

RESULTS OF SEQUENTIAL LEACH TESTS ON BLUE PIT WASTE ROCK BREWERY CREEK MINE

Report Prepared for
Viceroy Minerals Corporation

Report Prepared by



February 2004

Results of Sequential Leach Tests on Blue Pit Waste Rock Brewery Creek Mine

VICEROY MINERALS CORPORATION

**Suite 900-570 Granville Street
Vancouver, British Columbia
V6C 3P1
CANADA**

SRK Project Number 1CV001.01

**Steffen Robertson and Kirsten (Canada) Inc.
Suite 800, 1066 West Hastings Street
Vancouver, B.C. V6E 3X2**

**Tel: 604.681.4196 Fax: 604.687.5532
E-mail: vancouver@srk.com Web site: www.srk.com**

Stephen Day, sday@srk.com

February 2004

Compiled by:

Stephen Day, P.Eng

Endorsed by:

Principal

Table of Contents

1	Introduction	1
1.1	Background	1
1.2	Basis for Sequential Leach Test	2
2	Methods	3
2.1	Sample Selection	3
2.2	Sample Collection	3
2.3	Sample Testing and Analysis	4
2.4	Data Reduction	4
3	Results	5
3.1	Quality Control	5
3.2	Leach Chemistry	5
3.2.1	Indicator Parameters	5
3.2.2	Major Rock Components	6
3.2.3	Heavy Elements	7
4	Interpretation and Application	8
4.1	Discussion of Results	8
4.2	Application of Results to Blue WRSA Pore Water Chemistry Predictions.....	10
5	Conclusions	13
6	References.....	14

List of Tables

Table 1: Comparison of Pore Water Chemistry Estimates 12

List of Figures

Figure 1. Leachate Recovery 8
Figure 2. Infiltration and Evaporative Processes in the Leach Column 9

List of Appendices

Appendix A Description of Field Program
Appendix B Results of Analysis
Appendix C Graphs

1 Introduction

1.1 Background

Viceroy Minerals Corporation (VMC) is in the process of decommissioning the Brewery Creek Mine, located 57 km east of Dawson City, Yukon Territory. Gold ore was mined from several small pits located along a sulphide mineralized trend in argillites, shales, greywackes and conglomerates of the Earn Group intruded by quartz monzonite. Most of the pits extracted oxide-type ores with low potential for acid generation due to the prior removal of sulphide minerals by natural weathering processes. The exception was the Blue Zone which occurred in partially oxidized graphitic shales containing sulphide minerals (primarily pyrite and arsenopyrite). Concerns have been raised by both VMC and the regulatory agencies that approximately 1.1 million tonnes of waste rock generated from the Blue Zone and placed in the Blue Waste Rock Storage Area (Blue WRSA) is a current or potential source of acidic and/or metal-bearing water that could cause downstream impact to Laura Creek and the South Klondike River if not mitigated.

1.2 Previous Investigation of the Blue WRSA

In August 2003, SRK Consulting was retained by VMC to develop estimates of pore water chemistry for the Blue WRSA and predict the resultant water quality in Laura Creek and the South Klondike River. Two overall approaches (Approach “A” and Approach “B”) were used to estimate pore water chemistry. Approach “A” was intended to represent a “worst case” in which it was assumed that all soluble minerals and acidity generated by the pile is leached (ie no storage of weathering products). Approach “B” represented more realistic conditions in which some storage was allowed. Results of previous water extraction tests (AMEC 2002) were used as input into the geochemical model to predict pore water chemistry and the effect of mixing pore water with groundwater in the vicinity of the Blue WRSA. A simple dilution model was then used to predict water quality in Laura Creek and the South Klondike River

It was concluded (SRK 2003) that the Blue WRSA contains components of rock that are acidic, and that pore water quality in the waste rock is driven by the presence of sulphide mineral oxidation products. It was concluded that copper, arsenic and antimony might marginally exceed CCME levels at station BC-1 in Laura Creek during winter low flow conditions; however, effects on the South Klondike River were predicted to be negligible.

Both of the approaches used to predict pore water quality resulted in high concentrations of some parameters that did not seem appropriate based on the minerals present in the rock (particularly copper). To support the theoretically-derived predictions of pore water quality, a laboratory procedure (Sequential Leach Test) was developed to leach samples of Blue WRSA oxidized waste rock and determine whether the pore water estimates were reasonable. The method was accepted by federal and territorial agencies prior to implementation of the procedure.

1.3 Basis for Sequential Leach Test

Pore water chemistry in the Blue WRSA is predicted to be driven by dissolution of soluble products of sulphide mineral oxidation and acid leaching. These products might include sulphates, carbonates and hydroxides of iron, copper, zinc and cadmium, and possibly arsenates. Pore water chemistry is controlled by the solubility of these minerals in the local pH and Eh conditions. The actual concentration of a particular ion in solution is determined by a number of factors including:

- **The absolute leachable amount of the component in the rock**, which is determined by the original concentration and availability of the mineral in the rock or the rate at which the mineral is generated by processes such as weathering. This factor places limits on the concentrations of trace elements in solution regardless of the other factors.
- **The thermodynamic properties of the minerals**, which indicates the maximum solubility of minerals in water. This factor places limits on the concentrations of ions in weakly to moderately soluble minerals.
- **The kinetics of mineral dissolution** indicates the rate at which the mineral is dissolved. This indicates that regardless of the theoretical solubility other factors may control the rate at which the mineral dissolved.

As rain water or snow melt comes into contact with waste rock, it is expected that the water will not equilibrate with the rock instantaneously to the concentrations indicated by the thermodynamic properties. Instead concentrations will increase as the water moves through the waste rock depending on the first and third factors.

Conventional short term extraction tests involve a single batch addition of water (or another solution) to a test material (such as waste rock) over a specified time period (usually 24 hours). At the end of the procedure, the leachate is analyzed. The resulting water may not indicate the pore water chemistry if:

- the time frame of leaching was not sufficient to allow the solution chemistry to approach the theoretical limits indicated by the thermodynamic properties;
- the leachate produced by dissolution of readily soluble minerals did not react with less soluble minerals;
- the high liquid to solid ratio resulted in complete dissolution of a mineral component before the solubility limit could be reached.

A simple procedure was designed for this project that attempts to address these shortcomings. The procedure is based in the State of Nevada Department of Environmental Protection Meteoric Water

Mobility Procedure (MWMP, NDEP 1996). This test involved a single pass of water through rock in a column at a ratio of one part water to one part rock (by weight). The MWMP procedure has the same limitation as other types of short term of extractions; however, in this modified procedure, the leachate from the test is then used as feed solution for a second sample. This leachate can then be used as feed for a third column, and so on. Analysis of each leachate sample shows how solution chemistry evolves along the flow path.

2 Methods

2.1 Sample Selection

SRK (2003) showed that the pH of rock in the Blue WRSA is trimodally distributed. Approximately 13% of samples had pH less than 4.1 (median 3.1), 14% had pHs between 4.1 and 5 (median 4.6), and the balance (73%) had pHs between 5 and 7.6 (median 6.4). These pH ranges correspond roughly to buffering by dissolution of iron hydroxide, aluminum hydroxide and carbonates, respectively. It was expected that release of heavy elements to solution would largely be controlled by the solubility of these major weathering components. Therefore, six sequential leach tests were proposed consisting of two tests in each pH range.

Sample locations to target these pH ranges were selected using the results reported by AMEC 2002.

2.2 Sample Collection

Samples specifically for these tests were collected by Rick Diment, P.Geo. (VMC Mine Geologist) following instructions provided by SRK. A track mounted excavator was used to excavate three test pits to a maximum depth of 3.7 m. A combination of a dilute hydrochloric acid fizz test and field contact pH test was used to identify appropriate sampling intervals. The presence of black shale was determined as a good indicator of acidic conditions.

The previous sampling locations (AMEC 2002) from which the new samples were collected are:

- **Low pH:** TP2A 2 to 3 m.
- **Mid-range pH:** TP4A 1.5 to 3.7 m.
- **Neutral pH:** TP11A 0.5 to 1.8 m.

Two samples, each consisting of 60 kg were collected at each depth interval and placed into two 20 L plastic pails. Material greater than 1 inch was removed manually at the time of sampling.

The sampling program is described in Appendix A.

2.3 Sample Testing and Analysis

As described in Section 1.2, the leaching procedure consisted of a series of extractions performed in leach column. The leachate from each column was used as the feed for leaching of a fresh sample. Each leaching step was performed in a leach column as follows:

- The sample was placed in a 15.2 cm diameter column.
- The volume of feed water was determined as the amount needed to achieve a 1:1 leachate to sample ratio. This volume was dripped through the column over a period of 96 hours.
- 200 mL of the resulting leachate was removed for analysis and the remainder was used for the next leach step.

Due to the decrease in leachate volume from retention of water in the solids, the mass of sample was calculated to provide sufficient leachate for seven leaching steps. As a result, the first sample was 9 kg, and the last was 0.9 kg.

Leachates were analyzed for pH, Eh, electrical conductivity, alkalinity, sulphate and a 72-element scan determined by ICP-MS. Results are provided in Appendix B.

The four samples with low and intermediate pH were leached for seven steps. Due to the low concentration and stability of concentrations in leachates from the higher pH samples, leaching was stopped after four steps.

The leach testing was performed by BC Research Inc. Analysis was sub-contracted to Acme Analytical Laboratories.

2.4 Data Reduction

The data obtained from the columns was evaluated on the basis of both the amount of chemical load added each step, and concentration in the leachate. The load added during each leach step (L_n) was calculated on a unit basis using the formula:

$$L_n = (V_{o,n}C_{o,n} - V_{i,n}C_{i,n})/M_{s,n}$$

Where $V_{i,n}$ and $V_{o,n}$ are the input and output volumes for the step, respectively;
 $C_{i,n}$ and $C_{o,n}$ are the input and output concentrations for the step, respectively; and
 $M_{s,n}$ is the mass of samples used for step

L_n may be positive (indicating that load is leached during the step) or negative due to load removal (for example by precipitation).

It should be noted that an increase in concentration between steps does not necessarily equate to an increase in load. Concentration increase may be due to leaching of the test material, or it may be due to evaporation. As discussed below, the latter is believed to have been a factor in overall concentration increase.

Appendix C provides graphs for the chemical load leached, and concentrations in leachates. In each graph, the x-axis shows the leach step (from 1 to 7), and the y-axis shows load or concentration. Connected lines show results for each column (1 to 6). Squares show tests on low pH range waste rock, diamonds show mid-pH range, and triangles show the neutral pH range tests. Column designations are as follows:

- **Low pH:** Columns 1 and 2.
- **Mid-range pH:** Columns 3 and 4.
- **Neutral pH:** Columns 4 and 5.

3 Results

3.1 Quality Control

Ion balances were better than $\pm 10\%$ in most cases indicating that the leachate chemistry accounted for the majority of the ions in solution. This suggests that components such as nitrate, and ammonia associated with explosives residues were relatively unimportant.

A blank column was operated without a sample to monitor possible dissolution of metals from the column construction materials. The parameters that accumulated in the blank column leachates at generally low levels were barium (up to $0.75 \mu\text{g/L}$), cobalt ($0.06 \mu\text{g/L}$), copper ($0.6 \mu\text{g/L}$), antimony ($0.1 \mu\text{g/L}$), silicon ($50 \mu\text{g/L}$), tin ($470 \mu\text{g/L}$), strontium ($0.52 \mu\text{g/L}$), and zinc ($14 \mu\text{g/L}$). As none of these parameters (except tin) are at significant levels relative to leached concentrations from the sample, these blank effects are not important. Tin is apparently leaching from the column materials and is not considered further in this discussion.

3.2 Leach Chemistry

3.2.1 Indicator Parameters

The pH of the leachates were consistent with the broad sampling categories. The two samples from Test Pit 2A (Columns 1 and 2) showed pHs below 4, with leachate from Column 2 yielding pHs as low as 2.6. The two samples from Test Pit 4A (Columns 3 and 4) both initially had pHs above those of Column 1 and 2 and between 4 and 5. Leachate pH for both columns decreased, and Column 3 pH dropped below 4 in Step 4. Leachate pH for the two near neutral pH samples from Test Pit 11A remained stable near 7.6 for all four steps.

Electrical conductivity increased for all samples with the exception of column 4 which decreased slightly in Step 7. The highest conductivity was obtained for the most acidic sample. The two pH neutral samples yielded the lowest conductivity.

The Eh of leachates followed an inverse order to pH. The highest Eh's (between 550 and 600 mV) were obtained for Column 2, and the lowest for the two pH neutral samples (between 350 and 400 mV).

3.2.2 Major Rock Components

The major ions sulphate (Figures C-4 and C-5), aluminum (Figures C-6 and C-7), calcium (Figures C-10 and C-11), iron (Figures C-16 and C-17), potassium (Figures C-18 and C-19), magnesium (Figures C-20 and C-21), sodium (Figures C-24 and C-25) and silicon (Figures C-31 and C-32) are considered first because they indicate the degree to which major mineral components are dissolved during the test.

Sulphate is the major anion in leachate. The greatest leaching of sulphate occurred in the first or second step and was correlated with pH (ie sulphate load release decreased as pH increases). Leached load during each step from these columns then decreased despite a steady increase in concentration. After leach Step 4, all continuing tests showed load removal during the step. The total load removed for Steps 5 and 7 was much less than the load added in Steps 1 to 4 due to the decrease in mass of sample.

Calcium and magnesium were the major cations in the leachates. On a molar basis, calcium usually exceeded magnesium, but the ratio of calcium and magnesium decreased for each successive step. In the final step, magnesium exceeded calcium slightly on a molar basis. Load released generally smoothly decreased during each step (with the exception of Column 2 which was erratic in Steps 5 to 7). Load loss occurred for calcium by Steps 3 and 4 and by Step 5 for magnesium.

Potassium and sodium concentrations were roughly equivalent. Potassium concentrations increased steadily and were initially greater than sodium. Sodium concentrations increased later in the test and exceeded potassium. Potassium load release decreased for each step and became negligible or load loss by Step 3. In contrast, sodium was added to the leachate fairly consistently as the test proceeded (with the exception of the two pH neutral columns which showed negligible sodium leaching). A sharp loss occurred in Step 7 for all four acidic columns.

Aluminum was a major ion in solution for Column 2 only, reaching a maximum concentration of 232 mg/L by Step 7. Other acidic columns showed increasing aluminum concentrations. The two pH neutral columns showed decreasing aluminum concentrations. The two strongly acidic columns showed a steady trend of decreasing load leached, becoming load loss from solution by Step 5 or 6. Aluminum is the main source of titratable acidity in the leachates. Acidity was not determined directly but calculated from concentrations of aluminum, copper, iron and manganese. Column 2

yielded a maximum acidity of 1350 mg CaCO₃/L. Final acidity from other columns was less than 200 mgCaCO₃/L.

Iron concentrations in leachates were low compared to other parameters. Maximum concentrations in the most acidic leachate from Column 2 were 7.5 mg/L but were not consistently detectable in leachates from other columns. Column 2 showed steadily decreasing iron leaching. Load loss from the leachate occurred by Step 3.

Silicon concentrations increased and were correlated with pH. The exception was Step 6 when concentrations decreased for all four acidic columns. The increase resumed in Step 7. Load leached was steady or slightly decreasing in each step.

3.2.3 Heavy Elements

The leachate trends for the heavy metals antimony (Figure C-28 and C-29), arsenic (Figures C-8 and C-9), cadmium (Figures C-12 and C-13), copper (Figures C-14 and C-15), manganese (Figures C-22 and C-23), nickel (Figures C-26 and C-27) and zinc (Figures C-34 and C-35) were evaluated. These elements occur at higher than parts per billion levels, and some have been identified as potential sources of surface water impacts at the Brewery Creek Mine. Mercury was not detected above 0.1 µg/L detection limit in the column leachates.

The general trend for all heavy elements was for increasing concentrations and decreasing load leached in each step. The latter resulted in load loss from the leachate by Step 3 to 6. Details within these general results include groupings of elements showing similar behaviour:

- **Cadmium, Manganese, Nickel and Zinc.** Release of these elements followed the same pattern, which was roughly negatively correlated with pH. Concentrations were in the order

Column 2 > Column 3 > Column 1 > Column 4 > Column 5 = Column 6

- **Copper.** Release of copper was strongly negatively correlated with pH:

Column 2 > Column 1 > Column 3 > Column 4 > Column 5 = Column 6

- **Arsenic and Antimony.** Release of these elements was greater for the intermediate pH columns. The reverse correlation for antimony was very strong with the lowest antimony concentrations being associated with the lowest pH.
- **Selenium.** Selenium release was greatest (over 0.7 mg/L) for the two mostly strongly acidic columns and much lower in the other columns (less than 0.1 mg/L).

4 Interpretation and Application

4.1 Discussion of Results

4.1.1 Introduction

The overall trend of increasing concentrations in each step of the test was expected. However, it was also expected that concentrations would increase rapidly initially and then slowly decrease as total dissolved solids increased and concentrations approached the solubility limits of minerals in the samples. Several parameters (including Al, Ca, Mg, Mn, Ni, sulphate, Zn) in fact showed evidence of a flattening in the concentration curve, while others flattened and decreased (As, Cd, Cu, Fe, K, Sb, Si) before increasing again in the later steps of the test.

As noted above, the increase in concentration was also accompanied by a decrease in the load leached from the sample in each step. For almost all parameters, load was eventually not added to the leachate but was retained in the sample as shown by negative loadings

4.1.2 Effect of Leachate Evaporation

A possible explanation for these trends lies in the decreasing leachate recovery from the columns for successive steps (Figure 1). In Steps 1 to 3, leachate recovery was uniform at between 87% and 95% and probably controlled by differences in particle size distribution and moisture content for each sample. After Step 4, leachate recovery decreased in all samples, and the trend was exactly mirrored by the blank column, though at a higher level because no sample was present to retain leachate.

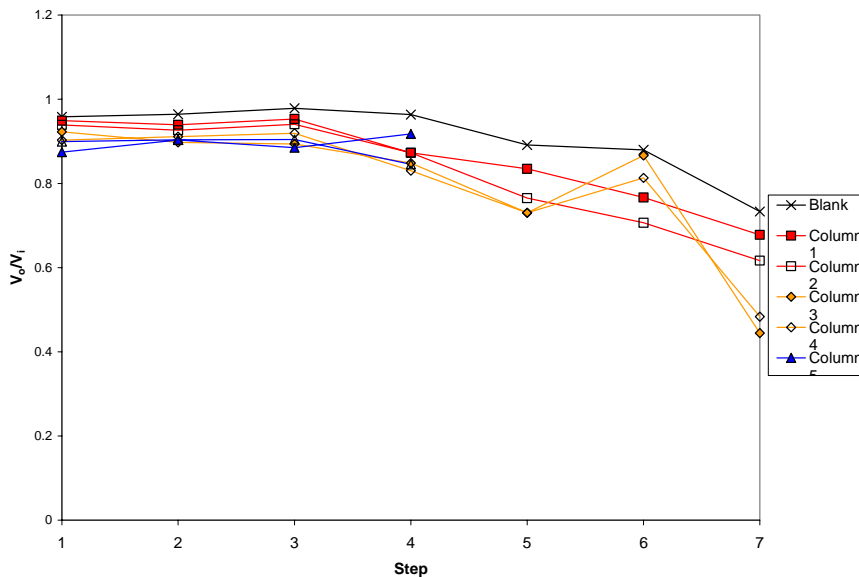


Figure 1. Leachate Recovery

Based on the trend of decreasing leachate recovery in the Blank test, it appears that decreasing leachate recovery after Step 4 in all tests is due to the increasing effect of evaporative losses at slower leachate application rates rather than greater leachate retention in the samples (Figure 2). The slower leachate application rate for the later stages means that the column surfaces likely remained drier and the leachate remained in the column longer than at faster application rates before exiting to the collection bottle. Both effects would allow greater evaporation.

An effect of evaporation is to cause salt concentration. This would locally cause salts to precipitate (removing load from solution) (Figure 2). The start of significant evaporative losses around Step 5 would therefore explain the decrease in leachate recovery, the onset of load loss rather than weak load accumulation, and the sharp increase in leachate concentrations observed in Steps 5 to 7.

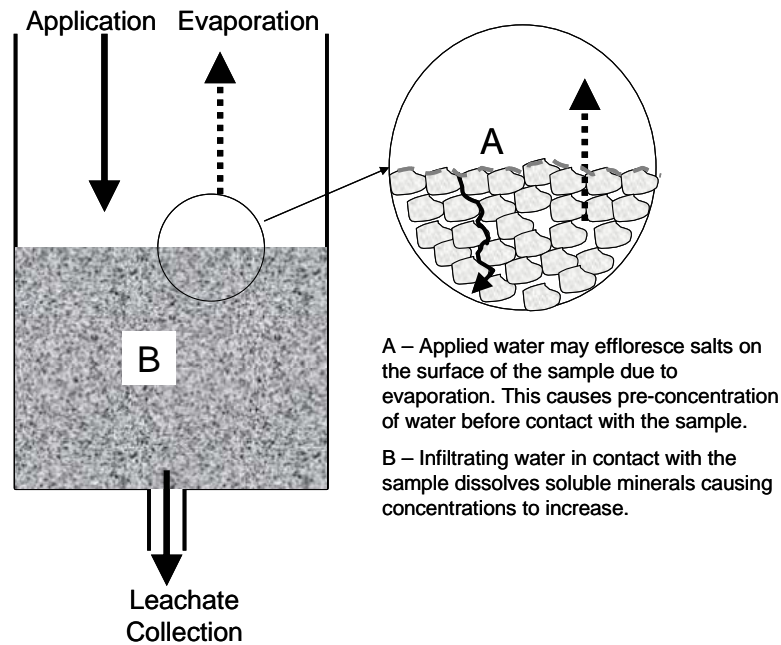


Figure 2. Infiltration and Evaporative Processes in the Leach Column

4.1.3 Solubility Controls

MINTEQA2 (Allison et al. 1991) was used to evaluate indications of solubility controls on leachate chemistry. In the four acidic columns, the main mineralogical control on major ion chemistry is the formation and dissolution of gypsum. Gypsum may be expected to form when the acidic pore water produced by dissolution of acid salts reacts with calcium-containing minerals. Calcium concentrations to some degree stabilized as a result of gypsum precipitation. Sulphate concentrations increased even as gypsum formed due to dissolution of magnesium-bearing minerals (like chlorite). Aluminum concentrations appeared to be controlled by formation of $AlOHSO_4$, and jarosite may also have been present in the more acidic samples. No indications of mineralogical controls for trace heavy elements were apparent.

4.2 Application of Results to Blue WRSA Pore Water Chemistry Predictions

4.2.1 Evaluation of Approach “A” and “B” Predictions

Table 1 shows an update of a similar table presented previously by SRK (2003). The first part of the table shows predictions of pore water chemistry using the two approaches “A” and “B” as described in Section 1.2. For each approach, the predicted chemistry of porewater associated with each pH range, and the modelled result of mixing the pore water chemistry in the indicated proportions is shown. Following these previous results, Table 1 shows actual average maximum concentrations from the sequential leach test. The average concentrations shown in the table were selected from the indicated columns in the flattening part of the concentration trend before concentrations increased in response to probable evaporative effects observed primarily in Steps 6 and 7 (as discussed in Section 4.1.2). The justification for this selection is that the limit of concentrations produced by rock contact are shown by the steps in the column when load was continuing to be added and before evapo-concentration began to remove load (Figure 2). Evaporation is not an effect that would occur in the moist pore spaces of the waste rock, especially with the soil cover and therefore the higher concentrations produced later in the tests were not included in Table 1.

It is apparent when comparing the sequential leach tests with the predicted pore water chemistry that the sequential leach tests produced water chemistries closer to the Approach “B” predictions. For most parameters (with the exception of copper and iron for the lowest pH waters), concentrations indicated by the sequential leach tests were of the same order-of-magnitude as Approach “B”. For iron and copper, the most acidic sequential leach tests produced much lower concentrations than indicated by Approach “B”. The lower iron resulted in lower acidity for the most acidic pore water.

MINTEQA2 was used to combine the pore water concentrations indicated by the sequential leach tests in the same proportions used previously for Approaches “A” and “B” for comparison with prediction of overall average pore water chemistry. Like Approach “B”, the overall pore water is expected to be near neutral (ie pH greater than 6), and overall water chemistry was comparable to the Approach “B” prediction.

Overall, the sequential leach tests demonstrated that the Approach “B” gave a more reasonable estimate of pore water chemistry (ie that overall pore water is non-acidic) though concentrations of copper were significantly over-estimated by Approach “B”.

The overall finding eliminates the need for significant neutralizing effects in the natural soils downgradient of the WRSA to consume acidity prior to mixing of groundwater with Laura Creek.

4.2.2 Maximum Concentrations in Sequential Leach Tests

The final section of Table 1 updates the previous compilation (SRK 2003) of observed maximum concentrations in humidity cells test leachates, shake flask leachates, Blue Pit seeps and seep BC-11. The latter is a seep below the toe of the Blue WRSA.

With the exception of aluminum and sulphate, the sequential leach tests did not result in higher concentrations of any parameters than had been measured previously in other tests or site seeps. The aluminum concentration of 128 mg/L measured at pH 2.7 in Column 2 is the result of prolonged contact of a strongly acidic solution produced by dissolution of iron sulphates with alumino-silicate minerals in fine-grained argillites and shales. The reaction of acidity with alumino-silicates would also have resulted in consumption of acidity and release of elements associated with silicates such as potassium and sodium. These in turn could have caused precipitation of iron by formation of jarosite ($\text{KFe}_3(\text{SO}_4)_2(\text{OH})_6$). Therefore, acidity as dissolved iron is replaced by acidity as dissolved aluminum. This aspect of the sequential leach test demonstrates the importance of dissolution of alumino-silicates as a process for internal consumption of acidity and removal of iron from solution. The short duration of leaching in other test procedures did not allow this to occur.

Table 1: Comparison of Pore Water Chemistry Estimates

Type	Comment	Modelling Proportions %	Calc'd Acidity mgCaCO ₃ /L	Al mg/L	Sb mg/L	As mg/L	Cd mg/L	Cu mg/L	Fe mg/L	Mn mg/L	Hg mg/L	Se mg/L	SO ₄ mg/L	Zn mg/L
Pore Water Concentrations Predictions from SRK (2003)														
Approach "A" Estimates														
Modelled Estimated Pore Water	pH<4	13%	2321	36	1	23	4	491	414	129	0.005	2.9	6272	90
	4<pH<5	14%	90	5	1.4	2	0.05	4	0.1	32	0.005	0.2	2452	8
	pH>5	74%	2	0.01	9	5	0.05	0.7	0.01	0.59	0.005	0.2	2023	2
	Modelled (pH~3.9)	100%		5	7	7	0.5	62	52	21	0.005	0.6	2614	14
Approach "B" Estimates														
Modelled Estimated Pore Water	pH<4	13%	615	26	0.04	0.9	0.15	20	161	5	0.0002	0.1	2005	3.6
	4<pH<5	14%	9	1	0.1	0.1	0.002	0.2	0.0	1	0.0002	0.01	651	0.3
	pH>5	74%	0	0.01	0.4	0.2	0.002	0.03	0.01	0.12	0.0002	0.01	286	0.1
	Modelled (pH~7.9)	100%		0.004	0.3	0.3	0.021	0.8	0.00	0.4	0.0002	0.04	550	0.56
Pore Water Concentrations Predicted by Sequential Leach Test														
Leach Test Results	pH<4 (Column 1, 2, 3)	13%	404	67	0.05	0.1	0.04	0.6	2.45	13	0.0001	0.3	3500	3
	4<pH<5 (Column 4)	14%	12	0.6	0.08	0.1	0.01	0.03	0.005	5	0.0001	0.045	2500	1
	pH>5 (Columns 5 and 6)	74%	0	0.003	0.08	0.02	0.00007	0.0008	0.01	0.008	0.0001	0.03	140	0.003
	Modelled (pH~6.4)	100%		0.0001	0.08	0.05	0.007	0.08	0.0002	2.4	0.0001	0.08	900	0.6
Observed Maximum Concentrations														
Humidity Cells	pH<3 (except As and Sb)		1941	78	0.18	35	0.4	13	514	58	0.0096	0.2	1360	10
Shake Flasks	pH<3 (except As and Sb)		446	28	0.24	5	0.05	8	101	2	0.0008	0.04	3	3
BC-11	Neutral pH		4	0.623	0.02	0.02	0.0010	0.02	0.18	0.03	0.00008	0.03	124	0.02
Blue Pit Seeps	pH<3 (except As and Sb)		636	26	1.40	4.9	0.09	0.75	180	4	<0.00005	0.014	1230	5.48
Sequential Leach Test	pH<3 (except As and Sb)		751	128	0.1	0.1	0.05	1.4	6	13	0.0001	0.5	4460	3.9

5 Conclusions

The sequential leach test described in this report was performed to obtain actual chemistry of water in contact with Blue Pit waste rock for comparison with earlier concentrations estimated used shake flask data and modelling.

The testwork produced water chemistry closest to that previously predicted using Approach “B” in SRK (2003). This modelling approach allowed for some storage of oxidation products in the rock and indicated that the overall pore water in the Blue WRSA is non-acidic.

The sequential leach tests demonstrated that leachable copper concentrations are likely to be much lower than indicated by both Approach “A” and Approach “B”. The tests also demonstrated that dissolution of alumino-silicates in the rock removes acidity and iron.

As a result of the prediction that pore water is non-acidic and copper concentrations in pore water are likely to be lower than predicted previously, acid buffering and copper precipitations effects in groundwater beneath the Blue WRSA do not need to be invoked to protect Laura Creek at BC-1 and the South Klondike River.

Based on these findings, the earlier conclusion of negligible effects on monitoring point BC-1 in Laura Creek and the South Klondike River is confirmed, and mitigation measures to further reduce infiltration or limit oxygen entry are not believed to be necessary. The current cover provides a beneficial effect by limiting flushing of oxidation products by reduction of infiltration.

6 References

Allison, J.D., Brown, D.S., and Novo-Gradac, K.J. (1991), MINTEQA2/PRODEFA2, A Geochemical Assessment Model for Environmental Systems: Version 3.0 User's Manual, EPA/600/3-91/021. U.S. Environmental Protection Agency, Environ. Res. Lab., Athens, Ga.

AMEC 2002. Blue Waste Rock Dump 2002 Geochemical Investigation Program Brewery Creek Mine. Prepared for Viceroy Minerals Corporation. November 2002.

Nevada Division of Environmental Protection. 1996. Meteoric Water Mobility Procedure (MWMP) Statandardized Column Test Procedure. *NDEP publication MWMP.ltr*. May 3 1996. 6p

SRK Consulting. 2003. Geochemical Assessment – Blue Waste Rock Storage Area, Brewery Creek Mine. SRK File 1CV001.01, August 2003.

SRK Report Distribution Record

Complete this form and include it as the final page for each copy of the report produced.

Report No.

Copy No.

Name/Title	Company	Copy	Date	Authorised by

Approval Signature:

This report is protected by copyright vested in **Steffen, Robertson & Kirsten (Canada) Inc.** It may not be reproduced or transmitted in any form or by any means whatsoever to any person without the written permission of the copyright holder, SRK.

Appendix A
Description of Field Program

Memorandum

To: Brad Thrall

From: Rick Diment

Date: October 13, 2003

Re: Rock Characterization and Sampling of Blue Dump; Brewery Creek Mine

The following memo describes a test pit mapping and sampling program on the Blue Dump in September of 2003. The purpose of the program was to characterize and collect representative rock types from the Blue waste dump for planned test work by SRK Consulting (SRK) to determine metal leaching and acid rock drainage (ARD) potential.

Sampling Protocol and Procedures

As per instructions from SRK's geochemist Stephen Day, three 50 kilogram samples were collected from test pits over the central portion of the dump that represented low (less than 5) , mid (5-6) and neutral (7) pH ranges. These specific pH ranges within the dump were located using previously recorded data from a test pit mapping and sampling campaign by BGC Engineering Ltd. (BGC) in 2002.

Three test pits were dug ranging in depth from 1.8 to 3.7 metres, using a track mounted excavator. Material excavated from each pit was segregated into separate piles based on geology. Pits walls were then photographed and geologically mapped. A paste pH was conducted for each rock type in each pit to verify the pH previously identified by BGC in 2002. After a specific pH range was identified (i.e. low, mid and neutral), a 60 kg sample of minus one inch material was collected by hand into two, 20 litre pails.

Rock Characterization of Samples

A total of five paste pH tests were completed on various rock types in the three pits, producing an acceptable variability of pH values ranging from 4.0 to 7.33. All pits that were excavated were relatively dry and free draining, exhibiting no obvious zones of higher moisture contents due to impervious geological units.

Following is a geological description of the material collected for each pH range.

Low pH Range (4.0)

Location; 3 m grid east of BGC Test Pit 2

Test Pit; TP-2A; 2.0-3.0 metres

Rock Characterization; Fissile, dark grey shale and siltstone with traces of limonite along planar fracture surfaces. Rare fine grained pyrite (< 1mm wide) preserved along limonitic fractures. Platy shale and siltstone fragments up to 7 cm wide are intercalated with minor clay rich, shale forming a silty, gravel texture. No presence of carbonate. Low pH possibly derived from on going oxidation of preserved pyrite along bedding and fractures surfaces.

Mid pH Range (5.91)

Location; 3 metres grid east of BGC Test Pit #4

Test Pit; TP-4A; 1.5 – 3.7 metres

Rock Characterization; Alternating 0.20 – 0.30 metre layers of soft black shale and limonitic (orange –brown) coarse clastics of chert pebble conglomerate and greywacke. Black shale has clay consistency with rare, cm scale limonitic seams of limonitic altered quartz monzonite. No visible sulphides or presence of carbonate. Limonite most likely derived from destruction of biotite in quartz monzonite and oxidation of pyrite.

Coarse clastic layers have a sand/gravel consistency of pervasively limonitic chert pebble conglomerate (chert clasts up to 1 cm wide) and slightly finer grained greywacke (chert clasts 0.1 to 0.5 cm wide). Strong limonite staining localized along planar fracture surfaces. Limonite is most likely derived from complete oxidation of sulphides (pyrite, marcasite) that was introduced along open fractures. No visible, preserved sulphides or carbonate were noted. The original sulphide content, prior to oxidation is difficult to estimate but is most likely no more than 2%.

Neutral pH Range (6.95)

Location; Approximately 50 metres grid east of TP-4A. Sample material derived from excavation of PVC lined infiltration sump to monitor infiltration rates of precipitation through 0.5 metre thick growth media cover.

Test Pit; TP-11; 0.5 -1.8 metres

Rock Characterization; Graphitic, black shale with 10-15%, intercalated orange-brown fragments of limonitic altered quartz monzonite. Shale is very soft, clay rich and malleable with no competent fragments greater than 1 cm wide. No visible sulphides or presence of carbonate. Shale is devoid of any limonite staining.

Minor limonitic fragments of quartz monzonite range from 0.5 to 2 cm in diameter. Fragments are relatively competent exhibiting silty gravel texture. No visible, preserved sulphides. Rare, planar fracture surfaces are weakly calcareous (i.e. reacts moderately to 10% HCL) and most likely represents ankeritic alteration.

Based on my past experience as Project Geologist and Exploration Manager for the Brewery Creek Gold Project, spanning 11 continuous years from 1989 through 1999, I regard the samples collected during this program as representative waste rock types from the Blue and Pacific pits. The lack of primary carbonate and trace to 2% pyrite content in sedimentary rocks are typical of the regional stratigraphy in the Brewery Creek area. The limonitic quartz monzonite, representing no more than 15% of the total waste material on Blue Dump, typically forms an ankeritic halo (iron-magnesium carbonate alteration) around most ore deposits at Brewery Creek.

Respectfully Submitted,

Rick Diment, P.Ge
Professional Geoscientist of British Columbia # 20288

Appendix B
Results of Analysis

Column	Units	Col 1	Col 1	Col 1	Col 1	Col 1	Col 1	Col 1
Start Date		25-Sep-03	30-Sep-03	5-Oct-03	10-Oct-03	16-Oct-03	21-Oct-03	28-Oct-03
Step		1	2	3	4	5	6	7
Dry Weight Required	g	9000	6600	4700	3300	2300	1500	900
Moisture	%	6.9	6.9	6.9	6.9	6.9	6.9	6.9
Equivalent Wet Weight	g	9662	7086	5046	3543	2469	1610	966
Input Volume	mL	9000	6600	4700	3300	2300	1500	900
Output Volume	mL	8540	6200	4480	2880	1920	1150	610
pH	-	3.53	3.46	3.4	3.44	3.33	3.36	3.59
Eh	mV	505	420	485	485	475	430	490
EC	uS/cm	1078	1588	2510	2860	3360	3590	4010
Alkalinity	mg/L CaCO3	-	-	-	-	-	-	-
Sulphate	mg/L	590	1115	1425	2100	2270	2710	3560
Ag	ug/L	<0.05	<0.05	<0.05	<0.05	0.44	0.1	0.31
Al	ug/L	4556	13000	13395	16379	22840	25510	31433
As	ug/L	34.6	56.5	67.3	65.7	79.6	118	88.9
Au	ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	0.6	<0.05
B	ug/L	37	64	73	105	122	140	240
Ba	ug/L	31.63	32.74	30.32	23.26	27.68	44.6	34.31
Be	ug/L	4.05	5.97	11.69	16.11	13.52	19.4	20.96
Bi	ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	0.1	0.06
Br	ug/L	<5	16	<5	18	<5	10	45
Ca	ug/L	124081	261984	345662	395946	500890	592970	672441
Cd	ug/L	2.21	5.41	6.77	7.14	12.29	7.1	11.1
Ce	ug/L	6.62	13.71	20.88	26.48	34.15	42.3	45.9
Cl	mg/L	1	<1	<1	1	<1	<1	<1
Co	ug/L	48.57	115.06	150.32	159.1	244.79	263.9	354.06
Cr	ug/L	<0.5	<0.5	<0.5	0.8	1.2	19	1.3
Cs	ug/L	4.12	7.82	8.43	7.42	10.24	11.1	11.88
Cu	ug/L	44.6	90.7	113.4	138.4	128.5	127	123.8
Dy	ug/L	2.82	5.26	8.63	11.16	13.25	15.8	20.19
Er	ug/L	1.14	2.38	4.11	4.58	5.88	7.8	8.54
Eu	ug/L	0.55	1.01	1.63	2.23	2.71	3.3	3.81
Fe	ug/L	<10	319	689	<10	<10	130	<10
Ga	ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	0.2	0.1
Gd	ug/L	3.33	6.85	11.29	13.05	17.22	22.4	24.07
Ge	ug/L	0.39	0.96	1.2	1.22	1.31	2.3	2.43
Hf	ug/L	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	0.03
Hg	ug/L	<0.1	0.1	<0.1	0.1	<0.1	0.3	<0.01
Ho	ug/L	0.47	0.98	1.6	1.88	2.44	3	3.54
In	ug/L	<0.01	0.09	0.07	<0.01	<0.01	0.4	<0.01
Ir	ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
K	ug/L	7263	14133	14768	14056	21639	18380	23401
La	ug/L	2.51	5.27	8.62	9.58	13.53	16.1	18.13
Li	ug/L	24	46.2	67.6	91.9	101	133	202.4
Lu	ug/L	0.11	0.24	0.43	0.47	0.63	0.7	0.92
Mg	ug/L	61326	132032	162141	217455	259097	323750	439184
Mn	ug/L	918.27	2166.05	2956.4	3355.61	4139.39	4874.2	6475.56
Mo	ug/L	<0.1	0.1	0.5	0.1	<0.1	1	0.1
Na	ug/L	2905	5110	6343	9042	13148	20920	28864
Nb	ug/L	<0.01	<0.01	<0.01	0.01	<0.01	0.02	0.01
Nd	ug/L	5.3	10.42	17.61	22.67	27.88	31.6	37.2
Ni	ug/L	170.2	379.8	496.7	564.2	862.4	990	1325.2
Os	ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
P	ug/L	<20	<20	31	<20	35	60	31
Pb	ug/L	1	1.9	1	1.6	5.9	13	4.2
Pd	ug/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Pr	ug/L	1.03	1.8	3	4.21	4.91	6	6.91
Pt	ug/L	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
Rb	ug/L	37.45	62.12	67.74	58.97	78.82	81.5	104.22
Re	ug/L	0.01	0.01	0.03	0.02	0.03	0.02	0.05
Rh	ug/L	<0.01	0.1	0.06	<0.01	<0.01	<0.01	<0.01
Ru	ug/L	<0.05	0.12	0.09	<0.05	<0.05	<0.05	<0.05
S	mg/L	180	475	606	562	879	976	1209
Sb	ug/L	24.94	32.82	33.33	28.57	33.09	34.6	42.35
Sc	ug/L	1	1	<1	<1	1	<1	9
Se	ug/L	90.9	240.1	323.6	542.9	475.1	496	781
Si	ug/L	12986	28861	34494	46383	62438	48680	83488
Sm	ug/L	1.74	3.41	5.9	7.22	8.79	10.4	12.06
Sn	ug/L	175.74	147.9	163.72	201.1	298.18	363.4	896.08
Sr	ug/L	575.27	1275.04	1680.77	1783.08	2398.14	2505	3292.13
Ta	ug/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Tb	ug/L	0.49	0.96	1.57	2.08	2.59	3.1	3.68
Te	ug/L	<0.05	0.18	0.11	0.08	0.23	0.3	0.21
Th	ug/L	<0.05	0.16	0.07	<0.05	<0.05	0.5	0.07
Ti	ug/L	<10	<10	<10	<10	<10	10	12
Tl	ug/L	0.62	1.05	1.19	1.07	1.44	1.6	1.92
Tm	ug/L	0.14	0.27	0.41	0.6	0.73	0.9	1.02
U	ug/L	0.58	1.33	2.03	1.7	2.02	2.4	2.81
V	ug/L	<0.2	<0.2	<0.2	<0.2	0.6	56	<0.2
W	ug/L	<0.02	0.04	0.06	<0.02	<0.02	2.1	0.05
Y	ug/L	15.65	30.57	51.99	65.82	79.66	90.5	118.18
Yb	ug/L	0.84	1.66	2.72	3.35	4.17	5.1	6.05
Zn	ug/L	208.3	444.8	588.6	628.4	883.6	941	1346.1
Zr	ug/L	0.02	0.08	0.08	0.06	0.04	0.4	0.23

Column	Units	Col 2	Col 2	Col 2	Col 2	Col 2	Col 2	Col 2
Start Date		25-Sep-03	30-Sep-03	5-Oct-03	10-Oct-03	16-Oct-03	21-Oct-03	28-Oct-03
Step		1	2	3	4	5	6	7
Dry Weight Required	g	9000	6600	4700	3300	2300	1500	900
Moisture	%	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Equivalent Wet Weight	g	9681	7100	5056	3550	2474	1614	968
Input Volume	mL	9000	6600	4700	3300	2300	1500	900
Output Volume	mL	8450	6115	4420	2880	1760	1060	555
pH	-	2.87	2.76	2.69	2.71	2.65	2.61	2.78
Eh	mV	580	560	565	575	570	560	605
EC	uS/cm	1886	3620	4300	4350	5170	5890	6160
Alkalinity	mg/L CaCO3	-	-	-	-	-	-	-
Sulphate	mg/L	1065	2485	2950	3600	4050	4460	5980
Ag	ug/L	<0.05	<0.05	<0.05	0.18	0.31	0.4	0.29
Al	ug/L	22558	71000	94227	113772	128194	170340	231570
As	ug/L	31.7	63.6	67.7	77.3	75.4	102	105.1
Au	ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
B	ug/L	21	46	60	<20	62	100	168
Ba	ug/L	21.28	18.32	16.89	16.39	15.66	19.6	19.33
Be	ug/L	22.46	61.56	88.06	97.44	102.69	162.7	215.02
Bi	ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Br	ug/L	<5	<5	<5	<5	<5	20	<5
Ca	ug/L	204493	535959	549278	568077	594066	576600	613389
Cd	ug/L	9.74	27.33	34.68	49.1	50.67	59.5	76.35
Ce	ug/L	46.84	142.08	178.98	239.53	244.14	324.4	368.36
Cl	mg/L	<1	<1	<1	<1	<1	<1	<1
Co	ug/L	151.27	468.86	568.64	814.18	920.63	1112.6	1536.45
Cr	ug/L	5.6	14.8	16.4	23.3	22.1	28	32.2
Cs	ug/L	3.45	6.02	6.32	5.99	6.77	8.5	8.59
Cu	ug/L	339	870.4	969.1	1403.5	1251.4	1517	1852.8
Dy	ug/L	23.77	73.09	101.37	114.95	121.76	160.8	211.87
Er	ug/L	8.77	29.74	39.02	43.44	49.76	73	87.67
Eu	ug/L	4.91	14.11	19.95	23.91	25.89	33.6	41.09
Fe	ug/L	3436	5558	5563	5921	5472	7150	7459
Ga	ug/L	0.06	0.08	<0.05	<0.05	0.23	<0.05	0.55
Gd	ug/L	28.08	85.71	116.51	128.56	150.42	208.9	243.89
Ge	ug/L	0.32	0.92	1.11	1.44	1.23	2.3	2.59
Hf	ug/L	0.02	0.15	0.05	<0.02	<0.02	<0.02	0.12
Hg	ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.01
Ho	ug/L	3.76	11.92	17.62	18.37	20.55	29	36.34
In	ug/L	0.03	0.15	0.13	0.07	<0.01	1.1	0.02
Ir	ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
K	ug/L	3957	7796	6747	8719	9687	9840	11277
La	ug/L	15.04	45.84	60.77	73.8	79.83	110.9	125.15
Li	ug/L	27.4	97.5	123.3	191.2	193.3	273	514.4
Lu	ug/L	0.88	2.94	4.13	3.98	4.81	7.3	8.69
Mg	ug/L	81123	219270	283239	384959	381738	625610	784391
Mn	ug/L	2155.74	6235.94	8183.56	11184.99	11560.61	14388	19819.2
Mo	ug/L	<0.1	0.1	0.3	0.2	<0.1	0.4	0.2
Na	ug/L	1744	4425	6121	8921	18950	30070	29267
Nb	ug/L	<0.01	0.02	<0.01	0.02	<0.01	<0.01	0.03
Nd	ug/L	42.46	127	179.2	207.92	214.79	266	324.92
Ni	ug/L	402.5	1195.7	1507.4	2134.3	2559.1	3237	4350.9
Os	ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
P	ug/L	<20	<20	<20	35	41	40	34
Pb	ug/L	1.1	4.3	2.9	8	3	8	5
Pd	ug/L	<0.2	0.2	<0.2	<0.2	<0.2	<0.2	0.5
Pr	ug/L	8.02	23.53	30.22	39.86	39.56	51.2	58.74
Pt	ug/L	<0.01	<0.01	0.02	0.01	<0.01	<0.01	<0.01
Rb	ug/L	29.24	46.41	48.35	48.01	49.76	56.9	66.78
Re	ug/L	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01
Rh	ug/L	<0.01	0.01	0.01	<0.01	<0.01	<0.01	<0.01
Ru	ug/L	<0.05	0.14	0.1	<0.05	<0.05	<0.05	<0.05
S	mg/L	300	853	974	1016	1284	1642	1992
Sb	ug/L	4.95	8.96	10.28	13	14.24	16.4	21.01
Sc	ug/L	22	52	76	63	99	120	165
Se	ug/L	70	217.1	309.7	523.4	444.2	471	735.7
Si	ug/L	16241	38800	53652	82733	96722	88940	149205
Sm	ug/L	16.21	48.45	64.87	77.93	82.02	104.6	129.29
Sn	ug/L	234.43	238.9	202.88	411.11	532.15	875.9	1753.34
Sr	ug/L	919.09	2357.6	2835.54	3329.66	3497.45	3849.4	4941.25
Ta	ug/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.03
Tb	ug/L	4.33	13.64	17.84	21.29	22.72	31.4	39.31
Te	ug/L	0.07	0.14	0.14	0.57	<0.05	0.2	0.59
Th	ug/L	0.41	1.23	1.23	0.92	1.1	1.8	2.04
Ti	ug/L	<10	<10	<10	17	11	20	24
Tl	ug/L	0.51	0.99	1.07	0.82	1.14	1.3	1.46
Tm	ug/L	1.09	3.38	4.65	5.48	6.04	8.4	10.29
U	ug/L	18.05	52.66	57.63	55.82	57.51	86.3	101.53
V	ug/L	<0.2	<0.2	<0.2	<0.2	0.9	20	0.6
W	ug/L	<0.02	0.05	0.09	0.19	<0.02	0.1	0.07
Y	ug/L	95.82	295.56	411.19	537.41	530.11	668.4	966.54
Yb	ug/L	6.47	20.02	29.48	30.39	34.72	48.5	59.72
Zn	ug/L	682.4	2158.5	2798.4	3725.8	3933.1	4564	6319.7
Zr	ug/L	0.18	0.53	0.69	0.83	0.8	2.1	3.1

Column	Units	Col 3	Col 3	Col 3	Col 3	Col 3	Col 3	Col 3
Start Date		25-Sep-03	30-Sep-03	5-Oct-03	10-Oct-03	16-Oct-03	21-Oct-03	28-Oct-03
Step		1	2	3	4	5	6	7
Dry Weight Required	g	9000	6600	4700	3300	2300	1500	900
Moisture	%	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Equivalent Wet Weight	g	9630	7062	5029	3531	2461	1605	963
Input Volume	mL	9000	6600	4700	3300	2300	1500	900
Output Volume	mL	8305	5925	4200	2800	1680	1300	400
pH	-	4.3	4.22	4.1	3.89	3.76	3.78	3.69
Eh	mV	500	500	500	500	520	510	555
EC	uS/cm	1473	2560	3110	3120	3690	3760	3950
Alkalinity	mg/L CaCO3	-	-	-	-	-	-	-
Sulphate	mg/L	1010	1845	1940	2450	2500	2510	3690
Ag	ug/L	<0.05	<0.05	<0.05	<0.05	0.3	0.3	0.32
Al	ug/L	416	921	1426	2721	3819	4450	8411
As	ug/L	68.6	81.6	90.7	78.9	111.7	96	129.6
Au	ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
B	ug/L	21	52	53	63	91	90	157
Ba	ug/L	28.47	34.06	25.72	23.22	26.91	25.3	31.69
Be	ug/L	2.11	5.02	10.58	11.43	18.8	19.3	33.64
Bi	ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Br	ug/L	<5	<5	<5	<5	<5	<5	<5
Ca	ug/L	267017	551247	504745	543900	561390	558600	647429
Cd	ug/L	4.32	10.75	14.43	18.13	29.44	25.2	47.89
Ce	ug/L	0.29	0.74	1.12	1.78	2.55	2.9	4.85
Cl	mg/L	2	<1	<1	6	<1	<1	<1
Co	ug/L	66.67	151.72	197.08	216.89	353.89	349.9	598.52
Cr	ug/L	<0.5	<0.5	<0.5	<0.5	0.9	<0.5	<0.5
Cs	ug/L	0.18	0.22	0.28	0.31	0.41	0.3	0.52
Cu	ug/L	16.2	32.4	36.4	72	115.8	60	188.8
Dy	ug/L	0.25	0.71	1.12	1.97	2.76	3.3	5.95
Er	ug/L	0.14	0.43	0.62	1.12	1.55	1.9	3.45
Eu	ug/L	0.05	0.12	0.18	0.31	0.46	0.5	0.95
Fe	ug/L	<10	143	<10	346	67	340	202
Ga	ug/L	<0.05	0.06	0.06	0.07	0.12	0.2	0.45
Gd	ug/L	0.26	0.75	1.05	1.65	2.73	3.2	5.83
Ge	ug/L	0.06	0.17	0.18	0.19	0.18	0.2	0.44
Hf	ug/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Hg	ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.01
Ho	ug/L	0.05	0.15	0.21	0.39	0.6	0.7	1.24
In	ug/L	<0.01	0.1	0.17	<0.01	<0.01	0.5	0.03
Ir	ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
K	ug/L	3503	7108	6775	7269	10752	7900	12453
La	ug/L	0.08	0.26	0.46	0.72	1.06	1.2	1.86
Li	ug/L	25.8	50.7	62.5	76.2	89.1	100	191.3
Lu	ug/L	0.01	0.04	0.06	0.12	0.14	0.2	0.36
Mg	ug/L	78010	155071	186728	243048	267820	311630	449308
Mn	ug/L	2726.31	5929.71	7365.98	9431.15	12239.37	13386.3	21388.17
Mo	ug/L	0.1	0.1	0.3	0.1	<0.1	0.3	0.2
Na	ug/L	2687	4365	4975	7544	16200	19440	20852
Nb	ug/L	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	0.03
Nd	ug/L	0.31	0.84	1.29	2.08	2.75	3.4	5.63
Ni	ug/L	327.2	833.7	1078.6	1144.6	1841	1832	2998.1
Os	ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
P	ug/L	21	<20	20	<20	40	20	30
Pb	ug/L	0.3	2.2	0.3	0.1	2.8	10	5
Pd	ug/L	<0.2	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Pr	ug/L	0.05	0.13	0.18	0.31	0.44	0.5	0.83
Pt	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01
Rb	ug/L	7.3	10.39	10.68	9.08	13.85	13	19.19
Re	ug/L	0.01	0.01	<0.01	<0.01	<0.01	<0.01	0.01
Rh	ug/L	0.01	0.02	0.04	<0.01	<0.01	<0.01	<0.01
Ru	ug/L	<0.05	0.06	0.07	<0.05	<0.05	<0.05	<0.05
S	mg/L	277	681	682	714	928	931	1248
Sb	ug/L	74.91	94.15	91.56	78.41	87.19	82.4	98.31
Sc	ug/L	1	1	2	2	1	10	13
Se	ug/L	10.9	27.8	38.1	58.4	63	59	101.8
Si	ug/L	11379	18082	20634	31839	42194	32060	63581
Sm	ug/L	0.11	0.33	0.47	0.78	1.21	1.2	2.49
Sn	ug/L	159.53	179.36	206.77	237.83	320.38	431.7	1044.51
Sr	ug/L	1913.97	3911.72	4307.17	4446.23	5957.47	5810.3	7980.32
Ta	ug/L	<0.02	<0.02	<0.02	<0.02	0.04	0.03	<0.02
Tb	ug/L	0.04	0.11	0.2	0.32	0.43	0.5	0.93
Te	ug/L	<0.05	0.12	0.18	0.1	0.43	0.1	<0.05
Th	ug/L	<0.05	0.11	<0.05	<0.05	<0.05	0.1	<0.05
Ti	ug/L	<10	<10	<10	<10	<10	10	10
Tl	ug/L	0.38	0.71	0.73	0.67	0.97	0.9	1.22
Tm	ug/L	0.02	0.04	0.06	0.13	0.14	0.2	0.42
U	ug/L	0.06	0.26	0.38	0.63	0.97	1.1	2.59
V	ug/L	<0.2	<0.2	<0.2	0.3	0.4	6	0.4
W	ug/L	<0.02	0.07	0.06	<0.02	<0.02	0.1	0.07
Y	ug/L	2.22	6.13	10.06	15.6	23.16	25.5	47.57
Yb	ug/L	0.09	0.27	0.38	0.74	1.01	1.3	2.41
Zn	ug/L	367.1	944.3	1234.9	1183.2	2121.1	2087	3511.1
Zr	ug/L	<0.02	0.02	0.03	0.02	0.05	0.1	0.09

Column	Units	Col 4	Col 4	Col 4	Col 4	Col 4	Col 4	Col 4
Start Date		25-Sep-03	30-Sep-03	5-Oct-03	10-Oct-03	16-Oct-03	21-Oct-03	28-Oct-03
Step		1	2	3	4	5	6	7
Dry Weight Required	g	9000	6600	4700	3300	2300	1500	900
Moisture	%	8.7	8.7	8.7	8.7	8.7	8.7	8.7
Equivalent Wet Weight	g	9858	7229	5148	3615	2519	1643	986
Input Volume	mL	9000	6600	4700	3300	2300	1500	900
Output Volume	mL	8125	6015	4320	2740	1680	1220	435
pH	-	5.17	4.94	4.64	4.61	4.47	4.38	4.33
Eh	mV	460	460	460	460	480	470	510
EC	uS/cm	819	1196	1786	2310	3090	3240	3160
Alkalinity	mg/L CaCO3	4	7	7	8	-	-	-
Sulphate	mg/L	445	824	1075	1775	1965	2225	2540
Ag	ug/L	<0.05	<0.05	<0.05	<0.05	0.28	0.3	0.34
Al	ug/L	26	57	65	140	237	330	571
As	ug/L	63.5	59.9	55.4	61.7	97.7	89	147.7
Au	ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
B	ug/L	28	44	39	57	99	90	133
Ba	ug/L	43.83	45.8	30.58	28.68	37.87	37.6	45.22
Be	ug/L	0.09	0.24	0.35	0.4	1.03	1.3	1.67
Bi	ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Br	ug/L	5	<5	13	<5	<5	10	31
Ca	ug/L	126258	248775	323132	440483	547806	586340	642017
Cd	ug/L	0.91	1.85	2.54	3.71	11.42	5.9	11.63
Ce	ug/L	0.01	0.02	0.07	<0.01	0.22	0.3	0.45
Cl	mg/L	2	<1	3	9	<1	<1	<1
Co	ug/L	7.63	14.79	17.81	26.36	52.22	52.1	79.01
Cr	ug/L	<0.5	<0.5	<0.5	<0.5	1	1	0.7
Cs	ug/L	0.13	0.21	0.22	0.22	0.33	0.3	0.42
Cu	ug/L	1.3	1.2	4.4	5.3	11.4	7	25.9
Dy	ug/L	0.01	<0.01	0.05	0.03	0.14	0.2	0.41
Er	ug/L	<0.01	<0.01	0.03	0.02	0.11	0.1	0.23
Eu	ug/L	<0.01	<0.01	0.01	<0.01	0.03	0.1	0.08
Fe	ug/L	<10	139	23	434	<10	100	<10
Ga	ug/L	<0.05	<0.05	<0.05	<0.05	0.06	<0.05	0.2
Gd	ug/L	<0.01	<0.01	0.05	<0.01	<0.01	<0.01	0.39
Ge	ug/L	<0.05	0.09	0.09	0.1	0.13	0.2	0.23
Hf	ug/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Hg	ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.01
Ho	ug/L	<0.01	<0.01	0.01	0.01	0.02	0.03	0.09
In	ug/L	0.01	0.06	0.06	<0.01	<0.01	0.3	<0.01
Ir	ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
K	ug/L	2818	4334	3758	5577	8641	6710	10006
La	ug/L	<0.01	<0.01	0.02	<0.01	0.09	0.1	0.2
Li	ug/L	11.8	18.5	19.7	28.7	37.3	47	69.8
Lu	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03
Mg	ug/L	37415	61006	77391	119107	157773	188430	261396
Mn	ug/L	451.44	938.77	1157.92	1752.58	2703.34	3221.1	4752.1
Mo	ug/L	0.1	0.1	0.1	0.1	<0.1	0.1	0.1
Na	ug/L	3736	4793	4957	7808	13706	17720	21485
Nb	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nd	ug/L	<0.01	0.01	0.08	<0.01	0.19	0.3	0.56
Ni	ug/L	90.3	180.8	242.9	373	759.4	750	1121.5
Os	ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
P	ug/L	32	<20	<20	<20	31	40	29
Pb	ug/L	<0.1	1.7	0.1	<0.1	2.4	11	4.2
Pd	ug/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Pr	ug/L	<0.01	<0.01	0.01	<0.01	0.03	0.02	0.07
Pt	ug/L	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Rb	ug/L	5.68	7.65	7.49	6.76	12.39	11.8	16.03
Re	ug/L	0.06	0.06	0.04	0.03	0.02	0.03	0.03
Rh	ug/L	<0.01	0.11	<0.01	<0.01	<0.01	<0.01	<0.01
Ru	ug/L	<0.05	0.11	<0.05	<0.05	<0.05	<0.05	<0.05
S	mg/L	168	332	327	484	753	803	903
Sb	ug/L	60.14	65.27	57.16	49.47	66.36	64.3	79.54
Sc	ug/L	<1	<1	1	<1	1	<1	2
Se	ug/L	5.9	13.3	15.6	25.8	36.4	31	54.9
Si	ug/L	10637	12426	11041	18471	25840	19350	36112
Sm	ug/L	<0.02	<0.02	0.03	<0.02	0.08	0.1	0.16
Sn	ug/L	117.34	153.9	90.33	181.48	241.62	273.4	429.82
Sr	ug/L	780.94	1388.93	1652.27	1919.17	3178.37	3162.6	4142.16
Ta	ug/L	<0.02	<0.02	<0.02	<0.02	0.03	<0.02	<0.02
Tb	ug/L	<0.01	0.01	0.01	<0.01	0.01	0.02	0.06
Te	ug/L	<0.05	0.06	<0.05	<0.05	0.06	<0.05	<0.05
Th	ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	0.1	<0.05
Ti	ug/L	<10	<10	<10	<10	<10	10	<10
Tl	ug/L	0.29	0.4	0.39	0.47	0.76	0.7	0.93
Tm	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03
U	ug/L	<0.02	<0.02	0.02	0.03	0.05	0.1	0.12
V	ug/L	0.3	<0.2	<0.2	0.4	0.7	4	0.6
W	ug/L	<0.02	0.05	<0.02	<0.02	0.03	0.04	0.02
Y	ug/L	0.07	0.22	0.56	0.47	1.57	2	3.56
Yb	ug/L	<0.01	<0.01	0.02	<0.01	<0.01	0.1	0.14
Zn	ug/L	90.9	209.9	219.4	310.8	691.4	683	1166.3
Zr	ug/L	<0.02	0.03	<0.02	<0.02	<0.02	0.03	0.07

Column	Units	Col 5	Col 5	Col 5	Col 5	Col 6	Col 6	Col 6	Col 6
Start Date		25-Sep-03	30-Sep-03	5-Oct-03	10-Oct-03	25-Sep-03	30-Sep-03	5-Oct-03	10-Oct-03
Step		1	2	3	4	1	2	3	4
Dry Weight Required	g	8411	6168	4392	3084	8904	6530	4650	3265
Moisture	%	9.6	9.6	9.6	9.6	8.6	8.6	8.6	8.6
Equivalent Wet Weight	g	9303	6822	4858	3411	9747	7148	5090	3574
Input Volume	mL	8411	6168	4390	3084	8904	6530	4650	3265
Output Volume	mL	7355	5570	3885	2830	8010	5900	4205	2760
pH	-	7.54	7.57	7.54	7.75	7.54	7.58	7.51	7.56
Eh	mV	370	370	385	385	365	365	350	360
EC	uS/cm	254	318	395	423	265	319	394	434
Alkalinity	mg/L CaCO3	40	43	36	24	44	40	36	25
Sulphate	mg/L	54	86	114	138	58	88	112	142
Ag	ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Al	ug/L	18	7	3	3	14	3	2	3
As	ug/L	30.4	25.1	25.8	20.8	27.2	26	29.9	24.5
Au	ug/L	0.07	<0.05	<0.05	<0.05	0.07	<0.05	<0.05	<0.05
B	ug/L	<20	23	22	<20	<20	21	21	<20
Ba	ug/L	112.18	126.05	114.61	102.96	102.32	111.21	113.86	111.53
Be	ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Bi	ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Br	ug/L	<5	11	15	<5	<5	13	17	<5
Ca	ug/L	40200	45848	50686	55140	36054	48272	50300	55938
Cd	ug/L	0.07	0.15	<0.05	0.1	<0.05	0.14	<0.05	<0.05
Ce	ug/L	0.02	0.01	<0.01	<0.01	0.02	0.01	<0.01	<0.01
Cl	mg/L	1	<1	<1	1	1	<1	<1	1
Co	ug/L	0.05	0.05	0.05	0.06	0.03	0.06	0.04	0.07
Cr	ug/L	<0.5	0.5	0.5	<0.5	<0.5	<0.5	0.5	<0.5
Cs	ug/L	0.03	0.03	0.04	0.02	0.02	0.03	0.04	0.02
Cu	ug/L	1.4	1.3	0.6	0.7	0.7	0.7	0.9	0.9
Dy	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Er	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Eu	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fe	ug/L	18	23	115	19	<10	18	27	<10
Ga	ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Gd	ug/L	0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
Ge	ug/L	<0.05	0.06	0.08	0.08	<0.05	0.06	0.08	0.07
Hf	ug/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Hg	ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ho	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
In	ug/L	<0.01	0.02	<0.01	<0.01	<0.01	0.04	0.03	<0.01
Ir	ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
K	ug/L	1443	1929	1761	1853	1353	2199	1843	1774
La	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Li	ug/L	1.1	1.4	1.1	0.7	1.1	1.4	1.8	0.7
Lu	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Mg	ug/L	7474	10141	9245	11904	7284	9307	8783	11887
Mn	ug/L	11.66	7.67	8.08	8.29	6.12	12.92	7.32	7.58
Mo	ug/L	23.2	22.9	25	27.8	24.3	23.4	24.3	28
Na	ug/L	1812	2050	2122	2395	1738	1982	1985	2460
Nb	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nd	ug/L	0.01	0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
Ni	ug/L	2.3	0.8	1.3	<0.2	<0.2	0.6	1.6	0.4
Os	ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
P	ug/L	39	<20	<20	<20	29	<20	<20	<20
Pb	ug/L	0.4	1.5	0.1	<0.1	<0.1	0.1	<0.1	<0.1
Pd	ug/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Pr	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pt	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Rb	ug/L	1.63	1.86	1.85	1.34	1.61	1.78	1.74	1.23
Re	ug/L	0.09	0.17	0.22	0.27	0.09	0.17	0.23	0.28
Rh	ug/L	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	0.01	<0.01
Ru	ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
S	mg/L	16	34	34	32	16	34	29	30
Sb	ug/L	92.8	98.21	87.83	79	82.72	91.65	94.03	87.35
Sc	ug/L	1	<1	<1	<1	<1	<1	<1	1
Se	ug/L	8.3	18.4	25.2	30.2	8	17.4	22.6	30.4
Si	ug/L	3487	3614	3426	3837	3568	3417	3012	3636
Sm	ug/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Sn	ug/L	65.63	57.94	134.03	149.98	69.92	77.32	128.13	149.1
Sr	ug/L	187.44	275.64	300.36	271.06	185.1	285.36	288.13	275.08
Ta	ug/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Tb	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Te	ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Th	ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ti	ug/L	<10	<10	<10	<10	<10	<10	<10	<10
Tl	ug/L	0.08	0.11	0.1	0.09	0.08	0.13	0.12	0.1
Tm	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
U	ug/L	0.2	0.2	0.13	0.06	0.15	0.19	0.14	0.07
V	ug/L	1.5	1.8	1.8	1.6	1.5	1.8	2.1	1.8
W	ug/L	<0.02	<0.02	0.03	<0.02	<0.02	0.02	0.03	<0.02
Y	ug/L	0.02	0.03	0.02	<0.01	0.03	0.03	0.03	<0.01
Yb	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Zn	ug/L	3.8	5.9	3.2	2.6	4.9	2.4	3.2	2.7
Zr	ug/L	0.02	<0.02	<0.02	<0.02	0.03	<0.02	<0.02	<0.02

Column	Units	Blank	Blank	Blank	Blank	Blank	Blank	Blank
Start Date		25-Sep-03	30-Sep-03	5-Oct-03	10-Oct-03	16-Oct-03	21-Oct-03	28-Oct-03
Step		1	2	3	4	5	6	7
Dry Weight Required	g	0	0	0	0	0	0	0
Moisture	%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Equivalent Wet Weight	g	0	0	0	0	0	0	0
Input Volume	mL	9000	6600	4700	3300	2300	1500	900
Output Volume	mL	8625	6365	4600	3180	2050	1320	660
pH	-	4.7	5.2	5	5.1	4.7	4.7	4.6
Eh	mV	420	410	375	405	420	430	420
EC	uS/cm	2.1	2.6	3.4	4.4	5.9	11.4	14.5
Alkalinity	mg/L CaCO3	<1	<1	<1	<1	<1	<1	<1
Sulphate	mg/L	<1	<1	<1	<1	1	<1	1
Ag	ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Al	ug/L	1	1	1	1	1	4	2
As	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Au	ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
B	ug/L	<20	<20	<20	<20	<20	20	<20
Ba	ug/L	0.1	0.1	0.09	0.17	0.38	0.53	0.75
Be	ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Bi	ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Br	ug/L	<5	<5	<5	<5	<5	<5	<5
Ca	ug/L	<50	<50	<50	<50	<50	50	50
Cd	ug/L	<0.05	<0.05	<0.05	<0.05	0.44	<0.05	<0.05
Ce	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cl	mg/L	1	<1	<1	<1	<1	<1	<1
Co	ug/L	<0.02	<0.02	0.02	<0.02	<0.02	0.03	0.06
Cr	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Cs	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cu	ug/L	0.1	0.3	0.2	0.2	0.3	0.3	0.6
Dy	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Er	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Eu	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fe	ug/L	<10	<10	11	<10	<10	10	<10
Ga	ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Gd	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ge	ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Hf	ug/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Hg	ug/L	<0.1	<0.1	<0.1	<0.1	<0.01	<0.5	<0.01
Ho	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
In	ug/L	<0.01	0.03	0.01	<0.01	<0.01	0.07	<0.01
Ir	ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
K	ug/L	<50	<50	<50	<50	<50	<50	<50
La	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Li	ug/L	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1
Lu	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Mg	ug/L	<50	<50	<50	<50	<50	<50	<50
Mn	ug/L	<0.05	<0.05	<0.05	<0.05	0.07	0.2	0.07
Mo	ug/L	0.2	0.1	0.1	<0.1	<0.1	0.1	<0.1
Na	ug/L	<50	<50	<50	<50	<50	<50	<50
Nb	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nd	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ni	ug/L	<0.2	<0.2	0.2	0.2	0.2	0.3	0.2
Os	ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
P	ug/L	<20	<20	<20	<20	<20	<20	<20
Pb	ug/L	<0.1	0.3	0.1	<0.1	0.1	1	0.4
Pd	ug/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Pr	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pt	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Rb	ug/L	<0.01	0.01	0.01	0.01	0.01	0.02	0.04
Re	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Rh	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ru	ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
S	mg/L	<1	<1	<1	<1	<1	<1	<1
Sb	ug/L	<0.05	<0.05	<0.05	<0.05	0.07	0.08	0.1
Sc	ug/L	<1	1	<1	<1	<1	<1	1
Se	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Si	ug/L	11	13	16	17	1	56	50
Sm	ug/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Sn	ug/L	31.53	54.96	84.97	105.62	179.51	242.56	469.35
Sr	ug/L	<0.01	0.03	0.01	0.03	0.01	0.38	0.52
Ta	ug/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Tb	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Te	ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Th	ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ti	ug/L	<10	<10	<10	<10	<10	<10	<10
Tl	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tm	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
U	ug/L	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.02
V	ug/L	<0.2	<0.2	<0.2	<0.2	<0.2	0.2	<0.2
W	ug/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Y	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Yb	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Zn	ug/L	2.6	4.2	4.4	3.5	7.3	9	14.1
Zr	ug/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02

Appendix C
Graphs

Figure C-1. pH of Leachates

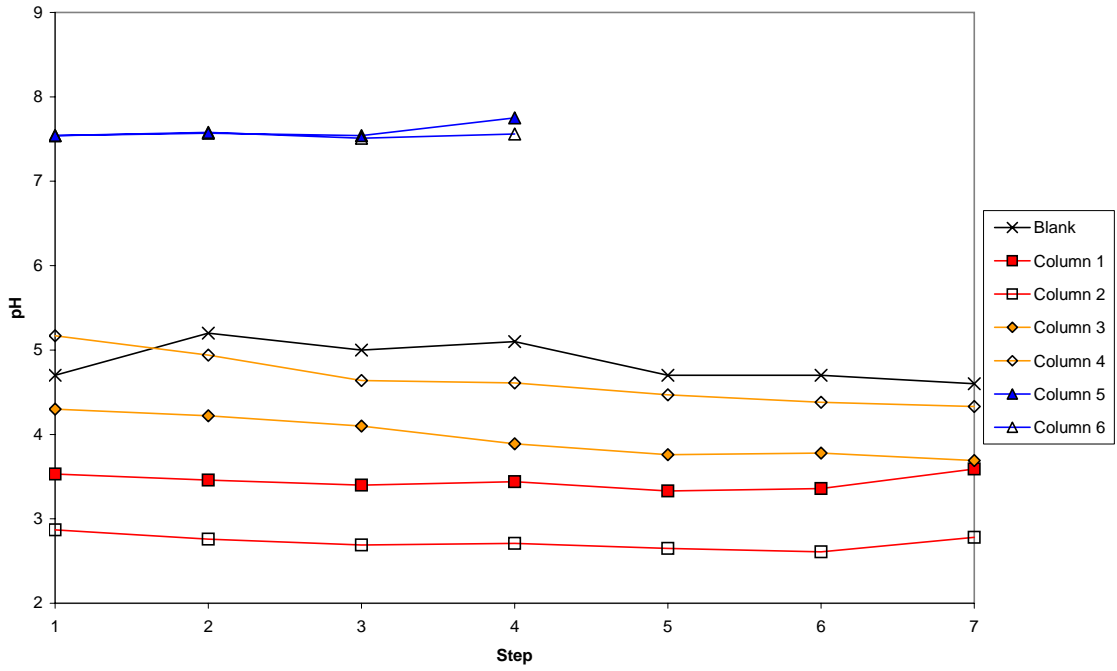


Figure C-2. Electrical Conductivity of Leachates

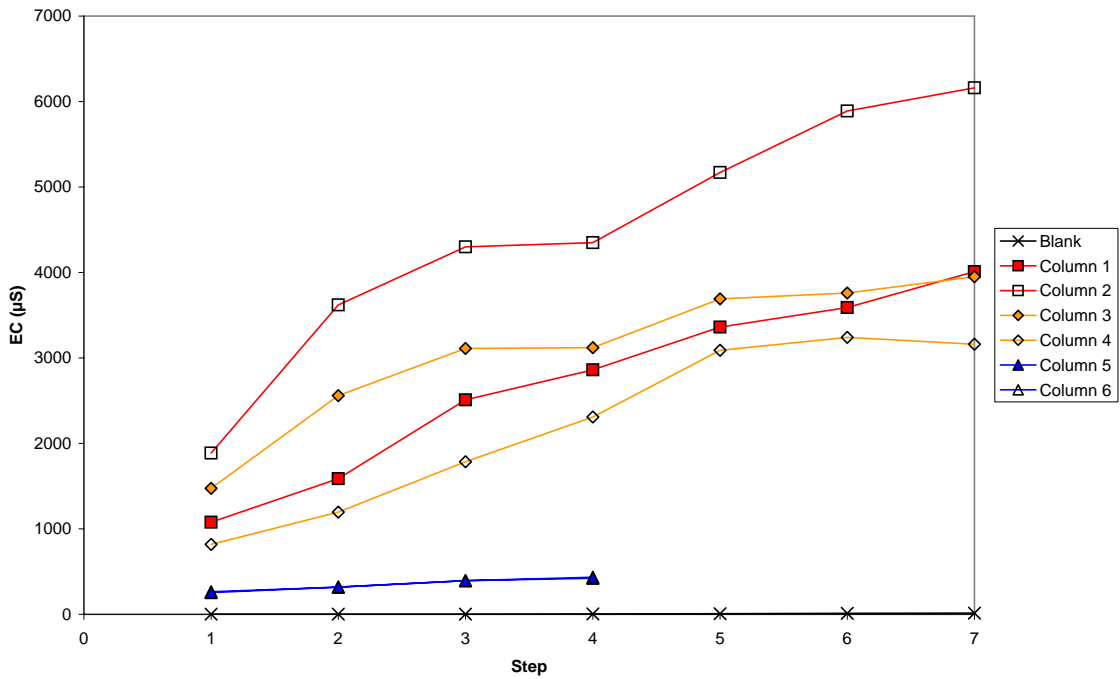
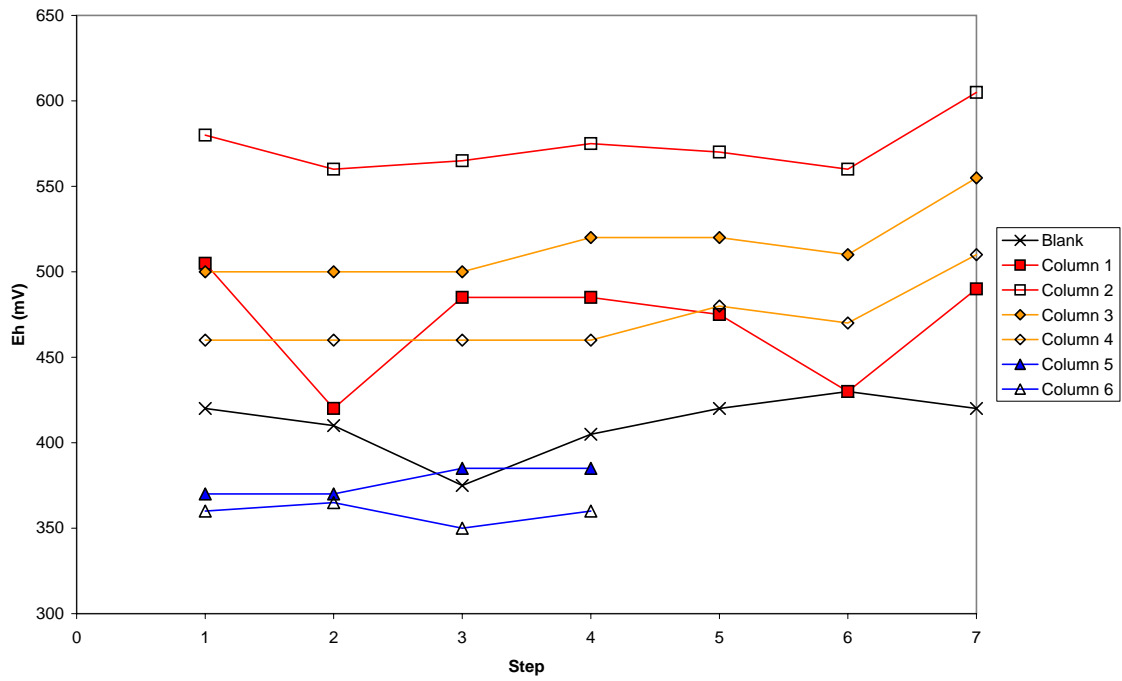


Figure C-3. Oxidation Reduction Potential



Intentionally Left Blank

Figure C-4. Sulphate Concentrations

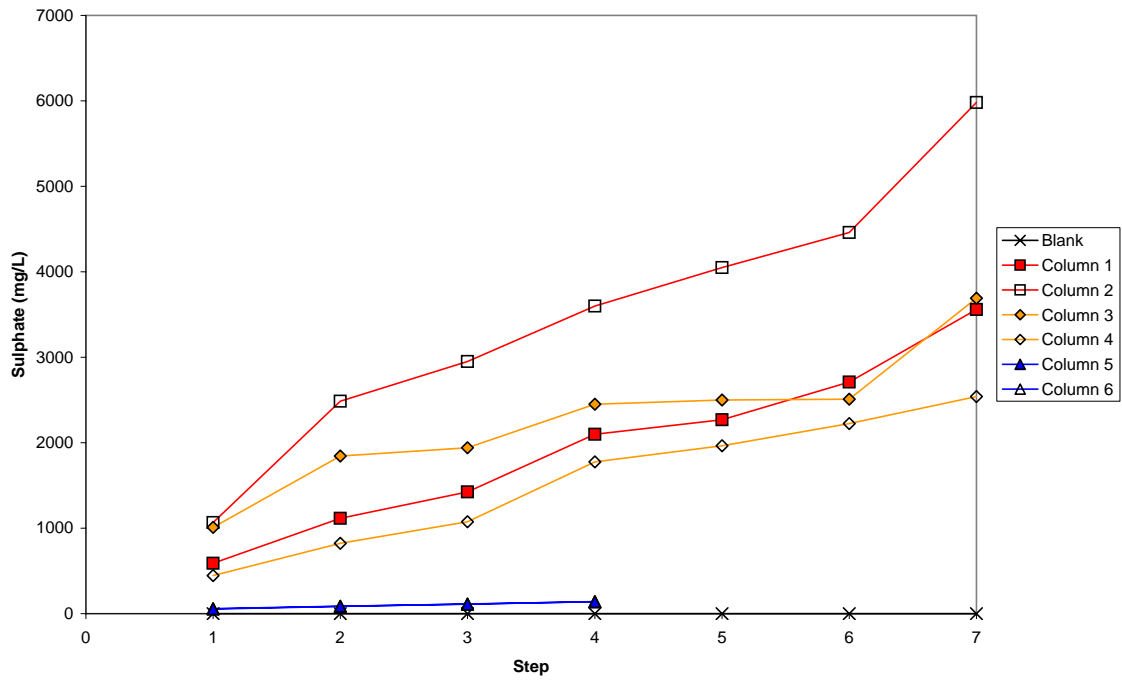


Figure C-5. Sulphate Loading

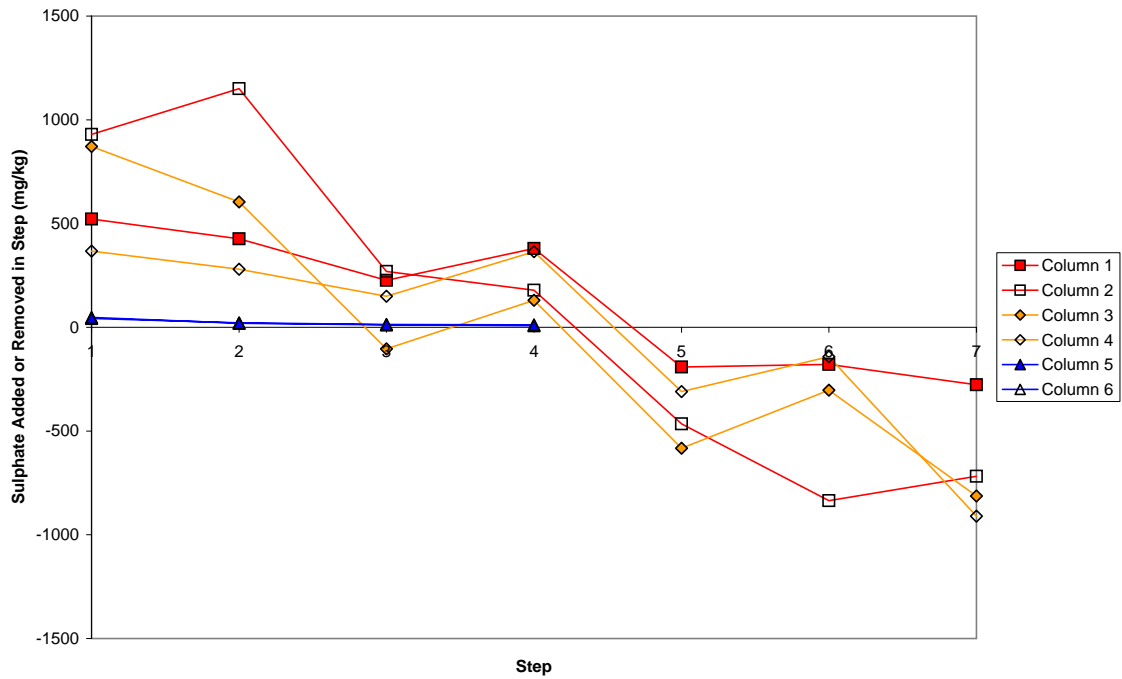


Figure C-6. Aluminum Concentrations

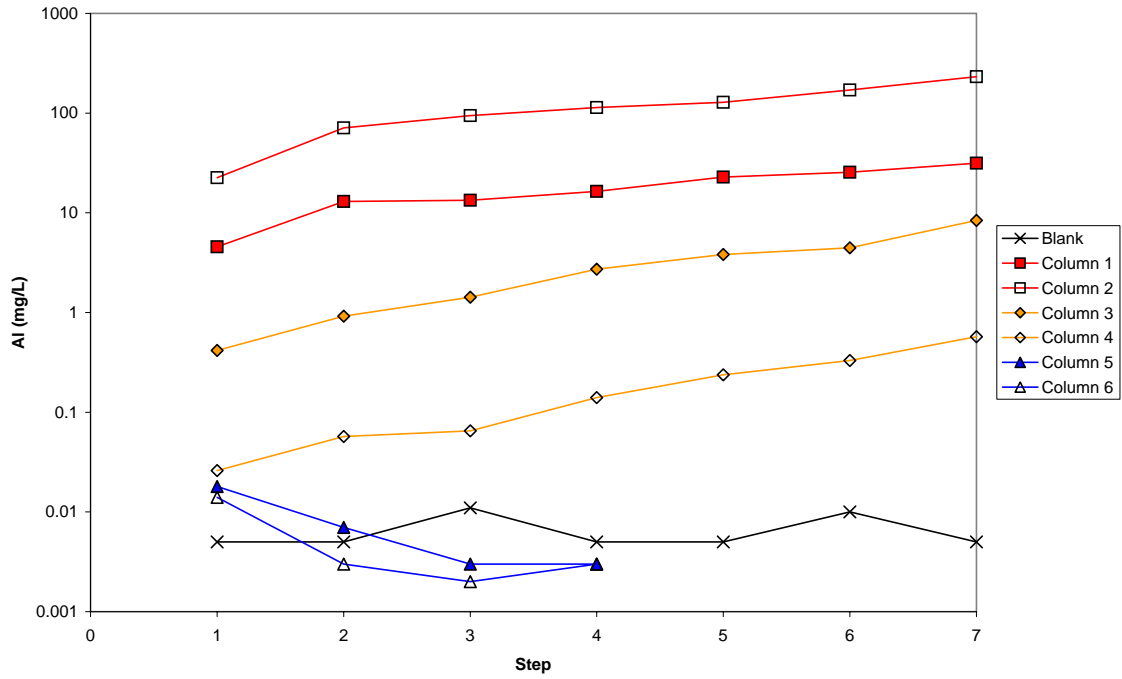


Figure C-7. Aluminum Loading

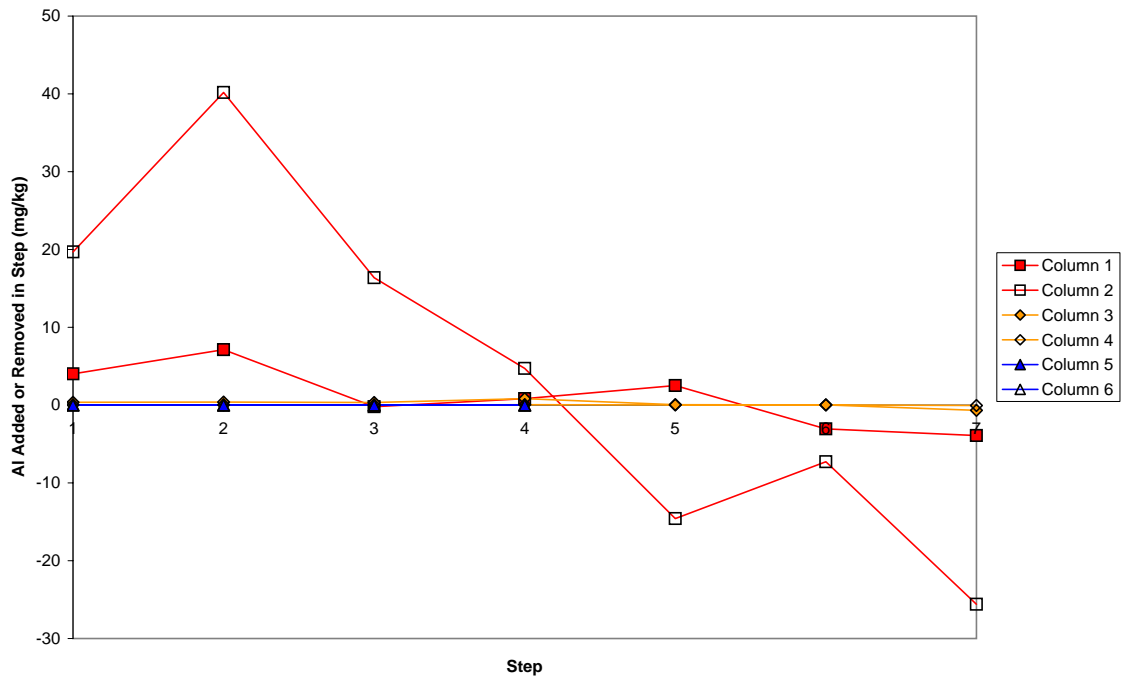


Figure C-8. Arsenic Concentrations

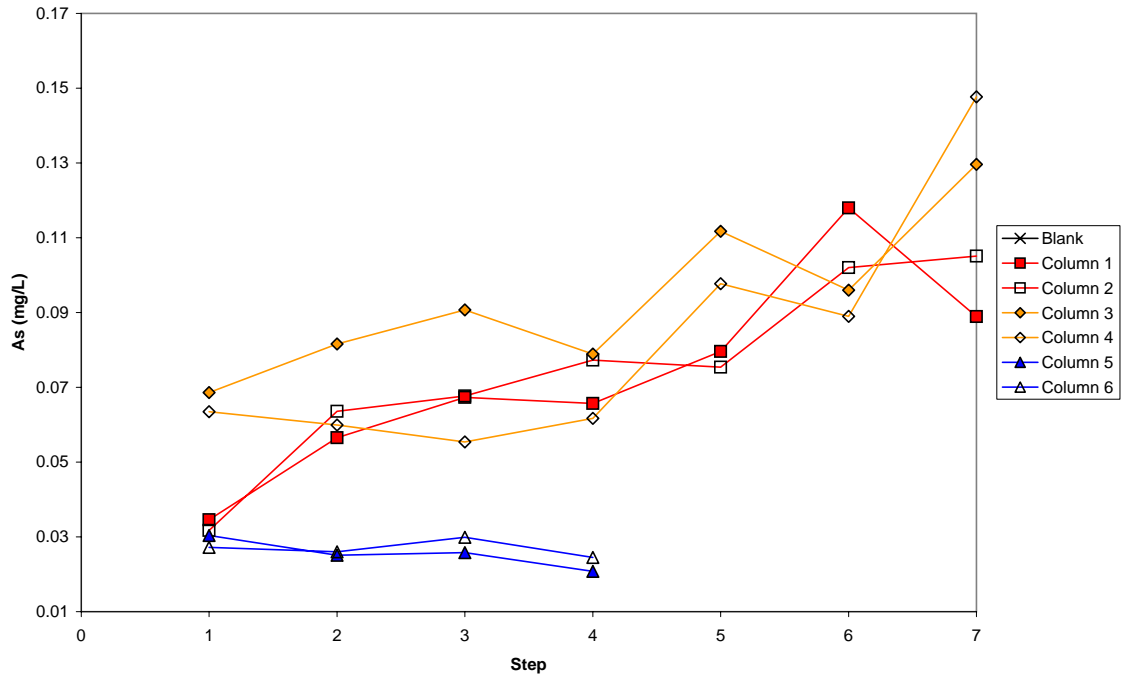


Figure C-9. Arsenic Loading

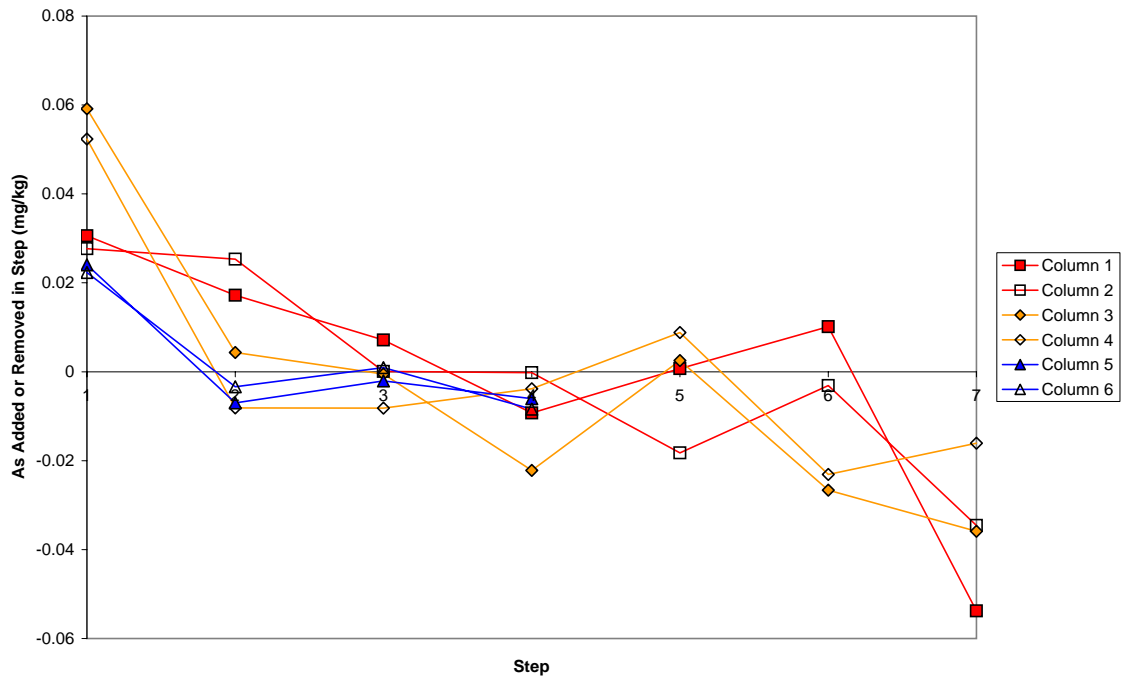


Figure C-10. Calcium concentrations

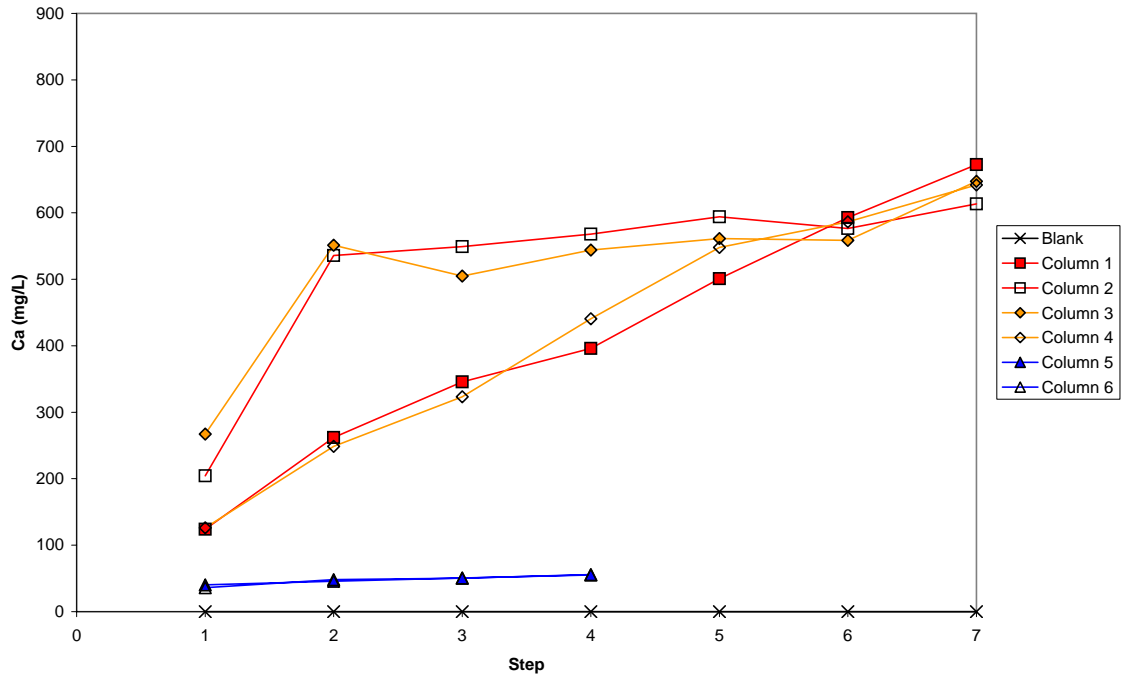


Figure C-11. Calcium Loadings

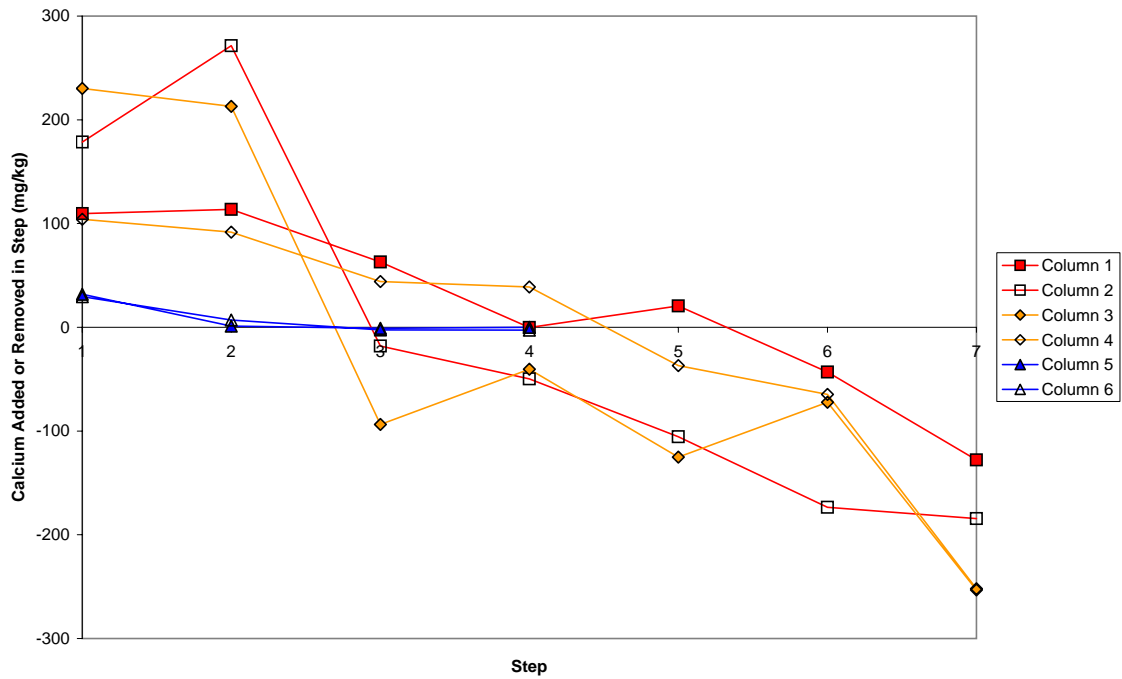


Figure C-12. Cadmium Concentrations

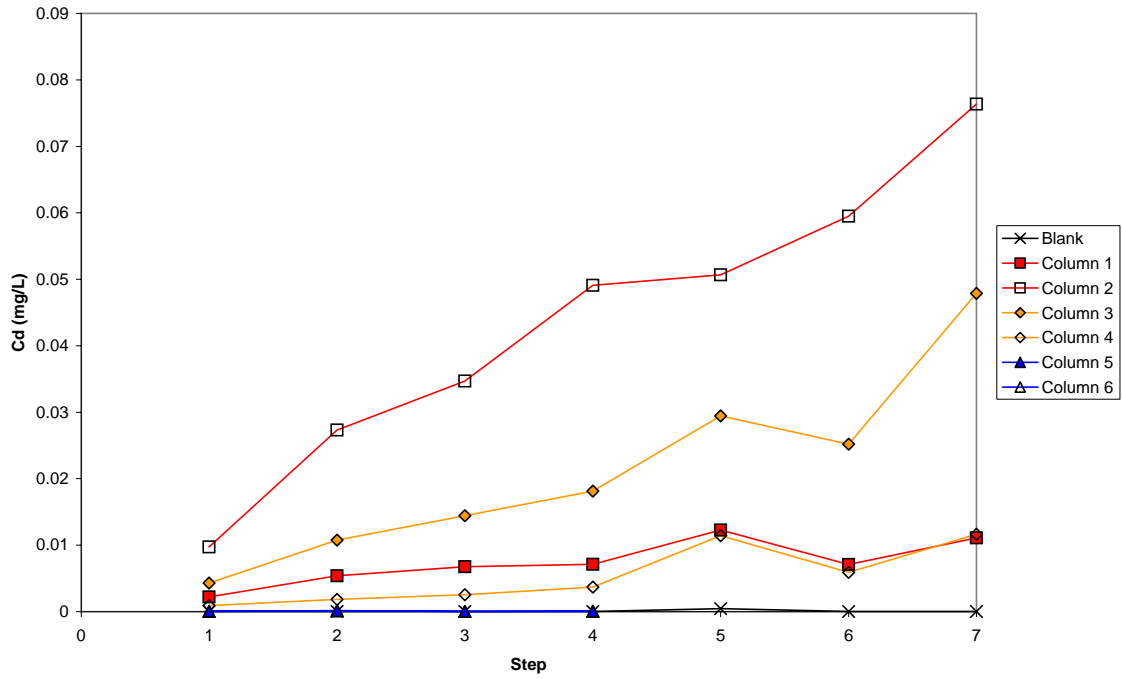


Figure C-13. Cadmium Loadings

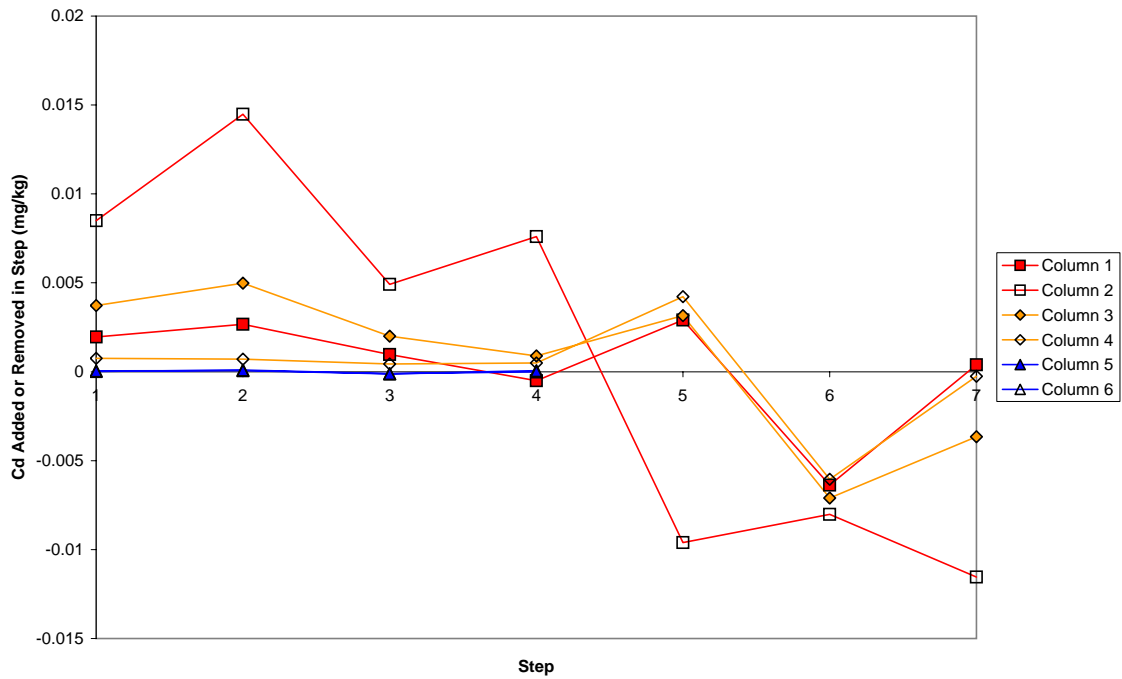


Figure C-14. Copper Concentrations

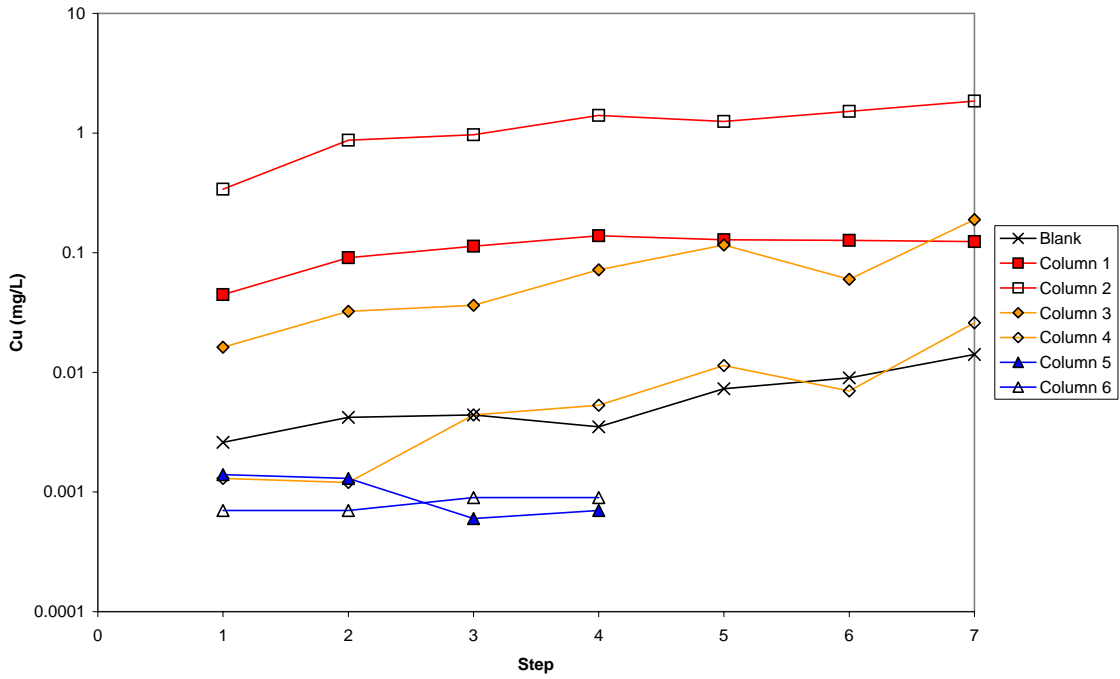


Figure C-15. Copper Loadings

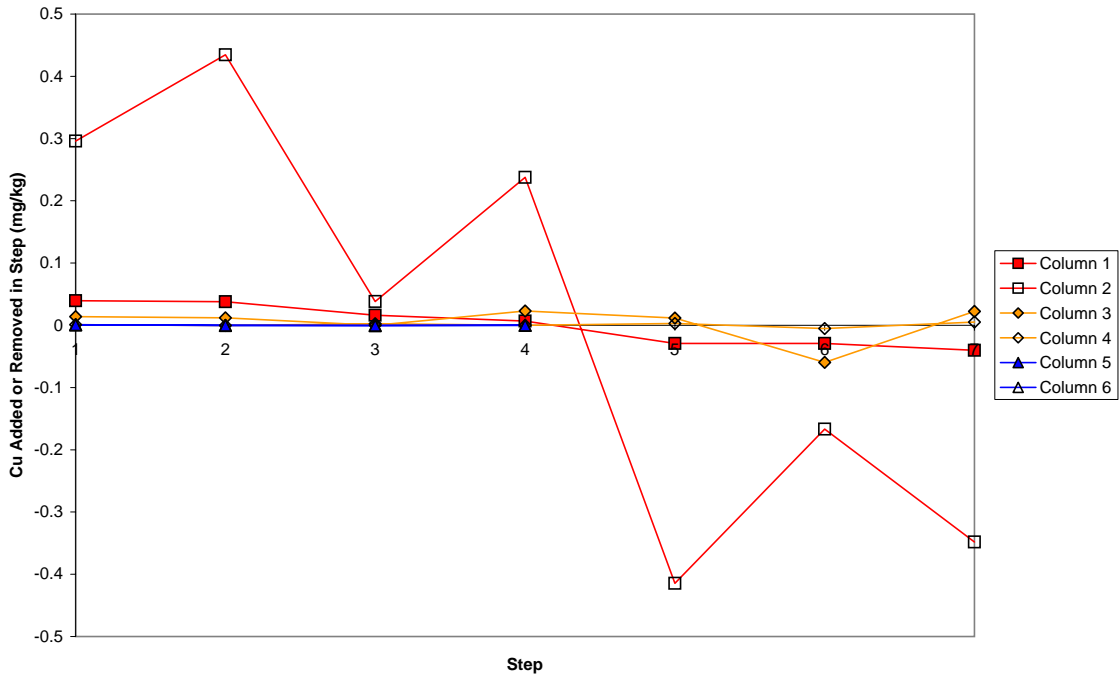


Figure C-16. Iron Concentrations

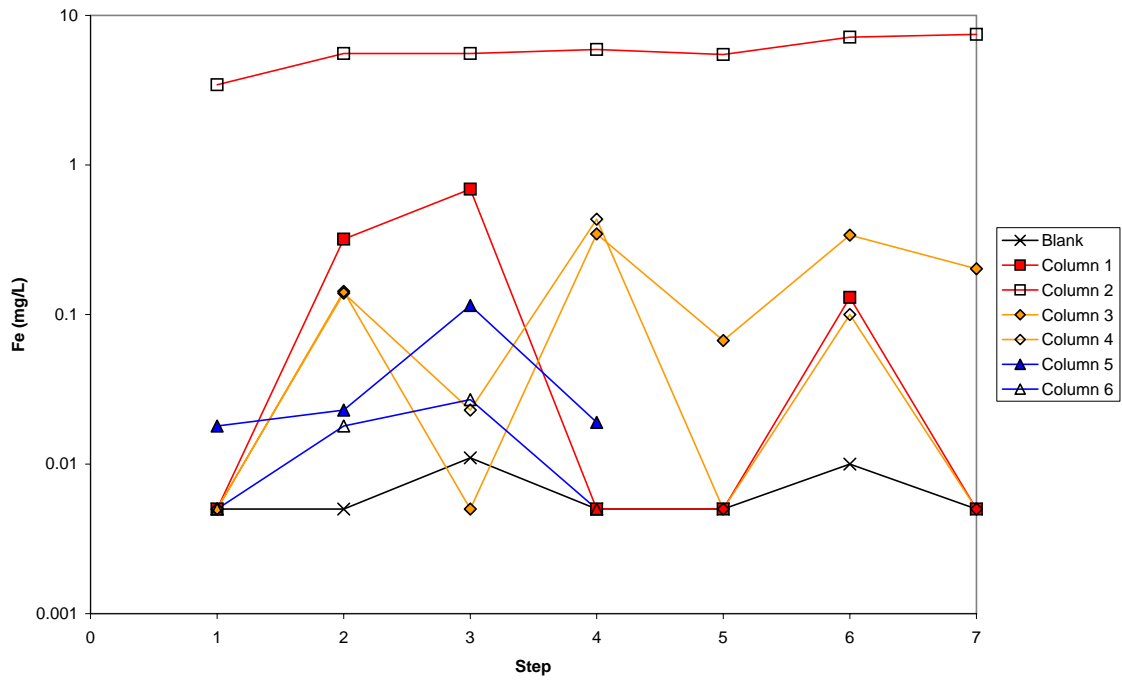


Figure C-17. Iron Loadings

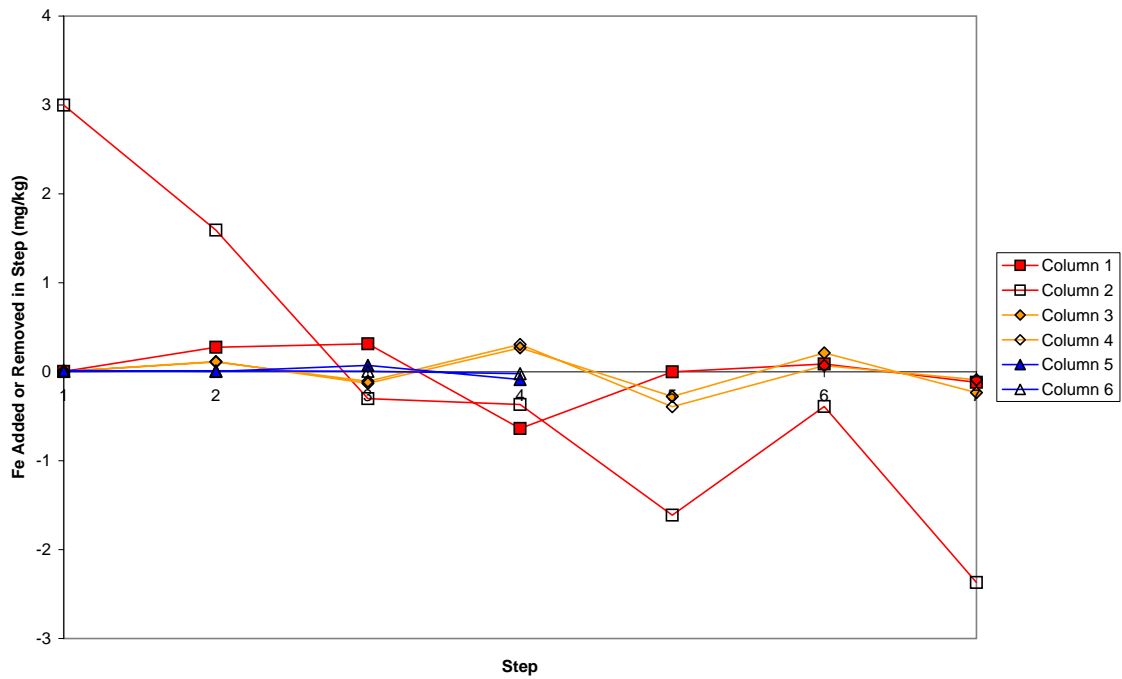


Figure C-18. Potassium Concentrations

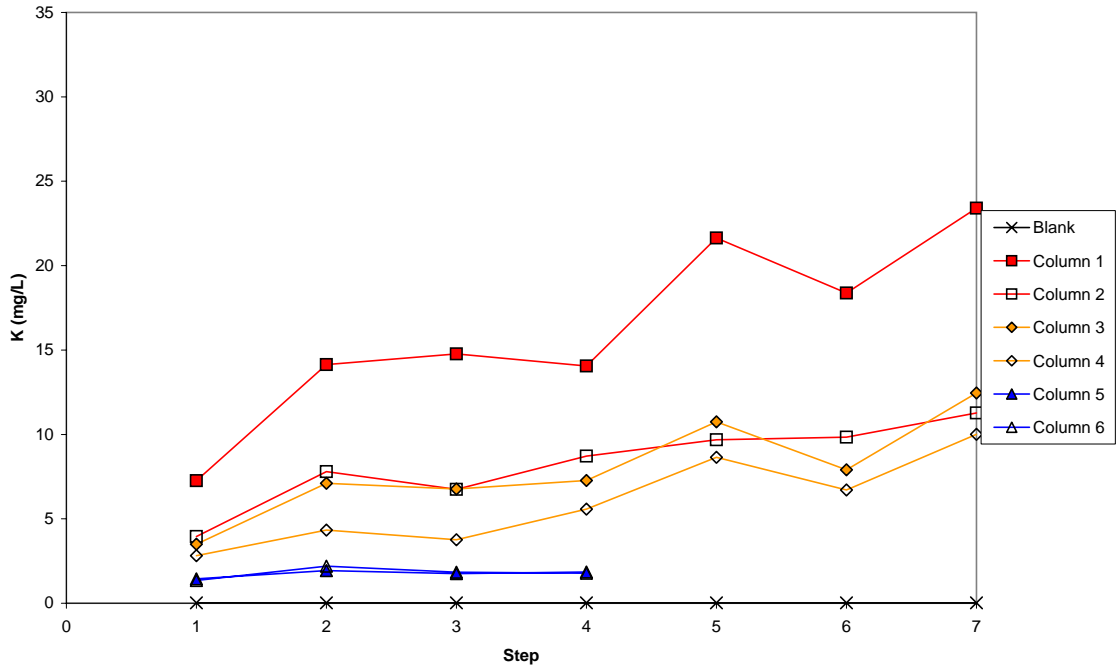


Figure C-19. Potassium Loadings

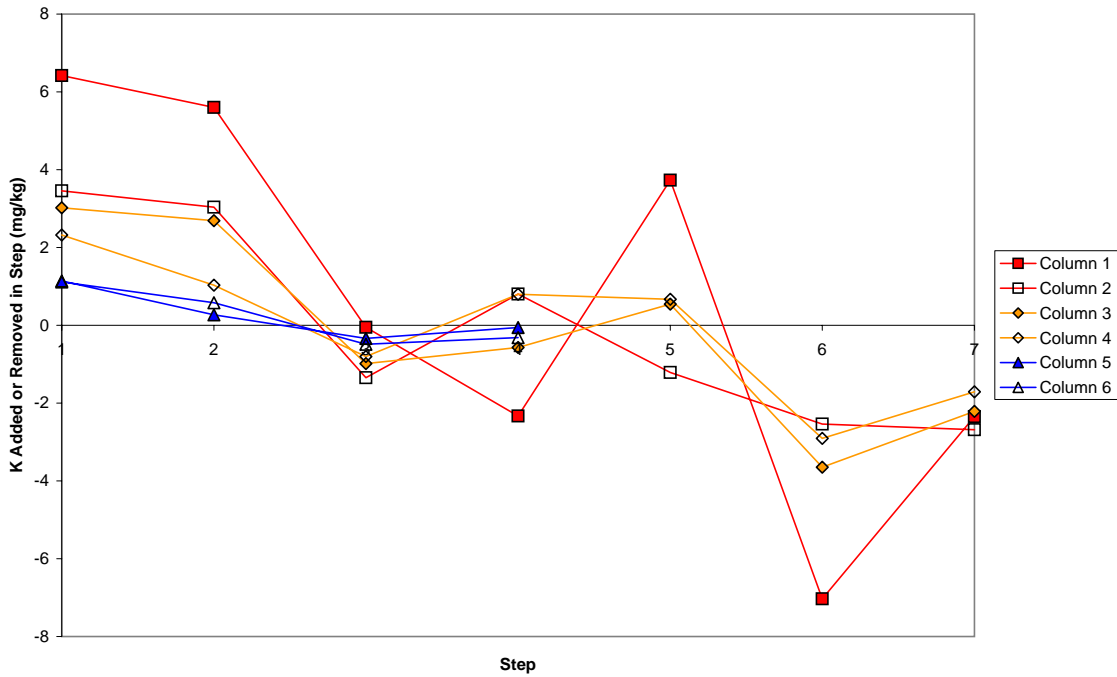


Figure C-20. Magnesium Concentrations

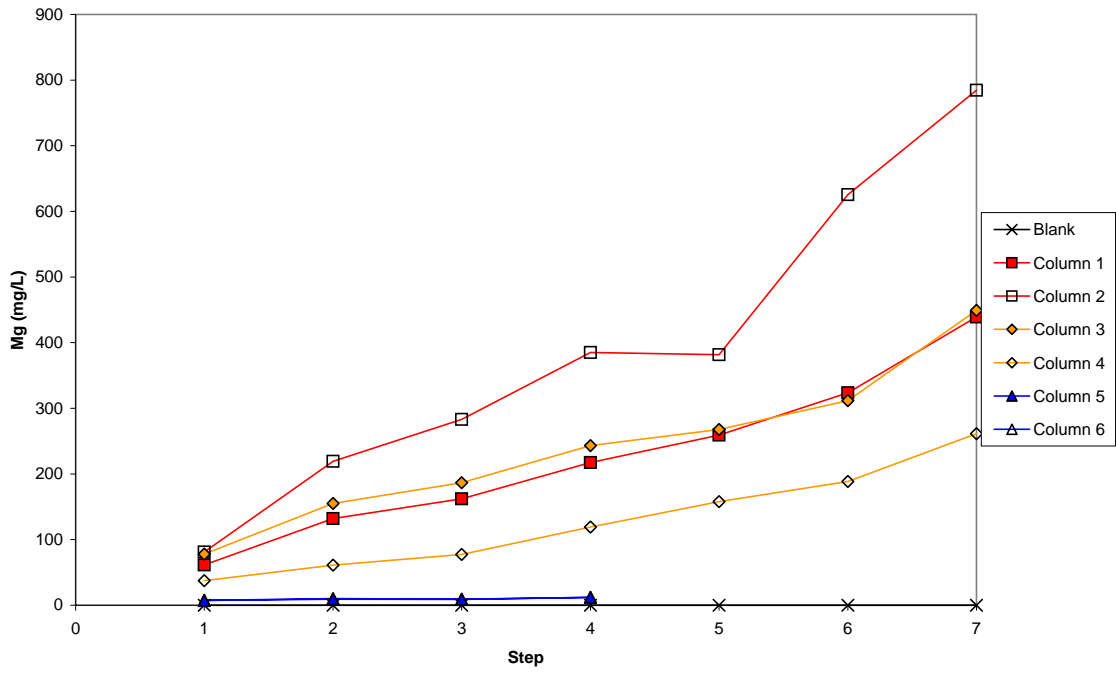


Figure C-21. Magnesium Loadings

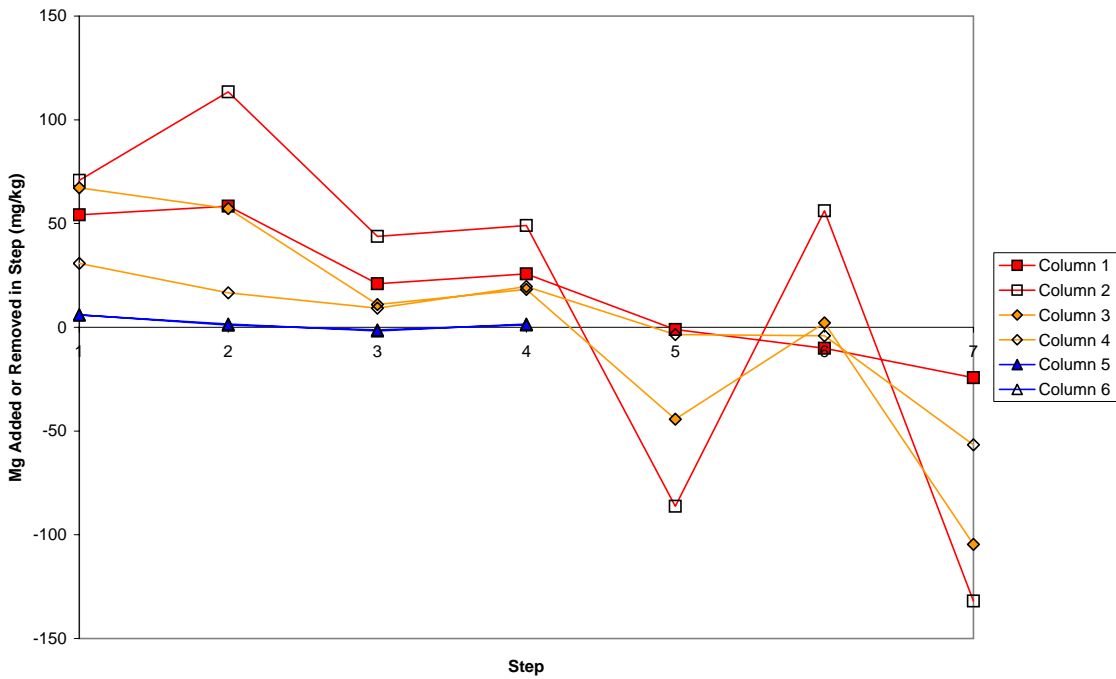


Figure C-22. Manganese Concentrations

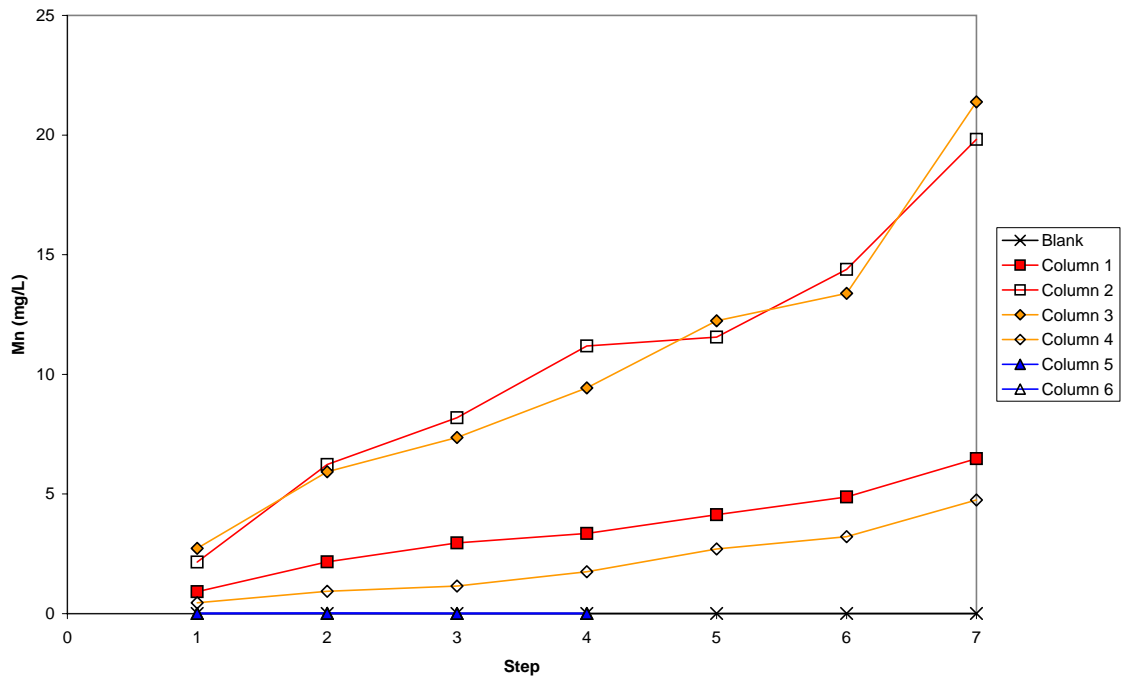


Figure C-23. Manganese Loadings

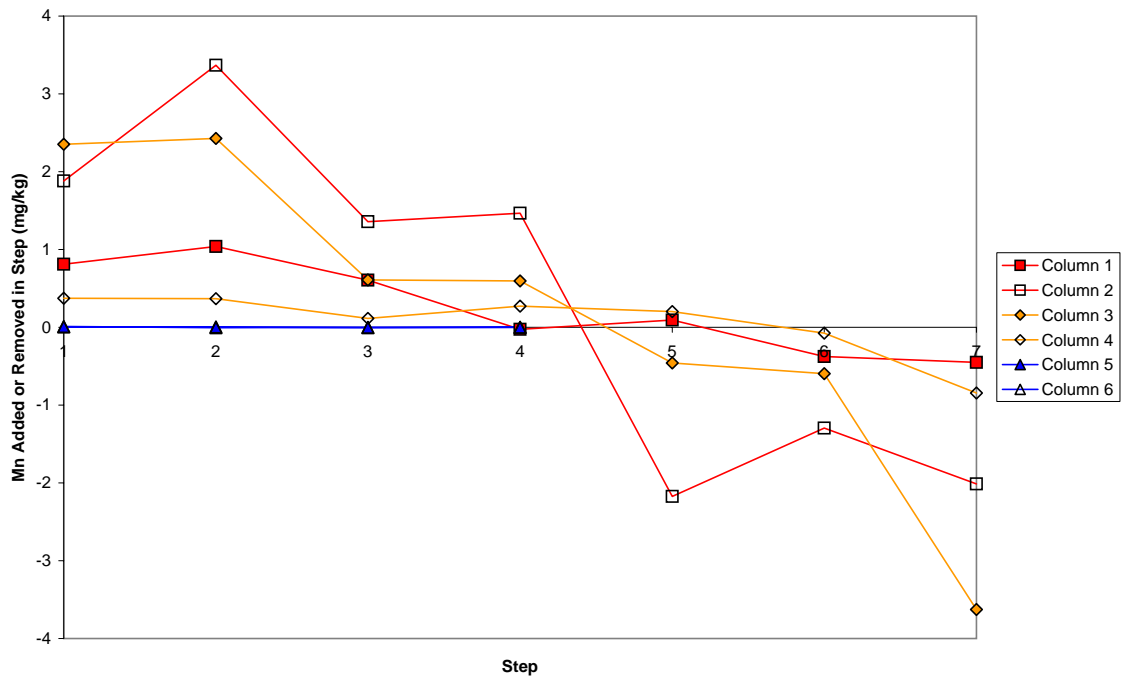


Figure C-24. Sodium Concentrations

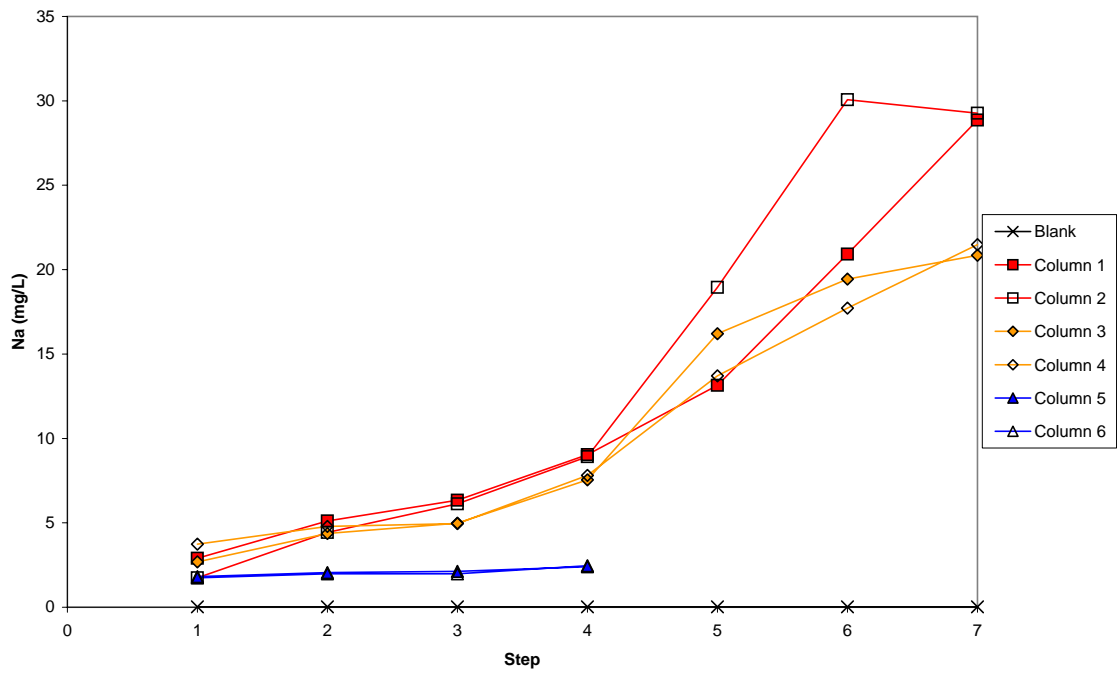


Figure C-25. Sodium Loadings

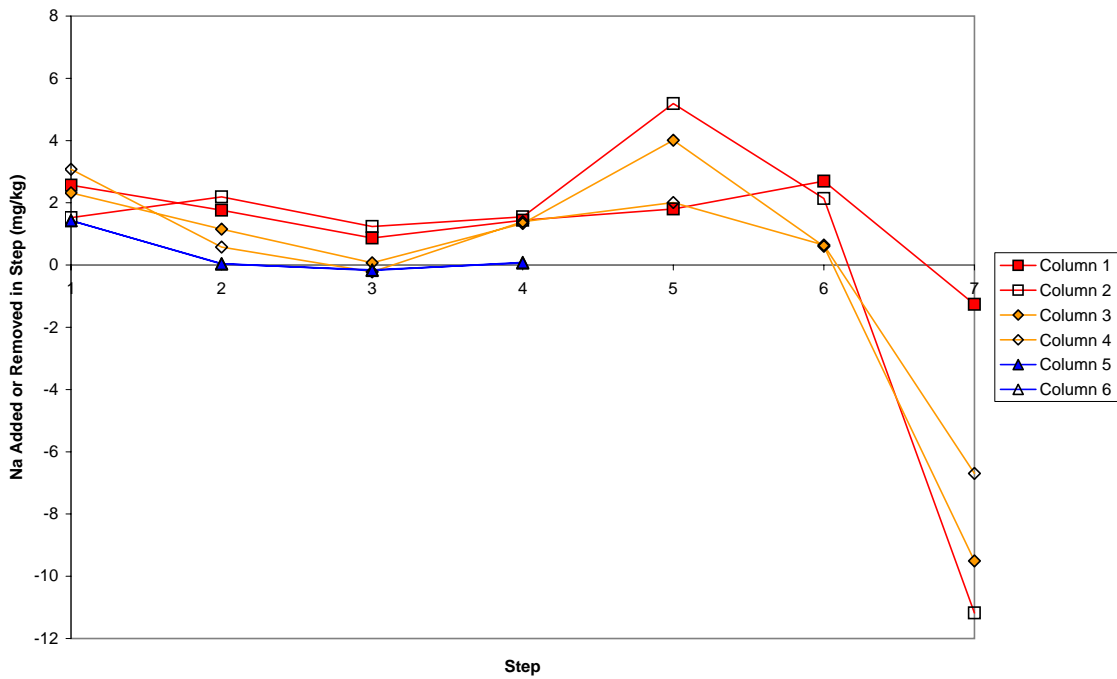


Figure C-26. Nickel Concentrations

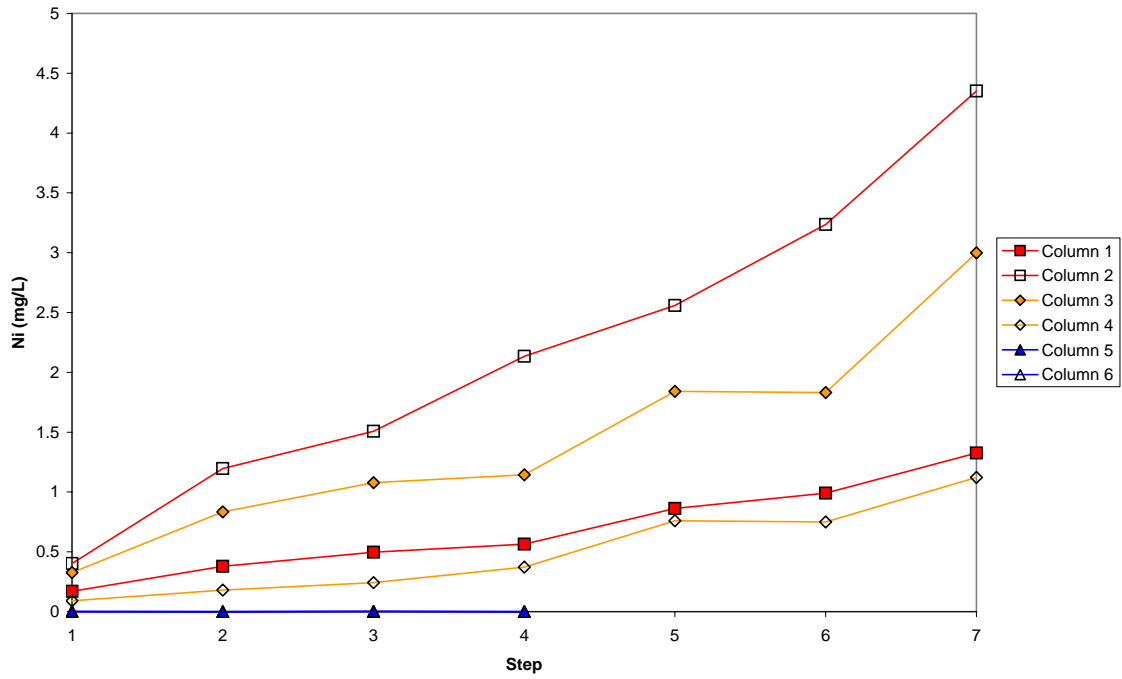


Figure C-27. Nickel Loadings

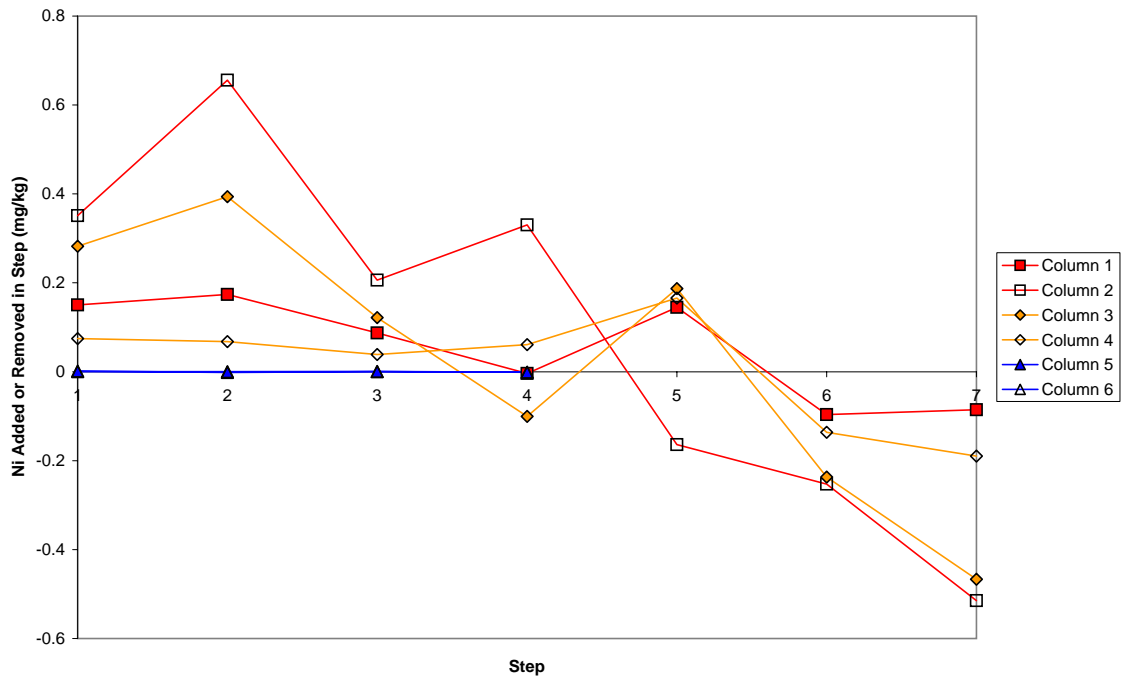


Figure C-28. Antimony Concentrations

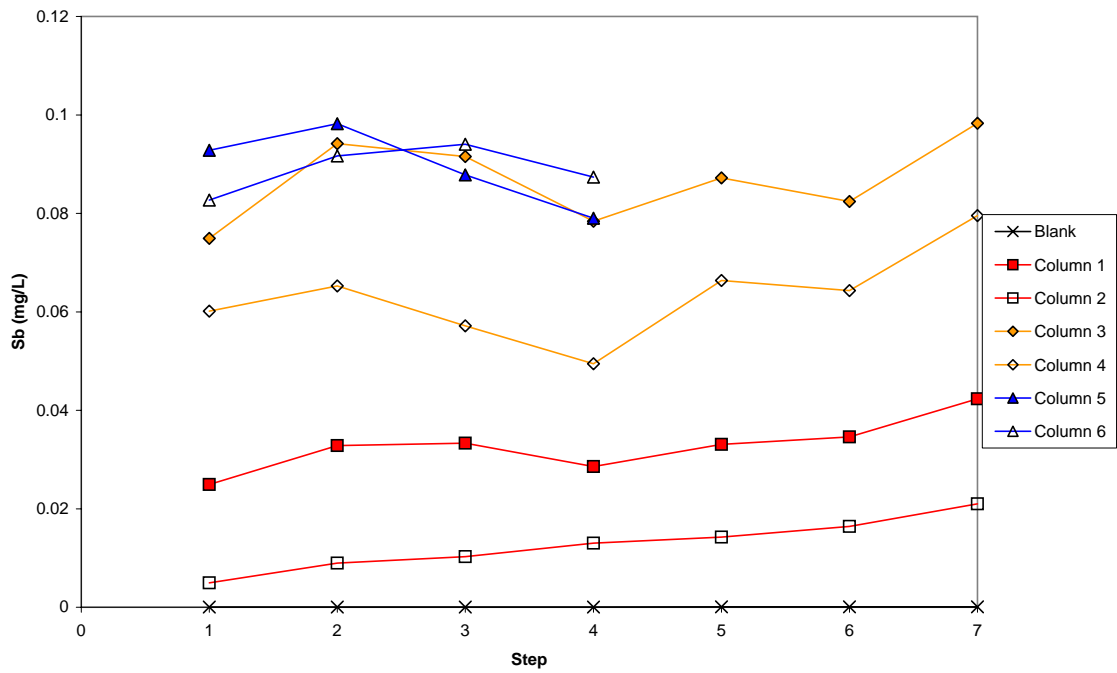


Figure C-29. Antimony Loadings

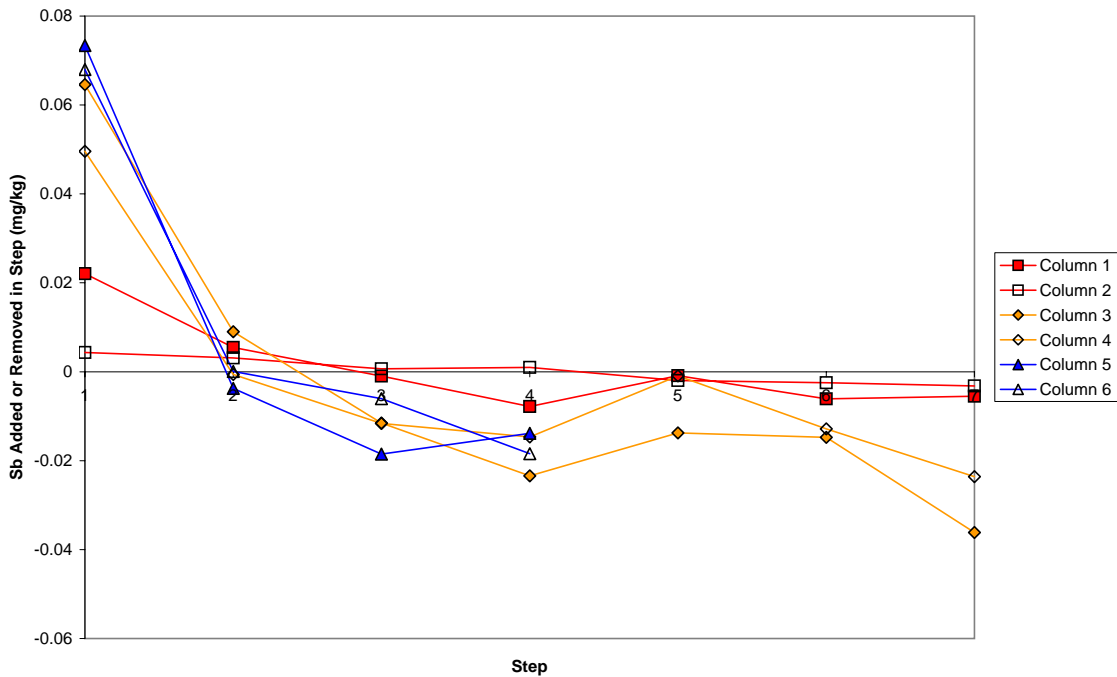


Figure C-30. Selenium Concentrations

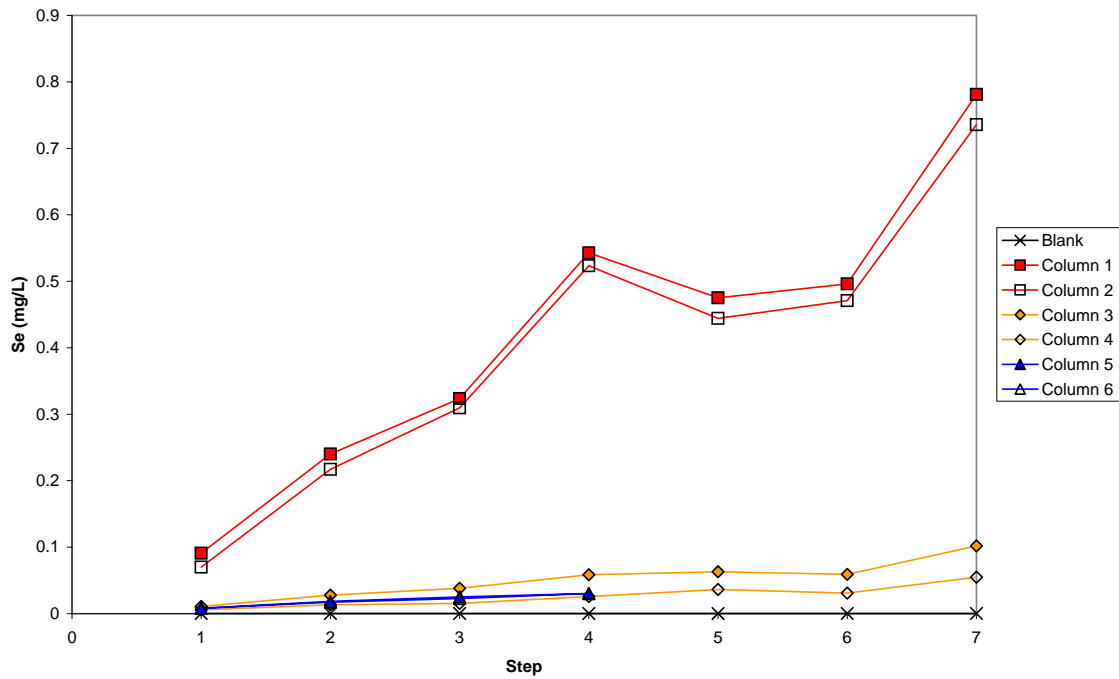


Figure C-31. Selenium Loadings

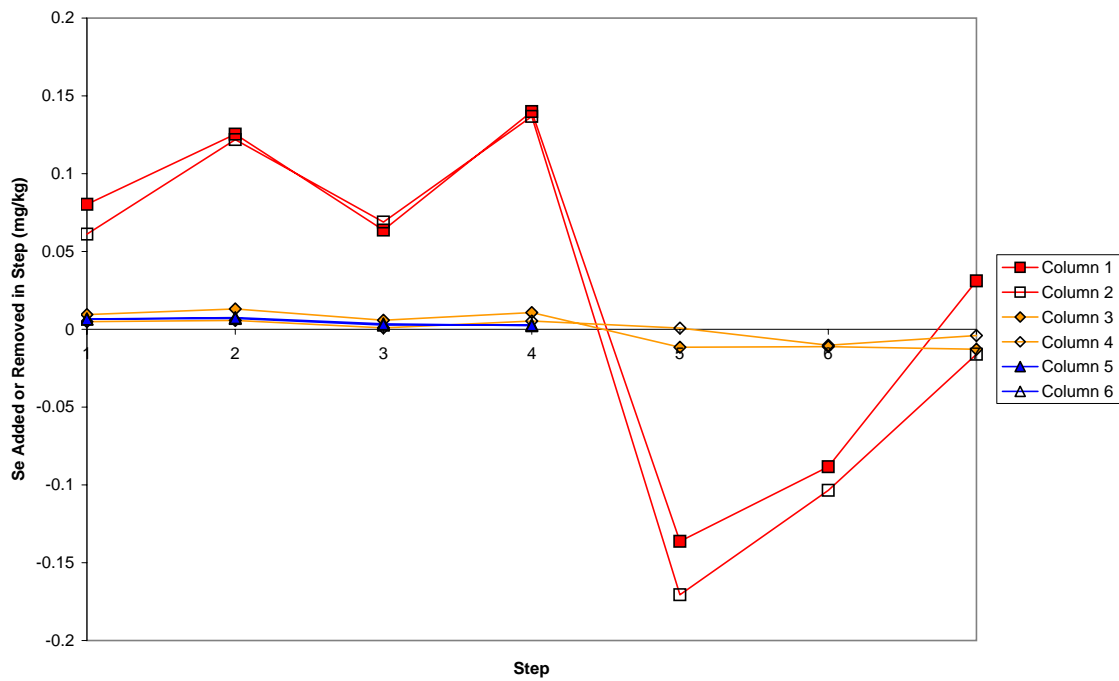


Figure C-32. Silicon Concentrations

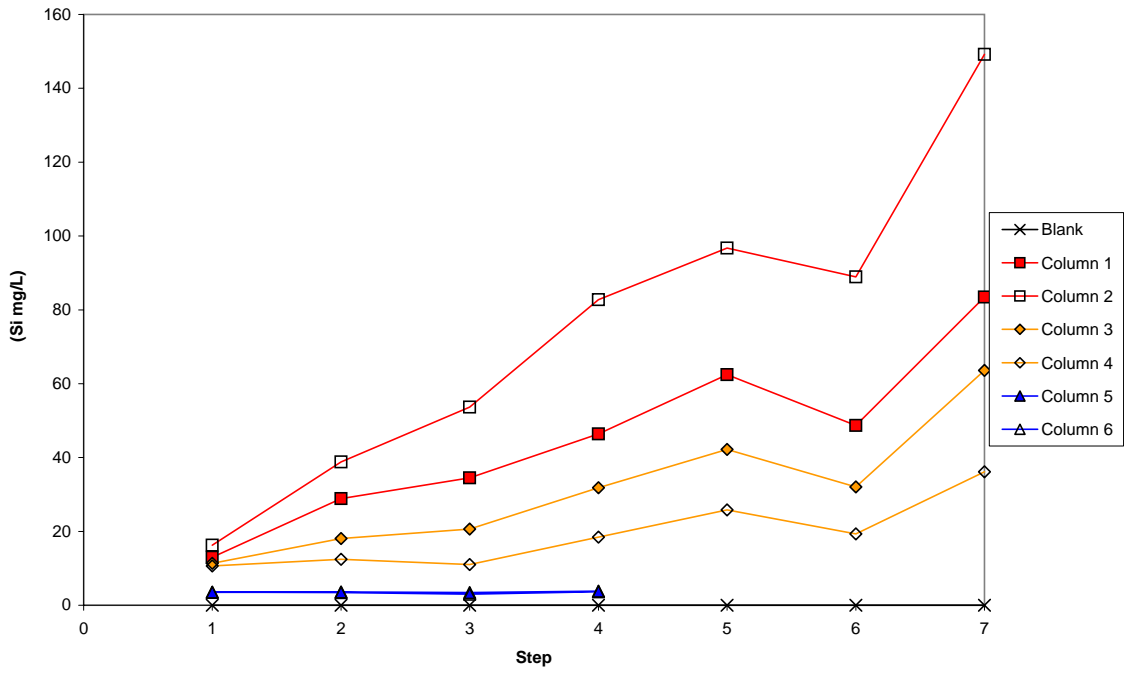


Figure C-33. Silicon Loadings

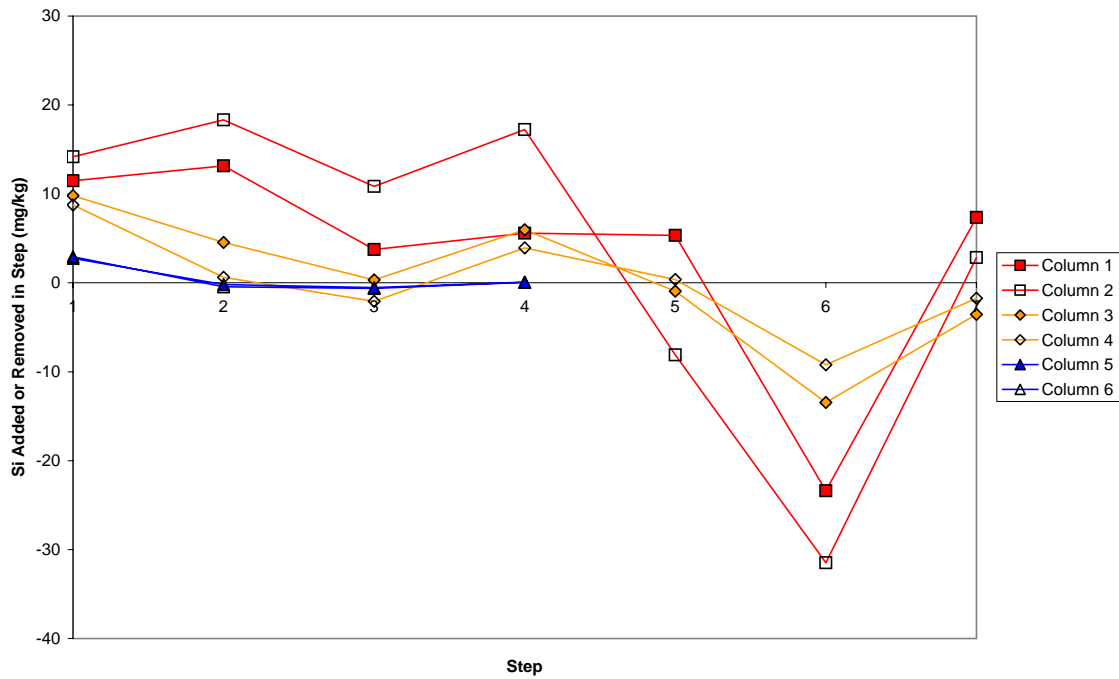


Figure C-34. Zinc Concentrations

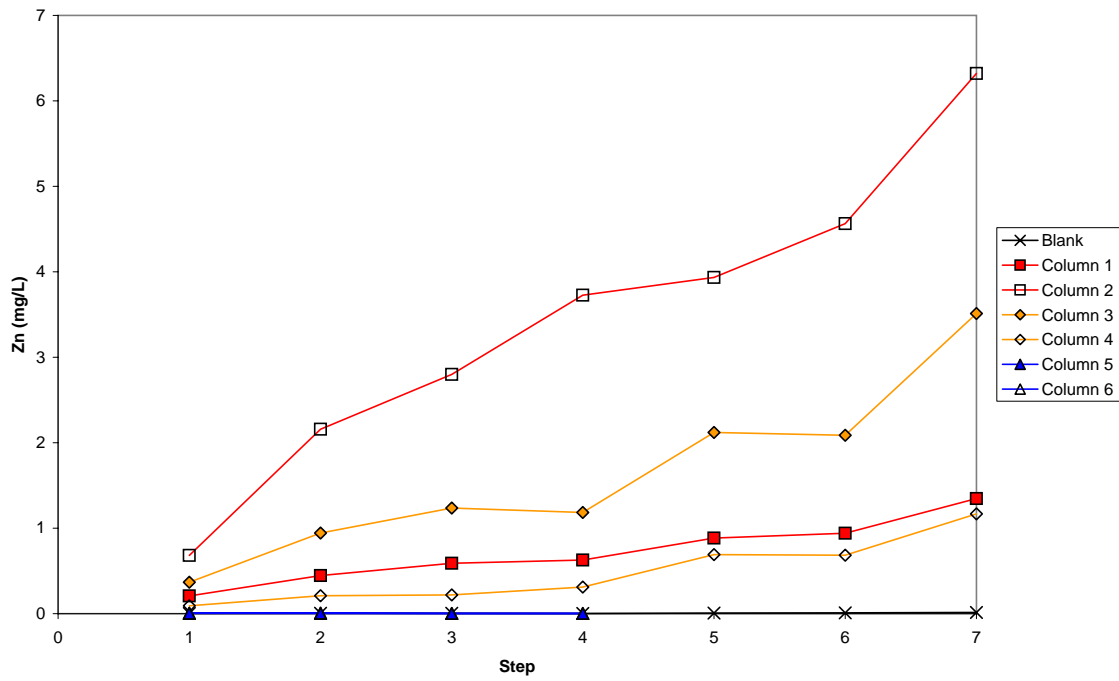


Figure C-35. Zinc Loadings

