Deloitte & Touche

Water Quality Estimates for Anvil Range Waste Rock

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1 Scope of Report

This report has been completed in conjunction with the development of a mine closure plan for the Anvil Range Mining Complex. The scope of work covered by this report addresses Task 13(b), Revise Waste Dump Water Quality Predictions, as outlined in the 2004/05 project scope of work. This work is a follow-up of work completed in 2003/04, and the objective is to update the water quality predictions to reflect:

- Additional data obtained from seepage and thermal monitoring collected in June and September 2004 for Task 12.
- Comments provided by stakeholders in relation to the 2003/04 report on ARD monitoring and laboratory studies.
- Re-visited interpretation of seepage chemistry and thermal data in October 2004.

This report presents estimates of contaminant concentrations in drainage from the waste rock and ore dumps at the Anvil Range Mining Complex. The concentration estimates are then used together with estimates of runoff and infiltration to predict overall contaminant loadings.

The water quality estimates are derived from the site geochemical investigation (SRK Report 1CD003.011.610, Geochemical Studies of Waste Rock at the Anvil Range Mining Complex – Phase 3 Report, hereinafter referred to as the "2004 Geochemistry Report"), and therefore represent the most current understanding of the site geochemistry. Estimates are presented for current average, current maximum and future worst case conditions.

Verification calculations using the kinetic test results and field monitoring results are also presented.

Waste rock dump water balances are currently being developed in a separate project. The runoff and infiltration estimates used herein rely on preliminary results from that work, and will need to be updated once results become available.

2 Background

2.1 Background of the Project

This project was initially conceived in program planning sessions carried out in 2002. At that time, the program of geochemical studies referred to above was being initiated, and it was recognized that the end result of the geochemical studies would be estimates of contaminant concentrations in water from the waste and ore dumps. However, it was decided that the process of developing the estimates could be better managed as a separate project.

The project was further discussed at the June 2003 planning workshop (Deloitte & Touche, 2003). A detailed scope of work for development of the water quality estimates was presented in a letter from SRK to Deloitte & Touche, dated September 8, 2003. The scope of work was authorized later in September 2003 (Task 14b).

A draft of that report was prepared in December 2003, and circulated to reviewers from the Type II Mines Project Office and Environment Canada. The current report incorporates suggestions from these reviewers and also makes more extensive use of data presented in the 2004 Geochemistry Report (Task 12) as support for the 'worst case future' prediction.

2.2 Project Objectives

The primary objective of the project was to develop estimates of contaminant concentrations in water draining from the waste rock and ore dumps at the Faro, Vangorda and Grum mines. The estimates are needed to provide a basis for assessing water collection and treatment requirements, and/or downstream water quality impacts.

Secondary objectives of the project were to incorporate the latest information from the 2004 Geochemistry Report, and to present the estimates in a simple and transparent form that can be used to assess various closure measures.

2.3 Project Team

The estimates presented herein were developed by John Chapman, Stephen Day, Daryl Hockley and Kelly Sexsmith. Those individuals were responsible for the geochemical studies referred to above, and have collectively developed water quality estimates for waste rock and ore at over 50 other mine sites.

3 Water Quality Predictions

3.1 Introduction

The work program for this project began with a review of data from geochemical testing program to identify the best methodology for estimating current and future water quality. Generally speaking, there are three ways to develop such estimates:

- *A priori* estimates based on comparison to experience elsewhere;
- Empirical estimates based on water quality measured through site seep surveys;
- Mechanistic predictions based on measurements of key parameters and processes

The first approach was rejected because it is inferior to the others in cases such as this, where site geochemistry and seepage data are available. The second and third approaches were both examined in detail and it was concluded that there are enough data available to support either method. However, the second approach better meets the objective of providing results in a form that is transparent and easy for others to modify in future.

The empirical approach was therefore adopted as the primary method for the estimates presented herein. The steps in the method are discussed in more detail in the following section. Results from the mechanistic approach are presented in a subsequent section, and used to provide support for some of the choices made in the application of the empirical method.

3.2 Seepage Quality Prediction (Empirical) Method

The steps used to estimate the dump drainage water quality and loadings using the seepage quality method are most easily explained by referencing the results tables.

A series of estimates have been prepared as discussed in the next section. The results for these estimates are presented in Tables 1 to 6.

Each table consists of five parts that lead to estimates of contaminant concentrations and loads in water draining from each waste rock or ore dump.

- Part 1 of each table presents summaries of contaminant concentrations measured in seeps from the relevant waste and ore dumps. The geochemical testing report presents the raw seepage data and the reasons for grouping seeps into a limited number of representative types.
- Part 2 of each table defines the water types that are to be used in the subsequent calculations. The selection is made from the Part 1 table.
- Part 3 of each table shows the proportion of each dump (or dump sector) that is assumed to produce water of each type. In some of the “current condition” cases, a single seep was clearly representative of the entire drainage from a dump. However, in most cases, the assignment of

drainage type proportions was based on a combination of results from the geochemical testing program and earlier inventories of rock types, as shown in the supporting information component of the table.

- Part 4 of each table calculates the estimates of contaminant concentrations in drainage from each dump (or dump sector). The estimates of contaminant concentrations are weighted averages of the Part 2 concentrations, with the weighting obtained from the proportions shown in Part 3.
- Part 5 of each table calculates the estimated annual loading of contaminants from each dump (or dump sector). The loading estimates are derived by multiplying the average concentrations by assumed drainage rates and plan areas. Drainage rates include both seepage and surface runoff, and are currently set at 45% of mean annual precipitation. This estimate will be revised when results of the dump water balance studies are available.

All of the above steps are completed in an Excel workbook. The workbook is set up to allow easy modification by others. Copies of the workbook are available upon request.

At this time, no distinction is made between water that exits the dumps as surface seeps and water that infiltrates to groundwater. That distinction will be needed to assess collection requirements and/or impacts, and will be made once results of the dump water balance project are available.

Also at this time, the estimates deal only with the current geometry of the dumps. The calculations are set up to easily incorporate the effects of dump re-sloping and/or covers, once the assessments of cover performance are available.

In support of the decision making process, the proportions of rock types and average rock type geochemical characteristics provided in the 2004 Geochemistry Report and were used to estimate the average acid generation properties for each of the areas delineated in the table. The estimated average acid generation properties for each dump are provided in Appendix A. These properties were used in selecting the changes in the Type Selection to estimate future seepage water quality from the dumps. The decision tree that was used in the assignment of seepage quality is provided in Appendix B. Additional discussion of anticipated changes in seepage quality from the dumps is provided in Section 5.5 of the 2004 Geochemistry Report.

3.3 Results and Discussion

Three different sets of estimates were prepared as follows:

Case 1. Current Average Estimates. The calculated average seep properties were adopted for these estimates. The water types were assigned based on the current understanding of each dump's geochemical composition. The results for the Faro waste rock and ore dump drainage are presented in Table 1 and the corresponding estimates for the Vangorda-Grum area are presented in Table 2.

Case 2. Current Maximum Estimates. The assumptions for these estimates were as in Case 1, but the maximum concentrations within each seep category were adopted. The results are provided in Tables 3 and 4.

Case 3. Worst Case Future Estimate. To develop these estimates, seepage proportions for the Faro waste rock and ore dumps were re-assigned as follows:

a. Drainage from material with an NNP of less than -50 kg$CaCO_3$ eq/tonne and a Zn content in excess of 0.5 % (5000 mg/kg) was assigned seep type "F3-Ore" quality.

b. Drainage from material with an NNP of less than -50 kg$CaCO_3$ eq/tonne and a Zn content of less than 0.5 % (5000 mg/kg) was assigned seep type "Other 1" quality.

c. Drainage from material with -15 > NNP > -50 kg$CaCO_3$ eq/tonne was assigned 50 % Type "F3-Waste" quality and the balance seep type "F2-Waste" quality.

d. Drainage from material with +15 > NNP > -15 kg$CaCO_3$ eq/tonne was assigned 20 % Type "F3-Waste" quality and the balance seep type "F2-Waste" quality.

e. The remainder of the material dumps were assigned 70 % seep type "F2-Waste" and the balance seep type "F1".

In all cases (a to e above), the maximum concentrations in each category were utilized. A similar approach was adopted for the assignment of seep types to the Grum-Vangorda area. The results for the Faro mining area are provided in Table 5, and Table 6 shows the results for the Grum-Vangorda mining area.

The average seep quality used in the Case 1 estimates results in an estimated sulphate loading of about 1,200 tonnes per year from the Faro waste rock and ore dumps (Table 1, Part 5). The maximum concentrations used in the Case 2 estimates result in an estimated sulphate loading of about 2,900 tonnes per year. The estimated acidity loading increases from about 550 tonnes (as $CaCO_3$eq) per year in Case 1 to about 2,000 tonnes (as $CaCO_3$ eq) per year in Case 2. The increase disproportional to the sulphate loading is indicative of a higher acidity loading that is observed at lower pH conditions. The range of loadings derived in Cases 1 and 2 provide an indication of current and near future loadings.

The future worst case estimates derived in Case 3 represent conditions when all the dumps that could become acidic do so at the same time. The sulphate loading is estimated to increase to about 12,000 tonnes per year, or about four times the estimated maximum current loading (Case 2).

The estimates derived by these methods represent the combined loadings to surface flows (measured in toe seeps) and flows that infiltrate to groundwater. It is not possible to compare these estimates directly to loadings that would be derived from seepage and surface water quality monitoring alone because travel times of contaminant loadings entering the groundwater system and surfacing in

downstream seeps and streams could be long. The assumptions also assume that steady state conditions have already been reached whereas this may not be the case. However, these estimates can be compared to similar estimates of total loadings at other ARD sites. The sulphate release rates expressed as tonnes of SO_4 per hectare per year for the various cases are as follows:

	tonnes SO_4/ha/year		
	Faro	**Grum**	**Vangorda**
Current Average	3.7	1.5	14
Current Maximum	8.8	2.4	27
Future Worst Case	36	13	31

Corresponding released rates that have been estimated at other sites are as follows:

	tonnes SO_4/ha/year
Equity Silver Main Dump - Uncovered	74
Equity Silver Main Dump - Covered*	< 38
Equity Silver Bessemer/Plant - Uncovered	54
Mines Doyon	29
Wismut - Nordhalde	9.2
Red Dog	3.0

(* -0.5m compacted + 0.3m un-compacted till; not at steady state)

This comparison shows that the upper end estimates for the Anvil Range Waste Rock are within the range in the literature. The only site with significantly higher loadings, Equity Silver Mine, has a very different geology and much more rainfall. Calculations are presented in the next section which further supports this conclusion.

4 Supporting Calculations

4.1 Oxidation Rate from Temperature and Pore-gas Monitoring

The oxygen and thermal monitoring provide a direct measure of the oxidation rate within the Anvil Range waste rock and ore dumps. The calculation of the oxidation rate from the thermal gradients is discussed in the 2004 Geochemistry Report. That report also discusses the interpretation of the pore gas oxygen profile as it pertains to the primary mechanism of oxygen transport. The results are summarised in Table 7.

The results summarised in Table 7 indicate that oxidation rates in the sulphide cell and high sulphide waste rock are much higher than in the low sulphur waste rock. As noted, the higher oxidation rates are sustainable only for conditions of advective airflow through the dumps. Other field observations (discussed in the 2004 Geochemical Report) support this conclusion.

Results from humidity cell tests completed on the waste rock indicate that, where oxygen supply is not limiting, there is a linear relationship between oxidation rate and sulphide content of the waste rock. Linear regressions were therefore completed to establish the correlation between i) the rate of sulphate production and sulphide mineral content, and, ii) the rate of AP depletion and sulphide mineral content, as shown below Table 7. These correlations were used to estimate sulphate production rates for all the waste rock and ore stockpile dumps, and to calculate rates NP and AP depletion.

Table 8 provides estimates of the primary sulphate production rates for each of the dumps. These estimates represent the total annual sulphate production within the waste rock and ore dumps; they do not reflect the loadings that are released from the dumps. Release rates are limited by flushing processes and solubility constraints. The leach extraction tests and sulphate analyses of the solids provide ample evidence that not all the sulphate generated is released from the waste rock dumps.

It is probable that oxygen supply to some high sulphide areas is controlled by diffusion processes, in which case the overall production rates in Table 8 will be overestimated. However, they do provide a calibration point by which the kinetic test results can be scaled to field conditions, as shown in the next section.

4.2 Kinetic Testing

A number of kinetic tests have been completed on various waste rock samples. The results from these tests were used to calculate the potential contaminant release rates from the waste rock as follows:

- Average solute release rates, reported as mg/kg/week, were calculated from the final cycles of the humidity cell tests. The results are summarised in Appendix C. Average release rates were calculated for each rock type and are shown in Table 9.

- The solute release rates were multiplied by the total mass of each waste rock type in each dump and corrected to a period of one year to yield an annual contaminant generation rate.

Calculations to this point provide an indication of the overall maximum rate of sulphide oxidation and resultant metal release, i.e. maximum potential overall contaminant generation, but do not address any field factors or differences between field and laboratory conditions. These include:

- **Surface Area**. The physical preparation of the samples tested in humidity cell tests varied. While some were crushed and for others only the fines fraction was tested, it is important to note that all tests were completed on the fines fraction only, which represents a high surface are per unit weight. The actual fines content of the waste rock per unit weight will be significantly lower than that of the samples tested. The fines content is expected to range from 0.1 to 0.3 (except in the Oxide Fines which will have a much higher fines content). Since the specific surface area (surface area per unit mass) increases inversely with particle size, and thus the area of available reactive surfaces, the lower proportion of fines in the waste rock compared to the samples tested will result in reduced rates of solute generation. Therefore, a correction is required to address this difference between the laboratory and field conditions.
- **Oxygen availability.** Oxygen availability will vary greatly from dump to dump, depending on the mechanism of oxygen supply. At Faro Main Dump there is clear evidence of thermally driven advective airflow through the dump, which results in a high oxygen supply. In contrast, evidence at the Grum Dump suggests diffusion control of oxygen entry. In either case, there are likely to be areas that are deficient in oxygen which will limit the oxidation rate. (In fact, the estimated sulphate production from the humidity cell calculations exceed those of the field determined oxidation rates shown in Table 8 by factors of 2.67, 1.77 and 1.52 for the Faro, Grum and Vangorda waste rock dumps respectively.) Some correction for this effect is therefore indicated. Therefore, the gross sulphate generation rates were calibrated to the calculated oxidation rates presented in the next section.

A single correction factor which addresses both the above in the calculation to determine the average annual generation rate load was as follows:

$$M_i = L_{\underline{HC})_i} * WR * t * CF / 1000$$

Where:

M_i = *loading of solute i in kg/year*
$L_{\underline{HC})_i}$ = *solute i production rate in the humidity cell (mg/kg/wk),*
WR = tonnes of waste rock in dump,
t = timeperiod (52 weeks)
CF = correction factor to scale from laboratory to field (includes factors such as particle size, temperature, oxygen availability etc.)

The correction factors to match the field determined sulphate generation rates are 0.103 at Faro, 0.073 at Grum and 0.091 at Vangorda.

The next step is to calculate the release rate, i.e. net loadings that are released to surface and groundwater, which requires that the difference between laboratory and field flushing be addressed.

- **Flushing**. The humidity cell tests are operated under conditions of high and frequent flushing which promotes the release of solutes generated from oxidation, which greatly exceeds field conditions. The lower infiltration rate in the field is expected to lead to the formation of selective flowpaths and thus a lower proportion of the waste rock will be contacted by infiltrating water which will limit solute release. (The fact that there is a net accumulation of oxidation products within the dumps provides ample evidence of this phenomenon.) Experience elsewhere indicates that only about 10% to 40% of the soluble loads that are generated are released to seepage. For the purpose of this calculation, conservatively a factor of 20% was adopted.

  $R_i = M_i * CC$

  Where:

  CC = correction for infiltration contact (0.2)

Estimates of average annual seepage quality were then calculated by dividing the annual loadings for each dump by the estimated annual infiltration to the dump.

4.3 NP and AP Depletion

Since a linear relationship exists between the sulphide content and the oxidation rate, it is possible to estimate the oxidation rate into the future when AP and NP are depleted from the dumps as follows:

$R(t) = R_0 * e^{(-kt)}$

Where:

R(t) = rate of oxidation or depletion (kg $CaCO_3$/tonne/year) at time t
R_0 = rate of oxidation or depletion (kg $CaCO_3$/tonne/year) at time = 0
k = rate constant (1/year)
t = time (year)

Tables 14 and 15 summarise the estimated time to NP depletion, i.e. time to the onset of acidic conditions. The results suggest that all the high sulphide dumps and cells are likely already acidic. The remainder of the dumps that are potentially net acid generating are expected to acidify in decades to centuries. The projected sulphate release rates with time are shown in Figure 1 for Faro and in Figure 2 for the Grum-Vangorda areas. In general, release rates are expected to increase from low levels to reach peak levels before declining according to the curves shown. The curves illustrate the expected change in release with time after the peak levels of release are achieved. Other factors that have not been accounted for include attenuation, travel time and solubility constraint.

Figure 3 illustrates the proportion of the release that is acidic at any one time in the future. For example, at year 200, the estimated release for Faro is about 10,000 tonnes SO_4 per year. Of this approximately 50 percent would be acidic, i.e. 5,000 tonnes would be contained in acidic seepage. At 250 years the release would decline to about 9,000 tonnes of SO_4, however, the proportion that would be acidic increases to about 90 percent, i.e. the sulphate loading associated with acidic seepage increases from about 5,000 tonnes per year to about 8,100 tonnes per year. Therefore, while the sulphate release would decrease, the acidic seepage would increase. These curves can be used to project future sulphate and acidic seepage loads.

4.4 Discussion

Results of water quality estimates from these calculations for the Faro Site are presented in Tables 10 and 11. The results for the Grum waste dumps are presented in Table 12 and those for the Vangorda dumps are shown in Table 13. Note that apart from a correction for gypsum formation, potential solubility constraints have not been applied to the water quality estimates. Not applying solubility constraints results in an overestimation of the total acidity and hence lime demand.

The supporting calculations provide an upper bound to the likely sulphate generation rates that might occur currently in the waste rock and ore dumps. Both the seepage calculations and the supporting calculations require a good understanding of the water balance of the dumps. A primary difference between the calculation methods is that using seepage water quality provides estimates of solute released from the dumps, whereas the supporting estimates of solutes generated within the dumps, which then rely on additional assumptions to estimate what is actually released. Nonetheless, the supporting calculations do suggest that the estimated future maximum loadings are reasonable:

	Sulphate Release (tonnes SO_4/year	
Site	**Seepage Method (Case 3)**	**Supporting Calculations**
Faro	12,104,000	15,800,000
Grum	1,640,000	600,000
Vangorda	1,324,000	560,000

5 Water Treatment Requirements

The theoretical lime demands were calculated for each case using two different methods as follows:

- Method 1 calculated the lime demand from the sum of the acidity, magnesium and zinc loadings (corrected to CaO equivalent). (This method did not apply to the supporting calculations).
- Method 2 derived the lime demand from the sum-total loadings of metals in solution together with the magnesium loading, corrected to CaO equivalent units.

The results are shown in Table 16 and indicate that the lime demand at Faro, should all of the infiltration from the dumps be captured and treated, could increase from about 500 tonnes CaO per year to in excess of 7,000 tonnes CaO per year. Using the curves shown in Figures 1 to 3, the time to reach this maximum demand could be in the order of 200 to 250 years.

Similarly, the lime demand at Grum-Vangorda could increase from about 300 tonnes to about 1,500 tonnes per year. The peak demand could occur within about 4 to 5 decades.

6 Conclusions and Recommendations

This project has resulted in water quality estimates that reflect the most current understanding of the geochemistry of waste and ore dumps at the Anvil Range Mining Complex. The estimates are developed in a "user-friendly" format that will allow for easy modifications to assess various closure measures.

Using seepage water quality to estimate overall solute loadings provides a reasonable estimate of current loadings from the waste rock and ore dumps. However, reliance on an 'average' seepage water quality may not accurately reflect loadings. For example, the acidity range within the Faro Type 3 seepage is from 227 to 49,500 mg$CaCO_3$ eq/L, with an average of 14,470 mg$CaCO_3$ eq/L. Even a marginal shift toward the upper bound of this range can significantly affect the estimated lime requirements.

The supporting calculations lend credence to the future worst case estimates. However, the calculations rely heavily on assumptions about the proportion of waste rock that is actually contacted by infiltrating water. Furthermore, to retain simplicity and transparency, the supporting calculations do not consider solubility controls. Therefore, estimates of lime demand derived by the supporting calculations represent an upper bound.

The current estimates should be updated once results from the dump water balance and dump cover assessments are available.

This Report, **Water Quality Estimates for Anvil Range Waste Rock**, 1CD003.50, was prepared by SRK Consulting (Canada) Inc.

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7 References

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Tables

TABLE 1. Faro Current Conditions

Table 1: Part 1 - Input seepage water quality summary from site data

Updated Statistics (from Kelly)

Type	Statistic	pH	Acidity	Alk	Cl	SO4	Ca	Mg	K	Na	Al	Cd	Co	Cu	Fe	Pb	Mn	Ni	Zn
Faro Type 1	Average	7.3	14	185	1.6	722	154	114	6.5	29	0.2	0.01	0.01	0.01	0.03	0.06	0.11	0.06	2.5
	Median	7.2	15	190.5	1.6	493	145	86	4.0	7.5	0.2	0.01	0.01	0.01	0.03	0.05	0.05	0.05	2.0
	Min	6.6	3	112	0.5	266	82.2	27	3.0	4.0	0.2	0.01	0.01	0.01	0.03	0.05	0.005	0.05	0.17
	Max	8.1	29	242	2.7	2470	263	378	24	122	0.2	0.01	0.01	0.01	0.03	0.15	0.422	0.09	5.3
	N	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Faro Type 2 Waste	Average	6.7	51	137	1.6	1701	288	231	7.9	16	0.3	0.03	0.052	0.04	1.9	0.06	4.9	0.17	26
	Median	6.8	46	71.5	1.3	1425	227	177	8.0	11	0.2	0.02	0.045	0.01	0.12	0.05	2.8	0.12	26
	Min	5.8	15	4	0.5	334	49.1	37	2.0	3.0	0.2	0.01	0.01	0.01	0.03	0.05	0.037	0.05	3.9
	Max	7.3	115	407	4.6	3860	628	584	15	122	1.6	0.09	0.15	0.5	20.2	0.23	19	0.6	51
	N	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
Faro Type 2 Ore	Average	6.5	601	242	12	3783	491	505	13	49	0.4	0.16	0.41	0.08	33	0.10	44	0.61	261
	Median	6.4	477	319.5	15	4285	529	635	14	54	0.4	0.07	0.45	0.05	31.95	0.075	49.5	0.63	221
	Min	6.2	37	13	0.7	962	272	51	7.0	11	0.2	0.01	0.03	0.01	0.09	0.05	3.84	0.05	13.7
	Max	7.0	2160	350	17.5	4600	576	694	17	69	0.6	0.62	0.53	0.3	89.9	0.2	54	0.9	595
	N	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Faro Type 3 Waste	Average	3.9	968	16	3.1	1614	173	161	6.4	7.5	15	0.16	0.30	2	76	0.36	10	0.56	109
	Median	3.4	177	1	0.60	1170	239	104	5.0	4.0	4.1	0.08	0.20	0.58	3.91	0.08	3.79	0.24	46.7
	Min	2.6	27	1	0.50	69	6.45	3.8	2.0	2.0	0.2	0.01	0.01	0.03	0.03	0.05	0.161	0.05	2.2
	Max	5.9	8750	92	23.8	4780	410	504	14	36	73	0.85	1.5	8.06	416	1.6	64.3	3.2	751
	N	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
Faro Type 3 Ore	Average	3.4	14470	6	126	17107	305	727	39	44	207	6.5	5.0	92	2773	1.5	388	3.9	4260
	Median	2.5	6550	1	2.9	7490	268	235	20	46	71	6.9	1.7	7.8	1040	1.78	125	1.5	2260
	Min	2.2	227	1	0.50	700	107	38.8	2.0	2.0	0.2	0.12	0.080	0.14	1.3	0.3	5.7	0.08	128
	Max	6.0	49500	31	1050	59000	504	3210	100	100	986	15.5	20	559	15100	3.0	2360	15	10900
	N	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
Others (average only)	FD04	2.4	30970	1.00	342	35523	378	1655	73	73	502	10	11	187	6748	2	936	7.7	6930
	FD05/06	7.2	12	204	1.9	462	133	95	3.9	6.9	0.20	0.010	0.010	0.010	0.030	0.05	0.044	0.05	2.2
	FD14	7.6	16	111	0.77	2050	211	283	18	121	0.20	0.013	0.013	0.027	0.317	0.05	0.14	0.07	6.0
	FD19	7.1	85	398	2.1	3680	601	558	10	20	0.25	0.013	0.055	0.038	0.785	0.063	18	0.31	45
	FD37	2.4	11700	1.0	0.50	14850	242	273	31	31	94	11.3	4.0	127	1410	1.3	149	4.1	6985
	FD40	4.3	98	10	0.57	386	42	46	2.0	2.7	2.8	0.05	0.09	0.37	2.2	0.08	2.3	0.093	35

Table 1: Part 2 - Select representative Seepage Types

Cut and paste rows from above

Seepage Type	Selection	pH	Acidity	Alk	Cl	SO4	Ca	Mg	K	Na	Al	Cd	Co	Cu	Fe	Pb	Mn	Ni	Zn
F1	Average	7.3	14	185	1.6	722	154	114	6.5	29	0.2	0.01	0.01	0.01	0.03	0.06	0.11	0.06	2.5
F2 Waste	Average	6.7	51	137	1.6	1701	288	231	7.9	16	0.3	0.03	0.052	0.04	1.9	0.06	4.9	0.17	26
F2 Ore	Average	6.5	601	242	12	3783	491	505	13	49	0.4	0.16	0.41	0.08	33	0.10	44	0.61	261
F3 Waste	Average	3.9	968	16	3.1	1614	173	161	6.4	7.5	15	0.16	0.30	2	76	0.36	10	0.56	109
F3 Ore	Average	3.4	14470	6	126	17107	305	727	39	44	207	6.5	5.0	92	2773	1.5	388	3.9	4260
Other 1	FD04	2.4	30970	1.00	342	35523	378	1655	73	73	502	10	11	187	6748	2	936	7.7	6930
Other 2	FD05/06	7.2	12	204	1.9	462	133	95	3.9	6.9	0.20	0.010	0.010	0.010	0.030	0.05	0.044	0.05	2.2
Other 3	FD14	7.6	16	111	0.77	2050	211	283	18	121	0.20	0.013	0.013	0.027	0.317	0.05	0.14	0.07	6.0
Other 4	FD19	7.1	85	398	2.1	3680	601	558	10	20	0.25	0.013	0.055	0.038	0.785	0.063	18	0.31	45
Other 5	FD37	2.4	11700	1.0	0.50	14850	242	273	31	31	94	11.3	4.0	127	1410	1.3	149	4.1	6985
Other 6	FD40	4.3	98	10	0.57	386	42	46	2.0	2.7	2.8	0.05	0.09	0.37	2.2	0.08	2.3	0.093	35

Table 1: Part 3 - Assign Seepage Types to each source area
Input fractions of seepage represented by each type

Source	Code	Current Seep Types (as fraction)												
		F1	F2 Waste	F2 Ore	F3 Waste	F3-ore	Other 1	Other 2	Other 3	Other 4	Other 5	Other 6	Check	Certainty
Faro Valley North	FVN				1								1.0	known
Faro Valley South	FVS				1								1.0	known
Medium Grade Stockpile	MGSP										1		1.0	known
Crusher Stockpile	CHSP					1							1.0	estimated
Oxide Fines Stockpile	OXSP						1						1.0	known
Low Grade Stockpile A	LGSPA					1							1.0	estimated
Upper Northwest Dump	NWU	0.7	0.2		0.1								1.0	estimated
Middle Northwest Dump	NWM	0.7	0.2		0.1								1.0	estimated
Lower Northwest Dump	NWL									1			1.0	known
Mt. Mungly West	MMW				1								1.0	estimated
Mt. Mungly East	MME				1								1.0	estimated
Fuel Tank Dump W	FTW				1								1.0	estimated
Fuel Tank Dump E	FTE		1										1.0	estimated
Upper Parking Lot Dump	UPL	0.95	0.05										1.0	known
Lower Parking Lot Dump	LPL	0.9	0.1										1.0	estimated
Stock Piles Base	SPB		1										1.0	estimated
Southwest Pit Wall Dump	SWPWD				1								1.0	estimated
Low Grade Stockpile C	LGSPC					1							1.0	estimated
Main East Sulphide Cell	MESC				1								1.0	estimated
Intermediate Dump Sulphide Cell	IDSC				1								1.0	estimated
Ranch Dump	RD	0.5	0.5										1.0	estimated
Ramp Zone Dump	RZD								1				1.0	known
Main Dump West	MDW		0.9		0.1								1.0	estimated
Main Dump East	MDE	0.4	0.4		0.2								1.0	estimated
Intermediate Dump	ID	0.5	0.3		0.2								1.0	estimated
Outer Haul Road West	OHRW	0.5	0.5										1.0	estimated
Outer Haul Road East	OHRE	0.4	0.6										1.0	estimated
Lower Northeast sulphide cell	NELS				1								1.0	estimated
Outer Northeast Dump	NEO	0.5	0.5										1.0	estimated
Zone II West	ZIIW	0.4	0.6										1.0	estimated
Zone II East	ZIIE	0.5	0.5										1.0	estimated
Lower Northeast Dump	NEL							1					1.0	known
Upper Northeast Dump	NEU							1					1.0	known

Supporting information

Proportion of rock types				
sulphides	schist	calc-sil	intru	Till
15%	50%	10%	15%	10%
0%	65%	0%	30%	5%
100%	0%	0%	0%	0%
100%	0%	0%	0%	0%
100%	0%	0%	0%	0%
100%	0%	0%	0%	0%
7%	15%	8%	65%	5%
10%	30%	40%	15%	5%
8%	37%	30%	15%	10%
50%	10%	20%	0%	20%
30%	40%	20%	10%	0%
100%	0%	0%	0%	0%
2%	60%	35%	3%	0%
5%	25%	70%	0%	0%
10%	5%	85%	0%	0%
0%	70%	10%	0%	20%
45%	50%	0%	5%	0%
100%	0%	0%	0%	0%
100%	0%	0%	0%	0%
100%	0%	0%	0%	0%
5%	85%	0%	10%	0%
2%	30%	68%	0%	0%
10%	75%	10%	0%	5%
15%	40%	35%	5%	5%
20%	20%	54%	1%	5%
2%	78%	10%	10%	0%
10%	70%	0%	5%	15%
100%				
0%	40%	40%	10%	10%
10%	50%	20%	10%	10%
0%	75%	20%	5%	0%
5%	30%	30%	10%	25%
5%	25%	30%	10%	30%

Table 1: Part 4 - Water Quality Estimates
Calculations are automatic

Source	Code	pH	Acidity mg/L	Alk mg/L	Cl mg/L	SO4 mg/L	Ca mg/L	Mg mg/L	K mg/L	Na mg/L	Al mg/L	Cd mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L	Mn mg/L	Ni mg/L	Zn mg/L
Faro Valley North	FVN		968	16	3.1	1614	173	161	6	8	14.8	0.16	0.30	2.05	76.33	0.36	9.98	0.56	109.5
Faro Valley South	FVS		968	16	3	1614	173	161	6	8	15	0.16	0.30	2	76	0.36	10	0.56	109
Medium Grade Stockpile	MGSP		11700	1	1	14850	242	273	31	31	94	11.30	4.02	127	1410	1.30	149	4.09	6985
Crusher Stockpile	CHSP		14470	6	126	17107	305	727	39	44	207	6.48	4.97	92	2773	1.48	388	3.88	4260
Oxide Fines Stockpile	OXSP		30970	1	342	35523	378	1655	73	73	502	9.65	10.62	187	6748	2.08	936	7.70	6930
Low Grade Stockpile A	LGSPA		14470	6	126	17107	305	727	39	44	207	6.48	4.97	92	2773	1.48	388	3.88	4260
Upper Northwest Dump	NWU		117	158	2	1007	182	143	7	24	2	0.03	0.05	0	8	0.09	2	0.13	18
Middle Northwest Dump	NWM		117	158	2	1007	182	143	7	24	2	0.03	0.05	0	8	0.09	2	0.13	18
Lower Northwest Dump	NWL		85	398	2	3680	601	558	10	20	0	0.01	0.06	0	1	0.06	18	0.31	45
Mt. Mungly West	MMW		968	16	3	1614	173	161	6	8	15	0.16	0.30	2	76	0.36	10	0.56	109
Mt. Mungly East	MME		968	16	3	1614	173	161	6	8	15	0.16	0.30	2	76	0.36	10	0.56	109
Fuel Tank Dump W	FTW		968	16	3	1614	173	161	6	8	15	0.16	0.30	2	76	0.36	10	0.56	109
Fuel Tank Dump E	FTE		51	137	2	1701	288	231	8	16	0	0.03	0.05	0	2	0.06	5	0.17	26
Upper Parking Lot Dump	UPL		16	182	2	771	160	120	7	28	0	0.01	0.01	0	0	0.06	0	0.06	4
Lower Parking Lot Dump	LPL		18	180	2	820	167	126	7	28	0	0.01	0.01	0	0	0.06	1	0.07	5
Stock Piles Base	SPB		51	137	2	1701	288	231	8	16	0	0.03	0.05	0	2	0.06	5	0.17	26
Southwest Pit Wall Dump	SWPWD		968	16	3	1614	173	161	6	8	15	0.16	0.30	2	76	0.36	10	0.56	109
Low Grade Stockpile C	LGSPC		14470	6	126	17107	305	727	39	44	207	6.48	4.97	92	2773	1.48	388	3.88	4260
Main East Sulphide Cell	MESC		968	16	3	1614	173	161	6	8	15	0.16	0.30	2	76	0.36	10	0.56	109
Intermediate Dump Sulphide Cell	IDSC		968	16	3	1614	173	161	6	8	15	0.16	0.30	2	76	0.36	10	0.56	109
Ranch Dump	RD		33	161	2	1212	221	173	7	22	0	0.02	0.03	0	1	0.06	3	0.11	14
Ramp Zone Dump	RZD		16	111	1	2050	211	283	18	121	0	0.01	0.01	0	0	0.05	0	0.07	6
Main Dump West	MDW		143	125	2	1693	276	224	8	15	2	0.04	0.08	0	9	0.09	5	0.20	34
Main Dump East	MDE		220	132	2	1292	211	171	7	19	3	0.05	0.08	0	16	0.12	4	0.20	33
Intermediate Dump	ID		216	137	2	1194	198	159	7	21	3	0.05	0.08	0	16	0.12	4	0.19	31
Outer Haul Road West	OHRW		33	161	2	1212	221	173	7	22	0	0.02	0.03	0	1	0.06	3	0.11	14
Outer Haul Road East	OHRE		36	156	2	1310	234	185	7	21	0	0.02	0.04	0	1	0.06	3	0.12	16
Lower Northeast sulphide cell	NELS		968	16	3	1614	173	161	6	8	15	0.16	0.30	2	76	0.36	10	0.56	109
Outer Northeast Dump	NEO		33	161	2	1212	221	173	7	22	0	0.02	0.03	0	1	0.06	3	0.11	14
Zone II West	ZIIW		36	156	2	1310	234	185	7	21	0	0.02	0.04	0	1	0.06	3	0.12	16
Zone II East	ZIIE		33	161	2	1212	221	173	7	22	0	0.02	0.03	0	1	0.06	3	0.11	14
Lower Northeast Dump	NEL		12	204	2	462	133	95	4	7	0	0.01	0.01	0	0	0.05	0	0.05	2
Upper Northeast Dump	NEU		12	204	2	462	133	95	4	7	0	0.01	0.01	0	0	0.05	0	0.05	2

Table 1: Part 5 - Load Estimates

Enter infiltration rates as percentage of Mean Annual Precipitation (see Project 1CD001.33)

Mean Annual Precipitation = 400 mm

Source	Code	Inf. %MAP	Acidity kg/yr	Alk kg/yr	Cl kg/yr	SO4 kg/yr	Ca kg/yr	Mg kg/yr	K kg/yr	Na kg/yr	Al kg/yr	Cd kg/yr	Co kg/yr	Cu kg/yr	Fe kg/yr	Pb kg/yr	Mn kg/yr	Ni kg/yr	Zn kg/yr
Faro Valley North	FVN	45%	23,680	384	75	39,477	4,235	3,947	157	184	362	3.9	7.3	50.2	1,867	8.9	244	13.6	2,677
Faro Valley South	FVS	45%	5,682	92	18	9,473	1,016	947	38	44	87	0.9	1.8	12.0	448	2.1	59	3.3	643
Medium Grade Stockpile	MGSP	45%	71,391	6	3	90,612	1,477	1,663	189	189	574	69.0	24.5	771.9	8,604	7.9	909	24.9	42,621
Crusher Stockpile	CHSP	45%	59,688	23	519	70,569	1,259	2,999	161	182	855	26.7	20.5	380.1	11,438	6.1	1,601	16.0	17,571
Oxide Fines Stockpile	OXSP	45%	115,913	4	1,280	132,951	1,414	6,194	271	271	1,878	36.1	39.7	698.9	25,254	7.8	3,503	28.8	25,937
Low Grade Stockpile A	LGSPA	45%	76,451	29	665	90,387	1,612	3,841	206	233	1,095	34.3	26.2	486.9	14,650	7.8	2,051	20.5	22,505
Upper Northwest Dump	NWU	45%	2,712	3,672	41	23,362	4,231	3,305	157	561	39	0.7	1.1	5.1	186	2.1	48	3.0	414
Middle Northwest Dump	NWM	45%	3,328	4,505	50	28,663	5,191	4,056	193	688	48	0.8	1.3	6.3	229	2.5	59	3.6	507
Lower Northwest Dump	NWL	45%	1,621	7,559	40	69,985	11,434	10,612	181	371	5	0.2	1.0	0.7	15	1.2	338	5.8	860
Mt. Mungly West	MMW	45%	3,536	57	11	5,894	632	589	23	27	54	0.6	1.1	7.5	279	1.3	36	2.0	400
Mt. Mungly East	MME	45%	5,948	96	19	9,917	1,064	992	39	46	91	1.0	1.8	12.6	469	2.2	61	3.4	673
Fuel Tank Dump W	FTW	45%	1,459	24	5	2,432	261	243	10	11	22	0.2	0.5	3.1	115	0.5	15	0.8	165
Fuel Tank Dump E	FTE	45%	887	2,396	29	29,670	5,018	4,034	138	277	5	0.5	0.9	0.8	33	1.1	86	2.9	449
Upper Parking Lot Dump	UPL	45%	155	1,763	16	7,458	1,551	1,163	64	273	2	0.1	0.1	0.1	1	0.5	3	0.6	35
Lower Parking Lot Dump	LPL	45%	105	1,060	10	4,832	984	743	39	163	1	0.1	0.1	0.1	1	0.3	3	0.4	28
Stock Piles Base	SPB	45%	835	2,257	27	27,947	4,727	3,800	130	261	4	0.5	0.9	0.7	31	1.0	81	2.7	423
Southwest Pit Wall Dump	SWPWD	45%	13,645	221	43	22,748	2,440	2,275	90	106	208	2.2	4.2	28.9	1,076	5.1	141	7.9	1,543
Low Grade Stockpile C	LGSPC	45%	89,953	34	782	106,350	1,897	4,519	242	274	1,289	40.3	30.9	572.9	17,237	9.2	2,413	24.1	26,480
Main East Sulphide Cell	MESC	45%	14,083	228	45	23,479	2,519	2,348	93	110	215	2.3	4.4	29.8	1,110	5.3	145	8.1	1,592
Intermediate Dump Sulphide Cell	IDSC	45%	16,180	262	51	26,974	2,894	2,697	107	126	247	2.7	5.0	34.3	1,276	6.1	167	9.3	1,829
Ranch Dump	RD	45%	248	1,226	12	9,229	1,681	1,317	55	171	2	0.2	0.2	0.2	7	0.5	19	0.8	107
Ramp Zone Dump	RZD	45%	170	1,208	8	22,238	2,285	3,066	195	1,313	2	0.1	0.1	0.3	3	0.5	2	0.8	65
Main Dump West	MDW	45%	5,668	4,979	71	67,295	10,985	8,919	309	598	68	1.7	3.0	9.7	371	3.7	217	8.1	1,356
Main Dump East	MDE	45%	14,048	8,440	123	82,644	13,506	10,910	451	1,243	201	3.1	5.4	27.6	1,025	7.7	257	12.8	2,122
Intermediate Dump	ID	45%	12,778	8,087	113	70,657	11,700	9,400	409	1,227	186	2.7	4.8	25.3	937	7.1	209	11.2	1,825
Outer Haul Road West	OHRW	45%	1,095	5,419	55	40,782	7,427	5,818	243	754	8	0.7	1.0	0.9	32	2.0	85	3.7	475
Outer Haul Road East	OHRE	45%	565	2,438	26	20,428	3,651	2,879	115	329	4	0.3	0.5	0.5	18	0.9	47	1.9	256
Lower Northeast sulphide cell	NELS	45%	3,043	49	10	5,073	544	507	20	24	46	0.5	0.9	6.4	240	1.1	31	1.8	344
Outer Northeast Dump	NEO	45%	75	371	4	2,789	508	398	17	52	1	0.0	0.1	0.1	2	0.1	6	0.3	32
Zone II West	ZIIW	45%	582	2,513	26	21,058	3,764	2,968	118	339	4	0.4	0.6	0.5	18	1.0	48	2.0	264
Zone II East	ZIIE	45%	739	3,655	37	27,505	5,009	3,924	164	509	5	0.5	0.7	0.6	22	1.4	57	2.5	320
Lower Northeast Dump	NEL	45%	610	10,028	93	22,715	6,510	4,670	189	337	10	0.5	0.5	0.5	1	2.5	2	2.6	106
Upper Northeast Dump	NEU	45%	569	9,345	86	21,168	6,067	4,352	177	314	9	0.5	0.5	0.5	1	2.3	2	2.4	99

Total Loadings

Subtotal Area F1	29,362	476	93	48,950	5,251	4,895	194	228	448	5	9	62	2,315	11	302	17	3,320
Subtotal Area F2	344,031	23,452	2,714	594,680	40,854	44,234	1,801	3,554	4,673	171	120	2,375	61,304	42	8,796	116	112,588
Subtotal Area F3	168,435	32,545	1,330	492,824	60,985	54,148	2,309	6,250	2,430	56	60	730	23,093	48	3,701	89	37,652
Subtotal Area F4	5,618	25,961	256	100,308	22,402	16,819	685	1,574	75	2	3	9	285	8	147	11	1,165
TOTAL	547,446	82,434	4,393	1,236,763	129,493	120,096	4,990	11,607	7,627	234	192	3,176	86,997	110	12,947	233	154,725

Area weighted concentrations

Subtotal Area F1	968	16	3	1614	173	161	6	8	15	0	0	2	76	0	10	1	109
Subtotal Area F2	2284	156	18	3948	271	294	12	24	31	1	1	16	407	0	58	1	747
Subtotal Area F3	597	115	5	1747	216	192	8	22	9	0	0	3	82	0	13	0	133
Subtotal Area F4	40	187	2	721	161	121	5	11	1	0	0	0	2	0	1	0	8

TABLE 2. Vangorda/Grum Current Conditions
Table 2: Part 1 - Input seepage water quality summary from site data
Updated Statistics (from JTC)

Type	Statistic	pH	Acidity	Alk	Cl	SO4	Ca	Mg	K	Na	Al	Cd	Co	Cu	Fe	Pb	Mn	Ni	Zn
Vangorda/Grum Type 1a	Average	7.46	10	325	1.6	255	137	56	2.4	2.6	0.20	0.01	0.01	0.01	0.03	0.05	0.16	0.05	0.009
	Median	7.47	6.0	338	1.7	313	153	64	2.0	3.0	0.20	0.01	0.01	0.01	0.03	0.05	0.005	0.05	0.005
	Min	7.85	1.0	186	0.50	7.0	45	24	2.0	2.0	0.20	0.01	0.01	0.01	0.03	0.05	0.005	0.05	0.005
	Max	6.87	40	405	2.5	575	219	81	4.0	4.0	0.20	0.01	0.01	0.01	0.03	0.05	1.9	0.07	0.028
	N	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
Vangorda/Grum Type 1b	Average	7.29	23	526	2.1	1093	323	205	7.1	10	0.20	0.01	0.01	0.01	0.03	0.05	0.10	0.38	3.0
	Median	7.31	19	546	2.2	1165	337	210	7.0	11	0.20	0.01	0.01	0.01	0.03	0.05	0.056	0.38	2.7
	Min	7.84	1.0	278	0.90	593	201	108	3.0	4.0	0.20	0.01	0.01	0.01	0.03	0.05	0.005	0.22	1.7
	Max	6.67	69	700	2.8	1350	380	347	10	16	0.20	0.01	0.03	0.01	0.03	0.05	0.43	0.59	5.1
	N	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
Vangorda/GrumType 2	Average	6.44	352	134	0.77	2878	351	374	9.0	8.2	0.28	0.11	1.4	0.01	40	0.08	67	2.6	184
	Median	6.34	203	144	0.60	2785	399	389	11	10	0.20	0.09	0.85	0.01	2.9	0.09	39	2.0	107
	Min	7.08	53	27	0.50	766	199	54	2.0	2.0	0.20	0.05	0.06	0.01	0.03	0.05	3.7	0.14	23
	Max	6.03	755	289	1.3	4440	436	602	13	13	0.40	0.28	3.0	0.02	127	0.10	139	5.3	412
	N	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Vangorda/Grum Type 3	Average	4.08	6279	26	1.4	15482	432	1624	12	8.7	40	3.5	9.5	29	706	1.0	996	8.0	2948
	Median	3.67	2550	3.0	0.50	13100	445	721	10	4.0	14	1.2	6.0	0.69	243	0.70	232	7.0	1650
	Min	6.21	581	1.0	0.50	2470	196	105	4.0	4.0	0.40	0.45	0.75	0.07	0.12	0.10	18	1.1	352
	Max	2.55	16500	160	11	33400	528	3490	20	20	339	8.5	22	180	3040	2.5	2600	17	6990
	N	13	13	13	13	13	13	13	7	7	12	13	13	7	13	7	13	13	13
Faro Type 2 Waste	Average	6.7	51	137	1.6	1701	288	231	7.9	16	0.3	0.03	0.052	0.04	1.9	0.06	4.9	0.17	26
	Median	6.8	46	71.5	1.3	1425	227	177	8.0	11	0.2	0.02	0.045	0.01	0.12	0.05	2.8	0.12	26
	Min	5.8	15	4	0.5	334	49.1	37	2.0	3.0	0.2	0.01	0.01	0.01	0.03	0.05	0.037	0.05	3.9
	Max	7.3	115	407	4.6	3860	628	584	15	122	1.6	0.09	0.15	0.5	20.2	0.23	19	0.6	51
	N	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
Faro Type 3 Waste	Average	3.9	968	16	3.1	1614	173	161	6.4	7.5	15	0.16	0.30	2	76	0.36	10	0.56	109
	Median	3.4	177	1	0.60	1170	239	104	5.0	4.0	4.1	0.08	0.20	0.58	3.91	0.08	3.79	0.24	46.7
	Min	2.6	27	1	0.50	69	6.45	3.8	2.0	2.0	0.2	0.01	0.01	0.03	0.03	0.05	0.161	0.05	2.2
	Max	5.9	8750	92	23.8	4780	410	504	14	36	73	0.85	1.5	8.06	416	1.6	64.3	3.2	751
	N	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
Other																			

Table 2: Part 2 - Select representative Seepage Types
Cut and paste rows from above

Seepage Type	Selection	pH	Acidity	Alk	Cl	SO4	Ca	Mg	K	Na	Al	Cd	Co	Cu	Fe	Pb	Mn	Ni	Zn
G1a	Average	7.5	10	325	1.6	255	137	56	2.4	3	0.2	0.01	0.01	0.01	0.03	0.05	0.16	0.05	0.0
G1b	Average	7.3	23	526	2.1	1093	323	205	7.1	10	0.2	0.01	0.011	0.01	0.0	0.05	0.1	0.38	3
V2	Average	6.4	352	134	1	2878	351	374	9	8	0.3	0.11	1.37	0.01	40	0.08	67	2.57	184
V3	Average	4.1	6279	26	1.4	15482	432	1624	11.6	8.7	40	3.53	9.52	29	706	1.03	996	8.03	2948
F2waste	Average	6.7	51	137	2	1701	288	231	8	16	0.3	0.03	0.05	0.04	2	0.06	5	0.2	26
F3waste	Average	3.9	968	16	3	1614	173	161	6	8	15	0.2	0.3	2.1	76	0.36	10	0.6	109
Other 6	0	0.0	0	0	0.00	0	0	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.00	0.0	0.000	0

Table 2: Part 3 - Assign Seepage Types to each source area
Input fractions of seepage represented by each type

Source	Code	Current Seep Types (as fraction)												
		G1a	G1b	V2	V3	F2waste	F3waste	Other 2	Other 3	Other 4	Other 5	Other 6	Check	Certainty
Grum Main Sulphide Cell	G1-S		1										1.0	
Grum Main Dump	G1-B		1										1.0	
Grum Southwest Dump	G2	1											1.0	
Overburden Dump	G3-O	1											1.0	
Vangorda Main Sulphide Cell	V1-S				1								1.0	
Vangorda Main Dump	V1-B			0.8	0.2								1.0	
Baritic Fines Dump	V2				1								1.0	
Overburden Dump	V3-O		0.9	0.1									1.0	

Supporting information

Proportion of rock types			
sulphides	Non-Calc Phyl	Calc Phyl	OB
100%			
	15%	85%	
	15%	85%	
			100%
100%			
	91%	9%	
	100%		
			100%

Table 2: Part 4 - Water Quality Estimates
Calculations are automatic

Source	Code	pH	Acidity mg/L	Alk mg/L	Cl mg/L	SO4 mg/L	Ca mg/L	Mg mg/L	K mg/L	Na mg/L	Al mg/L	Cd mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L	Mn mg/L	Ni mg/L	Zn mg/L
Grum Main Sulphide Cell	G1-S		23	526	2	1093	323	205	7	10	0	0.01	0.01	0	0	0.05	0	0.38	3
Grum Main Dump	G1-B		23	526	2	1093	323	205	7	10	0	0.01	0.01	0	0	0.05	0	0.38	3
Grum Southwest Dump	G2		10	325	2	255	137	56	2	3	0	0.01	0.01	0	0	0.05	0	0.05	0
Overburden Dump	G3-O		10	325	2	255	137	56	2	3	0	0.01	0.01	0	0	0.05	0	0.05	0
Vangorda Main Sulphide Cell	V1-S		6279	26	1	15482	432	1624	12	9	40	3.53	9.52	29	706	1.03	996	8.03	2948
Vangorda Main Dump	V1-B		1537	112	1	5399	367	624	10	8	8	0.79	3.00	6	173	0.27	253	3.66	737
Baritic Fines Dump	V2		6279	26	1	15482	432	1624	12	9	40	3.53	9.52	29	706	1.03	996	8.03	2948
Overburden Dump	V3-O		56	487	2	1272	326	222	7	10	0	0.02	0.15	0	4	0.05	7	0.60	21

Table 2: Part 5 - Load Estimates
Enter infiltration rates as percentage of Mean Annual Precipitation (see Project 1CD001.33)
Grum MAP = 450 mm
Vangorda MAP = 380 mm

Source	Code	Inf. %MAP	Acidity kg/yr	Alk kg/yr	Cl kg/yr	SO4 kg/yr	Ca kg/yr	Mg kg/yr	K kg/yr	Na kg/yr	Al kg/yr	Cd kg/yr	Co kg/yr	Cu kg/yr	Fe kg/yr	Pb kg/yr	Mn kg/yr	Ni kg/yr	Zn kg/yr
Grum Main Sulphide Cell	G1-S	45%	838	19,181	77	39,852	11,790	7,488	259	379	7	0.4	0.4	0.4	1	1.8	4	13.9	108
Grum Main Dump	G1-B	45%	2,072	47,399	190	98,481	29,134	18,505	641	936	18	0.9	1.0	0.9	3	4.5	9	34.2	267
Grum Southwest Dump	G2	45%	1,343	42,980	217	33,792	18,116	7,411	315	346	26	1.3	1.3	1.3	4	6.6	21	6.8	1
Overburden Dump	G3-O	45%	947	30,315	153	23,835	12,778	5,227	222	244	19	0.9	0.9	0.9	3	4.7	15	4.8	1
Vangorda Main Sulphide Cell	V1-S	45%	98,774	402	22	243,568	6,799	25,556	182	137	629	55.5	149.8	454.4	11,102	16.2	15,671	126.3	46,385
Vangorda Main Dump	V1-B	45%	86,053	6,274	50	302,246	20,555	34,945	533	465	460	44.3	167.8	324.1	9,711	15.0	14,169	204.9	41,264
Baritic Fines Dump	V2	45%	9,448	38	2	23,298	650	2,444	17	13	60	5.3	14.3	43.5	1,062	1.5	1,499	12.1	4,437
Overburden Dump	V3-O	45%	437	3,810	15	9,951	2,552	1,739	57	80	2	0.2	1.1	0.1	32	0.4	53	4.7	165

Total Loadings

Grum			5,201	139,875	636	195,960	71,817	38,631	1,438	1,904	70	4	4	4	11	18	48	60	377
Vangorda			194,712	10,524	90	579,062	30,556	64,685	789	695	1,151	105	333	822	21,907	33	31,393	348	92,251

TABLE 3. Faro Current Conditions

Table 3: Part 1 - Input seepage water quality summary from site data

Updated Statistics (from Kelly)

Type	Statistic	pH	Acidity	Alk	Cl	SO4	Ca	Mg	K	Na	Al	Cd	Co	Cu	Fe	Pb	Mn	Ni	Zn
Faro Type 1	Average	7.3	14	185	1.6	722	154	114	6.5	29	0.2	0.01	0.01	0.01	0.03	0.06	0.11	0.06	2.5
	Median	7.2	15	190.5	1.6	493	145	86	4.0	7.5	0.2	0.01	0.01	0.01	0.03	0.05	0.05	0.05	2.0
	Min	6.6	3	112	0.5	266	82.2	27	3.0	4.0	0.2	0.01	0.01	0.01	0.03	0.05	0.005	0.05	0.17
	Max	8.1	29	242	2.7	2470	263	378	24	122	0.2	0.01	0.01	0.01	0.03	0.15	0.422	0.09	5.3
	N	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Faro Type 2 Waste	Average	6.7	51	137	1.6	1701	288	231	7.9	16	0.3	0.03	0.052	0.04	1.9	0.06	4.9	0.17	26
	Median	6.8	46	71.5	1.3	1425	227	177	8.0	11	0.2	0.02	0.045	0.01	0.12	0.05	2.8	0.12	26
	Min	5.8	15	4	0.5	334	49.1	37	2.0	3.0	0.2	0.01	0.01	0.01	0.03	0.05	0.037	0.05	3.9
	Max	7.3	115	407	4.6	3860	628	584	15	122	1.6	0.09	0.15	0.5	20.2	0.23	19	0.6	51
	N	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
Faro Type 2 Ore	Average	6.5	601	242	12	3783	491	505	13	49	0.4	0.16	0.41	0.08	33	0.10	44	0.61	261
	Median	6.4	477	319.5	15	4285	529	635	14	54	0.4	0.07	0.45	0.05	31.95	0.075	49.5	0.63	221
	Min	6.2	37	13	0.7	962	272	51	7.0	11	0.2	0.01	0.03	0.01	0.09	0.05	3.84	0.05	13.7
	Max	7.0	2160	350	17.5	4600	576	694	17	69	0.6	0.62	0.53	0.3	89.9	0.2	54	0.9	595
	N	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Faro Type 3 Waste	Average	3.9	968	16	3.1	1614	173	161	6.4	7.5	15	0.16	0.30	2	76	0.36	10	0.56	109
	Median	3.4	177	1	0.60	1170	239	104	5.0	4.0	4.1	0.08	0.20	0.58	3.91	0.08	3.79	0.24	46.7
	Min	2.6	27	1	0.50	69	6.45	3.8	2.0	2.0	0.2	0.01	0.01	0.03	0.03	0.05	0.161	0.05	2.2
	Max	5.9	8750	92	23.8	4780	410	504	14	36	73	0.85	1.5	8.06	416	1.6	64.3	3.2	751
	N	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
Faro Type 3 Ore	Average	3.4	14470	6	126	17107	305	727	39	44	207	6.5	5.0	92	2773	1.5	388	3.9	4260
	Median	2.5	6550	1	2.9	7490	268	235	20	46	71	6.9	1.7	7.8	1040	1.78	125	1.5	2260
	Min	2.2	227	1	0.50	700	107	38.8	2.0	2.0	0.2	0.12	0.080	0.14	1.3	0.3	5.7	0.08	128
	Max	6.0	49500	31	1050	59000	504	3210	100	100	986	15.5	20	559	15100	3.0	2360	15	10900
	N	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
Others (average only)	FD04	2.4	30970	1.00	342	35523	378	1655	73	73	502	10	11	187	6748	2	936	7.7	6930
	FD05/06	7.2	12	204	1.9	462	133	95	3.9	6.9	0.20	0.010	0.010	0.010	0.030	0.05	0.044	0.05	2.2
	FD14	7.6	16	111	0.77	2050	211	283	18	121	0.20	0.013	0.013	0.027	0.317	0.05	0.14	0.07	6.0
	FD19	7.1	85	398	2.1	3680	601	558	10	20	0.25	0.013	0.055	0.038	0.785	0.063	18	0.31	45
	FD37	2.4	11700	1.0	0.50	14850	242	273	31	31	94	11.3	4.0	127	1410	1.3	149	4.1	6985
	FD40	4.3	98	10	0.57	386	42	46	2.0	2.7	2.8	0.05	0.09	0.37	2.2	0.08	2.3	0.093	35

Table 3: Part 2 - Select representative Seepage Types

Cut and paste rows from above

Seepage Type	Selection	pH	Acidity	Alk	Cl	SO4	Ca	Mg	K	Na	Al	Cd	Co	Cu	Fe	Pb	Mn	Ni	Zn
F1	Max	6.6	29	242	2.7	2470	263	378	24	122	0.2	0.01	0.01	0.01	0.03	0.15	0.422	0.09	5.3
F2 Waste	Max	7.3	115	407	4.6	3860	628	584	15	122	1.6	0.09	0.15	0.5	20.2	0.23	19	0.6	51
F2 Ore	Max	7.0	2160	350	17.5	4600	576	694	17	69	0.6	0.62	0.53	0.3	89.9	0.2	54	0.9	595
F3 Waste	Max	5.9	8750	92	23.8	4780	410	504	14	36	73	0.85	1.5	8.06	416	1.6	64.3	3.2	751
F3 Ore	Max	6.0	49500	31	1050	59000	504	3210	100	100	986	15.5	20.0	559	15100	3.0	2360	15.0	10900
Other 1	FD04	2.4	30970	1.00	342	35523	378	1655	73	73	502	10	11	187	6748	2	936	7.7	6930
Other 2	FD05/06	7.2	12	204	1.9	462	133	95	3.9	6.9	0.20	0.010	0.010	0.010	0.030	0.05	0.044	0.05	2.2
Other 3	FD14	7.6	16	111	0.77	2050	211	283	18	121	0.20	0.013	0.013	0.027	0.317	0.05	0.14	0.07	6.0
Other 4	FD19	7.1	85	398	2.1	3680	601	558	10	20	0.25	0.013	0.055	0.038	0.785	0.063	18	0.31	45
Other 5	FD37	2.4	11700	1.0	0.50	14850	242	273	31	31	94	11.3	4.0	127	1410	1.3	149	4.1	6985
Other 6	FD40	4.3	98	10	0.57	386	42	46	2.0	2.7	2.8	0.05	0.09	0.37	2.2	0.08	2.3	0.093	35

Table 3: Part 3 - Assign Seepage Types to each source area
Input fractions of seepage represented by each type

Source	Code	Current Seep Types (as fraction)												
		F1	F2 Waste	F2 Ore	F3 Waste	F3-ore	Other 1	Other 2	Other 3	Other 4	Other 5	Other 6	Check	Certainty
Faro Valley North	FVN				1								1.0	known
Faro Valley South	FVS				1								1.0	known
Medium Grade Stockpile	MGSP										1		1.0	known
Crusher Stockpile	CHSP					1							1.0	estimated
Oxide Fines Stockpile	OXSP						1						1.0	known
Low Grade Stockpile A	LGSPA					1							1.0	estimated
Upper Northwest Dump	NWU	0.7	0.2		0.1								1.0	estimated
Middle Northwest Dump	NWM	0.7	0.2		0.1								1.0	estimated
Lower Northwest Dump	NWL									1			1.0	known
Mt. Mungly West	MMW				1								1.0	estimated
Mt. Mungly East	MME				1								1.0	estimated
Fuel Tank Dump W	FTW				1								1.0	estimated
Fuel Tank Dump E	FTE		1										1.0	estimated
Upper Parking Lot Dump	UPL	0.95	0.05										1.0	known
Lower Parking Lot Dump	LPL	0.9	0.1										1.0	estimated
Stock Piles Base	SPB		1										1.0	estimated
Southwest Pit Wall Dump	SWPWD				1								1.0	estimated
Low Grade Stockpile C	LGSPC					1							1.0	estimated
Main East Sulphide Cell	MESC				1								1.0	estimated
Intermediate Dump Sulphide Cell	IDSC				1								1.0	estimated
Ranch Dump	RD	0.5	0.5										1.0	estimated
Ramp Zone Dump	RZD								1				1.0	known
Main Dump West	MDW		0.9		0.1								1.0	estimated
Main Dump East	MDE	0.4	0.4		0.2								1.0	estimated
Intermediate Dump	ID	0.5	0.3		0.2								1.0	estimated
Outer Haul Road West	OHRW	0.5	0.5										1.0	estimated
Outer Haul Road East	OHRE	0.4	0.6										1.0	estimated
Lower Northeast sulphide cell	NELS				1								1.0	estimated
Outer Northeast Dump	NEO	0.5	0.5										1.0	estimated
Zone II West	ZIIW	0.4	0.6										1.0	estimated
Zone II East	ZIIE	0.5	0.5										1.0	estimated
Lower Northeast Dump	NEL							1					1.0	known
Upper Northeast Dump	NEU							1					1.0	known

Supporting information

Proportion of rock types				
sulphides	schist	calc-sil	intru	Till
15%	50%	10%	15%	10%
0%	65%	0%	30%	5%
100%	0%	0%	0%	0%
100%	0%	0%	0%	0%
100%	0%	0%	0%	0%
100%	0%	0%	0%	0%
7%	15%	8%	65%	5%
10%	30%	40%	15%	5%
8%	37%	30%	15%	10%
50%	10%	20%	0%	20%
30%	40%	20%	10%	0%
100%	0%	0%	0%	0%
2%	60%	35%	3%	0%
5%	25%	70%	0%	0%
10%	5%	85%	0%	0%
0%	70%	10%	0%	20%
45%	50%	0%	5%	0%
100%	0%	0%	0%	0%
100%	0%	0%	0%	0%
100%	0%	0%	0%	0%
5%	85%	0%	10%	0%
2%	30%	68%	0%	0%
10%	75%	10%	0%	5%
15%	40%	35%	5%	5%
20%	20%	54%	1%	5%
2%	78%	10%	10%	0%
10%	70%	0%	5%	15%
100%				
0%	40%	40%	10%	10%
10%	50%	20%	10%	10%
0%	75%	20%	5%	0%
5%	30%	30%	10%	25%
5%	25%	30%	10%	30%

Table 3: Part 4 - Water Quality Estimates
Calculations are automatic

Source	Code	pH	Acidity mg/L	Alk mg/L	Cl mg/L	SO4 mg/L	Ca mg/L	Mg mg/L	K mg/L	Na mg/L	Al mg/L	Cd mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L	Mn mg/L	Ni mg/L	Zn mg/L
Faro Valley North	FVN		8750	92	23.8	4780	410	504	14	36	73.0	0.85	1.53	8.06	416.00	1.60	64.30	3.20	751.0
Faro Valley South	FVS		8750	92	24	4780	410	504	14	36	73	0.85	1.53	8	416	1.60	64	3.20	751
Medium Grade Stockpile	MGSP		11700	1	1	14850	242	273	31	31	94	11.30	4.02	127	1410	1.30	149	4.09	6985
Crusher Stockpile	CHSP		49500	31	1050	59000	504	3210	100	100	986	15.50	20.00	559	15100	3.00	2360	15.00	10900
Oxide Fines Stockpile	OXSP		30970	1	342	35523	378	1655	73	73	502	9.65	10.62	187	6748	2.08	936	7.70	6930
Low Grade Stockpile A	LGSPA		49500	31	1050	59000	504	3210	100	100	986	15.50	20.00	559	15100	3.00	2360	15.00	10900
Upper Northwest Dump	NWU		918	260	5	2979	351	432	21	113	8	0.11	0.19	1	46	0.31	11	0.50	89
Middle Northwest Dump	NWM		918	260	5	2979	351	432	21	113	8	0.11	0.19	1	46	0.31	11	0.50	89
Lower Northwest Dump	NWL		85	398	2	3680	601	558	10	20	0	0.01	0.06	0	1	0.06	18	0.31	45
Mt. Mungly West	MMW		8750	92	24	4780	410	504	14	36	73	0.85	1.53	8	416	1.60	64	3.20	751
Mt. Mungly East	MME		8750	92	24	4780	410	504	14	36	73	0.85	1.53	8	416	1.60	64	3.20	751
Fuel Tank Dump W	FTW		8750	92	24	4780	410	504	14	36	73	0.85	1.53	8	416	1.60	64	3.20	751
Fuel Tank Dump E	FTE		115	407	5	3860	628	584	15	122	2	0.09	0.15	1	20	0.23	19	0.60	51
Upper Parking Lot Dump	UPL		33	250	3	2540	281	388	24	122	0	0.01	0.02	0	1	0.15	1	0.12	8
Lower Parking Lot Dump	LPL		38	259	3	2609	300	399	23	122	0	0.02	0.02	0	2	0.16	2	0.14	10
Stock Piles Base	SPB		115	407	5	3860	628	584	15	122	2	0.09	0.15	1	20	0.23	19	0.60	51
Southwest Pit Wall Dump	SWPWD		8750	92	24	4780	410	504	14	36	73	0.85	1.53	8	416	1.60	64	3.20	751
Low Grade Stockpile C	LGSPC		49500	31	1050	59000	504	3210	100	100	986	15.50	20.00	559	15100	3.00	2360	15.00	10900
Main East Sulphide Cell	MESC		8750	92	24	4780	410	504	14	36	73	0.85	1.53	8	416	1.60	64	3.20	751
Intermediate Dump Sulphide Cell	IDSC		8750	92	24	4780	410	504	14	36	73	0.85	1.53	8	416	1.60	64	3.20	751
Ranch Dump	RD		72	325	4	3165	446	481	20	122	1	0.05	0.08	0	10	0.19	10	0.35	28
Ramp Zone Dump	RZD		16	111	1	2050	211	283	18	121	0	0.01	0.01	0	0	0.05	0	0.07	6
Main Dump West	MDW		979	376	7	3952	606	576	15	113	9	0.17	0.29	1	60	0.37	24	0.86	121
Main Dump East	MDE		1808	278	8	3488	438	486	18	105	15	0.21	0.37	2	91	0.47	21	0.92	173
Intermediate Dump	ID		1799	262	7	3349	402	465	19	105	15	0.20	0.36	2	89	0.46	19	0.87	168
Outer Haul Road West	OHRW		72	325	4	3165	446	481	20	122	1	0.05	0.08	0	10	0.19	10	0.35	28
Outer Haul Road East	OHRE		81	341	4	3304	482	502	19	122	1	0.06	0.09	0	12	0.20	12	0.40	33
Lower Northeast sulphide cell	NELS		8750	92	24	4780	410	504	14	36	73	0.85	1.53	8	416	1.60	64	3.20	751
Outer Northeast Dump	NEO		72	325	4	3165	446	481	20	122	1	0.05	0.08	0	10	0.19	10	0.35	28
Zone II West	ZIIW		81	341	4	3304	482	502	19	122	1	0.06	0.09	0	12	0.20	12	0.40	33
Zone II East	ZIIE		72	325	4	3165	446	481	20	122	1	0.05	0.08	0	10	0.19	10	0.35	28
Lower Northeast Dump	NEL		12	204	2	462	133	95	4	7	0	0.01	0.01	0	0	0.05	0	0.05	2
Upper Northeast Dump	NEU		12	204	2	462	133	95	4	7	0	0.01	0.01	0	0	0.05	0	0.05	2

Table 3: Part 5 - Load Estimates

Enter infiltration rates as percentage of Mean Annual Precipitation (see Project 1CD001.33)

Mean Annual Precipitation = 400 mm

Source	Code	Inf. %MAP	Acidity kg/yr	Alk kg/yr	Cl kg/yr	SO4 kg/yr	Ca kg/yr	Mg kg/yr	K kg/yr	Na kg/yr	Al kg/yr	Cd kg/yr	Co kg/yr	Cu kg/yr	Fe kg/yr	Pb kg/yr	Mn kg/yr	Ni kg/yr	Zn kg/yr
Faro Valley North	FVN	45%	213,994	2,250	582	116,902	10,027	12,326	342	880	1,785	20.8	37.4	197.1	10,174	39.1	1,573	78.3	18,367
Faro Valley South	FVS	45%	51,353	540	140	28,053	2,406	2,958	82	211	428	5.0	9.0	47.3	2,441	9.4	377	18.8	4,408
Medium Grade Stockpile	MGSP	45%	71,391	6	3	90,612	1,477	1,663	189	189	574	69.0	24.5	771.9	8,604	7.9	909	24.9	42,621
Crusher Stockpile	CHSP	45%	204,190	128	4,331	243,379	2,079	13,241	413	413	4,067	63.9	82.5	2,305.9	62,288	12.4	9,735	61.9	44,963
Oxide Fines Stockpile	OXSP	45%	115,913	4	1,280	132,951	1,414	6,194	271	271	1,878	36.1	39.7	698.9	25,254	7.8	3,503	28.8	25,937
Low Grade Stockpile A	LGSPA	45%	261,535	164	5,548	311,729	2,663	16,960	528	528	5,210	81.9	105.7	2,953.5	79,781	15.9	12,469	79.3	57,591
Upper Northwest Dump	NWU	45%	21,295	6,029	120	69,083	8,133	10,013	492	2,630	180	2.6	4.4	21.2	1,059	7.2	245	11.7	2,065
Middle Northwest Dump	NWM	45%	26,128	7,398	148	84,760	9,978	12,286	603	3,227	221	3.1	5.4	26.0	1,299	8.8	301	14.3	2,534
Lower Northwest Dump	NWL	45%	1,621	7,559	40	69,985	11,434	10,612	181	371	5	0.2	1.0	0.7	15	1.2	338	5.8	860
Mt. Mungly West	MMW	45%	31,952	336	87	17,455	1,497	1,840	51	131	267	3.1	5.6	29.4	1,519	5.8	235	11.7	2,742
Mt. Mungly East	MME	45%	53,755	565	146	29,365	2,519	3,096	86	221	448	5.2	9.4	49.5	2,556	9.8	395	19.7	4,614
Fuel Tank Dump W	FTW	45%	13,186	139	36	7,203	618	760	21	54	110	1.3	2.3	12.1	627	2.4	97	4.8	1,132
Fuel Tank Dump E	FTE	45%	2,005	7,097	80	67,312	10,951	10,184	262	2,127	28	1.6	2.6	8.7	352	4.0	337	10.5	895
Upper Parking Lot Dump	UPL	45%	322	2,420	27	24,554	2,719	3,754	228	1,180	3	0.1	0.2	0.3	10	1.5	13	1.1	73
Lower Parking Lot Dump	LPL	45%	221	1,523	17	15,368	1,764	2,348	136	719	2	0.1	0.1	0.3	12	0.9	14	0.8	58
Stock Piles Base	SPB	45%	1,889	6,685	76	63,401	10,315	9,592	246	2,004	26	1.5	2.5	8.2	332	3.8	317	9.9	843
Southwest Pit Wall Dump	SWPWD	45%	123,313	1,297	335	67,364	5,778	7,103	197	507	1,029	12.0	21.6	113.6	5,863	22.5	906	45.1	10,584
Low Grade Stockpile C	LGSPC	45%	307,725	193	6,527	366,783	3,133	19,955	622	622	6,130	96.4	124.3	3,475.1	93,872	18.6	14,671	93.2	67,762
Main East Sulphide Cell	MESC	45%	127,272	1,338	346	69,527	5,964	7,331	204	524	1,062	12.4	22.3	117.2	6,051	23.3	935	46.5	10,924
Intermediate Dump Sulphide Cell	IDSC	45%	146,221	1,537	398	79,878	6,851	8,422	234	602	1,220	14.2	25.6	134.7	6,952	26.7	1,075	53.5	12,550
Ranch Dump	RD	45%	548	2,471	28	24,101	3,392	3,663	148	929	7	0.4	0.6	1.9	77	1.4	75	2.6	215
Ramp Zone Dump	RZD	45%	170	1,208	8	22,238	2,285	3,066	195	1,313	2	0.1	0.1	0.3	3	0.5	2	0.8	65
Main Dump West	MDW	45%	38,900	14,928	259	157,112	24,099	22,899	592	4,508	347	6.6	11.4	49.9	2,377	14.6	946	34.2	4,821
Main Dump East	MDE	45%	115,589	17,777	491	223,045	28,034	31,052	1,177	6,702	980	13.4	23.7	116.1	5,838	30.2	1,327	58.6	11,052
Intermediate Dump	ID	45%	106,415	15,468	443	198,101	23,773	27,506	1,142	6,199	898	11.9	21.1	104.5	5,281	27.4	1,116	51.2	9,951
Outer Haul Road West	OHRW	45%	2,423	10,919	123	106,501	14,991	16,185	656	4,105	30	1.7	2.7	8.6	340	6.4	332	11.6	952
Outer Haul Road East	OHRE	45%	1,257	5,318	60	51,529	7,517	7,823	290	1,903	16	0.9	1.5	4.7	189	3.1	183	6.2	513
Lower Northeast sulphide cell	NELS	45%	27,498	289	75	15,022	1,288	1,584	44	113	229	2.7	4.8	25.3	1,307	5.0	202	10.1	2,360
Outer Northeast Dump	NEO	45%	166	747	8	7,285	1,025	1,107	45	281	2	0.1	0.2	0.6	23	0.4	23	0.8	65
Zone II West	ZIIW	45%	1,296	5,482	62	53,117	7,749	8,064	299	1,961	17	0.9	1.5	4.9	195	3.2	189	6.4	529
Zone II East	ZIIE	45%	1,634	7,365	83	71,830	10,111	10,916	443	2,769	20	1.1	1.8	5.8	230	4.3	224	7.8	642
Lower Northeast Dump	NEL	45%	610	10,028	93	22,715	6,510	4,670	189	337	10	0.5	0.5	0.5	1	2.5	2	2.6	106
Upper Northeast Dump	NEU	45%	569	9,345	86	21,168	6,067	4,352	177	314	9	0.5	0.5	0.5	1	2.3	2	2.4	99

Total Loadings

Subtotal Area F1	265,347	2,790	722	144,955	12,433	15,284	425	1,092	2,214	26	46	244	12,615	49	1,950	97	22,774
Subtotal Area F2	805,404	40,052	11,939	1,227,156	67,561	102,544	3,707	14,065	13,018	270	286	6,887	183,708	89	28,908	285	186,927
Subtotal Area F3	969,834	72,454	9,019	1,366,179	125,819	155,006	5,457	27,913	11,721	170	255	4,127	126,842	175	21,568	403	129,387
Subtotal Area F4	31,773	33,255	407	191,137	32,750	30,693	1,196	5,775	288	6	9	38	1,758	18	642	30	3,800
TOTAL	2,072,358	148,552	22,087	2,929,426	238,564	303,527	10,785	48,844	27,240	471	596	11,295	324,924	331	53,068	816	342,889

Area weighted concentrations

Subtotal Area F1	8750	92	24	4780	410	504	14	36	73	1	2	8	416	2	64	3	751
Subtotal Area F2	5347	266	79	8146	449	681	25	93	86	2	2	46	1220	1	192	2	1241
Subtotal Area F3	3438	257	32	4842	446	549	19	99	42	1	1	15	450	1	76	1	459
Subtotal Area F4	228	239	3	1374	235	221	9	42	2	0	0	0	13	0	5	0	27

TABLE 4. Vangorda/Grum Current Conditions

Table 4: Part 1 - Input seepage water quality summary from site data

Updated Statistics (from JTC)

Type	Statistic	pH	Acidity	Alk	Cl	SO4	Ca	Mg	K	Na	Al	Cd	Co	Cu	Fe	Pb	Mn	Ni	Zn
Vangorda/Grum Type 1a	Average	7.46	10	325	1.6	255	137	56	2.4	2.6	0.20	0.01	0.01	0.01	0.03	0.05	0.16	0.05	0.009
	Median	7.47	6.0	338	1.7	313	153	64	2.0	3.0	0.20	0.01	0.01	0.01	0.03	0.05	0.005	0.05	0.005
	Min	7.85	1.0	186	0.50	7.0	45	24	2.0	2.0	0.20	0.01	0.01	0.01	0.03	0.05	0.005	0.05	0.005
	Max	6.87	40	405	2.5	575	219	81	4.0	4.0	0.20	0.01	0.01	0.01	0.03	0.05	1.9	0.07	0.028
	N	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
Vangorda/Grum Type 1b	Average	7.29	23	526	2.1	1093	323	205	7.1	10	0.20	0.01	0.01	0.01	0.03	0.05	0.10	0.38	3.0
	Median	7.31	19	546	2.2	1165	337	210	7.0	11	0.20	0.01	0.01	0.01	0.03	0.05	0.056	0.38	2.7
	Min	7.84	1.0	278	0.90	593	201	108	3.0	4.0	0.20	0.01	0.01	0.01	0.03	0.05	0.005	0.22	1.7
	Max	6.67	69	700	2.8	1350	380	347	10	16	0.20	0.01	0.03	0.01	0.03	0.05	0.43	0.59	5.1
	N	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
Vangorda/GrumType 2	Average	6.44	352	134	0.77	2878	351	374	9.0	8.2	0.28	0.11	1.4	0.01	40	0.08	67	2.6	184
	Median	6.34	203	144	0.60	2785	399	389	11	10	0.20	0.09	0.85	0.01	2.9	0.09	39	2.0	107
	Min	7.08	53	27	0.50	766	199	54	2.0	2.0	0.20	0.05	0.06	0.01	0.03	0.05	3.7	0.14	23
	Max	6.03	755	289	1.3	4440	436	602	13	13	0.40	0.28	3.0	0.02	127	0.10	139	5.3	412
	N	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Vangorda/Grum Type 3	Average	4.08	6279	26	1.4	15482	432	1624	12	8.7	40	3.5	9.5	29	706	1.0	996	8.0	2948
	Median	3.67	2550	3.0	0.50	13100	445	721	10	4.0	14	1.2	6.0	0.69	243	0.70	232	7.0	1650
	Min	6.21	581	1.0	0.50	2470	196	105	4.0	4.0	0.40	0.45	0.75	0.07	0.12	0.10	18	1.1	352
	Max	2.55	16500	160	11	33400	528	3490	20	20	339	8.5	22	180	3040	2.5	2600	17	6990
	N	13	13	13	13	13	13	13	7	7	12	13	13	7	13	7	13	13	13
Faro Type 2 Waste	Average	6.7	51	137	1.6	1701	288	231	7.9	16	0.3	0.03	0.052	0.04	1.9	0.06	4.9	0.17	26
	Median	6.8	46	71.5	1.3	1425	227	177	8.0	11	0.2	0.02	0.045	0.01	0.12	0.05	2.8	0.12	26
	Min	5.8	15	4	0.5	334	49.1	37	2.0	3.0	0.2	0.01	0.01	0.01	0.03	0.05	0.037	0.05	3.9
	Max	7.3	115	407	4.6	3860	628	584	15	122	1.6	0.09	0.15	0.5	20.2	0.23	19	0.6	51
	N	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
Faro Type 3 Waste	Average	3.9	968	16	3.1	1614	173	161	6.4	7.5	15	0.16	0.30	2	76	0.36	10	0.56	109
	Median	3.4	177	1	0.60	1170	239	104	5.0	4.0	4.1	0.08	0.20	0.58	3.91	0.08	3.79	0.24	46.7
	Min	2.6	27	1	0.50	69	6.45	3.8	2.0	2.0	0.2	0.01	0.01	0.03	0.03	0.05	0.161	0.05	2.2
	Max	5.9	8750	92	23.8	4780	410	504	14	36	73	0.85	1.5	8.06	416	1.6	64.3	3.2	751
	N	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
Other																			

Table 4: Part 2 - Select representative Seepage Types

Cut and paste rows from above

Seepage Type	Selection	pH	Acidity	Alk	Cl	SO4	Ca	Mg	K	Na	Al	Cd	Co	Cu	Fe	Pb	Mn	Ni	Zn
G1a	Max	6.87	40	405	2.5	575	219	81	4.0	4.0	0.20	0.01	0.01	0.01	0.03	0.05	1.9	0.07	0.028
G1b	Max	6.67	69	700	2.8	1350	380	347	10	16	0.20	0.01	0.03	0.01	0.03	0.05	0.43	0.59	5.1
V2	Max	6.03	755	289	1.3	4440	436	602	13	13	0.40	0.28	3.0	0.02	127	0.10	139	5.3	412
V3	Max	2.55	16500	160	11	33400	528	3490	20	20	339	8.5	22	180	3040	2.5	2600	17	6990
F2waste	Max	7.3	115	407	4.6	3860	628	584	15	122	1.6	0.09	0.15	0.5	20.2	0.23	19	0.6	51
F3waste	Max	5.9	8750	92	23.8	4780	410	504	14	36	73	0.85	1.5	8.06	416	1.6	64.3	3.2	751
Other 6	0	0.0	0	0	0.00	0	0	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.00	0.0	0.000	0

Table 4: Part 3 - Assign Seepage Types to each source area

Input fractions of seepage represented by each type

Source	Code	Current Seep Types (as fraction)												
		G1a	G1b	V2	V3	F2waste	F3waste	Other 2	Other 3	Other 4	Other 5	Other 6	Check	Certainty
Grum Main Sulphide Cell	G1-S		1										1.0	
Grum Main Dump	G1-B		1										1.0	
Grum Southwest Dump	G2	1											1.0	
Overburden Dump	G3-O	1											1.0	
Vangorda Main Sulphide Cell	V1-S				1								1.0	
Vangorda Main Dump	V1-B			0.8	0.2								1.0	
Baritic Fines Dump	V2				1								1.0	
Overburden Dump	V3-O		0.9	0.1									1.0	

Supporting information

Proportion of rock types			
sulphides	Non-Calc Phyl	Calc Phyl	OB
100%			
	15%	85%	
	15%	85%	
			100%
100%			
	91%	9%	
	100%		
			100%

Table 4: Part 4 - Water Quality Estimates
Calculations are automatic

Source	Code	pH	Acidity mg/L	Alk mg/L	Cl mg/L	SO4 mg/L	Ca mg/L	Mg mg/L	K mg/L	Na mg/L	Al mg/L	Cd mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L	Mn mg/L	Ni mg/L	Zn mg/L
Grum Main Sulphide Cell	G1-S		69	700	3	1350	380	347	10	16	0	0.01	0.03	0	0	0.05	0	0.59	5
Grum Main Dump	G1-B		69	700	3	1350	380	347	10	16	0	0.01	0.03	0	0	0.05	0	0.59	5
Grum Southwest Dump	G2		40	405	3	575	219	81	4	4	0	0.01	0.01	0	0	0.05	2	0.07	0
Overburden Dump	G3-O		40	405	3	575	219	81	4	4	0	0.01	0.01	0	0	0.05	2	0.07	0
Vangorda Main Sulphide Cell	V1-S		16500	160	11	33400	528	3490	20	20	339	8.50	22.30	180	3040	2.50	2600	17.00	6990
Vangorda Main Dump	V1-B		3904	263	3	10232	454	1180	14	14	68	1.92	6.85	36	710	0.58	631	7.64	1728
Baritic Fines Dump	V2		16500	160	11	33400	528	3490	20	20	339	8.50	22.30	180	3040	2.50	2600	17.00	6990
Overburden Dump	V3-O		138	659	3	1659	386	373	10	16	0	0.04	0.33	0	13	0.06	14	1.06	46

Table 4: Part 5 - Load Estimates
Enter infiltration rates as percentage of Mean Annual Precipitation (see Project 1CD001.33)
Grum MAP = 450 mm
Vangorda MAP = 380 mm

Source	Code	Inf. %MAP	Acidity kg/yr	Alk kg/yr	Cl kg/yr	SO4 kg/yr	Ca kg/yr	Mg kg/yr	K kg/yr	Na kg/yr	Al kg/yr	Cd kg/yr	Co kg/yr	Cu kg/yr	Fe kg/yr	Pb kg/yr	Mn kg/yr	Ni kg/yr	Zn kg/yr
Grum Main Sulphide Cell	G1-S	45%	2,515	25,515	102	49,208	13,851	12,648	365	583	7	0.4	1.1	0.4	1	1.8	15	21.5	185
Grum Main Dump	G1-B	45%	6,215	63,052	252	121,600	34,228	31,256	901	1,441	18	0.9	2.7	0.9	3	4.5	38	53.1	457
Grum Southwest Dump	G2	45%	5,291	53,573	331	76,060	28,969	10,688	529	529	26	1.3	1.3	1.3	4	6.6	254	9.3	4
Overburden Dump	G3-O	45%	3,732	37,786	233	53,647	20,433	7,539	373	373	19	0.9	0.9	0.9	3	4.7	179	6.5	3
Vangorda Main Sulphide Cell	V1-S	45%	259,578	2,517	173	525,449	8,306	54,905	315	315	5,333	133.7	350.8	2,831.8	47,825	39.3	40,903	267.4	109,967
Vangorda Main Dump	V1-B	45%	218,565	14,735	181	572,837	25,440	66,040	806	806	3,814	107.7	383.6	2,016.4	39,727	32.5	35,338	427.7	96,719
Baritic Fines Dump	V2	45%	24,829	241	17	50,260	795	5,252	30	30	510	12.8	33.6	270.9	4,575	3.8	3,912	25.6	10,519
Overburden Dump	V3-O	45%	1,077	5,155	21	12,980	3,017	2,914	81	123	2	0.3	2.6	0.1	100	0.4	112	8.3	358

Total Loadings

Grum			17,753	179,926	918	300,515	97,481	62,131	2,168	2,927	70	4	6	4	11	18	487	90	648
Vangorda			504,049	22,648	392	1,161,527	37,558	129,111	1,232	1,274	9,659	255	771	5,119	92,226	76	80,265	729	217,563

TABLE 5. Faro Future Practical Worst Conditions
Table 5: Part 1 - Input seepage water quality summary from site data
Updated Statistics (from Kelly)

Type	Stat	pH	Acidity	Alk	Cl	SO4	Ca	Mg	K	Na	Al	Cd	Co	Cu	Fe	Pb	Mn	Ni	Zn
Faro Type 1	Average	7.3	14	185	1.6	722	154	114	6.5	29	0.2	0.01	0.01	0.01	0.03	0.06	0.11	0.06	2.5
	Median	7.2	15	190.5	1.6	493	145	86	4.0	7.5	0.2	0.01	0.01	0.01	0.03	0.05	0.05	0.05	2.0
	Min	6.6	3	112	0.5	266	82.2	27	3.0	4.0	0.2	0.01	0.01	0.01	0.03	0.05	0.005	0.05	0.17
	Max	8.1	29	242	2.7	2470	263	378	24	122	0.2	0.01	0.01	0.01	0.03	0.15	0.422	0.09	5.3
	N	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Faro Type 2 Waste	Average	6.7	51	137	1.6	1701	288	231	7.9	16	0.3	0.03	0.052	0.04	1.9	0.06	4.9	0.17	26
	Median	6.8	46	71.5	1.3	1425	227	177	8.0	11	0.2	0.02	0.045	0.01	0.12	0.05	2.8	0.12	26
	Min	5.8	15	4	0.5	334	49.1	37	2.0	3.0	0.2	0.01	0.01	0.01	0.03	0.05	0.037	0.05	3.9
	Max	7.3	115	407	4.6	3860	628	584	15	122	1.6	0.09	0.15	0.5	20.2	0.23	19	0.6	51
	N	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
Faro Type 2 Ore	Average	6.5	601	242	12	3783	491	505	13	49	0.4	0.16	0.41	0.08	33	0.10	44	0.61	261
	Median	6.4	477	319.5	15	4285	529	635	14	54	0.4	0.07	0.45	0.05	31.95	0.075	49.5	0.63	221
	Min	6.2	37	13	0.7	962	272	51	7.0	11	0.2	0.01	0.03	0.01	0.09	0.05	3.84	0.05	13.7
	Max	7.0	2160	350	17.5	4600	576	694	17	69	0.6	0.62	0.53	0.3	89.9	0.2	54	0.9	595
	N	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Faro Type 3 Waste	Average	3.9	968	16	3.1	1614	173	161	6.4	7.5	15	0.16	0.30	2	76	0.36	10	0.56	109
	Median	3.4	177	1	0.60	1170	239	104	5.0	4.0	4.1	0.08	0.20	0.58	3.91	0.08	3.79	0.24	46.7
	Min	2.6	27	1	0.50	69	6.45	3.8	2.0	2.0	0.2	0.01	0.01	0.03	0.03	0.05	0.161	0.05	2.2
	Max	5.9	8750	92	23.8	4780	410	504	14	36	73	0.85	1.5	8.06	416	1.6	64.3	3.2	751
	N	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
Faro Type 3 Ore	Average	3.4	14470	6	126	17107	305	727	39	44	207	6.5	5.0	92	2773	1.5	388	3.9	4260
	Median	2.5	6550	1	2.9	7490	268	235	20	46	71	6.9	1.7	7.8	1040	1.78	125	1.5	2260
	Min	2.2	227	1	0.50	700	107	38.8	2.0	2.0	0.2	0.12	0.080	0.14	1.3	0.3	5.7	0.08	128
	Max	6.0	49500	31	1050	59000	504	3210	100	100	986	15.5	20	559	15100	3.0	2360	15	10900
	N	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
Others (average only)	FD04	2.4	30970	1.00	342	35523	378	1655	73	73	502	10	11	187	6748	2	936	7.7	6930
	FD05/06	7.2	12	204	1.9	462	133	95	3.9	6.9	0.20	0.010	0.010	0.010	0.030	0.05	0.044	0.05	2.2
	FD14	7.6	16	111	0.77	2050	211	283	18	121	0.20	0.013	0.013	0.027	0.317	0.05	0.14	0.07	6.0
	FD19	7.1	85	398	2.1	3680	601	558	10	20	0.25	0.013	0.055	0.038	0.785	0.063	18	0.31	45
	FD37	2.4	11700	1.0	0.50	14850	242	273	31	31	94	11.3	4.0	127	1410	1.3	149	4.1	6985
	FD40	4.3	98	10	0.57	386	42	46	2.0	2.7	2.8	0.05	0.09	0.37	2.2	0.08	2.3	0.093	35

Table 5: Part 2 - Select representative Seepage Types
Cut and paste rows from above

Seepage Type	Selection	pH	Acidity	Alk	Cl	SO4	Ca	Mg	K	Na	Al	Cd	Co	Cu	Fe	Pb	Mn	Ni	Zn
F1	Max	8.1	29	242	2.7	2470	263	378	24	122	0.2	0.01	0.01	0.01	0.03	0.15	0.422	0.09	5.3
F2 Waste	Max	5.8	115	407	4.6	3860	628	584	15	122	1.6	0.09	0.15	0.5	20.2	0.23	19	0.6	51
F2 Ore	Max	6.2	2160	350	17.5	4600	576	694	17	69	0.6	0.62	0.53	0.3	89.9	0.2	54	0.9	595
F3 Waste	Max	2.2	8750	92	23.8	4780	410	504	14	36	73	0.85	1.5	8.06	416	1.6	64.3	3.2	751
F3 Ore	Max	2.2	49500	31	1050	59000	504	3210	100	100	986	15.5	20	559	15100	3.0	2360	15	10900
Other 1	FD04	2.4	30970	1.00	342	35523	378	1655	73	73	502	10	11	187	6748	2	936	7.7	6930
Other 2	FD05/06	7.2	12	204	1.9	462	133	95	3.9	6.9	0.20	0.010	0.010	0.010	0.030	0.05	0.044	0.05	2.2
Other 3	FD14	7.6	16	111	0.77	2050	211	283	18	121	0.20	0.013	0.013	0.027	0.317	0.05	0.14	0.07	6.0
Other 4	FD19	7.1	85	398	2.1	3680	601	558	10	20	0.25	0.013	0.055	0.038	0.785	0.063	18	0.31	45
Other 5	FD37	2.4	11700	1.0	0.50	14850	242	273	31	31	94	11.3	4.0	127	1410	1.3	149	4.1	6985
Other 6	FD40	4.3	98	10	0.57	386	42	46	2.0	2.7	2.8	0.05	0.09	0.37	2.2	0.08	2.3	0.093	35

Table 5: Part 3 - Assign Seepage Types to each source area
Input fractions of seepage represented by each type

Source	Code	Current Seep Types (as fraction)												
		F1	F2 Waste	F2 Ore	F3 Waste	F3-ore	Other 1	Other 2	Other 3	Other 4	Other 5	Other 6	Check	Certainty
Faro Valley North	FVN						1						1.0	
Faro Valley South	FVS		0.8		0.2								1.0	
Medium Grade Stockpile	MGSP					1							1.0	
Crusher Stockpile	CHSP					1							1.0	
Oxide Fines Stockpile	OXSP					1							1.0	
Low Grade Stockpile A	LGSPA					1							1.0	
Upper Northwest Dump	NWU		0.5		0.5								1.0	
Middle Northwest Dump	NWM		0.5		0.5								1.0	
Lower Northwest Dump	NWL		0.5		0.5								1.0	
Mt. Mungly West	MMW						1						1.0	
Mt. Mungly East	MME						1						1.0	
Fuel Tank Dump W	FTW											1	1.0	
Fuel Tank Dump E	FTE		0.8		0.2								1.0	
Upper Parking Lot Dump	UPL		0.8		0.2								1.0	
Lower Parking Lot Dump	LPL		0.5		0.5								1.0	
Stock Piles Base	SPB		0.8		0.2								1.0	
Southwest Pit Wall Dump	SWPWD						1						1.0	
Low Grade Stockpile C	LGSPC					1							1.0	
Main East Sulphide Cell	MESC						1						1.0	
Intermediate Dump Sulphide Ce	IDSC						1						1.0	
Ranch Dump	RD		0.5		0.5								1.0	
Ramp Zone Dump	RZD	0.7	0.3										1.0	
Main Dump West	MDW						1						1.0	
Main Dump East	MDE						1						1.0	
Intermediate Dump	ID						1						1.0	
Outer Haul Road West	OHRW		0.5		0.5								1.0	
Outer Haul Road East	OHRE						1						1.0	
Lower Northeast sulphide cell	NELS						1						1.0	
Outer Northeast Dump	NEO	0.5	0.5										1.0	
Zone II West	ZIIW		0.2		0.8								1.0	
Zone II East	ZIIE		0.8		0.2								1.0	
Lower Northeast Dump	NEL		0.5		0.5								1.0	
Upper Northeast Dump	NEU		0.5		0.5								1.0	

Supporting information

Proportion of rock types				
sulphides	schist	calc-sil	intru	Till
15%	50%	10%	15%	10%
0%	65%	0%	30%	5%
100%	0%	0%	0%	0%
100%	0%	0%	0%	0%
100%	0%	0%	0%	0%
100%	0%	0%	0%	0%
7%	15%	8%	65%	5%
10%	30%	40%	15%	5%
8%	37%	30%	15%	10%
50%	10%	20%	0%	20%
30%	40%	20%	10%	0%
100%	0%	0%	0%	0%
2%	60%	35%	3%	0%
5%	25%	70%	0%	0%
10%	5%	85%	0%	0%
0%	70%	10%	0%	20%
45%	50%	0%	5%	0%
100%	0%	0%	0%	0%
100%	0%	0%	0%	0%
100%	0%	0%	0%	0%
5%	85%	0%	10%	0%
2%	30%	68%	0%	0%
10%	75%	10%	0%	5%
15%	40%	35%	5%	5%
20%	20%	54%	1%	5%
2%	78%	10%	10%	0%
10%	70%	0%	5%	15%
100%				
0%	40%	40%	10%	10%
10%	50%	20%	10%	10%
0%	75%	20%	5%	0%
5%	30%	30%	10%	25%
5%	25%	30%	10%	30%

Table 5: Part 4 - Water Quality Estimates
Calculations are automatic

Source	Code	pH	Acidity mg/L	Alk mg/L	Cl mg/L	SO4 mg/L	Ca mg/L	Mg mg/L	K mg/L	Na mg/L	Al mg/L	Cd mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L	Mn mg/L	Ni mg/L	Zn mg/L
Faro Valley North	FVN		30970	1	342.1	35523	378	1655	73	73	501.8	9.65	10.62	186.73	6747.50	2.08	936.00	7.70	6930.0
Faro Valley South	FVS		1842	344	8	4044	584	568	15	105	16	0.24	0.43	2	99	0.50	28	1.12	191
Medium Grade Stockpile	MGSP		49500	31	1050	59000	504	3210	100	100	986	15.50	20.00	559	15100	3.00	2360	15.00	10900
Crusher Stockpile	CHSP		49500	31	1050	59000	504	3210	100	100	986	15.50	20.00	559	15100	3.00	2360	15.00	10900
Oxide Fines Stockpile	OXSP		49500	31	1050	59000	504	3210	100	100	986	15.50	20.00	559	15100	3.00	2360	15.00	10900
Low Grade Stockpile A	LGSPA		49500	31	1050	59000	504	3210	100	100	986	15.50	20.00	559	15100	3.00	2360	15.00	10900
Upper Northwest Dump	NWU		4433	250	14	4320	519	544	15	79	37	0.47	0.84	4	218	0.92	42	1.90	401
Middle Northwest Dump	NWM		4433	250	14	4320	519	544	15	79	37	0.47	0.84	4	218	0.92	42	1.90	401
Lower Northwest Dump	NWL		4433	250	14	4320	519	544	15	79	37	0.47	0.84	4	218	0.92	42	1.90	401
Mt. Mungly West	MMW		30970	1	342	35523	378	1655	73	73	502	9.65	10.62	187	6748	2.08	936	7.70	6930
Mt. Mungly East	MME		30970	1	342	35523	378	1655	73	73	502	9.65	10.62	187	6748	2.08	936	7.70	6930
Fuel Tank Dump W	FTW		98	10	1	386	42	46	2	3	3	0.05	0.09	0	2	0.08	2	0.09	35
Fuel Tank Dump E	FTE		1842	344	8	4044	584	568	15	105	16	0.24	0.43	2	99	0.50	28	1.12	191
Upper Parking Lot Dump	UPL		1842	344	8	4044	584	568	15	105	16	0.24	0.43	2	99	0.50	28	1.12	191
Lower Parking Lot Dump	LPL		4433	250	14	4320	519	544	15	79	37	0.47	0.84	4	218	0.92	42	1.90	401
Stock Piles Base	SPB		1842	344	8	4044	584	568	15	105	16	0.24	0.43	2	99	0.50	28	1.12	191
Southwest Pit Wall Dump	SWPWD		30970	1	342	35523	378	1655	73	73	502	9.65	10.62	187	6748	2.08	936	7.70	6930
Low Grade Stockpile C	LGSPC		49500	31	1050	59000	504	3210	100	100	986	15.50	20.00	559	15100	3.00	2360	15.00	10900
Main East Sulphide Cell	MESC		30970	1	342	35523	378	1655	73	73	502	9.65	10.62	187	6748	2.08	936	7.70	6930
Intermediate Dump Sulphide Ce	IDSC		30970	1	342	35523	378	1655	73	73	502	9.65	10.62	187	6748	2.08	936	7.70	6930
Ranch Dump	RD		4433	250	14	4320	519	544	15	79	37	0.47	0.84	4	218	0.92	42	1.90	401
Ramp Zone Dump	RZD		55	292	3	2887	373	440	21	122	1	0.03	0.05	0	6	0.17	6	0.24	19
Main Dump West	MDW		30970	1	342	35523	378	1655	73	73	502	9.65	10.62	187	6748	2.08	936	7.70	6930
Main Dump East	MDE		30970	1	342	35523	378	1655	73	73	502	9.65	10.62	187	6748	2.08	936	7.70	6930
Intermediate Dump	ID		30970	1	342	35523	378	1655	73	73	502	9.65	10.62	187	6748	2.08	936	7.70	6930
Outer Haul Road West	OHRW		4433	250	14	4320	519	544	15	79	37	0.47	0.84	4	218	0.92	42	1.90	401
Outer Haul Road East	OHRE		30970	1	342	35523	378	1655	73	73	502	9.65	10.62	187	6748	2.08	936	7.70	6930
Lower Northeast sulphide cell	NELS		30970	1	342	35523	378	1655	73	73	502	9.65	10.62	187	6748	2.08	936	7.70	6930
Outer Northeast Dump	NEO		72	325	4	3165	446	481	20	122	1	0.05	0.08	0	10	0.19	10	0.35	28
Zone II West	ZIIW		7023	155	20	4596	454	520	14	53	59	0.70	1.25	7	337	1.33	55	2.68	611
Zone II East	ZIIE		1842	344	8	4044	584	568	15	105	16	0.24	0.43	2	99	0.50	28	1.12	191
Lower Northeast Dump	NEL		4433	250	14	4320	519	544	15	79	37	0.47	0.84	4	218	0.92	42	1.90	401
Upper Northeast Dump	NEU		4433	250	14	4320	519	544	15	79	37	0.47	0.84	4	218	0.92	42	1.90	401

Table 5: Part 5 - Load Estimates

Enter infiltration rates as percentage of Mean Annual Precipitation (see Project 1CD001.33)

Mean Annual Precipitation = 400 mm

Source	Code	Inf. %MAP	Acidity kg/yr	Alk kg/yr	Cl kg/yr	SO4 kg/yr	Ca kg/yr	Mg kg/yr	K kg/yr	Na kg/yr	Al kg/yr	Cd kg/yr	Co kg/yr	Cu kg/yr	Fe kg/yr	Pb kg/yr	Mn kg/yr	Ni kg/yr	Zn kg/yr
Faro Valley North	FVN	45%	757,415	24	8,367	868,753	9,238	40,475	1,773	1,773	12,271	235.9	259.7	4,566.6	165,020	50.7	22,891	188.3	169,483
Faro Valley South	FVS	45%	10,811	2,019	50	23,734	3,430	3,334	87	615	93	1.4	2.5	11.8	583	3.0	166	6.6	1,122
Medium Grade Stockpile	MGSP	45%	302,040	189	6,407	360,007	3,075	19,587	610	610	6,016	94.6	122.0	3,410.9	92,137	18.3	14,400	91.5	66,510
Crusher Stockpile	CHSP	45%	204,190	128	4,331	243,379	2,079	13,241	413	413	4,067	63.9	82.5	2,305.9	62,288	12.4	9,735	61.9	44,963
Oxide Fines Stockpile	OXSP	45%	185,266	116	3,930	220,822	1,886	12,014	374	374	3,690	58.0	74.9	2,092.2	56,515	11.2	8,833	56.1	40,796
Low Grade Stockpile A	LGSPA	45%	261,535	164	5,548	311,729	2,663	16,960	528	528	5,210	81.9	105.7	2,953.5	79,781	15.9	12,469	79.3	57,591
Upper Northwest Dump	NWU	45%	102,789	5,786	329	100,181	12,036	12,615	336	1,832	865	10.9	19.5	99.3	5,058	21.2	969	44.1	9,303
Middle Northwest Dump	NWM	45%	126,115	7,099	404	122,914	14,767	15,478	413	2,248	1,061	13.4	23.9	121.8	6,205	26.0	1,189	54.1	11,414
Lower Northwest Dump	NWL	45%	84,295	4,745	270	82,156	9,870	10,346	276	1,502	709	8.9	16.0	81.4	4,148	17.4	795	36.1	7,629
Mt. Mungly West	MMW	45%	113,092	4	1,249	129,716	1,379	6,043	265	265	1,832	35.2	38.8	681.9	24,640	7.6	3,418	28.1	25,306
Mt. Mungly East	MME	45%	190,261	6	2,102	218,229	2,321	10,167	445	445	3,082	59.3	65.2	1,147.1	41,453	12.7	5,750	47.3	42,574
Fuel Tank Dump W	FTW	45%	148	16	1	582	64	69	3	4	4	0.1	0.1	0.6	3	0.1	4	0.1	53
Fuel Tank Dump E	FTE	45%	32,121	5,999	147	70,520	10,191	9,905	258	1,828	277	4.2	7.4	35.1	1,733	8.8	494	19.5	3,335
Upper Parking Lot Dump	UPL	45%	17,810	3,326	82	39,101	5,650	5,492	143	1,013	154	2.3	4.1	19.5	961	4.9	274	10.8	1,849
Lower Parking Lot Dump	LPL	45%	26,109	1,470	84	25,446	3,057	3,204	85	465	220	2.8	4.9	25.2	1,285	5.4	246	11.2	2,363
Stock Piles Base	SPB	45%	30,255	5,650	139	66,423	9,599	9,329	243	1,721	261	4.0	7.0	33.0	1,632	8.3	465	18.4	3,141
Southwest Pit Wall Dump	SWPWD	45%	436,458	14	4,822	500,616	5,324	23,324	1,022	1,022	7,071	135.9	149.7	2,631.5	95,092	29.2	13,191	108.5	97,664
Low Grade Stockpile C	LGSPC	45%	307,725	193	6,527	366,783	3,133	19,955	622	622	6,130	96.4	124.3	3,475.1	93,872	18.6	14,671	93.2	67,762
Main East Sulphide Cell	MESC	45%	450,471	15	4,976	516,689	5,495	24,073	1,055	1,055	7,298	140.3	154.5	2,716.0	98,145	30.2	13,614	112.0	100,800
Intermediate Dump Sulphide Ce	IDSC	45%	517,539	17	5,717	593,616	6,313	27,657	1,212	1,212	8,385	161.2	177.5	3,120.4	112,757	34.7	15,641	128.7	115,807
Ranch Dump	RD	45%	33,753	1,900	108	32,896	3,952	4,143	110	602	284	3.6	6.4	32.6	1,661	7.0	318	14.5	3,055
Ramp Zone Dump	RZD	45%	594	3,162	35	31,317	4,041	4,771	231	1,323	7	0.4	0.6	1.7	66	1.9	66	2.6	207
Main Dump West	MDW	45%	1,231,212	40	13,601	1,412,196	15,017	65,794	2,882	2,882	19,947	383.4	422.2	7,423.2	268,247	82.5	37,211	306.1	275,502
Main Dump East	MDE	45%	1,980,417	64	21,878	2,271,532	24,156	105,831	4,636	4,636	32,085	616.8	679.1	11,940.4	431,478	132.7	59,854	492.4	443,148
Intermediate Dump	ID	45%	1,831,949	59	20,238	2,101,240	22,345	97,897	4,289	4,289	29,680	570.5	628.2	11,045.2	399,131	122.7	55,367	455.5	409,926
Outer Haul Road West	OHRW	45%	149,152	8,396	478	145,366	17,464	18,305	488	2,658	1,255	15.8	28.3	144.0	7,339	30.8	1,407	63.9	13,499
Outer Haul Road East	OHRE	45%	483,006	16	5,336	554,006	5,891	25,811	1,131	1,131	7,825	150.4	165.6	2,912.1	105,233	32.4	14,598	120.1	108,080
Lower Northeast sulphide cell	NELS	45%	97,326	3	1,075	111,633	1,187	5,201	228	228	1,577	30.3	33.4	586.8	21,205	6.5	2,941	24.2	21,778
Outer Northeast Dump	NEO	45%	166	747	8	7,285	1,025	1,107	45	281	2	0.1	0.2	0.6	23	0.4	23	0.8	65
Zone II West	ZIIW	45%	112,907	2,492	321	73,889	7,292	8,360	228	855	944	11.2	20.2	105.3	5,415	21.3	889	43.1	9,824
Zone II East	ZIIE	45%	41,804	7,807	192	91,779	13,263	12,891	336	2,378	360	5.5	9.7	45.7	2,255	11.4	642	25.4	4,340
Lower Northeast Dump	NEL	45%	217,727	12,256	698	212,201	25,494	26,722	712	3,881	1,832	23.1	41.3	210.2	10,713	44.9	2,053	93.3	19,705
Upper Northeast Dump	NEU	45%	202,900	11,421	650	197,751	23,758	24,902	664	3,616	1,707	21.5	38.5	195.9	9,984	41.9	1,913	87.0	18,363

Total Loadings

Subtotal Area F1	768,226	2,043	8,417	892,487	12,668	43,809	1,860	2,388	12,364	237	262	4,578	165,603	54	23,057	195	170,605
Subtotal Area F2	1,676,028	34,697	25,022	1,991,204	78,637	144,452	4,393	13,249	27,449	439	572	13,007	377,839	170	59,041	559	316,826
Subtotal Area F3	7,422,275	13,874	83,716	8,526,258	113,130	417,561	17,676	21,430	119,967	2,275	2,536	45,442	1,613,020	523	225,938	1,898	1,635,448
Subtotal Area F4	672,831	34,726	2,944	694,537	72,019	79,182	2,213	11,239	6,423	92	143	1,144	49,595	127	8,462	274	74,075
TOTAL	10,539,359	85,340	120,099	**12,104,486**	276,454	685,004	26,142	48,307	166,203	3,043	3,514	64,172	2,206,057	873	316,498	2,925	2,196,954

Area weighted concentrations

Subtotal Area F1	25333	67	278	29430	418	1445	61	79	408	8	9	151	5461	2	760	6	5626
Subtotal Area F2	11126	230	166	13219	522	959	29	88	182	3	4	86	2508	1	392	4	2103
Subtotal Area F3	26308	49	297	30221	401	1480	63	76	425	8	9	161	5717	2	801	7	5797
Subtotal Area F4	4837	250	21	4993	518	569	16	81	46	1	1	8	357	1	61	2	532

TABLE 6. Vangorda/Grum Future Practical Worst Conditions
Table 6: Part 1 - Input seepage water quality summary from site data
Updated Statistics (from JTC)

Type	Statistic	pH	Acidity	Alk	Cl	SO4	Ca	Mg	K	Na	Al	Cd	Co	Cu	Fe	Pb	Mn	Ni	Zn
Vangorda/Grum Type 1a	Average	7.46	10	325	1.6	255	137	56	2.4	2.6	0.20	0.01	0.01	0.01	0.03	0.05	0.16	0.05	0.009
	Median	7.47	6.0	338	1.7	313	153	64	2.0	3.0	0.20	0.01	0.01	0.01	0.03	0.05	0.005	0.05	0.005
	Min	7.85	1.0	186	0.50	7.0	45	24	2.0	2.0	0.20	0.01	0.01	0.01	0.03	0.05	0.005	0.05	0.005
	Max	6.87	40	405	2.5	575	219	81	4.0	4.0	0.20	0.01	0.01	0.01	0.03	0.05	1.9	0.07	0.028
	N	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
Vangorda/Grum Type 1b	Average	7.29	23	526	2.1	1093	323	205	7.1	10	0.20	0.01	0.01	0.01	0.03	0.05	0.10	0.38	3.0
	Median	7.31	19	546	2.2	1165	337	210	7.0	11	0.20	0.01	0.01	0.01	0.03	0.05	0.056	0.38	2.7
	Min	7.84	1.0	278	0.90	593	201	108	3.0	4.0	0.20	0.01	0.01	0.01	0.03	0.05	0.005	0.22	1.7
	Max	6.67	69	700	2.8	1350	380	347	10	16	0.20	0.01	0.03	0.01	0.03	0.05	0.43	0.59	5.1
	N	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
Vangorda/GrumType 2	Average	6.44	352	134	0.77	2878	351	374	9.0	8.2	0.28	0.11	1.4	0.01	40	0.08	67	2.6	184
	Median	6.34	203	144	0.60	2785	399	389	11	10	0.20	0.09	0.85	0.01	2.9	0.09	39	2.0	107
	Min	7.08	53	27	0.50	766	199	54	2.0	2.0	0.20	0.05	0.06	0.01	0.03	0.05	3.7	0.14	23
	Max	6.03	755	289	1.3	4440	436	602	13	13	0.40	0.28	3.0	0.02	127	0.10	139	5.3	412
	N	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Vangorda/Grum Type 3	Average	4.08	6279	26	1.4	15482	432	1624	12	8.7	40	3.5	9.5	29	706	1.0	996	8.0	2948
	Median	3.67	2550	3.0	0.50	13100	445	721	10	4.0	14	1.2	6.0	0.69	243	0.70	232	7.0	1650
	Min	6.21	581	1.0	0.50	2470	196	105	4.0	4.0	0.40	0.45	0.75	0.07	0.12	0.10	18	1.1	352
	Max	2.55	16500	160	11	33400	528	3490	20	20	339	8.5	22	180	3040	2.5	2600	17	6990
	N	13	13	13	13	13	13	13	7	7	12	13	13	7	13	7	13	13	13
Faro Type 2 Waste	Average	6.7	51	137	1.6	1701	288	231	7.9	16	0.3	0.03	0.052	0.04	1.9	0.06	4.9	0.17	26
	Median	6.8	46	71.5	1.3	1425	227	177	8.0	11	0.2	0.02	0.045	0.01	0.12	0.05	2.8	0.12	26
	Min	7.3	15	4	0.5	334	49.1	37	2.0	3.0	0.2	0.01	0.01	0.01	0.03	0.05	0.037	0.05	3.9
	Max	5.8	115	407	4.6	3860	628	584	15	122	1.6	0.09	0.15	0.5	20.2	0.23	19	0.6	51
	N	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
Faro Type 3 Waste	Average	3.9	968	16	3.1	1614	173	161	6.4	7.5	15	0.16	0.30	2	76	0.36	10	0.56	109
	Median	3.4	177	1	0.60	1170	239	104	5.0	4.0	4.1	0.08	0.20	0.58	3.91	0.08	3.79	0.24	46.7
	Min	5.9	27	1	0.50	69	6.45	3.8	2.0	2.0	0.2	0.01	0.01	0.03	0.03	0.05	0.161	0.05	2.2
	Max	2.6	8750	92	23.8	4780	410	504	14	36	73	0.85	1.5	8.06	416	1.6	64.3	3.2	751
	N	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
Other																			

Table 6: Part 2 - Select representative Seepage Types
Cut and paste rows from above

Seepage Type	Selection	pH	Acidity	Alk	Cl	SO4	Ca	Mg	K	Na	Al	Cd	Co	Cu	Fe	Pb	Mn	Ni	Zn
G1a	Max	6.87	40	405	2.5	575	219	81	4.0	4.0	0.20	0.01	0.01	0.01	0.03	0.05	1.9	0.07	0.028
G1b	Max	6.67	69	700	2.8	1350	380	347	10	16	0.20	0.01	0.03	0.01	0.03	0.05	0.43	0.59	5.1
V2	Max	6.03	755	289	1.3	4440	436	602	13	13	0.40	0.28	3.0	0.02	127	0.10	139	5.3	412
V3	Max	2.55	16500	160	11	33400	528	3490	20	20	339	8.5	22	180	3040	2.5	2600	17	6990
F2waste	Max	5.8	115	407	4.6	3860	628	584	15	122	1.6	0.09	0.15	0.5	20.2	0.23	19	0.6	51
F3waste	Max	2.6	8750	92	23.8	4780	410	504	14	36	73	0.85	1.5	8.06	416	1.6	64.3	3.2	751

Table 6: Part 3 - Assign Seepage Types to each source area
Input fractions of seepage represented by each type

Source	Code	Current Seep Types (as fraction)												
		G1a	G1b	V2	V3	F2waste	F3waste	Other 2	Other 3	Other 4	Other 5	Other 6	Check	Certainty
Grum Main Sulphide Cell	G1-S				1								1.0	moderate
Grum Main Dump	G1-B		0.9	0.1									1.0	high
Grum Southwest Dump	G2		0.9	0.1									1.0	moderate
Overburden Dump	G3-O	1											1.0	low
Vangorda Main Sulphide Cell	V1-S				1								1.0	high
Vangorda Main Dump	V1-B			0.7	0.3								1.0	moderate
Baritic Fines Dump	V2				1								1.0	high
Overburden Dump	V3-O		0.9	0.1									1.0	low

Supporting information

Proportion of rock types			
sulphides	Non-Calc Phyl	Calc Phyl	OB
100%			
	15%	85%	
	15%	85%	
			100%
100%			
	91%	9%	
	100%		
			100%

Table 6: Part 4 - Water Quality Estimates
Calculations are automatic

Source	Code	pH	Acidity mg/L	Alk mg/L	Cl mg/L	SO4 mg/L	Ca mg/L	Mg mg/L	K mg/L	Na mg/L	Al mg/L	Cd mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L	Mn mg/L	Ni mg/L	Zn mg/L
Grum Main Sulphide Cell	G1-S		16500	160	11	33400	528	3490	20	20	339	8.50	22.30	180	3040	2.50	2600	17.00	6990
Grum Main Dump	G1-B		138	659	3	1659	386	373	10	16	0	0.04	0.33	0	13	0.06	14	1.06	46
Grum Southwest Dump	G2		138	659	3	1659	386	373	10	16	0	0.04	0.33	0	13	0.06	14	1.06	46
Overburden Dump	G3-O		40	405	3	575	219	81	4	4	0	0.01	0.01	0	0	0.05	2	0.07	0
Vangorda Main Sulphide Cell	V1-S		16500	160	11	33400	528	3490	20	20	339	8.50	22.30	180	3040	2.50	2600	17.00	6990
Vangorda Main Dump	V1-B		5479	250	4	13128	464	1468	15	15	102	2.75	8.78	54	1001	0.82	877	8.81	2385
Baritic Fines Dump	V2		16500	160	11	33400	528	3490	20	20	339	8.50	22.30	180	3040	2.50	2600	17.00	6990
Overburden Dump	V3-O		138	659	3	1659	386	373	10	16	0	0.04	0.33	0	13	0.06	14	1.06	46

Table 6: Part 5 - Load Estimates
Enter infiltration rates as percentage of Mean Annual Precipitation (see Project 1CD001.33)
Grum MAP = 450 mm
Vangorda MAP = 380 mm

Source	Code	Inf. %MAP	Acidity kg/yr	Alk kg/yr	Cl kg/yr	SO4 kg/yr	Ca kg/yr	Mg kg/yr	K kg/yr	Na kg/yr	Al kg/yr	Cd kg/yr	Co kg/yr	Cu kg/yr	Fe kg/yr	Pb kg/yr	Mn kg/yr	Ni kg/yr	Zn kg/yr
Grum Main Sulphide Cell	G1-S	45%	601,425	5,832	401	1,217,430	19,246	127,211	729	729	12,357	309.8	812.8	6,561.0	110,808	91.1	94,770	619.7	254,786
Grum Main Dump	G1-B	45%	12,394	59,350	239	149,433	34,733	33,553	928	1,414	20	3.3	29.4	1.0	1,146	5.0	1,286	95.6	4,122
Grum Southwest Dump	G2	45%	18,202	87,158	351	219,450	51,007	49,274	1,362	2,077	29	4.9	43.1	1.5	1,684	7.3	1,889	140.3	6,053
Overburden Dump	G3-O	45%	3,732	37,786	233	53,647	20,433	7,539	373	373	19	0.9	0.9	0.9	3	4.7	179	6.5	3
Vangorda Main Sulphide Cell	V1-S	45%	259,578	2,517	173	525,449	8,306	54,905	315	315	5,333	133.7	350.8	2,831.8	47,825	39.3	40,903	267.4	109,967
Vangorda Main Dump	V1-B	45%	306,713	14,013	236	734,970	25,955	82,208	845	845	5,709	153.7	491.7	3,024.0	56,035	45.9	49,116	493.2	133,546
Baritic Fines Dump	V2	45%	24,829	241	17	50,260	795	5,252	30	30	510	12.8	33.6	270.9	4,575	3.8	3,912	25.6	10,519
Overburden Dump	V3-O	45%	1,077	5,155	21	12,980	3,017	2,914	81	123	2	0.3	2.6	0.1	100	0.4	112	8.3	358

Total Loadings

Grum	635,753	190,127	1,223	1,639,961	125,417	217,576	3,392	4,593	12,424	319	886	6,564	113,641	108	98,125	862	264,964
Vangorda	592,197	21,926	446	1,323,659	38,073	145,279	1,271	1,313	11,554	301	879	6,127	108,535	89	94,043	795	254,390

Table 7. Summary of Oxidation Rate Estimates from Temperature Data

Drillhole		Estimated Heat Production J m-3 s-1	Conversion J / kg O2	Estimated Oxidation Rate kg O2 m-3 s-1	Estimated Oxidation Rate mol O2 m-3 s-1	Sulphate Production Rate kg SO4 tonne-1 yr-1
Faro 30M1		0.15	10370650	1.4E-08	4.2E-07	1.20
Grum 30M3 (SC)		0.08	10370650	7.7E-09	2.2E-07	0.64
Grum 10M2	<	0.01	10370650	9.6E-10	2.8E-08	0.080
Vangorda 30M4	>	0.11	10370650	1.1E-08	3.1E-07	0.88
Vangorda 10M4	~	0.15	10370650	1.4E-08	4.2E-07	1.20
Grum 10M3	~	0.01	10370650	9.6E-10	2.8E-08	0.080
Faro 60M1	>	0.17	10370650	1.6E-08	4.8E-07	1.36
Notes						
Faro 30M1	Oxygen suggests non-uniform diffusion or advection					
Grum 30M3 (SC)	Oxygen shows some advection, but diffusion dominant.					
Grum 10M2	Temperature data shows no clear evidence of heating.					
Vangorda 30M4	Oxygen data suggest some advection.					
Vangorda 10M4	Hole is shallow so estimate is questionable.					
Grum 10M3	Very slight warming, may be due to surface only.					
Faro 60M1	Oxygen and temperature data show evidence of thermal convection.					

Summary by Area

Site		Sulphate Production kg SO_4 tonne^{-1} yr^{-1}
Faro 30M1		1.20
Faro 60M1		1.36
	Avg	1.28
Grum 30M3 (SC)		0.64
Grum 10M2		0.08
Grum 10M3		0.08
	Avg	0.08
Vangorda 30M4		0.88
Vangorda 10M4		1.20
	Avg	1.04

Linear Regression

S	Oxdtn. Rate
%	kg SO_4 tonne^{-1} yr^{-1}
20	1.28
15	1.04
12	0.64
0.8	0.08

R(SO4 Generation) = 0.0651*(%S)

AP	AP Depletion
kg$CaCO_3$ eq/t	kg$CaCO_3$ eq/t/yr
625	1.33
469	1.08
375	0.67
25	0.08

R(Oxidation kgCaCO3eq/tonne/year) = 0.0021*(AP)

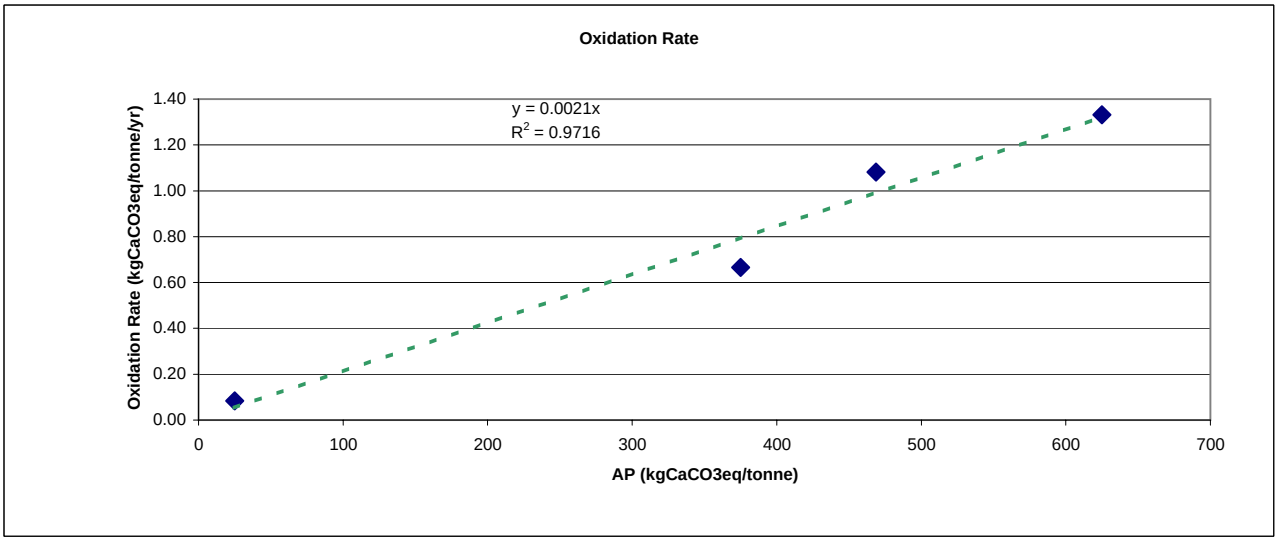


Table 8. Summary of Calculated Sulphate Production Rates

Waste Rock Dump	Code	Tonnage tonnes	S2 %	Rate SO4 kg/tonne/yr	SO4 kg/year
Faro Valley North	FVN	3,514,050	3.7	0.24	851,027
Faro Valley South	FVS	607,166	0.9	0.06	36,039
Medium Grade Stockpile	MGSP	120,000	19.9	1.30	155,750
Crusher Stockpile	CHSP	100,000	19.9	1.30	129,792
Oxide Fines Stockpile	OXSP	322,670	19.9	1.30	418,800
Low Grade Stockpile A	LGSPA	911,004	19.9	1.30	1,182,409
Upper Northwest Dump	NWU	2,665,666	1.9	0.13	337,887
Middle Northwest Dump	NWM	5,723,496	2.6	0.17	972,565
Lower Northwest Dump	NWL	6,558,132	2.3	0.15	967,326
Mt. Mungly West	MMW	251,854	10.2	0.67	168,047
Mt. Mungly East	MME	882,728	6.6	0.43	378,005
Fuel Tank Dump W	FTW	86,616	19.9	1.30	112,421
Fuel Tank Dump E	FTE	2,479,776	1.3	0.08	202,811
Upper Parking Lot Dump	UPL	2,222,854	1.6	0.10	231,054
Lower Parking Lot Dump	LPL	677,080	2.4	0.16	107,215
Stock Piles Base	SPB	2,832,056	0.9	0.06	169,873
Southwest Pit Wall Dump	SWPWD	1,619,962	9.6	0.62	1,009,037
Low Grade Stockpile C	LGSPC	786,068	19.9	1.30	1,020,253
Main East Sulphide Cell	MESC	12,606,018	19.9	1.30	16,361,592
Intermediate Dump Sulphide C	IDSC	11,512,005	19.9	1.30	14,941,651
Ranch Dump	RD	525,194	2.0	0.13	68,993
Ramp Zone Dump	RZD	2,182,144	1.0	0.07	148,694
Main Dump West	MDW	25,133,886	2.9	0.19	4,768,978
Main Dump East	MDE	55,063,032	3.6	0.24	13,079,780
Intermediate Dump	ID	40,810,467	4.5	0.29	11,909,059
Outer Haul Road West	OHRW	12,570,922	1.4	0.09	1,133,214
Outer Haul Road East	OHRE	4,481,826	2.9	0.19	839,130
Lower Northeast sulphide cell	NELS	1,361,794	19.9	1.30	1,767,498
Outer Northeast Dump	NEO	198,422	0.7	0.05	9,364
Zone II West	ZIIW	6,006,008	2.7	0.18	1,072,536
Zone II East	ZIIE	16,304,844	1.0	0.06	1,031,296
Lower Northeast Dump	NEL	21,166,698	1.6	0.11	2,232,640
Upper Northeast Dump	NEU	15,785,560	1.6	0.10	1,626,074
Site Total					**79,440,812**
Grum					
Main dump Sulphide Cell	G1-S	2,000,000	12.7	0.83	1,655,363
Main Dump	G1-B	13,000,000	0.8	0.05	690,287
Southwest Dump	G2	13,000,000	0.8	0.05	690,287
Overburden Dump	G3-O				
Site Total					**3,035,937**
Vangorda					
Main Dump Sulphide Cell	V1-S	2,600,000	13.6	0.89	2,309,434
Main Dump	V1-B	5,400,000	0.5	0.04	190,540
Barite Dump	V2	225,000	20.0	1.30	292,950
Overburden	V3-O				
Site Total					**2,792,924**

TABLE 9 Faro - Kinetic Testing Solute Production Rates by Rock Type
Source Production Rates (mg/kg/wk)

Rock Type	pH	SO4	Al	Sb	As	Cd	Ca	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Zn
		mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk
Sulphide	3.7	187	1E+00	4E-02	4E-02	1E-01	7E+00	7E-02	7E-01	3E+01	2E+00	5E+00	3E+00	7E-03	5E-02	4E+01
Schist	7.9	31	9E-03	9E-03	9E-03	5E-04	4E+00	5E-04	6E-03	6E-02	7E-03	7E+00	4E-03	1E-03	9E-04	3E-02
Calc. Silicates	7.9	15	7E-03	7E-03	7E-03	4E-04	6E+00	4E-04	1E-03	1E-02	1E-02	3E+00	2E-03	1E-03	7E-04	1E-02
Intrusives	7.7	32	0E+00	0E+00	0E+00	0E+00	3E+00	0E+00	9E-03	2E-02	4E-03	4E+00	0E+00	0E+00	0E+00	9E-03
Till	8.1	3	0E+00	0E+00	0E+00	0E+00	1E+01	0E+00	0E+00	0E+00	0E+00	1E+01	3E-02	0E+00	0E+00	0E+00

TABLE 10 Faro - Total Annual Solute Generation
Correction factors

Surface Area (Size fraction)	1
Dummy Variable 1 - do not apply	1
Laboratory to field Scaling Factor	0.103

Total Solute Generation

Waste Rock Dump	SO4	Al	Sb	As	Cd	Ca	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Zn
	kg/yr	kg/yr	kg/yr	kg/yr	kg/yr	kg/yr	kg/yr	kg/yr	kg/yr	kg/yr	kg/yr	kg/yr	kg/yr	kg/yr	kg/yr
Faro Valley North	952,565	3,472	214	215	387	99,748	206	2,036	97,068	5,514	125,634	8,912	34	147	107,671
Faro Valley South	98,753	20	20	20	1	13,185	1	21	147	18	21,047	12	3	2	69
Medium Grade Stockpile	120,722	767	25	25	87	4,387	46	445	21,951	1,232	3,533	2,009	4	31	24,440
Crusher Stockpile	100,602	639	21	21	72	3,656	38	371	18,292	1,027	2,944	1,674	4	26	20,367
Oxide Fines Stockpile	324,612	2,062	67	68	233	11,795	123	1,197	59,024	3,314	9,500	5,401	12	83	65,718
Low Grade Stockpile A	916,487	5,822	191	193	659	33,303	347	3,381	166,643	9,357	26,823	15,249	33	236	185,544
Upper Northwest Dump	577,318	1,222	68	68	136	62,132	73	791	34,447	1,984	68,362	3,152	11	51	38,160
Middle Northwest Dump	1,207,965	3,838	299	301	423	163,704	227	2,231	105,488	6,122	162,038	9,676	48	166	117,017
Lower Northwest Dump	1,280,383	3,556	313	314	390	194,556	210	2,079	96,987	5,638	211,516	8,941	49	156	107,396
Mt. Mungly West	135,836	808	30	30	91	10,349	48	468	23,046	1,298	9,233	2,116	5	33	25,655
Mt. Mungly East	355,857	1,718	80	81	193	23,810	102	999	48,577	2,747	26,376	4,442	13	71	54,005
Fuel Tank Dump W	87,137	554	18	18	63	3,166	33	321	15,844	890	2,550	1,450	3	22	17,641
Fuel Tank Dump E	385,037	428	121	121	41	59,980	24	237	9,622	626	76,157	869	18	24	10,387
Upper Parking Lot Dump	333,648	801	114	114	85	64,615	47	438	20,612	1,272	52,782	1,886	18	38	22,819
Lower Parking Lot Dump	121,246	458	39	39	50	21,511	27	256	12,433	737	13,656	1,139	6	20	13,832
Stock Piles Base	365,795	112	112	112	6	88,829	6	61	666	92	122,862	122	17	11	321
Southwest Pit Wall Dump	883,956	4,700	194	195	529	43,956	280	2,733	133,620	7,518	54,422	12,219	32	193	148,599
Low Grade Stockpile C	790,799	5,024	164	166	569	28,735	300	2,917	143,789	8,073	23,144	13,158	28	203	160,098
Main East Sulphide Cell	12,681,886	80,567	2,636	2,666	9,119	460,824	4,805	46,780	2,305,923	129,471	371,159	211,011	453	3,259	2,567,465
Intermediate Dump Sulphide Cell	11,581,289	73,575	2,407	2,435	8,328	420,831	4,388	42,720	2,105,804	118,235	338,948	192,699	413	2,976	2,344,647
Ranch Dump	110,788	191	28	28	20	10,640	11	113	4,955	287	19,092	449	4.4	9.1	5,419
Ramp Zone Dump	276,461	372	102	102	36	61,782	21	190	8,293	577	53,329	757	16	21	9,082
Main Dump West	5,929,812	17,125	1,587	1,593	1,871	632,056	1,011	9,901	466,078	26,674	940,287	42,663	249	756	514,939
Main Dump East	14,129,756	54,686	3,625	3,645	6,070	1,596,842	3,243	31,557	1,519,547	87,054	1,695,983	139,265	581	2,325	1,686,910
Intermediate Dump	11,504,189	53,468	3,010	3,030	5,970	1,316,627	3,176	30,687	1,497,153	85,697	1,108,434	137,270	489	2,241	1,665,027
Outer Haul Road West	2,227,773	2,157	603	603	209	263,787	123	1,293	49,399	3,054	434,411	4,426	92	120	52,842
Outer Haul Road East	1,028,601	3,024	254	255	332	130,452	179	1,767	83,030	4,722	187,740	7,661	40	132	91,771
Lower Northeast sulphide cell	1,369,990	8,703	285	288	985	49,782	519	5,054	249,103	13,986	40,095	22,795	49	352	277,356
Outer Northeast Dump	23,675	7.2	7.2	7.2	0.4	5,878	0.4	3.8	33	9	6,326	5	1.1	0.7	18
Zone II West	1,322,999	4,040	327	328	445	173,300	239	2,355	110,981	6,376	210,811	10,210	52	175	122,887
Zone II East	2,470,992	754	754	754	38	358,093	38	423	4,287	692	548,268	286	113	75	2,112
Lower Northeast Dump	3,107,015	7,343	801	803	795	786,478	432	4,259	196,285	11,597	815,597	18,633	125	332	217,021
Upper Northeast Dump	2,196,058	5,436	557	559	591	628,188	320	3,153	146,126	8,620	634,783	13,988	87	243	161,728
Site Total	79,000,000	347,450	19,075	19,202	38,825	7,826,974	20,646	201,240	9,755,253	554,509	8,417,844	894,544	3,102	14,530	10,838,963

TABLE 11 Faro - Seepage Water Quality Estimates from Kinetic Test Results

Infiltration

Mean Annual Precipitation =	400	mm
Infiltration	45%	%MAP
Contact	0.20	

Waste Rock Dump	SO4 mg/L	Al mg/L	Sb mg/L	As mg/L	Cd mg/L	Ca mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L	Mg mg/L	Mn mg/L	Mo mg/L	Ni mg/L	Zn mg/L
Faro Valley North	6,096	28	1.7	1.8	3.2	550	2	17	794	45	1,027	73	0.3	1.2	881
Faro Valley South	2,551	1	0.7	0.7	0.0	550	0.03	0.7	5.0	0.6	717	0	0.1	0.1	2
Medium Grade Stockpile	3,876	25	0.8	0.8	3	550	1	15	719	40	116	66	0.1	1.0	801
Crusher Stockpile	4,716	31	1.0	1.0	4	550	2	18	887	50	143	81	0.2	1.3	987
Oxide Fines Stockpile	16,097	110	3.6	3.6	12	550	6.6	64	3,154	177	508	289	0.6	4.5	3,512
Low Grade Stockpile A	31,931	220	7.2	7.3	25	550	13	128	6,308	354	1,015	577	1.2	9	7,023
Upper Northwest Dump	3,957	11	0.6	0.6	1.2	550	0.6	7	297	17	590	27	0.1	0.4	329
Middle Northwest Dump	5,993	27	2.1	2.1	3.0	550	1.6	16	742	43	1,139	68	0.3	1.2	823
Lower Northwest Dump	8,819	37	3.3	3.3	4.1	550	2.2	22	1,020	59	2,224	94	0.5	1.6	1,129
Mt. Mungly West	6,343	44	1.6	1.6	5.0	550	2.6	26	1,262	71	506	116	0.3	1.8	1,405
Mt. Mungly East	9,989	56	2.6	2.6	6.3	550	3.3	33	1,581	89	859	145	0.4	2.3	1,758
Fuel Tank Dump W	10,820	73	2.4	2.4	8	550	4.4	43	2,103	118	338	192	0.4	3.0	2,341
Fuel Tank Dump E	3,029	5	1.4	1.4	0.5	550	0.3	2.7	110	7.2	873	10	0.2	0.3	119
Upper Parking Lot Dump	3,958	17	2.4	2.4	1.8	550	1.0	9	426	26	1,092	39	0.4	0.8	472
Lower Parking Lot Dump	2,628	16	1.3	1.3	1.7	550	0.9	9	422	25	464	39	0.2	0.7	470
Stock Piles Base	2,122	1	1.4	1.4	0.1	550	0.1	0.7	8	1.1	1,496	1	0.2	0.1	4
Southwest Pit Wall Dump	11,312	67	2.7	2.8	7.5	550	4.0	39	1,896	107	772	173	0.5	2.7	2,109
Low Grade Stockpile C	23,487	162	5.3	5.3	18	550	10	94	4,626	260	745	423	0.9	6.5	5,151
Main East Sulphide Cell	159,433	1,108	36.2	36.7	125	550	66	643	31,707	1,780	5,103	2,901	6.2	45	35,303
Intermediate Dump Sulphide Cell	126,783	881	28.8	29.1	100	550	53	511	25,203	1,415	4,057	2,306	4.9	36	28,061
Ranch Dump	2,503	5	0.7	0.7	0.5	550	0.3	3.0	130	8	501	12	0.1	0.2	142
Ramp Zone Dump	2,627	7	1.9	1.9	0.7	550	0.4	3.5	153	11	983	14	0.3	0.4	167
Main Dump West	22,464	86	8.0	8.0	9	550	5.1	50	2,345	134	4,730	215	1.3	3.8	2,591
Main Dump East	32,470	171	11.3	11.4	19	550	10	99	4,753	272	5,304	436	1.8	7.3	5,276
Intermediate Dump	28,477	181	10.2	10.2	20	550	11	104	5,062	290	3,748	464	1.7	7.6	5,630
Outer Haul Road West	9,742	13	3.6	3.6	1.2	550	0.7	7.7	294	18	2,582	26	0.5	0.7	314
Outer Haul Road East	9,440	39	3.3	3.3	4.3	550	2.3	23	1,065	61	2,408	98	0.5	1.7	1,177
Lower Northeast sulphide cell	79,849	554	18.1	18.3	63	550	33	322	15,853	890	2,552	1,451	3.1	22	17,651
Outer Northeast Dump	1,095	1	0.6	0.6	0.0	550	0.03	0.33	3	1	550	0	0.1	0.1	2
Zone II West	11,548	50	4.1	4.1	5.5	550	3.0	29	1,381	79	2,623	127	0.6	2.2	1,529
Zone II East	14,466	7	6.6	6.6	0.3	550	0.3	3.7	38	6	4,832	3	1.0	0.7	19
Lower Northeast Dump	5,229	30	3.3	3.3	3.2	550	1.8	17	799	47	3,321	76	0.5	1.3	884
Upper Northeast Dump	3,272	24	2.4	2.4	2.6	550	1.4	14	638	38	2,773	61	0.4	1.1	707
Site Avg Concentrations	**20,262**	**115**	**6.3**	**6.4**	**13**	**550**	**6.9**	**67**	**3,240**	**184**	**2,796**	**297**	**1.0**	**4.8**	**3,600**
Site Avg. Release Load (kg/yr)	**15,800,000**	**69,490**	**3,815**	**3,840**	**7,765**	**1,565,395**	**4,129**	**40,248**	**1,951,051**	**110,902**	**1,683,569**	**178,909**	**620**	**2,906**	**2,167,793**

TABLE 12 Grum Solute Production Rate and Water Quality Estimates from Kinetic Test Results

Kinetic Testing Solute Production Rates by Rock Type

Rock Type	pH	SO4	Al	Sb	As	Cd	Ca	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Zn
		mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk
Sulphide	5.7	1.07E+02	3.30E+00	5.73E-02	1.61E-01	1.79E-02	2.17E+01	2.64E-02	2.99E+00	7.06E+01	4.88E-01	6.43E+00	7.12E+00	1.08E-02	4.54E-02	1.41E+01
Non. Cal. Phyllite	5.4	5.95E+01	5.17E-01	7.99E-02	7.99E-02	4.60E-03	1.71E+01	8.55E-03	5.60E-02	1.07E+00	6.54E-02	7.54E+00	1.94E-01	1.20E-02	5.38E-02	1.61E+00
Calc. Phyllite	8.1	1.55E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.96E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.73E+00	1.60E-03	0.00E+00	0.00E+00	3.02E-02

Correction factors

Surface Area (Size fraction)	1
Dummy Variable 1 - do not apply	1
Laboratory to field Scaling Factor	0.073

Loadings

Waste Rock Dump	SO4	Al	Sb	As	Cd	Ca	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Zn
	kg/yr	kg/yr	kg/yr	kg/yr	kg/yr	kg/yr	kg/yr	kg/yr	kg/yr	kg/yr	kg/yr	kg/yr	kg/yr	kg/yr	kg/yr
Main dump Sulphide Cell	811,177	25,117	436	1,222	136	164,751	201	22,748	537,015	3,712	48,892	54,150	82	345	107,081
Main Dump	1,094,411	3,837	592	592	34	250,971	63	415	7,907	485	254,886	1,504	89	399	13,245
Southwest Dump	1,094,411	3,837	592	592	34	250,971	63	415	7,907	485	254,886	1,504	89	399	13,245
Site Total	3,000,000	32,791	1,621	2,407	204	666,692	328	23,579	552,828	4,683	558,665	57,158	260	1,144	133,572

Infiltration

Mean Annual Precipitation =	450	mm
Infiltration	45%	%MAP
Contact	0.2	

Water Quality

Waste Rock Dump	SO4	Al	Sb	As	Cd	Ca	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Zn
	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
Main dump Sulphide Cell	2,545	138	2.4	6.7	0.7	550	1.1	125	2,947	20	268	297	0.5	1.9	588
Main Dump	1,357	9	1.3	1.3	0.1	550	0.1	0.9	18	1.1	566	3.3	0.2	0.9	29
Southwest Dump	1,008	6	0.9	0.9	0.1	550	0.1	0.6	12	0.7	385	2.3	0.1	0.6	20
Site Avg Concentrations	1,346	25	1.3	1.9	0.2	550	0.3	18.2	427.2	3.6	432	44	0.2	0.9	103
Site Avg. Release Load (kg/yr)	**600,000**	**-** **6,558**	**324**	**481**	**41**	**133,338**	**66**	**4,716**	**110,566**	**937**	**111,733**	**11,432**	**52**	**229**	**26,714**

TABLE 13 Vangorda Solute Production Rate and Water Quality Estimates from Kinetic Test Results

Source Production Rates (mg/kg/wk)

Rock Type	pH	SO4		Al	Sb	As	Cd	Ca	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Zn
		mg/kg/wk		mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk
Sulphide	5.7	1.1E+02	0.0E+00	3.3E+00	5.7E-02	1.6E-01	1.8E-02	2.2E+01	2.6E-02	3.0E+00	7.1E+01	4.9E-01	6.4E+00	7.1E+00	1.1E-02	4.5E-02	1.4E+01
Non. Cal. Phyllite	5.4	6.0E+01	0.0E+00	5.2E-01	8.0E-02	8.0E-02	4.6E-03	1.7E+01	8.6E-03	5.6E-02	1.1E+00	6.5E-02	7.5E+00	1.9E-01	1.2E-02	5.4E-02	1.6E+00
Calc. Phyllite	8.1	1.6E+01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.7E+00	1.6E-03	0.0E+00	0.0E+00	3.0E-02

Correction factors

Surface Area (Size fraction)	1
Dummy Variable 1 - do not apply	1
Laboratory to field Scaling Factor	0.091

Loadings

Waste Rock Dump	SO4	Al	Sb	As	Cd	Ca	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Zn
	kg/yr	kg/yr	kg/yr	kg/yr	kg/yr	kg/yr	kg/yr	kg/yr	kg/yr	kg/yr	kg/yr	kg/yr	kg/yr	kg/yr	kg/yr
Main Dump Sulphide Cell	1,315,542	40,735	707	1,982	220	267,188	326	36,893	870,914	6,020	79,291	87,819	133	560	173,661
Main Dump	1,420,909	12,028	1,857	1,857	107	403,676	199	1,302	24,788	1,522	186,550	4,508	279	1,252	37,618
Barite Dump	63,549	552	85	85	5	18,212	9	60	1,138	70	8,050	207	13	57	1,724
Site Total	2,800,000	53,315	2,650	3,924	332	689,076	534	38,254	896,840	7,612	273,891	92,534	425	1,869	213,003

Infiltration

Mean Annual Precipitation =	380	mm
Infilatration	45%	%MAP
Contact	0.2	

Water Quality

Waste Rock Dump	SO4		Al	Sb	As	Cd	Ca	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Zn
	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
Main Dump Sulphide Cell	8,836		518	45.0	126.0	2.8	550	4.1	469	11,072	77	1,008	1,116	1.7	7.1	2,208
Main Dump	1,879		43	33.2	33.2	0.4	550	0.7	4.7	89	5.4	666	16.1	1.0	4.5	134
Barite Dump	2,901		73	56.7	56.7	0.7	550	1.2	7.9	151	9.3	1,070	27.5	1.7	7.6	229
Site Avg Concentrations	3,381		125	46.8	58.2	0.9	550	1.5	71.7	1,667.5	17.4	921	177	1.5	6.5	475
Site Avg. Release Load (kg/yr)	**560,000**	**-**	**10,663**	**530**	**785**	**66**	**137,815**	**107**	**7,651**	**179,368**	**1,522**	**54,778**	**18,507**	**85**	**374**	**42,601**

TABLE 14. NP Depletion and Acidification o fthe Faro Waste Rock and Ore Dumps

Source	AP	NP	NNP	NP/AP	S %	S when Acid %	AP at NP Depletion kgCaCO3/t	Avg Rate of AP Depletion while Neutral kgCaCO3eq/t/yr	Avg. Rate of NP Depletion kgCaCO3/t/yr	Time to NP Depletion years	AP Depletion Rate when Acid kgCaCO3/t/yr
Faro Valley North	116	28	-88	0.24	3.72	2.83	88	0.21	0.21	130	0.19
Faro Valley South	28	26	-2	0.91	0.91	0.08	2	0.03	0.03	801	0.01
Medium Grade Stockpile	623	5	-618	0.01	19.94	19.78	618	1.30	1.30	4	1.30
Crusher Stockpile	623	5	-618	0.01	19.94	19.78	618	1.30	1.30	4	1.30
Oxide Fines Stockpile	623	5	-618	0.01	19.94	19.78	618	1.30	1.30	4	1.30
Low Grade Stockpile A	623	5	-618	0.01	19.94	19.78	618	1.30	1.30	4	1.30
Upper Northwest Dump	61	22	-39	0.36	1.95	1.24	39	0.10	0.10	210	0.08
Middle Northwest Dump	82	42	-39	0.52	2.61	1.25	39	0.13	0.13	335	0.08
Lower Northwest Dump	71	38	-33	0.54	2.27	1.05	33	0.11	0.11	351	0.07
Mt. Mungly West	320	24	-297	0.07	10.25	9.49	297	0.65	0.65	37	0.62
Mt. Mungly East	206	30	-175	0.15	6.58	5.61	175	0.40	0.40	76	0.37
Fuel Tank Dump W	623	5	-618	0.01	19.94	19.78	618	1.30	1.30	4	1.30
Fuel Tank Dump E	39	45	6	1.15	1.26	0.00	0	0.04	0.04	na	0.00
Upper Parking Lot Dump	50	59	9	1.19	1.60	0.00	0	0.05	0.05	na	0.00
Lower Parking Lot Dump	76	64	-12	0.84	2.43	0.38	12	0.09	0.09	696	0.02
Stock Piles Base	29	33	4	1.14	0.92	0.00	0	0.03	0.03	na	0.00
Southwest Pit Wall Dump	299	19	-280	0.06	9.57	8.97	280	0.61	0.61	31	0.59
Low Grade Stockpile C	623	5	-618	0.01	19.94	19.78	618	1.30	1.30	4	1.30
Main East Sulphide Cell	623	5	-618	0.01	19.94	19.78	618	1.30	1.30	4	1.30
Intermediate Dump Sulphide Cell	623	5	-618	0.01	19.94	19.78	618	1.30	1.30	4	1.30
Ranch Dump	63	29	-35	0.45	2.02	1.10	35	0.10	0.10	279	0.07
Ramp Zone Dump	33	59	27	1.81	1.05	0.00	0	0.03	0.03	na	0.00
Main Dump West	91	32	-59	0.35	2.91	1.88	59	0.16	0.16	205	0.12
Main Dump East	114	41	-73	0.36	3.65	2.35	73	0.20	0.20	206	0.15
Intermediate Dump	140	48	-92	0.34	4.48	2.95	92	0.24	0.24	196	0.19
Outer Haul Road West	43	34	-10	0.77	1.38	0.31	10	0.06	0.06	602	0.02
Outer Haul Road East	90	26	-64	0.29	2.88	2.04	64	0.16	0.16	161	0.13
Lower Northeast sulphide cell	623	5	-618	0.01	19.94	19.78	618	1.30	1.30	4	1.30
Outer Northeast Dump	23	45	23	2.00	0.72	0.00	0	0.02	0.02	na	0.00
Zone II West	86	34	-52	0.40	2.74	1.65	52	0.14	0.14	237	0.11
Zone II East	30	39	9	1.28	0.97	0.00	0	0.03	0.03	na	0.00
Lower Northeast Dump	51	38	-13	0.74	1.62	0.41	13	0.07	0.07	564	0.03
Upper Northeast Dump	49	37	-12	0.75	1.58	0.40	12	0.06	0.06	569	0.03
Site Average	147	35	-112	0.24	4.72						

TABLE 16 Estimated Lime Demand

Site	Method	Description	Lime (tonne CaO / yr) Acidity	Metal Acidity
Faro	Seepage	Current Avg	528	525
	Seepage	Current Max	1,720	1,492
	Seepage	Future Worst	7,165	7,367
	Supporting		-	8,339
Grum	Seepage	Current Avg	74	72
	Seepage	Current Max	124	116
	Seepage	Future Worst	757	945
	Supporting		-	432
Vangorda	Seepage	Current Avg	228	268
	Seepage	Current Max	520	681
	Seepage	Future Worst	599	788
	Supporting		-	467

TABLE 15. NP Depletion and Acidification of the Grum/Vangorda Waste Rock Dumps

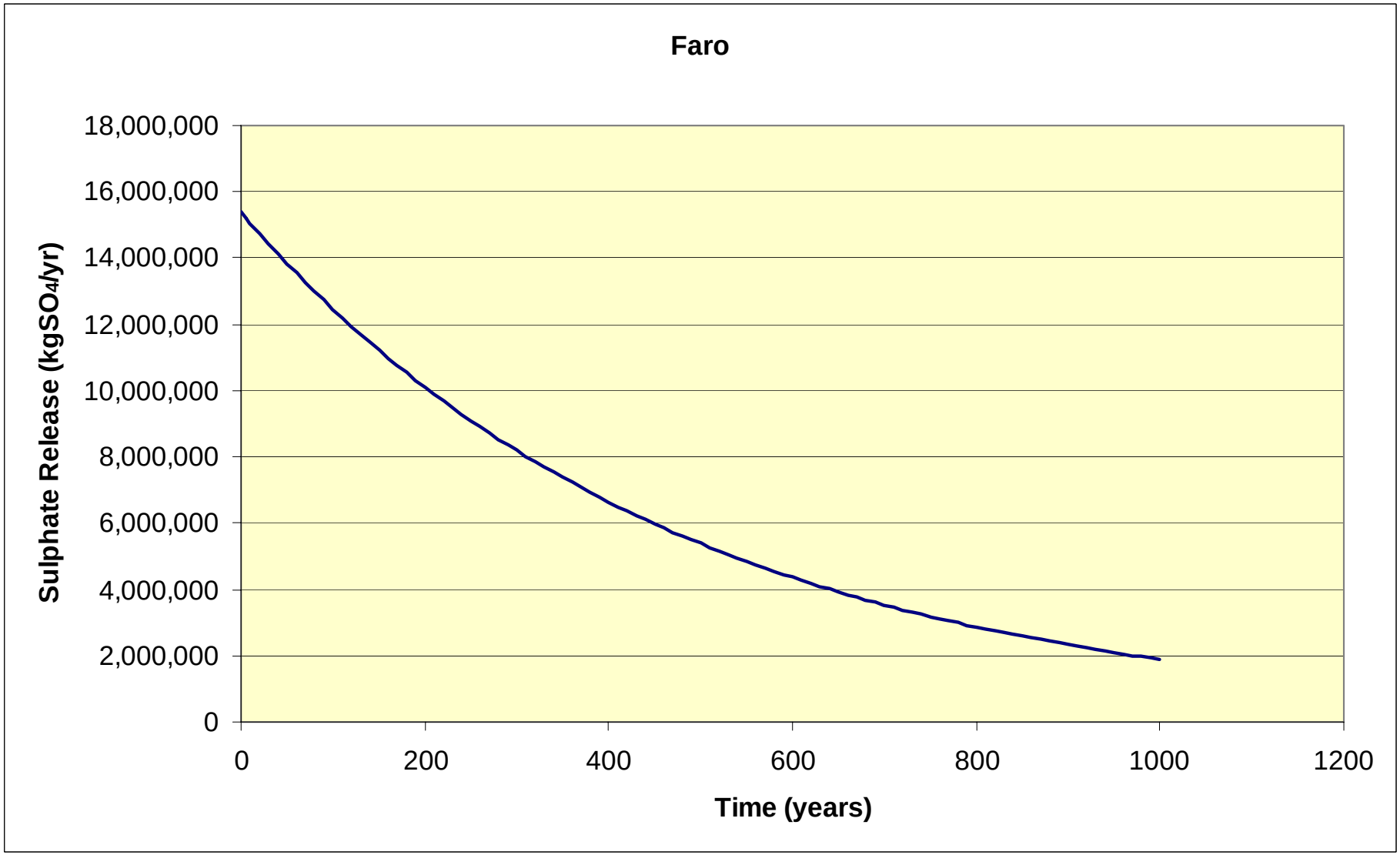
Part 1 - Grum

Name	AP	NP	NNP	NP/AP	S %	S when Acid %	AP at NP Depletion kgCaCO3/t	Avg Rate of AP Depletion while Neutral kgCaCO3eq/t/yr	Avg. Rate of NP Depletion kgCaCO3/t/yr	Time to NP Depletion years	AP Depletion Rate when Acid kgCaCO3/t/yr
Main dump Sulphide Cell	397	26	-371	0.07	12.7	11.9	371	0.81	0.81	32	0.78
Main Dump	25	69	43	2.70	0.82	0.0	0	0.03	0.03	na	0.00
Southwest Dump	25	69	43	2.70	0.82	0.0	0	0.03	0.03	na	0.00
Overburden Dump	0	0	0								
Site Average	52	66	14	1.26	1.67	0.0					

Part 2 - Vangorda

Name	AP	NP	NNP	NP/AP	S %	S when Acid %	AP at NP Depletion kgCaCO3/t	Avg Rate of AP Depletion while Neutral kgCaCO3eq/t/yr	Avg. Rate of NP Depletion kgCaCO3/t/yr	Time to NP Depletion years	AP Depletion Rate when Acid kgCaCO3/t/yr
Main Dump Sulphide Cell	426	26	-400	0.06	13.64	12.8	400	0.87	0.87	30	0.84
Main Dump	17	39	22	2.30	0.54	0.0	0	0.02	0.02	na	0.00
Barite Dump	625	0	-625	0.00	20.00	20.0	625	1.31	1.31	0	1.31
Overburden Dump											
Site Average	163	34	-129		5.22	4.1					

Figures



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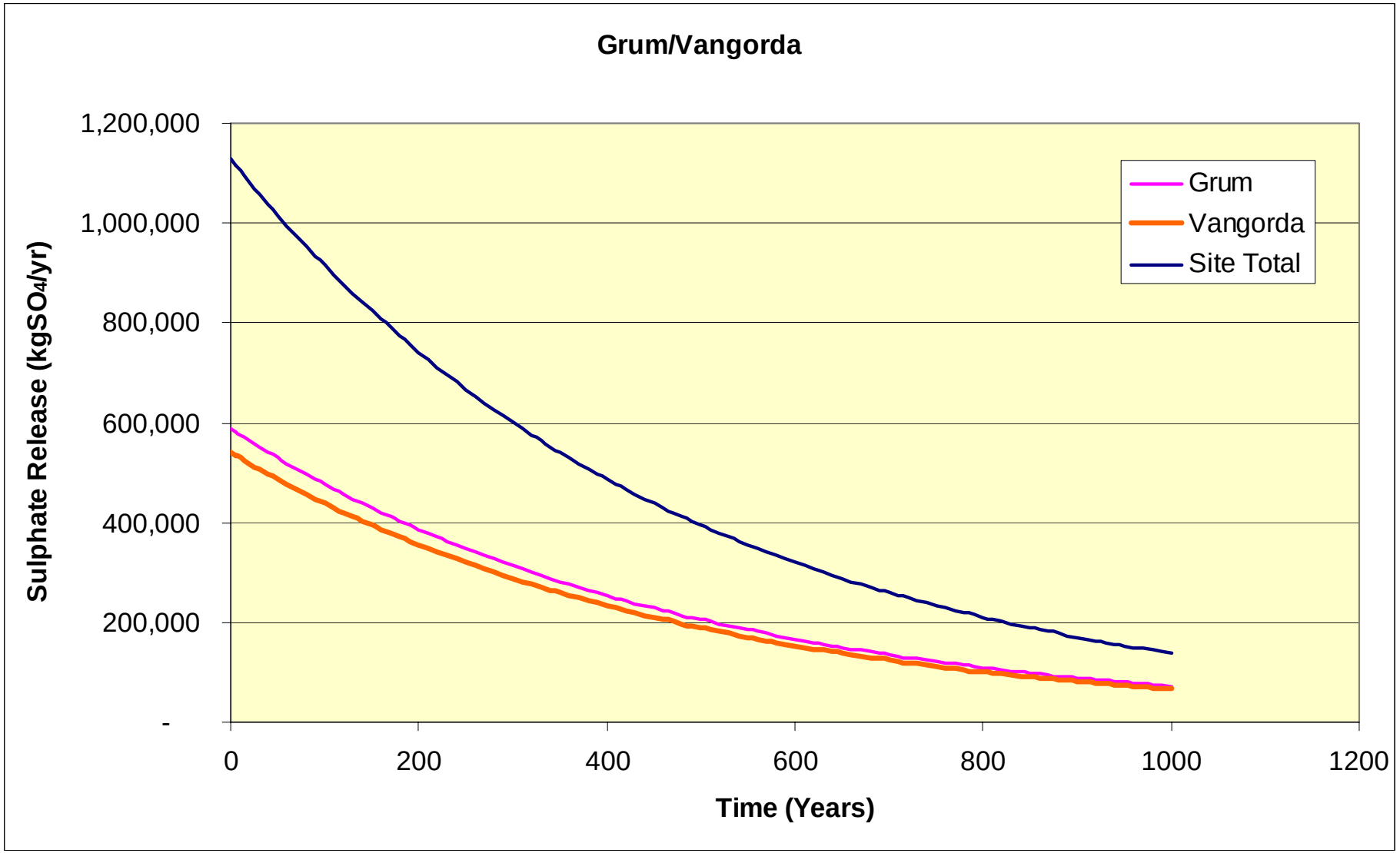
Water Quality Estimates

Estimated Sulphate Release with Time - Faro

PROJECT:	DATE:	APPROVED:	FIGURE:
1CD003.50	Nov. 2004		1



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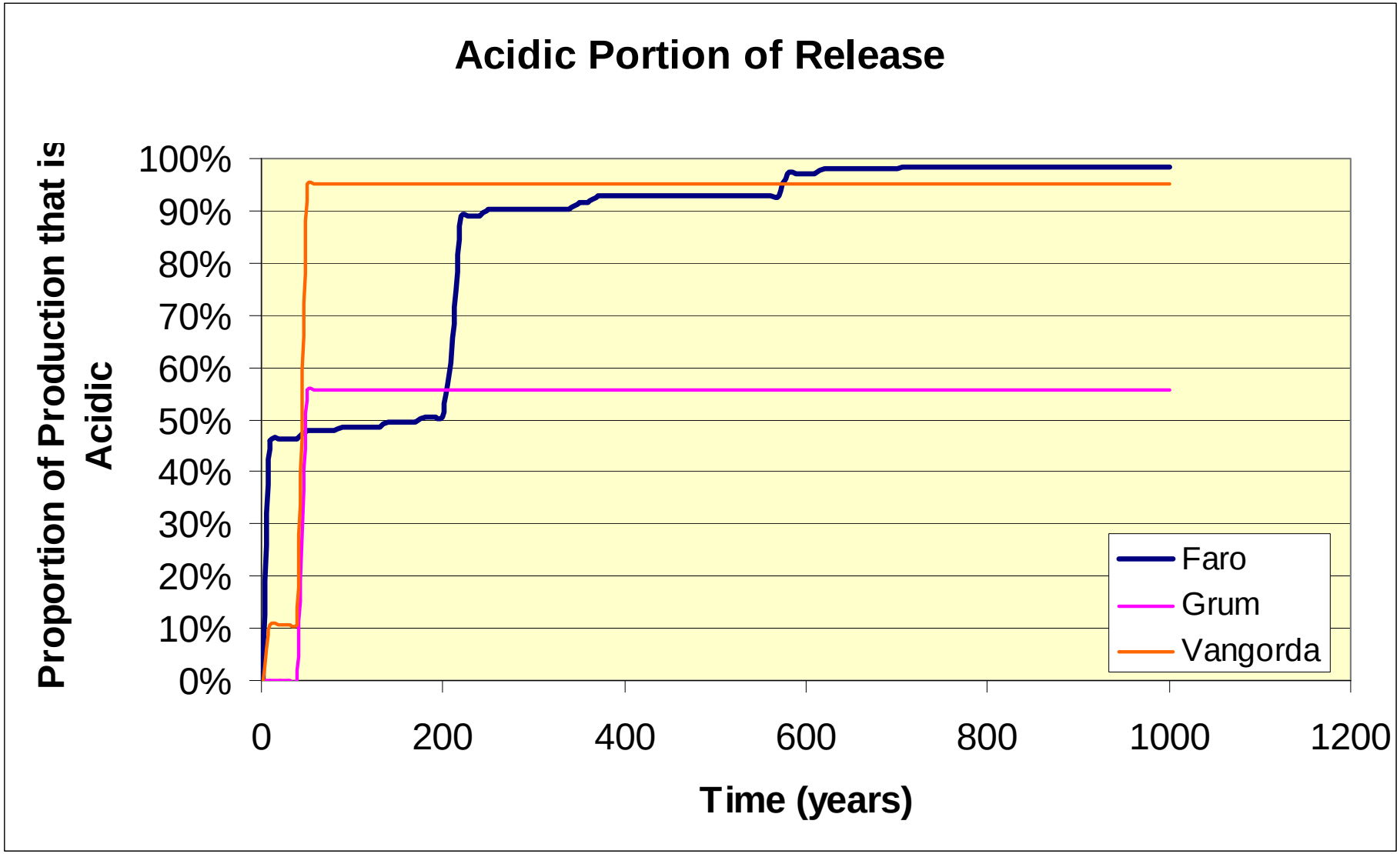
Water Quality Estimates

Estimated Sulphate Release with Time – Grum-Vangorda

PROJECT:	DATE:	APPROVED:	FIGURE:
1CD003.50	Nov. 2004		2



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Water Quality Estimates

Estimated Portion of Sulphate Release Occurring as Acidic Flow

PROJECT:	DATE:	APPROVED:	FIGURE:
1CD003.50	Nov. 2004		3

Appendix A

Estimated Average Acid Generation Properties

Estimated Average Acid Generation Properties

Faro Waste Rock and Ore Dumps

Source	Code	Proportion of rock types					Contained	Area	AP	NP	NNP	NP/AP	S	Zn
		sulphides	schist	calc-sil	intru	Till	tonnes	m2					%	mg/kg
Faro Valley North	FVN	15%	50%	10%	15%	10%	3,514,050	135,869	116	28	-88	0.24	3.72	2,489
Faro Valley South	FVS	0%	65%	0%	30%	5%	607,166	32,605	28	26	-2	0.91	0.91	1,637
Medium Grade Stockpile	MGSP	100%	0%	0%	0%	0%	120,000	33,899	623	5	-618	0.01	19.94	8,560
Crusher Stockpile	CHSP	100%	0%	0%	0%	0%	100,000	22,917	623	5	-618	0.01	19.94	8,560
Oxide Fines Stockpile	OXSP	100%	0%	0%	0%	0%	322,670	20,793	623	5	-618	0.01	19.94	8,560
Low Grade Stockpile A	LGSPA	100%	0%	0%	0%	0%	911,004	29,353	623	5	-618	0.01	19.94	8,560
Upper Northwest Dump	NWU	7%	15%	8%	65%	5%	2,665,666	128,833	61	22	-39	0.36	1.95	1,916
Middle Northwest Dump	NWM	10%	30%	40%	15%	5%	5,723,496	158,069	82	42	-39	0.52	2.61	1,905
Lower Northwest Dump	NWL	8%	37%	30%	15%	10%	6,558,132	105,653	71	38	-33	0.54	2.27	1,792
Mt. Mungly West	MMW	50%	10%	20%	0%	20%	251,854	20,287	320	24	-297	0.07	10.25	4,599
Mt. Mungly East	MME	30%	40%	20%	10%	0%	882,728	34,130	206	30	-175	0.15	6.58	3,584
Fuel Tank Dump W	FTW	100%	0%	0%	0%	0%	86,616	8,372	623	5	-618	0.01	19.94	8,560
Fuel Tank Dump E	FTE	2%	60%	35%	3%	0%	2,479,776	96,879	39	45	6	1.15	1.26	1,547
Upper Parking Lot Dump	UPL	5%	25%	70%	0%	0%	2,222,854	53,716	50	59	9	1.19	1.60	1,365
Lower Parking Lot Dump	LPL	10%	5%	85%	0%	0%	677,080	32,724	76	64	-12	0.84	2.43	1,533
Stock Piles Base	SPB	0%	70%	10%	0%	20%	2,832,056	91,250	29	33	4	1.14	0.92	1,340
Southwest Pit Wall Dump	SWPWD	45%	50%	0%	5%	0%	1,619,962	78,294	299	19	-280	0.06	9.57	4,836
Low Grade Stockpile C	LGSPC	100%	0%	0%	0%	0%	786,068	34,537	623	5	-618	0.01	19.94	8,560
Main East Sulphide Cell	MESC	100%	0%	0%	0%	0%	12,606,018	80,808	623	5	-618	0.01	19.94	8,560
Intermediate Dump Sulphide Cell	IDSC	100%	0%	0%	0%	0%	11,512,005	92,839	623	5	-618	0.01	19.94	8,560
Ranch Dump	RD	5%	85%	0%	10%	0%	525,194	42,305	63	29	-35	0.45	2.02	2,123
Ramp Zone Dump	RZD	2%	30%	68%	0%	0%	2,182,144	60,265	33	59	27	1.81	1.05	1,185
Main Dump West	MDW	10%	75%	10%	0%	5%	25,133,886	220,861	91	32	-59	0.35	2.91	2,287
Main Dump East	MDE	15%	40%	35%	5%	5%	55,063,032	355,257	114	41	-73	0.36	3.65	2,328
Intermediate Dump	ID	20%	20%	54%	1%	5%	40,810,467	328,624	140	48	-92	0.34	4.48	2,463
Outer Haul Road West	OHRW	2%	78%	10%	10%	0%	12,570,922	186,942	43	34	-10	0.77	1.38	1,808
Outer Haul Road East	OHRE	10%	70%	0%	5%	15%	4,481,826	86,644	90	26	-64	0.29	2.88	2,203
Lower Northeast sulphide cell	NELS	*100%*					1,361,794	17,459	623	5	-618	0.01	19.94	8,560
Outer Northeast Dump	NEO	0%	40%	40%	10%	10%	198,422	12,787	23	45	23	2.00	0.72	1,154
Zone II West	ZIIW	10%	50%	20%	10%	10%	6,006,008	89,315	86	34	-52	0.40	2.74	2,054
Zone II East	ZIIE	0%	75%	20%	5%	0%	16,304,844	126,084	30	39	9	1.28	0.97	1,576
Lower Northeast Dump	NEL	5%	30%	30%	10%	25%	21,166,698	272,892	51	38	-13	0.74	1.62	1,332
Upper Northeast Dump	NEU	5%	25%	30%	10%	30%	15,785,560	254,309	49	37	-12	0.75	1.58	1,241
Site Average									147	35	-112	0.24	4.72	2,738

Grum

Name	Code	Proportion of rock types				Contained	Area	AP	NP	NNP	NP/AP	S	Zn
		Sulphide	NonCalc. Phyllite	Calc. Phyllite	OB	tonnes	m2					%	ppm
Main dump Sulphide Cell	G1-S	100%	0%	0%	0%	2,000,000	*180,000*	397	26	-371	0.07	12.7	23215
Main Dump	G1-B	0%	15%	85%	0%	13,000,000	444,810	25	69	43	2.70	0.82	2254
Southwest Dump	G2	0%	15%	85%	0%	13,000,000	653,228	25	69	43	2.70	0.82	2254
Overburden Dump	G3-O	0%	0%	0%	100%		460,740	0	0	0			0
Site Average								52	66	14	1.26	1.67	3751

Vangorda

Name	Code	Proportion of rock types				Contained	Area	AP	NP	NNP	NP/AP	S	Zn
		Sulphide	NonCalc. Phyllite	Calc. Phyllite	OB	tonnes	m2					%	ppm
Main Dump Sulphide Cell	V1-S	100%	0%	0%	0%	2,600,000	92,000	426	26	-400	0.06	13.64	11346
Main Dump	V1-B	0%	91%	9%	0%	5,400,000	327,397	17	39	22	2.30	0.54	2125
Barite Dump	V2	100%	0%	0%	0%	225,000	8,800	625	0	-625	0.00	20.00	20500
Overburden Dump	V3-O	0%	0%	0%	100%		45,755						
Site Average								163	34	-129		5.22	5542.20

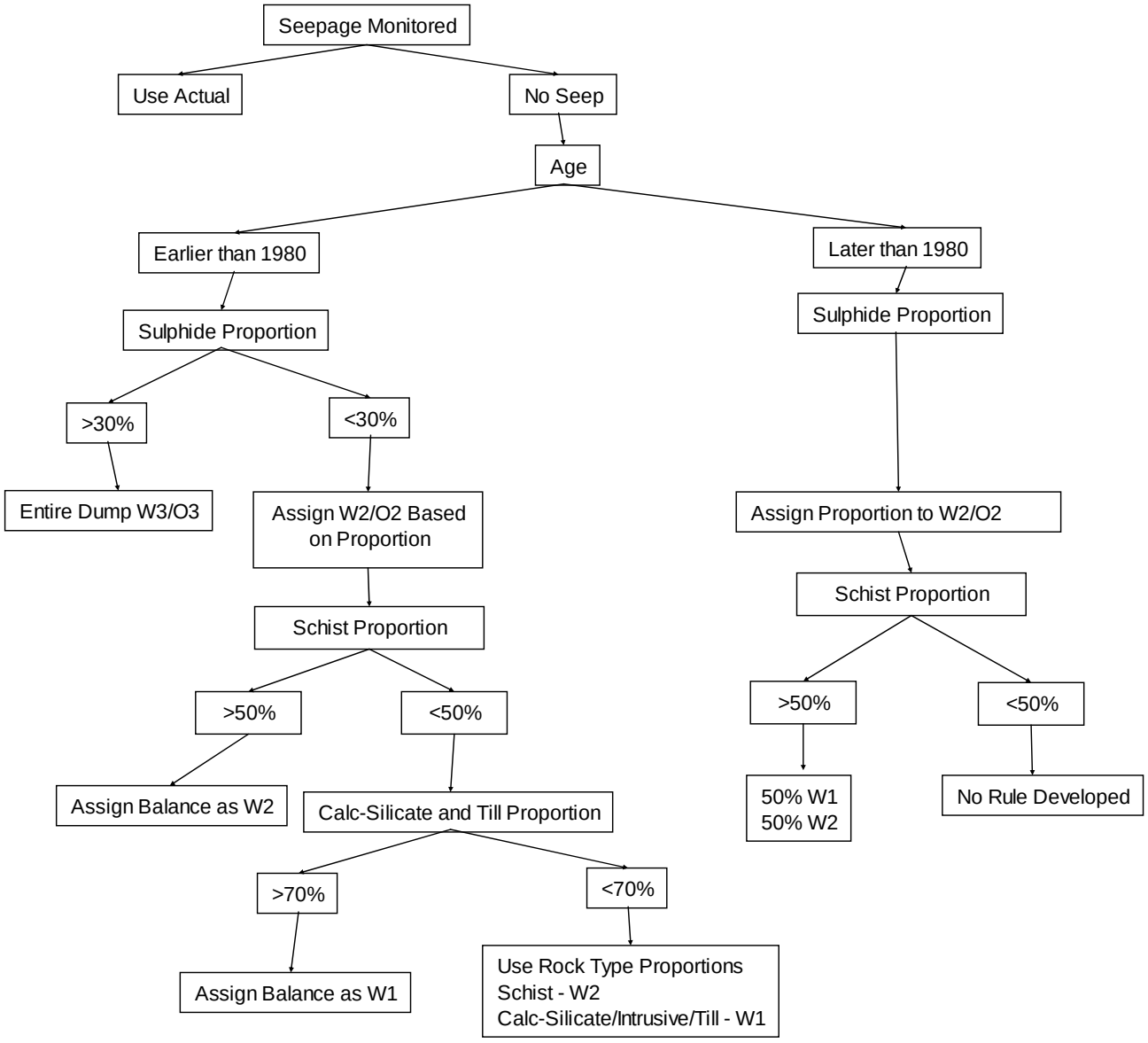
Appendix B

Decision Making Tree for Assigning Seep Quality

Assignment of Seep Water Quality

Basic assumptions:

- All sulphide rock will produce acidic water.
- 50% of schist produces acidic water.
- If calc-silicate is greater than 60%, no acidic water is expected.



Appendix C

Compilation of Kinetic Test Results

Appendix C - Compilation of Kinetic Test Results

Ref.	Source	Test	Location	Rock Type	pH	SO4 mg/kg/wk	Al mg/kg/wk	Sb mg/kg/wk	As mg/kg/wk	Ba mg/kg/wk	Be mg/kg/wk	Bi mg/kg/wk	B mg/kg/wk	Cd mg/kg/wk	Ca mg/kg/wk	Cr mg/kg/wk	Co mg/kg/wk	Cu mg/kg/wk	Fe mg/kg/wk	Pb mg/kg/wk	Li mg/kg/wk	Mg mg/kg/wk	Mn mg/kg/wk	Mo mg/kg/wk	Ni mg/kg/wk	P mg/kg/wk	K mg/kg/wk	Se mg/kg/wk	Si mg/kg/wk	Ag mg/kg/wk	Na mg/kg/wk	Sr mg/kg/wk	Tl mg/kg/wk	Sn mg/kg/wk	Ti mg/kg/wk	V mg/kg/wk	Zn mg/kg/wk
IEE HC	AppD4	VG HCT1	Vangorda	Sulphide Comp.	4.29	83	9.7E-02	9.7E-02	9.7E-02	1.2E-02				2.6E-02	1.3E+01	7.3E-03	4.9E-02	5.8E-02	2.8E+00	1.4E+00		4.8E+00	9.4E+00	1.5E-02	5.7E-02												9.3E+00
IEE HC	AppD4	VG HCT2	Vangorda	Sulphide Comp.	2.91	143	9.8E+00	5.9E-02	3.7E-01	3.3E-03				2.5E-02	1.6E+01	1.5E-02	#N/A	8.9E+00	2.1E+02	2.1E-02		9.0E+00	1.2E+01	1.5E-02	7.7E-02												3.2E+01
IEE HC	AppD4	VG HCT3	Vangorda	Phyllite	4.49	78	1.3E-01	9.3E-02	9.3E-02	9.8E-03				4.6E-03	1.3E+01	7.0E-03	8.6E-03	4.1E-02	1.0E+00	1.1E-01		1.1E+01	3.8E-01	1.4E-02	1.2E-02												2.8E-01
IEE HC	AppD4	VG HCT4	Vangorda	Phyllite	3.57	72	9.0E-01	6.7E-02	6.7E-02	2.4E-02				4.6E-03	3.1E+01	5.5E-03	#N/A	7.1E-02	1.1E+00	1.7E-02		7.2E+00	#N/A	1.0E-02	9.6E-02												4.5E+00
ICAP	AppD5	DR-10A	Faro	Sulphide	6.85	35	8.5E-03	8.5E-03	8.5E-03	1.7E-03	2.1E-04	4.2E-03	4.2E-03	4.2E-04	9.5E+00	4.2E-04	4.2E-04	7.9E-04	1.3E-03	2.1E-03	4.2E-03	3.0E+00	2.8E-02	1.3E-03	9.7E-04	1.3E-02	4.7E-01	8.5E-03	9.8E-01	4.2E-04	8.5E-02	2.3E-02	4.2E-03	1.3E-03	4.2E-04	1.3E-03	2.1E-02
ICAP	AppD5	DR-10B	Faro	Sulphide	7.05	32																														
ICAP	AppD5	FV-17A	Faro	Sulphide	1.6	660	3.5E+00	3.2E-02	3.2E-02	1.8E-03	7.1E-04	1.6E-02	1.8E-02	6.2E-03	2.0E+01	5.4E-03	4.9E-02	1.0E+00	1.9E+02	3.5E-01	6.6E-03	1.1E+00	6.0E-02	3.9E-03	1.2E-02	1.0E-01	3.2E-01	3.2E-02	6.9E+00	1.7E-03	3.2E-01	1.7E-02	4.2E-02	3.9E-03	3.2E-02	3.9E-02	2.8E+00
ICAP	AppD5	FV-17B	Faro	Sulphide	2.38	314																														
ICAP	AppD5	LG-28A	Faro	Sulphide	3.09	139	1.6E-01	3.0E-02	3.0E-02	1.5E-03	8.7E-04	1.7E-02	1.5E-02	7.0E-02	3.6E+00	1.5E-03	1.4E-02	1.2E+00	7.5E+00	2.3E-01	1.5E-03	6.3E+00	5.0E+00	3.3E-03	9.1E-03	3.4E-02	3.0E-01	3.0E-02	4.6E-01	1.5E-03	3.0E-01	3.7E-03	1.5E-02	3.4E-03	1.5E-03	3.4E-03	5.0E+01
ICAP	AppD5	LG-28B	Faro	Sulphide	3	190																														
ICAP	AppD5	G1-03A	Grum	Intrusive	7.57	27	2.2E-02	2.2E-02	2.2E-02	1.2E-02	5.4E-04	1.1E-02	1.1E-02	1.1E-03	7.6E+00	1.1E-03	4.5E-03	1.1E-03	4.6E-03	1.8E-02	1.1E-03	3.9E+00	2.6E-02	3.2E-03	9.8E-03	3.2E-02	2.2E-01	2.2E-02	9.9E-02	1.1E-03	2.2E-01	3.8E-02	1.1E-02	3.2E-03	1.1E-03	3.2E-03	2.6E-01
ICAP	AppD5	G1-03B	Grum	Intrusive	7.74	30																														
ICAP	AppD5	GD-205+26	Grum	MSulphide / Phyllite	7.79	108	8.4E-03	8.4E-03	8.4E-03	1.3E-03	2.1E-04	4.2E-03	4.2E-03	2.3E-03	3.4E+01	4.2E-04	2.6E-03	4.2E-04	1.5E-03	9.9E-03	1.5E-03	4.5E+00	6.4E-02	1.3E-03	2.9E-03	1.3E-02	2.1E-01	8.4E-03	5.1E-02	4.2E-04	8.4E-02	5.9E-02	4.2E-03	1.3E-03	4.2E-04	1.3E-03	7.9E-01
ICAP	AppD5	GD-205+26	Grum	MSulphide / Phyllite	7.73	109																														
ICAP	AppD5	LG-29+32A	Faro	Sulphide	2.44	120	3.1E-01	1.5E-02	1.7E-02	1.2E-03	3.8E-04	8.1E-03	7.6E-03	3.6E-02	6.7E-01	9.3E-04	1.3E-02	2.8E+00	2.6E+01	2.1E-01	7.6E-04	7.2E-01	2.4E-01	4.7E-03	1.9E-03	1.1E-02	1.5E-01	1.5E-02	5.5E-01	7.6E-04	1.5E-01	3.0E-03	9.5E-03	3.7E-03	7.6E-04	2.2E-03	2.6E+01
ICAP	AppD5	LG-29+32E	Faro	Sulphide	2.39	183																														
ICAP	AppD5	MD-33A	Faro	Schist	8.25	15	9.5E-03	9.5E-03	9.5E-03	3.3E-03	2.4E-04	8.7E-03	4.7E-03	4.7E-04	3.6E+00	4.7E-04	4.7E-04	5.5E-04	1.4E-03	2.4E-03	4.7E-03	7.2E+00	3.9E-03	1.4E-03	9.5E-04	1.4E-02	2.7E-01	9.5E-03	6.2E-03	4.7E-04	9.5E-02	9.6E-03	4.7E-03	1.4E-03	4.7E-04	1.4E-03	1.2E-03
ICAP	AppD5	MD-33B	Faro	Schist	8.31	20																														
ICAP	AppD5	NW-25	Faro	Sulphide	2.18	774	4.3E+00	1.4E-01	1.4E-01	7.2E-03	3.5E-03	7.2E-02	7.2E-02	7.0E-01	1.6E+01	9.6E-03	3.8E-01	2.9E+00	1.2E+02	1.4E-01	7.8E-03	1.4E+01	3.3E+00	2.8E-02	2.7E-01	2.0E-01	1.4E+00	1.4E-01	5.2E+00	7.2E-03	1.4E+00	2.5E-02	7.5E-02	2.7E-02	7.2E-03	2.1E-02	2.7E+02
ICAP	AppD5	SC-04A	Faro	Sulphide	3.66	144	2.9E-02	2.9E-02	2.9E-02	1.4E-03	6.3E-04	1.9E-02	1.4E-02	7.4E-02	5.4E+00	1.4E-03	2.3E-02	1.1E-01	1.1E+00	2.6E-01	1.4E-03	1.1E+01	5.1E+00	3.1E-03	2.5E-02	3.4E-02	2.9E-01	2.9E-02	1.1E-01	1.4E-03	2.9E-01	1.9E-03	1.5E-02	3.4E-03	1.4E-03	3.4E-03	5.0E+01
ICAP	AppD5	SC-04B	Faro	Sulphide	3.56	190																														
ICAP	AppD5	SC-08A	Faro	Calc. Silicate	8.26	5	7.5E-03	7.5E-03	7.5E-03	5.0E-03	1.9E-04	3.7E-03	3.7E-03	3.7E-04	3.7E+00	3.7E-04	3.7E-04	3.9E-04	1.2E-03	1.9E-03	5.1E-03	1.7E+00	1.2E-03	1.1E-03	7.5E-04	1.1E-02	4.5E-01	7.5E-03	1.9E-01	3.7E-04	7.3E-01	5.1E-02	3.7E-03	1.1E-03	3.7E-04	1.1E-03	3.6E-03
ICAP	AppD5	VP-01A	Vangorda	MSulphide / Phyllite	7.84	105	1.6E-02	1.6E-02	1.6E-02	2.9E-03	3.9E-04	7.9E-03	7.9E-03	2.6E-03	3.5E+01	7.9E-04	3.4E-03	7.9E-04	2.4E-03	7.0E-03	1.2E-03	5.5E+00	3.6E-01	2.4E-03	1.6E-03	2.4E-02	1.6E-01	1.6E-02	8.3E-02	7.9E-04	1.6E-01	1.1E-01	7.9E-03	2.4E-03	7.9E-04	2.4E-03	4.4E-01
ICAP	AppD5	VP-01B	Vangorda	MSulphide / Phyllite	7.7	96																														
ICAP	AppD5	ZT-42A	Faro	Sulphide	4.2	135	1.5E-02	1.5E-02	1.6E-02	8.5E-04	3.7E-04	1.7E-02	7.4E-03	5.4E-02	6.9E+00	7.4E-04	1.4E-02	5.9E-03	3.6E+00	2.7E-01	6.2E-03	1.1E+01	8.1E+00	2.2E-03	2.3E-02	2.2E-02	3.8E-01	1.5E-02	4.1E-01	7.4E-04	1.5E-01	5.8E-03	1.4E-02	2.2E-03	7.4E-04	2.2E-03	2.9E+01
ICAP	AppD5	ZT-42B	Faro	Sulphide	3.6	123																														
Schedule D	AppD3	1CD	Faro	Schist	7.7	23									#N/A			2.28E-03	1.49E-02	3.37E-03		#N/A														1.17E-02
Schedule D	AppD3	1CD Inoc	Faro	Schist	7.7	23									#N/A			2.35E-03	7.39E-03	3.85E-03		#N/A														1.08E-02
Schedule D	AppD3	1DO	Faro	Schist	7.8	18									#N/A			6.03E-03	1.71E-02	3.75E-03		#N/A														3.49E-03
Schedule D	AppD3	1DO-Inoc	Faro	Schist	7.8	25									#N/A			1.64E-03	9.78E-03	4.34E-03		#N/A														4.68E-03
Schedule D	AppD3	1D4	Faro	Schist	7.7	63									#N/A			9.41E-03	#N/A	1.77E-02		#N/A														6.46E-02
Schedule D	AppD3	1D4-Inoc	Faro	Schist	7.8	63									#N/A			1.64E-02	3.14E-01	1.18E-02		#N/A														1.02E-01
Schedule D	AppD3	10E	Faro	Intrusive	7.5	27									#N/A			9.51E-03	1.35E-02	3.97E-03		#N/A														7.65E-03
Schedule D	AppD3	10E-Inoc	Faro	Intrusive	7.5	63									#N/A			8.79E-03	2.31E-02	4.26E-03		#N/A														9.86E-03
Schedule D	AppD3	2A Comp	Faro	Sulphide	3.9	110									5.56E+00			5.05E-02	2.43E+01	3.20E+00		2.60E+00														7.30E+00
Schedule D	AppD3	2B	Faro	Sulphide	3.7	124									5.90E+00			6.19E-02	2.88E+01	1.25E+00		9.37E+00														1.68E-01
Schedule D	AppD3	2CE	Faro	Sulphide	4.5	31									3.42E+00			1.64E-02	9.13E-01	3.94E+00		3.04E+00														8.96E-01
Schedule D	AppD3	2CO	Faro	Sulphide	5	19									1.97E+00			4.55E-03	6.22E-02	6.06E+00		3.56E-01														7.42E+00
Schedule D	AppD3	2CO/2EO	Faro	Sulphide	3.9	47									2.47E+00			6.57E-02	4.20E+00	7.01E+00		3.22E+00														7.22E+00
Schedule D	AppD3	3D	Faro	Calc.Silicate	7.6	5									4.75E+00			1.89E-03	2.27E-02	2.45E-02		1.57E+00														4.23E-02
SRK 2003	AppE6	Cell 1	Faro	Calc.Silicate	8.05	8	-8.00E-02	-8.00E-02	-8.00E-02	2.00E-02	-2.00E-03	-8.00E-02	-4.00E-02	-4.00E-03	4.16E+00	-4.00E-03	-4.00E-03	-4.00E-03	-1.20E-02	-2.00E-02	2.00E-03	3.06E+00	2.00E-03	-1.20E-02	-2.00E-02	-1.20E-01	0.00E+00	-8.00E-02	1.34E-01	-4.00E-03	-8.00E-01	4.94E-02	-8.00E-02	-1.20E-02	-4.00E-03	-1.20E-02	4.00E-04
SRK 2003	AppE6	Cell 2	Faro	Calc.Silicate	7.93	8	-8.00E-02	-8.00E-02	-8.00E-02	1.80E-02	-2.00E-03	-8.00E-02	-4.00E-02	-4.00E-03	2.32E+00	-4.00E-03	-4.00E-03	-4.00E-03	-1.20E-02	-2.00E-02	0.00E+00	2.56E+00	-2.00E-03	-1.20E-02	-2.00E-02	-1.20E-01	-8.00E-01	-8.00E-02	5.60E-02	-4.00E-03	-8.00E-01	3.26E-02	-8.00E-02	-1.20E-02	-4.00E-03	-1.20E-02	-2.00E-03
SRK 2003	AppE6	Cell 3	Faro	Intrusive	8.10	7	-8.00E-02	-8.00E-02	-8.00E-02	4.40E-02	-2.00E-03	-8.00E-02	-4.00E-02	-4.00E-03	3.33E+00	-4.00E-03	-4.00E-03	-4.00E-03	-1.20E-02	-2.00E-02	8.00E-03	3.64E+00	-2.00E-03	-1.20E-02	-2.00E-02	-1.20E-01	1.20E+00	-8.00E-02	1.18E-01	-4.00E-03	-8.00E-01	4.28E-02	-8.00E-02	-1.20E-02	-4.00E-03	-1.20E-02	-2.00E-03
SRK 2003	AppE6	Cell 4	Faro	Till	8.07	3	-8.00E-02	-8.00E-02	-8.00E-02	3.00E-02	-2.00E-03	-8.00E-02	-4.00E-02	-4.00E-03	1.35E+01	-4.00E-03	-4.00E-03	-4.00E-03	-1.20E-02	-2.00E-02	8.00E-03	1.35E+01	2.56E-02	-1.20E-02	-2.00E-02	-1.20E-01	1.00E+00	-8.00E-02	2.88E-01	-4.00E-03	-8.00E-01	7.18E-02	-8.00E-02	-1.20E-02	-4.00E-03	-1.20E-02	-2.00E-03
SRK 2003	AppE6	Cell 5	Grum	Phyllite	8.20	13	-8.00E-02	-8.00E-02	-8.00E-02	1.00E-02	-2.00E-03	-8.00E-02	-4.00E-02	-4.00E-03	1.68E+00	-4.00E-03	-4.00E-03	-4.00E-03	-1.20E-02	-2.00E-02	-4.00E-03	6.10E+00	-2.00E-03	-1.20E-02	-2.00E-02	-1.20E-01	-8.00E-01	-8.00E-02	4.00E-02	-4.00E-03	-8.00E-01	1.52E-02	-8.00E-02	-1.20E-02	-4.00E-03	-1.20E-02	-2.00E-03
SRK 2003	AppE6	Cell 6	Faro	Calc.Silicate + Schist	7.52	54	-8.00E-02	-8.00E-02	-8.00E-02	8.93E-03	-2.00E-03	-8.00E-02	-4.00E-02	-4.00E-03	1.51E+01	-4.00E-03	-4.00E-03	-4.00E-03	-1.20E-02	-2.00E-02	-4.00E-03	6.25E+00	-2.00E-03	-1.20E-02	-2.00E-02	-1.20E-01	-8.00E-01	-8.00E-02	7.56E-02	-4.00E-03	-8.00E-01	2.71E-02	-8.00E-02	-1.20E-02	-4.00E-03	-1.20E-02	-2.00E-03
SRK 2003	AppE6	Cell 7	Grum	Phyllite	8.05	22	-8.00E-02	-8.00E-02	-8.00E-02	0.00E+00	-2.00E-03	-8.00E-02	-4.00E-02	-4.00E-03	5.22E+00	-4.00E-03	-4.00E-03	-4.00E-03	-1.20E-02	-2.00E-02	-4.00E-03	4.48E+00	1.60E-03	-1.20E-02	-2.00E-02	-1.20E-01	-8.00E-01	-8.00E-02	4.20E-02	-4.00E-03	-8.00E-01	1.78E-02	-8.00E-02	-1.20E-02	-4.00E-03	-1.20E-02	3.02E-02
SRK 2003	AppE6	Cell 8	Faro	Calc.Silicate + Schist	8.05	12	-8.00E-02	-8.00E-02	-8.00E-02	1.80E-02	-2.00E-03	-8.00E-02	-4.00E-02	-4.00E-03	5.62E+00	-4.00E-03	-4.00E-03	-4.00E-03	-1.20E-02	-2.00E-02	8.00E-03	4.92E+00	-2.00E-03	-1.20E-02	-2.00E-02	-1.20E-01	1.40E+00	-8.00E-02	1.28E-01	-4.00E-03	-8.00E-01	4.74E-02	-8.00E-02	-1.20E-02	-4.00E-03	-1.20E-02	6.00E-04
SRK 2003	AppE6	Cell 9	Grum	Phyllite	8.05	12	-8.00E-02	-8.00E-02	-8.00E-02	8.00E-03	-2.00E-03	-8.00E-02	-4.00E-02	-4.00E-03	1.99E+00	-4.00E-03	-4.00E-03	-4.00E-03	-1.20E-02	-2.00E-02	-4.00E-03	3.62E+00	-2.00E-03	-1.20E-02	-2.00E-02	-1.20E-01	-8.00E-01	-8.00E-02	3.00E-02	-4.00E-03	-8.00E-01	1.52E-02	-8.00E-02	-1.20E-02	-4.00E-03	-1.20E-02	-2.00E-03
SRK 2003	AppE6	Cell 10	Grum	Intrusive	8.05	35	-8.00E-02	-8.00E-02	-8.00E-02	8.00E-03	-2.00E-03	-8.00E-02	-4.00E-02	-4.00E-03	5.66E+00	-4.00E-03	-4.00E-03	-4.00E-03	-1.20E-02	-2.00E-02	-4.00E-03	7.18E+00	-2.00E-03	-1.20E-02	-2.00E-02	-1.20E-01	-8.00E-01	-8.00E-02	5.40E-02	-4.00E-03	-8.00E-01	1.90E-02	-8.00E-02	-1.20E-02	-4.00E-03	-1.20E-02	2.58E-02
SRK 2003	AppE6	Cell 11	VTP06B	Phyllite	8.05	29	-8.00E-02	-8.00E-02	-8.00E-02	1.08E-02	-2.00E-03	-8.00E-02	-4.00E-02	-4.00E-03	6.77E+00	-4.00E-03	-4.00E-03	-4.00E-03	-1.20E-02	-2.00E-02	-4.00E-03	4.51E+00	3.87E-03	-1.20E-02	-2.00E-02	-1.20E-01	-8.00E-01	-8.00E-02	-5.33E-03	-4.00E-03	-8.00E-01	1.95E-02	-8.00E-02	-1.20E-02	-4.00E-03	-1.20E-02	1.41E-02

note: (-) values are below detection limit