CONTROL OF ACIDIC DRAINAGE IN LAYERED WASTE ROCK: LABORATORY STUDIES AND FIELD MONITORING

MEND Project 2.37.3

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CONTROL OF ACIDIC DRAINAGE IN LAYERED WASTE ROCK AT THE SAMATOSUM MINESITE: LABORATORY STUDIES AND FIELD MONITORING

prepared for:

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NOTICE

This study is based on detailed technical information interpreted through standard and advanced chemical and geoscientific techniques available at this time. As with all geoscientific investigations, the findings are based on data collected at discrete points in time and location. In portions of this report, it has been necessary to infer information between and beyond the measured data points using established techniques and scientific judgement. In our opinion, this report contains the appropriate level of chemical and geoscientific information to reach the conclusions stated herein.

This study has been conducted in accordance with British Columbia provincial law as stated in the Engineers and Geoscientists Act and in the Applied Science Technologists and Technicians Act.

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TABLE OF CONTENTS

List of Tables

List of Figures

EXECUTIVE SUMMARY/SOMMAIRE

This study represents another contribution in the MEND series on the prediction and control of acidic drainage from waste-rock dumps. The Samatosum Minesite in southeastern British Columbia implemented full-scale layering of acid-generating and acid-neutralizing rock in its waste-rock dump, based on a series of column tests.

This study has reviewed existing information, reinterpreted old data, and obtained new data for the layered waste-rock dump at Samatosum and the column tests which simulated it. Most of the rock units at Samatosum had significant proportions of net-acid-generating rock, except for mafic pyroclastics (MAF). As a result, all rock was divided into MAF and Potentially Acid Generating (PAG) rock. The PAG was encapsulated by MAF layers within the dump, and the overall ratio of Neutralization Potential (NP) to Total Acid Potential (TAP) within the dump was 3:1.

Column tests containing 10-50 kg of rock simulated various layered and unlayered sequences of PAG and MAF rock. These columns were operated up to 5.5 years to determine if the dump design was appropriate. However, the two columns containing layers of PAG and MAF to simulate the dump had NP:TAP ratios close to 1:1, instead of 3:1.

Because effluent concentrations of metals like calcium and magnesium were not measured during column testing, rates of NP consumption and depletion could not be determined. However, simple geochemical relationships and data from other mines indicated that the ratio of NP consumption to sulphide depletion in the layered columns was likely greater than 1:1. Additionally, not all measured NP at Samatosum is available for neutralization: up to 10 t $CaCO_3$/1000 t is unavailable. Therefore, the columns were predicted to eventually release net acidity if they had continued. This contradicted previous predictions, primarily because previous work assumed that the rate of NP consumption was lower and equivalent to the rate of alkalinity production. In reality, alkalinity production typically represents only a portion of total NP consumption.

Comparisons of pre-test and post-test analyses on various grain-size ranges from the columns indicated layering as small as 0.2 m did not alter the reaction rates and the geochemical behaviour of the PAG and MAF material. In other words, layering with MAF did not slow reaction rates in the adjacent PAG layers. However, the effluent from the layered columns did represent a composite from the two materials.

Significant accumulation of sulphate from sulphide oxidation was noted in PAG, where it originated, and in basal MAF layers within the columns. Also, NP was significantly depleted in MAF layers, particularly in the finest grain-size range. In fact, NP depletion in the finest MAF particles caused some MAF to become net acid generating and suggested that NP in the coarser particles may not be readily available. This also supported the prediction of net acidity from the columns.

Monitoring of drainage from the dump at Samatosum has revealed signs of impending net acidity. In fact, pH at one station has fluctuated between neutral and acidic values, with the acidic values becoming lower and more persistent with time. However, unlike the columns, the dump has an overall ratio of NP:TAP of 3:1, and thus is not predicted to generate net acidity.

The reconciliation of predictions with monitoring data is based on (1) the observations in the columns that layering does not suppress reaction rates in the PAG and (2) coarser rock can preferentially channel water through a layer. Consequently, the appearance of net acidity in some dump drainage is simply the result of physical conditions rather than a failure of geochemical principles. This highlights the importance of physical design and physical hydrogeology in any future design and construction of a layered dump. If drainage does not pass through all available neutralizing layers, acidic drainage may appear even in the presence of excess neutralizing potential.

A final note focusses on metal leaching. Although acidic pH may be prevented with carefully designed and implemented layering, leaching of metals is not so easily controlled. Because reaction rates in even small layers of net-acid-generating Samatosum rock, on the order of 0.2 m, could proceed unattenuated by adjacent net-acid-neutralizing rock, metal leaching can probably occur at accelerated rates in layered dumps. If site-specific solubilities of secondary minerals are relatively high, aqueous metal concentrations may then exceed water-quality requirements even in near-neutral drainage. Therefore, layering is not necessarily a control technique for metal leaching.

1. INTRODUCTION AND OBJECTIVES

The Mine Environment Neutral Drainage (MEND) Program has sponsored numerous studies in the areas of prediction, prevention, and control of acidic drainage. This has led to improved techniques and approaches under each area. Through the combination of prediction and prevention, this project contributes to the improvements by documenting how field-scale control for a full-size waste-rock dump was designed using predictive techniques.

As documented in the references, much of the original work reported here was carried out by Minnova Inc. (now Inmet Mining Corporation), its consultants, and regulatory agencies. This work showed thoughtful, long-range planning and execution of the dump design. For the benefit of the Canadian mining industry and regulatory agencies, MEND has sponsored this project which compiles the original work, reinterprets the analytical data through more recent approaches, includes additional sample analysis, and draws new conclusions for comparison to the initial ones.

The Samatosum Minesite is located near Kamloops, British Columbia (Figures 1-1 to 1-3), approximately 39 km east of Barriere by road. Average annual net precipitation is 0.940 m. The mine was operated from May 1989 to September 1992 for recovery of silver, gold, copper, zinc, and lead. Initially, mining was in an open pit, turning to underground methods in 1991. The average daily rate of mining was 465 tonnes. In total, 565,700 t of ore and $9.6x10^6$ t of waste rock were mined (Piteau Associates, 1996).

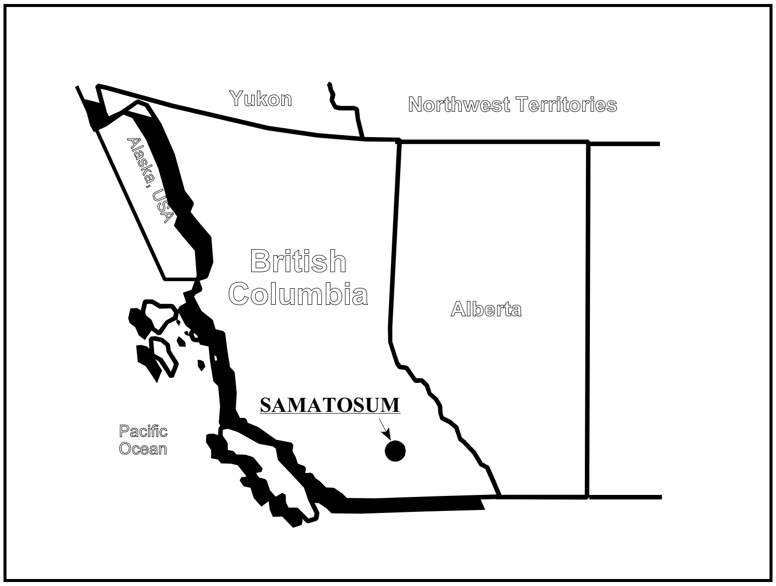


FIGURE 1-1. Location of the Samatosum Minesite in British Columbia.

The following chapters follow the logical design, construction, and monitoring of the dump. Specifically, Chapter 2 describes the geology and rock units at Samatosum. The types and volumes of these units were the key to designing the dump in order to prevent acidic drainage. Chapter 3 describes the predictive laboratory testwork, particularly acid-base accounting and kinetic column tests, on which the dump was designed. Monitoring of drainage from the dump, as documented in Chapter 4, shows how relevant and representative the predictive results were. Various conclusions are then discussed in Chapter 5 about prediction and prevention of acidic drainage at Samatosum.

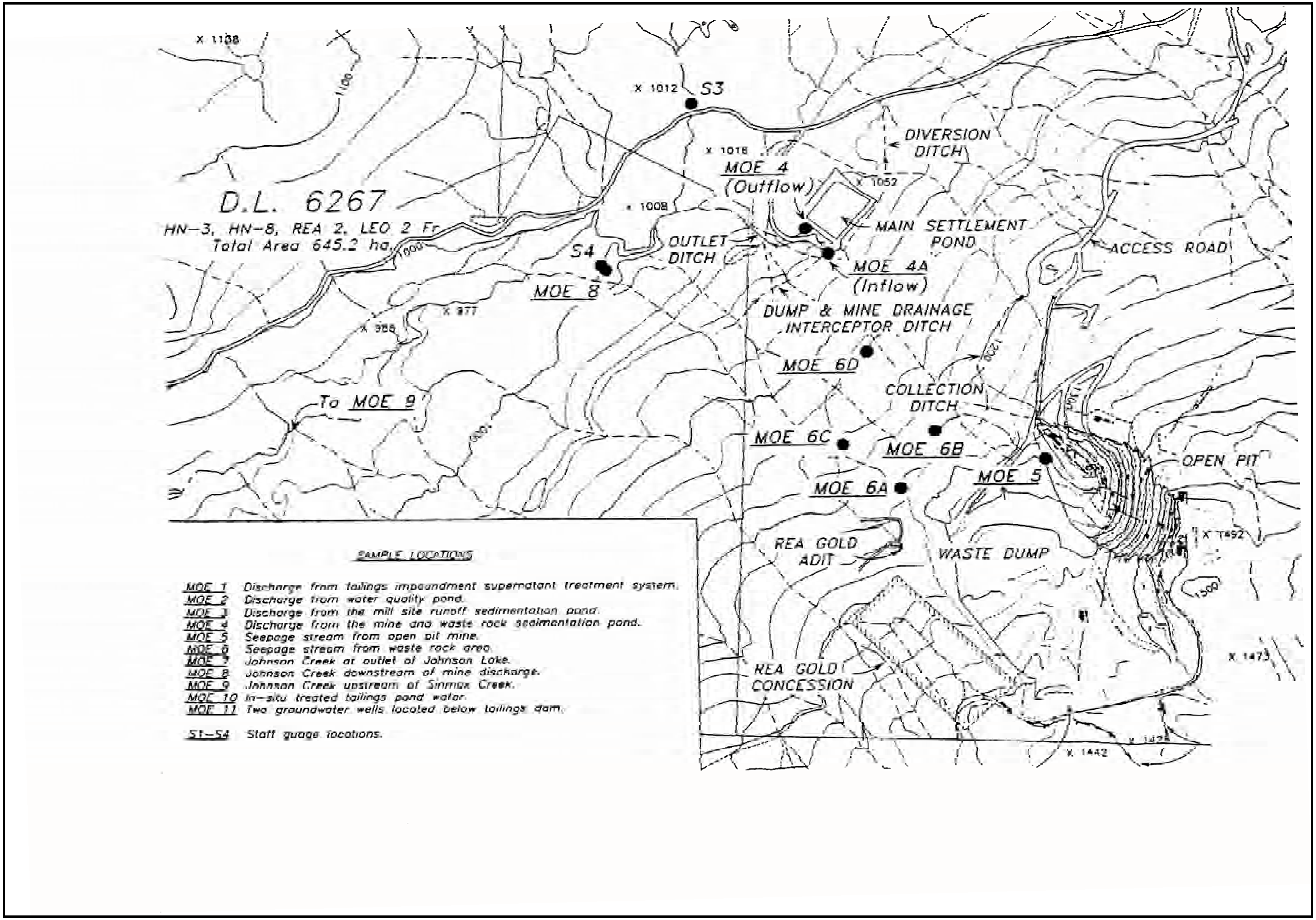


FIGURE 1-3. Layout and Monitoring Sites of the Samatosum Minesite (adapted from Piteau Associates, 1996).

2. GEOLOGY AND ROCK UNITS AT SAMATOSUM

The Samatosum Deposit is located in the Eagle Bay Assemblage of Early Cambrian to Late Mississippian age (Hatfield Consultants Limited, 1988). During the Jurassic and Cretaceous Periods (65-190 million years ago), this rock was subjected to multiple stages of thrust faulting and folding, causing it to be metamorphosed, strongly foliated, and overturned. The Eagle Bay Assemblage was then intruded by granodiorite, quartz monzonite, quartz-feldspar porphyry, basalt and lamprophyre dykes. All of this was later overlain by sedimentary and volcanic rocks and plateau lava.

The Samatosum Deposit is primarily a stratabound quartz-carbonate vein located within volcanic-related mafic pyroclastics, sericitic tuffs, cherts, muddy tuffs, argillite, mudstone, and greywacke (Hatfield Consultants Limited, 1988). The Muddy Tuff Unit contains up to 60% syngenetic to diagenetic pyrite, and 1 to 3% of zinc, lead, and copper over distances of 10-15 m. Ore is located near the interface of sericitic tuffs and cherts in the structural hanging wall and muddy tuff and metasedimentary rocks in the footwall (Figure 2-1). The ore rock is predominantly composed of 11% pyrite, 32% quartz, and 19% dolomite (calcium-magnesium carbonate), as well as tetrahedrite described as a copper-iron-zinc-silver-antimony sulphide, sphalerite, galena, chalcopyrite, and electrum (native gold-silver mixture). The degree of sericite alteration decreases away from the ore zones (Denholm and Hallam, 1991).

From the complex geology in the area, seven rock units can be delineated (Table 2-1). For the purposes of this study, all units except the mafic pyroclastics (MAF, Table 2-1) are combined into one group labelled “potentially acid generating” (PAG, Section 3.2).

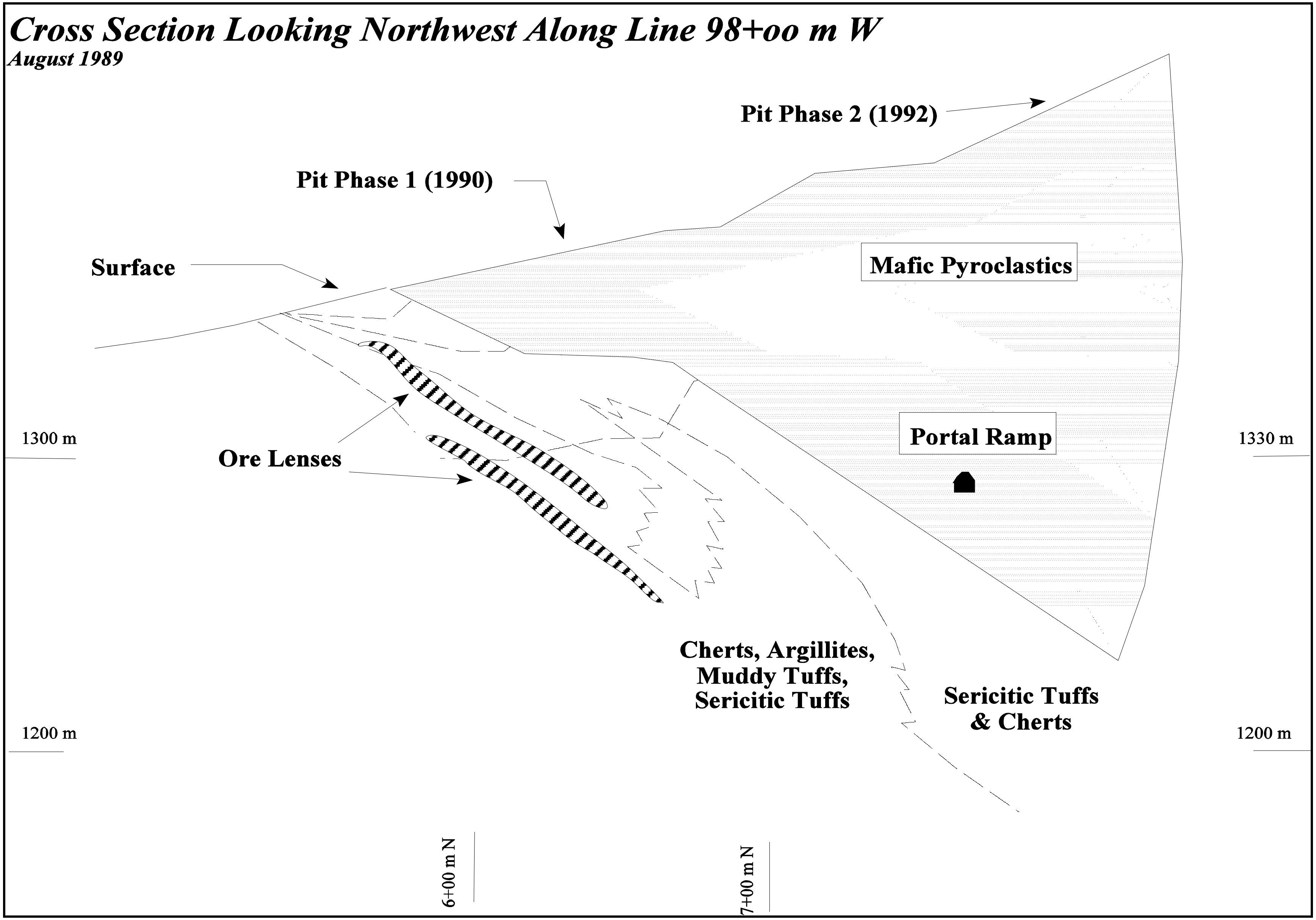


Figure 2-1. Geological Cross-section of the Samatosum Minesite (from Denholm and Hallam, 1991).

TABLE 2-1
Rock Units at the Samatosum Minesite
(from Denholm and Hallam, 1991)

Rock Unit	Mine Code	Code for This Study	Volume (Percentage) of Total Waste Rock
mafic pyroclastics	MAF	MAF	2,000,000 m^3 (58%)
sericitic tuff	SERT	PAG	982,000 m^3 (29%)
argillite	ARG		173,000 m^3 (5.0%)
muddy tuff	MUT		116,000 m^3 (3.4%)
quartz vein	QV		87,000 m^3 (2.5%)
quartzite	QITE		72,000 m^3 (2.1%)
chert	CHERT		3,600 m^3 (0.11%)

3. RESULTS OF PREDICTIVE STATIC AND KINETIC TESTS

3.1 Introduction to Static and Kinetic Testing

Static tests characterize samples only once, at the time of analysis. The results are then extrapolated through time to estimate past conditions or predict future conditions. The three most common static tests are acid-base accounting (ABA), total-metal contents, and whole-rock composition. The latter two involve digestion of samples in acid followed by chemical analyses for metals and nonmetals. ABA is more complicated.

Acid-base accounting is a specialized chemical procedure that determines a sample's balance of potentially acid-generating and acid-neutralizing minerals. The best known and most widely used method is known as Sobek or EPA 600 ABA (e.g., Morin and Hutt, 1997). This method was used for column samples (Section 3.3), but the method used for past ABA on rock units (Section 3.2) was not reported.

The total acid-generating potential, also known as Total Acid Potential (TAP), is mathematically calculated from ABA's total sulphur (TAP = %S total * 31.25). The conversion factor is based on various stoichiometric and environmental assumptions, and provides TAP in any one of three equivalent units: tonnes (t) of $CaCO_3$ equivalent/1000 tonnes of sample, kg of $CaCO_3$ equivalent/t of sample, or parts of $CaCO_3$ equivalent per thousand.

Since not all forms of sulphur are acid generating, the expanded version of ABA (used for column samples) also includes analyses of non-acid-generating sulphate (including gypsum) and acid-generating sulphide. In theory, total sulphur equals sulphate plus sulphide, but other forms of sulphur and analytical accuracy often cause some discrepancy (del %S). The discrepancy is added to sulphide so that Sulphide Acid Potential [SAP = (%S sulphide + del %S) * 31.25] is not underestimated.

Expanded ABA also includes measurements of bulk Neutralization Potential (NP), based on a hot acid bath, and Carbonate Neutralization Potential (CaNP), based on CO_2 measurement. The comparison of NP to CaNP reveals that amount of NP consisting of fast-neutralizing carbonate minerals and slower-neutralizing aluminosilicate minerals. Like acid potentials, these NPs are typically reported in any one of three equivalent units: tonnes (t) of $CaCO_3$ equivalent/1000 tonnes of sample, kg of $CaCO_3$ equivalent/t of sample, or parts of $CaCO_3$ equivalent per thousand.

The net balance of acid potentials ("xAP") and neutralization potentials ("xNP") are determined through either subtraction or division. With subtraction, Total Net Neutralization Potential is calculated from Total Acid Potential (TNNP = NP - TAP) and Sulphide Net Neutralization Potential (SNNP = NP - SAP). In contrast, Total Net Potential Ratio (TNPR = NP / TAP) and Sulphide Net Potential Ratio (SNPR = NP / SAP) are calculated through division.

According to general criteria, any sample with a TNNP or SNNP less than +10 t $CaCO_3$/1000 t is declared net acid generating, although it may not be so at the time of analysis. Similarly, any sample with a TNPR or SNPR less than 1.0-2.0 is considered net acid generating. Negligible levels of sulphide (≤ 0.05%S) are considered non-acid-generating regardless of their xNNP and xNPR values. Exceptions to these criteria are known, and site-specific kinetic testwork is needed to determine site-specific criteria of xNNP and xNPR (Morin and Hutt, 1997).

Finally, ABA also includes a measurement of "paste pH" on a mixture of pulverized sample and water. If a sample's paste pH is acidic, net acid generation has already begun and any measured NP is not available for neutralization.

Another less-common type of static test, used for the Samatosum laboratory columns (Section 3.3), was repetitive batch leaching of samples at pH 2 until pH remained constant. This was followed by distilled-water rinsing until pH recovered. The remaining solids were then analyzed for total-metal contents. This revealed the amount of each metal that was retained in secondary minerals or occurred in primary soluble minerals like calcite.

Since static tests like ABA are one-time analyses, they cannot provide information on reaction rates. They may indicate whether pH or water chemistry may change, but not when the changes might happen. For this information, kinetic tests are required. One common kinetic test is a Sobek humidity cell, which has been in use for approximately 30 years. Another common test uses columns to hold a sample. Column tests containing 10-50 kg of sample were used for Samatosum (Appendices B and F).

Column kinetic tests typically allow exposure of a sample to air with a thorough weekly rinse or a nearly continuous trickling of water. For Samatosum columns, approximately 20 L were passed through each column weekly. Samples were collected once a week and chemically analyzed. Rates of acid generation, acid neutralization, and metal leaching could then be calculated using:

$$\text{Rate (mg/kg/wk)} = \text{Concentration (mg/L)} * \text{Flow (L/wk)} / \text{Weight (kg)} \qquad (3\text{-}1)$$

Pre-test analyses combined with reaction rates allow the calculation of depletion rates and time to total depletion within the columns. For example, a pre-test copper level of 1000 ppm and a leach rate of 10 mg Cu/kg of sample/wk indicate that copper would be fully leached and depleted in 100 weeks. This is discussed further in Section 3.3.

3.2 Acid-Base Accounting of Rock Units

The various rock units at Samatosum (Table 2-1) were subjected to acid-base accounting of the basic, rather than expanded, form (Section 3.1). Pre-mining ABA characterization was based on 61 samples (Hatfield Consultants Limited, 1988) that indicated that all rock units, except Mafic

Pyroclastics (MAF), were considered potentially net acid generating (PAG). In reality, Quartzite and Quartz Vein were net-acid-neutralizing, but they could not be segregated from surrounding PAG rock during mining.

A search of DBARD, the Database for Acid Rock Drainage (B. Price, personal communication, 1996), provided 109 ABA analyses of Samatosum waste rock, ore, and overburden (Appendix A1 and Table 3-1). The original source of the data is not reported in DBARD, but probably includes the 61 samples from Hatfield Consultants Limited (1988).

TABLE 3-1
Summary of ABA Samples for Samatosum Rock Units
(from DBARD, the Database for Acid Rock Drainage, 1996)

Unit	No. of Samples	Unit	No. of Samples
Ore	10	Overburden	2
Waste Rock			
Mafic Pyroclastics	8	Sericite Tuff	55
Muddy Tuff	10	Quartz Vein & Quartzite	8
Chert	6	Argillite	10

A scatterplot of total sulphur against paste pH for Samatosum rock units (Figure 3-1) shows that most samples had total sulphur levels less than 5 wt-%S. A few samples had levels above 10%S, particularly the massive-sulphide ore. Most of the acidic paste pHs (pH < 5.0) were associated with the high-sulphide samples.

A scatterplot of NP against paste pH (Figure 3-2) shows that paste pH can decrease to acidic levels as NP falls below 10 t/1000 t. This level of "unavailable NP" (UNP) is typical of many mines (Morin and Hutt, 1997) and can be subtracted from measured NP to obtain "effective NP" for calculating xNNP and xNPR (Section 3.1). Alternatively, any xNNP value below +10 t/1000 t can be declared net acid generating, as already indicated in Section 3.1.

A comparison of total sulphur and measured NP (Figure 3-3) demonstrates no clear correlation between the two parameters. This is typical of most mines and confirms that these two independent variables require separate evaluations before combining them into xNNP and xNPR values.

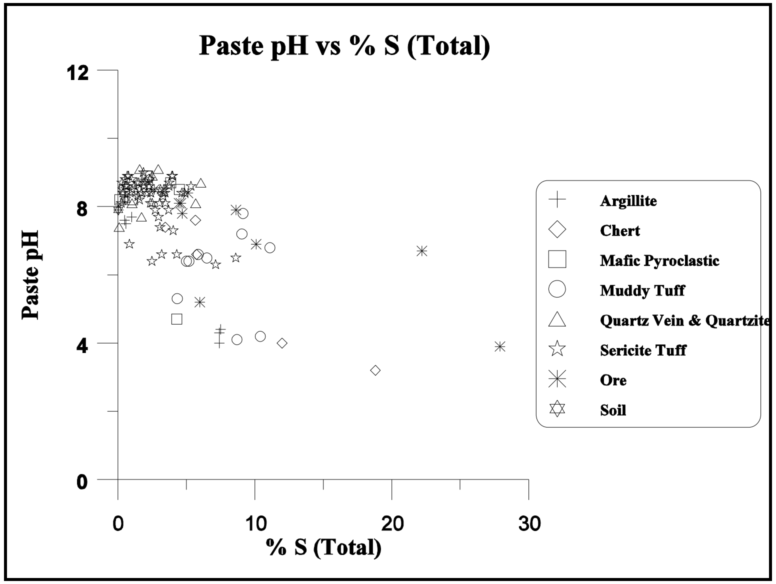


FIGURE 3-1. ABA Paste pH vs. Total Sulphur.

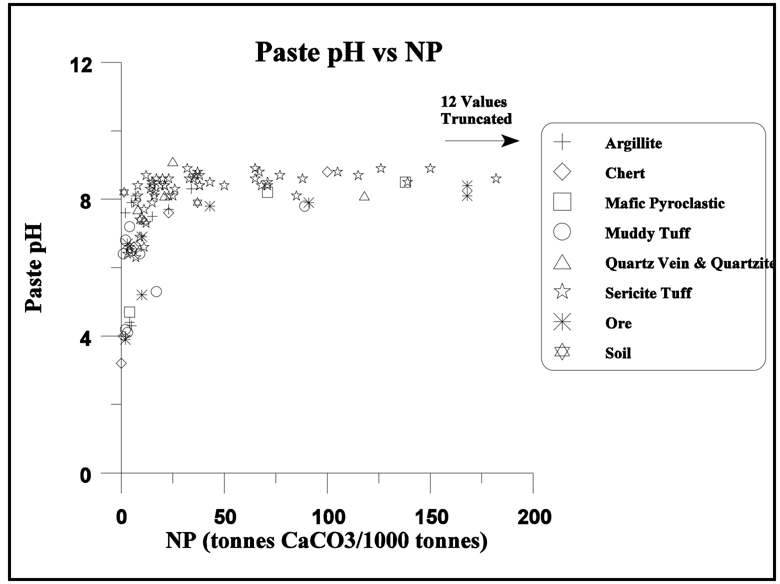


FIGURE 3-2. ABA Paste pH vs. Neutralization Potential.

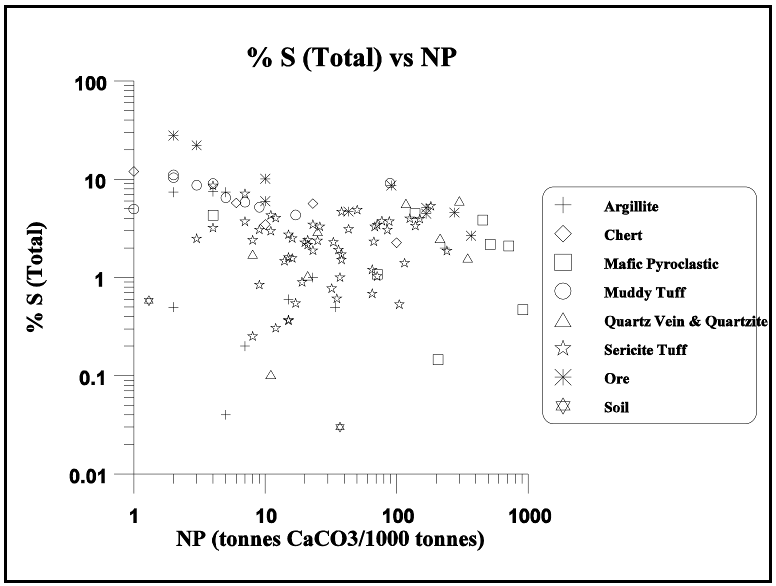


FIGURE 3-3. ABA Total Sulphur vs. NP.

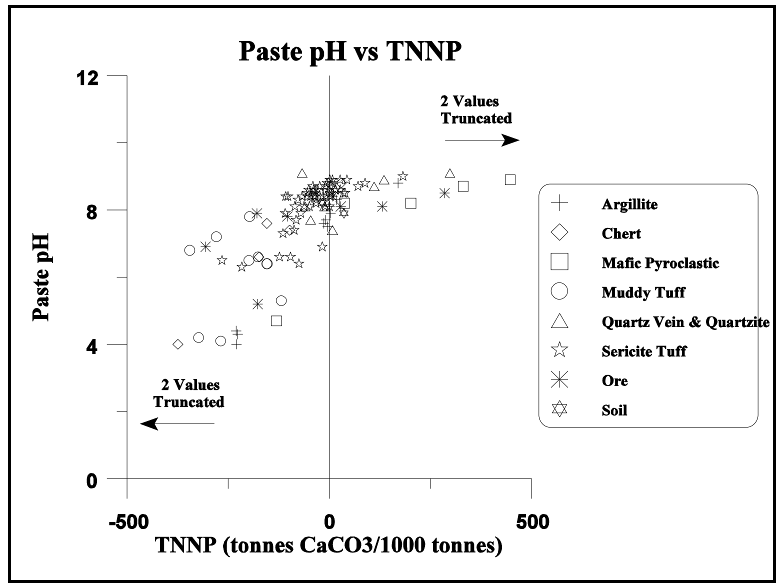


FIGURE 3-4. ABA Paste pH vs. TNNP.

Paste pH vs. TNNP (Figure 3-4) shows that most Samatosum rock units have significant percentages capable of generating net acidity. However, many of the samples were not doing so at the time of analysis.

The correlation of TNNP and TNPR demonstrates that the Samatosum TNNP criterion of +10 t/1000 t is comparable to a TNPR criterion of approximately 1.2 (Figure 3-5). The best estimate for the TNPR criterion is obtained from kinetic tests, but the Samatosum columns (Section 3.3) did not include metals like calcium in the effluent. As a result, the TNPR criterion cannot be accurately estimated. Morin and Hutt (1997) indicate "safe" TNPR criteria for mines like Samatosum with significant quantities of carbonate minerals are often in the range of 1.3-1.7. This is discussed further in Section 3.3.

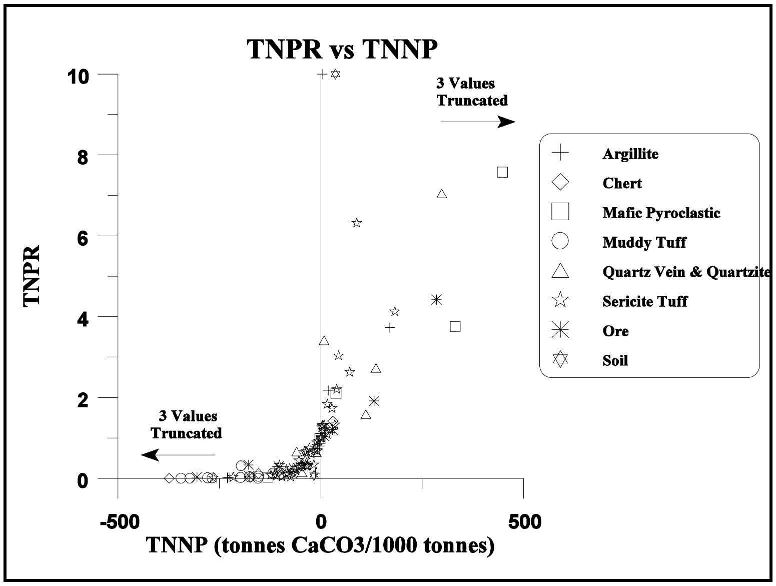


FIGURE 3-5. ABA TNPR vs. TNNP.

Based on ABA statistics by rock unit (Appendix A1 and Table 3-2), all units have some percentage of net-acid-generating rock (Table 3-3). On average, only Mafic Pyroclastics and Quartzite/Quartz Veins are net acid neutralizing. Thus, these units would be entirely net acid neutralizing if the entire units were thoroughly blended, but would generate net acidity in places if the net-acid-generating portions were piled separately or not well blended.

TABLE 3-2
Summary TNNP Statistics for Samatosum Waste-Rock Units
(from Appendix A1)

Rock Unit	Minimum TNNP[1]	Mean TNNP[1]	Maximum TNNP[1]
Mafic Pyroclastics	-130	+305	+901
Sericite Tuffs	-265	-33	+68
Muddy Tuffs	-345	-221	-119
Quartzite & Qtz Veins	-67	+46	+299
Cherts	-588	-226	+29
Argillites	-230	-52	+171
Overburden	-17	+10	+36

[1] TNNP (Total Net Neutralization Potential, see Section 3.1) in units of t $CaCO_3$ equivalent/ 1000 t.

TABLE 3-3
Predicted Tonnages and Weight-Averaged ABA Results
(from Hatfield Consultants Limited, 1988; Denholm and Hallam, 1991; and Appendix A1)

Unit	Code	Rock (t)[1]	Total Acid Potential		Neutralization Potential	
			(t/1000 t)[2]	(tonnes)	(t/1000 t)[2]	(tonnes)
Net Acid Neutralizing (MAF)						
Mafic Pyroclastics	MAF	5,300,000	73	387,000	377	2,000,000
Net Acid Generating (PAG)						
Sericite Tuffs	SERT	2,600,000	79	205,000	45	117,000
Muddy Tuffs	MUT	307,000	235	72,100	14	4,300
Quartzite & Qtz Vein	QITE & QV	421,000	85	35,800	131	55,200
Cherts	CHERT	9,540	250	2,390	23	219
Argillites	ARG	458,000	85	38,900	33	15,100
TOTAL PAG		3,800,000		354,000		192,000
Overburden						
Overburden		728,580	10	7,290	19	13,800
GRAND TOTAL		**9,830,000**		**748,000**		**2,210,000**

[1] Based on an assumed bulk density of 2.65 t /m^3 in the original report and volumes in Table 2-1, except for overburden with an assumed bulk density of 1.6 t /m^3 for this report. Total predicted tonnage excluding overburden is 9.8×10^6 t compared with a final reported tonnage of 9.6×10^6 t (Piteau Associates, 1996). This is due to some ambiguity in final volumes of each rock unit.

[2] mean values from Appendix A1, as $CaCO_3$ equivalent

3.3 Laboratory Kinetic Column Tests

3.3.1 Design and Contents of Column Tests

Laboratory-based column tests (Section 3.1) were designed to test various aspects of layered and unlayered net-acid-neutralizing MAF and net-acid-generating PAG waste rock (Table 3-4). There were six columns containing various proportions of MAF and/or PAG rock (Figure 3-6, Table 3-4, and Appendix B). The first four columns were started in February 1989, and were operated for up to 5½ years. Columns 5 and 6 were started later, apparently to answer specific questions about PAG reaction rates after all NP was removed (Column 5) and the effect of a single MAF layer above a PAG layer. Samples were retained in all columns with a basal perforated plastic plate with 1 cm holes, covered with fiberglass.

Columns 2 and 3 were dismantled over a year before this study began. Nevertheless, rock from the MAF (acid "consuming") and PAG (acid "producing") layers were sampled and bagged at that time for later analysis. Columns 1, 4, and 6 were dismantled as part of this study (Appendix F), and a sample from a large bag of Column 5 material was collected. Dismantling of all columns was handled by B.C. Research in Vancouver, and the authors collected samples for analysis. B.C. Research also indicated that the residence time of water during column testing was approximately 3-4 days.

Visual examination of dismantled Column 1 material (pure PAG) showed most of the material was orange-brown silty sandy gravel with approximately 15% of the material well cemented (but with some porosity) with fines and precipitants (Appendix F). The bottom few cm was more iron stained than higher material.

Secondary-mineral precipitants identified through x-ray diffraction of field samples (Piteau Associates, 1996) were: iron oxides ($Fe(OH)_3$), zinc-bearing copiapite ($Fe^{2+}Fe_4^{3+}(SO_4)_6(OH)_2 \cdot 20H_2O$), gypsum ($CaSO_4 \cdot H_2O$), and epsomite ($MgSO_4 \cdot 7H_2O$). These minerals are therefore also expected in the observed column precipitants.

Column 4 (pure MAF) contained light grey-green silty gravel (Appendix F). About 2% of the material was well cemented with fine particles, but with no obvious precipitants and obvious porosity.

The bag with Column 5 material (acid-leached PAG material) contained silty gravel, grey to buff to orange-brown in colour. Any cemented material was likely broken up during bagging.

Finally, Column 6 contained an upper MAF layer of grey-green silty gravel with 10% cemented with fines having some porosity. The lower PAG layer was grey to orange to tan/buff in colour with 5% cemented with fines having some porosity (Appendix F).

TABLE 3-4
Summary of Six Column Tests on Samatosum Waste Rock
(see Figure 3-1 and Appendix B)

Column No.	No. PAG/MAF Layers	Start Date/No. Of Weeks	Initial/Final Rinse pH
1	1/0	08 Feb 89/214	7.5/2.95
2	1/2	08 Feb 89/286	7.6/7.05
3	2/3	08 Feb 89/286	7.9/7.19
4	0/1	08 Feb 89/20	7.6/7.9
5	1/0	19 Jul 89/131	2.9/3.2
6	1/1	19 Feb 92/128	7.4/8.15

Sieving of column samples into >11 mm, 2-11 mm, and < 2 mm was conducted by the Soil Science Laboratory at the University of British Columbia. Where sufficient sample for a grain-size range was obtained, it was submitted for four static tests (Section 3.1): ABA (Appendices A2 and A3), whole-rock composition (Appendix A4), total-metal contents (Appendices A5 and A6), and acid-rinse tests (Appendix A2). Results are discussed in Section 3.3.3.

3.3.2 Effluent Chemistry and Reaction Rates from Columns

Lead analyses were suspended at Week 74 for Columns 1, 2, and 3 and at Week 48 for Column 5 because of low concentrations (Appendix B). For the same reason, antimony analyses were suspended at Week 70 for Columns 1, 2, and 3 and at Week 50 for Column 5. On the other hand, manganese analyses started at Week 70 for Columns 1, 2, and 3 and at Week 47 for Column 5, because elevated manganese was noticed in on-site drainage.

The effluent pH showed trends (Figure 3-7 and Table 3-4) which were generally expected, that is, any column with some acid-consuming MAF material yielded nearly the same neutral effluent during the length of the tests. The major uncertainty was whether full neutralization would continue until reactive sulphides were depleted. The trends of sulphate in the effluents showed the initial flushing effect of retained sulphate (Figure 3-8). Afterwards, sulphate-production rates began to stabilize and reflect the rates of sulphide oxidation and acidity production. The sulphate rate from Column 4 was significantly lower than the other columns, because there was no highly reactive, acid-generating PAG rock in this column. Thus, the rate from Column 4 provides the acid-generation rate from pure MAF rock.

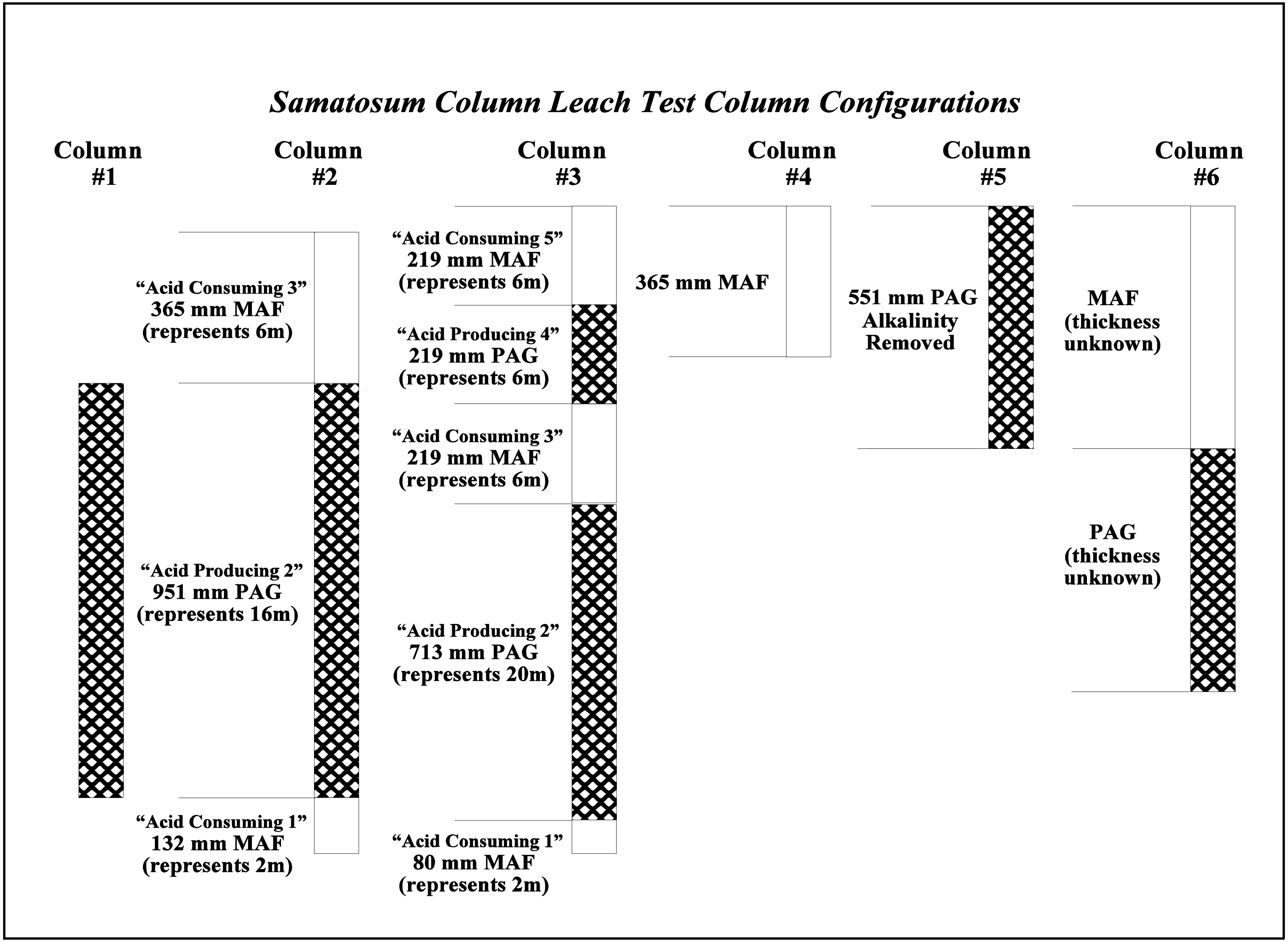


FIGURE 3-6. Schematic Diagrams of Samatosum Laboratory Columns (from Denholm and Hallam, 1991).

Columns 1, 5, and 6 with pure PAG rock yielded similar rates indicating pretreatment with acid and overlying MAF rock make little difference in the long-term rate of acid generation.

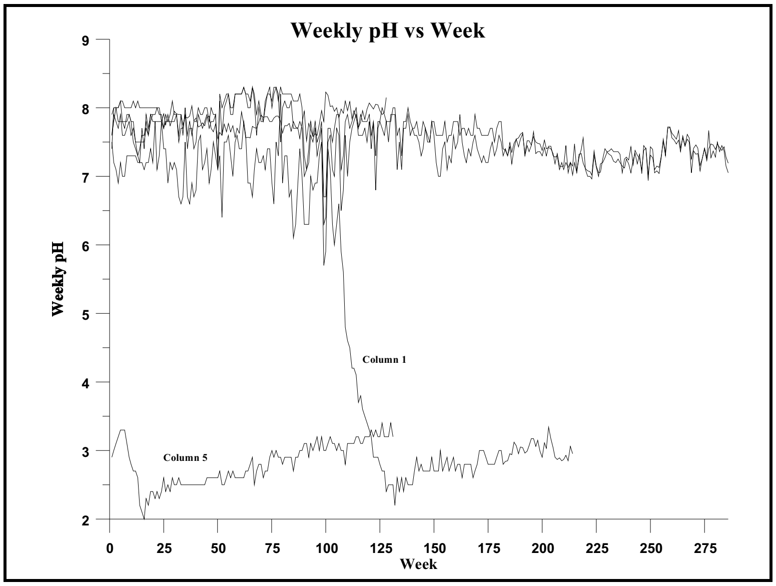


FIGURE 3-7. Temporal Trends of pH in the Samatosum Columns.

Calcium was not measured in the effluent, so aqueous saturation with respect to gypsum and subsequent retention of sulphate could not be determined. However, post-test column dismantling (Section 3.3.1) and solid-phase sulphate analyses (Section 3.3.3) show that significant secondary-mineral precipitants and sulphate was retained within PAG material and basal MAF layers in Columns 2 and 3. Overall, columns retained about 0.1-0.5 wt-%S as sulphate. This is equivalent to a sulphate production rate (Figure 3-8) of approximately 20-70 mg/kg/wk for pure PAG columns and 10-20 mg/kg/wk for the layered columns, with the exception of Column 4 (pure MAF) which showed no significant accumulation. Therefore, late-stage sulphate-production (sulphide-oxidation) rates of Table 3-5 were actually 50-100% higher than listed due to this internal retention of sulphate.

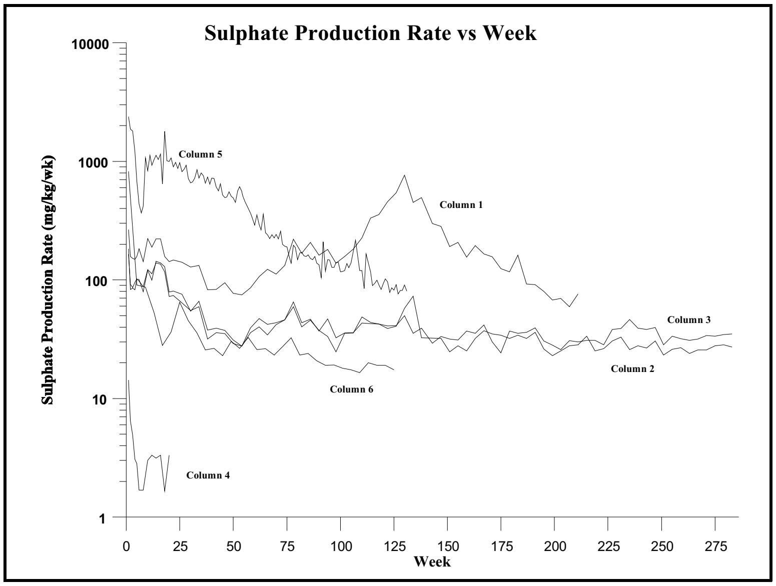


FIGURE 3-8. Temporal Trends of Sulphate Production in the Samatosum Columns.

With the assumption that all sulphur in the columns would have oxidized and generated acidity, sulphur in the layered columns would have been depleted in roughly 40-50 years. Because metals like calcium and magnesium were not measured, the corresponding consumption rate and depletion time of NP could not be determined. However, by assuming simple chemical relationships and stoichiometries of reactions between sulphide and carbonate minerals, approximate theoretical NP rates could be calculated

(Appendix B and Table 3-5). These rates are

TABLE 3-5
Summary of Rates and Predictions from Column Tests
(from Appendix B)

Parameter	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Weeks of Testing	214	286	286	20	131	128
Initial wt. (kg)	28.9	46.2	46.2	11.5	17.2	35.8
pH, minimum	2.2	6.3	6.7	7.3	2.0	7.4
pH, maximum	8.2	8.3	8.3	8.0	3.4	8.23
pH, late stage[1]	2.9	7.3	7.3	7.7	3.2	8.0
SO_4 rate [1]	71	28	34	2.7	82	18
Years to sulphur depletion	22	48	38	30	14	56
Acidity rate [1]	5.9	1.6	1.4	4.5	18	0.89
Alkalinity rate [1]	0	8.9	8.0	87	0.00	22
Molar Ratio Alk/SO_4	0.00	0.32	0.23	34	0.00	0.00
Theoretical Open-System NP Consumption						
NP rate[1]	68	36	42	85	67	40
% remaining at end	33	78	77	98	45	87
Years to NP depletion	9.9	38	33	25	10	39
Theoretical Closed-System NP Consumption						
NP rate[1]	140	56	70	1.4	150	36
% remaining at end	-34	69	68	99	-59	84
Years to NP depletion	2.7	24	20	1600	0.8	40
Dissolved copper rate [1]	0.049	0.0022	0.0038	0.0011	0.085	0.0024
Dissolved zinc rate [1]	0.21	0.011	0.014	0.019	0.24	0.0020

[1] Late-stage rates as mg/kg/wk, defined as average of the last five weeks, or last eight weeks if only one data value was available in the last five; these values used as long-term predictions

roughly 1-2 times greater than the sulphate production rate on a molar ratio, and are consistent with observations of 1.3-1.7 for carbonate systems like Samatosum (Morin and Hutt, 1997).

Based on these rates, NP in the layered columns, which is close to a ratio of 1:1 with acid potential (Appendices B2 and B3), will be depleted in 20-40 years, or before all sulphide is oxidized. Therefore, eventual net acidity is expected from the layered columns.

This prediction is further reinforced by the knowledge that approximately 10 t/1000 t of NP, or about 12% of total NP in these columns, is unavailable for neutralization (Section 3.2). These predictions of net acidity for the layered columns contradict those of Denholm and Hallam (1991), because they used measured alkalinity for the rate of NP depletion.

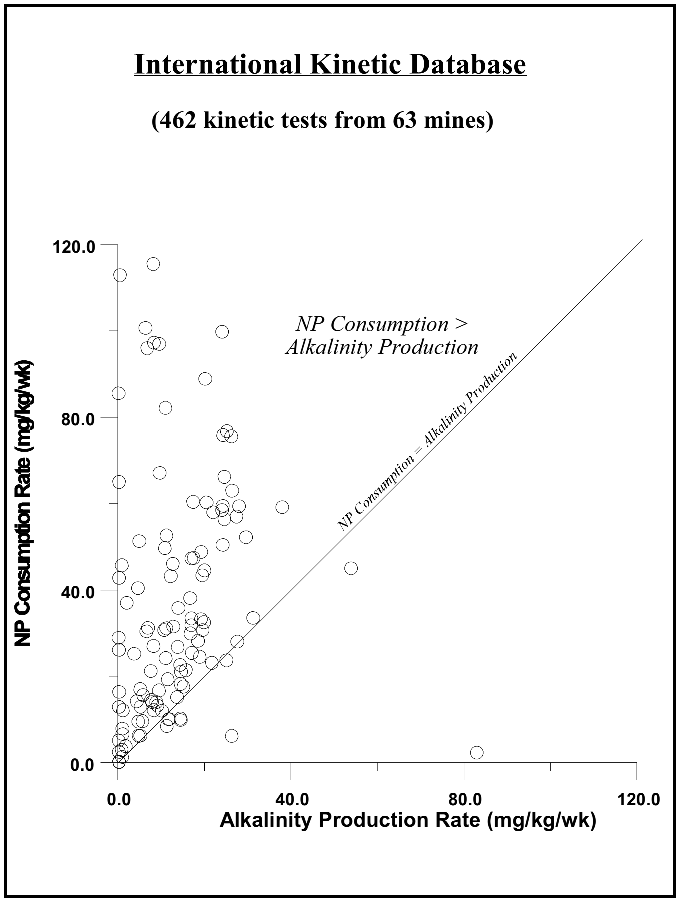


FIGURE 3-9. Comparison of NP Consumption Rate to Alkalinity Production from the International Kinetic Database.

Alkalinity production is typically less than NP consumption. For example, the International Kinetic Database (Morin et al., 1996; Morin and Hutt, 1997) with 462 kinetic tests from 63 mines shows that NP consumption at levels of the layered columns often exceeds alkalinity consumption by a 70-100% (Figure 3-9). Also, carbonate molar ratios which indicate the rate of NP consumption to sulphate production are virtually always greater than 1.0 in near-neutral kinetic tests. In comparison, the alkalinity/sulphate ratios for the layered Samatosum columns were only 0.32 and 0.23, meaning that NP consumption was likely a factor of at least 3-4 times greater than alkalinity production. Since the ratio of NP to acid potential in the layered columns were close to 1:1, the preferential depletion of NP appeared inevitable. Furthermore, post-test analyses of the layered columns (Section 3.3.3) indicate that most of the NP in the finer, and presumably most reactive, grains was nearly consumed by the end of the tests. All these observations indicate the prediction of eventual net acidity is reasonable.

Even Column 4 which contains pure MAF could eventually generate net acidity, depending on its actual rate of NP consumption (Table 3-5). However, this is not the result of active sulphide oxidation, but to the opposite: because the rate of acid generation is so low, NP is preferentially depleted from the column simply by the water passing through it. The late-stage ratio of alkalinity to sulfate is 33.8 in Column 4, indicating that NP is being depleted at some rate greater than 34 times the rate that acid is being generated.

3.3.3 Static Tests of Layers from Columns

Post-test samples from the various layers in the columns were sieved to three grain sizes and analyzed for expanded ABA, total-metal contents, and whole-rock composition (Appendix A2; see also Section 3.1 and 3.3.1). Additionally, post-test samples from Columns 1 (PAG only) and 4 (MAF only) were submitted for mineralogical examinations (Appendix C).

Samples of the original PAG and MAF materials placed into the columns, stored in tightly sealed plastic bags and apparently unreacted, unsorted, and unoxidized, were analyzed for comparison to the post-test reacted rock. Since this original material had already been analyzed by ABA (Denholm and Hallam, 1991), these second ABA analyses were a check on accuracy of sample splitting and chemical analyses. A comparison of the results revealed discrepancies up to 50%. Therefore, there are probably error bars on the order of 50% for chemical characterization of column materials (see also Appendix A6).

To more easily examine and discuss ABA results for the column layers, ABA values were graphed by grain size in Appendix A3. In these diagrams, MAF material is labelled acid "consuming" and PAG is acid "producing" to remain consistent with terminology in the original column testwork. Numbering of layers in layered Columns 2 and 3 begins with 1 at the bottom and increases upward.

Paste pH (Appendix A3) for the PAG and MAF (acid "consuming") in the original material ("unreacted unsorted") was near neutral (7.60 and 8.20, respectively). Thus, all rock in the columns initially started neutral, except Column 5 which was presoaked with acid. Paste pH data for Column 4 (MAF only) show that pH was consistently alkaline for all grain sizes, whereas the finer grain sizes were more acidic in Column 1 (PAG only). This indicates that finer particles of PAG either generated or retained acidity more than the coarser particles. These same trends also appear in layered Columns 2 and 3 (Appendix A3), so that layering made no difference to paste pH in the individual layers. In other words, the presence or absence of MAF material in the columns made little difference to paste pH in the PAG material.

Total sulphur and sulphide in post-test MAF (acid "consuming") rock reached minimum values in the 2-11 mm size range in all columns (Appendix A3). However, values in all ranges were generally similar to values in the original MAF rock ("unreacted unsorted"), indicating no significant depletion of sulphur in all ranges of MAF during the column tests. This is consistent with the relatively low sulphate production rate from pure MAF (Table 3-5).

For the net-acid-generating PAG, total sulphur and sulphide were variable with grain size between columns, but generally steady. Post-test levels were generally higher than the original PAG, indicating formation of sulphide in most samples. The exception was the finest grain size (<2 mm) of Column 1 which significant depletion of total sulphur and sulphide. Since sulphide probably did not form in the PAG material and the rate of sulphide depletion in the MAF should not be significantly higher than in PAG, the preceding differences with original materials probably reflect accuracy of the chemical analyses and sample compositing rather than actual chemical reactions (discussed above). In fact, two separate analyses of total sulphur for the PAG material yielded 2.63 and 3.62 %S, a difference of 38%.

Leachable sulphate (Appendices A2 and A3) increased markedly (1) with decreasing grain size in post-test MAF (acid "consuming") rock and (2), in comparison to original levels ("unreacted unsorted"), within the bottom layers ("Consuming 1") in both layered columns. The upper MAF layers in these columns showed only some increase in sulphate in the finest range. The PAG layers in these columns also showed some accumulation in the post-test unsorted and finest range. Additionally, accumulation of sulphate occurred in the unlayered PAG columns and the basal PAG in Column 6, particularly in the finest range. Therefore, there are significant accumulations of sulphate, probably as gypsum and/or epsomite, in all PAG rock and in the bottom layer of MAF in the layered columns. All columns, except Column 4, showed roughly 0.1-0.5 wt-%S retention of sulphate over the duration of the tests.

Measured bulk NP and Carbonate NP in Column 4 containing only acid-consuming MAF were relatively constant across the grain-size ranges and somewhat lower in comparison to the original ("unreacted unsorted") levels (Appendix A3). In contrast, the MAF layers in layered Columns 2 and 3 showed marked and often consistent decreases in NP and CaNP with decreasing grain size and relative to original levels. Thus, most of the neutralization within the columns came from the finer grain sizes of MAF rock. In contrast to MAF, NP and CaNP in PAG has not changed much during the column tests, except for some depletion in the finest grain-size range.

Trends in TNNP (using NP) and RNNP (using CaNP) in the layered columns were parallel to those of NP and CaNP for MAF rock (Appendix A3), again showing significant depletion with decreasing grain size. In fact, the TNNP and RNNP values of the finest grain sizes of MAF were reduced toward and into net acid generating values. In other words, the acid generation in the PAG rock caused finer grains of MAF to become net acid generating. However, the weighted average TNNP and RNNP values for MAF were still net acid neutralizing, but there is some doubt on whether the NP in the coarser grains is reactive, available, and can be counted on for neutralization.

TNPR and RNPR values (Appendix A3) for MAF rock showed peak values in the 2-11 mm or > 11 mm range. This primarily reflects the minimum sulphide values in these ranges (discussed above) rather than a peak in NP values. Trends in TNNP and RNPR for PAG rock were generally constant with grain size and in comparison to original ("unreacted unsorted") levels.

Like ABA, whole-rock composition and total-metal contents were measured in original MAF and PAG material ("unreacted unsorted") and in the three grain-size ranges (Appendices A4 to A6). Many metals like chromium and sodium displayed no clear and regular trend in the MAF and PAG layers within the columns, and thus no clear pattern of enrichment or depletion. On the other hand, calcium and strontium clearly parallelled the concentrations of NP discussed above, demonstrating the dominance of calcium-based carbonate minerals in reactive NP. Notably, magnesium displayed a trend different from NP and calcium, indicating magnesium-bearing minerals did not contribute to NP in the columns. This may be the result of the subsequent precipitation of epsomite (magnesium sulphate, Section 3.3.1), rather than the lack of initial dolomite dissolution.

Comparisons of pre-test and post-test levels of arsenic, lead, molybdenum, and zinc showed that MAF materials often display some depletion during the column test, whereas PAG layers often show enrichment. This suggests these metals were significantly leached from MAF and precipitated in PAG rock. Similar comparisons for aluminum, iron, and potassium show no significant depletion or enrichment.

The repetitive acid-batch leaching explained in Section 3.1 was used to calculate the amount of each metal that was retained in secondary minerals or occurred in primary soluble minerals like calcite within the layered column tests. Appendix A2 contains columns with the label, "remaining after acid rinse test", providing the percentage of total metal not removed by this test. Due to analytical accuracy, some values close to 100% are greater than 100%, meaning virtually none of the metal was removed. Most metals typically showed no significant removal (>50%) in the acid washes. The exceptions were: copper in a few samples of acid "producing" PAG rock, and silver and sometimes cadmium in samples of acid "consuming" MAF rock. Since these metals showed no clear enrichment or depletion in Appendices A3 to A5, they were probably dissolved from primary minerals rather than secondary minerals formed during the column tests. Thus, there was only limited secondary-mineral accumulation according to the total-metal, whole-rock, and acid-leach static tests.

Notably, calcium and magnesium from the acid-leach tests showed generally 0-50% depletion (mostly < 30%) in acid, meaning large amounts did not occur as soluble carbonate minerals (discussed below). Thus the preceding discussions on NP and calcium depletion in finer grain sizes lead to the conclusion that most NP occurred as finer grains and was nearly depleted in the layered columns, despite the persistence of most of the original non-carbonate calcium.

Mineralogical observations of Column 1 (pure PAG) rock revealed quartz-rich rock showing iron-oxide staining and cementation by fine mica and iron oxides (Appendix C), which was also noted during column dismantling (Section 3.3.1). The lack of iron enrichment or depletion in the post-test samples indicates the iron oxides were formed predominantly from the oxidized pyrite in the PAG. Chlorite at 3.5% in the PAG sample indicates some minor neutralization probably occurred even after net acidity, and would likely be characterized by the release of magnesium. Elevated magnesium levels have been noted in dump drainage (Chapter 4), but this has been attributed solely to dolomite dissolution in the past. The low percentage of carbonate (0.2%) in the PAG of Column 1 is in close agreement with CaNP from ABA analyses (Appendices A2 and A3), confirming the presence of unavailable NP initially discussed in Section 3.2.

Mineralogical examination of a sample of MAF from Column 4 (pure MAF) noted little to no reaction of the sulphide and carbonate minerals, in agreement with the relatively low NP reaction rates in the absence of PAG (Section 3.3.2) and with no accumulation of secondary minerals in Column 4. The high levels of plagioclase, chlorite, and amphibole can provide additional NP, albeit at a lower rate, to the already abundant carbonate in the MAF.

3.3.4 Summary of Column Results

Interpretations of rates and depletion times (Section 3.3.2) and comparison of pre-test and post-test results by grain size (Section 3.3.3) have shown that PAG is relatively reactive from the perspective of acid generation and generates net acidity within several weeks to months due to a relative lack of neutralization potential (NP). On the other hand, MAF contains excess NP and sulphide oxidizes at a slower rate. A significant amount of the sulphate from oxidation is retained within PAG and basal (lower) MAF layers within the columns.

The layering of MAF and PAG within columns did not change the onset of net acidity or the precipitation of secondary minerals in PAG and basal MAF layers relative to unlayered columns. Therefore, layering on the order of 0.2-1.0 m did not affect reaction rates or geochemical behaviour within individual layers, but the layering did affect the composite effluent from the columns. For example, layered columns produced near-neutral pH in spite of the presence of net acid generation from PAG layers, although effluent pH and alkalinity were 0.4 pH units and a factor of 10 lower, respectively, than the pure MAF column.

Mass-balance calculations of acid generation and NP depletion were hampered by the lack of effluent analyses for metals like calcium and magnesium. However, based on simple chemical relationships and the International Kinetic Database, rates of NP consumption were estimated to be greater than 1.0 relative to the rate of sulphate production. Since the layered columns contained nearly equal amounts of NP and acid potential, the excess consumption of NP led to a prediction of eventual net acidity in 20-40 years. However, not all measured NP is available for neutralization (Section 3.2), so net acidity may have appeared in even less time.

4. CONSTRUCTION, FIELD MONITORING, AND PREDICTIONS FOR THE FULL-SCALE SAMATOSUM DUMP

The primary requirement behind the design of the waste-rock dump was the encapsulation of net-acid-generating (PAG) layers within net-acid-neutralizing (MAF) layers (Figures 4-1 and 4-2), as reflected in the laboratory columns (Section 3.3). A basal MAF layer of 2 m thickness was placed over the undisturbed till and organic soil with hydraulic conductivities around 10^{-5} to 10^{-7} m/s (Denholm and Hallam, 1991). Any mixing or blending of rock units within a layer was an unintentional result of blasting, loadings, hauling, and dumping.

Because most MAF rock was removed from the pit by mid-1990 due to its shallow occurrence, it was stockpiled for use as needed in dump layering. Overburden (till) was also stockpiled for a final, uppermost cover. By the end of 1990, the 2 m base of MAF, the lower 6 m of PAG, and 6 m of MAF were completed. The second 6 m of PAG was half completed by mid-1991 and completed by the end of mining. The uppermost MAF layer was reportedly completed, and the overburden was moved onto the dump at thicknesses of 0.3 to 1 m (Piteau Associates, 1996).

Eight strings of thermistors were installed during dump construction to monitor temperature. However, all strings were apparently damaged by the unexpected degree of dump settlement.

Seepage through the waste-rock dump flows into the Minewater Sedimentation Pond (MWSP), which is monitored at Site MOE-4 (Figures 1-2 and 1-3). Also, a trench was excavated and lined at the base of the lowermost PAG layer, above the basal MAF, and drains to either side of the dump (Sites MOE-6A and 6B). As a result, drainage chemistry can be monitored at MWSP, in seepage locations at the toe of the dump, and in the minor flow from the internal trench. A sample from the internal trench collected in April 1991 had insufficient volume for filtration and analysis of dissolved metals, so only pH and total metals could be determined (Table 4-1). This sample had a near-neutral pH with detectable concentrations of several metals.

TABLE 4-1
Chemical Analysis of One Drainage Sample from the Internal Trench Beneath the Lowermost PAG Layer in the Dump
(from Denholm and Hallam, 1991)

	Total Metals as mg/L						
pH	Cu	Pb	Zn	Fe	Ag	Cd	Mn
7.3	0.03	0.2	0.84	3.37	<0.01	<0.01	29.3

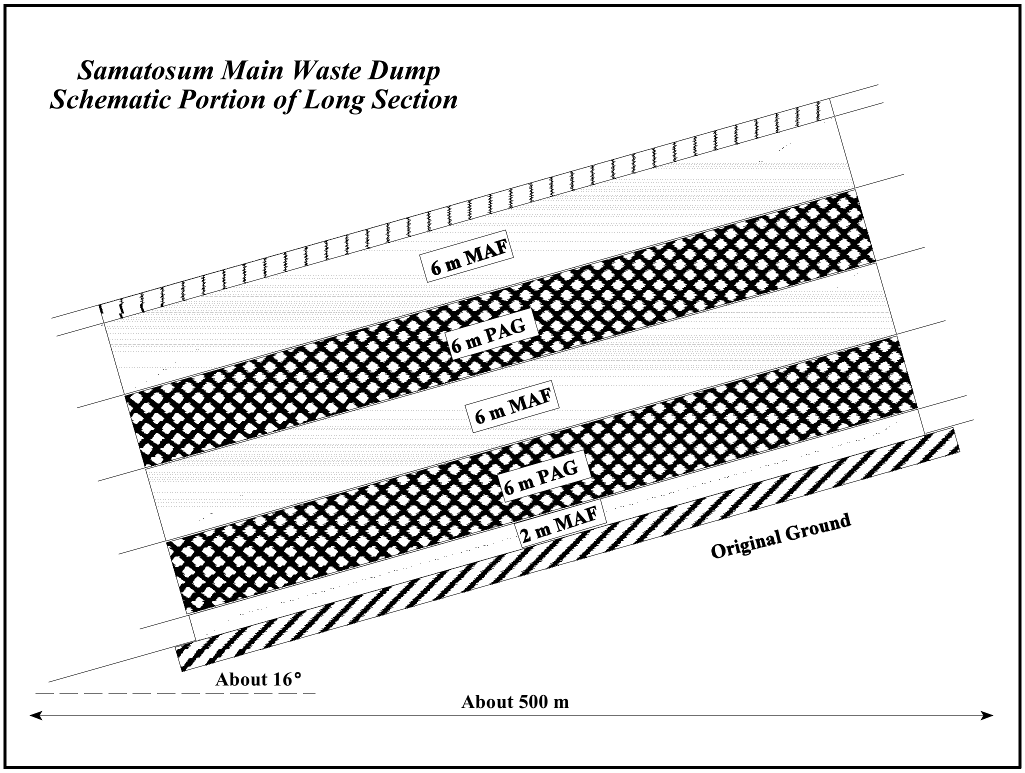


FIGURE 4-1. Schematic Diagram of the Layered Samatosum Waste-Rock Dump (from Denholm and Hallam, 1991).

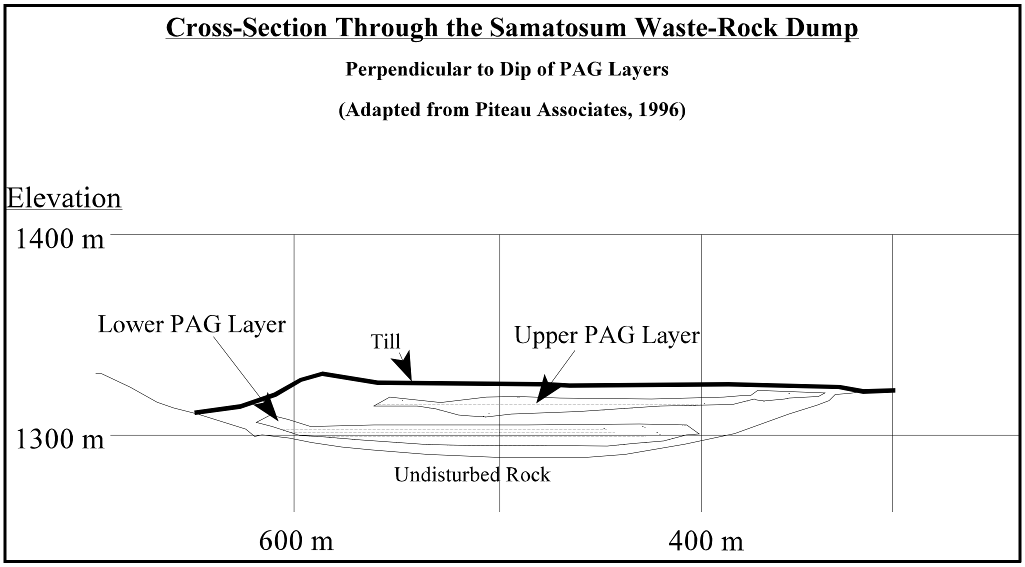


FIGURE 4-2. Cross-Section Through the Samatosum Waste-Rock Dump Perpendicular to Dip of PAG Layers (adapted from Piteau Associates, 1996).

Monitoring data for MOE-6A (Appendix D) show that pH has remained between 7.0 and 8.0. However, sulphate has increased sharply since 1990, and this was found to be a sign of impending onset of net acidity at Island Copper Mine (Morin et al., 1995a) and in kinetic tests (Morin and Hutt, 1997). The accompanying increases in calcium and magnesium suggested that the dissolution rate of carbonate minerals has increased in response to the accelerating rate of acid generation signalled by sulphate. Copper and zinc concentrations also increased through time, reaching peak concentrations of 0.23 and 23 mg/L in spring of 1995. The prediction for future drainage passing MOE-6A is acidic pH with elevated metal concentrations.

Monitoring data for MOE-6B (Appendix D) show that acidic pH was first measured at this location in spring of 1993, which then recovered to over 7.0. Each spring the acidic water reappears, probably reflecting the increased flow and flushing of the dump's PAG layers. However, compared to the previous year, each year has a lower pH for a longer duration. This was also noted at one waste-rock monitoring station at Island Copper Mine (Morin et al., 1995a). Therefore, the prediction for MOE-6B is acidic pH with elevated metal concentrations.

Monitoring data for MOE-4 (Appendix D) show that the combined drainage from the dump and pit has remained consistently around pH 8.0. Consequently, the pH fluctuations at MOE-6B do not overwhelm the alkalinity in the entire drainage system. Nevertheless, the trends of increasing sulphate, increasing calcium, and decreasing alkalinity indicate acidic drainage may soon appear. Due to this, Inmet Mining has built a water-treatment plant near MOE-4.

At this point, it is informative to examine various predictions for dump drainage and their justifications. The new treatment plant and preceding predictions seem to contrast with the predictions of Piteau Associates (1996):

> "In the short term, ARD rates ... are expected to increase in the waste dump, but this increase is not expected to be significant.... Iron precipitates may also be coating exposed pyrite crystals, which should naturally reduce the rate of ARD generation over time, and sulphate precipitates (e.g. gypsum) should start to blind off pathways for oxygen and water flow through the dump. The long term prognosis is an improving trend in dump discharge water quality after the next one or two decades.... [T]he waste dump actually contains much more than twice the buffering capacity required to neutralize the products of any sulphide oxidation which is likely to occur over time." (p. iii-iv)

These expectations appear overly optimistic since case studies show that (1) metal leaching can continue at elevated levels for many decades and (2) acidic drainage can appear even when large-scale calculations show excess neutralization potential (Morin and Hutt, 1997). Although it is not clear, Piteau Associates may have tempered their optimistic predictions later in their report:

> "Kinetic simulation and ABA data suggest that ARD in the waste dump will be buffered by the available neutralization potential. Nevertheless, some important dynamic factors such as channelling and seasonal flushing are ignored in the column simulation. Taking these factors into account, one can conclude that ARD will be significantly mitigated by the existing NP, but will not be totally inhibited." (p. 14)

Denholm and Hallam (1991) indicated that flowpaths of infiltration through the dump are assumed to be vertical, turning to lateral as the drainage reaches the basal MAF layer and undisturbed till. However, lateral flow within layers is considered a possibility, particularly since sericitized rock can have a low permeability. Consequently, the appearance of acidic drainage from the dump does not necessarily mean that all neutralizing capacities of the MAF layers are nearly consumed. This turns out to be the key factor in reconciling various predictions and monitoring data, as explained below.

To reconcile predictions, estimates of acid generation and neutralization within the dump are needed. A relatively simple technique for assessing and predicting drainage chemistry involves the compilation of all relevant monitoring data (Morin and Hutt, 1993; Morin et al., 1995b; Norecol, Dames and Moore, 1996; Morin and Hutt, 1997). This leads to an "empirical drainage-chemistry model" (EDCM) that predicts average annual concentrations as well as shorter-term fluctuations based on past data and an estimate of pH.

The compilation of relevant monitoring data (Appendix E) shows that some parameters like alkalinity and copper produce reliable trends with pH, and are thus easily amenable to prediction. Other parameters like sulphate and manganese show a poor trend with pH, particularly around neutral values. This is one of a few cases where the technique for the EDCM fails to reasonably characterize overall drainage chemistry, and is the result of generally increasing concentrations through time at constant pH which violates one of the premises of the model.

This means that a consistent and repeatable release of sulphate and calcium from the Samatosum does not occur. Instead, annual concentrations and loadings have fluctuated and generally increased despite the neutral pH, by over an order of magnitude. This is further complicated by the precipitation and retention of sulphate within the dump, so the actual rate of in situ sulphide oxidation is only known to be greater than the variable loadings draining from the dump. Consequently, depletion of sulphide and NP within the dump cannot be estimated accurately.

Piteau Associates ignored the significant internal retention of sulphate and other metals, and calculated a flux of sulphate from the dump. The estimated flux of approximately 280 t SO_4/yr in 1995 was accompanied by warnings that significant error bars are attached to this flux. Following the same approach, the flux of calcium and magnesium can be estimated at 40 and 30 t/yr, respectively. When these fluxes are converted to molar values, the carbonate molar ratio

[(Ca+Mg)/SO_4] is 0.77 in the dump drainage. Due to the error bars and internal retention, the ratio is probably around or above the theoretical value of 1.0 (Section 3.3.2).

The uncertain mass balance for the dump can be avoided, for the most part, by noting that the molar ratio of NP to TAP within the dump (Table 3-3) is approximately 3. This is much greater than the layered columns with ratios around 1.0 (Section 3.3.2). Therefore, on a geochemical mass-balance basis, it is unlikely that the dump can generate net acidity. However, as noted in the columns, even a PAG layer as thin as 0.2 m will generate net acidity at an unattenuated rate even when surrounded by acid-neutralizing MAF rock.

This fact, combined with physical channelling of water through the dump, particularly the coarser PAG layers, explains the discrepancies between predictions and observations. In other words, the release of net acidity from the dump is not a consequence of geochemical factors, but of physical factors. Because acidic drainage in the PAG layers does not always contact MAF material before exiting the dump, this layered dump has released net acidity and will probably do so at a greater rate in the future in spite of its overall 3:1 NP:TAP ratio. This highlights the importance of physical hydrogeology in the success of geochemical layering scenarios.

Recently, the ratio of NP to TAP in the Samatosum dump has been recalculated and reported as between 10:1 and 13:1 (letter from E. Denholm to P. Mehling, 14 March 1997). However, these ratios are incorrect because they are based on averaged NNP values for PAG and MAF rock, rather than NP and AP values for each unit (e.g., Table 3-3). Since NP and AP are independent variables (Section 3.2), averaged combinations of them as NNP or NPR are not valid.

5. CONCLUSIONS

This study has reviewed existing information, reinterpreted old data, and obtained new data for the layered waste-rock dump at Samatosum. Most of the rock units at Samatosum had significant proportions of net-acid-generating rock, except for mafic pyroclastics (MAF). As a result, all rock was divided into MAF and Potentially Acid Generating (PAG). The PAG was encapsulated by MAF layers within the dump, and the overall ratio of Neutralization Potential (NP) to Total Acid Potential (TAP) was 3:1.

Column tests with various layered and unlayered sequences of PAG and MAF rock were used to determine if the dump design was appropriate. However, the two columns containing layers of PAG and MAF, simulating the dump, had NP:TAP ratios only close to 1:1. Because effluent concentrations of metals like calcium and magnesium were not measured during column testing, rates of NP consumption and depletion could not be determined. However, simple geochemical relationships and data from other mines indicated that the ratio of NP consumption to sulphide depletion in the columns was likely greater than 1:1. Additionally, as is typical at many minesites, not all measured NP at Samatosum is available for neutralization: up to 10 t $CaCO_3$/1000 t is unavailable at Samatosum. Therefore, the columns were predicted to eventually release net acidity if they had continued. This contradicted previous predictions, primarily because previous work assumed that the rate of NP consumption was lower and equivalent to the rate of alkalinity production. In reality, alkalinity production typically represents only a portion of total NP consumption.

Comparisons of pre-test and post-test analyses on various grain-size ranges indicated layering as small as 0.2 m in the columns did not alter the reaction rates and the geochemical behaviour of the PAG and MAF material. In other words, layering with MAF did not slow reaction rates in the adjacent PAG layers. However, the effluent from the layered columns did represent a composite from the two materials.

Significant accumulation of sulphate from sulphide oxidation was noted in PAG, where it originated, and in basal (lower) MAF layers within the columns. Also, NP was significantly depleted in MAF layers, particularly in the finest grain-size range. In fact, NP depletion in the finest MAF particles caused some MAF to become net acid generating and suggested that NP in the coarser particles may not be readily available. This also supports the prediction of net acidity from the columns.

Monitoring of drainage from the dump at Samatosum has revealed signs of impending net acidity. In fact, pH at one station has fluctuated between neutral and acidic values, with the acidic values becoming lower and more persistent with time. However, unlike the columns, the dump has an overall ratio of NP:TAP of 3:1, and thus is not predicted to generate net acidity.

The reconciliation of predictions with monitoring data is based on the observations in the columns that layering does not suppress reaction rates in the PAG and that coarser rock can preferentially channel water through a layer. Consequently, the appearance of net acidity in some dump drainage is simply the result of physical conditions rather than a failure of geochemical principles. This highlights the importance of physical design and physical hydrogeology in any future design and construction of a layered dump. If drainage does not pass through all available neutralizing layers, acidic drainage may appear even in the presence of excess neutralizing potential.

A final note focusses on metal leaching. Although acidic pH may be prevented with carefully designed and implemented layering, leaching of metals is not so easily controlled. Because reaction rates in even small layers of net-acid-generating Samatosum rock, on the order of 0.2 m, could proceed unattenuated by adjacent net-acid-neutralizing rock, metal leaching can probably occur at accelerated rates in layered dumps. If site-specific solubilities of secondary minerals are relatively high, aqueous metal concentrations may then exceed water-quality requirements even in near-neutral drainage. Therefore, layering is not necessarily a control technique for metal leaching.

6. ACKNOWLEDGEMENTS

This study was initiated by Bill Price (British Columbia Ministry of Employment and Investment), who wrote the Terms of Reference and helped design the analytical protocol.

This report has benefited greatly from reviews and comments by Gilles Tremblay (MEND), Peri Mehling and Kelly Sexsmith (Mehling Environmental Management), Bill Price (British Columbia Ministry of Employment and Investment), and Pat Bolger (Inmet Mining). We appreciated the assistance and kindness that John Froese (Samatosum) and his family gave us during our site visit and during the preparation of this report.

Although the layering of waste rock at Samatosum was not very successful, the commitment of time and money by Inmet Mining to carry out the layering was outstanding and exemplary. There is no doubt that Inmet carried out the layering with diligence and care.

7. REFERENCES

Denholm, E., and R. Hallam. 1991. A review of acid generation research at the Samatosum Mine. Proceedings of the Second International Conference on the Abatement of Acidic Drainage, Montreal, September 16-18, Tome 2, p.561-578.

Hatfield Consultants Limited. 1988. Samatosum Project - Stage I Environmental and Socio-Economic Impact Assessment. Submitted to the British Columbia Mine Development Steering Committee (representing regulatory agencies). May, 1988.

Morin, K.A., and N.M. Hutt. 1997. *Environmental Geochemistry of Minesite Drainage: Practical Theory and Case Studies*. MDAG Publishing, Vancouver, British Columbia.

Morin, K.A., and N.M. Hutt. 1993. The use of routine monitoring data for assessment and prediction of water chemistry. Proceedings of the 17th Annual Mine Reclamation Symposium, Port Hardy, British Columbia, May 4-7, p.191-201.

Morin, K.A., N.M. Hutt, and K.D. Ferguson. 1996. The International Kinetic Database: Rates of acid generation, neutralization, and metal leaching from mines around the world. Proceedings of the 3rd International and 21st Annual Minerals Council of Australia Environmental Workshop, October 14-18, Newcastle, New South Wales, Australia, Volume 1, p.132-148.

Morin, K.A., N.M. Hutt, and I.A. Horne. 1995a. Prediction of future water chemistry from Island Copper Mine's On-Land Dumps. Proceedings of the 19th Annual British Columbia Mine Reclamation Symposium, Dawson Creek, B.C., June 19-23, p. 224-233.

Morin, K.A., N.M. Hutt, and R. McArthur. 1995b. Statistical assessment of past water chemistry to predict future chemistry at Noranda Minerals' Bell Mine. Proceedings of the Conference on Mining and the Environment, Sudbury, Ontario, May 28 - June 1, Volume 3, p.925-934

Norecol, Dames & Moore. 1996. Guide for Predicting Water Chemistry from Waste Rock Piles. Canadian MEND Project 1.27.1a.

Piteau Associates. 1996. Assessment of ARD Mitigation Measures for the Open Pit and Waste Dump, Volume 1 and 2. Report for Inmet Mining, Project 1464, April 1996.

APPENDIX

A. Data from Static Tests

A1. Acid-Base Accounting (ABA) for Samatosum Rock Units

Samatosum Mine

ABA Data

Sample ID	Rock Type	Pyrite (%)	Mine Component	Material Type	Paste pH	% S (Total)	TAP (tonnes $CaCO_3$/1000 tonnes)	NP (tonnes $CaCO_3$/1000 tonnes)	TNNP (tonnes $CaCO_3$/1000 tonnes)	TNPR
BCS 8551	Sercite Tuff			Waste Rock	8.4	4.67	146	38	-108	0.26
BCS 8552	Sercite Tuff			Waste Rock	8.4	2.15	67	21	-46	0.31
BCS 8553	Sercite Tuff			Waste Rock	8.4	0.37	12	15	3	1.30
BCS 8554	Seroite Tuff			Waste Rock	7.9	2.73	85	15	-70	0.18
BCS 8555	Sercite Tuff			Waste Rock	8.1	2.37	74	25	-49	0.34
BCS 8557	Sercite Tuff			Waste Rock	8.1	2.51	78	16	-62	0.20
BCS 8559	Sercite Tuff			Waste Rock	6.3	1.47	46	14	-32	0.30
BCS 8560	Sercite Tuff			Waste Rock	6.6	3.73	117	88	-29	0.75
BCS 8561	Serolte Tuff			Waste Rock	a.7	1.52	48	38	-10	0.80
BCS 8562	Serolte Tuff			Waste Rock	8.6	1.88	59	23	-36	0.39
BCS 8563	Serolte Tuff			Waste Rock	7.9	3.71	116	7	-109	0.06
BCS 8564	Serolte Tuff			Waste Rock	8.4	1.72	54	38	-16	0.71
BCS 8565	Sercite Tuff			Waste Rock	8.8	2.32	73	67	-6	0.92
BCS 8566	Sercite Tuff			Waste Rock	8.1	3.46	108	23	-85	0.21
BCS 8567	Serolte Tuft			Waste Rock	8.3	3.30	103	26	-77	0.25
BCS 8569	Serolte Tuff			Waste Rock	7.3	4.04	126	12	-114	0.10
BCS 8570	Semite Tuff			Waste Rock	6.4	2.49	78	3	-75	0.04
BCS 8574	Serolte Tuff			Waste Rock	8.6	1.20	38	65	28	1.73
BCS 8575	Sercite Tuff			Waste Rock	6.9	0.64	26	9	-17	0.34
BCS 6576	Sercite Tuff			Waste Rock	8.6	0.61	19	35	16	1.84
BCS 8577	Sercite Tuff			Waste Rock	6.9	0.69	21	65	44	3.04
BCS 8578	Semite Tuff			Waste Rock	7.4	3.07	96	9	-87	0.09
BCS 8579	Semite Tuff			Waste Rock	8.1	0.25	8	6	0	1.02
BCS 6580	Semite Tuff			Waste Rock	6.6	4.30	134	11	-123	0.06
BCS 6581	Semite Tuft			Waste Rock	8.1	3.05	95	85	-10	0.89
BCS 8582	Sercite Tuff			Waste Rock	8.7	3.76	118	77	-41	0.66
BCS 8583	Sercite Tuff			Waste Rock	8.5	0.36	11	15	4	1.32
BCS 8584	Semite Tuff			Waste Rock	a.4	2.40	75	21	-54	0.28
BCS 8585	Semite Tuff			Waste Rock	8.5	3.11	97	43	-54	0.44
BCS 6586	Sercite Tuff			Waste Rock	8.7	1.91	60	36	-24	0.60
BCS 8587	Semite Tuff			Waste Rock	6.6	2.29	72	33	-39	0.46
BCS 8586	Sercite Tuff			Waste Rock	8.2	1.57	49	16	-33	0.33
BCS 8591	Serolte Tuff			Waste Rock	8.8	1.00	31	37	6	1.18
BCS 8592	Serolte Tuff			Waste Rock	8.7	1.40	44	115	71	2.63
BCS 6593	Serolte Tuff			Waste Rock	8.6	0.55	17	17	0	0.99
BCS 8595	Sercite Tuff			Waste Rock	8.5	1.03	32	71	39	2.21
BCS 8596	Serolte Tuff			Waste Rock	8.9	0.77	24	32	6	1.32
BCS 8597	Sercite Tuff			Waste Rock	8.5	1.60	50	15	-35	0.30
BCS 8598	Sercite Tuff			Waste Rock	8.6	2.27	71	20	-51	0.26
BCS 8599	Sercite Tuff			Waste Rock	8.7	0.31	10	12	2	1.26
SCD10393	Sericite Tuff	5	Hw	Waste Rock	8.4	3.29	103	68	-35	0.66
BCD10377	Sericite Tuft / Chert	5	HW	Waste Rock	8.4	4.87	152	50	-102	0.33
BCD10431	Sericite Tuff I Chert		HW,FW	Waste Rock	8.9	3.95	123	150	27	1.22
BCD10434	Sericite Tuff / Chert		Fw	Waste Rock	8.6	5.34	167	182	15	1.09
BCD10476	Serioite Tuff / Chert	5	HW	Waste Rock	8.4	3.44	108	71	-37	0.66
BCD4140	Sericite Tuff / Chert	10	Hw	Waste Rock	8.5	3.35	105	139	34	1.33
BCD4178	Sericite Tuff / Chert	5	Pit	Waste Rock	6.4	0.90	28	19	-9	0.68
BCD5280	Sericite Tuff / Chert	10	Hw	Waste Rock	7.7	2.97	93	11	-82	0.12
BCD8355	Sericite Tuff / Mafic Tuff + Chert	Trace-3	Pi	Waste Rock	9.0	1.87	56	241	163	4.12
BCD10313	Serlclle Tuff + Quartzite	5	Fw	Waste Rock	8.9	3.99	125	126	1	1.01
BCD5259	Serioiie Tuft + Quartzite	20	HW	Waste Rock	8.8	0.53	17	105	88	6.32
BCD5298	Sericite Tuff + Quartzite + Argillite		FW	Waste Rock	6.6	3.20	100	4	-96	0.04
BCD5302	Sericite Tuff + Quartzite + Argiltiie		Hw	Waste Rock	8.4	2.40	75	8	-67	0.11
BCD10541	Sertciie Tuff + Quartzite + Quarts Vein	15	FW	Waste Rock	6.5	8.61	269	4	-265	0.01
BCD5883	Sericite Tuft + Quarztite		HW,FW	Waste Rock	6.3	7.14	223	7	-216	0.03
Maximum					9.0	8.61	269	241	183	6.32
Minimum					6.3	0.25	8	3	-265	0.01
Mean					8.2	2.52	79	45	33	0.88
Standard Deviation					0.7	1.68	52	49	66	1.10
10 Percentile					7.1	0.57	18	a	-106	0.09
Median					8.4	2.37	74	25	33	0.60
90 Percentile					8.8	4.20	131	111	32	1.79
Count					55	55	55	55	55	55

TAP = % S (Total) * 31.25
TNNP = NP • TAP
TNPR = NP I TAP

Note: Data taken from DBARD database

Samatosum Mine

ABA Data

Sample ID	Rock Type	Pyrite (%)	Mine Component	Material Type	Paste pH	% S (Total)	TAP (tonnes $CaCO_3$/1000 tonnes)	NP (tonnes $CaCO_3$/1000 tonnes)	TNNP (tonnes $CaCO_3$/1000 tonnes)	TNPR
SC010426	Mafic Pyroclastic	Trace-3	PI	Waste Rock	6.9	2.10	66	715	649	10.90
BCD10514	Mafic Pyroclastic	Trace-2	Pi	Waste Rock	a.9	2.10	66	516	440	7.57
BCD10526	Mafic Pyroclastic		Pit	Waste Rock	6.7	3.65	120	452	332	3.76
BCD4255	Mafic Pyroclastic	5-a	Pit	Waste Rock	6.5	4.46	140	136	-2	0.99
BCD4257	Maftc Pyroclastic		PI	Waste Rock	0.2	1.06	34	71	37	2.10
BCD4275	Mafic Pyroclastic	Trace	Pi	Waste Rock	6.2	0.15	5	207	202	45.37
BCD5251	Mafic Pyroclastic		Pi	Waste Rock	6.5	0.47	15	916	901	62.10
BCD5717	Mafic Pyroclastic		PI	Waste Rock	4.7	4.30	134	4	-130	0.03
Maximum					a.9	4.46	140	916	901	62.10
Minimum					4.7	0.15	5	4	-130	0.03
Mean					8.1	2.33	73	377	305	16.60
Standard Deviation					1.4	1.72	54	327	351	23.62
10 Percentile					7.2	0.37	12	51	-41	0.70
Median					a.5	2.14	67	330	267	5.67
90 Percentile					0.9	4.35	136	775	725	50.39
Count					a	8	a	a	a	8

TAP = % S (Total) • 31.25
TNNP = NP - TAP
TNPR = NP / TAP

Note: Data taken from DBARD database

Samatosum Mine

ABA Data

Sample ID	Rock Type	Pyrite (%)	Mine Component	Material Type	Paste pH	% S (Total)	TAP (tonnes $CaCO_3$/1000 tonnes)	NP (tonnes $CaCO_3$/1000 tonnes)	TNNP (tonnes $CaCO_3$/1000 tonnes)	TNPR
BCD10203	Muddy Tuff	IO-20	Fw	Waste Rock	6.6	5.86	183	7	-176	0.04
BCD10520	Muddy Tuff	30 - 60	Fw	Waste Rock	7.2	9.06	203	4	-279	0.01
SC010645	Muddy Tuff	20	Fw	Waste Rock	6.8	11.10	347	2	-345	0.01
BCD4082	Muddy TM	20.40	HW,FW	Waste Rock	4.1	8.69	272	3	-269	0.01
BCD4215	Muddy Tuff	20	Fw	Waste Rock	6.4	5.20	163	9	-154	0.06
BCD5214	Muddy Tuff	40	Fw	Waste Rack	4.2	10.40	325	2	-323	0.01
BCD5727	Muddy Tuff	40	Hw	Waste Rock	6.5	6.51	203	5	-198	0.02
BCD5889	Muddy Tuff	10-20	Fw	Waste Rock	6.4	4.99	156	1	-155	0.01
BCD5905	Muddy Tuff	+ sun	Fw	Waste Rock	5.3	4.34	136	17	-119	0.13
BCD9343	Muddy Tuff	30 - 40	FW	Waste Rock	7.0	9.15	286	89	-197	0.31
Maximum					7.0	11.10	347	09	-119	0.31
Minimum					4.1	4.34	136	1	-345	0.01
Mean					6.1	7.53	236	14	-221	0.06
Standard Deviation					1.2	2.43	76	27	77	0.10
10 Percentile					4.2	4.93	154	2	-325	0.01
Median					6.5	7.60	238	5	-198	0.02
90 Percentile					7.3	10.47	327	24	-150	0.14
Count					10	10	10	10	10	10

TAP = % S (Total) . 31.25
TNNP = NP -TAP
TNPR = NP I TAP

Note: Data taken from DBARD database

Samatosum Mine

ABA Data

Sample ID	Rock Type	Pyrite (%)	Mine Component	Material Type	Paste pH	% S (Total)	TAP (tonnes $CaCO_3$/1000 tonnes)	NP (tonnes $CaCO_3$/1000 tonnes)	TNNP (tonnes $CaCO_3$/1000 tonnes)	TNPR
SC04111	Quartz Vein I Quartz BX		HW	Waste Rock	a.1	5.68	178	118	-60	0.66
BCD10130	Quartz Vein + Quartzite		HW	Waste Rock	9.1	1.58	49	348	299	7.05
BCD4036	Quartz Vein + Sulphide		HW,FW	Waste Rock	8.1	1.04	33	21	-12	0.65
BCD5743	Quartzite		HW	Waste Rock	7.4	0.10	3	11	a	3.42
BCD9336	Quartzite	20	Fw	Waste Rock	a.7	6.05	189	300	111	1.59
BCD4146	Quartzite + Muddy Tuff		Fw	Waste Rock	9.1	2.95	92	25	-67	0.27
BCD1 0255	Quartzite + Quartz Vein		Fw	Waste Rock	a.9	2.51	78	214	136	2.73
BCD5877	Quartzite + Tuff		Hw	Waste Rock	7.7	1.73	54	a	46	0.15
Maximum					9.1	6.05	189	346	299	7.05
Minimum					7.4	0.10	3	a	-67	0.15
Mean					a.4	2.71	85	131	46	2.66
Standard Deviation					0.7	2.13	67	139	127	2.34
10 Percentile					7.6	0.76	24	10	-62	0.23
Median					a.4	2.12	66	72	-2	1.13
90 Percentile					9.1	5.79	181	314	la4	4.51
Count					a	a	a	a	a	a

TAP = % S (Total) '31.25
TNNP = NP -TAP
TNPR = NP I TAP

Note: Data taken from DBARD database

Samatosum Mine

ABA Data

Sample ID	Rock Type	Pyrite (%)	Mine Component	Material Type	Paste pH	% S (Total)	TAP (tonnes $CaCO_3$/1000 tonnes)	NP (tonnes $CaCO_3$/1000 tonnes)	TNNP (tonnes $CaCO_3$/1000 tonnes)	TNPR
BCD10442	Chert	5	FW	Waste Rock	7.6	5.67	177	23	-154	0.13
BCD4019	Chert	10-15	Fw	Waste Rock	7.4	3.46	106	10	-96	0.09
Sax376	Chert		HW	Waste Rock	4.0	12.00	375	1	-374	0.00
BCD4739	Chert		Fw	Waste Rock	3.2	16.60	566	0	-566	0.00
BCD5304	Chert	5	Fw	Waste Rock	6.6	2.26	71	100	29	1.42
BCD4025	Chett + Muddy Tuff	30	Fw	Waste Rock	6.6	5.75	160	6	-174	0.03
Maximum					6.6	16.60	566	100	29	1.42
Minimum					3.2	2.26	71	0	-566	0.00
Mean					6.3	7.99	250	23	-226	0.28
Standard Deviation					2.2	6.27	196	38	220	0.56
10 Percentile					3.6	2.86	89	1	-481	0.00
Median					7.0	5.71	178	6	-164	0.06
90 Percentile					8.2	15.40	461	62	-34	0.77
Count					6	6	6	6	6	6

TAP = % S (Total) ‘31.25
TNNP = NP -TAP
TNPR = NP I TAP

Note: Data taken from DBARD database

Samatosum Mine **ABA Data**

Sample ID	Rook Type	Pyrite (%)	Mine Component	Material Type	Paste pH	% S (Total)	TAP (tonnes $CaCO_3$/1000 tonnes)	NP (tonnes $CaCO_3$/1000 tonnes)	TNNP (tonnes $CaCO_3$/1000 tonnes)	TNPR
BCS 8556	Argillite			Waste Rock	8.1	0.20	6	7	1	1.12
BCS 8558	Argilliie			Waste Rock	7.7	1.00	31	23	-8	0.74
BCS 8568	Argilliie			Waste Rock	8.3	0.50	16	34	18	2.18
BCS 8571	Argillite			Waste Rock	7.5	0.80	19	15	-4	0.80
BCS 8572	Argillite			Waste Rock	4.3	7.40	231	5	-226	0.02
BCS 8573	Argillite			Waste Rock				2	-229	0.01
BCS 8589	Argillite			Waste Rock	[illegible]	[illegible]	231	5	4	10.00
BCS 8590	Argilliie			Waste Rock	7.6	0.50	16	2	-14	0.13
BCS 8594	Argillite			Waste Rock	8.8	2.00	63	233	171	3.73
BCS 8600	Argillite			Waste Rock	4.4	7.50	234	4	-230	0.02
Maximum					8.8	7.50	234	233	171	10.00
Minimum					4.0	0.04	1	2	-230	0.01
Mean					6.9	2.71	85	33	-52	1.87
Standard Deviation					1.9	3.30	103	71	133	3.09
10 Percentile					4.3	0.18	6	2	-229	0.02
Median					7.7	0.80	25	6	-6	0.77
90 Percentile					8.4	7.41	232	54	34	4.38
Count					10	10	10	10	10	10

TAP = % S (Total) • 31.25
TNNP = NP -TAP
TNPR = NP I TAP

Note: Data taken from DBARD database

Samatosum Mine

ABA Data

Sample ID	Rock Type	Pyrite (%)	Mine Component	Material Type	Paste pH	% S (Total)	TAP (tonnes $CaCO_3$/1000 tonnes)	N P (tonnes $CaCO_3$/1000 tonnes)	TNNP (tonnes $CaCO_3$/1000 tonnes)	TNPR
BCD5432	Massive Sulphide			Ore	3.9	27.90	872	2	-870	0.00
BCD5887	Massive Sulphkte			Ore	8.1	4.80	144	275	131	1.91
BCD10441	Chert + Muddy Tuff			Ore	8.9	10.10	316	10	-306	0.03
BCD4214	Muddy Tuff			Ore	5.2	5.98	187	10	-177	0.05
BCD10398	Quartz Vein			Ore	8.4	5.13	160	168	8	1.06
BCD5209	Quartz Vein			Ore	8.5	2.67	83	369	286	4.42
BCD5592	Quartz Vein			Ore	7.9	8.63	270	91	-179	0.34
BCD9366	Quartz Vein + Quartzite			Ore	6.7	22.20	694	3	-691	0.00
BCD5903	Quartzite			Ore	8.1	4.47	140	168	28	1.20
BCD5303	Semite Tuff			Ore	7.8	4.69	147	43	-104	0.29
Maximum					8.5	27.90	872	369	286	4.42
Minimum					3.9	2.67	83	2	-870	0.00
Mean					7.2	9.64	301	114	-187	0.93
Standard Deviation					1.5	8.51	268	129	357	1.39
10 Percentile					5.1	4.29	134	3	-709	0.00
Median					7.9	5.56	174	67	-140	0.32
90 Percentile					6.4	22.77	712	284	147	2.16
Count					10	10	10	10	10	10

TAP = % S (Total) • 31.25
TNNP = NP -TAP
TNPR = NP I TAP

Note: Data taken from DBARD database

Samatosum Mine

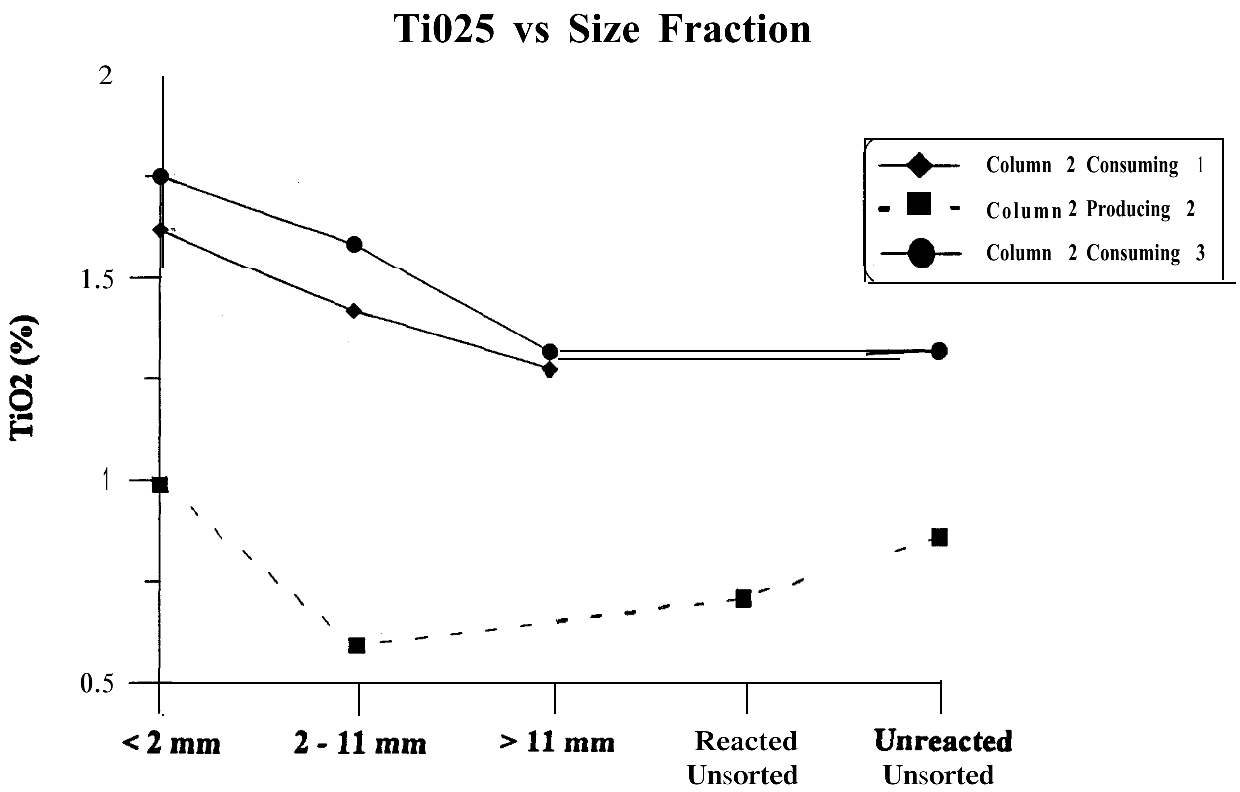
ABA Data

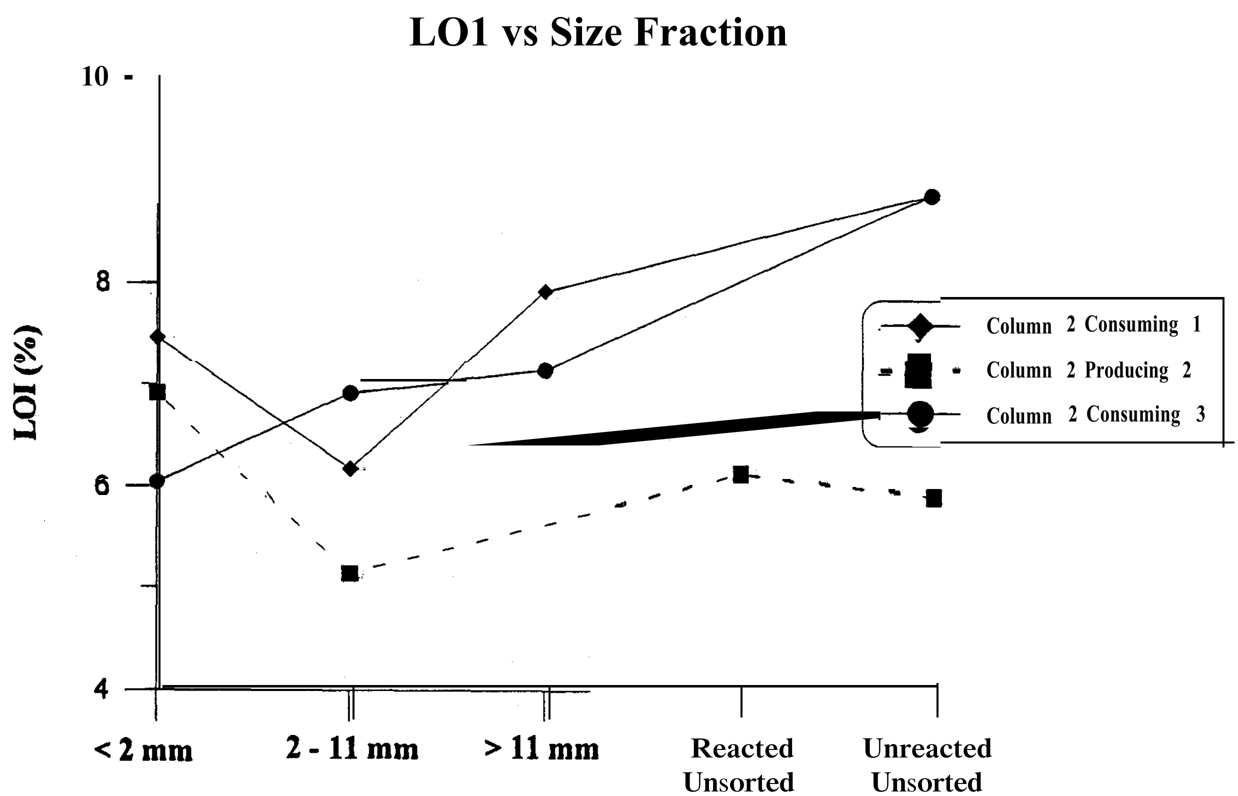
Sample ID	Rock Type	Pyrite (%)	Mine Component	Material Type	Paste pH	% S (Total)	TAP (tonnes $CaCO_3$/1000 tonnes)	NP (tonnes $CaCO_3$/1000 tonnes)	TNNP (tonnes $CaCO_3$/1000 tonnes)	TNPR
TAILINGS AREA/SOILS	Soils		Tailings Area / PI	Unspecified	7.9	0.03	1	37	36	10.00
WASTE DUMP/SOILS	Soils		Waste Dump / Pi	Unspecified	0.2	0.56	18	1	-17	0.07
Maximum					a.2	0.58	18	37	36	10.00
Minimum					7.9	0.03	1	1	-17	0.07
Mean					8.1	0.31	10	19	10	5.04
Standard Deviation					0.2	0.39	12	25	37	7.02
10 Percentile					7.9	0.09	3	5	-12	1.06
Median					8.1	0.31	10	19	10	5.04
90 Percentile					a.2	0.53	16	33	31	9.01
Count					2	2	2	2	2	2

TAP = % S (Total) • 2131.25
TNNP = NP -TAP
TNPR = NP / TAP

Note: Data taken from DBARD database

A2. ABA, Whole-Rock and Total-Metal Contents for Column Samples


Ti025 vs Size Fraction
TiO2 (%)
2
1.5
1
0.5
Column 2 Consuming 1
Column 2 Producing 2
Column 2 Consuming 3
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted


LO1 vs Size Fraction
LOI (%)
10
8
6
4
Column 2 Consuming 1
Column 2 Producing 2
Column 2 Consuming 3
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

Samatosum Mine

Column Test Samples

Sample	Size Fraction	Sample Weights (g)	Rinse pH (1:1)	Paste pH	% s (Total)	% S (Sulphide)	% S (Sulphate)	% S (BaSO4)	% S (del)	TAP (tonnes $CaCO_3$/1000 tonnes)	SAP (tonnes $CaCO_3$/1000 tonnes)	HAP (tonnes $CaCO_3$/1000 lonnes)	NP (tonnes $CaCO_3$/1000 tonnes)	co2 % (inorganic)	CaNP (tonnes $CaCO_3$/1000 tonnes)	TNNP (tonnes $CaCO_3$/1000 tonnes)	SNNP (tonnes $CaCO_3$/1000 tonnes)	RNNP (tonnes $CaCO_3$/1000 tonnes)	HNNP (tonnes $CaCO_3$/1000 tonnes)	TNPR	SNPR	RNPR	HNPR	(CaNP /NP) '100
Column 2. Consuming 1	> 11 mm	362 4	6.60	7.60	0.14	0.09	0.06	0011	0.000	4	3	3	116	4.50	102	112	113	100	113	26.51	41.24	36.39	41.24	66
Column 2. Consuming 1	2 - 11 mm	175.4	5.20	7.60	0.34	0.26	0.07	0.022	0.000	11	6	6	74	2.70	61	63	66	53	66	6.96	9.11	7.56	9.11	63
Column 2, Consuming 1	< 2 mm	44		7.30	0.61	0.55	027	0.015	0.000	25	17	17	17	0.30	7	-8	0	-10	0	067	0.99	0.40	0.99	40
Column 2. Consuming 1	Pulped	225																						
Column 2. Producing 2	> 11 mm	13.9																						
Column 2. Producing 2	2 - 11 mm	1360.2	4.00	6.60	3.12	3.14	0.06	0.020	0.000	98	98	98	40	1.70	39	-56	-56	-59	-56	0.41	0.41	0.39	0.41	97
Column 2. Producing 2	< 2 mm	858.7	4.30	5.30	3.51	3.39	0.27	0.006	0.000	110	106	106	14	0.70	16	-96	-92	-90	-92	0.13	0.13	0.15	0.13	114
Column 2. Producing 2	Pulped	170.5		6.39	3.16	316	017	0.023	0.000	99	99	99	35	1.60	36	-64	-64	-63	-64	035	0.35	0.37	0.35	104
Column 2. Consuming 3	> 11 mm	792.7	7 50	6.30	0.09	009	0.01	0.006	0.000	3	3	3	91	3.40	77	88	66	75	66	32.36	32.36	27.49	32.36	65
Column 2. Consuming 3	2 - 11 mm	436.2	7.70	8.30	0.11	0.12	0.01	0.004	0.000	3	4	4	77	2.50	57	74	73	53	73	22.40	20.53	15.16	20.53	74
Column 2. Consuming 3	< 2 mm	61.6		6.10	0.37	0.22	0.03	0.010	0.110	12	IO	7	17	0.40	9	5	7	-1	IO	1.47	1.65	0.68	2.47	54
Column 2. Consuming 3	Pulped	179.2																						
Column 3. Consuming 1	> 11 mm	266	6.30	7.60	0.16	0.06	007	0 003	0.027	6	3	3	100	3.60	66	94	97	63	98	17.76	28.65	25.60	40.00	66
Column 3. Consuming 1	2 - 11 mm	194.3	3.80	7.49	0.36	021	0.16	0 014	0.000	12	7	7	66	2.20	50	54	59	43	59	5.56	10.06	7.62	10.06	76
Column 3. Consuming 1	< 2 mm	79.7		6.30	0.99	0.33	0.66	0.016	0.000	31	IO	IO	14	0.40	Q	17	4	-1	4	045	1.36	0.66	1.36	65
Column 3. Consuming 1	Pulped	173.2																						
Column 3. Producing 2	> 11 mm	15.6																						
Column 3. Producing 2	2 - 11 mm	1133.1	3.30	6.00	2.62	2.76	0.15	0.016	0.000	62	66	66	36	1.90	43	44	46	-43	46	0.46	0.44	0.50	0.44	114
Column 3. Producing 2	< 2 mm	11063	3.10	4.40	3.42	3.14	0.49	0.005	0.000	107	98	96	7	0.40	9	-100	-91	-89	-91	0.07	0.07	0.09	0.07	130
Column 3. Producing 2	Pulped	149.5		5.60	3.21	3.04	0.33	0.005	0.000	100	95	95	27	1.30	30	-73	-68	-65	-68	0.27	0.26	0.31	0.26	110
Column 3. Consuming 3	> 11 mm	740.1	3.00	7.90	0.20	0.16	0.02	0.001	0.000	6	6	6	74	2.80	59	66	66	54	68	11.64	13.16	10.51	13.16	60
Column 3. Consuming 3	2 - 11 mm	252	4.10	7.60	0.40	0.32	0.03	0.011	0.036	13	11	IO	76	2.90	68	66	67	55	66	6.24	6.96	5.66	7.60	65
Column 3. Consuming 3	< 2 mm	297		7.50	0.63	0.43	0.15	0.036	0.012	20	14	13	21	0.40	9	1	7	-5	6	1.07	1.52	0.66	1.56	43
Column 3. Consuming 3	Pulped	251.5																						
Column 3. Producing 4	2 - 11 mm	746.5	3.40	6.30	2.40	2.44	0.16	0.012	0.000	75	76	76	60	3.00	66	-15	-16	-8	-16	0.60	0.79	0.69	0.79	114
Column 3. Producing 4	< 2 mm	935.6	3.40	5.30	3.13	2.66	0.41	0.006	0.000	96	69	89	24	1.20	27	-74	-65	-62	-65	0.25	0.27	0.31	0.27	114
column 3. Producing 4	Pulped	196.4		6.10	2.92	2.65	0.33	0.007	0.000	91	83	63	33	1.60	36	-56	-50	-46	-60	0.36	0.40	0.44	0.40	110
Column 3. Consuming 5	> 11 mm	799.5	7.70	6.10	0.05	0.02	0.02	0.004	0.006	2	1	1	76	2.30	52	76	77	52	77	10.00	10.00	10.00	10.00	67
Column 3. Consuming 5	2 - 11 mm	242.6	7.30	6.30	0.12	0.11	0.02	0 005	0.000	4	3	3	69	2.30	52	65	66	49	66	16.40	20.07	15.22	20.07	76
Column 3. Consuming 5	< 2 mm	26		6.00	0.36	0.24	0.11	0.009	0.001	11	6	6	41	0.60	14	30	33	6	34	3.64	5.45	1.61	5.47	33
Column 3. Consuming 5	Pulped	226.9																						
Original PAG	Pulped	296		7.60	3.62	3.62	0.11	0.006	0.000	113	113	113	35	1.60	41	-76	-76	-72	-76	0.31	0.31	0.36	0.31	117
Original MAF	Pulped	245.7		6.20	0.14	0.14	0.02	0.032	0.000	4	4	4	125	5.30	121	121	121	116	121	26.57	26.57	27.55	26.57	96
Column I. Original PAG	Unsorted	940																						
Column I. Original PAG	> 9.6 mm	2540	2.80	6.30	3.00	2.65	0.35	0.017	0.000	94	63	63	45	2.20	50	49	-36	-33	-36	0.46	0.54	0.60	0.54	III
Column I. Original PAG	2 - 9.6 mm	1565	2.50	3.60	2.64	2.17	0.47	0.014	0.000	63	66	66	4	0.40	9	-7s	-64	-59	-64	0.05	0.06	0.13	0.06	227
Column 1. Original PAG	< 2 mm	610	2.40	2.99	1.56	0.51	1.12	0.007	0.000	49	16	16	-18	0.10	2	-67	-34	-14	-34	-0.36	-1.13	0.14	-1.13	-13
Column 4. Original MAF	Unsorted	1400																						
Column 4. Original MAF	> 9.6 mm	3095	6 70	7.90	0.44	0.40	0.02	0.006	0.014	14	13	13	95	3.30	75	61	62	62	63	6.91	7.34	5.60	7.60	79
Column 4. Original MAF	2 - 9.6 mm	1215	8.50	6.09	0.16	0.13	0.03	0.021	0.000	5	4	4	99	3.70	64	94	95	60	95	19.80	24.37	29.71	24.37	65
Column 4. Original MAF	< 2 mm	630	760	6.10	0.26	0.23	002	0.013	0.017	9	6	7	66	3.10	71	79	80	63	81	1006	11.39	9.13	12.24	80
Column 5	Unsorted	1 5 0 0	2.60	5.00	1.39	0.97	042	0.005	0.000	43	30	30	13	0.60	18	-30	-17	-12	-17	0.30	0.43	0.60	0.43	140
Column 5	> 9.6 mm	1705																						
Column 5	2 • 9.6 mm	1790																						
Column 5	< 2 mm	765																						
Column 6, MAF (Top)	Unsorted	1355	7.60	7.49	1.42	1.42	0.03	0.006	0.000	44	44	44	65	3.50	80	41	41	35	41	1.92	1.92	1.79	1.92	94
Column 6, MAF (Top)	> 9.6 mm	2370																						
Column 6, MAF (Top)	2 • 9.6 mm	1445																						
Column 6, MAF (Top)	< 2 mm	1190																						
Column 6, PAG (Bottom)	Unsorted	1725	3.70	6.30	2.27	2.04'	0.22	0.006	0.004	71	64	64	42	2.60	59	-29	-22	-5	-22	0.59	0.66	0.93	0.66	141
Column 6. PAG (Bottom)	> 9.6 mm	1460																						
Column 6, PAG (Bottom)	2 • 9.6 mm	1495																						
Column 6. PAG (Bottom)	< 2 mm	1015																						
Maximum		3095	6.70	6.30	3.62	3.62	1.12	0.036	0.110	113	113	113	125	5.30	121	121	121	116	121	32.36	41.24	36.39	41.24	227
Minimum		13.9	2 40	2.90	0.05	0.02	0.01	0.001	0.000	2	1	1	-18	0.10	2	-100	-92	-90	-92	-0.36	-1.13	0.09	-1.13	-13
Mean		605.6	509	6.67	1.42	1.26	020	0 012	0.007	44	'lo	39	52	2.04	46	6	13	7	13	6.77	6.05	6.79	6.43	91
Standard Deviation		721.1	219	1.39	1.31	1.30	0.23	0.006	0.020	41	40	41	38	1.33	30	69	66	56	66	945	11.29	9.61	11.97	39
IO Percentile		80.1	266	5.12	0.13	0.10	002	0.005	0.000	4	3	3	13	0.40	9	-76	67	-64	-67	0.17	0.10	0.21	0.19	47
Median		740.1	4.10	7.40	0.61	0.43	0.11	0.009	0.000	25	14	13	42	2.20	50	1	7	-1	8	1.07	1.52	0.69	1.56	66
90 Precentile		1661.0	7.76	6.16	3.20	3.14	0.45	0.021	0.016	100	96	98	97	3.62	62	92	92	78	92	21.36	26.89	23.76	26.69	125
count		53	25	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35

% S ($BaSO_4$) = Ba (ppm) '32.06 / 44.01 HO000
% s (del) = % S (Total) - % S (Sulphide) - % s (Sulphate) - % s ($BaSO_4$)
Note: If % S (del) < 0 then set to 0
TAP = % S (Total) * 31.25
SAP = (% S (Sulphide) + % S (del)) * 31.25

HAP = % S (Sulphide) * 31.25
CaNP = % CO2 * 100.09 * 10 / 44.01
TNNP = NP - TAP
SNNP = NP - SAP
RNNP = CaNP - SAP

HNNP = NP - HAP
TNPR = NP / TAP
Note: If % S (Total) =<0.05 then set to 10
SNPR = NP I SAP
Note: If (% S (Sulpide) + % S (del)) =<0.05 then set to IO

RNPR = CaNP - SAP
Note: If (% S (Sulpide) + % s (del)) =<0.05 then set to 10
HNPR = NP / HAP
Note: If % S (Sulpide) =<0.05 then set to IO

Sample	Al_2O_3 (%) XRF	CaO (%) XRF	Cr_2O_3 (%) XRF	Fe_2O_3 (%) XRF	K_2O (%) XRF	MgO (%) XRF	MnO (%) XRF	Na_2O (%) XRF	P_2O_5 (%) XRF	SiO_2 (%) XRF	TiO_2 (%) XRF	LOI (%) XRF	Total (%) XRF
Column 2, Consuming 1	13.18	7.66	0.010	11.35	0.07	11.58	0.19	2.69	0.15	42.46	1.28	7.88	98.50
Column 2, Consuming 1	13.72	5.48	0.010	11.81	0.31	11.16	0.19	2.52	0.15	45.44	t.42	6.19	98.40
Column 2, Consuming 1	15.01	2.37	0.010	12.99	0.69	11.91	0.27	2.08	0.17	44.21	1.62	7.47	98.78
Column 2, Consuming 1													
Column 2, Producing 2													
Column 2, Producing 2	9.58	1.43	0.010	6.05	2.15	2.07	0.11	0.16	0.14	71.96	0.59	5.14	99.37
Column 2, Producing 2	17.07	0.79	0.010	r.56	4.11	1.78	0.09	0.33	0.16	59.08	0.99	6.91	98.90
Column 2, Producing 2	11.87	1.34	0.010	6.71	2.70	2.10	0.11	0.27	0.13	67.42	0.71	6.08	99.15
Column 2, Consuming 3	13.13	6.84	0.010	11.38	0.08	12.08	0.17	2.58	0.15	U.42	1.32	7.12	99.26
Column 2, Consuming 3	14.15	5.88	0.010	13.36	0.06	12.98	0.18	2.43	0.17	41.97	1.59	6.92	99.48
Column 2, Consuming 3	14.89	2.92	0.010	14.16	0.13	13.03	0.21	2.60	0.20	43.35	1.75	6.65	99.30
Column 2, Consuming 3													
Column 3, Consuming 1	12.71	7.40	0.010	12.14	0.06	11.37	0.22	2.59	0.15	43.25	1.39	7.16	98.47
Column 3, Consuming 1	13.30	4.84	0.010	12.26	0.17	12.20	0.22	2.20	0.17	43.74	1.45	6.63	97.21
Column 3, Consuming 1	14.26	2.78	0.010	13.46	0.30	12.47	0.36	2.24	0.19	42.24	1.64	6.83	98.78
Column 3, Consuming 1													
Column 3, Producing 2													
Column 3, Producing 2	9.34	1.59	0.010	6.07	1.92	2.67	0.11	0.12	0.10	70.54	0.63	5.36	98.46
Column 3, Producing 2	17.10	0.68	0.005	7.31	4.14	1.78	0.08	0.29	0.16	58.45	1.01	7.63	98.63
Column 3, Producing 2	13.01	1.23	0010	6.82	3.01	2.22	0.11	0.28	0.14	84.50	0.78	8.81	98.92
Column 3, Consuming 3	12.84	5.33	0.010	12.45	0.08	12.07	0.18	1.82	0.18	46.08	1.42	7.34	99.58
Column 3, Consuming 3	13.91	5.82	0.010	12.45	0.22	11.86	0.18	2.49	0.17	43.60	1.48	7.36	SS.55
Column 3, Consuming 3	15.51	2.48	0.010	13.86	0.63	12.41	0.33	2.15	0.21	45.48	1.69	4.08	95.64
Column 3, Consuming 3													
Column 3, Producing 4	7.60	2.34	0.005	5.87	1.55	2.86	0.15	0.17	0.09	72.36	0.58	5.23	99.00
Column 3, Producing 4	14.02	1.25	0.010	7.51	3.26	2.27	0.10	0.36	0.15	62.34	0.89	7.00	99.16
Column 3, Producing 4	11.66	1.46	0.010	6.95	2.59	2.47	0.11	0.25	0.13	65.81	0.77	6.57	98.78
Column 3, Consuming 5	13.59	5.89	0.010	12.12	0.07	12.10	0.17	2.89	0.15	44.03	1.36	6.77	99.15
Column 3, Consuming 5	13.18	4.86	0.010	12.11	0.08	12.94	0.17	2.16	0.17	40.63	141	12.58	99.28
Column 3, Consuming 5	1444	314	0010	13.85	0.14	13.19	0.22	2.33	0.19	42.81	1.69	7.16	99.17
Column 3, Consuming 5													
Original PAG	1237	1.41	0010	6.49	2.57	1.71	0.10	0.30	0.15	67.00	0.66	5.87	98.84
Original MAF	12.93	8.89	0.010	10.87	0.62	9.27	0.19	1.69	0.18	46.04	1.32	6.83	99.02
Column 1, Original PAG													
Column 1, Original PAG	9.18	1.92	0.020	6.91	1.73	3.13	0.15	0.25	0.10	65.07	0.58	8.33	95.37
Column 1, Original PAG	12.44	0.55	0.005	6.29	2.87	1.52	0.08	0.21	0.15	66.52	0.78	6.40	97.77
Column 1, Original PAG	17.77	026	0.005	8.60	4.22	1.52	0.05	0.38	0.19	55.77	1.07	9.52	99.35
Column 4, Original MAF													
Column 4, Original MAF	13.51	6.12	0.010	12.37	0.07	12.05	0.17	2.49	0.17	42.41	1.52	7.58	98.47
Column 4, Original MAF	13.32	7.16	0.010	12.u	0.07	12.04	0.18	2.42	0.16	42.25	1.46	7.80	99.31
Column 4, Original MAF	13.98	5.91	0.010	13.34	0.13	12.86	0.18	2.11	0.18	41.00	1.62	7.74	98.86
Column 5	12.53	0.76	0.005	4.54	2.75	1.61	0.09	0.41	0.11	67.94	0.74	5.85	97.13
Column 5													
Column 5													
Column 5													
Column 6, MAF (Top)	13.07	4.75	0.010	11.26	0.87	9.22	0.18	1.45	0.15	47.93	1.29	7.25	97.40
Column 6. MAF (Top)													
Column 6, MAF (Top)													
Column 6. MAF (Top)													
Column 6, PAG (Bottom)	13.10	2.05	0.005	6.14	2.76	1.83	0.10	0.23	0.12	64.82	0.88	6.10	98.19
Column 6, PAG (Bottom)													
Column 6, PAG (Bottom)													
Column 6, PAG (Bottom)													
Maximum	17.77	7.68	0.020	14.16	4.22	13.19	0.36	2.89	0.21	72.36	1.75	12.58	99.58
Minimum	7.80	0.26	0.005	4.54	0.06	1.52	0.05	0.12	0.09	40.63	0.88	4.08	98.37
Mean	13.23	3.52	0.009	9.99	1.35	7.69	0.16	1.43	0.15	52.94	1.19	7.01	98.68
Standard Deviation	2.10	2.37	0.003	3.07	1.41	4.98	0.07	1.05	0.03	11.38	0.38	1.48	0.85
10 Percentile	10.36	0.77	0.005	6.10	0.08	1.74	0.09	0.23	0.11	42.24	0.66	5.48	97.55
Median	13.18	2.78	0.010	11.35	0.69	11.16	0.17	1.82	0.15	46.04	1.32	6.92	98.88
90 Precentile	15.31	6.87	0.010	13.42	3.16	12.58	0.22	2.59	0.19	67.73	1.63	8.45	99.38
Count	35.00	35.00	35.000	35.00	35.m	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.m

Test = (Original (ppm) / Acid Rinse (ppm)) * 100

Samatosum Mine

Column Test Samples

Sample	Ag (ppm) Original	Ag (ppm) Acid Rinse	Ag % Remaining After Acid Rinse Test	Al (ppm) Original	Al(ppm) Acid Rinse	Al % Remaining After Acid Rinse Test	As (ppm) Original	As (ppm) Acid Rinse	As % Remaining After Acid Rinse Test	Ba (ppm) Original	Ba (ppm) Acid Rinse	Ba % Remaining After Acid Rinse Test	Be (ppm) Original	Be (ppm) Acid Rinse	Be % Remaining After Acid Rinse Test	Bi (ppm) Original	Bi (ppm) Acid Rinse	Bi % Remaining After Acid Rinse Test	Ca (ppm) Original	Ca (ppm) Acid Rinse	Ca % Remaining After Acid Rinse Test	Cd (ppm) Original	Cd (ppm) Acid Rinse	Cd % Remaining After Acid Rinse Test	Co (ppm) Original	Co (ppm) Acid Rinse	Co % Remaining After Acid Rinse Test
Column 2, Consuming 1	1.0			73000			4			490			0.25			1			50900			0.25			51		
Column 2, Consuming 1	4.0	0 1	2.50	73400	73109	99.59	20	22	110.00	930	790	84.95	0.25	0.50	200.00	1	1	100.00	35300	33300	94.33	0.5	0.25	50.00	54	52	96.30
Column 2, Consuming 1	1.4			80000			52			660			0.25			1			15100			2.5			81		
Column 2, Consuming 1																											
Column 2, Producing 2																											
Column 2, Producing 2	14.2	44.0	309.86	50700	43100	85.01	148	172	116.22	860	500	66.14	0.50	1.00	200.00	2	2	100.00	9800	7600	77.55	0.25	3.00	1200.00	19	19	100.90
Column 2, Producing 2	14.8	12.4	83.78	a2300	a9200	108.38	198	178	as.90	260	660	253.85	2.09	3.00	150.00	2	1	50.00	4900	2300	46.94	1.5	1.W	66.67	23	23	100.60
Column 2, Producing 2	21.2			61500			176			1000			1.50			1			9600			2			22		
Column 2, Consuming 3	1.0			72300			6			240			0.25			1			44200			2.5			47		
Column 2, Consuming 3	1.0	0.1	1o.w	78200	72700	92.97	2	2	100.00	160	350	21a.75	0.25	0.50	200.00	1	1	100.00	36500	33500	91.78	2.5	0.25	1o.w	56	55	98.21
Column 2, Consuming 3	1.0			79400			14			420			0.25			1			18300			2.5			60		
Column 2, Consuming 3																											
Column 3, Consuming 1	1.0			66400			6			120			0.25			1			47100			0.5			56		
Column 3, Consuming 1	1.0	0.1	10.00	70800	68800	97.16	m	16	80.00	620	1200	193.55	0.25	0.50	200.09	1	1	100.00	30500	29300	96.07	0.25	0.25	100.00	58	53	91.38
Column 3, Consuming 1	0.8			74300			40			790			0.2s			1			17200			1.5			99		
Column 3, Consuming 1																											
Column 3, Producing 2																											
Column 3, Producing 2	12.0	3.0	25.00	49800	47000	94.38	150	164	109.33	680	710	104.41	0.50	1.50	3w.w	2	1	50.00	4600	7600	69.09	2	0.50	25.00	19	17	69.47
Column 3, Producing 2	11.4	13.6	119.36	a5600	a2000	96.73	196	186	94.90	210	520	247.62	2.50	2.56	100.00	1	1	160.00	8400	1900	41.30	1.5	2.60	133.33	26	m	76.92
Column 3, Producing 2	134			65700			162			230			1.50			4						2			22		
Column 3, Consuming 3	0.1			67700			10			60			0.25			1			33800			2.5			52		
Column 3, Consuming 3	4.6	0.1	2.17	73800	78000	10569	16	14	67.56	480	460	95.83	0.25	0.50	200.00	1	1	100.00	37100	19200	51.75	2	0.25	12.50	53	61	115.09
Column 3, Consuming 3	1.6			80600			52			1630			0.50			1			15200			0.5			80		
Column 3, Consuming 3																											
Column 3. Producing 4	300	13.2	44.00	41100	67800	164.96	176	176	96.88	500	440	88.00	0.50	2.W	400.00	8	1	12.50	16100	5000	31.06	2	2.00	100.00	18	16	100.00
Column 3, Producing 4	156	14.2	91.03	694W	43600	62.82	202	146	7327	240	1190	495.83	1.50	1.00	66.67	2	8	4w.w	8300	8800	106.02	2	1.50	75.00	23	1a	78.26
Column 3, Producing 4	13.4			60700			176			320			1.50			2			9900			2			21		
Column 3, Consuming 5	1.0			75600			4			190			0.25			1			36900			0.25			50		
Column 3, Consuming 5	02	0.1	50.00	79500	75100	94.47	10	2	20.w	200	140	70.00	0.25	0.50	200.00	1	1	100.00	32500	26000	80.00	0.25	0.25	100.00	56	55	98.21
Column 3, Consuming 5	06			81600			16			390			0.25			1			20500			0.25			65		
Column 3, Consuming 5																											
Original PAG	1.2			64400			132			350			1.50			2			9900			05			27		
Original MAF	06			70800			76			1370			0.50			1			44600			1.5			51		
Column 1, Original PAG																											
Column 1, Original PAG	1.2			51100			226			730			0.50			1			13700			0.5			21		
Column 1, Original PAG	7.4			67000			166			590			1.50			2			3900			0.25			14		
Column 1, Original PAG	17.4			90200			346			310			2.50			6			1600			0.25			18		
Column 4, Original MAF																											
Column 4, Original MAF	1.0			74400			16			260			025			1			38900			0.25			53		
Column 4, Original MAF	1.0			75300			8			880			0.25			1			46800			0.25			54		
Column 4, Original MAF	1.0			80600			22			550			0.25			1			39200			0.25			60		
Column 5	12.4			67700			132			220			1.50			2			5500			0.25			10		
Column 5																											
Column 5																											
Column 5																											
Column 6, MAF (Top)	9.2			73500			124			270			0.50			1			31800			6.5			44		
Column 6, MAF (Top)																											
Column 6, MAF (Top)																											
Column 6, MAF (Top)																											
Column 6, PAG (Bottom)	1.4			67300			126			240			1.50			1			13900			0.25			26		
Column 6, PAG (Bottom)																											
Column 6, PAG (Bottom)																											
Column 6, PAG (Bottom)																											
Maximum	30.0	44.0	309.86	90200	89200	164.96	346	186	116.22	1630	1200	495.83	2.50	3.09	400.00	6	6	400.00	50900	33500	166.02	6.5	3.00	1200.00	99	61	115.09
Minimum	0.1	0.1	2.17	41100	43100	62.82	2	2	20.00	60	140	58.14	0.26	0.50	66.67	1	1	12.50	1600	1soO	31.06	0.25	0.25	10.00	10	17	76.92
Mean	6.3	92	67.97	70734	67382	100.20	93	98	as.09	499	633	173.72	0.76	1.23	ml.52	2	2	110.23	22957	15664	71.45	1.28	1.02	170.23	43	36	94.90
Standard Deviation	7.5	13.2	89.45	10658	15874	24.62	88	84	26.35	356	329	129.72	0.70	0.90	89.58	1	2	100.75	15234	12621	25.27	1.28	0.96	343.87	22	is	1073
10 Percentile	0.7	0.1	2.50	54940	43600	85.01	6	2	73.27	194	359	70.06	0.25	0.50	100.00	1	1	50.00	5140	2300	41.36	0.25	0.25	12.50	18	18	76.26
Median	1.4	3.0	44.00	73000	72700	96.73	52	148	94.96	399	520	104.41	0.50	1.00	200.00	1	1	100.00	17209	8800	77.55	0.5	0.50	75.60	50	23	98.21
so Precentile	15.3	14.2	119.30	a1200	a2800	108.38	197	178	110.00	910	1190	253.1	1.50	2.50	300.00	2	2	100.00	44446	33300	96.07	2.5	2.00	133.33	63	65	100.00
Count	35	11	11	35	11	11	35	11	11	36	11	11	35	11	11	35	11	11	35	11	11	35	11	11	36	11	11

*% Remaining After Acid Rinse Test = (Original (ppm) / Acid Rinse (ppm)) * 100*

Samatosum Mine **Column Test Samples**

Sample	Cr (ppm) Original	Cr (ppm) Acid Rinse	Cr % Remaining After Acid Rinse Test	Cu (ppm) Original	Cu (ppm) Acid Rinse	Cu % Remaining After Acid Rinse Test	Fe (ppm) Original	Fe (ppm) Acid Rinse	Fe % Remaining After Acid Rinse Test	Hg (ppm) Original	Hg (ppm) Acid Rinse	Hg % Remaining After Acid Rinse Test	K (ppm) Original	K (ppm) Acid Rinse	K % Remaining After Acid Rinse Test
Column 2, Consuming 1	467			102			71300			0.005			1000		
Column 2, Consuming 1	493	515	104.46	129	93	72.09	72700	75tm	103.30	0.060	0.05	63.33	2700	2500	92.59
Column 2, Consuming 1	602			124			80000			0.100			5300		
Column 2, Consuming 1															
Column 2, Producing 2															
Column 2, Producing 2	215	289	134.42	174	382	219.54	39800	40500	101.76	0.930	1.01	108.60	16400	14200	86.59
Column 2, Producing 2	170	322	189.41	188	175	93.09	47800	54100	113.18	0.560	0.74	132.14	28000	30900	110.36
Column 2, Producing 2	265			240			44500			0.520			20100		
Column 2, Consuming 3	547			90			a9900			0.005			1000		
Column 2, Consuming 3	57a	556	96.19	l m	106	t06.m	83300	76400	91.72	0.005	0.005	100.00	to00	1000	100.00
Column 2, Consuming 3	616			110			87300			0.030			1500		
Column 2, Consuming 3															
Column 3, Consuming 1	418			93			74mo			0.005			800		
Column 3, Consuming 1	439	537	122.32	87	97	111.49	74800	78200	104.55	0.010	0.01	100.00	1400	1500	107.14
Column 3, Consuming 1	500			137			81300			0.070			2600		
Column 3, Consuming 1															
Column 3, Producing 2															
Column 3, Producing 2	200	249	124.50	146	al	55.48	39800	41700	104.77	0.440	0.5	113.64	14700	16200	110.20
Column 3, Producing 2	131	285	217.56	148	173	116.89	49400	49600	100.40	0.790	1.39	175.95	29200	28400	97.26
Column 3, Producing 2	170			175			44900			0.600			22000		
Column 3, Consuming 3	440			121			76400			0.005			800		
Column 3, Consuming 3	456	659	143.69	128	149	116.41	76400	87700	114.79	0190	0.005	2.63	2300	1300	56.52
Column 3, Consuming 3	612			154			82000			0.130			5100		
Column 3, Consuming 3															
Column 3, Producing 4	166	341	205.42	304	166	54.61	38500	48900	127.01	0.530	069	130.19	11600	231m	195.76
Column 3, Producing 4	164	298	tat.71	la4	166	90.22	48600	39700	81.69	0.410	0.53	129.27	23000	13800	60.00
Column 3, Producing 4	212			160			45500			0.520			19300		
Column 3, Consuming 5	521			80			74500			0.010			am		
Column 3, Consuming 5	533	593	111.26	91	102	112.09	82300	77600	94.29	0.005	0.005	tm.m	1300	600	46.15
Column 3, Consuming 5	677			124			88400			0.040			1700		
Column 3, Consuming 5															
Original PAG	197			92			43400			0.150			19306		
Original MAF	478			151			67000			0.080			6900		
Column 1, Original PAG															
Column 1, Original PAG	290			74			47000			0.160			13800		
Column 1, Original PAG	177			lo3			43900			0.440			22200		
Column 1, Original PAG	190			238			59900			0.770			30700		
Column 4, Original MAF															
Column 4, Original MAF	568			76			75700			0.005			1200		
Column 4, Original MAF	584			123			77800			0.005			1300		
Column 4, Original MAF	683			177			85800			0.060			1900		
Column 5	192			220			32400			0.390			22100		
Column 5															
Column 5															
Column 5															
Column 6, MAF (Top)	489			1510			71600			1.310			7400		
Column 6, MAF (Top)															
Column 6, MAF (Top)															
Column 6, MAF (Top)															
Column 6, PAG (Bottom)	la2			80			40100			0.080			21000		
Column 6, PAG (Bottom)															
Column 6, PAG (Bottom)															
Column 6, PAG (Bottom)															
Maximum	683	659	217.56	1510	382	219.54	88400	87700	127.01	1.310	1.39	175.95	30700	30900	195.76
Minimum	131	249	96.19	74	81	54.61	32400	39700	61.69	0.005	0.005	2.63	600	600	46.15
Mean	389	422	148.23	178	154	104.35	63371	60864	103.41	0.269	0.449	106.89	10331	12136	96.60
Standard o&anon	162	150	42.81	238	84	44.63	17743	tat40	12.20	0.326	0.479	42.50	10056	11579	39.92
10 Percentile	170	285	104.46	63	93	55.48	39920	40500	91.72	0.005	0.005	63.33	looo	tmo	56.52
Median	440	341	134.42	128	149	106.00	71300	54100	103.30	0.100	0.5	108.60	5300	13800	97.26
Qo Precentile	608	593	205.42	231	175	116.89	82900	78200	114.79	0.702	1.01	132.14	22680	28400	110.36
Count	35	11	11	35	11	11	35	11	11	35	11	11	35	11	11

Sample	Mg (ppm) Original	Mg (ppm) Acid Rinse	Mg % Remaining After Acid Rinse Test	Mn (ppm) Original	Mn (ppm) Acid Rinse	Mn % Remaining After Acid Rinse Test	Mo (ppm) Original	Mo (ppm) Acid Rinse	Mo % Remaining After Acid Rinse Test	Na (ppm) Original	Na (ppm) Acid Rinse	Na % Remaining After Acid Rinse Test
Column 2, Consuming 1	66200			1355			1.0			24200		
Column 2, Consuming 1	62700	62000	98.88	1295	1250	86.53	0.5	2	400.00	21300	19800	92.96
Column 2, Consuming 1	65300			1795			5.0			18200		
Column 2, Consuming 1												
Column 2, Producing 2												
Column 2, Producing 2	12400	11700	94.35	745	610	81.88	15.0	24	i60.m	2700	1700	62.96
Column 2, Producing 2	9400	8900	94.68	560	305	54.46	19.0	21	110.53	4300	4200	97.67
Column 2, Producing 2	12300			790			24.0			3206		
Column 2, Consuming 3	67900			1170			1.0			227m		
Column 2, Consuming 3	74000	64900	87.70	1270	1185	93.31	0.5	1	200.00	21700	24600	l14.29
Column 2, Consuming 3	72000			1455			1.0			22500		
Column 2, Consuming 3												
Column 3, Consuming 1	61600			1485			0.5			21400		
Column 3, Consuming 1	66400	62300	93.63	1445	1110	76.82	2.0	1	50.00	talm	18700	103.31
Column 3, Consuming 1	69000			2396			4.0			18800		
Column 3, Consuming 1												
Column 3, Producing 2												
Column 3, Producing 2	15600	97m	62.18	765	530	69.28	14.0	8	57.14	2600	2300	88.46
Column 3, Producing 2	9900	a400	84.85	560	235	41.96	21.0	18	85.71	4500	4100	91.11
Column 3, Producing 2	12300			750			23.0			3600		
Column 3, Consuming 3	66800			1215			1.0			15800		
Column 3, Consuming 3	66800	70800	105.99	1260	1150	91.27	1.0	3	300.m	21100	16800	79.62
Column 3, Consuming 3	66000			2220			2.0			18300		
Column 3, Consuming 3												
Column 3, Producing 4	16600	11300	66.07	1010	410	40.59	13.0	18	13646	2400	3800	154.33
Column 3, Producing 4	12500	12700	101.60	640	676	105.47	18.0	14	77.78	4200	2600	61.90
Column 3, Producing 4	14000			766			20.0			3700		
Column 3, Consuming 5	69500			1115			1.0			25100		
Column 3, Consuming 5	743m	66800	69.91	1255	1105	88.05	0 5	1	2 m . m	21500	23400	108.84
Column 3, Consuming 5	75500			1565			1.0			21100		
Column 3, Consuming 5												
Original PAG	10100			660			9.0			4mo		
Original MAF	52600			1300			3.0			15800		
Column 1, Original PAG												
Column 1, Original PAG	18700			1140			5.0			3200		
Column 1, Original PAG	9400			405			10.0			3600		
Column 1, Original PAG	8500			300			29.0			4500		
Column 4, Original MAF												
Column 4, Original MAF	68200			1185			0.5			21700		
Column 4, Original MAF	69900			1275			0.5			22000		
Column 4, Original MAF	74tm			1305			0.5			20500		
Column 5	10400			620			11.0			4500		
Column 5												
Column 5												
Column 5												
Column 6, MAF (Top)	53500			1105			11.0			14000		
Column 6, MAF (Top)												
Column 6, MAF (Top)												
Column 6, MAF (Top)												
Column 6, PAG (Bottom)	10800			675			1.0			3900		
Column 6, PAG (Bottom)												
Column 6, PAG (Bottom)												
Column 6, PAG (Bottom)												
Maximum	75500	70800	105.99	2390	1250	105.47	29.0	24	4oo.m	25100	24800	158.33
Minimum	a500	8400	62.18	300	236	40.59	0.5	1	50.00	2400	1700	61.90
Mean	43577	35409	89.28	1110	779	76.33	7.7	10	161.76	13163	11109	96.31
Standard o&anon	28017	28792	t3.u	468	387	22.19	8.6	9	108.74	a633	9449	26.56
10 Percentile	9980	8900	68.07	584	305	41.66	0.5	1	57.14	3200	2300	62.96
Median	61600	12700	93.83	1170	675	81.88	3.0	8	138.46	15800	4200	92.96
Qo Precentile	73200	66600	101.66	1533	1185	96.53	20.6	21	300.00	22306	23406	114.29
Count	35	11	11	35	11	11	35	11	11	35	11	11

% Remaining After Add Rinse Test = (Original (ppm) / Acid Rinse (ppm)) * 100

Samatosum Mine

Column Test Samples

Sample	Ni (ppm) Original	Ni (ppm) Acid Rinse	Ni % Remaining After Acid Rinse Test	P (ppm) Original	P (ppm) Acid Rinse	P % Remaining After Acid Rinse Test	Pb (ppm) Original	Pb (ppm) Acid Rinse	Pb % Remaining After Acid Rinse Test	Sb (ppm) Original	Sb (ppm) Acid Rinse	Sb % Remaining After Acid Rinse Test	Se (ppm) Original	Se (ppm) Acid Rinse	Se % Remaining After Acid Rinse Test	Sr (ppm) Original	Sr (ppm) Acid Rinse	Sr % Remaining After Acid Rinse Test	Ti (ppm) Original	Ti (ppm) Acid Rinse	Ti % Remaining After Acid Rinse Test	V (ppm) Original	V (ppm) Acid Rinse	V % Remaining After Acid Rinse Test	W (ppm) Original	W (ppm) Acid Rinse	W % Remaining After Acid Rinse Test
Column 2, Consuming 1	239			620			1			0.2			3			216			6500			204			10		
Column 2, Consuming 1	233	232	99.57	670	600	89.55	1	1	1w.w	20.0	3.8	19.00	1	1	1W.W	137	151	110.22	7200	7300	101.39	205	208	101.46	10	5	50.00
Column 2, Consuming 1	304			770			40			9.8			1			69			7700			230			10		
Column 2, Consuming 1																											
Column 2, Producing 2																											
Column 2, Producing 2	57	69	121.05	590	430	72.88	62	500	806.45	82.0	220.0	268.29	1	5	500.00	71	74	104.23	1000	1200	120.w	91	85	93.41	5	5	1w.w
Column 2, Producing 2	66	65	98.48	610	640	104.92	126	120	96.24	98.0	74.0	76.51	3	1	33.33	68	62	91.18	1800	2600	144.44	170	189	111.18	5	5	1w.w
Column 2, Producing 2	72			550			190			120.0			1			73			1500			122			5		
Column 2, Consuming 3	225			800			1			0.1			1			157			6800			208			10		
Column 2, Consuming 3	260	238	91.54	740	550	74.32	1	1	1w.w	0.1	2.4	2400.00	2	2	100.00	157	110	70.08	8400	7800	92.86	234	224	95.73	20	5	25.w
Column 2, Consuming 3	271			830			8			1.2			5			58			8900			246			10		
Column 2, Consuming 3																											
Column 3, Consuming 1	240			MO			1			01			1			166			7200			210			10		
Column 3, Consuming 1	255	244	9569	660	570	88.36	1	14	14w.w	02	2.2	11w.w	2	1	50.00	133	111	8346	7000	7400	105.71	208	215	104.37	10	5	50.00
Column 3, Consuming 1	346			740			20			4.8			1			70			7900			225			5		
Column 3, Consuming 1																											
Column 3, Producing 2																											
Column 3, Producing 2	a1	58	71.60	500	380	76.00	100	108	106.00	56.0	17.5	31.25	1	2	200.00	72	71	98.61	1200	1600	133.33	100	a3	83.00	5	5	1w.w
Column 3, Producing 2	72	61	84.72	700	630	90.00	136	130	95.59	66.0	57.0	88.38	7	4	67.14	65	54	83.08	2100	2300	109.52	183	179	97.81	5	5	1w.w
Column 3, Producing 2	73			600			230			76.0			4			72			1800			137			5		
Column 3, Consuming 3	245			740			2			0.6			2			161			7500			220			10		
Column 3, Consuming 3	248	281	113.31	7w	680	97.14	80	1	1.25	24.0	1.4	5.83	1	1	100.w	157	a7	55.41	7500	8100	108.00	217	241	111.06	10	5	50.00
Column 3, Consuming 3	297			800			46			0.2			1			65			7600			234			5		
Column 3, Consuming 3																											
Column 3, Producing 4	73	68	93.15	460	530	115.22	144	94	65.28	1600	53.0	33.13	3	2	66.67	93	61	6559	1300	2300	176.92	83	143	172.29	5	5	1w.w
Column 3, Producing 4	70	67	95.71	600	430	71.67	100	200	200.00	86.0	56.0	66.12	2	3	150.00	73	85	89.04	1900	1400	73.88	144	as	61.81	5	5	1w.w
Column 3, Producing 4	70			560			80			66.0			3			74			1800			124			5		
Column 3, Consuming 5	224			550			1			0.6			1			122			7500			204			5		
Column 3, Consuming 5	264	250	94.70	730	570	78.08	1	1	100.00	04	0.4	100.00	1	1	1w.w	136	93	68.38	8300	7600	91.57	232	219	94.40	10	5	50.W
Column 3, Consuming 5	280			830			10			22			1			74			8600			247			10		
Column 3, Consuming 5																											
Original PAG	75			640			52			92			1			80			1900			144			5		
Original MAF	217			670			88			42			2			203			5000			187			10		
Column 1, Original PAG																											
Column 1, Original PAG	107			430			100			10.5			2			60			1400			103			5		
Column 1. Original PAG	51			690			54			46.0			1			57			1500			126			5		
Column 1, Original PAG	54			890			230			140.0			5			62			2200			197			5		
Column 4, Original MAF																											
Column 4, Original MAF	244			750			8			01			1			182			6900			214			10		
Column 4, Original MAF	245			710			1			0.2			1			213			7800			223			10		
Column 4, Original MAF	266			820			6			12			2			175			8500			242			10		
Column 5	38			500			980			700			5			57			14w			129			20		
Column 5																											
Column 5																											
Column 5																											
Column 6, MAF (Top)	227			820			1000			38.0			2			116			5700			193			10		
Column 6, MAF (Top)																											
Column 6, MAF (Top)																											
Column 6, MAF (Top)																											
Column 6, PAG (Bottom)	63			510			4			10.0			1			102			17w			142			5		
Column 6, PAG (Bottom)																											
Column 6, PAG (Bottom)																											
Column 6, PAG (Bottom)																											
Maximum	346	281	121.05	890	6ao	115.22	1000	500	14w.w	160.0	220.0	2400.00	7	5	5W.W	216	151	110.22	8900	8100	176.92	247	241	172.29	20	5	1w.w
Minimum	3a	58	71.60	430	380	71.67	1	1	1.25	0.1	0.4	5.83	1	1	33.33	57	54	55.41	1ooo	1200	73.68	83	83	61.81	5	8	25.W
Mean	176	148	96.32	658	546	88.92	112	106	279.07	34.6	44.3	380.41	2	2	132.47	110	a5	83.57	4940	4509	114.31	1a2	170	102.41	8	5	75.w
Standard Deviation	98	97	13.03	112	98	14.26	229	147	430.97	45.0	648	740.27	2	1	130.69	51	29	17.26	3002	3032	28.56	50	60	26.97	4	0	23.58
10 Percentile	59	61	84.72	504	430	72.88	1	1	65.28	0.1	1.4	19.00	1	1	50.00	61	61	65.59	1400	1400	91.57	111	85	83.00	5	5	50.W
Median	225	69	95.69	660	570	86.36	46	94	1w.w	9.8	17.5	75.51	1	2	1w.w	80	74	83.46	6500	2600	108.00	204	189	97.81	10	5	1w.w
90 Precentile	276	250	113.31	812	640	104.92	214	200	80645	93.2	74.0	11w.w	5	4	200.00	179	111	104.23	a380	7800	14444	234	224	111.18	10		100.00
Count	35	11	11	35	11	11	35	11	11	35	11	11	35	11	11	35	11	11	35	11	11	35	11	11	35	11	11

% Remaining After Acid Rinse Test = (Original (ppm) / Acid Rinse (ppm)) * 100

Sample	Zn (ppm) Original	Zn (ppm) Acid Rinse	Zn % Remaining After Acid Rinse Test
Column 2, Consuming 1	122		
Column 2, Consuming 1	140	116	62.66
Column 2, Consuming 1	306		
Column 2, Consuming 1			
Column 2, Producing 2			
Column 2, Producing 2	212	736	341.17
Column 2, Producing 2	378	466	123.61
Column 2, Producing 2	446		
Column 2, Consuming 3	92		
Column 2, Consuming 3	110	112	101.62
Column 2, Consuming 3	132		
Column 2, Consuming 3			
Column 3, Consuming 1	136		
Column 3, Consuming 1	162	126	69.23
Column 3, Consuming 1	394		
Column 3, Consuming 1			
Column 3, Producing 2			
Column 3, Producing 2	604	320	52.96
Column 3, Producing 2	432	566	131.46
Column 3, Producing 2	444		
Column 3, Consuming 3	110		
Column 3, Consuming 3	500	140	26.00
Column 3, Consuming 3	256		
Column 3, Consuming 3			
Column 3. Producinq 4	550	536	97.45
Column 3, Producing 4	544	526	95.59
Column 3, Producing 4	456		
Column 3, Consuming 5	90		
Column 3, Consuming 5	110	102	92.73
Column 3, Consuming 5	162		
Column 3, Consuming 5			
Original PAG	202		
Original MAF	256		
Column 1, Original PAG			
Column 1, Original PAG	206		
Column 1, Original PAG	166		
Column 1, Original PAG	366		
Column 4, Original MAF			
Column 4. Original MAP	96		
Column 4, Original MAF	96		
Column 4, Original MAF	132		
Column 5	256		
Column 5			
Column 5			
Column 5			
Column 6, MAF (Top)	1990		
Column 6, MAF (Top)			
Column 6. MAF (Top)			
Column 6, MAF (Top)			
Column 6, PAG (Bottom)	170		
Column 6, PAG (Bottom)			
Column 6. PAG (Bottom)			
Column 6, PAG (Bottom)			
Maximum	1990	736	347.17
Minimum	90	102	26.00
Mean	310	340	111.19
Standard Deviation	331	233	63.66
10 Percentile	103	112	52.96
Median	203	326	95.59
9 0 - b	526	568	131.46
Count	35	11	11

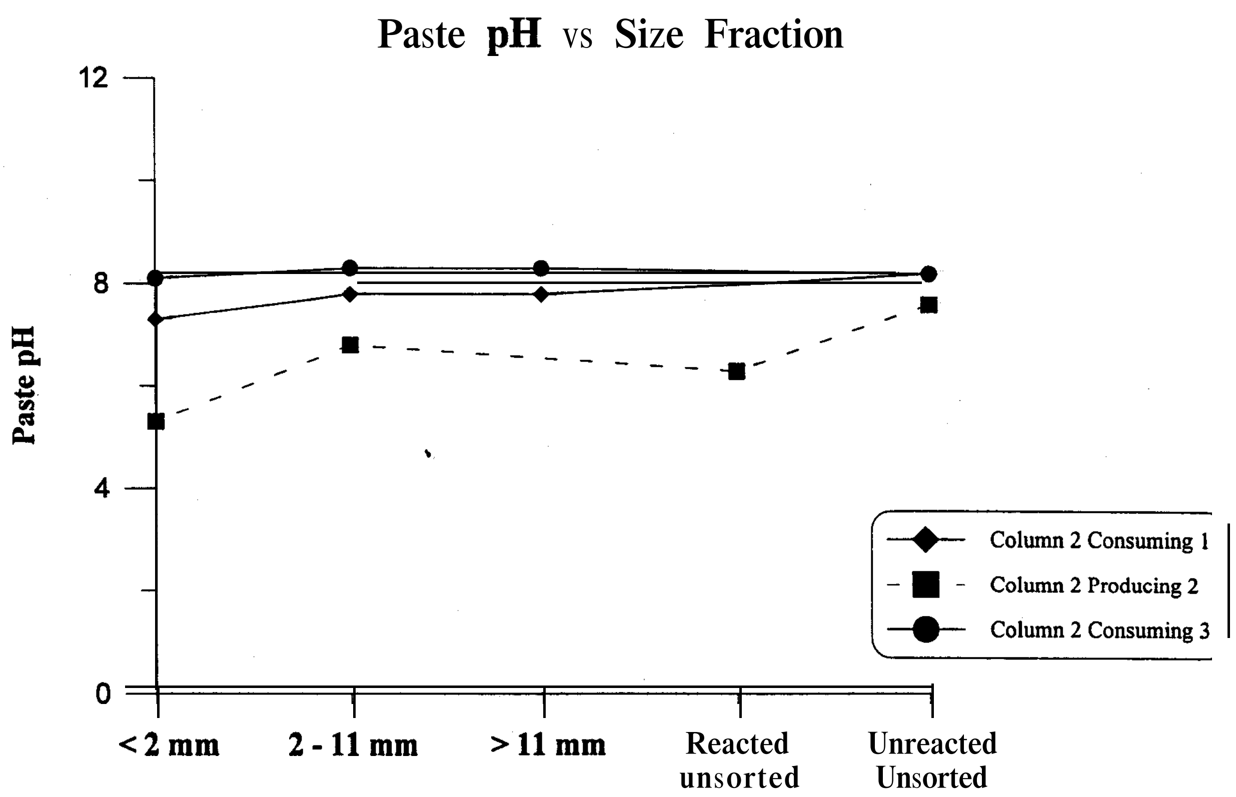
% Remaining After Acid Rins

Note: If data was reported as < detection then half the detection limit is shown in Italics

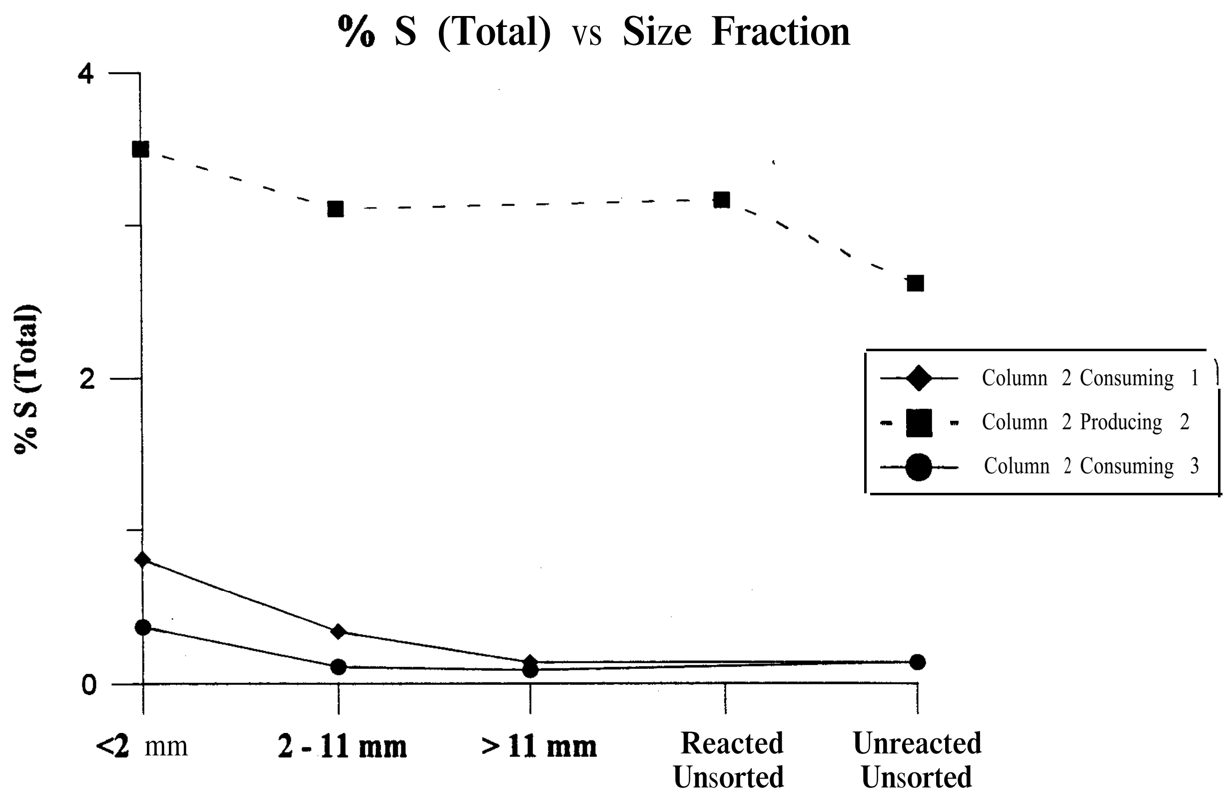
Note: If data was reported as > detection [illegible]

A3. Graphs of ABA Results for Columns by Grain Size

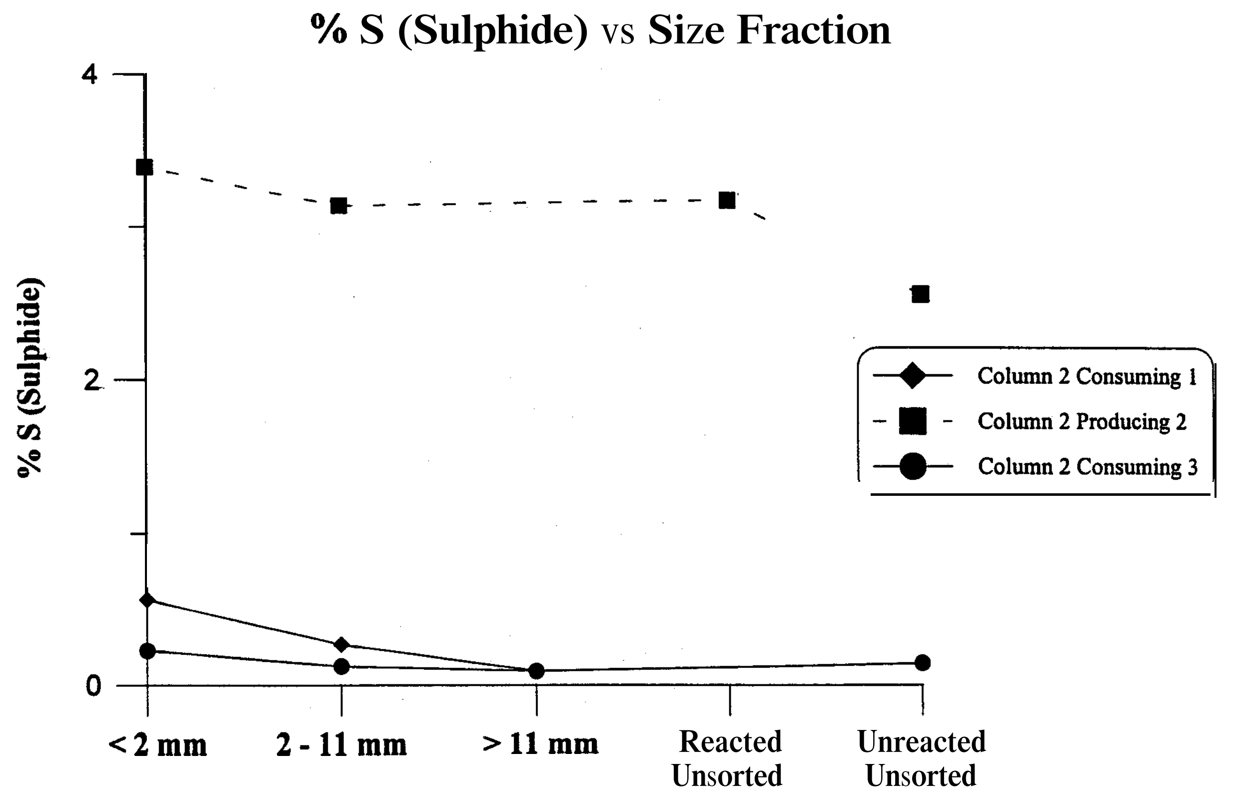
A3.1. Column 2

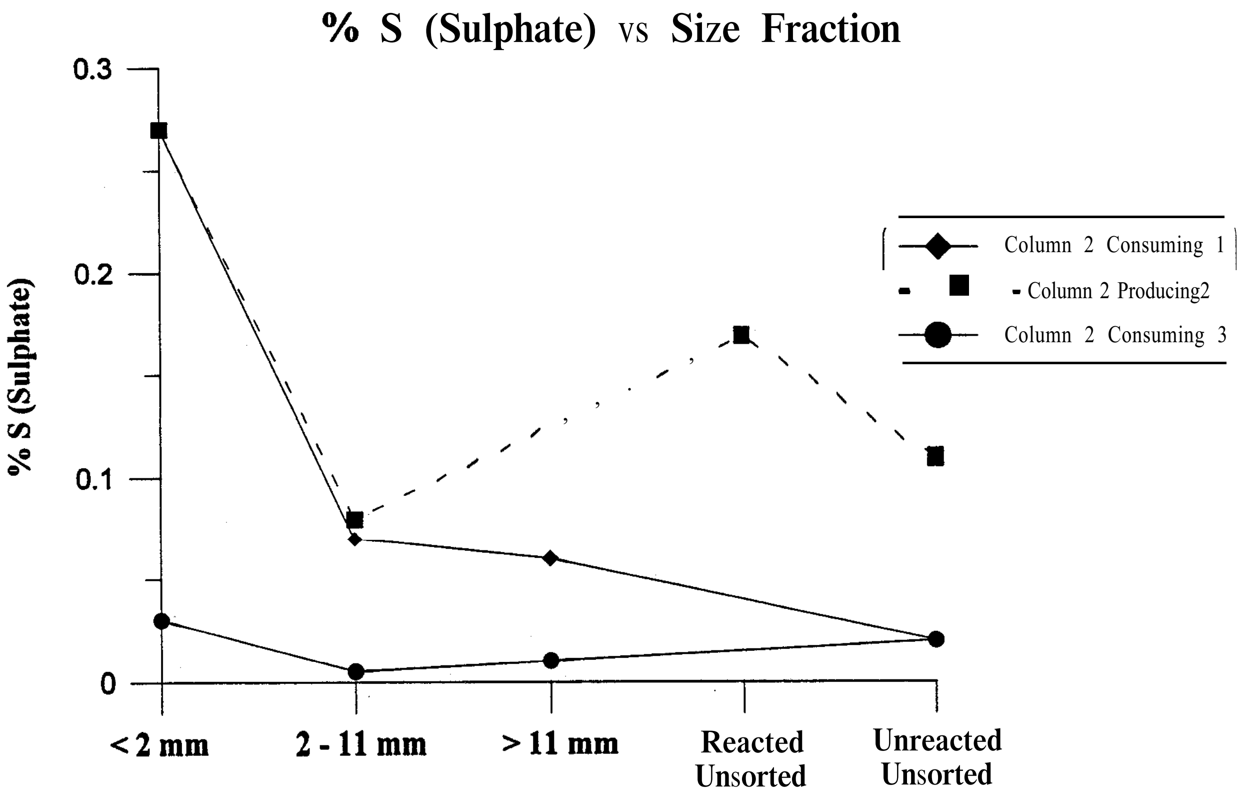


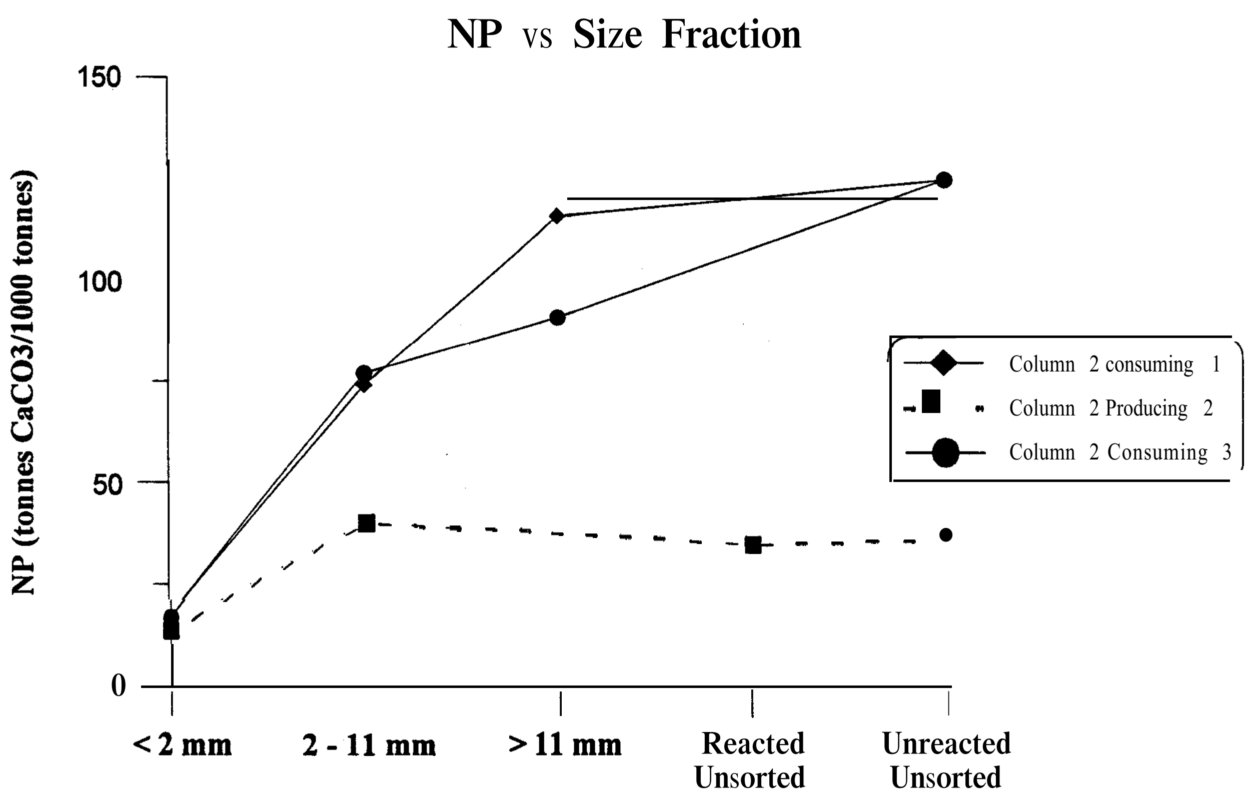
Paste pH vs Size Fraction
Paste pH
12
8
4
0
< 2 mm
2 - 11 mm
> 11 mm
Reacted unsorted
Unreacted Unsorted
Column 2 Consuming 1
Column 2 Producing 2
Column 2 Consuming 3

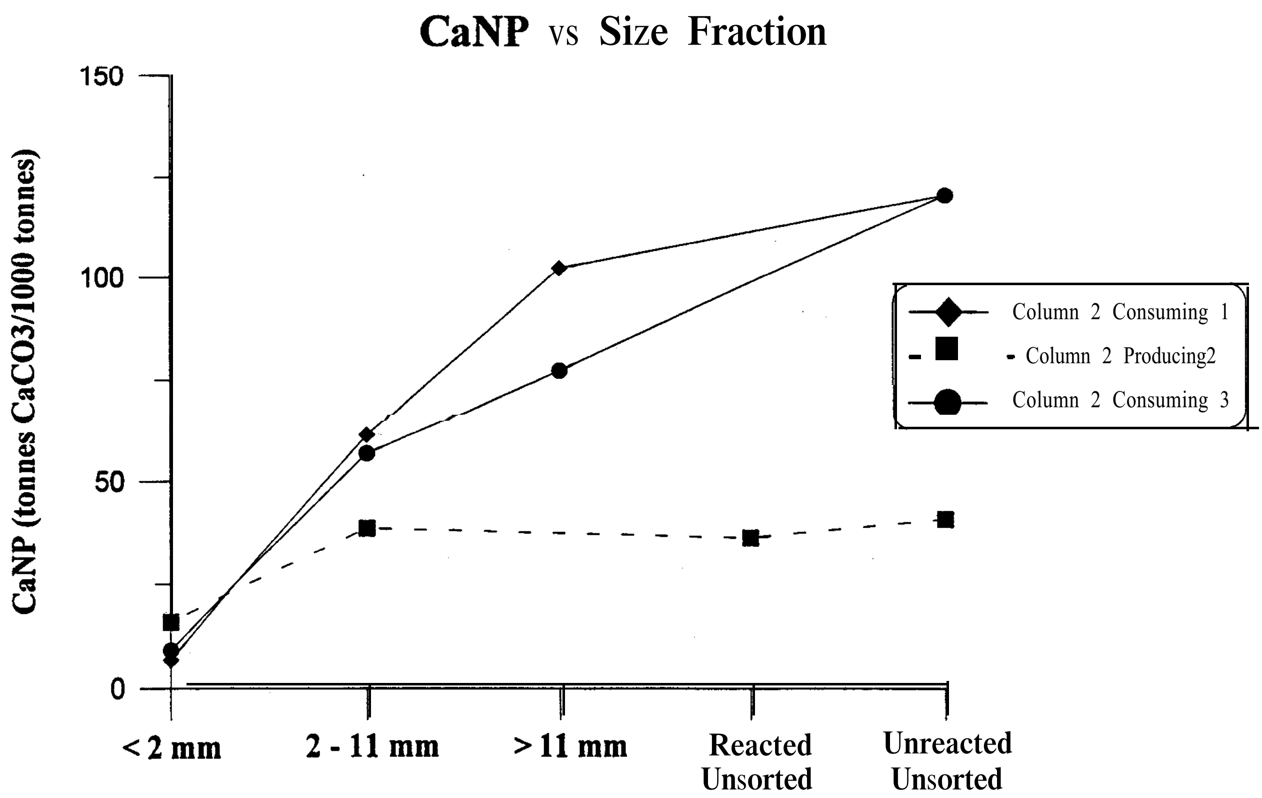


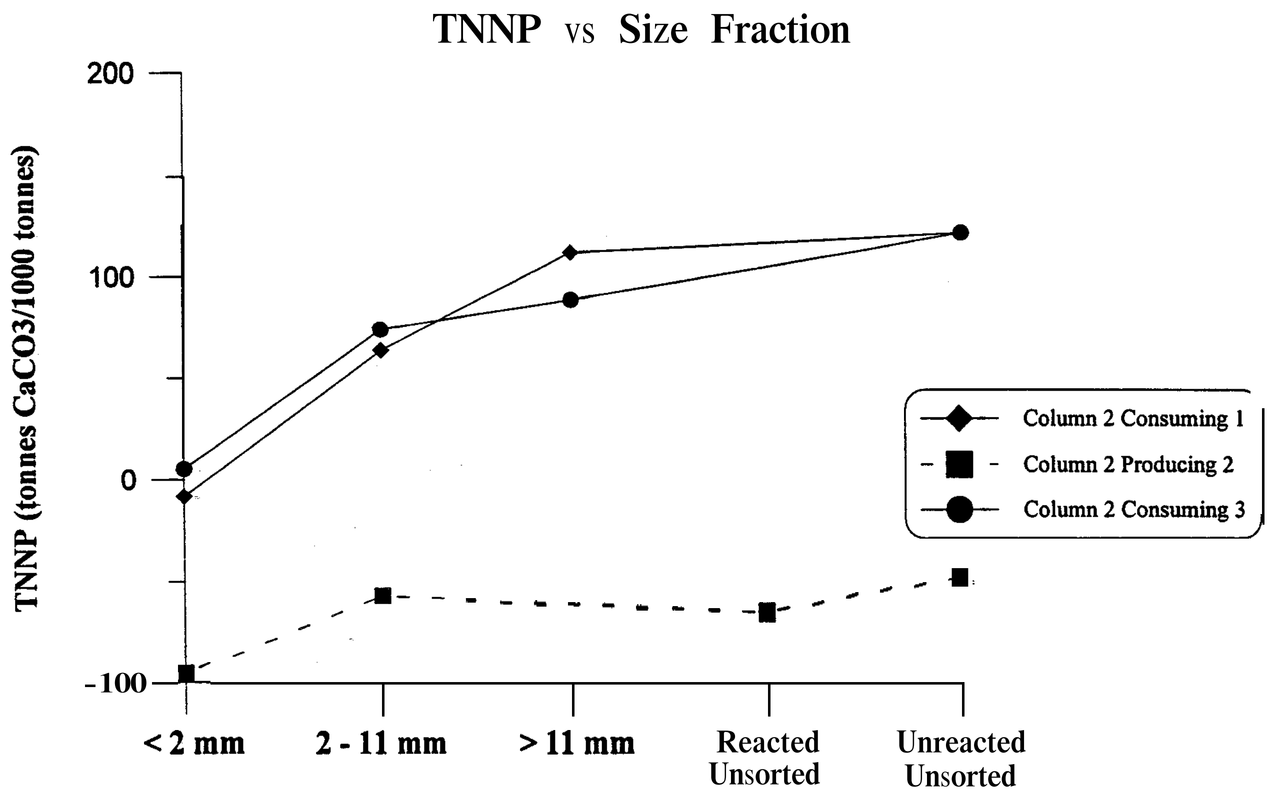
% S (Total) vs Size Fraction
% S (Total)
4
2
0
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 2 Consuming 1
Column 2 Producing 2
Column 2 Consuming 3


% S (Sulphide) vs Size Fraction
4
2
0
% S (Sulphide)
Column 2 Consuming 1
Column 2 Producing 2
Column 2 Consuming 3
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

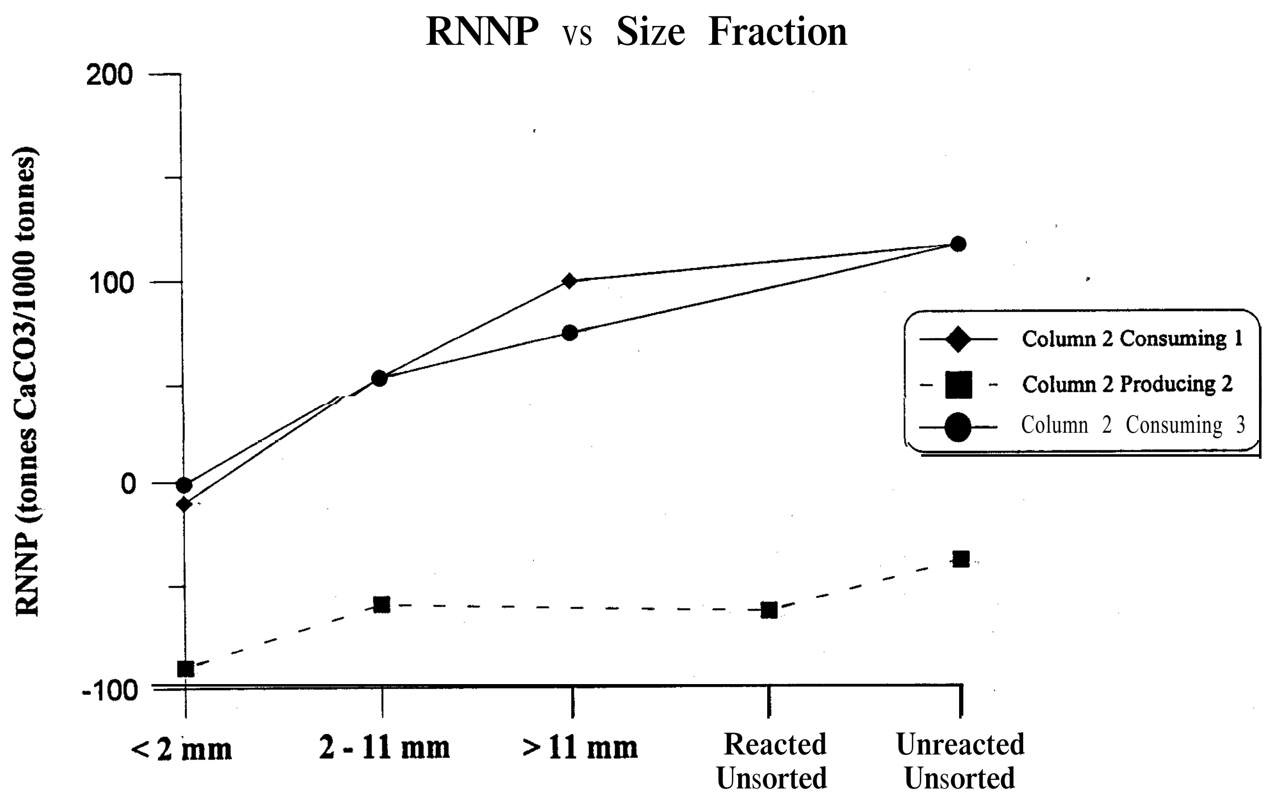

% S (Sulphate) vs Size Fraction
0.3
0.2
0.1
0
% S (Sulphate)
Column 2 Consuming 1
Column 2 Producing2
Column 2 Consuming 3
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted


NP vs Size Fraction
150
100
50
0
NP (tonnes CaCO3/1000 tonnes)
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 2 consuming 1
Column 2 Producing 2
Column 2 Consuming 3

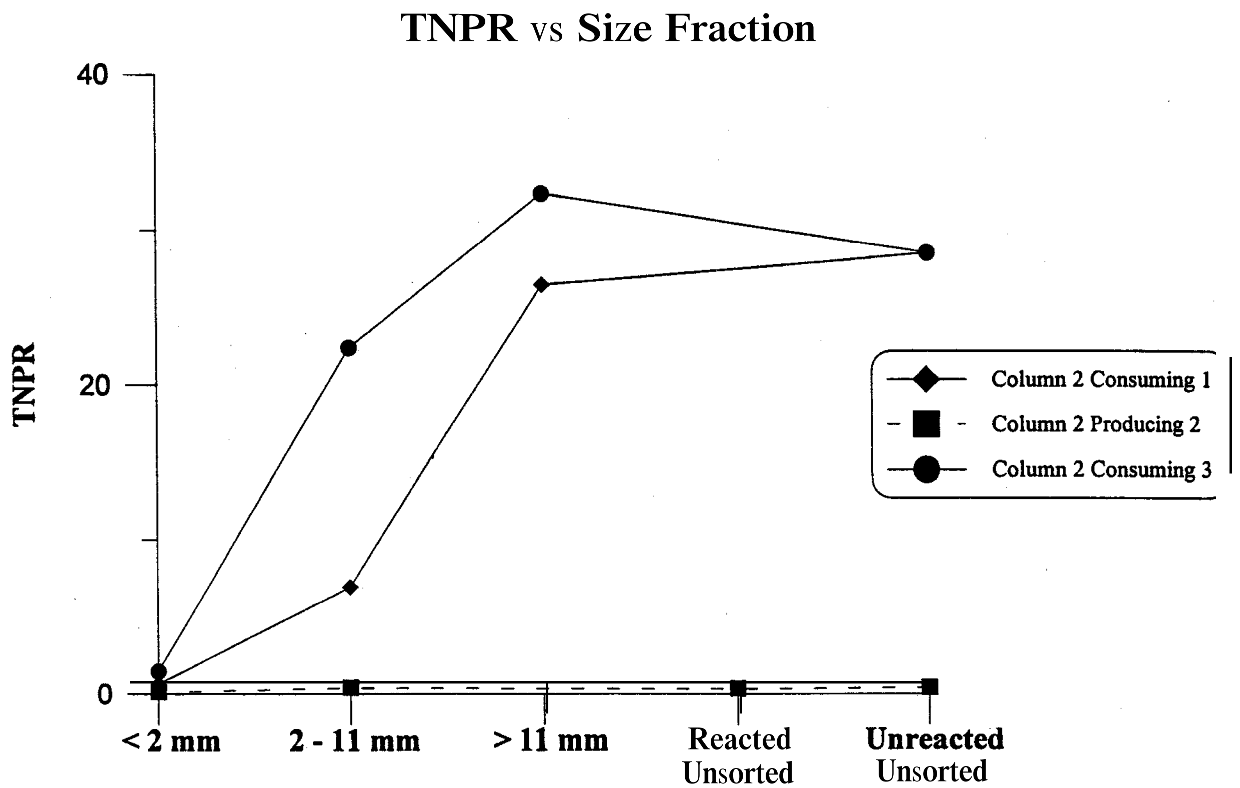

CaNP vs Size Fraction
150
100
50
0
CaNP (tonnes CaCO3/1000 tonnes)
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 2 Consuming 1
Column 2 Producing2
Column 2 Consuming 3

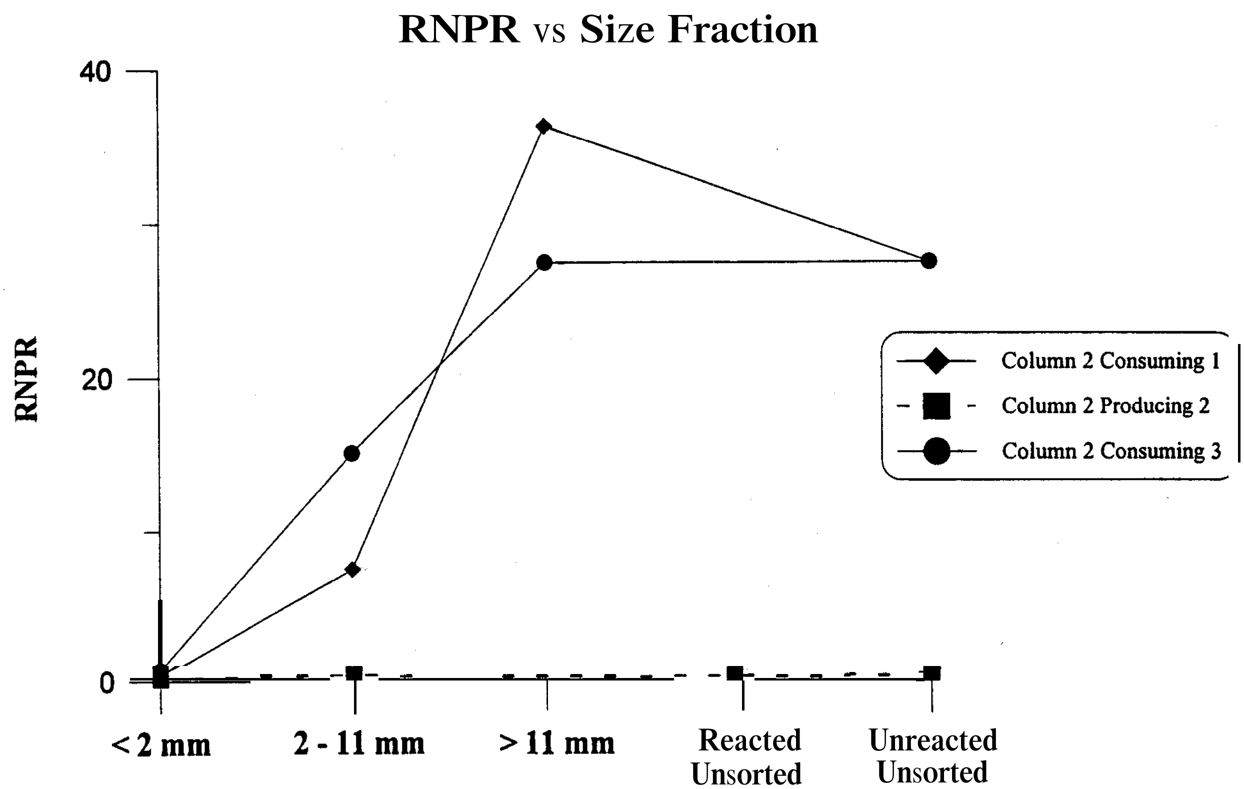


TNNP vs Size Fraction
TNNP (tonnes CaCO3/1000 tonnes)
200
100
0
-100
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 2 Consuming 1
Column 2 Producing 2
Column 2 Consuming 3

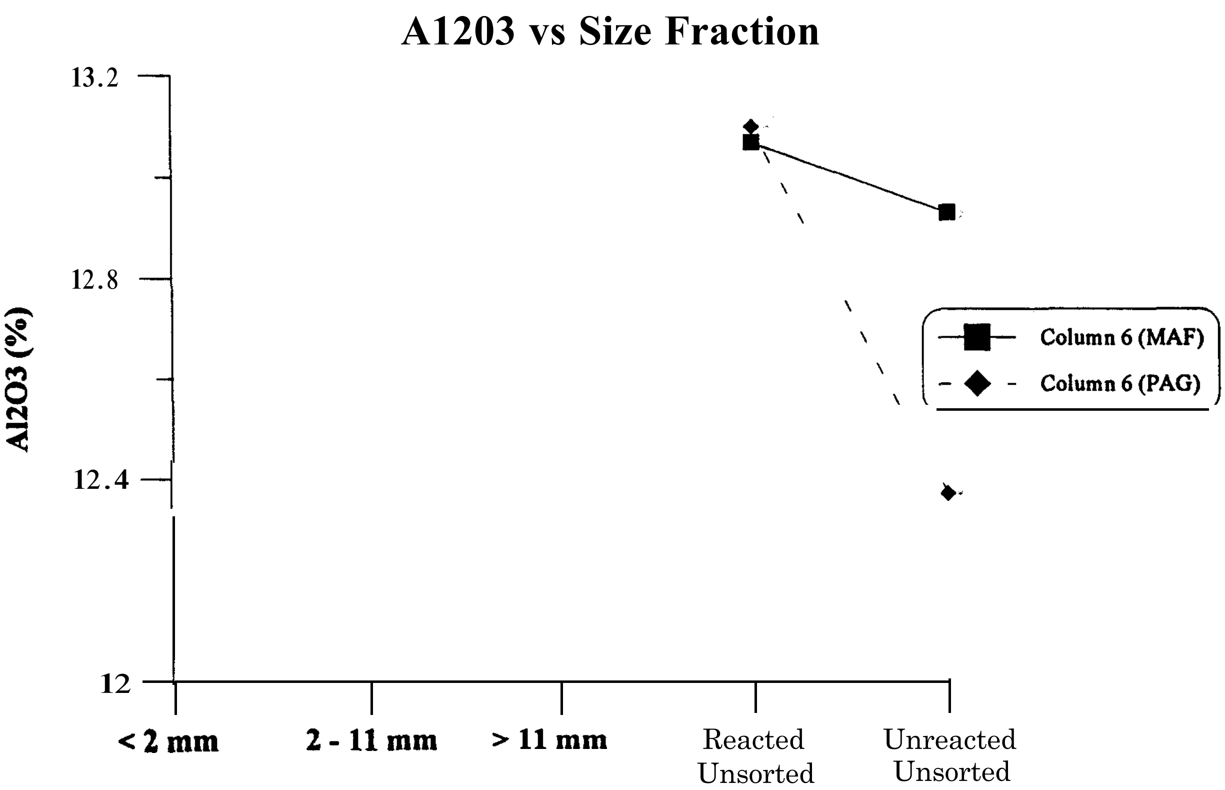


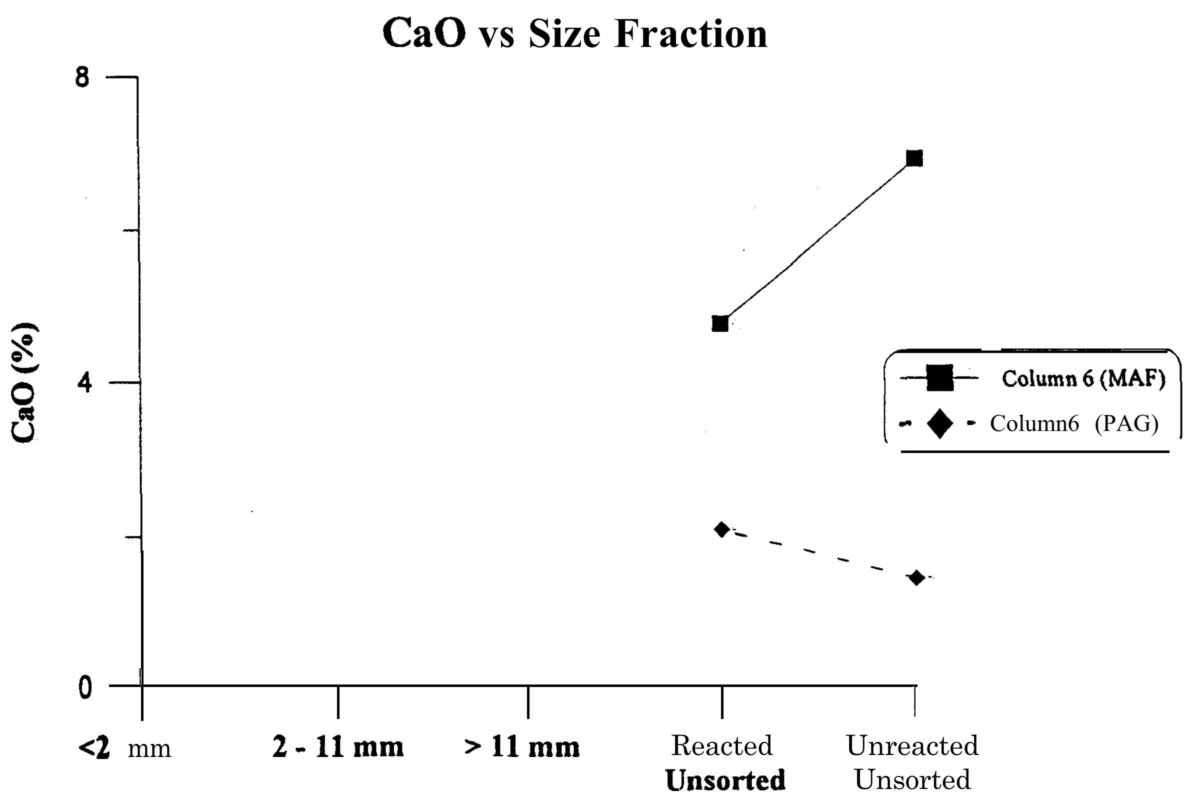
RNNP vs Size Fraction
RNNP (tonnes CaCO3/1000 tonnes)
200
100
0
-100
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 2 Consuming 1
Column 2 Producing 2
Column 2 Consuming 3

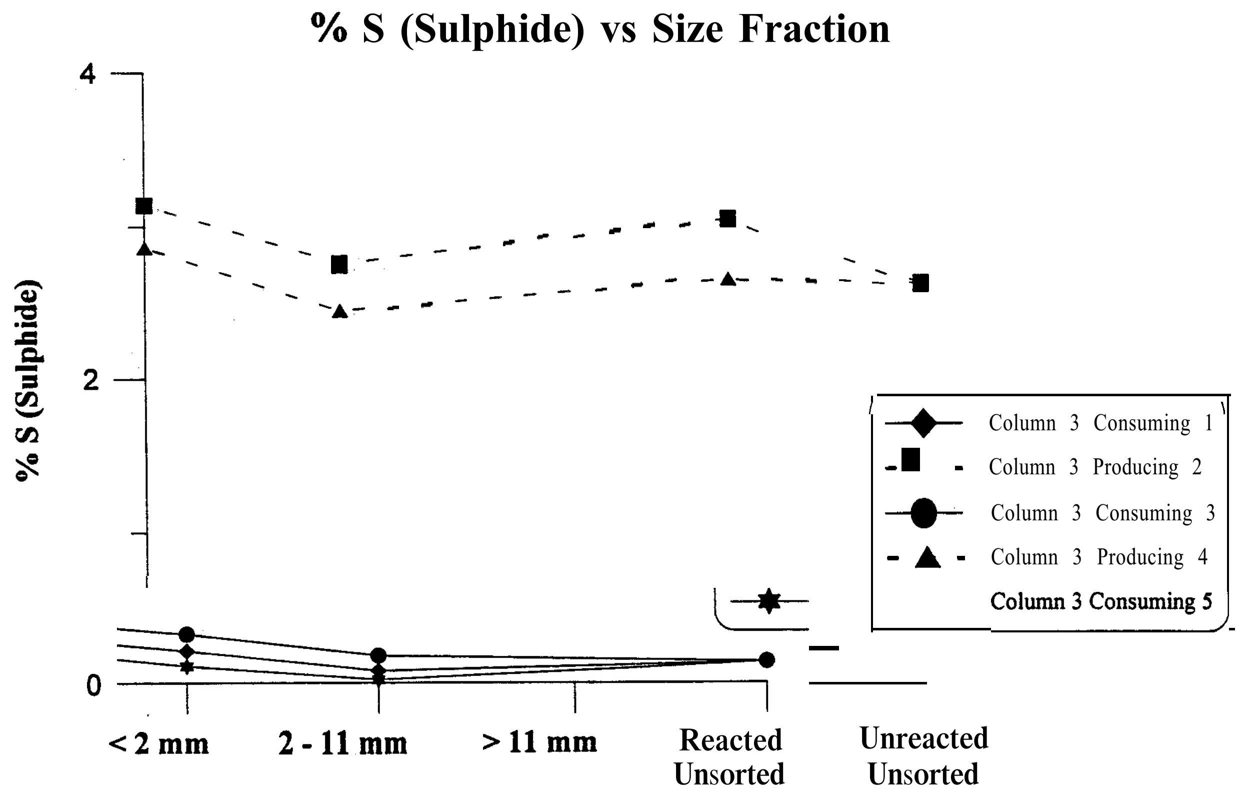

TNPR vs Size Fraction
40
20
0
TNPR
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 2 Consuming 1
Column 2 Producing 2
Column 2 Consuming 3


RNPR vs Size Fraction
40
20
0
RNPR
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 2 Consuming 1
Column 2 Producing 2
Column 2 Consuming 3

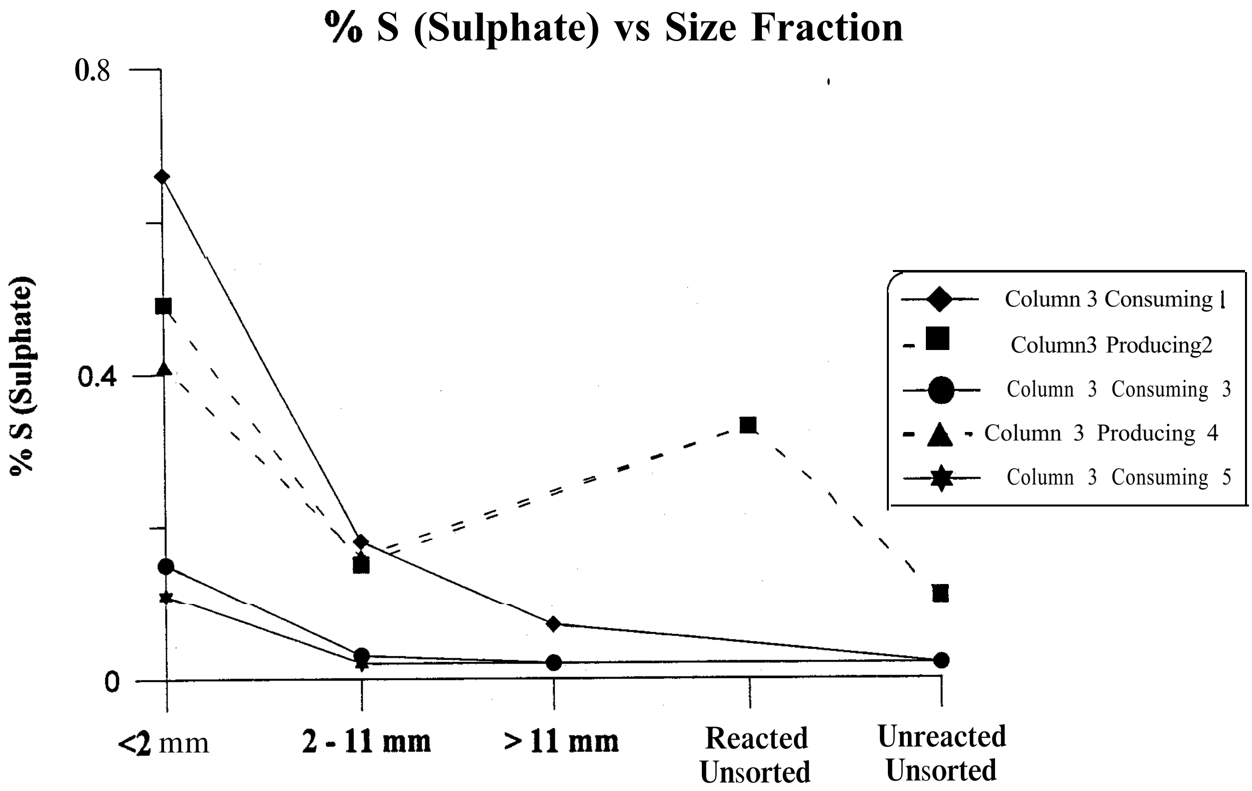
A3.2. Column 3


A1203 vs Size Fraction
13.2
12.8
12.4
12
Al2O3 (%)
Column 6 (MAF)
Column 6 (PAG)
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

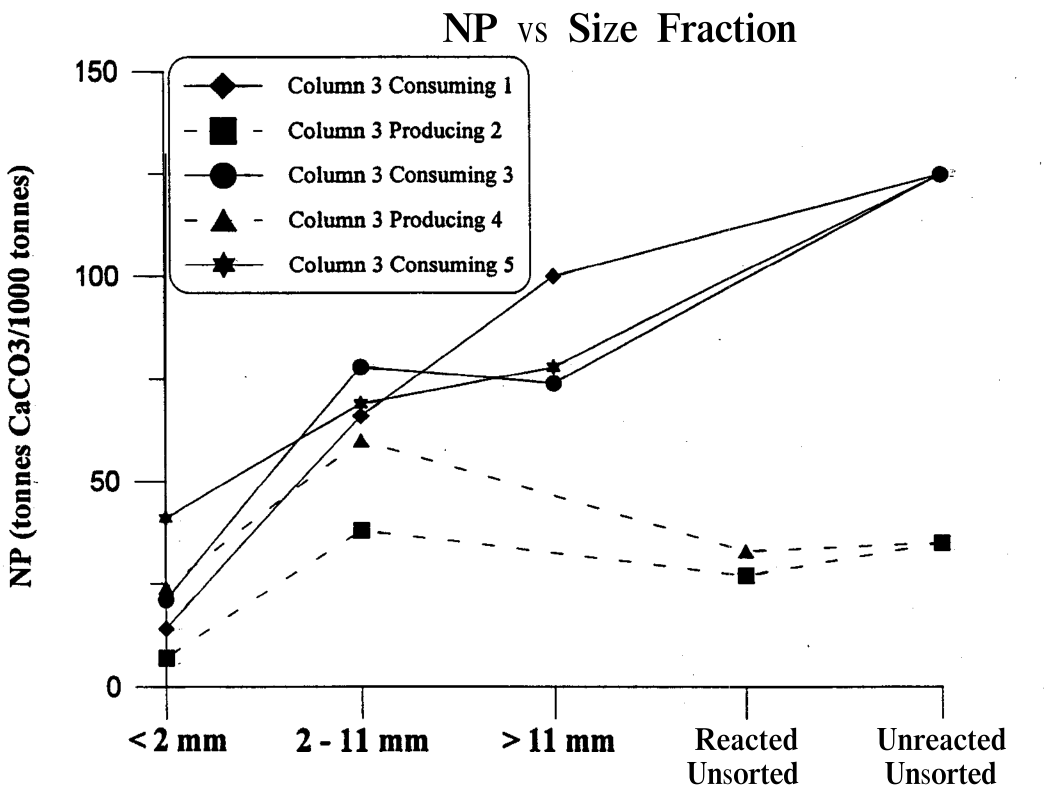

CaO vs Size Fraction
8
4
0
CaO (%)
Column 6 (MAF)
Column6 (PAG)
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

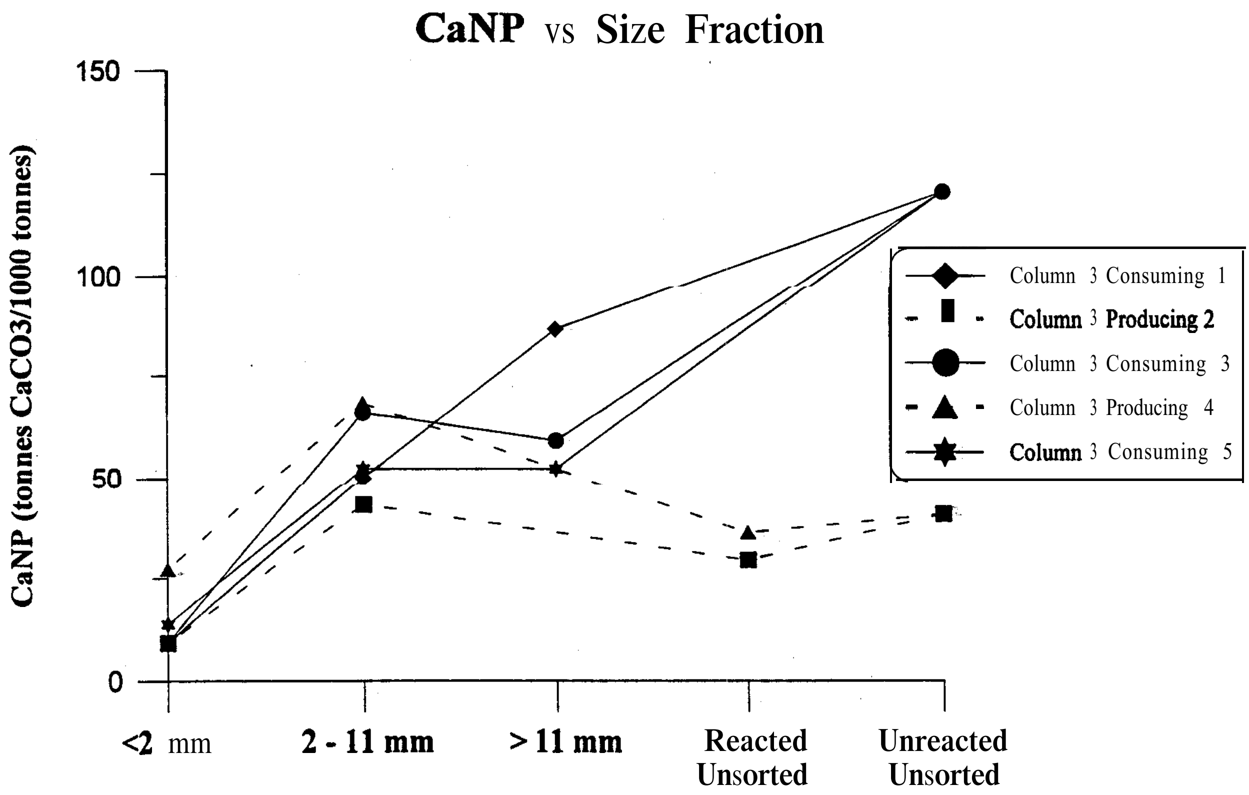


% S (Sulphide) vs Size Fraction
4
2
0
% S (Sulphide)
Column 3 Consuming 1
Column 3 Producing 2
Column 3 Consuming 3
Column 3 Producing 4
Column 3 Consuming 5
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

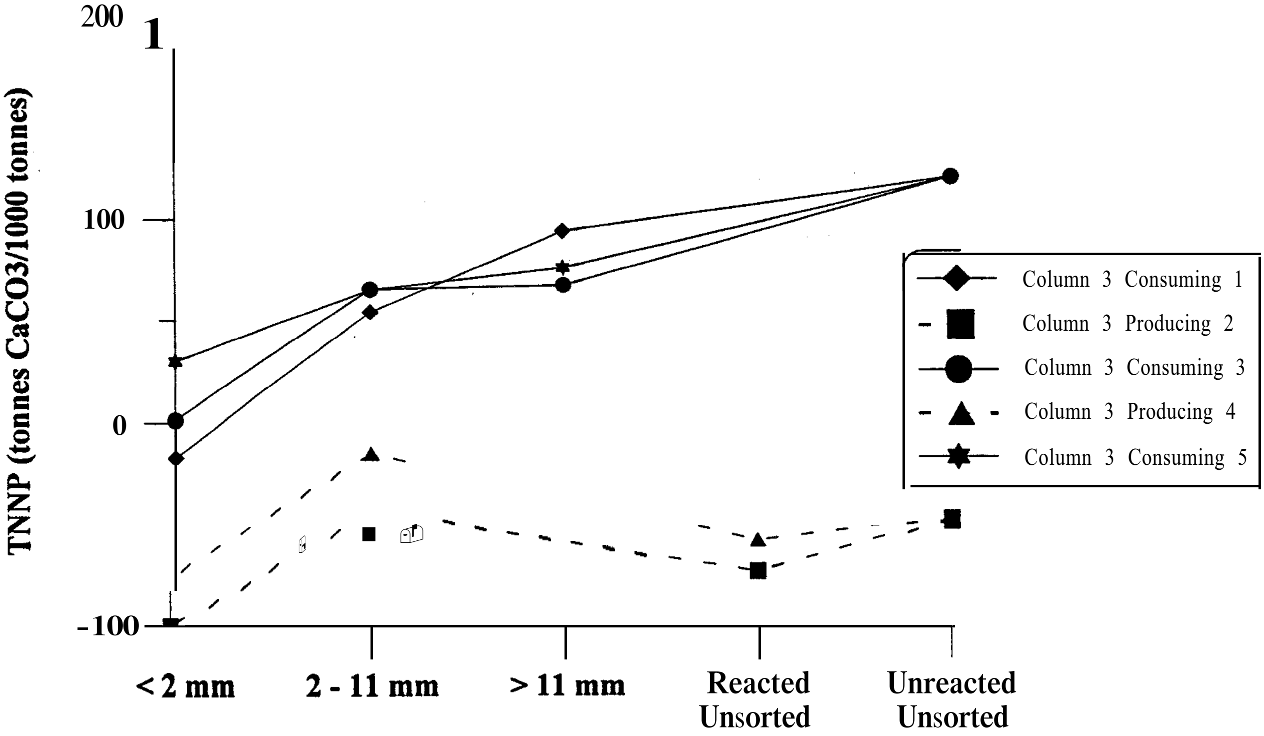


% S (Sulphate) vs Size Fraction
0.8
0.4
0
% S (Sulphate)
Column 3 Consuming 1
Column3 Producing2
Column 3 Consuming 3
Column 3 Producing 4
Column 3 Consuming 5
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

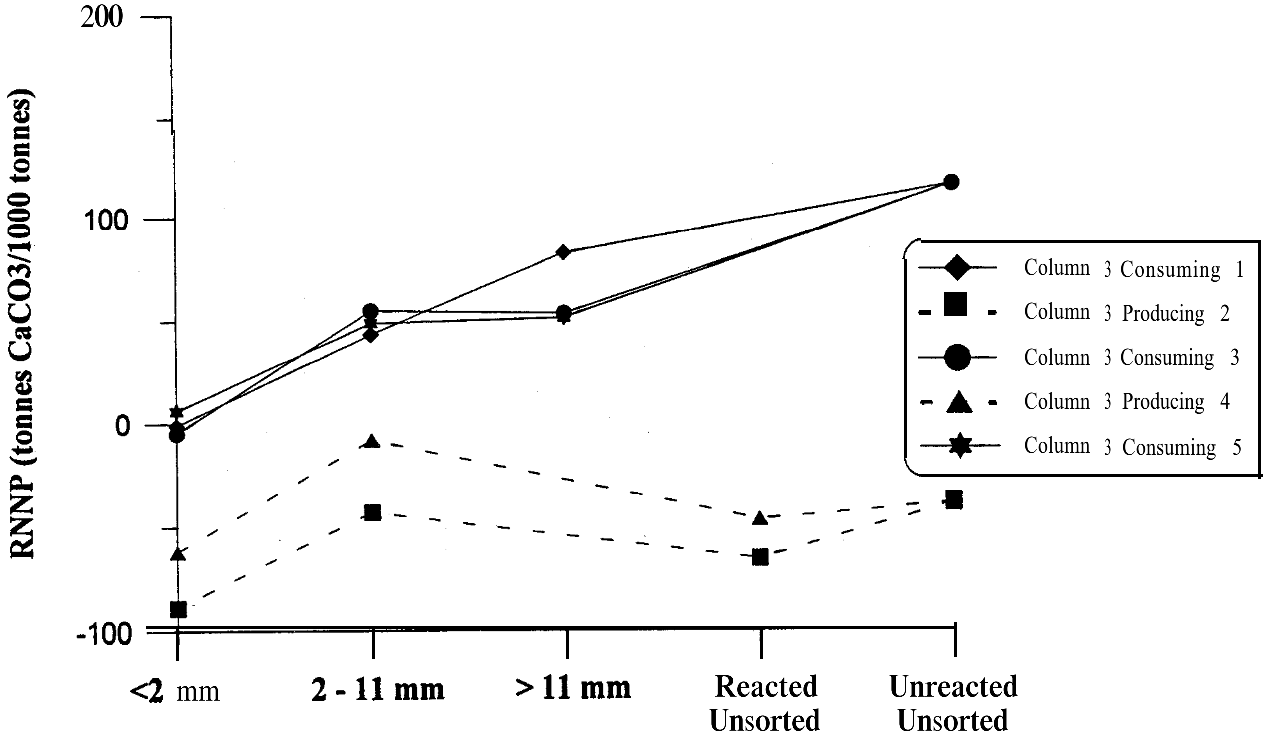

NP vs Size Fraction
150
100
50
0
NP (tonnes CaCO3/1000 tonnes)
Column 3 Consuming 1
Column 3 Producing 2
Column 3 Consuming 3
Column 3 Producing 4
Column 3 Consuming 5
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

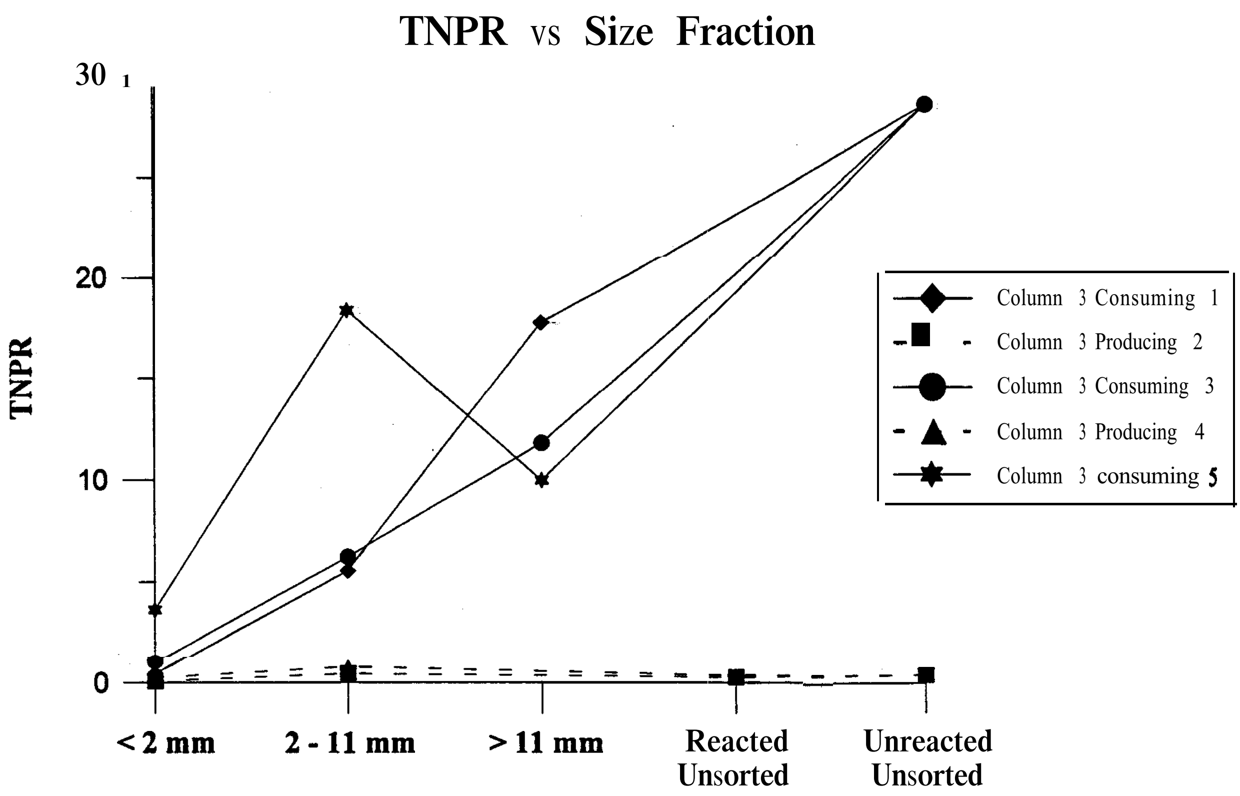

CaNP vs Size Fraction
150
100
50
0
CaNP (tonnes CaCO3/1000 tonnes)
Column 3 Consuming 1
Column 3 Producing 2
Column 3 Consuming 3
Column 3 Producing 4
Column 3 Consuming 5
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

TNNP vs Size Fraction

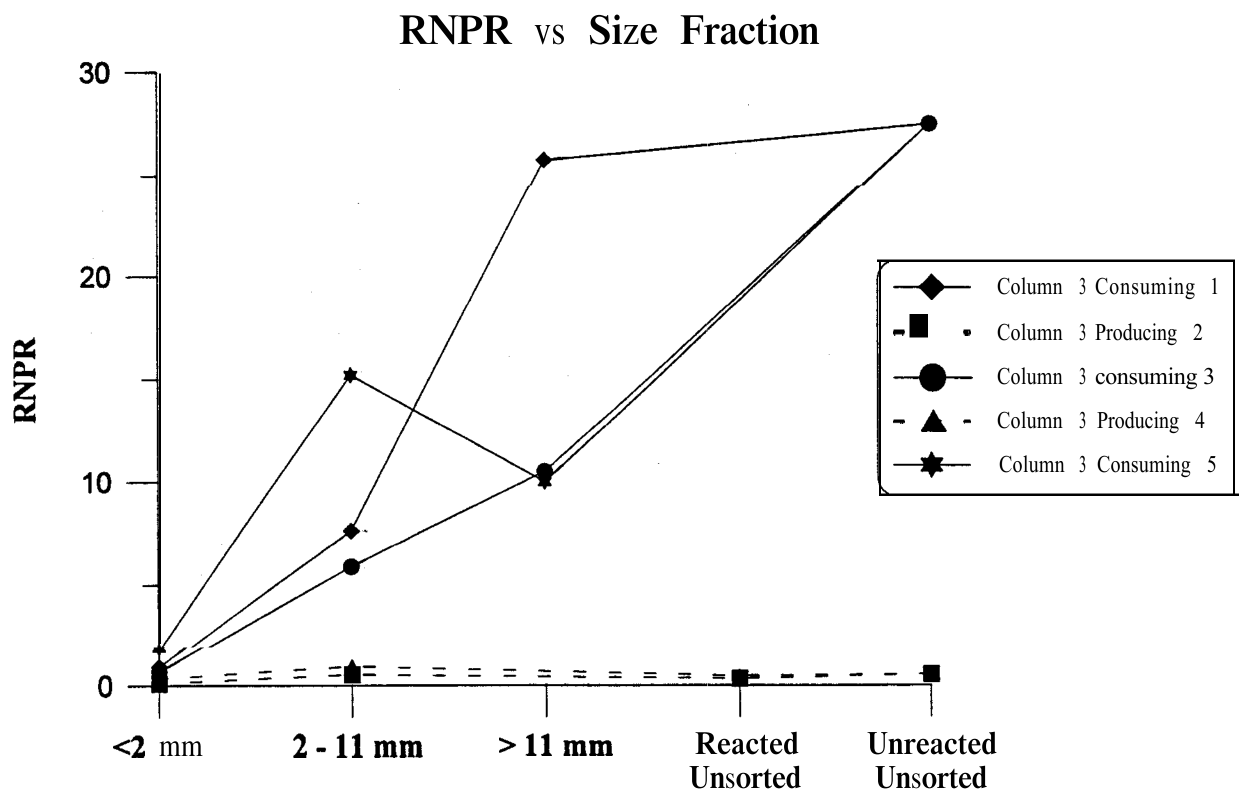


RNNP vs Size Fraction





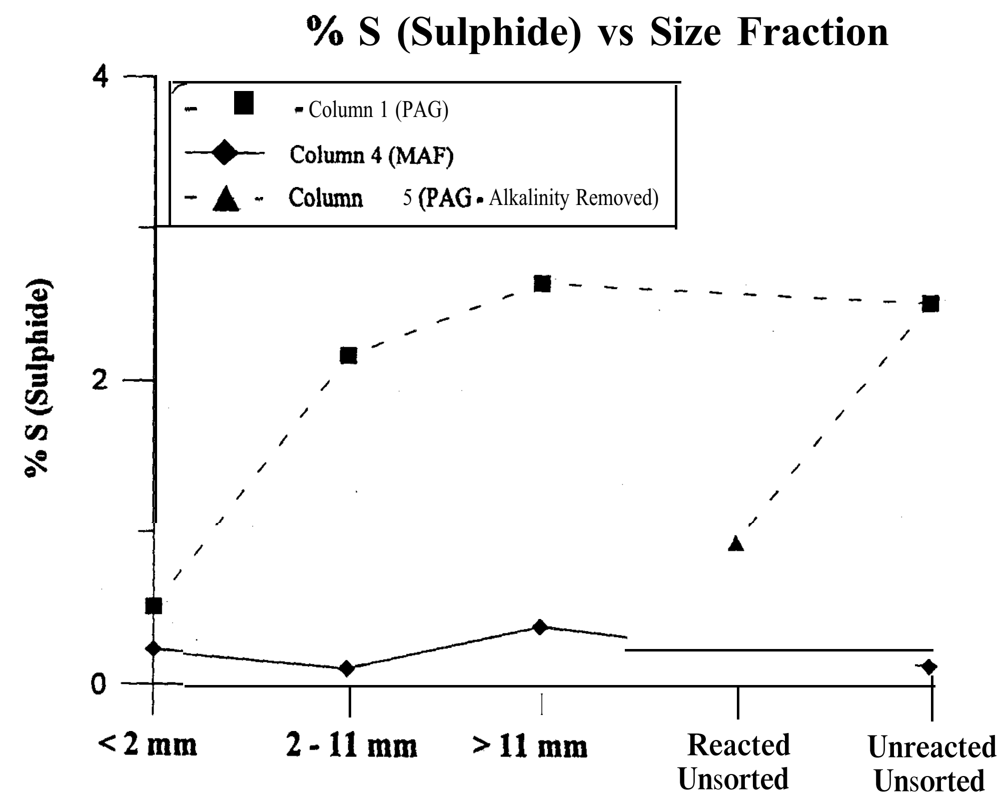
TNPR vs Size Fraction
30
20
10
0
TNPR
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 3 Consuming 1
Column 3 Producing 2
Column 3 Consuming 3
Column 3 Producing 4
Column 3 consuming 5

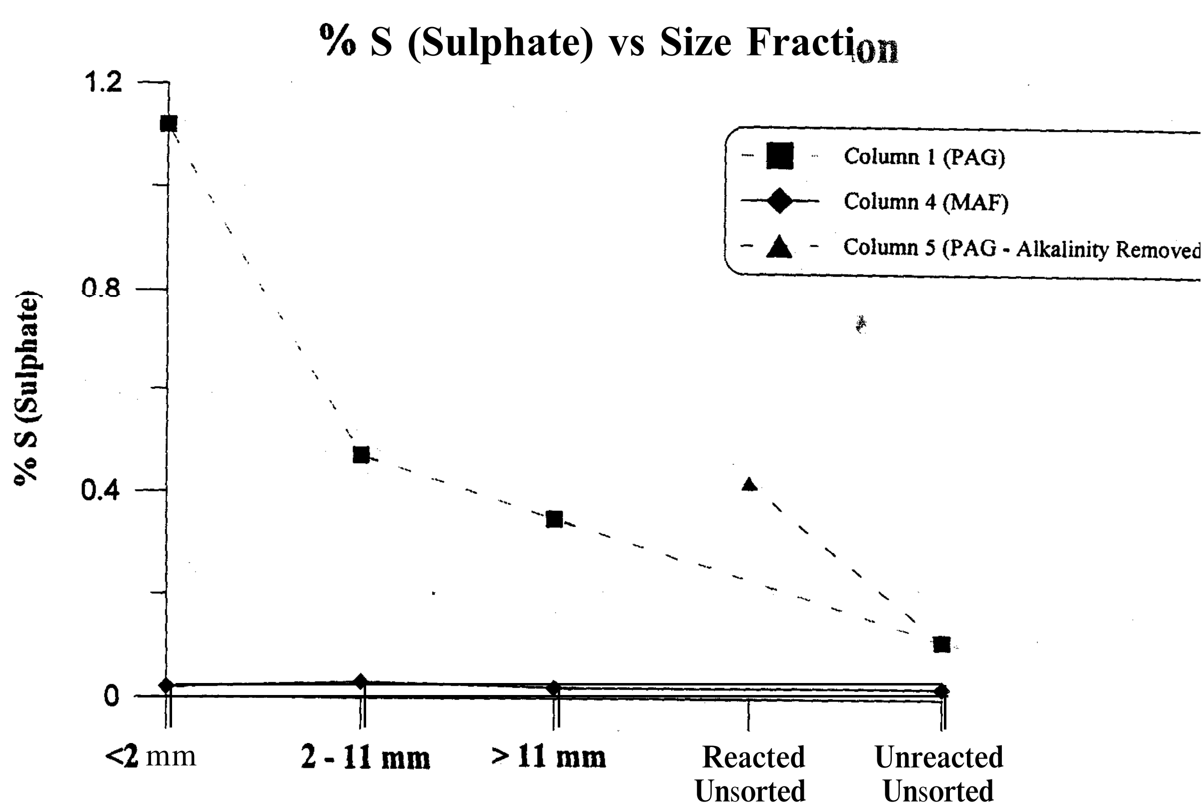


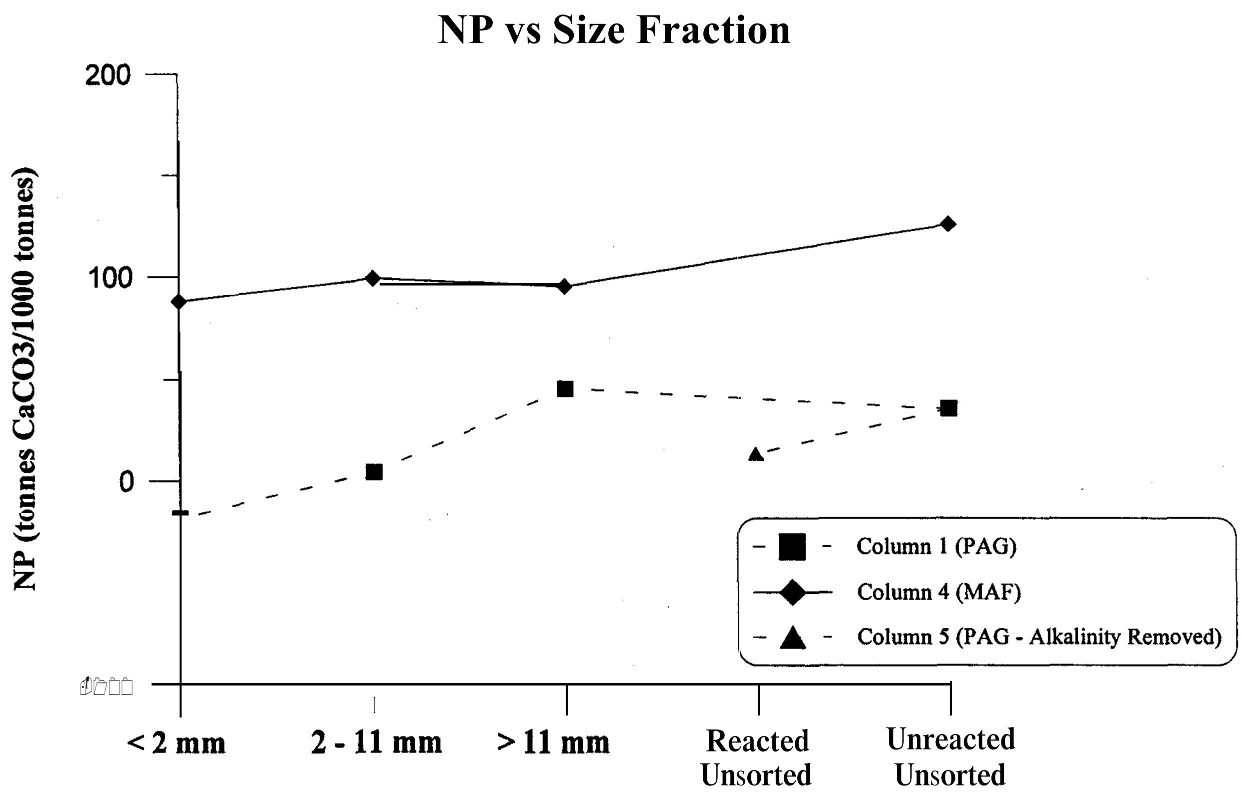
RNPR vs Size Fraction
30
20
10
0
RNPR
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 3 Consuming 1
Column 3 Producing 2
Column 3 consuming 3
Column 3 Producing 4
Column 3 Consuming 5

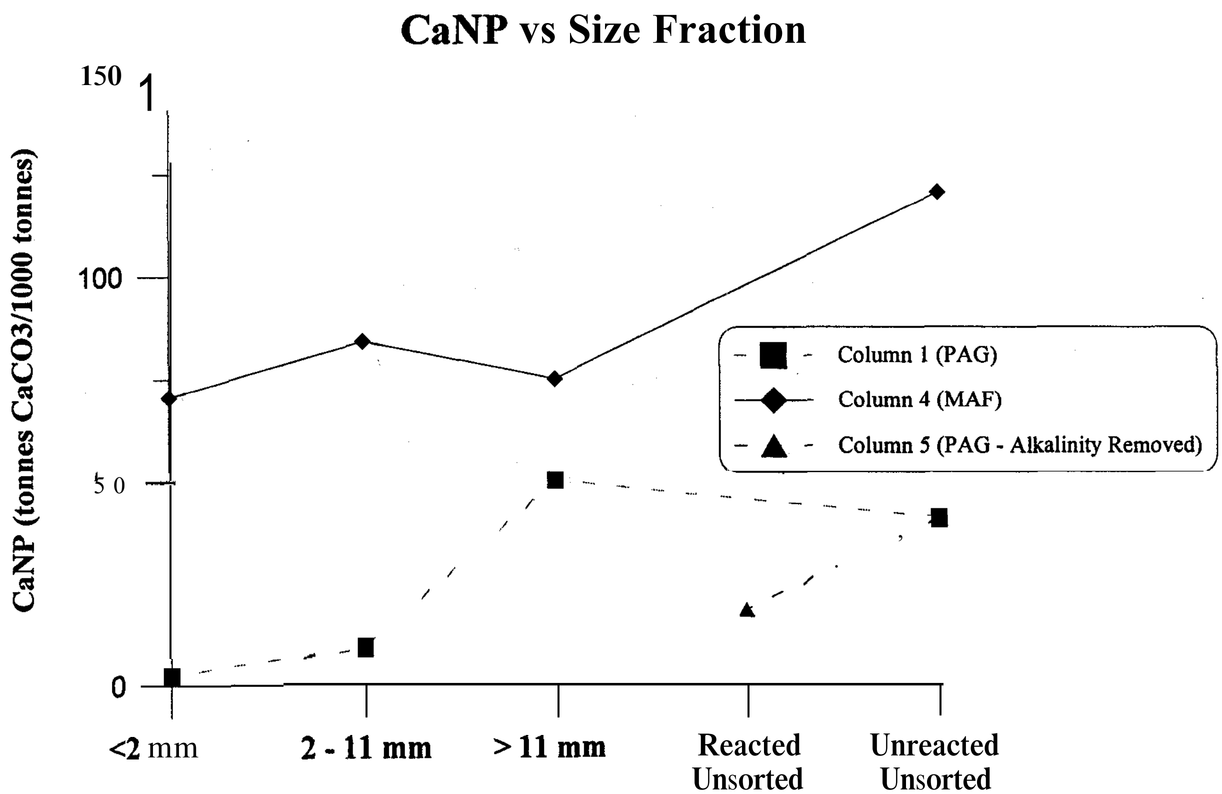
A3.3. Columns 1, 4, and 5

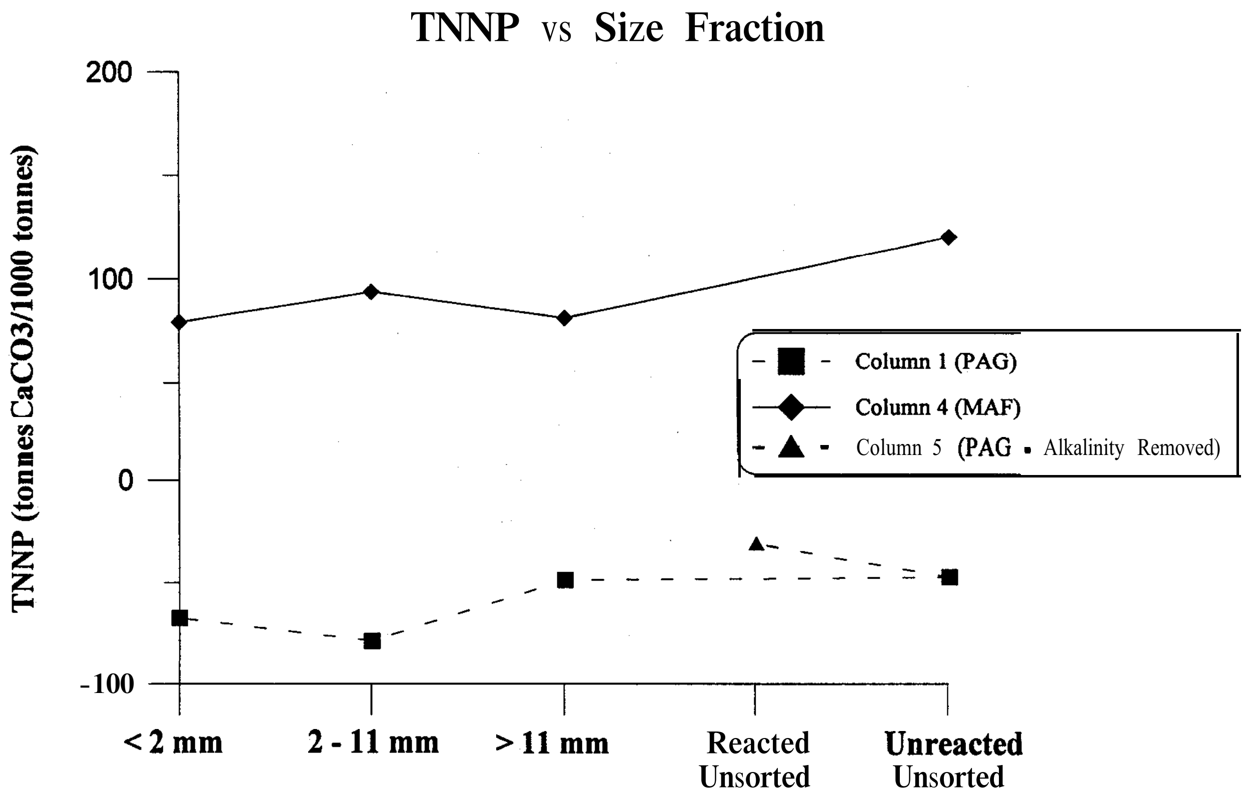
A5.1. Column 2


% S (Sulphide) vs Size Fraction
4
2
0
% S (Sulphide)
Column 1 (PAG)
Column 4 (MAF)
Column 5 (PAG - Alkalinity Removed)
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

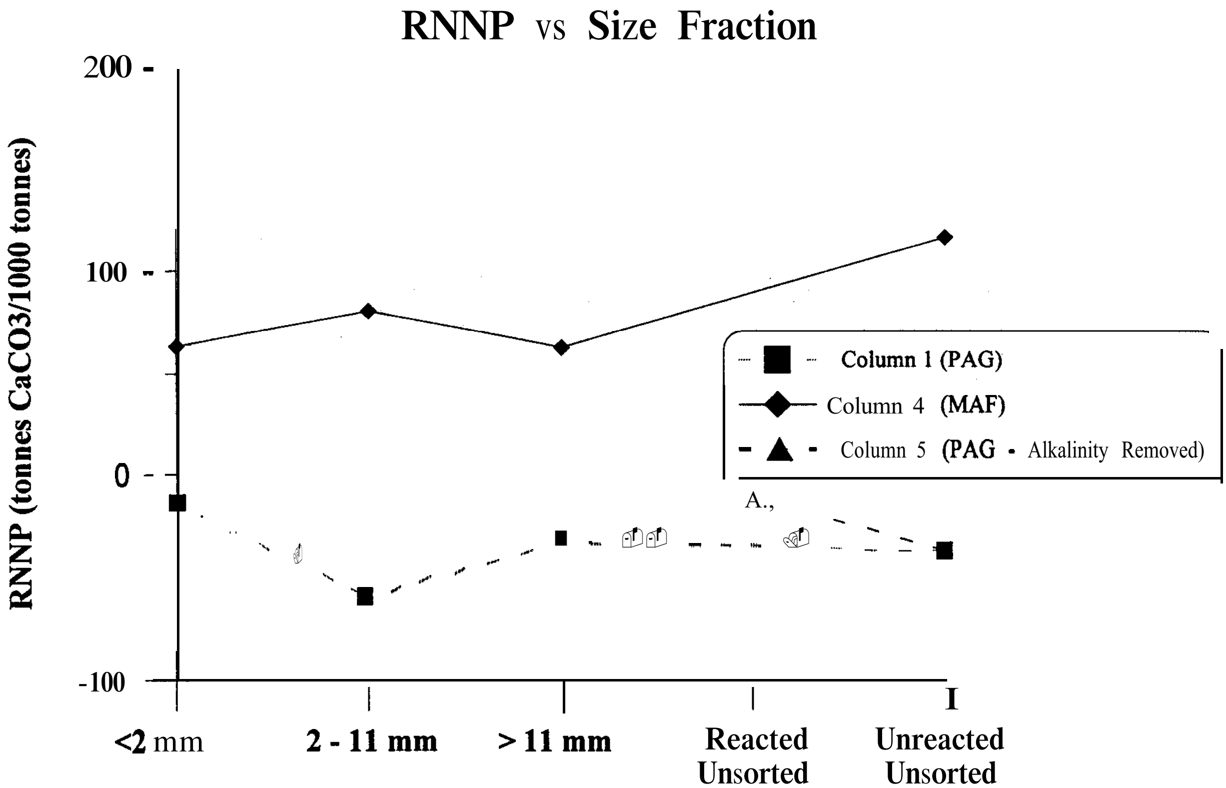

% S (Sulphate) vs Size Fraction
1.2
0.8
0.4
0
% S (Sulphate)
Column 1 (PAG)
Column 4 (MAF)
Column 5 (PAG - Alkalinity Removed
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted


NP vs Size Fraction
NP (tonnes CaCO3/1000 tonnes)
200
100
0
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 1 (PAG)
Column 4 (MAF)
Column 5 (PAG - Alkalinity Removed)

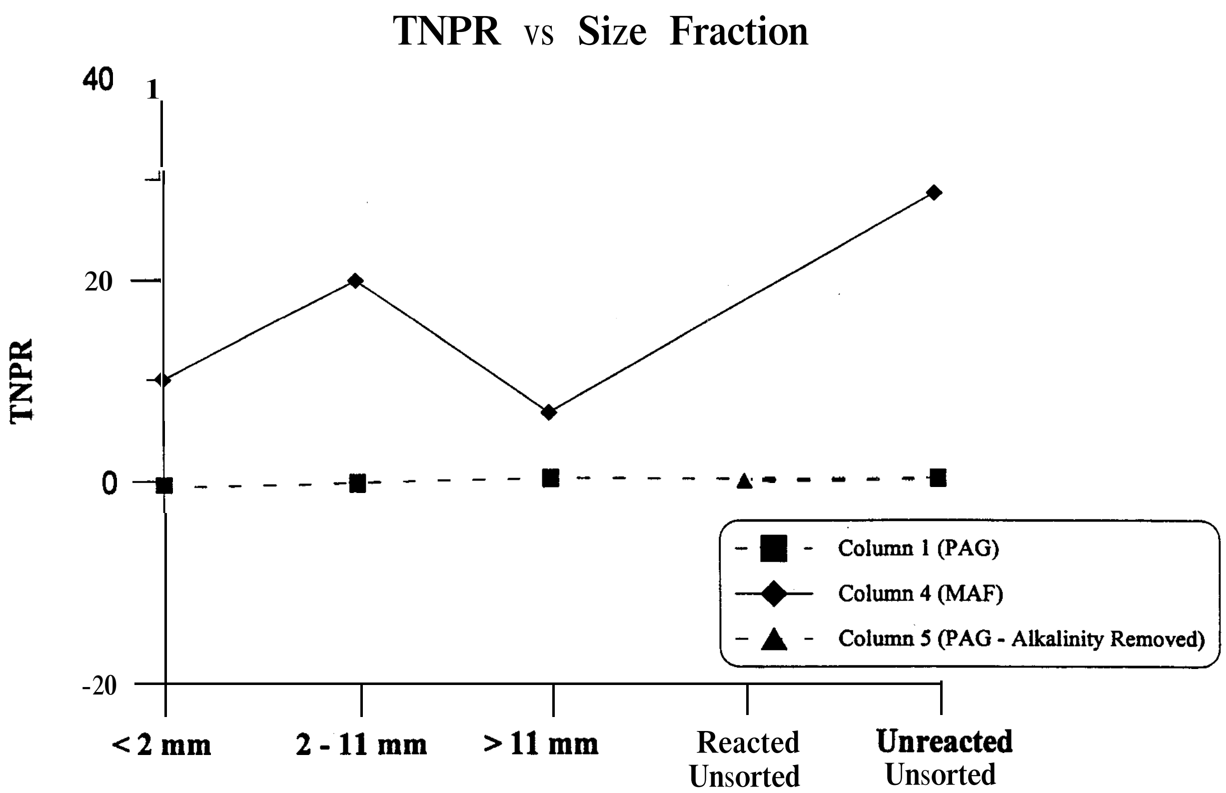

CaNP vs Size Fraction
CaNP (tonnes CaCO3/1000 tonnes)
150
100
5 0
0
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 1 (PAG)
Column 4 (MAF)
Column 5 (PAG - Alkalinity Removed)



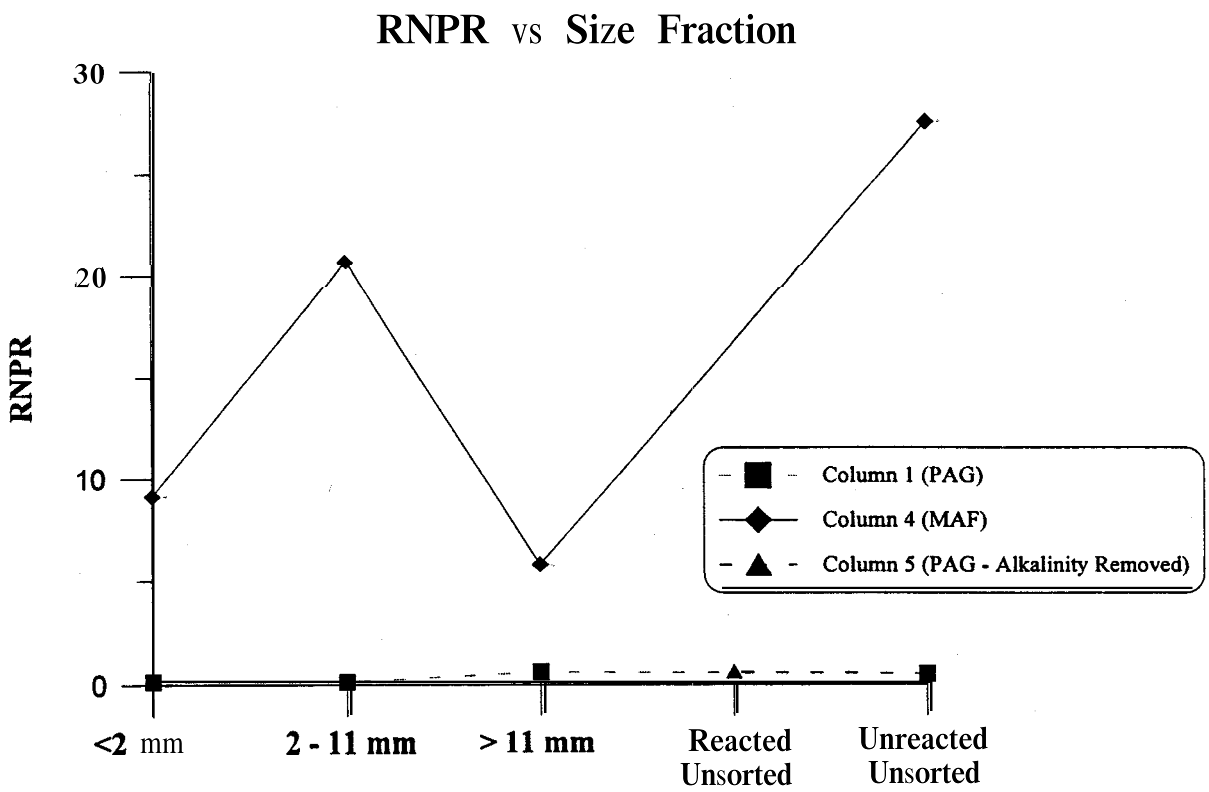
TNNP vs Size Fraction
200
100
0
-100
TNNP (tonnes CaCO3/1000 tonnes)
Column 1 (PAG)
Column 4 (MAF)
Column 5 (PAG - Alkalinity Removed)
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted



RNNP vs Size Fraction
200
100
0
-100
RNNP (tonnes CaCO3/1000 tonnes)
Column 1 (PAG)
Column 4 (MAF)
Column 5 (PAG - Alkalinity Removed)
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

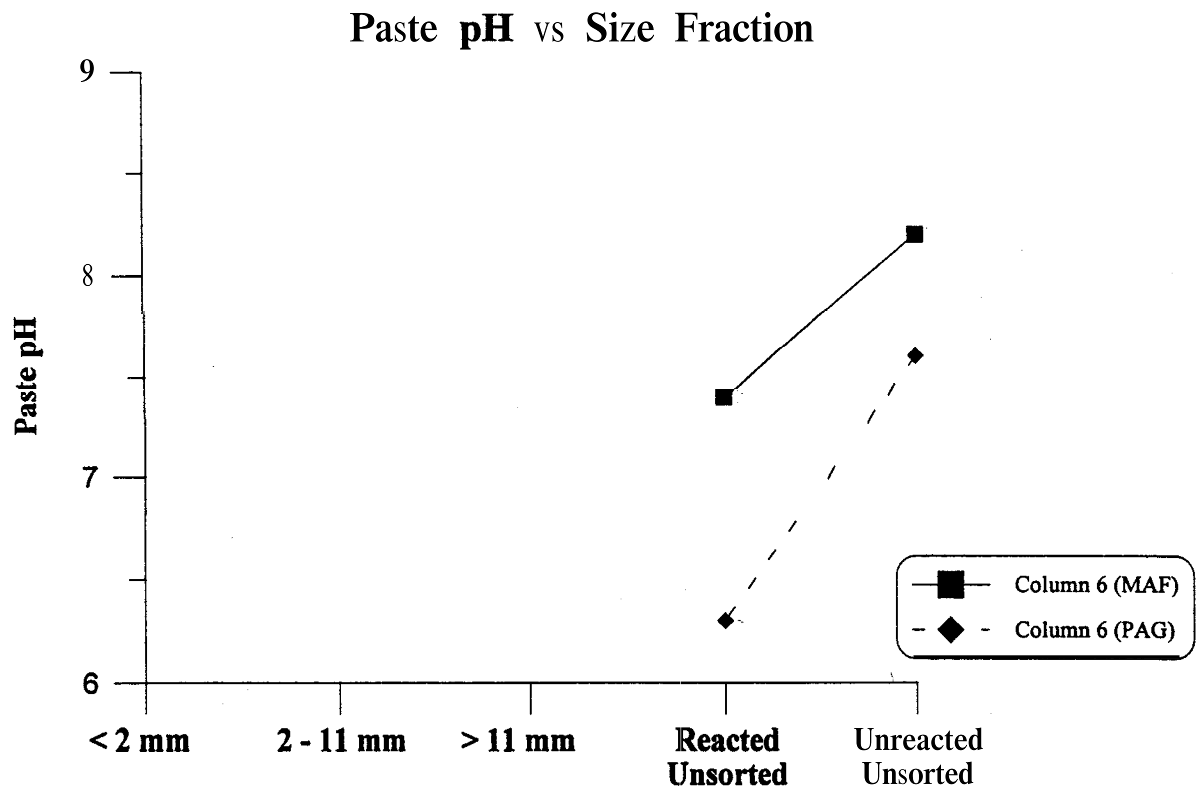


TNPR vs Size Fraction
40
20
0
-20
TNPR
Column 1 (PAG)
Column 4 (MAF)
Column 5 (PAG - Alkalinity Removed)
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

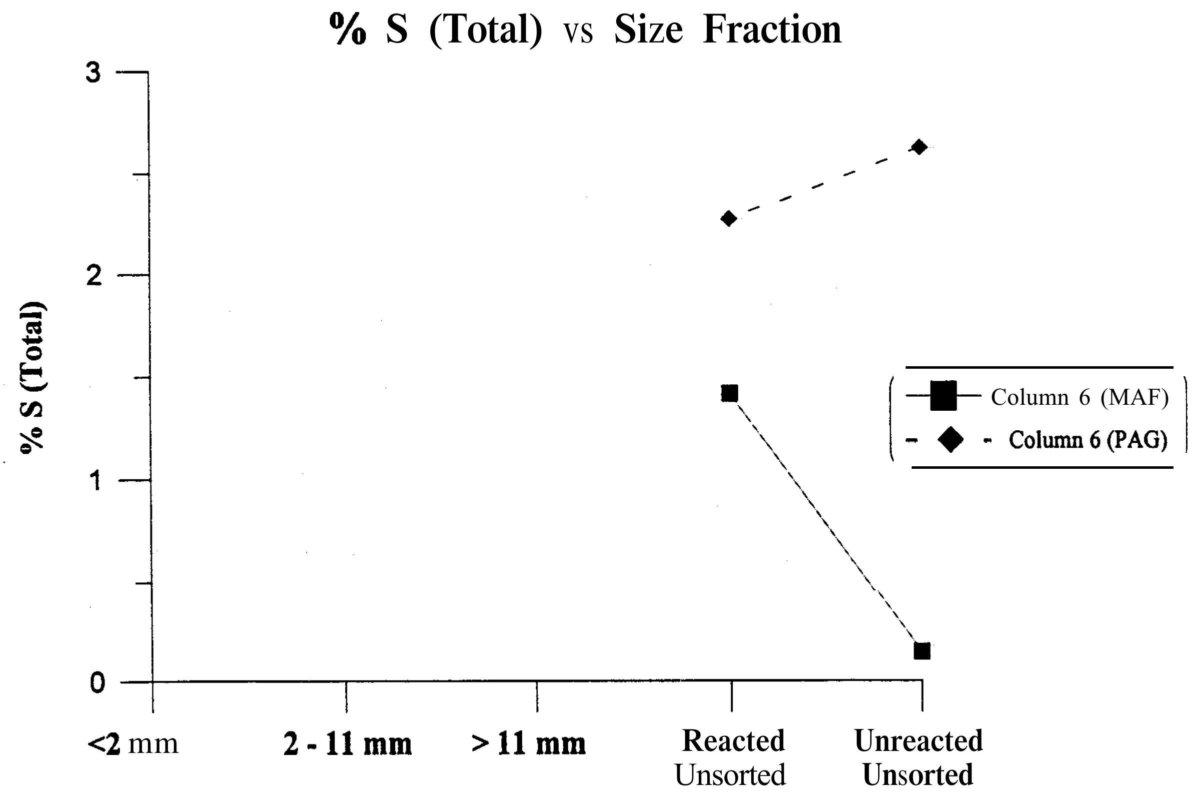


RNPR vs Size Fraction
30
20
10
0
RNPR
Column 1 (PAG)
Column 4 (MAF)
Column 5 (PAG - Alkalinity Removed)
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

A3.4. Column 6

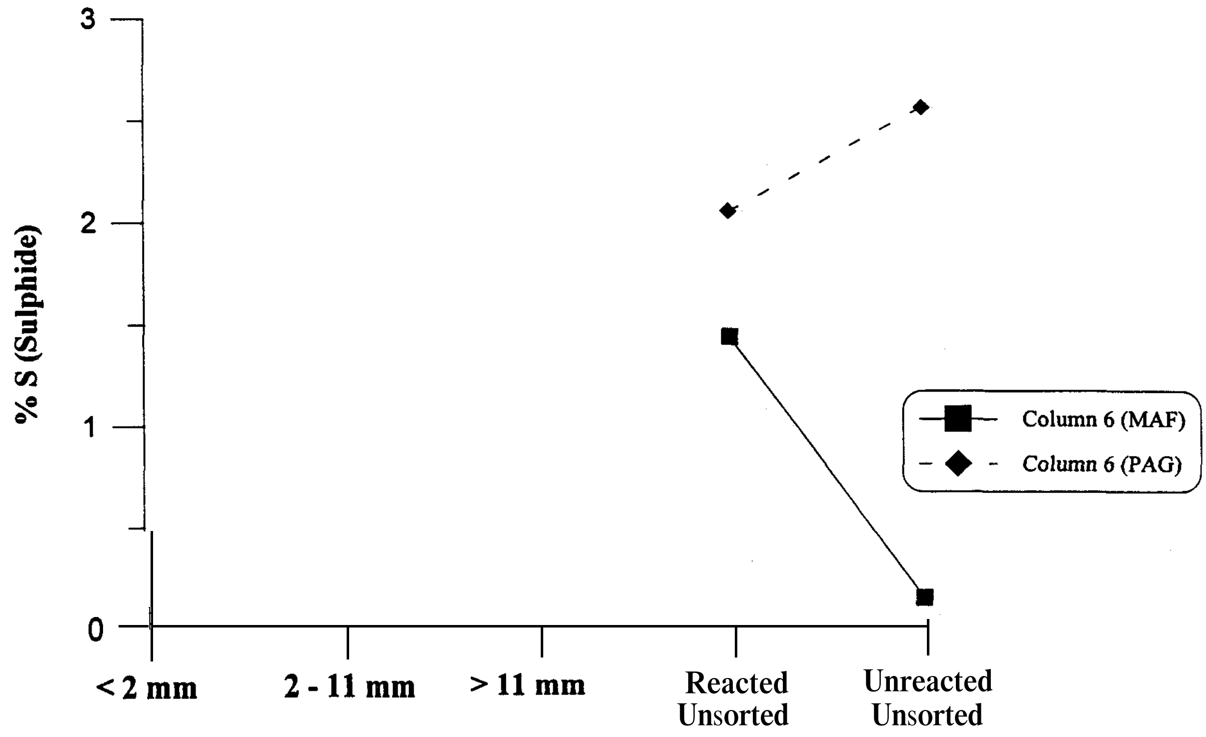


Paste pH vs Size Fraction
9
8
7
6
Paste pH
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 6 (MAF)
Column 6 (PAG)

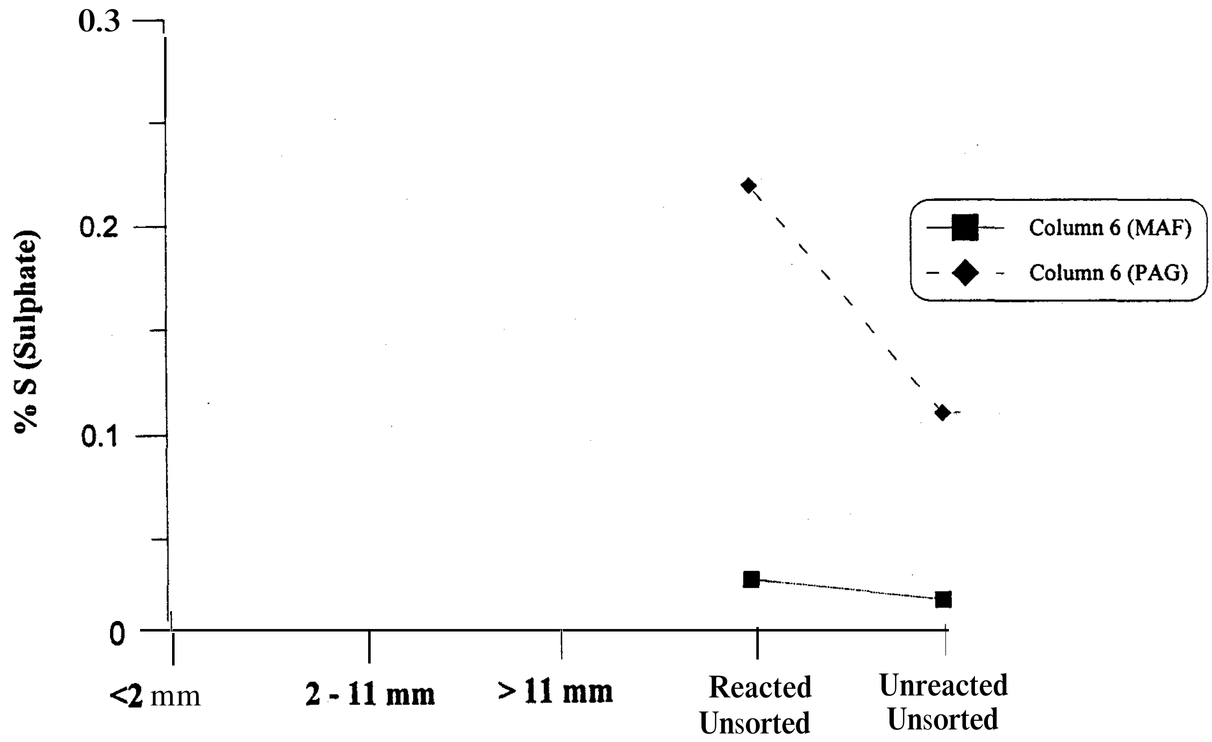


% S (Total) vs Size Fraction
3
2
1
0
% S (Total)
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 6 (MAF)
Column 6 (PAG)

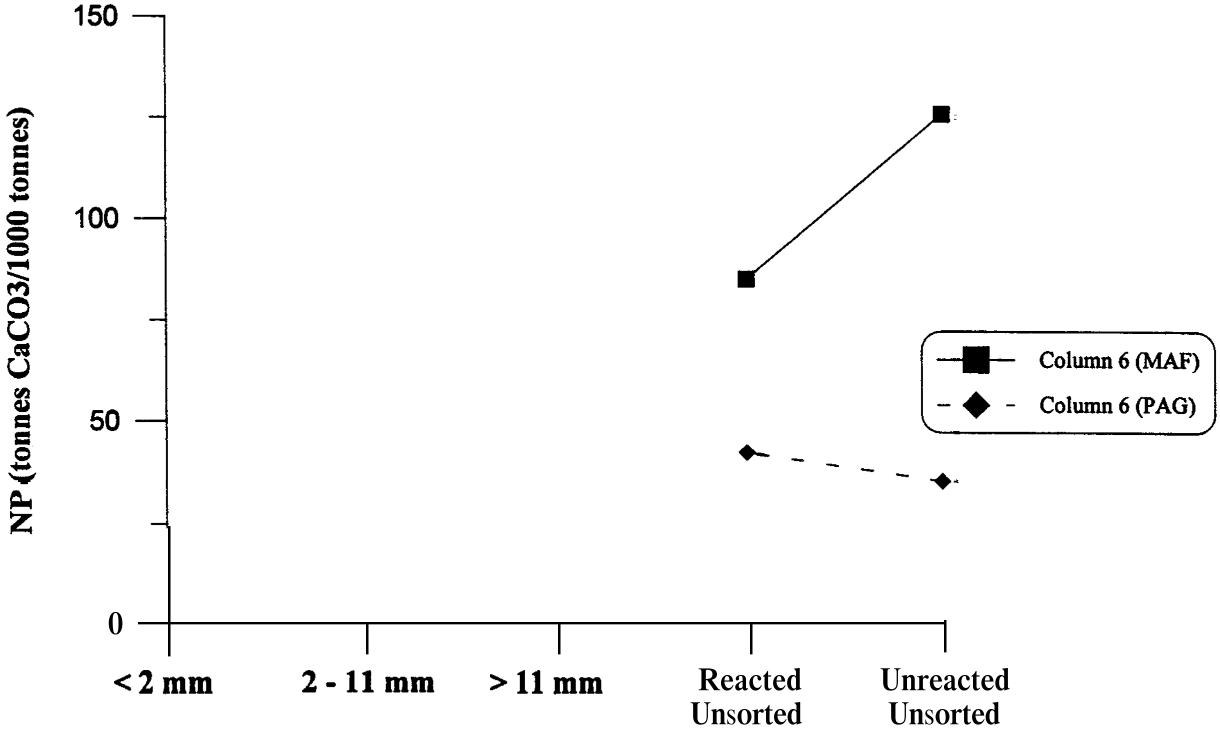
% S (Sulphide) vs Size Fraction



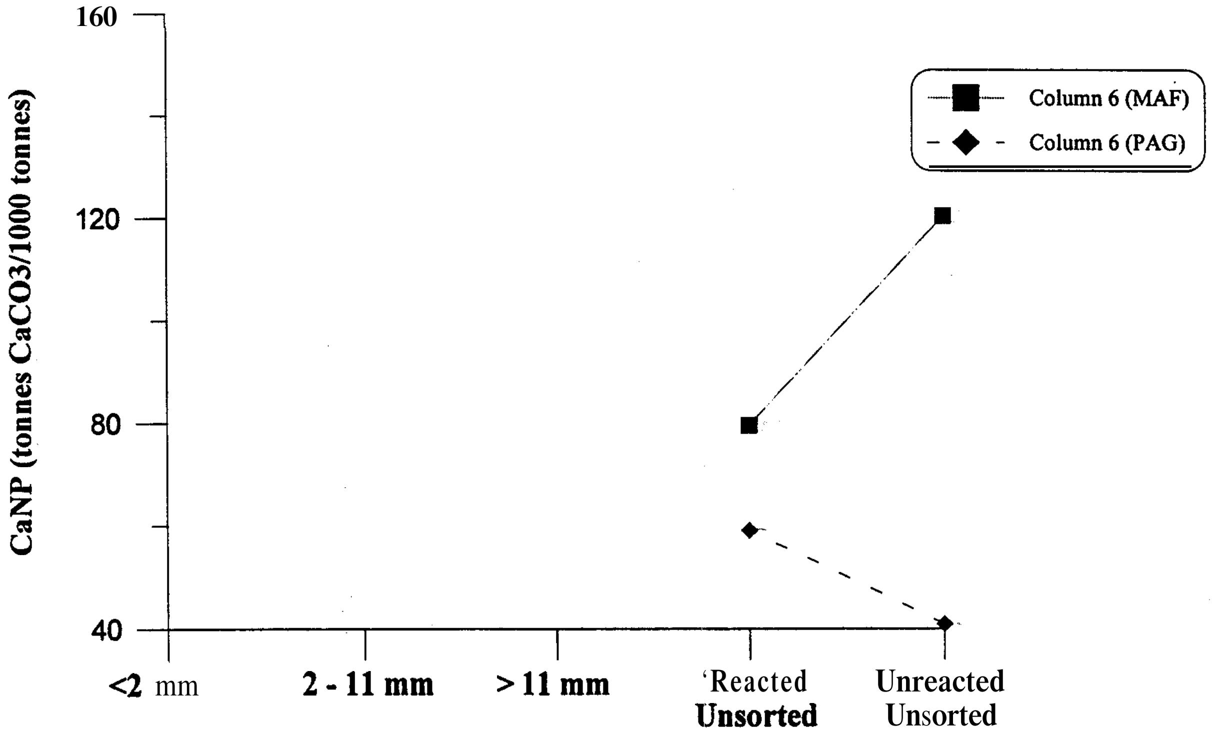
% S (Sulphate) vs Size Fraction

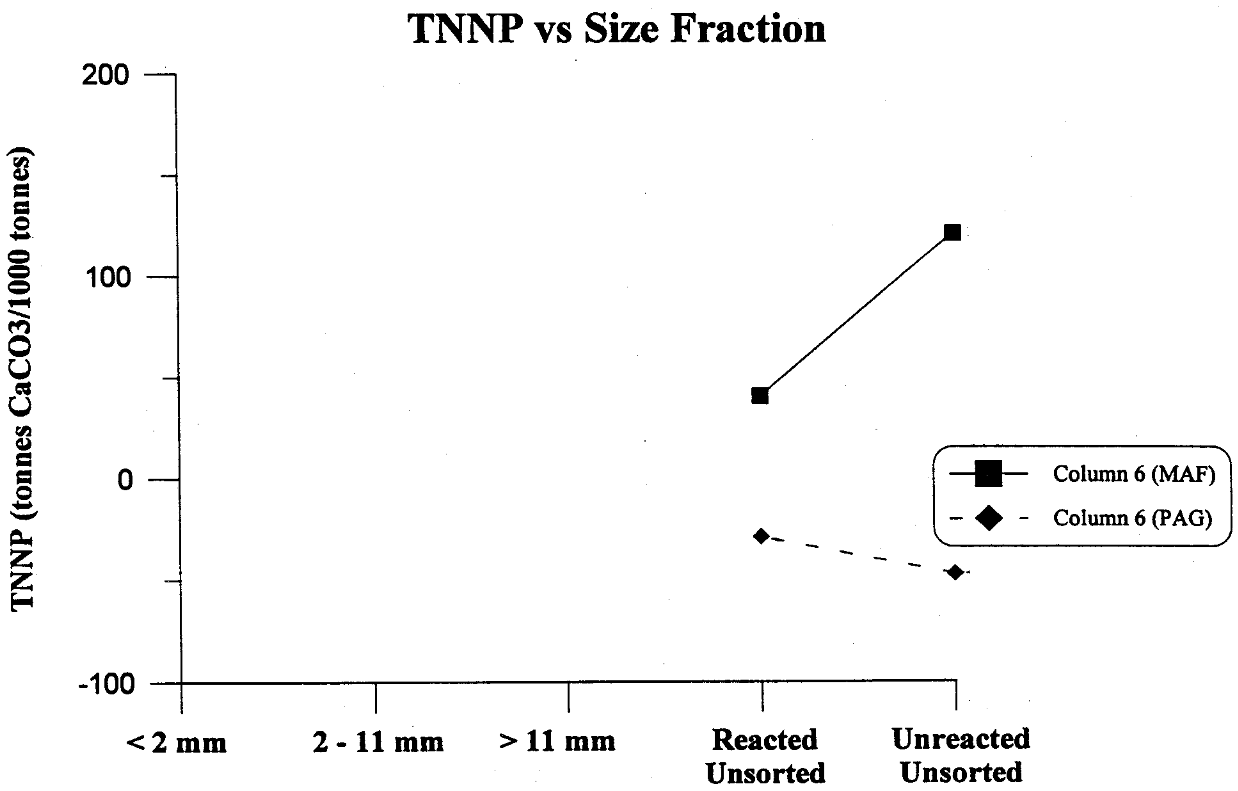


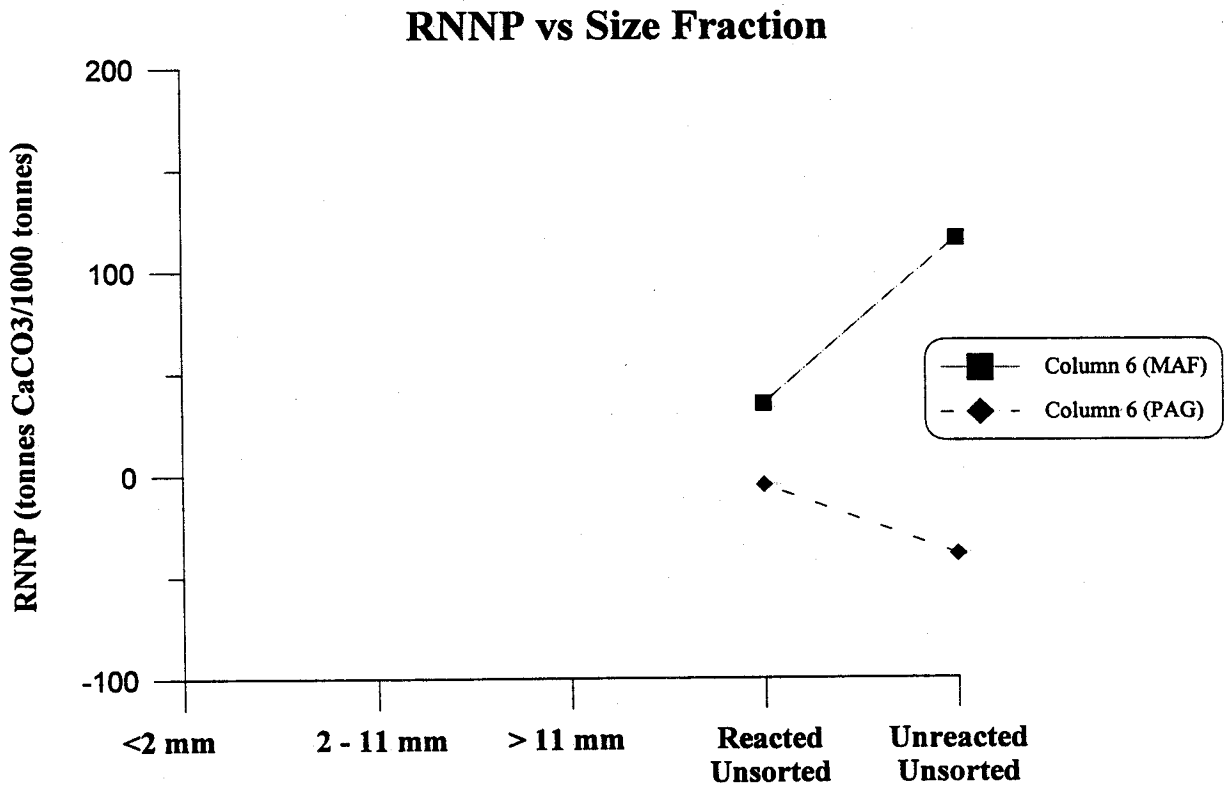
NP vs Size Fraction

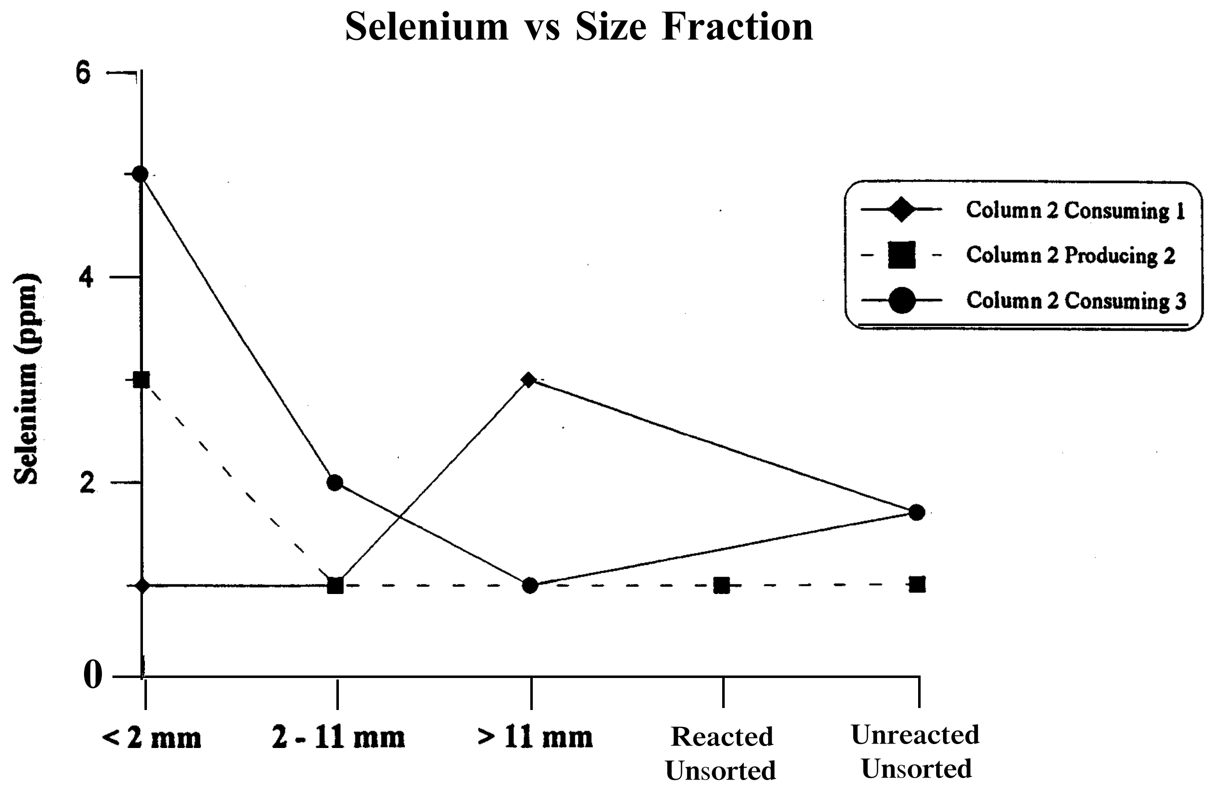


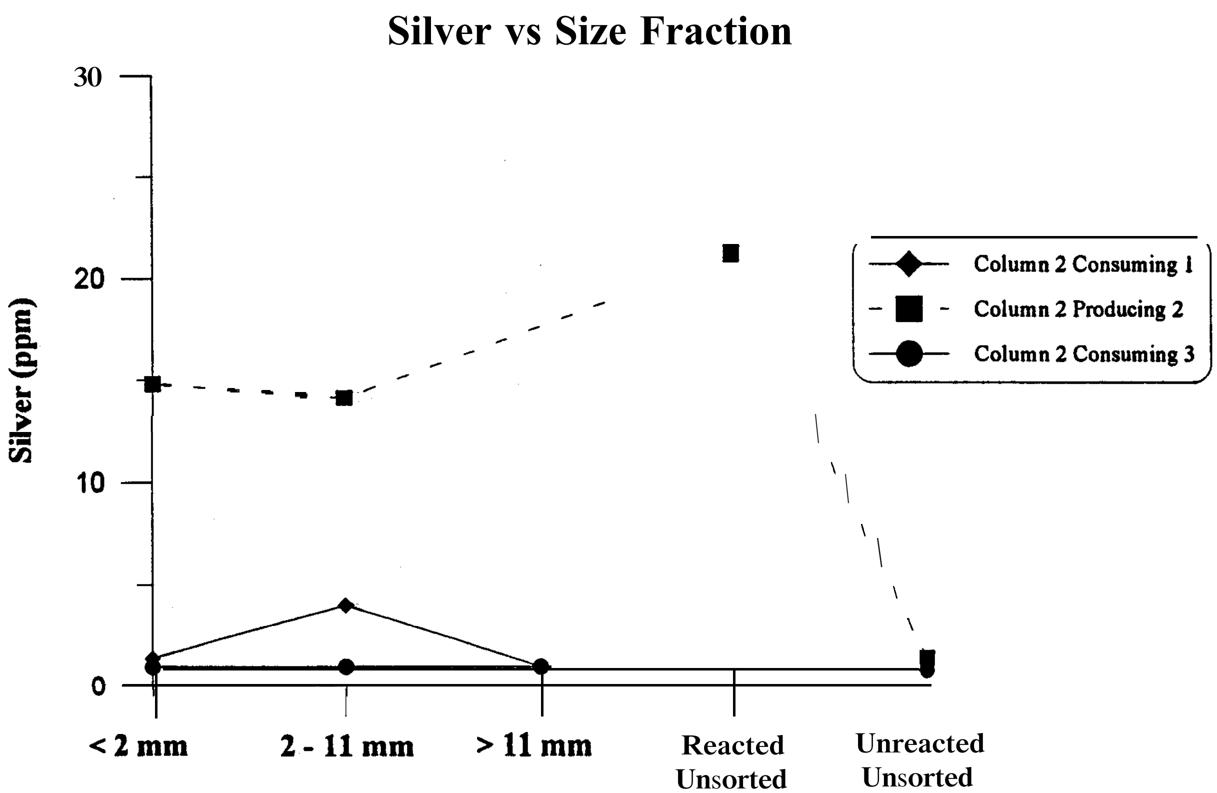
CaNP vs Size Fraction




TNNP vs Size Fraction
TNNP (tonnes CaCO3/1000 tonnes)
200
100
0
-100
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 6 (MAF)
Column 6 (PAG)

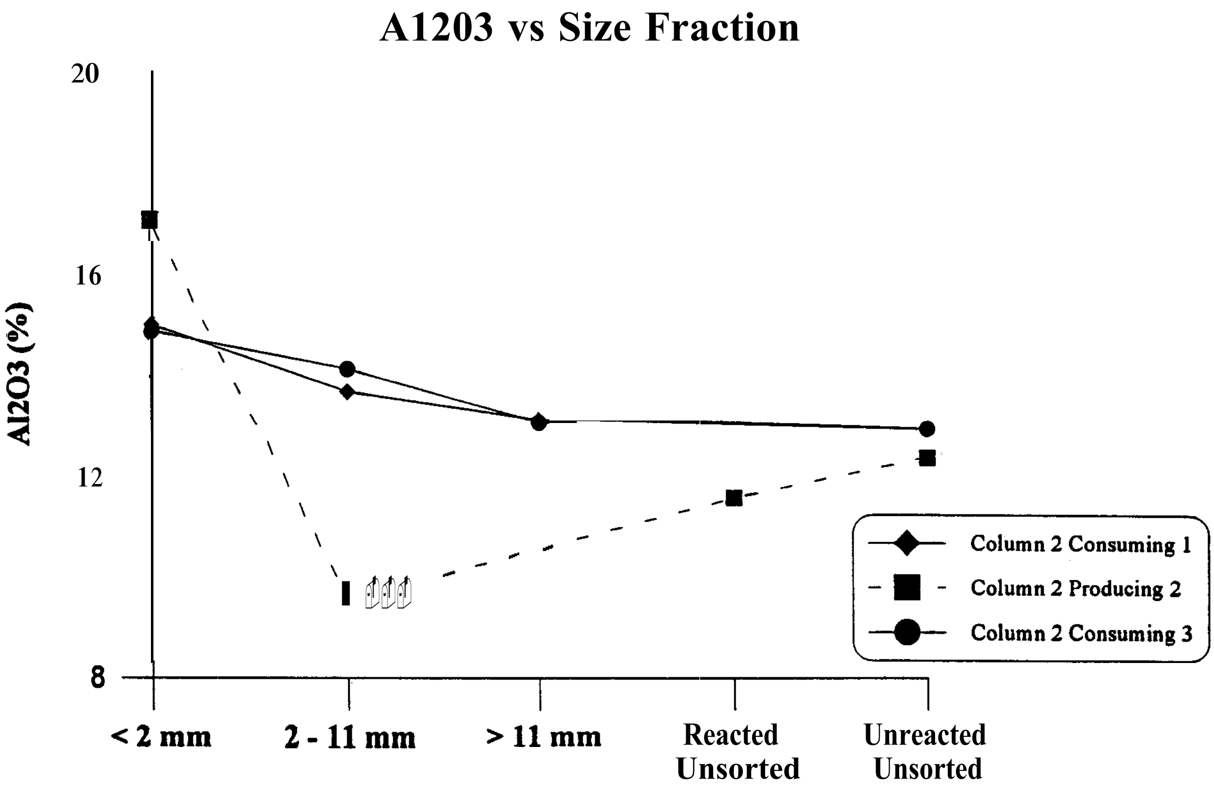

RNNP vs Size Fraction
RNNP (tonnes CaCO3/1000 tonnes)
200
100
0
-100
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 6 (MAF)
Column 6 (PAG)

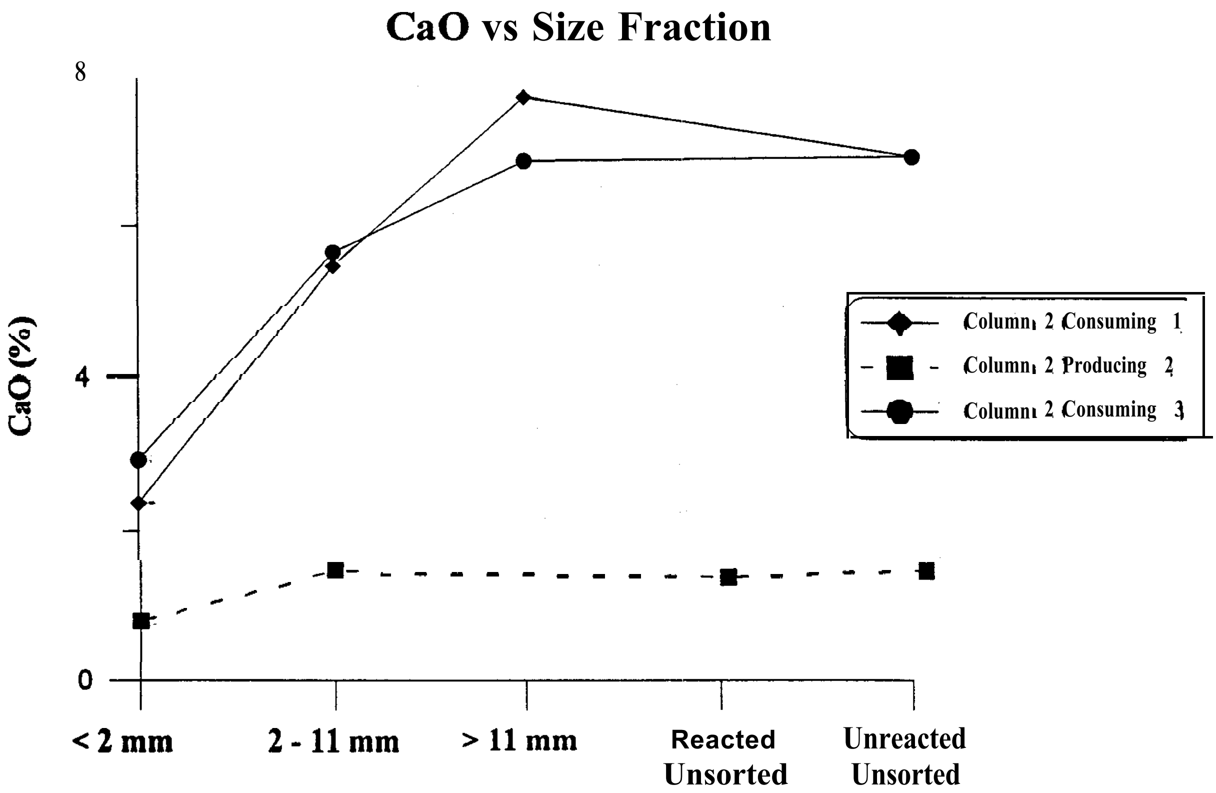

Selenium vs Size Fraction
Selenium (ppm)
6
4
2
0
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 2 Consuming 1
Column 2 Producing 2
Column 2 Consuming 3

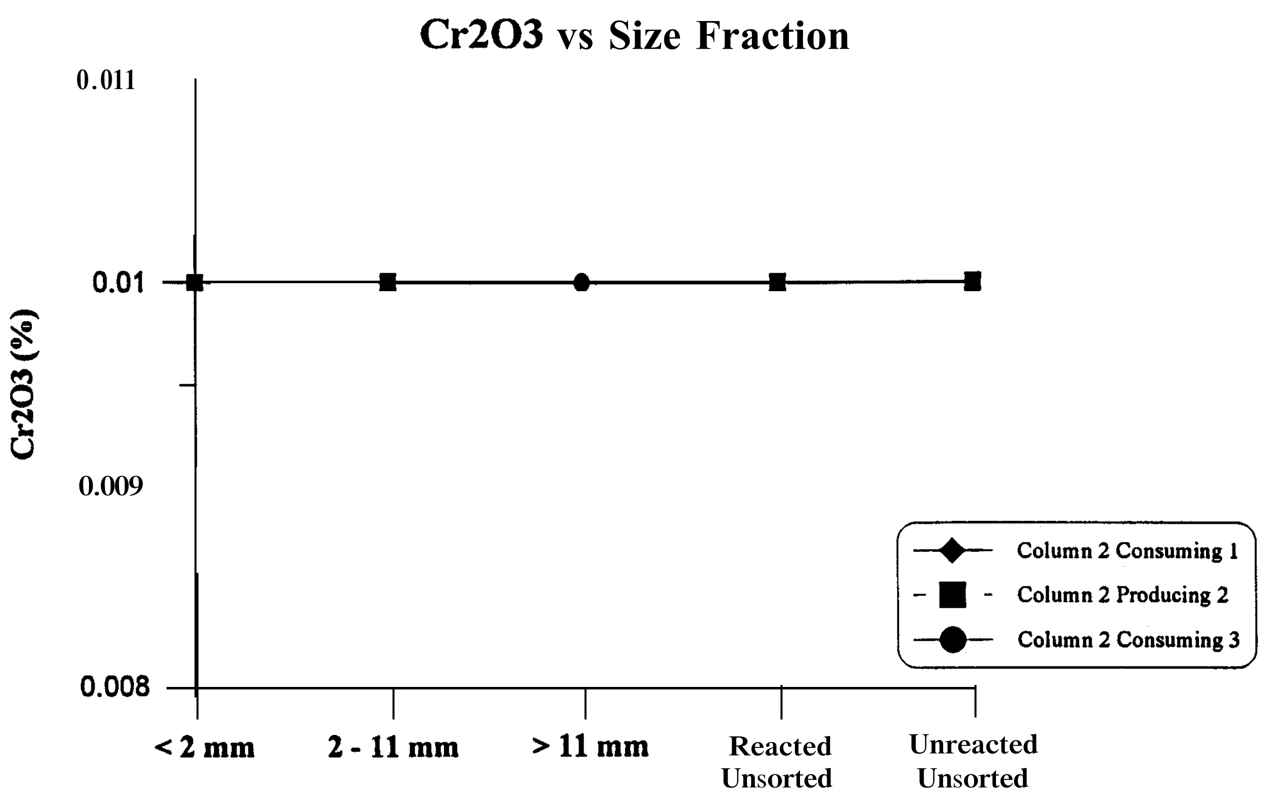

Silver vs Size Fraction
Silver (ppm)
30
20
10
0
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 2 Consuming 1
Column 2 Producing 2
Column 2 Consuming 3

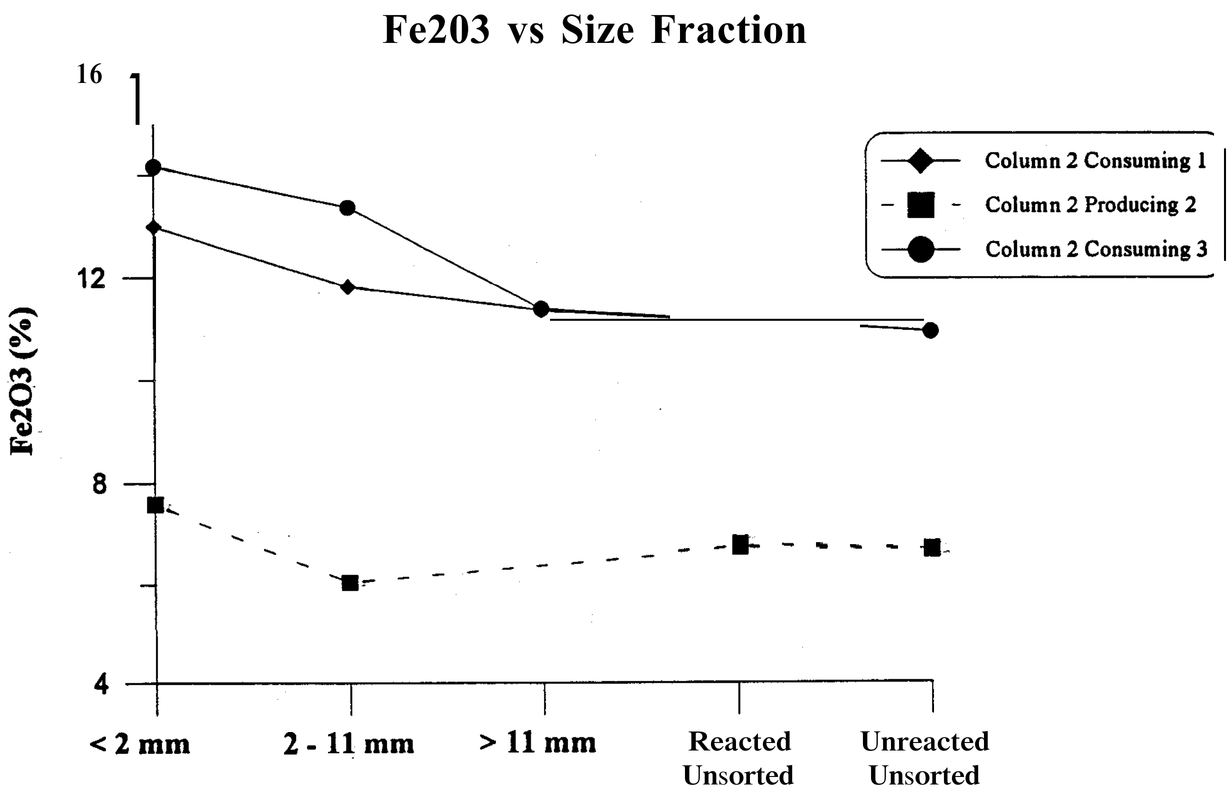
A4. Graphs of Whole-Rock Composition for Columns by Grain Size

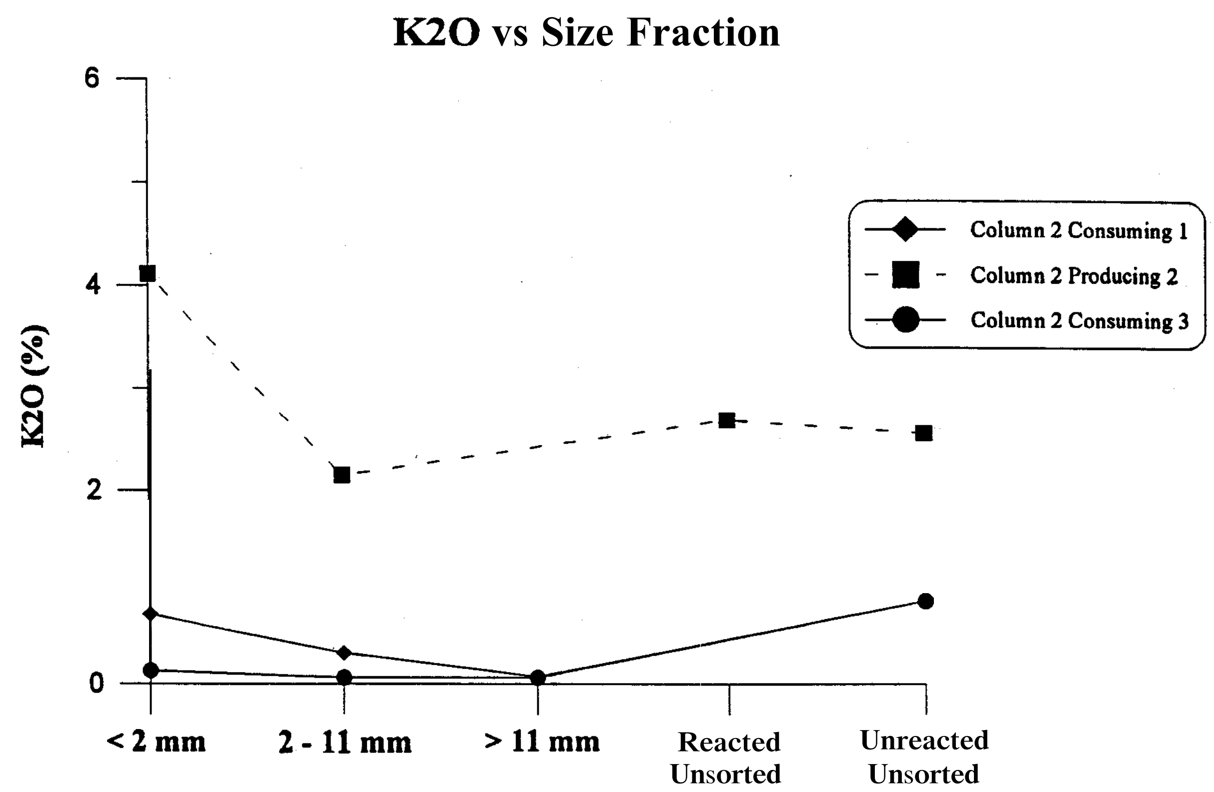
A4.1. Column 2


A1203 vs Size Fraction
Al2O3 (%)
20
16
12
8
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 2 Consuming 1
Column 2 Producing 2
Column 2 Consuming 3

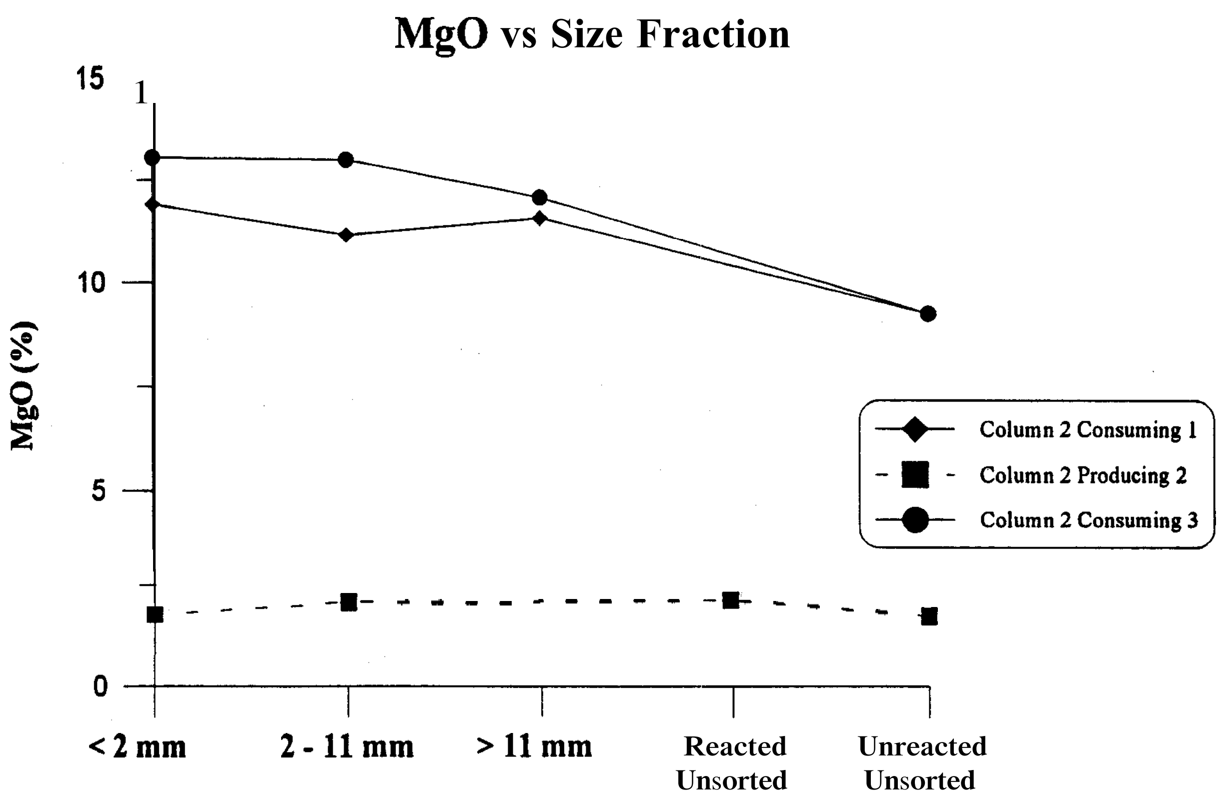

CaO vs Size Fraction
CaO (%)
8
4
0
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 2 Consuming 1
Column 2 Producing 2
Column 2 Consuming 3


Cr2O3 vs Size Fraction
0.011
0.01
0.009
0.008
Cr2O3 (%)
Column 2 Consuming 1
Column 2 Producing 2
Column 2 Consuming 3
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

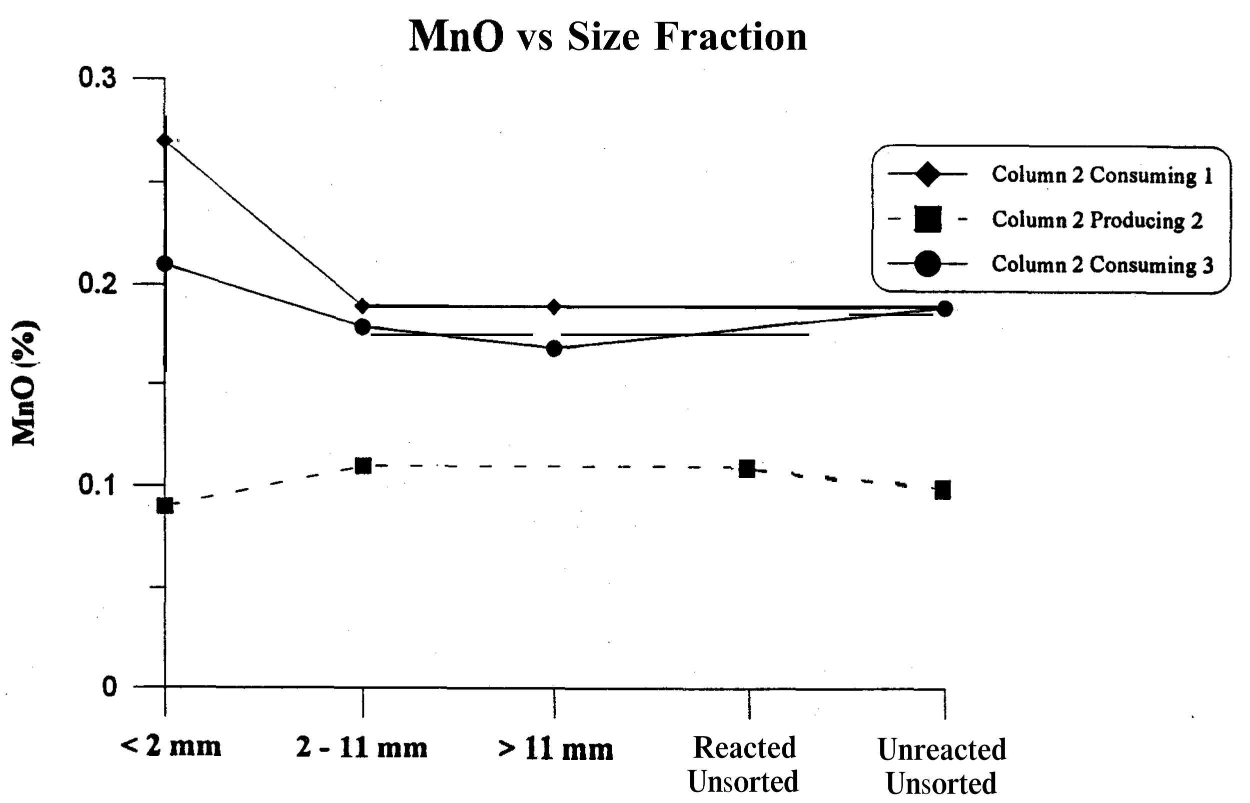

Fe2O3 vs Size Fraction
16
12
8
4
Fe2O3 (%)
Column 2 Consuming 1
Column 2 Producing 2
Column 2 Consuming 3
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

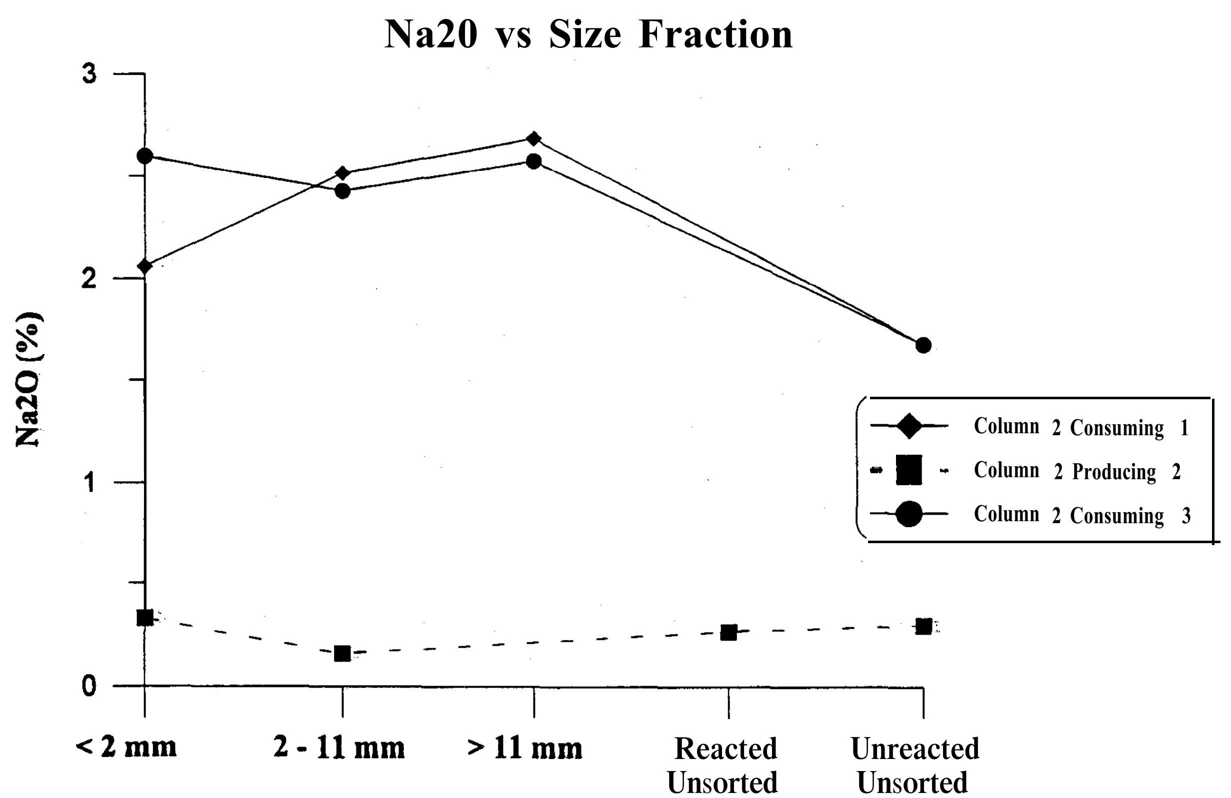


K2O vs Size Fraction
K2O (%)
6
4
2
0
Column 2 Consuming 1
Column 2 Producing 2
Column 2 Consuming 3
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

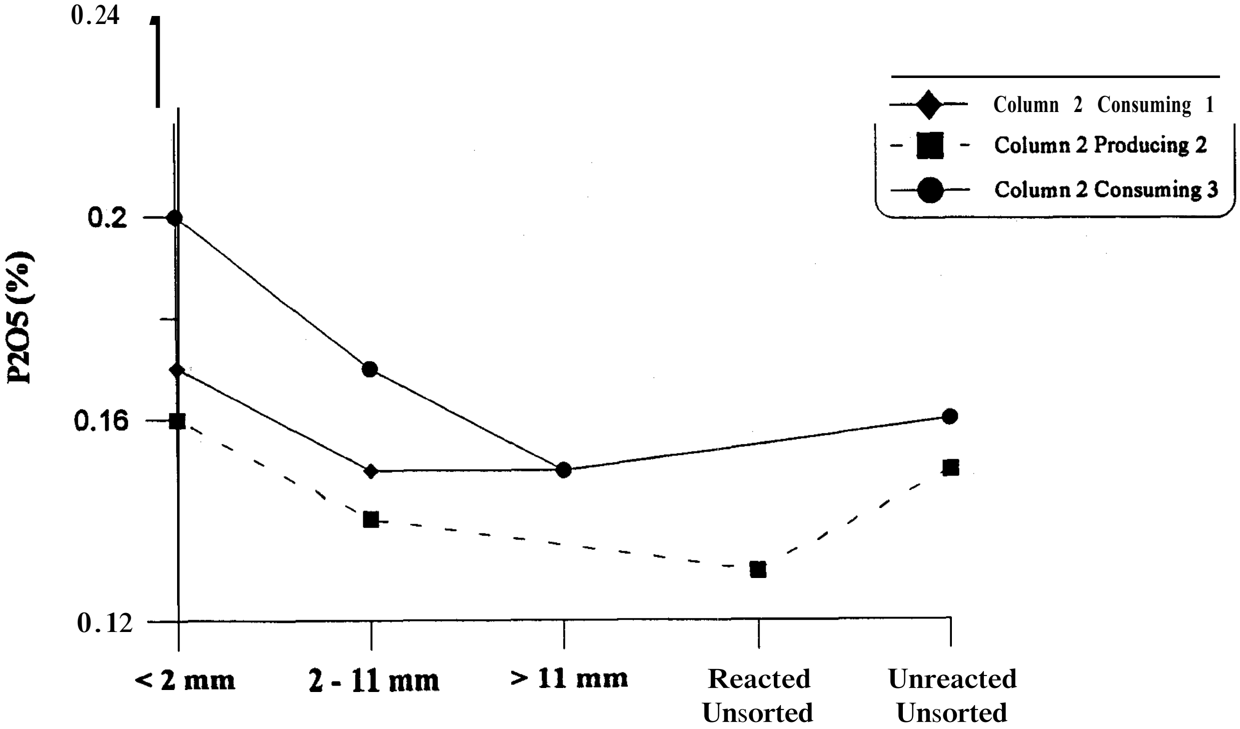


MgO vs Size Fraction
MgO (%)
15
10
5
0
Column 2 Consuming 1
Column 2 Producing 2
Column 2 Consuming 3
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

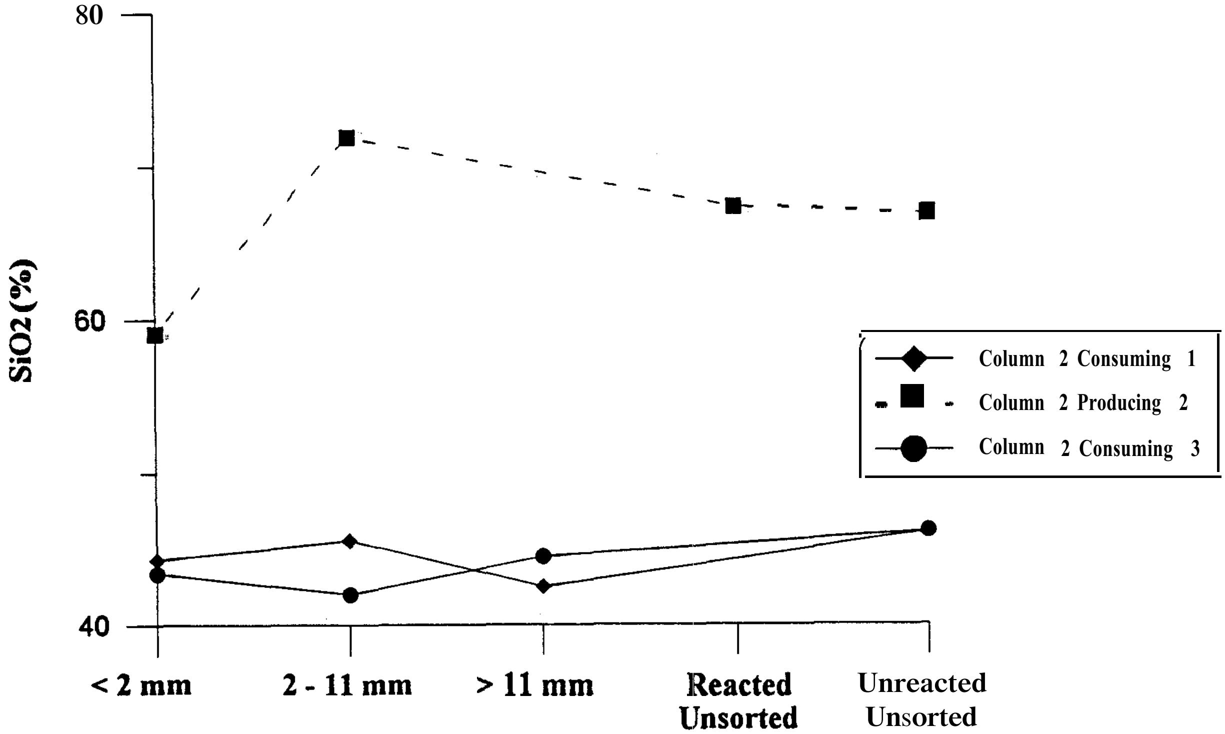

MnO vs Size Fraction
0.3
0.2
0.1
0
MnO (%)
Column 2 Consuming 1
Column 2 Producing 2
Column 2 Consuming 3
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted


Na20 vs Size Fraction
3
2
1
0
Na2O (%)
Column 2 Consuming 1
Column 2 Producing 2
Column 2 Consuming 3
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

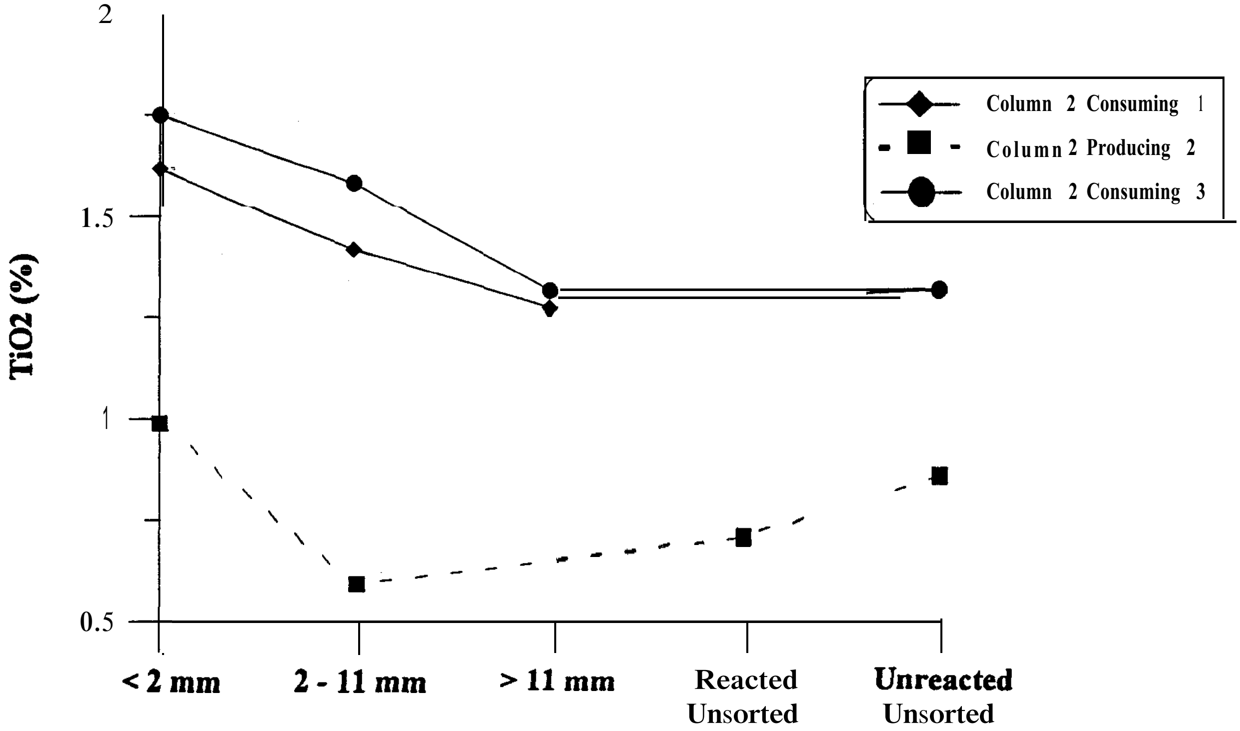
P2O5 vs Size Fraction



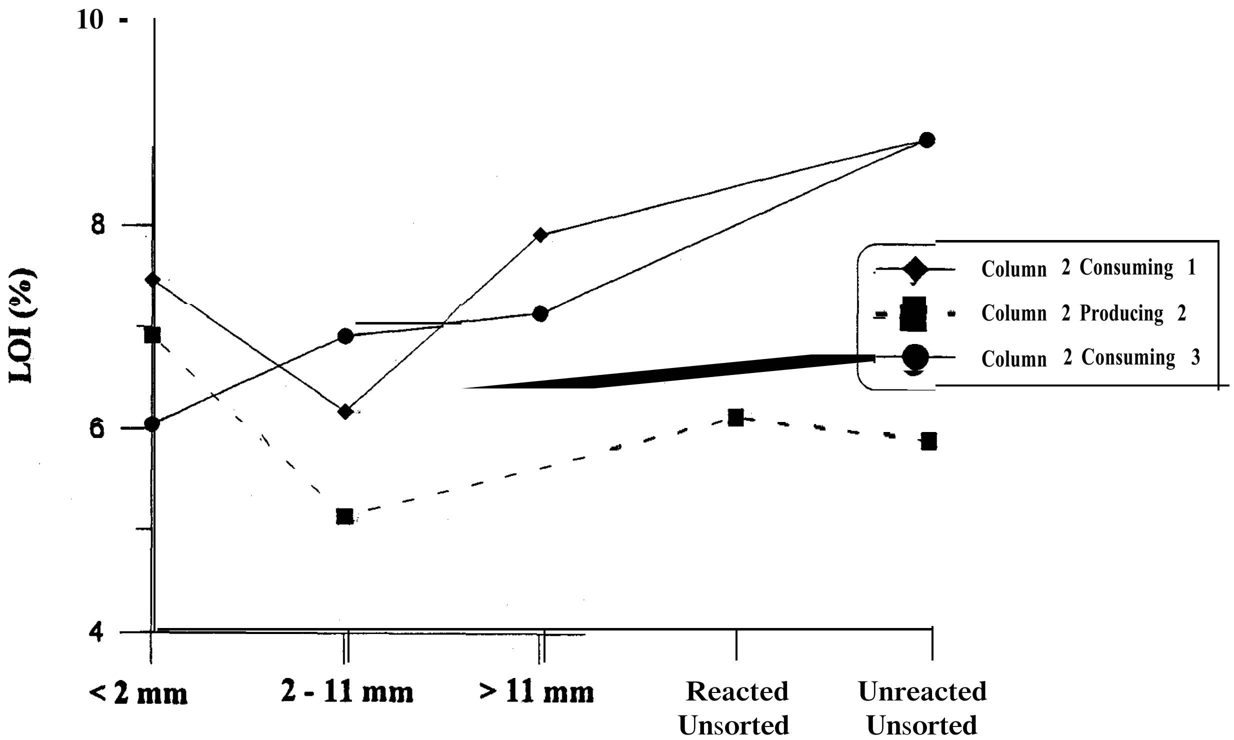
Si02 vs Size Fraction



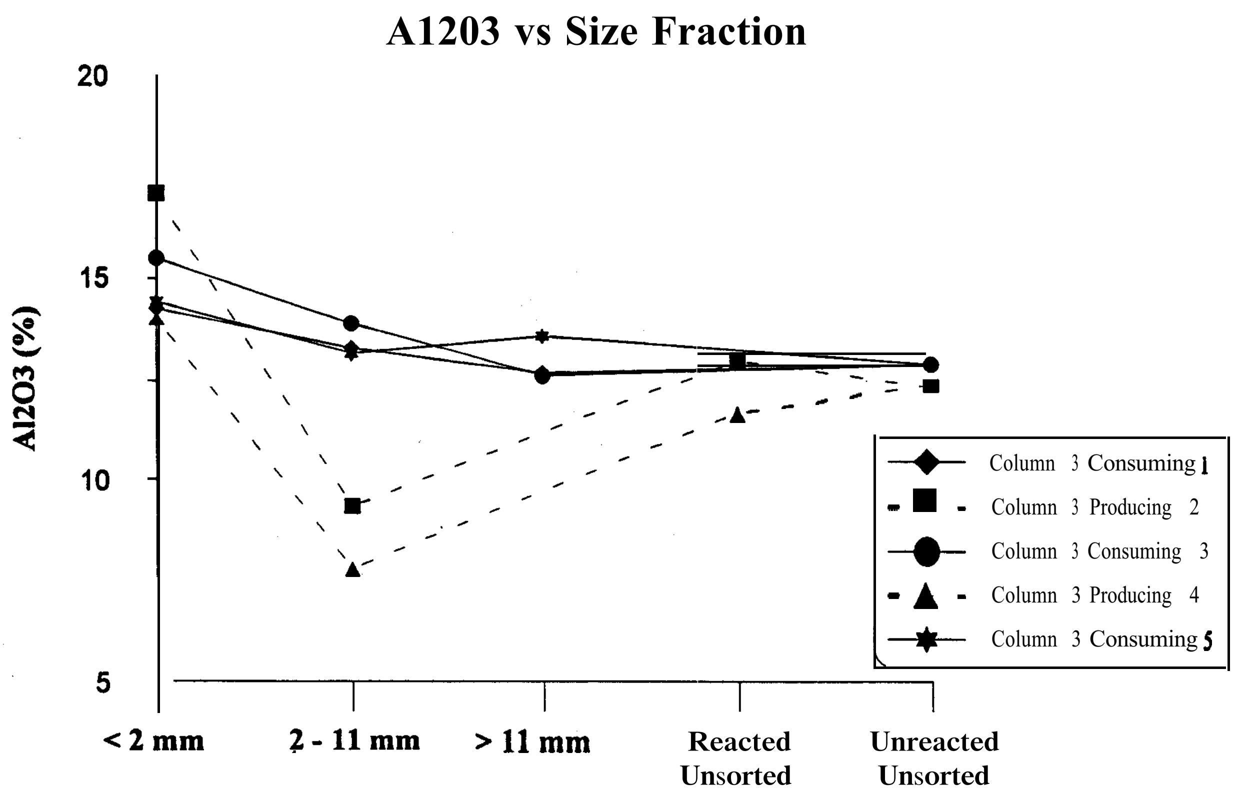
Ti025 vs Size Fraction



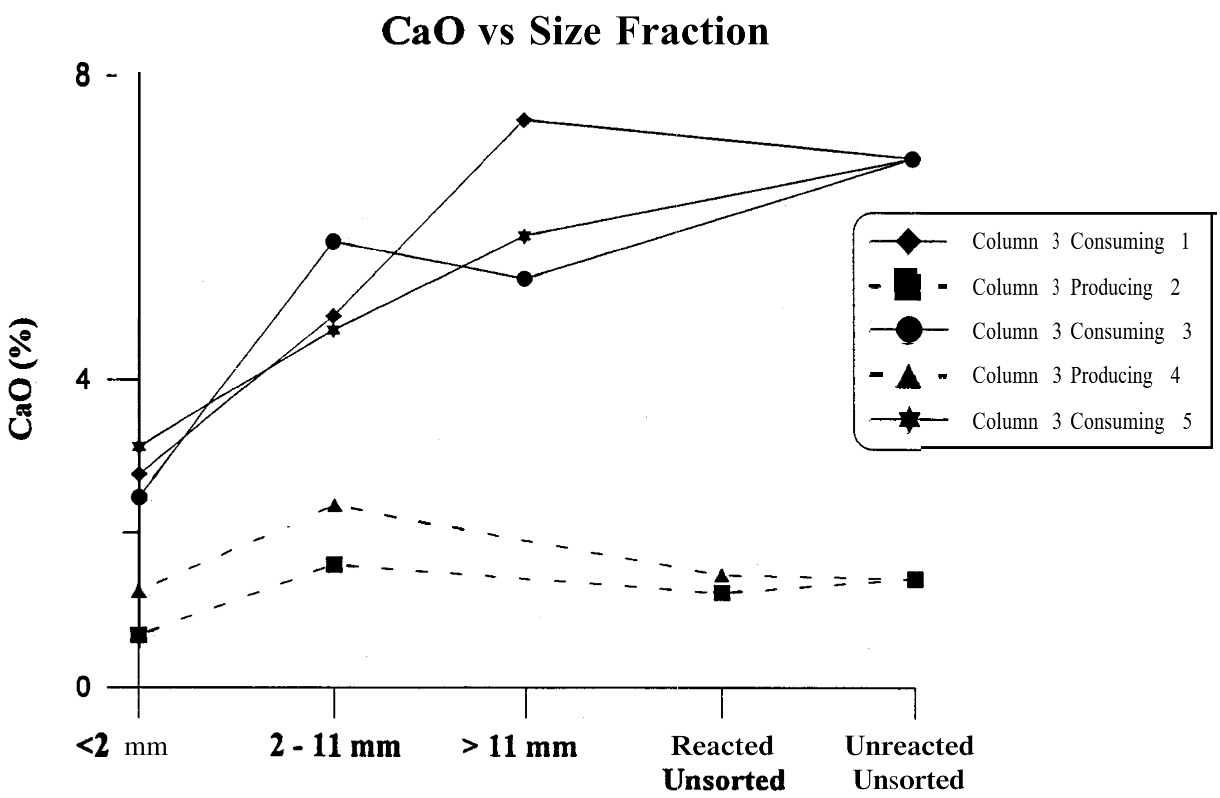
LO1 vs Size Fraction



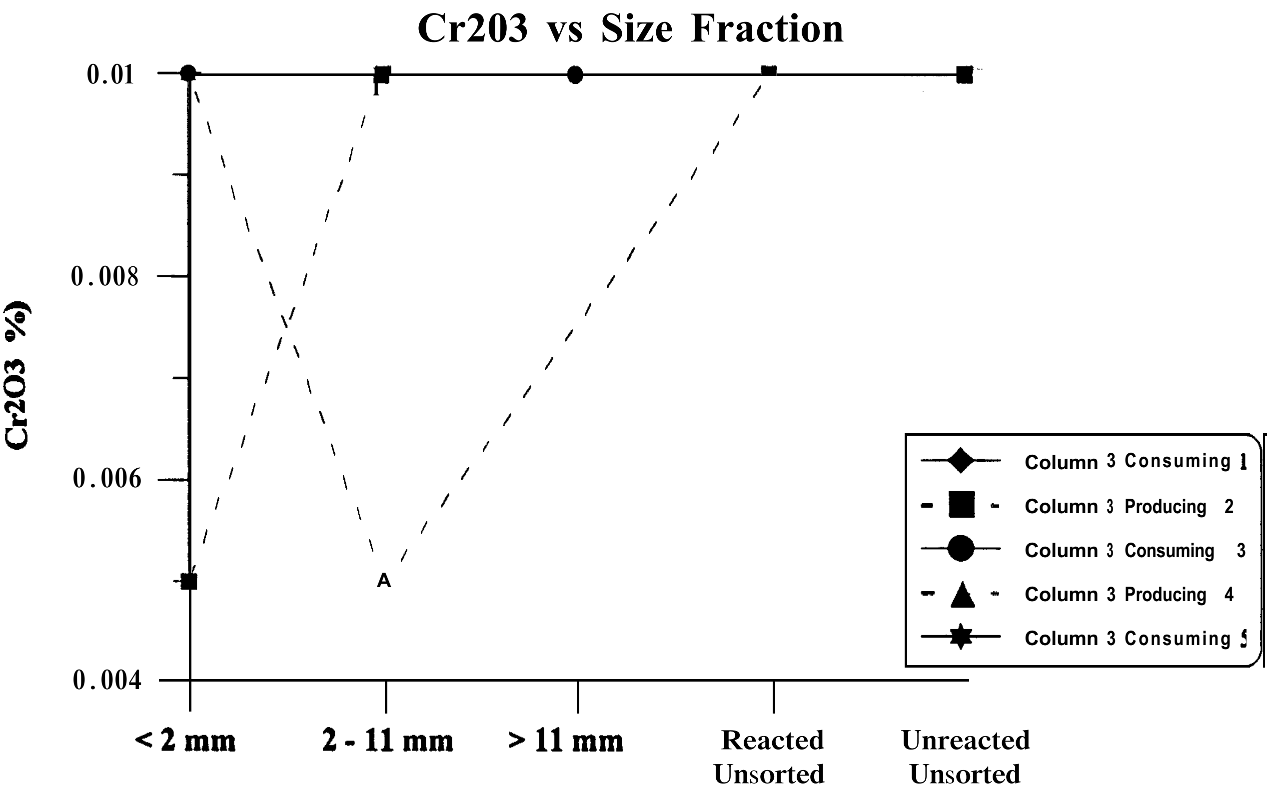
A4.2. Column 3

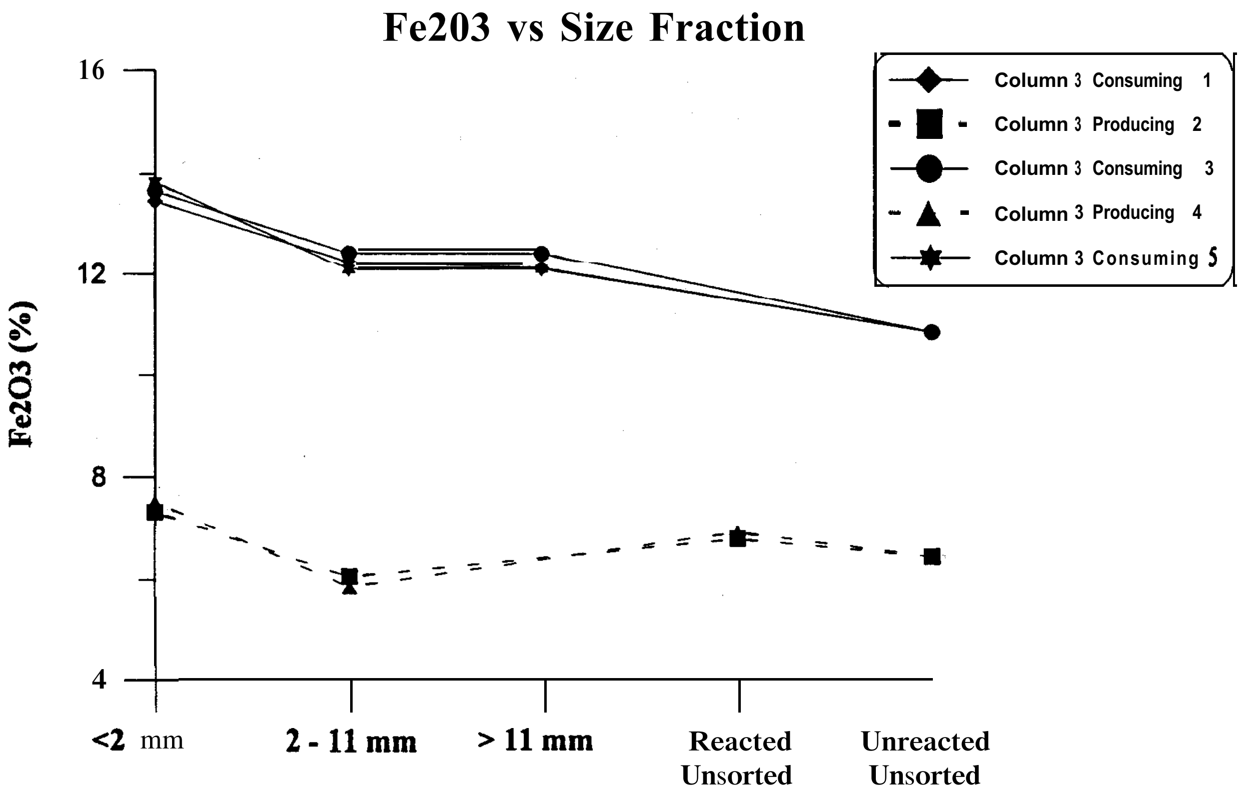


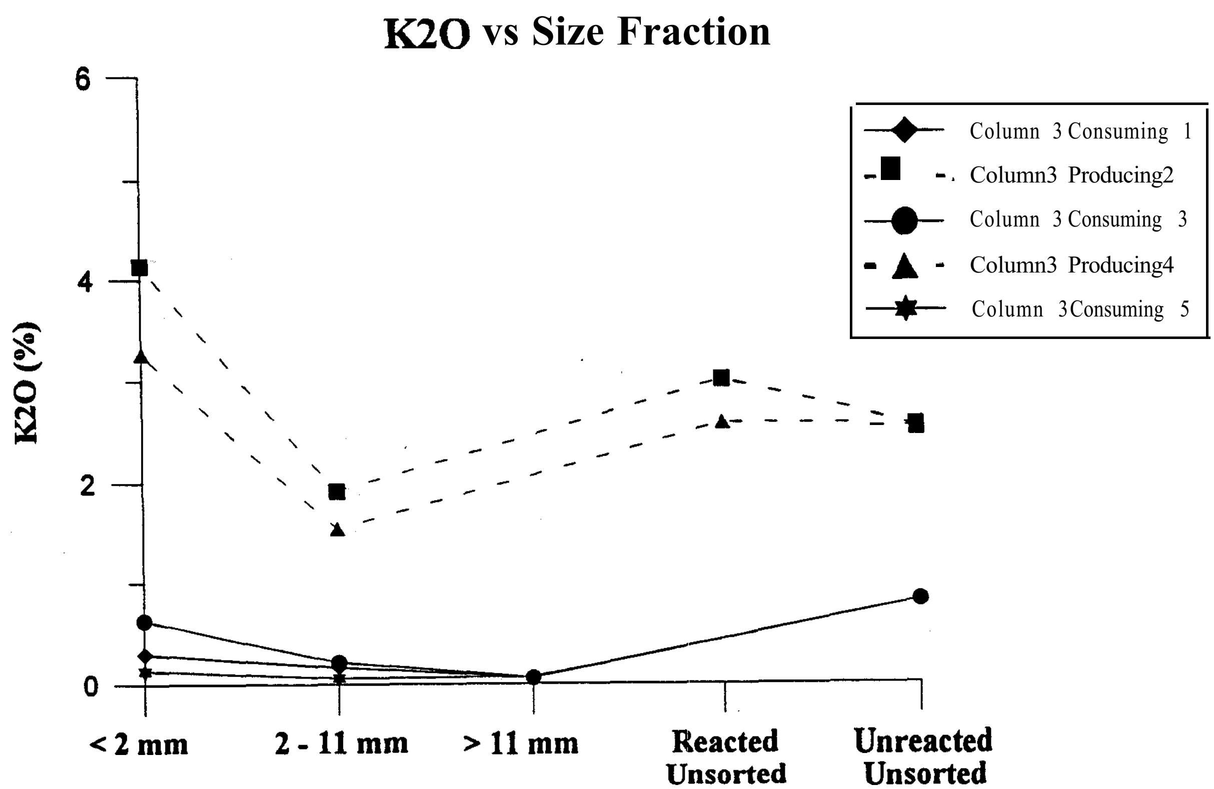
A1203 vs Size Fraction
20
15
10
5
Al2O3 (%)
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 3 Consuming 1
Column 3 Producing 2
Column 3 Consuming 3
Column 3 Producing 4
Column 3 Consuming 5

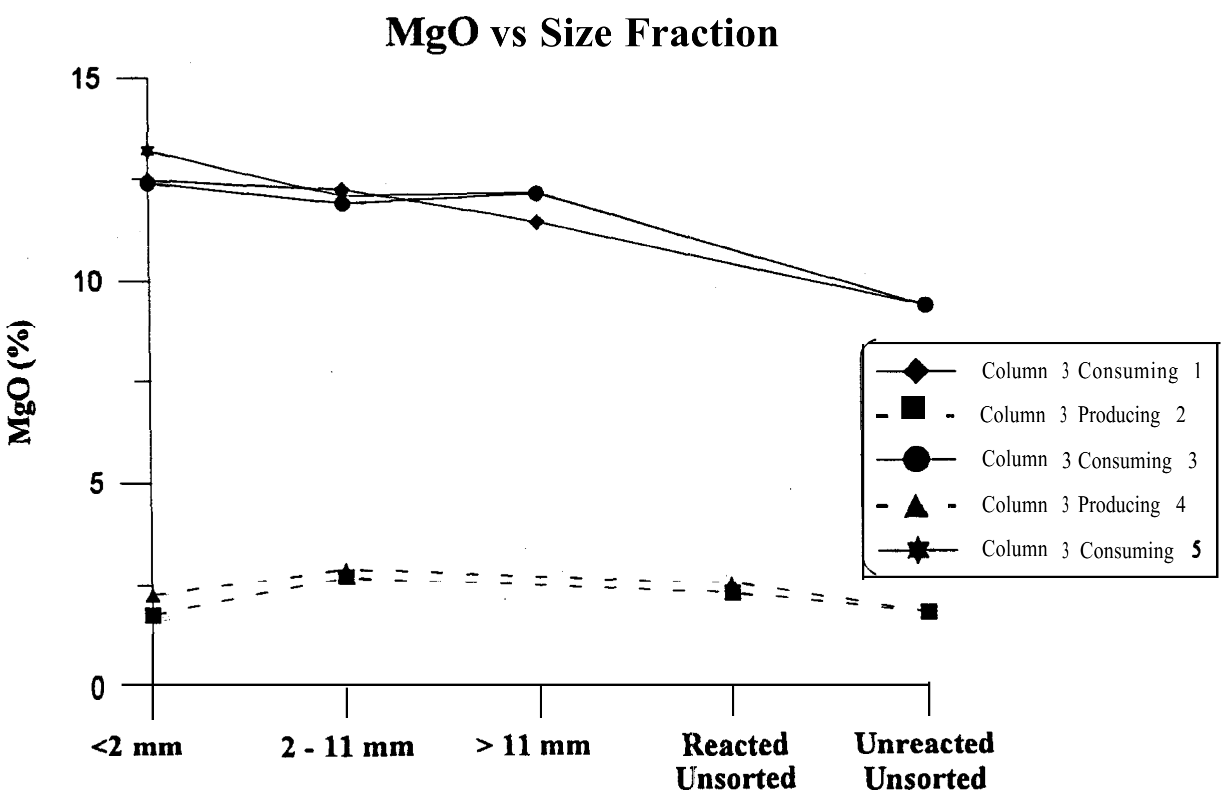


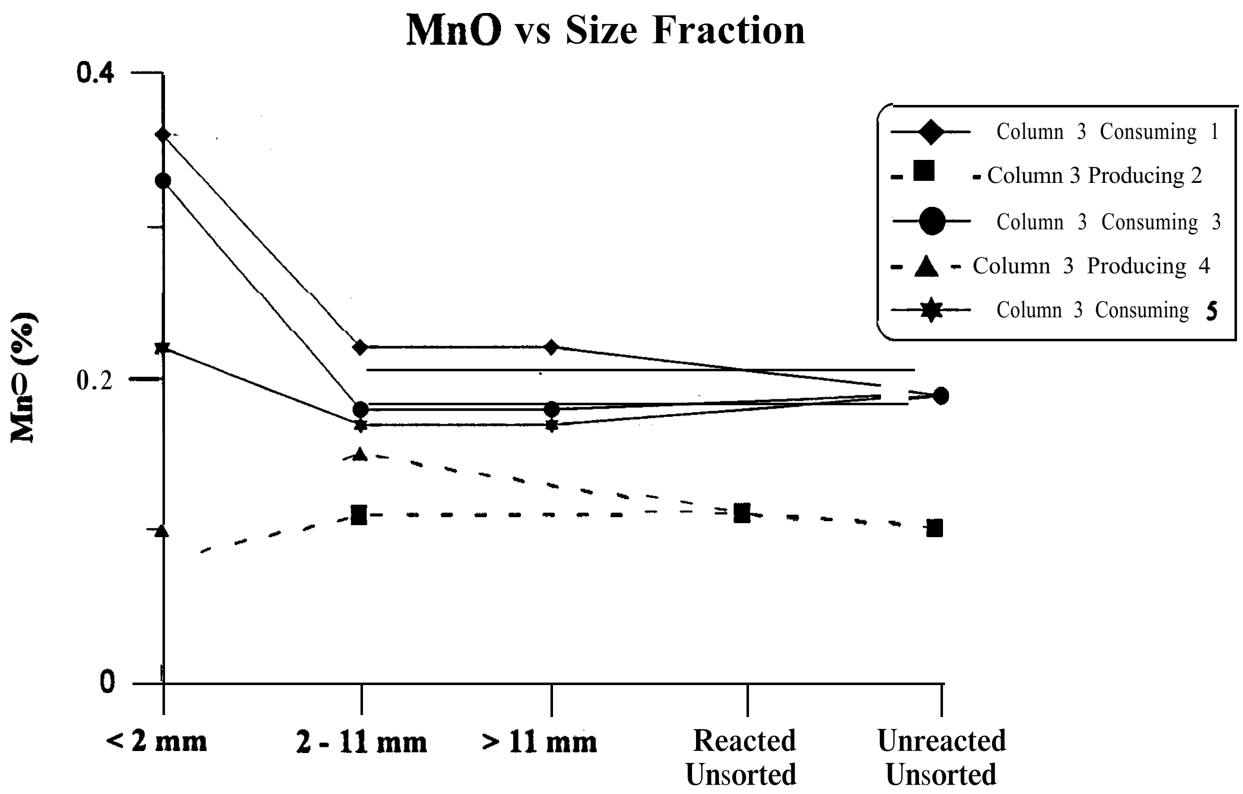
CaO vs Size Fraction
8
4
0
CaO (%)
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 3 Consuming 1
Column 3 Producing 2
Column 3 Consuming 3
Column 3 Producing 4
Column 3 Consuming 5

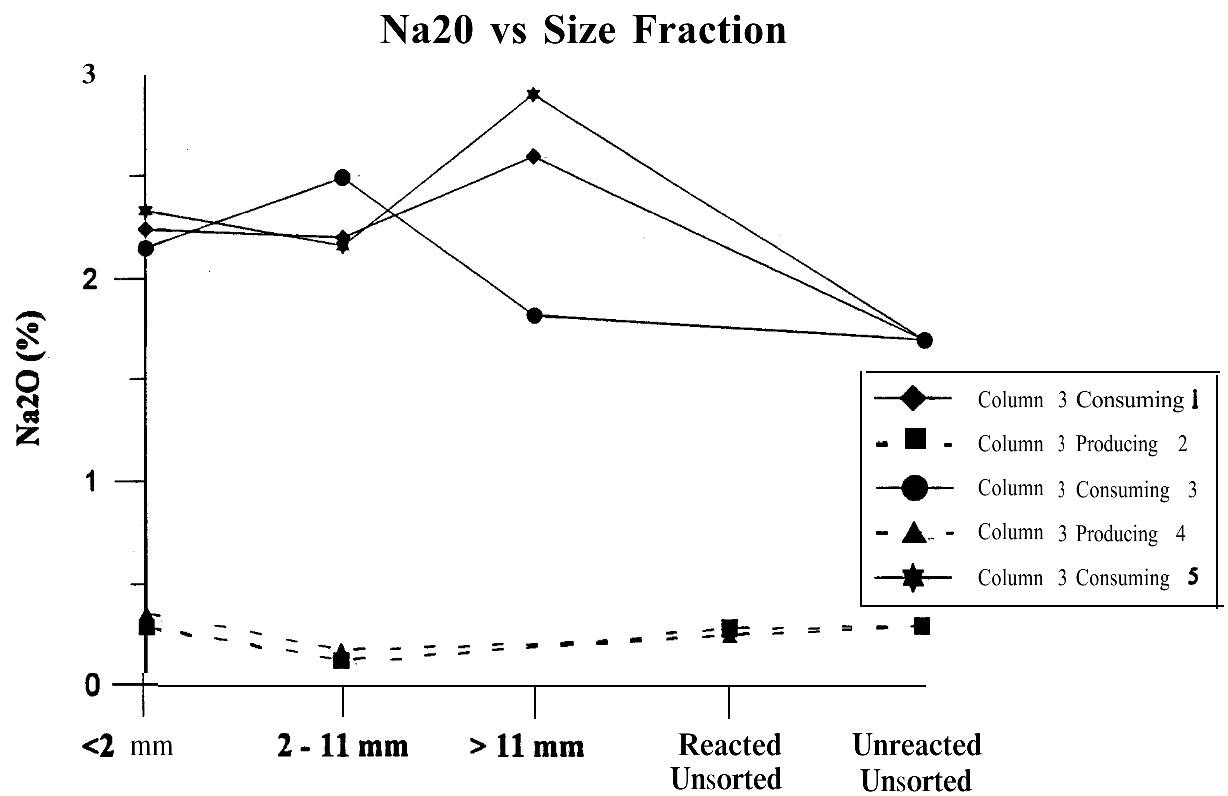

Cr203 vs Size Fraction
0.01
0.008
0.006
0.004
Cr2O3 %)
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 3 Consuming 1
Column 3 Producing 2
Column 3 Consuming 3
Column 3 Producing 4
Column 3 Consuming 5

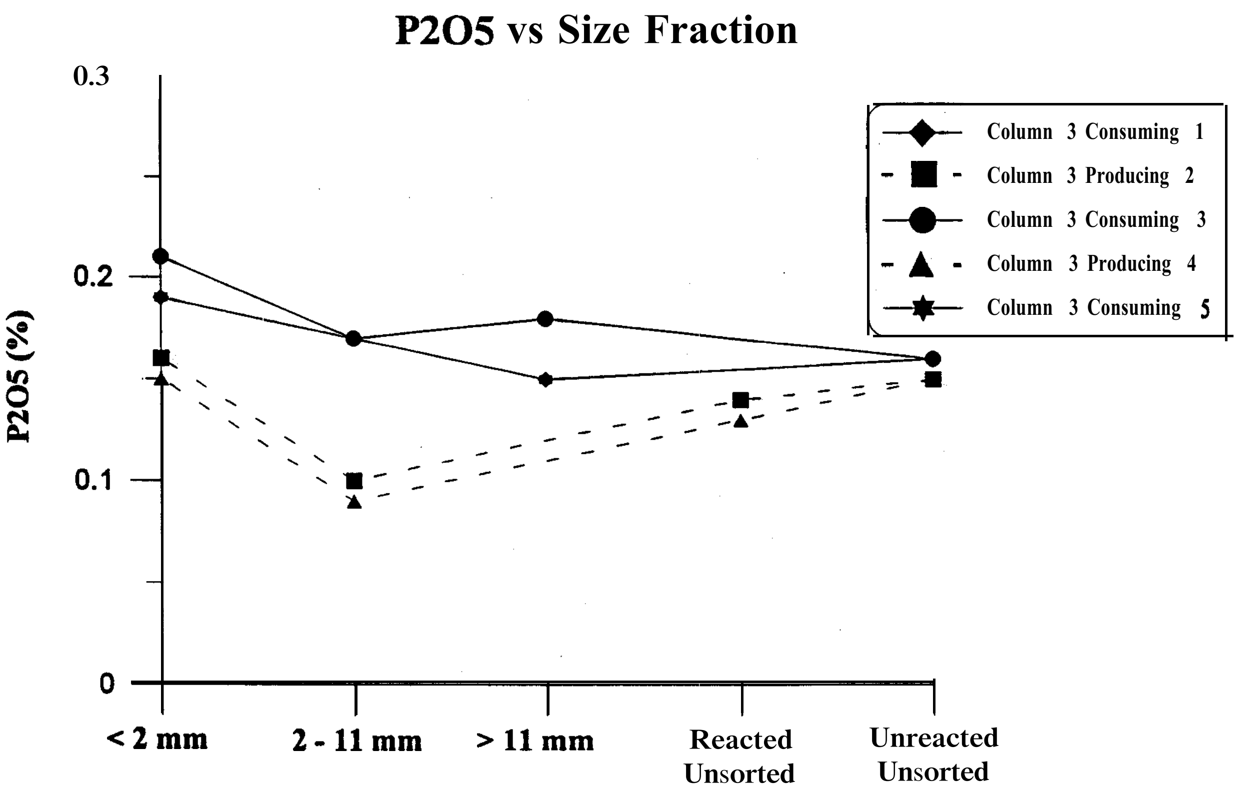

Fe203 vs Size Fraction
16
12
8
4
Fe2O3 (%)
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 3 Consuming 1
Column 3 Producing 2
Column 3 Consuming 3
Column 3 Producing 4
Column 3 Consuming 5

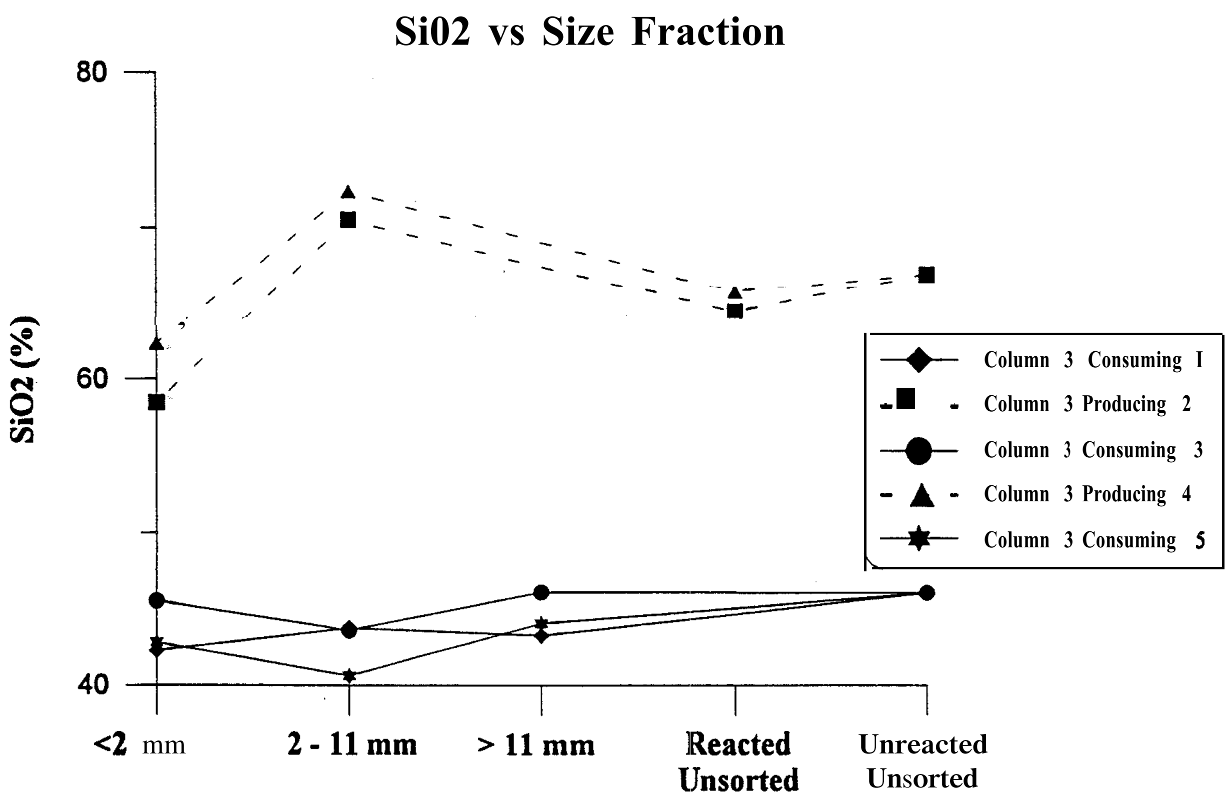

K2O vs Size Fraction
6
4
2
0
K2O (%)
Column 3 Consuming 1
Column3 Producing2
Column 3 Consuming 3
Column3 Producing4
Column 3Consuming 5
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted


MgO vs Size Fraction
15
10
5
0
MgO (%)
Column 3 Consuming 1
Column 3 Producing 2
Column 3 Consuming 3
Column 3 Producing 4
Column 3 Consuming 5
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

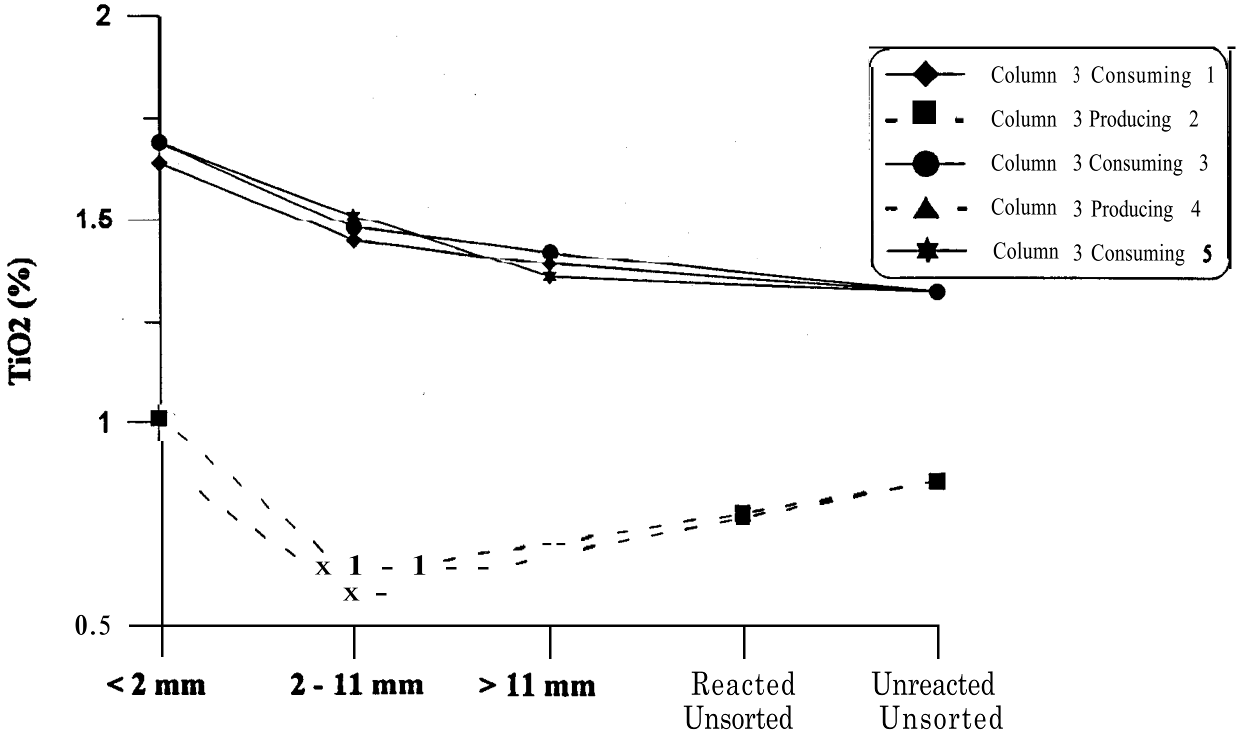

MnO vs Size Fraction
0.4
0.2
0
MnO (%)
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 3 Consuming 1
Column 3 Producing 2
Column 3 Consuming 3
Column 3 Producing 4
Column 3 Consuming 5


Na20 vs Size Fraction
3
2
1
0
Na2O (%)
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 3 Consuming 1
Column 3 Producing 2
Column 3 Consuming 3
Column 3 Producing 4
Column 3 Consuming 5

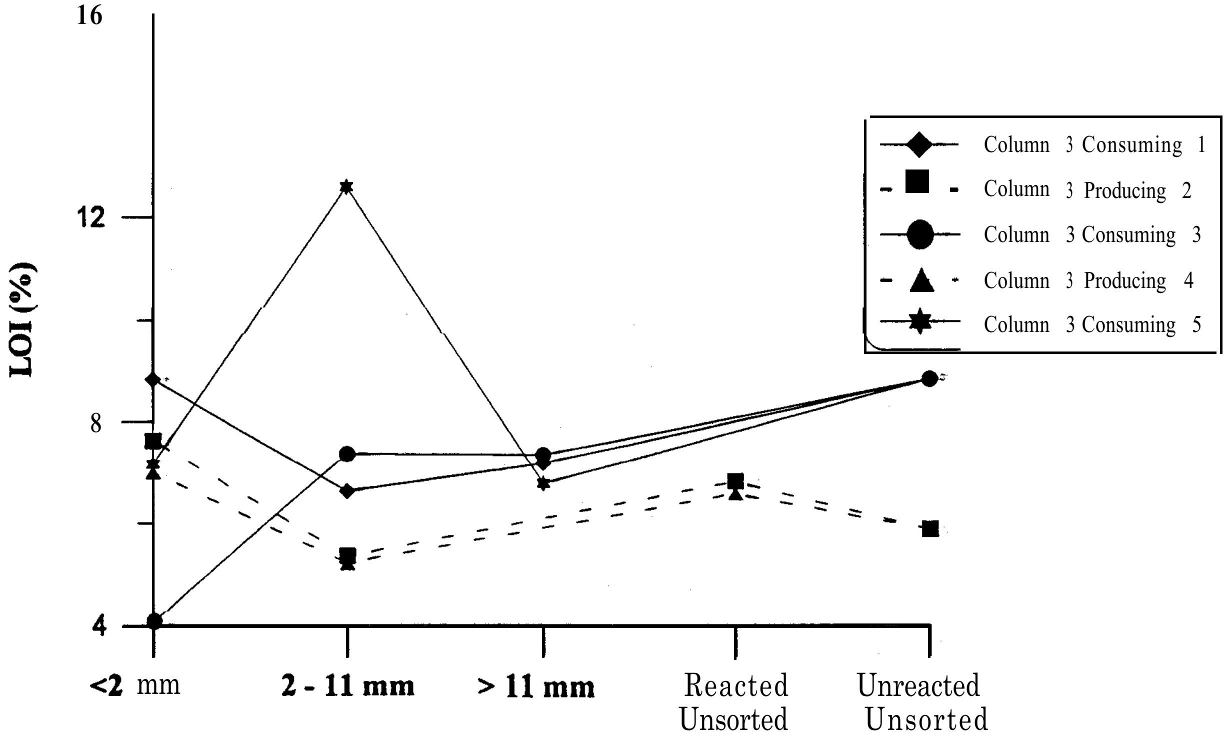

P2O5 vs Size Fraction
0.3
0.2
0.1
0
P2O5 (%)
Column 3 Consuming 1
Column 3 Producing 2
Column 3 Consuming 3
Column 3 Producing 4
Column 3 Consuming 5
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted


Si02 vs Size Fraction
80
60
40
SiO2 (%)
Column 3 Consuming I
Column 3 Producing 2
Column 3 Consuming 3
Column 3 Producing 4
Column 3 Consuming 5
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

Ti02 vs Size Fraction

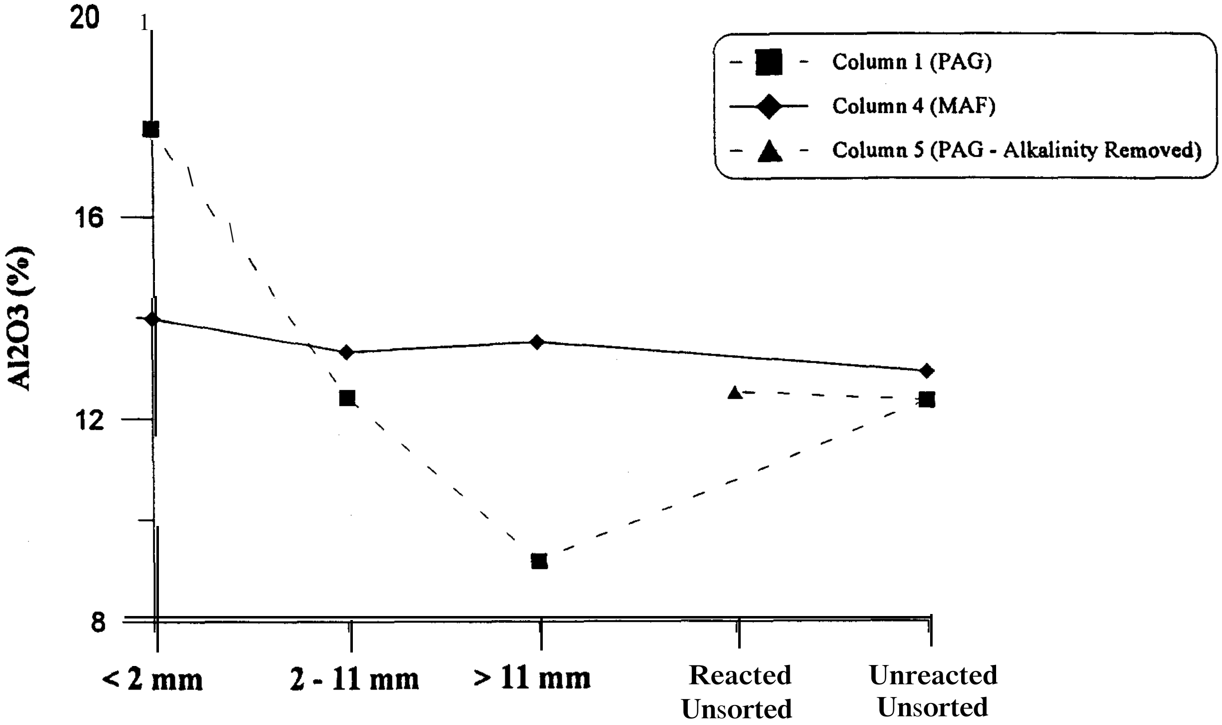


LO1 vs Size Fraction

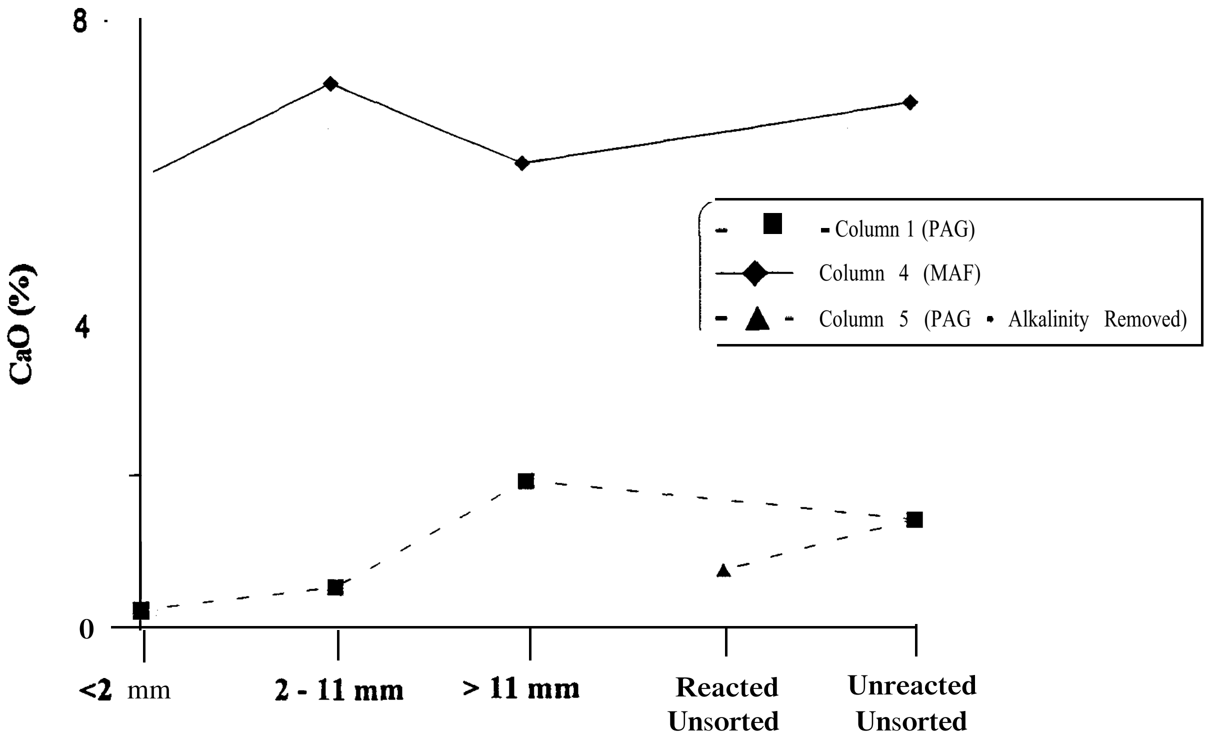


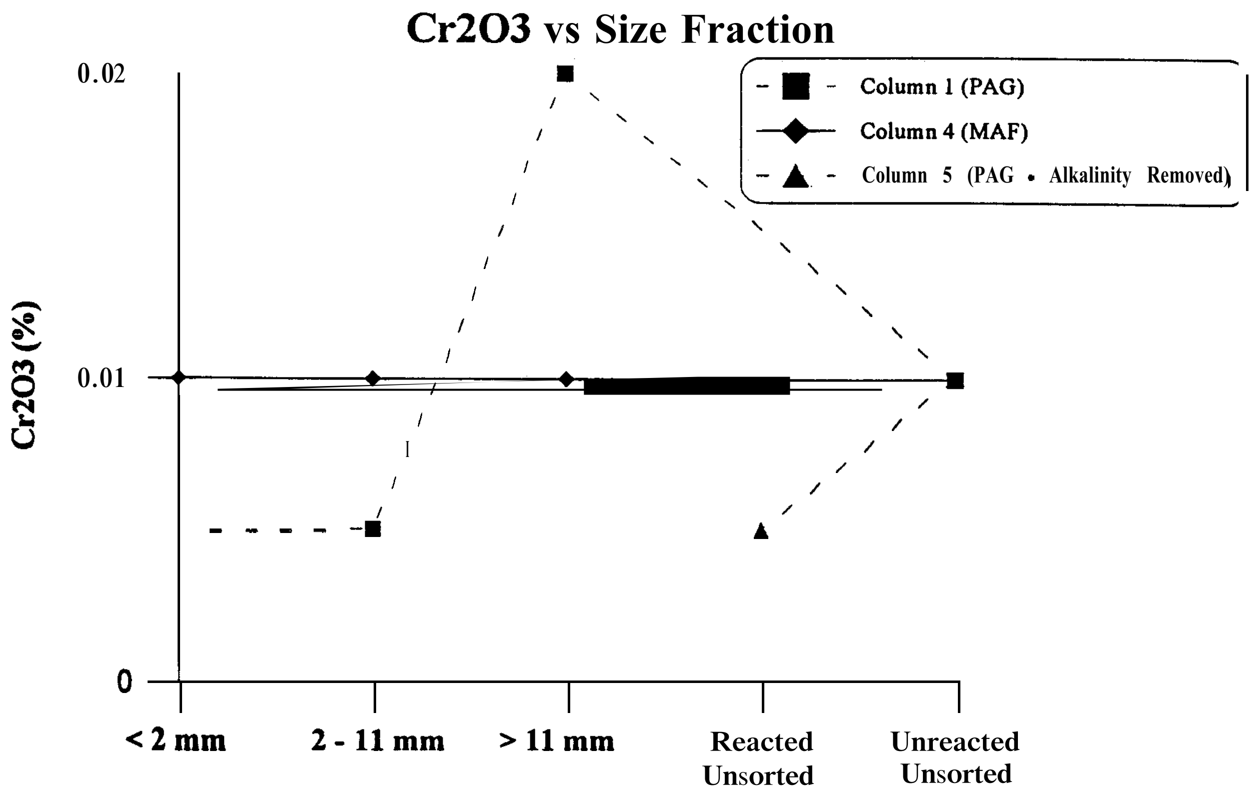
A4.3. Columns 1, 4, and 5

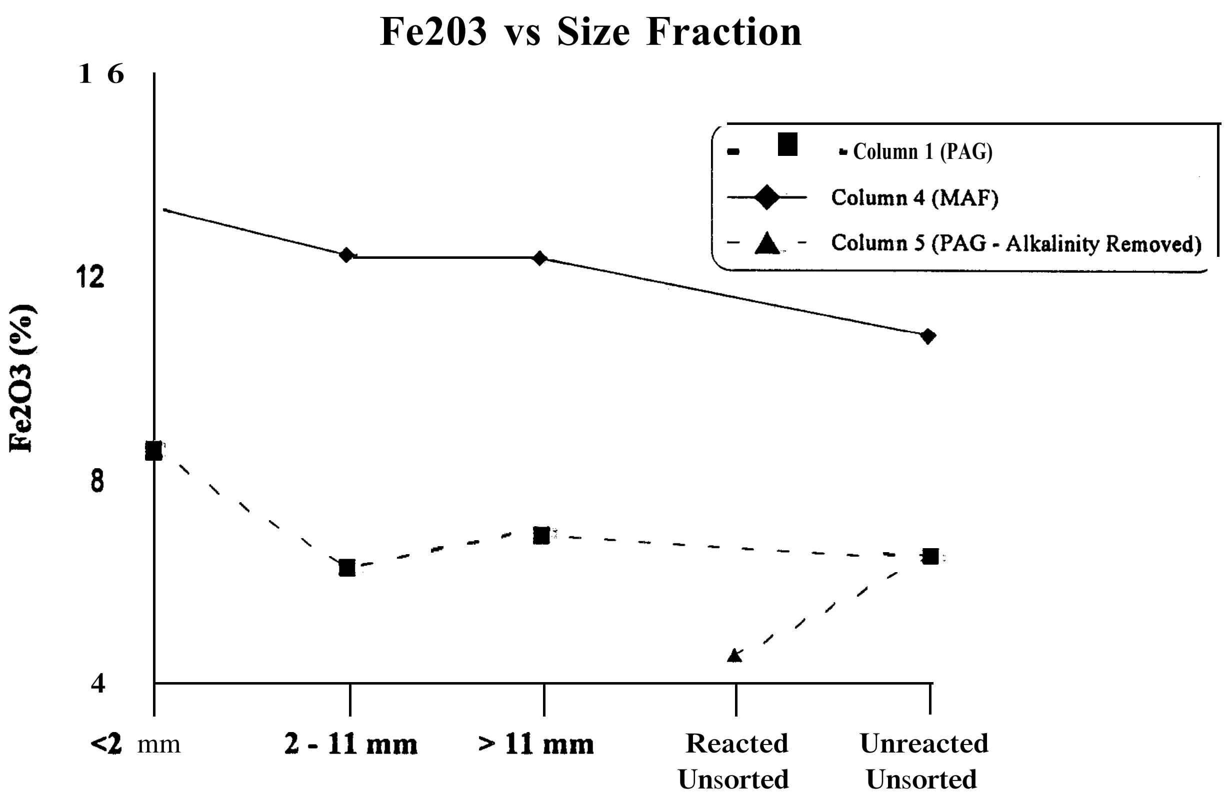
A1203 vs Size Fraction

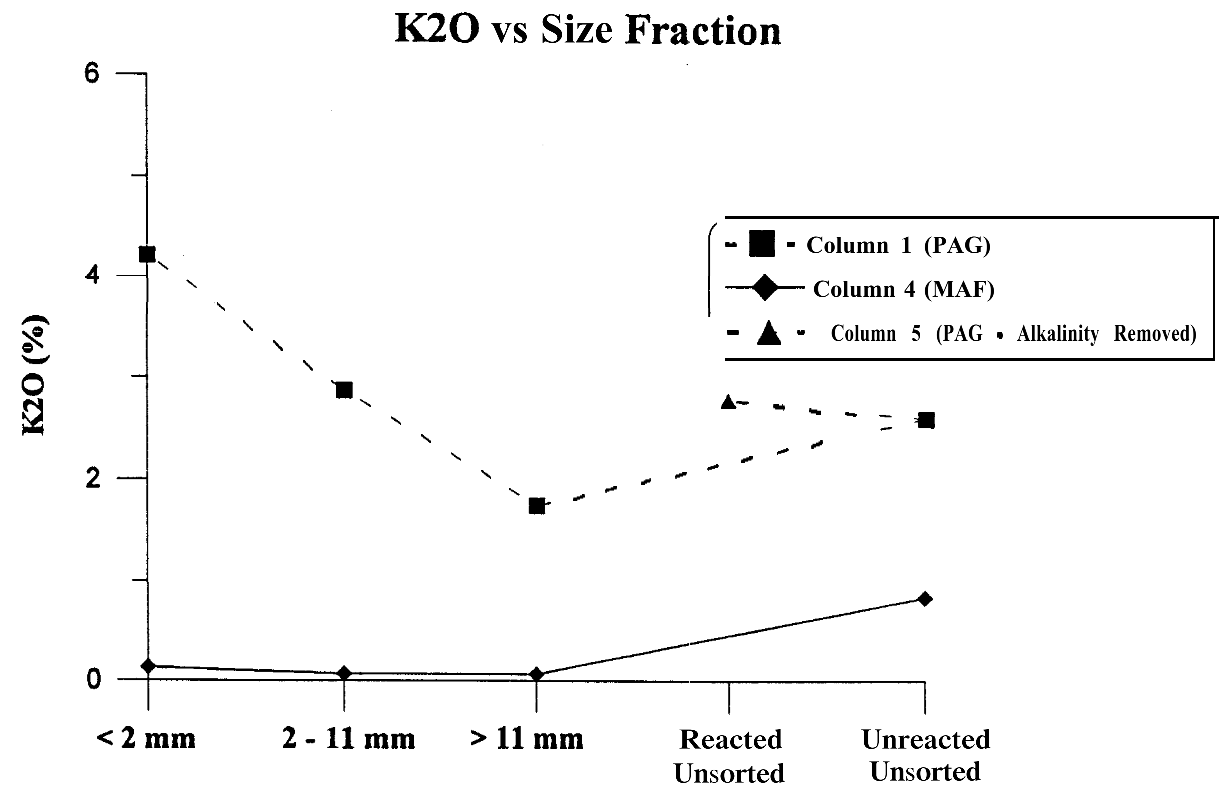


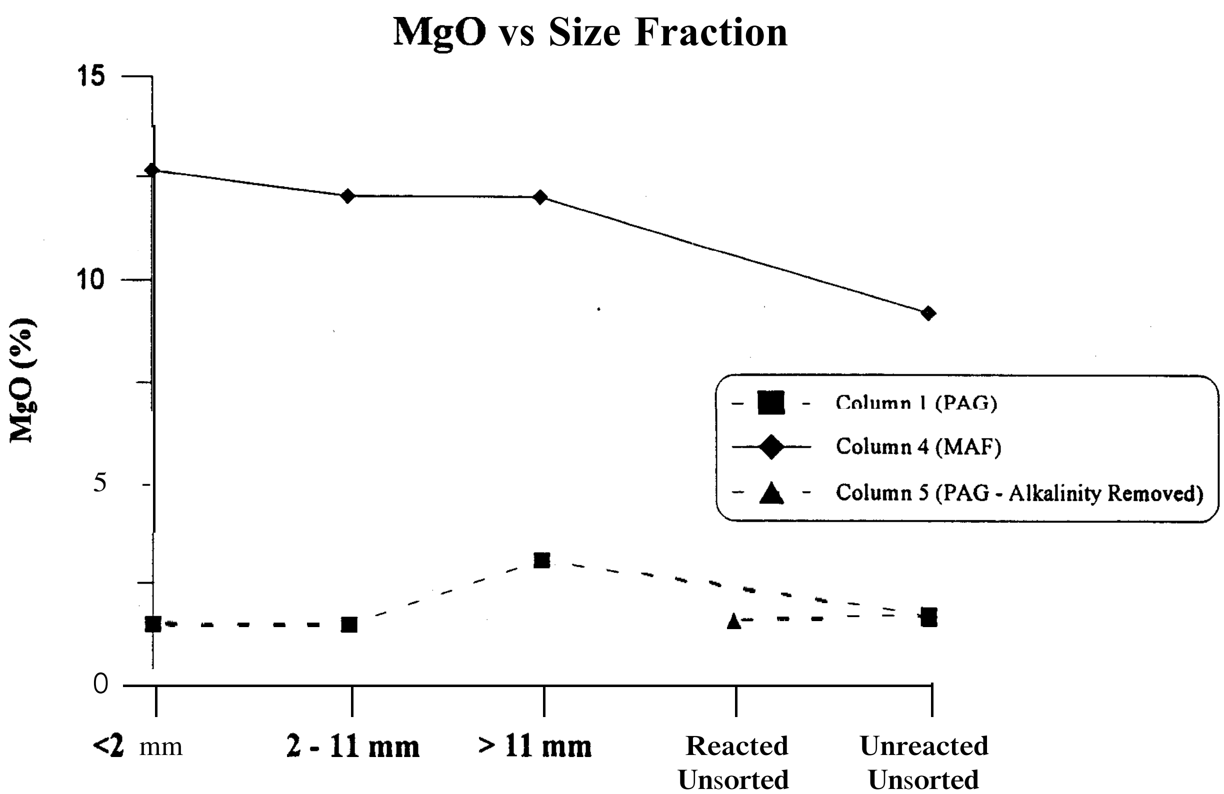
CaO vs Size Fraction

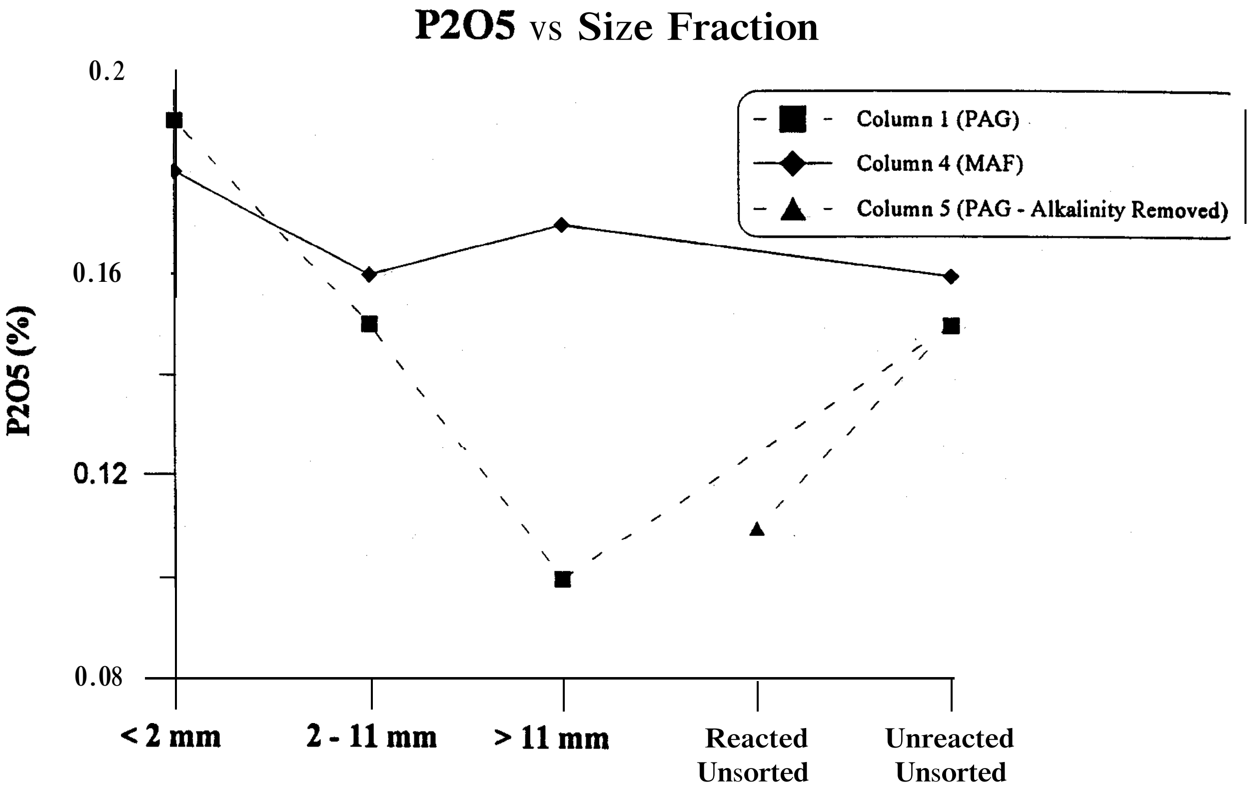


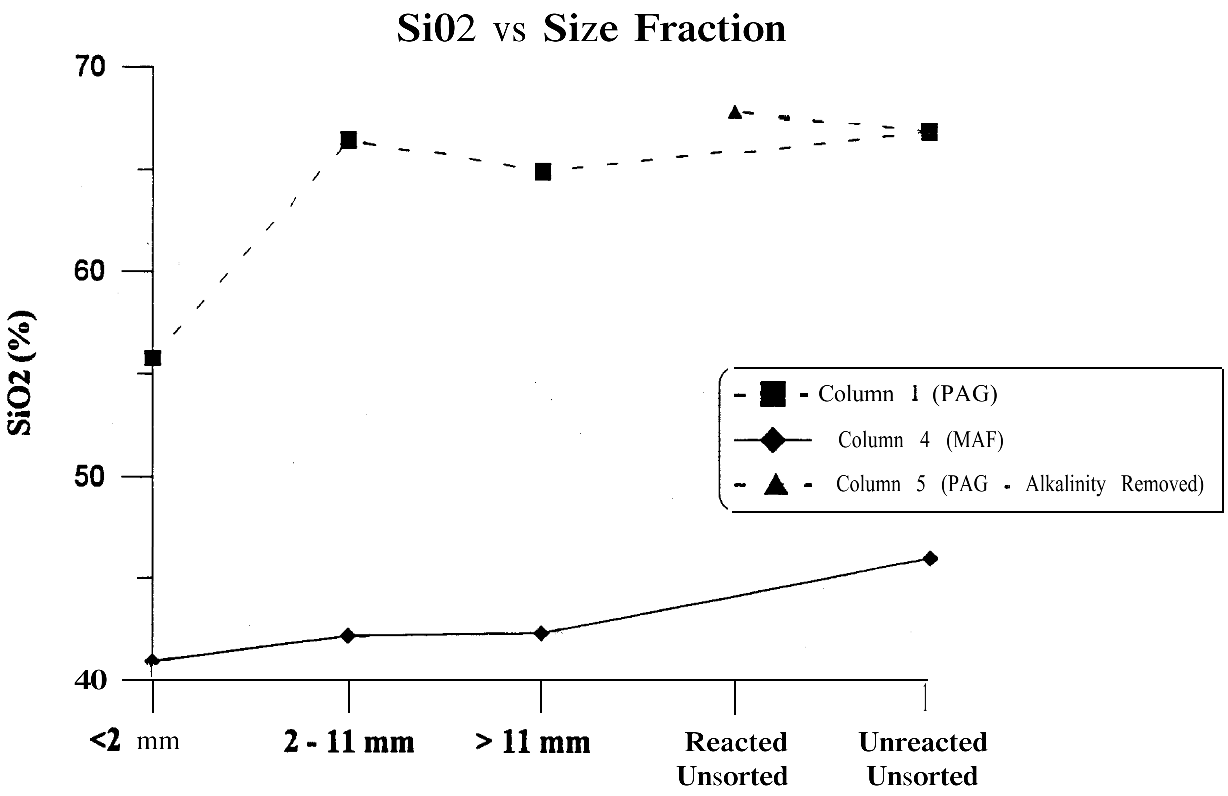

Cr2O3 vs Size Fraction
0.02
0.01
0
Cr2O3 (%)
Column 1 (PAG)
Column 4 (MAF)
Column 5 (PAG • Alkalinity Removed)
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

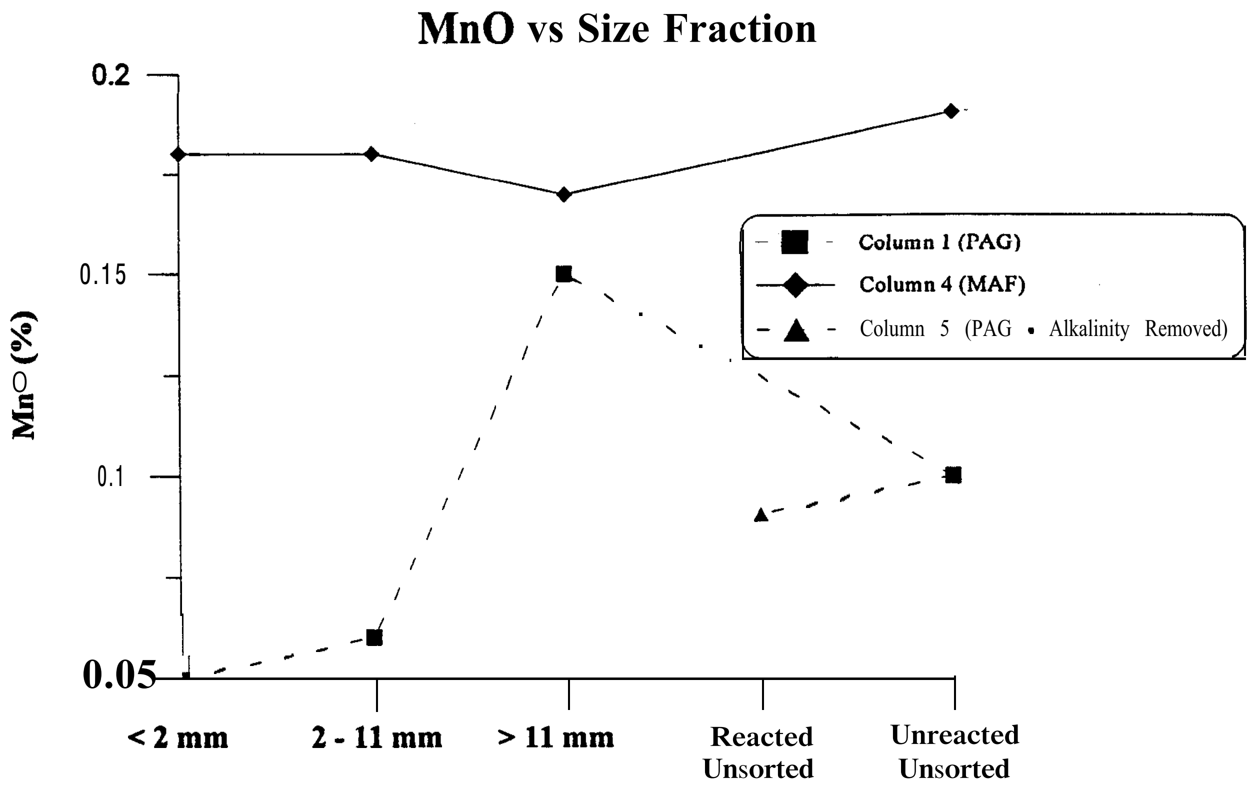

Fe203 vs Size Fraction
1 6
12
8
4
Fe2O3 (%)
Column 1 (PAG)
Column 4 (MAF)
Column 5 (PAG - Alkalinity Removed)
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

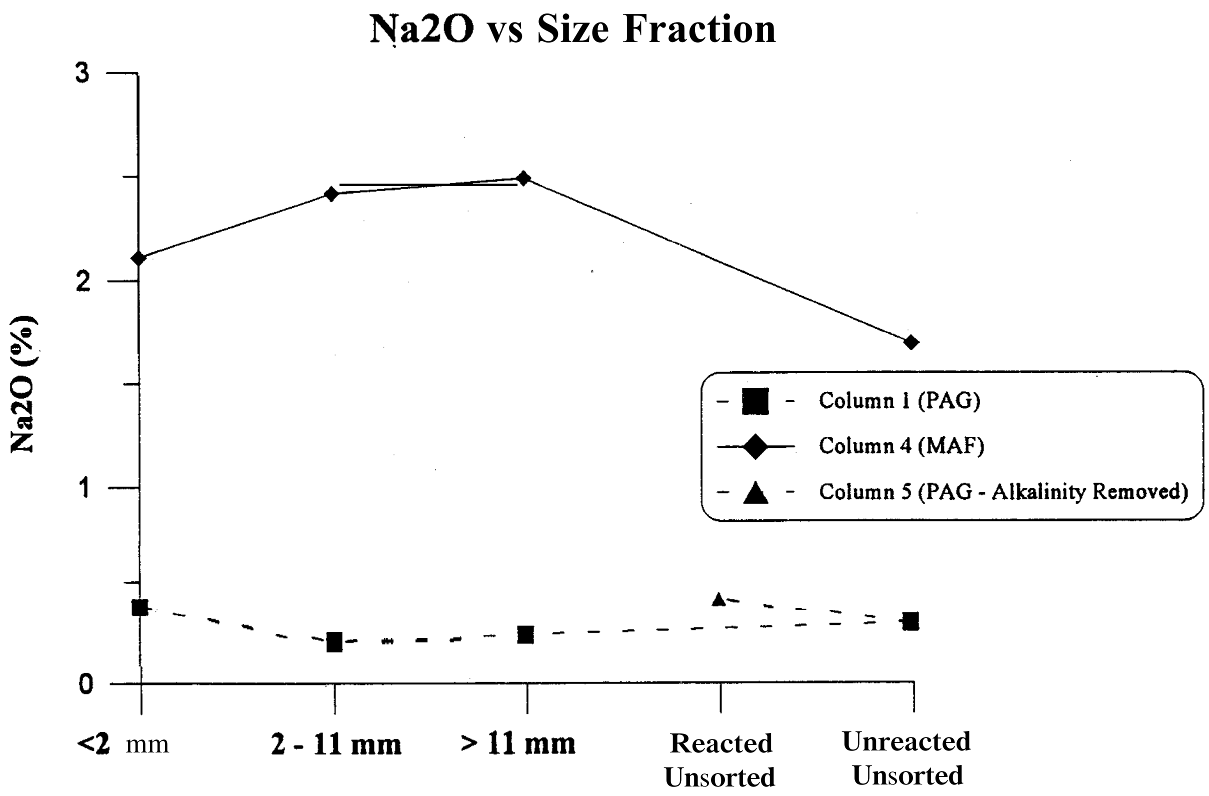

K2O vs Size Fraction
6
4
2
0
K2O (%)
Column 1 (PAG)
Column 4 (MAF)
Column 5 (PAG • Alkalinity Removed)
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted


MgO vs Size Fraction
15
10
5
0
MgO (%)
Column 1 (PAG)
Column 4 (MAF)
Column 5 (PAG - Alkalinity Removed)
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

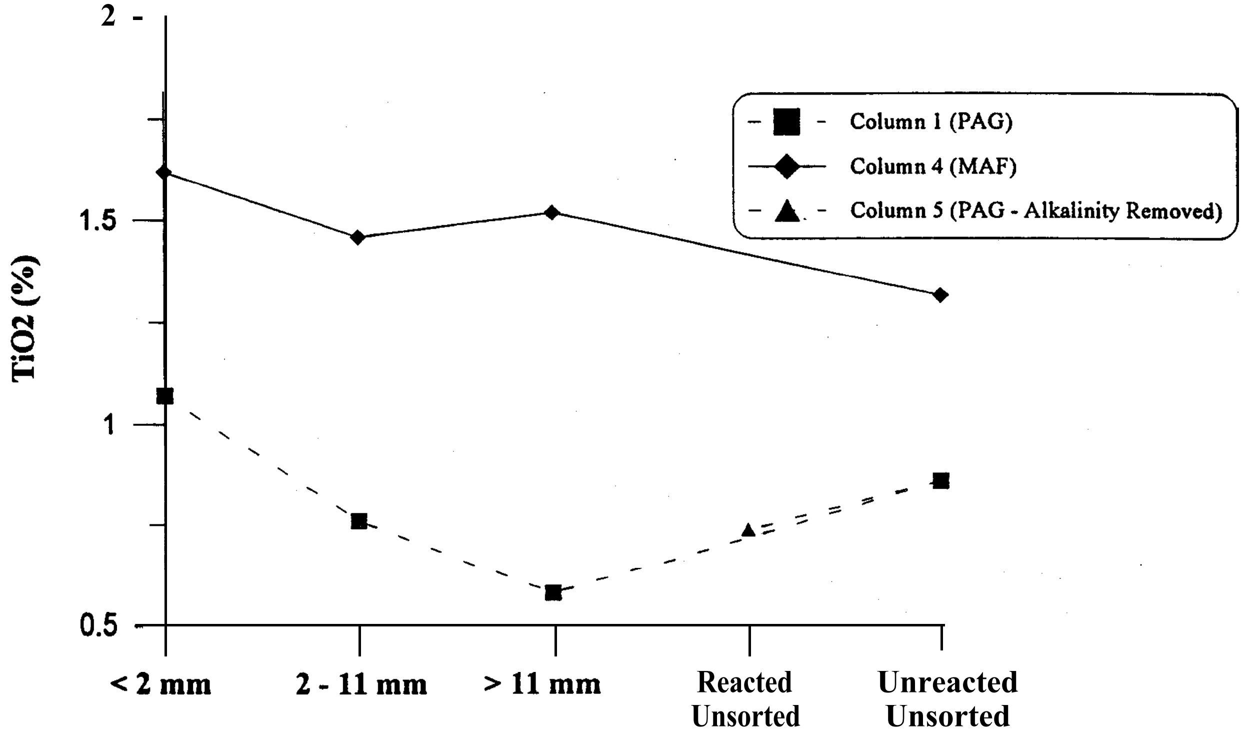

P2O5 vs Size Fraction
0.2
0.16
0.12
0.08
P2O5 (%)
Column 1 (PAG)
Column 4 (MAF)
Column 5 (PAG - Alkalinity Removed)
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted


Si02 vs Size Fraction
70
60
50
40
SiO2 (%)
Column 1 (PAG)
Column 4 (MAF)
Column 5 (PAG - Alkalinity Removed)
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

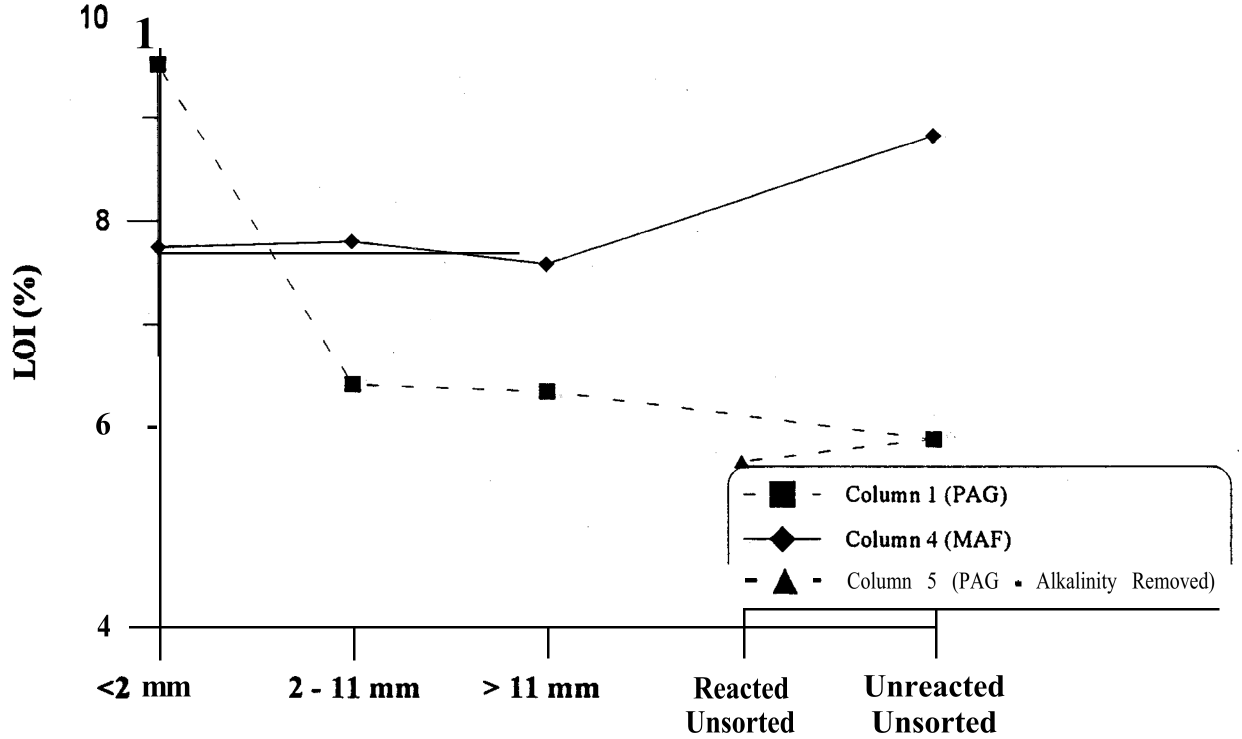

MnO vs Size Fraction
0.2
0.15
0.1
0.05
MnO (%)
Column 1 (PAG)
Column 4 (MAF)
Column 5 (PAG • Alkalinity Removed)
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted


Na2O vs Size Fraction
3
2
1
0
Na2O (%)
Column 1 (PAG)
Column 4 (MAF)
Column 5 (PAG - Alkalinity Removed)
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

Ti02 vs Size Fraction

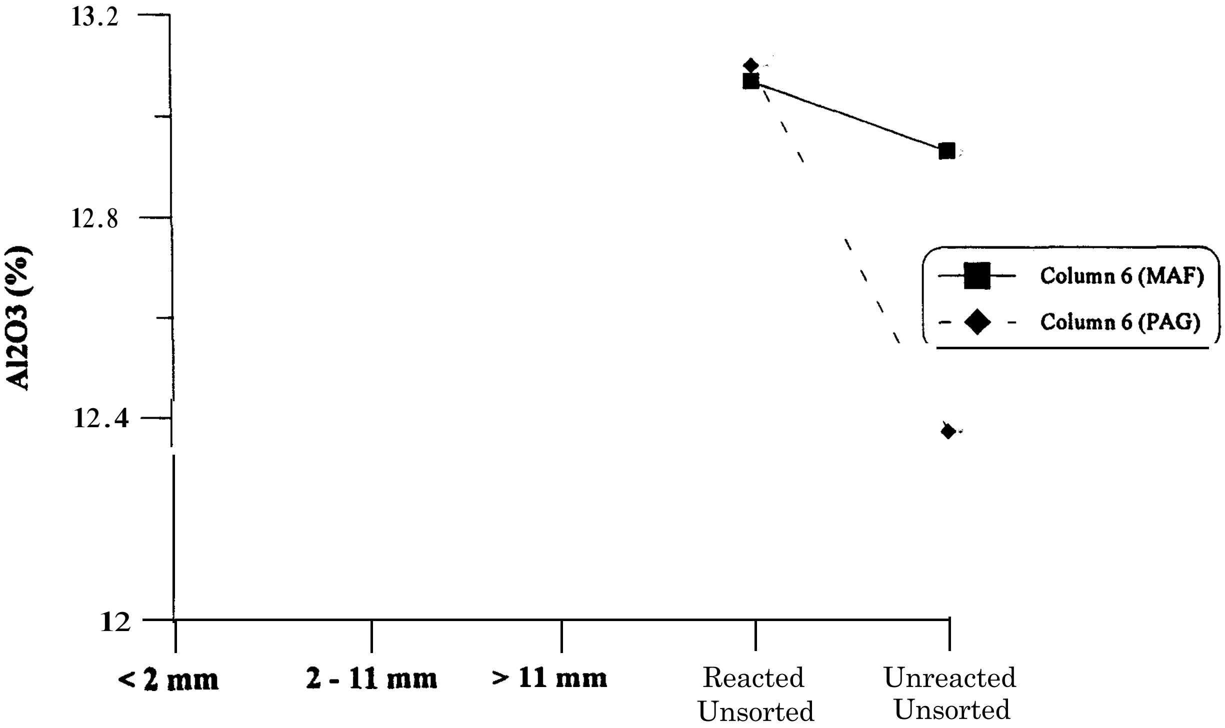


LO1 vs Size Fraction

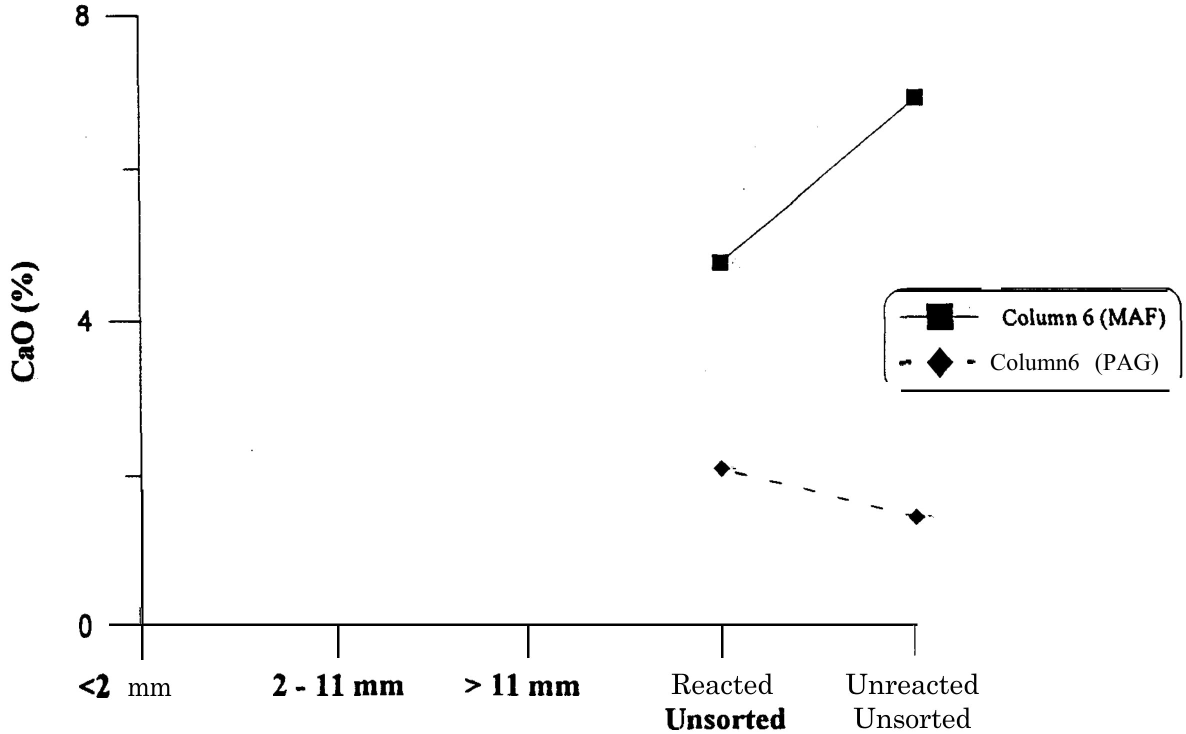


A4.4. Column 6

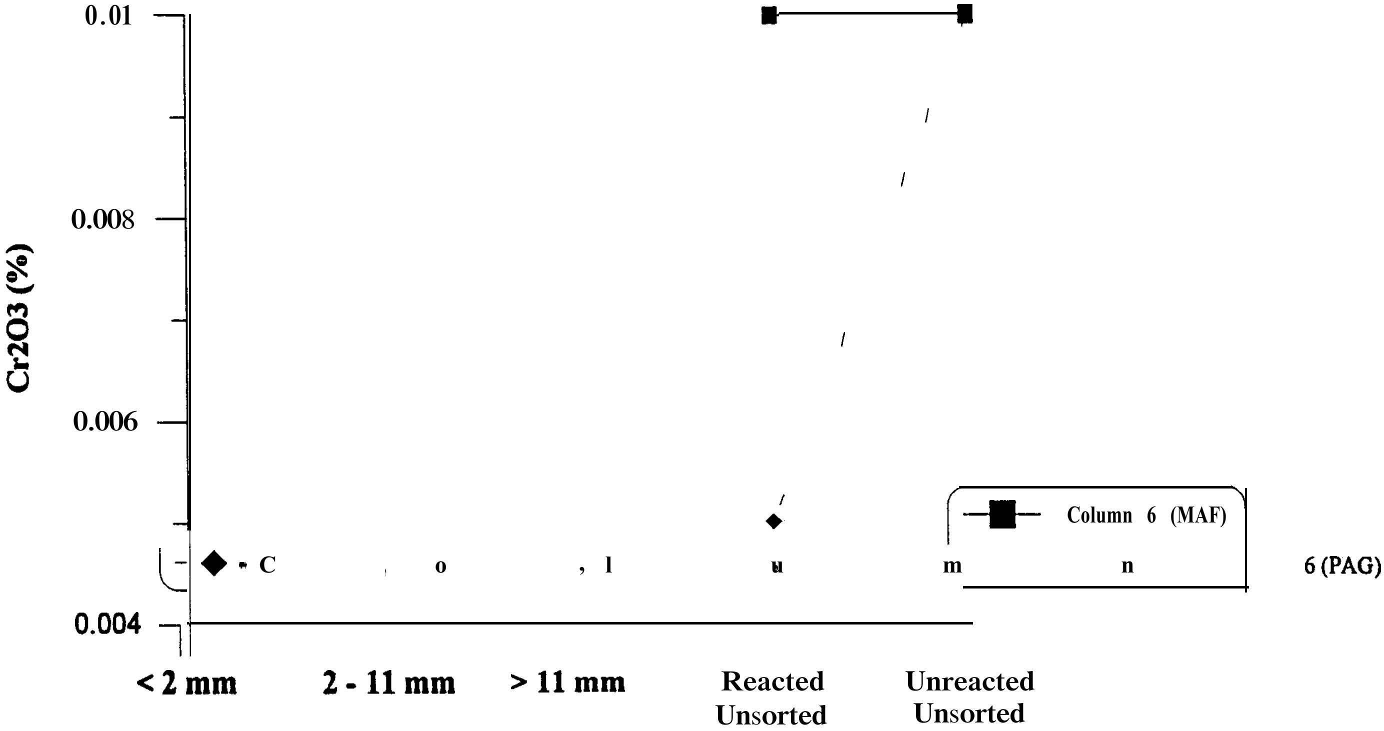
A1203 vs Size Fraction



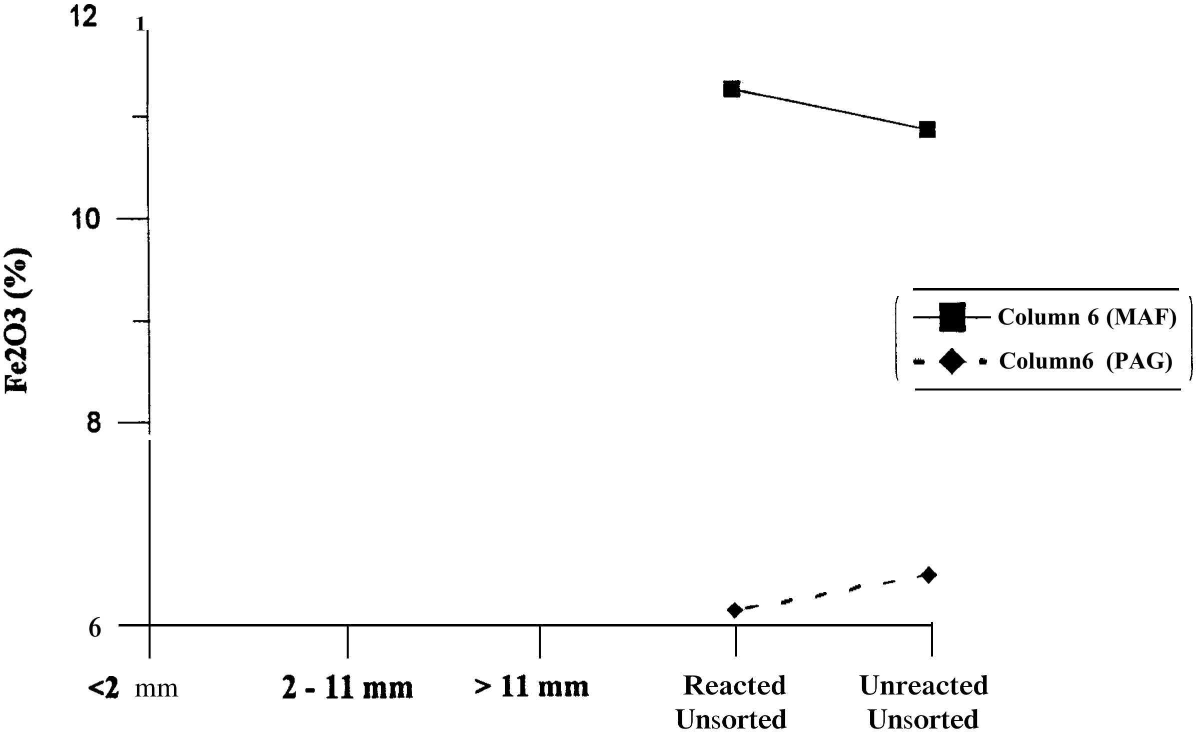
CaO vs Size Fraction



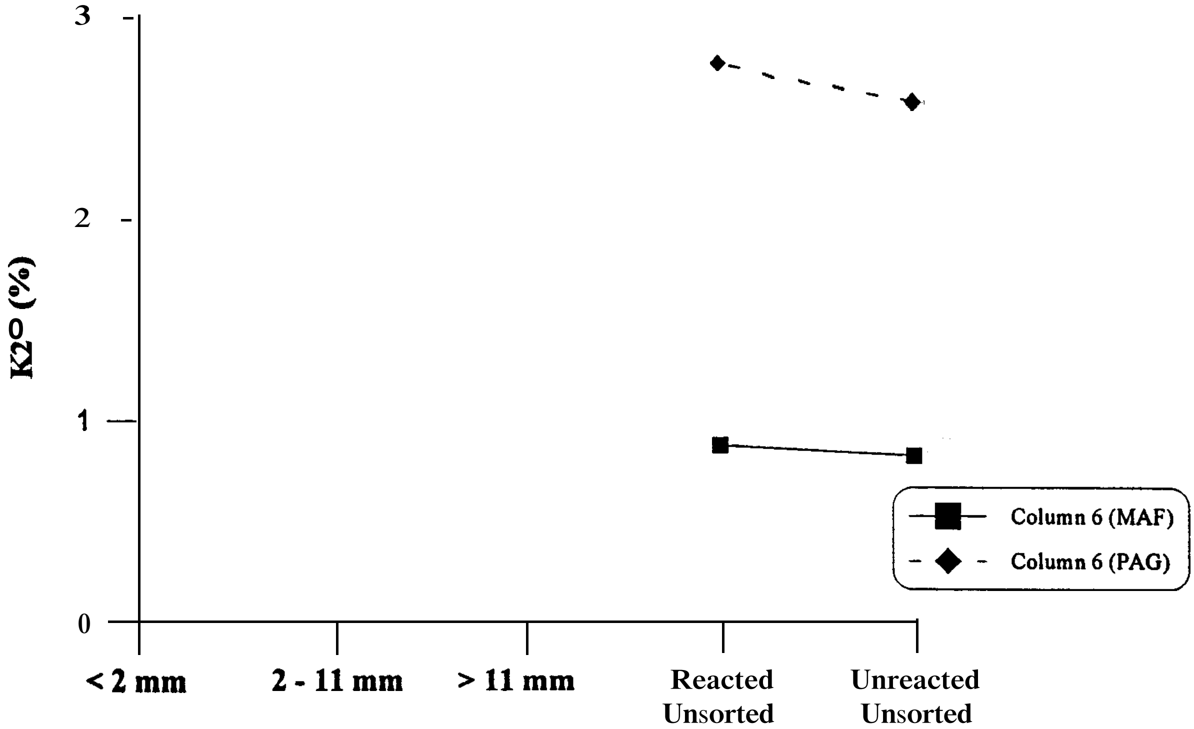
Cr203 vs Size Fraction



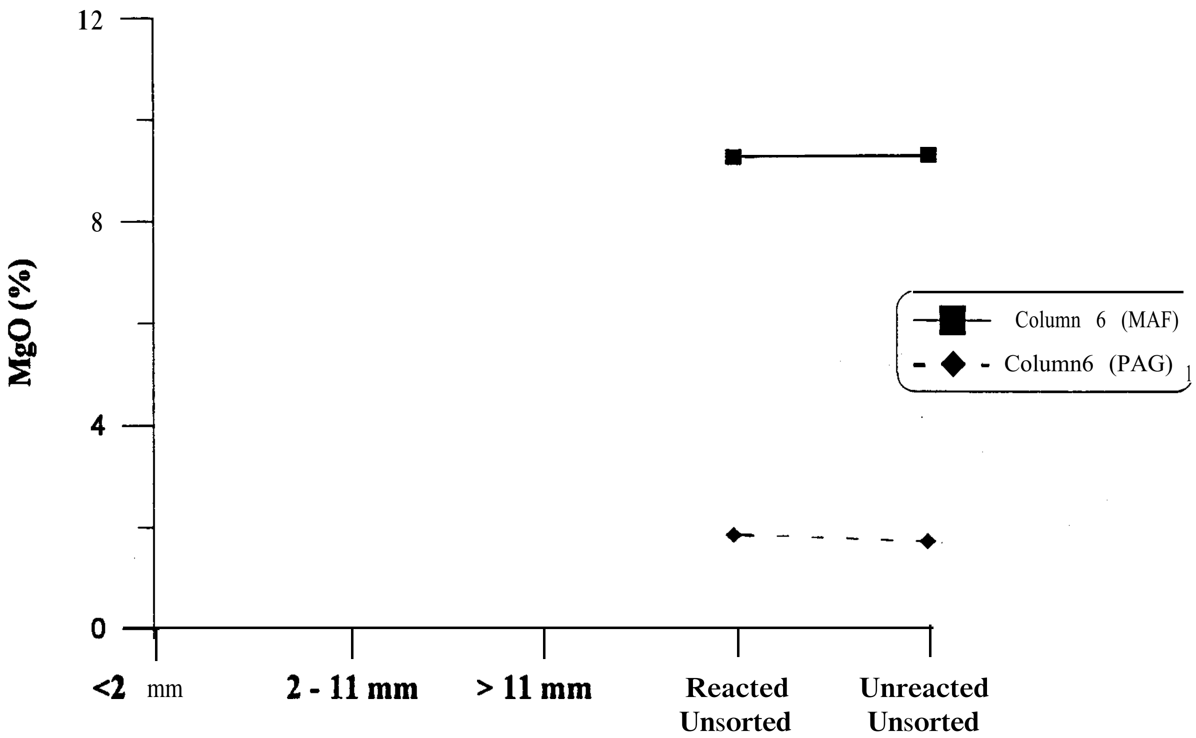
Fe203 vs Size Fraction

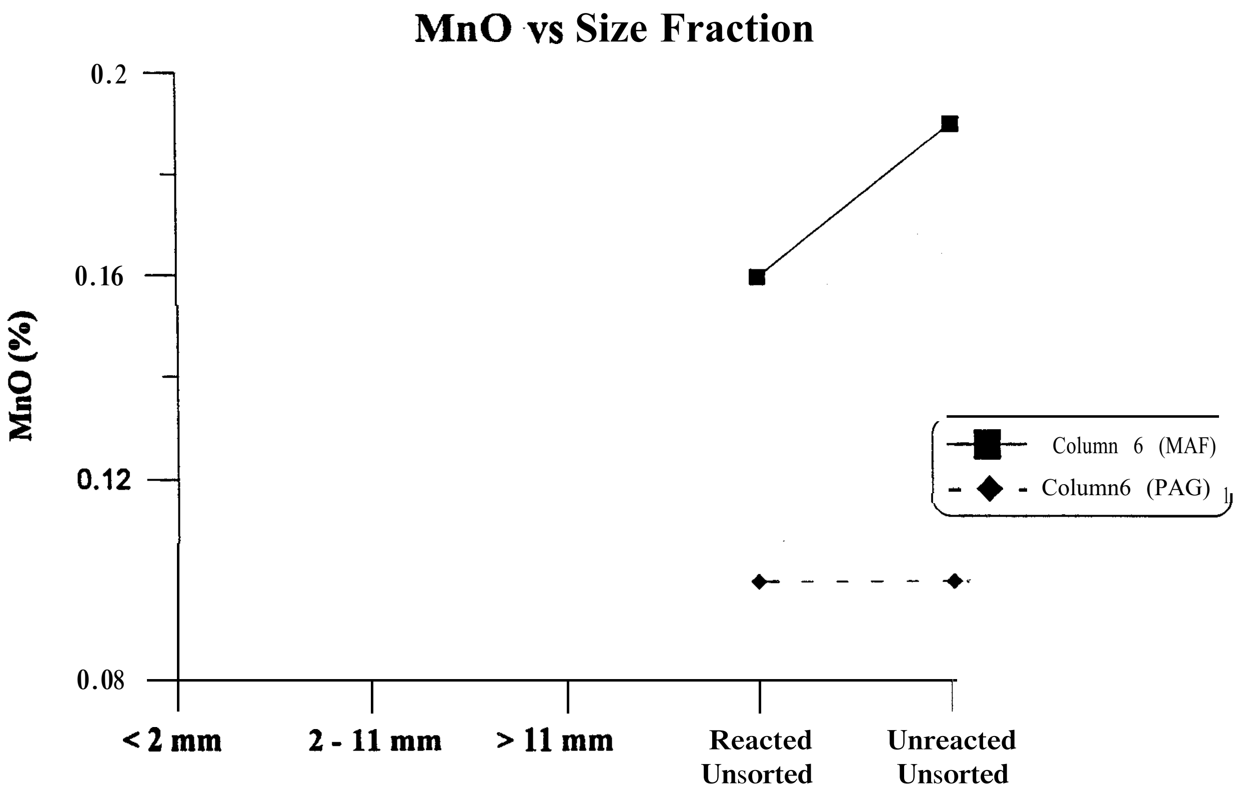


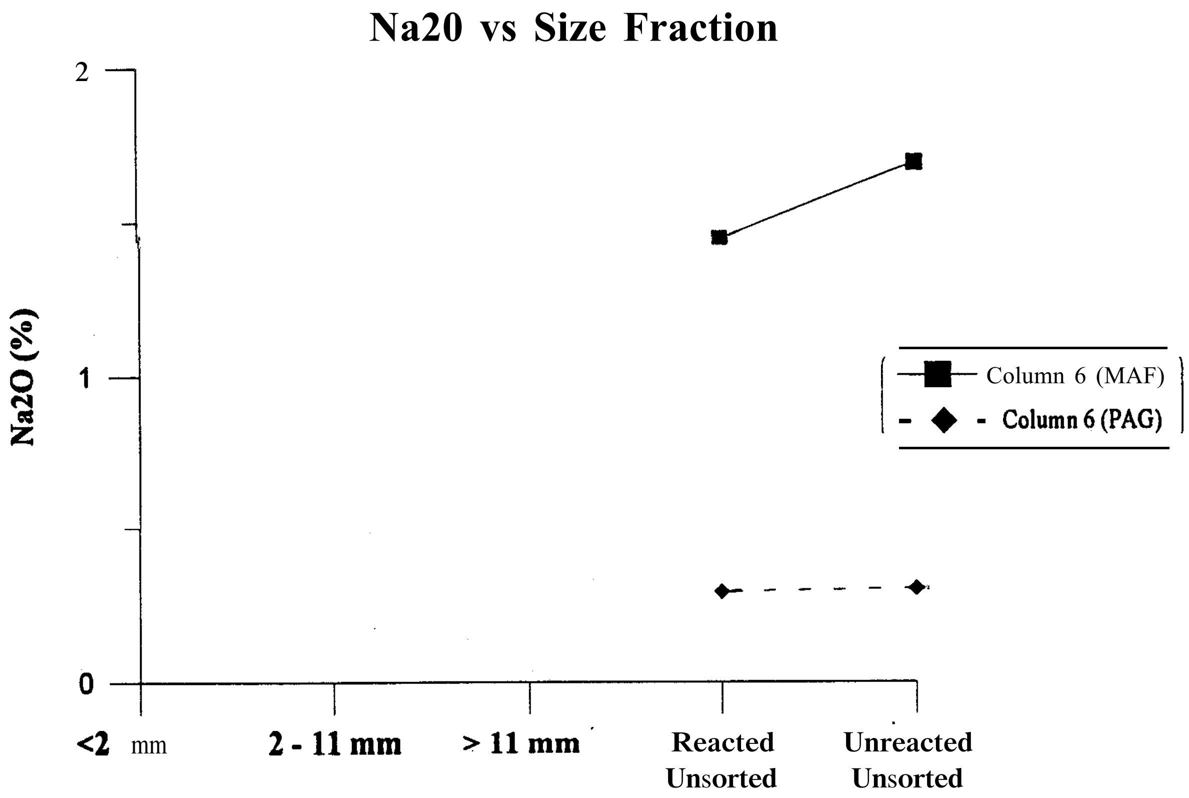
K2O vs Size Fraction

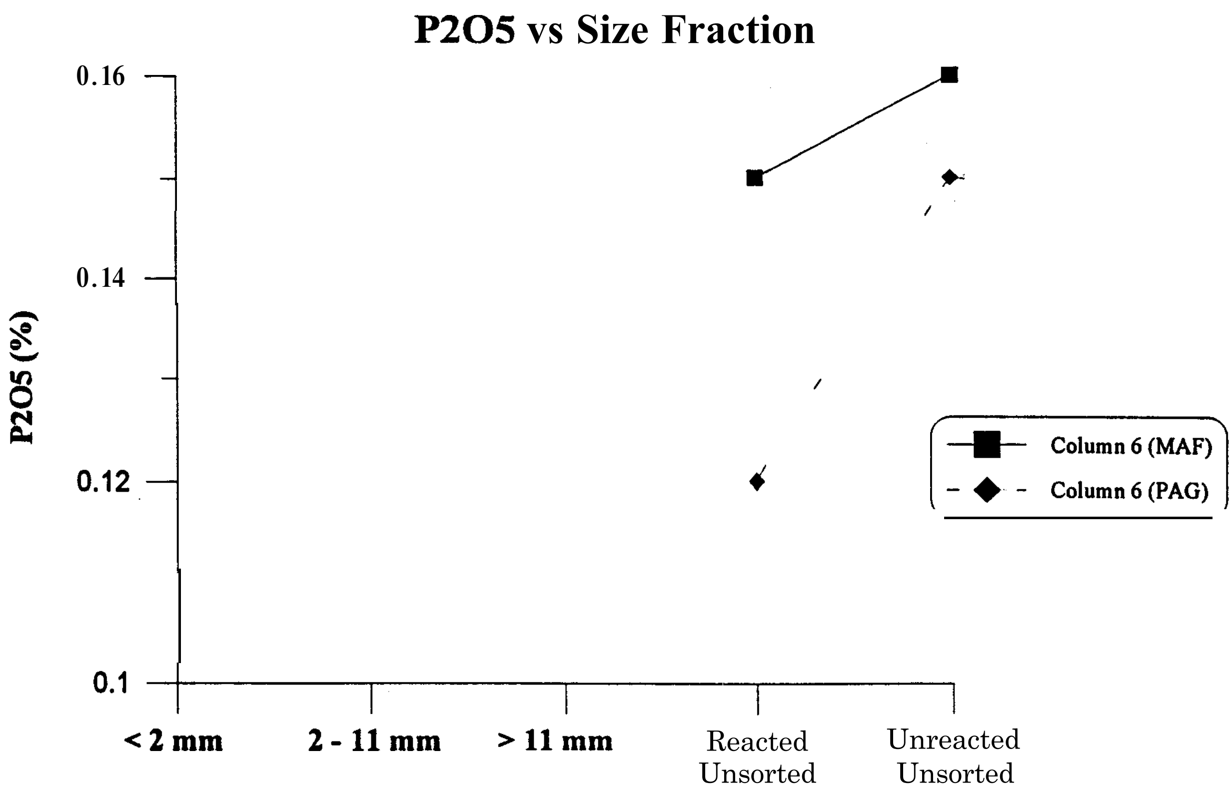


MgO vs Size Fraction

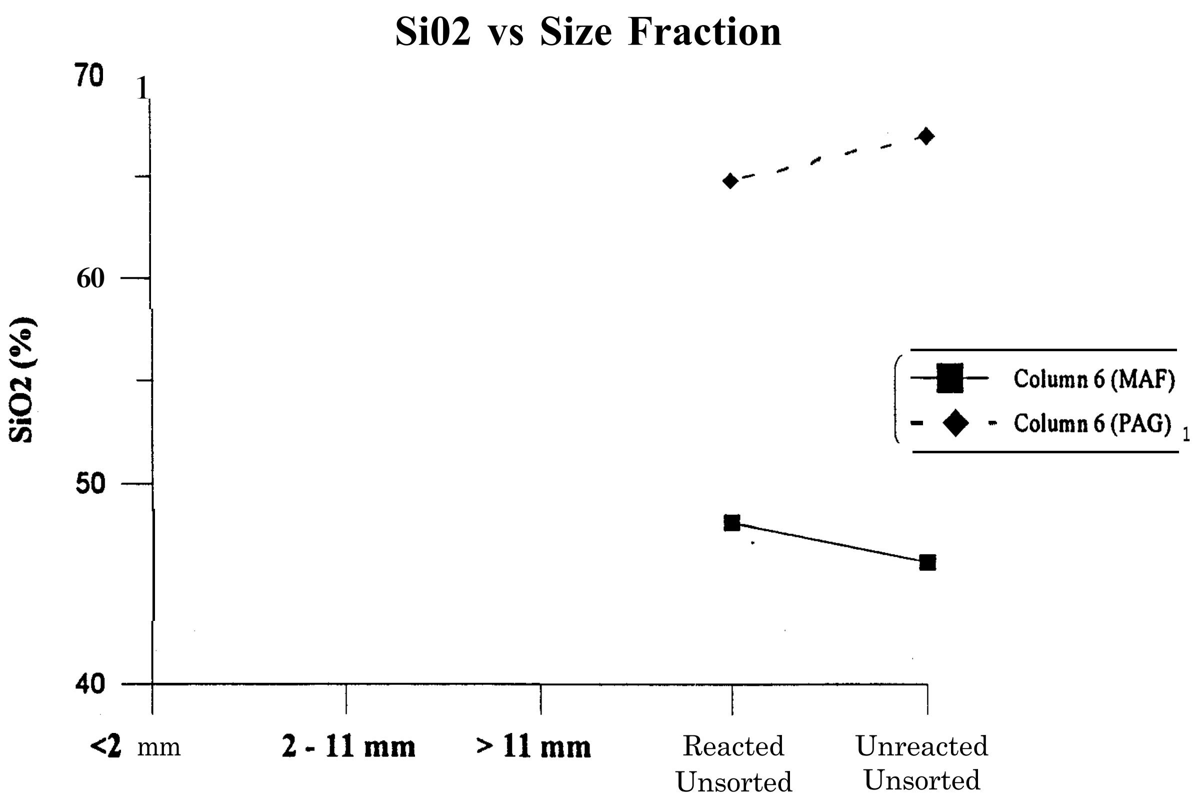



MnO vs Size Fraction
0.2
0.16
0.12
0.08
MnO (%)
Column 6 (MAF)
Column6 (PAG)
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted


Na20 vs Size Fraction
2
1
0
Na2O (%)
Column 6 (MAF)
Column 6 (PAG)
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

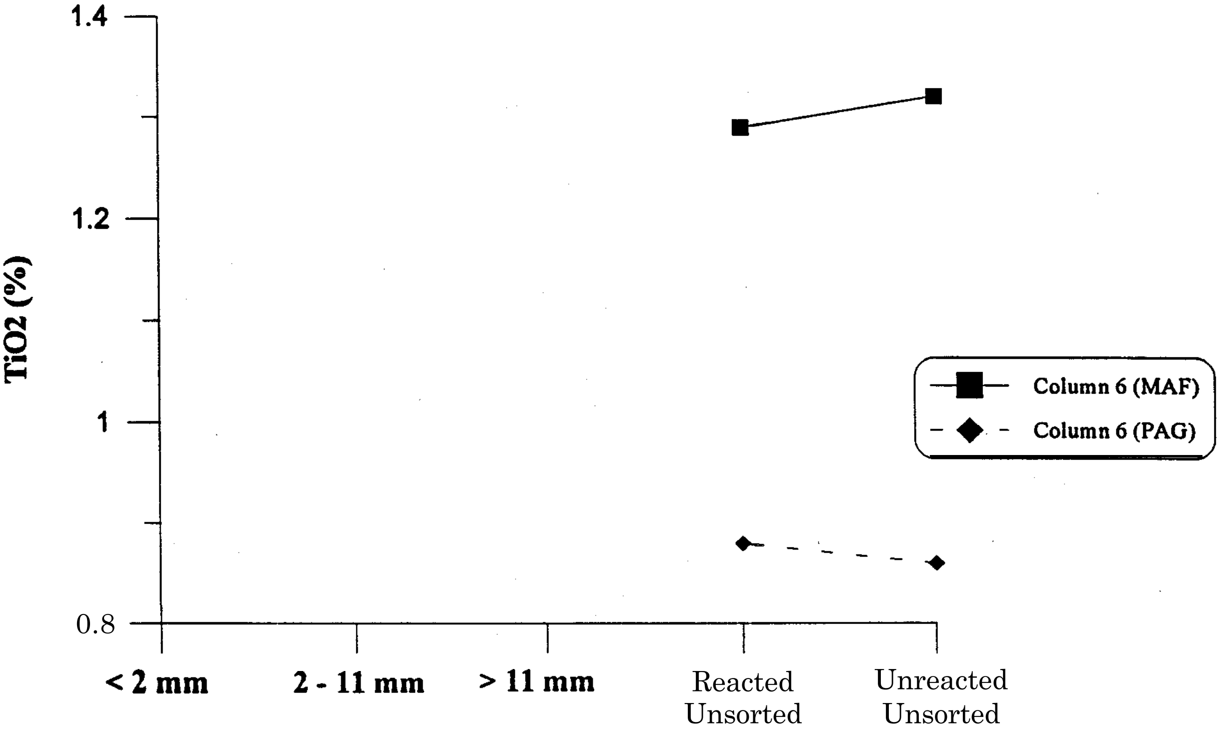


P2O5 vs Size Fraction
P2O5 (%)
0.16
0.14
0.12
0.1
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 6 (MAF)
Column 6 (PAG)

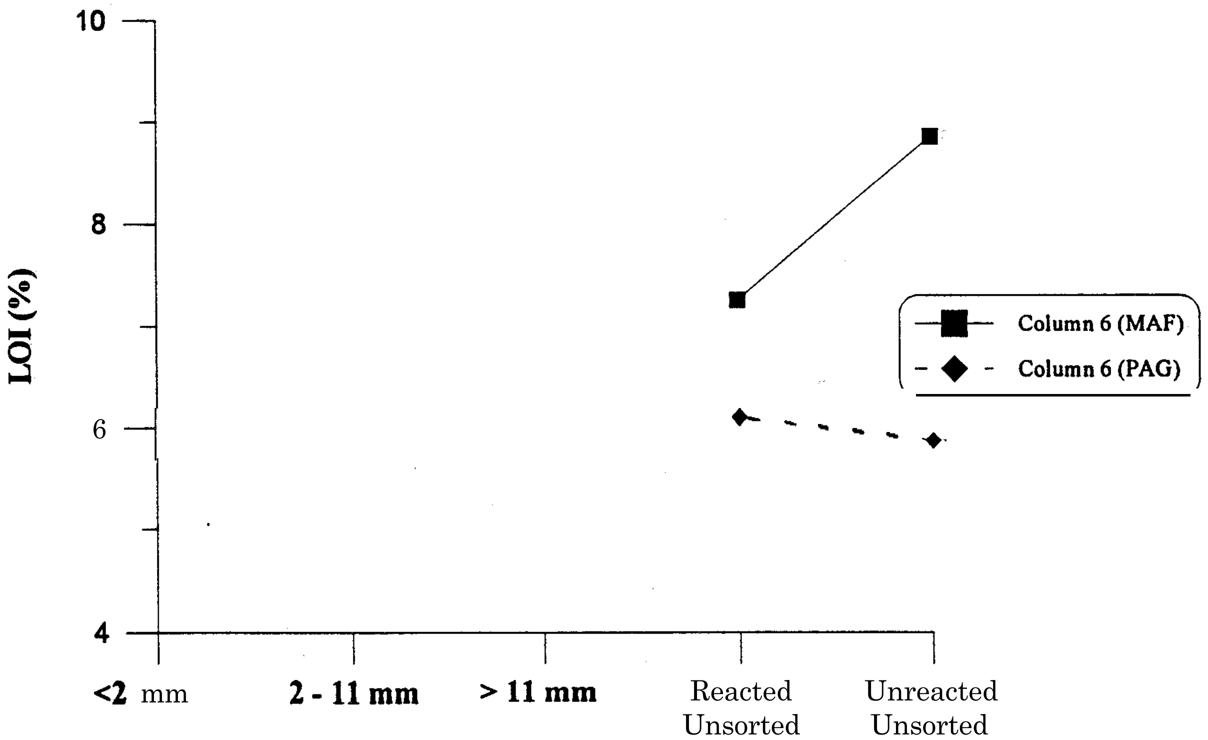


Si02 vs Size Fraction
SiO2 (%)
70
60
50
40
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 6 (MAF)
Column 6 (PAG)

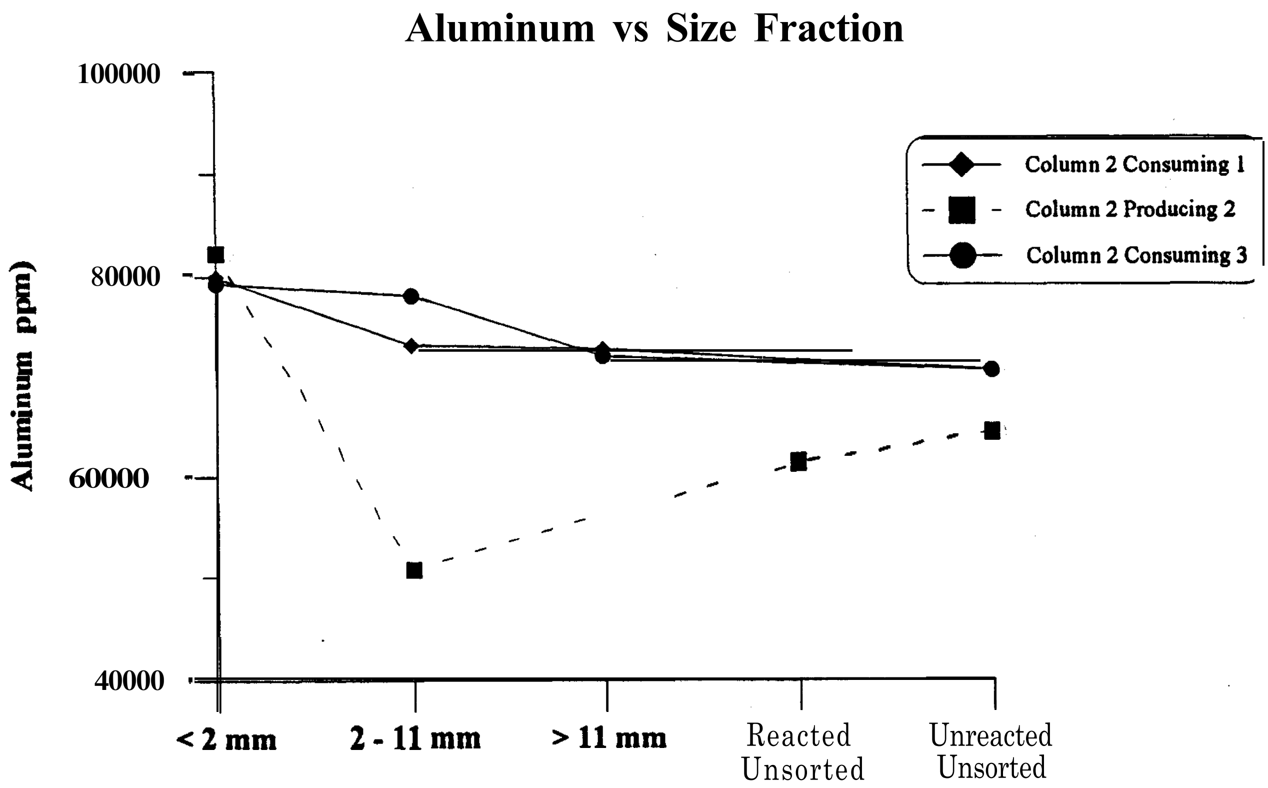
Ti02 vs Size Fraction

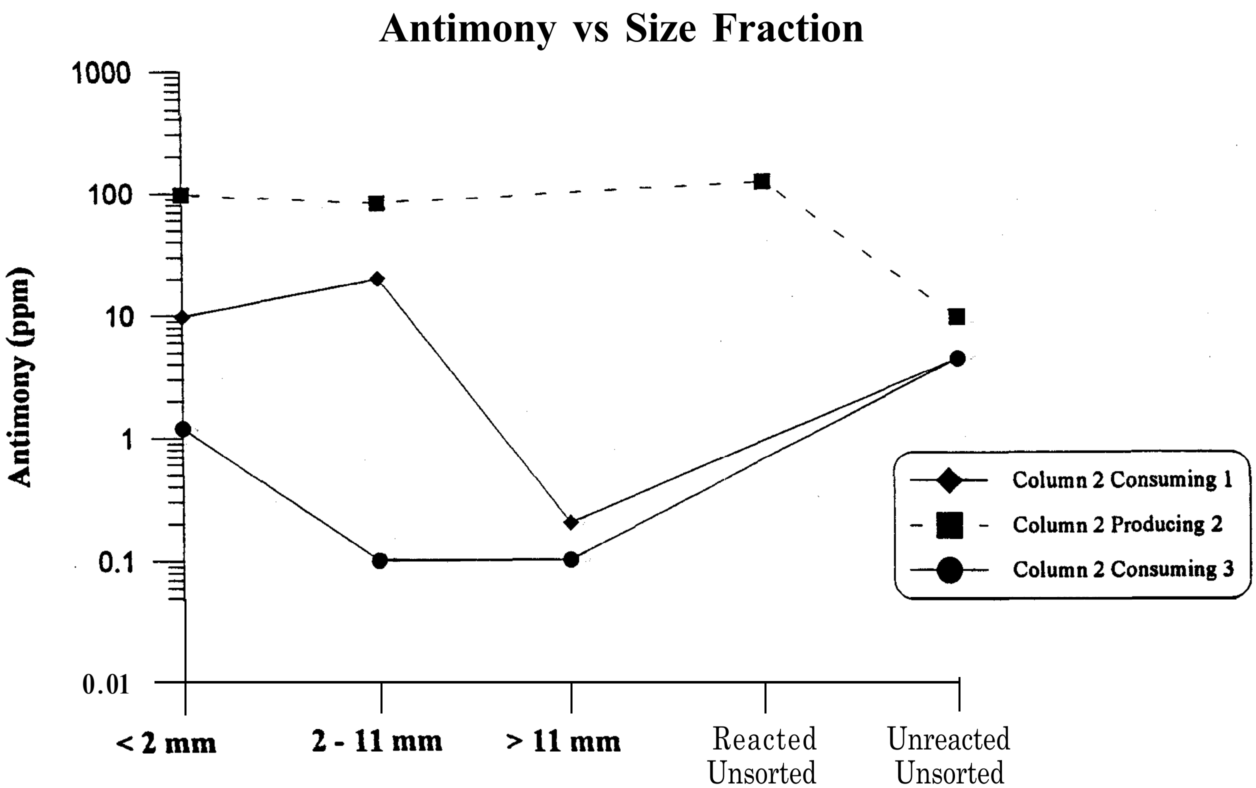


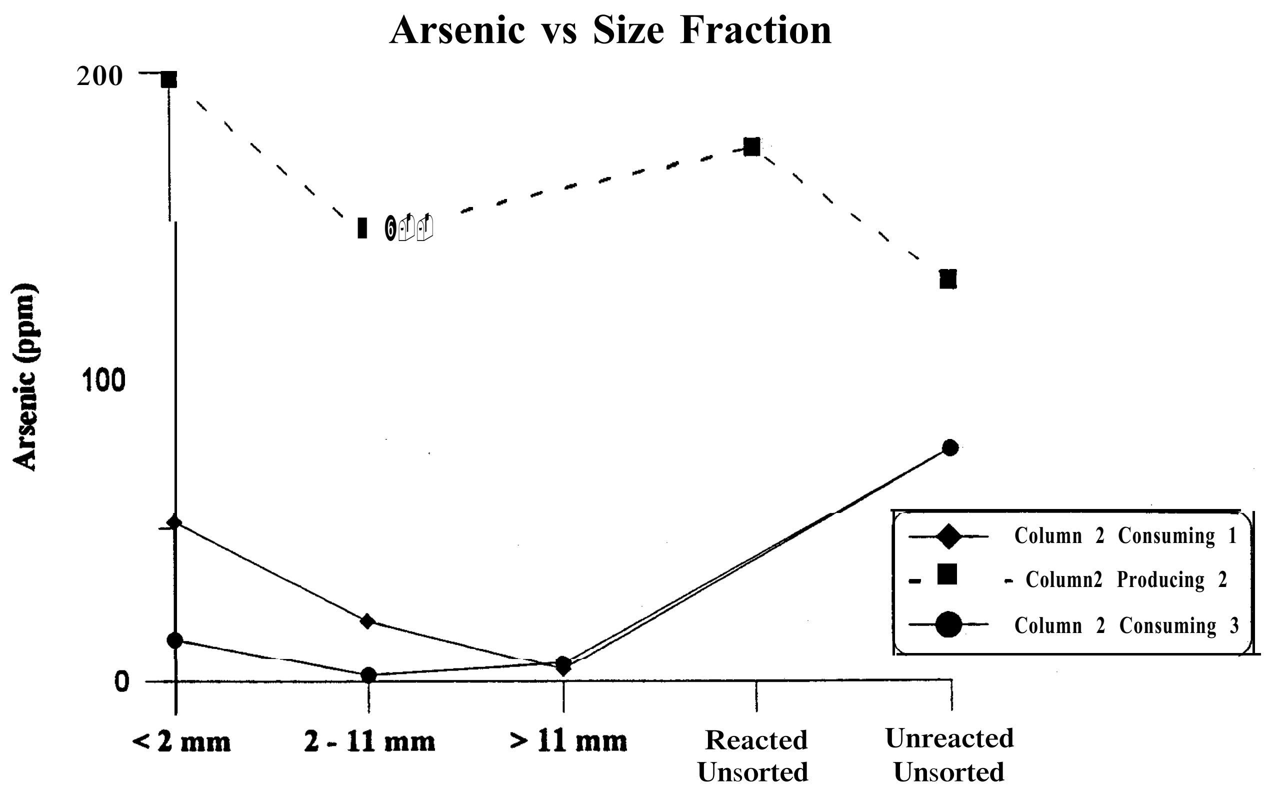
LO1 vs Size Fraction



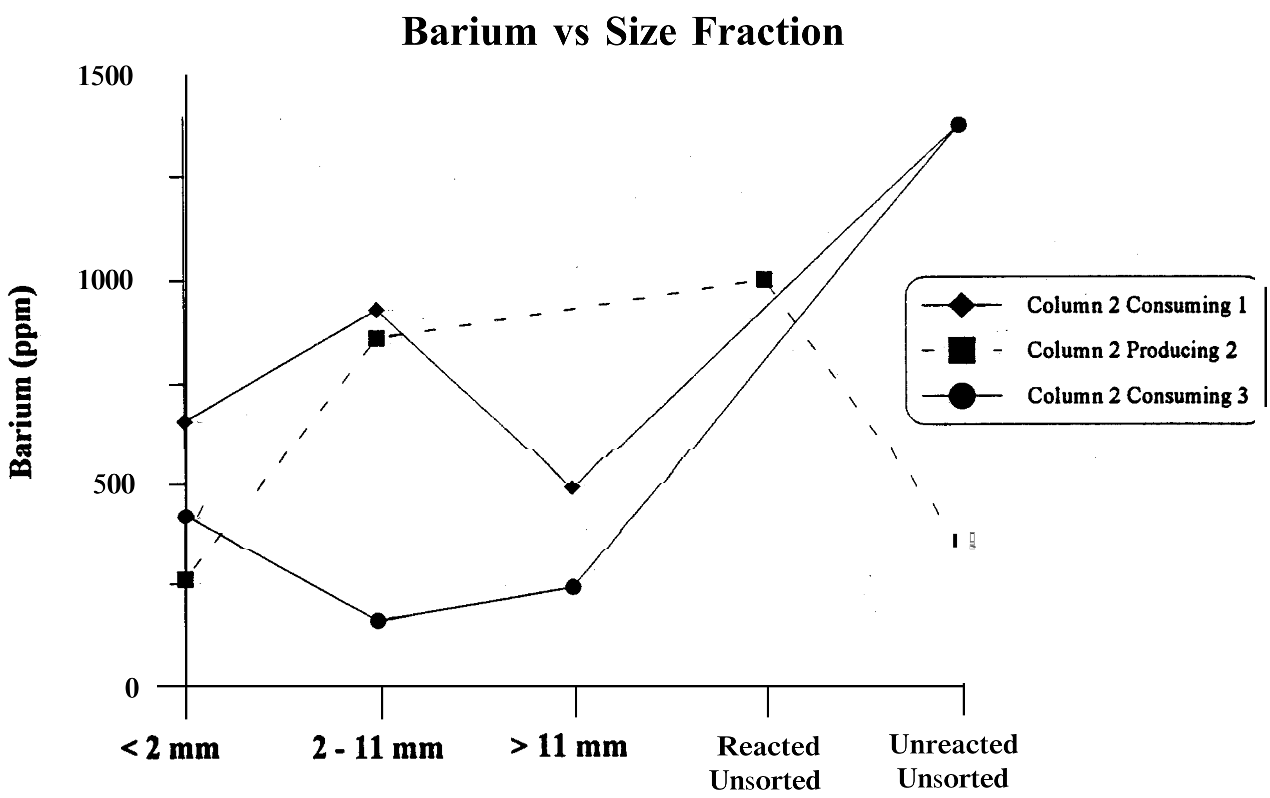
A5. Graphs of Total-Metal Contents for Columns by Grain Size


Aluminum vs Size Fraction
100000
80000
60000
40000
Aluminum (ppm)
Column 2 Consuming 1
Column 2 Producing 2
Column 2 Consuming 3
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

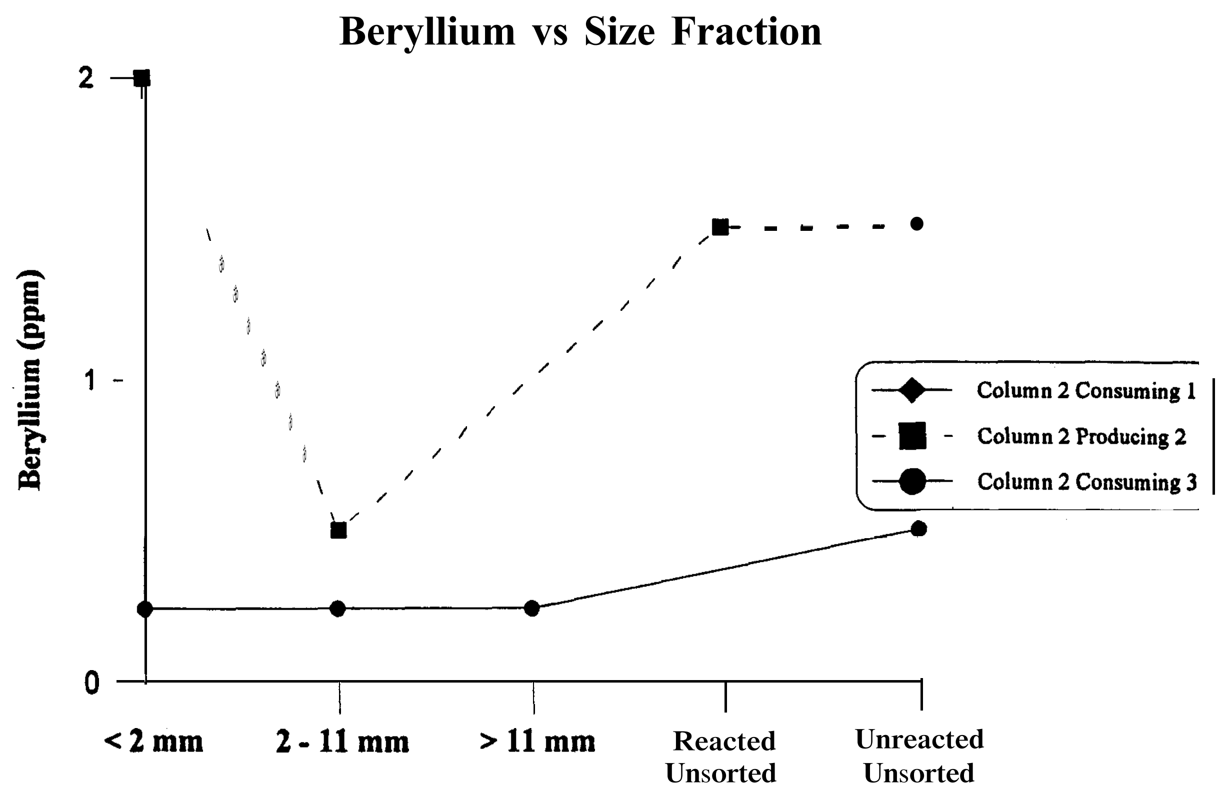

Antimony vs Size Fraction
1000
100
10
1
0.1
0.01
Antimony (ppm)
Column 2 Consuming 1
Column 2 Producing 2
Column 2 Consuming 3
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

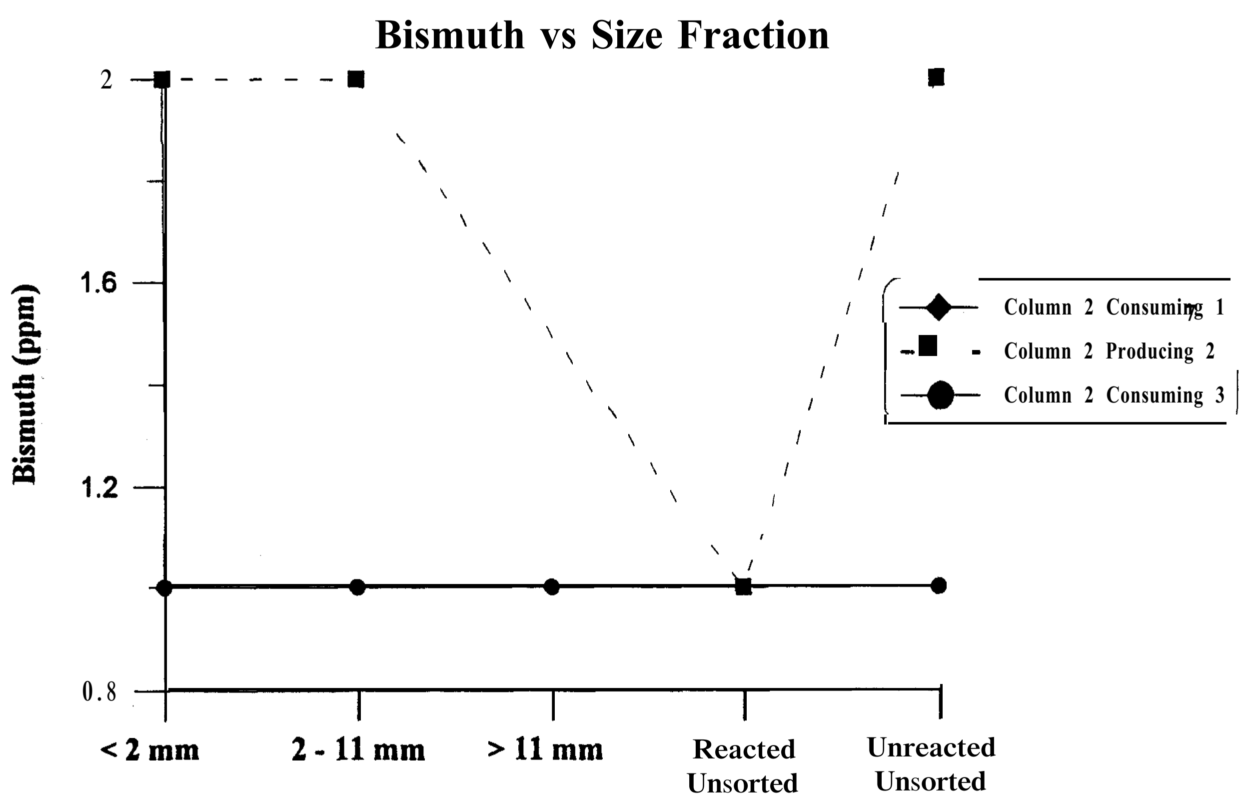


Arsenic vs Size Fraction
200
100
0
Arsenic (ppm)
< 2 mm
2 - 11 mm
> 11 mm
Reacted
Unsorted
Unreacted
Unsorted
Column 2 Consuming 1
Column2 Producing 2
Column 2 Consuming 3

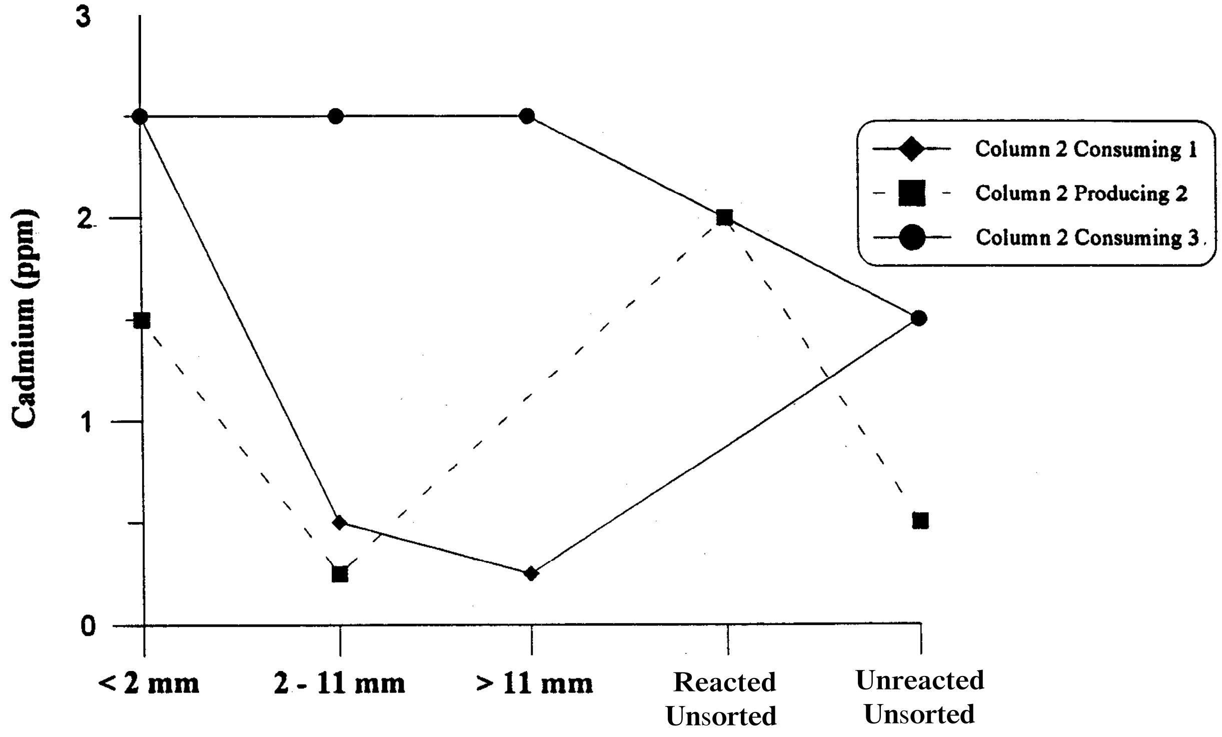


Barium vs Size Fraction
1500
1000
500
0
Barium (ppm)
< 2 mm
2 - 11 mm
> 11 mm
Reacted
Unsorted
Unreacted
Unsorted
Column 2 Consuming 1
Column 2 Producing 2
Column 2 Consuming 3

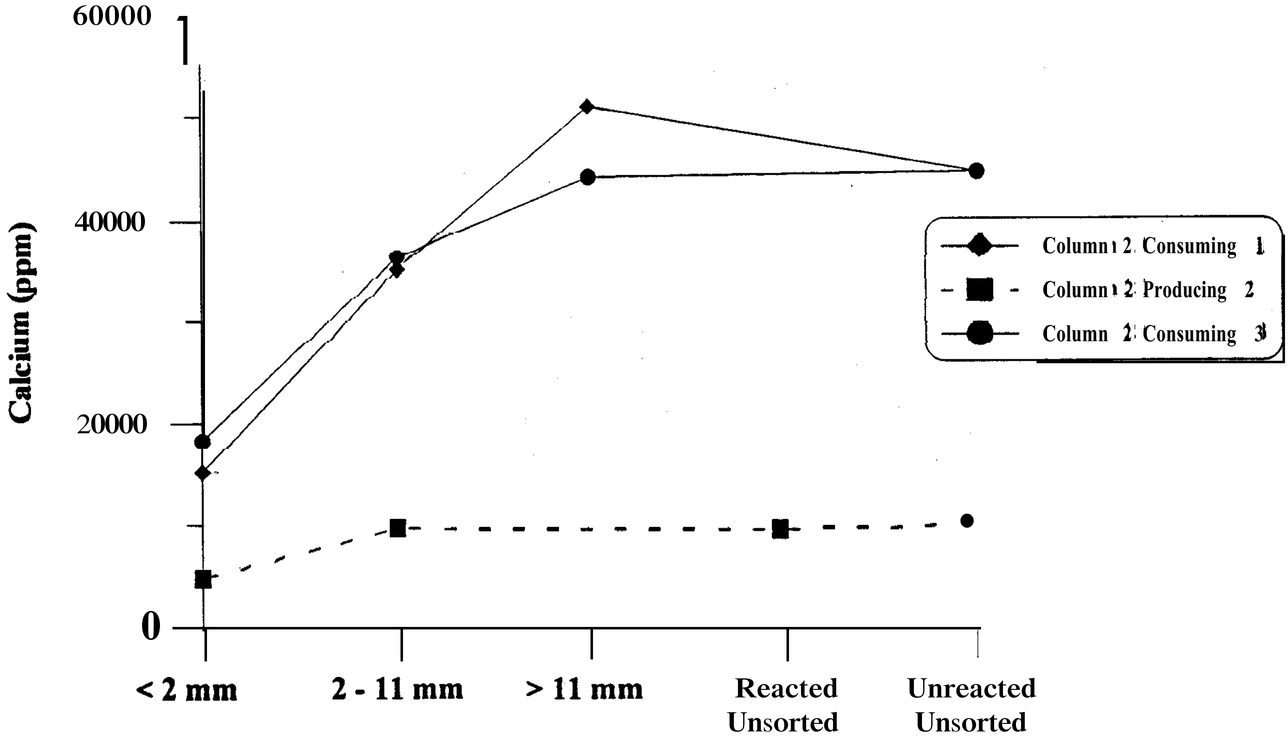

Beryllium vs Size Fraction
2
1
0
Beryllium (ppm)
Column 2 Consuming 1
Column 2 Producing 2
Column 2 Consuming 3
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

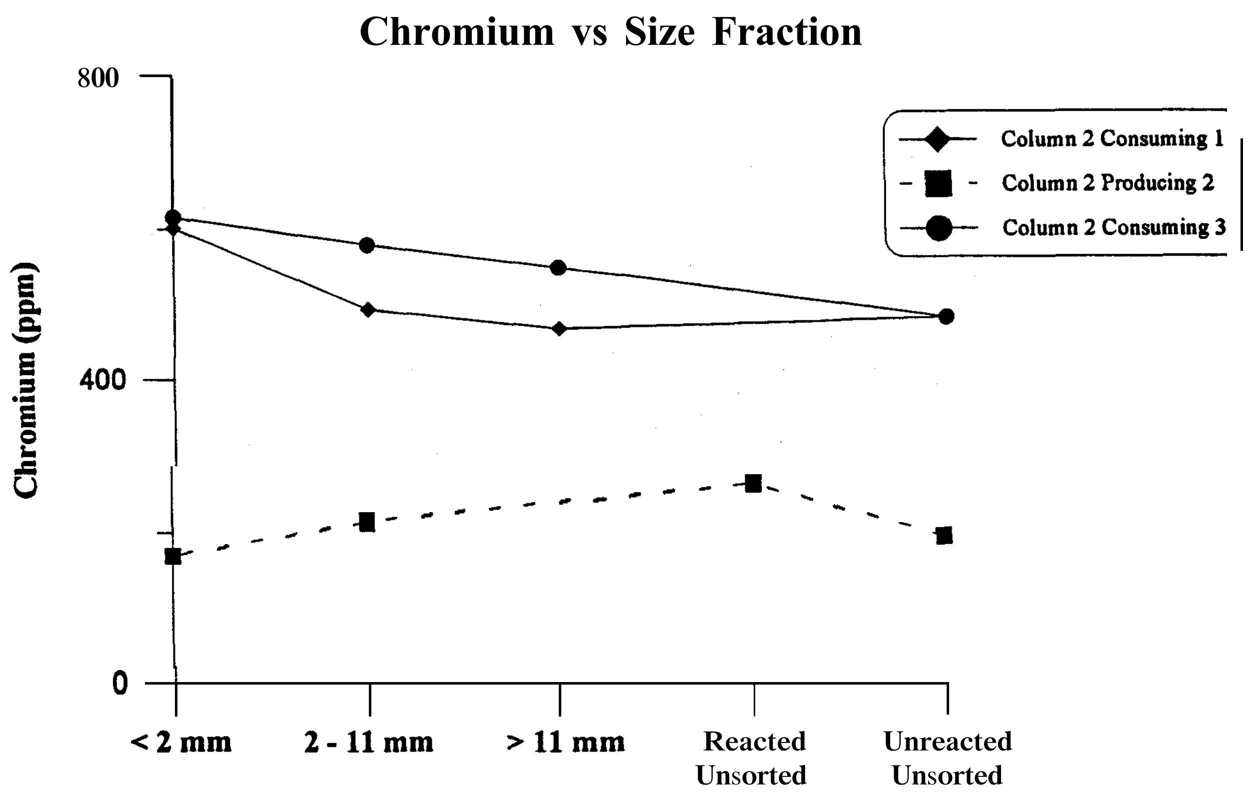

Bismuth vs Size Fraction
2
1.6
1.2
0.8
Bismuth (ppm)
Column 2 Consuming 1
Column 2 Producing 2
Column 2 Consuming 3
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

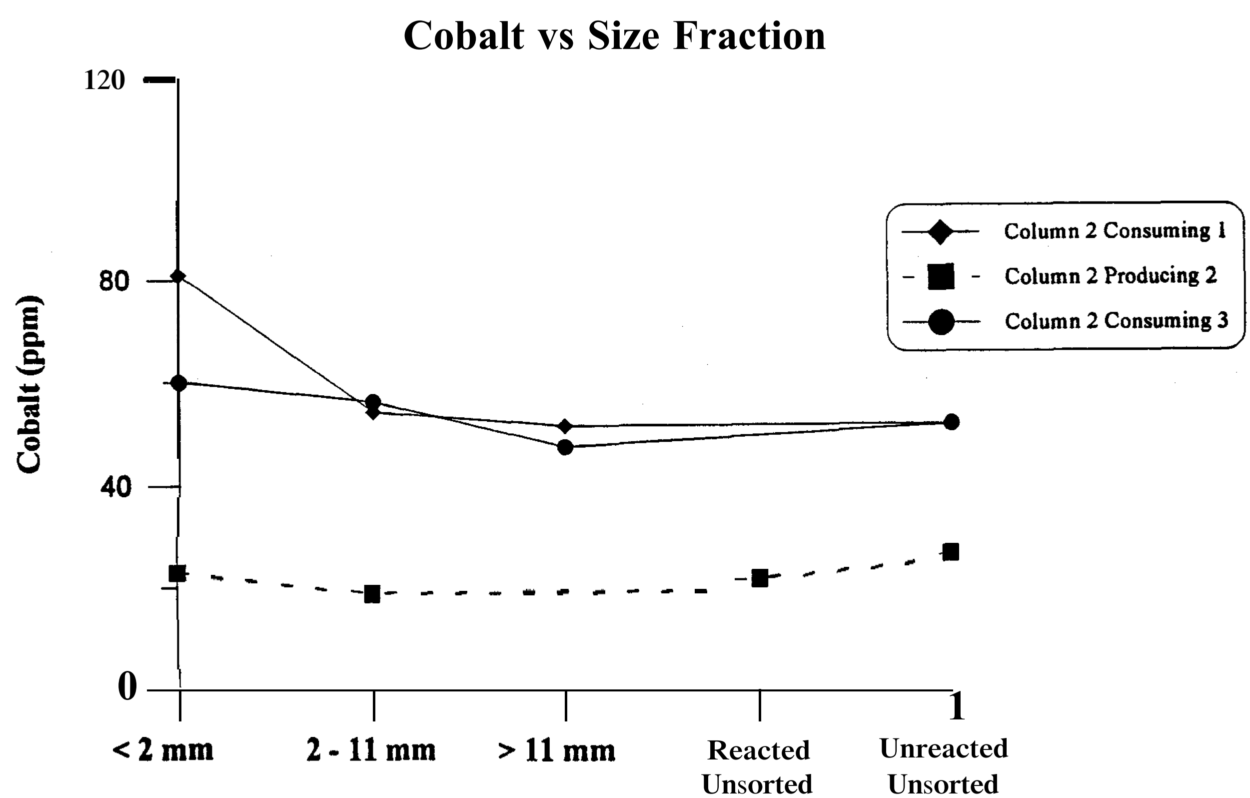
Cadmium vs Size Fraction



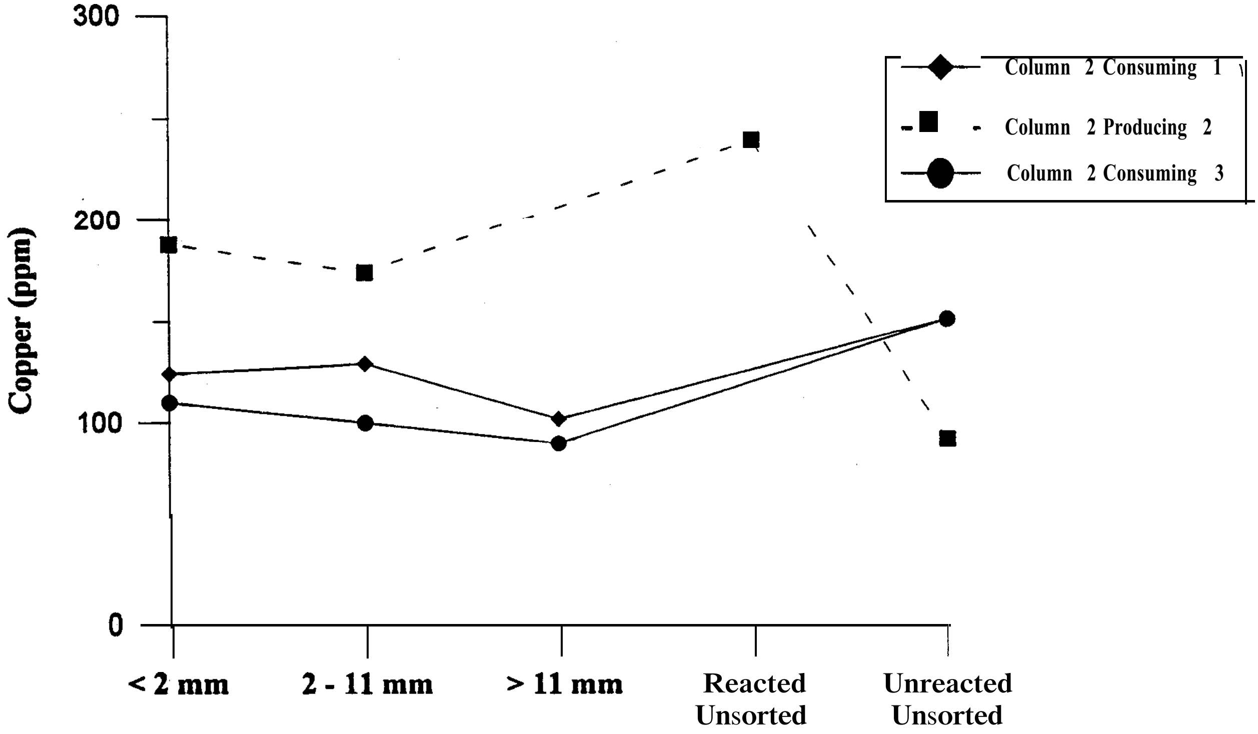
Calcium vs Size Fraction



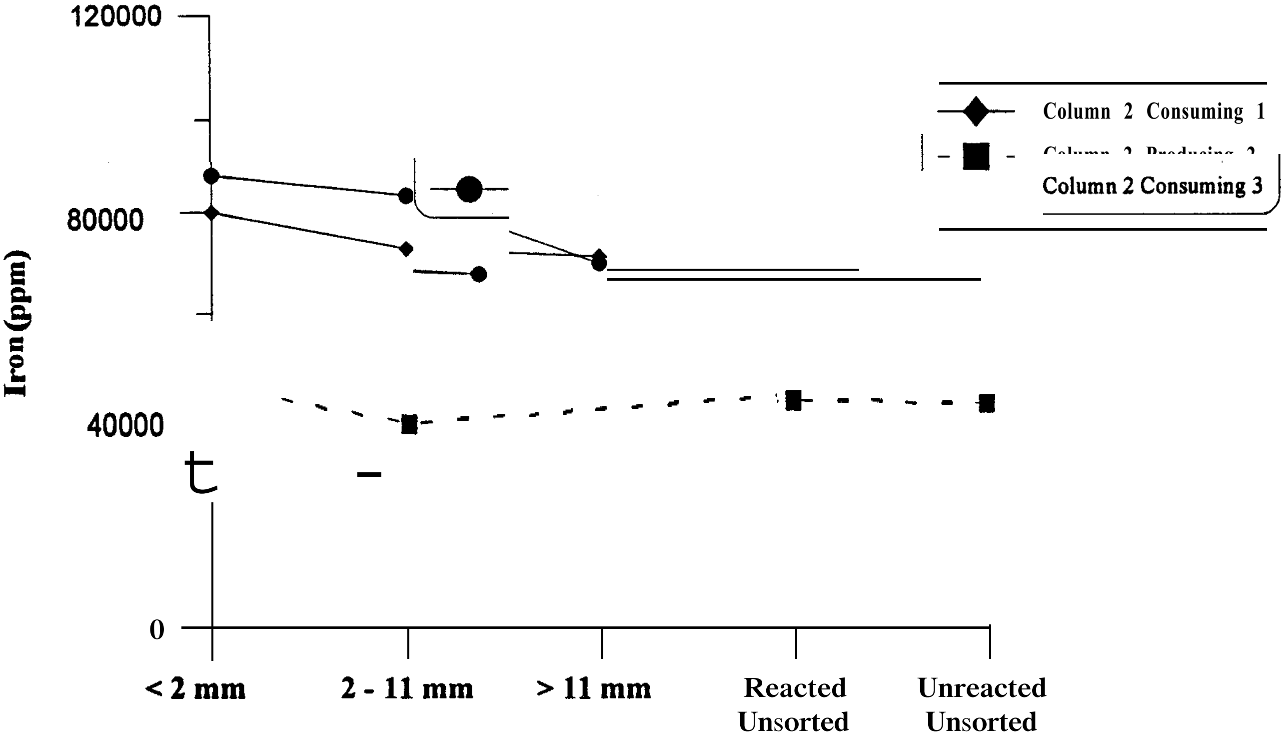

Chromium vs Size Fraction
800
400
0
Chromium (ppm)
Column 2 Consuming 1
Column 2 Producing 2
Column 2 Consuming 3
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

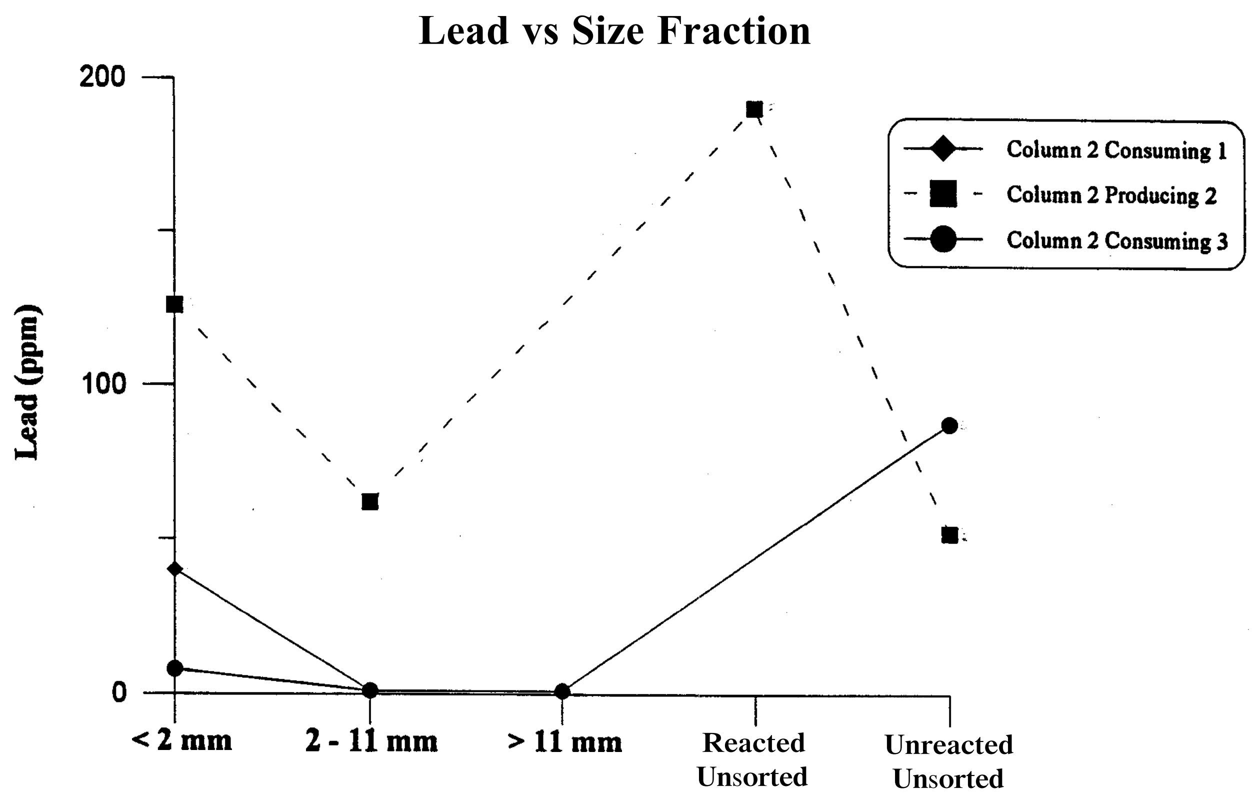

Cobalt vs Size Fraction
120
80
40
0
Cobalt (ppm)
Column 2 Consuming 1
Column 2 Producing 2
Column 2 Consuming 3
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

Copper vs Size Fraction

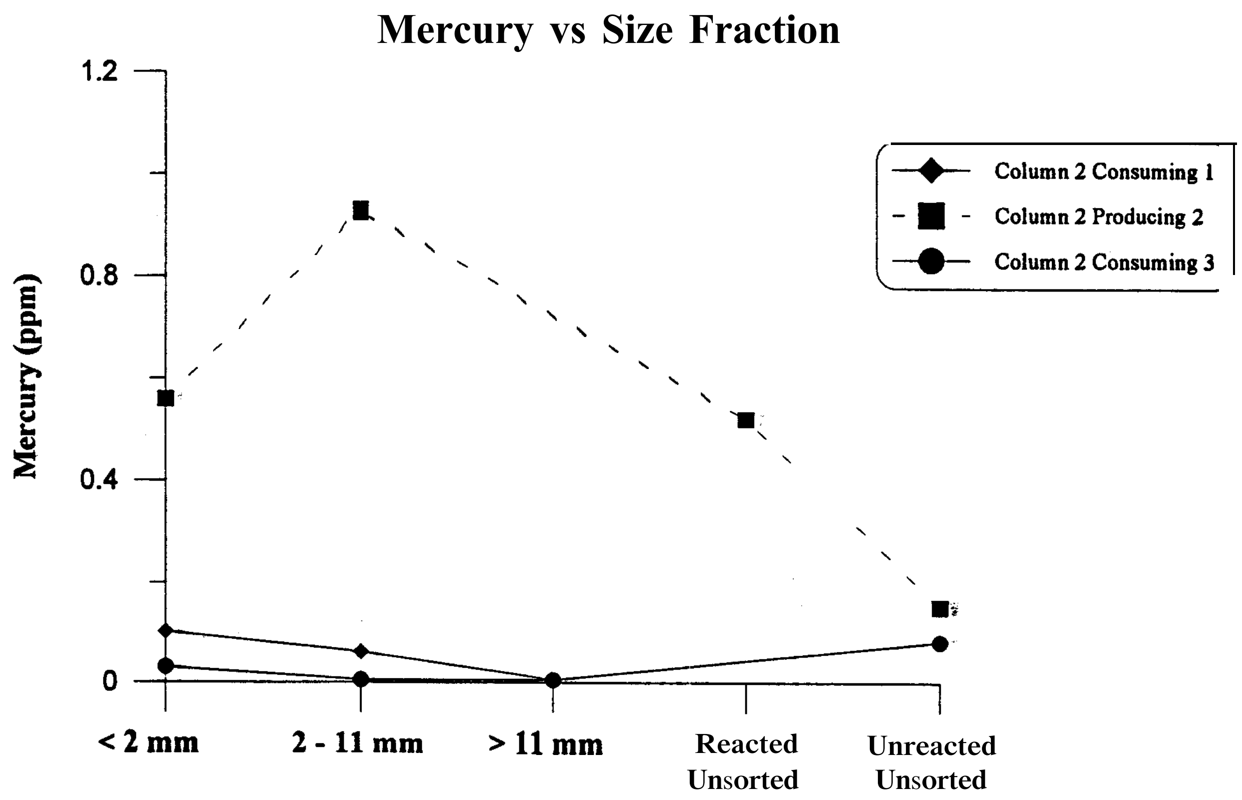


Iron vs Size Fraction

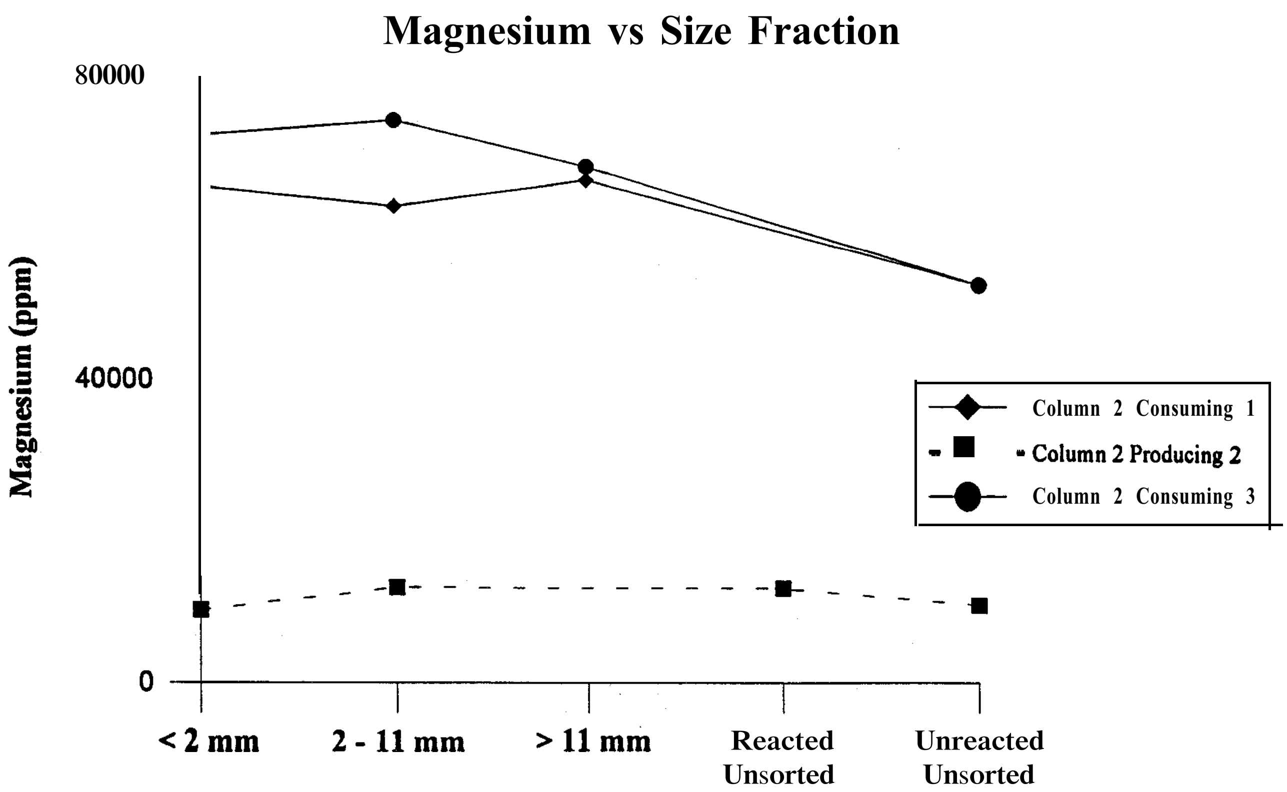


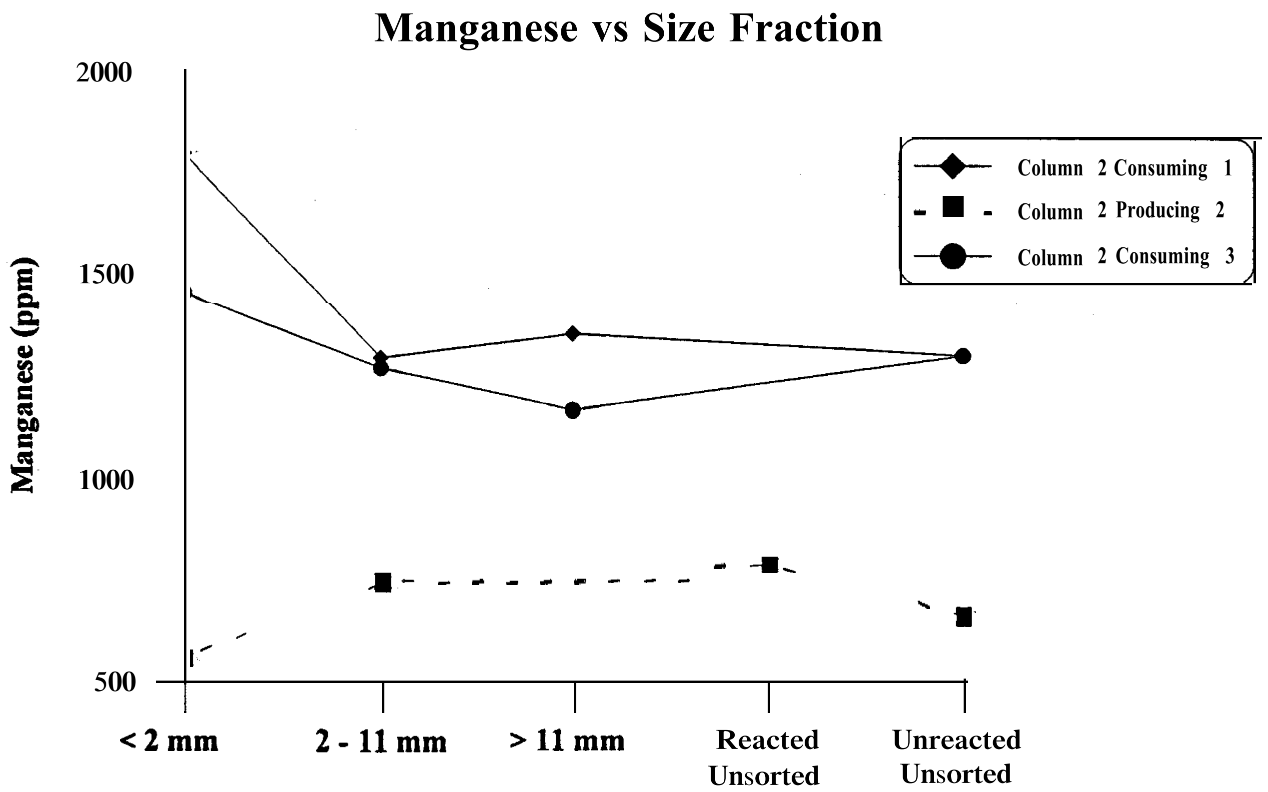


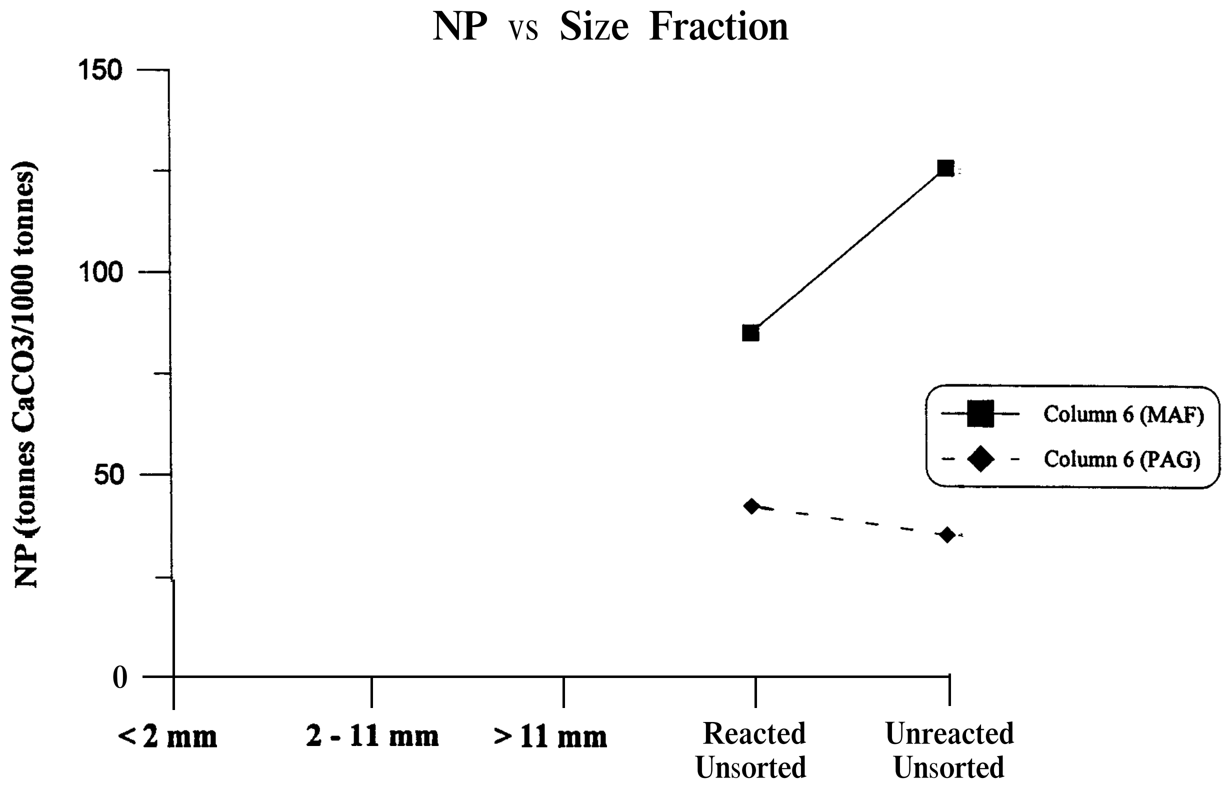
Lead vs Size Fraction
200
100
0
Lead (ppm)
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 2 Consuming 1
Column 2 Producing 2
Column 2 Consuming 3



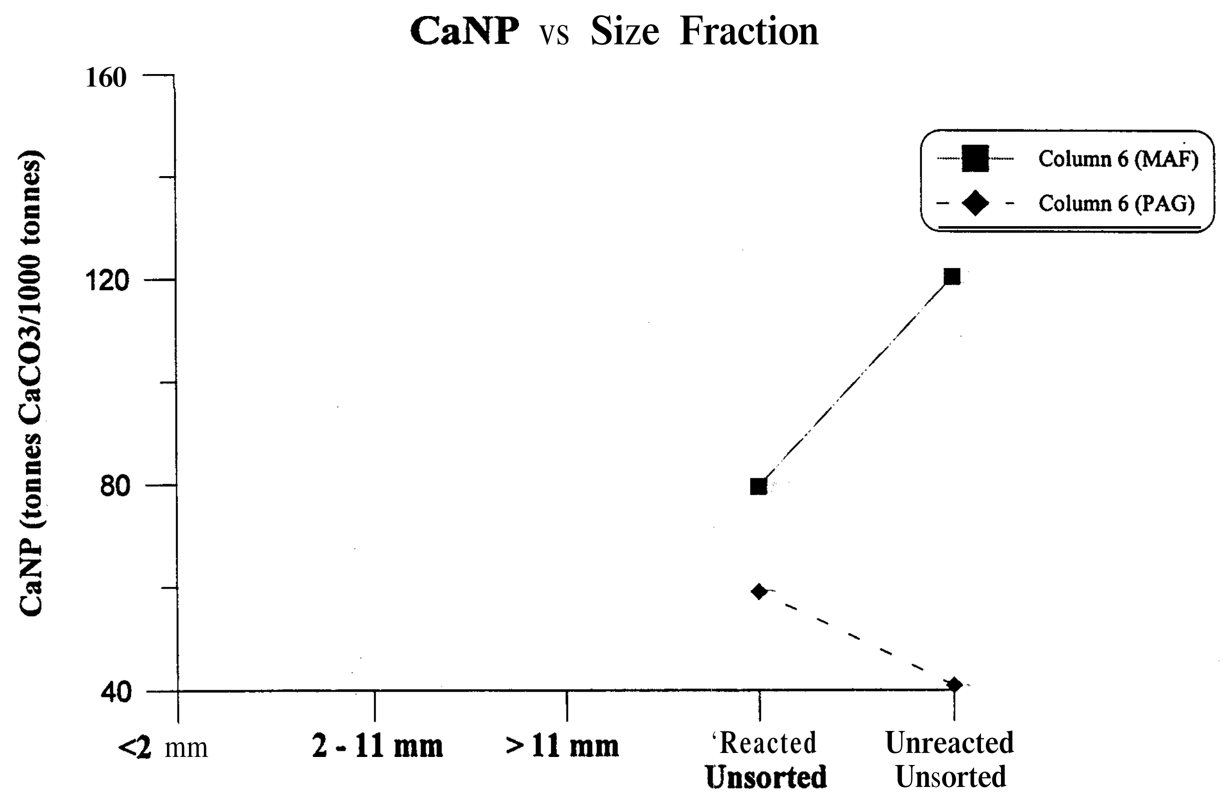
Mercury vs Size Fraction
1.2
0.8
0.4
0
Mercury (ppm)
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 2 Consuming 1
Column 2 Producing 2
Column 2 Consuming 3


Magnesium vs Size Fraction
80000
40000
0
Magnesium (ppm)
Column 2 Consuming 1
Column 2 Producing 2
Column 2 Consuming 3
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted


Manganese vs Size Fraction
2000
1500
1000
500
Manganese (ppm)
Column 2 Consuming 1
Column 2 Producing 2
Column 2 Consuming 3
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

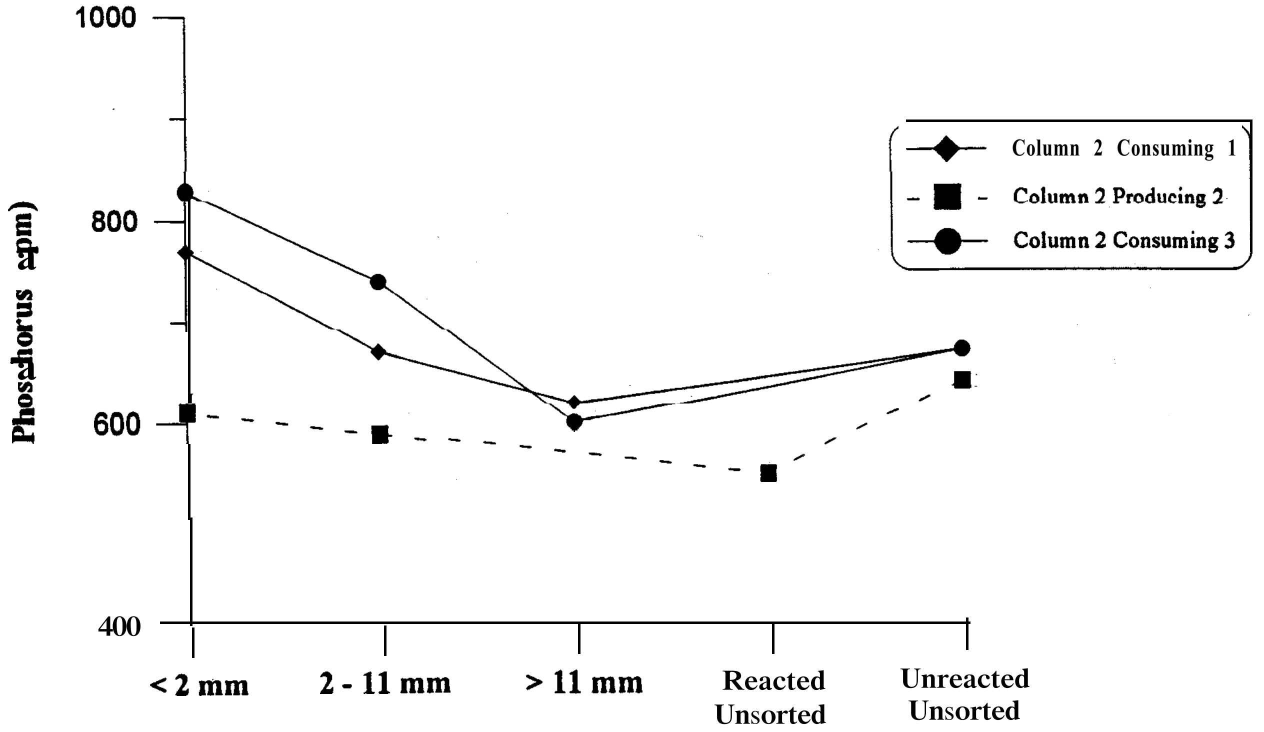


NP vs Size Fraction
150
100
50
0
NP (tonnes CaCO3/1000 tonnes)
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 6 (MAF)
Column 6 (PAG)

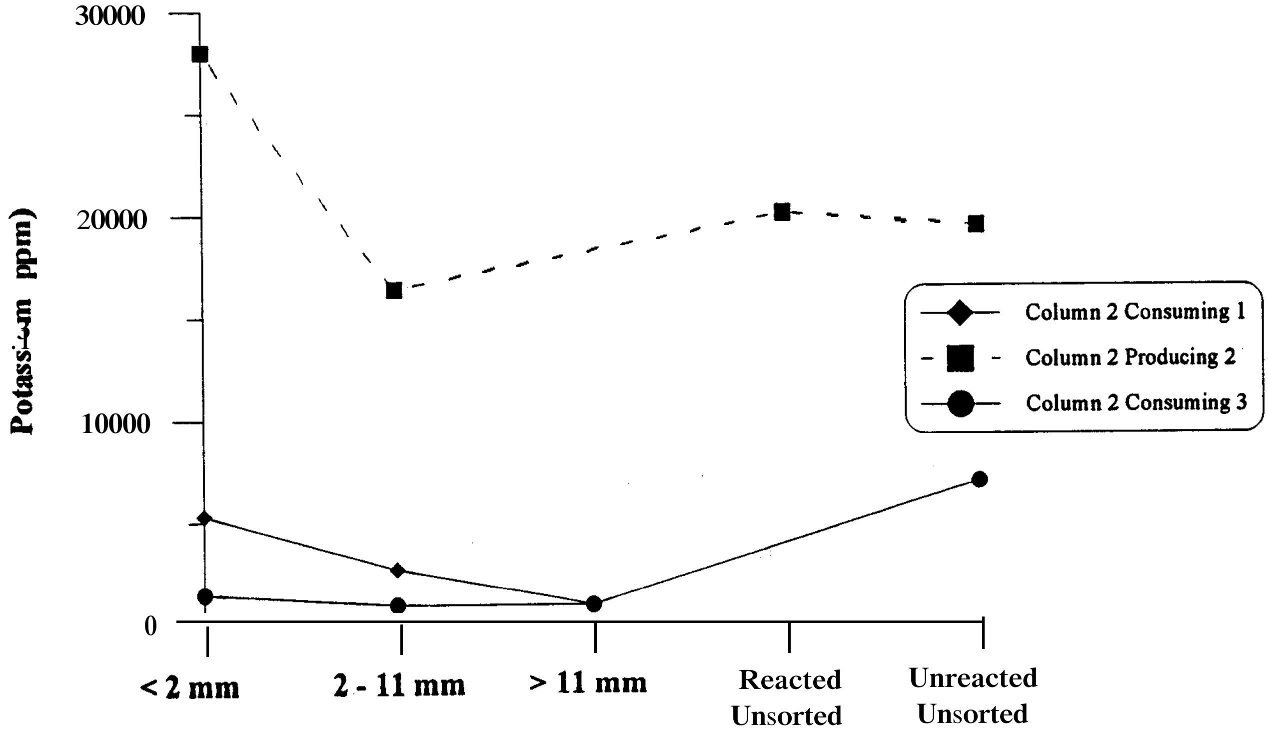


CaNP vs Size Fraction
160
120
80
40
CaNP (tonnes CaCO3/1000 tonnes)
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 6 (MAF)
Column 6 (PAG)

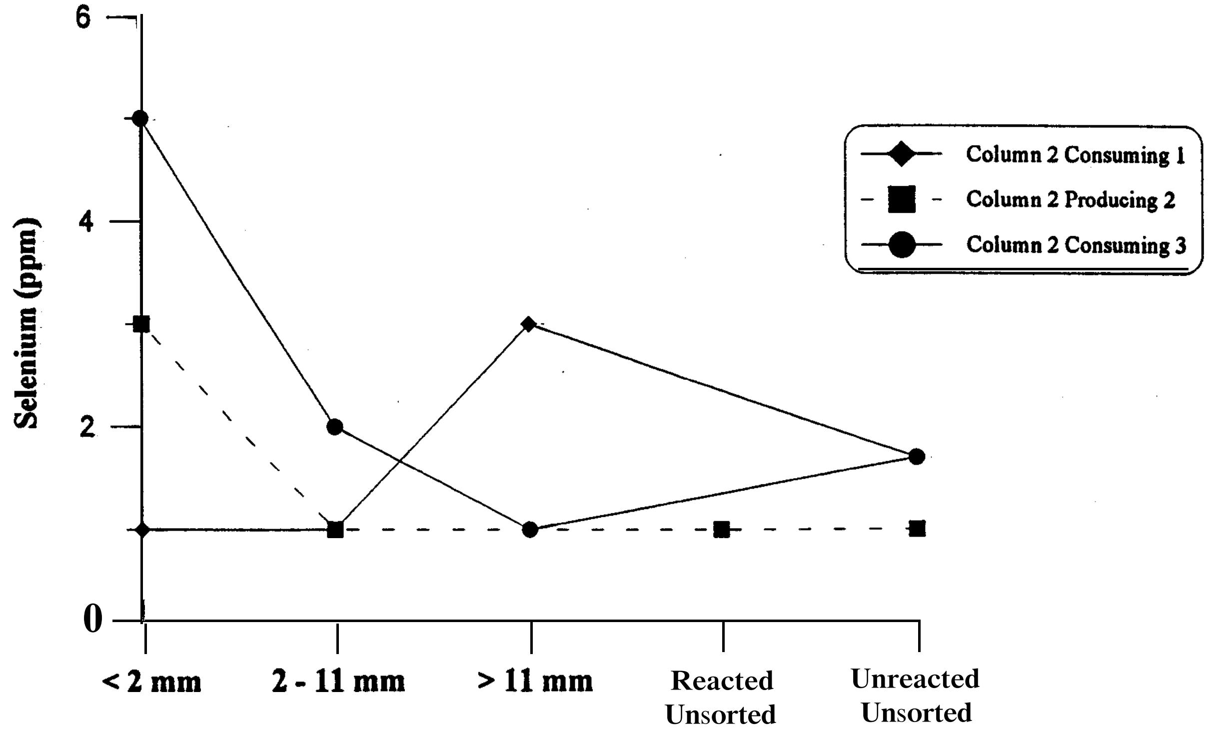
Phosphorus vs Size Fraction



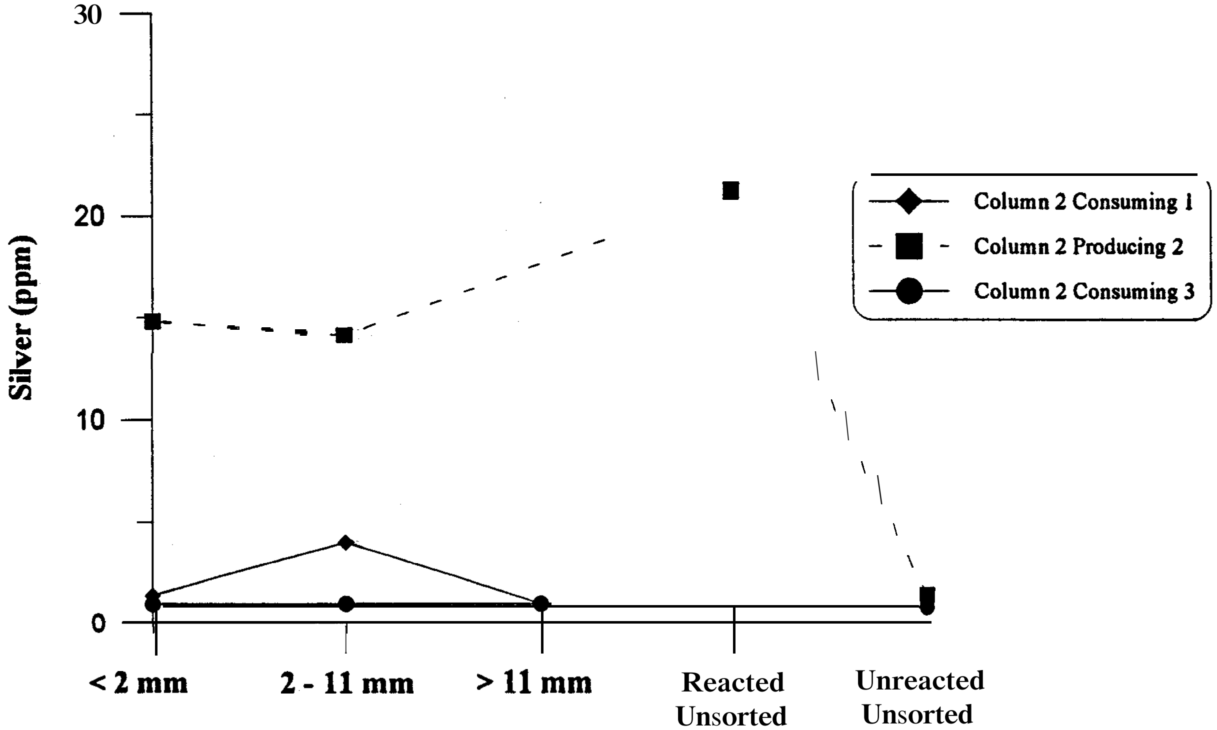
Potassium vs Size Fraction

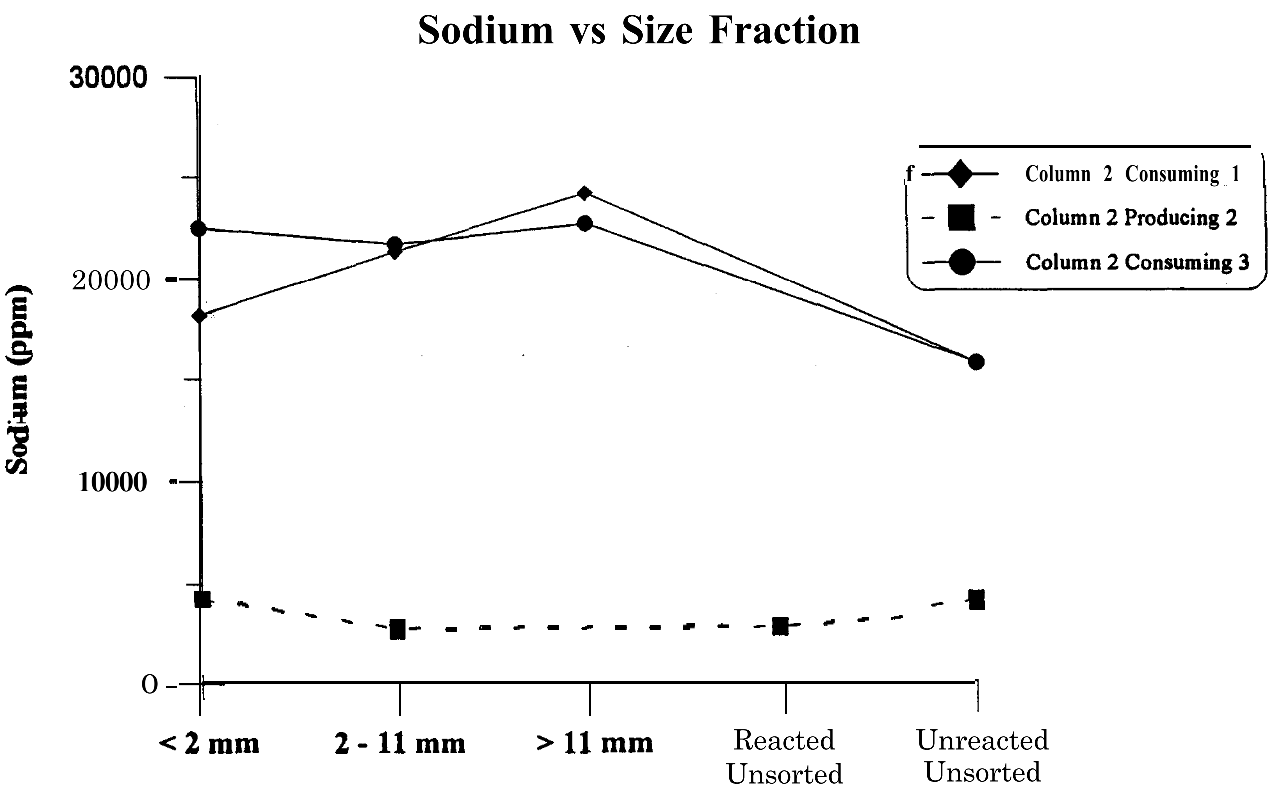


Selenium vs Size Fraction

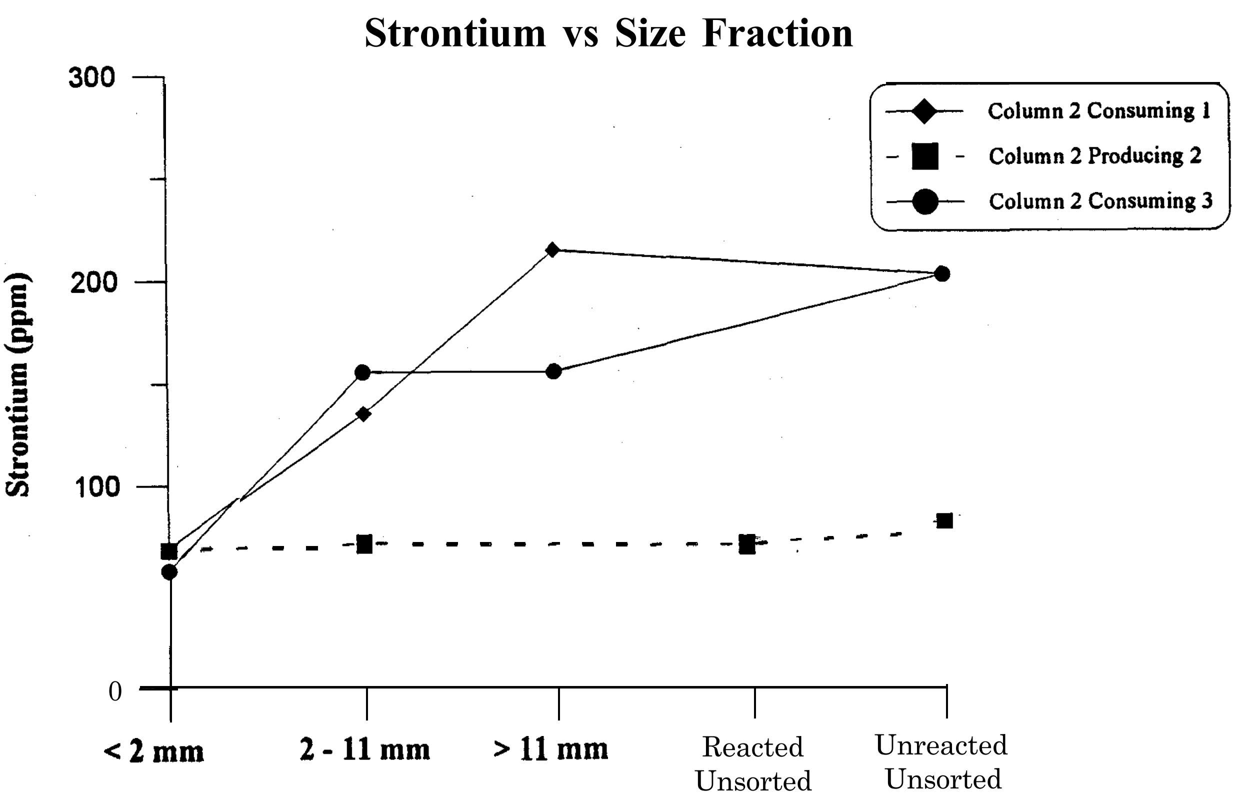


Silver vs Size Fraction



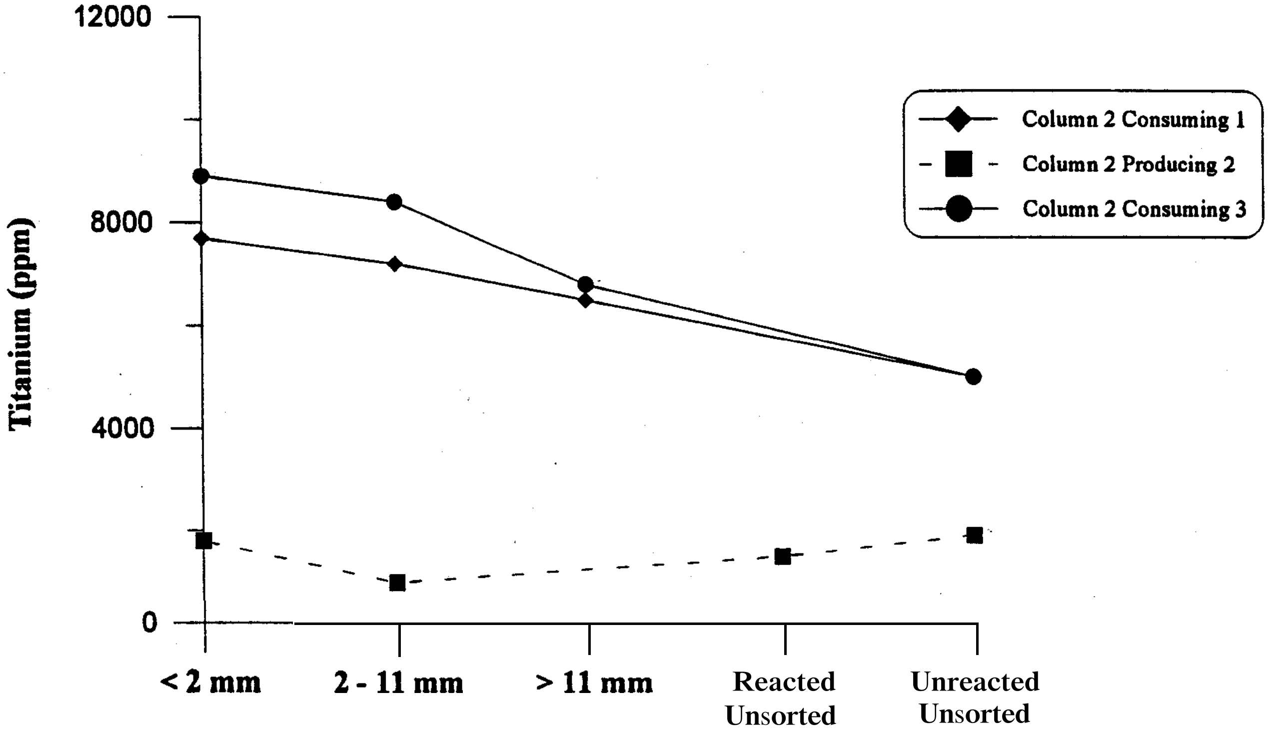


Sodium vs Size Fraction
30000
20000
10000
0
Sodium (ppm)
Column 2 Consuming 1
Column 2 Producing 2
Column 2 Consuming 3
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

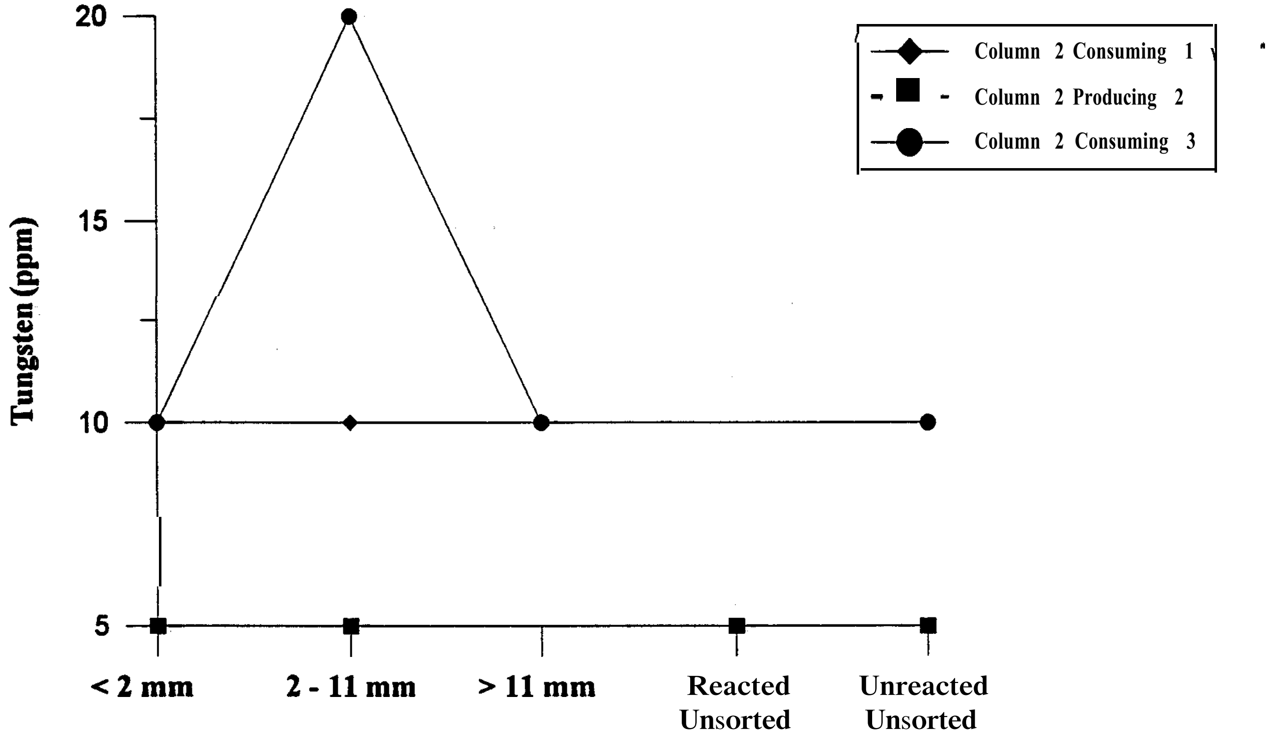


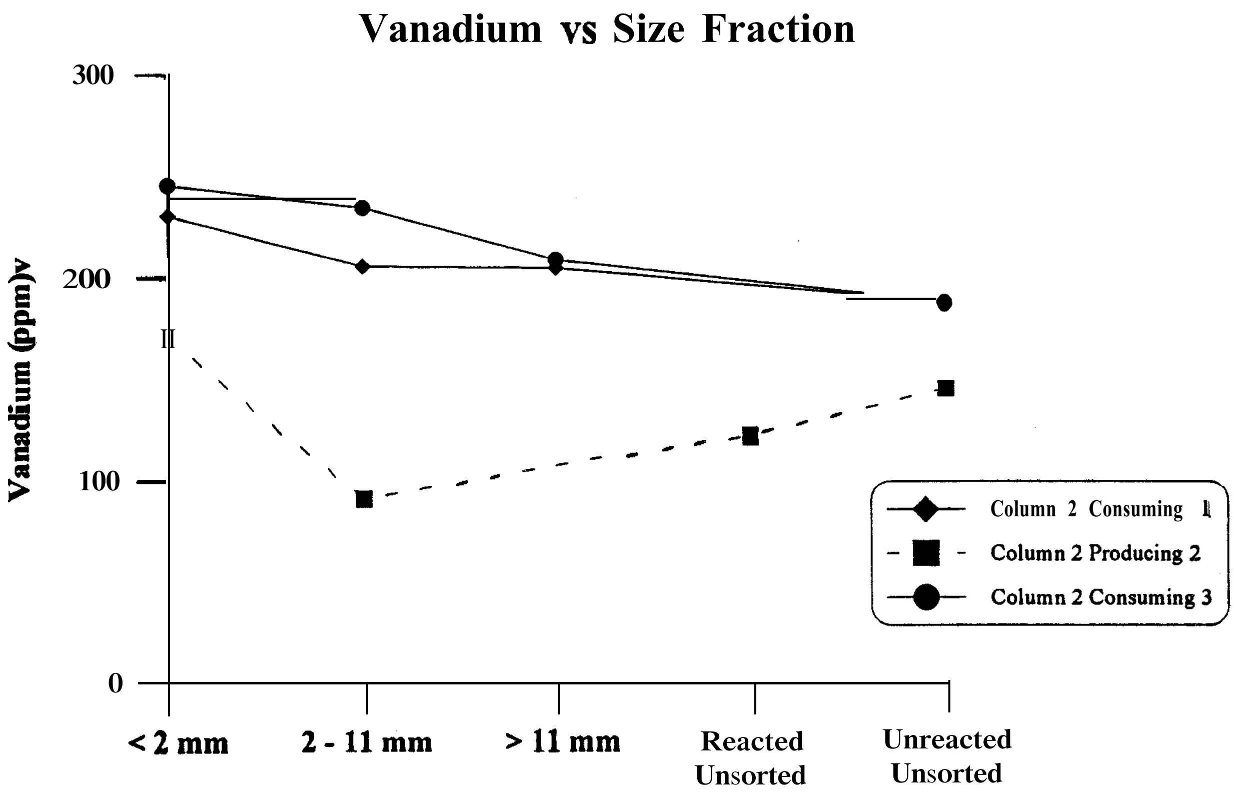
Strontium vs Size Fraction
300
200
100
0
Strontium (ppm)
Column 2 Consuming 1
Column 2 Producing 2
Column 2 Consuming 3
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

Titanium vs Size Fraction

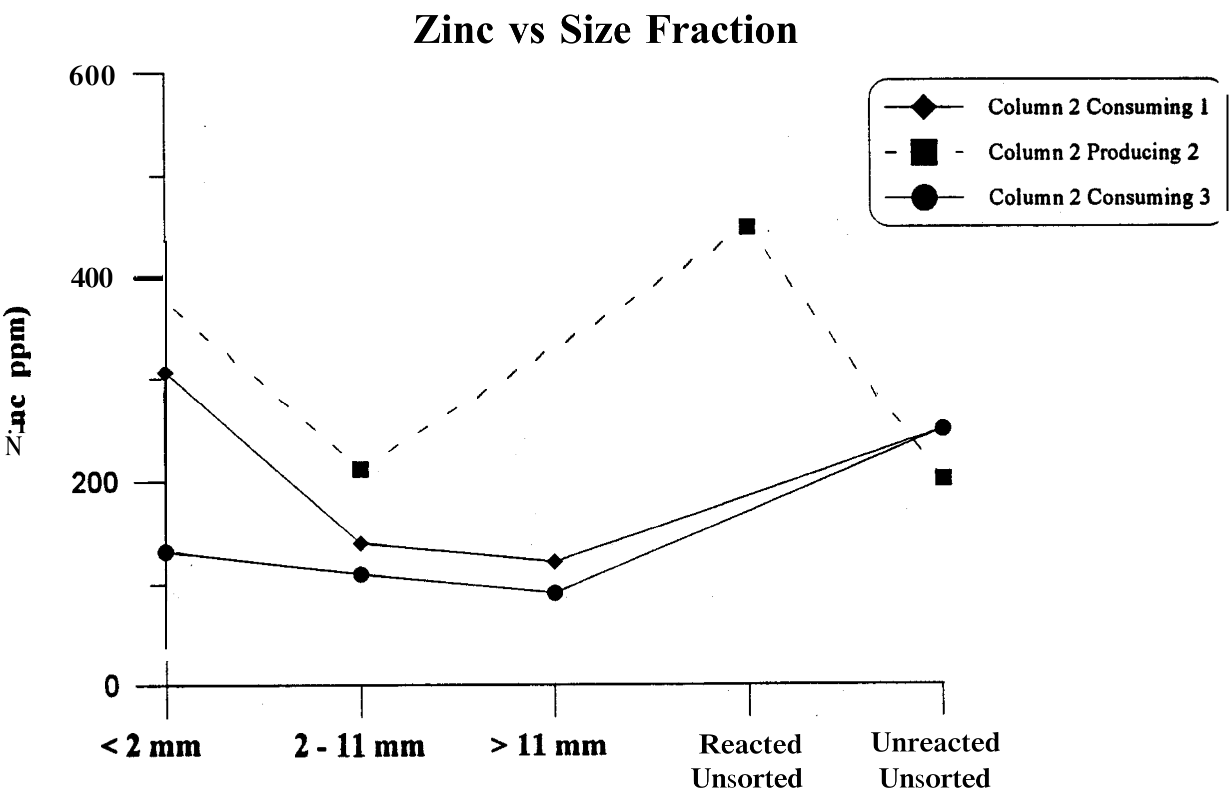


Tungsten vs Size Fraction



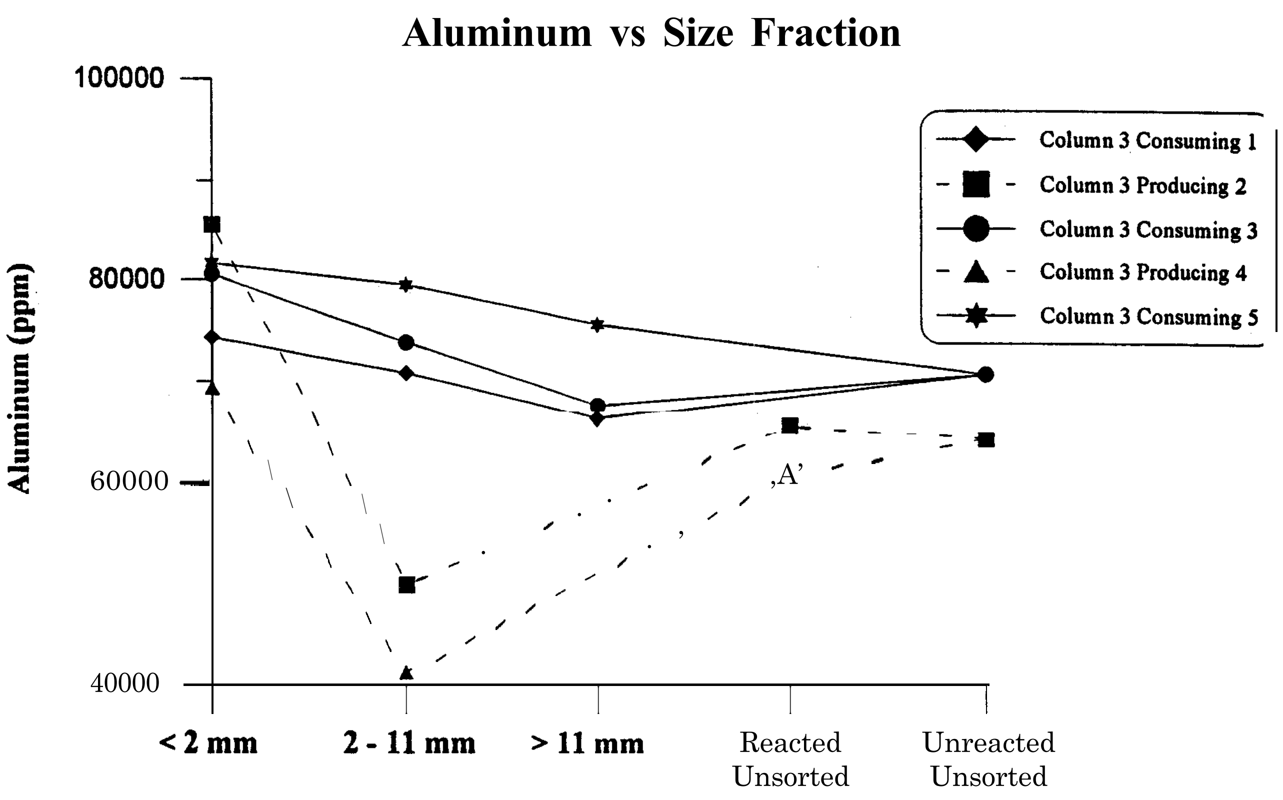


Vanadium vs Size Fraction
300
200
100
0
Vanadium (ppm)
Column 2 Consuming 1
Column 2 Producing 2
Column 2 Consuming 3
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

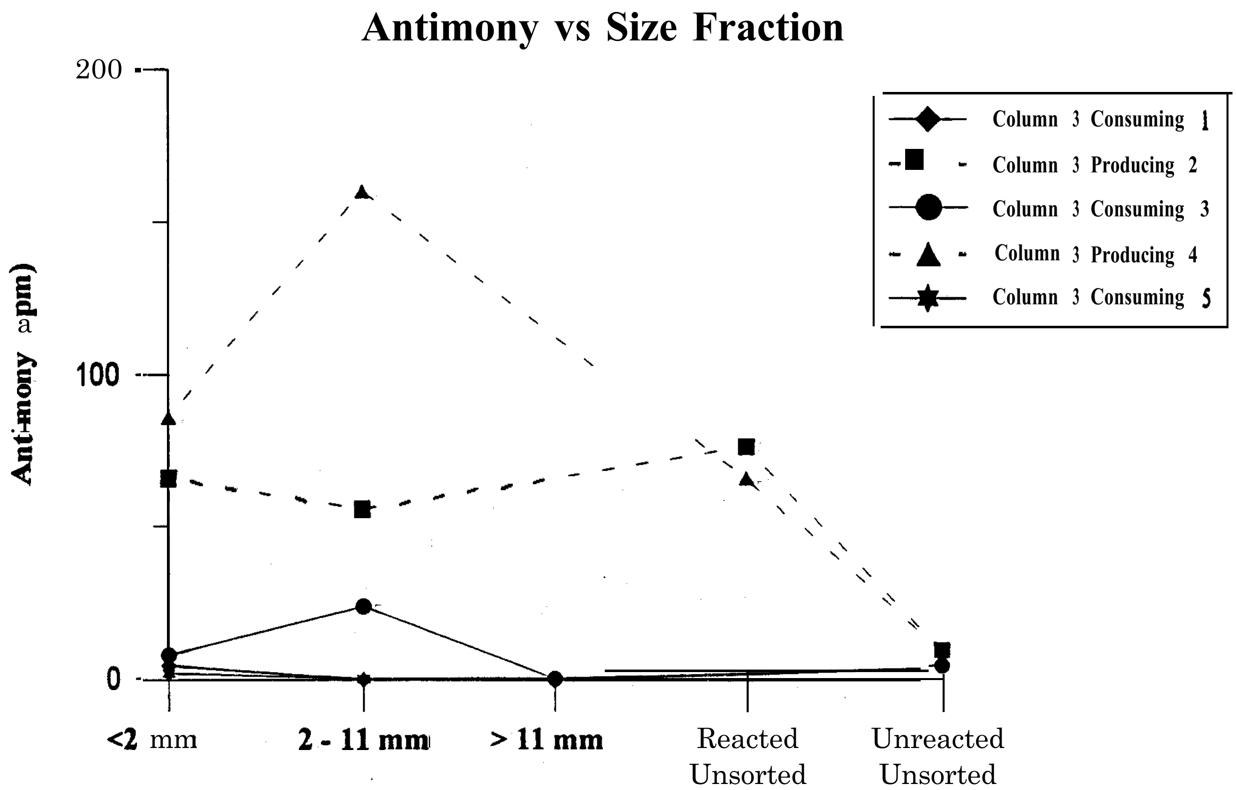


Zinc vs Size Fraction
600
400
200
0
Zinc ppm)
Column 2 Consuming 1
Column 2 Producing 2
Column 2 Consuming 3
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

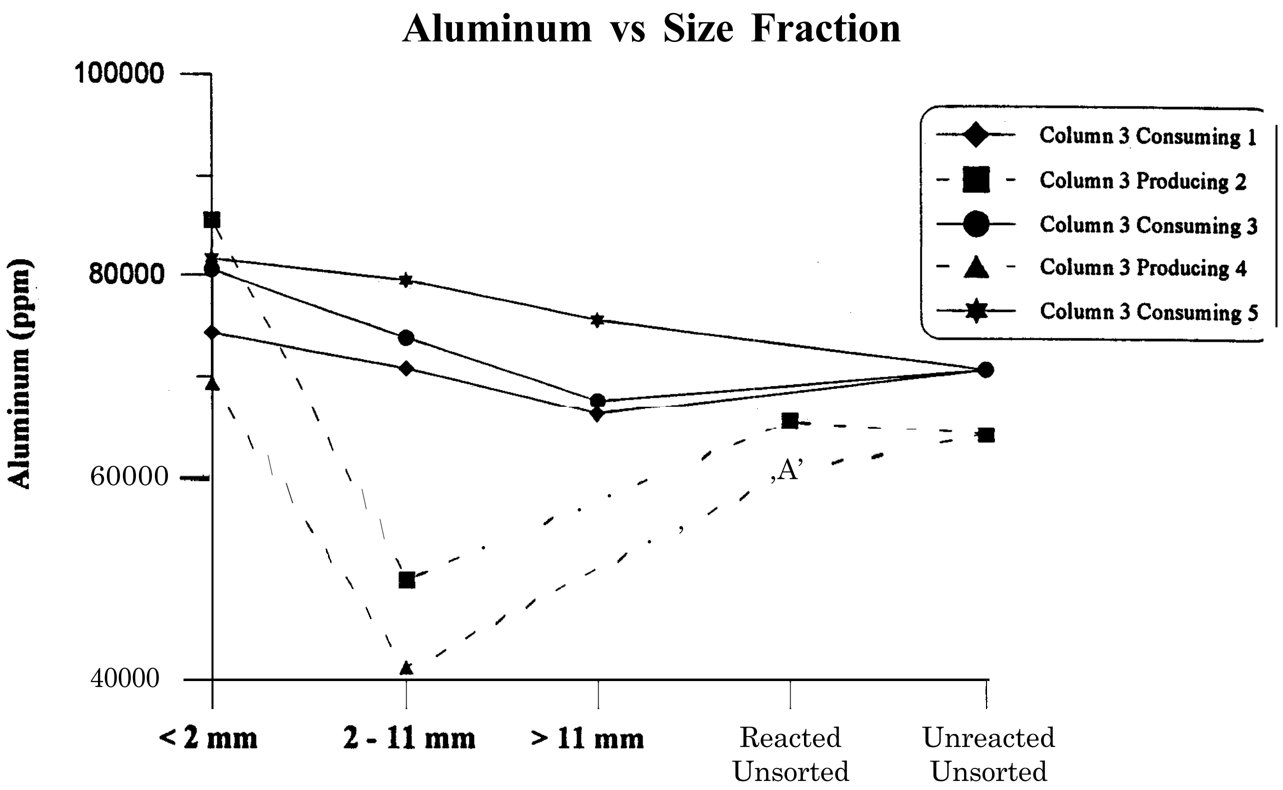
A5.2. Column 3

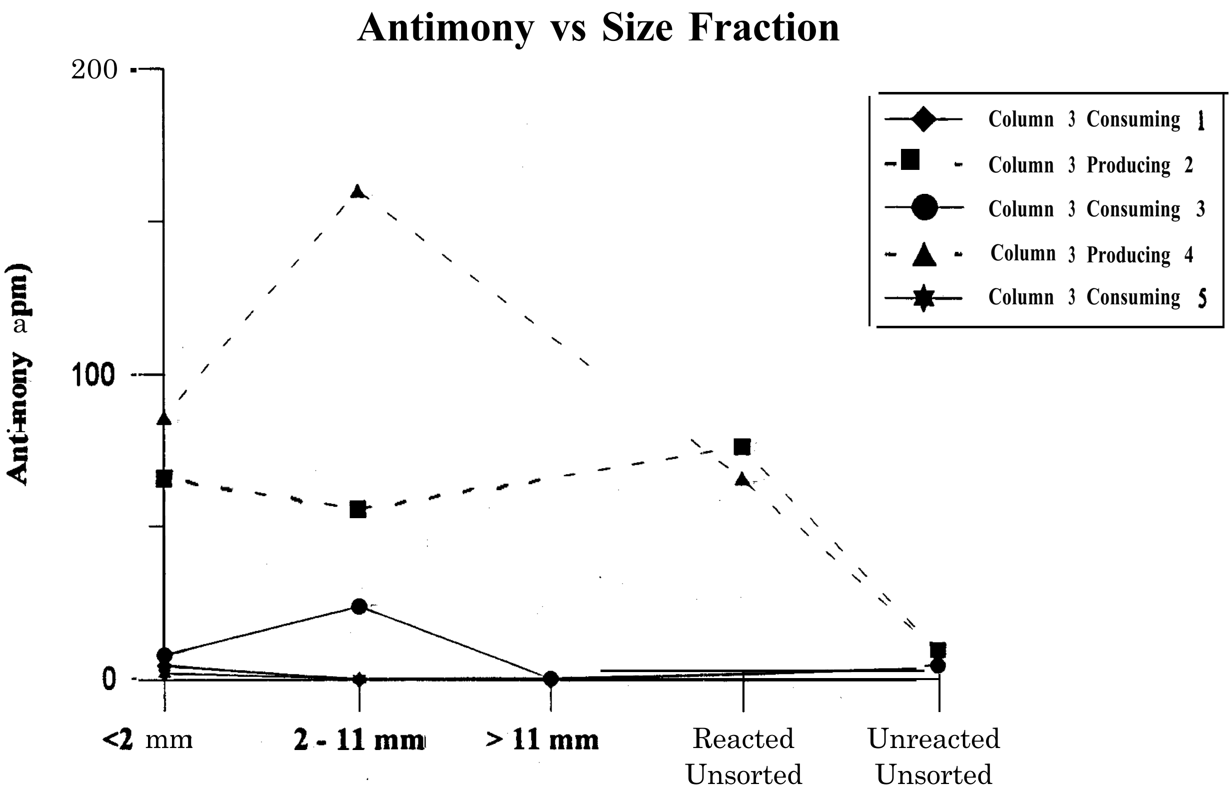


Aluminum vs Size Fraction
100000
80000
60000
40000
Aluminum (ppm)
Column 3 Consuming 1
Column 3 Producing 2
Column 3 Consuming 3
Column 3 Producing 4
Column 3 Consuming 5
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

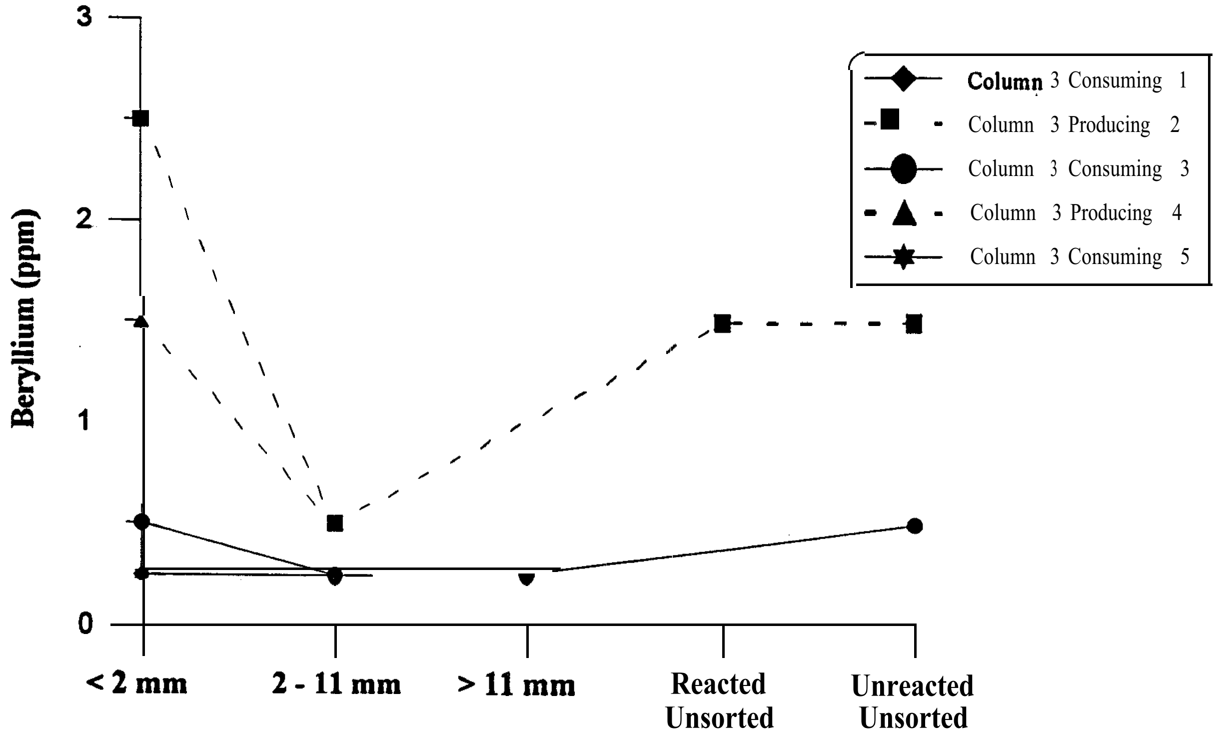


Antimony vs Size Fraction
200
100
0
Antimony (ppm)
Column 3 Consuming 1
Column 3 Producing 2
Column 3 Consuming 3
Column 3 Producing 4
Column 3 Consuming 5
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

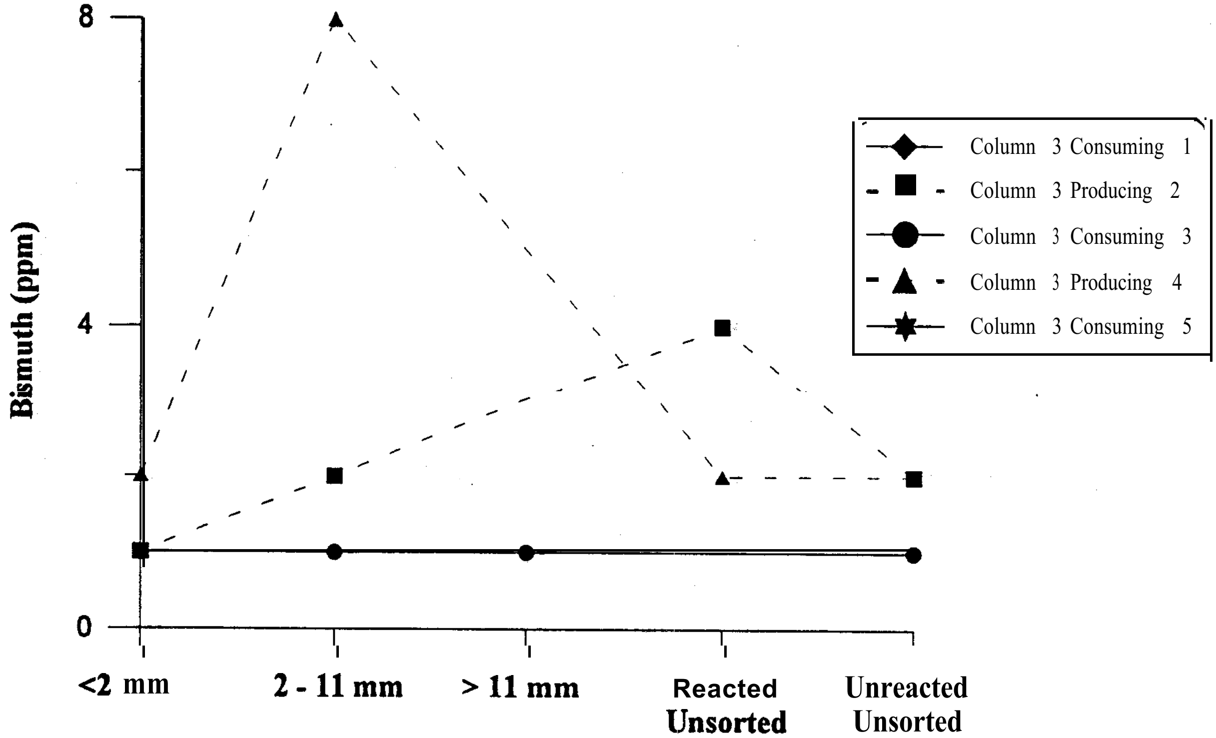

Aluminum vs Size Fraction
100000
80000
60000
40000
Aluminum (ppm)
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 3 Consuming 1
Column 3 Producing 2
Column 3 Consuming 3
Column 3 Producing 4
Column 3 Consuming 5

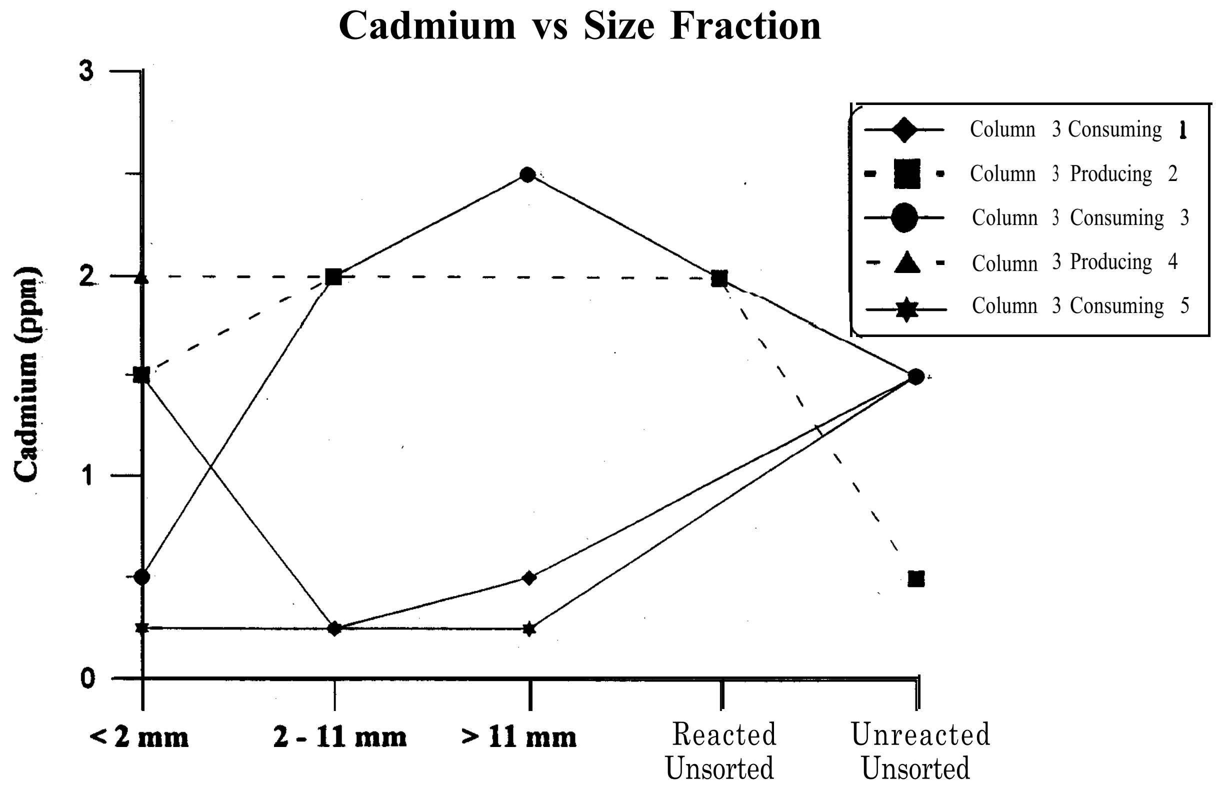

Antimony vs Size Fraction
200
100
0
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 3 Consuming 1
Column 3 Producing 2
Column 3 Consuming 3
Column 3 Producing 4
Column 3 Consuming 5

Beryllium vs Size Fraction

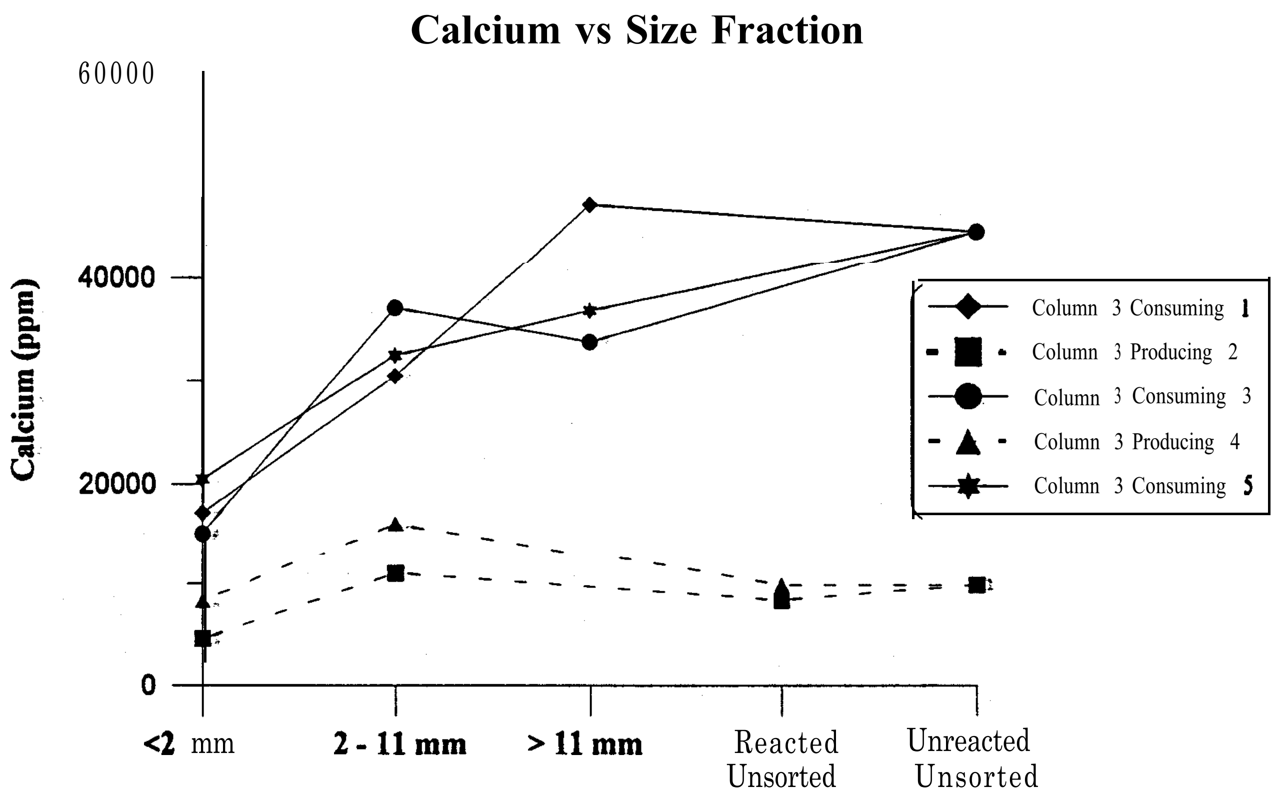


Bismuth vs Size Fraction



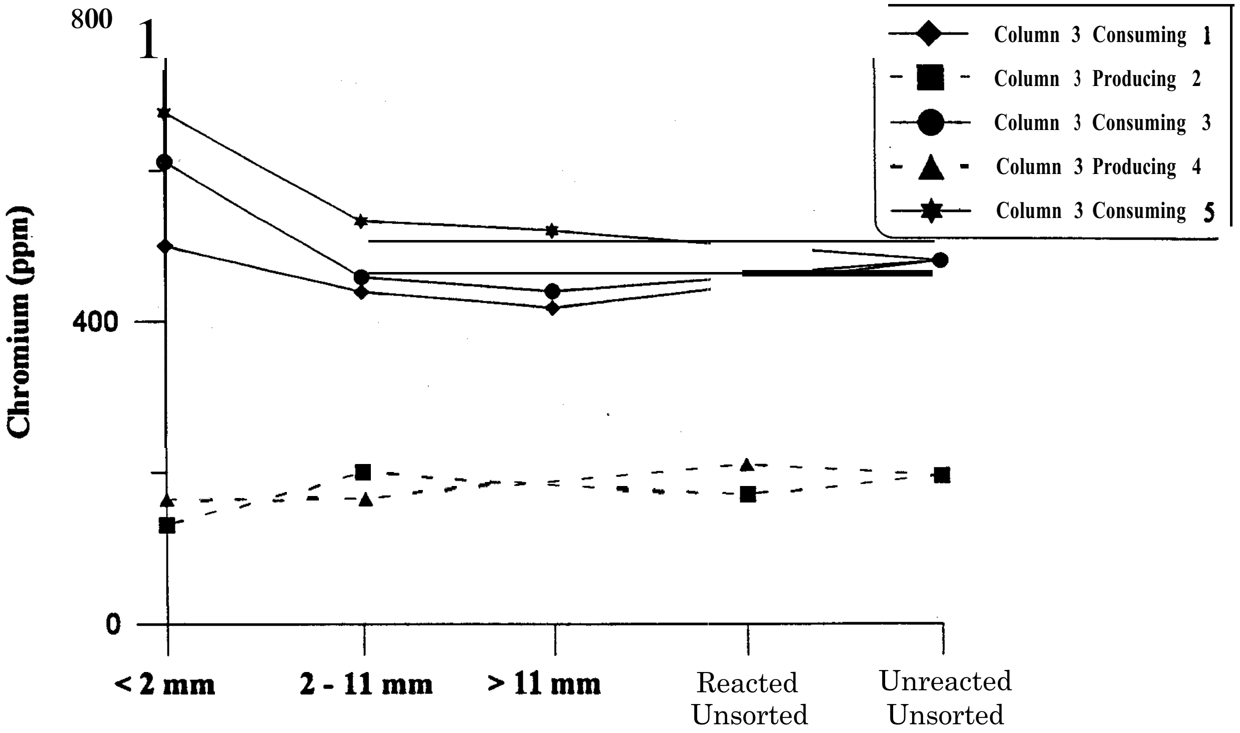


Cadmium vs Size Fraction
Cadmium (ppm)
3
2
1
0
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 3 Consuming 1
Column 3 Producing 2
Column 3 Consuming 3
Column 3 Producing 4
Column 3 Consuming 5

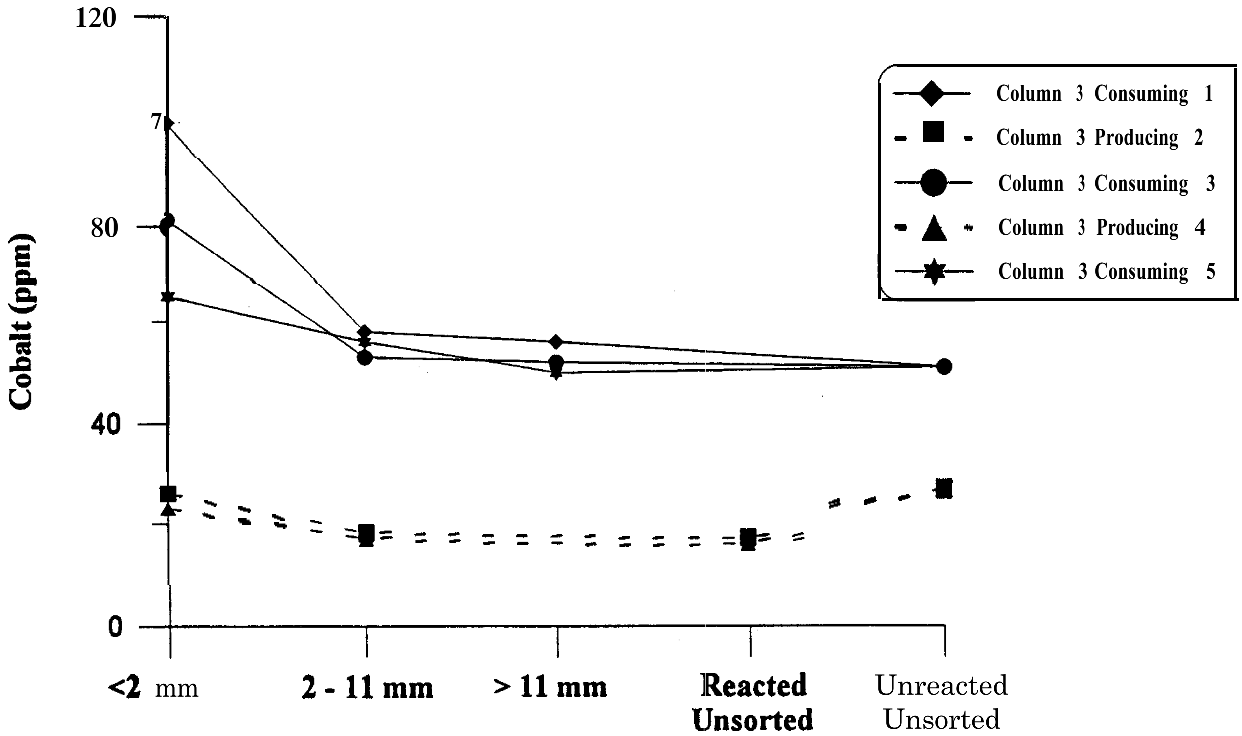


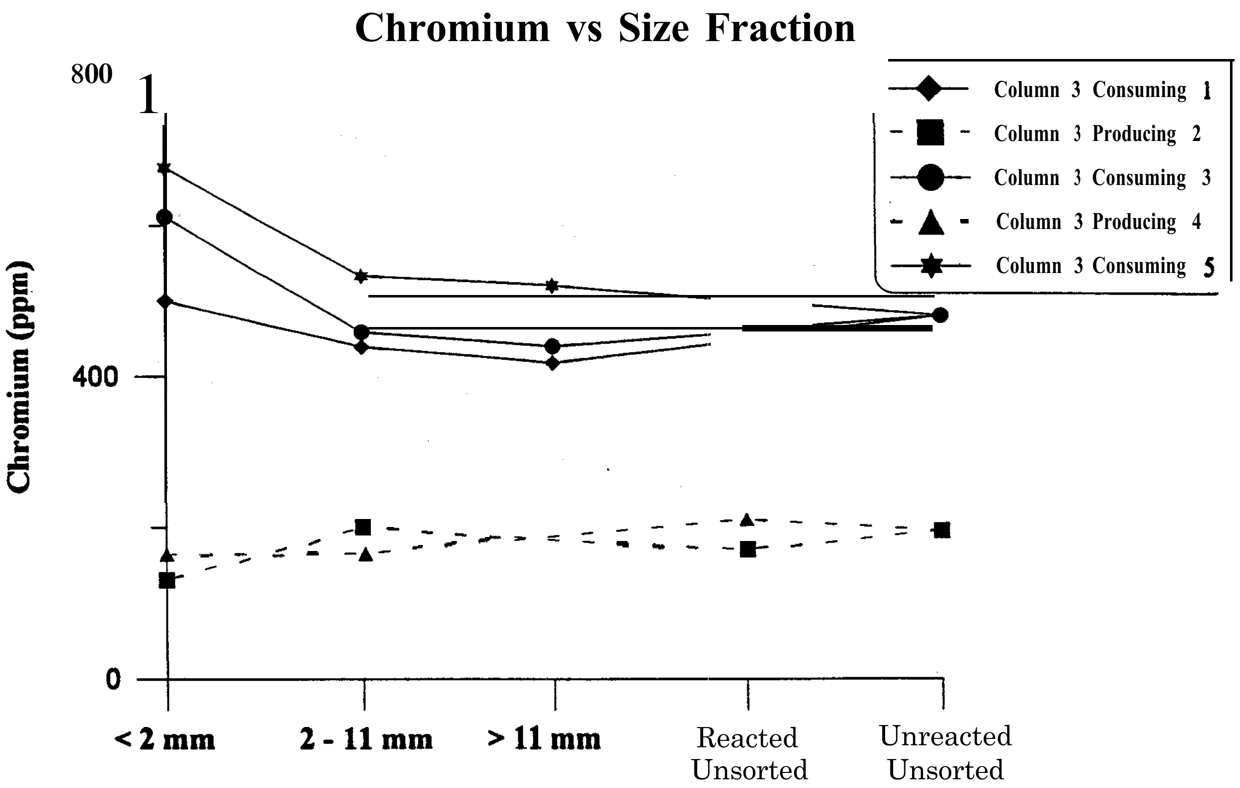
Calcium vs Size Fraction
Calcium (ppm)
60000
40000
20000
0
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 3 Consuming 1
Column 3 Producing 2
Column 3 Consuming 3
Column 3 Producing 4
Column 3 Consuming 5

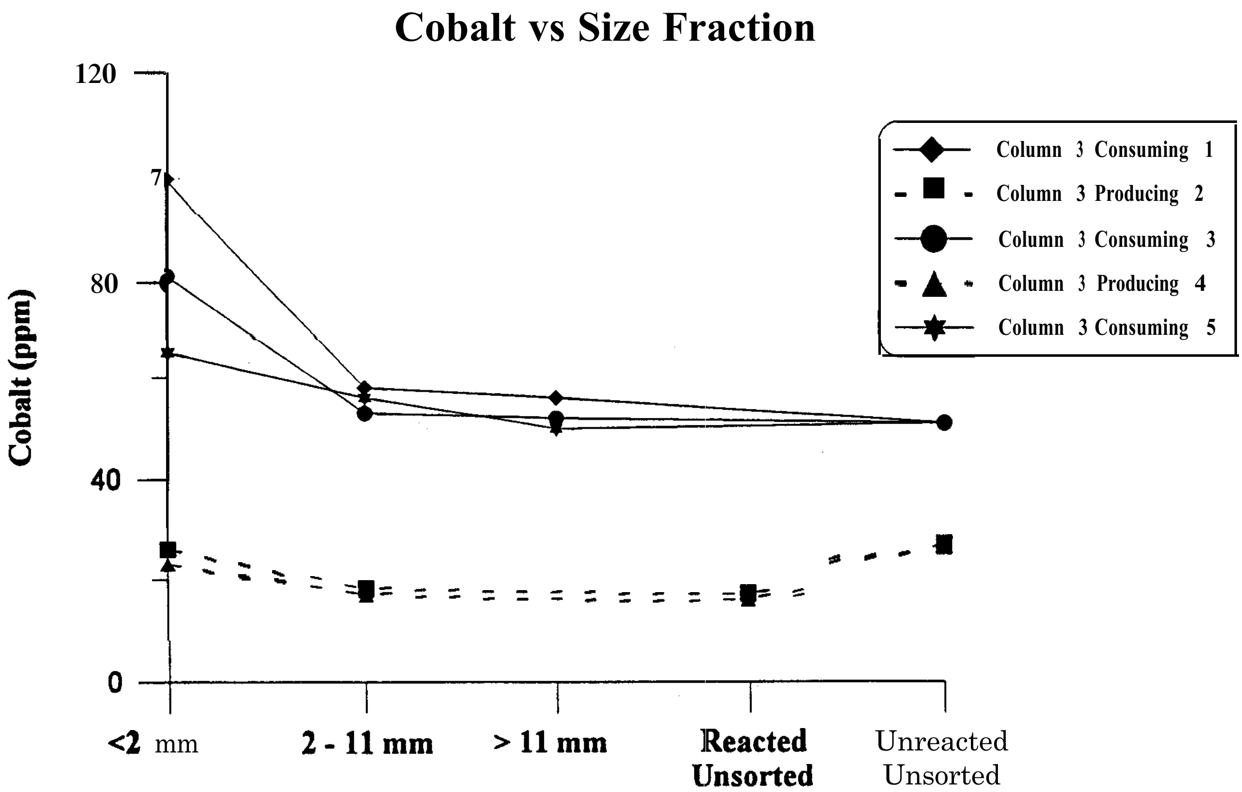
Chromium vs Size Fraction



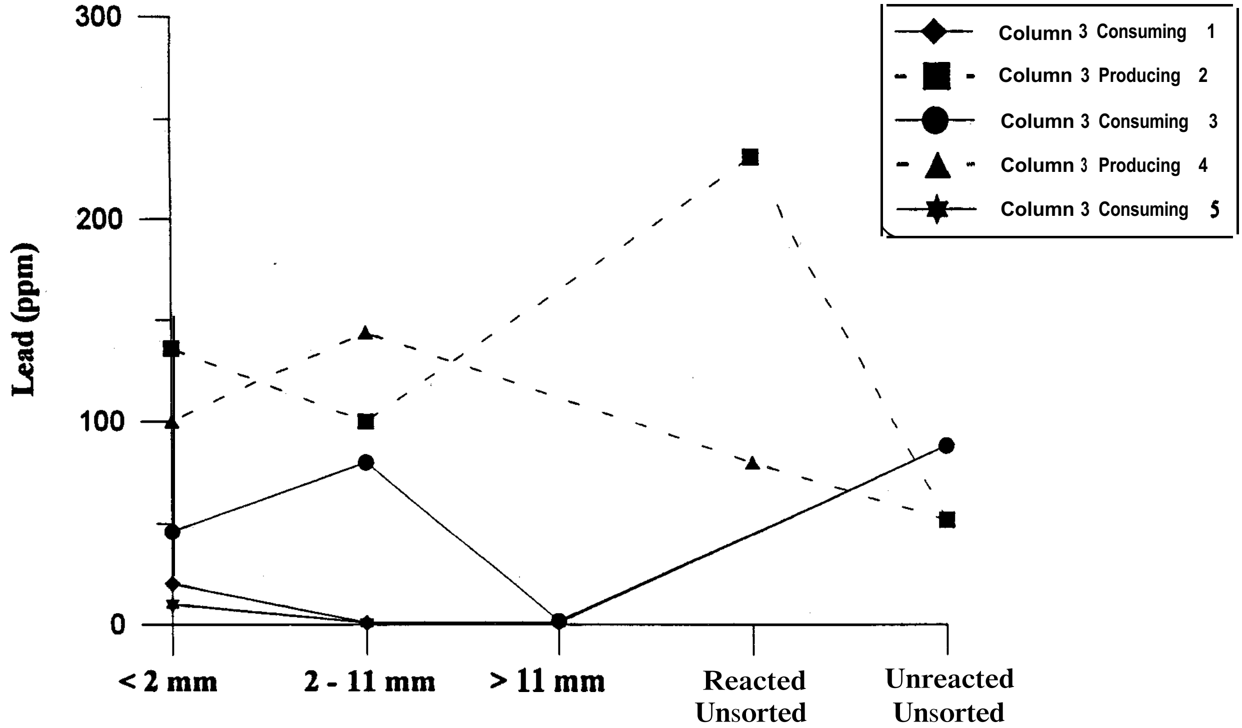
Cobalt vs Size Fraction



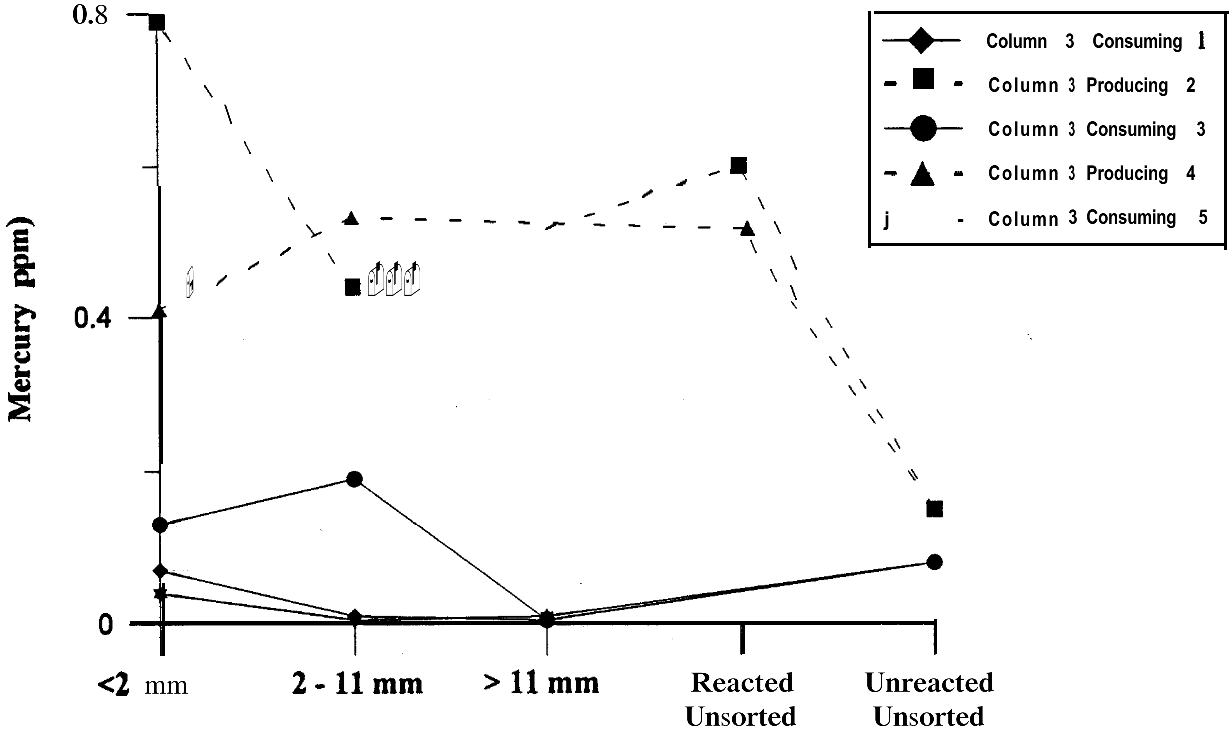

Chromium vs Size Fraction
800
400
0
Chromium (ppm)
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 3 Consuming 1
Column 3 Producing 2
Column 3 Consuming 3
Column 3 Producing 4
Column 3 Consuming 5

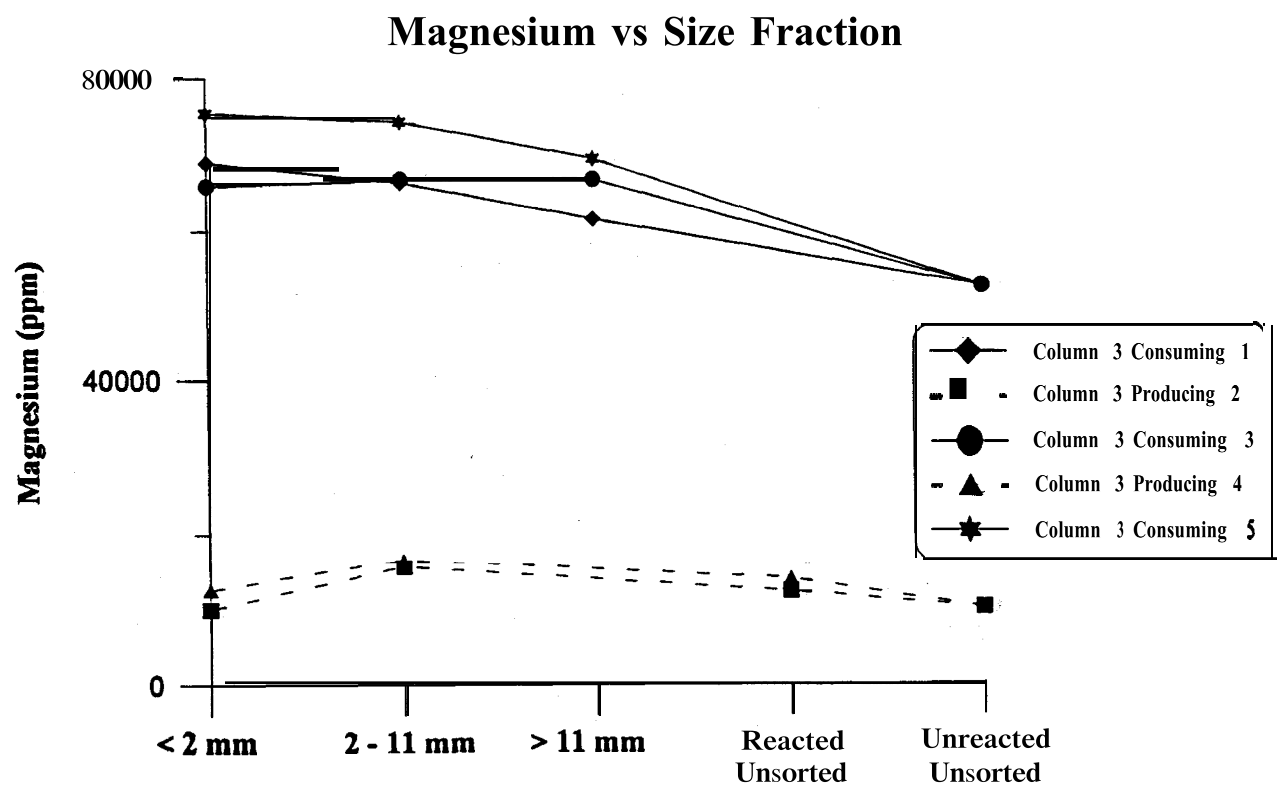

Cobalt vs Size Fraction
120
80
40
0
Cobalt (ppm)
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 3 Consuming 1
Column 3 Producing 2
Column 3 Consuming 3
Column 3 Producing 4
Column 3 Consuming 5

Lead vs Size Fraction

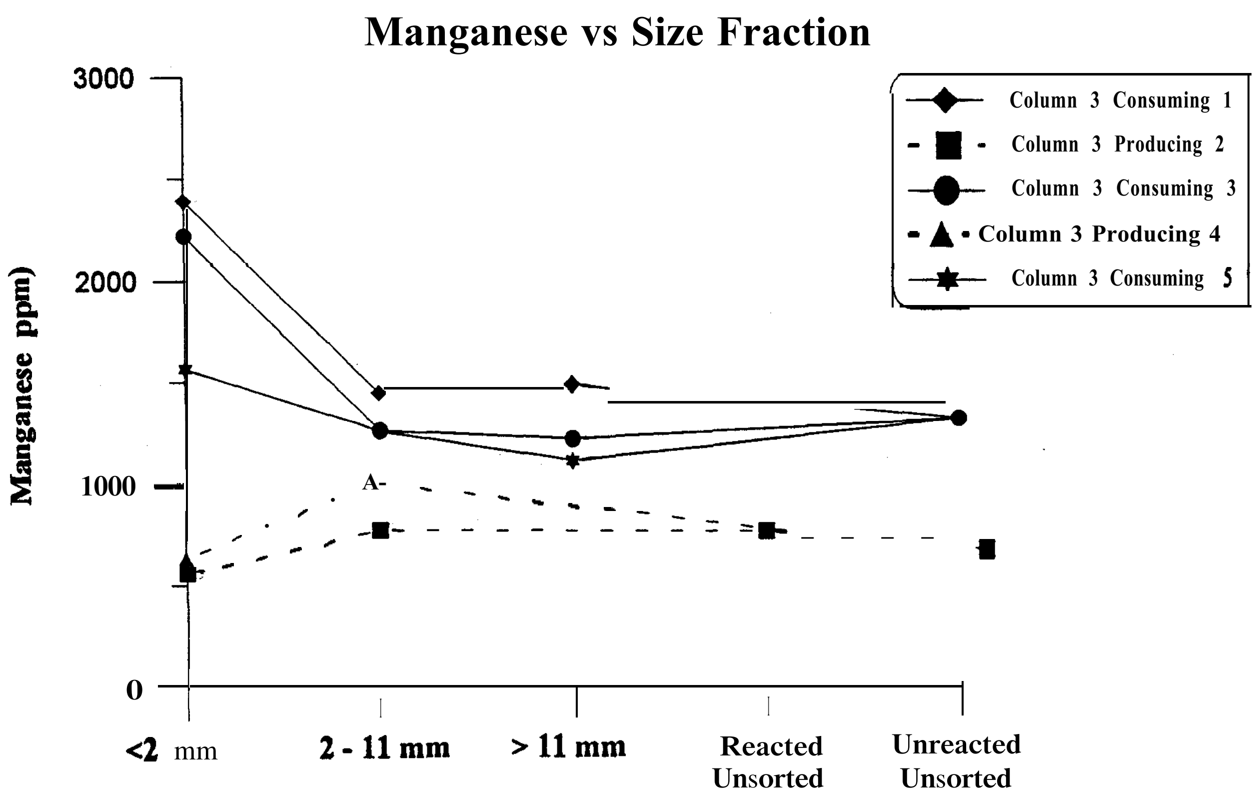


Mercury vs Size Fraction



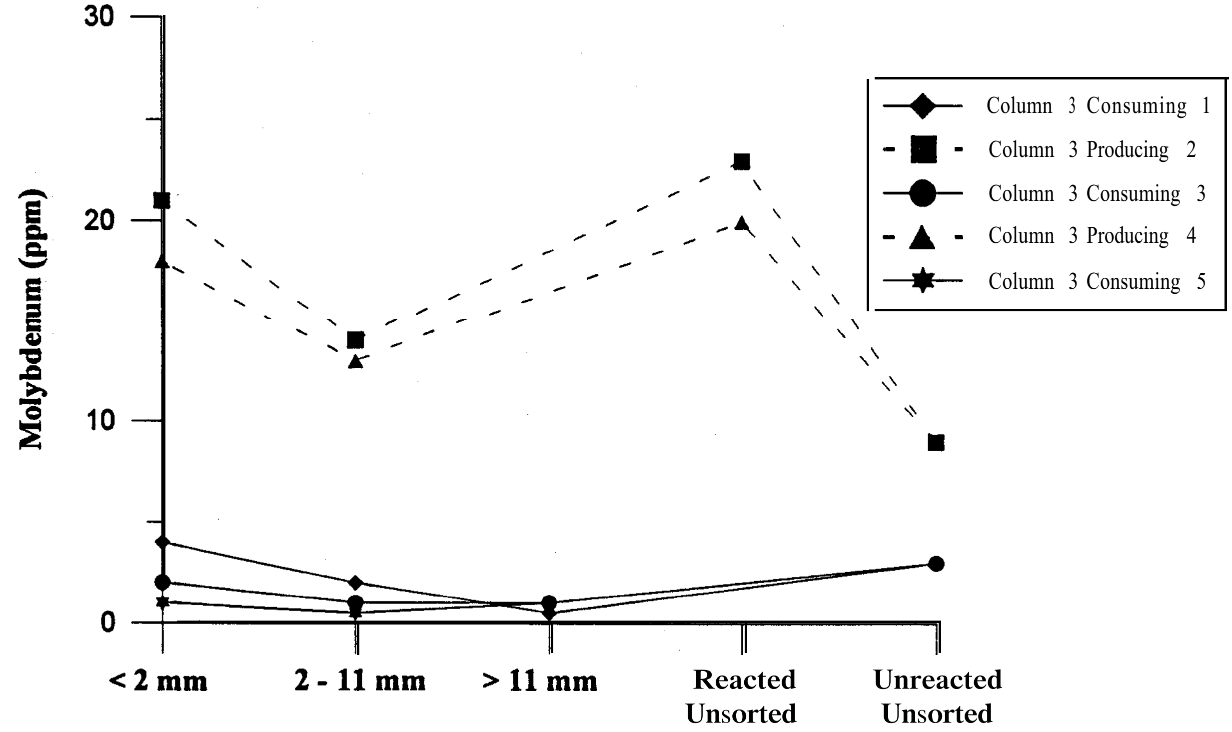


Magnesium vs Size Fraction
80000
40000
0
Magnesium (ppm)
Column 3 Consuming 1
Column 3 Producing 2
Column 3 Consuming 3
Column 3 Producing 4
Column 3 Consuming 5
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

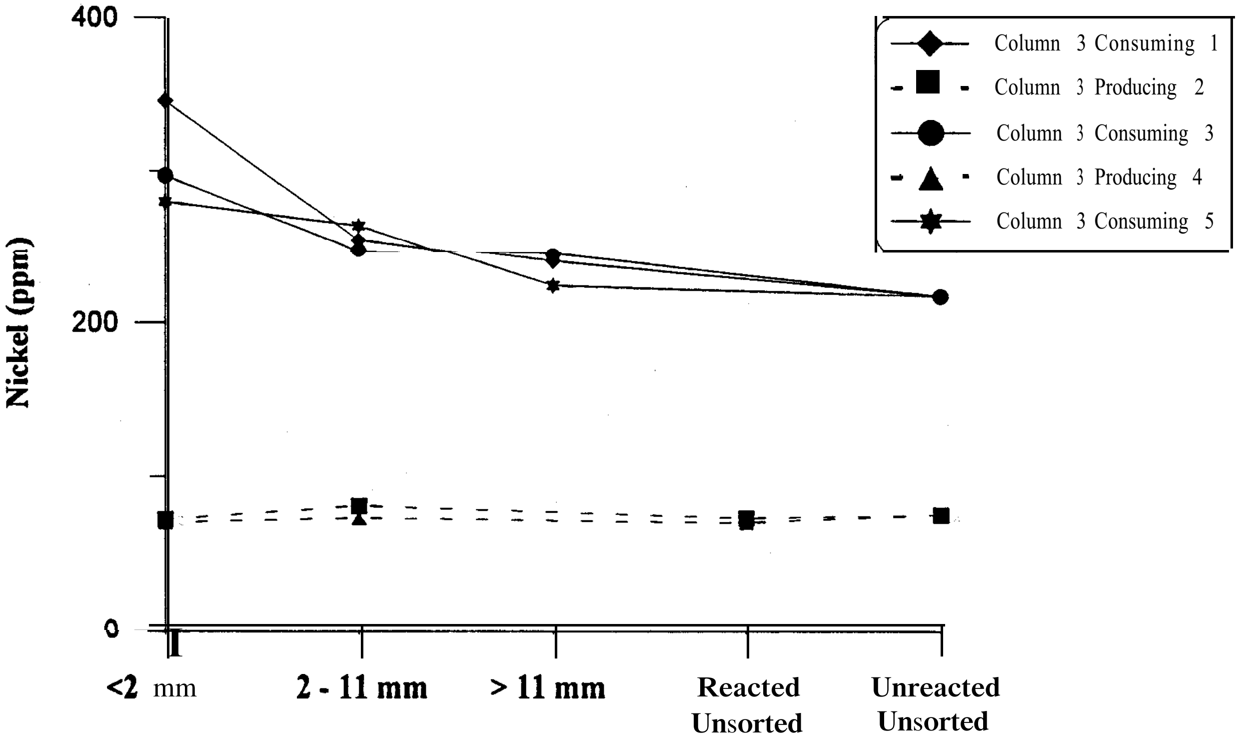


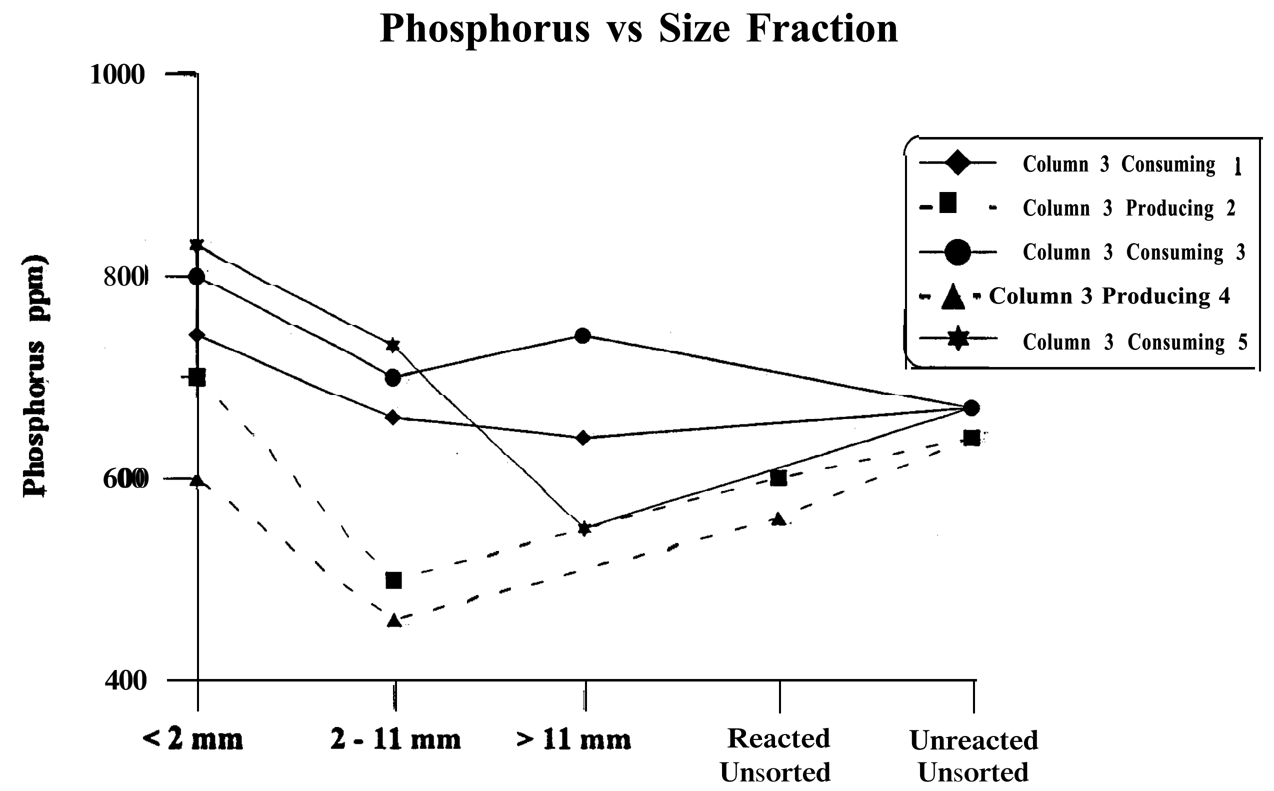
Manganese vs Size Fraction
3000
2000
1000
0
Manganese ppm)
Column 3 Consuming 1
Column 3 Producing 2
Column 3 Consuming 3
Column 3 Producing 4
Column 3 Consuming 5
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

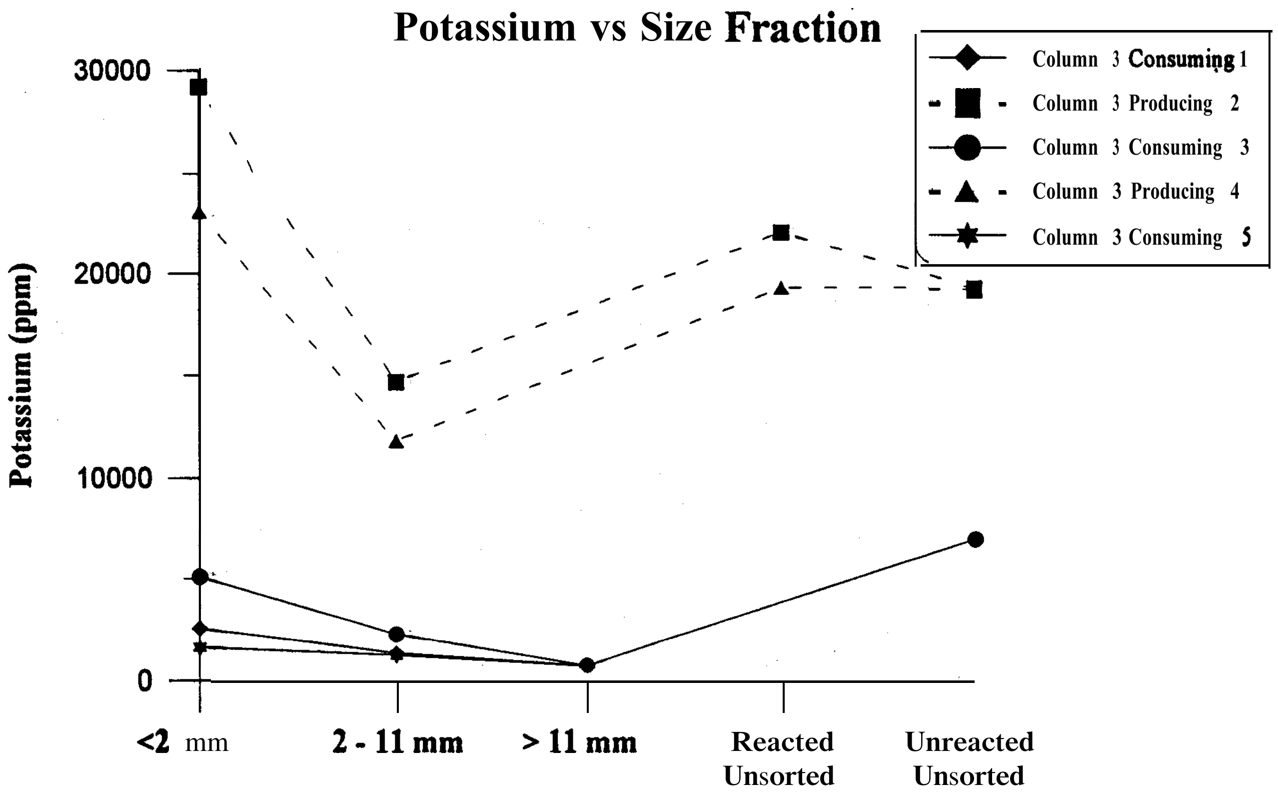
Molybdenum vs Size Fraction

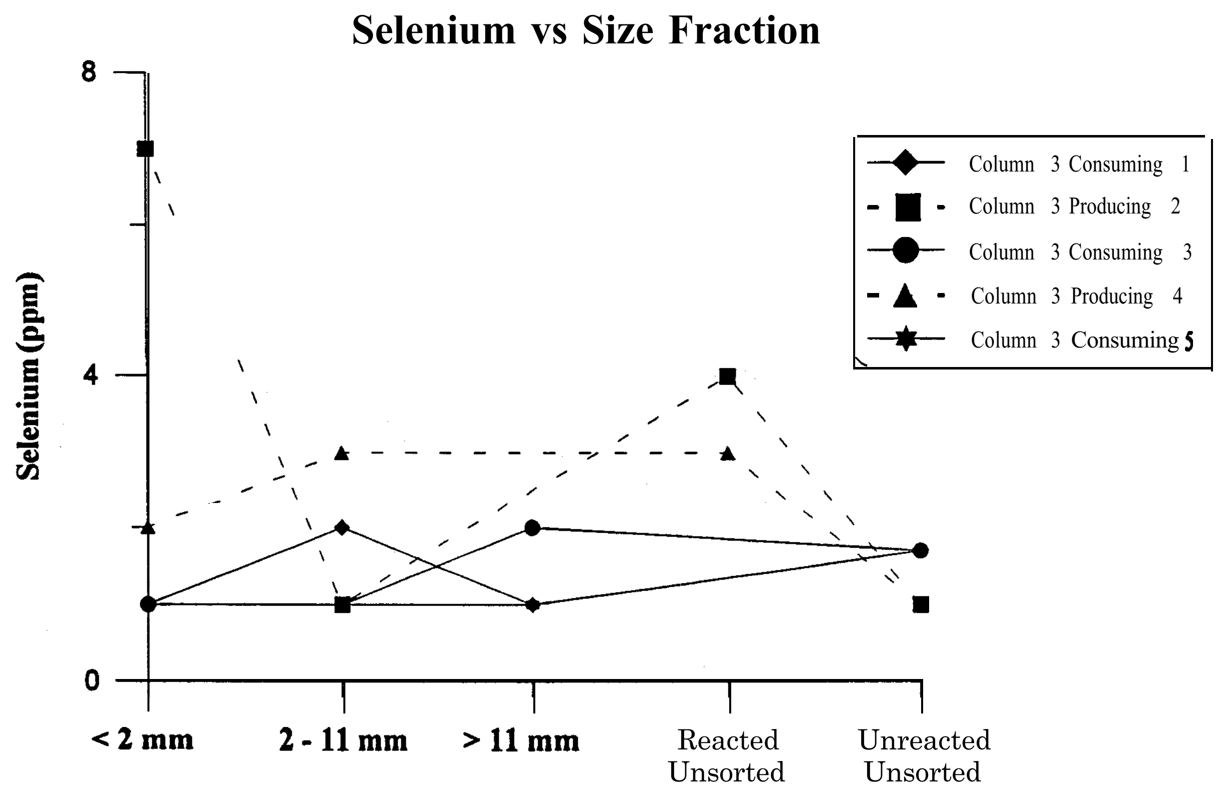


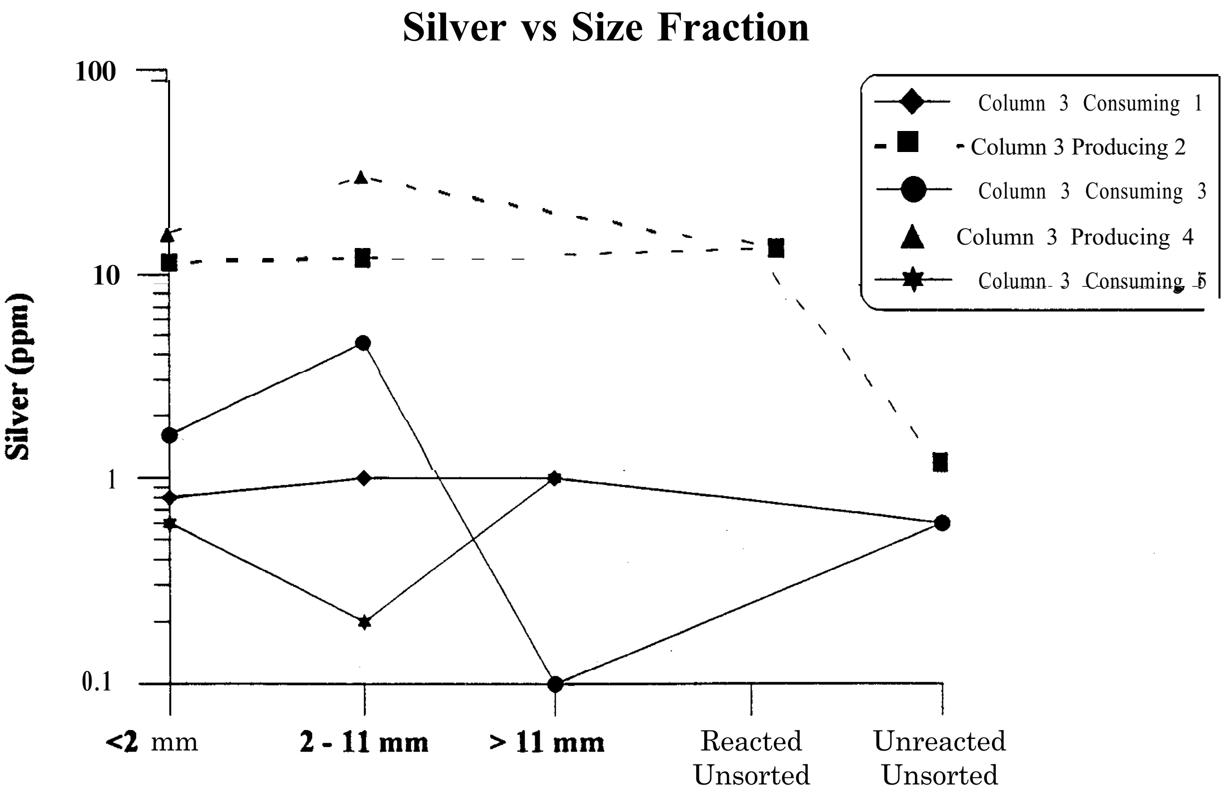
Nickel vs Size Fraction

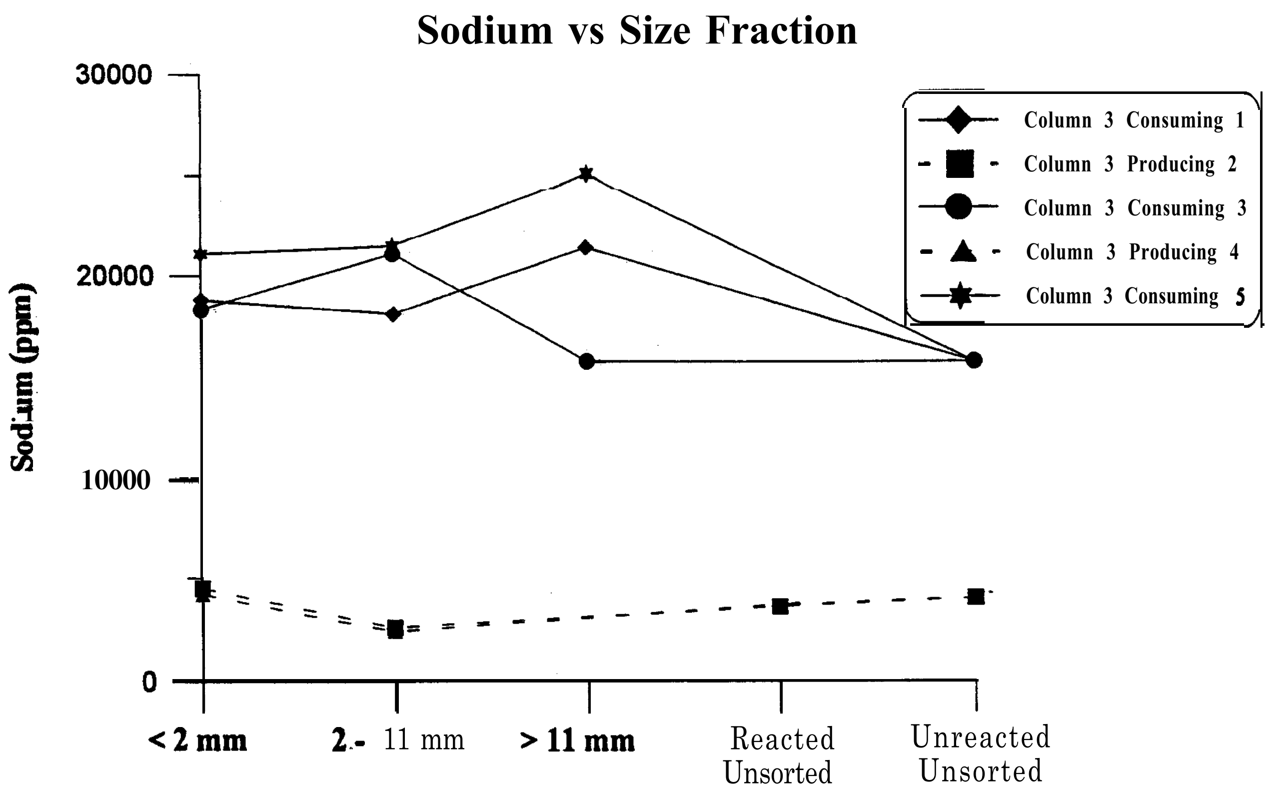


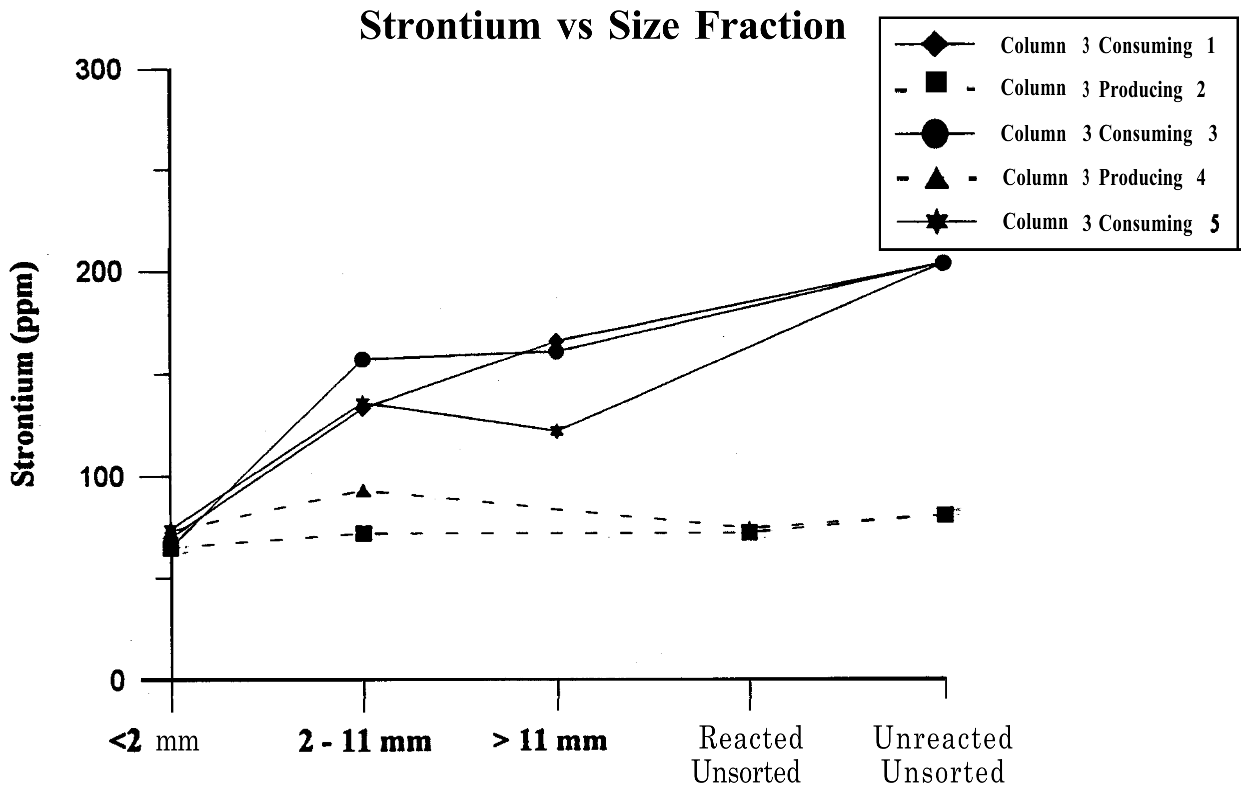

Phosphorus vs Size Fraction
1000
800
600
400
Phosphorus ppm)
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 3 Consuming 1
Column 3 Producing 2
Column 3 Consuming 3
Column 3 Producing 4
Column 3 Consuming 5

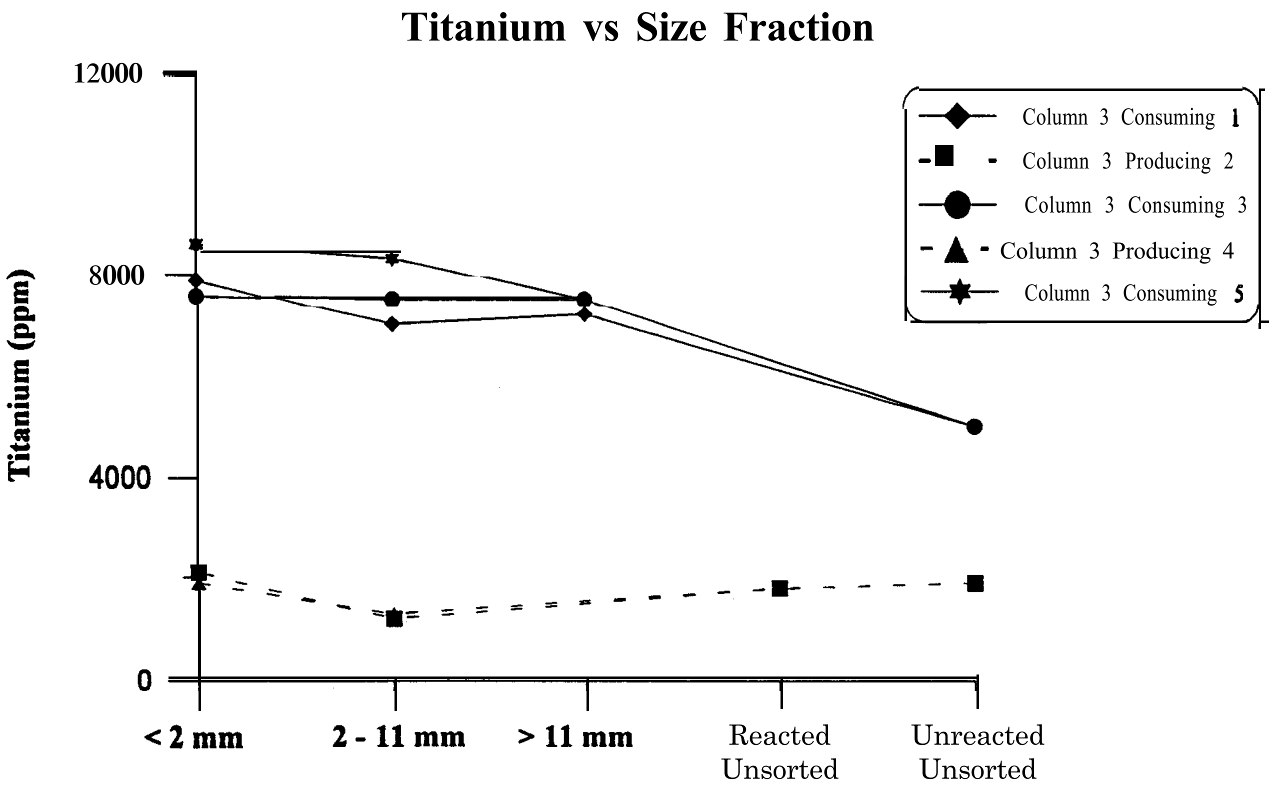

Potassium vs Size Fraction
30000
20000
10000
0
Potassium (ppm)
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 3 Consuming 1
Column 3 Producing 2
Column 3 Consuming 3
Column 3 Producing 4
Column 3 Consuming 5

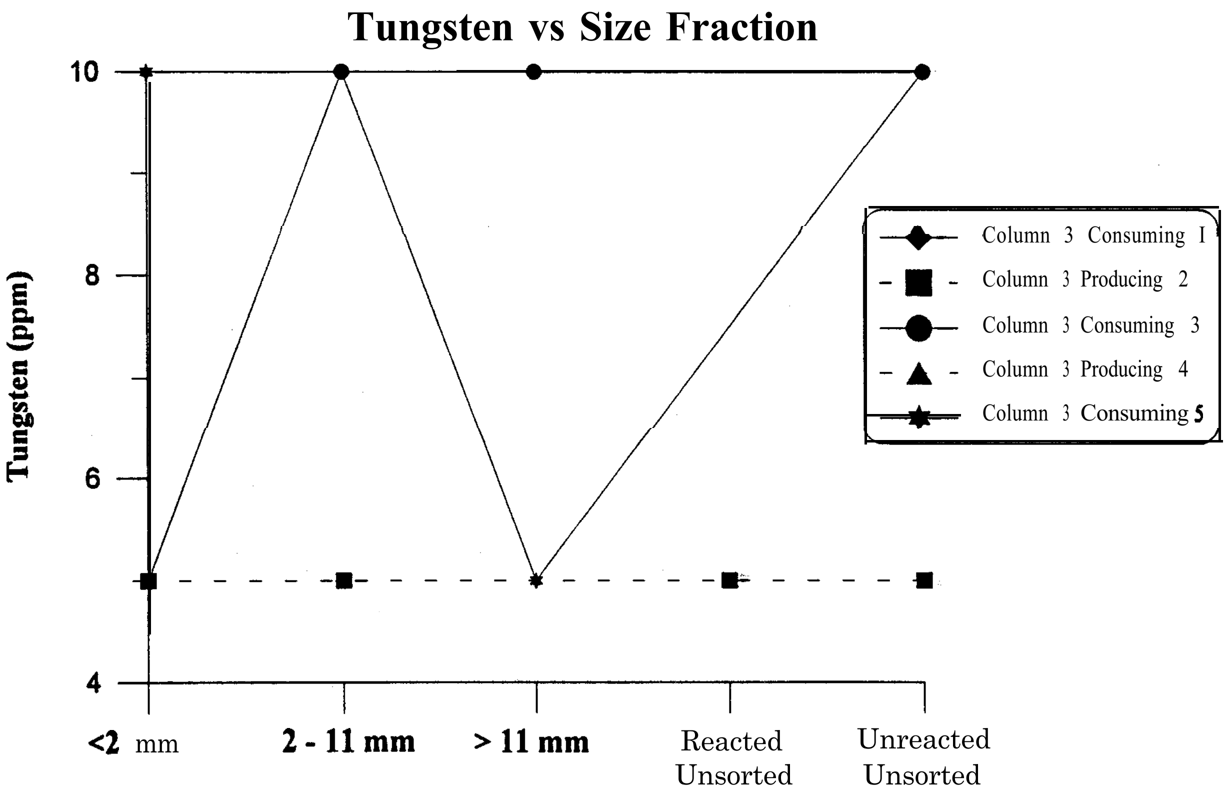

Selenium vs Size Fraction
8
4
0
Selenium (ppm)
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 3 Consuming 1
Column 3 Producing 2
Column 3 Consuming 3
Column 3 Producing 4
Column 3 Consuming 5


Silver vs Size Fraction
100
10
1
0.1
Silver (ppm)
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 3 Consuming 1
Column 3 Producing 2
Column 3 Consuming 3
Column 3 Producing 4
Column 3 Consuming 5

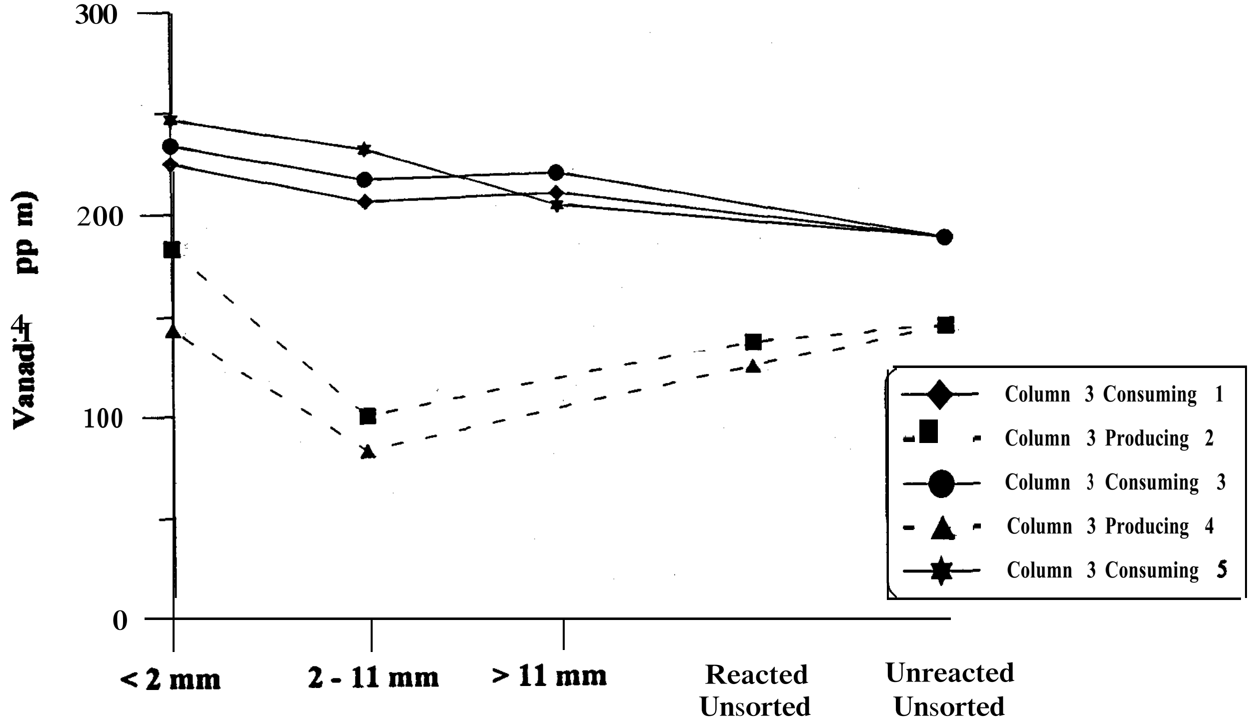

Sodium vs Size Fraction
30000
20000
10000
0
Sod:um (ppm)
< 2 mm
2.- 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 3 Consuming 1
Column 3 Producing 2
Column 3 Consuming 3
Column 3 Producing 4
Column 3 Consuming 5


Strontium vs Size Fraction
300
200
100
0
Strontium (ppm)
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 3 Consuming 1
Column 3 Producing 2
Column 3 Consuming 3
Column 3 Producing 4
Column 3 Consuming 5

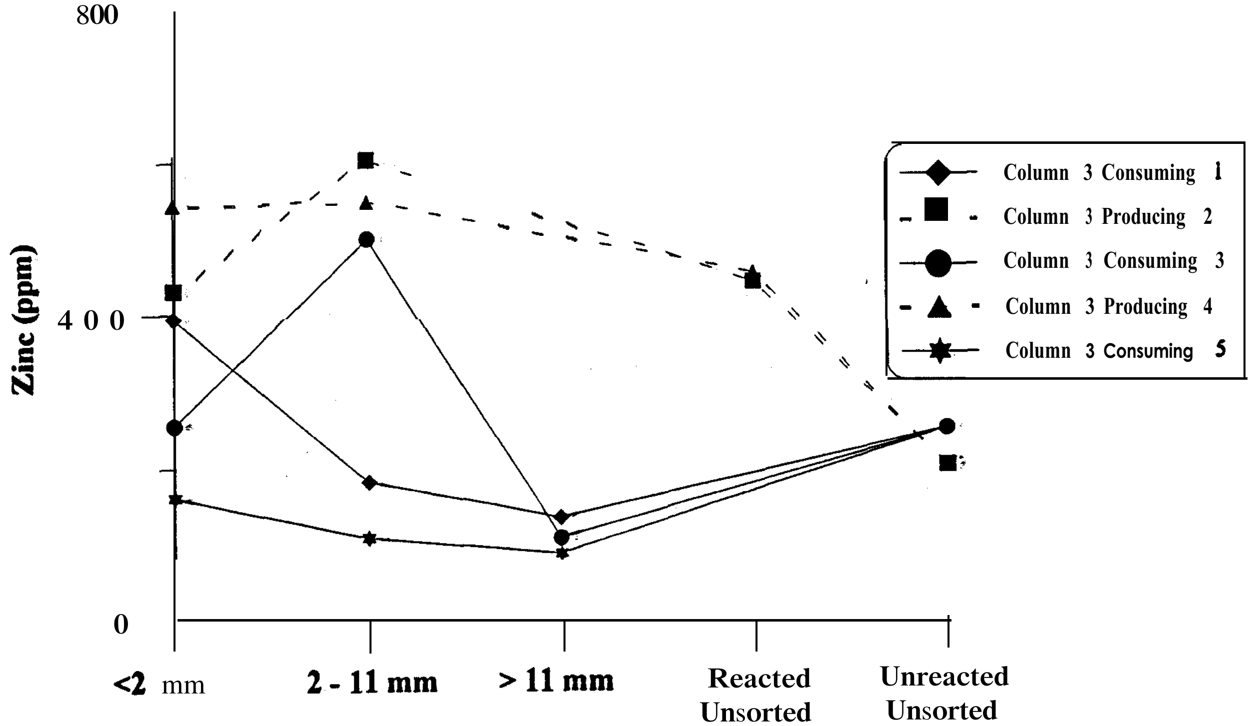

Titanium vs Size Fraction
12000
8000
4000
0
Titanium (ppm)
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 3 Consuming 1
Column 3 Producing 2
Column 3 Consuming 3
Column 3 Producing 4
Column 3 Consuming 5


Tungsten vs Size Fraction
10
8
6
4
Tungsten (ppm)
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 3 Consuming I
Column 3 Producing 2
Column 3 Consuming 3
Column 3 Producing 4
Column 3 Consuming 5

Vanadium vs Size Fraction

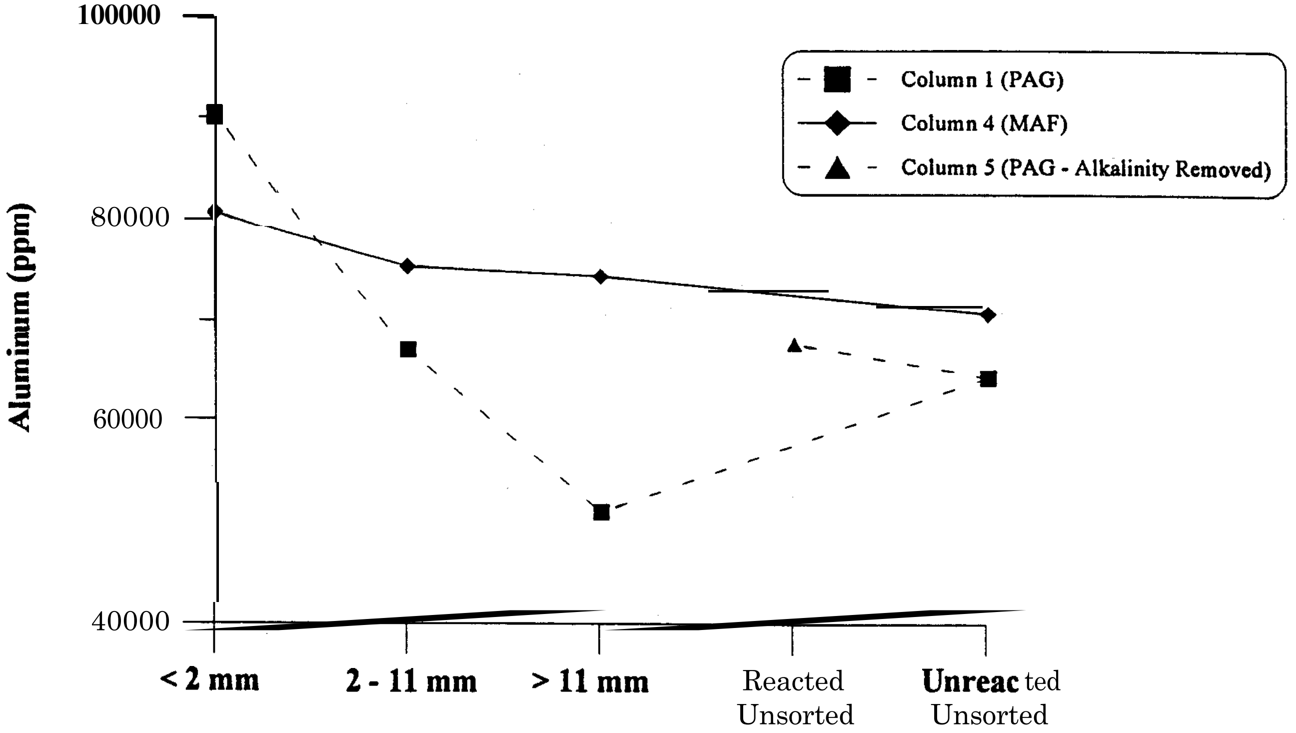


Zinc vs Size Fraction

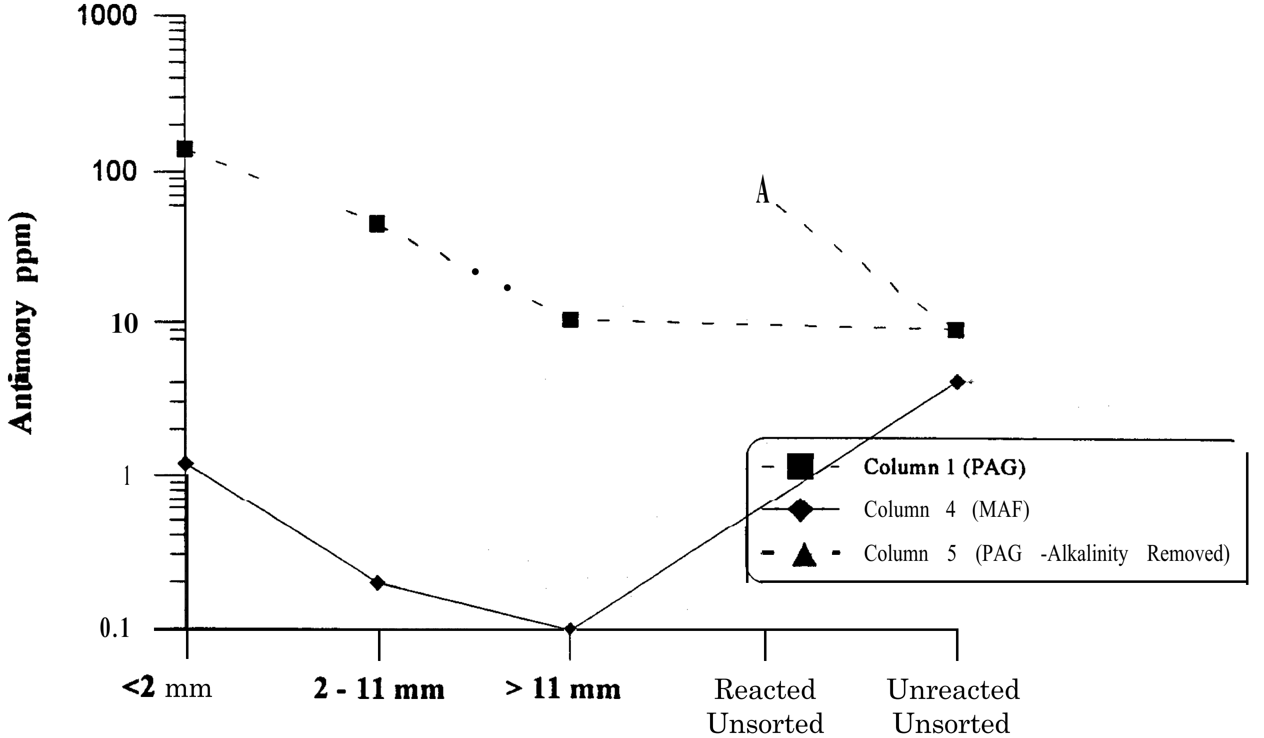


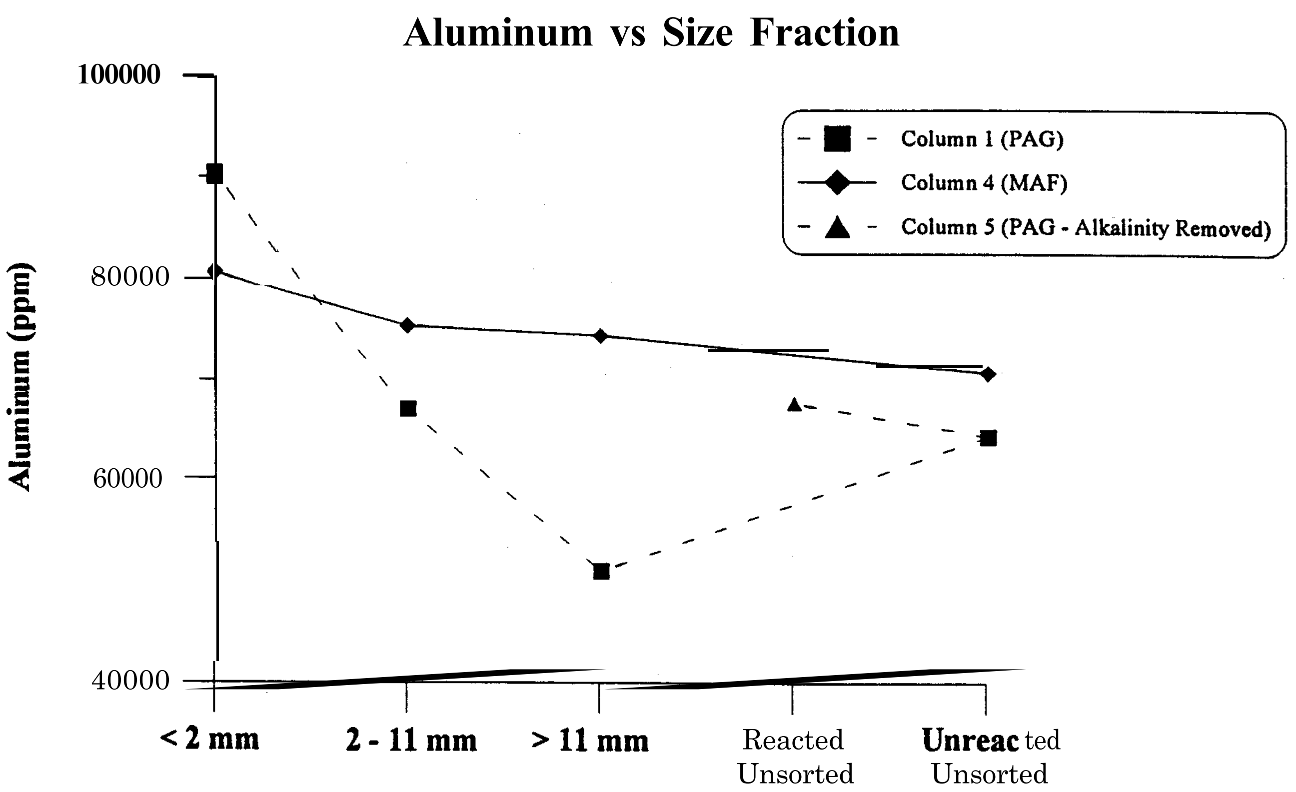
A5.3. Columns 1, 4, and 5

Aluminum vs Size Fraction

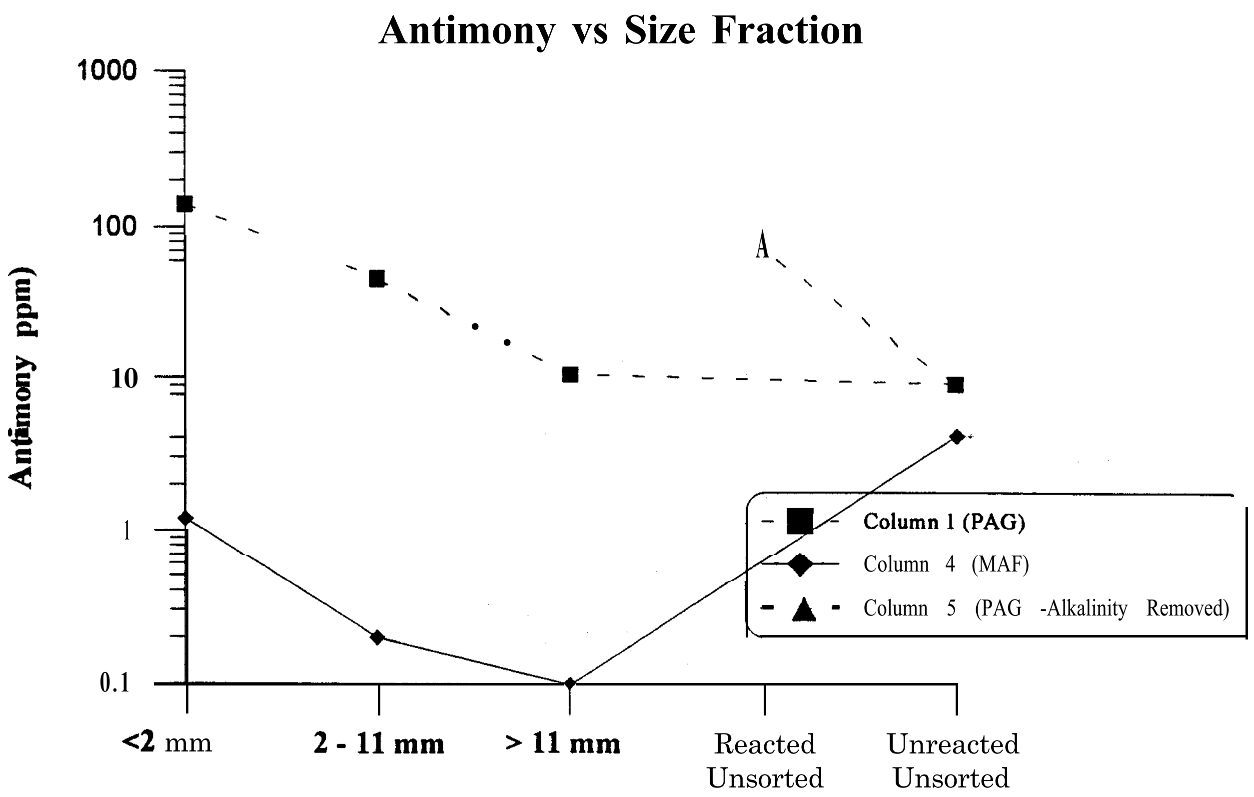


Antimony vs Size Fraction





Aluminum vs Size Fraction
100000
80000
60000
40000
Aluminum (ppm)
Column 1 (PAG)
Column 4 (MAF)
Column 5 (PAG - Alkalinity Removed)
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

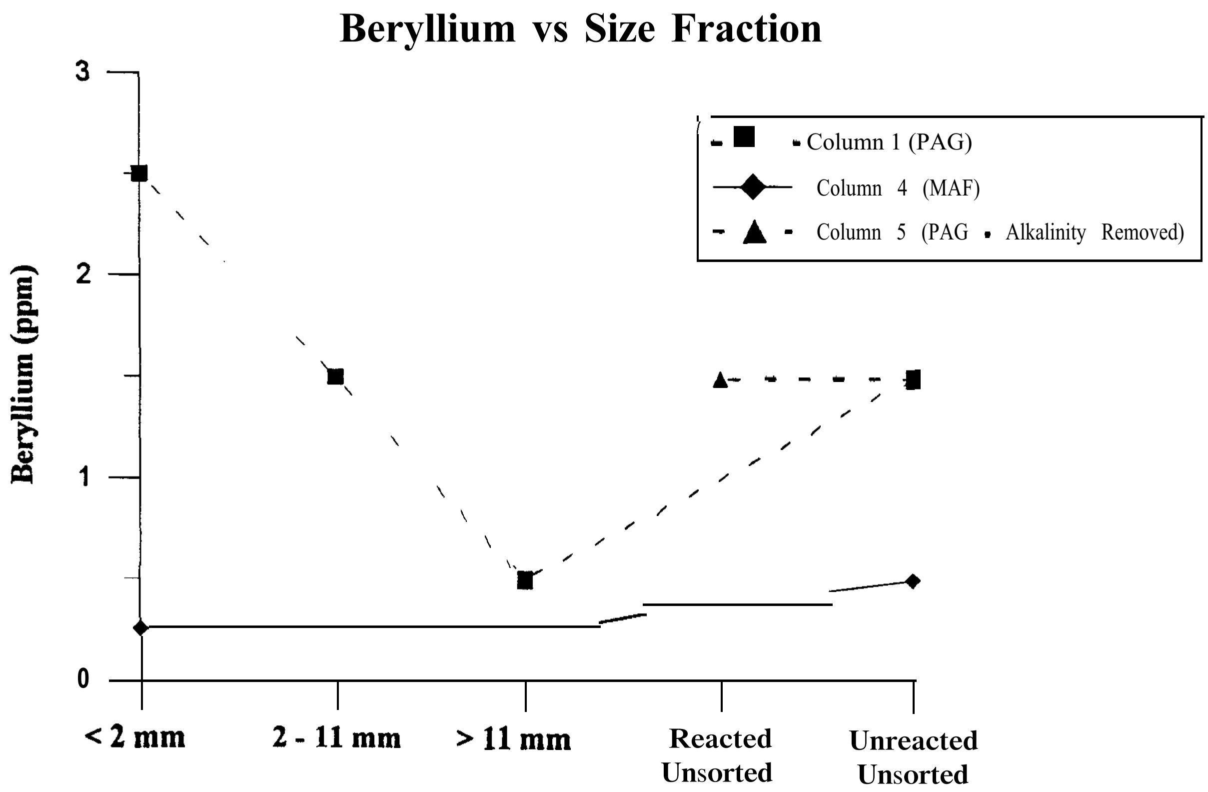


Antimony vs Size Fraction
1000
100
10
1
0.1
Antimony ppm)
Column 1 (PAG)
Column 4 (MAF)
Column 5 (PAG -Alkalinity Removed)
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

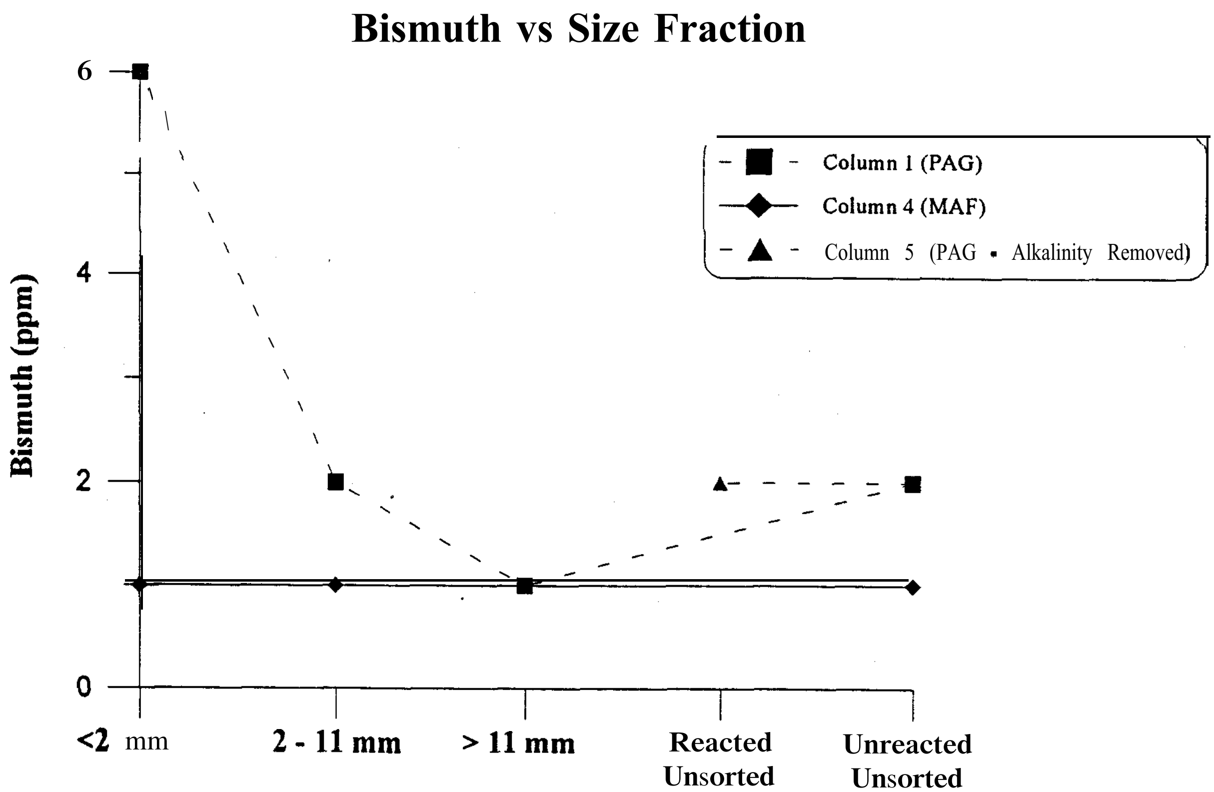
Samatosum Mine Humidity Cell Data -Column 1 (Blend Control)

		Dissolved Metals*:								Metal Leach Rates:								Cumulative Metal Leach Rates:							
		Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc	Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc	Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc
Week No.	Date	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn
		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(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)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
132	21-Aug-91																	2.1E-01	2.4E-01	6.9E+00	2.9E+02	1.6E-01	1.9E+02	4.2E-02	3.0E+01
133	28-Aug-91																	2.1E-01	2.5E-01	7.3E+00	3.2E+02	1.6E-01	1.9E+02	4.3E-02	3.0E+01
134	4-Sep-91		0.15	2.4	285		15	0.004	1.3		4.2E-02	6.6E-01	7.9E+01		4.2E+00	1.1E-03	3.6E-01	2.1E-01	2.9E-01	7.9E+00	4.0E+02	1.6E-01	2.0E+02	4.4E-02	3.0E+01
135	11-Sep-91																	2.1E-01	3.0E-01	8.2E+00	4.3E+02	1.6E-01	2.0E+02	4.5E-02	3.1E+01
136	18-Sep-91																	2.2E-01	3.1E-01	8.4E+00	4.6E+02	1.6E-01	2.0E+02	4.5E-02	3.1E+01
137	25-Sep-91																	2.2E-01	3.2E-01	8.7E+00	4.9E+02	1.7E-01	2.0E+02	4.6E-02	3.2E+01
138	2-Oct-91		0.003	0.66	50		4.9	0.003	1.6		2.0E-03	3.9E-01	3.3E+01		3.3E+00	2.0E-03	1.1E+00	2.2E-01	3.2E-01	9.1E+00	5.2E+02	1.7E-01	2.0E+02	4.8E-02	3.3E+01
139	9-Oct-91																	2.2E-01	3.2E-01	9.2E+00	5.3E+02	1.7E-01	2.1E+02	4.9E-02	3.3E+01
140	16-Oct-91																	2.2E-01	3.3E-01	9.3E+00	5.4E+02	1.7E-01	2.1E+02	4.9E-02	3.3E+01
141	23-Oct-91																	2.2E-01	3.3E-01	9.5E+00	5.5E+02	1.7E-01	2.1E+02	5.0E-02	3.4E+01
142	30-Oct-91																	2.2E-01	3.3E-01	9.6E+00	5.6E+02	1.8E-01	2.1E+02	5.1E-02	3.4E+01
143	6-Nov-91		0.002	0.41	26		3.4	0.002	1		1.3E-03	2.7E-01	1.7E+01		2.2E+00	1.3E-03	6.6E-01	2.2E-01	3.3E-01	9.9E+00	5.8E+02	1.8E-01	2.1E+02	5.2E-02	3.5E+01
144	13-Nov-91																	2.3E-01	3.3E-01	1.0E+01	5.8E+02	1.8E-01	2.1E+02	5.3E-02	3.5E+01
145	20-Nov-91																	2.3E-01	3.3E-01	1.0E+01	5.9E+02	1.8E-01	2.1E+02	5.3E-02	3.5E+01
146	27-Nov-91																	2.3E-01	3.3E-01	1.0E+01	6.0E+02	1.8E-01	2.1E+02	5.4E-02	3.6E+01
147	4-Dec-91		0.001	0.37	20		3.1	0.001	0.94		6.6E-04	2.4E-01	1.3E+01		2.0E+00	6.6E-04	6.2E-01	2.3E-01	3.3E-01	1.1E+01	6.1E+02	1.9E-01	2.2E+02	5.4E-02	3.6E+01
148	11-Dec-91																	2.3E-01	3.3E-01	1.1E+01	6.2E+02	1.9E-01	2.2E+02	5.5E-02	3.7E+01
149	18-Dec-91																	2.3E-01	3.3E-01	1.1E+01	6.2E+02	1.9E-01	2.2E+02	5.5E-02	3.7E+01
150	25-Dec-91																	2.3E-01	3.3E-01	1.1E+01	6.3E+02	1.9E-01	2.2E+02	5.5E-02	3.7E+01
151	1-Jan-92		0.001	0.2	8.3		1.9	0.001	0.69		6.8E-04	1.4E-01	5.7E+00		1.3E+00	6.8E-04	4.7E-01	2.4E-01	3.3E-01	1.1E+01	6.3E+02	1.9E-01	2.2E+02	5.6E-02	3.8E+01
152	8-Jan-92																	2.4E-01	3.3E-01	1.1E+01	6.4E+02	2.0E-01	2.2E+02	5.6E-02	3.8E+01
153	15-Jan-92																	2.4E-01	3.3E-01	1.1E+01	6.4E+02	2.0E-01	2.2E+02	5.7E-02	3.8E+01
154	22-Jan-92																	2.4E-01	3.3E-01	1.1E+01	6.4E+02	2.0E-01	2.2E+02	5.7E-02	3.8E+01
155	29-Jan-92		0.001	0.22	9.5		2.1	0.001	0.77		6.6E-04	1.5E-01	6.3E+00		1.4E+00	6.6E-04	5.1E-01	2.4E-01	3.3E-01	1.1E+01	6.5E+02	2.0E-01	2.2E+02	5.8E-02	3.9E+01
156	5-Feb-92																	2.4E-01	3.3E-01	1.1E+01	6.5E+02	2.0E-01	2.2E+02	5.8E-02	3.9E+01
157	12-Feb-92																	2.4E-01	3.3E-01	1.1E+01	6.5E+02	2.1E-01	2.2E+02	5.8E-02	3.9E+01
158	19-Feb-92																	2.4E-01	3.3E-01	1.1E+01	6.6E+02	2.1E-01	2.2E+02	5.9E-02	3.9E+01
159	26-Feb-92		0.001	0.17	4.9		1.7	0.001	0.56		6.7E-04	1.1E-01	3.3E+00		1.1E+00	6.7E-04	3.7E-01	2.5E-01	3.4E-01	1.2E+01	6.6E+02	2.1E-01	2.3E+02	5.9E-02	4.0E+01
160	4-Mar-92																	2.5E-01	3.4E-01	1.2E+01	6.6E+02	2.1E-01	2.3E+02	6.0E-02	4.0E+01
161	11-Mar-92																	2.5E-01	3.4E-01	1.2E+01	6.6E+02	2.1E-01	2.3E+02	6.0E-02	4.0E+01
162	18-Mar-92																	2.5E-01	3.4E-01	1.2E+01	6.6E+02	2.2E-01	2.3E+02	6.0E-02	4.0E+01
163	25-Mar-92		0.001	0.18	4.9		2.1	0.001	0.65		6.9E-04	1.2E-01	3.4E+00		1.4E+00	6.9E-04	4.5E-01	2.5E-01	3.4E-01	1.2E+01	6.7E+02	2.2E-01	2.3E+02	6.1E-02	4.1E+01
164	1-Apr-92																	2.5E-01	3.4E-01	1.2E+01	6.7E+02	2.2E-01	2.3E+02	6.1E-02	4.1E+01
165	8-Apr-92																	2.5E-01	3.4E-01	1.2E+01	6.7E+02	2.2E-01	2.3E+02	6.2E-02	4.1E+01
166	15-Apr-92																	2.6E-01	3.4E-01	1.2E+01	6.7E+02	2.2E-01	2.3E+02	6.2E-02	4.1E+01
167	22-Apr-92		0.001	0.16	3.2		2	0.001	0.52		6.6E-04	1.1E-01	2.1E+00		1.3E+00	6.6E-04	3.5E-01	2.6E-01	3.4E-01	1.2E+01	6.7E+02	2.3E-01	2.3E+02	6.3E-02	4.2E+01
168	29-Apr-92																	2.6E-01	3.4E-01	1.2E+01	6.7E+02	2.3E-01	2.3E+02	6.3E-02	4.2E+01
169	6-May-92																	2.6E-01	3.4E-01	1.2E+01	6.8E+02	2.3E-01	2.3E+02	6.3E-02	4.2E+01
170	13-May-92																	2.6E-01	3.4E-01	1.2E+01	6.8E+02	2.3E-01	2.3E+02	6.4E-02	4.2E+01
171	20-May-92		0.002	0.17	2.5		1.9	0.001	0.46		1.3E-03	1.1E-01	1.6E+00		1.2E+00	6.5E-04	3.0E-01	2.6E-01	3.4E-01	1.2E+01	6.8E+02	2.3E-01	2.4E+02	6.4E-02	4.3E+01
172	27-May-92																	2.6E-01	3.4E-01	1.3E+01	6.8E+02	2.4E-01	2.4E+02	6.5E-02	4.3E+01
173	3-Jun-92																	2.6E-01	3.4E-01	1.3E+01	6.8E+02	2.4E-01	2.4E+02	6.5E-02	4.3E+01
174	10-Jun-92																	2.7E-01	3.4E-01	1.3E+01	6.8E+02	2.4E-01	2.4E+02	6.5E-02	4.3E+01
175	17-Jun-92		0.001	0.16	2.2		2.2	0.001	0.55		6.9E-04	1.1E-01	1.5E+00		1.5E+00	6.9E-04	3.8E-01	2.7E-01	3.4E-01	1.3E+01	6.8E+02	2.4E-01	2.4E+02	6.6E-02	4.3E+01
176	24-Jun-92																	2.7E-01	3.4E-01	1.3E+01	6.8E+02	2.4E-01	2.4E+02	6.6E-02	4.4E+01
177	1-Jul-92																	2.7E-01	3.4E-01	1.3E+01	6.8E+02	2.5E-01	2.4E+02	6.7E-02	4.4E+01
178	8-Jul-92																	2.7E-01	3.4E-01	1.3E+01	6.8E+02	2.5E-01	2.4E+02	6.7E-02	4.4E+01
179	15-Jul-92		0.001	0.1	0.93		1.4	0.001	0.34		6.6E-04	6.6E-02	6.1E-01		9.2E-01	6.6E-04	2.2E-01	2.7E-01	3.5E-01	1.3E+01	6.8E+02	2.5E-01	2.4E+02	6.8E-02	4.4E+01
180	22-Jul-92																	2.7E-01	3.5E-01	1.3E+01	6.8E+02	2.5E-01	2.4E+02	6.8E-02	4.4E+01
181	29-Jul-92																	2.7E-01	3.5E-01	1.3E+01	6.8E+02	2.5E-01	2.4E+02	6.8E-02	4.4E+01
182	5-Aug-92																	2.8E-01	3.5E-01	1.3E+01	6.8E+02	2.6E-01	2.4E+02	6.9E-02	4.5E+01
183	12-Aug-92		0.001	0.18	1.4		2	0.001	0.51		6.7E-04	1.2E-01	9.4E-01		1.3E+00	6.7E-04	3.4E-01	2.8E-01	3.5E-01	1.3E+01	6.9E+02	2.6E-01	2.5E+02	6.9E-02	4.5E+01
184	19-Aug-92																	2.8E-01	3.5E-01	1.3E+01	6.9E+02	2.6E-01	2.5E+02	7.0E-02	4.5E+01
185	26-Aug-92																	2.8E-01	3.5E-01	1.3E+01	6.9E+02	2.6E-01	2.5E+02	7.0E-02	4.5E+01
186	2-Sep-92																	2.8E-01	3.5E-01	1.3E+01	6.9E+02	2.6E-01	2.5E+02	7.0E-02	4.5E+01
187	9-Sep-92		0.001	0.12	0.67		1.1	0.001	0.35		6.4E-04	7.7E-02	4.3E-01		7.0E-01	6.4E-04	2.2E-01	2.8E-01	3.5E-01	1.3E+01	6.9E+02	2.7E-01	2.5E+02	7.1E-02	4.6E+01
188	16-Sep-92																	2.8E-01	3.5E-01	1.3E+01	6.9E+02	2.7E-01	2.5E+02	7.1E-02	4.6E+01
189	23-Sep-92																	2.9E-01	3.5E-01	1.4E+01	6.9E+02	2.7E-01	2.5E+02	7.2E-02	4.6E+01
190	30-Sep-92																	2.9E-01	3.5E-01	1.4E+01	6.9E+02	2.7E-01	2.5E+02	7.2E-02	4.6E+01
191	7-Oct-92		0.001	0.17	0.45		1.1	0.001	0.27		6.6E-04	1.1E-01	3.0E-01		7.3E-01	6.6E-04	1.8E-01	2.9E-01	3.5E-01	1.4E+01	6.9E+02	2.7E-01	2.5E+02	7.3E-02	4.6E+01
192	14-Oct-92																	2.9E-01	3.5E-01	1.4E+01	6.9E+02	2.8E-01	2.5E+02	7.3E-02	4.6E+01
193	21-Oct-92																	2.9E-01	3.5E-01	1.4E+01	6.9E+02	2.8E-01	2.5E+02	7.3E-02	4.6E+01
194	28-Oct-92																	2.9E-01	3.5E-01	1.4E+01	6.9E+02	2.8E-01	2.5E+02	7.4E-02	4.6E+01
195	4-Nov-92		0.001	0.17	0.52		0.89	0.001	0.21		6.7E-04	1.1E-01	3.5E-01		6.0E-01	6.7E-04	1.4E-01	2.9E-01	3.5E-01	1.4E+01	6.9E+02	2.8E-01	2.5E+02	7.4E-02	4.6E+01
196	11-Nov-92																	2.9E-01	3.5E-01	1.4E+01	6.9E+02	2.8E-01	2.5E+02	7.5E-02	4.7E+01
197	18-Nov-92																	3.0E-01	3.5E-01	1.4E+01	6.9E+02	2.9E-01	2.5E+02	7.5E-02	4.7E+01

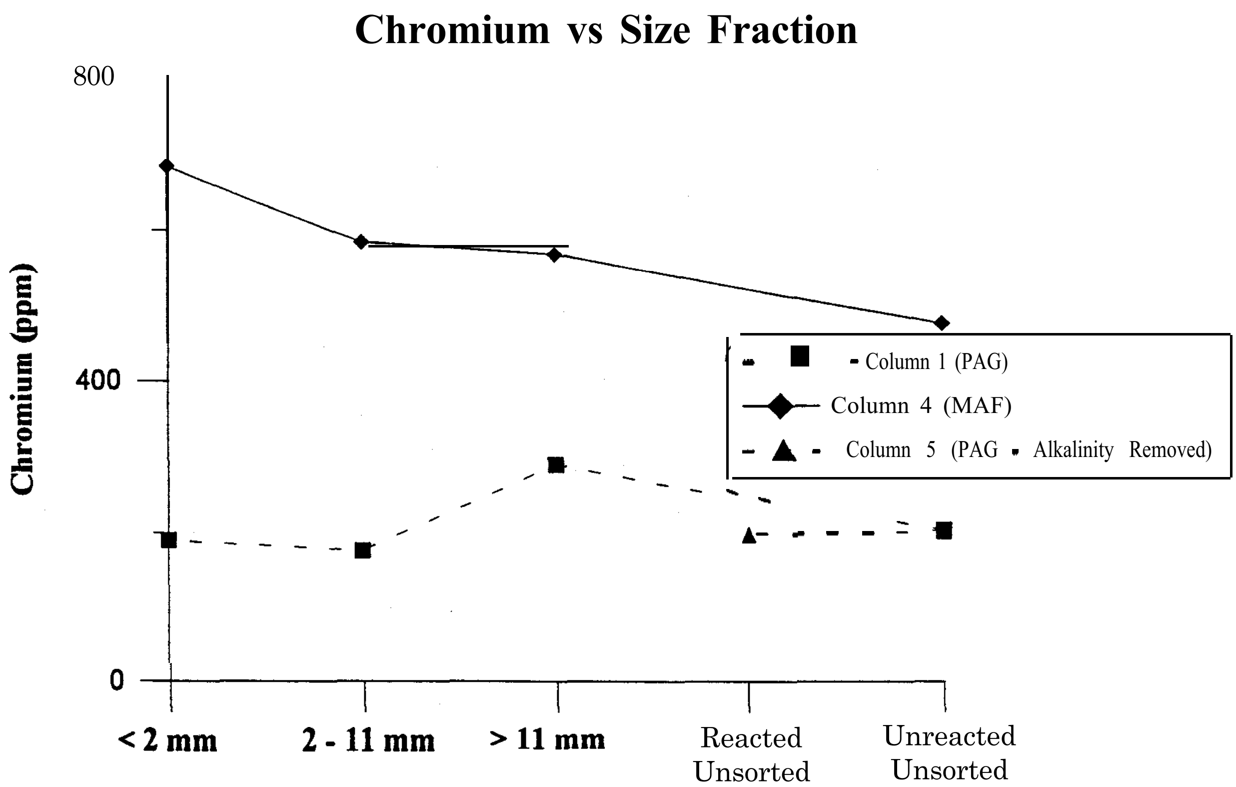
** If values were reported as < detection limit, 1/2 the detection limit is shown in italics and was used in subsequent calculations.*



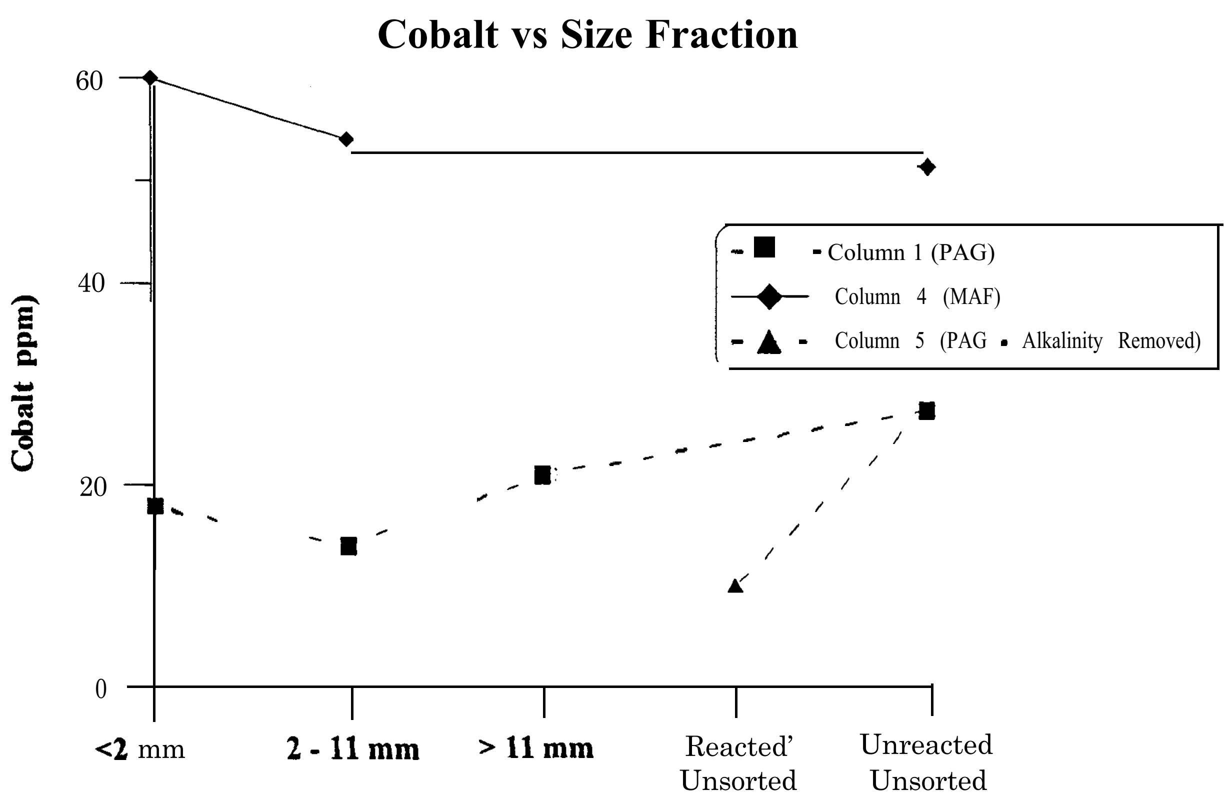
Beryllium vs Size Fraction
Beryllium (ppm)
3
2
1
0
Column 1 (PAG)
Column 4 (MAF)
Column 5 (PAG • Alkalinity Removed)
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted



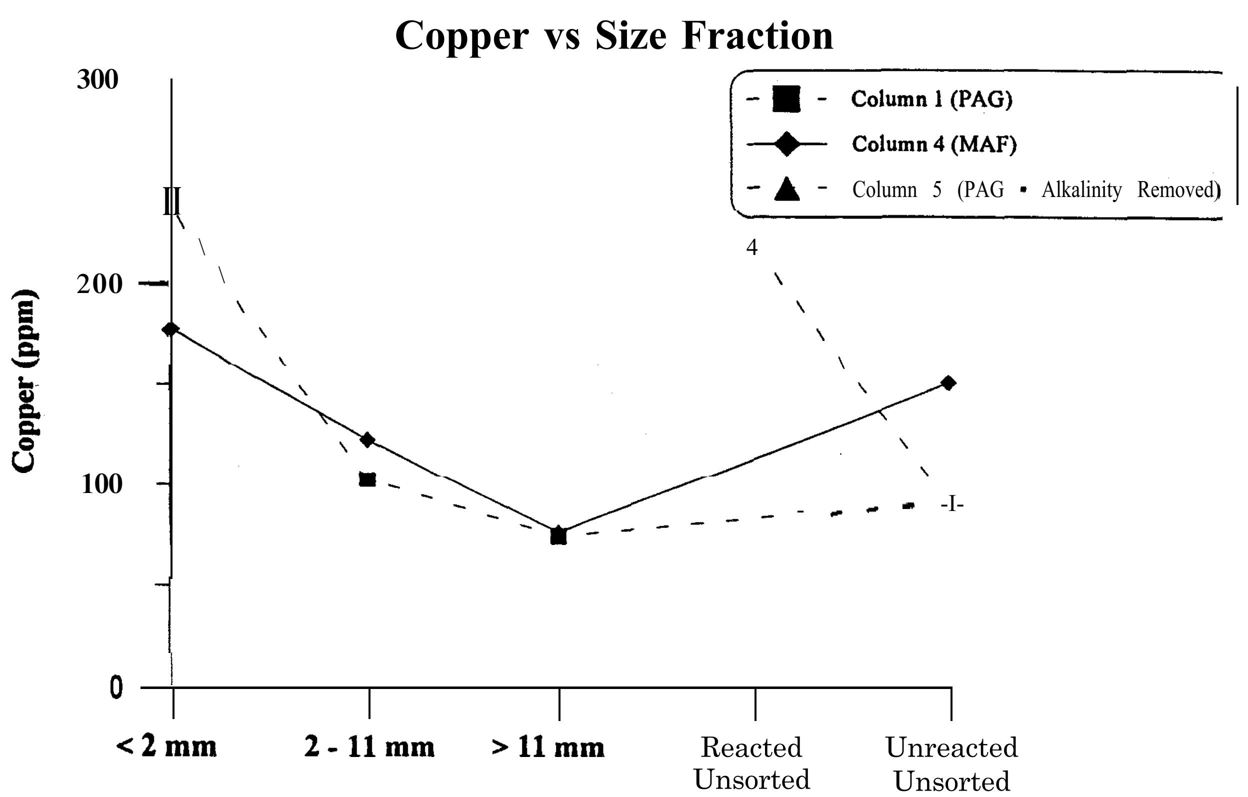
Bismuth vs Size Fraction
Bismuth (ppm)
6
4
2
0
Column 1 (PAG)
Column 4 (MAF)
Column 5 (PAG • Alkalinity Removed)
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

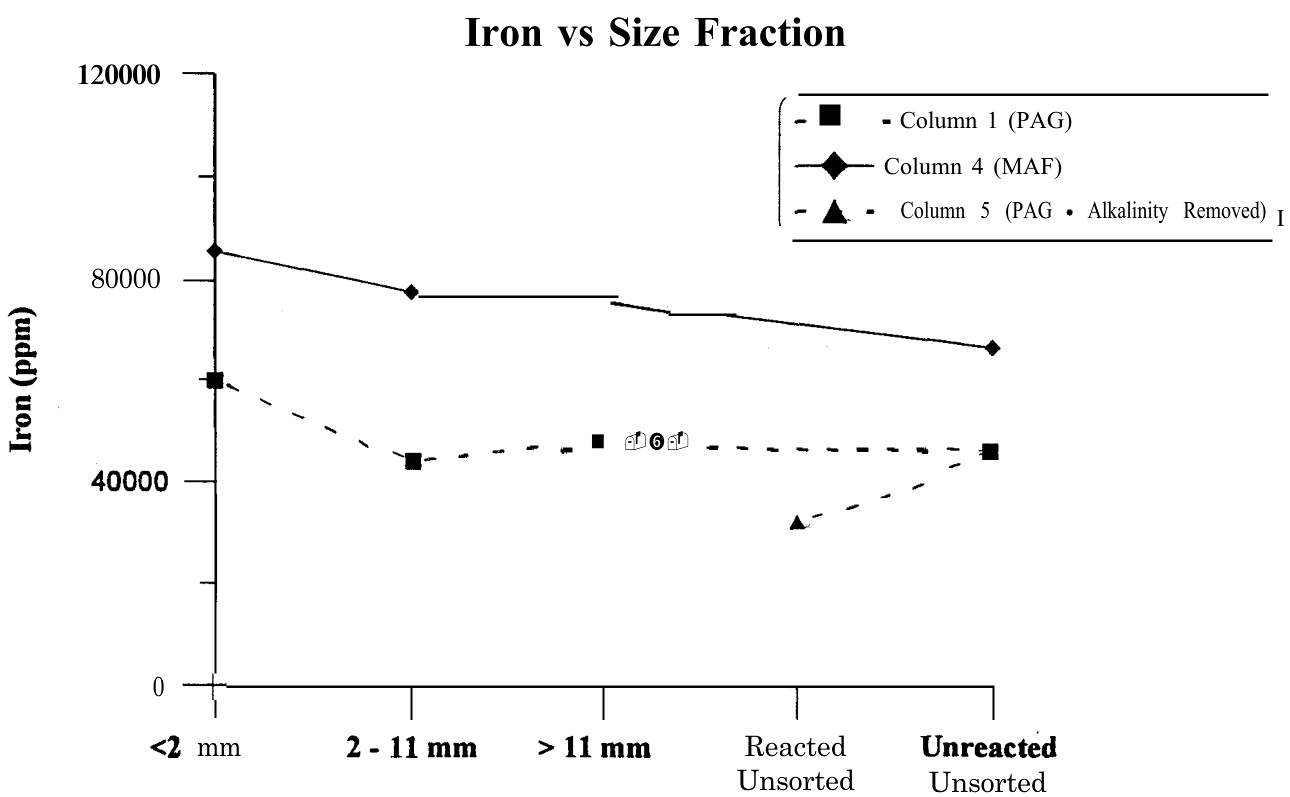


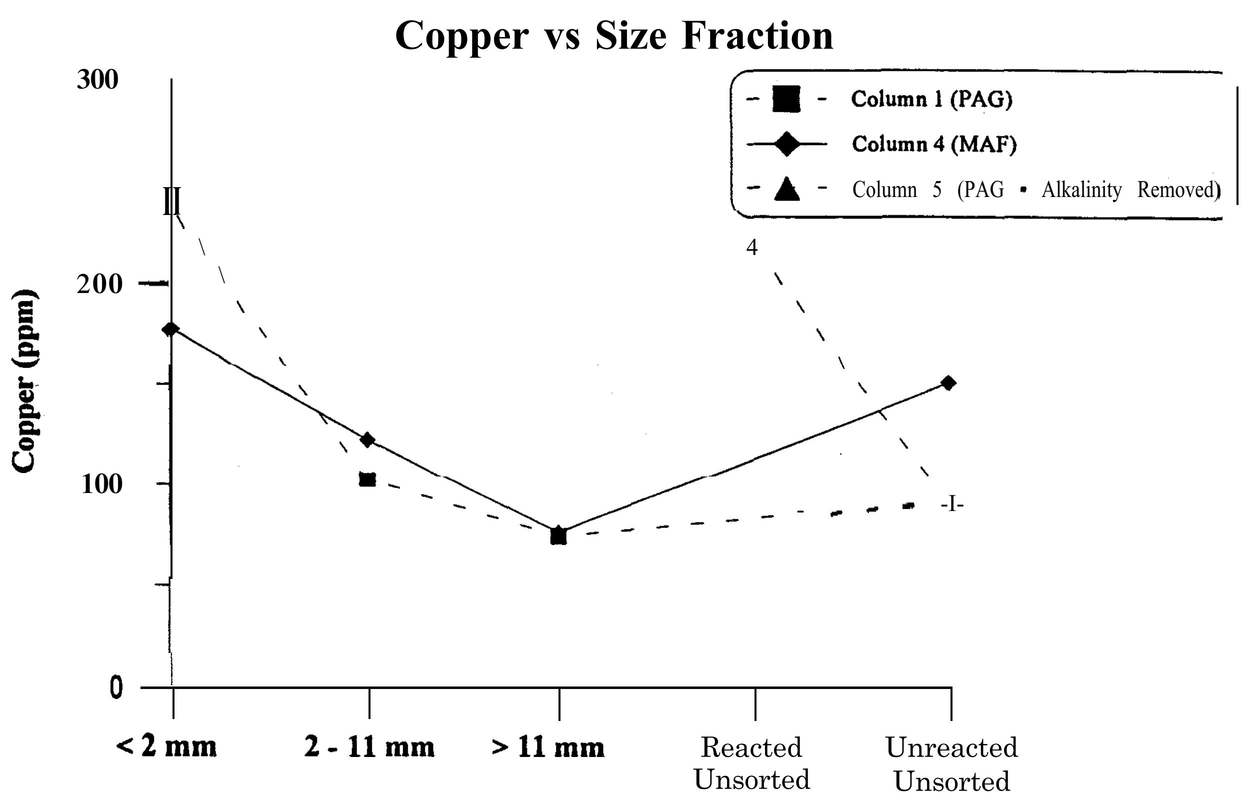
Chromium vs Size Fraction
800
400
0
Chromium (ppm)
Column 1 (PAG)
Column 4 (MAF)
Column 5 (PAG • Alkalinity Removed)
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted



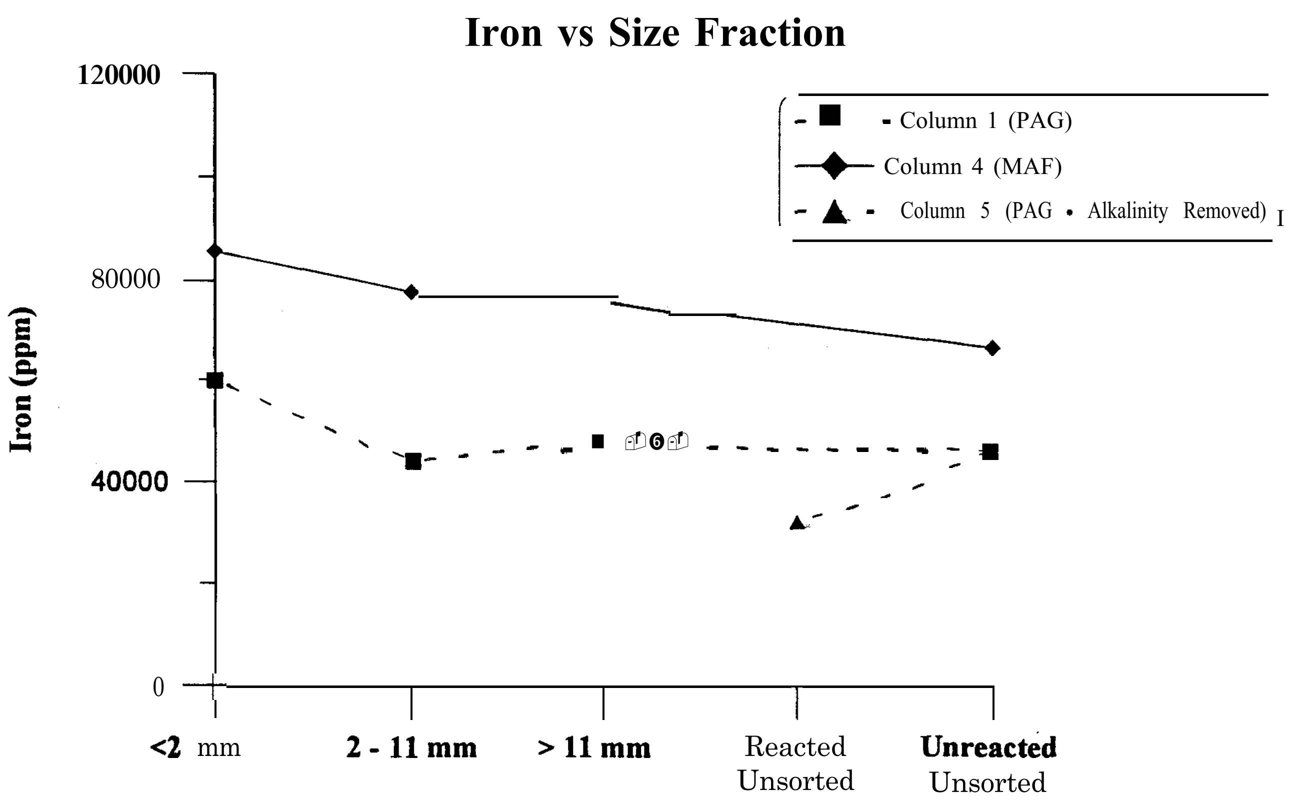
Cobalt vs Size Fraction
60
40
20
0
Cobalt ppm)
Column 1 (PAG)
Column 4 (MAF)
Column 5 (PAG • Alkalinity Removed)
<2 mm
2 - 11 mm
> 11 mm
Reacted' Unsorted
Unreacted Unsorted


Copper vs Size Fraction
300
200
100
0
Copper (ppm)
Column 1 (PAG)
Column 4 (MAF)
Column 5 (PAG • Alkalinity Removed)
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

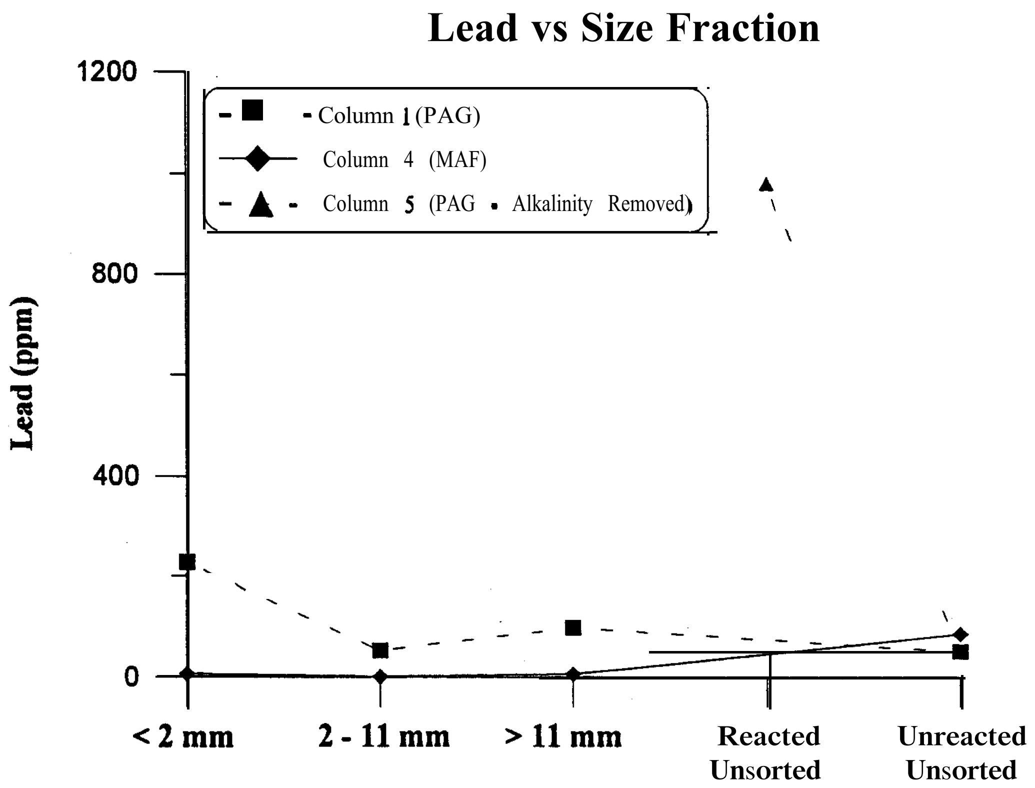

Iron vs Size Fraction
120000
80000
40000
0
Iron (ppm)
Column 1 (PAG)
Column 4 (MAF)
Column 5 (PAG • Alkalinity Removed)
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

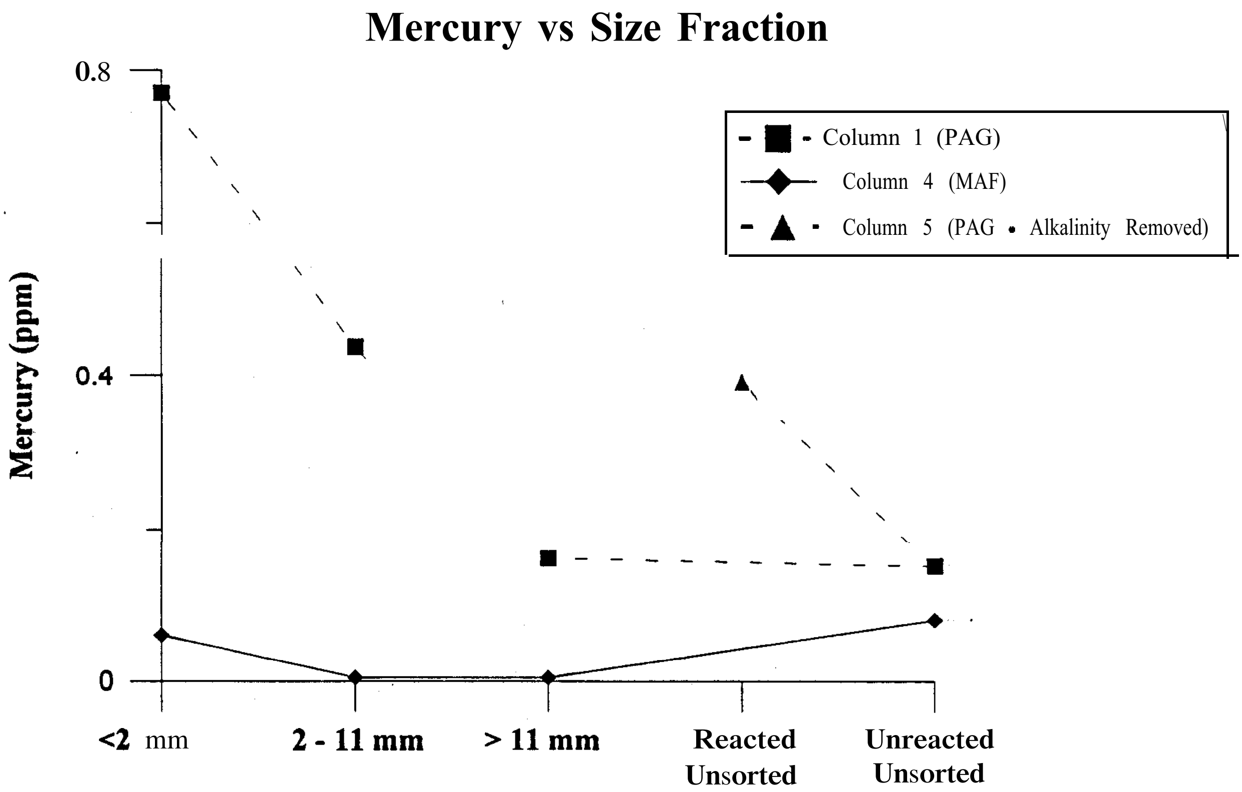


Copper vs Size Fraction
300
200
100
0
Copper (ppm)
Column 1 (PAG)
Column 4 (MAF)
Column 5 (PAG • Alkalinity Removed)
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

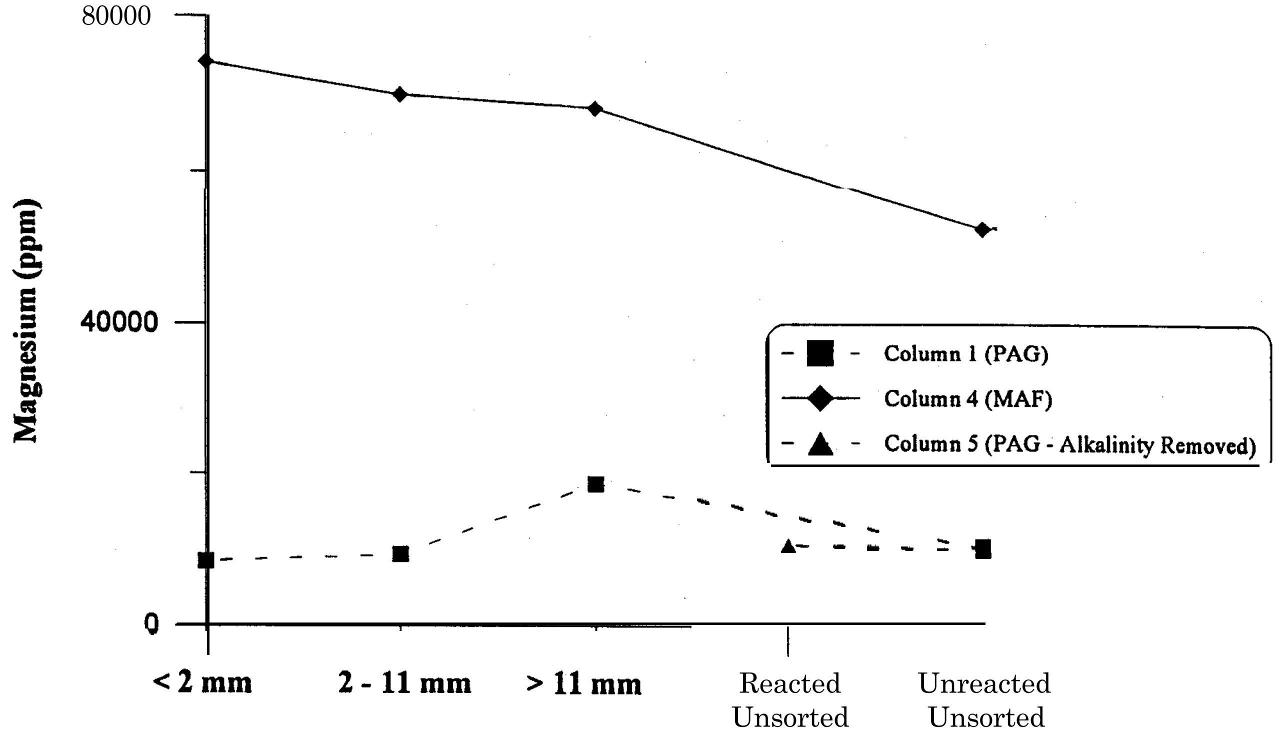


Iron vs Size Fraction
120000
80000
40000
0
Iron (ppm)
Column 1 (PAG)
Column 4 (MAF)
Column 5 (PAG • Alkalinity Removed)
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

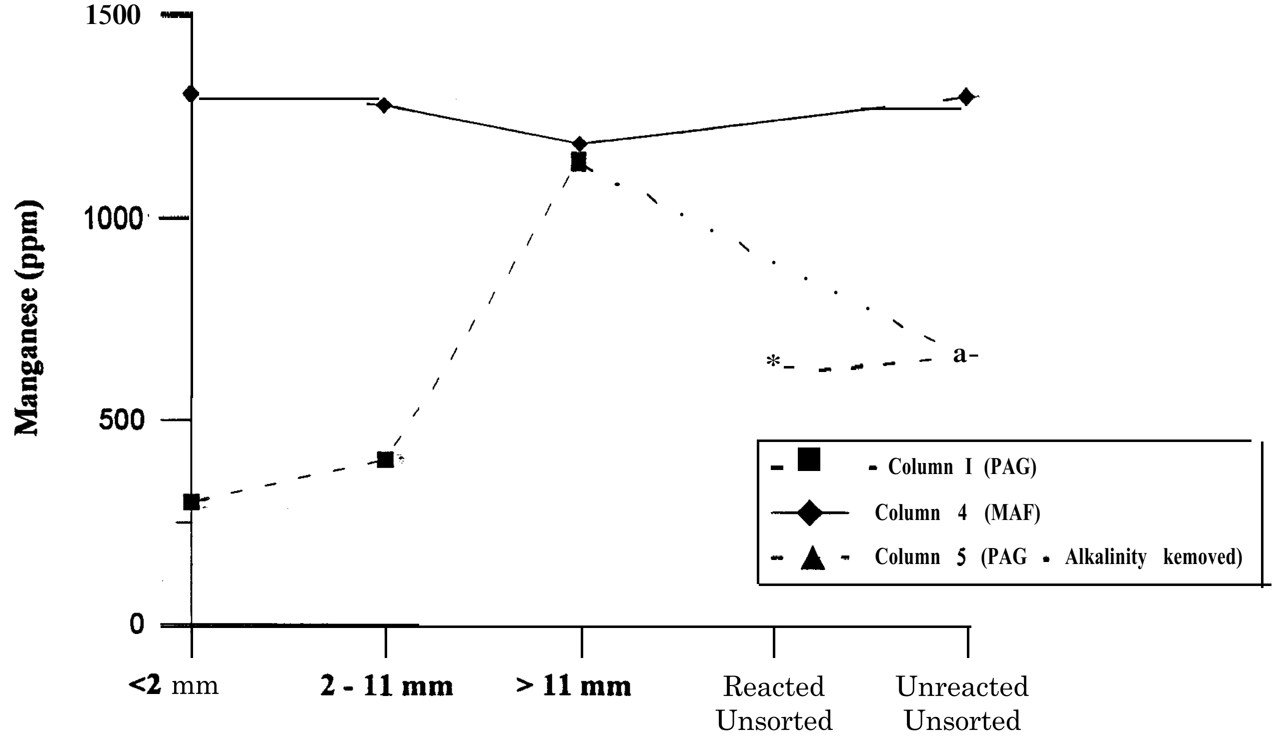

Lead vs Size Fraction
1200
800
400
0
Lead (ppm)
Column 1 (PAG)
Column 4 (MAF)
Column 5 (PAG • Alkalinity Removed)
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

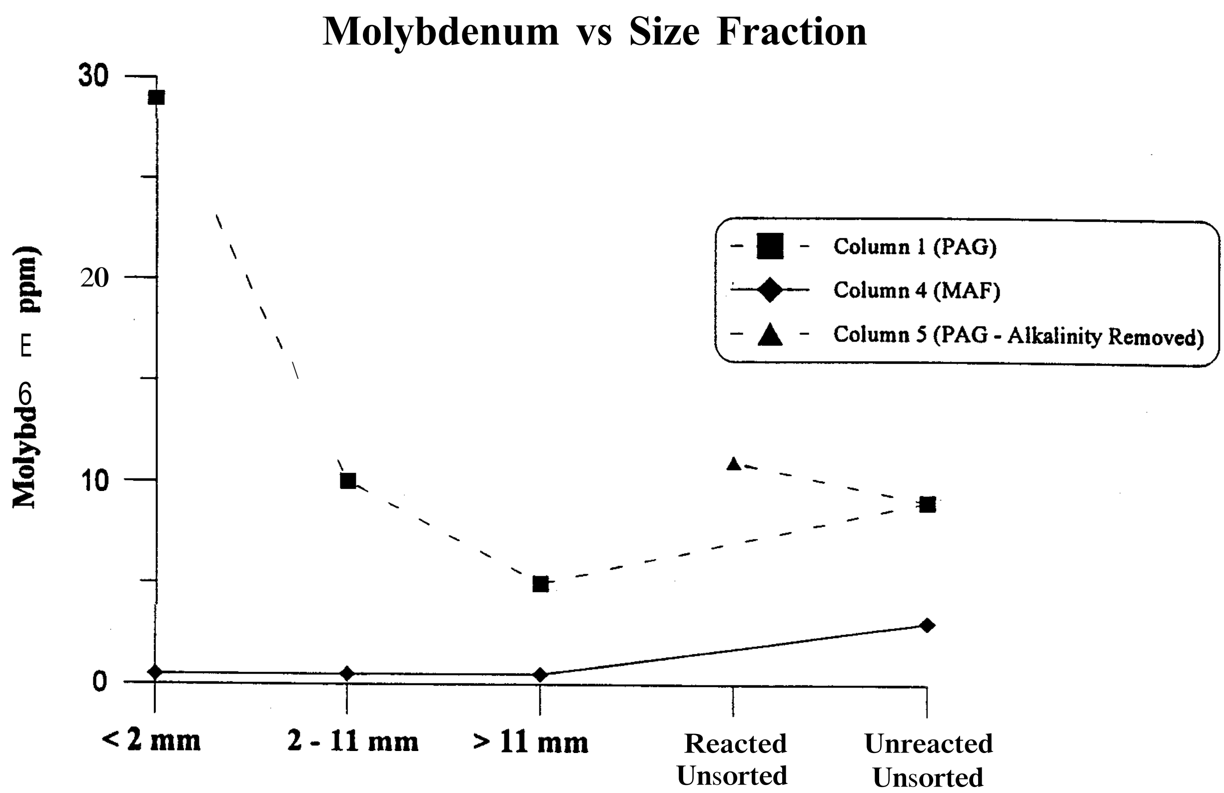

Mercury vs Size Fraction
0.8
0.4
0
Mercury (ppm)
Column 1 (PAG)
Column 4 (MAF)
Column 5 (PAG • Alkalinity Removed)
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

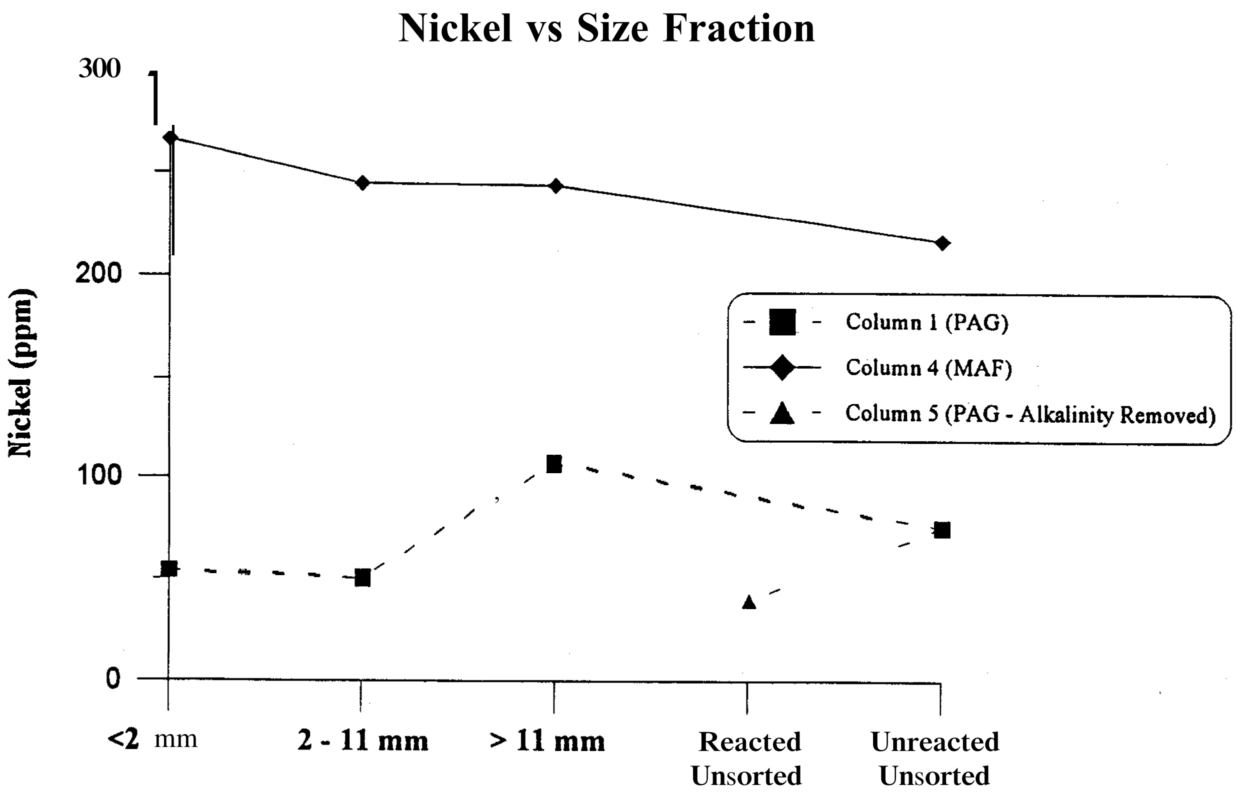
Magnesium vs Size Fraction

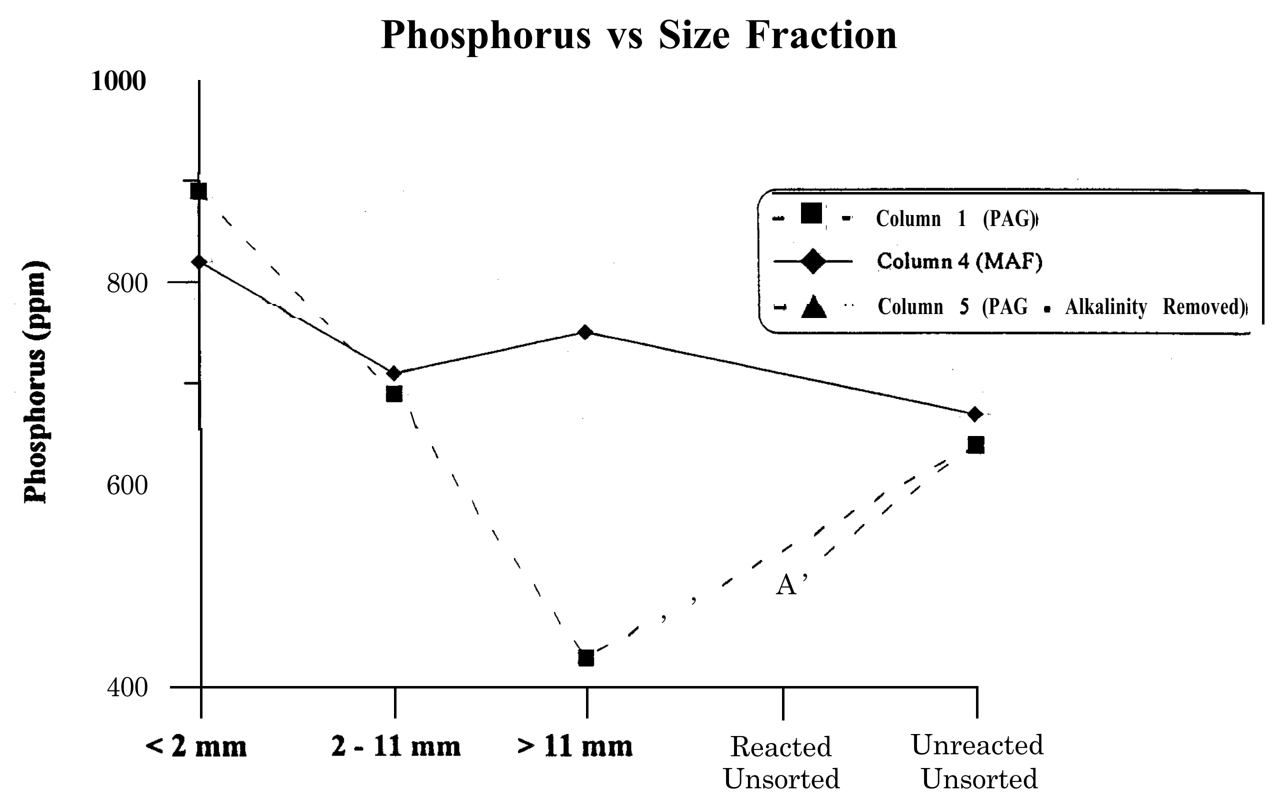


Manganese vs Size Fraction

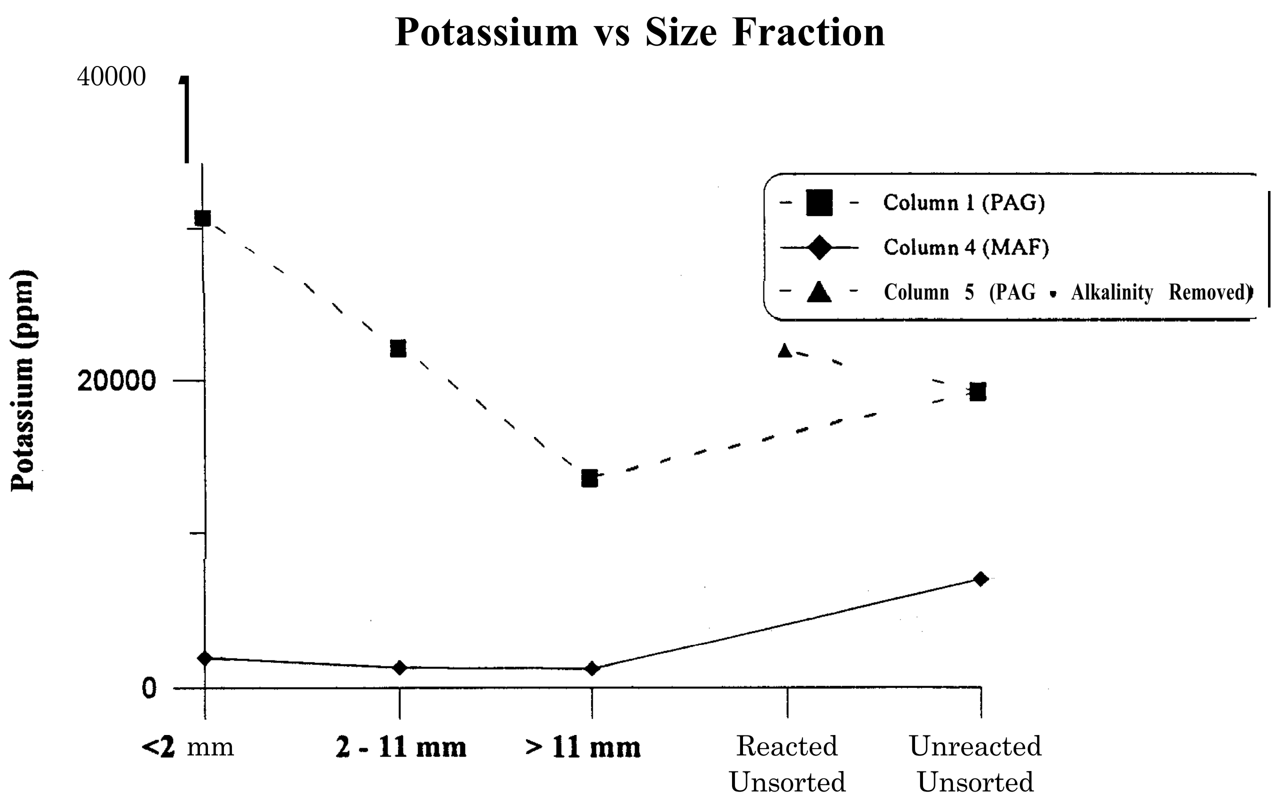



Molybdenum vs Size Fraction
30
20
10
0
Molybd6 E ppm)
Column 1 (PAG)
Column 4 (MAF)
Column 5 (PAG - Alkalinity Removed)
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

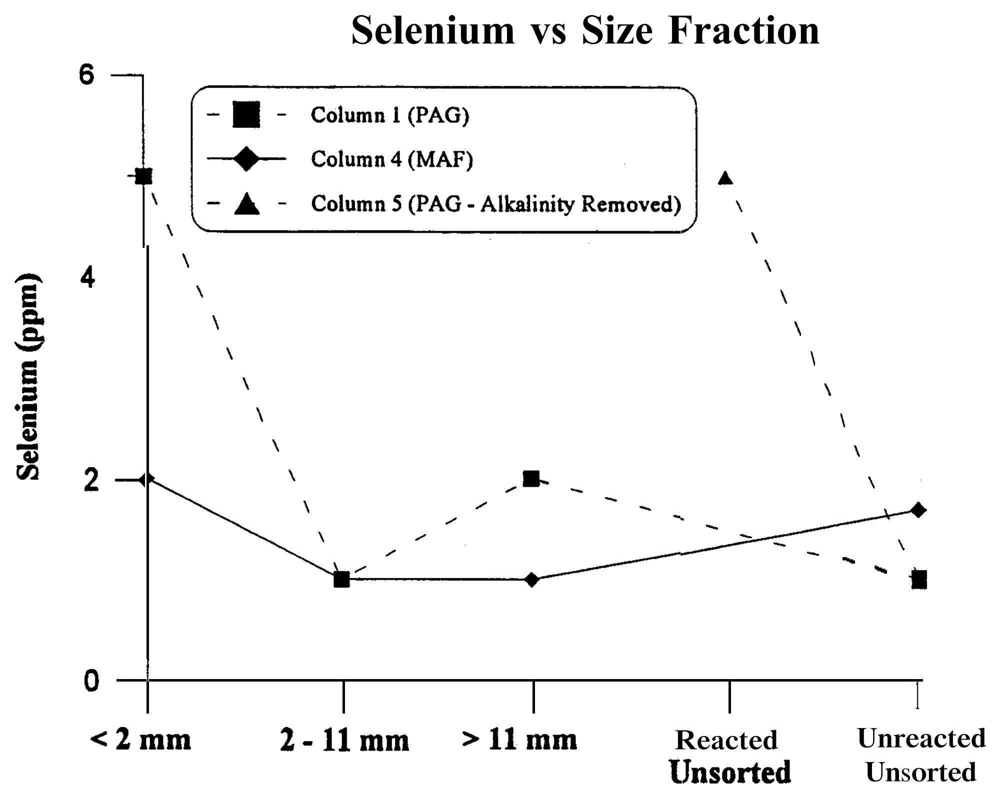

Nickel vs Size Fraction
300
200
100
0
Nickel (ppm)
Column 1 (PAG)
Column 4 (MAF)
Column 5 (PAG - Alkalinity Removed)
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted



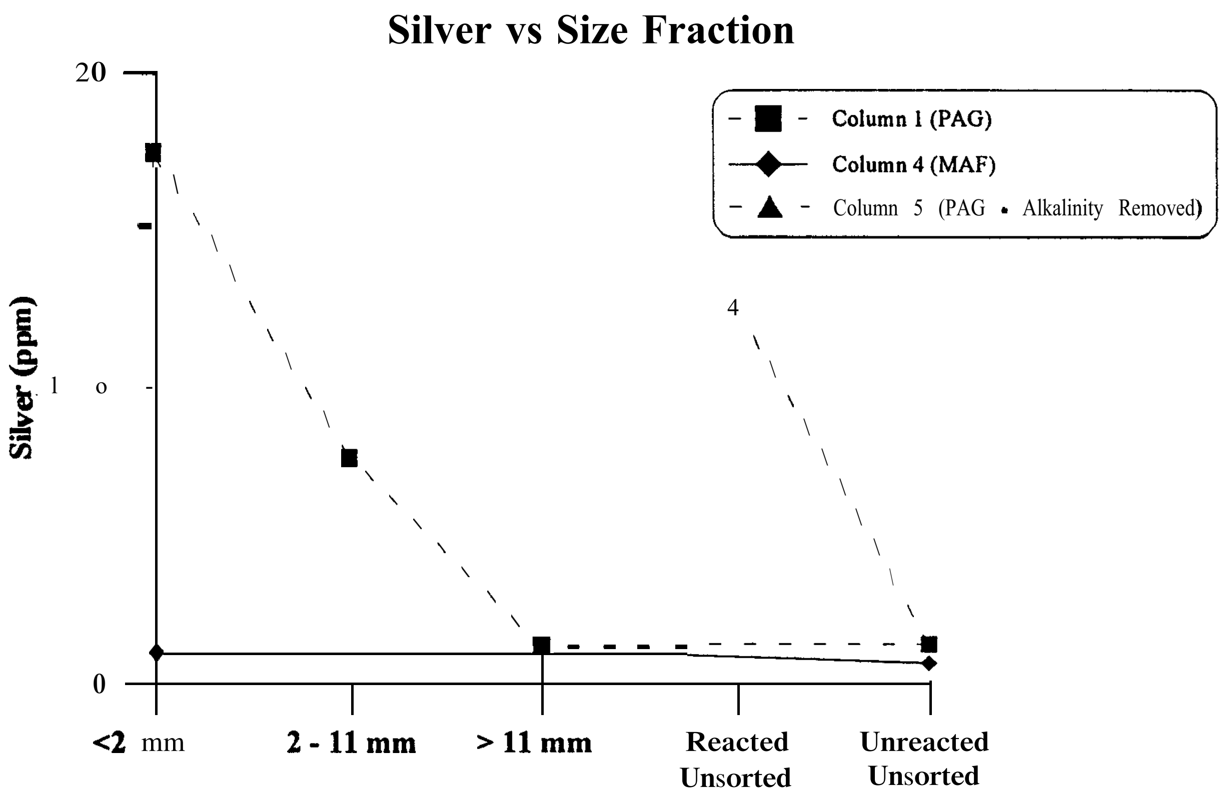
Phosphorus vs Size Fraction
1000
800
600
400
Phosphorus (ppm)
Column 1 (PAG)
Column 4 (MAF)
Column 5 (PAG • Alkalinity Removed)
A'
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted



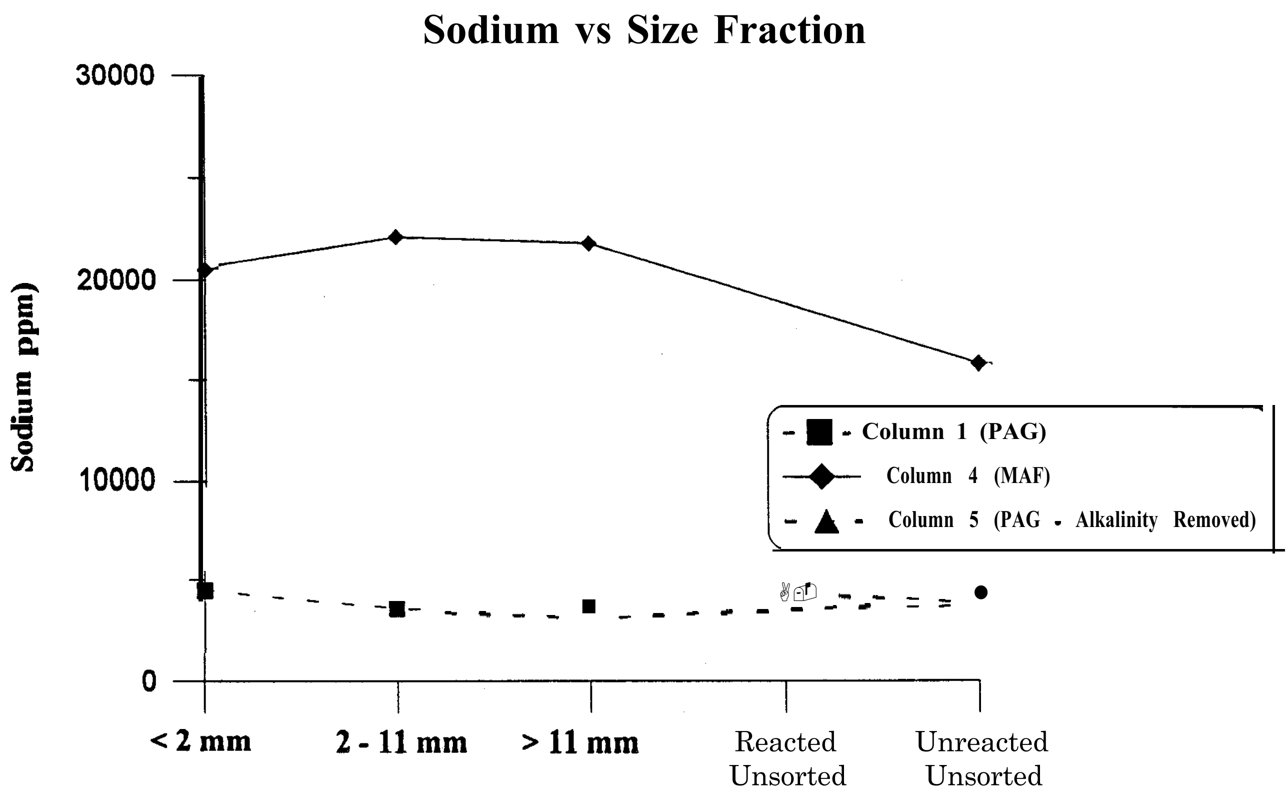
Potassium vs Size Fraction
40000
20000
0
Potassium (ppm)
Column 1 (PAG)
Column 4 (MAF)
Column 5 (PAG • Alkalinity Removed)
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

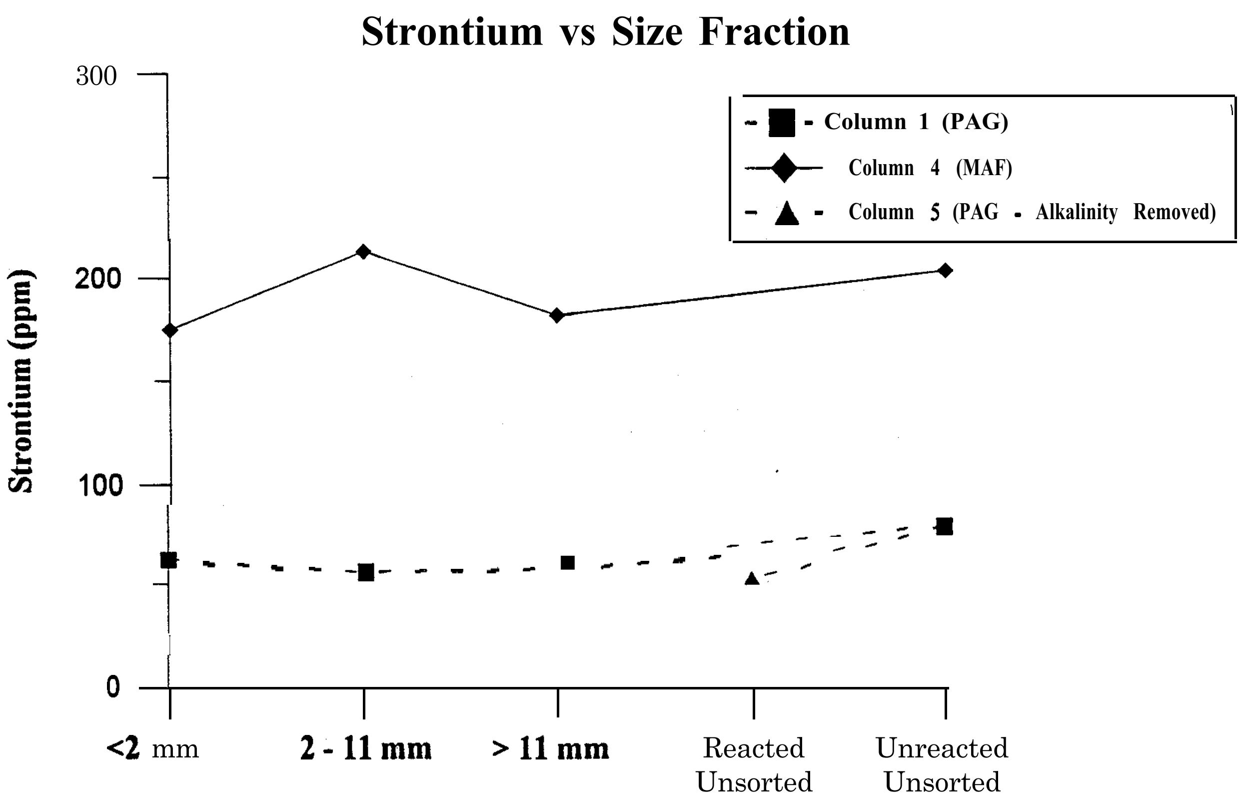


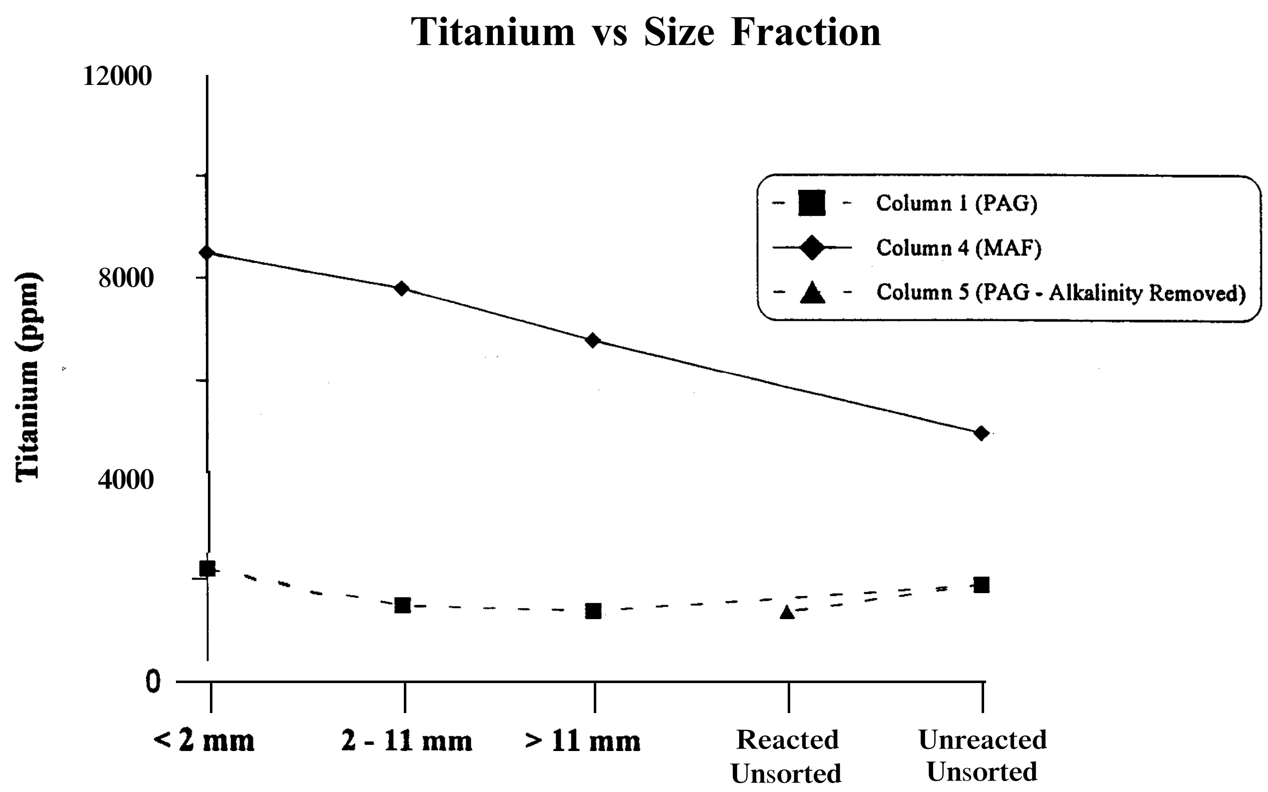
Selenium vs Size Fraction
6
4
2
0
Selenium (ppm)
Column 1 (PAG)
Column 4 (MAF)
Column 5 (PAG - Alkalinity Removed)
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted



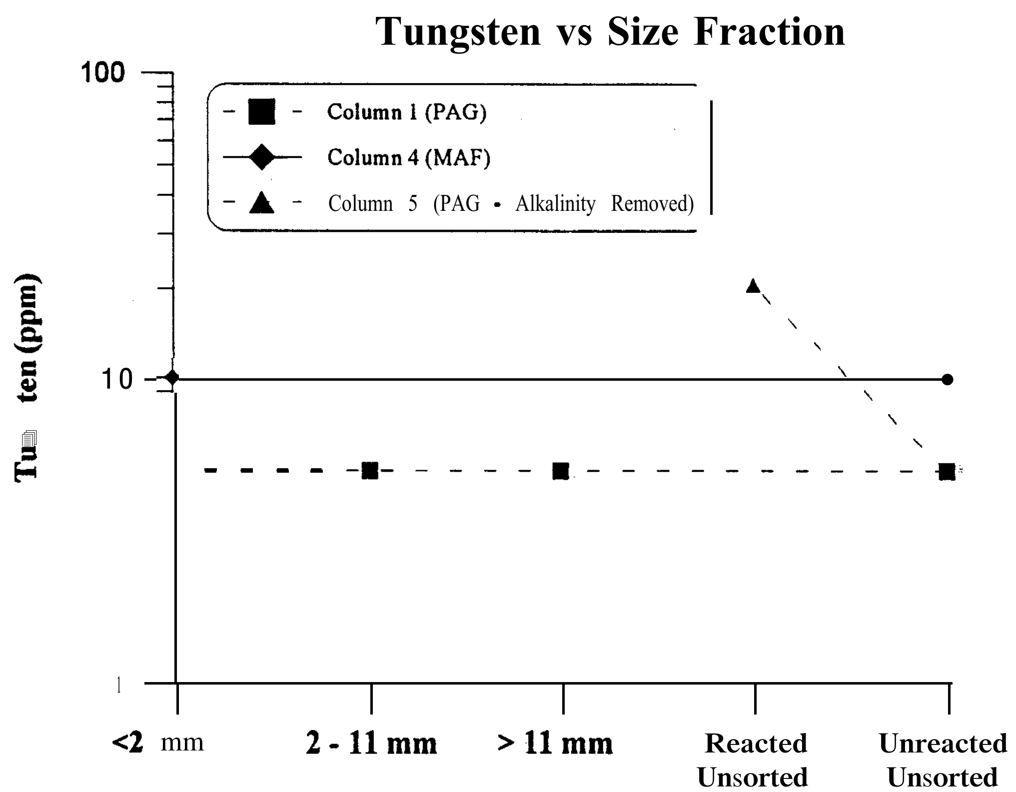
Silver vs Size Fraction
20
1 o
0
Silver (ppm)
Column 1 (PAG)
Column 4 (MAF)
Column 5 (PAG • Alkalinity Removed)
4
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted


Sodium vs Size Fraction
30000
20000
10000
0
Sodium ppm)
Column 1 (PAG)
Column 4 (MAF)
Column 5 (PAG - Alkalinity Removed)
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted


Strontium vs Size Fraction
300
200
100
0
Strontium (ppm)
Column 1 (PAG)
Column 4 (MAF)
Column 5 (PAG - Alkalinity Removed)
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

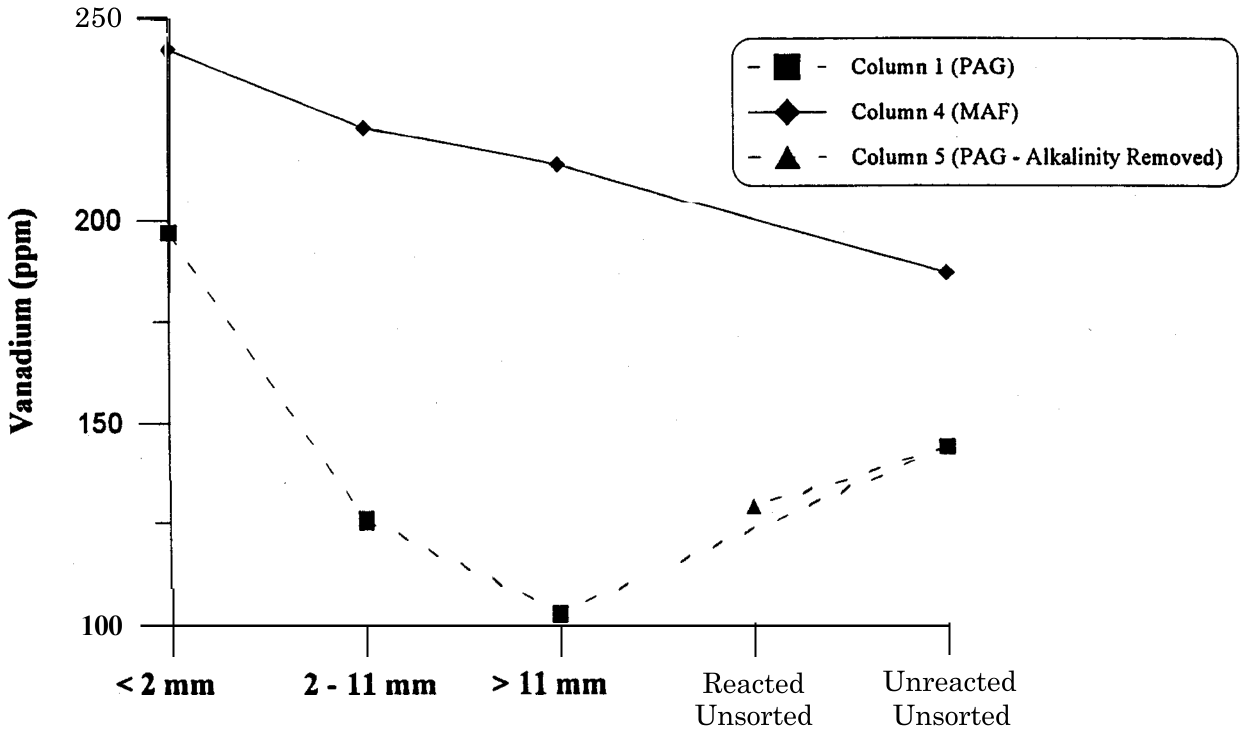


Titanium vs Size Fraction
12000
8000
4000
0
Titanium (ppm)
Column 1 (PAG)
Column 4 (MAF)
Column 5 (PAG - Alkalinity Removed)
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

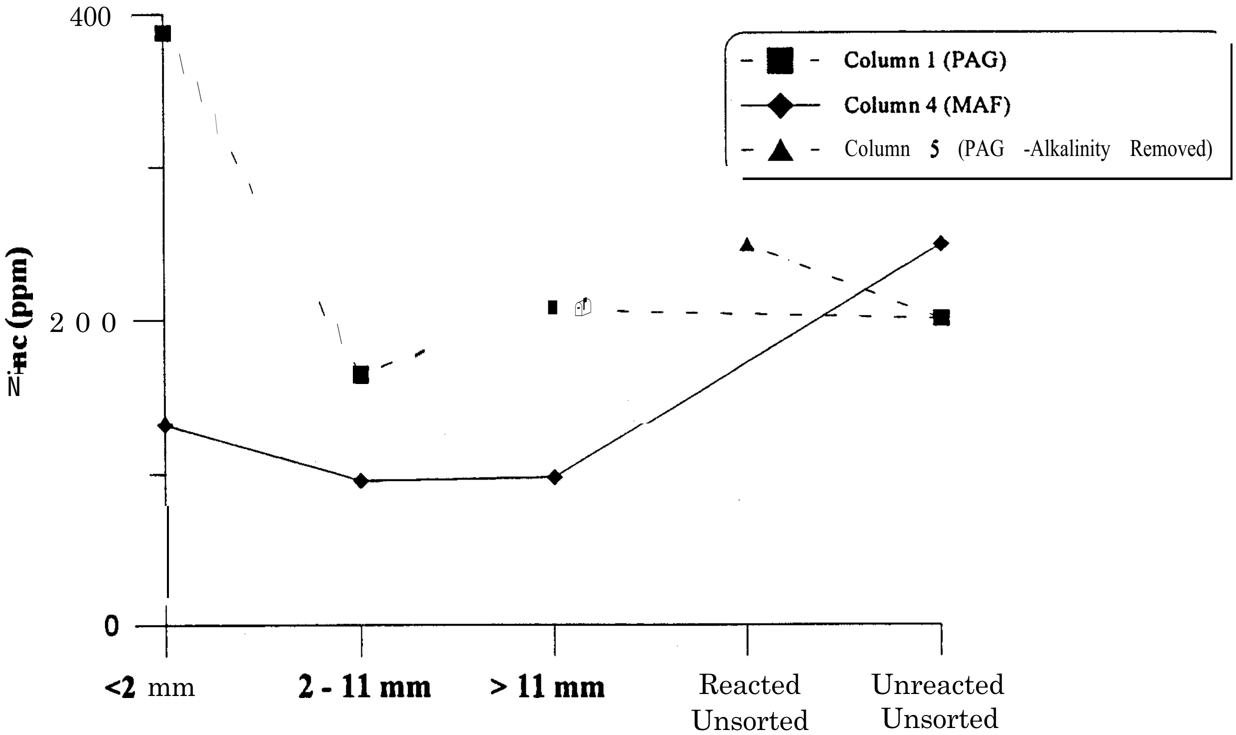


Tungsten vs Size Fraction
100
10
1
Column 1 (PAG)
Column 4 (MAF)
Column 5 (PAG - Alkalinity Removed)
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

Vanadium vs Size Fraction

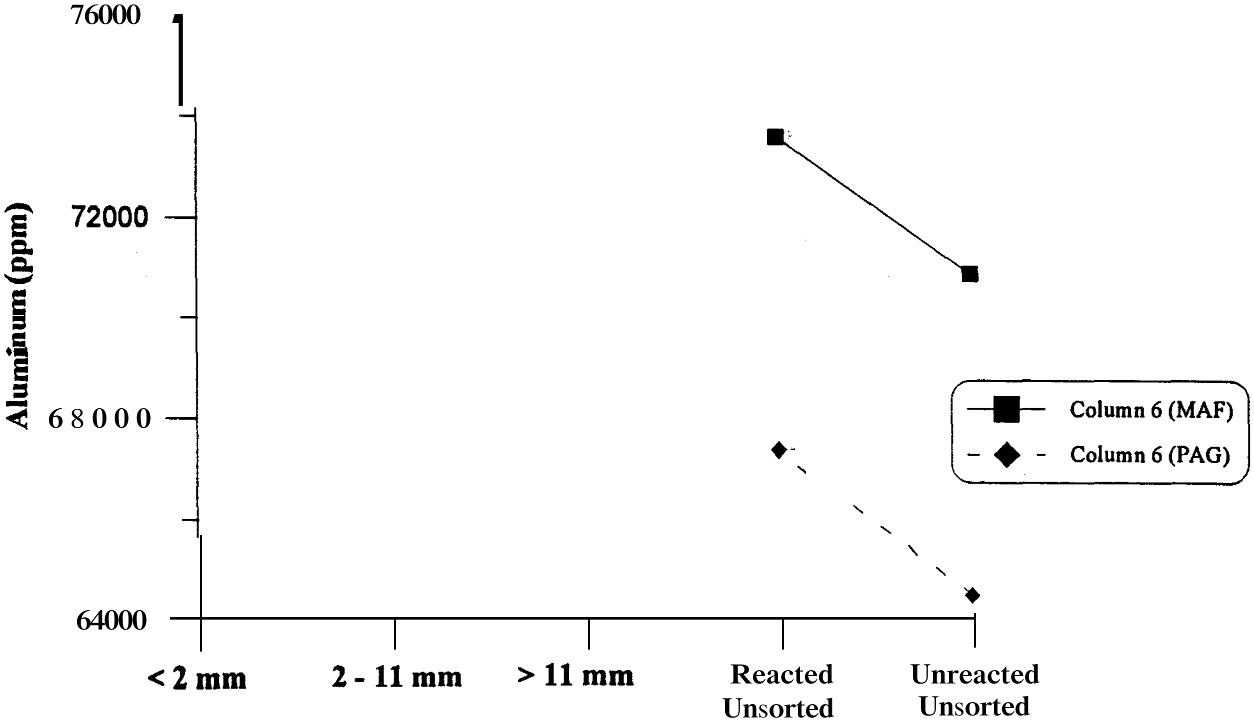


Zinc vs Size Fraction

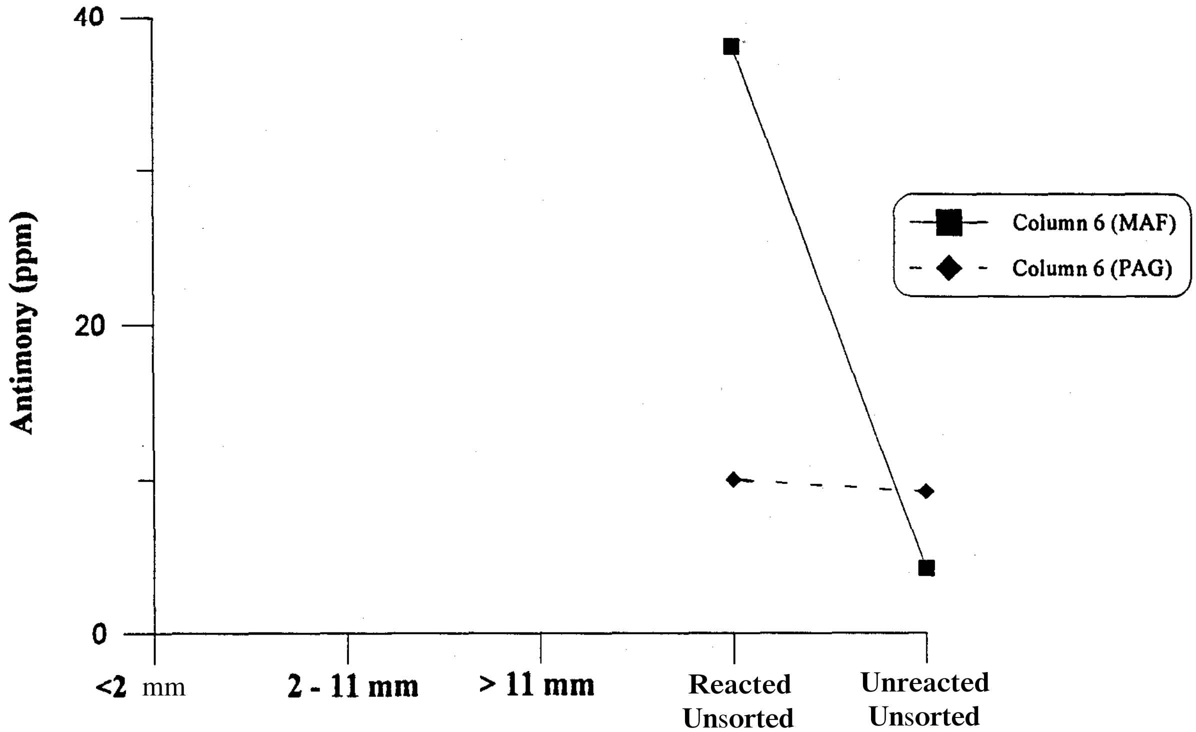


A5.4. Column 6

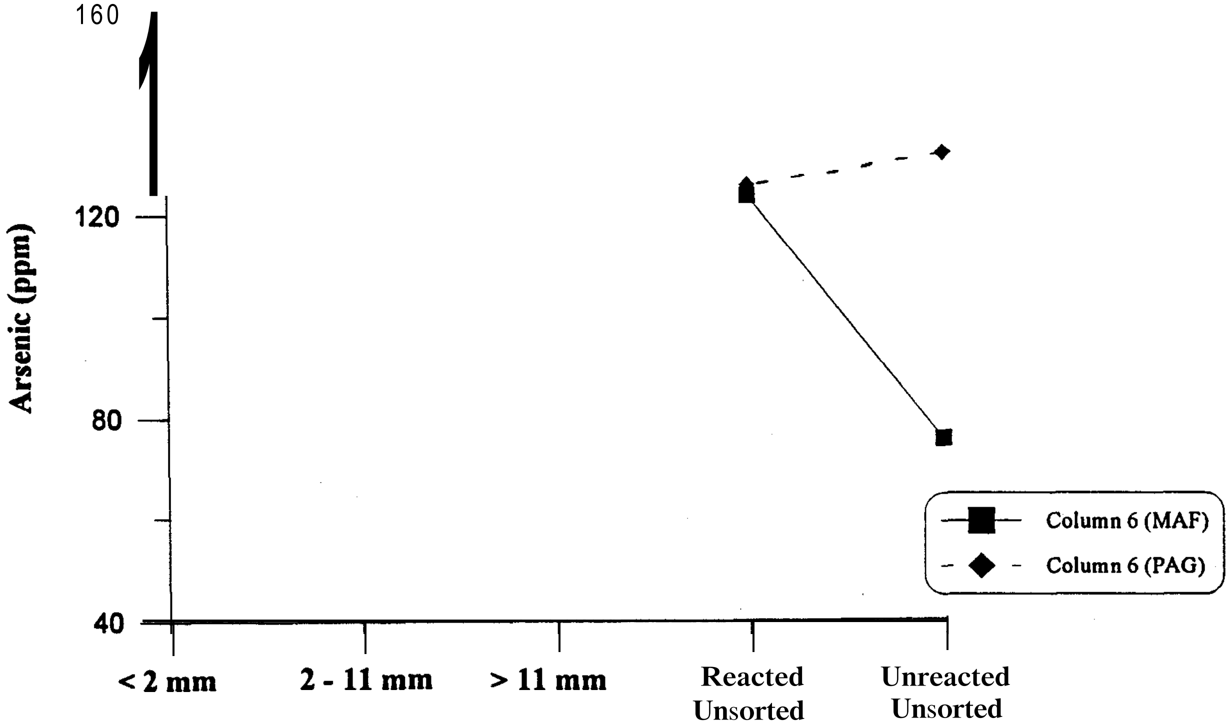
Aluminum vs Size Fraction



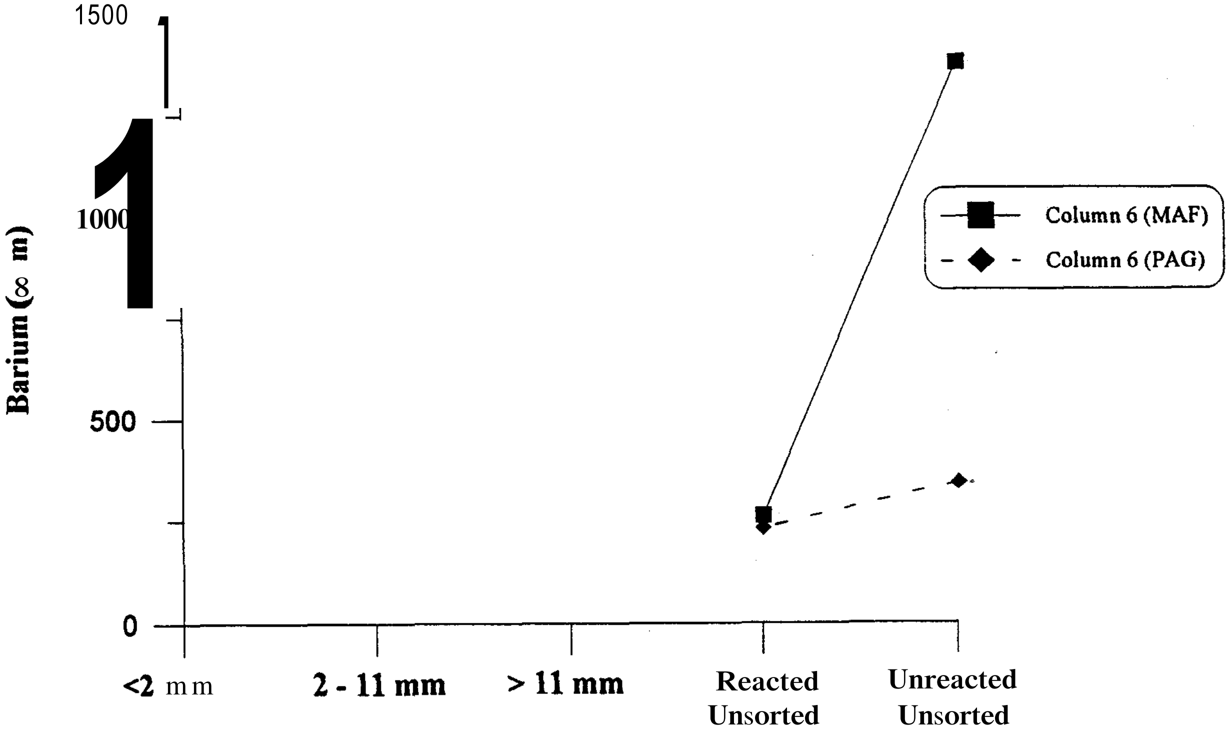
Antimony vs Size Fraction

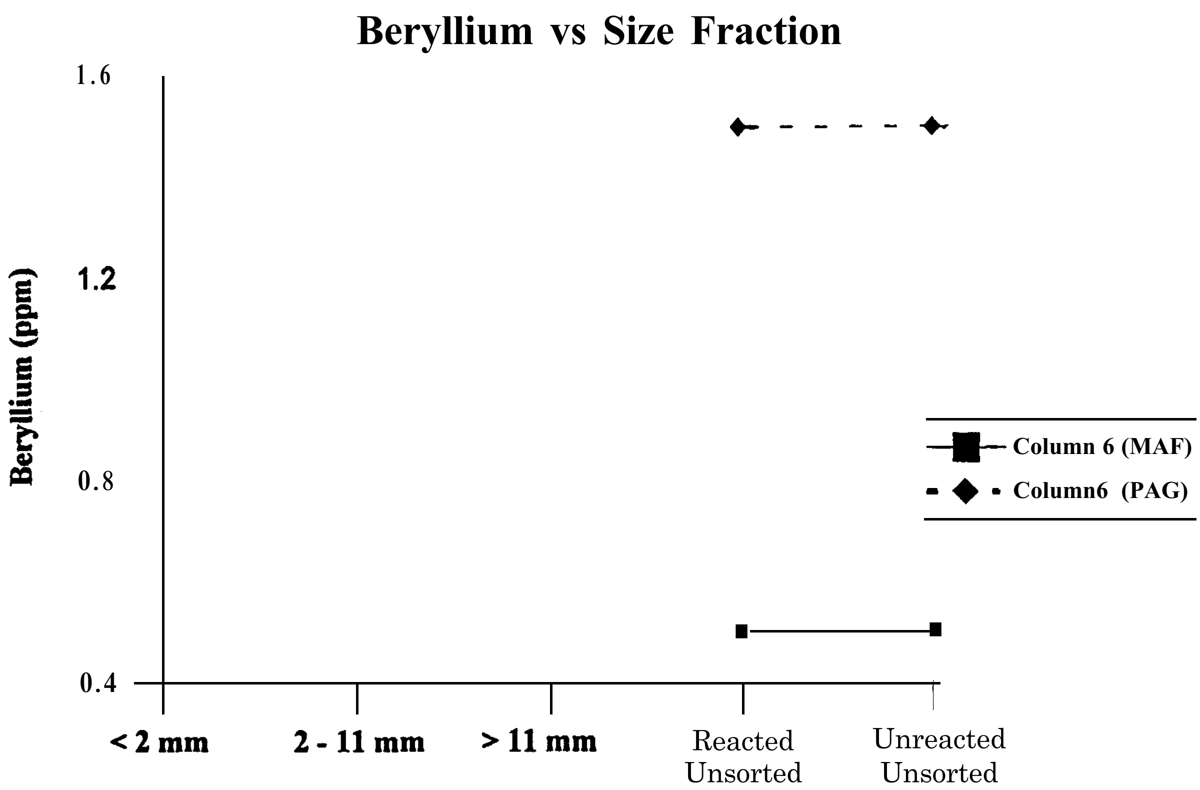


Arsenic vs Size Fraction

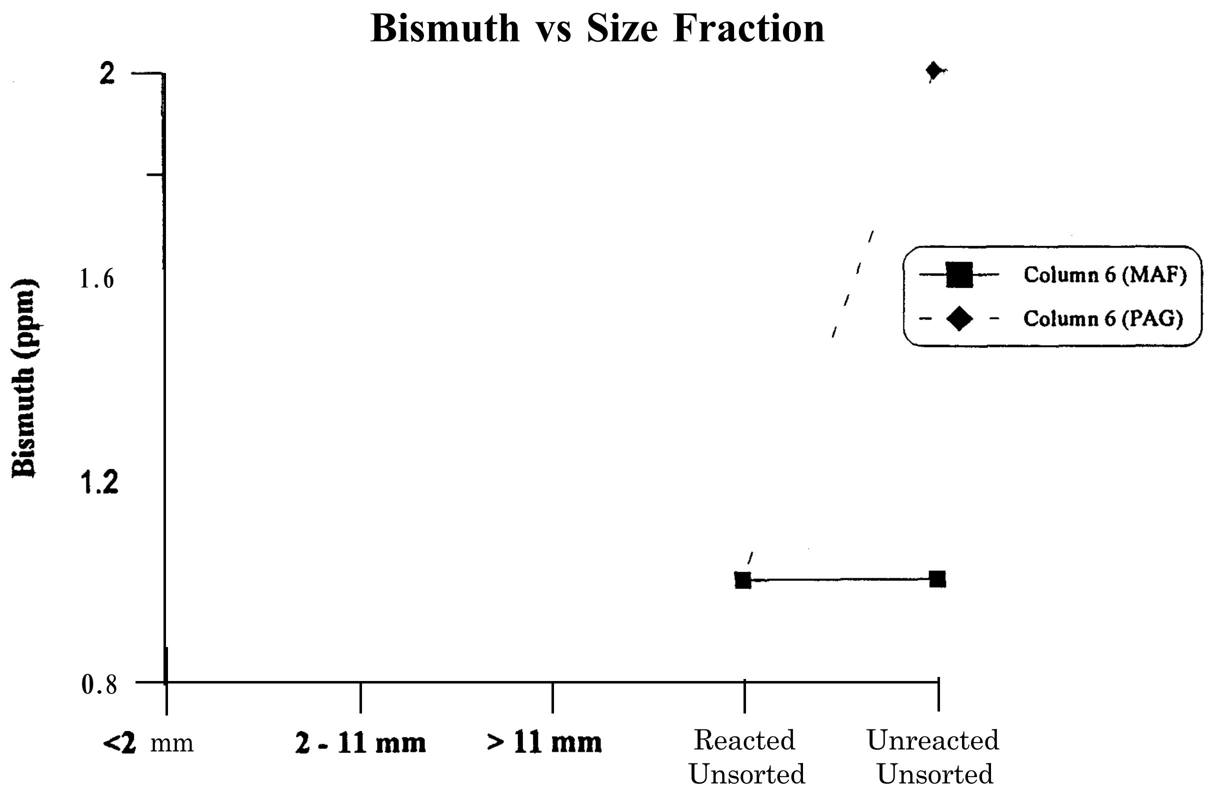


Barium vs Size Fraction

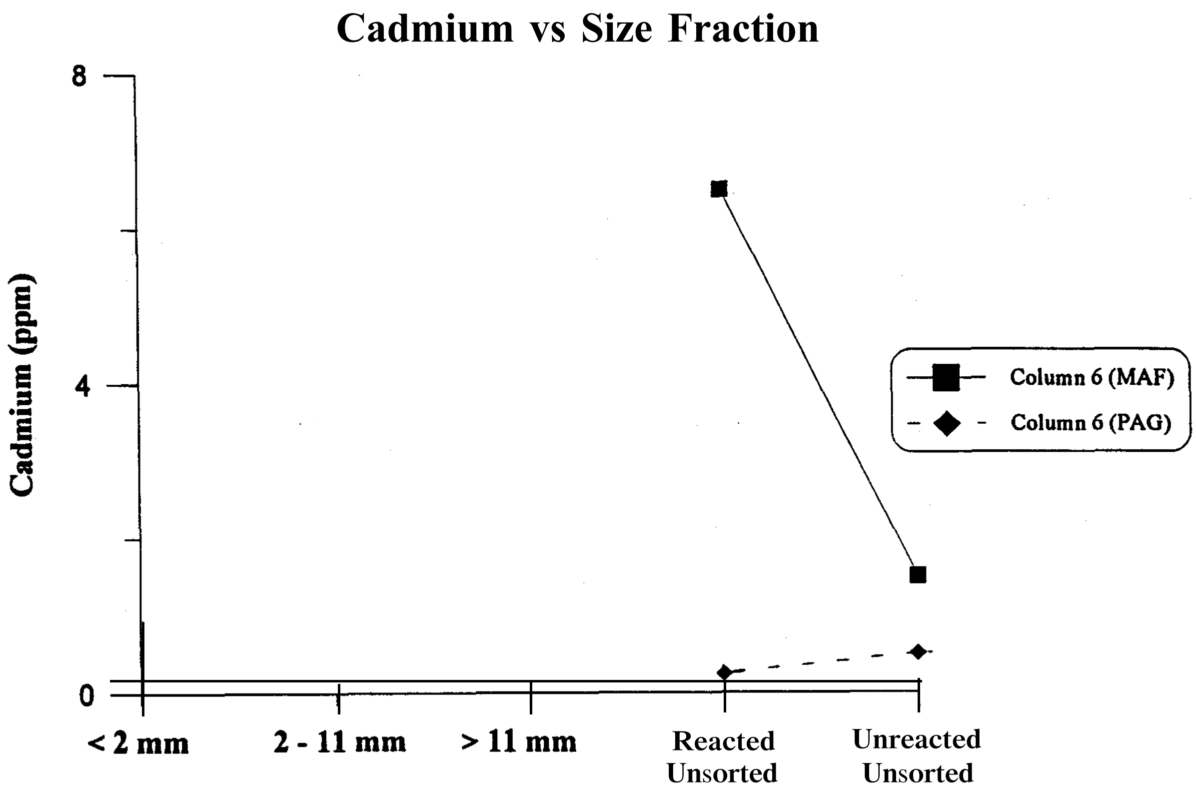




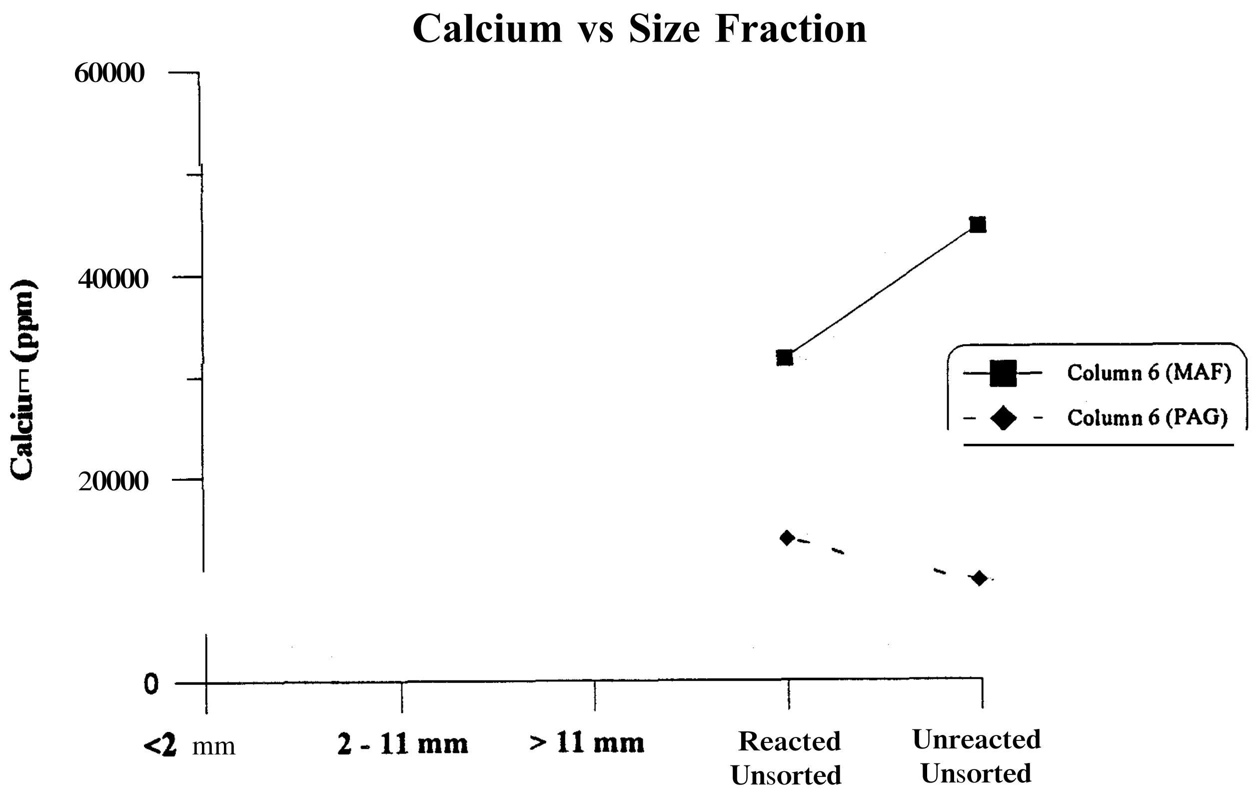
Beryllium vs Size Fraction
Beryllium (ppm)
1.6
1.2
0.8
0.4
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 6 (MAF)
Column6 (PAG)



Bismuth vs Size Fraction
Bismuth (ppm)
2
1.6
1.2
0.8
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 6 (MAF)
Column 6 (PAG)



Cadmium vs Size Fraction
Cadmium (ppm)
8
4
0
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 6 (MAF)
Column 6 (PAG)



Calcium vs Size Fraction
Calcium (ppm)
60000
40000
20000
0
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 6 (MAF)
Column 6 (PAG)

Samatosum Mine Humidity Cell Data -Column 2 (Encapsulated 3 Layers)

Week No.	Date	Analytical Results: Leachate Recovered (mL)	Weekly pH (pH units)	Conductivity (umhos/cm)	Eh (mV)	Acidity (CaCO3 mg/L)*	Alkalinity (CaCO3 mg/L)*	Sulphate (SO4 mg/L)*	Acidity Production Rate (mg/kg/wk)**	Alkalinity Production Rate (mg/kg/wk)**	Sulphate Production: SO4 Production Rate (mg/kg/wk)**	Cumulative SO4 Production (mg/kg)	Remaining S (% of original)	By Surface Area: SO4 Production Rate (mg/m2/wk)**	Cumulative SO4 Production (mg/m2)	Molar Ratio: Alk /SO4	NP Consumption: Theoretical NP Consumption At pH 6 (mg/kg/wk)	Empirical Open-System NP Consumption At Measured pH (mg/kg/wk)	Cum NP Consumption Open-System (mg/kg/wk)	Remaining NP Open-System (%)	Theoretical Closed-System NP Consumption Above pH 6.5 (mg/kg/wk)	Cum NP Consumption Closed-System (mg/kg/wk)	Remaining NP Closed-System (%)
198	25-Nov-92	18200	7.48	200					1.26	14.92	26.8	9484	87.04	17.6	6238		27.9	41.6	13683	82.50	54.6	19529	75.03
199	02-Dec-92	19300	7.47	188	440	3	36	64	1.25	15.05	26.8	9511	87.01	17.6	6256	0.540	27.9	41.7	13725	82.45	54.5	19584	74.96
200	09-Dec-92	16500	7.38	214					1.26	14.44	26.4	9537	86.97	17.3	6273		27.5	40.7	13765	82.40	53.7	19637	74.89
201	16-Dec-92	19600	7.53	170					1.26	13.83	26.0	9563	86.94	17.1	6290		27.1	39.6	13805	82.35	52.9	19690	74.82
202	23-Dec-92	19000	7.4	170					1.26	13.22	25.6	9588	86.90	16.8	6307		26.7	38.6	13844	82.30	52.1	19742	74.75
203	30-Dec-92	19400	7.42	170	450	3	30	60	1.26	12.61	25.2	9614	86.87	16.6	6324	0.480	26.3	37.6	13881	82.25	51.3	19793	74.69
204	06-Jan-93	19300	7.4	125					1.36	12.49	25.9	9640	86.83	17.0	6341		27.0	38.1	13919	82.20	52.6	19846	74.62
205	13-Jan-93	19200	7.33	150					1.47	12.37	26.6	9666	86.79	17.5	6358		27.7	38.6	13958	82.15	54.0	19900	74.55
206	20-Jan-93	19100	7.18	175					1.57	12.25	27.3	9694	86.76	18.0	6376		28.5	39.1	13997	82.10	55.3	19955	74.48
207	27-Jan-93	19300	7.33	173	450	4	29	67	1.67	12.13	28.0	9722	86.72	18.4	6394	0.415	29.2	39.6	14037	82.05	56.7	20012	74.41
208	03-Feb-93	19200	7.15	168					1.86	11.52	28.0	9750	86.68	18.4	6413		29.2	38.8	14076	82.00	56.5	20069	74.34
209	10-Feb-93	19000	7.14	178					2.05	10.92	28.0	9778	86.64	18.4	6431		29.1	38.0	14114	81.95	56.2	20125	74.26
210	17-Feb-93	19400	7.15	178					2.24	10.32	28.0	9805	86.60	18.4	6450		29.1	37.2	14151	81.90	56.0	20181	74.19
211	24-Feb-93	18700	7.45	180	430	6	24	69	2.43	9.72	28.0	9833	86.57	18.4	6468	0.334	29.1	36.4	14187	81.86	55.8	20237	74.12
212	03-Mar-93	19000	7.05	152					3.15	9.53	30.0	9863	86.53	19.8	6488		31.3	37.7	14225	81.81	59.4	20296	74.05
213	10-Mar-93	19200	7.2	155					3.86	9.34	32.1	9896	86.48	21.1	6509		33.4	38.9	14264	81.76	63.0	20359	73.97
214	17-Mar-93	19100	7.02	160					4.58	9.15	34.2	9930	86.43	22.5	6531		35.6	40.2	14304	81.71	66.6	20426	73.88
215	24-Mar-93	18800	7.2	192	510	13	22	89	5.29	8.96	36.2	9966	86.39	23.8	6555	0.237	37.8	41.4	14345	81.66	70.2	20496	73.79
216	31-Mar-93	17400	7.05	160					4.39	9.35	33.6	10000	86.34	22.1	6577		35.0	40.0	14385	81.60	65.6	20562	73.71
217	07-Apr-93	20000	7.32	150					3.49	9.73	30.9	10031	86.30	20.4	6598		32.2	38.5	14424	81.56	61.0	20622	73.63
218	14-Apr-93	19600	7.33	190					2.58	10.12	28.3	10059	86.26	18.6	6616		29.5	37.0	14461	81.51	56.4	20679	73.56
219	21-Apr-93	19400	7.19	162	420	4	25	61	1.68	10.51	25.6	10084	86.22	16.9	6633	0.393	26.7	35.5	14496	81.46	51.7	20731	73.49
220	28-Apr-93	19100	7.11	170					1.78	10.35	25.8	10110	86.19	17.0	6650		26.9	35.5	14532	81.42	52.0	20783	73.42
221	05-May-93	18900	7.08	194					1.87	10.19	26.0	10136	86.15	17.1	6667		27.1	35.4	14567	81.37	52.3	20835	73.36
222	12-May-93	19700	7.07	147					1.96	10.04	26.2	10162	86.12	17.2	6684		27.3	35.3	14603	81.33	52.5	20887	73.29
223	19-May-93	19000	7.02	184	460	5	24	64	2.06	9.88	26.3	10189	86.08	17.3	6702	0.360	27.4	35.3	14638	81.28	52.8	20940	73.22
224	26-May-93	19000	7.37	188					2.07	10.02	27.4	10216	86.04	18.0	6720		28.5	36.5	14674	81.23	55.0	20995	73.15
225	02-Jun-93	19200	7.15	188					2.07	10.17	28.4	10245	86.00	18.7	6738		29.6	37.7	14712	81.19	57.2	21052	73.08
226	09-Jun-93	19400	7.05	198					2.08	10.31	29.5	10274	85.96	19.4	6758		30.7	38.9	14751	81.14	59.3	21112	73.00
227	16-Jun-93	19300	7.06	180	410	5	25	73	2.09	10.45	30.5	10305	85.92	20.1	6778	0.329	31.8	40.2	14791	81.09	61.5	21173	72.92
228	23-Jun-93	19300	7.25	182					1.88	10.45	30.8	10335	85.88	20.3	6798		32.1	40.7	14832	81.03	62.4	21236	72.84
229	30-Jun-93	19700	7.4	195					1.67	10.45	31.1	10367	85.84	20.5	6819		32.4	41.2	14873	80.98	63.2	21299	72.76
230	07-Jul-93	19500	7.35	170					1.46	10.45	31.5	10398	85.80	20.7	6839		32.8	41.8	14915	80.93	64.1	21363	72.68
231	14-Jul-93	19300	7.32	172	370	3	25	76	1.25	10.45	31.8	10430	85.75	20.9	6860	0.316	33.1	42.3	14957	80.87	64.9	21428	72.60
232	21-Jul-93	20000	7.3	178					1.27	10.11	30.5	10460	85.71	20.1	6880		31.8	40.7	14998	80.82	62.4	21490	72.52
233	28-Jul-93	19700	7.22	168					1.28	9.78	29.3	10490	85.67	19.3	6900		30.5	39.0	15037	80.77	59.8	21550	72.44
234	04-Aug-93	18000	7.2	160					1.29	9.44	28.1	10518	85.63	18.5	6918		29.3	37.4	15074	80.72	57.2	21607	72.37
235	11-Aug-93	20000	7.25	130	410	3	21	62	1.30	9.10	26.9	10545	85.59	17.7	6936	0.325	28.0	35.8	15110	80.68	54.7	21662	72.30
236	18-Aug-93	19200	7.2	170					1.29	9.56	27.1	10572	85.56	17.8	6954		28.2	36.5	15147	80.63	55.1	21717	72.23
237	25-Aug-93	19000	7.15	160					1.28	10.01	27.3	10599	85.52	18.0	6972		28.4	37.2	15184	80.58	55.6	21773	72.16
238	01-Sep-93	19200	7.12	168					1.27	10.47	27.5	10627	85.48	18.1	6990		28.7	37.9	15222	80.54	56.1	21829	72.09
239	08-Sep-93	19400	7.25	150	410	3	26	66	1.26	10.93	27.7	10654	85.44	18.2	7008	0.378	28.9	38.6	15260	80.49	56.5	21885	72.01
240	15-Sep-93	19400	7.18	168					1.26	10.88	27.5	10682	85.41	18.1	7026		28.7	38.3	15298	80.44	56.1	21941	71.94
241	22-Sep-93	19600	7.05	177					1.25	10.84	27.3	10709	85.37	18.0	7044		28.5	38.0	15336	80.39	55.7	21997	71.87
242	29-Sep-93	19400	7.24	153					1.25	10.80	27.1	10736	85.33	17.8	7062		28.2	37.8	15374	80.34	55.2	22052	71.80
243	06-Oct-93	19100	7.33	152	350	3	26	65	1.24	10.76	26.9	10763	85.30	17.7	7080	0.384	28.0	37.5	15412	80.29	54.8	22107	71.73
244	13-Oct-93	18900	7.18	160					1.24	10.56	27.9	10791	85.26	18.3	7098		29.0	38.3	15450	80.24	56.8	22164	71.66
245	20-Oct-93	19100	7.32	162					1.24	10.37	28.8	10820	85.22	19.0	7117		30.0	39.2	15489	80.19	58.8	22223	71.58
246	27-Oct-93	19000	7.04	162					1.25	10.18	29.8	10850	85.18	19.6	7136		31.1	40.0	15529	80.14	60.9	22283	71.50
247	03-Nov-93	19200	7.45	178	370	3	24	74	1.25	9.98	30.8	10880	85.14	20.2	7157	0.311	32.1	40.8	15570	80.09	62.9	22346	71.42
248	10-Nov-93	19000	7.4	146					1.24	9.75	28.8	10909	85.10	19.0	7176		30.0	38.6	15609	80.04	58.9	22405	71.35
249	17-Nov-93	19200	6.94	126					1.24	9.52	26.9	10936	85.06	17.7	7193		28.0	36.3	15645	79.99	54.8	22460	71.28
250	24-Nov-93	19100	7.43	148					1.24	9.29	25.0	10961	85.03	16.4	7210		26.0	34.1	15679	79.95	50.8	22511	71.21
251	01-Dec-93	19000	7.39	147	270	3	22	56	1.23	9.06	23.1	10984	84.99	15.2	7225	0.377	24.0	31.8	15711	79.91	46.8	22558	71.15
252	08-Dec-93	19100	7.05	148					1.24	8.77	23.7	11008	84.96	15.6	7241		24.7	32.3	15743	79.87	48.2	22606	71.09
253	15-Dec-93	19200	7.08	134					1.24	8.48	24.4	11032	84.93	16.1	7257		25.4	32.7	15776	79.83	49.6	22655	71.03
254	22-Dec-93	18800	7.04	146					1.24	8.19	25.1	11057	84.89	16.5	7273		26.1	33.1	15809	79.78	51.1	22707	70.96
255	29-Dec-93	19200	7.28	154	280	3	19	62	1.25	7.90	25.8	11083	84.86	17.0	7290	0.294	26.9	33.5	15842	79.74	52.5	22759	70.90
256	05-Jan-94	19400	7.54	136					1.04	8.23	25.9	11109	84.82	17.1	7307		27.0	34.2	15877	79.70	53.0	22812	70.83
257	12-Jan-94	19000	7.34	187					0.83	8.55	26.1	11135	84.79	17.1	7324		27.2	34.9	15911	79.65	53.5	22865	70.76
258	19-Jan-94	20000	7.7	173					0.63	8.87	26.2	11161	84.75	17.2	7342		27.3	35.5	15947	79.61	54.0	22919	70.69
259	26-Jan-94	19300	7.71	173	280	1	22	63	0.42	9.20	26.3	11188	84.72	17.3	7359	0.335	27.4	36.2	15983	79.56	54.5	22974	70.62
260	02-Feb-94	19600	7.63	157					0.63	9.42	25.7	11214	84.68	16.9	7376		26.8	35.6	16019	79.52	53.0	23027	70.55
261	09-Feb-94	18900	7.59	174					0.84	9.64	25.1	11239	84.65	16.5	7392		26.2	35.0	16054	79.47	51.6	23078	70.49
262	16-Feb-94	19300	7.54	165					1.05	9.86	24.6	11263	84.61	16.1	7409		25.6	34.4	16088	79.43	50.1	23129	70.42
263	23-Feb-94	19400	7.67	168	320	3	24	57	1.26	10.09	24.0	11287	84.58	15.8	7424	0.404	25.0	33.8	16122	79.38	48.6	23177	70.36

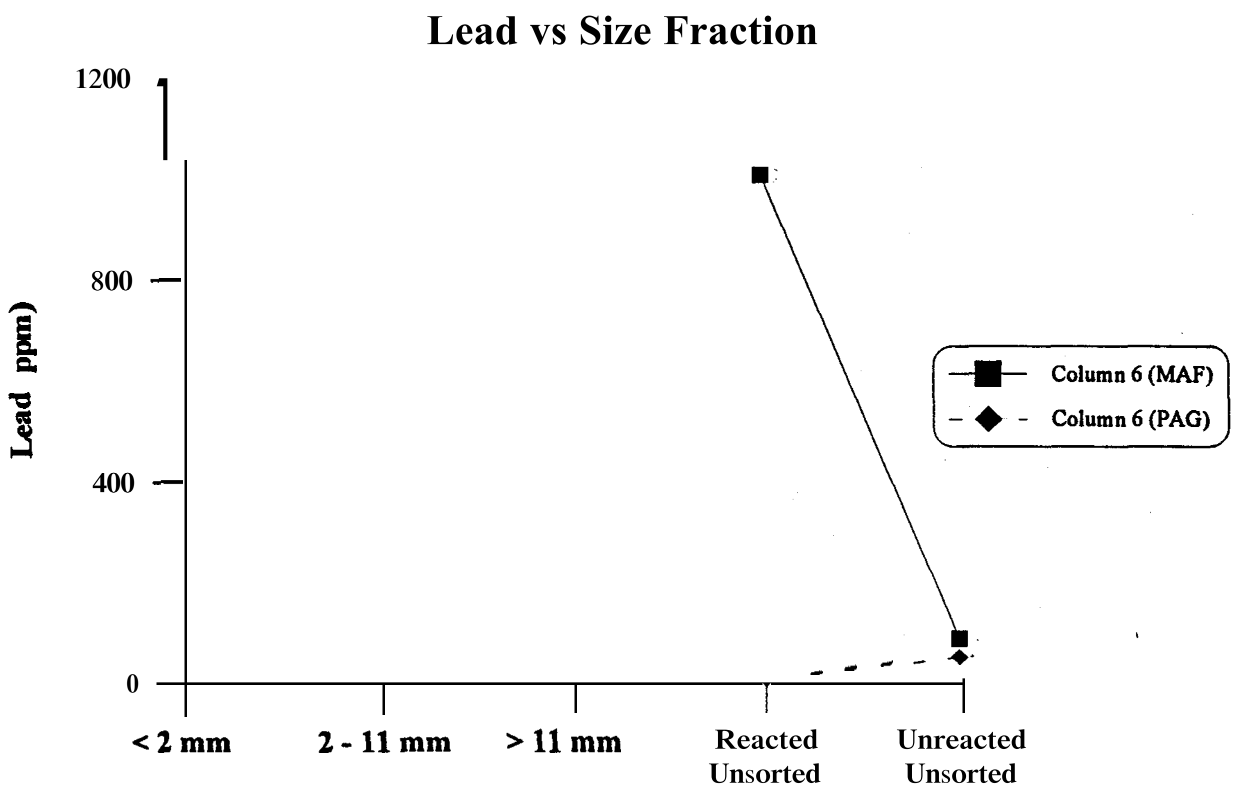
* If values were reported as < detection limit, 1/2 the detection limit is shown in italics and was used in subsequent calculations.

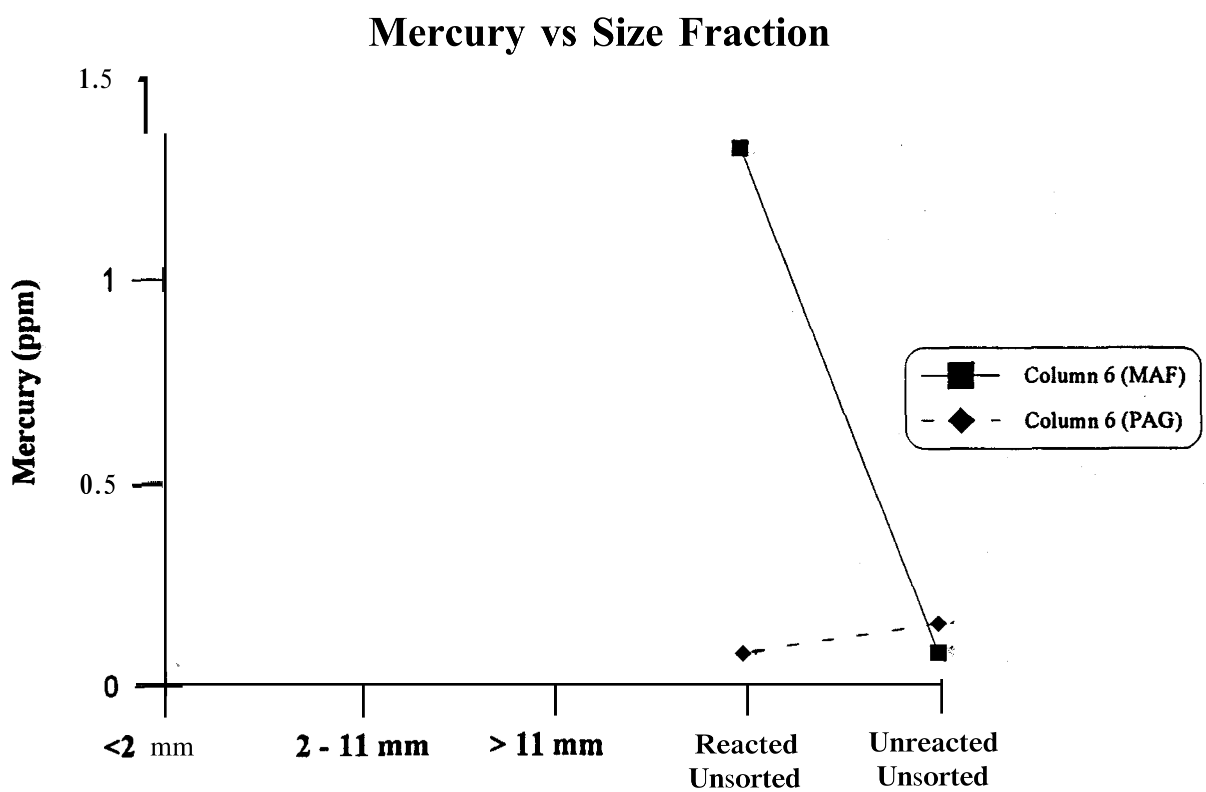
Samatosum Mine Humidity Cell Data - Column 2 (Encapsulated 3 Layers)

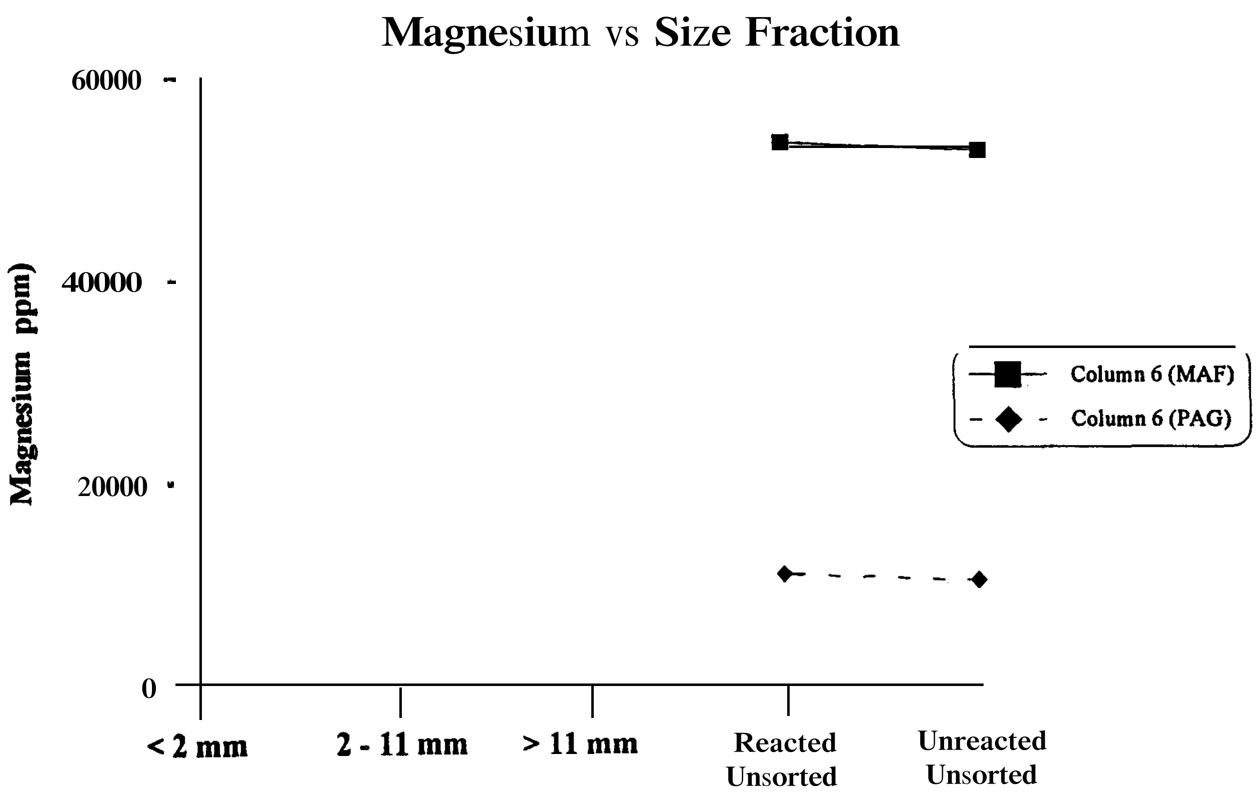
		Analytical Results:									Sulphate Production:			By Surface Area:		Molar Ratio:	NP Consumption:						
Week No.	Date	Leachate Recovered (mL)	Weekly pH (pH units)	Conductivity (umhos/cm)	Eh (mV)	Acidity (CaCO3 mg/L)*	Alkalinity (CaCO3 mg/L)*	Sulphate (SO4 mg/L)*	Acidity Production Rate (mg/kg/wk)**	Alkalinity Production Rate (mg/kg/wk)**	SO4 Production Rate (mg/kg/wk)**	Cumulative SO4 Production (mg/kg)	Remaining S (% of original)	SO4 Production Rate (mg/m2/wk)**	Cumulative SO4 Production (mg/m2)	Alk /SO4	Theoretical NP Consumption At pH 6 (mg/kg/wk)	Empirical Open-System NP Consumption At Measured pH (mg/kg/wk)	Cum NP Consumption Open-System (mg/kg/wk)	Remaining NP Open-System (%)	Theoretical Closed-System NP Consumption Above pH 6.5 (mg/kg/wk)	Cum NP Consumption Closed-System (mg/kg/wk)	Remaining NP Closed-System (%)
132	21-Aug-91	19800	7.9	322					0.64	10.05	41.2	7397	89.89	27.1	4866		42.9	52.4	10732	86.28	85.3	15271	80.47
133	28-Aug-91	19500	7.1	285					0.57	7.46	35.0	7432	89.85	23.0	4889		36.5	43.4	10775	86.22	72.3	15344	80.38
134	04-Sep-91	7500	7.5	438	282	3	30	177	0.49	4.87	28.8	7461	89.81	18.9	4907	0.163	30.0	34.3	10810	86.18	59.4	15403	80.30
135	11-Sep-91	19000	7.1	258					0.68	7.86	29.7	7491	89.77	19.5	4927		30.9	38.1	10848	86.13	61.1	15464	80.22
136	18-Sep-91	19500	7.7	260					0.87	10.84	30.6	7521	89.73	20.1	4947		31.8	41.8	10889	86.07	62.8	15527	80.14
137	25-Sep-91	19800	7.7	221					1.07	13.83	31.5	7553	89.68	20.7	4968		32.8	45.5	10935	86.02	64.5	15591	80.06
138	02-Oct-91	19400	7.9	232	180	3	40	77	1.26	16.81	32.4	7585	89.64	21.3	4989	0.499	33.7	49.3	10984	85.95	66.2	15658	79.98
139	09-Oct-91	19500	7.6	218	280				1.81	20.85	32.3	7617	89.59	21.2	5010		33.6	52.7	11037	85.89	65.5	15723	79.89
140	16-Oct-91	19300	7.7	219					2.36	24.89	32.2	7649	89.55	21.2	5031		33.6	56.1	11093	85.81	64.8	15788	79.81
141	23-Oct-91	19200	7.6	214					2.90	28.92	32.1	7682	89.51	21.1	5053		33.5	59.5	11152	85.74	64.0	15852	79.73
142	30-Oct-91	19300	7.6	218					3.45	32.96	32.1	7714	89.46	21.1	5074		33.4	62.9	11215	85.66	63.3	15915	79.65
143	06-Nov-91	19800	7.5	235	300	4	37		4.00	37.00	32.0	7746	89.42	21.0	5095		33.3	66.3	11282	85.57	62.6	15978	79.57
144	13-Nov-91	19700	7.3	212					3.42	31.81	31.9	7777	89.38	21.0	5116		33.2	61.6	11343	85.49	63.1	16041	79.49
145	20-Nov-91	19200	7.4	210					2.83	26.61	31.8	7809	89.33	20.9	5137		33.2	56.9	11400	85.42	63.5	16104	79.41
146	27-Nov-91	19500	7.7	195					2.25	21.42	31.8	7841	89.29	20.9	5158		33.1	52.3	11453	85.35	63.9	16168	79.32
147	04-Dec-91	19200	7.5	210	320	4	39	76	1.66	16.22	31.6	7873	89.24	20.8	5178	0.492	32.9	47.5	11500	85.29	64.2	16232	79.24
148	11-Dec-91	19500	7.5	208					1.67	14.90	29.9	7903	89.20	19.7	5198		31.2	44.4	11544	85.24	60.6	16293	79.16
149	18-Dec-91	19700	7.8	180					1.67	13.57	28.2	7931	89.17	18.6	5217		29.4	41.3	11586	85.18	57.1	16350	79.09
150	25-Dec-91	19300	7.6	155					1.68	12.25	26.5	7957	89.13	17.4	5234		27.6	38.2	11624	85.14	53.5	16404	79.02
151	01-Jan-92	19400	7.2	162	300	4	26	59	1.68	10.93	24.8	7982	89.10	16.3	5250	0.423	25.8	35.1	11659	85.09	50.0	16454	78.96
152	08-Jan-92	19300	7.0	180					1.57	10.48	25.5	8008	89.06	16.7	5267		26.5	35.4	11694	85.05	51.5	16505	78.89
153	15-Jan-92	19100	7.0	180					1.46	10.04	26.1	8034	89.03	17.2	5284		27.2	35.8	11730	85.00	53.0	16558	78.83
154	22-Jan-92	19700	7.4	162					1.36	9.59	26.8	8060	88.99	17.6	5302		27.9	36.1	11766	84.95	54.5	16613	78.76
155	29-Jan-92	19200	7.5	165	310	3	22	66	1.25	9.15	27.5	8088	88.95	18.1	5320	0.320	28.6	36.5	11803	84.91	55.9	16669	78.68
156	05-Feb-92	19400	7.1	170					1.15	8.99	27.1	8115	88.91	17.8	5338		28.2	36.0	11839	84.86	55.2	16724	78.61
157	12-Feb-92	19200	7.3	188					1.05	8.82	26.7	8142	88.88	17.5	5355		27.8	35.6	11874	84.82	54.5	16778	78.54
158	19-Feb-92	19700	7.2	165					0.95	8.66	26.3	8168	88.84	17.3	5373		27.4	35.1	11909	84.77	53.8	16832	78.48
159	26-Feb-92	19600	7.6	161	290	2	20	61	0.85	8.49	25.9	8194	88.81	17.0	5390	0.315	27.0	34.6	11944	84.73	53.1	16885	78.41
160	04-Mar-92	19000	7.4	170					0.84	8.33	27.9	8222	88.77	18.4	5408		29.1	36.6	11981	84.68	57.3	16943	78.33
161	11-Mar-92	19100	7.5	190					0.84	8.18	29.9	8252	88.73	19.7	5428		31.2	38.5	12019	84.63	61.5	17004	78.26
162	18-Mar-92	19400	7.9	175					0.83	8.02	31.9	8284	88.68	21.0	5449		33.3	40.4	12060	84.58	65.7	17070	78.17
163	25-Mar-92	19100	7.5	190	390	2	19	82	0.83	7.86	33.9	8318	88.64	22.3	5471	0.222	35.3	42.4	12102	84.52	69.9	17140	78.08
164	01-Apr-92	18000	7.3	225					0.93	8.60	34.5	8352	88.59	22.7	5494		35.9	43.6	12146	84.47	70.9	17210	77.99
165	08-Apr-92	19200	7.2	185					1.04	9.34	35.1	8387	88.54	23.1	5517		36.5	44.8	12190	84.41	72.0	17282	77.90
166	15-Apr-92	19000	7.4	200					1.14	10.08	35.6	8423	88.49	23.4	5540		37.1	46.0	12236	84.35	73.1	17356	77.81
167	22-Apr-92	19200	7.3	208	430	3	26	87	1.25	10.81	36.2	8459	88.44	23.8	5564	0.287	37.7	47.3	12284	84.29	74.1	17430	77.71
168	29-Apr-92	19700	7.5	200					1.24	10.24	35.6	8495	88.40	23.4	5587		37.1	46.1	12330	84.23	73.0	17503	77.62
169	06-May-92	19400	7.6	200					1.23	9.66	35.1	8530	88.35	23.1	5610		36.6	45.0	12375	84.18	71.9	17575	77.53
170	13-May-92	19000	7.4	191					1.22	9.08	34.6	8564	88.30	22.7	5633		36.0	43.9	12419	84.12	70.8	17645	77.44
171	20-May-92	18700	7.3	204	380	3	21	84	1.22	8.51	34.0	8598	88.25	22.4	5656	0.240	35.4	42.7	12461	84.06	69.7	17715	77.35
172	27-May-92	19200	7.2	185					1.33	8.89	34.2	8632	88.21	22.5	5678		35.6	43.2	12505	84.01	69.9	17785	77.26
173	03-Jun-92	19100	7.3	210					1.44	9.27	34.4	8667	88.16	22.6	5701		35.8	43.6	12548	83.95	70.2	17855	77.17
174	10-Jun-92	19200	7.2	190					1.56	9.65	34.5	8701	88.11	22.7	5723		36.0	44.1	12592	83.90	70.4	17926	77.08
175	17-Jun-92	19300	7.2	220	420	4	24	83	1.67	10.03	34.7	8736	88.07	22.8	5746	0.278	36.1	44.5	12637	83.84	70.6	17996	76.99
176	24-Jun-92	19000	7.4	220					1.47	10.29	34.2	8770	88.02	22.5	5769		35.6	44.4	12681	83.78	69.8	18066	76.90
177	01-Jul-92	19200	7.5	240					1.26	10.54	33.7	8804	87.97	22.2	5791		35.1	44.4	12726	83.73	68.9	18135	76.81
178	08-Jul-92	19500	7.3	195					1.06	10.79	33.2	8837	87.93	21.8	5813		34.6	44.3	12770	83.67	68.1	18203	76.72
179	15-Jul-92	19600	7.4	182	400	2	26	77	0.85	11.04	32.7	8870	87.88	21.5	5834	0.324	34.1	44.2	12814	83.61	67.3	18270	76.64
180	22-Jul-92	19200	7.6	225					0.96	12.29	33.4	8903	87.84	22.0	5856		34.8	46.1	12860	83.55	68.6	18339	76.55
181	29-Jul-92	18600	7.5	232					1.07	13.54	34.1	8937	87.79	22.4	5879		35.5	48.0	12908	83.49	70.0	18409	76.46
182	05-Aug-92	12900	7.3	340					1.19	14.78	34.8	8972	87.74	22.9	5902		36.3	49.9	12958	83.43	71.4	18480	76.37
183	12-Aug-92	20000	7.4	205	380	3	37	82	1.30	16.03	35.5	9008	87.69	23.4	5925	0.433	37.0	51.7	13010	83.36	72.7	18553	76.27
184	19-Aug-92	19200	7.3	230					1.19	14.56	34.9	9043	87.65	22.9	5948		36.3	49.7	13060	83.30	71.5	18624	76.18
185	26-Aug-92	19400	7.43	225					1.07	13.08	34.2	9077	87.60	22.5	5970		35.7	47.7	13107	83.24	70.3	18695	76.09
186	02-Sep-92	19000	7.18	222					0.96	11.61	33.6	9110	87.55	22.1	5992		35.0	45.6	13153	83.18	69.0	18764	76.01
187	09-Sep-92	19500	7.4	186	460	2	24	78	0.84	10.14	33.0	9143	87.51	21.7	6014	0.295	34.3	43.6	13197	83.12	67.8	18832	75.92
188	16-Sep-92	19000	7.54	204					0.84	10.59	33.7	9177	87.46	22.1	6036		35.1	44.8	13241	83.07	69.3	18901	75.83
189	23-Sep-92	19200	7.43	187					0.83	11.04	34.4	9211	87.42	22.6	6059		35.8	46.0	13287	83.01	70.8	18972	75.74
190	30-Sep-92	19100	7.54	200					0.83	11.49	35.1	9247	87.37	23.1	6082		36.6	47.2	13335	82.95	72.3	19044	75.65
191	07-Oct-92	19000	7.62	222	460	2	29	87	0.82	11.94	35.8	9282	87.32	23.6	6106	0.320	37.3	48.4	13383	82.89	73.8	19118	75.55
192	14-Oct-92	19100	7.33	212					0.94	12.58	33.6	9316	87.27	22.1	6128		35.0	46.6	13430	82.83	69.0	19187	75.46
193	21-Oct-92	19700	7.52	208					1.05	13.22	31.3	9347	87.23	20.6	6148		32.7	44.8	13474	82.77	64.3	19251	75.38
194	28-Oct-92	19200	7.52	206					1.17	13.87	29.1	9376	87.19	19.2	6167		30.3	43.0	13518	82.71	59.5	19310	75.31
195	04-Nov-92	19700	7.46	180	480	3	34	63	1.28	14.51	26.9	9403	87.15	17.7	6185	0.518	28.0	41.2	13559	82.66	54.7	19365	75.24
196	11-Nov-92	19100	7.58	192					1.27	14.65	26.9	9430	87.12	17.7	6203		28.0	41.3	13600	82.61	54.7	19420	75.17
197	18-Nov-92	19500	7.5	182					1.27	14.78	26.8	9457	87.08	17.6	6220		27.9	41.5	13642	82.56	54.6	19474	75.10

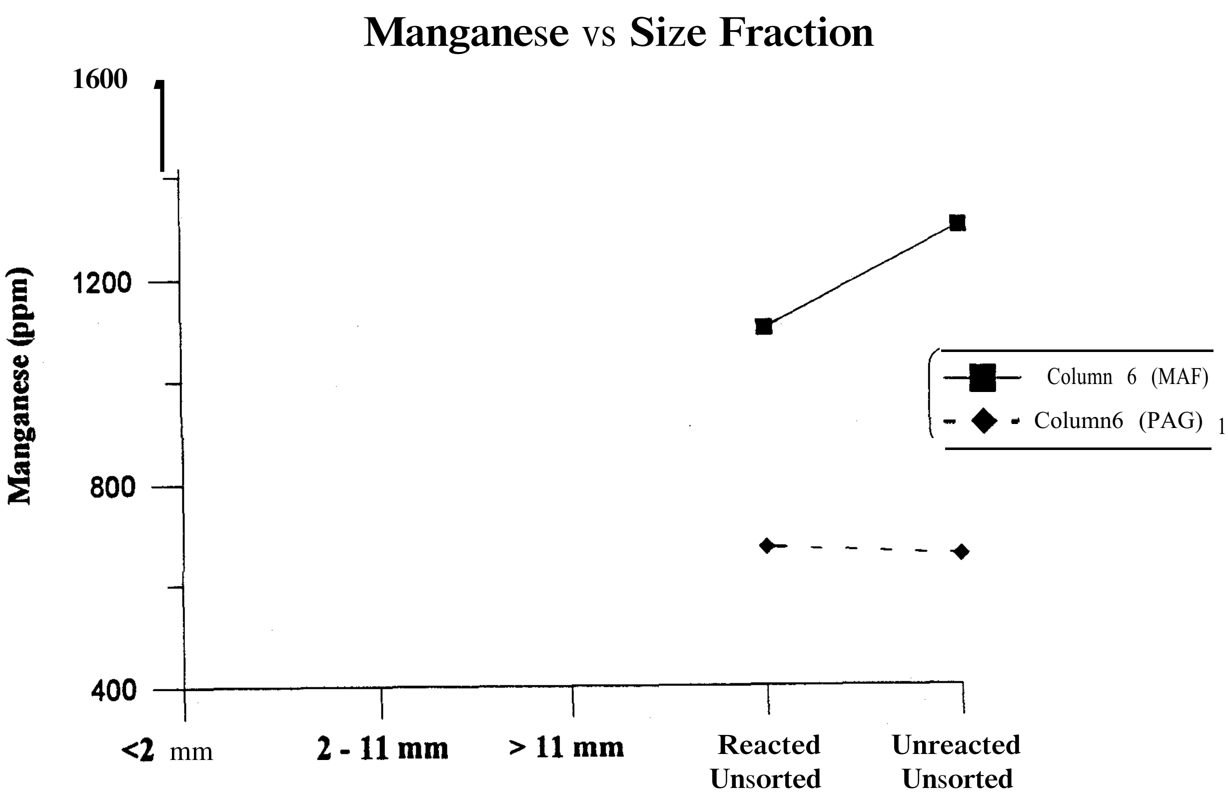
* If values were reported [illegible] detection limit, 1/2 the detection limit is shown in italics and was used in subsequent calculations

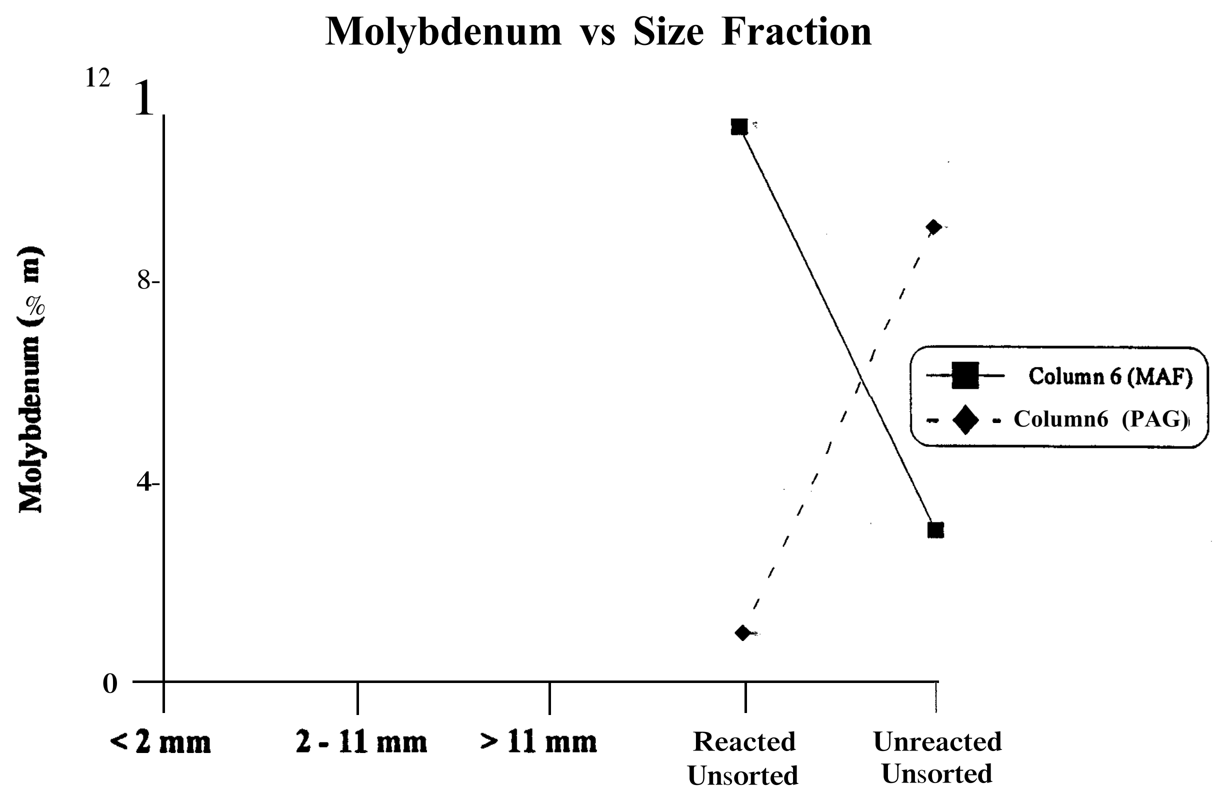
Version 5.0 - Mar 11, 1996


Lead vs Size Fraction
1200
800
400
0
Lead ppm)
Column 6 (MAF)
Column 6 (PAG)
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

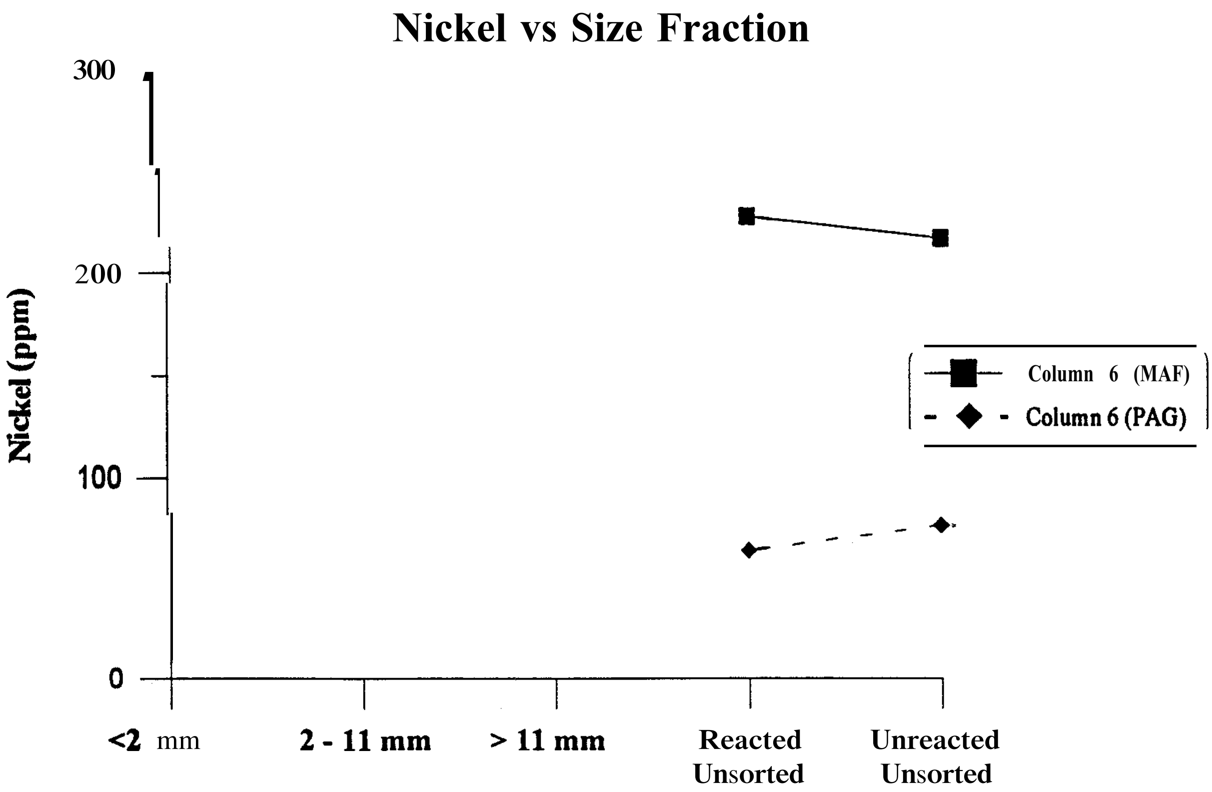

Mercury vs Size Fraction
1.5
1
0.5
0
Mercury (ppm)
Column 6 (MAF)
Column 6 (PAG)
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted


Magnesium vs Size Fraction
Magnesium ppm)
60000
40000
20000
0
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 6 (MAF)
Column 6 (PAG)

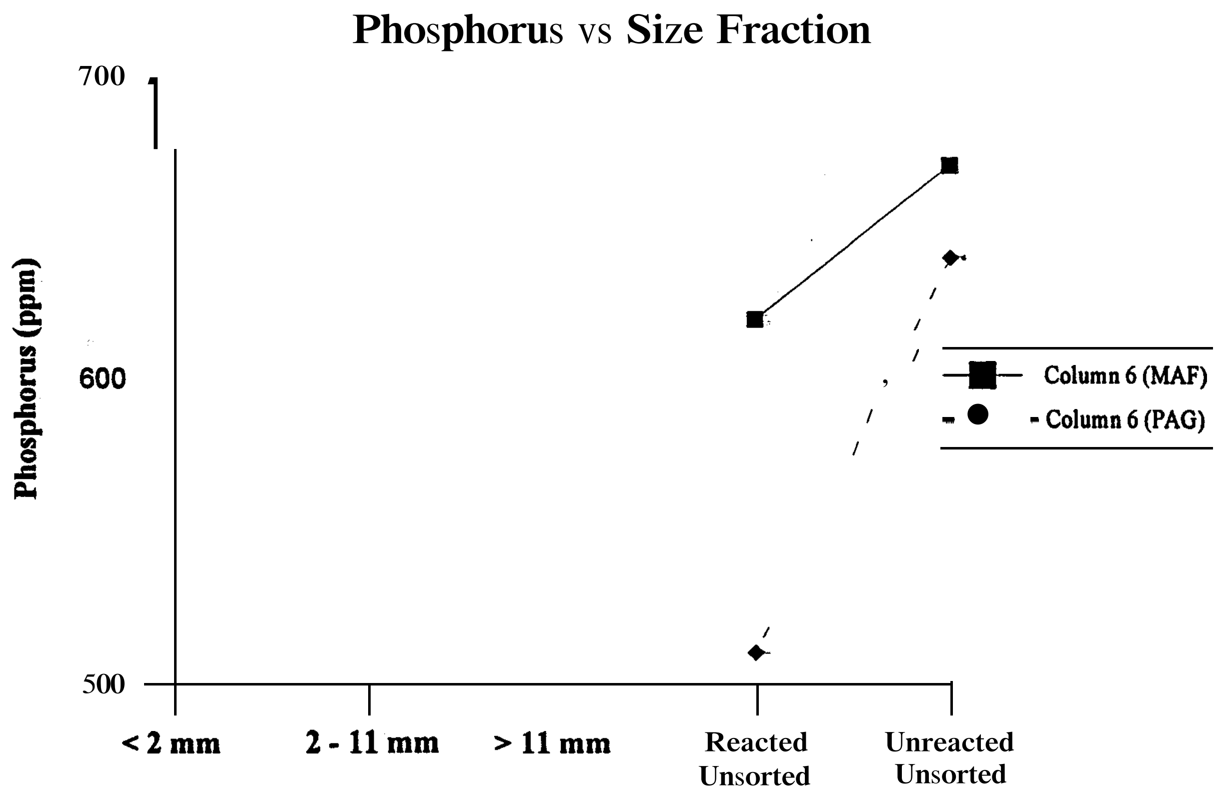

Manganese vs Size Fraction
Manganese (ppm)
1600
1200
800
400
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 6 (MAF)
Column6 (PAG)

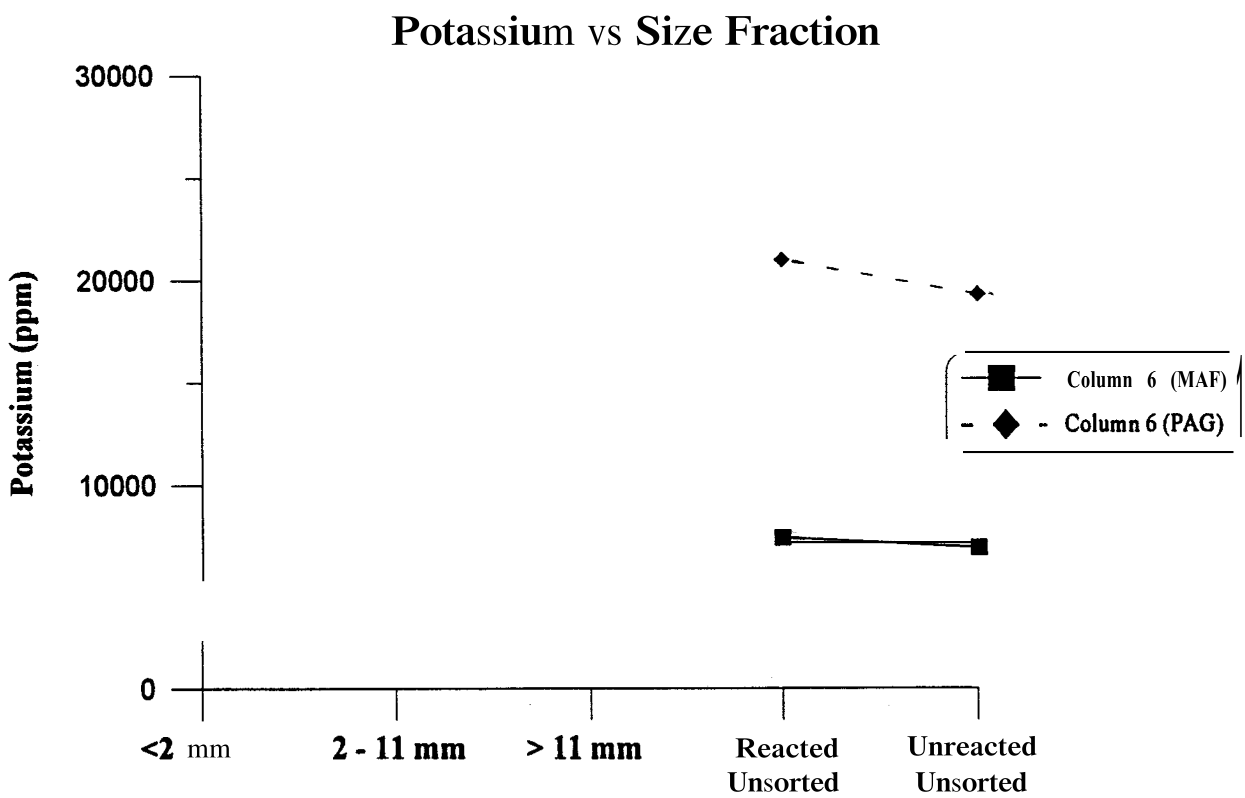


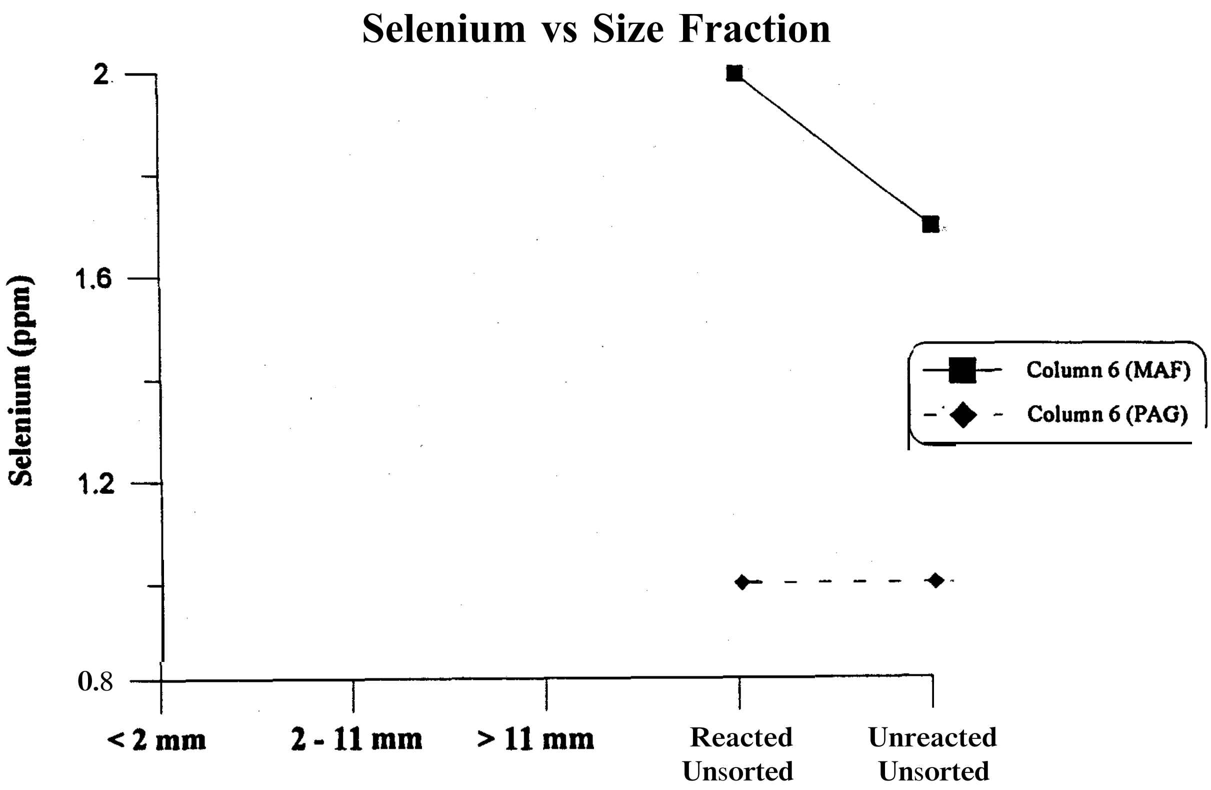
Molybdenum vs Size Fraction
Molybdenum (% m)
12
8
4
0
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 6 (MAF)
Column6 (PAG)

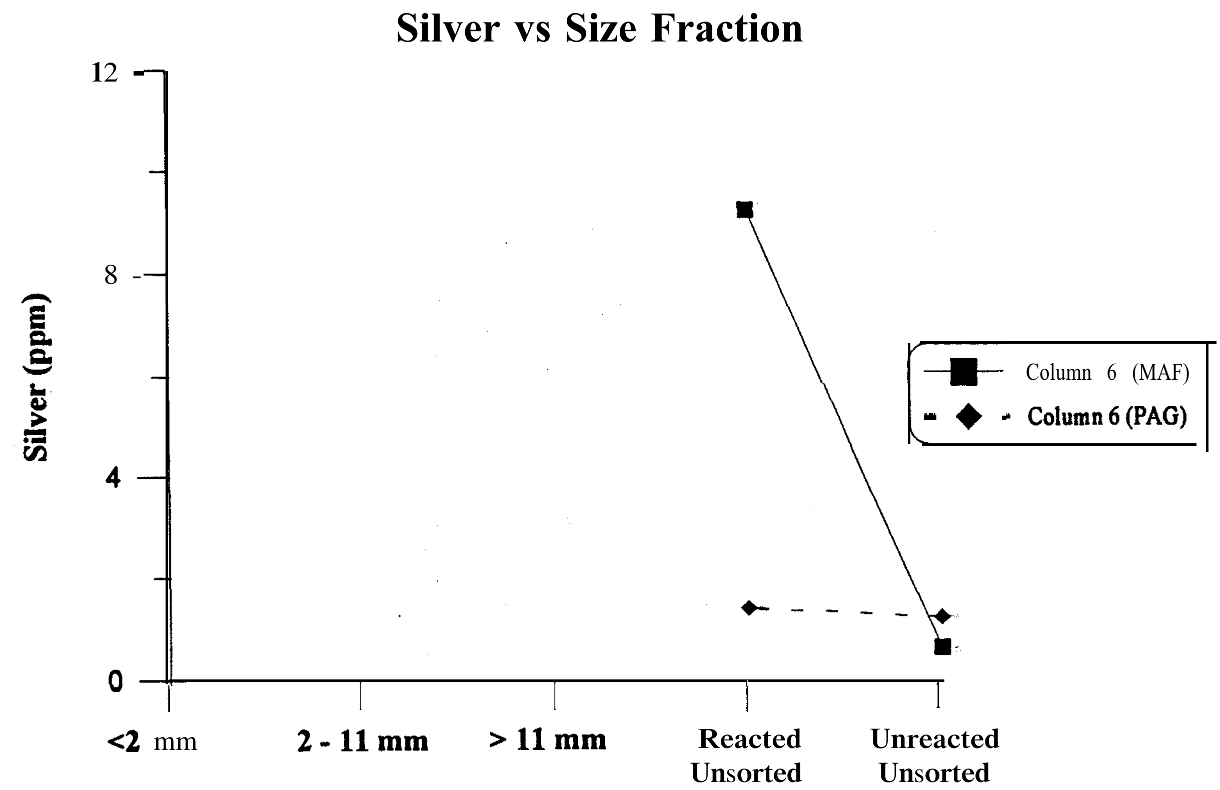


Nickel vs Size Fraction
Nickel (ppm)
300
200
100
0
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 6 (MAF)
Column 6 (PAG)

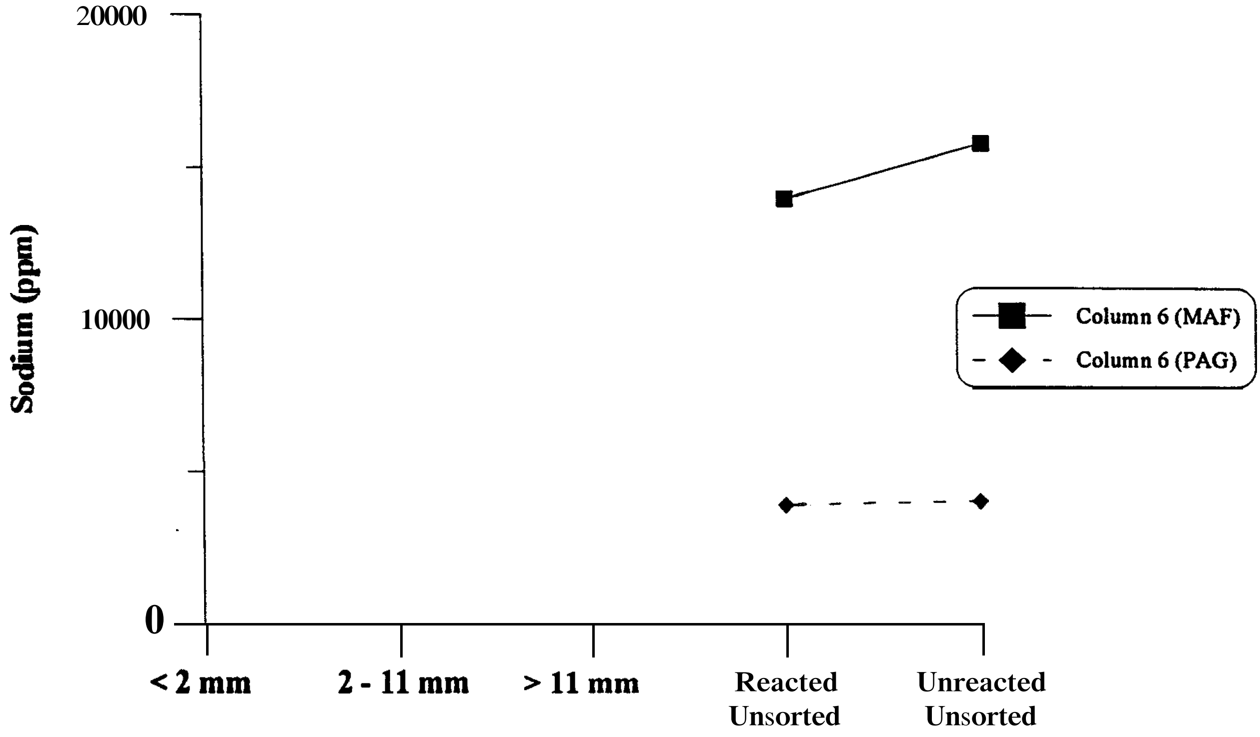

Phosphorus vs Size Fraction
700
600
500
Phosphorus (ppm)
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 6 (MAF)
Column 6 (PAG)


Potassium vs Size Fraction
30000
20000
10000
0
Potassium (ppm)
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted
Column 6 (MAF)
Column 6 (PAG)

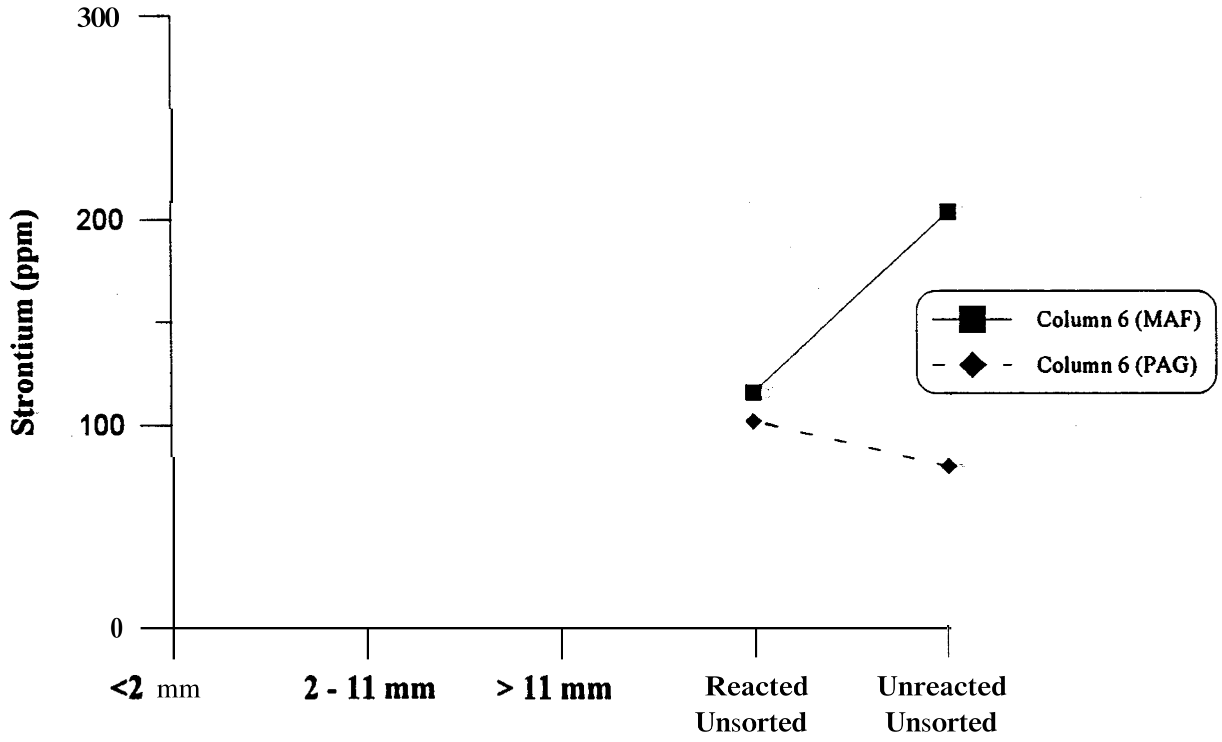

Selenium vs Size Fraction
2
1.6
1.2
0.8
Selenium (ppm)
Column 6 (MAF)
Column 6 (PAG)
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

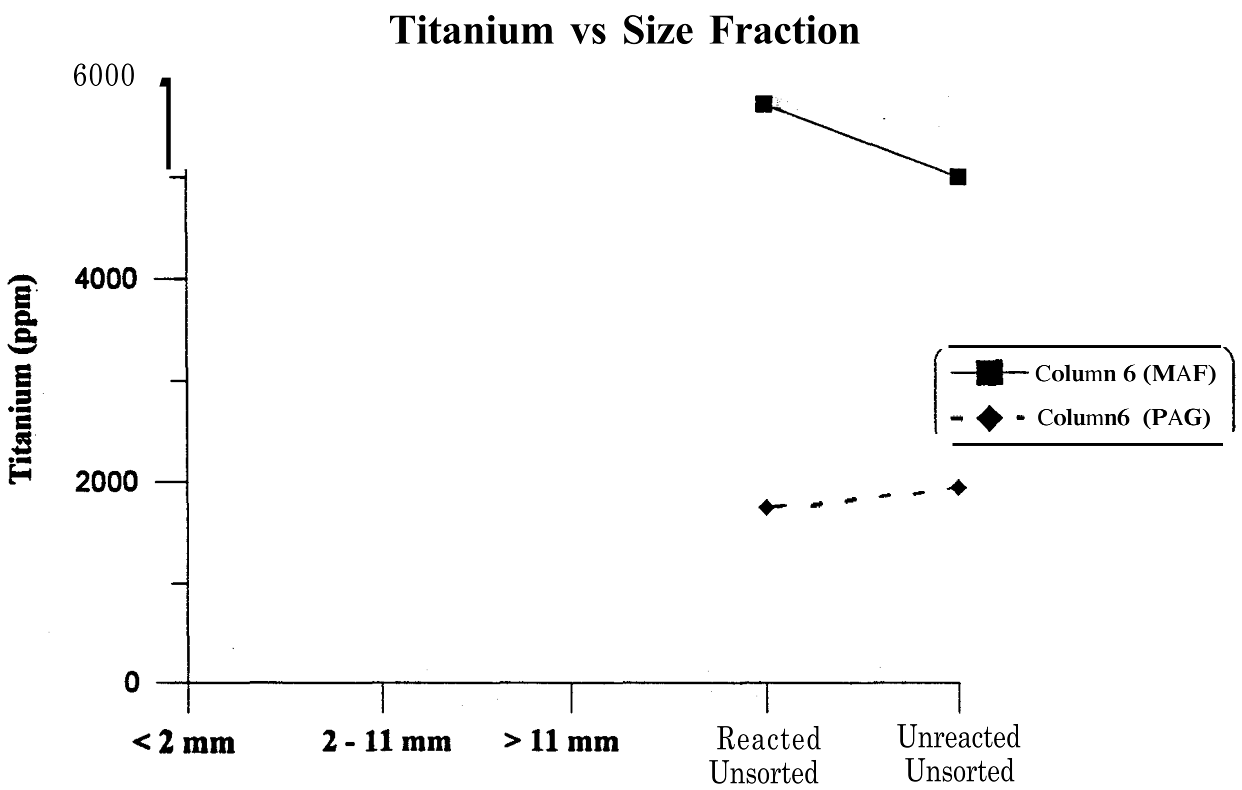

Silver vs Size Fraction
12
8
4
0
Silver (ppm)
Column 6 (MAF)
Column 6 (PAG)
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

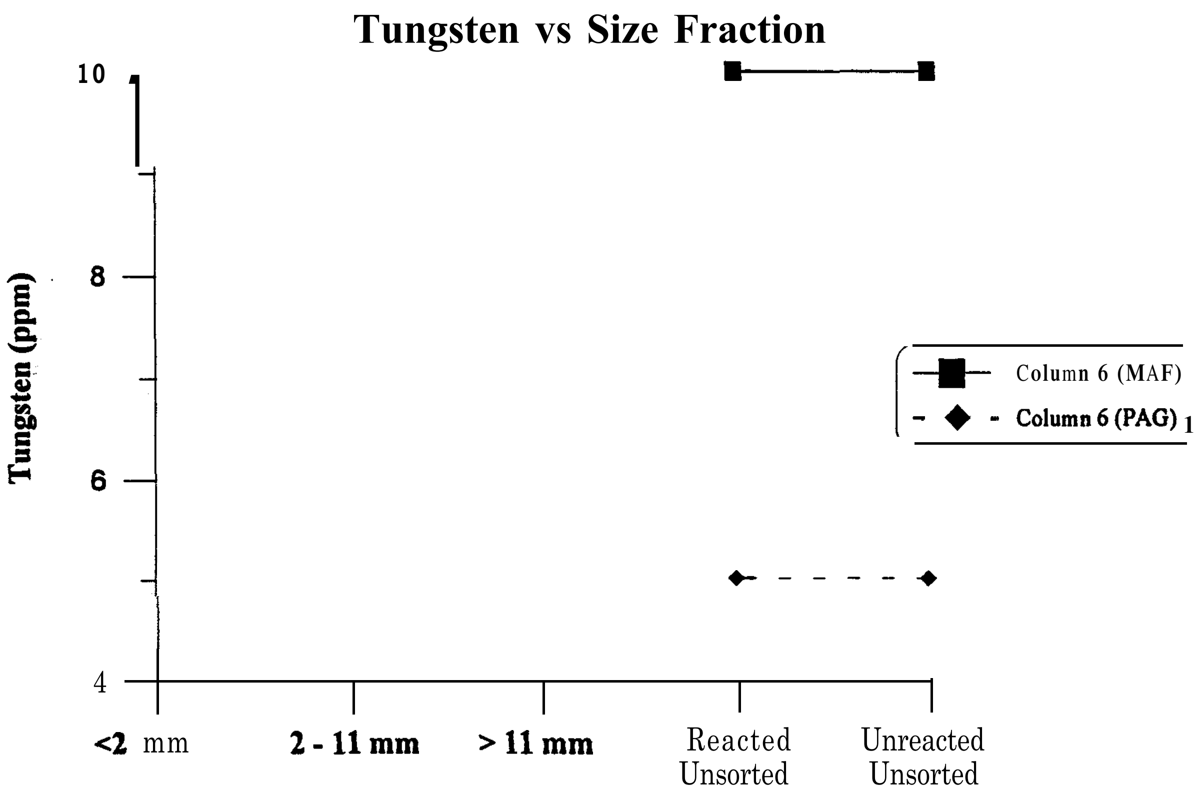
Sodium vs Size Fraction

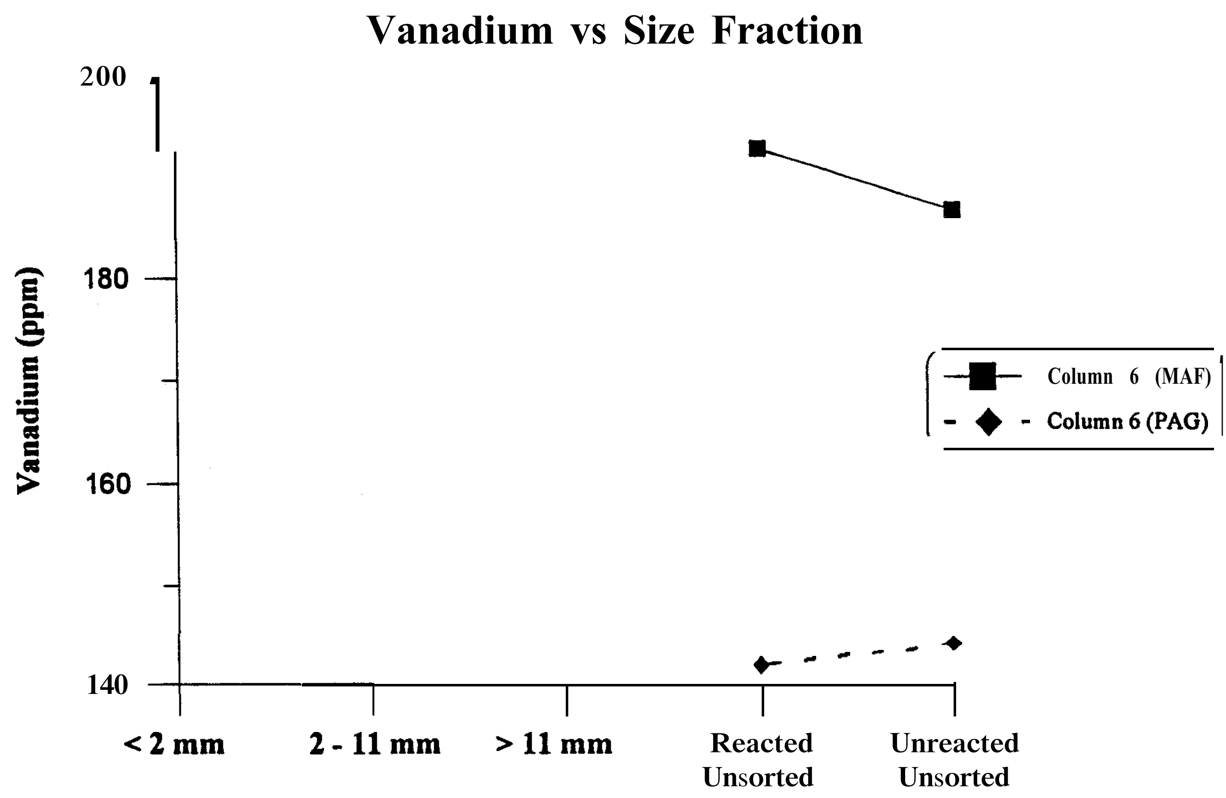


Strontium vs Size Fraction

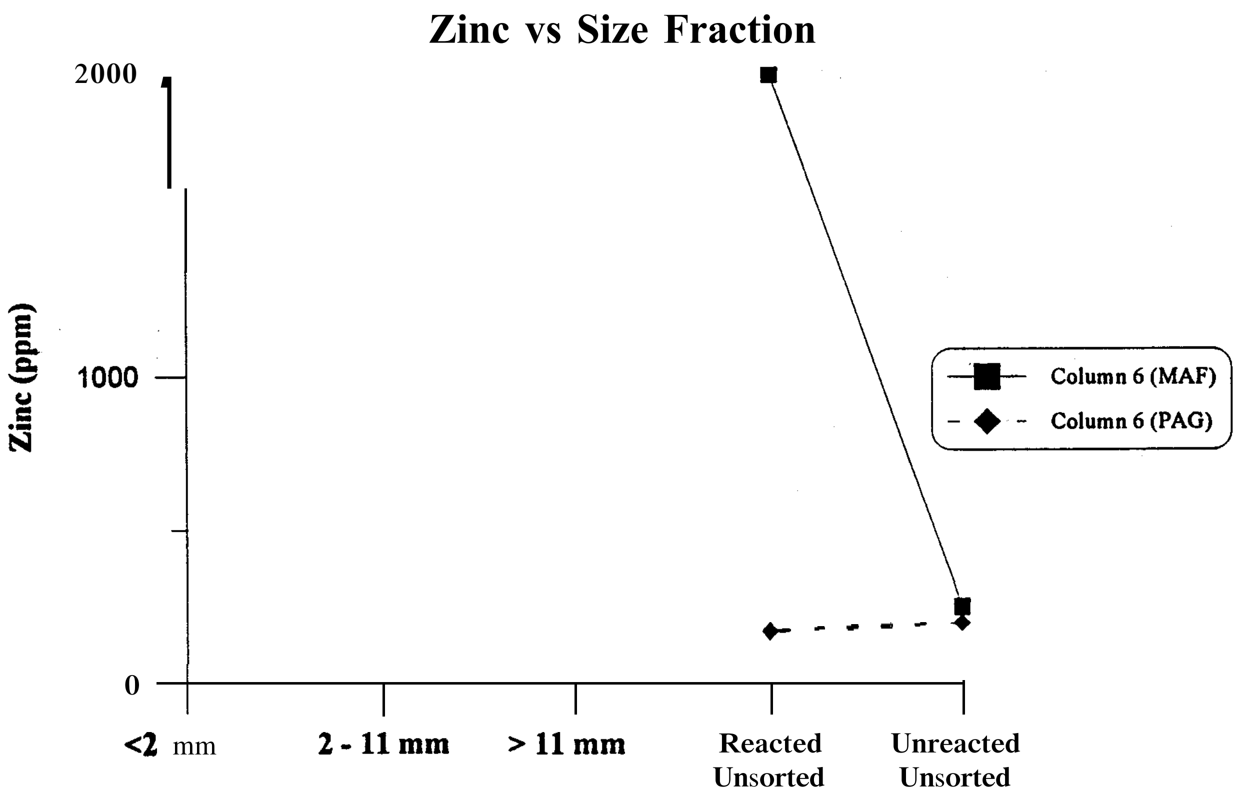



Titanium vs Size Fraction
6000
4000
2000
0
Titanium (ppm)
Column 6 (MAF)
Column6 (PAG)
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted


Tungsten vs Size Fraction
10
8
6
4
Tungsten (ppm)
Column 6 (MAF)
Column 6 (PAG)
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted



Vanadium vs Size Fraction
200
180
160
140
Vanadium (ppm)
Column 6 (MAF)
Column 6 (PAG)
< 2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted



Zinc vs Size Fraction
2000
1000
0
Zinc (ppm)
Column 6 (MAF)
Column 6 (PAG)
<2 mm
2 - 11 mm
> 11 mm
Reacted Unsorted
Unreacted Unsorted

Column Test Samples

Sample	Al_2O_3 (%) XRF	Al XRF Equivalent (ppm)	Al ICP (ppm)	Al (%) Difference	CaO (%) XRF	Ca XRF Equivalent (ppm)	Ca ICP (ppm)	Ca (%) Difference	Cr_2O_3 (%) XRF	Cr XRF Equivalent (ppm)	Cr ICP (ppm)	Cr (%) Difference	Fe_2O_3 (%) XRF	Fe XRF Equivalent (ppm)	Fe ICP (ppm)	Fe (%) Difference	K_2O (%) XRF	K XRF Equivalent (ppm)	K ICP (ppm)	K (%) Difference
Column 2, Consuming 1	13.16	34676	73000	52.22	7.66'	54746	50900	-7.56	0.01	54	467	65.45	11.35	36629	71300	45.54	0.07	261	73000	99.60
Column 2, Consuming 1	13.72	36305	73400	50.54	5.46	39166	35300	-10.66	0.01	54	493	69.06	11.81	40403	72700	44.43	0.31	1267	73400	96.25
Column 2, Consuming 1	15.01	39718	80000	50.35	2.37	16938	15100	-12.17	0.01	54	602	91.04	12.66	44439	80000	44.45	0.69	2864	80000	96.42
Column 2, Consuming 1																				
Column 2, Producing 2																				
Column 2, Producing 2	9.66	25297	50700	50.10	1.43	10220	9800	-4.29	0.01	54	215	74.91	6.05	20697	39800	46.W	2.15	8924	50700	82.40
Column 2, Producing 2	17.07	45170	82300	45.12	0.79	5646	4900	-15.23	0.01	54	170	68.27	7.56	25932	47600	45.75	4.11	17059	82300	79.27
Column 2, Producing 2	11.57	30616	61500	50.22	1.34	9577	9600	0.24	0.01	54	265	79.65	6.71	22955	44500	46.42	2.70	11207	61500	61.76
Column 2, Consuming 3	13.13	34744	72306	51.95	6.84	48885	44200	-10.60	0.01	54	547	90.14	11.38	38932	69900	44.30	0.06	249	72300	99.66
Column 2, Consuming 3	14.15	37443	76206	52.12	5.66	40452	36500	-10.83	0.01	54	576	90.67	13.36	45705	63300	45.13	0.06	249	78200	99.68
Column 2, Consuming 3	14.69	36401	79400	50.38	2.92	20669	16300	-14.04	0.01	54	616	91.24	14.16	48442	67300	44.51	0.13	540	79400	99.32
Column 2, Consuming 3																				
Column 3, Consuming 1	12.71	33632	66400	49.35	7.40	52887	471W	-12.29	0.01	54	418	87.10	12.14	41532	74000	43.88	0.05	249	66400	99.62
Column 3, Consuming 1	13.30	35194	70a00	50.29	4.84	34591	30500	-13.41	0.01	54	439	67.71	12.26	42011	74600	43.64	0.17	706	70800	99.00
Column 3, Consuming 1	14.26	37734	74306	49.21	2.76	19868	17200	-15.51	0.01	54	500	89.21	13.46	46047	81300	43.38	0.30	1245	74300	98.32
Column 3, Consuming 1																				
Column 3, Producing 2																				
Column 3, Producing 2	9.34	24715	49800	50.37	1.59	11364	11060	-3.31	0.01	54	200	73.03	6.07	20765	39800	47.82	1.92	7969	49800	84.00
Column 3, Producing 2	17.10	45249	65606	47.14	0.68	9660	4600	-5.65	0.01	27	131	79.41	7.31	25009	49400	49.30	4.14	17183	85600	79.93
Column 3, Producing 2	13.01	34426	65700	47.60	1.23	8791	8400	-4.65	0.01	54	170	68.27	6.82	23332	44900	48.04	3.01	12493	65700	80.98
Column 3, Consuming 3	12.64	33447	677W	50.60	5.33	38093	33600	-12.70	0.01	54	440	67.74	12.45	42592	76400	44.25	0.05	249	67700	99.63
Column 3, Consuming 3	13.91	36808	73800	50.13	5.62	41595	37100	-12.12	0.01	54	458	M.22	12.45	42592	76400	44.25	0.22	913	73800	90.76
Column 3, Consuming 3	15.51	41042	80600	4906	2.48	17724	15200	-16.61	0.01	54	612	91.19	13.66	46732	62000	43.01	0.63	2615	50600	96.76
Column 3, Consuming 3																				
Column 3, Producing 4	7.80	20640	41100	49.78	234	16724	16100	-3.87	0.01	27	166	83.75	5.67	20082	38500	47.64	1.55	6433	41100	84.35
Column 3, Producing 4	14.02	37099	69400	46.54	1.25	6934	8300	-7.63	0.01	54	164	67.11	7.51	25692	48600	47.14	3.26	13531	69400	60.50
Column 3, Producing 4	11.55	30854	60700	49.17	1.46	10435	9900	-5.40	0.01	54	212	74.56	6.95	23776	45500	47.74	2.59	10750	60700	62.29
Column 3, Consuming 5	13.59	36661	75600	52.43	5.89	42095	36900	-14.08	0.01	54	521	89.65	12.12	41463	74600	44.34	0.07	291	75600	99.62
Column 3, Consuming 5	13.18	34676	79506	56.13	466	33305	32500)	-2.48	0.01	54	533	89.88	12.11	41429	82300	49.66	0.06	249	79500	99.69
Column 3, Consuming 5	14.44	38210	81600	53.17	3.14	22441	20500	-9.47	0.01	54	677	92.03	13.65	47382	88400	46.40	0.14	661	81600	99.29
Column 3, Consuming 5																				
Original PAG	12.37	32733	64400	49.17	1.41	10077	9900	-1.79	0.01	54	197	72.62	6.49	22203	43400	48.64	2.57	1o667	644W	63.44
Original MAF	12.93	34215	70800	51.67	6.69	49242	44600	-10.41	0.01	54	478	1.72	10.87	37157	67000	44.50	0.62	3403	70800	95.19
Column 1. Original PAG																				
Column 1, Original PAG	9.18	24292	51100	52.46	1.92	13722	13700	-0.16	0.02	108	290	62.80	6.91	23639	47000	49.70	f.73	7180	51100	65.95
Column 1, Original PAG	12.44	32916	67000	50.87	0.55	3931	3900	-0.79	0.01	27	177	84.76	6.29	21518	43900	50.96	2.67	11912	67000	62.22
Column 1. Original PAG	17.77	47022	90200	47.87	0.26	1656	1600	-16.14	0.01	27	190	65.61	6.60	29421	59900	50.56	4.22	17515	90200	60.56
Column 4, Original MAF																				
Column 4, Original MAF	13.51	35749	74400	51.95	6.12	43739	38900	-12.44	0.01	54	565	90.50	12.37	42316	75700	44.10	0.07	291	744m	99.61
Column 4, Original MAF	13.32	35247	75300	53.19	7.16	51172	46.900	-9.34	0.01	54	584	90.76	12.44	42656	77800	45.30	0.07	291	75300	99.61
Column 4, Original MAF	13.1	36993	80600	54.10	5.91	42238	39200	-7.75	0.01	64	683	92.10	13.34	45637	85800	46.61	0.13	540	80600	99.33
Column 5	12.53	33156	67700	51.02	0.76	5432	5500	1.24	0.01	27	192	65.95	4.54	15532	32400	52.06	2.75	11414	677w	83.14
Column 5																				
Column 5																				
Column 5																				
Column 6. MAF(Top)	13.07	34565	73500	52.95	4.75	33948	31800	-6.75	0.01	54	489	86.97	11.25	38487	71600	46.25	0.87	3611	73500	95.09
Column6, MAF (Top)																				
Column 6, MAF (Top)																				
Column 6, MAF (Top)																				
Column 6, PAG (Bottom)	13.10	34664	67300	4a.49	2.05	14651	13900	-5.40	0.01	27	182	85.18	6.14	21005	40100	47.62	2.76	11456	67300	82.98
Column 6, PAG (Bottom)																				
Column 6. PAG (Bottom)																				
Column 6, PAG (Bottom)																				
Maximum	17.77	47022	so200	56.13	7.66	54746	50900	1.24	0.02	109	683	92.10	14.16	48442	88400	52.06	4.22	17515	90200	99.69
Minimum	7.80	20540	41100	45.12	0.26	1656	1600	-16.61	0.01	27	131	62.80	4.54	15532	32400	43.01	0.06	249	41100	79.27
Mean	13.23	35001	70734	60.51	3.52	25149	22957	8.41	0.01	51	389	84.01	9.99	34179	63371	46.53	1.35	5612	70734	91.61
Standard Deviation	2.10	5545	10658	2.23	2.37	16964	15234	5.13	0.00	14	182	6.39	3.07	10503	17743	2.44	1.41	5967	10658	6.38
10 Percentile	10.36	27425	54940	47.71	0.77	5517	5140	-14.77	0.01	27	170	70.01	6.10	20862	39920	43.96	0.06	249	54940	80.74
Median	13.16	34676	73000	50.37	2.78	19868	17200	-9.34	0.01	54	440	67.74	11.35	36629	71300	46.25	0.69	2664	73000	96.42
90 Precentile	15.31	40512	81200	53.08	6.67	49099	44440	-1.19	0.01	54	606	91.13	13.42	45911	82900	49.69	3.16	13116	81200	99.63
Count	35.w	35	35	35.w	35.00	35	35	35.00	35.w	35	35	35.00	35.00	35	35	35.w	35.00	35	35	35.00

% Difference = ((ICP (ppm) - XRF Equivalent (ppm)) / ICP (ppm)) * 100

APPENDIX

B. Results of Column Tests

Column lest Samples

Sample	MgO (%) XRF	Mg XRF Equivalent (ppm)	Mg ICP (ppm)	Mg (%) Difference	MnO (%) XRF	Mn XRF Equivalent (ppm)	Mn ICP (ppm)	Mn (%) Difference	Na_2O (%) XRF	Na XRF Equivalent (ppm)	Na ICP (ppm)	Na (%) Difference	P_2O_5 (%) XRF	P XRF Equivalent (ppm)	P ICP (ppm)	P (%) Difference	TiO_2 (%) XRF	Ti Equivalent (ppm)	Ti ICP (ppm)	Ti (%) Difference
Column 2, Consuming 1	11.58	69836	66200	-5.49	0.19	1471	13%	-8.60	2.69	9978	24200	58.77	0.15	327	620	47.21	1.28	7674	6500	-18.66
Column 2, Consuming 1	11.16	67303	62700	-7.34	0.19	1471	129s	-13.63	2.52	9347	21300	56.12	0.15	327	676	51.15	1.42	8513	7200	-18.23
Column 2, Consuming 1	11.91	71826	65300	-9.99	0.27	2091	179s	-16.49	2.06	7641	18209	58.02	0.17	371	n o	61.83	1.62	9712	noo	-26.13
Column 2, Consuming 1																				
Column 2, Producing 2																				
Column 2, Producing 2	2.07	12484	12460	-0.67	0.11	852	745	-14.35	0.16	593	2700	78.02	0.14	305	590	48.w	0.59	3537	1000	-253.70
Column 2, Producing 2	t.78	10735	9400	-14.20	0.09	697	560	-24.47	0.33	1224	4300	71.63	0.16	349	610	42.77	0.99	5935	1800	-229.72
Column 2, Producing 2	2.10	12666	12300	-2.98	0.11	852	790	-7.84	0.27	1002	3200	68.70	0.13	284	550	48.43	0.71	4256	IWO	-183.76
Column 2, Consuming 3	12.08	72852	67900	-7.29	0.17	1317	1170	-12.63	2.58	9570	22700	67.84	0.15	327	600	45.45	1.32	7913	6800	-16.37
Column 2, Consuming 3	12.98	78279	74000	-5.78	0.18	1394	1270	-9.77	2.43	9014	21700	5646	0.17	371	740	49.88	1.69	9532	8400	-13.48
Column 2, Consuming 3	13.03	78581	72000	-9.14	0.21	1626	1455	-11.78	2.60	9644	22500	57.14	0.20	436	830	47.42	1.75	16491	6900	-17.88
Column 2, Consuming 3																				
Column 3, Consuming 1	11.37	68570	61600	-11.31	0.22	1704	1485	-14.73	2.59	9607	21400	55.11	0.15	327	640	48.86	1.39	8333	7200	-15.74
Column 3, Consuming 1	12.20	73575	66400	-10.81	0.22	1704	1445	-17.91	2.20	8160	18100	54.92	0.17	371	660	43.80	1.45	8693	7000	
Column 3, Consuming 1	12.47	75204	69000	-8.99	0.36	2788	2390	-16.65	2.24	8309	18800	55.80	0.19	415	740	43.98	1.64	9832	7900	-24.18 -24.45
Column 3, Consuming 1																				
Column 3, Producing 2																			1200	
Column 3, Producing 2	2.67	16102	15600	-3.22	0.11	852	765	-11.36	0.12	445	2600	82.88	0.10	215	500	56.36	0.63	3777	2100	-214.74
Column 3, Producing 2	1.78	10735	9900	-8.43	0.08	620	560	-10.64	0.29	1076	4500	76.10	0.16	349	700	59.13	1.01	6055		-188.33
Column 3, Producing 2	2.22	13388	12300	-8.85	0.11	652	750	-13.59	0.28	1039	3600	71.15	0.14	305	600	49.09	0.78	4676	1800	-159.78
Column 3, Consuming 3	12.07	72791	66800	-8.97	0.18	1394	1215	-14.73	1.82	6751	15800	57.27	0.18	393	740	46.93	1.42	8513	7500	-13.51
Column 3, Consuming 3	11.86	71525	66800	-7.07	0.18	1394	IWO	-10.64	2.49	9236	21100	66.23	0.17	371	700	47.01	1.48	6873	7500	-18.30
Column 3, Consuming 3	12.41	74842	66000	-13.40	0.33	2566	2220	-15.12	2.15	7975	18300	55.42	0.21	458	800	42.72	1.69	10132	7600	-33.31
Column 3, Consuming 3																				
Column 3, Producing 4	2.86	17248	16600	-3.96	0.15	1162	6400	-15.02	0.17	631	24W	73.73	0.09	1%	460	57.31	0.58	3477	1300	-167.47
Column 3, Producing 4	2.27	13690	12500	-9.52	0.10	n 4	760	-12.09 -21.01	0.25 0.38	1335	4200	68.21	0.15	327	600	45.45	0.89	5336	1900	-180.82
Column 3, Producing 4	2.47	148%	14000	-6.40	0.11	852				927	3700	74.94	0.13	284	560	49.35	0.77	4616	1800	
Column 3, Consuming 5	12.10	72972	89500	-5.00	0.17	1317	1115	-18.08	2.69	10720	25100	57.29	0.15	327	550	40.49	1.36	8153	7500	-156.45 -8.71
Column 3, Consuming 5	12.64	72610	74300	2.27	0.17	1317	1255	-4.91	2.16	8012	21500	62.73	0.17	371	730	49.19	1.51	9052	8300	-9.07
Column 3, Consuming 5	13.19	79546	75500	-5.36	0.22	1704	1565	-8.87	2.33	8643	21100	59.04	0.19	415	830	50.05	1.69	10132	8600	-17.81
Column 3, Consuming 5																				
Original PAG	1.71	10313	10100	-2 10	0.10	774	660	-17.34	030	1113	4000	72.18	0.15	327	640	48.86	0.86	5156	IWO	-171.35
Original MAF	9.27	55905	52600	-6.28	0.19	1471	1300	-13.19	1.69	6269	15800	60.32	0.16	349	670	47.89	1.32	7913	5000	-55.27
Column 1, Original PAG																				
Column 1, Original PAG	3.13	18876	18700	-0.94	0.15	1162	1140	-1.90	0.25	927	3200	71.02	0.10	218	430	49.26	0.58	3477	1400	-148.36
Column 1, Original PAG	1.52	9167	9400	2.48	0.06	465	405	-14.73	0.21	779	3600	78.36	0.15	327	696	52.57	0.76	4556	1500	-203.75
Column 1, Original PAG	1.52	9167	8500	-7.84	0.05	387	300	-29.08	0.38	1410	4600	68.68	0.19	415	890	53.42	1.07	6415	2200	-191.57
Column 4, Original MAF																				
Column 4, Original MAF	12.05	72671	68200	-6.56	0.17	1317	1185	-11.10	2.49	9236	21700	57.44	0.17	371	750	50.54	1.52	9112	6800	-34.01
Column 4, Original MAF	12.04	72610	69900	-3.88	0.16	1394	1275	-9.34	2.42	8976	22000	59.20	0.16	349	710	So.83	1.46	8753	7800	-12.21
Column 4, Original MAF	12.66	76349	74100	-3.04	0.18	1394	1305	-6.82	2.11	7827	20500	61.82	0.18	393	826	52.10	1.62	9712	8500	-14.26
Column 5	1.61	9710	10400	6.64	0.09	697	620	-12.42	0.41	1521	4500	66.20	0.11	240	500	52.W	0.74	4436	1400	-216.88
Column 5																				
Column 5																				
Column 5																				
Column 6, MAF (Top)	9.22	55604	53500	-3.93	0.16	1239	1106	-12.14	1.45	5378	14000	61.68	0.15	327	620	47.21	1.29	7734	67W	-35.68
Column 6, MAF (Top)																				
Column 6, MAF (Top)																				
Column 6, MAF (Top)																				
Column 6, PAG (Bottom)	1.83	11036	10800	-2.19	0.10	774	675	-14.73	0.29	1076	3900	72.42	0.12	262	510	48.66	0.88	6276	1700	-210.33
Column 6, PAG (Bottom)																				
Column 6, PAG (Bottom)																				
Column 6, PAG (Bottom)																				
Maximum	13.19	79546	75500	6.64	0.36	2788	2390	-1.90	2.69	10720	25100	82.88	0.21	458	890	57.31	1.75	10491	8900	-8.71
Minimum	1.52	9167	8500	-14.20	0.05	387	300	-29.08	0.12	445	2400	'54.92	0.09	1%	430	40.49	0.58	3477	1ow	-253.70
Mean	7.69	46390	43577	-5.70	0.16	1262	1110	-13.36	1.43	5297	13163	64.45	0.15	337	85s	48.76	1.19	7136	4940	-94.48
Standard Deviation	4.95	30051	25017	4.45	0.07	533	468	5.15	1.05	3900	8633	8.17	0.03	61	112	3.60	0.38	2292	3002	58.04
10 Percentile	1.74	10481	9986	-10.48	0.09	697	584	-18.01	0.23	838	3200	66.16	0.11	249	504	43.87	0.66	3969	1400	-212.97
Median	11.16	67363	61600	-6.28	0.17	1317	1170	-13.19	1.82	6751	15800	61.58	0.15	327	660	48.86	1.32	7913	6500	-34.01
90 Precentile	12.58	75891	73200	-0.76	0.22	1704	1533	-5.14	2.69	9592	22300	75.63	0.19	415	612	52.36	1.63	9784	8360	-13.49
Count	35.00	35	35	35.00	35.00	35	35	35.00	35.00	35	35	35.00	3s.w	35	35	35.W	35.00	35	35	35.W

% Difference = ((ICP (ppm) - XRF Equivalent (ppm)) / ICP (ppm)) * 100

B1. Column 1

're-Test ABA & ICP Metals Data iamatosum Mine :olumn 1 (Blend Control)		
nitial Sample Weight (dry) (g)		28900
\BA Results:		
Slurry pH		8.3
% S (Total)		3.62
% S (Sulphate)		
% S (Sulphide)		
% S (BaS04)		
TAP (tonne CaCO3/ktonne)		113
SAP (tonne CaCO3/ktonne)		
NP (tonne CaCO3/ktonne)		61.5
Carbon (%)		
CaNP (t CaCO3/ktonne)		
TNNP (tonne CaCO3/ktonne)		-52
SNNP (tonne CaCO3/ktonne)		
RNNP (tonne CaCO3/ktonne)		
TNPR		0.54
SNPR		
RNPR		
;urface Area:		
Surface Area (m2/kg)		1.66
detals: (ppm)		
Aluminum	Al	
Antimony	Sb	
Arsenic	AS	
Barium	Ba	
Beryllium	Be	
Bismuth	Bi	
Cadmium	Cd	
Calcium	Ca	
Chromium	Cr	*Data*
cobalt	*co*	*Not*
Copper	cu	*Available*
Iron	Fe	
Lanthium	La	
Lead	Pb	
Lithium	Li	
Magnesium	Mg	
Manganese	Mn	
Mercury	Hg	
Molybdenum	Mo	
Nickel	Ni	
Phosphorus	P	
Potassium	K	
Selenium	Se	
Silver	Ag	
Sodium	Na	
Strontium	Sr	
Thallium	Tl	
Tin	Sn	
Titanium	Ti	
Tungsten	W	
Vanadium	V	
Zinc	Zn	

Post-Test ABA 8 ICP Metals Data iamatosum Mine :olumn 1 (Blend Control)		
'inal Sample Weight (dry) (g)		
\BA Results:		
'aste pH		
% s (Total)		
% S (Sulphate)		
% S (Sulphide)		
% S (BaS04)		
TAP (tonne CaCO3/ktonne)		*Data*
SAP (tonne CaCO3/ktonne)		*Not*
NP (tonne CaCO3/ktonne)		*Available*
Carbon (%)		
CaNP (t CaCO3/ktonne)		
TNNP (tonne CaCO3/ktonne)		
SNNP (tonne CaCO3/ktonne)		
RNNP (tonne CaCO3/ktonne)		
TNPR		
SNPR		
RNPR		
;urface Area:		
Surface Area (m2/kg)		
detals: (ppm)		
Aluminum	Al	
Antimony	Sb	
Arsenic	As	
Barium	Ba	
Beryllium	Be	
Bismuth	Bi	
Cadmium	Cd	
Calcium	Ca	
Chromium	Cr	Data
Cobalt	CO	*Not*
Copper	cu	*Available*
Iron	Fe	
Lanthium	La	
Lead	Pb	
Lithium	Li	
Magnesium	Mg	
Manganese	Mr	
Mercury	Hg	
Molybdenum	MC	
Nickel	Ni	
Phosphorus	P	
Potassium	K	
Selenium	Se	
Silver	Ag	
Sodium	Na	
Strontium	Sr	
Thallium	Tl	
Tin	Sn	
Titanium	Ti	
Tungsten	W	
Vanadium	V	
Zinc	Zn	

NOTE: When metals were reported as < *detection limit, half the value of the detection limit is shown in italics, and* was *used in subsequent calculations.*

Samatosum Mine Humidity Cell Data -Column 1 (Eland Control)

		Analytical Results:									Sulphate Production:			By Surface Area:		Molar Ratio:	NP Consumption:						
Week No.	Date	Leachate Recovered (mL)	Weekly pH (pH units)	Conductivity (umhos/cm)	Eh (mV)	Acidity (CaCO3 mg/L)*	Alkalinity (CaCO3 mg/L)*	Sulphate (SO4 mg/L)*	Acidity Production Rate (mg/kg/wk)**	Alkalinity Production Rate (mg/kg/wk)**	SO4 Production Rate (mg/kg/wk)**	Cumulative SO4 Production (mg/kg)	Remaining S (% of original)	SO4 Production Rate (mg/m2/wk)**	Cumulative SO4 Production (mg/m2)	Alk /SO4	Theoretical NP Consumption At pH 6 (mg/kg/wk)	Empirical Open-System NP Consumption At Measured pH (mg/kg/wk)	Cum NP Consumption Open-System (mg/kg/wk)	Remaining NP Open-System (%)	Theoretical Closed-System NP Consumption Above pH 6.5 (mg/kg/wk)	Cum NP Consumption Closed-System (mg/kg/wk)	Remaining NP Closed-System (%)
132	21-Aug-91	19300	2.2	2640					32.92	0.00	607.3	26483	75.61	366.9	15999		633	600	27632	55.07	1232	54057	12.10
133	28-Aug-91	19000	2.6	2430					19.65	0.00	529.2	27012	75.13	319.7	16318		551	532	28164	54.21	1083	55140	10.34
134	04-Sep-91	8000	2.4	3720	660	23	0	1630	6.37	0.00	451.2	27464	74.71	272.6	16591	0.000	470	464	28628	53.45	934	56074	8.82
135	11-Sep-91	19200	2.6	2300					15.24	0.00	461.8	27925	74.29	279.0	16870		481	466	29093	52.69	947	57021	7.28
136	18-Sep-91	19200	2.4	2150					24.11	0.00	472.4	28398	73.85	285.4	17155		492	468	29561	51.93	960	57981	5.72
137	25-Sep-91	19700	2.6	1726					32.98	0.00	483.0	28881	73.41	291.8	17447		503	470	30032	51.17	973	58954	4.14
138	02-Oct-91	19200	2.5	1778	580	63	0	743	41.85	0.00	493.6	29374	72.95	298.2	17745	0.000	514	472	30504	50.40	987	59941	2.54
139	09-Oct-91	19000	2.5	1635	630	45	0		29.58	0.00	454.7	29829	72.53	274.7	18020		474	444	30948	49.68	918	60858	1.04
140	16-Oct-91	18600	2.5	1560					27.12	0.00	415.8	30245	72.15	251.2	18271		433	406	31354	49.02	839	61698	-0.32
141	23-Oct-91	19300	2.7	1475					24.65	0.00	376.9	30622	71.80	227.7	18499		393	368	31722	48.42	761	62458	-1.56
142	30-Oct-91	19300	2.9	1450					22.19	0.00	338.0	30960	71.49	204.2	18703		352	330	32052	47.88	682	63140	-2.67
143	06-Nov-91	19000	2.7	1570	610	30	0	455	19.72	0.00	299.1	31259	71.22	180.7	18884	0.000	312	292	32344	47.41	603	63744	-3.65
144	13-Nov-91	18900	2.8	1420					25.31	0.00	295.0	31554	70.94	178.2	19062		307	282	32626	46.95	589	64333	-4.61
145	20-Nov-91	18800	2.7	1330					30.90	0.00	290.9	31845	70.68	175.7	19238		303	272	32898	46.51	575	64908	-5.54
146	27-Nov-91	18900	2.7	1175					36.49	0.00	286.8	32132	70.41	173.3	19411		299	262	33160	46.08	561	65469	-6.45
147	04-Dec-91	19000	2.7	1220	610	64	0	430	42.08	0.00	282.7	32415	70.15	170.8	19582	0.000	294	252	33413	45.67	547	66016	-7.34
148	11-Dec-91	19000	2.7	1180					40.59	0.00	259.7	32674	69.91	156.9	19739		271	230	33643	45.30	501	66517	-8.16
149	18-Dec-91	19300	2.9	920					39.10	0.00	236.8	32911	69.70	143.0	19882		247	208	33850	44.96	454	66971	-8.90
150	25-Dec-91	18800	2.7	1225					37.62	0.00	213.8	33125	69.50	129.2	20011		223	185	34035	44.66	408	67379	-9.56
151	01-Jan-92	19700	2.7	910	590	53	0	280	36.13	0.00	190.9	33316	69.32	115.3	20126	0.000	199	163	34198	44.39	362	67740	-10.15
152	08-Jan-92	19100	2.7	1100					36.06	0.00	195.1	33511	69.14	117.9	20244		203	167	34365	44.12	370	68111	-10.75
153	15-Jan-92	19000	3.0	1070					36.00	0.00	199.4	33710	68.96	120.5	20365		208	172	34537	43.84	379	68490	-11.37
154	22-Jan-92	19100	2.7	872					35.94	0.00	203.7	33914	68.77	123.0	20488		212	176	34713	43.56	388	68878	-12.00
155	29-Jan-92	19200	2.8	930	620	54	0	313	35.88	0.00	207.9	34122	68.58	125.6	20613	0.000	217	181	34894	43.26	397	69276	-12.64
156	05-Feb-92	19500	2.9	900					44.94	0.00	194.9	34317	68.40	117.7	20731		203	158	35052	43.01	361	69637	-13.23
157	12-Feb-92	19200	2.7	935					54.00	0.00	181.8	34499	68.23	109.8	20841		189	135	35187	42.79	325	69962	-13.76
158	19-Feb-92	19900	2.8	750					63.06	0.00	168.7	34667	68.08	101.9	20943		176	113	35300	42.60	288	70250	-14.23
159	26-Feb-92	19300	2.9	825	620	108	0	233	72.12	0.00	155.6	34823	67.93	94.0	21037	0.000	162	90	35390	42.46	252	70502	-14.64
160	04-Mar-92	19400	2.7	870					63.69	0.00	165.5	34988	67.78	100.0	21137		172	109	35499	42.28	281	70783	-15.09
161	11-Mar-92	19400	2.8	862					55.25	0.00	175.4	35164	67.62	106.0	21243		183	127	35626	42.07	310	71093	-15.60
162	18-Mar-92	19200	2.8	788					46.81	0.00	185.3	35349	67.45	112.0	21355		193	146	35772	41.83	339	71433	-16.15
163	25-Mar-92	19800	2.6	880	660	56	0	285	38.37	0.00	195.3	35544	67.27	118.0	21473	0.000	203	165	35937	41.57	368	71801	-16.75
164	01-Apr-92	18900	2.8	842					38.24	0.00	188.0	35732	67.10	113.6	21586		196	158	36095	41.31	353	72154	-17.32
165	08-Apr-92	19600	2.8	725					38.12	0.00	180.7	35913	66.93	109.1	21695		188	150	36245	41.07	338	72493	-17.87
166	15-Apr-92	19000	2.8	760					37.99	0.00	173.4	36086	66.77	104.7	21800		181	143	36388	40.83	323	72816	-18.40
167	22-Apr-92	19200	2.8	827	670	57	0	250	37.87	0.00	166.1	36252	66.62	100.3	21900	0.000	173	135	36523	40.61	308	73124	-18.90
168	29-Apr-92	19100	2.6	760					31.34	0.00	163.8	36416	66.47	99.0	21999		171	139	36662	40.39	310	73434	-19.40
169	06-May-92	19000	2.7	790					24.82	0.00	161.5	36578	66.32	97.6	22097		168	143	36805	40.15	312	73746	-19.91
170	13-May-92	18900	2.8	730					18.30	0.00	159.2	36737	66.17	96.2	22193		166	148	36953	39.91	313	74059	-20.42
171	20-May-92	18900	3.0	760	640	18	0	240	11.77	0.00	157.0	36894	66.03	94.8	22288	0.000	163	152	37105	39.67	315	74374	-20.93
172	27-May-92	19300	3.0	690					12.63	0.00	148.9	37043	65.89	89.9	22378		155	142	37247	39.44	297	74672	-21.42
173	03-Jun-92	19000	3.0	720					13.50	0.00	140.8	37184	65.76	85.0	22463		147	133	37380	39.22	280	74952	-21.87
174	10-Jun-92	10300	2.9	1060					14.36	0.00	132.7	37316	65.64	80.1	22543		138	124	37504	39.02	262	75214	-22.30
175	17-Jun-92	20000	2.8	820	610	22	0	180	15.22	0.00	124.6	37441	65.52	75.3	22618	0.000	130	115	37619	38.83	244	75458	-22.70
176	24-Jun-92	19000	2.8	770					14.05	0.00	122.7	37564	65.41	74.1	22692		128	114	37732	38.65	242	75699	-23.09
177	01-Jul-92	19100	2.8	758					12.87	0.00	120.8	37684	65.30	73.0	22765		126	113	37845	38.46	239	75938	-23.48
178	08-Jul-92	19300	2.8	610					11.70	0.00	118.9	37803	65.19	71.8	22837		124	112	37958	38.28	236	76174	-23.86
179	15-Jul-92	19000	2.9	560	650	16	0	178	10.52	0.00	117.0	37920	65.08	70.7	22908	0.000	122	111	38069	38.10	233	76408	-24.24
180	22-Jul-92	18800	3.0	674					10.07	0.00	128.2	38048	64.96	77.5	22985		134	123	38192	37.90	257	76665	-24.66
181	29-Jul-92	19000	3.0	654					9.62	0.00	139.4	38188	64.84	84.2	23070		145	136	38328	37.68	281	76945	-25.11
182	05-Aug-92	4900	2.8	1200					9.17	0.00	150.6	38338	64.70	91.0	23160		157	148	38476	37.44	305	77250	-25.61
183	12-Aug-92	19400	2.84	708	590	13	0	241	8.73	0.00	161.8	38500	64.55	97.7	23258	0.000	169	160	38635	37.18	328	77578	-26.14
184	19-Aug-92	18800	2.85	642					8.63	0.00	144.4	38645	64.42	87.2	23345		150	142	38777	36.95	292	77870	-26.62
185	26-Aug-92	18900	2.95	608					8.52	0.00	127.0	38772	64.30	76.7	23422		132	124	38901	36.75	256	78126	-27.03
186	02-Sep-92	19000	2.94	590					8.42	0.00	109.6	38881	64.20	66.2	23488		114	106	39007	36.57	220	78346	-27.39
187	09-Sep-92	18500	3.12	545	640	13	0	144	8.32	0.00	92.2	38973	64.11	55.7	23544	0.000	96	88	39094	36.43	184	78530	-27.69
188	16-Sep-92	18700	3.07	535					7.89	0.00	91.9	39065	64.03	55.5	23600		96	88	39182	36.29	184	78714	-27.99
189	23-Sep-92	19500	2.95	475					7.47	0.00	91.7	39157	63.94	55.4	23655		96	88	39270	36.15	184	78897	-28.29
190	30-Sep-92	19100	3.05	450					7.04	0.00	91.4	39248	63.86	55.2	23710		95	88	39359	36.00	183	79081	-28.59
191	07-Oct-92	19100	3.04	495	610	10	0	138	6.61	0.00	91.2	39340	63.78	55.1	23765	0.000	95	88	39447	35.86	183	79264	-28.88
192	14-Oct-92	19000	2.96	460					6.63	0.00	88.4	39428	63.69	53.4	23819		92	85	39532	35.72	177	79442	-29.17
193	21-Oct-92	19200	2.99	462					6.66	0.00	85.5	39514	63.62	51.7	23870		89	82	39615	35.59	172	79613	-29.45
194	28-Oct-92	19100	3.07	468					6.69	0.00	82.7	39596	63.54	50.0	23920		86	79	39694	35.46	166	79779	-29.72
195	04-Nov-92	19400	3.17	410	620	10	0	119	6.71	0.00	79.9	39676	63.47	48.3	23969	0.000	83	76	39771	35.33	160	79938	-29.98
196	11-Nov-92	18300	3.17	432					7.17	0.00	76.8	39753	63.40	46.4	24015		80	73	39844	35.21	153	80091	-30.23
197	18-Nov-92	19000	3.06	490					7.63	0.00	73.8	39827	63.33	44.6	24060		77	69	39913	35.10	146	80238	-30.47

* If values were reported as < detection limit, 1/2 the detection limit is shown in italics and was used in subsequent calculations.

Samatosum Mine Humidity Call Data -Column 1 (Blend Control)

		Analytical Results:									Sulphate Production:					Molar Ratio:	NP Consumption:	
														By Surface Area:			Theoretical	Empirical
									Acidity	Alkalinity	SO4	Cumulative	Remaining	SO4	Cumulative		NP	Open-System
		Leachate	Weekly			Acidity	Alkalinity	Sulphate	Production	Production	Production	SO4	S	Production	SO4	Alk	Consumption	NP Consumption
Week No.	Date	Recovered	pH	Conductivity	Eh	(CaCO3	(CaCO3	(SO4	Rate	Rate	Rate	Production	(% of	Rate	Production	/SO4	At pH 6	At Measured pH
		(mL)	(pH units)	(umhos/cm)	(mV)	mg/L)*	mg/L)*	mg/L)*	(mg/kg/wk)**	(mg/kg/wk)**	(mg/kg/wk)**	(mg/kg)	original)	(mg/m2/wk)**	(mg/m2)		(mg/kg/wk)	(mg/kg/wk)
0	08-Feb-89								3.76	28.18	266.2	266	99.75	160.8	161		277	302
1	15-Feb-89	18100	7.5	874	490	6	45	425	3.76	28.18	266.2	532	99.51	160.8	322	0.102	277	302
2	22-Feb-89	17000	7.2	518	480	3	26	269	1.76	15.29	158.2	691	99.36	95.6	417	0.093	165	178
3	01-Mar-89	15900	7.1	519	480	4	23	276	2.20	12.65	151.8	842	99.22	91.7	509	0.080	158	169
4	08-Mar-89	19200	6.9	442	470	6	26	225	3.99	17.27	149.5	992	99.09	90.3	599	0.111	156	169
5	15-Mar-89	19800	7.2	443	480	4	30	230	2.74	20.55	157.6	1149	98.94	95.2	694	0.125	164	182
6	22-Mar-89	19500	7.0	495	460	5	27	272	3.37	18.22	183.5	1333	98.77	110.9	805	0.095	191	206
7	29-Mar-89	19400	7.0	464					3.02	18.46	163.2	1496	98.62	98.6	904		170	185
8	05-Apr-89	19300	7.3	435	475	4	28	214	2.67	18.70	142.9	1639	98.49	86.3	990	0.126	149	165
9	12-Apr-89	19000	7.3	477					2.66	15.63	183.1	1822	98.32	110.6	1101		191	204
10	19-Apr-89	19100	7.3	562	462	4	19	338	2.64	12.56	223.4	2046	98.12	134.9	1236	0.054	233	243
11	26-Apr-89	13000	7.3	630					2.62	12.43	206.2	2252	97.93	124.5	1360		215	225
12	03-May-89	18700	7.3	536	480	4	19	292	2.59	12.29	188.9	2441	97.75	114.1	1474	0.062	197	207
13	10-May-89	18800	7.2	626					2.58	12.90	205.8	2647	97.56	124.3	1599		214	225
14	17-May-89	18600	7.2	605	474	4	21	346	2.57	13.52	222.7	2869	97.36	134.5	1733	0.058	232	243
15	24-May-89	19300	7.2	466					2.64	13.51	222.7	3092	97.15	134.5	1868		232	243
16	31-May-89	19500	7.1	368	470	4	20	330	2.70	13.49	222.7	3315	96.95	134.5	2002	0.058	232	243
17	07-Jun-89	19000	7.2	431					2.99	15.29	190.2	3505	96.77	114.9	2117		198	210
18	14-Jun-89	19000	7.2	469	542	5	26	240	3.29	17.09	157.8	3663	96.63	95.3	2213	0.104	164	178
19	21-Jun-89	19000	7.4	386					2.30	17.09	150.2	3813	96.49	90.8	2303		156	171
20	28-Jun-89	19000	7.2	445	545	2	26	217	1.31	17.09	142.7	3956	96.36	86.2	2390	0.115	149	164
21	05-Jul-89	19000	7.8	442					1.64	16.11	145.0	4100	96.22	87.6	2477		151	165
22	12-Jul-89	19000	7.1	448	520	3	23	224	1.97	15.12	147.3	4248	96.09	89.0	2566	0.099	153	167
23	19-Jul-89	19300	7.3	465					2.14	15.47	145.8	4394	95.95	88.1	2654		152	165
24	26-Jul-89	19500	7.8	387	490				2.31	15.82	144.3	4538	95.82	87.2	2741		150	164
25	02-Aug-89	19300	7.4	440					2.48	16.17	142.9	4681	95.69	86.3	2828		149	163
26	09-Aug-89	19100	7.4	414	505	4	25	214	2.64	16.52	141.4	4822	95.56	85.4	2913	0.112	147	161
27	16-Aug-89	19100	6.9	461					2.65	15.71	138.3	4961	95.43	83.5	2997		144	157
28	23-Aug-89	19500	7.2	380	554				2.65	14.90	135.2	5096	95.31	81.7	3078		141	153
29	30-Aug-89	19300	7.1	419					2.65	14.10	132.0	5228	95.19	79.8	3158		138	149
30	06-Sep-89	19200	7.2	380	400	4	20	194	2.66	13.29	128.9	5357	95.07	77.9	3236	0.099	134	145
31	13-Sep-89	19000	7.1	451					3.15	13.10	129.7	5486	94.95	78.4	3314		135	145
32	20-Sep-89	19800	6.7	439	540				3.64	12.92	130.5	5617	94.83	78.9	3393		136	145
33	27-Sep-89	19000	6.6	317					4.13	12.74	131.4	5748	94.71	79.4	3473		137	145
34	04-Oct-89	19100	6.7	397	400	7	19	200	4.63	12.56	132.2	5880	94.59	79.9	3552	0.091	138	146
35	11-Oct-89	19000	7.5	337					4.15	13.01	119.9	6000	94.47	72.4	3625		125	134
36	18-Oct-89	19400	6.7	356					3.68	13.47	107.5	6108	94.38	65.0	3690		112	122
37	25-Oct-89	19300	6.6	277					3.21	13.93	95.2	6203	94.29	57.5	3747		99	110
38	01-Nov-89	19800	6.9	288	470	4	21	121	2.74	14.39	82.9	6286	94.21	50.1	3797	0.167	86	98
39	08-Nov-89	19200	6.7	318					2.56	14.52	83.0	6369	94.14	50.2	3848		86	98
40	15-Nov-89	19000	6.8	311					2.39	14.65	83.2	6452	94.06	50.2	3898		87	99
41	22-Nov-89	19000	7.5	307					2.21	14.79	83.3	6535	93.98	50.3	3948		87	99
42	29-Nov-89	19600	7.6	284	360	3	22	123	2.03	14.92	83.4	6619	93.91	50.4	3998	0.172	87	100
43	06-Dec-89	19400	7.1	273					2.87	14.71	86.2	6705	93.83	52.1	4051		90	102
44	13-Dec-89	19200	7.2	303					3.70	14.51	89.0	6794	93.74	53.8	4104		93	104
45	20-Dec-89	19300	7.4	275					4.54	14.30	91.8	6886	93.66	55.5	4160		96	105
46	27-Dec-89	19400	6.9	298	520	8	21	141	5.37	14.10	94.7	6981	93.57	57.2	4217	0.143	99	107
47	03-Jan-90	19000	7.1	309					4.69	14.06	90.3	7071	93.49	54.5	4272		94	103
48	10-Jan-90	19900	7.5	251					4.01	14.02	85.9	7157	93.41	51.9	4323		89	99
49	17-Jan-90	19800	7.3	268					3.34	13.99	81.5	7238	93.34	49.2	4373		85	96
50	24-Jan-90	19200	7.1	261	450	4	21	116	2.66	13.95	77.1	7315	93.26	46.6	4419	0.174	80	92
51	31-Jan-90	19400	7.3	248					2.16	12.93	76.5	7392	93.19	46.2	4465		80	90
52	07-Feb-90	19300	6.4	235					1.66	11.91	76.0	7468	93.12	45.9	4511		79	89
53	14-Feb-90	19100	7.5	223					1.16	10.88	75.5	7543	93.05	45.6	4557		79	88
54	21-Feb-90	19000	7.5	258	345	1	15	114	0.66	9.86	74.9	7618	92.99	45.3	4602	0.126	78	87
55	28-Feb-90	19800	7.6	215					0.83	10.08	77.7	7696	92.91	46.9	4649		81	90
56	07-Mar-90	19100	7.3	295					1.00	10.30	80.4	7776	92.84	48.6	4698		84	93
57	14-Mar-90	19000	7.0	267					1.17	10.52	83.2	7859	92.76	50.2	4748		87	96
58	21-Mar-90	19400	7.5	282	245	2	16	128	1.34	10.74	85.9	7945	92.68	51.9	4800	0.120	90	99
59	28-Mar-90	19000	7.6	326					1.33	10.51	91.1	8036	92.60	55.0	4855		95	104
60	04-Apr-90	19800	7.4	236					1.33	10.28	96.3	8133	92.51	58.2	4913		100	109
61	11-Apr-90	19200	7.4	320					1.32	10.04	101.4	8234	92.42	61.3	4974		106	114
62	18-Apr-90	18900	7.8	353	220	2	15	163	1.31	9.81	106.6	8341	92.32	64.4	5039	0.088	111	120
63	25-Apr-90	19800	7.6	311					1.48	9.18	110.7	8451	92.22	66.9	5106		115	123
64	02-May-90	19400	6.9	287					1.65	8.56	114.8	8566	92.11	69.3	5175		120	126
65	09-May-90	19100	6.9	326					1.82	7.93	118.8	8685	92.00	71.8	5247		124	130

Samatosum Mine Humidity Cell Data - Column 1 (Blend Control)

		Dissolved Metals*:								Metal Leach Rates:							
		Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc	Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc
Week No.	Date	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn
		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/kg/wk)	(mg/kg/wk)	(mg/kg/wk)	(mg/kg/wk)	(mg/kg/wk)	(mg/kg/wk)	(mg/kg/wk)	(mg/kg/wk)
0	8-Feb-89																
1	15-Feb-89	0.023	0.012	0.007	0.01	0.001		2E-04	0.09	1.4E-02	7.5E-03	4.4E-03	6.3E-03	6.3E-04		1.3E-04	5.6E-02
2	22-Feb-89	0.014	0.01	0.002	0.01	0.001		2E-04	0.08	8.2E-03	5.9E-03	1.1E-03	2.9E-03	5.9E-04		1.2E-04	4.7E-02
3	1-Mar-89	0.008	0.009	0.002	0.01	0.001		2E-04	0.14	4.4E-03	5.0E-03	9.9E-04	2.8E-03	5.5E-04		1.1E-04	7.7E-02
4	8-Mar-89	0.006	0.008	0.001	0.02	0.001		2E-04	0.12	4.0E-03	5.3E-03	9.3E-04	1.0E-02	6.6E-04		1.3E-04	8.0E-02
5	15-Mar-89	0.006	0.008	0.001	0.01	0.001		2E-04	0.13	4.1E-03	5.5E-03	9.6E-04	4.1E-03	6.9E-04		1.4E-04	8.9E-02
6	22-Mar-89	0.004	0.007	5E-04	0.01	0.001		2E-04	0.13	2.7E-03	4.7E-03	3.4E-04	3.4E-03	6.7E-04		1.3E-04	8.8E-02
7	29-Mar-89																
8	5-Apr-89																
9	12-Apr-89																
10	19-Apr-89	0.002	0.004	0.004	0.01	0.001		2E-04	0.1	1.3E-03	2.6E-03	2.8E-03	4.0E-03	6.6E-04		1.3E-04	6.6E-02
11	26-Apr-89																
12	3-May-89																
13	10-May-89																
14	17-May-89	0.006	0.046	0.006	0.01	0.002		2E-04	0.06	3.9E-03	3.0E-02	3.9E-03	3.9E-03	1.3E-03		1.3E-04	3.9E-02
15	24-May-89																
16	31-May-89																
17	7-Jun-89																
18	14-Jun-89	0.005	0.005	0.006	0.01	0.001		2E-04	0.08	3.3E-03	3.3E-03	3.9E-03	3.3E-03	6.6E-04		1.3E-04	5.3E-02
19	21-Jun-89																
20	28-Jun-89																
21	5-Jul-89																
22	12-Jul-89	0.004	0.004	0.002	0.01	0.001		2E-04	0.06	2.6E-03	2.6E-03	1.2E-03	3.3E-03	6.6E-04		1.3E-04	3.9E-02
23	19-Jul-89																
24	26-Jul-89																
25	2-Aug-89																
26	9-Aug-89	0.005	0.003	0.028	0.01	0.001		2E-04	0.07	3.3E-03	2.0E-03	1.9E-02	5.9E-03	6.6E-04		1.3E-04	4.6E-02
27	16-Aug-89																
28	23-Aug-89																
29	30-Aug-89																
30	6-Sep-89	0.004	0.002	0.002	0.02	0.001		2E-04	0.06	2.7E-03	1.3E-03	1.2E-03	1.1E-02	6.6E-04		1.3E-04	4.0E-02
31	13-Sep-89																
32	20-Sep-89																
33	27-Sep-89																
34	4-Oct-89																
35	11-Oct-89																
36	18-Oct-89																
37	25-Oct-89																
38	1-Nov-89	0.003	0.002	0.002	0.02	0.001		2E-04	0.06	2.1E-03	1.4E-03	1.0E-03	1.2E-02	6.9E-04		1.4E-04	4.1E-02
39	8-Nov-89																
40	15-Nov-89																
41	22-Nov-89																
42	29-Nov-89	0.002	0.001	0.07	0.01	0.001		2E-04	0.05	1.4E-03	6.8E-04	4.7E-02	8.1E-03	6.8E-04		1.4E-04	3.4E-02
43	6-Dec-89																
44	13-Dec-89																
45	20-Dec-89																
46	27-Dec-89	0.002	0.001	0.07	0.01	0.001		3E-04	0.06	1.3E-03	6.7E-04	4.7E-02	3.4E-03	6.7E-04		2.0E-04	4.0E-02
47	3-Jan-90																
48	10-Jan-90																
49	17-Jan-90																
50	24-Jan-90	0.002	0.001	0.001	0.01	0.001		4E-04	0.06	1.3E-03	6.6E-04	7.3E-04	3.3E-03	6.6E-04		2.7E-04	4.0E-02
51	31-Jan-90																
52	7-Feb-90																
53	14-Feb-90																
54	21-Feb-90	0.002	0.001	7E-04	0.01	0.001		2E-04	0.07	1.3E-03	6.6E-04	4.6E-04	3.3E-03	6.6E-04		1.3E-04	4.9E-02
55	28-Feb-90																
56	7-Mar-90																
57	14-Mar-90																
58	21-Mar-90	0.002	0.002	0.001	0.01	0.001		0.001	0.06	1.3E-03	1.3E-03	6.7E-04	3.4E-03	6.7E-04		6.7E-04	4.0E-02
59	28-Mar-90																
60	4-Apr-90																
61	11-Apr-90																
62	18-Apr-90	0.002	0.001	0.01	0.01	0.002		0.001	0.07	1.3E-03	6.5E-04	6.5E-03	3.3E-03	1.3E-03		6.5E-04	4.6E-02
63	25-Apr-90																
64	2-May-90																
65	9-May-90																

		Cumulative Metal Leach Rates:							
		Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc
Week No.	Date	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn
		(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
0	8-Feb-89	1.4E-02	7.5E-03	4.4E-03	6.3E-03	6.3E-04	8.9E-01	1.3E-04	5.6E-02
1	15-Feb-89	2.9E-02	1.5E-02	8.8E-03	1.3E-02	1.3E-03	1.8E+00	2.5E-04	1.1E-01
2	22-Feb-89	3.7E-02	2.1E-02	9.9E-03	1.5E-02	1.8E-03	2.7E+00	3.7E-04	1.6E-01
3	1-Mar-89	4.1E-02	2.6E-02	1.1E-02	1.8E-02	2.4E-03	3.6E+00	4.8E-04	2.4E-01
4	8-Mar-89	4.5E-02	3.1E-02	1.2E-02	2.8E-02	3.1E-03	4.5E+00	6.1E-04	3.2E-01
5	15-Mar-89	5.0E-02	3.7E-02	1.3E-02	3.2E-02	3.7E-03	5.4E+00	7.5E-04	4.1E-01
6	22-Mar-89	5.2E-02	4.1E-02	1.3E-02	3.6E-02	4.4E-03	6.2E+00	8.8E-04	4.9E-01
7	29-Mar-89	5.3E-02	4.3E-02	1.4E-02	3.8E-02	4.7E-03	7.1E+00	9.5E-04	5.3E-01
8	5-Apr-89	5.4E-02	4.5E-02	1.5E-02	3.9E-02	5.1E-03	8.0E+00	1.0E-03	5.7E-01
9	12-Apr-89	5.5E-02	4.7E-02	1.5E-02	4.1E-02	5.4E-03	8.9E+00	1.1E-03	6.1E-01
10	19-Apr-89	5.7E-02	5.0E-02	1.8E-02	4.5E-02	6.1E-03	9.8E+00	1.2E-03	6.7E-01
11	26-Apr-89	5.8E-02	5.8E-02	2.0E-02	4.7E-02	6.6E-03	1.1E+01	1.3E-03	7.0E-01
12	3-May-89	5.9E-02	6.6E-02	2.2E-02	4.9E-02	7.1E-03	1.2E+01	1.3E-03	7.3E-01
13	10-May-89	6.0E-02	7.4E-02	2.3E-02	5.1E-02	7.5E-03	1.2E+01	1.4E-03	7.5E-01
14	17-May-89	6.4E-02	1.0E-01	2.7E-02	5.5E-02	8.8E-03	1.3E+01	1.5E-03	7.9E-01
15	24-May-89	6.6E-02	1.1E-01	2.9E-02	5.7E-02	9.3E-03	1.4E+01	1.6E-03	8.1E-01
16	31-May-89	6.8E-02	1.2E-01	3.1E-02	5.8E-02	9.8E-03	1.5E+01	1.7E-03	8.4E-01
17	7-Jun-89	7.0E-02	1.3E-01	3.3E-02	6.0E-02	1.0E-02	1.6E+01	1.7E-03	8.6E-01
18	14-Jun-89	7.3E-02	1.3E-01	3.7E-02	6.4E-02	1.1E-02	1.7E+01	1.9E-03	9.1E-01
19	21-Jun-89	7.4E-02	1.3E-01	3.8E-02	6.5E-02	1.1E-02	1.8E+01	1.9E-03	9.4E-01
20	28-Jun-89	7.6E-02	1.3E-01	4.0E-02	6.7E-02	1.2E-02	1.9E+01	2.0E-03	9.6E-01
21	5-Jul-89	7.7E-02	1.4E-01	4.1E-02	6.8E-02	1.2E-02	2.0E+01	2.1E-03	9.8E-01
22	12-Jul-89	8.0E-02	1.4E-01	4.2E-02	7.2E-02	1.3E-02	2.1E+01	2.2E-03	1.0E+00
23	19-Jul-89	8.2E-02	1.4E-01	4.7E-02	7.4E-02	1.3E-02	2.1E+01	2.3E-03	1.0E+00
24	26-Jul-89	8.3E-02	1.4E-01	5.2E-02	7.6E-02	1.3E-02	2.2E+01	2.3E-03	1.1E+00
25	2-Aug-89	8.4E-02	1.4E-01	5.7E-02	7.9E-02	1.4E-02	2.3E+01	2.4E-03	1.1E+00
26	9-Aug-89	8.8E-02	1.4E-01	7.5E-02	8.5E-02	1.4E-02	2.4E+01	2.5E-03	1.1E+00
27	16-Aug-89	8.9E-02	1.4E-01	8.0E-02	8.9E-02	1.5E-02	2.5E+01	2.6E-03	1.2E+00
28	23-Aug-89	9.1E-02	1.5E-01	8.5E-02	9.3E-02	1.5E-02	2.6E+01	2.7E-03	1.2E+00
29	30-Aug-89	9.2E-02	1.5E-01	9.0E-02	9.8E-02	1.5E-02	2.7E+01	2.7E-03	1.2E+00
30	6-Sep-89	9.5E-02	1.5E-01	9.1E-02	1.1E-01	1.6E-02	2.8E+01	2.9E-03	1.2E+00
31	13-Sep-89	9.6E-02	1.5E-01	9.2E-02	1.1E-01	1.6E-02	2.9E+01	2.9E-03	1.2E+00
32	20-Sep-89	9.6E-02	1.5E-01	9.2E-02	1.1E-01	1.6E-02	2.9E+01	2.9E-03	1.3E+00
33	27-Sep-89	9.7E-02	1.5E-01	9.2E-02	1.2E-01	1.6E-02	3.0E+01	3.0E-03	1.3E+00
34	4-Oct-89	9.7E-02	1.5E-01	9.3E-02	1.2E-01	1.7E-02	3.1E+01	3.0E-03	1.3E+00
35	11-Oct-89	9.8E-02	1.5E-01	9.3E-02	1.2E-01	1.7E-02	3.2E+01	3.0E-03	1.3E+00
36	18-Oct-89	9.8E-02	1.5E-01	9.3E-02	1.3E-01	1.7E-02	3.3E+01	3.1E-03	1.3E+00
37	25-Oct-89	9.9E-02	1.5E-01	9.3E-02	1.3E-01	1.7E-02	3.4E+01	3.1E-03	1.3E+00
38	1-Nov-89	1.0E-01	1.5E-01	9.4E-02	1.4E-01	1.8E-02	3.5E+01	3.2E-03	1.3E+00
39	8-Nov-89	1.0E-01	1.5E-01	1.1E-01	1.5E-01	1.8E-02	3.6E+01	3.3E-03	1.4E+00
40	15-Nov-89	1.0E-01	1.5E-01	1.2E-01	1.5E-01	1.8E-02	3.7E+01	3.4E-03	1.4E+00
41	22-Nov-89	1.0E-01	1.5E-01	1.3E-01	1.6E-01	1.9E-02	3.7E+01	3.4E-03	1.4E+00
42	29-Nov-89	1.1E-01	1.5E-01	1.8E-01	1.7E-01	1.9E-02	3.8E+01	3.6E-03	1.4E+00
43	6-Dec-89	1.1E-01	1.5E-01	2.0E-01	1.7E-01	2.0E-02	3.9E+01	3.7E-03	1.5E+00
44	13-Dec-89	1.1E-01	1.5E-01	2.3E-01	1.7E-01	2.0E-02	4.0E+01	3.7E-03	1.5E+00
45	20-Dec-89	1.1E-01	1.5E-01	2.5E-01	1.7E-01	2.0E-02	4.1E+01	3.8E-03	1.5E+00
46	27-Dec-89	1.1E-01	1.6E-01	3.0E-01	1.8E-01	2.1E-02	4.2E+01	4.0E-03	1.5E+00
47	3-Jan-90	1.1E-01	1.6E-01	3.1E-01	1.8E-01	2.1E-02	4.3E+01	4.1E-03	1.6E+00
48	10-Jan-90	1.1E-01	1.6E-01	3.2E-01	1.8E-01	2.2E-02	4.4E+01	4.3E-03	1.6E+00
49	17-Jan-90	1.1E-01	1.6E-01	3.3E-01	1.8E-01	2.2E-02	4.5E+01	4.4E-03	1.6E+00
50	24-Jan-90	1.1E-01	1.6E-01	3.3E-01	1.9E-01	2.3E-02	4.6E+01	4.6E-03	1.6E+00
51	31-Jan-90	1.1E-01	1.6E-01	3.3E-01	1.9E-01	2.3E-02	4.6E+01	4.7E-03	1.7E+00
52	7-Feb-90	1.1E-01	1.6E-01	3.3E-01	1.9E-01	2.3E-02	4.7E+01	4.8E-03	1.7E+00
53	14-Feb-90	1.1E-01	1.6E-01	3.3E-01	1.9E-01	2.4E-02	4.8E+01	4.9E-03	1.7E+00
54	21-Feb-90	1.2E-01	1.6E-01	3.3E-01	1.9E-01	2.4E-02	4.9E+01	5.1E-03	1.7E+00
55	28-Feb-90	1.2E-01	1.6E-01	3.3E-01	2.0E-01	2.5E-02	5.0E+01	5.3E-03	1.8E+00
56	7-Mar-90	1.2E-01	1.6E-01	3.3E-01	2.0E-01	2.5E-02	5.1E+01	5.5E-03	1.8E+00
57	14-Mar-90	1.2E-01	1.6E-01	3.3E-01	2.0E-01	2.5E-02	5.2E+01	5.7E-03	1.8E+00
58	21-Mar-90	1.2E-01	1.6E-01	3.4E-01	2.0E-01	2.6E-02	5.3E+01	6.3E-03	1.9E+00
59	28-Mar-90	1.2E-01	1.6E-01	3.4E-01	2.0E-01	2.7E-02	5.4E+01	6.7E-03	1.9E+00
60	4-Apr-90	1.2E-01	1.6E-01	3.4E-01	2.1E-01	2.7E-02	5.4E+01	7.0E-03	1.9E+00
61	11-Apr-90	1.2E-01	1.6E-01	3.4E-01	2.1E-01	2.8E-02	5.5E+01	7.3E-03	1.9E+00
62	18-Apr-90	1.2E-01	1.6E-01	3.5E-01	2.1E-01	2.9E-02	5.6E+01	8.0E-03	2.0E+00
63	25-Apr-90	1.2E-01	1.6E-01	3.5E-01	2.1E-01	2.9E-02	5.7E+01	8.8E-03	2.0E+00
64	2-May-90	1.2E-01	1.6E-01	3.5E-01	2.1E-01	3.0E-02	5.8E+01	9.6E-03	2.0E+00
65	9-May-90	1.2E-01	1.7E-01	3.5E-01	2.2E-01	3.0E-02	5.9E+01	1.0E-02	2.0E+00

* If values were recorded as < detection limit, 1/2 the detection limit is shown in italics and was used in subsequent calculations

Samatosum Mine Humidity Cell Data -Column 1 (Bland Control)

Week No.	Date	Analytical Results: Leachate Recovered (mL)	Weekly pH (pH units)	Conductivity (umhos/cm)	Eh (mV)	Acidity (CaCO3 mg/L)*	Alkalinity (CaCO3 mg/L)*	Sulphate (SO4 mg/L)*	Acidity Production Rate (mg/kg/wk)**	Alkalinity Production Rate (mg/kg/wk)**	Sulphate Production: SO4 Production Rate (mg/kg/wk)**	Cumulative SO4 Production (mg/kg)	Remaining S (% of original)	By Surface Area: SO4 Production Rate (mg/m2/wk)**	Cumulative SO4 Production (mg/m2)	Molar Ratio: Alk /SO4	NP Consumption: Theoretical NP Consumption At pH 6 (mg/kg/wk)	Empirical Open-System NP Consumption At Measured pH (mg/kg/wk)	Cum NP Consumption Open-System (mg/kg/wk)	Remaining NP Open-System (%)	Theoretical Closed-System NP Consumption Above pH 6.5 (mg/kg/wk)	Cum NP Consumption Closed-System (mg/kg/wk)	Remaining NP Closed-System (%)
66	16-May-90	19200	6.7	360	210	3	11	185	1.99	7.31	122.9	8808	91.89	74.2	5321	0.057	128	133	9944	83.83	254	18176	70.45
67	23-May-90	19100	7.1	337					2.32	7.46	120.1	8928	91.78	72.6	5393		125	130	10074	83.62	248	18424	70.04
68	30-May-90	19700	7.4	285					2.65	7.62	117.3	9045	91.67	70.9	5464		122	127	10202	83.41	242	18666	69.65
69	06-Jun-90	19000	7.2	257					2.98	7.78	114.5	9160	91.57	69.2	5534		119	124	10326	83.21	236	18901	69.27
70	13-Jun-90	19100	7.2	348	230	5	12	169	3.30	7.93	111.7	9272	91.46	67.5	5601	0.068	116	121	10447	83.01	229	19131	68.89
71	20-Jun-90	19100	7.3	351					2.97	7.60	116.8	9388	91.36	70.6	5672		122	126	10573	82.81	240	19371	68.50
72	27-Jun-90	19200	7.1	398					2.64	7.27	121.9	9510	91.24	73.7	5745		127	132	10705	82.59	251	19622	68.09
73	04-Jul-90	19300	7.4	390					2.31	6.94	127.1	9637	91.13	76.8	5822		132	137	10842	82.37	262	19885	67.67
74	11-Jul-90	19100	7.4	401	280	3	10	200	1.98	6.61	132.2	9770	91.00	79.9	5902	0.048	138	142	10984	82.14	273	20158	67.22
75	18-Jul-90	19000	6.9	467					2.14	5.78	154.4	9924	90.86	93.2	5995		161	164	11148	81.87	319	20478	66.70
76	25-Jul-90	19200	6.6	462					2.31	4.95	176.5	10100	90.70	106.6	6102		184	187	11335	81.57	365	20843	66.11
77	01-Aug-90	19000	7.5	507					2.47	4.12	198.7	10299	90.52	120.0	6222		207	209	11544	81.23	412	21255	65.44
78	08-Aug-90	19000	7.3	585	292	4	5	336	2.63	3.29	220.9	10520	90.31	133.4	6355	0.014	230	231	11774	80.85	458	21712	64.70
79	15-Aug-90	19100	8.2	586					2.31	4.14	207.6	10728	90.12	125.4	6481		216	218	11992	80.50	430	22142	64.00
80	22-Aug-90	19200	6.9	570					1.99	5.00	194.4	10922	89.94	117.4	6598		202	205	12198	80.17	403	22545	63.34
81	29-Aug-90	19000	7.3	533					1.66	5.86	181.1	11103	89.78	109.4	6707		189	193	12391	79.85	376	22921	62.73
82	05-Sep-90	19400	7.3	470	310	2	10	250	1.34	6.71	167.8	11271	89.62	101.4	6809	0.038	175	180	12571	79.56	348	23269	62.16
83	12-Sep-90	19400	6.7	517					1.50	5.86	177.6	11449	89.46	107.3	6916		185	189	12760	79.25	368	23638	61.56
84	19-Sep-90	19000	6.8	573					1.66	5.01	187.3	11636	89.29	113.2	7029		195	198	12959	78.93	389	24026	60.93
85	26-Sep-90	19100	6.1	563					1.82	4.16	197.1	11833	89.10	119.1	7148		205	208	13166	78.59	409	24435	60.27
86	03-Oct-90	19100	6.3	557	350	3	5	313	1.98	3.30	206.9	12040	88.91	125.0	7273	0.015	215	217	13383	78.24	429	24864	59.57
87	10-Oct-90	19100	6.9	509					1.99	3.64	195.5	12235	88.73	118.1	7391		204	205	13588	77.90	405	25269	58.91
88	17-Oct-90	19200	7.4	503					1.99	3.98	184.2	12419	88.56	111.2	7503		192	194	13782	77.59	382	25651	58.29
89	24-Oct-90	19400	7.0	452					1.99	4.31	172.8	12592	88.40	104.4	7607		180	182	13965	77.29	358	26009	57.71
90	31-Oct-90	19200	6.3	456	338	3	7	243	1.99	4.65	161.4	12754	88.26	97.5	7705	0.028	168	171	14135	77.02	334	26343	57.17
91	07-Nov-90	19200	6.3	540					2.00	4.50	166.3	12920	88.10	100.5	7805		173	176	14311	76.73	344	26688	56.61
92	14-Nov-90	19600	6.3	412					2.01	4.35	171.1	13091	87.95	103.4	7908		178	181	14492	76.44	355	27042	56.03
93	21-Nov-90	19400	7.0	488					2.02	4.20	176.0	13267	87.78	106.3	8015		183	185	14677	76.13	365	27407	55.44
94	28-Nov-90	19500	6.8	582	280	3	6	268	2.02	4.05	180.8	13448	87.62	109.2	8124	0.021	188	190	14868	75.83	375	27782	54.83
95	05-Dec-90	19100	6.9	680					2.02	3.70	170.3	13618	87.46	102.9	8227		177	179	15047	75.53	353	28135	54.25
96	12-Dec-90	19500	6.9	502					2.01	3.36	159.9	13778	87.31	96.6	8323		167	168	15215	75.26	331	28466	53.71
97	19-Dec-90	19400	7.3	665					2.01	3.02	149.4	13928	87.18	90.2	8414		156	157	15371	75.01	309	28775	53.21
98	26-Dec-90	19300	7.5	518	240	3	4	208	2.00	2.67	138.9	14066	87.05	83.9	8498	0.018	145	145	15517	74.77	287	29062	52.74
99	02-Jan-91	15800	5.7	670					2.34	3.17	143.6	14210	86.92	86.7	8584		150	150	15667	74.53	297	29359	52.26
100	09-Jan-91	19500	5.9	535					2.67	3.67	148.3	14358	86.78	89.6	8674		154	155	15822	74.27	306	29665	51.76
101	16-Jan-91	19400	7.4	372					3.01	4.17	152.9	14511	86.64	92.4	8766		159	160	15983	74.01	316	29981	51.25
102	23-Jan-91	19300	7.1	448	249	5	7	236	3.34	4.67	157.6	14669	86.49	95.2	8862	0.028	164	166	16148	73.74	325	30306	50.72
103	30-Jan-91	19200	6.3	402					3.17	4.67	163.7	14833	86.34	98.9	8960		171	172	16320	73.46	338	30644	50.17
104	06-Feb-91	19300	6.0	562					3.00	4.66	169.8	15002	86.19	102.6	9063		177	179	16499	73.17	351	30995	49.60
105	13-Feb-91	19400	6.3	448					2.83	4.66	175.9	15178	86.02	106.3	9169		183	185	16684	72.87	364	31358	49.01
106	20-Feb-91	19200	6.6	580	330	4	7	274	2.66	4.65	182.0	15360	85.86	110.0	9279	0.025	190	192	16876	72.56	377	31735	48.40
107	27-Feb-91	19200	5.9	552					4.15	3.99	193.2	15553	85.68	116.7	9396		201	201	17077	72.23	398	32133	47.75
108	06-Mar-91	19000	5.6	590					5.65	3.32	204.3	15758	85.49	123.4	9519		213	210	17287	71.89	420	32553	47.07
109	13-Mar-91	19200	4.8	548					7.14	2.66	215.4	15973	85.29	130.1	9650		224	220	17507	71.53	442	32995	46.35
110	20-Mar-91	19200	4.6	640	400	13	3	341	8.64	1.99	226.5	16200	85.08	136.9	9786	0.008	236	229	17736	71.16	463	33458	45.60
111	27-Mar-91	19100	4.5	564					10.04	1.66	253.3	16453	84.85	153.0	9939		264	256	17992	70.74	518	33976	44.75
112	03-Apr-91	19400	4.2	515					11.44	1.34	280.1	16733	84.59	169.2	10109		292	282	18274	70.29	572	34548	43.82
113	10-Apr-91	19100	4.2	640					12.84	1.01	306.9	17040	84.31	185.4	10294		320	308	18582	69.79	627	35174	42.81
114	17-Apr-91	19600	4.1	720	485	21	1	492	14.24	0.68	333.7	17374	84.00	201.6	10496	0.002	348	334	18916	69.24	681	35855	41.70
115	24-Apr-91	19200	3.7	720					16.66	0.67	339.1	17713	83.69	204.9	10700		353	337	19253	68.69	690	36545	40.58
116	01-May-91	19000	3.8	892					19.08	0.67	344.6	18057	83.37	208.1	10909		359	341	19593	68.14	699	37244	39.44
117	08-May-91	19100	3.6	875					21.50	0.67	350.0	18407	83.05	211.4	11120		365	344	19937	67.58	708	37951	38.29
118	15-May-91	19200	3.5	870	520	36	1	535	23.92	0.66	355.4	18763	82.72	214.7	11335	0.002	370	347	20284	67.02	717	38668	37.13
119	22-May-91	19600	3.4	820					33.95	0.50	380.3	19143	82.37	229.7	11564		396	363	20647	66.43	758	39426	35.89
120	29-May-91	19000	3.3	1100					43.99	0.33	405.2	19548	82.00	244.8	11809		422	378	21025	65.81	800	40226	34.59
121	05-Jun-91	19200	3.2	1130					54.02	0.17	430.0	19978	81.60	259.8	12069		448	394	21419	65.17	842	41068	33.22
122	12-Jun-91	18700	2.9	1300	620	99	0	703	64.06	0.00	454.9	20433	81.18	274.8	12344	0.000	474	410	21829	64.51	884	41952	31.79
123	19-Jun-91	18900	2.9	1410					58.97	0.00	476.6	20910	80.75	287.9	12632		496	437	22266	63.79	934	42886	30.27
124	26-Jun-91	18400	2.9	1350					53.87	0.00	498.3	21408	80.29	301.0	12933		519	465	22732	63.04	984	43870	28.67
125	03-Jul-91	14800	2.8	1800					48.78	0.00	520.0	21928	79.81	314.1	13247		542	493	23224	62.24	1034	44905	26.98
126	10-Jul-91	10700	2.7	2510	650	118	0	1463	43.69	0.00	541.7	22470	79.31	327.2	13574	0.000	564	521	23745	61.39	1085	45989	25.22
127	17-Jul-91	18700	2.7	2540					47.64	0.00	597.1	23067	78.76	360.7	13935		622	574	24319	60.46	1196	47186	23.28
128	24-Jul-91	18000	2.4	3550					51.58	0.00	652.5	23719	78.16	394.2	14329		680	628	24947	59.44	1308	48493	21.15
129	31-Jul-91	18800	2.5	3020					55.53	0.00	707.9	24427	77.51	427.7	14757		737	682	25629	58.33	1419	49913	18.84
130	07-Aug-91	19100	2.5	2640	740	90	0	1155	59.48	0.00	763.3	25191	76.80	461.1	15218	0.000	795	736	26365	57.13	1531	51444	16.35
131	14-Aug-91	19400	2.5	2260					46.20	0.00	685.3	25876	76.17	414.0	15632		714	668	27033	56.04	1382	52825	14.11

* If value was < detection limit, 1/2 the detection limit is shown in italics and was used in subsequent calculations.

Samatosum Mine Humidity Cell Data -Column 1 (Blend Control)

		Dissolved Metals*:								Metal Leach Rates:								Cumulative Metal Leach Rates:							
		Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc	Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc	Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc
Week No.	Date	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn
		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(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)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
132	21-Aug-91																	2.1E-01	2.4E-01	6.9E+00	2.9E+02	1.6E-01	1.9E+02	4.2E-02	3.0E+01
133	28-Aug-91																	2.1E-01	2.5E-01	7.3E+00	3.2E+02	1.6E-01	1.9E+02	4.3E-02	3.0E+01
134	4-Sep-91		0.15	2.4	285		15	0.004	1.3		4.2E-02	6.6E-01	7.9E+01		4.2E+00	1.1E-03	3.6E-01	2.1E-01	2.9E-01	7.9E+00	4.0E+02	1.6E-01	2.0E+02	4.4E-02	3.0E+01
135	11-Sep-91																	2.1E-01	3.0E-01	8.2E+00	4.3E+02	1.6E-01	2.0E+02	4.5E-02	3.1E+01
136	18-Sep-91																	2.2E-01	3.1E-01	8.4E+00	4.6E+02	1.6E-01	2.0E+02	4.5E-02	3.1E+01
137	25-Sep-91																	2.2E-01	3.2E-01	8.7E+00	4.9E+02	1.7E-01	2.0E+02	4.6E-02	3.2E+01
138	2-Oct-91		0.003	0.66	50		4.9	0.003	1.6		2.0E-03	3.9E-01	3.3E+01		3.3E+00	2.0E-03	1.1E+00	2.2E-01	3.2E-01	9.1E+00	5.2E+02	1.7E-01	2.0E+02	4.8E-02	3.3E+01
139	9-Oct-91																	2.2E-01	3.2E-01	9.2E+00	5.3E+02	1.7E-01	2.1E+02	4.9E-02	3.3E+01
140	16-Oct-91																	2.2E-01	3.3E-01	9.3E+00	5.4E+02	1.7E-01	2.1E+02	4.9E-02	3.3E+01
141	23-Oct-91																	2.2E-01	3.3E-01	9.5E+00	5.5E+02	1.7E-01	2.1E+02	5.0E-02	3.4E+01
142	30-Oct-91																	2.2E-01	3.3E-01	9.6E+00	5.6E+02	1.8E-01	2.1E+02	5.1E-02	3.4E+01
143	6-Nov-91		0.002	0.41	26		3.4	0.002	1		1.3E-03	2.7E-01	1.7E+01		2.2E+00	1.3E-03	6.6E-01	2.2E-01	3.3E-01	9.9E+00	5.8E+02	1.8E-01	2.1E+02	5.2E-02	3.5E+01
144	13-Nov-91																	2.3E-01	3.3E-01	1.0E+01	5.8E+02	1.8E-01	2.1E+02	5.3E-02	3.5E+01
145	20-Nov-91																	2.3E-01	3.3E-01	1.0E+01	5.9E+02	1.8E-01	2.1E+02	5.3E-02	3.5E+01
146	27-Nov-91																	2.3E-01	3.3E-01	1.0E+01	6.0E+02	1.8E-01	2.1E+02	5.4E-02	3.6E+01
147	4-Dec-91		0.001	0.37	20		3.1	0.001	0.94		6.6E-04	2.4E-01	1.3E+01		2.0E+00	6.6E-04	6.2E-01	2.3E-01	3.3E-01	1.1E+01	6.1E+02	1.9E-01	2.2E+02	5.4E-02	3.6E+01
148	11-Dec-91																	2.3E-01	3.3E-01	1.1E+01	6.2E+02	1.9E-01	2.2E+02	5.5E-02	3.7E+01
149	18-Dec-91																	2.3E-01	3.3E-01	1.1E+01	6.2E+02	1.9E-01	2.2E+02	5.5E-02	3.7E+01
150	25-Dec-91																	2.3E-01	3.3E-01	1.1E+01	6.3E+02	1.9E-01	2.2E+02	5.5E-02	3.7E+01
151	1-Jan-92		0.001	0.2	8.3		1.9	0.001	0.69		6.8E-04	1.4E-01	5.7E+00		1.3E+00	6.8E-04	4.7E-01	2.4E-01	3.3E-01	1.1E+01	6.3E+02	1.9E-01	2.2E+02	5.6E-02	3.8E+01
152	8-Jan-92																	2.4E-01	3.3E-01	1.1E+01	6.4E+02	2.0E-01	2.2E+02	5.6E-02	3.8E+01
153	15-Jan-92																	2.4E-01	3.3E-01	1.1E+01	6.4E+02	2.0E-01	2.2E+02	5.7E-02	3.8E+01
154	22-Jan-92																	2.4E-01	3.3E-01	1.1E+01	6.4E+02	2.0E-01	2.2E+02	5.7E-02	3.8E+01
155	29-Jan-92		0.001	0.22	9.5		2.1	0.001	0.77		6.6E-04	1.5E-01	6.3E+00		1.4E+00	6.6E-04	5.1E-01	2.4E-01	3.3E-01	1.1E+01	6.5E+02	2.0E-01	2.2E+02	5.8E-02	3.9E+01
156	5-Feb-92																	2.4E-01	3.3E-01	1.1E+01	6.5E+02	2.0E-01	2.2E+02	5.8E-02	3.9E+01
157	12-Feb-92																	2.4E-01	3.3E-01	1.1E+01	6.5E+02	2.1E-01	2.2E+02	5.8E-02	3.9E+01
158	19-Feb-92																	2.4E-01	3.3E-01	1.1E+01	6.6E+02	2.1E-01	2.2E+02	5.9E-02	3.9E+01
159	26-Feb-92		0.001	0.17	4.9		1.7	0.001	0.56		6.7E-04	1.1E-01	3.3E+00		1.1E+00	6.7E-04	3.7E-01	2.5E-01	3.4E-01	1.2E+01	6.6E+02	2.1E-01	2.3E+02	5.9E-02	4.0E+01
160	4-Mar-92																	2.5E-01	3.4E-01	1.2E+01	6.6E+02	2.1E-01	2.3E+02	6.0E-02	4.0E+01
161	11-Mar-92																	2.5E-01	3.4E-01	1.2E+01	6.6E+02	2.1E-01	2.3E+02	6.0E-02	4.0E+01
162	18-Mar-92																	2.5E-01	3.4E-01	1.2E+01	6.6E+02	2.2E-01	2.3E+02	6.0E-02	4.0E+01
163	25-Mar-92		0.001	0.18	4.9		2.1	0.001	0.65		6.9E-04	1.2E-01	3.4E+00		1.4E+00	6.9E-04	4.5E-01	2.5E-01	3.4E-01	1.2E+01	6.7E+02	2.2E-01	2.3E+02	6.1E-02	4.1E+01
164	1-Apr-92																	2.5E-01	3.4E-01	1.2E+01	6.7E+02	2.2E-01	2.3E+02	6.1E-02	4.1E+01
165	8-Apr-92																	2.5E-01	3.4E-01	1.2E+01	6.7E+02	2.2E-01	2.3E+02	6.2E-02	4.1E+01
166	15-Apr-92																	2.6E-01	3.4E-01	1.2E+01	6.7E+02	2.2E-01	2.3E+02	6.2E-02	4.1E+01
167	22-Apr-92		0.001	0.16	3.2		2	0.001	0.52		6.6E-04	1.1E-01	2.1E+00		1.3E+00	6.6E-04	3.5E-01	2.6E-01	3.4E-01	1.2E+01	6.7E+02	2.3E-01	2.3E+02	6.3E-02	4.2E+01
168	29-Apr-92																	2.6E-01	3.4E-01	1.2E+01	6.7E+02	2.3E-01	2.3E+02	6.3E-02	4.2E+01
169	6-May-92																	2.6E-01	3.4E-01	1.2E+01	6.8E+02	2.3E-01	2.3E+02	6.3E-02	4.2E+01
170	13-May-92																	2.6E-01	3.4E-01	1.2E+01	6.8E+02	2.3E-01	2.3E+02	6.4E-02	4.2E+01
171	20-May-92		0.002	0.17	2.5		1.9	0.001	0.46		1.3E-03	1.1E-01	1.6E+00		1.2E+00	6.5E-04	3.0E-01	2.6E-01	3.4E-01	1.2E+01	6.8E+02	2.3E-01	2.4E+02	6.4E-02	4.3E+01
172	27-May-92																	2.6E-01	3.4E-01	1.3E+01	6.8E+02	2.4E-01	2.4E+02	6.5E-02	4.3E+01
173	3-Jun-92																	2.6E-01	3.4E-01	1.3E+01	6.8E+02	2.4E-01	2.4E+02	6.5E-02	4.3E+01
174	10-Jun-92																	2.7E-01	3.4E-01	1.3E+01	6.8E+02	2.4E-01	2.4E+02	6.5E-02	4.3E+01
175	17-Jun-92		0.001	0.16	2.2		2.2	0.001	0.55		6.9E-04	1.1E-01	1.5E+00		1.5E+00	6.9E-04	3.8E-01	2.7E-01	3.4E-01	1.3E+01	6.8E+02	2.4E-01	2.4E+02	6.6E-02	4.3E+01
176	24-Jun-92																	2.7E-01	3.4E-01	1.3E+01	6.8E+02	2.4E-01	2.4E+02	6.6E-02	4.4E+01
177	1-Jul-92																	2.7E-01	3.4E-01	1.3E+01	6.8E+02	2.5E-01	2.4E+02	6.7E-02	4.4E+01
178	8-Jul-92																	2.7E-01	3.4E-01	1.3E+01	6.8E+02	2.5E-01	2.4E+02	6.7E-02	4.4E+01
179	15-Jul-92		0.001	0.1	0.93		1.4	0.001	0.34		6.6E-04	6.6E-02	6.1E-01		9.2E-01	6.6E-04	2.2E-01	2.7E-01	3.5E-01	1.3E+01	6.8E+02	2.5E-01	2.4E+02	6.8E-02	4.4E+01
180	22-Jul-92																	2.7E-01	3.5E-01	1.3E+01	6.8E+02	2.5E-01	2.4E+02	6.8E-02	4.4E+01
181	29-Jul-92																	2.7E-01	3.5E-01	1.3E+01	6.8E+02	2.5E-01	2.4E+02	6.8E-02	4.4E+01
182	5-Aug-92																	2.8E-01	3.5E-01	1.3E+01	6.8E+02	2.6E-01	2.4E+02	6.9E-02	4.5E+01
183	12-Aug-92		0.001	0.18	1.4		2	0.001	0.51		6.7E-04	1.2E-01	9.4E-01		1.3E+00	6.7E-04	3.4E-01	2.8E-01	3.5E-01	1.3E+01	6.9E+02	2.6E-01	2.5E+02	6.9E-02	4.5E+01
184	19-Aug-92																	2.8E-01	3.5E-01	1.3E+01	6.9E+02	2.6E-01	2.5E+02	7.0E-02	4.5E+01
185	26-Aug-92																	2.8E-01	3.5E-01	1.3E+01	6.9E+02	2.6E-01	2.5E+02	7.0E-02	4.5E+01
186	2-Sep-92																	2.8E-01	3.5E-01	1.3E+01	6.9E+02	2.6E-01	2.5E+02	7.0E-02	4.5E+01
187	9-Sep-92		0.001	0.12	0.67		1.1	0.001	0.35		6.4E-04	7.7E-02	4.3E-01		7.0E-01	6.4E-04	2.2E-01	2.8E-01	3.5E-01	1.3E+01	6.9E+02	2.7E-01	2.5E+02	7.1E-02	4.6E+01
188	16-Sep-92																	2.8E-01	3.5E-01	1.3E+01	6.9E+02	2.7E-01	2.5E+02	7.1E-02	4.6E+01
189	23-Sep-92																	2.9E-01	3.5E-01	1.4E+01	6.9E+02	2.7E-01	2.5E+02	7.2E-02	4.6E+01
190	30-Sep-92																	2.9E-01	3.5E-01	1.4E+01	6.9E+02	2.7E-01	2.5E+02	7.2E-02	4.6E+01
191	7-Oct-92		0.001	0.17	0.45		1.1	0.001	0.27		6.6E-04	1.1E-01	3.0E-01		7.3E-01	6.6E-04	1.8E-01	2.9E-01	3.5E-01	1.4E+01	6.9E+02	2.7E-01	2.5E+02	7.3E-02	4.6E+01
192	14-Oct-92																	2.9E-01	3.5E-01	1.4E+01	6.9E+02	2.8E-01	2.5E+02	7.3E-02	4.6E+01
193	21-Oct-92																	2.9E-01	3.5E-01	1.4E+01	6.9E+02	2.8E-01	2.5E+02	7.3E-02	4.6E+01
194	28-Oct-92																	2.9E-01	3.5E-01	1.4E+01	6.9E+02	2.8E-01	2.5E+02	7.4E-02	4.6E+01
195	4-Nov-92		0.001	0.17	0.52		0.89	0.001	0.21		6.7E-04	1.1E-01	3.5E-01		6.0E-01	6.7E-04	1.4E-01	2.9E-01	3.5E-01	1.4E+01	6.9E+02	2.8E-01	2.5E+02	7.4E-02	4.6E+01
196	11-Nov-92																	2.9E-01	3.5E-01	1.4E+01	6.9E+02	2.8E-01	2.5E+02	7.5E-02	4.7E+01
197	18-Nov-92																	3.0E-01	3.5E-01	1.4E+01	6.9E+02	2.9E-01	2.5E+02	7.5E-02	4.7E+01

* *If values were reported as < detection limit, 1/2 the detection limit is shown in italics and was used in subsequent calculations.*

Samatosum Mine Humidity Cell Data - Column 1 (Blend Control)

Week No.	Date	Analytical Results: Leachate Recovered (mL)	Weekly pH (pH units)	Conductivity (umhos/cm)	Eh (mV)	Acidity (CaCO3 mg/L)*	Alkalinity (CaCO3 mg/L)*	Sulphate (SO4 mg/L)*	Acidity Production Rate (mg/kg/wk)**	Alkalinity Production Rate (mg/kg/wk)**	Sulphate Production: SO4 Production Rate (mg/kg/wk)**	Cumulative SO4 Production (mg/kg)	Remaining S (% of original)	By Surface Area: SO4 Production Rate (mg/m2/wk)**	Cumulative SO4 Production (mg/m2)	Molar Ratio: Alk /SO4	NP Consumption: Theoretical NP Consumption At pH 6 (mg/kg/wk)	Empirical Open-System NP Consumption At Measured pH (mg/kg/wk)	Cum NP Consumption Open-System (mg/kg/wk)	Remaining NP Open-System (%)	Theoretical Closed-System NP Consumption Above pH 6.5 (mg/kg/wk)	Cum NP Consumption Closed-System (mg/kg/wk)	Remaining NP Closed-System (%)
198	25-Nov-92	19400	3.15	380					8.09	0.00	70.8	39898	63.26	42.7	24102		74	66	39978	34.99	139	80377	-30.69
199	02-Dec-92	19000	2.99	388	650	13	0	103	8.55	0.00	67.7	39965	63.20	40.9	24143	0.000	71	62	40040	34.89	133	80509	-30.91
200	09-Dec-92	19000	2.9	410					7.75	0.00	68.2	40034	63.14	41.2	24184		71	63	40104	34.79	134	80644	-31.13
201	16-Dec-92	19600	3.11	342					6.96	0.00	68.8	40102	63.07	41.5	24226		72	65	40168	34.69	136	80780	-31.35
202	23-Dec-92	19100	3.03	362					6.16	0.00	69.3	40172	63.01	41.9	24268		72	66	40234	34.58	138	80918	-31.57
203	30-Dec-92	19400	3.34	367	650	8	0	104	5.37	0.00	69.8	40241	62.95	42.2	24310	0.000	73	67	40302	34.47	140	81058	-31.80
204	06-Jan-93	19000	3.17	290					5.11	0.00	67.2	40309	62.88	40.6	24351		70	65	40367	34.36	135	81193	-32.02
205	13-Jan-93	19000	3.04	345					4.85	0.00	64.5	40373	62.82	39.0	24390		67	62	40429	34.26	130	81323	-32.23
206	20-Jan-93	19000	2.9	362					4.59	0.00	61.9	40435	62.77	37.4	24427		64	60	40489	34.16	124	81447	-32.43
207	27-Jan-93	12500	2.87	432	660	10	0	137	4.33	0.00	59.3	40494	62.71	35.8	24463	0.000	62	57	40546	34.07	119	81566	-32.63
208	03-Feb-93	19100	2.89	372					4.89	0.00	63.5	40558	62.65	38.4	24501		66	61	40608	33.97	127	81694	-32.84
209	10-Feb-93	19000	2.85	380					5.45	0.00	67.8	40626	62.59	40.9	24542		71	65	40673	33.87	136	81829	-33.06
210	17-Feb-93	19200	2.87	372					6.01	0.00	72.0	40698	62.53	43.5	24586		75	69	40742	33.75	144	81973	-33.29
211	24-Feb-93	19000	2.93	360	640	10	0	116	6.57	0.00	76.3	40774	62.46	46.1	24632	0.000	79	73	40815	33.63	152	82126	-33.54
212	03-Mar-93	19000	2.85	340					6.57	0.00	76.3	40850	62.38	46.1	24678		79	73	40887	33.52	152	82278	-33.79
213	10-Mar-93	19000	3.06	336					6.57	0.00	76.3	40926	62.31	46.1	24724		79	73	40960	33.40	152	82430	-34.03
214	17-Mar-93	18600	2.95	345					6.57	0.00	76.3	41003	62.24	46.1	24770		79	73	41033	33.28	152	82583	-34.28
Maximum		20000	8.20	3726	740	118	45.0	1630	72.12	28.18	763.3	41003	99.75	461.1	24770	0.174	795	736	41033	99.51	1531	82583	99.10
Minimum		4900	2.26	215	210	1	0.0	103	0.66	0.00	59.3	266	62.24	35.8	161	0.000	62	57	302	33.28	119	551	-34.28
Mean		18849	5.03	708	493	19.5	10.4	313	13.21	5.40	190.7	20133	81.46	115.2	12163	0.048	199	191	20917	63.99	384	46944	33.42
Median		19100	5.65	512	490	5.5	6.5	240	4.63	3.02	155.6	15553	85.68	94.0	9396	0.025	162	158	17077	72.23	310	32133	47.75
Mean Last 8 Weeks		18175	2.91	367	650	10	0.0	127	5.87	0.00	70.9	40741	62.49	42.9	24612	0.000	74	68	40783	33.69	142	82060	-33.43
75% Remaining (Wks)													134							98			52
50% Remaining (Wks)													401							139			104
25% Remaining (Wks)													783							289			127
0% Remaining (Wks)													1165							515			140

** If measured sulphate, alkalinity and/or acidity values were unavailable, data was interpolated from existing data and used in subsequent equations.

* If values were reported as < detection limit, 1/2 the detection limit is shown in italics and was used in subsequent calculations.

Samatosum Mine Humidity Cell Data -Column 1 (Blend Control)

		Dissolved Metals*:								Metal Leach Rates:								Cumulative Metal Leach Rates:							
		Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc	Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc	Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc
Week No.	Date	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn
		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(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)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
198	25-Nov-92																	3.0E-01	3.5E-01	1.4E+01	6.9E+02	2.9E-01	2.5E+02	7.5E-02	4.7E+01
199	2-Dec-92		0.001	0.13	0.46		0.7	0.001	0.21		6.6E-04	8.5E-02	3.0E-01		4.6E-01	6.6E-04	1.4E-01	3.0E-01	3.5E-01	1.4E+01	6.9E+02	2.9E-01	2.5E+02	7.6E-02	4.7E+01
200	9-Dec-92																	3.0E-01	3.5E-01	1.4E+01	6.9E+02	2.9E-01	2.5E+02	7.6E-02	4.7E+01
201	16-Dec-92																	3.0E-01	3.5E-01	1.4E+01	6.9E+02	2.9E-01	2.5E+02	7.7E-02	4.7E+01
202	23-Dec-92																	3.0E-01	3.5E-01	1.4E+01	6.9E+02	3.0E-01	2.5E+02	7.7E-02	4.7E+01
203	30-Dec-92		0.001	0.05	0.41		0.84	0.001	0.2		6.7E-04	3.4E-02	2.8E-01		5.6E-01	6.7E-04	1.3E-01	3.0E-01	3.6E-01	1.4E+01	6.9E+02	3.0E-01	2.5E+02	7.8E-02	4.7E+01
204	6-Jan-93																	3.1E-01	3.6E-01	1.4E+01	6.9E+02	3.0E-01	2.5E+02	7.8E-02	4.7E+01
205	13-Jan-93																	3.1E-01	3.6E-01	1.4E+01	6.9E+02	3.0E-01	2.5E+02	7.8E-02	4.7E+01
206	20-Jan-93																	3.1E-01	3.6E-01	1.4E+01	6.9E+02	3.0E-01	2.5E+02	7.8E-02	4.7E+01
207	27-Jan-93		0.001	0.15	0.61		1	0.001	0.29		4.3E-04	6.5E-02	2.6E-01		4.3E-01	4.3E-04	1.3E-01	3.1E-01	3.6E-01	1.4E+01	6.9E+02	3.1E-01	2.5E+02	7.9E-02	4.7E+01
208	3-Feb-93																	3.1E-01	3.6E-01	1.4E+01	6.9E+02	3.1E-01	2.6E+02	7.9E-02	4.8E+01
209	10-Feb-93																	3.1E-01	3.6E-01	1.4E+01	6.9E+02	3.1E-01	2.6E+02	7.9E-02	4.8E+01
210	17-Feb-93																	3.1E-01	3.6E-01	1.5E+01	6.9E+02	3.1E-01	2.6E+02	8.0E-02	4.8E+01
211	24-Feb-93		0.001	0.05	0.32		0.79	0.001	0.44		6.6E-04	3.3E-02	2.1E-01		5.2E-01	6.6E-04	2.9E-01	3.1E-01	3.6E-01	1.5E+01	6.9E+02	3.1E-01	2.6E+02	8.0E-02	4.8E+01
212	3-Mar-93																	3.2E-01	3.6E-01	1.5E+01	6.9E+02	3.2E-01	2.6E+02	8.1E-02	4.8E+01
213	10-Mar-93																	3.2E-01	3.6E-01	1.5E+01	6.9E+02	3.2E-01	2.6E+02	8.2E-02	4.9E+01
214	17-Mar-93																	3.2E-01	3.6E-01	1.5E+01	6.9E+02	3.2E-01	2.6E+02	8.2E-02	4.9E+01
Maximum		0.023	0.15	2.4	285	0.004	17	0.004	6.3	1.4E-02	4.2E-02	6.6E-01	7.9E+01	2.6E-03	6.3E+00	2.7E-03	2.3E+00	3.2E-01	3.6E-01	1.5E+01	6.9E+02	3.2E-01	2.6E+02	8.2E-02	4.9E+01
Minimum		0.002	0.001	0.0005	0.01	0.001	0.7	2E-04	0.04	1.3E-03	4.3E-04	3.3E-04	2.8E-03	5.5E-04	4.3E-01	1.1E-04	2.7E-02	1.4E-02	7.5E-03	4.4E-03	6.3E-03	6.3E-04	8.9E-01	1.3E-04	5.6E-02
Mean		0.005	0.006	0.1944	11.04	0.001	3.7	0.0009	0.59	3.2E-03	2.8E-03	1.0E-01	4.9E+00	8.6E-04	2.2E+00	5.8E-04	3.5E-01	1.8E-01	2.3E-01	5.2E+00	2.5E+02	1.2E-01	1.3E+02	3.5E-02	1.9E+01
Median		0.004	0.001	0.0410	0.019	0.001	2.6	0.0010	0.32	2.6E-03	6.7E-04	2.7E-02	1.2E-02	6.6E-04	1.7E+00	6.6E-04	2.0E-01	1.8E-01	1.9E-01	6.1E-01	4.5E-01	1.1E-01	1.1E+02	3.2E-02	8.5E+00
Mean Last 8 Weeks			0.001	0.1000	0.465		0.9	0.0010	0.37		5.4E-04	4.9E-02	2.4E-01		4.8E-01	5.4E-04	2.1E-01	3.1E-01	3.6E-01	1.5E+01	6.9E+02	3.1E-01	2.6E+02	8.0E-02	4.8E+01
75% Remaining (Wks)																									
50% Remaining (Wks)																									
25% Remaining (Wks)																									
0% Remaining (Wks)																									

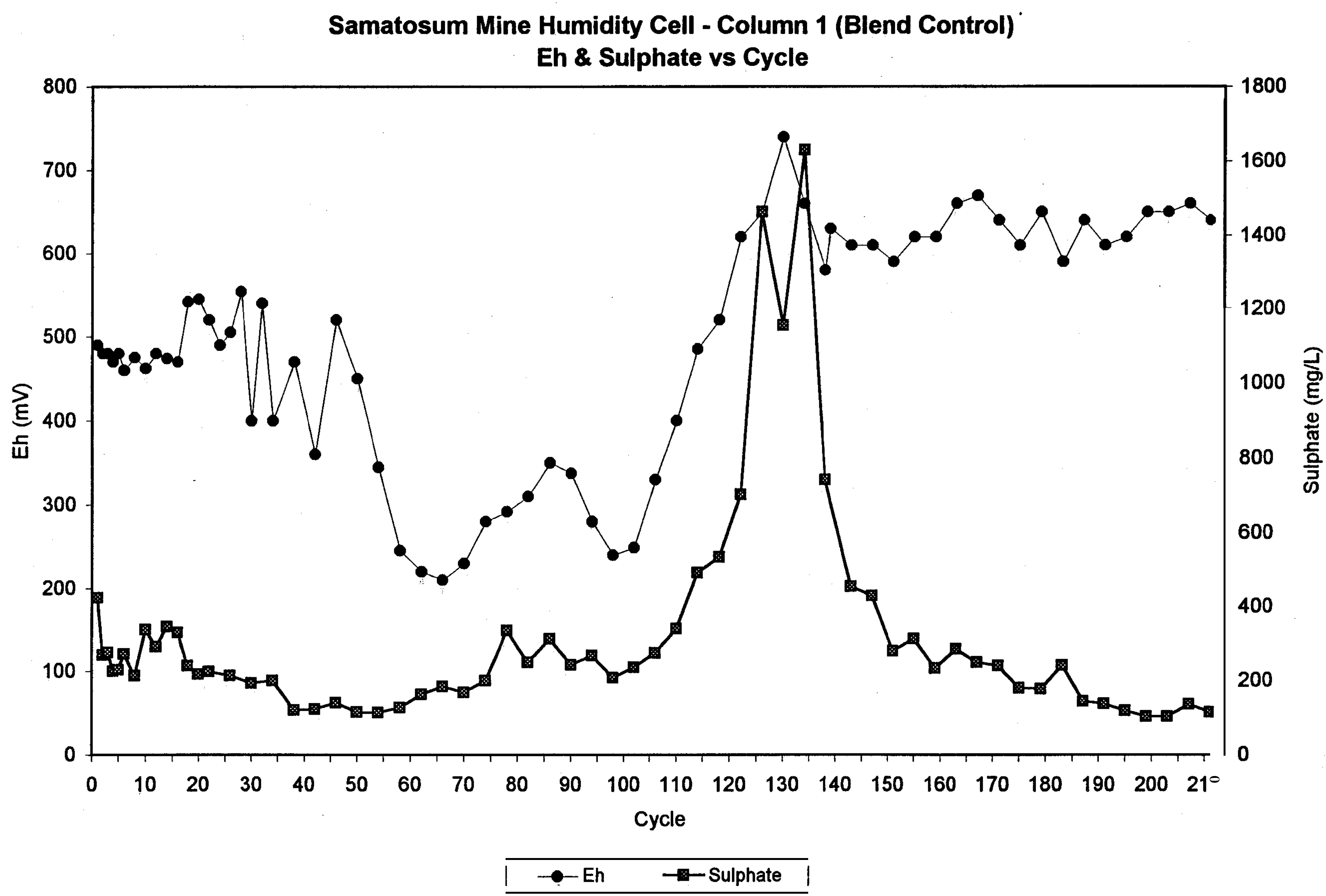
** If values were reported as < detection limit, 1/2 the detection limit is shown in italics and was used in subsequent calculations.*

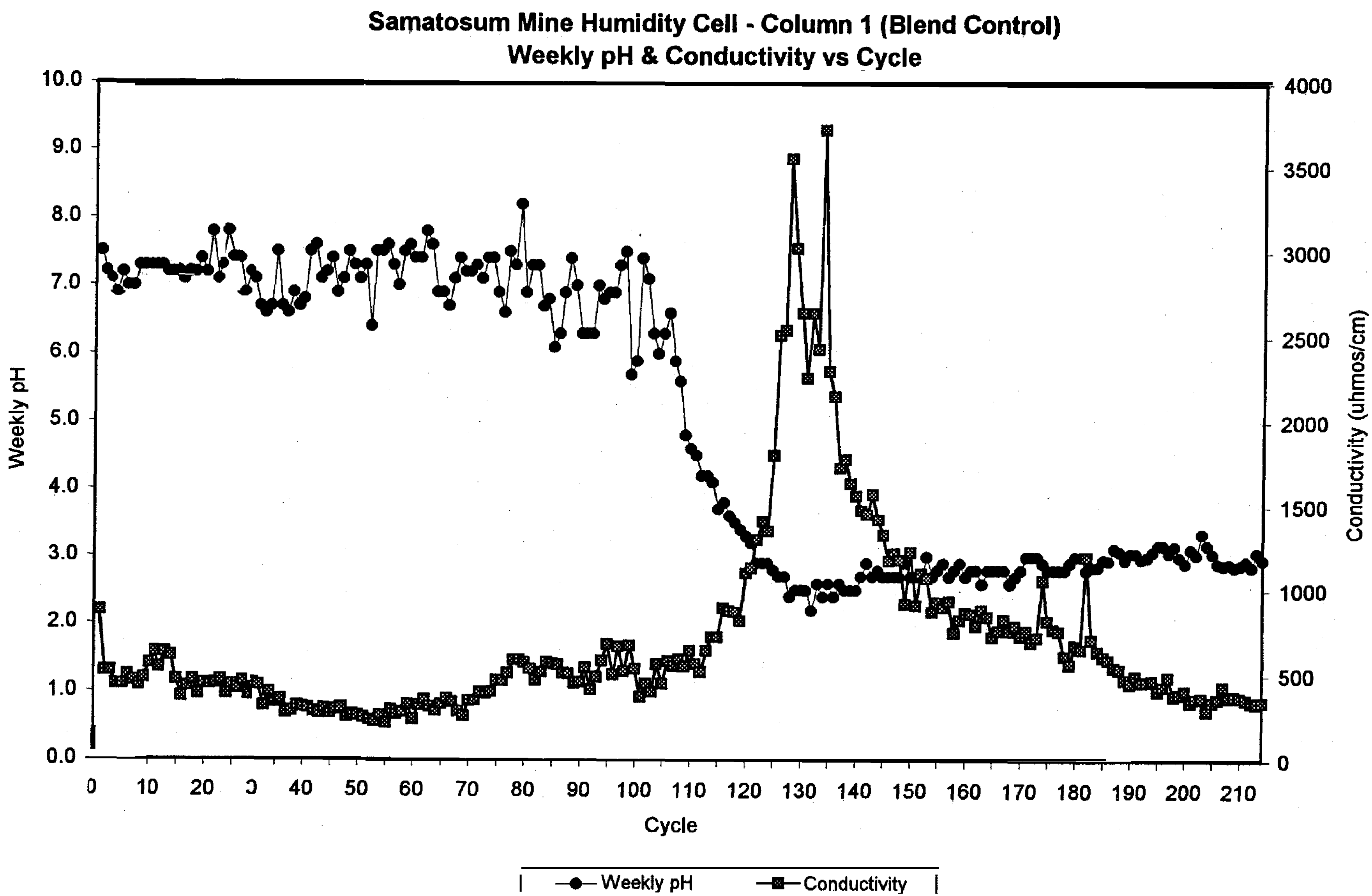
Version 5.0 - Mar 11, 1996

Samatosum Mine Humidity Cell Data -Column 1 (Blend Control)

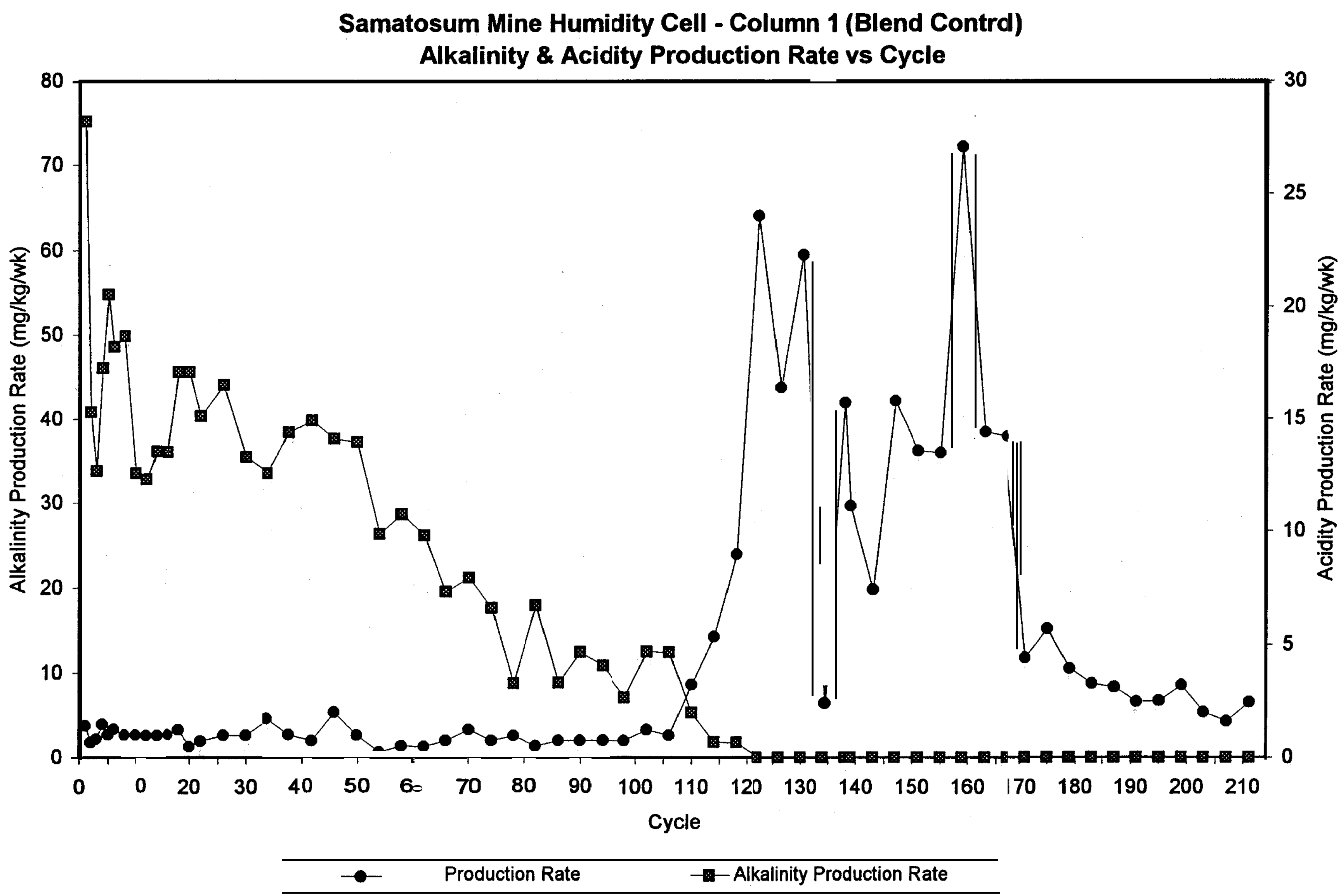
		Dissolved Metals*:								Metal Leach Rates:								Cumulative Metal Leach Rates:							
		Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc	Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc	Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc
Week No.	Date	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn
		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(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)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
66	16-May-90	0.002	0.002	5E-04	0.01	0.001		0.004	0.04	1.3E-03	1.3E-03	3.3E-04	3.3E-03	6.6E-04		2.7E-03	2.7E-02	1.2E-01	1.7E-01	[illegible]	2.2E-01	3.1E-02	6.0E+01	1.3E-02	2.0E+00
67	23-May-90																	1.3E-01	1.7E-01	3.5E-01	2.2E-01	3.2E-02	6.1E+01	1.4E-02	2.1E+00
68	30-May-90																	1.3E-01	1.7E-01	3.5E-01	2.2E-01	3.3E-02	6.2E+01	1.5E-02	2.1E+00
69	6-Jun-90																	1.3E-01	1.7E-01	3.6E-01	2.2E-01	3.4E-02	6.2E+01	1.6E-02	2.1E+00
70	13-Jun-90	0.002	0.001	0.004	0.01	0.004	1.35	0.001	0.08	1.3E-03	6.6E-04	2.4E-03	4.6E-03	2.6E-03	8.9E-01	6.6E-04	5.3E-02	1.3E-01	1.7E-01	3.6E-01	2.3E-01	3.6E-02	6.3E+01	1.6E-02	2.2E+00
71	20-Jun-90																	1.3E-01	1.7E-01	3.6E-01	2.3E-01	3.7E-02	6.4E+01	1.7E-02	2.2E+00
72	27-Jun-90																	1.3E-01	1.7E-01	3.6E-01	2.4E-01	3.9E-02	6.4E+01	1.7E-02	2.2E+00
73	4-Jul-90																	1.3E-01	1.7E-01	3.7E-01	2.4E-01	4.0E-02	6.5E+01	1.7E-02	2.3E+00
74	11-Jul-90		0.001	0.014	0.02	0.003	1.84	0.001	0.15		6.6E-04	9.4E-03	9.9E-03	2.0E-03	1.2E+00	6.6E-04	9.9E-02	1.3E-01	1.7E-01	3.8E-01	2.5E-01	4.2E-02	6.6E+01	1.8E-02	2.4E+00
75	18-Jul-90																	1.3E-01	1.7E-01	3.8E-01	2.5E-01	4.4E-02	6.7E+01	1.8E-02	2.4E+00
76	25-Jul-90																	1.4E-01	1.7E-01	3.8E-01	2.6E-01	4.6E-02	6.8E+01	1.9E-02	2.5E+00
77	1-Aug-90																	1.4E-01	1.7E-01	3.8E-01	2.6E-01	4.8E-02	6.9E+01	1.9E-02	2.6E+00
78	8-Aug-90		0.002	0.002	0.01		3.82	0.001	0.21		1.3E-03	1.6E-03	3.9E-03		2.5E+00	6.6E-04	1.4E-01	1.4E-01	1.7E-01	3.9E-01	2.6E-01	5.0E-02	7.1E+01	2.0E-02	2.7E+00
79	15-Aug-90																	1.4E-01	1.7E-01	3.9E-01	2.7E-01	5.2E-02	7.3E+01	2.0E-02	2.8E+00
80	22-Aug-90																	1.4E-01	1.7E-01	4.0E-01	2.7E-01	5.4E-02	7.4E+01	2.0E-02	2.9E+00
81	29-Aug-90																	1.4E-01	1.7E-01	4.0E-01	2.7E-01	5.6E-02	7.5E+01	2.1E-02	3.0E+00
82	5-Sep-90		0.001	0.03	0.01		3.2	0.001	0.34		6.7E-04	2.0E-02	8.7E-03		2.1E+00	6.7E-04	2.3E-01	1.4E-01	1.8E-01	4.2E-01	2.8E-01	5.8E-02	7.7E+01	2.1E-02	3.2E+00
83	12-Sep-90																	1.5E-01	1.8E-01	4.3E-01	2.9E-01	5.9E-02	7.8E+01	2.2E-02	3.3E+00
84	19-Sep-90																	1.5E-01	1.8E-01	4.4E-01	2.9E-01	6.1E-02	8.0E+01	2.2E-02	3.5E+00
85	26-Sep-90																	1.5E-01	1.8E-01	4.5E-01	2.9E-01	6.3E-02	8.1E+01	2.2E-02	3.6E+00
86	3-Oct-90		0.001	0.03	0.01		4.3	0.001	0.48		6.6E-04	2.0E-02	3.3E-03		2.8E+00	6.6E-04	3.2E-01	1.5E-01	1.8E-01	4.7E-01	3.0E-01	6.5E-02	8.4E+01	2.3E-02	3.9E+00
87	10-Oct-90																	1.5E-01	1.8E-01	4.8E-01	3.0E-01	6.7E-02	8.5E+01	2.3E-02	4.1E+00
88	17-Oct-90																	1.5E-01	1.8E-01	4.8E-01	3.0E-01	6.9E-02	8.6E+01	2.4E-02	4.2E+00
89	24-Oct-90																	1.5E-01	1.8E-01	4.9E-01	3.0E-01	7.1E-02	8.8E+01	2.4E-02	4.3E+00
90	31-Oct-90		0.001	0.007	0.02		3.6	0.001	0.37		6.6E-04	4.5E-03	1.0E-02		2.4E+00	6.6E-04	2.5E-01	1.5E-01	1.8E-01	4.9E-01	3.1E-01	7.3E-02	9.0E+01	2.5E-02	4.6E+00
91	7-Nov-90																	1.6E-01	1.8E-01	5.0E-01	3.2E-01	7.5E-02	9.1E+01	2.5E-02	4.7E+00
92	14-Nov-90																	1.6E-01	1.8E-01	5.0E-01	3.3E-01	7.7E-02	9.2E+01	2.5E-02	4.9E+00
93	21-Nov-90																	1.6E-01	1.8E-01	5.0E-01	3.3E-01	7.9E-02	9.4E+01	2.6E-02	5.0E+00
94	28-Nov-90		0.001	0.009	0.02		3.4	0.001	0.46		6.7E-04	5.7E-03	1.2E-02		2.3E+00	6.7E-04	3.1E-01	1.6E-01	1.8E-01	5.1E-01	3.4E-01	8.1E-02	9.6E+01	2.6E-02	5.3E+00
95	5-Dec-90																	1.6E-01	1.8E-01	5.1E-01	3.5E-01	8.3E-02	9.7E+01	2.7E-02	5.5E+00
96	12-Dec-90																	1.6E-01	1.8E-01	5.1E-01	3.6E-01	8.5E-02	9.8E+01	2.7E-02	5.6E+00
97	19-Dec-90																	1.6E-01	1.8E-01	5.2E-01	3.7E-01	8.7E-02	9.9E+01	2.7E-02	5.8E+00
98	26-Dec-90		0.001	0.008	0.03		2.9	0.001	0.52		6.7E-04	5.2E-03	2.1E-02		1.9E+00	6.7E-04	3.5E-01	1.7E-01	1.8E-01	5.2E-01	3.9E-01	8.9E-02	1.0E+02	2.8E-02	6.2E+00
99	2-Jan-91																	1.7E-01	1.8E-01	5.2E-01	4.0E-01	9.1E-02	1.0E+02	2.8E-02	6.3E+00
100	9-Jan-91																	1.7E-01	1.8E-01	5.3E-01	4.0E-01	9.3E-02	1.0E+02	2.9E-02	6.5E+00
101	16-Jan-91																	1.7E-01	1.8E-01	5.3E-01	4.1E-01	9.5E-02	1.0E+02	2.9E-02	6.7E+00
102	23-Jan-91		0.001	0.006	0.01		3	0.001	0.5		6.7E-04	3.7E-03	6.7E-03		2.0E+00	6.7E-04	3.3E-01	1.7E-01	1.8E-01	5.3E-01	4.2E-01	9.7E-02	1.1E+02	3.0E-02	7.0E+00
103	30-Jan-91																	1.7E-01	1.8E-01	5.4E-01	4.2E-01	9.9E-02	1.1E+02	3.0E-02	7.2E+00
104	6-Feb-91																	1.7E-01	1.8E-01	5.4E-01	4.3E-01	1.0E-01	1.1E+02	3.0E-02	7.4E+00
105	13-Feb-91																	1.7E-01	1.8E-01	5.5E-01	4.3E-01	1.0E-01	1.1E+02	3.1E-02	7.7E+00
106	20-Feb-91		0.001	0.032	0.02		4	0.001	0.81		6.6E-04	2.1E-02	1.3E-02		2.7E+00	6.6E-04	5.4E-01	1.8E-01	1.9E-01	5.7E-01	4.4E-01	1.1E-01	1.1E+02	3.1E-02	8.2E+00
107	27-Feb-91																	1.8E-01	1.9E-01	6.1E-01	4.5E-01	1.1E-01	1.1E+02	3.2E-02	8.5E+00
[illegible]	[illegible]		0.001	0.21	0.02		5.1	0.001	1.2		6.6E-04	1.4E-01	1.6E-02		3.4E+00	6.6E-04	8.0E-01	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
109	13-Mar-91																	1.8E-01	1.9E-01	6.9E-01	4.6E-01	1.1E-01	1.2E+02	3.2E-02	9.2E+00
110	20-Mar-91																	[illegible]	1.9E-01	8.3E-01	4.8E-01	1.1E-01	1.2E+02	3.3E-02	1.0E+01
111	27-Mar-91																	1.8E-01	1.9E-01	9.4E-01	5.0E-01	1.1E-01	1.2E+02	3.3E-02	1.0E+01
112	3-Apr-91																	1.8E-01	1.9E-01	1.1E+00	5.2E-01	1.2E-01	1.2E+02	3.4E-02	1.1E+01
113	10-Apr-91																	1.9E-01	1.9E-01	1.2E+00	5.3E-01	1.2E-01	1.3E+02	3.4E-02	1.1E+01
114	17-Apr-91		0.001	0.44	0.08		6.5	0.001	1.53		6.8E-04	3.0E-01	5.4E-02		4.4E+00	6.8E-04	1.0E+00	1.9E-01	1.9E-01	1.5E+00	5.9E-01	1.2E-01	1.3E+02	3.5E-02	1.2E+01
115	24-Apr-91																	1.9E-01	1.9E-01	1.6E+00	7.1E-01	1.2E-01	1.3E+02	3.5E-02	1.3E+01
116	1-May-91																	1.9E-01	1.9E-01	1.8E+00	8.3E-01	1.2E-01	1.3E+02	3.5E-02	1.3E+01
117	8-May-91																	1.9E-01	1.9E-01	2.0E+00	9.6E-01	1.3E-01	1.4E+02	3.6E-02	1.4E+01
118	15-May-91		0.001	0.57	0.66		7.4	0.001	1.6		6.6E-04	3.8E-01	4.4E-01		4.9E+00	6.6E-04	1.1E+00	1.9E-01	1.9E-01	2.3E+00	1.4E+00	1.3E-01	1.4E+02	3.6E-02	1.5E+01
119	22-May-91																	1.9E-01	1.9E-01	2.6E+00	3.4E+00	1.3E-01	1.4E+02	3.7E-02	1.6E+01
120	29-May-91																	1.9E-01	1.9E-01	2.8E+00	5.5E+00	1.3E-01	1.5E+02	3.7E-02	1.6E+01
121	5-Jun-91																	2.0E-01	1.9E-01	3.0E+00	7.5E+00	1.3E-01	1.5E+02	3.7E-02	1.7E+01
122	12-Jun-91		0.001	0.72	12		8.3	0.001	2		6.5E-04	4.7E-01	7.8E+00		5.4E+00	6.5E-04	1.3E+00	2.0E-01	1.9E-01	3.4E+00	1.5E+01	1.4E-01	1.6E+02	3.8E-02	1.8E+01
123	19-Jun-91																	2.0E-01	1.9E-01	3.7E+00	2.5E+01	1.4E-01	1.6E+02	3.8E-02	1.9E+01
124	26-Jun-91																	2.0E-01	1.9E-01	4.0E+00	3.4E+01	1.4E-01	1.6E+02	3.9E-02	2.0E+01
125	3-Jul-91																	2.0E-01	1.9E-01	4.2E+00	4.4E+01	1.4E-01	1.6E+02	3.9E-02	2.1E+01
126	10-Jul-91		0.007	1.5	81		17	0.002	6.3		2.6E-03	5.6E-01	3.0E+01		6.3E+00	7.4E-04	2.3E+00	2.0E-01	2.0E-01	4.8E+00	7.4E+01	1.4E-01	1.7E+02	4.0E-02	2.3E+01
127	17-Jul-91																	2.0E-01	2.0E-01	5.1E+00	9.8E+01	1.5E-01	1.7E+02	4.0E-02	2.4E+01
128	24-Jul-91																	2.0E-01	2.0E-01	5.4E+00	1.2E+02	1.5E-01	1.8E+02	4.0E-02	2.5E+01
129	31-Jul-91																	2.1E-01	2.0E-01	5.7E+00	1.5E+02	1.5E-01	1.8E+02	4.1E-02	2.6E+01
130	7-Aug-91		0.011	0.95	102		7.8	0.001	3		7.3E-03	6.3E-01	6.7E+01		5.2E+00	6.6E-04	2.0E+00	2.1E-01	2.1E-01	6.3E+00	2.1E+02	1.5E-01	1.8E+02	4.1E-02	2.8E+01
131	14-Aug-91																	2.1E-01	2.2E-01	6.6E+00	2.5E+02	1.5E-01	1.9E+02	4.2E-02	2.9E+01

*If values were reported as < detection limit, 1/2 the detection limit is shown in italics and was used in subsequent calculations.

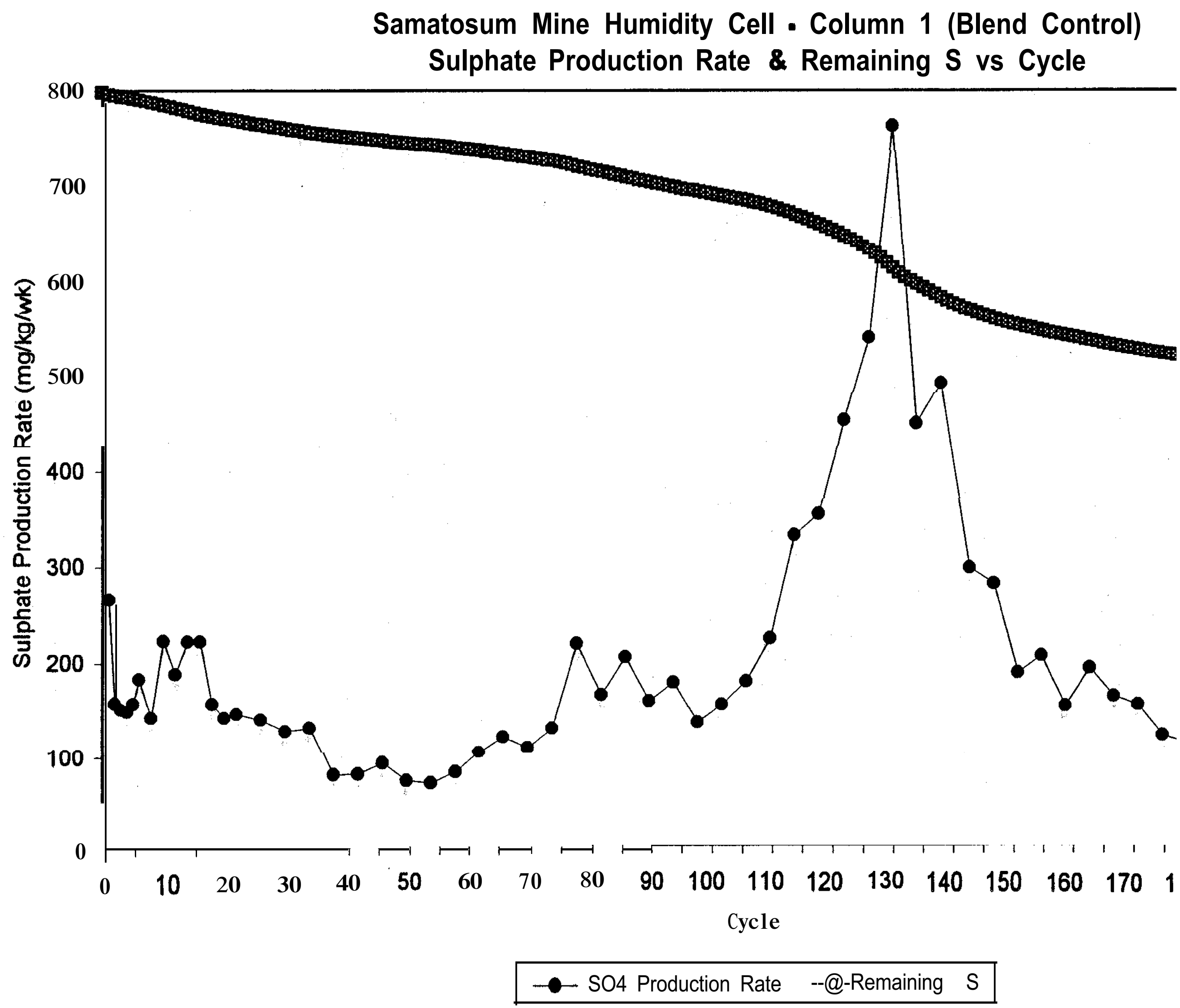

Samatosum Mine Humidity Cell - Column 1 (Blend Control)
Eh & Sulphate vs Cycle
800
700
600
500
400
300
200
100
0
Eh (mV)
1800
1600
1400
1200
1000
800
600
400
200
0
Sulphate (mg/L)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
Cycle
Eh
Sulphate

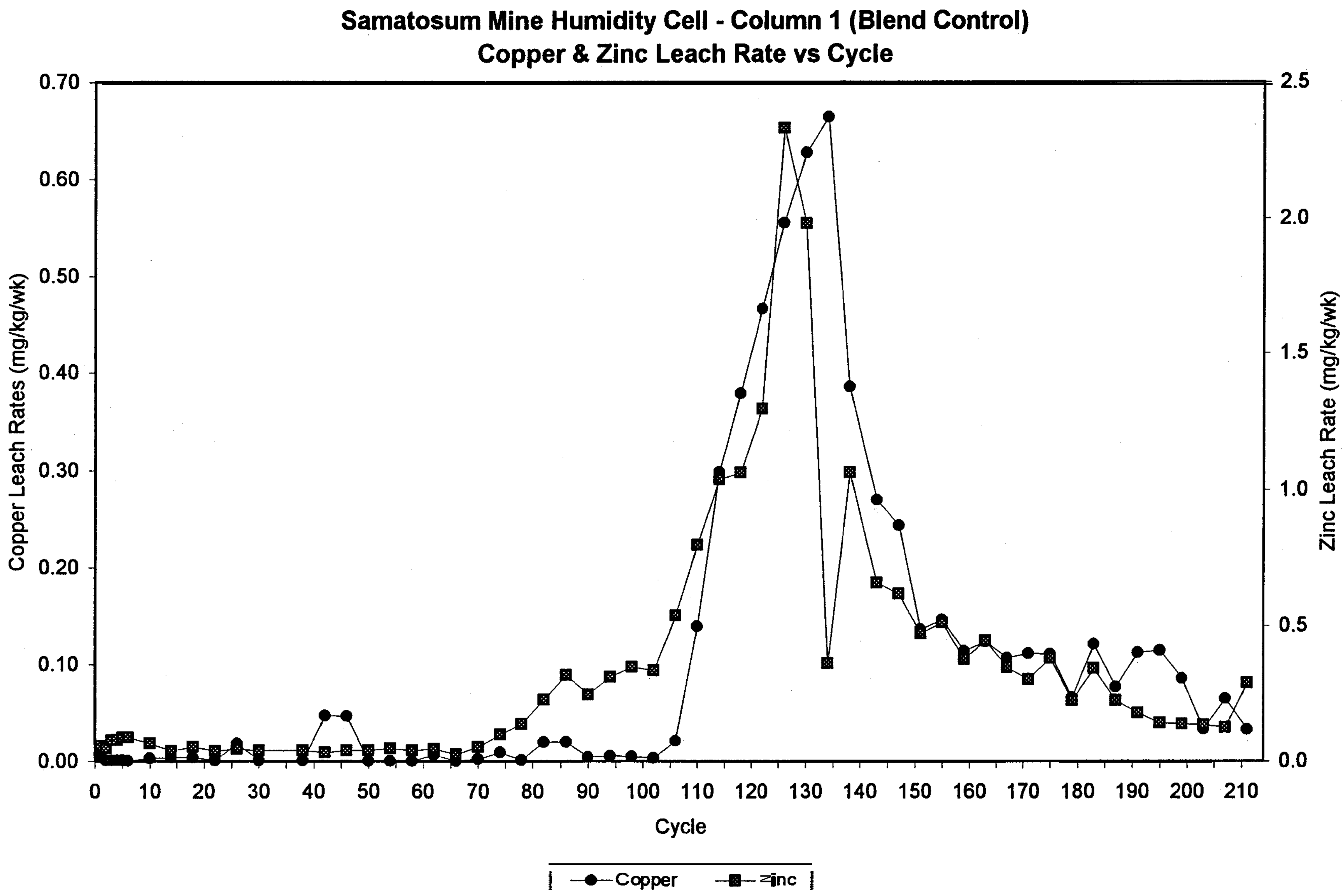


Samatosum Mine Humidity Cell - Column 1 (Blend Control)
Weekly pH & Conductivity vs Cycle
Weekly pH
Conductivity (uhmos/cm)
Cycle
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
4000
3500
3000
2500
2000
1500
1000
500
0
0
10
20
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
Weekly pH
Conductivity

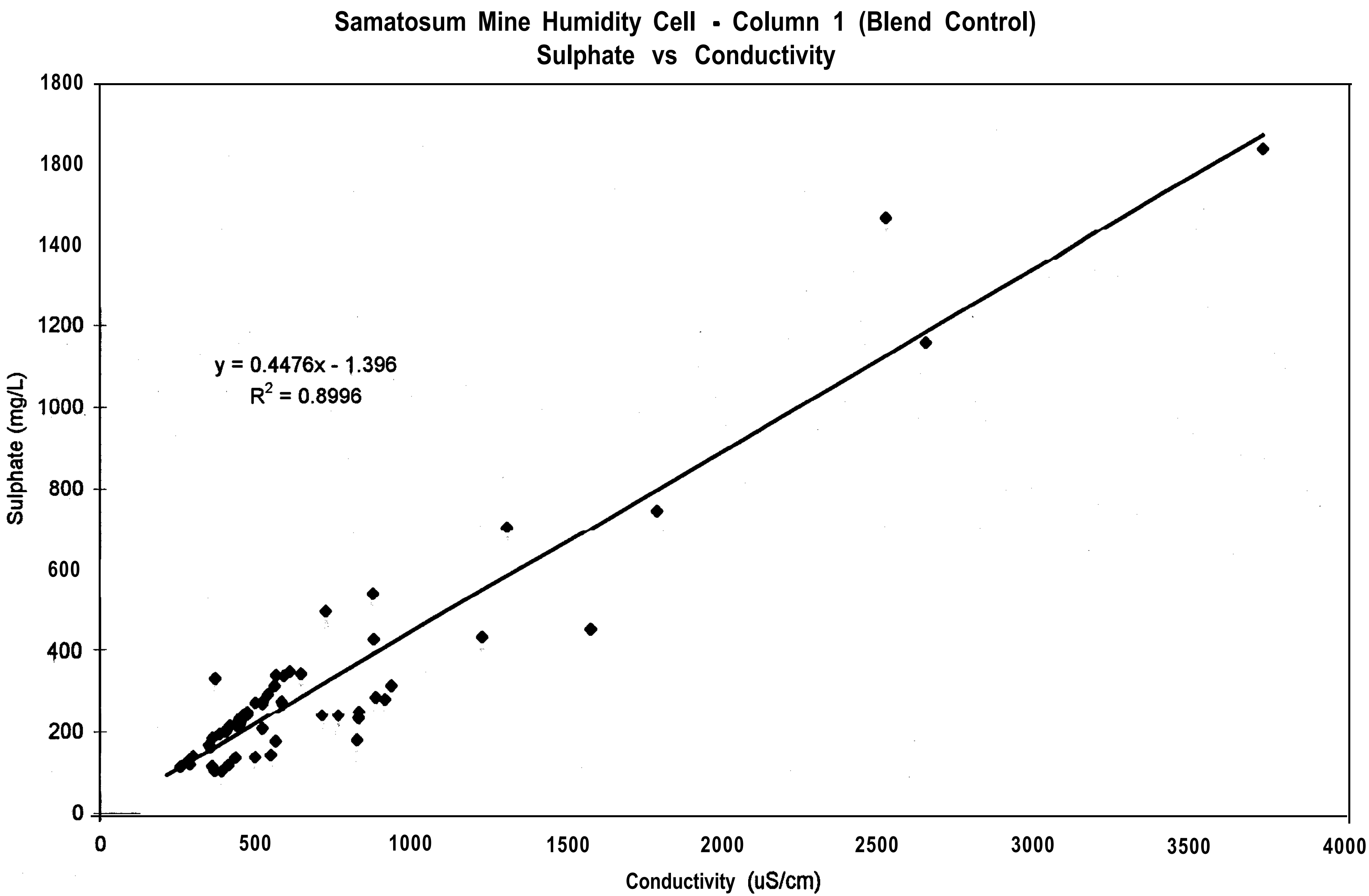


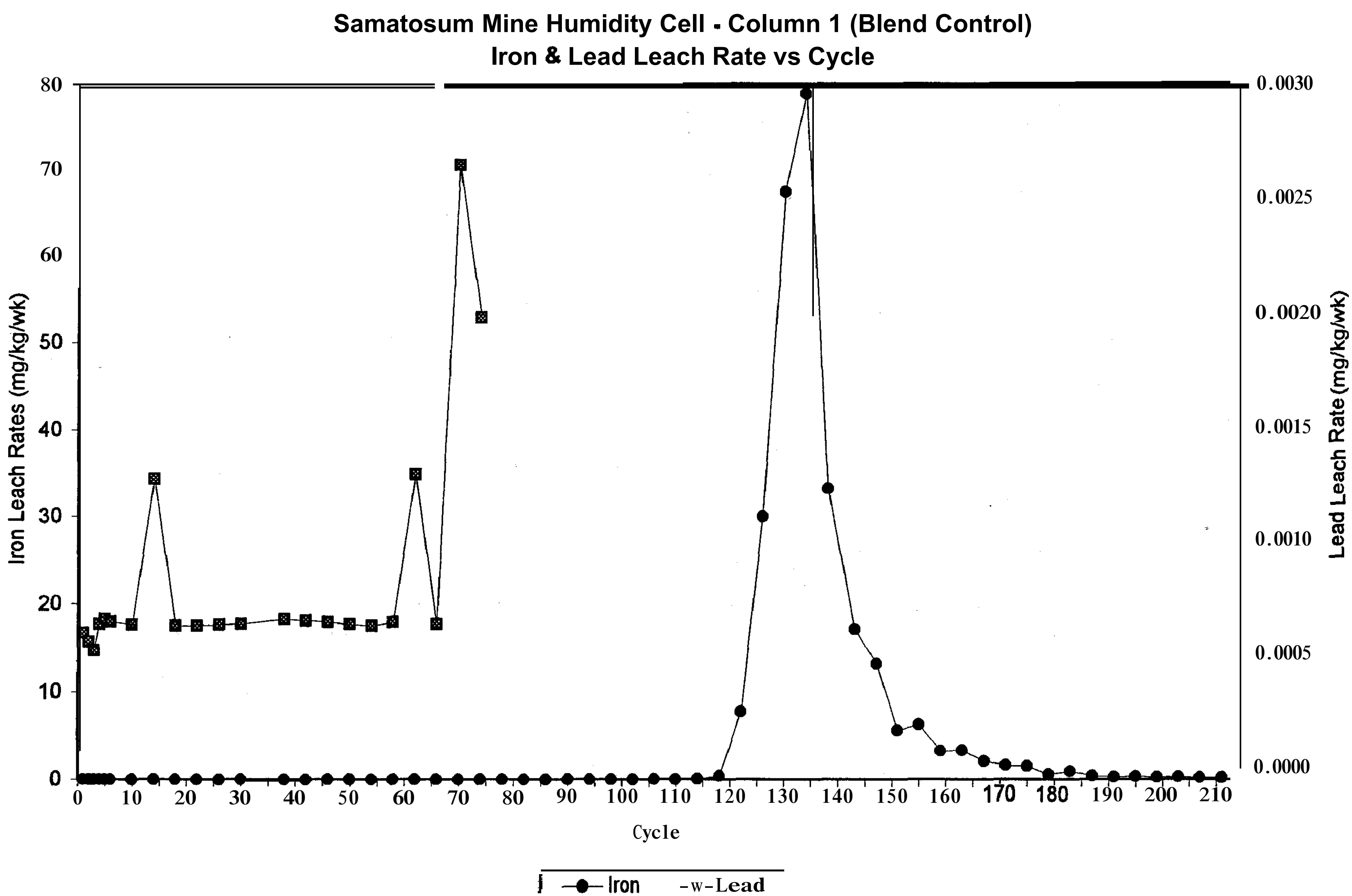
Samatosum Mine Humidity Cell - Column 1 (Blend Contrd)
Alkalinity & Acidity Production Rate vs Cycle
Alkalinity Production Rate (mg/kg/wk)
Acidity Production Rate (mg/kg/wk)
Cycle
80
70
60
50
40
30
20
10
0
30
25
20
15
10
5
0
0
0
20
30
40
50
6ꝏ
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
Production Rate
Alkalinity Production Rate


Samatosum Mine Humidity Cell - Column 1 (Blend Control)
Sulphate Production Rate & Remaining S vs Cycle
Sulphate Production Rate (mg/kg/wk)
800
700
600
500
400
300
200
100
0
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 1
Cycle
SO4 Production Rate
--@-Remaining S

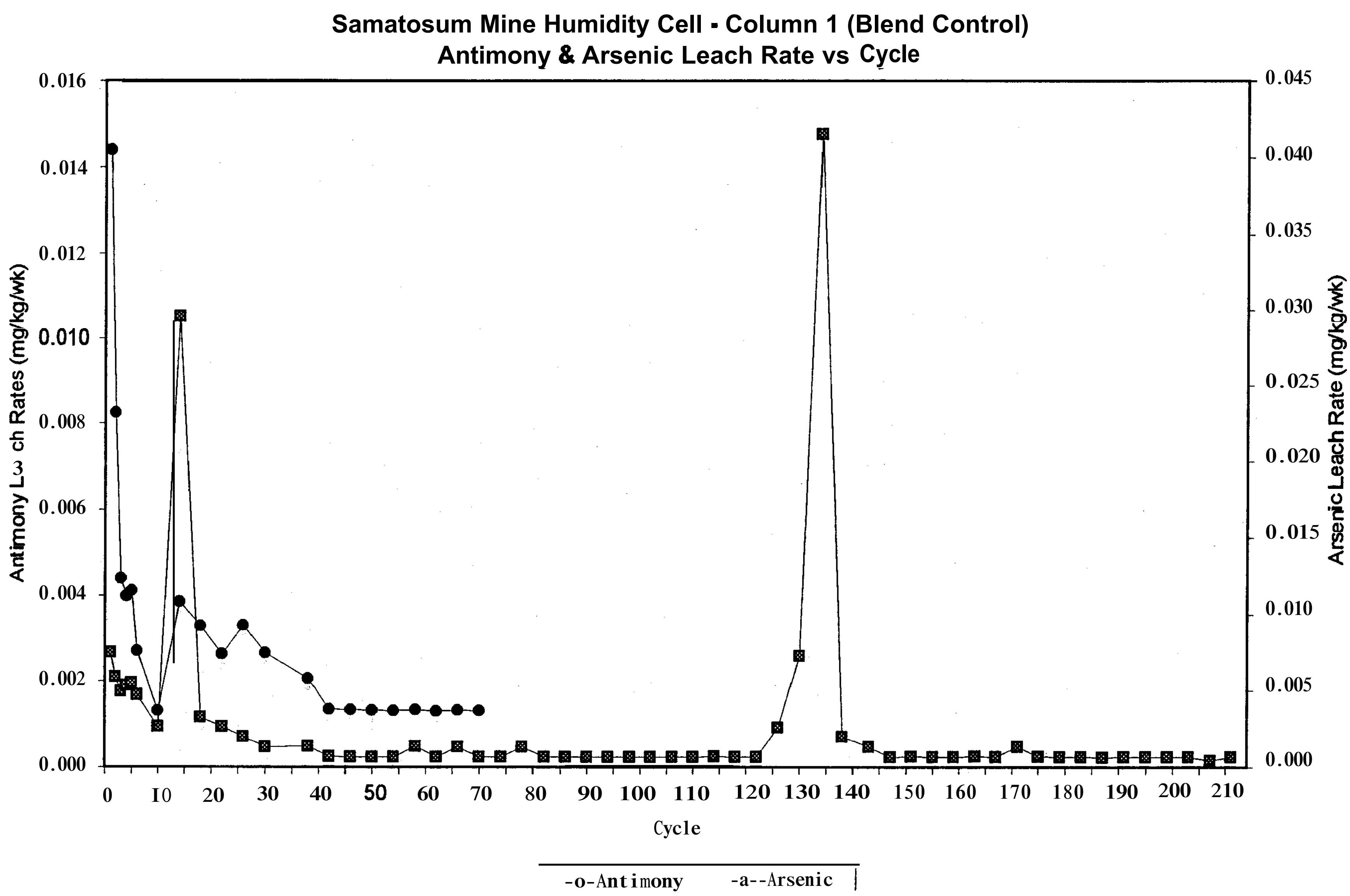


Samatosum Mine Humidity Cell - Column 1 (Blend Control)
Copper & Zinc Leach Rate vs Cycle
Copper Leach Rates (mg/kg/wk)
Zinc Leach Rate (mg/kg/wk)
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
2.5
2.0
1.5
1.0
0.5
0.0
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
Cycle
Copper
Zinc


Samatosum Mine Humidity Cell - Column 1 (Blend Control)
Sulphate vs Conductivity
y = 0.4476x - 1.396
R2 = 0.8996
Sulphate (mg/L)
1800
1800
1400
1200
1000
800
600
400
200
0
0
500
1000
1500
2000
2500
3000
3500
4000
Conductivity (uS/cm)

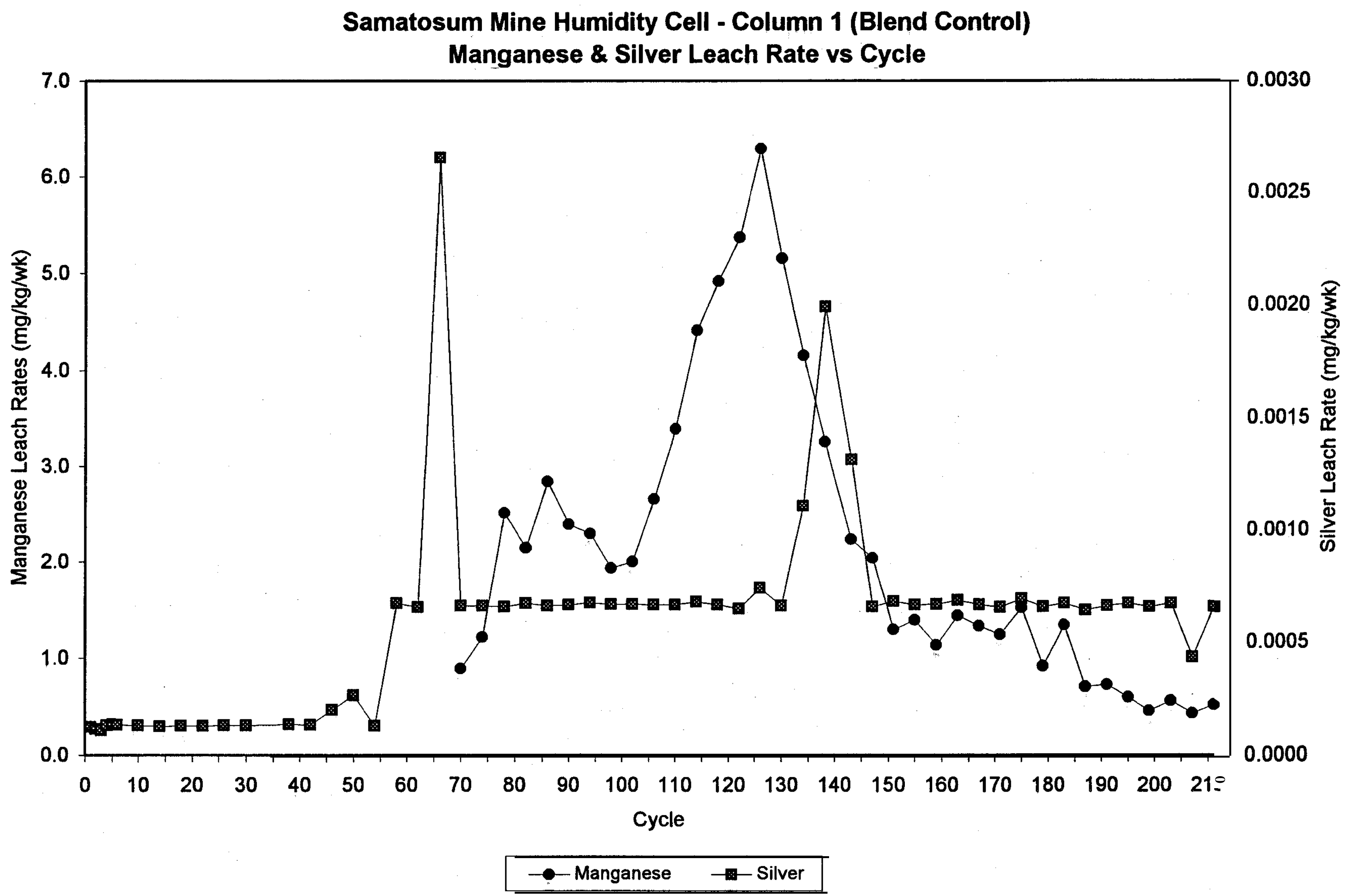


Samatosum Mine Humidity Cell - Column 1 (Blend Control)
Iron & Lead Leach Rate vs Cycle
Iron Leach Rates (mg/kg/wk)
Lead Leach Rate (mg/kg/wk)
0
10
20
30
40
50
60
70
80
0.0000
0.0005
0.0010
0.0015
0.0020
0.0025
0.0030
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210
Cycle
Iron
-w-Lead



Samatosum Mine Humidity Cell - Column 1 (Blend Control)
Antimony & Arsenic Leach Rate vs Cycle
Antimony Leach Rates (mg/kg/wk)
Arsenic Leach Rate (mg/kg/wk)
0.016
0.014
0.012
0.010
0.008
0.006
0.004
0.002
0.000
0.045
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
Cycle
-o-Antimony
-a--Arsenic

B2. Column 2



Samatosum Mine Humidity Cell - Column 1 (Blend Control)
Manganese & Silver Leach Rate vs Cycle
Manganese Leach Rates (mg/kg/wk)
Silver Leach Rate (mg/kg/wk)
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
0.0000
0.0005
0.0010
0.0015
0.0020
0.0025
0.0030
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200
Cycle
Manganese
Silver

Pre-Test ABA & ICP Metals Data
amatosum Mine
olumn 2 (Encapsulated 3 Layers)

itial Sample Weight (dry) (g)	46160
BA Results:	
Slurry **pH**	6.4
% S (Total)	2.44
% S (Sulphate)	
% S (Sulphide)	
% S (BaS04)	
TAP (tonne **CaCO3/ktonne)**	76
SAP (tonne **CaCO3/ktonne)**	
UP (tonne **CaCO3/ktonne)**	76.2
Carbon (%)	
CaNP (t **CaCO3/ktonne)**	
TNNP (tonne **CaCO3/ktonne)**	2
SNNP (tonne **CaCO3/ktonne)**	
RNNP (tonne **CaCO3/ktonne)**	
TNPR	1.03
SNPR	
RNPR	
iurface Area:	
Surface Area **(m2/kg)**	1.52
Metals: (ppm)	
Aluminum Al	Data Not Available
Antimony Sb	
Arsenic As	
Barium Ba	
Beryllium Be	
Bismuth Bi	
Cadmium Cd	
Calcium Ca	
Chromium Cr	
cobalt CO	
Copper cu	
Iron Fe	
Lanthium La	
Lead Pb	
Lithium Li	
Magnesium **Mg**	
Manganese Mn	
Mercury **Hg**	
Molybdenum **Mo**	
Nickel Ni	
Phosphorus P	
Potassium K	
Selenium Se	
Silver **Ag**	
Sodium Na	
Strontium **Sr**	
Thallium **Tl**	
Tin **Sn**	
Titanium Ti	
Tungsten W	
Vanadium V	
Zinc **Zn**	

Post-Test ABA & ICP Metals Data
amatosum Mine
olumn 2 (Encapsulated 3 Layers)

inal Sample Weight (dry) (g)	
BA Results:	
Paste pH	*Data Not Available*
% S (Total)	
% S (Sulphate)	
% S (Sulphide)	
% S (BaS04)	
TAP (tonne **CaCO3/ktonne)**	
SAP (tonne **CaCO3/ktonne)**	
VP (tonne **CaCO3/ktonne)**	
Carbon (%)	
CaNP (t **CaCO3/ktonne)**	
TNNP (tonne **CaCO3/ktonne)**	
SNNP (tonne **CaCO3/ktonne)**	
RNNP (tonne **CaCO3/ktonne)**	
TNPR	
SNPR	
RNPR	
iurface Area:	
Surface Area **(m2/kg)**	
Metals: (ppm)	
Aluminum Al	*Data Not Available*
Antimony Sb	
Arsenic As	
Barium Ba	
Beryllium Be	
Bismuth Bi	
Cadmium Cd	
Calcium Ca	
Chromium Cr	
Cobalt co	
Copper cu	
Iron Fe	
Lanthium La	
Lead Pb	
Lithium Li	
Magnesium **Mg**	
Manganese Mn	
Mercury **Hg**	
Molybdenum Mo	
Nickel Ni	
Phosphorus P	
Potassium K	
Selenium Se	
Silver **Ag**	
Sodium Na	
Strontium **Sr**	
Thallium **Tl**	
Tin **Sn**	
Titanium Ti	
Tungsten W	
Vanadium V	
Zinc **Zn**	

NOTE: When ***metals*** *were repotted as* **<** *detection limit,* ***half*** *the value of the detection* ***limit*** *is shown in italics, and was used in subsequent calculations.*

Samatosum Mine Humidity Cell Data -Column 2 (Encapsulated 3 Layers)

Week No.	Date	Analytical Results: Leachate Recovered (mL)	Weekly pH (pH units)	Conductivity (umhos/cm)	Eh (mV)	Acidity (CaCO3 mg/L)*	Alkalinity (CaCO3 mg/L)*	Sulphate (SO4 mg/L)*	Acidity Production Rate (mg/kg/wk)**	Alkalinity Production Rate (mg/kg/wk)**	Sulphate Production: SO4 Production Rate (mg/kg/wk)**	Cumulative SO4 Production (mg/kg)	Remaining S (% of original)	By Surface Area: SO4 Production Rate (mg/m2/wk)**	Cumulative SO4 Production (mg/m2)	Molar Ratio: Alk /SO4	NP Consumption: Theoretical NP Consumption At pH 6 (mg/kg/wk)	Empirical Open-System NP Consumption At Measured pH (mg/kg/wk)	Cum NP Consumption Open-System (mg/kg/wk)	Remaining NP Open-System (%)	Theoretical Closed-System NP Consumption Above pH 6.5 (mg/kg/wk)	Cum NP Consumption Closed-System (mg/kg/wk)	Remaining NP Closed-System (%)
66	16-May-90	19300	8.3	314	180	1	81	102	0.42	33.87	42.6	4621	93.69	28.1	3040	0.762	44.4	77.9	6756	91.36	88.4	9550	87.79
67	23-May-90	19100	8.1	311					0.52	33.16	43.0	4664	93.63	28.3	3068		44.7	77.4	6833	91.26	89.0	9639	87.67
68	30-May-90	19200	7.6	325					0.62	32.45	43.3	4707	93.57	28.5	3096		45.1	76.9	6910	91.16	89.5	9729	87.56
69	06-Jun-90	19200	8.0	307					0.73	31.74	43.6	4751	93.51	28.7	3125		45.4	76.4	6986	91.07	90.0	9819	87.44
70	13-Jun-90	19100	7.8	314	200	2	75	106	0.83	31.03	43.9	4795	93.45	28.8	3154	0.679	45.7	75.9	7062	90.97	90.5	9909	87.33
71	20-Jun-90	19000	7.8	321					0.72	31.24	44.4	4839	93.39	29.2	3183		46.2	76.7	7139	90.87	91.7	10001	87.21
72	27-Jun-90	19500	8.0	328					0.62	31.45	44.9	4884	93.33	29.5	3213		46.8	77.6	7217	90.77	92.9	10094	87.09
73	04-Jul-90	19200	8.2	311					0.52	31.65	45.4	4930	93.27	29.9	3242		47.3	78.4	7295	90.67	94.1	10188	86.97
74	11-Jul-90	19100	8.2	323	242	1	77	111	0.41	31.86	45.9	4976	93.20	30.2	3273	0.666	47.8	79.3	7374	90.57	95.3	10283	86.85
75	18-Jul-90	19100	8.1	357					0.41	28.03	49.1	5025	93.14	32.3	3305		51.2	78.8	7453	90.47	102.0	10385	86.72
76	25-Jul-90	19200	8.3	366					0.41	24.21	52.3	5077	93.06	34.4	3339		54.5	78.3	7531	90.37	108.6	10494	86.58
77	01-Aug-90	19400	8.3	354					0.41	20.38	55.5	5133	92.99	36.5	3376		57.9	77.8	7609	90.27	115.3	10609	86.43
78	08-Aug-90	19100	8.2	360	240	1	40	142	0.41	16.55	58.8	5191	92.91	38.6	3415	0.270	61.2	77.3	7687	90.17	122.0	10731	86.28
79	15-Aug-90	19300	7.5	368					0.41	16.59	54.0	5245	92.83	35.5	3450		56.2	72.4	7759	90.08	112.1	10843	86.13
80	22-Aug-90	19100	8.0	334					0.42	16.64	49.2	5295	92.77	32.4	3483		51.3	67.5	7826	89.99	102.2	10946	86.00
81	29-Aug-90	19000	8.1	292					0.42	16.68	44.5	5339	92.71	29.3	3512		46.3	62.6	7889	89.91	92.2	11038	85.89
82	05-Sep-90	19300	8.0	264	280	1	40	95	0.42	16.72	39.7	5379	92.65	26.1	3538	0.404	41.4	57.7	7947	89.84	82.3	11120	85.78
83	12-Sep-90	19500	8.0	318					0.52	16.06	41.2	5420	92.60	27.1	3565		42.9	58.4	8005	89.76	85.2	11205	85.67
84	19-Sep-90	19100	8.1	372					0.62	15.40	42.6	5463	92.54	28.0	3593		44.4	59.2	8064	89.69	88.2	11294	85.56
85	26-Sep-90	19100	7.7	275					0.73	14.73	44.1	5507	92.48	29.0	3622		45.9	59.9	8124	89.61	91.1	11385	85.44
86	03-Oct-90	19100	7.7	275	300	2	34	110	0.83	14.07	45.5	5552	92.42	29.9	3652	0.297	47.4	60.7	8185	89.53	94.0	11479	85.32
87	10-Oct-90	19200	7.7	249					0.93	13.77	43.4	5595	92.36	28.5	3680		45.2	58.0	8243	89.46	89.5	11568	85.21
88	17-Oct-90	19200	7.8	248					1.04	13.48	41.3	5637	92.30	27.1	3708		43.0	55.4	8298	89.39	84.9	11653	85.10
89	24-Oct-90	19300	7.7	230					1.14	13.19	39.1	5676	92.25	25.7	3733		40.8	52.8	8351	89.32	80.4	11734	85.00
90	31-Oct-90	19200	7.0	227	330	3	31	89	1.25	12.89	37.0	5713	92.20	24.3	3758	0.334	38.6	50.2	8401	89.26	75.9	11809	84.90
91	07-Nov-90	19400	7.1	235					1.25	12.81	36.3	5749	92.15	23.9	3782		37.8	49.4	8451	89.19	74.4	11884	84.80
92	14-Nov-90	19000	7.2	240					1.25	12.72	35.7	5785	92.10	23.5	3805		37.1	48.6	8499	89.13	73.0	11957	84.71
93	21-Nov-90	19100	7.6	251					1.25	12.63	35.0	5820	92.05	23.0	3828		36.4	47.8	8547	89.07	71.6	12028	84.62
94	28-Nov-90	19300	7.5	280	250	3	30	82	1.25	12.54	34.3	5854	92.00	22.6	3851	0.351	35.7	47.0	8594	89.01	70.2	12099	84.53
95	05-Dec-90	18800	7.7	328					1.15	12.10	33.5	5888	91.96	22.0	3873		34.9	45.8	8640	88.95	68.6	12167	84.44
96	12-Dec-90	19800	7.3	238					1.04	11.65	32.7	5920	91.91	21.5	3894		34.0	44.6	8685	88.89	67.0	12234	84.36
97	19-Dec-90	19200	7.5	340					0.93	11.20	31.8	5952	91.87	20.9	3915		33.2	43.4	8728	88.84	65.4	12300	84.27
98	26-Dec-90	19100	7.7	270	220	2	26	75	0.83	10.76	31.0	5983	91.83	20.4	3935	0.333	32.3	42.3	8770	88.78	63.8	12363	84.19
99	02-Jan-91	15200	6.3	322					1.04	10.67	32.1	6015	91.78	21.1	3957		33.5	43.1	8813	88.73	65.9	12429	84.11
100	09-Jan-91	19900	6.4	248					1.25	10.58	33.2	6048	91.74	21.8	3978		34.6	43.9	8857	88.67	67.9	12497	84.02
101	16-Jan-91	19000	7.5	205					1.45	10.49	34.3	6083	91.69	22.5	4001		35.7	44.7	8902	88.62	70.0	12567	83.93
102	23-Jan-91	19200	7.6	221	242	4	25	85	1.66	10.40	35.4	6118	91.64	23.3	4024	0.282	36.8	45.6	8948	88.56	72.0	12639	83.84
103	30-Jan-91	19300	7.1	182					1.56	10.32	35.6	6154	91.59	23.4	4048		37.0	45.8	8993	88.50	72.5	12712	83.74
104	06-Feb-91	19000	7.0	242					1.46	10.24	35.7	6189	91.54	23.5	4071		37.2	46.0	9039	88.44	73.0	12785	83.65
105	13-Feb-91	19100	7.7	245					1.36	10.16	35.9	6225	91.50	23.6	4095		37.4	46.2	9086	88.38	73.5	12858	83.56
106	20-Feb-91	19400	7.6	265	350	3	24	86	1.26	10.09	36.1	6262	91.45	23.8	4119	0.268	37.6	46.5	9132	88.32	74.0	12932	83.46
107	27-Feb-91	19100	6.5	248					1.26	12.53	39.3	6301	91.39	25.9	4144		41.0	52.2	9184	88.26	80.6	13013	83.36
108	06-Mar-91	18800	6.8	242					1.25	14.97	42.5	6343	91.33	27.9	4172		44.3	58.0	9242	88.18	87.3	13100	83.25
109	13-Mar-91	19200	7.6	270					1.25	17.42	45.7	6389	91.27	30.0	4202		47.6	63.7	9306	88.10	93.9	13194	83.13
110	20-Mar-91	19100	7.0	324	270	3	48	118	1.24	19.86	48.8	6438	91.21	32.1	4235	0.390	50.9	69.5	9376	88.01	100.5	13295	83.00
111	27-Mar-91	19000	7.5	278					1.14	19.62	47.8	6486	91.14	31.4	4266		49.7	68.2	9444	87.92	98.4	13393	82.87
112	03-Apr-91	19400	7.7	250					1.04	19.39	46.7	6532	91.08	30.7	4297		48.6	67.0	9511	87.84	96.2	13489	82.75
113	10-Apr-91	19100	7.8	270					0.94	19.15	45.6	6578	91.01	30.0	4327		47.5	65.7	9577	87.75	94.1	13583	82.63
114	17-Apr-91	19400	7.9	298	300	2	45	106	0.84	18.91	44.5	6622	90.95	29.3	4356	0.407	46.4	64.5	9641	87.67	92.0	13675	82.51
115	24-Apr-91	19100	7.6	300					0.94	19.05	43.9	6666	90.89	28.8	4385		45.7	63.8	9705	87.59	90.4	13766	82.40
116	01-May-91	19700	7.6	285					1.04	19.18	43.2	6709	90.83	28.4	4413		45.0	63.1	9768	87.51	88.9	13855	82.28
117	08-May-91	19600	7.6	282					1.14	19.31	42.5	6752	90.78	27.9	4441		44.3	62.4	9830	87.43	87.4	13942	82.17
118	15-May-91	19100	7.7	290	210	3	47	101	1.24	19.45	41.8	6794	90.72	27.5	4469	0.447	43.5	61.7	9892	87.35	85.8	14028	82.06
119	22-May-91	19400	7.5	254					1.14	18.98	41.2	6835	90.66	27.1	4496		42.9	60.7	9953	87.27	84.6	14112	81.95
120	29-May-91	19000	7.8	277					1.04	18.50	40.5	6875	90.61	26.7	4522		42.2	59.7	10013	87.20	83.4	14196	81.85
121	05-Jun-91	19100	7.4	260					0.94	18.03	39.9	6915	90.55	26.3	4549		41.6	58.7	10071	87.12	82.2	14278	81.74
122	12-Jun-91	19300	7.8	245	320	2	42	94	0.84	17.56	39.3	6955	90.50	25.9	4574	0.429	40.9	57.7	10129	87.05	81.0	14359	81.64
123	19-Jun-91	19100	6.8	262					0.94	17.20	39.5	6994	90.45	26.0	4600		41.2	57.4	10186	86.97	81.4	14440	81.53
124	26-Jun-91	19700	7.7	268					1.04	16.85	39.7	7034	90.39	26.1	4627		41.4	57.2	10243	86.90	81.7	14522	81.43
125	03-Jul-91	19300	7.8	280					1.14	16.49	39.9	7074	90.34	26.3	4653		41.6	56.9	10300	86.83	82.0	14604	81.32
126	10-Jul-91	19100	7.7	255	330	3	39	97	1.24	16.14	40.1	7114	90.28	26.4	4679	0.386	41.8	56.7	10357	86.76	82.4	14687	81.22
127	17-Jul-91	19300	7.6	300					1.13	15.91	43.5	7157	90.22	28.6	4708		45.3	60.1	10417	86.68	89.6	14776	81.10
128	24-Jul-91	19500	7.8	272					1.02	15.68	46.9	7204	90.16	30.9	4739		48.9	63.5	10481	86.60	96.7	14873	80.98
129	31-Jul-91	19200	7.5	314					0.91	15.46	50.3	7255	90.09	33.1	4772		52.4	67.0	10548	86.51	103.9	14977	80.85
130	07-Aug-91	18500	7.9	332	240	2	38	134	0.80	15.23	53.7	7308	90.02	35.3	4807	0.272	55.9	70.4	10618	86.42	111.1	15088	80.71
131	14-Aug-91	19800	7.9	280					0.72	12.64	47.5	7356	89.95	31.2	4838		49.4	61.4	10679	86.34	98.2	15186	80.58

* If values were reported as < detection limit, 1/2 the detection limit is shown in italics and was used in subsequent calculations.

Samatosum Mine Humidity Cell Data -Column **2** (Encapsulated 3 Layers)

Week No.	Date	Analytical Results: Leachate Recovered (mL)	Weekly pH (pH units)	Conductivity (umhos/cm)	Eh (mV)	Acidity (CaCO3 mg/L)*	Alkalinity (CaCO3 mg/L)*	Sulphate (SO4 mg/L)*	Acidity Production Rate (mg/kg/wk)**	Alkalinity Production Rate (mg/kg/wk)**	Sulphate Production: SO4 Production Rate (mg/kg/wk)**	Cumulative SO4 Production (mg/kg)	Remaining S (% of original)	By Surface Area: SO4 Production Rate (mg/m2/wk)**	By Surface Area: Cumulative SO4 Production (mg/m2)	Molar Ratio: Alk /SO4	NP Consumption: Theoretical NP Consumption At pH 6 (mg/kg/wk)	Empirical Open-System NP Consumption At Measured pH (mg/kg/wk)	Cum NP Consumption Open-System (mg/kg/wk)	Remaining NP Open-System (%)	Theoretical Closed-System NP Consumption Above pH 6.5 (mg/kg/wk)	Cum NP Consumption Closed-System (mg/kg/wk)	Remaining NP Closed-System (%)
0	08-Feb-89								2.27	38.67	168.7	169	99.77	111.0	111		175.7	212.1	212	99.73	349.2	349	99.55
1	15-Feb-89	17500	7.6	936	480	6	102	445	2.27	38.67	168.7	337	99.54	111.0	222	0.220	175.7	212.1	424	99.46	349.2	698	99.11
2	22-Feb-89	19000	7.9	488	490	1	77	199	0.41	31.69	81.9	419	99.43	53.9	276	0.371	85.3	116.6	541	99.31	170.2	869	98.89
3	01-Mar-89	19300	7.8	476	480	3	70	208	1.25	29.27	87.0	506	99.31	57.2	333	0.323	90.6	118.6	659	99.16	179.9	1049	98.66
4	08-Mar-89	19000	7.7	472	460	4	77	212	1.65	31.69	87.3	594	99.19	57.4	390	0.349	90.9	120.9	780	99.00	180.1	1229	98.43
5	15-Mar-89	18000	7.9	515	475	2	69	243	0.78	26.91	94.8	688	99.06	62.3	453	0.273	98.7	124.8	905	98.84	196.6	1425	98.18
6	22-Mar-89	19300	7.6	486	450	3	71	240	1.25	29.69	100.3	789	98.92	66.0	519	0.284	104.5	133.0	1038	98.67	207.8	1633	97.91
7	29-Mar-89	19400	7.6	475					1.46	27.80	90.3	879	98.80	59.4	578		94.1	120.4	1159	98.52	186.7	1820	97.67
8	05-Apr-89	19300	7.7	450	460	4	62	192	1.67	25.92	80.3	959	98.69	52.8	631	0.310	83.6	107.9	1266	98.38	165.6	1985	97.46
9	12-Apr-89	19100	7.8	490					1.45	28.40	100.6	1060	98.55	66.2	697		104.8	131.8	1398	98.21	208.2	2194	97.19
10	19-Apr-89	19000	7.6	576	450	3	75	294	1.23	30.87	121.0	1181	98.39	79.6	777	0.245	126.1	155.7	1554	98.01	250.9	2444	96.87
11	26-Apr-89	19000	7.7	473					1.24	31.66	110.8	1292	98.24	72.9	850		115.5	145.9	1700	97.83	229.7	2674	96.58
12	03-May-89	19200	7.5	557	472	3	78	242	1.25	32.44	100.7	1392	98.10	66.2	916	0.309	104.9	136.0	1836	97.65	208.5	2883	96.31
13	10-May-89	19000	7.5	698					1.68	32.06	124.3	1517	97.93	81.7	998		129.4	159.8	1996	97.45	257.2	3140	95.98
14	17-May-89	19500	7.5	700	460	5	75	350	2.11	31.68	147.9	1665	97.73	97.3	1095	0.206	154.0	183.6	2179	97.21	305.9	3446	95.59
15	24-May-89	19000	7.5	514					1.91	31.55	145.9	1810	97.53	96.0	1191		152.0	181.6	2361	96.98	302.1	3748	95.21
16	31-May-89	19600	7.5	407	469	4	74	339	1.70	31.42	143.9	1954	97.33	94.7	1285	0.209	149.9	179.7	2541	96.75	298.2	4046	94.83
17	07-Jun-89	19000	7.7	473					2.08	30.94	136.8	2091	97.14	90.0	1375		142.5	171.4	2712	96.53	282.9	4329	94.46
18	14-Jun-89	19000	7.6	467	512	6	74	315	2.47	30.46	129.7	2221	96.97	85.3	1461	0.225	135.1	163.0	2875	96.32	267.7	4597	94.12
19	21-Jun-89	19000	7.9	421					1.85	30.46	104.3	2325	96.82	68.6	1529		108.7	137.3	3012	96.15	215.5	4812	93.85
20	28-Jun-89	19000	7.8	482	490	3	74	192	1.23	30.46	79.0	2404	96.72	52.0	1581	0.370	82.3	111.5	3124	96.01	163.4	4975	93.64
21	05-Jul-89	19000	7.8	455					0.83	31.87	79.9	2484	96.61	52.5	1634		83.2	114.2	3238	95.86	165.6	5141	93.43
22	12-Jul-89	19200	7.8	464	515	1	80	194	0.42	33.28	80.7	2565	96.50	53.1	1687	0.396	84.1	116.9	3355	95.71	167.7	5309	93.21
23	19-Jul-89	19200	7.8	468					0.63	33.19	79.6	2644	96.39	52.4	1739		83.0	115.5	3471	95.56	165.3	5474	93.00
24	26-Jul-89	19500	7.8	417	482				0.84	33.11	78.6	2723	96.28	51.7	1791		81.9	114.1	3585	95.42	162.9	5637	92.79
25	02-Aug-89	18900	7.7	443					1.05	33.03	77.5	2800	96.17	51.0	1842		80.8	112.7	3697	95.27	160.4	5797	92.59
26	09-Aug-89	19500	7.8	417	460	3	78	181	1.27	32.95	76.5	2877	96.07	50.3	1892	0.414	79.6	111.3	3809	95.13	158.0	5955	92.38
27	16-Aug-89	19300	7.8	438					1.16	32.87	71.1	2948	95.97	46.8	1939		74.1	105.8	3914	94.99	147.1	6102	92.20
28	23-Aug-89	19200	7.8	418	542				1.05	32.78	65.8	3014	95.88	43.3	1982		68.6	100.3	4015	94.87	136.1	6238	92.02
29	30-Aug-89	19300	7.8	398					0.94	32.70	60.5	3074	95.80	39.8	2022		63.0	94.8	4110	94.74	125.1	6364	91.86
30	06-Sep-89	19300	7.8	392	380	2	78	132	0.84	32.61	55.2	3130	95.72	36.3	2059	0.567	57.5	89.3	4199	94.63	114.1	6478	91.72
31	13-Sep-89	19000	7.9	397					1.15	31.88	58.1	3188	95.65	38.2	2097		60.5	91.3	4290	94.51	119.9	6598	91.56
32	20-Sep-89	19200	7.5	389	490				1.46	31.15	61.0	3249	95.56	40.2	2137		63.6	93.3	4383	94.39	125.7	6723	91.40
33	27-Sep-89	19210	7.7	314					1.78	30.42	64.0	3313	95.47	42.1	2179		66.6	95.3	4479	94.27	131.5	6855	91.23
34	04-Oct-89	19300	7.7	380	390	5	71	160	2.09	29.69	66.9	3380	95.38	44.0	2223	0.426	69.7	97.3	4576	94.15	137.3	6992	91.06
35	11-Oct-89	19000	7.9	333					1.99	28.78	59.7	3439	95.30	39.3	2262		62.2	89.0	4665	94.03	122.5	7115	90.90
36	18-Oct-89	19000	7.4	315					1.89	27.87	52.6	3492	95.23	34.6	2297		54.8	80.7	4746	93.93	107.6	7222	90.76
37	25-Oct-89	19500	7.7	289					1.78	26.96	45.4	3537	95.17	29.9	2327		47.3	72.5	4818	93.84	92.8	7315	90.65
38	01-Nov-89	19400	7.7	279	460	4	62	91	1.68	26.06	38.2	3576	95.12	25.2	2352	0.654	39.8	64.2	4882	93.76	78.0	7393	90.55
39	08-Nov-89	19100	7.4	276					1.57	26.34	38.4	3614	95.06	25.3	2377		40.0	64.8	4947	93.67	78.4	7472	90.45
40	15-Nov-89	19200	7.5	289					1.47	26.62	38.6	3653	95.01	25.4	2403		40.2	65.3	5012	93.59	78.9	7550	90.34
41	22-Nov-89	19200	7.9	287					1.36	26.90	38.7	3691	94.96	25.5	2428		40.3	65.9	5078	93.51	79.3	7630	90.24
42	29-Nov-89	19300	7.8	284	370	3	65	93	1.25	27.18	38.9	3730	94.90	25.6	2454	0.671	40.5	66.4	5145	93.42	79.8	7709	90.14
43	06-Dec-89	19400	7.7	278					1.36	27.66	38.5	3769	94.85	25.3	2479		40.1	66.4	5211	93.34	78.9	7788	90.04
44	13-Dec-89	19200	7.8	286					1.46	28.15	38.2	3807	94.80	25.1	2504		39.7	66.4	5278	93.25	78.0	7866	89.94
45	20-Dec-89	19000	7.9	276					1.56	28.63	37.8	3845	94.75	24.9	2529		39.4	66.4	5344	93.17	77.2	7944	89.84
46	27-Dec-89	19200	7.7	273	380	4	70	90	1.66	29.12	37.4	3882	94.70	24.6	2553	0.746	39.0	66.4	5411	93.08	76.3	8020	89.74
47	03-Jan-90	19200	7.8	269					1.56	29.15	35.9	3918	94.65	23.6	2577		37.4	65.0	5476	93.00	73.3	8093	89.65
48	10-Jan-90	18700	7.8	275					1.46	29.19	34.4	3952	94.60	22.6	2600		35.8	63.6	5539	92.92	70.2	8163	89.56
49	17-Jan-90	19600	7.9	253					1.36	29.23	32.9	3985	94.56	21.6	2621		34.2	62.1	5601	92.84	67.1	8230	89.48
50	24-Jan-90	19300	7.1	266	435	3	70	75	1.25	29.27	31.4	4017	94.51	20.6	2642	0.896	32.7	60.7	5662	92.76	64.1	8295	89.39
51	31-Jan-90	19200	8.1	262					0.99	28.13	30.4	4047	94.47	20.0	2662		31.7	58.8	5721	92.68	62.4	8357	89.31
52	07-Feb-90	19200	7.6	245					0.73	26.98	29.5	4077	94.43	19.4	2681		30.7	56.9	5778	92.61	60.7	8418	89.24
53	14-Feb-90	19900	8.0	206					0.47	25.84	28.5	4105	94.39	18.8	2700		29.7	55.1	5833	92.54	59.0	8477	89.16
54	21-Feb-90	19000	8.1	253	360	1	60	67	0.21	24.70	27.6	4133	94.35	18.1	2718	0.859	28.7	53.2	5886	92.47	57.2	8534	89.09
55	28-Feb-90	19000	8.2	266					0.15	25.56	30.5	4163	94.31	20.1	2738		31.8	57.2	5943	92.40	63.4	8597	89.01
56	07-Mar-90	19000	7.9	294					0.10	26.42	33.4	4197	94.27	22.0	2760		34.8	61.2	6004	92.32	69.6	8667	88.92
57	14-Mar-90	19000	7.9	291					0.05	27.28	36.4	4233	94.22	23.9	2784		37.9	65.1	6069	92.24	75.7	8743	88.82
58	21-Mar-90	19100	8.2	281	200	0	68	95	0.00	28.14	39.3	4272	94.16	25.9	2810	0.687	40.9	69.1	6139	92.15	81.9	8824	88.72
59	28-Mar-90	19100	8.2	215					0.00	29.09	40.9	4313	94.11	26.9	2837		42.7	71.7	6210	92.06	85.3	8910	88.61
60	04-Apr-90	19600	8.2	267					0.00	30.04	42.6	4356	94.05	28.0	2865		44.4	74.4	6285	91.96	88.7	8998	88.49
61	11-Apr-90	19100	8.2	299					0.00	30.99	44.2	4400	93.99	29.1	2894		46.1	77.0	6362	91.86	92.1	9091	88.38
62	18-Apr-90	18900	8.3	344	190	0	78	112	0.00	31.94	45.9	4446	93.93	30.2	2924	0.668	47.8	79.7	6441	91.76	95.5	9186	88.25
63	25-Apr-90	19400	8.2	297					0.10	32.42	45.1	4491	93.86	29.6	2954		46.9	79.2	6521	91.66	93.8	9280	88.13
64	02-May-90	19100	8.0	280					0.21	32.90	44.3	4535	93.80	29.1	2983		46.1	78.8	6599	91.56	92.0	9372	88.02
65	09-May-90	19000	8.0	318					0.31	33.38	43.4	4579	93.75	28.6	3012		45.3	78.3	6678	91.46	90.2	9462	87.90

Samatosum Mine Humidity Cell Data -Column 2 (Encapsulated 3 Layers)

Week No.	Date	Analytical Results: Leachate Recovered (mL)	Weekly pH (pH units)	Conductivity (umhos/cm)	Eh (mV)	Acidity (CaCO3 mg/L)*	Alkalinity (CaCO3 mg/L)*	Sulphate (SO4 mg/L)*	Acidity Production Rate (mg/kg/wk)**	Alkalinity Production Rate (mg/kg/wk)**	Sulphate Production: SO4 Production Rate (mg/kg/wk)**	Cumulative SO4 Production (mg/kg)	Remaining S (% of original)	By Surface Area: SO4 Production Rate (mg/m2/wk)**	Cumulative SO4 Production (mg/m2)	Molar Ratio: Alk /SO4	NP Consumption: Theoretical NP Consumption At pH 6 (mg/kg/wk)	Empirical Open-System NP Consumption At Measured pH (mg/kg/wk)	Cum NP Consumption Open-System (mg/kg/wk)	Remaining NP Open-System (%)	Theoretical Closed-System NP Consumption Above pH 6.5 (mg/kg/wk)	Cum NP Consumption Closed-System (mg/kg/wk)	Remaining NP Closed-System (%)
198	25-Nov-92	18200	7.48	200					1.26	14.92	26.8	9484	87.04	17.6	6238		27.9	41.6	13683	82.50	54.6	19529	75.03
199	02-Dec-92	19300	7.47	188	440	3	36	64	1.25	15.05	26.8	9511	87.01	17.6	6256	0.540	27.9	41.7	13725	82.45	54.5	19584	74.96
200	09-Dec-92	16500	7.38	214					1.26	14.44	26.4	9537	86.97	17.3	6273		27.5	40.7	13765	82.40	53.7	19637	74.89
201	16-Dec-92	19600	7.53	170					1.26	13.83	26.0	9563	86.94	17.1	6290		27.1	39.6	13805	82.35	52.9	19690	74.82
202	23-Dec-92	19000	7.4	170					1.26	13.22	25.6	9588	86.90	16.8	6307		26.7	38.6	13844	82.30	52.1	19742	74.75
203	30-Dec-92	19400	7.42	170	450	3	30	60	1.26	12.61	25.2	9614	86.87	16.6	6324	0.480	26.3	37.6	13881	82.25	51.3	19793	74.69
204	06-Jan-93	19300	7.4	125					1.36	12.49	25.9	9640	86.83	17.0	6341		27.0	38.1	13919	82.20	52.6	19846	74.62
205	13-Jan-93	19200	7.33	150					1.47	12.37	26.6	9666	86.79	17.5	6358		27.7	38.6	13958	82.15	54.0	19900	74.55
206	20-Jan-93	19100	7.18	175					1.57	12.25	27.3	9694	86.76	18.0	6376		28.5	39.1	13997	82.10	55.3	19955	74.48
207	27-Jan-93	19300	7.33	173	450	4	29	67	1.67	12.13	28.0	9722	86.72	18.4	6394	0.415	29.2	39.6	14037	82.05	56.7	20012	74.41
208	03-Feb-93	19200	7.15	168					1.86	11.52	28.0	9750	86.68	18.4	6413		29.2	38.8	14076	82.00	56.5	20069	74.34
209	10-Feb-93	19000	7.14	178					2.05	10.92	28.0	9778	86.64	18.4	6431		29.1	38.0	14114	81.95	56.2	20125	74.26
210	17-Feb-93	19400	7.15	178					2.24	10.32	28.0	9805	86.60	18.4	6450		29.1	37.2	14151	81.90	56.0	20181	74.19
211	24-Feb-93	18700	7.45	180	430	6	24	69	2.43	9.72	28.0	9833	86.57	18.4	6468	0.334	29.1	36.4	14187	81.86	55.8	20237	74.12
212	03-Mar-93	19000	7.05	152					3.15	9.53	30.0	9863	86.53	19.8	6488		31.3	37.7	14225	81.81	59.4	20296	74.05
213	10-Mar-93	19200	7.2	155					3.86	9.34	32.1	9896	86.48	21.1	6509		33.4	38.9	14264	81.76	63.0	20359	73.97
214	17-Mar-93	19100	7.02	160					4.58	9.15	34.2	9930	86.43	22.5	6531		35.6	40.2	14304	81.71	66.6	20426	73.88
215	24-Mar-93	18800	7.2	192	510	13	22	89	5.29	8.96	36.2	9966	86.39	23.8	6555	0.237	37.8	41.4	14345	81.66	70.2	20496	73.79
216	31-Mar-93	17400	7.05	160					4.39	9.35	33.6	10000	86.34	22.1	6577		35.0	40.0	14385	81.60	65.6	20562	73.71
217	07-Apr-93	20000	7.32	150					3.49	9.73	30.9	10031	86.30	20.4	6598		32.2	38.5	14424	81.56	61.0	20622	73.63
218	14-Apr-93	19600	7.33	190					2.58	10.12	28.3	10059	86.26	18.6	6616		29.5	37.0	14461	81.51	56.4	20679	73.56
219	21-Apr-93	19400	7.19	162	420	4	25	61	1.68	10.51	25.6	10084	86.22	16.9	6633	0.393	26.7	35.5	14496	81.46	51.7	20731	73.49
220	28-Apr-93	19100	7.11	170					1.78	10.35	25.8	10110	86.19	17.0	6650		26.9	35.5	14532	81.42	52.0	20783	73.42
221	05-May-93	18900	7.08	194					1.87	10.19	26.0	10136	86.15	17.1	6667		27.1	35.4	14567	81.37	52.3	20835	73.36
222	12-May-93	19700	7.07	147					1.96	10.04	26.2	10162	86.12	17.2	6684		27.3	35.3	14603	81.33	52.5	20887	73.29
223	19-May-93	19000	7.02	184	460	5	24	64	2.06	9.88	26.3	10189	86.08	17.3	6702	0.360	27.4	35.3	14638	81.28	52.8	20940	73.22
224	26-May-93	19000	7.37	188					2.07	10.02	27.4	10216	86.04	18.0	6720		28.5	36.5	14674	81.23	55.0	20995	73.15
225	02-Jun-93	19200	7.15	188					2.07	10.17	28.4	10245	86.00	18.7	6738		29.6	37.7	14712	81.19	57.2	21052	73.08
226	09-Jun-93	19400	7.05	198					2.08	10.31	29.5	10274	85.96	19.4	6758		30.7	38.9	14751	81.14	59.3	21112	73.00
227	16-Jun-93	19300	7.06	180	410	5	25	73	2.09	10.45	30.5	10305	85.92	20.1	6778	0.329	31.8	40.2	14791	81.09	61.5	21173	72.92
228	23-Jun-93	19300	7.25	182					1.88	10.45	30.8	10335	85.88	20.3	6798		32.1	40.7	14832	81.03	62.4	21236	72.84
229	30-Jun-93	19700	7.4	195					1.67	10.45	31.1	10367	85.84	20.5	6819		32.4	41.2	14873	80.98	63.2	21299	72.76
230	07-Jul-93	19500	7.35	170					1.46	10.45	31.5	10398	85.80	20.7	6839		32.8	41.8	14915	80.93	64.1	21363	72.68
231	14-Jul-93	19300	7.32	172	370	3	25	76	1.25	10.45	31.8	10430	85.75	20.9	6860	0.316	33.1	42.3	14957	80.87	64.9	21428	72.60
232	21-Jul-93	20000	7.3	178					1.27	10.11	30.5	10460	85.71	20.1	6880		31.8	40.7	14998	80.82	62.4	21490	72.52
233	28-Jul-93	19700	7.22	168					1.28	9.78	29.3	10490	85.67	19.3	6900		30.5	39.0	15037	80.77	59.8	21550	72.44
234	04-Aug-93	18000	7.2	160					1.29	9.44	28.1	10518	85.63	18.5	6918		29.3	37.4	15074	80.72	57.2	21607	72.37
235	11-Aug-93	20000	7.25	130	410	3	21	62	1.30	9.10	26.9	10545	85.59	17.7	6936	0.325	28.0	35.8	15110	80.68	54.7	21662	72.30
236	18-Aug-93	19200	7.2	170					1.29	9.56	27.1	10572	85.56	17.8	6954		28.2	36.5	15147	80.63	55.1	21717	72.23
237	25-Aug-93	19000	7.15	160					1.28	10.01	27.3	10599	85.52	18.0	6972		28.4	37.2	15184	80.58	55.6	21773	72.16
238	01-Sep-93	19200	7.12	168					1.27	10.47	27.5	10627	85.48	18.1	6990		28.7	37.9	15222	80.54	56.1	21829	72.09
239	08-Sep-93	19400	7.25	150	410	3	26	66	1.26	10.93	27.7	10654	85.44	18.2	7008	0.378	28.9	38.6	15260	80.49	56.5	21885	72.01
240	15-Sep-93	19400	7.18	168					1.26	10.88	27.5	10682	85.41	18.1	7026		28.7	38.3	15298	80.44	56.1	21941	71.94
241	22-Sep-93	19600	7.05	177					1.25	10.84	27.3	10709	85.37	18.0	7044		28.5	38.0	15336	80.39	55.7	21997	71.87
242	29-Sep-93	19400	7.24	153					1.25	10.80	27.1	10736	85.33	17.8	7062		28.2	37.8	15374	80.34	55.2	22052	71.80
243	06-Oct-93	19100	7.33	152	350	3	26	65	1.24	10.76	26.9	10763	85.30	17.7	7080	0.384	28.0	37.5	15412	80.29	54.8	22107	71.73
244	13-Oct-93	18900	7.18	160					1.24	10.56	27.9	10791	85.26	18.3	7098		29.0	38.3	15450	80.24	56.8	22164	71.66
245	20-Oct-93	19100	7.32	162					1.24	10.37	28.8	10820	85.22	19.0	7117		30.0	39.2	15489	80.19	58.8	22223	71.58
246	27-Oct-93	19000	7.04	162					1.25	10.18	29.8	10850	85.18	19.6	7136		31.1	40.0	15529	80.14	60.9	22283	71.50
247	03-Nov-93	19200	7.45	178	370	3	24	74	1.25	9.98	30.8	10880	85.14	20.2	7157	0.311	32.1	40.8	15570	80.09	62.9	22346	71.42
248	10-Nov-93	19000	7.4	146					1.24	9.75	28.8	10909	85.10	19.0	7176		30.0	38.6	15609	80.04	58.9	22405	71.35
249	17-Nov-93	19200	6.94	126					1.24	9.52	26.9	10936	85.06	17.7	7193		28.0	36.3	15645	79.99	54.8	22460	71.28
250	24-Nov-93	19100	7.43	148					1.24	9.29	25.0	10961	85.03	16.4	7210		26.0	34.1	15679	79.95	50.8	22511	71.21
251	01-Dec-93	19000	7.39	147	270	3	22	56	1.23	9.06	23.1	10984	84.99	15.2	7225	0.377	24.0	31.8	15711	79.91	46.8	22558	71.15
252	08-Dec-93	19100	7.05	148					1.24	8.77	23.7	11008	84.96	15.6	7241		24.7	32.3	15743	79.87	48.2	22606	71.09
253	15-Dec-93	19200	7.08	134					1.24	8.48	24.4	11032	84.93	16.1	7257		25.4	32.7	15776	79.83	49.6	22655	71.03
254	22-Dec-93	18800	7.04	146					1.24	8.19	25.1	11057	84.89	16.5	7273		26.1	33.1	15809	79.78	51.1	22707	70.96
255	29-Dec-93	19200	7.28	154	280	3	19	62	1.25	7.90	25.8	11083	84.86	17.0	7290	0.294	26.9	33.5	15842	79.74	52.5	22759	70.90
256	05-Jan-94	19400	7.54	136					1.04	8.23	25.9	11109	84.82	17.1	7307		27.0	34.2	15877	79.70	53.0	22812	70.83
257	12-Jan-94	19000	7.34	187					0.83	8.55	26.1	11135	84.79	17.1	7324		27.2	34.9	15911	79.65	53.5	22865	70.76
258	19-Jan-94	20000	7.7	173					0.63	8.87	26.2	11161	84.75	17.2	7342		27.3	35.5	15947	79.61	54.0	22919	70.69
259	26-Jan-94	19300	7.71	173	280	1	22	63	0.42	9.20	26.3	11188	84.72	17.3	7359	0.335	27.4	36.2	15983	79.56	54.5	22974	70.62
260	02-Feb-94	19600	7.63	157					0.63	9.42	25.7	11214	84.68	16.9	7376		26.8	35.6	16019	79.52	53.0	23027	70.55
261	09-Feb-94	18900	7.59	174					0.84	9.64	25.1	11239	84.65	16.5	7392		26.2	35.0	16054	79.47	51.6	23078	70.49
262	16-Feb-94	19300	7.54	165					1.05	9.86	24.6	11263	84.61	16.1	7409		25.6	34.4	16088	79.43	50.1	23129	70.42
263	23-Feb-94	19400	7.67	168	320	3	24	57	1.26	10.09	24.0	11287	84.58	15.8	7424	0.404	25.0	33.8	16122	79.38	48.6	23177	70.36

* If value was below detection limit, 1/2 the detection limit is shown in italics and was used in subsequent calculations

Samatosum Mine Humidity Cell Data - Column 2 (Encapsulated 3 Layers)

Week No.	Date	Analytical Results: Leachate Recovered (mL)	Weekly pH (pH units)	Conductivity (umhos/cm)	Eh (mV)	Acidity (CaCO3 mg/L)*	Alkalinity (CaCO3 mg/L)*	Sulphate (SO4 mg/L)*	Acidity Production Rate (mg/kg/wk)**	Alkalinity Production Rate (mg/kg/wk)**	Sulphate Production: SO4 Production Rate (mg/kg/wk)**	Cumulative SO4 Production (mg/kg)	Remaining S (% of original)	By Surface Area: SO4 Production Rate (mg/m2/wk)**	Cumulative SO4 Production (mg/m2)	Molar Ratio: Alk /SO4	NP Consumption: Theoretical NP Consumption At pH 6 (mg/kg/wk)	Empirical Open-System NP Consumption At Measured pH (mg/kg/wk)	Cum NP Consumption Open-System (mg/kg/wk)	Remaining NP Open-System (%)	Theoretical Closed-System NP Consumption Above pH 6.5 (mg/kg/wk)	Cum NP Consumption Closed-System (mg/kg/wk)	Remaining NP Closed-System (%)
132	21-Aug-91	19800	7.9	322					0.64	10.05	41.2	7397	89.89	27.1	4866		42.9	52.4	10732	86.28	85.3	15271	80.47
133	28-Aug-91	19500	7.1	285					0.57	7.46	35.0	7432	89.85	23.0	4889		36.5	43.4	10775	86.22	72.3	15344	80.38
134	04-Sep-91	7500	7.5	438	282	3	30	177	0.49	4.87	28.8	7461	89.81	18.9	4907	0.163	30.0	34.3	10810	86.18	59.4	15403	80.30
135	11-Sep-91	19000	7.1	258					0.68	7.86	29.7	7491	89.77	19.5	4927		30.9	38.1	10848	86.13	61.1	15464	80.22
136	18-Sep-91	19500	7.7	260					0.87	10.84	30.6	7521	89.73	20.1	4947		31.8	41.8	10889	86.07	62.8	15527	80.14
137	25-Sep-91	19800	7.7	221					1.07	13.83	31.5	7553	89.68	20.7	4968		32.8	45.5	10935	86.02	64.5	15591	80.06
138	02-Oct-91	19400	7.9	232	180	3	40	77	1.26	16.81	32.4	7585	89.64	21.3	4989	0.499	33.7	49.3	10984	85.95	66.2	15658	79.98
139	09-Oct-91	19500	7.6	218	280				1.81	20.85	32.3	7617	89.59	21.2	5010		33.6	52.7	11037	85.89	65.5	15723	79.89
140	16-Oct-91	19300	7.7	219					2.36	24.89	32.2	7649	89.55	21.2	5031		33.6	56.1	11093	85.81	64.8	15788	79.81
141	23-Oct-91	19200	7.6	214					2.90	28.92	32.1	7682	89.51	21.1	5053		33.5	59.5	11152	85.74	64.0	15852	79.73
142	30-Oct-91	19300	7.6	218					3.45	32.96	32.1	7714	89.46	21.1	5074		33.4	62.9	11215	85.66	63.3	15915	79.65
143	06-Nov-91	19800	7.5	235	300	4	37		4.00	37.00	32.0	7746	89.42	21.0	5095		33.3	66.3	11282	85.57	62.6	15978	79.57
144	13-Nov-91	19700	7.3	212					3.42	31.81	31.9	7777	89.38	21.0	5116		33.2	61.6	11343	85.49	63.1	16041	79.49
145	20-Nov-91	19200	7.4	210					2.83	26.61	31.8	7809	89.33	20.9	5137		33.2	56.9	11400	85.42	63.5	16104	79.41
146	27-Nov-91	19500	7.7	195					2.25	21.42	31.8	7841	89.29	20.9	5158		33.1	52.3	11453	85.35	63.9	16168	79.32
147	04-Dec-91	19200	7.5	210	320	4	39	76	1.66	16.22	31.6	7873	89.24	20.8	5178	0.492	32.9	47.5	11500	85.29	64.2	16232	79.24
148	11-Dec-91	19500	7.5	208					1.67	14.90	29.9	7903	89.20	19.7	5198		31.2	44.4	11544	85.24	60.6	16293	79.16
149	18-Dec-91	19700	7.8	180					1.67	13.57	28.2	7931	89.17	18.6	5217		29.4	41.3	11586	85.18	57.1	16350	79.09
150	25-Dec-91	19300	7.6	155					1.68	12.25	26.5	7957	89.13	17.4	5234		27.6	38.2	11624	85.14	53.5	16404	79.02
151	01-Jan-92	19400	7.2	162	300	4	26	59	1.68	10.93	24.8	7982	89.10	16.3	5250	0.423	25.8	35.1	11659	85.09	50.0	16454	78.96
152	08-Jan-92	19300	7.0	180					1.57	10.48	25.5	8008	89.06	16.7	5267		26.5	35.4	11694	85.05	51.5	16505	78.89
153	15-Jan-92	19100	7.0	180					1.46	10.04	26.1	8034	89.03	17.2	5284		27.2	35.8	11730	85.00	53.0	16558	78.83
154	22-Jan-92	19700	7.4	162					1.36	9.59	26.8	8060	88.99	17.6	5302		27.9	36.1	11766	84.95	54.5	16613	78.76
155	29-Jan-92	19200	7.5	165	310	3	22	66	1.25	9.15	27.5	8088	88.95	18.1	5320	0.320	28.6	36.5	11803	84.91	55.9	16669	78.68
156	05-Feb-92	19400	7.1	170					1.15	8.99	27.1	8115	88.91	17.8	5338		28.2	36.0	11839	84.86	55.2	16724	78.61
157	12-Feb-92	19200	7.3	188					1.05	8.82	26.7	8142	88.88	17.5	5355		27.8	35.6	11874	84.82	54.5	16778	78.54
158	19-Feb-92	19700	7.2	165					0.95	8.66	26.3	8168	88.84	17.3	5373		27.4	35.1	11909	84.77	53.8	16832	78.48
159	26-Feb-92	19600	7.6	161	290	2	20	61	0.85	8.49	25.9	8194	88.81	17.0	5390	0.315	27.0	34.6	11944	84.73	53.1	16885	78.41
160	04-Mar-92	19000	7.4	170					0.84	8.33	27.9	8222	88.77	18.4	5408		29.1	36.6	11981	84.68	57.3	16943	78.33
161	11-Mar-92	19100	7.5	190					0.84	8.18	29.9	8252	88.73	19.7	5428		31.2	38.5	12019	84.63	61.5	17004	78.26
162	18-Mar-92	19400	7.9	175					0.83	8.02	31.9	8284	88.68	21.0	5449		33.3	40.4	12060	84.58	65.7	17070	78.17
163	25-Mar-92	19100	7.5	190	390	2	19	82	0.83	7.86	33.9	8318	88.64	22.3	5471	0.222	35.3	42.4	12102	84.52	69.9	17140	78.08
164	01-Apr-92	18000	7.3	225					0.93	8.60	34.5	8352	88.59	22.7	5494		35.9	43.6	12146	84.47	70.9	17210	77.99
165	08-Apr-92	19200	7.2	185					1.04	9.34	35.1	8387	88.54	23.1	5517		36.5	44.8	12190	84.41	72.0	17282	77.90
166	15-Apr-92	19000	7.4	200					1.14	10.08	35.6	8423	88.49	23.4	5540		37.1	46.0	12236	84.35	73.1	17356	77.81
167	22-Apr-92	19200	7.3	208	430	3	26	87	1.25	10.81	36.2	8459	88.44	23.8	5564	0.287	37.7	47.3	12284	84.29	74.1	17430	77.71
168	29-Apr-92	19700	7.5	200					1.24	10.24	35.6	8495	88.40	23.4	5587		37.1	46.1	12330	84.23	73.0	17503	77.62
169	06-May-92	19400	7.6	200					1.23	9.66	35.1	8530	88.35	23.1	5610		36.6	45.0	12375	84.18	71.9	17575	77.53
170	13-May-92	19000	7.4	191					1.22	9.08	34.6	8564	88.30	22.7	5633		36.0	43.9	12419	84.12	70.8	17645	77.44
171	20-May-92	18700	7.3	204	380	3	21	84	1.22	8.51	34.0	8598	88.25	22.4	5656	0.240	35.4	42.7	12461	84.06	69.7	17715	77.35
172	27-May-92	19200	7.2	185					1.33	8.89	34.2	8632	88.21	22.5	5678		35.6	43.2	12505	84.01	69.9	17785	77.26
173	03-Jun-92	19100	7.3	210					1.44	9.27	34.4	8667	88.16	22.6	5701		35.8	43.6	12548	83.95	70.2	17855	77.17
174	10-Jun-92	19200	7.2	190					1.56	9.65	34.5	8701	88.11	22.7	5723		36.0	44.1	12592	83.90	70.4	17926	77.08
175	17-Jun-92	19300	7.2	220	420	4	24	83	1.67	10.03	34.7	8736	88.07	22.8	5746	0.278	36.1	44.5	12637	83.84	70.6	17996	76.99
176	24-Jun-92	19000	7.4	220					1.47	10.29	34.2	8770	88.02	22.5	5769		35.6	44.4	12681	83.78	69.8	18066	76.90
177	01-Jul-92	19200	7.5	240					1.26	10.54	33.7	8804	87.97	22.2	5791		35.1	44.4	12726	83.73	68.9	18135	76.81
178	08-Jul-92	19500	7.3	195					1.06	10.79	33.2	8837	87.93	21.8	5813		34.6	44.3	12770	83.67	68.1	18203	76.72
179	15-Jul-92	19600	7.4	182	400	2	26	77	0.85	11.04	32.7	8870	87.88	21.5	5834	0.324	34.1	44.2	12814	83.61	67.3	18270	76.64
180	22-Jul-92	19200	7.6	225					0.96	12.29	33.4	8903	87.84	22.0	5856		34.8	46.1	12860	83.55	68.6	18339	76.55
181	29-Jul-92	18600	7.5	232					1.07	13.54	34.1	8937	87.79	22.4	5879		35.5	48.0	12908	83.49	70.0	18409	76.46
182	05-Aug-92	12900	7.3	340					1.19	14.78	34.8	8972	87.74	22.9	5902		36.3	49.9	12958	83.43	71.4	18480	76.37
183	12-Aug-92	20000	7.4	205	380	3	37	82	1.30	16.03	35.5	9008	87.69	23.4	5925	0.433	37.0	51.7	13010	83.36	72.7	18553	76.27
184	19-Aug-92	19200	7.3	230					1.19	14.56	34.9	9043	87.65	22.9	5948		36.3	49.7	13060	83.30	71.5	18624	76.18
185	26-Aug-92	19400	7.43	225					1.07	13.08	34.2	9077	87.60	22.5	5970		35.7	47.7	13107	83.24	70.3	18695	76.09
186	02-Sep-92	19000	7.18	222					0.96	11.61	33.6	9110	87.55	22.1	5992		35.0	45.6	13153	83.18	69.0	18764	76.01
187	09-Sep-92	19500	7.4	186	460	2	24	78	0.84	10.14	33.0	9143	87.51	21.7	6014	0.295	34.3	43.6	13197	83.12	67.8	18832	75.92
188	16-Sep-92	19000	7.54	204					0.84	10.59	33.7	9177	87.46	22.1	6036		35.1	44.8	13241	83.07	69.3	18901	75.83
189	23-Sep-92	19200	7.43	187					0.83	11.04	34.4	9211	87.42	22.6	6059		35.8	46.0	13287	83.01	70.8	18972	75.74
190	30-Sep-92	19100	7.54	200					0.83	11.49	35.1	9247	87.37	23.1	6082		36.6	47.2	13335	82.95	72.3	19044	75.65
191	07-Oct-92	19000	7.62	222	460	2	29	87	0.82	11.94	35.8	9282	87.32	23.6	6106	0.320	37.3	48.4	13383	82.89	73.8	19118	75.55
192	14-Oct-92	19100	7.33	212					0.94	12.58	33.6	9316	87.27	22.1	6128		35.0	46.6	13430	82.83	69.0	19187	75.46
193	21-Oct-92	19700	7.52	208					1.05	13.22	31.3	9347	87.23	20.6	6148		32.7	44.8	13474	82.77	64.3	19251	75.38
194	28-Oct-92	19200	7.52	206					1.17	13.87	29.1	9376	87.19	19.2	6167		30.3	43.0	13518	82.71	59.5	19310	75.31
195	04-Nov-92	19700	7.46	180	480	3	34	63	1.28	14.51	26.9	9403	87.15	17.7	6185	0.518	28.0	41.2	13559	82.66	54.7	19365	75.24
196	11-Nov-92	19100	7.58	192					1.27	14.65	26.9	9430	87.12	17.7	6203		28.0	41.3	13600	82.61	54.7	19420	75.17
197	18-Nov-92	19500	7.5	182					1.27	14.78	26.8	9457	87.08	17.6	6220		27.9	41.5	13642	82.56	54.6	19474	75.10

* If values were reported as < detection limit, 1/2 the detection limit is shown in italics and was used in subsequent calculations

Samatosum Mine Humidity Cell Data -Column 2 (Encapsulated 3 Layers)

		Dissolved Metals*:								Metal Leach Rates:								Cumulative Metal Leach Rates:							
		Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc	Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc	Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc
Week No.	Date	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn
		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(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)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
0	8-Feb-89																	7.2E-03	4.5E-03	1.7E-03	2.7E-03	3.8E-04	7.0E-02	7.6E-05	1.1E-02
1	15-Feb-89	0.019	0.012	0.005	0.007	0.001		2E-04	0.03	7.2E-03	4.5E-03	1.7E-03	2.7E-03	3.8E-04		7.6E-05	1.1E-02	1.4E-02	9.1E-03	3.4E-03	5.3E-03	7.6E-04	1.4E-01	1.5E-04	2.3E-02
2	22-Feb-89	0.016	0.005	0.002	0.005	0.001		2E-04	0.04	6.6E-03	2.1E-03	6.2E-04	2.1E-03	4.1E-04		8.2E-05	1.6E-02	2.1E-02	1.1E-02	4.0E-03	7.4E-03	1.2E-03	2.1E-01	2.3E-04	3.9E-02
3	1-Mar-89	0.011	0.004	0.002	0.005	0.001		2E-04	0.06	4.6E-03	1.7E-03	6.3E-04	2.1E-03	4.2E-04		8.4E-05	2.5E-02	2.6E-02	1.3E-02	4.7E-03	9.5E-03	1.6E-03	2.8E-01	3.2E-04	6.4E-02
4	8-Mar-89	0.007	0.003	9E-04	0.008	0.001		2E-04	0.07	2.9E-03	1.2E-03	3.7E-04	3.3E-03	4.1E-04		8.2E-05	2.9E-02	2.8E-02	1.4E-02	5.0E-03	1.3E-02	2.0E-03	3.5E-01	4.0E-04	9.3E-02
5	15-Mar-89	0.007	0.002	0.001	0.005	0.001		2E-04	0.08	2.7E-03	7.8E-04	3.9E-04	1.9E-03	3.9E-04		7.8E-05	3.1E-02	3.1E-02	1.5E-02	5.4E-03	1.5E-02	2.4E-03	4.2E-01	4.8E-04	1.2E-01
6	22-Mar-89	0.005	0.002	7E-04	0.005	0.001		2E-04	0.07	2.1E-03	8.4E-04	2.9E-04	2.1E-03	4.2E-04		8.4E-05	2.9E-02	3.3E-02	1.6E-02	5.7E-03	1.7E-02	2.8E-03	4.9E-01	5.6E-04	1.5E-01
7	29-Mar-89																	3.4E-02	1.6E-02	6.1E-03	1.8E-02	3.0E-03	5.6E-01	6.0E-04	1.7E-01
8	5-Apr-89																	3.5E-02	1.7E-02	6.6E-03	1.9E-02	3.2E-03	6.3E-01	6.4E-04	1.9E-01
9	12-Apr-89																	3.5E-02	1.7E-02	7.0E-03	2.0E-02	3.4E-03	7.0E-01	6.9E-04	2.0E-01
10	19-Apr-89	0.002	0.002	0.003	0.005	0.001		2E-04	0.09	8.2E-04	8.2E-04	1.4E-03	2.1E-03	4.1E-04		8.2E-05	3.7E-02	3.6E-02	1.8E-02	8.4E-03	2.2E-02	3.8E-03	7.7E-01	7.7E-04	2.4E-01
11	26-Apr-89																	3.7E-02	1.9E-02	8.8E-03	2.3E-02	4.1E-03	8.4E-01	8.1E-04	2.6E-01
12	3-May-89																	3.8E-02	1.9E-02	9.3E-03	2.4E-02	4.3E-03	9.1E-01	8.5E-04	2.7E-01
13	10-May-89																	3.9E-02	2.0E-02	9.7E-03	2.5E-02	4.5E-03	9.8E-01	8.9E-04	2.9E-01
14	17-May-89	0.006	0.006	0.001	0.005	0.001		2E-04	0.06	2.5E-03	2.5E-03	4.2E-04	2.1E-03	4.2E-04		8.4E-05	2.5E-02	4.1E-02	2.3E-02	1.0E-02	2.7E-02	4.9E-03	1.1E+00	9.8E-04	3.1E-01
15	24-May-89																	4.3E-02	2.4E-02	1.0E-02	2.9E-02	5.1E-03	1.1E+00	1.0E-03	3.3E-01
16	31-May-89																	4.4E-02	2.4E-02	1.1E-02	3.1E-02	5.3E-03	1.2E+00	1.1E-03	3.4E-01
17	7-Jun-89																	4.5E-02	2.5E-02	1.1E-02	3.3E-02	5.5E-03	1.3E+00	1.1E-03	3.6E-01
18	14-Jun-89	0.005	0.002	0.001	0.015	0.001		2E-04	0.09	2.1E-03	8.2E-04	4.5E-04	6.2E-03	4.1E-04		8.2E-05	3.7E-02	4.7E-02	2.6E-02	1.1E-02	4.0E-02	5.9E-03	1.3E+00	1.2E-03	4.0E-01
19	21-Jun-89																	4.8E-02	2.6E-02	1.1E-02	4.2E-02	6.1E-03	1.4E+00	1.2E-03	4.1E-01
20	28-Jun-89																	4.9E-02	2.7E-02	1.2E-02	4.4E-02	6.3E-03	1.5E+00	1.3E-03	4.2E-01
21	5-Jul-89																	5.0E-02	2.7E-02	1.2E-02	4.6E-02	6.5E-03	1.5E+00	1.3E-03	4.3E-01
22	12-Jul-89	0.005	0.001	5E-04	0.005	0.001		2E-04	0.03	2.1E-03	4.2E-04	2.1E-04	2.1E-03	4.2E-04		8.3E-05	1.2E-02	5.2E-02	2.7E-02	1.2E-02	4.8E-02	7.0E-03	1.6E+00	1.4E-03	4.5E-01
23	19-Jul-89																	5.3E-02	2.8E-02	1.2E-02	4.9E-02	7.2E-03	1.7E+00	1.4E-03	4.6E-01
24	26-Jul-89																	5.4E-02	2.8E-02	1.3E-02	5.0E-02	7.4E-03	1.8E+00	1.5E-03	4.7E-01
25	2-Aug-89																	5.5E-02	2.8E-02	1.3E-02	5.1E-02	7.6E-03	1.8E+00	1.5E-03	4.9E-01
26	9-Aug-89	0.005	0.001	0.004	0.005	0.001		2E-04	0.1	2.1E-03	4.2E-04	1.7E-03	2.1E-03	4.2E-04		8.4E-05	4.2E-02	5.7E-02	2.9E-02	1.5E-02	5.3E-02	8.0E-03	1.9E+00	1.6E-03	5.3E-01
27	16-Aug-89																	5.8E-02	2.9E-02	1.6E-02	5.7E-02	8.2E-03	2.0E+00	1.6E-03	5.5E-01
28	23-Aug-89																	5.9E-02	2.9E-02	1.6E-02	6.1E-02	8.4E-03	2.0E+00	1.7E-03	5.6E-01
29	30-Aug-89																	6.0E-02	2.9E-02	1.7E-02	6.6E-02	8.6E-03	2.1E+00	1.7E-03	5.8E-01
30	6-Sep-89	0.005	0.001	0.001	0.035	0.001		2E-04	0.07	2.1E-03	4.2E-04	5.0E-04	1.5E-02	4.2E-04		8.4E-05	2.9E-02	6.3E-02	3.0E-02	1.7E-02	8.0E-02	9.1E-03	2.2E+00	1.8E-03	6.1E-01
31	13-Sep-89																	6.3E-02	3.0E-02	1.7E-02	8.3E-02	9.2E-03	2.3E+00	1.8E-03	6.2E-01
32	20-Sep-89																	6.3E-02	3.0E-02	1.8E-02	8.6E-02	9.3E-03	2.3E+00	1.9E-03	6.3E-01
33	27-Sep-89																	6.4E-02	3.0E-02	1.8E-02	8.9E-02	9.4E-03	2.4E+00	1.9E-03	6.3E-01
34	4-Oct-89																	6.4E-02	3.0E-02	1.8E-02	9.1E-02	9.5E-03	2.5E+00	1.9E-03	6.4E-01
35	11-Oct-89																	6.5E-02	3.0E-02	1.8E-02	9.4E-02	9.6E-03	2.5E+00	1.9E-03	6.5E-01
36	18-Oct-89																	6.5E-02	3.1E-02	1.8E-02	9.7E-02	9.7E-03	2.6E+00	1.9E-03	6.5E-01
37	25-Oct-89																	6.5E-02	3.1E-02	1.8E-02	1.0E-01	9.8E-03	2.7E+00	2.0E-03	6.6E-01
38	1-Nov-89	0.003	0.002	0.002	0.018	0.001		2E-04	0.06	1.3E-03	8.4E-04	6.3E-04	7.6E-03	4.2E-04		8.4E-05	2.5E-02	6.7E-02	3.2E-02	1.9E-02	1.1E-01	1.0E-02	2.7E+00	2.0E-03	6.9E-01
39	8-Nov-89																	6.7E-02	3.2E-02	2.6E-02	1.1E-01	1.0E-02	2.8E+00	2.1E-03	7.0E-01
40	15-Nov-89																	6.8E-02	3.2E-02	3.4E-02	1.1E-01	1.1E-02	2.9E+00	2.1E-03	7.1E-01
41	22-Nov-89																	6.8E-02	3.2E-02	4.1E-02	1.2E-01	1.1E-02	3.0E+00	2.2E-03	7.2E-01
42	29-Nov-89	0.002	0.001	0.07	0.01	0.001		2E-04	0.06	8.4E-04	4.2E-04	2.9E-02	4.2E-03	4.2E-04		8.4E-05	2.5E-02	6.9E-02	3.3E-02	7.1E-02	1.2E-01	1.1E-02	3.0E+00	2.3E-03	7.5E-01
43	6-Dec-89																	7.0E-02	3.3E-02	8.5E-02	1.2E-01	1.1E-02	3.1E+00	2.3E-03	7.6E-01
44	13-Dec-89																	7.0E-02	3.3E-02	1.0E-01	1.3E-01	1.2E-02	3.2E+00	2.3E-03	7.7E-01
45	20-Dec-89																	7.0E-02	3.4E-02	1.1E-01	1.3E-01	1.2E-02	3.2E+00	2.4E-03	7.9E-01
46	27-Dec-89	0.002	0.001	0.07	0.032	0.001		2E-04	0.06	8.3E-04	4.2E-04	2.9E-02	1.3E-02	4.2E-04		8.3E-05	2.5E-02	7.1E-02	3.4E-02	1.4E-01	1.5E-01	1.2E-02	3.3E+00	2.5E-03	8.1E-01
47	3-Jan-90																	7.2E-02	3.4E-02	1.5E-01	1.5E-01	1.3E-02	3.4E+00	2.5E-03	8.2E-01
48	10-Jan-90																	7.2E-02	3.4E-02	1.6E-01	1.5E-01	1.3E-02	3.4E+00	2.5E-03	8.3E-01
49	17-Jan-90																	7.2E-02	3.5E-02	1.7E-01	1.6E-01	1.3E-02	3.5E+00	2.6E-03	8.4E-01
50	24-Jan-90	0.002	0.001	5E-04	0.005	0.001		2E-04	0.05	8.4E-04	4.2E-04	2.1E-04	2.1E-03	4.2E-04		8.4E-05	2.1E-02	7.3E-02	3.5E-02	1.7E-01	1.6E-01	1.3E-02	3.6E+00	2.7E-03	8.7E-01
51	31-Jan-90																	7.4E-02	3.5E-02	1.7E-01	1.6E-01	1.4E-02	3.7E+00	2.7E-03	8.8E-01
52	7-Feb-90																	7.4E-02	3.5E-02	1.7E-01	1.6E-01	1.4E-02	3.7E+00	2.8E-03	8.9E-01
53	14-Feb-90																	7.5E-02	3.6E-02	1.7E-01	1.6E-01	1.4E-02	3.8E+00	2.8E-03	9.0E-01
54	21-Feb-90	0.002	0.001	5E-04	0.005	0.001		2E-04	0.05	8.2E-04	4.1E-04	2.1E-04	2.1E-03	4.1E-04		8.2E-05	2.1E-02	7.5E-02	3.6E-02	1.7E-01	1.7E-01	1.4E-02	3.9E+00	2.9E-03	9.2E-01
55	28-Feb-90																	7.6E-02	3.6E-02	1.7E-01	1.7E-01	1.5E-02	3.9E+00	3.0E-03	9.3E-01
56	7-Mar-90																	7.6E-02	3.6E-02	1.7E-01	1.7E-01	1.5E-02	4.0E+00	3.1E-03	9.4E-01
57	14-Mar-90																	7.7E-02	3.7E-02	1.7E-01	1.7E-01	1.5E-02	4.1E+00	3.2E-03	9.5E-01
58	21-Mar-90	0.002	0.001	0.001	0.005	0.001		0.001	0.05	8.3E-04	4.1E-04	5.8E-04	2.1E-03	4.1E-04		4.1E-04	2.1E-02	7.7E-02	3.7E-02	1.7E-01	1.7E-01	1.5E-02	4.2E+00	3.7E-03	9.7E-01
59	28-Mar-90																	7.8E-02	3.7E-02	1.7E-01	1.7E-01	1.6E-02	4.2E+00	3.9E-03	9.8E-01
60	4-Apr-90																	7.8E-02	3.7E-02	1.7E-01	1.7E-01	1.6E-02	4.3E+00	4.1E-03	9.9E-01
61	11-Apr-90																	7.9E-02	3.8E-02	1.7E-01	1.7E-01	1.7E-02	4.4E+00	4.3E-03	1.0E+00
62	18-Apr-90	0.002	0.001	0.002	0.005	0.003		0.001	0.04	8.2E-04	4.1E-04	9.4E-04	2.0E-03	1.2E-03		4.1E-04	1.6E-02	7.9E-02	3.8E-02	1.7E-01	1.8E-01	1.8E-02	4.4E+00	4.7E-03	1.0E+00
63	25-Apr-90																	8.0E-02	3.8E-02	1.7E-01	1.8E-01	1.8E-02	4.5E+00	4.9E-03	1.0E+00
64	2-May-90																	8.0E-02	3.8E-02	1.7E-01	1.8E-01	1.9E-02	4.6E+00	5.1E-03	1.0E+00
65	9-May-90																	8.1E-02	3.9E-02	1.7E-01	1.8E-01	1.9E-02	4.6E+00	5.3E-03	1.0E+00

** If values were reported as < detection limit, 1/2 the detection limit is shown in italics and was used in subsequent calculations.*

Samatosum Mine Humidity Cell **Data** -Column **2** (Encapsulated 3 Layers)

		Analytical Results:									Sulphate Production:			By Surface Area:		Molar Ratio:	NP Consumption:						
Week No.	Date	Leachate Recovered (mL)	Weekly pH (pH units)	Conductivity (umhos/cm)	Eh (mV)	Acidity (CaCO3 mg/L)*	Alkalinity (CaCO3 mg/L)*	Sulphate (SO4 mg/L)*	Acidity Production Rate (mg/kg/wk)**	Alkalinity Production Rate (mg/kg/wk)**	SO4 Production Rate (mg/kg/wk)**	Cumulative SO4 Production (mg/kg)	Remaining S (% of original)	SO4 Production Rate (mg/m2/wk)**	Cumulative SO4 Production (mg/m2)	Alk /SO4	Theoretical NP Consumption At pH 6 (mg/kg/wk)	Empirical Open-System NP Consumption At Measured pH (mg/kg/wk)	Cum NP Consumption Open-System (mg/kg/wk)	Remaining NP Open-System (%)	Theoretical Closed-System NP Consumption Above pH 6.5 (mg/kg/wk)	Cum NP Consumption Closed-System (mg/kg/wk)	Remaining NP Closed-System (%)
264	02-Mar-94	19400	7.41	168					1.25	9.52	24.4	11312	84.55	16.1	7440		25.5	33.7	16156	79.34	49.7	23227	70.30
265	09-Mar-94	18900	7.56	182					1.25	8.95	24.9	11337	84.51	16.4	7457		26.0	33.7	16189	79.30	50.7	23278	70.23
266	16-Mar-94	19200	7.44	176					1.24	8.39	25.4	11362	84.48	16.7	7473		26.5	33.6	16223	79.25	51.8	23329	70.17
267	23-Mar-94	19000	7.54	179	320	3	19	63	1.23	7.82	25.9	11388	84.44	17.1	7491	0.289	27.0	33.6	16257	79.21	52.8	23382	70.10
268	30-Mar-94	18800	7.5	165					1.54	7.41	25.7	11414	84.41	16.9	7507		26.8	32.7	16289	79.17	52.1	23434	70.03
269	06-Apr-94	18900	7.05	168					1.85	7.00	25.5	11439	84.37	16.8	7524		26.6	31.7	16321	79.13	51.3	23485	69.97
270	13-Apr-94	18900	7.37	184					2.16	6.59	25.3	11465	84.34	16.7	7541		26.4	30.8	16352	79.09	50.6	23536	69.90
271	20-Apr-94	19000	7.32	168	370	6	15	61	2.47	6.17	25.1	11490	84.30	16.5	7557	0.236	26.2	29.9	16382	79.05	49.8	23586	69.84
272	27-Apr-94	19400	7.33	143					2.06	6.20	25.8	11515	84.27	17.0	7574		26.9	31.0	16413	79.01	51.8	23638	69.77
273	04-May-94	19300	7.08	173					1.65	6.22	26.6	11542	84.23	17.5	7592		27.7	32.2	16445	78.97	53.7	23691	69.70
274	11-May-94	19300	7.26	145					1.24	6.25	27.3	11569	84.19	17.9	7610		28.4	33.4	16478	78.93	55.6	23747	69.63
275	18-May-94	19300	7.41	169	400	2	15	67	0.84	6.27	28.0	11597	84.16	18.4	7628	0.215	29.2	34.6	16513	78.88	57.5	23804	69.56
276	25-May-94	19200	7.27	192					0.83	5.94	28.1	11625	84.12	18.5	7647		29.3	34.4	16547	78.84	57.7	23862	69.49
277	01-Jun-94	18700	7.67	207					0.83	5.61	28.2	11654	84.08	18.6	7665		29.4	34.2	16582	78.80	57.9	23920	69.41
278	08-Jun-94	19000	7.27	193					0.83	5.27	28.3	11682	84.04	18.6	7684		29.5	33.9	16616	78.75	58.1	23978	69.34
279	15-Jun-94	19000	7.37	183	250	2	12	69	0.82	4.94	28.4	11710	84.00	18.7	7703	0.167	29.6	33.7	16649	78.71	58.3	24037	69.26
280	22-Jun-94	18900	7.28	210					0.82	5.25	28.1	11738	83.96	18.5	7721		29.3	33.7	16683	78.67	57.7	24094	69.19
281	29-Jun-94	19300	7.5	187					0.82	5.56	27.8	11766	83.93	18.3	7739		28.9	33.7	16717	78.62	57.1	24151	69.12
282	06-Jul-94	19500	7.36	183					0.82	5.87	27.5	11794	83.89	18.1	7757		28.6	33.7	16750	78.58	56.4	24208	69.04
283	13-Jul-94	19000	7.45	174	265	2	15	66	0.82	6.17	27.2	11821	83.85	17.9	7775	0.218	28.3	33.6	16784	78.54	55.8	24264	68.97
284	20-Jul-94	19000	7.37	173					0.82	6.17	27.2	11848	83.81	17.9	7793		28.3	33.6	16818	78.49	55.8	24319	68.90
285	27-Jul-94	15300	7.15	230					0.82	6.17	27.2	11875	83.78	17.9	7811		28.3	33.6	16851	78.45	55.8	24375	68.83
286	03-Aug-94	19100	7.05	178					0.82	6.17	27.2	11902	83.74	17.9	7829		28.3	33.6	16885	78.41	55.8	24431	68.76
Maximum		20000	8.30	936	542	13	102.0	445	5.29	38.67	168.7	11902	99.77	111.0	7829	0.896	175.7	212.1	16885	99.73	349.2	24431	99.55
Minimum		7500	6.30	125	180	0	12.0	56	0.00	4.87	23.1	169	83.74	15.2	111	0.163	24.0	29.9	212	78.41	46.8	349	68.76
Mean		19107	7.52	254	369	3	43.7	118	1.27	16.91	41.5	7305	90.02	27.3	4805	0.386	43.2	58.8	10505	86.57	85.1	15044	80.76
Median		19200	7.50	222	380	3	36.0	87	1.24	12.72	33.9	7746	89.42	22.3	5095	0.335	35.3	46.1	11282	85.57	69.6	15978	79.57
Mean Last 8 Weeks		19133	7.28	170	367	4	21.7	67	1.58	8.91	27.6	10837	85.19	18.2	7128	0.316	28.8	36.1	15507	80.17	55.9	22262	71.53
75% Remaining (Wks)													517							360			199
50% Remaining (Wks)													1179							901			548
25% Remaining (Wks)													1841							1443			898
0% Remaining (Wks)													2503							1985			1247

** If measured sulphate, alkalinity and/or acidity values were unavailable, data was interpolated from existing data and used in subsequent equations.

* If values were reported as < detection limit, 1/2 the detection limit is shown in italics and was used in subsequent calculations

Samatosum Mine Humidity **Cell** Data **- Column** 2 (Encapsulated 3 **Layers)**

Dissolved Metals*:

Week No.	Date	Antimony D-Sb (mg/L)	Arsenic D-As (mg/L)	Copper D-Cu (mg/L)	Iron D-Fe (mg/L)	Lead D-Pb (mg/L)	Manganese D-Mn (mg/L)	Silver D-Ag (mg/L)	Zinc D-Zn (mg/L)
132	21-Aug-91								
133	28-Aug-91								
134	4-Sep-91		0.005	0.011	0.01		0.031	0.001	0.01
135	11-Sep-91								
136	18-Sep-91								
137	25-Sep-91								
138	2-Oct-91		0.002	0.001	0.015		0.0054	0.001	0.01
139	9-Oct-91								
140	16-Oct-91								
141	23-Oct-91								
142	30-Oct-91								
143	6-Nov-91		0.003	*0.002*	0.06		*0.0032*	*0.001*	*0.01*
144	13-Nov-91								
145	20-Nov-91								
146	27-Nov-91								
147	4-Dec-91		0.002	0.003	0.018		0.0013	0.001	0.01
148	11-Dec-91								
149	18-Dec-91								
150	25-Dec-91								
151	1-Jan-92		0.001	5E-04	0.005		0.0024	0.001	0.01
152	8-Jan-92								
153	15-Jan-92								
154	22-Jan-92								
155	29-Jan-92		0.001	6E-04	*0.05*		0.003	0.001	0.01
156	5-Feb-92								
157	12-Feb-92								
158	19-Feb-92								
159	26-Feb-92		0.001	0.004	*005*		0.002	0.001	*0.01*
160	4-Mar-92								
161	11-Mar-92								
162	18-Mar-92								
163	25-Mar-92		0.001	5E-04	0.05		0.002	0.001	0.01
164	1-Apr-92								
165	8-Apr-92								
166	15-Apr-92								
167	22-Apr-92		0.001	*0.001*	0.05		*0.002*	*0.001*	*0.01*
168	29-Apr-92								
169	6-May-92								
170	13-May-92								
171	20-May-92		0.003	7E-04	*0.05*		*0.003*	*0.001*	*0.01*
172	27-May-92								
173	3-Jun-92								
174	10-Jun-92								
175	17-Jun-92		*0.004*	*5E-04*	*0.05*		*0.002*	0.001	*0.01*
176	24-Jun-92								
177	1-Jul-92								
178	8-Jul-92								
179	15-Jul-92		*0.003*	*0.603*	0.05		*0.001*	0.001	*0.02*
180	22-Jul-92								
181	29-Jul-92								
182	5-Aug-92								
183	12-Aug-92		0.003	5E-04	*0.05*		*0.001*	*0.001*	*0.01*
184	19-Aug-92								
185	26-Aug-92								
186	2-Sep-92								
187	9-Sep-92		*0.002*	5E-04	*0.05*		*0.001*	0.001	*0*
188	16-Sep-92								
189	23-Sep-92								
190	30-Sep-92								
191	7-Oct-92		*0.003*	0.001	*0.05*		*0.001*	*0.001*	*0.01*
192	14-Oct-92								
193	21-Oct-92								
194	28-Oct-92								
195	4-Nov-92		0.003	5E-04	0.05		*0.001*	*0.001*	*0*
196	11-Nov-92								
197	18-Nov-92								

Metal Leach Rates:

Week No.	Date	Antimony D-Sb (mg/kg/wk)	Arsenic D-As (mg/kg/wk)	Copper D-Cu (mg/kg/wk)	Iron D-Fe (mg/kg/wk)	Lead D-Pb (mg/kg/wk)	Manganese D-Mn (mg/kg/wk)	Silver D-Ag (mg/kg/wk)	Zinc D-Zn (mg/kg/wk)
132	21-Aug-91								
133	28-Aug-91								
134	4-Sep-91		8.1E-04	1.8E-03	1.6E-03		5.0E-03	1.6E-04	1.2E-03
135	11-Sep-91								
136	18-Sep-91								
137	25-Sep-91								
138	2-Oct-91		8.4E-04	5.9E-04	6.3E-03		2.3E-03	4.2E-04	2.3E-03
139	9-Oct-91								
140	16-Oct-91								
141	23-Oct-91								
142	30-Oct-91								
143	6-Nov-91		1.3E-03	8.6E-04	2.6E-02		1.4E-03	4.3E-04	2.4E-03
144	13-Nov-91								
145	20-Nov-91								
146	27-Nov-91								
147	4-Dec-91		8.3E-04	1.1E-03	7.5E-03		5.4E-04	4.2E-04	3.1E-03
148	11-Dec-91								
149	18-Dec-91								
150	25-Dec-91								
151	1-Jan-92		4.2E-04	2.1E-04	2.1E-03		1.0E-03	4.2E-04	2.8E-03
152	8-Jan-92								
153	15-Jan-92								
154	22-Jan-92								
155	29-Jan-92		4.2E-04	2.5E-04	2.1E-02		1.2E-03	4.2E-04	2.7E-03
156	5-Feb-92								
157	12-Feb-92								
158	19-Feb-92								
159	26-Feb-92		4.2E-04	1.8E-03	2.1E-02		8.5E-04	4.2E-04	2.2E-03
160	4-Mar-92								
161	11-Mar-92								
162	18-Mar-92								
163	25-Mar-92		4.1E-04	2.1E-04	2.1E-02		8.3E-04	4.1E-04	3.1E-03
164	1-Apr-92								
165	8-Apr-92								
166	15-Apr-92								
167	22-Apr-92		4.2E-04	4.6E-04	2.1E-02		8.3E-04	4.2E-04	2.5E-03
168	29-Apr-92								
169	6-May-92								
170	13-May-92								
171	20-May-92		1.2E-03	2.8E-04	2.0E-02		1.2E-03	4.1E-04	2.2E-03
172	27-May-92								
173	3-Jun-92								
174	10-Jun-92								
175	17-Jun-92		1.7E-03	2.1E-04	2.1E-02		8.4E-04	4.2E-04	3.6E-03
176	24-Jun-92								
177	1-Jul-92								
178	8-Jul-92								
179	15-Jul-92		1.3E-03	1.1E-03	2.1E-02		4.2E-04	4.2E-04	1.0E-02
180	22-Jul-92								
181	29-Jul-92								
182	5-Aug-92								
183	12-Aug-92		1.3E-03	2.2E-04	2.2E-02		4.3E-04	4.3E-04	*3.9503*
184	19-Aug-92								
185	26-Aug-92								
186	2-Sep-92								
187	9-Sep-92		8.4E-04	2.1E-04	2.1E-02		4.2E-04	4.2E-04	1.8E-03
188	16-Sep-92								
189	23-Sep-92								
190	30-Sep-92								
191	7-Oct-92		1.2E-03	4.1E-04	2.1E-02		4.1E-04	4.1E-04	3.2E-03
192	14-Oct-92								
193	21-Oct-92								
194	28-Oct-92								
195	4-Nov-92		1.3E-03	2.1E-04	2.1E-02		4.3E-04	4.3E-04	1.4E-03
196	11-Nov-92								
197	18-Nov-92								

Cumulative Metal Leach Rates:

Week No.	Date	Antimony D-Sb (mg/kg)	Arsenic D-As (mg/kg)	Copper D-Cu (mg/kg)	Iron D-Fe (mg/kg)	Lead D-Pb (mg/kg)	Manganese D-Mn (mg/kg)	Silver D-Ag (mg/kg)	Zinc D-Zn (mg/kg)
132	21-Aug-91	1.3E-01	6.5E-02	1.1E+00	3.2E-01	7.0E-02	6.4E+00	2.3E-02	1.4E+00
133	28-Aug-91	1.4E-01	6.6E-02	1.1E+00	3.2E-01	7.1E-02	6.4E+00	2.3E-02	1.4E+00
134	4-Sep-91	1.4E-01	6.7E-02	1.1E+00	3.2E-01	7.2E-02	6.4E+00	2.3E-02	1.4E+00
135	11-Sep-91	1.4E-01	6.7E-02	1.1E+00	3.2E-01	7.3E-02	6.4E+00	2.3E-02	1.4E+00
136	18-Sep-91	1.4E-01	6.8E-02	1.1E+00	3.2E-01	7.4E-02	6.4E+00	2.3E-02	1.4E+00
137	25-Sep-91	1.4E-01	6.8E-02	1.1E+00	3.3E-01	7.4E-02	6.4E+00	2.3E-02	1.4E+00
138	2-Oct-91	1.4E-01	6.9E-02	1.1E+00	3.3E-01	7.5E-02	6.4E+00	2.4E-02	1.4E+00
139	9-Oct-91	1.4E-01	6.9E-02	1.1E+00	3.4E-01	7.6E-02	6.4E+00	2.4E-02	1.4E+00
140	16-Oct-91	1.4E-01	7.0E-02	1.1E+00	3.4E-01	7.7E-02	6.4E+00	2.4E-02	1.4E+00
141	23-Oct-91	1.4E-01	7.0E-02	1.1E+00	3.5E-01	7.8E-02	6.4E+00	2.4E-02	1.4E+00
142	30-Oct-91	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
143	6-Nov-91	1.4E-01	7.2E-02	1.1E+00	3.8E-01	7.9E-02	6.4E+00	2.5E-02	1.4E+00
144	13-Nov-91	1.4E-01	7.2E-02	1.1E+00	3.9E-01	8.0E-02	6.4E+00	2.5E-02	1.4E+00
145	20-Nov-91	1.5E-01	7.3E-02	1.1E+00	4.0E-01	8.1E-02	6.4E+00	2.5E-02	1.4E+00
146	27-Nov-91	1.5E-01	7.3E-02	1.1E+00	4.1E-01	8.2E-02	6.4E+00	2.6E-02	1.4E+00
147	4-Dec-91	1.5E-01	7.4E-02	1.1E+00	4.2E-01	8.3E-02	6.4E+00	2.6E-02	1.4E+00
148	11-Dec-91	1.5E-01	7.4E-02	1.1E+00	4.2E-01	8.4E-02	6.4E+00	2.6E-02	1.4E+00
149	18-Dec-91	1.5E-01	7.5E-02	1.1E+00	4.2E-01	8.4E-02	6.4E+00	2.6E-02	1.4E+00
150	25-Dec-91	1.5E-01	7.5E-02	1.1E+00	4.2E-01	8.5E-02	6.4E+00	2.7E-02	1.4E+00
151	1-Jan-92	1.5E-01	7.6E-02	1.1E+00	4.2E-01	8.6E-02	6.4E+00	2.7E-02	1.4E+00
152	8-Jan-92	1.5E-01	7.6E-02	1.1E+00	4.3E-01	8.7E-02	6.4E+00	2.7E-02	1.4E+00
153	15-Jan-92	1.5E-01	7.6E-02	1.1E+00	4.4E-01	8.8E-02	6.4E+00	2.7E-02	1.4E+00
154	22-Jan-92	1.5E-01	[illegible]	1.1E+00	[illegible]	[illegible]	6.4E+00	2.8E-02	1.4E+00
155	29-Jan-92	1.5E-01	7.7E-02	1.1E+00	4.6E-01	8.9E-02	6.4E+00	2.8E-02	1.4E+00
156	5-Feb-92	1.5E-01	7.7E-02	1.1E+00	4.7E-01	9.0E-02	6.4E+00	2.8E-02	1.4E+00
157	12-Feb-92	1.6E-01	7.7E-02	1.1E+00	4.8E-01	9.1E-02	6.4E+00	2.8E-02	1.4E+00
158	19-Feb-92	1.6E-01	7.7E-02	1.1E+00	4.9E-01	9.2E-02	6.4E+00	2.9E-02	1.4E+00
159	26-Feb-92	1.6E-01	7.8E-02	1.1E+00	5.2E-01	9.3E-02	6.4E+00	2.9E-02	1.4E+00
160	4-Mar-92	1.6E-01	7.8E-02	1.1E+00	5.3E-01	9.3E-02	6.4E+00	2.9E-02	1.4E+00
161	11-Mar-92	1.6E-01	7.8E-02	1.1E+00	5.4E-01	9.4E-02	6.4E+00	3.0E-02	1.4E+00
162	18-Mar-92	1.6E-01	7.8E-02	1.1E+00	5.5E-01	9.5E-02	6.4E+00	3.0E-02	1.4E+00
163	25-Mar-92	1.6E-01	7.9E-02	1.1E+00	5.7E-01	9.6E-02	6.4E+00	3.0E-02	1.4E+00
164	1-Apr-92	1.6E-01	7.9E-02	1.1E+00	5.8E-01	9.7E-02	6.4E+00	3.0E-02	1.4E+00
165	8-Apr-92	1.6E-01	7.9E-02	1.1E+00	5.9E-01	9.8E-02	6.4E+00	3.1E-02	1.4E+00
166	15-Apr-92	1.6E-01	7.9E-02	1.1E+00	6.0E-01	9.8E-02	6.4E+00	3.1E-02	1.4E+00
167	22-Apr-92	1.6E-01	8.0E-02	1.1E+00	6.2E-01	9.9E-02	6.4E+00	3.1E-02	1.4E+00
168	29-Apr-92	1.6E-01	8.0E-02	1.1E+00	6.3E-01	1.0E-01	6.4E+00	3.1E-02	1.4E+00
169	6-May-92	1.7E-01	8.1E-02	1.1E+00	6.4E-01	1.0E-01	6.4E+00	3.2E-02	1.4E+00
170	13-May-92	1.7E-01	8.1E-02	1.1E+00	6.5E-01	1.0E-01	6.4E+00	3.2E-02	1.4E+00
171	20-May-92	1.7E-01	8.2E-02	1.1E+00	6.7E-01	1.0E-01	6.4E+00	3.2E-02	1.4E+00
172	27-May-92	1.7E-01	8.3E-02	1.1E+00	6.8E-01	1.0E-01	6.4E+00	3.2E-02	1.4E+00
173	3-Jun-92	1.7E-01	8.4E-02	1.1E+00	6.9E-01	1.0E-01	6.4E+00	3.3E-02	1.4E+00
174	10-Jun-92	1.7E-01	8.4E-02	1.1E+00	7.0E-01	1.1E-01	6.4E+00	3.3E-02	1.4E+00
175	17-Jun-92	1.7E-01	8.6E-02	1.1E+00	7.2E-01	1.1E-01	6.4E+00	3.3E-02	1.4E+00
176	24-Jun-92	1.7E-01	8.7E-02	1.1E+00	7.3E-01	1.1E-01	6.4E+00	3.3E-02	1.5E+00
177	1-Jul-92	1.7E-01	8.7E-02	1.1E+00	7.4E-01	1.1E-01	6.4E+00	3.4E-02	1.5E+00
178	8-Jul-92	1.7E-01	8.8E-02	1.1E+00	7.5E-01	1.1E-01	6.4E+00	3.4E-02	1.5E+00
179	15-Jul-92	1.7E-01	8.9E-02	1.1E+00	7.8E-01	1.1E-01	6.4E+00	3.4E-02	1.5E+00
180	22-Jul-92	1.7E-01	9.0E-02	1.1E+00	7.9E-01	1.1E-01	6.4E+00	3.4E-02	1.5E+00
181	29-Jul-92	1.8E-01	9.1E-02	1.1E+00	8.0E-01	1.1E-01	6.4E+00	3.5E-02	1.5E+00
182	5-Aug-92	1.8E-01	9.1E-02	1.1E+00	8.1E-01	1.1E-01	6.4E+00	3.5E-02	1.5E+00
183	12-Aug-92	1.8E-01	9.3E-02	1.1E+00	8.3E-01	1.1E-01	6.4E+00	3.5E-02	1.5E+00
184	19-Aug-92	1.8E-01	9.3E-02	1.1E+00	8.4E-01	1.1E-01	6.4E+00	3.6E-02	1.5E+00
185	26-Aug-92	1.8E-01	9.4E-02	1.1E+00	8.5E-01	1.1E-01	6.4E+00	3.6E-02	1.5E+00
186	2-Sep-92	1.8E-01	9.4E-02	1.1E+00	8.6E-01	1.2E-01	6.4E+00	3.6E-02	1.5E+00
187	9-Sep-92	1.6E-01	9.5E-02	1.1E+00	8.8E-01	1.2E-01	6.4E+00	3.6E-02	1.5E+00
188	16-Sep-92	1.8E-01	9.6E-02	1.1E+00	8.9E-01	1.2E-01	6.4E+00	3.7E-02	1.5E+00
189	23-Sep-92	1.8E-01	9.6E-02	1.1E+00	9.0E-01	1.2E-01	6.4E+00	3.7E-02	1.5E+00
190	30-Sep-92	1.8E-01	9.7E-02	1.1E+00	9.1E-01	1.2E-01	6.4E+00	3.7E-02	1.5E+00
191	7-Oct-92	1.8E-01	9.8E-02	1.1E+00	9.3E-01	1.2E-01	6.4E+00	3.7E-02	1.5E+00
192	14-Oct-92	1.8E-01	9.9E-02	1.1E+00	9.4E-01	1.2E-01	6.4E+00	3.8E-02	1.5E+00
193	21-Oct-92	1.9E-01	9.9E-02	1.1E+00	9.5E-01	1.2E-01	6.4E+00	3.8E-02	1.5E+00
194	28-Oct-92	1.9E-01	1.0E-01	1.1E+00	9.7E-01	1.2E-01	6.4E+00	3.8E-02	1.5E+00
195	4-Nov-92	1.9E-01	1.0E-01	1.1E+00	9.9E-01	1.2E-01	6.4E+00	3.9E-02	1.5E+00
196	11-Nov-92	1.9E-01	1.0E-01	1.1E+00	1.0E+00	1.2E-01	6.4E+00	3.9E-02	1.5E+00
197	18-Nov-92	1.9E-01	1.0E-01	1.1E+00	1.0E+00	1.2E-01	6.4E+00	3.9E-02	1.5E+00

** If values were reported as < detection limit, 1/2 the detection limit is shown in italics and was used in subsequent calculations.*

Samatosum Mine Humidity Cell Data -Column 2 (Encapsulated 5 Layers)

		Dissolved Metals*:								Metal Leach Rates:								Cumulative Metal Leach Rates:							
		Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc	Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc	Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc
Week No.	Date	D-Sb (mg/L)	D-As (mg/L)	D-Cu (mg/L)	D-Fe (mg/L)	D-Pb (mg/L)	D-Mn (mg/L)	D-Ag (mg/L)	D-Zn (mg/L)	D-Sb (mg/kg/wk)	D-As (mg/kg/wk)	D-Cu (mg/kg/wk)	D-Fe (mg/kg/wk)	D-Pb (mg/kg/wk)	D-Mn (mg/kg/wk)	D-Ag (mg/kg/wk)	D-Zn (mg/kg/wk)	D-Sb (mg/kg)	D-As (mg/kg)	D-Cu (mg/kg)	D-Fe (mg/kg)	D-Pb (mg/kg)	D-Mn (mg/kg)	D-Ag (mg/kg)	D-Zn (mg/kg)
66	16-May-90	0.002	0.001	6E-04	0.005	0.001		0.001	0.02	8.4E-04	4.2E-04	2.5E-04	2.1E-03	4.2E-04		4.2E-04	8.4E-03	8.2E-02	3.9E-02	1.7E-01	1.8E-01	2.0E-02	4.7E+00	5.7E-03	1.0E+00
67	23-May-90																	8.2E-02	3.9E-02	1.7E-01	1.8E-01	2.0E-02	4.8E+00	5.9E-03	1.0E+00
68	30-May-90																	8.2E-02	4.0E-02	1.7E-01	1.8E-01	2.0E-02	4.9E+00	6.1E-03	1.0E+00
69	6-Jun-90																	8.3E-02	4.0E-02	1.7E-01	1.8E-01	2.0E-02	4.9E+00	6.4E-03	1.0E+00
70	13-Jun-90	0.002	0.001	0.001	0.005	0.001	0.17	0.001	0.01	8.3E-04	4.1E-04	5.4E-04	2.1E-03	4.1E-04	7.0E-02	4.1E-04	2.9E-03	8.4E-02	4.0E-02	1.7E-01	1.9E-01	2.1E-02	5.0E+00	6.8E-03	1.1E+00
71	20-Jun-90																	8.4E-02	4.0E-02	1.7E-01	1.9E-01	2.1E-02	5.0E+00	7.0E-03	1.1E+00
72	27-Jun-90																	8.5E-02	4.1E-02	1.7E-01	1.9E-01	2.1E-02	5.1E+00	7.2E-03	1.1E+00
73	4-Jul-90																	8.6E-02	4.1E-02	1.7E-01	1.9E-01	2.1E-02	5.1E+00	7.4E-03	1.1E+00
74	11-Jul-90		0.001	0.007	0.008	0.002	0.13	0.001	0.03		4.1E-04	2.9E-03	3.3E-03	8.3E-04	5.4E-02	4.1E-04	1.4E-02	8.7E-02	4.1E-02	1.8E-01	1.9E-01	2.2E-02	5.1E+00	7.8E-03	1.1E+00
75	18-Jul-90																	8.8E-02	4.1E-02	1.8E-01	1.9E-01	2.3E-02	5.2E+00	8.0E-03	1.1E+00
76	25-Jul-90																	8.9E-02	4.2E-02	1.8E-01	2.0E-01	2.4E-02	5.2E+00	8.2E-03	1.1E+00
77	1-Aug-90																	8.9E-02	4.2E-02	1.8E-01	2.0E-01	2.5E-02	5.2E+00	8.4E-03	1.1E+00
78	8-Aug-90		0.001	0.001	0.005		0.11	0.001	0.03		4.1E-04	4.6E-04	2.1E-03		4.6E-02	4.1E-04	1.2E-02	9.0E-02	4.2E-02	1.8E-01	2.0E-01	2.6E-02	5.3E+00	8.8E-03	1.1E+00
79	15-Aug-90																	9.1E-02	4.2E-02	1.8E-01	2.0E-01	2.6E-02	5.3E+00	9.0E-03	1.1E+00
80	22-Aug-90																	9.2E-02	4.3E-02	1.8E-01	2.0E-01	2.7E-02	5.3E+00	9.3E-03	1.1E+00
81	29-Aug-90																	9.3E-02	4.3E-02	1.9E-01	2.0E-01	2.8E-02	5.3E+00	9.5E-03	1.1E+00
82	5-Sep-90		0.001	0.019	0.005		0.09	0.001	0.02		4.2E-04	7.98031	2.1E-03		3.8E-02	4.2E-04	8.8E-03	9.4E-02	4.3E-02	1.9E-01	2.0E-01	2.9E-02	5.4E+00	9.9E-03	1.1E+00
83	12-Sep-90																	9.4E-02	4.3E-02	2.0E-01	2.1E-01	3.0E-02	5.4E+00	1.0E-02	1.1E+00
84	19-Sep-90																	9.5E-02	4.4E-02	2.0E-01	2.1E-01	3.1E-02	5.4E+00	1.0E-02	1.1E+00
85	26-Sep-90																	9.6E-02	4.4E-02	2.0E-01	2.1E-01	3.1E-02	5.4E+00	1.1E-02	1.1E+00
86	3-Oct-90		0.001	0.005	0.005		0.13	0.001	0.01		4.1E-04	2.1E-03	2.1E-03		5.4E-02	4.1E-04	4.0E-03	9.7E-02	[illegible]	2.0E-01	2.1E-01	3.2E-02	5.5E+00	1.1E-02	1.1E+00
87	10-Oct-90																	[illegible]	4.5E-02	2.0E-01	2.1E-01	3.3E-02	5.5E+00	1.1E-02	1.1E+00
88	17-Oct-90																	9.9E-02	4.5E-02	2.1E-01	2.1E-01	3.4E-02	5.5E+00	1.1E-02	1.2E+00
89	24-Oct-90																	9.9E-02	4.5E-02	2.1E-01	2.1E-01	3.5E-02	5.5E+00	1.2E-02	1.2E+00
90	31-Oct-90		0.001	0.001	0.005		0.08	0.001	0.01		4.2E-04	4.2E-04	2.1E-03		3.3E-02	4.2E-04	3.7E-03	1.0E-01	4.5E-02	2.1E-01	2.2E-01	3.6E-02	5.6E+00	1.2E-02	1.2E+00
91	7-Nov-90																	1.0E-01	4.6E-02	2.1E-01	2.2E-01	3.6E-02	5.6E+00	1.2E-02	1.2E+00
92	14-Nov-90																	1.0E-01	4.6E-02	2.1E-01	2.2E-01	3.7E-02	5.6E+00	1.2E-02	1.2E+00
93	21-Nov-90																	1.0E-01	4.6E-02	2.1E-01	2.3E-01	3.8E-02	5.6E+00	1.3E-02	1.2E+00
94	28-Nov-90		0.001	0.002	0.031		0.1	0.001	0.02		4.2E-04	8.4E-04	1.3E-02		4.2E-02	4.2E-04	8.4E-03	1.0E-01	4.6E-02	2.1E-01	2.4E-01	3.9E-02	5.7E+00	1.3E-02	1.2E+00
95	5-Dec-90																	1.0E-01	4.7E-02	2.1E-01	2.4E-01	4.0E-02	5.7E+00	1.3E-02	1.2E+00
96	12-Dec-90																	1.1E-01	4.7E-02	2.1E-01	2.5E-01	4.1E-02	5.7E+00	1.3E-02	1.2E+00
97	19-Dec-90																	1.1E-01	4.7E-02	2.1E-01	2.5E-01	4.1E-02	5.7E+00	1.4E-02	1.2E+00
98	26-Dec-90		0.001	5E-04	0.005		0.1	0.001	0.02		4.1E-04	2.1E-04	2.1E-03		4.1E-02	4.1E-04	7.0E-03	1.1E-01	4.7E-02	2.1E-01	2.5E-01	4.2E-02	5.8E+00	1.4E-02	1.2E+00
99	2-Jan-91																	1.1E-01	4.8E-02	2.1E-01	2.5E-01	4.3E-02	5.8E+00	1.4E-02	1.2E+00
100	9-Jan-91																	1.1E-01	4.8E-02	2.1E-01	2.5E-01	4.4E-02	5.8E+00	1.4E-02	1.2E+00
101	16-Jan-91																	1.1E-01	4.8E-02	2.1E-01	2.6E-01	4.5E-02	5.8E+00	1.5E-02	1.2E+00
102	23-Jan-91		0.001	5E-04	0.005		0.1	0.001	0.02		4.2E-04	2.1E-04	2.1E-03		4.2E-02	4.2E-04	6.7E-03	1.1E-01	4.8E-02	2.1E-01	2.6E-01	4.5E-02	5.9E+00	1.5E-02	1.2E+00
103	30-Jan-91																	1.1E-01	4.9E-02	2.1E-01	2.6E-01	4.6E-02	5.9E+00	1.5E-02	1.2E+00
104	6-Feb-91																	1.1E-01	4.9E-02	2.1E-01	2.6E-01	4.7E-02	5.9E+00	1.5E-02	1.2E+00
105	13-Feb-91																	1.1E-01	4.9E-02	2.1E-01	2.6E-01	4.8E-02	5.9E+00	1.6E-02	1.2E+00
106	20-Feb-91		0.001	5E-04	0.005		0.07	0.001	0.01		4.2E-04	2.1E-04	2.1E-03		2.9E-02	4.2E-04	4.6E-03	1.1E-01	5.0E-02	2.1E-01	2.6E-01	4.9E-02	6.0E+00	1.6E-02	1.2E+00
107	27-Feb-91																	1.1E-01	5.0E-02	2.1E-01	2.6E-01	5.0E-02	6.0E+00	1.6E-02	1.2E+00
108	6-Mar-91																	1.2E-01	5.0E-02	2.1E-01	2.7E-01	5.0E-02	6.0E+00	1.7E-02	1.2E+00
109	13-Mar-91																	1.2E-01	5.0E-02	2.1E-01	2.7E-01	5.1E-02	6.0E+00	1.7E-02	1.2E+00
110	20-Mar-91		0.001	0.001	0.005		0.12	0.001	0.01		4.1E-04	5.8E-04	2.1E-03		5.0E-02	4.1E-04	5.0E-03	1.2E-01	5.1E-02	2.1E-01	2.7E-01	5.2E-02	6.1E+00	1.7E-02	1.2E+00
111	27-Mar-91																	1.2E-01	5.1E-02	2.1E-01	2.7E-01	5.3E-02	6.1E+00	1.7E-02	1.2E+00
112	3-Apr-91																	1.2E-01	5.1E-02	2.1E-01	2.7E-01	5.4E-02	6.1E+00	1.8E-02	1.2E+00
113	10-Apr-91																	1.2E-01	5.1E-02	2.1E-01	2.7E-01	5.5E-02	6.2E+00	1.8E-02	1.2E+00
114	17-Apr-91		0.001	0.003	0.009		0.12	0.001	0.01		4.2E-04	1.2E-03	3.8E-03		5.0E-02	4.2E-04	5.5E-03	1.2E-01	5.2E-02	2.1E-01	2.8E-01	5.5E-02	6.2E+00	1.8E-02	1.2E+00
115	24-Apr-91																	1.2E-01	5.2E-02	2.3E-01	2.8E-01	5.6E-02	6.2E+00	1.8E-02	1.2E+00
116	1-May-91																	1.2E-01	5.2E-02	2.4E-01	2.8E-01	5.7E-02	6.2E+00	1.9E-02	1.3E+00
117	8-May-91																	1.2E-01	5.2E-02	2.5E-01	2.8E-01	5.8E-02	6.3E+00	1.9E-02	1.3E+00
118	15-May-91		0.001	0.12	0.005		0.07	0.001	0.01		4.1E-04	5.0E-02	2.1E-03		2.9E-02	4.1E-04	3.3E-03	1.2E-01	5.3E-02	3.0E-01	2.8E-01	5.9E-02	6.3E+00	1.9E-02	1.3E+00
119	22-May-91																	1.2E-01	5.3E-02	3.9E-01	2.8E-01	6.0E-02	6.3E+00	1.9E-02	1.3E+00
120	29-May-91																	1.3E-01	5.4E-02	4.8E-01	2.9E-01	6.0E-02	6.3E+00	2.0E-02	1.3E+00
121	5-Jun-91																	1.3E-01	5.4E-02	5.6E-01	2.9E-01	6.1E-02	6.3E+00	2.0E-02	1.3E+00
122	12-Jun-91		0.004	0.72	0.005		0.05	0.001	0.01		1.7E-03	3.0E-01	2.1E-03		2.1E-02	4.2E-04	2.5E-03	1.3E-01	5.6E-02	8.7E-01	2.9E-01	6.2E-02	6.4E+00	2.0E-02	1.3E+00
123	19-Jun-91																	1.3E-01	5.7E-02	9.4E-01	2.9E-01	6.3E-02	6.4E+00	2.0E-02	1.3E+00
124	26-Jun-91																	1.3E-01	5.8E-02	1.0E+00	2.9E-01	6.4E-02	6.4E+00	2.1E-02	1.3E+00
125	3-Jul-91																	1.3E-01	5.8E-02	1.1E+00	3.0E-01	6.5E-02	6.4E+00	2.1E-02	1.3E+00
126	10-Jul-91		0.004	0.003	0.017		0.018	0.001	0.09		1.7E-03	1.2E-03	7.0E-03		7.4E-03	4.1E-04	3.7E-02	1.3E-01	6.0E-02	1.1E+00	3.0E-01	6.5E-02	6.4E+00	2.1E-02	1.3E+00
127	17-Jul-91																	1.3E-01	6.1E-02	1.1E+00	3.0E-01	6.6E-02	6.4E+00	2.2E-02	1.3E+00
128	24-Jul-91																	1.3E-01	6.2E-02	1.1E+00	3.1E-01	6.7E-02	6.4E+00	2.2E-02	1.4E+00
129	31-Jul-91																	1.3E-01	6.3E-02	1.1E+00	3.1E-01	6.8E-02	6.4E+00	2.2E-02	1.4E+00
130	7-Aug-91		0.004	9E-04	0.009		0.0097	0.001	0.02		1.6E-03	3.6E-04	3.6E-03		3.9E-03	4.0E-04	8.0E-03	1.3E-01	6.4E-02	1.1E+00	3.1E-01	6.9E-02	6.4E+00	2.2E-02	1.4E+00
131	14-Aug-91																	1.3E-01	6.5E-02	1.1E+00	3.2E-01	6.9E-02	6.4E+00	2.2E-02	1.4E+00

*If values were reported as < detection limit, 1/2 the detection limit is shown in italics and was used in subsequent calculations.

Samatosum Mine Humidity Cell Data -Column 2 (Encapsulated 3 Layers)

Dissolved Metals*:

Week No.	Date	Antimony D-Sb (mg/L)	Arsenic D-As (mg/L)	Copper D-Cu (mg/L)	Iron D-Fe (mg/L)	Lead D-Pb (mg/L)	Manganese D-Mn (mg/L)	Silver D-Ag (mg/L)	Zinc D-Zn (mg/L)
264	2-Mar-94								
265	9-Mar-94								
266	16-Mar-94								
267	23-Mar-94			0.001	0.05		0.001		0.01
268	30-Mar-94								
269	6-Apr-94								
270	13-Apr-94								
271	20-Apr-94			8E-04	0.05		0.001		0.01
272	27-Apr-94								
273	4-May-94								
274	11-May-94								
275	18-May-94			9E-04	0.05		0.001		0.02
276	25-May-94								
277	1-Jun-94								
278	8-Jun-94								
279	15-Jun-94			0.005	0.05		0.001		0.02
280	22-Jun-94								
281	29-Jun-94								
282	6-Jul-94								
283	13-Jul-94			0.006	0.05		0.001		0.03
284	20-Jul-94								
285	27-Jul-94								
286	3-Aug-94								
Maximum		0.019	0.012	0.72	0.06	0.003	0.17	0.001	0.1
Minimum		0.002	0.001	0.0005	0.005	0.001	0.001	2E-04	0
Mean		0.005	0.002	0.0153	0.028	0.001	0.029	0.0008	0.03
Median		0.005	0.001	0.0014	0.025	0.001	0.002	0.0010	0.02
Mean Last 8 Weeks				0.0053	0.050		0.001		0.03
75% Remaining (Wks)									
50% Remaining (Wks)									
25% Remaining (Wks)									
0% Remaining (Wks)									

Metal Leach Rates:

Week No.	Date	Antimony D-Sb (mg/kg/wk)	Arsenic D-As (mg/kg/wk)	Copper D-Cu (mg/kg/wk)	Iron D-Fe (mg/kg/wk)	Lead D-Pb (mg/kg/wk)	Manganese D-Mn (mg/kg/wk)	Silver D-Ag (mg/kg/wk)	Zinc D-Zn (mg/kg/wk)
264	2-Mar-94								
265	9-Mar-94								
266	16-Mar-94								
267	23-Mar-94			5.8E-04	2.1E-02		4.1E-04		5.4E-03
268	30-Mar-94								
269	6-Apr-94								
270	13-Apr-94								
271	20-Apr-94			3.3E-04	2.1E-02		4.1E-04		5.8E-03
272	27-Apr-94								
273	4-May-94								
274	11-May-94								
275	18-May-94			3.8E-04	2.1E-02		4.2E-04		9.2E-03
276	25-May-94								
277	1-Jun-94								
278	8-Jun-94								
279	15-Jun-94			1.9E-03	2.1E-02		4.1E-04		9.5E-03
280	22-Jun-94								
281	29-Jun-94								
282	6-Jul-94								
283	13-Jul-94			2.5E-03	2.1E-02		4.1E-04		1.3E-02
284	20-Jul-94								
285	27-Jul-94								
286	3-Aug-94								
Maximum		7.2E-03	4.5E-03	3.0E-01	2.6E-02	1.2E-03	7.0E-02	4.3E-04	4.2E-02
Minimum		8.2E-04	4.1E-04	2.1E-04	1.6E-03	3.8E-04	4.1E-04	7.6E-05	9.6E-04
Mean		2.2E-03	8.6E-04	6.4E-03	1.2E-02	4.7E-04	1.2E-02	3.1E-04	1.2E-02
Median		2.1E-03	4.2E-04	5.8E-04	1.0E-02	4.2E-04	8.4E-04	4.1E-04	7.1E-03
Mean Last 8 Weeks				2.2E-03	2.1E-02		4.1E-04		1.1E-02
75% Remaining (Wks)									
50% Remaining (Wks)									
25% Remaining (Wks)									
0% Remaining (Wks)									

Cumulative Metal Leach Rates:

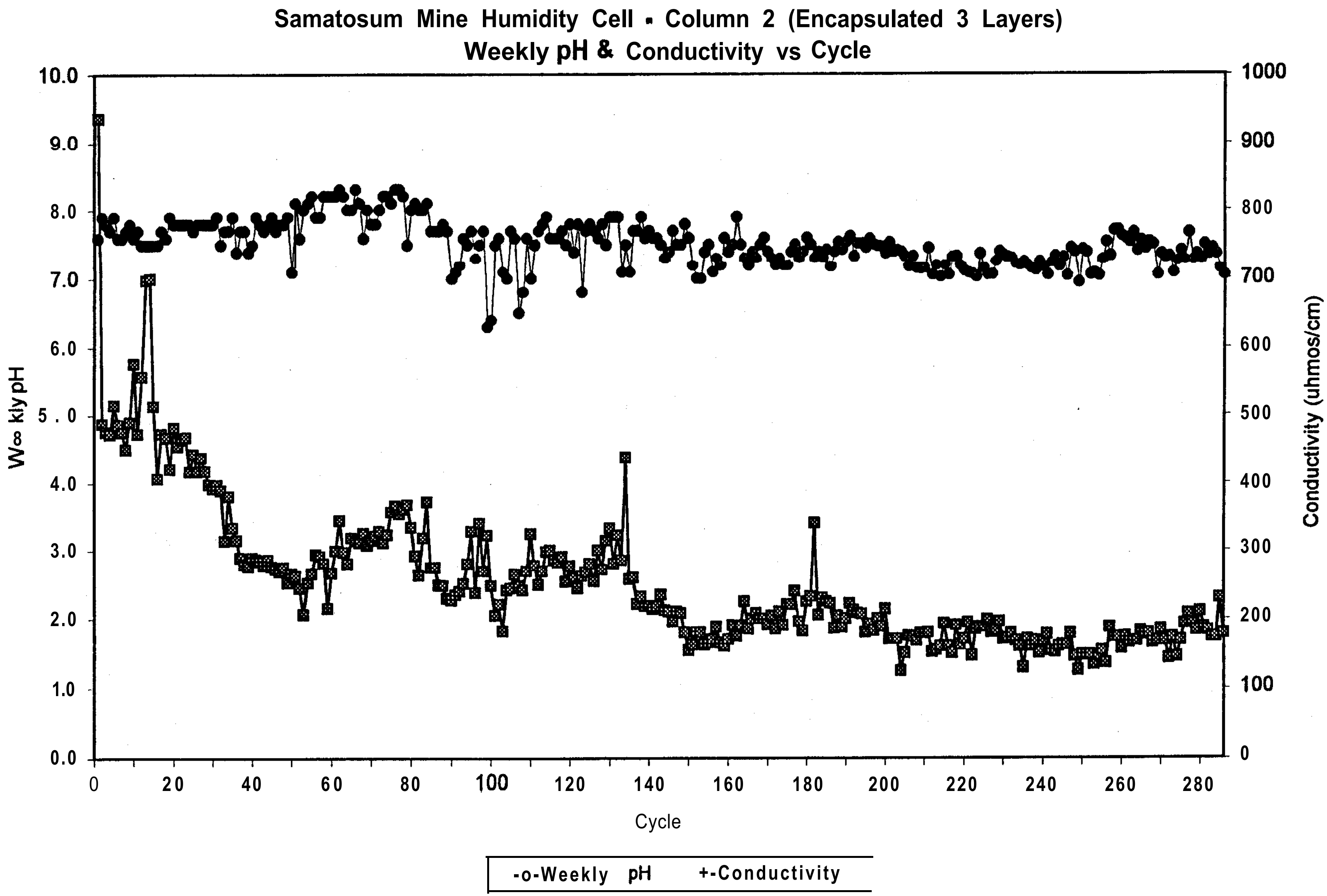
Week No.	Date	Antimony D-Sb (mg/kg)	Arsenic D-As (mg/kg)	Copper D-Cu (mg/kg)	Iron D-Fe (mg/kg)	Lead D-Pb (mg/kg)	Manganese D-Mn (mg/kg)	Silver D-Ag (mg/kg)	Zinc D-Zn (mg/kg)
264	2-Mar-94	2.4E-01	1.5E-01	1.2E+00	1.9E+00	1.8E-01	6.5E+00	6.4E-02	2.0E+00
265	9-Mar-94	2.5E-01	1.5E-01	1.2E+00	1.9E+00	1.8E-01	6.5E+00	6.5E-02	2.0E+00
266	16-Mar-94	2.5E-01	1.5E-01	1.2E+00	1.9E+00	1.8E-01	6.5E+00	6.5E-02	2.0E+00
267	23-Mar-94	2.5E-01	1.5E-01	1.2E+00	1.9E+00	1.8E-01	6.5E+00	6.5E-02	2.0E+00
268	30-Mar-94	2.5E-01	1.5E-01	1.2E+00	1.9E+00	1.8E-01	6.5E+00	6.6E-02	2.0E+00
269	6-Apr-94	2.5E-01	1.6E-01	1.2E+00	1.9E+00	1.8E-01	6.5E+00	6.6E-02	2.0E+00
270	13-Apr-94	2.5E-01	1.6E-01	1.2E+00	2.0E+00	1.8E-01	6.5E+00	6.7E-02	2.0E+00
271	20-Apr-94	2.5E-01	1.6E-01	1.2E+00	2.0E+00	1.9E-01	6.5E+00	6.7E-02	2.0E+00
272	27-Apr-94	2.5E-01	1.6E-01	1.2E+00	2.0E+00	1.9E-01	6.5E+00	6.7E-02	2.0E+00
273	4-May-94	2.5E-01	1.6E-01	1.2E+00	2.0E+00	1.9E-01	6.5E+00	6.8E-02	2.0E+00
274	11-May-94	2.5E-01	1.6E-01	1.2E+00	2.0E+00	1.9E-01	6.5E+00	6.8E-02	2.0E+00
275	18-May-94	2.5E-01	1.6E-01	1.2E+00	2.0E+00	1.9E-01	6.5E+00	6.9E-02	2.1E+00
276	25-May-94	2.5E-01	1.6E-01	1.2E+00	2.0E+00	1.9E-01	6.5E+00	6.9E-02	2.1E+00
277	1-Jun-94	2.5E-01	1.6E-01	1.2E+00	2.0E+00	1.9E-01	6.5E+00	6.9E-02	2.1E+00
278	8-Jun-94	2.6E-01	1.6E-01	1.2E+00	2.1E+00	1.9E-01	6.5E+00	7.0E-02	2.1E+00
279	15-Jun-94	2.6E-01	1.6E-01	1.2E+00	2.1E+00	1.9E-01	6.5E+00	7.0E-02	2.1E+00
280	22-Jun-94	2.6E-01	1.6E-01	1.2E+00	2.1E+00	1.9E-01	6.5E+00	7.1E-02	2.1E+00
281	29-Jun-94	2.6E-01	1.7E-01	1.2E+00	2.1E+00	1.9E-01	6.5E+00	7.1E-02	2.1E+00
282	6-Jul-94	2.6E-01	1.7E-01	1.2E+00	2.1E+00	1.9E-01	6.5E+00	7.1E-02	2.1E+00
283	13-Jul-94	2.6E-01	1.7E-01	1.2E+00	2.1E+00	2.0E-01	6.5E+00	7.2E-02	2.1E+00
284	20-Jul-94	2.6E-01	1.7E-01	1.2E+00	2.2E+00	2.0E-01	6.5E+00	7.2E-02	2.1E+00
285	27-Jul-94	2.6E-01	1.7E-01	1.2E+00	2.2E+00	2.0E-01	6.5E+00	7.3E-02	2.1E+00
286	3-Aug-94	2.6E-01	1.7E-01	1.2E+00	2.2E+00	2.0E-01	6.5E+00	7.3E-02	2.1E+00
Maximum		2.6E-01	1.7E-01	1.2E+00	2.2E+00	2.0E-01	6.5E+00	7.3E-02	2.1E+00
Minimum		7.2E-03	4.5E-03	1.7E-03	2.7E-03	3.8E-04	7.0E-02	7.6E-05	1.1E-02
Mean		1.5E-01	7.8E-02	7.1E-01	7.1E-01	8.4E-02	5.3E+00	2.8E-02	1.3E+00
Median		1.4E-01	7.2E-02	1.1E+00	3.8E-01	7.9E-02	6.4E+00	2.5E-02	1.4E+00
Mean Last 8 Weeks		2.6E-01	1.7E-01	1.2E+00	2.1E+00	1.9E-01	6.5E+00	7.2E-02	2.1E+00
75% Remaining (Wks)									
50% Remaining (Wks)									
25% Remaining (Wks)									
0% Remaining (Wks)									

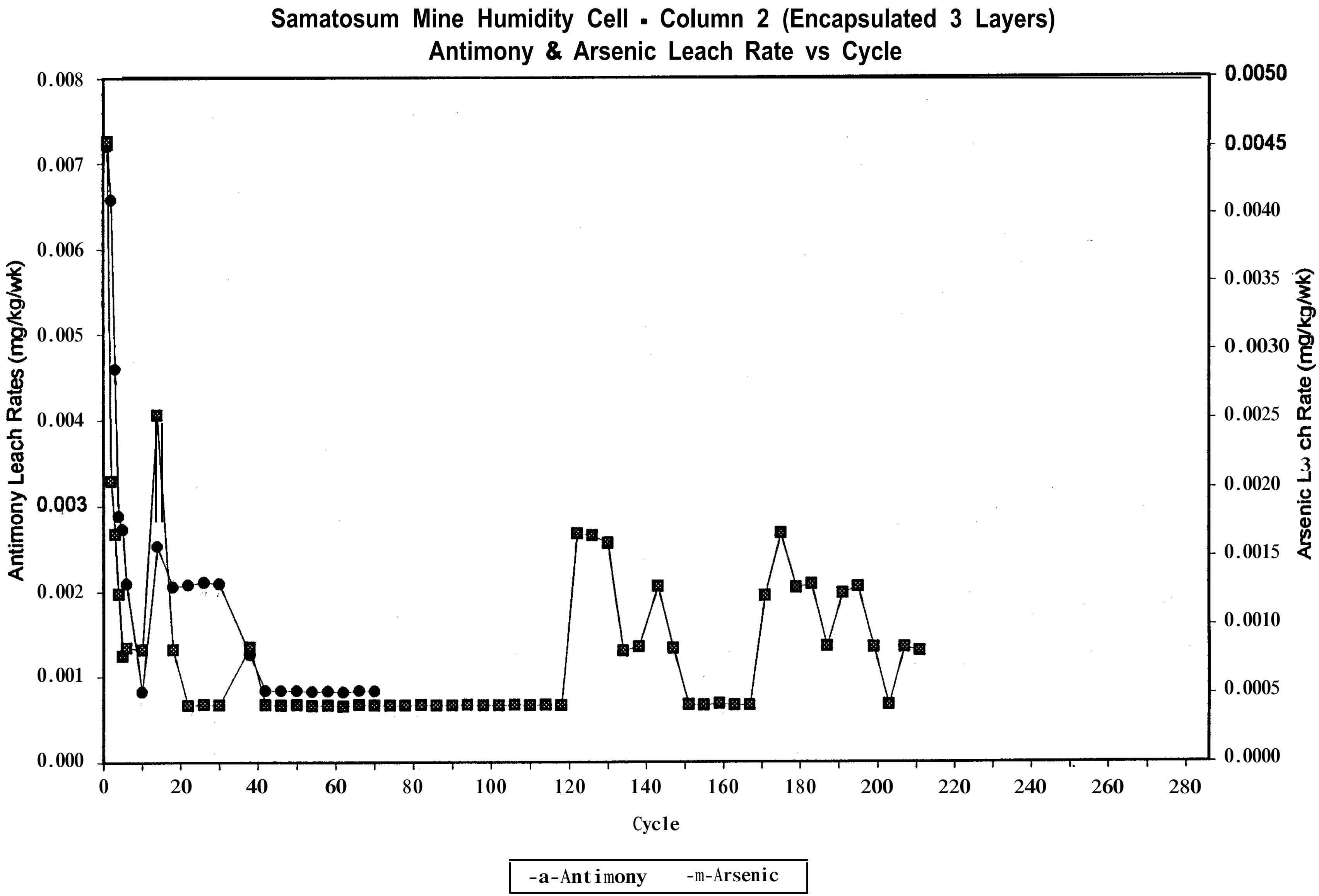
** If values were reported as < detection limit, 1/2 the detection limit is shown in italics and was used in subsequent calculations.*

Samatosum Mine Humidity Cell Data -Column 2 (Encapsulated 3 Layers)

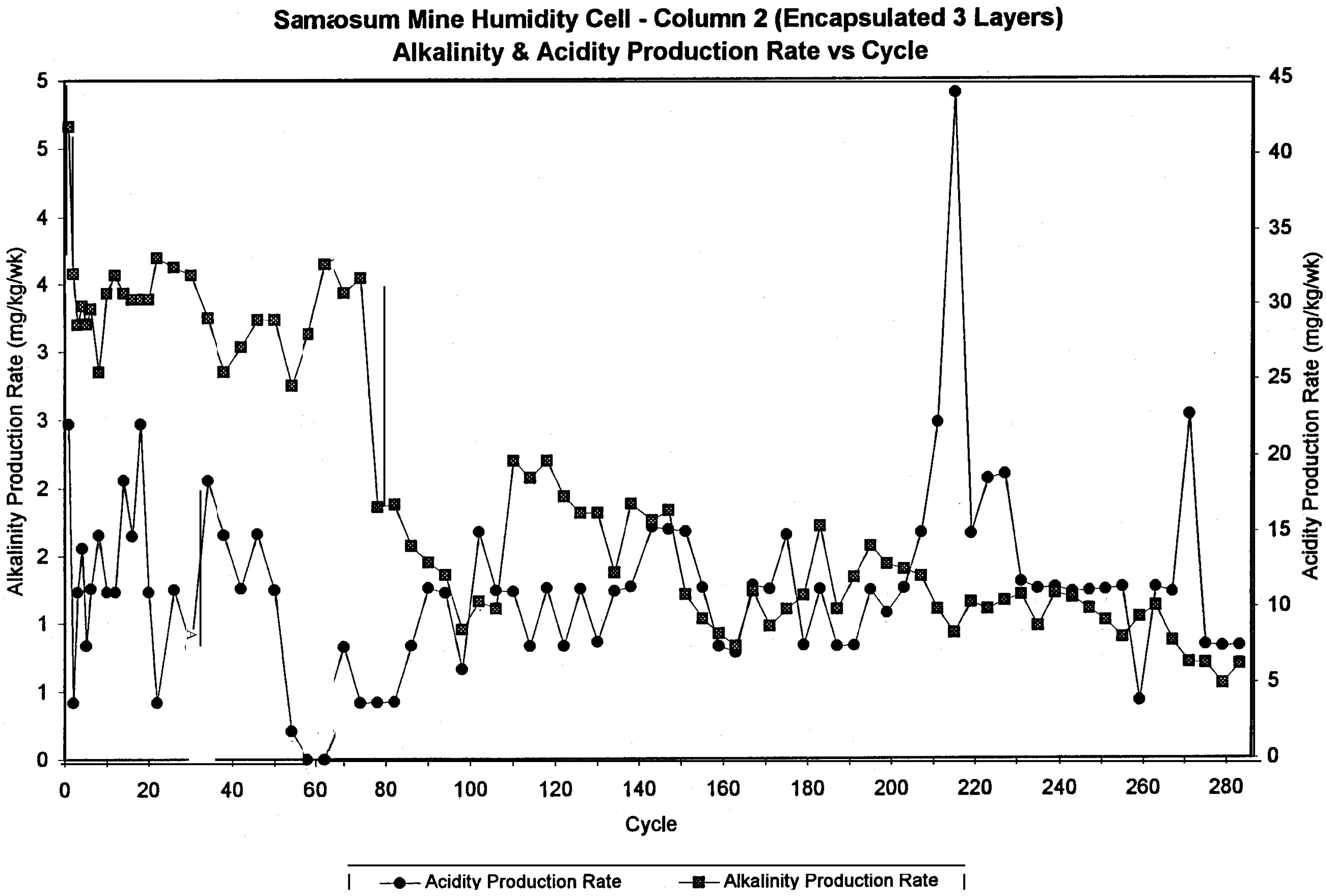
		Dissolved Metals*:								Metal Leach Rates:								Cumulative Metal Leach Rates:							
		Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc	Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc	Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc
Week No.	Date	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn
		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(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)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
198	25-Nov-92																	1.9E-01	1.0E-01	1.1E+00	1.0E+00	1.2E-01	6.4E+00	3.9E-02	1.5E+00
199	2-Dec-92		0.002	0.003	0.05		0.007	0.001	0		8.4E-04	1.0E-03	2.1E-02		2.9E-03	4.2E-04	9.6E-04	1.9E-01	1.0E-01	1.1E+00	1.0E+00	1.3E-01	6.4E+00	4.0E-02	1.5E+00
200	9-Dec-92																	1.9E-01	1.0E-01	1.1E+00	1.0E+00	1.3E-01	6.4E+00	4.0E-02	1.5E+00
201	16-Dec-92																	1.9E-01	1.0E-01	1.1E+00	1.1E+00	1.3E-01	6.4E+00	4.0E-02	1.5E+00
202	23-Dec-92																	1.9E-01	1.0E-01	1.1E+00	1.1E+00	1.3E-01	6.4E+00	4.0E-02	1.5E+00
203	30-Dec-92		0.001	0.009	0.05		0.004	0.001	0.02		4.2E-04	3.8E-03	2.1E-02		1.7E-03	4.2E-04	6.7E-03	1.9E-01	1.0E-01	1.1E+00	1.1E+00	1.3E-01	6.5E+00	4.1E-02	1.5E+00
204	6-Jan-93																	1.9E-01	1.1E-01	1.1E+00	1.1E+00	1.3E-01	6.5E+00	4.1E-02	1.5E+00
205	13-Jan-93																	2.0E-01	1.1E-01	1.1E+00	1.1E+00	1.3E-01	6.5E+00	4.1E-02	1.5E+00
206	20-Jan-93																	2.0E-01	1.1E-01	1.1E+00	1.1E+00	1.3E-01	6.5E+00	4.1E-02	1.5E+00
207	27-Jan-93		0.002	0.003	0.05		0.001	0.001	0.07		8.4E-04	1.1E-03	2.1E-02		4.2E-04	4.2E-04	2.9E-02	2.0E-01	1.1E-01	1.1E+00	1.1E+00	1.3E-01	6.5E+00	4.2E-02	1.6E+00
203	3-Feb-93																	2.0E-01	1.1E-01	1.1E+00	1.2E+00	1.3E-01	6.5E+00	4.2E-02	1.6E+00
209	10-Feb-93																	2.0E-01	1.1E-01	1.1E+00	1.2E+00	1.3E-01	6.5E+00	4.2E-02	1.6E+00
210	17-Feb-93																	2.0E-01	1.1E-01	1.1E+00	1.2E+00	1.3E-01	6.5E+00	4.2E-02	1.6E+00
211	24-Feb-93		0.002	0.002	0.05		0.001	0.001	0.1		8.1E-04	6.1E-04	2.0E-02		4.1E-04	4.1E-04	4.1E-02	2.0E-01	1.1E-01	1.1E+00	1.2E+00	1.4E-01	6.5E+00	4.3E-02	1.7E+00
212	3-Mar-93																	2.0E-01	1.1E-01	1.1E+00	1.2E+00	1.4E-01	6.5E+00	4.3E-02	1.7E+00
213	10-Mar-93																	2.0E-01	1.1E-01	1.1E+00	1.2E+00	1.4E-01	6.5E+00	4.3E-02	1.7E+00
214	17-Mar-93																	2.0E-01	1.1E-01	1.1E+00	1.2E+00	1.4E-01	6.5E+00	4.4E-02	1.7E+00
215	24-Mar-93			0.004	0.05		0.003		0.01			1.5E-03	2.0E-02		1.2E-03		3.4E-03	2.0E-01	1.1E-01	1.1E+00	1.2E+00	1.4E-01	6.5E+00	4.4E-02	1.7E+00
216	31-Mar-93																	2.0E-01	1.1E-01	1.1E+00	1.3E+00	1.4E-01	6.5E+00	4.5E-02	1.7E+00
217	7-Apr-93																	2.1E-01	1.1E-01	1.1E+00	1.3E+00	1.4E-01	6.5E+00	4.5E-02	1.7E+00
218	14-Apr-93																	2.1E-01	1.1E-01	1.1E+00	1.3E+00	1.4E-01	6.5E+00	4.6E-02	1.7E+00
219	21-Apr-93			0.001	0.05		0.002		0.08			5.5E-04	2.1E-02		8.4E-04		3.4E-02	2.1E-01	1.2E-01	1.1E+00	1.3E+00	1.4E-01	6.5E+00	4.6E-02	1.8E+00
220	28-Apr-93																	2.1E-01	1.2E-01	1.1E+00	1.3E+00	1.4E-01	6.5E+00	4.6E-02	1.8E+00
221	5-May-93																	2.1E-01	1.2E-01	1.1E+00	1.3E+00	1.4E-01	6.5E+00	4.7E-02	1.8E+00
222	12-May-93																	2.1E-01	1.2E-01	1.1E+00	1.3E+00	1.4E-01	6.5E+00	4.7E-02	1.8E+00
223	19-May-93			0.003	0.05		0.001		0.02			1.0E-03	2.1E-02		4.1E-04		7.0E-03	2.1E-01	1.2E-01	1.1E+00	1.3E+00	1.5E-01	6.5E+00	4.8E-02	1.8E+00
224	26-May-93																	2.1E-01	1.2E-01	1.1E+00	1.4E+00	1.5E-01	6.5E+00	4.8E-02	1.8E+00
225	2-Jun-93																	2.1E-01	1.2E-01	1.1E+00	1.4E+00	1.5E-01	6.5E+00	4.8E-02	1.8E+00
226	9-Jun-93																	2.1E-01	1.2E-01	1.1E+00	1.4E+00	1.5E-01	6.5E+00	4.9E-02	1.8E+00
227	16-Jun-93			0.002	0.05		0.001		0.05			6.7E-04	2.1E-02		4.2E-04		2.2E-02	2.1E-01	1.2E-01	1.1E+00	1.4E+00	1.5E-01	6.5E+00	4.9E-02	1.8E+00
228	23-Jun-93																	2.1E-01	1.2E-01	1.1E+00	1.4E+00	1.5E-01	6.5E+00	5.0E-02	1.8E+00
229	30-Jun-93																	2.2E-01	1.2E-01	1.1E+00	1.4E+00	1.5E-01	6.5E+00	5.0E-02	1.9E+00
230	7-Jul-93																	2.2E-01	1.2E-01	1.1E+00	1.4E+00	1.5E-01	6.5E+00	5.0E-02	1.9E+00
231	14-Jul-93			6E-04	0.05		0.001		0.01			2.5E-04	2.1E-02		4.2E-04		4.0E-03	2.2E-01	1.2E-01	1.1E+00	1.5E+00	1.5E-01	6.5E+00	5.1E-02	1.9E+00
232	21-Jul-93																	2.2E-01	1.3E-01	1.1E+00	1.5E+00	1.5E-01	6.5E+00	5.1E-02	1.9E+00
233	28-Jul-93																	2.2E-01	1.3E-01	1.1E+00	1.5E+00	1.5E-01	6.5E+00	5.2E-02	1.9E+00
234	4-Aug-93																	2.2E-01	1.3E-01	1.1E+00	1.5E+00	1.5E-01	6.5E+00	5.2E-02	1.9E+00
235	11-Aug-93			0.002	0.05		0.001		0.01			1.0E-03	2.2E-02		4.3E-04		2.9E-03	2.2E-01	1.3E-01	1.1E+00	1.5E+00	1.6E-01	6.5E+00	5.2E-02	1.9E+00
236	18-Aug-93																	2.2E-01	1.3E-01	1.1E+00	1.5E+00	1.6E-01	6.5E+00	5.3E-02	1.9E+00
237	25-Aug-93																	2.2E-01	1.3E-01	1.1E+00	1.5E+00	1.6E-01	6.5E+00	5.3E-02	1.9E+00
238	1-Sep-93																	2.2E-01	1.3E-01	1.1E+00	1.5E+00	1.6E-01	6.5E+00	5.4E-02	1.9E+00
[illegible]	[illegible]																	2.2E-01	1.3E-01	1.2E+00	1.6E+00	1.6E-01	6.5E+00	5.4E-02	1.9E+00
240	15-Sep-93			0.001	0.05		0.001		0.02			5.5E-04	2.1E-02		4.2E-04		7.1E-03	2.2E-01	1.3E-01	1.2E+00	1.6E+00	1.6E-01	6.5E+00	5.4E-02	1.9E+00
241	22-Sep-93																	2.3E-01	1.3E-01	1.2E+00	1.6E+00	1.6E-01	6.5E+00	5.5E-02	1.9E+00
242	29-Sep-93																	2.3E-01	1.3E-01	1.2E+00	1.6E+00	1.6E-01	6.5E+00	5.5E-02	1.9E+00
243	6-Oct-93			0.002	0.05		0.001		0.02			7.0E-04	2.1E-02		4.1E-04		7.0E-03	2.3E-01	1.3E-01	1.2E+00	1.6E+00	1.6E-01	6.5E+00	5.6E-02	1.9E+00
244	13-Oct-93																	2.3E-01	1.4E-01	1.2E+00	1.6E+00	1.6E-01	6.5E+00	5.6E-02	1.9E+00
245	20-Oct-93																	2.3E-01	1.4E-01	1.2E+00	1.6E+00	1.6E-01	6.5E+00	5.6E-02	1.9E+00
246	27-Oct-93																	2.3E-01	1.4E-01	1.2E+00	1.6E+00	1.6E-01	6.5E+00	5.7E-02	1.9E+00
247	3-Nov-93			5E-04	0.05		0.001		0.02			2.1E-04	2.1E-02		4.2E-04		7.1E-03	2.3E-01	1.4E-01	1.2E+00	1.7E+00	1.7E-01	6.5E+00	5.7E-02	1.9E+00
248	10-Nov-93																	2.3E-01	1.4E-01	1.2E+00	1.7E+00	1.7E-01	6.5E+00	5.8E-02	1.9E+00
249	17-Nov-93																	2.3E-01	1.4E-01	1.2E+00	1.7E+00	1.7E-01	6.5E+00	5.8E-02	1.9E+00
250	24-Nov-93																	2.3E-01	1.4E-01	1.2E+00	1.7E+00	1.7E-01	6.5E+00	5.8E-02	1.9E+00
251	1-Dec-93			5E-04	0.05		0.001		0.02			2.1E-04	2.1E-02		4.1E-04		6.2E-03	2.3E-01	1.4E-01	1.2E+00	1.7E+00	1.7E-01	6.5E+00	5.9E-02	1.9E+00
252	8-Dec-93																	2.3E-01	1.4E-01	1.2E+00	1.7E+00	1.7E-01	6.5E+00	5.9E-02	1.9E+00
253	15-Dec-93																	2.4E-01	1.4E-01	1.2E+00	1.7E+00	1.7E-01	6.5E+00	6.0E-02	1.9E+00
254	22-Dec-93																	2.4E-01	1.4E-01	1.2E+00	1.7E+00	1.7E-01	6.5E+00	6.0E-02	2.0E+00
255	29-Dec-93			5E-04	0.05		0.001		0.03			2.1E-04	2.1E-02		4.2E-04		1.0E-02	2.4E-01	1.4E-01	1.2E+00	1.8E+00	1.7E-01	6.5E+00	6.1E-02	2.0E+00
256	5-Jan-94																	2.4E-01	1.5E-01	1.2E+00	1.8E+00	1.7E-01	6.5E+00	6.1E-02	2.0E+00
257	12-Jan-94																	2.4E-01	1.5E-01	1.2E+00	1.8E+00	1.7E-01	6.5E+00	6.1E-02	2.0E+00
258	19-Jan-94																	2.4E-01	1.5E-01	1.2E+00	1.8E+00	1.7E-01	6.5E+00	6.2E-02	2.0E+00
[illegible]	[illegible]			8E-04	0.05		0.001		0.02			3.3E-04	2.1E-02		4.2E-04		8.4E-03	2.4E-01	1.5E-01	1.2E+00	1.8E+00	1.8E-01	6.5E+00	6.2E-02	2.0E+00
260	2-Feb-94																	2.4E-01	1.5E-01	1.2E+00	1.8E+00	1.8E-01	6.5E+00	[illegible]	2.0E+00
261	9-Feb-94																	2.4E-01	1.5E-01	1.2E+00	1.8E+00	1.8E-01	6.5E+00	6.3E-02	2.0E+00
262	16-Feb-94																	2.4E-01	1.5E-01	1.2E+00	1.9E+00	1.8E-01	6.5E+00	6.3E-02	2.0E+00
263	23-Feb-94			0.004	0.05		0.001		0.02			1.8E-03	2.1E-02		4.2E-04		7.1E-03	2.4E-01	1.5E-01	1.2E+00	1.9E+00	1.8E-01	6.5E+00	6.4E-02	2.0E+00

If values were reported as < detection limit, 1/2 the detection limit is shown in italics and was used in subsequent calculations.

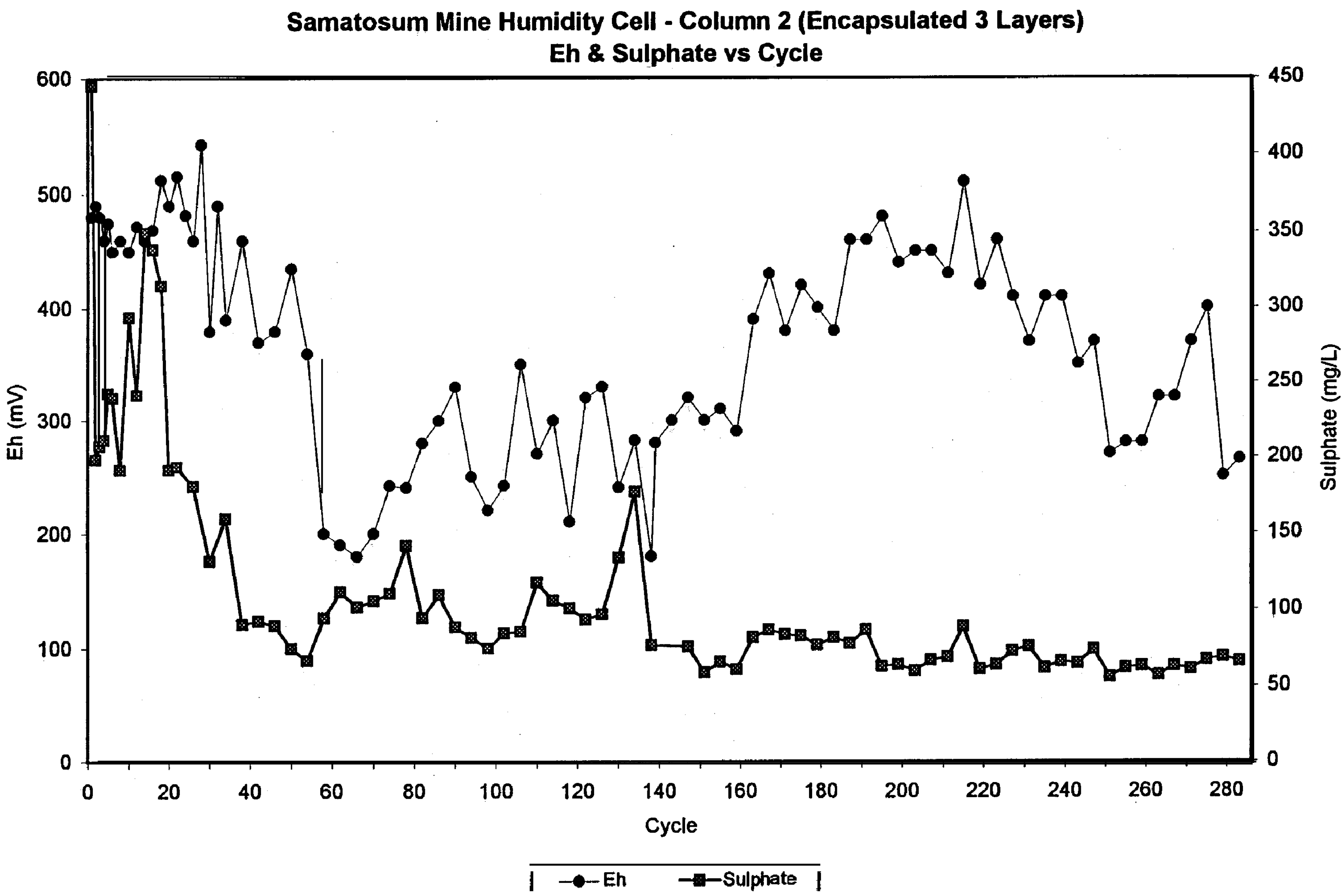

Samatosum Mine Humidity Cell - Column 2 (Encapsulated 3 Layers)
Weekly pH & Conductivity vs Cycle
W∞ kly pH
Conductivity (uhmos/cm)
Cycle
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
0
100
200
300
400
500
600
700
800
900
1000
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
-o-Weekly pH
+-Conductivity



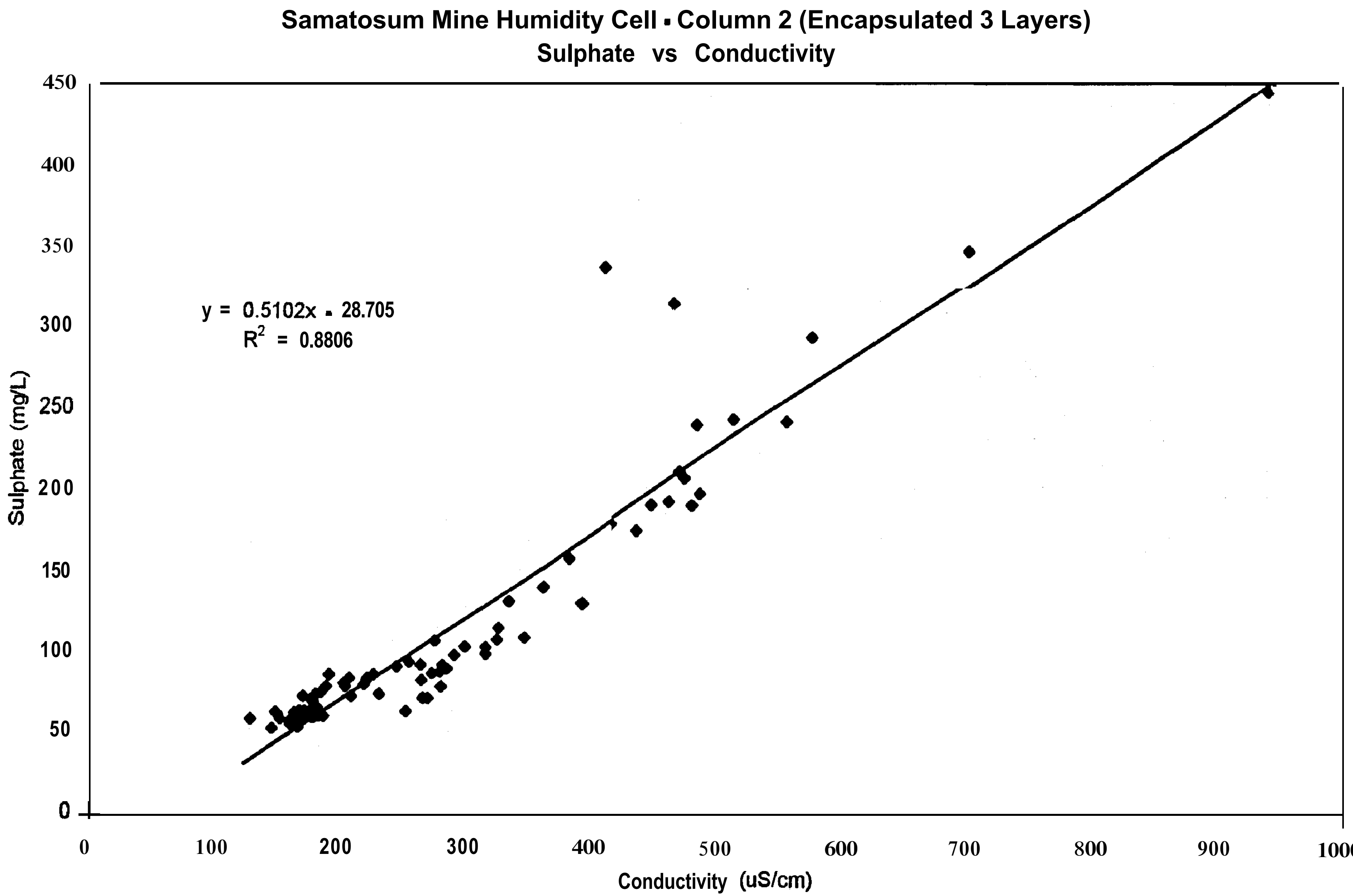
Samatosum Mine Humidity Cell - Column 2 (Encapsulated 3 Layers)
Antimony & Arsenic Leach Rate vs Cycle
Antimony Leach Rates (mg/kg/wk)
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0.000
Arsenic Leach Rate (mg/kg/wk)
0.0050
0.0045
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
Cycle
-a-Antimony
-m-Arsenic

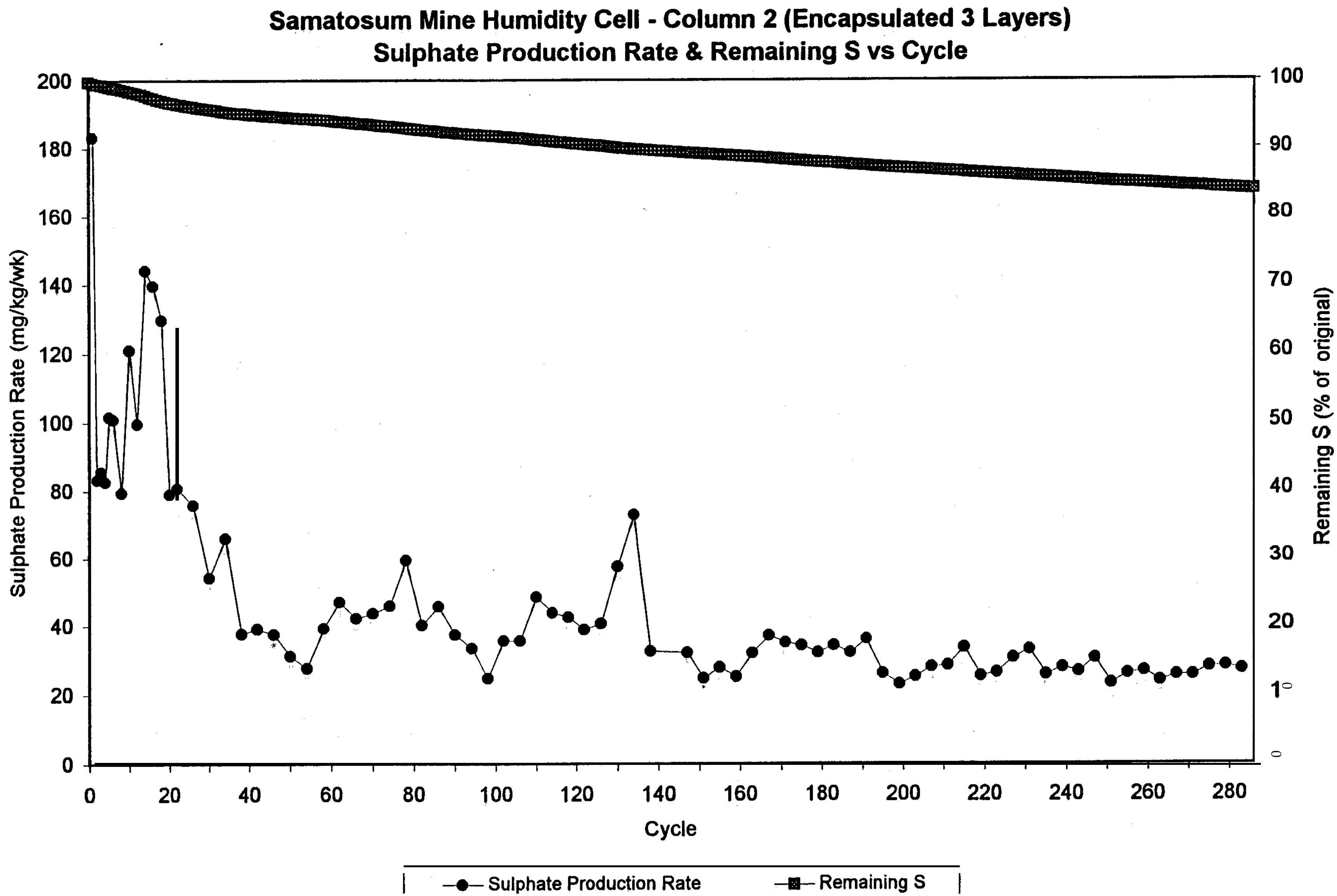


Samæosum Mine Humidity Cell - Column 2 (Encapsulated 3 Layers)
Alkalinity & Acidity Production Rate vs Cycle
Alkalinity Production Rate (mg/kg/wk)
Acidity Production Rate (mg/kg/wk)
Cycle
Acidity Production Rate
Alkalinity Production Rate

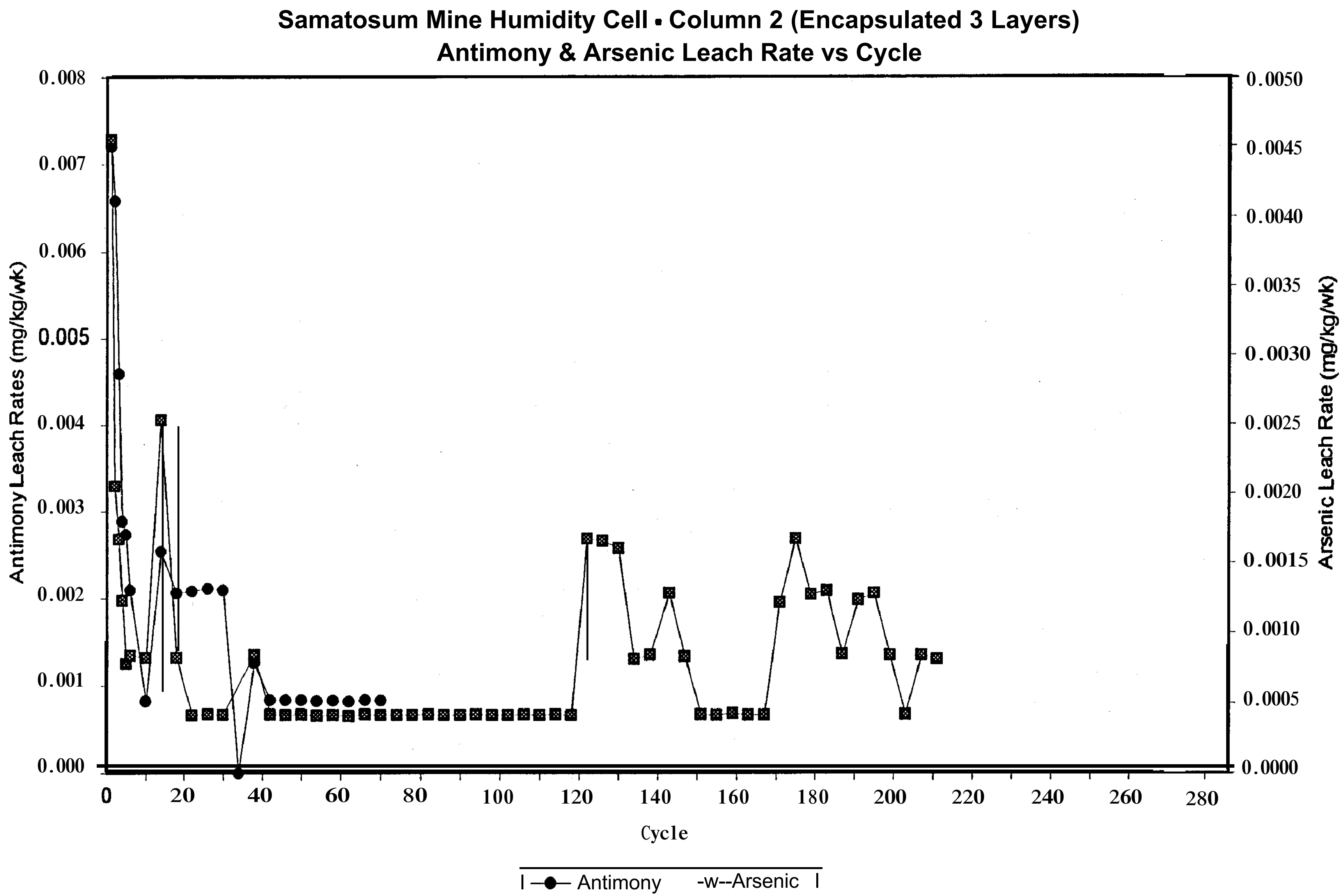


Samatosum Mine Humidity Cell - Column 2 (Encapsulated 3 Layers)
Eh & Sulphate vs Cycle
Eh (mV)
Sulphate (mg/L)
Cycle
0
100
200
300
400
500
600
0
50
100
150
200
250
300
350
400
450
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
Eh
Sulphate

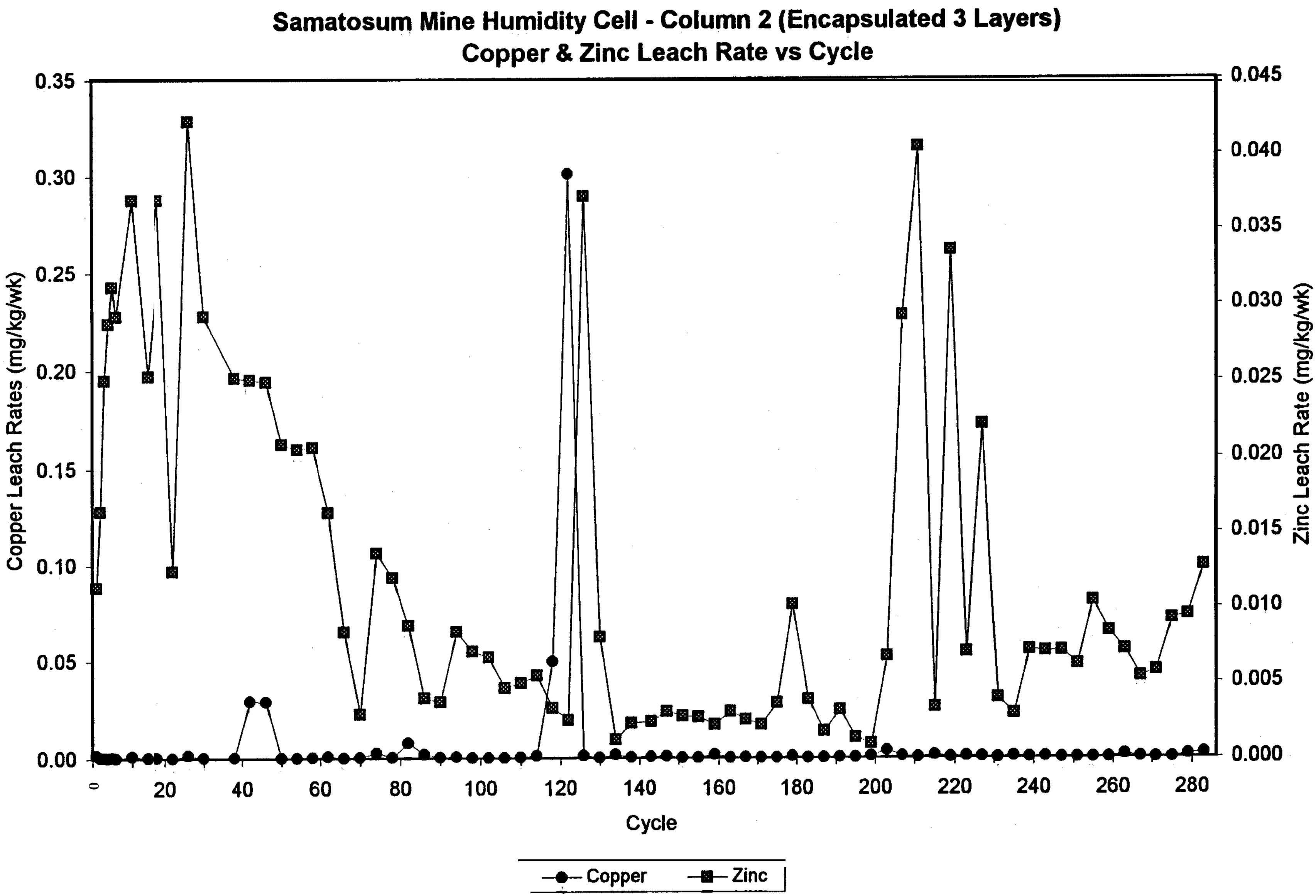

Samatosum Mine Humidity Cell - Column 2 (Encapsulated 3 Layers)
Sulphate vs Conductivity
y = 0.5102x - 28.705
R2 = 0.8806
Sulphate (mg/L)
Conductivity (uS/cm)
0
50
100
150
200
250
300
350
400
450
0
100
200
300
400
500
600
700
800
900
1000



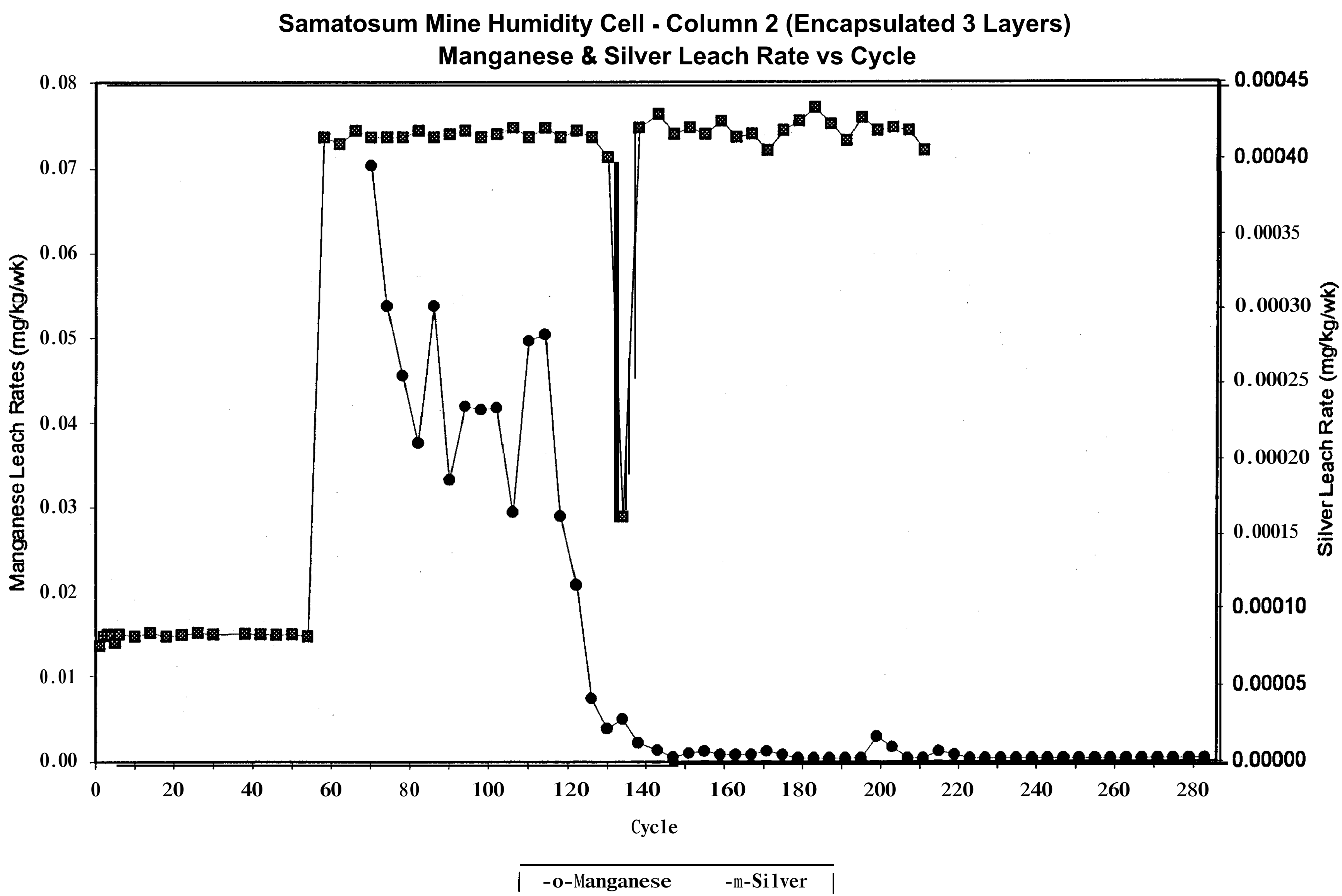
Samatosum Mine Humidity Cell - Column 2 (Encapsulated 3 Layers)
Sulphate Production Rate & Remaining S vs Cycle
Sulphate Production Rate (mg/kg/wk)
Remaining S (% of original)
Cycle
200
180
160
140
120
100
80
60
40
20
0
100
90
80
70
60
50
40
30
20
10
0
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
Sulphate Production Rate
Remaining S



Samatosum Mine Humidity Cell ▪ Column 2 (Encapsulated 3 Layers)
Antimony & Arsenic Leach Rate vs Cycle
Antimony Leach Rates (mg/kg/wk)
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0.000
Arsenic Leach Rate (mg/kg/wk)
0.0050
0.0045
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
Cycle
Antimony
-w--Arsenic

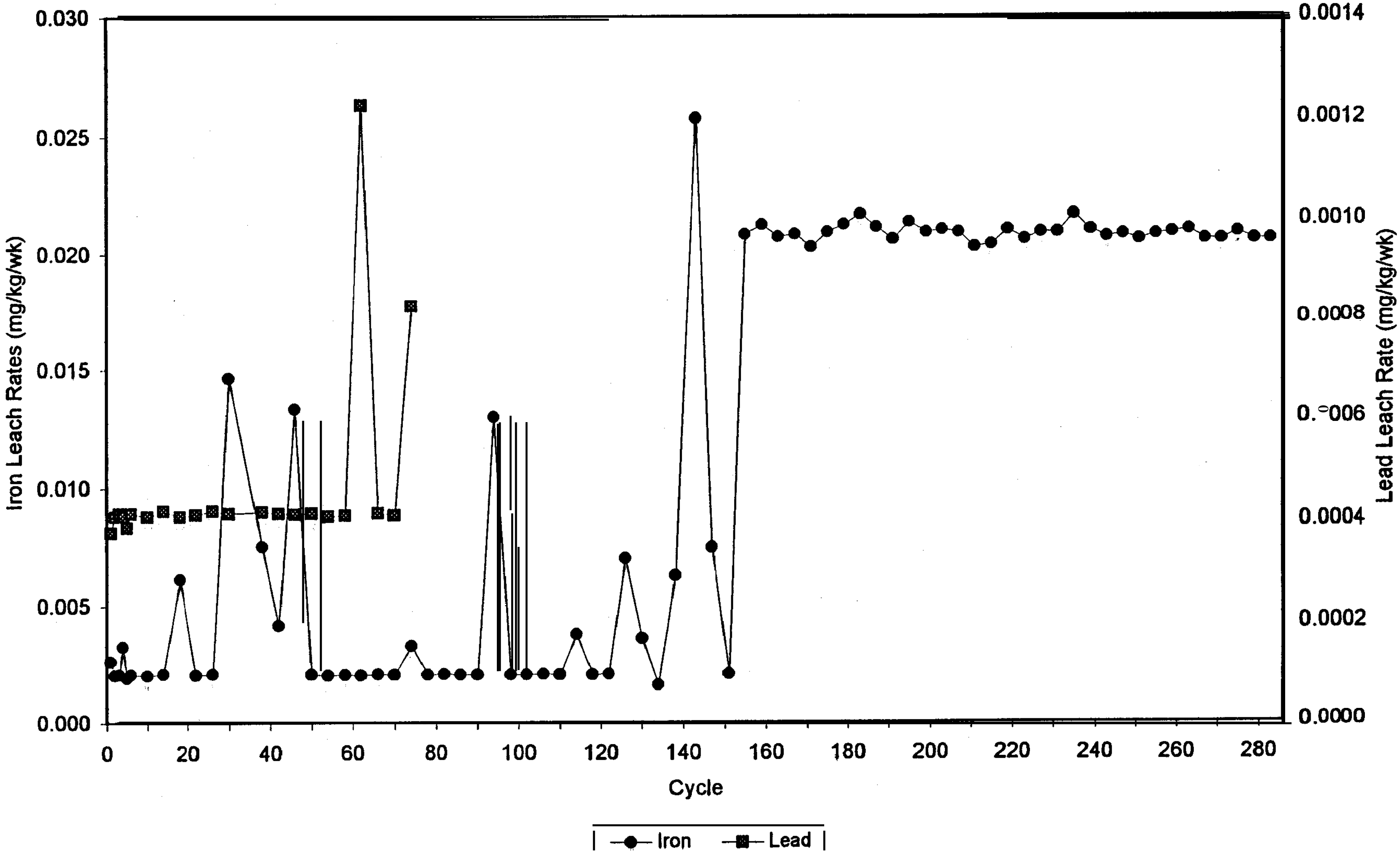


Samatosum Mine Humidity Cell - Column 2 (Encapsulated 3 Layers)
Copper & Zinc Leach Rate vs Cycle
Copper Leach Rates (mg/kg/wk)
Zinc Leach Rate (mg/kg/wk)
Cycle
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.045
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
Copper
Zinc



Samatosum Mine Humidity Cell - Column 2 (Encapsulated 3 Layers)
Manganese & Silver Leach Rate vs Cycle
Manganese Leach Rates (mg/kg/wk)
Silver Leach Rate (mg/kg/wk)
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
0.00045
0.00040
0.00035
0.00030
0.00025
0.00020
0.00015
0.00010
0.00005
0.00000
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
Cycle
-o-Manganese
-m-Silver

Samatosum Mine Humidity Cell - Column 2 (Encapsulated 3 Layers)
Iron & Lead Leach Rate vs Cycle



B3. Column 3

Pre-Ted ABA 8 ICP Metals Data iamatosum Mine Column 3 (Encapsulated 5 Layers)	
nitial Sample Weight (dry) (g)	*46150*
ABA Results:	
Slurry pH	8.41
% S (Total)	2.35
% S (Sulphate)	
% S (Sulphide)	
% S (BaS04)	
TAP (tonne CaCO3/ktonne)	73
SAP (tonne CaCO3/ktonne)	
NP (tonne CaCO3/ktonne)	79.33
Carbon (%)	
CaNP (t CaCO3/ktonne)	
TNNP (tonne CaCO3/ktonne)	6
SNNP (tonne CaCO3/ktonne)	
RNNP (tonne CaCO3/ktonne)	
TNPR	1.08
SNPR	
RNPR	
Surface Area:	
Surface Area (m2/kg)	*1.51*
Metals: (ppm)	
Aluminum Al	
Antimony Sb	
Arsenic As	
Barium Ba	
Beryllium Be	
Bismuth Bi	
Cadmium Cd	
Calcium Ca	
Chromium Cr	*Data Not Available*
Cobalt co	
Copper cu	
Iron Fe	
Lanthium La	
Lead Pb	
Lithium Li	
Magnesium Mg	
Manganese Mn	
Mercury Hg	
Molybdenum Ma	
Nickel Ni	
Phosphorus P	
Potassium K	
Selenium Se	
Silver Ag	
Sodium Na	
Strontium Sr	
Thallium Tl	
Tin Sn	
Titanium Ti	
Tungsten W	
Vanadium V	
Zinc Zn	

Post-Test ABA & ICP Metals Data iamatosum Mine Column 3 (Encapsulated 5 Layers)	
inal Sample Weight (dry) (g)	
ABA Results:	
Paste pH	
% S (Total)	
% S (Sulphate)	
% S (Sulphide)	
% S (BaS04)	
TAP (tonne CaCO3/ktonne)	*Data*
SAP (tonne CaCO3/ktonne)	*Not*
NP (tonne CaCO3/ktonne)	Available
Carbon (%)	
CaNP (t CaCO3/ktonne)	
TNNP (tonne CaCO3/ktonne)	
SNNP (tonne CaCO3/ktonne)	
RNNP (tonne CaCO3/ktonne)	
TNPR	
SNPR	
RNPR	
Surface Area:	
Surface Area (m2/kg)	
Metals: (ppm)	
Aluminum Al	
Antimony Sb	
Arsenic As	
Barium Ba	
Beryllium Be	
Bismuth Bi	
Cadmium Cd	
Calcium Ca	
Chromium Cr	*Data*
Cobalt co	*Not*
Copper cu	Available
Iron Fe	
Lanthium La	
Lead Pb	
Lithium Li	
Magnesium Mg	
Manganese Mn	
Mercury Hg	
Molybdenum Mo	
Nickel Ni	
Phosphorus P	
Potassium K	
Selenium Se	
Silver Ag	
Sodium Na	
Strontium Sr	
Thallium Tl	
Tin Sn	
Titanium Ti	
Tungsten W	
Vanadium V	
Zinc Zn	

NOTE: When metals were reported as < detection limit, half the value of the detection limit is shown in italics, and was used in subsequent calculations.

Pre-Test ABA & ICP Metals Data
Samatosum Mine
Column 6 **(Mafic Over** Oxidized **Footwall** PAG)

Initial Sample Weight (dry) (g)	
ABA Results:	
Paste pH	
% S (Total)	
% S (Sulphate)	
% S (Sulphide)	
% S (BaS04)	
TAP (tonne **CaCO3/ktonne)**	*Data Not* Available
SAP (tonne **CaCO3/ktonne)**	
NP (tonne **CaCO3/ktonne)**	
Carbon (%)	
CaNP (t **CaCO3/ktonne)**	
TNNP (tonne **CaCO3/ktonne)**	
SNNP (tonne **CaCO3/ktonne)**	
RNNP (tonne **CaCO3/ktonne)**	
TNPR	
SNPR	
RNPR	
Surface Area:	
Surface Area **(m2/kg)**	0.00

Metals: (ppm)		
Aluminum	Al	
Antimony	Sb	
Arsenic	As	
Barium	Ba	
Beryllium	Be	
Bismuth	Bi	
Cadmium	Cd	
Calcium	**Ca**	
Chromium	Cr	*Data* Not Available
cobalt	CO	
Copper	cu	
Iron	Fe	
Lanthium	La	
Lead	Pb	
Lithium	Li	
Magnesium	**Mg**	
Manganese	Mn	
Mercury	**Hg**	
Molybdenum	MC	
Nickel	Ni	
Phosphorus	P	
Potassium	K	
Selenium	Se	
Silver	**Ag**	
Sodium	Na	
Strontium	Sr	
Thallium	**Tl**	
Tin	St?	
Titanium	Ti	
Tungsten	W	
Vanadium	V	
Zinc	Zn	

Post-Test ABA 8 ICP Metals Data
Samatosum Mine
Column 6 **(Mafic** Over Oxidized Foohvall PAG)

Final Sample Weight (dry) (g)	
ABA Results:	
Paste **pH**	
% s (Total)	
% S (Sulphate)	
% S (Sulphide)	
% S (BaS04)	
TAP (tonne **CaCO3/ktonne)**	*Data Not* A*vailable*
SAP (tonne **CaCO3/ktonne)**	
NP (tonne **CaCO3/ktonne)**	
Carbon (%)	
CaNP (t **CaCO3/ktonne)**	
TNNP (tonne **CaCO3/ktonne)**	
SNNP (tonne **CaCO3/ktonne)**	
RNNP (tonne **CaCO3/ktonne)**	
TNPR	
SNPR	
RNPR	
Surface Area:	
Surface Area **(m2/kg)**	

Metals: (ppm)		
Aluminum	Al	
Antimony	Sb	
Arsenic	As	
Barium	Ba	
Beryllium	Be	
Bismuth	**Bi**	
Cadmium	Cd	
Calcium	**Ca**	
Chromium	Cr	Data *Not* Available
Cobalt	co	
Copper	cu	
Iron	Fe	
Lanthium	La	
Lead	Pb	
Lithium	Li	
Magnesium	**Mg**	
Manganese	**Mn**	
Mercury	**Hg**	
Molybdenum	Mc	
Nickel	Ni	
Phosphorus	P	
Potassium	K	
Selenium	Se	
Silver	**Ag**	
Sodium	Na	
Strontium	Sr	
Thallium	**Tl**	
Tin	Sn	
Titanium	Ti	
Tungsten	W	
Vanadium	V	
Zinc	Zn	

NOTE: When metals were ***reported*** *as* **<** *detection limit. half the value of the detection limit is shown in* **italics,** *and was used in subsequent* calculations.

Samatosum Mine Humidity Cell Data -Column 3 (Encapsulated 5 Layers)

		Analytical Results:									Sulphate Production:			By Surface Area:		Molar	NP Consumption:						
Week No.	Date	Leachate Recovered (mL)	Weekly pH (pH units)	Conductivity (umhos/cm)	Eh (mV)	Acidity (CaCO3 mg/L)*	Alkalinity (CaCO3 mg/L)*	Sulphate (SO4 mg/L)*	Acidity Production Rate (mg/kg/wk)**	Alkalinity Production Rate (mg/kg/wk)**	SO4 Production Rate (mg/kg/wk)**	Cumulative SO4 Production (mg/kg)	Remaining S (% of original)	SO4 Production Rate (mg/m2/wk)***	Cumulative SO4 Production (mg/m2)	Alk /SO4	Theoretical NP Consumption At pH 6 (mg/kg/wk)	Empirical Open-System NP Consumption At Measured pH (mg/kg/wk)	Cum NP Consumption Open-System (mg/kg/wk)	Remaining NP Open-System (%)	Theoretical Closed-System NP Consumption Above pH 6.5 (mg/kg/wk)	Cum NP Consumption Closed-System (mg/kg/wk)	Remaining NP Closed-System (%)
0	08-Feb-89								2.65	48.54	165.0	165	99.77	109.0	109		171.8	217.7	218	99.73	341.0	341	99.57
1	15-Feb-89	17500	7.9	948	490	7	128	435	2.65	48.54	165.0	330	99.53	109.0	218	0.28	171.8	217.7	435	99.45	341.0	682	99.14
2	22-Feb-89	18000	8.0	572	490	2	98	235	0.78	38.22	91.7	422	99.40	60.5	278	0.40	95.5	132.9	568	99.28	190.2	872	98.90
3	01-Mar-89	19300	8.0	500	470	3	95	207	1.25	39.73	86.6	508	99.28	57.2	336	0.44	90.2	128.6	697	99.12	179.1	1051	98.67
4	08-Mar-89	19000	8.0	522	460	4	92	232	1.65	37.88	95.5	604	99.14	63.1	399	0.38	99.5	135.7	833	98.95	197.3	1249	98.43
5	15-Mar-89	19400	8.1	540	470	2	92	243	0.84	38.67	102.1	706	99.00	67.5	466	0.36	106.4	144.2	977	98.77	212.0	1461	98.16
6	22-Mar-89	19300	7.8	508	460	4	88	234	1.67	36.80	97.9	804	98.86	64.6	531	0.36	101.9	137.1	1114	98.60	202.2	1663	97.90
7	29-Mar-89	19100	7.8	504					1.88	36.80	92.8	896	98.73	61.3	592		96.7	131.6	1246	98.43	191.5	1854	97.66
8	05-Apr-89	19300	7.8	508	460	5	88	210	2.09	36.80	87.8	984	98.60	58.0	650	0.40	91.5	126.2	1372	98.27	180.9	2035	97.43
9	12-Apr-89	19300	7.9	545					1.46	39.41	105.1	1089	98.45	69.4	720		109.4	147.4	1519	98.08	217.4	2253	97.16
10	19-Apr-89	19200	7.8	582	437	2	101	294	0.83	42.02	122.3	1212	98.28	80.8	800	0.33	127.4	168.6	1688	97.87	254.0	2507	96.84
11	26-Apr-89	19000	7.8	521					1.03	40.77	117.6	1329	98.11	77.7	878		122.5	162.2	1850	97.67	243.9	2750	96.53
12	03-May-89	19000	7.5	598	468	3	96	274	1.24	39.52	112.8	1442	97.95	74.5	953	0.34	117.5	155.8	2006	97.47	233.8	2984	96.24
13	10-May-89	19000	7.3	674					1.67	32.65	126.1	1568	97.78	83.3	1036		131.4	162.4	2168	97.27	261.1	3245	95.91
14	17-May-89	19500	7.2	650	456	5	61	330	2.11	25.77	139.4	1708	97.58	92.1	1128	0.18	145.2	168.9	2337	97.05	288.4	3534	95.55
15	24-May-89	19100	7.7	490					1.90	31.69	137.5	1845	97.38	90.8	1219		143.3	173.1	2510	96.84	284.6	3818	95.19
16	31-May-89	19500	7.4	422	470	4	89	321	1.69	37.61	135.6	1981	97.19	89.6	1308	0.27	141.3	177.2	2687	96.61	280.9	4099	94.83
17	07-Jun-89	19000	7.9	436					1.87	36.71	126.3	2107	97.01	83.4	1392		131.5	166.4	2854	96.40	261.2	4360	94.50
18	14-Jun-89	19000	7.7	495	501	5	87	284	2.06	35.82	116.9	2224	96.85	77.2	1469	0.29	121.8	155.6	3009	96.21	241.5	4602	94.20
19	21-Jun-89	19400	7.9	405					1.65	35.41	94.7	2319	96.71	62.5	1532		98.6	132.4	3142	96.04	195.6	4798	93.95
20	28-Jun-89	19000	7.9	466	454	3	85	176	1.24	34.99	72.5	2391	96.61	47.9	1579	0.46	75.5	109.2	3251	95.90	149.7	4947	93.76
21	05-Jul-89	19300	7.9	430					0.83	35.18	73.3	2464	96.50	48.4	1628		76.3	110.7	3362	95.76	151.8	5099	93.57
22	12-Jul-89	19200	8.0	446	512	1	85	178	0.42	35.36	74.1	2538	96.40	48.9	1677	0.46	77.1	112.1	3474	95.62	153.9	5253	93.38
23	19-Jul-89	19300	7.9	443					0.63	35.23	71.6	2610	96.30	47.3	1724		74.6	109.2	3583	95.48	148.5	5401	93.19
24	26-Jul-89	19500	7.9	388	490				0.85	35.09	69.1	2679	96.20	45.6	1770		72.0	106.2	3689	95.35	143.1	5545	93.01
25	02-Aug-89	18800	7.7	415					1.06	34.96	66.6	2746	96.11	44.0	1814		69.4	103.3	3792	95.22	137.7	5682	92.84
26	09-Aug-89	19600	7.9	388	440	3	82	151	1.27	34.83	64.1	2810	96.01	42.4	1856	0.52	66.8	100.4	3893	95.09	132.3	5815	92.67
27	16-Aug-89	19300	7.8	391					1.17	34.19	61.9	2872	95.93	40.9	1897		64.5	97.5	3990	94.97	127.8	5942	92.51
28	23-Aug-89	18200	7.9	391	518				1.06	33.55	59.7	2931	95.84	39.4	1936		62.2	94.6	4085	94.85	123.3	6066	92.35
29	30-Aug-89	19800	8.1	364					0.96	32.91	57.4	2989	95.76	37.9	1974		59.8	91.8	4177	94.74	118.7	6184	92.20
30	06-Sep-89	19600	7.9	342	365	2	76	130	0.85	32.28	55.2	3044	95.68	36.5	2011	0.56	57.5	88.9	4266	94.62	114.2	6299	92.06
31	13-Sep-89	18900	7.9	371					1.05	30.86	56.3	3100	95.60	37.2	2048		58.6	88.4	4354	94.51	116.2	6415	91.91
32	20-Sep-89	19600	7.6	363	475				1.26	29.45	57.4	3158	95.52	37.9	2086		59.7	87.9	4442	94.40	118.2	6533	91.76
33	27-Sep-89	19500	7.9	268					1.46	28.04	58.4	3216	95.44	38.6	2124		60.9	87.4	4529	94.29	120.3	6653	91.61
34	04-Oct-89	19200	7.6	350	370	4	64	143	1.66	26.63	59.5	3276	95.35	39.3	2164	0.43	62.0	86.9	4616	94.18	122.3	6775	91.46
35	11-Oct-89	19000	8.0	390					1.88	27.08	52.6	3328	95.28	34.7	2198		54.8	80.0	4696	94.08	107.6	6883	91.32
36	18-Oct-89	19200	7.6	286					2.09	27.53	45.6	3374	95.21	30.1	2228		47.5	73.0	4769	93.99	93.0	6976	91.21
37	25-Oct-89	19200	7.8	275					2.30	27.98	38.7	3413	95.16	25.6	2254		40.3	66.0	4835	93.90	78.3	7054	91.11
38	01-Nov-89	19300	7.6	260	430	6	68	76	2.51	28.44	31.8	3444	95.11	21.0	2275	0.86	33.1	59.0	4894	93.83	63.7	7118	91.03
39	08-Nov-89	19200	7.8	267					1.98	28.64	32.8	3477	95.07	21.7	2297		34.2	60.8	4955	93.75	66.3	7184	90.94
40	15-Nov-89	19400	7.8	253					1.46	28.83	33.8	3511	95.02	22.3	2319		35.2	62.6	5018	93.67	69.0	7253	90.86
41	22-Nov-89	19500	8.0	288					0.94	29.03	34.8	3546	94.97	23.0	2342		36.3	64.4	5082	93.59	71.6	7325	90.77
42	29-Nov-89	19000	7.9	283	368	1	71	87	0.41	29.23	35.8	3582	94.92	23.7	2366	0.78	37.3	66.1	5148	93.51	74.2	7399	90.67
43	06-Dec-89	19400	7.9	273					0.73	29.38	35.7	3617	94.87	23.6	2389		37.2	65.8	5214	93.43	73.6	7473	90.58
44	13-Dec-89	19400	8.0	264					1.05	29.54	35.6	3653	94.82	23.5	2413		37.0	65.5	5280	93.34	73.0	7546	90.49
45	20-Dec-89	19300	8.0	260					1.36	29.69	35.4	3688	94.77	23.4	2436		36.9	65.2	5345	93.26	72.5	7618	90.40
46	27-Dec-89	19400	7.8	260	385	4	71	84	1.68	29.85	35.3	3724	94.72	23.3	2459	0.81	36.8	64.9	5410	93.18	71.9	7690	90.31
47	03-Jan-90	19300	8.0	258					1.58	29.95	33.7	3757	94.67	22.3	2482		35.1	63.5	5473	93.10	68.7	7759	90.22
48	10-Jan-90	19300	7.9	248					1.47	30.06	32.2	3789	94.62	21.2	2503		33.5	62.1	5535	93.02	65.5	7824	90.14
49	17-Jan-90	19500	7.9	260					1.37	30.16	30.6	3820	94.58	20.2	2523		31.9	60.7	5596	92.95	62.3	7887	90.06
50	24-Jan-90	19400	7.2	254	445	3	72	69	1.26	30.27	29.0	3849	94.54	19.2	2542	1.00	30.2	59.2	5655	92.87	59.2	7946	89.98
51	31-Jan-90	19800	8.2	240					1.00	28.71	28.7	3878	94.50	18.9	2561		29.9	57.6	5713	92.80	58.7	8005	89.91
52	07-Feb-90	19600	8.0	233					0.73	27.16	28.3	3906	94.46	18.7	2580		29.5	55.9	5769	92.73	58.3	8063	89.84
53	14-Feb-90	19000	8.1	196					0.47	25.61	28.0	3934	94.42	18.5	2598		29.2	54.3	5823	92.66	57.9	8121	89.76
54	21-Feb-90	18500	8.2	259	360	1	60	69	0.20	24.05	27.7	3962	94.38	18.3	2617	0.83	28.8	52.7	5876	92.59	57.4	8178	89.69
55	28-Feb-90	19700	8.2	224					0.15	24.48	29.7	3991	94.34	19.6	2636		31.0	55.3	5931	92.52	61.8	8240	89.61
56	07-Mar-90	19000	8.0	271					0.10	24.91	31.8	4023	94.29	21.0	2657		33.1	57.9	5989	92.45	66.1	8306	89.53
57	14-Mar-90	19100	8.0	257					0.05	25.34	33.9	4057	94.25	22.4	2680		35.3	60.6	6049	92.37	70.5	8377	89.44
58	21-Mar-90	19500	8.2	261	190	0	61	85	0.00	25.77	35.9	4093	94.19	23.7	2703	0.69	37.4	63.2	6113	92.29	74.8	8452	89.35
59	28-Mar-90	19000	8.2	205					0.00	26.70	37.0	4130	94.14	24.4	2728		38.5	65.2	6178	92.21	77.0	8529	89.25
60	04-Apr-90	8500	8.2	303					0.00	27.63	38.0	4168	94.09	25.1	2753		39.6	67.2	6245	92.13	79.2	8608	89.15
61	11-Apr-90	19300	8.2	326					0.00	28.56	39.1	4207	94.03	25.8	2779		40.7	69.3	6314	92.04	81.4	8689	89.05
62	18-Apr-90	18900	8.3	303	190	0	72	98	0.00	29.49	40.1	4247	93.98	26.5	2805	0.71	41.8	71.3	6386	91.95	83.6	8773	88.94
63	25-Apr-90	19600	8.2	282					0.00	30.00	38.7	4286	93.92	25.6	2831		40.3	70.3	6456	91.86	80.6	8853	88.84
64	02-May-90	19100	8.2	275					0.00	30.51	37.3	4323	93.87	24.6	2856		38.8	69.3	6525	91.77	77.6	8931	88.74
65	09-May-90	19000	8.1	305					0.00	31.02	35.8	4359	93.82	23.7	2879		37.3	68.3	6594	91.69	74.7	9006	88.65

Samatosum Mine Humidity Call Data -Column 3 (Encapsulated 5 Layers)

Week No.	Date	Analytical Results: Leachate Recovered (mL)	Weekly pH (pH units)	Conductivity (umhos/cm)	Eh (mV)	Acidity (CaCO3 mg/L)*	Alkalinity (CaCO3 mg/L)*	Sulphate (SO4 mg/L)*	Acidity Production Rate (mg/kg/wk)**	Alkalinity Production Rate (mg/kg/wk)**	Sulphate Production: SO4 Production Rate (mg/kg/wk)**	Cumulative SO4 Production (mg/kg)	Remaining S (% of original)	By Surface Area: SO4 Production Rate (mg/m2/wk)***	Cumulative SO4 Production (mg/m2)	Molar Alk /SO4	NP Consumption: Theoretical NP Consumption At pH 6 (mg/kg/wk)	Empirical Open-System NP Consumption At Measured pH (mg/kg/wk)	Cum NP Consumption Open-System (mg/kg/wk)	Remaining NP Open-System (%)	Theoretical Closed-System NP Consumption Above pH 6.5 (mg/kg/wk)	Cum NP Consumption Closed-System (mg/kg/wk)	Remaining NP Closed-System (%)
198	25-Nov-92	18300	7.36	192					1.24	10.95	28.7	9472	86.56	19.0	6257		29.9	39.6	14254	82.03	58.6	19521	75.39
199	02-Dec-92	19100	7.36	182	460	3	26	68	1.24	10.76	28.1	9501	86.52	18.6	6275	0.37	29.3	38.8	14293	81.98	57.4	19578	75.32
200	09-Dec-92	18500	7.3	202					1.18	10.36	27.6	9528	86.48	18.2	6294		28.7	37.9	14331	81.93	56.3	19635	75.25
201	16-Dec-92	19200	7.42	158					1.11	9.96	27.0	9555	86.45	17.8	6311		28.1	37.0	14368	81.89	55.1	19690	75.18
202	23-Dec-92	19000	7.3	178					1.05	9.56	26.4	9582	86.41	17.5	6329		27.5	36.0	14404	81.84	54.0	19744	75.11
203	30-Dec-92	15100	7.44	200	460	3	28	79	0.98	9.16	25.8	9607	86.37	17.1	6346	0.34	26.9	35.1	14439	81.80	52.9	19797	75.05
204	06-Jan-93	9800	7.44	230					1.03	9.04	27.1	9635	86.33	17.9	6364		28.2	36.2	14475	81.75	55.4	19852	74.98
205	13-Jan-93	19700	7.3	162					1.08	8.92	28.3	9663	86.29	18.7	6382		29.5	37.3	14513	81.71	57.9	19910	74.90
206	20-Jan-93	19100	7.28	180					1.13	8.80	29.5	9692	86.25	19.5	6402		30.8	38.4	14551	81.66	60.4	19970	74.83
207	27-Jan-93	18200	7.3	188	450	3	22	78	1.18	8.68	30.8	9723	86.21	20.3	6422	0.27	32.0	39.5	14591	81.61	62.9	20033	74.75
208	03-Feb-93	19400	7.1	162					1.50	8.87	30.6	9754	86.16	20.2	6442		31.9	39.2	14630	81.56	62.2	20095	74.67
209	10-Feb-93	19200	7.2	212					1.83	9.07	30.4	9784	86.12	20.1	6463		31.7	38.9	14669	81.51	61.5	20157	74.59
210	17-Feb-93	19600	7.1	160					2.15	9.27	30.2	9814	86.08	20.0	6483		31.5	38.6	14707	81.46	60.8	20218	74.51
211	24-Feb-93	19000	7.2	182	410	6	23	73	2.47	9.47	30.1	9844	86.04	19.9	6502	0.30	31.3	38.3	14746	81.41	60.1	20278	74.44
212	03-Mar-93	19000	7.13	158					2.74	9.12	30.3	9875	85.99	20.0	6522		31.6	37.9	14784	81.36	60.4	20338	74.36
213	10-Mar-93	19200	7.2	185					3.01	8.77	30.5	9905	85.95	20.2	6543		31.8	37.6	14821	81.32	60.6	20399	74.29
214	17-Mar-93	19200	7.15	170					3.28	8.42	30.8	9936	85.91	20.3	6563		32.0	37.2	14858	81.27	60.8	20460	74.21
215	24-Mar-93	14900	7.47	196	210	11	25	96	3.55	8.07	31.0	9967	85.86	20.5	6583	0.25	32.3	36.8	14895	81.22	61.0	20521	74.13
216	31-Mar-93	19300	7.08	180					3.08	8.11	31.0	9998	85.82	20.5	6604		32.3	37.3	14932	81.18	61.4	20582	74.06
217	07-Apr-93	20000	7.27	160					2.60	8.15	30.9	10029	85.77	20.4	6624		32.2	37.8	14970	81.13	61.9	20644	73.98
218	14-Apr-93	19300	7.39	175					2.12	8.19	30.9	10060	85.73	20.4	6645		32.2	38.3	15008	81.08	62.3	20706	73.90
219	21-Apr-93	19000	7.56	188	430	4	20	75	1.65	8.23	30.9	10091	85.69	20.4	6665	0.26	32.2	38.8	15047	81.03	62.7	20769	73.82
220	28-Apr-93	19000	7.1	162					1.65	8.13	30.3	10121	85.64	20.0	6685		31.5	38.0	15085	80.98	61.4	20830	73.74
221	05-May-93	19000	7	176					1.65	8.03	29.6	10151	85.60	19.6	6705		30.9	37.3	15122	80.94	60.1	20890	73.67
222	12-May-93	19000	7	194					1.65	7.93	29.0	10180	85.56	19.2	6724		30.2	36.5	15159	80.89	58.8	20949	73.59
223	19-May-93	19000	6.96	180	420	4	19	69	1.65	7.82	28.4	10208	85.52	18.8	6743	0.26	29.6	35.8	15195	80.85	57.5	21007	73.52
224	26-May-93	19000	7.31	198					1.55	7.73	30.8	10239	85.48	20.4	6763		32.1	38.3	15233	80.80	62.7	21069	73.44
225	02-Jun-93	19200	7.13	200					1.44	7.64	33.2	10272	85.43	22.0	6785		34.6	40.8	15274	80.75	67.8	21137	73.36
226	09-Jun-93	19000	7	208					1.34	7.54	35.7	10308	85.38	23.6	6808		37.1	43.3	15317	80.69	72.9	21210	73.26
227	16-Jun-93	19100	7.18	195	430	3	18	92	1.24	7.45	38.1	10346	85.33	25.1	6834	0.19	39.7	45.9	15363	80.63	78.1	21288	73.17
228	23-Jun-93	19000	7.2	430					1.25	7.81	38.3	10384	85.27	25.3	6859		39.9	46.4	15410	80.58	78.5	21367	73.07
229	30-Jun-93	19200	7.27	220					1.25	8.16	38.5	10423	85.22	25.4	6884		40.1	47.0	15457	80.52	78.9	21446	72.97
230	07-Jul-93	19300	7.36	190					1.26	8.52	38.7	10461	85.16	25.5	6910		40.3	47.5	15504	80.46	79.3	21525	72.87
231	14-Jul-93	19500	7.37	212	420	3	21	92	1.27	8.87	38.9	10500	85.11	25.7	6935	0.22	40.5	48.1	15552	80.40	79.7	21605	72.77
232	21-Jul-93	20000	7.4	225					1.17	8.93	40.7	10541	85.05	26.9	6962		42.4	50.2	15602	80.33	83.7	21688	72.66
233	28-Jul-93	19800	7.36	200					1.07	8.99	42.6	10583	84.99	28.2	6991		44.4	52.3	15655	80.27	87.7	21776	72.55
234	04-Aug-93	11000	7.36	258					0.97	9.04	44.5	10628	84.92	29.4	7020		46.4	54.4	15709	80.20	91.7	21868	72.43
235	11-Aug-93	20000	7.36	130	400	2	21	107	0.87	9.10	46.4	10674	84.86	30.6	7051	0.19	48.3	56.5	15766	80.13	95.7	21964	72.31
236	18-Aug-93	19100	7.32	188					0.86	9.60	44.6	10719	84.80	29.5	7080		46.5	55.2	15821	80.06	92.0	22056	72.20
237	25-Aug-93	19000	7.05	198					0.86	10.10	42.8	10762	84.74	28.3	7108		44.6	53.8	15875	79.99	88.4	22144	72.09
238	01-Sep-93	18800	7.25	240					0.86	10.60	41.0	10803	84.68	27.1	7135		42.8	52.5	15927	79.92	84.7	22229	71.98
239	08-Sep-93	19700	7.28	198	380	2	26	92	0.85	11.10	39.3	10842	84.62	25.9	7161	0.27	40.9	51.2	15978	79.86	81.0	22310	71.88
240	15-Sep-93	19600	7.24	174					0.95	10.90	39.0	10881	84.57	25.8	7187		40.7	50.6	16029	79.79	80.4	22390	71.78
241	22-Sep-93	19400	7.43	193					1.04	10.70	38.8	10920	84.51	25.6	7213		40.4	50.0	16079	79.73	79.7	22470	71.68
242	29-Sep-93	19700	7.17	175					1.14	10.49	38.5	10958	84.46	25.5	7238		40.1	49.5	16128	79.67	79.1	22549	71.58
243	06-Oct-93	19000	7.38	198	330	3	25	93	1.24	10.29	38.3	10997	84.40	25.3	7263	0.26	39.9	48.9	16177	79.61	78.5	22627	71.48
244	13-Oct-93	19000	7.31	196					1.24	9.71	38.6	11035	84.35	25.5	7289		40.3	48.7	16226	79.55	79.3	22707	71.38
245	20-Oct-93	19000	7.26	195					1.24	9.12	39.0	11074	84.29	25.8	7315		40.6	48.5	16275	79.48	80.0	22787	71.28
246	27-Oct-93	19200	7.1	199					1.25	8.53	39.4	11114	84.24	26.0	7341		41.0	48.3	16323	79.42	80.8	22867	71.17
247	03-Nov-93	19300	7.38	200	330	3	19	95	1.25	7.95	39.7	11153	84.18	26.2	7367	0.19	41.4	48.1	16371	79.36	81.5	22949	71.07
248	10-Nov-93	19000	7.41	177					1.25	7.83	36.9	11190	84.13	24.4	7391		38.4	45.0	16416	79.31	75.6	23024	70.98
249	17-Nov-93	19500	7.03	182					1.25	7.72	34.0	11224	84.08	22.5	7414		35.4	41.9	16458	79.25	69.6	23094	70.89
250	24-Nov-93	19000	7.31	169					1.25	7.60	31.2	11255	84.03	20.6	7434		32.4	38.8	16497	79.20	63.6	23158	70.81
251	01-Dec-93	19200	7.27	165	300	3	18	68	1.25	7.49	28.3	11284	83.99	18.7	7453	0.25	29.5	35.7	16532	79.16	57.7	23215	70.74
252	08-Dec-93	19400	7.1	164					1.25	7.27	29.6	11313	83.95	19.6	7473		30.8	36.9	16569	79.11	60.4	23276	70.66
253	15-Dec-93	19200	7.15	175					1.24	7.06	30.9	11344	83.91	20.4	7493		32.2	38.0	16607	79.07	63.1	23339	70.58
254	22-Dec-93	19300	7.13	176					1.24	6.84	32.2	11376	83.86	21.3	7514		33.6	39.2	16646	79.02	65.9	23405	70.50
255	29-Dec-93	19100	7.3	180	290	3	16	81	1.24	6.62	33.5	11410	83.82	22.1	7536	0.19	34.9	40.3	16687	78.97	68.6	23473	70.41
256	05-Jan-94	19300	7.51	164					1.14	7.04	33.1	11443	83.77	21.9	7558		34.5	40.4	16727	78.91	67.8	23541	70.32
257	12-Jan-94	19400	7.3	201					1.03	7.45	32.7	11476	83.72	21.6	7580		34.1	40.5	16768	78.86	67.1	23608	70.24
258	19-Jan-94	19000	7.72	205					0.93	7.86	32.3	11508	83.68	21.3	7601		33.6	40.6	16808	78.81	66.3	23675	70.16
259	26-Jan-94	19100	7.72	204	280	2	20	77	0.83	8.28	31.9	11540	83.63	21.0	7622	0.25	33.2	40.6	16849	78.76	65.6	23740	70.07
260	02-Feb-94	19000	7.56	208					0.83	8.37	31.6	11572	83.59	20.9	7643		32.9	40.5	16889	78.71	65.0	23805	69.99
261	09-Feb-94	19000	7.53	203					0.83	8.46	31.4	11603	83.54	20.7	7664		32.7	40.3	16930	78.66	64.5	23870	69.91
262	16-Feb-94	18200	7.47	194					0.82	8.55	31.1	11634	83.50	20.6	7684		32.4	40.2	16970	78.61	64.0	23934	69.83
263	23-Feb-94	19000	7.53	196	315	2	21	75	0.82	8.65	30.9	11665	83.45	20.4	7705	0.27	32.2	40.0	17010	78.56	63.5	23997	69.75

Samatosum Mine Humidity Cell Data - Column 3 (Encapsulated 5 Layers)

		Analytical Results:									Sulphate Production:					Molar	NP Consumption:						
														By Surface Area:				Empirical		Remaining	Theoretical		Remaining
Week No.	Date	Leachate Recovered (mL)	Weekly pH (pH units)	Conductivity (umhos/cm)	Eh (mV)	Acidity (CaCO3 mg/L)*	Alkalinity (CaCO3 mg/L)*	Sulphate (SO4 mg/L)*	Acidity Production Rate (mg/kg/wk)**	Alkalinity Production Rate (mg/kg/wk)**	SO4 Production Rate (mg/kg/wk)**	Cumulative SO4 Production (mg/kg)	Remaining S (% of original)	SO4 Production Rate (mg/m2/wk)***	Cumulative SO4 Production (mg/m2)	Alk /SO4	Theoretical NP Consumption At pH 6 (mg/kg/wk)	Open-System NP Consumption At Measured pH (mg/kg/wk)	Cum NP Consumption Open-System (mg/kg/wk)	NP Open-System (%)	Closed-System NP Consumption Above pH 6.5 (mg/kg/wk)	Cum NP Consumption Closed-System (mg/kg/wk)	NP Closed-System (%)
132	21-Aug-91	19400	8.0	338					0.84	12.32	42.7	7223	89.75	28.2	4771		44.4	55.9	11054	86.07	88.0	14912	81.20
133	28-Aug-91	17000	7.6	338					0.64	8.44	39.0	7262	89.70	25.8	4797		40.6	48.4	11102	86.00	80.6	14993	81.10
134	04-Sep-91	6800	7.7	538	275	3	31	240	0.44	4.57	35.4	7298	89.65	23.4	4820	0.12	36.8	41.0	11143	85.95	73.2	15066	81.01
135	11-Sep-91	20000	7.3	306					0.76	7.80	36.3	7334	89.60	24.0	4844		37.9	44.9	11188	85.90	75.0	15141	80.91
136	18-Sep-91	18700	7.8	285					1.07	11.03	37.3	7371	89.54	24.6	4869		38.9	48.8	11237	85.84	76.7	15218	80.82
137	25-Sep-91	19800	7.8	238					1.39	14.27	38.3	7409	89.49	25.3	4894		39.9	52.8	11290	85.77	78.4	15296	80.72
138	02-Oct-91	19700	8.0	245	180	4	41	92	1.71	17.50	39.3	7449	89.43	25.9	4920	0.43	40.9	56.7	11347	85.70	80.1	15376	80.62
139	09-Oct-91	19000	7.8	234	280	3			1.24	17.46	37.3	7486	89.38	24.6	4945		38.8	55.0	11402	85.63	76.4	15453	80.52
140	16-Oct-91	19400	7.7	232					1.34	17.42	35.3	7521	89.33	23.3	4968		36.7	52.8	11454	85.56	72.1	15525	80.43
141	23-Oct-91	19100	7.7	235					1.44	17.38	33.2	7555	89.28	22.0	4990		34.6	50.6	11505	85.50	67.8	15593	80.34
142	30-Oct-91	19100	7.8	238					1.54	17.33	31.2	7586	89.24	20.6	5011		32.5	48.3	11553	85.44	63.5	15656	80.26
143	06-Nov-91	19000	7.6	260	300	4	42	71	1.65	17.29	29.2	7615	89.20	19.3	5030	0.57	30.4	46.1	11599	85.38	59.3	15715	80.19
144	13-Nov-91	19700	7.6	230					1.65	17.81	30.3	7645	89.16	20.0	5050		31.5	47.7	11647	85.32	61.4	15777	80.11
145	20-Nov-91	19000	7.8	250					1.65	18.32	31.3	7677	89.11	20.7	5070		32.6	49.3	11696	85.26	63.5	15840	80.03
146	27-Nov-91	20000	7.7	192					1.65	18.84	32.3	7709	89.07	21.3	5092		33.7	50.9	11747	85.19	65.7	15906	79.95
147	04-Dec-91	19000	7.6	225	320	4	47	81	1.65	19.35	33.3	7742	89.02	22.0	5114	0.56	34.7	52.4	11800	85.13	67.8	15974	79.86
148	11-Dec-91	19000	7.5	222					1.55	19.32	33.0	7775	88.97	21.8	5136		34.3	52.1	11852	85.06	67.1	16041	79.78
149	18-Dec-91	18700	7.8	230					1.45	19.29	32.6	7808	88.93	21.5	5157		33.9	51.8	11903	84.99	66.4	16107	79.70
150	25-Dec-91	19900	7.8	200					1.35	19.27	32.2	7840	88.88	21.3	5178		33.5	51.4	11955	84.93	65.7	16173	79.61
151	01-Jan-92	19300	7.6	214	300	3	46	76	1.25	19.24	31.8	7872	88.83	21.0	5199	0.58	33.1	51.1	12006	84.87	65.0	16238	79.53
152	08-Jan-92	19000	7.6	225					1.25	18.48	31.6	7903	88.79	20.9	5220		33.0	50.2	12056	84.80	64.7	16303	79.45
153	15-Jan-92	19000	7.6	222					1.25	17.73	31.5	7935	88.74	20.8	5241		32.8	49.3	12105	84.74	64.4	16367	79.37
154	22-Jan-92	19500	7.6	180					1.25	16.98	31.3	7966	88.70	20.7	5262		32.7	48.4	12154	84.68	64.1	16431	79.29
155	29-Jan-92	19200	7.8	200	310	3	39	75	1.25	16.23	31.2	7997	88.66	20.6	5282	0.50	32.5	47.5	12201	84.62	63.8	16495	79.21
156	05-Feb-92	19300	7.5	200					1.14	15.39	32.7	8030	88.61	21.6	5304		34.0	48.3	12250	84.56	66.9	16562	79.12
157	12-Feb-92	19300	7.6	210					1.04	14.56	34.1	8064	88.56	22.5	5326		35.5	49.1	12299	84.50	70.0	16632	79.03
158	19-Feb-92	19000	7.6	185					0.94	13.73	35.6	8100	88.51	23.5	5350		37.1	49.8	12349	84.43	73.2	16705	78.94
159	26-Feb-92	19200	7.8	227	310	2	31	89	0.83	12.90	37.0	8137	88.46	24.5	5374	0.33	38.6	50.6	12399	84.37	76.3	16781	78.85
160	04-Mar-92	19100	7.8	175					0.83	13.07	36.6	8173	88.41	24.2	5399		38.1	50.4	12450	84.31	75.5	16857	78.75
161	11-Mar-92	19000	7.8	220					0.83	13.24	36.2	8210	88.36	23.9	5423		37.7	50.1	12500	84.24	74.6	16931	78.66
162	18-Mar-92	19000	7.6	205					0.83	13.41	35.8	8245	88.30	23.7	5446		37.3	49.9	12550	84.18	73.8	17005	78.56
163	25-Mar-92	19000	7.7	227	380	2	33	86	0.82	13.59	35.4	8281	88.25	23.4	5470	0.37	36.9	49.6	12599	84.12	72.9	17078	78.47
164	01-Apr-92	18800	7.7	260					0.92	14.67	36.9	8318	88.20	24.4	5494		38.5	52.2	12651	84.05	76.0	17154	78.38
165	08-Apr-92	19400	7.6	215					1.02	15.76	38.5	8356	88.15	25.4	5519		40.1	54.8	12706	83.98	79.1	17233	78.28
166	15-Apr-92	19100	7.7	235					1.12	16.84	40.0	8396	88.09	26.4	5546		41.7	57.4	12764	83.91	82.2	17315	78.17
167	22-Apr-92	18800	7.6	255	400	3	44	102	1.22	17.92	41.6	8438	88.03	27.4	5573	0.41	43.3	60.0	12824	83.84	85.3	17401	78.07
168	29-Apr-92	19400	7.6	230					1.05	14.78	38.7	8476	87.98	25.5	5599		40.3	54.0	12878	83.77	79.5	17480	77.97
169	06-May-92	19200	7.9	250					0.88	11.63	35.8	8512	87.93	23.6	5622		37.3	48.0	12926	83.71	73.7	17554	77.87
170	13-May-92	19000	7.7	223					0.71	8.48	32.9	8545	87.88	21.7	5644		34.3	42.1	12968	83.65	67.9	17622	77.79
171	20-May-92	8200	7.7	365	375	3	30	169	0.53	5.33	30.0	8575	87.84	19.8	5664	0.17	31.3	36.1	13004	83.61	62.0	17684	77.71
172	27-May-92	19700	7.6	250					0.71	8.01	28.6	8604	87.80	18.9	5683		29.8	37.1	13041	83.56	58.9	17743	77.63
173	03-Jun-92	16300	7.6	290					0.88	10.69	27.2	8631	87.76	17.9	5701		28.3	38.1	13079	83.51	55.7	17798	77.56
174	10-Jun-92	19900	7.6	220					1.06	13.37	25.7	8657	87.72	17.0	5718		26.8	39.1	13118	83.46	52.5	17851	77.50
175	17-Jun-92	19000	7.6	260	420	3	39	59	1.24	16.06	24.3	8681	87.69	16.0	5734	0.63	25.3	40.1	13158	83.41	49.4	17900	77.44
176	24-Jun-92	19200	7.7	255					1.24	15.72	27.5	8708	87.65	18.1	5752		28.6	43.1	13201	83.36	56.0	17956	77.36
177	01-Jul-92	19000	7.7	282					1.25	15.38	30.6	8739	87.60	20.2	5772		31.9	46.1	13247	83.30	62.6	18019	77.29
178	08-Jul-92	19300	7.5	230					1.25	15.05	33.8	8773	87.56	22.3	5795		35.2	49.0	13296	83.24	69.2	18088	77.20
179	15-Jul-92	19400	7.7	218	400	3	35	88	1.26	14.71	37.0	8810	87.50	24.4	5819	0.38	38.5	52.0	13348	83.17	75.8	18164	77.10
180	22-Jul-92	19000	7.8	270					1.25	14.23	36.6	8846	87.45	24.2	5843		38.1	51.1	13399	83.11	75.0	18239	77.01
181	29-Jul-92	19000	7.8	270					1.25	13.74	36.2	8883	87.40	23.9	5867		37.7	50.2	13450	83.05	74.2	18313	76.92
182	05-Aug-92	18800	7.4	270					1.24	13.25	35.8	8918	87.35	23.6	5891		37.3	49.3	13499	82.98	73.3	18386	76.82
183	12-Aug-92	19000	7.38	230	380	3	31	86	1.24	12.76	35.4	8954	87.30	23.4	5914	0.35	36.9	48.4	13547	82.92	72.5	18459	76.73
184	19-Aug-92	19000	7.3	256					1.23	12.44	35.6	8989	87.25	23.5	5938		37.0	48.3	13596	82.86	72.9	18532	76.64
185	26-Aug-92	19000	7.49	228					1.23	12.11	35.7	9025	87.20	23.6	5961		37.2	48.1	13644	82.80	73.2	18605	76.55
186	02-Sep-92	18900	7.35	240					1.23	11.79	35.9	9061	87.15	23.7	5985		37.4	47.9	13692	82.74	73.5	18679	76.45
187	09-Sep-92	18900	7.48	215	460	3	28	88	1.23	11.47	36.0	9097	87.10	23.8	6009	0.31	37.5	47.8	13739	82.68	73.9	18752	76.36
188	16-Sep-92	19000	7.54	190					1.23	12.22	36.9	9134	87.04	24.3	6033		38.4	49.4	13789	82.62	75.6	18828	76.27
189	23-Sep-92	19000	7.56	208					1.24	12.98	37.7	9172	86.99	24.9	6058		39.2	51.0	13840	82.55	77.3	18905	76.17
190	30-Sep-92	19100	7.61	212					1.24	13.73	38.5	9210	86.94	25.4	6083		40.1	52.6	13892	82.49	79.0	18984	76.07
191	07-Oct-92	19100	7.64	236	460	3	35	95	1.24	14.49	39.3	9249	86.88	26.0	6109	0.35	41.0	54.2	13947	82.42	80.7	19065	75.97
192	14-Oct-92	19100	7.3	200					1.24	13.75	37.1	9287	86.83	24.5	6134		38.7	51.2	13998	82.36	76.1	19141	75.87
193	21-Oct-92	19000	7.45	208					1.24	13.01	34.9	9321	86.78	23.0	6157		36.3	48.1	14046	82.29	71.5	19212	75.78
194	28-Oct-92	19000	7.36	208					1.24	12.27	32.7	9354	86.73	21.6	6179		34.0	45.1	14091	82.24	66.8	19279	75.70
195	04-Nov-92	19000	7.45	188	475	3	28	74	1.24	11.53	30.5	9385	86.69	20.1	6199	0.36	31.7	42.0	14133	82.18	62.2	19341	75.62
196	11-Nov-92	19000	7.65	198					1.24	11.34	29.9	9414	86.65	19.7	6218		31.1	41.2	14174	82.13	61.0	19402	75.54
197	18-Nov-92	19200	7.33	176					1.24	11.14	29.3	9444	86.60	19.4	6238		30.5	40.4	14215	82.08	59.8	19462	75.47

Samatosum Mine Humidity Cell Data -Column 3 (Encapsulated 5 Layers)

		Dissolved Metals*:								Metal Leach Rates:							
		Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc	Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc
Week No.	Date	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn
		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/kg/wk)	(mg/kg/wk)	(mg/kg/wk)	(mg/kg/wk)	(mg/kg/wk)	(mg/kg/wk)	(mg/kg/wk)	(mg/kg/wk)
0	8-Feb-89																
1	15-Feb-89	0.008	0.016	0.004	0.009	0.001		2E-04	0.01	3.0E-03	6.1E-03	1.3E-03	3.4E-03	3.8E-04		7.6E-05	3.8E-03
2	22-Feb-89	0.004	0.016	0.001	0.005	0.001		2E-04	0.05	1.6E-03	6.2E-03	5.1E-04	2.0E-03	3.9E-04		7.8E-05	2.0E-02
3	1-Mar-89	0.003	0.011	0.003	0.005	0.001		2E-04	0.05	1.3E-03	4.6E-03	1.3E-03	2.1E-03	4.2E-04		8.4E-05	2.1E-02
4	8-Mar-89	0.002	0.008	0.001	0.017	0.001		2E-04	0.05	8.2E-04	3.3E-03	5.8E-04	7.0E-03	4.1E-04		8.2E-05	2.1E-02
5	15-Mar-89	0.001	0.008	5E-04	0.005	0.001		2E-04	0.05	4.2E-04	3.4E-03	2.1E-04	2.1E-03	4.2E-04		8.4E-05	2.1E-02
6	22-Mar-89	0.001	0.006	5E-04	0.005	0.001		2E-04	0.05	4.2E-04	2.5E-03	2.1E-04	2.1E-03	4.2E-04		8.4E-05	2.1E-02
7	29-Mar-89																
8	5-Apr-89																
9	12-Apr-89																
10	19-Apr-89	0.001	0.002	0.004	0.005	0.001		2E-04	0.08	4.2E-04	8.3E-04	1.5E-03	2.1E-03	4.2E-04		8.3E-05	3.3E-02
11	26-Apr-89																
12	3-May-89																
13	10-May-89																
14	17-May-89	0.002	0.006	5E-04	0.044	0.001		2E-04	0.05	8.5E-04	2.5E-03	3.8E-04	1.9E-02	4.2E-04		8.5E-05	2.1E-02
15	24-May-89																
16	31-May-89																
17	7-Jun-89																
18	14-Jun-89	0.002	0.006	9E-04	0.01	0.001		2E-04	0.05	8.2E-04	2.5E-03	3.7E-04	4.1E-03	4.1E-04		8.2E-05	2.1E-02
19	21-Jun-89																
20	28-Jun-89																
21	5-Jul-89																
22	12-Jul-89	0.001	0.005	5E-04	0.005	0.001		2E-04	0.04	4.2E-04	2.1E-03	2.1E-04	2.1E-03	4.2E-04		8.3E-05	1.7E-02
23	19-Jul-89																
24	26-Jul-89																
25	2-Aug-89																
26	9-Aug-89	0.001	0.004	0.006	0.005	0.001		2E-04	0.05	4.2E-04	1.7E-03	2.4E-03	2.1E-03	4.2E-04		8.5E-05	2.1E-02
27	16-Aug-89																
28	23-Aug-89																
29	30-Aug-89																
30	6-Sep-89	0.001	0.005	0.002	0.012	0.001		2E-04	0.03	4.2E-04	2.1E-03	7.6E-04	5.1E-03	4.2E-04		8.5E-05	1.3E-02
31	13-Sep-89																
32	20-Sep-89																
33	27-Sep-89																
34	4-Oct-89																
35	11-Oct-89																
36	18-Oct-89																
37	25-Oct-89																
38	1-Nov-89	0.002	0.003	5E-04	0.005	0.001		2E-04	0.05	8.4E-04	1.3E-03	2.1E-04	2.1E-03	4.2E-04		8.4E-05	2.1E-02
39	8-Nov-89																
40	15-Nov-89																
41	22-Nov-89																
42	29-Nov-89	0.001	0.002	0.07	0.011	0.001		2E-04	0.03	4.1E-04	8.2E-04	2.9E-02	4.5E-03	4.1E-04		8.2E-05	1.2E-02
43	6-Dec-89																
44	13-Dec-89																
45	20-Dec-89																
46	27-Dec-89	0.001	0.002	0.07	0.006	0.001		2E-04	0.02	4.2E-04	8.4E-04	2.9E-02	2.5E-03	4.2E-04		8.4E-05	8.4E-03
47	3-Jan-90																
48	10-Jan-90																
49	17-Jan-90																
50	24-Jan-90	0.001	0.002	5E-04	0.005	0.001		2E-04	0.03	4.2E-04	8.4E-04	2.1E-04	2.1E-03	4.2E-04		8.4E-05	1.3E-02
61	31-Jan 90																
52	7-Feb-90																
53	14-Feb-90																
54	21-Feb-90	0.001	0.002	8E-04	0.005	0.001		2E-04	0.03	4.0E-04	8.0E-04	3.2E-04	2.0E-03	4.0E-04		8.0E-05	1.2E-02
55	28-Feb-90																
56	7-Mar-90																
67	14-Mar-90																
58	21-Mar-90	0.002	0.004	0.002	0.01	0.002		0.001	0.03	8.5E-04	1.7E-03	7.6E-04	4.2E-03	8.5E-04		4.2E-04	1.3E-02
59	28-Mar-90																
60	4-Apr-90																
61	11-Apr-90																
62	18-Apr-90	0.002	0.004	0.001	0.005	0.002		0.001	0.03	8.2E-04	1.6E-03	4.1E-04	2.0E-03	8.2E-04		4.1E-04	1.2E-02
63	25-Apr-90																
64	2-May-90																
65	9-May-90																

		Cumulative Metal Leach Rates:							
		Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc
Week No.	Date	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn
		(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
0	8-Feb-89	3.0E-03	6.1E-03	1.3E-03	3.4E-03	3.8E-04	1.4E-03	7.6E-05	3.8E-03
1	15-Feb-89	6.1E-03	1.2E-02	2.7E-03	6.8E-03	7.6E-04	2.8E-03	1.5E-04	7.6E-03
2	22-Feb-89	7.6E-03	1.8E-02	3.2E-03	8.8E-03	1.1E-03	4.3E-03	2.3E-04	2.7E-02
3	1-Mar-89	8.9E-03	2.3E-02	4.4E-03	1.1E-02	1.6E-03	5.7E-03	3.1E-04	4.8E-02
4	8-Mar-89	9.7E-03	2.6E-02	5.0E-03	1.8E-02	2.0E-03	7.1E-03	4.0E-04	6.9E-02
5	15-Mar-89	1.0E-02	3.0E-02	5.2E-03	2.0E-02	2.4E-03	8.5E-03	4.8E-04	9.0E-02
6	22-Mar-89	1.1E-02	3.2E-02	5.4E-03	2.2E-02	2.8E-03	1.0E-02	5.6E-04	1.1E-01
7	29-Mar-89	1.1E-02	3.3E-02	5.8E-03	2.3E-02	3.0E-03	1.1E-02	6.1E-04	1.2E-01
8	5-Apr-89	1.1E-02	3.4E-02	6.2E-03	2.4E-02	3.2E-03	1.3E-02	6.5E-04	1.4E-01
9	12-Apr-89	1.1E-02	3.5E-02	6.7E-03	2.5E-02	3.4E-03	1.4E-02	6.9E-04	1.5E-01
10	19-Apr-89	1.2E-02	3.5E-02	8.1E-03	2.7E-02	3.9E-03	1.6E-02	7.7E-04	1.8E-01
11	26-Apr-89	1.2E-02	3.6E-02	8.6E-03	3.2E-02	4.1E-03	1.7E-02	8.1E-04	2.0E-01
12	3-May-89	1.2E-02	3.7E-02	9.0E-03	3.8E-02	4.3E-03	1.8E-02	8.6E-04	2.1E-01
13	10-May-89	1.3E-02	3.8E-02	9.6E-03	4.3E-02	4.5E-03	2.0E-02	9.0E-04	2.3E-01
14	17-May-89	1.3E-02	4.1E-02	9.9E-03	6.1E-02	4.9E-03	2.1E-02	9.8E-04	2.5E-01
15	24-May-89	1.4E-02	4.2E-02	1.0E-02	6.7E-02	5.1E-03	2.3E-02	1.0E-03	2.6E-01
16	31-May-89	1.4E-02	4.3E-02	1.0E-02	7.3E-02	5.3E-03	2.4E-02	1.1E-03	2.7E-01
17	7-Jun-89	1.5E-02	4.4E-02	1.0E-02	7.8E-02	5.5E-03	2.6E-02	1.1E-03	2.8E-01
18	14-Jun-89	1.5E-02	4.7E-02	1.1E-02	8.3E-02	5.9E-03	2.7E-02	1.2E-03	3.0E-01
19	21-Jun-89	1.6E-02	4.8E-02	1.1E-02	8.4E-02	6.2E-03	2.8E-02	1.2E-03	3.1E-01
20	28-Jun-89	1.6E-02	4.9E-02	1.1E-02	8.6E-02	6.4E-03	3.0E-02	1.3E-03	3.2E-01
21	5-Jul-89	1.6E-02	5.0E-02	1.1E-02	8.7E-02	6.6E-03	3.1E-02	1.3E-03	3.3E-01
22	12-Jul-89	1.7E-02	5.2E-02	1.1E-02	8.9E-02	7.0E-03	3.3E-02	1.4E-03	3.4E-01
23	19-Jul-89	1.7E-02	5.3E-02	1.2E-02	9.0E-02	7.2E-03	3.4E-02	1.4E-03	3.5E-01
24	26-Jul-89	1.7E-02	5.4E-02	1.3E-02	9.1E-02	7.4E-03	3.6E-02	1.5E-03	3.6E-01
25	2-Aug-89	1.7E-02	5.5E-02	1.3E-02	9.2E-02	7.6E-03	3.7E-02	1.5E-03	3.7E-01
26	9-Aug-89	1.8E-02	5.7E-02	1.6E-02	9.5E-02	8.0E-03	3.8E-02	1.6E-03	3.9E-01
27	16-Aug-89	1.8E-02	5.8E-02	1.7E-02	9.6E-02	8.3E-03	4.0E-02	1.7E-03	4.0E-01
28	23-Aug-89	1.8E-02	5.9E-02	1.7E-02	9.8E-02	8.5E-03	4.1E-02	1.7E-03	4.1E-01
29	30-Aug-89	1.8E-02	6.0E-02	1.8E-02	1.0E-01	8.7E-03	4.3E-02	1.7E-03	4.2E-01
30	6-Sep-89	1.9E-02	6.2E-02	1.9E-02	1.1E-01	9.1E-03	4.4E-02	1.8E-03	4.3E-01
31	13-Sep-89	1.9E-02	6.2E-02	1.9E-02	1.1E-01	9.2E-03	4.6E-02	1.8E-03	4.3E-01
32	20-Sep-89	1.9E-02	6.3E-02	1.9E-02	1.1E-01	9.3E-03	4.7E-02	1.9E-03	4.4E-01
33	27-Sep-89	1.9E-02	6.3E-02	1.9E-02	1.1E-01	9.4E-03	4.8E-02	1.9E-03	4.4E-01
34	4-Oct-89	2.0E-02	6.3E-02	1.9E-02	1.1E-01	9.5E-03	5.0E-02	1.9E-03	4.5E-01
35	11-Oct-89	2.0E-02	6.4E-02	1.9E-02	1.1E-01	9.6E-03	5.1E-02	1.9E-03	4.5E-01
36	18-Oct-89	2.0E-02	6.4E-02	2.0E-02	1.1E-01	9.7E-03	5.3E-02	1.9E-03	4.6E-01
37	25-Oct-89	2.0E-02	6.5E-02	2.0E-02	1.1E-01	9.8E-03	5.4E-02	2.0E-03	4.6E-01
38	1-Nov-89	2.1E-02	6.6E-02	2.0E-02	1.1E-01	1.0E-02	5.5E-02	2.1E-03	4.8E-01
39	8-Nov-89	2.1E-02	6.7E-02	2.7E-02	1.2E-01	1.0E-02	5.7E-02	2.1E-03	4.9E-01
40	15-Nov-89	2.1E-02	6.7E-02	3.4E-02	1.2E-01	1.1E-02	5.8E-02	2.1E-03	5.0E-01
41	22-Nov-89	2.2E-02	6.8E-02	4.2E-02	1.2E-01	1.1E-02	6.0E-02	2.2E-03	5.1E-01
42	29-Nov-89	2.2E-02	6.8E-02	7.1E-02	1.2E-01	1.1E-02	6.1E-02	2.3E-03	5.2E-01
43	6-Dec-89	2.2E-02	6.9E-02	8.5E-02	1.2E-01	1.1E-02	6.3E-02	2.3E-03	5.2E-01
44	13-Dec-89	2.3E-02	6.9E-02	1.0E-01	1.3E-01	1.2E-02	6.4E-02	2.3E-03	5.3E-01
45	20-Dec-89	2.3E-02	7.0E-02	1.1E-01	1.3E-01	1.2E-02	6.5E-02	2.4E-03	5.3E-01
46	27-Dec-89	2.3E-02	7.0E-02	1.4E-01	1.3E-01	1.2E-02	6.7E-02	2.5E-03	5.4E-01
47	3-Jan-90	2.3E-02	7.1E-02	1.5E-01	1.3E-01	1.3E-02	6.8E-02	2.5E-03	5.5E-01
48	10-Jan-90	2.4E-02	7.1E-02	1.6E-01	1.3E-01	1.3E-02	7.0E-02	2.6E-03	5.5E-01
49	17-Jan-90	2.4E-02	7.2E-02	1.7E-01	1.3E-01	1.3E-02	7.1E-02	2.6E-03	5.6E-01
50	24-Jan-90	2.4E-02	7.3E-02	1.7E-01	1.4E-01	1.3E-02	7.3E-02	2.7E-03	5.7E-01
61	31-Jan 90	2.6E-02	7.3E-02	1.7E-01	1.4E-01	1.4E-02	7.4E-02	2.7E-03	5.8E-01
52	7-Feb-90	2.5E-02	7.3E-02	1.7E-01	1.4E-01	1.4E-02	7.5E-02	2.8E-03	5.8E-01
53	14-Feb-90	2.5E-02	7.4E-02	1.7E-01	1.4E-01	1.4E-02	7.7E-02	2.8E-03	5.9E-01
54	21-Feb-90	2.5E-02	7.5E-02	1.7E-01	1.4E-01	1.4E-02	7.8E-02	2.9E-03	6.0E-01
55	28-Feb-90	2.6E-02	7.5E-02	1.7E-01	1.4E-01	1.5E-02	8.0E-02	3.0E-03	6.1E-01
56	7-Mar-90	2.6E-02	7.6E-02	1.7E-01	1.4E-01	1.5E-02	8.1E-02	3.1E-03	6.1E-01
67	14-Mar-90	2.6E-02	7.6E-02	1.7E-01	1.6E-01	1.6E-02	8.2E-02	3.3E-03	6.2E-01
58	21-Mar-90	2.7E-02	7.8E-02	1.7E-01	1.5E-01	1.6E-02	8.4E-02	3.7E-03	6.3E-01
59	28-Mar-90	2.8E-02	7.9E-02	1.7E-01	1.5E-01	1.7E-02	8.5E-02	3.9E-03	6.4E-01
60	4-Apr-90	2.8E-02	8.0E-02	1.7E-01	1.5E-01	1.7E-02	8.7E-02	4.1E-03	6.4E-01
61	11-Apr-90	2.8E-02	8.1E-02	1.7E-01	1.5E-01	1.7E-02	8.8E-02	4.3E-03	6.5E-01
62	18-Apr-90	2.9E-02	8.2E-02	1.7E-01	1.6E-01	1.8E-02	9.0E-02	4.7E-03	6.6E-01
63	25-Apr-90	3.0E-02	8.3E-02	1.7E-01	1.6E-01	1.9E-02	9.1E-02	4.9E-03	6.7E-01
64	2-May-90	3.0E-02	8.4E-02	1.7E-01	1.6E-01	1.9E-02	9.2E-02	5.1E-03	6.7E-01
65	9-May-90	3.0E-02	8.4E-02	1.7E-01	1.6E-01	1.9E-02	9.4E-02	5.3E-03	6.8E-01

** If values were reported as < detection limit, 1/2 the detection limit is shown in italics and was used in subsequent calculations.*

Samatosum Mine Humidity Cell Data -Column **3** (Encapsulated **5 Layers)**

Week No.	Date	Analytical Results: Leachate Recovered (mL)	Weekly pH (pH units)	Conductivity (umhos/cm)	Eh (mV)	Acidity (CaCO3 mg/L)*	Alkalinity (CaCO3 mg/L)*	Sulphate (SO4 mg/L)*	Acidity Production Rate (mg/kg/wk)**	Alkalinity Production Rate (mg/kg/wk)**	Sulphate Production: SO4 Production Rate (mg/kg/wk)**	Cumulative SO4 Production (mg/kg)	Remaining S (% of original)
264	02-Mar-94	19300	7.36	187					0.93	8.34	31.1	11696	83.41
265	09-Mar-94	19000	7.59	210					1.03	8.03	31.3	11727	83.37
266	16-Mar-94	19200	7.45	202					1.13	7.72	31.5	11759	83.32
267	23-Mar-94	19000	7.61	212	300	3	18	77	1.24	7.41	31.7	11791	83.28
268	30-Mar-94	19000	7.56	196					1.62	7.33	32.3	11823	83.23
269	06-Apr-94	19300	7.25	200					2.00	7.25	32.8	11856	83.18
270	13-Apr-94	18800	7.41	205					2.38	7.18	33.4	11889	83.14
271	20-Apr-94	18200	7.46	221	370	7	18	86	2.76	7.10	33.9	11923	83.09
272	27-Apr-94	20000	7.41	170					2.28	7.00	33.8	11957	83.04
273	04-May-94	19400	7.16	204					1.80	6.89	33.7	11990	82.99
274	11-May-94	19000	7.26	172					1.32	6.79	33.6	12024	82.94
275	18-May-94	19300	7.4	201	375	2	16	80	0.84	6.69	33.5	12057	82.90
276	25-May-94	19200	7.23	207					0.83	6.36	33.7	12091	82.85
277	01-Jun-94	18900	7.4	214					0.83	6.02	34.0	12125	82.80
278	08-Jun-94	18900	7.47	231					0.83	5.69	34.3	12159	82.75
279	15-Jun-94	19000	7.46	218	250	2	13	84	0.82	5.35	34.6	12194	82.70
280	22-Jun-94	19000	7.39	240					0.82	5.66	34.7	12229	82.65
281	29-Jun-94	19000	7.47	211					0.82	5.97	34.8	12264	82.60
282	06-Jul-94	19300	7.42	205					0.82	6.28	34.9	12298	82.56
283	13-Jul-94	19000	7.38	206	270	2	16	85	0.82	6.59	35.0	12333	82.51
284	20-Jul-94	19400	7.43	200					0.82	6.59	35.0	12368	82.46
285	27-Jul-94	19600	7.28	207					0.82	6.59	35.0	12403	82.41
286	03-Aug-94	19200	7.19	192					0.82	6.59	35.0	12438	82.36
Maximum		20000	8.30	948	518	11	128.0	435	3.55	48.54	165.0	12438	99.77
Minimum		6800	6.70	130	180	0	13.0	59	0.00	4.57	24.3	165	82.36
Mean		18919	7.64	272	363	3	50.3	124	1.16	18.53	43.3	7291	89.66
Median		19100	7.61	247	373	3	47.0	92	1.14	17.46	36.2	7615	89.20
Mean Last 8 Weeks		19024	7.31	197	348	4	19.8	84	1.39	8.02	34.3	11079	84.29
75% Remaining (Wks)													437
50% Remaining (Wks)													950
25% Remaining (Wks)													1462
0% Remaining (Wks)													1975

Week No.	Date	By Surface Area: SO4 Production Rate (mg/m2/wk)***	Cumulative SO4 Production (mg/m2)	Molar Alk /SO4	NP Consumption: Theoretical NP Consumption At pH 6 (mg/kg/wk)	Empirical Open-System NP Consumption At Measured pH (mg/kg/wk)	Cum NP Consumption Open-System (mg/kg/wk)	Remaining NP Open-System (%)	Theoretical Closed-System NP Consumption Above pH 6.5 (mg/kg/wk)	Cum NP Consumption Closed-System (mg/kg/wk)	Remaining NP Closed-System (%)
264	02-Mar-94	20.5	7725		32.4	39.8	17050	78.51	63.8	24061	69.67
265	09-Mar-94	20.7	7746		32.6	39.6	17089	78.46	64.2	24125	69.59
266	16-Mar-94	20.8	7767		32.8	39.4	17128	78.41	64.5	24190	69.51
267	23-Mar-94	20.9	7788	0.22	33.0	39.2	17168	78.36	64.8	24255	69.43
268	30-Mar-94	21.3	7809		33.6	39.3	17207	78.31	65.6	24320	69.34
269	06-Apr-94	21.7	7831		34.2	39.4	17246	78.26	66.4	24387	69.26
270	13-Apr-94	22.0	7853		34.8	39.5	17286	78.21	67.1	24454	69.17
271	20-Apr-94	22.4	7875	0.20	35.3	39.7	17326	78.16	67.9	24522	69.09
272	27-Apr-94	22.3	7898		35.2	39.9	17366	78.11	68.1	24590	69.00
273	04-May-94	22.2	7920		35.1	40.2	17406	78.06	68.4	24658	68.92
274	11-May-94	22.2	7942		35.0	40.4	17446	78.01	68.6	24727	68.83
275	18-May-94	22.1	7964	0.19	34.9	40.7	17487	77.96	68.9	24796	68.74
276	25-May-94	22.3	7986		35.1	40.7	17528	77.91	69.5	24865	68.66
277	01-Jun-94	22.5	8009		35.4	40.6	17568	77.85	70.0	24935	68.57
278	08-Jun-94	22.7	8032		35.7	40.6	17609	77.80	70.6	25006	68.48
279	15-Jun-94	22.8	8054	0.15	36.0	40.6	17649	77.75	71.2	25077	68.39
280	22-Jun-94	22.9	8077		36.1	41.0	17690	77.70	71.4	25148	68.30
281	29-Jun-94	23.0	8100		36.2	41.4	17732	77.65	71.7	25220	68.21
282	06-Jul-94	23.0	8123		36.3	41.8	17774	77.60	71.9	25292	68.12
283	13-Jul-94	23.1	8146	0.18	36.5	42.2	17816	77.54	72.1	25364	68.03
284	20-Jul-94	23.1	8170		36.5	42.2	17858	77.49	72.1	25436	67.94
285	27-Jul-94	23.1	8193		36.5	42.2	17900	77.44	72.1	25508	67.85
286	03-Aug-94	23.1	8216		36.5	42.2	17942	77.38	72.1	25580	67.75
Maximum		109.0	8216	1.00	171.8	217.7	17942	99.73	341.0	25580	99.57
Minimum		16.0	109	0.12	25.3	35.1	218	77.38	49.4	341	67.75
Mean		28.6	4816	0.42	45.1	62.5	10882	86.28	89.1	15029	81.05
Median		23.9	5030	0.38	37.7	52.7	11599	85.38	74.7	15715	80.19
Mean Last 8 Weeks		22.7	7318	0.23	35.8	42.4	16274	79.49	70.1	22795	71.27
75% Remaining (Wks)								331			204
50% Remaining (Wks)								798			487
25% Remaining (Wks)								1266			770
0% Remaining (Wks)								1734			1052

** If measured sulphate, alkalinity and/or acidity values were unavailable, data was interpolated from existing data and used in subsequent equations.

Samatosum Mine Humidity Cell Data -Column 3 (Encapsulated 5 Layers)

		Dissolved Metals*:								Metal Leach Rates:								Cumulative Metal Leach Rates:							
		Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc	Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc	Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc
Week No.	Date	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn
		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(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)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
132	21-Aug-91																	7.1E-02	1.4E-01	2.0E-01	2.8E-01	4.6E-02	1.3E-01	2.2E-02	1.1E+00
133	28-Aug-91																	7.2E-02	1.4E-01	2.0E-01	2.8E-01	4.6E-02	1.3E-01	2.3E-02	1.1E+00
134	4-Sep-91	0.002		0.004	0.009		0.035	0.001	0.04	2.9E-04		5.2E-04	1.3E-03		5.2E-03	1.5E-04	5.2E-C3	7.2E-02	1.4E-01	2.0E-01	2.8E-01	4.6E-02	1.3E-01	2.3E-02	1.1E+00
135	11-Sep-91																	7.2E-02	1.4E-01	2.0E-01	2.8E-01	4.7E-02	1.4E-01	2.3E-02	1.1E+00
136	18-Sep-91																	7.3E-02	1.4E-01	2.0E-01	2.8E-01	4.7E-02	1.4E-01	2.3E-02	1.1E+00
137	25-Sep-91																	7.3E-02	1.4E-01	2.0E-01	2.8E-01	4.8E-02	1.4E-01	2.3E-02	1.1E+00
138	2-Oct-91	0.003		0.001	0.01		0.0012	0.001	0.06	1.3E-03		4.3E-04	4.3E-03		5.1E-04	4.3E-04	2.6E-02	7.5E-02	1.4E-01	2.0E-01	2.9E-01	4.8E-02	1.4E-01	2.4E-02	1.1E+00
139	9-Oct-91																	7.5E-02	1.5E-01	2.0E-01	2.9E-01	4.9E-02	1.4E-01	2.4E-02	1.2E+00
140	16-Oct-91																	7.5E-02	1.5E-01	2.0E-01	2.9E-01	4.9E-02	1.4E-01	2.4E-02	1.2E+00
141	23-Oct-91																	7.6E-02	1.5E-01	2.0E-01	3.0E-01	4.9E-02	1.4E-01	2.4E-02	1.2E+00
142	30-Oct-91																	7.6E-02	1.5E-01	2.0E-01	3.0E-01	5.0E-02	1.4E-01	2.4E-02	1.2E+00
143	6-Nov-91	0.002		8E-04	0.028		0.0011	0.001	0.02	8.2E-04		3.3E-04	1.2E-02		4.5E-04	4.1E-04	9.1E-03	7.7E-02	1.5E-01	2.0E-01	3.1E-01	5.0E-02	1.4E-01	2.5E-02	1.2E+00
144	13-Nov-91																	7.7E-02	1.5E-01	2.0E-01	3.2E-01	5.1E-02	1.4E-01	2.5E-02	1.2E+00
145	20-Nov-91																	7.8E-02	1.5E-01	2.0E-01	3.2E-01	5.1E-02	1.4E-01	2.5E-02	1.2E+00
146	27-Nov-91																	7.8E-02	1.5E-01	2.0E-01	3.3E-01	5.1E-02	1.4E-01	2.5E-02	1.2E+00
147	4-Dec-91	0.001		8E-04	0.016		0.0008	0.001	0.01	4.1E-04		3.3E-04	7.4E-03		3.3E-04	4.1E-04	4.5E-03	7.8E-02	1.5E-01	2.0E-01	3.3E-01	5.2E-02	1.4E-01	2.6E-02	1.2E+00
148	11-Dec-91																	7.9E-02	1.5E-01	2.0E-01	3.4E-01	6.2E-02	1.4E-01	2.6E-02	1.2E+00
149	18-Dec-91																	7.9E-02	1.5E-01	2.0E-01	3.4E-01	5.3E-02	1.4E-01	2.6E-02	1.2E+00
150	25-Dec-91																	7.9E-02	1.5E-01	2.0E-01	3.4E-01	5.3E-02	1.4E-01	2.6E-02	1.2E+00
151	1-Jan-92	0.001		6E-04	0.005		0.0007	0.001	0.02	4.2E-04		2.5E-04	2.1E-03		2.9E-04	4.2E-04	6.3E-03	7.9E-02	1.6E-01	2.0E-01	3.4E-01	5.4E-02	1.4E-01	2.7E-02	1.2E+00
152	8-Jan-92																	8.0E-02	1.6E-01	2.0E-01	3.5E-01	5.4E-02	1.4E-01	2.7E-02	1.2E+00
153	15-Jan-92																	8.0E-02	1.6E-01	2.0E-01	3.5E-01	5.4E-02	1.4E-01	2.7E-02	1.2E+00
154	22-Jan-92																	8.0E-02	1.6E-01	2.0E-01	3.6E-01	5.5E-02	1.4E-01	2.7E-02	1.2E+00
155	29-Jan-92	0.001		5E-04	0.05		0.004	0.001	0.02	4.2E-04		2.1E-04	2.1E-02		1.7E-03	4.2E-04	7.9E-C3	8.0E-02	1.6E-01	2.0E-01	3.8E-01	5.5E-02	1.5E-01	2.8E-02	1.2E+00
156	5-Feb-92																	8.1E-02	1.6E-01	2.1E-01	3.9E-01	5.6E-02	1.5E-01	2.8E-02	1.2E+00
157	12-Feb-92																	8.1E-02	1.6E-01	2.1E-01	4.0E-01	5.6E-02	1.5E-01	2.8E-02	1.2E+00
158	19-Feb-92																	8.1E-02	1.6E-01	2.1E-01	4.1E-01	5.6E-02	1.5E-01	2.8E-02	1.2E+00
159	26-Feb-92	0.001		0.003	0.05		0.002	0.001	0.01	4.2E-04		1.4E-03	2.1E-02		8.3E-04	4.2004	4.2E-03	8.1E-02	1.6E-01	2.1E-01	4.3E-01	5.7E-02	1.5E-01	2.9E-02	1.2E+00
160	4-Mar-92																	8.2E-02	1.6E-01	2.1E-01	4.4E-01	5.7E-02	1.5E-01	2.9E-02	1.2E+00
161	11-Mar-92																	8.2E-02	1.6E-01	2.1E-01	4.5E-01	5.8E-02	1.5E-01	2.9E-02	1.2E+00
162	18-Mar-92																	8.2E-02	1.7E-01	2.1E-01	4.6E-01	5.8E-02	1.5E-01	2.9E-02	1.2E+00
163	25-Mar-92	0.001		5E-04	0.05		0.002	0.001	0.01	4.1E-04		2.1E-04	2.1E-02		8.2E-04	4.1E-04	2.9E-B3	8.3E-02	1.7E-01	2.1E-01	4.8E-01	5.8E-02	1.5E-01	3.0E-02	1.3E+00
164	1-Apr-92																	8.3E-02	1.7E-01	2.1E-01	4.9E-01	5.9E-02	1.5E-01	3.0E-02	1.3E+00
165	8-Apr-92																	8.3E-02	1.7E-01	2.1E-01	5.0E-01	5.9E-02	1.5E-01	3.0E-02	1.3E+00
166	15-Apr-92																	8.3E-02	1.7E-01	2.1E-01	5.1E-01	6.0E-02	1.5E-01	3.0E-02	1.3E+00
167	22-Apr-92	0.001		6E-04	0.05		0.001	0.001	0.01	4.1E-04		2.4E-04	2.0E-02		4.1E-04	4.1E-04	2.4E-03	8.4E-02	1.7E-01	2.1E-01	5.4E-01	6.0E-02	1.5E-01	3.1E-02	1.3E+00
168	29-Apr-92																	8.4E-02	1.7E-01	2.1E-01	5.4E-01	6.1E-02	1.5E-01	3.1E-02	1.3E+00
169	6-May-92																	8.4E-02	1.7E-01	2.1E-01	5.5E-01	6.1E-02	1.5E-01	3.1E-02	1.3E+00
170	13-May-92																	8.4E-02	1.7E-01	2.1E-01	5.6E-01	6.1E-02	1.5E-01	3.1E-02	1.3E+00
171	20-May-92	0.003		0.002	0.05		0.01	0.001	0.01	5.3E-04		3.7E-04	8.9E-03		1.8E-03	1.8E-04	2.5E-03	8.5E-02	1.7E-01	2.1E-01	5.7E-01	6.2E-02	1.6E-01	3.1E-02	1.3E+00
172	27-May-92																	8.5E-02	1.7E-01	2.1E-01	5.7E-01	6.2E-02	1.6E-01	3.2E-02	1.3E+00
173	3-Jun-92																	8.6E-02	1.7E-01	2.1E-01	5.8E-01	6.3E-02	1.6E-01	3.2E-02	1.3E+00
174	10-Jun-92																	8.6E-02	1.8E-01	2.1E-01	5.9E-01	6.3E-02	1.6E-01	3.2E-02	1.3E+00
175	17-Jun-92	0.004		5E-04	0.05		0.004	0.001	0.01	1.6E-03		2.1E-04	2.1E-02		1.6E-03	4.1E-04	2.9E-03	8.8E-02	1.8E-01	2.1E-01	6.1E-01	6.3E-02	1.6E-01	3.2E-02	1.3E+00
176	24-Jun-92																	8.9E-02	1.8E-01	2.1E-01	6.2E-01	6.4E-02	1.6E-01	3.3E-02	1.3E+00
177	1-Jul-92																	9.0E-02	1.8E-01	2.1E-01	6.3E-01	6.4E-02	1.6E-01	3.3E-02	1.3E+00
178	8-Jul-92																	9.0E-02	1.8E-01	2.1E-01	6.4E-01	6.5E-02	1.6E-01	3.3E-02	1.3E+00
179	15-Jul-92	0.003		0.001	0.05		0.001	0.001	0.03	1.3E-03		5.9E-04	2.1E-02		4.2E-04	4.2E-04	1.2E-02	9.2E-02	1.8E-01	2.1E-01	6.6E-01	6.5E-02	1.6E-01	3.3E-02	1.3E+00
180	22-Jul-92																	9.2E-02	1.8E-01	2.1E-01	6.7E-01	6.6E-02	1.6E-01	3.4E-02	1.3E+00
181	29-Jul-92																	9.3E-02	1.8E-01	2.1E-01	6.8E-01	6.6E-02	1.6E-01	3.4E-02	1.3E+00
182	5-Aug-92																	9.3E-02	1.8E-01	2.1E-01	6.9E-01	6.6E-02	1.6E-01	3.4E-02	1.3E+00
183	12-Aug-92	0.003		8E-04	0.05		0.001	0.001	0.01	1.2E-03		3.3E-04	2.1E-02		4.1E-04	4.1E-04	4.1E-03	9.5E-02	1.8E-01	2.1E-01	7.1E-01	6.7E-02	1.6E-01	3.4E-02	1.3E+00
184	19-Aug-92																	9.5E-02	1.8E-01	2.1E-01	7.2E-01	6.7E-02	1.6E-01	3.5E-02	1.3E+00
185	26-Aug-92																	9.5E-02	1.8E-01	2.1E-01	7.3E-01	6.8E-02	1.6E-01	3.5E-02	1.3E+00
186	2-Sep-92																	9.6E-02	1.9E-01	2.1E-01	7.4E-01	6.8E-02	1.6E-01	3.5E-02	1.3E+00
187	9-Sep-92	0.001		5E-04	0.05		0.003	0.001	0.07	4.1E-04		2.0E-04	2.0E-02		1.2E-03	4.1E-04	2.9E-02	9.6E-02	1.9E-01	2.1E-01	7.6E-01	6.8E-02	1.6E-01	3.5E-02	1.4E+00
188	16-Sep-92																	9.7E-02	1.9E-01	2.1E-01	7.7E-01	6.9E-02	1.7E-01	3.6E-02	1.4E+00
189	23-Sep-92																	9.7E-02	1.9E-01	2.1E-01	7.8E-01	6.9E-02	1.7E-01	3.6E-02	1.4E+00
190	30-Sep-92																	9.7E-02	1.9E-01	2.1E-01	7.9E-01	7.0E-02	1.7E-01	3.6E-02	1.4E+00
191	7-Oct-92	0.002		6E-04	0.05		0.009	0.001	0.01	8.3E-04		2.5E-04	2.1E-02		3.7E-03	4.1E-04	5.0E-03	9.8E-02	1.9E-01	2.1E-01	8.2E-01	7.0E-02	1.7E-01	3.6E-02	1.4E+00
192	14-Oct-92																	9.8E-02	1.9E-01	2.1E-01	8.3E-01	7.0E-02	1.7E-01	3.7E-02	1.4E+00
193	21-Oct-92																	9.9E-02	1.9E-01	2.1E-01	8.4E-01	7.1E-02	1.8E-01	3.7E-02	1.4E+00
194	28-Oct-92																	9.9E-02	1.9E-01	2.1E-01	8.5E-01	7.1E-02	1.8E-01	3.7E-02	1.4E+00
195	4-Nov-92	0.002		5E-04	0.05		0.014	0.001	0.02	8.2E-04		2.1E-04	2.1E-02		5.8E-03	4.1E-04	6.2E-03	1.0E-01	1.9E-01	2.1E-01	8.7E-01	7.2E-02	1.9E-01	3.7E-02	1.4E+00
196	11-Nov-92																	1.0E-01	1.9E-01	2.2E-01	8.8E-01	7.2E-02	1.9E-01	3.8E-02	1.4E+00
197	18-Nov-92																	1.0E-01	1.9E-01	2.2E-01	8.9E-01	7.3E-02	1.9E-01	3.8E-02	1.4E+00

** If values were reported as < detection limit, 1/2 the detection limit is shown in italics and was used in subsequent calculations.*

Samatosum Mine Humidity Cell Data -Column 3 (Encapsulated 5 Layers)

		Dissolved Metals*:								Metal Leach Rates:								Cumulative Metal Leach Rates:							
		Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc	Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc	Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc
Week No.	Date	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn
		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(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)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
66	16-May-90	0.002	0.003	6E-04	0.005	0.001		0.001	0.02	8.2E-04	1.2E-03	2.5E-04	2.0E-03	4.1E-04		4.1E-04	8.2E-03	3.1E-02	8.6E-02	1.7E-01	1.6E-01	2.0E-02	9.5E-02	5.7E-03	6.9E-01
67	23-May-90																	3.2E-02	8.6E-02	1.7E-01	1.6E-01	2.0E-02	9.7E-02	5.9E-03	6.9E-01
68	30-May-90																	3.2E-02	8.7E-02	1.7E-01	1.7E-01	2.0E-02	9.8E-02	6.2E-03	6.9E-01
69	6-Jun-90																	3.2E-02	8.7E-02	1.7E-01	1.7E-01	2.0E-02	1.0E-01	6.4E-03	7.0E-01
70	13-Jun-90	0.002	0.002	6E-04	0.014	0.001	0.0034	0.001	0.01	8.4E-04	8.4E-04	2.5E-04	5.9E-03	4.2E-04	1.4E-03	4.2E-04	4.6E-03	3.3E-02	8.8E-02	1.7E-01	1.7E-01	2.1E-02	1.0E-01	6.8E-03	7.0E-01
71	20-Jun-90																	3.4E-02	8.9E-02	1.7E-01	1.8E-01	2.1E-02	1.0E-01	7.0E-03	7.0E-01
72	27-Jun-90																	3.4E-02	9.0E-02	1.7E-01	1.8E-01	2.1E-02	1.0E-01	7.2E-03	7.1E-01
73	4-Jul-90																7.9E-03	3.5E-02	9.1E-02	1.7E-01	1.8E-01	2.1E-02	1.0E-01	7.4E-03	7.1E-01
74	11-Jul-90	*0.003*		0.003	0.007	0.001	0.003	0.001	0.02	1.2E-03		1.3E-03	2.9E-03	4.1E-04	1.2E-03	4.1E-04		3.6E-02	9.1E-02	1.7E-01	1.8E-01	2.2E-02	1.0E-01	7.8E-03	7.2E-01
75	18-Jul-90																	3.7E-02	9.2E-02	1.7E-01	1.8E-01	2.2E-02	1.1E-01	8.0E-03	7.2E-01
76	25-Jul-90																	3.7E-02	9.3E-02	1.7E-01	1.9E-01	2.2E-02	1.1E-01	8.2E-03	7.3E-01
77	1-Aug-90																	3.8E-02	9.4E-02	1.7E-01	1.9E-01	2.3E-02	1.1E-01	8.4E-03	7.3E-01
78	8-Aug-90	0.003		0.001	0.005		0.0053	0.001	0.03	1.2E-03		4.9E-04	2.1E-03		2.2E-03	4.1E-04	1.4E-02	3.9E-02	9.5E-02	1.8E-01	1.9E-01	2.3E-02	1.1E-01	8.8E-03	7.5E-01
79	15-Aug-90																	4.0E-02	9.6E-02	1.8E-01	1.9E-01	2.4E-02	1.1E-01	9.1E-03	7.5E-01
80	22-Aug-90																	4.0E-02	9.6E-02	1.8E-01	1.9E-01	2.4E-02	1.1E-01	9.3E-03	7.6E-01
81	29-Aug-90																	4.1E-02	9.7E-02	1.8E-01	1.9E-01	2.5E-02	1.1E-01	9.5E-03	7.6E-01
82	5-Sep-90	0.002		0.005	0.007		0.001	0.001	0.01	8.6E-04		2.3E-03	3.0E-03		4.3E-04	4.3E-04	5.6E-03	4.2E-02	9.8E-02	1.8E-01	2.0E-01	2.5E-02	1.1E-01	9.9E-03	7.7E-01
83	12-Sep-90																	4.2E-02	9.9E-02	1.8E-01	2.0E-01	2.5E-02	1.1E-01	1.0E-02	7.7E-01
84	19-Sep-90																	4.2E-02	1.0E-01	1.8E-01	2.0E-01	2.6E-02	1.1E-01	1.0E-02	7.7E-01
85	26-Sep-90																	4.3E-02	1.0E-01	1.8E-01	2.0E-01	2.6E-02	1.1E-01	1.1E-02	7.7E-01
86	3-Oct-90	0.002		0.006	0.005		0.001	0.001	0.01	8.2E-04		2.4E-03	2.1E-03		4.1E-04	4.1E-04	3.3E-03	4.4E-02	1.0E-01	1.9E-01	2.0E-01	2.7E-02	1.1E-01	1.1E-02	7.8E-01
87	10-Oct-90																	4.4E-02	1.0E-01	1.9E-01	2.0E-01	2.7E-02	1.1E-01	1.1E-02	7.8E-01
88	17-Oct-90																	4.5E-02	1.0E-01	1.9E-01	2.0E-01	2.7E-02	1.1E-01	1.1E-02	7.8E-01
89	24-Oct-90																	4.5E-02	1.0E-01	1.9E-01	2.0E-01	2.8E-02	1.1E-01	1.2E-02	7.8E-01
90	31-Oct-90	0.002		5E-04	0.005		0.001	0.001	0.01	8.3E-04		2.1E-04	2.1E-03		4.2E-04	4.2E-04	4.0E-03	4.6E-02	1.0E-01	1.9E-01	2.1E-01	2.8E-02	1.1E-01	1.2E-02	7.9E-01
91	7-Nov-90																	4.6E-02	1.1E-01	1.9E-01	2.1E-01	2.9E-02	1.1E-01	1.2E-02	7.9E-01
92	14-Nov-90																	4.7E-02	1.1E-01	1.9E-01	2.1E-01	2.9E-02	1.1E-01	1.2E-02	7.9E-01
93	21-Nov-90																	4.7E-02	1.1E-01	1.9E-01	2.1E-01	3.0E-02	1.1E-01	1.3E-02	8.0E-01
94	28-Nov-90	*0.002*		5E-04	0.017		0.001	0.001	0.02	8.4E-04		2.1E-04	7.1E-03		4.2E-04	4.2E-04	9.6E-03	4.8E-02	1.1E-01	1.9E-01	2.2E-01	3.0E-02	1.1E-01	1.3E-02	8.1E-01
95	5-Dec-90																	4.8E-02	1.1E-01	1.9E-01	2.2E-01	3.0E-02	1.1E-01	1.3E-02	8.1E-01
96	12-Dec-90																	4.9E-02	1.1E-01	1.9E-01	2.2E-01	3.1E-02	1.1E-01	1.3E-02	8.2E-01
97	19-Dec-90																	4.9E-02	1.1E-01	1.9E-01	2.2E-01	3.1E-02	1.2E-01	1.4E-02	8.2E-01
98	26-Dec-90	0.002		5E-04			0.001	0.001	0.02	8.5E-04		2.1E-04			4.2E-04	4.2E-04	7.6E-03	5.0E-02	1.1E-01	1.9E-01	2.2E-01	3.2E-02	1.2E-01	1.4E-02	8.3E-01
99	2-Jan-91																	5.0E-02	1.1E-01	1.9E-01	2.3E-01	3.2E-02	1.2E-01	1.4E-02	8.3E-01
100	9-Jan-91																	5.1E-02	1.1E-01	1.9E-01	2.3E-01	3.2E-02	1.2E-01	1.4E-02	8.4E-01
101	16-Jan-91																	5.1E-02	1.1E-01	1.9E-01	2.3E-01	3.3E-02	1.2E-01	1.5E-02	8.4E-01
102	23-Jan-91	0.002		5E-04	0.005		0.001	0.001	0.02	7.7E-04		1.9E-04	1.9E-03		3.8E-04	3.8E-04	6.8E-03	5.2E-02	1.1E-01	1.9E-01	2.3E-01	3.3E-02	1.2E-01	1.5E-02	8.5E-01
103	30-Jan-91																	5.2E-02	1.2E-01	1.9E-01	2.3E-01	3.4E-02	1.2E-01	1.5E-02	8.5E-01
104	6-Feb-91																	5.3E-02	1.2E-01	1.9E-01	2.3E-01	3.4E-02	1.2E-01	1.5E-02	8.6E-01
105	13-Feb-91																	5.3E-02	1.2E-01	1.9E-01	2.3E-01	3.4E-02	1.2E-01	1.6E-02	8.6E-01
106	20-Feb-91	0.003		5E-04	0.005		0.001	0.001	0.02	1.3E-03		2.1E-04	2.1E-03		4.3E-04	4.3E-04	6.1E-03	5.5E-02	1.2E-01	1.9E-01	2.3E-01	3.5E-02	1.2E-01	1.6E-02	8.7E-01
107	27-Feb-91																	5.5E-02	1.2E-01	1.9E-01	2.4E-01	3.5E-02	1.2E-01	1.6E-02	8.7E-01
108	6-Mar-91																	5.6E-02	1.2E-01	1.9E-01	2.4E-01	3.6E-02	1.2E-01	1.7E-02	8.8E-01
109	13-Mar-91																	5.6E-02	1.2E-01	1.9E-01	2.4E-01	3.6E-02	1.2E-01	1.7E-02	8.8E-01
110	20-Mar-91	0.002		5E-04	0.005		0.001	0.001	0.03	8.2E-04		2.1E-04	2.1E-03		4.1E-04	4.1E-04	1.0E-02	5.7E-02	1.2E-01	1.9E-01	2.4E-01	3.7E-02	1.2E-01	1.7E-02	8.9E-01
111	27-Mar-91																	5.8E-02	1.2E-01	1.9E-01	2.4E-01	3.7E-02	1.2E-01	1.7E-02	9.0E-01
112	3-Apr-91																	5.8E-02	1.2E-01	1.9E-01	2.4E-01	3.7E-02	1.2E-01	1.8E-02	9.0E-01
113	10-Apr-91																	5.8E-02	1.2E-01	1.9E-01	2.4E-01	3.8E-02	1.2E-01	1.8E-02	9.1E-01
114	17-Apr-91	0.002		0.001	0.005		0.001	0.001	0.03	8.3E-04		5.4E-04	2.1E-03		4.1E-04	4.1E-04	1.1E-02	5.9E-02	1.2E-01	1.9E-01	2.4E-01	3.8E-02	1.2E-01	1.8E-02	9.2E-01
115	24-Apr-91																	6.0E-02	1.3E-01	1.9E-01	2.5E-01	3.9E-02	1.2E-01	1.8E-02	9.3E-01
116	1-May-91																	6.0E-02	1.3E-01	1.9E-01	2.5E-01	3.9E-02	1.2E-01	1.9E-02	9.3E-01
117	8-May-91																	6.0E-02	1.3E-01	1.9E-01	2.5E-01	3.9E-02	1.2E-01	1.9E-02	9.4E-01
118	15-May-91	0.001		5E-04	0.005		0.001	0.001	0.04	4.2E-04		2.1E-04	2.1E-03		4.2E-04	4.2E-04	1.5E-02	6.1E-02	1.3E-01	1.9E-01	2.5E-01	4.0E-02	1.2E-01	1.9E-02	9.6E-01
119	22-May-91																	6.1E-02	1.3E-01	1.9E-01	2.5E-01	4.0E-02	1.2E-01	1.9E-02	9.6E-01
120	29-May-91																	6.2E-02	1.3E-01	1.9E-01	2.5E-01	4.1E-02	1.2E-01	2.0E-02	9.7E-01
121	6-Jun-91																	6.2E-02	1.3E-01	1.9E-01	2.5E-01	4.1E-02	1.2E-01	2.0E-02	9.7E-01
122	12-Jun-91	0.004		5E-04	0.005			0.001	0.02	1.7E-03		2.1E-04	2.1E-03			4.1E-04	6.6E-03	6.4E-02	1.3E-01	1.9E-01	2.6E-01	4.2E-02	1.2E-01	2.0E-02	9.8E-01
123	19-Jun-91																	6.5E-02	1.3E-01	1.9E-01	2.6E-01	4.2E-02	1.2E-01	2.0E-02	9.9E-01
124	26-Jun-91																	6.5E-02	1.3E-01	1.9E-01	2.6E-01	4.2E-02	1.2E-01	2.1E-02	1.0E+00
125	3-Jul-91																	6.6E-02	1.3E-01	1.9E-01	2.6E-01	4.3E-02	1.2E-01	2.1E-02	1.0E+00
126	10-Jul-91	0.004		0.006	0.016		0.0011	0.001	0.11	1.4E-03		2.1E-03	5.5E-03		3.8E-04	3.4E-04	3.8E-02	6.7E-02	1.3E-01	2.0E-01	2.7E-01	4.3E-02	1.2E-01	2.1E-02	1.0E+00
127	17-Jul-91																	6.8E-02	1.4E-01	2.0E-01	2.7E-01	4.4E-02	1.2E-01	2.1E-02	1.1E+00
126	24-Jul-91																	6.9E-02	1.4E-01	2.0E-01	2.7E-01	4.4E-02	1.2E-01	2.2E-02	1.1E+00
129	31-Jul-91																	6.9E-02	1.4E-01	2.0E-01	2.7E-01	4.4E-02	1.2E-01	2.2E-02	1.1E+00
130	7-Aug-91	0.003		0.002	0.006		0.0043	0.001	0.01	1.2E-03		6.1E-04	2.5E-03		1.8E-03	4.1E-04	3.3E-03	7.1E-02	1.4E-01	2.0E-01	2.7E-01	4.5E-02	1.2E-01	2.2E-02	1.1E+00
131	14-Aug-91																	7.1E-02	1.4E-01	2.0E-01	2.8E-01	4.5E-02	1.3E-01	2.2E-02	1.1E+00

* *If values were reported as < detection limit, 1/2 the detection limit is shown in italics and was used in subsequent calculations.*

Samatosum Mine Humidity Cell Data -Column 3 (Encapsulated 5 Layers)

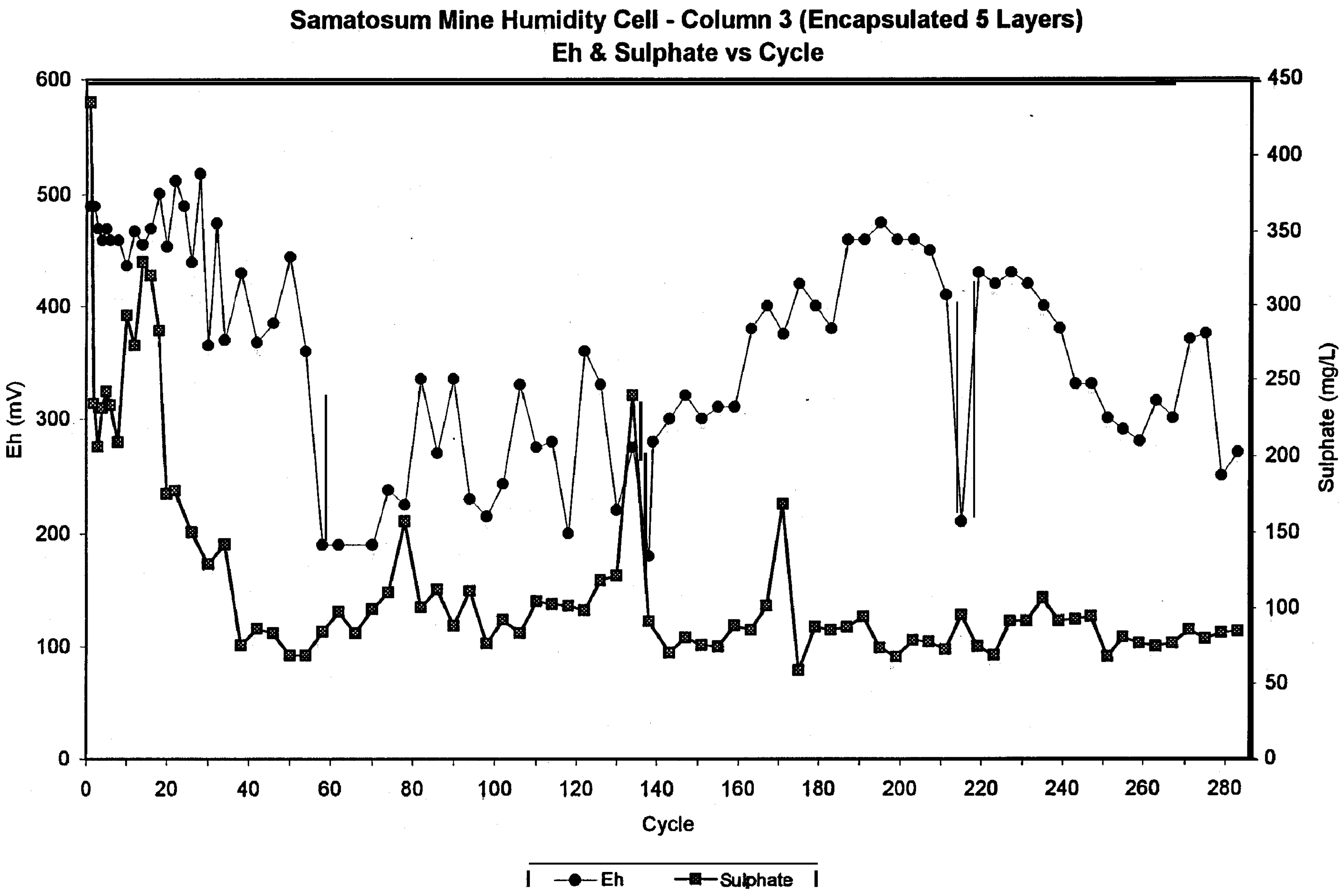
		Dissolved Metals*:								Metal Leach Rates:								Cumulative Metal Leach Rates:							
		Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc	Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc	Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc
Week No.	Date	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn
		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(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)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
264	2-Mar-94																	1.5E-01	2.5E-01	2.6E-01	1.7E+00	1.0E-01	1.3E+00	6.3E-02	2.0E+00
265	9-Mar-94																	1.5E-01	2.5E-01	2.6E-01	1.7E+00	1.0E-01	1.3E+00	6.4E-02	2.0E+00
266	16-Mar-94																	1.5E-01	2.5E-01	2.6E-01	1.8E+00	1.0E-01	1.3E+00	6.4E-02	2.0E+00
267	23-Mar-94			0.005	0.05		0.09		0.03			2.0E-03	2.1E-02		3.7E-02		1.1E-02	1.5E-01	2.5E-01	2.7E-01	1.8E+00	1.0E-01	1.4E+00	6.4E-02	2.0E+00
268	30-Mar-94																	1.5E-01	2.5E-01	2.7E-01	1.8E+00	1.0E-01	1.4E+00	6.5E-02	2.0E+00
269	6-Apr-94																	1.6E-01	2.5E-01	2.7E-01	1.8E+00	1.0E-01	1.4E+00	6.5E-02	2.0E+00
270	13-Apr-94																	1.6E-01	2.6E-01	2.7E-01	1.8E+00	1.0E-01	1.4E+00	6.6E-02	2.0E+00
271	20-Apr-94			0.004	0.05		0.08		0.03			1.5E-03	2.0E-02		3.2E-02		1.3E-02	1.6E-01	2.6E-01	2.7E-01	1.8E+00	1.0E-01	1.4E+00	6.6E-02	2.0E+00
272	27-Apr-94																	1.6E-01	2.6E-01	2.7E-01	1.8E+00	1.0E-01	1.5E+00	6.6E-02	2.0E+00
273	4-May-94																	1.6E-01	2.6E-01	2.7E-01	1.8E+00	1.0E-01	1.5E+00	6.7E-02	2.0E+00
274	11-May-94																	1.6E-01	2.6E-01	2.7E-01	1.9E+00	1.0E-01	1.5E+00	6.7E-02	2.0E+00
275	18-May-94			0.003	0.05		0.07		0.03			1.3E-03	2.1E-02		2.9E-02		1.4E-02	1.6E-01	2.6E-01	2.7E-01	1.9E+00	1.0E-01	1.5E+00	6.8E-02	2.1E+00
276	25-May-94																	1.6E-01	2.6E-01	2.8E-01	1.9E+00	1.1E-01	1.5E+00	6.8E-02	2.1E+00
277	1-Jun-94																	1.6E-01	2.6E-01	2.8E-01	1.9E+00	1.1E-01	1.5E+00	6.9E-02	2.1E+00
278	8-Jun-94																	1.6E-01	2.6E-01	2.8E-01	1.9E+00	1.1E-01	1.6E+00	6.9E-02	2.1E+00
279	15-Jun-94			0.009	0.05		0.07		0.03			3.8E-03	2.1E-02		2.9E-02		1.4E-02	1.6E-01	2.6E-01	2.8E-01	1.9E+00	1.1E-01	1.6E+00	6.9E-02	2.1E+00
280	22-Jun-94																	1.6E-01	2.6E-01	2.8E-01	1.9E+00	1.1E-01	1.6E+00	7.0E-02	2.1E+00
281	29-Jun-94																	1.7E-01	2.6E-01	2.9E-01	2.0E+00	1.1E-01	1.6E+00	7.0E-02	2.1E+00
282	6-Jul-94																	1.7E-01	2.7E-01	2.9E-01	2.0E+00	1.1E-01	1.6E+00	7.1E-02	2.1E+00
283	13-Jul-94			0.009	0.05		0.08		0.03			3.8E-03	2.1E-02		3.3E-02		1.4E-02	1.7E-01	2.7E-01	2.9E-01	2.0E+00	1.1E-01	1.7E+00	7.1E-02	2.1E+00
284	20-Jul-94																	1.7E-01	2.7E-01	3.0E-01	2.0E+00	1.1E-01	1.7E+00	7.1E-02	2.1E+00
285	27-Jul-94																	1.7E-01	2.7E-01	3.0E-01	2.0E+00	1.1E-01	1.7E+00	7.2E-02	2.1E+00
286	3-Aug-94																	1.7E-01	2.7E-01	3.0E-01	2.0E+00	1.1E-01	1.8E+00	7.2E-02	2.2E+00
Maximum		0.008	0.016	0.07	0.05	0.002	0.11	0.001	0.11	3.0E-03	6.2E-03	2.9E-02	2.2E-02	8X-04	4.7E-02	4.3E-04	3.8E-02	1.7E-01	2.7E-01	3.0E-01	2.0E+00	1.1E-01	1.8E+00	7.2E-02	2.2E+00
Minimum		0.001	0.002	0.0005	0.005	0.001	0.0007	2E-04	0.01	2.9E-04	8.0E-04	1.9E-04	1.3E-03	3.8E-04	2.9E-04	7.6E-05	2.4E-03	3.0E-03	6.1E-03	1.3E-03	3.4E-03	3.8E-04	1.4E-03	7.6E-05	3.8E-03
Mean		0.002	0.006	0.0040	0.028	0.001	0.0298	8E-04	0.031	8.3E-04	2.3E-03	1.6E-03	1.1E-02	4.5E-04	1.2E-02	3.0E-04	1.2E-02	7.7E-02	1.5E-01	1.8E-01	6.4E-01	5.1E-02	3.4E-01	2.7E-02	1.1E+00
Median		0.002	0.004	0.0014	0.017	0.001	0.0053	0.001	0.030	8.2E-04	1.7E-03	5.1E-04	7.1E-03	4.2E-04	1.8E-03	4.1E-04	1.2E-02	7.7E-02	1.5E-01	2.0E-01	3.1E-01	5.0E-02	1.4E-01	2.5E-02	1.2E+00
Mean Last	8 Weeks			0.0093	0.050		0.0750		0.034			3.8E-03	2.1E-02		3.1E-02		1.4E-02	1.7E-01	2.7E-01	2.9E-01	2.0E+00	1.1E-01	1.7E+00	7.1E-02	2.1E+00
75% Remaining (Wks)																									
50% Remaining (Wks)																									
25% Remaining (Wks)																									
0% Remaining (Wks)																									

*If values were reported as < detection limit, 1/2 the detection limit is shown in italics and was used in subsequent calculations.

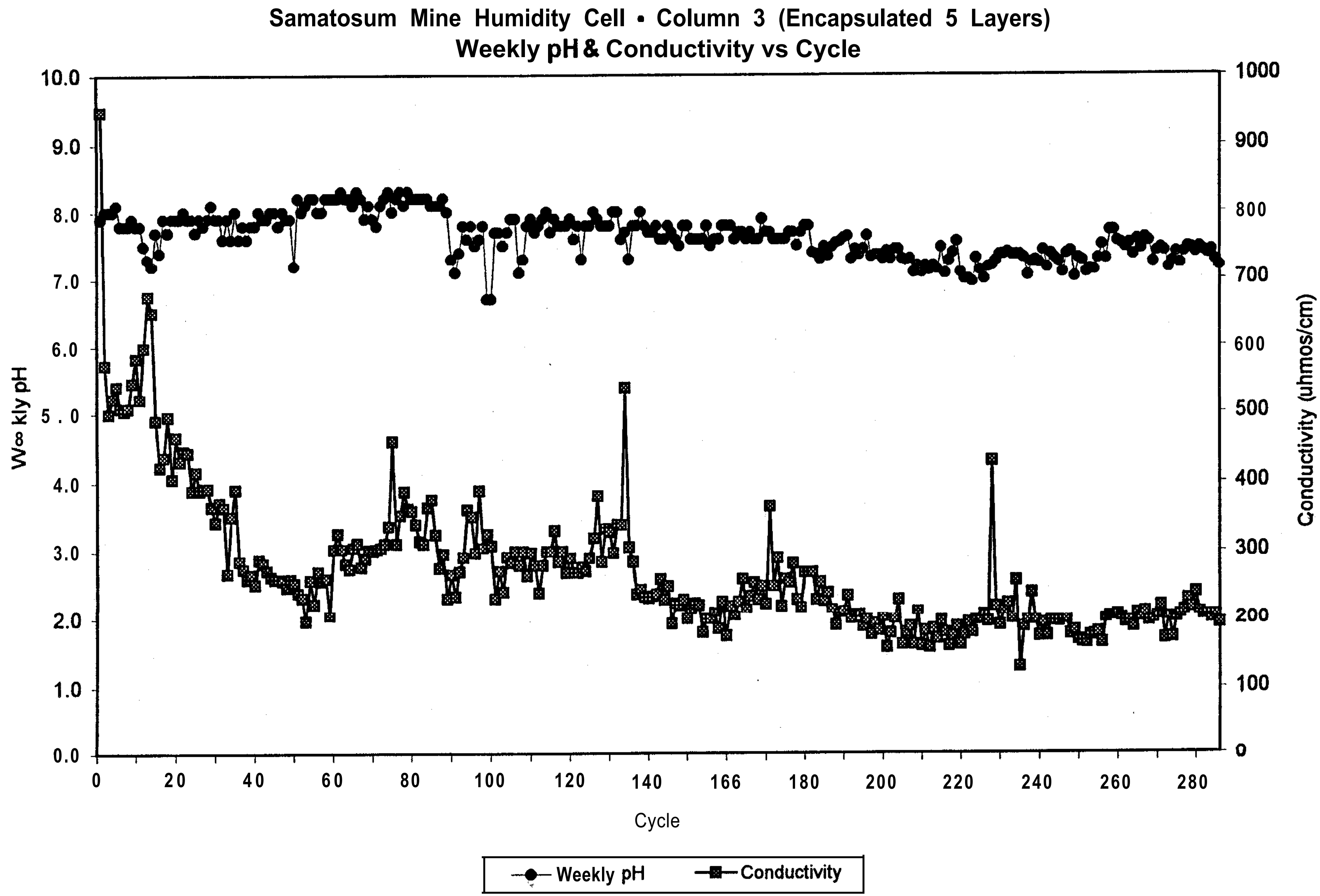
Samatosum Mine Humidity Cell Data -Column 5 (Encapsulated 5 Layers)

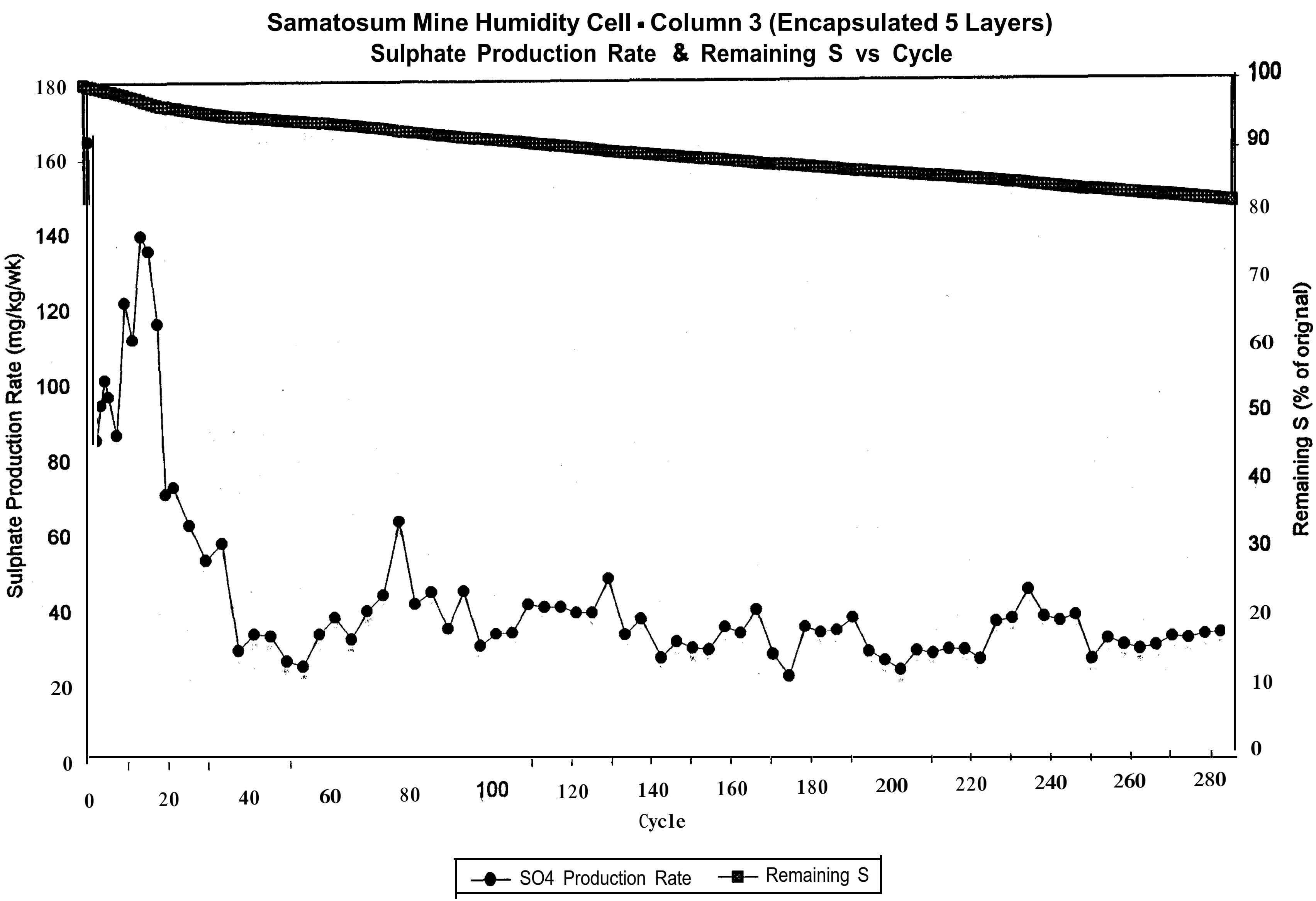
		Dissolved Metals*:								Metal Leach Rates:								Cumulative Metal Leac		
		Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc	Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc	Antimony	Arsenic	Coppe
Week No.	Date	D-Sb (mg/L)	D-As (mg/L)	D-Cu (mg/L)	D-Fe (mg/L)	D-Pb (mg/L)	D-Mn (mg/L)	D-Ag (mg/L)	D-Zn (mg/L)	D-Sb (mg/kg/wk)	D-As (mg/kg/wk)	D-Cu (mg/kg/wk)	D-Fe (mg/kg/wk)	D-Pb (mg/kg/wk)	D-Mn (mg/kg/wk)	D-Ag (mg/kg/wk)	D-Zn (mg/kg/wk)	D-Sb (mg/kg)	D-As (mg/kg)	D-Cu (mg/k
198	25-Nov-92																	1.0E-01	2.0E-01	2.2E-
199	2-Dec-92	0.002		0.002	0.05		0.021	0.001	0.02	8.3E-04		7.0E-04	2.1E-02		8.7E-03	4.1E-04	6.6E-03	1.0E-01	2.0E-01	2.2E-
200	9-Dec-92																	1.0E-01	2.0E-01	2.2E-
201	16-Dec-92																	1.0E-01	2.0E-01	2.2E-
202	23-Dec-92																	1.0E-01	2.0E-01	2.2E-
203	30-Dec-92	0.002		0.001	0.05		0.021	0.001	0.02	6.5E-04		3.9E-04	1.6E-02		6.9E-03	3.3E-04	6.5E-03	1.0E-01	2.0E-01	2.2E-
204	6-Jan-93																	1.0E-01	2.0E-01	2.2E-
205	13-Jan-93																	1.0E-01	2.0E-01	2.2E-
206	20-Jan-93																	1.0E-01	2.0E-01	2.2E-
207	27-Jan-93	0.002		0.002	0.05		0.033	0.001	0.05	7.9E-04		7.9E-04	2.0E-02		1.3E-02	3.9E-04	1.8E-02	1.1E-01	2.0E-01	2.2E-
208	3-Feb-93																	1.1E-01	2.0E-01	2.2E-
209	10-Feb-93																	1.1E-01	2.0E-01	2.2E-
210	17-Feb-93																	1.1E-01	2.1E-01	2.2E-
211	24-Feb-93	0.002		0.001	0.05		0.039	0.001		8.2E-04		4.9E-04	2.1E-02		1.6E-02	4.1E-04		1.1E-01	2.1E-01	2.2E-
212	3-Mar-93																	1.1E-01	2.1E-01	2.2E-
213	10-Mar-93																	1.1E-01	2.1E-01	2.2E-
214	17-Mar-93																	1.1E-01	2.1E-01	2.2E-
215	24-Mar-93			0.002	0.05		0.05		0.02			7.7E-04	1.6E-02		1.6E-02		7.1E-03	1.1E-01	2.1E-01	2.2E-
216	31-Mar-93																	1.1E-01	2.1E-01	2.2E-
217	7-Apr-93																	1.1E-01	2.1E-01	2.2E-
218	14-Apr-93																	1.1E-01	2.1E-01	2.2E-
219	21-Apr-93			0.001	0.05		0.043		0.04			4.5E-04	2.1E-02		1.8E-02		1.7E-02	1.1E-01	2.1E-01	2.2E-
220	28-Apr-93																	1.2E-01	2.1E-01	2.2E-
221	5-May-93																	1.2E-01	2.1E-01	2.3E-
222	12-May-93																	1.2E-01	2.2E-01	2.3E-
223	19-May-93			0.006	0.05		0.056		0.04			2.6E-03	2.1E-02		2.3E-02		1.5E-02	1.2E-01	2.2E-01	2.3E-
224	26-May-93																	1.2E-01	2.2E-01	2.3E-
225	2-Jun-93																	1.2E-01	2.2E-01	2.3E-
226	9-Jun-93																	1.2E-01	2.2E-01	2.3E-
227	16-Jun-93			0.002	0.05		0.057		0.05			9.9E-04	2.1E-02		2.4E-02		2.2E-02	1.2E-01	2.2E-01	2.3E-
228	23-Jun-93																	1.2E-01	2.2E-01	2.3E-
229	30-Jun-93																	1.2E-01	2.2E-01	2.3E-
230	7-Jul-93																	1.2E-01	2.2E-01	2.3E-
231	14-Jul-93			0.002	0.05		0.07		0.03			9.7E-04	2.1E-02		3.0E-02		1.2E-02	1.2E-01	2.2E-01	2.3E-
232	21-Jul-93																	1.3E-01	2.2E-01	2.4E-
233	28-Jul-93																	1.3E-01	2.2E-01	2.4E-
234	4-Aug-93																	1.3E-01	2.3E-01	2.4E-
235	11-Aug-93			0.003	0.05		0.09		0.03			1.2E-03	2.2E-02		3.9E-02		1.5E-02	1.3E-01	2.3E-01	2.4E-
236	18-Aug-93																	1.3E-01	2.3E-01	2.4E-
237	25-Aug-93																	1.3E-01	2.3E-01	2.4E-
238	1-Sep-93																	1.3E-01	2.3E-01	2.4E-
239	8-Sep-93			0.008	0.05		0.11		0.04			3.3E-03	2.1E-02		4.7E-02		1.6E-02	1.3E-01	2.3E-01	2.4E-
240	15-Sep-93																	1.3E-01	2.3E-01	2.5E-
241	22-Sep-93																	1.3E-01	2.3E-01	2.5E-
242	29-Sep-93																	1.3E-01	2.3E-01	2.5E-
243	6-Oct-93			0.003	0.05		0.09		0.03			1.0E-03	2.1E-02		3.7E-02		1.4E-02	1.3E-01	2.3E-01	2.5E-
244	13-Oct-93																	1.3E-01	2.3E-01	2.5E-
245	20-Oct-93																	1.4E-01	2.3E-01	2.5E-
246	27-Oct-93																	1.4E-01	2.4E-01	2.5E-
247	3-Nov-93			0.003	0.05		0.08		0.04			1.3E-03	2.1E-02		3.3E-02		1.7E-02	1.4E-01	2.4E-01	2.5E-
248	10-Nov-93																	1.4E-01	2.4E-01	2.5E-
249	17-Nov-93																	1.4E-01	2.4E-01	2.5E-
250	24-Nov-93																	1.4E-01	2.4E-01	2.5E-
251	1-Dec-93			0.002	0.05		0.07		0.03			8.7E-04	2.1E-02		2.9E-02		1.4E-02	1.4E-01	2.4E-01	2.5E-
252	8-Dec-93																	1.4E-01	2.4E-01	2.5E-
253	15-Dec-93																	1.4E-01	2.4E-01	2.5E-
254	22-Dec-93																	1.4E-01	2.4E-01	2.6E-
255	29-Dec-93			0.003	0.05		0.08		0.04			1.0E-03	2.1E-02		3.3E-02		1.7E-02	1.4E-01	2.4E-01	2.6E-
256	5-Jan-94																	1.4E-01	2.4E-01	2.6E-
257	12-Jan-94																	1.5E-01	2.4E-01	2.6E-
258	19-Jan-94																	1.5E-01	2.5E-01	2.6E-
259	26-Jan-94			0.003	0.05		0.06		0.03			1.1E-03	2.1E-02		2.5E-02		1.2E-02	1.5E-01	2.5E-01	2.6E-
260	2-Feb-94																	1.5E-01	2.5E-01	2.6E-
261	9-Feb-94																	1.5E-01	2.5E-01	2.6E-
262	16-Feb-94																	1.5E-01	2.5E-01	2.6E-
263	23-Feb-94			0.003	0.05		0.1		0.03			1.4E-03	2.1E-02		4.1E-02		1.2E-02	1.5E-01	2.5E-01	2.6E-

*If values were reported as < detection limit, 1/2 the detection limit is shown in italics and was used in subsequent calculations.

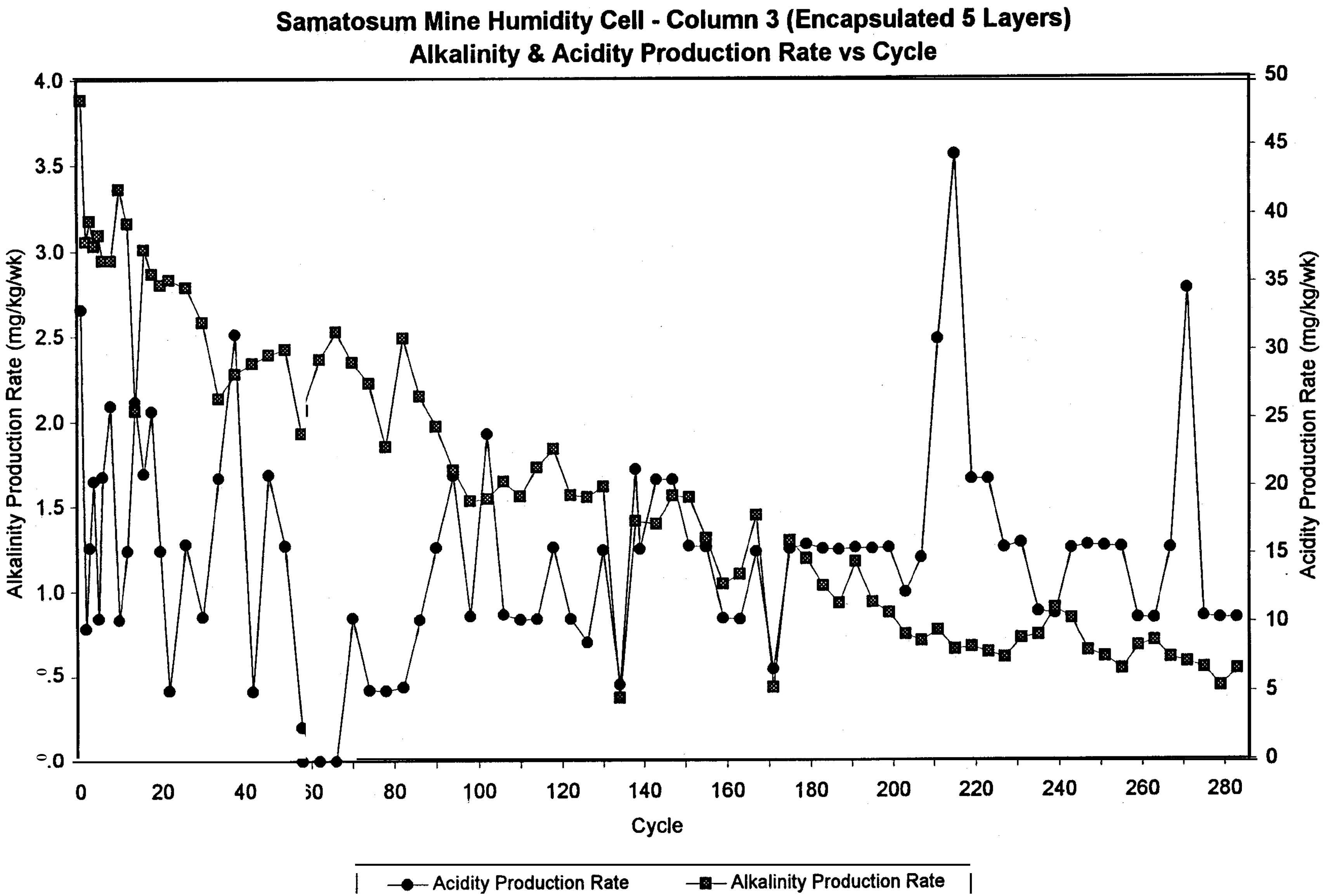


Samatosum Mine Humidity Cell - Column 3 (Encapsulated 5 Layers)
Eh & Sulphate vs Cycle
Eh (mV)
Sulphate (mg/L)
Cycle
0
100
200
300
400
500
600
50
150
250
350
450
20
40
60
80
100
120
140
160
180
200
220
240
260
280
Eh
Sulphate

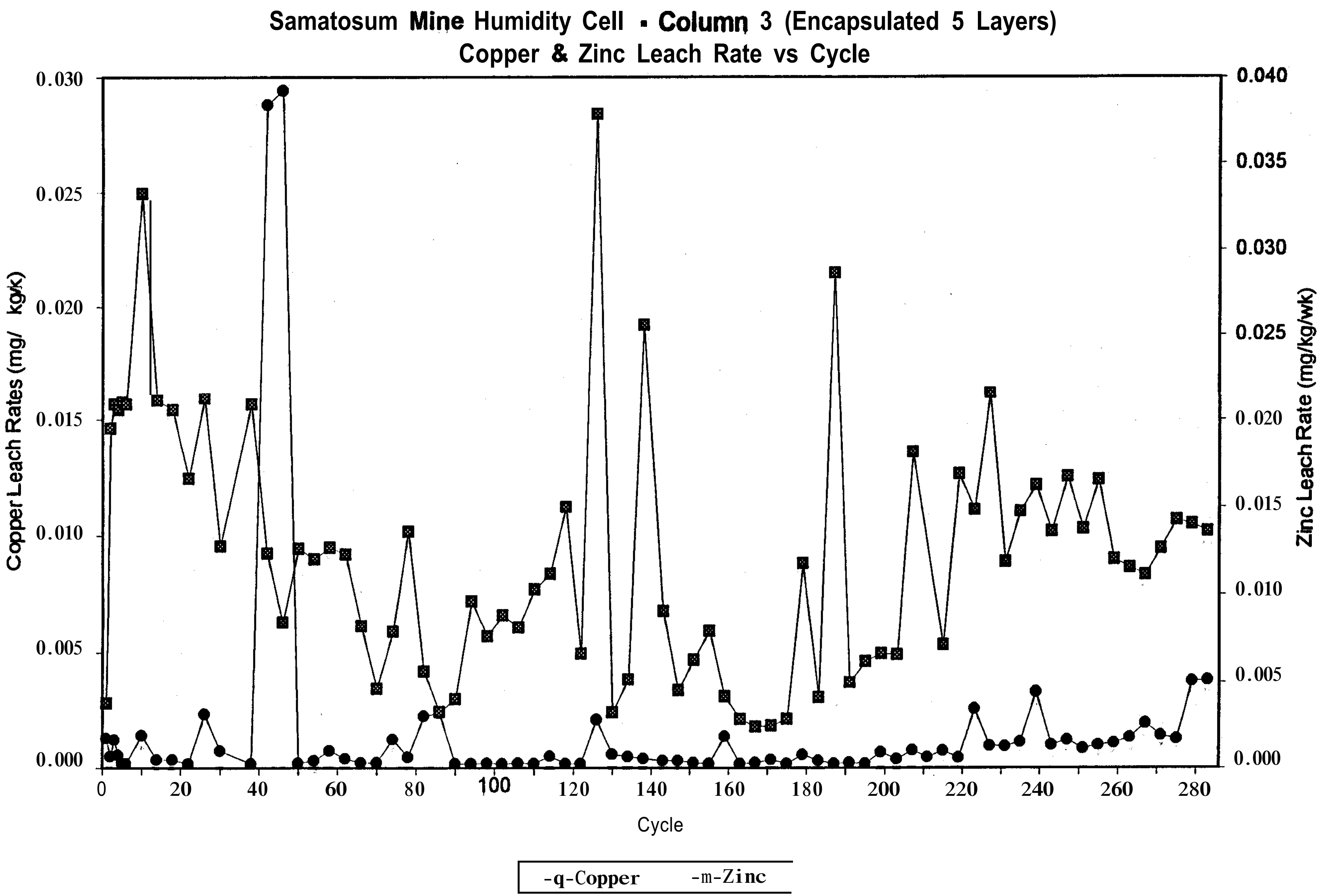

Samatosum Mine Humidity Cell • Column 3 (Encapsulated 5 Layers)
Weekly pH & Conductivity vs Cycle
W∞ kly pH
Conductivity (uhmos/cm)
Cycle
Weekly pH
Conductivity
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
1000
900
800
700
600
500
400
300
200
100
0
0
20
40
60
80
100
120
140
166
180
200
220
240
260
280

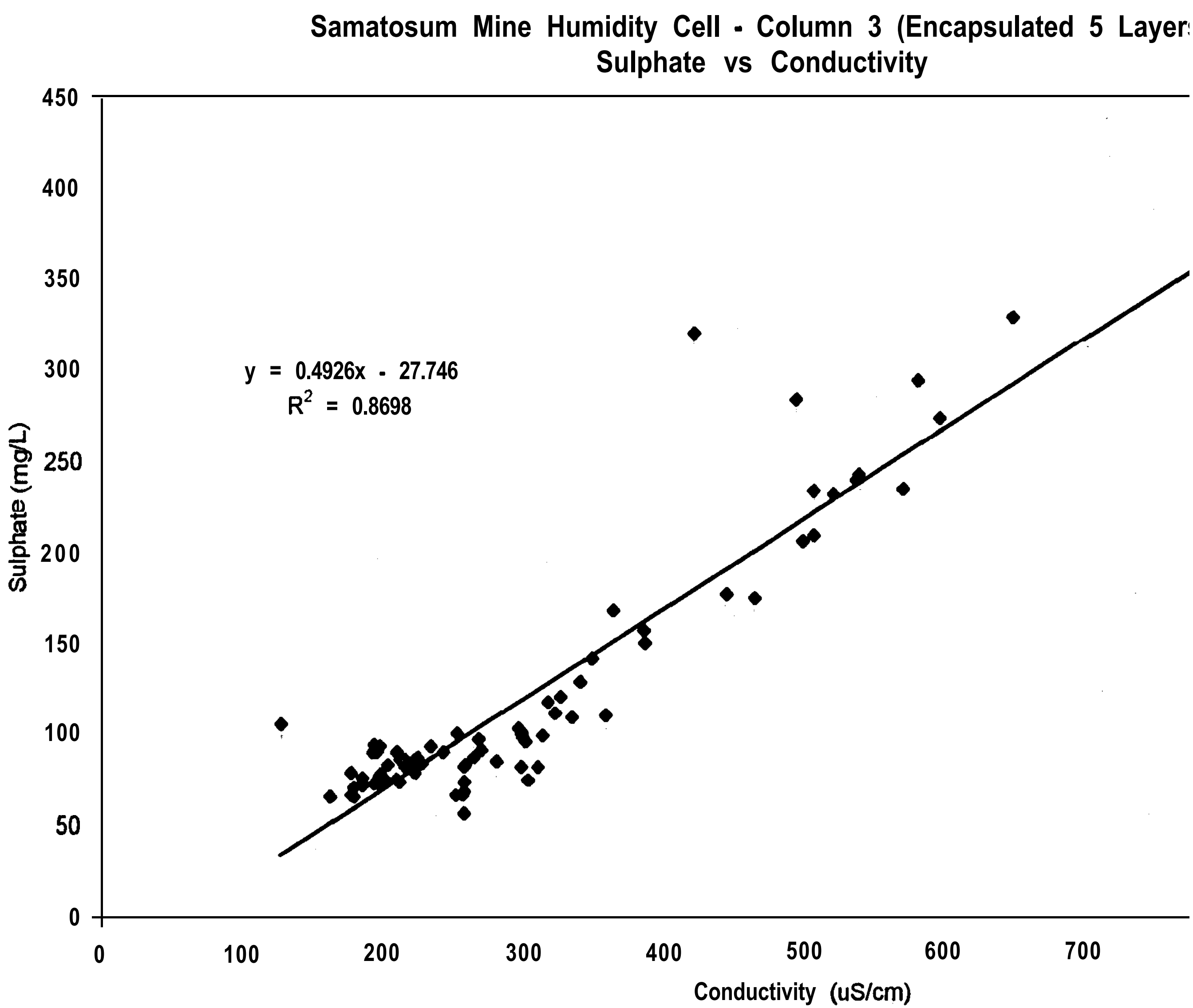


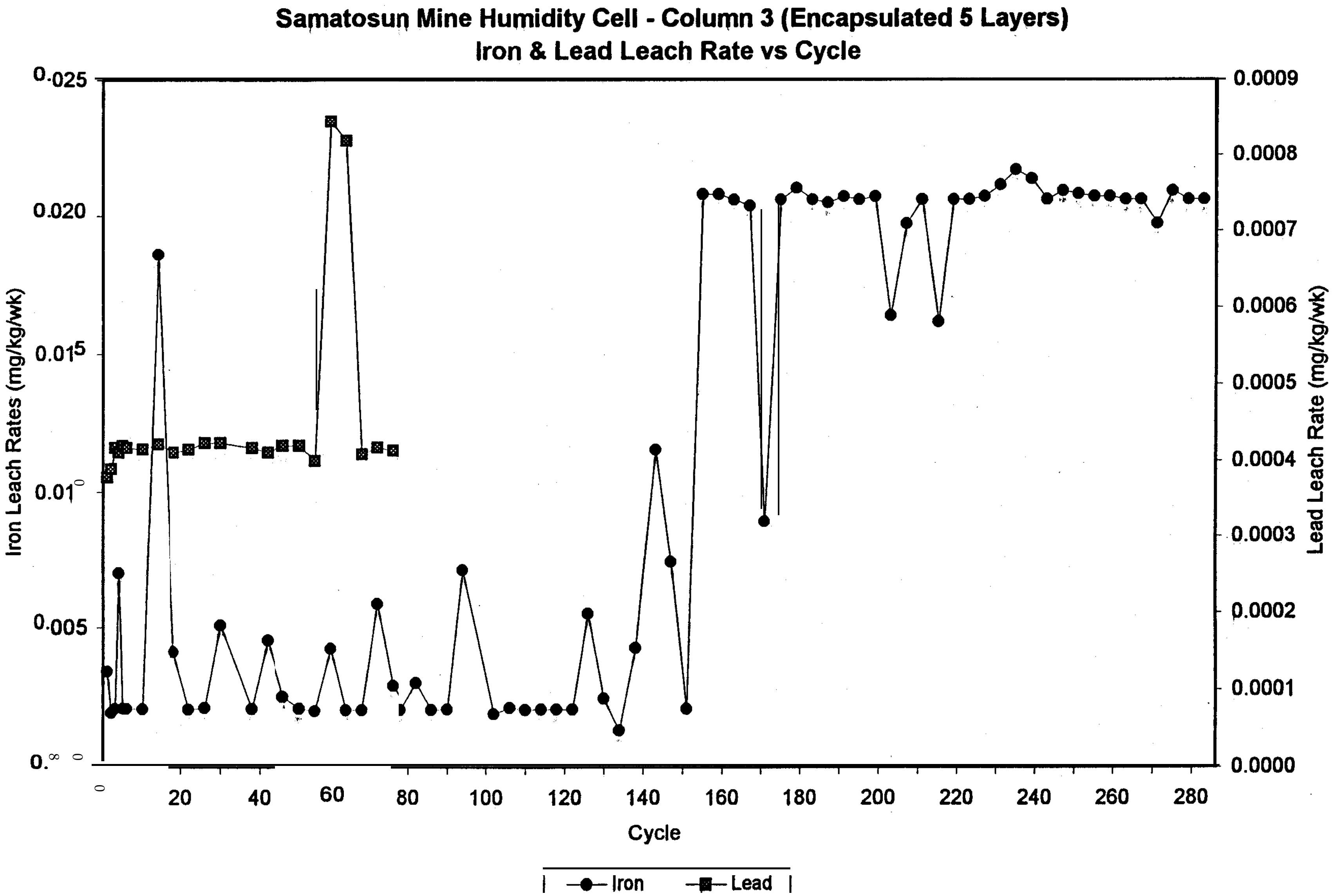
Samatosum Mine Humidity Cell - Column 3 (Encapsulated 5 Layers)
Sulphate Production Rate & Remaining S vs Cycle
Sulphate Production Rate (mg/kg/wk)
Remaining S (% of original)
Cycle
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
10
30
50
70
90
SO4 Production Rate
Remaining S

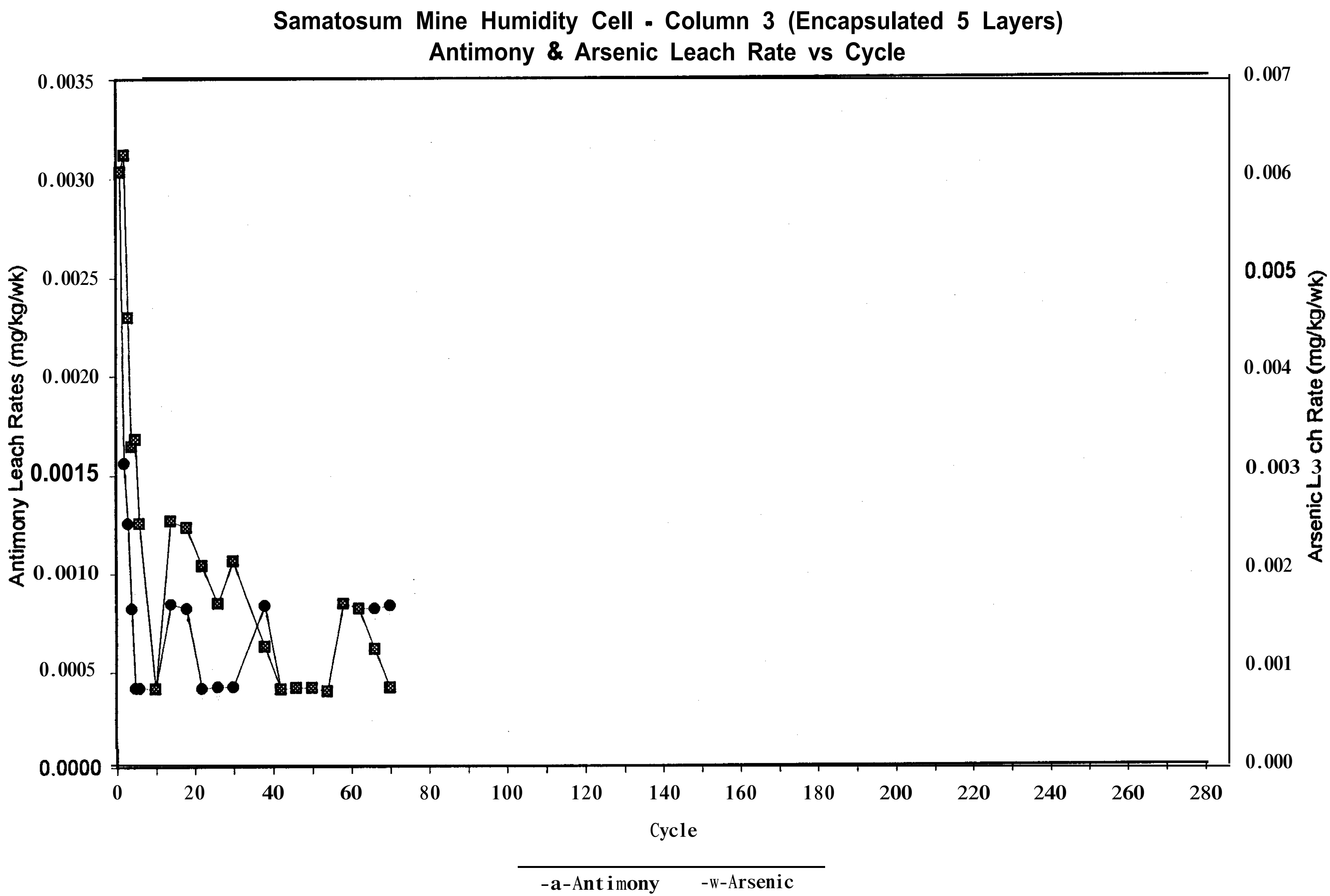


Samatosum Mine Humidity Cell - Column 3 (Encapsulated 5 Layers)
Alkalinity & Acidity Production Rate vs Cycle
Alkalinity Production Rate (mg/kg/wk)
Acidity Production Rate (mg/kg/wk)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
50
45
40
35
30
25
20
15
10
5
0
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
Cycle
Acidity Production Rate
Alkalinity Production Rate


Samatosum Mine Humidity Cell - Column 3 (Encapsulated 5 Layers)
Copper & Zinc Leach Rate vs Cycle
Copper Leach Rates (mg/ kg/k)
Zinc Leach Rate (mg/kg/wk)
0.030
0.025
0.020
0.015
0.010
0.005
0.000
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
Cycle
-q-Copper
-m-Zinc

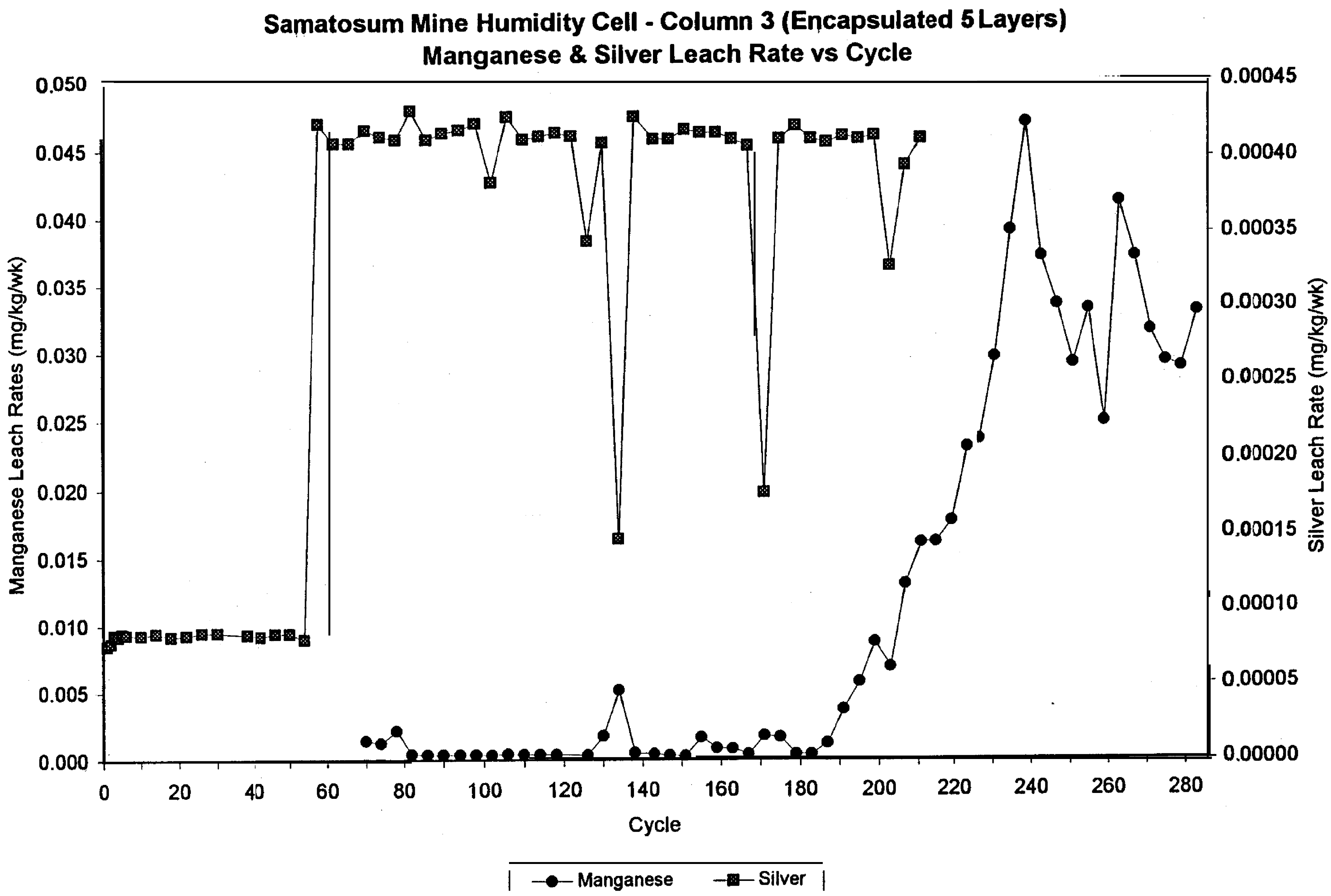

Samatosum Mine Humidity Cell - Column 3 (Encapsulated 5 Layer
Sulphate vs Conductivity
y = 0.4926x - 27.746
R2 = 0.8698
Sulphate (mg/L)
450
400
350
300
250
200
150
100
50
0
0
100
200
300
400
500
600
700
Conductivity (uS/cm)


Samatosun Mine Humidity Cell - Column 3 (Encapsulated 5 Layers)
Iron & Lead Leach Rate vs Cycle
Iron Leach Rates (mg/kg/wk)
Lead Leach Rate (mg/kg/wk)
Cycle
0.025
0.020
0.015
0.010
0.005
0.000
0.0009
0.0008
0.0007
0.0006
0.0005
0.0004
0.0003
0.0002
0.0001
0.0000
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
Iron
Lead



Samatosum Mine Humidity Cell - Column 3 (Encapsulated 5 Layers)
Antimony & Arsenic Leach Rate vs Cycle
Antimony Leach Rates (mg/kg/wk)
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
Arsenic Leach Rate (mg/kg/wk)
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0.000
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
Cycle
-a-Antimony
-w-Arsenic

B4. Column 4



Samatosum Mine Humidity Cell - Column 3 (Encapsulated 5 Layers)
Manganese & Silver Leach Rate vs Cycle
Manganese Leach Rates (mg/kg/wk)
Silver Leach Rate (mg/kg/wk)
Cycle
0.050
0.045
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
0.00045
0.00040
0.00035
0.00030
0.00025
0.00020
0.00015
0.00010
0.00005
0.00000
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
Manganese
Silver

Pre-Test ABA & ICP Metals Data Samatosum Mine **Column** 4 (Mafic Pyroclastic Control)		
Initial Sample Weight (dry) (g)		11450
ABA Results:		
Slurry **pH**		8.6
% **S** (Total)		0.14
% **S** (Sulphate)		
% **S** (Sulphide)		
% **S** (BaS04)		
TAP (tonne **CaCO3/ktonne)**		4
SAP (tonne **CaCO3/ktonne)**		
NP (tonne **CaCO3/ktonne)**		110.5
Carbon (%)		
CaNP (t **CaCO3/ktonne)**		
TNNP (tonne **CaCO3/ktonne)**		106
SNNP (tonne **CaCO3/ktonne)**		
RNNP (tonne **CaCO3/ktonne)**		
TNPR		25.26
SNPR		
RNPR		
Surface Area:		
Surface Area **(m2/kg)**		**1.27**
Metals: (ppm)		
Aluminum	Al	Data Not Available
Antimony	Sb	
Arsenic	As	
Barium	Ba	
Beryllium	Be	
Bismuth	Bi	
Cadmium	Cd	
Calcium	Ca	
Chromium	Cr	
cobalt	co	
Copper	cu	
Iron	Fe	
Lanthium	La	
Lead	Pb	
Lithium	Li	
Magnesium	**Mg**	
Manganese	Mn	
Mercury	**Hg**	
Molybdenum	Mo	
Nickel	Ni	
Phosphorus	P	
Potassium	K	
Selenium	Se	
Silver	**Ag**	
Sodium	Na	
Strontium	Sr	
Thallium	Tl	
Tin	Sn	
Titanium	Ti	
Tungsten	W	
Vanadium	V	
Zinc	Zn	

Post-Test ABA & ICP Metals Data **Samatosum** Mine **Column** 4 (Mafic Pyroclastic Control)		
Final Sample Weight (dry) (g)		
ABA Results:		
Paste **pH**		*Data Not Available*
% **S** (Total)		
% **S** (Sulphate)		
% **S** (Sulphide)		
% **S** (BaS04)		
TAP (tonne **CaCO3/ktonne)**		
SAP (tonne **CaCO3/ktonne)**		
NP (tonne **CaCO3/ktonne)**		
Carbon (%)		
CaNP (t **CaCO3/ktonne)**		
TNNP (tonne **CaCO3/ktonne)**		
SNNP (tonne **CaCO3/ktonne)**		
RNNP (tonne **CaCO3/ktonne)**		
TNPR		
SNPR		
RNPR		
Surface Area:		
Surface Area **(m2/kg)**		
Metals: (ppm)		
Aluminum	Al	*Data Not Available*
Antimony	Sb	
Arsenic	As	
Barium	Ba	
Beryllium	Be	
Bismuth	Bi	
Cadmium	Cd	
Calcium	Ca	
Chromium	Cr	
Cobalt	co	
Copper	cu	
Iron	Fe	
Lanthium	La	
Lead	Pb	
Lithium	Li	
Magnesium	**Mg**	
Manganese	Mn	
Mercury	**Hg**	
Molybdenum	Mo	
Nickel	Ni	
Phosphorus	P	
Potassium	K	
Selenium	Se	
Silver	**Ag**	
Sodium	**Na**	
Strontium	Sr	
Thallium	Tl	
Tin	Sn	
Titanium	Ti	
Tungsten	W	
Vanadium	V	
Zinc	Zn	

*NOTE: When metals were **reported** as < detection limit, half the value of the detection **limit** is shown in **italics,** and was used in subsequent calculations.*

Samatosum Mine Humidity Cell Data -Column 4 (Mafic Pyroclastic Control)

		Dissolved Metals*:								Metal Leach Rates:								Cumulative Metal Leach Rates:							
		Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc	Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc	Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc
Week No.	Date	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn
		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(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)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
0	8-Feb-89																	6.6E-03	4.9E-03	3.4E-03	8.2E-03	1.6E-03	NA	3.3E-04	7.4E-03
1	15-Feb-89	0.004	0.003	0.002	0.005	0.001		2E-04	0	6.6E-03	4.9E-03	3.4E-03	8.2E-03	1.6E-03		3.3E-04	7.4E-03	1.3E-02	9.9E-03	6.9E-03	1.6E-02	3.3E-03	NA	6.6E-04	1.5E-02
2	22-Feb-89	0.003	0.004	8E-04	0.005	0.001		2E-04	0.01	4.8E-03	6.5E-03	1.3E-03	8.1E-03	1.6E-03		3.2E-04	1.4E-02	1.8E-02	1.6E-02	8.2E-03	2.4E-02	4.9E-03	NA	9.8E-04	2.9E-02
3	1-Mar-89	0.002	0.003	0.001	0.005	0.001		2E-04	0.01	3.3E-03	4.9E-03	1.6E-03	8.2E-03	1.6E-03		3.3E-04	1.6E-02	2.1E-02	2.1E-02	9.8E-03	3.3E-02	6.5E-03	NA	1.3E-03	4.5E-02
4	8-Mar-89	0.003	0.003	7E-04	0.011	0.001		2E-04	0.01	4.6E-03	4.6E-03	1.1E-03	1.7E-02	1.5E-03		3.1E-04	1.8E-02	2.6E-02	2.6E-02	1.1E-02	5.0E-02	8.1E-03	NA	1.6E-03	6.3E-02
5	15-Mar-89	0.003	0.005	7E-04	0.005	0.001		2E-04	0.01	5.0E-03	8.3E-03	1.2E-03	8.3E-03	1.7E-03		3.3E-04	2.2E-02	3.1E-02	3.4E-02	1.2E-02	5.8E-02	9.7E-03	NA	1.9E-03	8.5E-02
6	22-Mar-89	0.002	0.005	5E-04	0.005	0.001		2E-04	0.01	3.4E-03	8.4E-03	8.4E-04	8.4E-03	1.7E-03		3.4E-04	1.9E-02	3.4E-02	4.3E-02	1.3E-02	6.6E-02	1.1E-02	NA	2.3E-03	1.0E-01
7	29-Mar-89																	3.6E-02	4.8E-02	1.3E-02	7.1E-02	1.2E-02	NA	2.5E-03	1.1E-01
8	5-Apr-89																	3.8E-02	5.3E-02	1.4E-02	7.5E-02	1.3E-02	NA	2.6E-03	1.2E-01
9	12-Apr-89																	3.9E-02	5.8E-02	1.5E-02	8.0E-02	1.4E-02	NA	2.8E-03	1.2E-01
10	19-Apr-89	0.002	0.007	8E-04	0.006	0.001		2E-04	0.01	3.3E-03	1.2E-02	1.3E-03	1.0E-02	1.7E-03		3.3E-04	8.3E-03	4.3E-02	6.9E-02	1.6E-02	9.0E-02	1.6E-02	NA	3.1E-03	1.3E-01
11	26-Apr-89																	4.5E-02	7.6E-02	1.6E-02	1.0E-01	1.6E-02	NA	3.3E-03	1.4E-01
12	3-May-89																	4.7E-02	8.2E-02	1.7E-02	1.1E-01	1.7E-02	NA	3.4E-03	1.5E-01
13	10-May-89																	4.9E-02	8.9E-02	1.8E-02	1.2E-01	1.8E-02	NA	3.6E-03	1.5E-01
14	17-May-89	0.003	0.009	6E-04	0.018	0.001		2E-04	0.01	4.7E-03	1.4E-02	9.4E-04	2.8E-02	1.6E-03		3.1E-04	2.2E-02	5.3E-02	1.0E-01	1.9E-02	1.5E-01	2.0E-02	NA	3.9E-03	1.8E-01
15	24-May-89																	5.6E-02	1.1E-01	1.9E-02	1.6E-01	2.0E-02	NA	4.1E-03	1.9E-01
16	31-May-89																	5.8E-02	1.2E-01	2.0E-02	1.7E-01	2.1E-02	NA	4.2E-03	2.0E-01
17	7-Jun-89																	6.1E-02	1.2E-01	2.0E-02	1.8E-01	2.2E-02	NA	4.4E-03	2.1E-01
18	14-Jun-89	0.003	IO.008	8E-04	0.009	0.001		2E-04	0.01	5.0E-03	1.3E-02	1.3E-03	1.5E-02	1.7E-03		3.3E-04	1.7E-02	6.6E-02	1.4E-01	2.2E-02	1.9E-01	2.4E-02	NA	4.7E-03	2.2E-01
19	21-Jun-89																	*7.1E-02*	*1.5E-01*	*2.3E-02*	*2.1E-01*	2.5E-02	NA	5.1E-03	2.4E-01
20	28-Jun-89																	7.6E-02	1.6E-01	2.4E-02	2.2E-01	2.7E-02	NA	5.4E-03	2.6E-01
Maximum		0 004	0.009	0.002	0.018	0.001	NA	2E-04	0.01	6.6E-03	1.4E-02	3.4E-03	2.8E-02	1.7E-03	NA	3.4E-04	2.2602	7.6E-02	1.6E-01	2.4602	2.2E-01	2.7E-02	NA	5.4E-03	2.6E-01
Minimum		0.002	0.003	0.0005	0.005	0.001	NA	2E-04	0	3.3E-03	4.6E-03	8.4E-04	8.1E-03	1.5E-03	NA	3.1E-04	7.4E-W	6.6E-03	4.9E-03	3.4E-03	8.2E-03	1.6E-03	NA	3.3604	7.4E-03
Mean		0.003	0.005	0.0009	0.01	0.001	NA	0.0002	0.010	4.5E-03	8.5E-03	1.5E-03	1.2E-02	1.6E-03	NA	3.3E-04	1.6E-02	4.2E-02	7.3802	1.5E-02	1.0E-01	1.5E-02	NA	3.0E-03	1.3E-01
Median		0.003	0.005	0.0008	0.005	0.001	NA	0.0002	0.010	4.7E-03	8.3E-03	1.3E-03	8.4E-03	1.6E-03	NA	3.3E-04	1.7E-02	4.3E-02	6.9E-02	1.6E-02	9.0E-02	1.6E-02	NA	3.1E-03	1.3E-01
Mean Last 5 weeks				0.0007	0.014			O.9002	0.012			1.1E-03	2.2E-02		NA		1.9E-02	6.3E-02	1.3E-01	2.1E-02	1.8E-01	2.3802	NA	4.6E-03	2.1E-01
75% Remaining (Wks)																									
50% Remaining (Wks)																									
25% Remaining (Wks)																									
0% Remaining (Wks)																									

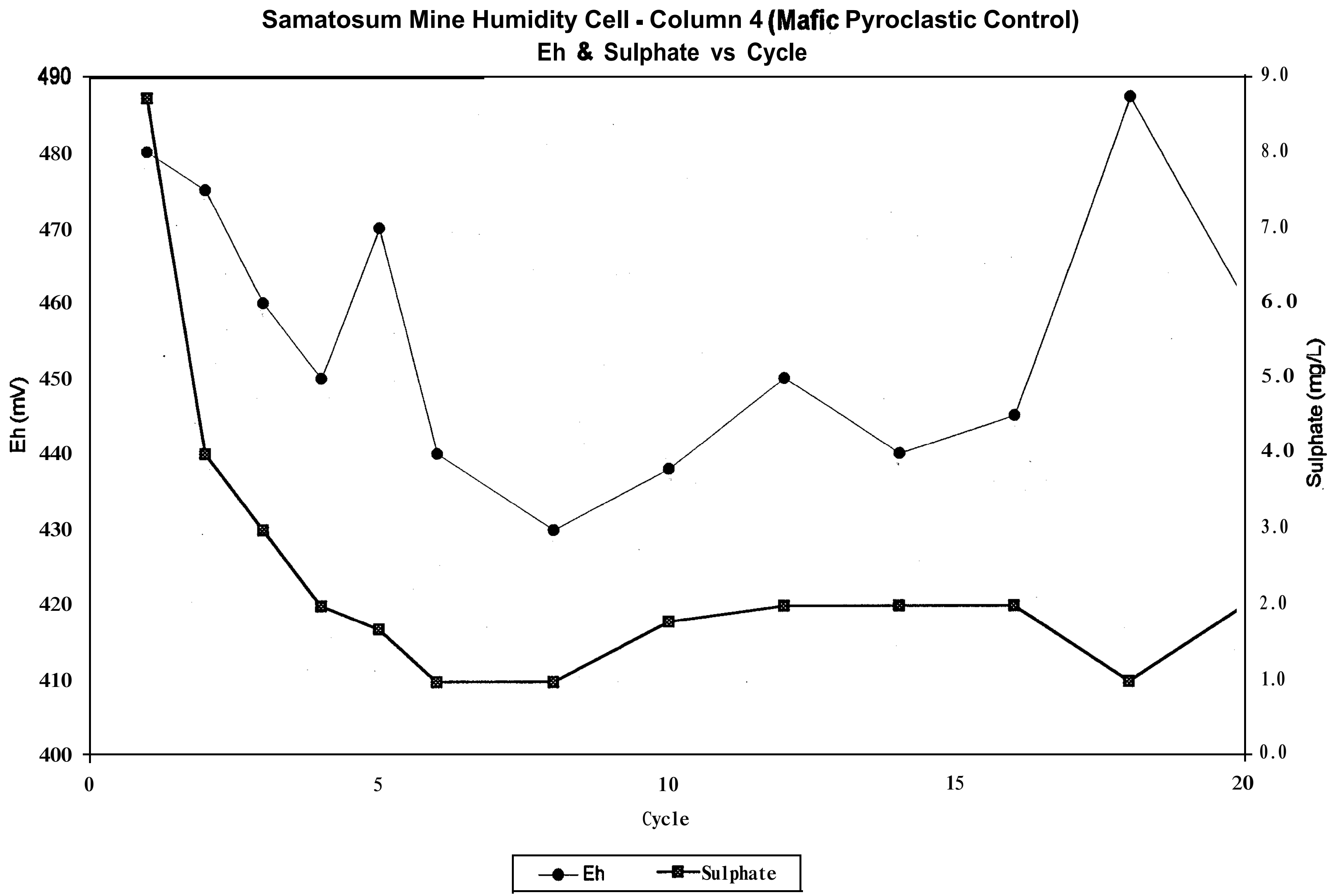
** If values were reported as < detection limit, 1/2 the detection limit is shown in italics and was used in subsequent calculations.*

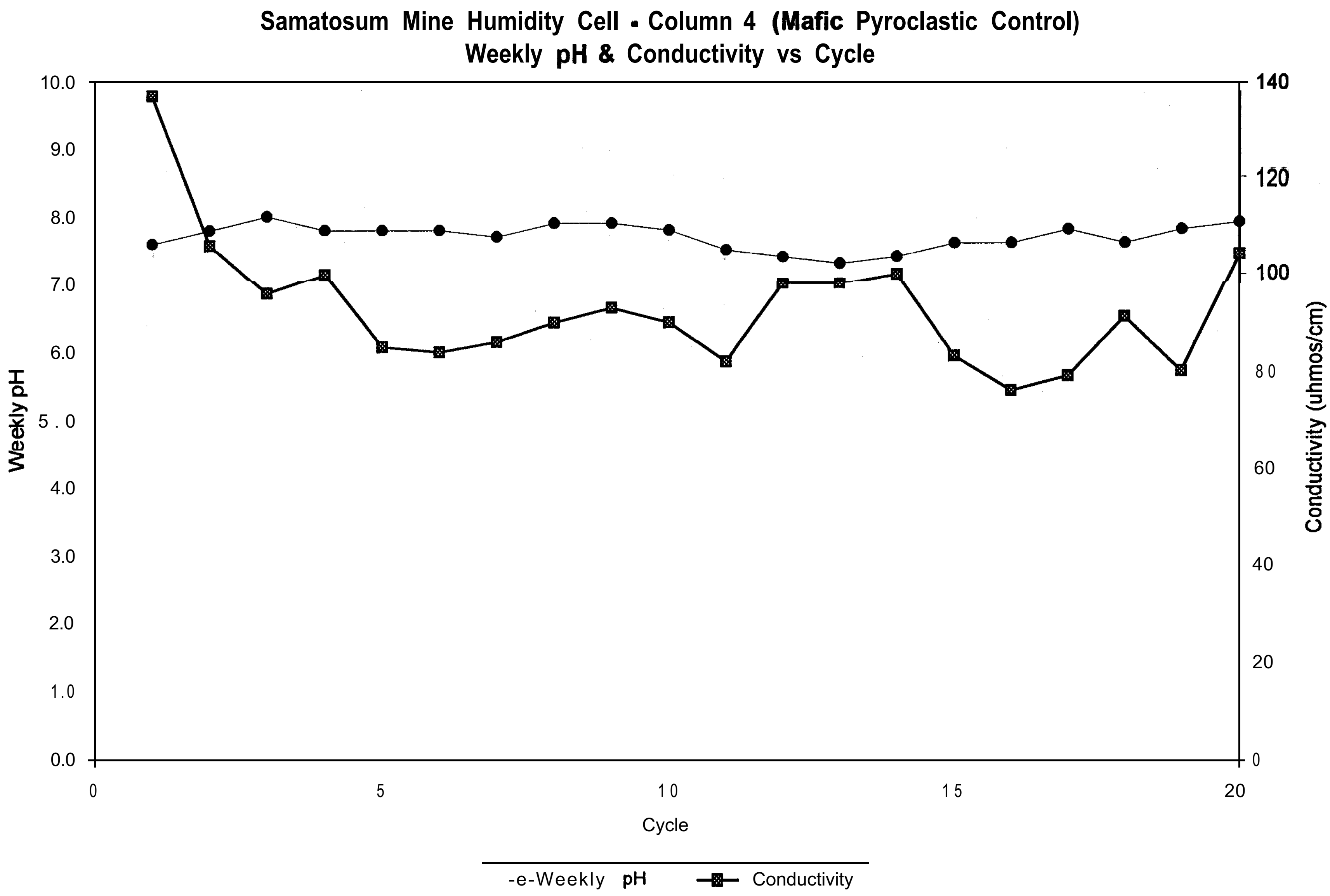
Samatosum Mine Humidity Cell Data -Column 4 (Mafic Pyroclastic Control)

		Analytical Results:									Sulphate Production:			By Surface Area:		Molar Ratio:	NP Consumption:	
Week No.	Date	Leachate Recovered (mL)	Weekly pH (pH units)	Conductivity (umhos/cm)	Eh (mV)	Acidity (CaCO3 mg/L)*	Alkalinity (CaCO3 mg/L)*	Sulphate (SO4 mg/L)*	Acidity Production Rate (mg/kg/wk)**	Alkalinity Production Rate (mg/kg/wk)**	SO4 Production Rate (mg/kg/wk)**	Cumulative SO4 Production (mg/kg)	Remaining S (% of original)	SO4 Production Rate (mg/m2/wk)**	Cumulative SO4 Production (mg/m2)	Alk /SO4	Theoretical NP Consumption At pH 6 (mg/kg/wk)	Empirical Open-System NP Consumption At Measured pH (mg/kg/wk)
0	08-Feb-89								4.93	118.2	14.28	14	99.66	11.28	11.3		14.88	128.2
1	15-Feb-89	18800	7.6	137	480	3	72	9	4.93	118.2	14.28	29	99.32	11.28	22.6	7.9	14.88	128.2
2	22-Feb-89	18500	7.8	106	475	2	56	4	3.23	90.5	6.46	35	99.17	5.10	27.7	13.4	6.73	94.0
3	01-Mar-89	18800	8.0	96	460	2	52	3	3.28	85.4	4.93	40	99.05	3.89	31.5	16.6	5.13	87.2
4	08-Mar-89	17500	7.8	100	450	5	54	2	7.64	82.5	3.06	43	98.98	2.41	34.0	25.9	3.18	78.1
5	15-Mar-89	19000	7.8	85	470	2	48	2	3.32	79.7	2.82	46	98.91	2.23	36.2	27.1	2.94	79.3
6	22-Mar-89	19300	7.8	84	440	2	54	1	3.37	91.0	1.69	48	98.87	1.33	37.5	51.8	1.76	89.4
7	29-Mar-89	19400	7.7	86					5.06	86.0	1.69	49	98.83	1.33	38.8		1.76	82.7
8	05-Apr-89	19300	7.9	90	430	4	48	1	6.74	80.9	1.69	51	98.79	1.33	40.2	46.1	1.76	75.9
9	12-Apr-89	19300	7.9	93					5.04	84.7	2.34	53	98.73	1.85	42.0		2.44	82.1
10	19-Apr-89	19100	7.8	90	438	2	53	2	3.34	88.4	3.00	56	98.66	2.37	44.4	28.3	3.13	88.2
11	26-Apr-89	19000	7.5	82					4.16	88.2	3.16	59	98.59	2.50	46.9		3.29	87.3
12	03-May-89	19000	7.4	98	450	3	53	2	4.98	87.9	3.32	63	98.51	2.62	49.5	25.4	3.46	86.4
13	10-May-89	18700	7.3	98					4.85	85.6	3.23	66	98.43	2.55	52.1		3.37	84.2
14	17-May-89	18000	7.4	100	440	3	53	2	4.72	83.3	3.14	69	98.35	2.48	54.5	25.4	3.28	81.9
15	24-May-89	19000	7.6	83					4.85	85.6	3.23	72	98.28	2.55	57.1		3.37	84.2
16	31-May-89	19000	7.6	76	445	3	53	2	4.98	87.9	3.32	76	98.20	2.62	59.7	25.4	3.46	86.4
17	07-Jun-89	19000	7.8	79					4.98	88.8	2.49	78	98.14	1.96	61.7		2.59	86.4
18	14-Jun-89	19000	7.6	91	487	3	54	1	4.98	89.6	1.66	80	98.10	1.31	63.0	51.8	1.73	86.4
19	21-Jun-89	19100	7.8	80					4.15	86.3	2.49	82	98.04	1.96	65.0		2.59	84.7
20	28-Jun-89	19000	7.9	104	460	2	50	2	3.32	83.0	3.32	86	97.96	2.62	67.6	24.0	3.46	83.1
Maximum		19400	8.00	137	487	5	72.0	9	7.64	118.2	14.28	86	99.66	11.28	67.6	51.8	14.88	128.2
Minimum		17500	7.30	76	430	2	48.0	1	3.23	79.7	1.66	14	97.96	1.31	11.3	7.9	1.73	75.9
Mean		18890	7.70	93	456	2.8	53.8	2	4.61	89.1	4.08	57	98.65	3.22	44.9	28.4	4.25	88.8
Median		19000	7.80	91	450	3.0	53.0	2	4.85	86.3	3.14	56	98.66	2.48	44.4	25.4	3.28	86.4
Mean Last 5 Weeks		19020	7.74	86	464	3	52.3	2	4.48	87.1	2.66	80	98.09	2.10	63.4	33.8	2.77	85.4
75% Remaining (Wks)													383					
50% Remaining (Wks)													778					
25% Remaining (Wks)													1173					
0% Remaining (Wks)													1568					

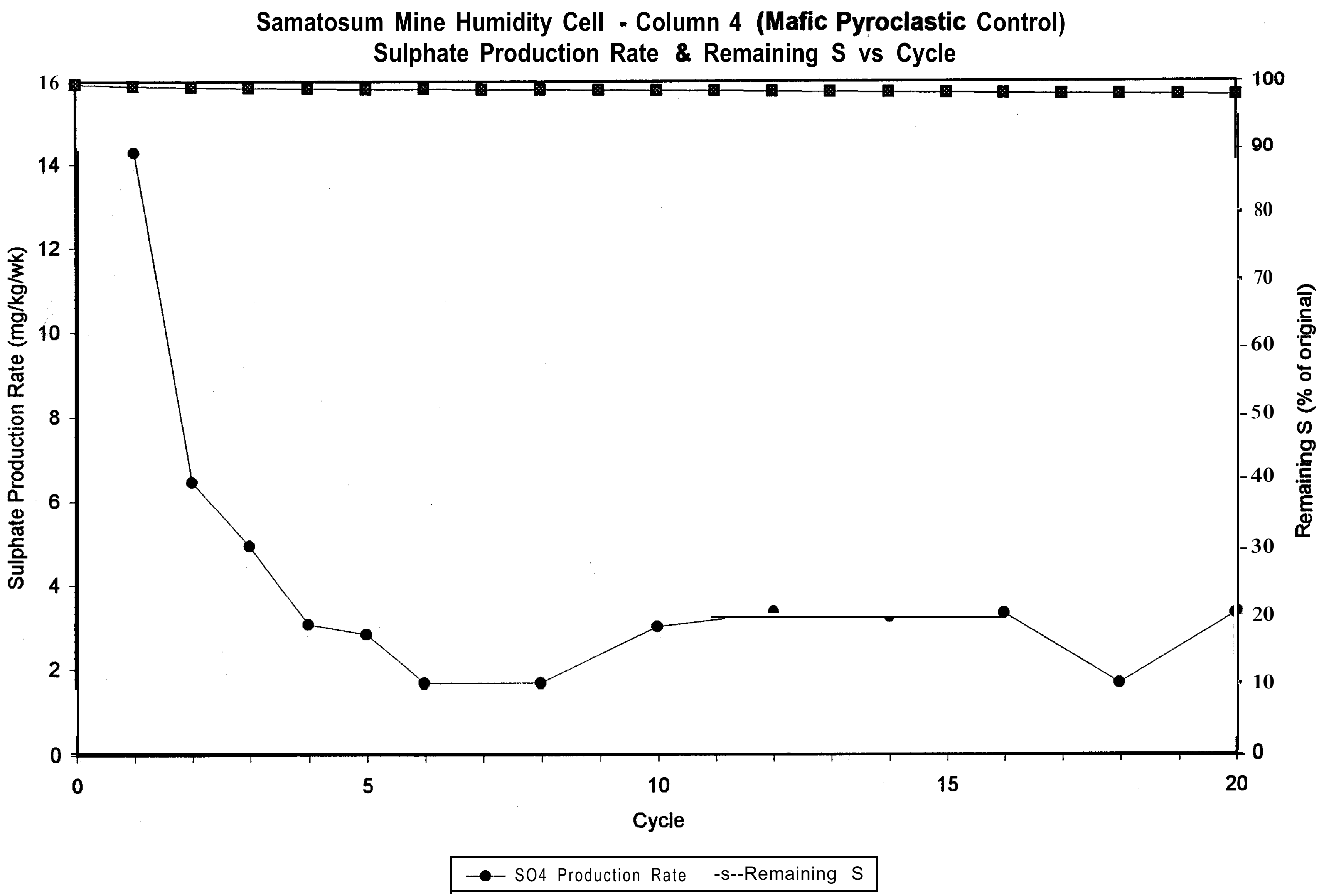
** If measured sulphate, alkalinity and/or acidity values were unavailable, data was interpolated from existing data and used in subsequent equations

* *if values were reported as < detection limit, 1/2 the detection limit is shown in italics and was used in subsequent calculations*


Samatosum Mine Humidity Cell - Column 4 (Mafic Pyroclastic Control)
Eh & Sulphate vs Cycle
Eh (mV)
Sulphate (mg/L)
Cycle
490
480
470
460
450
440
430
420
410
400
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0
5
10
15
20
Eh
Sulphate

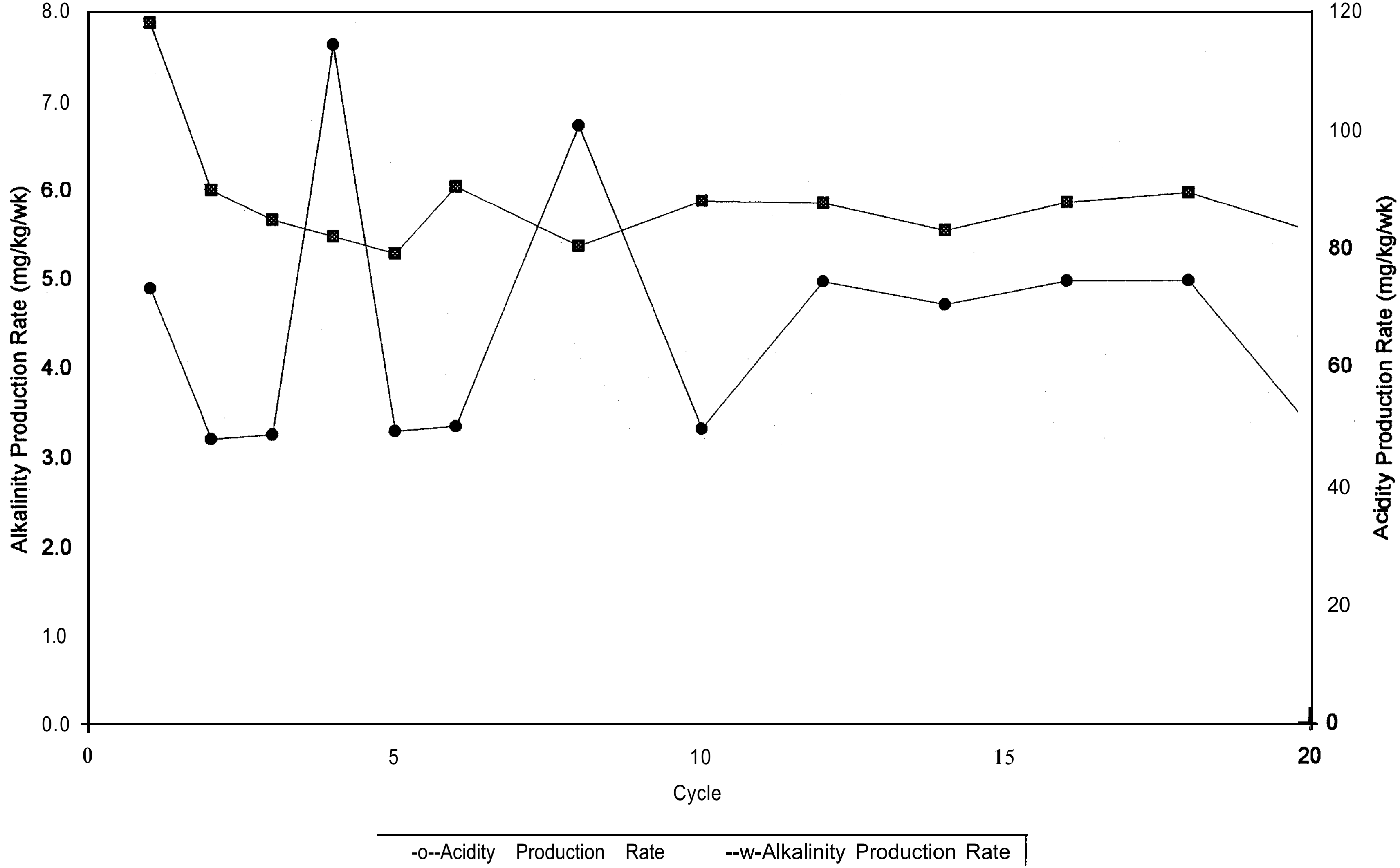


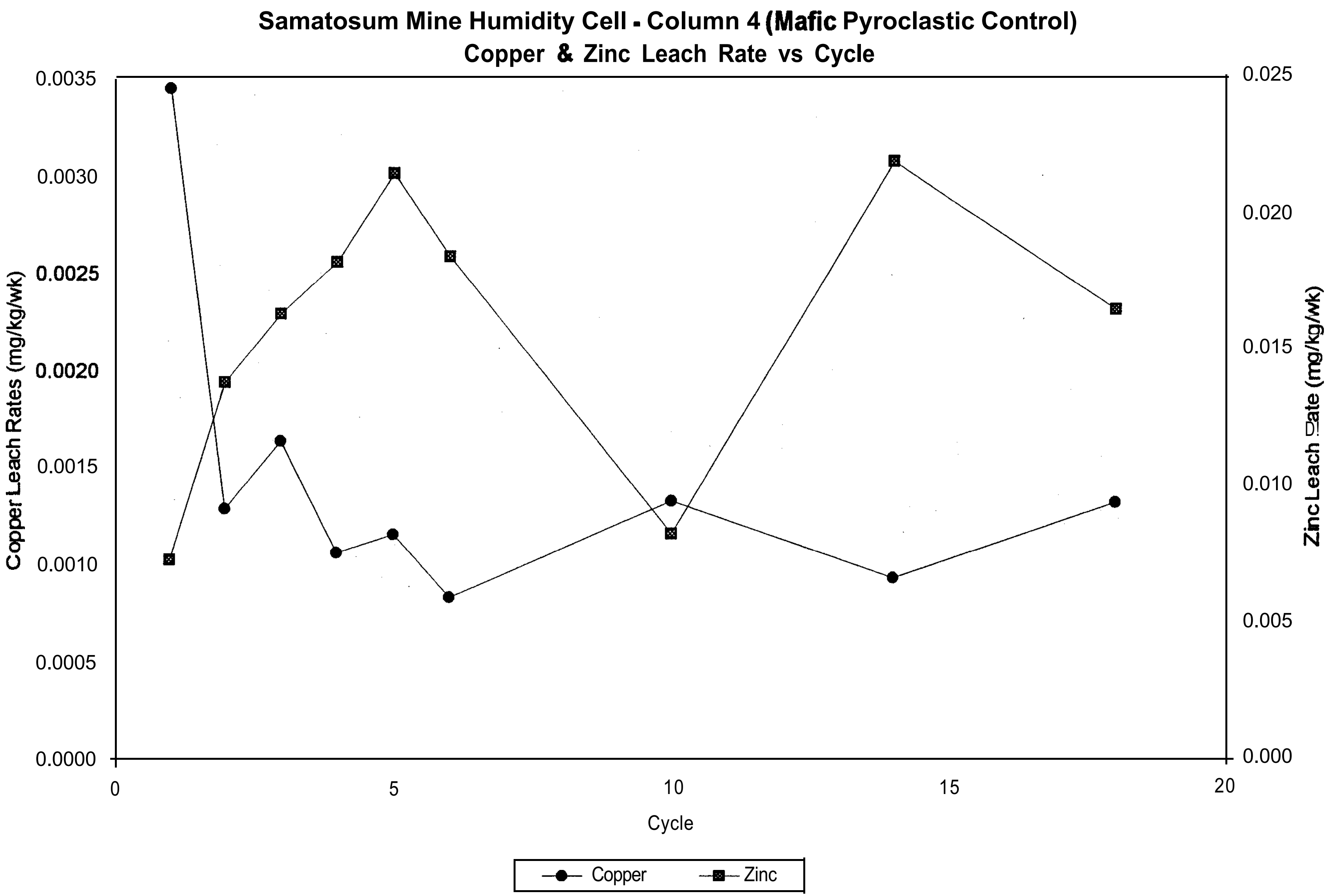
Samatosum Mine Humidity Cell - Column 4 (Mafic Pyroclastic Control)
Weekly pH & Conductivity vs Cycle
Weekly pH
Conductivity (uhmos/cm)
Cycle
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
140
120
100
80
60
40
20
0
0
5
10
15
20
-e-Weekly pH
Conductivity



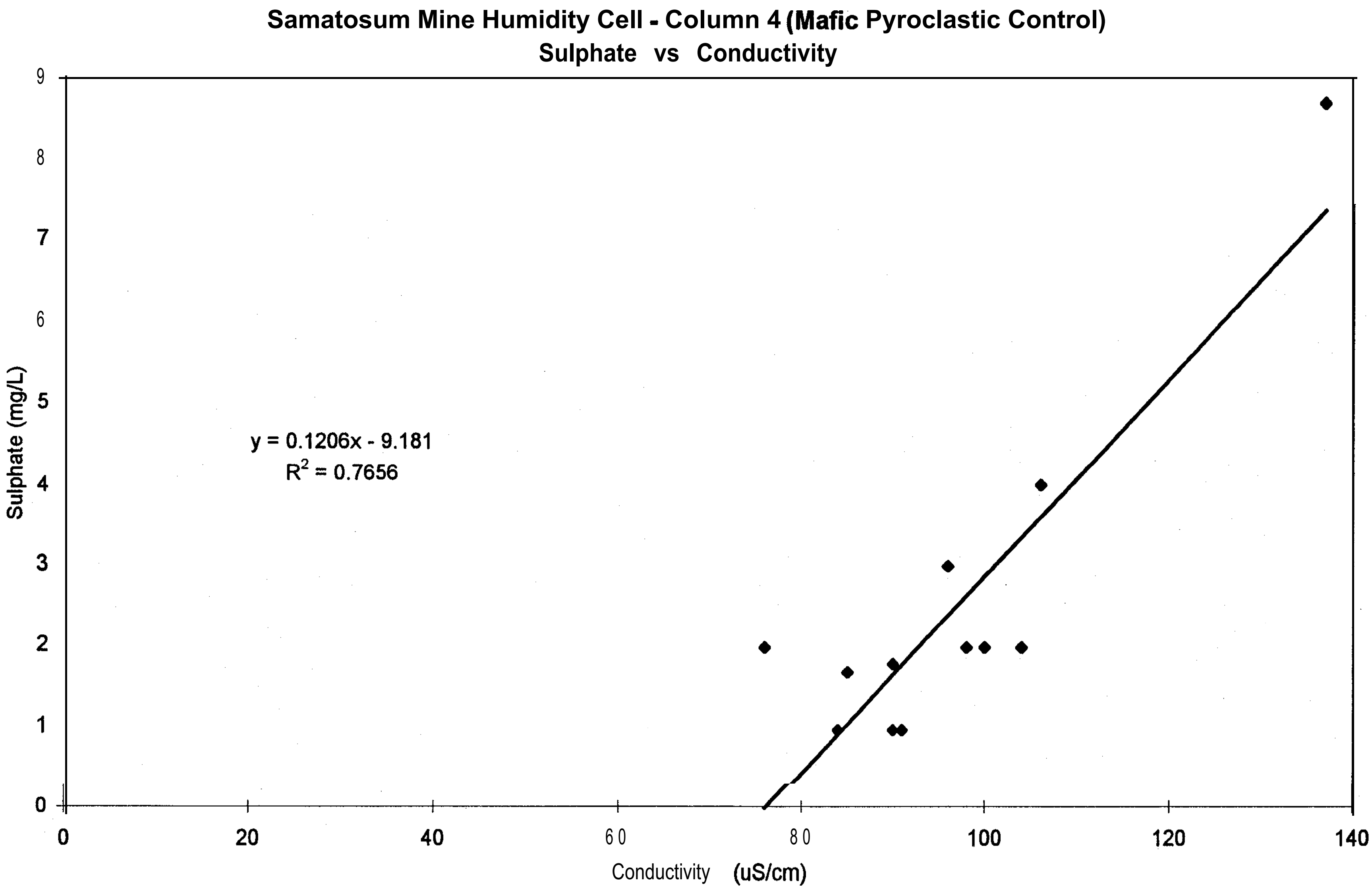
Samatosum Mine Humidity Cell - Column 4 (Mafic Pyroclastic Control)
Sulphate Production Rate & Remaining S vs Cycle
Sulphate Production Rate (mg/kg/wk)
Remaining S (% of original)
Cycle
0
2
4
6
8
10
12
14
16
0
5
10
15
20
0
10
20
30
40
50
60
70
80
90
100
SO4 Production Rate
-s--Remaining S

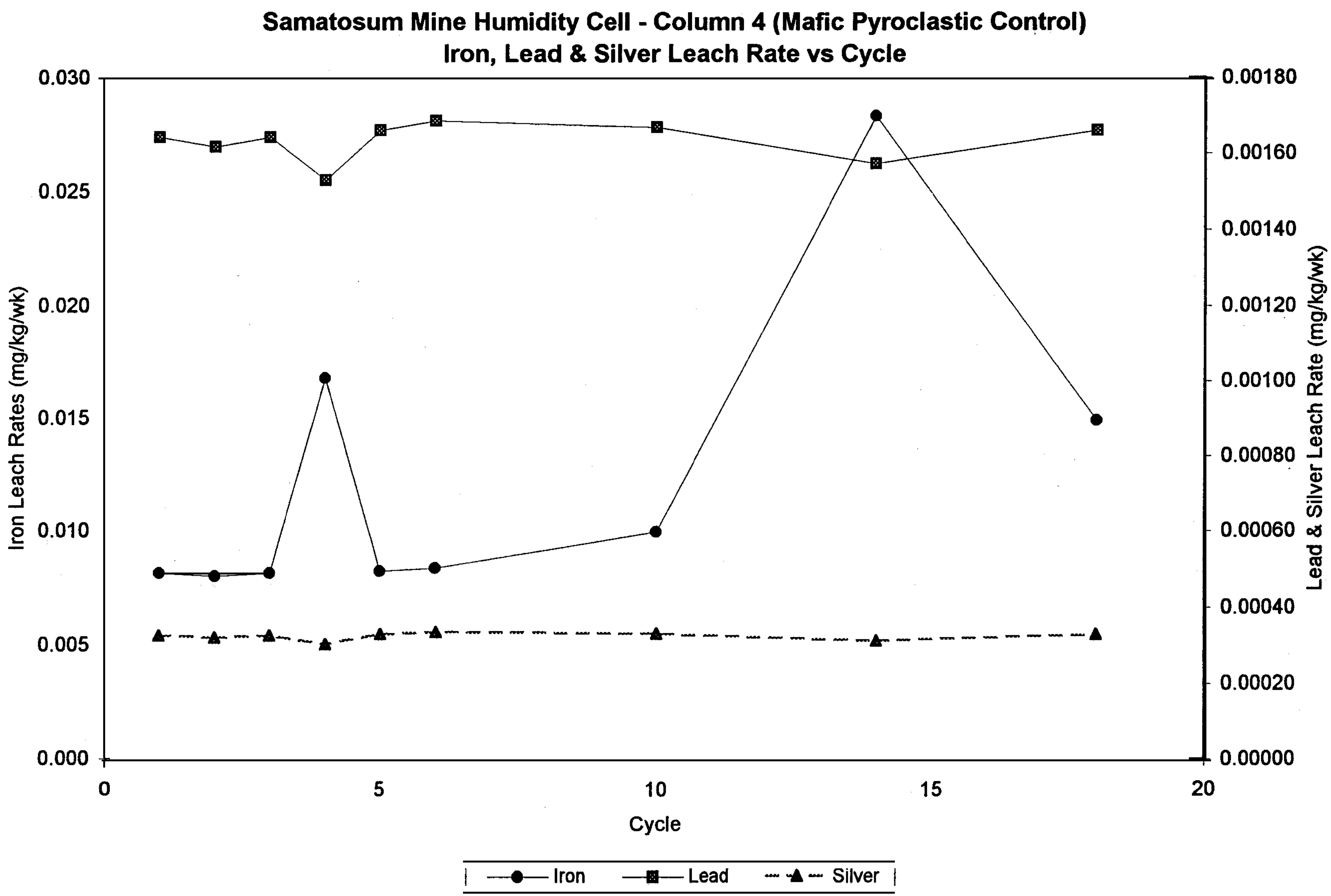
Samatosum Mine Humidity Cell - Column 4 (Mafic Pyroclastic Control)
Alkalinity & Acidity Production Rate vs Cycle

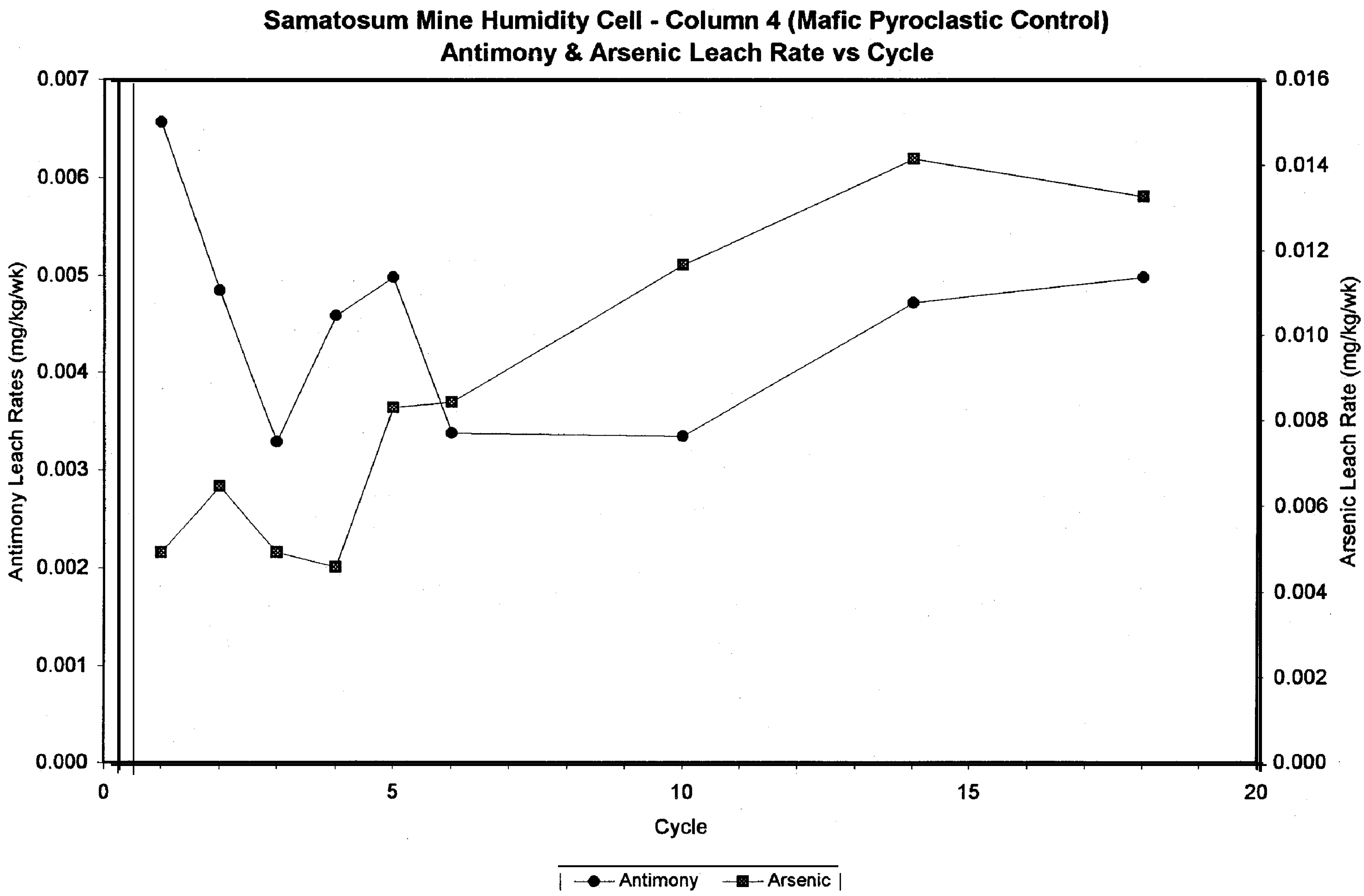




Samatosum Mine Humidity Cell - Column 4 (Mafic Pyroclastic Control)
Copper & Zinc Leach Rate vs Cycle
Copper Leach Rates (mg/kg/wk)
Zinc Leach Rate (mg/kg/wk)
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
0.025
0.020
0.015
0.010
0.005
0.000
0
5
10
15
20
Cycle
Copper
Zinc


Samatosum Mine Humidity Cell - Column 4 (Mafic Pyroclastic Control)
Sulphate vs Conductivity
y = 0.1206x - 9.181
R2 = 0.7656
Sulphate (mg/L)
0
1
2
3
4
5
6
7
8
9
0
20
40
60
80
100
120
140
Conductivity (uS/cm)


Samatosum Mine Humidity Cell - Column 4 (Mafic Pyroclastic Control)
Iron, Lead & Silver Leach Rate vs Cycle
Iron Leach Rates (mg/kg/wk)
Lead & Silver Leach Rate (mg/kg/wk)
0.030
0.025
0.020
0.015
0.010
0.005
0.000
0.00180
0.00160
0.00140
0.00120
0.00100
0.00080
0.00060
0.00040
0.00020
0.00000
0
5
10
15
20
Cycle
Iron
Lead
Silver


Samatosum Mine Humidity Cell - Column 4 (Mafic Pyroclastic Control)
Antimony & Arsenic Leach Rate vs Cycle
Antimony Leach Rates (mg/kg/wk)
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0.000
Arsenic Leach Rate (mg/kg/wk)
0.016
0.014
0.012
0.010
0.008
0.006
0.004
0.002
0.000
0
5
10
15
20
Cycle
Antimony
Arsenic

B5. Column 5

re-Test ABA 8 ICP Metals Data
iamatosum Mine
olumn 5 (Blend Control Alkalinity Removed)

nitial Sample Weight (dry) (g)		17210
BA Results:		
Paste pH		8.3
% S (Total)		3.62
% S (Sulphate)		
% S (Sulphide)		
% S (BaS04)		
TAP (tonne CaCO3/ktonne)		**113**
SAP (tonne CaCO3/ktonne)		
NP (tonne CaCO3/ktonne)		61.5
Carbon (%)		
CaNP (t CaCO3/ktonne)		
TNNP (tonne CaCO3/ktonne)		-52
SNNP (tonne CaCO3/ktonne)		
RNNP (tonne CaCO3/ktonne)		
TNPR		0.54
SNPR		
RNPR		
Surface Area:		
Surface Area (m2/kg)		*1.66*
Wetals: (ppm)		
Aluminum	Al	Data *Not* *Available*
Antimony	Sb	
Arsenic	As	
Barium	Ba	
Beryllium	Be	
Bismuth	Bi	
Cadmium	Cd	
Calcium	Ca	
Chromium	Cr	
Cobalt	co	
Copper	cu	
Iron	Fe	
Lanthium	La	
Lead	Pb	
Lithium	Li	
Magnesium	Mg	
Manganese	Mn	
Mercury	Hg	
Molybdenum	Mo	
Nickel	Ni	
Phosphorus	P	
Potassium	K	
Selenium	Se	
Silver	Ag	
Sodium	Na	
Strontium	Sr	
Thallium	Tl	
Tin	Sn	
Titanium	Ti	
Tungsten	W	
Vanadium	V	
Zinc	Zn	

Post-Test ABA & ICP Metals Data
Samatosum Mine
Column 5 (Blend Control Alkalinity Removed)

inal Sample Weight (dry) (g)		
BA Results:		Data *Not* *Available*
Paste pH		
% S (Total)		
% S (Sulphate)		
% S (Sulphide)		
% S (BaS04)		
TAP (tonne CaCO3/ktonne)		
SAP (tonne CaCO3/ktonne)		
NP (tonne CaCO3/ktonne)		
Carbon (%)		
CaNP (t CaCO3/ktonne)		
TNNP (tonne CaCO3/ktonne)		
SNNP (tonne CaCO3/ktonne)		
RNNP (tonne CaCO3/ktonne)		
TNPR		
SNPR		
RNPR		
urface Area:		
Surface Area (m2/kg)		
Metals: (ppm)		
Aluminum	Al	*Data* *Not* *Available*
Antimony	Sb	
Arsenic	As	
Barium	Ba	
Beryllium	Be	
Bismuth	Bi	
Cadmium	Cd	
Calcium	Ca	
Chromium	Cr	
Cobalt	co	
Copper	cu	
Iron	Fe	
Lanthium	La	
Lead	Pb	
Lithium	Li	
Magnesium	Mg	
Manganese	Mn	
Mercury	Hg	
Molybdenum	Mo	
Nickel	Ni	
Phosphorus	P	
Potassium	K	
Selenium	Se	
Silver	Ag	
Sodium	Na	
Strontium	Sr	
Thallium	Tl	
Tin	Sn	
Titanium	Ti	
Tungsten	W	
Vanadium	V	
Zinc	Zn	

NOTE: When metals were reported as < detection limit, half the value of the detection limit is shown in italics, and was used in subsequent calculations.

Samatosum Mine Humidity Cell Data - Column 5 (Blend Control Alkalinity Removed)

Week No.	Date	Analytical Results: Leachate Recovered (mL)	Weekly pH (pH units)	Conductivity (umhos/cm)	Eh (mV)	Acidity (CaCO3 mg/L)*	Alkalinity (CaCO3 mg/L)*	Sulphate (SO4 mg/L)*	Acidity Production Rate (mg/kg/wk)**	Alkalinity Production Rate (mg/kg/wk)**	Sulphate Production: SO4 Production Rate (mg/kg/wk)**	Cumulative SO4 Production (mg/kg)	Remaining S (% of original)	By Surface Area: SO4 Production Rate (mg/m2/wk)**	Cumulative SO4 Production (mg/m2)	Molar Ratio: Alk /SO4	NP Consumption: Theoretical NP Consumption At pH 6 (mg/kg/wk)	Empirical Open-System NP Consumption At Measured pH (mg/kg/wk)	Cum NP Consumption Open-System (mg/kg/wk)	Remaining NP Open-System (%)	Theoretical Closed-System NP Consumption Above pH 6.5 (mg/kg/wk)	Cum NP Consumption Closed-System (mg/kg/wk)	Remaining NP Closed-System (%)
66	24-Oct-90	19300	2.9	825	630	30		214	33.6	0.00	240.0	52230	51.91	145	31553	NA	250.0	216.3	25708	58.20	466.3	80035	-30.14
67	31-Oct-90	19300	2.5	775	585	25		200	28.0	0.00	224.3	52455	51.70	135	31688	NA	233.6	205.6	25914	57.86	439.2	80474	-30.85
68	07-Nov-90	19300	2.7	783	635	15		214	16.8	0.00	240.0	52695	51.48	145	31833	NA	250.0	233.2	26147	57.48	483.2	80957	-31.64
69	14-Nov-90	19300	2.8	773	630	25		202	28.0	0.00	226.5	52921	51.27	137	31970	NA	236.0	207.9	26355	57.15	443.9	81401	-32.36
70	21-Nov-90	19400	2.8	747	590	10		215	11.3	0.00	242.4	53163	51.05	146	32116	NA	252.5	241.2	26596	56.75	493.6	81895	-33.16
71	28-Nov-90	19400	2.6	905	595	26		197	29.3	0.00	222.1	53386	50.84	134	32251	NA	231.3	202.0	26798	56.43	433.3	82328	-33.87
72	05-Dec-90	19300	2.7	1080	602	15		230	16.8	0.00	257.9	53643	50.60	156	32406	NA	268.7	251.9	27050	56.02	520.5	82848	-34.71
73	12-Dec-90	19400	2.7	800	590	14		177	15.8	0.00	199.5	53843	50.42	121	32527	NA	207.8	192.1	27242	55.70	399.9	83248	-35.36
74	19-Dec-90	19300	2.9	1145	560	15		172	16.8	0.00	192.9	54036	50.24	117	32643	NA	200.9	184.1	27426	55.40	385.0	83633	-35.99
75	26-Dec-90	19200	3.0	838	580	20		170	22.3	0.00	189.7	54226	50.07	115	32758	NA	197.6	175.2	27601	55.12	372.8	84006	-36.60
76	02-Jan-91	19500	2.9	778	508	19		142	21.5	0.00	160.9	54386	49.92	97	32855	NA	167.6	146.1	27748	54.88	313.7	84320	-37.11
77	09-Jan-91	19800	3.0	677	490	15		120	17.3	0.00	138.1	54524	49.79	83	32939	NA	143.8	126.6	27874	54.68	270.4	84590	-37.54
78	16-Jan-91	18400	2.9	680	612	19		183	20.3	0.00	195.7	54720	49.61	118	33057	NA	203.8	183.5	28058	54.38	387.3	84977	-38.17
79	23-Jan-91	19400	2.9	675	600	20		166	22.5	0.00	187.1	54907	49.44	113	33170	NA	194.9	172.4	28230	54.10	367.3	85345	-38.77
80	30-Jan-91	19300	2.8	565	585	10		132	11.2	0.00	148.0	55055	49.30	89	33259	NA	154.2	143.0	28373	53.87	297.2	85642	-39.26
81	06-Feb-91	18900	2.9	674	615	15		154	16.5	0.00	169.1	55224	49.15	102	33361	NA	176.2	159.7	28533	53.61	335.9	85978	-39.80
82	13-Feb-91	18300	2.9	675	640	13		161	13.8	0.00	171.2	55396	48.99	103	33465	NA	178.3	164.5	28697	53.34	342.8	86321	-40.36
83	20-Feb-91	18200	2.9	752	620	10		151	10.6	0.00	159.7	55555	48.84	96	33561	NA	166.3	155.8	28853	53.08	322.1	86643	-40.88
84	27-Feb-91	19300	2.9	618	680	7		141	7.9	0.00	158.1	55713	48.70	96	33657	NA	164.7	156.9	29010	52.83	321.6	86964	-41.41
85	06-Mar-91	19000	2.7	620	620	13		147	14.4	0.00	162.3	55876	48.55	98	33755	NA	169.1	154.7	29164	52.58	323.8	87288	-41.93
86	13-Mar-91	18800	2.9	600	640	9		139	9.8	0.00	151.8	56028	48.41	92	33847	NA	158.2	148.3	29313	52.34	306.5	87595	-42.43
87	20-Mar-91	18500	2.9	600	590	13		138	14.0	0.00	148.3	56176	48.27	90	33936	NA	154.5	140.6	29453	52.11	295.1	87890	-42.91
88	27-Mar-91	16800	3.0	622	600	15		162	14.6	0.00	158.1	56334	48.13	96	34032	NA	164.7	150.1	29603	51.86	314.8	88204	-43.42
89	03-Apr-91	17500	3.0	540	590	8		136	8.1	0.00	138.3	56472	48.00	84	34115	NA	144.1	135.9	29739	51.64	280.0	88484	-43.88
90	10-Apr-91	18900	3.1	560	598	13		122	14.3	0.00	134.0	56606	47.88	81	34196	NA	139.6	125.3	29865	51.44	264.8	88749	-44.31
91	17-Apr-91	12600	3.1	578	600	9		143	6.6	0.00	104.7	56711	47.78	63	34259	NA	109.1	102.5	29967	51.27	211.5	88961	-44.65
92	24-Apr-91	18900	2.9	660	650	10		191	11.0	0.00	209.8	56921	47.59	127	34386	NA	218.5	207.5	30175	50.94	426.0	89387	-45.34
93	01-May-91	19200	3.1	512	590	13		106	14.5	0.00	118.3	57039	47.48	71	34458	NA	123.2	108.7	30283	50.76	231.9	89619	-45.72
94	08-May-91	19000	3.0	550	610	13		134	14.4	0.00	147.9	57187	47.34	89	34547	NA	154.1	139.7	30423	50.53	293.9	89913	-46.20
95	15-May-91	19200	3.1	550	590	12		132	13.4	0.00	147.3	57334	47.21	89	34636	NA	153.4	140.0	30563	50.30	293.4	90206	-46.68
96	22-May-91	19300	3.2	498	620	13		114	14.6	0.00	127.8	57462	47.09	77	34713	NA	133.2	118.6	30682	50.11	251.8	90458	-47.09
97	29-May-91	19500	3.0	520	580	13		113	14.7	0.00	128.0	57590	46.97	77	34791	NA	133.4	118.6	30800	49.92	252.0	90710	-47.50
98	05-Jun-91	19800	3.2	532	610	13		122	15.0	0.00	140.4	57730	46.84	85	34875	NA	146.2	131.3	30932	49.70	277.5	90987	-47.95
99	12-Jun-91	19100	3.0	510	620	10		127	11.1	0.00	140.9	57871	46.71	85	34960	NA	146.8	135.7	31067	49.48	282.5	91270	-48.41
100	19-Jun-91	18800	3.0	500	570	13		107	14.2	0.00	116.9	57988	46.60	71	35031	NA	121.8	107.6	31175	49.31	229.3	91499	-48.78
101	26-Jun-91	19300	3.1	530	580	22		105	24.7	0.00	117.8	58106	46.50	71	35102	NA	122.7	98.0	31273	49.15	220.6	91720	-49.14
102	03-Jul-91	19200	3.2	522	610	20		108	22.3	0.00	120.5	58227	46.38	73	35175	NA	125.5	103.2	31376	48.98	228.7	91948	-49.51
103	10-Jul-91	19100	3.1	478	640	10		124	11.1	0.00	137.6	58364	46.26	83	35258	NA	143.4	132.3	31508	48.77	275.6	92224	-49.96
104	17-Jul-91	19300	3.1	490	570	16		113	17.9	0.00	126.7	58491	46.14	77	35335	NA	132.0	114.1	31622	48.58	246.1	92470	-50.36
105	24-Jul-91	19300	3.0	516	570	16		124	17.9	0.00	139.1	58630	46.01	84	35419	NA	144.9	126.9	31749	48.38	271.8	92742	-50.80
106	31-Jul-91	18700	3.1	560	590	20			21.7	0.00	177.6	58808	45.85	107	35526	NA	185.0	163.3	31912	48.11	348.3	93090	-51.37
107	07-Aug-91	17800	3.0	550	590	16		209	16.5	0.00	216.2	59024	45.65	131	35657	NA	225.2	208.6	32121	47.77	433.8	93524	-52.07
108	14-Aug-91	19200	3.0	535	570	16			17.9	0.00	168.0	59192	45.50	102	35758	NA	175.0	157.2	32278	47.51	332.2	93856	-52.61
109	21-Aug-91	18100	2.8	546	610	16		114	16.8	0.00	119.9	59312	45.39	72	35830	NA	124.9	108.1	32386	47.34	233.0	94089	-52.99
110	28-Aug-91	17500	3.1	505	560	23		118	23.4	0.00	120.0	59432	45.27	72	35903	NA	125.0	101.6	32488	47.17	226.6	94316	-53.36
111	04-Sep-91	7000	3.1	533	604	67		208	27.3	0.00	84.6	59516	45.20	51	35954	NA	88.1	60.9	32549	47.08	149.0	94465	-53.60
112	11-Sep-91	19300	3.1	650	585	75		148	84.1	0.00	166.0	59682	45.04	100	36054	NA	172.9	88.8	32638	46.93	261.7	94726	-54.03
113	18-Sep-91	17400	3.1	447	560	59			59.7	0.00	141.6	59824	44.91	86	36140	NA	147.5	87.9	32725	46.79	235.4	94962	-54.41
114	25-Sep-91	19400	3.2	384	573	54		104	60.9	0.00	117.2	59941	44.81	71	36211	NA	122.1	61.2	32787	46.69	183.4	95145	-54.71
115	02-Oct-91	19300	3.2	345	530	23		80	25.8	0.00	89.7	60031	44.72	54	36265	NA	93.5	67.7	32854	46.58	161.1	95306	-54.97
116	09-Oct-91	19200	3.1	302	570	10		84	11.2	0.00	93.7	60124	44.64	57	36322	NA	97.6	86.5	32941	46.44	184.1	95490	-55.27
117	16-Oct-91	19000	3.1	335	580	10		90	11.0	0.00	99.4	60224	44.55	60	36382	NA	103.5	92.5	33033	46.29	196.0	95686	-55.59
118	23-Oct-91	19300	3.2	285	590	9		81	10.1	0.00	90.8	60315	44.46	55	36436	NA	94.6	84.5	33118	46.15	179.2	95865	-55.88
119	30-Oct-91	19400	3.2	305	550	19		74	21.4	0.00	83.4	60398	44.38	50	36487	NA	86.9	65.5	33183	46.04	152.4	96018	-56.13
120	06-Nov-91	19900	3.2	394	570	23		81	26.6	0.00	93.7	60492	44.30	57	36543	NA	97.6	71.0	33254	45.93	168.5	96186	-56.40
121	13-Nov-91	19900	3.3	332	560	22		88	25.4	0.00	101.8	60594	44.20	61	36605	NA	106.0	80.6	33335	45.80	186.6	96373	-56.70
122	20-Nov-91	19500	3.2	330	550	19		85	21.5	0.00	96.3	60690	44.12	58	36663	NA	100.3	78.8	33414	45.67	179.1	96552	-57.00
123	27-Nov-91	19300	3.3	265	560	17		70	19.1	0.00	78.5	60768	44.04	47	36710	NA	81.8	62.7	33476	45.57	144.5	96696	-57.23
124	04-Dec-91	19200	3.2	292	550	15		77	16.7	0.00	85.9	60854	43.96	52	36762	NA	89.5	72.7	33549	45.45	162.2	96859	-57.49
125	11-Dec-91	18100	3.2	328	600	15		78	15.8	0.00	82.0	60936	43.89	50	36812	NA	85.5	69.7	33619	45.34	155.1	97014	-57.75
126	18-Dec-91	19600	3.4	268	560	13		80	14.8	0.00	91.1	61027	43.81	55	36867	NA	94.9	80.1	33699	45.21	175.0	97189	-58.03
127	25-Dec-91	19300	3.2	240	550	17		68	19.1	0.00	76.3	61104	43.74	46	36913	NA	79.4	60.4	33759	45.11	139.8	97329	-58.26
128	01-Jan-92	19500	3.2	289	540	17		72	19.3	0.00	81.6	61185	43.66	49	36962	NA	85.0	65.7	33825	45.00	150.7	97479	-58.50
129	08-Jan-92	19200	3.2	290	540	18		73	20.1	0.00	81.4	61267	43.59	49	37012	NA	84.8	64.8	33890	44.89	149.6	97629	-58.75
130	15-Jan-92	16800	3.4	324	560	17		93	16.6	0.00	90.8	61357	43.50	55	37066	NA	94.6	78.0	33968	44.77	172.5	97801	-59.03
131	22-Jan-92	19800	3.2	290	590	14		70	16.1	0.00	80.5	61438	43.43	49	37115	NA	83.9	67.8	34035	44.66	151.7	97953	-59.27

Samatosum Mine Humidity Cell Data -Column 5 (Blend Control Alkalinity Removed)

Week No.	Date	Analytical Results: Leachate Recovered (mL)	Weekly pH (pH units)	Conductivity (umhos/cm)	Eh (mV)	Acidity (CaCO3 mg/L)*	Alkalinity (CaCO3 mg/L)*	Sulphate (SO4 mg/L)*	Acidity Production Rate (mg/kg/wk)**	Alkalinity Production Rate (mg/kg/wk)**	Sulphate Production: SO4 Production Rate (mg/kg/wk)**	Cumulative SO4 Production (mg/kg)	Remaining S (% of original)	By Surface Area: SO4 Production Rate (mg/m2/wk)**	By Surface Area: Cumulative SO4 Production (mg/m2)	Molar Ratio: Alk /SO4	NP Consumption: Theoretical NP Consumption At pH 6 (mg/kg/wk)	Empirical Open-System NP Consumption At Measured pH (mg/kg/wk)	Cum NP Consumption Open-System (mg/kg/wk)	Remaining NP Open-System (%)	Theoretical Closed-System NP Consumption Above pH 6.5 (mg/kg/wk)	Cum NP Consumption Closed-System (mg/kg/wk)	Remaining NP Closed-System (%)
0	19-Jul-89								205.0	0.00	2391.6	2392	97.80	1445	1445		2491.3	2286.3	2286	96.28	4777.6	4778	92.23
1	26-Jul-89	19600	2.9	2950	528	180		2100	205.0	0.00	2391.6	4783	95.60	1445	2890	NA	2491.3	2286.3	4573	92.56	4777.6	9555	84.46
2	02-Aug-89	19100	3.0	2150	575	128		1690	142.1	0.00	1875.6	6659	93.87	1133	4023	NA	1953.7	1811.7	6384	89.62	3765.4	13321	78.34
3	09-Aug-89	19600	3.1	2190	572	92		1580	104.8	0.00	1799.4	8458	92.21	1087	5110	NA	1874.4	1769.6	8154	86.74	3644.0	16965	72.42
4	16-Aug-89	19600	3.2	1583	524	66		1060	75.2	0.00	1207.2	9665	91.10	729	5839	NA	1257.5	1182.3	9336	84.82	2439.8	19404	68.45
5	23-Aug-89	19500	3.3	1057	585	23		603	26.1	0.00	683.2	10349	90.47	413	6252	NA	711.7	685.6	10022	83.70	1397.3	20802	66.18
6	30-Aug-89	19500	3.3	764	512	30		385	34.0	0.00	436.2	10785	90.07	264	6515	NA	454.4	420.4	10442	83.02	874.8	21677	64.75
7	06-Sep-89	19600	3.3	671	522	40		323	45.6	0.00	367.9	11153	89.73	222	6737	NA	383.2	337.6	10780	82.47	720.8	22397	63.58
8	13-Sep-89	19200	3.1	812	550	80		375	89.3	0.00	418.4	11571	89.35	253	6990	NA	435.8	346.5	11126	81.91	782.3	23180	62.31
9	20-Sep-89	19600	2.9	1690	602	268		940	305.2	0.00	1070.5	12642	88.36	647	7637	NA	1115.1	809.9	11936	80.59	1925.1	25105	59.18
10	27-Sep-89	19100	2.8	1394	625	320		750	355.1	0.00	832.4	13474	87.59	503	8140	NA	867.0	511.9	12448	79.76	1379.0	26484	56.94
11	04-Oct-89	19200	2.7	1752	550	532		1010	593.5	0.00	1126.8	14601	86.56	681	8820	NA	1173.7	580.2	13029	78.82	1754.0	28238	54.08
12	11-Oct-89	19000	2.7	1741	627	581		840	641.4	0.00	927.4	15528	85.70	560	9381	NA	966.0	324.6	13353	78.29	1290.6	29528	51.99
13	18-Oct-89	19000	2.6	1825	622	640		940	706.6	0.00	1037.8	16566	84.75	627	10008	NA	1081.0	374.4	13728	77.68	1455.5	30984	49.62
14	25-Oct-89	19000	2.2	1786	640	714		1020	788.3	0.00	1126.1	17692	83.71	680	10688	NA	1173.0	384.7	14112	77.05	1557.8	32542	47.09
15	01-Nov-89	19200	2.1	1736	630	708		930	789.9	0.00	1037.5	18730	82.75	627	11315	NA	1080.8	290.9	14403	76.58	1371.7	33913	44.86
16	08-Nov-89	19300	2.0	1880	640	756		1026	847.8	0.00	1150.6	19880	81.69	695	12010	NA	1198.5	350.7	14754	76.01	1549.3	35462	42.34
17	15-Nov-89	19000	2.3	1484	615	570		586	629.3	0.00	646.9	20527	81.10	391	12401	NA	673.9	44.6	14799	75.94	718.5	36181	41.17
18	22-Nov-89	19200	2.2	1711	600	730		1602	814.4	0.00	1787.2	22314	79.45	1080	13480	NA	1861.7	1047.3	15846	74.23	2909.0	39090	36.44
19	29-Nov-89	19300	2.4	1726	620	625		903	700.9	0.00	1012.7	23327	78.52	612	14092	NA	1054.9	354.0	16200	73.66	1408.8	40499	34.15
20	06-Dec-89	19100	2.4	1737	609	668		903	741.4	0.00	1002.2	24329	77.60	605	14697	NA	1043.9	302.6	16502	73.17	1346.5	41845	31.96
21	13-Dec-89	19200	2.3	1826	610	779		960	869.1	0.00	1071.0	25400	76.61	647	15344	NA	1115.6	246.6	16749	72.77	1362.2	43207	29.74
22	20-Dec-89	19300	2.4	1599	610	698		803	782.8	0.00	900.5	26301	75.78	544	15888	NA	938.0	155.3	16904	72.51	1093.3	44301	27.97
23	27-Dec-89	19200	2.3	1701	625	730		878	814.4	0.00	979.5	27280	74.88	592	16480	NA	1020.3	205.9	17110	72.18	1226.3	45527	25.97
24	03-Jan-90	19100	2.4	1626	625	756		785	839.0	0.00	871.2	28151	74.08	526	17006	NA	907.5	68.5	17179	72.07	976.0	46503	24.39
25	10-Jan-90	19000	2.6	1598	635	710		880	783.8	0.00	971.5	29123	73.18	587	17593	NA	1012.0	228.2	17407	71.70	1240.2	47743	22.37
26	17-Jan-90	19200	2.4	1551	640	789		733	880.2	0.00	817.8	29941	72.43	494	18087	NA	851.8	0.0	17407	71.70	823.4	48567	21.03
27	24-Jan-90	19200	2.5	1686	640	718		770	801.0	0.00	859.0	30800	71.64	519	18606	NA	894.8	93.8	17501	71.54	988.6	49555	19.42
28	31-Jan-90	19000	2.4	1768	610	652		838	719.8	0.00	925.2	31725	70.79	559	19165	NA	963.7	243.9	17744	71.15	1207.6	50763	17.46
29	07-Feb-90	19500	2.6	1538	630	702		630	795.4	0.00	713.8	32439	70.13	431	19596	NA	743.6	0.0	17744	71.15	691.7	51455	16.33
30	14-Feb-90	19000	2.5	1425	622	468		595	516.7	0.00	656.9	33096	69.53	397	19993	NA	684.3	167.6	17912	70.87	851.8	52306	14.95
31	21-Feb-90	19400	2.5	1506	590	488		595	550.1	0.00	670.7	33766	68.91	405	20398	NA	698.7	148.6	18061	70.63	847.2	53154	13.57
32	28-Feb-90	19100	2.6	1572	605	510		650	566.0	0.00	721.4	34488	68.24	436	20834	NA	751.4	185.4	18246	70.33	936.9	54091	12.05
33	07-Mar-90	19000	2.5	1565	640	584		770	644.7	0.00	850.1	35338	67.46	514	21348	NA	885.5	240.8	18487	69.94	1126.3	55217	10.22
34	14-Mar-90	19000	2.5	1634	565	524		655	578.5	0.00	723.1	36061	66.79	437	21785	NA	753.3	174.8	18662	69.66	928.0	56145	8.71
35	21-Mar-90	19000	2.5	1680	635	568		725	627.1	0.00	800.4	36861	66.06	484	22268	NA	833.8	206.7	18868	69.32	1040.4	57185	7.02
36	28-Mar-90	19000	2.5	1594	645	552		685	609.4	0.00	756.2	37618	65.36	457	22725	NA	787.8	178.3	19047	69.03	966.1	58151	5.44
37	04-Apr-90	19500	2.5	1530	600	488		578	552.9	0.00	654.9	38273	64.76	396	23121	NA	682.2	129.3	19176	68.82	811.5	58963	4.13
38	11-Apr-90	19000	2.5	1639	620	512		667	565.3	0.00	736.4	39009	64.08	445	23566	NA	767.1	201.8	19378	68.49	968.9	59932	2.55
39	18-Apr-90	19000	2.5	1593	620	468		583	516.7	0.00	643.6	39653	63.49	389	23954	NA	670.5	153.8	19531	68.24	824.2	60756	1.21
40	25-Apr-90	19100	2.5	1653	610	496		652	550.5	0.00	723.6	40376	62.82	437	24391	NA	753.8	203.3	19735	67.91	957.0	61713	-0.35
41	02-May-90	19000	2.5	1650	625	486		650	536.5	0.00	717.6	41094	62.16	434	24825	NA	747.5	211.0	19946	67.57	958.5	62671	-1.90
42	09-May-90	19000	2.5	1544	620	426		550	470.3	0.00	607.2	41701	61.60	367	25192	NA	632.5	162.2	20108	67.30	794.7	63466	-3.20
43	16-May-90	18000	2.5	1483	615	388		540	405.8	0.00	564.8	42266	61.08	341	25533	NA	588.3	182.5	20290	67.01	770.8	64237	-4.45
44	23-May-90	18700	2.5	1622	625	452		595	491.1	0.00	646.5	42912	60.49	391	25924	NA	673.5	182.3	20473	66.71	855.8	65093	-5.84
45	30-May-90	19200	2.6	1120	612	448		465	499.8	0.00	518.8	43431	60.01	313	26237	NA	540.4	40.6	20513	66.65	581.0	65674	-6.79
46	06-Jun-90	19100	2.6	1308	612	390		445	432.8	0.00	493.9	43925	59.55	298	26535	NA	514.4	81.6	20595	66.51	596.1	66270	-7.76
47	13-Jun-90	19200	2.6	1320	620	375		450	418.4	0.00	502.0	44427	59.09	303	26839	NA	523.0	104.6	20699	66.34	627.5	66897	-8.78
48	20-Jun-90	19100	2.6	1370	620	383		500	425.1	0.00	554.9	44982	58.58	335	27174	NA	578.0	153.0	20852	66.09	731.0	67628	-9.96
49	27-Jun-90	19100	2.6	1476	618	368		458	408.4	0.00	508.3	45490	58.11	307	27481	NA	529.5	121.1	20973	65.90	650.5	68279	-11.02
50	04-Jul-90	19200	2.6	1356	608	320		440	357.0	0.00	490.9	45981	57.66	297	27777	NA	511.3	154.3	21128	65.65	665.7	68945	-12.10
51	11-Jul-90	19200	2.7	1344	612	299		405	333.6	0.00	451.8	46433	57.24	273	28050	NA	470.7	137.1	21265	65.42	607.7	69552	-13.09
52	18-Jul-90	11500	2.5	1976	630	105		845	70.2	0.00	564.6	46998	56.72	341	28391	NA	588.2	518.0	21783	64.58	1106.2	70658	-14.89
53	25-Jul-90	19000	2.5	1395	615	72		555	79.5	0.00	612.7	47610	56.16	370	28762	NA	638.3	558.8	22342	63.67	1197.0	71855	-16.84
54	01-Aug-90	18600	2.6	1508	620	86		515	92.9	0.00	556.6	48167	55.65	336	29098	NA	579.8	486.8	22829	62.88	1066.6	72922	-18.57
55	08-Aug-90	19200	2.7	1330	605	51		425	56.9	0.00	474.1	48641	55.21	286	29384	NA	493.9	437.0	23266	62.17	930.9	73853	-20.09
56	15-Aug-90	19100	2.6	1300	630	42		400	46.6	0.00	443.9	49085	54.80	268	29652	NA	462.4	415.8	23681	61.49	878.2	74731	-21.51
57	22-Aug-90	19200	2.7	1230	598	220		360	245.4	0.00	401.6	49487	54.43	243	29895	NA	418.4	172.9	23854	61.21	591.3	75322	-22.48
58	29-Aug-90	19000	2.6	1144	600	87		330	96.0	0.00	364.3	49851	54.10	220	30115	NA	379.5	283.5	24138	60.75	663.0	75985	-23.55
59	05-Sep-90	19300	2.6	1035	600	195		295	218.7	0.00	330.8	50182	53.79	200	30315	NA	344.6	125.9	24264	60.55	470.5	76456	-24.32
60	12-Sep-90	19200	2.6	1040	570	168		260	187.4	0.00	290.1	50472	53.53	175	30490	NA	302.1	114.7	24378	60.36	416.9	76873	-25.00
61	19-Sep-90	18900	2.6	1134	590	204		322	224.0	0.00	353.6	50825	53.20	214	30704	NA	368.4	144.3	24523	60.13	512.7	77386	-25.83
62	26-Sep-90	19100	2.6	1074	585	173		265	192.0	0.00	294.1	51119	52.93	178	30882	NA	306.4	114.4	24637	59.94	420.7	77806	-26.51
63	03-Oct-90	19100	2.7	905	590	16		238	17.8	0.00	264.1	51384	52.69	160	31041	NA	275.1	257.4	24894	59.52	532.5	78339	-27.38
64	10-Oct-90	19200	2.7	826	620	15		320	16.7	0.00	357.0	51741	52.36	216	31257	NA	371.9	355.1	25250	58.94	727.0	79066	-28.56
65	17-Oct-90	19100	2.8	817	630	16		225	17.8	0.00	249.7	51990	52.13	151	31408	NA	260.1	242.4	25492	58.55	502.5	79568	-29.38

Samatosum Mine Humidity Cell Dab - Column 5 (Blend Control Alkalinity Removed)

		Dissolved Metals*:								Metal Leach Rates:								Cumulative Metal Leach Rates:							
		Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc	Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc	Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc
Week No.	Date	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn
		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(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)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
0	19-Jul-89																	6.8E-03	1.6E-02	3.6E-01	3.5E+01	3.4E-01	2.9E+00	1.5E-03	1.1E+00
1	26-Jul-89	0.006		0.32	31	0.3		0.001	0.94	6.8E-03		3.6E-01	3.5E+01	3.4E-01		1.5E-03	1.1E+00	1.4E-02	3.1E-02	7.3E-01	7.1E+01	6.8E-01	5.8E+00	3.0E-03	2.1E+00
2	2-Aug-89	0.003	0.014	0.18	4.3	0.08		8E-04	0.68	3.3E-03	1.6E-02	2.0E-01	4.8E+00	8.9E-02		8.9E-04	7.5E-01	1.7E-02	4.7E-02	9.3E-01	7.5E+01	7.7E-01	8.7E+00	3.8E-03	2.9E+00
3	9-Aug-89	0.007	0.016	0.21	5.1	0.02		0.002	0.8	8.0E-03	1.8E-02	2.4E-01	5.8E+00	2.3E-02		1.7E-03	9.1E-01	2.5E-02	6.5E-02	1.2E+00	8.1E+01	7.9E-01	1.2E+01	5.6E-03	3.8E+00
4	16-Aug-89	0.002	0.017	0.25	5.3	0.01		0.001	0.84	2.3E-03	1.9E-02	2.8E-01	6.0E+00	1.1E-02		1.3E-03	9.6E-01	2.7E-02	8.4E-02	1.5E+00	8.7E+01	8.1E-01	1.5E+01	6.8E-03	4.8E+00
5	23-Aug-89	0.002	0.019	0.15	3.4	0.05		3E-04	0.58	2.3E-03	2.2E-02	1.7E-01	3.9E+00	5.7E-02		3.4E-04	6.6E-01	3.0E-02	1.1E-01	1.6E+00	9.1E+01	8.6E-01	1.7E+01	7.1E-03	5.4E+00
6	30-Aug-89	0.002	0.016	0.1	0.66	0.02		2E-04	0.29	2.3E-03	1.8E-02	1.1E-01	7.5E-01	2.3E-02		2.3E-04	3.3E-01	3.2E-02	1.2E-01	1.7E+00	9.2E+01	8.9E-01	2.0E+01	7.4E-03	5.7E+00
7	6-Sep-89	0.002	0.015	0.16	1.4	0.01		3E-04	0.45	2.3E-03	1.7E-02	1.8E-01	1.6E+00	1.1E-02		3.4E-04	5.1E-01	3.4E-02	1.4E-01	1.9E+00	9.3E+01	9.0E-01	2.3E+01	7.7E-03	6.3E+00
8	13-Sep-89	0.002	0.016	0.24	5.9	0.01		2E-04	0.76	2.2E-03	1.8E-02	2.7E-01	6.6E+00	1.1E-02		2.2E-04	8.5E-01	3.6E-02	1.6E-01	2.2E+00	1.0E+02	9.1E-01	2.6E+01	7.9E-03	7.1E+00
9	20-Sep-89	0.002	0.1	0.64	80	0.01		0.001	2.05	2.3E-03	1.1E-01	7.3E-01	9.1E+01	1.1E-02		1.3E-03	2.3E+00	3.9E-02	2.7E-01	2.9E+00	1.9E+02	9.2E-01	2.9E+01	9.2E-03	9.4E+00
10	27-Sep-89	0.004	0.005	0.49	58	0.01		4E-04	1.54	4.4E-03	5.5E-03	5.4E-01	6.4E+01	1.1E-02		4.4E-04	1.7E+00	4.3E-02	2.8E-01	3.5E+00	2.6E+02	9.3E-01	3.2E+01	9.6E-03	1.1E+01
11	4-Oct-89	0.005	0.225	0.61	117	0.061		0.002	1.96	5.6E-03	2.5E-01	6.8E-01	1.3E+02	6.8E-02		1.9E-03	2.2E+00	4.9E-02	5.3E-01	4.1E+00	3.9E+02	1.0E+00	3.5E+01	1.2E-02	1.3E+01
12	11-Oct-89	0.005	0.249	0.57	142	0.04		0.002	1.77	5.5E-03	2.7E-01	6.3E-01	1.6E+02	4.4E-02		2.1E-03	2.0E+00	5.4E-02	8.0E-01	4.8E+00	5.4E+02	1.0E+00	3.8E+01	1.4E-02	1.5E+01
13	18-Oct-89	0.006	0.313	0.58	161	0.031		0.002	1.82	6.6E-03	3.5E-01	6.4E-01	1.8E+02	3.4E-02		2.2E-03	2.0E+00	6.1E-02	1.1E+00	5.4E+00	7.2E+02	1.1E+00	4.1E+01	1.6E-02	1.7E+01
14	25-Oct-89	0.007	0.41	0.61	180	0.025		0.003	1.87	7.7E-03	4.5E-01	6.7E-01	2.0E+02	2.8E-02		3.2E-03	2.1E+00	6.8E-02	1.6E+00	6.1E+00	9.2E+02	1.1E+00	4.4E+01	1.9E-02	1.9E+01
15	1-Nov-89	0.01	0.378	0.59	174	0.02		0.003	1.69	1.1E-02	4.2E-01	6.6E-01	1.9E+02	2.2E-02		2.8E-03	1.9E+00	8.0E-02	2.0E+00	6.7E+00	1.1E+03	1.1E+00	4.6E+01	2.2E-02	2.1E+01
16	8-Nov-89	0.011	0.525	0.62	197	0.018		0.003	1.74	1.2E-02	5.9E-01	7.0E-01	2.2E+02	2.0E-02		3.8E-03	2.0E+00	9.2E-02	2.6E+00	7.4E+00	1.3E+03	1.1E+00	4.9E+01	2.6E-02	2.3E+01
17	15-Nov-89	0.007	0.211	0.44	134	0.021		4E-04	1.29	7.7E-03	2.3E-01	4.9E-01	1.5E+02	2.3E-02		4.4E-04	1.4E+00	1.0E-01	2.8E+00	7.9E+00	1.5E+03	1.2E+00	5.2E+01	2.6E-02	2.5E+01
18	22-Nov-89	0.01	0.297	0.55	166	0.02		0.003	1.49	1.1E-02	3.3E-01	6.1E-01	1.9E+02	2.2E-02		3.8E-03	1.7E+00	1.1E-01	3.2E+00	8.5E+00	1.7E+03	1.2E+00	5.5E+01	3.0E-02	2.6E+01
19	29-Nov-89	0.005	0.44	0.65	166	0.013		0.005	1.6	5.6E-03	4.9E-01	7.3E-01	1.9E+02	1.5E-02		5.2E-03	1.8E+00	1.2E-01	3.7E+00	9.3E+00	1.9E+03	1.2E+00	5.8E+01	3.5E-02	2.8E+01
20	6-Dec-89	0.005	0.42	0.67	174	0.015		0.004	2	5.5E-03	4.7E-01	7.4E-01	1.9E+02	1.7E-02		4.4E-03	2.2E+00	1.2E-01	4.1E+00	1.0E+01	2.0E+03	1.2E+00	6.1E+01	3.9E-02	3.0E+01
21	13-Dec-89	0.004	0.06	0.68	167	0.014		0.002	1.7	4.5E-03	6.7E-02	7.6E-01	1.9E+02	1.6E-02		2.2E-03	1.9E+00	1.3E-01	4.2E+00	1.1E+01	2.2E+03	1.2E+00	6.4E+01	4.2E-02	3.2E+01
22	20-Dec-89	0.005	0.28	0.59	156	0.013		0.003	1.3	5.6E-03	3.1E-01	6.6E-01	1.7E+02	1.5E-02		3.4E-03	1.5E+00	1.3E-01	4.5E+00	1.1E+01	2.4E+03	1.3E+00	6.7E+01	4.5E-02	3.4E+01
23	27-Dec-89	0.005	0.38	0.65	172	0.012		0.004	1.6	5.6E-03	4.2E-01	7.3E-01	1.9E+02	1.3E-02		4.2E-03	1.8E+00	1.4E-01	4.9E+00	1.2E+01	2.6E+03	1.3E+00	7.0E+01	4.9E-02	3.5E+01
24	3-Jan-90	0.006	0.31	0.65	163	0.013		0.004	1.5	6.7E-03	3.4E-01	7.2E-01	1.8E+02	1.4E-02		3.9E-03	1.7E+00	1.4E-01	5.3E+00	1.3E+01	2.8E+03	1.3E+00	7.3E+01	5.3E-02	3.7E+01
25	10-Jan-90	0.006	0.27	0.65	158	0.013		0.004	1.4	6.6E-03	3.0E-01	7.2E-01	1.7E+02	1.4E-02		3.9E-03	1.5E+00	1.5E-01	5.6E+00	1.4E+01	3.0E+03	1.3E+00	7.5E+01	5.7E-02	3.9E+01
26	17-Jan-90	0.006	0.27	0.65	150	0.012		0.004	1.4	6.7E-03	3.0E-01	7.3E-01	1.7E+02	1.3E-02		3.9E-03	1.6E+00	1.6E-01	5.9E+00	1.4E+01	3.1E+03	1.3E+00	7.8E+01	6.1E-02	4.0E+01
27	24-Jan-90	0.006	0.28	0.64	159	0.012		0.004	1.6	6.7E-03	3.1E-01	7.1E-01	1.8E+02	1.3E-02		4.7E-03	1.8E+00	1.6E-01	6.2E+00	1.5E+01	3.3E+03	1.3E+00	8.1E+01	6.6E-02	4.2E+01
28	31-Jan-90	0.011	0.28	0.7	168	0.012		0.004	1.6	1.2E-02	3.1E-01	7.7E-01	1.9E+02	1.3E-02		4.4E-03	1.8E+00	1.8E-01	6.5E+00	1.6E+01	3.5E+03	1.3E+00	8.4E+01	7.0E-02	4.4E+01
29	7-Feb-90	0.009	0.11	0.55	123	0.016		0.002	1.1	1.0E-02	1.2E-01	6.2E-01	1.4E+02	1.8E-02		2.3E-03	1.2E+00	1.9E-01	6.6E+00	1.6E+01	3.6E+03	1.4E+00	8.7E+01	7.2E-02	4.5E+01
30	14-Feb-90	0.008	0.09	0.52	111	0.014		0.002	1	8.8E-03	9.9E-02	5.7E-01	1.2E+02	1.5E-02		2.2E-03	1.1E+00	2.0E-01	6.7E+00	1.7E+01	3.7E+03	1.4E+00	9.0E+01	7.5E-02	4.6E+01
31	21-Feb-90	0.009	0.13	0.55	116	0.018		0.002	1.2	1.0E-02	1.5E-01	6.2E-01	1.3E+02	2.0E-02		2.6E-03	1.4E+00	2.1E-01	6.9E+00	1.8E+01	3.9E+03	1.4E+00	9.3E+01	7.7E-02	4.7E+01
32	28-Feb-90	0.009	0.12	0.57	125	0.015		0.003	1.2	1.0E-02	1.3E-01	6.3E-01	1.4E+02	1.7E-02		3.3E-03	1.3E+00	2.2E-01	7.0E+00	1.8E+01	4.0E+03	1.4E+00	9.6E+01	8.0E-02	4.9E+01
33	7-Mar-90	0.01	0.2	0.67	141	0.013		0.004	1.5	1.1E-02	2.2E-01	7.4E-01	1.6E+02	1.4E-02		4.4E-03	1.7E+00	2.3E-01	7.2E+00	1.9E+01	4.2E+03	1.4E+00	9.9E+01	8.5E-02	5.0E+01
34	14-Mar-90	0.01	0.14	0.64	127	0.012		0.003	1.4	1.1E-02	1.5E-01	7.1E-01	1.4E+02	1.3E-02		3.3E-03	1.5E+00	2.4E-01	7.4E+00	2.0E+01	4.3E+03	1.4E+00	1.0E+02	8.8E-02	5.2E+01
35	21-Mar-90	0.01	0.15	0.64	130	0.013		0.003	1.43	1.1E-02	1.7E-01	7.1E-01	1.4E+02	1.4E-02		3.3E-03	1.6E+00	2.5E-01	7.6E+00	2.0E+01	4.5E+03	1.4E+00	1.0E+02	9.2E-02	5.4E+01
36	28-Mar-90	0.009	0.14	0.65	118	0.013		0.004	1.32	9.9E-03	1.5E-01	7.2E-01	1.3E+02	1.4E-02		4.4E-03	1.5E+00	2.6E-01	7.7E+00	2.1E+01	4.6E+03	1.5E+00	1.1E+02	9.6E-02	5.5E+01
37	4-Apr-90	0.008	0.09	0.56	101	0.014		0.003	1.11	9.1E-03	1.0E-01	6.3E-01	1.1E+02	1.6E-02		3.4E-03	1.3E+00	2.7E-01	7.8E+00	2.2E+01	4.7E+03	1.5E+00	1.1E+02	9.9E-02	5.6E+01
38	11-Apr-90	0.009	0.12	0.61	116	0.018		0.003	1.29	9.9E-03	1.3E-01	6.7E-01	1.3E+02	2.0E-02		3.3E-03	1.4E+00	2.8E-01	7.9E+00	2.2E+01	4.8E+03	1.5E+00	1.1E+02	1.0E-01	5.8E+01
39	18-Apr-90	0.009	0.09	0.57	99	0.016		0.003	1.22	9.9E-03	9.9E-02	6.3E-01	1.1E+02	1.8E-02		3.3E-03	1.3E+00	2.9E-01	8.0E+00	2.3E+01	4.9E+03	1.5E+00	1.2E+02	1.1E-01	5.9E+01
40	25-Apr-90	0.008	0.12	0.63	113	0.014		0.003	1.53	8.9E-03	1.3E-01	7.0E-01	1.3E+02	1.6E-02		3.3E-03	1.7E+00	3.0E-01	8.2E+00	2.4E+01	5.1E+03	1.5E+00	1.2E+02	1.1E-01	6.1E+01
41	2-May-90	0.009	0.08	0.56	101	0.013		0.003	1.19	9.9E-03	8.8E-02	6.2E-01	1.1E+02	1.4E-02		3.3E-03	1.3E+00	3.1E-01	8.3E+00	2.4E+01	5.2E+03	1.5E+00	1.2E+02	1.1E-01	6.2E+01
42	9-May-90	0.009	0.05	0.48	83	0.014		0.003	1.02	9.9E-03	5.5E-02	5.3E-01	9.2E+01	1.5E-02		3.3E-03	1.1E+00	3.2E-01	8.3E+00	2.5E+01	5.3E+03	1.6E+00	1.2E+02	1.2E-01	6.3E+01
43	16-May-90	0.003	0.04	0.44	69	0.016		0.003	0.89	3.1E-03	4.2E-02	4.6E-01	7.2E+01	1.7E-02		3.1E-03	9.3E-01	3.2E-01	8.4E+00	2.5E+01	5.3E+03	1.6E+00	1.3E+02	1.2E-01	6.4E+01
44	23-May-90	0.002	0.08	0.51	89	0.015		0.003	1.08	2.2E-03	8.7E-02	5.5E-01	9.7E+01	1.6E-02		3.3E-03	1.2E+00	3.2E-01	8.4E+00	2.6E+01	5.4E+03	1.6E+00	1.3E+02	1.2E-01	6.5E+01
45	30-May-90	0.002	0.04	0.4	60	0.017		0.002	0.8	2.2E-03	4.5E-02	4.5E-01	6.7E+01	1.9E-02		2.2E-03	8.9E-01	3.2E-01	8.5E+00	2.6E+01	5.5E+03	1.6E+00	1.3E+02	1.2E-01	6.6E+01
46	6-Jun-90	0.002	0.04	0.34	55	0.016		0.003	0.78	2.2E-03	4.4E-02	3.8E-01	6.1E+01	1.8E-02		3.3E-03	8.7E-01	3.3E-01	8.5E+00	2.7E+01	5.6E+03	1.6E+00	1.4E+02	1.3E-01	6.7E+01
47	13-Jun-90	0.002	*0.028*	0.37	57	*0.015*	2.6	*0.003*	*0.88*	2.2E-03	3.1E-02	4.1E-01	6.4E+01	1.7E-02	2.9E+00	3.3E-03	9.8E-01	3.3E-01	8.6E+00	2.7E+01	5.6E+03	1.6E+00	1.4E+02	1.3E-01	6.8E+01
48	20-Jun-90	0.002	0.035	0.37	63	0.015	3	0.003	1.2	2.2E-03	3.9E-02	4.1E-01	7.0E+01	1.7E-02	3.3E+00	3.3E-03	1.3E+00	3.3E-01	8.6E+00	2.8E+01	5.7E+03	1.7E+00	1.4E+02	1.3E-01	6.9E+01
49	27-Jun-90	0.002	0.022	0.4	52		3	0.003	0.99	2.2E-03	2.4E-02	4.4E-01	5.8E+01		3.3E+00	3.3E-03	1.1E+00	3.3E-01	8.6E+00	2.8E+01	5.8E+03	1.7E+00	1.5E+02	1.4E-01	7.0E+01
50	4-Jul-90	0.002	0.019	0.39	46		2.9	0.002	0.95	2.2E-03	2.1E-02	4.4E-01	5.1E+01		3.2E+00	2.2E-03	1.1E+00	3.4E-01	8.6E+00	2.8E+01	5.8E+03	1.7E+00	1.5E+02	1.4E-01	7.2E+01
51	11-Jul-90		0.018	0.36	42		2.7	0.003	0.87		2.0E-02	4.0E-01	4.7E+01		3.0E+00	3.3E-03	9.7E-01	3.4E-01	8.7E+00	2.9E+01	5.9E+03	1.7E+00	1.5E+02	1.4E-01	7.3E+01
52	18-Jul-90		0.14	0.87	114		5.8	0.005	2.12		9.4E-02	5.8E-01	7.6E+01		3.9E+00	3.3E-03	1.4E+00	3.4E-01	8.8E+00	2.9E+01	5.9E+03	1.7E+00	1.6E+02	1.5E-01	7.4E+01
53	25-Jul-90		0.029	0.5	58		4.12	0.004	1.28		3.2E-02	5.5E-01	6.4E+01		4.5E+00	4.4E-03	1.4E+00	3.4E-01	8.8E+00	3.0E+01	6.0E+03	1.7E+00	1.6E+02	1.5E-01	7.5E+01
54	1-Aug-90		0.02	0.46	50		3.79	0.003	1.14		2.2E-02	5.0E-01	5.4E+01		4.1E+00	3.2E-03	1.2E+00	3.4E-01	8.8E+00	3.0E+01	6.0E+03	1.8E+00	1.6E+02	1.5E-01	7.7E+01
55	8-Aug-90		0.008	0.31	32		2.81	0.003	0.81		8.9E-03	3.5E-01	3.6E+01		3.1E+00	3.3E-03	9.0E-01	3.5E-01	8.8E+00	3.1E+01	6.1E+03	1.8E+00	1.7E+02	1.6E-01	7.7E+01
56	15-Aug-90		0.006	0.34	26		2.84	0.003	0.87		6.7E-03	3.8E-01	2.9E+01		3.2E+00	3.3E-03	9.7E-01	3.5E-01	8.8E+00	3.1E+01	6.1E+03	1.8E+00	1.7E+02	1.6E-01	7.8E+01
57	22-Aug-90		0.007	0.34	25		2.73	0.003	0.83		7.8E-03	3.8E-01	2.8E+01		3.0E+00	3.3E-03	9.3E-01	3.5E-01	8.8E+00	3.2E+01	6.1E+03	1.8E+00	1.7E+02	1.6E-01	7.9E+01
58	29-Aug-90		0.006	0.31	23		2.27	0.002	0.73		6.6E-03	3.4E-01	2.5E+01		2.5E+00	2.2E-03	8.1E-01	3.5E-01	8.8E+00	3.2E+01	6.2E+03	1.8E+00	1.8E+02	1.7E-01	8.0E+01
59	5-Sep-90		0.005	0.25	21		1.9	0.002	0.59		5.6E-03	2.8E-01	2.4E+01		2.1E+00	2.2E-03	6.6E-01	3.6E-01	8.9E+00	3.2E+01	6.2E+03	1.8E+00	1.8E+02	1.7E-01	8.1E+01
60	12-Sep-90		0.004	0.21	17		1.7	0.002	0.51		4.5E-03	2.3E-01	1.9E+01		1.9E+00	2.2E-03	5.7E-01	3.6E-01	8.9E+00	3.2E+01	6.2E+03	1.9E+00	1.8E+02	1.7E-01	8.1E+01
61	19-Sep-90		0.005	0.27	22		2.1	0.003	0.68		5.5E-03	3.0E-01	2.4E+01		2.3E+00	3.3E-03	7.5E-01	3.6E-01	8.9E+00	3.3E+01	6.2E+03	1.9E+00	1.8E+02	1.7E-01	8.2E+01
62	26-Sep-90		0.003	0.18	18		1.8	0.002	0.52		3.3E-03	2.0E-01	2.0E+01		2.0E+00	2.2E-03	5.8E-01	3.6E-01	8.9E+00	3.3E+01	6.3E+03	1.9E+00	1.8E+02	1.8E-01	8.3E+01
63	3-Oct-90		0.002	0.19	13		1.6	0.002	0.48		2.2E-03	2.1E-01	1.4E+01		1.8E+00	2.2E-03	5.3E-01	3.6E-01	8.9E+00	3.3E+01	6.3E+03	1.9E+00	1.9E+02	1.8E-01	8.3E+01
64	10-Oct-90		0.003	0.21	17		1.8	0.002	0.43		3.3E-03	2.3E-01	1.9E+01		2.0E+00	2.2E-03	4.8E-01	3.7E-01	8.9E+00	3.3E+01	6.3E+03	1.9E+00	1.9E+02	1.8E-01	8.4E+01
65	17-Oct-90		0.002	0.2	14		1.4	0.002	0.44		2.2E-03	2.2E-01	1.6E+01		1.6E+00	2.2E-03	4.9E-01	3.7E-01	8.9E+00	3.4E+01	6.3E+03	1.9E+00	1.9E+02	1.8E-01	8.4E+01

*If values were reported as < detection limit, 1/2 the detection limit is shown in italics and was used in subsequent calculations

Samatosum Mine Humidity Cell Data -Column 5 (Bleed Control Alkalinity Removed)

Week No.	Date	Analytical Results: Leachate Recovered (mL)	Weekly pH (pH units)	Conductivity (umhos/cm)	Eh (mV)	Acidity (CaCO3 mg/L)*	Alkalinity (CaCO3 mg/L)*	Sulphate (SO4 mg/L)*	Acidity Production Rate (mg/kg/wk)**	Alkalinity Production Rate (mg/kg/wk)**	Sulphate Production: SO4 Production Rate (mg/kg/wk)**	Cumulative SO4 Production (mg/kg)	Remaining S (% of original)	By Surface Area: SO4 Production Rate (mg/m2/wk)**	Cumulative SO4 Production (mg/m2)	Molar Ratio: Alk /SO4	NP Consumption: Theoretical NP Consumption At pH 6 (mg/kg/wk)	Empirical Open-System NP Consumption At Measured pH (mg/kg/wk)	Cum NP Consumption Open-System (mg/kg/wk)	Remaining NP Open-System (%)	Theoretical Closed-System NP Consumption Above pH 6.5 (mg/kg/wk)	Cum NP Consumption Closed-System (mg/kg/wk)	Remaining NP Closed-System (%)
Maximum		19900	3.40	2950	680	789	0.0	2100	880.2	0.00	2391.6	61438	97.80	1445	37115	NA	2491.3	2286.3	34035	96.28	4777.6	97953	92.23
Minimum		7000	2.00	240	490	7	0.0	68	6.6	0.00	76.3	2392	43.43	46	1445	NA	79.4	0.0	2286	44.66	139.8	4778	-59.27
Mean		18877	2.82	1018	597	206	0.0	415	227.6	0.00	465.4	45001	58.56	281	27185	NA	484.8	257.8	24190	60.67	742.1	71002	-15.45
Median		19200	2.80	825	600	30	0.0	234	31.5	0.00	253.8	52110	52.02	153	31480	NA	264.4	155.5	25600	58.37	476.8	79801	-29.76
Mean Last 5 Weeks		18920	3.24	287	556	17	0.0	75	18.2	0.00	82.1	61270	43.58	50	37014	NA	85.5	67.3	33895	44.89	152.9	97638	-58.76
75% Remaining (Wks)													23							18			3
50% Remaining (Wks)													76							97			13
25% Remaining (Wks)													374							311			24
0% Remaining (Wks)													705							539			40

** If measured sulphate, alkalinity and/or acidity values were unavailable, data was interpolated from existing data and used in subsequent equations.

Samatosum Mine **Humidity** Cell Data **- Column** S **(Blend** Control **Alkalinity** Removed)

Week No.	Date	Dissolved Metals*: Antimony D-Sb (mg/L)	Arsenic D-As (mg/L)	Copper D-Cu (mg/L)	Iron D-Fe (mg/L)	Lead D-Pb (mg/L)	Manganese D-Mn (mg/L)	Silver D-Ag (mg/L)	Zinc D-Zn (mg/L)
Maximum		0.011	0.525	0.87	197	0.3	5.8	0.005	2.12
Minimum		0.002	0.001	0.06	0.36	0.01	0.35	2E-04	0.17
Mean		0.006	0.103	0.29	46.31	0.025	1.30	0.0024	0.75
Median		0.006	0.032	0.19	13.00	0.015	0.94	0.0020	0.49
Mean Last 5 Weeks				0.08	0.52		0.49		0.22
75% Remaining (Wks)									
50% Remaining (Wks)									
25% Remaining (Wks)									
0% Remaining (Wks)									

Week No.	Metal Leach Rates: Antimony D-Sb (mg/kg/wk)	Arsenic D-As (mg/kg/wk)	Copper D-Cu (mg/kg/wk)	Iron D-Fe (mg/kg/wk)	Lead D-Pb (mg/kg/wk)	Manganese D-Mn (mg/kg/wk)	Silver D-Ag (mg/kg/wk)	Zinc D-Zn (mg/kg/wk)
Maximum	1.2E-02	5.9E-01	7.7E-01	2.2E+02	3.4E-01	4.5E+00	5.2E-03	2.3E+00
Minimum	2.2E-03	1.1E-03	4.9E-02	4.0E-01	1.1E-02	3.9E-01	2.2E-04	1.9E-01
Mean	6.6E-03	1.1E-01	3.2E-01	5.1E+01	2.8E-02	1.4E+00	2.6E-03	8.2E-01
Median	6.6E-03	3.5E-02	2.1E-01	1.4E+01	1.6E-02	1.0E+00	2.3E-03	5.3E-01
Mean Last 5 Weeks			8.5E-02	5.7E-01		5.3E-01		2.4E-01
75% Remaining (Wks)								
50% Remaining (Wks)								
25% Remaining (Wks)								
0% Remaining (Wks)								

Week No.	Cumulative Metal Leach Rates: Antimony D-Sb (mg/kg)	Arsenic D-As (mg/kg)	Copper D-Cu (mg/kg)	Iron D-Fe (mg/kg)	Lead D-Pb (mg/kg)	Manganese D-Mn (mg/kg)	Silver D-Ag (mg/kg)	Zinc D-Zn (mg/kg)
Maximum	5.2E-01	9.0E+00	4.1E+01	6.6E+03	3.0E+00	2.5E+02	3.2E-01	1.1E+02
Minimum	6.8E-03	1.6E-02	3.6E-01	3.5E+01	3.4E-01	2.9E+00	1.5E-03	1.1E+00
Mean	3.3E-01	7.3E+00	2.8E+01	5.1E+03	1.9E+00	1.6E+02	1.7E-01	7.2E+01
Median	3.7E-01	8.9E+00	3.4E+01	6.3E+03	2.0E+00	1.9E+02	1.8E-01	8.4E+01
Mean Last 5 Weeks	5.1E-01	9.0E+00	4.1E+01	6.6E+03	3.0E+00	2.5E+02	3.1E-01	1.1E+02
75% Remaining (Wks)								
50% Remaining (Wks)								
25% Remaining (Wks)								
0% Remaining (Wks)								

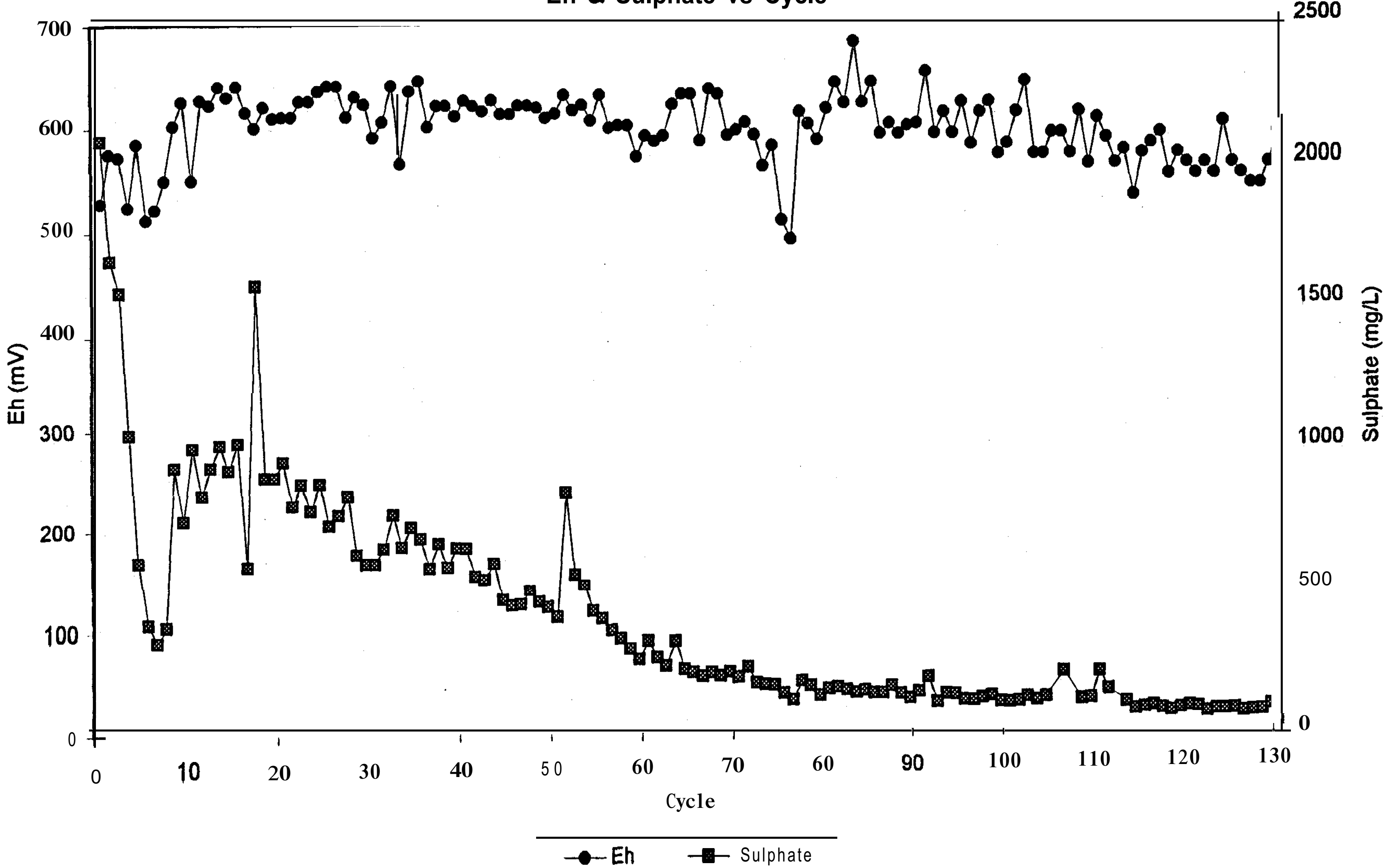
Samatosum Mine Humidity Cell Data -Column 5 (Blond Control Alkalinity Removed)

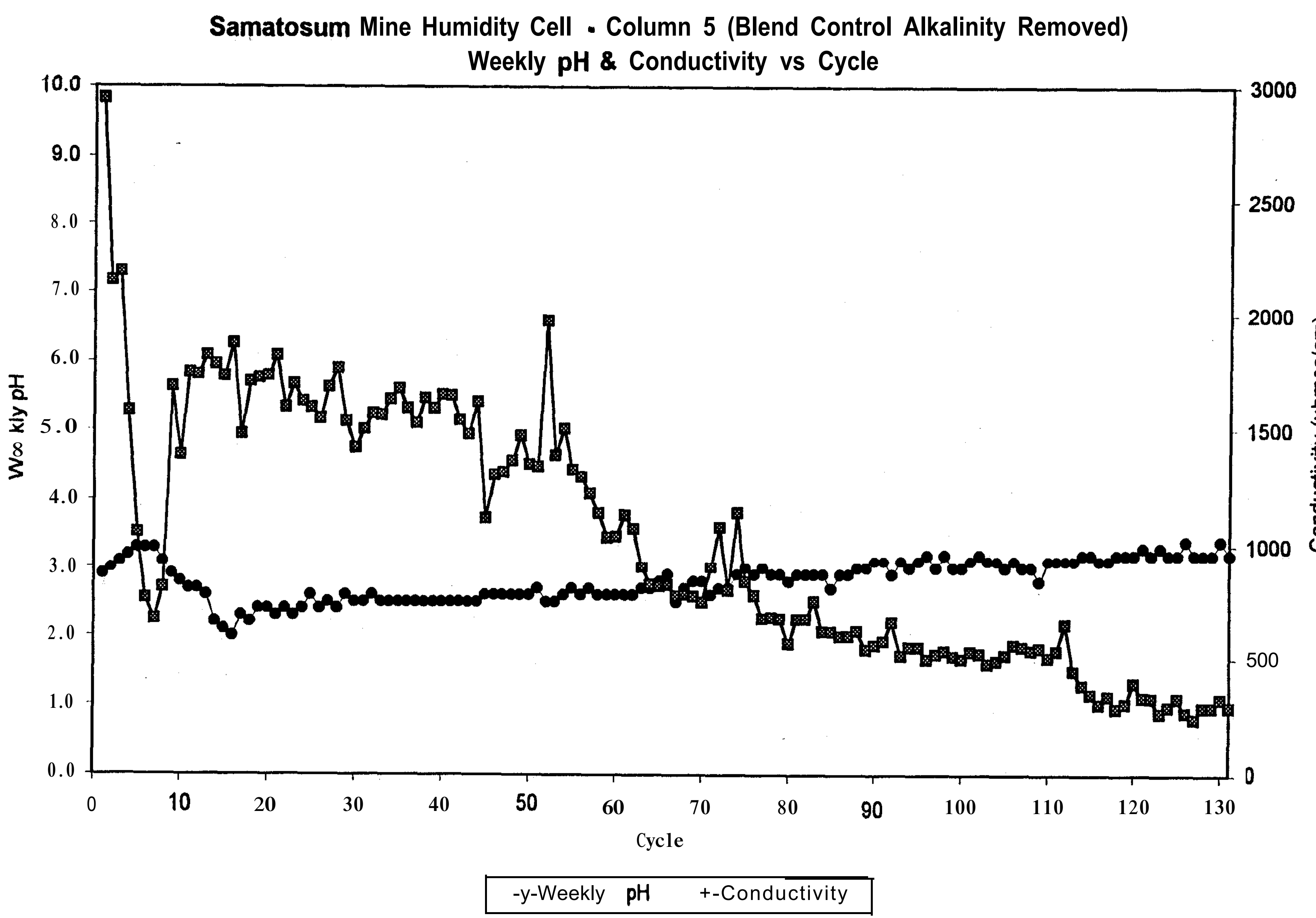
		Dissolved Metals*:								Metal Leach Rates:							
		Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc	Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc
Week No.	Date	D-Sb (mg/L)	D-As (mg/L)	D-Cu (mg/L)	D-Fe (mg/L)	D-Pb (mg/L)	D-Mn (mg/L)	D-Ag (mg/L)	D-Zn (mg/L)	D-Sb (mg/kg/wk)	D-As (mg/kg/wk)	D-Cu (mg/kg/wk)	D-Fe (mg/kg/wk)	D-Pb (mg/kg/wk)	D-Mn (mg/kg/wk)	D-Ag (mg/kg/wk)	D-Zn (mg/kg/wk)
66	24-Oct-90		0.002	0.19	14		1.2	0.002	0.4		2.2E-03	2.1E-01	1.6E+01		1.3E+00	2.2E-03	4.5E-01
67	31-Oct-90		0.002	0.19	15		1.4	0.001	0.42		2.2E-03	2.1E-01	1.7E+01		1.6E+00	1.1E-03	4.7E-01
68	7-Nov-90		0.003	0.19	14		1.2	0.002	0.42		3.4E-03	2.1E-01	1.6E+01		1.3E+00	2.2E-03	4.7E-01
69	14-Nov-90		0.002	0.17	13		1.5	0.002	0.41		2.2E-03	1.9E-01	1.5E+01		1.7E+00	2.2E-03	4.6E-01
70	21-Nov-90		0.002	0.19	13		1.5	0.001	0.45		2.3E-03	2.1E-01	1.5E+01		1.7E+00	1.1E-03	5.1E-01
71	28-Nov-90		0.002	0.17	11		1.1	0.002	0.39		2.3E-03	1.9E-01	1.2E+01		1.2E+00	2.3E-03	4.4E-01
72	5-Dec-90		0.002	0.21	13		1.3	0.002	0.49		2.2E-03	2.4E-01	1.5E+01		1.5E+00	2.2E-03	5.5E-01
73	12-Dec-90		0.001	0.13	7.7		0.94	0.001	0.33		1.1E-03	1.5E-01	8.7E+00		1.1E+00	1.1E-03	3.7E-01
74	19-Dec-90		0.001	0.14	10		1.3	0.001	0.36		1.1E-03	1.6E-01	1.1E+01		1.5E+00	1.1E-03	4.0E-01
75	26-Dec-90		0.001	0.16	12		1.1	0.001	0.52		1.1E-03	1.8E-01	1.3E+01		1.2E+00	1.1E-03	5.8E-01
76	2-Jan-91		0.001	0.13	9.6		0.79	0.001	0.28		1.1E-03	1.5E-01	1.1E+01		9.0E-01	1.1E-03	3.2E-01
77	9-Jan-91		0.001		8.3			0.002	0.25		1.2E-03		9.5E+00			2.3E-03	2.9E-01
78	16-Jan-91		0.001		14.4			0.002	0.39		1.1E-03		1.5E+01			2.1E-03	4.2E-01
79	23-Jan-91		0.001	0.13	11		0.9	0.002	0.33		1.1E-03	1.5E-01	1.2E+01		1.0E+00	2.3E-03	3.7E-01
80	30-Jan-91			0.11	8.2		0.85		0.29			1.2E-01	9.2E+00		9.5E-01		3.3E-01
81	6-Feb-91			0.12	6		1		0.35			1.3E-01	6.6E+00		1.1E+00		3.8E-01
82	13-Feb-91			0.12	8.8		1		0.36			1.3E-01	9.4E+00		1.1E+00		3.8E-01
83	20-Feb-91			0.11	7.5		1.1		0.36			1.2E-01	7.9E+00		1.2E+00		3.8E-01
84	27-Feb-91			0.09	3.7		1		0.32			1.0E-01	4.1E+00		1.1E+00		3.6E-01
85	6-Mar-91																
86	13-Mar-91			0.1	4.3		1		0.35			1.1E-01	4.7E+00		1.1E+00		3.8E-01
87	20-Mar-91			0.1	4.5		1		0.35			1.1E-01	4.8E+00		1.1E+00		3.8E-01
88	27-Mar-91			0.11	4.5		1.1		0.39			1.1E-01	4.4E+00		1.1E+00		3.8E-01
89	3-Apr-91			0.1	3.5		0.87		0.33			1.0E-01	3.6E+00		8.8E-01		3.4E-01
90	10-Apr-91			0.09	3.3		0.87		0.3			9.9E-02	3.6E+00		9.6E-01		3.3E-01
91	17-Apr-91			0.13	3.4		0.97		0.35			9.5E-02	2.5E+00		7.1E-01		2.6E-01
92	24-Apr-91			0.15	4.5		1.2		0.45			1.6E-01	4.9E+00		1.3E+00		4.9E-01
93	1-May-91			0.11	2.4		0.84		0.29			1.2E-01	2.7E+00		9.4E-01		3.2E-01
94	8-May-91			0.12	3.3		0.99		0.36			1.3E-01	3.6E+00		1.1E+00		4.0E-01
95	15-May-91			0.12	3.1		0.92		0.33			1.3E-01	3.5E+00		1.0E+00		3.7E-01
96	22-May-91			0.11	2.4		0.77		0.28			1.2E-01	2.7E+00		8.6E-01		3.1E-01
97	29-May-91			0.1	3		0.91		0.35			1.1E-01	3.4E+00		1.0E+00		4.0E-01
98	5-Jun-91			0.1	3		0.9		0.33			1.2E-01	3.5E+00		1.0E+00		3.8E-01
99	12-Jun-91			0.1	3.3		0.93		0.34			1.1E-01	3.7E+00		1.0E+00		3.8E-01
100	19-Jun-91			0.09	2.6		0.84		0.3			9.8E-02	2.8E+00		9.2E-01		3.3E-01
101	26-Jun-91			0.09	2.7		0.91		0.32			1.0E-01	3.0E+00		1.0E+00		3.6E-01
102	3-Jul-91			0.08	2.3		0.8		0.28			8.9E-02	2.6E+00		8.9E-01		3.1E-01
103	10-Jul-91			0.08	2.4		0.94		0.5			8.9E-02	2.7E+00		1.0E+00		5.5E-01
104	17-Jul-91			0.07	2		0.87		0.31			7.9E-02	2.2E+00		9.8E-01		3.5E-01
105	24-Jul-91			0.08	2.1		0.91		0.33			9.0E-02	2.4E+00		1.0E+00		3.7E-01
106	31-Jul-91			0.08	2		0.9		0.33			8.7E-02	2.2E+00		9.8E-01		3.6E-01
107	7-Aug-91			0.07	1.7		0.91		0.33			7.2E-02	1.8E+00		9.4E-01		3.4E-01
108	14-Aug-91			0.08	1.4		0.83		0.28			8.9E-02	1.6E+00		9.3E-01		3.1E-01
109	21-Aug-91			0.08	1.3		0.88		0.3			8.4E-02	1.4E+00		9.3E-01		3.2E-01
110	28-Aug-91			0.07	1.2		0.82		0.28			7.1E-02	1.2E+00		8.3E-01		2.8E-01
111	4-Sep-91			0.12	1.9		1.1		0.58			4.9E-02	7.7E-01		4.5E-01		2.4E-01
112	11-Sep-91			0.16	2.3		1.2		0.49			1.8E-01	2.6E+00		1.3E+00		5.5E-01
113	18-Sep-91			0.11	1.7		0.83		0.31			1.1E-01	1.7E+00		8.4E-01		3.1E-01
114	25-Sep-91			0.06	0.95		0.72		0.43			6.8E-02	1.1E+00		8.1E-01		4.8E-01
115	2-Oct-91			0.06	1.1		0.63		0.22			6.7E-02	1.2E+00		7.1E-01		2.5E-01
116	9-Oct-91			0.12	0.68		0.63		0.23			1.3E-01	7.6E-01		7.0E-01		2.6E-01
117	16-Oct-91			0.08	0.75		0.65		0.22			8.8E-02	8.3E-01		7.2E-01		2.4E-01
118	23-Oct-91			0.08	0.73		0.59		0.2			9.0E-02	8.2E-01		6.6E-01		2.2E-01
119	30-Oct-91			0.08	0.96		0.58		0.21			9.0E-02	1.1E+00		6.5E-01		2.4E-01
120	6-Nov-91			0.09	0.77		0.64		0.22			1.0E-01	8.9E-01		7.4E-01		2.5E-01
121	13-Nov-91			0.09	0.7		0.61		0.21			1.0E-01	8.1E-01		7.1E-01		2.4E-01
122	20-Nov-91			0.08	0.67		0.57		0.19			9.1E-02	7.6E-01		6.5E-01		2.2E-01
123	27-Nov-91			0.07	0.53		0.46		0.17			7.9E-02	5.9E-01		5.2E-01		1.9E-01
124	4-Dec-91			0.07	0.56		0.55		0.2			7.8E-02	6.2E-01		6.1E-01		2.2E-01
125	11-Dec-91																
126	18-Dec-91			0.09	0.4		0.37		0.17			1.0E-01	4.6E-01		4.2E-01		1.9E-01
127	25-Dec-91			0.08	0.36		0.35		0.21			9.0E-02	4.0E-01		3.9E-01		2.4E-01
128	1-Jan-92			0.08	0.41		0.48		0.2			9.1E-02	4.6E-01		5.4E-01		2.3E-01
129	8-Jan-92			0.07	0.6		0.49		0.26			7.8E-02	6.7E-01		5.5E-01		2.9E-01
130	15-Jan-92			0.09	0.64		0.63		0.25			8.8E-02	6.2E-01		6.1E-01		2.4E-01
131	22-Jan-92			0.07	0.61		0.5		0.19			8.1E-02	7.0E-01		5.8E-01		2.2E-01

		Cumulative Metal Leach Rates:							
		Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc
Week No.	Date	D-Sb (mg/kg)	D-As (mg/kg)	D-Cu (mg/kg)	D-Fe (mg/kg)	D-Pb (mg/kg)	D-Mn (mg/kg)	D-Ag (mg/kg)	D-Zn (mg/kg)
66	24-Oct-90	3.7E-01	8.9E+00	3.4E+01	6.3E+03	2.0E+00	1.9E+02	1.9E-01	8.5E+01
67	31-Oct-90	3.7E-01	8.9E+00	3.4E+01	6.3E+03	2.0E+00	1.9E+02	1.9E-01	8.5E+01
68	7-Nov-90	3.8E-01	8.9E+00	3.4E+01	6.3E+03	2.0E+00	1.9E+02	1.9E-01	8.6E+01
69	14-Nov-90	3.8E-01	8.9E+00	3.4E+01	6.4E+03	2.0E+00	2.0E+02	1.9E-01	8.6E+01
70	21-Nov-90	3.8E-01	8.9E+00	3.5E+01	6.4E+03	2.0E+00	2.0E+02	1.9E-01	8.7E+01
71	28-Nov-90	3.8E-01	8.9E+00	3.5E+01	6.4E+03	2.0E+00	2.0E+02	1.9E-01	8.7E+01
72	5-Dec-90	3.8E-01	8.9E+00	3.5E+01	6.4E+03	2.1E+00	2.0E+02	2.0E-01	8.8E+01
73	12-Dec-90	3.9E-01	8.9E+00	3.5E+01	6.4E+03	2.1E+00	2.0E+02	2.0E-01	8.8E+01
74	19-Dec-90	3.9E-01	8.9E+00	3.5E+01	6.4E+03	2.1E+00	2.0E+02	2.0E-01	8.8E+01
75	26-Dec-90	3.9E-01	8.9E+00	3.6E+01	6.4E+03	2.1E+00	2.0E+02	2.0E-01	8.9E+01
76	2-Jan-91	3.9E-01	8.9E+00	3.6E+01	6.4E+03	2.1E+00	2.1E+02	2.0E-01	8.9E+01
77	9-Jan-91	4.0E-01	8.9E+00	3.6E+01	6.5E+03	2.1E+00	2.1E+02	2.0E-01	9.0E+01
78	16-Jan-91	4.0E-01	8.9E+00	3.6E+01	6.5E+03	2.2E+00	2.1E+02	2.1E-01	9.0E+01
79	23-Jan-91	4.0E-01	8.9E+00	3.6E+01	6.5E+03	2.2E+00	2.1E+02	2.1E-01	9.0E+01
80	30-Jan-91	4.0E-01	8.9E+00	3.6E+01	6.5E+03	2.2E+00	2.1E+02	2.1E-01	9.1E+01
81	6-Feb-91	4.0E-01	8.9E+00	3.6E+01	6.5E+03	2.2E+00	2.1E+02	2.1E-01	9.1E+01
82	13-Feb-91	4.1E-01	8.9E+00	3.6E+01	6.5E+03	2.2E+00	2.1E+02	2.1E-01	9.1E+01
83	20-Feb-91	4.1E-01	8.9E+00	3.7E+01	6.5E+03	2.2E+00	2.1E+02	2.2E-01	9.2E+01
84	27-Feb-91	4.1E-01	8.9E+00	3.7E+01	6.5E+03	2.3E+00	2.1E+02	2.2E-01	9.2E+01
85	6-Mar-91	4.1E-01	8.9E+00	3.7E+01	6.5E+03	2.3E+00	2.1E+02	2.2E-01	9.3E+01
86	13-Mar-91	4.2E-01	8.9E+00	3.7E+01	6.5E+03	2.3E+00	2.2E+02	2.2E-01	9.3E+01
87	20-Mar-91	4.2E-01	8.9E+00	3.7E+01	6.5E+03	2.3E+00	2.2E+02	2.2E-01	9.3E+01
88	27-Mar-91	4.2E-01	8.9E+00	3.7E+01	6.5E+03	2.3E+00	2.2E+02	2.3E-01	9.4E+01
89	3-Apr-91	4.2E-01	8.9E+00	3.7E+01	6.5E+03	2.3E+00	2.2E+02	2.3E-01	9.4E+01
90	10-Apr-91	4.2E-01	8.9E+00	3.7E+01	6.5E+03	2.4E+00	2.2E+02	2.3E-01	9.4E+01
91	17-Apr-91	4.3E-01	8.9E+00	3.7E+01	6.6E+03	2.4E+00	2.2E+02	2.3E-01	9.5E+01
92	24-Apr-91	4.3E-01	8.9E+00	3.8E+01	6.6E+03	2.4E+00	2.2E+02	2.4E-01	9.5E+01
93	1-May-91	4.3E-01	8.9E+00	3.8E+01	6.6E+03	2.4E+00	2.2E+02	2.4E-01	9.5E+01
94	8-May-91	4.3E-01	8.9E+00	3.8E+01	6.6E+03	2.4E+00	2.2E+02	2.4E-01	9.6E+01
95	15-May-91	4.4E-01	8.9E+00	3.8E+01	6.6E+03	2.4E+00	2.2E+02	2.4E-01	9.6E+01
96	22-May-91	4.4E-01	8.9E+00	3.8E+01	6.6E+03	2.5E+00	2.2E+02	2.4E-01	9.6E+01
97	29-May-91	4.4E-01	8.9E+00	3.8E+01	6.6E+03	2.5E+00	2.3E+02	2.5E-01	9.7E+01
98	5-Jun-91	4.4E-01	8.9E+00	3.8E+01	6.6E+03	2.5E+00	2.3E+02	2.5E-01	9.7E+01
99	12-Jun-91	4.4E-01	8.9E+00	3.8E+01	6.6E+03	2.5E+00	2.3E+02	2.5E-01	9.8E+01
100	19-Jun-91	4.5E-01	8.9E+00	3.8E+01	6.6E+03	2.5E+00	2.3E+02	2.5E-01	9.8E+01
101	26-Jun-91	4.5E-01	8.9E+00	3.9E+01	6.6E+03	2.5E+00	2.3E+02	2.5E-01	9.8E+01
102	3-Jul-91	4.5E-01	8.9E+00	3.9E+01	6.6E+03	2.6E+00	2.3E+02	2.6E-01	9.9E+01
103	10-Jul-91	4.5E-01	8.9E+00	3.9E+01	6.6E+03	2.6E+00	2.3E+02	2.6E-01	9.9E+01
104	17-Jul-91	4.6E-01	8.9E+00	3.9E+01	6.6E+03	2.6E+00	2.3E+02	2.6E-01	1.0E+02
105	24-Jul-91	4.6E-01	8.9E+00	3.9E+01	6.6E+03	2.6E+00	2.3E+02	2.6E-01	1.0E+02
106	31-Jul-91	4.6E-01	8.9E+00	3.9E+01	6.6E+03	2.6E+00	2.3E+02	2.7E-01	1.0E+02
107	7-Aug-91	4.6E-01	8.9E+00	3.9E+01	6.6E+03	2.6E+00	2.4E+02	2.7E-01	1.0E+02
108	14-Aug-91	4.6E-01	8.9E+00	3.9E+01	6.6E+03	2.7E+00	2.4E+02	2.7E-01	1.0E+02
109	21-Aug-91	4.7E-01	8.9E+00	3.9E+01	6.6E+03	2.7E+00	2.4E+02	2.7E-01	1.0E+02
110	28-Aug-91	4.7E-01	8.9E+00	3.9E+01	6.6E+03	2.7E+00	2.4E+02	2.7E-01	1.0E+02
111	4-Sep-91	4.7E-01	8.9E+00	3.9E+01	6.6E+03	2.7E+00	2.4E+02	2.8E-01	1.0E+02
112	11-Sep-91	4.7E-01	8.9E+00	4.0E+01	6.6E+03	2.7E+00	2.4E+02	2.8E-01	1.0E+02
113	18-Sep-91	4.8E-01	8.9E+00	4.0E+01	6.6E+03	2.7E+00	2.4E+02	2.8E-01	1.0E+02
114	25-Sep-91	4.8E-01	8.9E+00	4.0E+01	6.6E+03	2.8E+00	2.4E+02	2.8E-01	1.0E+02
115	2-Oct-91	4.8E-01	8.9E+00	4.0E+01	6.6E+03	2.8E+00	2.4E+02	2.8E-01	1.0E+02
116	9-Oct-91	4.8E-01	8.9E+00	4.0E+01	6.6E+03	2.8E+00	2.4E+02	2.9E-01	1.0E+02
117	16-Oct-91	4.8E-01	8.9E+00	4.0E+01	6.6E+03	2.8E+00	2.4E+02	2.9E-01	1.0E+02
118	23-Oct-91	4.9E-01	8.9E+00	4.0E+01	6.6E+03	2.8E+00	2.4E+02	2.9E-01	1.0E+02
119	30-Oct-91	4.9E-01	8.9E+00	4.0E+01	6.6E+03	2.8E+00	2.5E+02	2.9E-01	1.0E+02
120	6-Nov-91	4.9E-01	8.9E+00	4.0E+01	6.6E+03	2.9E+00	2.5E+02	3.0E-01	1.0E+02
121	13-Nov-91	4.9E-01	8.9E+00	4.0E+01	6.6E+03	2.9E+00	2.5E+02	3.0E-01	1.0E+02
122	20-Nov-91	5.0E-01	8.9E+00	4.1E+01	6.6E+03	2.9E+00	2.5E+02	3.0E-01	1.1E+02
123	27-Nov-91	5.0E-01	8.9E+00	4.1E+01	6.6E+03	2.9E+00	2.5E+02	3.0E-01	1.1E+02
124	4-Dec-91	5.0E-01	8.9E+00	4.1E+01	6.6E+03	2.9E+00	2.5E+02	3.0E-01	1.1E+02
125	11-Dec-91	5.0E-01	9.0E+00	4.1E+01	6.6E+03	2.9E+00	2.5E+02	3.1E-01	1.1E+02
126	18-Dec-91	5.0E-01	9.0E+00	4.1E+01	6.6E+03	3.0E+00	2.5E+02	3.1E-01	1.1E+02
127	25-Dec-91	5.1E-01	9.0E+00	4.1E+01	6.6E+03	3.0E+00	2.5E+02	3.1E-01	1.1E+02
128	1-Jan-92	5.1E-01	9.0E+00	4.1E+01	6.6E+03	3.0E+00	2.5E+02	3.1E-01	1.1E+02
129	8-Jan-92	5.1E-01	9.0E+00	4.1E+01	6.6E+03	3.0E+00	2.5E+02	3.1E-01	1.1E+02
130	15-Jan-92	5.1E-01	9.0E+00	4.1E+01	6.6E+03	3.0E+00	2.5E+02	3.2E-01	1.1E+02
131	22-Jan-92	5.2E-01	9.0E+00	4.1E+01	6.6E+03	3.0E+00	2.5E+02	3.2E-01	1.1E+02

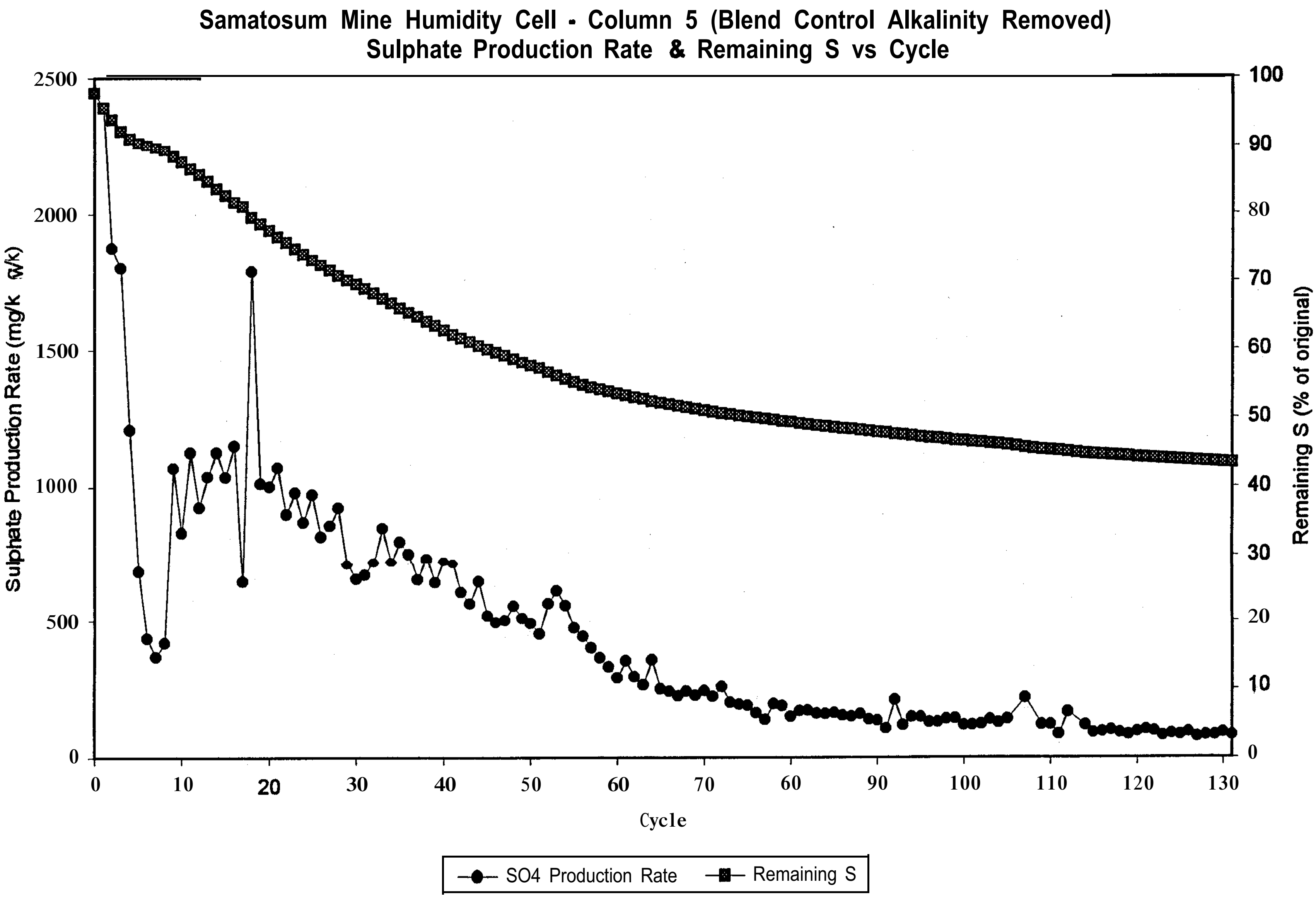
*If values were reported as < detection limit, 1/2 the detection limit is shown in italics and was used in subsequent calculations.

Samatosum Mine Humidity Cell - Column 5 (Blend Control Alkalinity Removed)
Eh & Sulphate vs Cycle

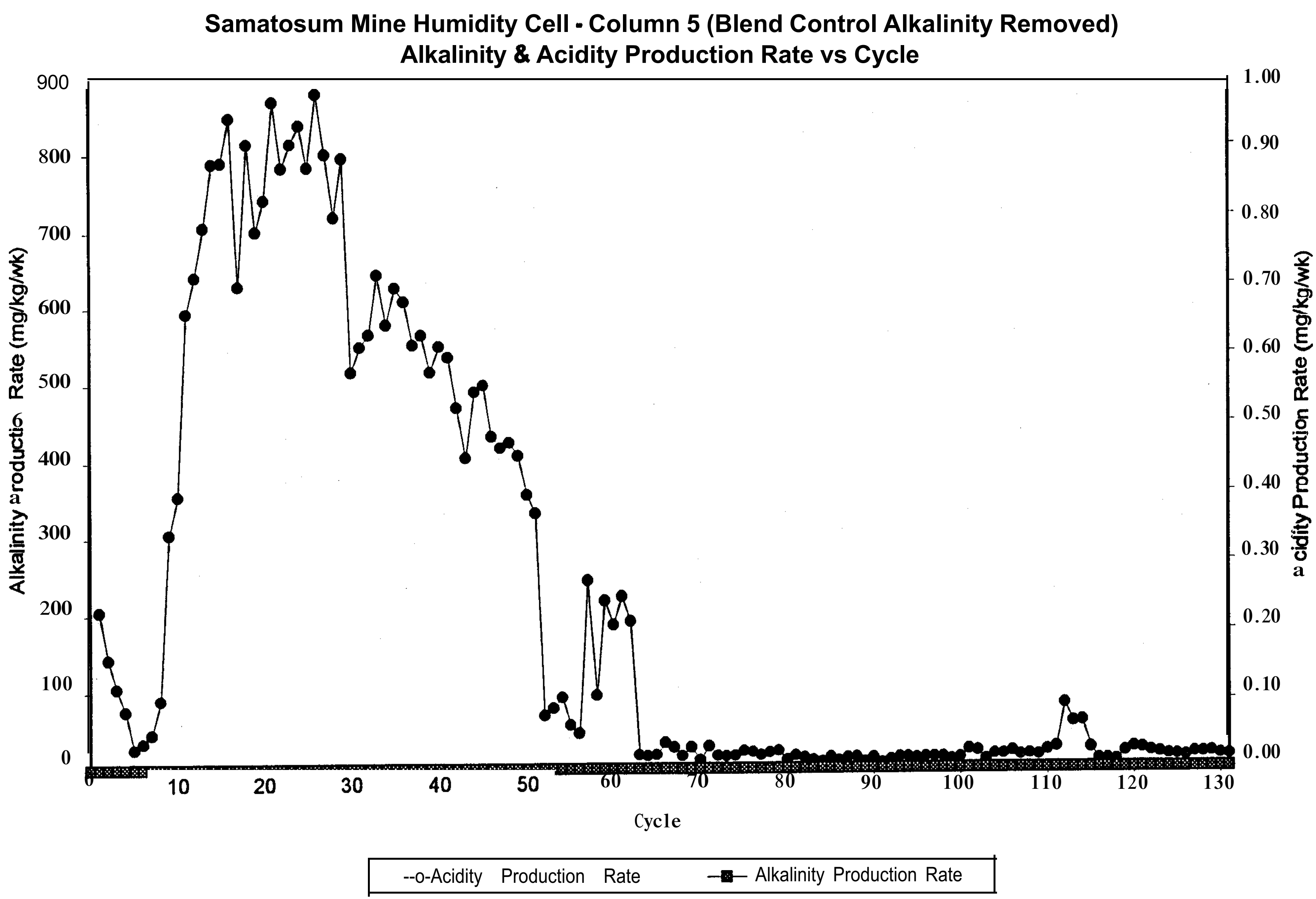




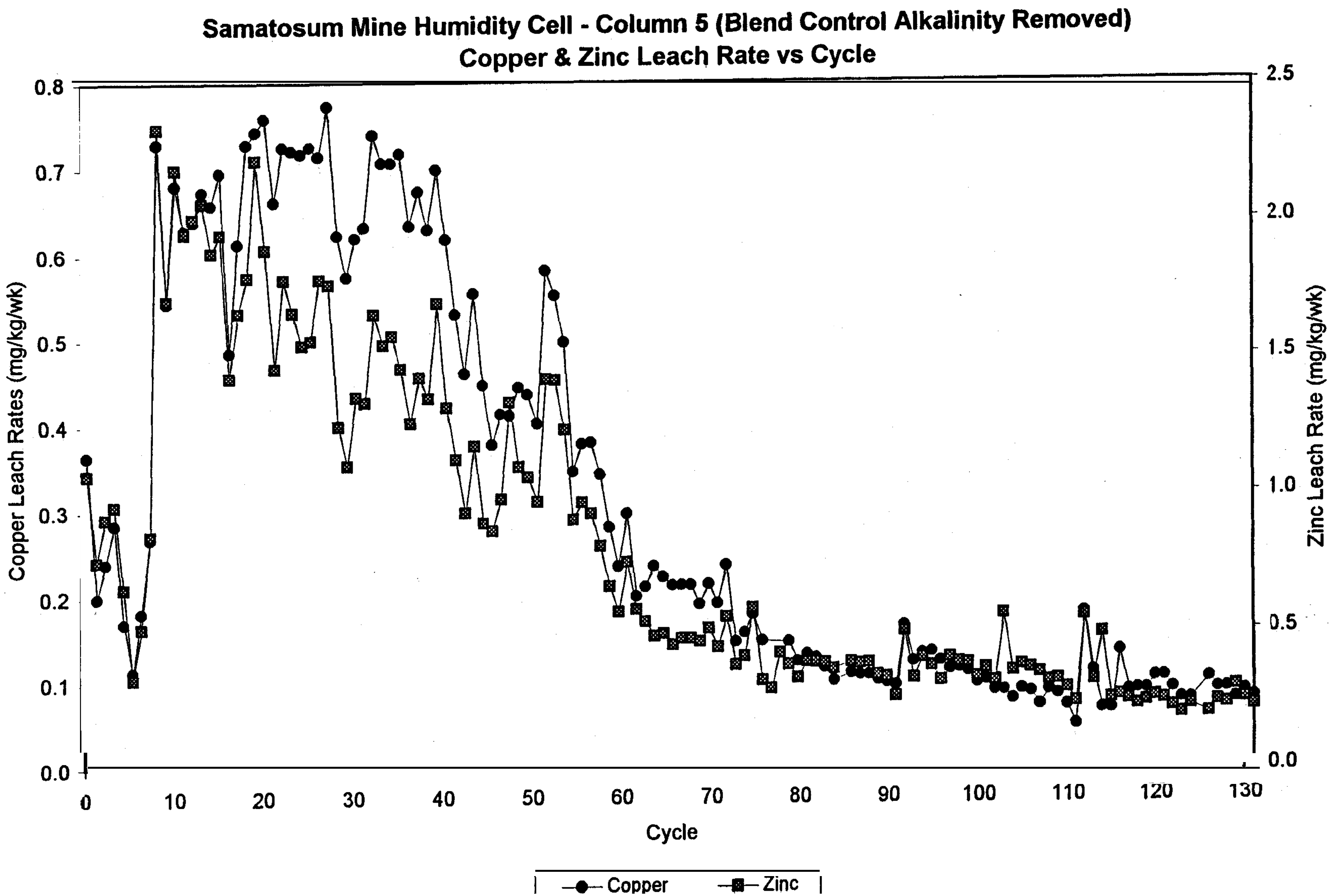
Samatosum Mine Humidity Cell - Column 5 (Blend Control Alkalinity Removed)
Weekly pH & Conductivity vs Cycle
W∞ kly pH
Conductivity (uhmos/cm)
Cycle
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
3000
2500
2000
1500
1000
500
0
0
10
20
30
40
50
60
70
80
90
100
110
120
130
-y-Weekly pH
+-Conductivity



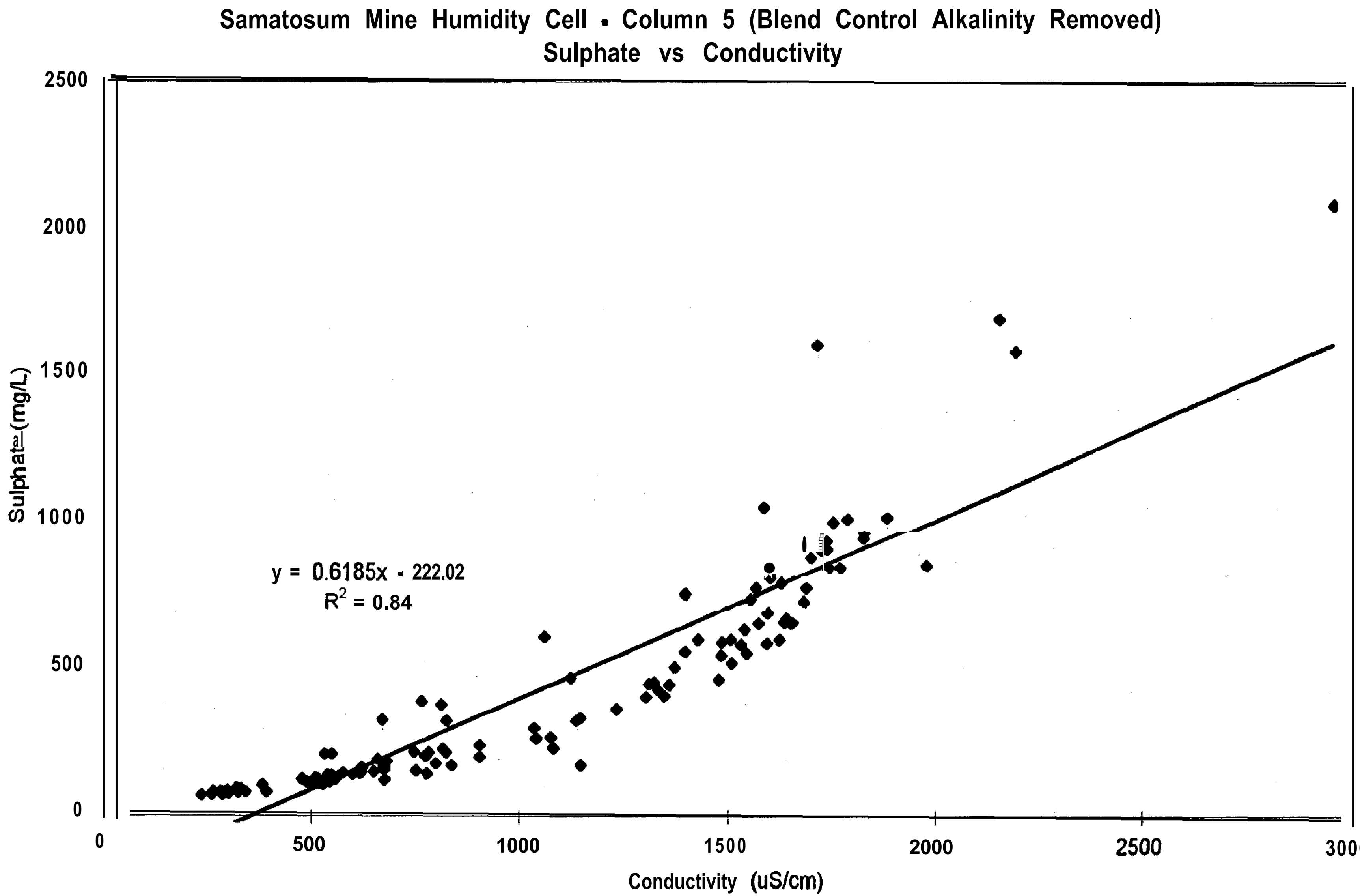
Samatosum Mine Humidity Cell - Column 5 (Blend Control Alkalinity Removed)
Sulphate Production Rate & Remaining S vs Cycle
Sulphate Production Rate (mg/kg/wk)
Remaining S (% of original)
Cycle
SO4 Production Rate
Remaining S

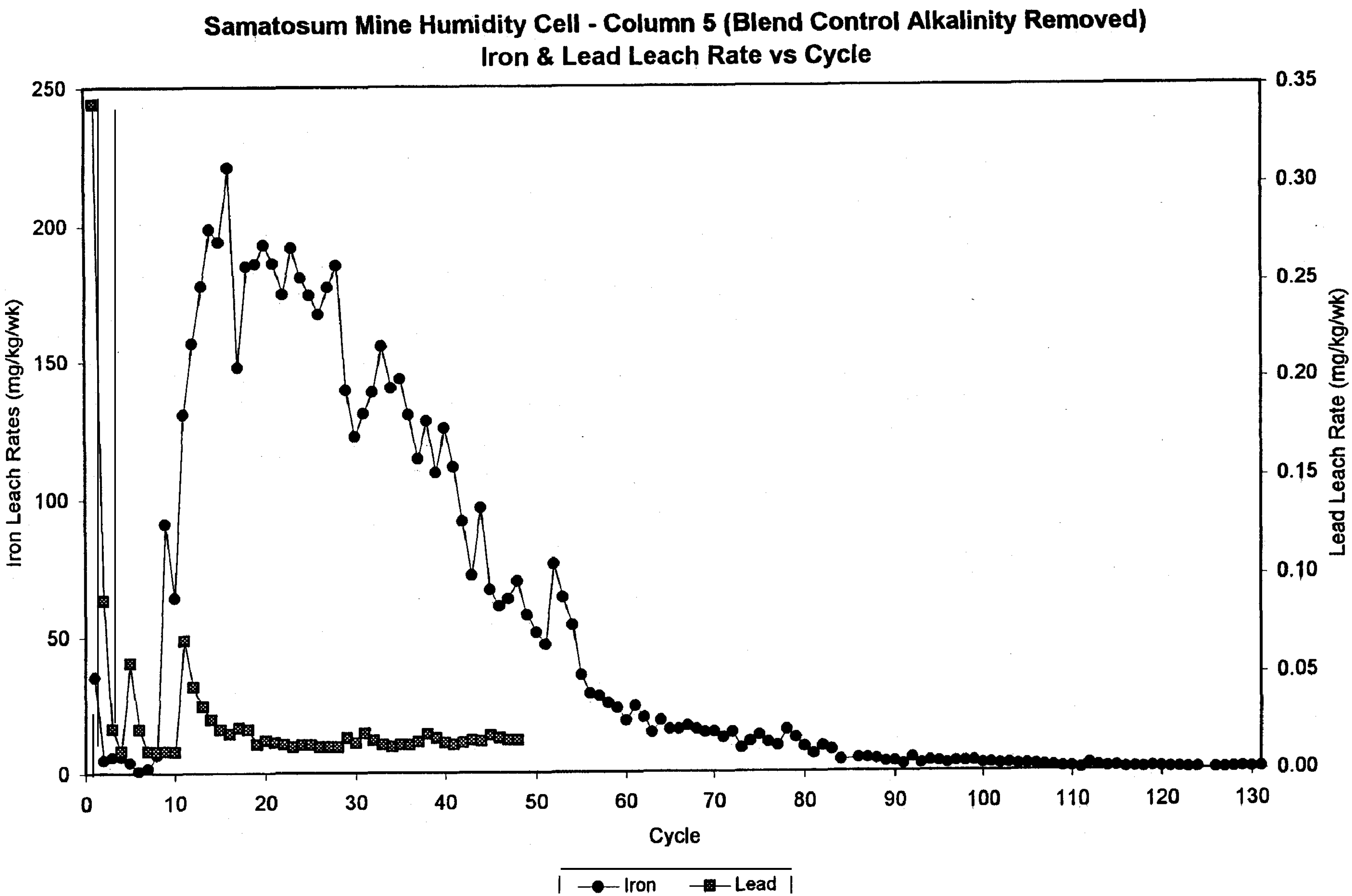


Samatosum Mine Humidity Cell - Column 5 (Blend Control Alkalinity Removed)
Alkalinity & Acidity Production Rate vs Cycle
Alkalinity Production Rate (mg/kg/wk)
Acidity Production Rate (mg/kg/wk)
Cycle
0
100
200
300
400
500
600
700
800
900
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.70
0.80
0.90
1.00
10
20
30
40
50
60
70
80
90
100
110
120
130
--o-Acidity Production Rate
Alkalinity Production Rate

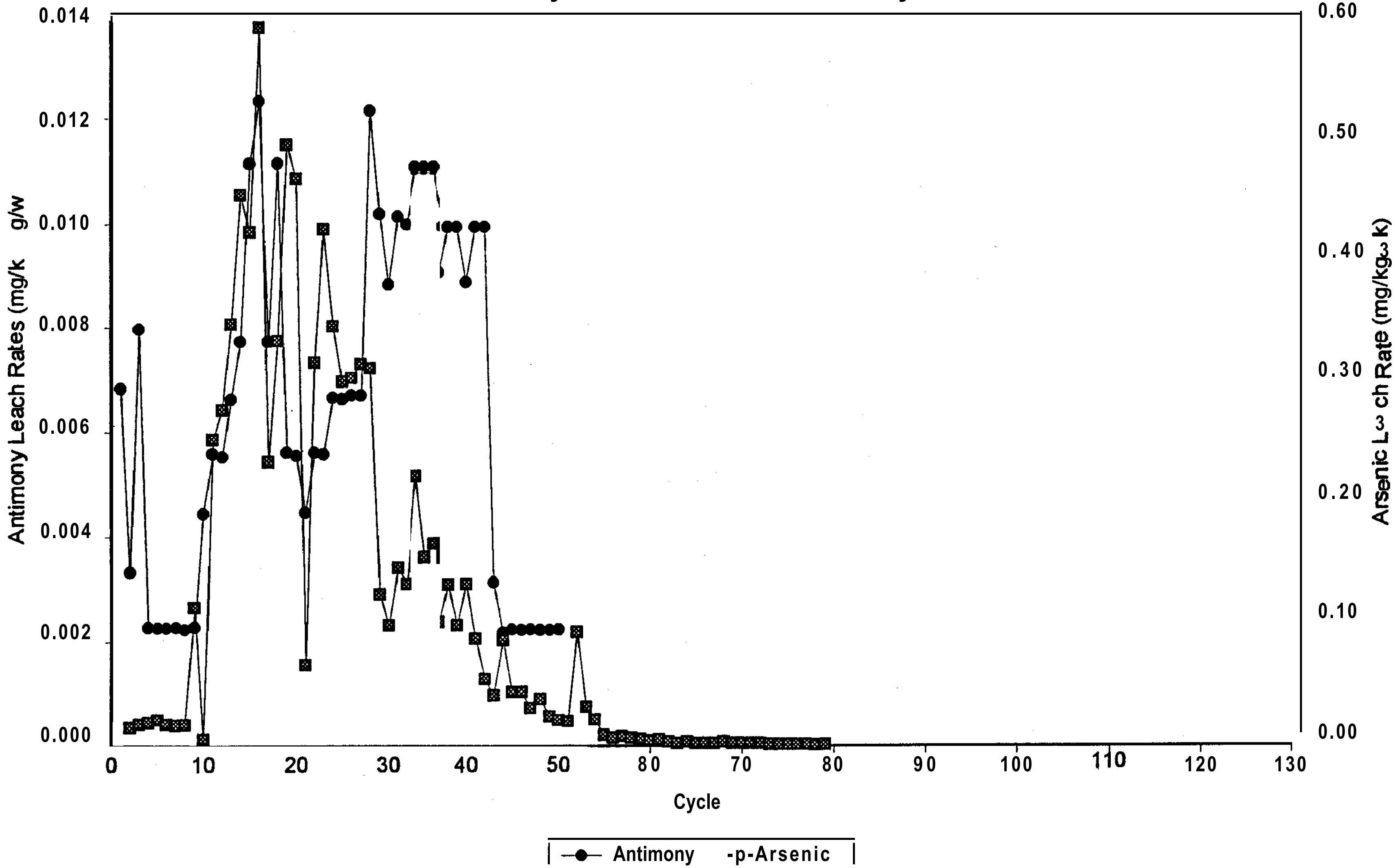


Samatosum Mine Humidity Cell - Column 5 (Blend Control Alkalinity Removed)
Copper & Zinc Leach Rate vs Cycle
Copper Leach Rates (mg/kg/wk)
Zinc Leach Rate (mg/kg/wk)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
2.5
2.0
1.5
1.0
0.5
0.0
0
10
20
30
40
50
60
70
80
90
100
110
120
130
Cycle
Copper
Zinc

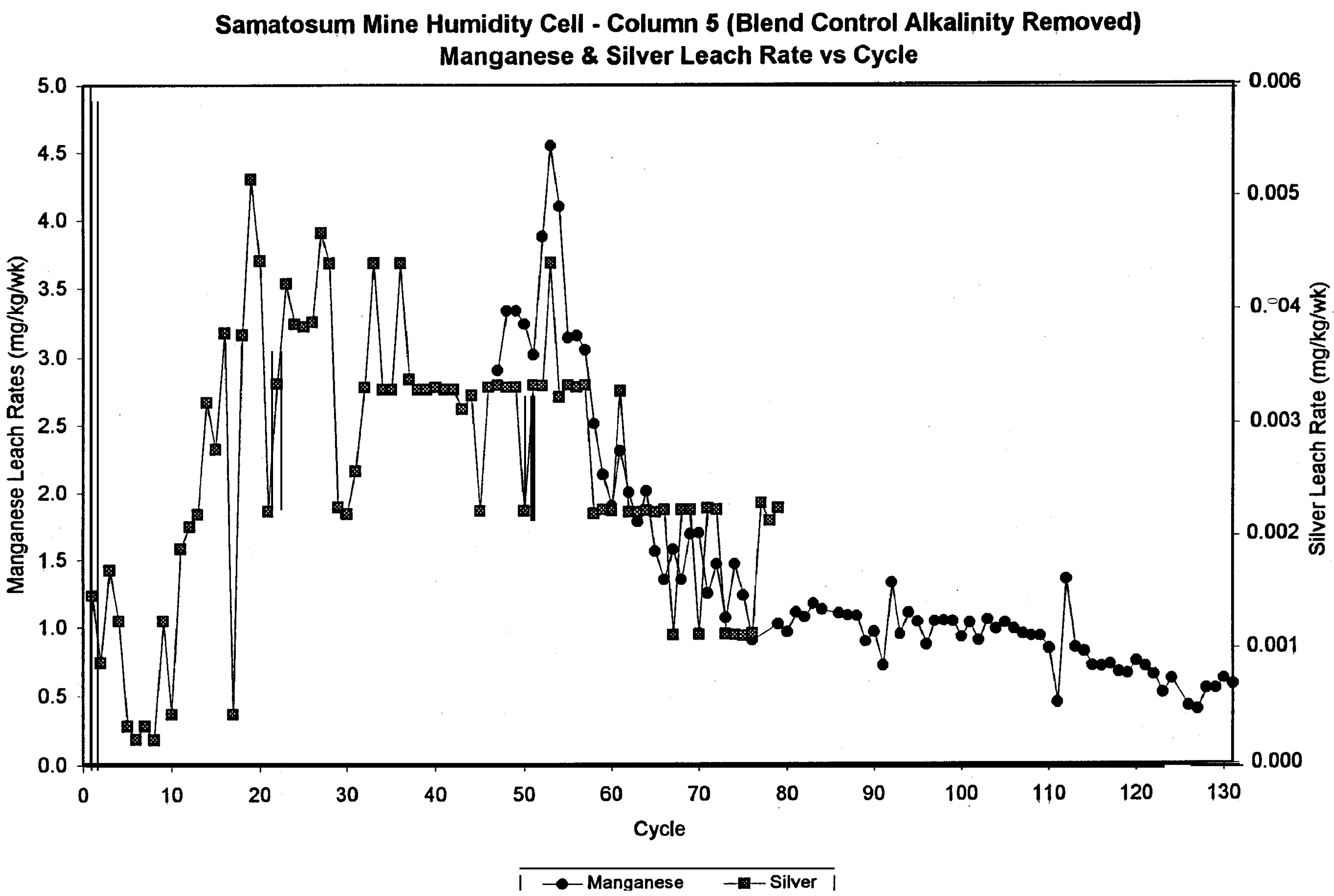

Samatosum Mine Humidity Cell - Column 5 (Blend Control Alkalinity Removed)
Sulphate vs Conductivity
y = 0.6185x - 222.02
R^2 = 0.84
Sulphate (mg/L)
2500
2000
1500
1000
500
0
0
500
1000
1500
2000
2500
3000
Conductivity (uS/cm)


Samatosum Mine Humidity Cell - Column 5 (Blend Control Alkalinity Removed)
Iron & Lead Leach Rate vs Cycle
Iron Leach Rates (mg/kg/wk)
Lead Leach Rate (mg/kg/wk)
250
200
150
100
50
0
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0
10
20
30
40
50
60
70
80
90
100
110
120
130
Cycle
Iron
Lead

Samatosum Mineiumidity Cell - Column 5 (Blend Control Alkalinity Removed)
Antimony & Arsenic Leach Rate vs Cycle



B6. Column 6


Samatosum Mine Humidity Cell - Column 5 (Blend Control Alkalinity Removed)
Manganese & Silver Leach Rate vs Cycle
Manganese Leach Rates (mg/kg/wk)
Silver Leach Rate (mg/kg/wk)
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.006
0.005
0.003
0.002
0.001
0.000
0
10
20
30
40
50
60
70
80
90
100
110
120
130
Cycle
Manganese
Silver

Pre-Test ABA & ICP Metals Data
Samatosum Mine
Column 6 **(Mafic Over** Oxidized **Footwall** PAG)

Initial Sample Weight (dry) (g)	
ABA Results: **Paste pH** % S (Total) % S (Sulphate) % S (Sulphide) % S (BaS04) **TAP** (tonne **CaCO3/ktonne)** **SAP** (tonne **CaCO3/ktonne)** **NP** (tonne **CaCO3/ktonne)** **Carbon** (%) **CaNP** (t **CaCO3/ktonne)** **TNNP** (tonne **CaCO3/ktonne)** **SNNP** (tonne **CaCO3/ktonne)** **RNNP** (tonne **CaCO3/ktonne)** **TNPR** **SNPR** **RNPR**	*Data* *Not* Available
Surface Area: Surface Area **(m2/kg)**	0.00
Metals: (ppm) **Aluminum** Al Antimony Sb **Arsenic** As Barium Ba Beryllium Be Bismuth Bi Cadmium Cd Calcium **Ca** Chromium Cr cobalt CO **Copper** cu Iron Fe Lanthium La Lead Pb Lithium Li Magnesium **Mg** **Manganese** Mr Mercury **Hg** Molybdenum MC Nickel Ni Phosphorus P Potassium K Selenium Se Silver **Ag** Sodium Na Strontium Sr Thallium **Tl** Tin St? Titanium Ti Tungsten W Vanadium V Zinc Zn	*Data* Not Available

Post-Test ABA 8 ICP Metals Data
Samatosum Mine
Column 6 **(Mafic** Over Oxidized Foohvall PAG)

Final Sample Weight (dry) (g)	
ABA Results: Paste **pH** % s (Total) % S (Sulphate) % S (Sulphide) **%** S (BaS04) TAP (tonne **CaCO3/ktonne)** SAP (tonne **CaCO3/ktonne)** NP (tonne **CaCO3/ktonne)** Carbon (%) **CaNP** (t **CaCO3/ktonne)** TNNP (tonne **CaCO3/ktonne)** SNNP (tonne **CaCO3/ktonne)** RNNP (tonne **CaCO3/ktonne)** TNPR SNPR RNPR	*Data* *Not* A***vailable***
Surface Area: Surface Area **(m2/kg)**	
Metals: (ppm) Aluminum Al Antimony Sb Arsenic As Barium Ba Beryllium Be Bismuth **Bi** Cadmium Cd Calcium **Ca** Chromium Cr Cobalt co Copper cu Iron Fe Lanthium La Lead Pb **Lithium** Li Magnesium **Mg** Manganese **Mr** Mercury **Hg** Molybdenum Mc Nickel Ni Phosphorus P Potassium K Selenium Se Silver **Ag** Sodium Na Strontium Sr Thallium **Tl** Tin Sn Titanium Ti Tungsten W Vanadium V Zinc Zn	Data *Not* Available

NOTE: When metals were ***reported*** *as* **<** *detection limit. half the value of the detection limit is shown in* **italics,** *and was used in subsequent* calculations.

Samatosum Mine Humidity Cell Data -Column 6 (Mafic Over Oxidized Footwall PAG)

Week No.	Date	Analytical Results: Leachate Recovered (mL)	Weekly pH (pH units)	Conductivity (umhos/cm)	Eh (mV)	Acidity (CaCO3 mg/L)*	Alkalinity (CaCO3 mg/L)*	Sulphate (SO4 mg/L)*	Acidity Production Rate (mg/kg/wk)**	Alkalinity Production Rate (mg/kg/wk)**	Sulphate Production: SO4 Production Rate (mg/kg/wk)**	Cumulative SO4 Production (mg/kg)	Remaining S (% of original)	By Surface Area: SO4 Production Rate (mg/m2/wk)**	Cumulative SO4 Production (mg/m2)	Molar Ratio: Alk /SO4	NP Consumption: Theoretical NP Consumption At pH 6 (mg/kg/wk)	Empirical Open-System NP Consumption At Measured pH (mg/kg/wk)	Cum NP Consumption Open-System (mg/kg/wk)	Remaining NP Open-System (%)	Theoretical Closed-System NP Consumption Above pH 6.5 (mg/kg/wk)	Cum NP Consumption Closed-System (mg/kg/wk)	Remaining NP Closed-System (%)
0	19-Feb-92								1.27	22.4	825.77	826	98.54	565	565		860.2	881.3	881	98.97	1719.1	1719	98.00
1	26-Feb-92	9100	7.4	3480	310	5	88	3250	1.27	22.4	825.77	1652	97.07	565	1130	0.027	860.2	881.3	1763	97.95	1719.1	3438	96.00
2	04-Mar-92	19100	8.0	1710					1.23	28.9	642.02	2294	95.93	439	1569		668.8	696.4	2459	97.14	1336.3	4774	94.45
3	11-Mar-92	19400	8.0	680					1.19	35.4	458.26	2752	95.12	314	1883		477.4	511.6	2971	96.54	953.5	5728	93.34
4	18-Mar-92	19300	8.0	475					1.14	41.9	274.51	3026	94.63	188	2071		285.9	326.7	3297	96.16	570.8	6299	92.67
5	25-Mar-92	19700	8.1	415	340	2	88	165	1.10	48.4	90.76	3117	94.47	62	2133	0.533	94.5	141.8	3439	96.00	188.0	6487	92.45
6	01-Apr-92	19200	8.1	450					1.37	47.3	89.74	3207	94.31	61	2194		93.5	139.4	3578	95.84	185.6	6672	92.24
7	08-Apr-92	19800	8.0	368					1.63	46.1	88.71	3296	94.16	61	2255		92.4	136.9	3715	95.68	183.2	6856	92.02
8	15-Apr-92	10700	8.0	384					1.90	45.0	87.69	3383	94.00	60	2315		91.3	134.5	3850	95.52	180.8	7036	91.81
9	22-Apr-92	19400	8.0	404	380	4	81	160	2.17	43.9	86.67	3470	93.85	59	2374	0.506	90.3	132.0	3982	95.37	178.4	7215	91.61
10	29-Apr-92	19300	8.0	334			79		1.76	42.7	78.20	3548	93.71	54	2428		81.5	122.4	4104	95.22	161.2	7376	91.42
11	06-May-92	19100	8.1	330			78		1.35	41.3	69.73	3618	93.59	48	2475		72.6	112.6	4217	95.09	143.9	7520	91.25
12	13-May-92	19200	8.0	330			76		0.94	40.6	61.26	3679	93.48	42	2517		63.8	103.5	4320	94.97	126.7	7646	91.10
13	20-May-92	19100	8.1	330	330	1	74	99	0.53	39.5	52.80	3732	93.38	36	2554	0.747	55.0	93.9	4414	94.86	109.5	7756	90.98
14	27-May-92	19300	8.0	295					0.67	40.7	46.61	3779	93.30	32	2585		48.6	88.6	4503	94.76	96.4	7852	90.86
15	03-Jun-92	19300	8.0	300					0.82	42.0	40.42	3819	93.23	28	2613		42.1	83.3	4586	94.66	83.4	7936	90.77
16	10-Jun-92	19100	8.0	350					0.96	43.3	34.24	3853	93.17	23	2637		35.7	78.0	4664	94.57	70.4	8006	90.69
17	17-Jun-92	19700	8.0	280	400	2	81	51	1.10	44.6	28.05	3881	93.12	19	2656	1.588	29.2	72.7	4737	94.49	57.3	8063	90.62
18	24-Jun-92	19000	8.0	260					1.10	44.5	30.11	3911	93.07	21	2676		31.4	74.8	4812	94.40	61.6	8125	90.55
19	01-Jul-92	19000	8.0	293					1.09	44.5	32.17	3944	93.01	22	2698		33.5	76.9	4888	94.31	65.9	8191	90.47
20	08-Jul-92	19200	8.0	260					1.09	44.5	34.23	3978	92.95	23	2722		35.7	79.0	4968	94.22	70.2	8261	90.39
21	15-Jul-92	19400	8.0	230	380	2	82	67	1.08	44.4	36.29	4014	92.88	25	2747	1.224	37.8	81.1	5049	94.13	74.5	8336	90.30
22	22-Jul-92	18800	8.0	264					1.21	43.8	43.40	4057	92.81	30	2776		45.2	87.8	5136	94.02	89.2	8425	90.20
23	29-Jul-92	19200	8.0	260					1.34	43.2	50.51	4108	92.72	35	2811		52.6	94.4	5231	93.91	103.9	8529	90.08
24	05-Aug-92	19000	7.8	278					1.46	42.5	57.61	4166	92.61	39	2850		60.0	101.1	5332	93.80	118.6	8647	89.94
25	12-Aug-92	19000	7.91	252	360	3	79	122	1.59	41.9	64.72	4230	92.50	44	2895	0.648	67.4	107.7	5440	93.67	133.2	8781	89.78
26	19-Aug-92	19200	7.75	266					1.62	40.2	59.82	4290	92.39	41	2935		62.3	100.9	5541	93.55	123.0	8904	89.64
27	26-Aug-92	19100	7.9	253					1.64	38.4	54.92	4345	92.30	38	2973		57.2	94.0	5635	93.44	112.8	9016	89.51
28	02-Sep-92	19300	7.74	255					1.67	36.7	50.02	4395	92.21	34	3007		52.1	87.1	5722	93.34	102.5	9119	89.39
29	09-Sep-92	20200	7.84	214	440	3	62	80	1.69	35.0	45.12	4440	92.13	31	3038	0.775	47.0	80.3	5802	93.25	92.3	9211	89.28
30	16-Sep-92	13500	7.95	278					1.67	35.3	42.73	4483	92.05	29	3067		44.5	78.1	5880	93.16	87.4	9299	89.18
31	23-Sep-92	18900	7.91	241					1.65	35.5	40.34	4523	91.98	28	3095		42.0	75.9	5956	93.07	82.4	9381	89.09
32	30-Sep-92	19000	7.9	241					1.64	35.8	37.95	4561	91.91	26	3121		39.5	73.7	6030	92.98	77.4	9459	89.00
33	07-Oct-92	19300	7.9	240	440	3	67	66	1.62	36.1	35.57	4597	91.85	24	3145	1.015	37.0	71.5	6101	92.90	72.5	9531	88.91
34	14-Oct-92	19100	7.75	235					1.62	35.9	33.07	4630	91.79	23	3168		34.5	68.8	6170	92.82	67.3	9598	88.83
35	21-Oct-92	19500	7.87	234					1.63	35.7	30.58	4660	91.74	21	3189		31.9	66.0	6236	92.74	62.1	9660	88.76
36	28-Oct-92	19200	7.85	237					1.63	35.6	28.08	4688	91.69	19	3208		29.3	63.2	6299	92.67	56.9	9717	88.69
37	04-Nov-92	19500	7.88	195	430	3	65	47	1.63	35.4	25.59	4714	91.64	18	3226	1.383	26.7	60.4	6360	92.60	51.7	9769	88.63
38	11-Nov-92	18900	8.03	216					1.76	35.8	25.82	4740	91.60	18	3243		26.9	61.0	6421	92.53	52.0	9821	88.57
39	18-Nov-92	19100	7.81	214					1.88	36.3	26.06	4766	91.55	18	3261		27.1	61.5	6482	92.46	52.4	9873	88.51
40	25-Nov-92	18200	7.85	223					2.00	36.7	26.29	4792	91.50	18	3279		27.4	62.1	6544	92.39	52.8	9926	88.45
41	02-Dec-92	19000	7.72	202	430	4	70	50	2.12	37.1	26.53	4819	91.46	18	3297	1.400	27.6	62.6	6607	92.31	53.1	9979	88.39
42	09-Dec-92	19100	7.74	226					1.86	36.6	25.61	4844	91.41	18	3315		26.7	61.4	6668	92.24	51.5	10031	88.33
43	16-Dec-92	18800	7.78	188					1.61	36.0	24.70	4869	91.37	17	3332		25.7	60.1	6728	92.17	49.8	10081	88.27
44	23-Dec-92	19200	7.74	210					1.35	35.4	23.78	4893	91.32	16	3348		24.8	58.8	6787	92.10	48.2	10129	88.22
45	30-Dec-92	19500	7.86	190	450	2	64	42	1.09	34.8	22.87	4916	91.28	16	3364	1.524	23.8	57.6	6845	92.04	46.6	10175	88.16
46	06-Jan-93	19600	7.88	148					1.36	35.2	24.73	4940	91.24	17	3380		25.8	59.6	6904	91.97	50.2	10226	88.10
47	13-Jan-93	19300	7.7	170					1.63	35.6	26.60	4967	91.19	18	3399		27.7	61.7	6966	91.90	53.8	10279	88.04
48	20-Jan-93	19200	7.65	198					1.90	35.9	28.47	4996	91.14	19	3418		29.7	63.7	7030	91.82	57.4	10337	87.97
49	27-Jan-93	19400	7.76	200	440	4	67	56	2.17	36.3	30.33	5026	91.09	21	3439	1.196	31.6	65.7	7095	91.74	61.0	10398	87.90
50	03-Feb-93	19500	7.55	172					2.29	35.7	29.38	5055	91.04	20	3459		30.6	64.0	7159	91.67	58.9	10457	87.83
51	10-Feb-93	19200	7.64	195					2.41	35.1	28.43	5084	90.99	19	3478		29.6	62.3	7222	91.60	56.8	10514	87.77
52	17-Feb-93	19400	7.6	200					2.53	34.5	27.48	5111	90.94	19	3497		28.6	60.6	7282	91.53	54.7	10568	87.70
53	24-Feb-93	19000	7.76	190	400	5	64	50	2.65	34.0	26.53	5138	90.89	18	3515	1.280	27.6	58.9	7341	91.46	52.6	10621	87.64
54	03-Mar-93	19100	7.65	175					2.95	31.6	28.08	5166	90.84	19	3535		29.3	57.9	7399	91.39	55.6	10676	87.58
55	10-Mar-93	19200	7.77	189					3.25	29.3	29.64	5195	90.79	20	3555		30.9	56.9	7456	91.32	58.5	10735	87.51
56	17-Mar-93	19000	7.65	170					3.55	27.0	31.20	5227	90.73	21	3576		32.5	55.9	7512	91.26	61.4	10796	87.44
57	24-Mar-93	13800	7.74	245	370	10	64	85	3.85	24.7	32.75	5259	90.67	22	3599	0.753	34.1	54.9	7567	91.20	64.4	10861	87.36
58	31-Mar-93	19400	7.57	150					3.16	26.8	31.00	5290	90.62	21	3620		32.3	55.9	7623	91.13	61.4	10922	87.29
59	07-Apr-93	20000	7.7	165					2.46	28.9	29.24	5320	90.57	20	3640		30.5	56.9	7680	91.06	58.5	10981	87.22
60	14-Apr-93	19500	7.63	184					1.77	31.1	27.49	5347	90.52	19	3659		28.6	58.0	7738	91.00	55.5	11036	87.16
61	21-Apr-93	19200	7.94	190	410	2	62	48	1.07	33.2	25.73	5373	90.47	18	3676	1.292	26.8	59.0	7797	90.93	52.5	11089	87.10
62	28-Apr-93	19100	7.76	208					1.75	34.8	25.90	5399	90.43	18	3694		27.0	60.0	7857	90.86	52.2	11141	87.04
63	05-May-93	19500	7.56	188					2.42	36.3	26.07	5425	90.38	18	3712		27.2	61.0	7918	90.79	51.9	11193	86.98
64	12-May-93	19300	7.57	193					3.10	37.8	26.24	5451	90.34	18	3730		27.3	62.0	7980	90.72	51.6	11244	86.92
65	19-May-93	19300	7.56	200	390	7	73	49	3.77	39.3	26.41	5477	90.29	18	3748	1.490	27.5	63.1	8043	90.64	51.2	11296	86.86

re-Test ABA & ICP Metals Data amatosum Mine olumn 6 (Mafic Over Oxidized Footwall PAG)		
iitial Sample Weight (dry) (g)		35815
BA Results:		
'aste pH		8.45
% s (Total)		1.88
lb S (Sulphate)		
% S (Sulphide)		
% S (BaS04)		
TAP (tonne CaCO3/ktonne)		59
SAP (tonne CaCO3/ktonne)		
NP (tonne CaCO3/ktonne)		85.95
Carbon (%)		
CaNP (t CaCO3/ktonne)		
TNNP (tonne CaCO3/ktonne)		27
SNNP (tonne CaCO3/ktonne)		
RNNP (tonne CaCO3/ktonne)		
TNPR		1.46
SNPR		
RNPR		
Surface Area:		
Surface Area (m2/kg)		1.48
Metals: (ppm)		
Aluminum	Al	
Antimony	Sb	
Arsenic	As	
Barium	Ba	
Beryllium	Be	
Bismuth	Bi	
Cadmium	Cd	
Calcium	Ca	
Chromium	Cr	*Data Not Available*
cobalt	Co	
Copper	CL	
Iron	Fe	
Lanthium	La	
Lead	Pb	
Liiium	Li	
Magnesium	Mg	
Manganese	Ml	
Mercury	Hg	
Molybdenum	Mo	
Nickel	Ni	
Phosphorus	P	
Potassium	K	
Selenium	Se	
Silver	Ag	
Sodium	Na	
Strontium	Sr	
Thallium	Tl	
Tin	Sn	
Titanium	Ti	
Tungsten	W	
Vanadium	V	
Zinc	Zr	

Post-Test ABA & ICP Metals Data amatosum Mine olumn 6 (Mafic Over Oxidized Footwall PAG)		
nal Sample Weight (dry) (g)		
BA Results:		
'aste pH		
b S (Total)		
b S (Sulphate)		
6 S (Sulphide)		
6 S (BaS04)		
TAP (tonne CaCO3/ktonne)		Data
SAP (tonne CaCO3/ktonne)		*Not*
NP (tonne CaCO3/ktonne)		Available
Carbon (%)		
CaNP (t CaCO3/ktonne)		
TNNP (tonne CaCO3/ktonne)		
SNNP (tonne CaCO3/ktonne)		
RNNP (tonne CaCO3/ktonne)		
TNPR		
SNPR		
RNPR		
Surface Area:		
Surface Area (m2/kg)		
Metals: (ppm)		
Aluminum	Al	
Antimony	Sb	
Arsenic	As	
Barium	Ba	
Beryllium	Be	
Bismuth	Bi	
Cadmium	Cd	
Calcium	Ca	
Chromium	Cr	Data *Not Available*
Cobalt	CO	
Copper	cu	
Iron	Fe	
Lanthium	La	
Lead	Pb	
Liiium	Li	
Magnesium	Mg	
Manganese	Mn	
Mercury	Hg	
Molybdenum	MO	
Nickel	Ni	
Phosphorus	P	
Potassium	K	
Selenium	Se	
Silver	Ag	
Sodium	Na	
Strontium	Sr	
Thallium	Tl	
Tin	Sn	
Titanium	Ti	
Tungsten	W	
Vanadium	V	
Zinc	zn	

NOTE: When metals were reported as < *detection limit, half the value of the detection* ***limit*** *is shown in* ***italics,*** *and* **was** *used in subsequent calculations.*

Samatosum Mine Humidity Cell Data -Column 6 (Mafic Over Oxidized Footwall PAQ)

Week No.	Date	Analytical Results: Leachate Recovered (mL)	Weekly pH (pH units)	Conductivity (umhos/cm)	Eh (mV)	Acidity (CaCO3 mg/L)*	Alkalinity (CaCO3 mg/L)*	Sulphate (SO4 mg/L)*	Acidity Production Rate (mg/kg/wk)**	Alkalinity Production Rate (mg/kg/wk)**	Sulphate Production: SO4 Production Rate (mg/kg/wk)**	Cumulative SO4 Production (mg/kg)	Remaining S (% of original)	By Surface Area: SO4 Production Rate (mg/m2/wk)**	Cumulative SO4 Production (mg/m2)	Molar Ratio: Alk /SO4	NP Consumption: Theoretical NP Consumption At pH 6 (mg/kg/wk)	Empirical Open-System NP Consumption At Measured pH (mg/kg/wk)	Cum NP Consumption Open-System (mg/kg/wk)	Remaining NP Open-System (%)	Theoretical Closed-System NP Consumption Above pH 6.5 (mg/kg/wk)	Cum NP Consumption Closed-System (mg/kg/wk)	Remaining NP Closed-System (%)
Mean I		18899	7.05	248	357	3	0.0	159	1.62	32.1	52.70	5255	90.58	36	3595	NA	55.0	85.4	7686	91.06	106.3	10840	67.39
Median		19100	7.86	188	370	3	0.0	49	1.62	34.8	26.05	5451	90.34	16	3736	NA	27.1	59.8	7960	90.72	52.0	11244	86.92
Mean Last 8 Weeks		18800	8.01	169	250	2	0.0	35	0.89	21.6	17.91	6747	88.04	12	4617	NA	18.7	39.6	10885	87.34	36.4	13852	83.88
75% Remaining (Wks)													534							392			334
50% Remaining (Wks)													1321							935			924
25% Remaining (Wks)													2107							1470			1514
0% Remaining (Wks)													2893							2020			2104

** If measured sulphate, alkalinity and/or acidity values were unavailable, data was interpolated from existing data and used in subsequent equations.

Samatosum Mine Humidity Call Data -Column 6 (Mafic Over Oxidized Footwall PAG)

Week No.	Date	Analytical Results: Leachate Recovered (mL)	Weekly pH (pH units)	Conductivity (umhos/cm)	Eh (mV)	Acidity (CaCO3 mg/L)*	Alkalinity (CaCO3 mg/L)*	Sulphate (SO4 mg/L)*	Acidity Production Rate (mg/kg/wk)**	Alkalinity Production Rate (mg/kg/wk)**	Sulphate Production: SO4 Production Rate (mg/kg/wk)**	Cumulative SO4 Production (mg/kg)	Remaining S (% of original)	By Surface Area: SO4 Production Rate (mg/m2/wk)**	Cumulative SO4 Production (mg/m2)	Molar Ratio: Alk /SO4	NP Consumption: Theoretical NP Consumption At pH 6 (mg/kg/wk)	Empirical Open-System NP Consumption At Measured pH (mg/kg/wk)	Cum NP Consumption Open-System (mg/kg/wk)	Remaining NP Open-System (%)	Theoretical Closed-System NP Consumption Above pH 6.5 (mg/kg/wk)	Cum NP Consumption Closed-System (mg/kg/wk)	Remaining NP Closed-System (%)
66	26-May-93	19000	7.73	208					3.23	38.0	25.60	5503	90.24	18	3765		26.7	61.4	8104	90.57	50.1	11346	86.80
67	02-Jun-93	19200	7.71	200					2.69	36.6	24.79	5528	90.20	17	3782		25.8	59.8	8164	90.50	48.9	11395	86.74
68	09-Jun-93	19200	7.7	210					2.16	35.3	23.98	5552	90.16	16	3799		25.0	58.1	8222	90.43	47.8	11442	86.69
69	16-Jun-93	19300	7.79	180	400	3	63	43	1.62	33.9	23.17	5575	90.12	16	3815	1.465	24.1	56.5	8279	90.37	46.7	11489	86.63
70	23-Jun-93	19000	7.89	204					1.62	35.0	24.18	5599	90.07	17	3831		25.2	58.6	8337	90.30	48.8	11538	86.58
71	30-Jun-93	19300	7.86	210					1.63	36.0	25.20	5624	90.03	17	3848		26.2	60.7	8398	90.23	50.9	11589	86.52
72	07-Jul-93	19600	7.87	180					1.63	37.1	26.21	5651	89.98	18	3866		27.3	62.7	8461	90.16	53.0	11642	86.46
73	14-Jul-93	19500	7.87	188	390	3	70	50	1.63	38.1	27.22	5678	89.93	19	3885	1.400	28.4	64.8	8526	90.08	55.1	11697	86.39
74	21-Jul-93	20000	7.8	180					1.63	38.2	28.54	5706	89.88	20	3905		29.7	66.3	8592	90.00	57.8	11755	86.32
75	28-Jul-93	19800	7.8	182					1.63	38.3	29.86	5736	89.83	20	3925		31.1	67.8	8660	89.92	60.6	11815	86.25
76	04-Aug-93	19100	7.85	170					1.63	38.4	31.18	5767	89.77	21	3946		32.5	69.2	8729	89.84	63.3	11878	86.18
77	11-Aug-93	19400	7.88	190	390	3	71	60	1.63	38.5	32.50	5800	89.72	22	3969	1.183	33.9	70.7	8800	89.76	66.1	11945	86.10
78	18-Aug-93	19400	7.88	190					1.63	35.6	30.20	5830	89.66	21	3989		31.5	65.4	8865	89.69	61.3	12006	86.03
79	25-Aug-93	19300	7.8	170					1.63	32.8	27.90	5858	89.61	19	4008		29.1	60.2	8925	89.62	56.5	12062	85.97
80	01-Sep-93	19400	7.63	160					1.63	29.9	25.59	5884	89.57	18	4026		26.7	55.0	8980	89.55	51.7	12114	85.91
81	08-Sep-93	19400	7.74	150	370	3	50	43	1.63	27.1	23.29	5907	89.53	16	4042	1.163	24.3	49.7	9030	89.49	46.9	12161	85.85
82	15-Sep-93	20000	7.74	158					1.62	26.8	23.47	5930	89.49	16	4058		24.4	49.7	9080	89.44	47.3	12208	85.80
83	22-Sep-93	19600	7.77	159					1.61	26.6	23.65	5954	89.44	16	4074		24.6	49.6	9129	89.38	47.6	12256	85.74
84	29-Sep-93	19200	7.66	143					1.61	26.4	23.82	5978	89.40	16	4090		24.8	49.6	9179	89.32	48.0	12304	85.68
85	06-Oct-93	19100	7.8	153	320	3	49	45	1.60	26.1	24.00	6002	89.36	16	4107	1.089	25.0	49.5	9228	89.26	48.4	12352	85.63
86	13-Oct-93	19100	7.72	150					1.60	25.5	23.20	6025	89.32	16	4123		24.2	48.0	9276	89.21	46.7	12399	85.57
87	20-Oct-93	18800	7.7	149					1.60	24.8	22.40	6047	89.28	15	4138		23.3	46.5	9323	89.15	45.1	12444	85.52
88	27-Oct-93	18600	7.55	162					1.60	24.1	21.60	6069	89.24	15	4153		22.5	45.0	9368	89.10	43.4	12487	85.47
89	03-Nov-93	19100	7.78	151	320	3	44	39	1.60	23.5	20.80	6090	89.20	14	4167	1.128	21.7	43.5	9411	89.05	41.7	12529	85.42
90	10-Nov-93	19400	7.95	138					1.76	23.6	20.35	6110	89.17	14	4181		21.2	43.0	9454	89.00	40.6	12570	85.38
91	17-Nov-93	19000	7.52	147					1.92	23.7	19.89	6130	89.13	14	4194		20.7	42.5	9497	88.95	39.5	12609	85.33
92	24-Nov-93	19200	7.77	140					2.08	23.9	19.44	6149	89.10	13	4208		20.2	42.0	9539	88.90	38.4	12648	85.28
93	01-Dec-93	20000		139	285	4	43	34	2.23	24.0	18.99	6168	89.06	13	4221	1.265	19.8	41.6	9581	88.85	37.3	12685	85.24
94	08-Dec-93	19100	7.58	138					2.06	23.7	19.02	6187	89.03	13	4234		19.8	41.4	9622	88.81	37.6	12723	85.20
95	15-Dec-93	19200	7.62	133					1.89	23.4	19.05	6206	89.00	13	4247		19.8	41.3	9663	88.76	37.8	12760	85.15
96	22-Dec-93	18700	7.6	143					1.72	23.0	19.08	6226	88.96	13	4260		19.9	41.2	9705	88.71	38.0	12798	85.11
97	29-Dec-93	18500	7.76	152	275	3	44	37	1.55	22.7	19.11	6245	88.93	13	4273	1.189	19.9	41.1	9746	88.66	38.3	12837	85.06
98	05-Jan-94	18800	7.96	137					1.29	23.0	18.84	6264	88.89	13	4286		19.6	41.3	9787	88.61	38.0	12875	85.02
99	12-Jan-94	19000	7.8	182					1.04	23.3	18.57	6282	88.86	13	4299		19.3	41.6	9829	88.56	37.7	12912	84.98
100	19-Jan-94	19000	8.23	165					0.79	23.6	18.31	6300	88.83	13	4311		19.1	41.9	9870	88.52	37.4	12950	84.93
101	26-Jan-94	19000	8.18	162	280	1	45	34	0.53	23.9	18.04	6318	88.80	12	4323	1.324	18.8	42.1	9913	88.47	37.0	12987	84.89
102	02-Feb-94	18700	8.02	167					0.66	24.0	17.88	6336	88.77	12	4336		18.6	41.9	9955	88.42	36.6	13023	84.85
103	09-Feb-94	18800	8.03	164					0.79	24.1	17.73	6354	88.73	12	4348		18.5	41.7	9996	88.37	36.1	13059	84.81
104	16-Feb-94	18700	7.95	160					0.92	24.2	17.57	6372	88.70	12	4360		18.3	41.6	10038	88.32	35.7	13095	84.76
105	23-Feb-94	18900	8	160	260	2	46	33	1.06	24.3	17.41	6389	88.67	12	4372	1.394	18.1	41.4	10079	88.27	35.2	13130	84.72
106	02-Mar-94	18800	7.85	156					1.06	25.5	17.19	6406	88.64	12	4383		17.9	42.4	10122	88.22	34.8	13165	84.68
107	09-Mar-94	18700	7.98	168					1.06	26.8	16.97	6423	88.61	12	4395		17.7	43.4	10165	88.17	34.3	13199	84.64
108	16-Mar-94	18800	7.92	167					1.06	28.1	16.75	6440	88.58	11	4407		17.5	44.5	10209	88.12	33.8	13233	84.60
109	23-Mar-94	19100	8.1	170	285	2	55	31	1.07	29.3	16.53	6456	88.55	11	4418	1.774	17.2	45.5	10255	88.07	33.4	13267	84.56
110	30-Mar-94	19000	7.96	156					1.46	27.6	17.39	6474	88.52	12	4430		18.1	44.3	10299	88.02	34.8	13301	84.52
111	06-Apr-94	17000	8.09	162					1.85	26.0	18.24	6492	88.49	12	4442		19.0	43.1	10342	87.97	36.2	13338	84.48
112	13-Apr-94	19300	7.84	142					2.24	24.3	19.09	6511	88.46	13	4455		19.9	41.9	10384	87.92	37.5	13375	84.44
113	20-Apr-94	18800	7.96	172	290	5	43	38	2.62	22.6	19.95	6531	88.42	14	4469	1.132	20.8	40.7	10425	87.87	38.9	13414	84.39
114	27-Apr-94	19200	7.86	150					2.23	22.2	19.71	6551	88.38	13	4482		20.5	40.5	10465	87.82	38.8	13453	84.35
115	04-May-94	18800	7.71	150					1.83	21.8	19.48	6570	88.35	13	4496		20.3	40.3	10506	87.78	38.8	13492	84.30
116	11-May-94	18800	7.79	147					1.43	21.4	19.24	6590	88.32	13	4509		20.0	40.1	10546	87.73	38.7	13530	84.26
117	18-May-94	18400	7.96	160	350	2	41	37	1.03	21.1	19.01	6609	88.28	13	4522	1.108	19.8	39.8	10586	87.68	38.6	13569	84.21
118	25-May-94	18200	7.83	175					0.90	21.1	19.01	6628	88.25	13	4535		19.8	40.0	10626	87.64	38.7	13608	84.17
119	01-Jun-94	18600	7.98	171					0.77	21.1	19.01	6647	88.22	13	4548		19.8	40.1	10666	87.59	38.8	13646	84.12
120	08-Jun-94	18800	8.07	178					0.64	21.1	19.01	6666	88.18	13	4561		19.8	40.2	10706	87.54	39.0	13685	84.08
121	15-Jun-94	18400	8.03	171	250	1	41	37	0.51	21.1	19.01	6685	88.15	13	4574	1.108	19.8	40.4	10746	87.50	39.1	13724	84.03
122	22-Jun-94	18400	7.98	177					0.65	21.3	18.61	6703	88.11	13	4587		19.4	40.1	10786	87.45	38.1	13763	83.99
123	29-Jun-94	18900	8.05	168					0.78	21.6	18.21	6721	88.08	12	4599		19.0	39.8	10826	87.40	37.2	13800	83.94
124	06-Jul-94	19100	8.04	161					0.92	21.9	17.81	6739	88.05	12	4611		18.6	39.5	10866	87.36	36.2	13836	83.90
125	13-Jul-94	18900	7.96	161	250	2	42	33	1.06	22.2	17.41	6757	88.02	12	4623	1.273	18.1	39.2	10905	87.31	35.2	13871	83.86
126	20-Jul-94	19700	7.9	156					1.06	22.2	17.41	6774	87.99	12	4635		18.1	39.2	10944	87.27	35.2	13906	83.82
127	27-Jul-94	18200	7.93	175					1.06	22.2	17.41	6792	87.96	12	4647		18.1	39.2	10983	87.22	35.2	13942	83.78
128	03-Aug-94	18800	8.15	181					1.06	22.2	17.41	6809	87.93	12	4659		18.1	39.2	11023	87.18	35.2	13977	83.74
Maximum		20200	8.23	3480	450	10	88.0	3250	3.85	48.4	825.77	6809	98.54	565	4659	NA	860.2	881.3	11023	98.97	1719.1	13977	98.00
Minimum		9100	7.40	133	250	1	41.0	31	0.51	21.1	16.53	826	87.93	11	565	NA	17.2	39.2	881	87.18	33.4	1719	83.74

Samatosum Mine Humidity Cell Data - Column 6 (Mafic Over Oxidized PAG)

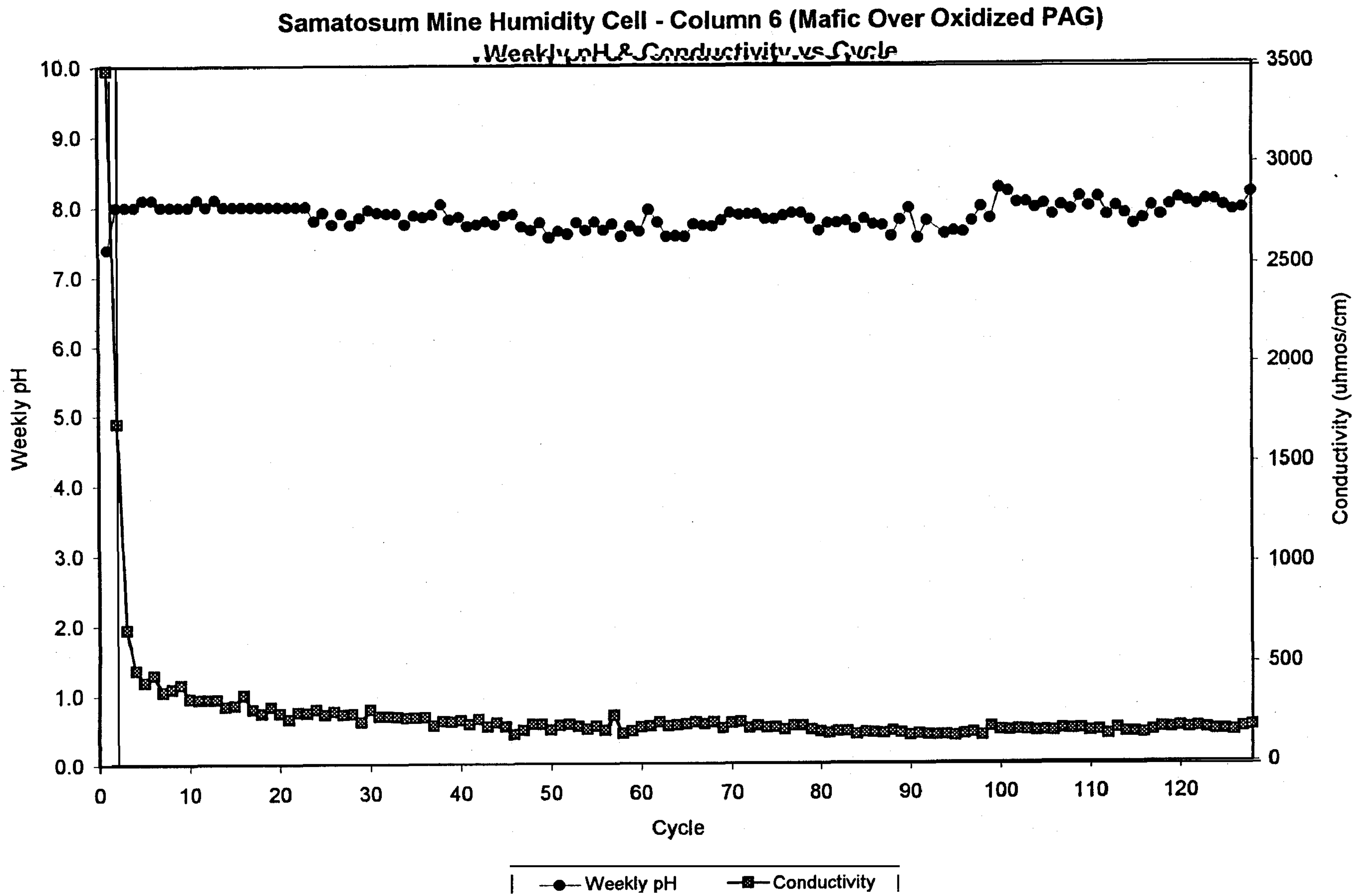
		Dissolved Metals*:								Metal Leach Rates:								Cumulative Metal Leach Rates:							
		Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc	Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc	Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc
Week No.	Date	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn
		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(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)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
66	26-May-93																		1.7E-02	2.3E-02	9.0E-01	2.7E-02	1.3E+01		6.1E-01
67	2-Jun-93																		1.7E-02	2.3E-02	9.0E-01	2.7E-02	1.3E+01		6.1E-01
68	9-Jun-93																		1.7E-02	2.3E-02	9.0E-01	2.7E-02	1.3E+01		6.1E-01
69	16-Jun-93			7E-04	0.05	0.002	0.001		0.01			3.8E-04	2.7E-02	1.1E-03	5.4E-04		4.6E-03		1.7E-02	2.3E-02	9.3E-01	2.8E-02	1.3E+01		6.1E-01
70	23-Jun-93																		1.7E-02	2.3E-02	9.5E-01	2.9E-02	1.3E+01		6.2E-01
71	30-Jun-93																		1.7E-02	2.3E-02	9.5E-01	2.9E-02	1.3E+01		6.2E-01
72	7-Jul-93																		1.7E-02	2.3E-02	9.5E-01	2.9E-02	1.3E+01		6.2E-01
73	14-Jul-93			0.001	0.05	0.002	0.001		0			5.48041	2.7E-02	1.1E-03	5.4E-04		1.9E-03		1.7E-02	2.4E-02	9.8E-01	3.0E-02	1.3E+01		6.2E-01
74	21-Jul-93																		1.7E-02	2.4E-02	1.0E+00	3.1E-02	1.3E+01		6.2E-01
75	28-Jul-93																		1.7E-02	2.4E-02	1.0E+00	3.1E-02	1.3E+01		6.2E-01
76	4-Aug-93																		1.7E-02	2.4E-02	1.0E+00	3.1E-02	1.3E+01		6.2E-01
77	11-Aug-93			9E-04	0.05	0.001	0.005		0			4.9E-04	2.7E-02	5.4E-04	2.7E-03		1.8E-03		1.7E-02	2.5E-02	1.0E+00	3.1E-02	1.3E+01		6.2E-01
78	18-Aug-93																		1.7E-02	2.6E-02	1.1E+00	3.2E-02	1.3E+01		6.2E-01
79	25-Aug-93																		1.7E-02	2.6E-02	1.1E+00	3.2E-02	1.3E+01		6.2E-01
80	1-Sep-93																		1.7E-02	2.6E-02	1.1E+00	3.2E-02	1.3E+01		6.3E-01
81	8-Sep-93			0.002	0.05	0.001	0.001		0.01			9.8E-04	2.7E-02	5.4E-04	5.4E-04		4.1E-03		1.7E-02	2.7E-02	1.1E+00	3.3E-02	1.3E+01		6.3E-01
82	15-Sep-93																		1.7E-02	2.8E-02	1.1E+00	3.3E-02	1.3E+01		6.3E-01
83	22-Sep-93																		1.7E-02	2.7E-02	1.1E+00	3.3E-02	1.3E+01		6.3E-01
84	29-Sep-93																		1.7E-02	2.7E-02	1.1E+00	3.3E-02	1.3E+01		6.3E-01
85	6-Oct-93			8E-04	0.05	0.001	0.006		0			4.3E-04	2.7E-02	5.3E-04	3.2E-03		2.0E-03		1.7E-02	2.8E-02	1.1E+00	3.4E-02	1.3E+01		6.3E-01
86	13-Oct-93																		1.7E-02	2.8E-02	1.2E+00	3.4E-02	1.3E+01		6.4E-01
87	20-Oct-93																		1.7E-02	2.8E-02	1.2E+00	3.4E-02	1.3E+01		6.4E-01
88	27-Oct-93																		1.7E-02	2.8E-02	1.2E+00	3.4E-02	1.3E+01		6.4E-01
89	3-Nov-93			0.001	0.05	0.001	0.001		0			6.4E-04	2.7E-02	5.3E-04	5.3E-04		2.2E-03		1.7E-02	2.9E-02	1.2E+00	3.5E-02	1.3E+01		6.4E-01
90	10-Nov-93																		1.7E-02	3.0E-02	1.2E+00	3.5E-02	1.3E+01		6.4E-01
91	17-Nov-93																		1.7E-02	2.9E-02	1.2E+00	3.5E-02	1.3E+01		6.4E-01
92	24-Nov-93																		1.7E-02	2.9E-02	1.2E+00	3.5E-02	1.3E+01		6.4E-01
93	1-Dec-93			5E-04	0.05	0.001	0.001		0			2.8E-04	2.8E-02	5.6E-04	5.6E-04		1.5E-03		1.7E-02	3.0E-02	1.3E+00	3.6E-02	1.3E+01		6.4E-01
94	8-Dec-93																		1.7E-02	3.0E-02	1.3E+00	3.6E-02	1.3E+01		6.4E-01
95	15-Dec-93																		1.7E-02	3.0E-02	1.3E+00	3.6E-02	1.3E+01		6.4E-01
96	22-Dec-93																		1.7E-02	3.0E-02	1.3E+00	3.6E-02	1.3E+01		6.4E-01
97	29-Dec-93			5E-04	0.05	0.001	0.001		0			2.6E-04	2.6E-02	5.2E-04	5.2E-04		1.9E-03		1.7E-02	3.0E-02	1.3E+00	3.7E-02	1.3E+01		6.4E-01
98	5-Jan-94																		1.7E-02	3.0E-02	1.3E+00	3.8E-02	1.3E+01		6.5E-01
99	12-Jan-94																		1.7E-02	3.0E-02	1.3E+00	3.8E-02	1.3E+01		6.5E-01
100	19-Jan-94																		1.7E-02	3.0E-02	1.3E+00	3.8E-02	1.3E+01		6.6E-01
101	26-Jan-94			7E-04	0.05	0.002	0.001		0			3.7E-04	2.7E-02	1.1E-03	5.3E-04		2.1E-03		1.7E-02	3.1E-02	1.4E+00	3.9E-02	1.3E+01		6.5E-01
102	2-Feb-94																		1.7E-02	3.1E-02	1.4E+00	4.0E-02	1.3E+01		6.5E-01
103	9-Feb-94																		1.7E-02	3.1E-02	1.4E+00	4.0E-02	1.3E+01		6.5E-01
104	16-Feb-94																		1.7E-02	3.2E-02	1.4E+00	4.0E-02	1.3E+01		6.5E-01
105	23-Feb-94			0.001	0.05	0.001	0.001		0			7.4E-04	2.6E-02	5.3E-04	5.3E-04		2.1E-04		1.7E-02	3.2E-02	1.4E+00	4.0E-02	1.3E+01		6.5E-01
106	2-Mar-94																		1.7E-02	3.3E-02	1.4E+00	4.1E-02	1.3E+01		6.5E-01
107	9-Mar-94																		1.7E-02	3.3E-02	1.4E+00	4.1E-02	1.3E+01		6.5E-01
108	16-Mar-94																		1.7E-02	3.3E-02	1.4E+00	4.1E-02	1.3E+01		6.6E-01
109	23-Mar-94			0.002	0.05	0.002	0.001		0.02			1.2E-03	2.7E-02	1.1E-03	5.3E-04		1.0E-02		1.7E-02	3.5E-02	1.5E+00	4.2E-02	1.3E+01		6.7E-01
110	30-Mar-94																		1.7E-02	3.6E-02	1.5E+00	4.3E-02	1.3E+01		6.8E-01
111	6-Apr-94																		1.7E-02	3.5E-02	1.5E+00	4.3E-02	1.3E+01		6.7E-01
112	13-Apr-94																		1.7E-02	3.5E-02	1.5E+00	4.3E-02	1.3E+01		6.7E-01
113	20-Apr-94			0.001	0.05	0.001	0.001		0			5.2E-04	2.6E-02	5.2E-04	5.2E-04		1.8E-03		1.7E-02	3.6E-02	1.5E+00	4.3E-02	1.3E+01		6.7E-01
114	27-Apr-94																		1.7E-02	3.6E-02	1.5E+00	4.4E-02	1.3E+01		6.8E-01
115	4-May-94																		1.7E-02	3.6E-02	1.5E+00	4.4E-02	1.3E+01		6.8E-01
116	11-May-94																		1.7E-02	3.6E-02	1.5E+00	4.4E-02	1.3E+01		6.8E-01
117	18-May-94			8E-04	0.05	0.001	0.001		0			4.1E-04	2.6E-02	5.1E-04	5.1E-04		1.8E-03		1.7E-02	3.7E-02	1.6E+00	4.4E-02	1.3E+01		6.8E-01
118	25-May-94																		1.7E-02	3.7E-02	1.6E+00	4.5E-02	1.3E+01		6.8E-01
119	1-Jun-94																		1.7E-02	3.8E-02	1.6E+00	4.5E-02	1.3E+01		6.8E-01
120	8-Jun-94																		1.7E-02	3.8E-02	1.6E+00	4.5E-02	1.3E+01		6.8E-01
121	15-Jun-94			0.004	0.05	0.001	0.001		0			1.8E-03	2.6E-02	5.1E-04	5.1E-04		1.4E-03		1.7E-02	4.0E-02	1.6E+00	4.5E-02	1.3E+01		6.8E-01
122	22-Jun-94																		1.7E-02	4.2E-02	1.6E+00	4.6E-02	1.3E+01		6.8E-01
123	29-Jun-94																		1.7E-02	4.2E-02	1.6E+00	4.6E-02	1.3E+01		6.8E-01
124	6-Jul-94																		1.7E-02	4.3E-02	1.6E+00	4.6E-02	1.3E+01		6.8E-01
125	13-Jul-94			0.006	0.05	0.001	0.001		0			3.0E-03	2.6E-02	5.3E-04	5.3E-04		2.6E-03		1.7E-02	4.6E-02	1.7E+00	4.6E-02	1.3E+01		6.8E-01
126	20-Jul-94																		1.7E-02	4.9E-02	1.7E+00	4.7E-02	1.3E+01		6.9E-01
127	27-Jul-94																		1.7E-02	5.2E-02	1.7E+00	4.7E-02	1.3E+01		6.9E-01
128	3-Aug-94																		1.7E-02	5.5E-02	1.7E+00	4.8E-02	1.3E+01		6.9E-01
Maximum			0.002	0.006	0.05	0.005	19.5		0.79		1.1E-03	3.0E-03	2.8E-02	2.7E-03	5.0E+00		2.0E-01		1.7E-02	5.5E-02	1.7E+00	4.8E-02	1.4E+01		6.9E-01
Minimum			0.001	5E-04	0.05	0.001	0.001		0		2.5E-04	2.6E-04	1.3E-02	2.5E-04	3.9E-04		2.1E-04		2.5E-04	3.0E-04	1.3E-02	2.5E-04	5.0E+00		2.0E-01

* If values were reported as < detection limit, 1/2 the detection limit is shown in italics and was used in subsequent calculations

Samatosum Mine Humidity Cell Data -Column 6 (Mafic Over Oxidized PAG)

		Dissolved Metals*:								Metal Leach Rates:								Cumulative Metal Leach		
Week No.	Date	Antimony D-Sb (mg/L)	Arsenic D-As (mg/L)	Copper D-Cu (mg/L)	Iron D-Fe (mg/L)	Lead D-Pb (mg/L)	Manganese D-Mn (mg/L)	Silver D-Ag (mg/L)	Zinc D-Zn (mg/L)	Antimony D-Sb (mg/kg/wk)	Arsenic D-As (mg/kg/wk)	Copper D-Cu (mg/kg/wk)	Iron D-Fe (mg/kg/wk)	Lead D-Pb (mg/kg/wk)	Manganese D-Mn (mg/kg/wk)	Silver D-Ag (mg/kg/wk)	Zinc D-Zn (mg/kg/wk)	Antimony D-Sb (mg/kg)	Arsenic D-As (mg/kg)	Coppe D-C (mg/k
0	19-Feb-92																		2.5E-04	3.0E-
1	26-Feb-92		0.001	0.001	0.05	0.001	19.5		0.79		2.5E-04	3.0E-04	1.3E-02	2.5E-04	5.0E+00		2.0E-01		5.1E-04	6.1E-
2	4-Mar-92																		8.4E-04	9.5E-
3	11-Mar-92																		9.1E-04	9.8E-
4	18-Mar-92																		9.8E-04	1.0E-
5	25-Mar-92		0.001	8E-04	0.05	0.001	1.8		0.01		5.5E-04	4.4E-04	2.8E-02	5.5E-04	9.9E-01		7.2E-03		1.5E-03	1.5E-
6	1-Apr-92																		2.1E-03	1.9E-
7	8-Apr-92																		2.1E-03	1.8E-
8	15-Apr-92																		2.1E-03	1.8E-
9	22-Apr-92		0.001	6E-04	0.05	0.001	0.002		0		5.4E-04	3.3E-04	2.7E-02	5.4E-04	1.1E-03		8.1E-04		2.6E-03	2.1E-
10	29-Apr-92																		3.2E-03	2.5E-
11	6-May-92																		3.2E-03	2.5E-
12	13-May-92																		3.2E-03	2.5E-
13	20-May-92		0.001	7E-04	0.05	0.001	0.001		0		5.3E-04	3.7E-04	2.7E-02	5.3E-04	5.3E-04		2.5E-03		3.7E-03	2.9E-
14	27-May-92																		4.2E-03	3.2E-
15	3-Jun-92																		4.2E-03	3.2E-
16	10-Jun-92																		4.2E-03	3.2E-
17	17-Jun-92		0.001	5E-04	0.05	0.001	0.001		0		5.5E-04	2.8E-04	2.8E-02	5.5E-04	5.5E-04		1.5E-03		4.8E-03	3.4E-
18	24-Jun-92																		5.5E-03	3.8E-
19	1-Jul-92																		5.6E-03	3.8E-
20	8-Jul-92																		5.7E-03	3.9E-
21	15-Jul-92		0.002	9E-04	0.05	0.001	0.001		0.06		1.1E-03	4.9E-04	2.7E-02	5.4E-04	5.4E-04		3.3E-02		6.8E-03	4.4E-
22	22-Jul-92																		7.9E-03	4.9E-
23	29-Jul-92																		7.9E-03	5.0E-
24	5-Aug-92																		7.9E-03	5.0E-
25	12-Aug-92		0.002	0.001	0.05	0.00	0.001		0.01		1.1E-03	7.4E-04	2.7E-02	5.3E-04	5.3E-04		3.0E-03		8.9E-03	5.8E-
26	19-Aug-92																		9.9E-03	6.4E-
27	26-Aug-92																		9.8E-03	6.3E-
28	2-Sep-92																		9.6E-03	6.2E-
29	9-Sep-92		0.001	5E-04	0.05	0.001	0.001		0		5.6E-04	2.8E-04	2.8E-02	5.6E-04	5.6E-04		1.4E-03		1.0E-02	6.5E-
30	16-Sep-92																		1.1E-02	6.8E-
31	23-Sep-92																		1.1E-02	6.9E-
32	30-Sep-92																		1.1E-02	7.0E-
33	7-Oct-92		0.001	0.001	0.05	0.001	0.001		0.01		5.4E-04	5.9E-04	2.7E-02	5.4E-04	5.4E-04		2.7E-03		1.1E-02	7.6E-
34	14-Oct-92																		1.2E-02	8.1E-
35	21-Oct-92																		1.2E-02	8.0E-
36	28-Oct-92																		1.2E-02	7.9E-
37	4-Nov-92		0.001	5E-04	0.05	0.001	0.001		0		5.4E-04	2.7E-04	2.7E-02	5.4E-04	5.4E-04		2.2E-03		1.2E-02	8.2E-
38	11-Nov-92																		1.3E-02	8.5E-
39	18-Nov-92																		1.3E-02	8.6E-
40	25-Nov-92																		1.3E-02	8.7E-
41	2-Dec-92		0.001	0.001	0.05	0.001	0.005		0		5.3E-04	5.3E-04	2.7E-02	5.3E-04	2.7E-03		1.7E-03		1.3E-02	9.2E-
42	9-Dec-92																		1.4E-02	9.8E-
43	16-Dec-92																		1.4E-02	9.8E-
44	23-Dec-92																		1.4E-02	9.8E-
45	30-Dec-92		0.001	0.001	0.05	0.001	0.003		0		5.4E-04	6.5E-04	2.7E-02	5.4E-04	1.6E-03		1.3E-03		1.5E-02	1.0E-
46	6-Jan-93																		1.5E-02	1.1E-
47	13-Jan-93																		1.5E-02	1.1E-
48	20-Jan-93																		1.5E-02	1.1E-
49	27-Jan-93		0.001	0.002	0.05	0.005	0.001		0.01		5.4E-04	1.1E-03	2.7E-02	2.7E-03	5.4E-04		6.5E-03		1.6E-02	1.3E-
50	3-Feb-93																		1.6E-02	1.4E-
51	10-Feb-93																		1.6E-02	1.4E-
52	17-Feb-93																		1.6E-02	1.4E-
53	24-Feb-93		0.001	0.002	0.05	0.001	0.002		0.01		5.3E-04	1.0E-03	2.7E-02	5.3E-04	1.1E-03		2.9E-03		1.7E-02	1.5E-
54	3-Mar-93																		1.7E-02	1.5E-
55	10-Mar-93																		1.7E-02	1.5E-
56	17-Mar-93																		1.7E-02	1.5E-
57	24-Mar-93			0.001	0.05	0.001	0.001		0.01			5.4E-04	1.9E-02	3.9E-04	3.9E-04		3.1E-03		1.7E-02	1.6E-
58	31-Mar-93																		1.7E-02	1.6E-
59	7-Apr-93																		1.7E-02	1.7E-
60	14-Apr-93																		1.7E-02	1.7E-
61	21-Apr-93			0.002	0.05	0.003	0.001		0.01			1.2E-03	2.7E-02	1.6E-03	5.4E-04		4.0E-03		1.7E-02	1.8E-
62	28-Apr-93																		1.7E-02	1.9E-
63	5-May-93																		1.7E-02	2.0E-
64	12-May-93																		1.7E-02	2.0E-
65	19-May-93			0.004	0.05	0.003	0.001		0.01			1.9E-03	2.7E-02	1.6E-03	5.4E-04		3.6E-03		1.7E-02	2.2E-

** If values were reported as < detection limit, 1/2 the detection limit is shown in italics and was used in subsequent calculations.*



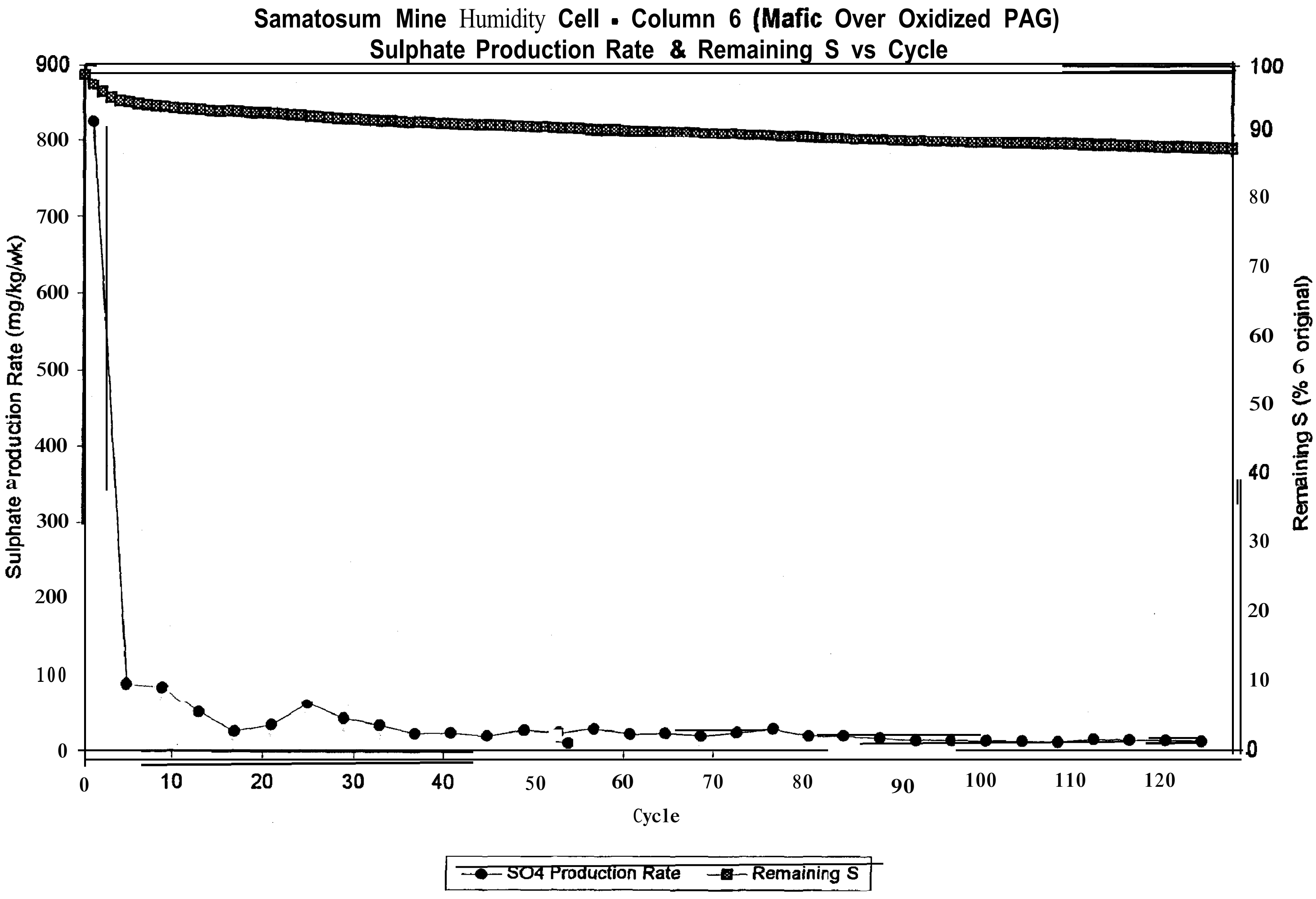
Samatosum Mine Humidity Cell - Column 6 (Mafic Over Oxidized PAG)
Weekly pH & Conductivity vs Cycle
Weekly pH
Conductivity (uhmos/cm)
Cycle
Weekly pH
Conductivity

Samatosum Mine Humidity Cell Data -Column 6 (Mafic Over Oxidized PAG)

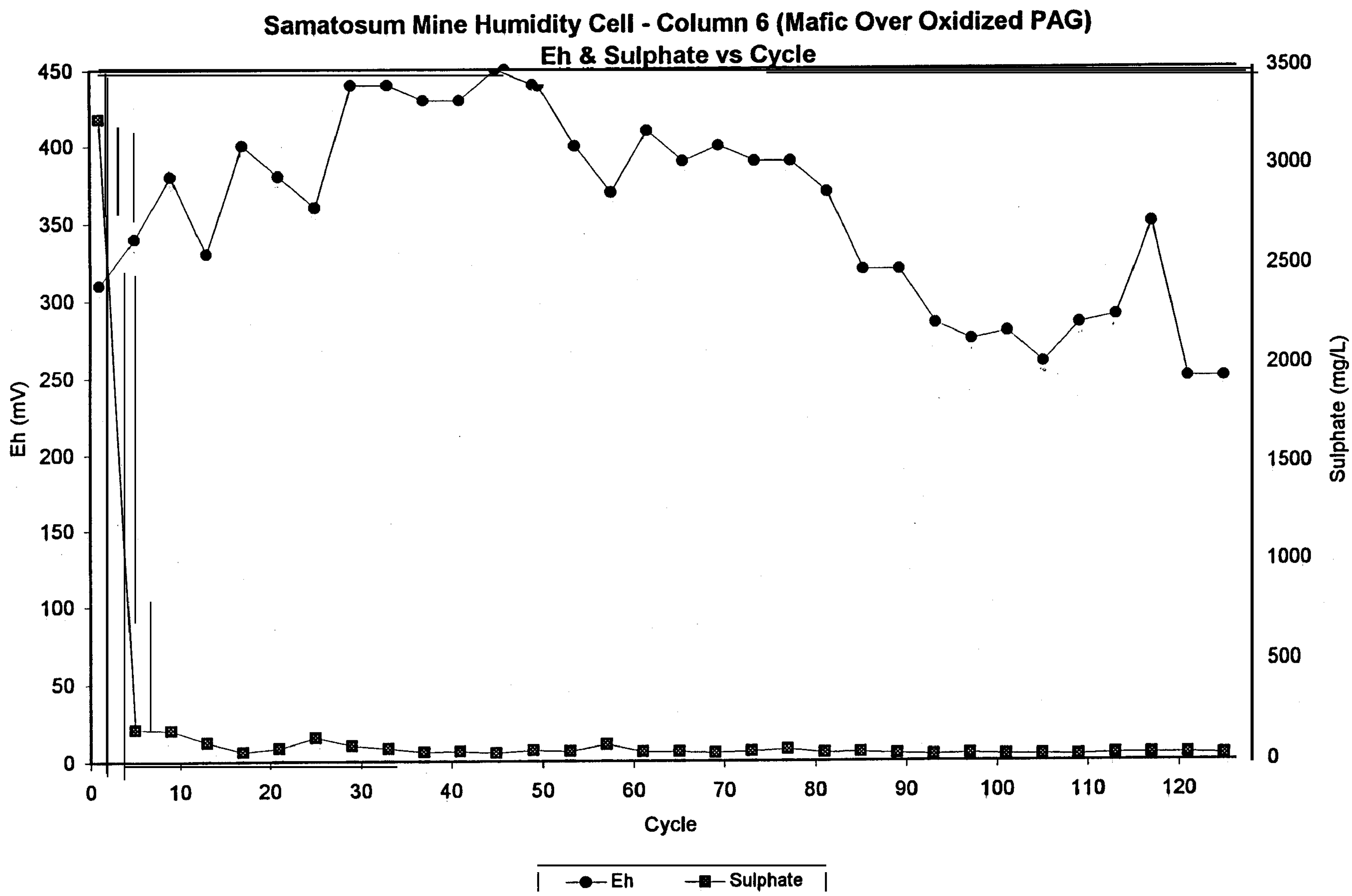
		Dissolved Metals*:							
		Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc
Week No.	Date	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn
		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Mean			0.001	0.0014	0.05	0.001	0.667		0.032
Median			0.001	0.0010	0.05	0.001	0.001		0.004
Mean Last 8 Weeks				0.0046	0.05	0.00	0.001		0.004
75% Remaining (Wks)									
50% Remaining (Wks)									
25% Remaining (Wks)									
0% Remaining (Wks)									

	Metal Leach Rates:							
	Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc
Week No.	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-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)
Mean		6.0E-04	7.2E-04	2.6E-02	7.2E-04	1.9E-01		9.9E-03
Median		5.4E-04	5.3E-04	2.7E-02	5.4E-04	5.4E-04		2.2E-03
Mean Last 8 Weeks			2.4E-03	2.6E-02	5.2E-04	5.2E-04		2.0E-03
75% Remaining (Wks)								
50% Remaining (Wks)								
25% Remaining (Wks)								
0% Remaining (Wks)								

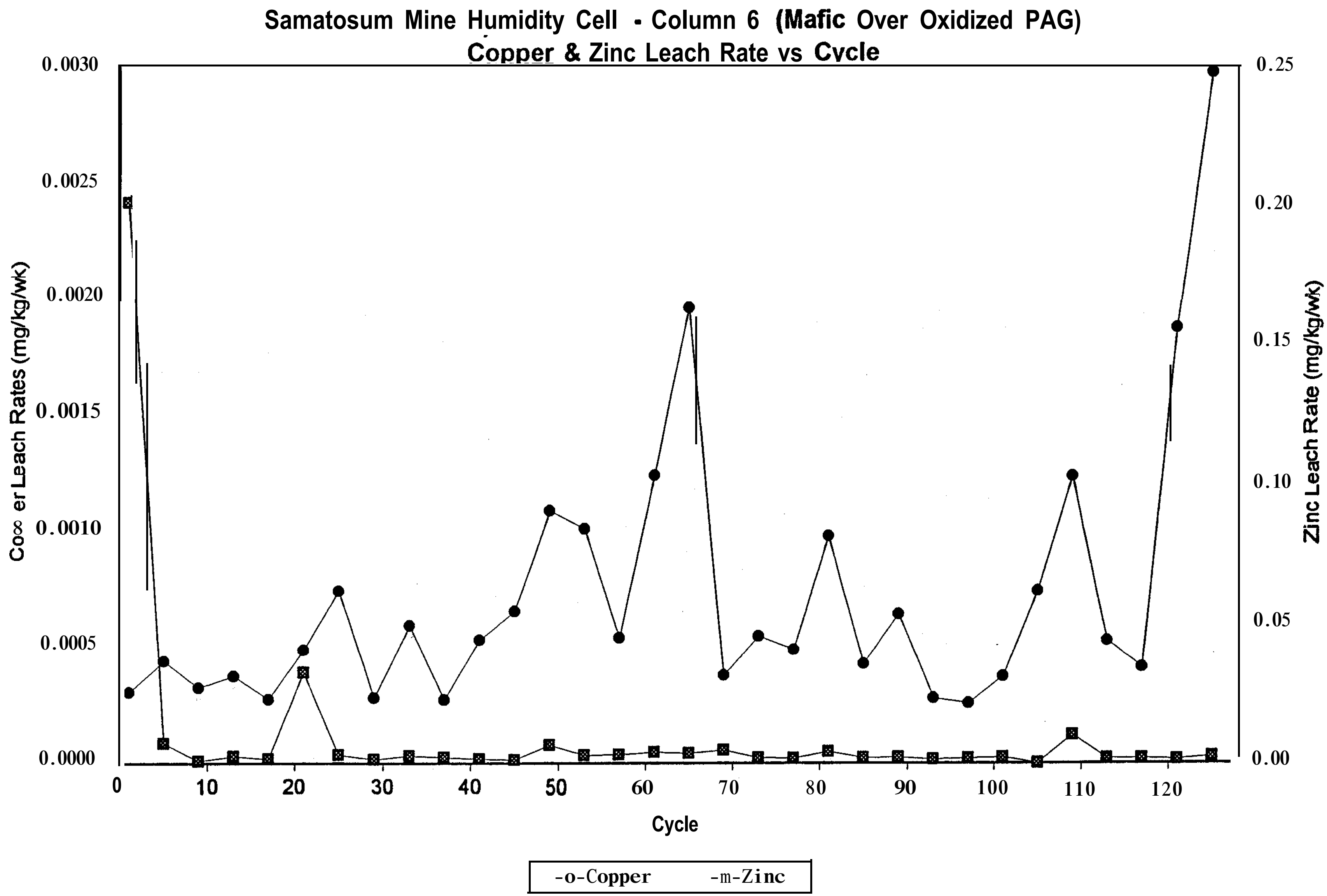
	Cumulative Metal Leach Rates:							
	Antimony	Arsenic	Copper	Iron	Lead	Manganese	Silver	Zinc
Week No.	D-Sb	D-As	D-Cu	D-Fe	D-Pb	D-Mn	D-Ag	D-Zn
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Mean		1.3E-02	2.0E-02	8.6E-01	2.4E-02	1.3E+01		5.9E-01
Median		1.7E-02	2.0E-02	8.5E-01	2.4E-02	1.3E+01		6.0E-01
Mean Last 8 Weeks		1.7E-02	4.6E-02	1.7E+00	4.6E-02	1.3E+01		6.9E-01
75% Remaining (Wks)								
50% Remaining (Wks)								
25% Remaining (Wks)								
0% Remaining (Wks)								



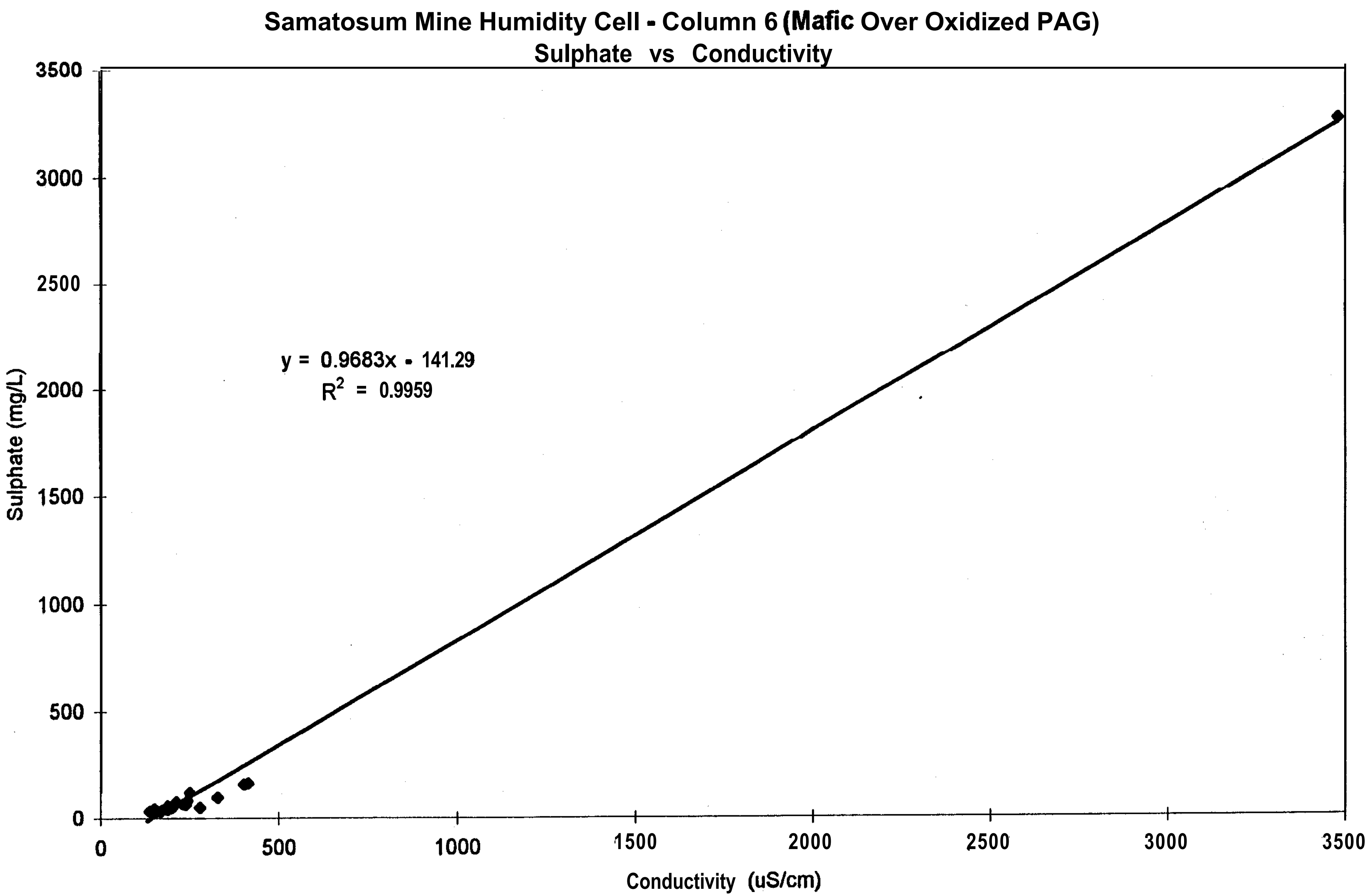
Samatosum Mine Humidity Cell - Column 6 (Mafic Over Oxidized PAG)
Sulphate Production Rate & Remaining S vs Cycle
Sulphate Production Rate (mg/kg/wk)
Remaining S (% of original)
Cycle
SO4 Production Rate
Remaining S



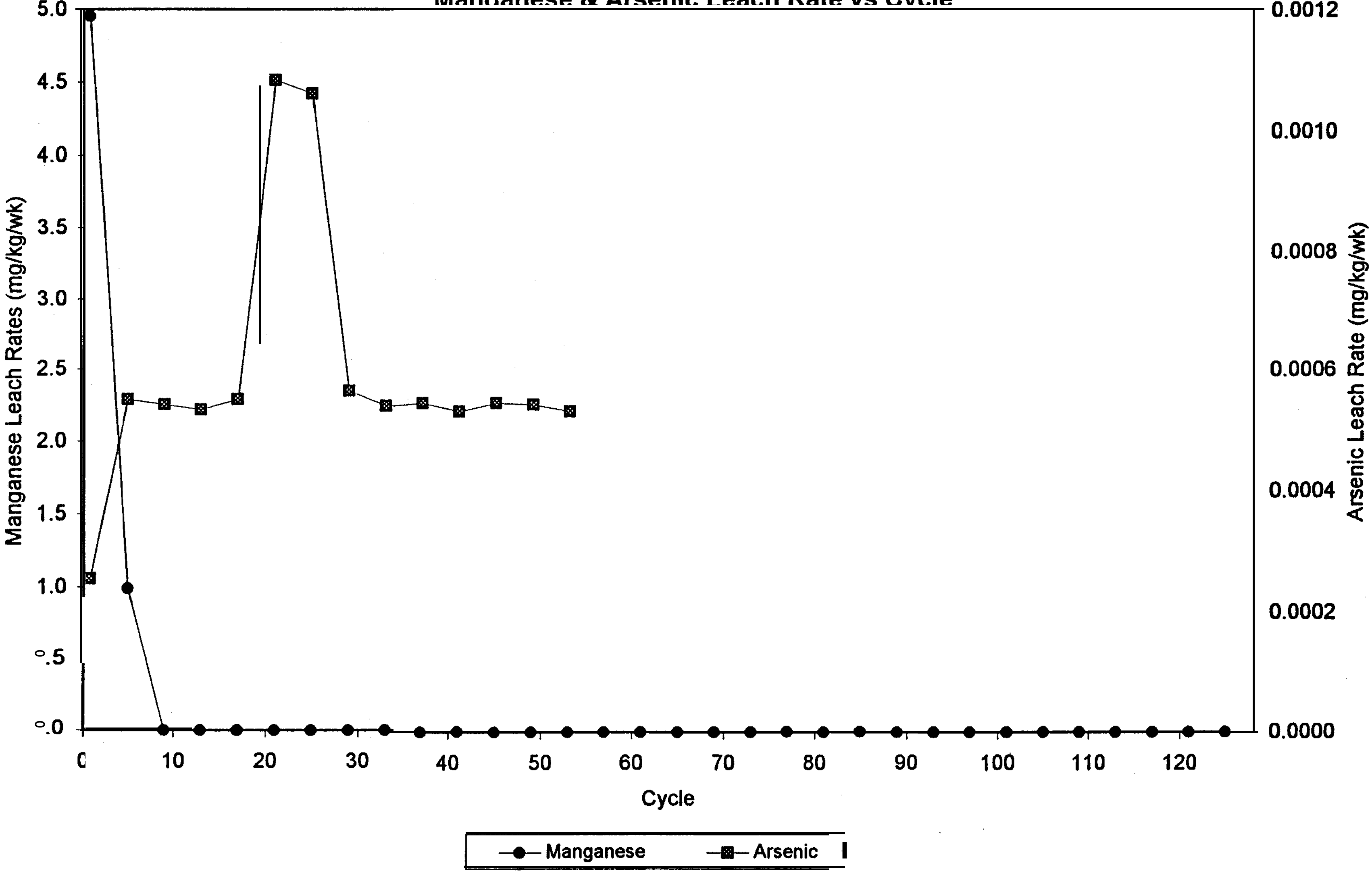
Samatosum Mine Humidity Cell - Column 6 (Mafic Over Oxidized PAG)
Eh & Sulphate vs Cycle
Eh (mV)
Sulphate (mg/L)
Cycle
0
50
100
150
200
250
300
350
400
450
500
1000
1500
2000
2500
3000
3500
10
20
30
40
50
60
70
80
90
100
110
120
Eh
Sulphate

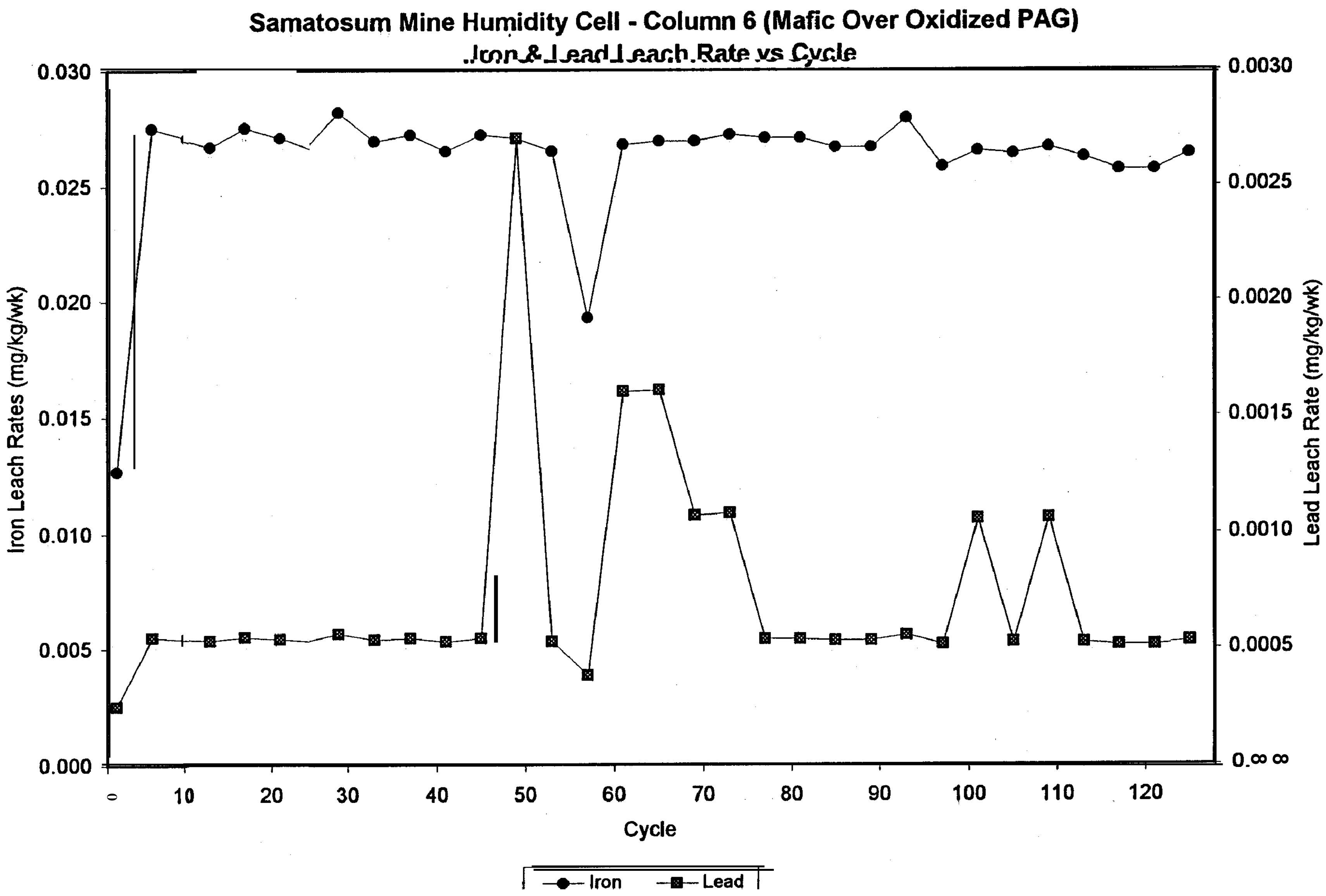


Samatosum Mine Humidity Cell - Column 6 (Mafic Over Oxidized PAG)
Copper & Zinc Leach Rate vs Cycle
Co∞ er Leach Rates (mg/kg/wk)
Zinc Leach Rate (mg/kg/wk)
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
0.25
0.20
0.15
0.10
0.05
0.00
0
10
20
30
40
50
60
70
80
90
100
110
120
Cycle
-o-Copper
-m-Zinc


Samatosum Mine Humidity Cell - Column 6 (Mafic Over Oxidized PAG)
Sulphate vs Conductivity
y = 0.9683x - 141.29
R^2 = 0.9959
Sulphate (mg/L)
3500
3000
2500
2000
1500
1000
500
0
500
1000
1500
2000
2500
3000
3500
Conductivity (uS/cm)

Samatosum Mine Humidity Cell - Column 6 (Mafic Over Oxidized PAG)
Manganese & Arsenic Leach Rate vs Cycle





Samatosum Mine Humidity Cell - Column 6 (Mafic Over Oxidized PAG)
Iron & Lead Leach Rate vs Cycle
Iron Leach Rates (mg/kg/wk)
Lead Leach Rate (mg/kg/wk)
0.030
0.025
0.020
0.015
0.010
0.005
0.000
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0
10
20
30
40
50
60
70
80
90
100
110
120
Cycle
Iron
Lead

APPENDIX

C. Mineralogical Examination of Rock from Column 1 (PAG) and 4 (MAF)

Harris
EXPLORATION SERVICES

MINERALOGY AND GEOCHEMISTRY

534 ELLIS STREET, NORTH VANCOUVER, B.C., CANADA V7H 2G6 TELEPHONE (604) 929-5667

Report for: Morwijk Enterprises,
2401 - 289 Drake St.,
VANCOUVER, B.C.
V6B 5Z5

Report 96-96

September 24, 1996

PETROGRAPHIC EXAMINATION OF SAMPLES FROM THE SAMATOSUM DEPOSIT

Introduction:

Two samples of crushed rock (designated COL. 1 and COL. 4), representing the end products of prolonged simulated weathering in humidity cells, were forwarded by Chemex Labs. Portions of the 1 - 10 mm size fractions from each sample were briquetted in epoxy and prepared as polished thin sections.

Summary:

Sample COL. 1 consists of fine-grained, quartz-rich rocks of meta-sedimentary and meta-exhalite aspect. Carbonate is rare - its estimated overall abundance in the sectioned material being about 0.2%. The estimated overall sulfide content is about 1%, as sporadic fine-grained disseminations of pyrite. Rare traces of sphalerite were also seen.

The constituent rock fragments show surface staining by transported limonite and/or encrustation and incipient cementation by limonite-impregnated, mica-rich fines. Pyrite in the rock matrices shows no recognizable effects of oxidation. It would appear that, under the conditions of the test, oxidation of sulfides was confined to liberated, micron-sized grains in a minor slimes-sized component of the crushed sample.

Sample COL. 4 consists of fragments of greenstone meta-volcanics - probably original andesitic tuffs or volcaniclastics. They consist dominantly of intergrowths of plagioclase, chlorite, actinolite and carbonate. The overall carbonate is estimated as 18%.

Sulfides are rare (estimated 0.3% overall), and restricted to a very few fragments. They consist of sparsely disseminated subhedra of fresh pyrite up to 0.3 mm in size.

The rock fragments making up this sample are notably clean. They show no surface staining or ferruginized coatings. This is also

PHOTOMICROGRAPHS

All photos are at a scale of 1 cm = 170 microns.

SAMPLE COL. 1

Neg. 406-18: Reflected light. Example of relatively abundant development of disseminated pyrite in a siliceous rock matrix. The pyrite is fresh. Two grey grains (left centre) are sphalerite.

Neg. 406-19: Cross-polarized transmitted light. Same field as 406-18. Matrix at left side of field is varigranular quartz (greys). That at right includes a band of fine-grained sericite (colours).

Neg. 406-20: Reflected light. Example of the greywacke lithotype commonly represented in this sample. Field includes sparse disseminated pyrite (white) and a diagonal microfracture (dark) delineated by local development of limonite. The pyrite grains show no evidence of oxidation.

Neg. 406-21: Cross-polarized transmitted light. Same field as 405-20. rock is composed of discrete quartz grains in a silty matrix of quartz and sericite.

Neg. 406-22: Plane-polarized transmitted light. Fine-grained quartz aggregate (probable meta-chert) with vari-granular disseminated pyrite (opaque; equant black grains). Dark area at bottom is part of an encrustation of limonite-cemented slimes coating the surface of the rock fragment. Minor diffuse limonite staining (brown) is developed in the body of the rock.

Neg. 406-23: Reflected light. Same field as 406-22. Note that the pyrite grains show no evidence of oxidation (in the form of limonite rims or leached outlines), even immediately adjacent to the surface coating of limonite. The latter is indicated as being of exogenic (redistributed) origin - not derived from in-situ oxidation of the pyrite in this particular rock fragment.

SAMPLE COL. 4

Neg. 406-24: Reflected light. Example of a rare development of pyrite, as disseminated, fresh grains in a chlorite-rich matrix.

Neg. 406-25: Cross-polarized transmitted light. Same field as 406-24. Dark olive green is chlorite. Grey/white grains are quartz. Tan colour (lower right) are carbonate. The pyrite grains (opaque) appear black.

true of the concentrations of carbonate within the fragments. It would appear that little or no reaction has occurred under the test conditions. The large excess of carbonate present can be expected to have neutralized any incipient generation of acid.

Individual sample descriptions are attached, together with illustrative photomicrographs.

J.F. Harris Ph.D.

SAMPLE: COL. 1

Estimated mode

Quartz	83
Sericite	12
Chlorite	3.5
Carbonate	0.2
Pyrite	1
Sphalerite	trace
Limonite	0.3

This sample consists of fragments of a variety of lithotypes - dominantly of siliceous composition and probable meta-sedimentary and/or meta-volcanic exhalative affinities.

They include greywackes composed of quartz grains, 50 - 500 microns in size, in a silty matrix with minor accessory sericite; microgranular quartz and quartz/sericite rocks (possible meta-cherts); intensely sheared quartz aggregates; coarsely granular vein-type quartz; and compact aggregates of cryptocrystalline chlorite.

Carbonate is very minor. It was seen in only 2 of the 32 fragments making up the thin section. These two occurrences consist of disseminated small grains of carbonate in a compact chlorite rock; and interstitial pockets of carbonate in a fragment of coarsely granular, vein-type quartz.

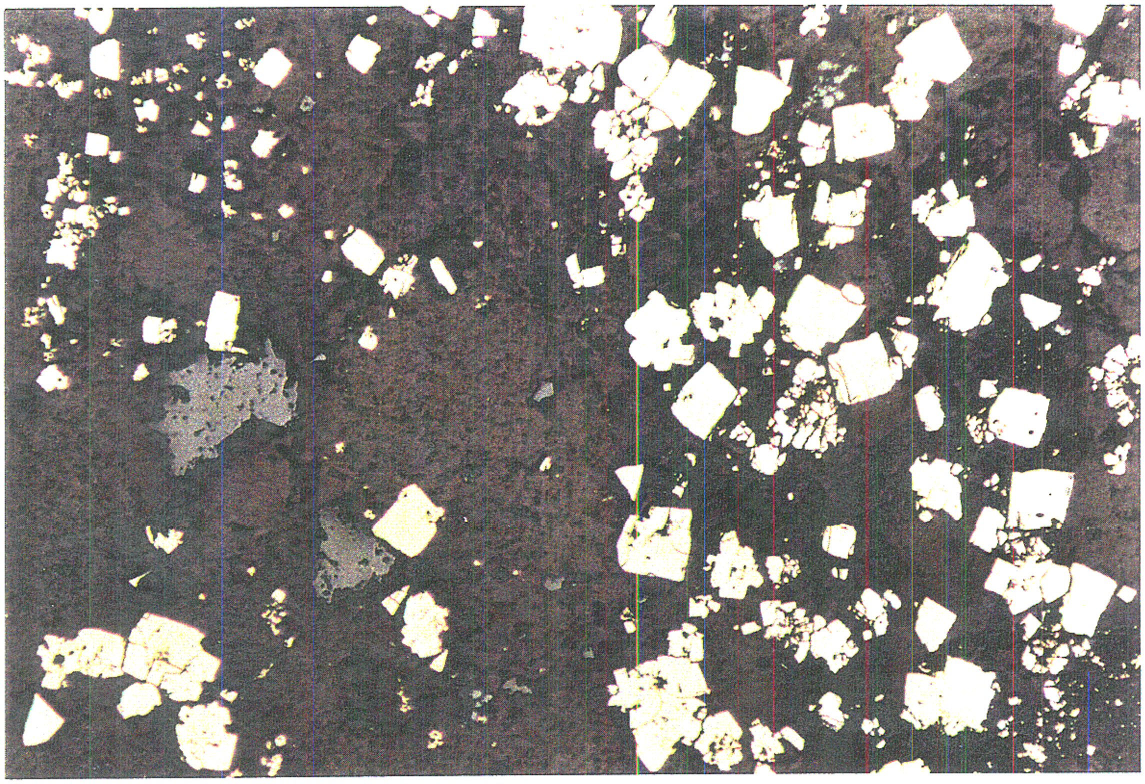
Sulfides are also minor, but somewhat more widespread than the carbonate. About 7 of the 32 constituent fragments contain an average of 5% pyrite. This occurs as localized fine-grained disseminations of grains 5 - 100 microns in size, locally aggregating as small clumps. Rare, small grains of sphalerite were seen in a couple of fragments.

The rock fragments making up this sample typically show surface staining by limonite and/or have thin surface coatings of limonite-cemented micaceous fines. These ferruginized slimes sometimes incorporate small, discrete rock chips, and act as a potential cementing agent to the larger fragments.

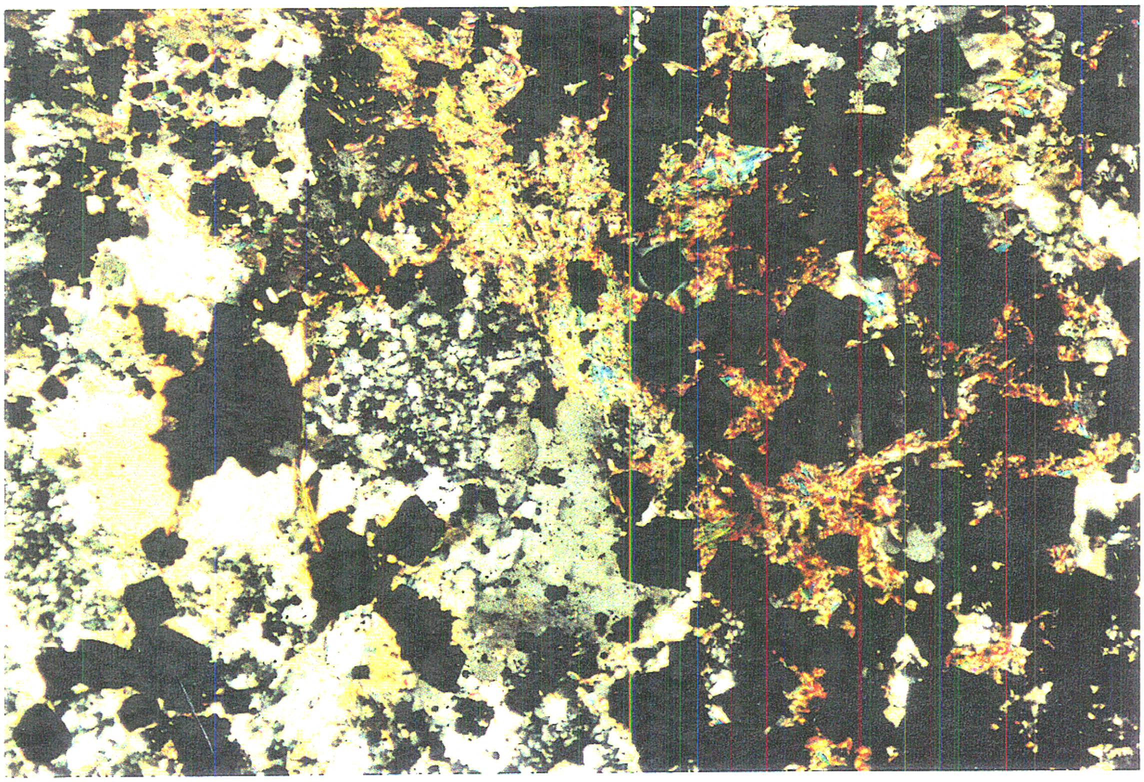
The incidence of ferruginous coatings appears independent of the presence or absence of sulfides in the fragments. Where pyrite does occur in the body of the rock, it shows no recognizable evidence of oxidation. This is true even of those grains immediately adjacent to the limonite-stained surfaces. Apparently the latter effect represents the redistribution of Fe from oxidation of liberated sulfides in a minor slimes-sized component of the sample.

Neg. 406-26: Cross-polarized transmitted light. Example of a banded concentration of carbonate (abundant in this sample). This takes the form of an equigranular aggregate of carbonate (tan **colours)** intergrown with plagioclase (grey). The upper half of the field (dark/orange) is a compact aggregate of fine-grained actinolite.

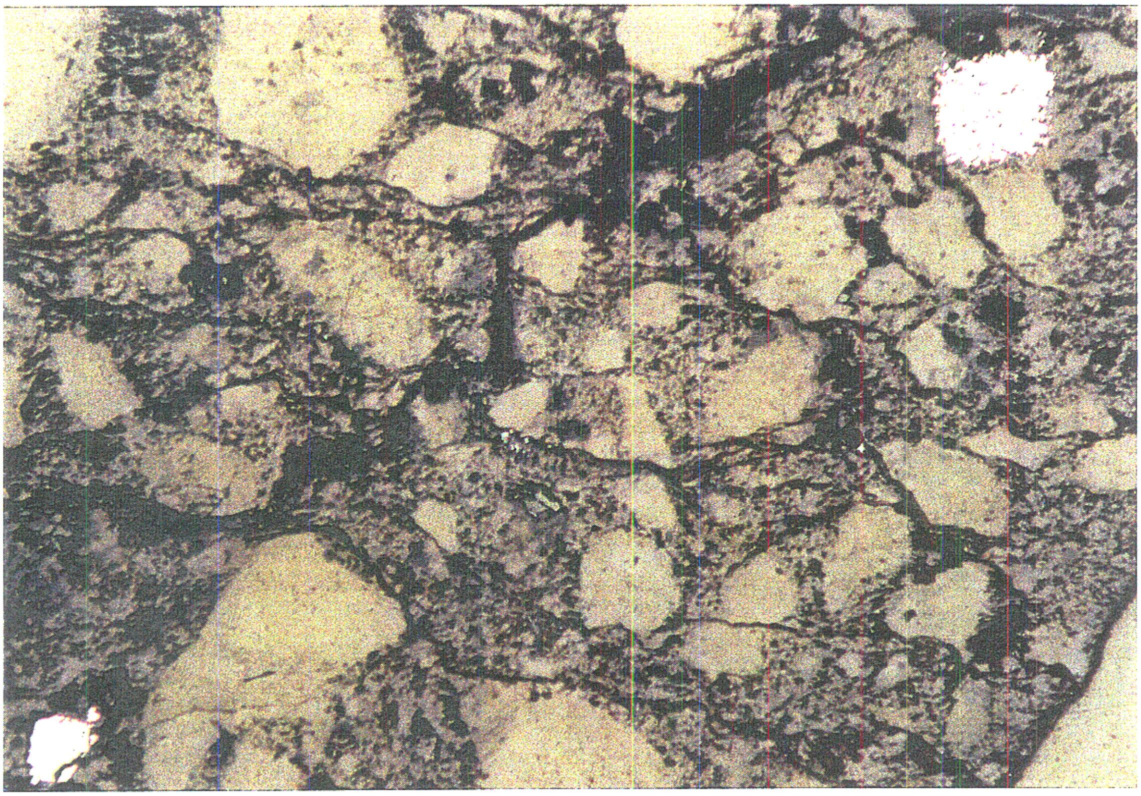
Neg. 406-27: Reflected light. Fragment at upper left is compact chlorite (greenish) with disseminated pyrite (one of the few occurrences of sulfides in the thin section). The other fragment is rich in carbonate (light-coloured flecks). Note freshness of the pyrite, and lack of limonite staining or coatings on the fragment surfaces.



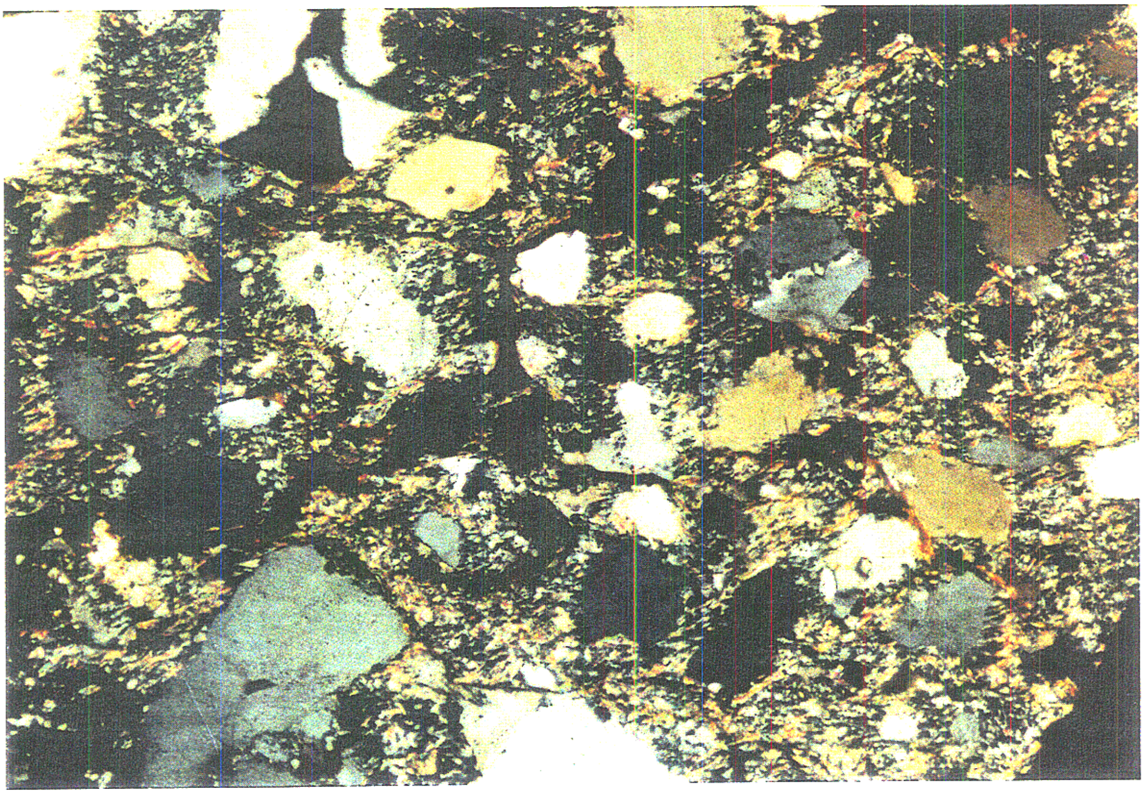
Samatosum Sample Column 1 (unsorted), Neg. 406-19



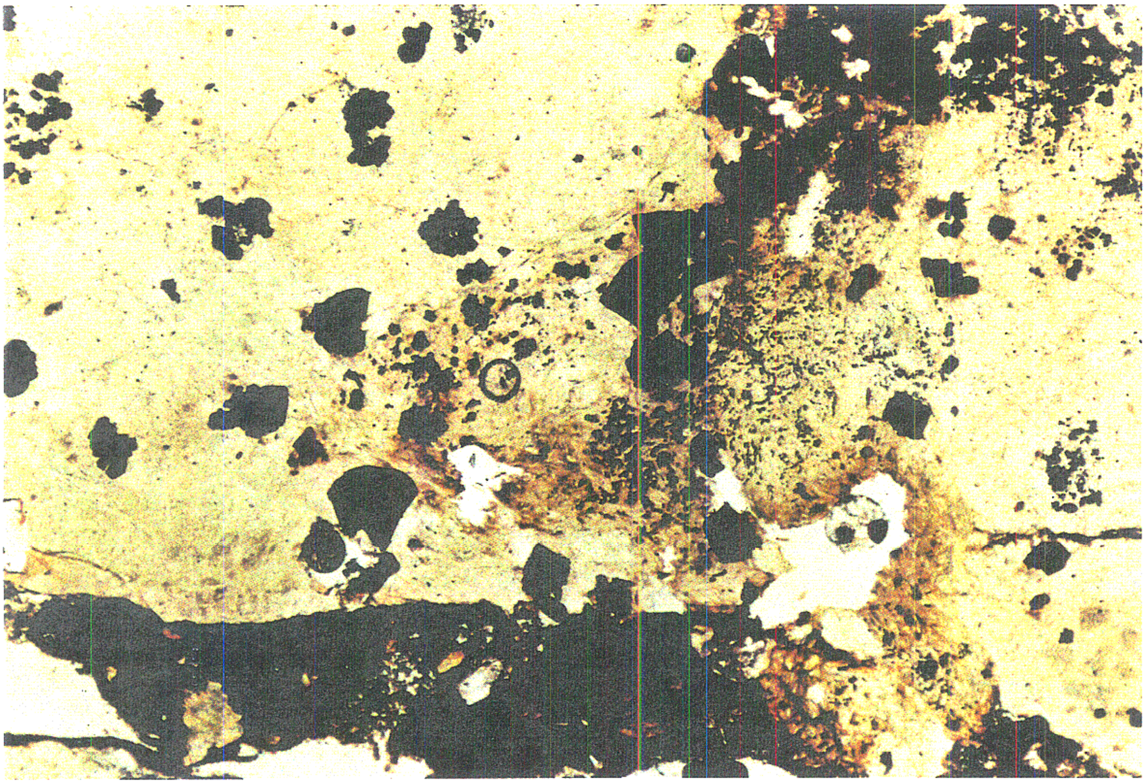
Samatosum Sample Column 1 (unsorted), Neg. 406-18



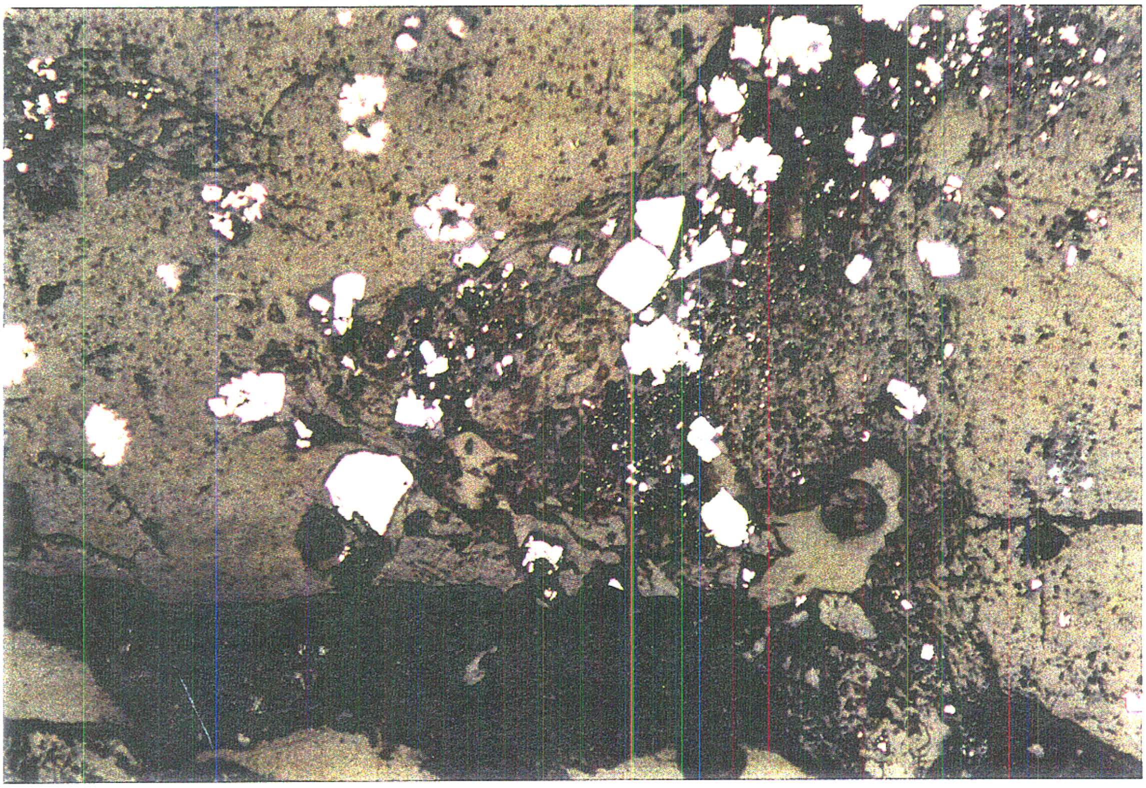
Samatosum Sample Column 1 (unsorted), Neg. 406-20



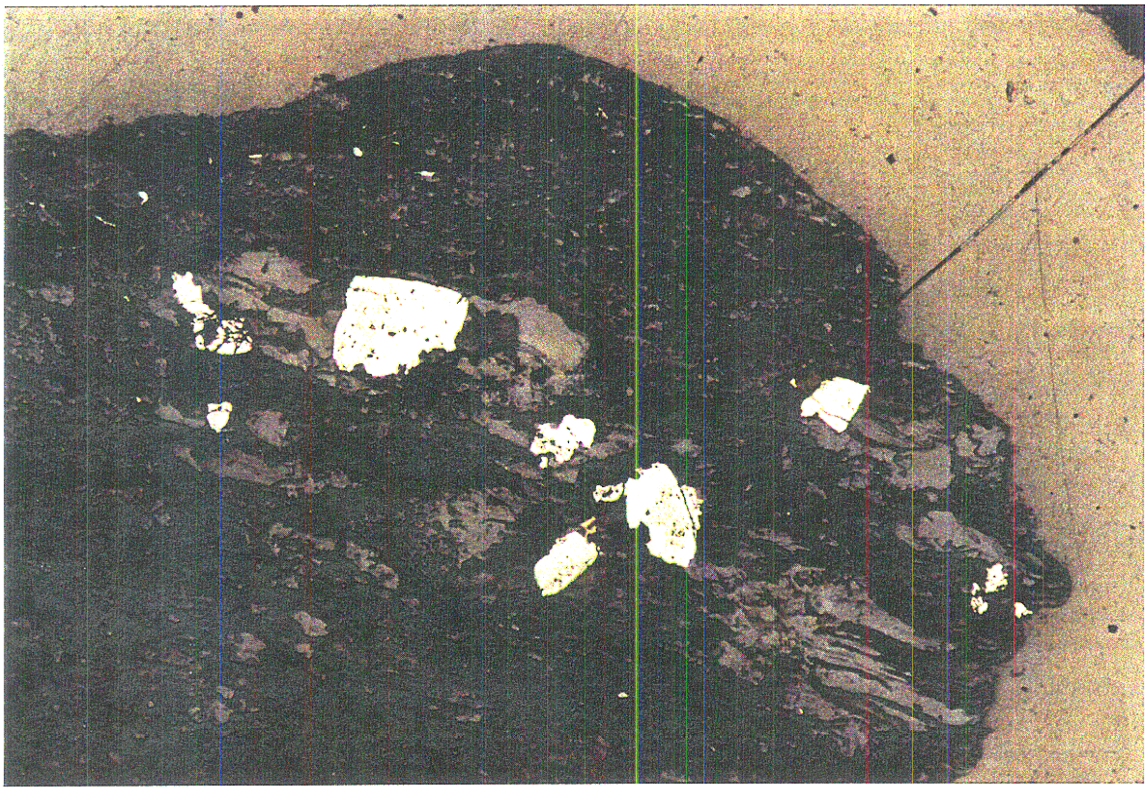
Samatosum Sample Column 1 (unsorted), Neg. 406-21



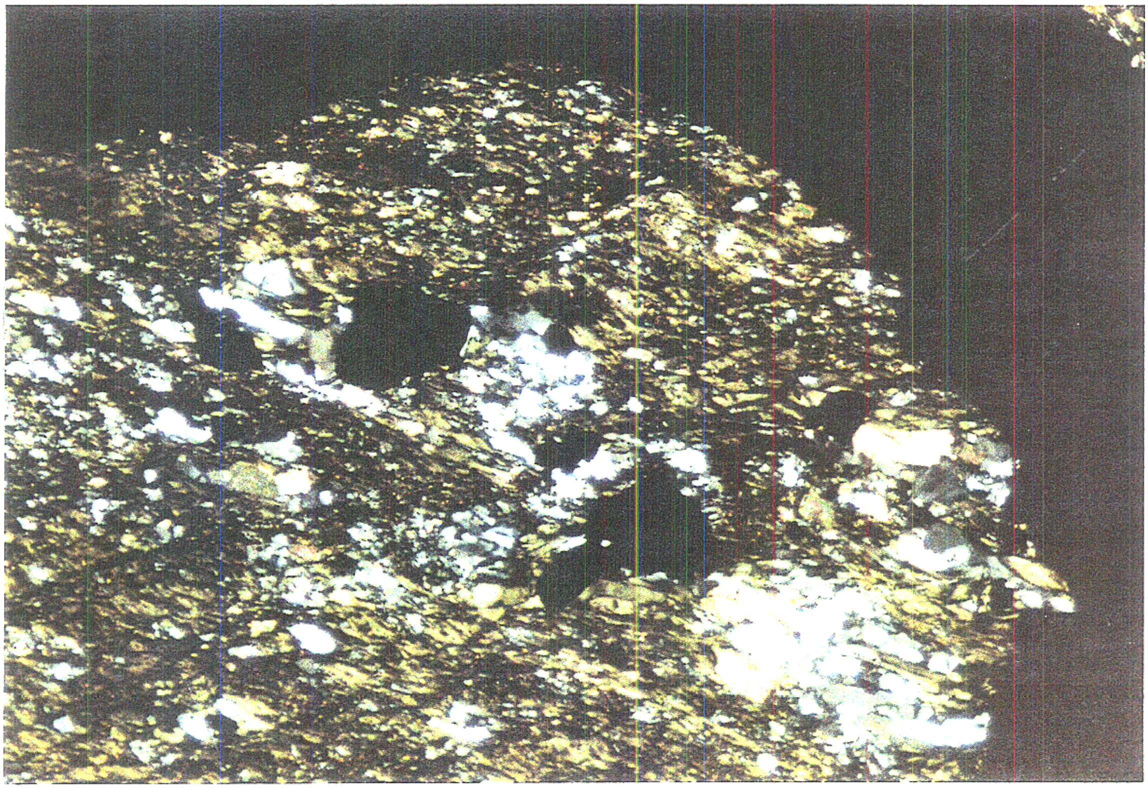
Samatosum Sample Column 1 (unsorted), Neg. 406-22



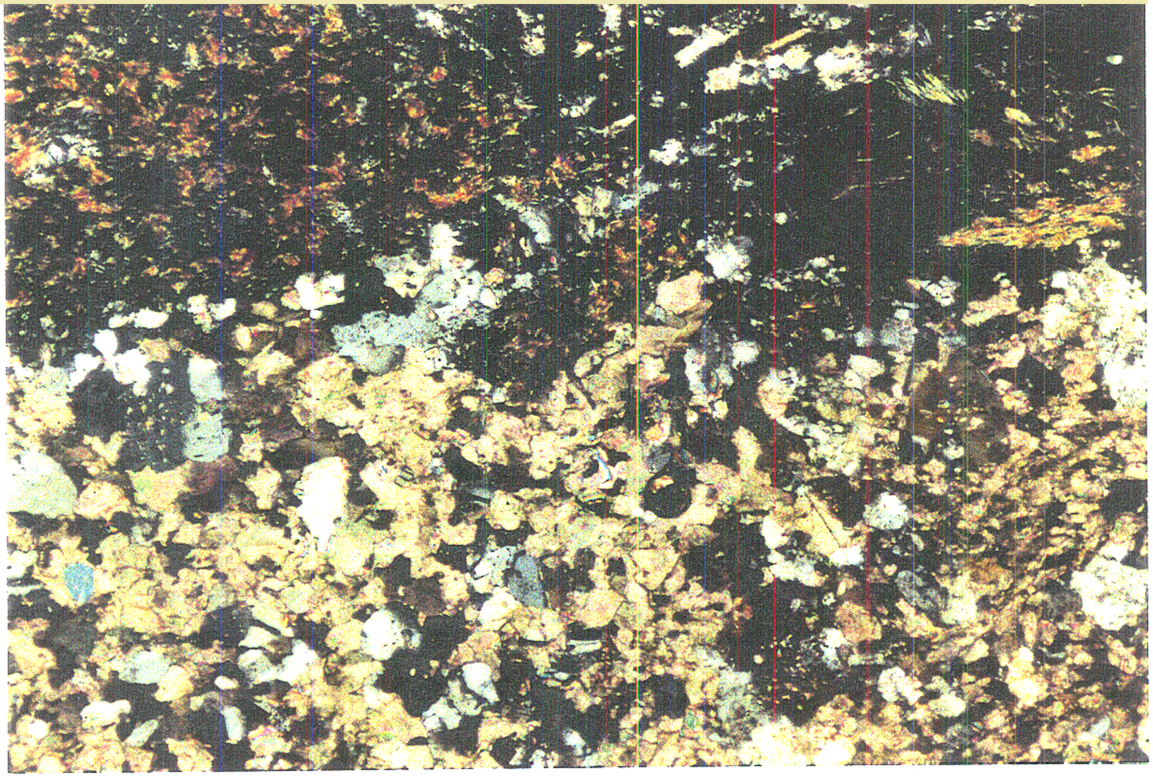
Samatosum Sample Column 1 (unsorted), Neg. 406-23



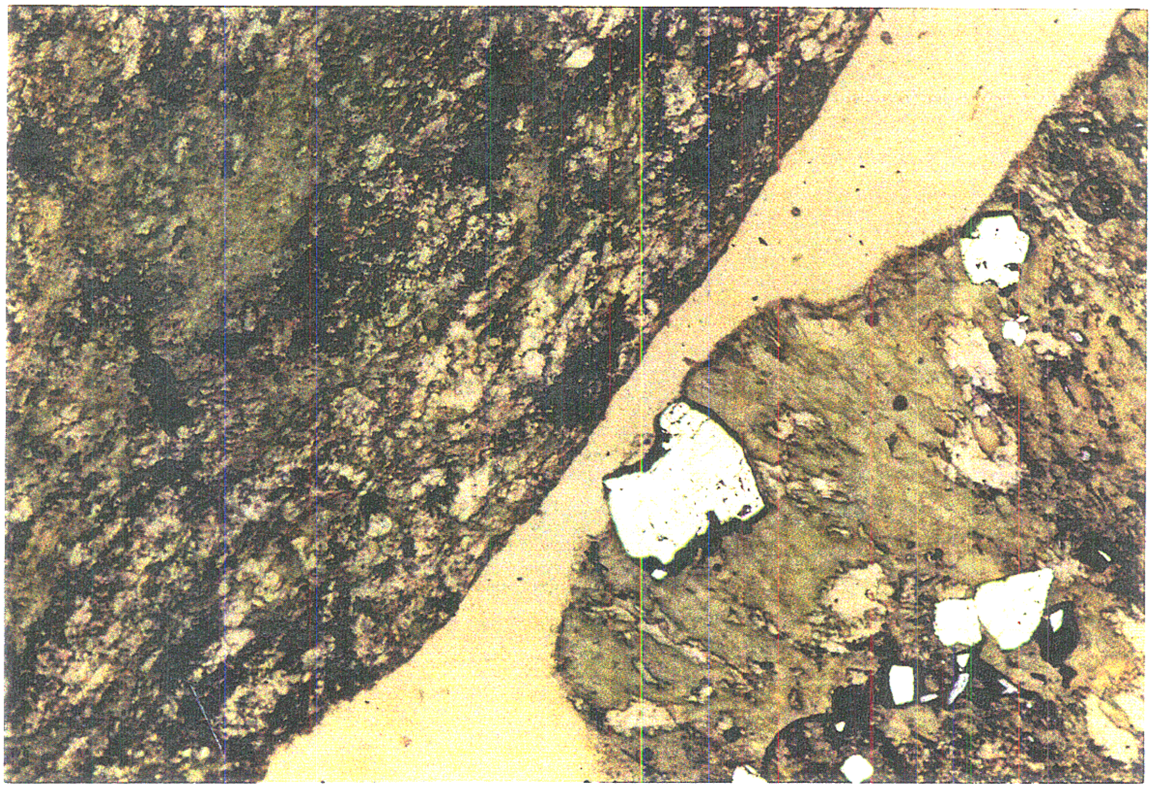
Samatosum Sample Column 4 (unsorted), Neg. 406-24



Samatosum Sample Column 4 (unsorted), Neg. 406-25



Samatosum Sample Column 4 (unsorted), Neg. 406-26

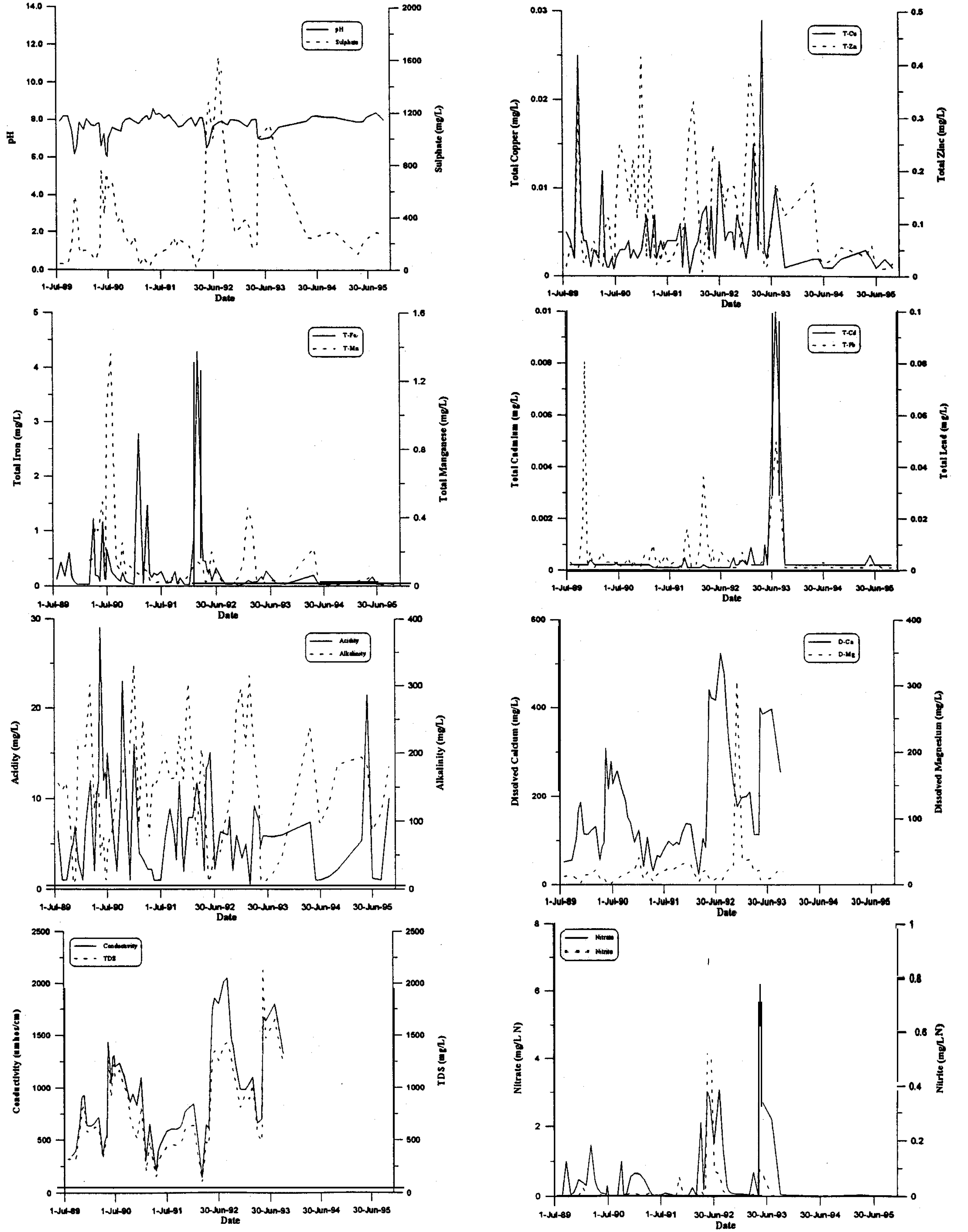


Samatosum Sample Column 4 (unsorted), Neg. 406-27

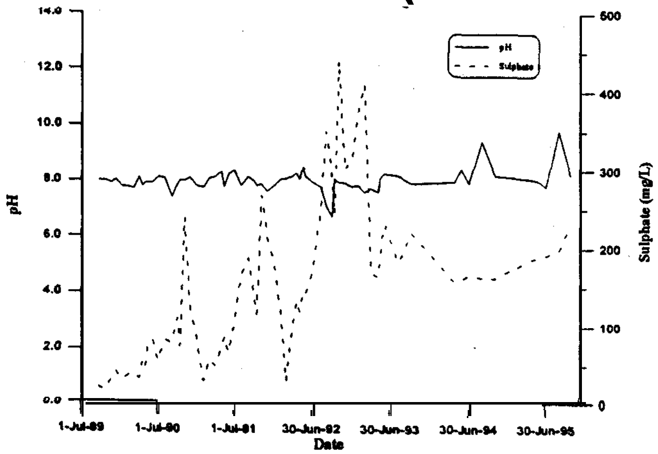
APPENDIX

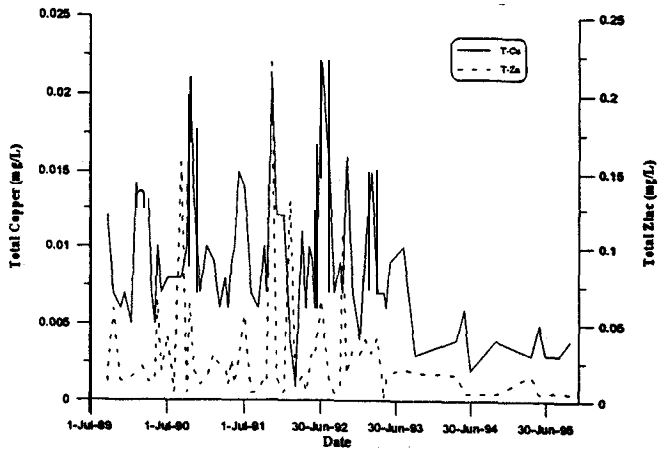
D. Field Monitoring Data from 1989 to 1996

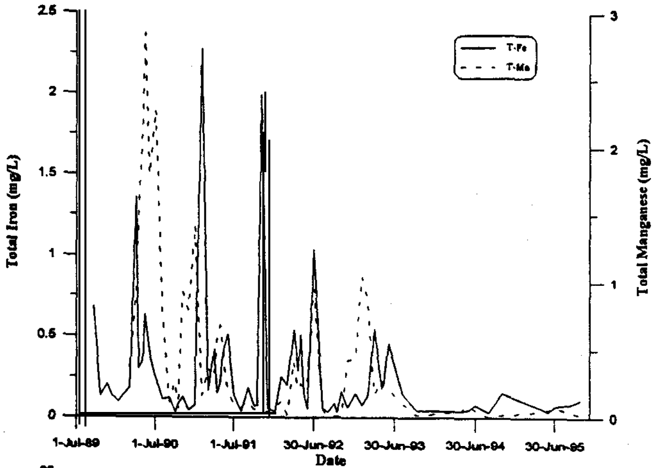
MOE 2 (Water Quality. Pond)

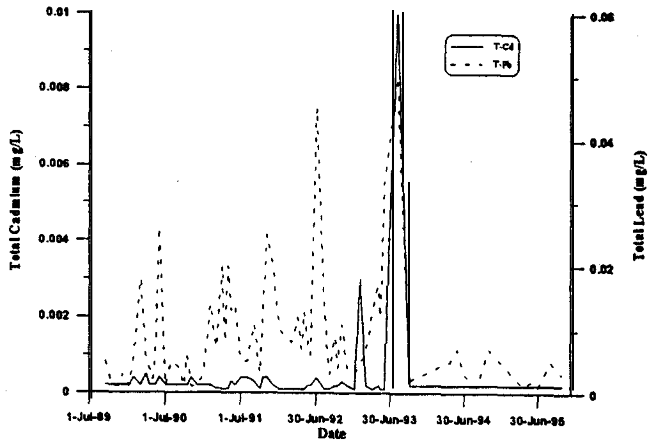


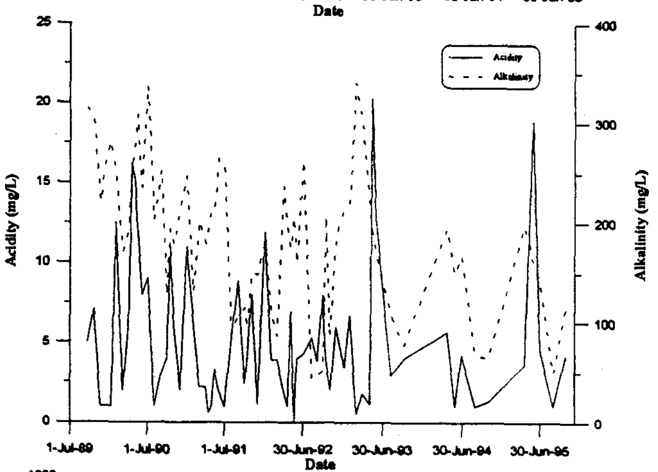
MOE 3 (Mill Site Sedimentation Pond)

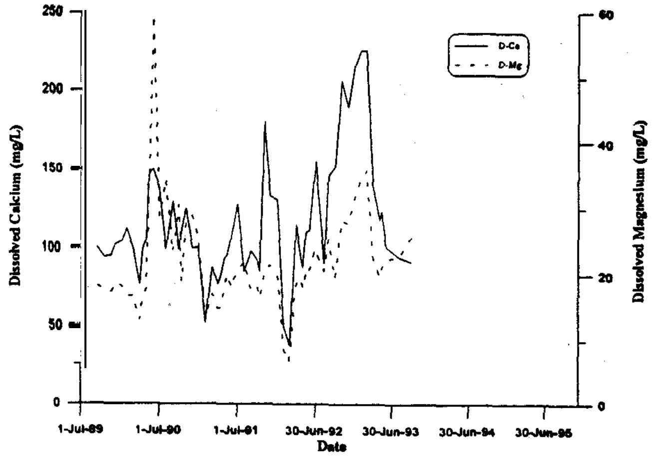


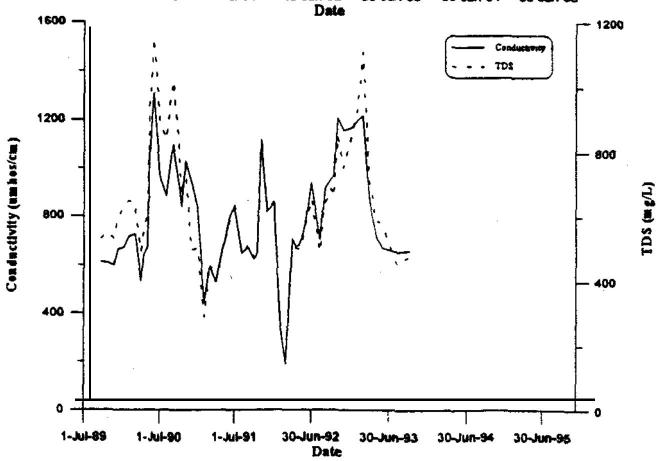


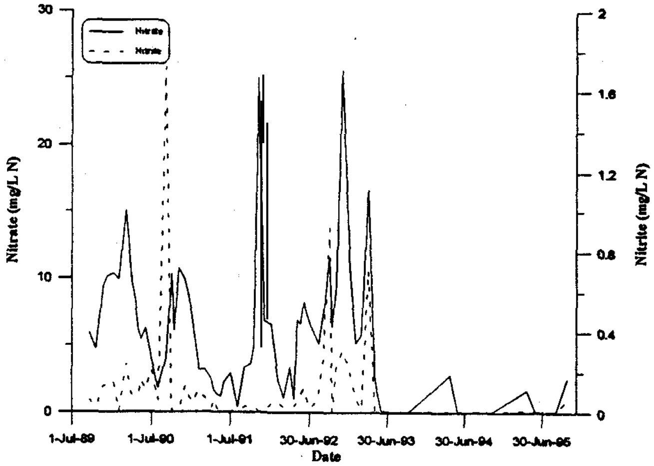




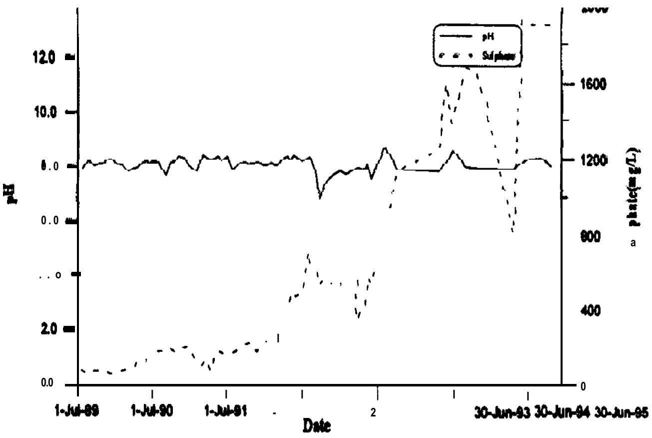


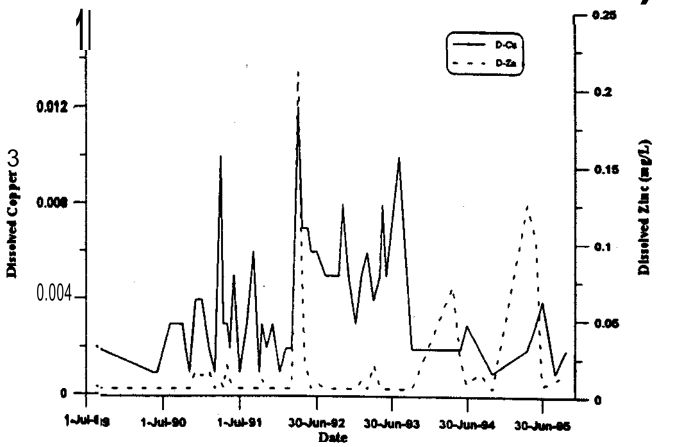


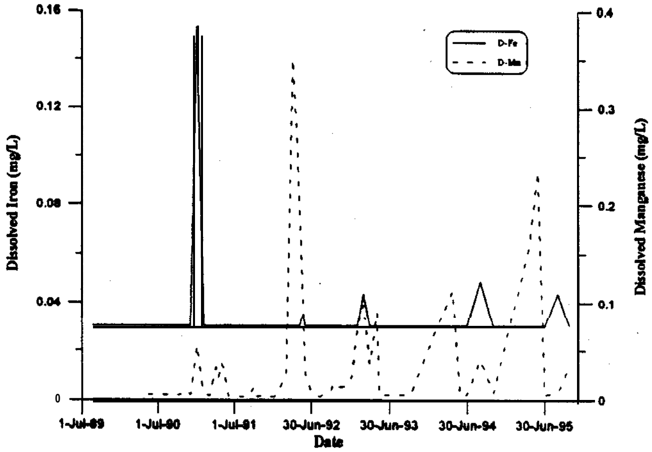


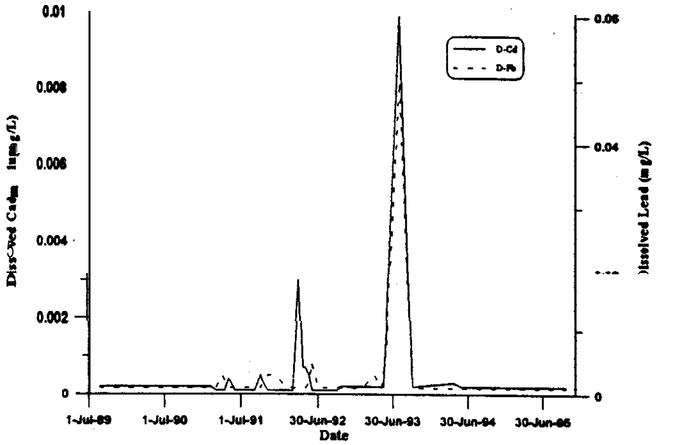


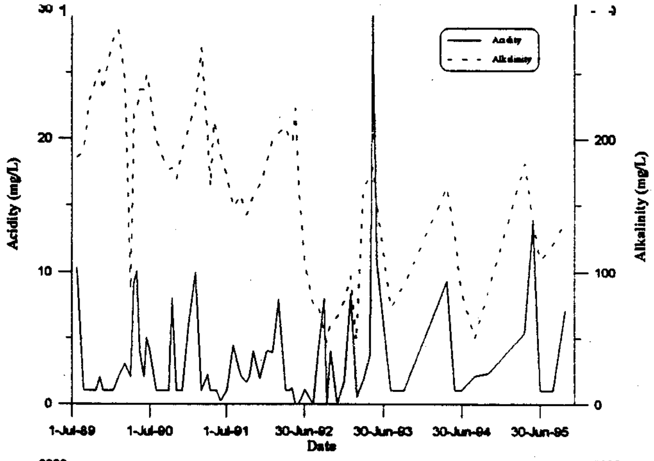
MOE 4 (Mine & Waste Rock Sedimentation Pond)

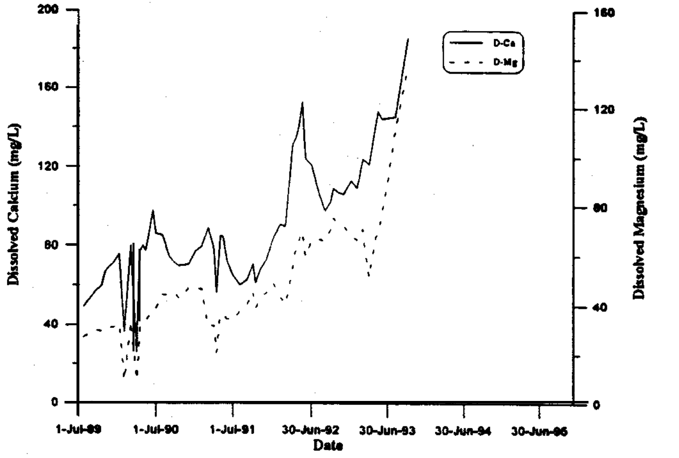


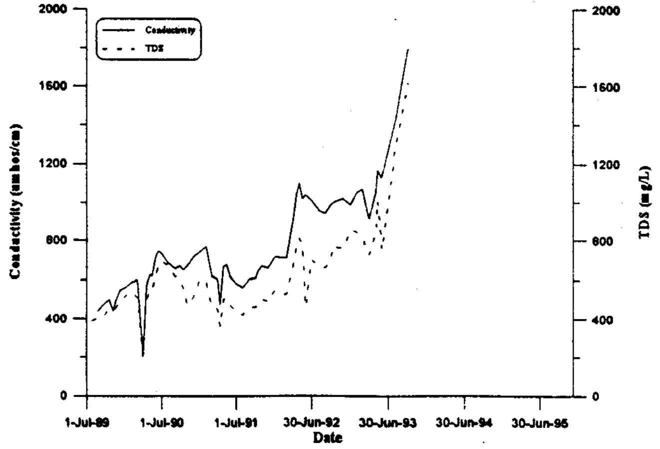


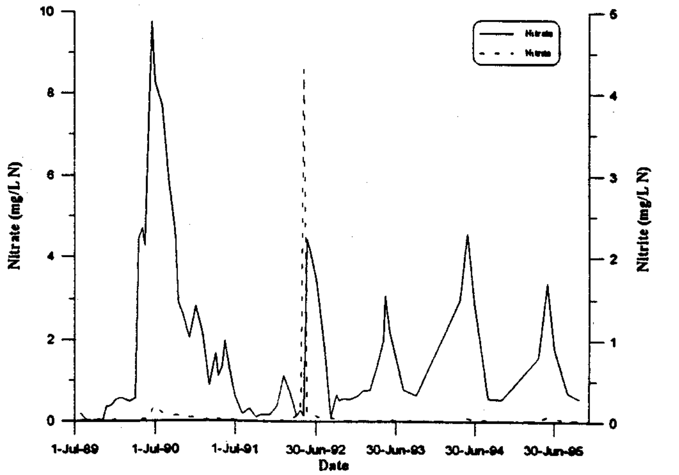




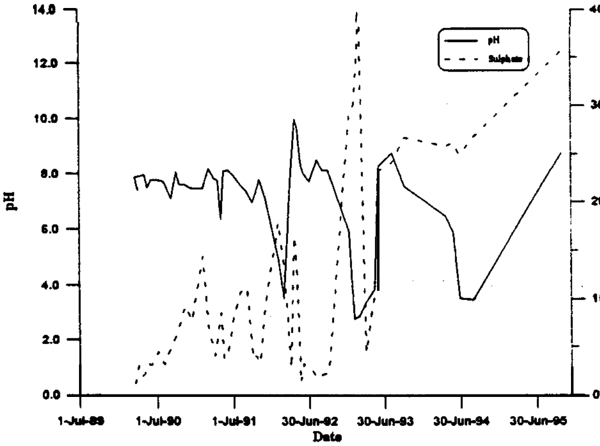


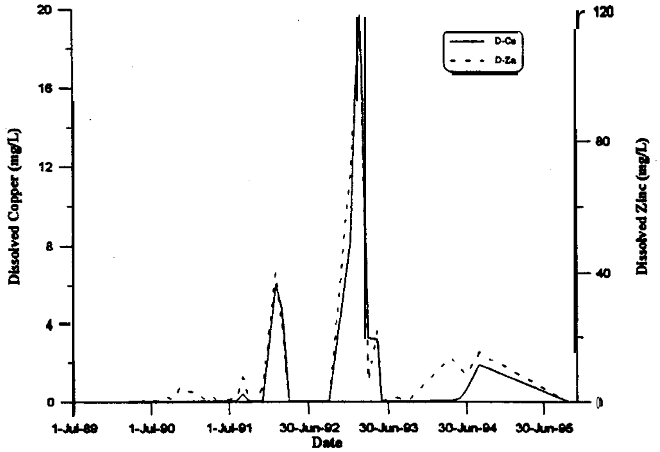


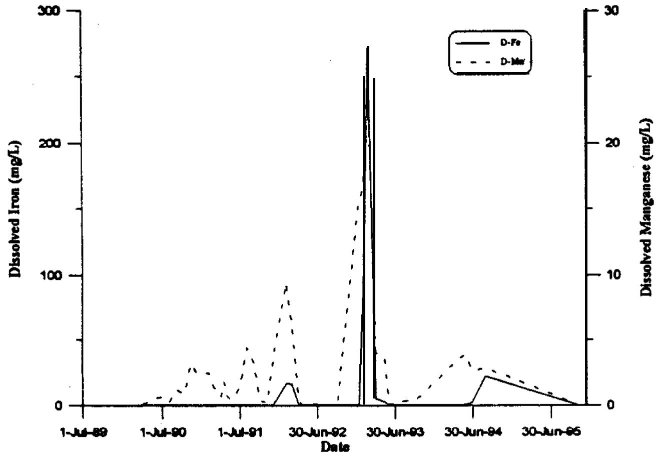


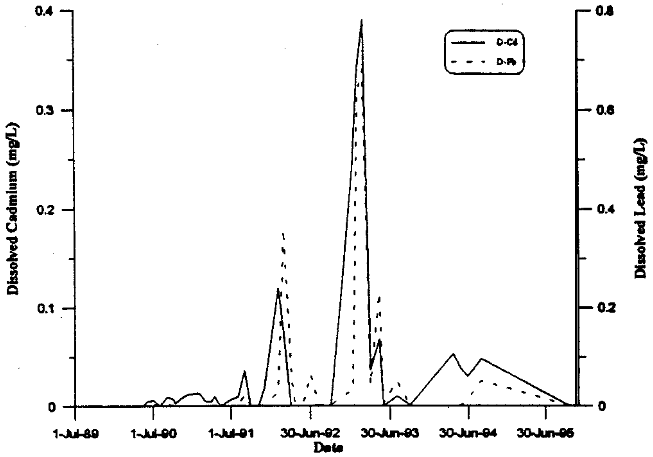


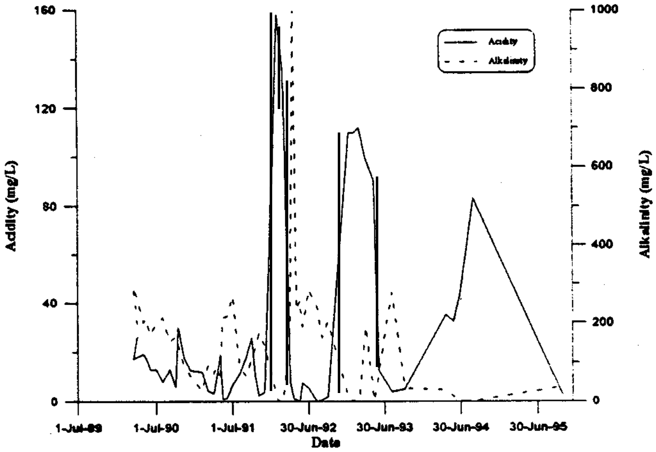
MOE 5 (Waste Rock Area B and Pit Seepage)

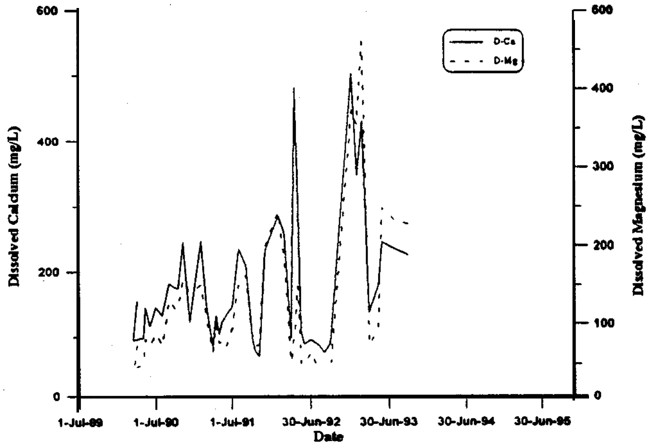


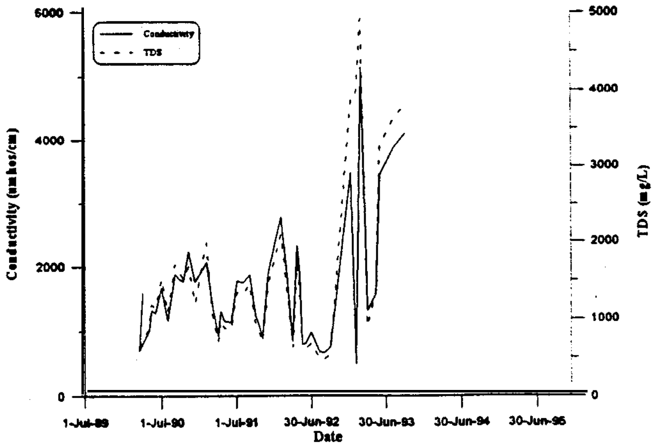


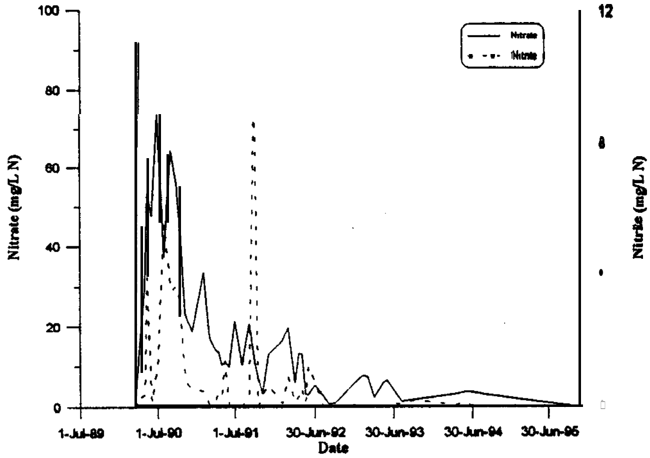




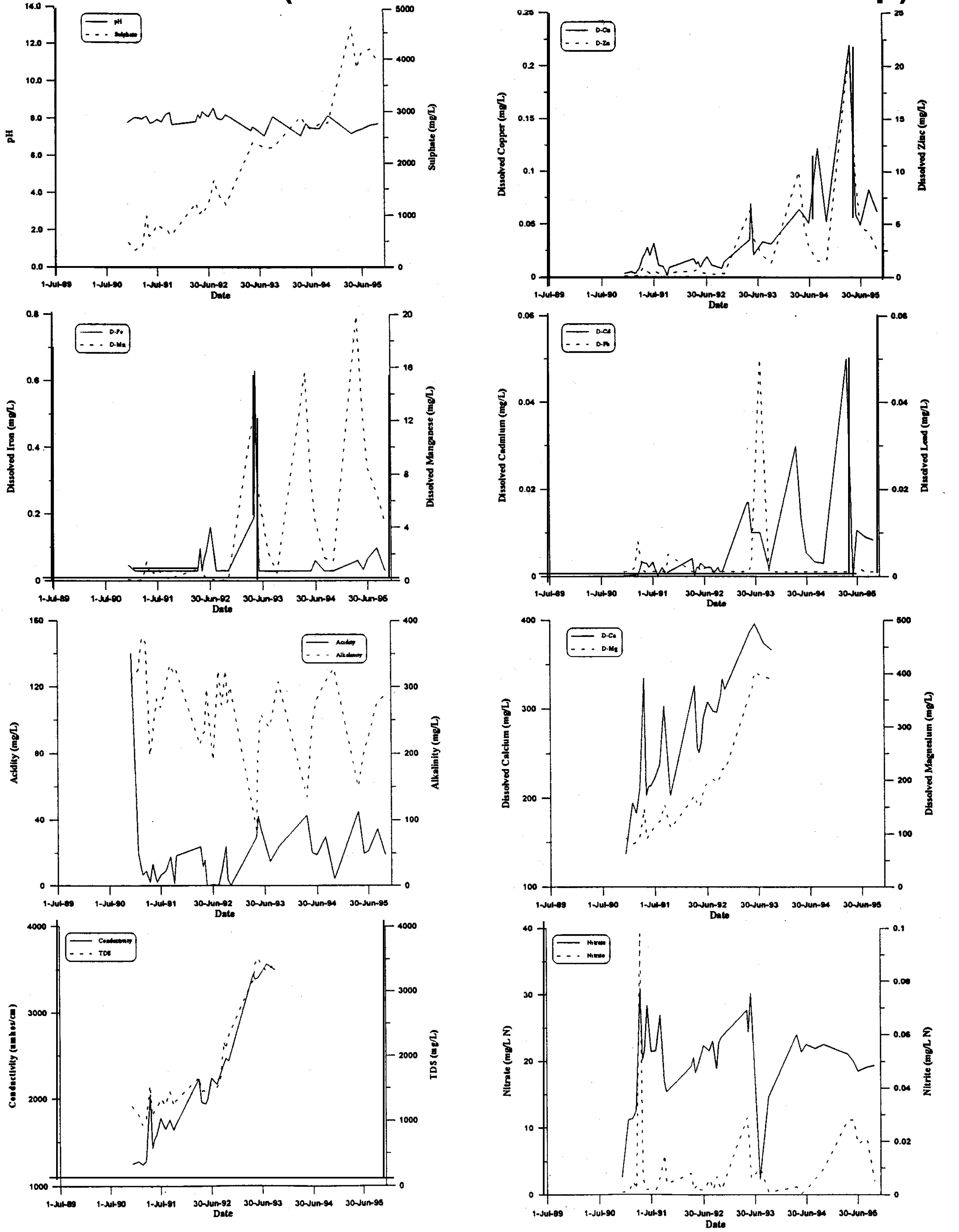




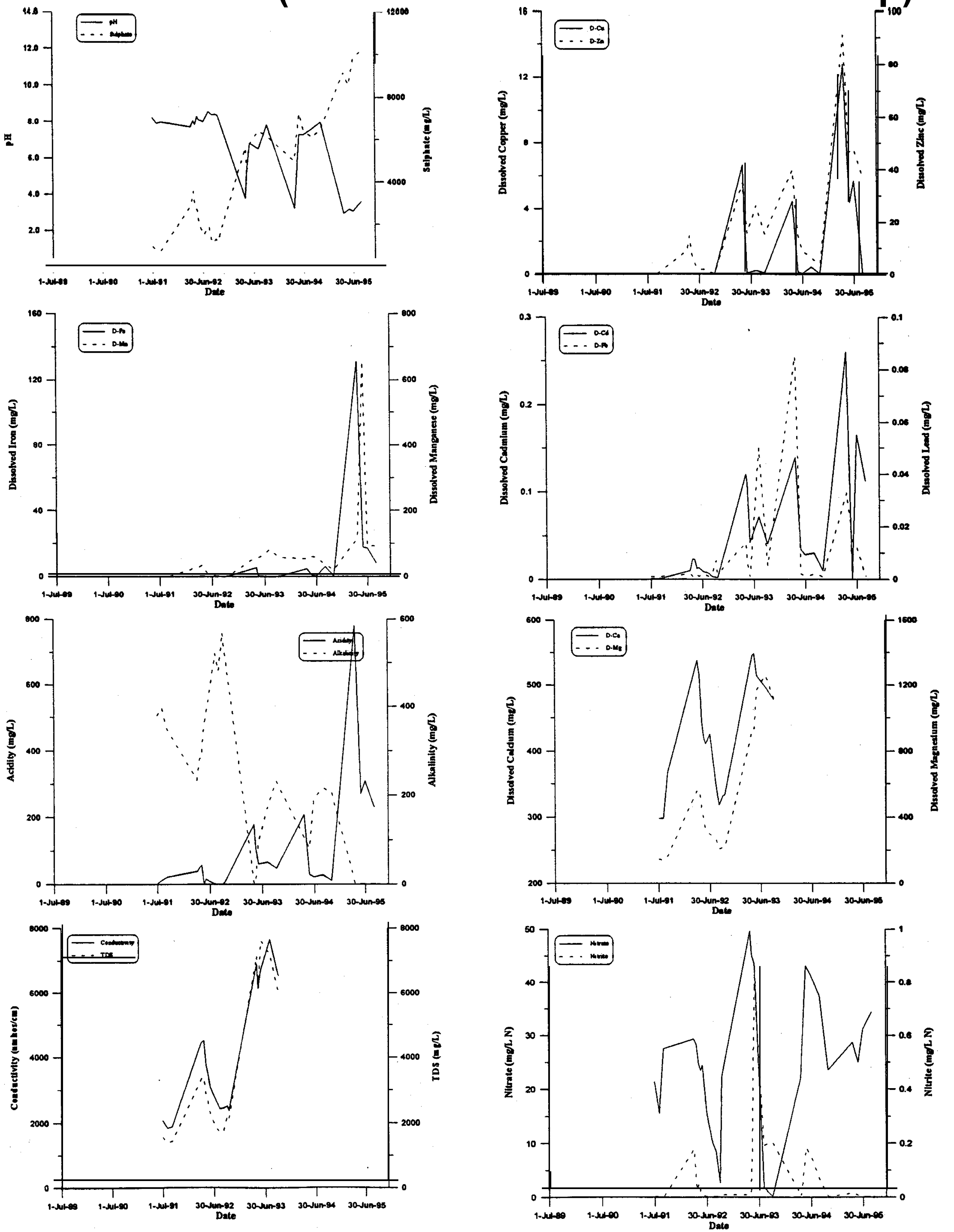




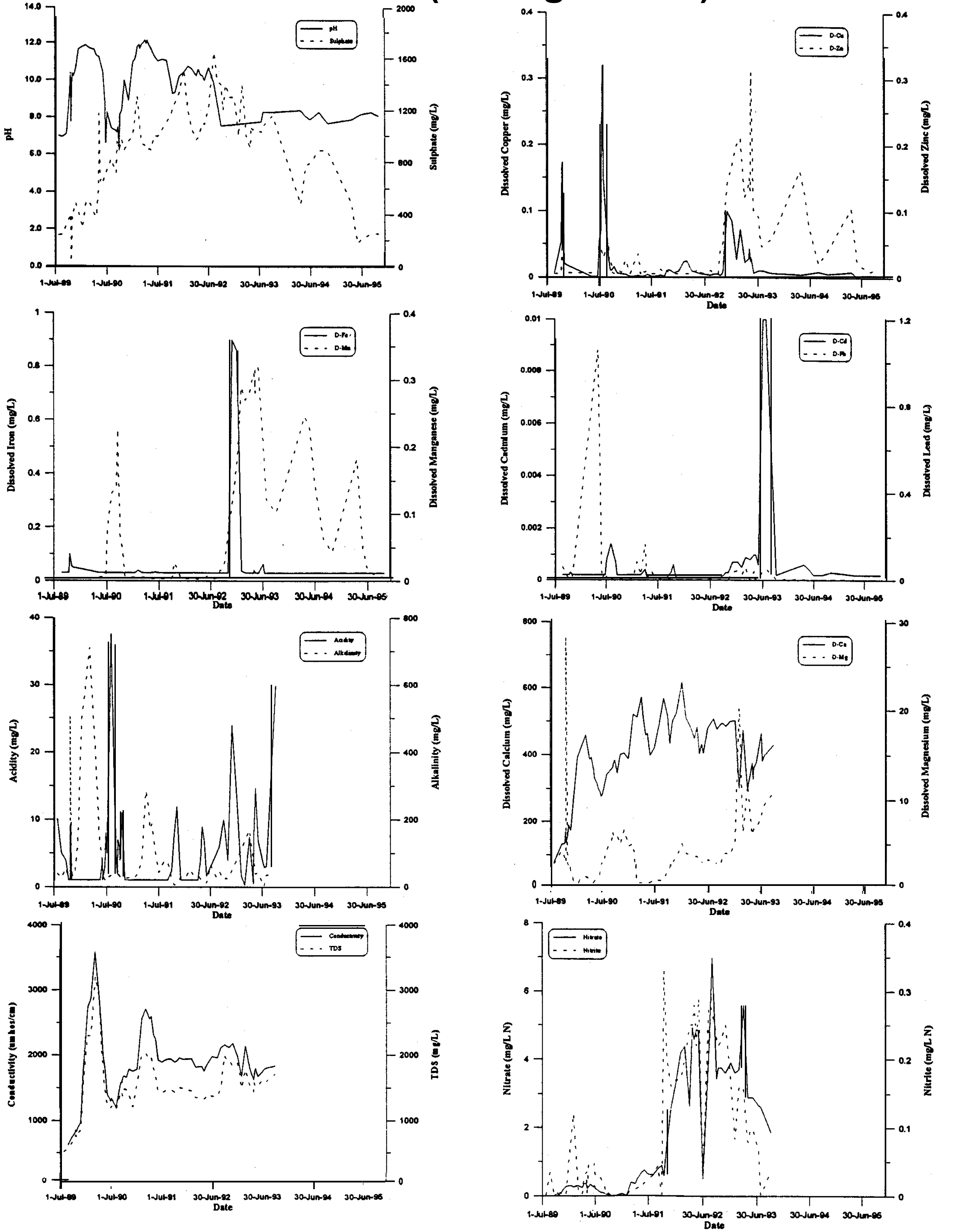
MOE 6 Site A (Waste Rock -Toe of Rock Dump)



MOE 6 Site B (Waste Rock --Toe of Rock Dump)



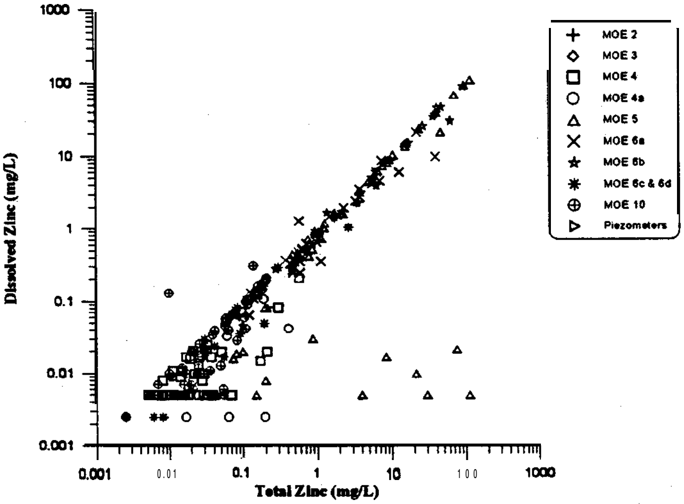
MOE 10 (Tailings Pond)



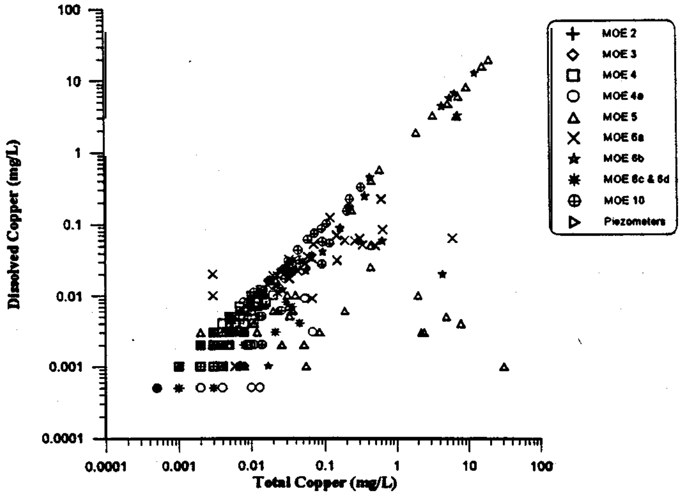
APPENDIX

E. Compiled Monitoring Data and Empirical Drainage-Chemistry Model

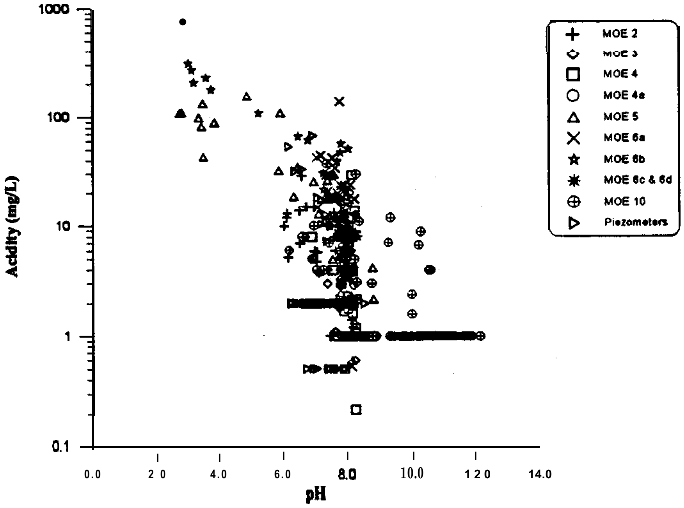
Dissolved Zinc vs Total Zinc



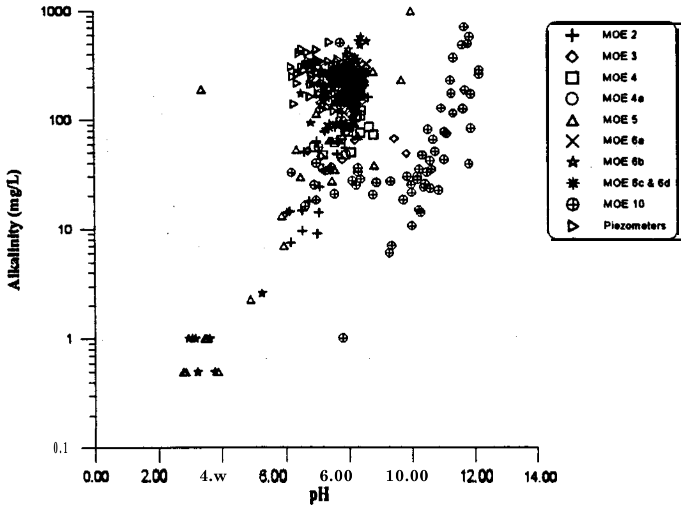
Dissolved Copper vs Total Copper



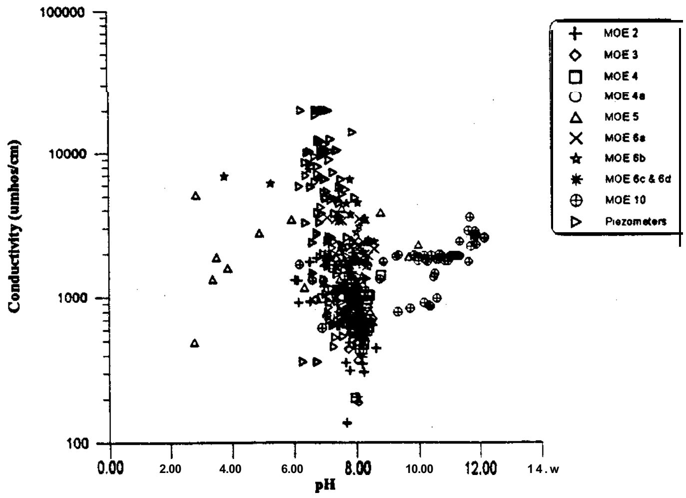
Acidity vs pH



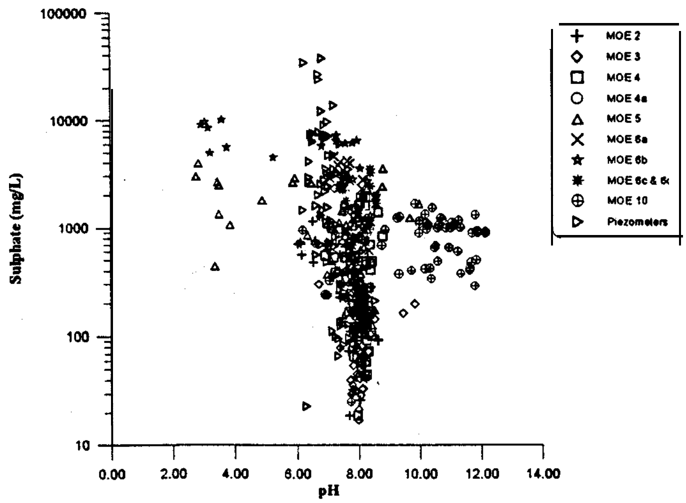
Alkalinity vs pH



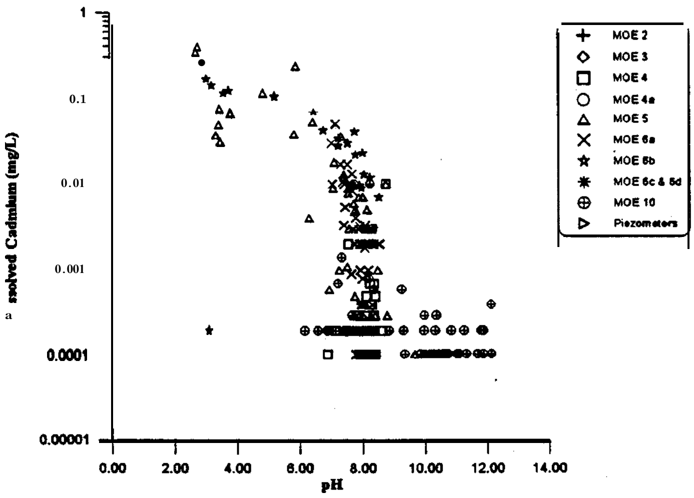
Conductivity vs pH



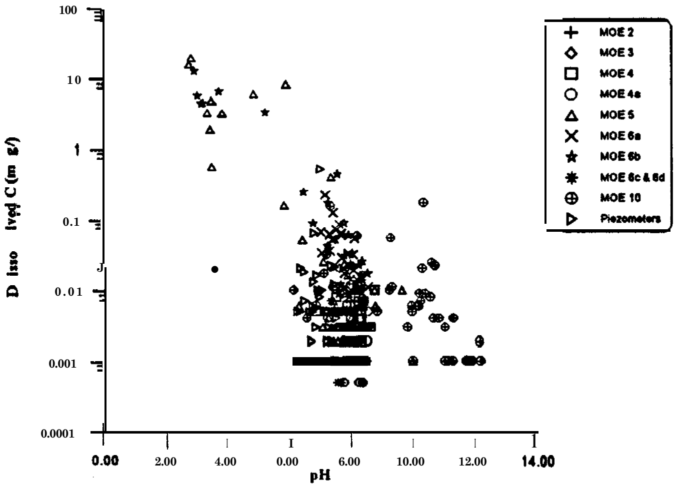
Sulphate vs pH



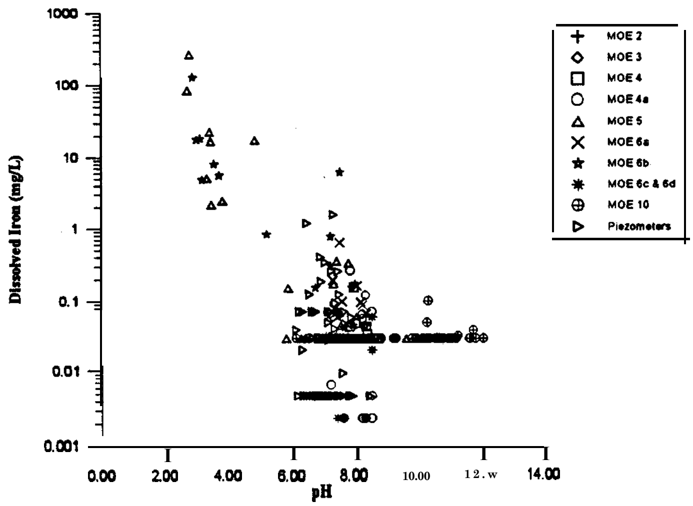
Dissolved Cadmium vs pH



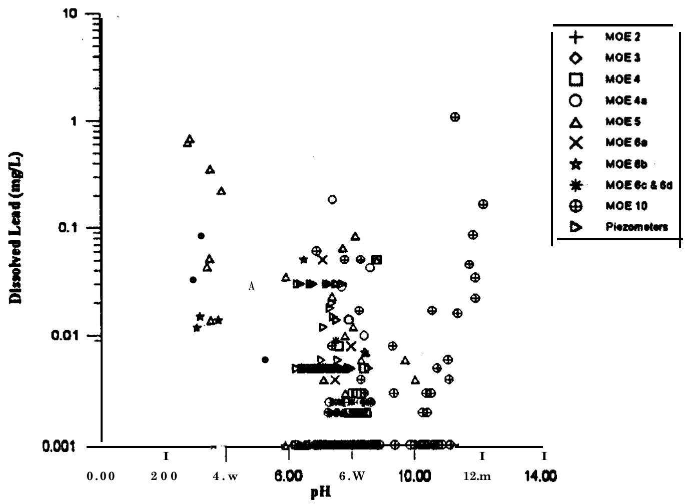
Dissolved Copper vs pH



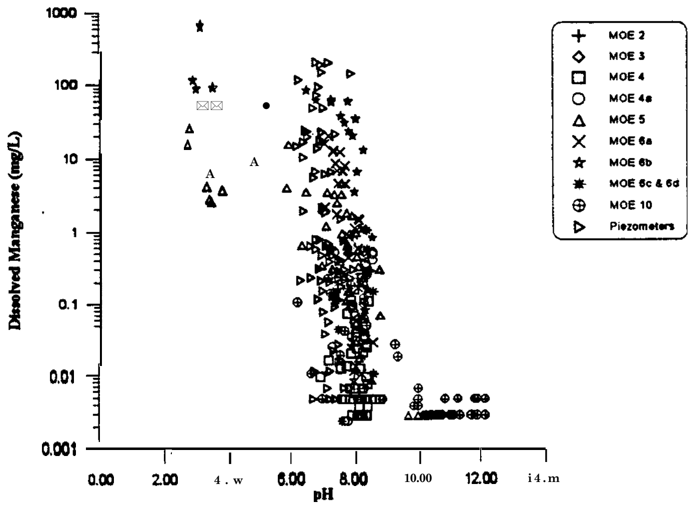
Dissolved Iron vs pH



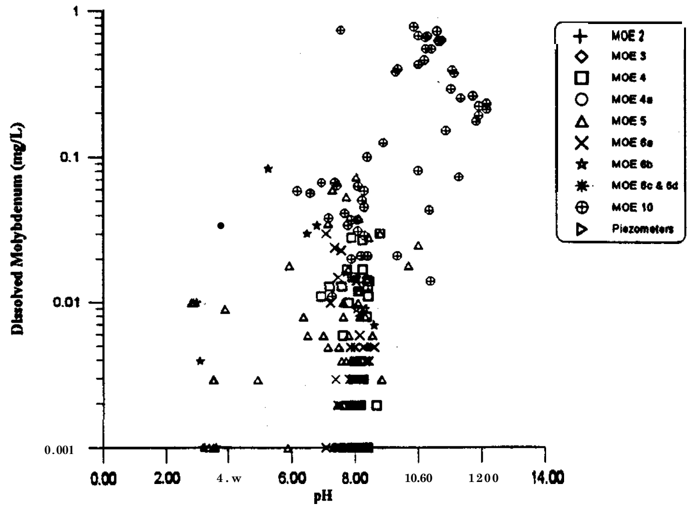
Dissolved Lead vs pH



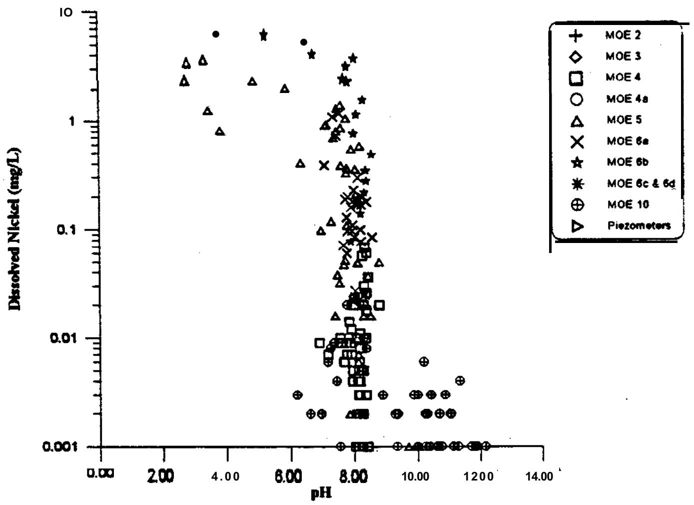
Dissolved Manganese vs pH



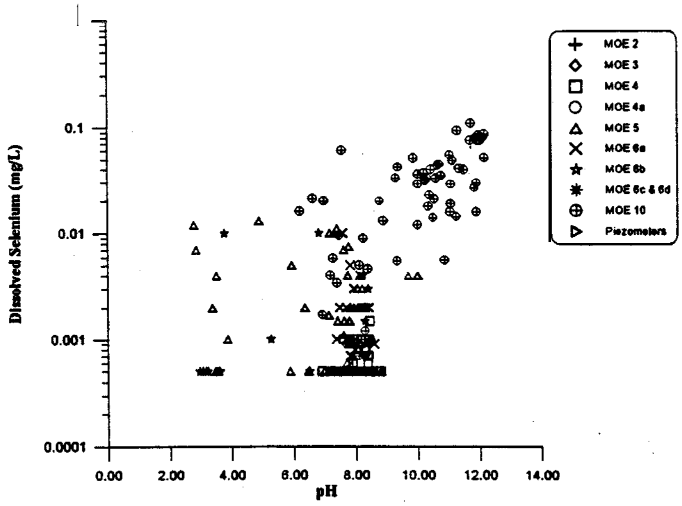
Dissolved Molybdenum vs pH



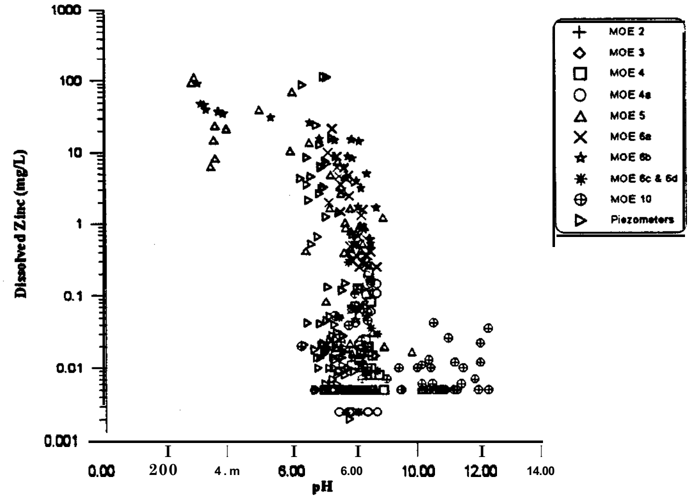
Dissolved Nickel vs pH



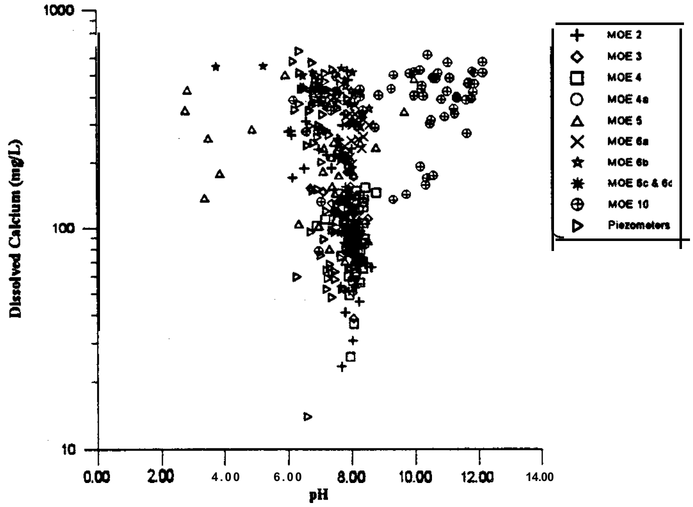
Dissolved Selenium vs pH



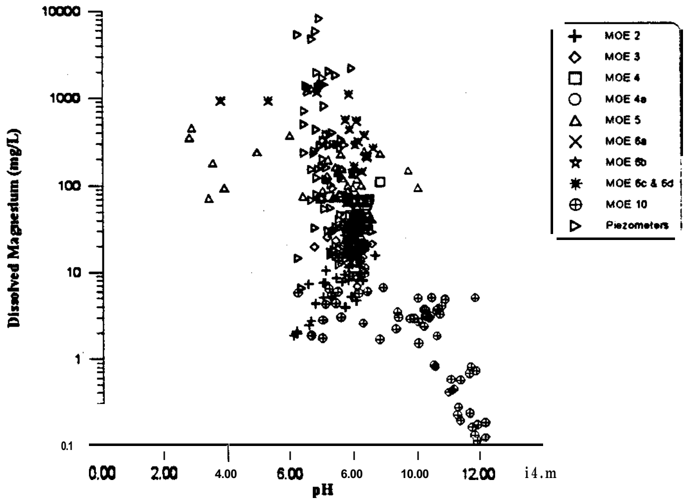
Dissolved Zinc vs pH



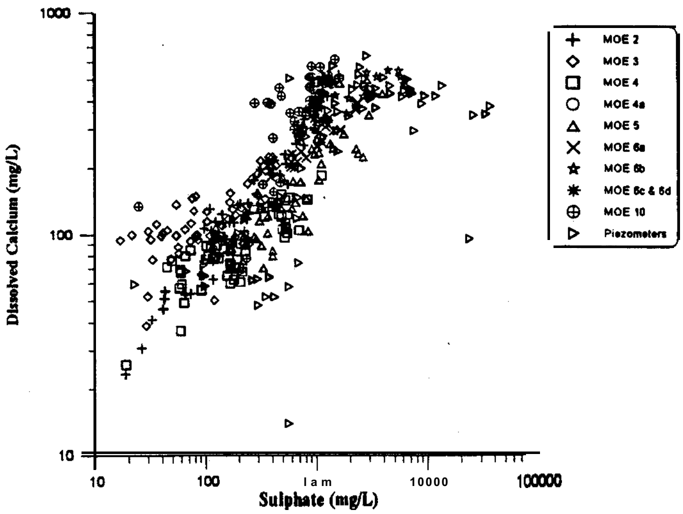
Dissolved Calcium vs pH



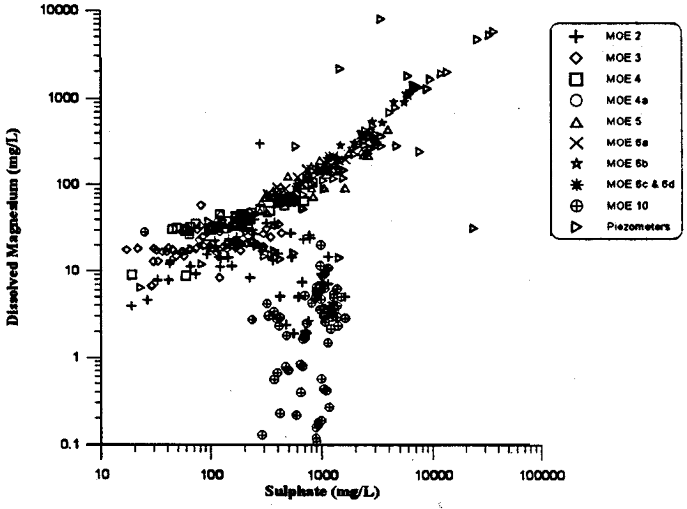
Dissolved Magnesium vs pH



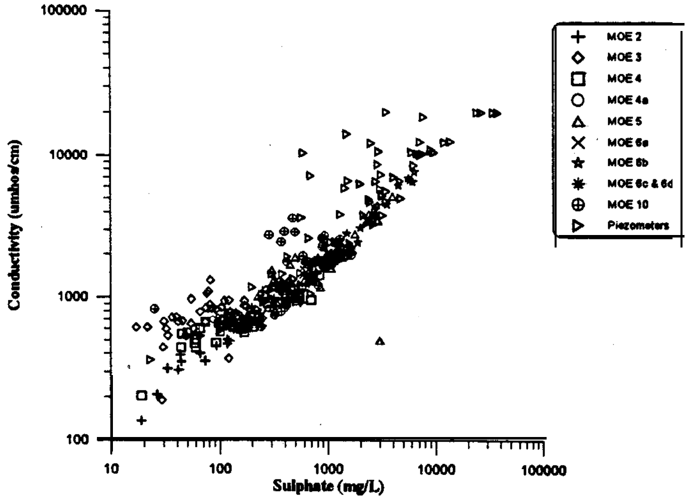
Dissolved Calcium vs Sulphate (mg/L)



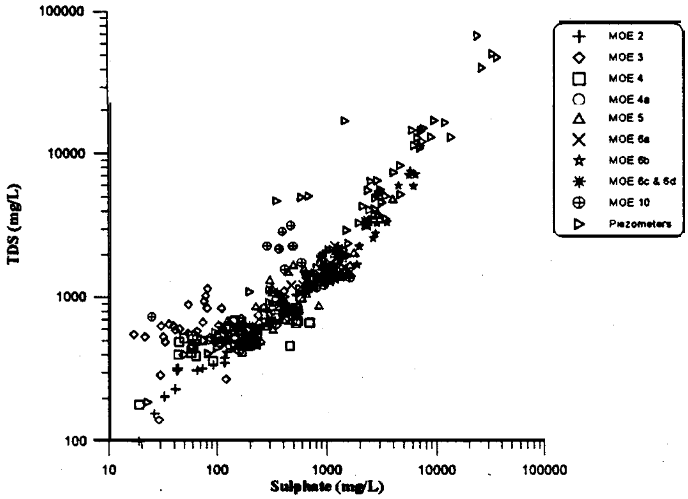
Dissolved Magnesium vs Sulphate (mg/L)



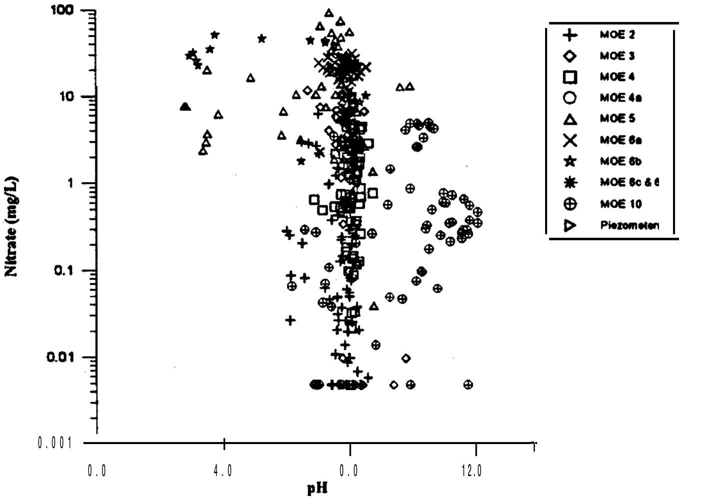
Conductivity vs Sulphate



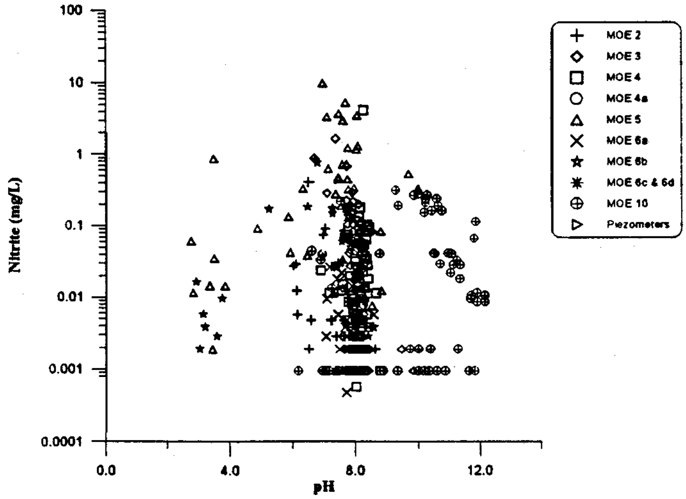
TDS vs Sulphate



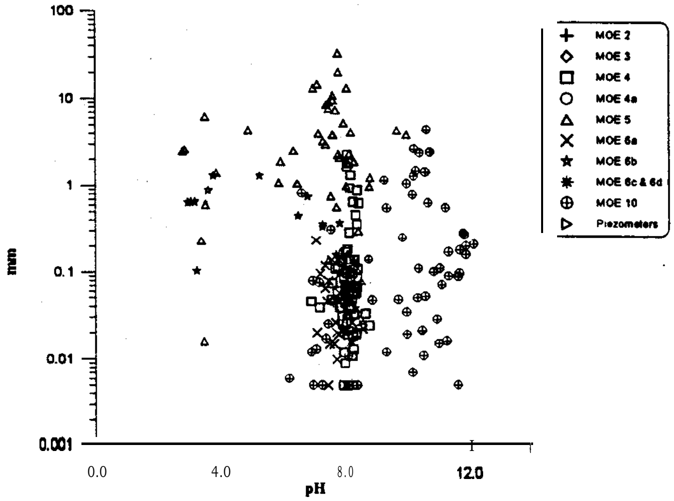
Dissolved Nitrate vs pH



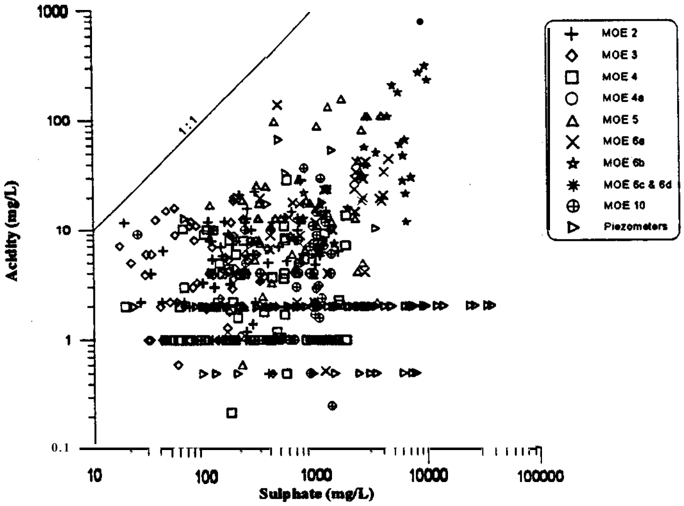
Dissolved Nitrite vs pH



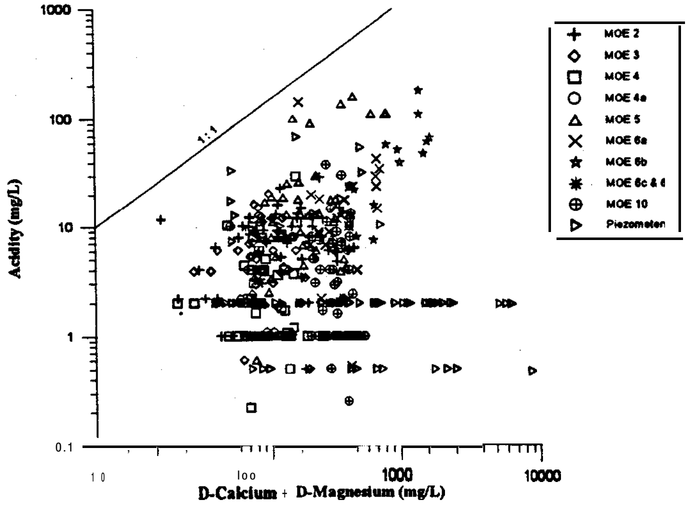
Ammonia vs pH



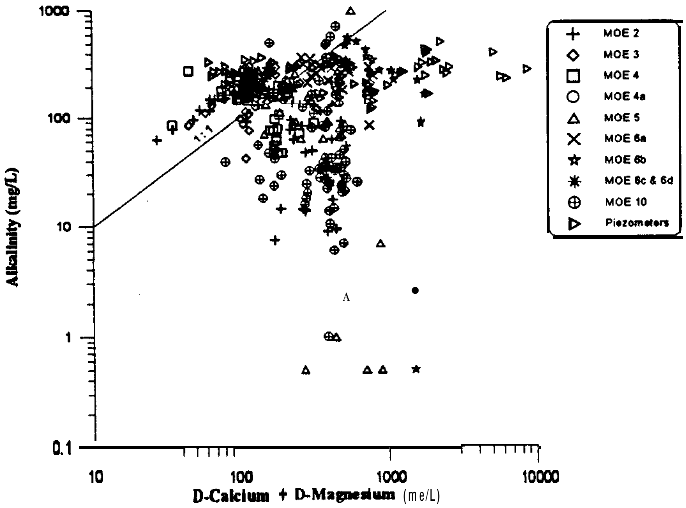
Acidity vs Sulphate



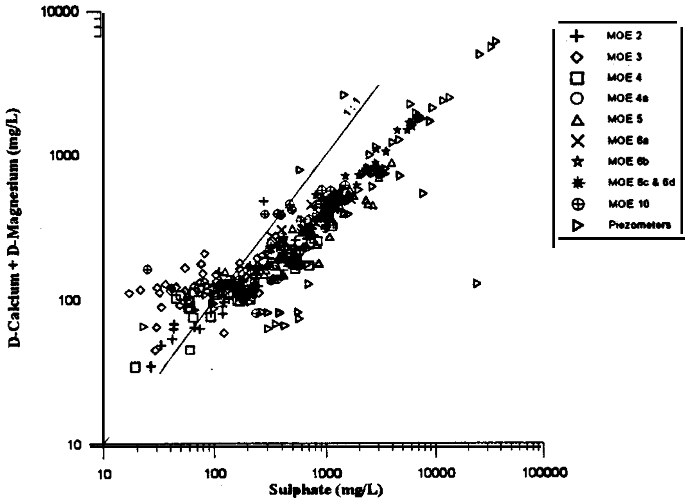
Acidity vs D-Calcium + D-Magnesium



Alkalinity vs D-Calcium + D-Magnesium



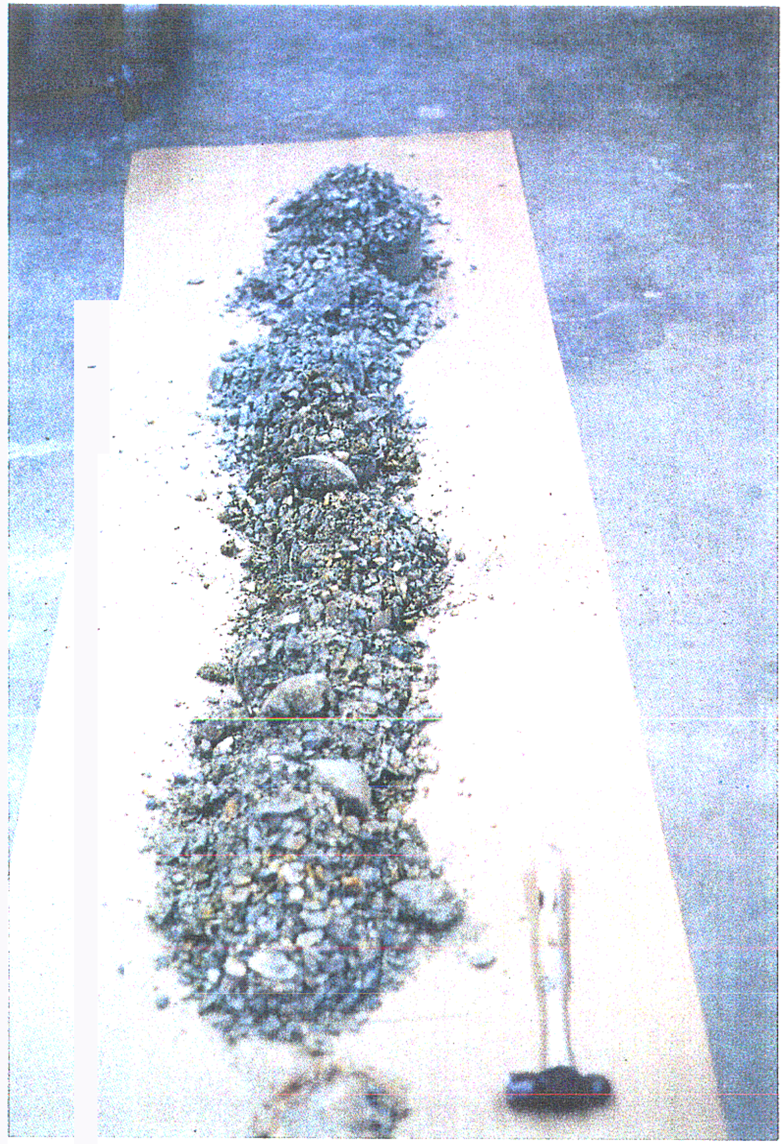
D-Calcium + D-Magnesium vs Sulphate



APPENDIX

F. Photographs of Column Dismantling

Column 6



Glumn 6 dismantled; bottom in foreground

Column dismantled; bottom n foreground

Column 4 dismantled; bottom in background