Laboratory Treatment of Three Acidic Stockpile Drainages by Limestone Columns

Minnesota Department of Natural Resources
Division of Minerals
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Status Report

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Table of Contents

List of Figures

List of Tables

List of Appendices

1. Introduction

Limestone dissolution increases pH, alkalinity, and calcium concentration, with an attendant decrease in acidity.

$$H^+ (aq) + CaCO_3 (s) = HCO_3^- (aq) + Ca^{2+} (aq) \quad (1)$$

The extent of neutralization depends on the rate of dissolution relative to the flow rate, as well as the drainage composition.

Increasing pH and alkalinity leads to precipitation of trace metals, e.g.,

$$2Cu^{2+} (aq) + 2(OH^-) (aq) + CO_3^{2-} (aq) = Cu_2(OH)_2CO_3 (s) \quad (2)$$

The extent of metal removal depends on the degree of pH elevation and the chemistry of the individual trace metal. For example, copper precipitates at a lower pH than cobalt or nickel.

2. Objectives

The objectives of the column experiments were to determine, for each of three different drainage compositions:

i) the flow rate at which a column of limestone can neutralize the acidity present in the drainage (i.e., the rate at which the limestone will dissolve when in contact with a given drainage),

ii) the amount of acidity the limestone can neutralize at a given flow (i.e., the neutralization capacity of the limestone for a given drainage and flow), and

iii) the masses of copper, nickel, cobalt, and zinc which can be removed from the drainage (i.e., trace metal removal capacity).

3. Methods

Into each of nine acrylic columns (d = 5.1 cm = 2 in), 780 g of -0.64 cm (0.25 in)/+10 mesh high calcium limestone was added (table 1). The bed depth ranged from 24.8 to 26 cm, yielding an average bed volume of 520 cm^3 for the combination of the limestone and the pores. The average porosity was 0.44 and the pore volume was 230 cm^3, assuming a limestone density of 2.7 g/cm^3. The columns were covered with a dark sheet of plastic to shield them from the light and, therefore, inhibit biological growth.

Triplicate columns were used for each of three different samples of stockpile drainage. The Seep 1 sample was drainage from an operational scale stockpile at the LTV Steel Mining Company Dunka site, and had the lowest concentrations of trace metals and acidity. The remaining samples were drainage from test stockpiles at the Kennecott site (Eger and Lapakko, 1985). The FL3 sample represented intermediate values of acidity and trace metals, while the FL6 sample had the highest values of these parameters (table 2).

The drainage was stored in covered plastic garbage cans and transferred into covered 18-L plastic containers as needed. From these plastic containers, the drainage was pumped into the the bottom of each column, through a swinnex filter, using a Manostat^{R,1} Cassette Pump (Standard Model). After passing through the limestone column the flow exited through a discharge tube which was located 30 cm above the bottom of the column and 3.1 to 4.1 cm above the limestone bed (figure 1).

The discharge tube passed through a hole in a tared collection vessel, which was weighed daily to determine the volume of flow through the column. Gross adjustments to flow rates were made by altering the size of the tubing delivering the feed, while finer adjustments were made by pinching off the tubing with a small set screw on the pump. The 5/32-inch tubing (0.40-cm) was shifted on a regular basis to prohibit excessive wear on one section of

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[1]The use of trade names does not imply endorsement by the Minnesota Department of Natural Resources.

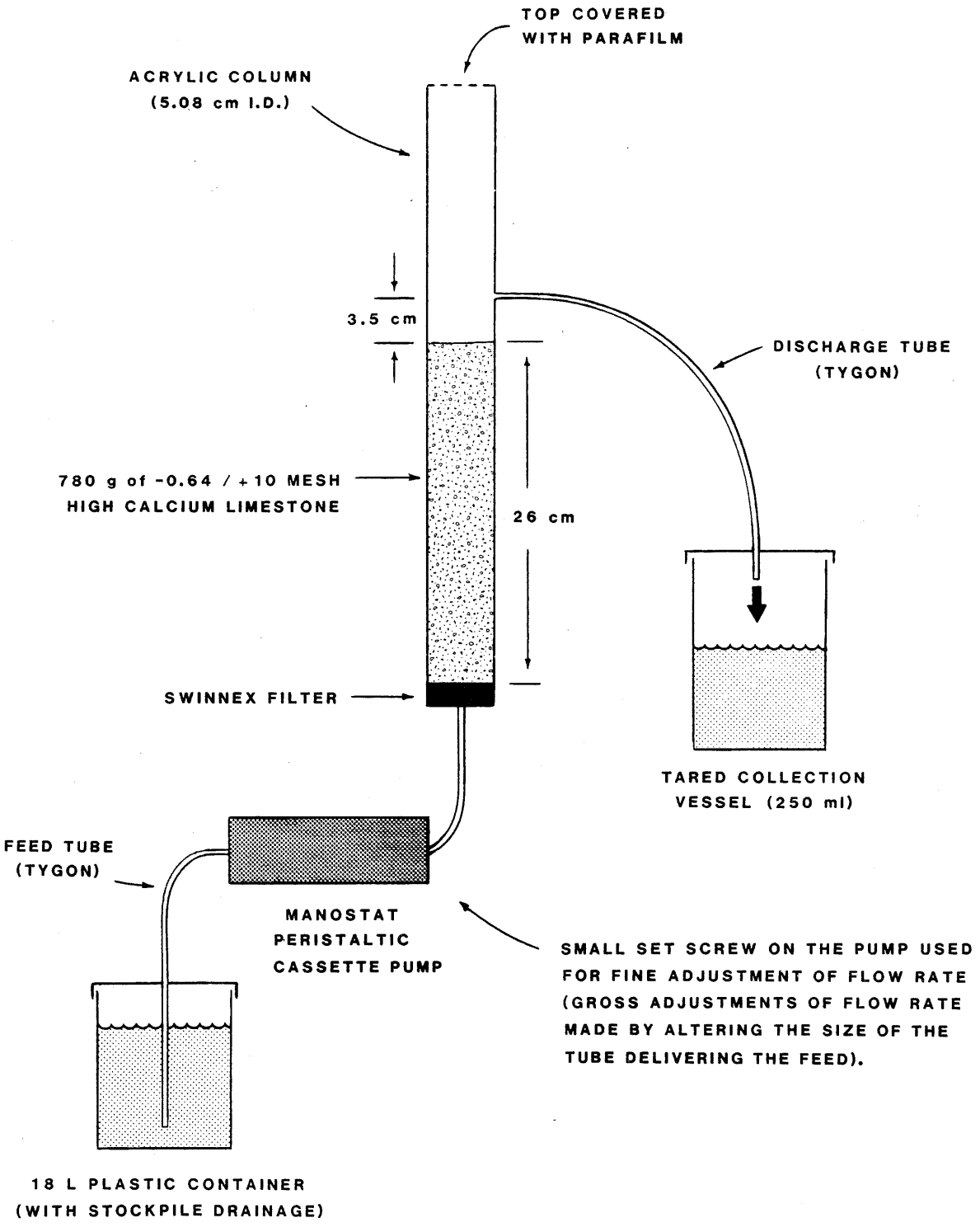

Figure 1. Column design.

Table 1. Chemical analysis of Presque Isle limestone.

Parameter	% Weight
Fe_2O_3	0.23
Al_2O_3	.27
SiO_2	.75
S	.085
CaO	54.14
MgO	.99
R_2O_3	.49
Loss on Ignition (LOI)	43.63
Equivalent $CaCO_3$	96.68
Equivalent $MgCO_3$	2.08

Table 2. Input water quality (data through November 9, 1989; t = 584 days). Columntab2,jon

(concentrations in mg/L unless noted otherwise)

	pH	Alk[1]	Acy[1]	Net alk.[1]	S.C.[2]	Cu	Ni	Co	Zn	Fe	Al	Ca	SO_4
Seep 1													
Max	6.90	12.9	76	4	2630	1.1	30	2.3	4.7	1.0	2.7	380	2000
Med	5.35	5.2	22	-16	2050	0.40	9	0.9	1.6	0.1	0.9	200	1300
Min	4.60	1.4	4.9	-74	580	0.05	3.0	0.5	0.5	L0.1	L0.1	100	700
FL3													
Max	5.35	10.3	484	-66	4080	69	274	14.2	10.9	0.1	4.0	400	3560
Med	4.90	4.0	208	-204	3450	60	188	7.8	8.0	0.05	1.9	322	2435
Min	4.65	1.0	68	-483	1640	27	72	4.2	4.8	L0.1	L0.1	160	1080
FL6													
Max	4.35	0	819	-372	G5000	143	279	11.3	10.7	0.3	42	500	4300
Med	4.15	0	602	-602	4125	117	184	9.8	7.7	0.2	33	350	3200
Min	3.80	0	372	-819	2350	58	83	4.9	3.7	L0.1	17	190	1380

[1] mg/L as $CaCO_3$
[2] umho/cm
L:less than
G:greater than

tubing, which might affect the flow rate. The smaller tubing was less susceptible to wear. Flow rates were initially adjusted to approximately 2.5 L/day. When the column effluent acidity exceeded the alkalinity, the flow rate was reduced. The approximate flow rates are presented in table 3.

Water quality samples were collected directly from the discharge tube in tared 250-mL bottles. The samples were weighed to determine the volume and analyzed on site for specific conductance, pH, acidity, and alkalinity. Conductance was measured using a Myron L conductivity meter and pH was analyzed with either a Radiometer 29 or an Orion SA 720 pH meter. Additional samples were collected and sent to the Division of Minerals laboratory in Hibbing for analysis of trace metals and sulfate. Trace metals (Cu, Ni, Co, Zn), Fe, Al, and Ca were analyzed on a Perkin Elmer 603 atomic absorption spectrophotometer and sulfate was analyzed using the barium sulfate turbidimetric technique (APHA et al., 1975).

4. Results and discussion

4.1. Introduction

This report presents the results of the column experiment through 9 November 1989, the first 584 days of the experiment. The flow was initially set at approximately 5 bv/day (2.5 L/day) and, when treatment was no longer acceptable, the flow was reduced to 2.7, 1.4, 0.56, 0.37, and ultimately 0.16 bv/day (Table 3). Treatment was defined as acceptable if effluent alkalinity exceeded effluent acidity (i.e., net alkalinity exceeded zero). A treatment summary for the three drainages is presented in table 4.

The flow rates were highly uniform among the columns and for an individual column over time. The effluent quality from the triplicated columns was fairly reproducible and, consequently, results are often presented as an average of the values from the three columns. The data for the individual columns are presented in appendix 1.

Table 3. Target flow rates for columns.

tubing diam in.	APPROXIMATE FLOW RATE mL/hr	L/d	bv/day[1]	contact time hr[2]	pv/day[3]	contact time hr[4]
5/32	120	2.9	5.6	4.3	12.6	1.9
3/32	57	1.4	2.7	9.0	5.9	4.0
2/32	30	0.72	1.4	17	3.1	7.7
2/32L[5]	12	.29	0.56	43	1.3	19
1/32	8	.19	.37	64	.83	29
1/32L[5]	3.4	.082	.16	150	.36	67

[1]Based on a bed volume of 0.515 L (column height of 25.4 cm).

[2]Based on bed volumes

[3]Flow rate in pore volumes/day, using a pore volume of 230 cm^3.

[4]Based on pore volumes.

[5]L designates low drive on the peristaltic pump.

Table 4. Volume of drainage acceptably treated as a function of flow rate. Data through 9 November 1989, t=584 days.

FLOW RATE		DETENTION TIME	VOLUME ACCEPTABLY TREATED[1]		
			REPLICATE 1	REPLICATE 2	REPLICATE 3
bv/day	mL/hr	hr	bv	bv	bv
		SEEP 1[3]			
5	110	4.8	2625[2]	2806[2]	2598[2]
		FL3[4]			
5	110	4.8	0	0	0
0.43	9.2	56	4.3	6.0	9.5
.15	3.3	156	80[2,6]	73[2,6]	79[2,6]
		FL6[5]			
5	110	4.8	16	19	12
2.7	57	9.0	42	27	8.2
1.4	31	17	53	66	32
.56	12	43	281[2,6]	290[2,6]	277[2,6]

[1]Drainage treatment is acceptable if effluent alkalinity exceeds effluent acidity, i.e. if net alkalinity exceeds zero.

[2]Treatment continues to be acceptable.

[3]Median influent pH and mean net alkalinity: 5.35 and -18 mg/L, respectively.

[4]Median influent pH and mean net alkalinity: 4.90 and -210 mg/L, respectively.

[5]Median influent pH and net alkalinity: 4.15 and -600 mg/L, respectively.

[6]Volumes presented in the April 1989 report were in error.

4.2. Seep 1 drainage

4.2.1. Neutralization

The limestone columns have elevated the pH and net alkalinity of the Seep 1 drainage for a period of 584 days. The limestone columns have neutralized an average of 2680 bed volumes (bv, 1380 liters) of Seep 1 drainage at an average flow of about 4.6 bv/day. The flow was averaged over a period during which the columns were shut down for repairs and is, therefore, slower than the typical flow during operation. The median pH and flow-weighted mean net alkalinity (alkalinity - acidity) of the influent were 5.35 and -23 mg/L, respectively. Dissolution of the limestone bed elevated these values to pH 7.5 and 15 mg/L, respectively, in the column effluent (figure 2). An average of about 53 g of alkalinity has been transferred from the limestone to the drainage at a rate of about 90 mg/day (figure 3).

4.2.2. Trace metal removal

Trace metals were removed from solution due to neutralization of the drainage. Since the initial drainage pH was only slightly acidic and trace metal concentrations were only slightly elevated, the two-unit increase in pH did not remove a large amount of metals from solution. The average mass removal of copper and nickel was 650 and 2030 mg, respectively. Relative to the mass input, the removal of these metals was 80 and 11 percent, respectively. The flow-weighted mean copper concentration was reduced from an influent value of 0.59 mg/L to 0.12 mg/L in the effluent. The corresponding nickel concentration was reduced from 13.4 to 12 mg/L. Since the observed effluent pH range was relatively small, it was not possible to quantify a relationship between metal concentrations and pH.

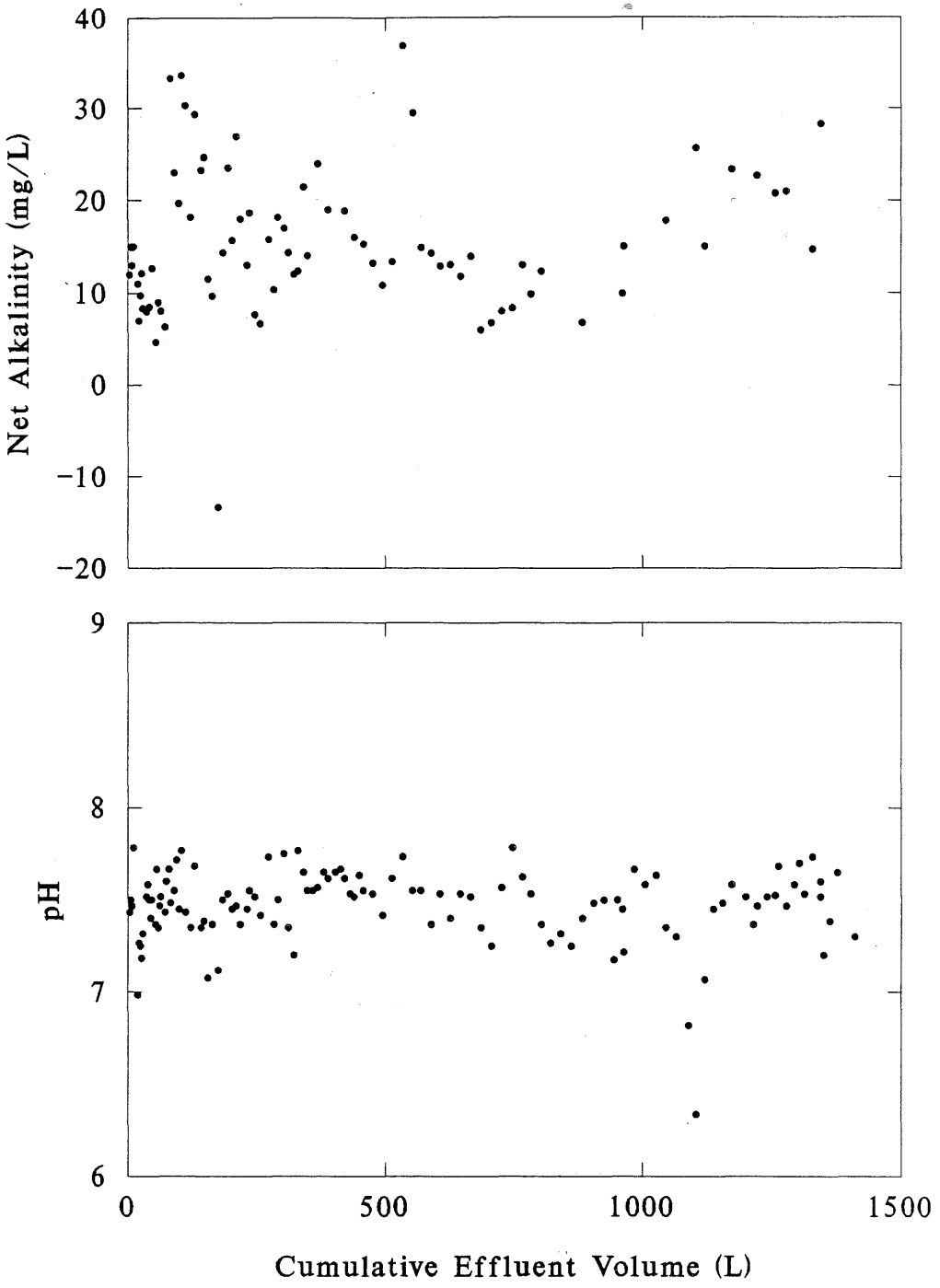

Figure 2. Effluent net alkalinity and pH vs cumulative volume: Seep 1.

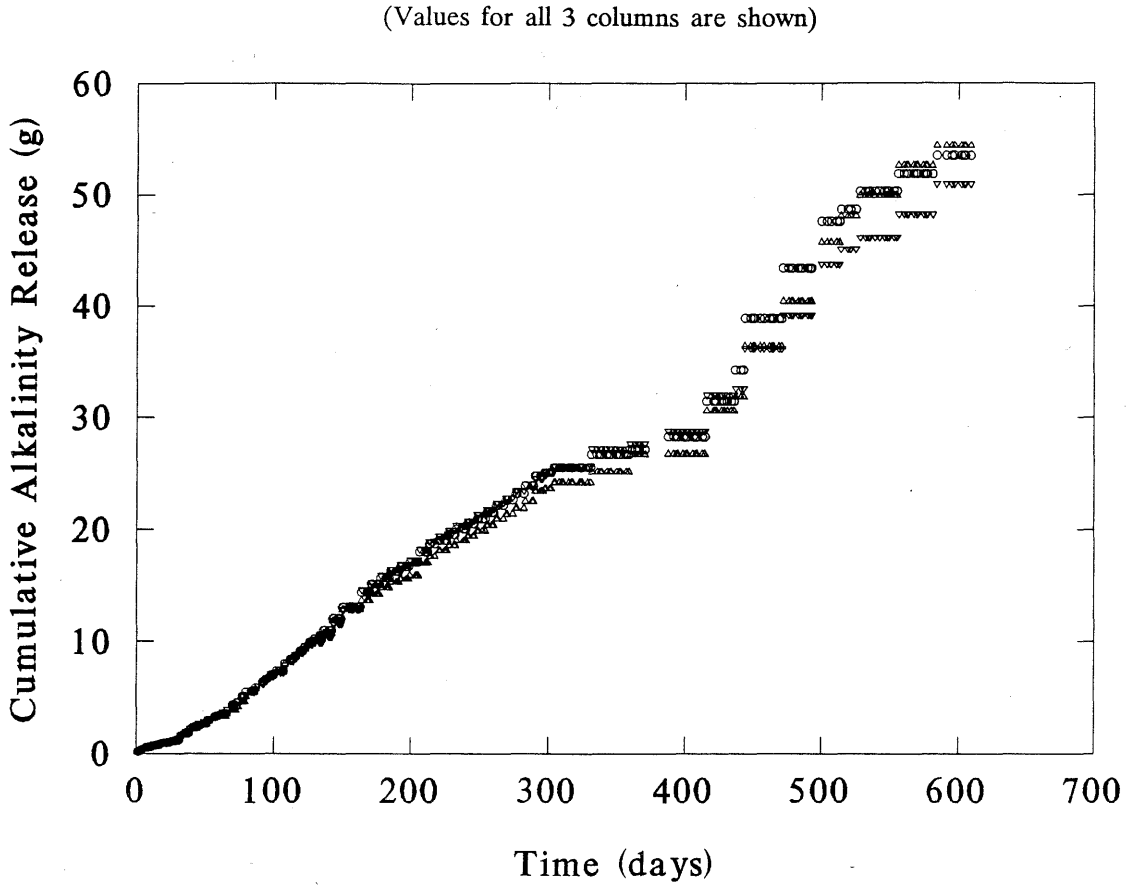

Figure 3. Cumulative net alkalinity release vs. time: Seep 1.

4.3. FL3 drainage

4.3.1. Neutralization

Over a period of 584 days the limestone columns have neutralized an average of about 84 bed volumes (43 liters) of FL3 drainage. The median influent pH and flow-weighted mean net alkalinity (alkalinity - acidity) were 4.9 and -210 mg/L as $CaCO_3$, respectively, over the entire experiment. The limestone bed elevated these values to pH 7.9 and 37 mg/L (figure 4). Treatment was inadequate at flows of 4.6, 2.9, and 0.41 bv/day. At a flow of 0.16 bv/day the median influent pH and flow-weighted mean net alkalinity were 4.95 and -170 mg/L, respectively. A total of 13 g of alkalinity was released to the flow at an average rate of 22 mg/day (figure 5). The release during the slow flow period was slightly slower, averaging about 17 mg/day.

4.3.2. Trace metal removal

Due to the pH elevation, trace metals were removed by chemical precipitation and/or adsorption. The average removals for Cu and Ni were 2720 and 740 mg, respectively. These removals represent 93 and 8 percent, respectively, of the input metal masses. When flow was maintained at 0.16 bv/d, the flow-weighted mean copper concentration was reduced more than 99 percent, from 45 mg/L in the influent to 0.052 mg/L in the effluent. At this low flow the nickel concentration was reduced about 15 percent, from 137 to 117 mg/L.

The effluent copper concentrations were highly pH dependent, and for column 2 the copper-pH relationship was described by the following equation (figure 6):

$$\log [\dot{C}u] = -3.242\ pH + 24.609. \qquad (3)$$

The values of r and r^2 were 0.844 and 0.712, respectively ($p = 0.000$). The pH dependence of the other trace metals did not appear to be significant at the 95 percent confidence interval. This lack of dependence is consistent with their lower degree of removal.

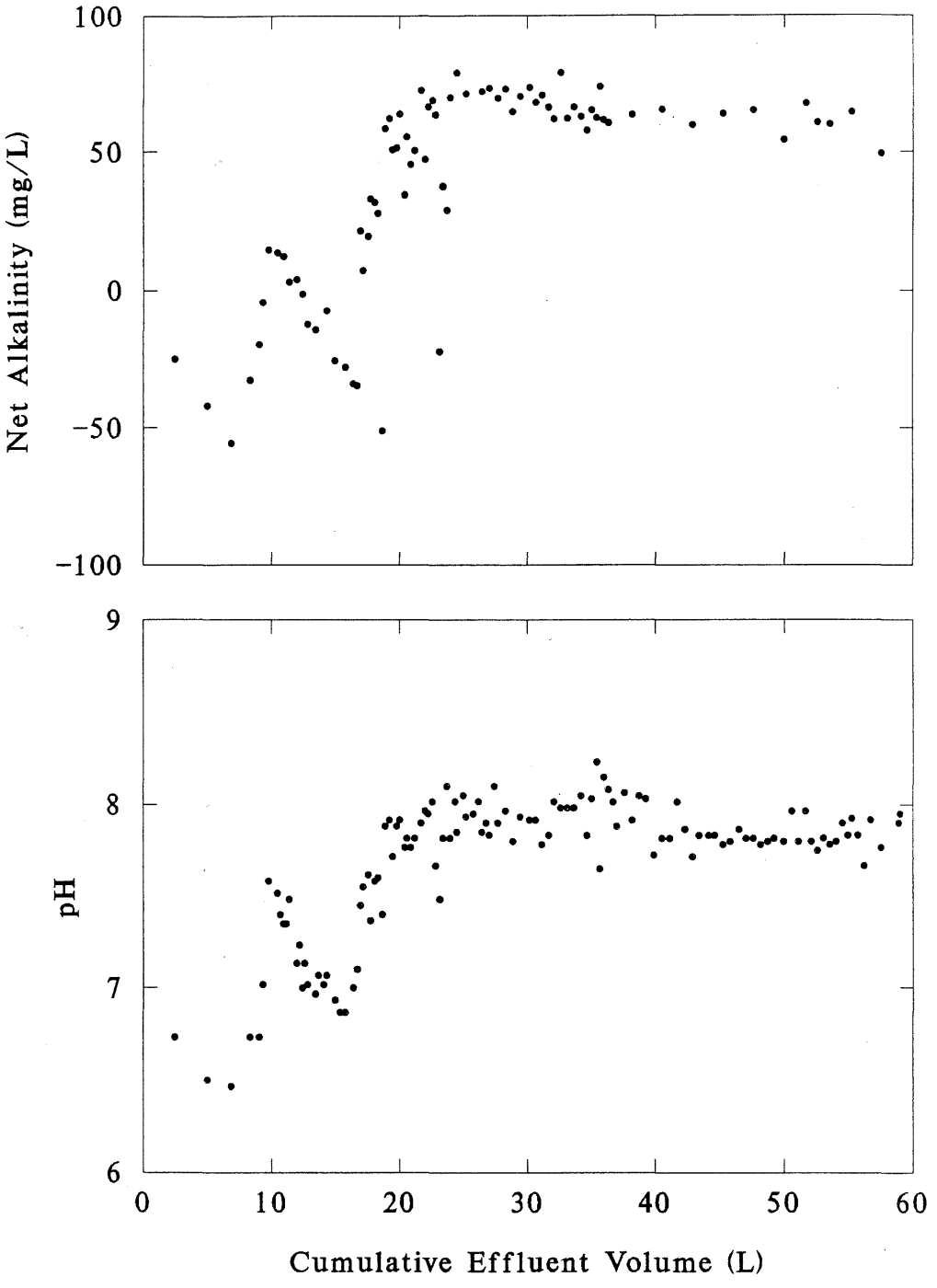

Figure 4. Effluent net alkalinity and pH vs. cumulative volume: FL3.

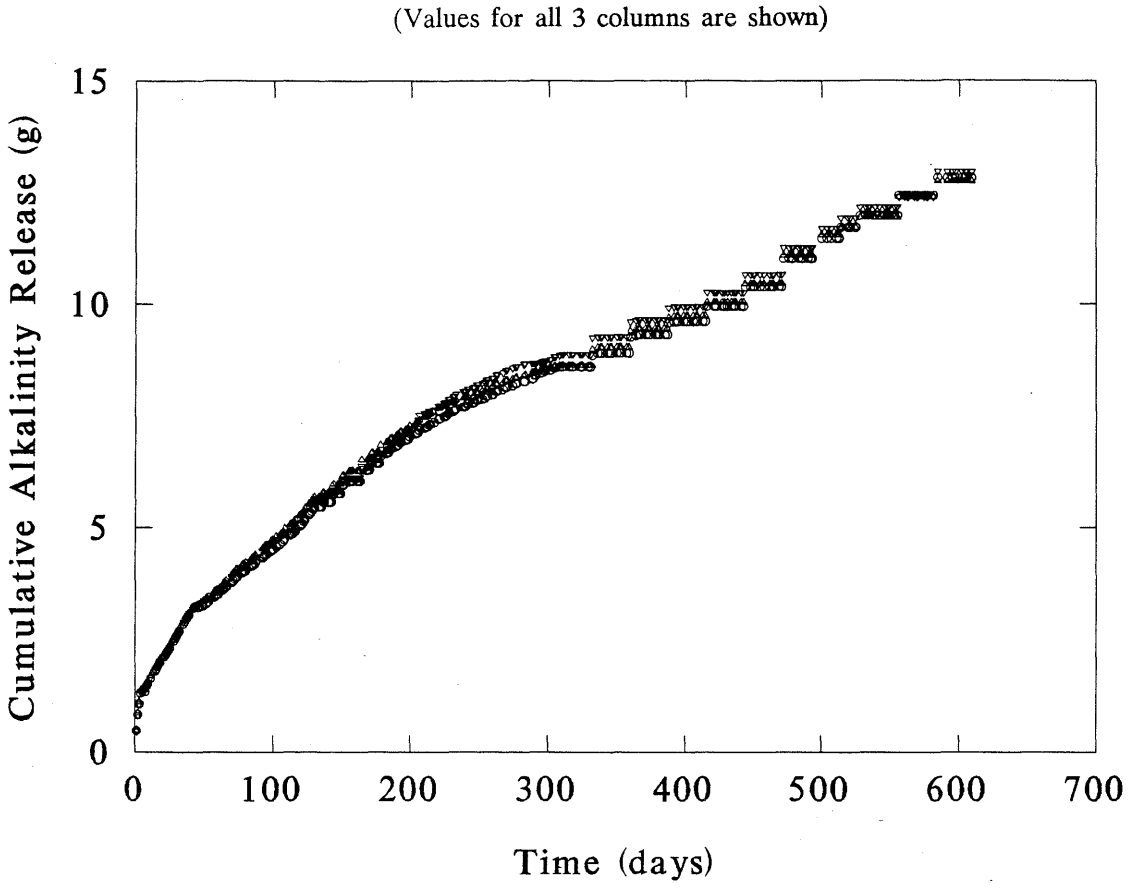

Figure 5. Cumulative net alkalinity release vs. time: FL3.

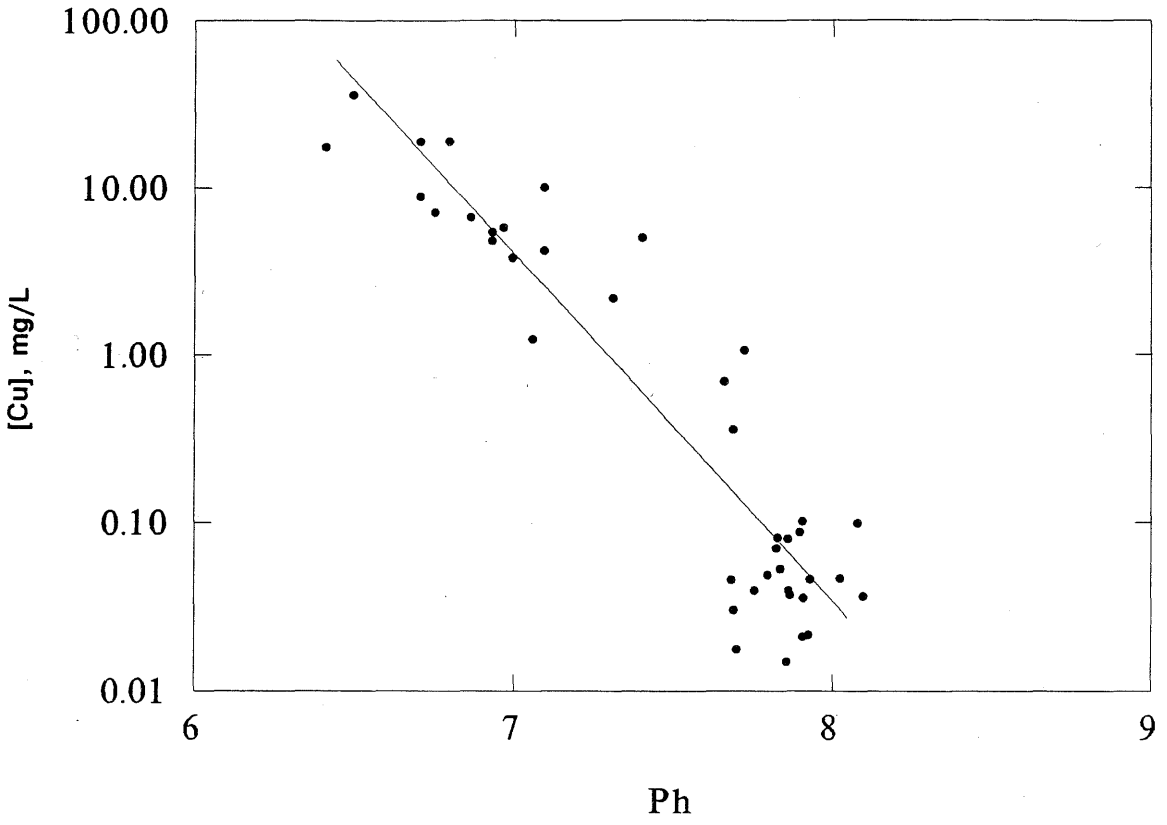

Figure 6. Log [Cu] vs. pH: Leachate FL3, Column 2.

4.4. FL6 drainage

4.4.1. Neutralization

Over a period of 584 days the limestone columns have neutralized an average of 370 bed volumes (192 liters) of the FL6 drainage. The column effluent quality was fairly reproducible, although at times column 3 tended to neutralize the drainage less effectively than columns 1 and 2. The influent to column 3 may not have flowed uniformly through all portions of the limestone bed, although there was no visible evidence of such short-circuiting.

The treatment was inadequate at flows of 5, 3.3, 2.6 bv/d. A flow of 1.4 bv/d (30 mL/hr) achieved adequate treatment for about 50 bv. When treatment at this flow was no longer adequate the rate was reduced to 0.55 bv/day. Over the course of the entire experiment the median pH and flow-weighted mean net alkalinity (alkalinity - acidity) of the influent were 4.15 and -600 mg/L as $CaCO_3$, respectively. These values were elevated to pH 7.95 and 120 mg/L in the effluent (figure 7). Alkalinity release from the three limestone beds to the FL6 flow averaged about 140 g at a rate of 240 mg/day. At the 0.55 bv/day flow the alkalinity release averaged about 180 mg/day (figure 8). This average included periods when the column flow was stopped for repairs.

4.4.2. Metal removal

Trace metals were removed as a consequence of the neutralization. The total copper and nickel removals were 19 g (90 percent of the input) and 9.6 g (27 percent of the input), respectively. The percent removals were higher at the low flow rate, at which flow-weighted mean copper concentration was reduced from about 87 mg/L to 0.52 mg/L, indicating a removal of 99.4 percent. The corresponding nickel concentration was reduced from 147 to 101 mg/L, a removal of 31 percent. As was the case for the FL3 drainage, the copper removal was highly pH dependent ($\log [Cu] = -3.232\ pH + 24.609$, $r^2 = 0.712$, $n = 41$, figure 9). The pH dependence of Ni, Co, and Zn was not significant. Aluminum concentrations in the FL6 drainage were consistently reduced from an influent level of 17 to 42 mg/L to an effluent level typically less than 1 mg/L.

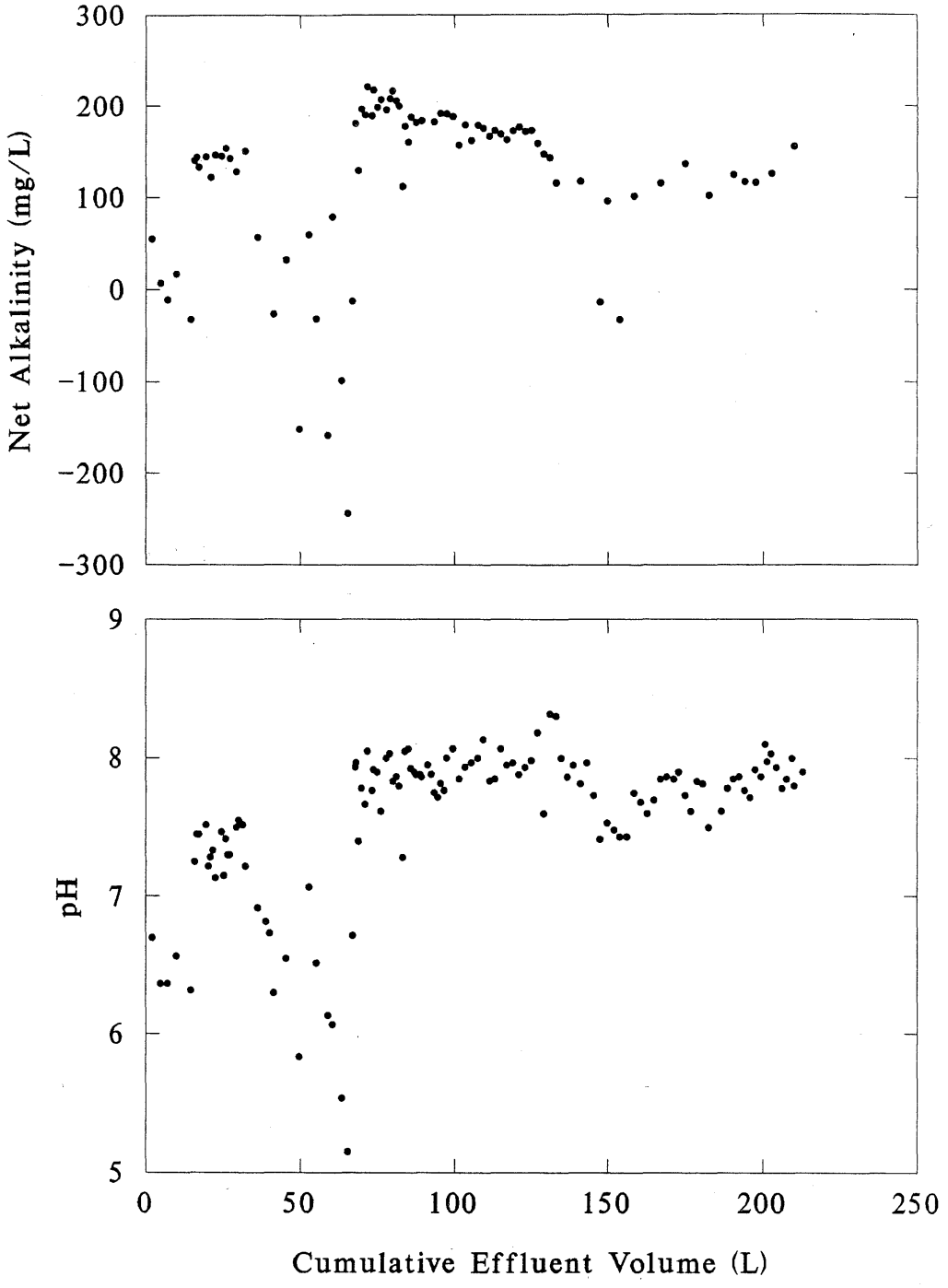

Figure 7. Effluent net alkalinity and pH vs. cumulative volume: FL6.

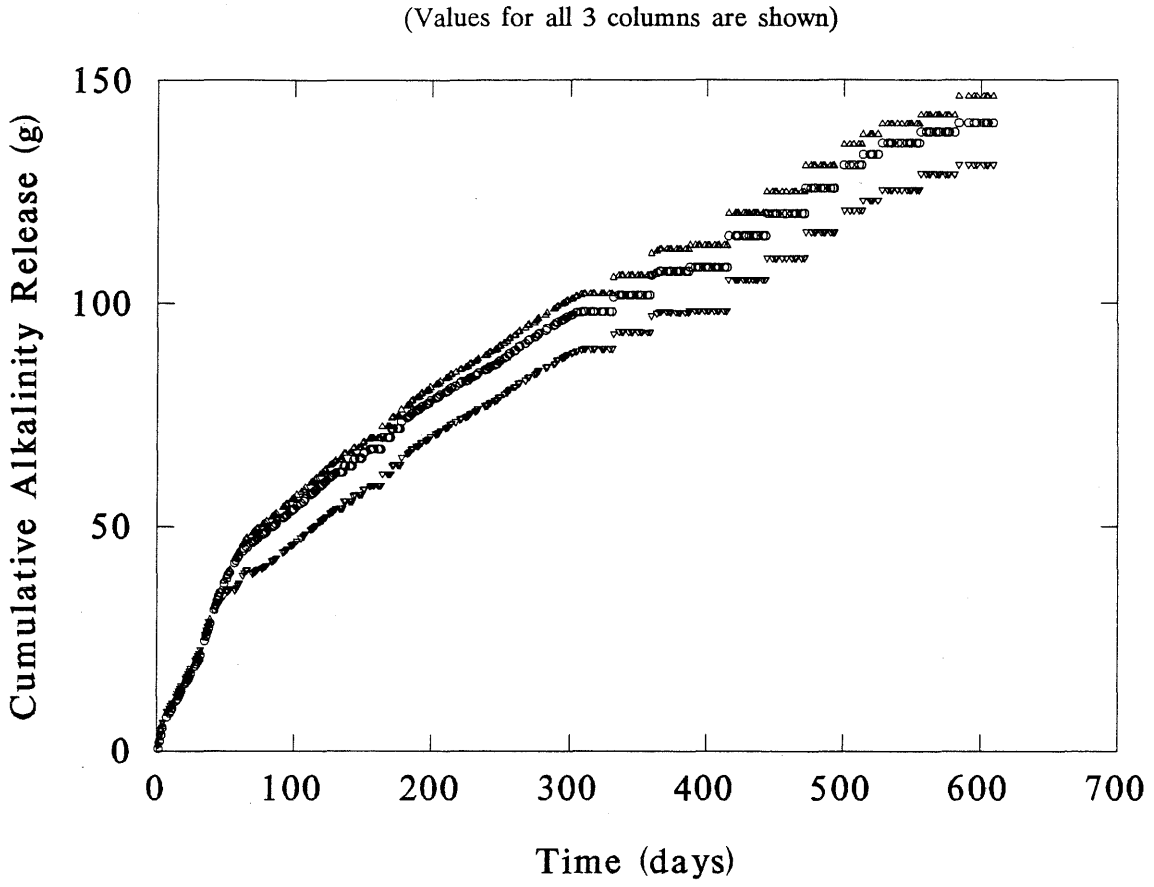

Figure 8. Cumulative net alkalinity release vs. time: FL6.

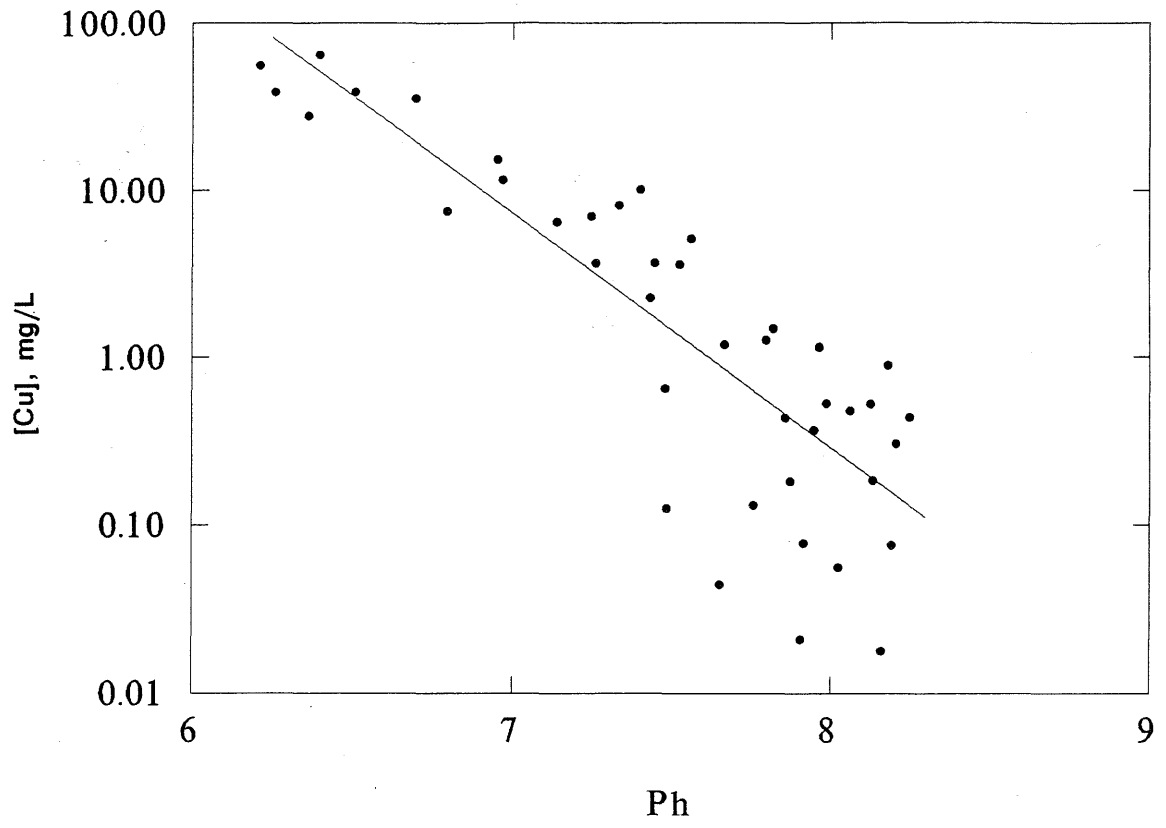

Figure 9. Log [Cu] vs. pH: Leachate FL6, Column 2.

5. Summary and conclusions

High calcium limestone (-6.4 mm/+2.0 mm) was used to treat three different stockpile drainages. Flow rates were adjusted to attain an effluent in which alkalinity exceeded acidity. The rate of limestone dissolution was a function of the stockpile drainage composition. The rate was slowest for the FL3 drainage (22 mg/day), which had a moderately low pH and fairly high acidity. The dissolution rate was about an order of magnitude higher with the FL6 drainage, which had the lowest pH. Metal removals of 7 to over 99 percent also resulted from the treatment (table 5, 6).

The results indicate that limestone beds are capable of neutralizing these stockpile drainages if adequate detention time is allowed. The detention times required ranged from 0.2 days for Seep 1 to 6.2 days for the FL3 drainage. The variability in detention rates indicates that tests must be conducted on individual drainages to determine the treatment bed design parameters for the drainage. Pilot scale field tests should also be conducted to evaluate the influence of environmental parameters on the effectiveness of limestone beds. Such a test is being conducted on the Seep 1 drainage. Field tests on other drainages would be necessary to design limestone beds for their treatment.

ACKNOWLEDGEMENTS

Albert Klaysmat was responsible for the majority of the experimental apparatus design and construction. Cal Jokela and Anne Jagunich assisted in experimental sampling and maintenance, as well as analysis of specific conductance, pH, acidity, and alkalinity. Trace metals and sulfate were analyzed by Albert Klaysmat and Jean Drotts, respectively. Tony Deneka and Jon Wagner managed computerized data storage and output. LTV Steel Mining Company provided financial assistance.

Table 5. Summary data for column experiments through 9 November 1989, t=584. With the exception of pH, flow weighted mean values are presented.

	Seep 1	FL3		FL6	
Effective flow (bv/day)	5	0.16		0.55	
Detention time (days)	0.2	6.2		1.8	
Influent pH[1]	5.35	4.90		4.15	
Effluent pH[1]	7.5	7.9		7.95	
Influent net alkalinity	-23	-210		-600	
Effluent net alkalinity	15	37		120	
Influent copper, mg/L	0.59	51	(45)[2]	100	(87)[3]
Effluent copper, mg/L	.12	3.6	(0.052)[2]	10	(0.52)[3]
Influent nickel, mg/L	13.4	158	(137)[2]	170	(147)[3]
Effluent nickel, mg/L	12	145	(117)[2]	124	(101)[3]
Influent cobalt, mg/L	2.7	7.4	(6.9)[2]	8.1	(7.5)[3]
Effluent cobalt, mg/L	1.9	4.7	(5.9)[2]	6.5	(6.0)[3]
Influent zinc, mg/L	1.2	7.4	(7.6)[2]	7.5	(7.3)[3]
Effluent zinc, mg/L	1.1	3.4	(2.1)[2]	3.9	(2.8)[3]
Limestone dissolution rate (mg/day)	90	22	(17)[2]	240	(180)[3]
Mass limestone dissolved (g)	53	13		140	

[1]Median value

[2]Values for 0.16 bv/d only.

[3]Values for 0.55 bv/d flow only.

Table 6. Mass removal summary for column experiments.
(through November 9, 1989; T = 584 days)

	Seep 1			FL3			FL6		
	Input (mg)	Output (mg)	Removal (mg)	Input (mg)	Output (mg)	Removal (mg)	Input (mg)	Output (mg)	Removal (mg)
Net Alk	-31,441	21,508	52,949	-10,797	2,039	12,836	-119,194	20,030	139,224
Cu	817	169	648	2,923	204	2,719	20,793	2,094	18,699
Ni	18,520	16,494	2,026	9,035	8,298	737	35,337	25,731	9,606
Co	3,691	2,566	1,125	424	269	155	1,688	1,362	326
Zn	1,656	1,509	147	427	196	231	1,572	808	764

APPENDIX 1

Influent and Effluent Quality

Table A1.1. FL3 effluent quality: Column 1.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
1	2.420	3900	6.700	46	72	14.000	182.000	7.600	4.600	0.100	388.000	2660.000
2	5.000	3975	6.500	36	81	24.000	183.000	7.500	4.500	0.000	354.000	.
3	6.800	4025	6.450	36	90	22.000	180.000	7.500	4.400	0.100	352.000	2540.000
4	8.260	3880	6.700	36	72	14.000	167.000	6.700	3.800	0.000	322.000	.
7	8.380	.	.	.	.	.	.	.	.	.	.	.
8	8.970	4000	6.650	44	60	11.000	178.000	7.100	5.400	0.100	342.000	.
9	9.220	4025	7.050	39	42	3.000	190.000	7.400	4.800	0.000	542.000	2700.000
11	9.690	3925	7.700	45	36	1.400	192.000	7.400	4.700	.	410.000	2960.000
14	10.390	4075	7.650	46	45	1.080	191.000	7.400	4.600	0.100	418.000	2800.000
15	10.610	.	7.450	.	.	.	.	.	.	.	.	.
16	10.860	3950	7.450	42	36	1.040	187.000	7.000	4.800	0.000	388.000	2900.000
17	11.070	.	7.450	.	.	.	.	.	.	.	.	.
18	11.320	3850	7.600	52	54	0.860	193.000	7.100	5.100	0.000	396.000	2900.000
21	11.930	3950	7.200	46	42	3.000	199.000	7.300	5.300	0.000	384.000	2860.000
22	12.130	.	7.300	.	.	.	.	.	.	.	.	.
23	12.360	3840	6.950	41	54	.	.	.	.	.	.	.
24	12.540	.	7.250	.	.	.	.	.	.	.	.	.
25	12.770	3900	7.050	41	54	3.600	268.000	9.800	10.100	0.000	400.000	2560.000
28	13.400	3825	7.000	36	52	5.200	246.000	9.600	10.100	0.000	420.000	2600.000
29	13.610	.	7.050	.	.	.	.	.	.	.	.	.
30	13.820	.	.	.	.	.	.	.	.	.	.	.
31	14.010	.	7.100	.	.	.	.	.	.	.	.	.
32	14.260	3900	7.100	36	45	.	.	.	.	.	.	.
35	14.920	3825	7.050	35	57	3.700	234.000	9.400	10.200	0.000	380.000	2600.000
36	15.140	.	.	.	.	.	.	.	.	.	.	.
37	15.330	.	6.850	.	.	.	.	.	.	.	.	.
38	15.520	.	.	.	.	.	.	.	.	.	.	.
39	15.690	3775	6.850	39	52	16.000	182.000	8.500	8.900	0.000	640.000	2500.000
42	16.310	.	.	.	.	6.400	245.000	10.200	10.100	0.000	380.000	3000.000
43	16.430	.	.	.	.	.	.	.	.	.	.	.
44	16.520	.	.	.	.	.	.	.	.	.	.	.
45	16.630	3700	6.900	28	90	0.700	214.000	9.600	5.900	0.100	400.000	2700.000
46	16.640	.	.	.	.	.	.	.	.	.	.	.
49	16.750	3650	7.350	46	36	.	.	.	.	.	.	.
51	16.910	.	.	.	.	.	.	.	.	.	.	.
52	17.010	3450	7.450	46	32	0.300	206.000	9.400	4.400	0.000	400.000	2800.000
53	17.090	.	.	.	.	.	.	.	.	.	.	.
57	17.420	3500	7.500	54	37	0.200	202.000	9.300	5.500	0.000	400.000	4200.000
58	17.510	.	.	.	.	.	.	.	.	.	.	.
59	17.590	3680	7.250	64	36	.	.	.	.	.	.	.
60	17.670	.	.	.	.	.	.	.	.	.	.	.

Table A1.1. FL3 effluent quality: Column 1.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
63	17.920	3775	7.400	70	36	.	.	.	.	.	.	.
64	18.010	.	.	.	.	.	.	.	.	.	.	.
65	18.090	.	.	.	.	.	.	.	.	.	.	.
66	18.170	3490	7.550	84	60	.	.	.	.	.	.	.
70	18.500	3550	7.400	44	167	.	.	.	.	.	.	.
71	18.580	.	.	.		.	.	.	.	.	.	.
72	18.660	.	.	.		.	.	.	.	.	.	.
73	18.740	3500	7.900	67	9	0.100	212.000	9.600	5.900	0.000	480.000	2560.000
74	18.830	.	.	.		.	.	.	.	.	.	.
77	19.070	3500	7.900	76	12	.	.	.	.	.	.	.
78	19.150	.	.	.		.	.	.	.	.	.	.
79	19.230	.	.	.		.	.	.	.	.	.	.
80	19.280	3475	7.650	82	30	.	.	.	.	.	.	.
84	19.620	3425	7.750	67	20	.	.	.	.	.	.	.
85	19.700	.	.	.		.	.	.	.	.	.	.
86	19.770	.	.	.		.	.	.	.	.	.	.
87	19.840	3575	7.900	70	12	0.200	207.000	9.500	4.100	0.100	420.000	2800.000
92	20.220	3500	7.650	62	63	.	.	.	.	.	.	.
93	20.300	.	.	.		.	.	.	.	.	.	.
94	20.390	3450	7.850	64	21	.	.	.	.	.	.	.
95	20.460	.	.	.		.	.	.	.	.	.	.
98	20.700	3575	7.600	72	39	.	.	.	.	.	.	.
99	20.790	.	.	.		.	.	.	.	.	.	.
100	20.870	.	.	.		.	.	.	.	.	.	.
102	21.010	3575	7.750	71	30	0.200	181.000	8.700	4.200	0.100	440.000	2250.000
105	21.250	.	.	.		.	.	.	.	.	.	.
107	21.430	.	.	.		.	.	.	.	.	.	.
108	21.500	3500	7.900	80	10	.	.	.	.	.	.	.
112	21.820	3525	8.000	70	36	.	.	.	.	.	.	.
113	21.900	.	.	.		.	.	.	.	.	.	.
114	21.980	.	.	.		.	.	.	.	.	.	.
115	22.050	3500	8.000	74	10	0.050	168.000	8.900	1.000	0.000	400.000	2170.000
116	22.130	.	.	.		.	.	.	.	.	.	.
119	22.370	3700	7.950	91	24	.	.	.	.	.	.	.
120	22.450	.	.	.		.	.	.	.	.	.	.
121	22.530	.	.	.		.	.	.	.	.	.	.
122	22.610	3620	7.700	81	14	.	.	.	.	.	.	.
123	22.700	.	.	.		.	.	.	.	.	.	.
126	22.930	3700	7.500	78	74	.	.	.	.	.	.	.
127	23.010	.	.	.		.	.	.	.	.	.	.
128	23.090	.	.	.		.	.	.	.	.	.	.

Table A1.1. FL3 effluent quality: Column 1.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
129	23.170	3600	7.800	91	48	0.100	151.000	8.800	4.200	0.000	384.000	2740.000
130	23.250	.	.	.	.	.	.	.	.	.	.	.
133	23.490	3690	8.100	83	20	.	.	.	.	.	.	.
134	23.580	.	.	.	.	.	.	.	.	.	.	.
135	23.650	.	.	.	.	.	.	.	.	.	.	.
136	23.730	3600	7.850	82	10	.	.	.	.	.	.	.
137	23.810	.	.	.	.	.	.	.	.	.	.	.
140	24.120	3680	8.100	.	.	.	.	.	.	.	.	.
141	24.200	.	.	.	.	.	.	.	.	.	.	.
142	24.280	.	.	.	.	.	.	.	.	.	.	.
143	24.280	3800	7.850	108	18	0.100	135.000	8.800	5.700	0.000	420.000	2700.000
144	24.460	.	.	.	.	.	.	.	.	.	.	.
147	24.800	3800	8.100	.	.	.	.	.	.	.	.	.
148	24.880	.	.	.	.	.	.	.	.	.	.	.
149	24.970	.	.	.	.	.	.	.	.	.	.	.
150	25.030	3775	7.950	81	12	.	.	.	.	.	.	.
151	25.110	.	.	.	.	.	.	.	.	.	.	.
155	25.490	.	.	.	.	.	.	.	.	.	.	.
156	25.570	.	.	.	.	.	.	.	.	.	.	.
157	25.650	3650	8.000	.	.	0.050	192.000	9.300	4.600	0.000	400.000	2260.000
158	25.720	.	.	.	.	.	.	.	.	.	.	.
161	26.030	3700	8.050	.	.	.	.	.	.	.	.	.
162	26.120	.	.	.	.	.	.	.	.	.	.	.
163	26.200	.	.	.	.	.	.	.	.	.	.	.
164	26.280	3640	7.900	86	9.6	.	.	.	.	.	.	.
168	26.600	3550	7.900	.	.	.	.	.	.	.	.	.
169	26.680	.	.	.	.	.	.	.	.	.	.	.
170	26.760	.	.	.	.	.	.	.	.	.	.	.
171	26.840	3900	7.800	91	18	0.050	195.000	9.300	5.200	0.000	420.000	2340.000
172	26.920	.	.	.	.	.	.	.	.	.	.	.
175	27.240	3900	8.100	.	.	.	.	.	.	.	.	.
176	27.330	.	.	.	.	.	.	.	.	.	.	.
177	27.410	.	.	.	.	.	.	.	.	.	.	.
178	27.490	3790	7.900	77	9.6	.	.	.	.	.	.	.
182	27.810	.	.	.	.	.	.	.	.	.	.	.
183	27.840	.	.	.	.	.	.	.	.	.	.	.
184	27.970	.	.	.	.	.	.	.	.	.	.	.
185	28.060	3700	8.000	86	12	0.050	185.000	9.600	5.300	0.000	400.000	.
186	28.130	.	.	.	.	.	.	.	.	.	.	.
189	28.370	.	.	.	.	.	.	.	.	.	.	.
190	28.460	.	.	.	.	.	.	.	.	.	.	.

Table A1.1. FL3 effluent quality: Column 1.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
191	28.530	.	.	.	.	.	.	.	.	.	.	.
192	28.610	3970	7.800	80	14	.	.	.	.	.	.	.
193	28.690	.	.	.	.	.	.	.	.	.	.	.
196	28.920	.	.	.	.	.	.	.	.	.	.	.
197	29.000	.	.	.	.	.	.	.	.	.	.	.
198	29.070	.	.	.	.	.	.	.	.	.	.	.
199	29.150	3900	7.900	86	15	0.030	226.000	13.800	4.700	0.000	386.000	2600.000
203	29.460	.	.	.	.	.	.	.	.	.	.	.
204	29.540	.	.	.	.	.	.	.	.	.	.	.
205	29.620	.	.	.	.	.	.	.	.	.	.	.
206	29.690	3890	7.850	86	11	.	.	.	.	.	.	.
210	30.000	.	.	.	.	.	.	.	.	.	.	.
211	30.070	.	.	.	.	.	.	.	.	.	.	.
212	30.150	.	.	.	.	.	.	.	.	.	.	.
213	30.230	3400	7.900	59	6	0.040	194.000	11.600	3.600	0.000	336.000	2100.000
214	30.300	.	.	.	.	.	.	.	.	.	.	.
217	30.540	.	.	.	.	.	.	.	.	.	.	.
220	30.760	3000	7.800	77	7.2	.	.	.	.	.	.	.
221	30.830	.	.	.	.	.	.	.	.	.	.	.
224	31.050	.	.	.	.	.	.	.	.	.	.	.
225	31.130	.	.	.	.	.	.	.	.	.	.	.
226	31.210	.	.	.	.	.	.	.	.	.	.	.
227	31.290	2810	7.850	75	12	0.020	166.000	9.500	1.000	0.000	304.000	1900.000
228	31.350	.	.	.	.	.	.	.	.	.	.	.
231	31.570	.	.	.	.	.	.	.	.	.	.	.
232	31.670	.	.	.	.	.	.	.	.	.	.	.
233	31.730	2200	8.050	65	6	.	.	.	.	.	.	.
238	32.100	.	.	.	.	.	.	.	.	.	.	.
239	32.140	.	.	.	.	.	.	.	.	.	.	.
240	32.190	.	.	.	.	.	.	.	.	.	.	.
241	32.230	2020	8.050	97	3	0.050	71.000	4.400	0.700	0.000	242.000	1300.000
242	32.300	.	.	.	.	.	.	.	.	.	.	.
245	32.510	.	.	.	.	.	.	.	.	.	.	.
246	32.590	.	.	.	.	.	.	.	.	.	.	.
248	32.730	2100	8.050	66	4.3	.	.	.	.	.	.	.
249	32.800	.	.	.	.	.	.	.	.	.	.	.
252	33.000	.	.	.	.	.	.	.	.	.	.	.
254	33.140	.	.	.	.	.	.	.	.	.	.	.
255	33.220	2050	8.050	75	3	.	.	.	.	.	.	.
256	33.280	.	.	.	.	.	.	.	.	.	.	.
259	33.480	.	.	.	.	.	.	.	.	.	.	.

Table A1.1. FL3 effluent quality: Column 1.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
260	33.550	.	.	.	.	.	.	.	.	.	.	.
262	33.750	2030	8.100	78	6	0.050	72.000	4.800	0.700	0.100	256.000	1160.000
263	33.810	.	.	.	.	.	.	.	.	.	.	.
267	34.070	.	.	.	.	.	.	.	.	.	.	.
269	34.200	1990	7.900	65	7	.	.	.	.	.	.	.
270	34.270	.	.	.	.	.	.	.	.	.	.	.
274	34.480	.	.	.	.	.	.	.	.	.	.	.
276	34.590	2025	8.100	78	3	.	.	.	.	.	.	.
277	34.660	.	.	.	.	.	.	.	.	.	.	.
282	34.940	.	.	.	.	.	.	.	.	.	.	.
283	34.990	2025	8.300	64	.	.	.	.	.	.	.	.
288	35.260	.	.	.	.	.	.	.	.	.	.	.
289	35.330	.	.	.	.	.	.	.	.	.	.	.
290	35.390	1800	7.650	77	3	.	.	.	.	.	.	.
291	35.450	.	.	.	.	.	.	.	.	.	.	.
294	35.620	.	.	.	.	.	.	.	.	.	.	.
295	35.680	.	.	.	.	.	.	.	.	.	.	.
296	35.740	.	.	.	.	.	.	.	.	.	.	.
297	35.790	2050	8.250	73	1.9	.	.	.	.	.	.	.
298	35.840	.	.	.	.	.	.	.	.	.	.	.
301	36.000	.	.	.	.	.	.	.	.	.	.	.
302	36.060	.	.	.	.	.	.	.	.	.	.	.
304	36.170	2060	8.200	67	3	0.100	97.000	4.400	0.300	0.000	210.000	1250.000
305	36.220	.	.	.	.	.	.	.	.	.	.	.
308	36.360	.	.	.	.	.	.	.	.	.	.	.
310	36.450	.	.	.	.	.	.	.	.	.	.	.
311	36.490	2070	8.100	.	.	.	.	.	.	.	.	.
315	36.490	.	.	.	.	.	.	.	.	.	.	.
317	36.490	.	.	.	.	.	.	.	.	.	.	.
318	36.540	2000	7.900	.	.	.	.	.	.	.	.	.
323	36.940	.	.	.	.	.	.	.	.	.	.	.
324	37.030	.	.	.	.	.	.	.	.	.	.	.
325	37.120	2100	8.100	.	.	.	.	.	.	.	.	.
329	37.460	.	.	.	.	.	.	.	.	.	.	.
331	37.640	.	.	.	.	.	.	.	.	.	.	.
332	37.720	2180	7.950	72	17	.	.	.	.	.	.	.
336	38.080	.	.	.	.	.	.	.	.	.	.	.
338	38.250	.	.	.	.	.	.	.	.	.	.	.
339	38.330	2140	8.150	.	.	.	.	.	.	.	.	.
343	38.660	.	.	.	.	.	.	.	.	.	.	.
345	38.830	.	.	.	.	.	.	.	.	.	.	.

Table A1.1. FL3 effluent quality: Column 1.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
346	38.910	2150	8.100	.		.	.	.	.	.	.	.
350	39.240	.	.	.	.	.	.	.	.	.	.	.
352	39.410	.	.	.	.	.	.	.	.	.	.	.
353	39.490	.	.	.	.	.	.	.	.	.	.	.
357	39.840	.	.	.	.	.	.	.	.	.	.	.
359	40.010	.	.	.	.	.	.	.	.	.	.	.
360	40.090	1880	7.900	77	9.2	0.030	94.000	3.900	0.500	0.000	.	1150.000
364	40.430	.	.	.	.	.	.	.	.	.	.	.
366	40.630	.	.	.	.	.	.	.	.	.	.	.
367	40.700	1880	7.900	.	.	.	.	.	.	.	.	.
371	41.050	.	.	.	.	.	.	.	.	.	.	.
373	41.170	.	.	.	.	.	.	.	.	.	.	.
374	41.250	1900	8.100	.	.	.	.	.	.	.	.	.
378	41.590	.	.	.	.	.	.	.	.	.	.	.
380	41.760	.	.	.	.	.	.	.	.	.	.	.
381	41.840	1890	7.950	.	.	.	.	.	.	.	.	.
385	42.150	.	.	.	.	.	.	.	.	.	.	.
387	42.320	.	.	.	.	.	.	.	.	.	.	.
388	42.400	1740	7.800	71	6.1	.	.	.	.	.	.	.
392	42.720	.	.	.	.	.	.	.	.	.	.	.
394	42.890	.	.	.	.	.	.	.	.	.	.	.
395	42.970	1760	7.900	.	.	.	.	.	.	.	.	.
399	43.300	.	.	.	.	.	.	.	.	.	.	.
401	43.460	.	.	.	.	.	.	.	.	.	.	.
402	43.700	1790	7.950	.	.	.	.	.	.	.	.	.
406	43.860	.	.	.	.	.	.	.	.	.	.	.
408	44.030	.	.	.	.	.	.	.	.	.	.	.
409	44.110	1750	7.950	.	.	.	.	.	.	.	.	.
413	44.440	.	.	.	.	.	.	.	.	.	.	.
415	44.660	.	.	.	.	.	.	.	.	.	.	.
416	44.690	1750	7.900	77	7.3	0.050	58.000	3.400	0.600	0.000	226.000	1030.000
421	45.080	.	.	.	.	.	.	.	.	.	.	.
422	45.180	.	.	.	.	.	.	.	.	.	.	.
423	45.240	1780	7.900	.	.	.	.	.	.	.	.	.
427	45.560	.	.	.	.	.	.	.	.	.	.	.
429	45.720	.	.	.	.	.	.	.	.	.	.	.
431	45.870	1730	7.900	.	.	.	.	.	.	.	.	.
434	46.110	.	.	.	.	.	.	.	.	.	.	.
436	46.280	.	.	.	.	.	.	.	.	.	.	.
437	46.350	1650	7.900	.	.	.	.	.	.	.	.	.
441	46.660	.	.	.	.	.	.	.	.	.	.	.

Table A1.1. FL3 effluent quality: Column 1.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
443	46.830	.	.	.	.	.	.	.	.	.	.	.
444	46.910	1700	7.900	81	7.3	.	.	.	.	.	.	.
448	47.210	.	.	.	.	.	.	.	.	.	.	.
450	47.360	.	.	.	.	.	.	.	.	.	.	.
451	47.440	1790	7.800	.	.	.	.	.	.	.	.	.
455	47.760	.	.	.	.	.	.	.	.	.	.	.
458	47.980	1790	7.900	.	.	.	.	.	.	.	.	.
462	48.270	.	.	.	.	.	.	.	.	.	.	.
464	48.380	.	.	.	.	.	.	.	.	.	.	.
465	48.470	1730	7.900	.	.	.	.	.	.	.	.	.
469	48.810	.	.	.	.	.	.	.	.	.	.	.
471	48.960	.	.	.	.	.	.	.	.	.	.	.
472	49.020	1650	7.800	79	18	0.020	58.000	3.500	0.270	0.030	208.000	1240.000
476	49.360	.	.	.	.	.	.	.	.	.	.	.
478	49.520	.	.	.	.	.	.	.	.	.	.	.
479	49.590	.	.	.	.	.	.	.	.	.	.	.
483	49.930	.	.	.	.	.	.	.	.	.	.	.
485	50.060	.	.	.	.	.	.	.	.	.	.	.
486	50.130	2000	7.950	.	.	.	.	.	.	.	.	.
490	50.430	.	.	.	.	.	.	.	.	.	.	.
492	50.590	.	.	.	.	.	.	.	.	.	.	.
493	50.650	2290	7.850	.	.	.	.	.	.	.	.	.
500	51.170	2200	8	78	7	.	.	.	.	.	.	.
504	51.470	.	.	.	.	.	.	.	.	.	.	.
507	51.680	2320	7.850	.	.	.	.	.	.	.	.	.
511	51.960	.	.	.	.	.	.	.	.	.	.	.
513	52.110	.	.	.	.	.	.	.	.	.	.	.
514	52.190	2400	7.800	85	12	0.030	99.000	6.100	0.950	0.030	318.000	1830.000
519	52.540	.	.	.	.	.	.	.	.	.	.	.
521	52.680	2420	7.850	.	.	.	.	.	.	.	.	.
525	52.970	.	.	.	.	.	.	.	.	.	.	.
528	53.170	2400	7.850	92	20	0.030	100.000	6.050	1.610	0.040	286.000	1700.000
532	53.460	.	.	.	.	.	.	.	.	.	.	.
534	53.610	.	.	.	.	.	.	.	.	.	.	.
535	53.670	2420	7.700	.	.	.	.	.	.	.	.	.
539	53.950	.	.	.	.	.	.	.	.	.	.	.
542	54.170	2440	7.900	.	.	.	.	.	.	.	.	.
546	54.460	.	.	.	.	.	.	.	.	.	.	.
548	54.550	.	.	.	.	.	.	.	.	.	.	.
549	54.610	2430	7.850	.	.	.	.	.	.	.	.	.
553	54.890	.	.	.	.	.	.	.	.	.	.	.

Table A1.1. FL3 effluent quality: Column 1.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
555	55.040	.	.	.	.	.	.	.	.	.	.	.
556	55.100	2500	7.950	79	17	0.030	108.000	5.870	1.190	0.020	440.000	1500.000
560	55.400	.	.	.	.	.	.	.	.	.	.	.
562	55.550	.	.	.	.	.	.	.	.	.	.	.
563	55.620	2500	7.900	.	.	.	.	.	.	.	.	.
567	55.890	.	.	.	.	.	.	.	.	.	.	.
569	56.040	.	.	.	.	.	.	.	.	.	.	.
570	56.120	2400	7.700	.	.	.	.	.	.	.	.	.
574	56.420	.	.	.	.	.	.	.	.	.	.	.
576	56.560	.	.	.	.	.	.	.	.	.	.	.
577	56.630	2590	7.950	.	.	.	.	.	.	.	.	.
581	56.910	.	.	.	.	.	.	.	.	.	.	.
584	57.300	2500	7.700	60	11.5	0.040	117.000	6.090	1.520	0.010	480.000	1520.000
591	58.880	2600	8.000	.	.	.	.	.	.	.	.	.
595	59.080	.	.	.	.	.	.	.	.	.	.	.
597	59.360	.	.	.	.	.	.	.	.	.	.	.
602	59.530	.	.	.	.	.	.	.	.	.	.	.
604	59.600	.	.	.	.	.	.	.	.	.	.	.
605	60.000	2700	7.900	.	.	.	.	.	.	.	.	.
609	60.150	.	.	.	.	.	.	.	.	.	.	.

Table A1.2. FL3 effluent quality: Column 2.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
1	2.540	3900	6.700	46	75	17.000	184.000	7.500	4.500	0.100	384.000	2800.000
2	5.200	3990	6.500	39	84	26.000	184.000	7.500	4.500	0.000	354.000	.
3	7.130	3960	6.450	36	96	24.000	184.000	7.500	4.400	0.000	362.000	2540.000
4	8.640	3875	6.700	34	66	17.000	167.000	6.800	3.900	0.100	318.000	.
7	8.770	.	.	.	.	.	.	.	.	.	.	.
8	9.350	3990	6.800	41	60	11.000	176.000	7.100	5.300	0.100	342.000	.
9	9.610	4050	7.000	41	42	4.000	191.000	7.500	4.800	0.000	456.000	3360.000
11	10.060	3960	7.650	46	27	1.490	191.000	7.400	4.800	0.000	408.000	2900.000
14	10.760	4025	7.350	57	40	3.000	190.000	7.300	4.700	0.100	412.000	2800.000
15	10.990	.	7.300	.	.	.	.	.	.	.	.	.
16	11.250	3960	7.200	60	39	3.000	196.000	7.100	4.900	0.000	394.000	2860.000
17	11.450	.	7.250	.	.	.	.	.	.	.	.	.
18	11.690	3860	7.300	46	48	5.000	196.000	7.200	5.300	0.000	400.000	2960.000
21	12.290	3975	7.050	46	42	5.000	196.000	7.300	5.300	0.000	384.000	2960.000
22	12.490	.	7.200	.	.	.	.	.	.	.	.	.
23	12.720	3875	6.950	44	42	.	.	.	.	.	.	.
24	12.890	.	7.050	.	.	.	.	.	.	.	.	.
25	13.120	3860	6.900	41	63	6.400	272.000	10.100	10.300	0.000	400.000	2460.000
28	13.740	3875	6.900	36	52	5.000	246.000	9.600	10.200	0.000	400.000	2600.000
29	13.960	.	7.000	.	.	.	.	.	.	.	.	.
30	14.170	.	.	.	.	.	.	.	.	.	.	.
31	14.380	.	6.900	.	.	.	.	.	.	.	.	.
32	14.610	3880	7.000	36	48	.	.	.	.	.	.	.
35	15.250	3975	6.850	33	65	6.700	234.000	9.300	10.400	0.000	380.000	2600.000
36	15.470	.	.	.	.	.	.	.	.	.	.	.
37	15.680	.	6.800	.	.	.	.	.	.	.	.	.
38	15.870	.	.	.	.	.	.	.	.	.	.	.
39	16.080	3800	6.800	41	98	7.000	213.000	8.800	9.900	0.000	400.000	2560.000
42	16.700	.	7.050	31	78	9.800	244.000	10.100	10.300	0.000	380.000	3200.000
43	16.820	.	.	.	.	.	.	.	.	.	.	.
44	16.900	.	.	.	.	.	.	.	.	.	.	.
45	17.000	3630	7.100	36	48	1.200	217.000	9.700	7.700	0.100	400.000	2700.000
46	17.070	.	.	.	.	.	.	.	.	.	.	.
49	17.330	3700	7.450	52	24	.	.	.	.	.	.	.
51	17.500	.	.	.	.	.	.	.	.	.	.	.
52	17.600	3575	7.600	46	42	0.500	212.000	9.600	8.400	0.000	380.000	2700.000
53	17.680	.	.	.	.	.	.	.	.	.	.	.
57	18.020	3600	7.650	57	42	0.400	211.000	9.500	8.700	0.000	400.000	4260.000
58	18.110	.	.	.	.	.	.	.	.	.	.	.
59	18.190	3675	7.350	62	36	.	.	.	.	.	.	.
60	18.270	.	.	.	.	.	.	.	.	.	.	.

Table A1.2. FL3 effluent quality: Column 2.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
63	18.530	3775	7.650	67	33	.	.	.	.	.	.	.
64	18.620	.	.	.	.	.	.	.	.	.	.	.
65	18.710	.	.	.	.	.	.	.	.	.	.	.
66	18.780	3575	7.600	84	48	.	.	.	.	.	.	.
70	19.120	3625	7.350	72	87	.	.	.	.	.	.	.
71	19.200	.	.	.	.	.	.	.	.	.	.	.
72	19.280	.	.	.	.	.	.	.	.	.	.	.
73	19.360	3550	7.850	75	12	0.100	216.000	9.700	6.100	0.000	480.000	2660.000
74	19.450	.	.	.	.	.	.	.	.	.	.	.
77	19.700	3475	7.900	80	16	.	.	.	.	.	.	.
78	19.790	.	.	.	.	.	.	.	.	.	.	.
79	19.870	.	.	.	.	.	.	.	.	.	.	.
80	19.950	3525	7.750	75	24	.	.	.	.	.	.	.
84	20.270	3500	7.900	77	24	.	.	.	.	.	.	.
85	20.360	.	.	.	.	.	.	.	.	.	.	.
86	20.440	.	.	.	.	.	.	.	.	.	.	.
87	20.510	3600	7.950	82	15	0.100	215.000	9.700	6.000	0.100	400.000	2600.000
92	20.900	3500	7.800	82	24	.	.	.	.	.	.	.
93	20.980	.	.	.	.	.	.	.	.	.	.	.
94	21.070	3525	7.800	82	24	.	.	.	.	.	.	.
95	21.140	.	.	.	.	.	.	.	.	.	.	.
98	21.380	3625	7.850	82	28	.	.	.	.	.	.	.
99	21.470	.	.	.	.	.	.	.	.	.	.	.
100	21.550	.	.	.	.	.	.	.	.	.	.	.
102	21.700	3725	7.900	81	24	0.100	182.000	8.700	3.800	0.000	420.000	2350.000
105	21.950	.	.	.	.	.	.	.	.	.	.	.
107	22.130	.	.	.	.	.	.	.	.	.	.	.
108	22.200	3625	7.900	89	16	.	.	.	.	.	.	.
112	22.530	3675	7.950	81	26	.	.	.	.	.	.	.
113	22.620	.	.	.	.	.	.	.	.	.	.	.
114	22.690	.	.	.	.	.	.	.	.	.	.	.
115	22.760	3580	7.950	85	17	0.050	168.000	8.900	3.200	0.000	394.000	2200.000
116	22.850	.	.	.	.	.	.	.	.	.	.	.
119	23.100	3750	8.000	87	22	.	.	.	.	.	.	.
120	23.190	.	.	.	.	.	.	.	.	.	.	.
121	23.270	.	.	.	.	.	.	.	.	.	.	.
122	23.350	3800	7.700	87	24	.	.	.	.	.	.	.
123	23.440	.	.	.	.	.	.	.	.	.	.	.
126	23.680	3790	7.450	67	105	.	.	.	.	.	.	.
127	23.760	.	.	.	.	.	.	.	.	.	.	.
128	23.840	.	.	.	.	.	.	.	.	.	.	.

Table A1.2. FL3 effluent quality: Column 2.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
129	23.920	3700	7.800	86	54	0.100	156.000	9.000	4.800	0.000	388.000	3500.000
130	24.000	.	.	.	.	.	.	.	.	.	.	.
133	24.240	3750	8.100	82	115	.	.	.	.	.	.	.
134	24.340	.	.	.	.	.	.	.	.	.	.	.
135	24.410	.	.	.	.	.	.	.	.	.	.	.
136	24.490	3700	7.800	82	12	.	.	.	.	.	.	.
137	24.580	.	.	.	.	.	.	.	.	.	.	.
140	24.900	3760	7.950	.	.	.	.	.	.	.	.	.
141	24.980	.	.	.	.	.	.	.	.	.	.	.
142	25.070	.	.	.	.	.	.	.	.	.	.	.
143	25.070	3750	7.850	86	18	0.050	141.000	9.000	5.800	0.000	386.000	2650.000
144	25.250	.	.	.	.	.	.	.	.	.	.	.
147	25.610	3880	8.000	.	.	.	.	.	.	.	.	.
148	25.700	.	.	.	.	.	.	.	.	.	.	.
149	25.780	.	.	.	.	.	.	.	.	.	.	.
150	25.850	3800	7.850	89	13	.	.	.	.	.	.	.
151	25.930	.	.	.		.	.	.	.	.	.	.
155	26.320	.	.	.	.	.	.	.	.	.	.	.
156	26.410	.	.	.	.	.	.	.	.	.	.	.
157	26.490	3700	8.000	.	.	0.100	170.000	8.800	4.800	0.100	240.000	2780.000
158	26.570	.	.	.	.	.	.	.	.	.	.	.
161	26.890	3750	8.000	.	.	.	.	.	.	.	.	.
162	26.980	.	.	.	.	.	.	.	.	.	.	.
163	27.060	.	.	.	.	.	.	.	.	.	.	.
164	27.140	3690	7.850	84	12	.	.	.	.	.	.	.
168	27.470	3620	7.900	.	.	.	.	.	.	.	.	.
169	27.560	.	.	.	.	.	.	.	.	.	.	.
170	27.640	.	.	.	.	.	.	.	.	.	.	.
171	27.700	3900	7.800	91	18	0.050	195.000	9.200	5.800	0.000	420.000	2340.000
172	27.800	.	.	.	.	.	.	.	.	.	.	.
175	28.130	3900	8.100	.	.	.	.	.	.	.	.	.
176	28.220	.	.	.	.	.	.	.	.	.	.	.
177	28.300	.	.	.	.	.	.	.	.	.	.	.
178	28.380	3730	7.900	84	12	.	.	.	.	.	.	.
182	28.700	.	.	.	.	.	.	.	.	.	.	.
183	28.780	.	.	.	.	.	.	.	.	.	.	.
184	28.860	.	.	.	.	.	.	.	.	.	.	.
185	28.940	3690	8.000	89	18	0.050	155.000	8.000	4.600	0.000	360.000	.
186	29.020	.	.	.	.	.	.	.	.	.	.	.
189	29.250	.	.	.	.	.	.	.	.	.	.	.
190	29.330	.	.	.	.	.	.	.	.	.	.	.

Table A1.2. FL3 effluent quality: Column 2.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
191	29.460	.	.	.	.	.	.	.	.	.	.	.
192	29.490	3980	7.800	84	19	.	.	.	.	.	.	.
193	29.560	.	.	.	.	.	.	.	.	.	.	.
196	29.790	.	.	.	.	.	.	.	.	.	.	.
197	29.880	.	.	.	.	.	.	.	.	.	.	.
198	29.950	.	.	.	.	.	.	.	.	.	.	.
199	30.030	3910	7.900	86	17	0.030	222.000	13.700	5.200	0.000	390.000	2560.000
203	30.330	.	.	.	.	.	.	.	.	.	.	.
204	30.410	.	.	.	.	.	.	.	.	.	.	.
205	30.480	.	.	.	.	.	.	.	.	.	.	.
206	30.550	3950	7.900	82	11	.	.	.	.	.	.	.
210	30.850	.	.	.	.	.	.	.	.	.	.	.
211	30.930	.	.	.	.	.	.	.	.	.	.	.
212	31.000	.	.	.	.	.	.	.	.	.	.	.
213	31.070	3800	7.900	86	11	0.030	214.000	13.100	4.900	0.000	364.000	2460.000
214	31.140	.	.	.	.	.	.	.	.	.	.	.
217	31.360	.	.	.	.	.	.	.	.	.	.	.
220	31.580	3700	7.700	86	12	.	.	.	.	.	.	.
221	31.640	.	.	.	.	.	.	.	.	.	.	.
224	31.850	.	.	.	.	.	.	.	.	.	.	.
225	31.930	.	.	.	.	.	.	.	.	.	.	.
226	32.000	.	.	.	.	.	.	.	.	.	.	.
227	32.010	3480	7.850	81	6	0.020	209.000	13.100	3.800	0.000	370.000	2400.000
228	32.010	.	.	.	.	.	.	.	.	.	.	.
231	32.150	.	.	.	.	.	.	.	.	.	.	.
232	32.260	.	.	.	.	.	.	.	.	.	.	.
233	32.310	2550	8.000	71	7	.	.	.	.	.	.	.
238	32.680	.	.	.	.	.	.	.	.	.	.	.
239	32.710	.	.	.	.	.	.	.	.	.	.	.
240	32.740	.	.	.	.	.	.	.	.	.	.	.
241	32.760	2200	7.950	.	.	0.050	72.000	4.400	2.000	0.000	252.000	1360.000
242	32.820	.	.	.	.	.	.	.	.	.	.	.
245	33.030	.	.	.	.	.	.	.	.	.	.	.
246	33.110	.	.	.	.	.	.	.	.	.	.	.
248	33.260	2300	7.900	67	6	.	.	.	.	.	.	.
249	33.330	.	.	.	.	.	.	.	.	.	.	.
252	33.540	.	.	.	.	.	.	.	.	.	.	.
254	33.690	.	.	.	.	.	.	.	.	.	.	.
255	33.770	2100	7.950	71	6	.	.	.	.	.	.	.
256	33.830	.	.	.	.	.	.	.	.	.	.	.
259	34.030	.	.	.	.	.	.	.	.	.	.	.

Table A1.2. FL3 effluent quality: Column 2.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
260	34.100	.	.	.	.	.	.	.	.	.	.	.
262	34.290	2210	8.050	65	6	0.050	78.000	5.100	1.300	0.000	274.000	1260.000
263	34.360	.	.	.	.	.	.	.	.	.	.	.
267	34.570	.	.	.	.	.	.	.	.	.	.	.
269	34.690	2150	7.700	66	9.1	.	.	.	.	.	.	.
270	34.740	.	.	.	.	.	.	.	.	.	.	.
274	34.940	.	.	.	.	.	.	.	.	.	.	.
276	35.030	2175	8.050	65	6	.	.	.	.	.	.	.
277	35.080	.	.	.	.	.	.	.	.	.	.	.
282	35.330	.	.	.	.	.	.	.	.	.	.	.
283	35.370	2250	8.200	70	3	.	.	.	.	.	.	.
288	35.590	.	.	.	.	.	.	.	.	.	.	.
289	35.640	.	.	.	.	.	.	.	.	.	.	.
290	35.690	.	.	.	.	.	.	.	.	.	.	.
291	35.740	.	.	.	.	.	.	.	.	.	.	.
294	35.860	.	.	.	.	.	.	.	.	.	.	.
295	35.900	.	.	.	.	.	.	.	.	.	.	.
296	35.940	.	.	.	.	.	.	.	.	.	.	.
297	35.970	2200	8.150	70	2.4	.	.	.	.	.	.	.
298	36.010	.	.	.	.	.	.	.	.	.	.	.
301	36.110	.	.	.	.	.	.	.	.	.	.	.
302	36.120	.	.	.	.	.	.	.	.	.	.	.
304	36.160	2230	8.000	59	3	.	.	.	.	.	.	.
305	36.180	.	.	.	.	.	.	.	.	.	.	.
308	36.300	.	.	.	.	.	.	.	.	.	.	.
310	36.350	.	.	.	.	.	.	.	.	.	.	.
311	36.350	2150	8.050	.	.	.	.	.	.	.	.	.
315	36.580	.	.	.	.	.	.	.	.	.	.	.
317	36.740	.	.	.	.	.	.	.	.	.	.	.
318	36.820	2250	7.850	.	.	.	.	.	.	.	.	.
323	37.260	.	.	.	.	.	.	.	.	.	.	.
324	37.350	.	.	.	.	.	.	.	.	.	.	.
325	37.440	2250	8.000	.	.	.	.	.	.	.	.	.
329	37.780	.	.	.	.	.	.	.	.	.	.	.
331	37.960	.	.	.	.	.	.	.	.	.	.	.
332	38.030	2300	7.900	73	4.9	.	.	.	.	.	.	.
336	38.390	.	.	.	.	.	.	.	.	.	.	.
338	38.550	.	.	.	.	.	.	.	.	.	.	.
339	38.640	2250	8.000	.	.	.	.	.	.	.	.	.
343	38.980	.	.	.	.	.	.	.	.	.	.	.
345	39.150	.	.	.	.	.	.	.	.	.	.	.

Table A1.2. FL3 effluent quality: Column 2.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
346	39.230	2290	7.950	.	.	.	.	.	.	.	.	.
350	39.570	.	.	.	.	.	.	.	.	.	.	.
352	39.750	.	.	.	.	.	.	.	.	.	.	.
353	39.840	2200	7.700	.	.	.	.	.	.	.	.	.
357	40.210	.	.	.	.	.	.	.	.	.	.	.
359	40.380	.	.	.	.	.	.	.	.	.	.	.
360	40.460	2090	7.800	77	9.2	0.040	111.000	4.600	1.100	0.000	.	1280.000
364	40.810	.	.	.	.	.	.	.	.	.	.	.
366	41.010	.	.	.	.	.	.	.	.	.	.	.
367	41.070	2090	7.750	.	.	.	.	.	.	.	.	.
371	41.430	.	.	.	.	.	.	.	.	.	.	.
373	41.550	.	.	.	.	.	.	.	.	.	.	.
374	41.620	2100	8.000	.	.	.	.	.	.	.	.	.
378	41.950	.	.	.	.	.	.	.	.	.	.	.
380	42.120	.	.	.	.	.	.	.	.	.	.	.
381	42.200	2040	7.750	.	.	.	.	.	.	.	.	.
385	42.510	.	.	.	.	.	.	.	.	.	.	.
387	42.680	.	.	.	.	.	.	.	.	.	.	.
388	42.750	1780	7.700	66	8.5	.	.	.	.	.	.	.
392	43.050	.	.	.	.	.	.	.	.	.	.	.
394	43.210	.	.	.	.	.	.	.	.	.	.	.
395	43.290	1770	7.800	.	.	.	.	.	.	.	.	.
399	43.610	.	.	.	.	.	.	.	.	.	.	.
401	43.780	.	.	.	.	.	.	.	.	.	.	.
402	44.020	1780	7.800	.	.	.	.	.	.	.	.	.
406	44.160	.	.	.	.	.	.	.	.	.	.	.
408	44.330	.	.	.	.	.	.	.	.	.	.	.
409	44.420	1720	7.800	.	.	.	.	.	.	.	.	.
413	44.740	.	.	.	.	.	.	.	.	.	.	.
415	44.970	.	.	.	.	.	.	.	.	.	.	.
416	45.000	1700	7.750	71	12.(	0.050	58.000	3.400	0.800	0.000	224.000	1000.000
421	45.400	.	.	.	.	.	.	.	.	.	.	.
422	45.500	.	.	.	.	.	.	.	.	.	.	.
423	45.570	1760	7.800	.	.	.	.	.	.	.	.	.
427	45.890	.	.	.	.	.	.	.	.	.	.	.
429	46.060	.	.	.	.	.	.	.	.	.	.	.
431	46.200	1780	7.850	.	.	.	.	.	.	.	.	.
434	46.460	.	.	.	.	.	.	.	.	.	.	.
436	46.620	.	.	.	.	.	.	.	.	.	.	.
437	46.700	1700	7.800	.	.	.	.	.	.	.	.	.
441	47.030	.	.	.	.	.	.	.	.	.	.	.

Table A1.2. FL3 effluent quality: Column 2.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
443	47.190	.	.	.	.	.	.	.	.	.	.	.
444	47.280	1700	7.800	72	12	.	.	.	.	.	.	.
448	47.600	.	.	.	.	.	.	.	.	.	.	.
450	47.760	.	.	.	.	.	.	.	.	.	.	.
451	47.830	1790	7.800	.	.	.	.	.	.	.	.	.
455	48.160	.	.	.	.	.	.	.	.	.	.	.
458	48.390	1780	7.800	.	.	.	.	.	.	.	.	.
462	48.690	.	.	.	.	.	.	.	.	.	.	.
464	48.750	.	.	.	.	.	.	.	.	.	.	.
465	48.840	1780	7.800	.	.	.	.	.	.	.	.	.
469	49.170	.	.	.	.	.	.	.	.	.	.	.
471	49.330	.	.	.	.	.	.	.	.	.	.	.
472	49.420	1640	7.850	71	12	0.030	55.000	3.530	0.630	0.040	.	1240.000
476	49.760	.	.	.	.	.	.	.	.	.	.	.
478	49.930	.	.	.	.	.	.	.	.	.	.	.
479	50.020	.	.	.	.	.	.	.	.	.	.	.
483	50.350	.	.	.	.	.	.	.	.	.	.	.
485	50.480	.	.	.	.	.	.	.	.	.	.	.
486	50.560	1725	7.950	.	.	.	.	.	.	.	.	.
490	50.870	.	.	.	.	.	.	.	.	.	.	.
492	51.030	.	.	.	.	.	.	.	.	.	.	.
493	51.110	1890	7.850	.	.	.	.	.	.	.	.	.
500	51.650	2250	7.950	74	7	.	.	.	.	.	.	.
504	51.950	.	.	.	.	.	.	.	.	.	.	.
507	51.950	.	.	.	.	.	.	.	.	.	.	.
511	52.120	.	.	.	.	.	.	.	.	.	.	.
513	52.260	.	.	.	.	.	.	.	.	.	.	.
514	52.340	2375	7.750	65	14	0.040	92.000	5.920	0.880	0.030	320.000	1750.000
519	52.670	.	.	.	.	.	.	.	.	.	.	.
521	52.810	2400	7.800	.	.	.	.	.	.	.	.	.
525	53.090	.	.	.	.	.	.	.	.	.	.	.
528	53.290	2390	7.800	74	17	0.020	97.000	6.150	1.520	0.060	288.000	1750.000
532	53.570	.	.	.	.	.	.	.	.	.	.	.
534	53.720	.	.	.	.	.	.	.	.	.	.	.
535	53.780	2400	7.850	.	.	.	.	.	.	.	.	.
539	54.050	.	.	.	.	.	.	.	.	.	.	.
542	54.260	2500	7.900	.	.	.	.	.	.	.	.	.
546	54.570	.	.	.	.	.	.	.	.	.	.	.
548	54.670	.	.	.	.	.	.	.	.	.	.	.
549	54.720	2450	7.850	.	.	.	.	.	.	.	.	.
553	54.980	.	.	.	.	.	.	.	.	.	.	.

Table A1.2. FL3 effluent quality: Column 2.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
555	55.130	.	.	.	.	.	.	.	.	.	.	.
556	55.180	2550	7.900	84	17	0.020	107.000	5.760	1.430	0.030	440.000	1520.000
560	55.450	.	.	.	.	.	.	.	.	.	.	.
562	55.580	.	.	.	.	.	.	.	.	.	.	.
563	55.640	2500	7.900	.	.	.	.	.	.	.	.	.
567	55.880	.	.	.	.	.	.	.	.	.	.	.
569	56.040	.	.	.	.	.	.	.	.	.	.	.
570	56.110	2400	7.700	.	.	.	.	.	.	.	.	.
574	56.400	.	.	.	.	.	.	.	.	.	.	.
576	56.530	.	.	.	.	.	.	.	.	.	.	.
577	56.580	2500	7.900	.	.	.	.	.	.	.	.	.
581	56.790	.	.	.	.	.	.	.	.	.	.	.
584	57.170	2400	7.800	52	8.6	0.040	95.000	4.970	0.730	0.040	420.000	1480.000
591	57.170	.	.	.	.	.	.	.	.	.	.	.
595	57.170	.	.	.	.	.	.	.	.	.	.	.
597	57.170	.	.	.	.	.	.	.	.	.	.	.
602	57.170	.	.	.	.	.	.	.	.	.	.	.
604	57.170	.	.	.	.	.	.	.	.	.	.	.
605	57.170	.	.	.	.	.	.	.	.	.	.	.
609	57.170	.	.	.	.	.	.	.	.	.	.	.

Table A1.3. FL3 effluent quality: Column 3.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
1	2.310	3860	6.800	52	72	13.000	184.000	7.600	4.500	0.100	392.000	2700.000
2	4.700	3980	6.500	36	72	20.000	184.000	7.600	4.500	0.000	356.000	.
3	6.530	3900	6.500	34	87	19.000	178.000	7.200	4.200	0.000	346.000	2540.000
4	8.020	3950	6.800	36	66	14.000	179.000	7.400	4.100	0.000	348.000	.
7	8.140	.	.	.	.	.	.	.	.	.	.	.
8	8.750	4025	6.750	36	60	10.000	179.000	7.400	5.400	0.100	346.000	.
9	9.010	4025	7.000	36	45	4.000	188.000	7.500	4.900	0.000	456.000	2800.000
11	9.480	3950	7.400	52	36	3.000	192.000	7.200	4.800	0.000	412.000	2860.000
14	10.120	4075	7.550	57	34	2.000	191.000	7.400	4.700	0.100	417.000	2800.000
15	10.340	.	7.450	.	.	.	.	.	.	.	.	.
16	10.590	3940	7.400	52	42	2.100	195.000	7.200	5.000	0.000	396.000	2860.000
17	10.790	.	7.350	.	.	.	.	.	.	.	.	.
18	11.030	3800	7.550	49	36	3.000	196.000	7.200	5.200	0.000	384.000	2860.000
21	11.620	3950	7.150	46	42	3.000	199.000	7.300	5.200	0.000	358.000	2900.000
22	11.810	.	7.200	.	.	.	.	.	.	.	.	.
23	12.040	3825	7.100	49	42	.	.	.	.	.	.	.
24	12.210	.	7.100	.	.	.	.	.	.	.	.	.
25	12.430	3900	7.100	46	48	4.000	267.000	10.200	10.000	0.000	400.000	2600.000
28	13.050	3900	7.000	41	52	5.900	241.000	9.700	10.300	0.000	440.000	2600.000
29	13.270	.	7.150	.	.	.	.	.	.	.	.	.
30	13.470	.	.	.	.	.	.	.	.	.	.	.
31	13.690	.	7.050	.	.	.	.	.	.	.	.	.
32	13.910	3890	7.100	41	42	.	.	.	.	.	.	.
35	14.580	3925	6.900	37	60	5.800	235.000	9.300	10.200	0.000	400.000	2600.000
36	14.800	.	.	.	.	.	.	.	.	.	.	.
37	15.010	.	6.950	.	.	.	.	.	.	.	.	.
38	15.200	.	.	.	.	.	.	.	.	.	.	.
39	15.410	3875	6.950	46	60	6.700	215.000	9.000	10.100	0.000	400.000	2600.000
42	16.050	.	6.950	39	60	6.600	245.000	10.300	10.300	0.000	380.000	2900.000
43	16.160	.	.	.	.	.	.	.	.	.	.	.
44	16.230	.	.	.	.	.	.	.	.	.	.	.
45	16.340	3650	7.300	36	66	1.200	217.000	9.700	7.700	0.100	400.000	2700.000
46	16.400	.	.	.	.	.	.	.	.	.	.	.
49	16.640	3750	7.550	57	30	.	.	.	.	.	.	.
51	16.680	.	.	.	.	.	.	.	.	.	.	.
52	16.720	3500	7.600	46	42	0.300	191.000	8.200	4.900	0.000	360.000	.
53	16.790	.	.	.	.	.	.	.	.	.	.	.
57	17.130	3600	7.700	64	37	0.200	206.000	9.600	5.600	0.000	420.000	2740.000
58	17.220	.	.	.	.	.	.	.	.	.	.	.
59	17.300	3740	7.500	70	24	.	.	.	.	.	.	.
60	17.380	.	.	.	.	.	.	.	.	.	.	.

Table A1.3. FL3 effluent quality: Column 3.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
63	17.640	3725	7.700	64	36	.	.	.	.	.	.	.
64	17.720	.	.	.		.	.	.	.	.	.	.
65	17.800	.	.	.	.	.	.	.	.	.	.	.
66	17.880	3600	7.650	75	51	.	.	.	.	.	.	.
70	18.220	3600	7.450	75	90	.	.	.	.	.	.	.
71	18.300	.	.	.	.	.	.	.	.	.	.	.
72	18.380	.	.	.	.	.	.	.	.	.	.	.
73	18.460	3550	7.900	67	12	0.100	213.000	9.500	5.600	0.100	520.000	2600.000
74	18.550	.	.	.	.	.	.	.	.	.	.	.
77	18.790	3500	7.950	73	14	.	.	.	.	.	.	.
78	18.880	.	.	.	.	.	.	.	.	.	.	.
79	18.960	.	.	.	.	.	.	.	.	.	.	.
80	19.040	3500	7.750	77	27	.	.	.	.	.	.	.
84	19.350	3475	8.000	77	22	.	.	.	.	.	.	.
85	19.430	.	.	.	.	.	.	.	.	.	.	.
86	19.510	.	.	.	.	.	.	.	.	.	.	.
87	19.580	3600	7.900	82	15	0.200	213.000	9.600	6.400	0.000	340.000	2760.000
92	19.970	3480	7.850	77	30	.	.	.	.	.	.	.
93	20.050	.	.	.	.	.	.	.	.	.	.	.
94	20.140	3525	7.800	87	21	.	.	.	.	.	.	.
95	20.210	.	.	.	.	.	.	.	.	.	.	.
98	20.450	3575	7.850	82	32	.	.	.	.	.	.	.
99	20.540	.	.	.	.	.	.	.	.	.	.	.
100	20.610	.	.	.	.	.	.	.	.	.	.	.
102	20.760	3650	7.800	84	30	0.010	178.000	8.500	3.100	0.000	400.000	2200.000
105	21.000	.	.	.	.	.	.	.	.	.	.	.
107	21.180	.	.	.	.	.	.	.	.	.	.	.
108	21.250	3625	7.900	89	14	.	.	.	.	.	.	.
112	21.560	3625	7.950	84	31	.	.	.	.	.	.	.
113	21.650	.	.	.	.	.	.	.	.	.	.	.
114	21.730	.	.	.	.	.	.	.	.	.	.	.
115	21.810	3550	7.900	82	14	0.100	181.000	9.400	3.400	0.000	416.000	2260.000
116	21.900	.	.	.	.	.	.	.	.	.	.	.
119	22.140	3680	8.100	89	14	.	.	.	.	.	.	.
120	22.230	.	.	.	.	.	.	.	.	.	.	.
121	22.310	.	.	.	.	.	.	.	.	.	.	.
122	22.390	3750	7.600	85	24	.	.	.	.	.	.	.
123	22.470	.	.	.	.	.	.	.	.	.	.	.
126	22.700	3740	7.500	67	100	.	.	.	.	.	.	.
127	22.780	.	.	.	.	.	.	.	.	.	.	.
128	22.860	.	.	.	.	.	.	.	.	.	.	.

Table A1.3. FL3 effluent quality: Column 3.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
129	22.940	3650	7.850	86	48	0.100	142.000	8.300	4.400	0.000	368.000	2740.000
130	23.020	.	.	.	.	.	.	.	.	.	.	.
133	23.260	3700	8.100	77	20	.	.	.	.	.	.	.
134	23.350	.	.	.	.	.	.	.	.	.	.	.
135	23.430	.	.	.	.	.	.	.	.	.	.	.
136	23.510	3675	7.800	80	12	.	.	.	.	.	.	.
137	23.590	.	.	.	.	.	.	.	.	.	.	.
140	23.900	3720	8.000	.	.	.	.	.	.	.	.	.
141	23.930	.	.	.	.	.	.	.	.	.	.	.
142	23.940	.	.	.	.	.	.	.	.	.	.	.
143	23.940	.	.	.	.	.	.	.	.	.	.	.
144	24.030	.	.	.	.	.	.	.	.	.	.	.
147	24.460	3840	8.050	.	.	.	.	.	.	.	.	.
148	24.560	.	.	.	.	.	.	.	.	.	.	.
149	24.600	.	.	.	.	.	.	.	.	.	.	.
150	24.600	3775	8.000	81	12	.	.	.	.	.	.	.
151	24.600	.	.	.	.	.	.	.	.	.	.	.
155	24.910	.	.	.	.	.	.	.	.	.	.	.
156	25.000	.	.	.	.	.	.	.	.	.	.	.
157	25.090	3700	7.850	.	.	0.100	204.000	9.500	5.700	0.000	380.000	2680.000
158	25.180	.	.	.	.	.	.	.	.	.	.	.
161	25.540	3720	8.000	.	.	.	.	.	.	.	.	.
162	25.640	.	.	.	.	.	.	.	.	.	.	.
163	25.730	.	.	.	.	.	.	.	.	.	.	.
164	25.810	3670	7.800	82	14	.	.	.	.	.	.	.
168	26.180	3620	7.900	.	.	.	.	.	.	.	.	.
169	26.280	.	.	.	.	.	.	.	.	.	.	.
170	26.370	.	.	.	.	.	.	.	.	.	.	.
171	26.440	3900	7.900	86	12	0.050	186.000	8.800	6.000	0.000	400.000	2340.000
172	26.550	.	.	.	.	.	.	.	.	.	.	.
175	26.820	3900	8.100	.	.	.	.	.	.	.	.	.
176	26.920	.	.	.	.	.	.	.	.	.	.	.
177	27.030	.	.	.	.	.	.	.	.	.	.	.
178	27.110	3700	7.900	.	.	.	.	.	.	.	.	.
182	27.490	.	.	.	.	.	.	.	.	.	.	.
183	27.580	.	.	.	.	.	.	.	.	.	.	.
184	27.680	.	.	.	.	.	.	.	.	.	.	.
185	27.770	3780	7.900	86	12	0.050	182.000	9.000	6.000	0.000	400.000	.
186	27.860	.	.	.	.	.	.	.	.	.	.	.
189	28.140	.	.	.	.	.	.	.	.	.	.	.
190	28.240	.	.	.	.	.	.	.	.	.	.	.

Table A1.3. FL3 effluent quality: Column 3.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
191	28.330	.	.	.	.	.	.	.	.	.	.	.
192	28.400	3930	7.800	82	19	.	.	.	.	.	.	.
193	28.500	.	.	.	.	.	.	.	.	.	.	.
196	28.770	.	.	.	.	.	.	.	.	.	.	.
197	28.860	.	.	.	.	.	.	.	.	.	.	.
198	28.950	.	.	.	.	.	.	.	.	.	.	.
199	29.030	3890	8.000	83	12	0.020	221.000	13.800	4.400	0.000	388.000	2560.000
203	29.390	.	.	.	.	.	.	.	.	.	.	.
204	29.490	.	.	.	.	.	.	.	.	.	.	.
205	30.080	.	.	.	.	.	.	.	.	.	.	.
206	30.150	3920	8.000	82	7.2	.	.	.	.	.	.	.
210	30.390	.	.	.	.	.	.	.	.	.	.	.
211	30.400	.	.	.	.	.	.	.	.	.	.	.
212	30.460	.	.	.	.	.	.	.	.	.	.	.
213	30.560	3580	7.950	86	9.6	0.040	198.000	11.800	4.300	0.000	354.000	2160.000
214	30.570	.	.	.	.	.	.	.	.	.	.	.
217	30.750	.	.	.	.	.	.	.	.	.	.	.
220	31.000	3000	7.850	78	9.6	.	.	.	.	.	.	.
221	31.090	.	.	.	.	.	.	.	.	.	.	.
224	31.360	.	.	.	.	.	.	.	.	.	.	.
225	31.460	.	.	.	.	.	.	.	.	.	.	.
226	31.550	.	.	.	.	.	.	.	.	.	.	.
227	31.630	2780	7.800	70	9.	0.020	170.000	9.800	1.600	0.000	288.000	1860.000
228	31.710	.	.	.	.	.	.	.	.	.	.	.
231	31.970	.	.	.	.	.	.	.	.	.	.	.
232	32.090	.	.	.	.	.	.	.	.	.	.	.
233	32.150	2100	8.000	68	4.8	.	.	.	.	.	.	.
238	32.600	.	.	.	.	.	.	.	.	.	.	.
239	32.640	.	.	.	.	.	.	.	.	.	.	.
240	32.700	.	.	.	.	.	.	.	.	.	.	.
241	32.750	2000	7.950	67	3	0.050	69.000	4.500	1.700	0.000	238.000	1260.000
242	32.840	.	.	.	.	.	.	.	.	.	.	.
245	33.080	.	.	.	.	.	.	.	.	.	.	.
246	33.170	.	.	.	.	.	.	.	.	.	.	.
248	33.340	2120	8.000	67	2.9	.	.	.	.	.	.	.
249	33.410	.	.	.	.	.	.	.	.	.	.	.
252	33.660	.	.	.	.	.	.	.	.	.	.	.
254	33.830	.	.	.	.	.	.	.	.	.	.	.
255	33.900	2100	7.950	67	4.7	.	.	.	.	.	.	.
256	33.980	.	.	.	.	.	.	.	.	.	.	.
259	34.220	.	.	.	.	.	.	.	.	.	.	.

Table A1.3. FL3 effluent quality: Column 3.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
260	34.300	.	.	.	.	.	.	.	.	.	.	.
262	34.530	2100	8.000	70	12	0.050	73.000	4.900	1.200	0.000	260.000	1260.000
263	34.610	.	.	.	.	.	.	.	.	.	.	.
267	34.900	.	.	.	.	.	.	.	.	.	.	.
269	35.040	2020	7.900	65	6	.	.	.	.	.	.	.
270	35.130	.	.	.	.	.	.	.	.	.	.	.
274	35.390	.	.	.	.	.	.	.	.	.	.	.
276	35.420	2050	7.950	68	6	.	.	.	.	.	.	.
277	35.480	.	.	.	.	.	.	.	.	.	.	.
282	35.840	.	.	.	.	.	.	.	.	.	.	.
283	35.840	2025	8.200	64	6	.	.	.	.	.	.	.
288	35.840	.	.	.	.	.	.	.	.	.	.	.
289	35.840	.	.	.	.	.	.	.	.	.	.	.
290	35.840	.	.	.	.	.	.	.	.	.	.	.
291	35.840	.	.	.	.	.	.	.	.	.	.	.
294	35.910	.	.	.	.	.	.	.	.	.	.	.
295	35.930	.	.	.	.	.	.	.	.	.	.	.
296	36.020	.	.	.	.	.	.	.	.	.	.	.
297	36.030	2080	8.050	49	2.4	.	.	.	.	.	.	.
298	36.110	.	.	.	.	.	.	.	.	.	.	.
301	36.370	.	.	.	.	.	.	.	.	.	.	.
302	36.460	.	.	.	.	.	.	.	.	.	.	.
304	36.620	2150	8.050	65	3	0.100	104.000	4.800	1.100	0.000	204.000	1350.000
305	36.700	.	.	.	.	.	.	.	.	.	.	.
308	36.950	.	.	.	.	.	.	.	.	.	.	.
310	37.120	.	.	.	.	.	.	.	.	.	.	.
311	37.190	2100	7.900	.	.	.	.	.	.	.	.	.
315	37.450	.	.	.	.	.	.	.	.	.	.	.
317	37.460	.	.	.	.	.	.	.	.	.	.	.
318	37.540	2100	7.900	.	.	.	.	.	.	.	.	.
323	38.000	.	.	.	.	.	.	.	.	.	.	.
324	38.090	.	.	.	.	.	.	.	.	.	.	.
325	38.180	2100	8.100	.	.	.	.	.	.	.	.	.
329	38.530	.	.	.	.	.	.	.	.	.	.	.
331	38.710	.	.	.	.	.	.	.	.	.	.	.
332	38.780	2130	7.900	73	4.9	.	.	.	.	.	.	.
336	38.940	.	.	.	.	.	.	.	.	.	.	.
338	39.090	.	.	.	.	.	.	.	.	.	.	.
339	39.160	2140	8.000	.	.	.	.	.	.	.	.	.
343	39.420	.	.	.	.	.	.	.	.	.	.	.
345	39.490	.	.	.	.	.	.	.	.	.	.	.

Table A1.3. FL3 effluent quality: Column 3.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
346	39.590	2120	8.050	.	.	.	.	.	.	.	.	.
350	39.980	.	.	.	.	.	.	.	.	.	.	.
352	40.180	.	.	.	.	.	.	.	.	.	.	.
353	40.260	2050	7.750	.	.	.	.	.	.	.	.	.
357	40.670	.	.	.	.	.	.	.	.	.	.	.
359	40.860	.	.	.	.	.	.	.	.	.	.	.
360	40.950	1900	7.750	72	11	0.030	99.000	4.100	1.100	0.000	.	1150.000
364	41.300	.	.	.	.	.	.	.	.	.	.	.
366	41.500	.	.	.	.	.	.	.	.	.	.	.
367	41.580	1920	7.800	.	.	.	.	.	.	.	.	.
371	41.950	.	.	.	.	.	.	.	.	.	.	.
373	42.080	.	.	.	.	.	.	.	.	.	.	.
374	42.170	1900	7.950	.	.	.	.	.	.	.	.	.
378	42.540	.	.	.	.	.	.	.	.	.	.	.
380	42.730	.	.	.	.	.	.	.	.	.	.	.
381	42.810	1900	7.900	.	.	.	.	.	.	.	.	.
385	43.160	.	.	.	.	.	.	.	.	.	.	.
387	43.340	.	.	.	.	.	.	.	.	.	.	.
388	43.420	1760	7.650	67	9.8(	.	.	.	.	.	.	.
392	43.740	.	.	.	.	.	.	.	.	.	.	.
394	43.840	.	.	.	.	.	.	.	.	.	.	.
395	43.890	1810	7.800	.	.	.	.	.	.	.	.	.
399	44.210	.	.	.	.	.	.	.	.	.	.	.
401	44.390	.	.	.	.	.	.	.	.	.	.	.
402	44.640	1840	7.750	.	.	.	.	.	.	.	.	.
406	44.790	.	.	.	.	.	.	.	.	.	.	.
408	44.970	.	.	.	.	.	.	.	.	.	.	.
409	45.050	1810	7.750	.	.	.	.	.	.	.	.	.
413	45.370	.	.	.	.	.	.	.	.	.	.	.
415	45.590	.	.	.	.	.	.	.	.	.	.	.
416	45.610	1800	7.700	74	11	0.050	63.000	3.600	0.800	0.000	238.000	1080.000
421	45.990	.	.	.	.	.	.	.	.	.	.	.
422	46.080	.	.	.	.	.	.	.	.	.	.	.
423	46.150	1850	7.700	.	.	.	.	.	.	.	.	.
427	46.450	.	.	.	.	.	.	.	.	.	.	.
429	46.610	.	.	.	.	.	.	.	.	.	.	.
431	46.760	1800	7.850	.	.	.	.	.	.	.	.	.
434	47.000	.	.	.	.	.	.	.	.	.	.	.
436	47.170	.	.	.	.	.	.	.	.	.	.	.
437	47.240	1750	7.750	.	.	.	.	.	.	.	.	.
441	47.540	.	.	.	.	.	.	.	.	.	.	.

Table A1.3. FL3 effluent quality: Column 3.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
443	47.700	.	.	.	.	.	.	.	.	.	.	.
444	47.780	1790	7.750	74	12	.	.	.	.	.	.	.
448	48.070	.	.	.	.	.	.	.	.	.	.	.
450	48.210	.	.	.	.	.	.	.	.	.	.	.
451	48.290	1850	7.750	.	.	.	.	.	.	.	.	.
455	48.600	.	.	.	.	.	.	.	.	.	.	.
458	48.820	1850	7.700	.	.	.	.	.	.	.	.	.
462	49.100	.	.	.	.	.	.	.	.	.	.	.
464	49.180	.	.	.	.	.	.	.	.	.	.	.
465	49.260	1870	7.750	.	.	.	.	.	.	.	.	.
469	49.650	.	.	.	.	.	.	.	.	.	.	.
471	49.820	.	.	.	.	.	.	.	.	.	.	.
472	49.900	1720	7.750	66	23	0.030	58.000	3.600	0.690	0.030	220.000	1300.000
476	50.110	.	.	.	.	.	.	.	.	.	.	.
478	50.280	.	.	.	.	.	.	.	.	.	.	.
479	50.360	.	.	.	.	.	.	.	.	.	.	.
483	50.750	.	.	.	.	.	.	.	.	.	.	.
485	50.890	.	.	.	.	.	.	.	.	.	.	.
486	50.960	1800	8.000	.	.	.	.	.	.	.	.	.
490	51.270	.	.	.	.	.	.	.	.	.	.	.
492	51.340	.	.	.	.	.	.	.	.	.	.	.
493	51.420	1950	7.700	.	.	.	.	.	.	.	.	.
500	51.990	2180	7.950	74	9	.	.	.	.	.	.	.
504	52.300	.	.	.	.	.	.	.	.	.	.	.
507	52.520	2250	7.750	.	.	.	.	.	.	.	.	.
511	52.800	.	.	.	.	.	.	.	.	.	.	.
513	52.950	.	.	.	.	.	.	.	.	.	.	.
514	53.030	2350	7.700	72	14	0.050	90.000	5.720	0.970	0.030	324.000	1700.000
519	53.380	.	.	.	.	.	.	.	.	.	.	.
521	53.530	2310	7.800	.	.	.	.	.	.	.	.	.
525	53.820	.	.	.	.	.	.	.	.	.	.	.
528	54.030	2300	7.700	71	20	0.030	89.000	5.720	1.490	0.060	272.000	1750.000
532	54.310	.	.	.	.	.	.	.	.	.	.	.
534	54.460	.	.	.	.	.	.	.	.	.	.	.
535	54.520	2400	7.850	.	.	.	.	.	.	.	.	.
539	54.790	.	.	.	.	.	.	.	.	.	.	.
542	55.000	2420	7.900	.	.	.	.	.	.	.	.	.
546	55.290	.	.	.	.	.	.	.	.	.	.	.
548	55.350	.	.	.	.	.	.	.	.	.	.	.
549	55.350	2300	7.800	.	.	.	.	.	.	.	.	.
553	55.350	.	.	.	.	.	.	.	.	.	.	.
555	55.350	.	.	.	.	.	.	.	.	.	.	.

Table A1.3. FL3 effluent quality: Column 3.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
556	55.350	.	.	.	.	.	.	.	.	.	.	.
560	55.460	.	.	.	.	.	.	.	.	.	.	.
562	55.620	.	.	.	.	.	.	.	.	.	.	.
563	55.700	2430	7.700	.	.	.	.	.	.	.	.	.
567	55.980	.	.	.	.	.	.	.	.	.	.	.
569	56.140	.	.	.	.	.	.	.	.	.	.	.
570	56.220	2350	7.600	.	.	.	.	.	.	.	.	.
574	56.510	.	.	.	.	.	.	.	.	.	.	.
576	56.660	.	.	.	.	.	.	.	.	.	.	.
577	56.740	2500	7.900	.	.	.	.	.	.	.	.	.
581	56.990	.	.	.	.	.	.	.	.	.	.	.
584	57.950	2450	7.800	68	11.5	0.040	110.000	5.700	1.290	0.020	440.000	1470.000
591	59.060	2450	7.900	.	.	.	.	.	.	.	.	.
595	59.220	.	.	.	.	.	.	.	.	.	.	.
597	59.410	.	.	.	.	.	.	.	.	.	.	.
602	59.410	.	.	.	.	.	.	.	.	.	.	.
604	59.410	.	.	.	.	.	.	.	.	.	.	.
605	59.410	.	.	.	.	.	.	.	.	.	.	.
609	59.640	.	.	.	.	.	.	.	.	.	.	.

Table A1.4. FL6 effluent quality: Column 1.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
1	0.710	4450	7.100	200	48	7.000	133.000	5.900	2.900	0.000	536.000	3060.000
2	3.400	4460	6.350	93	90	43.000	138.000	6.000	3.300	0.100	488.000	.
3	5.670	4650	6.350	108	116	35.000	136.000	6.000	3.100	0.000	434.000	3200.000
4	8.390	4400	6.600	77	60	22.000	136.000	6.000	2.900	0.100	442.000	.
7	12.980	4800	6.300	103	125	44.000	133.000	5.800	3.900	0.100	436.000	3060.000
9	14.220	4880	7.250	172	39	7.000	119.000	5.500	2.700	0.000	610.000	3460.000
10	15.000	4800	7.500	180	36	5.000	128.000	6.000	3.500	0.000	622.000	.
11	15.760	4575	7.550	170	30	3.000	129.000	5.900	3.700	0.100	626.000	3400.000
14	18.060	4680	7.650	180	30	2.400	128.000	5.900	3.400	0.100	544.000	3300.000
15	18.800	.	7.450	.	.	.	.	.	.	.	.	.
16	19.540	4480	7.150	175	60	3.000	130.000	6.000	3.800	0.000	544.000	3360.000
17	20.300	.	7.600	.	.	.	.	.	.	.	.	.
18	21.030	5000	7.400	188	30	4.000	168.000	6.800	4.400	0.000	598.000	3860.000
21	23.070	5000	7.550	190	36	3.020	170.000	7.100	4.500	0.000	606.000	2760.000
22	23.720	.	7.350	.	.	.	.	.	.	.	.	.
23	24.390	5000	7.500	.	.	.	.	.	.	.	.	.
24	25.040	.	7.400	.	.	.	.	.	.	.	.	.
25	25.730	5000	7.500	196	48	4.100	216.000	9.700	8.800	0.000	620.000	3400.000
28	27.810	5000	7.550	160	54	1.700	201.000	8.600	8.200	0.000	640.000	3560.000
29	28.510	.	7.550	.	.	.	.	.	.	.	.	.
30	29.200	.	.	.	.	.	.	.	.	.	.	.
31	29.890	.	7.600	.	.	.	.	.	.	.	.	.
32	30.630	5000	7.450	206	42	.	.	.	.	.	.	.
35	34.690	5000	6.900	147	87	20.000	190.000	8.700	8.900	0.000	645.000	3600.000
36	36.040	.	.	.	.	.	.	.	.	.	.	.
37	37.320	.	6.850	.	.	.	.	.	.	.	.	.
38	38.510	.	6.850	.	.	.	.	.	.	.	.	.
39	39.820	5000	6.650	134	84	20.000	183.000	8.500	10.800	0.000	620.000	3700.000
42	43.760	.	6.650	154	98	.	.	.	.	.	.	.
43	45.100	.	.	.	.	.	.	.	.	.	.	.
44	46.520	.	.	.	.	.	.	.	.	.	.	.
45	47.880	4900	6.650	118	96	39.600	222.000	9.400	8.500	0.100	600.000	4100.000
46	48.850	.	.	.	.	.	.	.	.	.	.	.
49	51.160	5000	7.450	185	48	.	.	.	.	.	.	.
51	52.680	.	.	.	.	.	.	.	.	.	.	.
52	53.580	4950	7.400	147	55	4.400	196.000	9.200	8.500	0.100	620.000	4120.000
53	54.240	.	.	.	.	.	.	.	.	.	.	.
57	57.200	4600	6.650	118	96	.	.	.	.	.	.	.
58	57.950	.	.	.	.	.	.	.	.	.	.	.
59	58.670	4800	6.650	118	71	17.500	184.000	8.600	9.200	0.100	580.000	3500.000
60	59.420	.	.	.	.	.	.	.	.	.	.	.

Table A1.4. FL6 effluent quality: Column 1.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
63	61.700	4500	5.700	23	221	.	.	.	.	.	.	.
64	62.460	.	.	.	.	.	.	.	.	.	.	.
65	63.170	.	.	.	.	.	.	.	.	.	.	.
66	63.850	4400	4.950	7.7	372	.	.	.	.	.	.	.
70	65.210	4300	7.400	160	66	.	.	.	.	.	.	.
71	65.530	.	.	.	.	.	.	.	.	.	.	.
72	65.840	.	.	.	.	.	.	.	.	.	.	.
73	66.140	4475	8.150	203	9	0.100	100.000	5.400	0.200	0.000	700.000	3400.000
74	66.460	.	8.200	.	.	.	.	.	.	.	.	.
77	67.360	4400	7.800	196	18	.	.	.	.	.	.	.
78	67.660	.	.	.	.	.	.	.	.	.	.	.
79	67.960	.	.	.	.	.	.	.	.	.	.	.
80	68.250	4400	8.000	227	18	.	.	.	.	.	.	.
84	69.450	4225	7.550	237	36	.	.	.	.	.	.	.
85	69.710	.	.	.	.	.	.	.	.	.	.	.
86	69.990	.	.	.	.	.	.	.	.	.	.	.
87	70.260	4300	8.100	239	15	0.100	138.000	7.000	1.100	0.100	620.000	3400.000
92	71.660	4200	7.950	231	30	.	.	.	.	.	.	.
93	71.940	.	.	.	.	.	.	.	.	.	.	.
94	72.230	4275	8.100	245	15	.	.	.	.	.	.	.
95	72.540	.	.	.	.	.	.	.	.	.	.	.
98	73.400	4300	8.000	227	15	.	.	.	.	.	.	.
99	73.700	.	.	.	.	.	.	.	.	.	.	.
100	73.990	.	.	.	.	.	.	.	.	.	.	.
102	74.540	4575	7.750	245	15	0.200	104.000	6.500	1.800	0.000	580.000	3300.000
105	75.410	.	.	.	.	.	.	.	.	.	.	.
107	76.040	.	.	.	.	.	.	.	.	.	.	.
108	76.290	4475	8.100	211	14	.	.	.	.	.	.	.
112	77.440	4450	8.150	245	15	.	.	.	.	.	.	.
113	77.730	.	.	.	.	.	.	.	.	.	.	.
114	78.010	.	.	.	.	.	.	.	.	.	.	.
115	78.300	4450	7.900	237	9	0.200	97.000	6.700	0.500	0.000	560.000	3000.000
116	78.570	.	.	.	.	.	.	.	.	.	.	.
119	79.440	4720	8.100	237	26	.	.	.	.	.	.	.
120	79.730	.	.	.	.	.	.	.	.	.	.	.
121	80.020	.	.	.	.	.	.	.	.	.	.	.
122	80.310	4750	7.900	237	31	.	.	.	.	.	.	.
123	80.610	.	.	.	.	.	.	.	.	.	.	.
126	81.470	4800	7.450	227	120	.	.	.	.	.	.	.
127	81.730	.	.	.	.	.	.	.	.	.	.	.
128	82.020	.	.	.	.	.	.	.	.	.	.	.

Table A1.4. FL6 effluent quality: Column 1.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
129	82.310	4520	8.000	226	48	0.100	90.000	7.400	1.500	0.000	540.000	4000.000
130	82.590	.	.	.	.	.	.	.	.	.	.	.
133	83.450	4780	8.200	242	84	.	.	.	.	.	.	.
134	83.760	.	.	.	.	.	.	.	.	.	.	.
135	84.020	.	.	.	.	.	.	.	.	.	.	.
136	84.310	.	.	.	.	.	.	.	.	.	.	.
137	84.590	.	.	.	.	.	.	.	.	.	.	.
140	85.420	4500	7.900	.	.	.	.	.	.	.	.	.
141	85.660	.	.	.	.	.	.	.	.	.	.	.
142	85.970	.	.	.	.	.	.	.	.	.	.	.
143	85.970	4650	8.000	210	15	0.100	98.000	7.600	2.900	0.100	540.000	3500.000
144	86.600	.	.	.	.	.	.	.	.	.	.	.
147	87.530	4650	8.100	.	.	.	.	.	.	.	.	.
148	87.810	.	.	.	.	.	.	.	.	.	.	.
149	87.840	.	.	.	.	.	.	.	.	.	.	.
150	87.870	4825	8.000	210	14	.	.	.	.	.	.	.
151	88.150	.	.	.	.	.	.	.	.	.	.	.
155	89.270	.	.	.	.	.	.	.	.	.	.	.
156	89.550	.	.	.	.	.	.	.	.	.	.	.
157	89.830	4700	7.850	.	.	0.100	151.000	7.600	1.300	0.100	500.000	3060.000
158	90.110	.	.	.	.	.	.	.	.	.	.	.
161	90.950	4600	7.900	.	.	.	.	.	.	.	.	.
162	91.260	.	.	.	.	.	.	.	.	.	.	.
163	91.520	.	.	.	.	.	.	.	.	.	.	.
164	91.810	4700	7.900	215	24	.	.	.	.	.	.	.
168	92.970	4300	7.800	.	.	.	.	.	.	.	.	.
169	93.260	.	.	.	.	.	.	.	.	.	.	.
170	93.540	.	.	.	.	.	.	.	.	.	.	.
171	93.830	4900	7.750	204	18	0.100	165.000	8.500	3.100	0.100	600.000	3300.000
172	94.110	.	.	.	.	.	.	.	.	.	.	.
175	94.990	5000	7.800	.	.	.	.	.	.	.	.	.
176	95.260	.	.	.	.	.	.	.	.	.	.	.
177	95.540	.	.	.	.	.	.	.	.	.	.	.
178	95.830	4900	8.000	223	32	.	.	.	.	.	.	.
182	97.000	.	.	.	.	.	.	.	.	.	.	.
183	97.290	.	.	.	.	.	.	.	.	.	.	.
184	97.580	.	.	.	.	.	.	.	.	.	.	.
185	97.810	4900	8.200	167	9	0.050	159.000	8.400	2.400	0.000	600.000	3200.000
186	98.150	.	.	.	.	.	.	.	.	.	.	.
189	99.020	.	.	.	.	.	.	.	.	.	.	.
190	99.310	.	.	.	.	.	.	.	.	.	.	.

Table A1.4. FL6 effluent quality: Column 1.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
191	99.590	.	.	.	.	.	.	.	.	.	.	.
192	99.870	4000	7.700	151	24	.	.	.	.	.	.	.
193	100.150	.	.	.	.	.	.	.	.	.	.	.
196	101.010	.	.	.	.	.	.	.	.	.	.	.
197	101.300	.	.	.	.	.	.	.	.	.	.	.
198	101.580	.	.	.	.	.	.	.	.	.	.	.
199	101.870	4050	7.850	203	18	0.260	130.000	8.000	3.300	0.000	520.000	2760.000
203	103.070	.	.	.	.	.	.	.	.	.	.	.
204	103.360	.	.	.	.	.	.	.	.	.	.	.
205	103.640	.	.	.	.	.	.	.	.	.	.	.
206	103.930	3850	8.000	177	4.8	.	.	.	.	.	.	.
210	105.070	.	.	.	.	.	.	.	.	.	.	.
211	105.350	.	.	.	.	.	.	.	.	.	.	.
212	105.630	.	.	.	.	.	.	.	.	.	.	.
213	105.930	3800	8.000	188	12	0.180	113.000	6.700	1.600	0.000	498.000	2500.000
214	106.200	.	.	.	.	.	.	.	.	.	.	.
217	107.070	.	.	.	.	.	.	.	.	.	.	.
220	107.690	3720	8.100	175	4.3	.	.	.	.	.	.	.
221	108.690	.	.	.	.	.	.	.	.	.	.	.
224	108.820	.	.	.	.	.	.	.	.	.	.	.
225	109.110	.	.	.	.	.	.	.	.	.	.	.
226	109.390	.	.	.	.	.	.	.	.	.	.	.
227	109.680	3380	7.800	168	9.6	0.300	109.000	6.400	2.200	0.000	488.000	[illegible]
228	109.960	.	.	.	.	.	.	.	.	.	.	.
231	110.800	.	.	.	.	.	.	.	.	.	.	.
232	111.160	.	.	.	.	.	.	.	.	.	.	.
233	111.370	3520	7.850	213	20	.	.	.	.	.	.	.
238	112.810	.	.	.	.	.	.	.	.	.	.	.
239	112.960	.	.	.	.	.	.	.	.	.	.	.
240	113.140	.	.	.	.	.	.	.	.	.	.	.
241	113.340	3700	8.000	183	30	0.100	92.000	5.700	0.900	0.000	520.000	2600.000
242	113.630	.	.	.	.	.	.	.	.	.	.	.
245	114.450	.	.	.	.	.	.	.	.	.	.	.
246	114.720	.	.	.	.	.	.	.	.	.	.	.
247	115.010	.	.	.	.	.	.	.	.	.	.	.
248	115.290	3900	7.950	160	3.6	.	.	.	.	.	.	.
249	115.560	.	.	.	.	.	.	.	.	.	.	.
252	116.420	.	.	.	.	.	.	.	.	.	.	.
254	116.980	.	.	.	.	.	.	.	.	.	.	.
255	117.290	3850	8.000	188	5.3	.	.	.	.	.	.	.
256	117.570	.	.	.	.	.	.	.	.	.	.	.
259	118.410	.	.	.	.	.	.	.	.	.	.	.

Table A1.4. FL6 effluent quality: Column 1.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
260	118.700	.	.	.	.	.	.	.	.	.	.	.
262	119.270	3920	7.950	210	12	0.400	103.000	6.400	3.000	0.000	520.000	2400.000
263	119.560	.	.	.	.	.	.	.	.	.	.	.
267	120.710	.	.	.	.	.	.	.	.	.	.	.
269	121.250	3500	7.850	210	12	.	.	.	.	.	.	.
270	121.590	.	.	.	.	.	.	.	.	.	.	.
274	122.680	.	.	.	.	.	.	.	.	.	.	.
275	123.030	.	.	.	.	.	.	.	.	.	.	.
276	123.250	3875	8.000	183	9.6	.	.	.	.	.	.	.
277	123.570	.	.	.	.	.	.	.	.	.	.	.
282	124.970	.	.	.	.	.	.	.	.	.	.	.
283	125.240	3850	8.150	172	15	.	.	.	.	.	.	.
288	126.660	.	.	.	.	.	.	.	.	.	.	.
289	126.950	.	.	.	.	.	.	.	.	.	.	.
290	127.270	2900	7.700	159	9.6	.	.	.	.	.	.	.
291	127.550	.	.	.	.	.	.	.	.	.	.	.
294	128.420	.	.	.	.	.	.	.	.	.	.	.
295	128.690	.	.	.	.	.	.	.	.	.	.	.
296	128.990	.	.	.	.	.	.	.	.	.	.	.
297	129.280	3380	8.300	146	2.4	.	.	.	.	.	.	.
298	129.560	.	.	.	.	.	.	.	.	.	.	.
301	130.410	.	.	.	.	.	.	.	.	.	.	.
302	130.690	.	.	.	.	.	.	.	.	.	.	.
304	131.260	3580	8.300	102	5	0.100	94.000	4.600	0.600	0.100	476.000	2500.000
305	131.560	.	.	.	.	.	.	.	.	.	.	.
308	131.730	.	.	.	.	.	.	.	.	.	.	.
310	132.000	.	.	.	.	.	.	.	.	.	.	.
311	132.330	3250	7.950	.	.	.	.	.	.	.	.	.
315	133.470	.	.	.	.	.	.	.	.	.	.	.
317	134.050	.	.	.	.	.	.	.	.	.	.	.
318	134.360	3170	7.900	.	.	.	.	.	.	.	.	.
323	135.870	.	.	.	.	.	.	.	.	.	.	.
324	136.150	.	.	.	.	.	.	.	.	.	.	.
325	136.460	3100	7.950	.	.	.	.	.	.	.	.	.
329	137.720	.	.	.	.	.	.	.	.	.	.	.
331	138.330	.	.	.	.	.	.	.	.	.	.	.
332	138.640	2950	7.800	122	15	.	.	.	.	.	.	.
336	139.940	.	.	.	.	.	.	.	.	.	.	.
338	140.500	.	.	.	.	.	.	.	.	.	.	.
339	140.800	2980	8.000	.	.	.	.	.	.	.	.	.
343	142.020	.	.	.	.	.	.	.	.	.	.	.
345	142.620	.	.	.	.	.	.	.	.	.	.	.

Table A1.4. FL6 effluent quality: Column 1.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
346	142.920	2890	8.150	.	.	.	.	.	.	.	.	.
350	144.120	.	.	.	.	.	.	.	.	.	.	.
352	144.720	.	.	.	.	.	.	.	.	.	.	.
353	145.040	2790	7.900	.	.	.	.	.	.	.	.	.
357	146.360	.	.	.	.	.	.	.	.	.	.	.
359	146.960	.	.	.	.	.	.	.	.	.	.	.
360	147.290	2700	7.750	118	12	0.250	98.000	4.100	2.100	0.000	.	1850.000
364	148.530	.	.	.	.	.	.	.	.	.	.	.
366	149.250	.	.	.	.	.	.	.	.	.	.	.
367	149.510	2730	7.750	.	.	.	.	.	.	.	.	.
371	150.790	.	.	.	.	.	.	.	.	.	.	.
373	151.200	.	.	.	.	.	.	.	.	.	.	.
374	151.510	2750	8.100	.	.	.	.	.	.	.	.	.
378	152.830	.	.	.	.	.	.	.	.	.	.	.
380	153.470	.	.	.	.	.	.	.	.	.	.	.
381	153.780	2750	7.700	.	.	.	.	.	.	.	.	.
385	155.060	.	.	.	.	.	.	.	.	.	.	.
387	155.090	.	.	.	.	.	.	.	.	.	.	.
388	155.990	2650	7.850	121	12	.	.	.	.	.	.	.
392	157.190	.	.	.	.	.	.	.	.	.	.	.
394	157.800	.	.	.	.	.	.	.	.	.	.	.
395	158.110	2620	7.900	.	.	.	.	.	.	.	.	.
399	159.340	.	.	.	.	.	.	.	.	.	.	.
401	159.930	.	.	.	.	.	.	.	.	.	.	.
402	160.230	2600	7.700	.	.	.	.	.	.	.	.	.
406	161.430	.	.	.	.	.	.	.	.	.	.	.
408	162.030	.	.	.	.	.	.	.	.	.	.	.
409	162.340	2600	7.900	.	.	.	.	.	.	.	.	.
413	163.540	.	.	.	.	.	.	.	.	.	.	.
415	164.140	.	.	.	.	.	.	.	.	.	.	.
416	164.440	2800	7.900	126	18	.	.	.	.	.	.	.
421	165.900	.	.	.	.	.	.	.	.	.	.	.
422	166.220	.	.	.	.	.	.	.	.	.	.	.
423	166.470	2950	7.900	.	.	.	.	.	.	.	.	.
427	167.630	.	.	.	.	.	.	.	.	.	.	.
429	168.210	.	.	.	.	.	.	.	.	.	.	.
431	168.790	2790	7.900	.	.	.	.	.	.	.	.	.
434	169.660	.	.	.	.	.	.	.	.	.	.	.
436	170.250	.	.	.	.	.	.	.	.	.	.	.
437	170.520	2800	7.950	.	.	.	.	.	.	.	.	.
441	171.680	.	.	.	.	.	.	.	.	.	.	.

Table A1.4. FL6 effluent quality: Column 1.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
443	172.250	.	.	.	.	.	.	.	.	.	.	.
444	172.540	3490	7.800	159	15	.	.	.	.	.	.	.
448	173.710	.	.	.	.	.	.	.	.	.	.	.
450	174.250	.	.	.	.	.	.	.	.	.	.	.
451	174.530	3400	7.650	.	.	.	.	.	.	.	.	.
455	175.690	.	.	.	.	.	.	.	.	.	.	.
458	176.480	3500	7.800	.	.	.	.	.	.	.	.	.
462	177.530	.	.	.	.	.	.	.	.	.	.	.
464	178.010	.	.	.	.	.	.	.	.	.	.	.
465	178.320	3530	7.850	.	.	.	.	.	.	.	.	.
469	179.260	.	.	.	.	.	.	.	.	.	.	.
471	179.880	.	.	.	.	.	.	.	.	.	.	.
472	180.140	3800	7.550	154	58	.	.	.	.	.	.	.
476	181.470	.	.	.	.	.	.	.	.	.	.	.
478	182.050	.	.	.	.	.	.	.	.	.	.	.
479	182.370	.	.	.	.	.	.	.	.	.	.	.
483	183.650	.	.	.	.	.	.	.	.	.	.	.
485	184.150	.	.	.	.	.	.	.	.	.	.	.
486	184.430	4525	7.750	.	.	.	.	.	.	.	.	.
490	185.570	.	.	.	.	.	.	.	.	.	.	.
492	186.140	.	.	.	.	.	.	.	.	.	.	.
493	186.430	5200	7.850	.	.	.	.	.	.	.	.	.
500	188.390	4000	7.950	138	20	.	.	.	.	.	.	.
504	189.510	.	.	.	.	.	.	.	.	.	.	.
507	190.330	3600	7.900	.	.	.	.	.	.	.	.	.
511	191.380	.	.	.	.	.	.	.	.	.	.	.
513	191.910	.	.	.	.	.	.	.	.	.	.	.
514	192.220	3500	7.800	128	18	0.030	91.000	5.800	0.670	0.030	464.000	2800.000
519	193.540	.	.	.	.	.	.	.	.	.	.	.
520	193.810	.	.	.	.	.	.	.	.	.	.	.
521	194.060	3400	7.700	.	.	.	.	.	.	.	.	.
525	195.160	.	.	.	.	.	.	.	.	.	.	.
528	**195.940**	**3500**	**7.850**	**129**	**23**	**0.370**	**95.000**	**6.030**	**3.780**	**0.020**	**448.000**	**2870.000**
532	196.980	.	.	.	.	.	.	.	.	.	.	.
534	197.530	.	.	.	.	.	.	.	.	.	.	.
535	197.770	3880	8.000	.	.	.	.	.	.	.	.	.
539	198.630	.	.	.	.	.	.	.	.	.	.	.
542	198.630	.	.	.	.	.	.	.	.	.	.	.
546	198.630	.	.	.	.	.	.	.	.	.	.	.
548	198.730	.	.	.	.	.	.	.	.	.	.	.
549	198.960	3860	8.000	.	.	.	.	.	.	.	.	.
553	199.980	.	.	.	.	.	.	.	.	.	.	.

Table A1.4. FL6 effluent quality: Column 1.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
555	200.490	.	.	.	.	.	.	.	.	.	.	.
556	200.760	4090	8.050	131	17	0.020	110.000	5.820	0.190	0.050	620.000	2650.000
560	201.830	.	.	.	.	.	.	.	.	.	.	.
562	202.330	.	.	.	.	.	.	.	.	.	.	.
563	202.590	4200	7.950	.	.	.	.	.	.	.	.	.
567	203.590	.	.	.	.	.	.	.	.	.	.	.
569	204.120	.	.	.	.	.	.	.	.	.	.	.
570	204.410	4100	7.850	.	.	.	.	.	.	.	.	.
574	205.490	.	.	.	.	.	.	.	.	.	.	.
576	205.650	.	.	.	.	.	.	.	.	.	.	.
577	205.650	.	.	.	.	.	.	.	.	.	.	.
581	205.650	.	.	.	.	.	.	.	.	.	.	.
584	205.650	.	.	.	.	.	.	.	.	.	.	.
591	206.060	4300	8.100	.	.	.	.	.	.	.	.	.
595	207.260	.	.	.	.	.	.	.	.	.	.	.
597	207.820	.	.	.	.	.	.	.	.	.	.	.
602	209.190	.	.	.	.	.	.	.	.	.	.	.
604	209.690	.	.	.	.	.	.	.	.	.	.	.
605	209.940	5000	8.000	.	.	.	.	.	.	.	.	.
609	211.000	.	.	.	.	.	.	.	.	.	.	.

Table A1.5. FL6 effluent quality: Column 2.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
1	2.370	4380	6.500	116	90	35.000	133.000	6.100	3.300	0.100	476.000	3010.000
2	5.000	4475	6.400	113	96	47.000	136.000	6.000	3.300	0.100	486.000	.
3	7.190	4700	6.400	113	116	38.000	136.000	6.000	3.100	0.100	456.000	3060.000
4	9.850	4475	6.600	113	84	32.000	134.000	5.900	3.000	0.100	464.000	.
7	14.700	4775	6.350	98	125	48.000	131.000	5.800	3.800	0.100	430.000	3100.000
9	15.760	4850	7.400	212	36.	6.000	122.000	5.700	2.400	0.000	632.000	3600.000
10	16.500	4750	7.450	185	33	5.000	129.000	5.900	3.300	0.000	620.000	.
11	17.220	4525	7.300	157	36	5.000	127.000	5.800	3.600	0.100	542.000	3300.000
14	19.440	4725	7.350	157	39	5.000	128.000	5.900	3.500	0.100	548.000	3260.000
15	20.170	.	7.000	.	.	.	.	.	.	.	.	.
16	20.910	4475	7.300	154	42	10.000	127.000	5.800	3.700	0.000	526.000	3660.000
17	21.660	.	7.250	.	.	.	.	.	.	.	.	.
18	22.380	5000	7.050	170	30	10.000	164.000	6.800	4.300	0.000	510.000	3860.000
21	24.450	5000	7.400	170	42	3.000	167.000	6.500	4.300	0.100	612.000	2960.000
22	25.100	.	7.050	.	.	.	.	.	.	.	.	.
23	25.780	5000	7.350	196	42	.	.	.	.	.	.	.
24	26.440	.	7.300	.	.	.	.	.	.	.	.	.
25	27.130	5000	7.350	198	48	4.800	224.000	9.800	9.000	0.000	640.000	3540.000
28	29.240	5000	7.650	190	45	1.200	206.000	8.800	7.900	0.000	640.000	4400.000
29	29.940	.	7.550	.	.	.	.	.	.	.	.	.
30	30.640	.	.	.	.	.	.	.	.	.	.	.
31	31.340	.	7.550	.	.	.	.	.	.	.	.	.
32	32.070	5000	7.200	206	54	.	.	.	.	.	.	.
35	36.090	5000	7.000	160	90	15.000	193.000	8.800	9.300	0.000	560.000	3560.000
36	37.430	.	.	.	.	.	.	.	.	.	.	.
37	38.690	.	6.900	.	.	.	.	.	.	.	.	.
38	39.880	.	6.900	.	.	.	.	.	.	.	.	.
39	41.160	5000	6.750	162	81	7.300	223.000	8.800	10.000	0.000	420.000	3800.000
42	45.060	.	6.700	144	81	.	.	.	.	.	.	.
43	46.350	.	.	.	.	.	.	.	.	.	.	.
44	47.770	.	.	.	.	.	.	.	.	.	.	.
45	49.110	5000	6.250	72	155	54.000	226.000	9.400	9.100	0.100	540.000	4100.000
46	50.070	.	.	.	.	.	.	.	.	.	.	.
49	52.390	5000	7.700	206	30	.	.	.	.	.	.	.
51	53.900	.	.	.	.	.	.	.	.	.	.	.
52	54.790	5000	7.500	193	42	3.700	192.000	8.800	8.000	0.100	600.000	4000.000
53	55.450	.	.	.	.	.	.	.	.	.	.	.
57	58.410	4650	7.200	178	57	.	.	.	.	.	.	.
58	59.150	.	.	.	.	.	.	.	.	.	.	.
59	59.870	4850	7.100	175	63	7.200	181.000	8.300	8.400	0.100	520.000	3800.000
60	60.620	.	.	.	.	.	.	.	.	.	.	.

Table A1.5. FL6 effluent quality: Column 2.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
63	62.880	4620	6.450	93	93	.	.	.	.	.	.	.
64	63.640	.	.	.	.	.	.	.	.	.	.	.
65	64.350	.	.	.	.	.	.	.	.	.	.	.
66	65.030	4500	6.100	59	182	.	.	.	.	.	.	.
70	66.360	4200	7.550	218	90	.	.	.	.	.	.	.
71	66.670	.	.	.	.	.	.	.	.	.	.	.
72	66.980	.	.	.	.	.	.	.	.	.	.	.
73	67.270	4500	8.200	242	6	0.500	141.000	7.200	2.300	0.100	680.000	3400.000
74	67.590	.	8.200	.	.	.	.	.	.	.	.	.
77	68.500	4390	7.600	237	30	.	.	.	.	.	.	.
78	68.800	.	.	.	.	.	.	.	.	.	.	.
79	69.100	.	.	.	.	.	.	.	.	.	.	.
80	69.390	4480	7.700	252	36	.	.	.	.	.	.	.
84	70.590	4150	7.850	242	30	.	.	.	.	.	.	.
85	70.900	.	.	.	.	.	.	.	.	.	.	.
86	71.190	.	.	.	.	.	.	.	.	.	.	.
87	71.470	4500	8.150	250	6	0.600	147.000	7.500	1.400	0.100	640.000	3400.000
92	72.920	4300	7.800	245	24	.	.	.	.	.	.	.
93	73.210	.	.	.	.	.	.	.	.	.	.	.
94	73.510	4375	8.050	250	12	.	.	.	.	.	.	.
95	73.810	.	.	.	.	.	.	.	.	.	.	.
98	74.710	4350	7.850	231	24	.	.	.	.	.	.	.
99	75.020	.	.	.	.	.	.	.	.	.	.	.
100	75.310	.	.	.	.	.	.	.	.	.	.	.
102	75.880	4700	7.550	236	23	0.800	125.000	7.600	2.700	0.000	620.000	3060.000
105	76.800	.	.	.	.	.	.	.	.	.	.	.
107	77.460	.	.	.	.	.	.	.	.	.	.	.
108	77.720	4575	7.950	216	20	.	.	.	.	.	.	.
112	78.920	4400	8.050	245	23	.	.	.	.	.	.	.
113	79.210	.	.	.	.	.	.	.	.	.	.	.
114	79.510	.	.	.	.	.	.	.	.	.	.	.
115	79.810	4500	7.900	237	12	2.000	122.000	7.700	3.000	0.100	600.000	3060.000
116	80.090	.	.	.	.	.	.	.	.	.	.	.
119	80.990	4750	7.900	239	26	.	.	.	.	.	.	.
120	81.290	.	.	.	.	.	.	.	.	.	.	.
121	81.590	.	.	.	.	.	.	.	.	.	.	.
122	81.890	4750	7.700	232	26	.	.	.	.	.	.	.
123	82.200	.	.	.	.	.	.	.	.	.	.	.
126	83.060	4800	7.200	221	103	.	.	.	.	.	.	.
127	83.320	.	.	.	.	.	.	.	.	.	.	.
128	83.600	.	.	.	.	.	.	.	.	.	.	.

Table A1.5. FL6 effluent quality: Column 2.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
129	83.900	4550	8.100	221	33	0.300	104.000	7.700	4.500	0.000	540.000	3640.000
130	84.180	.	.	.	.	.	.	.	.	.	.	.
133	85.060	4750	8.050	237	55	.	.	.	.	.	.	.
134	85.370	.	.	.	.	.	.	.	.	.	.	.
135	85.650	.	.	.	.	.	.	.	.	.	.	.
136	85.840	4580	8.000	174	19	.	.	.	.	.	.	.
137	86.130	.	.	.	.	.	.	.	.	.	.	.
140	86.960	4375	8.000	.	.	.	.	.	.	.	.	.
141	87.180	.	.	.	.	.	.	.	.	.	.	.
142	87.440	.	.	.	.	.	.	.	.	.	.	.
143	87.440	4500	8.000	188	15	0.500	93.000	7.400	3.600	0.100	520.000	4460.000
144	87.730	.	.	.	.	.	.	.	.	.	.	.
147	88.680	4700	7.800	.	.	.	.	.	.	.	.	.
148	88.970	.	.	.	.	.	.	.	.	.	.	.
149	89.100	.	.	.	.	.	.	.	.	.	.	.
150	89.130	4800	7.800	204	26	.	.	.	.	.	.	.
151	89.410	.	.	.	.	.	.	.	.	.	.	.
155	90.550	.	.	.	.	.	.	.	.	.	.	.
156	90.840	.	.	.	.	.	.	.	.	.	.	.
157	91.130	4730	8.100	.	.	0.900	162.000	8.500	5.900	0.100	580.000	3260.000
158	91.420	.	.	.	.	.	.	.	.	.	.	.
161	92.290	4700	7.950	.	.	.	.	.	.	.	.	.
162	92.610	.	.	.	.	.	.	.	.	.	.	.
163	92.910	.	.	.	.	.	.	.	.	.	.	.
164	93.210	4700	7.800	221	33	.	.	.	.	.	.	.
168	94.400	4580	7.750	.	.	.	.	.	.	.	.	.
169	94.710	.	.	.	.	.	.	.	.	.	.	.
170	95.000	.	.	.	.	.	.	.	.	.	.	.
171	95.300	4850	7.800	221	18	1.300	150.000	8.300	5.600	0.100	560.000	3300.000
172	95.590	.	.	.	.	.	.	.	.	.	.	.
175	96.480	5000	7.800	.	.	.	.	.	.	.	.	.
176	96.760	.	.	.	.	.	.	.	.	.	.	.
177	97.060	.	.	.	.	.	.	.	.	.	.	.
178	97.360	4850	8.100	210	19	.	.	.	.	.	.	.
182	98.550	.	.	.	.	.	.	.	.	.	.	.
183	98.850	.	.	.	.	.	.	.	.	.	.	.
184	99.150	.	.	.	.	.	.	.	.	.	.	.
185	99.450	5000	8.000	225	12	0.060	155.000	8.600	4.000	0.000	560.000	3300.000
186	99.740	.	.	.	.	.	.	.	.	.	.	.
189	100.630	.	.	.	.	.	.	.	.	.	.	.
190	100.920	.	.	.	.	.	.	.	.	.	.	.

Table A1.5. FL6 effluent quality: Column 2.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
191	101.220	.	.	.	.	.	.	.	.	.	.	.
192	101.510	4100	8.000	199	14	.	.	.	.	.	.	.
193	101.800	.	.	.	.	.	.	.	.	.	.	.
196	102.690	.	.	.	.	.	.	.	.	.	.	.
197	102.990	.	.	.	.	.	.	.	.	.	.	.
198	103.280	.	.	.	.	.	.	.	.	.	.	.
199	103.570	4100	8.000	199	12	0.880	125.000	7.200	3.200	0.000	534.000	2760.000
203	104.750	.	.	.	.	.	.	.	.	.	.	.
204	105.050	.	.	.	.	.	.	.	.	.	.	.
205	105.330	.	.	.	.	.	.	.	.	.	.	.
206	105.630	3920	7.900	177	9.6	.	.	.	.	.	.	.
210	106.810	.	.	.	.	.	.	.	.	.	.	.
211	107.100	.	.	.	.	.	.	.	.	.	.	.
212	107.380	.	.	.	.	.	.	.	.	.	.	.
213	107.690	3700	8.100	193	6	0.730	102.000	6.100	2.700	0.000	480.000	2460.000
214	107.970	.	.	.	.	.	.	.	.	.	.	.
217	108.880	.	.	.	.	.	.	.	.	.	.	.
220	109.500	3690	8.200	178	0	.	.	.	.	.	.	.
221	109.780	.	.	.	.	.	.	.	.	.	.	.
224	110.660	.	.	.	.	.	.	.	.	.	.	.
225	110.960	.	.	.	.	.	.	.	.	.	.	.
226	111.250	.	.	.	.	.	.	.	.	.	.	.
227	111.550	3390	7.850	188	9.6	0.580	94.000	5.700	1.700	0.000	488.000	2400.000
228	111.840	.	.	.	.	.	.	.	.	.	.	.
231	112.700	.	.	.	.	.	.	.	.	.	.	.
232	113.080	.	.	.	.	.	.	.	.	.	.	.
233	113.300	3510	7.900	188	14	.	.	.	.	.	.	.
238	114.790	.	.	.	.	.	.	.	.	.	.	.
239	114.940	.	.	.	.	.	.	.	.	.	.	.
240	115.130	.	.	.	.	.	.	.	.	.	.	.
241	115.330	3660	8.150	194	3	0.200	76.000	5.400	1.400	0.000	540.000	2800.000
242	115.630	.	.	.	.	.	.	.	.	.	.	.
245	116.460	.	.	.	.	.	.	.	.	.	.	.
246	116.740	.	.	.	.	.	.	.	.	.	.	.
247	117.030	.	.	.	.	.	.	.	.	.	.	.
248	117.320	3820	8.000	178	5.3	.	.	.	.	.	.	.
249	117.600	.	.	.	.	.	.	.	.	.	.	.
252	118.480	.	.	.	.	.	.	.	.	.	.	.
254	119.060	.	.	.	.	.	.	.	.	.	.	.
255	119.370	3600	8.050	178	3.6	.	.	.	.	.	.	.
256	119.660	.	.	.	.	.	.	.	.	.	.	.
259	120.540	.	.	.	.	.	.	.	.	.	.	.

Table A1.5. FL6 effluent quality: Column 2.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
260	120.830	.	.	.	.	.	.	.	.	.	.	.
262	121.430	3750	7.900	194	17	0.500	90.000	6.200	3.400	0.100	540.000	2700.000
263	121.720	.	.	.	.	.	.	.	.	.	.	.
267	122.920	.	.	.	.	.	.	.	.	.	.	.
269	123.480	3400	7.950	171	14	.	.	.	.	.	.	.
270	123.830	.	.	.	.	.	.	.	.	.	.	.
274	124.460	.	.	.	.	.	.	.	.	.	.	.
275	125.320	.	.	.	.	.	.	.	.	.	.	.
276	125.550	3775	8.050	188	9.6	.	.	.	.	.	.	.
277	125.870	.	.	.	.	.	.	.	.	.	.	.
282	127.300	.	.	.	.	.	.	.	.	.	.	.
283	127.580	3700	8.200	167	6	.	.	.	.	.	.	.
288	129.060	.	.	.	.	.	.	.	.	.	.	.
289	129.370	.	.	.	.	.	.	.	.	.	.	.
290	129.680	2925	7.500	155	9.6	.	.	.	.	.	.	.
291	129.960	.	.	.	.	.	.	.	.	.	.	.
294	130.860	.	.	.	.	.	.	.	.	.	.	.
295	131.140	.	.	.	.	.	.	.	.	.	.	.
296	131.450	.	.	.	.	.	.	.	.	.	.	.
297	131.740	3230	8.450	151	10	.	.	.	.	.	.	.
298	132.030	.	.	.	.	.	.	.	.	.	.	.
301	132.920	.	.	.	.	.	.	.	.	.	.	.
302	133.210	.	.	.	.	.	.	.	.	.	.	.
304	133.790	3400	8.300	145	10	0.100	85.000	4.200	0.700	0.100	448.000	2360.000
305	134.090	.	.	.	.	.	.	.	.	.	.	.
308	134.970	.	.	.	.	.	.	.	.	.	.	.
310	135.560	.	.	.	.	.	.	.	.	.	.	.
311	135.890	3000	8.050	.	.	.	.	.	.	.	.	.
315	137.070	.	.	.	.	.	.	.	.	.	.	.
317	137.650	.	.	.	.	.	.	.	.	.	.	.
318	137.960	3000	7.850	.	.	.	.	.	.	.	.	.
323	139.460	.	.	.	.	.	.	.	.	.	.	.
324	139.750	.	.	.	.	.	.	.	.	.	.	.
325	140.070	2990	7.900	.	.	.	.	.	.	.	.	.
329	141.350	.	.	.	.	.	.	.	.	.	.	.
331	141.950	.	.	.	.	.	.	.	.	.	.	.
332	142.260	2930	7.850	148	16	.	.	.	.	.	.	.
336	143.590	.	.	.	.	.	.	.	.	.	.	.
338	144.160	.	.	.	.	.	.	.	.	.	.	.
339	144.460	2900	8.000	.	.	.	.	.	.	.	.	.
343	145.700	.	.	.	.	.	.	.	.	.	.	.
345	146.310	.	.	.	.	.	.	.	.	.	.	.

Table A1.5. FL6 effluent quality: Column 2.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
346	146.620	2910	7.950	.	.	.	.	.	.	.	.	.
350	147.890	.	.	.	.	.	.	.	.	.	.	.
352	148.520	.	.	.	.	.	.	.	.	.	.	.
353	148.850	2820	7.800	.	.	.	.	.	.	.	.	.
357	150.250	.	.	.	.	.	.	.	.	.	.	.
359	150.860	.	.	.	.	.	.	.	.	.	.	.
360	151.190	2780	7.800	144	10	0.130	92.000	3.900	1.500	0.000	.	1880.000
364	152.480	.	.	.	.	.	.	.	.	.	.	.
366	153.200	.	.	.	.	.	.	.	.	.	.	.
367	153.470	2760	7.800	.	.	.	.	.	.	.	.	.
371	154.790	.	.	.	.	.	.	.	.	.	.	.
373	155.210	.	.	.	.	.	.	.	.	.	.	.
374	155.440	2800	7.900	.	.	.	.	.	.	.	.	.
378	156.780	.	.	.	.	.	.	.	.	.	.	.
380	157.440	.	.	.	.	.	.	.	.	.	.	.
381	157.760	2760	7.750	.	.	.	.	.	.	.	.	.
385	159.080	.	.	.	.	.	.	.	.	.	.	.
387	159.740	.	.	.	.	.	.	.	.	.	.	.
388	160.060	2680	7.750	126	17	.	.	.	.	.	.	.
392	161.300	.	.	.	.	.	.	.	.	.	.	.
394	161.920	.	.	.	.	.	.	.	.	.	.	.
395	162.240	2650	7.750	.	.	.	.	.	.	.	.	.
399	163.510	.	.	.	.	.	.	.	.	.	.	.
401	164.110	.	.	.	.	.	.	.	.	.	.	.
402	164.420	2610	7.750	.	.	.	.	.	.	.	.	.
406	165.650	.	.	.	.	.	.	.	.	.	.	.
408	166.270	.	.	.	.	.	.	.	.	.	.	.
409	166.580	2600	7.700	.	.	.	.	.	.	.	.	.
413	167.800	.	.	.	.	.	.	.	.	.	.	.
415	168.400	.	.	.	.	.	.	.	.	.	.	.
416	168.710	2750	7.850	132	18	0.100	66.000	4.100	1.000	0.000	422.000	1830.000
421	170.170	.	.	.	.	.	.	.	.	.	.	.
422	170.490	.	.	.	.	.	.	.	.	.	.	.
423	170.730	2900	7.900	.	.	.	.	.	.	.	.	.
427	171.890	.	.	.	.	.	.	.	.	.	.	.
429	172.470	.	.	.	.	.	.	.	.	.	.	.
431	173.040	2810	7.850	.	.	.	.	.	.	.	.	.
434	173.910	.	.	.	.	.	.	.	.	.	.	.
436	174.480	.	.	.	.	.	.	.	.	.	.	.
437	174.750	2900	7.900	.	.	.	.	.	.	.	.	.
441	175.900	.	.	.	.	.	.	.	.	.	.	.

Table A1.5. FL6 effluent quality: Column 2.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
443	176.480	.	.	.	.	.	.	.	.	.	.	.
444	176.780	3360	7.800	145	17	.	.	.	.	.	.	.
448	177.910	.	.	.	.	.	.	.	.	.	.	.
450	178.190	.	.	.	.	.	.	.	.	.	.	.
451	178.380	3350	7.650	.	.	.	.	.	.	.	.	.
455	179.530	.	.	.	.	.	.	.	.	.	.	.
458	180.340	3480	7.850	.	.	.	.	.	.	.	.	.
462	181.420	.	.	.	.	.	.	.	.	.	.	.
464	181.920	.	.	.	.	.	.	.	.	.	.	.
465	182.230	3540	7.850	.	.	.	.	.	.	.	.	.
469	183.490	.	.	.	.	.	.	.	.	.	.	.
471	184.050	.	.	.	.	.	.	.	.	.	.	.
472	184.300	3950	7.550	158	46	0.110	111.000	6.700	3.850	0.060	560.000	3900.000
476	185.530	.	.	.	.	.	.	.	.	.	.	.
478	186.070	.	.	.	.	.	.	.	.	.	.	.
479	186.370	.	.	.	.	.	.	.	.	.	.	.
483	187.550	.	.	.	.	.	.	.	.	.	.	.
485	188.000	.	.	.	.	.	.	.	.	.	.	.
486	188.270	4525	7.650	.	.	.	.	.	.	.	.	.
490	189.340	.	.	.	.	.	.	.	.	.	.	.
492	189.860	.	.	.	.	.	.	.	.	.	.	.
493	190.130	5200	7.800	.	.	.	.	.	.	.	.	.
500	191.980	4100	7.800	153	28	.	.	.	.	.	.	.
504	193.020	.	.	.	.	.	.	.	.	.	.	.
507	193.780	3720	7.850	.	.	.	.	.	.	.	.	.
511	194.740	.	.	.	.	.	.	.	.	.	.	.
513	195.240	.	.	.	.	.	.	.	.	.	.	.
514	195.530	3600	7.750	142	22	0.050	91.000	5.930	2.420	0.030	516.000	2870.000
519	196.760	.	.	.	.	.	.	.	.	.	.	.
520	197.010	.	.	.	.	.	.	.	.	.	.	.
521	197.250	3420	7.700	.	.	.	.	.	.	.	.	.
525	198.270	.	.	.	.	.	.	.	.	.	.	.
528	198.980	4200	7.900	139	23	0.020	111.000	6.640	2.130	0.070	508.000	3330.000
532	199.990	.	.	.	.	.	.	.	.	.	.	.
534	200.490	.	.	.	.	.	.	.	.	.	.	.
535	200.710	4160	7.900	.	.	.	.	.	.	.	.	.
539	201.700	.	.	.	.	.	.	.	.	.	.	.
542	202.360	3920	8.100	.	.	.	.	.	.	.	.	.
546	202.360	.	.	.	.	.	.	.	.	.	.	.
548	202.360	.	.	.	.	.	.	.	.	.	.	.
549	202.360	.	.	.	.	.	.	.	.	.	.	.

Table A1.5. FL6 effluent quality: Column 2.

Time (Days)	Cum. Vol. (l)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
553	202.360	.	.	.	.	.	.	.	.	.	.	.
555	202.590	.	.	.	.	.	.	.	.	.	.	.
556	202.770	4300	8.050	131	14	0.020	96.000	4.830	0.370	0.030	620.000	2750.000
560	203.760	.	.	.	.	.	.	.	.	.	.	.
562	204.240	.	.	.	.	.	.	.	.	.	.	.
563	204.490	4400	7.900	.	.	.	.	.	.	.	.	.
567	205.440	.	.	.	.	.	.	.	.	.	.	.
569	205.940	.	.	.	.	.	.	.	.	.	.	.
570	206.220	4300	7.700	.	.	.	.	.	.	.	.	.
574	207.250	.	.	.	.	.	.	.	.	.	.	.
576	207.730	.	.	.	.	.	.	.	.	.	.	.
577	208.000	5000	7.850	.	.	.	.	.	.	.	.	.
581	209.110	.	.	.	.	.	.	.	.	.	.	.
584	209.890	4500	7.800	184	29	0.110	150.000	8.220	5.570	0.040	640.000	3300.000
591	212.620	4700	8.000	.	.	.	.	.	.	.	.	.
595	213.580	.	.	.	.	.	.	.	.	.	.	.
597	214.030	.	.	.	.	.	.	.	.	.	.	.
602	215.160	.	.	.	.	.	.	.	.	.	.	.
604	215.570	.	.	.	.	.	.	.	.	.	.	.
605	215.770	5000	7.900	.	.	.	.	.	.	.	.	.
609	216.650	.	.	.	.	.	.	.	.	.	.	.

Table A1.6. FL6 effluent quality: Column 3.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
1	2.610	4350	6.500	103	116	36.000	133.000	6.000	3.300	0.100	466.000	3200.000
2	5.600	4525	6.350	103	102	50.000	137.000	6.000	3.300	0.100	472.000	.
3	8.020	4675	6.350	98	120	54.000	136.000	6.000	3.200	0.000	444.000	3360.000
4	10.990	4400	6.500	113	108	42.000	133.000	5.900	3.000	0.100	440.000	.
7	15.900	4620	6.300	95	143	58.000	131.000	5.700	3.500	0.100	434.000	3160.000
9	16.940	4880	7.100	154	42	9.000	118.000	5.500	2.900	0.000	588.000	3360.000
10	17.710	4750	7.400	160	24	5.000	129.000	5.800	3.200	0.000	614.000	.
11	18.440	4600	7.500	172	33	4.000	132.000	6.000	3.600	0.100	540.000	3300.000
14	20.710	4750	7.550	196	30	3.000	133.000	6.000	3.500	0.100	556.000	3300.000
15	21.460	.	7.200	.	.	.	.	.	.	.	.	.
16	22.210	4575	7.400	170	30	6.000	128.000	5.900	4.000	0.000	534.000	3400.000
17	22.980	.	7.150	.	.	.	.	.	.	.	.	.
18	23.710	5000	6.950	190	48	11.000	162.000	6.800	4.200	0.000	600.000	4000.000
21	25.750	5000	7.450	190	36	3.000	160.000	6.700	4.300	0.100	554.000	2760.000
22	26.410	.	7.050	.	.	.	.	.	.	.	.	.
23	27.100	5000	7.400	196	42	.	.	.	.	.	.	.
24	27.770	.	7.200	.	.	.	.	.	.	.	.	.
25	28.480	5000	7.050	193	63	8.400	216.000	9.700	8.600	0.000	640.000	3500.000
28	30.630	5000	7.300	183	48	4.000	201.000	8.600	7.900	0.000	660.000	3460.000
29	31.350	.	7.550	.	.	.	.	.	.	.	.	.
30	32.060	.	.	.	.	.	.	.	.	.	.	.
31	32.770	.	7.400	.	.	.	.	.	.	.	.	.
32	33.510	5000	7.000	206	69	.	.	.	.	.	.	.
35	37.710	5000	6.850	139	99	24.000	180.000	8.600	8.300	0.000	640.000	3560.000
36	39.100	.	.	.	.	.	.	.	.	.	.	.
37	40.420	.	6.700	.	.	.	.	.	.	.	.	.
38	41.660	.	6.450	.	.	.	.	.	.	.	.	.
39	43.010	.	5.500	16	227	81.000	185.000	8.500	9.100	0.000	540.000	3660.000
42	47.120	.	6.300	85	108	.	.	.	.	.	.	.
43	48.480	.	.	.	.	.	.	.	.	.	.	.
44	49.970	.	.	.	.	.	.	.	.	.	.	.
45	51.810	4900	4.600	5.2	400	107.000	245.000	10.600	9.700	0.100	440.000	4000.000
46	52.380	.	.	.	.	.	.	.	.	.	.	.
49	54.740	5000	6.050	27	161	.	.	.	.	.	.	.
51	56.260	.	.	.	.	.	.	.	.	.	.	.
52	57.180	4850	4.650	2.1	340	98.000	203.000	9.700	8.900	0.000	460.000	4060.000
53	57.860	.	.	.	.	.	.	.	.	.	.	.
57	60.940	4600	4.550	2.5	621	.	.	.	.	.	.	.
58	61.720	.	.	.	.	.	.	.	.	.	.	.
59	62.470	4775	4.450	.	538	116.000	209.000	9.800	9.600	0.100	400.000	3960.000
60	63.240	.	.	.	.	.	.	.	.	.	.	.

Table A1.6. FL6 effluent quality: Column 3.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
63	65.600	4525	4.450	.	603	.	.	.	.	.	.	.
64	66.360	.	.	.	.	.	.	.	.	.	.	.
65	67.100	.	.	.	.	.	.	.	.	.	.	.
66	67.280	4475	4.400	.	565	.	.	.	.	.	.	.
70	69.140	4500	5.200	13	272	.	.	.	.	.	.	.
71	69.440	.	.	.	.	.	.	.	.	.	.	.
72	69.740	.	.	.	.	.	.	.	.	.	.	.
73	70.030	4400	7.450	129	15	1.500	114.000	6.000	2.600	0.100	640.000	3500.000
74	70.330	.	7.500	.	.	.	.	.	.	.	.	.
77	70.750	4350	6.800	46	42	.	.	.	.	.	.	.
78	71.040	.	.	.	.	.	.	.	.	.	.	.
79	71.320	.	.	.	.	.	.	.	.	.	.	.
80	71.600	4475	7.650	196	30	.	.	.	.	.	.	.
84	72.740	4275	7.600	191	32	.	.	.	.	.	.	.
85	73.020	.	.	.	.	.	.	.	.	.	.	.
86	73.300	.	.	.	.	.	.	.	.	.	.	.
87	73.570	4475	7.900	214	18	0.200	152.000	7.600	2.500	0.100	600.000	3300.000
92	74.960	4300	7.550	183	36	.	.	.	.	.	.	.
93	75.240	.	.	.	.	.	.	.	.	.	.	.
94	75.520	4350	7.600	206	21	.	.	.	.	.	.	.
95	75.820	.	.	.	.	.	.	.	.	.	.	.
98	76.680	4400	7.850	196	18	.	.	.	.	.	.	.
99	76.970	.	.	.	.	.	.	.	.	.	.	.
100	77.260	.	.	.	.	.	.	.	.	.	.	.
102	77.810	4675	7.550	203	24	0.400	132.000	7.600	4.500	0.100	560.000	3050.000
105	78.690	.	.	.	.	.	.	.	.	.	.	.
107	79.310	.	.	.	.	.	.	.	.	.	.	.
108	79.560	4575	7.950	216	20	.	.	.	.	.	.	.
112	80.710	4475	7.900	196	23	.	.	.	.	.	.	.
113	80.990	.	.	.	.	.	.	.	.	.	.	.
114	81.280	.	.	.	.	.	.	.	.	.	.	.
115	81.560	4600	7.700	216	19	6.000	129.000	7.900	4.800	0.000	380.000	2980.000
116	81.840	.	.	.	.	.	.	.	.	.	.	.
119	82.700	4700	7.600	227	33	.	.	.	.	.	.	.
120	82.990	.	.	.	.	.	.	.	.	.	.	.
121	83.280	.	.	.	.	.	.	.	.	.	.	.
122	83.570	4700	7.800	211	22	.	.	.	.	.	.	.
123	83.870	.	.	.	.	.	.	.	.	.	.	.
126	84.720	4750	7.200	193	81	.	.	.	.	.	.	.
127	84.980	.	.	.	.	.	.	.	.	.	.	.
128	85.270	.	.	.	.	.	.	.	.	.	.	.

Table A1.6. FL6 effluent quality: Column 3.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
129	85.560	4550	8.050	199	30	0.200	109.000	7.900	3.000	0.000	560.000	3760.000
130	85.840	.	.	.	.	.	.	.	.	.	.	.
133	86.700	4700	7.950	204	62	.	.	.	.	.	.	.
134	87.010	.	.	.	.	.	.	.	.	.	.	.
135	87.270	.	.	.	.	.	.	.	.	.	.	.
136	87.560	4580	7.850	242	22	.	.	.	.	.	.	.
137	87.840	.	.	.	.	.	.	.	.	.	.	.
140	88.670	4600	7.800	.	.	.	.	.	.	.	.	.
141	88.910	.	.	.	.	.	.	.	.	.	.	.
142	89.220	.	.	.	.	.	.	.	.	.	.	.
143	89.220	4675	7.650	202	24	0.060	117.000	8.300	7.800	0.100	540.000	3650.000
144	89.830	.	.	.	.	.	.	.	.	.	.	.
147	90.770	4850	7.750	.	.	.	.	.	.	.	.	.
148	91.050	.	.	.	.	.	.	.	.	.	.	.
149	91.080	.	.	.	.	.	.	.	.	.	.	.
150	91.110	4800	7.800	204	26	.	.	.	.	.	.	.
151	91.380	.	.	.	.	.	.	.	.	.	.	.
155	92.500	.	.	.	.	.	.	.	.	.	.	.
156	92.780	.	.	.	.	.	.	.	.	.	.	.
157	93.070	4730	7.900	.	.	1.100	170.000	8.600	7.700	0.100	500.000	3200.000
158	93.350	.	.	.	.	.	.	.	.	.	.	.
161	94.210	4700	7.800	.	.	.	.	.	.	.	.	.
162	94.520	.	.	.	.	.	.	.	.	.	.	.
163	94.810	.	.	.	.	.	.	.	.	.	.	.
164	95.110	4700	7.550	210	41	.	.	.	.	.	.	.
168	96.290	4575	7.600	.	.	.	.	.	.	.	.	.
169	96.580	.	.	.	.	.	.	.	.	.	.	.
170	96.870	.	.	.	.	.	.	.	.	.	.	.
171	97.170	4900	7.900	210	24	1.100	178.000	9.000	7.000	0.100	560.000	3200.000
172	97.460	.	.	.	.	.	.	.	.	.	.	.
175	98.340	5000	7.700	.	.	.	.	.	.	.	.	.
176	98.620	.	.	.	.	.	.	.	.	.	.	.
177	98.930	.	.	.	.	.	.	.	.	.	.	.
178	99.220	4850	7.900	215	23	.	.	.	.	.	.	.
182	100.400	.	.	.	.	.	.	.	.	.	.	.
183	100.690	.	.	.	.	.	.	.	.	.	.	.
184	100.990	.	.	.	.	.	.	.	.	.	.	.
185	101.280	4900	8.000	209	15	1.000	172.000	9.100	6.600	0.000	620.000	3300.000
186	101.570	.	.	.	.	.	.	.	.	.	.	.
189	102.450	.	.	.	.	.	.	.	.	.	.	.
190	102.520	.	.	.	.	.	.	.	.	.	.	.

Table A1.6. FL6 effluent quality: Column 3.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
191	102.790	.	.	.	.	.	.	.	.	.	.	.
192	103.080	4030	7.850	178	19	.	.	.	.	.	.	.
193	103 370	.	.	.	.	.	.	.	.	.	.	.
196	104.270	.	.	.	.	.	.	.	.	.	.	.
197	104.570	.	.	.	.	.	.	.	.	.	.	.
198	104.860	.	.	.	.	.	.	.	.	.	.	.
199	105.160	4090	7.950	183	17	0.910	136.000	7.800	4.300	0.000	532.000	2800.000
203	106.350	.	.	.	.	.	.	.	.	.	.	.
204	106.650	.	.	.	.	.	.	.	.	.	.	.
205	106.930	.	.	.	.	.	.	.	.	.	.	.
206	107.230	3950	8.000	161	14	.	.	.	.	.	.	.
210	108.400	.	.	.	.	.	.	.	.	.	.	.
211	108.690	.	.	.	.	.	.	.	.	.	.	.
212	108.980	.	.	.	.	.	.	.	.	.	.	.
213	109.290	3840	7.900	183	9	0.500	118.000	6.800	2.600	0.000	486.000	2500.000
214	109.570	.	.	.	.	.	.	.	.	.	.	.
217	110.460	.	.	.	.	.	.	.	.	.	.	.
220	111.060	3750	8.100	180	1.9	.	.	.	.	.	.	.
221	111.340	.	.	.	.	.	.	.	.	.	.	.
224	112.200	.	.	.	.	.	.	.	.	.	.	.
225	112.500	.	.	.	.	.	.	.	.	.	.	.
226	112.780	.	.	.	.	.	.	.	.	.	.	.
227	113.080	3450	7.850	175	12	0.630	112.000	6.600	3.100	0.000	476.000	2500.000
228	113.370	.	.	.	.	.	.	.	.	.	.	.
231	114.210	.	.	.	.	.	.	.	.	.	.	.
232	114.580	.	.	.	.	.	.	.	.	.	.	.
233	114.790	3475	7.800	172	20	.	.	.	.	.	.	.
238	116.220	.	.	.	.	.	.	.	.	.	.	.
239	116.360	.	.	.	.	.	.	.	.	.	.	.
240	116.540	.	.	.	.	.	.	.	.	.	.	.
241	116.730	3580	8.050	166	3	0.200	88.000	5.400	1.100	0.000	520.000	2960.000
242	117.020	.	.	.	.	.	.	.	.	.	.	.
245	117.820	.	.	.	.	.	.	.	.	.	.	.
246	118.090	.	.	.	.	.	.	.	.	.	.	.
247	118.370	.	.	.	.	.	.	.	.	.	.	.
248	118.670	3750	7.900	167	7.2	.	.	.	.	.	.	.
249	118.920	.	.	.	.	.	.	.	.	.	.	.
252	119.810	.	.	.	.	.	.	.	.	.	.	.
254	120.370	.	.	.	.	.	.	.	.	.	.	.
255	120.680	3750	7.850	167	5.3	.	.	.	.	.	.	.
256	120.950	.	.	.	.	.	.	.	.	.	.	.

Table A1.6. FL6 effluent quality: Column 3.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
259	121.810	.	.	.	.	.	.	.	.	.	.	.
260	122.090	.	.	.	.	.	.	.	.	.	.	.
262	122.660	3660	7.800	178	22	0.900	88.000	6.100	4.100	0.000	500.000	2660.000
263	122.930	.	.	.	.	.	.	.	.	.	.	.
267	124.060	.	.	.	.	.	.	.	.	.	.	.
269	124.590	3450	8.000	178	17	.	.	.	.	.	.	.
270	124.920	.	.	.	.	.	.	.	.	.	.	.
274	125.980	.	.	.	.	.	.	.	.	.	.	.
275	126.330	.	.	.	.	.	.	.	.	.	.	.
276	126.540	3600	7.900	183	15	0.600	130.000	5.800	4.000	0.000	420.000	2760.000
277	126.860	.	.	.	.	.	.	.	.	.	.	.
282	128.230	.	.	.	.	.	.	.	.	.	.	.
283	128.490	3475	8.200	153	.	.	.	.	.	.	.	.
288	129.870	.	.	.	.	.	.	.	.	.	.	.
289	130.150	.	.	.	.	.	.	.	.	.	.	.
290	130.450	2850	7.600	153	6	.	.	.	.	.	.	.
291	130.720	.	.	.	.	.	.	.	.	.	.	.
294	131.560	.	.	.	.	.	.	.	.	.	.	.
295	131.820	.	.	.	.	.	.	.	.	.	.	.
296	132.080	.	.	.	.	.	.	.	.	.	.	.
297	132.370	3080	8.200	145	0	.	.	.	.	.	.	.
298	132.640	.	.	.	.	.	.	.	.	.	.	.
301	133.490	.	.	.	.	.	.	.	.	.	.	.
302	133.750	.	.	.	.	.	.	.	.	.	.	.
304	134.290	3250	8.300	143	.	0.200	89.000	4.900	1.200	0.100	416.000	2400.000
305	134.570	.	.	.	.	.	.	.	.	.	.	.
308	135.390	.	.	.	.	.	.	.	.	.	.	.
310	135.950	.	.	.	.	.	.	.	.	.	.	.
311	136.270	2990	8.000	.	.	.	.	.	.	.	.	.
315	137.350	.	.	.	.	.	.	.	.	.	.	.
317	137.880	.	.	.	.	.	.	.	.	.	.	.
318	138.160	2930	7.850	.	.	.	.	.	.	.	.	.
323	139.420	.	.	.	.	.	.	.	.	.	.	.
324	139.640	.	.	.	.	.	.	.	.	.	.	.
325	139.870	2980	8.000	.	.	.	.	.	.	.	.	.
329	141.120	.	.	.	.	.	.	.	.	.	.	.
331	141.740	.	.	.	.	.	.	.	.	.	.	.
332	142.050	2900	7.800	134	20	.	.	.	.	.	.	.
336	143.370	.	.	.	.	.	.	.	.	.	.	.
338	143.940	.	.	.	.	.	.	.	.	.	.	.
339	144.240	2900	7.900	.	.	.	.	.	.	.	.	.

Table A1.6. FL6 effluent quality: Column 3.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
343	145.460	.	.	.	.	.	.	.	.	.	.	.
345	146.070	.	.	.	.	.	.	.	.	.	.	.
346	146.380	2750	7.100	.	.	.	.	.	.	.	.	.
350	147.610	.	.	.	.	.	.	.	.	.	.	.
352	148.190	.	.	.	.	.	.	.	.	.	.	.
353	148.510	2700	6.550	31	45	.	.	.	.	.	.	.
357	149.850	.	.	.	.	.	.	.	.	.	.	.
359	150.450	.	.	.	.	.	.	.	.	.	.	.
360	150.780	2700	7.050	72	24	4.100	87.000	3.800	3.200	0.000	.	1880.000
364	152.040	.	.	.	.	.	.	.	.	.	.	.
366	152.750	.	.	.	.	.	.	.	.	.	.	.
367	153.010	2700	6.900	.	.	.	.	.	.	.	.	.
371	154.310	.	.	.	.	.	.	.	.	.	.	.
373	154.350	.	.	.	.	.	.	.	.	.	.	.
374	154.650	2710	6.300	33	66	.	.	.	.	.	.	.
378	155.970	.	.	.	.	.	.	.	.	.	.	.
380	156.610	.	.	.	.	.	.	.	.	.	.	.
381	156.920	2710	6.850	.	.	.	.	.	.	.	.	.
385	158.200	.	.	.	.	.	.	.	.	.	.	.
387	158.830	.	.	.	.	.	.	.	.	.	.	.
388	159.130	2590	7.650	110	24	.	.	.	.	.	.	.
392	160.320	.	.	.	.	.	.	.	.	.	.	.
394	160.930	.	.	.	.	.	.	.	.	.	.	.
395	161.260	2670	7.400	.	.	.	.	.	.	.	.	.
399	162.480	.	.	.	.	.	.	.	.	.	.	.
401	163.100	.	.	.	.	.	.	.	.	.	.	.
402	163.380	2630	7.350	.	.	.	.	.	.	.	.	.
406	164.620	.	.	.	.	.	.	.	.	.	.	.
408	165.230	.	.	.	.	.	.	.	.	.	.	.
409	165.530	2610	7.500	.	.	.	.	.	.	.	.	.
413	166.720	.	.	.	.	.	.	.	.	.	.	.
415	167.320	.	.	.	.	.	.	.	.	.	.	.
416	167.570	2800	7.800	142	18	0.400	58.000	3.800	2.000	0.000	430.000	1860.000
421	169.010	.	.	.	.	.	.	.	.	.	.	.
422	169.330	.	.	.	.	.	.	.	.	.	.	.
423	169.570	2880	7.800	.	.	.	.	.	.	.	.	.
427	170.710	.	.	.	.	.	.	.	.	.	.	.
429	171.270	.	.	.	.	.	.	.	.	.	.	.
431	171.820	2830	7.800	.	.	.	.	.	.	.	.	.
434	172.690	.	.	.	.	.	.	.	.	.	.	.
436	173.260	.	.	.	.	.	.	.	.	.	.	.

Table A1.6. FL6 effluent quality: Column 3.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
437	173.520	2780	7.850	.	.	.	.	.	.	.	.	.
441	174.650	.	.	.	.	.	.	.	.	.	.	.
443	175 210	.	.	.	.	.	.	.	.	.	.	.
444	175.500	3330	7.600	164	27	.	.	.	.	.	.	.
448	176.610	.	.	.	.	.	.	.	.	.	.	.
450	177.130	.	.	.	.	.	.	.	.	.	.	.
451	177.390	3400	7.550	.	.	.	.	.	.	.	.	.
455	178.540	.	.	.	.	.	.	.	.	.	.	.
458	179.310	3490	7.850	.	.	.	.	.	.	.	.	.
462	180.350	.	.	.	.	.	.	.	.	.	.	.
464	180.830	.	.	.	.	.	.	.	.	.	.	.
465	181.150	3530	7.750	.	.	.	.	.	.	.	.	.
469	182.350	.	.	.	.	.	.	.	.	.	.	.
471	182.810	.	.	.	.	.	.	.	.	.	.	.
472	183.070	3800	7.400	148	50	1.330	91.000	5.840	4.340	0.050	546.000	3180.000
476	184.300	.	.	.	.	.	.	.	.	.	.	.
478	184.830	.	.	.	.	.	.	.	.	.	.	.
479	185.110	.	.	.	.	.	.	.	.	.	.	.
483	186.330	.	.	.	.	.	.	.	.	.	.	.
485	186.800	.	.	.	.	.	.	.	.	.	.	.
486	187.060	4450	7.450	.	.	.	.	.	.	.	.	.
490	188.140	.	.	.	.	.	.	.	.	.	.	.
492	188.670	.	.	.	.	.	.	.	.	.	.	.
493	188.940	5000	7.700	.	.	.	.	.	.	.	.	.
500	190.800	4100	7.800	155	25	.	.	.	.	.	.	.
504	191.830	.	.	.	.	.	.	.	.	.	.	.
507	192.590	3760	7.850	.	.	.	.	.	.	.	.	.
511	193.560	.	.	.	.	.	.	.	.	.	.	.
513	194.050	.	.	.	.	.	.	.	.	.	.	.
514	194.330	3575	7.750	140	20	0.230	80.000	5.490	1.850	0.050	484.000	2950.000
519	195.550	.	.	.	.	.	.	.	.	.	.	.
520	195.800	.	.	.	.	.	.	.	.	.	.	.
521	196.030	3450	7.750	.	.	.	.	.	.	.	.	.
525	197.030	.	.	.	.	.	.	.	.	.	.	.
528	197.700	4070	8.000	147	22	0.120	98.000	5.860	1.610	0.070	504.000	3280.000
532	198.700	.	.	.	.	.	.	.	.	.	.	.
534	199.200	.	.	.	.	.	.	.	.	.	.	.
535	199.420	4060	7.700	.	.	.	.	.	.	.	.	.
539	200.380	.	.	.	.	.	.	.	.	.	.	.
542	201.100	4040	8.100	.	.	.	.	.	.	.	.	.
546	202.130	.	.	.	.	.	.	.	.	.	.	.

Table A1.6. FL6 effluent quality: Column 3.

Time (Days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
548	202.450	.	.	.	.	.	.	.	.	.	.	.
549	202.650	4000	7.950	.	.	.	.	.	.	.	.	.
553	203.530	.	.	.	.	.	.	.	.	.	.	.
555	203.940	.	.	.	.	.	.	.	.	.	.	.
556	204.180	4240	8.000	163	17	0.090	105.000	5.940	1.220	0.030	640.000	2700.000
560	205.160	.	.	.	.	.	.	.	.	.	.	.
562	205.640	.	.	.	.	.	.	.	.	.	.	.
563	205.860	4350	7.950	.	.	.	.	.	.	.	.	.
567	206.690	.	.	.	.	.	.	.	.	.	.	.
569	207.150	.	.	.	.	.	.	.	.	.	.	.
570	207.420	4300	7.800	.	.	.	.	.	.	.	.	.
574	208.340	.	.	.	.	.	.	.	.	.	.	.
576	208.720	.	.	.	.	.	.	.	.	.	.	.
577	208.720	.	.	.	.	.	.	.	.	.	.	.
581	208.720	.	.	.	.	.	.	.	.	.	.	.
584	208.820	.	.	.	.	.	.	.	.	.	.	.
591	209.060	4550	7.900	.	.	.	.	.	.	.	.	.
595	210.250	.	.	.	.	.	.	.	.	.	.	.
597	210.760	.	.	.	.	.	.	.	.	.	.	.
602	212.000	.	.	.	.	.	.	.	.	.	.	.
604	212.470	.	.	.	.	.	.	.	.	.	.	.
605	212.680	5000	7.800	.	.	.	.	.	.	.	.	.
609	213.160	.	.	.	.	.	.	.	.	.	.	.

Table A1.7. Seep 1 effluent quality: Column 1.

Time (days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy.	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
1	2.510	2240	7.400	21	6	0.020	6.800	0.700	0.200	0.000	222.000	1400.000
2	5.200	2300	7.450	18	3	0.010	6.800	0.700	0.200	0.000	206.000	.
3	7.450	2290	7.400	21	6	0.010	6.600	0.700	0.200	0.000	204.000	1550.000
4	10.200	2300	7.700	15	3	0.010	6.200	0.700	0.200	0.100	204.000	.
7	19.010	2375	6.900	15	6	0.020	6.400	0.700	0.300	0.100	196.000	1400.000
8	21.350	2325	7.150	15	9	0.030	6.400	0.700	0.300	0.100	198.000	.
9	23.750	2325	7.100	16	7	0.020	8.000	0.700	0.300	0.000	250.000	1430.000
10	26.020	2400	7.150	18	7	0.020	6.000	0.800	0.300	0.000	252.000	.
11	28.380	2250	7.300	15	7	0.020	8.000	0.800	0.300	0.000	220.000	1500.000
14	36.280	2350	7.600	14	4	0.020	8.000	0.800	0.300	0.000	214.000	1500.000
15	38.910	.	7.600	.	.	.	.	.	.	.	.	.
16	41.580	2240	7.400	14	.	0.020	7.000	0.800	0.300	0.000	216.000	1700.000
17	44.140	.	7.350	.	.	.	.	.	.	.	.	.
18	46.790	2200	7.400	18	10	0.020	7.000	0.800	0.300	0.000	210.000	1550.000
21	53.960	2290	7.200	14	10	0.020	8.000	0.800	0.300	.	204.000	1550.000
22	56.480	.	7.650	.	.	.	.	.	.	.	.	.
23	59.160	2225	7.300	14	7	.	.	.	.	.	.	.
24	61.690	.	7.400	.	.	.	.	.	.	.	.	.
25	64.340	2250	7.700	16	8	0.050	5.000	0.900	0.600	0.000	200.000	1300.000
28	72.010	2275	7.450	12	6	0.050	5.000	0.800	0.600	0.000	220.000	1330.000
29	74.620	.	7.650	.	.	.	.	.	.	.	.	.
30	77.060	.	.	.	.	.	.	.	.	.	.	.
31	79.680	.	7.600	.	.	.	.	.	.	.	.	.
32	82.240	1400	7.550	39	5	.	.	.	.	.	.	.
35	89.320	1375	7.600	30	7	0.050	3.000	0.600	0.400	0.000	120.000	2200.000
36	91.730	.	.	.	.	.	.	.	.	.	.	.
37	94.020	.	7.700	.	.	.	.	.	.	.	.	.
38	96.160	.	.	.	.	.	.	.	.	.	.	.
39	98.470	1375	7.350	29	10	0.050	3.000	0.600	0.400	0.000	120.000	800.000
42	105.700	.	7.700	35	7	.	.	.	.	.	.	.
43	108.100	.	.	.	.	.	.	.	.	.	.	.
44	110.640	.	.	.	.	.	.	.	.	.	.	.
45	113.100	1100	7.400	33	6	0.100	6.000	0.600	0.700	0.100	120.000	700.000
46	115.620	.	.	.	.	.	.	.	.	.	.	.
49	123.380	1175	7.350	30	13	.	.	.	.	.	.	.
51	128.180	.	.	.	.	.	.	.	.	.	.	.
52	130.720	1375	7.650	39	8	0.050	10.000	0.700	0.900	0.100	140.000	950.000
53	133.410	.	.	.	.	.	.	.	.	.	.	.
57	143.640	1490	7.400	34	7	.	.	.	.	.	.	.
58	146.190	.	.	.	.	.	.	.	.	.	.	.
59	148.700	1575	7.250	39	18	0.050	11.000	0.800	1.100	0.100	160.000	1000.000

Table A1.7. Seep 1 effluent quality: Column 1.

Time (days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy.	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
60	151.250	.	.	.	.	.	.	.	.	.	.	.
63	159.090	2190	6.950	28	21	.	.	.	.	.	.	.
64	161.970	.	.	.	.	.	.	.	.	.	.	.
65	165.090	.	.	.	.	.	.	.	.	.	.	.
66	168.250	2450	7.250	31	24	.	.	.	.	.	.	.
70	180.890	2550	7.150	41	36	.	.	.	.	.	.	.
71	184.040	.	.	.	.	.	.	.	.	.	.	.
72	187.440	.	.	.	.	.	.	.	.	.	.	.
73	190.540	2550	7.500	21	12	0.100	25.000	2.200	2.800	0.000	320.000	1800.000
74	193.790	.	.	.	.	.	.	.	.	.	.	.
77	199.890	2600	7.650	44	12	.	.	.	.	.	.	.
78	200.770	.	.	.	.	.	.	.	.	.	.	.
79	204.010	.	.	.	.	.	.	.	.	.	.	.
80	207.210	2600	7.400	31	12	.	.	.	.	.	.	.
84	208.470	2550	7.800	58	10	.	.	.	.	.	.	.
85	211.240	.	.	.	.	.	.	.	.	.	.	.
86	213.900	.	.	.	.	.	.	.	.	.	.	.
87	216.420	2575	7.450	26	9	0.100	29.000	2.200	3.500	0.100	240.000	1800.000
92	229.580	2450	7.450	31	16	.	.	.	.	.	.	.
93	232.060	.	.	.	.	.	.	.	.	.	.	.
94	234.690	2500	7.600	44	24	.	.	.	.	.	.	.
95	237.440	.	.	.	.	.	.	.	.	.	.	.
98	245.200	2450	7.550	26	18	.	.	.	.	.	.	.
99	247.830	.	.	.	.	.	.	.	.	.	.	.
100	250.400	.	.	.	.	.	.	.	.	.	.	.
102	255.300	2500	7.400	28	21	0.200	19.400	1.800	2.700	0.000	284.000	1560.000
105	263.220	.	.	.	.	.	.	.	.	.	.	.
107	268.770	.	.	.	.	.	.	.	.	.	.	.
108	271.020	2400	7.800	26	11	.	.	.	.	.	.	.
112	281.360	2225	7.300	31	18	.	.	.	.	.	.	.
113	283.980	.	.	.	.	.	.	.	.	.	.	.
114	286.520	.	.	.	.	.	.	.	.	.	.	.
115	289.040	2290	7.400	28	10	0.100	14.200	1.600	1.500	0.000	254.000	1300.000
116	292	.	.	.	.	.	.	.	.	.	.	.
119	300.840	2550	7.800	26	7	.	.	.	.	.	.	.
120	303.800	.	.	.	.	.	.	.	.	.	.	.
121	306.720	.	.	.	.	.	.	.	.	.	.	.
122	309.540	2650	7.350	21	6	.	.	.	.	.	.	.
123	312.550	.	.	.	.	.	.	.	.	.	.	.
126	320.900	1490	7.300	21	7	.	.	.	.	.	.	.
127	323.490	.	.	.	.	.	.	.	.	.	.	.

Table A1.7. Seep 1 effluent quality: Column 1.

Time (days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy.	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
128	326.250	.	.	.	.	.	.	.	.	.	.	.
129	329.030	1450	7.700	32	18	0.100	7.000	0.700	1.200	0.000	150.000	900.000
130	331.770	.	.	.	.	.	.	.	.	.	.	.
133	339.950	2100	7.700	28	0	.	.	.	.	.	.	.
134	342.820	.	.	.	.	.	.	.	.	.	.	.
135	345.330	.	.	.	.	.	.	.	.	.	.	.
136	347.930	2000	7.600	19	7.2	.	.	.	.	.	.	.
137	350.640	.	.	.	.	.	.	.	.	.	.	.
140	358.750	2000	7.600	.	.	.	.	.	.	.	.	.
141	361.480	.	.	.	.	.	.	.	.	.	.	.
142	364.470	.	.	.	.	.	.	.	.	.	.	.
142	364.470	.	.	.	.	.	.	.	.	.	.	.
143	367.470	2150	7.500	32	9	0.200	12.000	1.300	4.100	0.000	140.000	1500.000
144	370.560	.	.	.	.	.	.	.	.	.	.	.
147	378.580	2290	7.700	.	.	.	.	.	.	.	.	.
148	382.260	.	.	.	.	.	.	.	.	.	.	.
149	384.860	.	.	.	.	.	.	.	.	.	.	.
150	387.560	2275	7.650	24	7	.	.	.	.	.	.	.
151	390.180	.	.	.	.	.	.	.	.	.	.	.
155	400.700	.	.	.	.	.	.	.	.	.	.	.
156	403.240	.	.	.	.	.	.	.	.	.	.	.
157	405.860	1680	7.650	.	.	0.200	8.000	0.800	1.800	0.000	180.000	860.000
158	408.400	.	.	.	.	.	.	.	.	.	.	.
161	416.250	2030	7.600	.	.	.	.	.	.	.	.	.
162	418.900	.	.	.	.	.	.	.	.	.	.	.
163	421.520	.	.	.	.	.	.	.	.	.	.	.
164	424.170	1980	7.650	20	4.8	.	.	.	.	.	.	.
168	434.960	1930	7.600	.	.	.	.	.	.	.	.	.
169	437.580	.	.	.	.	.	.	.	.	.	.	.
170	440.150	.	.	.	.	.	.	.	.	.	.	.
171	442.810	2120	7.550	26	6	0.100	9.000	0.900	2.000	0.000	200.000	1080.000
172	445.340	.	.	.	.	.	.	.	.	.	.	.
175	453.280	2180	7.700	.	.	.	.	.	.	.	.	.
176	455.970	.	.	.	.	.	.	.	.	.	.	.
177	458.550	.	.	.	.	.	.	.	.	.	.	.
178	461.170	2050	7.550	22	9.6	.	.	.	.	.	.	.
182	471.790	.	.	.	.	.	.	.	.	.	.	.
183	474.390	.	.	.	.	.	.	.	.	.	.	.
184	476.990	.	.	.	.	.	.	.	.	.	.	.
185	479.630	2090	7.700	22	6	0.200	10.000	1.000	2.400	0.100	220.000	1100.000
186	482.270	.	.	.	.	.	.	.	.	.	.	.

Table A1.7. Seep 1 effluent quality: Column 1.

Time (days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy.	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
189	490.290	.	.	.	.	.	.	.	.	.	.	.
190	492.970	.	.	.	.	.	.	.	.	.	.	.
191	495.630	.	.	.	.	.	.	.	.	.	.	.
192	498.230	2100	7.450	22	9.1	.	.	.	.	.	.	.
193	500.840	.	.	.	.	.	.	.	.	.	.	.
196	508.890	.	.	.	.	.	.	.	.	.	.	.
197	511.590	.	.	.	.	.	.	.	.	.	.	.
198	514.170	.	.	.	.	.	.	.	.	.	.	.
199	516.800	2010	7.700	27	12	0.120	11.000	0.800	1.300	0.000	180.000	1250.000
203	527.610	.	.	.	.	.	.	.	.	.	.	.
204	530.340	.	.	.	.	.	.	.	.	.	.	.
205	532.900	.	.	.	.	.	.	.	.	.	.	.
206	535.600	1830	7.800	41	3.6	.	.	.	.	.	.	.
210	546.650	.	.	.	.	.	.	.	.	.	.	.
211	549.350	.	.	.	.	.	.	.	.	.	.	.
212	552.000	.	.	.	.	.	.	.	.	.	.	.
213	554.710	1700	7.700	38	6	0.100	8.000	0.600	1.200	0.000	144.000	980.000
214	557.310	.	.	.	.	.	.	.	.	.	.	.
217	558.310	.	.	.	.	.	.	.	.	.	.	.
220	565.520	1900	7.600	22	4.8	.	.	.	.	.	.	.
221	568.480	.	.	.	.	.	.	.	.	.	.	.
224	576.610	.	.	.	.	.	.	.	.	.	.	.
225	578.940	.	.	.	.	.	.	.	.	.	.	.
226	581.860	.	.	.	.	.	.	.	.	.	.	.
227	584.900	1950	7.350	22	6	0.130	14.000	1.000	2.500	0.000	198.000	1350.000
228	587.940	.	.	.	.	.	.	.	.	.	.	.
231	597.180	.	.	.	.	.	.	.	.	.	.	.
232	601.140	.	.	.	.	.	.	.	.	.	.	.
233	603.270	1900	7.650	19	4.8	.	.	.	.	.	.	.
238	617.870	.	.	.	.	.	.	.	.	.	.	.
239	617.940	.	.	.	.	.	.	.	.	.	.	.
240	619.790	.	.	.	.	.	.	.	.	.	.	.
241	621.720	2000	7.450	21.500	4.8	0.050	11.000	1.200	2.300	0.000	238.000	1350.000
242	624.950	.	.	.	.	.	.	.	.	.	.	.
245	631.710	.	.	.	.	.	.	.	.	.	.	.
246	634.830	.	.	.	.	.	.	.	.	.	.	.
248	641.050	2130	7.550	15	4.3	.	.	.	.	.	.	.
249	644.050	.	.	.	.	.	.	.	.	.	.	.
252	653.300	.	.	.	.	.	.	.	.	.	.	.
254	659.380	.	.	.	.	.	.	.	.	.	.	.
255	659.380	2100	7.650	22	4.3	.	.	.	.	.	.	.

Table A1.7. Seep 1 effluent quality: Column 1.

Time (days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy.	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
256	662.690	.	.	.	.	.	.	.	.	.	.	.
259	672.410	.	.	.	.	.	.	.	.	.	.	.
260	675.570	.	.	.	.	.	.	.	.	.	.	.
262	681.810	2110	7.400	16	11	0.100	11.000	1.100	2.200	0.000	248.000	1380.000
263	684.970	.	.	.	.	.	.	.	.	.	.	.
267	697.670	.	.	.	.	.	.	.	.	.	.	.
269	703.520	2050	7.350	15	8.4	.	.	.	.	.	.	.
270	706.860	.	.	.	.	.	.	.	.	.	.	.
274	718.660	.	.	.	.	.	.	.	.	.	.	.
276	724.660	2100	7.600	16	9	.	.	.	.	.	.	.
277	728.030	.	.	.	.	.	.	.	.	.	.	.
282	743.070	.	.	.	.	.	.	.	.	.	.	.
283	746.170	2025	7.900	16	6	.	.	.	.	.	.	.
288	760.360	.	.	.	.	.	.	.	.	.	.	.
289	763.460	.	.	.	.	.	.	.	.	.	.	.
290	766.650	1875	7.600	19	6	.	.	.	.	.	.	.
291	769.730	.	.	.	.	.	.	.	.	.	.	.
294	778.780	.	.	.	.	.	.	.	.	.	.	.
295	781.610	.	.	.	.		.	.	.	.	.	.
296	784.450	.	.	.	.	.	.	.	.	.	.	.
297	787.320	2050	7.600	13	7.2	.	.	.	.	.	.	.
298	790.260	.	.	.	.	.	.	.	.	.	.	.
301	799.110	.	.	.	.	.	.	.	.	.	.	.
302	802.000	.	.	.	.	.	.	.	.	.	.	.
304	807.910	2200	7.350	16	7.2	0.200	12.000	1.100	2.300	0.000	196.000	1500.000
305	810.920	.	.	.	.	.	.	.	.	.	.	.
308	819.720	.	.	.	.	.	.	.	.	.	.	.
310	825.430	.	.	.	.	.	.	.	.	.	.	.
311	825.570	2120	7.300	.	.	.	.	.	.	.	.	.
315	829.820	.	.	.	.	.	.	.	.	.	.	.
317	832.690	.	.	.	.	.	.	.	.	.	.	.
318	835.730	2000	7.250	.	.	.	.	.	.	.	.	.
323	851.390	.	.	.	.	.	.	.	.	.	.	.
324	854.460	.	.	.	.	.	.	.	.	.	.	.
325	857.610	2010	7.100	.	.	.	.	.	.	.	.	.
329	869.590	.	.	.	.	.	.	.	.	.	.	.
331	875.800	.	.	.	.	.	.	.	.	.	.	.
332	878.920	2120	7.550	15	7.3	.	.	.	.	.	.	.
336	892.040	.	.	.	.	.	.	.	.	.	.	.
338	897.380	.	.	.	.	.	.	.	.	.	.	.
339	900.140	2100	7.500	.	.	.	.	.	.	.	.	.

Table A1.7. Seep 1 effluent quality: Column 1.

Time (days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy.	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
343	910.710	.	.	.	.	.	.	.	.	.	.	.
345	916.270	.	.	.	.	.	.	.	.	.	.	.
346	919.390	2100	7.550	.	.	.	.	.	.	.	.	.
350	932.230	.	.	.	.	.	.	.	.	.	.	.
352	935.670	.	.	.	.	.	.	.	.	.	.	.
353	935.670	.	.	.	.	.	.	.	.	.	.	.
357	937.870	.	.	.	.	.	.	.	.	.	.	.
359	938.970	.	.	.	.	.	.	.	.	.	.	.
360	939.520	.	.	.	.	.	.	.	.	.	.	.
364	941.720	.	.	.	.	.	.	.	.	.	.	.
366	948.640	.	.	.	.	.	.	.	.	.	.	.
367	951.300	2070	7.500	.	.	.	.	.	.	.	.	.
371	962.800	.	.	.	.	.	.	.	.	.	.	.
388	964.700	620	7.150	16	2.4	.	.	.	.	.	.	.
392	975.340	.	.	.	.	.	.	.	.	.	.	.
394	981.340	.	.	.	.	.	.	.	.	.	.	.
395	984.320	610	7.750	.	.	.	.	.	.	.	.	.
399	996.350	.	.	.	.	.	.	.	.	.	.	.
401	1002.010	.	.	.	.	.	.	.	.	.	.	.
402	1004.770	990	7.650	.	.	.	.	.	.	.	.	.
406	1016.200	.	.	.	.	.	.	.	.	.	.	.
408	1021.760	.	.	.	.	.	.	.	.	.	.	.
409	1024.490	800	7.700	.	.	.	.	.	.	.	.	.
413	1035.400	.	.	.	.	.	.	.	.	.	.	.
415	1037.080	.	.	.	.	.	.	.	.	.	.	.
416	1040.080	1510	7.600	27	9.2	0.200	14.000	1.300	1.800	0.000	158.000	850.000
421	1055.410	.	.	.	.	.	.	.	.	.	.	.
422	1058.710	.	.	.	.	.	.	.	.	.	.	.
423	1061.160	1825	7.300	.	.	.	.	.	.	.	.	.
427	1072.940	.	.	.	.	.	.	.	.	.	.	.
429	1078.760	.	.	.	.	.	.	.	.	.	.	.
431	1084.660	2290	6.800	.	.	.	.	.	.	.	.	.
434	1093.720	.	.	.	.	.	.	.	.	.	.	.
436	1099.740	.	.	.	.	.	.	.	.	.	.	.
437	1102.460	2440	5.500	51	6	.	.	.	.	.	.	.
441	1114.560	.	.	.	.	.	.	.	.	.	.	.
443	1120.370	.	.	.	.	.	.	.	.	.	.	.
444	1123.230	2000	7.000	28	17	.	.	.	.	.	.	.
448	1132.470	.	.	.	.	.	.	.	.	.	.	.
450	1136.040	.	.	.	.	.	.	.	.	.	.	.
451	1137.760	1810	7.600	.	.	.	.	.	.	.	.	.

Table A1.7. Seep 1 effluent quality: Column 1.

Time (days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy.	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
455	1147.630	.	.	.	.	.	.	.	.	.	.	.
458	1155.440	1900	7.500	.	.	.	.	.	.	.	.	.
462	1165.560	.	.	.	.	.	.	.	.	.	.	.
464	1170.160	.	.	.	.	.	.	.	.	.	.	.
465	1170.160	.	.	.	.	.	.	.	.	.	.	.
469	1170.160	.	.	.	.	.	.	.	.	.	.	.
471	1171.280	.	.	.	.	.	.	.	.	.	.	.
472	1171.280	2090	7.700	55	12	0.300	12.000	1.170	1.600	0.040	278.000	1550.000
476	1180.330	.	.	.	.	.	.	.	.	.	.	.
478	1183.910	.	.	.	.	.	.	.	.	.	.	.
479	1185.810	.	.	.	.	.	.	.	.	.	.	.
483	1190.390	.	.	.	.	.	.	.	.	.	.	.
485	1192.960	.	.	.	.	.	.	.	.	.	.	.
486	1194.440	2225	7.600	.	.	.	.	.	.	.	.	.
490	1204.710	.	.	.	.	.	.	.	.	.	.	.
492	1209.630	.	.	.	.	.	.	.	.	.	.	.
493	1212.070	2250	7.300	.	.	.	.	.	.	.	.	.
500	1215.720	2400	7.450	29	9	.	.	.	.	.	.	.
504	1220.900	.	.	.	.	.	.	.	.	.	.	.
507	1235.800	2270	7.600	.	.	.	.	.	.	.	.	.
511	1242.030	.	.	.	.	.	.	.	.	.	.	.
513	1246.700	.	.	.	.	.	.	.	.	.	.	.
514	1246.920	.	.	.	.	.	.	.	.	.	.	.
519	1248.010	.	.	.	.	.	.	.	.	.	.	.
521	1248.450	1850	7.700	.	.	.	.	.	.	.	.	.
525	1257.190	.	.	.	.	.	.	.	.	.	.	.
528	1262.490	1800	7.500	37	12	0.040	12.000	1.000	1.720	0.050	220.000	1350.000
532	1270.720	.	.	.	.	.	.	.	.	.	.	.
534	1275.100	.	.	.	.	.	.	.	.	.	.	.
535	1276.860	2120	7.650	.	.	.	.	.	.	.	.	.
539	1280.890	.	.	.	.	.	.	.	.	.	.	.
542	1280.890	.	.	.	.	.	.	.	.	.	.	.
546	1280.890	.	.	.	.	.	.	.	.	.	.	.
548	1282.140	.	.	.	.	.	.	.	.	.	.	.
549	1284.150	2100	7.500	.	.	.	.	.	.	.	.	.
553	1293.570	.	.	.	.	.	.	.	.	.	.	.
555	1298.610	.	.	.	.	.	.	.	.	.	.	.
556	1300.360	2000	7.800	26	12	0.040	8.200	0.710	0.860	0.020	360.000	1220.000
560	1311.060	.	.	.	.	.	.	.	.	.	.	.
562	1315.490	.	.	.	.	.	.	.	.	.	.	.
563	1317.490	2025	7.550	.	.	.	.	.	.	.	.	.

Table A1.7. Seep 1 effluent quality: Column 1.

Time (days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy.	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
567	1326.770	.	.	.	.	.	.	.	.	.	.	.
569	1332.860	.	.	.	.	.	.	.	.	.	.	.
570	1335.960	1900	7.350	.	.	.	.	.	.	.	.	.
574	1348.150	.	.	.	.	.	.	.	.	.	.	.
576	1350.480	.	.	.	.	.	.	.	.	.	.	.
577	1350.480	.	.	.	.	.	.	.	.	.	.	.
581	1350.480	.	.	.	.	.	.	.	.	.	.	.
584	1350.480	.	.	.	.	.	.	.	.	.	.	.
591	1354.080	2000	7.200	.	.	.	.	.	.	.	.	.
595	1366.020	.	.	.	.	.	.	.	.	.	.	.
597	1371.100	.	.	.	.	.	.	.	.	.	.	.
602	1383.670	.	.	.	.	.	.	.	.	.	.	.
604	1386.570	.	.	.	.	.	.	.	.	.	.	.
605	1388.960	2000	7.300	.	.	.	.	.	.	.	.	.
609	1398.860	.	.	.	.	.	.	.	.	.	.	.

Table A1.8. Seep 1 effluent quality: Column 2.

Time (days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy.	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
1	2.520	2210	7.500	18	6	0.010	6.800	0.700	0.200	0.000	224.000	1400.000
2	5.200	2330	7.600	18	3	0.010	6.800	0.700	0.200	0.000	204.000	.
3	7.450	2300	7.500	15	3	0.010	6.600	0.700	0.200	0.000	204.000	1480.000
4	10.220	2250	7.800	21	3	0.020	6.100	0.700	0.200	0.000	200.000	.
7	18.820	2360	7.000	15	3	0.020	6.500	0.700	0.300	0.100	202.000	1400.000
8	21.320	2350	7.400	15	9	0.010	6.300	0.700	0.300	0.100	204.000	.
9	23.980	2360	7.400	14	5	0.030	8.000	0.700	0.300	0.000	248.000	1480.000
10	26.600	2400	7.150	19	5	0.020	6.000	0.800	0.300	0.000	256.000	.
11	29.120	2300	7.250	14	6	0.020	6.000	0.800	0.300	0.000	218.000	1530.000
14	36.920	2340	7.550	14	7	0.030	8.000	0.800	0.200	0.100	222.000	1500.000
15	39.380	.	7.600	.	.	.	.	.	.	.	.	.
16	41.850	2240	7.400	14	7	0.010	8.000	0.800	0.300	0.000	216.000	1660.000
17	44.240	.	7.450	.	.	.	.	.	.	.	.	.
18	46.760	2225	7.500	21	7	0.010	7.000	0.800	0.300	0.000	218.000	1480.000
21	53.540	2280	7.450	12	7	0.010	9.000	0.800	0.300	0.000	202.000	1530.000
22	56.070	.	7.650	.	.	.	.	.	.	.	.	.
23	58.760	2240	7.350	15	5	.	.	.	.	.	.	.
24	61.390	.	7.500	.	.	.	.	.	.	.	.	.
25	64.200	2225	7.600	14	7	0.050	5.000	0.900	0.600	0.000	220.000	1300.000
28	72.470	2300	7.400	14	9	0.050	5.000	0.800	0.600	0.000	220.000	1350.000
29	75.270	.	7.550	.	.	.	.	.	.	.	.	.
30	77.920	.	.	.	.	.	.	.	.	.	.	.
31	80.740	.	7.700	.	.	.	.	.	.	.	.	.
32	83.490	1400	7.450	36	5	.	.	.	.	.	.	.
35	91.090	1375	7.500	29	6	0.050	3.000	0.600	0.500	0.000	120.000	850.000
36	93.710	.	.	.	.	.	.	.	.	.	.	.
37	96.190	.	7.700	.	.	.	.	.	.	.	.	.
38	97.520	.	.	.	.	.	.	.	.	.	.	.
39	100.040	1375	7.500	27	6	0.050	3.000	0.600	0.400	0.000	120.000	800.000
42	100.200	.	7.800	49	7	.	.	.	.	.	.	.
43	103.000	.	.	.	.	.	.	.	.	.	.	.
44	105.760	.	.	.	.	.	.	.	.	.	.	.
45	108.380	1125	7.400	28	0	0.100	6.000	0.600	0.500	0.100	120.000	700.000
46	111.020	.	.	.	.	.	.	.	.	.	.	.
49	118.970	1190	7.350	29	10	.	.	.	.	.	.	.
51	123.900	.	.	.	.	.	.	.	.	.	.	.
52	126.500	1425	7.700	37	7	0.050	10.000	0.700	1.000	0.000	160.000	900.000
53	129.190	.	.	.	.	.	.	.	.	.	.	.
57	139.440	1520	7.400	30	7	.	.	.	.	.	.	.
58	141.980	.	.	.	.	.	.	.	.	.	.	.

Table A1.8. Seep 1 effluent quality: Column 2.

Time (days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy.	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
59	144.490	1600	7.400	36	12	0.050	11.000	0.800	1.100	0.100	160.000	1000.000
60	147.050	.	.	.	.	.	.	.	.	.	.	.
63	147.330	.	.	.	.	.	.	.	.	.	.	.
64	149.960	.	.	.	.	.	.	.	.	.	.	.
65	152.940	.	.	.	.	.	.	.	.	.	.	.
66	155.760	1960	7.450	26	19	.	.	.	.	.	.	.
70	167.510	2450	7.200	33	42	.	.	.	.	.	.	.
71	170.500	.	.	.	.	.	.	.	.	.	.	.
72	173.500	.	.	.	.	.	.	.	.	.	.	.
73	176.330	2500	7.500	23	6	0.050	24.000	2.100	2.400	0.000	280.000	1850.000
74	179.280	.	.	.	.	.	.	.	.	.	.	.
77	184.620	2590	7.500	39	14	.	.	.	.	.	.	.
78	187.460	.	.	.	.	.	.	.	.	.	.	.
79	190.420	.	.	.	.	.	.	.	.	.	.	.
80	193.240	2600	7.450	26	9	.	.	.	.	.	.	.
84	204.090	2600	7.250	29	10	.	.	.	.	.	.	.
85	206.730	.	.	.	.	.	.	.	.	.	.	.
86	209.330	.	.	.	.	.	.	.	.	.	.	.
87	211.810	2575	7.150	26	6	0.100	27.000	2.200	3.500	0.100	220.000	2080.000
92	225.090	2490	7.450	26	12	.	.	.	.	.	.	.
93	227.610	.	.	.	.	.	.	.	.	.	.	.
94	230.260	2480	7.500	36	15	.	.	.	.	.	.	.
95	233.030	.	.	.	.	.	.	.	.	.	.	.
98	240.860	2450	7.450	22	15	.	.	.	.	.	.	.
99	243.550	.	.	.	.	.	.	.	.	.	.	.
100	246.170	.	.	.	.	.	.	.	.	.	.	.
102	251.280	2475	7.400	23	18	0.200	21.000	1.900	2.700	0.000	298.000	1560.000
105	259.530	.	.	.	.	.	.	.	.	.	.	.
107	265.330	.	.	.	.	.	.	.	.	.	.	.
108	267.700	2600	7.700	25	8	.	.	.	.	.	.	.
112	278.390	2250	7.400	26	18	.	.	.	.	.	.	.
113	281.040	.	.	.	.	.	.	.	.	.	.	.
114	283.670	.	.	.	.	.	.	.	.	.	.	.
115	286.270	2300	7.500	23	7	0.100	15.000	1.600	1.800	0.000	246.000	1260.000
116	289.300	.	.	.	.	.	.	.	.	.	.	.
119	297.950	2600	7.750	25	9	.	.	.	.	.	.	.
120	300.730	.	.	.	.	.	.	.	.	.	.	.
121	303.470	.	.	.	.	.	.	.	.	.	.	.
122	306.180	2650	7.300	23	12	.	.	.	.	.	.	.
123	309.110	.	.	.	.	.	.	.	.	.	.	.

Table A1.8. Seep 1 effluent quality: Column 2.

Time (days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy.	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
126	317.190	1500	7.200	23	12	.	.	.	.	.	.	.
127	319.710	.	.	.	.	.	.	.	.	.	.	.
128	322.390	.	.	.	.	.	.	.	.	.	.	.
129	325.080	1450	7.800	32	18	0.100	7.000	0.700	1.200	0.000	148.000	900.000
130	327.710	.	.	.	.	.	.	.	.	.	.	.
133	336.770	2050	7.650	26	11	.	.	.	.	.	.	.
134	339.980	.	.	.	.	.	.	.	.	.	.	.
135	342.860	.	.	.	.	.	.	.	.	.	.	.
136	345.960	1975	7.550	22	6	.	.	.	.	.	.	.
137	348.450	.	.	.	.	.	.	.	.	.	.	.
140	357.190	2050	7.550	.	.	.	.	.	.	.	.	.
141	360.060	.	.	.	.	.	.	.	.	.	.	.
142	363.180	.	.	.	.	.	.	.	.	.	.	.
142	363.180	.	.	.	.	.	.	.	.	.	.	.
143	366.340	2175	7.600	32	9	0.100	11.000	1.300	4.400	0.000	230.000	1500.000
144	369.550	.	.	.	.	.	.	.	.	.	.	.
147	378.810	2250	7.700	.	.	.	.	.	.	.	.	.
148	381.570	.	.	.	.	.	.	.	.	.	.	.
149	384.260	.	.	.	.	.	.	.	.	.	.	.
150	387.050	2275	7.600	27	12	.	.	.	.	.	.	.
151	389.770	.	.	.	.	.	.	.	.	.	.	.
155	389.990	.	.	.	.	.	.	.	.	.	.	.
156	390.350	.	.	.	.	.	.	.	.	.	.	.
157	391.710	1700	7.650	.	.	0.200	8.000	0.800	2.000	0.000	180.000	860.000
158	393.820	.	.	.	.	.	.	.	.	.	.	.
161	401.620	2020	7.700	.	.	.	.	.	.	.	.	.
162	404.160	.	.	.	.	.	.	.	.	.	.	.
163	406.680	.	.	.	.	.	.	.	.	.	.	.
164	409.240	1970	7.600	23	7.8	.	.	.	.	.	.	.
168	419.510	1940	7.500	.	.	.	.	.	.	.	.	.
169	421.990	.	.	.	.	.	.	.	.	.	.	.
170	424.380	.	.	.	.	.	.	.	.	.	.	.
171	426.840	2100	7.500	22	9	0.100	10.000	0.900	1.900	0.000	240.000	1100.000
172	429.220	.	.	.	.	.	.	.	.	.	.	.
175	436.460	2100	7.600	.	.	.	.	.	.	.	.	.
176	438.880	.	.	.	.	.	.	.	.	.	.	.
177	441.170	.	.	.	.	.	.	.	.	.	.	.
178	443.490	2050	7.600	24	7.2	.	.	.	.	.	.	.
182	452.930	.	.	.	.	.	.	.	.	.	.	.
183	455.240	.	.	.	.	.	.	.	.	.	.	.
184	457.540	.	.	.	.	.	.	.	.	.	.	.

Table A1.8. Seep 1 effluent quality: Column 2.

Time (days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy.	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
185	459.810	2050	7.500	22	8.4	0.100	9.000	0.900	1.800	0.000	380.000	1060.000
186	462.070	.	.	.	.	.	.	.	.	.	.	.
189	468.970	.	.	.	.	.	.	.	.	.	.	.
190	471.240	.	.	.	.	.	.	.	.	.	.	.
191	474.330	.	.	.	.	.	.	.	.	.	.	.
192	477.250	2100	7.400	15	7.2	.	.	.	.	.	.	.
193	479.970	.	.	.	.	.	.	.	.	.	.	.
196	487.470	.	.	.	.	.	.	.	.	.	.	.
197	489.790	.	.	.	.	.	.	.	.	.	.	.
198	491.790	.	.	.	.	.	.	.	.	.	.	.
199	494.960	2050	7.550	22	12	0.110	11.000	0.700	1.200	0.000	180.000	1250.000
203	509.120	.	.	.	.	.	.	.	.	.	.	.
204	512.110	.	.	.	.	.	.	.	.	.	.	.
205	514.890	.	.	.	.	.	.	.	.	.	.	.
206	517.750	1830	7.700	42	4.8	.	.	.	.	.	.	.
210	529.430	.	.	.	.	.	.	.	.	.	.	.
211	532.270	.	.	.	.	.	.	.	.	.	.	.
212	535.020	.	.	.	.	.	.	.	.	.	.	.
213	537.840	1700	7.500	30	5.4	0.090	8.000	0.600	1.200	0.000	146.000	950.000
214	540.580	.	.	.	.	.	.	.	.	.	.	.
217	549.300	.	.	.	.	.	.	.	.	.	.	.
220	557.760	1990	7.500	19	4.8	.	.	.	.	.	.	.
221	560.510	.	.	.	.	.	.	.	.	.	.	.
224	569.140	.	.	.	.	.	.	.	.	.	.	.
225	572.110	.	.	.	.	.	.	.	.	.	.	.
226	574.900	.	.	.	.	.	.	.	.	.	.	.
227	577.830	1900	7.400	24	12	0.130	14.000	0.900	2.300	0.000	200.000	1320.000
228	580.760	.	.	.	.	.	.	.	.	.	.	.
231	589.660	.	.	.	.	.	.	.	.	.	.	.
232	593.460	.	.	.	.	.	.	.	.	.	.	.
233	595.520	1900	7.500	17	4.8	.	.	.	.	.	.	.
238	609.800	.	.	.	.	.	.	.	.	.	.	.
239	611.290	.	.	.	.	.	.	.	.	.	.	.
240	613.110	.	.	.	.	.	.	.	.	.	.	.
241	614.900	2000	7.350	16	4.8	0.100	10.000	1.200	2.000	0.000	238.000	1380.000
242	617.710	.	.	.	.	.	.	.	.	.	.	.
245	625.410	.	.	.	.	.	.	.	.	.	.	.
246	628.000	.	.	.	.	.	.	.	.	.	.	.
248	634.020	2140	7.500	16	3.6	.	.	.	.	.	.	.
249	636.860	.	.	.	.	.	.	.	.	.	.	.
252	645.620	.	.	.	.	.	.	.	.	.	.	.

Table A1.8. Seep 1 effluent quality: Column 2.

Time (days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy.	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
254	651.320	.	.	.	.	.	.	.	.	.	.	.
255	654.320	2150	7.450	16	3.6	.	.	.	.	.	.	.
256	657.200	.	.	.	.	.	.	.	.	.	.	.
259	665.780	.	.	.	.	.	.	.	.	.	.	.
260	668.610	.	.	.	.	.	.	.	.	.	.	.
262	674.190	2110	7.300	16	11	0.200	11.000	1.100	2.400	0.000	246.000	1380.000
263	677.050	.	.	.	.	.	.	.	.	.	.	.
267	688.570	.	.	.	.	.	.	.	.	.	.	.
269	693.830	2050	7.200	15	9.1	.	.	.	.	.	.	.
270	696.840	.	.	.	.	.	.	.	.	.	.	.
274	707.480	.	.	.	.	.	.	.	.	.	.	.
276	713.040	2025	7.550	16	9	.	.	.	.	.	.	.
277	716.280	.	.	.	.	.	.	.	.	.	.	.
282	731.010	.	.	.	.	.	.	.	.	.	.	.
283	734.030	2010	7.750	18	9	.	.	.	.	.	.	.
288	748.280	.	.	.	.	.	.	.	.	.	.	.
289	751.170	.	.	.	.	.	.	.	.	.	.	.
290	754.220	1925	7.650	19	6	.	.	.	.	.	.	.
291	756.770	.	.	.	.	.	.	.	.	.	.	.
294	756.770	.	.	.	.	.	.	.	.	.	.	.
295	759.870	.	.	.	.	.	.	.	.	.	.	.
296	763.090	.	.	.	.	.	.	.	.	.	.	.
297	766.230	2090	7.450	14	2.9	.	.	.	.	.	.	.
298	769.420	.	.	.	.	.	.	.	.	.	.	.
301	778.870	.	.	.	.	.	.	.	.	.	.	.
302	781.950	.	.	.	.	.	.	.	.	.	.	.
304	788.270	2170	7.350	16	3.9	0.200	12.000	1.100	2.300	0.000	194.000	1500.000
305	791.490	.	.	.	.	.	.	.	.	.	.	.
308	800.920	.	.	.	.	.	.	.	.	.	.	.
310	807.060	.	.	.	.	.	.	.	.	.	.	.
311	807.220	2100	7.250	.	.	.	.	.	.	.	.	.
315	822.600	.	.	.	.	.	.	.	.	.	.	.
317	827.820	.	.	.	.	.	.	.	.	.	.	.
318	830.930	2050	7.350	.	.	.	.	.	.	.	.	.
323	845.570	.	.	.	.	.	.	.	.	.	.	.
324	848.580	.	.	.	.	.	.	.	.	.	.	.
325	849.890	2050	7.350	.	.	.	.	.	.	.	.	.
329	862.880	.	.	.	.	.	.	.	.	.	.	.
331	869.200	.	.	.	.	.	.	.	.	.	.	.
332	872.280	2100	7.350	11	8.5	.	.	.	.	.	.	.
336	885.750	.	.	.	.	.	.	.	.	.	.	.

Table A1.8. Seep 1 effluent quality: Column 2.

Time (days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy.	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
338	891.670	.	.	.	.	.	.	.	.	.	.	.
339	894.870	2100	7.450	.	.	.	.	.	.	.	.	.
343	907.680	.	.	.	.	.	.	.	.	.	.	.
345	913.890	.	.	.	.	.	.	.	.	.	.	.
346	916.900	2100	7.450	.	.	.	.	.	.	.	.	.
350	929.300	.	.	.	.	.	.	.	.	.	.	.
352	935.340	.	.	.	.	.	.	.	.	.	.	.
353	938.440	2230	7.350	.	.	.	.	.	.	.	.	.
357	951.750	.	.	.	.	.	.	.	.	.	.	.
359	957.640	.	.	.	.	.	.	.	.	.	.	.
360	960.770	2090	7.450	16	6.1	0.080	11.000	1.000	1.900	0.000	.	1350.000
364	961.150	.	.	.	.	.	.	.	.	.	.	.
366	961.350	.	.	.	.	.	.	.	.	.	.	.
367	961.440	.	.	.	.	.	.	.	.	.	.	.
371	961.830	.	.	.	.	.	.	.	.	.	.	.
388	963.460	620	7.250	19	4.9	.	.	.	.	.	.	.
392	977.060	.	.	.	.	.	.	.	.	.	.	.
394	983.680	.	.	.	.	.	.	.	.	.	.	.
395	987.000	610	7.650	.	.	.	.	.	.	.	.	.
399	1000.390	.	.	.	.	.	.	.	.	.	.	.
401	1006.780	.	.	.	.	.	.	.	.	.	.	.
402	1009.900	1190	7.550	.	.	.	.	.	.	.	.	.
406	1022.940	.	.	.	.	.	.	.	.	.	.	.
408	1029.530	.	.	.	.	.	.	.	.	.	.	.
409	1032.850	810	7.650	.	.	.	.	.	.	.	.	.
413	1046.230	.	.	.	.	.	.	.	.	.	.	.
415	1053.230	.	.	.	.	.	.	.	.	.	.	.
416	1055.230	1630	6.950	27	9.2	.	.	.	.	.	.	.
421	1071.010	.	.	.	.	.	.	.	.	.	.	.
422	1074.430	.	.	.	.	.	.	.	.	.	.	.
423	1076.970	1825	7.300	.	.	.	.	.	.	.	.	.
427	1089.130	.	.	.	.	.	.	.	.	.	.	.
429	1094.970	.	.	.	.	.	.	.	.	.	.	.
431	1100.760	2300	6.850	.	.	.	.	.	.	.	.	.
434	1109.530	.	.	.	.	.	.	.	.	.	.	.
436	1115.170	.	.	.	.	.	.	.	.	.	.	.
437	1117.730	2480	6.700	42	22	.	.	.	.	.	.	.
441	1129.020	.	.	.	.	.	.	.	.	.	.	.
443	1134.120	.	.	.	.	.	.	.	.	.	.	.
444	1134.120	1900	7.100	33	12	.	.	.	.	.	.	.
448	1146.120	.	.	.	.	.	.	.	.	.	.	.

Table A1.8. Seep 1 effluent quality: Column 2.

Time (days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy.	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
450	1151.580	.	.	.	.	.	.	.	.	.	.	.
451	1154.300	1870	7.400	.	.	.	.	.	.	.	.	.
455	1166.130	.	.	.	.	.	.	.	.	.	.	.
458	1173.790	1900	7.500	.	.	.	.	.	.	.	.	.
462	1183.680	.	.	.	.	.	.	.	.	.	.	.
464	1188.500	.	.	.	.	.	.	.	.	.	.	.
465	1188.500	.	.	.	.	.	.	.	.	.	.	.
469	1188.500	.	.	.	.	.	.	.	.	.	.	.
471	1192.260	.	.	.	.	.	.	.	.	.	.	.
472	1195.360	1980	7.550	33	18	0.180	15.000	1.230	2.350	0.030	250.000	1550.000
476	1202.210	.	.	.	.	.	.	.	.	.	.	.
478	1203.940	.	.	.	.	.	.	.	.	.	.	.
479	1205.390	.	.	.	.	.	.	.	.	.	.	.
483	1215.290	.	.	.	.	.	.	.	.	.	.	.
485	1219.090	.	.	.	.	.	.	.	.	.	.	.
486	1221.740	2225	7.500	.	.	.	.	.	.	.	.	.
490	1232.720	.	.	.	.	.	.	.	.	.	.	.
492	1238.020	.	.	.	.	.	.	.	.	.	.	.
493	1240.660	2300	7.400	.	.	.	.	.	.	.	.	.
500	1252.250	2400	7.450	32	12	.	.	.	.	.	.	.
504	1269.470	.	.	.	.	.	.	.	.	.	.	.
507	1276.770	2320	7.450	.	.	.	.	.	.	.	.	.
511	1286.560	.	.	.	.	.	.	.	.	.	.	.
513	1291.330	.	.	.	.	.	.	.	.	.	.	.
514	1294.060	2300	7.600	26	5	0.040	12.000	1.310	1.570	0.030	326.000	1800.000
519	1306.130	.	.	.	.	.	.	.	.	.	.	.
521	1310.810	1790	7.700	.	.	.	.	.	.	.	.	.
525	1320.770	.	.	.	.	.	.	.	.	.	.	.
528	1327.570	1820	7.500	34	8.6	0.030	11.000	0.930	1.280	0.050	224.000	1400.000
532	1337.360	.	.	.	.	.	.	.	.	.	.	.
534	1342.160	.	.	.	.	.	.	.	.	.	.	.
535	1344.250	2200	7.600	.	.	.	.	.	.	.	.	.
539	1353.600	.	.	.	.	.	.	.	.	.	.	.
542	1360.490	2100	7.700	.	.	.	.	.	.	.	.	.
546	1370.860	.	.	.	.	.	.	.	.	.	.	.
548	1373.840	.	.	.	.	.	.	.	.	.	.	.
549	1375.760	2100	7.550	.	.	.	.	.	.	.	.	.
553	1384.800	.	.	.	.	.	.	.	.	.	.	.
555	1389.860	.	.	.	.	.	.	.	.	.	.	.
556	1391.660	2020	7.700	27	12	0.030	7.500	0.560	0.650	0.020	380.000	1220.000
560	1402.140	.	.	.	.	.	.	.	.	.	.	.

Table A1.8. Seep 1 effluent quality: Column 2.

Time (days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy.	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
562	1406.940	.	.	.	.	.	.	.	.	.	.	.
563	1409.320	2100	7.500	.	.	.	.	.	.	.	.	.
567	1420.740	.	.	.	.	.	.	.	.	.	.	.
569	1426.500	.	.	.	.	.	.	.	.	.	.	.
570	1429.630	1875	7.350	.	.	.	.	.	.	.	.	.
574	1443.280	.	.	.	.	.	.	.	.	.	.	.
576	1445.480	.	.	.	.	.	.	.	.	.	.	.
577	1445.480	.	.	.	.	.	.	.	.	.	.	.
581	1445.480	.	.	.	.	.	.	.	.	.	.	.
584	1445.480	.	.	.	.	.	.	.	.	.	.	.
591	1445.480	.	.	.	.	.	.	.	.	.	.	.
595	1445.480	.	.	.	.	.	.	.	.	.	.	.
597	1445.480	.	.	.	.	.	.	.	.	.	.	.
602	1459.760	.	.	.	.	.	.	.	.	.	.	.
604	1464.920	.	.	.	.	.	.	.	.	.	.	.
605	1467.540	2000	7.300	.	.	.	.	.	.	.	.	.
609	1478.270	.	.	.	.	.	.	.	.	.	.	.

Table A1.9. Seep 1 effluent quality: Column 3.

Time (days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy.	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
1	2.240	2250	7.400	15	6	0.020	6.800	0.700	0.200	0.000	226.000	1350.000
2	4.400	2325	7.450	18	3	0.010	6.900	0.700	0.200	0.000	214.000	.
3	6.690	2325	7.500	18	6	0.020	6.800	0.800	0.200	0.100	202.000	1250.000
4	9.450	2250	7.850	21	6	0.010	6.300	0.700	0.200	0.100	200.000	.
7	17.480	2360	7.050	15	3	0.020	6.600	0.800	0.400	0.100	206.000	1400.000
8	20.070	2325	7.250	15	6	0.030	6.600	0.700	0.400	0.000	200.000	.
9	22.590	2290	7.250	16	4.8	0.020	8.000	0.700	0.300	0.000	248.000	1530.000
10	25.050	2400	7.250	15	3.6	0.020	6.000	0.800	0.300	0.000	252.000	.
11	27.140	2350	7.400	14	5	0.020	6.000	0.800	0.300	0.000	220.000	1500.000
14	34.470	2350	7.400	14	7	0.020	7.000	0.800	0.300	0.000	218.000	1530.000
15	36.970	.	7.550	.	.	.	.	.	.	.	.	.
16	39.460	2225	7.700	16	6	0.010	8.000	0.800	0.300	0.000	214.000	1660.000
17	41.870	.	7.400	.	.	.	.	.	.	.	.	.
18	44.410	2225	7.600	22	6	0.010	8.000	0.800	0.300	0.000	216.000	1530.000
21	51.140	2280	7.450	12	7	0.010	9.000	0.800	0.300	0.000	214.000	1480.000
22	53.560	.	7.700	.	.	.	.	.	.	.	.	.
23	56.410	2250	7.400	16	6	.	.	.	.	.	.	.
24	58.950	.	7.500	.	.	.	.	.	.	.	.	.
25	61.630	2225	7.250	14	4.8	0.050	5.000	0.900	0.700	0.000	220.000	1350.000
28	69.390	2300	7.450	14	6	0.050	5.000	0.800	0.600	0.000	220.000	1350.000
29	72.070	.	7.600	.	.	.	.	.	.	.	.	.
30	74.540	.	.	.	.	.	.	.	.	.	.	.
31	77.200	.	7.700	.	.	.	.	.	.	.	.	.
32	79.780	1420	7.450	39	4	.	.	.	.	.	.	.
35	86.900	1400	7.550	29	6	0.050	3.000	0.600	0.400	0.000	120.000	830.000
36	89.320	.	.	.	.	.	.	.	.	.	.	.
37	91.620	.	7.750	.	.	.	.	.	.	.	.	.
38	93.780	.	.	.	.	.	.	.	.	.	.	.
39	96.110	1380	7.500	25	6	0.050	3.000	0.600	0.400	0.000	140.000	800.000
42	103.400	.	7.800	38	7	.	.	.	.	.	.	.
43	105.800	.	.	.	.	.	.	.	.	.	.	.
44	108.360	.	.	.	.	.	.	.	.	.	.	.
45	110.820	1150	7.500	36	0.	0.050	6.000	0.600	0.700	0.100	120.000	650.000
46	113.360	.	.	.	.	.	.	.	.	.	.	.
49	121.200	1190	7.350	27	8.4	0.050	9.000	0.700	0.800	0.000	140.000	850.000
51	126.050	.	.	.	.	.	.	.	.	.	.	.
52	128.590	1375	7.700	33	5.9	.	.	.	.	.	.	.
53	131.280	.	.	.	.	.	.	.	.	.	.	.
57	141.520	1500	7.250	27	7.2	.	.	.	.	.	.	.
58	144.060	.	.	.	.	.	.	.	.	.	.	.
59	146.590	1600	7.500	41	12	0.050	11.000	0.800	1.100	0.100	160.000	1000.000

Table A1.9. Seep 1 effluent quality: Column 3.

Time (days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy.	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
60	149.170	.	.	.	.	.	.	.	.	.	.	.
63	157.060	1900	7.200	28	12	.	.	.	.	.	.	.
64	159.590	.	.	.	.	.	.	.	.	.	.	.
65	162.020	.	.	.	.	.	.	.	.	.	.	.
66	164.400	2350	7.400	33	18	.	.	.	.	.	.	.
70	174.680	2600	7.000	33	69	.	.	.	.	.	.	.
71	177.600	.	.	.	.	.	.	.	.	.	.	.
72	180.800	.	.	.	.	.	.	.	.	.	.	.
73	183.720	2525	7.500	23	6	0.050	25.000	2.200	2.800	0.000	260.000	1840.000
74	186.770	.	.	.	.	.	.	.	.	.	.	.
77	195.610	2550	7.450	22	8.4	.	.	.	.	.	.	.
78	197.310	.	.	.	.	.	.	.	.	.	.	.
79	200.190	.	.	.	.	.	.	.	.	.	.	.
80	203.010	2620	7.500	26	15	.	.	.	.	.	.	.
84	214.070	2600	7.350	24	10	.	.	.	.	.	.	.
85	216.820	.	.	.	.	.	.	.	.	.	.	.
86	219.520	.	.	.	.	.	.	.	.	.	.	.
87	222.100	2550	7.500	23	6	0.200	28.000	2.200	3.800	0.100	260.000	1880.000
92	235.520	2450	7.450	26	16	.	.	.	.	.	.	.
93	237.880	.	.	.	.	.	.	.	.	.	.	.
94	240.570	2500	7.550	36	21	.	.	.	.	.	.	.
95	243.380	.	.	.	.	.	.	.	.	.	.	.
98	251.350	2500	7.550	26	18	.	.	.	.	.	.	.
99	254.060	.	.	.	.	.	.	.	.	.	.	.
100	256.680	.	.	.	.	.	.	.	.	.	.	.
102	261.780	2550	7.450	26	18	0.200	20.000	1.900	2.800	0.000	304.000	1560.000
105	269.650	.	.	.	.	.	.	.	.	.	.	.
107	275.350	.	.	.	.	.	.	.	.	.	.	.
108	277.630	2600	7.700	25	9.6	.	.	.	.	.	.	.
112	287.640	2225	7.400	31	21	.	.	.	.	.	.	.
113	289.950	.	.	.	.	.	.	.	.	.	.	.
114	292.280	.	.	.	.	.	.	.	.	.	.	.
115	295.300	2250	7.600	29	8.4	0.200	15.000	1.600	2.200	0.000	250.000	1260.000
116	298.170	.	.	.	.	.	.	.	.	.	.	.
119	306.690	2600	7.700	26	10	.	.	.	.	.	.	.
120	309.460	.	.	.	.	.	.	.	.	.	.	.
121	312.230	.	.	.	.	.	.	.	.	.	.	.
122	314.930	2650	7.400	23	6	.	.	.	.	.	.	.
123	317.800	.	.	.	.	.	.	.	.	.	.	.
126	325.610	1500	7.100	25	14	.	.	.	.	.	.	.
127	327.930	.	.	.	.	.	.	.	.	.	.	.

Table A1.9. Seep 1 effluent quality: Column 3.

Time (days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy.	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
128	330.240	.	.	.	.	.	.	.	.	.	.	.
129	332.740	1450	7.800	27	18	0.100	6.000	0.700	1.200	0.000	140.000	900.000
130	334.990	.	.	.	.	.	.	.	.	.	.	.
133	343.430	2100	7.600	26	.	.	.	.	.	.	.	.
134	345.840	.	.	.	.	.	.	.	.	.	.	.
135	345.840	.	.	.	.	.	.	.	.	.	.	.
136	348.400	2050	7.500	19	4.8	.	.	.	.	.	.	.
137	351.090	.	.	.	.	.	.	.	.	.	.	.
140	359.550	2050	7.500	.	.	.	.	.	.	.	.	.
141	362.450	.	.	.	.	.	.	.	.	.	.	.
142	365.610	.	.	.	.	.	.	.	.	.	.	.
142	365.610	.	.	.	.	.	.	.	.	.	.	.
143	368.810	2125	7.600	32	6	0.200	12.000	1.300	4.000	0.000	224.000	1200.000
144	372.040	.	.	.	.	.	.	.	.	.	.	.
147	381.360	2300	7.550	.	.	.	.	.	.	.	.	.
148	384.130	.	.	.	.	.	.	.	.	.	.	.
149	386.830	.	.	.	.	.	.	.	.	.	.	.
150	389.630	2290	7.600	32	7	.	.	.	.	.	.	.
151	392.330	.	.	.	.	.	.	.	.	.	.	.
155	403.050	.	.	.	.	.	.	.	.	.	.	.
156	405.630	.	.	.	.	.	.	.	.	.	.	.
157	408.330	1700	7.650	.	.	0.100	8.000	0.800	1.700	0.000	160.000	860.000
158	410.930	.	.	.	.	.	.	.	.	.	.	.
161	419	2030	7.700	.	.	.	.	.	.	.	.	.
162	421.740	.	.	.	.	.	.	.	.	.	.	.
163	424.460	.	.	.	.	.	.	.	.	.	.	.
164	427.230	2000	7.600	34	7.8	.	.	.	.	.	.	.
168	438.320	1950	7.500	.	.	.	.	.	.	.	.	.
169	441.040	.	.	.	.	.	.	.	.	.	.	.
170	443.680	.	.	.	.	.	.	.	.	.	.	.
171	446.400	2120	7.500	27	12	0.200	9.000	0.900	2.200	0.100	240.000	1080.000
172	447.960	.	.	.	.	.	.	.	.	.	.	.
175	456.700	2150	7.600	.	.	.	.	.	.	.	.	.
176	459.700	.	.	.	.	.	.	.	.	.	.	.
177	462.590	.	.	.	.	.	.	.	.	.	.	.
178	465.510	2075	7.500	25	8.4	.	.	.	.	.	.	.
182	477.280	.	.	.	.	.	.	.	.	.	.	.
183	480.160	.	.	.	.	.	.	.	.	.	.	.
184	483.080	.	.	.	.	.	.	.	.	.	.	.
185	486.110	2100	7.400	16	6	0.050	10.000	0.900	2.000	0.000	260.000	1140.000
186	488.790	.	.	.	.	.	.	.	.	.	.	.

Table A1.9. Seep 1 effluent quality: Column 3.

Time (days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy.	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
189	497.090	.	.	.	.	.	.	.	.	.	.	.
190	499.960	.	.	.	.	.	.	.	.	.	.	.
191	502.830	.	.	.	.	.	.	.	.	.	.	.
192	505.710	2100	7.400	19	7.2	.	.	.	.	.	.	.
193	508.560	.	.	.	.	.	.	.	.	.	.	.
196	517.310	.	.	.	.	.	.	.	.	.	.	.
197	520.230	.	.	.	.	.	.	.	.	.	.	.
198	523.030	.	.	.	.	.	.	.	.	.	.	.
199	525.890	2030	7.600	27	12	0.120	11.000	0.700	1.200	0.000	182.000	1230.000
203	537.360	.	.	.	.	.	.	.	.	.	.	.
204	540.220	.	.	.	.	.	.	.	.	.	.	.
205	542.900	.	.	.	.	.	.	.	.	.	.	.
206	545.680	1840	7.700	41	4.8	.	.	.	.	.	.	.
210	557.080	.	.	.	.	.	.	.	.	.	.	.
211	559.840	.	.	.	.	.	.	.	.	.	.	.
212	562.540	.	.	.	.	.	.	.	.	.	.	.
213	565.280	1730	7.450	38	6	0.110	8.000	0.600	1.400	0.000	146.000	1020.000
214	567.950	.	.	.	.	.	.	.	.	.	.	.
217	576.450	.	.	.	.	.	.	.	.	.	.	.
220	584.580	1990	7.550	18	4.8	.	.	.	.	.	.	.
221	587.190	.	.	.	.	.	.	.	.	.	.	.
224	595.210	.	.	.	.	.	.	.	.	.	.	.
225	597.940	.	.	.	.	.	.	.	.	.	.	.
226	600.500	.	.	.	.	.	.	.	.	.	.	.
227	603.180	1900	7.350	22	7.2	0.130	14.000	1.000	2.400	0.000	202.000	1350.000
228	606.070	.	.	.	.	.	.	.	.	.	.	.
231	615.080	.	.	.	.	.	.	.	.	.	.	.
232	618.940	.	.	.	.	.	.	.	.	.	.	.
233	621.010	1900	7.450	17	4.8	.	.	.	.	.	.	.
238	635.830	.	.	.	.	.	.	.	.	.	.	.
239	637.370	.	.	.	.	.	.	.	.	.	.	.
240	639.290	.	.	.	.	.	.	.	.	.	.	.
241	641.490	2050	7.400	16	4.8	0.100	11.000	1.200	2.300	0.000	242.000	1420.000
242	645.050	.	.	.	.	.	.	.	.	.	.	.
245	654.270	.	.	.	.	.	.	.	.	.	.	.
246	657.400	.	.	.	.	.	.	.	.	.	.	.
248	663.600	2130	7.550	17	4.8	.	.	.	.	.	.	.
249	666.490	.	.	.	.	.	.	.	.	.	.	.
252	675.150	.	.	.	.	.	.	.	.	.	.	.
254	680.590	.	.	.	.	.	.	.	.	.	.	.
255	683.570	2100	7.450	16	4.3	.	.	.	.	.	.	.

Table A1.9. Seep 1 effluent quality: Column 3.

Time (days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy.	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
256	686.450	.	.	.	.	.	.	.	.	.	.	.
259	695.120	.	.	.	.	.	.	.	.	.	.	.
260	695.120	.	.	.	.	.	.	.	.	.	.	.
262	701.480	2110	7.350	19	11	0.100	11.000	1.200	2.300	0.000	246.000	1400.000
263	704.660	.	.	.	.	.	.	.	.	.	.	.
267	716.020	.	.	.	.	.	.	.	.	.	.	.
269	721.320	2050	7.200	15	7.2	.	.	.	.	.	.	.
270	724.680	.	.	.	.	.	.	.	.	.	.	.
274	736.360	.	.	.	.	.	.	.	.	.	.	.
276	742.200	2025	7.550	16	6	.	.	.	.	.	.	.
277	745.470	.	.	.	.	.	.	.	.	.	.	.
282	759.230	.	.	.	.	.	.	.	.	.	.	.
283	761.850	2000	7.700	18	12	.	.	.	.	.	.	.
288	774.030	.	.	.	.	.	.	.	.	.	.	.
289	776.510	.	.	.	.	.	.	.	.	.	.	.
290	779.110	.	.	.	.	.	.	.	.	.	.	.
291	781.510	.	.	.	.	.	.	.	.	.	.	.
294	788.810	.	.	.	.	.	.	.	.	.	.	.
295	791.270	.	.	.	.	.	.	.	.	.	.	.
296	794.030	.	.	.	.	.	.	.	.	.	.	.
297	796.630	2050	7.550	15	2.4	.	.	.	.	.	.	.
298	799.260	.	.	.	.	.	.	.	.	.	.	.
301	806.870	.	.	.	.	.	.	.	.	.	.	.
302	809.210	.	.	.	.	.	.	.	.	.	.	.
304	813.960	2150	7.400	22	6	0.200	12.000	1.100	2.500	0.000	200.000	1480.000
305	815.420	.	.	.	.	.	.	.	.	.	.	.
308	825.270	.	.	.	.	.	.	.	.	.	.	.
310	831.490	.	.	.	.	.	.	.	.	.	.	.
311	831.650	2110	7.250	.	.	.	.	.	.	.	.	.
315	847.020	.	.	.	.	.	.	.	.	.	.	.
317	853.010	.	.	.	.	.	.	.	.	.	.	.
318	856.090	2100	7.350	.	.	.	.	.	.	.	.	.
323	871.270	.	.	.	.	.	.	.	.	.	.	.
324	874.250	.	.	.	.	.	.	.	.	.	.	.
325	877.310	2030	7.300	.	.	.	.	.	.	.	.	.
329	889.280	.	.	.	.	.	.	.	.	.	.	.
331	895.110	.	.	.	.	.	.	.	.	.	.	.
332	897.970	2100	7.300	15	4.9	.	.	.	.	.	.	.
336	910.370	.	.	.	.	.	.	.	.	.	.	.
338	915.960	.	.	.	.	.	.	.	.	.	.	.
339	918.800	2100	7.500	.	.	.	.	.	.	.	.	.

Table A1.9. Seep 1 effluent quality: Column 3.

Time (days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy.	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
343	930.310	.	.	.	.	.	.	.	.	.	.	.
345	935.720	.	.	.	.	.	.	.	.	.	.	.
346	938.320	2100	7.500	.	.	.	.	.	.	.	.	.
350	949.070	.	.	.	.	.	.	.	.	.	.	.
352	955.950	.	.	.	.	.	.	.	.	.	.	.
353	959.370	2150	7.000	.	.	.	.	.	.	.	.	.
357	959.750	.	.	.	.	.	.	.	.	.	.	.
359	959.940	.	.	.	.	.	.	.	.	.	.	.
360	960.030	.	.	.	.	.	.	.	.	.	.	.
364	960.410	.	.	.	.	.	.	.	.	.	.	.
366	960.600	.	.	.	.	.	.	.	.	.	.	.
367	960.700	.	.	.	.	.	.	.	.	.	.	.
371	961.080	.	.	.	.	.	.	.	.	.	.	.
388	961.740	620	7.250	21	3.7	.	.	.	.	.	.	.
392	971.830	.	.	.	.	.	.	.	.	.	.	.
394	977.530	.	.	.	.	.	.	.	.	.	.	.
395	980.460	610	7.600	.	.	.	.	.	.	.	.	.
399	992.390	.	.	.	.	.	.	.	.	.	.	.
401	998.100	.	.	.	.	.	.	.	.	.	.	.
402	1000.900	1050	7.550	.	.	.	.	.	.	.	.	.
406	1012.660	.	.	.	.	.	.	.	.	.	.	.
408	1018.450	.	.	.	.	.	.	.	.	.	.	.
409	1021.310	800	7.550	.	.	.	.	.	.	.	.	.
413	1032.790	.	.	.	.	.	.	.	.	.	.	.
415	1036.280	.	.	.	.	.	.	.	.	.	.	.
416	1038.160	1540	7.500	27	9.2	.	.	.	.	.	.	.
421	1050.600	.	.	.	.	.	.	.	.	.	.	.
422	1053.660	.	.	.	.	.	.	.	.	.	.	.
423	1055.980	1800	7.300	.	.	.	.	.	.	.	.	.
427	1067.060	.	.	.	.	.	.	.	.	.	.	.
429	1072.540	.	.	.	.	.	.	.	.	.	.	.
431	1078.020	2280	6.800	.	.	.	.	.	.	.	.	.
434	1084.690	.	.	.	.	.	.	.	.	.	.	.
436	1087.090	.	.	.	.	.	.	.	.	.	.	.
437	1088.190	2400	6.800	42	30	.	.	.	.	.	.	.
441	1095.920	.	.	.	.	.	.	.	.	.	.	.
443	1100.200	.	.	.	.	.	.	.	.	.	.	.
444	1102.320	2100	7.100	25	12	.	.	.	.	.	.	.
448	1109.660	.	.	.	.	.	.	.	.	.	.	.
450	1114.900	.	.	.	.	.	.	.	.	.	.	.
451	1117.580	1850	7.350	.	.	.	.	.	.	.	.	.

Table A1.9. Seep 1 effluent quality: Column 3.

Time (days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy.	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
455	1126.890	.	.	.	.	.	.	.	.	.	.	.
458	1133.510	1890	7.450	.	.	.	.	.	.	.	.	.
462	1140.300	.	.	.	.	.	.	.	.	.	.	.
464	1140.300	.	.	.	.	.	.	.	.	.	.	.
465	1141.280	.	.	.	.	.	.	.	.	.	.	.
469	1141.280	.	.	.	.	.	.	.	.	.	.	.
471	1147.030	.	.	.	.	.	.	.	.	.	.	.
472	1149.930	2050	7.500	27	15	0.130	16.000	1.300	2.430	0.030	256.000	1550.000
476	1160.980	.	.	.	.	.	.	.	.	.	.	.
478	1164.970	.	.	.	.	.	.	.	.	.	.	.
479	1166.890	.	.	.	.	.	.	.	.	.	.	.
483	1173.090	.	.	.	.	.	.	.	.	.	.	.
485	1177.710	.	.	.	.	.	.	.	.	.	.	.
486	1180.130	2225	7.450	.	.	.	.	.	.	.	.	.
490	1180.850	.	.	.	.	.	.	.	.	.	.	.
492	1185.550	.	.	.	.	.	.	.	.	.	.	.
493	1187.870	2410	7.400	.	.	.	.	.	.	.	.	.
500	1195.010	2435	7.500	38	10	.	.	.	.	.	.	.
504	1204.070	.	.	.	.	.	.	.	.	.	.	.
507	1208.150	2300	7.500	.	.	.	.	.	.	.	.	.
511	1214.360	.	.	.	.	.	.	.	.	.	.	.
513	1217.240	.	.	.	.	.	.	.	.	.	.	.
514	1218.760	2300	7.450	29	8.5	0.100	12.000	1.380	2.010	0.030	332.000	1750.000
519	1227.360	.	.	.	.	.	.	.	.	.	.	.
521	1228.510	1710	7.650	.	.	.	.	.	.	.	.	.
525	1235.910	.	.	.	.	.	.	.	.	.	.	.
528	1242.880	1750	7.400	24	11.5	0.050	10.000	0.850	1.110	0.050	212.000	1350.000
532	1252.820	.	.	.	.	.	.	.	.	.	.	.
534	1257.720	.	.	.	.	.	.	.	.	.	.	.
535	1259.840	2200	7.500	.	.	.	.	.	.	.	.	.
539	1264.140	.	.	.	.	.	.	.	.	.	.	.
542	1267.520	2000	7.700	.	.	.	.	.	.	.	.	.
546	1275.510	.	.	.	.	.	.	.	.	.	.	.
548	1277.480	.	.	.	.	.	.	.	.	.	.	.
549	1278.930	2100	7.550	.	.	.	.	.	.	.	.	.
553	1286.370	.	.	.	.	.	.	.	.	.	.	.
555	1291.210	.	.	.	.	.	.	.	.	.	.	.
556	1292.970	2030	7.700	26	11	0.020	8.020	0.730	0.860	0.020	380.000	1230.000
560	1295.630	.	.	.	.	.	.	.	.	.	.	.
562	1300.950	.	.	.	.	.	.	.	.	.	.	.
563	1303.690	2075	7.500	.	.	.	.	.	.	.	.	.

Table A1.9. Seep 1 effluent quality: Column 3.

Time (days)	Cum. Vol. (L)	S.C. (uS/cm)	pH	Alk.	Acy.	Cu	Ni	Co	Zn	Fe	Ca	Sulfate
567	1312.420	.	.	.	.	.	.	.	.	.	.	.
569	1315.820	.	.	.	.	.	.	.	.	.	.	.
570	1318.300	1900	7.450	.	.	.	.	.	.	.	.	.
574	1327.950	.	.	.	.	.	.	.	.	.	.	.
576	1331.790	.	.	.	.	.	.	.	.	.	.	.
577	1333.770	1990	7.650	.	.	.	.	.	.	.	.	.
581	1337.120	.	.	.	.	.	.	.	.	.	.	.
584	1337.520	2000	7.600	34	5.7	0.060	6.300	0.510	0.880	0.010	440.000	1180.000
591	1345.690	2000	7.200	.	.	.	.	.	.	.	.	.
595	1351.050	.	.	.	.	.	.	.	.	.	.	.
597	1351.280	.	.	.	.	.	.	.	.	.	.	.
602	1365.470	.	.	.	.	.	.	.	.	.	.	.
604	1370.670	.	.	.	.	.	.	.	.	.	.	.
605	1373.330	2000	7.300	.	.	.	.	.	.	.	.	.
609	1382.630	.	.	.	.	.	.	.	.	.	.	.

Table A1.10. FL3 feedwater quality.

Time (days)	Spec.Cond. (uS/cm)	pH	Alk.	Acy.	Cu	Ni	Co	Zn	Fe	Al	Ca	Sulfate
1.000	3800.000	4.850	.	221.000	63.000	184.000	7.800	5.300	L0.100	1.000	322.000	2700.000
2.000	3975.000	4.900	2.6	185.000	63.000	188.000	7.600	4.980	0.100	2.000	350.000	2600.000
4.000	3900.000	4.950	5.2	203.000	66.000	187.000	7.700	4.800	0.100	3.000	308.000	.
7.000	4080.000	4.800	3.0	227.000	63.000	183.000	7.300	5.600	0.100	3.000	302.000	2500.000
9.000	4025.000	4.900	5.0	227.000	62.000	194.000	7.500	5.500	L0.100	2.000	358.000	3000.000
11.000	3875.000	4.850	5.0	248.000	60.000	188.000	7.500	5.200	0.100	4.000	346.000	2960.000
14.000	4075.000	4.800	7.0	221.000	60.000	192.000	7.500	5.200	0.100	4.000	346.000	3360.000
16.000	3925.000	4.850	5.0	230.000	61.000	186.000	7.400	5.300	L0.100	1.000	206.000	3060.000
18.000	3800.000	5.000	5.0	185.000	64.000	197.000	7.300	5.300	L0.100	3.000	334.000	3060.000
21.000	3925.000	4.950	5.2	191.000	63.000	196.000	7.200	5.700	L0.100	2.000	334.000	2900.000
23.000	3780.000	4.950	5.2	248.000	.	.	.	.	.	.	.	.
25.000	3900.000	4.850	3.9	287.000	60.000	274.000	10.400	10.600	0.100	3.000	360.000	3560.000
28.000	3875.000	4.850	5.2	274.000	64.000	254.000	9.100	10.800	L0.100	2.000	220.000	2600.000
32.000	3800.000	4.800	5.2	236.000	.	.	.	.	.	.	.	.
35.000	3900.000	4.800	5.2	266.000	60.000	230.000	9.600	10.800	L0.100	2.000	340.000	2600.000
39.000	3900.000	4.800	5.2	245.000	63.000	212.000	9.100	10.600	L0.100	2.000	340.000	1360.000
45.000	3450.000	4.900	5.2	251.000	54.400	240.000	10.100	10.500	0.100	2.000	380.000	3000.000
52.000	3475.000	4.900	10.3	275.000	53.400	215.000	9.700	10.500	0.100	2.000	340.000	2760.000
57.000	3500.000	4.900	6.2	284.000	69.000	213.000	9.800	10.800	0.100	2.000	340.000	2700.000
59.000	3600.000	4.750	L3.0	209.000	.	.	.	.	.	.	.	.
63.000	3675.000	4.800	5.2	329.000	.	.	.	.	.	.	.	.
66.000	3575.000	4.850	5.2	245.000	.	.	.	.	.	.	.	.
70.000	3625.000	4.750	7.7	427.000	.	.	.	.	.	.	.	.
73.000	3475.000	4.950	5.2	227.000	67.000	238.000	10.400	10.800	0.100	2.000	360.000	2740.000
77.000	3450.000	4.850	4.1	227.000	.	.	.	.	.	.	.	.
80.000	3480.000	4.750	L3.0	218.000	.	.	.	.	.	.	.	.
84.000	3375.000	4.850	5.0	239.000	.	.	.	.	.	.	.	.
87.000	3460.000	4.950	5.2	323.000	66.000	221.000	10.200	10.800	0.100	2.000	360.000	2900.000
92.000	3450.000	4.750	3.1	311.000	.	.	.	.	.	.	.	.
94.000	3475.000	4.950	4.1	314.000	.	.	.	.	.	.	.	.
98.000	3475.000	4.950	4.1	245.000	.	.	.	.	.	.	.	.
102.000	3600.000	4.850	4.1	278.000	59.000	198.000	9.400	10.900	0.100	1.000	344.000	2300.000
108.000	3600.000	4.850	4.1	245.000	.	.	.	.	.	.	.	.
112.000	3500.000	4.900	4.1	245.000	.	.	.	.	.	.	.	.
115.000	3580.000	4.900	4.1	287.000	55.000	179.000	9.400	10.300	L0.100	1.000	312.000	2260.000
119.000	3650.000	5.000	4.1	340.000	.	.	.	.	.	.	.	.
122.000	3700.000	4.950	2.1	454.000	.	.	.	.	.	.	.	.
126.000	3700.000	4.680	1.0	484.000	.	.	.	.	.	.	.	.
129.000	3550.000	4.800	2.7	400.000	57.000	156.000	9.100	10.300	L0.100	2.100	316.000	3100.000
133.000	3600.000	4.950	2.2	.	.	.	.	.	.	.	.	.

Table A1.10. FL3 feedwater quality.

Time (days)	Spec.Cond. (uS/cm)	pH	Alk.	Acy.	Cu	Ni	Co	Zn	Fe	Al	Ca	Sulfate
136.000	3650.000	4.850	3.2	191.000	.	.	.	.	.	.	.	.
143.000	3700.000	4.700	L3.0	194.000	57.000	159.000	9.100	10.400	0.100	.	316.000	2740.000
147.000	3800.000	4.850	.	.	.	.	.	.	.	.	.	.
150.000	3840.000	4.850	4.0	206.000	.	.	.	.	.	.	.	.
157.000	3675.000	4.800	.	.	65.000	204.000	9.800	10.100	L0.100	1.900	320.000	2330.000
161.000	3720.000	4.900	.	.	.	.	.	.	.	.	.	.
164.000	3620.000	4.750	2.2	215.000	.	.	.	.	.	.	.	.
168.000	3580.000	4.750	.	.	.	.	.	.	.	.	.	.
171.000	3850.000	4.800	2.2	179.000	63.000	192.000	9.400	9.800	0.100	1.500	400.000	2370.000
175.000	3830.000	4.950	.	.	.	.	.	.	.	.	.	.
178.000	3700.000	4.800	2.2	194.000	.	.	.	.	.	.	.	.
185.000	3700.000	4.800	4.0	209.000	64.000	204.000	9.700	10.200	L0.100	1.900	360.000	2350.000
192.000	3870.000	4.750	2.4	188.000	.	.	.	.	.	.	.	.
199.000	3830.000	4.900	2.7	191.000	69.000	228.000	14.200	10.000	L0.100	1.800	312.000	2560.000
206.000	3490.000	4.850	2.2	182.000	.	.	.	.	.	.	.	.
213.000	3090.000	5.000	5.4	167.000	57.000	191.000	11.400	9.100	L0.100	1.600	250.000	2040.000
220.000	3100.000	4.900	3.9	185.000	.	.	.	.	.	.	.	.
227.000	2500.000	5.000	4.8	177.000	48.000	170.000	9.600	8.000	L0.100	1.300	230.000	1730.000
233.000	1830.000	5.050	3.9	124.000	.	.	.	.	.	.	.	.
241.000	2000.000	4.950	2.7	102.000	36.000	93.000	5.500	5.700	L0.100	0.600	186.000	1300.000
248.000	2040.000	5.100	3.9	125.000	.	.	.	.	.	.	.	.
255.000	2000.000	5.050	2.7	125.000	.	.	.	.	.	.	.	.
262.000	2040.000	5.050	2.7	148.000	0.200	91.000	5.600	5.800	L0.100	0.800	190.000	1260.000
269.000	1980.000	4.950	2.2	134.000	.	.	.	.	.	.	.	.
276.000	1950.000	5.000	2.7	144.000	.	.	.	.	.	.	.	.
283.000	1925.000	4.900	1.1	155.000	.	.	.	.	.	.	.	.
290.000	1950.000	5.200	2.7	198.000	.	.	.	.	.	.	.	.
297.000	2000.000	5.050	3.2	96.000	37.000	122.000	5.300	6.000	0.100	0.600	160.000	1300.000
304.000	2100.000	5.300	5.4	125.000	38.000	125.000	5.400	6.200	L0.100	1.100	154.000	2030.000
311.000	2090.000	4.900	.	.	.	.	.	.	.	.	.	.
318.000	2080.000	5.150	.	.	.	.	.	.	.	.	.	.
325.000	2100.000	5.200	.	.	.	.	.	.	.	.	.	.
332.000	2100.000	5.200	4.4	140.000	.	.	.	.	.	.	.	.
339.000	2110.000	5.100	.	.	.	.	.	.	.	.	.	.
346.000	2100.000	5.200	.	.	.	.	.	.	.	.	.	.
353.000	1950.000	4.900	.	.	.	.	.	.	.	.	.	.
360.000	1890.000	5.000	4.9	104.000	35.000	120.000	4.800	5.600	L0.100	1.000	.	1180.000
367.000	1880.000	5.100	.	.	.	.	.	.	.	.	.	.
374.000	1900.000	5.150	.	.	.	.	.	.	.	.	.	.
381.000	1700.000	5.350	.	.	.	.	.	.	.	.	.	.

Table A1.10. FL3 feedwater quality.

Time (days)	Spec.Cond. (uS/cm)	pH	Alk.	Acy.	Cu	Ni	Co	Zn	Fe	Al	Ca	Sulfate
388.000	1680.000	4.650	2.2	68.000	.	.	.	.	.	.	.	.
395.000	1700.000	5.250	.	.	.	.	.	.	.	.	.	.
402.000	1710.000	5.300	.	.	.	.	.	.	.	.	.	.
409.000	1700.000	5.150	.	.	.	.	.	.	.	.	.	.
416.000	1650.000	5.100	5.5	105.000	27.000	72.000	4.200	5.000	L0.100	0.200	158.000	1080.000
423.000	1700.000	5.150	.	.	.	.	.	.	.	.	.	.
431.000	1650.000	5.150	.	.	.	.	.	.	.	.	.	.
437.000	1640.000	5.150	.	.	.	.	.	.	.	.	.	.
444.000	1720.000	5.050	3.9	128.000	.	.	.	.	.	.	.	.
451.000	1720.000	5.050	.	.	.	.	.	.	.	.	.	.
458.000	1740.000	5.050	.	.	.	.	.	.	.	.	.	.
465.000	1710.000	5.050	.	.	.	.	.	.	.	.	.	.
472.000	1700.000	5.050	L2.7	237.000	39.900	87.000	4.730	6.070	0.030	0.600	164.000	1320.000
479.000	.	.	.	.	.	.	.	.	.	.	.	.
486.000	1800.000	5.000	.	.	.	.	.	.	.	.	.	.
493.000	2150.000	4.900	.	.	.	.	.	.	.	.	.	.
500.000	2100.000	4.900	4.0	144.000	.	.	.	.	.	.	.	.
507.000	2300.000	5.000	.	.	.	.	.	.	.	.	.	.
514.000	2300.000	4.950	4.0	172.000	46.000	115.000	6.550	8.010	0.060	1.000	256.000	1780.000
521.000	2290.000	4.900	.	.	.	.	.	.	.	.	.	.
528.000	2290.000	4.950	5.3	201.000	43.000	114.000	6.420	7.050	0.050	1.200	212.000	1750.000
535.000	2380.000	5.000	.	.	.	.	.	.	.	.	.	.
542.000	2330.000	4.950	.	.	.	.	.	.	.	.	.	.
549.000	3400.000	4.900	.	.	.	.	.	.	.	.	.	.
556.000	2400.000	5.000	2.6	173.000	53.000	119.000	6.240	7.660	0.010	0.800	360.000	1500.000
563.000	2450.000	4.900	.	.	.	.	.	.	.	.	.	.
570.000	2300.000	4.650	.	.	.	.	.	.	.	.	.	.
577.000	2490.000	4.950	.	.	.	.	.	.	.	.	.	.
584.000	2400.000	4.700	2.6	132.000	52.000	120.000	6.290	7.730	0.040	1.200	380.000	1550.000
591.000	2500.000	4.900	.	.	.	.	.	.	.	.	.	.
605.000	2600.000	5.000	.	.	.	.	.	.	.	.	.	.

Note: All values are mg/L unless noted otherwise. Our computer software package automatically assigns each value three decimal digits; pH values are actually significant to the hundredths, while alkalinity, acidity and metal values contain two or three significant digits.

L: less than
.: not analyzed

Table A1.12. Seep 1 influent quality.

Time (days)	Spec.Cond. (uS/cm)	pH	Alk.	Acy.	Cu	Ni	Co	Zn	Fe	Al	Ca	Sulfate
1.000	2175.000	6.050	7.700	54.000	0.070	7.300	0.800	0.500	0.100	L0.100	204.000	1480.000
2.000	2300.000	6.150	7.700	12.000	0.070	7.600	0.800	0.500	0.100	L0.100	214.000	1250.000
4.000	2275.000	6.200	5.200	21.000	0.070	7.400	0.800	0.500	0.100	L0.100	190.000	.
7.000	2350.000	6.050	5.200	18.000	0.060	7.100	0.800	0.500	0.100	L0.100	174.000	1500.000
9.000	2340.000	6.350	10.300	.	0.060	8.000	0.800	0.500	L0.100	L0.100	204.000	1650.000
11.000	2200.000	6.200	7.200	10.000	0.060	7.000	0.800	0.500	L0.100	L0.100	242.000	1960.000
14.000	2300.000	6.100	5.000	10.000	0.070	7.000	0.800	0.500	L0.100	L0.100	218.000	880.000
16.000	2300.000	6.150	5.200	8.400	0.060	7.000	0.800	0.500	0.100	L0.100	214.000	1800.000
18.000	2225.000	6.050	8.000	12.000	0.050	8.000	0.800	0.500	L0.100	L0.100	204.000	1530.000
21.000	2300.000	6.050	5.200	10.000	0.060	9.000	0.900	0.500	L0.100	L0.100	208.000	1540.000
23.000	2200.000	6.000	6.200	12.000	.	.	.	.	.	.	.	.
28.000	2225.000	6.000	5.200	10.000	0.100	5.000	0.800	0.900	L0.100	L0.100	220.000	1300.000
30.000	1275.000	6.050	10.300	23.000	.	.	.	.	.	.	.	.
32.000	1390.000	6.100	10.300	14.300	.	.	.	.	.	.	.	.
35.000	1275.000	6.000	10.300	16.700	L0.100	3.000	0.700	0.600	L0.100	L0.100	120.000	750.000
39.000	1275.000	5.700	7.200	27.000	0.200	3.000	0.500	0.800	0.100	L0.100	100.000	700.000
45.000	1100.000	6.350	10.300	6.000	L0.100	6.000	0.600	0.800	0.100	L0.100	100.000	720.000
52.000	1375.000	6.100	10.300	13.000	0.100	10.000	0.700	1.000	0.100	L0.100	140.000	860.000
57.000	1480.000	6.500	12.400	12.000	.	.	.	.	.	.	.	.
59.000	1500.000	6.350	10.300	6.000	L0.100	11.000	0.800	1.100	L0.100	L0.100	140.000	950.000
63.000	1975.000	5.950	12.900	20.900	.	.	.	.	.	.	.	.
66.000	2260.000	6.000	7.700	24.000	.	.	.	.	.	.	.	.
70.000	2550.000	5.500	7.700	48.000	.	.	.	.	.	.	.	.
73.000	2550.000	5.500	5.200	18.000	0.700	27.000	2.300	3.800	L0.100	L0.100	260.000	1880.000
77.000	2550.000	5.150	4.100	33.000	.	.	.	.	.	.	.	.
80.000	2600.000	5.050	4.100	39.000	.	.	.	.	.	.	.	.
84.000	2450.000	5.150	10.300	32.000	.	.	.	.	.	.	.	.
87.000	2475.000	5.300	5.200	24.000	1.000	30.000	2.300	4.300	0.100	1.000	300.000	2000.000
92.000	2400.000	5.300	4.100	30.000	.	.	.	.	.	.	.	.
94.000	2480.000	5.350	4.600	31.000	.	.	.	.	.	.	.	.
98.000	2450.000	5.250	4.100	32.000	.	.	.	.	.	.	.	.
102.000	2500.000	5.350	5.100	33.000	0.800	20.300	2.000	3.600	L0.100	L0.100	262.000	1550.000
108.000	2550.000	5.400	5.200	31.000	.	.	.	.	.	.	.	.
112.000	2150.000	5.700	4.100	31.000	.	.	.	.	.	.	.	.
115.000	2450.000	5.650	4.000	22.000	0.500	17.700	1.600	2.500	0.100	L0.100	288.000	1460.000
119.000	2600.000	5.910	6.200	27.000	.	.	.	.	.	.	.	.
122.000	2630.000	5.920	4.100	28.000	.	.	.	.	.	.	.	.
126.000	1450.000	5.580	4.000	31.000	.	.	.	.	.	.	.	.

Table A1.12. Seep 1 influent quality.

Time (days)	Spec.Cond. (uS/cm)	pH	Alk.	Acy.	Cu	Ni	Co	Zn	Fe	Al	Ca	Sulfate
129.000	1400.000	5.700	5.400	24.000	0.200	8.000	0.700	1.700	0.100	0.200	122.000	900.000
133.000	2100.000	5.650	5.400	.	.	.	.	.	.	.	.	.
136.000	1920.000	5.200	5.400	24.000	.	.	.	.	.	.	.	.
142.000	2050.000	5.100	.	.	.	.	.	.	.	.	.	.
143.000	2140.000	4.900	2.000	29.000	1.000	13.000	1.400	4.700	0.100	2.100	206.000	1400.000
147.000	2275.000	5.000	.	.	.	.	.	.	.	.	.	.
150.000	2210.000	4.600	2.200	36.000	.	.	.	.	.	.	.	.
157.000	1680.000	5.200	.	.	0.500	9.000	0.900	2.700	0.100	1.300	160.000	930.000
161.000	2000.000	5.250	.	.	.	.	.	.	.	.	.	.
164.000	1980.000	5.100	3.200	24.000	.	.	.	.	.	.	.	.
168.000	1930.000	5.100	.	.	.	.	.	.	.	.	.	.
171.000	2100.000	5.150	5.400	24.000	0.500	10.000	1.000	2.700	0.100	0.900	240.000	1170.000
175.000	2080.000	5.350	.	.	.	.	.	.	.	.	.	.
178.000	2000.000	5.300	4.300	23.000	.	.	.	.	.	.	.	.
185.000	2000.000	6.000	5.400	21.000	0.400	9.000	1.000	2.600	0.100	0.700	240.000	1200.000
192.000	2100.000	5.250	4.300	14.000	.	.	.	.	.	.	.	.
199.000	2000.000	6.000	5.400	12.000	0.150	12.000	0.800	1.500	L0.100	0.300	176.000	1250.000
206.000	1780.000	5.700	4.300	17.000	.	.	.	.	.	.	.	.
213.000	1690.000	6.250	8.000	12.000	0.150	8.000	0.600	1.300	L0.100	0.400	140.000	1030.000
220.000	1950.000	5.400	3.200	14.000	.	.	.	.	.	.	.	.
227.000	1890.000	5.200	5.400	18.000	0.480	15.000	1.000	2.500	L0.100	1.000	186.000	1350.000
233.000	1900.000	5.200	4.300	17.000	.	.	.	.	.	.	.	.
241.000	2050.000	5.150	2.700	12.000	0.500	12.000	1.200	2.700	L0.100	0.700	238.000	1440.000
248.000	2050.000	5.200	4.300	16.000	.	.	.	.	.	.	.	.
255.000	2050.000	5.200	3.200	17.000	.	.	.	.	.	.	.	.
262.000	2100.000	5.400	5.400	29.000	0.500	12.000	1.200	2.700	L0.100	0.700	236.000	1400.000
269.000	2030.000	5.150	3.700	19.000	.	.	.	.	.	.	.	.
276.000	2125.000	5.350	4.300	24.000	.	.	.	.	.	.	.	.
283.000	2050.000	5.200	2.200	24.000	.	.	.	.	.	.	.	.
290.000	2050.000	5.250	2.200	33.000	.	.	.	.	.	.	.	.
297.000	2050.000	5.300	3.900	12.000	.	.	.	.	.	.	.	.
304.000	2180.000	5.450	5.400	18.000	0.500	13.000	1.100	2.800	L0.100	0.900	194.000	1480.000
311.000	2150.000	5.050	.	.	.	.	.	.	.	.	.	.
318.000	1990.000	6.000	.	.	.	.	.	.	.	.	.	.
325.000	2020.000	5.750	.	.	.	.	.	.	.	.	.	.
332.000	2090.000	5.700	4.400	13.000	.	.	.	.	.	.	.	.
339.000	2100.000	5.250	.	.	.	.	.	.	.	.	.	.
346.000	2090.000	5.400	.	.	.	.	.	.	.	.	.	.

Table A1.12. Seep 1 influent quality.

Time (days)	Spec.Cond. (uS/cm)	pH	Alk.	Acy.	Cu	Ni	Co	Zn	Fe	Al	Ca	Sulfate
353.000	2120.000	5.000	.	.	.	.	.	.	.	.	.	.
360.000	2090.000	5.250	5.500	13.000	0.440	12.000	1.000	2.700	L0.100	1.000	.	1400.000
367.000	2050.000	5.250	.	.	.	.	.	.	.	.	.	.
388.000	580.000	6.350	6.600	4.900	.	.	.	.	.	.	.	.
395.000	700.000	6.900	.	.	.	.	.	.	.	.	.	.
402.000	1050.000	6.900	.	.	.	.	.	.	.	.	.	.
409.000	800.000	6.650	.	.	.	.	.	.	.	.	.	.
416.000	1600.000	5.200	5.500	30.000	0.800	16.000	1.600	2.600	L0.100	1.000	156.000	880.000
423.000	1800.000	4.950	.	.	.	.	.	.	.	.	.	.
431.000	2280.000	4.850	.	.	.	.	.	.	.	.	.	.
437.000	2480.000	4.800	.	.	.	.	.	.	.	.	.	.
444.000	1950.000	4.850	3.300	56.000	.	.	.	.	.	.	.	.
451.000	1850.000	4.900	.	.	.	.	.	.	.	.	.	.
458.000	2100.000	4.900	.	.	.	.	.	.	.	.	.	.
465.000	2240.000	4.800	.	.	.	.	.	.	.	.	.	.
472.000	1900.000	4.900	0.000	53.000	1.140	17.000	1.400	3.910	0.120	2.600	216.000	1530.000
479.000	.	.	.	.	.	.	.	.	.	.	.	.
486.000	2225.000	4.850	.	.	.	.	.	.	.	.	.	.
493.000	2280.000	4.750	.	.	.	.	.	.	.	.	.	.
500.000	2350.000	4.700	2.000	76.000	.	.	.	.	.	.	.	.
514.000	2250.000	4.900	3.000	38.000	1.010	18.000	1.670	3.950	0.120	2.700	320.000	1780.000
521.000	1780.000	5.050	.	.	.	.	.	.	.	.	.	.
528.000	1760.000	5.000	5.300	35.000	0.850	14.000	1.070	1.880	0.090	1.700	204.000	1400.000
535.000	2200.000	5.050	.	.	.	.	.	.	.	.	.	.
542.000	2100.000	5.000	.	.	.	.	.	.	.	.	.	.
549.000	2100.000	4.900	.	.	.	.	.	.	.	.	.	.
556.000	2030.000	5.300	5.000	32.000	0.630	12.100	0.960	2.360	0.050	1.000	380.000	1230.000
563.000	2060.000	5.150	.	.	.	.	.	.	.	.	.	.
570.000	1900.000	5.100	.	.	.	.	.	.	.	.	.	.
577.000	1990.000	5.350	.	.	.	.	.	.	.	.	.	.
584.000	1800.000	4.900	2.600	35.000	0.550	10.200	0.820	2.190	0.030	1.200	340.000	1200.000
591.000	2000.000	5.200	.	.	.	.	.	.	.	.	.	.
605.000	2000.000	5.300	.	.	.	.	.	.	.	.	.	.

Note: All values are mg/L unless noted otherwise. Our computer software package automatically assigns three decimal digits; pH values are actually significant to the hundredths, while acidity and metal values contain two or three significant digits.

L: less than
.: not analyzed

Table A1.11. FL6 feedwater quality.

Time (days)	Spec.Cond. (uS/cm)	pH	Alk.	Acy.	Cu	Ni	Co	Zn	Fe	Al	Ca	Sulfate
1.000	4300.000	4.150	.	550.000	111.000	157.000	6.900	3.900	L0.100	29.000	316.000	2900.000
2.000	4480.000	4.150	.	609.000	113.000	160.000	6.600	3.800	0.300	29.000	338.000	3400.000
4.000	4450.000	4.150	.	580.000	112.000	159.000	6.800	3.700	0.300	29.000	320.000	.
7.000	4650.000	4.100	.	550.000	109.000	160.000	6.500	4.200	0.300	29.000	302.000	3060.000
9.000	4525.000	4.100	.	565.000	113.000	160.000	6.800	4.700	0.200	33.000	350.000	3360.000
11.000	4550.000	4.050	.	568.000	107.000	156.000	6.600	4.400	0.200	39.000	424.000	3160.000
14.000	4625.000	4.150	.	583.000	103.000	156.000	6.600	4.300	0.200	38.000	332.000	3360.000
16.000	4460.000	4.150	.	636.000	112.000	154.000	6.700	4.500	0.200	38.000	336.000	3360.000
18.000	4900.000	4.150	.	600.000	121.000	197.000	7.700	4.900	0.200	40.000	356.000	3960.000
21.000	5000.000	4.150	.	645.000	121.000	198.000	7.500	5.200	0.200	42.000	370.000	2960.000
23.000	4900.000	4.150	.	681.000	.	.	.	.	.	.	.	.
25.000	5001.000	4.100	.	720.000	117.000	279.000	11.100	10.200	0.300	34.000	360.000	3560.000
28.000	5001.000	4.150	.	693.000	128.000	275.000	10.700	10.500	0.300	38.000	380.000	2900.000
32.000	5001.000	4.100	.	700.000	.	.	.	.	.	.	.	.
35.000	5001.000	4.150	.	720.000	133.000	264.000	11.000	10.700	0.300	41.000	360.000	3860.000
39.000	5001.000	4.050	.	711.000	132.000	262.000	10.700	10.600	0.300	38.000	400.000	3800.000
45.000	4850.000	4.100	.	729.000	143.000	256.000	11.300	10.400	0.300	38.000	380.000	4300.000
52.000	4800.000	4.100	.	681.000	143.000	230.000	11.000	10.300	0.300	38.000	400.000	4120.000
57.000	4600.000	4.150	.	705.000	.	.	.	.	.	.	.	.
59.000	4850.000	3.800	.	651.000	140.000	218.000	10.400	10.200	0.200	38.000	360.000	3700.000
63.000	4675.000	4.050	.	732.000	.	.	.	.	.	.	.	.
66.000	4475.000	4.150	.	687.000	.	.	.	.	.	.	.	.
70.000	4600.000	4.150	.	765.000	.	.	.	.	.	.	.	.
73.000	4300.000	4.200	.	567.000	135.000	221.000	11.000	10.200	0.200	41.000	420.000	3640.000
77.000	4375.000	4.100	.	592.000	.	.	.	.	.	.	.	.
80.000	4400.000	4.000	.	627.000	.	.	.	.	.	.	.	.
84.000	4175.000	4.150	.	633.000	.	.	.	.	.	.	.	.
87.000	4430.000	4.200	.	627.000	130.000	236.000	10.200	10.100	0.200	36.000	360.000	3700.000
92.000	4300.000	4.050	.	717.000	.	.	.	.	.	.	.	.
94.000	4300.000	4.150	.	657.000	.	.	.	.	.	.	.	.
98.000	4350.000	4.200	.	717.000	.	.	.	.	.	.	.	.
102.000	4575.000	4.150	.	696.000	102.000	208.000	9.800	9.900	0.200	21.000	392.000	3100.000
108.000	4475.000	4.150	.	699.000	.	.	.	.	.	.	.	.
112.000	4475.000	4.200	.	677.000	.	.	.	.	.	.	.	.
115.000	4500.000	4.150	.	705.000	95.000	178.000	9.800	9.400	0.100	17.000	328.000	3200.000
119.000	4600.000	4.260	.	747.000	.	.	.	.	.	.	.	.
122.000	4630.000	4.210	.	759.000	.	.	.	.	.	.	.	.
126.000	4620.000	3.920	.	819.000	.	.	.	.	.	.	.	.
129.000	4460.000	4.150	.	687.000	102.000	203.000	9.900	10.100	0.200	38.500	334.000	3760.000
133.000	4500.000	4.200	.	.	.	.	.	.	.	.	.	.

Table A1.11. FL6 feedwater quality.

Time (days)	Spec.Cond. (uS/cm)	pH	Alk.	Acy.	Cu	Ni	Co	Zn	Fe	Al	Ca	Sulfate
136.000	4500.000	4.100	.	794.000	.	.	.	.	.	.	.	.
143.000	4525.000	4.100	.	550.000	105.000	194.000	9.900	10.100	0.200	35.300	334.000	3800.000
147.000	4750.000	4.150	.	.	.	.	.	.	.	.	.	.
150.000	4800.000	4.100	.	574.000	.	.	.	.	.	.	.	.
157.000	4650.000	4.150	.	.	119.000	199.000	10.300	10.000	0.200	33.800	360.000	3200.000
161.000	4650.000	4.200	.	.	119.000	199.000	10.300	10.000	0.200	33.800	360.000	3200.000
164.000	4480.000	4.050	.	806.000	.	.	.	.	.	.	.	.
168.000	4600.000	4.050	.	.	.	.	.	.	.	.	.	.
171.000	5000.000	4.100	.	717.000	120.000	190.000	10.300	9.900	L0.100	30.800	440.000	3300.000
175.000	4950.000	4.250	.	.	.	.	.	.	.	.	.	.
178.000	4750.000	4.200	.	717.000	.	.	.	.	.	.	.	.
185.000	4700.000	4.050	.	603.000	120.000	197.000	10.000	10.000	L0.100	33.100	400.000	3260.000
192.000	3300.000	4.050	.	530.000	.	.	.	.	.	.	.	.
199.000	3850.000	4.150	.	514.000	120.000	171.000	10.400	7.700	0.200	23.400	290.000	2760.000
206.000	3550.000	4.100	.	496.000	.	.	.	.	.	.	.	.
213.000	3330.000	4.150	.	478.000	102.000	144.000	8.400	6.400	L0.100	19.200	238.000	2360.000
220.000	3280.000	4.150	.	441.000	.	.	.	.	.	.	.	.
227.000	3280.000	4.200	.	484.000	117.000	160.000	9.700	7.000	0.200	21.400	276.000	2000.000
233.000	3300.000	4.200	.	496.000	.	.	.	.	.	.	.	.
241.000	3550.000	4.100	.	496.000	62.000	113.000	7.200	6.500	0.100	23.400	332.000	1380.000
248.000	3620.000	4.250	.	657.000	.	.	.	.	.	.	.	.
255.000	3450.000	4.200	.	603.000	.	.	.	.	.	.	.	.
262.000	3580.000	4.200	.	551.000	0.200	108.000	6.800	6.300	L0.100	22.800	332.000	2660.000
269.000	3490.000	4.050	.	532.000	.	.	.	.	.	.	.	.
276.000	3400.000	4.200	.	514.000	.	.	.	.	.	.	.	.
283.000	3000.000	4.100	.	484.000	.	.	.	.	.	.	.	.
290.000	2575.000	4.200	.	478.000	.	.	.	.	.	.	.	.
297.000	2800.000	4.250	.	400.000	79.000	111.000	5.200	5.100	0.200	18.100	192.000	1880.000
304.000	2980.000	4.350	.	377.000	84.000	118.000	5.600	5.400	0.200	18.800	198.000	1380.000
311.000	2650.000	4.100	.	.	.	.	.	.	.	.	.	.
318.000	2650.000	4.200	.	.	.	.	.	.	.	.	.	.
325.000	2650.000	4.300	.	.	.	.	.	.	.	.	.	.
332.000	2660.000	4.250	.	372.000	.	.	.	.	.	.	.	.
339.000	2680.000	4.200	.	.	.	.	.	.	.	.	.	.
346.000	2670.000	4.250	.	.	.	.	.	.	.	.	.	.
353.000	2650.000	4.200	.	.	.	.	.	.	.	.	.	.
360.000	2590.000	4.300	.	476.000	70.000	114.000	4.900	4.700	L0.100	22.000	.	1830.000
367.000	2580.000	4.300	.	.	.	.	.	.	.	.	.	.
374.000	2600.000	4.300	.	.	.	.	.	.	.	.	.	.
381.000	2600.000	4.250	.	.	.	.	.	.	.	.	.	.

Table A1.11. FL6 feedwater quality.

Time (days)	Spec.Cond. (uS/cm)	pH	Alk.	Acy.	Cu	Ni	Co	Zn	Fe	Al	Ca	Sulfate
388.000	2350.000	4.200	.	.	.	.	.	.	.	.	.	.
395.000	2490.000	4.250	.	.	.	.	.	.	.	.	.	.
402.000	2500.000	4.250	.	.	.	.	.	.	.	.	.	.
409.000	2420.000	4.200	.	.	.	.	.	.	.	.	.	.
416.000	2600.000	4.250	.	397.000	69.000	83.000	5.300	5.200	0.100	25.100	252.000	1850.000
423.000	2600.000	4.250	.	.	.	.	.	.	.	.	.	.
431.000	2800.000	4.250	.	.	.	.	.	.	.	.	.	.
437.000	2580.000	4.250	.	.	.	.	.	.	.	.	.	.
444.000	3250.000	4.250	.	470.000	.	.	.	.	.	.	.	.
451.000	3290.000	4.250	.	.	.	.	.	.	.	.	.	.
458.000	3230.000	4.300	.	.	.	.	.	.	.	.	.	.
465.000	3400.000	4.250	.	.	.	.	.	.	.	.	.	.
472.000	3780.000	4.250	.	656.000	62.300	211.000	8.120	8.490	0.220	25.500	346.000	3800.000
479.000	.	.	.	.	.	.	.	.	.	.	.	.
486.000	4400.000	4.000	.	.	.	.	.	.	.	.	.	.
493.000	4800.000	4.000	.	.	.	.	.	.	.	.	.	.
500.000	3700.000	4.100	.	502.000	.	.	.	.	.	.	.	.
507.000	3480.000	4.200	.	.	.	.	.	.	.	.	.	.
514.000	3300.000	4.200	.	505.000	57.600	108.000	6.760	7.160	0.190	23.800	350.000	2750.000
521.000	3300.000	4.100	.	.	.	.	.	.	.	.	.	.
528.000	3750.000	4.100	.	575.000	94.000	118.000	7.840	7.130	0.040	23.400	338.000	3340.000
535.000	3900.000	4.100	.	.	.	.	.	.	.	.	.	.
542.000	3750.000	4.050	.	.	.	.	.	.	.	.	.	.
549.000	3790.000	4.000	.	.	.	.	.	.	.	.	.	.
556.000	3800.000	4.200	.	414.000	112.000	123.000	7.300	7.560	0.170	20.500	480.000	2700.000
563.000	4175.000	4.100	.	.	.	.	.	.	.	.	.	.
570.000	4075.000	3.800	.	.	.	.	.	.	.	.	.	.
577.000	4680.000	4.150	.	.	.	.	.	.	.	.	.	.
584.000	4400.000	4.100	.	425.000	132.000	148.000	8.560	9.100	0.240	28.700	500.000	3440.000
591.000	4500.000	4.200	.	.	.	.	.	.	.	.	.	.
605.000	4800.000	4.100	.	.	.	.	.	.	.	.	.	.

Note: All values are mg/L unless noted otherwise (pH is in standard units). Our computer software package automatically assigns each value three decimal digits; pH values are actually significant to the hundredths, acidity and metal values contain two or three significant digits. Alkalinity values were obtained on the same dates as the aciditiy values, and all were below the detection limit.

L: less than
.: not analyzed

APPENDIX 2

Timeline for Column Experiment

Table A2.1. Timeline for Column Experiments Through November 1989.

colmtimeline89,ERIE2

FL6 Leachate: Columns 1, 2, 3

4/4 Started experiment at 8:15 AM

4/5 Col 1-low flow, adjusted tubing. Sampled all columns. Day 1

4/6 All column flow rates ok. Adjusted flow on Col 3 tiny bit to slow it down. Treated water is very blue in color like feed water & collection buckets - all have a blue precipitate in them. Likewise, a blue precipitate is noticeable in outlet tubing on all three columns and within columns themselves. In columns, it is more of a whitish coating on and between limestone particle.

4/8 Changed tubing at 0830 from 5/32 I.D to 3/32 I.D. Sampled what was left in feed buckets before filling them from large barrels. Lots of blue precipitate in collection buckets. Columns are also getting gunked up with whitish-blue ppt.

Note: Water sat in columns for 1 hour while we changed tubing, siphoned feed water from blue barrels etc... before pump was turned on to collect today's sample.

4/11 Collected samples from 0920-1250. After measuring alkalinity/acidity we exchanged tubing for a lower flow to 2/32 I.D at 1345. Flows up to that time were Col 1 48 ml
2 47 ml
3 47 ml

4/12 Tues. Arrived to find zero water collected after changing tubing yesterday. Apparently tubing wasn't tight enough in cassettes. One length of tube was even pulled all the way through. So tightened these down and started pump up again. It will take several hours to fill 2 of the columns again. Sample may be collected late today or else tomorrow. Column 1 has quite a build up of blue ppt. in outlet tubing. All columns have major build up of stuff on the rock.

Col 1 - started flowing at 0900.
Col 2 - started flowing at 1345.
Col 3 - started flowing at 1500.

We're letting all the columns fill up and start flowing before timing them for flow measurements on 4/13.
All columns were flowing at 1500.
Column one had 183 ml between 0900 and 1500
Column two had 42 ml between 1345 and 1500
Column three had just started to flow at 1500

4/13 The pump was shut off for 20 min while we changed tubing on columns 4, 5, 6.

4/20 Added more water to feed buckets. This batch was siphoned from the 2nd barrel. S. conductance seems higher than other barrel.

5/6 Changed the tubing back to 3/32.

5/13 Col 3 has gone up in acidity, 4 in pH. I hope the metal & SO_4 samples didn't get misnumbered for these 3 columns!?! It's Friday.

5/19 Changed FL6 tubing from 3/32 back to 2/32. Also, combined two blue barrels so next sampling will be a mixture of the two (5/26).

5/25 Column 3 - 5/23 H_2O was very cloudy (white)
Columns 1, 2, & 3 flow was estimated based on 33 ml/hr.
Column 1: The tubing fell out of the collection bottle and some flow was lost. I estimated flow based on 32 mls/hr.

Table A2.1. Timeline for Column Experiments Through November 1989 (contd).

5/26	Column 3: There is a whitish blue coating on the top of the limestone, it appears to be about 1/4" thick. This is not present on columns 1 & 2.
	Sometime during week of May 23 took pictures of columns
6/6	Column 1, water getting cloudier (like col. 3)
6/9	Reversed (1300) the tubing on columns 1, 2, & 3, expected flow = 10-15 mls/hr.
6/16	Took pictures of the columns
6/20	Monday: Col. 3 tubing was not in receiving bottle so lost flow, but can figure out rate from sample collection today.
6/23	Filled feed buckets pH on column 3 went up considerably from Monday's readings and is similar to last week's sample date. This could be due to the fact that the sample site from Monday till Thursday in order to collect any volume for sampling. On this past Monday, however, the sample for pH and alkalinity was collected that day and had not been sitting for more than 5 hours.
6/28	Column 1 outlet tube had plugged up overnight, reamed it out with a piece of wire and now it is flowing freely again. All the blue gunk came out in the cleaning.
8/25	Col. 2 was leaking around outlet port. This was repaired and col. started flowing around 9 AM. Collected 67 more mLs by 2 PM and added this to the 8/22-8/25 sample which was processed today.
10/11	Col. 3 feed line had slipped from holder in bucket allowing it to curl up to surface of H_2O. Did not have good suction.
1/19	Samples stored overnight - chem. ran on 20th.
2/13	Columns 1, 2, 3 were down from 1000-1230 for cleaning and repairs.
3/2	Acidity calculations are probably wrong due to dirty pH probe on col. 1, 2, 3, and 4. Probe was then changed.
4/11	Monostat pump quit running approximately 1530 hours.
4/12	Changed brushes in pump motor. Started pump 0845 - Column 3 feed line had fallen out of sample bottle.
6/28	Column 2. changed plastic band on cassette.
8/17	Col. 1, 2, 3, flow not measured today.
9/25	Col. 1 removed to repair base leak.
9/28	Column 2. removed to repair base leak.
10/2	Installed Col. 1
10/9	Installed Col. 2. 0830
10/30	Measured head loss press in Col. 1, 2, 3, used GAST p.s.i. press gage in line with tee. 1 = 2 p.s.i. 2 = 2 p.s.i. 3 = 3.1 p.s.i. 3/32" tygon
10/31	Col. 1 removed for repairs. Base leaks.
11/1	Col. 3 removed for repairs. Base leaks.
11/13	Column 1, 3 reinstalled after repairs.

Table A2.1. Timeline for Column Experiments Through November 1989 (contd).

FL3 Leachate: Columns 4, 5, 6

4/6	All columns ok. Water blue in collection buckets. Some precipitate noticeable in tubing and columns.
4/6	Switched Tubing to 4/32 on all columns, turned pump on at 1354 Column 4 started flowing at 1431; Column 5 at 1408; Column 6 at 1423.
4/7	Started taking sample in 250 ml bottle at the same pumping rate as previous day, after 20 min, we adjusted the knob on the cassette in an attempt to reduce the flow rate. The volume of the 20 min time period was recorded and will be added to the cumulative flow.
4/7	Changed tubing on columns 4 - 6 to 3/32. Started all columns at 1020.
4/8	After sampling it was clear that acidity was greater than alkalinity. To slow down flow we switched the cassettes around to lower speed using the same size tubing 3/32. It looked like it was pumping water okay so left it at that.
4/11	No sample collected, tubing got kinked inside cassettes. Changed from 3/32 to 2/32 I.D. on columns which should be approximately 30 mls/hr. Also changed to a new batch of feed water because the columns had drained back into feed buckets and may have contaminated the feed. 0920 started pump with new tubing on 4, 5 & 6. These will have to fill with water so it will be several hours before they start overflowing to collect a sample. By 1515 none of the columns had started flowing yet, two had water showing above rock. We will calculate overnight volume based on known volume/time collected for sampling tomorrow.
4/12	All 3 buckets had some water collected. 0828 started collecting samples. Collected samples at 1228. Started pump at 1230.
4/12	At 1330 we changed the cassettes to the low drive, still using 2/32" tubing. This should bring the flow rate to about 10-15 ml/hr. (4/13 we got 12-13 mls/hr.)
4/13	At 1230 we changed the tubing from 2/32 I.D. to 1/32 I.D. because acidity was still a little higher than alkalinity. This should bring flow down to approximately 5 ml/hr. It is estimated that columns started flowing at this new rate at 1315 - very hard to tell at this low flow so we'll just say that Col 4 was behind the others (had lost a little more water when changing tubing).
4/25	When changing the tubing on columns 7, 8, 9, the tubing to column 6 was knocked off, lost about 60 ml from the column.
4/26	We included the estimated 60 mls which was lost on 4/25, in the cumulative total.
5/20	Adjusted Column 4, the tubing and the plastic shield in good condition
5/23	Column 4 still slower than the others.
5/25	Slow flow on Column 6, lost some flow out of column when trying to adjust tubing.
6/20	Blue flaky ppt. obvious in treated water from Col. 6 - hardly noticeable in other two receiving bottles.
8/23	Column 6, The tubing was crimped, when changing the tubing some H_2O drained from the column. Should be ok at about 0400 on 8/24
8/25	Added "new" water to FL3 feed buckets. This came from the second large barrel so may be a little different than what has been going through for the last couple months. No sample from Column 6 today. Hopefully it is working okay now. Hard to tell at such low flow. So - no sample no. 5378.

Table A2.1. Timeline for Column Experiments Through November 1989 (contd).

8/31	Pump pulled tubing thru and column drained overnite. Will take a good while before it is full again. (Column 6)
9/1	Column 6 - the column is about 1/2 full, should be normal by 9/2.
11/1	Tubing too far into sump on Col. 6. Tubing suction out of H_2O.
11/17	Column 5 not flowing, changed tubing. 1/32"
11/18	Column 5 not flowing, reprimed new tubing, started to pump.
11/30	Column 5 - tubing was clamped off from 0800 to 1500.
12/1	Column 5 not flowing - changed guard band - started to flow at 1400
1/5	Leak in Column 6, lost some flow, there wasn't enough sample to run metals & SO_4 on columns 4, 5, & 6. I had emptied the sample bottles on Tuesday.
1/19	Col. 6 - No flow recorded, problem with column 6, moved tubing in cassette. No sample.
1/19	Column 5 - No sample because sample accidently mixed with sample from column 9. Column 4 & 6 chem. ran on 20th.
1/26	Low flow recorded, tightened cassette screws as they were loose. Column 6
1/31	Column 5. Low flow recorded, moved tubing, tightened clamp. Will monitor to see if flow increases.
2/9	Col. 5 Low flow. Changed cassette pressure plate. Started to flow at 0945.
2/13	Col. 4. Line pulled out of sump by pump. Column drained down.
2/13	Col. 4, 5, 6 were down from 1000-1230 for cleaning and repairs.
2/15	Col. 4, 6, changed tubing, low flows recorded today. Started to flow at 1500 hrs.
3/2	Col. 4. Acidity calculation probably wrong. pH probe dirty and was changed after this calculation.
3/6	Col. 6 Low flow recorded, moved tubing, started at 12:15.
3/15	Col. 6 low flow, moved tubing. Started at 0815.
3/23	Added 1 liter to Col. 6, there was an addition error on 9/23.
3/23	Column 4's sample bottle was contaminated, no sample was taken.
4/11	Monostat pump quit running at approximately 1530 hr.
4/12	Changed brushes in pump motor. Started working at 0845.
5/3	Col. 6. Low flow recorded. Tubing was accidently displaced from column and column drained down.
6/12	Low flows recorded because columns were moved to new lab and some leachate lost out of columns during transportation. Columns 4, 5, 6.
8/17	Flow not measured today. Col. 4, 5, 6.
8/23	Col. 5, feed line came off column, column drained empty. Replaced feed line.
8/26	Column 5, started to flow at approximately 1200 hr.
10/4	Column 6. Removed to repair base leak.
10/9	Column 6. Installed at 0830.
10/12	Column 6. No sample. Column not yet filled after repair.
11/14	Column 5. Lined plugged - no flow recorded.
11/22	Column 5. Purged feed line to open blockage in column. Pumping OK 0900.
11/27	Col. 5, 6. Tightened plastic band - no flow recorded. This seemed to help produce flow. Band clamps had released some tension to not be tight around pump cams. Col. 5 started flowing 11/29 0800 Col. 6 started flowing

Table A2.1. Timeline for Column Experiments Through November 1989 (contd).

Seep 1 Leachate: Columns 7, 8, 9

4/6 Columns ok although #9 is a little slow. I adjusted it a little. Some precipitate or coating of the limestone can be seen in the columns but not as much as in the other 6.

4/12 Columns have been flowing consistently since start up. Treatment also consistent so far, so we continued to use 5/32 I.D. tubing.
*Moved tubing in cassettes to an unused section because other was getting worn and slowly decreasing the flow.

4/13 The pump was shut off for 20 min, while we changed tubing on columns 4, 5, 6.

4/14 Column 7 The flow rate was decreasing so we moved the tubing. Did a 1 hr. test on column 7 to check flow rate. Flow rate = 121 ml/hr, adjusted cassette to reduce flow rate.

4/25 Changed the tubing on columns 7, 8, 9 (ALL NEW TUBING).

5/4 Changed the Seep 1 feed H_2O, the new H_2O is browner in color and appears to have more sediment in it.

5/9-12 Columns have slowed down in flow...clogging from sediment?

5/13 Changed the Seep 1 feed water to that collected 5/12. Not as brown or as much sediment as last batch. I put new feed buckets on at 9:00 before collecting today's sample this sample will be a mixture of new and old through the column. Today's feed sample will be of new batch (5/12).

5/16 Column 8 - No Flow Over the Weekend
The plastic shield was broken, replaced shield started pumping at 0710, flow from column started at 0800.

6/3 Column 8 - stopped flowing sometime 6/3 afternoon. Not discovered until Monday AM. Same problem as above. Replaced plastic shield and started column at 0830 6/6. About 1/3-1/2 of the column had emptied. Outflow started at approximately 1215. Measured at 1415 approximately 138 ml/hr. Turned down. Tomorrows volume will be from 6/6 1415.

6/7 Adjusted flow on Col. 8 - was flowing too fast at 130 ml/hr.

6/13 Changed tubing on columns 7, 8, 9.

6/20 Monday. Columns 7 & 8 are plugged. This must have happened over the weekend because there had been some flow (5000 + mls). Going to replace pipette tips where tubing is attached to see if that will do it. Probably should start filtering the Seep 1 feed water as it seems to get cruddier while it sits after collection, precipitating something (?) Added 500 mls to columns 7 & 8, when we replaced the plastic tip, we had to empty the columns, the 500 mls we added was the estimated volume emptied from the columns.

6/21 Columns 7 & 9 were not flowing. Col. 7 had a kink in the feed tube. Col. 9 was plugged we changed the pipette tip. Restarted at approximately 0830. Only lost a few mls. (less than 40) from Col. 9 while changing tip. Put a new plastic strip on col. 9 cassette.

6/23 Put new full feed buckets on with water collected Tuesday, 6/14.

6/27 Column 7 The plastic band was broken, replaced the band.

6/30 Noticed flow was low on Col. 7 - plastic band in cassette was broken - replaced it at 1515.

7/27 Adjusted tubing on column #9

7/28 Adjusted tubing on columns 7 & 8.

8/16 Plastic band broke, replaced band at 1600 (Column 9)

Table A2.1. Timeline for Column Experiments Through November 1989 (contd).

8/17	Tubing was put on backwards, the column drained and no flow was recorded. Column started flowing again at - 0940. (Column 9)
8/19	Changed tubing on columns 7, 8, 9.
9/6	Changed tubing and pipet on column 8. Cassette malfunctioned to crimp tubing.
9/7	Tubing crimped, changed cassette.
9/8	Replaced wear guard band - came loose from clamp lock 1530 hr. (Col. 8)
9/23	Replaced wear band (broken) 0940 Column 9 started flowing at 0950.
11/7	Changed guard band (broken) 0830 Col. 7.
11/10	Cassette locking tab replaced on Col. 7. Column was not flowing. Started flowing at 0945.
11/17	Changed tubing on columns 7, 8, 9. Changed broken guard band on cassette, column 7. Replaced locking tab on cassette, column 9. Lost a few mls column 5. Changed band on column 8.
11/28	Column 7 leaking at base, shut system down to repair. Started at 1330 hr. Column 7 would not seal, left off overnight.
11/29	Drained Column 7, to repair leak on base. Replaced tubing. Column started flowing again at - 1100 hr.
12/14	Column 7 Plastic band broke, no flow recorded. Fixed band at 0830.
12/20	Column 9 Cassette hold down clamp broke, no flow recorded. Repaired at 0815.
1/19	Column 9 No sample because sample accidently mixed with sample from column 5. Column 7 & 8 chem. ran on 20th.
2/13	Column 7 Column sample flow line came apart from column. Flow lost on floor. Column working at 1300.
2/13	Col. 7, 8, 9 were down from 1000-1230 for cleaning and repairs.
2/14	Col. 7 Cassette pump gear tooth stripped, replaced at 0930, col. flowing at 0945.
3/13	Col. 7 Low flow recorded, replaced plastic band. Fixed at 0900. - noticed not pumping at 1500 hrs. Band came loose from clamp. Repaired at 1515 hrs.
3/23	Running low on Seep 1 Leachate. Since columns 7 & 8 have a lower total flow than column 9 we will run only column 8 until it reaches column 9's total flow, we will then run column 7 to the same point if there is enough leachate. At this point we will stop the columns and wait until Seep 1 starts flowing, in order to collect more leachate.
3/30	Stopped leachate to column 8 and switched to column 7. Column 8 and 9 are now close to equal in flow volumes. Column 7 flow started at approximately 1030 hrs.
3/31	Column 7, replaced plastic band as it had pulled loose from clamp. Flow resumed at 0900 hr.
4/3	Column 7, low flow recorded. Band loose from clamp. Replaced clamp.
4/10	Column 7, stopped Seep 1 columns. They are approximately equal in total flow and ran out of leachate. Will start when more leachate is collected from Seep 1. It is still froze.
4/26	Started Col. 7, 8, 9. Flow started 7 = 1540 hr., 8 = 1540 hr. 9 = 1500 hr.
5/25	Col. 8 Band broke, replaced it at 0930. At 1030 noticed drive gear B.O. Replaced cassette, started pumping at 1030 hrs.
6/12	Col. 9 Replaced plastic band. Started at 0900.
6/21	Col. 8 0900: disconnected for column leak. (Base) must be repaired.

Table A2.1. Timeline for Column Experiments Through November 1989 continued.

6/22	Col. 8 Repair completed. Reconnected column to pump at 0930. Started to flow at 1030. Changed plastic band. Col. 7, 9 changed plastic band.
7/12	Column 7, 8, shut down for repair of leaks at 0745. Col. 9, 0 flow recorded as clip was left on feed line overnight and column is also plugging with brown precipitate matter. Will flush with leachate and monitor flow rate.
7/13	No chemistry done on Col. 7, 8, 9, due to column repair required.
7/17	Columns 7, 8, 9, reconnected to pump. Repairs complete. Col. 7 & 8 started flowing at 0900. Col. 9 started flowing at 1230.
7/18	Column 7, disconnected at 0830. Must repair base leak again.
7/20	Column 7 Hooked back up. Started to flow at 1145.
7/25	Column 8 Low flow, broken cassette gear. Changed cassette. Flow started at 0800.
7/31	Column 7, low flow recorded, leaking at base. Repair with contact cement. Purged column 5 times with 50 cc. H_2O. To limit plugging by precipitate - put back on line.
8/15	Column 7, leaking at base. Disconnected for repair.
8/16	Column 7, reconnected at 0740.
8/30	Col. 7, leaking, disconnected for repairs.
9/5	Col. 7, repair to column base damaged. Had to repair again.
9/6	Col. 7, reinstalled at 0845. At 0950 changed plastic band. Started to flow at 1100.
9/25	Col. 7 removed to repair base leak.
9/26	Col. 9 changed plastic band.
10/2	Col. 7 reinstalled column. Started flowing 0800 10-3-89
10/6	Col. 7, 8, 9 measured head loss pressures = pressure developed in line before column. Using a GAST press gage and inline tee to gage. 7 = 3.8 p.s.i., 8 = 5.6 p.s.i., 9 = 4.6 p.s.i. 5/32" tygon tube.
10/19	Col. 7, 8, 9 changed tygon tubing on columns. Replaced hold down clamp on Col. 9 cassette.
10/23	Col. 9, changed plastic band. Replaced hold down clamp. 1425
10/31	Col. 7, 8 removed to repair base leak.
11/6	Col. 9 secured plastic band.
11/7	Col. 9 secured plastic band.
11/8	Col. 9 secured plastic band.
11/13	Column 7, 8 reinstalled columns after repairs.
11/20	Col. 8 no flow recorded - leak on input line repaired.
11/22	Col. 8, 9 purged columns with syringe to force open feed blockages. Pumping OK 0900.

APPENDIX 3

Quality Assurance Data for

Column Experiment, Alkaline Mixture Experiment, and

Seep 1 Limestone Bed Field Test

Summary of QA for Alkaline Treatment Experiments

Parameter	Total # of samples	# of samples used in Calculations	$\overline{\%RR}$	$\overline{\%RR}$ – outliers	%RR 95% CI	95% CI – outliers	$\overline{Aj}$	S	% Recovery 95% CI
Cu	1042	75	2.3	.9	5.8	2.2	100.1	1.7	96.8 – 103.4
Ni	1042	75	1.9	1.0	4.8	2.6	101.7	7.9	86.0 – 117.4
Co	1042	75	4.9	2.3	12.4	5.7	100.8	3.5	93.1 – 107.7
Zn	1042	74	1.2	.7	3.1	1.8	101.1	3.2	94.8 – 107.4
Ca	1042	74	2.9	2.0	7.2	5.0	99.5	2.6	94.4 – 104.6
Mg	498	32	5.6	3.5	14.1	8.8	99.8	.9	97.9 – 101.7
Fe	1042	75	.1	.3	NA	NA	99.8	1.6	96.7 – 102.9
Al	544	43	3.6	2.0	8.9	5.0	97.7	4.8	88.0 – 107.4
SO_4	1242 [1]	40	1.6	4.1	NA	NA	94.4	7.8	78.7 – 110.1

NA - Not Applicable

1 - Not enough sample to run spikes on 644 of these samples

Precision and Accuracy for Alkaline Treatment Experiments

Sample #	Sample Value	Duplicate	π Value	% RR	Spike Value	% Recovery
6000	.1	.1	.1	0	9.9	99
6030	.1	.1	.1	0	9.9	99
6040	.1	.1	.1	0	10.0	100
6047	.1	.1	.1	0	5.0	99
6064	.1	.1	.1	0	5.0	99
6070	.1	.1	.1	0	5.1	101
6078	.1	.1	.1	0	5.0	99
6113	1.3	1.4	1.35	7.4	10.5	99
6118	.1	.1	.1	0	10.0	100
6134	.8	.8	.8	0	10.3	99
6141	.1	.1	.1	0	10.2	101
6151	.1	.1	.1	0	10.1	100
6168	.1	.1	.1	0	10.2	101
6176	.2	.2	.2	0	10.3	102
6188	.06	.06	.06	0	10.0	100
6199	.14	.13	1.35	7.4	10.1	100
6203	.08	.08	.08	0	10.0	100
6223	.06	.06	.06	0	10.0	100
6236	.01	.01	.01	0	10.0	100
6238	.08	.08	.08	0	10.0	100
6348	.05	.05	.05	0	5.0	100
6349	.16	.16	.16	0	5.1	100
6401	<.01	<.01	<.01	0	5.21	104
6403	<.01	<.01	<.01	0	5.04	101
5012	7	7	7	0	14	104
5017	47	47	47	0	35	104
5027	54	54	54	0	38	103
5041	17	17	17	0	18	97
5046	.06	.06	.06	0	10	100
5066	9	9	9	0	15	103
5080	60	60	60	0	40	100
5099	2	2	2	0	11	100
5106	3	3	3	0	12	104
5120	11	10	10.5	9.5	15	98

Parameter: Cu

$\overline{\%\,RR}$ = 2.3

95% CI = 5.8

$\overline{A_J}$ = 100.1

95% CI = 96.8 and 103.4

S = 1.7

Values when samples 5578 + 6591 are omitted from data set

$\overline{\%\,RR}$ = .9

95% CI = 2.2

Precision and Accuracy for Alkaline Treatment Experiments

Sample #	Sample Value	Duplicate	π Value	% RR	Spike Value	% Recovery
5134	5	5	5	0	12	96
5164	4.1	4.1	4.1	0	12.2	101
5177	1.7	1.6	1.65	6.1	10.6	98
5206	3.7	3.7	3.7	0	11.8	100
5220	7	6.9	6.95	1.4	13.6	101
5231	.1	.1	.1	0	9.8	98
5251	3.7	3.6	3.65	2.7	12	101
5268	.1	.1	.1	0	10	100
5292	.1	.1	.1	0	5	99
5318	.2	.2	.2	0	5.1	100
5369	.1	.1	.1	0	9.9	99
5376	.1	.1	.1	0	9.9	99
5389	.1	.1	.1	0	10	100
5407	63	64	63.5	1.6	40	96
5408	120	122	121	1.7	72	102
5413	.1	.1	.1	0	10	100
5416	.1	.1	.1	0	10	100
5421	.26	.27	.265	3.8	9.9	98
5441	.11	.11	.11	0	9.9	98
5451	.13	.13	.13	0	10.1	100
5466	.5	.5	.5	0	5.3	101
5469	.4	.4	.4	0	5.2	100
5471	.9	.9	.9	0	5.6	103
5484	.2	.2	.2	0	5.0	98
5493	<.1	<.1	<.1	0	5.0	100
5505	.2	.2	.2	0	5.1	100
5512	4.10	4.12	4.11	.5	7.10	100
5521	.1	.1	.1	0	5.0	98
5536	.03	.03	.03	0	4.95	99
5546	.23	.24	.235	4.3	5.02	102
5555	.37	.36	.365	2.7	5.2	97
5578	.02	.03	.025	40.0	5.0	100
5582	.11	.10	.105	9.5	5.09	101
6457	.01	.01	.01	0	4.99	100

Parameter: Cu

$\overline{\%\,RR}$ = NA

95% CI = NA

$\overline{A_J}$ = NA

95% CI = NA

S = NA

Precision and Accuracy for Alkaline Treatment Experiments

Sample #	Sample Value	Duplicate	$\bar{x}$ Value	% RR	Spike Value	% Recovery
6461	<.01	<.01	<.01	0	5.0	100
6493	NS					
6494	NS					
6507	NS					
6513	NS					
6519	NS					
6591	.02	.01	.015	66.7	4.97	99
6622	<.01	<.01	<.01	0	5.03	101
6629	.12	.12	.12	0	5.10	101
1037	1.20	1.19	1.195	.8	5.62	101
1085	.62	.60	.61	3.3	5.38	102
1089	.35	.36	.355	2.8	5.20	101
6632	NS					
6639	NS					

Parameter: Cu

$\overline{\%\,RR}$ = NA

95% CI = NA

$\overline{A_J}$ = NA

95% CI = NA

S = NA

Precision and Accuracy for Alkaline Treatment Experiments

Sample #	Sample Value	Duplicate	$\bar{x}$ Value	% RR	Spike Value	% Recovery
6000	.1	.1	.1	0	10.0	100
6030	.1	.1	.1	0	9.9	99
6040	.1	.1	.1	0	10.1	100
6047	.1	.1	.1	0	10.0	100
6064	.18	.18	.18	0	10.0	99
6070	.01	.01	.01	0	10.0	100
6078	.02	.02	.02	0	10.0	100
6113	1.3	1.4	1.35	7.4	10.5	98
6118	.1	.1	.1	0	10.0	100
6134	.8	.8	.8	0	10.3	103
6141	.1	.1	.1	0	10.1	100
6151	.6	.6	.6	0	10.3	100
6168	.1	.1	.1	0	10.0	100
6176	.4	.4	.4	0	10.3	101
6188	.1	.1	.1	0	10.0	100
6199	.5	.5	.5	0	10.3	100
6203	.2	.2	.2	0	10.0	99
6223	.7	.7	.7	0	10.3	100
6236	.1	.1	.1	0	10.0	100
6238	.8	.8	.8	0	10.3	99
6348	.8	.8	.8	0	5.8	107
6349	.4	.4	.4	0	5.8	112
6401	<.1	<.1	<.1	0	5.1	104
6403	<.1	<.1	<.1	0	5.1	102
5012	132	132	132	0	78	103
5017	136	137	136.5	.7	77	98
5027	136	136	136	0	76	97
5041	167	167	167	0	91	97
5046	7.1	7.1	7.1	0	8.2	96
5066	118	120	119	1.7	69	99
5080	188	187	187.5	.5	102	98
5099	191	191	191	0	99	94
5106	130	130	130	0	69	92
5120	162	163	162.5	.6	93	102

Parameter: Ni

$\overline{\%\,RR}$ = 1.9

95% CI = 4.8

$\bar{A_J}$ = 101.7

95% CI = 86.0 and 117.4

S = 7.9

Values when sample 6622 is omitted from data set

$\overline{\%\,RR}$ = 1.0

95% CI = 2.6

Precision and Accuracy for Alkaline Treatment Experiments

Sample #	Sample Value	Duplicate	$\bar{x}$ Value	% RR	Spike Value	% Recovery
5134	196	193	194.5	1.5	111	103
5164	216	220	218	1.8	127	107
5177	201	205	203	2.0	120	108
5206	234	237	235.5	1.3	138	108
5220	213	215	214	.9	135	115
5231	6	6	6	0	13	100
5251	192	192	192	0	104	98
5268	11	10	10.5	9.5	10	98
5292	100	104	102	3.9	62	102
5318	152	154	153	1.3	86	99
5369	142	144	143	1.4	88	108
5376	98	96	97	2.1	70	120
5389	170	172	171	1.2	92	96
5407	192	198	195	3.1	108	100
5408	190	194	192	2.1	99	93
5413	155	158	156.5	1.9	84	95
5416	9	9	9	0	15	103
5421	130	128	129	1.6	80	107
5441	8	8	8	0	19	136
5451	14	13	13.5	7.4	20	119
5466	12	12	12	0	12	75
5469	103	107	105	3.8	54	86
5471	88	89	88.5	4.5	49	90
5484	12	12	12	0	34	109
5493	102	98	100	4.0	75	100
5505	12	12	12	0	34	109
5512	87	86	86.5	1.2	45	107
5521	66	67	66.5	1.5	41	93
5536	55	56	55.5	1.8	33	101
5546	80	81	80.5	1.2	46	101
5555	95	95	95	0	5.49	100
5578	8.2	8.3	8.25	1.2	10.7	116
5582	1.50	1.52	1.51	1.3	5.74	100
6457	<.1	<.1	<.1	0	5.1	100

Parameter: Ni

$\overline{\%\,RR}$ = NA

95% CI = NA

$\bar{A}_J$ = NA

95% CI = NA

S = NA

...

Precision and Accuracy for Alkaline Treatment Experiments

Sample #	Sample Value	Duplicate	π Value	% RR	Spike Value	% Recovery
6461	<.1	<.1	<.1	0	4.9	100
6493	NS					
6494	NS					
6507	NS					
6513	NS					
6519	NS					
6591	.03	.03	.03	0	4.89	98
6622	.01	.02	.015	66.7	5.04	101
6629	.66	.65	.655	1.5	5.48	103
1037	21.6	21.7	21.65	.5	17.3	118
1085	10.77	10.70	10.735	.7	10.45	101
1089	9.76	9.80	9.78	.4	10.03	106
6632	NS					
6639	NS					

Parameter: Ni

$\overline{\%\,RR}$ = NA

95% CI = NA

$\overline{A_J}$ = NA

95% CI = NA

S = NA

Precision and Accuracy for Alkaline Treatment Experiments

Sample #	Sample Value	Duplicate	$\bar{x}$ Value	%RR	Spike Value	% Recovery
6000	.03	.03	.03	0	10.0	100
6030	.02	.02	.02	0	10.0	100
6040	.05	.05	.05	0	10.0	100
6047	.01	.01	.01	0	10.0	100
6064	.02	.02	.02	0	10.0	100
6070	.01	.01	.01	0	10.0	100
6078	.01	.01	.01	0	10.0	100
6113	.20	.23	.215	14.0	10.1	100
6118	.01	.01	.01	0	10.0	100
6134	.10	.12	.11	18.2	10.0	99
6141	.01	.01	.01	0	10.0	100
6151	.07	.06	.065	15.4	10.0	100
6168	.01	.01	.01	0	9.9	99
6176	.06	.06	.06	0	10.0	100
6188	.08	.07	.075	13.3	10.0	100
6199	.08	.08	.08	0	10.0	100
6203	.01	.01	.01	0	9.9	99
6223	.04	.05	.045	22.2	10.1	101
6236	.01	.01	.01	0	9.8	98
6238	.03	.03	.03	0	9.9	99
6348	.06	.08	.065	28.6	5.2	103
6349	.02	.02	.02	0	5.2	104
6401	.02	.01	.015	66.6	5.3	96
6403	<.01	<.01	<.01	0	5.3	106
5012	5.8	5.8	5.8	0	12.9	100
5017	6.0	6.0	6.0	0	12.9	99
5027	6.0	6.0	6.0	0	12.9	99
5041	6.8	6.8	6.8	0	13.2	99
5046	.8	.8	.8	0	10.2	98
5066	5.5	5.5	5.5	0	12.6	99
5080	7.5	7.5	7.5	0	14.0	102
5099	7.4	7.4	7.4	0	14.0	102
5106	6.0	6.0	6.0	0	13.1	101
5120	6.8	6.8	6.8	0	13.3	99

Parameter: Co

$\overline{\%RR}$ = 4.9

95% CI = 12.4

$\overline{A_J}$ = 100.8

95% CI = 93.1 and 107.7

S = 3.5

Values when samples 6401 & 6457 are omitted from data set

$\overline{\%RR}$ = 2.3

95% CI = 5.7

Precision and Accuracy for Alkaline Treatment Experiments

Sample #	Sample Value	Duplicate	$\bar{x}$ Value	% RR	Spike Value	% Recovery
5134	7.3	7.3	7.3	0	13.6	99
5164	9.7	9.6	9.65	1.0	16.8	113
5177	8.6	8.6	8.6	0	14.5	101
5206	9.4	9.4	9.4	0	15.0	102
5220	8.8	8.9	8.85	1.1	14.6	101
5231	.6	.6	.6	0	10.2	99
5251	8.8	8.7	8.75	1.1	14.4	100
5268	.8	.8	.8	0	10.4	100
5292	5.4	5.4	5.4	0	12.8	101
5318	7.6	7.5	7.55	1.3	13.8	100
5369	8.3	8.2	8.25	1.2	14.0	99
5376	7.6	7.7	7.65	1.3	13.8	100
5389	8.8	8.6	8.7	2.3	14.2	99
5407	9.4	9.6	9.5	2.1	15.1	103
5408	10.3	10.1	10.2	2.0	15.2	101
5413	8.0	7.9	7.95	1.3	14.0	100
5416	.9	.9	.9	0	10.5	100
5421	8.0	8.1	8.05	1.2	14.5	103
5441	.6	.6	.6	0	11.1	108
5451	1.0	1.0	1.0	0	10.2	97
5466	1.2	1.2	1.2	0	5.8	104
5469	6.4	6.2	6.3	3.2	9.1	112
5471	6.1	6.2	6.15	1.6	8.9	110
5484	1.0	1.0	1.0	0	5.1	92
5493	4.5	4.5	4.5	0	7.4	102
5505	1.1	1.1	1.1	0	5.4	97
5512	3.8	4.0	3.9	11.7	6.9	101
5521	4.1	4.0	4.05	2.5	7.4	103
5536	3.53	3.56	3.545	.8	7.06	104
5546	5.49	5.54	5.515	.9	7.74	100
5555	6.03	5.95	5.99	1.3	8.12	103
5578	.73	.72	.725	1.4	5.4	102
5582	8.22	8.20	8.21	.2	9.1	100
6457	.01	.05	.03	133.3	5.04	99

Parameter: Co

$\overline{\%\,RR}$ = NA

95% CI = NA

$\overline{A_J}$ = NA

95% CI = NA

S = NA

...

Precision and Accuracy for Alkaline Treatment Experiments

Sample #	Sample Value	Duplicate	π Value	% RR	Spike Value	% Recovery
6461	<.01	<.01	<.01	0	4.9	102
6493	NS					
6494	NS					
6507	NS					
6513	NS					
6519	NS					
6591	.01	.01	.01	0	4.96	99
6622	.01	.01	.01	0	4.88	98
6629	.07	.08	.075	13.3	4.96	98
1037	1.84	1.87	1.855	1.6	6.52	112
1085	.86	.87	.865	1.2	5.19	96
1089	.80	.82	.81	2.5	5.21	96
6632	NS					
6639	NS					

Parameter: C_0

$\overline{\%\,RR}$ = NA

95% CI = NA

$\overline{A_J}$ = NA

95% CI = NA

S = NA

Precision and Accuracy for Alkaline Treatment Experiments

Sample #	Sample Value	Duplicate	$\bar{x}$ Value	%RR	Spike Value	% Recovery
6000	.03	.03	.03	0	10.0	100
6030	.02	.02	.02	0	10.0	100
6040	.05	.05	.05	0	10.0	100
6047	.01	.01	.01	0	9.7	97
6064	.06	.06	.06	0	10.0	100
6070	.01	.01	.01	0	9.8	98
6078	.01	.01	.01	0	9.8	98
6113	.78	.77	.775	1.3	9.8	94
6118	.01	.01	.01	0	10.0	100
6134	1.10	1.09	1.095	.9	10.5	100
6141	.01	.01	.01	0	10.1	101
6151	.45	.45	.45	0	10.3	101
6168	.01	.01	.01	0	10.0	100
6176	.40	.39	.395	2.5	10.2	100
6188	.01	.01	.01	0	10.0	100
6199	.30	.32	.31	6.5	10.1	99
6203	.01	.01	.01	0	10.0	100
6223	.24	.24	.24	0	10.1	100
6236	.02	.02	.02	0	9.9	99
6238	.10	.10	.10	0	10.1	100
6348	.05	.05	.05	0	5.4	107
6349	.17	.17	.17	6	5.5	108
6401	<.1	<.1	<.1	0	5.2	104
6403	<.01	<.01	<.01	0	5.4	108
5012	2.8	2.8	2.8	0	11.2	98
5017	3.3	3.3	3.3	0	11.2	96
5027	3.2	3.2	3.2	0	10.4	90
5041	3.9	3.9	3.9	0	NS	NA
5046	.5	.5	.5	0	10.4	101
5066	2.9	2.9	2.9	0	11.5	100
5080	5.2	5.2	5.2	0	13.5	107
5099	4.7	4.7	4.7	0	12.4	100
5106	3.8	3.8	3.8	0	12.0	101
5120	4.2	4.2	4.2	0	12.1	100

Parameter: Zn

$\overline{\%RR} = 1.2$

95% CI = 3.1

$\overline{A_J} = 101.1$

95% CI = 94.8 and 107.4

S = 3.2

Values when sample 5493 is omitted from data set

$\overline{\%RR} = .7$

95% CI = 1.8

Precision and Accuracy for Alkaline Treatment Experiments

Sample #	Sample Value	Duplicate	$\bar{x}$ Value	% RR	Spike Value	% Recovery
5134	5.3	5.3	5.3	0	12.6	100
5164	8.8	8.8	8.8	0	14.4	100
5177	8.2	8.2	8.2	0	14.1	100
5206	10.2	10.2	10.2	0	15.3	101
5220	9.9	10.0	9.95	1.0	15.2	102
5231	.8	.8	.8	0	10.4	100
5251	8.0	8.1	8.05	1.2	14.0	100
5268	1.1	1.0	1.05	9.5	10.5	100
5292	.2	.2	.2	0	10.1	100
5318	2.5	2.5	2.5	0	11.3	100
5369	4.4	4.4	4.4	0	12.2	100
5376	2.9	2.8	2.85	3.5	11.5	101
5389	4.8	4.9	4.85	2.1	12.4	100
5407	9.8	10.0	9.9	2.0	15.2	102
5408	9.9	10.0	9.95	1.0	14.8	99
5413	4.6	4.6	4.6	0	12.4	101
5416	1.8	1.8	1.8	0	11.8	108
5421	3.3	3.3	3.3	0	11.7	100
5441	1.4	1.4	1.4	0	10.8	101
5451	2.5	2.6	2.55	3.9	11.5	102
5466	2.7	2.7	2.7	0	7.0	110
5469	3.0	3.0	3.0	0	7.1	109
5471	4.1	4.1	4.1	0	7.4	105
5484	2.4	2.4	2.4	0	6.3	101
5493	.3	.2	.25	40.0	5.4	103
5505	2.3	2.3	2.3	0	6.6	107
5512	3.2	3.3	3.25	3.1	6.6	101
5521	1.0	1.0	1.0	0	5.9	98
5536	.63	.64	.635	1.6	5.51	104
5546	1.85	1.83	1.84	1.1	6.03	102
5555	3.78	3.80	3.79	.5	6.95	101
5578	.86	.86	.86	0	5.52	101
5582	5.57	5.56	5.565	.2	7.97	102
6457	.01	.01	.01	0	5.21	104

Parameter: Zn

$\overline{\%\,RR}$ = NA

95% CI = NA

$\overline{A_J}$ = NA

95% CI = NA

S = NA

...

Precision and Accuracy for Alkaline Treatment Experiments

Sample #	Sample Value	Duplicate	π Value	% RR	Spike Value	% Recovery
6461	.02	.02	.02	0	5.04	101
6493	NS					
6494	NS					
6507	NS					
6513	NS					
6519	NS					
6591	.02	.02	.02	0	5.01	100
6622	.01	.01	.01	0	5.10	102
6629	.11	.12	.115	8.7	5.09	101
1037	3.31	3.33	3.32	.6	6.70	101
1085	2.36	2.38	2.37	.8	6.20	100
1089	1.68	1.69	1.685	.6	5.85	101
6632	NS					
6639	NS					

Parameter: Zn

$\overline{\%\,RR}$ = NA

95% CI = NA

$\overline{A_J}$ = NA

95% CI = NA

S = NA

...

Precision and Accuracy for Alkaline Treatment Experiments

Sample #	Sample Value	Duplicate	$\bar{x}$ Value	% RR	Spike Value	% Recovery
6000	18	18	18	0	19	100
6030	1.0	1.0	1.0	0	11.0	105
6040	1.0	1.0	1.0	0	10.0	95
6047	1.7	1.6	1.65	6.1	10.5	97
6064	.8	.8	.8	0	10.3	99
6070	1.0	1.0	1.0	0	10.0	95
6078	1.0	1.0	1.0	0	10.0	95
6113	.1	.1	.1	0	10.0	100
6118	.07	.06	.065	15.4	10.0	100
6134	.1	.1	.1	0	10.0	100
6141	.9	.9	.9	0	10.4	100
6151	.2	.2	.2	0	10.1	100
6168	.8	.8	.8	6	10.6	102
6176	.4	.4	.4	0	10.4	102
6188	.6	.6	.6	0	10.3	100
6199	.3	.3	.3	0	10.1	100
6203	.6	.6	.6	0	10.3	100
6223	.1	.1	.1	0	10.0	100
6236	.6	.6	.6	0	10.4	101
6238	.3	.3	.3	0	10.2	100
6348	.3	.3	.3	0	5.1	99
6349	.3	.3	.3	0	5.1	99
6401	12	10	11	9.1	104	93
6403	.7	.7	.7	0	5.4	94
5012	26.4	26.4	26.4	0	23.4	101
5017	24.3	24.3	24.3	0	22.0	99
5027	22.2	22.4	22.4	0	21.2	100
5041	15.9	16.1	16.0	1.3	18.1	101
5046	8.7	8.5	8.6	2.3	14.3	100
5066	29.4	29.2	29.3	.7	24.4	99
5080	19.5	19.7	19.6	1.0	19.5	98
5099	20.7	20.5	20.6	1.0	20.3	100
5106	27.2	27.4	27.3	.7	23.6	100
5120	30	30.4	30.2	1.3	25.1	100

Parameter: Ca

$\overline{\%RR}$ = 2.9

95% CI = 7.2

$\bar{A}_J$ = 99.5

95% CI = 94.4 and 104.6

S = 2.6

Values when sample 5512 is omitted from data set

$\overline{\%RR}$ = 2.0

95% CI = 5.0

Precision and Accuracy for Alkaline Treatment Experiments

Sample #	Sample Value	Duplicate	$\bar{x}$ Value	% RR	Spike Value	% Recovery
5134	19.2	19.3	19.25	.5	19.6	100
5164	31	32	31.5	3.2	NS	NA
5177	32	31	31.5	3.2	25	97
5206	19	20	19.5	5.1	19	96
5220	20	20	20	0	20	100
5231	5	4	4.5	22.2	12	98
5251	30	30	30	0	25	100
5268	7	7	7	0	14	104
5292	35	35	35	0	27	98
5318	30	28	29	6.9	26	106
5369	18.4	18.2	18.3	1.1	19	99
5376	27	27	27	0	24	102
5389	12	12	12	0	16	100
5407	20	19	19.5	5.1	20	101
5408	22	22	22	0	21	100
5413	18	17	17.5	5.7	19	101
5416	19	19	19	0	19	97
5421	26	26.1	26.05	.4	23	100
5441	7.3	7.4	7.35	1.4	13.6	99
5451	9.9	9.8	9.85	1.0	15	101
5466	11.9	12.9	12.4	8.1	11	98
5469	26	27	26.5	3.8	18	97
5471	25	26	25.5	3.9	17	96
5484	194	192	193	1.1	200	104
5493	212	216	214	1.9	210	100
5505	196	196	196	0	188	90
5512	.4	.2	.3	66.7	5.1	100
5521	422	424	423	.5	314	103
5536	9.6	10.2	9.9	6.1	9.8	98
5546	24.2	25.8	25.0	6.4	17.4	99
5555	448	444	446	.9	326	103
5578	380	380	380	0	300	103
5582	640	660	650	3.1	420	99
6457	1.1	1.1	1.1	0	5.6	102

Parameter: Ca

$\overline{\%\ RR}$ = NA

95% CI = NA

$\overline{A_J}$ = NA

95% CI = NA

S = NA

Precision and Accuracy for Alkaline Treatment Experiments

Sample #	Sample Value	Duplicate	$\bar{x}$ Value	% RR	Spike Value	% Recovery
6461	2.1	2.2	2.15	4.7	6.2	98
6493	NS					
6494	NS					
6507	NS					
6513	NS					
6519	NS					
6591	7.4	7.4	7.4	0	103.2	100
6622	6.4	6.4	6.4	0	102.4	99
6629	6.0	6.4	6.2	6.5	102.6	99
1037	192	188	190	2.2	196	101
1085	340	360	350	5.7	280	101
1089	360	360	360	0	280	101
6632	NS					
6639	NS					

Parameter: Ca

$\overline{\%\,RR}$ = NA

95% CI = NA

$\overline{A_J}$ = NA

95% CI = NA

S = NA

Precision and Accuracy for Alkaline Treatment Experiments

Sample #	Sample Value	Duplicate	$\bar{x}$ Value	% RR	Spike Value	% Recovery
6000	.04	.03	.035	28.6	10.0	100
6030	.09	.09	.09	0	10.0	100
6040	.11	.11	.11	0	10.0	99
6047	2.3	2.33	2.315	1.3	11.19	100
6064	1.13	1.12	1.125	.9	10.58	100
6070	.9	.88	.89	2.2	10.47	100
6078	.4	.4	.4	0	10.22	100
6113	.01	.01	.01	0	10.0	100
6118	.07	.06	.065	15.4	10.0	100
6134	.01	.01	.01	0	10.0	100
6141	.12	.12	.12	0	10.0	99
6151	.11	.10	.105	9.5	10.0	99
6168	.07	.07	.07	0	10.0	100
6176	.12	.12	.12	0	10.1	100
6188	.17	.17	.17	0	10.0	99
6199	.21	.23	.22	9.1	10.1	100
6203	.20	.19	.195	5.1	10.1	100
6223	.20	.21	.205	4.9	10.1	100
6236	.17	.18	.175	5.7	10.1	100
6238	.22	.22	.22	0	10.1	100
6348	.06	.06	.06	0	5.0	99
6349	.05	.05	.05	0	5.0	100
6401	.04	.04	.04	0	5.0	99
6403	.03	.03	.03	0	5.0	99
5012	NS					
5017	NS					
5027	NS					
5041	NS					
5046	NS					
5066	NS					
5080	NS					
5099	NS					
5106	NS					
5120	NS					

Parameter: Mg

$\overline{\%\,RR}$ = 5.6

95% CI = 14.1

$\overline{A_J}$ = 99.8

95% CI = 97.9 and 101.7

S = .9

Values when sample 6457 is omitted from data set

$\overline{\%RR}$ = 3.5

95% CI = 8.8

Precision and Accuracy for Alkaline Treatment Experiments

Sample #	Sample Value	Duplicate	π Value	% RR	Spike Value	% Recovery
5134	NS					
5164	NS					
5177	NS					
5206	NS					
5220	NS					
5231	NS					
5251	NS					
5268	NS					
5292	NS					
5318	NS					
5369	NS					
5376	NS					
5389	NS					
5407	NS					
5408	NS					
5413	NS					
5416	NS					
5421	NS					
5441	NS					
5451	NS					
5466	NS					
5469	NS					
5471	NS					
5484	NS					
5493	NS					
5505	NS					
5512	NS					
5521	NS					
5536	NS					
5546	NS					
5555	NS					
5578	NS					
5582	NS					
6457	.1	.05	.075	66.7	5.0	100

Parameter: Mg

$\overline{\%\,RR}$ = NA

95% CI = NA

$\overline{A_J}$ = NA

95% CI = NA

S = NA

Precision and Accuracy for Alkaline Treatment Experiments

Sample #	Sample Value	Duplicate	$\bar{x}$ Value	% RR	Spike Value	% Recovery
6461	.06	.05	.055	18.2	5.0	100
6493	NS					
6494	NS					
6507	NS					
6513	NS					
6519	NS					
6591	.6	.6	.6	0	98.6	98
6622	1.2	1.2	1.2	0	99.4	99
6629	2.0	2.2	2.1	9.5	100.4	99
1037	168	170	169	1.2	188	104
1085	234	232	233	.9	216	100
1089	222	222	222	0	212	100
6632	NS					
6639	NS					

Parameter: Mg

$\overline{\%\,RR}$ = NA

95% CI = NA

$\overline{A_J}$ = NA

95% CI = NA

S = NA

...

Precision and Accuracy for Alkaline Treatment Experiments

Sample #	Sample Value	Duplicate	$\bar{x}$ Value	% RR	Spike Value	% Recovery
6000	<.1	<.1	<.1	0	10	99
6030	<.1	<.1	<.1	0	10	99
6040	<.1	<.1	<.1	0	10.1	100
6047	<.1	<.1	<.1	0	10.1	100
6064	<.1	<.1	<.1	0	10	99
6070	<.1	<.1	<.1	0	10.1	100
6078	<.1	<.1	<.1	0	10	99
6113	.5	.5	.5	0	10.2	97
6118	<.1	<.1	<.1	0	10	99
6134	4.0	3.9	3.95	2.5	12.1	101
6141	<.1	<.1	<.1	0	10.4	103
6151	4.4	4.4	4.4	0	12.4	102
6168	<.1	<.1	<.1	0	10.2	101
6176	3.2	3.2	3.2	0	11.6	100
6188	5.9	6.0	5.95	1.7	13.1	101
6199	2.3	2.3	2.3	0	11.2	101
6203	<.1	<.1	<.1	0	10	99
6223	19.7	19.8	19.75	.5	20	101
6236	<.1	<.1	<.1	0	10	99
6238	26.3	26.5	26.4	.8	23.1	99
6348	17.4	17.2	17.3	1.2	13.6	99
6349	12.4	12.5	12.45	.8	11.6	108
6401	<.1	<.1	<.1	0	4.9	96
6403	.1	.1	.1	0	4.9	96
5012	.1	.1	.1	0	10	100
5017	.1	.1	.1	0	10	100
5027	.1	.1	.1	0	10	100
5041	.1	.1	.1	0	10	100
5046	.1	.1	.1	0	10.1	100
5066	.1	.1	.1	0	10	100
5080	.1	.1	.1	0	10	100
5099	.1	.1	.1	0	10	100
5106	.1	.1	.1	0	10	100
5120	.1	.1	.1	0	9.8	98

Parameter: Fe

$\overline{\%\,RR}$ = .1

95% CI = .3

$\overline{A_J}$ = 99.8

95% CI = 96.7 and 102.9

S = 1.6

Precision and Accuracy for Alkaline Treatment Experiments

Sample #	Sample Value	Duplicate	π Value	% RR	Spike Value	% Recovery
5134	.1	.1	.1	0	9.9	99
5164	.1	.1	.1	0	9.9	99
5177	.1	.1	.1	0	9.9	99
5206	.1	.1	.1	0	10	100
5220	.1	.1	.1	0	10.1	100
5231	.1	.1	.1	0	10	100
5251	.1	.1	.1	0	9.9	99
5268	.1	.1	.1	0	9.8	98
5292	.1	.1	.1	0	10.1	100
5318	.1	.1	.1	0	10	100
5369	.1	.1	.1	0	10.2	101
5376	.1	.1	.1	0	10.2	101
5389	.1	.1	.1	0	10	100
5407	.1	.1	.1	0	10	100
5408	.1	.1	.1	0	10	100
5413	.1	.1	.1	0	10	100
5416	.1	.1	.1	0	10	100
5421	.1	.1	.1	0	10.3	102
5441	.1	.1	.1	0	10.1	100
5451	.1	.1	.1	0	10	100
5466	.1	.1	.1	0	5.0	99
5469	.1	.1	.1	0	4.9	97
5471	.1	.1	.1	0	5.1	101
5484	<.1	<.1	<.1	0	4.9	98
5493	.1	.1	.1	0	5.1	102
5505	<.1	<.1	<.1	0	5.0	100
5512	<.1	<.1	<.1	0	4.9	98
5521	<.1	<.1	<.1	0	5.1	100
5536	.04	.04	.04	0	5.0	100
5546	.05	.05	.05	0	5.1	101
5555	.02	.02	.02	0	5.0	100
5578	.02	.02	.02	0	5.0	100
5582	.04	.04	.04	0	4.96	99
6457	<.1	<.1	<.1	0	5.1	101

Parameter: Fe

$\overline{\%\,RR}$ = NA

95% CI = NA

$\overline{A_J}$ = NA

95% CI = NA

S = NA

...

Precision and Accuracy for Alkaline Treatment Experiments

Sample #	Sample Value	Duplicate	π Value	% RR	Spike Value	% Recovery
6461	<.1	<.1	<.1	0	5.0	100
6493	NS					
6494	NS					
6507	NS					
6513	NS					
6519	NS					
6591	<.01	<.01	<.01	0	4.96	99
6622	<.01	<.01	<.01	0	5.04	101
6629	17.54	17.49	17.515	.3	13.69	100
1037	<.1	<.1	<.1	0	5.01	98
1085	.03	.03	.03	0	4.96	99
1089	.01	.01	.01	0	4.96	99
6632	NS					
6639	NS					

Parameter: Fe

$\overline{\%\ RR}$ = NA

95% CI = NA

$\overline{A_J}$ = NA

95% CI = NA

S = NA

Precision and Accuracy for Alkaline Treatment Experiments

Sample #	Sample Value	Duplicate	π Value	% RR	Spike Value	% Recovery
6000	NS					
6030	NS					
6040	NS					
6047	NS					
6064	NS					
6070	NS					
6078	NS					
6113	NS					
6118	NS					
6134	NS					
6141	NS					
6151	NS					
6168	NS					
6176	NS					
6188	NS					
6199	NS					
6203	NS					
6223	NS					
6236	NS					
6238	NS					
6348	NS					
6349	NS					
6401	NS					
6403	NS					
5012	1	1	1	0	9	86
5017	1	1	1	0	11	105
5027	1	1	1	0	10	95
5041	1	1	1	0	11	105
5046	1	1	1	0	11	105
5066	1	1	1	0	9	86
5080	4	3	3.5	28.6	12	104
5099	1	1	1	0	9	86
5106	1	1	1	0	10	95
5120	1	1	1	0	10	95

Parameter: Al

$\overline{\%RR}$ = 3.6

95% CI = 8.9

$\overline{A_J}$ = 97.7

95% CI = 88.0 and 107.4

S = 4.8

Values when sample 5451 is omitted from data set

$\overline{\%RR}$ = 2.0

95% CI = 5.0

Precision and Accuracy for Alkaline Treatment Experiments

Sample #	Sample Value	Duplicate	π Value	% RR	Spike Value	% Recovery
5134	1	1	1	0	10	95
5164	1	1	1	0	11	105
5177	1	1	1	0	10	95
5206	1	1	1	0	10	95
5220	1	1	1	0	10	95
5231	1	1	1	0	10	95
5251	1	1	1	0	10	95
5268	1	1	1	0	10	95
5292	1	1	1	0	10	95
5318	1	1	1	0	10	95
5369	1	1	1	0	10.2	97
5376	1	1	1	0	9.9	94
5389	1	1	1	0	9.9	94
5407	1.5	1.7	1.6	12.5	10.1	94
5408	30.8	29.8	30.3	3.3	25.4	101
5413	.1	.1	.1	0	10.2	101
5416	.1	.1	.1	0	10.2	101
5421	.1	.1	.1	0	10.3	102
5441	.1	.1	.1	0	10.1	100
5451	.2	.1	.15	66.7	10.1	100
5466	.7	.8	.75	13.3	5.3	99
5469	.1	.1	.1	0	4.8	95
5471	.1	.1	.1	0	5.1	101
5484	<.1	<.1	<.1	0	5.2	104
5493	.1	.1	.1	0	5.1	102
5505	<.1	<.1	<.1	0	4.9	98
5512	<.1	<.1	<.1	0	5.0	100
5521	<.1	<.1	<.1	0	5.3	104
5536	.2	.2	.2	0	5.0	98
5546	<.1	<.1	<.1	0	4.8	96
5555	<.1	<.1	<.1	0	5.0	98
5578	.4	.3	.35	28.6	5.0	100
5582	.1	.1	.1	0	5.0	100
6457	NS					

Parameter: Al

$\overline{\%\,RR}$ = NA

95% CI = NA

$\overline{A_J}$ = NA

95% CI = NA

S = NA

...

Precision and Accuracy for Alkaline Treatment Experiments

Sample #	Sample Value	Duplicate	π Value	% RR	Spike Value	% Recovery
6961	NS					
6493	NS					
6494	NS					
6507	NS					
6513	NS					
6519	NS					
6591	NS					
6622	NS					
6629	NS					
1037	NS					
1085	NS					
1089	NS					
6632	NS					
6639	NS					

Parameter: Al

$\overline{\%\,RR}$ = NA

95% CI = NA

$\overline{A_J}$ = NA

95% CI = NA

S = NA

Precision and Accuracy for Alkaline Treatment Experiments

Sample #	Sample Value	Duplicate	$\bar{x}$ Value	% RR	Spike Value	% Recovery
6000	NS					
6030	NS					
6040	NS					
6047	NS					
6064	NS					
6070	NS					
6078	NS					
6113	NS					
6118	NS					
6134	NS					
6141	NS					
6151	NS					
6168	NS					
6176	NS					
6188	NS					
6199	NS					
6203	NS					
6223	NS					
6236	NS					
6238	NS					
6348	NS					
6349	NS					
6401	NS					
6403	NS					
5012	NS					
5017	NS					
5027	NS					
5041	NS					
5046	1500	1460	1480	2.7	3160	84
5066	3360	3360	3360	0	5600	112
5080	2960	2860	2910	3.4	4700	90
5099	2800	2860	2830	2.1	4600	89
5106	3360	3400	3380	1.2	5300	96
5120	4000	4000	4000	0	5800	90

Parameter: SO_4

$\overline{\%\,RR}$ = 1.6

95% CI = 4.1

$\overline{A_J}$ = 94.4

95% CI = 78.7 and 110.1

S = 7.8

Precision and Accuracy for Alkaline Treatment Experiments

Sample #	Sample Value	Duplicate	π Value	% RR	Spike Value	% Recovery
5134	2960	2960	2960	0	4800	92
5164	3400	3400	3400	0	5300	95
5177	3560	3560	3560	0	5360	90
5206	2600	2600	2600	0	4500	95
5220	2560	2600	2580	1.6	4300	86
5231	720	650	685	10.2	1630	95
5251	4000	4100	4050	2.5	5800	90
5268	930	950	940	2.1	3800	96
5292	NS					
5318	NS					
5369	NS					
5376	NS					
5389	4660	4640	4650	.4	6200	77
5407	2370	2400	2385	1.3	3300	93
5408	3300	3300	3300	0	5000	85
5413	NS					
5416	1060	1080	1070	1.9	2100	104
5421	2760	2800	2780	1.4	4800	102
5441	1020	1050	1035	2.9	2000	98
5451	1350	1400	1375	3.6	2400	95
5466	1940	1960	1950	1.4	2500	106
5469	2400	2400	2400	0	2100	90
5471	NS					
5484	NS					
5493	2250	NS	NA	NA	NA	94
5505	2430	NS	NA	NA	NA	93
5512	1880	1880				
5521	NS					
5536	1240	1240			2470	100
5546	NS					
5555	NS					
5578	1230	1230	1230	0	2130	90
5582	3300	3300	3300	0	5240	97
6457	NS					

Parameter: SO_4

$\overline{\%\,RR}$ = NA

95% CI = NA

$\overline{A_J}$ = NA

95% CI = NA

S = NA

...

Precision and Accuracy for Alkaline Treatment Experiments

Sample #	Sample Value	Duplicate	π Value	% RR	Spike Value	% Recovery
6461	NS					
6493	4	NS	NA	NA	42	85
6494	2+.5	NS	NA	NA	60	96
6507	29	NS	NA	NA	49.5	102
6513	14	NS	NA	NA	30	80
6519	12	NS	NA	NA	NA	100
6591	12	12	12	0	60	90
6622	<1	<1	<1	0	39.2	98
6629	48.8	50	49.4	2.4	86	93
1037	1275	1175	1225	8.2	1725	100
1085	1280	1280	1280	0	2150	87
1089	NS					
6632	10.6	NS	NA	NA	32	107
6639	8	NS	NA	NA	30.8	114

Parameter: SO_4

$\overline{\%\,RR}$ = NA

95% CI = NA

$\overline{A_J}$ = NA

95% CI = NA

S = NA

...