LABORATORY DISSOLUTION OF DRILL CORE SAMPLES OF DULUTH COMPLEX ROCK

Report to the US Bureau of Mines
Salt Lake City Research Center

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INTRODUCTION

This study examined the effect of sulfur content on the dissolution of Duluth Complex rock. Fourteen Duluth Complex samples of variable sulfur content (0.47 ≤ percent sulfur ≤ 2.57) and uniformly small particle size (0.053 mm < particle diameter ≤ 0.149 mm; +270/-100 mesh) were subjected to laboratory dissolution tests. The copper and nickel content of the rock samples selected is uniformly low, therefore the sulfur content is an indicator of iron sulfide minerals, which are of major importance due to their role in acid production. Since trace-metal sulfides are present in low concentrations, their influence is diminished and to some extent uniform.

The rate of metal sulfide oxidation by atmospheric oxygen has been reported to be directly proportional to the reactive sulfide mineral surface area which can be accessed by oxygen and water (Lapakko 1980; Nelson 1978; Sato 1960a, 1960b; Sato and Mooney 1960). In turn, the available surface area of nonporous solids is a function of the sulfide content of the rock, particle size, and the roughness of the surface. By using uniformly small solids, the influence of particle size and host rock association of the iron sulfides is normalized. If the sulfide minerals are liberated and of fairly uniform grain size, the sulfur content will be proportional to the available sulfide surface area, assuming specific surface area does not vary greatly among sulfide minerals of the same particle size. Since all the sulfide surface area is known to be available for reaction, acid production rates per unit sulfide surface area can be determined. Using this normalized value, the acid production rate can be extrapolated to mining wastes based on their available sulfide surface area. This extrapolation will allow appropriate mitigation based on the rock composition.

The use of sulfur content as the independent variable neglects the effects of many other variables, environmental as well as compositional, on the leaching of mine wastes. Although there is a given degree of compositional uniformity within an ore body, there are deviations from the norm. To accurately assess the leaching potential of mining wastes from a given body, a large number of samples must be analyzed. This implies the use of efficient and accurate laboratory techniques from which results can be extrapolated to operational conditions.

The effect of sulfur content on the leaching of Duluth Complex mining wastes has been examined previously for a limited number of samples. Field tests were conducted on test stockpiles constructed of rock removed from a test shaft. Over a six-year period, test stockpiles containing 0.8 and 1.4 percent sulfur produced acid leachate while piles containing 0.6 percent sulfur did not (Eger and Lapakko 1985). Subsequent data indicate that the piles containing 0.6 percent sulfur have generated drainage pH values which are typically in the range of pH 4.8 to 5.3. In shake flask tests, neutral leachate was generated by tailings containing 0.92 percent sulfur or less, while acidic leachate was generated by tailings with sulfur contents equaling or exceeding 2.65 percent (Natarajan and Iwasaki 1983).

As presented in Cooperative Agreement No. C0219003, the objectives of this report on the dissolution of drill core samples of Duluth Complex rock in laboratory experiments, are to

a) describe the variation of drainage quality with respect to time,
b) determine the chemical mass release of sulfate, calcium, and magnesium,
c) describe the variation of drainage quality and mass release with respect to sulfur content, and
d) determine the buffering capacities, or neutralization potentials, of the Duluth Complex rock samples examined.

Analysis of leached solids to assess reaction products and potential for additional leaching was initially stated as a project task. This task was deleted by mutual agreement between the MNDNR and the Salt Lake City Research Center.

METHODS

Materials

An experiment was conducted to examine the effect of solid phase sulfur content on the quality of drainage from Duluth Complex mining wastes. The sulfur content of the 14 samples examined ranged from 0.47 to 2.57 percent. Acid digestion (U.S. Bureau of Mines 1980) and subsequent analysis revealed typical solid phase copper and nickel contents of 0.13 to 0.23 and 0.05 to 0.09 percent, respectively (table 1). The samples were selected to approximate mining wastes, based on a 0.2 percent copper cutoff. Mine waste would of course be larger, with approximate maximum diameters of 45 cm for underground mines and 120 cm for open pits. Plagioclase, olivine, pyroxenes, and biotite were the predominant minerals, as determined by examination of polished thin sections with an optical microscope (table 2). The silicate mineralogy of the samples with sulfur contents of 1.47, 1.74, 2.17, and 2.57 percent were identified as atypical of Duluth Complex rock (appendix 1). Specific surface area was determined by single point BET nitrogen adsorption by A. U. Baes of the Soil Science Department at the University of Minnesota, St. Paul.

With one exception, the solids were MINNAMAX core samples which had been drilled from 1974 to 1977. The core samples had been crushed to minus 6.35 mm (1/4 inch), placed into plastic bags, and stored inside 55-gal barrels at the MINNAMAX site near Babbitt, MN. Under the direction of Karl Smith, the samples were processed for experimental use at the Mineral Resource Research Center at the University of Minnesota. The plus 2.00-mm (10 mesh) fraction was selected for experimentation in order to minimize the amount of surface area exposed to oxidation while the samples had been stored after drilling. This fraction was stage crushed using a pulverizer and wet-screened to segregate particles in the size fraction $0.053 <$ particle diameter ≤ 0.149 mm (+270/-100 mesh) for use in laboratory tests.

The remaining sample (1.26 pct S) was collected from a test stockpile which was constructed in April 1977 at the MINNAMAX site. The pile was constructed of rock mined during the development of a test shaft. When part of the test pile was removed in September 1982, a representative sample, weighing over three tons, was collected for analysis of particle size distribution, specific surface area, chemistry, and mineralogy (Lapakko et al. 1986). A subsample of stockpile material in the size fraction 0.053 < particle diameter ≤ 0.149 mm was collected for use in the experiments.

Leaching Procedure

Several techniques have been used in laboratory leaching of mining wastes (Caruccio 1986; Ferguson and Mehling 1986). The method used was based on the principle that sulfide minerals oxidize in the presence of atmospheric oxygen and water (Gottschalk and Buehler 1912; Caruccio et al. 1980). Samples (75 g) of 0.053-0.149 mm rock were placed into the upper segment, or reactor, of a two-stage filter unit. The samples were placed onto a glass fiber filter which rested on a perforated plastic plate near the bottom of the reactor (figure 1). Ten of the solids were run in duplicate while, due to practical constraints, single reactors were used for the remaining four solids (0.47, 0.59, 1.35, and 2.01 pct S).

The samples were rinsed with 200-mL volumes of distilled-deionized water to remove reaction products from the solids for subsequent analysis. The rinse water was allowed to remain in contact with the solids for five minutes and filtered through a 0.45 micrometer filter. At the beginning of the experiment, the solids were rinsed five times to remove oxidation products generated after crushing and wet sieving. After this initial washing, a one-week rinse interval was used. Four rinses were used after one week and three rinses after two weeks. Two rinses were found to remove the majority of sulfate from the solids and were used in subsequent weeks. For most of the solids the rinse interval duration was extended beyond one week later in the experiment (table 3).

Between rinses the solids remained in the upper segment and were stored in a box to dry. A cover was placed about three cm above the upper edge of the box to allow drying of the solids and inhibit the input of airborne debris. A thermostatically controlled heating pad was placed beneath the box to maintain a constant temperature. Water containers were placed in the box in an attempt to maintain a fairly constant humidity. Temperature and relative humidity in the box were monitored four to five times per week. The average temperature was 25°C with a standard deviation of 1.0°C, while the corresponding values for relative humidity were 56 and 9.1 percent. More detail on the temporal variation of temperature and relative humidity is presented in figure 2.

The rinse water, or drainage, was analyzed for specific conductance, pH, sulfate, copper, nickel, cobalt, zinc, calcium, magnesium, sodium, and potassium. Specific conductance was analyzed using a Myron L conductivity meter, while a Radiometer 29 pH meter was used for pH analyses. Sulfate was analyzed using either the barium sulfate turbidimetric technique (APHA et al. 1975) or occasionally, for low concentrations, a Technicon

autoanalyzer. Metals were analyzed with a Perkin Elmer 603 atomic absorption spectrophotometer. The experiments were conducted near Babbitt, MN at a site which was leased by Kennecott Minerals at the time of the experiment and was previously leased by MINNAMAX.

Calculations

Release Rates

The masses of sulfate, calcium, and magnesium released were calculated as the product of the concentration in the drainage sample and the drainage volume. Some drainage samples were not analyzed for sulfate, calcium, and magnesium. Missing sulfate concentrations were estimated based on regression analyses of the measured sulfate concentrations versus specific conductance, which was measured weekly. These regressions were conducted for each of the solids. Concentrations of calcium and magnesium were estimated as the average of the previous and subsequent samples analyzed for these parameters.

Periods of linear sulfate release were selected based on visual examination of the cumulative sulfate release versus time plots. Rates of sulfate release were calculated for these periods by linear regression analysis. The average release rate was calculated as the total sulfate release during the one-week rinse interval divided by the number of weeks in this period. For some reactors the sulfate release in the initial weeks was inconsistent with that observed over the experiment as a whole. In these cases the initial period was ignored in the calculation of the average sulfate-release rates. The rates of sulfate release were tabulated along with the pH, temperature, and relative humidity for the period of rate determination. The rates of calcium and magnesium release were calculated for the same periods and tabulated separately.

Neutralization Potential

Neutralization potentials (NP) were calculated to determine the amount of acid neutralized by the solids prior to the drainage pH decreasing and, for the duration of the experiment, remaining below pH values of 7, 6, 5, 4.5, 4, and 3.5. The acid neutralized was calculated as the cumulative sulfate release (expressed as mg $CaCO_3$/g rock) prior to the drainage pH decreasing and remaining below the specified pH value. If the drainage pH from a given solid never decreased permanently below a specified value, the NP was reported as "greater than" the total sulfate release for the period of record. If the drainage pH was continuously below the specified pH, the NP for that pH was reported as zero.

RESULTS AND DISCUSSION

The generation of acidic drainage is the major water quality concern associated with mine wastes. Acid is produced as a result of the oxidation of iron sulfide minerals. The rate of this oxidation, and the attendant acid production, is proportional to the iron sulfide surface area available for reaction. For the solids examined in this study the iron sulfide surface area is roughly proportional to the solid-phase sulfur content, since it occurs largely as liberated pyrrhotite grains in a fairly small range of particle sizes. The non-sulfide mineralogy of the solids examined was also generally uniform, although some exceptions were noted. Consequently, drainage pH decreased as the solid-phase sulfur content increased. Based on this relationship, samples were divided into three classes, or groups. This classification is discussed first due to its importance with respect to mine waste management. It also provides background for subsequent detailed discussion of the variation of drainage quality and chemical mass release with time and solid-phase sulfur content.

Sample Classification

The solids examined were divided into three classes based on the observation that drainage pH decreased with sulfur content:

Group 1: $0.47 \leq$ pct S ≤ 0.80,
Group 2: $0.92 \leq$ pct S ≤ 1.26, and
Group 3: $1.35 \leq$ pct S ≤ 2.57.

The classification was complicated by the variable periods of record for the samples. The rates of release for sulfate and calcium plus magnesium are presented for each of the three groups (table 4).

The three Group 1 solids were rinsed weekly for either 13 weeks (0.47 percent sulfur) or 17 weeks (0.59, 0.80 percent sulfur), and the pH of drainage from these samples was continuously above 6.0 (table 4). The maximum sulfate release rates ranged from 5.8 to 16 micromoles per week. For all periods of rate calculation, the sum of calcium and magnesium release rates for these solids exceeded the corresponding sulfate release rate. This indicates that the rate of acid neutralization exceeded the rate of acid production, which is consistent with the observed drainage pH.

The four Group 2 samples contained 0.92 to 1.26 percent sulfur and were rinsed weekly for 17 to 34 weeks. Drainage from these samples became acidic, with minimum pH values ranging from 4.60 (34 weeks) to 5.70 (21 weeks). The mineralogy of the samples containing 0.92 and 1.24 percent sulfur was typical of unweathered Duluth Complex rock. The maximum sulfate release rates for these two samples was 20 to 45 micromoles per week, which exceeded the associated calcium plus magnesium release rates. This is consistent with the acidic drainage observed.

The samples with sulfur contents of 1.17 and 1.26 percent were compositionally atypical of the remaining samples. The sample with a sulfur content of 1.17 percent contained about three percent calcium carbonate, which is unusually high for Duluth Complex rock. The sulfate release from this sample was in the same range as that for the previously discussed two samples. However, the acid neutralization was higher, apparently due to the dissolution of the calcium carbonate present. This dissolution maintained a basic pH. The sample containing 1.26 percent sulfur was taken from a test pile at the Babbitt Research Site, after it had been exposed to oxidizing conditions in the environment for about 5.5 years. Sulfate release from this sample was low relative to its sulfur content, perhaps due to the prior oxidation of the more reactive sulfides or the formation of protective coatings on the sulfide mineral surfaces.

The seven Group 3 samples had sulfur contents of 1.35 to 2.57 percent, and produced minimum drainage pH values in the range of 3.7 to 4.5. The maximum sulfate release rates for this group ranged from 35 to 190 micromoles per week, with all but two values falling between 77 and 190 micromoles per week. The rate of sulfate release exceeded the sum of the calcium and magnesium release rates, which is consistent with the acidic drainage pH observed. The release of calcium and magnesium from the sample containing 1.87 percent sulfur was higher than that from all samples.

Four samples from this group were identified as atypical of Duluth Complex rock based on their silicate mineralogy. Two of the atypical samples (1.47 and 1.74 percent S) exhibited sulfate, calcium, and magnesium release rates, as well as drainage pH values, similar to those of the Duluth Complex rocks in this group. The sulfate, calcium, and magnesium release rates for the remaining two atypical samples (2.17 and 2.57 percent S) were lower than those of the typical Duluth Complex rocks in this group.

Temporal Variation

Drainage Quality

Tabular and graphical displays of drainage quality results are presented in appendix 2. The following discussion at times addresses results for the period during which the rinse interval for the solids was one week. The duration of this interval varied due to practical constraints, and was 13 weeks (0.47 pct S), 17 weeks (0.59. 0.80, 1.17 pct S), 21 weeks (1.24, 1.26, 1.47, 1.74, 2.17, 2.57 pct S), or 34 weeks (0.92, 1.35, 1.87, 2.01 pct S; see table 3 for rinse intervals). The observations on temporal variation of drainage quality and chemical mass release are summarized in table 5.

The temporal variations of pH and concentrations of sulfate, calcium, and magnesium were not entirely consistent for the various solids examined. The following general statements can be made, although exceptions were observed. Drainage pH tended to decrease with time, while sulfate and magnesium concentrations generally increased over time. Calcium

concentrations tended to parallel sulfate concentrations until pH dropped below about 4.5, after which they were fairly constant or decreased.

These observations suggest that two factors contributed to the observed decrease in drainage pH. First, the temporal variation of sulfate concentrations indicates that acid production increased over time, which would tend to depress the drainage pH. Second, the variation of calcium concentrations over time suggests that acid neutralization by host rock mineral dissolution became less effective as dissolution progressed.

The pH of drainage from the seven solids containing 0.47 to 1.26 percent sulfur (Groups 1 and 2) was initially in the range of 6.0 to 8.3. The pH of drainage from these samples tended to oscillate over an approximate range of 0.5 to 1.5 pH units during the initial ten weeks of the experiment. This oscillation dampened subsequently. The pH of drainages from the samples with sulfur contents of 0.92 and 1.24 percent decreased below pH 6.0 at weeks 22 and 19, respectively. Drainage pH values for the rocks containing 0.59, 0.80, 1.17, and 1.26 percent sulfur were continuously above pH 6.0 (appendix 2, figures A2.1-A2.24).

The initial drainage pH values for the seven samples containing 1.35 to 2.57 percent sulfur (Group 3) were lower than those for the lower sulfur samples. Five of the drainage pH values at week 1 were in the range of pH 3.8 to 4.5, while the remaining two values were 5.5 and 6.1. The pH of drainage from all seven samples tended to remain fairly constant or increase over the initial ten weeks of the experiment then decrease steadily (appendix 2).

Sulfate concentrations generally increased during the one-week rinse interval, although this increase was not necessarily continuous. For example, sulfate concentrations from the 1.87-percent-sulfur sample increased over time, but also exhibited a peak between weeks 13 and 17. Sulfate concentrations in drainages from samples containing 0.47, 1.24, and 1.26 were fairly constant over time, while those in drainage from the 1.35-percent-sulfur sample decreased over the initial eight weeks and then plateaued.

Although variations in calcium concentrations tended to parallel sulfate concentrations during the one-week rinse interval, the relative increases in concentrations of calcium were less than those for sulfate. Calcium concentrations typically exceeded those of magnesium by a factor of three to eight (concentrations in mg/L). Magnesium concentrations tended to increase over time and, consequently, the disparity between calcium and magnesium concentrations decreased over time.

Chemical Mass Release

Cumulative sulfate, calcium, and magnesium mass release over time is presented in both tabular and graphical forms in appendix 3. The rates of sulfate release were tabulated along with the pH, temperature, and relative humidity for the period of rate determination (appendix 4). The rates of calcium and magnesium release were calculated for the same periods and tabulated separately (appendix 4).

The rates of chemical mass release were calculated using the drainage quality data and, therefore, the trends observed reflect those reported for drainage quality. The rates of sulfate release were relatively constant from samples with sulfur contents of 0.47, 1.24, and 1.26 percent sulfur. For the 1.35-percent-sulfur sample, the sulfate release rate was initially elevated and then decreased to a constant level. For the remaining solids, the sulfate release rates were lowest during the initial phase of the experiment, typically lasting for six to twelve weeks, and subsequently increased.

The variation in sulfate release from a given sample tended to increase with the sulfur content. The ratio of the maximum rate to the minimum rate for solids with sulfur contents of 0.47 to 1.35 percent ranged from 1 to 2.5. For samples of higher sulfur content this ratio ranged from three to six. The exception to this trend was the 0.92-percent-sulfur sample, for which the ratios of the maximum to minimum sulfate release rates were six and ten for the duplicate reactors (table 4).

The rates of calcium and magnesium release were calculated over the same periods as the sulfate release rates. Calcium and magnesium release rates were summed to represent the rate of acid neutralization. This rate was also typically lowest during the initial phase of the experiment, and increased over time. A decrease in this rate was observed for one of the duplicate samples containing 1.87, 2.17, and 2.57 percent sulfur (table A4.2). However, the rates of acid neutralization did not increase as much as the rates of sulfate release. The ratio of the maximum rate to the minimum rate of acid neutralization for solids containing 0.47 to 1.47 percent sulfur ranged from 1 to 1.3. For samples of higher sulfur content this ratio ranged from one to two (table 4).

Variation with Sulfur Content

Drainage Quality

The variation of water quality with sulfur content is presented as a series of box plots, which are explained in figure 3. These plots present all drainage quality data collected for the parameters presented, and allow presentation of a large amount of data in a single figure. For example, if 30 data points are available for each of the 14 samples, a single box plot represents over 400 data points. These concise graphs are intended to provide a qualitative comparison of the drainage compositions observed for the various rock samples.

Drainage pH generally decreased as sulfur content increased from 0.47 to 1.35 percent. The pH of drainage from most solids containing 1.35 to 2.57 percent sulfur was in the approximate range of pH 3.8 to 4.4 (figure 4). Exceptions to these trends were samples with sulfur contents of 1.17, 1.26, and 1.87 percent, from which drainage pH values were higher than those from samples of similar sulfur content. The pH of drainage from the 2.17-percent-sulfur sample was slightly higher than the 3.8 to 4.4 range.

Sulfate concentrations in drainages generally increased as sulfur content increased from 0.47 to 1.74 percent, and decreased as sulfur content increased from 1.74 to 2.57 percent. A notable exception to these trends was the 1.26-percent-sulfur sample (figure 5). The variation in calcium concentrations generally paralleled those observed for sulfate (figure 6). Calcium concentrations were above the norm in drainages from the 1.17-percent-sulfur sample, which contained three percent calcium carbonate, and the 1.87-percent-sulfur sample. Magnesium concentrations increased as sulfur content increased from 0.47 to 1.87 percent and were low in drainages from samples of higher sulfur content (figure 7). Concentrations of all three parameters were low in drainage from the test pile sample (1.26 percent S), which had been subjected to environmental dissolution for about 5.5 years.

Chemical Mass Release

The minimum, average, and maximum rates of sulfate release as functions of sulfur content are presented in figure 8. As discussed previously, the minimum rates of sulfate release were observed during the initial phase of the experiment. The rate of sulfate release increased as sulfur content increased, although there was considerable scatter among the data. Some of the scatter is due to inherent experimental variation, as indicated by the difference in rates for duplicate reactors. The agreement in rates for duplicate samples containing 0.80 to 1.26 percent sulfur was quite good. There was a larger disparity between duplicates of higher sulfur content, for which the disparity was greatest for the maximum rates and least for the minimum rates.

Variations in experimental duration, drainage pH, and possible subtle variations in sulfide mineralogy and available sulfide surface area, may have contributed to the scatter in sulfate release rates. The one-week rinse interval lasted 34 weeks for solids containing 0.92, 1.35, 1.87, and 2.01 percent sulfur, and only 17 or 21 weeks for the remaining solids. This contributed to higher rates for these four samples since sulfate release increased over time. The pH of drainage from the various samples ranged from 3.7 to 8.8, and may have influenced the variation in sulfate release rates with respect to sulfur content.

The calcium release rates demonstrated no dependence on sulfur content, while magnesium release rates tended to increase with sulfur content (figures 9, 10).

Neutralization Potentials

Drainage pH values below 6.0 were generated by nine of the fourteen solids, and the NP values calculated for these solids based on drainage quality were quite low, ranging from 0 to 1.95 mg $CaCO_3$/g rock. Most of the values were between 0 and 0.61 mg $CaCO_3$/g rock, with the value for the 1.87-percent-sulfur sample being exceptionally high (table 6).

The drainage pH from five of the solids never decreased below 6.0, and the NP values determined were limited by the sulfate release during the relatively short periods of record for the solids. For example, the NP values for the duplicate samples containing 1.17 percent

sulfur were calculated as >0.388 and >0.420 mg $CaCO_3$/g rock. These values represented the total sulfate release over the 17-week period of record for this solid. Mineralogical analysis of this solid indicated a calcium carbonate content of three percent, which would indicate an NP of 30 mg $CaCO_3$/g rock. No calcium carbonate was reported in the other samples, and their NP values are more consistent with the low values typically observed for Duluth Complex rock (for example see Lapakko 1990).

SUMMARY

Drainage pH generally decreased, due to increased rates of iron sulfide oxidation, as the solid-phase sulfur content of the Duluth Complex rock increased. For typical Duluth Complex rock, the experiment indicated a critical sulfur content between 0.80 and 0.92 percent. Samples with sulfur contents of 0.80 percent or less, produced drainage pH values of at least 6.0 for the duration of the experiment. Since pH decreased with time, lower pH values may be produced for a longer period of dissolution. Samples of higher sulfur content produced acidic drainage, with two exceptions. One exception was the 1.17-percent-sulfur sample, and this sample contained about three percent calcium carbonate, which is unusual for the Duluth Complex. The second sample (1.26 percent sulfur) had been leached in the environment for about 5.5 years, and its dissolution character was apparently altered as a result.

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Figure 1. Experimental reactor apparatus.

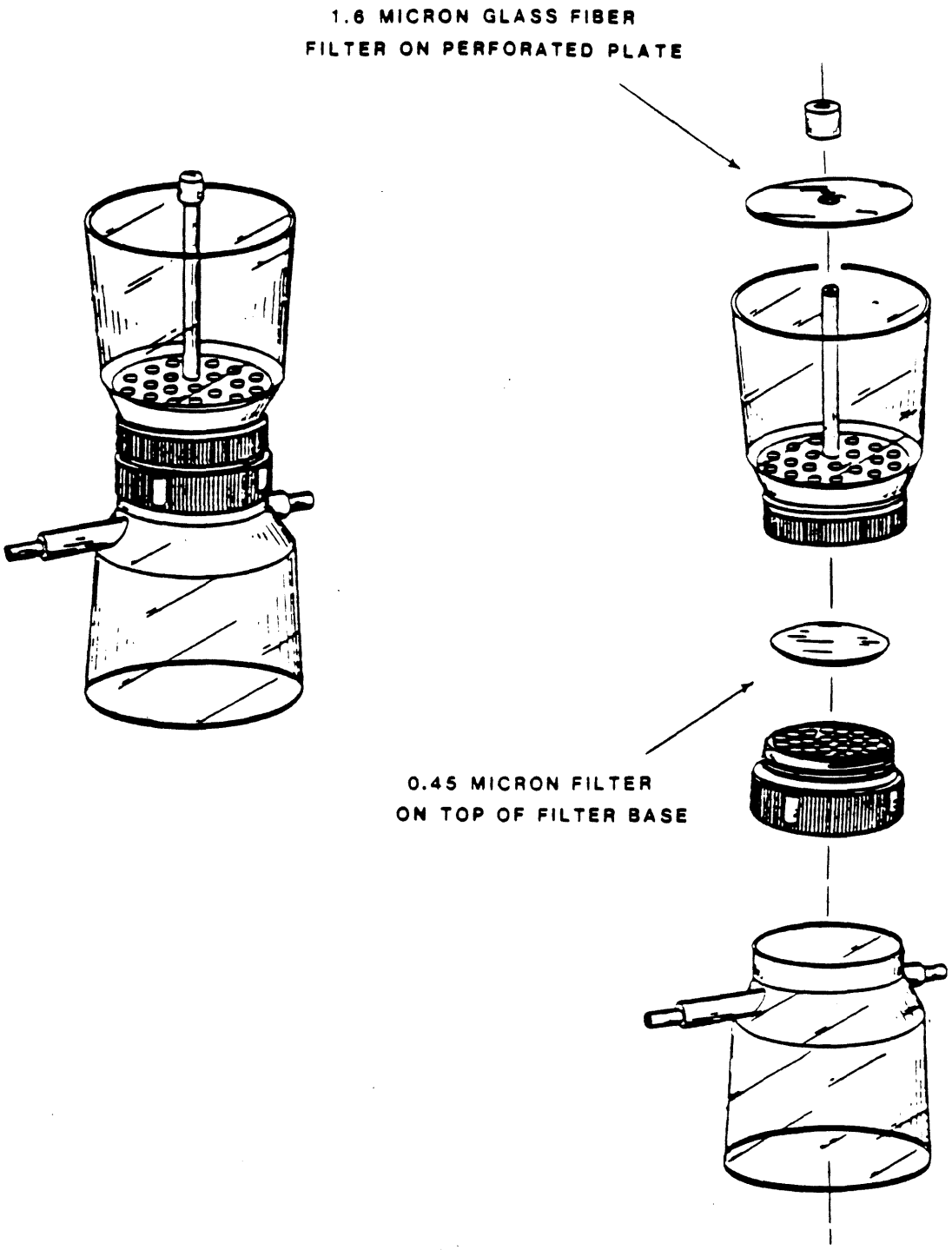

Figure 2. Temperature and relative humidity versus time.

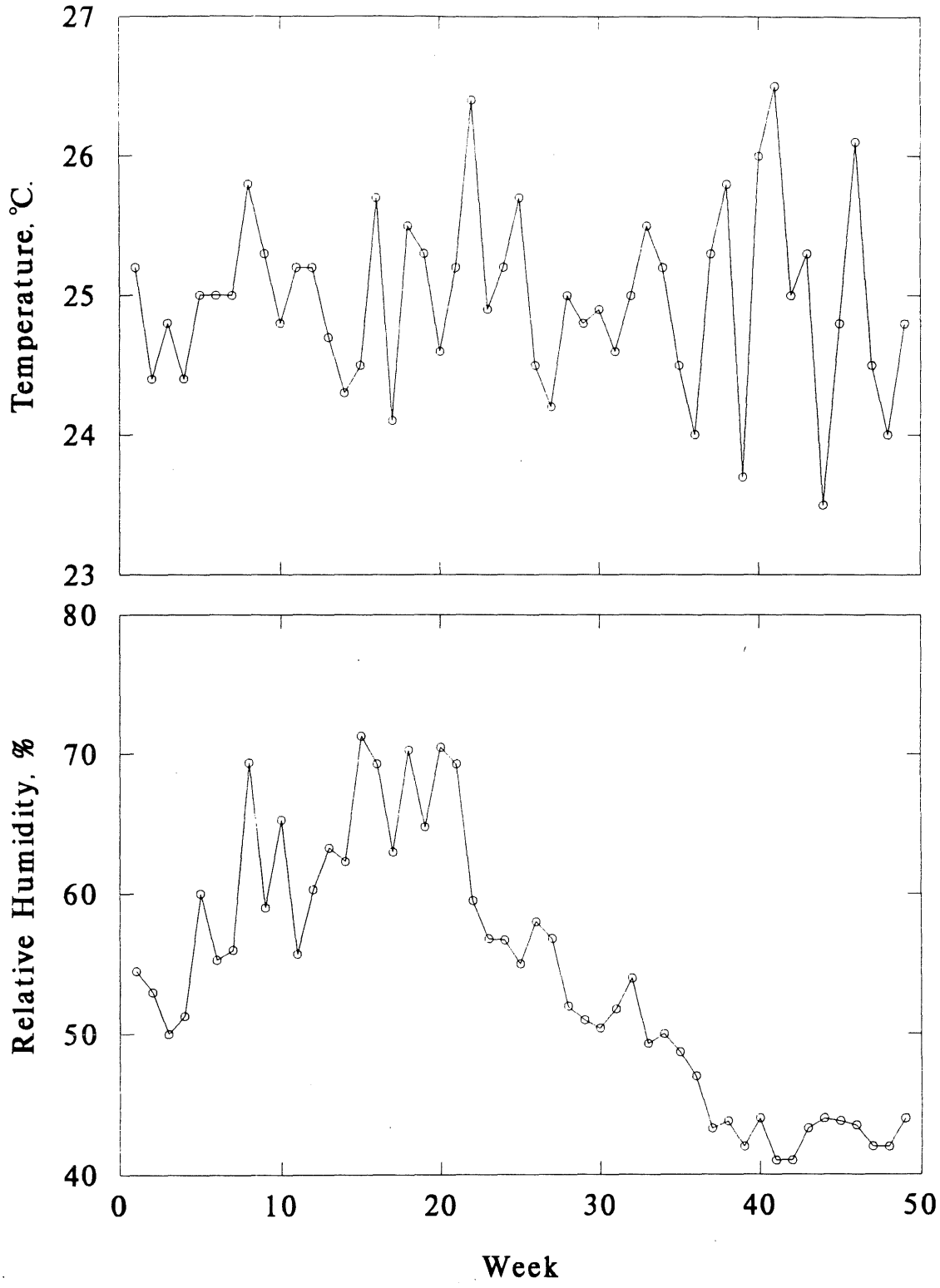

Figure 3. Key for box plot interpretation.

The box plot is comprised of the *central box*, the *whiskers*, and the *outliers*.

- Within the *central box*, the *median* of the data set is depicted by the center horizontal line, and the *lower and upper hinges* are depicted by the other two horizontal lines of the central box. The median splits the ordered data set in half, and the hinges split those two resulting halves in half again (i.e. the three horizontal lines in the central box represent the 25th, 50th, and 75th percentiles of the entire data set). The distance between the two hinges is called the *H-spread (H)*.

- The *whiskers* (the two vertical lines) represent the range of values that fall within 1.5 H-spreads of the two hinges.

- The *outliers* represent values that fall outside of the *Inner and Outer Fences*. Asterisks represent those values which lie outside of the inner fences but within the outer fences. Open circles represent those values which lie outside of the outer fences. The inner and outer fences are defined as:

$$\begin{aligned} \text{Inner fences} &= \text{lower hinge} - 1.5H \\ &= \text{upper hinge} + 1.5H \\ \text{Outer fences} &= \text{lower hinge} - 3H \\ &= \text{upper hinge} + 3H \end{aligned}$$

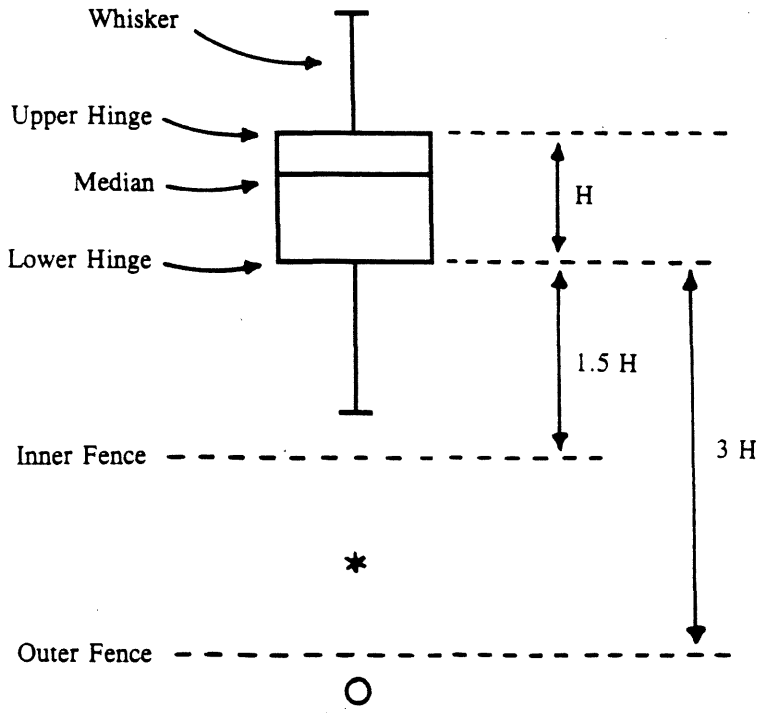

Figure 4. pH versus sulfur content boxplot.

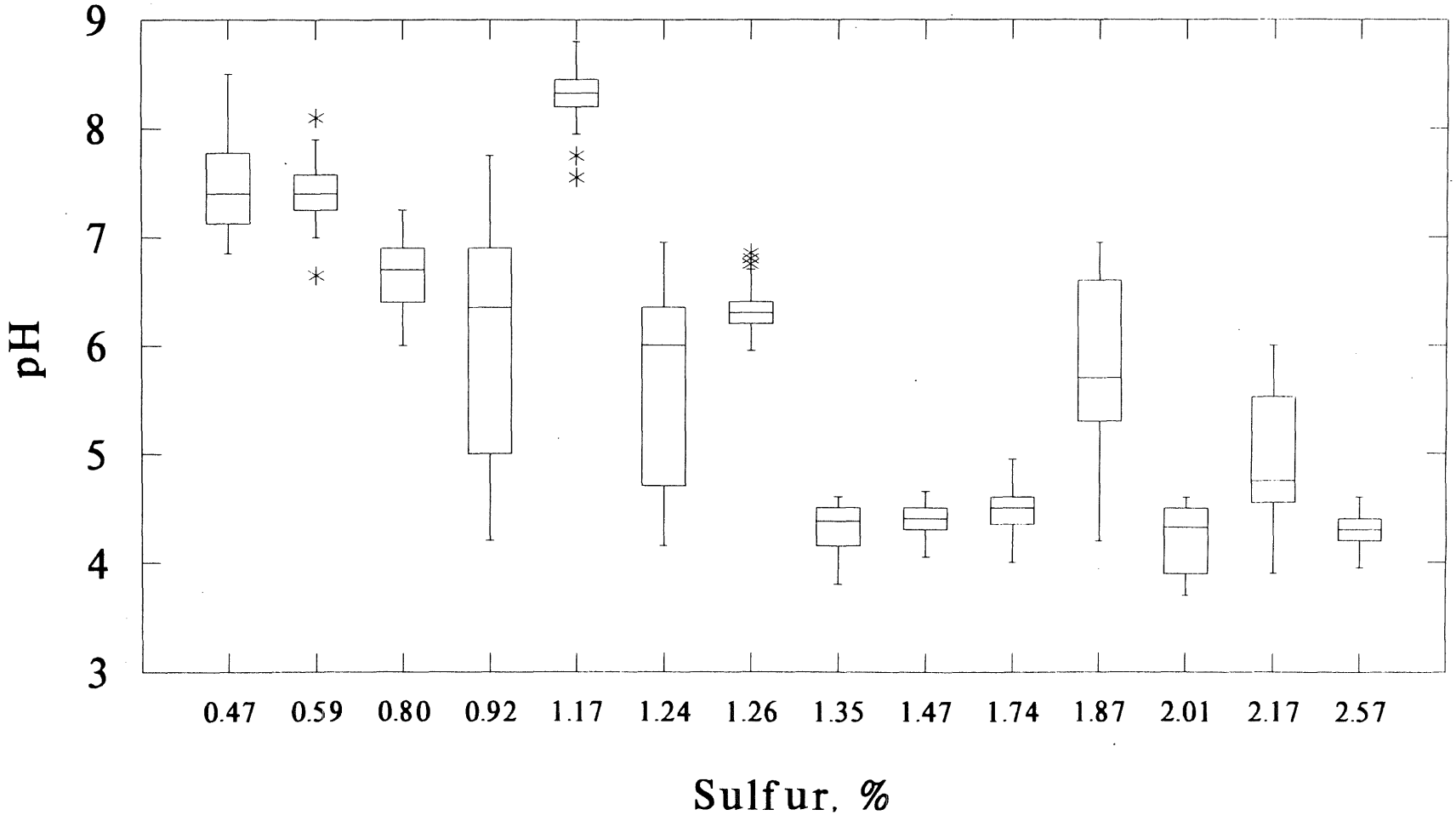

Figure 5. Sulfate concentration versus sulfur content boxplot.

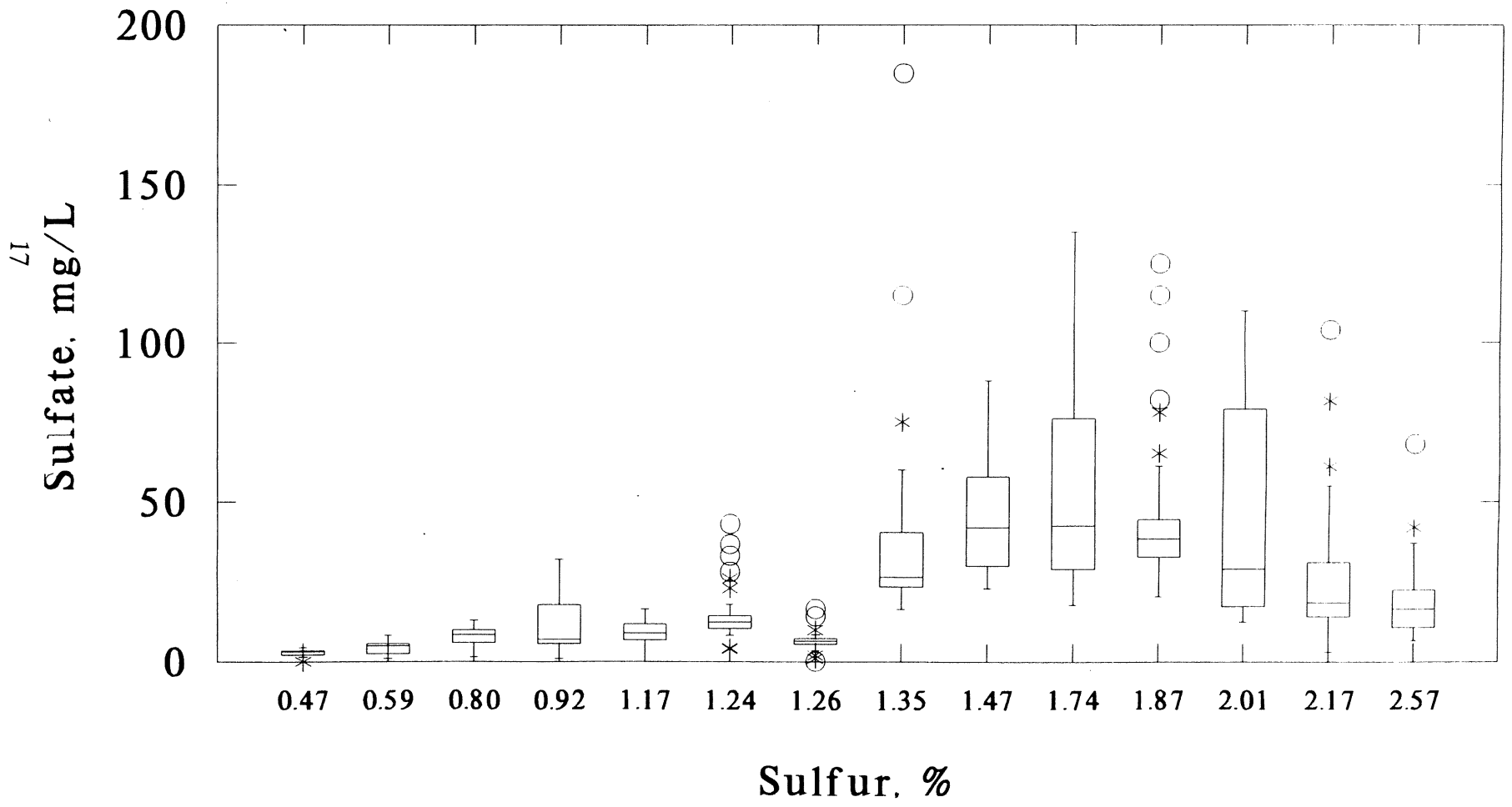

Figure 6. Calcium concentration versus sulfur content boxplot.

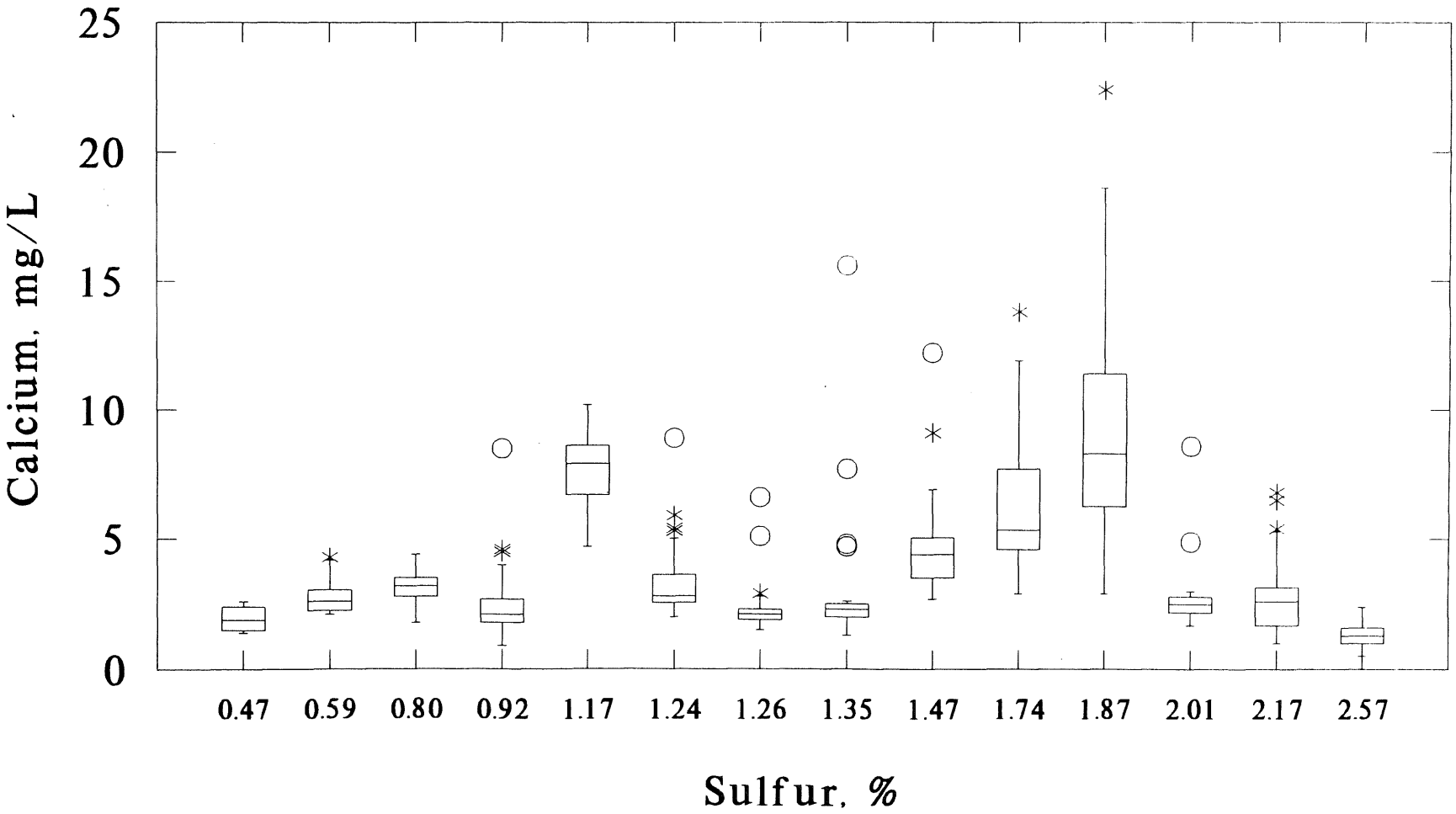

Figure 7. Magnesium concentration versus sulfur content boxplot.

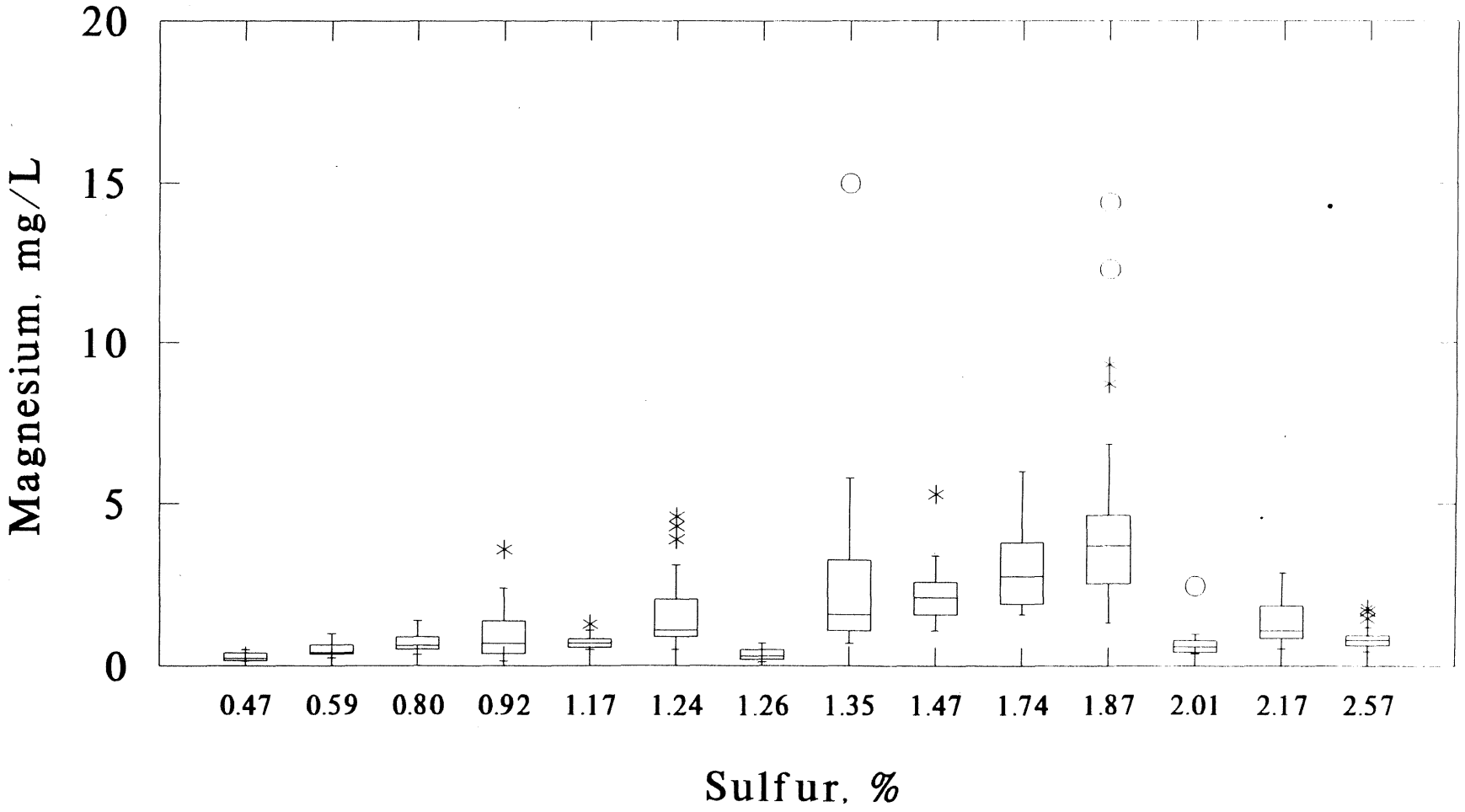

Figure 8. Rates of sulfate release versus sulfur content.

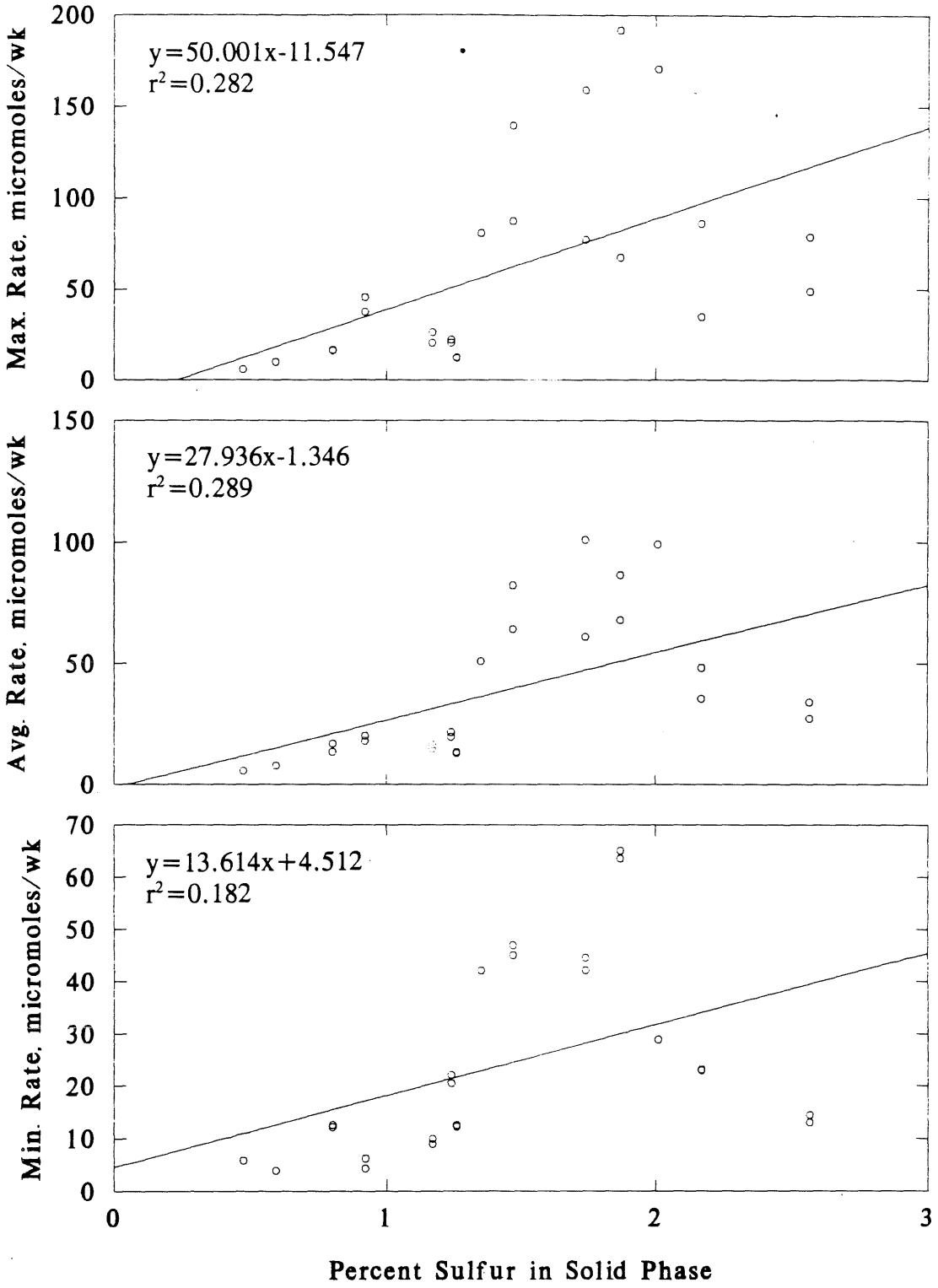

Figure 9. Rates of calcium release versus sulfur content.

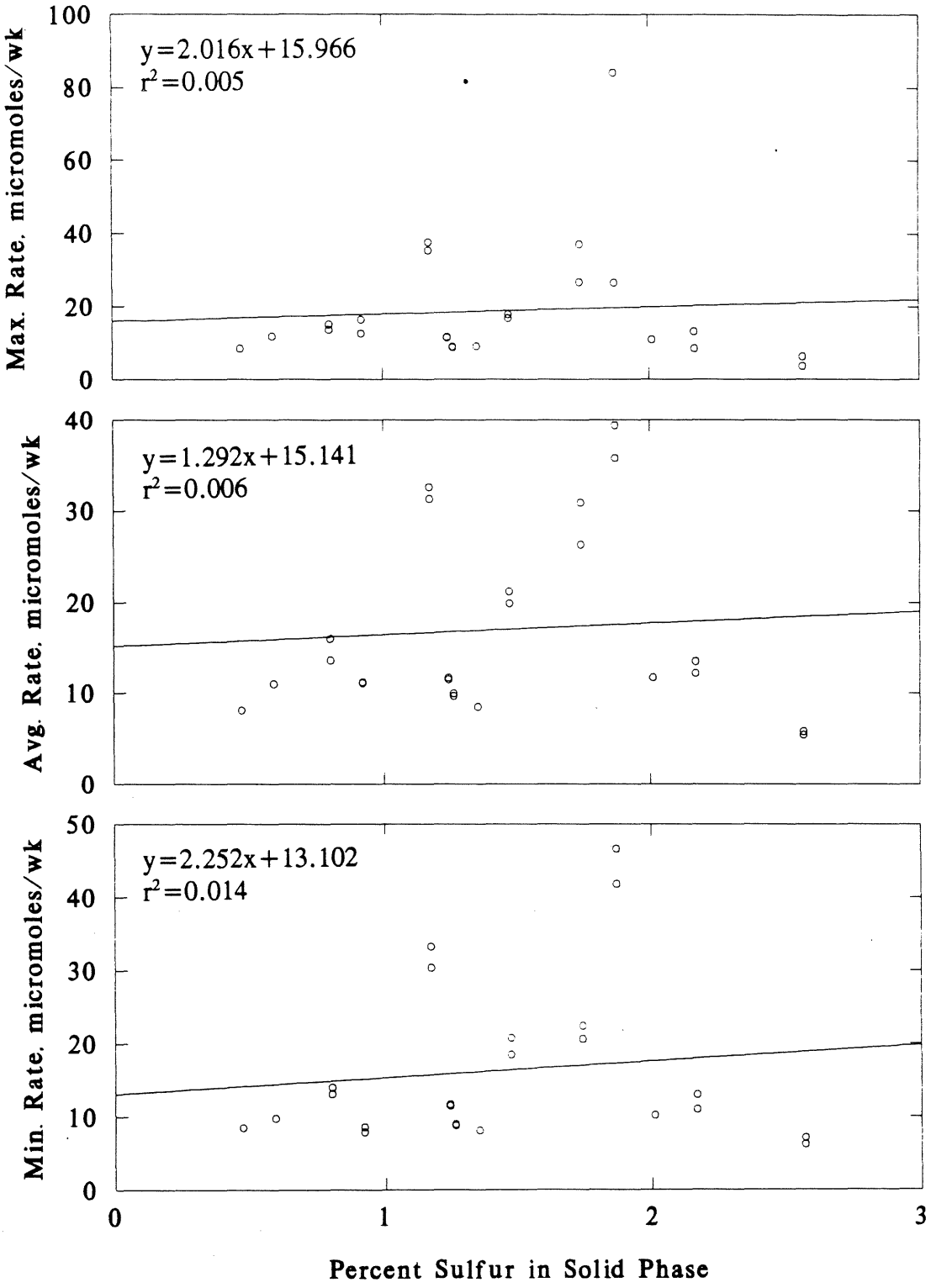

Figure 10. Rates of magnesium release versus sulfur content.

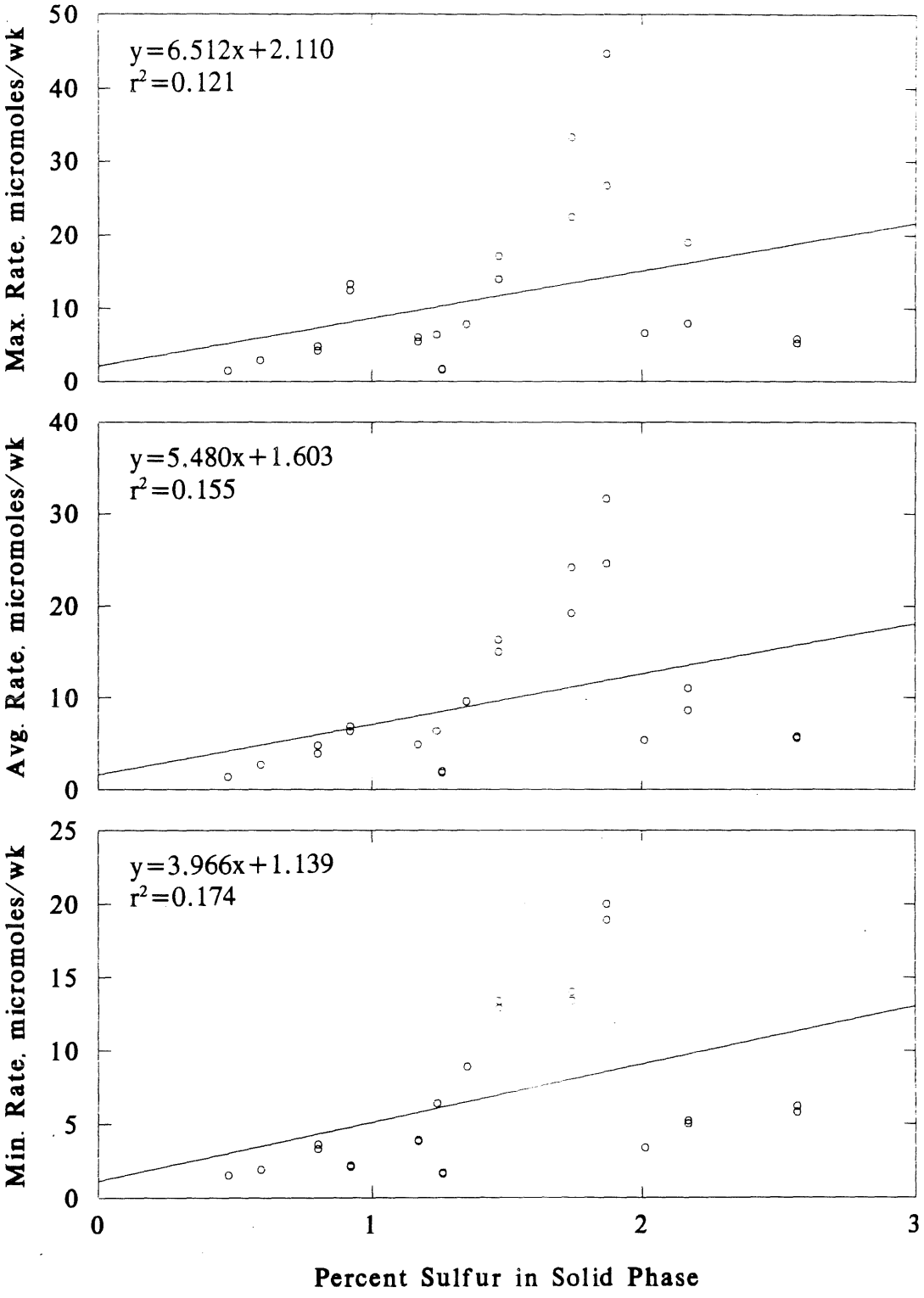

Table 1. Elemental composition of AMAX drill core samples. Values in weight percent.

S	Cu	Ni	Co	Zn	S with FeS[1]	Fe	Ca	Mg	Na	K	Pct of total S bound by Fe
0.47	0.23	0.060	0.011	0.017	0.31	15.2	7.8	7.9	2.6	0.37	65
0.59	0.13	0.072	0.013	0.0070	0.44	11.5	11	7.1	3.1	0.27	75
0.80	0.19	0.067	0.011	0.010	0.66	13.7	9.8	6.6	3.0	0.42	82
0.92	0.091	0.049	0.014	0.016	0.83	24.6	8.0	11.8	2.3	0.42	90
1.17	0.23	0.082	0.011	0.015	1.0	16.3	14.6	10.5	2.4	0.42	85
1.24	0.19	0.066	0.012	0.013	1.1	15.4	6.8	10.1	7.5	0.42	91
1.35	0.23	0.086	0.018	0.011	1.2	18.4	9.4	7.3	2.2	0.30	87
1.47	0.15	0.073	0.018	0.010	1.3	17.4	9.4	6.1	3.2	0.97	88
1.74	0.23	0.090	0.020	0.011	1.6	18.0	10.2	6.0	2.8	0.99	92
1.87	0.17	0.088	0.021	0.011	1.7	19	9.6	8.7	2.6	0.86	92
2.01	0.20	0.055	0.012	0.020	1.9	19.6	5.3	5.1	2.7	1.10	93
2.17	0.20	0.078	0.010	0.027	2.0	19.5	4.7	6.9	2.3	1.84	93
2.57	0.19	0.046	0.0040	0.0090	2.4	8.5	1.7	2.9	2.6	1.83	93
1.26[2]	0.55	0.20	0.018	0.014	0.97	18	8.0	8.0	2.7	0.44	77

[1] Calculated as the sulfur not bound by Cu, Ni, Co, or Zn assuming all trace metals were bound by sulfur in a 1:1 mole ratio of sulfur to metal.

[2] Sample from test pile.

Table 2. Approximate modal compositions of AMAX drill core samples.
(By Tatiana Sabelin, Mineral Resources Research Center, University of Minnesota).

	Mineralogy (%)							
% S	Olivine	Pyroxene	Plagioclase	Biotite	Opaque	Amphibole	Other	Calcite
0.47	30	10	45	5	8	-	2	-
0.59	17	4	68	2	5	-	4	-
0.80	20	8	59	4	7	-	2	-
0.92	31	27	24	2	16	-	-	-
1.17	19	15	28	2	8	-	25	3
1.24	17	27	47	1	5	-	3	-
1.35	10	14	57	-	9	-	10	-
1.47[1]	NA[2]	NA	NA	NA	NA	NA	NA	NA
1.74[1]	NA	NA	NA	NA	NA	NA	NA	NA
1.87	18	4	57	2	10	-	9	-
2.01	7	15	59	6	13	-	-	-
2.17	15	8	51[3]	6	17	-	3	-
2.57[4]	NA	NA	NA	NA	NA	NA	NA	NA
1.26[5]	15	11	49	3	16	2	4	-

[1] These samples were amphibole-rich and thus atypical of the Duluth Complex.
[2] Not analyzed.
[3] Includes plagioclase and quartz; of this total maybe as much as 1/3 to 1/2 is quartz.
[4] This sample was found to be mineralogically similar to the 2.17% sulfur sample. The complete mineralogical analysis report may be found in appendix 1.
[5] Sample from test pile.

Table 3. Rinse interval changes for AMAX drill core samples.

Reactor	%S	Interval 1		Interval 2		Interval 3		Interval 4		Interval 5		Interval 6		Rinse cycles including week 0
		Interval[1]	To Week	Interval[1]	To Week	Interval[1]	To Week	Interval[1]	To Week	Interval[1]	To Week	Interval[1]	To Week	
A	0.47	1	17[2]	2	19[2]	3	28[2]	5	33[2]	4[3]	37[2]	3[3]	49[2]	~~28~~ 24
D	0.59	1	17	2	19	3	28	5	33	4[3]	37	3[3]	49	28
E	0.80	1	17	2	19	3	28	1[3]	34	3[3]	49			~~3~~ 33
F	0.80	1	17	2	19	3	28	1	34	3[3]	49			33
G	0.92	1	34	3[3]	49									~~3~~ 40
H	0.92	1	34	3[3]	49									40
I	1.17	1	17	2	19	3	28	5	33					23
J	1.17	1	17	2	19	3	28	5	33					23
K	1.24	1	21	2[4]	29	1[3]	34	3[3]	49					~~3~~ 36
L	1.24	1	21	2	29	1	34	3[3]	49					~~3~~ 36
M	1.26	1	21	2[5]	29	1[3]	34	3[3]	49					~~3~~ 36
N	1.26	1	21	2	29	1	34	3[3]	49					~~3~~ 36
C	1.35	1	34[2]											~~3~~ 31
O	1.47	1	21	2	27	3	33							~~2~~ 26
P	1.47	1	21	2	27	3	33							~~2~~ 26
Q	1.74	1	21	2	27	3	33							~~2~~ 26
R	1.74	1	21	2	27	3	33							~~2~~ 26
S	1.87	1	34	3[3]	49									40
T	1.87	1	34	3[3]	49									46
B	2.01	1	34[2]											~~3~~ 31
U	2.17	1	21	2	27	3	33							26
V	2.17	1	21	2	27	3	33							26
W	2.57	1	21	2	27	3	33							26
X	2.57	1	21	2	27	3	33							26

Note: Unless specified otherwise, samples were rinsed with two 200-mL volumes.

[1] Interval between rinses in weeks.

[2] Reactors A, B, and C began at week four, while all other reactors began at week zero. Thus, reactor A had a one-week rinse interval for 13 weeks, between weeks 4 and 17. Reactors B and C each had a one-week rinse interval for 30 weeks, between weeks 4 and 34.

[3] Samples were rinsed with a single 200-mL volume during these intervals.

[4] Sample was rinsed with a single 200-mL volume on week 27.

[5] Sample was rinsed with a single 200-mL volume on weeks 23 and 27.

1.47 50 mg/L 50 x 0.175

Table 4. Summary of sulfate release and acid neutralization rates.

Group	Sulfur %	Sulfur % with FeS	Min. pH (1 wk int.) s.u.	Time weeks	Min. pH (Overall) s.u.	No. of Weeks Rinsed[1]	Rate of SO_4 Release, µmol/wk			Max SO_4 Rate/ Min SO_4 Rate	Rate of Ca+Mg Release[2], µmol/wk			Reactor
							Min	Avg	Max		Min	Avg	Max	
1	0.47	0.31	6.85	13	6.85	27	5.8	5.7	5.8	1.0	10.0	9.5	10.0	A
	0.59	0.44	7.00	17	6.65	27	3.9	7.8	9.8	2.5	11.7	13.7	14.7	D
	0.80	0.66	6.25	17	6.25	32	12.1	16.9	16.3	1.3	16.7	20.8	20.0	E
	0.80	0.66	6.60	17	6.00	32	12.5	13.5	16.0	1.3	17.3	17.5	17.9	F
2	0.92	0.83	4.60	34	4.20	39	6.2	20.2	37.3	6.0	10.7	18.1	25.1	G
	0.92	0.83	4.90	34	4.55	39	4.3	18.1	45.3	10.5	10.1	17.5	29.8	H
	1.17[3]	1.00	7.55	17	7.55	22	8.9	14.8	20.4	2.3	37.2	37.5	40.8	I
	1.17[3]	1.00	7.75	17	7.75	22	9.9	16.6	26.3	2.7	34.2	36.2	43.6	J
	1.24	1.10	5.70	21	4.20	35	22.1	21.7	22.1	1.0	18.1	18.1	18.1	K
	1.24	1.10	5.70	21	4.15	35	20.5	19.7	20.5	1.0	17.9	17.9	17.9	L
	1.26[4]	0.97	6.20	21	5.65[5]	35	12.2	13.0	12.2	1.0	10.6	11.5	10.6	M
	1.26[4]	0.97	5.95[6]	21	5.80[6]	35	12.5	13.6	12.5	1.0	10.5	12.0	10.5	N
3	1.35	1.20	4.00	30	3.75	34	42.1	51.0	80.7	1.9	17.0	18.1	16.9	C
	1.47[7]	1.34	4.05	21	4.05	26	46.9	64.4	86.9	1.9	31.4	34.9	30.8	O
	1.47[7]	1.34	4.10	21	4.00	26	45.0	82.5	139.2	3.1	34.2	37.5	35.1	P
	1.74[7]	1.56	4.10	21	4.05	26	44.5	101.0	158.9	3.6	36.4	55.1	70.4	Q
	1.74[7]	1.56	4.00	21	4.00	26	42.1	61.1	76.9	1.8	34.0	45.5	49.3	R
	1.87	1.70	5.05	34	4.50	39	63.6	68.1	67.4	1.1	60.7	60.4	53.3	S
	1.87	1.70	4.90	34	4.20	39	65.1	86.7	191.8	2.9	66.6	71.0	128.9	T
	2.01	1.90	3.70	30	3.70	34	28.9	99.2	170.6	5.9	13.6	17.1	17.6	B
	2.17[7]	2.00	4.30	21	3.90	26	23.1	48.2	85.9	3.7	16.2	24.5	32.2	U
	2.17[7]	2.00	4.65	21	4.55	26	23.0	35.5	34.6	1.5	18.0	20.8	16.4	V
	2.57[7]	2.44	4.20	21	3.95	26	14.4	27.5	48.7	3.4	13.3	11.0	8.9	W
	2.57[7]	2.44	4.10	21	3.95	26	13.0	34.2	78.8	6.1	12.0	11.6	12.1	X

[1] Number of weeks during which the sample was rinsed. The rinse interval was variable; this number does not represent all the weeks of the experiment. See the rinse interval table.
[2] Minimum, average, and maximum total calcium and magnesium release rates shown represent the rates corresponding to the min., avg., and max. sulfate release rate periods, respectively.
[3] Sample contained 3% $CaCO_3$, which buffered the drainage.
[4] Sample was taken from a test pile, and thus had undergone previous oxidation.
[5] pH value of 5.75 observed at week 0.
[6] pH values of 5.80 and 5.95 were observed at weeks 0 and 1, respectively.
[7] Sample was compositionally atypical of Duluth Complex rocks.

Table 5. Summary of temporal variation of drainage quality and release rates.

Group	Sulfur %	Number of Samples	Test Duration, Weeks	Initial pH	Final pH	pH Comments	Sulfate Release Comments
1	0.47-0.80	3	13-17	6.2-8.3	6.9-7.7	Oscillated 0.5 to 1.5 pH units for the initial 10 weeks, then stabilized	Increased over the initial 15 to 20 weeks, then generally decreased
2	0.92, 1.24	2	34, 21	6.9-7.0	4.6-5.7	Oscillated 0.5 to 1.5 pH units for the initial 10 weeks, then decreased	Remained constant or increased over the initial 20 to 25 weeks, with peak release during max. pH drop
	1.17[1]	1	17	8.2	8.5	Increased for the initial 12 weeks, then decreased gradually	Increased over the initial 20 weeks, then generally decreased
	1.26[2]	1	21	6.1	6.3	Increased for the initial 10 weeks, then decreased gradually	Remained fairly constant over the initial 30 weeks, then decreased
3	1.35-2.57	7	21-34	3.8-6.2[3]	3.7-5.1[4]	Remained constant or increased for the initial 10 weeks, then decreased	Increased over the initial 15 to 20 weeks, then plateaued[5]

[1] Sample contained 3% $CaCO_3$, which buffered the drainage.
[2] Sample was taken from a test pile, and thus had undergone previous oxidation.
[3] Five of the seven samples in Group 3 had initial pH values between 3.8 and 4.5.
[4] The 1.87% sulfur sample had a final pH of 5.1. The other samples in this group had final pH values between 3.7 and 4.7.
[5] Sulfate release for the 1.35% sulfur sample decreased over the initial eight weeks, then plateaued.

Table 6. Neutralization potentials of AMAX drill core samples.

Sulfur %	Time[1] weeks	Neutralization Potential[2], mg $CaCO_3$/g rock						Reactor	Comments
		pH 7	pH 6	pH 5	pH 4.5	pH 4	pH 3.5		
0.47	13	>0.140	>0.140	>0.140	>0.140	>0.140	>0.140	A	
0.59	17	>0.218	>0.218	>0.218	>0.218	>0.218	>0.218	D	
0.80	17	0.331	>0.405	>0.405	>0.405	>0.405	>0.405	E	
0.80	17	0.315	>0.380	>0.380	>0.380	>0.380	>0.380	F	
0.92	37[3]	0.192	0.402	0.677	0.996	>0.996	>0.996	G	
0.92	37[3]	0.191	0.406	0.868	>0.868	>0.868	>0.868	H	
1.17	17	>0.388	>0.388	>0.388	>0.388	>0.388	>0.388	I	
1.17	17	>0.420	>0.420	>0.420	>0.420	>0.420	>0.420	J	
1.24	37[3]	0	0.611	0.858	1.355	>1.355	>1.355	K	
1.24	37[3]	0	0.584	0.847	1.189	>1.189	>1.189	L	
1.26	21	0	>0.690	>0.690	>0.690	>0.690	>0.690	M	
1.26	21	0	>0.706	>0.706	>0.706	>0.706	>0.706	N	
1.35	30	0	0	0	3.138	>3.713	>3.713	C	
1.47	21	0	0	0	1.948	>2.441	>2.441	O	
1.47	21	0	0	0	1.444	>2.708	>2.708	P	
1.74	21	0	0	0	3.102	>3.464	>3.464	Q	
1.74	30[3]	0	0	0	2.808	>2.808	>2.808	R	
1.87	34	0	1.950	>3.300	>3.300	>3.300	>3.300	S	
1.87	40[3]	0	1.757	4.029	4.297	>4.297	>4.297	T	
2.01	30	0	0	0	0.936	2.625	>4.231	B	
2.17	21	0	0.217	0.612	0.795	>1.383	>1.383	U	
2.17	21	0	0	0.738	>1.104	>1.104	>1.104	V	
2.57	21	0	0	0	1.018	>1.018	>1.018	W	
2.57	21	0	0	0	0.562	>1.204	>1.204	X	

[1] Neutralization potential was calculated for the one week rinse interval period except where noted.

[2] Neutralization potential (NP) was calculated using the cumulative sulfate release at the point after which the pH was consistently below the given threshold value. NP = [(cum. mg SO_4)(100 mg $CaCO_3$/96.1 mg SO_4)]/(75 g rock).

[3] For neutralization potentials calculated beyond the one-week rinse interval period, unmeasured sulfate concentrations were estimated as the average of the previous and subsequent measured sulfate concentrations when the corresponding specific conductance values were similar. For cases in which the correponding specific conductance values were not similar, missing sulfate concentrations were estimated by setting the concentration equal to a previous or subsequent measurement or by linear interpolation between previous and subsequent measurements.

APPENDIX 1

METHODS

Report A1.1. Mineralogical Examination of Duluth Complex Samples used in DNR Sulfur Leaching Experiments. (University of Minnesota Mineral Resources Research Center.)

UNIVERSITY OF MINNESOTA
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October 18, 1985

OCT 2 1985

Mr. Elwood Rafn
Director - Minerals Division
Department of Natural Resources
Box 45
500 Lafayette Road
St. Paul, MN 55146

Dear Elwood,

Enclosed is the report on the mineralogical analysis of the 14 samples from the DNR Duluth Gabbro Leaching project, together with DNR Purchase Orders and MRRC Invoices.

Any questions regarding this work should be directed to Tanya Sabelin.

Yours sincerely,

Ken.

Dr. K. J. Reid
Professor of Mineral Engineering
Director

KJR:pab

Enclosures

MINERAL RESOURCES RESEARCH CENTER

Mineralogical Report

Mineralogical Examination of Duluth Complex Samples used in DNR Sulfur Leaching Experiments.

Fourteen samples of Duluth Complex rock crushed to -100/+270 mesh were received from the Department of Natural Resources for mineralogical analysis. These were individually coned and quartered to obtain representative samples which were then prepared as polished thin sections. The thin sections were examined in transmitted and reflected light to determine the silicate and oxide/sulfide mineralogies, respectively. The samples were studied in terms of their mineralogical composition, mode of sulfide occurence and approximate volume estimates (modal composition) of the major minerals. Included in this report are overall comments on sample mineralogy, microscopy observations on individual samples and a table with the relative volume per cent of minerals for fairly unaltered Duluth Complex samples. It was discovered during the course of this study that several samples are quite atypical for the Duluth Complex. Samples OP and QR are both amphibole-rich rocks with extensive alteration. Sample WX is essentially a quartz-rich rock (looks like a quartzite). These three samples are not included in the volume estimates table.

Sulfides

No significant differences in the textural associations of sulfides in the 14 samples were observed. The sulfides are mostly liberated and in the size range 0.1 - 0.3 mm. Some finer-grained sulfides occur as inclusions in or locked with silicates. The major sulfide phases are pyrrhotite and chalcopyrite with some occurences of pentlandite and cubanite as noted below. Pyrrhotite is more abundant than chalcopyrite in samples B, D, GH, IJ, KL, ST, UV and WX. In the remaining samples no distinct differences in abundances were noted. The overall sulfide contents of samples A and C are less than those of the other samples.

Silicates

Plagioclase, olivine and pyroxene are the major constituents in all samples except OP, QR and WX. Sample UV also appears to have a significant amount of quartz - very similar in appearance to that in WX. Biotite is also present in all samples but it is a minor constituent. The major differences between the DC (Duluth Complex) samples (all samples except OP,

QR and WX) are modal mineralogy (See Table 1) and degree of alteration (see Microscopy Observations). Relatively unaltered DC may contain some chlorite/serpentine grains. More altered DC may have incipient (beginning) alteration of plagioclase and partial alteration of olivine, pyroxene and biotite as well as chlorite/serpentine grains. Extensively altered DC may contain very little unaltered plagioclase, more extensively altered to completely altered olivine, pyroxene and plagioclase and carbonate minerals as does sample IJ.

Microscopy Observations

Key:

Silicates: ol = olivine, px = pyroxene, plag = plagioclase, qtz = quartz, bio = biotite
opaques: ilm = ilmenite, cpy = chalcopyrite, po = pyrrhotite, pn = pentlandite, cb = cubanite, hem = hematite

A: fairly unaltered DC

silicates: plag >/= ol + px, bio, some altered plag grains, some chloritic (part amphibole) grains.

opaques: ilm, cpy, po, (1 pn in po); sulfides mostly liberated, some locked w/ and included in silicates-mostly cpy.

B: unaltered DC

silicates: plag > px > ol, bio (some w/ zircon inclusions)

opaques: ilm, po > cpy; sulfides mostly free, a few grains locked with or included in silicates.

C: fairly unaltered DC

silicates: finer-grained than D, plag unaltered but ol and px show chloritic alteration, chlorite/serpentine grains - some w/ transition to amphibole (?), bio.

opaques: ilm, cpy, po, (1 cb); sulfides mostly liberated, some locked/included in silicates.

D: fairly unaltered DC

silicates: some incipient alteration of plag, plag > ol > px, bio, grains of chloritic alteration, (a grain of ol partly altered), a few amphibole grains.

opaques: very little ilm, po > cpy; sulfides mostly liberated, a few locked/included in silicates - both po and cpy

EF: unaltered DC

silicates: plag > ol > px, bio, a few chloritic mica grains, some

chlorite/serpentine grains, a few amphibole grains.

opaques: ilm, cpy, po, pn; sulfides mostly liberated or composite cpy/po grains, minor amount locked with silicates or included in them.

Note: even though there are alteration minerals present, the plag is not altered - therefore I call this rock unaltered.

GH: unaltered DC

silicates: ol-rich, ol > plag, px, bio, minor chloritic alteration

opaques: increase in ilm content from previous slides, po > cpy, (1 pn in po); sulfides mostly liberated, some locked/included.

IJ: altered DC

silicates: plag, ol, px, bio; alteration minerals - carbonate, chlorite/serpentine alteration, altered plag, some bio altered to chlorite, some px partially altered, and some of the green "chloritic" grains may be altered olivines.

opaques: little ilm, po > cpy, (1 pn in po); sulfides mostly liberated, some locked/included.

KL: fairly unaltered DC

silicates: plag, ol, high px content, chloritic alteration and chlorite, bio.

opaques: a few ilm grains, po > cpy; sulfides mostly liberated, a few inclusions.

MN: fairly unaltered DC

silicates: plag > ol > px with bio, chloritic mica/alteration, and amphibole.

opaques: ilm, cpy, po; sulfides mostly liberated, some included in silicates.

OP: amphibole-rich rock

silicates: plag grains range from unaltered to partially altered to completely altered, chloritic mica, altered bio - minor, a few px grains.

opaques: increased ilm content, cpy, po; sulfides mostly liberated, some as inclusions.

QR: amphibole-rich rock

silicates: most plag grains partially to entirely altered, chloritic mica, bio - mostly altered. Lath-shaped habit dominant (amph, mica, bio).

opaques: ilm, cpy, po, pn; sulfides mostly liberated, a few as inclusions.

ST: DC with alteration

silicates: ol, px, altered and fresh plag, chloritic alteration, bio, some serpentinized or chloritized olivine, some px grains show partial alteration.

opaques: a little ilm, po > cpy; sulfides mostly liberated, same as inclusions in silicates.

UV: fairly unaltered DC with some quartzite (?)

silicates: ol, px, plag, qtz, bio

opaques: ilm, po > cpy; sulfides mostly liberated, some as inclusions

WX: essentially a quartz-opaques rock with some biotite, chloritic mica and possibly some other type of alteration. Quartz has abundant opaque inclusions and minor apatite. A few grains of plag and px observed. Fine-grained, abundant quartz subgrains. Source rock must have been a quartzite (metamorphic texture).

opaques: trace oxide (maybe hem) - as inclusions in silicate; po > cpy, mostly as liberated grains, some locked w/ and included in silicates.

Table A1.1. Rinse interval changes with final pH values.

Reactor	%S	Interval 1			Interval 2			Interval 3			Interval 4			Interval 5			Interval 6		
		Int[1]	To Wk	End pH	Int[1]	To Wk	End pH	Int[1]	To Wk	End pH	Int[1]	To Wk	End pH	Int[1]	To Wk	End pH	Int[1]	To Wk	End pH
A[2]	0.47	1	17	7.70	2	19	7.65	3	28	7.00	5	33	7.15	4[3]	37	7.10	3[3]	49	7.00
D	0.59	1	17	7.55	2	19	7.60	3	28	7.10	5	33	7.15	4[3]	37	7.50	3[3]	49	7.25
E	0.80	1	17	6.85	2	19	6.75	3	28	6.50	1[3]	34	6.35	3[3]	49	6.35			
F	0.80	1	17	6.90	2	19	6.70	3	28	6.50	1	34	6.15	3[3]	49	6.15			
G	0.92	1	34	4.60	3[3]	49	4.25												
H	0.92	1	34	5.00	3[3]	49	4.60												
I	1.17	1	17	8.50	2	19	8.40	3	28	8.20	5	33	8.25						
J	1.17	1	17	8.45	2	19	8.45	3	28	8.20	5	33	8.10						
K	1.24	1	21	5.70	2[4]	29	4.85	1[3]	34	4.60	3[3]	49	4.20						
L	1.24	1	21	5.70	2	29	5.20	1	34	4.65	3[3]	49	4.20						
M	1.26	1	21	6.30	2[3]	29	6.10	1[3]	34	6.25	3[3]	49	6.10						
N	1.26	1	21	6.30	2	29	6.00	1	34	6.20	3[3]	49	6.10						
C[2]	1.35	1	34	4.05															
O	1.47	1	21	4.40	2	27	4.35	3	33	4.20									
P	1.47	1	21	4.25	2	27	4.25	3	33	4.15									
Q	1.74	1	21	4.35	2	27	4.30	3	33	4.05									
R	1.74	1	21	4.70	2	27	4.50	3	33	4.15									
S	1.87	1	34	5.05	3[3]	49	4.55												
T	1.87	1	34	4.90	3[3]	49	4.20												
B[2]	2.01	1	34	3.70															
U	2.17	1	21	4.35	2	27	4.00	3	33	3.90									
V	2.17	1	21	4.65	2	27	4.55	3	33	4.55									
W	2.57	1	21	4.20	2	27	3.95	3	33	4.05									
X	2.57	1	21	4.20	2	27	3.95	3	33	4.00									

Note: Unless specified otherwise, samples were rinsed with two 200-mL volumes.

[1] Interval between rinses in weeks.

[2] Reactors A, B, and C began at week four. All other reactors began at week zero.

[3] Samples were rinsed with a single 200-mL volume during these intervals.

[4] Sample was rinsed with a single 200-mL volume on week 27.

[5] Sample was rinsed with a single 200-mL volume on weeks 23 and 27.

APPENDIX 2

DRAINAGE QUALITY

Table A2.1. Drainage quality from AMAX drill core of Duluth Complex rock containing 0.47% sulfur (reactor A).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/l	Ca mg/l	Mg mg/l	Na mg/L	K mg/L	Cu mg/l	Ni mg/l	Co mg/L	Zn mg/l	Vol ml	Temp. °C	R.H. %
0	1	7.55	68.0	18.0	5.2	0.88	4.80	2.74	0.007	0.004	0.001	0.030	173.0	24.4	51.3
0	2	8.25	16.0	1.3	1.8	0.20	0.49	0.91	<0.001	0.001	0.001	<0.010	202.1	NA'	NA
0	3	8.40	13.0	1.3	1.6	0.15	0.22	0.68	<0.001	<0.001	0.001	0.010	200.4	NA	NA
0	4	8.40	12.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.8	NA	NA
0	5	8.25	11.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.9	NA	NA
1	1	8.25	20.0	2.1	1.6	0.16	1.00	2.44	0.002	<0.001	<0.001	0.010	174.1	25.0	60.0
1	2	8.60	11.5	0.3	NA	NA	NA	NA	NA	NA	NA	NA	201.3	NA	NA
1	3	8.55	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.9	NA	NA
1	4	8.40	9.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.9	NA	NA
2	1	7.30	24.0	2.1	1.5	0.17	0.62	2.28	0.004	0.002	<0.001	0.010	173.4	25.0	55.3
2	2	8.00	9.5	0.6	NA	NA	NA	NA	NA	NA	NA	NA	198.4	NA	NA
2	3	8.35	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.6	NA	NA
3	1	8.20	19.0	3.3	1.4	0.16	0.55	1.79	0.005	<0.001	<0.001	0.010	173.2	25.0	56.0
3	2	8.30	10.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.3	NA	NA
4	1	6.85	21.0	3.4	1.4	0.18	0.52	2.23	0.004	0.001	<0.001	0.010	173.8	25.8	69.4
4	2	7.85	13.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.5	NA	NA
5	1	7.95	21.0	3.3	1.5	0.19	0.46	1.75	0.002	<0.001	<0.001	<0.010	172.3	25.3	59.0
5	2	8.75	9.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	206.5	NA	NA
6	1	7.65	19.0	3.0	1.5	0.16	0.40	1.44	0.001	0.001	<0.001	<0.010	173.8	24.8	65.3
6	2	7.60	9.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.3	NA	NA
7	1	8.50	19.0	3.0	2.0	0.17	0.35	1.64	0.001	0.012	0.020	<0.010	172.9	25.2	55.7
7	2	8.70	9.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.7	NA	NA
8	1	7.85	25.0	3.2	2.2	0.23	0.30	1.54	0.004	0.001	0.001	0.010	172.7	25.2	60.3
8	2	7.40	8.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.0	NA	NA
9	1	7.95	21.0	2.8	2.3	0.24	0.29	1.46	0.005	0.001	<0.001	0.010	172.7	24.7	63.3
9	2	8.30	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.8	NA	NA
10	1	7.40	21.0	3.1	2.4	0.24	0.26	1.38	0.007	0.003	0.001	<0.010	171.8	24.3	62.3
10	2	7.50	6.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.9	NA	NA
11	1	7.50	21.0	NA	2.5	0.25	0.25	1.32	0.004	0.001	0.001	0.010	172.7	24.5	71.3
11	2	7.50	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.5	NA	NA
12	1	7.55	21.0	3.8	1.9	0.21	0.33	1.23	0.003	<0.001	<0.001	0.010	173.4	25.7	69.3
12	2	7.85	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.0	NA	NA
13	1	7.70	18.0	3.6	1.9	0.20	0.39	1.20	0.004	0.001	<0.001	<0.001	171.5	24.1	63.0
13	2	7.75	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.8	NA	NA
14	1	NS*	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.5	70.3
14	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
15	1	7.65	23.0	4.5	2.6	0.40	0.30	1.41	0.002	0.001	0.001	0.010	173.2	25.3	64.8
15	2	7.60	7.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.4	NA	NA
16	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.6	70.5
16	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
17	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.2	69.3
17	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
18	1	7.30	25.0	4.2	2.6	0.40	0.31	1.14	0.001	0.001	0.001	0.010	173.7	26.4	59.5
18	2	7.30	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.7	NA	NA
19	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.9	56.8
19	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
20	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.2	56.7
20	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
21	1	7.10	23.0	3.5	NA	NA	NA	NA	NA	NA	NA	NA	173.5	25.7	55.0
21	2	7.15	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.4	NA	NA
22	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	58.0
22	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
23	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.2	56.8
23	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
24	1	7.00	20.0	<1.0	2.5	0.40	0.24	0.75	0.002	0.001	0.001	0.010	175.2	25.0	52.0
24	2	7.10	6.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	196.4	NA	NA
25	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.8	51.0
25	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA

Table A2.1. Drainage quality from AMAX drill core of Duluth Complex rock containing 0.47% sulfur (reactor A).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/L	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cu mg/l	Ni mg/l	Co mg/L	Zn mg/l	Vol. mL	Temp. °C	R.H. %
26	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.9	50.4
26	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
27	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.6	51.8
27	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
28	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.0	54.0
28	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
29	1	7.15	20.0	<1.0	2.4	0.50	0.23	0.69	0.001	0.001	<0.001	0.010	171.9	25.5	49.3
29	2	7.15	6.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.3	NA	NA
30	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.2	50.0
30	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
31	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	48.7
31	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
32	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.0	47.0
32	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
33	1	7.10	15.0	2.1	1.7	0.50	1.10	0.60	0.003	<0.001	0.001	0.004	172.5	25.3	43.3
33	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
34	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.8	43.8
34	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
35	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	23.7	42.0
35	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
36	1	7.20	14.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	173.3	26.0	44.0
36	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
37	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	26.5	41.0
37	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
38	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.0	41.0
38	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
39	1	7.20	12.0	NA	1.4	0.40	1.10	0.50	0.001	0.001	0.001	0.002	173.7	25.3	43.3
39	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
40	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	23.5	44.0
40	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
41	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.8	43.8
41	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
42	1	7.10	11.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	173.0	26.1	43.5
42	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
43	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	42.0
43	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
44	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.0	42.0
44	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
45	1	7.00	12.0	1.4	1.4	0.50	1.00	0.40	0.001	0.001	0.001	0.004	174.6	24.8	44.0
45	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA

'NA: Not analyzed.

*NS: No sample taken.

Table A2.2. Drainage quality from AMAX drill core of Duluth Complex rock containing 0.59% sulfur (reactor D).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/l	Ca mg/l	Mg mg/L	Na mg/L	K mg/L	Cu mg/L	Ni mg/l	Co mg/L	Zn mg/l	Vol. mL	Temp. °C	R.H. %
0	1	7.60	81.0	15.0	7.0	1.80	4.30	3.60	<0.001	0.008	<0.001	0.010	174.3	NA'	NA
0	2	8.25	22.7	1.4	2.8	0.50	0.90	1.20	<0.001	<0.001	<0.001	0.010	199.1	NA	NA
0	3	8.20	17.5	NA	1.7	0.40	0.50	1.00	<0.001	<0.001	<0.001	0.010	198.6	NA	NA
0	4	8.55	17.0	<0.2	2.3	0.40	0.70	1.10	0.001	<0.001	<0.001	<0.001	198.3	NA	NA
0	5	8.65	16.0	NA	3.1	0.50	1.50	1.00	0.001	<0.001	<0.001	<0.001	201.7	NA	NA
1	1	6.65	28.0	NA	3.0	0.60	0.97	2.31	<0.001	<0.001	<0.001	<0.001	173.0	25.2	54.5
1	2	8.00	15.5	NA	2.3	0.30	0.27	1.02	<0.001	<0.001	<0.001	<0.001	199.1	NA	NA
1	3	8.00	14.0	NA	2.1	0.30	0.22	0.77	<0.001	<0.001	<0.001	<0.001	199.4	NA	NA
1	4	8.05	13.5	NA	2.4	0.30	0.14	0.68	<0.001	<0.001	<0.001	<0.001	197.9	NA	NA
2	1	8.10	19.5	1.0	2.1	0.50	0.46	2.29	<0.001	<0.001	<0.001	<0.001	174.5	24.4	53.0
2	2	8.70	12.0	NA	1.7	0.40	0.17	1.13	<0.001	<0.001	<0.001	<0.001	197.2	NA	NA
2	3	8.70	10.5	NA	1.7	0.30	0.12	0.87	<0.001	<0.001	<0.001	<0.001	197.6	NA	NA
3	1	7.45	19.0	1.8	2.2	0.25	0.57	1.83	<0.001	0.001	0.001	0.010	172.2	24.8	50.0
3	2	8.15	12.5	1.2	NA	NA	NA	NA	NA	NA	NA	NA	200.3	NA	NA
4	1	7.00	19.5	2.1	2.2	0.26	0.63	1.75	0.001	<0.001	0.001	0.010	172.4	24.4	51.3
4	2	7.90	11.0	0.9	NA	NA	NA	NA	NA	NA	NA	NA	200.5	NA	NA
5	1	7.90	19.0	NA	2.3	0.26	0.45	1.92	0.004	<0.001	0.005	0.010	172.8	25.0	60.0
5	2	8.05	10.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.4	NA	NA
6	1	7.25	17.5	2.4	2.4	0.30	0.42	1.76	0.004	0.002	<0.001	0.010	173.9	25.0	55.3
6	2	7.85	9.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	197.9	NA	NA
7	1	7.45	22.0	4.5	2.1	0.34	0.47	1.60	0.006	<0.001	<0.001	0.010	171.7	25.0	56.0
7	2	8.15	10.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.0	NA	NA
8	1	7.30	26.0	5.3	2.4	0.42	0.46	2.06	0.003	0.001	<0.001	<0.010	173.5	25.8	69.4
8	2	7.60	11.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.2	NA	NA
9	1	7.90	23.0	NA	2.3	0.37	0.39	1.79	0.002	0.001	0.001	<0.010	172.2	25.3	59.0
9	2	8.30	9.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.8	NA	NA
10	1	7.30	22.0	5.4	2.2	0.38	0.37	1.29	<0.001	0.002	<0.001	0.010	174.8	24.8	65.3
10	2	7.60	11.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.6	NA	NA
11	1	8.10	24.0	5.5	2.4	0.36	0.35	1.54	0.002	<0.001	0.006	<0.010	174.3	25.2	55.7
11	2	8.65	9.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.5	NA	NA
12	1	7.70	26.0	5.7	2.9	0.43	0.28	1.40	0.004	0.001	0.001	<0.010	173.3	25.2	60.3
12	2	8.35	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.4	NA	NA
13	1	7.80	25.0	5.2	2.9	0.42	0.27	1.40	0.003	0.001	0.001	<0.010	173.5	24.7	63.3
13	2	8.00	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.4	NA	NA
14	1	7.55	26.0	5.4	3.1	0.42	0.26	1.32	0.004	0.001	0.001	<0.010	172.3	24.3	62.3
14	2	7.90	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	203.8	NA	NA
15	1	7.40	25.0	NA	3.0	0.41	0.26	1.26	0.004	0.001	<0.001	<0.010	174.1	24.5	71.3
15	2	7.55	9.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.1	NA	NA
16	1	7.50	29.0	6.8	3.0	0.47	0.41	1.30	0.010	0.003	<0.001	0.010	169.6	25.7	69.3
16	2	7.50	9.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	203.3	NA	NA
17	1	7.55	28.0	6.2	3.1	0.44	0.38	1.30	0.002	0.001	<0.001	<0.001	174.6	24.1	63.0
17	2	7.75	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.7	NA	NA
18	1	NS[a]	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.5	70.3
18	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
19	1	7.60	32.0	7.3	3.5	0.70	0.37	1.45	0.004	0.012	0.001	0.010	174.7	25.3	64.8
19	2	7.55	9.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.1	NA	NA
20	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.6	70.5
20	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
21	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.2	69.3
21	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
22	1	7.40	36.0	8.2	4.3	0.80	0.29	1.23	<0.001	0.030	0.001	0.010	174.6	26.4	59.5
22	2	7.50	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.1	NA	NA
23	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.9	56.8
23	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
24	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.2	56.7
24	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
25	1	7.15	33.0	NA	4.2	1.00	1.00	1.20	0.001	0.001	0.001	0.001	174.2	25.7	55.0
25	2	7.25	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	197.1	NA	NA

Table A2.2. Drainage quality from AMAX drill core of Duluth Complex rock containing 0.59% sulfur (reactor D).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/L	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cu mg/L	Ni mg/L	Co mg/L	Zn mg/L	Vol. ml	Temp. °C	R.H. %
26	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	58.0
26	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
27	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.2	56.8
27	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
28	1	7.10	30.0	2.5	NA	NA	NA	NA	NA	NA	NA	NA	174.5	25.0	52.0
28	2	7.35	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.9	NA	NA
29	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.8	51.0
29	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
30	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.9	50.4
30	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
31	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.6	51.8
31	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
32	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.0	54.0
32	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
33	1	7.15	28.0	2.3	3.8	0.90	1.00	1.00	0.001	0.002	0.001	0.001	171.8	25.5	49.3
33	2	6.75	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.9	NA	NA
34	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.2	50.0
34	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
35	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	48.7
35	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
36	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.0	47.0
36	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
37	1	7.50	23.0	4.1	NA	NA	NA	NA	NA	NA	NA	NA	175.8	25.3	43.3
37	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
38	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.8	43.8
38	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
39	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	23.7	42.0
39	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
40	1	7.40	19.0	2.9	2.6	0.70	1.00	0.80	<0.001	<0.001	<0.001	0.001	174.6	26.0	44.0
40	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
41	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	26.5	41.0
41	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
42	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.0	41.0
42	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
43	1	7.35	14.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	175.1	25.3	43.3
43	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
44	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	23.5	44.0
44	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
45	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.8	43.8
45	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
46	1	7.20	15.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	172.8	26.1	43.5
46	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
47	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	42.0
47	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
48	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.0	42.0
48	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
49	1	7.25	15.0	2.0	2.2	0.70	0.90	0.60	<0.001	0.001	<0.001	0.001	174.1	24.8	44.0
49	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA

[1]NA: Not analyzed.

[2]NS: No sample taken.

Table A2.3. Drainage quality from AMAX drill core of Duluth Complex rock containing 0.80% sulfur (reactor E).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/l	Ca mg/L	Mg mg/l	Na mg/L	K mg/l	Cu mg/l	Ni mg/l	Co mg/l	Zn mg/l	Vol. ml	Temp. °C	R.H. %
0	1	6.60	108.0	27.0	NA'	NA	NA	NA	0.002	0.080	<0.001	0.020	172.3	NA	NA
0	2	7.80	21.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.4	NA	NA
0	3	8.10	14.1	NA	NA	NA	NA	NA	<0.001	0.016	<0.001	0.010	198.8	NA	NA
0	4	7.70	12.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.5	NA	NA
0	5	7.90	11.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.5	NA	NA
1	1	6.25	37.0	8.2	3.7	0.70	1.71	1.06	<0.001	<0.001	<0.001	0.010	167.6	25.2	54.5
1	2	6.65	12.5	NA	1.5	0.30	0.47	0.49	<0.001	<0.001	<0.001	<0.001	196.5	NA	NA
1	3	6.60	9.5	NA	1.3	0.20	0.25	0.38	<0.001	<0.001	<0.001	<0.001	199.0	NA	NA
1	4	6.75	8.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	197.5	NA	NA
2	1	6.95	24.0	NA	2.8	0.70	0.64	1.21	<0.001	<0.001	<0.001	0.010	172.3	24.4	53.0
2	2	7.50	10.0	NA	1.4	0.30	0.27	0.63	<0.001	<0.001	<0.001	<0.001	198.5	NA	NA
2	3	7.30	7.5	NA	1.2	0.30	0.17	0.48	<0.001	<0.001	<0.001	0.010	199.7	NA	NA
3	1	6.85	21.0	5.1	2.8	0.36	0.59	0.80	<0.001	0.001	<0.001	0.010	172.2	24.8	50.0
3	2	6.95	8.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.0	NA	NA
4	1	6.60	23.5	6.9	3.1	0.42	0.49	0.82	<0.001	0.001	<0.001	0.010	172.2	24.4	51.3
4	2	6.65	8.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.7	NA	NA
5	1	6.65	23.0	7.8	3.2	0.46	0.38	0.95	0.002	<0.001	0.005	0.010	173.3	25.0	60.0
5	2	7.00	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.9	NA	NA
6	1	6.80	22.0	6.3	2.7	0.49	0.34	0.83	0.003	0.002	0.001	0.010	169.0	25.0	55.3
6	2	6.85	7.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.1	NA	NA
7	1	6.85	30.5	NA	3.6	0.63	0.44	0.84	0.005	<0.001	<0.001	0.010	169.7	25.0	56.0
7	2	7.05	6.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.5	NA	NA
8	1	6.75	30.0	9.8	3.8	0.61	0.35	0.96	0.003	0.002	0.001	<0.010	169.9	25.8	69.4
8	2	6.65	6.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.6	NA	NA
9	1	6.95	28.0	NA	3.8	1.00	1.00	0.90	0.004	0.002	0.001	0.003	173.7	25.3	59.0
9	2	7.25	6.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.9	NA	NA
10	1	7.00	26.0	8.6	2.8	0.54	0.30	0.62	0.005	0.002	0.001	<0.010	175.5	24.8	65.3
10	2	6.95	8.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	196.3	NA	NA
11	1	7.25	27.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	172.4	25.2	55.7
11	2	7.40	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.8	NA	NA
12	1	7.10	30.0	8.9	3.5	0.61	0.22	0.64	0.004	0.002	<0.001	0.010	171.3	25.2	60.3
12	2	7.40	5.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.2	NA	NA
13	1	7.05	27.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	172.4	24.7	63.3
13	2	7.30	6.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.5	NA	NA
14	1	6.90	30.0	9.0	3.3	0.64	0.23	0.59	0.006	0.005	0.001	0.020	172.0	24.3	62.3
14	2	6.95	6.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.7	NA	NA
15	1	6.90	33.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	173.5	24.5	71.3
15	2	6.85	6.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.7	NA	NA
16	1	6.95	35.0	11.3	4.4	0.82	0.28	0.51	0.003	0.005	<0.001	0.020	172.0	25.7	69.3
16	2	7.05	4.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.8	NA	NA
17	1	6.85	29.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	171.0	24.1	63.0
17	2	7.00	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.5	NA	NA
18	1	NS²	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.5	70.3
18	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
19	1	6.75	36.0	10.6	3.9	0.90	0.27	0.50	0.004	0.011	0.001	<0.010	172.2	25.3	64.8
19	2	6.90	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.0	NA	NA
20	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.6	70.5
20	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
21	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.2	69.3
21	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
22	1	6.70	38.0	10.0	4.2	1.20	0.26	0.54	0.002	0.019	0.001	0.010	173.6	26.4	59.5
22	2	6.80	6.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.9	NA	NA
23	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.9	56.8
23	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
24	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.2	56.7
24	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
25	1	6.60	34.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	170.1	25.7	55.0
25	2	6.75	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.2	NA	NA

Table A2.3. Drainage quality from AMAX drill core of Duluth Complex rock containing 0.80% sulfur (reactor E).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/L	Ca mg/l	Mg mg/L	Na mg/l	K mg/L	Cu mg/L	Ni mg/l	Co mg/L	Zn mg/l	Vol. ml	Temp. °C	R.H. %
26	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	58.0
26	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
27	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.2	56.8
27	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
28	1	6.50	27.0	5.0	2.8	0.80	0.25	0.45	0.001	0.015	<0.001	<0.010	173.2	25.0	52.0
28	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
29	1	6.40	22.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	173.5	24.8	51.0
29	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
30	1	6.45	17.0	1.5	1.8	0.50	0.18	0.31	0.001	0.012	0.001	<0.010	173.4	24.9	50.4
30	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
31	1	6.60	15.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	174.8	24.6	51.8
31	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
32	1	6.70	16.0	2.5	1.8	0.40	0.38	0.21	0.001	0.001	<0.001	0.010	175.1	25.0	54.0
32	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
33	1	6.45	19.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	173.4	25.5	49.3
33	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
34	1	6.35	23.0	2.0	2.3	0.60	0.28	0.36	0.001	0.012	<0.001	0.010	173.5	25.2	50.0
34	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
35	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	48.7
35	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
36	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.0	47.0
36	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
37	1	6.45	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	172.0	25.3	43.3
37	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
38	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.8	43.8
38	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
39	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	23.7	42.0
39	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
40	1	6.35	30.0	11.5	3.5	1.10	1.00	0.60	0.005	0.013	0.001	0.008	172.5	26.0	44.0
40	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
41	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	26.5	41.0
41	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
42	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.0	41.0
42	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
43	1	6.35	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	172.6	25.3	43.3
43	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
44	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	23.5	44.0
44	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
45	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.8	43.8
45	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
46	1	6.35	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	171.2	26.1	43.5
46	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
47	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	42.0
47	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
48	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.0	42.0
48	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
49	1	6.35	23.0	8.0	2.7	1.00	0.90	0.50	0.004	0.013	0.001	0.006	173.2	24.8	44.0
49	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA

'NA: Not analyzed.

²NS: No sample taken.

Table A2.4. Drainage quality from AMAX drill core of Duluth Complex rock containing 0.80% sulfur (reactor F).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/L	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cu mg/L	Ni mg/L	Co mg/L	Zn mg/L	Vol. mL	Temp. °C	R.H. %
0	1	6.80	108.0	27.0	8.8	1.60	9.00	1.30	0.008	0.014	<0.001	0.030	172.2	NA[1]	NA
0	2	7.60	20.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	204.8	NA	NA
0	3	7.90	14.5	1.0	1.0	0.30	0.90	0.30	<0.001	<0.001	<0.001	<0.001	199.3	NA	NA
0	4	8.35	12.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	197.0	NA	NA
0	5	8.25	11.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	197.5	NA	NA
1	1	6.30	34.5	NA	3.3	0.70	1.69	1.05	<0.001	<0.001	<0.001	<0.001	170.4	25.2	54.5
1	2	6.75	13.0	NA	1.4	0.30	0.32	0.52	<0.001	<0.001	<0.001	<0.001	197.3	NA	NA
1	3	6.60	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.3	NA	NA
1	4	6.85	8.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.2	NA	NA
2	1	7.25	24.0	4.8	2.7	0.70	0.62	1.18	<0.001	<0.001	<0.001	<0.001	170.9	24.4	53.0
2	2	7.70	8.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.3	NA	NA
2	3	7.70	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.3	NA	NA
3	1	7.00	24.5	NA	3.1	0.42	0.64	0.86	0.002	0.002	0.001	0.010	171.4	24.8	50.0
3	2	7.20	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.8	NA	NA
4	1	6.60	23.0	NA	3.1	0.40	0.51	0.84	0.001	0.002	<0.001	0.010	171.0	24.4	51.3
4	2	6.70	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.0	NA	NA
5	1	6.85	23.0	6.3	3.2	0.43	0.40	0.97	0.003	0.001	0.001	0.010	170.7	25.0	60.0
5	2	7.10	7.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.6	NA	NA
6	1	6.80	22.0	NA	3.5	0.49	0.37	0.88	0.004	0.002	0.001	0.010	172.2	25.0	55.3
6	2	6.65	7.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.9	NA	NA
7	1	6.95	26.5	8.1	NA	NA	NA	NA	NA	NA	NA	NA	172.9	25.0	56.0
7	2	7.00	7.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.6	NA	NA
8	1	6.80	29.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	172.8	25.8	69.4
8	2	6.95	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.7	NA	NA
9	1	7.10	29.0	2.0	3.1	0.55	0.35	0.98	0.003	0.002	0.001	<0.010	172.8	25.3	59.0
9	2	7.25	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.4	NA	NA
10	1	6.90	28.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	171.7	24.8	65.3
10	2	6.70	7.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.1	NA	NA
11	1	7.25	30.0	8.7	3.0	0.52	0.40	0.86	0.003	<0.001	0.005	<0.010	172.5	25.2	55.7
11	2	7.30	6.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.8	NA	NA
12	1	7.15	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	172.2	25.2	60.3
12	2	7.30	6.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	197.9	NA	NA
13	1	7.20	27.0	8.9	3.3	0.61	0.24	0.71	0.004	0.003	0.001	0.010	172.7	24.7	63.3
13	2	7.30	6.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.7	NA	NA
14	1	6.90	28.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	170.1	24.3	62.3
14	2	6.95	6.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.8	NA	NA
15	1	6.90	28.0	9.0	3.3	0.63	0.24	0.68	0.005	0.004	<0.001	<0.010	170.8	24.5	71.3
15	2	6.85	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.5	NA	NA
16	1	6.95	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	172.3	25.7	69.3
16	2	7.05	6.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.8	NA	NA
17	1	6.90	27.0	8.6	3.1	0.62	0.27	0.60	0.003	0.003	<0.001	<0.001	172.0	24.1	63.0
17	2	7.00	6.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.6	NA	NA
18	1	NS[2]	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.5	70.3
18	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
19	1	6.70	35.0	10.0	3.4	0.70	0.32	0.76	0.001	0.014	0.001	0.010	172.4	25.3	64.8
19	2	6.85	9.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	164.3	NA	NA
20	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.6	70.5
20	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
21	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.2	69.3
21	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
22	1	6.60	37.0	11.2	3.5	1.20	0.27	0.73	0.003	0.007	0.001	0.010	172.0	26.4	59.5
22	2	6.75	7.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.0	NA	NA
23	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.9	56.8
23	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
24	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.2	56.7
24	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
25	1	6.60	33.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	173.8	25.7	55.0
25	2	6.70	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.0	NA	NA

Table A2.4. Drainage quality from AMAX drill core of Duluth Complex rock containing 0.80% sulfur (reactor F).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/L	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cu mg/L	Ni mg/L	Co mg/L	Zn mg/L	Vol. ml	Temp. °C	R.H. %
26	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	58.0
26	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
27	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.2	56.8
27	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
28	1	6.50	28.0	6.0	2.0	0.60	0.27	0.63	0.020	0.004	<0.001	0.010	172.1	25.0	52.0
28	2	6.60	6.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.4	NA	NA
29	1	6.40	22.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	173.0	24.8	51.0
29	2	6.40	4.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.8	NA	NA
30	1	6.40	24.0	6.0	2.8	0.60	0.20	0.53	0.001	0.003	0.001	0.010	173.5	24.9	50.4
30	2	6.40	4.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.3	NA	NA
31	1	6.40	27.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	172.3	24.6	51.8
31	2	6.50	4.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.3	NA	NA
32	1	6.40	37.0	13.0	4.1	0.90	0.20	0.57	0.002	0.006	<0.001	0.010	172.4	25.0	54.0
32	2	6.40	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.5	NA	NA
33	1	6.20	43.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	173.2	25.5	49.3
33	2	6.35	6.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.3	NA	NA
34	1	6.15	34.0	13.0	3.8	0.90	1.80	0.50	0.004	0.021	0.001	0.010	172.6	25.2	50.0
34	2	6.25	7.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.8	NA	NA
35	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	48.7
35	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
36	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.0	47.0
36	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
37	1	6.10	34.0	NA	4.0	1.40	0.90	0.70	0.009	0.031	0.004	0.012	172.4	25.3	43.3
37	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
38	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.8	43.8
38	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
39	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	23.7	42.0
39	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
40	1	6.00	32.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	172.2	26.0	44.0
40	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
41	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	26.5	41.0
41	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
42	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.0	41.0
42	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
43	1	6.05	29.0	10.3	3.1	1.20	1.00	0.60	0.008	0.026	0.003	0.010	171.2	25.3	43.3
43	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
44	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	23.5	44.0
44	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
45	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.8	43.8
45	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
46	1	6.10	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	171.2	26.1	43.5
46	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
47	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	42.0
47	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
48	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.0	42.0
48	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
49	1	6.15	21.0	6.9	2.3	1.00	1.00	0.50	0.001	0.020	0.002	0.008	172.5	24.8	44.0
49	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA

[1]NA: Not analyzed.

[2]NS: No sample taken.

Table A2.5. Drainage quality from AMAX drill core of Duluth Complex rock containing 0.92% sulfur (reactor G).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/l	Ca mg/l	Mg mg/L	Na mg/l	K mg/l	Cu mg/l	Ni mg/L	Co mg/l	Zn mg/l	Vol. ml	Temp. °C	R.H. %
0	1	7.50	79.0	16.0	7.1	2.30	2.10	3.30	0.007	0.004	<0.001	0.010	175.1	NA'	NA
0	2	8.35	17.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.7	NA	NA
0	3	8.40	13.5	0.5	1.8	0.70	2.40	0.90	<0.001	0.002	<0.001	<0.001	199.2	NA	NA
0	4	8.40	12.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.5	NA	NA
0	5	8.50	12.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.5	NA	NA
1	1	6.90	22.5	4.9	2.4	0.60	0.37	1.61	<0.001	<0.001	<0.001	0.010	173.7	25.2	54.5
1	2	7.10	12.0	0.9	2.0	0.30	0.08	0.56	<0.001	<0.001	<0.001	<0.001	199.4	NA	NA
1	3	6.90	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	197.1	NA	NA
1	4	7.60	9.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.2	NA	NA
2	1	7.70	15.0	NA	1.8	0.50	0.20	1.64	<0.001	<0.001	<0.001	0.010	177.1	24.4	53.0
2	2	8.30	8.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.4	NA	NA
2	3	8.35	7.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.6	NA	NA
3	1	7.15	13.5	NA	1.8	0.17	0.33	1.18	<0.001	0.001	<0.001	0.010	177.1	24.8	50.0
3	2	7.50	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.5	NA	NA
4	1	6.90	14.0	NA	1.9	0.19	0.22	1.11	<0.001	0.005	<0.001	0.010	175.9	24.4	51.3
4	2	7.05	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	197.4	NA	NA
5	1	7.35	15.5	2.7	2.0	0.25	0.21	1.38	0.002	<0.001	0.001	0.010	175.4	25.0	60.0
5	2	7.60	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.9	NA	NA
6	1	6.90	15.0	NA	2.1	0.26	0.22	1.20	0.002	0.002	0.001	0.010	176.3	25.0	55.3
6	2	6.90	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.0	NA	NA
7	1	6.95	18.5	5.1	1.8	0.36	0.26	1.13	0.007	<0.001	<0.001	<0.010	174.5	25.0	56.0
7	2	7.40	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.4	NA	NA
8	1	6.60	22.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	177.0	25.8	69.4
8	2	6.90	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.9	NA	NA
9	1	7.10	22.0	1.1	2.3	0.36	0.25	1.40	0.002	0.001	0.001	<0.010	177.9	25.3	59.0
9	2	7.35	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.4	NA	NA
10	1	6.90	23.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	176.6	24.8	65.3
10	2	6.85	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.2	NA	NA
11	1	6.35	22.0	6.0	2.4	0.33	0.24	1.09	0.004	0.007	0.005	<0.010	175.3	25.2	55.7
11	2	6.45	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.8	NA	NA
12	1	7.30	24.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	174.6	25.2	60.3
12	2	7.55	6.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.6	NA	NA
13	1	7.25	24.0	6.5	2.7	0.39	0.20	1.02	0.004	0.004	0.001	<0.010	176.3	24.7	63.3
13	2	7.25	6.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.5	NA	NA
14	1	6.90	24.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	174.5	24.3	62.3
14	2	6.85	4.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.6	NA	NA
15	1	6.85	23.0	6.6	2.5	0.43	0.22	1.00	0.004	0.005	0.001	0.010	176.0	24.5	71.3
15	2	6.90	6.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.2	NA	NA
16	1	6.95	22.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	177.1	25.7	69.3
16	2	6.95	6.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.0	NA	NA
17	1	6.85	20.0	5.5	2.1	0.42	0.27	0.91	0.003	0.006	<0.001	<0.001	175.7	24.1	63.0
17	2	6.85	3.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.1	NA	NA
18	1	6.80	23.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	175.6	25.5	70.3
18	2	6.95	4.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.7	NA	NA
19	1	6.70	23.0	6.7	1.9	0.70	0.22	0.94	<0.001	0.011	0.001	0.010	175.6	25.3	64.8
19	2	6.75	4.0	NA	0.5	0.20	0.04	0.20	<0.001	0.001	0.001	0.010	201.8	NA	NA
20	1	6.55	23.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	175.4	24.6	70.5
20	2	6.75	4.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.2	NA	NA
21	1	6.35	26.0	NA	1.7	0.80	0.22	1.07	<0.001	0.040	0.010	0.010	175.4	25.2	69.3
21	2	6.55	6.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.6	NA	NA
22	1	6.20	36.0	14.5	2.7	0.90	0.30	1.47	0.001	0.110	0.001	0.020	175.3	26.4	59.5
22	2	6.50	6.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.5	NA	NA
23	1	5.90	70.0	27.0	4.6	2.30	0.37	2.13	0.110	0.560	0.060	0.010	175.1	24.9	56.8
23	2	6.00	11.0	NA	0.7	0.30	0.04	0.30	0.030	0.080	0.020	0.020	201.7	NA	NA
24	1	5.55	70.0	23.0	8.5	3.60	0.54	2.29	0.200	0.800	0.100	0.160	176.8	25.2	56.7
24	2	5.70	11.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.2	NA	NA
25	1	5.40	62.0	NA	4.0	1.50	0.90	1.70	0.460	0.880	0.110	0.180	176.5	25.7	55.0
25	2	5.60	12.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.8	NA	NA

Table A2.5. Drainage quality from AMAX drill core of Duluth Complex rock containing 0.92% sulfur (reactor G).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	Cu mg/L	Ni mg/L	Co mg/L	Zn mg/l	Vol. ml	Temp. °C	R.H. %
26	1	5.30	45.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	175.1	24.5	58.0
26	2	5.40	12.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.7	NA	NA
27	1	5.20	58.0	18.0	3.1	1.40	1.00	1.40	0.570	0.800	0.110	0.160	173.0	24.2	56.8
27	2	5.40	12.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.0	NA	NA
28	1	5.05	46.0	14.5	2.0	1.40	0.32	1.11	0.520	0.790	0.080	0.140	174.3	25.0	52.0
28	2	5.35	12.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.6	NA	NA
29	1	4.75	60.0	20.5	2.2	1.70	0.30	1.05	1.010	1.010	0.120	0.200	175.4	24.8	51.0
29	2	5.10	14.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.0	NA	NA
30	1	4.65	72.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	175.0	24.9	50.4
30	2	4.90	17.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.1	NA	NA
31	1	4.70	60.0	NA	2.7	1.60	0.80	1.00	1.970	0.970	0.130	0.170	175.0	24.6	51.8
31	2	NS[2]	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
32	1	4.80	68.0	24.4	3.0	2.40	1.10	0.80	2.360	1.360	0.160	0.230	178.2	25.0	54.0
32	2	4.95	18.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.9	NA	NA
33	1	4.70	68.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	176.2	25.5	49.3
33	2	4.90	18.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.4	NA	NA
34	1	4.60	58.0	17.0	1.2	1.50	0.47	0.84	1.290	0.760	0.090	0.160	175.9	25.2	50.0
34	2	4.85	19.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.6	NA	NA
35	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	48.7
35	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
36	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.0	47.0
36	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
37	1	4.45	61.0	17.7	1.9	1.40	1.00	0.70	1.670	0.630	0.070	0.110	175.3	25.3	43.3
37	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
38	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.8	43.8
38	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
39	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	23.7	42.0
39	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
40	1	4.30	67.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	176.0	26.0	44.0
40	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
41	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	26.5	41.0
41	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
42	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.0	41.0
42	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
43	1	4.30	62.0	NA	1.9	1.20	0.90	0.40	1.570	0.620	0.070	0.110	174.9	25.3	43.3
43	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
44	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	23.5	44.0
44	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
45	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.8	43.8
45	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
46	1	4.20	60.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	175.1	26.1	43.5
46	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
47	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	42.0
47	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
48	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.0	42.0
48	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
49	1	4.25	60.0	17.7	1.9	1.20	0.80	0.20	1.360	0.560	0.070	0.080	175.6	24.8	44.0
49	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA

[1]NA: Not analyzed.

[2]NS: No sample taken.

Table A2.6. Drainage quality from AMAX drill core of Duluth Complex rock containing 0.92% sulfur (reactor H).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/L	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cu mg/L	Ni mg/L	Co mg/L	Zn mg/L	Vol. ml	Temp. °C	R.H. %
0	1	8.00	78.0	16.0	7.2	2.40	2.10	2.90	<0.001	0.019	<0.001	0.010	175.8	NA'	NA
0	2	8.50	16.8	NA	2.3	0.50	0.50	0.90	<0.001	<0.001	<0.001	0.010	198.4	NA	NA
0	3	8.35	13.8	NA	1.3	0.30	0.40	0.60	<0.001	<0.001	<0.001	0.010	200.2	NA	NA
0	4	8.50	13.0	NA	2.2	0.30	0.50	0.70	<0.001	<0.001	<0.001	0.010	199.1	NA	NA
0	5	8.25	12.3	<0.2	2.5	0.20	0.60	0.20	<0.001	<0.001	<0.001	<0.001	200.4	NA	NA
1	1	6.95	20.5	1.8	2.4	0.60	0.34	1.50	<0.001	<0.001	<0.001	<0.001	175.1	25.2	54.5
1	2	7.35	12.0	NA	2.1	0.40	0.08	0.56	<0.001	<0.001	<0.001	<0.001	198.5	NA	NA
1	3	7.60	9.5	NA	1.8	0.30	0.06	0.41	<0.001	<0.001	<0.001	<0.001	200.0	NA	NA
1	4	7.65	9.0	NA	1.4	0.20	0.05	0.38	<0.001	<0.001	<0.001	<0.001	195.6	NA	NA
2	1	7.75	15.0	0.9	1.7	0.50	0.26	1.65	<0.001	<0.001	<0.001	0.010	177.0	24.4	53.0
2	2	8.20	9.5	NA	1.5	0.30	0.10	0.73	<0.001	<0.001	<0.001	<0.001	199.6	NA	NA
2	3	8.40	7.5	NA	1.3	0.30	0.09	0.55	<0.001	<0.001	<0.001	0.010	199.6	NA	NA
3	1	7.30	13.0	2.4	1.5	0.16	0.26	1.09	<0.001	<0.001	<0.001	0.010	177.4	24.8	50.0
3	2	7.65	10.0	0.9	NA	NA	NA	NA	NA	NA	NA	NA	199.4	NA	NA
4	1	6.90	14.0	2.4	1.8	0.20	0.21	1.05	<0.001	<0.001	<0.001	0.010	174.6	24.4	51.3
4	2	7.20	7.5	0.9	NA	NA	NA	NA	NA	NA	NA	NA	198.9	NA	NA
5	1	7.30	15.5	NA	2.0	0.25	0.27	1.28	0.002	<0.001	0.002	0.010	177.6	25.0	60.0
5	2	7.35	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.3	NA	NA
6	1	6.70	14.0	3.6	1.6	0.27	0.20	1.08	0.003	0.001	0.001	0.010	178.1	25.0	55.3
6	2	6.95	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	197.2	NA	NA
7	1	7.00	16.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	181.5	25.0	56.0
7	2	7.25	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	194.0	NA	NA
8	1	6.80	21.0	5.7	2.4	0.33	0.26	1.19	0.001	0.001	0.001	<0.010	177.5	25.8	69.4
8	2	6.85	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.4	NA	NA
9	1	7.30	21.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	178.7	25.3	59.0
9	2	7.35	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.5	NA	NA
10	1	7.00	22.0	6.5	2.3	0.38	0.28	0.88	<0.001	<0.001	0.001	<0.010	175.4	24.8	65.3
10	2	6.95	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.7	NA	NA
11	1	6.25	23.0	6.0	NA	NA	NA	NA	NA	NA	NA	NA	175.8	25.2	55.7
11	2	6.50	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.4	NA	NA
12	1	7.30	25.0	6.7	2.9	0.41	0.22	0.93	0.006	0.004	0.001	0.010	176.6	25.2	60.3
12	2	7.50	6.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.2	NA	NA
13	1	7.25	26.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	173.1	24.7	63.3
13	2	7.35	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.2	NA	NA
14	1	6.85	24.0	6.3	2.6	0.40	0.19	0.83	0.007	0.005	0.002	0.010	176.8	24.3	62.3
14	2	6.90	6.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.8	NA	NA
15	1	6.85	24.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	178.0	24.5	71.3
15	2	6.85	6.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.8	NA	NA
16	1	6.90	23.0	7.0	2.7	0.48	0.29	0.81	0.002	0.006	<0.001	0.020	175.5	25.7	69.3
16	2	6.90	5.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.6	NA	NA
17	1	6.85	21.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	174.7	24.1	63.0
17	2	6.90	3.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	203.0	NA	NA
18	1	6.90	26.0	6.9	2.2	0.60	0.22	0.72	0.010	0.030	0.010	0.010	178.3	25.5	70.3
18	2	6.90	6.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.5	NA	NA
19	1	6.70	22.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	179.4	25.3	64.8
19	2	6.70	4.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.2	NA	NA
20	1	6.45	29.0	11.5	2.7	0.90	0.22	0.88	0.001	0.050	0.010	0.020	176.8	24.6	70.5
20	2	6.65	6.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.7	NA	NA
21	1	6.15	46.0	20.0	NA	NA	NA	NA	NA	NA	NA	NA	175.4	25.2	69.3
21	2	6.30	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.5	NA	NA
22	1	5.70	62.0	24.5	4.5	2.20	3.70	1.92	0.090	0.480	0.060	0.010	176.2	26.4	59.5
22	2	5.95	9.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.0	NA	NA
23	1	5.40	81.0	32.0	NA	NA	NA	NA	NA	NA	NA	NA	176.6	24.9	56.8
23	2	5.55	14.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.2	NA	NA
24	1	5.30	69.0	22.0	3.4	1.70	0.64	2.02	0.280	0.810	0.100	0.190	177.7	25.2	56.7
24	2	5.45	14.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.9	NA	NA
25	1	5.20	58.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	176.9	25.7	55.0
25	2	5.30	14.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.8	NA	NA

Table A2.6. Drainage quality from AMAX drill core of Duluth Complex rock containing 0.92% sulfur (reactor H).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/l	Ca mg/l	Mg mg/l	Na mg/L	K mg/L	Cu mg/L	Ni mg/L	Co mg/L	Zn mg/l	Vol. ml	Temp. °C	R.H. %
26	1	5.15	49.0	16.5	2.1	1.50	0.41	1.46	0.370	0.730	0.090	0.170	177.5	24.5	58.0
26	2	5.20	15.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.4	NA	NA
27	1	5.10	46.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	177.6	24.2	56.8
27	2	5.25	14.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.4	NA	NA
28	1	5.00	40.0	NA	2.5	1.00	0.80	1.00	0.600	0.630	0.090	0.120	171.0	25.0	52.0
28	2	5.30	12.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.5	NA	NA
29	1	4.95	38.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	175.8	24.8	51.0
29	2	5.10	12.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.4	NA	NA
30	1	4.90	33.0	11.0	0.9	1.20	0.20	0.40	0.450	0.490	0.050	0.090	176.9	24.9	50.4
30	2	5.10	13.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.5	NA	NA
31	1	4.95	33.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	176.5	24.6	51.8
31	2	5.10	14.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.7	NA	NA
32	1	5.05	30.0	NA	2.0	1.20	0.80	0.30	0.650	0.510	0.070	0.080	177.2	25.0	54.0
32	2	5.20	12.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.8	NA	NA
33	1	5.20	29.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	179.1	25.5	49.3
33	2	5.25	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.9	NA	NA
34	1	5.00	27.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	176.6	25.2	50.0
34	2	5.10	11.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.8	NA	NA
35	1	NS[2]	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	48.7
35	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
36	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.0	47.0
36	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
37	1	4.75	[illegible]	9.7	[illegible]	0.90	[illegible]	0.40	0.710	0.290	0.050	0.090	178.2	25.3	43.3
37	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
38	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.8	43.8
38	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
39	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	23.7	42.0
39	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
40	1	4.60	39.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	176.1	26.0	44.0
40	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
41	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	26.5	41.0
41	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
42	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.0	41.0
42	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
43	1	4.60	39.0	NA	1.6	0.90	1.00	0.30	1.020	0.460	0.070	0.100	177.0	25.3	43.3
43	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
44	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	23.5	44.0
44	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
45	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.8	43.8
45	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
46	1	4.55	39.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	174.5	26.1	43.5
46	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
47	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	42.0
47	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
48	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.0	42.0
48	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
49	1	4.60	36.0	12.7	1.7	1.20	0.90	0.20	1.000	0.410	0.040	0.080	176.5	24.8	44.0
49	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA

[1]NA: Not analyzed.

[2]NS: No sample taken.

Table A2.7. Drainage quality from AMAX drill core of Duluth Complex rock containing 1.17% sulfur (reactor I).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/l	Ca mg/L	Mg mg/l	Na mg/L	K mg/L	Cu mg/L	Ni mg/l	Co mg/l	Zn mg/L	Vol. ml	Temp. °C	R.H. %
0	1	9.20	145.0	24.0	3.8	0.40	38.40	6.00	<0.001	0.003	<0.001	0.010	170.9	NA'	NA
0	2	9.40	68.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.6	NA	NA
0	3	9.20	53.0	0.5	NA	NA	NA	NA	NA	NA	NA	NA	198.3	NA	NA
0	4	9.05	37.7	NA	2.8	0.30	0.80	0.50	<0.001	<0.001	<0.001	0.010	197.9	NA	NA
0	5	9.25	34.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	196.4	NA	NA
1	1	8.20	58.0	6.6	4.7	0.50	3.57	0.49	<0.001	0.004	<0.001	0.010	171.3	25.2	54.5
1	2	8.50	36.0	NA	3.9	0.50	2.24	0.31	<0.001	<0.001	<0.001	<0.001	199.9	NA	NA
1	3	8.55	24.5	NA	3.9	0.30	0.96	0.23	<0.001	<0.001	<0.001	<0.001	202.9	NA	NA
1	4	8.60	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	194.7	NA	NA
2	1	8.20	43.0	<1.0	6.4	0.90	1.73	0.56	<0.001	<0.001	<0.001	<0.001	171.6	24.4	53.0
2	2	8.60	27.0	<1.0	4.6	0.60	0.46	0.39	<0.001	<0.001	<0.001	0.010	198.4	NA	NA
2	3	8.80	24.5	NA	4.4	0.50	0.21	0.31	<0.001	<0.001	<0.001	<0.001	199.5	NA	NA
3	1	8.00	47.0	4.5	8.5	0.58	2.07	0.40	0.001	<0.001	<0.001	<0.010	170.4	24.8	50.0
3	2	8.40	28.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.7	NA	NA
4	1	7.55	46.0	5.4	8.1	0.57	1.56	0.37	0.001	<0.001	<0.001	0.010	171.3	24.4	51.3
4	2	8.05	26.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.2	NA	NA
5	1	8.00	40.0	NA	6.7	0.53	1.30	0.41	0.002	0.013	<0.001	0.010	170.7	25.0	60.0
5	2	8.25	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.6	NA	NA
6	1	8.25	38.0	6.3	6.3	0.61	1.05	0.38	0.005	0.002	0.001	0.010	169.7	25.0	55.3
6	2	8.35	24.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.8	NA	NA
7	1	7.95	60.0	NA	7.9	0.77	1.19	0.40	0.007	<0.001	<0.001	<0.010	169.0	25.0	56.0
7	2	8.20	32.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.2	NA	NA
8	1	8.35	45.0	8.1	6.8	0.62	0.93	0.43	0.003	<0.001	0.001	<0.010	173.5	25.8	69.4
8	2	8.65	27.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.5	NA	NA
9	1	8.55	45.0	8.5	NA	NA	NA	NA	NA	NA	NA	NA	173.3	25.3	59.0
9	2	8.85	27.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.3	NA	NA
10	1	8.35	44.0	7.0	NA	NA	NA	NA	NA	NA	NA	NA	173.1	24.8	65.3
10	2	8.60	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.8	NA	NA
11	1	8.55	58.0	7.2	7.4	0.67	0.83	0.45	0.002	<0.001	0.006	<0.010	171.2	25.2	55.7
11	2	8.95	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.1	NA	NA
12	1	8.75	55.0	9.0	NA	NA	NA	NA	NA	NA	NA	NA	171.4	25.2	60.3
12	2	9.05	33.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.8	NA	NA
13	1	8.65	65.0	10.5	8.5	0.85	0.68	0.41	0.005	0.002	0.001	0.010	171.2	24.7	63.3
13	2	9.15	27.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.0	NA	NA
14	1	8.30	56.0	10.5	NA	NA	NA	NA	NA	NA	NA	NA	172.6	24.3	62.3
14	2	8.70	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.7	NA	NA
15	1	8.40	60.0	11.0	7.9	0.73	0.67	0.26	0.004	0.002	<0.001	0.010	175.5	24.5	71.3
15	2	8.90	32.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.9	NA	NA
16	1	8.35	68.0	14.5	NA	NA	NA	NA	NA	NA	NA	NA	171.0	25.7	69.3
16	2	8.85	32.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.3	NA	NA
17	1	8.50	58.0	12.5	8.6	0.70	0.60	0.35	0.002	<0.001	0.001	<0.010	173.1	24.1	63.0
17	2	8.90	29.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.4	NA	NA
18	1	NS²	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.5	70.3
18	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
19	1	8.40	65.0	14.5	8.7	0.70	0.62	0.45	0.001	<0.001	0.002	0.010	173.1	25.3	64.8
19	2	8.90	29.0	<1.0	NA	NA	NA	NA	NA	NA	NA	NA	200.0	NA	NA
20	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.6	70.5
20	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
21	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.2	69.3
21	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
22	1	8.40	70.0	15.0	10.2	1.00	0.60	0.40	0.010	0.001	0.002	0.010	173.3	26.4	59.5
22	2	8.90	31.0	<1.0	NA	NA	NA	NA	NA	NA	NA	NA	200.7	NA	NA
23	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.9	56.8
23	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
24	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.2	56.7
24	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
25	1	8.30	70.0	11.0	8.5	0.70	0.65	0.47	0.001	<0.001	0.001	0.010	172.0	25.7	55.0
25	2	8.80	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.4	NA	NA

Table A2.7. Drainage quality from AMAX drill core of Duluth Complex rock containing 1.17% sulfur (reactor I).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/L	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cu mg/L	Ni mg/L	Co mg/L	Zn mg/L	Vol. mL	Temp. °C	R.H. %
26	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	58.0
26	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
27	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.2	56.8
27	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
28	1	8.20	67.0	9.0	8.9	0.80	0.65	0.47	<0.001	0.001	0.001	0.010	173.2	25.0	52.0
28	2	8.85	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.8	NA	NA
29	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.8	51.0
29	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
30	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.9	50.4
30	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
31	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.6	51.8
31	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
32	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.0	54.0
32	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
33	1	8.25	62.0	6.5	8.6	0.70	0.61	0.43	<0.001	<0.001	0.001	0.010	172.5	25.5	49.3
33	2	8.80	29.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.0	NA	NA

[1]NA: Not analyzed.

[2]NS: No sample taken.

Table A2.8. Drainage quality from AMAX drill core of Duluth Complex rock containing 1.17% sulfur (reactor J).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/L	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cu mg/L	Ni mg/L	Co mg/L	Zn mg/L	Vol. ml	Temp. °C	R.H. %
0	1	9.20	149.0	26.0	4.1	0.50	40.00	0.60	<0.001	0.002	<0.001	0.010	172.0	NA'	NA
0	2	9.40	69.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.0	NA	NA
0	3	9.30	55.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	197.3	NA	NA
0	4	9.30	40.0	NA	3.2	0.20	0.70	0.40	<0.001	<0.001	<0.001	<0.001	196.4	NA	NA
0	5	9.20	34.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.3	NA	NA
1	1	8.05	67.0	2.0	5.5	0.70	3.62	0.59	<0.001	<0.001	<0.001	<0.001	172.0	25.2	54.5
1	2	8.55	32.5	NA	4.6	0.40	2.00	0.32	<0.001	<0.001	<0.001	<0.001	198.6	NA	NA
1	3	8.70	26.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.5	NA	NA
1	4	8.75	26.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.7	NA	NA
2	1	8.35	44.0	2.5	6.7	0.90	1.60	0.53	<0.001	<0.001	<0.001	<0.001	170.7	24.4	53.0
2	2	8.70	26.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.4	NA	NA
2	3	8.70	27.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.6	NA	NA
3	1	8.10	44.0	NA	8.1	0.54	1.95	0.38	<0.001	<0.001	<0.001	0.010	170.7	24.8	50.0
3	2	8.50	28.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.2	NA	NA
4	1	7.75	43.0	NA	7.5	0.53	1.58	0.36	0.002	<0.001	<0.001	0.010	171.4	24.4	51.3
4	2	8.10	26.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.4	NA	NA
5	1	8.00	40.0	5.4	6.7	0.52	1.36	0.44	0.001	<0.001	<0.001	0.010	171.0	25.0	60.0
5	2	8.40	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.4	NA	NA
6	1	8.35	38.0	NA	6.1	0.57	1.10	0.39	0.002	0.001	0.001	<0.010	172.8	25.0	55.3
6	2	8.50	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.3	NA	NA
7	1	8.15	41.0	7.5	NA	NA	NA	NA	NA	NA	NA	NA	172.5	25.0	56.0
7	2	8.30	32.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.1	NA	NA
8	1	8.20	60.0	10.5	NA	NA	NA	NA	NA	NA	NA	NA	173.7 •	25.8	69.4
8	2	8.75	24.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	203.3	NA	NA
9	1	8.55	45.0	8.2	6.2	0.60	0.97	0.54	0.003	0.001	0.001	<0.010	174.3	25.3	59.0
9	2	8.80	27.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.8	NA	NA
10	1	8.35	44.0	8.2	5.8	0.61	0.94	0.40	<0.001	<0.001	0.001	<0.010	173.4	24.8	65.3
10	2	8.65	26.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.4	NA	NA
11	1	8.65	47.0	10.0	NA	NA	NA	NA	NA	NA	NA	NA	174.0	25.2	55.7
11	2	9.10	27.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.0	NA	NA
12	1	8.80	55.0	9.2	7.2	0.71	0.76	0.51	0.005	0.002	0.002	0.010	172.1	25.2	60.3
12	2	9.20	26.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.5	NA	NA
13	1	8.70	58.0	10.5	NA	NA	NA	NA	NA	NA	NA	NA	174.7	24.7	63.3
13	2	9.10	26.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.9	NA	NA
14	1	8.20	68.0	NA	9.0	0.86	0.78	0.60	0.006	0.002	0.001	0.010	171.6	24.3	62.3
14	2	8.85	29.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.5	NA	NA
15	1	8.55	60.0	12.5	NA	NA	NA	NA	NA	NA	NA	NA	175.2	24.5	71.3
15	2	8.95	32.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.0	NA	NA
16	1	8.45	65.0	16.5	8.5	0.83	0.80	0.55	0.002	0.001	0.001	<0.010	173.3	25.7	69.3
16	2	8.90	31.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.5	NA	NA
17	1	8.45	60.0	15.0	NA	NA	NA	NA	NA	NA	NA	NA	174.8	24.1	63.0
17	2	9.00	28.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.5	NA	NA
18	1	NS²	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.5	70.3
18	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
19	1	8.45	68.0	16.0	NA	NA	NA	NA	NA	NA	NA	NA	173.6	25.3	64.8
19	2	8.95	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.8	NA	NA
20	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.6	70.5
20	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
21	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.2	69.3
21	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
22	1	8.30	78.0	16.5	NA	NA	NA	NA	NA	NA	NA	NA	240.4	26.4	59.5
22	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
23	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.9	56.8
23	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
24	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.2	56.7
24	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
25	1	8.30	72.0	NA	9.9	1.30	1.50	0.70	0.001	0.004	0.001	0.005	175.3	25.7	55.0
25	2	8.85	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	203.4	NA	NA

Table A2.8. Drainage quality from AMAX drill core of Duluth Complex rock containing 1.17% sulfur (reactor J).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	Cu mg/L	Ni mg/l	Co mg/l	Zn mg/l	Vol. mL	Temp. °C	R.H. %
26	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	58.0
26	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
27	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.2	56.8
27	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
28	1	8.20	68.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	174.6	25.0	52.0
28	2	8.95	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.5	NA	NA
29	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.8	51.0
29	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
30	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.9	50.4
30	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
31	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.6	51.8
31	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
32	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.0	54.0
32	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
33	1	8.10	62.0	NA	9.1	1.10	1.40	0.90	0.001	0.003	<0.001	0.005	173.3	25.5	49.3
33	2	8.80	24.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.6	NA	NA

[1]NA: Not analyzed.

[2]NS: No sample taken.

Table A2.9. Drainage quality from AMAX drill core of Duluth Complex rock containing 1.24% sulfur (reactor K).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/L	Ca mg/L	Mg mg/l	Na mg/L	K mg/L	Cu mg/L	Ni mg/L	Co mg/L	Zn mg/L	Vol. ml	Temp. °C	R.H. %
0	1	6.70	115.0	33.0	13.3	3.90	5.10	2.70	0.003	0.060	<0.001	0.030	170.8	NA[1]	NA
0	2	7.00	19.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.6	NA	NA
0	3	7.20	12.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.8	NA	NA
0	4	6.95	10.8	NA	1.7	0.30	0.70	0.50	<0.001	<0.001	<0.001	0.010	199.0	NA	NA
0	5	7.25	9.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.0	NA	NA
1	1	6.95	45.5	8.2	4.3	1.40	0.77	2.09	0.002	0.004	<0.001	0.010	173.7	25.2	54.5
1	2	6.90	13.0	NA	1.4	0.40	0.18	0.71	<0.001	0.001	<0.001	<0.001	198.6	NA	NA
1	3	6.85	13.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.3	NA	NA
1	4	6.90	7.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.1	NA	NA
2	1	6.75	31.5	4.0	3.2	1.10	0.15	2.21	<0.001	<0.001	<0.001	0.010	174.0	24.4	53.0
2	2	7.00	9.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	197.3	NA	NA
2	3	6.75	6.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.8	NA	NA
3	1	6.75	27.0	NA	2.8	0.53	0.31	1.57	0.002	0.002	<0.001	0.010	171.7	24.8	50.0
3	2	6.80	8.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.6	NA	NA
4	1	6.35	27.0	14.4	2.8	0.57	0.24	1.54	0.002	0.002	<0.001	0.010	170.5	24.4	51.3
4	2	6.55	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.2	NA	NA
5	1	6.50	35.0	13.3	3.9	0.96	0.24	2.34	0.002	0.006	<0.001	0.010	172.2	25.0	60.0
5	2	6.70	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.7	NA	NA
6	1	6.55	33.0	NA	3.5	0.91	0.21	1.95	0.004	0.001	0.001	0.010	171.6	25.0	55.3
6	2	6.50	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.7	NA	NA
7	1	6.35	36.0	12.9	3.1	0.89	0.28	1.71	0.006	0.008	<0.001	0.010	175.4	25.0	56.0
7	2	6.50	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	197.0	NA	NA
8	1	6.30	38.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	175.1	25.8	69.4
8	2	6.30	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.5	NA	NA
9	1	6.35	34.0	12.4	2.9	0.88	0.24	2.20	0.003	0.023	0.004	<0.010	175.3	25.3	59.0
9	2	6.35	6.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.4	NA	NA
10	1	6.20	32.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	175.8	24.8	65.3
10	2	6.45	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.9	NA	NA
11	1	6.60	33.0	10.4	2.7	0.82	0.20	1.78	0.002	0.023	0.008	0.010	174.9	25.2	55.7
11	2	6.80	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.1	NA	NA
12	1	6.45	33.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	173.6	25.2	60.3
12	2	6.75	6.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.4	NA	NA
13	1	6.55	30.0	9.9	2.5	0.88	0.21	1.62	0.006	0.070	0.007	0.020	173.7	24.7	63.3
13	2	6.85	7.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.6	NA	NA
14	1	6.05	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	173.1	24.3	62.3
14	2	6.20	6.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.0	NA	NA
15	1	6.10	33.0	11.4	2.5	0.97	0.21	1.85	0.007	0.160	0.014	0.030	173.4	24.5	71.3
15	2	6.55	6.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.4	NA	NA
16	1	6.00	35.0	16.0	NA	NA	NA	NA	NA	NA	NA	NA	173.4	25.7	69.3
16	2	6.25	7.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.7	NA	NA
17	1	6.05	30.0	11.2	2.3	0.92	0.39	1.81	0.006	0.220	0.019	0.020	172.5	24.1	63.0
17	2	6.20	7.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.5	NA	NA
18	1	6.10	35.0	15.0	NA	NA	NA	NA	NA	NA	NA	NA	173.8	25.5	70.3
18	2	6.30	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.2	NA	NA
19	1	5.90	32.0	13.0	NA	NA	NA	NA	NA	NA	NA	NA	174.6	25.3	64.8
19	2	6.05	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.4	NA	NA
20	1	5.75	34.0	14.5	NA	NA	NA	NA	NA	NA	NA	NA	174.0	24.6	70.5
20	2	5.90	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.6	NA	NA
21	1	5.70	31.0	12.5	2.1	1.10	0.20	1.27	0.030	0.370	0.040	0.060	175.0	25.2	69.3
21	2	5.85	9.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.5	NA	NA
22	1	NS[2]	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	26.4	59.5
22	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
23	1	5.70	35.0	13.0	2.2	1.30	0.25	1.24	0.050	0.400	0.040	0.070	173.8	24.9	56.8
23	2	5.90	10.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.8	NA	NA
24	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.2	56.7
24	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
25	1	5.40	44.0	14.0	8.9	1.20	0.32	1 12	0.070	0.530	0.070	0.070	172.8	25.7	55.0
25	2	5.65	11.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.4	NA	NA

Table A2.9. Drainage quality from AMAX drill core of Duluth Complex rock containing 1.24% sulfur (reactor K).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/l	Ca mg/L	Mg mg/l	Na mg/l	K mg/l	Cu mg/L	Ni mg/l	Co mg/L	Zn mg/l	Vol. ml.	Temp. °C	R.H. %
26	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	58.0
26	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
27	1	5.25	60.0	18.0	3.3	1.50	0.30	0.90	0.170	0.710	0.080	0.090	174.8	24.2	56.8
27	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
28	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.0	52.0
28	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
29	1	4.85	70.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	172.9	24.8	51.0
29	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
30	1	4.60	118.0	43.0	5.9	4.30	0.35	1.03	1.980	1.940	0.240	0.310	171.8	24.9	50.4
30	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
31	1	4.60	108.0	NA	4.8	1.00	1.00	1.00	2.490	1.520	0.190	0.250	172.4	24.6	51.8
31	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
32	1	4.60	95.0	36.6	4.2	3.90	1.00	0.80	1.820	1.180	0.150	0.190	173.9	25.0	54.0
32	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
33	1	4.65	90.0	NA	3.7	3.90	0.90	0.80	1.440	0.950	0.120	0.160	171.8	25.5	49.3
33	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
34	1	4.60	82.0	28.0	2.7	3.00	0.25	0.72	0.780	0.690	0.090	0.130	172.3	25.2	50.0
34	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
35	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	48.7
35	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
36	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.0	47.0
36	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
37	1	4.25	80.0	NA	2.8	2.50	1.20	0.80	1.230	0.510	0.070	0.100	172.4	25.3	43.3
37	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
38	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.8	43.8
38	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
39	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	23.7	42.0
39	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
40	1	4.35	80.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	178.5	26.0	44.0
40	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
41	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	26.5	41.0
41	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
42	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.0	41.0
42	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
43	1	4.20	85.0	28.0	2.7	1.80	1.30	0.70	1.300	0.540	0.060	0.140	175.1	25.3	43.3
43	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
44	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	23.5	44.0
44	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
45	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.8	43.8
45	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
46	1	4.20	70.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	176.1	26.1	43.5
46	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
47	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	42.0
47	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
48	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.0	42.0
48	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
49	1	4.20	75.0	23.0	2.4	1.70	1.10	0.50	1.270	0.510	0.060	0.110	171.9	24.8	44.0
49	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA

[1]NA: Not analyzed.

[2]NS: No sample taken.

Table A2.10. Drainage quality from AMAX drill core of Duluth Complex rock containing 1.24% sulfur (reactor L).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/L	Cu mg/l	Ni mg/L	Co mg/L	Zn mg/l	Vol. ml	Temp. °C	R.H. %
0	1	6.50	114.0	33.0	10.9	4.10	8.20	2.80	0.050	0.070	<0.001	0.030	173.0	NA	NA
0	2	6.75	19.3	3.7	2.0	0.60	0.80	0.80	<0.001	0.004	<0.001	0.010	199.2	NA	NA
0	3	6.85	12.0	NA	0.8	0.40	0.40	0.40	<0.001	0.004	<0.001	0.010	197.9	NA	NA
0	4	6.90	10.2	NA	1.9	0.30	0.70	0.70	<0.001	<0.001	<0.001	0.010	200.0	NA	NA
0	5	7.20	9.0	0.5	1.9	0.30	0.10	0.60	<0.001	<0.001	<0.001	<0.001	198.6	NA	NA
1	1	6.90	45.0	10.0	4.2	1.30	0.72	2.08	0.002	0.004	<0.001	0.010	175.0	25.2	54.5
1	2	6.80	13.0	NA	1.3	0.40	0.16	0.71	<0.001	0.002	<0.001	<0.001	197.1	NA	NA
1	3	7.00	8.5	NA	0.8	0.20	0.08	0.47	<0.001	0.002	<0.001	<0.001	198.4	NA	NA
1	4	7.00	7.5	NA	0.7	0.20	0.08	0.47	<0.001	0.002	<0.001	<0.001	200.1	NA	NA
2	1	6.75	32.0	4.2	3.3	1.10	0.15	2.24	<0.001	<0.001	<0.001	0.010	172.4	24.4	53.0
2	2	6.70	9.0	NA	1.2	0.40	0.04	0.82	<0.001	<0.001	<0.001	0.010	198.5	NA	NA
2	3	6.85	6.5	NA	0.9	0.30	0.04	0.57	<0.001	<0.001	<0.001	<0.001	204.0	NA	NA
3	1	6.70	24.0	NA	2.6	0.51	0.25	1.40	0.001	0.001	<0.001	0.010	173.5	24.8	50.0
3	2	6.65	8.0	NA	0.9	0.12	0.09	0.54	0.002	<0.001	<0.001	0.010	201.9	NA	NA
4	1	6.35	24.0	14.0	2.8	0.52	0.21	1.40	0.005	0.002	<0.001	0.010	173.4	24.4	51.3
4	2	6.35	8.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.7	NA	NA
5	1	6.50	30.0	14.0	3.4	0.77	0.22	1.98	0.002	0.004	<0.001	0.010	173.4	25.0	60.0
5	2	6.60	7.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.6	NA	NA
6	1	6.60	32.0	13.0	3.5	0.90	0.18	1.80	0.003	0.009	0.001	0.010	172.5	25.0	55.3
6	2	6.70	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.6	NA	NA
7	1	6.35	32.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	175.1	25.0	56.0
7	2	6.60	7.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	206.8	NA	NA
8	1	6.25	30.0	11.0	2.7	0.73	0.17	1.67	0.003	0.012	0.002	<0.010	174.5	25.8	69.4
8	2	6.40	6.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.1	NA	NA
9	1	6.35	37.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	172.2	25.3	59.0
9	2	6.45	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.6	NA	NA
10	1	6.15	31.0	11.9	2.6	0.88	0.22	1.32	<0.001	0.020	0.002	<0.010	172.0	24.8	65.3
10	2	6.20	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.2	NA	NA
11	1	6.45	34.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	174.2	25.2	55.7
11	2	6.70	8.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.0	NA	NA
12	1	6.55	32.0	10.7	2.7	0.92	0.16	1.32	0.005	0.040	0.005	<0.010	172.3	25.2	60.3
12	2	6.70	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.9	NA	NA
13	1	6.50	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	174.6	24.7	63.3
13	2	6.65	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.4	NA	NA
14	1	6.05	32.0	10.9	2.7	0.99	0.17	1.28	0.005	0.100	0.007	0.020	171.8	24.3	62.3
14	2	6.20	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.7	NA	NA
15	1	6.15	33.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	174.7	24.5	71.3
15	2	6.30	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.7	NA	NA
16	1	6.00	31.0	11.1	2.6	1.00	0.23	1.30	0.005	0.190	0.014	0.020	172.8	25.7	69.3
16	2	6.55	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.9	NA	NA
17	1	6.05	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	174.7	24.1	63.0
17	2	6.20	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.9	NA	NA
18	1	6.15	31.0	10.0	NA	NA	NA	NA	NA	NA	NA	NA	174.1	25.5	70.3
18	2	6.30	8.5	<1.0	NA	NA	NA	NA	NA	NA	NA	NA	202.7	NA	NA
19	1	5.95	31.0	8.5	2.0	1.00	0.18	1.14	0.020	0.290	0.040	0.050	173.8	25.3	64.8
19	2	6.05	8.0	<1.0	NA	NA	NA	NA	NA	NA	NA	NA	201.7	NA	NA
20	1	5.75	34.0	10.5	NA	NA	NA	NA	NA	NA	NA	NA	161.5	24.6	70.5
20	2	5.95	8.0	1.0	NA	NA	NA	NA	NA	NA	NA	NA	201.3	NA	NA
21	1	5.70	31.0	9.0	2.0	1.10	NA	NA	0.020	0.330	0.060	0.050	174.9	25.2	69.3
21	2	5.90	9.0	1.5	NA	NA	NA	NA	NA	NA	NA	NA	202.2	NA	NA
22	1	NS[a]	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	26.4	59.5
22	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
23	1	5.70	35.0	9.5	2.1	1.00	0.22	1.02	0.030	0.380	0.040	0.050	174.0	24.9	56.8
23	2	6.00	8.0	<1.0	NA	NA	NA	NA	NA	NA	NA	NA	201.9	NA	NA
24	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.2	56.7
24	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
25	1	5.55	37.0	12.0	2.7	1.20	0.27	0.85	0.040	0.490	0.060	0.060	173.9	25.7	55.0
25	2	5.80	11.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.0	NA	NA

Table A2.10. Drainage quality from AMAX drill core of Duluth Complex rock containing 1.24% sulfur (reactor L).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/L	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cu mg/L	Ni mg/L	Co mg/L	Zn mg/L	Vol. ml	Temp. °C	R.H. %
26	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	58.0
26	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
27	1	5.40	44.0	12.5	2.8	1.20	0.25	0.57	0.080	0.540	0.050	0.060	174.9	24.2	56.8
27	2	5.65	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.2	NA	NA
28	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.0	52.0
28	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
29	1	5.20	43.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	175.3	24.8	51.0
29	2	5.30	13.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.7	NA	NA
30	1	4.80	100.0	33.0	5.3	3.00	0.28	0.62	1.780	1.600	0.200	0.250	175.8	24.9	50.4
30	2	5.00	21.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.5	NA	NA
31	1	4.70	100.0	NA	5.4	3.10	0.90	1.00	3.460	1.590	0.190	0.260	174.3	24.6	51.8
31	2	4.85	23.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.1	NA	NA
32	1	4.60	115.0	NA	5.0	4.30	1.00	1.20	3.780	1.620	0.200	0.280	175.1	25.0	54.0
32	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
33	1	4.75	109.0	NA	4.6	4.60	1.10	1.10	2.820	1.190	0.150	0.270	175.9	25.5	49.3
33	2	4.95	21.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	203.4	NA	NA
34	1	4.65	80.0	26.0	2.3	2.90	0.67	1.00	1.090	0.580	0.060	0.170	175.2	25.2	50.0
34	2	4.90	22.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.4	NA	NA
35	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	48.7
35	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
36	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.0	47.0
36	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
37	1	4.35	77.0	NA	2.4	2.30	1.10	0.90	1.490	0.360	0.060	0.110	174.9	25.3	43.3
37	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
38	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.8	43.8
38	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
39	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	23.7	42.0
39	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
40	1	4.15	90.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	174.8	26.0	44.0
40	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
41	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	26.5	41.0
41	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
42	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.0	41.0
42	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
43	1	4.15	88.0	NA	2.6	2.30	1.20	0.70	1.870	0.560	0.080	0.130	175.6	25.3	43.3
43	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
44	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	23.5	44.0
44	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
45	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.8	43.8
45	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
46	1	4.15	90.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	175.2	26.1	43.5
46	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
47	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	42.0
47	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
48	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.0	42.0
48	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
49	1	4.20	89.0	NA	2.4	1.80	0.90	0.60	1.530	0.530	0.080	0.110	173.9	24.8	44.0
49	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA

[1]NA: Not analyzed.

[2]NS: No sample taken.

Table A2.11. Drainage quality from AMAX drill core of Duluth Complex rock containing 1.26% sulfur (reactor M).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	Cu mg/L	Ni mg/l	Co mg/l	Zn mg/l	Vol. mL	Temp. °C	R.H. %
0	1	5.75	255.0	135.0	50.3	4.70	4.80	5.80	0.080	0.130	<0.001	0.070	174.7	NA'	NA
0	2	5.75	29.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	203.6	NA	NA
0	3	5.80	16.9	NA	1.8	0.50	1.00	1.10	0.001	0.007	<0.001	0.010	192.3	NA	NA
0	4	5.75	11.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.3	NA	NA
0	5	5.65	10.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.1	NA	NA
1	1	6.20	58.0	14.2	5.1	0.60	1.09	3.24	0.010	0.037	<0.001	0.010	166.9	25.2	54.5
1	2	5.90	12.0	3.7	1.5	0.20	0.17	1.20	0.001	0.008	<0.001	<0.001	198.7	NA	NA
1	3	5.85	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.8	NA	NA
1	4	6.00	6.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.8	NA	NA
2	1	6.40	27.0	8.5	2.7	0.40	0.31	2.74	<0.001	0.008	<0.001	0.010	176.0	24.4	53.0
2	2	6.05	9.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.1	NA	NA
2	3	6.10	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.2	NA	NA
3	1	6.50	23.0	8.4	2.3	0.12	0.58	1.79	0.004	0.004	<0.001	0.010	177.2	24.8	50.0
3	2	6.45	9.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.2	NA	NA
4	1	6.55	20.0	6.6	2.1	0.12	0.47	1.71	0.005	0.003	<0.001	0.010	177.5	24.4	51.3
4	2	6.30	7.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.0	NA	NA
5	1	6.35	20.0	5.0	2.2	0.15	0.45	2.36	0.003	0.005	<0.001	0.010	175.4	25.0	60.0
5	2	6.35	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.9	NA	NA
6	1	6.40	17.5	5.4	1.9	0.19	0.37	1.77	0.008	0.006	0.001	<0.010	175.8	25.0	55.3
6	2	6.15	8.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.6	NA	NA
7	1	6.70	21.0	6.3	1.5	0.18	0.47	1.69	0.006	0.002	<0.001	0.010	176.4	25.0	56.0
7	2	6.35	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.6	NA	NA
8	1	6.85	21.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	175.7	25.8	69.4
8	2	6.50	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.8	NA	NA
9	1	6.80	21.0	6.3	2.2	0.21	0.44	1.80	0.004	0.007	0.002	0.010	172.4	25.3	59.0
9	2	6.80	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.3	NA	NA
10	1	6.45	28.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	175.2	24.8	65.3
10	2	6.45	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.3	NA	NA
11	1	6.60	22.0	5.9	2.0	0.21	0.34	1.50	0.003	0.004	0.007	0.010	176.6	25.2	55.7
11	2	6.60	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.0	NA	NA
12	1	6.65	22.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	175.5	25.2	60.3
12	2	6.65	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.3	NA	NA
13	1	6.65	21.0	5.4	2.2	0.23	0.27	1.40	0.004	0.011	0.001	0.010	176.0	24.7	63.3
13	2	6.60	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.7	NA	NA
14	1	6.40	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	176.9	24.3	62.3
14	2	6.45	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.3	NA	NA
15	1	6.35	22.0	5.9	2.2	0.23	0.28	1.36	0.004	0.014	0.002	0.010	176.8	24.5	71.3
15	2	6.40	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.7	NA	NA
16	1	6.40	23.0	10.0	NA	NA	NA	NA	NA	NA	NA	NA	175.7	25.7	69.3
16	2	6.45	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.5	NA	NA
17	1	6.40	24.0	6.1	2.1	0.25	0.41	1.43	0.004	0.018	0.002	<0.010	175.9	24.1	63.0
17	2	6.40	7.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.9	NA	NA
18	1	6.45	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	177.3	25.5	70.3
18	2	6.50	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.5	NA	NA
19	1	6.40	23.0	6.4	1.9	0.40	0.32	1.57	0.010	0.040	0.020	0.020	175.3	25.3	64.8
19	2	6.40	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.1	NA	NA
20	1	6.30	22.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	175.8	24.6	70.5
20	2	6.50	12.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.9	NA	NA
21	1	6.30	25.0	6.6	1.8	0.30	0.32	1.73	0.010	0.020	0.010	0.020	177.5	25.2	69.3
21	2	6.40	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.7	NA	NA
22	1	NS*	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	26.4	59.5
22	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
23	1	6.40	30.0	7.0	2.3	0.50	0.36	1.94	0.010	0.040	0.010	0.020	172.9	24.9	56.8
23	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
24	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.2	56.7
24	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
25	1	6.20	32.0	7.0	2.9	0.50	0.59	1.54	0.020	0.030	0.010	0.020	178.3	25.7	55.0
25	2	6.40	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.7	NA	NA

Table A2.11. Drainage quality from AMAX drill core of Duluth Complex rock containing 1.26% sulfur (reactor M).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/l	Ca mg/l	Mg mg/l	Na mg/L	K mg/L	Cu mg/l	Ni mg/l	Co mg/l	Zn mg/l	Vol. ml	Temp. °C	R.H. %
26	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	58.0
26	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
27	1	6.20	27.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	176.8	24.2	56.8
27	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
28	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.0	52.0
28	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
29	1	6.10	27.0	6.5	2.5	0.50	0.55	1.46	0.020	0.030	0.010	0.020	175.8	24.8	51.0
29	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
30	1	6.15	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	175.9	24.9	50.4
30	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
31	1	6.20	20.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	176.6	24.6	51.8
31	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
32	1	6.30	18.0	3.5	1.8	0.30	0.23	0.72	0.010	0.010	0.010	0.010	176.4	25.0	54.0
32	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
33	1	6.20	18.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	176.5	25.5	49.3
33	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
34	1	6.25	18.0	2.0	1.8	0.30	0.20	0.56	0.010	0.010	0.010	0.010	174.8	25.2	50.0
34	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
35	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	48.7
35	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
36	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.0	47.0
36	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
37	1	6.10	18.0	NA	2.0	0.60	0.90	0.70	0.020	0.022	0.003	0.015	176.4	25.3	43.3
37	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
38	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.8	43.8
38	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
39	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	23.7	42.0
39	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
40	1	6.05	19.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	176.7	26.0	44.0
40	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
41	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	26.5	41.0
41	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
42	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.0	41.0
42	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
43	1	6.10	18.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	175.3	25.3	43.3
43	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
44	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	23.5	44.0
44	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
45	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.8	43.8
45	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
46	1	6.10	18.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	177.0	26.1	43.5
46	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
47	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	42.0
47	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
48	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.0	42.0
48	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
49	1	6.10	18.0	5.0	1.9	0.60	0.90	0.60	0.017	0.015	0.002	0.011	176.0	24.8	44.0
49	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA

[1]NA: Not analyzed

[2]NS: No sample taken.

Table A2.12. Drainage quality from AMAX drill core of Duluth Complex rock containing 1.26% sulfur (reactor N).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/L	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cu mg/L	Ni mg/L	Co mg/L	Zn mg/L	Vol. mL	Temp. °C	R.H. %
0	1	5.80	260.0	135.0	50.7	4.80	4.70	6.00	0.070	0.130	0.009	0.060	173.8	NA'	NA
0	2	5.90	24.5	8.4	2.5	0.50	0.90	1.70	0.004	0.008	<0.001	0.010	196.2	NA	NA
0	3	6.00	16.5	NA	1.2	0.20	0.80	1.20	0.003	0.004	<0.001	<0.001	199.4	NA	NA
0	4	6.10	12.6	NA	2.1	0.20	0.70	1.10	<0.001	0.002	<0.001	<0.001	198.1	NA	NA
0	5	5.85	10.1	NA	1.8	0.10	0.60	0.40	<0.001	0.002	<0.001	<0.001	196.0	NA	NA
1	1	5.95	60.0	16.5	6.6	0.70	1.18	2.80	0.008	0.018	<0.001	0.020	175.3	25.2	54.5
1	2	5.95	12.5	NA	1.8	0.20	0.17	1.33	0.001	0.012	<0.001	<0.001	200.8	NA	NA
1	3	5.95	7.0	NA	1.1	0.10	0.09	0.82	<0.001	0.008	<0.001	<0.001	199.7	NA	NA
1	4	6.20	5.5	NA	0.8	0.10	0.07	0.64	<0.001	0.008	<0.001	<0.001	197.7	NA	NA
2	1	6.40	27.0	NA	2.7	0.40	0.31	2.84	0.006	0.006	<0.001	0.010	175.6	24.4	53.0
2	2	6.15	9.5	NA	1.0	0.20	0.07	1.35	0.003	<0.001	<0.001	0.010	200.4	NA	NA
2	3	6.20	7.0	NA	0.9	0.20	0.05	1.05	0.002	<0.001	0.002	0.010	199.0	NA	NA
3	1	6.65	23.0	NA	2.2	0.13	0.62	2.54	0.003	0.002	0.001	0.010	176.1	24.8	50.0
3	2	6.40	9.0	NA	1.6	0.10	0.16	1.24	0.004	<0.001	0.002	0.010	199.3	NA	NA
4	1	6.40	20.0	NA	2.5	0.14	0.49	2.37	0.003	<0.001	0.003	0.010	175.7	24.4	51.3
4	2	6.50	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.3	NA	NA
5	1	6.40	21.0	7.2	2.1	0.15	0.49	2.53	0.003	0.004	<0.001	0.010	175.0	25.0	60.0
5	2	6.30	7.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.3	NA	NA
6	1	6.35	22.0	7.2	2.1	0.22	0.48	2.42	0.010	0.005	0.002	0.010	172.3	25.0	55.3
6	2	6.20	17.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.5	NA	NA
7	1	6.60	21.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	176.9	25.0	56.0
7	2	6.35	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.1	NA	NA
8	1	6.60	22.0	6.9	2.1	0.19	0.45	2.45	0.003	0.006	0.002	<0.010	177.0	25.8	69.4
8	2	6.40	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.0	NA	NA
9	1	6.75	22.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	176.3	25.3	59.0
9	2	6.70	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.9	NA	NA
10	1	6.25	24.0	7.0	1.6	0.21	0.46	1.84	0.002	0.006	0.001	<0.010	177.2	24.8	65.3
10	2	6.50	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.0	NA	NA
11	1	6.60	23.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	175.4	25.2	55.7
11	2	6.60	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.1	NA	NA
12	1	6.60	23.0	5.9	1.9	0.21	0.35	2.11	0.003	0.009	0.001	0.010	175.2	25.2	60.3
12	2	6.60	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.7	NA	NA
13	1	6.65	23.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	176.9	24.7	63.3
13	2	6.60	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.7	NA	NA
14	1	6.40	25.0	5.2	2.1	0.24	0.39	2.26	0.007	0.013	0.001	0.010	174.3	24.3	62.3
14	2	6.45	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.8	NA	NA
15	1	6.30	23.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	177.0	24.5	71.3
15	2	6.35	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.3	NA	NA
16	1	6.40	25.0	7.4	2.0	0.24	0.45	2.18	0.004	0.016	0.002	0.010	177.5	25.7	69.3
16	2	6.40	7.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.1	NA	NA
17	1	6.30	26.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	175.2	24.1	63.0
17	2	6.35	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.8	NA	NA
18	1	6.40	27.0	7.9	2.0	0.40	0.42	2.44	0.010	0.040	0.010	0.020	176.5	25.5	70.3
18	2	6.50	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.5	NA	NA
19	1	6.30	26.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	175.9	25.3	64.8
19	2	6.35	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.0	NA	NA
20	1	6.30	24.0	7.9	NA	NA	NA	NA	NA	NA	NA	NA	175.5	24.6	70.5
20	2	NS[a]	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
21	1	6.30	26.0	NA	2.1	0.40	0.51	2.06	0.010	0.030	0.020	0.030	176.9	25.2	69.3
21	2	6.40	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.7	NA	NA
22	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	26.4	59.5
22	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
23	1	6.35	30.0	8.0	2.5	0.50	0.55	2.53	0.020	0.040	0.010	0.030	176.8	24.9	56.8
23	2	6.40	8.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.2	NA	NA
24	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.2	56.7
24	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
25	1	6.20	33.0	7.0	2.8	0.50	0.58	2.65	0.020	0.040	0.010	0.020	175.7	25.7	55.0
25	2	6.35	9.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.6	NA	NA

Table A2.12. Drainage quality from AMAX drill core of Duluth Complex rock containing 1.26% sulfur (reactor N).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/L	Cu mg/l	Ni mg/l	Co mg/l	Zn mg/l	Vol. ml	Temp. °C	R.H. %
26	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	58.0
26	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
27	1	6.20	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	175.8	24.2	56.8
27	2	6.30	9.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.4	NA	NA
28	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.0	52.0
28	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
29	1	6.00	27.0	6.5	2.1	0.40	0.48	2.05	0.020	0.030	0.004	0.020	177.3	24.8	51.0
29	2	6.10	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.7	NA	NA
30	1	6.15	21.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	176.3	24.9	50.4
30	2	6.10	7.0	1.0	NA	NA	NA	NA	NA	NA	NA	NA	201.7	NA	NA
31	1	6.20	18.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	176.3	24.6	51.8
31	2	6.25	6.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.1	NA	NA
32	1	6.20	16.0	1.0	1.6	0.30	0.31	0.90	0.010	0.020	0.003	0.020	174.9	25.0	54.0
32	2	6.30	4.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.6	NA	NA
33	1	6.15	14.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	176.6	25.5	49.3
33	2	6.15	5.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.9	NA	NA
34	1	6.20	16.0	<1.0	1.5	0.30	0.25	0.72	0.020	0.020	0.006	0.010	176.5	25.2	50.0
34	2	6.20	4.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.2	NA	NA
35	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	48.7
35	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
36	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.0	47.0
36	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
37	1	6.15	17.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	175.2	25.3	43.3
37	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
38	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.8	43.8
38	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
39	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	23.7	42.0
39	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
40	1	6.05	19.0	NA	2.0	0.60	1.00	1.10	0.026	0.022	0.002	0.017	176.0	26.0	44.0
40	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
41	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	26.5	41.0
41	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
42	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.0	41.0
42	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
43	1	6.05	19.0	5.5	NA	NA	NA	NA	NA	NA	NA	NA	175.4	25.3	43.3
43	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
44	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	23.5	44.0
44	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
45	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.8	43.8
45	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
46	1	6.10	18.0	NA	1.9	0.60	1.00	0.90	0.027	0.019	0.002	0.013	174.3	26.1	43.5
46	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
47	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	42.0
47	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
48	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.0	42.0
48	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
49	1	6.10	16.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	175.1	24.8	44.0
49	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA

[1]NA: Not analyzed.

[2]NS: No sample taken.

Table A2.13. Drainage quality from AMAX drill core of Duluth Complex rock containing 1.35% sulfur (reactor C).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/L	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cu mg/L	Ni mg/L	Co mg/L	Zn mg/L	Vol ml	Temp. °C	R.H. %
0	1	3.75	750.0	NA'	35.3	30.00	5.14	14.80	0.330	7.145	1.660	0.150	173.6	24.4	51.3
0	2	4.30	75.0	34.0	3.3	2.61	0.22	1.15	0.006	0.500	0.060	0.030	200.7	NA	NA
0	3	4.40	43.0	20.0	1.9	0.95	0.10	0.70	0.002	0.230	0.031	0.010	200.8	NA	NA
0	4	4.40	30.0	NA	1.6	0.49	0.07	0.54	0.002	0.150	0.022	0.010	198.8	NA	NA
0	5	4.35	24.0	NA	1.5	0.36	0.06	0.48	0.001	0.130	0.018	0.010	200.0	NA	NA
1	1	3.80	350.0	185.0	15.6	15.00	2.40	5.32	0.440	11.350	2.420	0.400	172.5	25.0	60.0
1	2	3.95	108.0	32.5	4.3	1.90	0.18	1.10	0.140	2.110	0.340	0.060	199.4	NA	NA
1	3	4.00	68.0	18.5	2.1	0.51	0.11	0.79	0.065	0.820	0.150	0.030	198.6	NA	NA
1	4	4.00	42.0	13.0	NA	NA	NA	NA	NA	NA	NA	NA	200.3	NA	NA
2	1	3.80	215.0	115.0	7.7	5.81	1.34	4.07	0.430	7.820	1.000	0.240	171.7	25.0	55.3
2	2	3.90	85.0	25.0	2.3	1.15	0.16	0.80	0.150	1.480	0.200	0.050	198.9	NA	NA
2	3	4.00	60.0	14.5	1.5	0.48	0.08	0.49	0.090	0.700	0.080	0.030	199.2	NA	NA
3	1	3.95	180.0	75.0	4.8	5.27	1.03	2.28	0.410	5.560	0.710	0.180	170.6	25.0	56.0
3	2	4.00	81.0	22.5	1.8	1.32	0.15	0.52	0.140	1.320	0.170	0.050	201.2	NA	NA
4	1	4.05	170.0	60.0	4.7	5.46	0.88	1.92	0.480	4.960	0.680	0.170	170.3	25.8	69.4
4	2	4.10	69.0	19.0	1.4	1.02	0.10	0.34	0.150	0.930	0.130	0.030	202.0	NA	NA
5	1	4.15	125.0	40.0	2.6	3.95	0.67	0.90	0.410	3.200	0.450	0.100	171.0	25.3	59.0
5	2	4.15	62.0	17.0	1.0	1.13	0.12	0.23	0.160	0.960	0.130	0.030	201.4	NA	NA
6	1	4.20	102.0	50.0	2.5	3.27	0.57	0.62	0.350	2.740	0.440	0.090	172.1	24.8	65.3
6	2	4.25	49.0	16.5	1.0	1.03	0.10	0.17	0.150	1.000	0.150	0.020	202.3	NA	NA
7	1	4.25	100.0	30.0	2.4	2.61	0.49	0.58	0.310	2.290	0.400	0.070	173.7	25.2	55.7
7	2	4.30	48.0	15.0	1.2	0.90	0.15	0.18	0.140	0.900	0.170	0.030	201.7	NA	NA
8	1	4.35	90.0	23.0	2.4	2.44	0.39	0.44	0.270	2.680	0.380	0.080	171.7 •	25.2	60.3
8	2	4.40	44.0	16.0	1.3	0.82	0.07	0.14	0.120	1.060	0.160	0.030	201.0	NA	NA
9	1	4.40	82.0	25.0	2.4	2.07	0.36	0.41	0.250	2.570	0.380	0.070	172.6	24.7	63.3
9	2	4.50	42.0	13.0	1.4	0.71	0.07	0.13	0.120	1.070	0.140	0.030	201.4	NA	NA
10	1	4.45	85.0	24.0	2.4	1.85	0.38	0.41	0.240	2.520	0.380	0.080	171.8	24.3	62.3
10	2	4.50	40.0	12.5	1.3	0.66	0.07	0.13	0.110	1.040	0.150	0.030	202.5	NA	NA
11	1	4.45	77.0	21.0	2.0	1.60	0.38	0.36	0.200	2.490	0.360	0.070	173.4	24.5	71.3
11	2	4.55	42.0	12.0	1.2	0.60	0.07	0.12	0.090	1.120	0.150	0.030	200.0	NA	NA
12	1	4.50	72.0	29.0	2.2	1.53	0.47	0.35	0.200	2.440	0.310	0.070	173.0	25.7	69.3
12	2	4.60	37.0	13.5	1.2	0.58	0.10	0.12	0.100	1.070	0.130	0.020	201.9	NA	NA
13	1	4.45	72.0	26.0	2.1	1.39	0.44	0.40	0.190	2.560	0.320	0.050	173.1	24.1	63.0
13	2	4.55	35.0	14.0	1.0	0.49	0.08	0.12	0.090	0.990	0.100	0.010	201.1	NA	NA
14	1	4.55	78.0	28.0	2.0	1.50	0.42	0.43	0.190	2.540	0.360	0.070	172.5	25.5	70.3
14	2	4.70	31.0	11.5	0.8	0.30	0.05	0.09	0.090	0.820	0.120	0.026	203.4	NA	NA
15	1	4.55	70.0	26.5	NA	NA	NA	NA	NA	NA	NA	NA	173.1	25.3	64.8
15	2	4.55	36.0	13.0	NA	NA	NA	NA	NA	NA	NA	NA	200.6	NA	NA
16	1	4.50	70.0	24.0	1.3	1.10	0.33	0.48	0.160	2.030	0.300	0.060	175.4	24.6	70.5
16	2	4.55	34.0	12.0	0.6	0.50	0.06	0.11	0.080	0.870	0.130	0.020	201.6	NA	NA
17	1	4.50	68.0	22.0	NA	NA	NA	NA	NA	NA	NA	NA	171.0	25.2	69.3
17	2	4.65	31.0	10.5	NA	NA	NA	NA	NA	NA	NA	NA	203.8	NA	NA
18	1	4.50	62.0	21.0	1.5	1.00	0.29	0.36	0.170	1.770	0.260	0.050	171.9	26.4	59.5
18	2	4.60	30.0	10.5	0.6	0.50	0.05	0.07	0.080	0.740	0.110	0.020	201.3	NA	NA
19	1	4.60	68.0	26.5	NA	NA	NA	NA	NA	NA	NA	NA	172.4	24.9	56.8
19	2	4.65	33.0	11.0	NA	NA	NA	NA	NA	NA	NA	NA	201.7	NA	NA
20	1	4.55	63.0	NA	2.3	0.70	1.00	0.30	0.260	1.620	0.220	0.040	173.0	25.2	56.7
20	2	4.65	34.0	NA	1.6	0.20	0.70	0.10	0.140	0.780	0.090	0.030	202.5	NA	NA
21	1	4.60	62.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	173.0	25.7	55.0
21	2	4.70	34.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.2	NA	NA
22	1	4.45	68.0	16.5	1.6	0.80	0.26	0.28	0.180	1.430	0.200	0.030	174.1	24.5	58.0
22	2	4.55	33.0	14.5	0.9	0.50	0.06	0.08	0.080	0.630	0.090	0.020	201.1	NA	NA
23	1	4.50	69.0	20.6	NA	NA	NA	NA	NA	NA	NA	NA	172.2	24.2	56.8
23	2	4.55	34.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	203.7	NA	NA
24	1	4.35	72.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	172.1	25.0	52.0
24	2	4.50	36.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	203.1	NA	NA
25	1	4.25	88.0	28.5	1.8	1.00	0.34	0.72	0.320	1.560	0.220	0.040	171.0	24.8	51.0
25	2	4.45	37.0	16.0	0.8	0.50	0.06	0.15	0.120	0.500	0.070	0.010	203.1	NA	NA

Table A2.13. Drainage quality from AMAX drill core of Duluth Complex rock containing 1.35% sulfur (reactor C).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/L	Ca mg/L	Mg mg/l	Na mg/L	K mg/L	Cu mg/l	Ni mg/L	Co mg/l	Zn mg/l	Vol. ml	Temp. °C	R.H. %
26	1	4.20	90.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	172.5	24.9	50.4
26	2	4.35	47.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.7	NA	NA
27	1	4.15	102.0	NA	2.1	0.70	1.10	1.00	0.630	1.380	0.180	0.050	172.4	24.6	51.8
27	2	4.30	58.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.2	NA	NA
28	1	4.15	120.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	173.6	25.0	54.0
28	2	4.30	62.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.4	NA	NA
29	1	4.00	138.0	41.0	2.1	1.30	0.39	1.78	0.590	1.390	0.190	0.040	172.8	25.5	49.3
29	2	4.15	70.0	16.0	0.8	0.40	0.08	0.36	0.190	0.330	0.040	0.010	201.4	NA	NA
30	1	4.05	138.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	172.7	25.2	50.0
30	2	4.20	70.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.8	NA	NA

'NA: Not analyzed.

Table A2.14. Drainage quality from AMAX drill core of Duluth Complex rock containing 1.47% sulfur (reactor O).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/L	Ca mg/L	Mg mg/l	Na mg/L	K mg/L	Cu mg/L	Ni mg/L	Co mg/L	Zn mg/l	Vol. ml	Temp. °C	R.H. %
0	1	4.05	590.0	275.0	57.8	27.40	11.30	7.70	0.080	11.400	2.940	0.240	167.6	NA[1]	NA
0	2	4.10	78.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.5	NA	NA
0	3	4.25	42.0	NA	1.9	1.10	0.50	1.10	<0.001	0.410	0.150	0.010	196.8	NA	NA
0	4	4.15	29.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.7	NA	NA
0	5	4.25	22.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.3	NA	NA
1	1	4.05	155.0	35.5	12.2	5.30	1.51	2.80	0.040	2.960	0.630	0.100	167.0	25.2	54.5
1	2	4.15	58.0	14.5	4.5	1.50	0.22	1.02	0.020	0.850	0.170	0.030	198.9	NA	NA
1	3	4.20	28.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.2	NA	NA
1	4	4.20	20.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.8	NA	NA
2	1	4.15	98.0	26.0	6.9	3.40	0.66	3.03	0.040	1.980	0.130	0.100	170.2	24.4	53.0
2	2	4.30	33.0	10.5	NA	NA	NA	NA	NA	NA	NA	NA	197.8	NA	NA
2	3	4.35	21.5	7.2	NA	NA	NA	NA	NA	NA	NA	NA	148.7	NA	NA
3	1	4.35	78.0	NA	6.3	2.39	0.84	2.05	0.030	1.630	0.320	0.070	170.0	24.8	50.0
3	2	4.55	29.0	NA	2.9	0.58	0.13	0.74	0.020	0.570	0.120	0.030	201.5	NA	NA
4	1	4.30	70.0	NA	5.8	2.12	0.66	1.46	0.040	1.680	0.330	0.070	170.5	24.4	51.3
4	2	4.55	27.0	NA	2.8	0.57	0.16	0.60	0.020	0.630	0.130	0.030	198.3	NA	NA
5	1	4.30	70.0	24.0	4.6	2.10	0.59	1.37	0.030	1.900	0.370	0.080	167.6	25.0	60.0
5	2	4.50	26.0	9.5	1.9	0.52	0.10	0.49	0.010	0.660	0.130	0.030	197.7	NA	NA
6	1	4.40	71.0	26.0	4.4	1.80	0.52	1.28	0.030	2.000	0.410	0.080	169.5	25.0	55.3
6	2	4.30	28.5	NA	2.0	0.66	0.10	0.53	0.010	0.800	0.170	0.030	201.4	NA	NA
7	1	4.50	72.0	27.0	3.7	1.59	0.58	1.57	0.024	1.930	0.380	0.090	170.4	25.0	56.0
7	2	4.55	29.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.6	NA	NA
8	1	4.50	79.0	26.5	3.8	1.54	0.55	2.25	0.020	1.920	0.390	0.070	168.4	25.8	69.4
8	2	4.60	29.0	NA	1.7	0.52	0.08	0.77	0.010	0.690	0.140	0.030	202.4	NA	NA
9	1	4.60	72.0	27.0	3.6	1.49	0.51	2.24	0.020	1.790	0.380	0.070	170.1	25.3	59.0
9	2	4.75	27.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	203.8	NA	NA
10	1	4.50	72.0	27.0	3.1	1.44	0.59	1.55	0.020	1.620	0.360	0.070	170.0	24.8	65.3
10	2	4.70	28.0	12.0	1.4	0.50	0.16	0.55	0.008	0.650	0.150	0.030	201.4	NA	NA
11	1	4.65	82.0	30.0	3.9	1.67	0.48	1.94	0.020	1.950	0.450	0.080	169.1	25.2	55.7
11	2	4.80	33.0	12.0	NA	NA	NA	NA	NA	NA	NA	NA	200.4	NA	NA
12	1	4.55	102.0	36.0	4.7	2.29	0.46	2.07	0.030	2.540	0.560	0.100	168.5	25.2	60.3
12	2	4.75	36.0	13.0	1.6	0.60	0.10	0.62	0.010	0.790	0.190	0.020	202.1	NA	NA
13	1	4.60	102.0	35.0	4.6	2.22	0.40	2.05	0.030	2.340	0.530	0.090	168.0	24.7	63.3
13	2	4.70	34.0	12.0	NA	NA	NA	NA	NA	NA	NA	NA	202.0	NA	NA
14	1	4.50	112.0	40.0	4.6	2.37	0.38	1.94	0.040	2.400	0.520	0.100	170.2	24.3	62.3
14	2	4.65	41.0	14.0	1.6	0.57	0.07	0.54	0.020	0.690	0.160	0.020	200.3	NA	NA
15	1	4.50	122.0	42.5	4.7	2.51	0.39	1.80	0.020	2.520	0.520	0.100	169.3	24.5	71.3
15	2	4.65	42.0	13.5	NA	NA	NA	NA	NA	NA	NA	NA	196.7	NA	NA
16	1	4.50	122.0	50.0	4.4	2.16	0.44	1.65	0.020	2.300	0.380	0.080	169.1	25.7	69.3
16	2	4.60	40.0	15.5	1.5	0.46	0.08	0.42	0.010	0.520	0.060	0.010	202.3	NA	NA
17	1	4.40	130.0	54.0	4.4	2.11	0.41	1.51	0.020	2.250	0.340	0.080	173.1	24.1	63.0
17	2	4.60	39.0	15.0	NA	NA	NA	NA	NA	NA	NA	NA	198.9	NA	NA
18	1	4.40	130.0	49.0	NA	NA	NA	NA	NA	NA	NA	NA	169.8	25.5	70.3
18	2	4.60	41.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	203.5	NA	NA
19	1	4.40	130.0	45.0	3.4	1.80	0.34	1.46	0.030	1.500	0.250	0.070	168.9	25.3	64.8
19	2	4.60	44.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.2	NA	NA
20	1	4.40	130.0	47.0	NA	NA	NA	NA	NA	NA	NA	NA	168.7	24.6	70.5
20	2	4.65	41.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	204.1	NA	NA
21	1	4.40	115.0	69.0	2.8	1.40	0.30	1.33	0.020	1.150	0.190	0.060	169.1	25.2	69.3
21	2	4.60	43.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.7	NA	NA
22	1	NS[2]	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	26.4	59.5
22	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
23	1	4.35	108.0	42.0	2.8	1.50	0.37	1.53	0.050	1.100	0.180	0.070	170.2	24.9	56.8
23	2	4.55	45.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.0	NA	NA
24	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.2	56.7
24	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
25	1	4.30	138.0	NA	3.6	1.10	1.00	1.60	0.100	1.420	0.230	0.070	168.7	25.7	55.0
25	2	4.50	60.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.3	NA	NA

Table A2.14. Drainage quality from AMAX drill core of Duluth Complex rock containing 1.47% sulfur (reactor O).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/l	Ca mg/l	Mg mg/l	Na mg/L	K mg/L	Cu mg/l	Ni mg/L	Co mg/l	Zn mg/l	Vol. ml	Temp. °C	R.H. %
26	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	58.0
26	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
27	1	4.35	118.0	42.0	2.9	1.30	0.44	1.51	0.080	1.170	0.210	0.060	170.8	24.2	56.8
27	2	4.50	60.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.7	NA	NA
28	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.0	52.0
28	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
29	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.8	51.0
29	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
30	1	4.30	128.0	47.0	2.9	1.50	0.49	1.63	0.110	1.370	0.230	0.060	169.4	24.9	50.4
30	2	4.50	45.0	NA	1.4	0.40	0.70	0.40	0.040	0.380	0.060	0.030	201.1	NA	NA
31	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.6	51.8
31	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
32	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.0	54.0
32	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	[illegible]	NS	NA	NA
33	1	4.20	107.0	36.0	2.7	1.80	0.37	1.06	0.110	1.130	0.200	0.1	168.8	25.5	49.3
33	2	4.50	41.0	NA	NA	NA	NA	NA	NA	NA	NA	[illegible]	202.0	NA	NA

[1]NA: Not analyzed.
[2]NS: No sample taken.

Table A2.15. Drainage quality from AMAX drill core of Duluth Complex rock containing 1.47% sulfur (reactor P).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/L	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cu mg/L	Ni mg/L	Co mg/L	Zn mg/L	Vol. ml	Temp. °C	R.H. %
0	1	4.00	465.0	215.0	39.5	22.40	8.20	6.40	0.070	8.410	2.250	0.170	133.4	NA[1]	NA
0	2	4.20	70.0	23.0	3.3	1.80	0.70	1.60	0.003	0.670	0.190	0.030	195.6	NA	NA
0	3	4.35	42.0	NA	1.7	1.00	0.60	1.20	<0.001	0.360	0.149	0.020	190.9	NA	NA
0	4	4.25	27.7	NA	2.3	0.70	0.70	0.80	<0.001	0.092	0.070	0.010	198.2	NA	NA
0	5	4.35	21.5	NA	2.2	0.50	0.70	0.40	<0.001	0.082	0.048	0.010	196.9	NA	NA
1	1	4.10	122.0	27.0	9.1	1.50	0.22	1.02	0.030	2.270	0.450	0.070	140.4	25.2	54.5
1	2	4.25	43.0	NA	4.2	1.30	0.25	1.03	0.010	0.740	0.150	0.020	194.6	NA	NA
1	3	4.30	26.5	NA	2.4	0.70	0.15	0.61	0.010	0.400	0.070	0.010	194.3	NA	NA
1	5	4.30	19.5	NA	2.1	0.50	0.14	0.47	0.010	0.280	0.050	0.010	199.1	NA	NA
2	1	4.30	98.0	25.0	6.8	3.30	0.66	3.28	0.040	1.940	0.110	0.090	173.3	24.4	53.0
2	2	4.35	32.0	10.2	2.3	1.10	0.16	1.13	0.010	0.590	0.040	0.030	198.9	NA	NA
2	3	4.40	20.0	7.0	1.5	0.60	0.10	0.63	0.010	0.360	0.030	0.020	202.4	NA	NA
3	1	4.40	74.0	NA	6.5	2.23	0.74	2.23	0.040	1.520	0.310	0.060	171.3	24.8	50.0
3	2	4.55	27.0	NA	2.8	0.56	0.13	0.83	0.020	0.540	0.120	0.030	199.1	NA	NA
4	1	4.40	70.0	NA	5.7	1.98	0.59	1.62	0.030	1.600	0.330	0.070	169.9	24.4	51.3
4	2	4.55	26.5	NA	2.4	0.54	0.12	0.64	0.010	0.600	0.140	0.030	200.8	NA	NA
5	1	4.40	70.0	23.0	4.5	1.99	0.55	1.37	0.030	1.880	0.370	0.080	170.7	25.0	60.0
5	2	4.55	25.0	10.2	NA	NA	NA	NA	NA	NA	NA	NA	200.5	NA	NA
6	1	4.40	65.0	30.0	4.2	1.63	0.48	1.12	0.027	1.880	0.380	0.080	169.3	25.0	55.3
6	2	4.30	28.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.6	NA	NA
7	1	4.45	70.0	NA	3.7	1.52	0.55	1.17	0.030	1.850	0.380	0.080	169.8	25.0	56.0
7	2	4.55	28.0	NA	1.6	0.54	0.10	0.44	0.020	0.730	0.150	0.040	202.1	NA	NA
8	1	4.60	76.0	NA	4.2	1.54	0.51	1.74	0.020	1.970	0.410	0.070	171.6	25.8	69.4
8	2	4.65	29.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.3	NA	NA
9	1	4.60	80.0	31.0	4.7	1.84	0.52	2.29	0.030	2.270	0.480	0.080	170.0	25.3	59.0
9	2	4.75	29.0	11.5	1.6	0.53	0.09	0.58	0.009	0.740	0.150	0.030	202.0	NA	NA
10	1	4.50	95.0	37.0	5.0	2.31	0.59	1.88	0.030	2.500	0.590	0.100	170.5	24.8	65.3
10	2	4.65	32.0	14.0	NA	NA	NA	NA	NA	NA	NA	NA	201.1	NA	NA
11	1	4.50	118.0	40.0	6.2	2.58	0.62	2.47	0.030	2.730	0.640	0.110	170.3	25.2	55.7
11	2	4.60	38.0	14.0	1.8	0.62	0.09	0.66	0.009	0.740	0.190	0.030	202.5	NA	NA
12	1	4.45	125.0	42.5	5.9	2.96	0.46	2.25	0.050	2.830	0.630	0.110	170.2	25.2	60.3
12	2	4.65	42.0	15.0	NA	NA	NA	NA	NA	NA	NA	NA	201.7	NA	NA
13	1	4.50	120.0	40.0	5.1	2.65	0.42	2.14	0.050	2.450	0.540	0.110	170.9	24.7	63.3
13	2	4.65	44.0	9.5	1.7	0.65	0.07	0.59	0.020	0.720	0.180	0.030	201.9	NA	NA
14	1	4.40	145.0	54.5	5.3	3.20	0.84	2.03	0.030	2.580	0.550	0.180	172.2	24.3	62.3
14	2	4.50	58.0	16.5	NA	NA	NA	NA	NA	NA	NA	NA	197.9	NA	NA
15	1	4.35	175.0	73.0	4.8	3.40	1.02	2.12	0.030	2.630	0.530	0.250	172.3	24.5	71.3
15	2	4.50	49.0	15.5	1.2	0.51	0.09	0.51	0.010	0.480	0.130	0.040	202.0	NA	NA
16	1	4.35	170.0	86.0	5.0	2.81	0.74	1.88	0.020	2.310	0.380	0.170	170.0	25.7	69.3
16	2	4.50	58.0	19.5	NA	NA	NA	NA	NA	NA	NA	NA	200.7	NA	NA
17	1	4.30	168.0	88.0	4.4	2.59	0.63	1.74	0.030	2.090	0.320	0.140	173.2	24.1	63.0
17	2	4.45	60.0	19.0	1.1	0.42	0.09	0.44	0.010	0.370	0.070	0.010	201.5	NA	NA
18	1	4.35	170.0	76.0	3.9	2.60	0.52	1.70	0.030	1.640	0.270	0.130	173.0	25.5	70.3
18	2	4.45	58.0	17.0	NA	NA	NA	NA	NA	NA	NA	NA	201.8	NA	NA
19	1	4.25	172.0	74.0	4.1	1.70	1.10	1.70	0.050	1.550	0.210	0.100	170.3	25.3	64.8
19	2	4.40	60.0	18.0	NA	NA	NA	NA	NA	NA	NA	NA	201.7	NA	NA
20	1	4.30	178.0	84.0	NA	NA	NA	NA	NA	NA	NA	NA	170.9	24.6	70.5
20	2	4.50	60.0	12.0	NA	NA	NA	NA	NA	NA	NA	NA	203.0	NA	NA
21	1	4.25	169.0	50.0	3.3	2.40	0.38	1.56	0.050	1.200	0.190	0.090	170.6	25.2	69.3
21	2	4.45	60.0	15.0	NA	NA	NA	NA	NA	NA	NA	NA	201.4	NA	NA
22	1	NS[2]	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	26.4	59.5
22	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
23	1	4.25	160.0	74.0	3.0	2.60	0.45	1.64	0.090	1.070	0.180	0.090	170.7	24.9	56.8
23	2	4.35	62.0	19.5	1.4	0.50	0.70	0.40	0.040	0.300	0.040	0.030	200.7	NA	NA
24	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.2	56.7
24	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
25	1	4.25	165.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	170.2	25.7	55.0
25	2	4.40	65.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.7	NA	NA

Table A2.15. Drainage quality from AMAX drill core of Duluth Complex rock containing 1.47% sulfur (reactor P).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/L	Ca mg/l	Mg mg/L	Na mg/L	K mg/l	Cu mg/L	Ni mg/L	Co mg/L	Zn mg/L	Vol. mL	Temp. °C	R.H. %
26	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	58.0
26	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
27	1	4.25	150.0	61.0	2.8	2.10	0.47	1.44	0.140	1.160	0.200	0.080	174.3	24.2	56.8
27	2	4.35	60.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.8	NA	NA
28	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.0	52.0
28	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
29	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.8	51.0
29	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
30	1	4.20	163.0	62.0	2.9	2.70	0.53	1.60	0.180	1.300	0.220	0.070	169.1	24.9	50.4
30	2	4.35	62.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.9	NA	NA
31	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.6	51.8
31	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
32	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.0	54.0
32	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
33	1	4.15	165.0	61.0	2.7	2.50	0.47	1.80	0.240	1.340	0.230	0.070	168.4	25.5	49.3
33	2	4.35	58.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.9	NA	NA
34	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.2	50.0
34	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA

[1]NA: Not analyzed.

[2]NS: No sample taken.

Table A2.16. Drainage quality from AMAX drill core of Duluth Complex rock containing 1.74% sulfur (reactor Q).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/L	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cu mg/L	Ni mg/L	Co mg/L	Zn mg/L	Vol. ml	Temp. °C	R.H. %
0	1	4.10	670.0	275.0	69.6	23.60	17.60	9.50	0.120	6.620	1.250	0.210	167.0	NA[1]	NA
0	2	4.40	79.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.9	NA	NA
0	3	4.35	38.5	NA	2.3	0.80	0.60	1.50	<0.001	0.190	0.042	0.010	198.8	NA	NA
0	4	4.45	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.7	NA	NA
0	5	4.60	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	195.9	NA	NA
1	1	4.10	150.0	31.5	11.7	4.60	1.77	3.00	0.050	1.980	0.310	0.090	166.5	25.2	54.5
1	2	4.30	49.0	NA	4.3	1.10	0.25	1.29	0.010	0.450	0.060	0.020	201.6	NA	NA
1	3	4.35	22.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.2	NA	NA
1	4	4.40	17.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.7	NA	NA
2	1	4.30	100.0	25.0	7.5	3.20	1.09	2.95	0.040	1.280	0.070	0.050	167.2	24.4	53.0
2	2	4.55	32.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	192.5	NA	NA
2	3	4.55	19.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	194.7	NA	NA
3	1	4.50	62.0	NA	5.4	1.68	0.80	1.32	0.020	0.820	0.170	0.040	170.2	24.8	50.0
3	2	4.75	22.0	NA	2.3	0.43	0.23	0.60	0.010	0.290	0.050	0.020	200.0	NA	NA
4	1	4.45	64.0	NA	5.5	1.75	0.57	0.98	0.030	0.940	0.160	0.050	170.0	24.4	51.3
4	2	4.65	23.0	NA	2.3	0.45	0.18	0.46	0.010	0.340	0.050	0.020	201.0	NA	NA
5	1	4.50	70.0	27.0	5.6	2.40	0.56	0.89	0.040	1.410	0.260	0.070	168.9	25.0	60.0
5	2	4.70	24.0	11.0	2.2	0.55	0.11	0.37	0.020	0.440	0.070	0.030	198.9	NA	NA
6	1	4.80	70.0	29.0	5.2	1.97	0.47	0.64	0.030	1.400	0.270	0.070	168.6	25.0	55.3
6	2	4.70	23.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.0	NA	NA
7	1	4.50	72.0	27.0	4.9	1.89	0.63	0.61	0.040	1.440	0.260	0.080	169.9	25.0	56.0
7	2	4.60	21.0	NA	1.7	0.61	0.23	0.27	0.020	0.480	0.100	0.030	201.5	NA	NA
8	1	4.55	75.0	29.0	5.0	1.88	0.47	0.76	0.020	1.450	0.290	0.060	168.9	25.8	69.4
8	2	4.70	26.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.9	NA	NA
9	1	4.80	72.0	28.0	4.9	1.88	0.49	0.76	0.030	1.440	0.320	0.060	171.5	25.3	59.0
9	2	4.90	25.0	NA	1.7	0.57	0.10	0.24	0.009	0.460	0.090	0.020	201.9	NA	NA
10	1	4.60	72.0	28.5	4.3	1.85	0.47	0.64	0.040	1.390	0.310	0.060	169.2	24.8	65.3
10	2	5.00	24.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.2	NA	NA
11	1	4.55	95.0	34.5	5.9	2.28	0.57	1.45	0.080	1.660	0.390	0.080	170.7	25.2	55.7
11	2	4.80	34.0	NA	2.1	0.65	0.19	0.49	0.020	0.540	0.130	0.030	199.1	NA	NA
12	1	4.40	205.0	115.0	13.8	6.00	0.94	4.19	0.210	5.330	1.050	0.220	170.6	25.2	60.3
12	2	4.70	65.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.7	NA	NA
13	1	4.40	175.0	95.0	10.3	5.28	0.70	3.55	0.160	3.890	0.740	0.170	170.5	24.7	63.3
13	2	4.70	58.0	NA	2.4	1.09	0.10	0.92	0.040	0.770	0.170	0.030	201.3	NA	NA
14	1	4.40	180.0	135.0	9.8	5.43	0.61	3.29	0.150	3.720	0.740	0.180	171.3	24.3	62.3
14	2	4.70	55.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.5	NA	NA
15	1	4.40	178.0	90.0	10.0	5.33	0.60	3.06	0.130	3.230	0.660	0.170	172.3	24.5	71.3
15	2	4.65	60.0	NA	2.1	1.02	0.08	0.75	0.030	0.610	0.150	0.030	201.0	NA	NA
16	1	4.40	168.0	84.0	9.6	5.28	0.62	2.70	0.120	2.960	0.560	0.140	171.4	25.7	69.3
16	2	4.65	47.0	17.0	NA	NA	NA	NA	NA	NA	NA	NA	201.8	NA	NA
17	1	4.40	158.0	76.0	8.3	4.80	0.49	2.40	0.110	2.360	0.470	0.120	172.1	24.1	63.0
17	2	4.65	45.0	NA	1.9	0.91	0.10	0.62	0.030	0.400	0.110	0.010	200.4	NA	NA
18	1	4.50	178.0	78.0	7.7	3.80	1.10	2.20	0.190	2.190	0.390	0.120	172.6	25.5	70.3
18	2	4.70	41.0	16.0	NA	NA	NA	NA	NA	NA	NA	NA	200.3	NA	NA
19	1	4.30	165.0	76.0	NA	NA	NA	NA	NA	NA	NA	NA	169.7	25.3	64.8
19	2	4.60	45.0	16.0	NA	NA	NA	NA	NA	NA	NA	NA	202.0	NA	NA
20	1	4.35	163.0	80.0	NA	NA	NA	NA	NA	NA	NA	NA	171.5	24.6	70.5
20	2	4.60	43.0	9.5	NA	NA	NA	NA	NA	NA	NA	NA	202.5	NA	NA
21	1	4.35	160.0	72.0	4.9	3.70	0.33	1.92	0.140	1.380	0.260	0.100	172.2	25.2	69.3
21	2	4.60	45.0	16.0	NA	NA	NA	NA	NA	NA	NA	NA	202.0	NA	NA
22	1	NS[2]	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	26.4	59.5
22	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
23	1	4.30	162.0	72.0	4.2	3.80	0.38	1.96	0.230	1.260	0.250	0.100	170.1	24.9	56.8
23	2	4.55	58.0	20.0	NA	NA	NA	NA	NA	NA	NA	NA	201.2	NA	NA
24	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.2	56.7
24	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
25	1	4.30	205.0	80.0	4.8	2.90	0.55	2.28	0.320	1.670	0.330	0.100	169.1	25.7	55.0
25	2	4.55	62.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.7	NA	NA

Table A2.16. Drainage quality from AMAX drill core of Duluth Complex rock containing 1.74% sulfur (reactor Q).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/l	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cu mg/L	Ni mg/L	Co mg/L	Zn mg/L	Vol. ml	Temp. °C	R.H. %
26	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	58.0
26	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
27	1	4.30	180.0	76.0	4.2	3.50	1.10	1.80	0.460	1.500	0.270	0.090	170.8	24.2	56.8
27	2	4.60	65.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.0	NA	NA
28	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.0	52.0
28	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
29	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.8	51.0
29	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
30	1	4.20	202.0	72.0	4.4	4.20	1.30	1.70	0.550	1.600	0.290	0.120	172.6	24.9	50.4
30	2	4.50	62.0	NA	1.4	0.80	0.70	0.60	0.110	0.320	0.050	0.030	200.9	NA	NA
31	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.6	51.8
31	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
32	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.0	54.0
32	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
33	1	4.05	186.0	82.0	2.9	3.40	0.95	2.33	0.390	1.240	0.230	0.180	169.3	25.5	49.3
33	2	4.40	67.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.8	NA	NA

[1]NA: Not analyzed.

[2]NS: No sample taken.

Table A2.17. Drainage quality from AMAX drill core of Duluth Complex rock containing 1.74% sulfur (reactor R).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/L	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cu mg/L	Ni mg/L	Co mg/L	Zn mg/L	Vol. ml	Temp. °C	R.H. %
0	1	4.10	630.0	275.0	72.7	23.40	17.40	9.90	0.120	6.390	1.230	0.220	167.7	NA'	NA
0	2	4.50	72.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.7	NA	NA
0	3	4.30	36.3	NA	2.3	0.80	0.50	1.30	<0.001	0.190	0.038	0.010	204.1	NA	NA
0	4	4.35	25.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	197.6	NA	NA
0	5	4.50	22.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	197.8	NA	NA
1	1	4.00	152.0	33.0	11.9	4.80	1.72	3.00	0.050	1.910	0.280	0.090	173.2	25.2	54.5
1	2	4.15	38.0	NA	4.2	1.10	0.24	1.25	0.010	0.420	0.040	0.020	200.2	NA	NA
1	3	4.30	22.0	NA	2.6	0.60	0.11	0.67	0.001	0.230	0.020	0.010	202.3	NA	NA
1	4	4.30	17.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.8	NA	NA
2	1	4.35	95.0	26.0	7.4	3.10	0.71	3.14	0.040	1.280	0.070	0.080	164.7	24.4	53.0
2	2	4.55	29.0	9.5	2.2	0.90	0.18	1.28	0.020	0.360	0.020	0.030	200.5	NA	NA
2	3	4.50	17.5	NA	1.4	0.50	0.11	0.70	0.010	0.190	0.010	0.020	198.7	NA	NA
3	1	4.50	69.0	17.8	6.0	2.02	0.70	1.66	0.030	0.970	0.160	0.060	169.4	24.8	50.0
3	2	4.75	24.0	7.5	2.1	0.47	0.22	0.83	0.010	0.320	0.060	0.020	202.1	NA	NA
4	1	4.45	63.0	24.3	5.3	1.91	0.40	1.39	0.040	1.060	0.190	0.070	169.7	24.4	51.3
4	2	4.65	23.0	NA	2.1	0.48	0.10	0.62	0.010	0.360	0.070	0.020	200.0	NA	NA
5	1	4.50	70.0	26.5	5.5	2.38	0.65	1.18	0.040	1.490	0.260	0.080	168.5	25.0	60.0
5	2	4.60	25.0	10.2	NA	NA	NA	NA	NA	NA	NA	NA	199.3	NA	NA
6	1	4.70	68.0	27.0	5.1	1.90	0.49	0.90	0.020	1.450	0.290	0.070	166.1	25.0	55.3
6	2	4.65	24.0	NA	2.0	0.60	0.10	0.42	0.013	0.490	0.110	0.030	201.4	NA	NA
7	1	4.45	75.0	NA	4.7	1.94	0.60	0.99	0.030	1.560	0.300	0.080	169.4	25.0	56.0
7	2	4.65	27.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.8	NA	NA
8	1	4.50	74.0	NA	4.2	1.73	0.54	1.59	0.020	1.510	0.300	0.060	169.8	25.8	69.4
8	2	4.70	26.0	NA	2.0	0.56	0.09	0.72	0.011	0.470	0.100	0.020	201.2	NA	NA
9	1	4.80	70.0	NA	4.1	1.64	0.49	1.53	0.020	1.450	0.290	0.060	170.8	25.3	59.0
9	2	5.00	24.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.8	NA	NA
10	1	4.75	70.0	NA	4.0	1.66	0.50	1.33	0.020	1.390	0.310	0.060	170.2	24.8	65.3
10	2	5.00	24.5	NA	1.6	0.53	0.11	0.55	0.008	0.490	0.110	0.020	202.1	NA	NA
11	1	4.90	82.0	27.0	4.3	1.61	0.45	1.47	0.020	1.440	0.320	0.070	169.6	25.2	55.7
11	2	5.10	28.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.4	NA	NA
12	1	4.95	77.0	29.0	5.1	2.02	0.39	1.45	0.030	1.920	0.410	0.080	169.6	25.2	60.3
12	2	5.20	27.0	NA	1.8	0.58	0.07	0.60	0.010	0.590	0.150	0.020	201.0	NA	NA
13	1	4.70	118.0	42.5	7.8	3.54	0.48	2.26	0.050	3.340	0.720	0.130	168.5	24.7	63.3
13	2	4.90	39.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.2	NA	NA
14	1	4.60	160.0	80.0	10.5	4.77	0.60	2.66	0.070	4.400	0.890	0.180	169.6	24.3	62.3
14	2	4.80	44.0	NA	2.4	0.95	0.07	0.74	0.020	0.880	0.220	0.030	201.9	NA	NA
15	1	4.60	130.0	44.0	7.8	3.86	0.52	2.33	0.050	3.180	0.650	0.140	169.9	24.5	71.3
15	2	4.85	38.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.4	NA	NA
16	1	4.65	120.0	48.0	7.7	3.61	0.53	1.86	0.040	2.790	0.570	0.120	171.3	25.7	69.3
16	2	4.90	36.0	NA	2.1	0.75	0.09	0.64	0.010	0.630	0.150	0.020	202.0	NA	NA
17	1	4.60	118.0	42.5	7.4	3.47	0.47	1.80	0.030	2.600	0.530	0.120	167.1	24.1	63.0
17	2	4.85	35.0	14.5	NA	NA	NA	NA	NA	NA	NA	NA	199.1	NA	NA
18	1	4.65	120.0	43.0	NA	NA	NA	NA	NA	NA	NA	NA	169.6	25.5	70.3
18	2	4.90	34.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.3	NA	NA
19	1	4.55	112.0	42.5	5.1	2.80	0.40	1.49	0.040	1.640	0.340	0.100	169.2	25.3	64.8
19	2	4.80	33.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.5	NA	NA
20	1	4.60	110.0	42.0	NA	NA	NA	NA	NA	NA	NA	NA	172.8	24.6	70.5
20	2	NS²	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
21	1	4.70	110.0	42.5	5.1	3.00	0.67	1.25	0.040	1.680	0.350	0.140	173.5	25.2	69.3
21	2	4.85	33.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.0	NA	NA
22	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	26.4	59.5
22	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
23	1	4.65	103.0	37.0	4.1	2.40	1.03	1.49	0.060	1.360	0.280	0.210	170.9	24.9	56.8
23	2	4.85	36.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.9	NA	NA
24	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.2	56.7
24	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
25	1	4.50	138.0	50.0	4.5	2.40	0.83	1.66	0.130	1.850	0.360	0.180	170.6	25.7	55.0
25	2	4.70	45.0	14.5	NA	NA	NA	NA	NA	NA	NA	NA	202.0	NA	NA

Table A2.17. Drainage quality from AMAX drill core of Duluth Complex rock containing 1.74% sulfur (reactor R).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/L	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cu mg/L	Ni mg/L	Co mg/L	Zn mg/L	Vol. mL	Temp. °C	R.H. %
26	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	58.0
26	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
27	1	4.50	137.0	NA	5.5	2.30	1.30	1.40	0.260	1.840	0.350	0.150	171.4	24.2	56.8
27	2	4.70	60.0	NA	2.2	0.70	0.70	0.60	0.070	0.530	0.110	0.050	201.8	NA	NA
28	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.0	52.0
28	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
29	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.8	51.0
29	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
30	1	4.30	143.0	54.0	5.4	2.70	1.20	1.40	0.370	1.900	0.370	0.130	170.6	24.9	50.4
30	2	4.55	60.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.8	NA	NA
31	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.6	51.8
31	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
32	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.0	54.0
32	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
33	1	4.15	130.0	49.0	4.1	2.70	0.55	1.35	0.240	1.530	0.300	0.110	170.7	25.5	49.3
33	2	4.45	58.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.6	NA	NA

[1]NA: Not analyzed.

[2]NS: No sample taken.

Table A2.18. Drainage quality from AMAX drill core of Duluth Complex rock containing 1.87% sulfur (reactor S).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/l	Ca mg/L	Mg mg/l	Na mg/L	K mg/L	Cu mg/L	Ni mg/l	Co mg/L	Zn mg/l	Vol. mL	Temp. °C	R.H. %
0	1	6.25	380.0	150.0	47.7	13.30	16.00	6.50	0.060	0.290	0.018	0.030	171.0	NA	NA
0	2	6.20	42.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.9	NA	NA
0	3	6.40	26.5	5.3	2.0	0.90	1.00	1.70	<0.001	0.008	<0.001	0.010	199.3	NA	NA
0	4	6.30	19.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.0	NA	NA
0	5	6.50	17.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.1	NA	NA
1	1	6.15	110.0	21.0	10.0	4.00	1.53	2.60	0.005	0.027	<0.001	0.010	172.5	25.2	54.5
1	2	6.30	22.5	NA	2.4	0.90	3.60	1.35	<0.001	0.010	<0.001	<0.001	200.0	NA	NA
1	3	6.50	13.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.1	NA	NA
1	4	6.50	10.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.3	NA	NA
2	1	6.60	65.0	30.6	5.9	2.50	0.50	2.65	0.008	0.010	<0.001	<0.001	170.1	24.4	53.0
2	2	6.75	16.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.3	NA	NA
2	3	7.00	10.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.9	NA	NA
3	1	6.85	45.0	NA	5.7	1.75	0.49	2.12	0.002	0.005	0.004	0.010	173.4	24.8	50.0
3	2	6.85	13.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.9	NA	NA
4	1	6.75	60.0	NA	6.7	1.97	0.42	2.10	0.003	0.006	0.005	0.010	172.1	24.4	51.3
4	2	6.80	14.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.9	NA	NA
5	1	6.65	75.0	30.0	9.4	3.20	0.38	2.43	0.003	0.012	0.002	0.010	173.8	25.0	60.0
5	2	6.85	19.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.9	NA	NA
6	1	6.70	96.0	38.0	11.7	3.34	0.36	2.46	0.006	0.017	0.030	0.020	171.4	25.0	55.3
6	2	6.80	16.0	NA	2.0	0.42	0.08	0.77	0.004	0.005	0.020	0.010	200.3	NA	NA
7	1	6.40	120.0	45.5	13.2	3.51	0.41	2.44	0.007	0.018	0.003	0.010	173.0	25.0	56.0
7	2	6.55	16.5	NA	1.7	0.38	0.12	0.72	<0.001	<0.001	<0.001	0.010	201.0	NA	NA
8	1	6.50	115.0	43.0	11.0	3.12	0.37	2.93	0.002	0.020	0.005	<0.010	172.9 •	25.8	69.4
8	2	6.65	19.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.8	NA	NA
9	1	6.90	85.0	35.0	9.5	2.32	0.33	2.23	0.002	0.017	0.004	<0.010	172.8	25.3	59.0
9	2	6.95	12.5	NA	1.2	0.22	0.09	0.62	<0.001	0.180	<0.001	<0.010	200.6	NA	NA
10	1	6.85	79.0	33.0	8.2	2.00	0.45	1.84	0.008	0.017	0.002	0.010	172.8	24.8	65.3
10	2	6.95	12.0	NA	1.0	0.40	NA	0.60	0.001	0.002	<0.001	0.001	201.2	NA	NA
11	1	6.90	82.0	29.0	8.6	1.85	0.32	2.27	0.001	0.012	0.008	0.010	172.2	25.2	55.7
11	2	7.00	13.0	NA	1.3	0.20	0.08	0.72	0.001	0.036	0.012	0.010	202.5	NA	NA
12	1	6.95	80.0	30.5	8.3	2.17	0.27	1.88	0.010	0.030	0.030	<0.010	173.7	25.2	60.3
12	2	7.00	15.0	NA	1.0	0.60	NA	0.80	0.001	0.002	<0.001	0.001	202.3	NA	NA
13	1	6.70	79.0	29.0	6.8	2.60	NA	1.80	0.001	0.026	0.004	0.007	170.7	24.7	63.3
13	2	6.70	15.0	NA	0.8	0.80	NA	0.60	0.005	0.005	<0.001	0.001	200.1	NA	NA
14	1	6.50	90.0	35.0	9.8	2.77	0.25	2.04	0.010	0.050	0.010	<0.010	174.1	24.3	62.3
14	2	6.60	15.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.8	NA	NA
15	1	6.25	118.0	48.0	13.8	4.60	NA	2.40	0.005	0.130	0.017	0.008	172.5	24.5	71.3
15	2	6.40	20.0	NA	1.6	1.00	NA	0.80	0.001	0.017	0.002	0.004	200.3	NA	NA
16	1	6.10	138.0	61.0	17.7	4.69	0.37	2.89	0.004	0.220	0.026	0.020	173.6	25.7	69.3
16	2	6.25	33.0	14.0	NA	NA	NA	NA	NA	NA	NA	NA	202.0	NA	NA
17	1	6.00	127.0	55.0	15.2	4.39	0.33	2.56	0.002	0.290	0.026	0.020	174.4	24.1	63.0
17	2	6.25	23.0	NA	2.0	1.00	NA	0.80	NA	0.046	0.004	0.001	200.3	NA	NA
18	1	6.10	110.0	43.0	11.4	4.00	0.28	2.35	0.010	0.360	0.040	0.030	173.2	25.5	70.3
18	2	6.35	23.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.5	NA	NA
19	1	5.85	98.0	40.5	8.3	2.60	0.35	2.32	0.001	0.360	0.040	0.020	172.6	25.3	64.8
19	2	6.05	19.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.7	NA	NA
20	1	5.85	102.0	41.0	9.6	4.00	0.27	2.02	0.002	0.500	0.070	0.040	174.5	24.6	70.5
20	2	6.10	18.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.3	NA	NA
21	1	5.80	90.0	35.0	NA	NA	NA	NA	NA	NA	NA	NA	174.3	25.2	69.3
21	2	6.05	17.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.5	NA	NA
22	1	5.75	90.0	36.0	7.3	3.10	0.23	1.48	0.010	0.550	0.090	0.040	172.3	26.4	59.5
22	2	5.95	15.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.5	NA	NA
23	1	5.85	88.0	38.0	NA	NA	NA	NA	NA	NA	NA	NA	174.2	24.9	56.8
23	2	6.05	20.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.6	NA	NA
24	1	5.65	100.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	173.5	25.2	56.7
24	2	5.85	19.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.4	NA	NA
25	1	5.65	95.0	36.0	6.0	3.60	0.30	1.31	0.008	0.730	0.120	0.040	173.1	25.7	55.0
25	2	5.80	21.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.2	NA	NA

Table A2.18. Drainage quality from AMAX drill core of Duluth Complex rock containing 1.87% sulfur (reactor S).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/l	Ca mg/l	Mg mg/l	Na mg/L	K mg/L	Cu mg/L	Ni mg/L	Co mg/l	Zn mg/l	Vol. ml	Temp. °C	R.H. %
26	1	5.50	95.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	173.2	24.5	58.0
26	2	5.75	18.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.5	NA	NA
27	1	5.55	81.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	173.2	24.2	56.8
27	2	5.70	22.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.3	NA	NA
28	1	5.35	95.0	36.0	4.9	4.10	0.26	1.03	0.020	0.820	0.170	0.050	174.0	25.0	52.0
28	2	5.55	21.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.8	NA	NA
29	1	5.30	103.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	173.2	24.8	51.0
29	2	5.45	22.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.4	NA	NA
30	1	5.35	82.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	173.4	24.9	50.4
30	2	5.50	22.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	203.1	NA	NA
31	1	5.25	88.0	NA	5.5	3.90	0.80	0.80	0.070	0.910	0.180	0.070	172.9	24.6	51.8
31	2	5.50	23.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.5	NA	NA
32	1	5.20	100.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	172.2	25.0	54.0
32	2	5.50	23.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.8	NA	NA
33	1	5.15	102.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	173.1	25.5	49.3
33	2	5.40	26.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.9	NA	NA
34	1	5.05	88.0	36.0	2.9	4.60	0.21	0.57	0.070	0.780	0.160	0.060	173.0	25.2	50.0
34	2	5.30	24.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.6	NA	NA
35	1	NS*	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	48.7
35	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
36	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.0	47.0
36	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
37	1	4.90	90.0	31.0	5.0	4.50	0.90	0.60	0.150	0.520	0.110	0.070	177.9	25.3	43.3
37	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
38	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.8	43.8
38	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
39	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	23.7	42.0
39	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
40	1	4.65	123.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	173.3	26.0	44.0
40	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
41	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	26.5	41.0
41	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
42	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.0	41.0
42	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
43	1	4.50	151.0	61.2	8.0	9.30	0.90	0.90	0.630	1.130	0.250	0.140	173.0	25.3	43.3
43	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
44	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	23.5	44.0
44	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
45	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.8	43.8
45	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
46	1	NA	165.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	173.3	26.1	43.5
46	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
47	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	42.0
47	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
48	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.0	42.0
48	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
49	1	4.55	130.0	54.0	6.8	8.70	1.60	0.60	0.680	1.140	0.260	0.180	173.6	24.8	44.0
49	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA

*NA: Not analyzed.

*NS: No sample taken.

Table A2.19. Drainage quality from AMAX drill core of Duluth Complex rock containing 1.87% sulfur (reactor T).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/l	Ca mg/l	Mg mg/L	Na mg/L	K mg/L	Cu mg/L	Ni mg/l	Co mg/l	Zn mg/L	Vol. ml	Temp. °C	R.H. %
0	1	6.20	370.0	155.0	45.3	13.30	17.60	6.70	0.080	0.380	0.019	0.030	171.7	NA'	NA
0	2	6.40	43.3	10.1	3.0	1.30	1.80	2.10	<0.001	0.017	<0.001	<0.001	201.3	NA	NA
0	3	6.20	19.0	NA	1.1	0.60	0.80	1.30	<0.001	0.006	<0.001	<0.001	204.0	NA	NA
0	4	6.50	24.2	NA	3.3	0.90	0.70	1.70	<0.001	0.006	<0.001	<0.001	197.0	NA	NA
0	5	6.50	18.0	NA	2.9	0.60	0.80	1.00	<0.001	0.003	<0.001	<0.001	197.6	NA	NA
1	1	6.30	118.0	23.5	10.6	4.30	1.60	2.60	0.004	0.031	<0.001	0.010	168.8	25.2	54.5
1	2	6.40	23.0	NA	2.5	0.90	0.39	1.37	<0.001	0.011	<0.001	<0.001	198.7	NA	NA
1	3	6.60	12.5	NA	1.4	0.50	0.21	0.91	<0.001	0.013	<0.001	<0.001	199.2	NA	NA
1	4	6.65	10.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.6	NA	NA
2	1	6.80	70.0	32.4	6.2	2.40	0.49	2.70	0.004	0.006	0.001	0.010	167.7	24.4	53.0
2	2	6.95	15.5	NA	1.8	0.70	0.25	1.16	0.001	0.002	<0.001	0.010	200.3	NA	NA
2	3	6.95	10.5	NA	1.3	0.50	0.12	0.90	0.003	<0.001	<0.001	<0.001	200.6	NA	NA
3	1	6.90	48.0	NA	6.3	1.81	0.46	2.18	0.002	0.005	0.005	0.010	171.3	24.8	50.0
3	2	6.95	13.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.0	NA	NA
4	1	6.85	62.0	20.4	6.9	1.33	0.38	2.03	<0.001	0.005	0.006	0.010	172.8	24.4	51.3
4	2	7.00	14.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.8	NA	NA
5	1	6.75	70.0	27.0	7.8	2.56	0.36	2.18	0.002	0.007	0.001	0.010	170.5	25.0	60.0
5	2	6.90	14.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.1	NA	NA
6	1	6.80	79.0	27.5	8.5	2.35	0.32	1.92	0.009	0.008	0.002	<0.010	170.5	25.0	55.3
6	2	7.00	12.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.1	NA	NA
7	1	6.70	85.0	29.0	8.6	2.35	0.37	1.79	0.008	0.003	<0.001	0.010	173.0	25.0	56.0
7	2	6.85	14.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.6	NA	NA
8	1	6.70	90.0	36.0	9.9	2.40	0.37	2.29	0.002	0.009	0.003	<0.010	172.9	25.8	69.4
8	2	6.85	17.0	NA	1.9	0.34	0.13	0.85	0.005	0.003	0.001	<0.010	201.4	NA	NA
9	1	6.75	110.0	40.0	13.0	3.90	0.43	2.26	0.006	0.015	0.002	<0.010	170.8	25.3	59.0
9	2	6.90	16.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.0	NA	NA
10	1	6.70	110.0	44.0	12.9	3.05	0.37	1.99	<0.001	0.017	0.002	<0.010	171.7	24.8	65.3
10	2	6.85	15.0	NA	1.6	3.10	1.00	0.59	<0.001	0.001	<0.001	<0.010	201.1	NA	NA
11	1	6.90	98.0	38.5	11.4	2.47	0.33	2.44	0.001	0.014	0.009	0.010	171.4	25.2	55.7
11	2	6.95	15.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.0	NA	NA
12	1	6.60	120.0	42.0	13.3	3.62	0.29	2.49	0.010	0.090	0.010	0.010	180.6	25.2	60.3
12	2	6.80	26.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	196.0	NA	NA
13	1	6.10	150.0	115.0	18.1	5.06	0.34	3.22	0.010	0.240	0.020	0.020	171.9	24.7	63.3
13	2	6.25	29.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	203.3	NA	NA
14	1	5.80	168.0	100.0	18.6	6.80	NA	3.00	0.005	0.440	0.069	0.030	172.7	24.3	62.3
14	2	6.10	42.0	NA	4.0	1.60	NA	1.20	0.001	0.090	0.014	0.009	199.8	NA	NA
15	1	5.55	205.0	125.0	22.4	6.82	0.43	3.80	0.030	0.940	0.140	0.050	172.4	24.5	71.3
15	2	5.75	62.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.9	NA	NA
16	1	5.55	162.0	82.0	18.3	6.04	0.45	3.22	0.020	0.940	0.180	0.060	172.2	25.7	69.3
16	2	5.70	38.0	NA	3.2	1.80	NA	1.20	0.003	0.190	0.029	0.009	201.4	NA	NA
17	1	5.70	130.0	61.0	13.9	5.50	0.39	2.42	0.020	0.900	0.180	0.060	171.9	24.1	63.0
17	2	5.85	31.0	14.0	2.4	1.60	NA	1.00	0.002	0.180	0.030	0.006	202.1	NA	NA
18	1	5.80	105.0	43.0	8.4	3.50	0.37	2.07	0.010	0.810	0.130	0.060	175.2	25.5	70.3
18	2	5.90	27.0	11.0	NA	NA	NA	NA	NA	NA	NA	NA	202.3	NA	NA
19	1	5.50	103.0	41.0	7.8	4.50	0.30	1.63	0.010	0.710	0.130	0.050	174.0	25.3	64.8
19	2	5.65	22.0	9.0	NA	NA	NA	NA	NA	NA	NA	NA	199.8	NA	NA
20	1	5.55	110.0	32.5	7.3	3.30	0.35	1.78	0.010	0.970	0.180	0.060	173.6	24.6	70.5
20	2	5.65	23.0	10.0	NA	NA	NA	NA	NA	NA	NA	NA	202.3	NA	NA
21	1	5.55	90.0	37.0	NA	NA	NA	NA	NA	NA	NA	NA	172.9	25.2	69.3
21	2	5.65	24.0	11.0	NA	NA	NA	NA	NA	NA	NA	NA	201.4	NA	NA
22	1	5.45	95.0	40.5	6.5	5.10	0.24	1.20	0.010	0.810	0.170	0.070	173.7	26.4	59.5
22	2	5.60	19.0	8.5	NA	NA	NA	NA	NA	NA	NA	NA	201.1	NA	NA
23	1	5.60	95.0	40.0	NA	NA	NA	NA	NA	NA	NA	NA	173.5	24.9	56.8
23	2	5.75	25.0	12.5	NA	NA	NA	NA	NA	NA	NA	NA	200.7	NA	NA
24	1	5.40	98.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	172.3	25.2	56.7
24	2	NS²	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
25	1	5.60	110.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	175.5	25.7	55.0
25	2	5.70	23.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.4	NA	NA

Table A2.19. Drainage quality from AMAX drill core of Duluth Complex rock containing 1.87% sulfur (reactor T).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/L	Ca mg/L	Mg mg/l	Na mg/L	K mg/L	Cu mg/L	Ni mg/L	Co mg/l	Zn mg/l	Vol. ml	Temp. °C	R.H. %
26	1	5.40	91.0	36.0	5.0	3.80	0.61	0.94	0.020	0.840	0.160	0.070	174.3	24.5	58.0
26	2	5.65	21.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.3	NA	NA
27	1	5.40	73.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	172.6	24.2	56.8
27	2	5.55	26.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.2	NA	NA
28	1	5.30	89.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	173.3	25.0	52.0
28	2	5.40	21.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	203.0	NA	NA
29	1	5.20	102.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	172.6	24.8	51.0
29	2	5.30	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.9	NA	NA
30	1	5.25	95.0	NA	4.7	4.50	0.90	0.80	0.080	0.880	0.190	0.080	172.8	24.9	50.4
30	2	5.35	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.2	NA	NA
31	1	5.15	96.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	173.3	24.6	51.8
31	2	5.30	27.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.8	NA	NA
32	1	5.15	105.0	45.0	5.4	6.80	0.29	0.61	0.110	1.070	0.250	0.100	173.5	25.0	54.0
32	2	5.30	31.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.5	NA	NA
33	1	5.00	112.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	171.5	25.5	49.3
33	2	5.30	32.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.6	NA	NA
34	1	4.90	100.0	43.0	4.0	6.50	0.26	0.53	0.150	0.970	0.210	0.100	171.6	25.2	50.0
34	2	5.15	28.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.3	NA	NA
35	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	48.7
35	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
36	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.0	47.0
36	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
37	1	4.70	103.0	42.0	5.0	6.40	0.90	0.70	0.330	0.660	0.140	0.090	172.0	25.3	43.3
37	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
38	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.8	43.8
38	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
39	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	23.7	42.0
39	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
40	1	4.40	168.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	172.4	26.0	44.0
40	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
41	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	26.5	41.0
41	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
42	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.0	41.0
42	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
43	1	4.25	187.0	78.0	7.5	14.40	1.00	0.70	0.970	1.650	0.360	0.210	171.5	25.3	43.3
43	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
44	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	23.5	44.0
44	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
45	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.8	43.8
45	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
46	1	4.40	180.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	175.9	26.1	43.5
46	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
47	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	42.0
47	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
48	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.0	42.0
48	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
49	1	4.20	162.0	65.2	5.4	12.30	1.00	0.60	1.080	1.400	0.300	0.210	172.0	24.8	44.0
49	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA

[1]NA: Not analyzed.

[2]NS: No sample taken.

Table A2.20. Drainage quality from AMAX drill core of Duluth Complex rock containing 2.01% sulfur (reactor B).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/l	Ca mg/l	Mg mg/L	Na mg/l	K mg/L	Cu mg/L	Ni mg/L	Co mg/L	Zn mg/L	Vol. ml	Temp. °C	R.H. %
0	1	4.60	280.0	NA'	23.2	7.90	5.07	5.35	0.100	1.450	0.220	0.150	170.6	24.4	51.3
0	2	5.05	37.5	17.0	3.2	0.45	0.17	0.57	0.003	0.160	0.017	0.020	198.3	NA	NA
0	3	5.25	15.0	9.0	1.6	0.14	0.08	0.30	<0.001	0.070	0.007	0.010	198.7	NA	NA
0	4	5.35	9.0	NA	1.4	0.08	0.05	0.21	<0.001	0.030	0.004	<0.010	199.7	NA	NA
0	5	5.15	7.0	NA	0.9	0.06	0.05	0.19	<0.001	0.024	0.003	<0.010	199.2	NA	NA
1	1	4.50	98.0	30.0	8.6	2.47	0.81	2.12	0.040	1.810	0.210	0.090	173.0	25.0	60.0
1	2	4.80	26.0	11.0	2.4	0.31	0.13	0.44	0.009	0.480	0.060	0.030	198.7	NA	NA
1	3	4.65	14.0	NA	1.3	0.11	0.10	0.25	0.007	0.200	0.029	0.020	200.9	NA	NA
1	4	4.90	10.0	NA	1.0	0.20	0.70	0.20	0.020	0.150	0.010	0.020	201.0	NA	NA
2	1	4.25	60.0	17.5	4.9	0.90	0.52	1.31	0.031	1.390	0.180	0.100	172.3	25.0	55.3
2	2	4.60	18.0	NA	1.7	0.20	0.07	0.27	0.012	0.380	0.050	0.030	198.2	NA	NA
2	3	4.60	12.0	NA	1.2	0.10	0.05	0.15	0.009	0.210	0.030	0.020	197.4	NA	NA
3	1	4.50	58.0	14.0	3.0	0.63	0.53	0.86	0.033	1.240	0.170	0.100	172.5	25.0	56.0
3	2	4.60	20.5	6.3	1.2	0.19	0.11	0.20	0.015	0.400	0.070	0.040	200.9	NA	NA
4	1	4.35	60.0	16.0	2.8	0.57	0.48	0.82	0.020	1.270	0.190	0.080	172.5	25.8	69.4
4	2	4.45	22.0	7.0	1.3	0.20	0.13	0.21	0.011	0.500	0.070	0.020	200.2	NA	NA
5	1	4.50	44.0	13.0	1.7	0.45	0.40	0.47	0.030	1.050	0.170	0.060	174.8	25.3	59.0
5	2	4.60	19.0	5.5	0.7	0.15	0.09	0.11	0.009	0.360	0.050	0.020	201.5	NA	NA
6	1	4.40	41.0	14.5	1.8	0.39	0.40	0.38	0.030	1.010	0.170	0.050	173.5	24.8	65.3
6	2	4.50	18.0	7.0	0.6	0.13	0.20	0.10	0.009	0.390	0.060	0.020	201.8	NA	NA
7	1	4.60	45.0	12.5	2.0	0.38	0.33	0.40	0.030	0.980	0.190	0.060	171.4	25.2	55.7
7	2	4.75	19.0	5.5	1.0	0.12	0.08	0.09	0.011	0.330	0.090	0.020	200.7	NA	NA
8	1	4.60	60.0	20.0	2.5	0.50	0.24	0.33	0.030	1.320	0.210	0.060	171.9	25.2	60.3
8	2	4.80	20.0	5.0	1.3	0.13	0.05	0.09	0.020	0.370	0.040	0.020	202.2	NA	NA
9	1	4.60	62.0	20.0	2.3	0.41	0.25	0.36	0.030	1.300	0.220	0.060	171.2	24.7	63.3
9	2	4.80	21.0	5.5	1.3	0.13	0.06	0.09	0.010	0.360	0.040	0.020	204.9	NA	NA
10	1	4.55	62.0	17.0	2.2	0.39	0.24	0.33	0.030	1.240	0.160	0.060	173.6	24.3	62.3
10	2	4.75	21.0	5.0	1.3	0.11	0.05	0.09	0.010	0.360	0.020	0.020	202.1	NA	NA
11	1	4.50	68.0	21.0	2.5	0.43	0.28	0.36	0.030	1.360	0.220	0.060	171.3	24.5	71.3
11	2	4.70	21.0	7.0	1.1	0.09	0.06	0.09	0.010	0.310	0.050	0.020	200.1	NA	NA
12	1	4.55	72.0	28.0	2.2	0.46	0.37	0.40	0.011	1.300	0.200	0.060	174.4	25.7	69.3
12	2	4.75	24.0	8.0	1.0	0.10	0.10	0.12	0.005	0.280	0.033	0.020	199.2	NA	NA
13	1	4.50	70.0	24.0	2.2	0.39	0.34	0.55	0.019	0.940	0.140	0.050	174.0	24.1	63.0
13	2	4.65	25.0	9.0	0.9	0.10	0.07	0.14	0.008	0.230	0.028	0.020	202.7	NA	NA
14	1	4.45	82.0	33.0	NA	NA	NA	NA	NA	NA	NA	NA	172.5	25.5	70.3
14	2	4.70	26.0	8.0	NA	NA	NA	NA	NA	NA	NA	NA	201.5	NA	NA
15	1	4.45	85.0	32.0	2.0	0.60	0.32	0.96	0.020	0.840	0.110	0.050	176.8	25.3	64.8
15	2	4.65	28.0	10.0	0.8	0.20	0.08	0.18	0.010	0.210	0.040	0.020	196.7	NA	NA
16	1	4.40	98.0	38.0	NA	NA	NA	NA	NA	NA	NA	NA	170.8	24.6	70.5
16	2	4.55	28.0	9.5	NA	NA	NA	NA	NA	NA	NA	NA	201.8	NA	NA
17	1	4.30	137.0	60.0	2.7	0.80	0.37	2.30	0.020	1.070	0.140	0.060	174.1	25.2	69.3
17	2	4.50	36.0	11.5	0.8	0.20	0.05	0.31	0.010	0.150	0.020	0.010	201.7	NA	NA
18	1	4.20	165.0	78.0	NA	NA	NA	NA	NA	NA	NA	NA	174.1	26.4	59.5
18	2	4.40	41.0	13.0	NA	NA	NA	NA	NA	NA	NA	NA	200.7	NA	NA
19	1	4.10	258.0	110.0	2.9	1.00	0.43	2.82	0.030	1.120	0.120	0.060	173.8	24.9	56.8
19	2	4.30	60.0	15.0	0.5	0.20	0.05	0.39	0.010	0.120	0.020	0.010	200.1	NA	NA
20	1	3.95	258.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	173.7	25.2	56.7
20	2	4.30	68.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.4	NA	NA
21	1	3.90	264.0	96.0	3.0	1.00	0.43	3.83	0.030	0.740	0.030	0.040	172.7	25.7	55.0
21	2	4.15	71.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.4	NA	NA
22	1	4.00	230.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	172.8	24.5	58.0
22	2	4.20	78.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.0	NA	NA
23	1	3.90	240.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	172.7	24.2	56.8
23	2	4.15	75.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.3	NA	NA
24	1	3.80	215.0	80.0	2.5	1.00	0.34	2.70	0.030	0.510	0.040	0.020	173.1	25.0	52.0
24	2	4.10	72.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	203.2	NA	NA
25	1	3.80	250.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	172.5	24.8	51.0
25	2	4.10	80.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.4	NA	NA

Table A2.20. Drainage quality from AMAX drill core of Duluth Complex rock containing 2.01% sulfur (reactor B).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/L	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cu mg/L	Ni mg/L	Co mg/L	Zn mg/L	Vol. ml	Temp. °C	R.H. %
26	1	3.75	250.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	170.5	24.9	50.4
26	2	4.00	80.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	203.7	NA	NA
27	1	3.80	248.0	92.0	2.1	0.80	0.30	2.29	0.030	0.680	0.050	0.020	172.2	24.6	51.8
27	2	4.05	88.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.7	NA	NA
28	1	3.75	258.0	94.0	2.5	0.80	0.30	2.55	0.040	0.720	0.050	0.020	172.1	25.0	54.0
28	2	4.15	85.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.3	NA	NA
29	1	3.80	251.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	171.5	25.5	49.3
29	2	4.05	82.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	203.0	NA	NA
30	1	3.70	260.0	110.0	2.2	0.70	0.28	2.16	0.040	0.670	0.060	0.020	171.3	25.2	50.0
30	2	4.05	89.0	NA	0.9	0.10	0.70	0.50	0.040	0.130	0.020	0.010	201.4	NA	NA

'NA: Not analyzed.

Table A2.21. Drainage quality from AMAX drill core of Duluth Complex rock containing 2.17% sulfur (reactor U).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/L	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cu mg/L	Ni mg/L	Co mg/L	Zn mg/L	Vol. ml	Temp. °C	R.H. %
0	1	5.70	155.0	55.0	19.4	4.30	8.50	40.00	0.008	0.340	0.005	0.050	170.0	NA[1]	NA
0	2	5.70	18.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.1	NA	NA
0	3	5.70	10.1	NA	0.4	0.20	0.50	0.70	<0.001	0.014	<0.001	<0.001	196.5	NA	NA
0	4	5.75	7.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.4	NA	NA
0	5	5.65	7.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	191.2	NA	NA
1	1	5.45	43.5	10.9	4.0	1.30	1.25	1.91	<0.001	0.180	0.001	0.020	171.0	25.2	54.5
1	2	5.50	10.5	NA	0.9	0.30	0.22	0.59	<0.001	0.055	0.001	<0.001	200.7	NA	NA
1	3	5.55	6.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.3	NA	NA
1	4	5.55	5.0	NA	0.5	0.20	0.09	0.28	<0.001	0.029	0.001	<0.001	198.8	NA	NA
2	1	5.60	27.0	3.0	2.3	1.00	0.46	1.37	0.008	0.140	0.010	0.020	170.0	24.4	53.0
2	2	5.90	7.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.0	NA	NA
2	3	5.85	3.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.7	NA	NA
3	1	6.00	26.0	NA	2.5	0.54	0.62	1.12	0.010	0.170	0.020	0.020	170.2	24.8	50.0
3	2	5.80	7.0	NA	1.0	0.08	0.22	0.40	0.010	0.030	0.010	0.010	198.8	NA	NA
4	1	5.65	30.0	14.1	3.1	0.72	0.39	1.17	0.010	0.290	0.030	0.030	170.0	24.4	51.3
4	2	5.80	7.0	NA	1.3	0.09	0.10	0.41	0.010	0.030	0.010	0.010	201.1	NA	NA
5	1	5.55	31.0	14.1	2.9	0.78	0.36	1.22	0.010	0.410	0.030	0.030	169.6	25.0	60.0
5	2	5.70	7.5	NA	0.9	0.10	0.08	0.37	<0.010	0.060	0.010	0.010	201.6	NA	NA
6	1	5.60	29.0	12.3	2.6	0.75	0.31	0.99	0.008	0.470	0.040	0.040	167.4	25.0	55.3
6	2	5.55	7.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.6	NA	NA
7	1	5.35	32.0	12.6	2.3	0.72	0.54	0.99	0.012	0.580	0.060	0.050	170.1	25.0	56.0
7	2	5.50	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	203.0	NA	NA
8	1	5.40	33.0	12.9	2.7	0.75	0.30	1.02	0.009	0.660	0.070	0.040	171.3	25.8	69.4
8	2	5.50	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.7	NA	NA
9	1	5.60	33.0	13.0	2.6	0.76	0.31	0.81	0.059	0.780	0.100	0.050	171.0	25.3	59.0
9	2	5.75	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.0	NA	NA
10	1	5.60	33.0	13.0	2.1	0.74	0.29	0.67	0.010	0.810	0.090	0.060	171.0	24.8	65.3
10	2	5.65	8.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.7	NA	NA
11	1	5.50	37.0	13.3	2.8	0.76	0.34	0.78	0.020	0.940	0.120	0.080	170.1	25.2	55.7
11	2	5.80	9.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.7	NA	NA
12	1	5.40	45.0	18.5	3.1	1.05	0.23	0.65	0.040	1.480	0.160	0.120	172.0	25.2	60.3
12	2	5.60	10.5	NA	0.8	0.17	0.05	0.19	0.010	0.250	0.040	0.020	200.4	NA	NA
13	1	5.10	70.0	26.0	4.2	1.57	0.35	0.74	0.090	2.320	0.250	0.210	169.8	24.7	63.3
13	2	5.30	15.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.9	NA	NA
14	1	4.75	85.0	31.0	5.4	1.94	0.31	0.83	0.260	2.730	0.290	0.300	172.1	24.3	62.3
14	2	5.00	19.0	NA	1.2	0.25	0.07	0.21	0.060	0.370	0.040	0.040	201.1	NA	NA
15	1	4.50	100.0	35.0	5.3	2.48	0.37	1.26	0.730	2.870	0.300	0.430	171.7	24.5	71.3
15	2	4.70	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.6	NA	NA
16	1	4.40	110.0	42.0	4.8	2.87	0.38	1.56	0.750	2.720	0.290	0.440	171.1	25.7	69.3
16	2	4.70	33.0	10.5	1.2	0.37	0.14	0.34	0.140	0.370	0.050	0.070	201.6	NA	NA
17	1	4.30	110.0	41.0	4.0	2.73	0.36	1.74	0.570	2.060	0.200	0.360	171.8	24.1	63.0
17	2	4.60	29.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.4	NA	NA
18	1	4.35	115.0	49.0	NA	NA	NA	NA	NA	NA	NA	NA	172.1	25.5	70.3
18	2	4.60	34.0	10.5	NA	NA	NA	NA	NA	NA	NA	NA	201.9	NA	NA
19	1	4.30	128.0	48.0	2.6	2.80	0.28	1.94	0.350	1.280	0.130	0.240	170.8	25.3	64.8
19	2	4.50	39.0	11.0	NA	NA	NA	NA	NA	NA	NA	NA	202.6	NA	NA
20	1	4.35	135.0	54.0	NA	NA	NA	NA	NA	NA	NA	NA	171.1	24.6	70.5
20	2	4.60	32.0	10.5	NA	NA	NA	NA	NA	NA	NA	NA	200.5	NA	NA
21	1	4.35	128.0	55.0	1.8	2.30	0.21	1.48	0.120	0.920	0.100	0.140	171.6	25.2	69.3
21	2	4.60	33.0	12.0	NA	NA	NA	NA	NA	NA	NA	NA	193.2	NA	NA
22	1	NS[2]	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	26.4	59.5
22	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
23	1	4.20	155.0	61.0	1.4	2.30	0.26	1.49	0.090	0.940	0.110	0.140	171.0	24.9	56.8
23	2	4.55	42.0	14.0	NA	NA	NA	NA	NA	NA	NA	NA	200.9	NA	NA
24	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.2	56.7
24	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
25	1	4.20	210.0	NA	2.0	2.10	1.20	1.20	0.150	1.260	0.130	0.140	171.4	25.7	55.0
25	2	4.50	60.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.8	NA	NA

Table A2.21. Drainage quality from AMAX drill core of Duluth Complex rock containing 2.17% sulfur (reactor U).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/L	Ca mg/l	Mg mg/L	Na mg/l	K mg/L	Cu mg/L	Ni mg/l	Co mg/L	Zn mg/l	Vol. ml	Temp. °C	R.H. %
26	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	58.0
26	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
27	1	4.00	218.0	104.0	1.5	1.70	0.38	2.04	0.080	1.220	0.210	0.130	171.3	24.2	56.8
27	2	4.40	68.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.6	NA	NA
28	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.0	52.0
28	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
29	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.8	51.0
29	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
30	1	3.95	248.0	104.0	1.4	2.40	0.41	2.40	0.120	1.220	0.110	0.120	170.7	24.9	50.4
30	2	4.30	69.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.5	NA	NA
31	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.6	51.8
31	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
32	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.0	54.0
32	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
33	1	3.90	210.0	81.5	1.2	2.30	0.38	2.32	0.300	0.980	0.080	0.110	170.6	25.5	49.3
33	2	4.20	69.0	NA	0.7	0.30	0.70	0.50	0.120	0.170	0.030	0.030	202.1	NA	NA

[1]NA: Not analyzed.

[2]NS: No sample taken.

Table A2.22. Drainage quality from AMAX drill core of Duluth Complex rock containing 2.17% sulfur (reactor V).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/L	Ca mg/l	Mg mg/L	Na mg/L	K mg/L	Cu mg/L	Ni mg/L	Co mg/L	Zn mg/L	Vol. mL	Temp. °C	R.H. %
0	1	5.65	160.0	55.0	18.2	4.30	8.60	2.90	0.007	0.350	0.004	0.050	170.0	NA'	NA
0	2	5.60	16.2	NA	0.8	0.40	0.90	1.00	<0.001	0.021	<0.001	0.010	197.4	NA	NA
0	3	5.90	9.3	NA	0.2	0.20	0.50	0.80	<0.001	0.010	<0.001	<0.001	198.0	NA	NA
0	4	5.75	7.5	NA	1.2	0.20	0.70	0.40	<0.001	0.008	<0.001	<0.001	198.6	NA	NA
0	5	5.80	6.3	1.0	1.6	0.10	0.40	0.10	<0.001	0.006	<0.001	<0.001	198.2	NA	NA
1	1	5.55	46.5	12.5	4.5	1.40	1.29	1.98	<0.001	0.200	0.004	0.020	165.6	25.2	54.5
1	2	5.60	10.0	NA	1.0	0.20	0.21	0.57	<0.001	0.060	0.002	<0.001	197.3	NA	NA
1	3	5.70	6.0	NA	0.8	0.10	0.11	0.34	<0.001	0.035	0.001	<0.001	199.9	NA	NA
1	4	5.60	3.8	NA	0.7	0.10	0.09	0.27	<0.001	0.030	<0.001	<0.001	200.1	NA	NA
2	1	5.70	27.0	8.2	2.4	1.00	0.50	1.53	0.001	0.150	0.010	0.020	169.3	24.4	53.0
2	2	5.85	8.0	NA	0.8	0.30	0.14	0.58	0.001	0.040	<0.010	<0.001	202.2	NA	NA
2	3	5.80	4.1	NA	0.6	0.20	0.10	0.39	0.003	0.020	<0.010	<0.001	200.1	NA	NA
3	1	5.75	26.0	10.8	2.9	0.60	0.48	1.16	0.010	0.180	0.020	0.020	170.8	24.8	50.0
3	2	5.95	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.4	NA	NA
4	1	5.65	28.0	13.2	3.1	0.70	0.42	1.29	0.010	0.280	0.020	0.030	169.4	24.4	51.3
4	2	5.80	7.5	NA	1.3	0.10	0.09	0.43	<0.010	0.040	<0.010	0.010	200.2	NA	NA
5	1	5.50	33.0	15.0	3.2	0.86	0.38	1.44	0.010	0.460	0.030	0.030	169.8	25.0	60.0
5	2	5.65	8.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.1	NA	NA
6	1	4.90	75.0	27.5	6.5	2.21	0.47	1.90	0.028	1.480	0.150	0.120	168.8	25.0	55.3
6	2	4.90	14.0	NA	1.1	0.31	0.09	0.49	0.011	0.230	0.020	0.030	201.2	NA	NA
7	1	4.60	100.0	35.5	6.8	2.68	0.60	2.48	0.110	2.570	0.270	0.270	174.3	25.0	56.0
7	2	4.75	21.0	NA	1.4	0.42	0.10	0.57	0.030	0.440	0.060	0.060	198.5	NA	NA
8	1	5.40	80.0	30.5	5.0	1.78	0.47	2.28	0.100	1.740	0.200	0.220	172.1	25.8	69.4
8	2	5.50	17.0	NA	1.4	0.26	0.06	0.54	0.019	0.300	0.037	0.030	200.1	NA	NA
9	1	5.60	65.0	24.5	3.6	1.30	0.42	1.46	0.120	1.300	0.120	0.190	170.8	25.3	59.0
9	2	5.75	14.0	NA	0.8	0.21	0.12	0.35	0.020	0.120	0.002	0.030	200.7	NA	NA
10	1	5.60	60.0	21.0	2.6	1.19	0.37	1.10	0.110	1.100	0.120	0.160	170.5	24.8	65.3
10	2	5.65	15.0	NA	0.8	0.21	0.07	0.27	0.020	0.230	0.020	0.030	202.5	NA	NA
11	1	5.50	60.0	20.0	2.8	1.06	0.32	1.19	0.100	0.940	0.120	0.150	170.1	25.2	55.7
11	2	5.80	16.0	NA	1.1	0.20	0.08	0.31	0.020	0.220	0.030	0.030	201.7	NA	NA
12	1	5.40	60.0	20.0	2.7	1.18	0.29	0.93	0.110	1.090	0.110	0.140	171.0	25.2	60.3
12	2	5.60	16.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.9	NA	NA
13	1	4.75	58.0	18.5	2.3	1.05	0.28	0.89	0.100	0.900	0.100	0.120	168.6	24.7	63.3
13	2	4.95	16.0	NA	0.9	0.22	0.07	0.27	0.030	0.200	0.040	0.020	203.3	NA	NA
14	1	4.75	58.0	18.5	2.3	1.05	0.29	0.77	0.100	0.830	0.090	0.120	171.4	24.3	62.3
14	2	4.95	16.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.7	NA	NA
15	1	4.70	58.0	18.5	2.1	1.10	0.24	0.75	0.100	0.890	0.110	0.110	170.5	24.5	71.3
15	2	4.95	15.0	NA	0.7	0.19	0.05	0.19	0.030	0.170	0.040	0.010	203.1	NA	NA
16	1	4.70	55.0	20.5	1.9	1.06	0.24	0.87	0.100	0.780	0.100	0.130	170.8	25.7	69.3
16	2	4.95	17.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.7	NA	NA
17	1	4.70	49.0	19.0	1.6	1.30	0.21	0.95	0.090	0.790	0.080	0.120	173.4	24.1	63.0
17	2	4.95	15.0	4.5	0.5	0.30	0.05	0.22	0.020	0.170	0.040	0.020	201.9	NA	NA
18	1	4.80	60.0	NA	1.5	1.10	0.21	0.95	0.100	0.640	0.080	0.110	172.4	25.5	70.3
18	2	5.10	19.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.6	NA	NA
19	1	4.70	54.0	18.0	NA	NA	NA	NA	NA	NA	NA	NA	172.7	25.3	64.8
19	2	4.90	17.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.6	NA	NA
20	1	4.75	58.0	18.5	NA	NA	NA	NA	NA	NA	NA	NA	172.5	24.6	70.5
20	2	5.00	17.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.4	NA	NA
21	1	4.65	45.0	18.0	1.3	1.10	0.15	0.88	0.110	0.550	0.080	0.100	172.3	25.2	69.3
21	2	4.95	16.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	203.7	NA	NA
22	1	NS[a]	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	26.4	59.5
22	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
23	1	4.70	58.0	21.0	1.3	1.10	0.18	0.86	0.140	0.570	0.080	0.100	172.0	24.9	56.8
23	2	4.95	18.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.2	NA	NA
24	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.2	56.7
24	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
25	1	4.60	68.0	18.0	1.5	0.90	0.80	0.80	0.340	0.750	0.100	0.100	172.3	25.7	55.0
25	2	4.95	19.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	203.0	NA	NA

Table A2.22. Drainage quality from AMAX drill core of Duluth Complex rock containing 2.17% sulfur (reactor V).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/L	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cu mg/L	Ni mg/L	Co mg/L	Zn mg/L	Vol. ml	Temp. °C	R.H. %
26	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	58.0
26	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
27	1	4.55	60.0	17.5	1.1	1.00	0.22	0.56	0.190	0.570	0.060	0.080	172.8	24.2	56.8
27	2	4.85	22.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	203.0	NA	NA
28	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.0	57.0
28	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
29	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.8	51.0
29	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
30	1	4.60	50.0	16.0	1.0	1.00	0.24	0.46	0.240	0.500	0.060	0.080	172.8	24.9	50.4
30	2	4.90	20.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.0	NA	NA
31	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.6	51.8
31	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
32	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.0	54.0
32	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
33	1	4.55	48.0	15.5	1.0	0.90	0.21	0.35	0.250	0.450	0.050	0.070	172.2	25.5	49.3
33	2	4.85	18.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.4	NA	NA

[1]NA: Not analyzed.

[2]NS: No sample taken.

Table A2.23. Drainage quality from AMAX drill core of Duluth Complex rock containing 2.57% sulfur (reactor W).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/L	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cu mg/L	Ni mg/L	Co mg/L	Zn mg/L	Vol. ml	Temp. °C	R.H. %
0	1	4.50	202.0	105.0	14.6	6.50	13.10	1.90	0.009	0.690	0.056	0.140	170.0	NA'	NA
0	2	4.80	31.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	197.4	NA	NA
0	3	5.05	17.8	NA	0.1	0.30	1.00	0.30	<0.001	0.022	<0.001	0.010	198.0	NA	NA
0	4	4.95	13.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.6	NA	NA
0	5	5.40	11.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.2	NA	NA
1	1	4.25	60.0	13.0	2.4	1.80	2.25	0.92	0.024	0.590	0.037	0.110	165.6	25.2	54.5
1	2	4.30	17.5	NA	0.9	0.40	0.65	0.35	0.007	0.180	0.002	0.050	197.3	NA	NA
1	3	4.45	11.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.9	NA	NA
1	4	4.50	9.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.1	NA	NA
2	1	4.40	41.0	8.0	1.7	1.70	0.84	0.81	0.020	0.710	0.010	0.170	169.3	24.4	53.0
2	2	4.50	16.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.2	NA	NA
2	3	4.50	11.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.1	NA	NA
3	1	4.50	33.0	8.7	2.0	0.99	0.94	0.59	0.020	0.630	0.040	0.170	170.8	24.8	50.0
3	2	4.65	14.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.4	NA	NA
4	1	4.50	30.5	NA	1.9	0.88	0.75	0.57	0.020	0.690	0.050	0.210	169.4	24.4	51.3
4	2	4.60	13.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.2	NA	NA
5	1	4.40	28.5	7.2	1.5	0.72	0.57	0.51	0.020	0.670	0.060	0.230	169.8	25.0	60.0
5	2	4.60	13.0	NA	0.7	0.16	0.25	0.25	0.010	0.220	0.020	0.090	200.1	NA	NA
6	1	4.25	28.0	7.2	1.4	0.64	0.49	0.40	0.018	0.610	0.060	0.250	168.8	25.0	55.3
6	2	4.30	13.5	NA	0.6	0.19	0.19	0.19	0.010	0.210	0.020	0.100	201.2	NA	NA
7	1	4.25	31.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	174.3	25.0	56.0
7	2	4.30	15.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.5	NA	NA
8	1	4.20	35.0	13.3	1.3	0.57	0.39	0.41	0.017	0.610	0.070	0.260	169.3	25.8	69.4
8	2	4.40	16.0	NA	0.6	0.14	0.19	0.21	0.009	0.200	0.022	0.080	202.5	NA	NA
9	1	4.35	34.0	11.0	NA	NA	NA	NA	NA	NA	NA	NA	169.1	25.3	59.0
9	2	4.60	17.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.1	NA	NA
10	1	4.45	34.5	16.5	0.8	0.51	0.39	0.28	0.020	0.550	0.070	0.260	167.8	24.8	65.3
10	2	4.60	18.0	NA	0.4	0.13	0.15	0.12	0.007	0.210	0.020	0.090	202.1	NA	NA
11	1	4.40	44.0	10.3	1.1	1.49	0.32	0.34	0.020	0.530	0.070	0.270	167.3	25.2	55.7
11	2	4.60	21.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.9	NA	NA
12	1	4.40	49.0	18.5	1.3	0.49	0.45	0.32	0.030	0.640	0.070	0.300	169.1	25.2	60.3
12	2	4.50	23.0	NA	0.6	0.11	0.17	0.13	0.020	0.170	0.020	0.070	202.2	NA	NA
13	1	4.30	55.0	14.5	NA	NA	NA	NA	NA	NA	NA	NA	168.2	24.7	63.3
13	2	4.45	24.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	203.6	NA	NA
14	1	4.25	62.0	14.0	1.2	0.49	0.26	0.25	0.020	0.600	0.070	0.270	168.9	24.3	62.3
14	2	4.45	27.0	NA	0.7	0.11	0.11	0.11	0.010	0.160	0.020	0.070	201.1	NA	NA
15	1	4.30	65.0	14.0	NA	NA	NA	NA	NA	NA	NA	NA	170.1	24.5	71.3
15	2	4.50	29.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.0	NA	NA
16	1	4.30	72.0	22.5	0.9	0.80	0.21	0.19	0.020	0.710	0.070	0.290	169.1	25.7	69.3
16	2	4.45	31.0	9.5	0.4	0.20	0.09	0.07	0.010	0.160	0.030	0.070	200.9	NA	NA
17	1	4.40	72.0	17.0	0.8	0.80	0.45	0.19	0.020	0.690	0.040	0.300	170.2	24.1	63.0
17	2	4.50	29.0	NA	0.7	0.40	0.12	0.12	0.010	0.120	0.010	0.070	203.5	NA	NA
18	1	4.45	80.0	33.0	0.9	0.80	0.41	0.19	0.010	0.660	0.070	0.260	168.1	25.5	70.3
18	2	4.60	29.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	203.1	NA	NA
19	1	4.25	90.0	34.0	0.6	0.80	0.37	0.22	0.020	0.670	0.060	0.200	169.6	25.3	64.8
19	2	4.40	36.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.4	NA	NA
20	1	4.50	96.0	25.0	NA	NA	NA	NA	NA	NA	NA	NA	169.1	24.6	70.5
20	2	4.60	32.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.7	NA	NA
21	1	4.20	97.0	22.5	1.3	0.60	0.32	0.35	0.010	0.770	0.070	0.120	169.6	25.2	69.3
21	2	4.40	38.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.2	NA	NA
22	1	NS*	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	26.4	59.5
22	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
23	1	4.00	108.0	27.0	1.8	0.80	0.44	0.49	0.050	0.900	0.070	0.130	169.6	24.9	56.8
23	2	4.15	60.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.9	NA	NA
24	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.2	56.7
24	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
25	1	4.00	118.0	NA	1.3	0.90	1.00	0.40	0.090	0.940	0.060	0.110	169.8	25.7	55.0
25	2	4.20	62.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.3	NA	NA

Table A2.23. Drainage quality from AMAX drill core of Duluth Complex rock containing 2.57% sulfur (reactor W).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/L	Ca mg/l	Mg mg/l	Na mg/L	K mg/l	Cu mg/l	Ni mg/l	Co mg/L	Zn mg/l	Vol. ml	Temp. °C	R.H. %
26	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	58.0
26	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
27	1	3.95	108.0	22.5	1.0	0.90	0.43	0.35	0.050	0.750	0.050	0.090	170.1	24.2	56.8
27	2	4.15	62.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	197.8	NA	NA
28	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.0	52.0
28	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
29	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.8	51.0
29	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
30	1	4.05	110.0	22.5	0.9	0.80	0.41	0.33	0.060	0.640	0.050	0.080	168.6	24.9	50.4
30	2	4.20	62.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.3	NA	NA
31	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.6	51.8
31	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
32	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.0	54.0
32	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
33	1	4.05	93.0	18.0	0.9	0.70	0.39	0.30	0.050	0.510	0.040	0.070	168.7	25.5	49.3
33	2	4.15	58.0	NA	0.6	0.20	0.70	0.20	0.060	0.150	0.030	0.030	201.8	NA	NA

[1]NA: Not analyzed.
[2]NS: No sample taken.

Table A2.24. Drainage quality from AMAX drill core of Duluth Complex rock containing 2.57% sulfur (reactor X).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/L	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cu mg/L	Ni mg/l	Co mg/L	Zn mg/L	Vol. mL	Temp. °C	R.H. %
0	1	4.30	205.0	105.0	15.2	6.50	13.10	2.00	0.030	0.720	0.059	0.150	169.3	NA'	NA
0	2	4.70	31.2	10.9	0.6	0.50	1.80	0.40	<0.001	0.045	0.004	0.020	200.3	NA	NA
0	3	4.85	18.3	NA	<0.1	0.30	1.20	0.30	<0.001	0.028	0.001	0.020	198.1	NA	NA
0	4	4.90	14.0	NA	1.0	0.20	1.00	0.40	<0.001	0.020	<0.001	0.010	198.4	NA	NA
0	5	5.00	11.8	NA	1.3	0.20	0.90	<0.10	<0.001	0.016	<0.001	0.010	198.8	NA	NA
1	1	4.30	60.0	11.5	2.3	1.80	2.25	0.94	0.025	0.610	0.039	0.110	164.7	25.2	54.5
1	2	4.35	16.5	5.6	0.7	0.40	0.63	0.35	0.008	0.170	<0.001	0.040	201.2	NA	NA
1	3	4.45	11.5	NA	0.6	0.20	0.37	0.24	0.003	0.110	<0.001	0.030	198.9	NA	NA
1	4	4.40	9.0	NA	0.6	0.20	0.27	0.19	0.002	0.080	<0.001	0.020	199.0	NA	NA
2	1	4.40	39.0	9.3	1.7	1.70	0.82	0.81	0.020	0.690	0.010	0.170	169.2	24.4	53.0
2	2	4.45	16.0	NA	0.8	0.50	0.30	0.35	0.010	0.230	<0.010	0.060	202.2	NA	NA
2	3	4.50	10.0	NA	0.5	0.30	0.18	0.24	0.010	0.120	<0.010	0.040	199.7	NA	NA
3	1	4.50	32.0	7.5	1.8	0.95	0.96	0.58	0.020	0.600	0.040	0.160	167.2	24.8	50.0
3	2	4.70	14.0	3.6	NA	NA	NA	NA	NA	NA	NA	NA	202.2	NA	NA
4	1	4.45	28.5	6.6	1.8	0.76	0.81	0.60	0.020	0.600	0.040	0.180	170.1	24.4	51.3
4	2	4.55	14.0	3.6	1.2	0.18	0.33	0.28	0.010	0.210	0.020	0.070	200.5	NA	NA
5	1	4.40	27.0	7.0	1.3	0.70	0.56	0.51	0.020	0.650	0.050	0.210	168.5	25.0	60.0
5	2	4.55	13.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.7	NA	NA
6	1	4.30	26.5	NA	1.1	0.63	0.48	0.41	0.018	0.560	0.050	0.230	167.5	25.0	55.3
6	2	4.30	12.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	202.2	NA	NA
7	1	4.25	29.0	7.5	1.0	0.58	0.46	0.36	0.017	0.610	0.070	0.250	170.0	25.0	56.0
7	2	4.40	14.5	NA	0.5	0.17	0.23	0.16	0.009	0.230	0.050	0.100	200.8	NA	NA
8	1	4.30	32.0	12.7	NA	NA	NA	NA	NA	NA	NA	NA	169.7	25.8	69.4
8	2	4.45	15.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.1	NA	NA
9	1	4.45	31.0	18.5	1.0	0.50	0.39	0.33	0.020	0.540	0.040	0.250	171.0	25.3	59.0
9	2	4.60	16.0	NA	0.3	0.14	0.22	0.15	0.007	0.048	0.016	0.090	199.0	NA	NA
10	1	4.60	31.5	8.2	NA	NA	NA	NA	NA	NA	NA	NA	168.3	24.8	65.3
10	2	4.70	16.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.1	NA	NA
11	1	4.50	36.0	10.5	1.4	1.20	NA	0.40	0.010	0.570	0.058	0.270	167.7	25.2	55.7
11	2	4.70	18.0	NA	0.7	0.12	0.11	0.14	0.008	0.210	0.020	0.090	202.7	NA	NA
12	1	4.50	42.0	17.0	NA	NA	NA	NA	NA	NA	NA	NA	168.4	25.2	60.3
12	2	NA	20.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.9	NA	NA
13	1	4.45	42.0	11.0	1.2	0.45	0.27	0.26	0.030	0.580	0.070	0.280	168.4	24.7	63.3
13	2	4.70	22.0	NA	0.6	0.11	0.11	0.11	0.020	0.180	0.040	0.080	200.6	NA	NA
14	1	4.35	55.0	12.0	NA	NA	NA	NA	NA	NA	NA	NA	168.7	24.3	62.3
14	2	4.60	24.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	197.9	NA	NA
15	1	4.35	68.0	17.0	1.4	0.59	0.28	0.24	0.030	0.750	0.100	0.380	168.6	24.5	71.3
15	2	4.50	25.0	NA	0.5	0.08	0.08	0.09	0.020	0.130	0.040	0.050	202.3	NA	NA
16	1	4.30	90.0	28.0	1.3	0.80	0.21	0.18	0.020	0.840	0.060	0.420	168.7	25.7	69.3
16	2	4.45	33.0	NA	0.5	0.20	0.09	0.06	0.020	0.150	0.010	0.090	202.4	NA	NA
17	1	4.20	109.0	35.0	0.5	0.80	0.20	0.22	0.010	0.790	0.070	0.340	172.7	24.1	63.0
17	2	4.40	38.0	12.0	0.5	0.20	0.09	0.05	0.010	0.120	0.010	0.070	199.9	NA	NA
18	1	4.35	150.0	68.0	NA	NA	NA	NA	NA	NA	NA	NA	170.1	25.5	70.3
18	2	4.50	42.0	16.5	NA	NA	NA	NA	NA	NA	NA	NA	198.0	NA	NA
19	1	4.10	163.0	42.0	2.2	0.80	0.26	0.49	0.010	1.400	0.110	0.150	169.5	25.3	64.8
19	2	4.25	61.0	17.0	NA	NA	NA	NA	NA	NA	NA	NA	179.8	NA	NA
20	1	4.35	150.0	37.0	NA	NA	NA	NA	NA	NA	NA	NA	169.1	24.6	70.5
20	2	4.55	41.0	15.0	NA	NA	NA	NA	NA	NA	NA	NA	201.2	NA	NA
21	1	4.20	128.0	33.0	1.1	0.90	0.27	0.52	0.010	1.240	0.100	0.060	170.2	25.2	69.3
21	2	4.40	46.0	16.5	NA	NA	NA	NA	NA	NA	NA	NA	202.5	NA	NA
22	1	NS²	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	26.4	59.5
22	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
23	1	4.00	125.0	30.0	1.3	1.20	0.61	0.61	0.040	1.200	0.080	0.110	173.2	24.9	56.8
23	2	4.10	68.0	14.0	NA	NA	NA	NA	NA	NA	NA	NA	200.9	NA	NA
24	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.2	56.7
24	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
25	1	3.95	140.0	NA	1.6	1.70	1.50	0.60	0.070	1.160	0.050	0.080	169.7	25.7	55.0
25	2	4.10	78.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.2	NA	NA

Table A2.24. Drainage quality from AMAX drill core of Duluth Complex rock containing 2.57% sulfur (reactor X).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/L	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cu mg/l	Ni mg/L	Co mg/L	Zn mg/L	Vol. ml.	Temp. °C	R.H. %
26	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.5	58.0
26	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
27	1	3.95	128.0	20.0	1.3	1.10	0.59	0.50	0.030	0.970	0.050	0.060	170.4	24.2	56.8
27	2	4.15	78.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.0	NA	NA
28	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.0	52.0
28	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
29	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.8	51.0
29	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
30	1	4.05	130.0	19.5	1.2	0.90	0.52	0.43	0.040	0.880	0.050	0.050	170.4	24.9	50.4
30	2	4.20	70.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.7	NA	NA
31	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24.6	51.8
31	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
32	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	25.0	54.0
32	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
33	1	4.00	108.0	15.5	1.2	0.80	0.78	0.38	0.040	0.760	0.040	0.050	169.2	25.5	49.3
33	2	4.15	64.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	201.8	NA	NA

[1]NA: Not analyzed.

[2]NS: No sample taken.

Table A2.25. Drainage quality from AMAX drill core of Duluth Complex rock containing 0.00% sulfur (reactor Y).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/L	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cu mg/L	Ni mg/L	Co mg/L	Zn mg/L	Vol. ml	Temp. °C	R.H. %
0	1	5.00	4.3	NA'	<0.1	<0.10	0.70	<0.10	0.004	0.006	<0.001	<0.001	197.1	NA	NA
0	2	5.10	2.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.5	NA	NA
0	3	4.80	3.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.5	NA	NA
0	4	4.80	1.9	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.3	NA	NA
0	5	5.15	2.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.2	NA	NA
1	1	4.90	3.5	NA	0.4	<0.10	0.09	0.01	0.015	0.015	<0.001	0.010	194.7	NA	NA
1	2	5.05	1.8	NA	0.3	<0.10	0.04	<0.01	<0.001	0.014	<0.001	0.010	197.9	NA	NA
1	3	5.00	1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.3	NA	NA
1	4	5.00	1.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.4	NA	NA
2	1	5.75	1.8	NA	0.4	0.10	0.05	0.02	<0.001	<0.001	<0.001	0.010	194.5	NA	NA
2	2	5.65	1.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	197.4	NA	NA
2	3	5.75	1.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	197.8	NA	NA
3	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	195.9	NA	NA
3	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	197.4	NA	NA
4	1	5.30	1.8	NA	0.9	<0.10	0.07	<1.00	0.010	<0.001	<0.001	0.010	193.9	NA	NA
4	2	5.10	1.6	NA	0.7	<0.10	0.13	0.07	<0.010	<0.001	<0.001	0.010	199.8	NA	NA
5	1	5.35	1.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.2	NA	NA
5	2	5.20	1.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.2	NA	NA
6	1	5.15	1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.6	NA	NA
6	2	5.85	2.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	195.2	NA	NA
7	1	5.65	1.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.7	NA	NA
7	2	5.45	1.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.0	NA	NA
8	1	5.40	1.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.9	NA	NA
8	2	5.70	1.8	NA	0.3	0.01	0.05	<0.01	0.012	0.007	0.001	0.020	195.7	NA	NA
9	1	5.25	1.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.4	NA	NA
9	2	5.00	1.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	199.7	NA	NA
10	1	5.80	3.0	NA	0.1	0.01	0.11	0.01	0.005	0.003	<0.001	0.010	199.1	NA	NA
10	2	5.50	1.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	200.2	NA	NA
11	1	5.50	1.7	NA	0.3	0.01	0.08	0.01	<0.001	0.002	0.001	0.010	196.9	NA	NA
11	2	5.35	1.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	197.7	NA	NA
12	1	6.10	1.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	195.9	NA	NA
12	2	5.60	1.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	198.2	NA	NA
13	1	5.45	2.1	NA	0.4	0.01	0.08	<0.01	<0.001	0.001	0.001	<0.010	NA	NA	NA
13	2	5.40	1.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
14	1	6.00	1.7	NA	0.5	0.01	0.05	<0.01	0.002	0.016	0.018	<0.010	NA	NA	NA
14	2	5.90	1.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
15	1	5.90	1.2	NA	0.7	<0.01	0.04	<0.01	0.002	<0.001	0.001	0.010	NA	NA	NA
15	2	5.90	1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16	1	5.90	2.1	NA	0.5	<0.01	0.04	<0.01	0.007	0.002	0.001	0.010	NA	NA	NA
16	2	5.95	1.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
17	1	5.70	3.7	NA	0.5	<0.01	<0.04	<0.01	0.004	0.002	<0.001	<0.010	NA	NA	NA
17	2	5.70	2.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
18	1	6.80	7.0	NA	0.7	<0.01	0.04	<0.01	0.002	0.001	<0.001	0.020	NA	NA	NA
18	2	6.70	1.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
19	1	5.75	2.3	NA	0.3	0.10	0.06	0.01	0.010	0.001	0.002	0.020	NA	NA	NA
19	2	5.80	1.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
20	1	5.80	2.8	NA	0.3	0.10	0.05	0.01	0.010	0.001	0.002	0.010	NA	NA	NA
20	2	5.75	1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
21	1	6.00	2.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
21	2	6.00	1.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
22	1	5.85	2.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
22	2	6.05	1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
23	1	5.70	2.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
23	2	5.65	2.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
24	1	5.75	6.0	NA	0.7	0.20	0.09	0.01	0.001	<0.001	<0.001	0.010	NA	NA	NA
24	2	5.80	1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
25	1	5.60	4.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
25	2	5.70	1.9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table A2.25. Drainage quality from AMAX drill core of Duluth Complex rock containing 0.00% sulfur (reactor Y).

Week	Rinse	pH s.u.	S.C. µS/cm	SO4 mg/l	Ca mg/l	Mg mg/l	Na mg/L	K mg/l	Cu mg/L	Ni mg/l	Co mg/l	Zn mg/L	Vol. ml	Temp. °C	R.H. %
26	1	5.90	3.9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
26	2	5.90	1.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
27	1	5.80	1.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
27	2	5.80	1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
28	1	5.75	2.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
28	2	5.85	1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
29	1	5.70	8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
29	2	5.95	1.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
30	1	5.70	1.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
30	2	5.80	1.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
31	1	5.80	7.5	<1.0	0.6	0.20	0.05	0.01	0.001	<0.001	<0.001	0.010	NA	NA	NA
31	2	5.80	1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
32	1	5.55	2.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
32	2	5.55	1.9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
33	1	5.55	7.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
33	2	5.70	1.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
34	1	5.65	6.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
34	2	5.90	1.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
35	1	5.65	8.0	<1.0	0.6	0.20	0.03	0.01	0.001	<0.001	<0.001	0.010	NA	NA	NA
35	2	5.90	1.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
36	1	5.65	6.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
36	2	5.75	1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
37	1	5.55	7.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
37	2	5.80	1.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
38	1	5.75	3.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
38	2	NS[2]	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	
39	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
39	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
40	1	5.70	2.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
40	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
41	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
41	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
42	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
42	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
43	1	5.85	1.9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
43	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
44	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
44	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
45	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
45	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
46	1	5.65	1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
46	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
47	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
47	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
48	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
48	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
49	1	5.70	2.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
49	2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA

[1]NA: Not analyzed.

[2]NS: No sample taken.

Figure A2.1. Drainage quality from AMAX drill core of Duluth Complex rock containing 0.47% sulfur (reactor A).

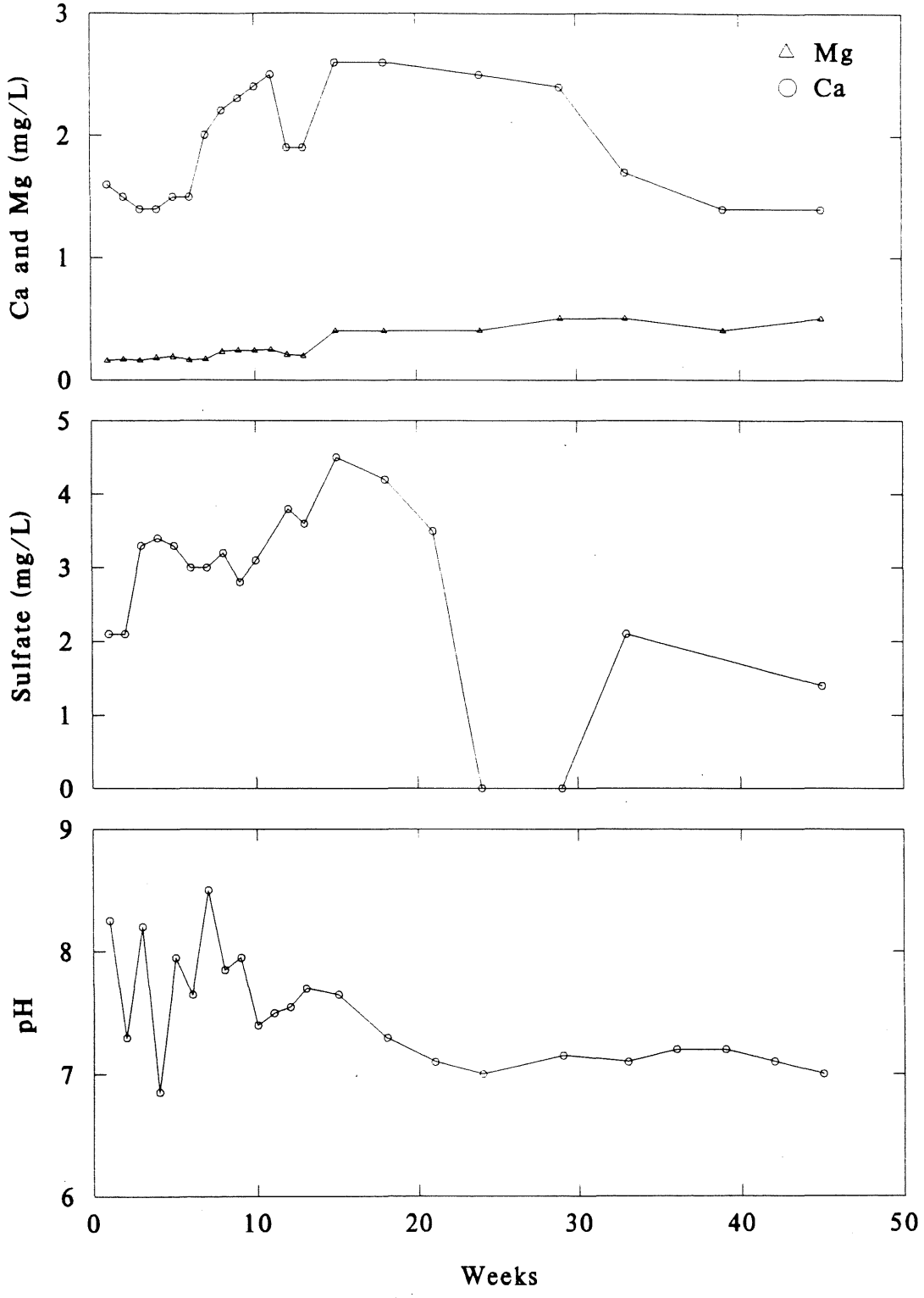


Figure A2.2. Drainage quality from AMAX drill core of Duluth Complex rock containing 0.59% sulfur (reactor D).

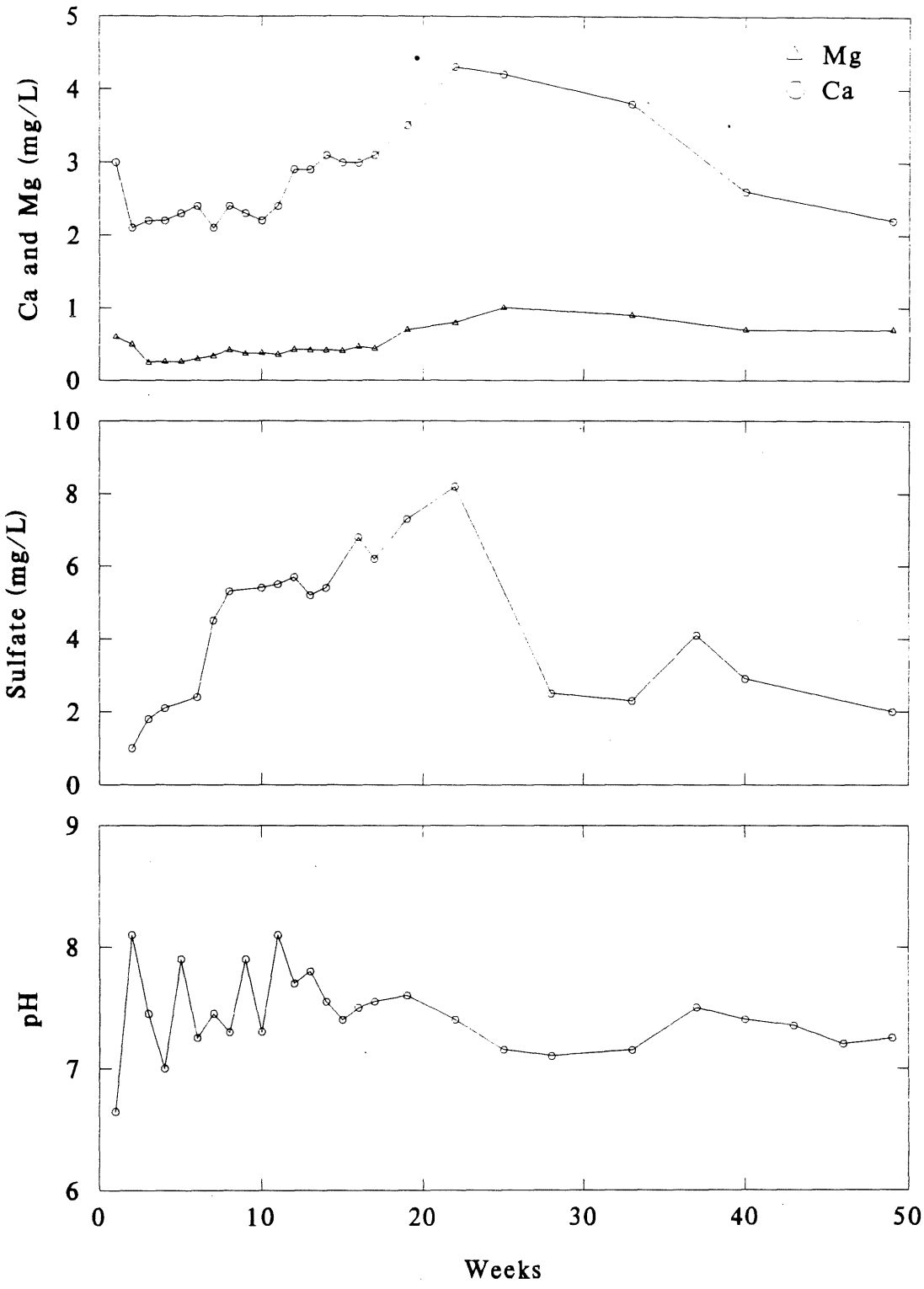


Figure A2.3. Drainage quality from AMAX drill core of Duluth Complex rock containing 0.80% sulfur (reactor E).

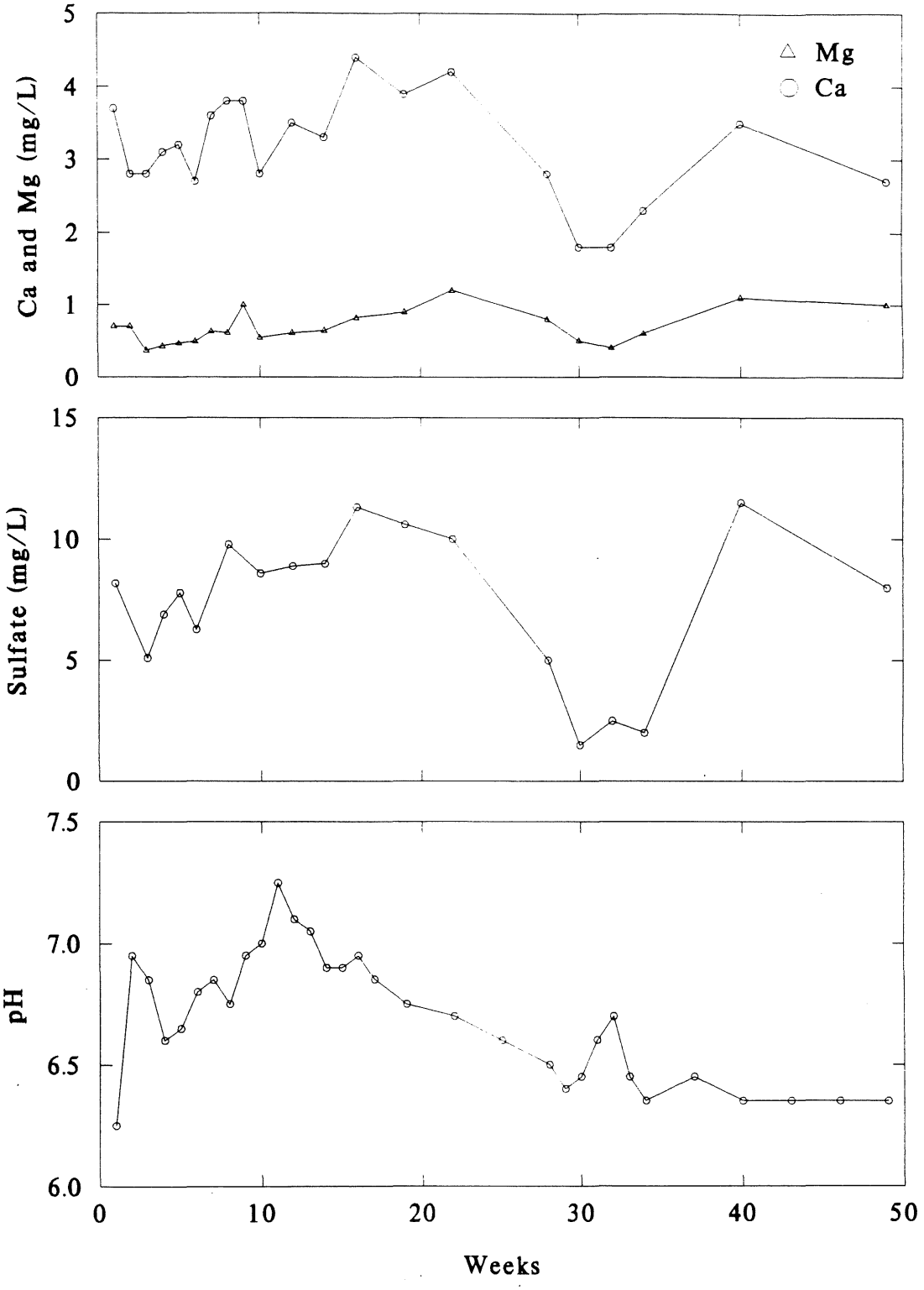


Figure A2.4. Drainage quality from AMAX drill core of Duluth Complex rock containing 0.80% sulfur (reactor F).

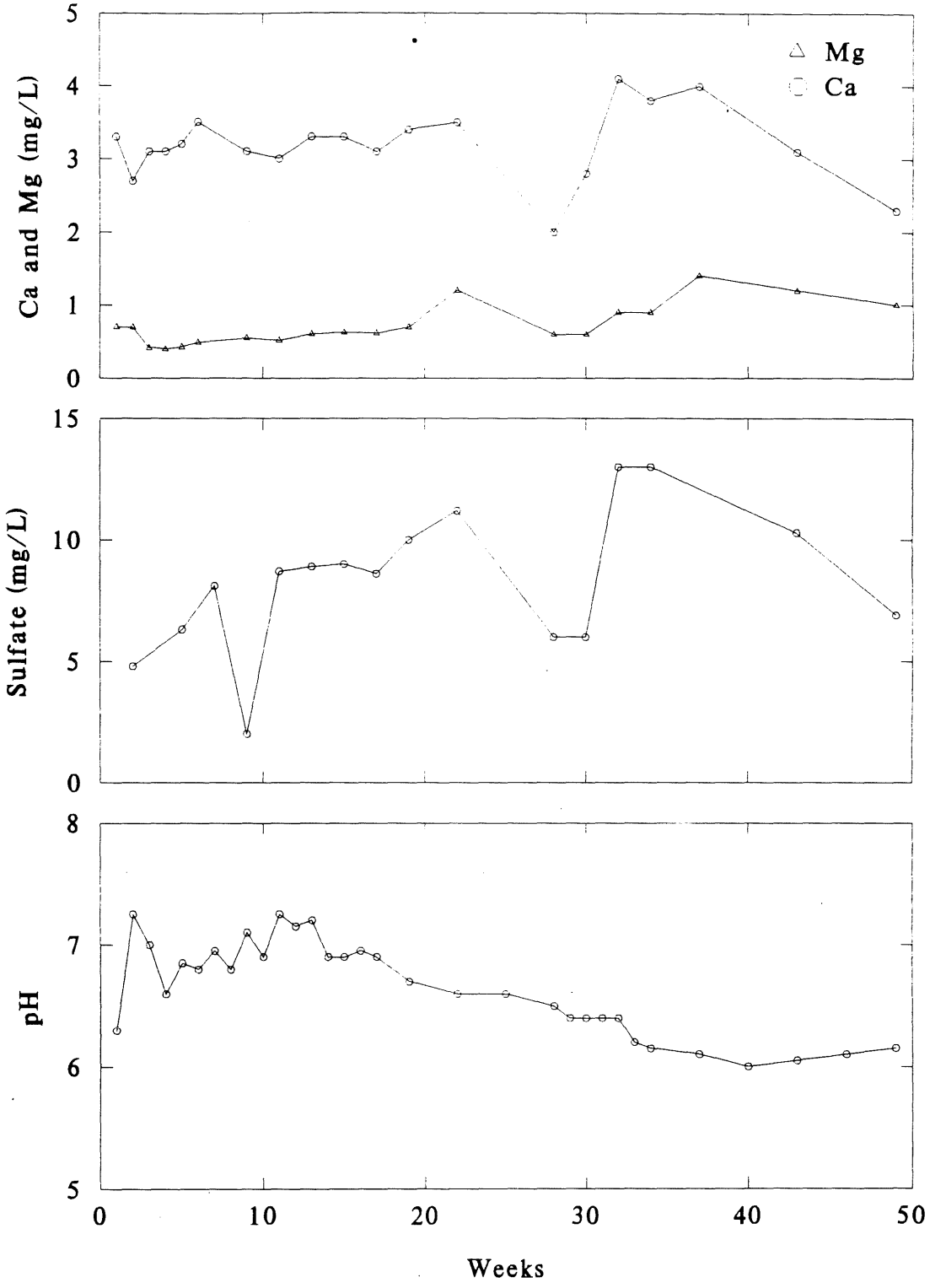


Figure A2.5. Drainage quality from AMAX drill core of Duluth Complex rock containing 0.92% sulfur (reactor G).

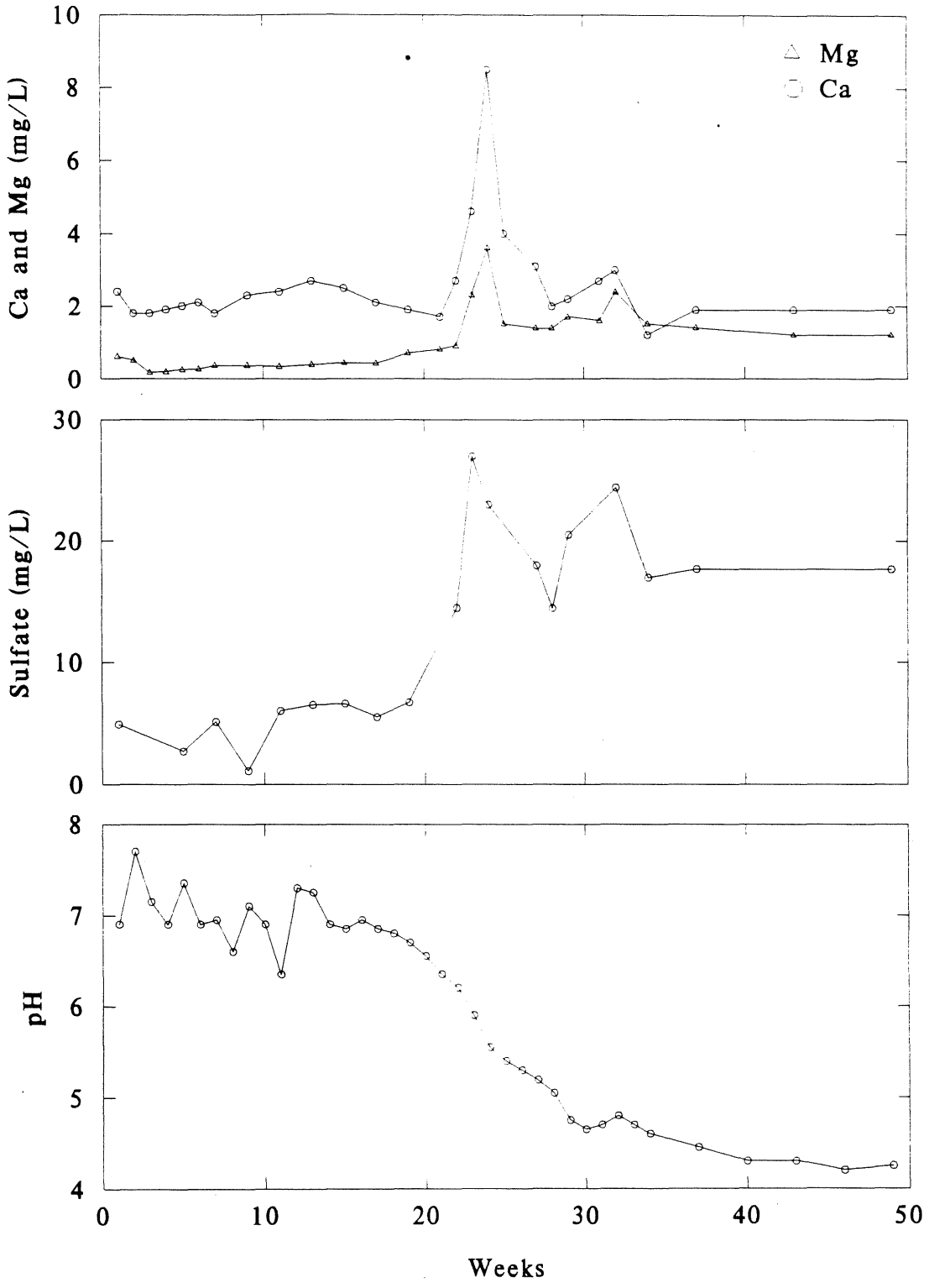


Figure A2.6. Drainage quality from AMAX drill core of Duluth Complex rock containing 0.92% sulfur (reactor H).

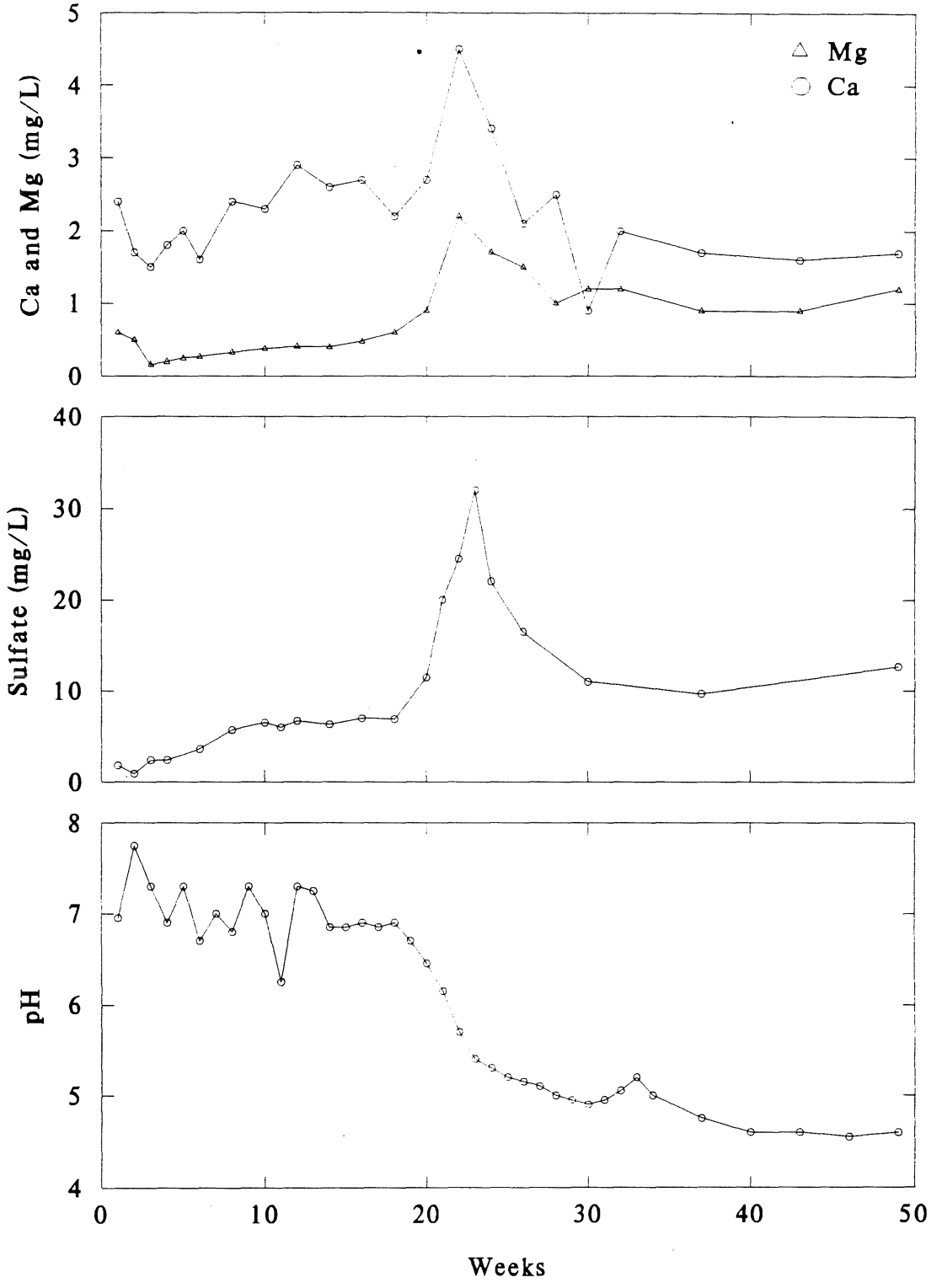


Figure A2.7. Drainage quality from AMAX drill core of Duluth Complex rock containing 1.17% sulfur (reactor I).

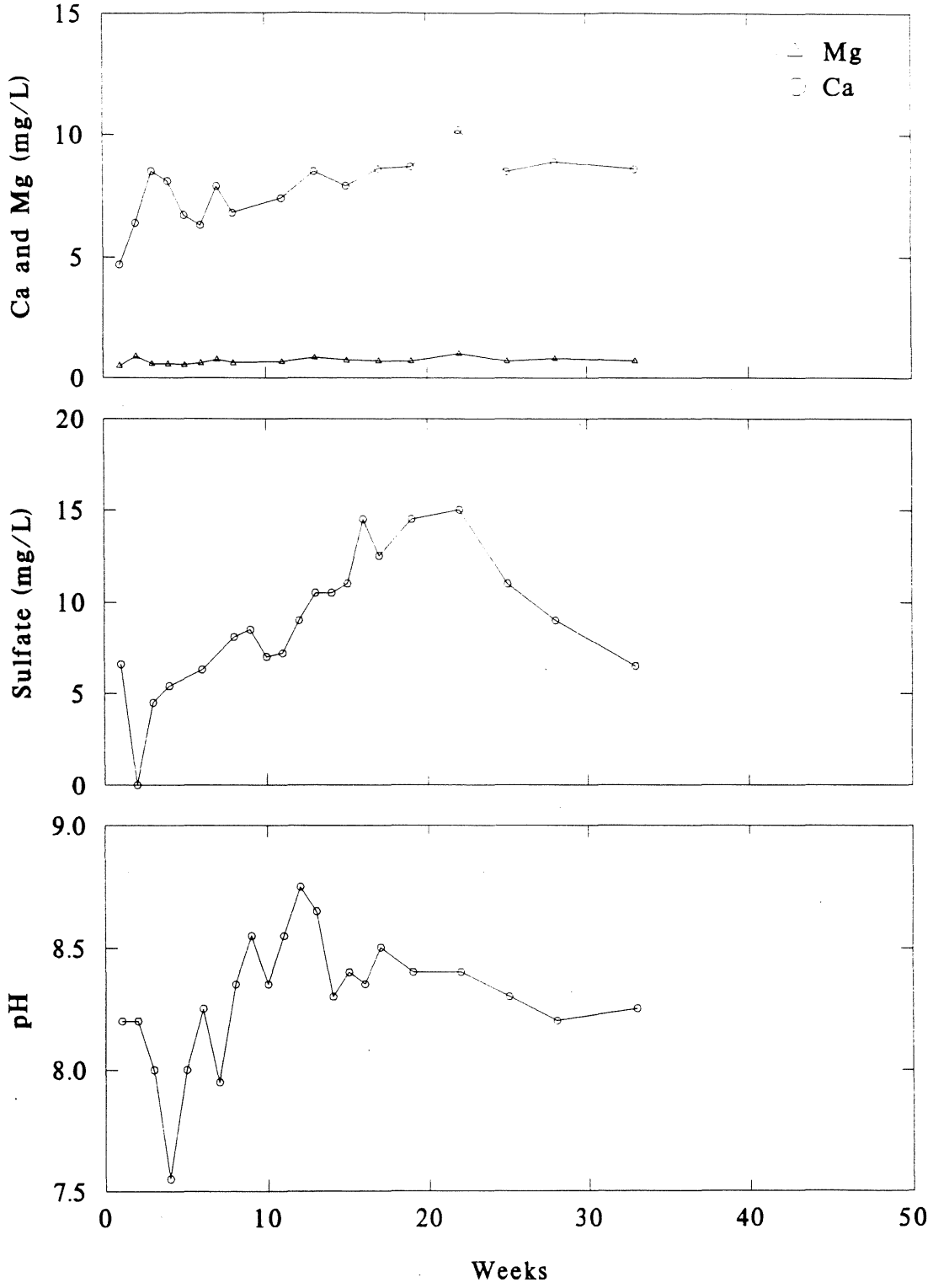


Figure A2.8. Drainage quality from AMAX drill core of Duluth Complex rock containing 1.17% sulfur (reactor J).

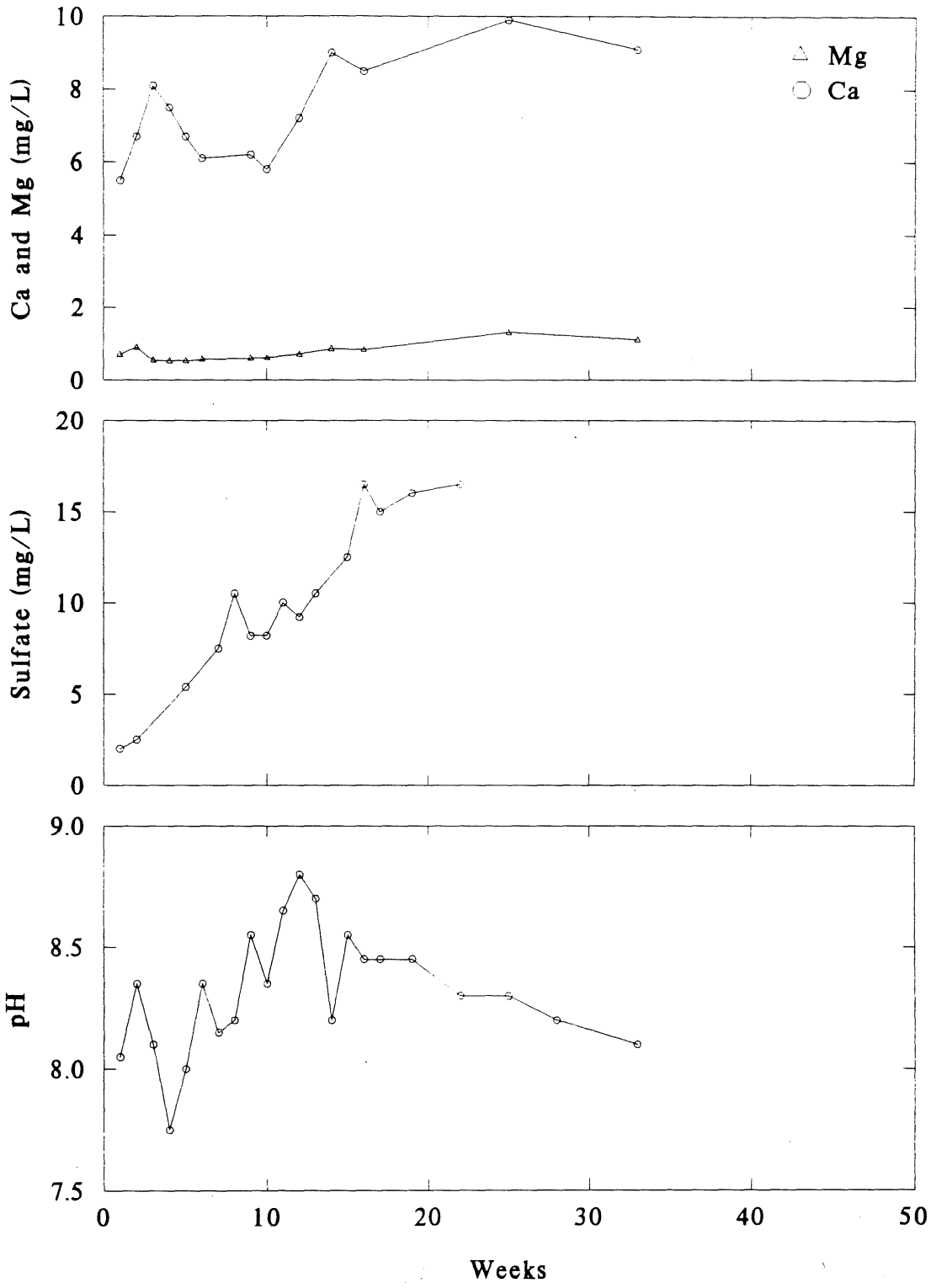


Figure A2.9. Drainage quality from AMAX drill core of Duluth Complex rock containing 1.24% sulfur (reactor K).

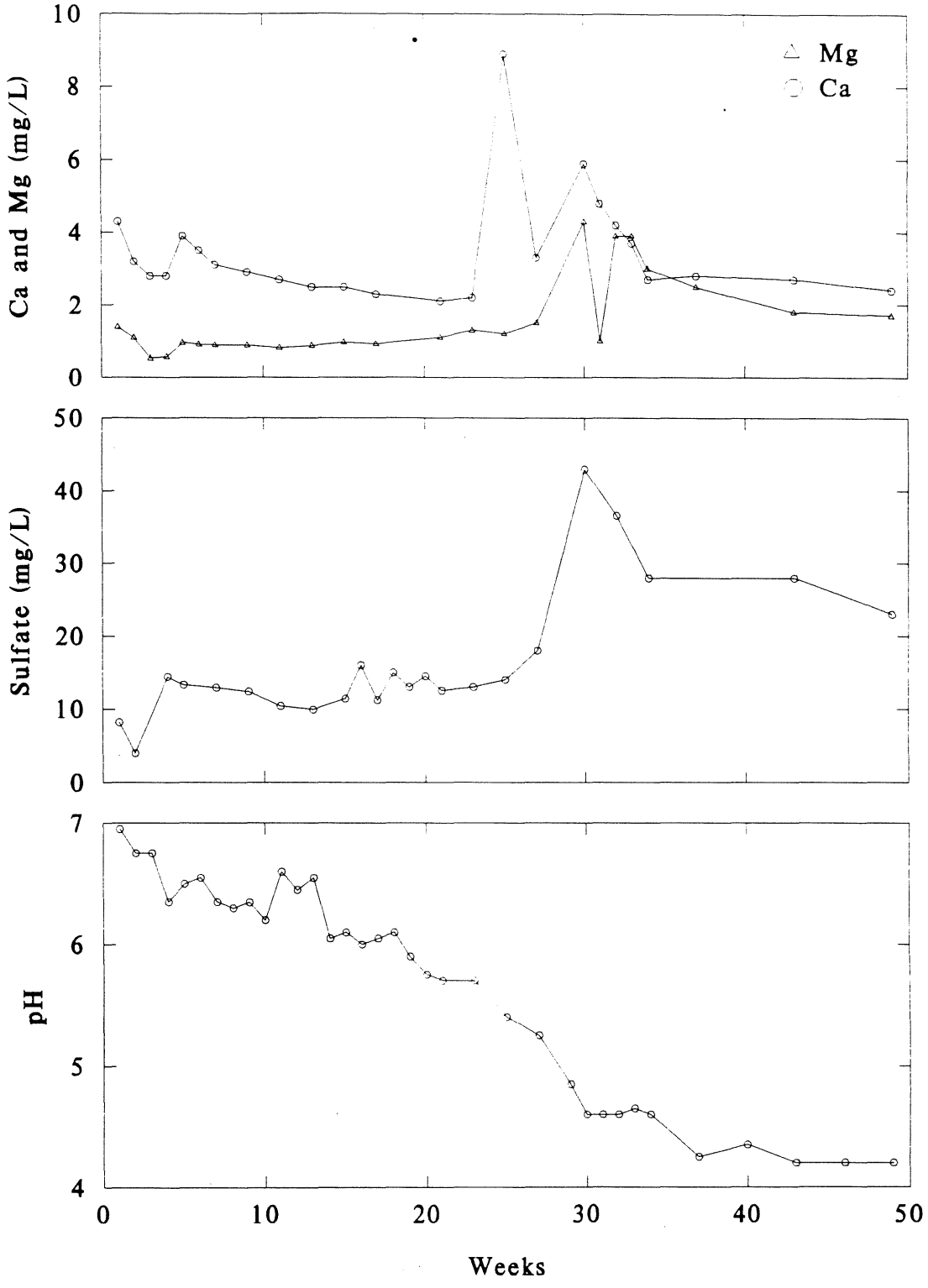


Figure A2.10. Drainage quality from AMAX drill core of Duluth Complex rock containing 1.24% sulfur (reactor L).

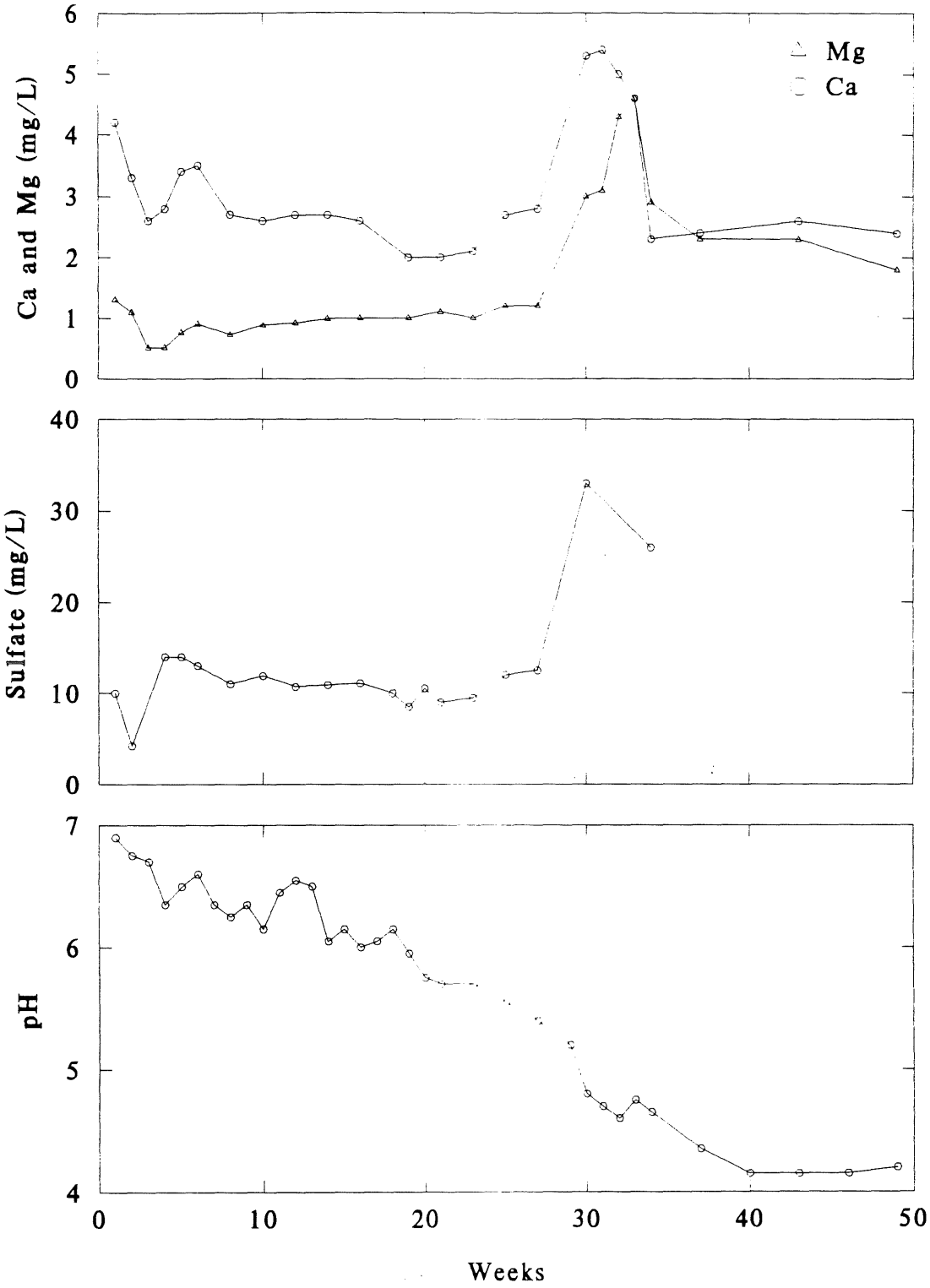


Figure A2.11. Drainage quality from AMAX drill core of Duluth Complex rock containing 1.26% sulfur (reactor M).

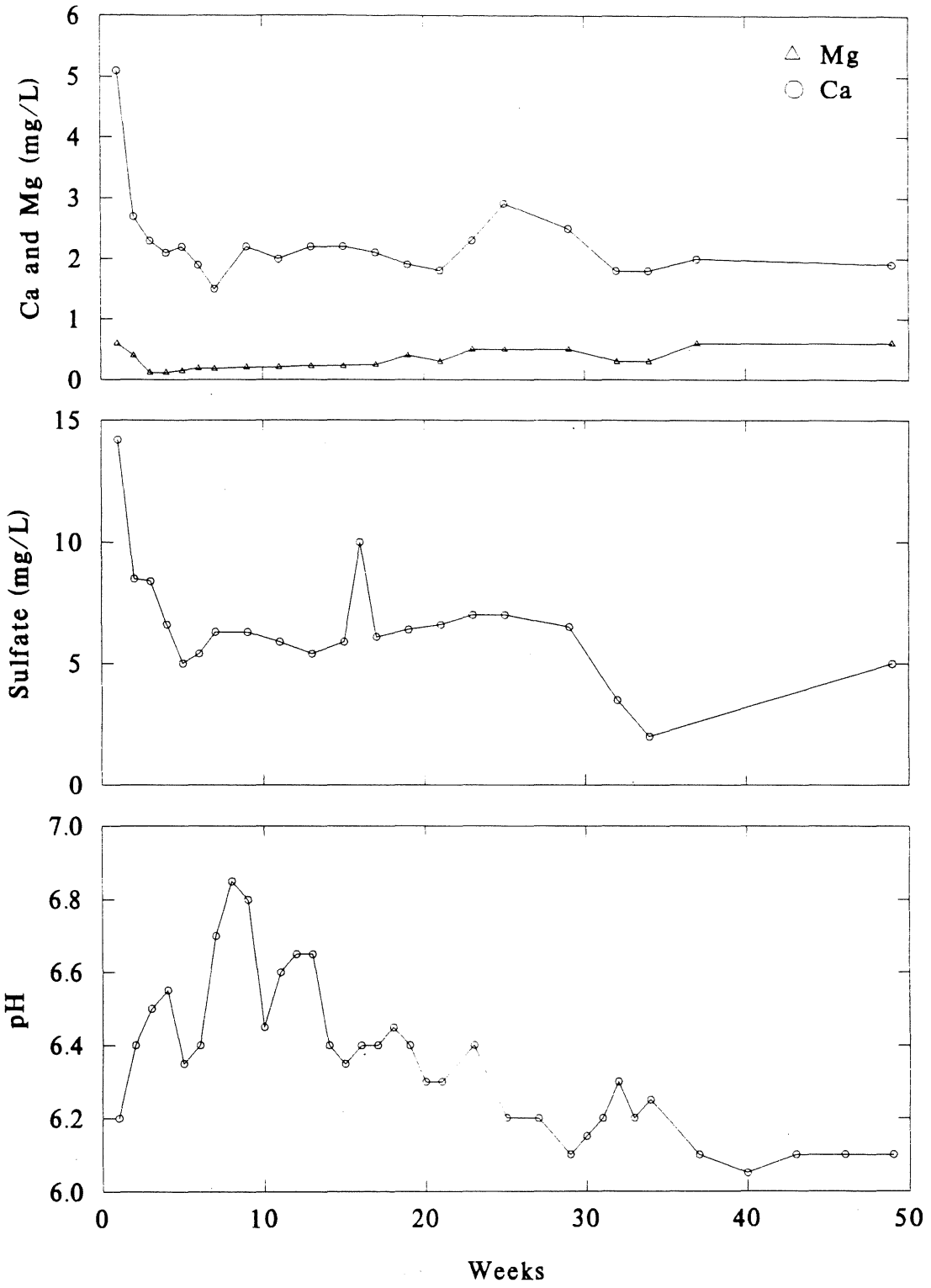


Figure A2.12. Drainage quality from AMAX drill core of Duluth Complex rock containing 1.26% sulfur (reactor N).

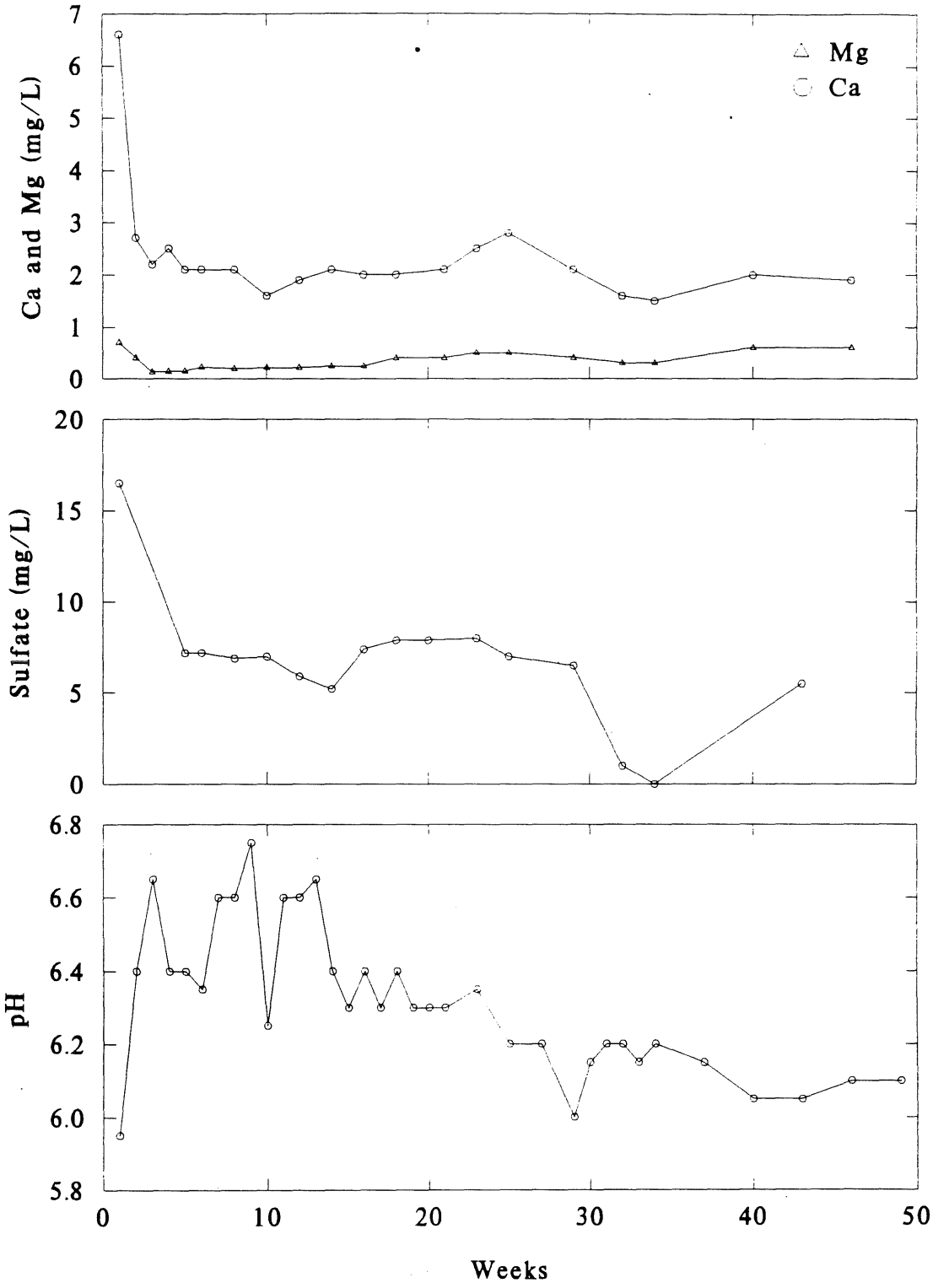


Figure A2.13. Drainage quality from AMAX drill core of Duluth Complex rock containing 1.35% sulfur (reactor C).

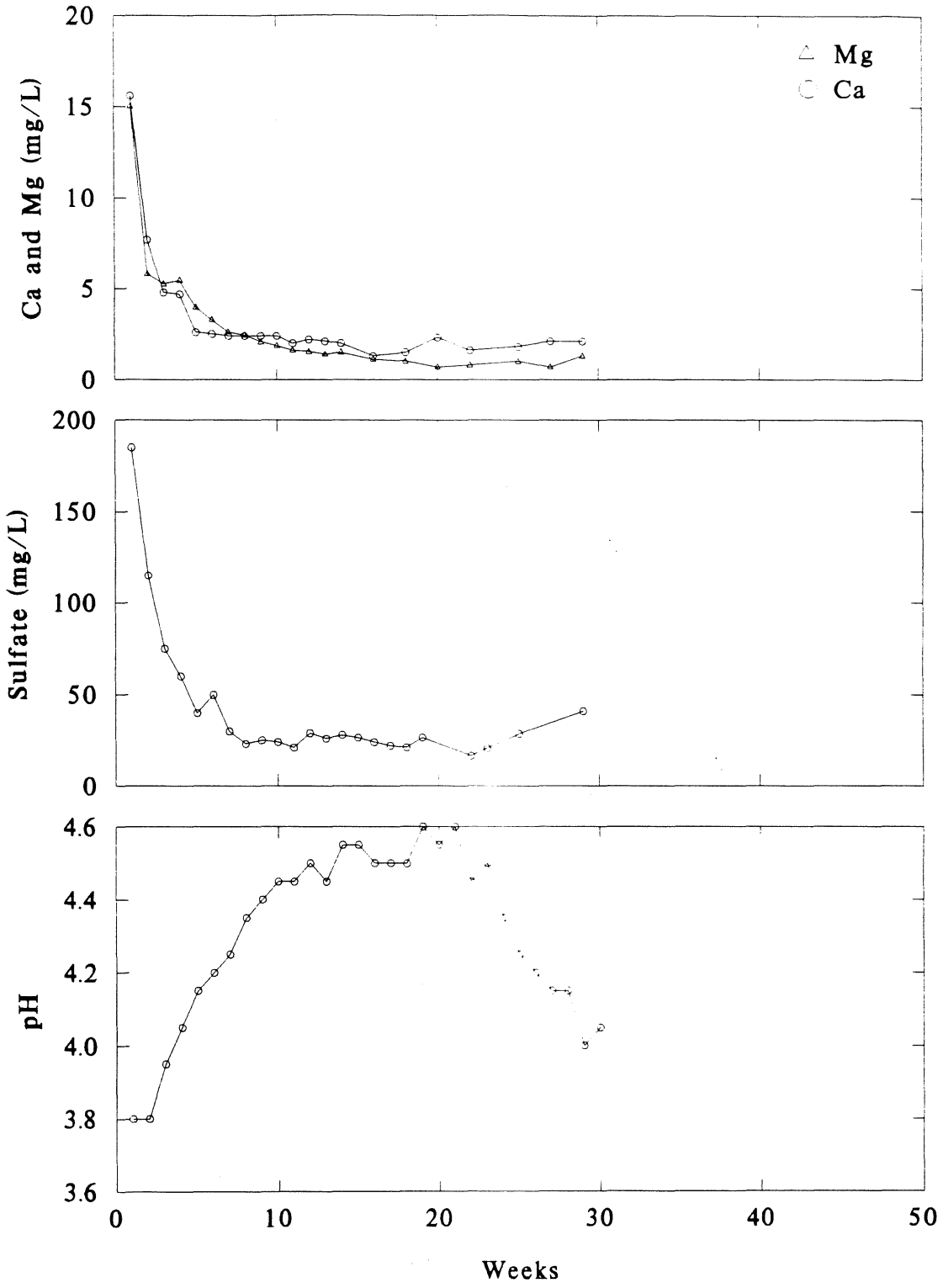


Figure A2.14. Drainage quality from AMAX drill core of Duluth Complex rock containing 1.47% sulfur (reactor O).

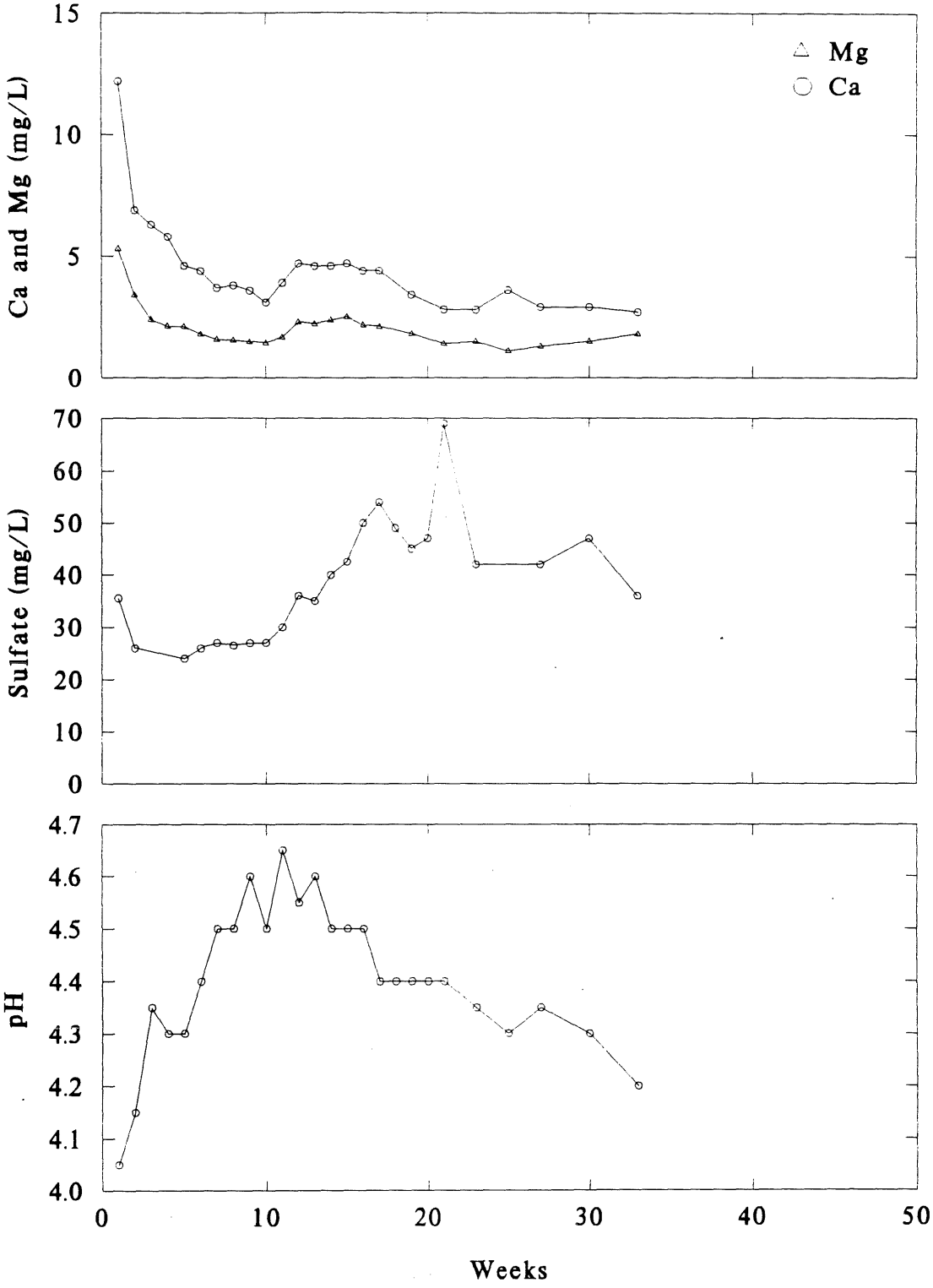


Figure A2.15. Drainage quality from AMAX drill core of Duluth Complex rock containing 1.47% sulfur (reactor P).

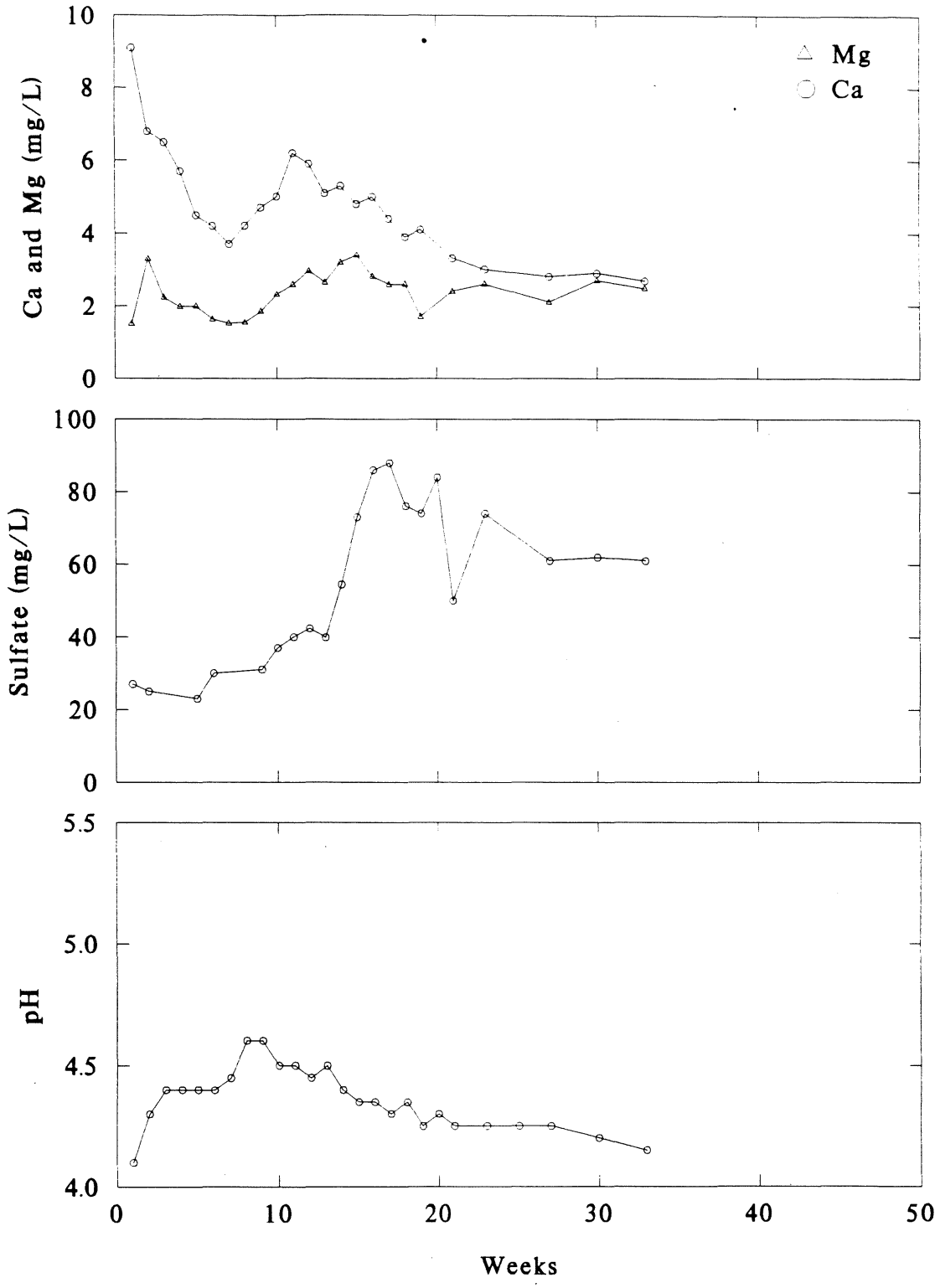


Figure A2.16. Drainage quality from AMAX drill core of Duluth Complex rock containing 1.74% sulfur (reactor Q).

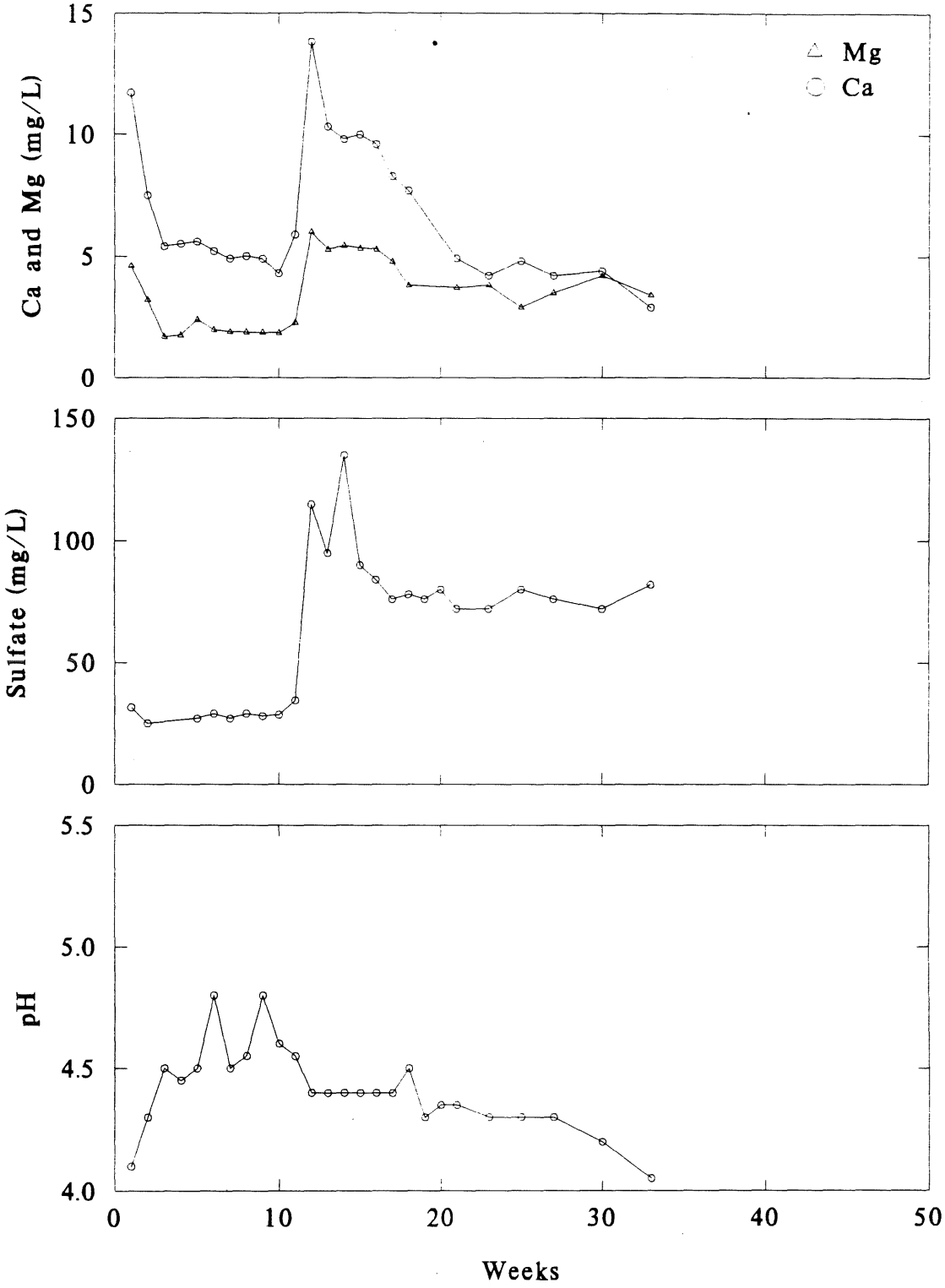


Figure A2.17. Drainage quality from AMAX drill core of Duluth Complex rock containing 1.74% sulfur (reactor R).

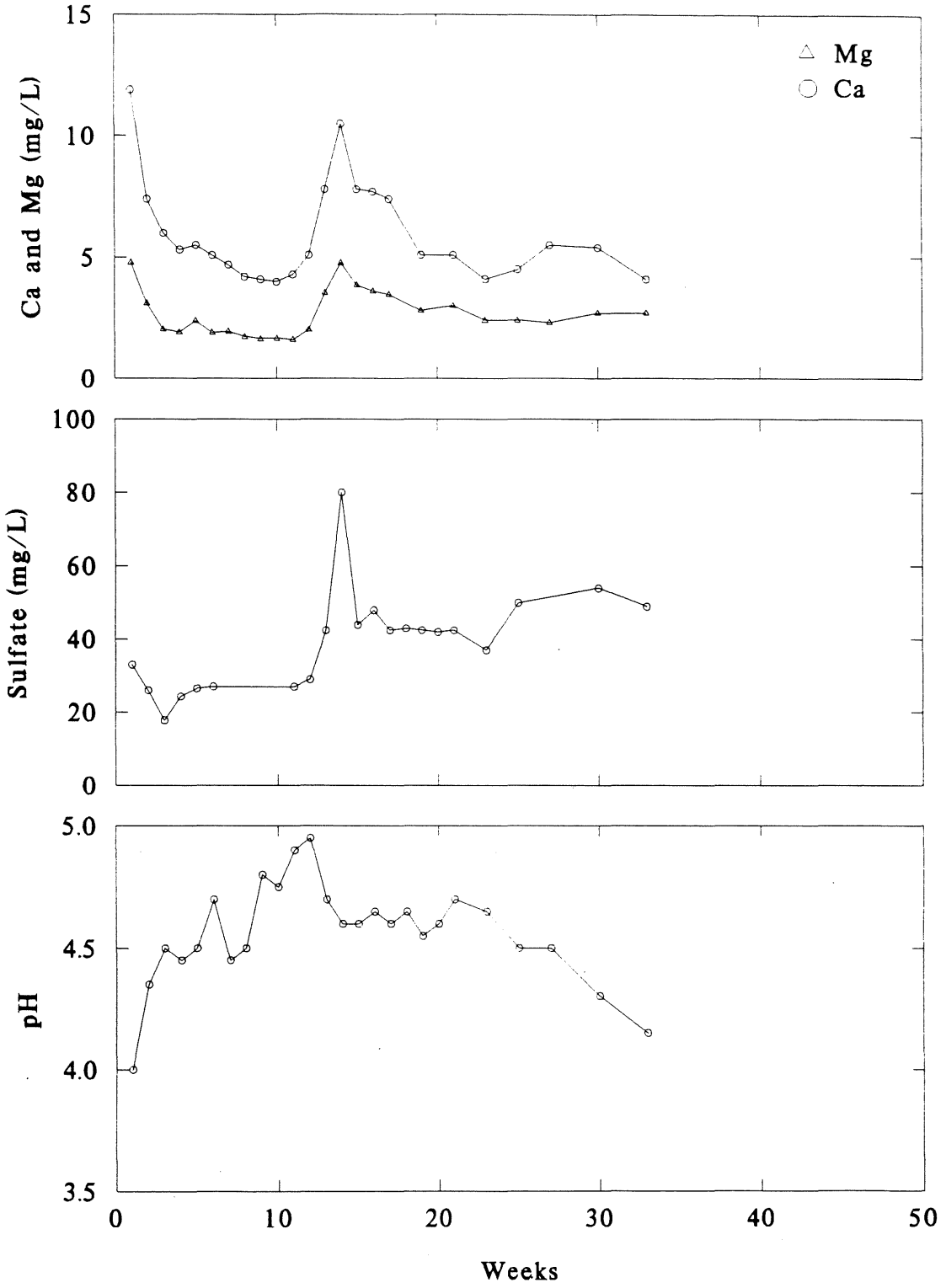


Figure A2.18. Drainage quality from AMAX drill core of Duluth Complex rock containing 1.87% sulfur (reactor S).

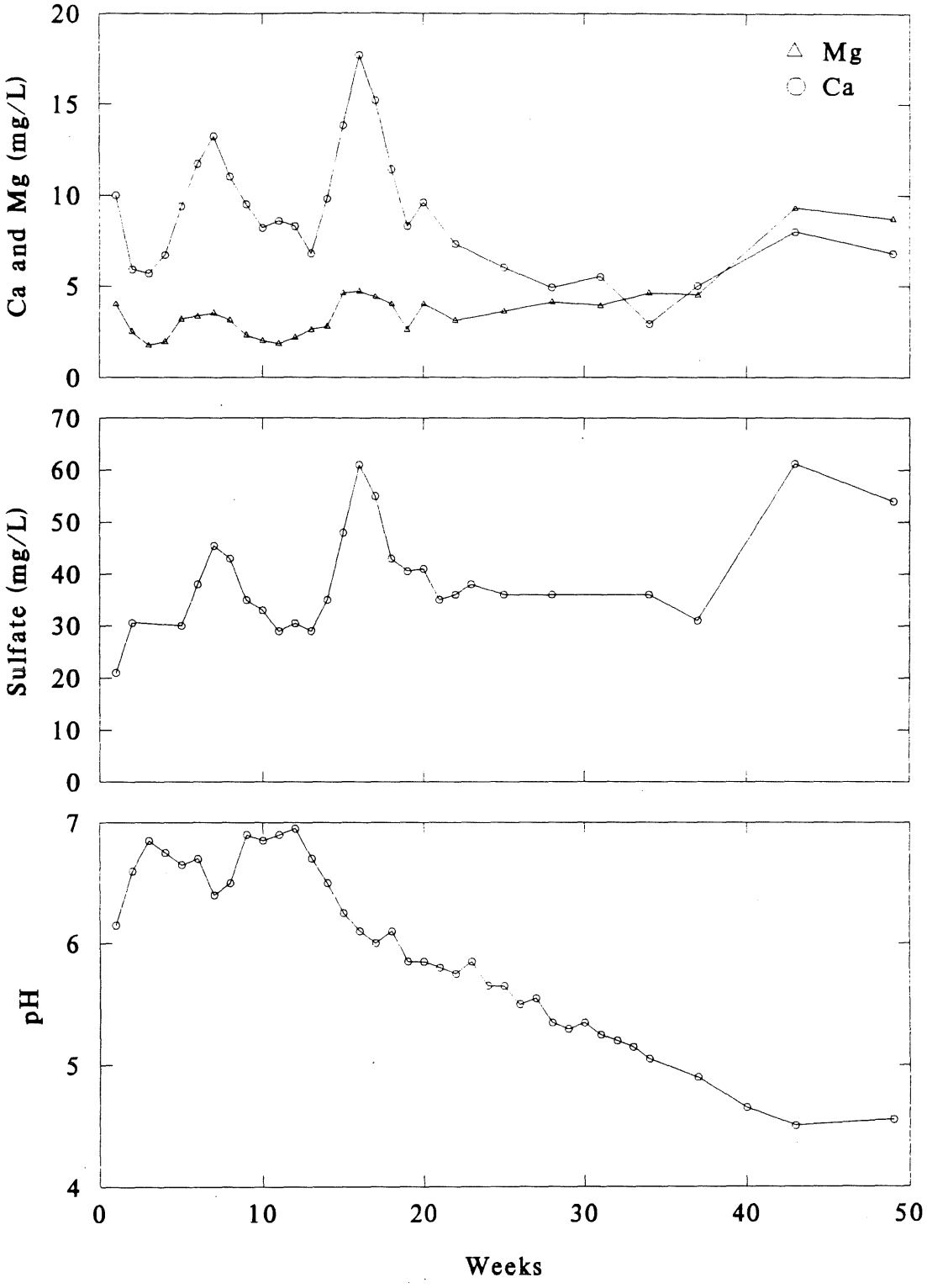


Figure A2.19. Drainage quality from AMAX drill core of Duluth Complex rock containing 1.87% sulfur (reactor T).

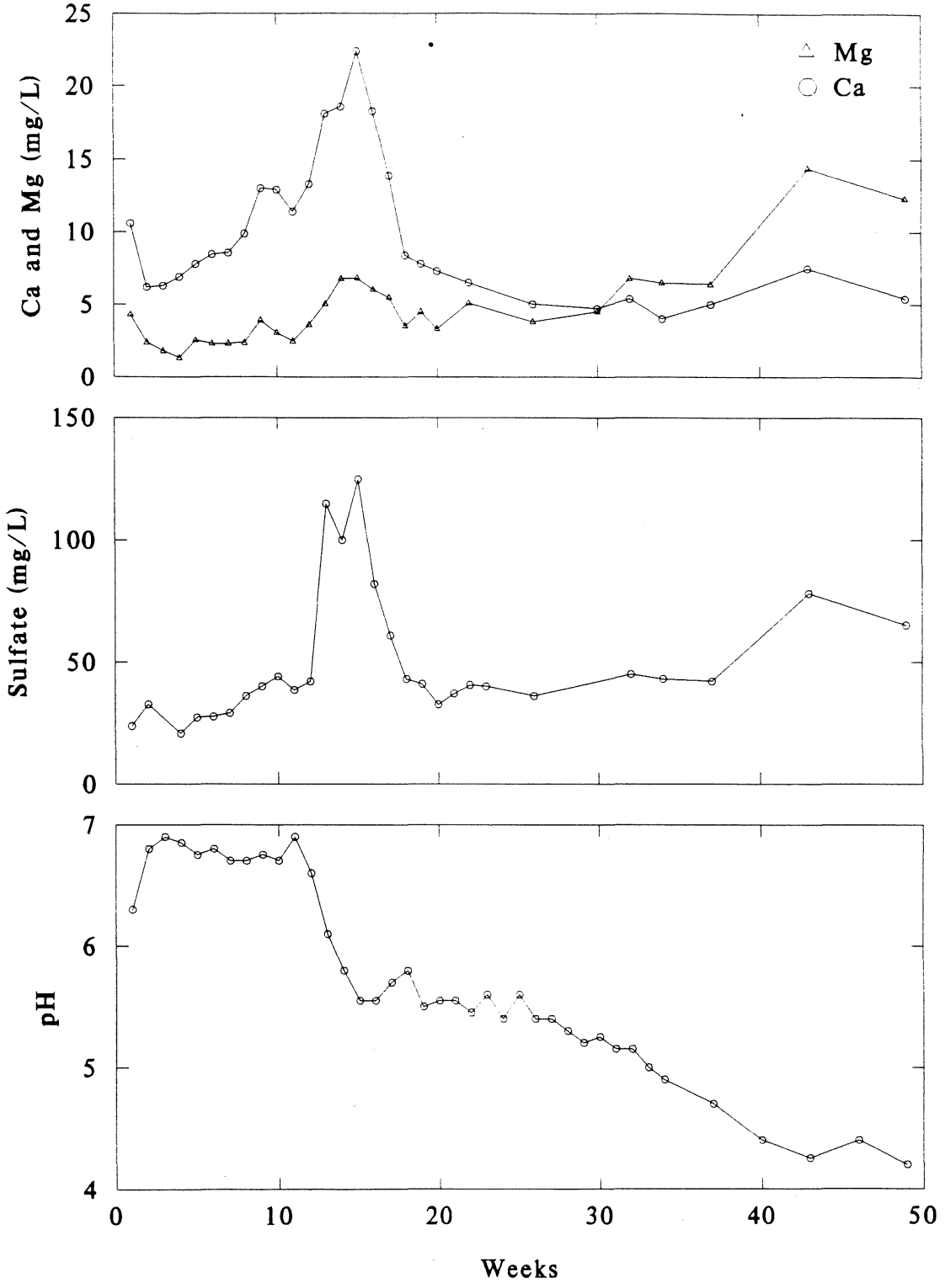


Figure A2.20. Drainage quality from AMAX drill core of Duluth Complex rock containing 2.01% sulfur (reactor B).

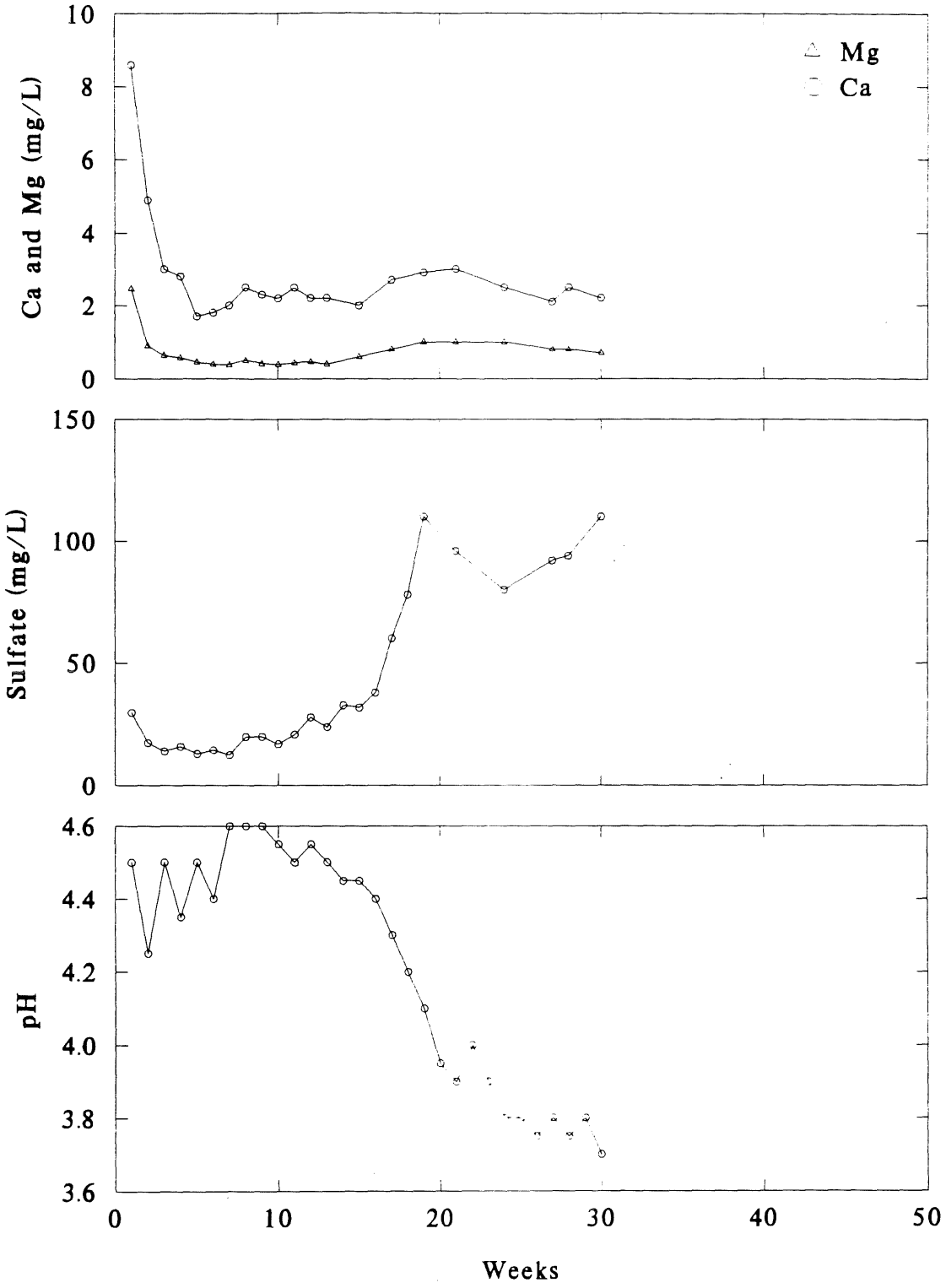


Figure A2.21. Drainage quality from AMAX drill core of Duluth Complex rock containing 2.17% sulfur (reactor U).

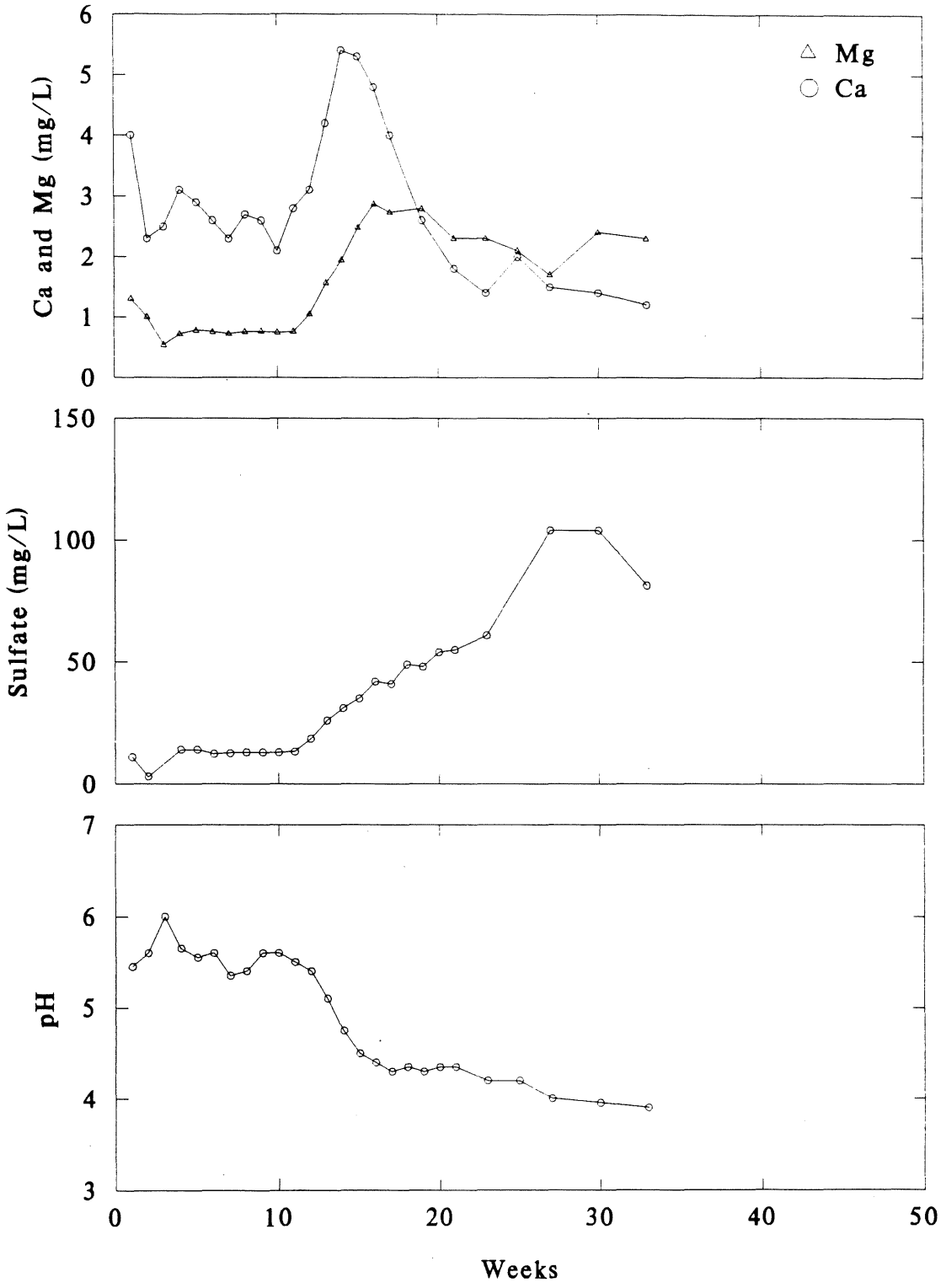


Figure A2.22. Drainage quality from AMAX drill core of Duluth Complex rock containing 2.17% sulfur (reactor V).

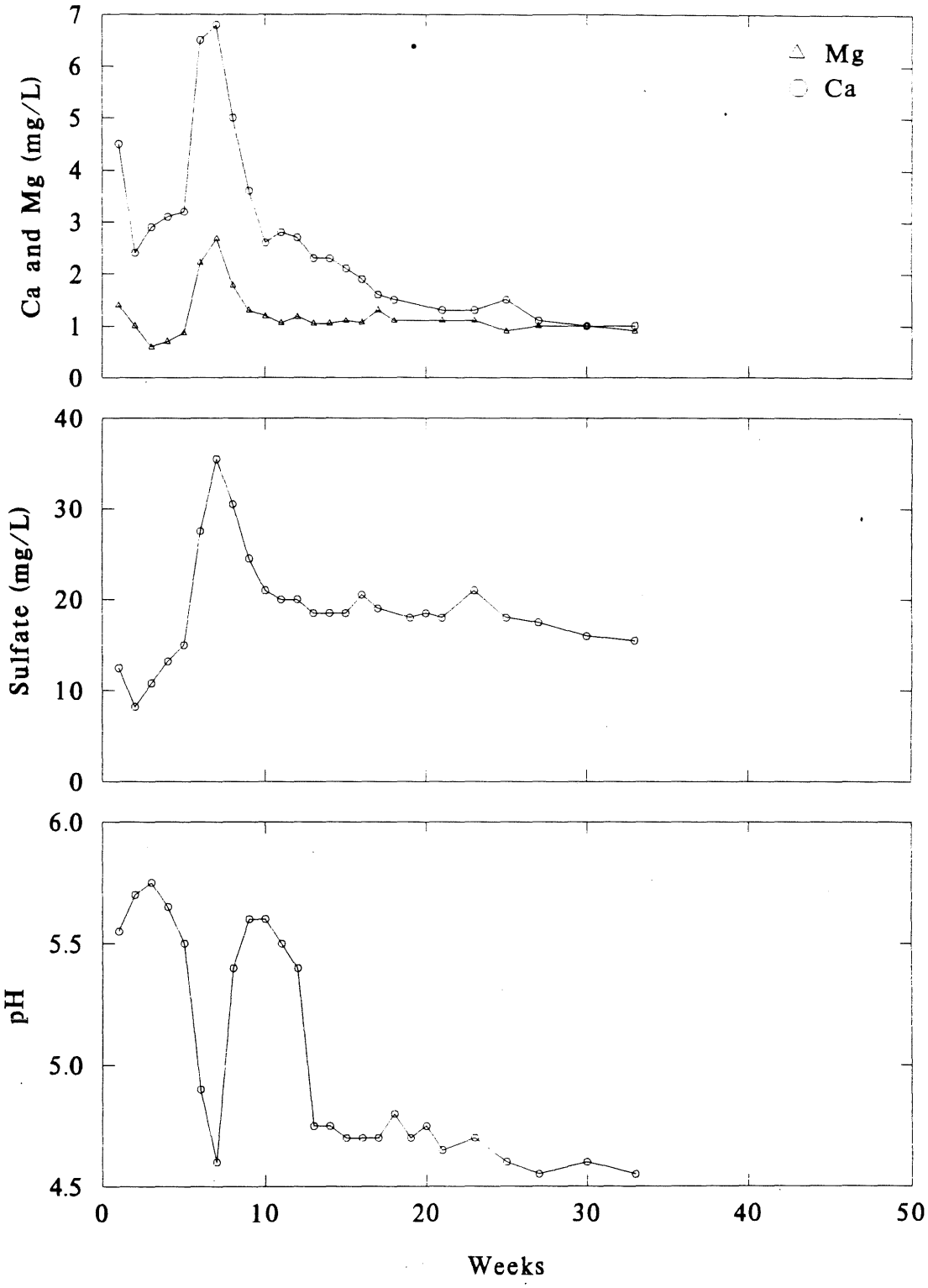


Figure A2.23. Drainage quality from AMAX drill core of Duluth Complex rock containing 2.57% sulfur (reactor W).

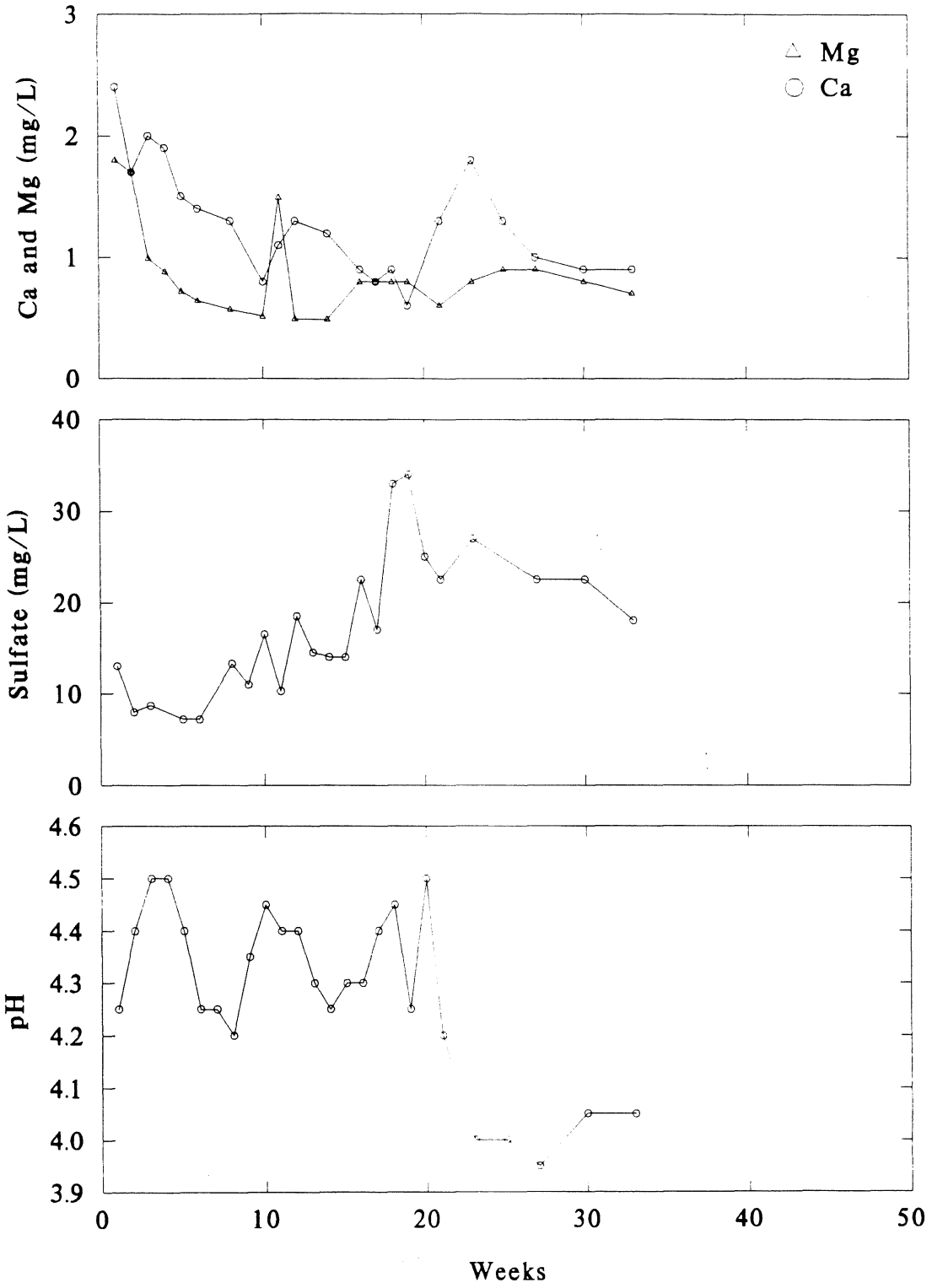


Figure A2.24. Drainage quality from AMAX drill core of Duluth Complex rock containing 2.57% sulfur (reactor X).

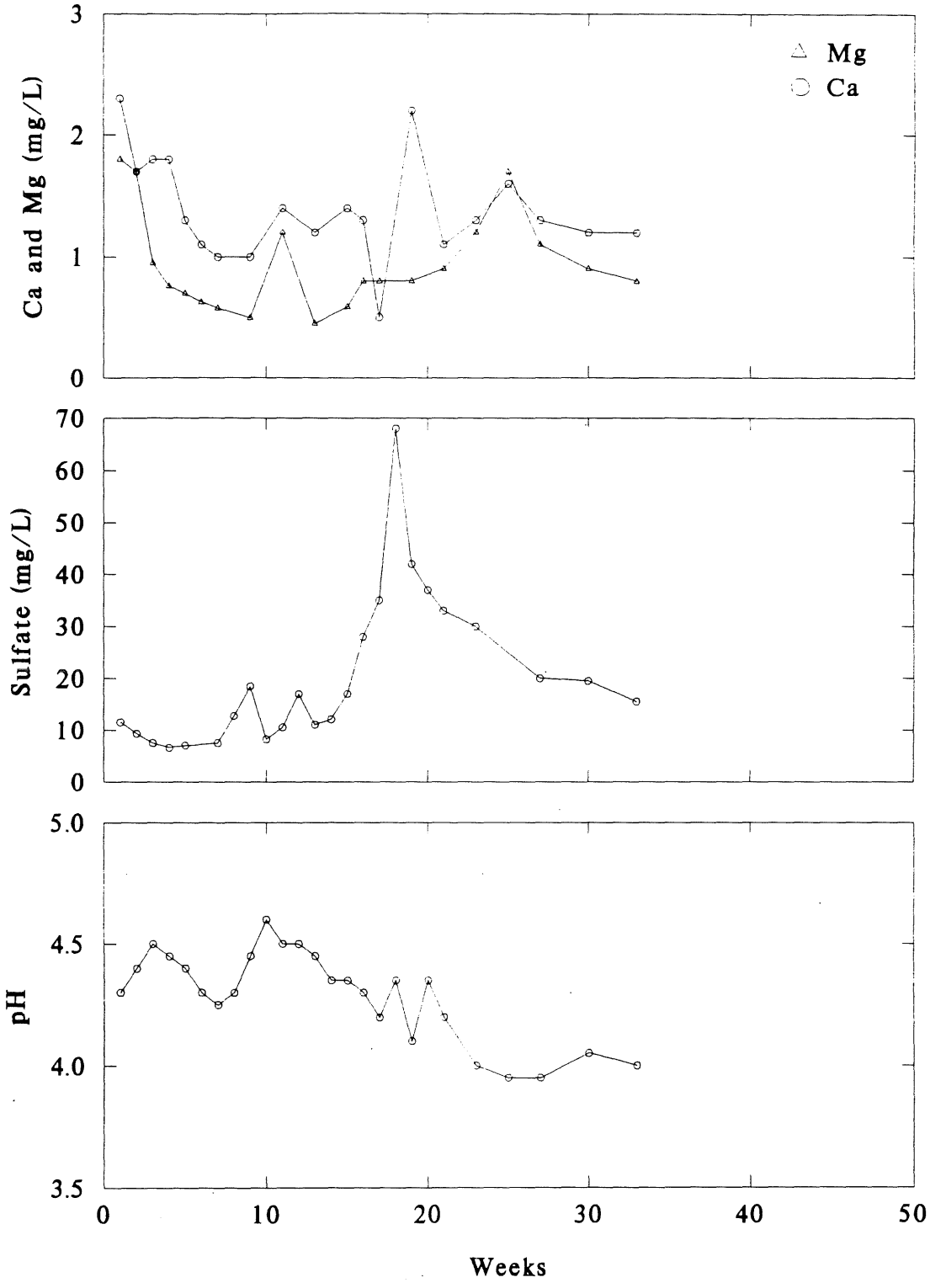


Figure A2.25. Drainage quality from AMAX drill core of Duluth Complex rock containing 0.00% sulfur (reactor Y).

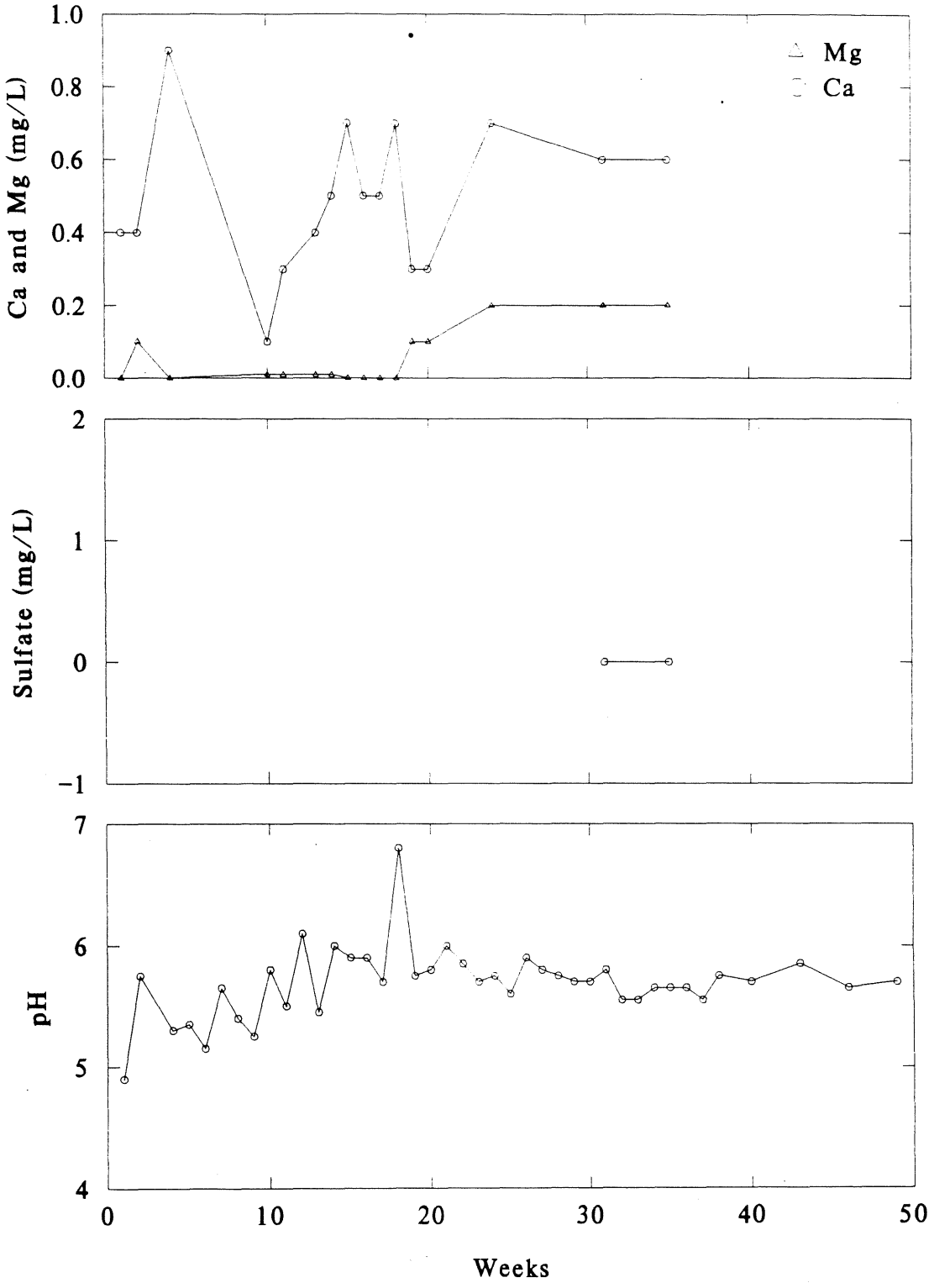


Figure A2.26. Minimum pH versus sulfur content by reactor for the one-week rinse interval period. 1.17% sulfur sample not considered in fitted curve.

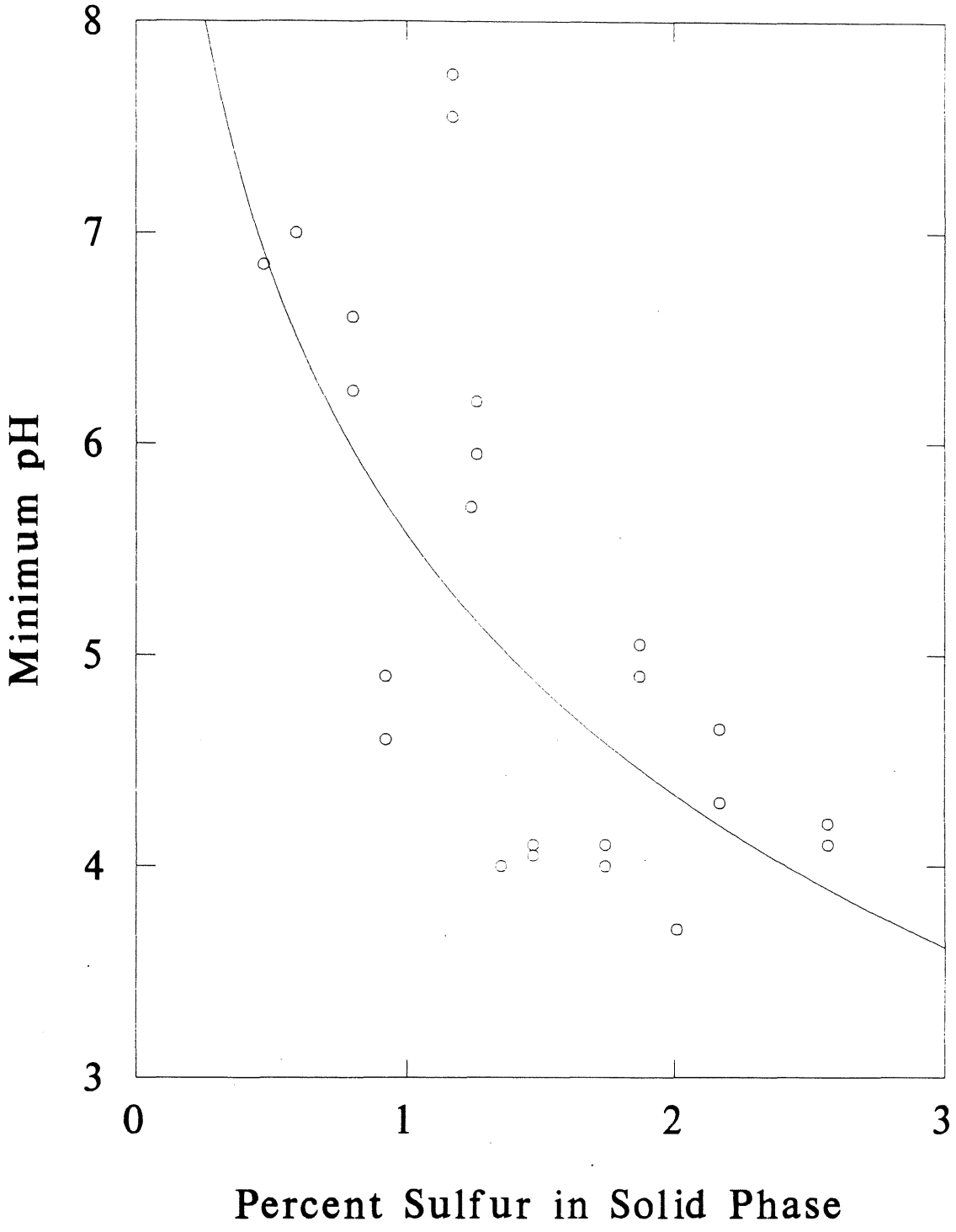


Figure A2.27. Mean minimum pH versus sulfur content by solid for the one-week rinse interval period. Mean minimum pH calculated as the negative $\log_{10}$ of the mean of the maximum hydrogen ion concentration (minimum pH) observed for each reactor for a given solid. 1.17% sulfur sample not considered in fitted curve.

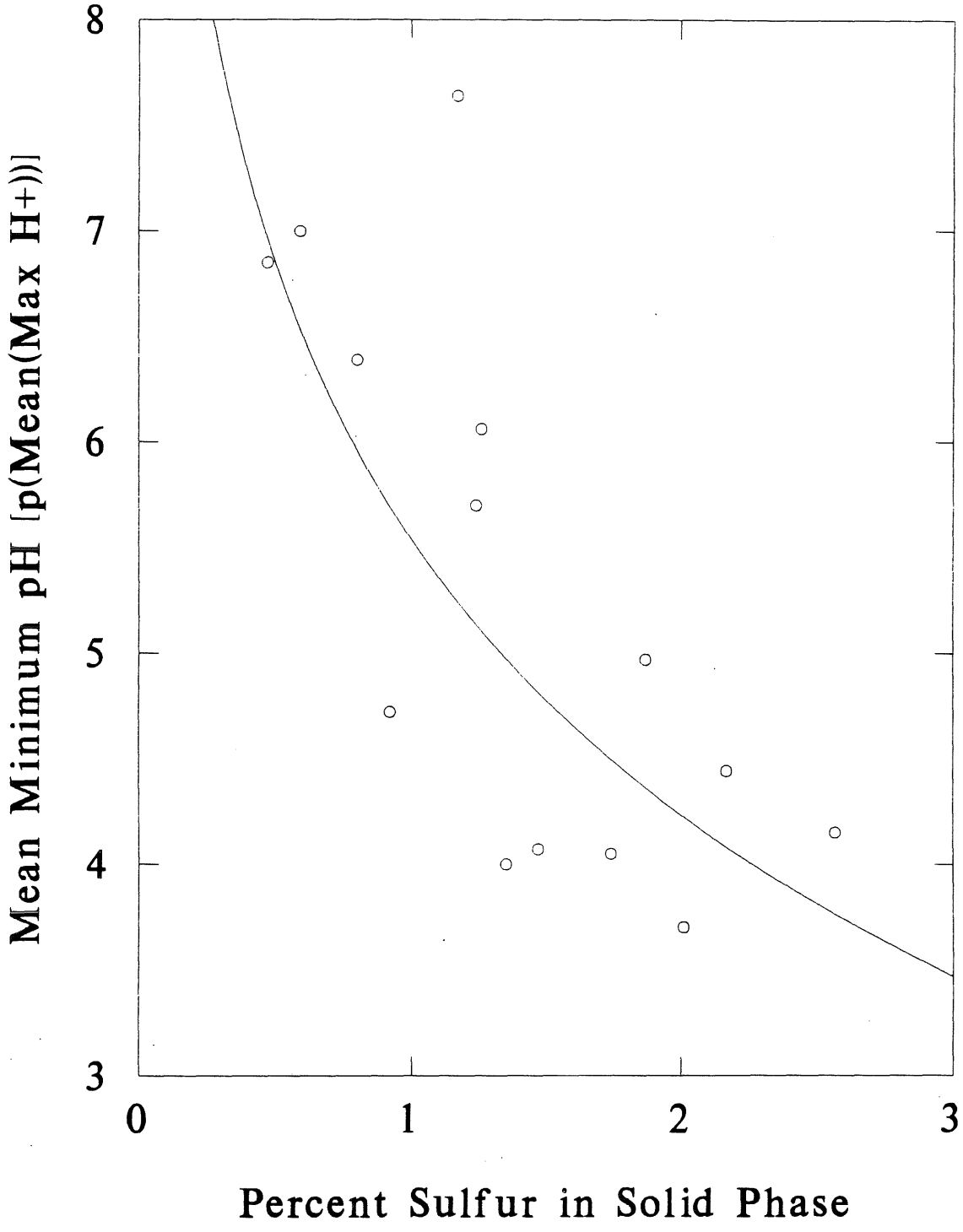


Figure A2.28. Minimum pH versus sulfur content by reactor for the entire experimental period. 1.17% sulfur sample not considered in fitted curve.

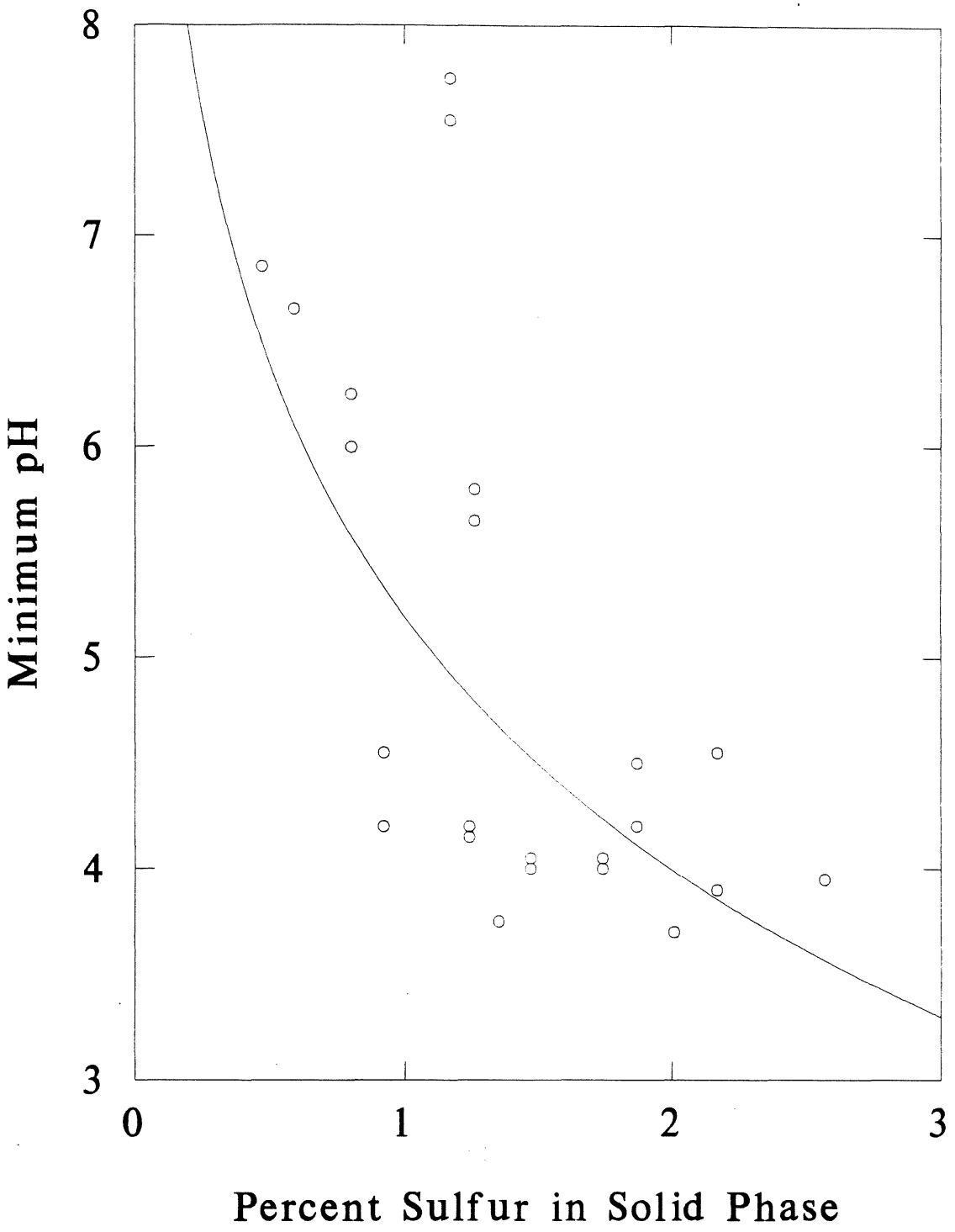
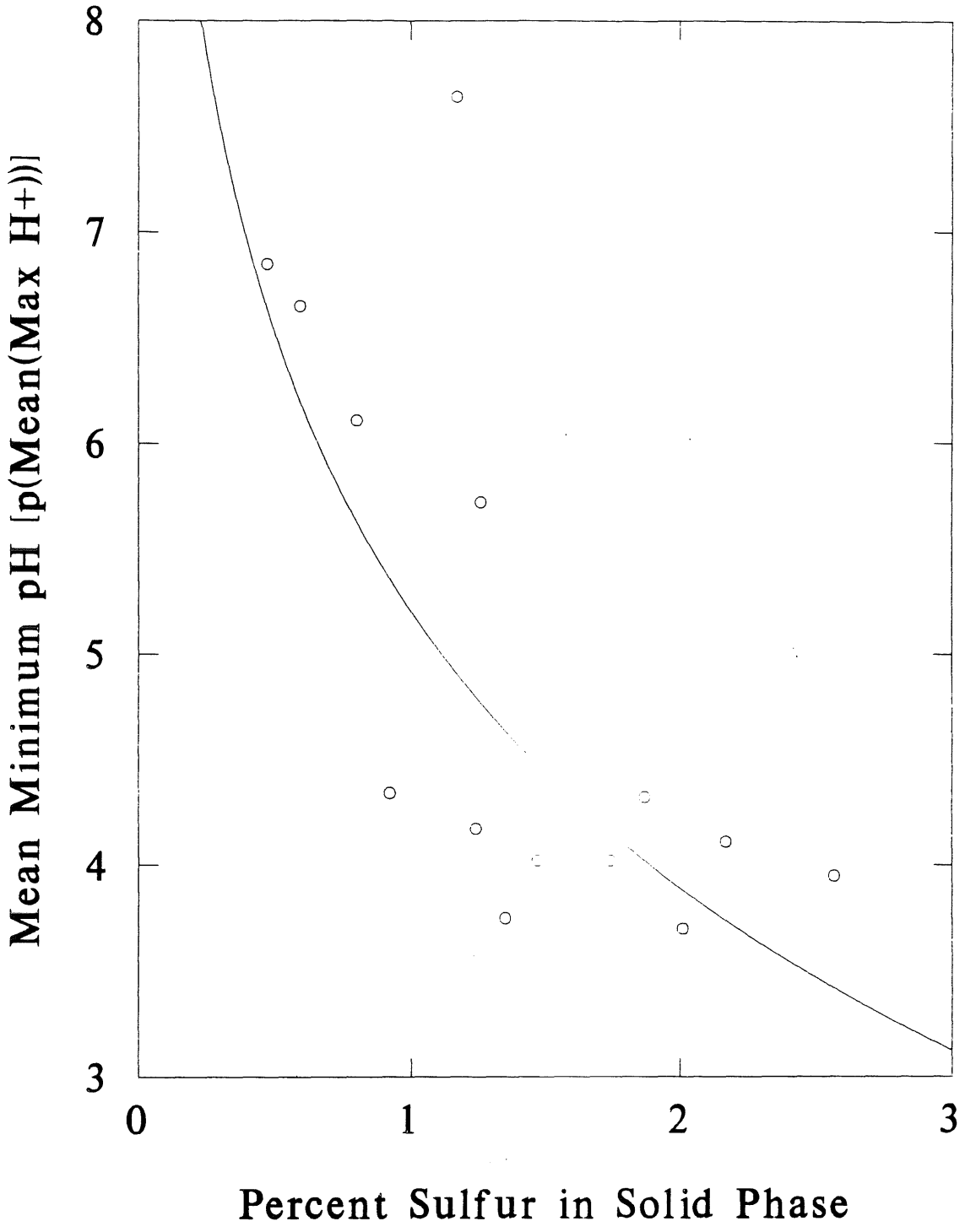


Figure A2.29. Mean minimum pH versus sulfur content by solid for the entire experimental period. Mean minimum pH calculated as the negative $\log_{10}$ of the mean of the maximum hydrogen ion concentration (minimum pH) observed for each reactor for a given solid. 1.17% sulfur sample not considered in fitted curve.



APPENDIX 3

CUMULATIVE MASS RELEASE

Table A3.1. Cumulative mass release of sulfate, calcium, and magnesium over time for reactor A (0.47% sulfur).

Week	Volume	Sulfate			Calcium			Magnesium		
		Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.
	mL	µmol/L	µmol	µmol	µmol/L	µmol	µmol	µmol/L	µmol	µmol
0	173.0	187.4	32.4	32.4	129.7	22.4	22.4	36.2	6.3	6.3
1	174.1	21.9	3.8	36.2	39.9	7.0	29.4	6.6	1.1	7.4
2	173.4	21.9	3.8	40.0	37.4	6.5	35.9	7.0	1.2	8.6
3	173.2	34.4	6.0	46.0	34.9	6.0	41.9	6.6	1.1	9.8
4	173.8	35.4	6.2	52.1	34.9	6.1	48.0	7.4	1.3	11.0
5	172.3	34.4	5.9	58.0	37.4	6.4	54.5	7.8	1.3	12.4
6	173.8	31.2	5.4	63.5	37.4	6.5	61.0	6.6	1.1	13.5
7	172.9	31.2	5.4	68.9	49.9	8.6	69.6	7.0	1.2	14.8
8	172.7	33.3	5.8	74.6	54.9	9.5	79.1	9.5	1.6	16.4
9	172.7	29.1	5.0	79.7	57.4	9.9	89.0	9.9	1.7	18.1
10	171.8	32.3	5.5	85.2	59.9	10.3	99.3	9.9	1.7	19.8
11	172.7	35.9 *	6.2	91.4	62.4	10.8	110.0	10.3	1.8	21.6
12	173.4	39.6	6.9	98.3	47.4	8.2	118.3	8.6	1.5	23.1
13	171.5	37.5	6.4	104.7	47.4	8.1	126.4	8.2	1.4	24.5

* This value was estimated rather than measured directly. See Methods for discussion.

Table A3.2. Cumulative mass release of sulfate, calcium, and magnesium over time for reactor D (0.59% sulfur).

Week	Volume	Sulfate			Calcium			Magnesium		
		Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.
	mL	µmol/L	µmol	µmol	µmol/L	µmol	µmol	µmol/L	µmol	µmol
0	174.3	156.2	27.2	27.2	174.7	30.4	30.4	74.1	12.9	12.9
1	173.0	68.2 *	11.8	39.0	74.9	12.9	43.4	24.7	4.3	17.2
2	174.5	10.4	1.8	40.8	52.4	9.1	52.5	20.6	3.6	20.8
3	172.2	18.7	3.2	44.1	54.9	9.5	62.0	10.3	1.8	22.5
4	172.4	21.9	3.8	47.8	54.9	9.5	71.4	10.7	1.8	24.4
5	172.8	24.9 *	4.3	52.1	57.4	9.9	81.4	10.7	1.8	26.2
6	173.9	25.0	4.3	56.5	59.9	10.4	91.8	12.3	2.1	28.4
7	171.7	46.8	8.0	64.5	52.4	9.0	100.8	14.0	2.4	30.8
8	173.5	55.2	9.6	74.1	59.9	10.4	111.2	17.3	3.0	33.8
9	172.2	44.1 *	7.6	81.7	57.4	9.9	121.0	15.2	2.6	36.4
10	174.8	56.2	9.8	91.5	54.9	9.6	130.6	15.6	2.7	39.1
11	174.3	57.3	10.0	101.5	59.9	10.4	141.1	14.8	2.6	41.7
12	173.3	59.3	10.3	111.8	72.4	12.5	153.6	17.7	3.1	44.8
13	173.5	54.1	9.4	121.2	72.4	12.6	166.2	17.3	3.0	47.8
14	172.3	56.2	9.7	130.9	77.3	13.3	179.5	17.3	3.0	50.8
15	174.1	53.7 *	9.4	140.2	74.9	13.0	192.5	16.9	2.9	53.7
16	169.6	70.8	12.0	152.2	74.9	12.7	205.2	19.3	3.3	57.0
17	174.6	64.5	11.3	163.5	77.3	13.5	218.7	18.1	3.2	60.1

* These values were estimated rather than measured directly. See Methods for discussion.

Table A3.3. Cumulative mass release of sulfate, calcium, and magnesium over time for reactor E (0.80% sulfur).

Week	Volume	Sulfate			Calcium			Magnesium		
		Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.
	mL	µmol/L	µmol	µmol	µmol/L	µmol	µmol	µmol/L	µmol	µmol
0	172.3	281.1	48.4	48.4	219.6 *	37.8	37.8	65.8 *	11.3	11.3
1	167.6	85.4	14.3	62.7	92.3	15.5	53.3	28.8	4.8	16.2
2	172.3	72.3 *	12.5	75.2	69.9	12.0	65.3	28.8	5.0	21.1
3	172.2	53.1	9.1	84.3	69.9	12.0	77.4	14.8	2.6	23.7
4	172.2	71.8	12.4	96.7	77.3	13.3	90.7	17.3	3.0	26.7
5	173.3	81.2	14.1	110.8	79.8	13.8	104.5	18.9	3.3	29.9
6	169.0	65.6	11.1	121.9	67.4	11.4	115.9	20.2	3.4	33.3
7	169.7	99.8 *	16.9	138.8	89.8	15.2	131.2	25.9	4.4	37.7
8	169.9	102.0	17.3	156.1	94.8	16.1	147.3	25.1	4.3	42.0
9	173.7	89.2 *	15.5	171.6	94.8	16.5	163.7	41.1	7.1	49.2
10	175.5	89.5	15.7	187.3	69.9	12.3	176.0	22.2	3.9	53.1
11	172.4	85.0 *	14.7	202.0	78.6 *	13.5	189.5	23.7 *	4.1	57.1
12	171.3	92.7	15.9	217.9	87.3	15.0	204.5	25.1	4.3	61.4
13	172.4	85.0 *	14.7	232.5	84.8 *	14.6	219.1	25.7 *	4.4	65.9
14	172.0	93.7	16.1	248.6	82.3	14.2	233.3	26.3	4.5	70.4
15	173.5	110.4 *	19.1	267.8	96.1 *	16.7	249.9	30.0 *	5.2	75.6
16	172.0	117.6	20.2	288.0	109.8	18.9	268.8	33.7	5.8	81.4
17	171.0	93.4 *	16.0	304.0	109.8 *	18.8	287.6	33.7 *	5.8	87.2

* These values were estimated rather than measured directly. See Methods for discussion.

Table A3.4. Cumulative mass release of sulfate, calcium, and magnesium over time for reactor F (0.80% sulfur).

Week	Volume	Sulfate			Calcium			Magnesium		
		Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.
	mL	µmol/L	µmol	µmol	µmol/L	µmol	µmol	µmol/L	µmol	µmol
0	172.2	281.1	48.4	48.4	219.6	37.8	37.8	65.8	11.3	11.3
1	170.4	116.7 *	19.9	68.3	82.3	14.0	51.8	28.8	4.9	16.2
2	170.9	50.0	8.5	76.8	67.4	11.5	63.4	28.8	4.9	21.2
3	171.4	74.4 *	12.8	89.6	77.3	13.3	76.6	17.3	3.0	24.1
4	171.0	68.1 *	11.6	101.2	77.3	13.2	89.8	16.5	2.8	26.9
5	170.7	65.6	11.2	112.4	79.8	13.6	103.5	17.7	3.0	30.0
6	172.2	63.9 *	11.0	123.4	87.3	15.0	118.5	20.2	3.5	33.4
7	172.9	84.3	14.6	138.0	84.0 *	14.5	133.0	21.0 *	3.6	37.1
8	172.8	93.4 *	16.1	154.1	80.7 *	13.9	147.0	21.8 *	3.8	40.8
9	172.8	20.8	3.6	157.7	77.3	13.4	160.3	22.6	3.9	44.7
10	171.7	89.2 *	15.3	173.1	76.1 *	13.1	173.4	22.0 *	3.8	48.5
11	172.5	90.6	15.6	188.7	74.9	12.9	186.3	21.4	3.7	52.2
12	172.2	97.7 *	16.8	205.5	78.6 *	13.5	199.8	23.2 *	4.0	56.2
13	172.7	92.7	16.0	221.5	82.3	14.2	214.1	25.1	4.3	60.5
14	170.1	89.2 *	15.2	236.7	82.3 *	14.0	228.1	25.5 *	4.3	64.9
15	170.8	93.7	16.0	252.7	82.3	14.1	242.1	25.9	4.4	69.3
16	172.3	97.7 *	16.8	269.5	79.8 *	13.8	255.9	25.7 *	4.4	73.7
17	172.0	89.5	15.4	284.9	77.3	13.3	269.2	25.5	4.4	78.1

* These values were estimated rather than measured directly. See Methods for discussion.

Table A3.5. Cumulative mass release of sulfate, calcium, and magnesium over time for reactor G (0.92% sulfur).

Week	Volume	Sulfate			Calcium			Magnesium		
		Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.
	mL	µmol/L	µmol	µmol	µmol/L	µmol	µmol	µmol/L	µmol	µmol
0	175.1	166.6	29.2	29.2	177.1	31.0	31.0	94.6	16.6	16.6
1	173.7	51.0	8.9	38.0	59.9	10.4	41.4	24.7	4.3	20.9
2	177.1	31.7 *	5.6	43.6	44.9	8.0	49.4	20.6	3.6	24.5
3	177.1	25.4 *	4.5	48.1	44.9	8.0	57.3	7.0	1.2	25.7
4	175.9	27.5 *	4.8	53.0	47.4	8.3	65.7	7.8	1.4	27.1
5	175.4	28.1	4.9	57.9	49.9	8.8	74.4	10.3	1.8	28.9
6	176.3	31.7 *	5.6	63.5	52.4	9.2	83.7	10.7	1.9	30.8
7	174.5	53.1	9.3	72.7	44.9	7.8	91.5	14.8	2.6	33.4
8	177.0	61.0 *	10.8	83.6	51.1 *	9.1	100.5	14.8 *	2.6	36.0
9	177.9	11.5	2.0	85.6	57.4	10.2	110.8	14.8	2.6	38.6
10	176.6	65.2 *	11.5	97.1	58.6 *	10.4	121.1	14.2 *	2.5	41.2
11	175.3	62.5	10.9	108.1	59.9	10.5	131.6	13.6	2.4	43.5
12	174.6	69.4 *	12.1	120.2	63.6 *	11.1	142.7	14.8 *	2.6	46.1
13	176.3	67.7	11.9	132.1	67.4	11.9	154.6	16.0	2.8	48.9
14	174.5	69.4 *	12.1	144.2	64.9 *	11.3	165.9	16.9 *	2.9	51.9
15	176.0	68.7	12.1	156.3	62.4	11.0	176.9	17.7	3.1	55.0
16	177.1	61.0 *	10.8	167.1	57.4 *	10.2	187.1	17.5 *	3.1	58.1
17	175.7	57.3	10.1	177.2	52.4	9.2	196.3	17.3	3.0	61.1
18	175.6	65.2 *	11.5	188.7	49.9 *	8.8	205.0	23.0 *	4.0	65.2
19	175.6	69.7	12.2	200.9	47.4	8.3	213.3	28.8	5.1	70.2
20	175.4	65.2 *	11.4	212.3	44.9 *	7.9	221.2	30.9 *	5.4	75.7
21	175.4	77.8 *	13.7	226.0	42.4	7.4	228.7	32.9	5.8	81.4
22	175.3	151.0	26.5	252.5	67.4	11.8	240.5	37.0	6.5	87.9
23	175.1	281.1	49.2	301.7	114.8	20.1	260.6	94.6	16.6	104.5
24	176.8	239.4	42.3	344.0	212.1	37.5	298.1	148.1	26.2	130.7
25	176.5	228.9 *	40.4	384.4	99.8	17.6	315.7	61.7	10.9	141.6
26	175.1	157.5 *	27.6	412.0	88.6 *	15.5	331.2	59.7 *	10.4	152.0
27	173.0	187.4	32.4	444.4	77.3	13.4	344.6	57.6	10.0	162.0
28	174.3	151.0	26.3	470.7	49.9	8.7	353.3	57.6	10.0	172.0
29	175.4	213.4	37.4	508.1	54.9	9.6	362.9	69.9	12.3	184.3
30	175.0	270.8 *	47.4	555.5	61.1 *	10.7	373.6	67.9 *	11.9	196.2
31	175.0	220.5 *	38.6	594.1	67.4	11.8	385.4	65.8	11.5	207.7
32	178.2	254.0	45.3	639.4	74.9	13.3	398.7	98.7	17.6	225.3
33	176.2	254.0 *	44.8	684.1	52.4 *	9.2	407.9	80.2 *	14.1	239.4
34	175.9	177.0	31.1	715.3	29.9	5.3	413.2	61.7	10.9	250.3

* These values were estimated rather than measured directly. See Methods for discussion.

Table A3.6. Cumulative mass release of sulfate, calcium, and magnesium over time for reactor H (0.92% sulfur).

Week	Volume	Sulfate			Calcium			Magnesium		
		Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.
	mL	µmol/L	µmol	µmol	µmol/L	µmol	µmol	µmol/L	µmol	µmol
0	175.8	166.6	29.3	29.3	179.6	31.6	31.6	98.7	17.4	17.4
1	175.1	18.7	3.3	32.6	59.9	10.5	42.1	24.7	4.3	21.7
2	177.0	9.4	1.7	34.2	42.4	7.5	49.6	20.6	3.6	25.3
3	177.4	25.0	4.4	38.7	37.4	6.6	56.2	6.6	1.2	26.5
4	174.6	25.0	4.4	43.0	44.9	7.8	64.1	8.2	1.4	27.9
5	177.6	33.8 *	6.0	49.0	49.9	8.9	72.9	10.3	1.8	29.8
6	178.1	37.5	6.7	55.7	39.9	7.1	80.0	11.1	2.0	31.7
7	181.5	35.9 *	6.5	62.2	49.9 *	9.1	89.1	12.3 *	2.2	34.0
8	177.5	59.3	10.5	72.7	59.9	10.6	99.7	13.6	2.4	36.4
9	178.7	56.9 *	10.2	82.9	58.6 *	10.5	110.2	14.6 *	2.6	39.0
10	175.4	67.7	11.9	94.8	57.4	10.1	120.3	15.6	2.7	41.7
11	175.8	62.5	11.0	105.7	64.9 *	11.4	131.7	16.3 *	2.9	44.6
12	176.6	69.7	12.3	118.1	72.4	12.8	144.4	16.9	3.0	47.6
13	173.1	77.8 *	13.5	131.5	68.6 *	11.9	156.3	16.7 *	2.9	50.5
14	176.8	65.6	11.6	143.1	64.9	11.5	167.8	16.5	2.9	53.4
15	178.0	69.4 *	12.4	155.5	66.1 *	11.8	179.6	18.1 *	3.2	56.6
16	175.5	72.9	12.8	168.3	67.4	11.8	191.4	19.7	3.5	60.1
17	174.7	56.9 *	9.9	178.2	61.1 *	10.7	202.1	22.2 *	3.9	63.9
18	178.3	71.8	12.8	191.0	54.9	9.8	211.8	24.7	4.4	68.3
19	179.4	61.0 *	11.0	202.0	61.1 *	11.0	222.8	30.9 *	5.5	73.9
20	176.8	119.7	21.2	223.1	67.4	11.9	234.7	37.0	6.5	80.4
21	175.4	208.2	36.5	259.7	89.8 *	15.8	250.5	63.8 *	11.2	91.6
22	176.2	255.1	44.9	304.6	112.3	19.8	270.3	90.5	15.9	107.6
23	176.6	333.1	58.8	363.4	98.6 *	17.4	287.7	80.2 *	14.2	121.7
24	177.7	229.0	40.7	404.1	84.8	15.1	302.7	69.9	12.4	134.2
25	176.9	212.1 *	37.5	441.6	68.6 *	12.1	314.9	65.8 *	11.6	145.8
26	177.5	171.8	30.5	472.1	52.4	9.3	324.2	61.7	11.0	156.8
27	177.6	161.7 *	28.7	500.9	57.4 *	10.2	334.4	51.4 *	9.1	165.9
28	171.0	136.6 *	23.4	524.2	62.4	10.7	345.0	41.1	7.0	172.9
29	175.8	128.2 *	22.5	546.7	42.4 *	7.5	352.5	45.3 *	8.0	180.9
30	176.9	114.5	20.3	567.0	22.5	4.0	356.5	49.4	8.7	189.6
31	176.5	107.2 *	18.9	585.9	36.2 *	6.4	362.8	49.4 *	8.7	198.3
32	177.2	94.6 *	16.8	602.7	49.9	8.8	371.7	49.4	8.7	207.1
33	179.1	90.4 *	16.2	618.9	49.9 *	8.9	380.6	49.4 *	8.8	215.9
34	176.6	82.0 *	14.5	633.4	49.9 *	8.8	389.4	49.4 *	8.7	224.6

* These values were estimated rather than measured directly. See Methods for discussion.

Table A3.7. Cumulative mass release of sulfate, calcium, and magnesium over time for reactor I (1.17% sulfur).

Week	Volume	Sulfate			Calcium			Magnesium		
		Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.
	mL	µmol/L	µmol	µmol	µmol/L	µmol	µmol	µmol/L	µmol	µmol
0	170.9	249.9	42.7	42.7	94.8	16.2	16.2	16.5	2.8	2.8
1	171.3	68.7	11.8	54.5	117.3	20.1	36.3	20.6	3.5	6.3
2	171.6	5.2 *	0.9	55.4	159.7	27.4	63.7	37.0	6.4	12.7
3	170.4	46.8	8.0	63.3	212.1	36.1	99.8	23.9	4.1	16.8
4	171.3	56.2	9.6	73.0	202.1	34.6	134.4	23.5	4.0	20.8
5	170.7	52.5 *	9.0	81.9	167.2	28.5	163.0	21.8	3.7	24.5
6	169.7	65.6	11.1	93.1	157.2	26.7	189.7	25.1	4.3	28.8
7	169.0	120.2 *	20.3	113.4	197.1	33.3	223.0	31.7	5.4	34.1
8	173.5	84.3	14.6	128.0	169.7	29.4	252.4	25.5	4.4	38.5
9	173.3	88.5	15.3	143.3	174.7 *	30.3	282.7	26.2 *	4.5	43.1
10	173.1	72.9	12.6	156.0	179.6 *	31.1	313.8	26.9 *	4.7	47.7
11	171.2	75.0	12.8	168.8	184.6	31.6	345.4	27.6	4.7	52.4
12	171.4	93.7	16.1	184.8	198.4 *	34.0	379.4	31.3 *	5.4	57.8
13	171.2	109.3	18.7	203.6	212.1	36.3	415.7	35.0	6.0	63.8
14	172.6	109.3	18.9	222.4	204.6 *	35.3	451.0	32.5 *	5.6	69.4
15	175.5	114.5	20.1	242.5	197.1	34.6	485.6	30.0	5.3	74.7
16	171.0	151.0	25.8	268.3	205.8 *	35.2	520.8	29.4 *	5.0	79.7
17	173.1	130.1	22.5	290.9	214.6	37.1	557.9	28.8	5.0	84.7

* These values were estimated rather than measured directly. See Methods for discussion.

Table A3.8. Cumulative mass release of sulfate, calcium, and magnesium over time for reactor J (1.17% sulfur).

Week	Volume	Sulfate			Calcium			Magnesium		
		Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.
	mL	µmol/L	µmol	µmol	µmol/L	µmol	µmol	µmol/L	µmol	µmol
0	172.0	270.7	46.6	46.6	102.3	17.6	17.6	20.6	3.5	3.5
1	172.0	20.8	3.6	50.1	137.2	23.6	41.2	28.8	5.0	8.5
2	170.7	26.0	4.4	54.6	167.2	28.5	69.7	37.0	6.3	14.8
3	170.7	66.0 *	11.3	65.9	202.1	34.5	104.2	22.2	3.8	18.6
4	171.4	62.7 *	10.7	76.6	187.1	32.1	136.3	21.8	3.7	22.3
5	171.0	56.2	9.6	86.2	167.2	28.6	164.9	21.4	3.7	26.0
6	172.8	45.7 *	7.9	94.1	152.2	26.3	191.2	23.5	4.1	30.1
7	172.5	78.1	13.5	107.6	153.0 *	26.4	217.6	23.9 *	4.1	34.2
8	173.7	109.3	19.0	126.6	153.9 *	26.7	244.3	24.3 *	4.2	38.4
9	174.3	85.4	14.9	141.4	154.7	27.0	271.3	24.7	4.3	42.7
10	173.4	85.4	14.8	156.2	144.7	25.1	296.4	25.1	4.4	47.0
11	174.0	104.1	18.1	174.4	162.2 *	28.2	324.6	27.2 *	4.7	51.8
12	172.1	95.8	16.5	190.8	179.6	30.9	355.5	29.2	5.0	56.8
13	174.7	109.3	19.1	209.9	202.1 *	35.3	390.8	32.3 *	5.6	62.4
14	171.6	147.2 *	25.3	235.2	224.6	38.5	429.3	35.4	6.1	68.5
15	175.2	130.1	22.8	258.0	218.3 *	38.2	467.6	34.8 *	6.1	74.6
16	173.3	171.8	29.8	287.8	212.1	36.8	504.3	34.1	5.9	80.5
17	174.8	156.2	27.3	315.1	212.1 *	37.1	541.4	34.1 *	6.0	86.5

* These values were estimated rather than measured directly. See Methods for discussion.

Table A3.9. Cumulative mass release of sulfate, calcium, and magnesium over time for reactor K (1.24% sulfur).

Week	Volume	Sulfate			Calcium			Magnesium		
		Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.
	mL	µmol/L	µmol	µmol	µmol/L	µmol	µmol	µmol/L	µmol	µmol
0	170.8	343.5	58.7	58.7	331.8	56.7	56.7	160.5	27.4	27.4
1	173.7	85.4	14.8	73.5	107.3	18.6	75.3	57.6	10.0	37.4
2	174.0	41.6	7.2	80.8	79.8	13.9	89.2	45.3	7.9	45.3
3	171.7	115.2 *	19.8	100.5	69.9	12.0	101.2	21.8	3.7	49.0
4	170.5	149.9	25.6	126.1	69.9	11.9	113.1	23.5	4.0	53.0
5	172.2	138.5	23.8	149.9	97.3	16.8	129.9	39.5	6.8	59.8
6	171.6	120.6 *	20.7	170.6	87.3	15.0	144.9	37.4	6.4	66.3
7	175.4	134.3	23.6	194.2	77.3	13.6	158.4	36.6	6.4	72.7
8	175.1	125.2 *	21.9	216.1	74.9 *	13.1	171.5	36.4 *	6.4	79.1
9	175.3	129.1	22.6	238.7	72.4	12.7	184.2	36.2	6.3	85.4
10	175.8	119.7 *	21.0	259.8	69.9 *	12.3	196.5	35.0 *	6.1	91.5
11	174.9	108.3	18.9	278.7	67.4	11.8	208.3	33.7	5.9	97.5
12	173.6	120.6 *	20.9	299.7	64.9 *	11.3	219.5	35.0 *	6.1	103.5
13	173.7	103.1	17.9	317.6	62.4	10.8	230.4	36.2	6.3	109.8
14	173.1	117.9 *	20.4	338.0	62.4 *	10.8	241.2	38.1 *	6.6	116.4
15	173.4	118.7	20.6	358.5	62.4	10.8	252.0	39.9	6.9	123.3
16	173.4	166.6	28.9	387.4	59.9 *	10.4	262.4	38.9 *	6.7	130.1
17	172.5	116.6	20.1	407.5	57.4	9.9	272.3	37.9	6.5	136.6
18	173.8	156.2	27.1	434.7	56.1 *	9.8	282.0	39.7 *	6.9	143.5
19	174.6	135.3	23.6	458.3	54.9 *	9.6	291.6	41.6 *	7.3	150.7
20	174.0	151.0	26.3	484.6	53.6 *	9.3	300.9	43.4 *	7.6	158.3
21	175.0	130.1	22.8	507.3	52.4	9.2	310.1	45.3	7.9	166.2

* These values were estimated rather than measured directly. See Methods for discussion.

Table A3.10. Cumulative mass release of sulfate, calcium, and magnesium over time for reactor L (1.24% sulfur).

Week	Volume	Sulfate			Calcium			Magnesium		
		Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.
	mL	µmol/L	µmol	µmol	µmol/L	µmol	µmol	µmol/L	µmol	µmol
0	173.0	343.5	59.4	59.4	272.0	47.0	47.0	168.7	29.2	29.2
1	175.0	104.1	18.2	77.7	104.8	18.3	65.4	53.5	9.4	38.5
2	172.4	43.7	7.5	85.2	82.3	14.2	79.6	45.3	7.8	46.3
3	173.5	112.5 *	19.5	104.7	64.9	11.3	90.8	21.0	3.6	50.0
4	173.4	145.7	25.3	130.0	69.9	12.1	103.0	21.4	3.7	53.7
5	173.4	145.7	25.3	155.2	84.8	14.7	117.7	31.7	5.5	59.2
6	172.5	135.3	23.3	178.6	87.3	15.1	132.7	37.0	6.4	65.6
7	175.1	119.7 *	21.0	199.6	77.3 *	13.5	146.3	33.5 *	5.9	71.4
8	174.5	114.5	20.0	219.5	67.4	11.8	158.0	30.0	5.2	76.7
9	172.2	124.2 *	21.4	240.9	66.1 *	11.4	169.4	33.1 *	5.7	82.4
10	172.0	123.9	21.3	262.2	64.9	11.2	180.6	36.2	6.2	88.6
11	174.2	121.5 *	21.2	283.4	66.1 *	11.5	192.1	37.0 *	6.5	95.1
12	172.3	111.4	19.2	302.6	67.4	11.6	203.7	37.9	6.5	101.6
13	174.6	117.9 *	20.6	323.2	67.4 *	11.8	215.5	39.3 *	6.9	108.5
14	171.8	113.5	19.5	342.7	67.4	11.6	227.0	40.7	7.0	115.5
15	174.7	120.6 *	21.1	363.8	66.1 *	11.6	238.6	40.9 *	7.2	122.6
16	172.8	115.6	20.0	383.7	64.9	11.2	249.8	41.1	7.1	129.7
17	174.7	117.9 *	20.6	404.3	59.9 *	10.5	260.2	41.1 *	7.2	136.9
18	174.1	104.1	18.1	422.5	54.9 *	9.6	269.8	41.1 *	7.2	144.1
19	173.8	88.5	15.4	437.8	49.9	8.7	278.5	41.1	7.2	151.2
20	161.5	109.3	17.7	455.5	49.9 *	8.1	286.5	43.2 *	7.0	158.2
21	174.9	93.7	16.4	471.9	49.9	8.7	295.3	45.3	7.9	166.1

* These values were estimated rather than measured directly. See Methods for discussion.

Table A3.11. Cumulative mass release of sulfate, calcium, and magnesium over time for reactor M (1.26% sulfur).

Week	Volume	Sulfate			Calcium			Magnesium		
		Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.
	mL	µmol/L	µmol	µmol	µmol/L	µmol	µmol	µmol/L	µmol	µmol
0	174.7	1405.4	245.5	245.5	1255.0	219.2	219.2	193.4	33.8	33.8
1	166.9	147.8	24.7	270.2	127.2	21.2	240.5	24.7	4.1	37.9
2	176.0	88.5	15.6	285.8	67.4	11.9	252.3	16.5	2.9	40.8
3	177.2	87.4	15.5	301.3	57.4	10.2	262.5	4.9	0.9	41.7
4	177.5	68.7	12.2	313.5	52.4	9.3	271.8	4.9	0.9	42.6
5	175.4	52.1	9.1	322.6	54.9	9.6	281.4	6.2	1.1	43.6
6	175.8	56.2	9.9	332.5	47.4	8.3	289.8	7.8	1.4	45.0
7	176.4	65.6	11.6	344.0	37.4	6.6	296.4	7.4	1.3	46.3
8	175.7	65.9 *	11.6	355.6	46.2 *	8.1	304.5	8.0 *	1.4	47.7
9	172.4	65.6	11.3	366.9	54.9	9.5	313.9	8.6	1.5	49.2
10	175.2	84.0 *	14.7	381.6	52.4 *	9.2	323.1	8.6 *	1.5	50.7
11	176.6	61.4	10.8	392.5	49.9	8.8	331.9	8.6	1.5	52.3
12	175.5	68.5 *	12.0	404.5	52.4 *	9.2	341.1	9.1 *	1.6	53.8
13	176.0	56.2	9.9	414.4	54.9	9.7	350.8	9.5	1.7	55.5
14	176.9	76.2 *	13.5	427.9	54.9 *	9.7	360.5	9.5 *	1.7	57.2
15	176.8	61.4	10.9	438.8	54.9	9.7	370.2	9.5	1.7	58.9
16	175.7	104.1	18.3	457.1	53.6 *	9.4	379.6	9.9 *	1.7	60.6
17	175.9	63.5	11.2	468.2	52.4	9.2	388.8	10.3	1.8	62.4
18	177.3	76.2 *	13.5	481.7	49.9 *	8.8	397.7	13.4 *	2.4	64.8
19	175.3	66.6	11.7	493.4	47.4	8.3	406.0	16.5	2.9	67.7
20	175.8	68.5 *	12.0	505.5	46.2 *	8.1	414.1	14.4 *	2.5	70.2
21	177.5	68.7	12.2	517.7	44.9	8.0	422.1	12.3	2.2	72.4

* These values were estimated rather than measured directly. See Methods for discussion.

Table A3.12. Cumulative mass release of sulfate, calcium, and magnesium over time for reactor N (1.26% sulfur).

Week	Volume	Sulfate			Calcium			Magnesium		
		Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.
	mL	µmol/L	µmol	µmol	µmol/L	µmol	µmol	µmol/L	µmol	µmol
0	173.8	1405.4	244.3	244.3	1265.0	219.9	219.9	197.5	34.3	34.3
1	175.3	171.8	30.1	274.4	164.7	28.9	248.7	28.8	5.0	39.4
2	175.6	81.4 *	14.3	288.7	67.4	11.8	260.5	16.5	2.9	42.3
3	176.1	71.1 *	12.5	301.2	54.9	9.7	270.2	5.3	0.9	43.2
4	175.7	63.3 *	11.1	312.3	62.4	11.0	281.2	5.8	1.0	44.2
5	175.0	75.0	13.1	325.4	52.4	9.2	290.3	6.2	1.1	45.3
6	172.3	75.0	12.9	338.3	52.4	9.0	299.4	9.1	1.6	46.9
7	176.9	65.9 *	11.7	350.0	52.4 *	9.3	308.6	8.4 *	1.5	48.3
8	177.0	71.8	12.7	362.7	52.4	9.3	317.9	7.8	1.4	49.7
9	176.3	68.5 *	12.1	374.8	46.2 *	8.1	326.1	8.2 *	1.5	51.2
10	177.2	72.9	12.9	387.7	39.9	7.1	333.1	8.6	1.5	52.7
11	175.4	71.1 *	12.5	400.2	43.7 *	7.7	340.8	8.6 *	1.5	54.2
12	175.2	61.4	10.8	410.9	47.4	8.3	349.1	8.6	1.5	55.7
13	176.9	71.1 *	12.6	423.5	49.9 *	8.8	357.9	9.3 *	1.6	57.4
14	174.3	54.1	9.4	432.9	52.4	9.1	367.0	9.9	1.7	59.1
15	177.0	71.1 *	12.6	445.5	51.1 *	9.1	376.1	9.9 *	1.7	60.8
16	177.5	77.0	13.7	459.2	49.9	8.9	385.0	9.9	1.8	62.6
17	175.2	78.8 *	13.8	473.0	49.9 *	8.7	393.7	13.2 *	2.3	64.9
18	176.5	82.2	14.5	487.5	49.9	8.8	402.5	16.5	2.9	67.8
19	175.9	78.8 *	13.9	501.4	50.7 *	8.9	411.4	16.5 *	2.9	70.7
20	175.5	82.2	14.4	515.8	51.6 *	9.0	420.5	16.5 *	2.9	73.6
21	176.9	78.8 *	13.9	529.8	52.4	9.3	429.8	16.5	2.9	76.5

* These values were estimated rather than measured directly. See Methods for discussion.

Table A3.13. Cumulative mass release of sulfate, calcium, and magnesium over time for reactor C (1.35% sulfur).

Week	Volume	Sulfate			Calcium			Magnesium		
		Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.
	mL	µmol/L	µmol	µmol	µmol/L	µmol	µmol	µmol/L	µmol	µmol
0	173.6	3808.7 *	661.2	661.2	880.7	152.9	152.9	1234.3	214.3	214.3
1	172.5	1925.9	332.2	993.4	389.2	67.1	220.0	617.2	106.5	320.7
2	171.7	1197.2	205.6	1199.0	192.1	33.0	253.0	239.0	41.0	361.8
3	170.6	780.8	133.2	1332.2	119.8	20.4	273.5	216.8	37.0	398.8
4	170.3	624.6	106.4	1438.5	117.3	20.0	293.4	224.6	38.3	437.0
5	171.0	416.4	71.2	1509.8	64.9	11.1	304.5	162.5	27.8	464.8
6	172.1	520.5	89.6	1599.3	62.4	10.7	315.3	134.5	23.2	488.0
7	173.7	312.3	54.2	1653.6	59.9	10.4	325.7	107.4	18.7	506.6
8	171.7	239.4	41.1	1694.7	59.9	10.3	335.9	100.4	17.2	523.9
9	172.6	260.3	44.9	1739.6	59.9	10.3	346.3	85.2	14.7	538.6
10	171.8	249.9	42.9	1782.5	59.9	10.3	356.6	76.1	13.1	551.6
11	173.4	218.6	37.9	1820.4	49.9	8.7	365.2	65.8	11.4	563.1
12	173.0	301.9	52.2	1872.7	54.9	9.5	374.7	63.0	10.9	573.9
13	173.1	270.7	46.9	1919.5	52.4	9.1	383.8	57.2	9.9	583.8
14	172.5	291.5	50.3	1969.8	49.9	8.6	392.4	61.7	10.6	594.5
15	173.1	275.9	47.8	2017.6	41.2 *	7.1	399.5	53.5 *	9.3	603.7
16	175.4	249.9	43.8	2061.4	32.4	5.7	405.2	45.3	7.9	611.7
17	171.0	229.0	39.2	2100.6	34.9 *	6.0	411.2	43.2 *	7.4	619.1
18	171.9	218.6	37.6	2138.1	37.4	6.4	417.6	41.1	7.1	626.1
19	172.4	275.9	47.6	2185.7	47.4 *	8.2	425.8	35.0 *	6.0	632.2
20	173.0	182.7 *	31.6	2217.3	57.4	9.9	435.7	28.8	5.0	637.2
21	173.0	177.4 *	30.7	2248.0	48.7 *	8.4	444.1	30.9 *	5.3	642.5
22	174.1	171.8	29.9	2277.9	39.9	7.0	451.1	32.9	5.7	648.2
23	172.2	214.5	36.9	2314.8	41.6 *	7.2	458.2	35.7 *	6.1	654.4
24	172.1	230.2 *	39.6	2354.4	43.2 *	7.4	465.7	38.4 *	6.6	661.0
25	171.0	296.7	50.7	2405.2	44.9	7.7	473.4	41.1	7.0	668.0
26	172.5	325.2 *	56.1	2461.3	48.7 *	8.4	481.7	35.0 *	6.0	674.0
27	172.4	388.5 *	67.0	2528.2	52.4	9.0	490.8	28.8	5.0	679.0
28	173.6	483.5 *	83.9	2612.2	52.4 *	9.1	499.9	41.1 *	7.1	686.2
29	172.8	426.8	73.8	2685.9	52.4	9.1	508.9	53.5	9.2	695.4
30	172.7	578.5 *	99.9	2785.8	52.4 *	9.0	518.0	53.5 *	9.2	704.6

* These values were estimated rather than measured directly. See Methods for discussion.

Table A3.14. Cumulative mass release of sulfate, calcium, and magnesium over time for reactor O (1.47% sulfur).

Week	Volume	Sulfate			Calcium			Magnesium		
		Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.
	mL	µmol/L	µmol	µmol	µmol/L	µmol	µmol	µmol/L	µmol	µmol
0	167.6	2862.9	479.8	479.8	1442.1	241.7	241.7	1127.3	188.9	188
1	167.0	369.6	61.7	541.5	304.4	50.8	292.5	218.1	36.4	225.4
2	170.2	270.7	46.1	587.6	172.2	29.3	321.8	139.9	23.8	249.2
3	170.0	278.9 *	47.4	635.0	157.2	26.7	348.6	98.3	16.7	265.9
4	170.5	238.1 *	40.6	675.6	144.7	24.7	373.2	87.2	14.9	280.8
5	167.6	249.9	41.9	717.5	114.8	19.2	392.5	86.4	14.5	295.2
6	169.5	270.7	45.9	763.4	109.8	18.6	411.1	74.1	12.6	307.8
7	170.4	281.1	47.9	811.3	92.3	15.7	426.8	65.4	11.1	[illegible]
8	168.4	275.9	46.5	857.7	94.8	16.0	442.8	63.4	10.7	
9	170.1	281.1	47.8	905.5	89.8	15.3	458.0	61.3	10.4	
10	170.0	281.1	47.8	953.3	77.3	13.1	471.2	59.2	10.1	
11	169.1	312.3	52.8	1006.1	97.3	16.5	487.6	68.7	11.6	
12	168.5	374.8	63.1	1069.3	117.3	19.8	507.4	94.2	15.9	
13	168.0	364.4	61.2	1130.5	114.8	19.3	526.7	91.3	15.3	[illegible]
14	170.2	416.4	70.9	1201.4	114.8	19.5	546.2	97.5	16.6	409.5
15	169.3	442.4	74.9	1276.3	117.3	19.9	566.1	103.3	17.5	427.0
16	169.1	520.5	88.0	1364.3	109.8	18.[illegible]	584.6	88.9	15.0	442.1
17	173.1	562.2	97.3	1461.6	109.8	19.[illegible]	603.6	86.8	15.0	457.1
18	169.8	510.1	86.6	1548.2	97.3 *	16.[illegible]	620.2	80.4 *	13.7	470.7
19	168.9	468.5	79.1	1627.3	84.8	14.3	634.5	74.1	12.5	483.2
20	168.7	489.3	82.5	1709.9	77.3 *	13.0	647.5	65.8 *	11.1	494.4
21	169.1	718.3	121.5	1831.3	69.9	11.8	659.4	57.6	9.7	504.1

* These values were estimated rather than measured directly. See Methods for discussion.

Table A3.15. Cumulative mass release of sulfate, calcium, and magnesium over time for reactor P (1.47% sulfur).

Week	Volume	Sulfate			Calcium			Magnesium		
		Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.
	mL	µmol/L	µmol	µmol	µmol/L	µmol	µmol	µmol/L	µmol	µmol
0	133.4	2238.2	298.6	298.6	985.5	131.5	131.5	921.6	122.9	122.9
1	140.4	281.1	39.5	338.0	227.0	31.9	163.3	61.7	8.7	131.6
2	173.3	260.3	45.1	383.1	169.7	29.4	192.7	135.8	23.5	155.1
3	171.3	258.5 *	44.3	427.4	162.2	27.8	220.5	91.8	15.7	170.9
4	169.9	238.1 *	40.5	467.9	142.2	24.2	244.7	81.5	13.8	184.7
5	170.7	239.4	40.9	508.8	112.3	19.2	263.9	81.9	14.0	198.7
6	169.3	312.3	52.9	561.6	104.8	17.7	281.6	67.1	11.4	210.0
7	169.8	238.1 *	40.4	602.1	92.3	15.7	297.3	62.5	10.6	220.6
8	171.6	268.7 *	46.1	648.2	104.8	18.0	315.3	63.4	10.9	231.5
9	170.0	322.7	54.9	703.0	117.3	19.9	335.2	75.7	12.9	244.4
10	170.5	385.2	65.7	768.7	124.8	21.3	356.5	95.0	16.2	260.6
11	170.3	416.4	70.9	839.6	154.7	26.3	382.8	106.2	18.1	278.7
12	170.2	442.4	75.3	914.9	147.2	25.1	407.9	121.8	20.7	299.4
13	170.9	416.4	71.2	986.1	127.2	21.7	429.6	109.0	18.6	318.0
14	172.2	567.4	97.7	1083.8	132.2	22.8	452.4	131.7	22.7	340.7
15	172.3	760.0	130.9	1214.7	119.8	20.6	473.0	139.9	24.1	364.8
16	170.0	895.3	152.2	1366.9	124.8	21.2	494.2	115.6	19.7	384.5
17	173.2	916.1	158.7	1525.6	109.8	19.0	513.2	106.6	18.5	402.9
18	173.0	791.2	136.9	1662.5	97.3	16.8	530.1	107.0	18.5	421.4
19	170.3	770.4	131.2	1793.7	102.3	17.4	547.5	69.9	11.9	433.3
20	170.9	874.5	149.4	1943.1	92.3 *	15.8	563.3	84.3 *	14.4	447.8
21	170.6	520.5	88.8	2031.9	82.3	14.0	577.3	98.7	16.8	464.6

* These values were estimated rather than measured directly. See Methods for discussion.

Table A3.16. Cumulative mass release of sulfate, calcium, and magnesium over time for reactor Q (1.74% sulfur).

Week	Volume	Sulfate			Calcium			Magnesium		
		Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.
	mL	µmol/L	µmol	µmol	µmol/L	µmol	µmol	µmol/L	µmol	µmol
0	167.0	2862.9	478.1	478.1	1736.5	290.0	290.0	971.0	162.2	162.2
1	166.5	327.9	54.6	532.7	291.9	48.6	338.6	189.3	31.5	193.7
2	167.2	260.3	43.5	576.2	187.1	31.3	369.9	131.7	22.0	215.7
3	170.2	161.5 *	27.5	603.7	134.7	22.9	392.8	69.1	11.8	227.4
4	170.0	174.9 *	29.7	633.4	137.2	23.3	416.2	72.0	12.2	239.7
5	168.9	281.1	47.5	680.9	139.7	23.6	439.7	98.7	16.7	256.4
6	168.6	301.9	50.9	731.8	129.7	21.9	461.6	81.1	13.7	270.0
7	169.9	281.1	47.8	779.6	122.3	20.8	482.4	77.8	13.2	283.2
8	168.9	301.9	51.0	830.6	124.8	21.1	503.5	77.4	13.1	296.3
9	171.5	291.5	50.0	880.6	122.3	21.0	524.4	77.4	13.3	309.6
10	169.2	296.7	50.2	930.8	107.3	18.2	542.6	76.1	12.9	322.5
11	170.7	359.2	61.3	992.1	147.2	25.1	567.7	93.8	16.0	338.5
12	170.6	1197.2	204.2	1196.3	344.3	58.7	626.5	246.9	42.1	380.6
13	170.5	989.0	168.6	1364.9	257.0	43.8	670.3	217.2	37.0	417.6
14	171.3	1405.4	240.7	1605.7	244.5	41.9	712.2	223.4	38.3	455.9
15	172.3	936.9	161.4	1767.1	249.5	43.0	755.1	219.3	37.8	493.7
16	171.4	874.5	149.9	1917.0	239.5	41.1	796.2	217.2	37.2	530.9
17	172.1	791.2	136.2	2053.2	207.1	35.6	831.8	197.5	34.0	564.9
18	172.6	812.0	140.2	2193.3	192.1	33.2	865.0	156.3	27.0	591.9
19	169.7	791.2	134.3	2327.6	168.8 *	28.7	893.6	155.0 *	26.3	618.2
20	171.5	832.8	142.8	2470.4	145.5 *	25.0	918.6	153.6 *	26.3	644.5
21	172.2	749.6	129.1	2599.5	122.3	21.1	939.7	152.2	26.2	670.7

* These values were estimated rather than measured directly. See Methods for discussion.

Table A3.17. Cumulative mass release of sulfate, calcium, and magnesium over time for reactor R (1.74% sulfur).

Week	Volume	Sulfate			Calcium			Magnesium		
		Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.
	mL	µmol/L	µmol	µmol	µmol/L	µmol	µmol	µmol/L	µmol	µmol
0	167.7	2862.9	480.1	480.1	1813.9	304.2	304.2	962.8	161.5	161.5
1	173.2	343.5	59.5	539.6	296.9	51.4	355.6	197.5	34.2	195.7
2	164.7	270.7	44.6	584.2	184.6	30.4	386.0	127.5	21.0	216.7
3	169.4	185.3	31.4	615.6	149.7	25.4	411.4	83.1	14.1	230.7
4	169.7	253.0	42.9	658.5	132.2	22.4	433.8	78.6	13.3	244.1
5	168.5	275.9	46.5	705.0	137.2	23.1	456.9	97.9	16.5	260.6
6	166.1	281.1	46.7	751.7	127.2	21.1	478.1	78.2	13.0	273.6
7	169.4	248.7 *	42.1	793.8	117.3	19.9	497.9	79.8	13.5	287.1
8	169.8	242.0 *	41.1	834.9	104.8	17.8	515.7	71.2	12.1	299.2
9	170.8	215.2 *	36.7	871.6	102.3	17.5	533.2	67.5	11.5	310.7
10	170.2	215.2 *	36.6	908.3	99.8	17.0	550.2	68.3	11.6	322.3
11	169.6	281.1	47.7	955.9	107.3	18.2	568.4	66.2	11.2	333.6
12	169.6	301.9	51.2	1007.1	127.2	21.6	590.0	83.1	14.1	347.7
13	168.5	442.4	74.6	1081.7	194.6	32.8	622.8	145.6	24.5	372.2
14	169.6	832.8	141.2	1222.9	262.0	44.4	667.2	196.3	33.3	405.5
15	169.9	458.1	77.8	1300.8	194.6	33.1	700.3	158.8	27.0	432.5
16	171.3	499.7	85.6	1386.4	192.1	32.9	733.2	148.5	25.4	457.9
17	167.1	442.4	73.9	1460.3	184.6	30.9	764.0	142.8	23.9	481.8
18	169.6	447.6	75.9	1536.2	155.9 *	26.4	790.5	129.0 *	21.9	503.6
19	169.2	442.4	74.9	1611.1	127.2	21.5	812.0	115.2	19.5	523.1
20	172.8	437.2	75.6	1686.6	127.2 *	22.0	834.0	119.3 *	20.6	543.7
21	173.5	442.4	76.8	1763.4	127.2	22.1	856.1	123.4	21.4	565.2

* These values were estimated rather than measured directly. See Methods for discussion.

Table A3.18. Cumulative mass release of sulfate, calcium, and magnesium over time for reactor S (1.87% sulfur).

Week	Volume	Sulfate			Calcium			Magnesium		
		Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.
	mL	µmol/L	µmol	µmol	µmol/L	µmol	µmol	µmol/L	µmol	µmol
0	171.0	1561.6	267.0	267.0	1190.1	203.5	203.5	547.2	93.6	93.6
1	172.5	218.6	37.7	304.7	249.5	43.0	246.5	164.6	28.4	122.0
2	170.1	318.6	54.2	358.9	147.2	25.0	271.6	102.9	17.5	139.5
3	173.4	37.7 *	6.5	365.5	142.2	24.7	296.2	72.0	12.5	151.9
4	172.1	147.3 *	25.4	390.8	167.2	28.8	325.0	81.1	13.9	165.9
5	173.8	312.3	54.3	445.1	234.5	40.8	365.8	131.7	22.9	188.8
6	171.4	395.6	67.8	512.9	291.9	50.0	415.8	137.4	23.6	212.3
7	173.0	473.7	81.9	594.9	329.3	57.0	472.8	144.4	25.0	237.3
8	172.9	447.6	77.4	672.2	274.5	47.5	520.2	128.4	22.2	259.5
9	172.8	364.4	63.0	735.2	237.0	41.0	561.2	95.5	16.5	276.0
10	172.8	343.5	59.4	794.6	204.6	35.4	596.6	82.3	14.2	290.2
11	172.2	301.9	52.0	846.6	214.6	36.9	633.5	76.1	13.1	303.3
12	173.7	317.5	55.2	901.7	207.1	36.0	669.5	89.3	15.5	318.8
13	170.7	301.9	51.5	953.3	169.7	29.0	698.4	107.0	18.3	337.1
14	174.1	364.4	63.4	1016.7	244.5	42.6	741.0	114.0	19.8	356.9
15	172.5	499.7	86.2	1102.9	344.3	59.4	800.4	189.3	32.6	389.6
16	173.6	635.0	110.2	1213.1	441.6	76.7	877.1	193.0	33.5	423.1
17	174.4	572.6	99.9	1313.0	379.2	66.1	943.2	180.6	31.5	454.6
18	173.2	447.6	77.5	1390.5	284.4	49.3	992.5	164.6	28.5	483.1
19	172.6	421.6	72.8	1463.3	207.1	35.7	1028.2	107.0	18.5	501.6
20	174.5	426.8	74.5	1537.8	239.5	41.8	1070.0	164.6	28.7	530.3
21	174.3	364.4	63.5	1601.3	210.8 *	36.7	1106.8	146.1 *	25.5	555.7
22	172.3	374.8	64.6	1665.9	182.1	31.4	1138.1	127.5	22.0	577.7
23	174.2	395.6	68.9	1734.8	171.3 *	29.8	1168.0	134.4 *	23.4	601.1
24	173.5	439.7 *	76.3	1811.0	160.5 *	27.8	1195.8	141.3 *	24.5	625.6
25	173.1	374.8	64.9	1875.9	149.7	25.9	1221.7	148.1	25.6	651.3
26	173.2	403.1 *	69.8	1945.7	140.6 *	24.3	1246.1	155.0 *	26.8	678.1
27	173.2	300.8 *	52.1	1997.8	131.4 *	22.8	1268.8	161.8 *	28.0	706.1
28	174.0	374.8	65.2	2063.0	122.3	21.3	1290.1	168.7	29.4	735.5
29	173.2	461.6 *	79.9	2143.0	127.2 *	22.0	1312.2	165.9 *	28.7	764.2
30	173.4	308.1 *	53.4	2196.4	132.2 *	22.9	1335.1	163.2 *	28.3	792.5
31	172.9	352.0 *	60.9	2257.3	137.2	23.7	1358.8	160.5	27.7	820.3
32	172.2	439.7 *	75.7	2333.0	115.6 *	19.9	1378.7	170.1 *	29.3	849.6
33	173.1	454.3 *	78.6	2411.6	94.0 *	16.3	1395.0	179.7 *	31.1	880.7
34	173.0	374.8	64.8	2476.4	72.4	12.5	1407.5	189.3	32.7	913.4

* These values were estimated rather than measured directly. See Methods for discussion.

Table A3.19. Cumulative mass release of sulfate, calcium, and magnesium over time for reactor T (1.87% sulfur).

Week	Volume	Sulfate			Calcium			Magnesium		
		Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.
	mL	µmol/L	µmol	µmol	µmol/L	µmol	µmol	µmol/L	µmol	µmol
0	171.7	1613.6	277.1	277.1	1130.2	194.1	194.1	547.2	94.0	94.0
1	168.8	244.6	41.3	318.4	264.5	44.6	238.7	176.9	29.9	123.8
2	167.7	337.3	56.6	374.9	154.7	25.9	264.6	98.7	16.6	140.4
3	171.3	59.6 *	10.2	385.1	157.2	26.9	291.6	74.5	12.8	153.1
4	172.8	212.4	36.7	421.8	172.2	29.7	321.3	54.7	9.5	162.6
5	170.5	281.1	47.9	469.8	194.6	33.2	354.5	105.3	18.0	180.6
6	170.5	286.3	48.8	518.6	212.1	36.2	390.7	96.7	16.5	197.0
7	173.0	301.9	52.2	570.8	214.6	37.1	427.8	96.7	16.7	213.8
8	172.9	374.8	64.8	635.6	247.0	42.7	470.5	98.7	17.1	230.8
9	170.8	416.4	71.1	706.7	324.4	55.4	525.9	160.5	27.4	258.2
10	171.7	458.1	78.6	785.4	321.9	55.3	581.2	125.5	21.5	279.8
11	171.4	400.8	68.7	854.1	284.4	48.8	629.9	101.6	17.4	297.2
12	180.6	437.2	79.0	933.0	331.8	59.9	689.8	148.9	26.9	324.1
13	171.9	1197.2	205.8	1138.8	451.6	77.6	767.5	208.2	35.8	359.9
14	172.7	1041.0	179.8	1318.6	464.1	80.1	847.6	279.8	48.3	408.2
15	172.4	1301.3	224.3	1543.0	558.9	96.4	944.0	280.6	48.4	456.6
16	172.2	853.7	147.0	1690.0	456.6	78.6	1022.6	248.5	42.8	499.4
17	171.9	635.0	109.2	1799.1	346.8	59.6	1082.2	226.3	38.9	538.3
18	175.2	447.6	78.4	1877.6	209.6	36.7	1118.9	144.0	25.2	563.5
19	174.0	426.8	74.3	1951.8	194.6	33.9	1152.8	185.1	32.2	595.7
20	173.6	338.3	58.7	2010.6	182.1	31.6	1184.4	135.8	23.6	619.3
21	172.9	385.2	66.6	2077.2	172.2 *	29.8	1214.2	172.8 *	29.9	649.2
22	173.7	421.6	73.2	2150.4	162.2	28.2	1242.3	209.8	36.4	685.6
23	173.5	416.4	72.2	2222.6	152.8 *	26.5	1268.8	196.5 *	34.1	719.7
24	172.3	425.0 *	73.2	2295.9	143.5 *	24.7	1293.6	183.1 *	31.5	751.3
25	175.5	512.7 *	90.0	2385.9	134.1 *	23.5	1317.1	169.7 *	29.8	781.0
26	174.3	374.8	65.3	2451.2	124.8	21.7	1338.8	156.3	27.3	808.3
27	172.6	242.3 *	41.8	2493.0	122.9 *	21.2	1360.1	163.5 *	28.2	836.5
28	173.3	359.3 *	62.3	2555.3	121.0 *	21.0	1381.0	170.7 *	29.6	866.1
29	172.6	454.3 *	78.4	2633.7	119.1 *	20.6	1401.6	177.9 *	30.7	896.8
30	172.8	403.1 *	69.7	2703.3	117.3	20.3	1421.9	185.1	32.0	928.8
31	173.3	410.4 *	71.1	2774.5	126.0 *	21.8	1443.7	232.5 *	40.3	969.1
32	173.5	468.5	81.3	2855.7	134.7	23.4	1467.1	279.8	48.5	1017.6
33	171.5	527.4 *	90.4	2946.2	117.3 *	20.1	1487.2	273.6 *	46.9	1064.6
34	171.6	447.6	76.8	3023.0	99.8	17.1	1504.3	267.4	45.9	1110.5

* These values were estimated rather than measured directly. See Methods for discussion.

Table A3.20. Cumulative mass release of sulfate, calcium, and magnesium over time for reactor B (2.01% sulfur).

Week	Volume	Sulfate			Calcium			Magnesium		
		Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.
	mL	µmol/L	µmol	µmol	µmol/L	µmol	µmol	µmol/L	µmol	µmol
0	170.6	1160.5 *	198.0	198.0	578.8	98.8	98.8	325.0	55.5	55.5
1	173.0	312.3	54.0	252.0	214.6	37.1	135.9	101.6	17.6	73.0
2	172.3	182.2	31.4	283.4	122.3	21.1	156.9	37.0	6.4	79.4
3	172.5	145.7	25.1	308.5	74.9	12.9	169.8	25.9	4.5	83.9
4	172.5	166.6	28.7	337.3	69.9	12.1	181.9	23.5	4.0	87.9
5	174.8	135.3	23.7	360.9	42.4	7.4	189.3	18.5	3.2	91.2
6	173.5	151.0	26.2	387.1	44.9	7.8	197.1	16.0	2.8	93.9
7	171.4	130.1	22.3	409.4	49.9	8.6	205.7	15.6	2.7	96.6
8	171.9	208.2	35.8	445.2	62.4	10.7	216.4	20.6	3.5	100.2
9	171.2	208.2	35.6	480.9	57.4	9.8	226.2	16.9	2.9	103.1
10	173.6	177.0	30.7	511.6	54.9	9.5	235.7	16.0	2.8	105.8
11	171.3	218.6	37.4	549.0	62.4	10.7	246.4	17.7	3.0	108.9
12	174.4	291.5	50.8	599.9	54.9	9.6	256.0	18.9	3.3	112.2
13	174.0	249.9	43.5	643.3	54.9	9.6	265.5	16.0	2.8	115.0
14	172.5	343.5	59.3	702.6	52.4 *	9.0	274.6	20.4 *	3.5	118.5
15	176.8	333.1	58.9	761.5	49.9	8.8	283.4	24.7	4.4	122.8
16	170.8	395.6	67.6	829.1	58.6 *	10.0	293.4	28.8 *	4.9	127.8
17	174.1	624.6	108.7	937.8	67.4	11.7	305.1	32.9	5.7	133.5
18	174.1	812.0	141.4	1079.2	69.9 *	12.2	317.3	37.0 *	6.4	139.9
19	173.8	1145.1	199.0	1278.2	72.4	12.6	329.9	41.1	7.2	147.1
20	173.7	1065.4 *	185.1	1463.3	73.6 *	12.8	342.7	41.1 *	7.1	154.2
21	172.7	999.4	172.6	1635.9	74.9	12.9	355.6	41.1	7.1	161.3
22	172.8	944.5 *	163.2	1799.1	70.7 *	12.2	367.8	41.1 *	7.1	168.4
23	172.7	987.7 *	170.6	1969.7	66.5 *	11.5	379.3	41.1 *	7.1	175.6
24	173.1	832.8	144.2	2113.8	62.4	10.8	390.1	41.1	7.1	182.7
25	172.5	1030.9 *	177.8	2291.6	59.0 *	10.2	400.3	38.4 *	6.6	189.3
26	170.5	1030.9 *	175.8	2467.4	55.7 *	9.5	409.8	35.7 *	6.1	195.4
27	172.2	957.8	164.9	2632.3	52.4	9.0	418.8	32.9	5.7	201.0
28	172.1	978.6	168.4	2800.7	62.4	10.7	429.5	32.9	5.7	206.7
29	171.5	1035.2 *	177.5	2978.3	58.6 *	10.1	439.6	30.9 *	5.3	212.0
30	171.3	1145.1	196.2	3174.4	54.9	9.4	449.0	28.8	4.9	216.9

* These values were estimated rather than measured directly. See Methods for discussion.

Table A3.21. Cumulative mass release of sulfate, calcium, and magnesium over time for reactor U (2.17% sulfur).

Week	Volume	Sulfate			Calcium			Magnesium		
		Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.
	mL	µmol/L	µmol	µmol	µmol/L	µmol	µmol	µmol/L	µmol	µmol
0	170.0	572.6	97.3	97.3	484.0	82.3	82.3	176.9	30.1	30.1
1	171.0	113.5	19.4	116.7	99.8	17.1	99.4	53.5	9.1	39.2
2	170.0	31.2	5.3	122.1	57.4	9.8	109.1	41.1	7.0	46.2
3	170.2	94.1 *	16.0	138.1	62.4	10.6	119.7	22.2	3.8	50.0
4	170.0	146.8	25.0	163.0	77.3	13.1	132.9	29.6	5.0	55.0
5	169.6	146.8	24.9	187.9	72.4	12.3	145.1	32.1	5.4	60.5
6	167.4	128.0	21.4	209.3	64.9	10.9	156.0	30.9	5.2	65.6
7	170.1	131.2	22.3	231.7	57.4	9.8	165.8	29.6	5.0	70.7
8	171.3	134.3	23.0	254.7	67.4	11.5	177.3	30.9	5.3	76.0
9	171.0	135.3	23.1	277.8	64.9	11.1	188.4	31.3	5.3	81.3
10	171.0	135.3	23.1	300.9	52.4	9.0	197.4	30.4	5.2	86.5
11	170.1	138.5	23.6	324.5	69.9	11.9	209.2	31.3	5.3	91.8
12	172.0	192.6	33.1	357.6	77.3	13.3	222.5	43.2	7.4	99.3
13	169.8	270.7	46.0	403.6	104.8	17.8	240.3	64.6	11.0	110.2
14	172.1	322.7	55.5	459.1	134.7	23.2	263.5	79.8	13.7	124.0
15	171.7	364.4	62.6	521.7	132.2	22.7	286.2	102.0	17.5	141.5
16	171.1	437.2	74.8	596.5	119.8	20.5	306.7	118.1	20.2	161.7
17	171.8	426.8	73.3	669.8	99.8	17.1	323.9	112.3	19.3	181.0
18	172.1	510.1	87.8	757.6	82.3 *	14.2	338.0	113.8 *	19.6	200.6
19	170.8	499.7	85.3	843.0	64.9	11.1	349.1	115.2	19.7	220.3
20	171.1	562.2	96.2	939.2	54.9 *	9.4	358.5	104.9 *	18.0	238.2
21	171.6	572.6	98.3	1037.4	44.9	7.7	366.2	94.6	16.2	254.4

* These values were estimated rather than measured directly. See Methods for discussion.

Table A3.22. Cumulative mass release of sulfate, calcium, and magnesium over time for reactor V (2.17% sulfur).

Week	Volume	Sulfate			Calcium			Magnesium		
		Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.
	mL	µmol/L	µmol	µmol	µmol/L	µmol	µmol	µmol/L	µmol	µmol
0	170.0	572.6	97.3	97.3	454.1	77.2	77.2	176.9	30.1	30.1
1	165.6	130.1	21.5	118.9	112.3	18.6	95.8	57.6	9.5	39.6
2	169.3	85.4	14.5	133.3	59.9	10.1	105.9	41.1	7.0	46.6
3	170.8	112.4	19.2	152.5	72.4	12.4	118.3	24.7	4.2	50.8
4	169.4	137.4	23.3	175.8	77.3	13.1	131.4	28.8	4.9	55.7
5	169.8	156.2	26.5	202.3	79.8	13.6	144.9	35.4	6.0	61.7
6	168.8	286.3	48.3	250.7	162.2	27.4	172.3	90.9	15.3	77.0
7	174.3	369.6	64.4	315.1	169.7	29.6	201.9	110.3	19.2	96.3
8	172.1	317.5	54.6	369.7	124.8	21.5	223.4	73.2	12.6	108.9
9	170.8	255.1	43.6	413.3	89.8	15.3	238.7	53.5	9.1	118.0
10	170.5	218.6	37.3	450.6	64.9	11.1	249.8	49.0	8.3	126.3
11	170.1	208.2	35.4	486.0	69.9	11.9	261.6	43.6	7.4	133.8
12	171.0	208.2	35.6	521.6	67.4	11.5	273.2	48.5	8.3	142.1
13	168.6	192.6	32.5	554.1	57.4	9.7	282.8	43.2	7.3	149.3
14	171.4	192.6	33.0	587.1	57.4	9.8	292.7	43.2	7.4	156.7
15	170.5	192.6	32.8	619.9	52.4	8.9	301.6	45.3	7.7	164.5
16	170.8	213.4	36.5	656.4	47.4	8.1	309.7	43.6	7.4	171.9
17	173.4	197.8	34.3	690.6	39.9	6.9	316.6	53.5	9.3	181.2
18	172.4	233.2 *	40.2	730.8	37.4	6.5	323.1	45.3	7.8	189.0
19	172.7	187.4	32.4	763.2	35.8 *	6.2	329.3	45.3 *	7.8	196.8
20	172.5	192.6	33.2	796.4	34.1 *	5.9	335.1	45.3 *	7.8	204.6
21	172.3	187.4	32.3	828.7	32.4	5.6	340.7	45.3	7.8	212.4

* These values were estimated rather than measured directly. See Methods for discussion.

Table A3.23. Cumulative mass release of sulfate, calcium, and magnesium over time for reactor W (2.57% sulfur).

Week	Volume	Sulfate			Calcium			Magnesium		
		Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.
	mL	µmol/L	µmol	µmol	µmol/L	µmol	µmol	µmol/L	µmol	µmol
0	170.0	1093.1	185.8	185.8	364.3	61.9	61.9	267.4	45.5	45.5
1	165.6	135.3	22.4	208.2	59.9	9.9	71.8	74.1	12.3	57.7
2	169.3	83.3	14.1	222.3	42.4	7.2	79.0	69.9	11.8	69.6
3	170.8	90.6	15.5	237.8	49.9	8.5	87.5	40.7	7.0	76.5
4	169.4	92.8 *	15.7	253.5	47.4	8.0	95.6	36.2	6.1	82.7
5	169.8	75.0	12.7	266.3	37.4	6.4	101.9	29.6	5.0	87.7
6	168.8	75.0	12.7	278.9	34.9	5.9	107.8	26.3	4.4	92.1
7	174.3	96.0 *	16.7	295.6	33.7 *	5.9	113.7	24.9 *	4.3	96.5
8	169.3	138.5	23.4	319.1	32.4	5.5	119.2	23.5	4.0	100.4
9	169.1	114.5	19.4	338.4	26.2 *	4.4	123.6	22.2 *	3.8	104.2
10	167.8	171.8	28.8	367.3	20.0	3.3	127.0	21.0	3.5	107.7
11	167.3	107.2	17.9	385.2	27.4	4.6	131.6	61.3	10.3	118.0
12	169.1	192.6	32.6	417.8	32.4	5.5	137.0	20.2	3.4	121.4
13	168.2	151.0	25.4	443.2	31.2 *	5.2	142.3	20.2 *	3.4	124.8
14	168.9	145.7	24.6	467.8	29.9	5.1	147.3	20.2	3.4	128.2
15	170.1	145.7	24.8	492.6	26.2 *	4.5	151.8	26.5 *	4.5	132.7
16	169.1	234.2	39.6	532.2	22.5	3.8	155.6	32.9	5.6	138.3
17	170.2	177.0	30.1	562.3	20.0	3.4	159.0	32.9	5.6	143.9
18	168.1	343.5	57.7	620.1	22.5	3.8	162.8	32.9	5.5	149.4
19	169.6	354.0	60.0	680.1	15.0	2.5	165.3	32.9	5.6	155.0
20	169.1	260.3	44.0	724.1	23.7 *	4.0	169.3	28.8 *	4.9	159.9
21	169.6	234.2	39.7	763.8	32.4	5.5	174.8	24.7	4.2	164.0

* These values were estimated rather than measured directly. See Methods for discussion.

Table A3.24. Cumulative mass release of sulfate, calcium, and magnesium over time for reactor X (2.57% sulfur).

Week	Volume	Sulfate			Calcium			Magnesium		
		Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.	Conc.	Weekly Rel.	Cumul. Rel.
	mL	µmol/L	µmol	µmol	µmol/L	µmol	µmol	µmol/L	µmol	µmol
0	169.3	1093.1	185.1	185.1	379.[illegible]	64.2	64.2	267.4	45.3	45.3
1	164.7	119.7	19.7	204.8	57.4	9.5	73.7	74.1	12.2	57.5
2	169.2	96.8	16.4	221.2	42.4	7.2	80.8	69.9	11.8	69.3
3	167.2	78.1	13.1	234.2	44.9	7.5	88.3	39.1	6.5	75.8
4	170.1	68.7	11.7	245.9	44.9	7.6	96.0	31.3	5.3	81.2
5	168.5	72.9	12.3	258.2	32.4	5.5	101.4	28.8	4.9	86.0
6	167.5	80.2 *	13.4	271.6	27.4	4.6	106.0	25.9	4.3	90.4
7	170.0	78.1	13.3	284.9	25.0	4.2	110.3	23.9	4.1	94.4
8	169.7	132.2	22.4	307.3	25.0 *	4.2	114.5	22.2 *	3.8	98.2
9	171.0	192.6	32.9	340.3	25.0	4.3	118.8	20.6	3.5	101.7
10	168.3	85.4	14.4	354.6	29.9 *	5.0	123.8	35.0 *	5.9	107.6
11	167.7	109.3	18.3	372.9	34.9	5.9	129.7	49.4	8.3	115.9
12	168.4	177.0	29.8	402.8	32.4 *	5.5	135.1	33.9 *	5.7	121.6
13	168.4	114.5	19.3	422.0	29.9	5.0	140.2	18.5	3.1	124.7
14	168.7	124.9	21.1	443.1	32.4 *	5.5	145.7	21.4 *	3.6	128.3
15	168.6	177.0	29.8	472.9	34.9	5.9	151.5	24.3	4.1	132.4
16	168.7	291.5	49.2	522.1	32.4	5.5	157.0	32.9	5.6	138.0
17	172.7	364.4	62.9	585.1	12.5	2.2	159.2	32.9	5.7	143.6
18	170.1	707.9	120.4	705.5	33.7 *	5.7	164.9	32.9 *	5.6	149.2
19	169.5	437.2	74.1	779.6	54.9	9.3	174.2	32.9	5.6	154.8
20	169.1	385.2	65.1	844.7	41.2 *	7.0	181.2	35.0 *	5.9	160.7
21	170.2	343.5	58.5	903.2	27.4	4.7	185.8	37.0	6.3	167.0

* These values were estimated rather than measured directly. See Methods for discussion.

Figure A3.1. Cumulative mass release of sulfate, calcium, and magnesium versus time for reactor A (0.47% sulfur).

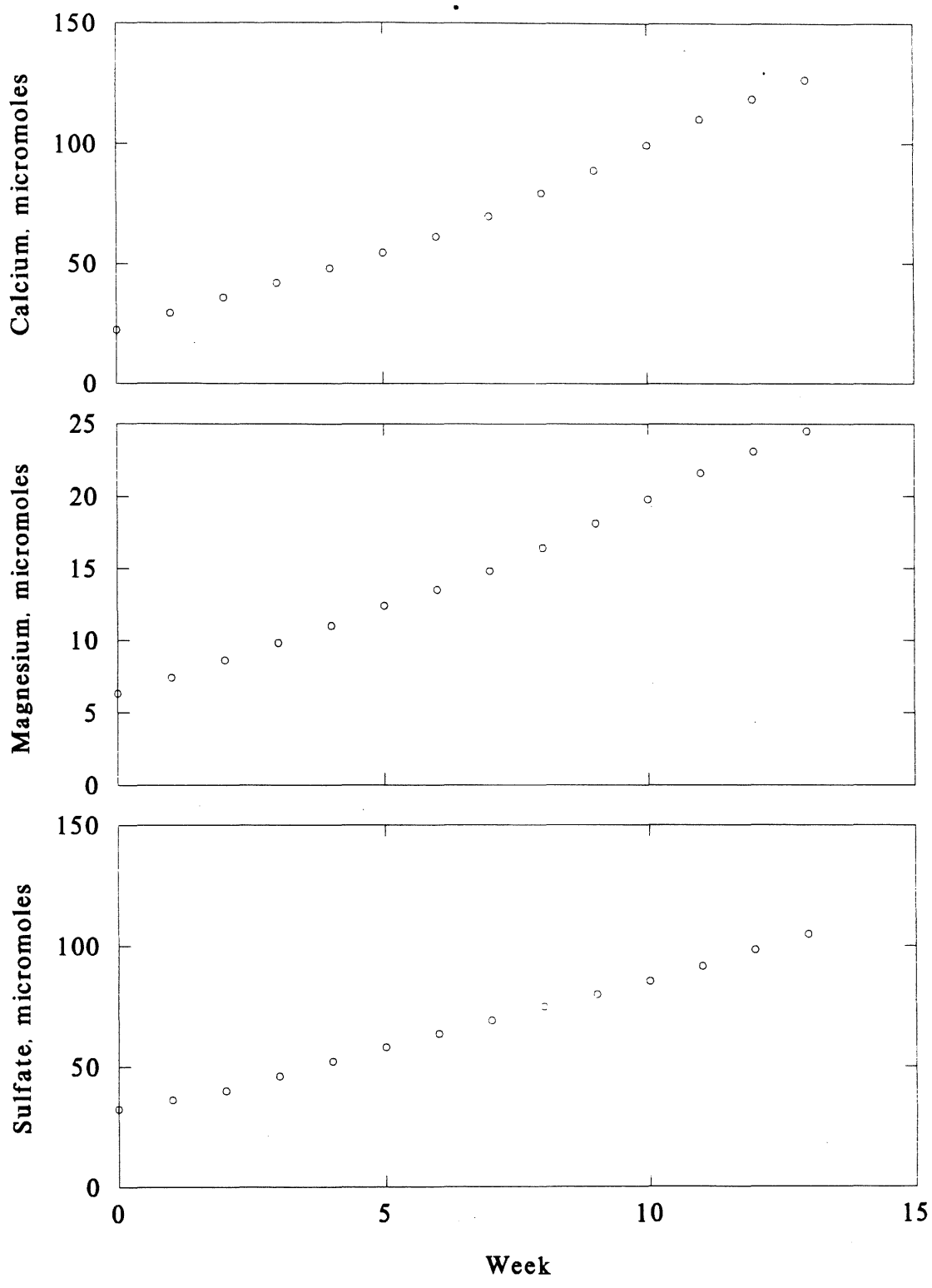


Figure A3.2. Cumulative mass release of sulfate, calcium, and magnesium versus time for reactor D (0.59% sulfur).

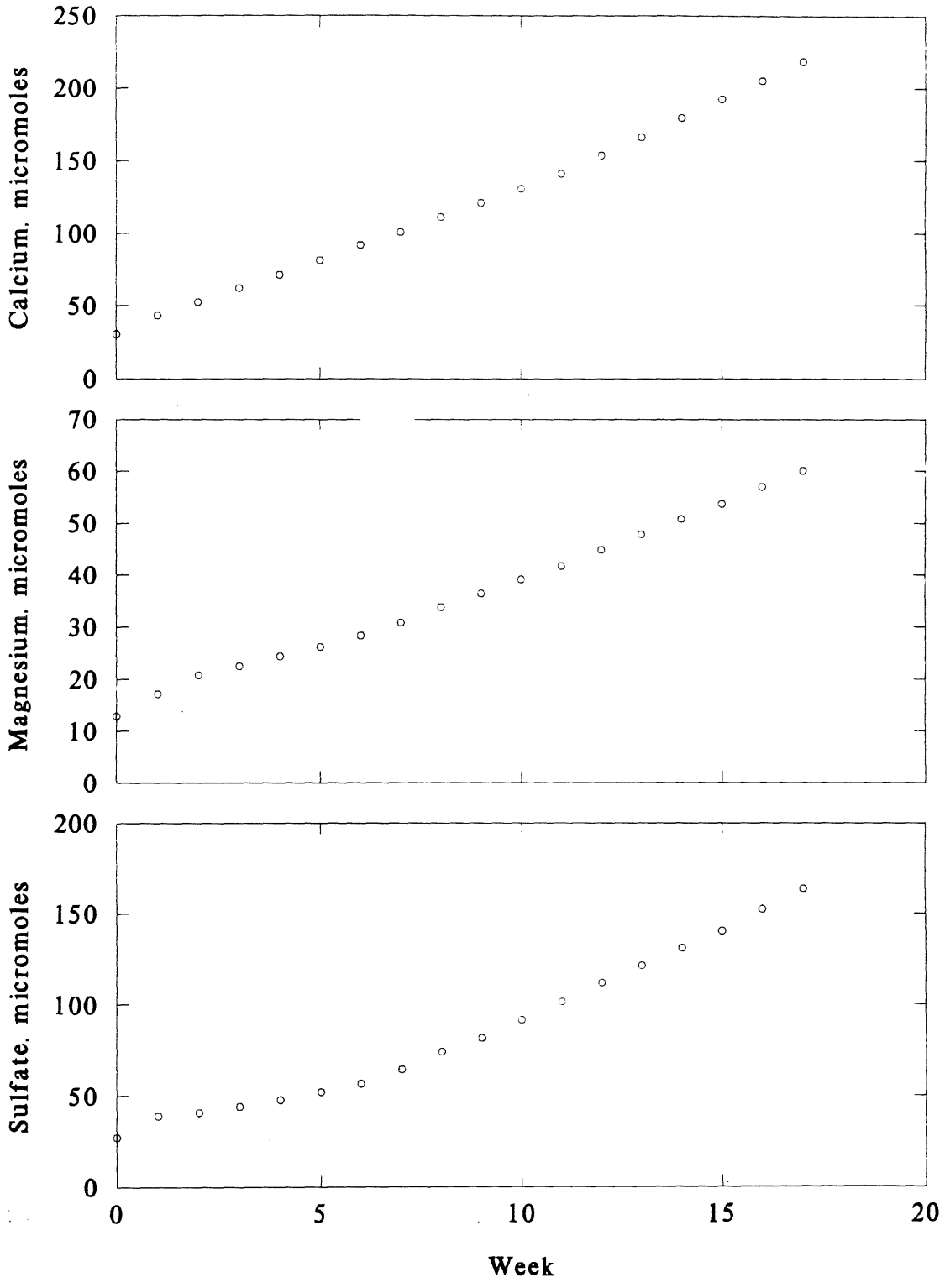


Figure A3.3. Cumulative mass release of sulfate, calcium, and magnesium versus time for reactors E and F (0.80% sulfur).

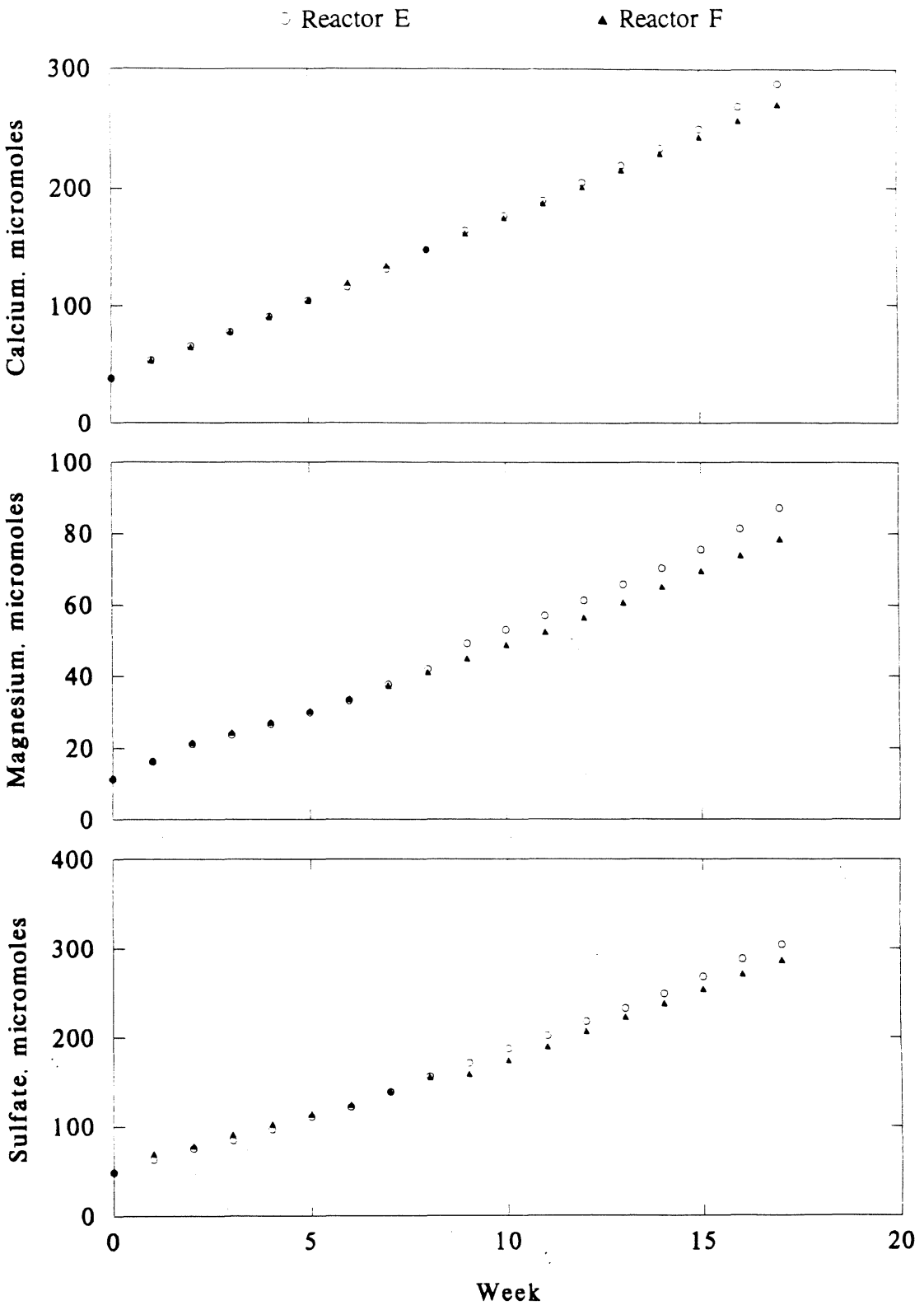


Figure A3.4. Cumulative mass release of sulfate, calcium, and magnesium versus time for reactors G and H (0.92% sulfur).

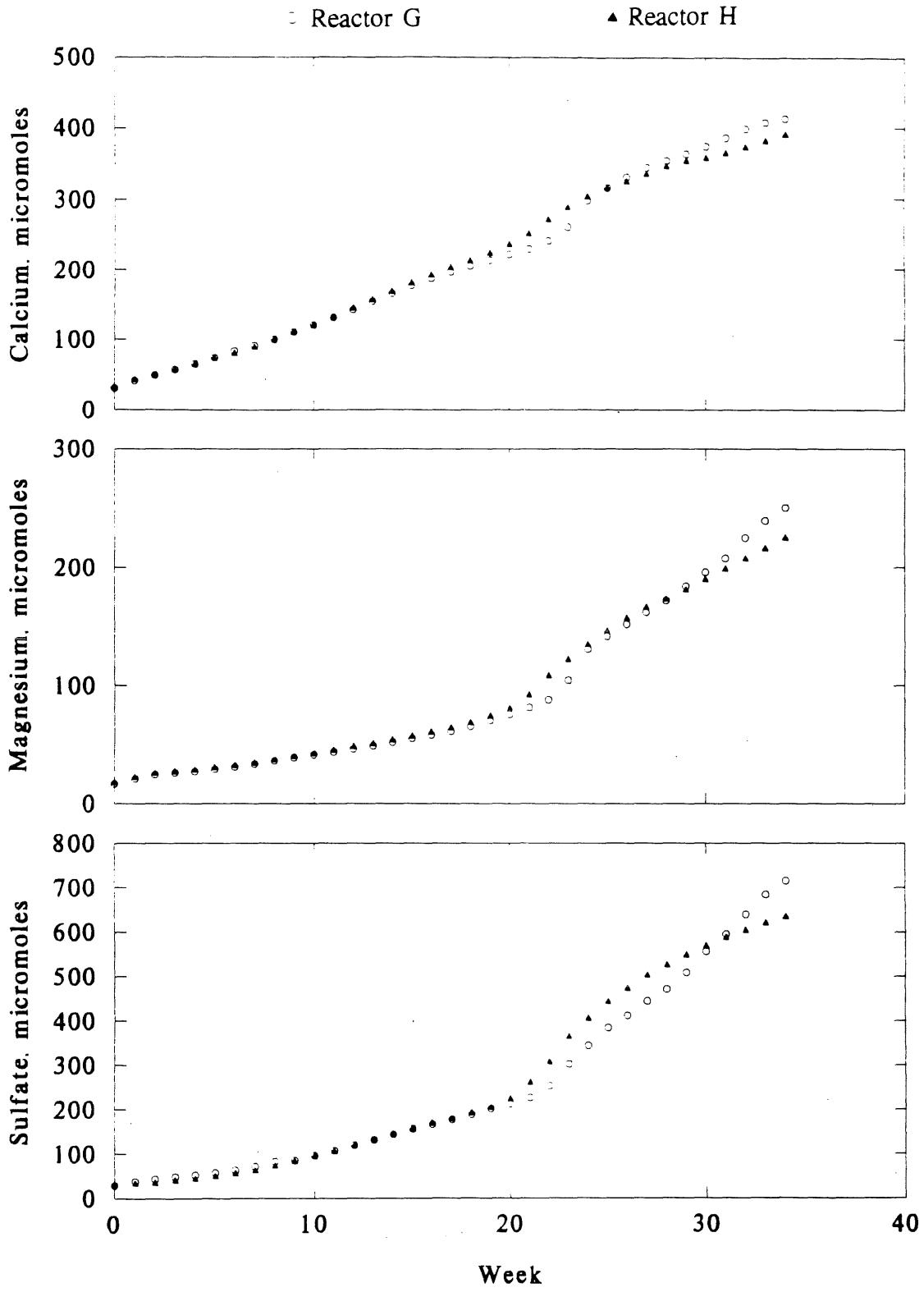


Figure A3.5. Cumulative mass release of sulfate, calcium, and magnesium versus time for reactors I and J (1.17% sulfur).

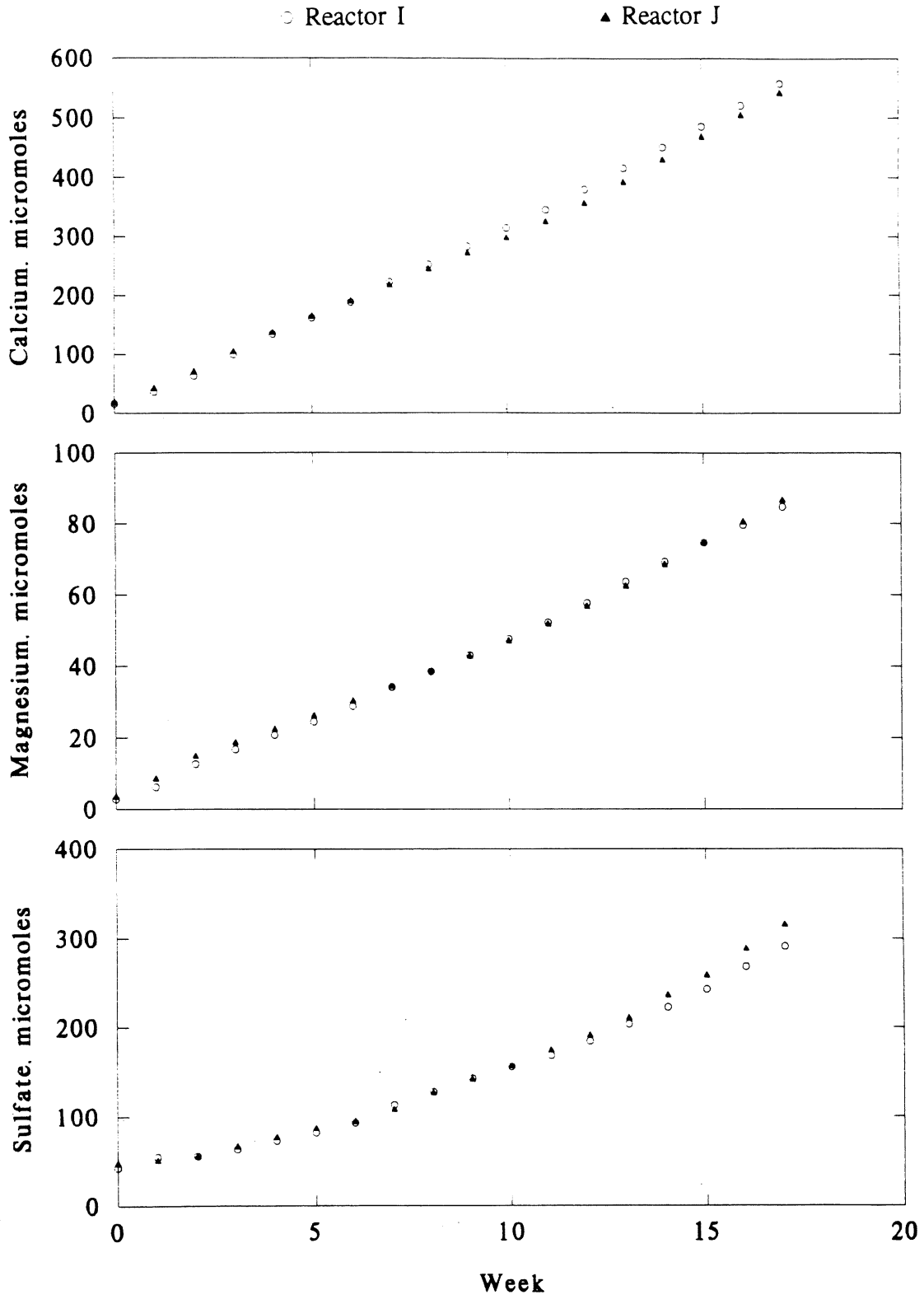


Figure A3.6. Cumulative mass release of sulfate, calcium, and magnesium versus time for reactors K and L (1.24% sulfur).

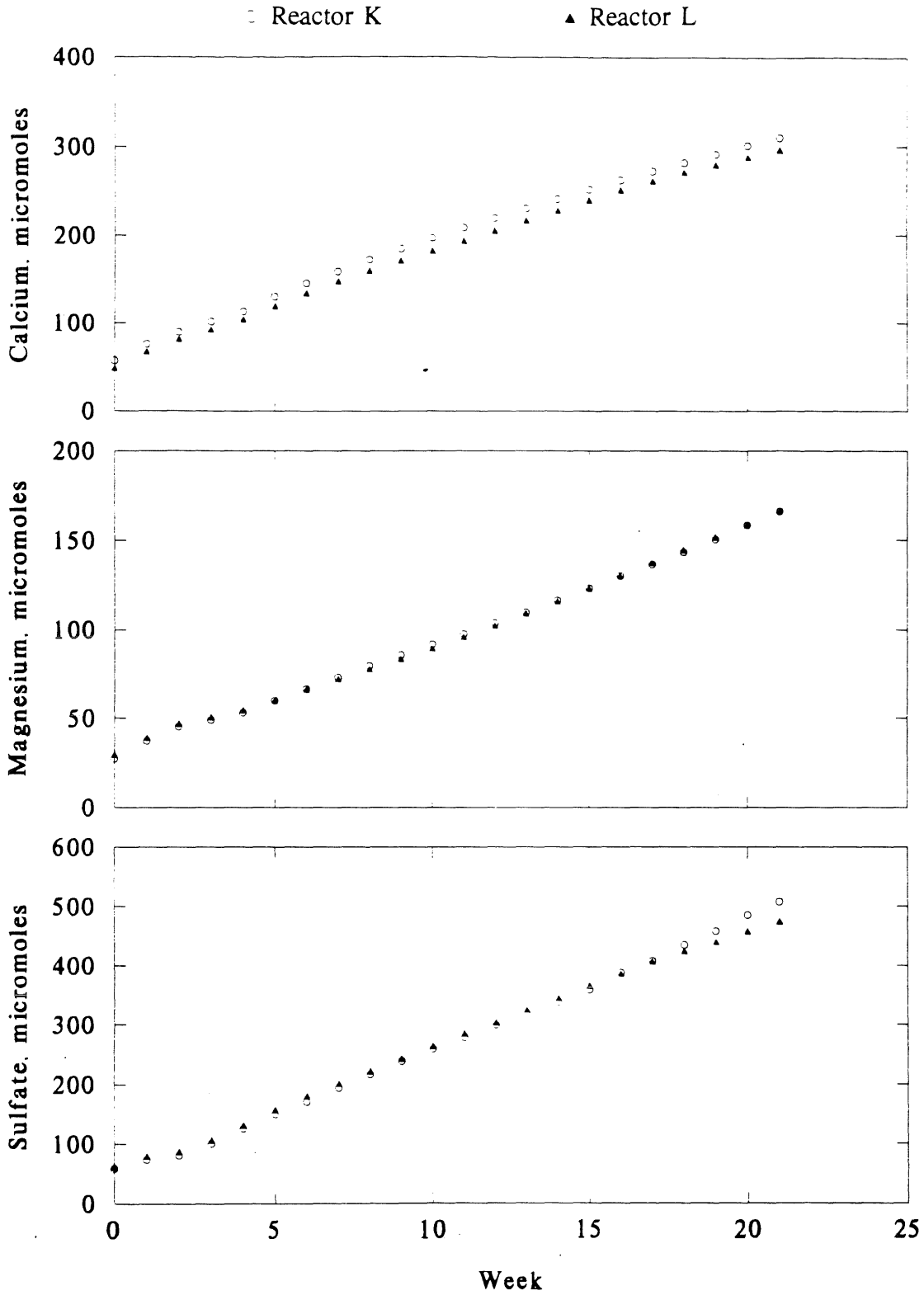


Figure A3.7. Cumulative mass release of sulfate, calcium, and magnesium versus time for reactors M and N (1.26% sulfur).

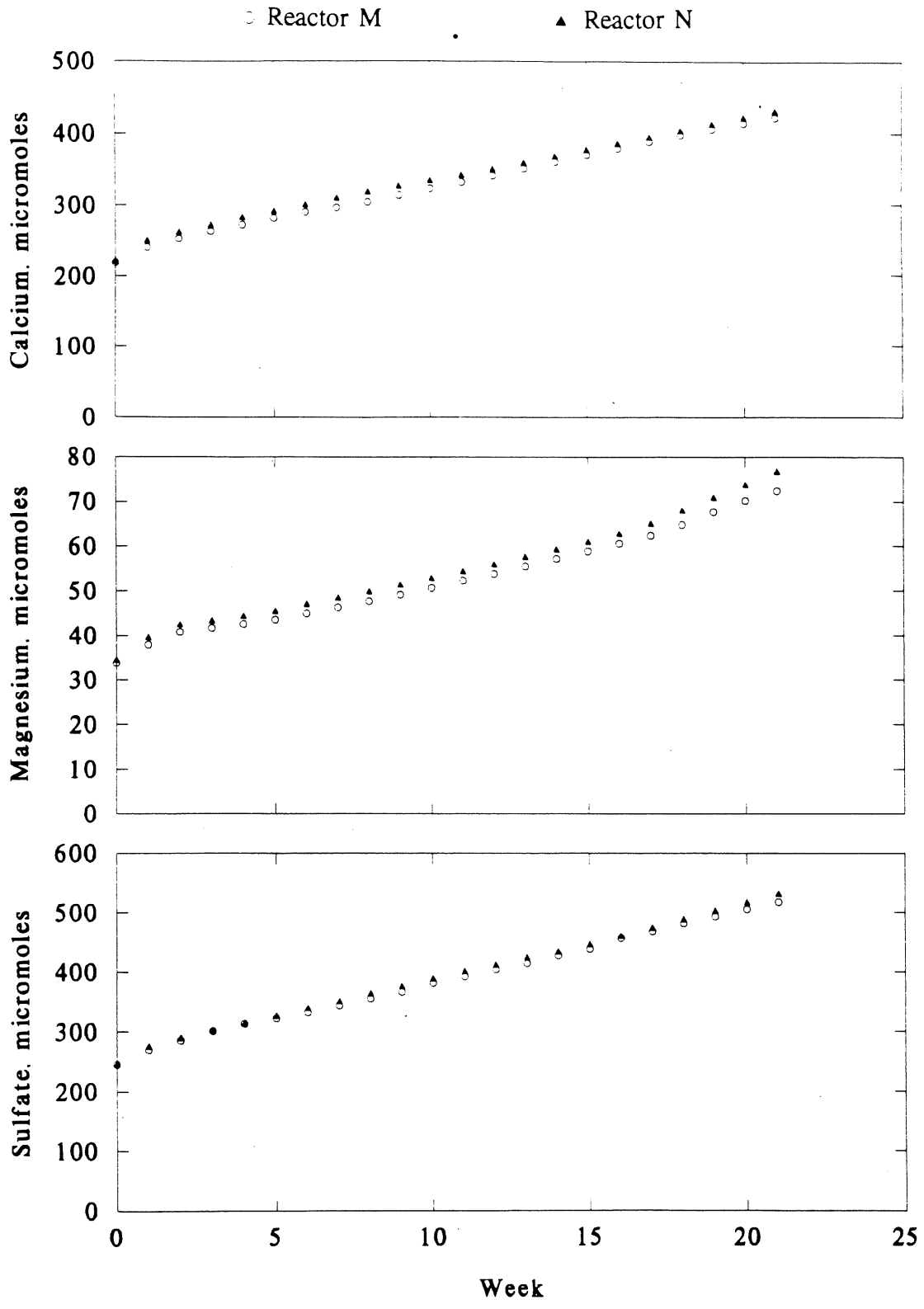


Figure A3.8. Cumulative mass release of sulfate, calcium, and magnesium versus time for reactor C (1.35% sulfur).

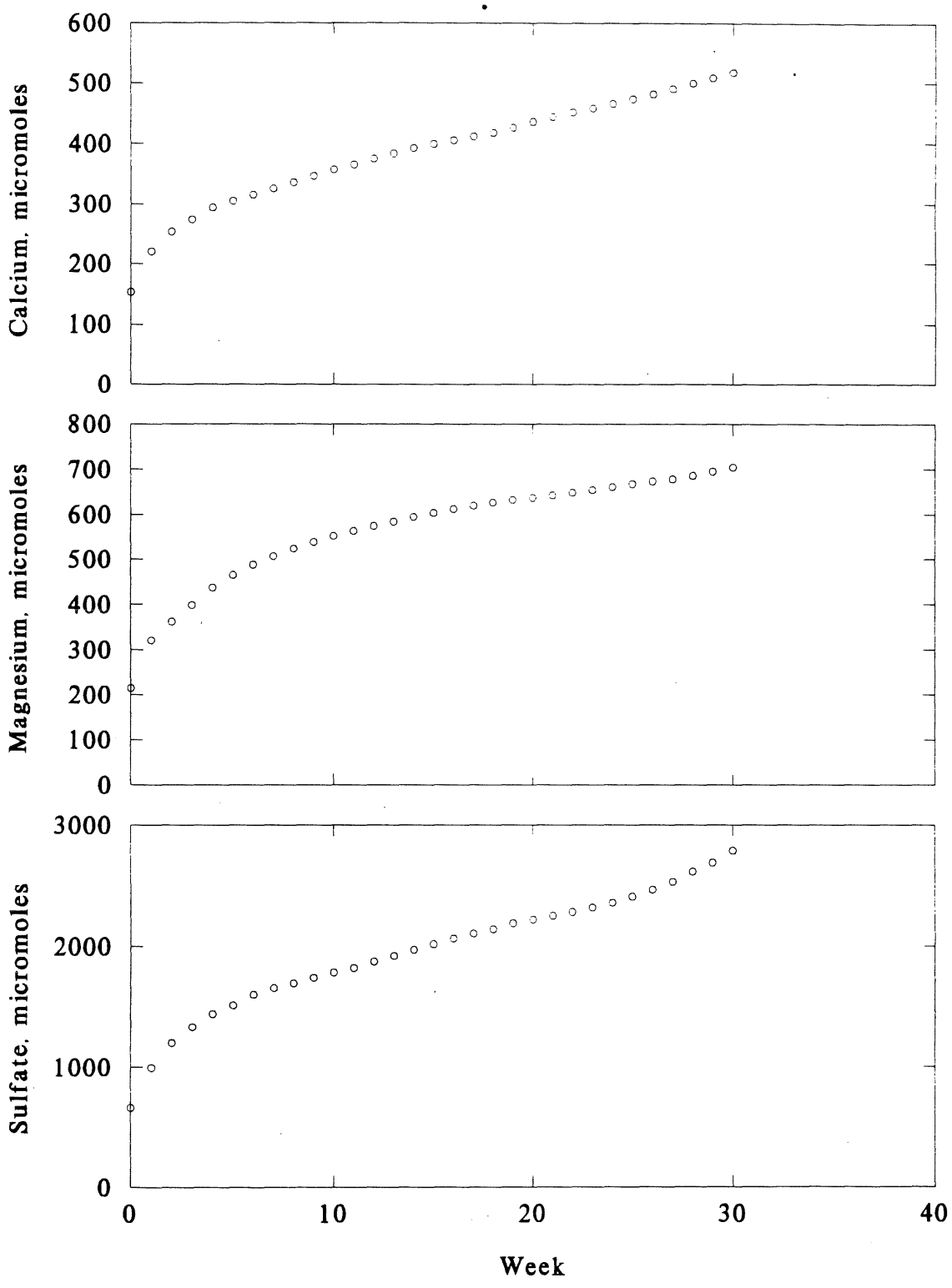


Figure A3.9. Cumulative mass release of sulfate, calcium, and magnesium versus time for reactors O and P (1.47% sulfur).

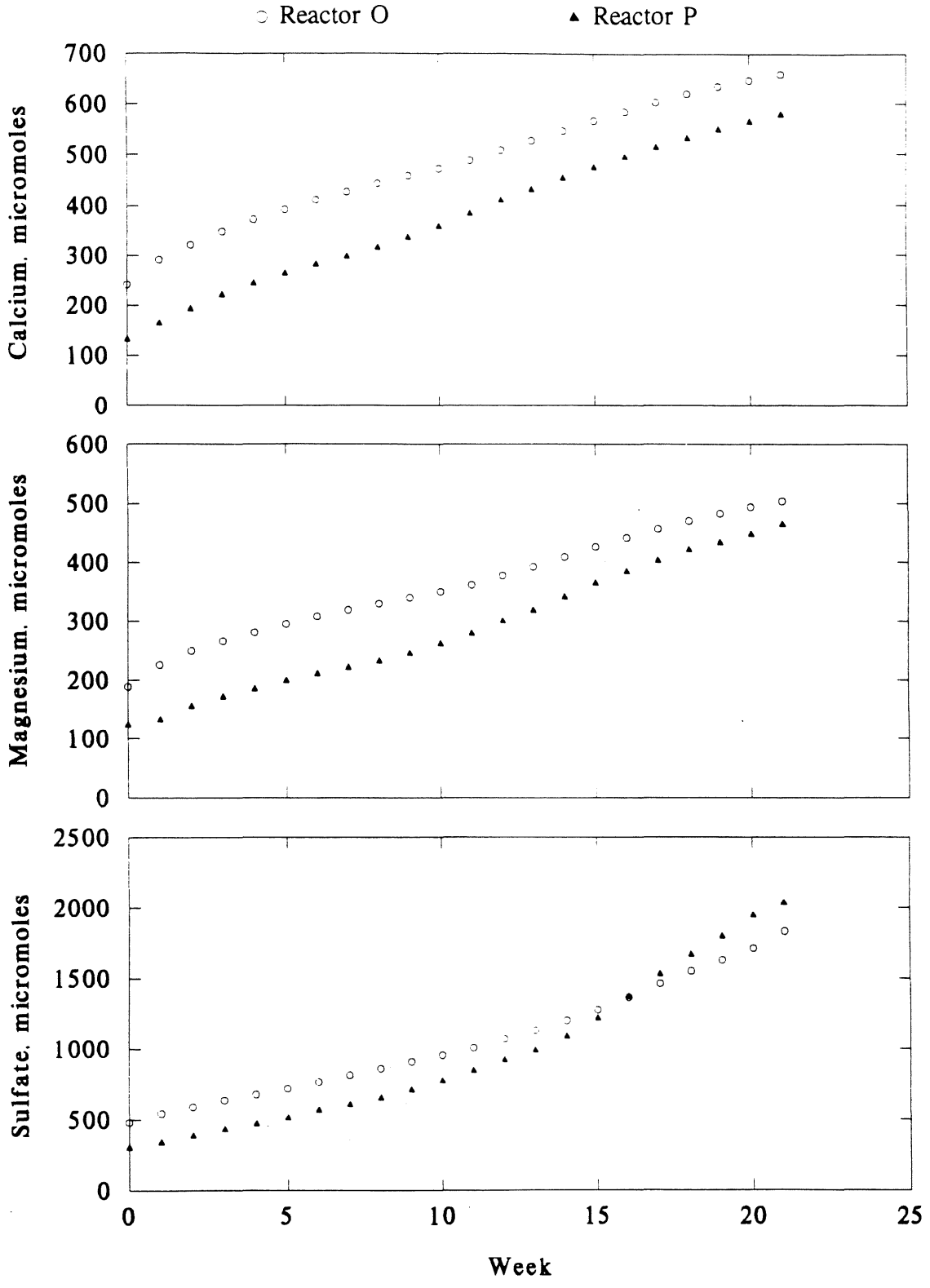


Figure A3.10. Cumulative mass release of sulfate, calcium, and magnesium versus time for reactors Q and R (1.74% sulfur).

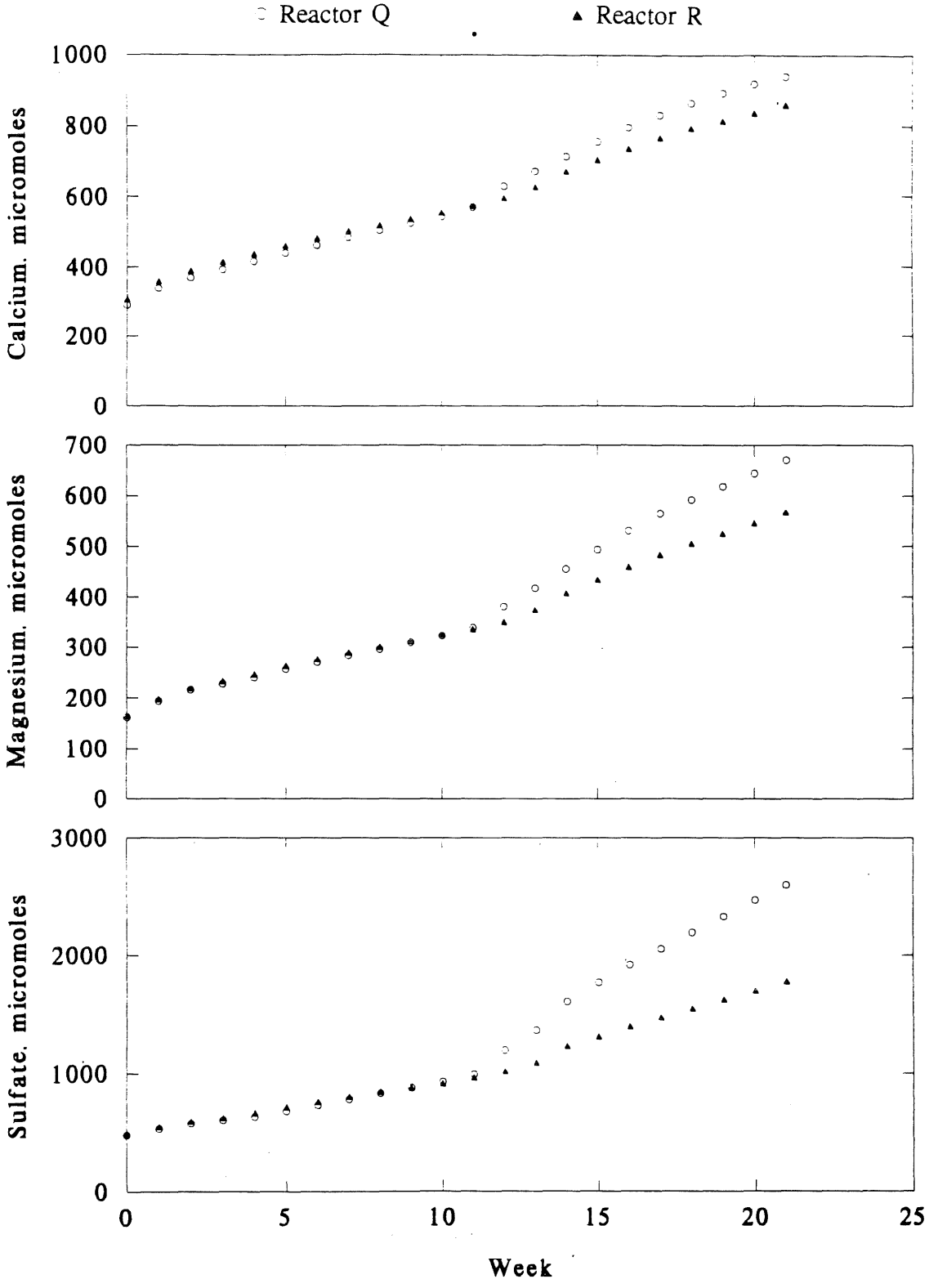


Figure A3.11. Cumulative mass release of sulfate, calcium, and magnesium versus time for reactors S and T (1.87% sulfur).

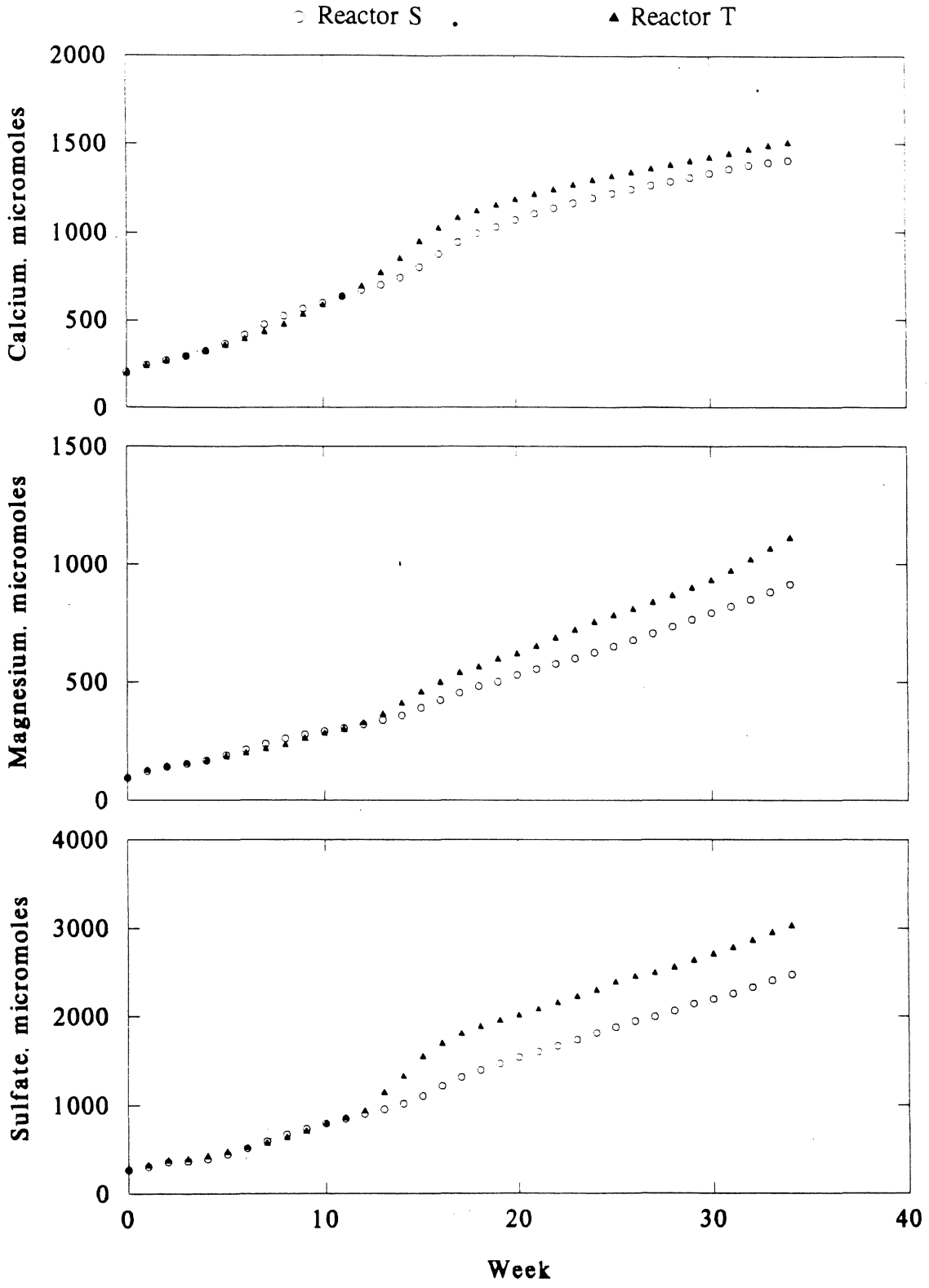


Figure A3.12. Cumulative mass release of sulfate, calcium, and magnesium versus time for reactor B (2.01% sulfur).

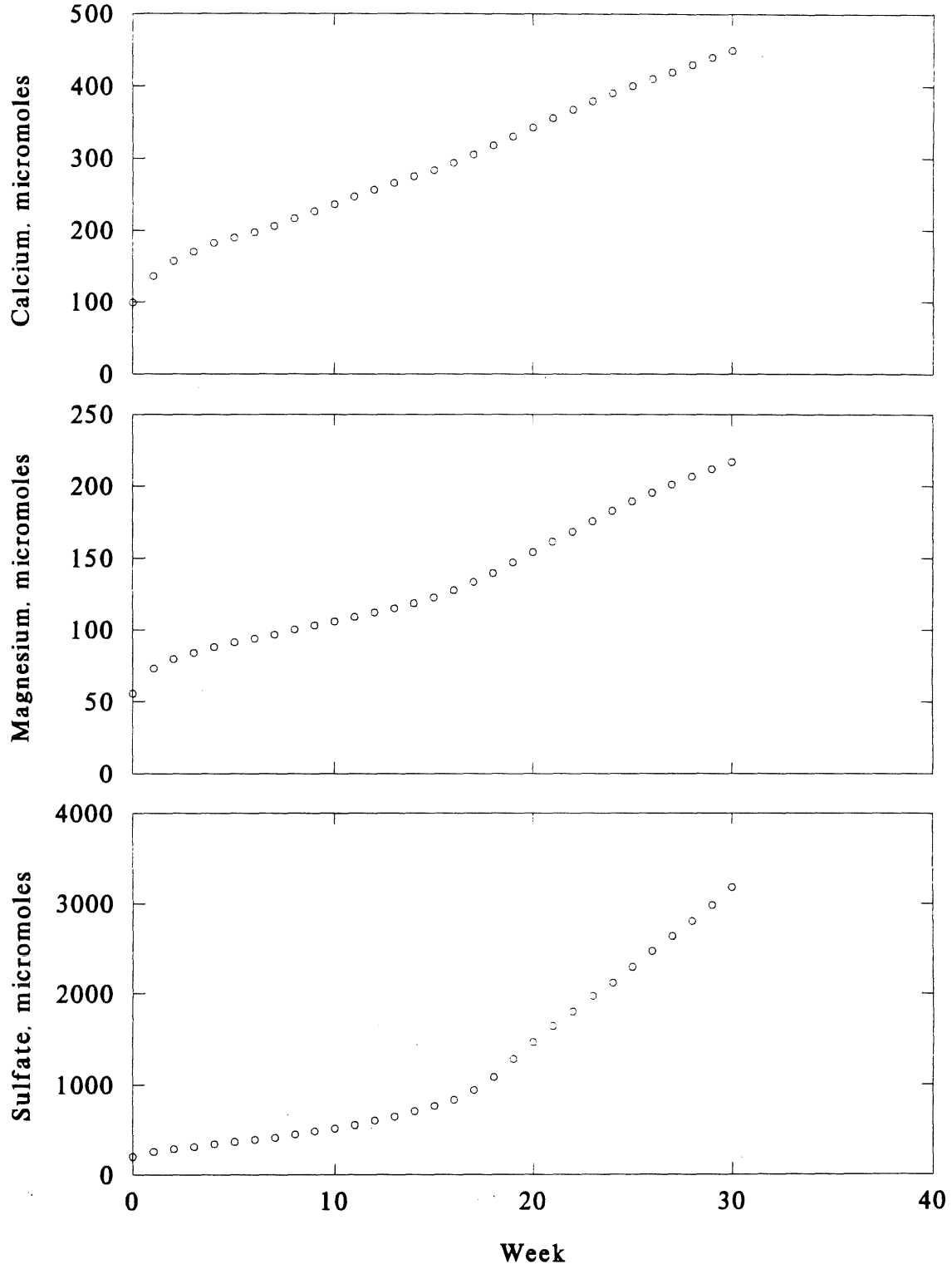


Figure A3.13. Cumulative mass release of sulfate, calcium, and magnesium versus time for reactors U and V (2.17% sulfur).

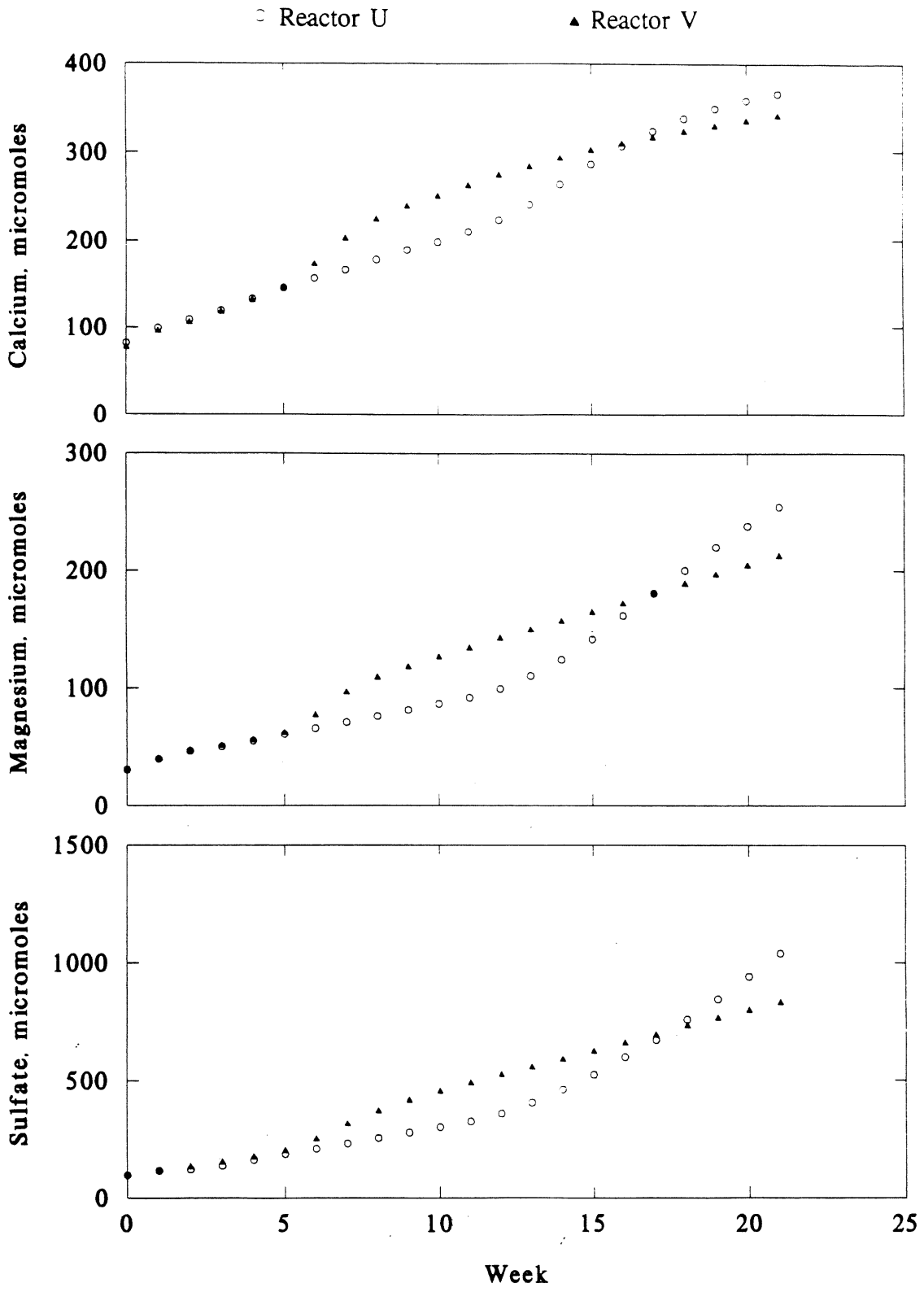
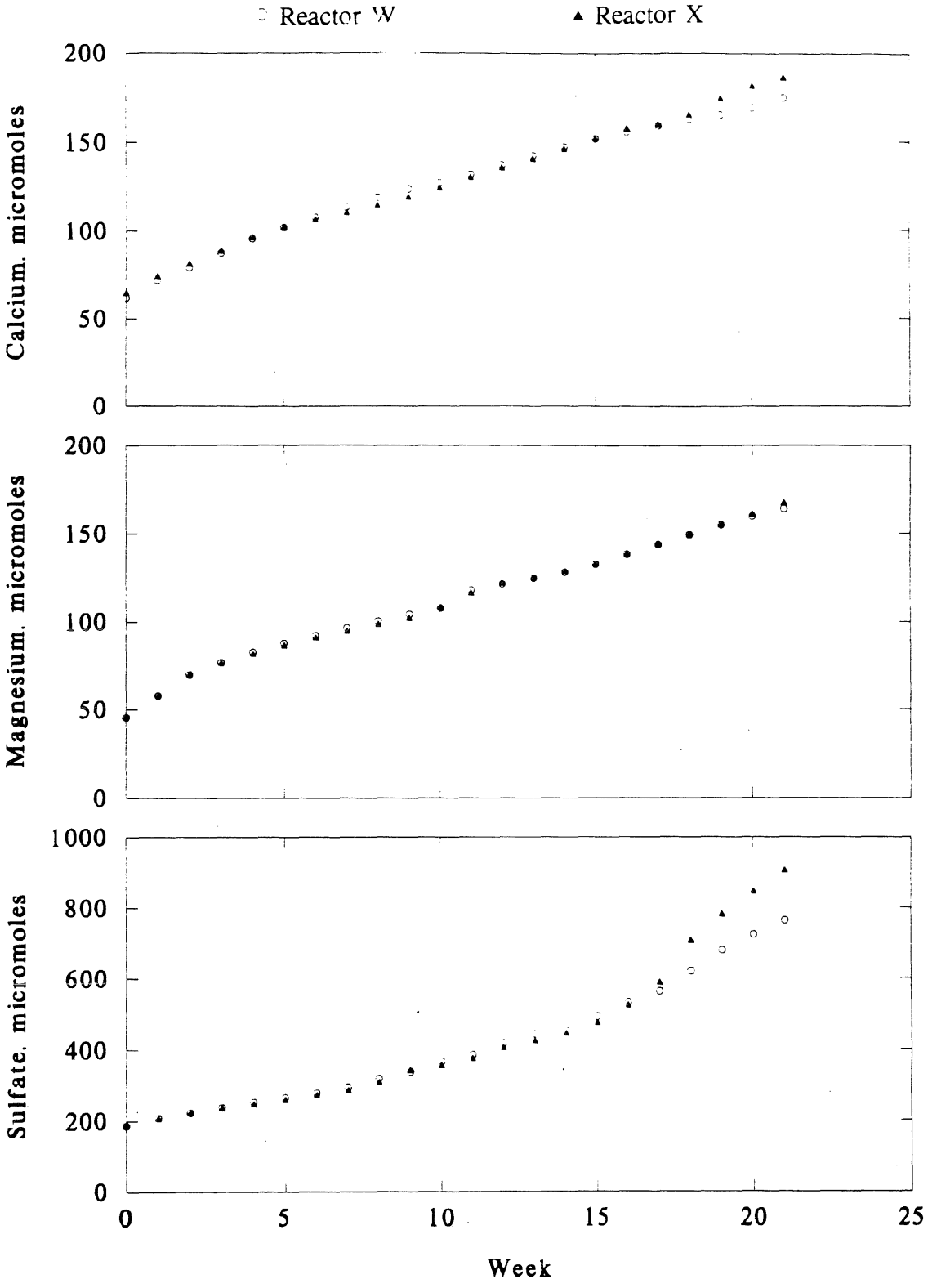


Figure A3.14. Cumulative mass release of sulfate, calcium, and magnesium versus time for reactors W and X (2.57% sulfur).



APPENDIX 4

RATES OF RELEASE

Table A4.1. Sulfate mass release rates and pH, temperature, and relative humidity of rate periods.

Sulfur, %	Reactor	Period, Weeks	n, Weeks	Regression of ΣSO_4 vs. Time, µmol/wk			pH, s.u.			Temperature, °C			Relative Humidity, %			Comments
				rate	y-int.	r^2	min	median	max	min	median	max	min	median	max	
0.47	A	2-13	12	5.8	28.7	0.999	6.85	7.68	8.50	24.1	25.0	25.8	55.3	62.7	71.3	
0.59	D	2-6	5	3.9	32.5	0.996	7.00	7.45	8.10	24.4	24.8	25.0	50.0	53.0	60.0	
		7-17	11	9.8	-5.9	0.999	7.30	7.55	8.10	24.1	25.0	25.8	55.7	63.0	71.3	
0.80	E	0-5	6	12.1	49.5	0.997	6.25	6.63	6.95	24.4	24.8	25.2	50.0	53.0	60.0	
		6-17	12	16.3	23.8	0.999	6.75	6.93	7.25	24.1	25.0	25.8	55.3	62.7	71.3	
	F	2-8	7	12.5	51.0	0.996	6.60	6.85	7.25	24.4	25.0	25.8	50.0	55.3	69.4	
		9-17	9	16.0	13.8	1.000	6.90	6.95	7.25	24.1	24.8	25.7	55.7	63.0	71.3	
0.92	G	1-9	9	6.2	29.8	0.980	6.60	6.95	7.70	24.4	25.0	25.8	50.0	55.3	69.4	
		9-21	13	11.6	-18.7	1.000	6.35	6.85	7.30	24.1	25.2	25.7	55.7	64.8	71.3	
		23-34	12	37.3	-559.5	0.996	4.60	4.93	5.90	24.2	25.0	25.7	49.3	53.0	58.0	
	H	0-6	7	4.3	27.4	0.965	6.70	7.30	8.00	24.4	24.9	25.2	50.0	53.8	60.0	
		7-19	13	11.8	-22.8	0.999	6.25	6.90	7.30	24.1	25.2	25.8	55.7	63.3	71.3	
		20-25	6	45.3	-685.9	0.995	5.20	5.55	6.45	24.6	25.2	26.4	55.0	58.2	70.5	
		27-34	8	18.9	-4.1	0.993	4.90	5.00	5.20	24.2	25.0	25.5	49.3	51.4	56.8	
1.17	I	2-5	4	8.9	37.2	0.999	7.55	8.00	8.20	24.4	24.6	25.0	50.0	52.2	60.0	Sample contained 3 % $CaCO_3$, which buffered the drainage.
		6-10	5	15.6	2.2	0.993	7.95	8.35	8.55	24.8	25.0	25.8	55.3	59.0	69.4	
		11-17	7	20.4	-60.2	0.995	8.30	8.50	8.75	24.1	24.7	25.7	55.7	63.0	71.3	
	J	2-6	5	9.9	35.8	0.995	7.75	8.10	8.35	24.4	24.8	25.0	50.0	53.0	60.0	
		7-12	6	16.4	-6.4	0.999	8.15	8.45	8.80	24.8	25.2	25.8	55.7	59.7	69.4	
		13-17	5	26.3	-133.3	0.998	8.20	8.45	8.70	24.1	24.5	25.7	62.3	63.3	71.3	
1.24	K	2-21	20	22.1	36.7	0.999	5.70	6.33	6.75	24.1	25.0	25.8	50.0	62.7	71.3	
	L	2-21	20	20.5	52.6	0.998	5.70	6.30	6.75	24.1	25.0	25.8	50.0	62.7	71.3	
1.26	M	1-21	21	12.2	260.1	0.999	6.20	6.40	6.85	24.1	25.0	25.8	50.0	62.3	71.3	Sample was taken from a test pile, and thus had undergone previous oxidation.
	N	1-21	21	12.5	262.2	0.999	5.95	6.40	6.75	24.1	25.0	25.8	50.0	62.3	71.3	
1.35	C	6-25	20	42.1	1366.7	0.997	4.20	4.48	4.60	24.1	25.0	26.4	51.0	61.3	71.3	
		26-30	5	80.7	355.9	0.996	4.00	4.15	4.20	24.6	25.0	25.5	49.3	50.4	54.0	
1.47	O	1-12	12	46.9	488.7	0.998	4.05	4.45	4.65	24.4	25.0	25.8	50.0	55.9	69.4	Sample was compositionally atypical of Duluth Complex rocks.
		13-21	9	86.9	-16.3	0.997	4.40	4.40	4.60	24.1	24.7	25.7	62.3	69.3	71.3	
	P	1-9	9	45.0	290.7	0.999	4.10	4.40	4.60	24.4	25.0	25.8	50.0	55.3	69.4	
		10-13	4	72.8	40.7	1.000	4.45	4.50	4.50	24.7	25.0	25.2	55.7	61.8	65.3	
		14-21	8	139.2	-858.9	0.997	4.25	4.33	4.40	24.1	24.9	25.7	62.3	69.3	71.3	

Table A4.1. Sulfate mass release rates and pH, temperature, and relative humidity of rate periods.

Sulfur, %	Reactor	Period, Weeks	n, Weeks	Regression of ΣSO_4 vs. Time, µmol/wk			pH, s.u.			Temperature, °C			Relative Humidity, %			Comments
				rate	y-int.	r^2	min	median	max	min	median	max	min	median	max	
1.74	Q	1-10	10	44.5	473.4	0.992	4.10	4.50	4.80	24.4	25.0	25.8	50.0	55.7	69.4	Sample was compositionally atypical of Duluth Complex rocks.
		11-21	11	158.9	-680.5	0.992	4.30	4.40	4.55	24.1	25.2	25.7	55.7	64.8	71.3	
	R	1-12	12	42.1	495.4	0.999	4.00	4.50	4.95	24.4	25.0	25.8	50.0	55.9	69.4	
		14-21	8	76.9	149.6	1.000	4.55	4.60	4.70	24.1	24.9	25.7	62.3	69.3	71.3	
1.87	S	4-15	12	63.6	143.5	0.996	6.25	6.70	6.95	24.3	25.0	25.8	51.3	60.2	71.3	
		17-34	18	67.4	183.0	1.000	5.05	5.60	6.10	24.1	25.0	26.4	49.3	56.8	70.5	
	S*	4-34	31	70.7	89.0	0.998	5.05	5.85	6.95	24.1	25.0	26.4	49.3	58.0	71.3	
	T	5-11	7	65.1	128.0	0.993	6.70	6.75	6.90	24.8	25.0	25.8	55.3	59.0	69.4	
		12-16	5	191.8	-1360.8	0.997	5.55	5.80	6.60	24.3	24.7	25.7	60.3	63.3	71.3	
		17-34	18	70.5	602.3	0.999	4.90	5.40	5.80	24.1	25.0	26.4	49.3	56.8	70.5	
2.01	B	1-11	11	28.9	219.8	0.995	4.25	4.50	4.60	24.3	25.0	25.8	55.3	60.3	71.3	
		12-16	5	57.7	-100.0	0.995	4.40	4.45	4.55	24.1	25.3	25.7	63.0	69.3	70.5	
		17-30	14	170.6	1965.1	1.000	3.70	3.85	4.30	24.2	25.0	26.4	49.3	54.5	69.3	
2.17	U	3-11	9	23.1	70.5	1.000	5.35	5.60	6.00	24.4	25.0	25.8	50.0	56.0	69.4	
		15-21	7	85.9	-780.1	0.997	4.30	4.35	4.50	24.1	25.2	25.7	63.0	69.3	71.3	
	V	2-5	4	23.0	85.4	0.995	5.50	5.68	5.75	24.4	24.6	25.0	50.0	52.2	60.0	
		9-21	13	34.6	103.7	1.000	4.65	4.75	5.60	24.1	25.2	25.7	55.7	64.8	71.3	
2.57	W	1-7	7	14.4	194.1	0.999	4.25	4.40	4.50	24.4	25.0	25.2	50.0	54.5	60.0	Sample was compositionally atypical of Duluth Complex rocks.
		8-15	8	25.3	113.4	0.998	4.20	4.33	4.45	24.3	25.0	25.8	55.7	62.8	71.3	
		16-21	6	48.7	-253.3	0.993	4.20	4.35	4.50	24.1	25.3	25.7	63.0	69.3	70.5	
	X	1-7	7	13.0	193.7	0.998	4.25	4.40	4.50	24.4	25.0	25.2	50.0	54.5	60.0	
		8-15	8	22.7	128.6	0.994	4.30	4.45	4.60	24.3	25.0	25.8	55.7	62.8	71.3	
		16-21	6	78.8	-734.6	0.987	4.10	4.25	4.35	24.1	25.3	25.7	63.0	69.3	70.5	

Table A4.2. Calcium and magnesium mass release rates.

Sulfur, %	Reactor	Period, Weeks	n, Weeks	Regression of ECa vs. Time, μmol/wk			Regression of EMg vs. Time, μmol/wk			Ca + Mg, μmol/wk	Comments
				slope	y-int.	r^2	slope	y-int.	r^2		
0.47	A	2-13	12	8.5	13.9	0.991	1.5	5.1	0.995	10.0	
0.59	D	2-6	5	9.8	32.6	1.000	1.9	16.9	0.998	11.7	
		7-17	11	11.8	14.3	0.996	2.9	10.1	0.999	14.7	
0.80	E	0-5	6	13.1	38.8	0.999	3.6	12.4	0.983	16.7	
		6-17	12	15.2	24.5	0.998	4.8	4.4	0.997	20.0	
	F	2-8	7	14.0	34.5	0.999	3.3	14.2	0.997	17.3	
		9-17	9	13.7	36.0	1.000	4.2	6.3	0.999	17.9	
0.92	G	1-9	9	8.6	31.9	0.999	2.1	19.2	0.986	10.7	
		9-21	13	10.0	23.0	0.995	3.4	5.3	0.978	13.4	
		23-34	12	12.6	-6.5	0.961	12.5	-174.4	0.992	25.1	
	H	0-6	7	7.9	32.9	0.997	2.2	19.1	0.949	10.1	
		7-19	13	11.3	8.6	0.999	3.2	9.9	0.989	14.5	
		20-25	6	16.4	-92.8	0.995	13.4	-187.9	0.997	29.8	
		27-34	8	7.5	134.0	0.991	8.5	-64.6	0.999	16.0	
1.17	I	2-5	4	33.3	-1.2	0.997	3.9	4.9	0.999	37.2	Sample contained 3% $CaCO_3$, which buffered the drainage.
		6-10	5	30.8	6.0	1.000	4.7	1.0	0.999	35.5	
		11-17	7	35.4	-44.3	1.000	5.4	-6.9	0.999	40.8	
	J	2-6	5	30.4	11.8	0.997	3.8	7.2	1.000	34.2	
		7-12	6	27.3	25.6	0.999	4.5	2.4	0.999	31.8	
		13-17	5	37.6	-97.6	1.000	6.0	-15.8	1.000	43.6	
1.24	K	2-21	20	11.7	73.6	0.994	6.4	28.2	0.998	18.1	
	L	2-21	20	11.5	62.1	0.996	6.4	27.3	0.996	17.9	
1.26	M	1-21	21	9.0	234.0	0.999	1.6	35.4	0.985	10.6	Sample was taken from a test pile, and thus had undergone previous oxidation.
	N	1-21	21	8.8	244.6	0.999	1.7	36.6	0.979	10.5	
1.35	C	6-25	20	8.1	273.7	0.995	8.9	458.9	0.963	17.0	
		26-30	5	9.1	245.9	1.000	7.8	470.6	0.986	16.9	
1.47	O	1-12	12	18.5	290.6	0.986	12.9	224.7	0.987	31.4	Sample was compositionally atypical of Duluth Complex rocks.
		13-21	9	16.8	313.4	0.992	14.0	215.3	0.992	30.8	
	P	1-9	9	20.8	153.3	0.988	13.4	127.1	0.986	34.2	
		10-13	4	24.4	113.1	0.998	19.3	67.3	0.999	43.7	
		14-21	8	17.9	205.8	0.996	17.2	106.0	0.991	35.1	

Table A4.2. Calcium and magnesium mass release rates.

Sulfur, %	Reactor	Period, Weeks	n, Weeks	Regression of ΣCa vs. Time, μmol/wk			Regression of ΣMg vs. Time, μmol/wk			Ca + Mg, μmol/wk	Comments
				slope	y-int.	r^2	slope	y-int.	r^2		
1.74	Q	1-10	10	22.4	324.1	0.997	14.0	184.6	0.997	36.4	Sample was compositionally atypical of Duluth Complex rocks.
		11-21	11	37.1	186.2	0.985	33.3	-13.7	0.993	70.4	
	R	1-12	12	20.6	347.7	0.994	13.4	189.8	0.995	34.0	
		14-21	8	26.8	300.1	0.991	22.5	95.1	0.997	49.3	
1.87	S	4-15	12	41.8	170.0	0.994	18.9	98.6	0.991	60.7	
		17-34	18	26.6	535.5	0.981	26.7	-7.0	0.998	53.3	
	S*	4-34	31	37.8	234.8	0.976	24.8	41.4	0.995	62.6	
	T	5-11	7	46.6	110.0	0.993	20.0	76.8	0.994	66.6	
		12-16	5	84.2	-324.6	0.999	44.7	-216.6	0.998	128.9	
		17-34	18	24.2	699.6	0.991	32.6	-31.1	0.994	56.8	
2.01	B	1-11	11	10.2	135.3	0.986	3.4	72.8	0.986	13.6	
		12-16	5	9.3	144.8	1.000	3.9	64.7	0.987	13.2	
		17-30	14	11.0	121.6	0.996	6.6	23.4	0.997	17.6	
2.17	U	3-11	9	11.0	88.8	0.999	5.2	34.2	1.000	16.2	
		15-21	7	13.2	95.6	0.971	19.0	-141.7	0.999	32.2	
	V	2-5	4	13.0	79.6	1.000	5.0	36.1	0.994	18.0	
		9-21	13	8.5	169.3	0.983	7.9	47.3	1.000	16.4	
2.57	W	1-7	7	7.1	65.7	0.995	6.2	55.7	0.966	13.3	Sample was compositionally atypical of Duluth Complex rocks.
		8-15	8	4.7	80.5	0.997	4.8	62.3	0.977	9.5	
		16-21	6	3.7	96.1	0.988	5.2	55.5	0.997	8.9	
	X	1-7	7	6.2	69.0	0.987	5.8	55.9	0.962	12.0	
		8-15	8	5.3	71.1	0.999	5.1	57.5	0.981	10.4	
		16-21	6	6.3	54.5	0.977	5.8	45.5	0.999	12.1	