BHP World Minerals

ACID ROCK DRAINAGE CHARACTERIZATION BOSTON PROPERTY (WASTE ROCK)

FINAL REPORT

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Executive Summary

EXECUTIVE SUMMARY

This report discusses the acid rock drainage (ARD) characterization program that was conducted on rock samples obtained from BHP's Boston Property, part of the Hope Bay Belt Project. The purpose of the program was to determine the acid-generating and metal-leaching characteristics of geologic material that may be exposed as a result of developing the Boston Property. In particular, certain rock units are currently envisioned to be used as construction material or stockpiled as low-grade ore prior to processing. The objectives of the report are: 1) to describe the ARD testwork that was completed on samples collected from the Boston Property, 2) summarize and interpret the analytical results, 3) use the results to conduct geochemical modelling and make predictions regarding water quality, and 4) provide recommendations regarding future handling of geologic material, on-site monitoring and potential additional analytical work.

Static prediction testwork in the form of acid-base accounting was performed on Boston Property samples collected from decline material during the 1996 and 1997 field seasons and from drill core material during the 1997 field season. According to the DIAND ARD guidelines, the majority of this material had low acid-generating potential, although some of the 1996 decline material was determined to have uncertain acid-generating potential. Due to the potential for some of the material to be used as construction material and/or stockpiled on the surface, it was decided to conduct additional prediction testwork in the form of kinetic testing.

Kinetic prediction testwork using humidity cells was conducted on three samples collected in 1997. The samples were collected by BHP geologists in consultation with Rescan personnel and represent the altered basalt, B2 mineralized zone and B3 alteration halo rock types. Although other rock types exist in the deposit, it was indicated by BHP that only the three rock types that were collected have any potential for surface exposure, either as construction material or stockpile material. The kinetic test results indicated that altered basalt and B3 alteration halo material is unlikely to generate net acidity in the long-term, but B2 mineralized zone material will probably become net acid-generating. With respect to metal-leaching, arsenic, copper and/or nickel were released at significant levels from all three samples.

Geochemical modelling was used to predict the quality of seepage coming from the three rock types tested and how this seepage might affect receiving water. The geochemical model PHREEQC predicted that after minimal dilution, seepage from the three rock types would not significantly affect receiving water quality.

Based on the testwork completed during the ARD characterization program, a number of recommendations are made:

- Due to potential arsenic leaching, altered basalt material should not be used for construction purposes without further mineralogical analysis.
- Existing piles of decline material located close to the Boston exploration camp should be covered to minimize infiltration and a diversion/collection system should be installed to prevent drainage from entering receiving waters.
- Any altered basalt, B2 mineralized zone or B3 alteration halo material that is exposed during future development should be isolated to keep drainage from entering receiving waters.
- On-site kinetic testing of materials that will be stored on the surface or used for construction should be initiated as soon as possible in the upcoming field season. Furthermore, opportunistic sampling of seepage from existing and identified piles of decline material should occur whenever seeps are observed, to verify the results obtained from laboratory kinetic testing.

Table of Contents

ACID ROCK DRAINAGE CHARACTERIZATION
BOSTON PROPERTY WASTE ROCK

TABLE OF CONTENTS

EXECUTIVE SUMMARY i

TABLE OF CONTENTS iii

List of Figures vi

List of Tables viii

List of Plates ix

1. INTRODUCTION 1-1

2. BACKGROUND INFORMATION 2-1
   - 2.1 Location and History 2-1
   - 2.2 Geology 2-1
     - 2.2.1 Regional Geology 2-1
     - 2.2.2 Deposit Geology 2-2
       - 2.2.2.1 Mafic Volcanic Rocks 2-2
       - 2.2.2.2 Felsic Volcanic Rocks 2-2
       - 2.2.2.3 Sedimentary Rocks 2-2
       - 2.2.2.4 Felsic Intrusives 2-2
       - 2.2.2.5 Granitic Rocks 2-3
   - 2.3 Previous Work 2-3

3. ARD CHARACTERIZATION - STATIC TESTWORK 3-1
   - 3.1 Methods 3-1
     - 3.1.1 Sampling 3-1
     - 3.1.2 Analytical Methods 3-2
       - 3.1.2.1 General 3-2
       - 3.1.2.2 Fizz Test 3-3
       - 3.1.2.3 Paste pH 3-3
       - 3.1.2.4 Sulphur Analysis 3-3
       - 3.1.2.5 Inorganic Carbon 3-4
       - 3.1.2.6 Neutralization Potential 3-4
       - 3.1.2.7 Calculated Parameters 3-5
   - 3.2 Results and Discussion 3-5
     - 3.2.1 General Interpretation 3-6
       - 3.2.1.1 Paste pH 3-6

TABLE OF CONTENTS

3.2.1.2 Net Neutralization Potential 3-6
3.2.1.3 Neutralization Potential Ratio 3-7
3.2.2 Detailed Results 3-7
3.2.2.1 Excavation Sampling 3-7
3.2.2.2 Drill Core 3-8

4. ARD CHARACTERIZATION – KINETIC TESTWORK 4-1
4.1 Background Information 4-1
4.1.1 Considerations for Interpreting Boston Project Kinetic Testwork 4-1
4.1.2 Acid Rock Drainage in Permafrost Environments 4-3
4.2 Methods 4-4
4.2.1 Sampling Methods 4-4
4.2.2 Analytical Methods 4-5
4.2.2.1 Sample Characterization 4-5
4.2.2.2 Kinetic Prediction Testing 4-5
4.2.3 Quality Assurance/Quality Control 4-10
4.3 Results and Discussion 4-10
4.3.1 Quality Assurance/Quality Control 4-11
4.3.2 Altered Basalt 4-12
4.3.2.1 Sample Characterization 4-12
4.3.2.2 Physical Parameters 4-14
4.3.2.3 Acid Generating Potential and Neutralization Potential 4-16
4.3.2.4 Metal Leaching 4-25
4.3.2.5 Summary 4-30
4.3.3 B2 Mineralized Zone 4-33
4.3.3.1 Sample Characterization 4-33
4.3.3.2 Physical Parameters 4-34
4.3.3.3 Acid Generating Potential and Neutralization Potential 4-37
4.3.3.4 Metal Leaching 4-41
4.3.3.5 Summary 4-48
4.3.4 B3 Alteration Halo 4-51
4.3.4.1 Sample Characterization 4-51
4.3.4.2 Physical Parameters 4-52
4.3.4.3 Acid Generating Potential and Neutralization Potential 4-55
4.3.4.4 Metal Leaching 4-61
4.3.4.5 Summary 4-66
4.4 Conclusions from Kinetic Prediction Testing 4-69

TABLE OF CONTENTS

5. WATER QUALITY PREDICTION 5-1
5.1 Geochemical Modelling 5-1
5.1.1 Models 5-1
5.1.1.1 MINTEQA2 5-2
5.1.1.2 PHREEQC 5-2
5.1.2 Model Assumptions 5-3
5.2 Results and Discussion 5-5
5.2.1 Geochemical Modelling 5-5
5.2.1.1 MINTEQA2 5-5
5.2.1.2 PHREEQC 5-5
5.2.2 Predicted Water Quality 5-10
5.2.3 Bulk Sample Piles 5-15

6. CONCLUSIONS 6-1
6.1 Conclusions 6-1
6.2 Recommendations 6-2

REFERENCES R-1

APPENDICES

Appendix A-1 - Static Test Data - Bulk Samples

Appendix A-2 - Static Test Data - Drill Core Samples

Appendix B - Equations for Interpreting Kinetic Test Data

Appendix C - Quality Assurance/Quality Control Data

Appendix D-1 - Petrographic Data

Appendix D-2 - Kinetic Test Data - Altered Basalt

Appendix D-3 - Kinetic Test Data - B2 Mineralized Zone

Appendix D-4 - Kinetic Test Data - B3 Alteration Halo

Appendix E-1 - Geochemical Modelling - MINTEQA2

Appendix E-2 - Geochemical Modelling - PHREEQC

List of Figures

Figure		Page
3-1	Neutralization Potential Ratio (NPR) vs Total Sulphur (%S) – Excavation Sample Data (1997)	3-9
3-2	Neutralization Potential Ratio (NPR) vs Total Sulphur (%S) – Drill Core Data (1997)	3-11
4-1	Altered Basalt: pH and Conductivity vs Cycle	4-15
4-2	Altered Basalt: Alkalinity and Acidity Production Rate vs. Cycle	4-17
4-3	Altered Basalt: pH, Sulphate Production and Carbonate NP Consumption vs. Cycle	4-19
4-4	Altered Basalt: Remaining S and Remaining NP vs. Cycle	4-20
4-5	Altered Basalt: Estimated Depletion Times for Sulphur Species and Neutralization Potential (NP)	4-21
4-6	Altered Basalt: Alkalinity Molar Ratios vs. Cycle	4-23
4-7	Altered Basalt: Sulphate Molar Ratio vs. Cycle	4-24
4-8	Altered Basalt: Percent Metal Remaining vs. Cycle	4-26
4-9	Altered Basalt: Percent Metal Remaining vs. Cycle	4-27
4-10	Altered Basalt: Percent Metal Remaining vs. Cycle	4-28
4-11	Altered Basalt: Estimated Depletion Times for Various Metals	4-31
4-12	Altered Basalt: Estimated Depletion Times for Various Metals	4-32
4-13	B2 Mineralized Zone: pH and Conductivity vs. Cycle	4-35
4-14	B2 Mineralized Zone: Alkalinity and Acidity Production Rate vs. Cycle	4-36
4-15	B2 Mineralized Zone: Sulphate Production Rate and Carbonate NP Consumption Rate vs. Cycle	4-38

TABLE OF CONTENTS

4-16 B2 Mineralized Zone: Remaining S and Remaining Carbonate NP vs. Cycle 4-39

4-17 B2 Mineralized Zone: Estimated Depletion Times for Sulphur Species and Neutralization Potential 4-40

4-18 B2 Mineralized Zone: Alkalinity Molar Ratio vs. Cycle 4-42

4-19 B2 Mineralized Zone: Sulphate Molar Ratios vs. Cycle 4-43

4-20 B2 Mineralized Zone: Percent Metal Remaining vs. Cycle 4-44

4-21 B2 Mineralized Zone: Percent Metal Remaining vs. Cycle 4-45

4-22 B2 Mineralized Zone: Percent Metal Remaining vs. Cycle 4-46

4-23 B2 Mineralized Zone: Estimated Depletion Times for Various Metals 4-49

4-24 B2 Mineralized Zone: Estimated Depletion Times for Various Metals 4-50

4-25 B3 Alteration Halo: pH and Conductivity vs. Cycle 4-53

4-26 B3 Alteration Halo: Alkalinity and Acidity Production Rate vs. Cycle 4-54

4-27 B3 Alteration Halo: Sulphate Production Rate and Carbonate NP Consumption Rate vs. Cycle 4-56

4-28 B3 Alteration Halo: Percent S Remaining and Remaining Carbonate NP vs. Cycle 4-57

4-29 B3 Alteration Halo: Estimated Depletion Times for Sulphur Species and Neutralization Potential (NP) 4-58

4-30 B3 Alteration Halo: Alkalinity Molar Ratios vs. Cycle 4-59

4-31 B3 Alteration Halo: Sulphate Molar Ratios vs. Cycle 4-60

4-32 B3 Alteration Halo: Percent Metal Remaining vs. Cycle 4-62

4-33 B3 Alteration Halo: Percent Metal Remaining vs. Cycle 4-63

4-34 B3 Alteration Halo: Percent Metal Remaining vs. Cycle 4-64

4-35 B3 Alteration Halo: Estimated Depletion Times for Various Metals... 4-67

4-36 B3 Alteration Halo: Estimated Depletion Times for Various Metals... 4-68

List of Tables

Table Page

3-1 Rock Types at Boston Property 3-2

3-2 Volumes and Normalities of Acid Used in NP Determination..... 3-3

4-1 Humidity Cell Data from Altered Basalt 4-29

4-2 Humidity Cell Data from B2 Mineralized Zone 4-48

4-3 Humidity Cell Data from B3 Alteration Halo..... 4-66

5-1 Selected Parameters for MINTEQA2 Modelling 5-3

5-2 Selected Parameters for PHREEQC Modelling..... 5-4

5-3a Predicted Values from PHREEQC Model (Altered Basalt)..... 5-6

5-3b Predicted Values from PHREEQC Model (B2 Mineralized Zone) 5-7

5-3c Predicted Values from PHREEQC Model (B3 Alteration Halo) 5-8

5-3d Predicted Values from PHREEQC Model (B2 and B3)..... 5-9

5-4a Comparison of Predicted Water Quality to Water Quality Criteria (Altered Basalt)..... 5-11

5-4b Comparison of Predicted Water Quality to Water Quality Criteria (B2 Mineralized Zone)..... 5-12

5-4c Comparison of Predicted Water Quality to Water Quality Criteria (B3 Alteration Halo)..... 5-13

5-4d Comparison of Predicted Water Quality to Water Quality Criteria (B2 Min Zone + B3 Alt Halo)..... 5-14

5-5 Chemistry of Water Samples Collected Near Bulk Sample Piles..... 5-15

List of Plates

Plate Page

4-1 Refrigerator used to maintain humidity cells at 4°C 4-7

4-2 Standard humidity cells containing Boston samples 4-8

4-3 Humidifier for generating humid air which is passed through humidity cells 4-9

5-1 Ponded water from which Samples 1 and 2 were obtained 5-17

5-2 Ponded water on temporary access road from which Sample 3 was taken 5-17

5-3 Ponded water from which Sample 5 was obtained 5-18

1. Introduction

1. INTRODUCTION

The exposure of sulphide-bearing material to the atmosphere can result in the generation of acid. This acid can cause metals to leach out of surrounding rock, producing acid rock drainage (ARD). If a sufficient quantity of ARD is generated, receiving water quality can be affected. This report discusses the ARD characterization program that was conducted on rock samples obtained from BHP's Boston Property. The Boston Property ARD characterization program is one component of the overall environmental management program for the Hope Bay Belt Project and as such, the results presented herein are intended to aid with future waste management decisions.

The purpose of the ARD characterization program was to characterize the acid-generating and metal-leaching nature of geologic material that may be exposed through development of the Boston Property. In particular, certain rock units are currently envisioned to be used as construction material (*e.g.* altered basalt) while others are likely to be stockpiled as low-grade ore prior to processing (*e.g.* B2 mineralized zone or B3 alteration halo). The objectives of this report are: 1) to describe the ARD testwork that was completed on samples collected from the Boston Property, 2) summarize and interpret the analytical results, 3) use the results to perform geochemical modelling and make predictions regarding water quality, and 4) provide recommendations regarding future handling of geologic material, on-site monitoring and potential additional analytical work.

The report is divided into six sections. The first section consists of a brief introduction that explains the objectives and organization of the report. The second section provides background information on the project and previous work that was performed. Section 3 briefly summarizes the static ARD characterization testwork that was completed in 1996 and 1997. A detailed analysis of the kinetic testwork that was conducted is provided in the fourth section. The results of geochemical modelling that was performed to predict on-site water quality using data from the kinetic testwork are presented in Section 5. The sixth and final section presents conclusions and recommendations.

2. Background Information

2. BACKGROUND INFORMATION

2.1 Location and History

The ARD characterization program was conducted on samples obtained from the Boston Property. The Boston Property is part of the Hope Bay Volcanic Belt located in the Kitikmeot Region of Nunavut. The property is located approximately 125 km north of the Arctic Circle and approximately 60 km east of Bathurst Inlet and south of Melville Sound. The property was discovered in 1991 and active exploration has been ongoing since 1992.

2.2 Geology

The information presented in this section, regarding the geology of the Boston area and its surroundings, comes from "The Geology of the Boston Deposit, Hope Bay Volcanic Belt, Northwest Territories, Canada" (Clarke, 1996). Relevant aspects of regional and deposit geology are presented below.

2.2.1 Regional Geology

The Boston Property is centred on a carbonatized, mineralized shear zone and consists of three main rock types: mafic volcanics, gabbro and sediments. The mafic volcanics are tholeiitic basalts found in pillowed and massive flows. Gabbroic sills are encountered exclusively in the mafic volcanics. Sediments in the shear zone are intensely folded, fine-grained phyllites that may contain graphite.

The most strongly carbonatized portions of the shear are comprised of fine-grained masses of dolomite/ankerite and sericite. These portions are typically enveloped within a less-altered domain comprised of strongly foliated, calcite-bearing, chlorite/sericite schists. Quartz veins are localized within the shear, generally trending sub-parallel to the structure. The veins are comprised of coarsely crystalline, translucent quartz with varying amounts of carbonate present. Sulphide accumulation of up to 3% is observed.

2.2.2 Deposit Geology

The Boston Property covers a 3 to 7 km wide assemblage of north to northwesterly-trending supracrustal rocks that are bounded by Archean granitoid intrusives. The property encompasses an approximately 20 km long portion of the Hope Bay Volcanic Belt that is centred over a 7 km long hydrothermally altered, gold-bearing fault zone. The majority of the Boston claims are underlain by basalts and their clastic derivatives with minor amounts of intrusives, felsic flows and pyroclastics.

2.2.2.1 Mafic Volcanic Rocks

Mafic volcanic rocks are believed to comprise up to 90% of the outcrop and underlie approximately 70% of the claim block. In the vicinity of the fault zone, the mafic volcanics and their clastic derivatives have been affected by widespread hydrothermal alteration. Three main alteration zones have been formed (albite/quartz, ankerite and sericite) which are contained within areas of less intense chlorite and calcite alteration.

2.2.2.2 Felsic Volcanic Rocks

Intermediate and felsic volcanic rocks, visible as outcroppings east of the Spyder River, are thought to underlie approximately 10% of the claims. The majority of the felsic volcanics consist of andesitic/dacitic pyroclastics.

2.2.2.3 Sedimentary Rocks

Sedimentary rocks represent a small fraction of the outcroppings within the property, but are believed to underlie up to 20% of the claim block. Within the fault zone, the sedimentary rocks consist of intensely folded, fine-grained phyllites that may or may not contain graphite.

2.2.2.4 Felsic Intrusives

Feldspar porphyritic dykes have intruded the mafic volcanics along the western portion of the Boston 1 claim. The light grey, fine- to medium-grained rock is often found within recessive gullies.

2.2.2.5 Granitic Rocks

The Boston Property is bounded by a granitic batholith. The medium- to coarse-grained intrusive is hematitic near the supracrustal contact. The tonalitic granite contains pegmatitic phases and aplite dykes.

2.3 Previous Work

Previous acid generation testwork was completed on samples collected in 1993, 1996 and 1997. The results of the previous work are described in detail in the 1996 and 1997 Environmental Data Reports (Rescan, 1997; Rescan, 1998) and are summarized in Section 3.

In 1993, three samples (hanging wall, footwall and mineralized zone) from each of three drill holes that intersected the mineralized shear zone were collected and submitted for acid-base accounting. The results from this analysis indicated that there is significant carbonate within the host rock and that according to the DIAND ARD guidelines, the rock has a low acid-generating potential.

In 1996, a more extensive analytical program was carried out. Samples were collected from Boston decline material and Doris Lake drill core. One hundred, fifty-seven samples were taken from every second round blasted during advancement of the decline on the Boston Property. According to the DIAND ARD guidelines, the results of acid-base accounting analyses performed on these samples indicated that the majority of rock has a low acid-generating potential.

Acid-base accounting analyses were performed in 1997 on 126 bulk samples and 43 drill core samples collected from the Boston Property. In general, the rocks that were analyzed had a low acid-generating potential, but the results of these analyses suggested that kinetic testing should be conducted on selected samples from the Boston Property. The kinetic prediction testwork carried out as a result of the previous analyses is described in Section 4.

3. ARD Characterization - Static Testwork

3. ARD CHARACTERIZATION – STATIC TESTWORK

Static prediction testwork is carried out to determine the balance between the acid-generating components and the acid-consuming components of a sample. The work is performed prior to kinetic testwork and provides important information for the interpretation of kinetic test results. This section presents a brief summary of the static ARD characterization testwork that was previously performed on samples from the Boston Property. A more detailed account of the static prediction testwork was presented earlier in the 1996 and 1997 Environmental Data Reports (Rescan, 1997; Rescan, 1998). The analytical methods used for static testing are described and relevant results are provided and discussed.

3.1 Methods

3.1.1 Sampling

Sampling of excavation material and drill core from the Boston Property was performed during the 1996 and 1997 exploration seasons by BHP geologists. One hundred, fifty seven samples of decline material were collected in 1996 and 126 samples from decline material were collected in 1997, for a total of 283 samples. Random grab samples were taken from the material produced after every second blast during development of the decline and sent for static prediction testing. The 1996 material was classified by BHP geologists into four categories: basalt; basalt ore horizon; basalt – sediment transition, ore horizon; and basalt – sediment transition. The 1997 material was classified by BHP geologists as weakly to moderately altered basalt. These are general classifications and it is possible that a particular sample included minor components of other rock types. Excavation samples were selected primarily to represent a specific volume of rock rather than a specific type of rock.

Samples were also collected from drill core and were chosen to represent the rock types listed in Table 3-1. Enough drill core was collected from an interval to ensure sufficient sample for analysis. At the analytical laboratory the drill core was crushed and a sub-sample was taken. A total of 43 drill core samples were collected in 1997 and submitted for chemical analysis.

Table 3-1
Rock Types at Boston Property

Rock Type	Label	Comments
Basalt - unaltered	B-ua	
Basalt - weakly altered	B-wa	Weakly sericitic, 1-30% dolomite
Basalt - moderately altered	B-ma	Moderately sericitic, 31-60% dolomite
Basalt - strongly altered	B-sa	Strongly sericitic, >60% dolomite
Zone B2 - Alteration halo	B2-AH	
Zone B2 - Mineralized zone	B2-MZ	
Zone B3 - Alteration halo	B3-AH	
Zone B3 - Mineralized zone	B3-MZ	
Gabbro - unaltered	G-ua	
Quartz/carbonate dyke	Q/C dyke	
Metasediments - unaltered	S-ua	
Metasediments - strongly altered	S-sa	Strongly sericitic, >60% dolomite

3.1.2 Analytical Methods

Analytical work was performed by Chemex Laboratories (Chemex) in North Vancouver, British Columbia.

3.1.2.1 General

Static prediction testing is used to determine the balance between the acid-consuming potential and acid-generating potential of a sample. The accepted method of static prediction testing is acid-base accounting (ABA). The ABA methods outlined below are based on standard methods developed by the U.S. EPA (Sobek *et al*., 1978). The ABA methods used for the analysis of the Boston Property samples are described in greater detail in the Department of Indian Affairs and Northern Development (DIAND) ARD guidelines (DIAND, 1993) and the more recent draft guidelines for ARD prediction in British Columbia (Price, 1997). The following parameters were determined as part of the static prediction testwork: fizz test, paste pH, total sulphur, sulphide sulphur, sulphate sulphur, inorganic carbon and neutralization potential. The analytical procedure for each of these parameters is described below.

3.1.2.2 Fizz Test

A fizz test is completed prior to conducting the neutralization potential (NP) analysis to determine the volume and normality of hydrochloric acid that is to be used in the NP analysis (see Table 3-2). The test is conducted by adding one or two drops of 25% HCl to approximately 0.5 grams of crushed sample and rating the amount of effervescence produced from 1 (none) to 4 (strong).

Table 3-2
Volumes and Normalities of Acid Used in NP Determination[a]

Fizz Rating	Volume of HCl (mL)	Normality of HCl (N)
None (1)	20	0.1
Slight (2)	40	0.1
Moderate (3)	40	0.5
Strong (4)	80	0.5

[a]: **adapted from Sobek et al., 1978**

3.1.2.3 Paste pH

Paste pH is a measure of the amount of readily available neutralizing mineral associated with a sample and can indicate whether or not the sample has previously generated acidity. Paste pH is determined by adding approximately 5 mL of deionized water to 10 grams of crushed sample and allowing the sample to become saturated. More water can be added if necessary to produce the desired consistency. The sample is stirred and the pH of the paste is measured using a Hanna Instruments S1900 combination pH meter/electrode.

3.1.2.4 Sulphur Analysis

Total sulphur is analyzed using a Leco sulphur analyzer. The sample (0.5 to 5.0 g of crushed material) is heated to approximately 1350ºC in an induction furnace while a stream of oxygen is passed through the sample. Sulphur dioxide released by the sample is measured using an infrared detection system and the total sulphur result is provided.

Sulphate sulphur is measured by heating a prepared sample (0.2 to 1.0 g of crushed material) in dilute hydrochloric acid for 30 minutes. Silica and other acid-insoluble materials are removed by filtration and ferric iron is reduced to ferrous iron by the addition of hydroxylamine hydrochloride. The sulphate in the resulting filtrate is then precipitated with barium chloride in a dilute hydrochloric acid medium. The barium sulphate precipitate is filtered, ignited, weighed and calculated as %S (of the HCl-soluble sulphate) in the original sample.

To measure sulphide sulphur, a prepared sample (0.2 to 1.0 g of crushed material) is digested with nitric acid and bromine, followed by hydrochloric acid, and then taken to dryness. The salts are dissolved in dilute hydrochloric acid. Silica and other acid-insoluble materials are removed by filtration and ferric iron is reduced to ferrous iron by the addition of hydroxylamine hydrochloride. The sulphate in the resulting filtrate is then precipitated with barium chloride in a dilute hydrochloric acid medium. The barium sulphate precipitate is filtered, ignited, weighed and calculated as %S in the original sample. The percent sulphide sulphur is the difference between the %S of this test and the %S found as HCl-soluble sulphate.

3.1.2.5 Inorganic Carbon

Inorganic carbon is determined by leaching a prepared sample with dilute hydrochloric acid. Carbon dioxide is released and carried into a measuring buret by a stream of oxygen. The volume of the two gases is measured and the gases are then passed through a potassium hydroxide solution that removes the carbon dioxide. The oxygen is returned to the buret and the volume is again measured. The difference in volume, corrected for temperature and pressure, is proportional to the amount of inorganic carbon in the sample.

3.1.2.6 Neutralization Potential

Neutralization potential is measured following the standard Sobek method, also known as the EPA-600 method. The standard Sobek method was used for the Boston Property testwork because the analytical laboratory follows the methods outlined in the BC ARD guidelines which specify that this method be used. For the standard Sobek method, a 2.0 gram sample of crushed material is treated with the volume and normality of HCl determined from Table 3-2. The sample is heated gently until the reaction is complete and then carbon dioxide-free deionized water is added. The

solution is allowed to boil for one minute and then covered tightly to cool. Once the solution has cooled to room temperature, it is titrated with the appropriate volume and normality of sodium hydroxide until the pH reading remains at 7.0 for at least 30 seconds. The neutralization potential is calculated from this information, using the following formula:

$$\text{Neutralization Potential (NP)} = \frac{50a\,[x-(b/a)y]}{c}$$

where a = normality of HCl
b = normality of NaOH
c = sample weight in grams
x = volume of HCl added (mL)
y = volume of NaOH added (mL) to pH 7.0

The NP is expressed as kilograms of calcium carbonate equivalent per tonne of material (kg $CaCO_3$/t).

3.1.2.7 Calculated Parameters

From these values, a number of other parameters can be calculated, including: maximum potential acidity (MPA), carbonate neutralization potential (CaNP), net neutralization potential (NNP) and the neutralization potential to maximum potential acidity ratio or neutralization potential ratio (NPR). Maximum potential acidity is calculated by multiplying the total sulphur result by 31.25. This is a molar conversion based on the assumption that the sulphur is present as pyrite and it generates a value expressed in the same terms as NP (kg $CaCO_3$/t). The carbonate NP is calculated by multiplying the percent CO_2 (measured as inorganic carbon) by 22.743, which converts the value into kilograms of $CaCO_3$ equivalent per tonne of material. The NNP is calculated by subtracting the MPA from the NP and the NPR is calculated by dividing the NP by the MPA.

3.2 Results and Discussion

The results of the 1996 and 1997 ABA analyses completed on Boston Property samples indicate that the majority of samples have a low acid-generating potential.

3.2.1 General Interpretation

3.2.1.1 Paste pH

Paste pH is a measure of the amount of readily available neutralizing minerals associated with a sample and indicates whether or not the sample has previously generated acidity. A paste pH of 5 or higher indicates that the sample contains sufficient neutralizing minerals to provide some degree of buffering capacity. A pH of less than 5, on the other hand, indicates that the sample has generated acidity.

All of the Boston samples had paste pH values that were 7.8 or higher and over 63% of the samples had paste pH values that were 8.5 or higher. This indicates that there are significant amounts of neutralizing minerals in these samples and that acidity had not previously been generated.

3.2.1.2 Net Neutralization Potential

The net neutralization potential (NNP) is the mathematical difference between the neutralization potential and the acid-generating potential. Theoretically, a sample with an NNP of less than zero is considered acid-generating. In practice, however, it has been observed that samples with an NNP of up to 20 may still generate net acidity. Therefore, it is generally accepted that a sample must have an NNP of +20 or higher to be considered net acid consuming (DIAND, 1993; Price, 1997). There can be a problem in using NNP, however, which can best be illustrated with an example. A sample with an NP of 40 and an MPA of 10 and a sample with an NP of 230 and an MPA of 200 both have an NNP of +30 kg $CaCO_3$/t. Relatively speaking, however, the first sample has four times as much acid-consuming potential as acid-generating potential while the second sample has approximately the same amount of acid-consuming and acid-generating potential. Thus, the first sample is less likely to go acid than the second sample. This is why the neutralization potential ratio (NPR) is a more reliable measure for assessing the long-term acid-generating nature of a sample.

The NNP of the Boston samples ranged from 0 to 450 kg $CaCO_3$/t of material, but the majority (71%) of samples had NNP values that were greater than 250 kg $CaCO_3$/t. The high NNP of the samples indicates an abundance of neutralizing minerals in material from the Boston Property.

3.2.1.3 Neutralization Potential Ratio

A more useful predictor of a sample's acid-generating potential is the neutralization potential ratio (NPR). This value is the ratio of neutralization potential to acid-generating potential in a sample. Depending on where the project is located, the interpretation of NPR differs slightly based on applicable guidelines. In the Northwest Territories, an NPR of greater than 3 indicates the sample has a low potential for generating acid; an NPR between 1 and 3 indicates an uncertain potential for generating acid; and an NPR of less than 1 indicates that the sample has a high potential for generating acid (DIAND, 1993). In most cases, samples with an NPR between 1 and 3 require further characterization, typically in the form of kinetic prediction testing.

The NPR of the Boston samples varied from 1.0 to as high as 660. Over 70% of the samples had NPR values greater than 10, suggesting significant concentrations of neutralizing minerals.

3.2.2 Detailed Results

The raw data, including graphs, are included in Appendices A-1 (decline material samples) and A-2 (drill core samples) and are discussed below.

3.2.2.1 Decline Material

Based on the results of earlier analyses, which indicated a very low sulphate content in Boston Property rocks, total sulphur was the only sulphur parameter measured in the samples collected from the decline material.

The majority (72%) of decline material samples had total sulphur contents below 1%, NP values greater than 250 kg $CaCO_3$/t and paste pH values greater than 8.0. All of the decline material samples had NPR values above 1.1 and nearly 80% had NPR values greater than 5.0. These results indicate that most of the decline material samples had a low acid-generating potential.

An NPR-S diagram, which plots NPR against total S, is presented in Figure 3-1. The diagram is divided into four quadrants with the dividing lines between quadrants being an NPR of 3 and total sulphur of 0.3%. In terms of relative acid-generating potential, Quadrant I has the lowest potential, Quadrants II and III have uncertain

potential and Quadrant IV has the highest potential. From this figure it can be seen that the majority (79%) of 1996 decline material samples and all of the 1997 samples fall within Quadrants I and II. Of the thirty-three 1996 samples that occur within Quadrant IV, 30 of them come from the basalt-sediment transition, ore horizon rock type. One sample from each of the other three rock types collected in 1996 is also found in Quadrant IV.

These results indicate that the majority of decline material samples have a low to uncertain potential for becoming net acid generators. These results also suggest that of the samples with an uncertain or high potential for acid generation, the majority come from the basalt-sediment transition, ore horizon rock type.

3.2.2.2 Drill Core

As mentioned above under sampling methods, the drill core samples were chosen to represent the various rock types found within the Boston deposit. Therefore, the results of the ABA analyses have been separated by rock type.

The drill core samples range in total sulphur content from 0.03 to 3.90% and in NP from 9 to 457 kg $CaCO_3$/t. The paste pH of these samples ranges from 8.4 to 9.6. More than 70% of the samples have total sulphur contents of less than 0.5%, NP values greater than 250 kg $CaCO_3$/t and paste pH values greater than 8.9. These results indicate a low acid-generating potential for the majority of rock types analyzed from drill core samples.

As expected from the degree of mineralization in these zones, samples from the B2 and B3 zones have among the highest total sulphur contents of the drill core samples. Samples taken from the basalt rock type, on the other hand, have among the lowest total sulphur contents, with almost 80% of basalt samples having less than 0.2% total sulphur. The other rock types varied between 0.04 and 3.90% total sulphur. With respect to NP, with the exception of one sediment sample and one dyke sample, the drill core samples have NP values greater than 100 kg $CaCO_3$/t and more than 85% of the samples have NP values greater than 200 kg $CaCO_3$/t.

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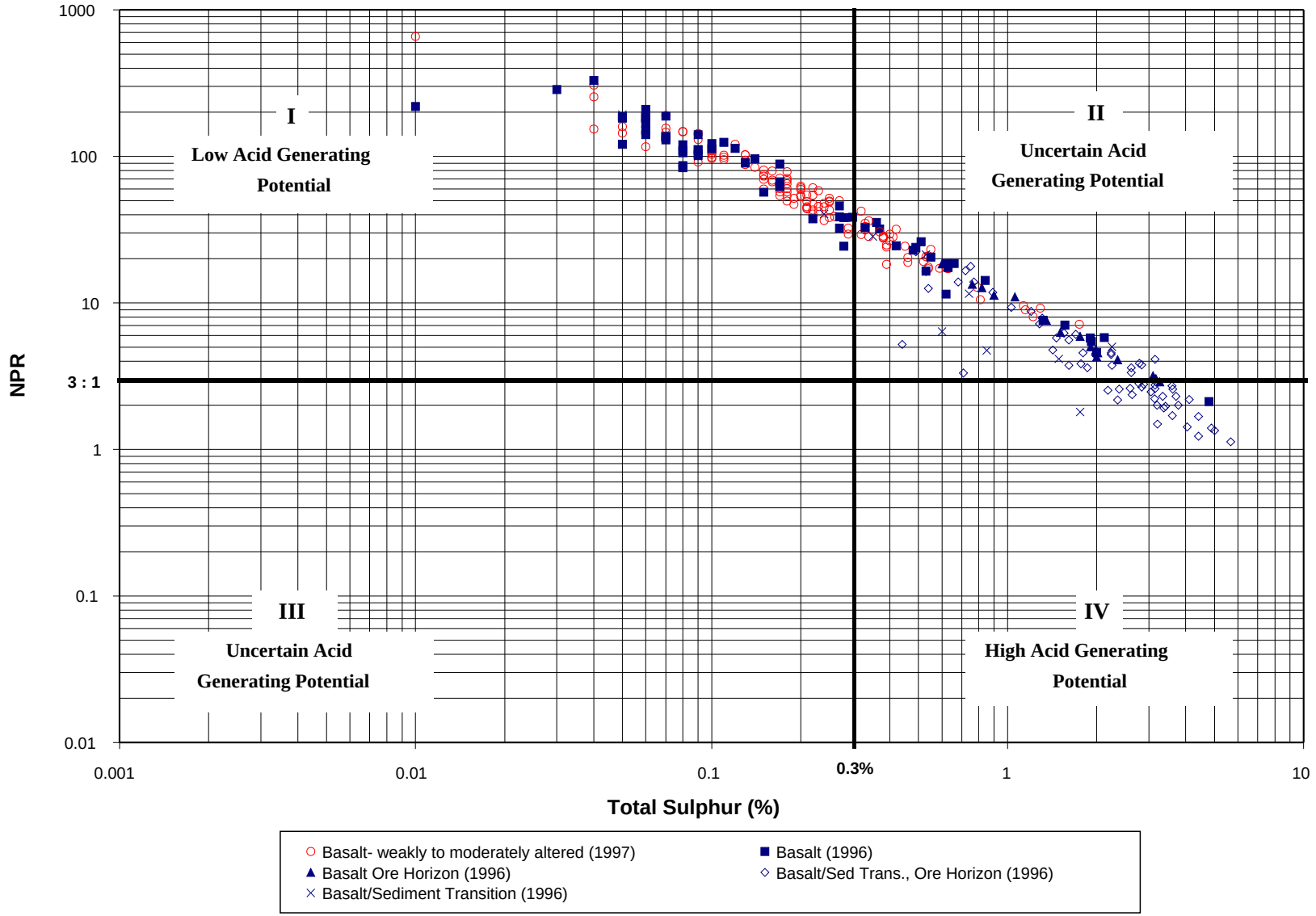

FIGURE 3-1

Bulk Sample Data (1996 and 1997)
Neutralization Potential Ratio (NPR) vs Total Sulphur

Source: Centro de Ecología Aplicada, 1995

No obvious trend in NP values exists amongst rock types because no specific NP value or range of values is consistently associated with a particular rock type.

A comparison of NP to carbonate NP indicates that there are non-alkalinity generating carbonates, such as iron carbonates (*e.g.* ankerite, siderite), in the majority of drill core samples. Upon dissolution, iron carbonates generate alkalinity and acidity in a 1:1 molar ratio, so unlike the dissolution of other carbonates (*e.g.* calcite, dolomite), no net alkalinity is generated.

Figure 3-2 shows that 24 out of 43 drill core samples (56%) fall within Quadrant I of the NPR-S diagram, indicating a low potential for generating acid. Most of the samples that fall within Quadrant II also have a low acid-generating potential. The samples in Quadrant II with a higher potential for generating acid are those with total sulphur greater than 1.0% and an NPR of less than 6. All of these samples are from the B2 and B3 zones. Due to its low NPR value relative to total sulphur content, the metasediment sample that falls in Quadrant II also has a higher relative acid-generating potential than most of the other samples in that quadrant. Not surprisingly, the samples with the greatest acid-generating potential (Quadrants III and IV) were collected from the B2 and B3 zones. With the high degree of sulphide mineralization in these zones, it is expected that these samples would display the highest potential for acid generation of all the drill core samples.

The low NPR for the dyke sample found in Quadrant III is somewhat surprising due to the high carbonate content of this structure. However, quartz-carbonate dykes found in lode gold-type deposits are typically inhomogeneous and exhibit a high degree of spatial variation with respect to secondary minerals such as carbonates and sulphides. With the limited number of samples that were analyzed from this structure, the high variability observed in the ABA results for the dyke material is to be expected.

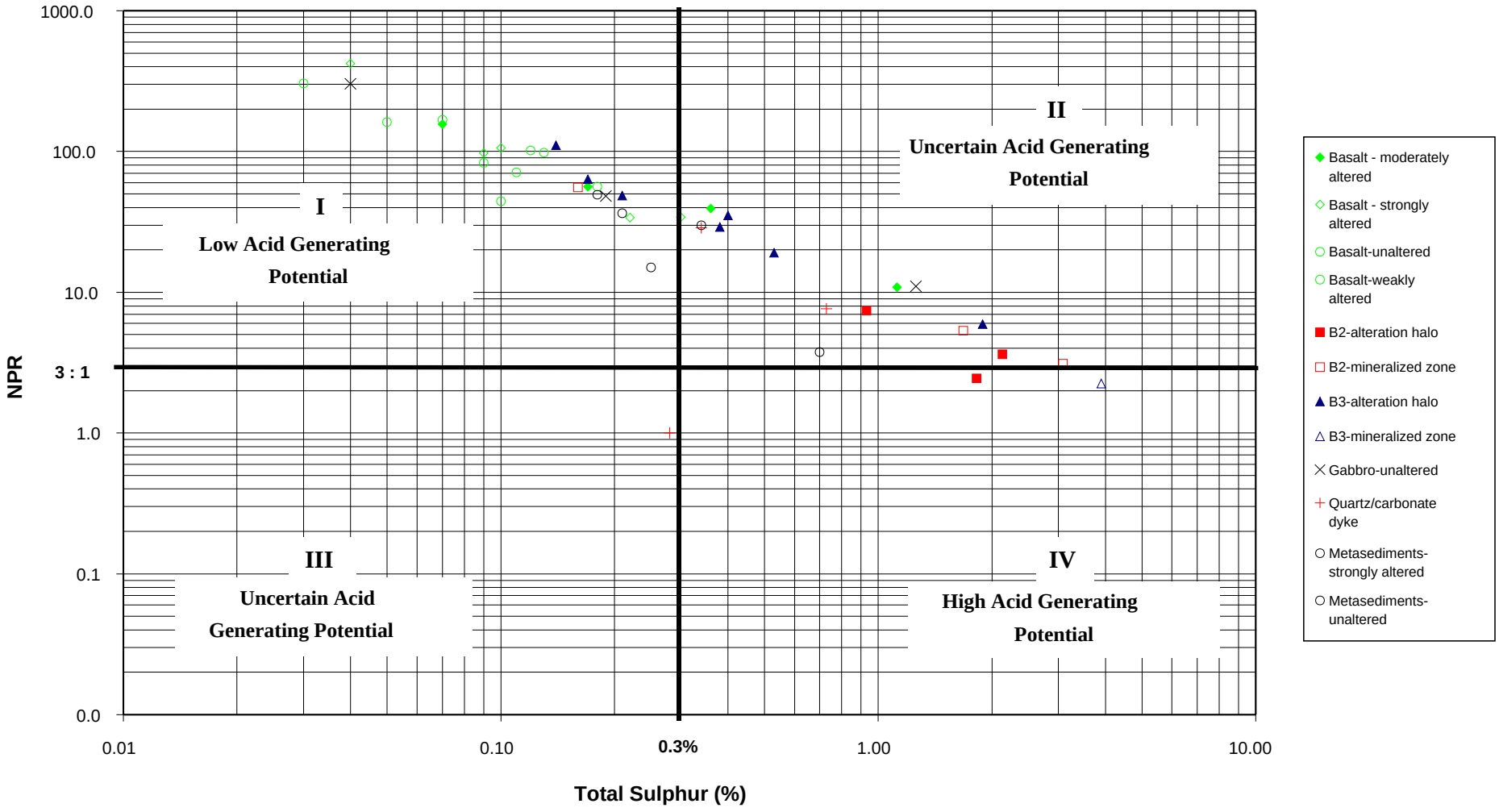

FIGURE 3-2

Drill Core Data (1997) - Neutralization Potential Ratio (NPR) vs Total Sulphur

Source: Centro de Ecología Aplicada, 1995

4. ARD Characterization - Kinetic Testwork

4. ARD CHARACTERIZATION – KINETIC TESTWORK

Kinetic prediction testing artificially accelerates natural weathering processes in order to provide information on, among other things, the rates of sulphide oxidation, neutralization potential depletion and metal leaching. This section presents a detailed discussion of the kinetic prediction testwork that was performed on samples from the Boston Property to determine their acid-generating and metal-leaching characteristics. The testwork was performed due to the potential for this material to be used as construction material and/or stockpiled on the surface. The analytical methods that were followed are described, relevant results are provided and a discussion of the results is presented.

4.1 Background Information

Considerations for the interpretation of kinetic testwork and a brief overview of ARD research in permafrost regions are presented below.

4.1.1 Considerations for Interpreting Boston Project Kinetic Testwork

When trying to predict field values from laboratory kinetic test data, certain factors must be taken into consideration. Some of these factors are quite general and are applicable to any project, while others are quite unique to the Boston Property, due to its northern location.

- Approximately one kilogram of sample is used to represent entire rock units, which can be billions of kilograms in size. This can cause problems with sample representivity;
- The particle size of material used in humidity cells is significantly smaller than that found in the field. Humidity cells typically use material crushed to -6mm, whereas much larger particle sizes (0.25 to 1.0 m) are common in waste rock piles. Therefore, humidity cell material has a greater surface area per unit mass than waste rock material and can be expected to have higher reaction rates;
- Based on shrinking reactive core or shrinking reactive front theory (Scharer *et al.*, 1995; Ritchie, 1994), it is predicted that as weathering progresses, reaction

rates will decrease because the reactive components will have to diffuse through a weathered rind that develops around the particle;

- Flushing of the material in the lab is almost always higher than it will be in the field. For the Boston samples, the weekly leaching cycle was equivalent to an annual precipitation rate of approximately 3000 mm/year. This is more than an order of magnitude higher than the 200 mm/year estimated for the project area (Rescan, 1998);

- Weekly flushing in the laboratory typically does not simulate actual field conditions. At Boston, flushing of waste rock is not likely to occur for approximately 8 months of the year due to freezing. When flushing does occur in the field, it will probably occur at two main times; during snowmelt and during the onset of fall rains;

- The Boston humidity cells were operated at 4ºC. The cells were operated at this temperature to simulate the active layer that forms from June to September. The average monthly air temperature from June to September, 1997 was 11.8ºC (Rescan, 1998). The annual average ambient air temperature in the project area was predicted to be -13.6ºC in 1996 (Rescan, 1997) and -10.3ºC in 1997 (Rescan, 1998); and

- Due to the formation of permafrost, only material which is located in the active layer will be available to react. Below this layer, waste material will be continuously frozen. The average ground temperature below a depth of 10 m, the depth of seasonal variation, ranges from -8 to -11ºC (Rescan, 1997; EBA, 1997) and permafrost is predicted to extend to a depth of 520 m (EBA, 1997). The active layer is estimated to range from 0.4 to 1.8 m in depth (Rescan, 1997; EBA, 1997). Acid rock drainage in permafrost regions is discussed in more detail in the following section.

For these reasons, the various rates calculated from humidity cell data (*e.g.* sulphide oxidation rate, neutralization potential depletion rate, metal leaching rate) are usually considered “worst-case” values. Unfortunately, due to a lack of scientific data, it is currently not possible to scale humidity cell results so that they more accurately reflect rates that could be expected in the field. Therefore, the rates

calculated from the humidity cell data have been used to represent the rates that material exposed through development of the Boston Property will exhibit.

4.1.2 Acid Rock Drainage in Permafrost Environments

With respect to ARD generation in northern climates, the following practical and theoretical considerations should be kept in mind (Dawson and Morin, 1996):

- In order for oxidation to start, water must be available. For a large part of the year in northern climates, water is frozen, thereby limiting an ingredient for oxidation and the primary mode of transportation for reaction products to enter the receiving environment;

- Oxidation of one kilogram of pyrite (FeS_2) generates 0.012 kJ of heat and the latent heat of water is 334 kJ/kg. Thus, relatively high concentrations of pyrite are needed in order to cause thawing due to oxidation reactions;

- Rates of acid generation and metal leaching are partially dependent on the surface area of sulphide minerals exposed to oxygen and water. Physical breakdown of rock into smaller particles as a result of “frost weathering” can lead to an increase in exposed surface area;

- At low temperatures (below 5ºC), the biological activity of bacteria that catalyze sulphide oxidation reactions (*e.g. Thiobacillus ferrooxidans*) is reduced, but not eliminated. In some instances, bacteria can adapt to the cold temperatures; and

- Although offset by dilution, increased surface flow that occurs during snowmelt can have detrimental effects on receiving environments by flushing accumulated oxidation products from rock surfaces.

The generation of ARD in waste rock piles located in permafrost regions is not well understood. A significant portion of our understanding comes from laboratory testwork that examined the effects of temperature on sulphide oxidation. The results are somewhat inconclusive as some studies indicated an decrease in oxidation and/or metal leaching with a decrease in temperature while others reported an increase in these values with a decrease in temperature.

Klohn-Crippen, in their analysis of waste rock from the Izok mine, determined that oxidation and metal leaching rates were higher in a humidity cell subjected to a freeze-thaw cycle than in humidity cells operated on the standard cycle of dry air, humid air, leach. Norecol, Dames and Moore operated humidity cells containing Windy Craggy waste rock at various temperatures for over a year. They reported that the drop in pH was slowest in the low temperature cell and that the rate of acid generation in the low temperature cell was five to ten times lower than the rate in the ambient temperature cell. Norecol also reported that the rate of zinc leaching decreased with a decrease in temperature, but the rate of copper leaching was highest in the low temperature cell. In a separate test (four samples run at two temperatures), Norecol determined that the leaching rate of zinc was highest in the low temperature cell.

To summarize, permafrost environments do not necessarily stop acid-generating and metal-leaching reactions. If sulphide oxidation is initiated, the exothermic nature of the reaction has the potential to thaw frozen ground. Furthermore, oxidizing and biological agents may not be eliminated at sub-zero temperatures. There is no evidence to suggest that the biological activity of oxidizing bacteria stops at sub-zero temperatures. Therefore, potentially acid-generating material in permafrost regions, especially material within the active layer, is capable of producing ARD, albeit probably at lower rates than in warmer climates.

4.2 Methods

4.2.1 Sampling Methods

Drill core samples representing the altered basalt, B2 mineralized zone and B3 alteration halo rock types were collected from the Boston Property by BHP geologists in consultation with Rescan personnel. Although other rock types exist in the deposit, it was indicated by BHP geologists that only these three rock types have the potential to be exposed on the surface, either as construction material or stockpile material. The altered basalt sample was taken from Drill Hole 93NOD57 (195 m interval), the B2 mineralized zone sample was taken from Drill Hole 94NOD120 (210 m interval) and the B3 alteration halo sample was taken from Drill Hole 93NOD57 (170 m interval). Approximately three kilograms of core were taken from each interval to provide sufficient material for chemical analysis. The

drill core was split into three 1-kg subsamples. One subsample remained intact for storage purposes, one subsample was crushed to 100%-60 mesh for sample characterization and static prediction testwork, and one subsample was crushed to 80%-6 mm for kinetic prediction testwork. After the samples were characterized through whole rock, total metals and petrographic analyses, they underwent kinetic testing.

4.2.2 Analytical Methods

Chemex Laboratories completed whole rock analysis, total metals analysis and kinetic prediction testing of the Boston samples. Harris Exploration Services of North Vancouver, British Columbia performed petrographic examinations of the samples. The methodologies that were followed are described below.

4.2.2.1 Sample Characterization

The drill core samples selected for kinetic testing were characterized by whole rock and total metals analyses. Whole rock analysis was accomplished using standard methods for X-ray Fluorescence (XRF) Spectrometry and Inductively Coupled Plasma-Mass Spectrometry (ICP-MS) following triple acid digestion. Total metals analysis was performed using standard ICP-MS and Atomic Absorption Spectrometry (AAS). Whole rock and total metals analyses were also performed on the humidity cell residue at the completion of kinetic testing.

Sub-splits from the same samples analyzed at Chemex were forwarded to Harris Exploration Services for petrographic examination. Small portions of each sample were briquetted with epoxy and prepared as polished thin sections. Thin section examination used both cross-polarized transmitted light and reflected light. Dominant constituents were identified and the abundance of each was estimated.

4.2.2.2 Kinetic Prediction Testing

Chemex followed the kinetic prediction testing procedure described in the guidelines for ARD prediction in British Columbia (Price, 1997) and outlined in the DIAND ARD guidelines (DIAND, 1993). Kinetic testing was performed using standard humidity cells. A humidity cell is a Plexiglas tube with a removable lid that

is fitted with inlet/outlet ports and a perforated plate that supports the sample off the bottom of the cell. The typical operation of a humidity cell is outlined below:

- **Cell Start-Up**: Splits from the samples are sent for mineralogical characterization (e.g. whole rock analysis, total metals analysis, petrographic examination). Following a moisture determination on the sample, approximately 1 kg (dry weight) of sample is placed in the cell and leached with 750 ml of deionized water. The leachate is analyzed for physical parameters and dissolved metals using standard analytical procedures. Cell start-up is designated as "Week 0".

- **Weekly Cell Operation**: The sample is artificially weathered by circulating dry air through the sample for three days, followed by humid air for three days. Air is introduced through a port at the bottom of the cell, passes through the sample and exits through a port in the lid of the cell.

- **Weekly Leaching/Analysis of Leachate**: Every seven days, all of the inlet/outlet ports are closed off and 500 ml of deionized water are added to the cell. The cell contents are gently agitated and allowed to stand for 2 hours. The leachate is collected, filtered, and analyzed. The weekly operation of the cell followed by leaching comprises one "cycle".

- **Cell Close-Down**: The cell contents undergo a "final leach" of 3 L of deionized water and a gentle rotary extraction for 24 hours. The supernatant liquid is analyzed in the same manner as previous leaches. The remaining test material, called the "final residue", is characterized in the same manner as at start-up (i.e. whole rock analysis, etc.). Any detectable retained reaction products are then evenly redistributed over the period of testing. A moisture determination is carried out on the entire cell contents to determine the final dry weight of the sample.

The standard method described above was modified slightly for the Boston samples in that the cells were run at a constant ambient temperature of 4°C rather than at room temperature. Photographs showing the humidity cell setup at the laboratory are presented in Plates 4-1 to 4-3.

Plate 4-1: Refrigerator used to maintain humidity cells at 4°C.

Plate 4-2: Standard humidity cells containing Boston samples.

Plate 4-3: Humidifier for generating humid air which is passed through humidity cells.

The minimum length of time for kinetic tests, as recommended in the ARD guidelines published by DIAND (DIAND, 1993), is 20 weeks. Kinetic testing on the Boston Project samples was initiated on October 9, 1997 and continued for slightly longer than twice the recommended 20-week time period. The altered basalt cell was run for a total of 42 weeks while the other two samples were run for a total of 49 weeks.

4.2.3 Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) is an important aspect of any study. The QA/QC program for this study included sample re-runs, comparative analyses and analytical blanks. In addition, whole rock and total metals analyses were completed on pre- and post-test samples.

Comparative analyses consisted of plotting the results of whole rock analysis against the results of total metals analysis. If the relationship was linear, the two analyses correlated with each other and the results for that element could be used with relative confidence. If the data were randomly scattered, however, then there was no relationship between the two analyses for that element and the results could not be used with any degree of certainty.

Chemex routinely analyzes humidity cell blanks on a weekly basis for pH and conductivity and on a monthly basis for alkalinity, acidity, sulphate and dissolved metals. Two types of analytical blanks are used; cell blanks and leachate blanks. The cell blank consists of analyzing deionized water that has passed through a humidity cell containing silica and the leachate blank consists of analyzing just deionized water. Only the data from the leachate blank were used for QA/QC purposes. Values measured for the leachate blank were subtracted from the values measured in the humidity cell leachate. Thus, if any parameter had a detectable concentration in the leachate it was coming from the material in the cell and not from the water used to leach the material.

4.3 Results and Discussion

The results of the ARD characterization program completed for the Boston Property indicate that the rock types analyzed produce neutral to slightly basic seepage and have low rates of sulphide oxidation, neutralization depletion and metal leaching.

The equations used to calculate the various rates are presented in Appendix B. The QA/QC results are included in Appendix C. The results of the petrographic examination are included as Appendix D-1. The raw data from sample characterization and kinetic testing are presented in Appendices D-2 to D-4. Selected results for each sample are presented and discussed below.

4.3.1 Quality Assurance/Quality Control

If the total metals analysis was repeated for a sample, the average of the re-run and the original concentration recorded for the sample was used. In most cases, the difference between the sample re-run and the original value was no more than 10%. The exceptions were for barium and those elements with extremely low concentrations (*i.e.* Be, Bi, Cd and Pb). The duplicate analysis for barium was inadvertently contaminated and therefore only the original result was used. The differences for the other four elements are due to the natural variability associated with ICP analysis. The rule-of-thumb is that ICP measurements can fluctuate plus-or-minus two times the detection limit. So if a particular parameter has a detection limit of 10 ppb, the range of variation is ± 20 ppb. This natural variation is only important for those parameters that have values that fluctuate around the detection limit. Parameters with higher values will consistently be outside the range of variation and parameters with lower values will consistently be measured as having a concentration below the detection limit.

When whole rock data were converted into elemental concentrations (*e.g.* $Al_2O_3 \rightarrow Al$), the elemental concentrations were typically within 10 to 15% of the concentrations measured by total metals analysis. In most cases, the elemental concentrations calculated from the results of whole rock analysis were higher than the concentrations measured by total metals analysis. Sodium, phosphorus and titanium consistently differed by at least 25% between the two methods for all three samples. For the B2 sample, chromium also showed a large discrepancy between the two analyses. Approximately 80% less chromium was measured by whole rock analysis than by total metals analysis. In addition, the elemental iron concentration in the B3 sample was calculated to be approximately 20% higher than the concentration measured by total metals analysis.

The high linear correlations ($R^2 > 0.95$) between the whole rock and total metals analyses for the majority of elements in both the pre- and post-test analyses indicate that the two methods are providing accurate and consistent measurements. However, the pre- and post-test correlations for chromium, sodium and titanium are significantly less than for the other elements ($0.80 < R^2 < 0.95$). This means that the results for these elements are not as reliable as for the others and they must be interpreted carefully. The reason for this lack of correlation is not clear, although it may be related to mineralogy and/or the type of analysis. Certain minerals (*e.g.* titanite: $CaTiO(SiO_4)$) prevent accurate measurement by ICP analysis and therefore negatively affect the relationship between whole rock and ICP analyses. It is also possible that there was interference between elements in the XRF analysis (*e.g.* constructive interference (overlapping) from Ba and Cr on Ti) which would also affect the correlation between the whole rock and total metals analyses.

During the cell close-down procedure for the B3 alteration halo sample, the liquid from the humidity cell ("Final Leach") was lost and could not be analyzed. Therefore, the weekly leachate results for the B3 sample were not adjusted based on the "Final Leach" data as was done for the other two samples. However, based on the results from the other two samples, the loss of the final leach liquid is not particularly significant. This is because the adjustment to the weekly data for the other two samples was less than 5%, and often less than 1%, of the concentration that was measured during any given week.

4.3.2 Altered Basalt

The analytical results for the altered basalt sample are presented in Appendix D-2 and are summarized below.

4.3.2.1 Sample Characterization

Whole Rock Analysis

The dominant constituents of the altered basalt sample, in decreasing order of abundance were silica (42.38%), iron oxide (10.37%), calcium oxide (9.94%), aluminum oxide (9.57%) and magnesium oxide (7.25%). These five components accounted for almost 80% of the chemical makeup of the sample.

Although the abundance of some of the constituents decreased between pre- and post-testing analyses (*e.g.* Al_2O_3), there were others that appeared to increase in abundance (*e.g.* Fe_2O_3). The increase could be due to the formation of oxides and hydroxides (*e.g.* goethite, etc.). These secondary minerals are formed from the precipitation of metals that results from sulphide oxidation and subsequent neutralization. Due to the similarity in values between the pre- and post-test analyses (most elements vary by no more than 5%), the apparent increase could also be attributed to analytical variability and/or sample inhomogeneity (*i.e.* the sub-sample that was analyzed was not mineralogically uniform throughout). Whole rock analysis is probably of more use for determining dominant sample constituents and possible mineralogy, rather than for comparing absolute pre- and post-test abundances of specific constituents.

Total Metals Analysis

As expected, the total metals analysis reflected the whole rock analysis in that the dominant metals present in the sample were aluminum, calcium, iron and magnesium. Other significant metals were potassium, sodium and manganese, as well as minor amounts of chromium and nickel.

Comparing the results of pre-test total metals analysis to post-test results, some metals appeared to decrease in concentration (*e.g.* Mg), while others seemed to increase (*e.g.* Al). Furthermore, the whole rock and total metals analyses for some metals did not always agree with each other. For example, whole rock analysis indicated that the abundance of aluminum oxide decreased from pre- to post-testing while total metals analysis indicated that the concentration of aluminum increased. The discrepancies are likely due to analytical variability and/or minor changes in the concentrations of particular elements over the course of testing. The apparent increase in some values may also indicate the presence of accumulated reaction products. Secondary minerals (*e.g.* oxides, hydroxides) may have precipitated onto the sample during testing and been included in the analysis which would have affected the final values.

Petrographic Examination

The dominant lithotype in the altered basalt sample was fine-grained carbonate, which accounted for 76% of the sample. This corresponds to the high NP measured

in the sample. Other important constituents were chlorite (13%) and quartz (10%). Sericite was present in minor amounts (1%) and trace amounts of sulphide (pyrite, chalcopyrite, arsenopyrite) were also observed.

The high percentage of carbonate observed in the sample is corroborated by the whole rock analysis which indicated high concentrations of calcium and magnesium oxides. A significant amount of silica, and to a lesser degree aluminum, were measured by whole rock analysis, supporting the observation that quartz and aluminosilicates (chlorite and sericite) were present in the sample.

4.3.2.2 Physical Parameters

The physical parameters of most importance when analyzing kinetic test data are pH, conductivity, alkalinity and acidity. The pH is a measure of the concentration of hydrogen ions in solution and reflects the outcome of mixing between acidic and basic solutions. Conductivity provides a measure of the ionic strength of a solution and reflects the reactivity of the sample. Alkalinity is indicative of the acid consuming capacity of a solution and reflects the composition of a sample in regards to neutralizing minerals. Acidity provides a measure of several aqueous species such as Fe^{3+} and Al^{3+} and is indicative of acid generation (SRK, 1989).

pH and Conductivity

The results of weekly pH and conductivity measurements of the altered basalt humidity cell leachate are presented in Figure 4-1. The pH ranged from 7.5 to 9.0. It decreased from 8.7 at the start of testing to 7.5 in Week 7. From Week 8 onwards, however, the pH was never less than 8.1. The pH steadily increased from Week 25 onwards and over the last five weeks of testing the average pH was 8.6. From the leachate blank data (Appendix C), it can be seen that the pH of the deionized water used to rinse the samples was lower in the first seven weeks than from Week 8 onwards. The increase in pH of the deionized water resulted in an increase in the pH of the leachate being collected from the humidity cell samples.

Conductivity ranged from a high of 170 µmhos/cm, at the start of testing, to a low of 40 µmhos/cm in Week 34. Although conductivity fluctuated throughout testing, it steadily decreased from start to finish, with the exception of peaks that were measured in Weeks 10, 19, 25 and 30. The average conductivity for the last five weeks of testing was 53 µmhos/cm. A change in the conductivity of a solution

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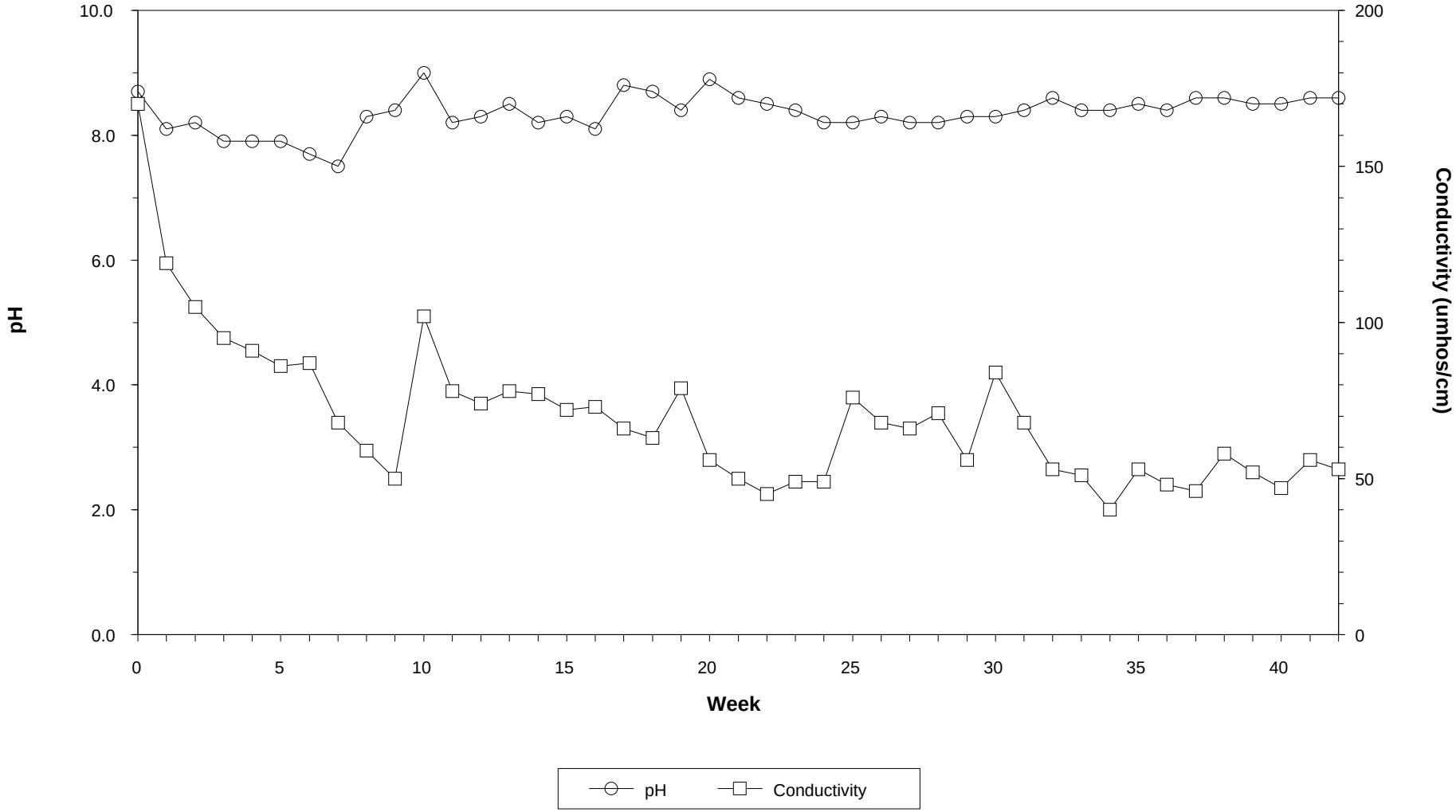

FIGURE 4-1

Altered Basalt:
pH and Conductivity vs. Week

Source: Centro de Ecología Aplicada, 1995

indicates a change in the number of ions being released into solution. The drop in conductivity throughout the duration of testing indicates that fewer and fewer ions were being released into solution. This suggests that chemical reactions were decreasing, either in the mass reacting or in the reaction rate. Sulphate concentration has a very strong influence on the conductivity of a solution. Therefore, the decrease in conductivity indicates that sulphide oxidation was also decreasing.

Alkalinity and Acidity Production

Alkalinity and acidity production values are shown in Figure 4-2. Alkalinity production decreased steadily from Week 0 (40.9 mg $CaCO_3$/kg/week) to Week 9 (8.5 mg $CaCO_3$/kg/week). From Week 11 onwards, alkalinity production was relatively steady, fluctuating between 9.6 and 19.6 mg $CaCO_3$/kg/week, with an average of approximately 14.0 mg $CaCO_3$/kg/week between Weeks 11 and 42. Alkalinity production decreased slightly over the last five weeks of testing, when it averaged 13.3 mg $CaCO_3$/kg/week.

Acidity was not detectable in the majority of weeks and as a result, acidity production was 0.0 mg $CaCO_3$/kg/week. Acidity was measured at or above the detection limit only in Weeks 3 to 7, resulting in acidity production between 0.5 and 2.0 mg $CaCO_3$/kg/week. From Weeks 25 to 30, acidity was present in the leachate, but at concentrations below the detection limit. From Week 31 onwards, no acidity was detectable in the leachate.

4.3.2.3 Acid Generating Potential and Neutralization Potential

Sulphate generation is representative of sulphide oxidation, if: i) all oxidized sulphur is released to the water, ii) all sulphur in the water is fully oxidized to sulphate and iii) the precipitation of gypsum or other sulphate minerals does not limit the aqueous sulphate concentration (SRK, 1989). If these conditions are satisfied, sulphate production can provide information on the acid generating potential of a sample. It is assumed that the first two conditions listed above were satisfied. With respect to the third condition, no gypsum or other sulphate mineral precipitation was observed in any of the samples either during operation or upon cell close-down. Furthermore, using the method presented by Ferguson and Morin

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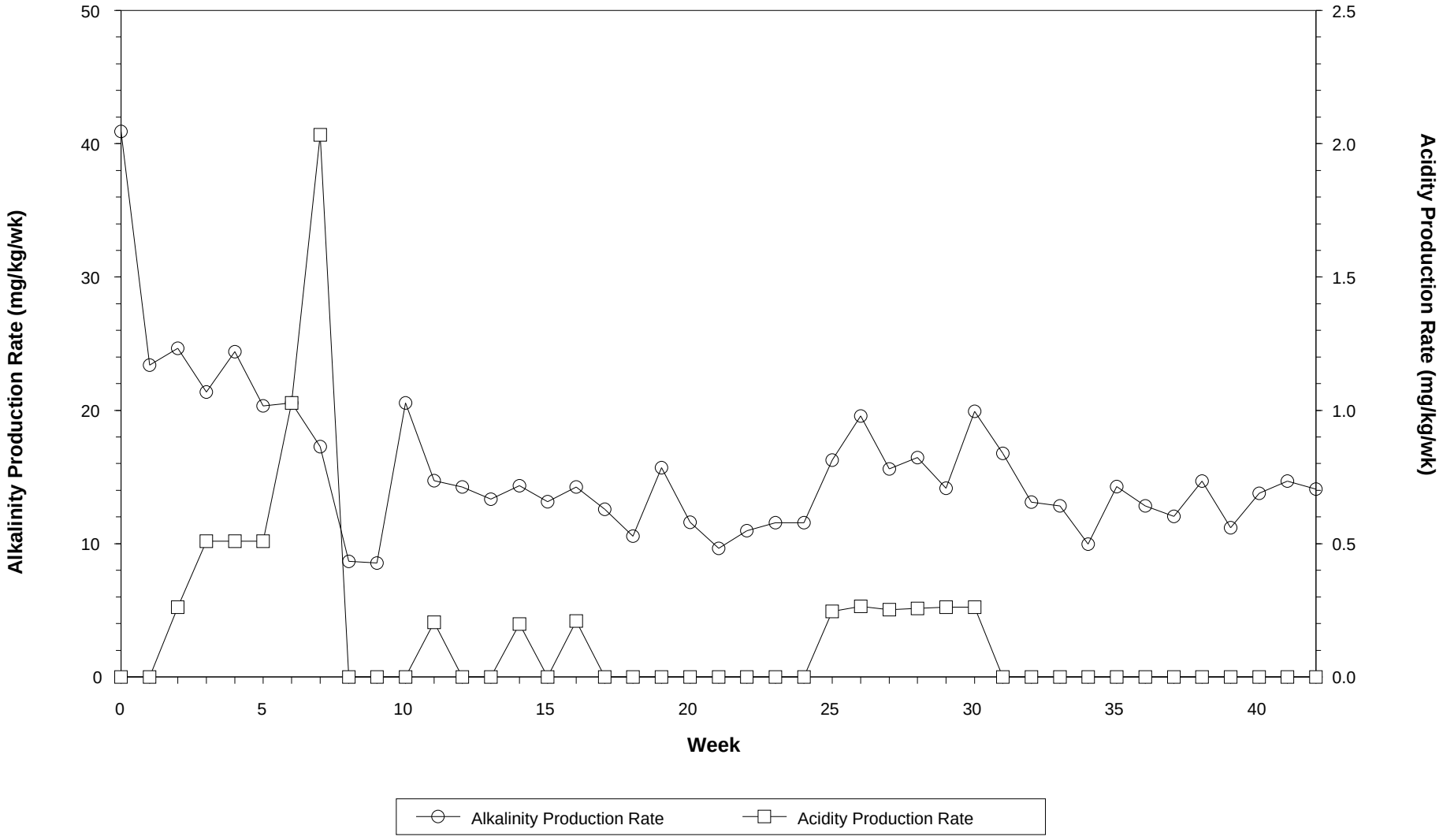

FIGURE 4-2

Altered Basalt: Alkalinity and Acidity Production Rates vs. Week

Source: Centro de Ecología Aplicada, 1995

(1991), the plot of sulphate:calcium ratio to sulphate concentration (Appendices D-2 to D-4) indicates that the weekly leachate from the waste rock samples was under-saturated with respect to gypsum throughout testing.

The release of certain elements into solution (*e.g*. Ca, Mg) is indicative of the dissolution of neutralizing minerals such as carbonates, and can provide information related to the depletion of neutralization potential from a sample.

Figure 4-3 plots pH, sulphate production and carbonate NP consumption (calculated from the concentration of Ca and Mg in the leachate) against time. Except for the first three weeks, NP consumption was approximately an order of magnitude greater than sulphate production. Sulphate production ranged from 0.6 to 4.8 mg SO_4/kg/week and gradually decreased over the duration of testing. The consumption of NP ranged from 7.9 to 20.4 mg $CaCO_3$/kg/week, but did not exhibit any observable trend. Over the last five weeks of kinetic testing, sulphate production averaged 0.9 mg SO_4/kg/week and NP consumption averaged 13.5 mg $CaCO_3$/kg/week. There does not appear to be any consistent correlation between pH, sulphate production or NP consumption. These results suggest that there was sufficient consumption of neutralizing minerals to buffer any acidity that was being generated by sulphide oxidation.

Figure 4-4 shows the amount of total sulphur and carbonate NP remaining in the sample over time. The rate of NP consumption relative to the amount of NP in the sample was much less than the rate of sulphide oxidation relative to the amount of total sulphur in the sample. Thus, the amount of original total sulphur remaining in the sample at the end of testing was significantly lower than the amount of original carbonate NP remaining (96.7% compared to 99.8%). These results indicate that NP will outlast sulphur (and by extension AP), assuming that the reaction rates remain constant with time.

Figure 4-5 follows from the results presented in Figure 4-4 above and shows the predicted time to depletion for sulphur and NP species (note the logarithmic scale on the y-axis). In general, sulphur is predicted to be depleted approximately an order of magnitude faster than NP. The estimated time to depletion indicates that NP will far outlast sulphur in the sample. Assuming that the reaction rates stay

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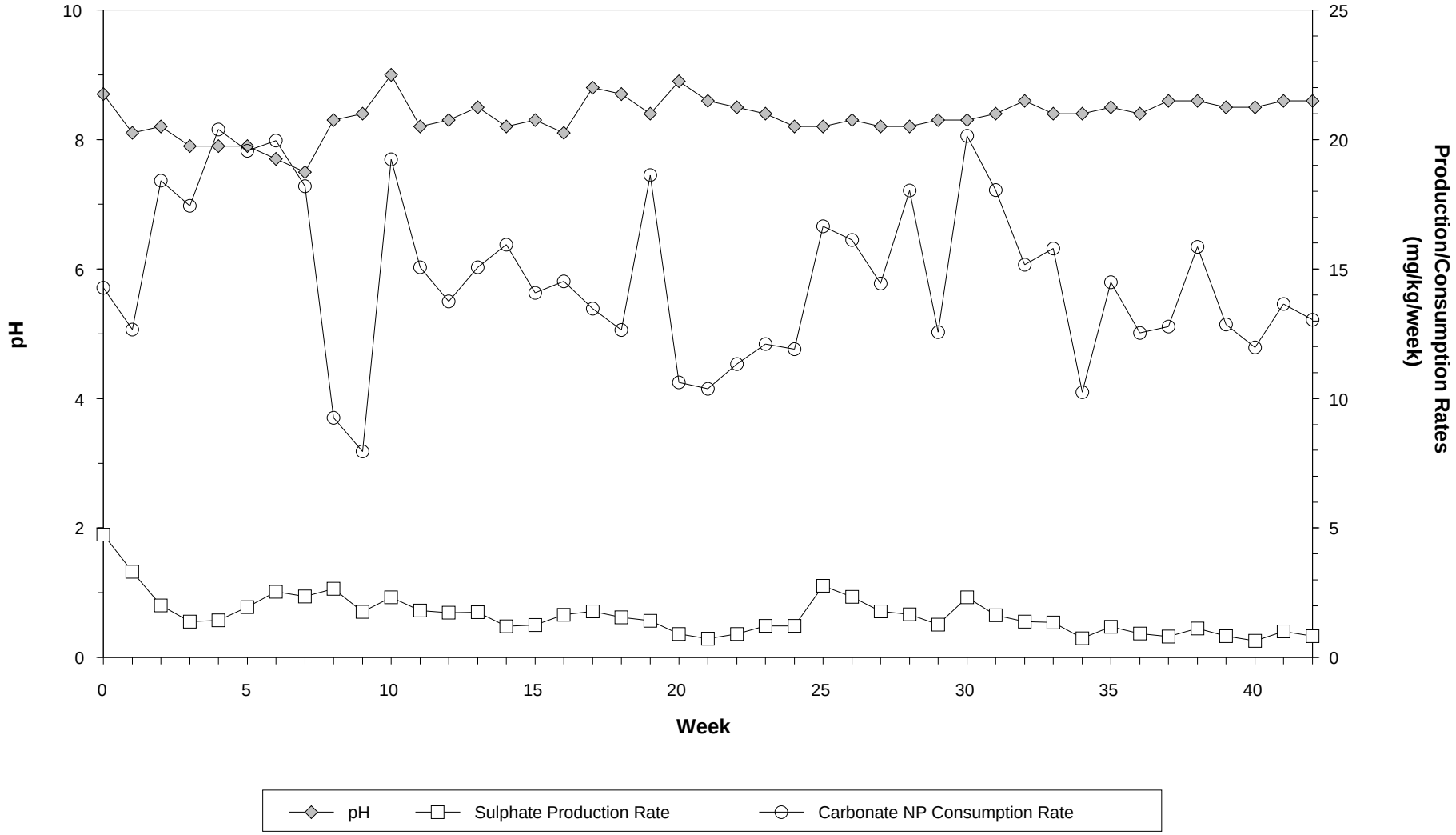


FIGURE 4-3

Altered Basalt:
pH, Sulphate Production and NP Consumption vs. Week

Source: Centro de Ecología Aplicada, 1995

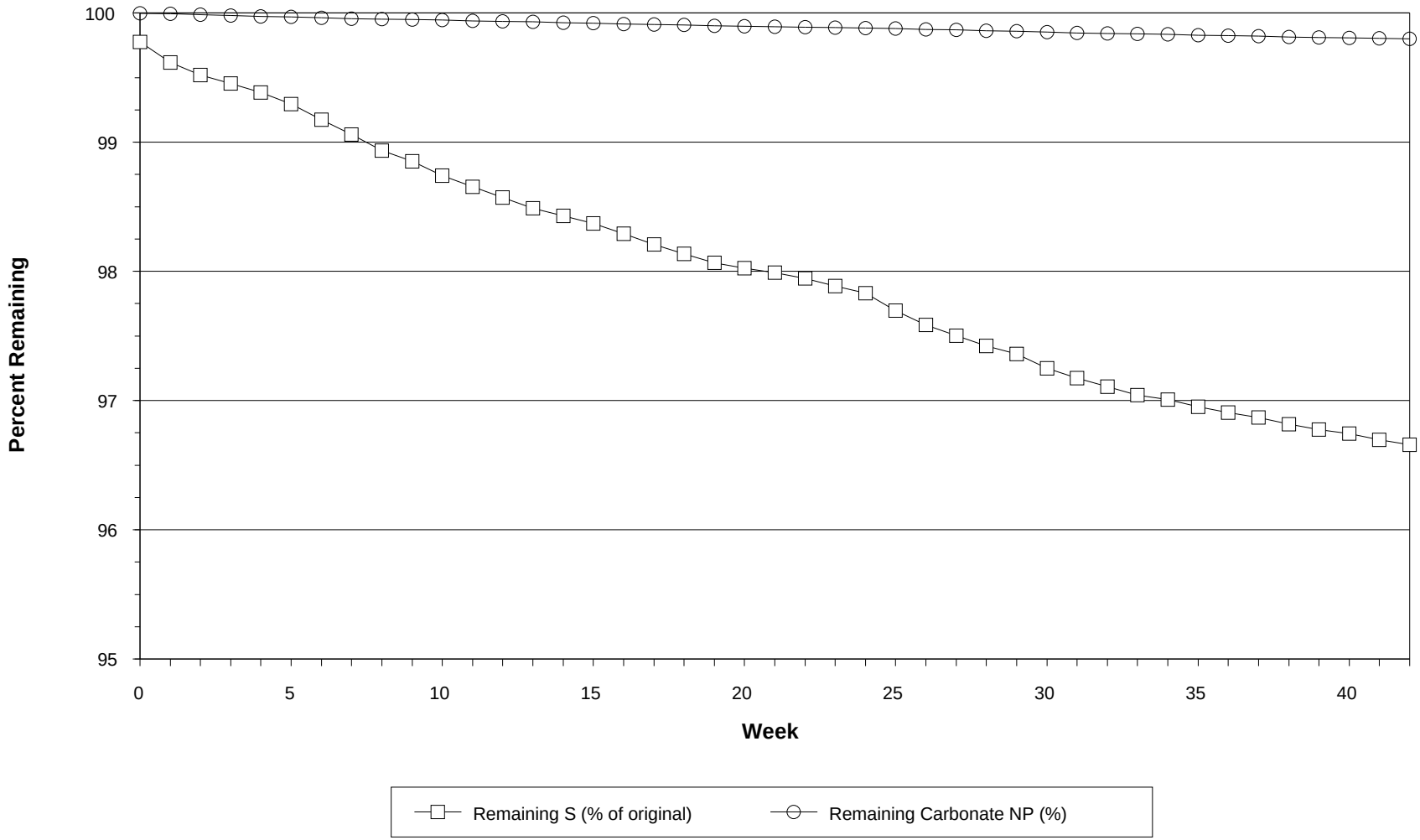
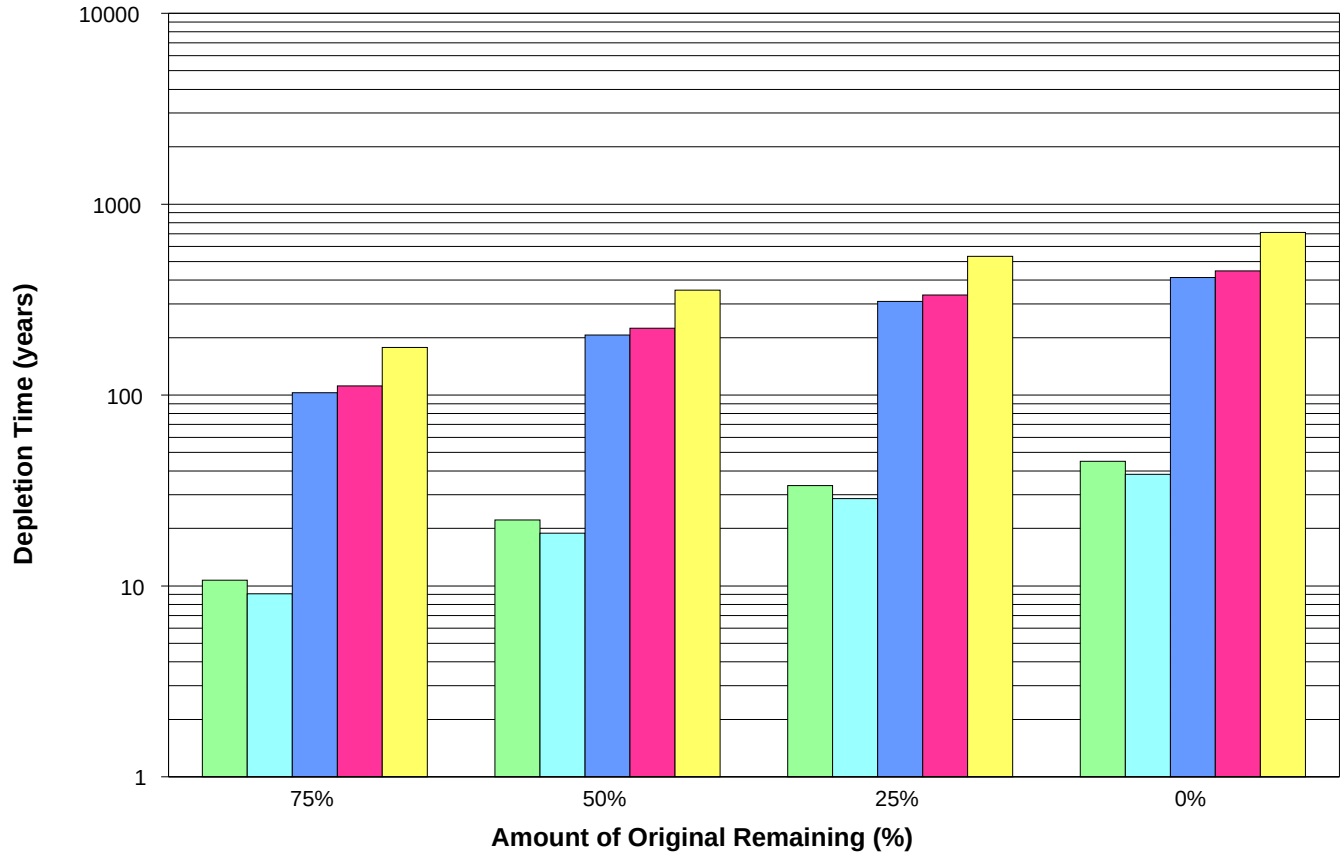


FIGURE 4-4

Altered Basalt: Remaining S and Remaining NP vs. Week

Source: Centro de Ecología Aplicada, 1995



Time to Depletion (years)

Total S	10.7	22.1	33.6	45.0
Sulphide S	9.1	18.9	28.7	38.5
NP: Empirical	103	206	309	412
NP: Carbonate	112	223	335	446
NP: Feldspar	177	355	533	710

FIGURE 4-5

Altered Basalt:
Estimated Depletion Times for Sulphur and NP

Source: Centro de Ecología Aplicada, 1995

constant and that sufficient NP is being released into solution, the potential of net acid generation from this material is low.

Figures 4-6 and 4-7 also support the conclusion that the neutralization potential of the sample will last much longer than the acid-generating potential of the sample. Figure 4-6 shows that alkalinity was generated almost completely by the dissolution of calcium- and magnesium-bearing minerals because the Ca+Mg:alkalinity molar ratio was essentially one for the duration of testing. The other plot in Figure 4-6 shows that excess alkalinity was being produced relative to sulphate production (*i.e.* sulphide oxidation). From Week 8 onwards, the ratio of alkalinity production to sulphate production steadily increased. This accounts for the neutral pH of the leachate throughout testing. Together with the information from Figure 4-4, which indicates that the sulphur depletion rate is faster than the NP depletion rate and that less sulphur remains at the end of testing than NP, these data provide evidence that altered basalt material is unlikely to produce net acidity.

Figure 4-7 provides some insight as to the neutralizing components of the sample. At the beginning of testing (Weeks 0-5), the release of potassium and sodium were much more closely associated with alkalinity than either calcium or magnesium. From Week 5 onwards, however, dissolution of calcium- and magnesium-bearing minerals became the most important producer of alkalinity in the sample. By Week 5, the contributions of potassic and sodic minerals to the buffering capacity of the leachate were so small as to be considered negligible in comparison to that provided by minerals containing calcium and magnesium. As seen in Figure 4-7, from Week 8 onwards calcium and magnesium were being released to solution in much higher proportions than sulphate. The average Ca+Mg:sulphate ratio over the last five weeks of testing was 15:1. Based on this information, one can calculate the “safe” NP:AP ratio as outlined in Morin and Hutt (1994). They suggest that molar ratios can be used to recalculate the NP:AP ratio above which the probability of net acid generation is practically nonexistent. Following their methodology, the “safe” NP:AP ratio for the altered basalt at Boston would be approximately 16:1. Thus, if the NP:AP ratio is 16:1 or higher for any new altered basalt material analyzed by acid-base accounting, it can be classified as non-acid generating.

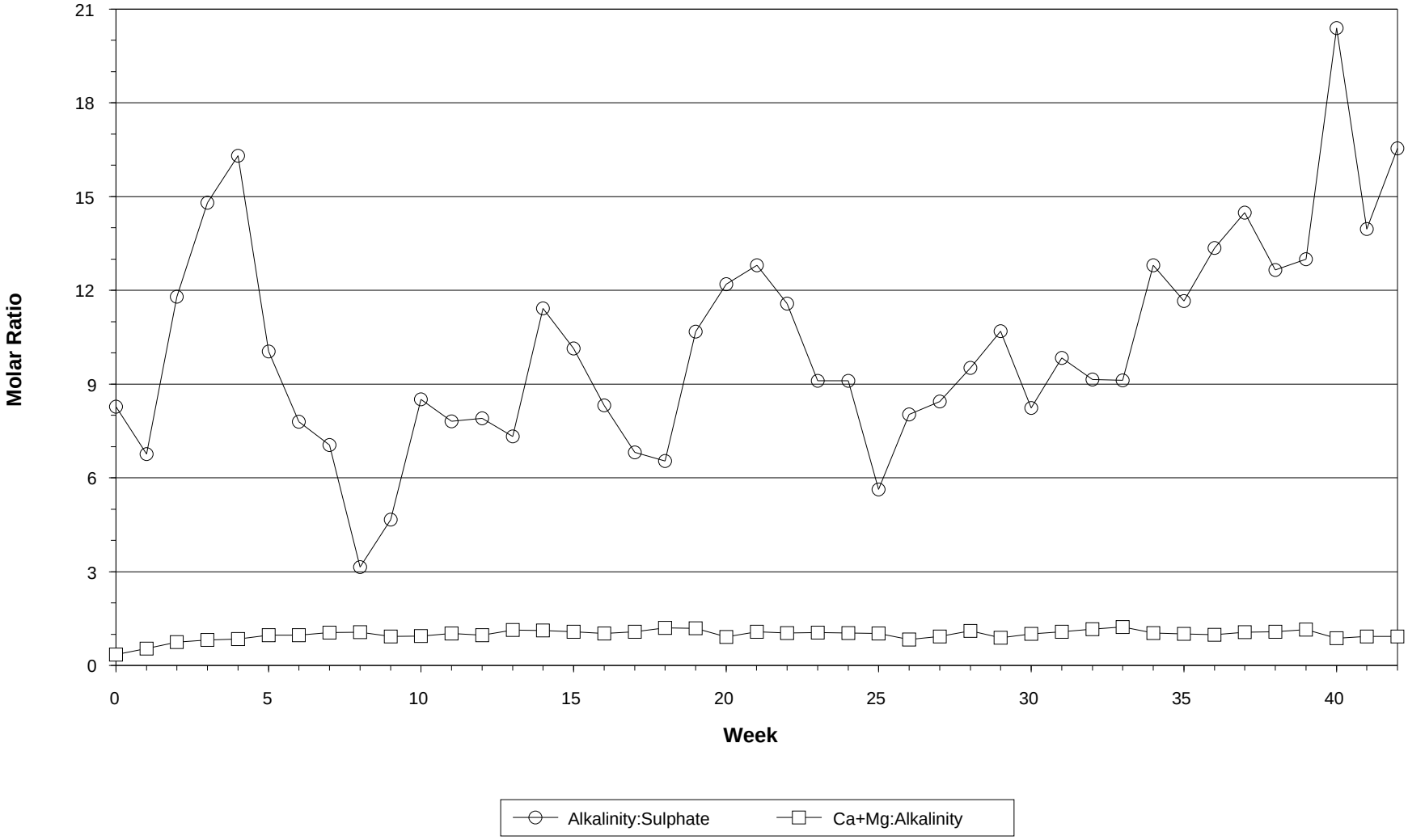


FIGURE 4-6

Altered Basalt: Alkalinity Molar Ratios vs. Week

Source: Centro de Ecología Aplicada, 1995

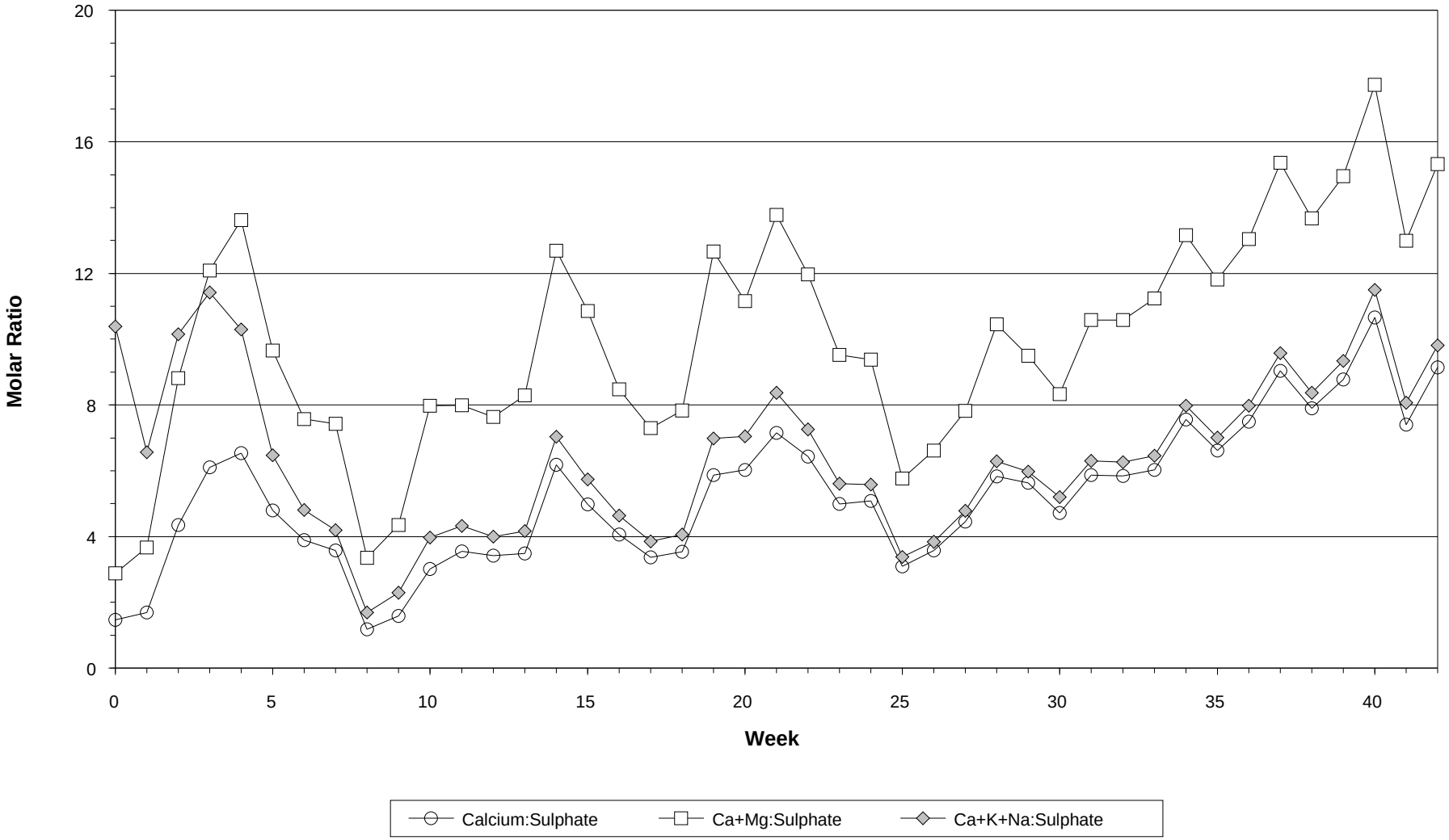


FIGURE 4-7

Altered Basalt:
Sulphate Molar Ratios vs. Week

Source: Centro de Ecología Aplicada, 1995

4.3.2.4 Metal Leaching

Metal leaching was calculated by multiplying the metal concentration in the weekly leachate by leachate volume to determine the mass of metal that had leached out of the sample in the previous week. According to the data included in Appendix D-2, some of the metals were completely depleted during testing (*e.g.* Hg). This is an artifact caused by the use of half the detection limit as the concentration of the metal in the weekly leachate. Half of the detection limit is obviously much higher than the actual value and by using it, much more of the metal is calculated to have leached than actually occurred. Therefore, any metal which had a concentration in the leachate consistently below the detection limit was excluded from the percent metal remaining calculations. For the altered basalt sample, these metals included beryllium, bismuth, cadmium, lead, mercury, molybdenum, phosphorus, selenium, silver, tin, titanium, thallium and uranium.

Figures 4-8 through 4-10 show the amount of metal, as a percent of its original concentration, that remained in the altered basalt sample over time. Thus, these figures also provide information on the leaching rate of each metal. Relative to other metals, a steeper slope indicates a higher proportional leaching rate (with respect to the percentage of the original concentration of the metal that has been leached). Thus, a metal with a steeper slope would have a higher proportional leaching rate than a metal with a shallower slope, even though the actual mass being leached may be less for the first metal compared to the second.

With the exception of arsenic, at least 99.00% of any given metal in Figures 4-8 to 4-10 was still present at the end of testing. If potassium and sodium are excluded, this value increases to 99.80%. Practically all of the iron still remained in the sample after 42 weeks of kinetic testing (more than 99.99%).

The other metals that were included in the percent metal remaining calculations, but not shown in Figures 4-8 to 4-10, had even more of their original concentrations remaining and for this reason were not plotted. Arsenic, by far, had the highest proportional leaching rate and thus had the least amount of metal remaining (only 92.50%) of all the metals.

The majority of the metals had a constant leaching rate, as indicated by the linear plots shown in Figures 4-8 to 4-10. Potassium and sodium are notable exceptions,

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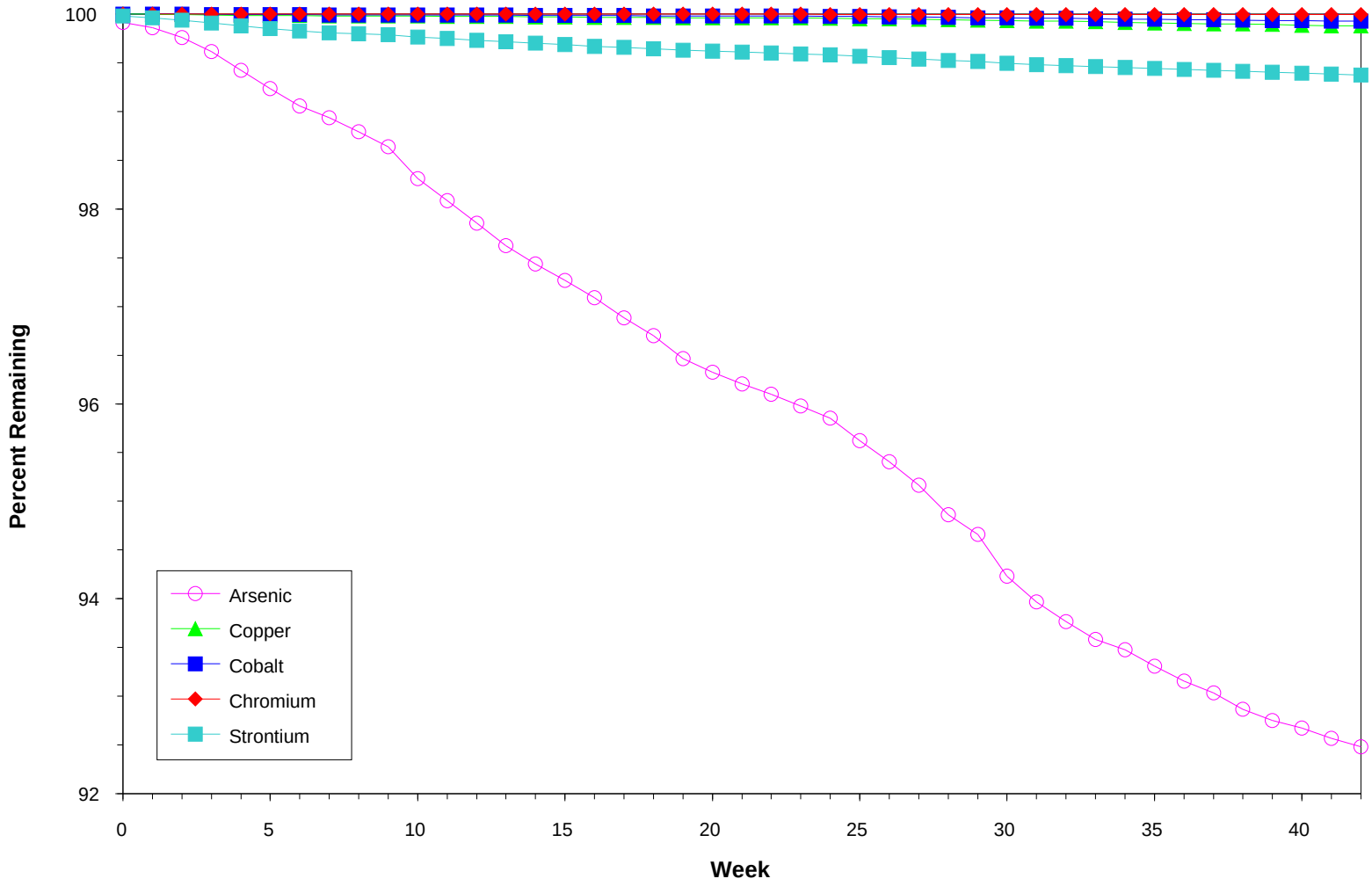

FIGURE 4-8

Altered Basalt:
Percent Metal Remaining vs. Week

Source: Centro de Ecología Aplicada, 1995

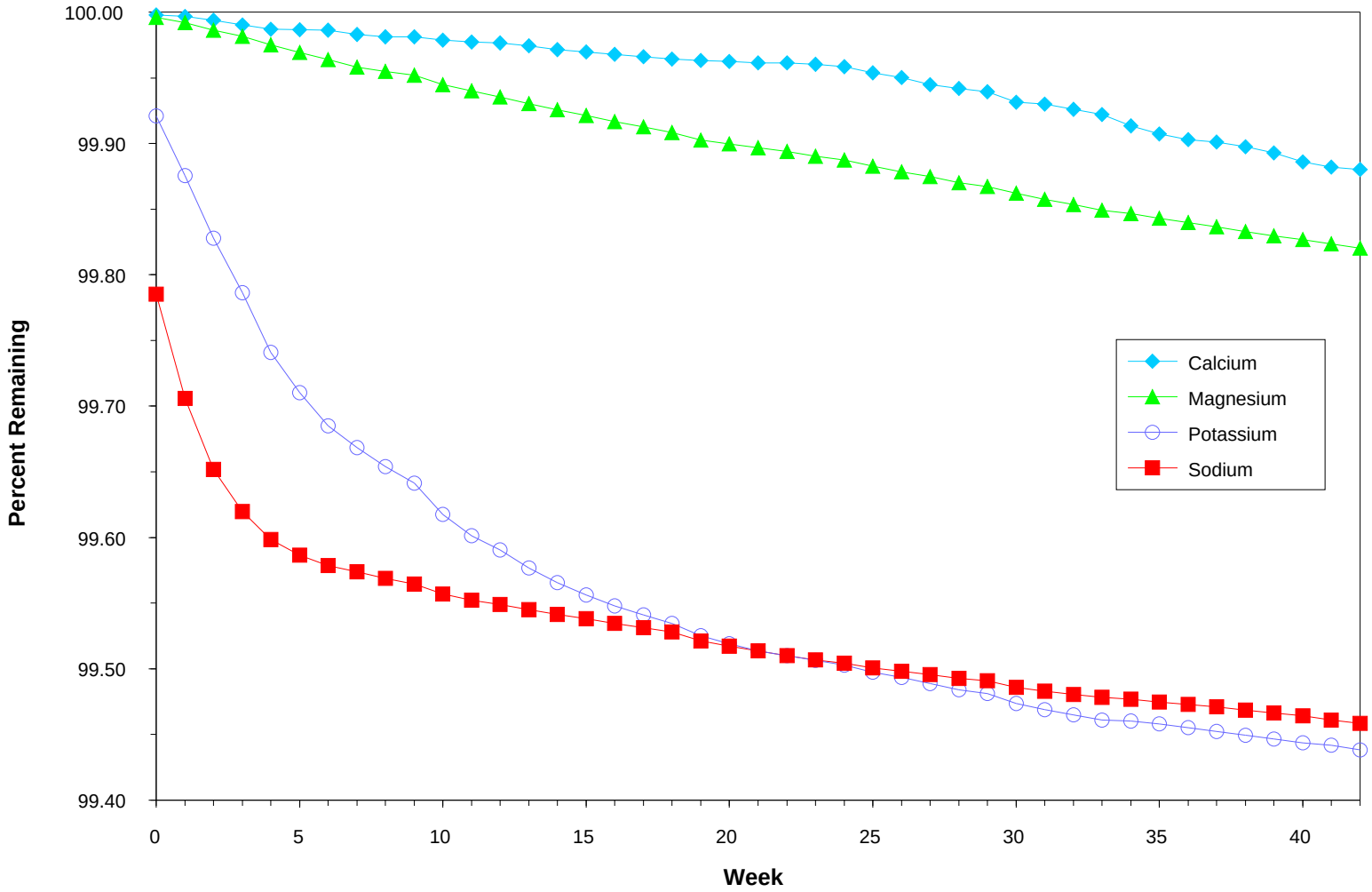

FIGURE 4-9

Altered Basalt: Percent Metal Remaining vs. Week

Source: Centro de Ecología Aplicada, 1995

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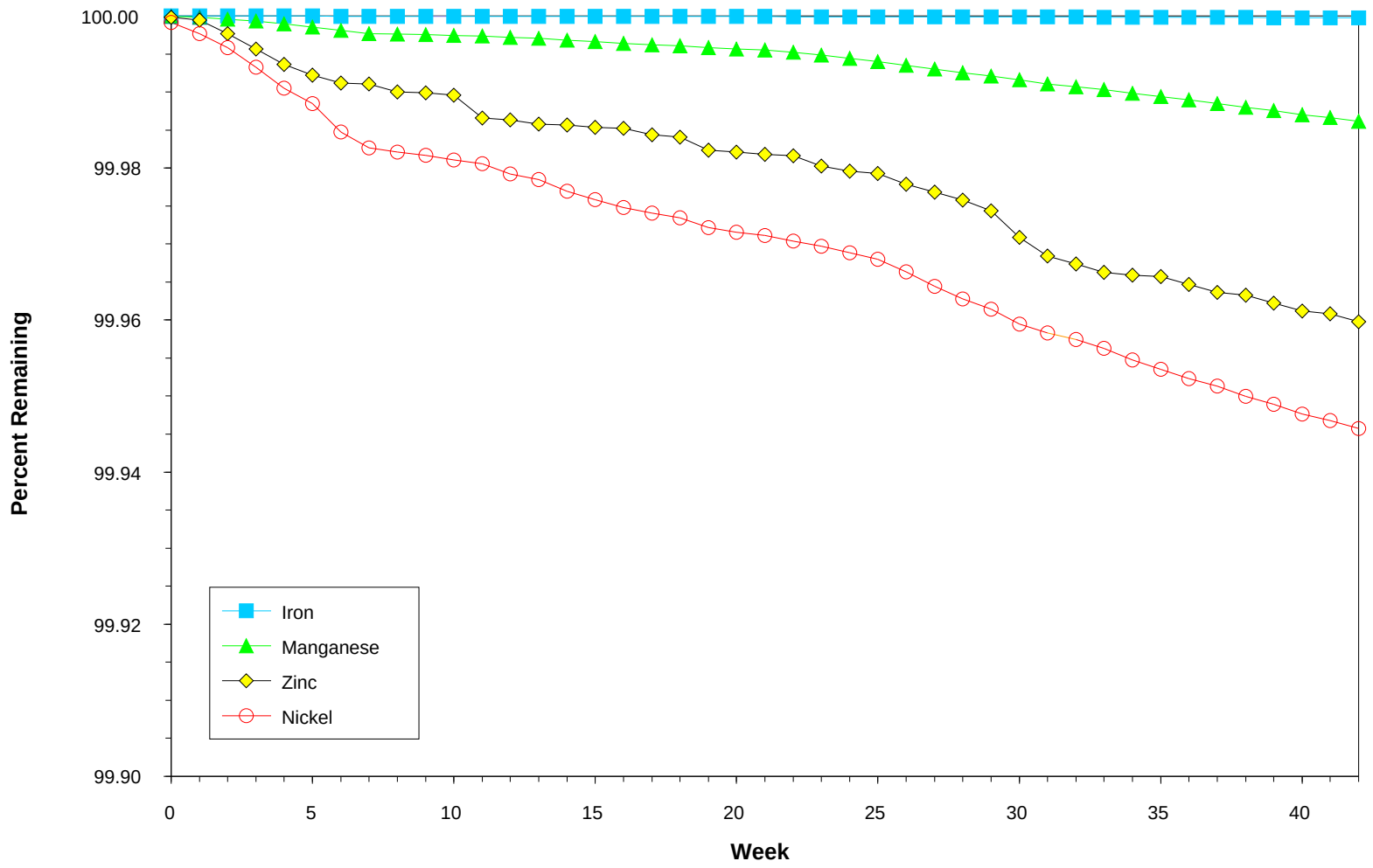

FIGURE 4-10

Altered Basalt: Percent Metal Remaining vs. Week

Source: Centro de Ecología Aplicada, 1995

both of which had much higher leaching rates in the first ten weeks of testing than in the last 30 weeks. Other noticeable trends occurred in the leaching rates for zinc, nickel and, to some extent, calcium, all of which slowed down in the middle portion of testing (Weeks 10-30) relative to the first and last 10 weeks. The average leaching rate and average concentration in the leachate over the last five weeks of testing for the elements included in Figures 4-8 to 4-10 are summarized in Table 4-1 and compared to federal water quality guidelines.

Table 4-1
Humidity Cell Data from Altered Basalt

Element	Leaching Rate[1] (mg/kg/week)	Leachate Concentration[1] (µg/L)	Water Quality Guidelines[2] (µg/L)
Arsenic	0.14	273	50
Calcium	3.16	6103	-
Chromium	0.001	1.5	2.0
Cobalt	0.001	2.7	50[3]
Copper	0.003	6.0	2.0
Iron	0.01	19	300
Magnesium	1.36	2619	-
Manganese	0.005	10	100-1000[3]
Nickel	0.003	5.8	65
Potassium	0.08	151	-
Sodium	0.22	424	-
Strontium	0.009	17	-
Zinc	0.001	1.1	30

1: values are the average over the last five weeks of testing.
2: values are from the Canadian Water Quality Guidelines for the protection of aquatic life (water with neutral pH, hardness of 60-120 mg $CaCO_3$/L).
3: values are from the British Columbia guidelines for the protection of freshwater aquatic life.

Based on their leaching rates and leachate concentrations, the metals of most significance for the altered basalt cell were arsenic and copper. High concentrations of the base cations (Ca, Mg, K, Na) were also measured, but no federal water quality criteria exist for these elements. Without detailed mineralogical analyses, it is difficult to determine the exact source of the metals that were leaching from the altered basalt material. Petrographic examinations detected trace quantities of arsenopyrite and chalcopyrite. Because the kinetic test results indicated that sulphide oxidation was minimal in the altered basalt sample, sulphides were probably

not the source of the arsenic and copper detected in the weekly leachate. Another possibility is that soluble metal oxide phases in the altered basalt material were releasing metals into the leachate.

Figures 4-11 and 4-12 present predicted depletion times for the different metals included in Figures 4-8 to 4-10. From Figure 4-11 it can be seen that arsenic is predicted to take less than 17 years to completely leach out of the altered basalt material (assuming that the leaching rate observed during kinetic testing persists into the future). Chemically and thermodynamically, it is almost impossible for geologic material to become completely depleted of an element. The statement that an element will completely leach out of a sample within a certain period of time is based on the extrapolation of the reaction rates calculated from kinetic testwork.

The other metals are predicted to take anywhere from 210 to over 100,000 years to become depleted. It is estimated that calcium and magnesium will take approximately 380 and 590 years, respectively, to leach out of altered basalt material. Recalling the information from Figure 4-5 (Altered Basalt: Estimated Depletion Times for Sulphur and NP), it was predicted that total sulphur and sulphide sulphur will be fully depleted in less than 50 years. If this holds true, then potential acidity production caused by sulphide oxidation will decrease after 50 years. If, up to that point, the acid being generated by sulphide oxidation had been migrating and coming into contact with metals before being neutralized, then an end to acidity production could lead to a concomitant decrease in metal leaching.

4.3.2.5 Summary

Altered basalt material is unlikely to be net acid-generating because there was more dissolution of neutralizing minerals than sulphate production (*i.e.* sulphide oxidation) and there was more NP remaining than sulphur (*i.e.* AP) in the kinetic test sample at the end of testing. Although this material is unlikely to generate net acidity, metal leaching may be a concern. Arsenic leaching could be high (up to 0.14 mg As/kg of material/week) as demonstrated by the kinetic testwork. The rate of copper leaching was not particularly high (0.003 mg Cu/kg of material/ week), but the amount of copper entering solution was enough to cause the leachate to exceed federal water quality guidelines. The source of these metals is

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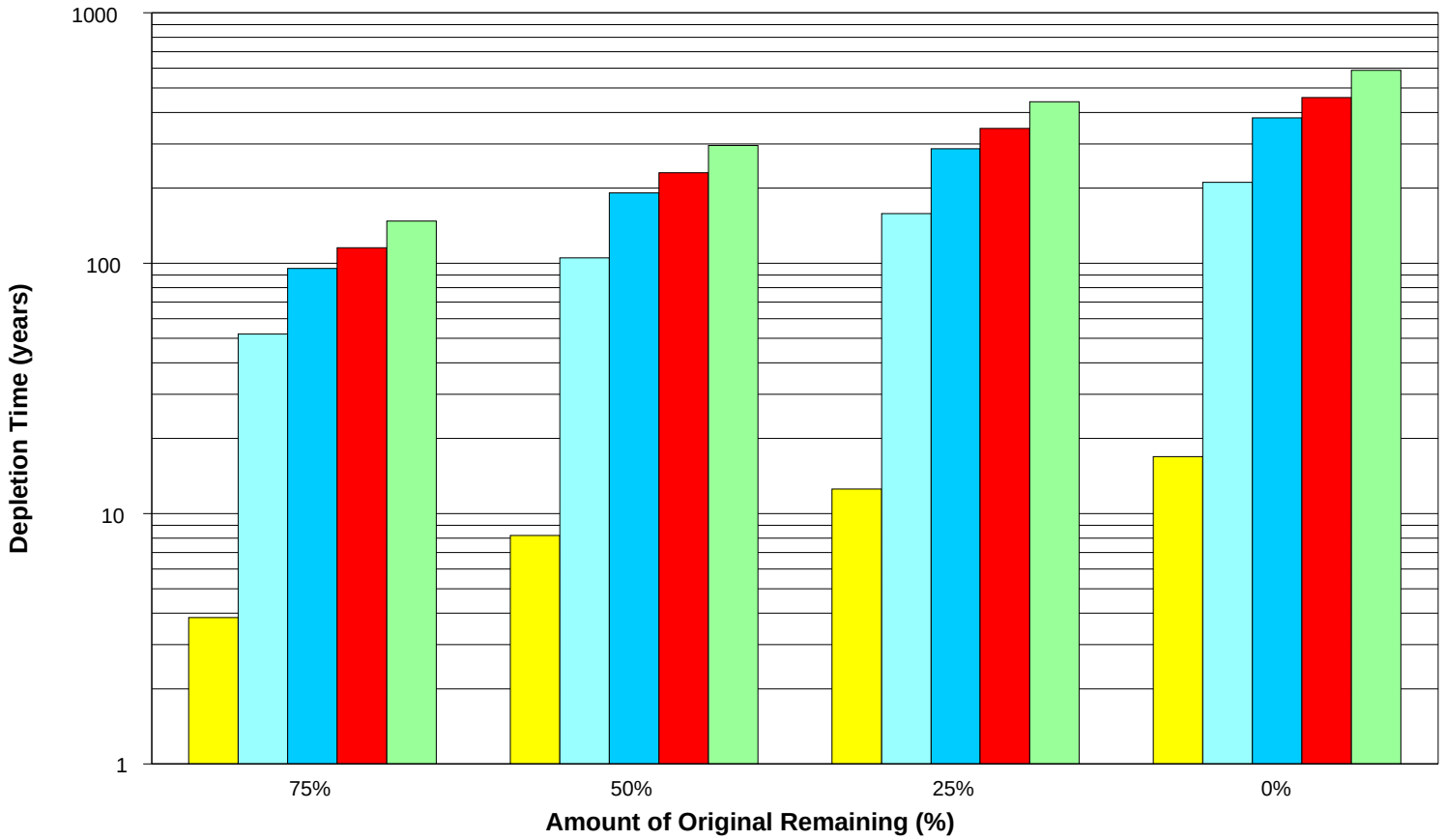


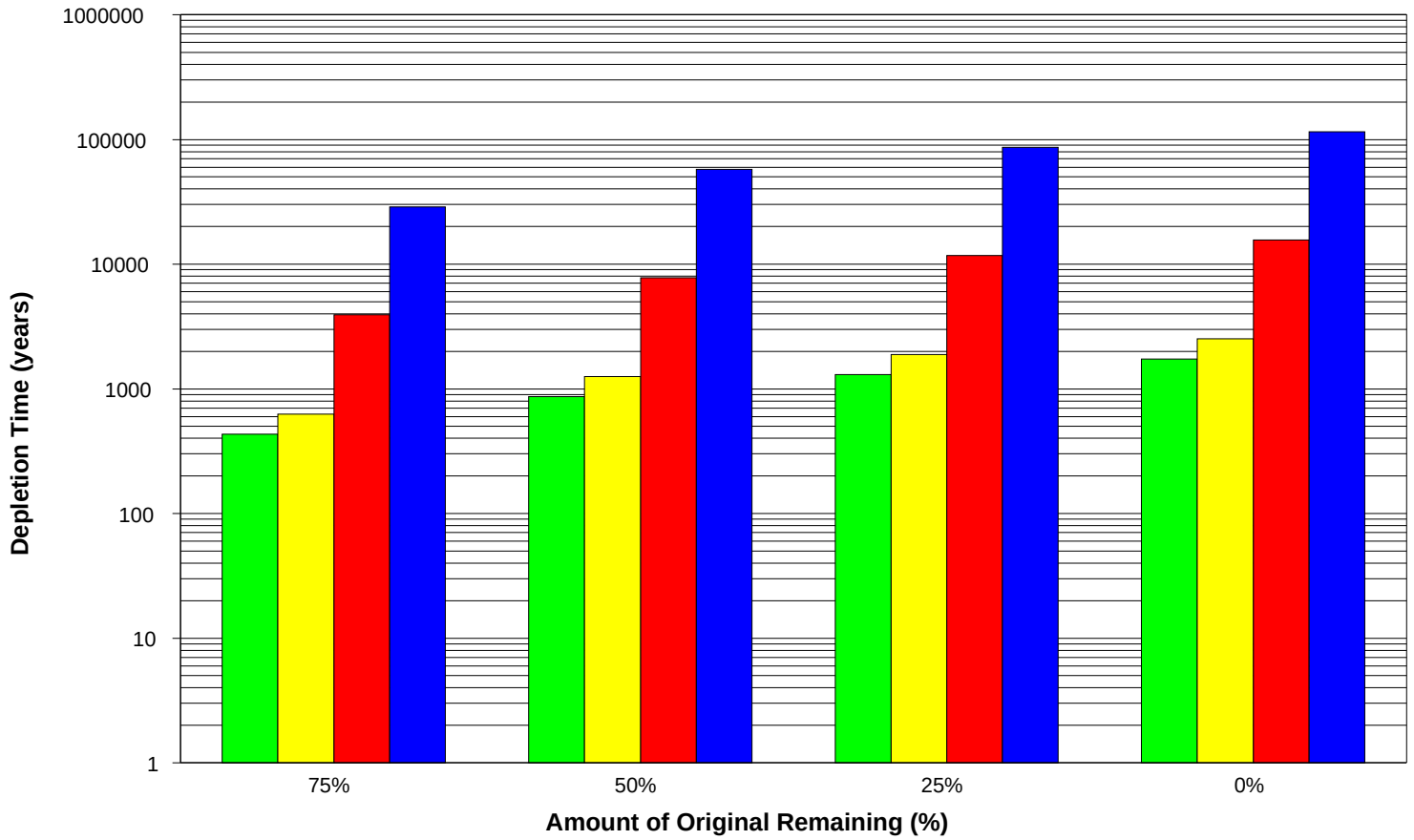
Time to Depletion (years)

Arsenic	3.8	8.2	12.5	16.9
Strontium	52	105	158	210
Calcium	95	191	286	382
Copper	115	230	345	459
Magnesium	147	295	442	589

FIGURE 4-11

Altered Basalt: Estimated Depletion Times for Various Metals

Source: Centro de Ecología Aplicada, 1995



Time to Depletion (years)

Nickel	433	867	1300	1734
Zinc	629	1257	1886	2515
Chromium	3908	7816	11723	15631
Iron	28779	57557	86335	115114

FIGURE 4-12

Altered Basalt:
Estimated Depletion Times for Various Metals

Source: Centro de Ecología Aplicada, 1995

unclear, but the kinetic test results indicate that they were not being released due to the oxidation of sulphide minerals. The most probable source of these metals is some form of soluble metal oxide species.

4.3.3 B2 Mineralized Zone

The analytical results for the B2 mineralized zone sample are presented in Appendix D-3 and are summarized below.

4.3.3.1 Sample Characterization

Whole Rock Analysis

Whole rock analysis indicated that the same components that were dominant in the altered basalt sample were also dominant in the B2 mineralized zone sample, namely silica (42.06%), iron oxide (12.90%), calcium oxide (10.97%), aluminum oxide (10.12%) and magnesium oxide (3.97%). In the B2 sample, however, the abundance of the first four components was higher relative to their abundance in the altered basalt, while the abundance of magnesium oxide was lower. Significant accessory metals that were measured included barium (136 ppm) and strontium (101 ppm). As was explained above for the altered basalt sample, the apparent increase in abundance of some components from pre- to post-testing is likely due to the formation of secondary mineral (oxides, hydroxides) precipitates, small changes in concentration over the course of testing and/or analytical variability.

Total Metals Analysis

Aluminum, calcium, iron and magnesium comprised the dominant elements in the B2 sample. Significant concentrations of potassium, sodium and manganese were also measured. Minor amounts of arsenic, chromium, copper, strontium and zinc were present as well.

Petrographic Examination

The B2 mineralized zone sample was observed to contain the least amount of carbonate (65%) and the greatest amount of pyrite (3%) of all three samples. Other important components were quartz (25%), sericite (5%) and chlorite (1%), with

minor amounts of rutile and sphalerite. Trace amounts of chalcopyrite, arsenopyrite and tourmaline were also observed.

The nearly equal proportions of calcium and iron oxide (11.0% compared to 12.9%, respectively) measured by whole rock analysis suggest the presence of ankerite. The slightly greater amount of iron is likely being contributed by pyrite or possibly chlorite, both of which were observed in the petrographic examination.

4.3.3.2 Physical Parameters

pH and Conductivity

Figure 4-13 presents the pH and conductivity measurements from the B2 mineralized zone sample leachate. The pH varied from 7.8 to 8.7 (in Weeks 7 and 32, respectively). From Week 11 onwards, the pH gradually increased and in the last five weeks of testing it averaged 8.5. As explained above, the lower pH in the first seven weeks of testing was due to a low pH in the deionized water being used to rinse the humidity cell samples.

Conductivity was at its highest in Week 0 (265 µmhos/cm) and steadily decreased throughout testing. It reached a low of 57 µmhos/cm in Week 34. The average conductivity in the last five weeks of testing was 75 µmhos/cm. The drop in conductivity indicates that progressively fewer ions were being released into solution and suggests that sulphide oxidation was very low.

Alkalinity and Acidity Production

Alkalinity and acidity production rates for the B2 sample are shown in Figure 4-14. Alkalinity production ranged from 10 to 50 mg/kg/week, while acidity production varied from 0.0 to 1.1 mg $CaCO_3$/kg/week. Alkalinity was at its maximum at the start of testing and rapidly decreased to Week 8. From Week 9 onwards, alkalinity gradually increased through to the end of testing. Acidity production values were minimal due to the number of measurements in which acidity was not present or was below the detection limit. Acidity was only measured in Weeks 3, 4 and 7, when approximately 1.0 mg $CaCO_3$/kg/week of acidity was being produced.

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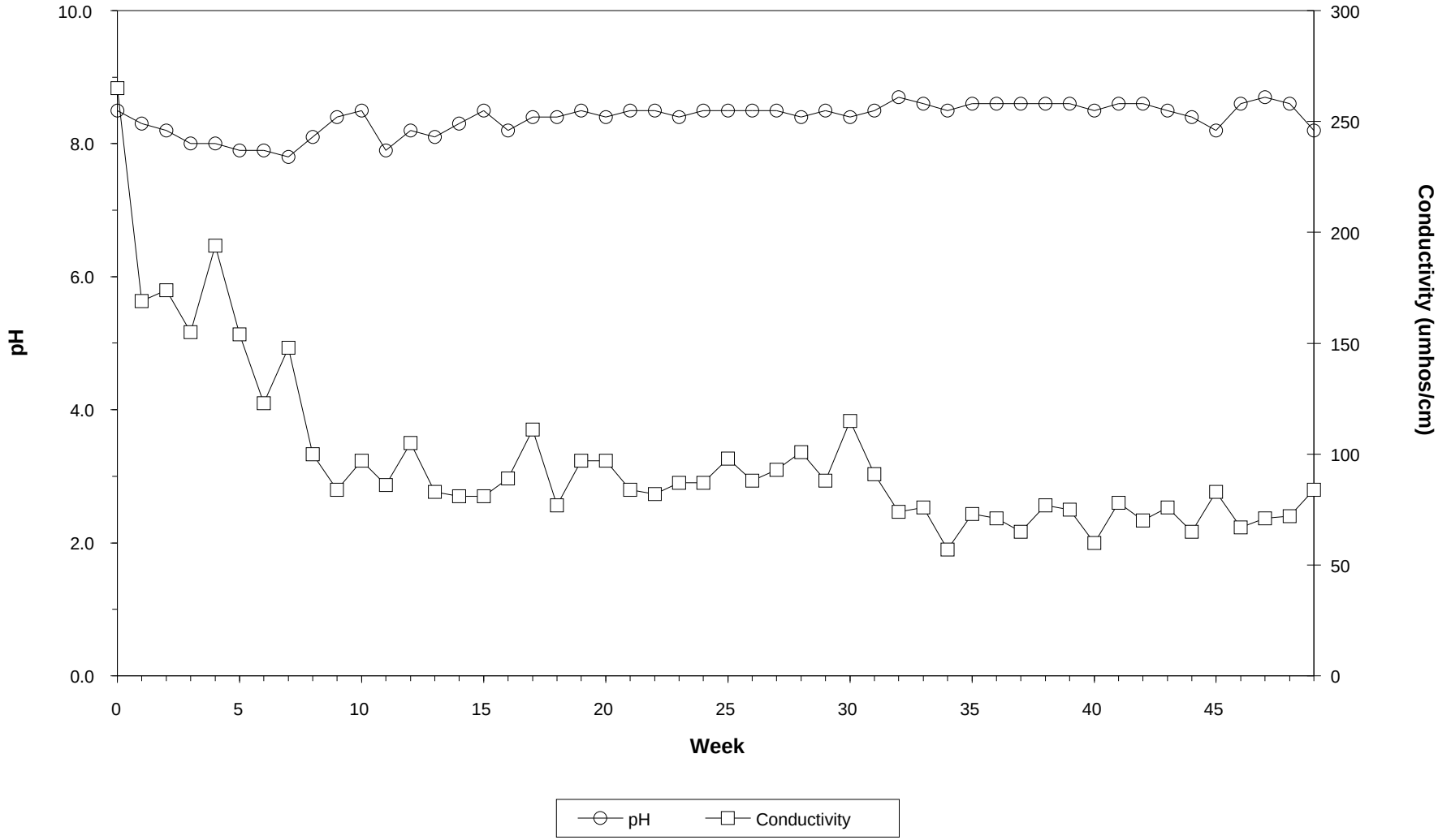

FIGURE 4-13

B2 Mineralized Zone: pH and Conductivity vs. Week

Source: Centro de Ecología Aplicada, 1995

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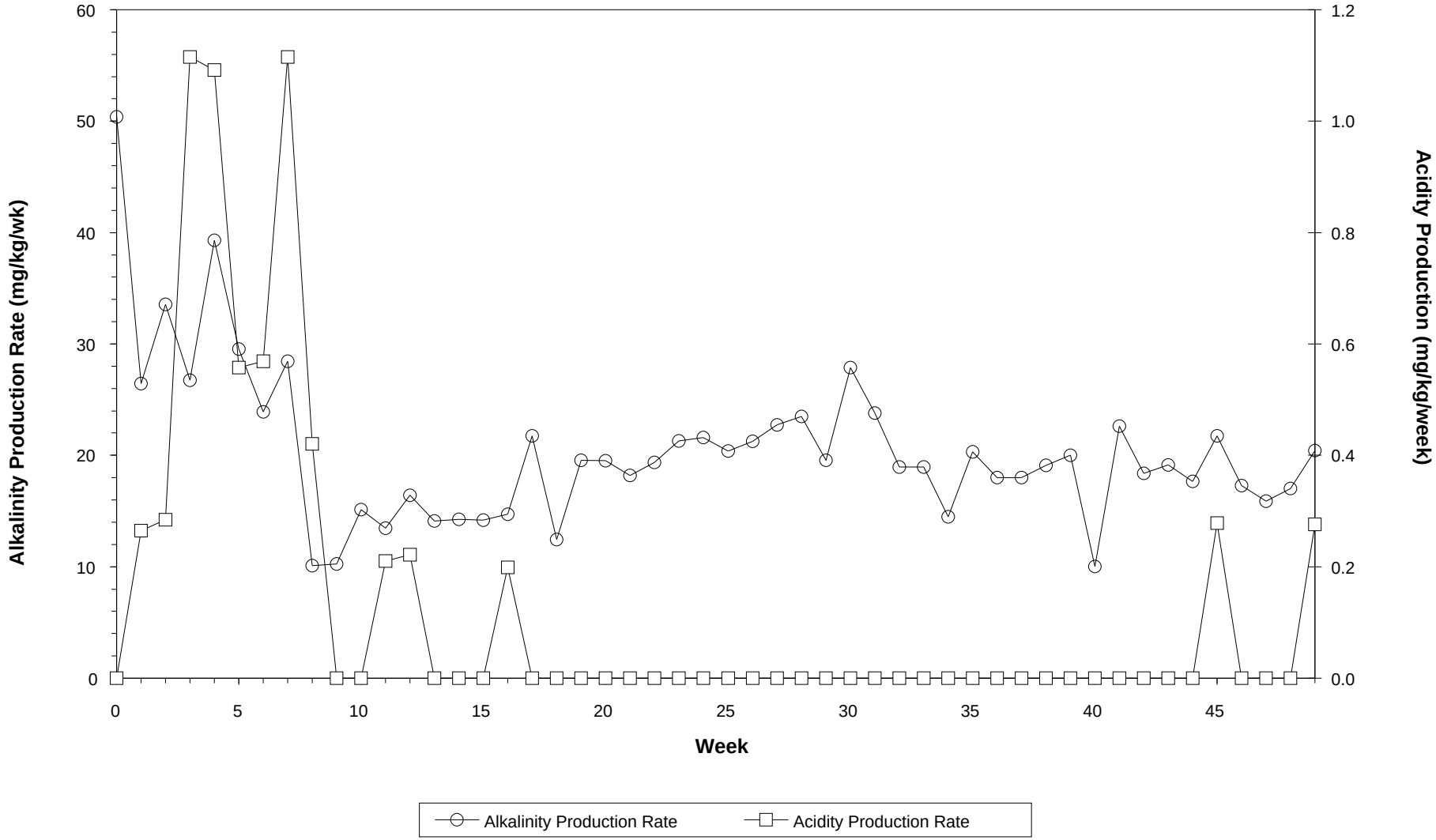

FIGURE 4-14

B2 Mineralized Zone: Alkalinity and Acidity Production Rates vs. Week

Source: Centro de Ecología Aplicada, 1995

4.3.3.3 Acid Generating Potential and Neutralization Potential

Figure 4-15 plots pH, sulphate production and carbonate NP consumption against time. In general, NP consumption was approximately an order of magnitude greater than sulphate production. During the first ten weeks of testing, however, when both sulphate production and NP consumption were at their highest, NP consumption was less than five times greater than sulphate production. Sulphate production ranged from 1.3 to 28.3 mg SO_4/kg/week and gradually decreased throughout testing. The consumption of NP ranged from 13.0 to 43.1 mg $CaCO_3$/kg/week. From Week 10 to Week 30, NP consumption increased and then subsequently dropped significantly. From Week 35 onwards, the rate of NP consumption remained relatively constant. Over the last five weeks of kinetic testing, sulphate production averaged 2.1 mg SO_4/kg/week and NP consumption averaged 19.0 mg $CaCO_3$/kg/week. With the exception of the first eight weeks, when the pH dropped and the rates of sulphate production and NP consumption were at their highest, there does not appear to be any consistent correlation between pH, sulphate production or NP consumption.

The total sulphur and carbonate NP remaining in the sample over time are plotted in Figure 4-16. The rate of NP consumption relative to the amount of NP in the sample was slightly higher than the rate of sulphide oxidation relative to the amount of total sulphur in the sample. Thus, at the end of testing there was fractionally more of the original total sulphur remaining in the sample than there was of the original carbonate NP (99.75% compared to 99.63%). The inflection point, when the amount of NP remaining became less than the amount of sulphur remaining, occurred in Week 22. If the depletion rates remain constant, these results indicate that carbonate NP will be depleted before total sulphur. Assuming the sample was representative of the B2 mineralized zone, material from this rock unit is likely to generate net acidity.

Figure 4-17 graphically demonstrates the consequences of the data presented in Figure 4-16. This figure shows that NP will be depleted approximately two to three times faster than sulphur, which supports the conclusion made above that the B2 material will eventually generate net acidity. The leachate will remain neutral until the rate of acid generation exceeds the dissolution rate of neutralizing minerals. Based on the reaction rates presented above, the carbonate NP will be

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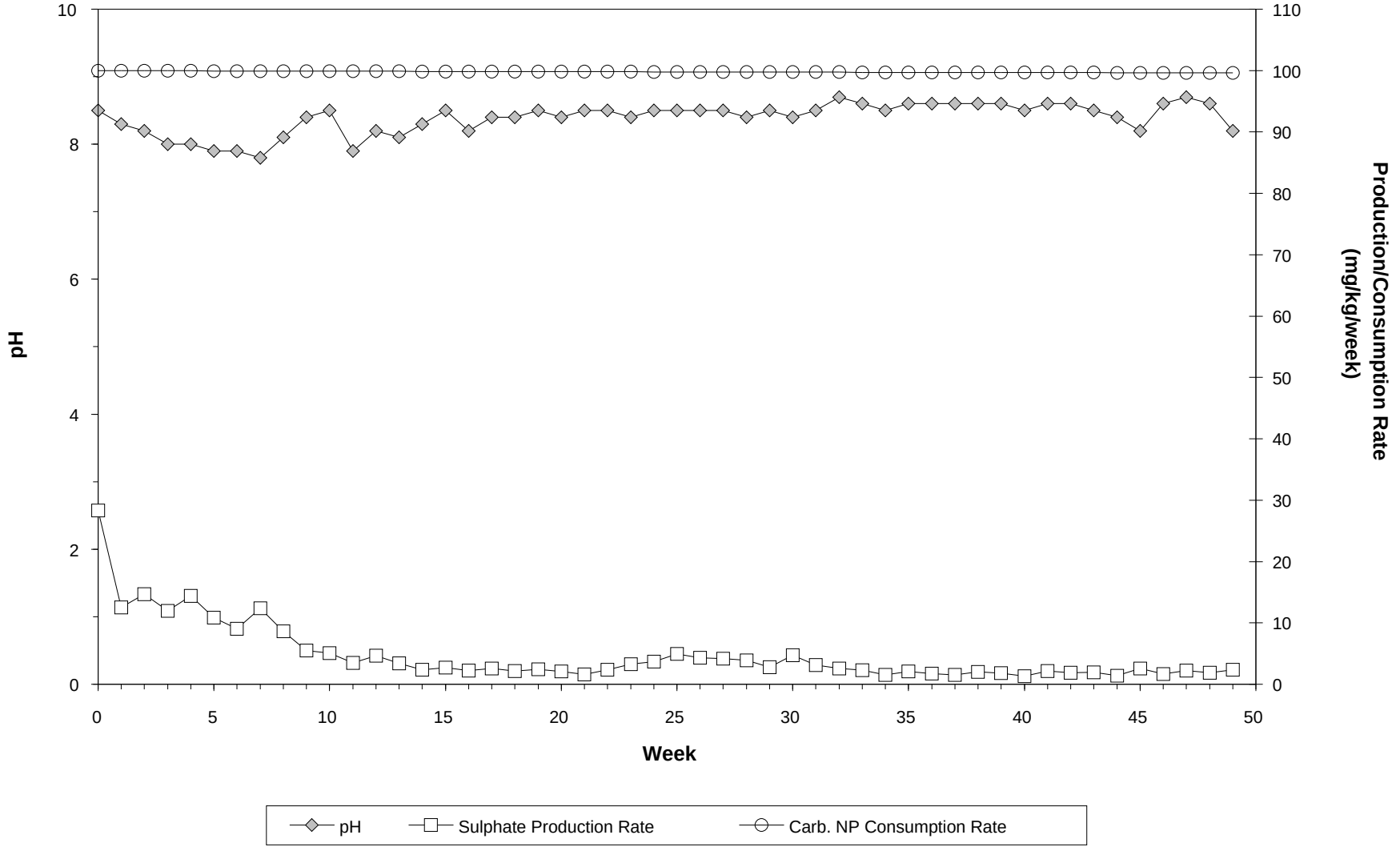

FIGURE 4-15

B2 Mineralized Zone:
pH, Sulphate Production and NP Consumption vs. Week

Source: Centro de Ecología Aplicada, 1995

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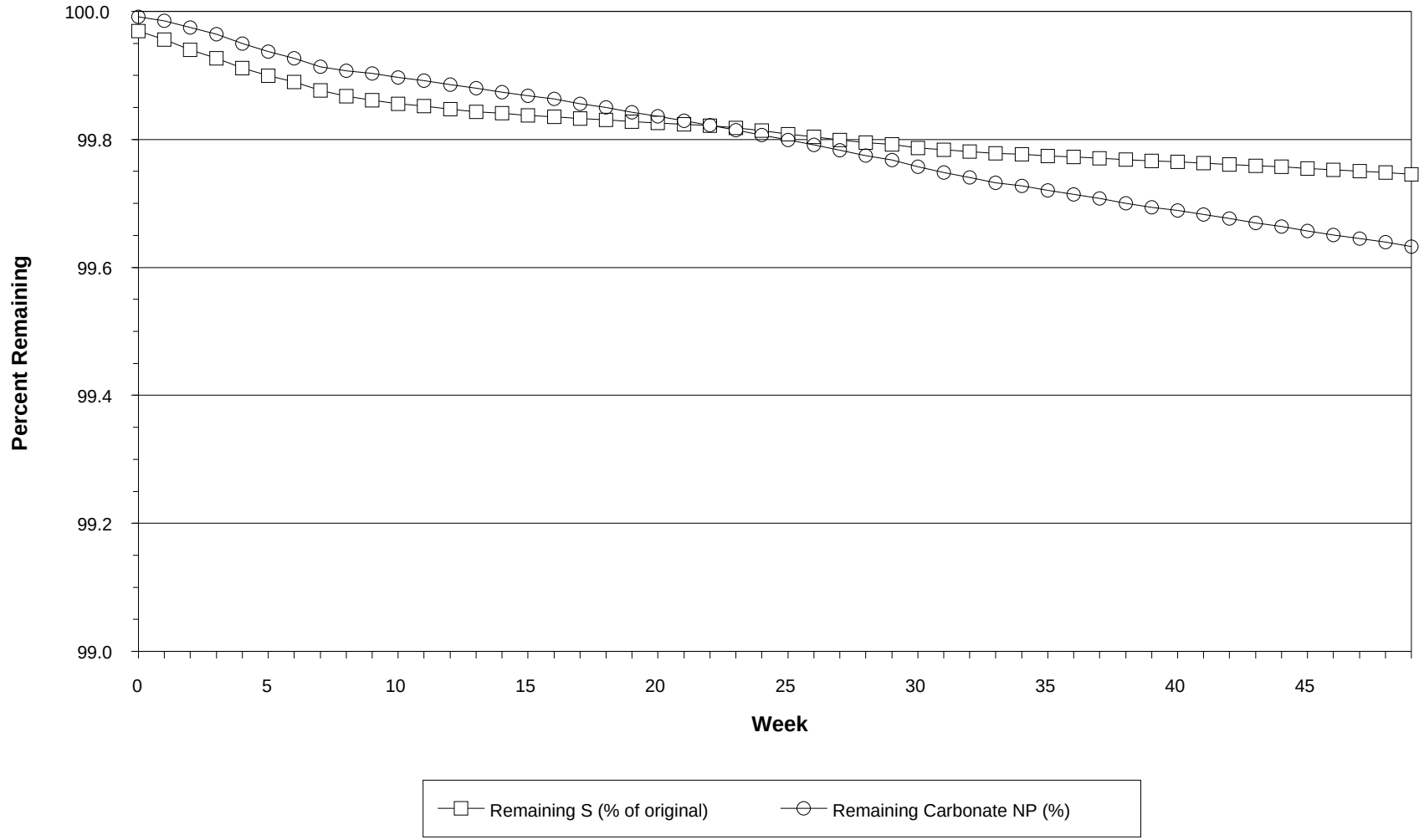
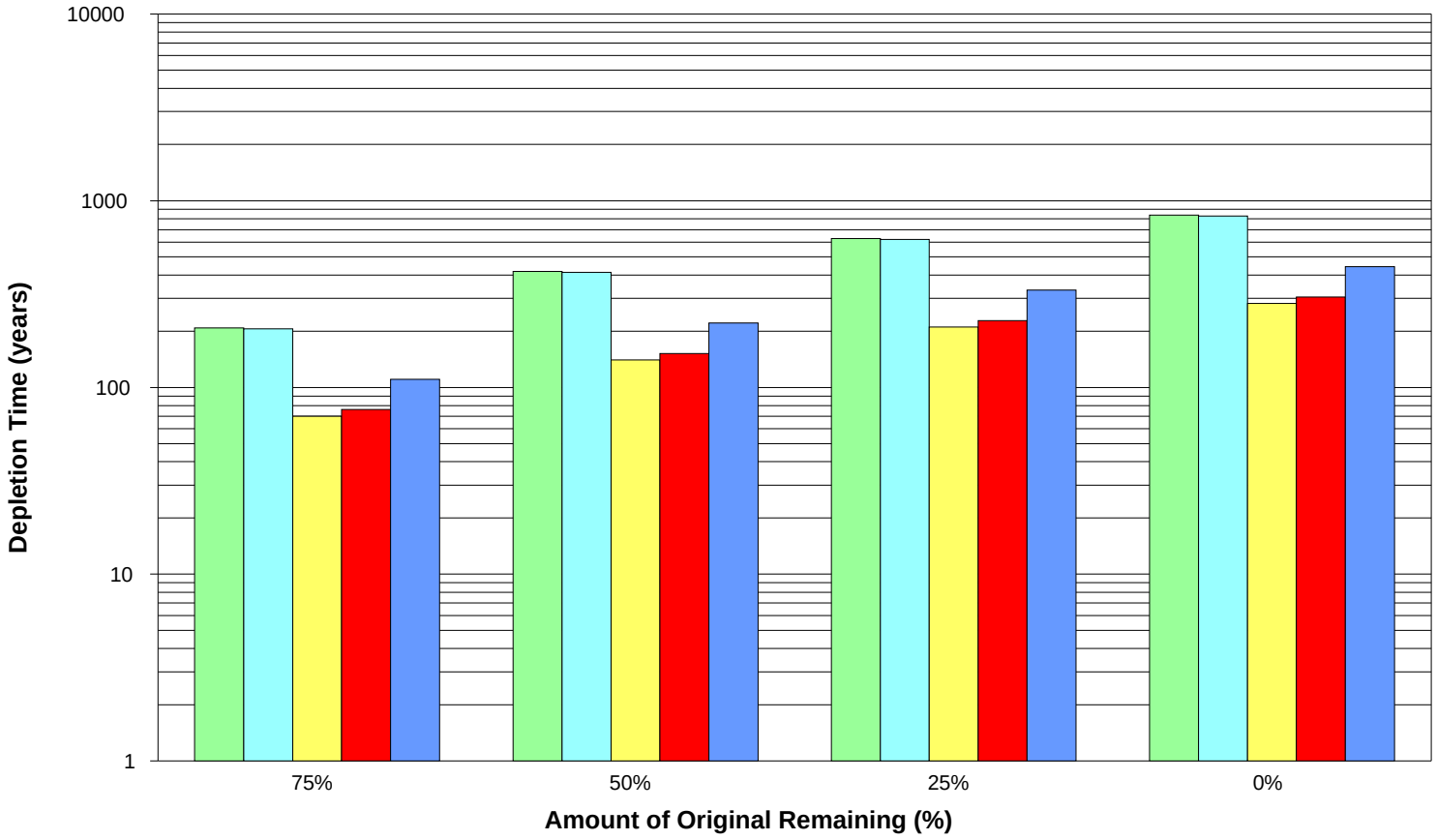


FIGURE 4-16

B2 Mineralized Zone:
Remaining S and Remaining Carbonate NP vs. Week

Source: Centro de Ecología Aplicada, 1995



Time to Depletion (years)

Total S	208	417	627	836
Sulphide S	206	413	621	828
NP: Empirical	70	140	211	281
NP: Carbonate	76	152	228	305
NP: Feldspar	110	221	332	443

FIGURE 4-17

B2 Mineralized Zone: Estimated Depletion Times for Sulphur Species and Neutralization Potential (NP)

Source: Centro de Ecología Aplicada, 1995

depleted in approximately 300 years. Therefore, net acid generation is predicted to occur no later than 300 years after initial exposure and will likely occur sooner.

Details regarding the dissolution of neutralizing minerals are provided by Figures 4-18 and 4-19. The ratio of alkalinity production to sulphate production (Figure 4-18) steadily increased throughout testing, indicating that either the rate and/or the amount of neutralizing mineral dissolution was greater than the rate and/or amount of sulphate production. Based on the information provided in Figure 4-16, it is likely that the rate and not the amount was higher. As with the altered basalt sample, buffering capacity in the B2 sample was supplied almost entirely by the dissolution of calcium- and magnesium-bearing minerals (1:1 Ca+Mg:alkalinity ratio).

Figure 4-19 indicates that the dissolution of potassium- and sodium-bearing minerals was providing more of the alkalinity than calcium- or magnesium-bearing minerals at the start of testing (Weeks 0-2). From Week 5 onwards, however, calcium-rich minerals were providing the majority of the alkalinity. The dissolution of magnesium-bearing minerals provided most of the remaining portion of alkalinity, with only negligible contributions coming from potassic and sodic minerals. As long as the NP dissolution and sulphide oxidation rates remain the same, the leachate should stay neutral until the NP has been consumed. The "safe" NP:AP ratio is not relevant for B2 mineralized zone material because it was predicted that neutralizing minerals will become depleted before sulphide minerals and thus the sample will eventually generate net acidity.

4.3.3.4 Metal Leaching

Any metal which had a concentration consistently below the detection limit in the weekly leachate was excluded from the percent metal remaining calculations. For the B2 mineralized zone sample, these metals included beryllium, bismuth, cadmium, lead, mercury, phosphorus, selenium, silver, tin, titanium, thallium, uranium and vanadium.

The amount of metal remaining in the B2 mineralized zone sample, as a percent of the original concentration, is plotted against time in Figures 4-20 through 4-22. At least 99.20% of each of the detectable metals remained in the sample at the end of testing.

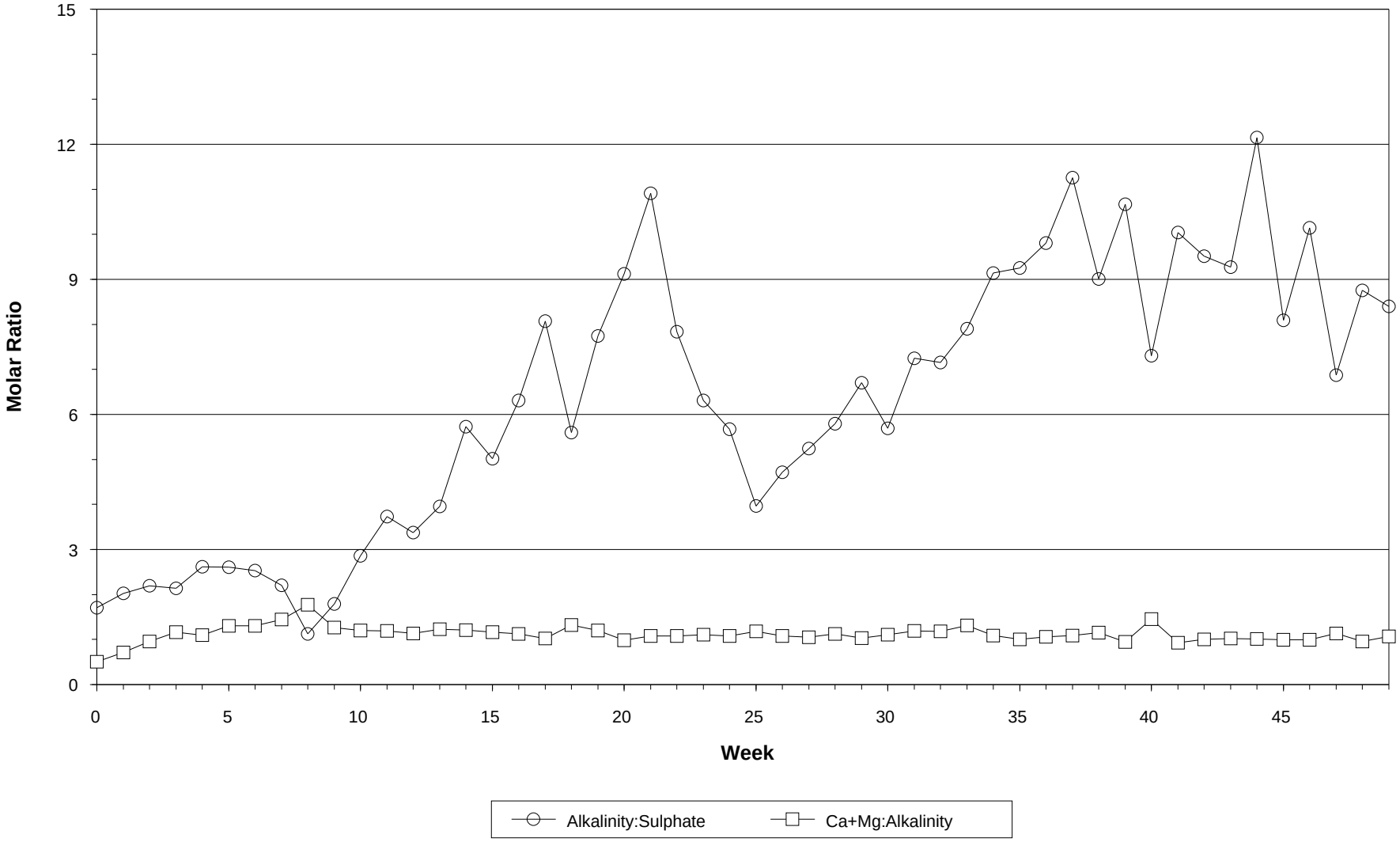


FIGURE 4-18

B2 Mineralized Zone: Alkalinity Molar Ratios vs. Week

Source: Centro de Ecología Aplicada, 1995

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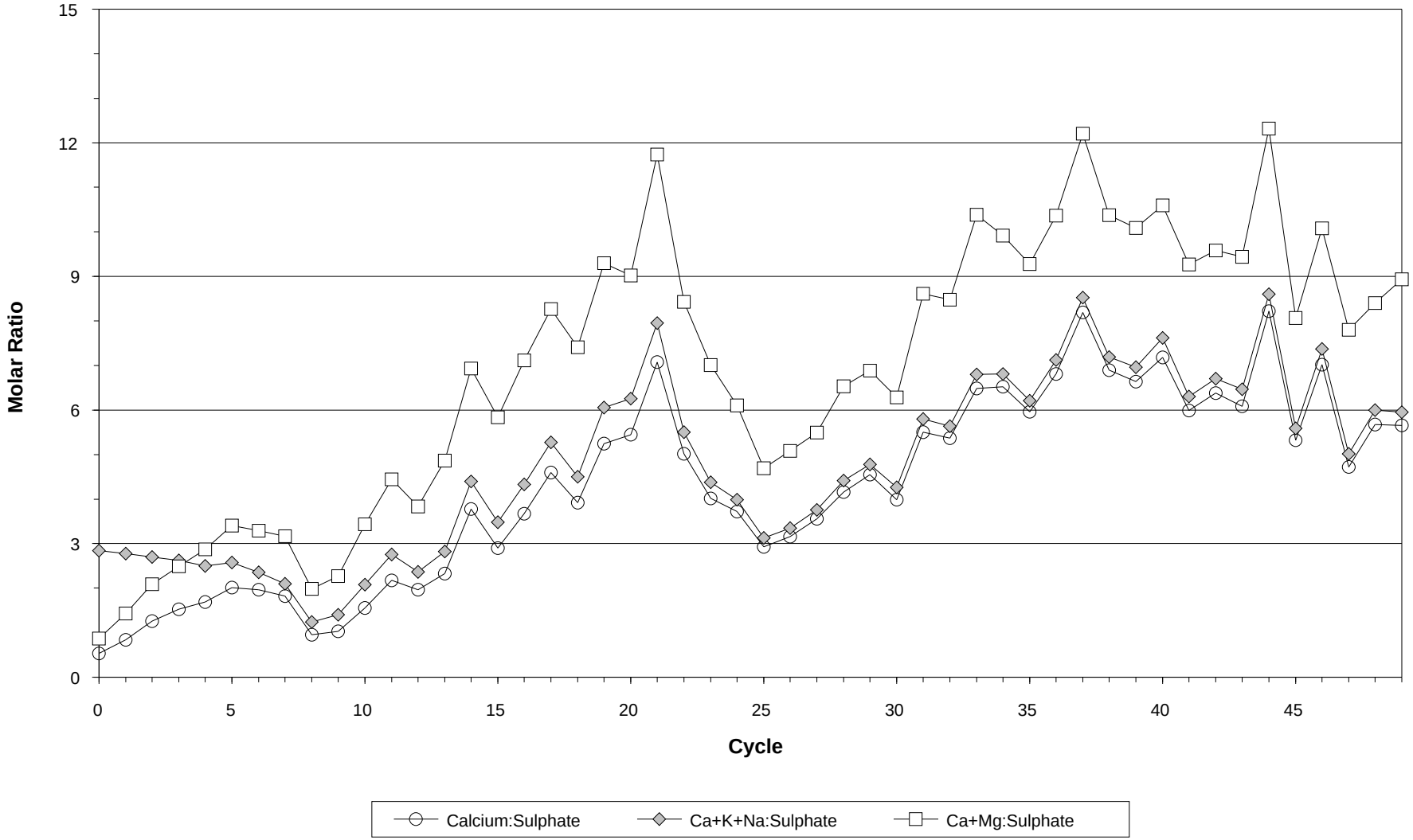

FIGURE 4-19

B2 Mineralized Zone: Sulphate Molar Ratios vs. Week

Source: Centro de Ecología Aplicada, 1995

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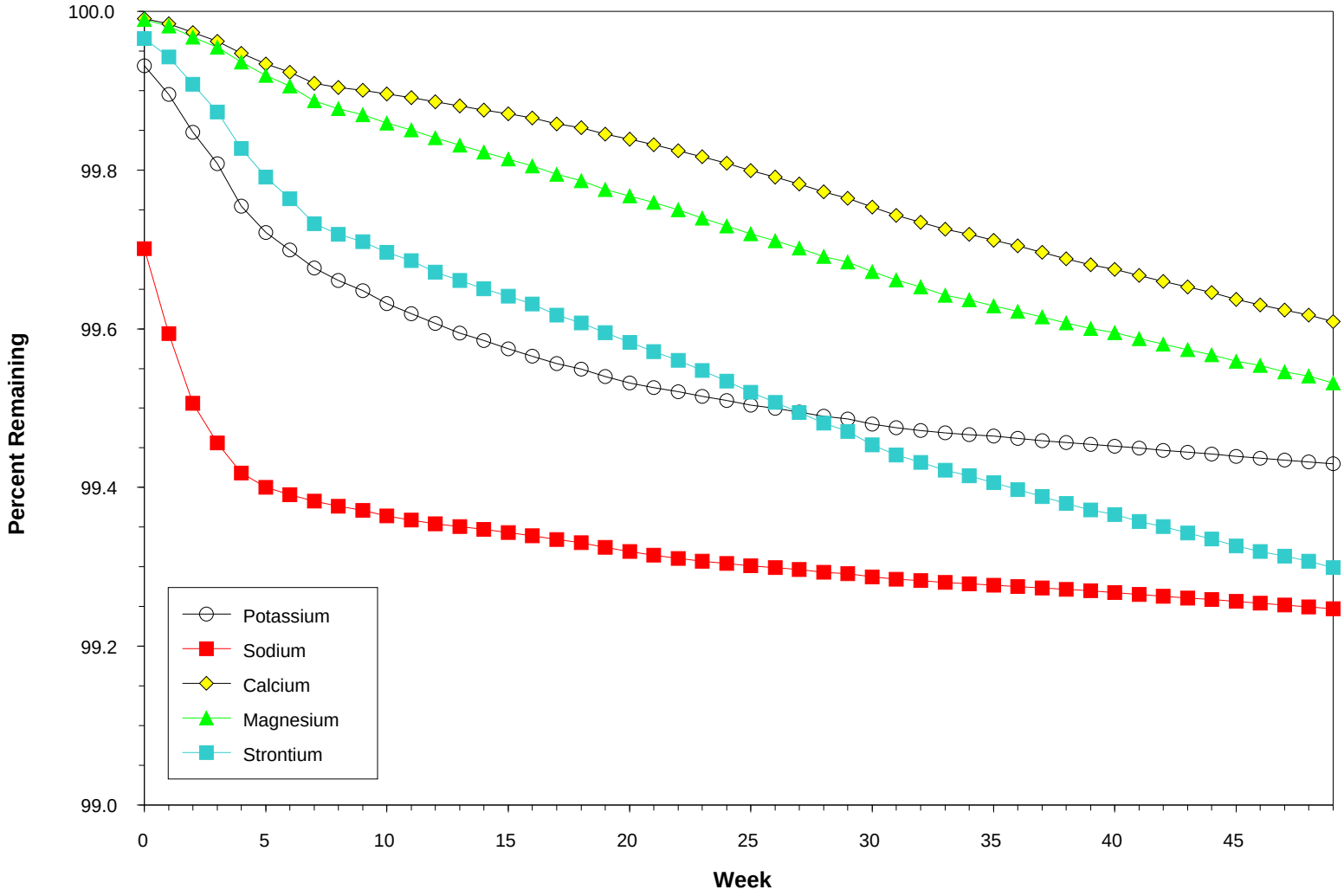

FIGURE 4-20

B2 Mineralized Zone: Percent Metal Remaining vs. Week

Source: Centro de Ecología Aplicada, 1995

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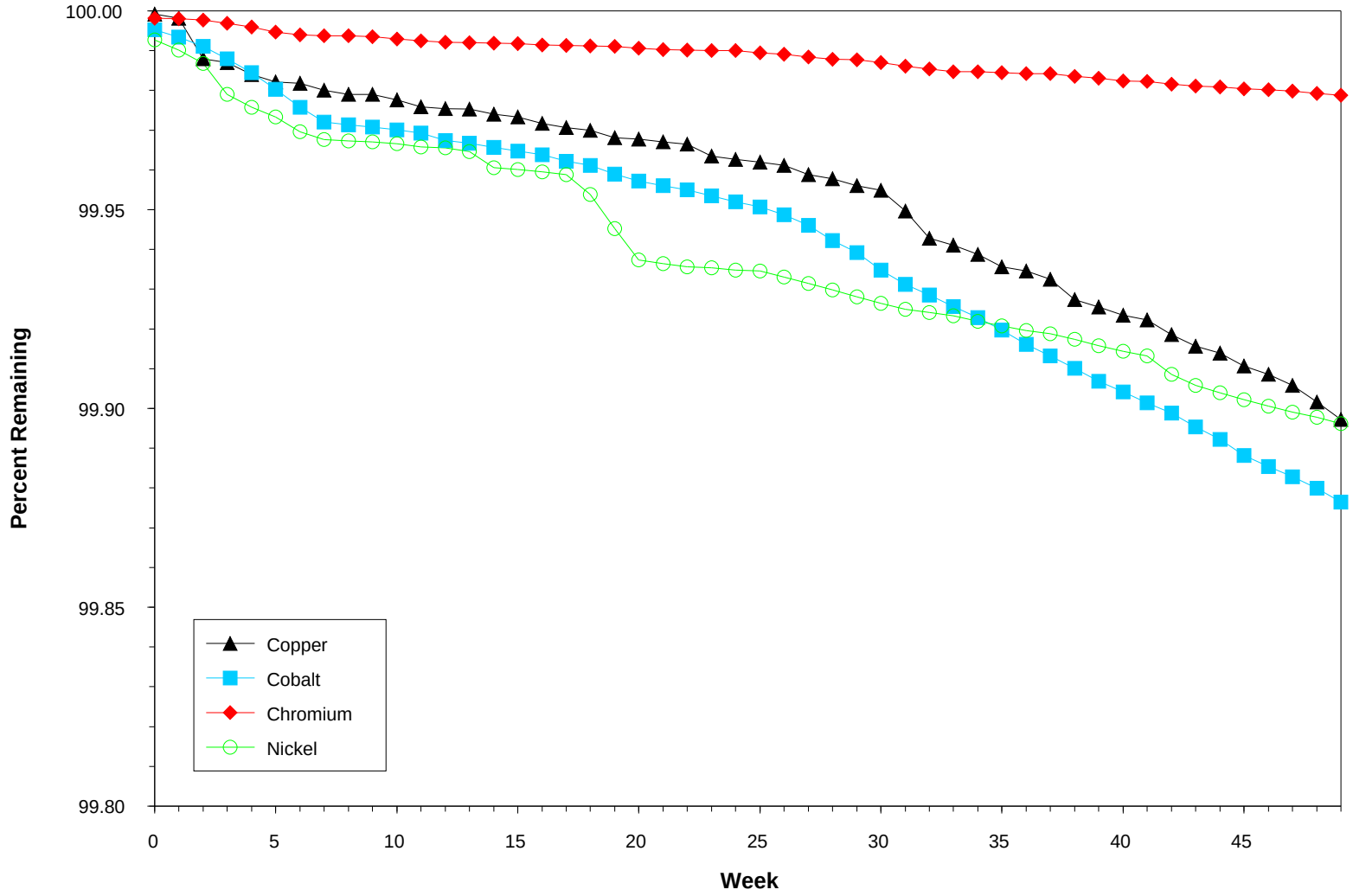

FIGURE 4-21

B2 Mineralized Zone: Percent Metal Remaining vs. Week

Source: Centro de Ecología Aplicada, 1995

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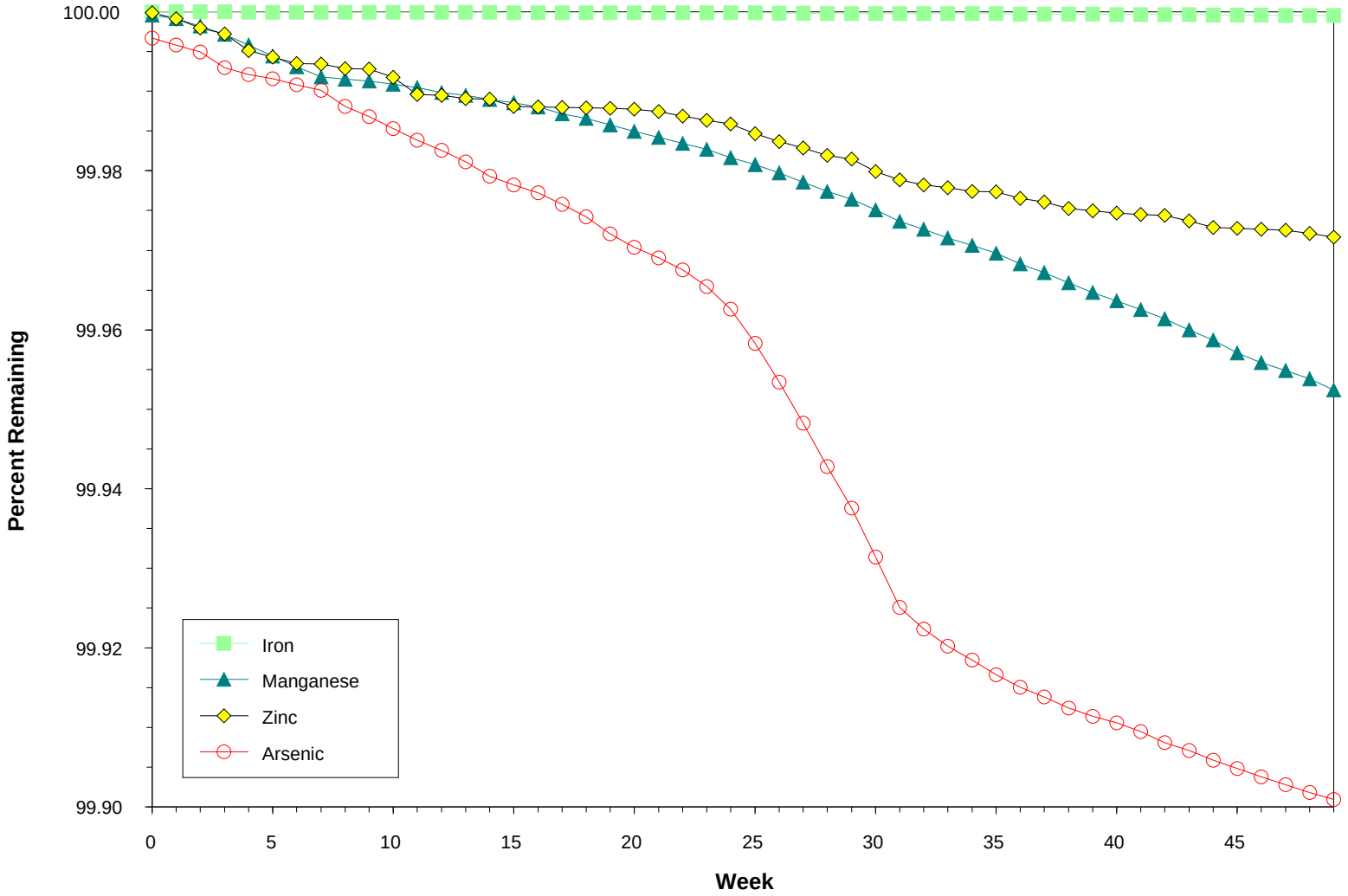

FIGURE 4-22

B2 Mineralized Zone: Percent Metal Remaining vs. Week

Source: Centro de Ecología Aplicada, 1995

The neutralizing minerals (those containing the base cations Ca, Mg, K, Na) and strontium leached the most, having 99.25 to 99.65% of their original concentrations remaining after 49 weeks of testing. More than 99.88% of the other metals remained at the completion of testing. As with the altered basalt sample, very little iron was leached out of the B2 mineralized zone sample. By the end of testing, more than 99.99% of the original iron remained in the sample.

All of the base cations and strontium displayed similar trends in leaching rates. The leaching rate was highest during the first five to eight weeks of testing but from Week 10 onwards there was a significant decrease in metal leaching, especially for sodium. Other metals that displayed similar leaching trends to each other were arsenic, copper, cobalt, nickel and zinc. These metals had high leaching rates for four to six weeks followed by periods of slower leaching that lasted up to 15 weeks. This cycle was repeated up to three times over the course of testing producing a step-like leaching profile. The remaining metals (Cr, Fe, Mn) had a relatively constant leaching rate throughout testing as can be seen from the relatively straight lines plotted for percent metal remaining in Figures 4-21 and 4-22. The average leaching rate and average concentration in the leachate over the last five weeks of testing for the elements included in Figures 4-20 to 4-22 are summarized in Table 4-2.

Based on its leaching rate and leachate concentration, the metal of most significance for the B2 mineralized zone cell was copper. As was seen in the altered basalt data, high concentrations of the base cations (Ca, Mg, K, Na) were measured, but no federal water quality criteria exist for these elements. Manganese also exhibited high leaching rates and/or leachate concentrations compared to the other elements included in Table 4-2.

The information presented in Figures 4-20 to 4-22 is extrapolated into the future in Figures 4-23 and 4-24. From Figure 4-23 one can see that strontium, calcium and magnesium are all predicted to take approximately 270 years to become depleted from B2 mineralized zone material, assuming that the leaching rates that existed at the end of testing persist into the future. Copper is predicted to take approximately twice that time (575 years) and nickel, manganese and arsenic will take from 1250 to 1950 years to leach out of the material. Chromium and zinc are predicted to take four to five times longer than nickel, manganese and arsenic (4500 and 7800

Table 4-2
Humidity Cell Data from B2 Mineralized Zone

Element	Leaching Rate[1] (mg/kg/week)	Leachate Concentration[1] (µg/L)	Water Quality Guidelines[2] (µg/L)
Arsenic	0.003	5.9	50.0
Calcium	4.96	9290	-
Chromium	0.001	1.4	2.0
Cobalt	0.001	2.0	50.0[3]
Copper	0.006	11	2.0
Iron	0.01	18	300.0
Magnesium	1.60	3007	-
Manganese	0.02	36	100-1000[3]
Nickel	0.001	1.2	65.0
Potassium	0.15	284	-
Sodium	0.22	415	-
Strontium	0.007	14	-
Zinc	0.0004	0.8	30.0

1: values are the average over the last five weeks of testing.
2: values are from the Canadian Water Quality Guidelines for the protection of aquatic life (water with neutral pH, hardness of 60-120 mg $CaCO_3$/L).
3: values are from the British Columbia guidelines for the protection of freshwater aquatic life.

years, respectively), while iron will take over two orders of magnitude longer (155,000 years) to become depleted. When one compares the predicted depletion time for carbonate NP (Figure 4-17) to the predicted depletion times for calcium and magnesium (Figure 4-23), a range of 265 to 305 years is observed. If the most conservative of these predictions is used, then in no longer than 265 years when the available carbonate NP is depleted and net acidity is being generated, metal leaching rates can be expected to increase, particularly for metals such as copper, lead and zinc.

4.3.3.5 Summary

The B2 mineralized zone material has the greatest potential for generating net acidity over the long-term of all three samples. It is predicted that within approximately 300 years, all of the readily available neutralization potential (*i.e.*

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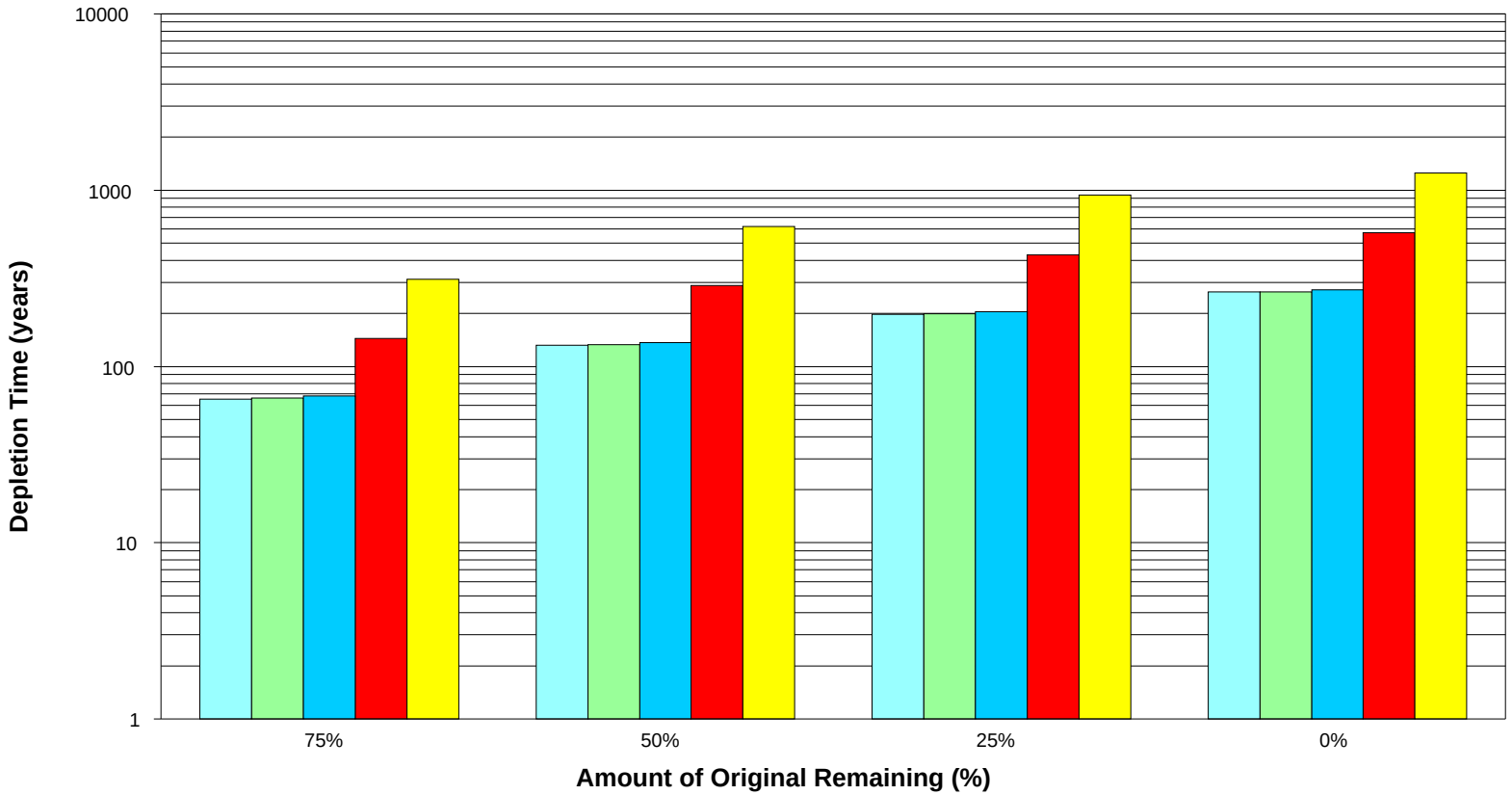


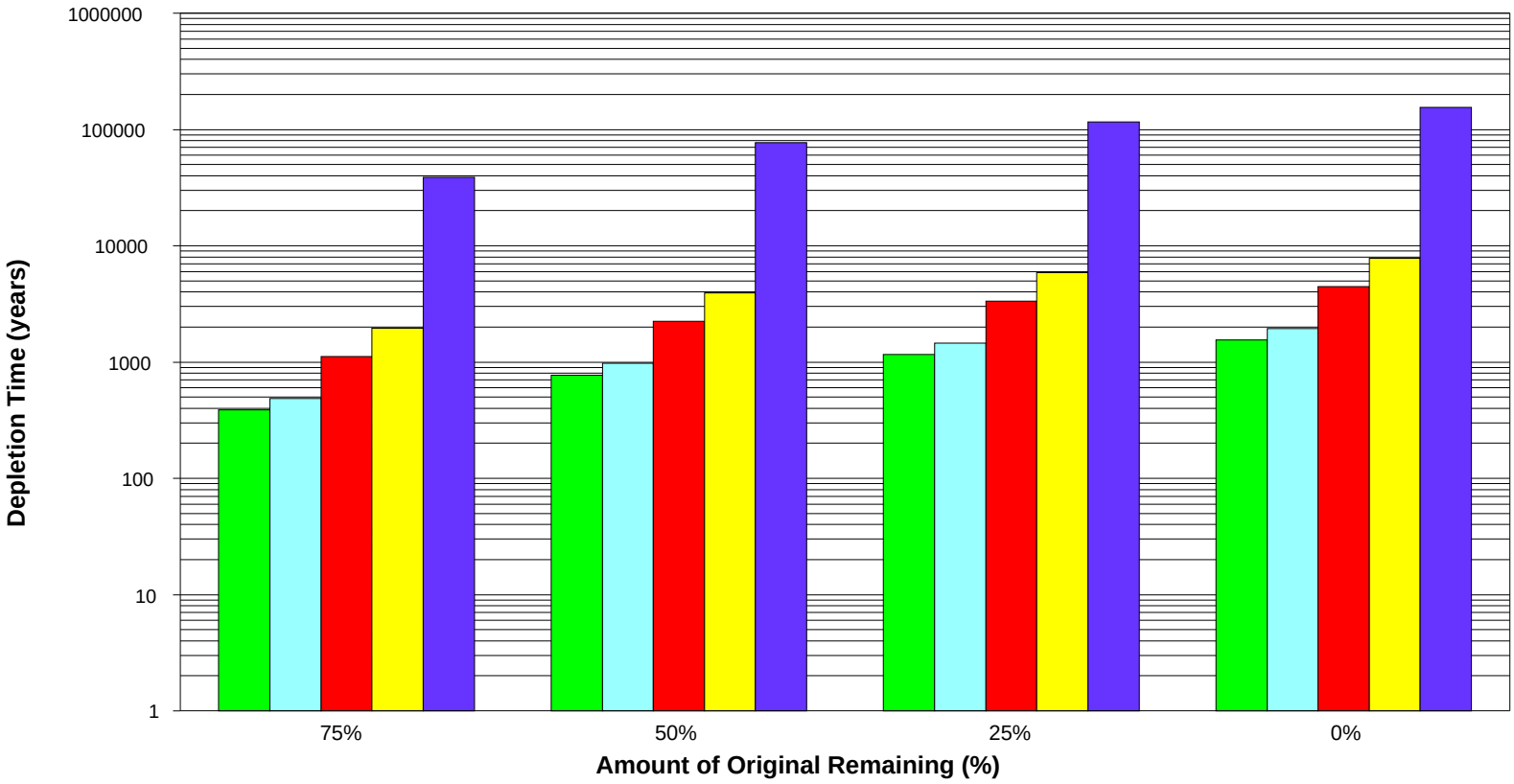
Time to Depletion (years)

Strontium	65	132	198	264
Calcium	66	133	199	266
Magnesium	68	136	204	272
Copper	144	288	432	575
Nickel	312	624	937	1249

FIGURE 4-23

B2 Mineralized Zone: Estimated Depletion Times for Various Metals

Source: Centro de Ecología Aplicada, 1995



Time to Depletion (years)

Manganese	386	771	1157	1543
Arsenic	486	973	1459	1946
Chromium	1117	2234	3351	4468
Zinc	1960	3922	5883	7845
Iron	38673	77345	116017	154690

FIGURE 4-24

B2 Mineralized Zone: Estimated Depletion Times for Various Metals

Source: Centro de Ecología Aplicada, 1995

carbonate NP) of this material will be consumed and net acid generation will occur. If the rate of neutralization potential consumption is not high enough to provide adequate buffering for acidity generated by sulphide oxidation, net acid generation could occur sooner than the 300 years predicted above. The metal of concern with respect to leaching from B2 mineralized zone material is copper.

4.3.4 B3 Alteration Halo

The analytical results for the B3 alteration halo sample are presented in Appendix D-4 and are summarized below.

4.3.4.1 Sample Characterization

Whole Rock Analysis

As with the other two samples, the dominant components of the B3 alteration halo sample were silica (32.28%), magnesium oxide (17.15%), iron oxide (10.92%), aluminum oxide (7.26%) and calcium oxide (4.68%). Unlike the other two samples, however, magnesium oxide was the second most abundant component after silica. As well, aluminum oxide was more abundant than calcium oxide, unlike the other samples in which calcium oxide was more abundant.

Total Metals Analysis

Based on ICP-MS analysis, magnesium was, by far, the most abundant element in the B3 sample, followed by iron, aluminum and calcium. Potassium and sodium were also detected at significant concentrations. Minor elements included arsenic, chromium, manganese, nickel and strontium.

Petrographic Examination

From the petrographic examination it was determined that carbonate was the dominant constituent (72%), followed by quartz (20%) and sericite (5%). Minor amounts of chlorite, rutile and pyrite were present (1%) and trace amounts of arsenopyrite and chalcopyrite were also observed.

The results of the whole rock and total metals analyses, when evaluated in conjunction with those from the petrographic examination, suggest a number of

things. Firstly, the carbonate observed in this sample was probably magnesium-rich (*e.g.* magnesite), rather than calcium-rich (*e.g.* calcite). Depending on the composition of the ankerite detected in the samples, ankerite could also account for the magnesium-rich carbonate. Chlorite may also be contributing some of the magnesium measured in the sample. Secondly, the higher proportion of aluminum to calcium in this sample relative to the others may be due to the observed presence of sericite (approximately 5% of the sample) and the probable lack of calcium-rich carbonate.

4.3.4.2 Physical Parameters

pH and Conductivity

Figure 4-25 presents the weekly pH and conductivity values measured for the B3 alteration halo sample. The B3 sample had the lowest minimum pH of the three samples at 6.8. The overall range of pH for this sample was 6.8 to 8.6. From Week 11 onwards, the pH steadily increased and over the last five weeks of testing it averaged 8.0.

Conductivity, as with the other samples, had its peak at the start of testing (Weeks 0 and 2; ~ 170 µmhos/cm) and decreased until the end. The average conductivity in the last five weeks of testing was 61 µmhos/cm.

Alkalinity and Acidity Production

The production of alkalinity and acidity generated by the B3 sample are displayed in Figure 4-26. Alkalinity production ranged from 4.7 mg $CaCO_3$/kg/week (Week 0) to 35.9 mg $CaCO_3$/kg/week (Week 16). Alkalinity production quickly decreased from Week 0 to Week 16 and subsequently increased. The average alkalinity production over the last five weeks of testing was 11.3 mg $CaCO_3$/kg/week.

Acidity production from the B3 sample was the highest of all three samples and aside from Week 0, when no acidity was measured, it ranged from 0.2 mg $CaCO_3$/kg/week (Week 13) to 2.5 mg $CaCO_3$/kg/week (Weeks 3 and 4). Acidity production fluctuated widely throughout testing, but averaged 0.7 mg $CaCO_3$/kg/week over the last five weeks of testing.

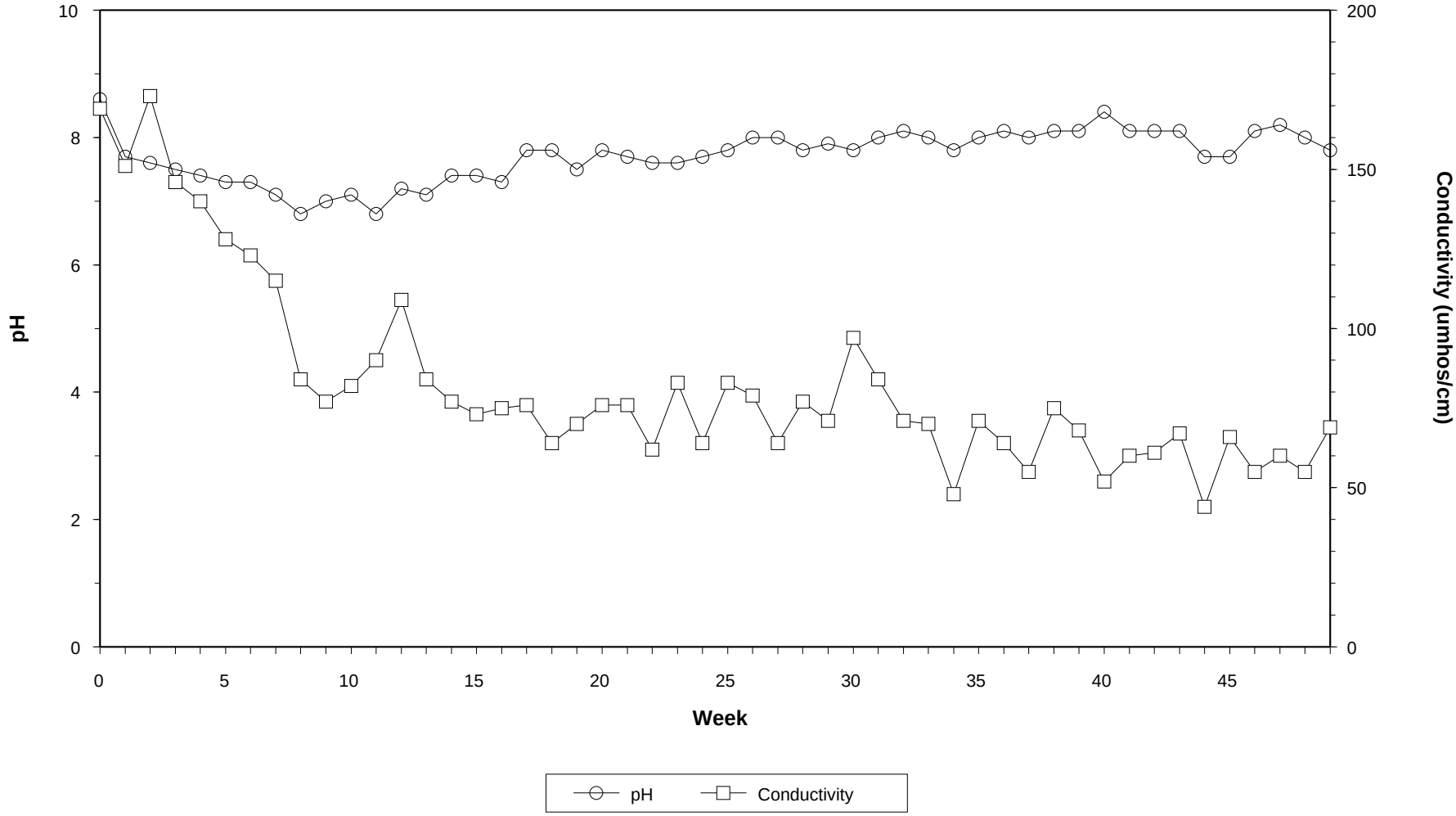


FIGURE 4-25

B3 Alteration Halo: pH and Conductivity vs. Week

Source: Centro de Ecología Aplicada, 1995

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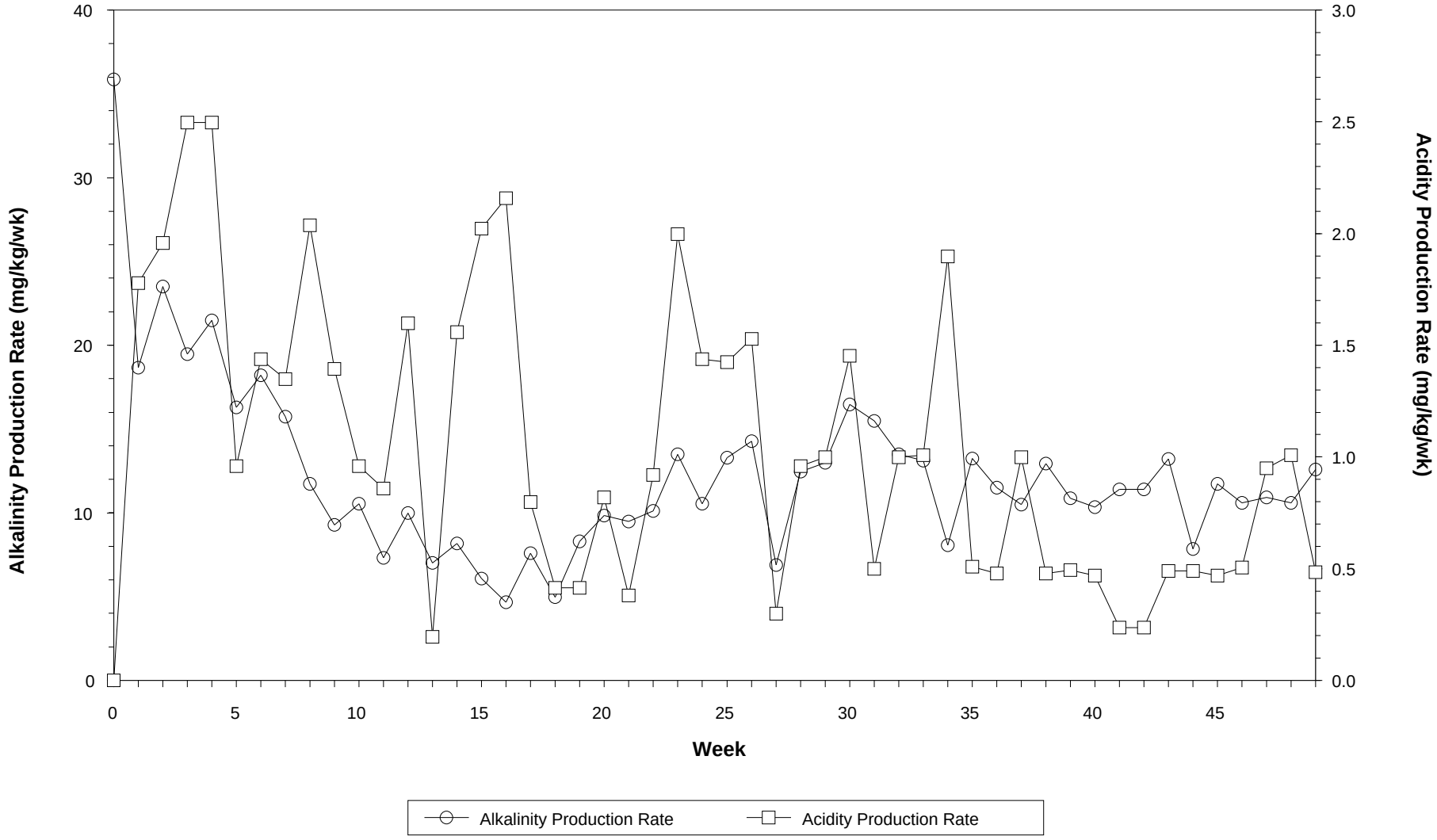

FIGURE 4-26

B3 Alteration Halo: Alkalinity and Acidity Production Rates vs. Week

Source: Centro de Ecología Aplicada, 1995

4.3.4.3 Acid Generating Potential and Neutralization Potential

A plot of pH, sulphate production and carbonate NP consumption over time is presented in Figure 4-27. Carbonate NP consumption was approximately four times greater than sulphate production. Sulphate production ranged from 1.0 to 5.0 mg SO_4/kg/week and NP consumption ranged from 7.4 to 25.6 mg $CaCO_3$/kg/week. Sulphate production averaged 2.6 mg SO_4/kg/week and NP consumption averaged 12.5 mg $CaCO_3$/kg/week during the last five weeks of testing. A drop in leachate pH from Weeks 0 to 8 coincided with a significant increase in NP consumption over the same period. When the pH began to increase (from Week 9 onwards), NP consumption dropped almost in half. Another correlation evident from this figure is that sulphate production and NP consumption mimicked each other. When NP consumption decreased there was a concomitant decrease in sulphate production and vice-versa. This is understandable because sulphate production is representative of sulphide oxidation. When sulphide oxidizes, acid is produced which causes the dissolution of neutralizing minerals (*i.e.* an increase in NP consumption).

The amount of total sulphur and carbonate NP remaining in the sample over time is shown in Figure 4-28. Carbonate NP consumption relative to the amount of carbonate NP in the sample was less than sulphide oxidation relative to the amount of total sulphur in the sample. Thus, proportionally more carbonate NP existed in the sample at the end of testing than total sulphur (99.8% compared to 97.9%).

If the original sample was representative of the B3 alteration halo, then total sulphur will be depleted before carbonate NP and material from this rock unit will probably not generate net acidity.

Projecting the results shown in Figure 4-28 into the future, it can be seen that both total sulphur and sulphide sulphur will be depleted approximately an order of magnitude sooner than the three major types of NP (see Figure 4-29). This suggests that B3 alteration halo material will not become net acid-producing.

Figures 4-30 and 4-31 provide details regarding the dissolution of neutralizing minerals. Unlike the other two samples, the ratio of alkalinity production to sulphate production (Figure 4-30) did not steadily increase throughout testing.

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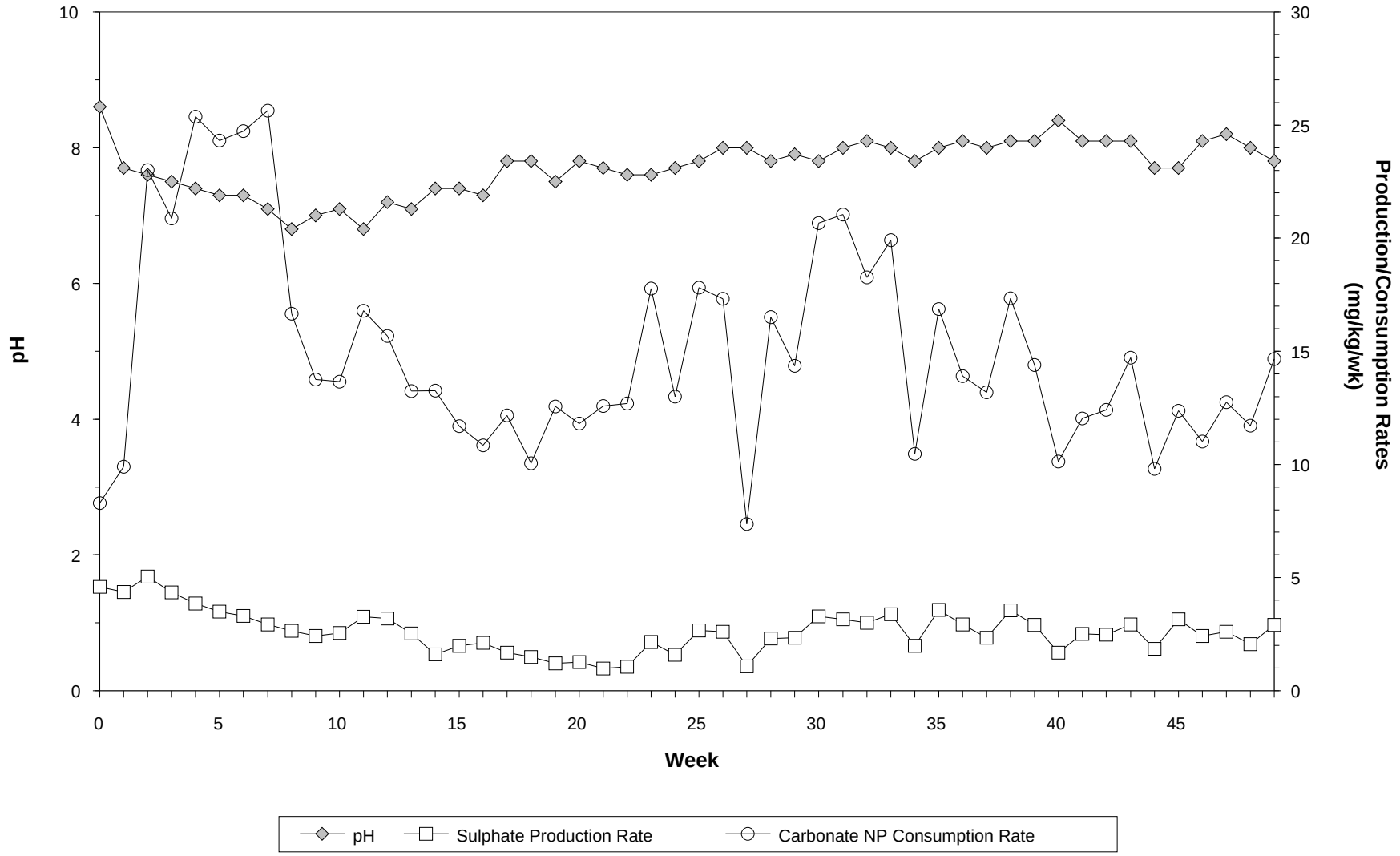

FIGURE 4-27

B3 Alteration Halo:

pH, Sulphate Production and NP Consumption vs. Week

Source: Centro de Ecología Aplicada, 1995

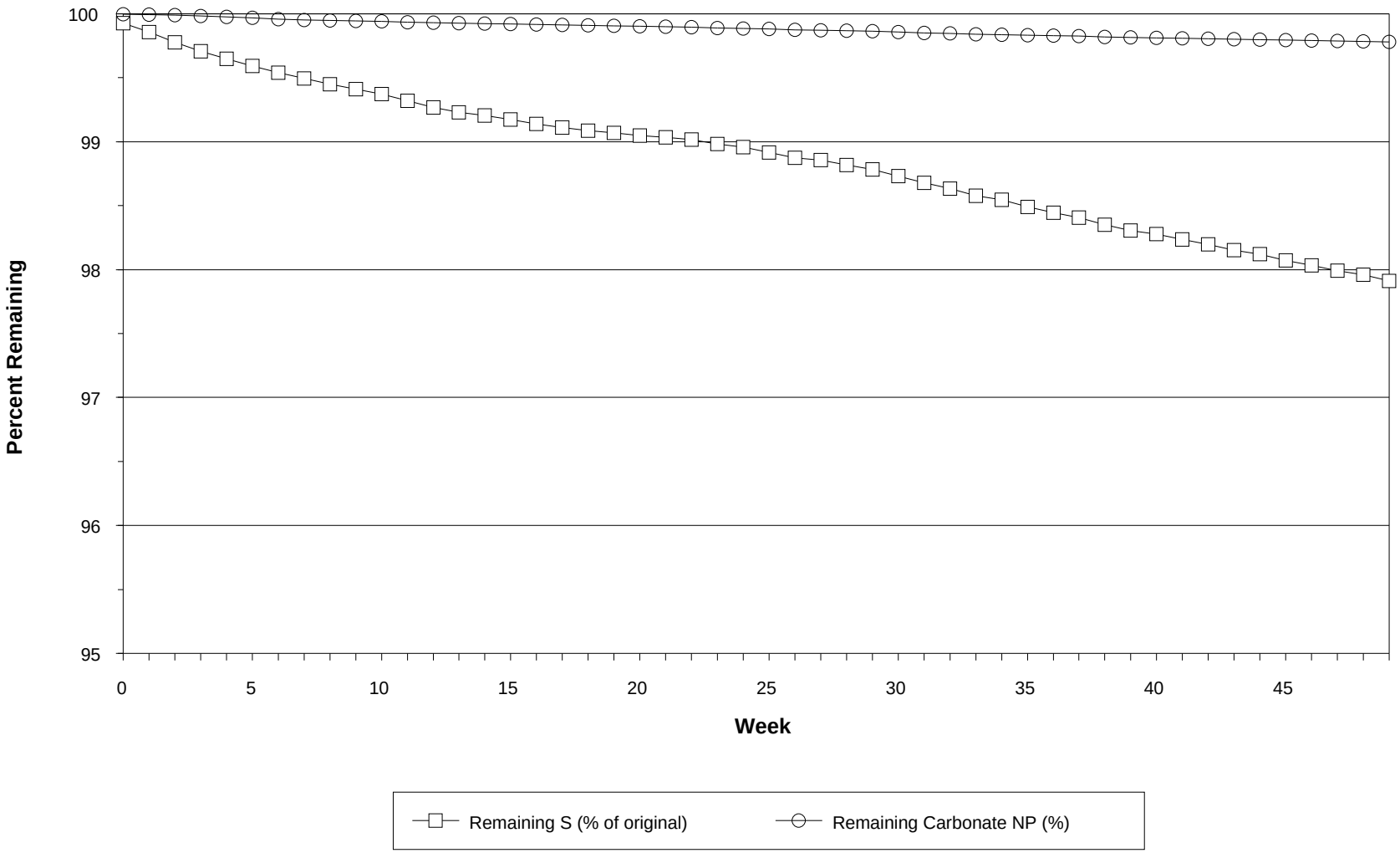

FIGURE 4-28

B3 Alteration Halo:
Remaining S and Remaining Carbonate NP vs. Week

Source: Centro de Ecología Aplicada, 1995

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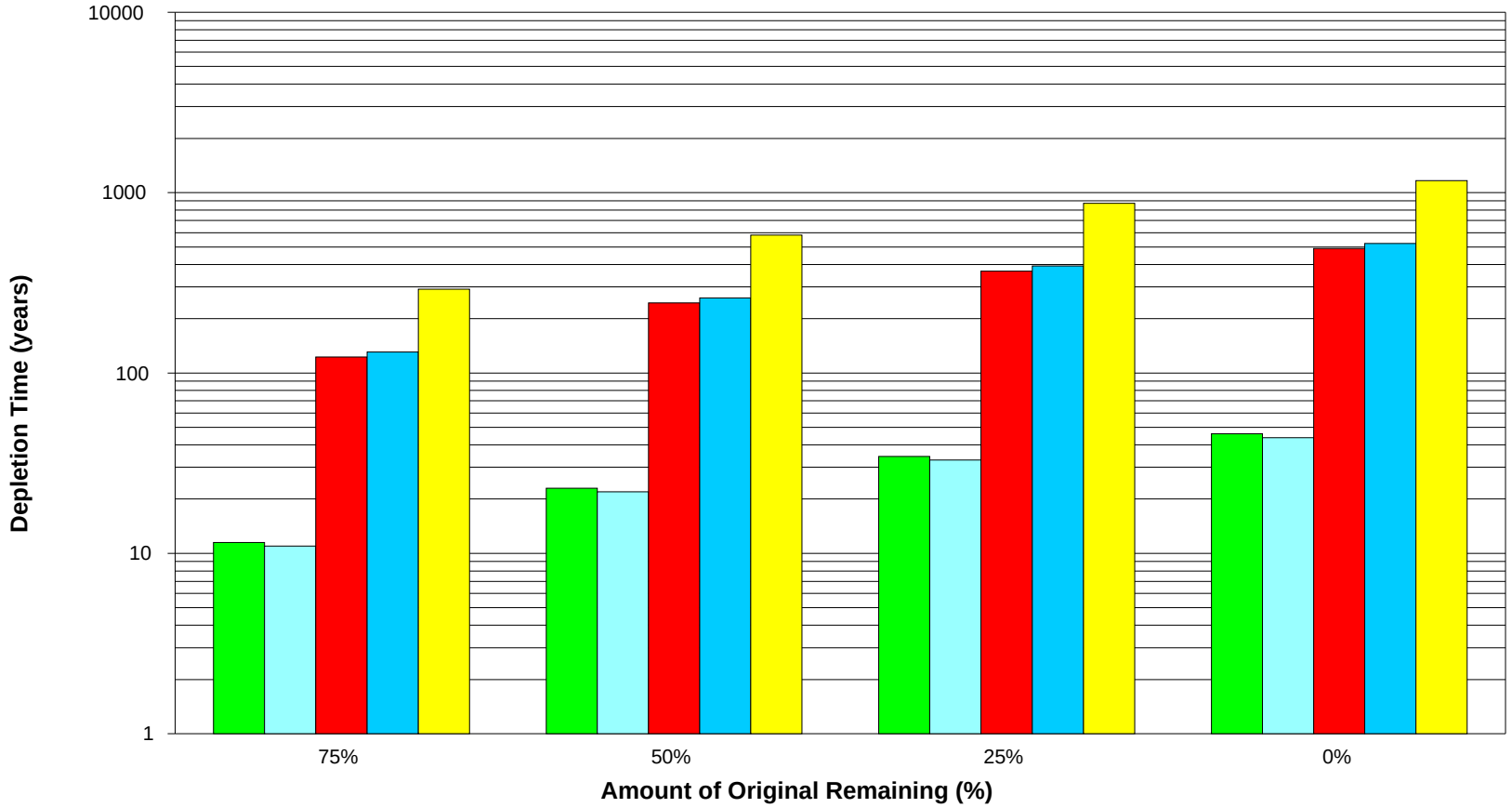

Time to Depletion (years)

Total S	11.5	23.0	34.5	46.0
Sulphide S	11.0	21.9	32.9	43.8
NP : Empirical	123	245	368	490
NP : Carbonate	131	261	392	523
NP : Feldspar	291	582	874	1165

FIGURE 4-29

B3 Alteration Halo: Estimated Depletion Times for Sulphur and NP

Source: Centro de Ecología Aplicada, 1995

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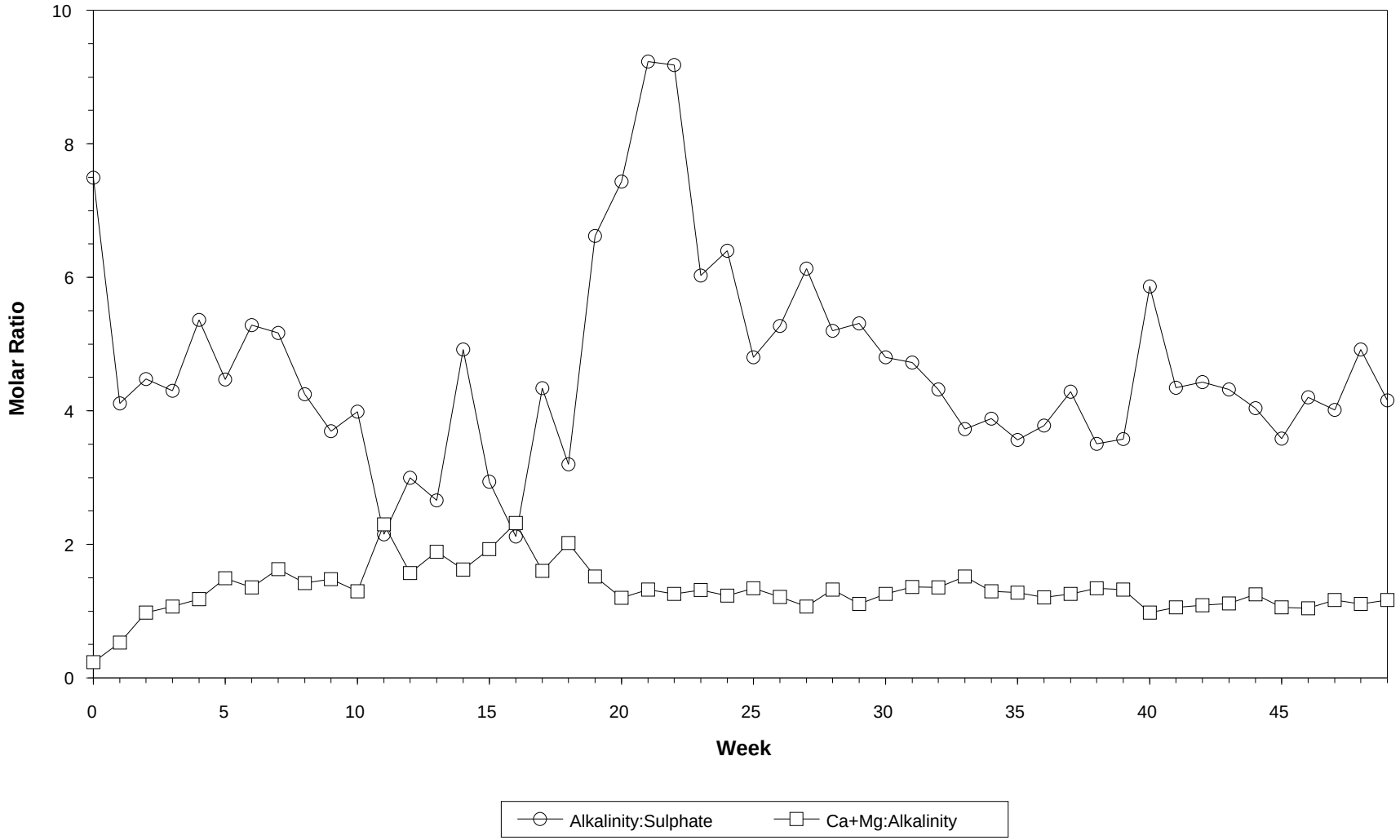

FIGURE 4-30

B3 Alteration Halo: Alkalinity Molar Ratios vs. Week

Source: Centro de Ecología Aplicada, 1995

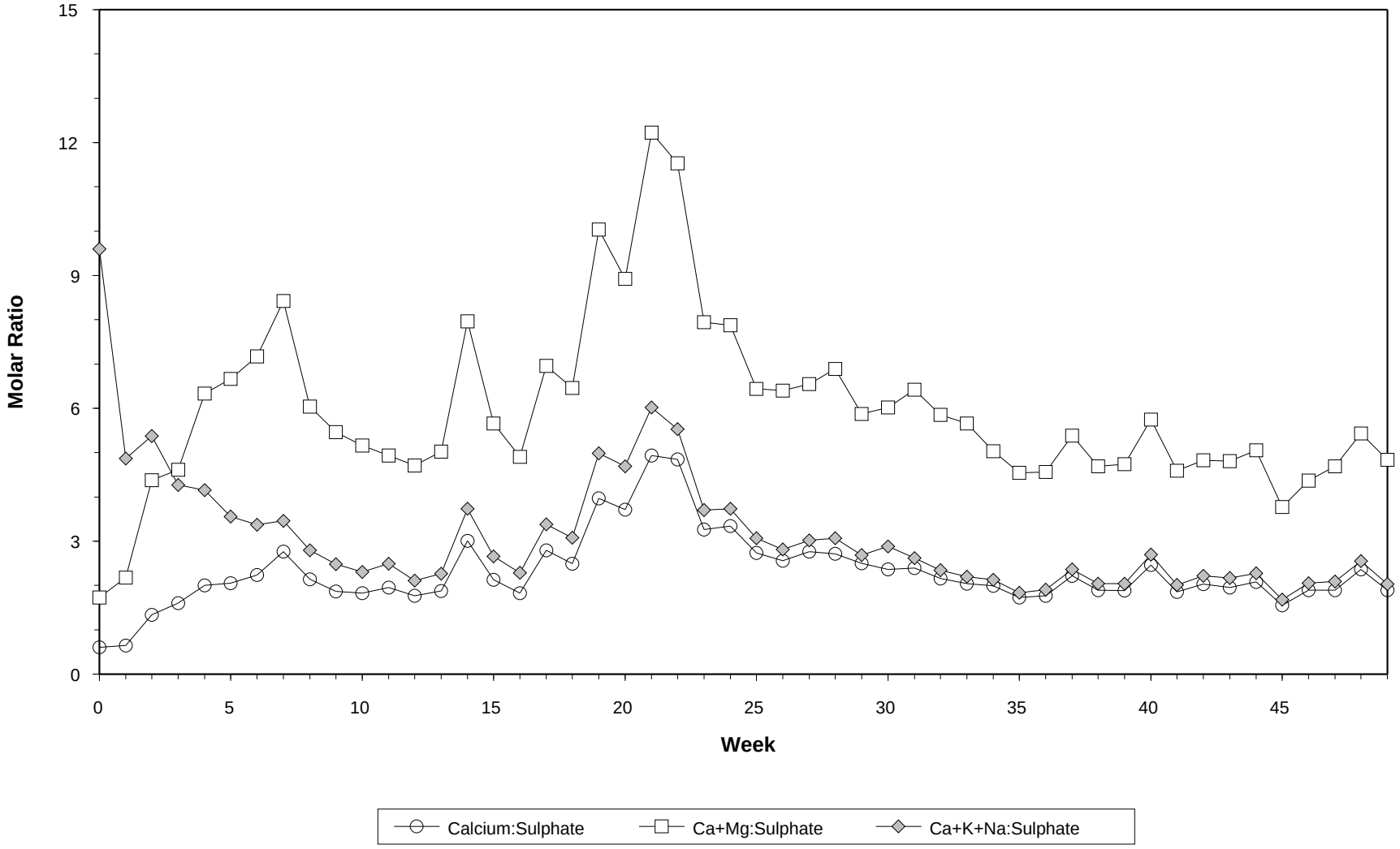

FIGURE 4-31

B3 Alteration Halo: Sulphate Molar Ratios vs. Week

Source: Centro de Ecología Aplicada, 1995

Instead, between Weeks 10 and 18, there was a noticeable drop in the ratio, followed by a significant increase from Weeks 19 to 22. From Weeks 23 to 34, the ratio gradually decreased and then remained relatively stable until the end of testing.

At the same time as the decrease in the alkalinity:sulphate ratio, there was an increase in the Ca+Mg:alkalinity ratio. This indicates that from Weeks 10 to 18, more calcium and magnesium were being released into solution relative to alkalinity being generated. When alkalinity was being generated, however, almost all of it came from the dissolution of calcium- and magnesium-bearing minerals as can be seen in the Ca+Mg:alkalinity ratio which is approximately 1 from Week 20 onwards.

Looking at the molar ratios in Figure 4-31, it can be seen that from Weeks 10 to 18 there was no noticeable increase in calcium- or magnesium-rich mineral dissolution, except in Week 14. This means that less alkalinity was being generated during this period than at other times.

As one can see from Figure 4-31, and as might be expected from the results of sample characterization, magnesium played an important role in the buffering capacity of this sample. In fact, the dissolution of magnesium-bearing minerals supplied almost 1.5 times the neutralization that calcium-bearing minerals provided for the B3 sample. It is also clear from this figure that the dissolution of potassic and sodic minerals had a very minor influence on neutralization, except for the first seven or eight weeks. The “safe” NP:AP ratio for B3 alteration halo material is approximately 5:1.

4.3.4.4 Metal Leaching

Metals that had less than detection limit concentrations in the weekly leachate were excluded from the percent metal remaining calculations. The relevant metals for the B3 alteration halo sample were beryllium, bismuth, cadmium, lead, mercury, phosphorus, selenium, tin, titanium, thallium and uranium.

Figures 4-32 through 4-34 show the amount of metal, as a percent of the original concentration, that remained in the B3 alteration halo sample at the end of testing. By the end of testing, approximately 22.0% of the arsenic had been leached out of

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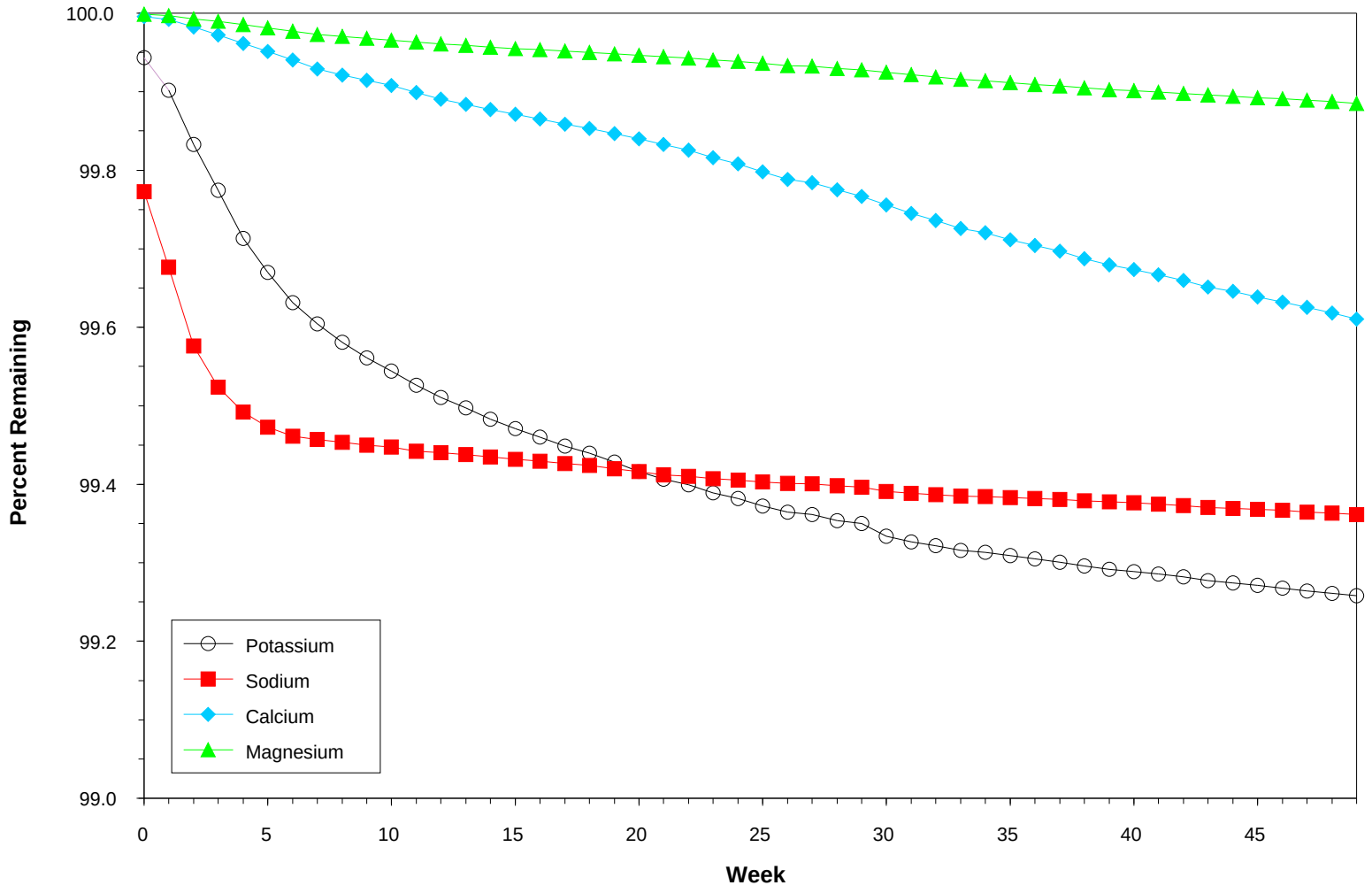

FIGURE 4-32

B3 Alteration Halo: Percent Metal Remaining vs. Week

Source: Centro de Ecología Aplicada, 1995

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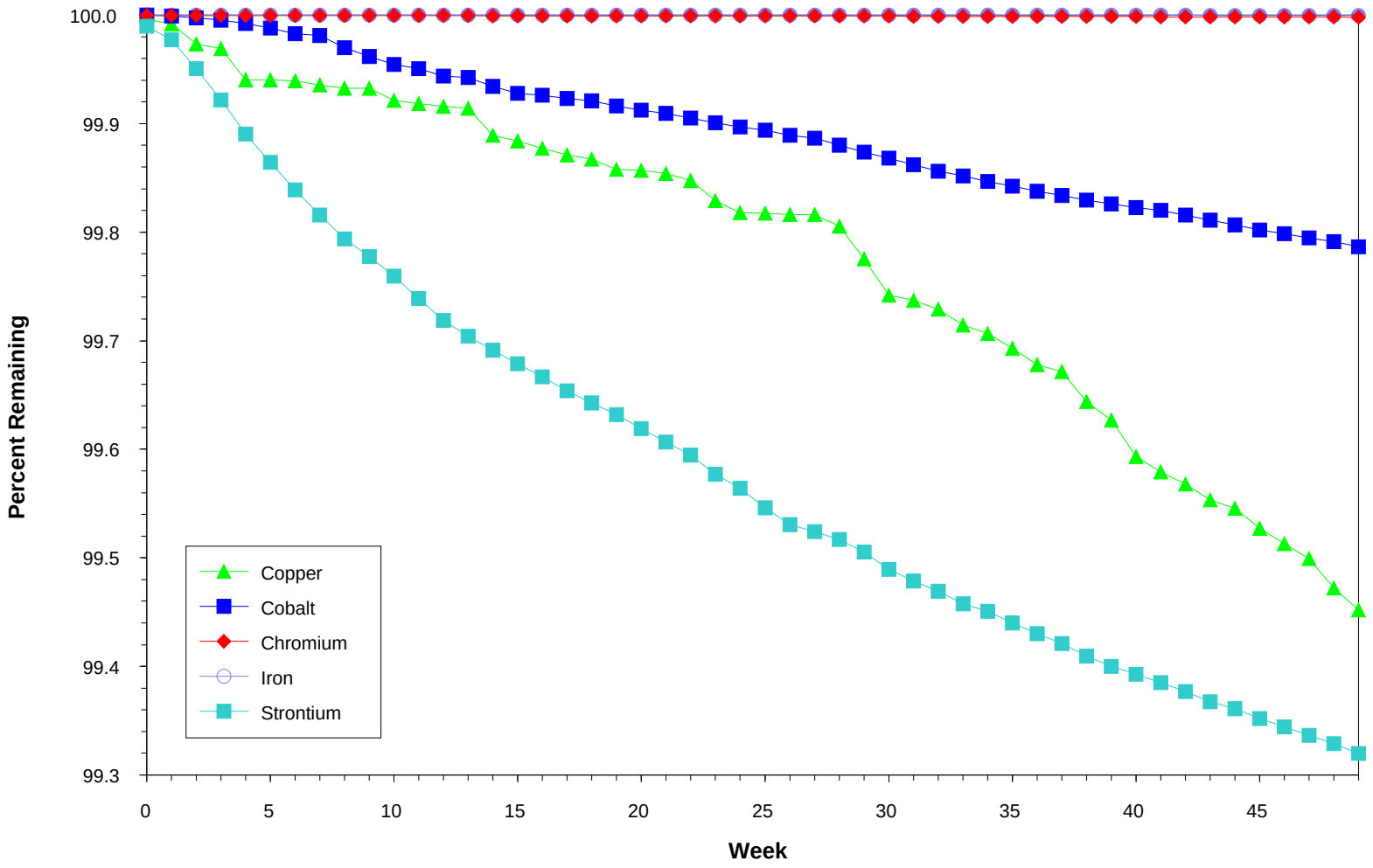

FIGURE 4-33

B3 Alteration Halo: Percent Metal Remaining vs. Week

Source: Centro de Ecología Aplicada, 1995

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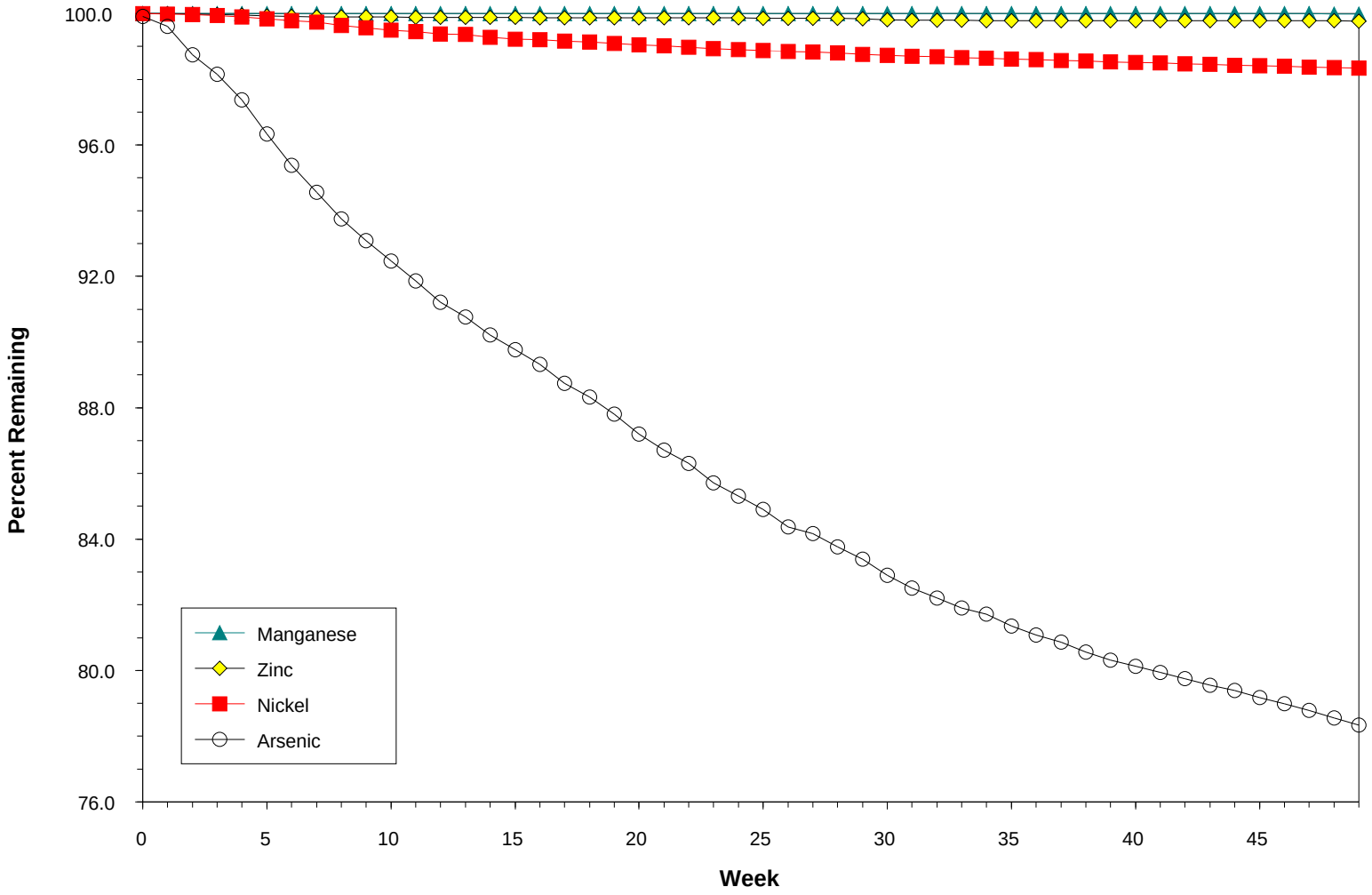

FIGURE 4-34

B3 Alteration Halo: Percent Metal Remaining vs. Week

Source: Centro de Ecología Aplicada, 1995

the B3 alteration halo sample. Nickel also exhibited accelerated leaching compared to the other metals, having lost approximately 1.7% of its original concentration after 49 weeks of testing. At least 99.2% of each of the remaining metals was still present at the end of testing and iron was hardly being leached at all.

The majority of the metals had relatively constant leaching rates, as indicated by the linear plots seen in Figures 4-32 to 4-34. The exceptions to this trend were arsenic, copper, potassium and sodium. Copper displayed a very distinct leaching pattern. Periods of accelerated leaching, lasting two to three weeks, were followed by periods of reduced leaching that lasted from five to ten weeks. This cycle was repeated five or six times over the course of testing, resulting in a step-like progression of the percent copper remaining plot. Arsenic, potassium and sodium, on the other hand, had high leaching rates in the first five to ten weeks of testing followed by slower leaching rates over the last 40 weeks, especially for sodium. The average leaching rate and average concentration in the leachate over the last five weeks of testing for the elements included in Figures 4-32 to 4-34 are summarized in Table 4-3.

Based on their leaching rates and leachate concentrations, the metals of most significance for the B3 alteration halo cell were arsenic, copper and nickel. The average leachate concentrations over the last five weeks of testing for all three of these metals exceeded federal water quality guidelines for the protection of aquatic life. The leachate concentration of chromium was very close to the federal guideline, but did not exceed it.

Figures 4-35 and 4-36 are the predicted depletion times for metals from the B3 alteration halo sample. From Figure 4-35 it can be seen that it will take less than 10 years for arsenic to leach out of B3 alteration halo material (assuming that the calculated leaching rate persists into the future). Copper and nickel are both predicted to take approximately 100 years to become completely leached. Strontium and calcium are predicted to take between 200 and 300 years and the remaining metals will take from 1000 (Mg) to 100,000 years (Fe) to be fully leached out of B3 alteration halo material. Because total sulphur and sulphide sulphur are predicted to become totally depleted within 50 years, no increases in metal leaching for metals such as zinc are expected once the main neutralizing

Table 4-3
Humidity Cell Data from B3 Alteration Halo

Element	Leaching Rate[1] (mg/kg/week)	Leachate Concentration[1] (µg/L)	Water Quality Guidelines[2] (µg/L)
Arsenic	1.61	3296	50.0
Calcium	2.07	4260	-
Chromium	0.001	1.9	2.0
Cobalt	0.003	6.7	50.0[3]
Copper	0.004	9.0	2.0
Iron	0.011	23	300.0
Magnesium	1.78	3660	-
Manganese	0.002	4.6	100-1000[3]
Nickel	0.115	237	65.0
Potassium	0.122	250	-
Sodium	0.126	260	-
Strontium	0.008	17	-
Zinc	0.0004	0.8	30.0

1: values are the average over the last five weeks of testing.
2: values are from the Canadian Water Quality Guidelines for the protection of aquatic life (water with neutral pH, hardness of 60-120 mg $CaCO_3$/L).
3: values are from the British Columbia guidelines for the protection of freshwater aquatic life.

minerals (Ca- and Mg-bearing minerals) become depleted, unless there is an outside source of acidity (*e.g.* surface runoff or groundwater) that could cause metal dissolution. From Figures 4-35 and 4-36 one can see that although calcium is predicted to leach out over approximately the same time period as for B2 mineralized zone material, magnesium will take approximately five times longer. This is probably indicative of differences in the mineralogy and/or lithology of magnesium-bearing minerals present in the two samples.

4.3.4.5 Summary

Based on the kinetic testwork described above, material from the B3 alteration halo is unlikely to generate net acidity. Neutralizing minerals are predicted to last approximately an order-of-magnitude longer than acid-generating minerals, thereby ensuring there will be adequate buffering to maintain a neutral pH in

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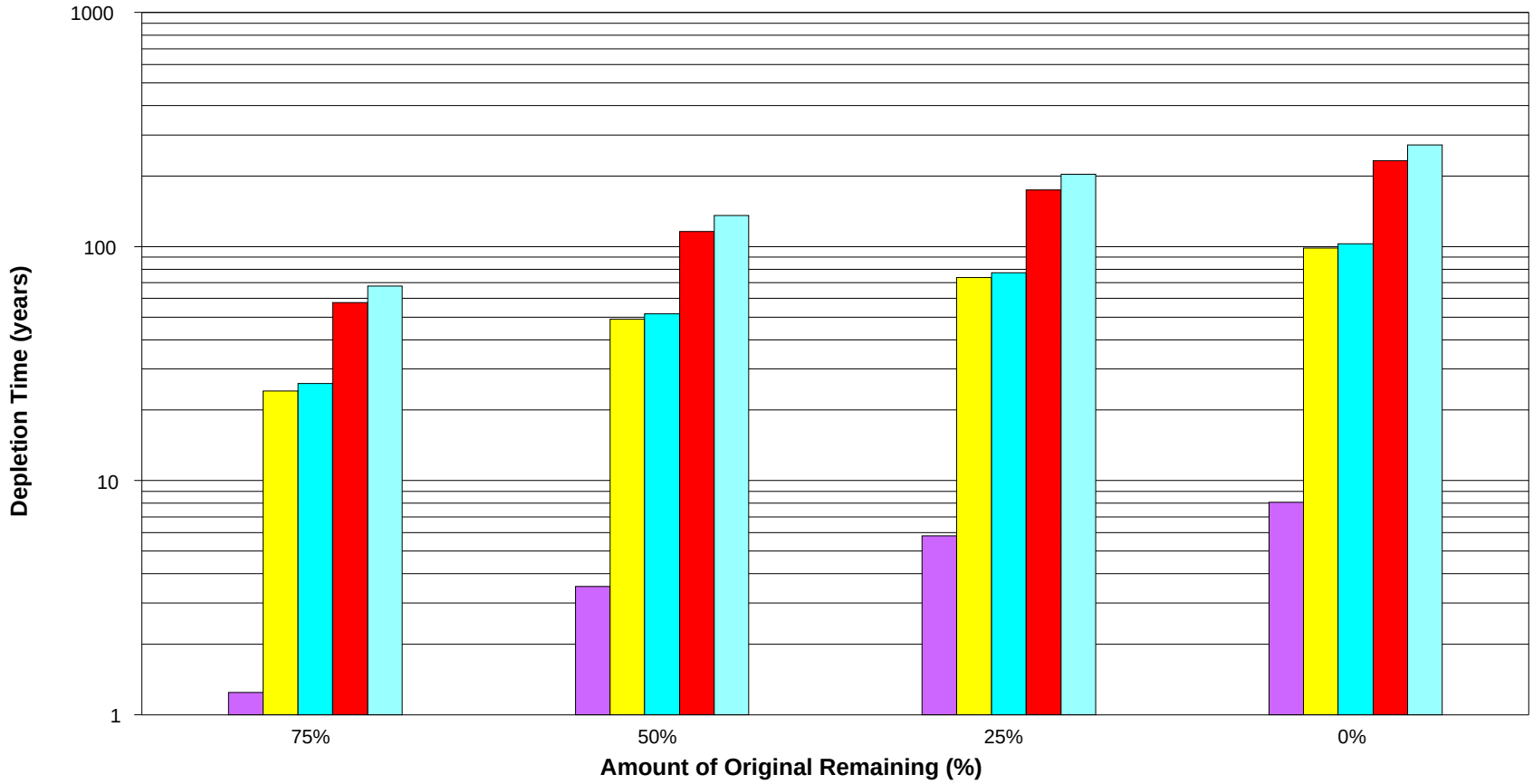

Time to Depletion (years)

Arsenic	1.2	3.5	5.8	8.1
Nickel	24	49	74	98
Copper	26	52	77	103
Strontium	58	116	174	233
Calcium	68	136	203	271

FIGURE 4-35

B3 Alteration Halo: Estimated Depletion Times for Various Metals

Source: Centro de Ecología Aplicada, 1995

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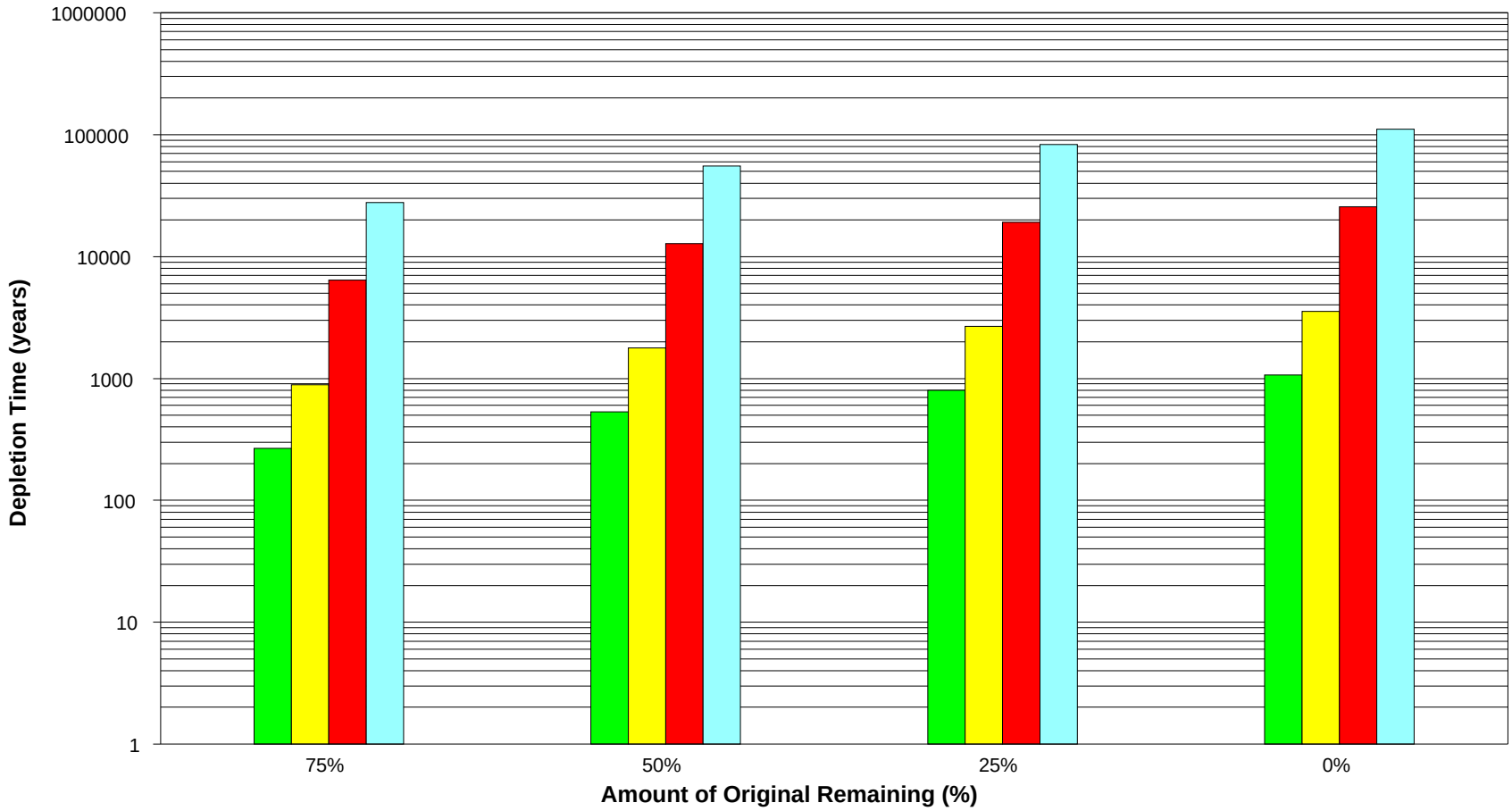

Time to Depletion (years)

Magnesium	267	534	801	1068
Zinc	886	1778	2671	3564
Chromium	6398	12796	19194	25592
Iron	27647	55293	82939	110586

FIGURE 4-36

B3 Alteration Halo: Estimated Depletion Times for Various Metals

Source: Centro de Ecología Aplicada, 1995

seepage produced by this material. Although B3 alteration halo material is not expected to generate net acidity, the leaching rates of arsenic, copper and nickel are predicted to be high enough to affect seepage water quality with respect to federal water quality guidelines.

4.4 Conclusions from Kinetic Prediction Testing

The material from the altered basalt and B3 alteration halo rock units is not expected to generate net acidity in the long-term. However, metal leaching (especially for arsenic, copper and nickel), is relatively high and depending on drainage conditions, seepage from this material may affect water quality before it is fully diluted by receiving waters.

Material from the B2 mineralized zone is predicted to generate net acidity in the long-term. When the neutralizing minerals are finally consumed, or their dissolution rate is no longer high enough to provide sufficient buffering, the leaching of metals from this material can be expected to increase. Test results suggest that even though neutral leachate is likely to be generated by this material for the first few years of exposure, copper leaching may be a concern. When the B2 material starts generating net acidity, leaching of nickel, manganese and zinc might also become significant.

As discussed above in Sections 4.1.1 and 4.1.2, these conclusions are based on the results of laboratory kinetic testwork and are thought to be worst-case conditions. In most cases, it is expected that field rates will actually be lower than those calculated from the testwork. Therefore, the altered basalt and B3 alteration halo material will most likely be non acid-generating and metal leaching may not be a concern. Arsenic, copper and/or nickel leaching may still be significant, however, and seepage from piles containing altered basalt and/or B3 alteration halo material should be monitored for these metals. To be conservative, the B2 mineralized zone material should still be considered as likely to generate net acidity in the long-term and steps should be taken to ensure that acid generation and metal leaching from this material does not affect the receiving environment.

5. Water Quality Prediction

5. WATER QUALITY PREDICTION

This section describes geochemical modelling that was conducted to predict the chemistry of seepage coming from waste rock piles and low grade ore stockpiles and how this seepage may affect receiving waters. Model assumptions are described, input data are presented and predictions are made and discussed.

5.1 Geochemical Modelling

Seepage chemistry was predicted with geochemical models using input data obtained from the kinetic prediction testing described in Section 4.

5.1.1 Models

Metal concentrations and solubilities in seepage coming from waste rock piles and low grade ore stockpiles were predicted using geochemical aqueous equilibrium models. These models, as described by Perkins *et al*. (1997), calculate the equilibria among the aqueous species of solutions. The input parameters (water chemistry, temperature, pressure) are used to estimate activities and concentrations of important aqueous species and to calculate saturation indices for different minerals.

The two models that were employed were MINTEQA2 (Version 3.11), a metal speciation equilibrium model for surface and groundwater developed by the U.S. EPA (Allison *et al*., 1991) and PHREEQC, a geochemical ion-association computer program (Charlton *et al*., 1997; Parkhurst, 1995).

The predictive ability of both models is limited primarily to the identification of species and estimates of maximum concentration and maximum load. Estimates of duration, concentration versus time or decommissioning options are not possible with these models. The primary limitation of MINTEQA2 in particular, as outlined by Day *et al*. (1996), is that it is assumed equilibrium is attained. No allowance is made for reaction kinetics which may prevent the formation of dissolved species and solids. Another limitation is that neither model contains all of the parameters that were measured in the weekly leachate (*e.g.* arsenic). All parameters for which there were data are included in each of the models.

5.1.1.1 MINTEQA2

MINTEQA2 is a geochemical model that can calculate equilibrium aqueous speciation, adsorption, gas-phase partitioning, solid-phase saturation states and metal precipitation-dissolution. Chemical information, specifically total dissolved metal concentrations and physical parameters, is inputted and from this information, the model can calculate equilibrium composition or mass distribution between phases.

The values that were used in the MINTEQA2 modelling are presented in Table 5-1. The values presented are the average values measured in the leachate over the last five weeks of kinetic testing. These values were inputted into the model and MINTEQA2 predicted what minerals might precipitate out and thus control the aqueous concentration of a particular metal. It should be pointed out that MINTEQA2 only incorporates chemical information into the model and does not take into account physical parameters, such as the mass of rock or seepage rates. This means that the predicted concentrations are based solely on chemical equilibria.

5.1.1.2 PHREEQC

PHREEQC is based on an ion-association aqueous model and can perform several types of geochemical modelling including speciation, inverse, reaction-path and 1-D advective reaction-transport modeling. Data are entered through a series of keyword data blocks which are used to define the data needed for each type of calculation.

The input data that were used in the PHREEQC modelling are summarized in Table 5-2 and represent average values over the last five weeks of testing. For those parameters that had concentrations less than the detection limit, one half of the detection limit was used in the model.

Parameter concentrations were predicted for various mixtures of the different seepages. Each type of predicted seepage was combined with rain water and the resulting solution was then combined with typical water from Spyder and Stickleback lakes at different dilution ratios (1:1; 1:1,000; 1:1,000,000). In addition, predicted seepages from B2 mineralized zone and B3 alteration halo

Table 5-1
Selected Parameters for MINTEQA2 Modelling

Parameter (mg/L)	Altered Basalt	B2 Mineralized Zone	B3 Alteration Halo
pH	8.55	8.50	8.00
Sulphate	1.680	3.86	5.42
Alkalinity (as $CaCO_3$)	15.89	20.53	13.91
Aluminum	0.095	0.086	0.0018
Barium	0.004	0.0009	0.001
Calcium	6.103	9.290	4.260
Chromium (as CrO_4^{2-})	0.0015	0.0014	-
Copper	0.006	0.0111	0.0075
Iron	0.019	0.0184	-
Magnesium	2.620	3.010	3.66
Manganese	0.010	0.0036	0.0045
Nickel	0.006	0.0012	0.237
Potassium	0.151	0.0284	0.250
Sodium	0.424	0.415	0.260
Strontium	0.0165	0.0136	0.0165
Zinc	0.0011	0.0008	0.00075

Note: all units are mg/L with the exception of pH.
values are average of last 5 weeks of kinetic testing.

material were combined and the predicted composite seepage was then mixed with rain water and typical water from Spyder and Stickleback lakes. The water quality data for Spyder and Stickleback lakes were obtained from information presented in the 1997 Environmental Data Report (Rescan, 1998).

5.1.2 Model Assumptions

The leaching rates used in the predictions were obtained from the results of kinetic testing on only one sample for each rock type. In order to extrapolate these

Table 5-2
Selected Parameters for PHREEQC Modelling[1]

Parameter	Altered Basalt	B2 Mineralized Zone	B3 Alteration Halo	Spyder Lake	Stickleback Lake
Physical					
Temperature (ºC)	4.0	4.0	4.0	4.0	4.0
pH	8.55	8.46	7.96	6.40	7.14
pe[2]	4.0	4.0	4.0	4.0	4.0
Dissolved Anions (µg/L)					
Alkalinity (as $CaCO_3$)	26000	34000	23200	7000	30330
Chloride	-	-	-	6940	38433
Fluoride	-	-	-	46	7.67
Sulphate	1680	3860	5420	1200	500
Dissolved Nutrients (µg/L)					
Ammonium	-	-	-	5.0	9.0
Nitrate	-	-	-	1.4	2.67
Nitrite	-	-	-	1.1	0.5
Silicate	-	-	-	52.2	548
Dissolved Metals (µg/L)					
Aluminum	95.34	86.1	12.8	19.4	2.5
Barium	3.74	0.89	1.36	5.0	5.0
Boron	-	-	-	50	50
Cadmium	0.05	0.05	0.025	0.10	0.10
Calcium	6103	9290	4260	2024	13967
Copper	6.0	11.12	9.04	1.0	0.5
Iron	19.0	18.37	23.0	60	5.0
Lead	1.4	1.2	1.0	0.5	0.5
Magnesium	2619	3007	3660	1186	4890
Manganese	10.34	35.53	4.55	2.5	2.5
Phosphorus	50	50	50	150	150
Potassium	151	284	250	574	1443
Sodium	424	415	260	3426	10900
Strontium	16.54	13.63	16.51	15.6	90
Zinc	1.11	0.81	0.75	2.5	2.5

1: for concentrations reported as less than detection limit, one half the detection limit was used.

2: pe is a measure of the redox potential of a solution and is expressed as – log [e^-], where [e^-] is the "activity" of electrons. At 25ºC, pe = *Eh*/0.059, where *Eh* is the redox potential expressed in volts, measured with an platinum/reference electrode. At a neutral pH, solutions with a low pe (lower than -10) are highly reducing and have a low potential for oxidation, whereas solutions with a high pe (higher than +10) are highly oxidizing and have a high potential for oxidation.

predictions to the entire rock type, one must assume that the sample was representative (physically, chemically and mineralogically) of the rock unit as a whole.

Other assumptions made regarding the information used in the predictions were that laboratory leaching rates were representative of field leaching rates (see Section 4.2.1); and leaching rates did not change over time. By incorporating these assumptions, the predicted concentrations should represent the worst-case scenarios for seepage quality from waste rock piles and low grade ore stockpiles.

5.2 Results and Discussion

5.2.1 Geochemical Modelling

5.2.1.1 MINTEQA2

The output files from the MINTEQA2 model are presented in Appendix E-1. Only those sections of the output file that are relevant to water quality prediction were included in the appendix. The results of the modelling indicate that a number of minerals would precipitate out of solution, including diaspore ($\alpha AlO(OH)$), hematite (Fe_2O_3) and threophrastite ($Ni(OH)_2$), depending on which sample was being examined. The precipitation of these minerals would be expected to control the aqueous concentrations of aluminum, iron and nickel, respectively.

5.2.1.2 PHREEQC

The output files generated by the PHREEQC model are included in Appendix E-2. As with the MINTEQA2 files, the output files in Appendix E-2 contain only those sections relevant to water quality prediction. The concentrations predicted by PHREEQC for the different solution mixtures are presented in Tables 5-3a to 5-3d. Only those parameters that were shared by both the weekly kinetic test leachate and the lakes and contained within PHREEQC's database are included in the tables.

The aqueous concentrations of metals in the seepages will be limited by the precipitation of various minerals. As predicted by MINTEQA2, PHREEQC

Table 5-3a
Predicted Values from PHREEQC Model
(Altered Basalt)

Parameter	Predicted Seepage	Mixed with rain water	Seepage and rain water mixed with Spyder Lake at various ratios			Seepage and rain water mixed with Stickleback Lake at various ratios		
		(1:1)	1:1	1:1,000	1:1,000,000	1:1	1:1,000	1:1,000,000
Physical								
pH	8.55	7.87	6.83	6.40	6.40	7.27	7.14	7.14
pe	4.0	9.81	-1.91	-1.57	-1.56	-2.74	-2.67	-2.67
Dissolved Anions (µg/L)								
Alkalinity (as $CaCO_3$)	26000	12991	9994	7001	6996	21664	30311	30326
Sulphate	1680	840	1020	1200	1200	670	500	500
Dissolved Metals (µg/L)								
Aluminum	95.34	47.67	33.54	19.43	19.40	25.09	2.55	2.50
Barium	3.74	1.87	3.43	5.00	5.00	3.43	5.00	5.00
Cadmium	0.05	0.03	0.06	0.10	0.10	0.06	0.10	0.10
Calcium	6103	3052	2538	2025	2024	8509	13955	13967
Copper	6.0	3.0	2.00	1.00	1.00	1.75	0.50	0.50
Iron	19.0	9.5	34.75	59.92	59.98	7.25	5.01	5.00
Lead	1.4	0.7	0.60	0.50	0.50	0.6	0.50	0.50
Magnesium	2619	1309	1247	1186	1186	3099	4885	4890
Manganese	10.34	5.17	3.84	2.50	2.50	3.84	2.50	2.50
Phosphorus	50	25	87.50	150	150	87.50	150	150
Potassium	151	76	325	574	574	759	1442	1443
Sodium	424	212	1819	3423	3426	5557	10890	10902
Zinc	1.11	0.56	1.53	2.50	2.50	1.53	2.50	2.50

Table 5-3b
Predicted Values from PHREEQC Model
(B2 Mineralized Zone)

Parameter	Predicted Seepage	Mixed with rain water	Seepage and rain water mixed with Spyder Lake at various ratios			Seepage and rain water mixed with Stickleback Lake at various ratios		
		(1:1)	1:1	1:1,000	1:1,000,000	1:1	1:1,000	1:1,000,000
Physical								
pH	8.46	7.94	6.90	6.40	6.40	7.30	7.14	7.14
pe	4.0	9.91	-1.94	-1.57	-1.56	-2.77	-2.67	-2.67
Dissolved Anions (µg/L)								
Alkalinity (as $CaCO_3$)	34000	16995	11995	7006	6996	23660	30316	30326
Sulphate	3860	1930	1565	1201	1200	1215	501	500
Dissolved Metals (µg/L)								
Aluminum	86.10	43.06	31.22	19.42	19.40	22.78	2.54	2.50
Barium	0.89	0.44	2.72	4.99	5.00	2.72	5.00	5.00
Cadmium	0.05	0.03	0.06	0.10	0.10	0.06	0.10	0.10
Calcium	9290	4645	3334	2027	2024	9306	13959	13967
Copper	11.12	5.56	3.28	1.00	1.00	3.03	0.51	0.50
Iron	18.37	9.19	34.59	59.92	59.98	7.09	5.00	5.00
Lead	1.20	0.60	0.55	0.50	0.50	0.55	0.50	0.50
Magnesium	3007	1503	1344	1186	1186	3196	4885	4890
Manganese	35.53	17.77	10.13	2.52	2.50	10.13	2.52	2.50
Phosphorus	50.00	25.00	87.50	150	150	87.50	150	150
Potassium	284	142	358	574	574	793	1442	1443
Sodium	415	208	1817	3423	3426	5554	10890	10902
Zinc	0.81	0.41	1.45	2.50	2.50	1.45	2.50	2.50

Table 5-3c
Predicted Values from PHREEQC Model
(B3 Alteration Halo)

Parameter	Predicted Seepage	Mixed with rain water	Seepage and rain water mixed with Spyder Lake at various ratios			Seepage and rain water mixed with Stickleback Lake at various ratios		
		(1:1)	1:1	1:1,000	1:1,000,000	1:1	1:1,000	1:1,000,000
Physical								
pH	7.96	7.59	6.78	6.40	6.40	7.23	7.14	7.14
pe	4.0	10.86	-1.71	-1.56	-1.56	-2.67	-2.67	-2.67
Dissolved Anions (µg/L)								
Alkalinity (as $CaCO_3$)	23200	11585	9293	7001	6996	20958	30311	30326
Sulphate	5420	2710	1955	1202	1200	1605	502	500
Dissolved Metals (µg/L)								
Aluminum	12.80	6.40	12.90	19.39	19.40	4.45	2.50	2.50
Barium	1.36	0.68	2.84	5.00	5.00	2.84	5.00	5.00
Cadmium	0.025	0.01	0.06	0.10	0.10	0.06	0.10	0.10
Calcium	4260	2130	2077	2024	2024	8048	13955	13967
Copper	9.04	4.52	2.76	1.00	1.00	2.51	0.50	0.50
Iron	23	11.50	35.75	59.98	59.98	8.25	5.01	5.00
Lead	1.0	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Magnesium	3660	1829	1508	1186	1186	3359	4885	4890
Manganese	4.55	2.27	2.39	2.50	2.50	2.39	2.50	2.50
Phosphorus	50.00	25.00	87.50	150	150	87.50	150	150
Potassium	250	125	349	574	574	784	1442	1443
Sodium	260	130	1778	3423	3426	5515	10890	10902
Zinc	0.75	0.38	1.44	2.50	2.50	1.44	2.50	2.50

Table 5-3d
Predicted Values from PHREEQC Model
(B2 Mineralized Zone and B3 Alteration Halo)

Parameter	Predicted Combined Seepage	Mixed with rain water (1:1)	Seepage and rain water mixed with Spyder Lake at various ratios 1:1	1:1,000	1:1,000,000	Seepage and rain water mixed with Stickleback Lake at various ratios 1:1	1:1,000	1:1,000,000
Physical								
pH	8.22	7.76	6.84	6.40	6.40	7.27	7.14	7.14
pe	9.24	10.23	-1.84	-1.57	-1.56	-2.72	-2.67	-2.67
Dissolved Anions (µg/L)								
Alkalinity (as $CaCO_3$)	28605	14292	10644	7006	6996	22309	30311	30326
Sulphate	4640	2320	1760	1201	1200	1410	502	500
Dissolved Metals (µg/L)								
Aluminum	49.46	24.73	22.06	19.41	19.40	13.61	2.52	2.50
Barium	1.12	0.56	2.78	4.99	5.00	2.78	5.00	5.00
Cadmium	0.04	0.02	0.06	0.10	0.10	0.06	0.10	0.10
Calcium	6773	3387	2706	2025	2024	8677	13955	13967
Copper	10.08	5.04	3.02	1.00	1.00	2.77	0.50	0.50
Iron	20.69	10.34	35.17	59.92	59.98	7.67	5.01	5.00
Lead	1.20	0.60	0.55	0.50	0.50	0.55	0.50	0.50
Magnesium	3332	1666	1426	1186	1186	3279	4885	4890
Manganese	20.04	10.02	6.26	2.51	2.50	6.26	2.51	2.50
Phosphorus	49.99	25.00	87.50	150	150	87.50	150	150
Potassium	267	133	354	574	574	788	1442	1443
Sodium	337	169	1797	3423	3426	5536	10890	10902
Zinc	0.78	0.39	1.45	2.50	2.50	1.45	2.50	2.50

predicted that the aqueous concentration of iron will likely be controlled by the precipitation of hematite (Fe_2O_3). However, PHREEQC predicted that iron could also be controlled by goethite (FeOOH) and $Fe(OH)_3$. Furthermore, whereas MINTEQA2 predicted that aluminum would be controlled by the precipitation of diaspore (αAlO(OH)), PHREEQC predicted that aluminum would be controlled by the precipitation of gibbsite ($Al(OH)_3$). The discrepancies between the two models with respect to which minerals are predicted to precipitate are most likely due to differences in the parameters that were included in the input data.

From Tables 5-3a to 5-3d it is apparent that mixing the predicted seepages at a 1:1 ratio with rain water reduces the concentrations of the different parameters, with the exceptions of pH and pe values, by half. Furthermore, by comparing Table 5-2 with Tables 5-3a to 5-3d, it is evident that water quality in the lakes might be affected at a 1:1 dilution with the predicted seepage, but by the time dilution reaches 1:1,000 there would be no significant difference in lake water quality. A 1:1 dilution might be expected in the immediate vicinity where seepage enters the lake. Within a very short distance from the point of entry, however, dilution would be high enough such that aqueous concentrations should be virtually identical to background levels.

5.2.2 Predicted Water Quality

The concentrations predicted by PHREEQC are compared to the background water chemistry of Spyder and Stickleback lakes and the Canadian Water Quality Guidelines (CCREM, 1993) in Tables 5-4a to 5-4d. Only those parameters which were used in the model and have water quality criteria have been compared. The copper guideline is exceeded by both the undiluted predicted seepages and the predicted seepages mixed with rain water at a ratio of 1:1. A mixing ratio of 1:6 (seepage to rain water) would be needed to produce copper concentrations that do not exceed guideline values. Such a low dilution ratio should be possible in the field when seepage mixes with surface runoff. When the predicted seepage and rain water are mixed with lake water at a ratio of 1:1,000, the resulting water chemistry is essentially the same as background concentrations. The overall change in concentration for each parameter is less than two percent of the background concentration. At a mixing ratio of 1:1,000,000 (seepage and rain

◎ Table of Contents

Table 5-4a
Comparison of Predicted Water Quality to Water Quality Criteria
(Altered Basalt)

Parameter	Predicted Seepage	Spyder Lake (background)	Stickleback Lake (background)	Predicted Seepage + rainwater (1:1)	Predicted Seepage + Spyder (1:1000)	Predicted Seepage + Stickleback (1:1000)	Water Quality Guidelines[1]
Physical							
pH	8.55	6.40	7.14	7.87	6.40	7.14	6.5 - 9.0
Dissolved Metals (µg/L)							
Aluminum	95.34	19.40	2.50	47.67	19.43	2.55	100
Cadmium	0.05	0.10	0.10	0.03	0.10	0.10	0.8
Copper	6.00	1.00	0.50	3.00	1.00	0.50	2.0
Iron	19.00	60.00	5.00	9.50	59.92	5.01	300
Lead	1.40	0.50	0.50	0.70	0.50	0.50	2.0
Zinc	1.11	2.50	2.50	0.56	2.50	2.50	30.0

1: values are the Canadian Water Quality Guidelines for protection of freshwater aquatic life (pH > 6.5, hardness = 60-120 mg/L $CaCO_3$).

Table 5-4b
Comparison of Predicted Water Quality to Water Quality Criteria
(B2 Mineralized Zone)

Parameter	Predicted Seepage	Spyder Lake (background)	Stickleback Lake (background)	Predicted Seepage + rainwater (1:1)	Predicted Seepage + Spyder (1:1000)	Predicted Seepage + Stickleback (1:1000)	Water Quality Guidelines[1]
Physical							
pH	8.46	6.40	7.14	7.94	6.40	7.14	6.5 - 9.0
Dissolved Metals (µg/L)							
Aluminum	86.10	19.40	2.50	43.06	19.42	2.54	100
Cadmium	0.05	0.10	0.10	0.03	0.10	0.10	0.8
Copper	11.12	1.00	0.50	5.56	1.00	0.51	2.0
Iron	18.37	60.00	5.00	9.19	59.92	5.00	300
Lead	1.20	0.50	0.50	0.60	0.50	0.50	2.0
Zinc	0.81	2.50	2.50	0.41	2.50	2.50	30.0

1: values are the Canadian Water Quality Guidelines for protection of freshwater aquatic life (pH > 6.5, hardness = 60-120 mg/L $CaCO_3$).

Table 5-4c
Comparison of Predicted Water Quality to Water Quality Criteria
(B3 Alteration Halo)

Parameter	Predicted Seepage	Spyder Lake (background)	Stickleback Lake (background)	Predicted Seepage			Water Quality Guidelines[1]
				+ rainwater (1:1)	+ Spyder (1:1000)	+ Stickleback (1:1000)	
Physical							
pH	7.96	6.40	7.14	7.59	6.40	7.14	6.5 - 9.0
Dissolved Metals (µg/L)							
Aluminum	12.80	19.40	2.50	6.40	19.39	2.50	100
Cadmium	0.025	0.10	0.10	0.01	0.10	0.10	0.8
Copper	9.04	1.00	0.50	4.52	1.00	0.50	2.0
Iron	23	60.00	5.00	11.50	59.98	5.01	300
Lead	1.0	0.50	0.50	0.50	0.50	0.50	2.0
Zinc	0.75	2.50	2.50	0.38	2.50	2.50	30.0

1: values are the Canadian Water Quality Guidelines for protection of freshwater aquatic life (pH > 6.5, hardness = 60-120 mg/L $CaCO_3$).

Table 5-4d
Comparison of Predicted Water Quality to Water Quality Criteria
(B2 Mineralized Zone + B3 Alteration Halo)

Parameter	Predicted Seepage	Spyder Lake (background)	Stickleback Lake (background)	Predicted Seepage			Water Quality Guidelines[1]
				+ rainwater (1:1)	+ Spyder (1:1000)	+ Stickleback (1:1000)	
Physical							
pH	8.22	6.40	7.14	7.76	6.40	7.14	6.5 - 9.0
Dissolved Metals (µg/L)							
Aluminum	49.46	19.40	2.50	24.73	19.41	2.52	100
Cadmium	0.04	0.10	0.10	0.02	0.10	0.10	0.8
Copper	10.08	1.00	0.50	5.04	1.00	0.50	2.0
Iron	20.69	60.00	5.00	10.34	59.92	5.01	300
Lead	1.20	0.50	0.50	0.60	0.50	0.50	2.0
Zinc	0.78	2.50	2.50	0.39	2.50	2.50	30.0

[1]: values are the Canadian Water Quality Guidelines for protection of freshwater aquatic life (pH > 6.5, hardness = 60-120 mg/L $CaCO_3$).

water + lake water), the concentrations of the different parameters are indistinguishable from background concentrations (see Tables 5-3a to 5-3d).

5.2.3 Bulk Sample Piles

Water quality samples were collected in July, 1998 from ponded surface water located in and around bulk sample piles at the Boston camp. The concentrations of selected parameters are summarized in Table 5-5 and compared to federal water quality guidelines where applicable.

Table 5-5
Chemistry of Water Samples Collected Near Bulk Sample Piles

Parameter (mg/L)	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Water Quality Guidelines[1]
Physical						
pH	7.49	7.58	-	-	-	6.5 - 9.0
Dissolved Anions						
Sulphate	451	382	-	-	-	-
Dissolved Metals						
Aluminum	<0.2	<0.2	<0.2	<0.2	<0.2	0.100
Arsenic	0.5	0.5	2.1	0.9	0.9	0.05
Cadmium	<0.01	<0.01	<0.01	<0.01	<0.01	0.0008
Calcium	258	266	343	162	124	-
Chromium	<0.01	<0.01	<0.01	<0.01	<0.01	0.002
Copper	<0.01	<0.01	0.02	0.04	<0.01	0.002
Iron	<0.03	0.07	0.07	<0.03	<0.03	0.300
Lead	<0.05	<0.05	<0.05	<0.05	<0.05	0.002
Magnesium	113	111	175	82.3	52.2	-
Manganese	0.94	1.18	0.66	0.33	0.05	-
Nickel	1.92	1.65	0.80	1.93	0.30	0.065
Potassium	64	62	102	46	32	-
Sodium	363	360	599	199	92	-
Strontium	2.19	2.07	3.65	0.98	0.81	-
Zinc	<0.005	0.008	<0.005	0.007	<0.005	0.030

[1]: **values are the Canadian Water Quality Guidelines for the protection of freshwater aquatic life (pH > 6.5, hardness = 60-120 mg/L $CaCO_3$).**

Samples 1 and 2 were collected from ponded water located close to bulk sample pile 96-B2N-A1, which is near the incinerator (see Plate 5-1). Sample 3 was collected from ponded water on a temporary road located between the incinerator and core shacks (see Plate 5-2). Sample 4 was taken at the base of pile 96-B2S-11, near the processing plant. Sample 5 was collected from ponded water located amidst piles 96-B2N-60 to 96-B2N-65, all of which are close to the processing plant (see Plate 5-3).

Based on the water quality analysis, piles composed of the bulk sample material could generate seepage that exceeds water quality guidelines for arsenic, copper and nickel (see Table 5-5). It is not possible to compare the two sets of values for aluminum, cadmium, chromium and lead because the concentrations were below the detection limit, and the detection limits for these parameters were higher than the water quality guideline values.

Because the concentrations of many of the parameters measured from the ponded water samples were less than the detection limit, and the detection limits were higher than the values predicted by geochemical modelling, it is not possible to compare the ponded water values to the predicted concentrations. For those samples where detectable concentrations were measured (*e.g.* Cu, Fe, Zn), the values are approximately an order of magnitude higher than the predicted concentrations. It is unclear as to why the ponded water samples should have such high concentrations of metals, but the difference may be due to evapoconcentration, whereby evaporation removes water molecules from a solution, producing a relative increase in metal concentrations in the water that remains.

Plate 5-1: Ponded water from which Samples 1 and 2 were obtained.

Plate 5-2: Ponded water on temporary access road from which Sample 3 was taken.

Plate 5-3: Ponded water from which Sample 5 was obtained.

6. Conclusions

6. CONCLUSIONS

6.1 Conclusions

The majority of material contained in the Boston deposit has low acid-generating potential. The results of ABA testing indicate that there is a preponderance of neutralizing minerals, predominantly carbonates, relative to sulphide minerals. This high ratio of neutralizing minerals to sulphide minerals suggests that most rock from the Boston deposit is unlikely to generate net acidity over the long-term.

Although the majority of material from the Boston deposit has low ARD potential, kinetic testing was carried out on samples from the altered basalt, B2 mineralized zone and B3 alteration halo rock units. Kinetic testing was performed to evaluate the acid-generating and metal-leaching potential of material from the three rock units in consideration of potential surface storage and/or use as construction material. The results of this testing indicated that while material from the altered basalt and B3 alteration halo rock units is unlikely to generate net acidity in the long-term, B2 mineralized zone material will likely generate net acidity. Furthermore, potential metal leaching from all three samples is a concern, particularly for arsenic, copper and nickel. As the B2 mineralized zone material goes acid, leaching of other metals, such as lead and zinc, could also become a concern. From an acid-generating standpoint, the altered basalt material could be used for construction material (*e.g.* roads, airstrips, *etc.*), but from a metal-leaching perspective, this material has the potential to cause problems related to arsenic and copper release. The other materials should not be used for construction material; either because of eventual long-term net acid generation (B2 mineralized zone material) or because of metal-leaching concerns (B3 alteration halo material).

Geochemical modelling indicated that the precipitation of minerals such as diaspore, gibbsite, goethite and hematite will control the aqueous concentrations of aluminum and iron in seepage coming from the three rock types submitted for kinetic testing. Water quality predictions suggested that although individual seepages are high in certain parameters, upon dilution with rain water, federal water quality guidelines will not be exceeded. Furthermore, if seepage enters Spyder or Stickleback lakes, water quality in the lakes will be indistinguishable from natural background concentrations at mixing ratios of 1:1,000 or higher.

6.2 Recommendations

Based on kinetic testwork performed on samples from the altered basalt, B2 mineralized zone and B3 alteration halo rock units, the following recommendations are made:

- There are potential arsenic- and copper-leaching problems associated with the altered basalt material and therefore it should not be used for construction purposes without further mineralogical analysis. To better understand the source of the metals coming from the altered basalt material, detailed mineralogical examinations should be conducted. These examinations could take the form of scanning electron microscope (SEM) analysis and/or microprobe analysis. If it is decided to use altered basalt material for construction purposes without conducting these analyses, its use should be limited in extent and ongoing monitoring of seepage from the material should be conducted, with particular attention paid to arsenic and copper;

- Based upon water samples collected in the field, existing piles of decline material located close to the Boston exploration camp should be covered to minimize infiltration and a diversion/collection system should be installed to prevent drainage from entering receiving waters;

- Future development of the deposit should take the acid-generating and metal-leaching characteristics of the material into consideration. Problematic material (altered basalt, B2 mineralized zone, B3 alteration halo) should be isolated to prevent potential contamination of receiving waters. Isolation could be accomplished by covering the material and constructing diversion ditches around it to reduce infiltration of precipitation and surface runoff; and

- Materials that will be stored on the surface or used for construction should undergo on-site kinetic testing. This testwork should be initiated as soon as possible in the upcoming 1999 field season. On-site testing should consist of placement of run-of-mine material in wooden cribs equipped with an impervious liner. Precipitation falling on the crib leaches through the sample and is directed towards a container which is periodically collected for chemical analysis and determination of seepage volume. Chemical analysis should employ low detection limits so that the results can be compared to kinetic test results.

Furthermore, opportunistic seepage sampling from existing and identified bulk sample piles should occur whenever conditions permit. The samples collected should be analyzed for the same parameters and with the same detection limits as the kinetic test leachate. Opportunistic sampling of seepage from the bulk sample piles would be used to verify the results of the completed laboratory kinetic testing.

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Appendix A-1
Static Test Data - Bulk Samples

◎ Table of Contents

APPENDIX A-1
ABA DATA FOR BOSTON PROPERTY, 1996

PROJECT: Hope Bay Belt
CLIENT: BHP Minerals
SAMPLE TYPE: Bulk Samples
COMMENTS: Analysis was performed by Chemex Labs, Vancouver, BC.

Location	Description	Paste pH	S % Total	MPA **	NP **	NNP **	NPR
96CX-3-3	BA	9.0	0.37	12	384	372	32.0
96CX-3-4	BA	9.1	0.36	11	389	378	35.4
96CX3-10	BA	9.2	1.56	49	345	296	7.0
96CX3-12	BA	8.5	1.32	41	313	272	7.6
96CX3-14A	BA	9.1	1.92	60	327	267	5.5
96CX3-14B	BA	9.0	2.00	63	290	227	4.6
96CX3-6	BA	8.8	4.79	150	319	169	2.1
96CX3-8	BA	9.4	1.90	59	341	282	5.8
96OD02	BA	8.9	0.17	5	312	307	62.4
96OD03	BA	8.9	0.10	3	338	335	112.7
96OD04	BA	8.9	0.27	8	368	360	46.0
96OD05	BA	9.0	0.33	10	326	316	32.6
96OD06	BA	9.1	0.28	9	345	336	38.3
96OD07	BA	9.1	0.62	19	353	334	18.6
96OD08	BA	8.9	0.27	8	260	252	32.5
96OD09	BA	9.1	0.06	2	363	361	181.5
96OD10	BA	9.2	0.06	2	301	299	150.5
96OD100	BA	8.5	0.55	17	350	333	20.6
96OD102	BA	9.2	0.63	20	350	330	17.5
96OD104	BA	9.0	0.13	4	362	358	90.5
96OD106	BA	9.1	0.10	3	368	365	122.7
96OD11	BA	9.0	0.04	1	331	330	331.0
96OD12	BA	8.3	0.42	13	319	306	24.5
96OD13	BA	9.2	0.06	2	372	370	186.0
96OD14	BA	8.8	0.05	2	364	362	182.0
96OD15	BA	8.5	0.07	2	376	374	188.0
96OD16	BA	8.5	0.11	3	374	371	124.7
96OD18	BA	8.4	0.51	16	419	403	26.2
96OD20	BA	8.9	0.48	15	344	329	22.9
96OD22	BA	8.6	0.49	15	358	343	23.9
96OD24	BA	8.7	0.06	2	336	334	168.0
96OD26	BA	8.4	0.08	3	251	248	83.7
96OD28	BA	8.6	0.06	2	282	280	141.0
96OD30	BA	8.2	0.07	2	270	268	135.0
96OD32	BA	9.0	0.07	2	272	270	136.0
96OD34	BA	8.5	0.07	2	272	270	136.0

◎ Table of Contents

Location	Description	Paste pH	S % Total	MPA **	NP **	NNP **	NPR
96OD36	BA	8.9	0.07	2	260	258	130.0
96OD38	BA	8.3	0.08	3	260	257	86.7
96OD40	BA	8.3	0.03	1	285	284	285.0
96OD42	BA	8.3	0.01	1	219	218	219.0
96OD44	BA	8.3	0.05	2	242	240	121.0
96OD46	BA	8.2	0.08	3	330	327	110.0
96OD48	BA	8.6	0.09	3	304	301	101.3
96OD50	BA	8.8	0.08	3	360	357	120.0
96OD52	BA	8.7	0.17	5	312	307	62.4
96OD54	BA	8.6	0.08	3	317	314	105.7
96OD56	BA	8.6	0.09	3	311	308	103.7
96OD58	BA	8.6	0.06	2	368	366	184.0
96OD60	BA	8.9	0.09	3	335	332	111.7
96OD62	BA	9.4	0.17	5	336	331	67.2
96OD64	BA	9.3	0.28	9	219	210	24.3
96OD66	BA	8.8	0.27	8	309	301	38.6
96OD68	BA	8.8	0.09	3	422	419	140.7
96OD70	BA	9.0	0.22	7	262	255	37.4
96OD72	BA	8.9	0.30	9	347	338	38.6
96OD74	BA	8.4	0.17	5	443	438	88.6
96OD76	BA	9.5	0.53	17	280	263	16.5
96OD78	BA	8.7	0.09	3	333	330	111.0
96OD80	BA	9.1	0.15	5	285	280	57.0
96OD82	BA	9.1	0.05	2	375	373	187.5
96OD84	BA	8.9	0.62	19	219	200	11.5
96OD86	BA	9.1	0.06	2	420	418	210.0
96OD88	BA	9.1	0.12	4	454	450	113.5
96OD90	BA	8.9	0.13	4	362	358	90.5
96OD92	BA	9.1	0.84	26	371	345	14.3
96OD94	BA	8.7	0.14	4	386	382	96.5
96OD96	BA	9.0	2.12	66	382	316	5.8
96OD98	BA	8.5	0.66	21	390	369	18.6
96B3N02	BO	8.6	3.17	99	301	202	3.0
96B3N04	BO	9.2	0.90	28	315	287	11.3
96B3N05	BO	8.9	2.35	73	299	226	4.1
96B3N06	BO	8.6	2.00	63	270	207	4.3
96B3NR-3+4	BO	8.1	1.51	47	297	250	6.3
96B3NR-5+6	BO	8.6	0.82	26	331	305	12.7
96B3NR-7+8	BO	8.4	0.76	24	321	297	13.4
96B3S02	BO	8.6	3.10	97	309	212	3.2
96B3S04	BO	8.9	1.35	42	319	277	7.6
96B3S05	BO	8.6	1.99	62	298	236	4.8
96B3S06	BO	8.8	2.02	63	287	224	4.6
96B3S08	BO	9.0	3.27	102	296	194	2.9
96B3S10	BO	9.0	1.76	55	325	270	5.9
96B3S12	BO	9.3	0.60	19	351	332	18.5

◎ Table of Contents

Location	Description	Paste pH	S % Total	MPA **	NP **	NNP **	NPR
96B3S14	BO	9.3	1.06	33	362	329	11.0
96B3SR-1&2	BO	8.9	1.91	60	302	242	5.0
96B2N02	BS	8.6	4.41	138	170	32	1.2
96B2N04	BS	8.5	3.60	113	192	79	1.7
96B2N06	BS	8.8	3.15	98	269	171	2.7
96B2N08	BS	8.7	3.15	98	255	157	2.6
96B2N10	BS	8.2	4.88	153	214	61	1.4
96B2N12	BS	8.6	3.78	118	236	118	2.0
96B2N14	BS	8.5	2.84	89	238	149	2.7
96B2N16	BS	8.4	4.11	128	281	153	2.2
96B2N18	BS	8.4	2.24	70	319	249	4.6
96B2N20	BS	8.3	3.34	104	240	136	2.3
96B2N22	BS	8.3	3.05	95	234	139	2.5
96B2N24	BS	8.0	3.37	105	202	97	1.9
96B2N26	BS	8.3	2.63	82	194	112	2.4
96B2N28	BS	8.2	1.46	46	265	219	5.8
96B2N30	BS	8.2	1.80	56	256	200	4.6
96B2N32	BS	8.2	1.70	53	323	270	6.1
96B2N34	BS	8.7	0.72	23	381	358	16.6
96B2N36	BS	8.6	2.24	70	312	242	4.5
96B2N38	BS	8.6	0.49	15	335	320	22.3
96B2N40	BS	8.6	0.75	23	410	387	17.8
96B2N42	BS	8.6	1.61	50	280	230	5.6
96B2N44	BS	8.6	0.54	17	214	197	12.6
96B2N46	BS	8.5	0.53	17	279	262	16.4
96B2N48	BS	8.3	1.20	38	332	294	8.7
96B2N50	BS	8.4	0.68	21	292	271	13.9
96B2N52	BS	8.5	1.31	41	323	282	7.9
96B2N54	BS	8.7	0.77	24	333	309	13.9
96B2N56	BS	8.8	0.89	28	331	303	11.8
96B2N58	BS	8.9	1.03	32	299	267	9.3
96B2N60	BS	8.5	1.55	48	299	251	6.2
96B2N62	BS	8.6	2.79	87	337	250	3.9
96B2N64	BS	8.5	5.01	157	211	54	1.3
96B2N66	BS	8.4	3.42	107	211	104	2.0
96B2N68	BS	8.5	3.15	98	404	306	4.1
96B2N70	BS	8.8	2.88	90	250	160	2.8
96B2N72	BS	8.1	0.71	22	73	51	3.3
96B2N74	BS	8.3	1.86	58	210	152	3.6
96B2N76	BS	8.2	3.14	98	297	199	3.0
96B2N78	BS	8.3	3.14	98	217	119	2.2
96B2N84	BS	8.8	0.44	14	73	59	5.2
96B2N88	BS	8.7	1.77	55	211	156	3.8
96B2NR1+2	BS	8.4	3.59	112	304	192	2.7
96B2NR3+4	BS	8.3	2.84	89	337	248	3.8
96B2NR5+6	BS	8.2	2.38	74	191	117	2.6

◎ Table of Contents

Location	Description	Paste pH	S % Total	MPA **	NP **	NNP **	NPR
96B2NR7+8	BS	8.6	2.62	82	296	214	3.6
96B2S02	BS	8.4	4.05	127	181	54	1.4
96B2S04	BS	8.6	2.62	82	275	193	3.4
96B2S06	BS	8.6	3.13	98	291	193	3.0
96B2S08	BS	8.2	2.25	70	262	192	3.7
96B2S10	BS	8.6	3.61	113	292	179	2.6
96B2S12	BS	8.7	4.41	138	232	94	1.7
96B2S14	BS	8.7	3.20	100	200	100	2.0
96B2S16	BS	8.6	2.35	73	159	86	2.2
96B2S18	BS	8.8	1.61	50	187	137	3.7
96B2S20	BS	8.8	1.42	44	210	166	4.8
96B2S22	BS	8.9	1.28	40	287	247	7.2
96B2S24	BS	8.9	1.98	62	274	212	4.4
96B2S26	BS	9.0	2.59	81	212	131	2.6
96B2S28	BS	8.5	2.78	87	245	158	2.8
96B2SR3/4	BS	8.7	2.18	68	172	104	2.5
96B2SR5/6	BS	8.5	3.21	100	149	49	1.5
96B2SR7/8	BS	8.7	3.71	116	267	151	2.3
96B2SR9	BS	8.7	5.68	178	201	23	1.1
96B3N80	BT	9.1	0.60	19	121	102	6.4
96B3N82	BT	8.7	1.49	47	195	148	4.1
96B3N86	BT	8.7	0.85	27	128	101	4.7
96CX2-10	BT	9.1	2.25	70	351	281	5.0
96CX2-12	BT	9.3	0.35	11	312	301	28.4
96CX2-14	BT	9.0	0.24	8	323	315	40.4
96CX2-4	BT	9.0	0.53	17	364	347	21.4
96CX2-6	BT	8.9	1.76	55	99	44	1.8
96CX2-8	BT	8.6	0.74	23	266	243	11.6
96CX2/3-2	BT	8.9	0.05	2	386	384	193.0
Maximum		9.5	5.68	178	454	450	331.0
Minimum		8.0	0.01	1	73	23	1.1
Average		8.7	1.41	44	294	250	43.3
Standard Deviation		0.3	1.37	43	72	98	63.9
10 Percentile		8.3	0.07	2	201	103	2.2
Median		8.7	0.84	26	301	267	11.0
90 Percentile		9.1	3.30	103	374	365	136.0
Count		157	157	157	157	157	157

*Description		
	BA	Basalt
	BO	Basalt Ore Horizon
	BS	Basalt - Sediment Transition, Ore Horizon
	BT	Basalt - Sediment Transition

MPA = % S (Total) * 31.25

** Units = Kilograms CaCO3 Equivalent per tonne of material

◎ Table of Contents

APPENDIX A-1
ABA DATA FOR BOSTON PROPERTY, 1997

PROJECT: **Hope Bay Belt**
CLIENT: **BHP Minerals**
SAMPLE TYPE: **Bulk Samples**

Location	Paste pH	S % Total	MPA **	NP **	NNP **	NPR
97 OD 119	9.2	0.13	4.1	417	413	102.6
97 OD 121	8.3	0.09	2.8	366	363	130.1
97 OD 123	8.4	0.25	7.8	404	396	51.7
97 OD-125	9	0.09	2.8	403	400	143.3
97 OD-127	8.7	0.15	4.7	379	374	80.9
97 OD-129	8.6	0.08	2.5	370	368	148.0
97 OD-131	8.8	0.20	6.3	381	375	61.0
97 OD-133	9.4	0.22	6.9	421	414	61.2
97 OD-135	9.2	0.27	8.4	420	412	49.8
970D-137	8.8	0.45	14.1	343	329	24.4
970D-139	8.1	0.38	11.9	332	320	28.0
970D-141	9.3	0.18	5.6	397	391	70.6
97-OD-143	8.9	0.23	7.2	421	414	58.6
97-OD-145	8.9	0.16	5.0	398	393	79.6
97-OD-147	8.8	0.20	6.3	391	385	62.6
97-OD-149	8.6	0.41	12.8	361	348	28.2
97-OD-151	8.2	0.59	18.4	318	300	17.2
9700-153 ABA	8.1	0.34	10.6	302	291	28.4
9700-155 ABA	8.3	0.13	4.1	373	369	91.8
9700-157 ABA	8.2	0.34	10.6	387	376	36.4
97 OD 159	9.1	0.12	3.8	452	448	120.5
97 OD 161	8	0.20	6.3	339	333	54.2
97 OD 163	9.1	0.04	1.3	383	382	306.4
97 OD 165	8.8	0.18	5.6	442	436	78.6
97OD-167	8	0.55	17.2	399	382	23.2
97OD-169	8	0.37	11.6	355	343	30.7
97-OD-171 (ABA)	8.1	1.15	35.9	323	287	9.0
97-OD-173 (ABA)	8.8	1.29	40.3	372	332	9.2
97 OD 175 ABA	8.5	0.33	10.3	361	351	35.0
97 OD 177 ABA	7.9	0.16	5.0	345	340	69.0
97 OD 179 ABA	8.4	0.46	14.4	294	280	20.5
97 OD 181 ABA	8	0.39	12.2	294	282	24.1
97 OD 183 ABA	8.4	0.81	25.3	267	242	10.5
97 OD 185 ABA	7.8	0.39	12.2	303	291	24.9
97 OD 187 ABA	8	0.25	7.8	337	329	43.1
97 OD 189 ABA	8.5	0.14	4.4	369	365	84.3
970D 191 ABA	8.2	0.54	16.9	354	337	21.0
970D 193 ABA	8.1	0.16	5.0	336	331	67.2
970D 195 ABA	8.3	0.38	11.9	328	316	27.6
970D 197 ABA	8.3	0.23	7.2	327	320	45.5

◎ Table of Contents

Location	Paste pH	S % Total	MPA **	NP **	NNP **	NPR
970D 199 ABA	8.2	0.22	6.9	325	318	47.3
97OD-201 ABA	7.8	0.21	6.6	324	317	49.4
97OD-203 ABA	8.1	0.23	7.2	303	296	42.2
97OD-205 ABA	8	0.17	5.3	332	327	62.5
97OD-207 ABA	7.9	0.33	10.3	342	332	33.2
97OD-209 ABA	8	0.25	7.8	299	291	38.3
97OD-211 ABA	8	0.15	4.7	352	347	75.1
97OD-213 ABA	8.1	0.15	4.7	343	338	73.2
97OD-215 ABA	8.3	0.13	4.1	417	413	102.6
97OD-217 ABA	8.7	1.22	38.1	308	270	8.1
97OD-219 ABA	8.6	0.32	10.0	422	412	42.2
97OD-221 ABA	8.7	0.20	6.3	371	365	59.4
97OD-223-ABA	8.5	0.24	7.5	341	334	45.5
97OD-225-ABA	8.7	0.38	11.9	340	328	28.6
97OD-227-ABA	9.1	0.18	5.6	339	333	60.3
97OD-229-ABA	8.6	0.15	4.7	326	321	69.5
97OD-231-ABA	9.4	0.39	12.2	224	212	18.4
97OD-233-ABA	9.3	0.79	24.7	316	291	12.8
97OD-235-ABA	8.4	0.24	7.5	275	268	36.7
97-OD-237 ABA	8.8	0.21	6.6	289	282	44.0
97-OD-239 ABA	9.3	0.18	5.6	302	296	53.7
97-OD-241 ABA	9.5	0.22	6.9	374	367	54.4
97-OD-243 ABA	9.5	0.15	4.7	280	275	59.7
97-OD-245 ABA	9.1	0.29	9.1	268	259	29.6
97-OD-249 ABA	8.5	0.17	5.3	320	315	60.2
97-OD-251 ABA	9.6	0.11	3.4	350	347	101.8
97-OD-254 ABA	9.3	0.29	9.1	293	284	32.3
97-OD-255 ABA	9.2	0.09	2.8	399	396	141.9
97OD 257 ABA	8.4	0.13	4.1	358	354	88.1
97OD 259 ABA	8.4	0.06	1.9	218	216	116.3
97OD 261 ABA	8.5	0.05	1.6	226	224	144.6
97OD 263 ABA	8.5	0.08	2.5	215	213	86.0
97OD 265 ABA	8.4	0.06	1.9	272	270	145.1
97OD 267 ABA	8.5	0.22	6.9	296	289	43.1
97OD 269 ABA	8.7	0.09	2.8	257	254	91.4
97OD 271 ABA	9.1	0.07	2.2	416	414	190.2
97OD 273 ABA	8.6	0.05	1.6	249	247	159.4
97OD 275 ABA	8.7	0.10	3.1	309	306	98.9
97OD 277 ABA	8.3	0.21	6.6	357	350	54.4
97OD 279 ABA	8.5	0.42	13.1	419	406	31.9
97OD 281 ABA	8.3	0.13	4.1	384	380	94.5
97OD 283 ABA	9	0.17	5.3	378	373	71.2
97OD 285 ABA	8.4	0.10	3.1	353	350	113.0
97OD-287 ABA	8.7	0.08	2.5	367	365	146.8
97OD-289 ABA	8.4	0.22	6.9	278	271	40.4
97OD-291 ABA	8.5	0.29	9.1	346	337	38.2
97OD 293	8.6	0.04	1.3	192	191	153.6
97OD-295-ABA	8.4	0.01	0.3	206	206	659.2
97OD-297-ABA	8.6	0.10	3.1	331	328	105.9

◎ Table of Contents

Location	Paste pH	S % Total	MPA **	NP **	NNP **	NPR
97OD-301 ABA	8.9	0.18	5.6	386	380	68.6
97OD-303 ABA	8.4	0.25	7.8	387	379	49.5
97OD-305 ABA	8.9	0.33	10.3	324	314	31.4
97OD-307 ABA	8.8	0.40	12.5	332	320	26.6
97OD-309 ABA	9.2	0.21	6.6	298	291	45.4
97OD 311 ABA	8.4	0.19	5.9	279	273	47.0
97OD 313 ABA	8.6	0.11	3.4	339	336	98.6
97OD 315 ABA	8.7	0.18	5.6	366	360	65.1
97 OD 317	9	0.52	16.3	312	296	19.2
97OD 319 ABA	8.1	0.24	7.5	360	353	48.0
97 OD 321	8.6	0.10	3.1	323	320	103.4
97OD-323 ABA	8.2	0.21	6.6	292	285	44.5
97OD-325 ABA	8.5	0.62	19.4	336	317	17.3
97OD-327 ABA	8.8	1.75	54.7	391	336	7.1
97-OD-329 ABA	9	0.63	19.7	339	319	17.2
97-OD-331 ABA	9.3	0.40	12.5	368	356	29.4
97-OD-333 ABA	8.6	0.63	19.7	337	317	17.1
97-OD-335 ABA	8.3	0.11	3.4	327	324	95.1
97-OD-337 ABA	8.2	0.04	1.3	318	317	254.4
97-OD-341 ABA	9	0.25	7.8	383	375	49.0
97OD-343 ABA	9	0.07	2.2	340	338	155.4
97OD-345 ABA	8.5	0.10	3.1	302	299	96.6
97OD-347 ABA	9	0.07	2.2	319	317	145.8
97OD-349 ABA	8.4	0.17	5.3	305	300	57.4
97OD351ABA	8.5	0.18	5.6	322	316	57.2
353 ABA	8.2	0.17	5.3	288	283	54.2
97OD-355 ABA	8.7	0.19	5.9	308	302	51.9
97OD-357 ABA	8.2	0.54	16.9	289	272	17.1
97OD-359 ABA	8.3	0.32	10.0	294	284	29.4
97 OD 361 ABA	8.2	0.18	5.6	279	273	49.6
97 OD 363 ABA	8.3	0.54	16.9	297	280	17.6
97 OD 365 ABA	8.3	0.46	14.4	273	259	19.0
97 OD 367 ABA	8.1	1.13	35.3	338	303	9.6
97OD 369 ABA	8.7	0.20	6.3	333	327	53.3
97OD 371 ABA	8.4	0.53	16.6	342	325	20.6
97OD 373 ABA	8.3	0.26	8.1	316	308	38.9
97OD 375 ABA	8.2	0.10	3.1	343	340	109.8

Description: all 1997 bulk samples were classified as basalt - weakly to moderately altered

Maximum	9.6	1.75	54.7	452	448	659.2
Minimum	7.8	0.01	0.3	192	191	7.1
Average	8.6	0.29	8.9	335	326	69.3
Standard Deviation	0.4	0.27	8.3	51	51	71.8
10 Percentile	8.1	0.08	2.5	277	270	18.0
Median	8.5	0.21	6.6	337	327	52.6
90 Percentile	9.2	0.54	16.9	399	395	142.6
Count	126	126	126	126	126	126

Total Sulphur vs Paste pH
Bulk Sample Data (1996 and 1997)

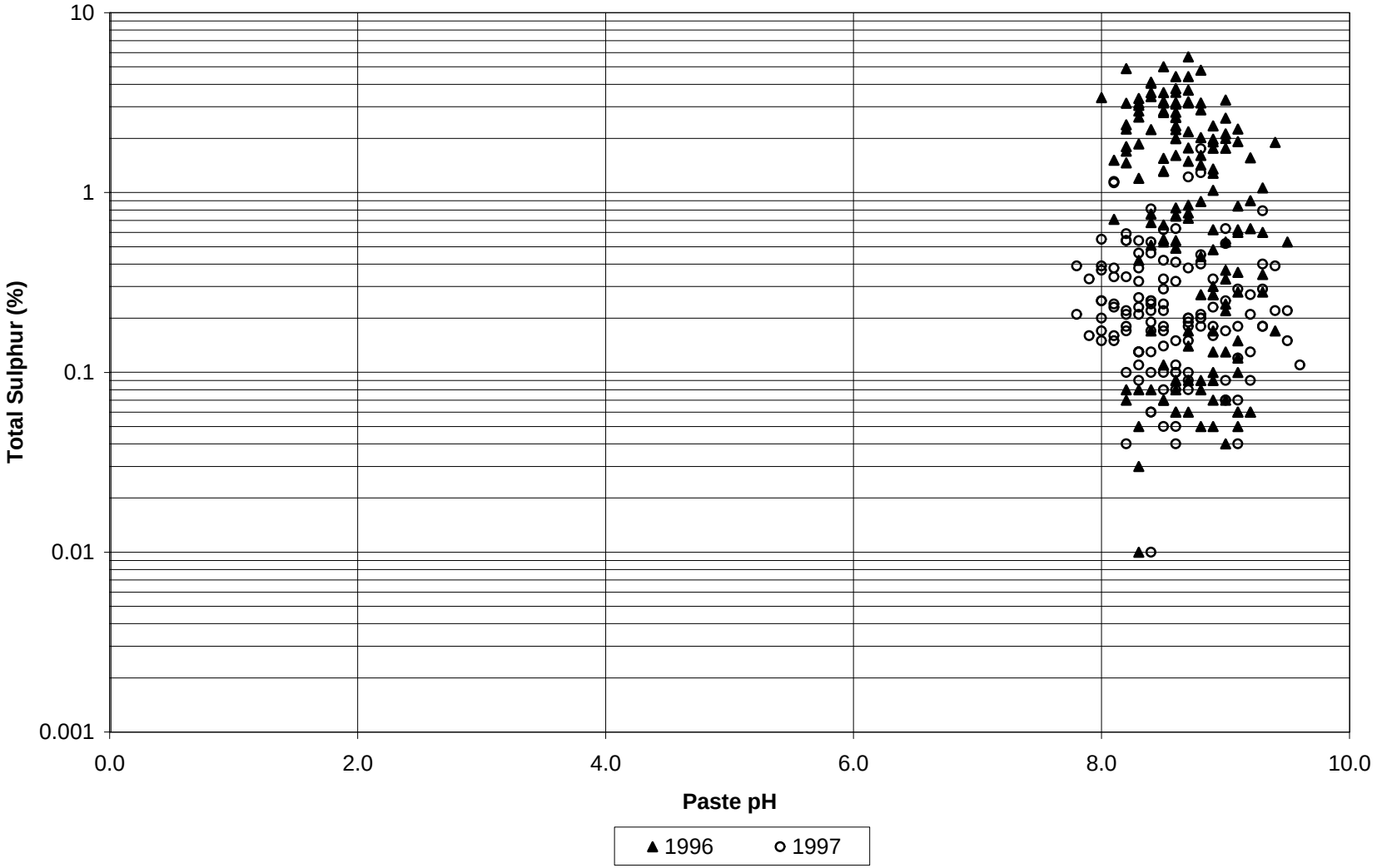
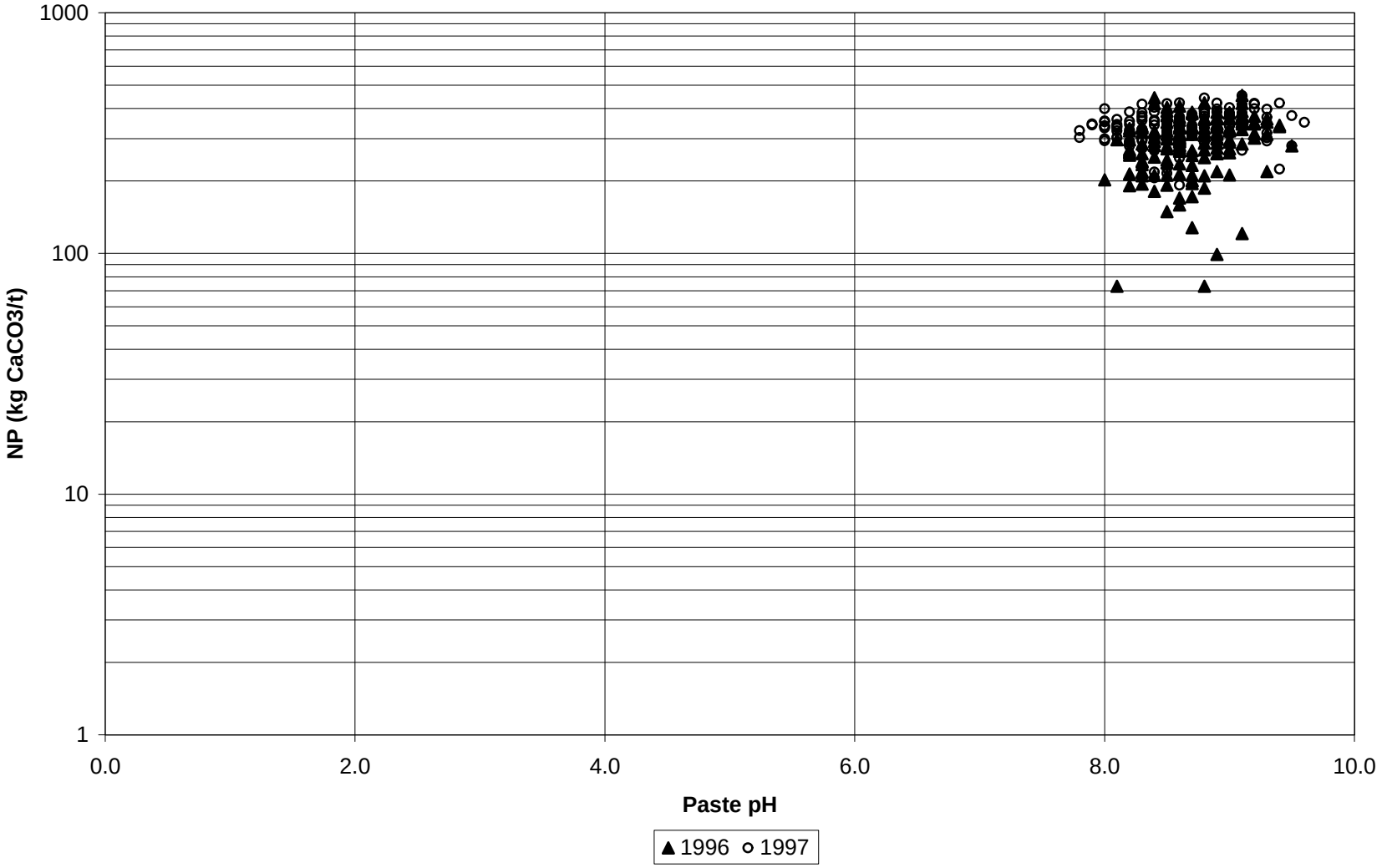
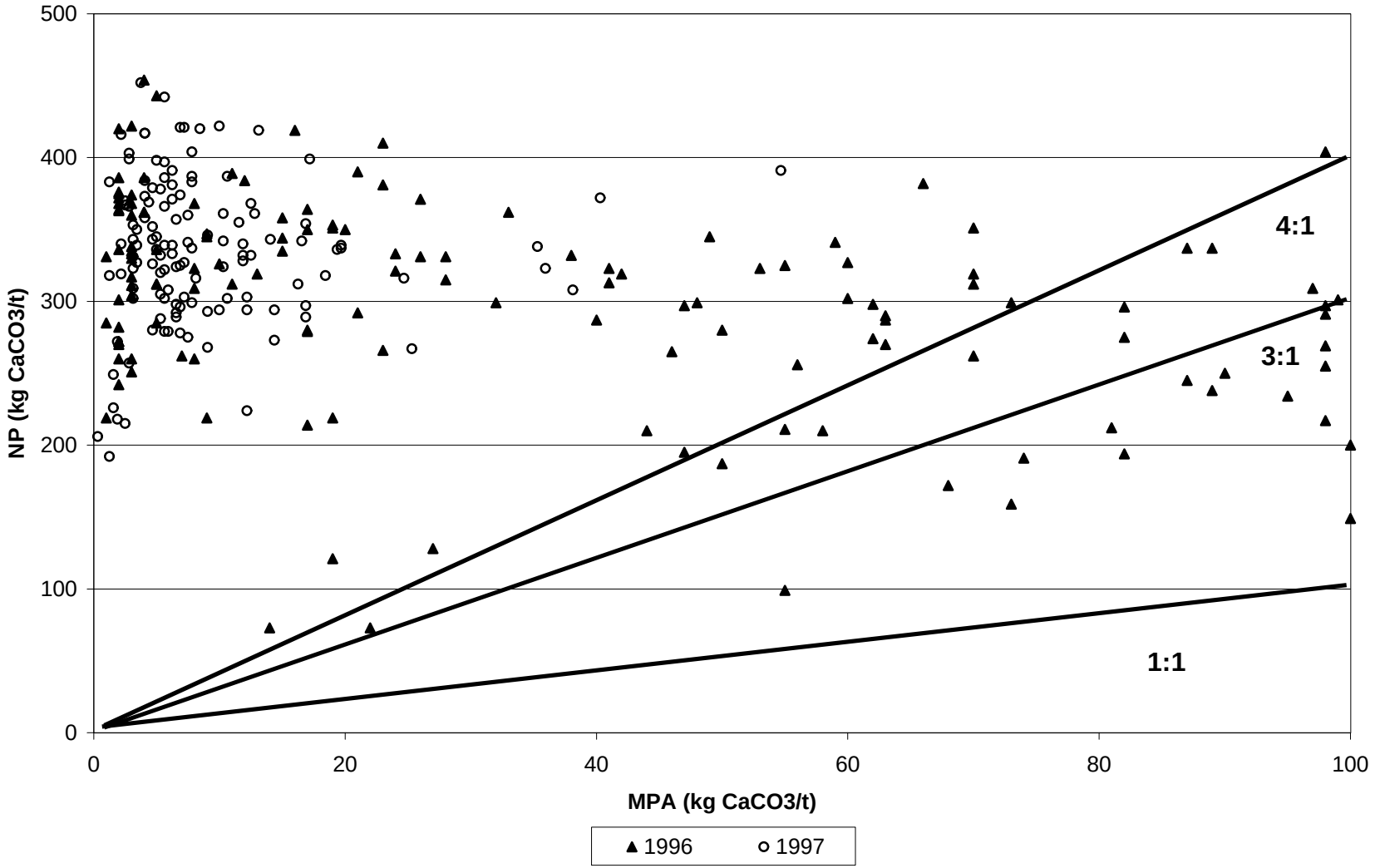


Table of Contents

Neutralization Potential (NP) vs Paste pH
Bulk Sample Data (1997)



Neutralization Potential (NP) vs Maximum Potential Acidity (MPA)
Bulk Sample Data (1996 and 1997)



Appendix A-2
Static Test Data - Drill Core Samples

APPENDIX A-2
ABA DATA FOR BOSTON PROPERTY, 1997

PROJECT: Hope Bay Belt
CLIENT: BHP Minerals
SAMPLE TYPE: Drill Core
COMMENTS: Analysis was performed by Chemex Labs, Vancouver, BC.

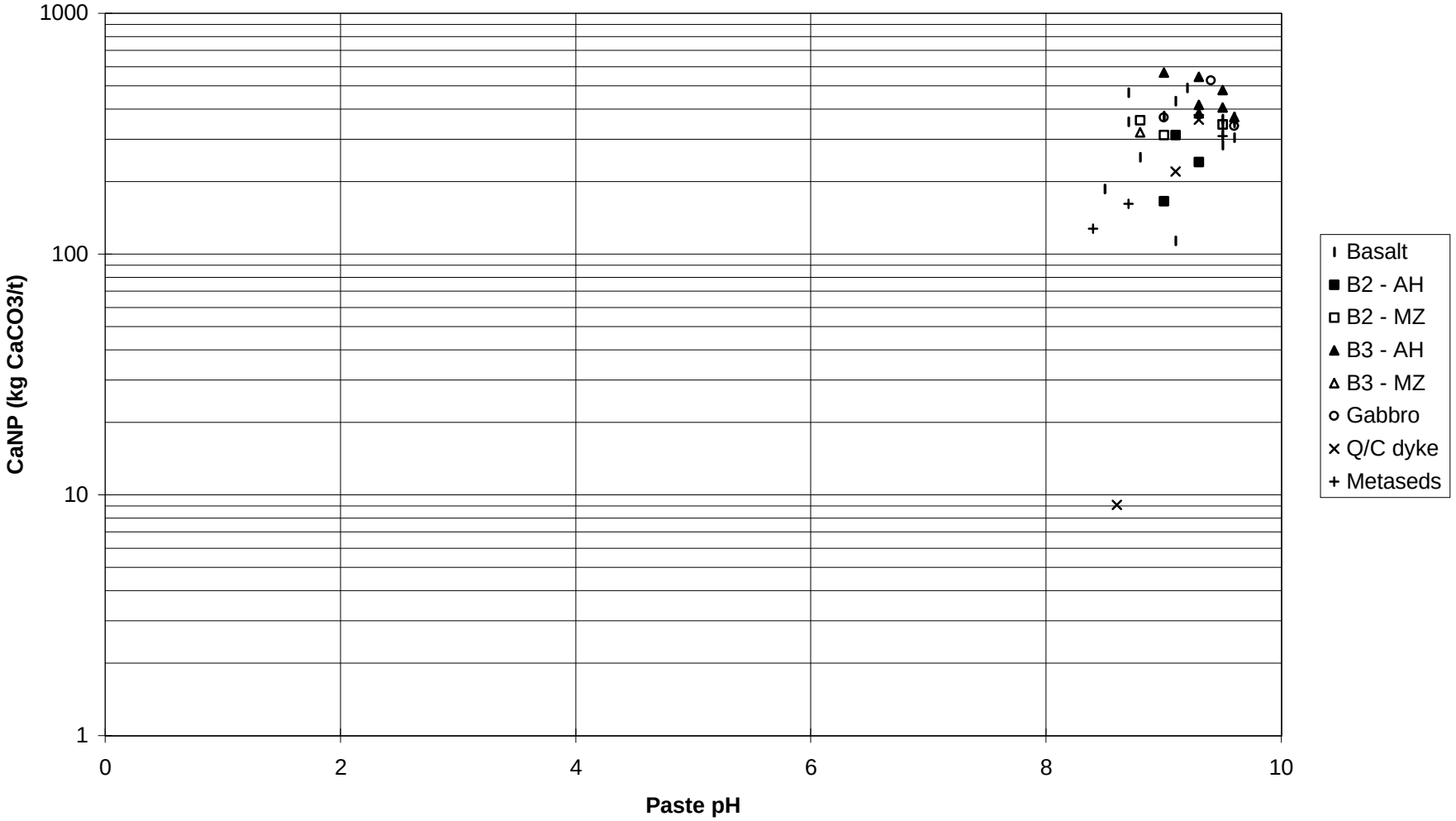
Sample Location	Sample Description	paste pH	S % Sulfate	S % Sulfide	S % Total	CO2 % inorg	CaNP	MPA	NP	NNP	NPR	Fizz Test
92NOD22 185	B - ma	9.6	<.01	0.13	0.17	13.4	305	5	282	277	56.4	3
92NOD04 75	B - ma	9.2	<.01	0.36	0.36	21.5	489	11	434	423	39.5	3
93NOD28 180	B - ma	9.1	<.01	1.07	1.12	19.0	432	35	379	344	10.8	3
93NOD57 195	B - ma	9.6	<.01	0.05	0.07	16.3	371	2	313	311	156.5	3
93NOD46 128	B - sa	9.6	<.01	0.08	0.09	15.8	359	3	292	289	97.3	3
93NOD46 195	B - sa	8.7	<.01	0.02	0.04	20.6	468	1	422	421	422.0	3
93NOD70 130	B - sa	9.5	<.01	0.2	0.22	12.5	284	7	238	231	34.0	3
93NOD70 290	B - sa	9.5	<.01	0.28	0.30	16.0	364	9	308	299	34.2	4
95NOD150 210	B - sa	9.5	<.01	0.11	0.10	13.8	314	3	318	315	106.0	3
92NOD22 150	B - ua	8.5	<.01	0.1	0.11	8.2	186	3	213	210	71.0	4
93NOD57 230	B - ua	9	<.01	0.03	0.05	16.3	371	2	324	322	162.0	3
93NOD57 280	B - ua	8.8	<.01	0.09	0.09	11.1	252	3	249	246	83.0	4
95NOD154 260	B - ua	9	<.01	0.13	0.12	16.5	375	4	407	403	101.8	4
95NOD150 168	B - ua	8.7	<.01	0.11	0.13	15.6	355	4	392	388	98.0	4
95NOD150 175	B - ua	9.1	<.01	0.1	0.10	5.0	114	3	133	130	44.3	4
92NOD22 120	B - wa	9.6	<.01	0.03	0.03	15.4	350	1	304	303	304.0	3
93NOD57 210	B - wa	9.3	<.01	0.16	0.18	18.0	409	6	339	333	56.5	3
95NOD156 110	B - wa	9.5	<.01	0.06	0.07	15.2	346	2	336	334	168.0	4
92NOD22 265	B2 - AH; B - sa	9.3	<.01	0.85	0.93	10.6	241	29	216	187	7.5	3
94NOD120 190	B2 - AH; B - sa	9	<.01	1.7	1.82	7.3	166	57	139	82	2.4	3
94NOD120 225	B2 - AH; S - a	9.1	<.01	2.13	2.13	13.7	312	67	243	176	3.6	4
93NOD44 220	B2 - MZ	9.5	<.01	0.14	0.16	15.2	346	5	278	273	55.6	3
94NOD113 180	B2 - MZ	9	<.01	1.61	1.68	13.7	312	53	283	230	5.3	4
94NOD120 210	B2 - MZ	8.8	<.01	3.06	3.09	15.8	359	97	301	204	3.1	4
93NOD57 170	B3 - AH; B - ma	9.5	<.01	0.19	0.21	21.1	480	7	340	333	48.6	3
94NOD113 80	B3 - AH; B - ma	9.3	<.01	0.35	0.38	18.3	416	12	350	338	29.2	3
94NOD121A 165	B3 - AH; B - ma	9.5	<.01	1.88	1.89	17.9	407	59	350	291	5.9	4
94NOD113 65	B3 - AH; B - sa	9.6	<.01	0.13	0.17	16.3	371	5	318	313	63.6	3
94NOD 120 100	B3 - AH; B - wa	9.3	<.01	0.48	0.53	16.9	384	17	325	308	19.1	3
94NOD141 225	B3 - AH; G - ua	9.3	<.01	0.32	0.40	24.0	546	13	457	444	35.2	3
94NOD121A 140	B3 - AH; G - ua?	9	<.01	0.13	0.14	25.0	569	4	444	440	111.0	3
94NOD120 72	B3 - MZ	8.8	<.01	3.85	3.90	14.1	321	122	275	153	2.3	3

Table of Contents

Sample Location	Sample Description	paste pH	S % Sulfate	S % Sulfide	S % Total	CO2 % inorg	CaNP	MPA	NP	NNP	NPR	Fizz Test
93NOD70 245	G - ua	9.6	<.01	0.06	0.04	15.0	341	1	302	301	302.0	3
93NOD70 278	G - ua	9.4	<.01	1.22	1.26	23.1	525	39	430	391	11.0	3
94NOD113 145	G - ua	9	<.01	0.16	0.19	16.2	368	6	290	284	48.3	4
92NOD20 90	Q/C dyke	9.3	<.01	0.31	0.34	15.9	362	11	316	305	28.7	3
93NOD46 178	Q/C dyke	8.6	<.01	0.23	0.28	0.4	9	9	9	0	1.0	1
94NOD120 155	Q/C dyke	9.1	<.01	0.69	0.73	9.7	221	23	176	153	7.7	3
92NOD20 150	S - sa	9.3	<.01	0.15	0.18	16.6	378	6	295	289	49.2	3
92NOD20 185	S - sa	8.7	<.01	0.64	0.70	7.1	161	22	83	61	3.8	2
92NOD10 160	S - sa	9.5	<.01	0.21	0.21	13.6	309	7	255	248	36.4	3
93NOD28 50	S - ua	8.4	<.01	0.21	0.25	5.6	127	8	120	112	15.0	3
93NOD28 80	S - ua	9.5	<.01	0.3	0.34	15.8	359	11	328	317	29.8	3
	Maximum	9.6		3.85	3.90	25.0	569	122	457	444	422.0	4
	Minimum	8.4		0.02	0.03	0.4	9	1	9	0	1.0	1
	Average	9.2		0.56	0.59	14.9	338	18	293	275	69.1	3
	Standard Deviation	0.3		0.84	0.85	5.0	115	27	97	103	89.0	1
	10 Percentile	8.7		0.06	0.07	7.5	170	2	146	135	3.7	3
	Median	9.3		0.20	0.21	15.8	359	7	304	299	39.5	3
	90 Percentile	9.6		1.68	1.79	21.0	478	56	419	401	160.9	4
	Count	43		43	43	43	43	43	43	43	43	43

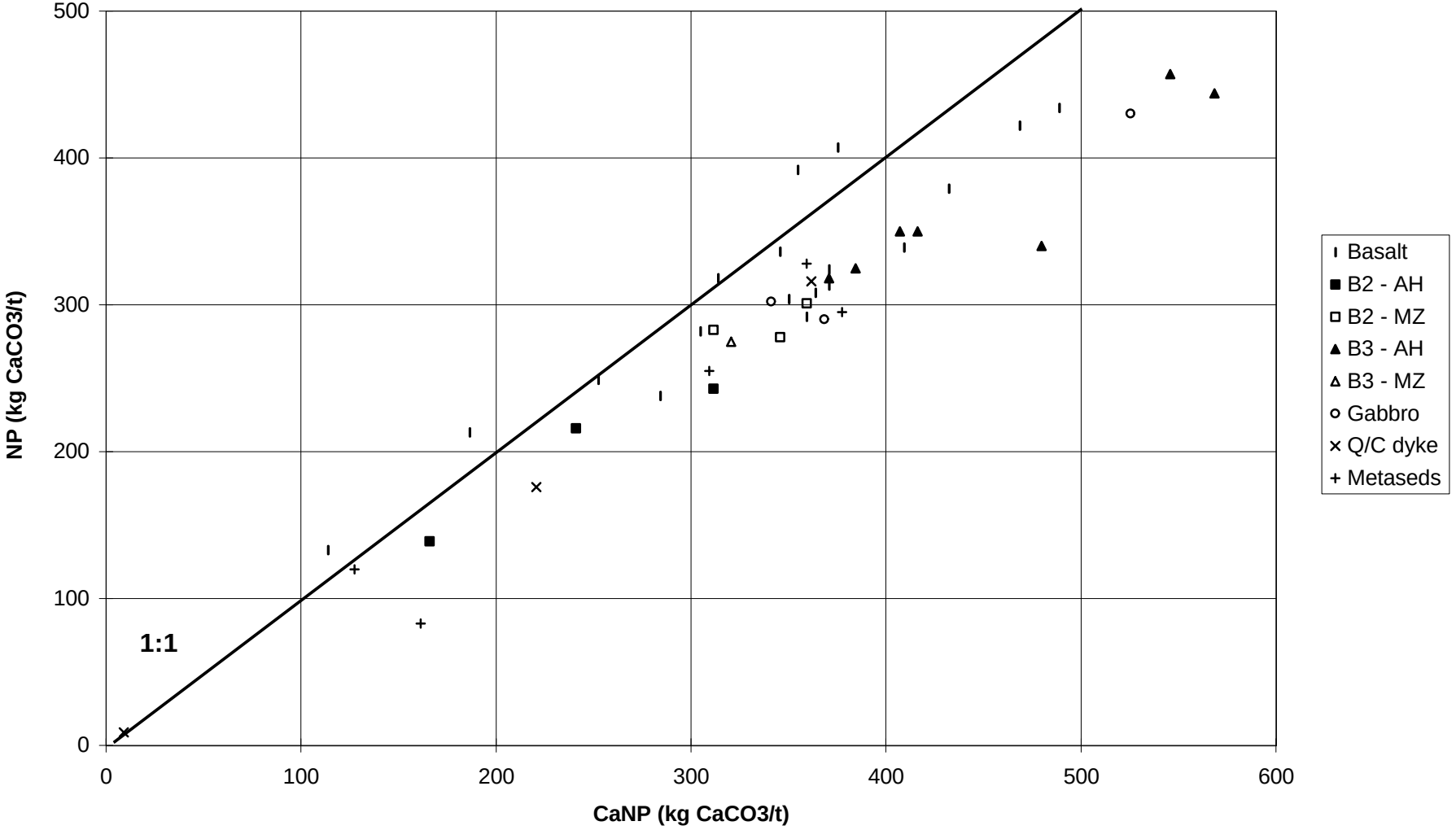
Table of Contents

Carbonate Neutralization Potential (CaNP) vs Paste pH
Drill Core Data (1997)



◎ Table of Contents

Neutralization Potential (NP) vs Carbonate Neutralization Potential (CaNP)
Drill Core Data (1997)



Neutralization Potential (NP) vs Maximum Potential Acidity (MPA)
Drill Core Data (1997)

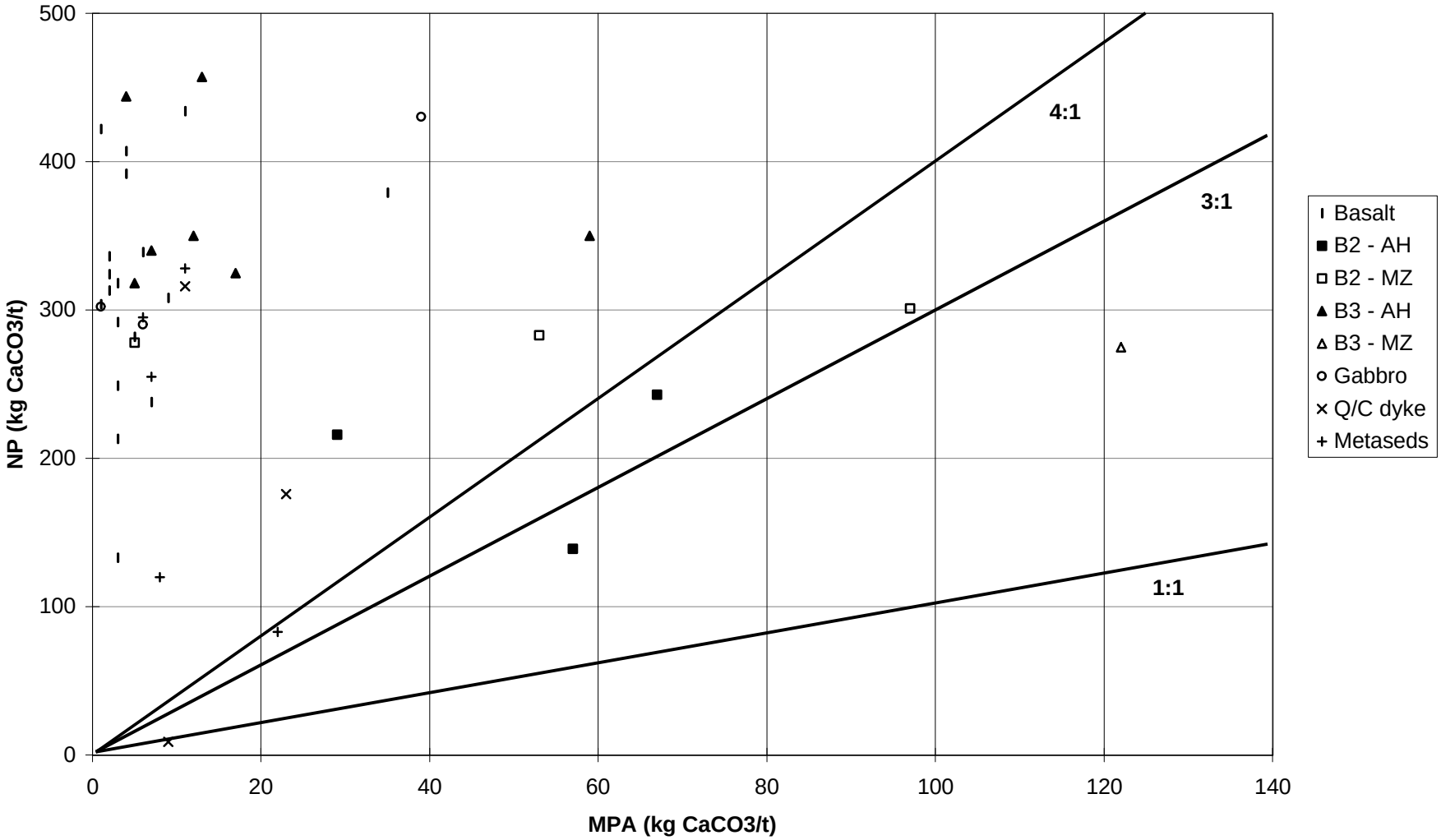


Table of Contents

Neutralization Potential (NP) vs Paste pH
Drill Core Data (1997)

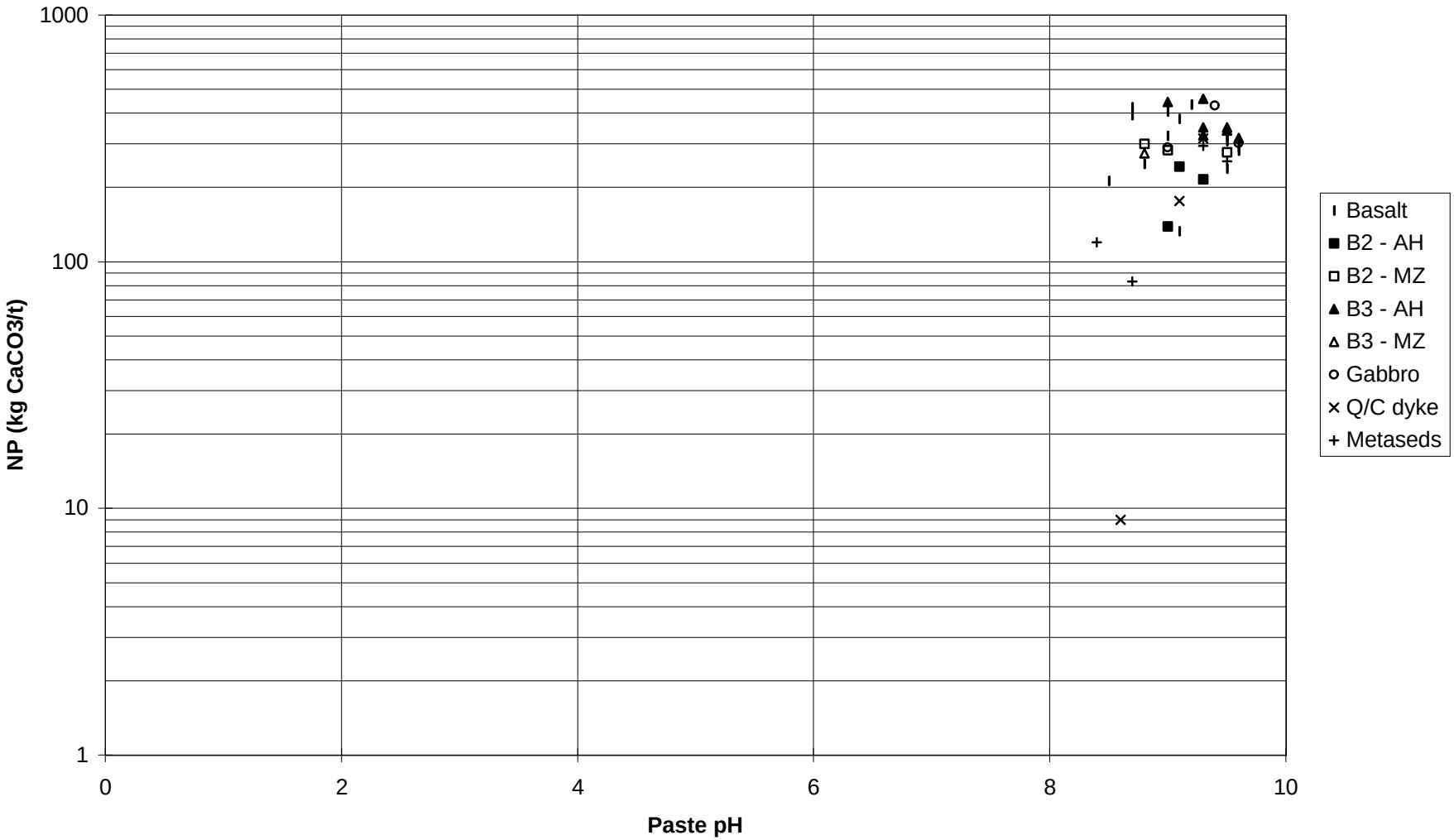
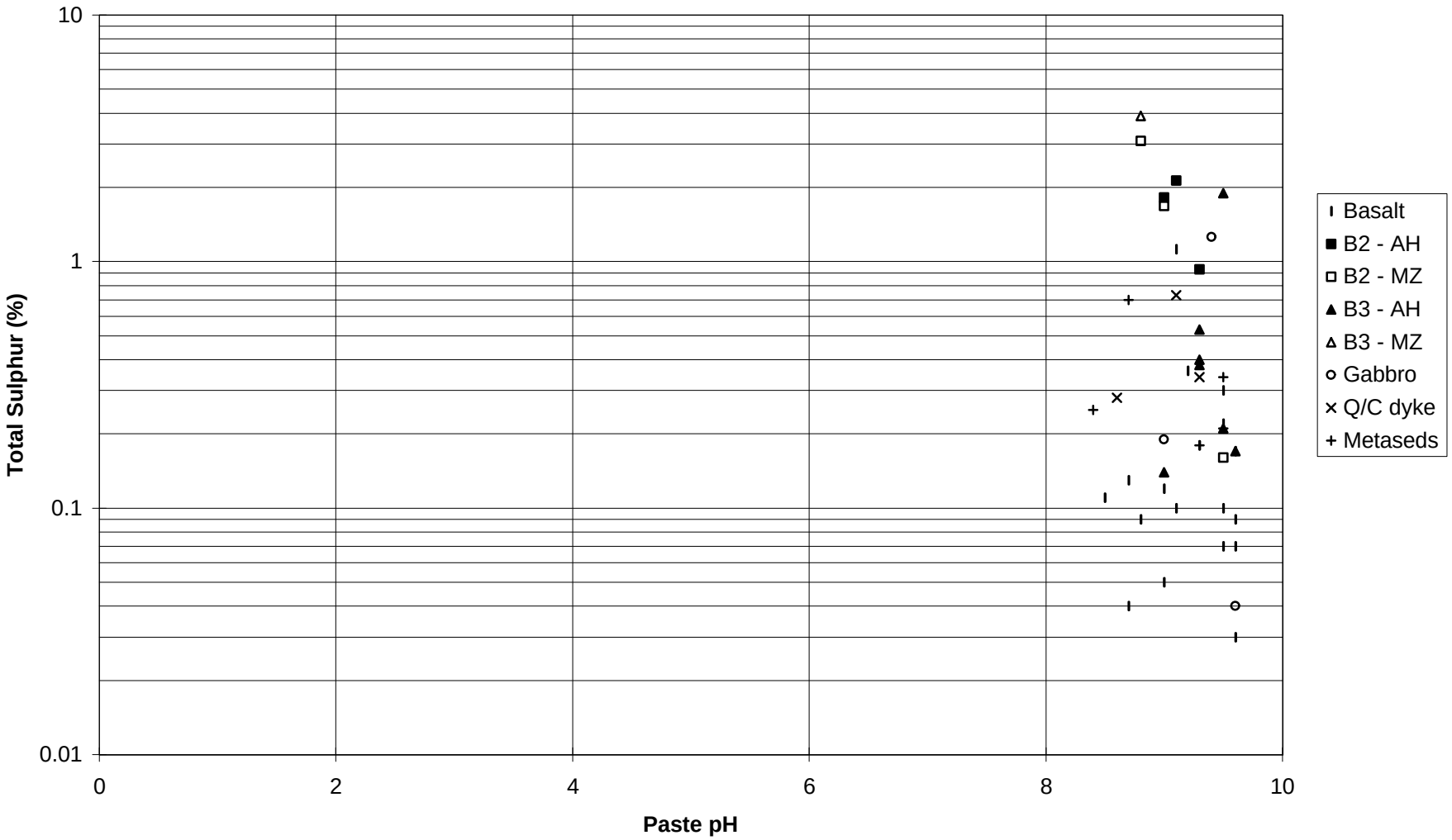


Table of Contents

Total Sulphur (%) vs Paste pH
Drill Core Data (1997)



Appendix B
Equations for Interpreting Kinetic Test Data

Appendix B – Kinetic Test Equations

Acid Generation

Acidity Production Rate (mg $CaCO_3$ equivalent /kg/wk) =

Acidity (mg $CaCO_3$/L) • Volume of Leachate Collected (L) / Sample Mass (kg)

Sulphate Production Rate (mg/kg/wk) =

Sulphate (mg/L) • Volume of Leachate Collected (L) / Sample Mass (kg)

Remaining S_{total} (% of original) =

{[Initial %S_{total}- ((Cumulative Sulphate Production Rate (mg/kg) • 32.06/96.06) /

10000))} / Initial %S_{total}} • 100%

Remaining $S_{sulphide}$ (% of original) =

{[Initial %$S_{sulphide}$-((Cumulative Sulphate Production Rate (mg/kg) • 32.06/96.06) /

10000)] / Initial %$S_{sulphide}$} • 100%

Sulphate Production Rate by Surface Area (mg/m^2/wk) =

Sulphate Production Rate (mg/kg/wk) / Surface Area (m^2/kg)

Molar Ratios

Carbonate Molar Ratio =

[(Ca (mg/L)/40.08)+(Mg (mg/L)/24.31)+(Sr (mg/L)/87.62)+(Ba (mg/L)/137.34)] /

(SO_4 (mg/L)/96.06)

Feldspar Molar Ratio =

[(Ca (mg/L)/40.08)+(½K (mg/L)/39.09)+(½Na (mg/L)/22.99)] / (SO_4 (mg/L)/96.06)

Acid Neutralization and NP Consumption

Alkalinity Production Rate (mg $CaCO_3$/kg/wk) =

Alkalinity (mg $CaCO_3$) • Volume of Leachate Collected (L) / Sample Mass (kg)

Theoretical NP Consumption at pH 6 (mg $CaCO_3$/kg/wk) =

Sulphate Production Rate (mg SO_4/kg/wk) • 100.09/96.06

Carbonate Ratio NP Consumption (mg $CaCO_3$/kg/wk) =

Carbonate Molar Ratio • Theoretical NP Consumption (mg/kg/wk)

Feldspar Ratio NP Consumption (mg $CaCO_3$/kg/wk) =

Feldspar Molar Ratio • Theoretical NP Consumption (mg/kg/wk)

Empirical Open-System NP Consumption around neutral pH (mg $CaCO_3$/kg/wk) =

Theoretical NP Consumption (mg/kg/wk) + Alkalinity Production Rate (mg/kg/wk) –

Acidity Production Rate (mg/kg/wk)

Theoretical Closed System NP Consumption above pH 6.5 (mg $CaCO_3$/kg/wk) =

[Theoretical NP Consumption (mg/kg/wk) • 2] – Acidity Production Rate (mg/kg/wk)

Remaining NP (% of original) =

{[Initial NP (t $CaCO_3$/1000 t) – (Cumulative NP Depletion Rate (mg/kg) / 1000)] / Initial NP (t $CaCO_3$/1000 t)} • 100%

Metal Leaching

Metal Leach Rates (mg/kg/wk) =

Metal Concentration (mg/L) • Volume of Leachate Collected (L) / Sample Mass (kg)

Remaining Metal (% of original) =

{[Initial Metal Content (mg/kg) – Cumulative Metal Leach Rate (mg/kg)] / Initial Metal Content (mg/kg)} • 100%

Appendix C
Quality Assurance/Quality Control Data

Table of Contents

QA/QC Data
Leachate Blank Metal Concentrations

Week	Date	Dissolved Metals: Silver AG ug/l	Aluminum AL ug/l	Arsenic AS ug/l	Barium BA ug/l	Beryllium BE ug/l	Bismuth BI ug/l	Calcium CA ug/l	Cadmium CD ug/l	Cobalt CO ug/l	Chromium CR ug/l	Copper CU ug/l	Iron FE ug/l	Mercury HG ug/l	Potassium K ug/l	Magnesium MG ug/l
0	06-Oct-97															
1	13-Oct-97															
2	20-Oct-97															
3	27-Oct-97	<.05	<1	<1	0.5	<.5	<.05	<50	<.1	<.02	<.5	<.1	<10	<1	<50	<1
4	03-Nov-97															
5	10-Nov-97															
6	17-Nov-97															
7	24-Nov-97	<.05	<1	<1	0.6	<.5	<.05	<50	<.1	<.02	<.5	1.1	<10	<1	<50	1
8	01-Dec-97															
9	08-Dec-97															
10	15-Dec-97															
11	22-Dec-97	<.05	<1	<1	0.2	<.5	<.05	<50	<.1	<.02	<.5	0.6	<10	<1	<50	<1
12	29-Dec-97															
13	05-Jan-98															
14	12-Jan-98															
15	19-Jan-98	<.05	<1	<1	<.05	<.5	<.05	<50	<.1	<.02	<.5	<.1	<10	<1	<50	<1
16	26-Jan-98															
17	02-Feb-98															
18	09-Feb-98															
19	16-Feb-98	<.05	<1	<1	0.05	<.5	<.05	<50	<.1	0.1	<.5	3.7	<10	<1	<50	<1
20	23-Feb-98															
21	02-Mar-98															
22	09-Mar-98															
23	16-Mar-98	<.05	<1	<1	0.55	<.5	<.05	<50	<.1	<.02	<.5	2	<10	<1	<50	<1
24	23-Mar-98															
25	30-Mar-98															
26	06-Apr-98															
27	13-Apr-98	<.05	<1	<1	<.05	<.5	<.05	50	<.1	<.02	<.5	1	<10	<1	<50	<1
28	20-Apr-98															
29	27-Apr-98															

Table of Contents

QA/QC Data
Leachate Blank Metal Concentrations

Week	Date	Dissolved Metals: Silver AG ug/l	Aluminum AL ug/l	Arsenic AS ug/l	Barium BA ug/l	Beryllium BE ug/l	Bismuth BI ug/l	Calcium CA ug/l	Cadmium CD ug/l	Cobalt CO ug/l	Chromium CR ug/l	Copper CU ug/l	Iron FE ug/l	Mercury HG ug/l	Potassium K ug/l	Magnesium MG ug/l
30	04-May-98															
31	11-May-98	<.05	<1	1	0.2	<.5	<.05	<50	<.1	0.02	<.5	2	<10	<1	<50	1
32	18-May-98															
33	25-May-98															
34	01-Jun-98															
35	08-Jun-98	<.05	<1	<1	0.05	<.5	<.05	<50	<.1	<.02	<.5	0.3	<10	<1	<50	<1
36	15-Jun-98															
37	22-Jun-98															
38	29-Jun-98															
39	06-Jul-98	<.05	<1	<1	<.05	<.5	<.05	<50	<.1	<.02	<.5	<.1	<10	<1	<50	<1
40	13-Jul-98															
41	20-Jul-98															
42	27-Jul-98															
43	03-Aug-98	<.05	<1	<1	<.05	<.5	<.05	<50	<.1	<.02	<.5	<.1	<10	<1	<50	<1
44	10-Aug-98															
45	17-Aug-98															
46	24-Aug-98															
47	31-Aug-98	<.05	7	<1	<.05	<.5	<.05	<50	<.1	<.02	<.5	0.7	<10	<1	<50	<1
48	07-Sep-98															
49	14-Sep-98															

Table of Contents

QA/QC Data
Leachate Blank Metal Concentrations

Week	Date	Manganese MN ug/l	Molybdenum MO ug/l	Sodium NA ug/l	Nickel NI ug/l	Phosphorus P ug/l	Lead PB ug/l	Antimony SB ug/l	Selenium SE ug/l	Tin SN ug/l	Strontium SR ug/l	Titanium TI ug/l	Thallium TL ug/l	Uranium U ug/l	Vanadium V ug/l	Zinc ZN ug/l
0	06-Oct-97															
1	13-Oct-97															
2	20-Oct-97															
3	27-Oct-97	<.05	<.1	<50	<.2	<100	<2	0.2	<1	0.5	0.1	<1	<.05	<.05	<1	1
4	03-Nov-97															
5	10-Nov-97															
6	17-Nov-97															
7	24-Nov-97	0.05	<.1	<50	<.2	<100	8	<.05	<1	<.5	0.2	<1	<.05	<.05	<1	1.5
8	01-Dec-97															
9	08-Dec-97															
10	15-Dec-97															
11	22-Dec-97	<.05	<.1	<50	<.2	<100	<2	<.05	<1	<.5	0.05	<1	<.05	<.05	<1	<.5
12	29-Dec-97															
13	05-Jan-98															
14	12-Jan-98															
15	19-Jan-98	<.05	<.1	<50	<.2	<100	<2	<.05	<1	0.5	0.05	<1	<.05	<.05	<1	<.5
16	26-Jan-98															
17	02-Feb-98															
18	09-Feb-98															
19	16-Feb-98	<.05	<.1	<50	<.2	<100	2	0.05	<1	<.5	<.05	<1	<.05	<.05	<1	0.5
20	23-Feb-98															
21	02-Mar-98															
22	09-Mar-98															
23	16-Mar-98	<.05	<.1	<50	<.2	<100	<2	<.05	<1	<.5	0.15	<1	<.05	<.05	<1	1.5
24	23-Mar-98															
25	30-Mar-98															
26	06-Apr-98															
27	13-Apr-98	<.05	<.1	<50	<.2	<100	<2	<.05	<1	<.5	<.05	<1	<.05	<.05	<1	0.5
28	20-Apr-98															
29	27-Apr-98															

Table of Contents

QA/QC Data
Leachate Blank Metal Concentrations

Week	Date	Manganese MN ug/l	Molybdenum MO ug/l	Sodium NA ug/l	Nickel NI ug/l	Phosphorus P ug/l	Lead PB ug/l	Antimony SB ug/l	Selenium SE ug/l	Tin SN ug/l	Strontium SR ug/l	Titanium TI ug/l	Thallium TL ug/l	Uranium U ug/l	Vanadium V ug/l	Zinc ZN ug/l
30	04-May-98															
31	11-May-98	<.05	<.1	<50	1.6	<100	<2	<.05	<1	0.5	0.15	<1	<.05	<.05	<1	2.5
32	18-May-98															
33	25-May-98															
34	01-Jun-98															
35	08-Jun-98	<.05	<.1	<50	<.2	<100	<2	<.05	<1	<.5	<.05	<1	<.05	<.05	<1	<.5
36	15-Jun-98															
37	22-Jun-98															
38	29-Jun-98															
39	06-Jul-98	<.05	<.1	<50	<.2	<100	<2	<.05	<1	<.5	<.05	<1	<.05	<.05	<1	0.5
40	13-Jul-98															
41	20-Jul-98															
42	27-Jul-98															
43	03-Aug-98	<.05	<.1	<50	<.2	<100	<2	<.05	<1	<.5	<.05	<1	<.05	<.05	<1	<.5
44	10-Aug-98															
45	17-Aug-98															
46	24-Aug-98															
47	31-Aug-98	<.05	<.1	<50	<.2	<100	<2	<.05	<1	<.5	0.05	<1	<.05	<.05	<1	<.5
48	07-Sep-98															
49	14-Sep-98															

Table of Contents

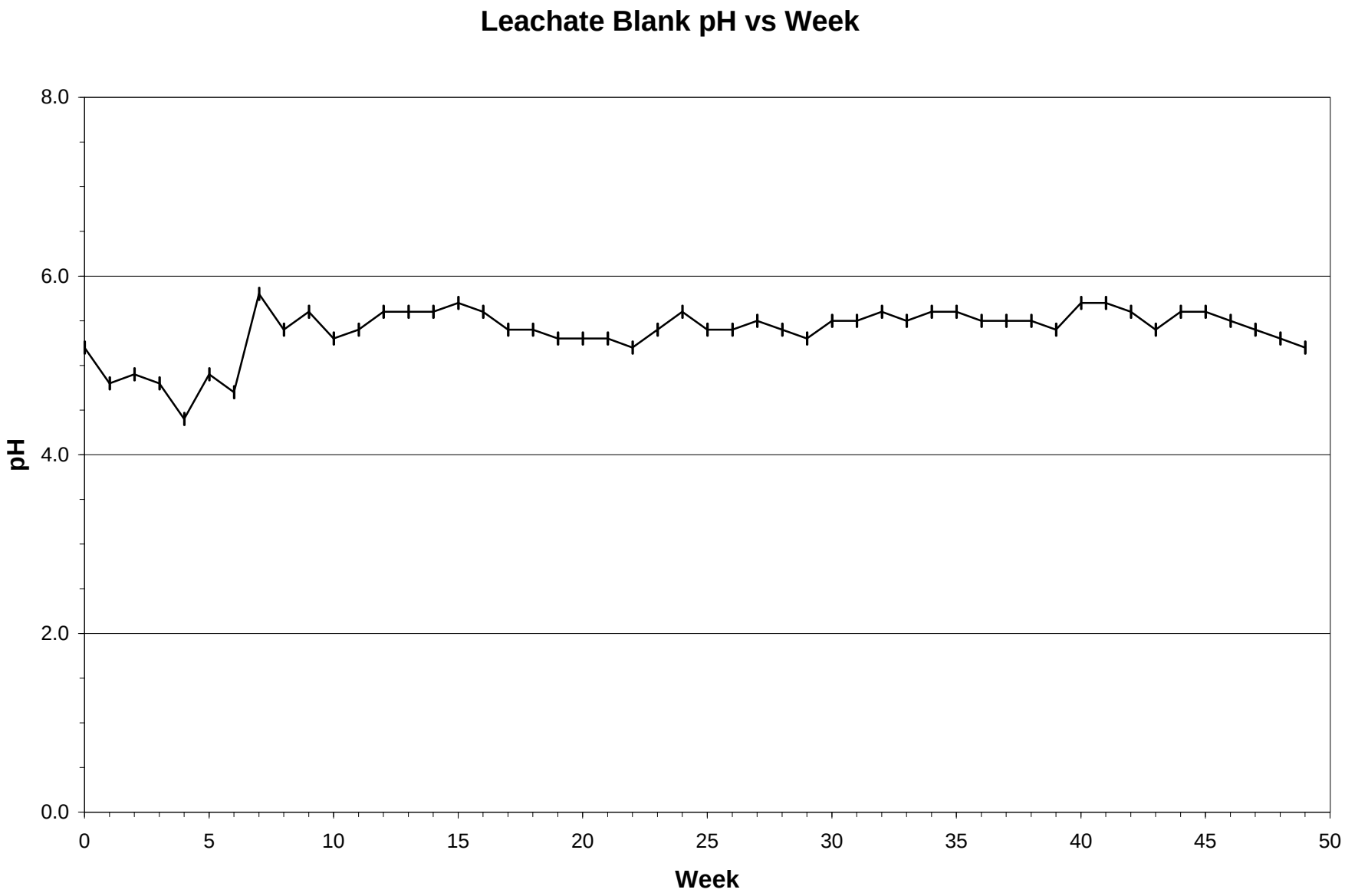


Table of Contents

Leachate Blank Conductivity vs Week

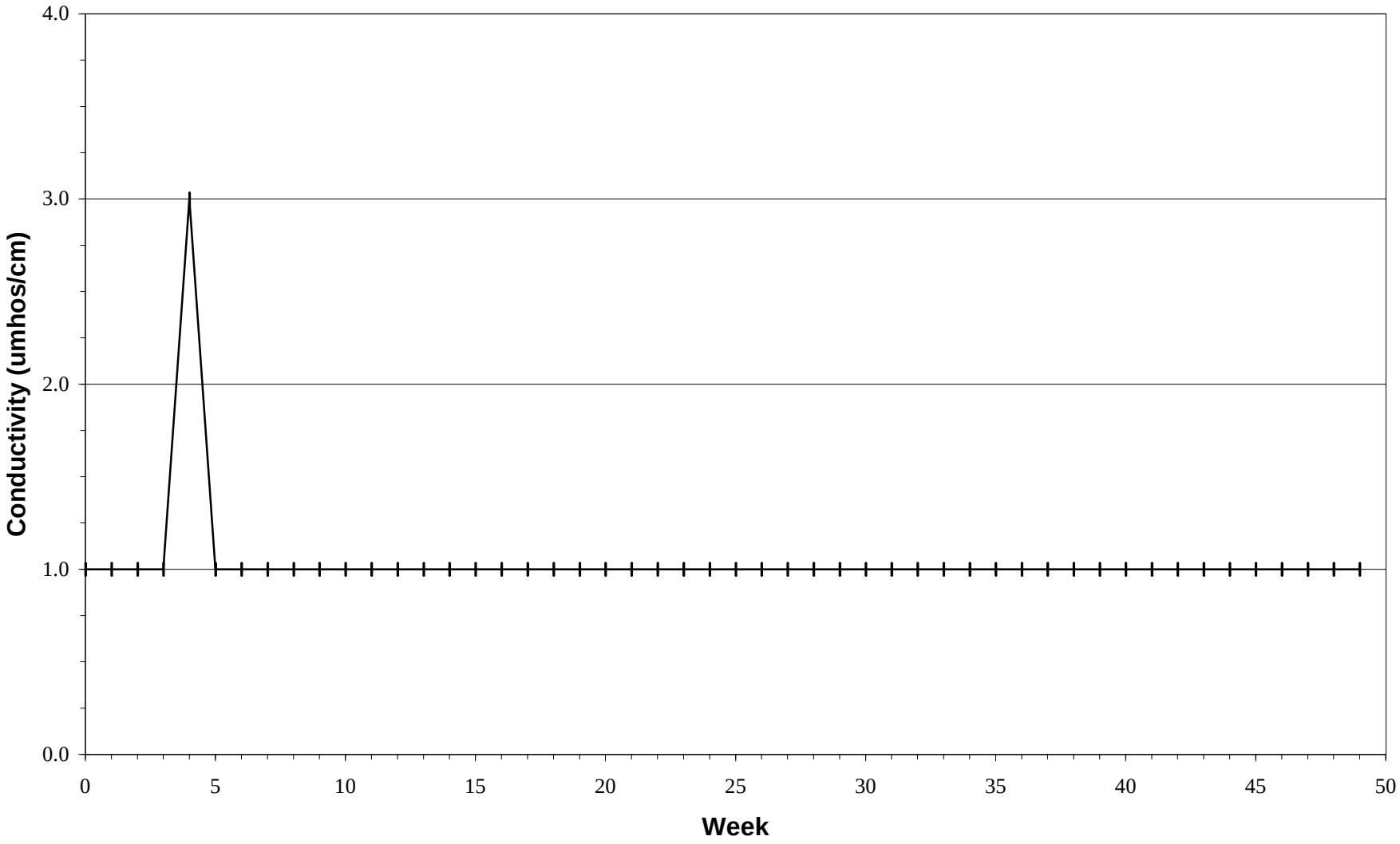


Table of Contents

Leachate Blank Alkalinity vs Week

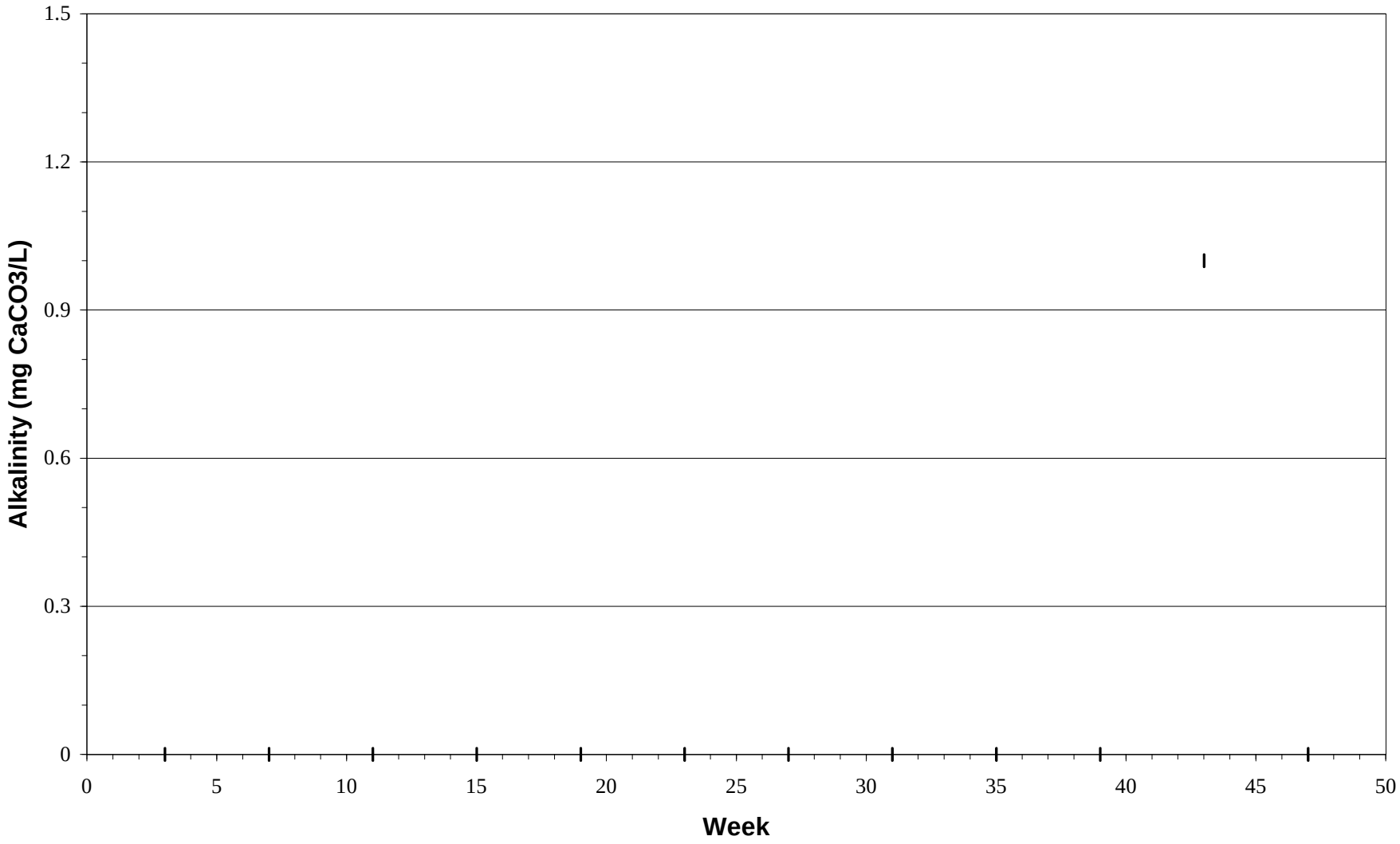


Table of Contents

Leachate Blank Acidity vs Week

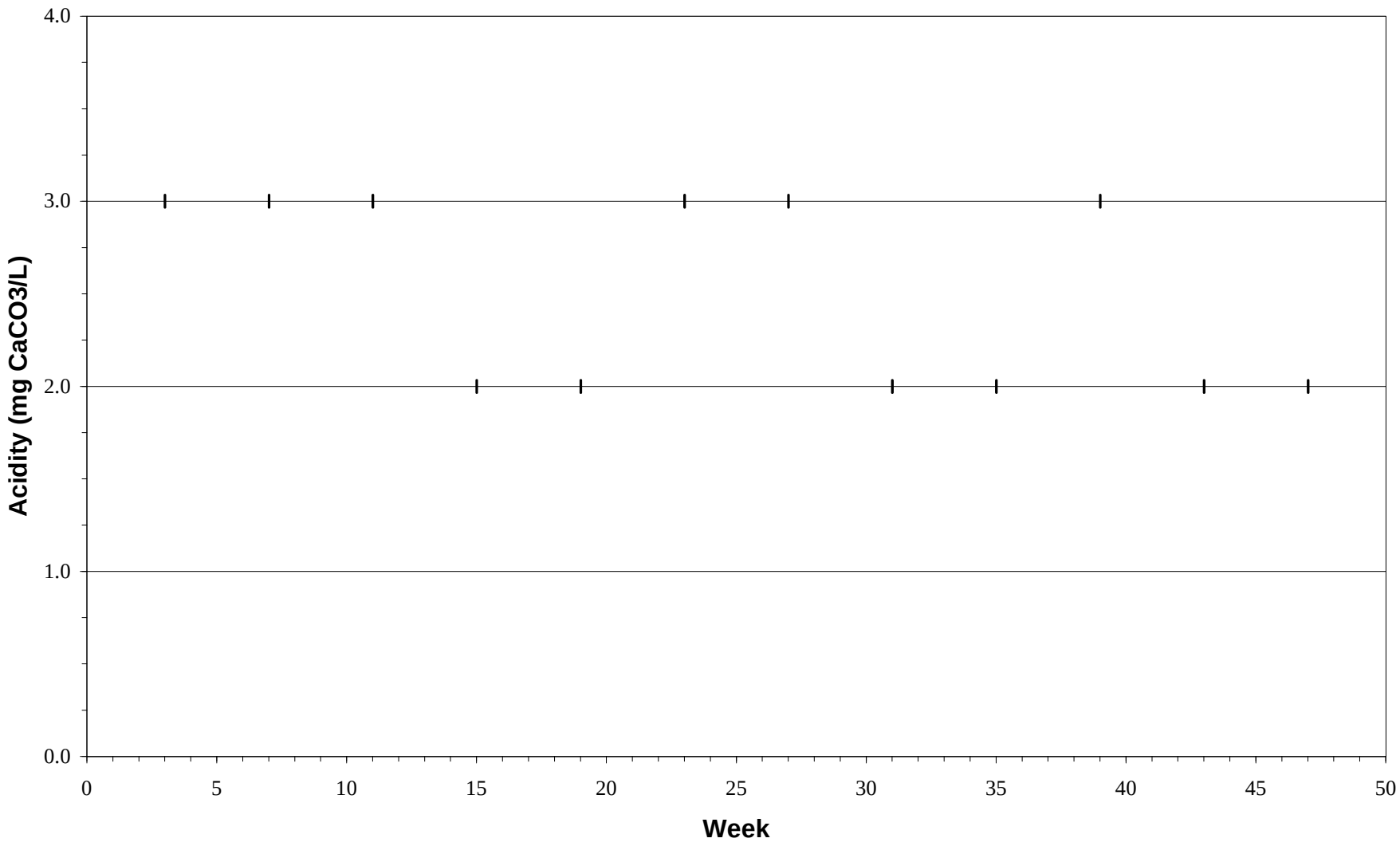


Table of Contents

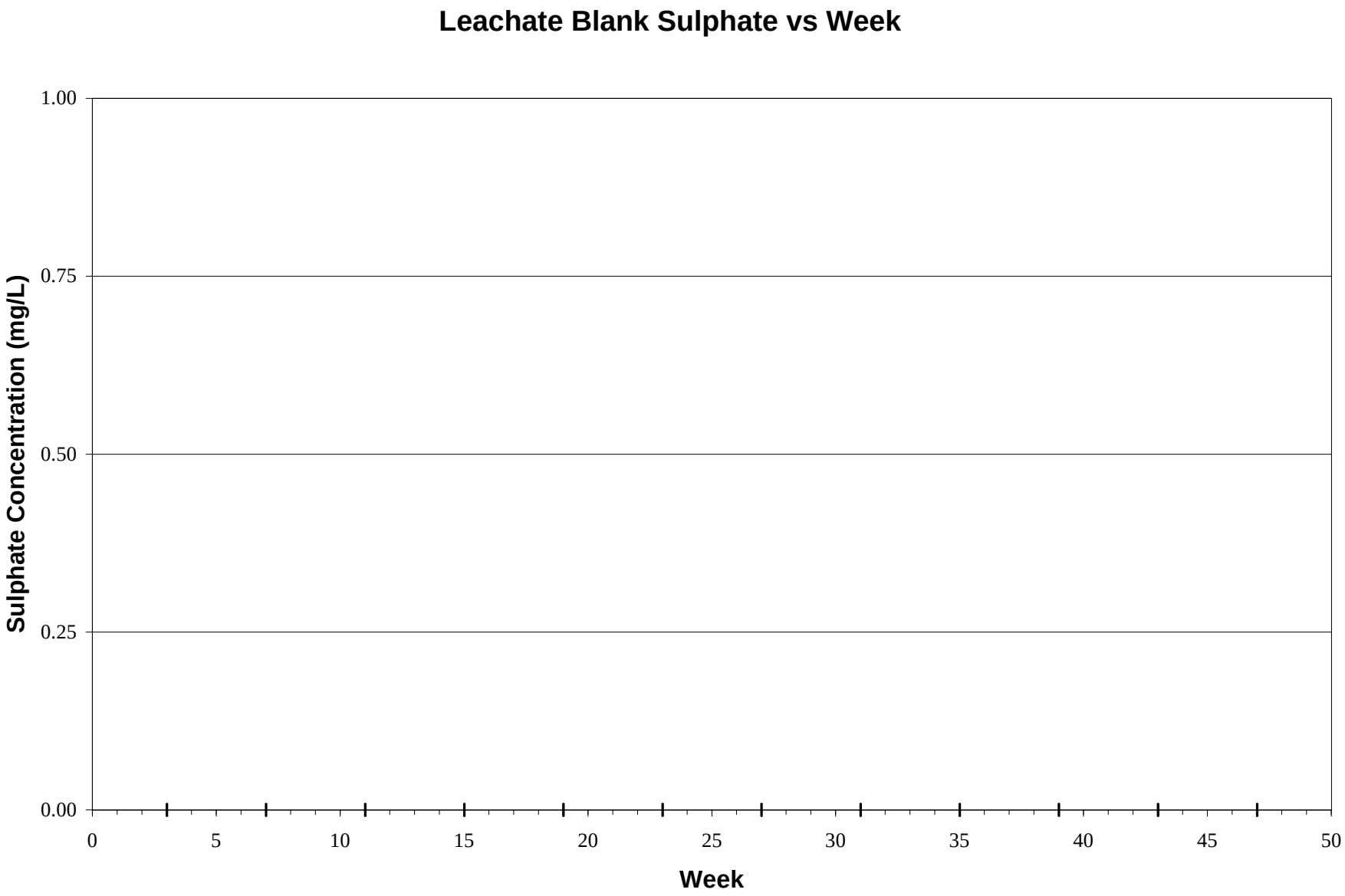


Table of Contents

Leachate Blank Metal Concentrations vs Week

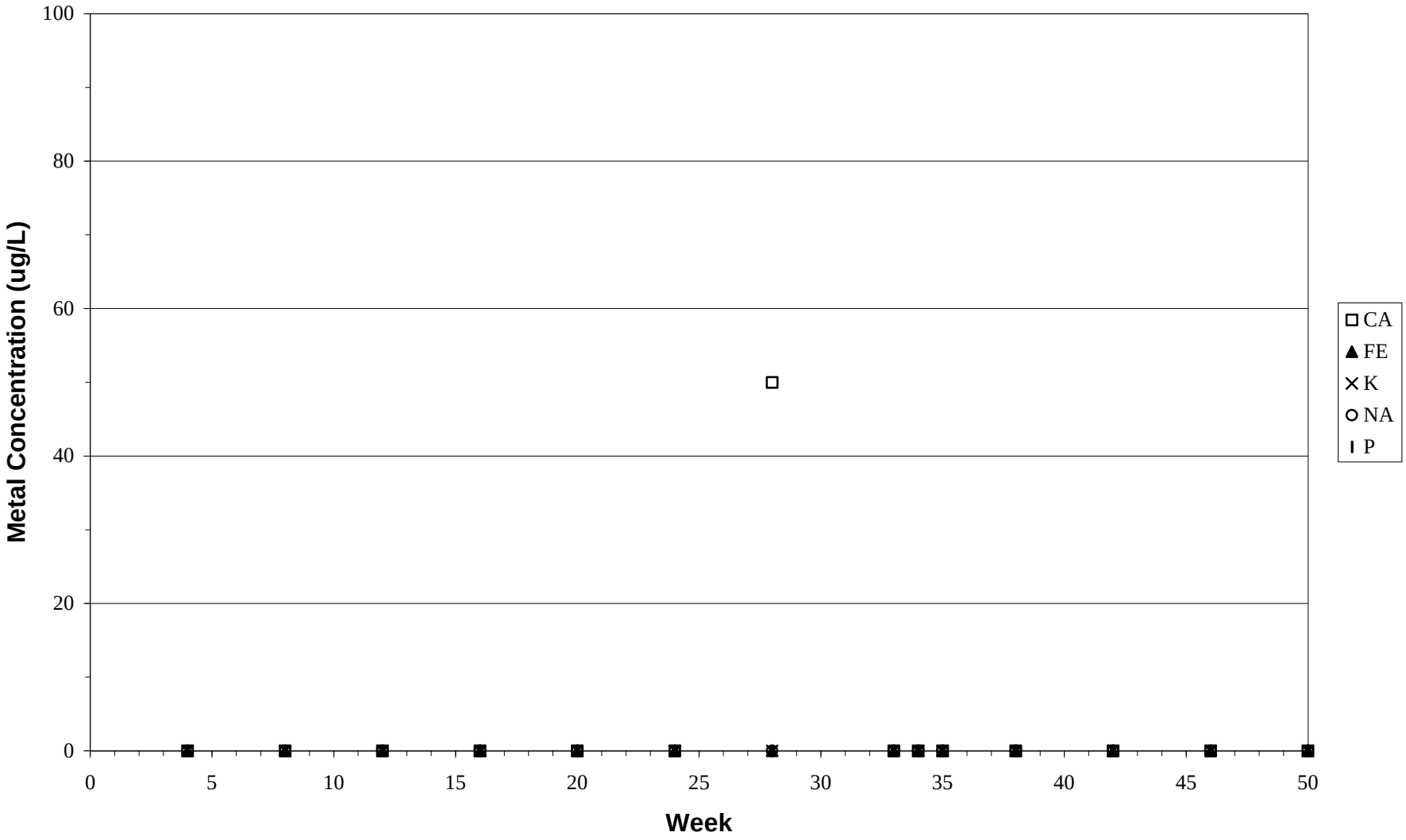


Table of Contents

Leachate Blank Metal Concentrations vs Week

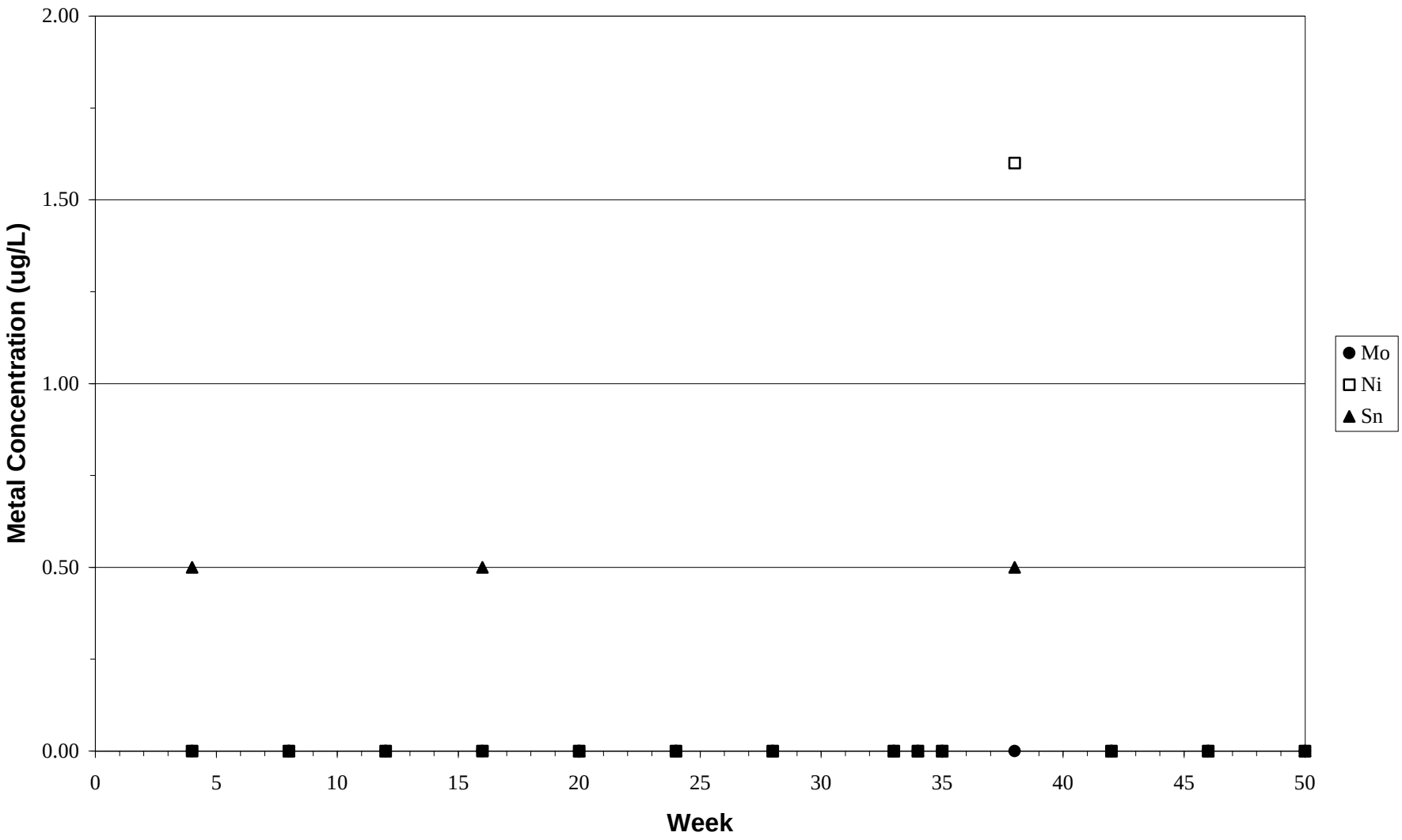


Table of Contents

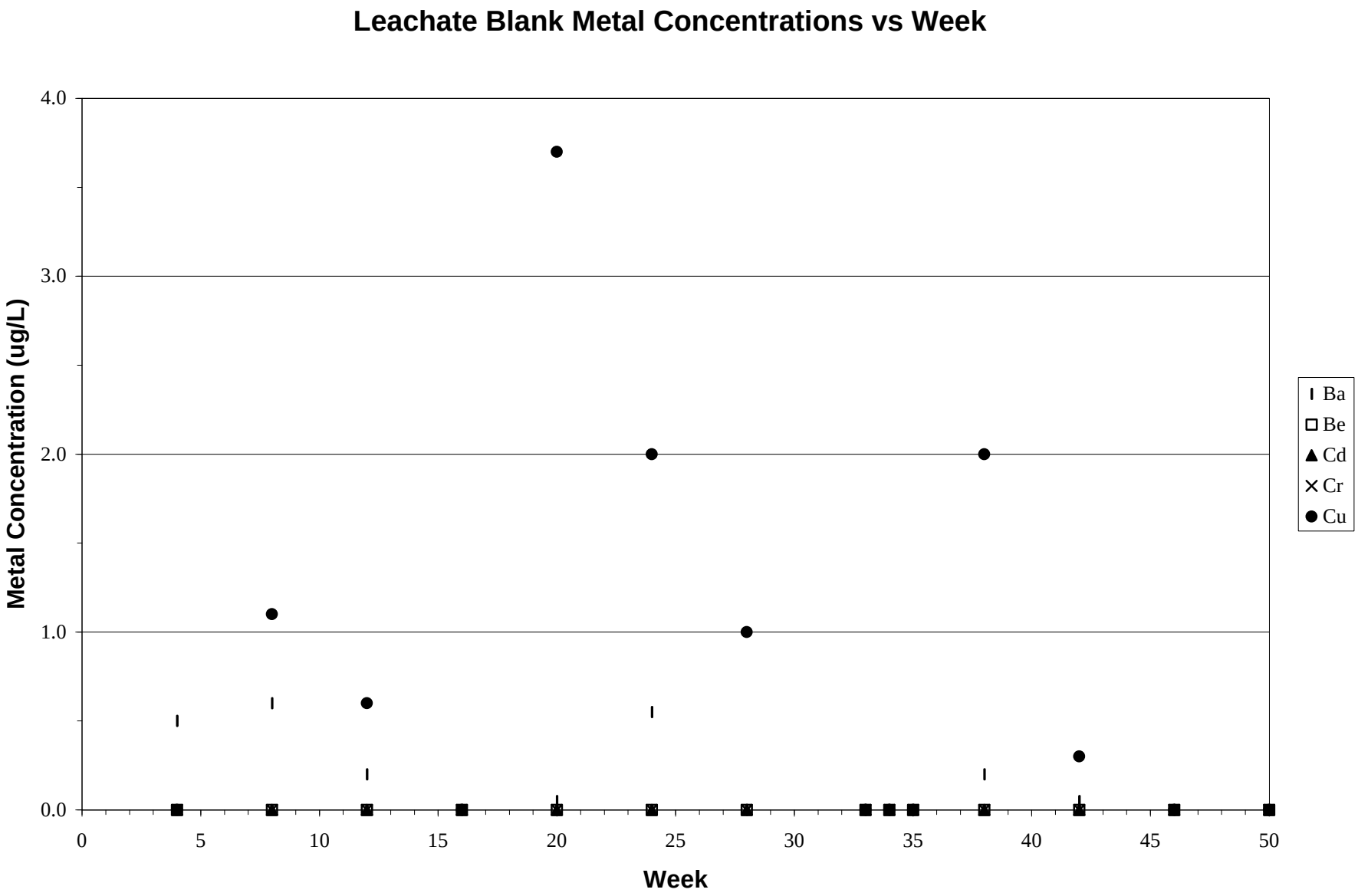


Table of Contents

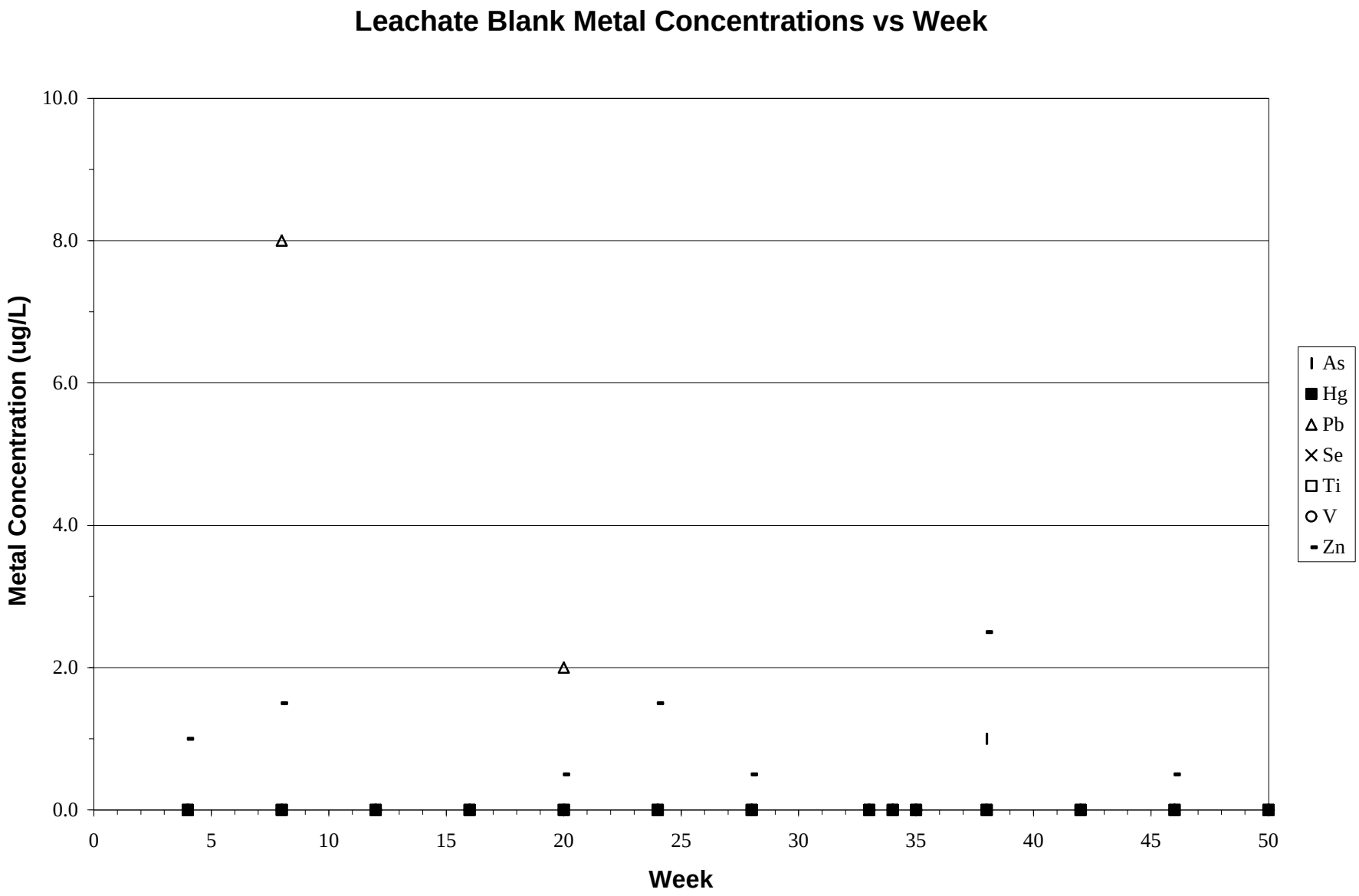
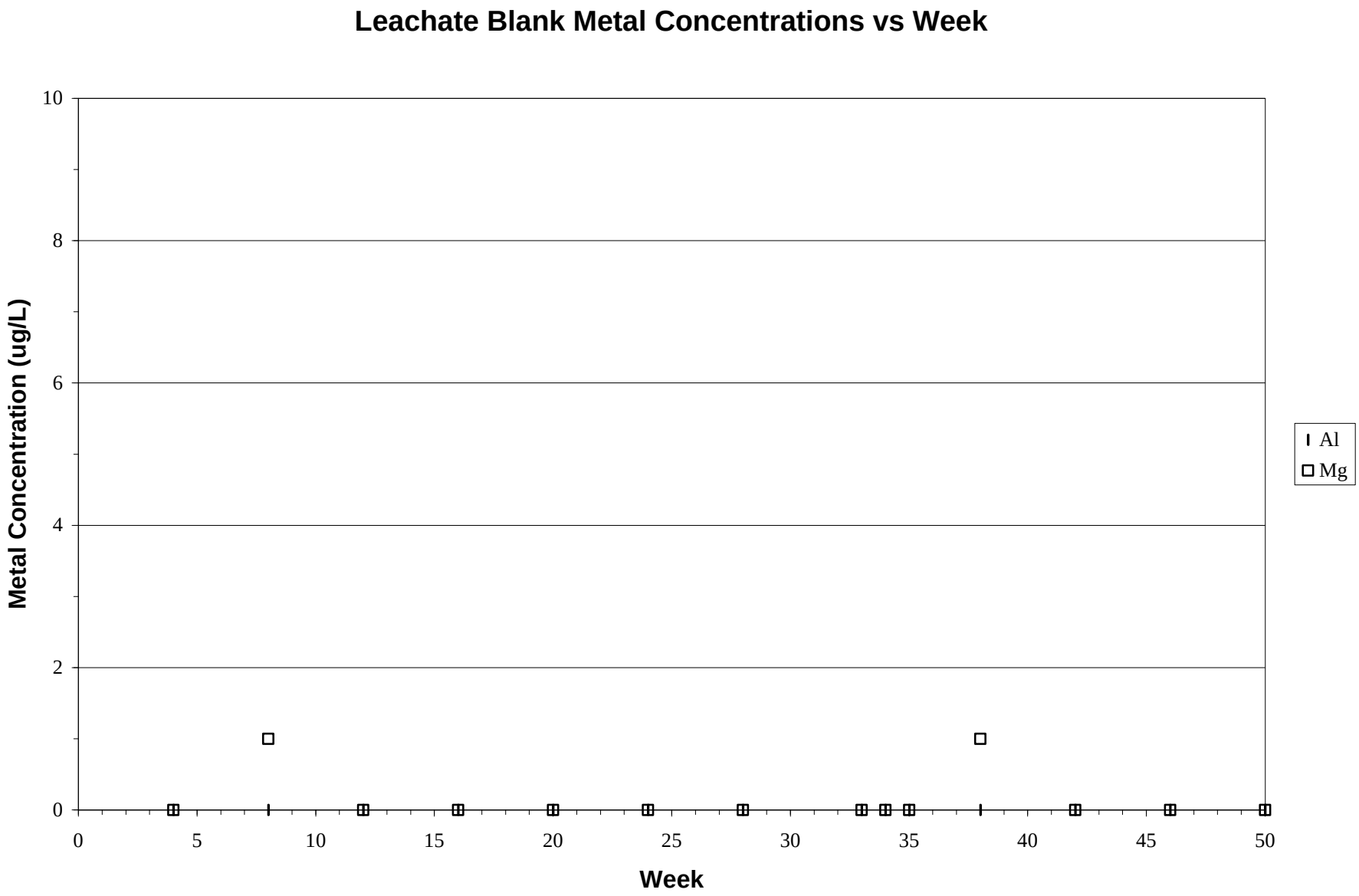


Table of Contents



Leachate Blank Metal Concentrations vs Week

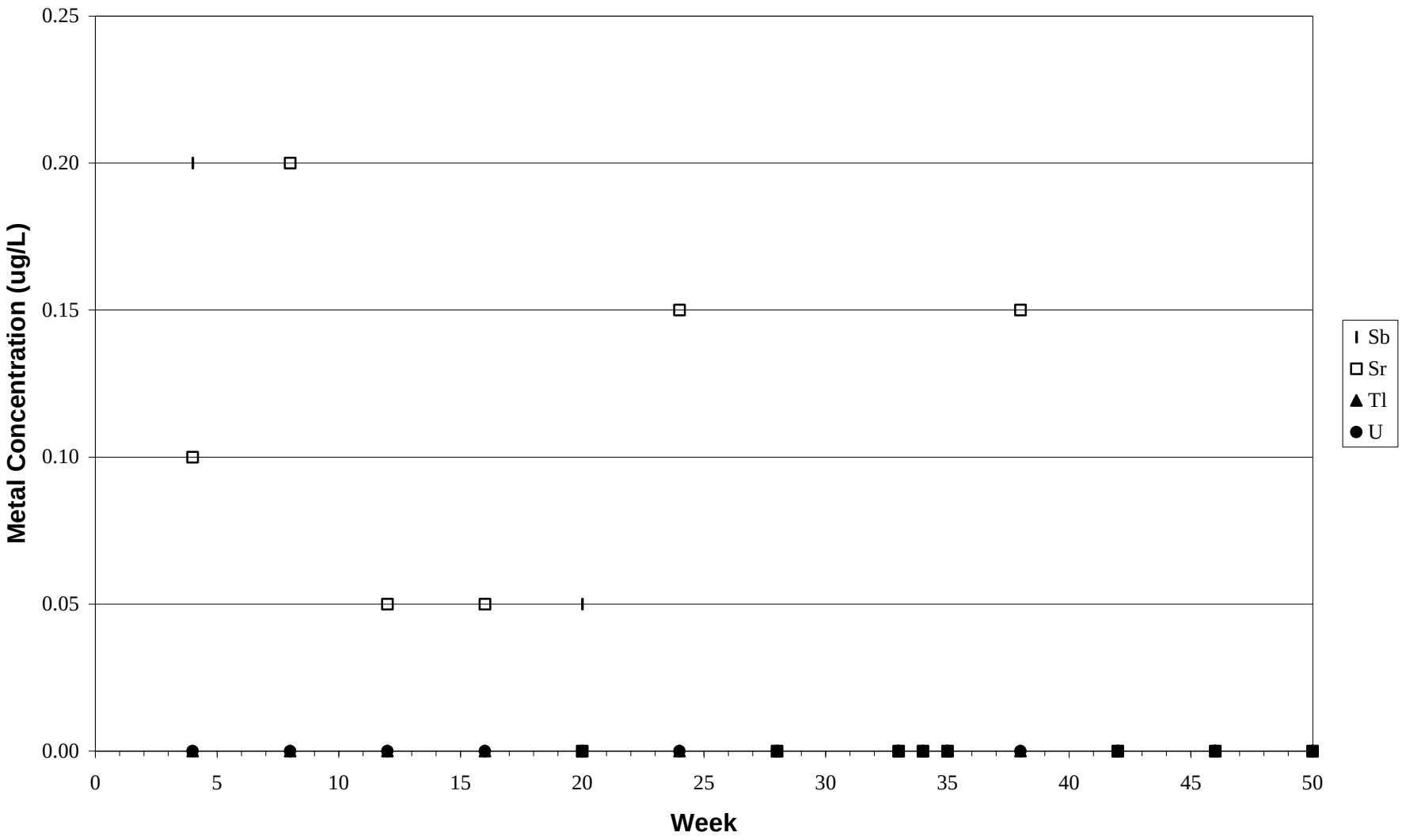
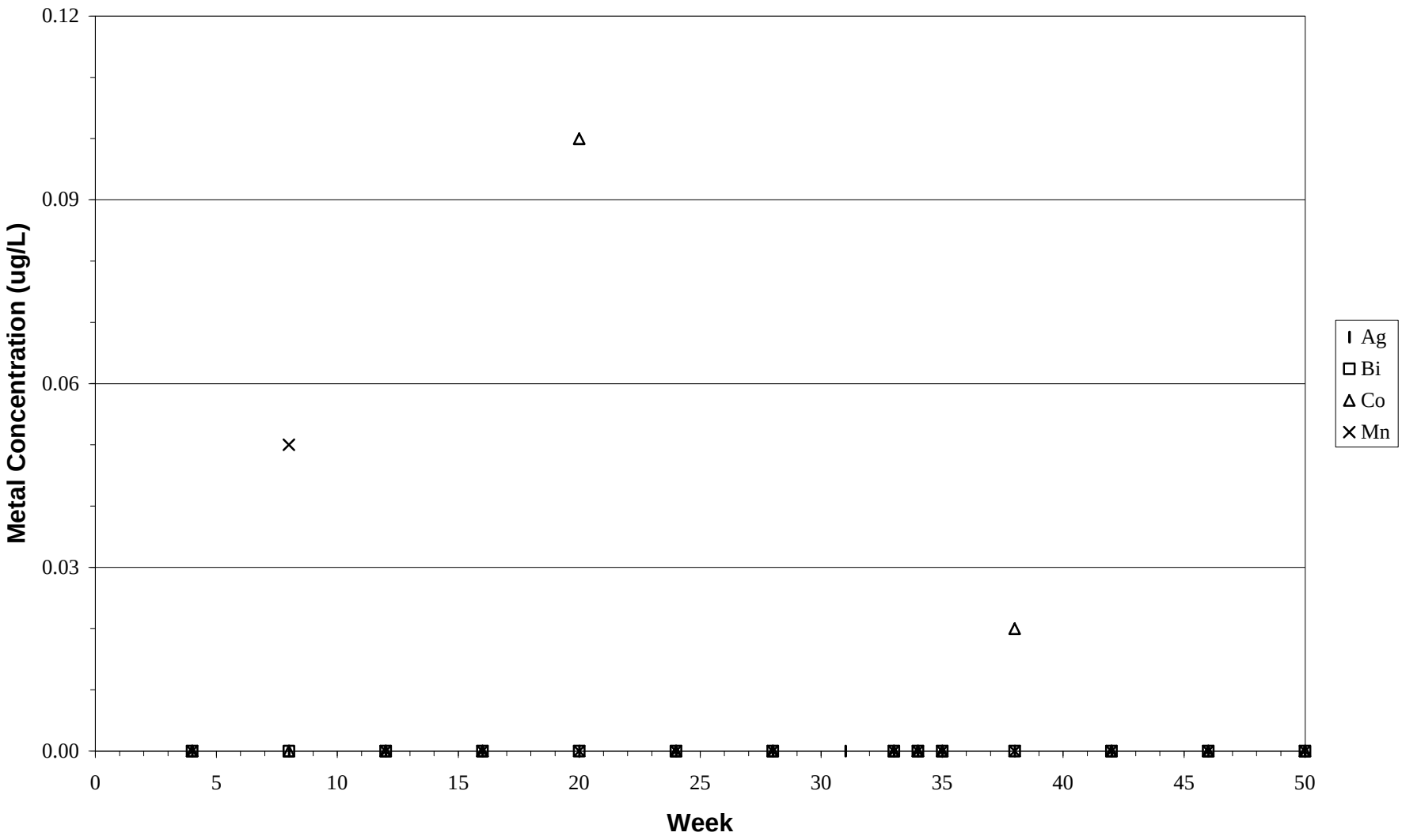


Table of Contents

Leachate Blank Metal Concentrations vs Week



◎ Table of Contents

QA/QC Data
Metal Concentrations (ppm) in Pre- and Post-Test Material

Altered Basalt	Al	Sb	As	Ba	Be	Bi	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg
Original Pre-test	49000	2.4	128	80	<0.5	<2	<0.5	61600	629	58	74	59400	***2***	42600
Pre-test Re-run	53100	-	-	260	<0.5	2	0.5	63800	609	60	75	59100	8	40600
Original Post-test	51500	1.2	113	80	<0.5	<2	<0.5	63700	534	61	82	59900	2	35500
Post-test Re-run	53800	-	-	150	<0.5	<2	0.5	63900	607	61	77	60400	6	42300
Average Pre-test	51050	2.4	128	170	<0.5	<2	<0.5	62700	619	59	74.5	59250	5	41600
Average Post-test	52650	1.2	113	115	<0.5	<2	<0.5	63800	570.5	61	79.5	60150	4	38900

B2 Mineralized Zone	Al	Sb	As	Ba	Be	Bi	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg
Original Pre-test	48300	1.8	320	90	0.5	4	0.5	66600	165	32	176	76900	***2***	22400
Pre-test Re-run	55000	-	-	100	<0.5	***2***	0.5	70400	173	36	177	79200	12	23100
Original Post-test	50600	2.4	276	90	<0.5	2	***0.5***	64900	165	39	154	71600	12	23100
Post-test Re-run	54200	-	-	100	<0.5	2	0.5	69500	170	37	142	76600	12	22400
Average Pre-test	51650	1.8	320	95	<0.5	3	0.5	68500	169	34	176.5	78050	7	22750
Average Post-test	52400	2.4	276	95	<0.5	2	0.5	67200	167.5	38	148	74100	12	22750

B3 Alteration Halo	Al	Sb	As	Ba	Be	Bi	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg
Original Pre-test	39600	19.6	760	60	<0.5	2	0.5	28300	1240	80	27	63300	2	95600
Pre-test Re-run	42100	-	-	70	<0.5	4	2	30200	1190	83	20	63300	6	102000
Original Post-test	38600	17	485	50	<0.5	4	0.5	27400	1115	76	26	64200	6	106000
Post-test Re-run	39500	-	-	110	<0.5	2	2	28300	1090	74	18	66600	6	107000
Average Pre-test	40850	19.6	760	65	<0.5	3	1.25	29250	1215	81.5	23.5	63300	4	98800
Average Post-test	39050	17	485	80	<0.5	3	1.25	27850	1102.5	75	22	65400	6	106500

Values in bold italics indicate where the measurement was less than the detection limit

Table of Contents

QA/QC Data
Metal Concentrations (ppm) in Pre- and Post-Test Material

Altered Basalt	Mn	Hg	Mo	Ni	P	K	Ag	Na	Sr	Ti	V	W	Zn
Original Pre-test	1100	<10	<1	258	150	2700	<0.2	8600	92	1000	170	<10	70
Pre-test Re-run	1185	-	<1	282	130	2800	<0.2	9100	96	1100	175	<10	80
Original Post-test	1195	<10	<1	270	110	2900	<0.2	8300	94	1300	169	<10	84
Post-test Re-run	1205	-	<1	286	120	3000	<0.2	9200	96	1600	180	<10	84
Average Pre-test	1142.5	<10	<1	270	140	2750	<0.2	8850	94	1050	172.5	<10	75
Average Post-test	1200	<10	<1	278	115	2950	<0.2	8750	95	1450	174.5	<10	84

B2 Mineralized Zone	Mn	Hg	Mo	Ni	P	K	Ag	Na	Sr	Ti	V	W	Zn
Original Pre-test	1435	<10	<1	38	260	5900	1.6	8900	98	1500	209	<10	156
Pre-test Re-run	1615	-	<1	43	250	6600	2.6	10300	103	2100	223	<10	192
Original Post-test	1550	70	<1	43	260	6200	2.6	9800	105	1600	218	<10	162
Post-test Re-run	1555	120	<1	40	260	6800	2.8	10400	96	2100	217	<10	162
Average Pre-test	1525	<10	<1	40.5	255	6250	2.1	9600	100.5	1800	216	<10	174
Average Post-test	1552.5	95	<1	41.5	260	6500	2.7	10100	100.5	1850	217.5	<10	162

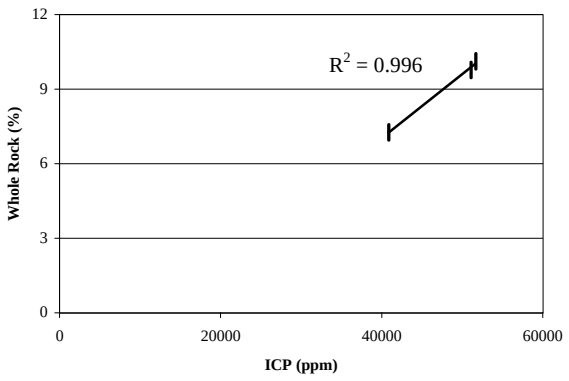
B3 Alteration Halo	Mn	Hg	Mo	Ni	P	K	Ag	Na	Sr	Ti	V	W	Zn
Original Pre-test	995	<10	<1	576	20	3700	0.4	7800	97	300	137	<10	64
Pre-test Re-run	1045	-	<1	614	10	3900	0.8	8500	98	300	134	<10	70
Original Post-test	1120	<10	<1	504	10	3400	0.8	7700	102	400	133	<10	76
Post-test Re-run	1085	-	<1	461	10	4100	0.4	8500	86	400	125	<10	82
Average Pre-test	1020	<10	<1	595	15	3800	0.6	8150	97.5	300	135.5	<10	67
Average Post-test	1102.5	<10	<1	482.5	10	3750	0.6	8100	94	400	129	<10	79

Values in bold italics indicate where the measurement was less than the detection limit

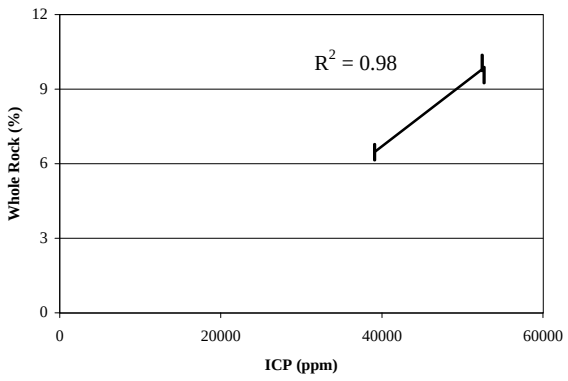
◎ Table of Contents

QA/QC Data
Whole Rock Analysis (%) vs ICP Analysis (ppm)

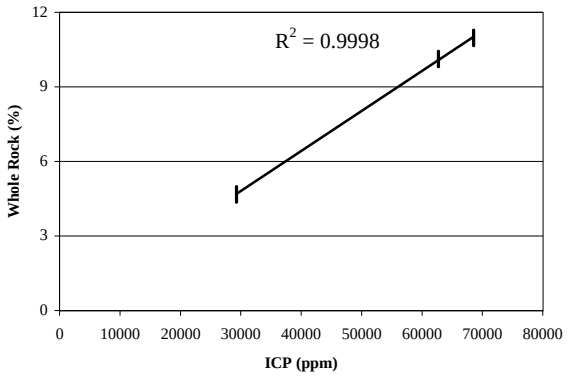
QA/QC
Aluminum (Pre-Test)



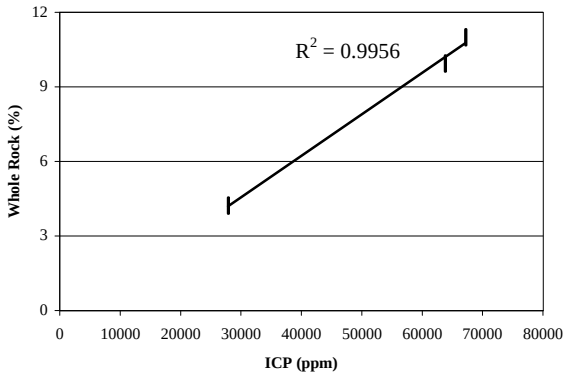
QA/QC
Aluminum (Post-Test)



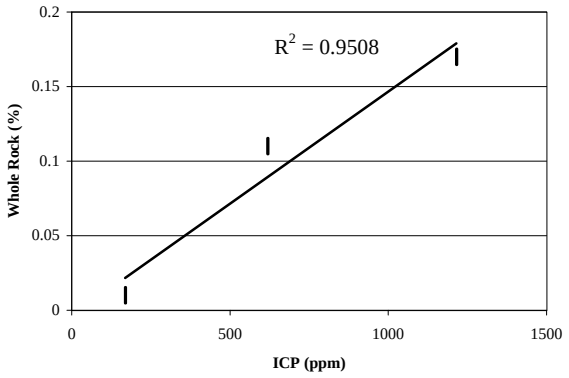
QA/QC
Calcium (Pre-Test)



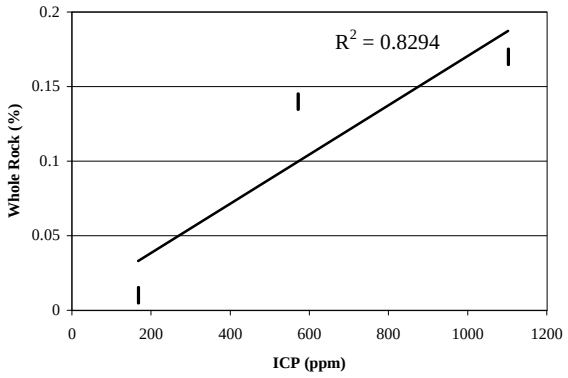
QA/QC
Calcium (Post-Test)



QA/QC
Chromium (Pre-Test)



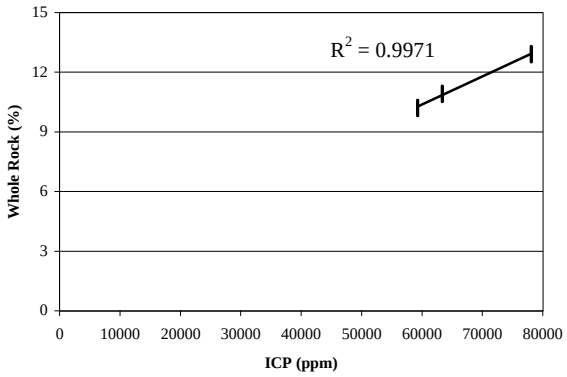
QA/QC
Chromium (Post-Test)



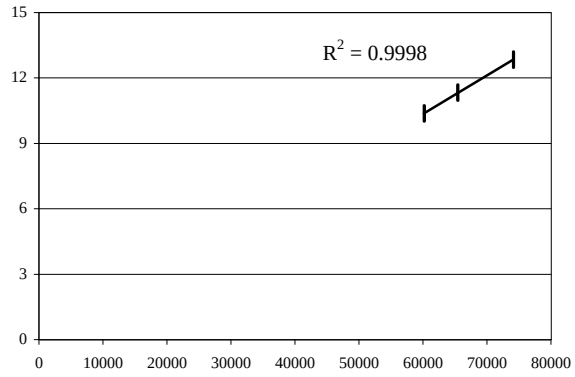
◎ Table of Contents

QA/QC Data
Whole Rock Analysis (%) vs ICP Analysis (ppm)

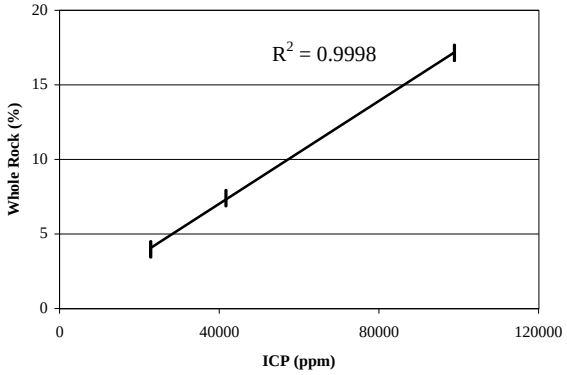
QA/QC
Iron (Pre-Test)



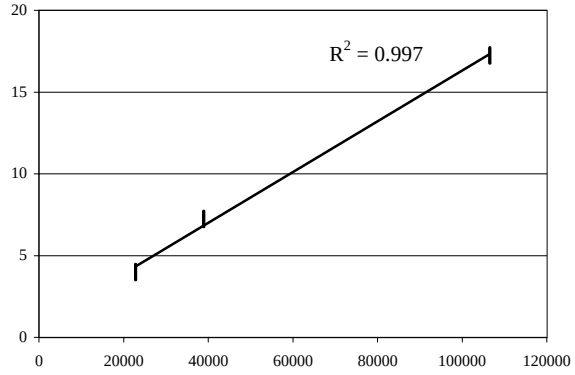
QA/QC
Iron (Post-Test)



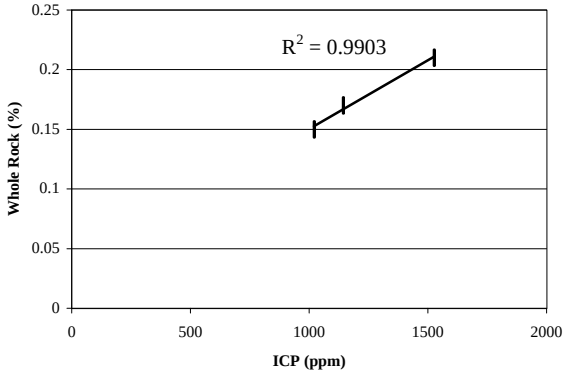
QA/QC
Magnesium (Pre-Test)



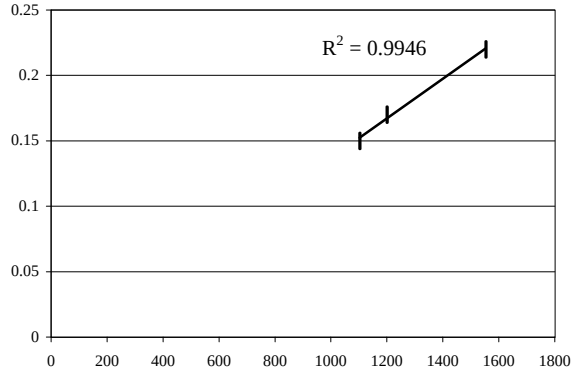
QA/QC
Magnesium (Post-Test)



QA/QC
Manganese (Pre-Test)



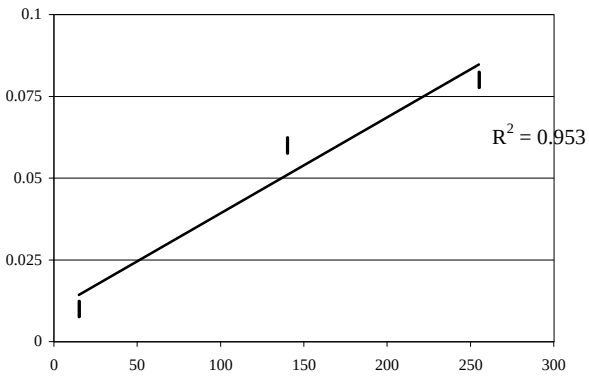
QA/QC
Manganese (Post-Test)



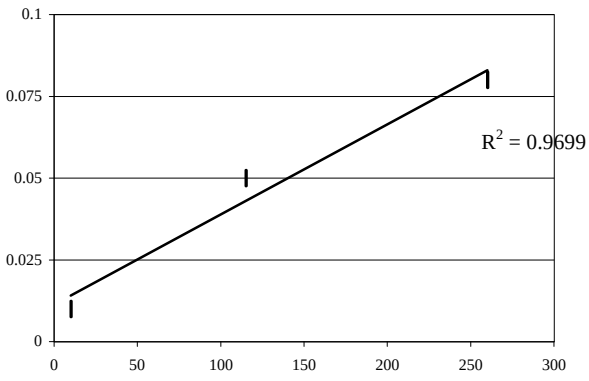
◎ Table of Contents

QA/QC Data
Whole Rock Analysis (%) vs ICP Analysis (ppm)

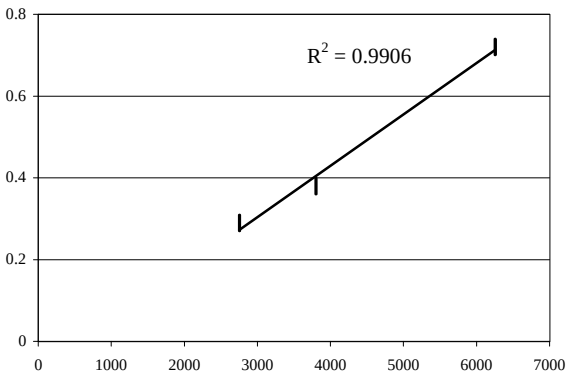
QA/QC
Phosphorus (Pre-Test)



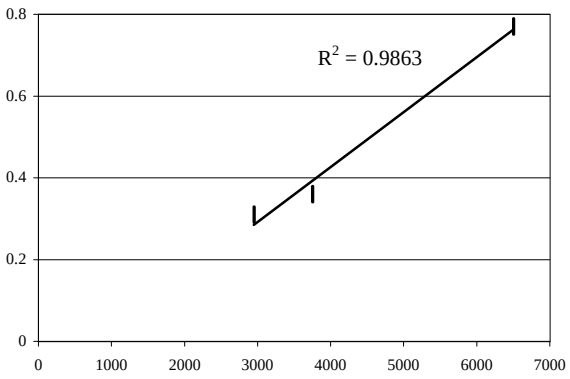
QA/QC
Phosphorus (Post-Test)



QA/QC
Potassium (Pre-Test)



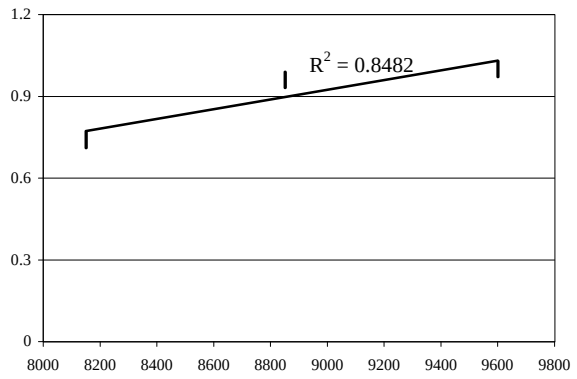
QA/QC
Potassium (Post-Test)



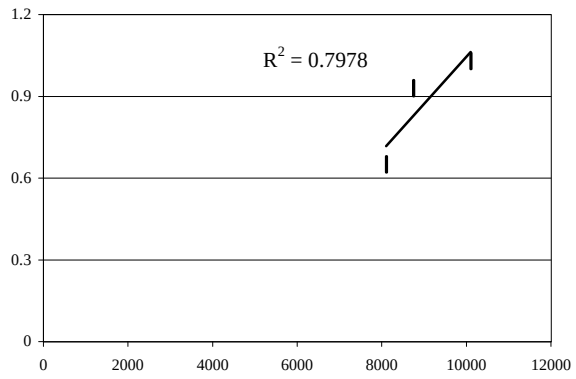
◎ Table of Contents

QA/QC Data
Whole Rock Analysis (%) vs ICP Analysis (ppm)

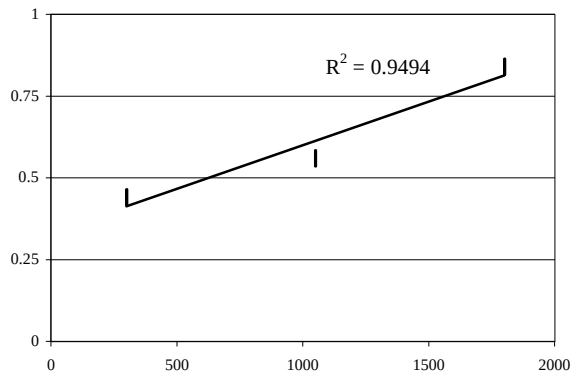
QA/QC
Sodium (Pre-Test)



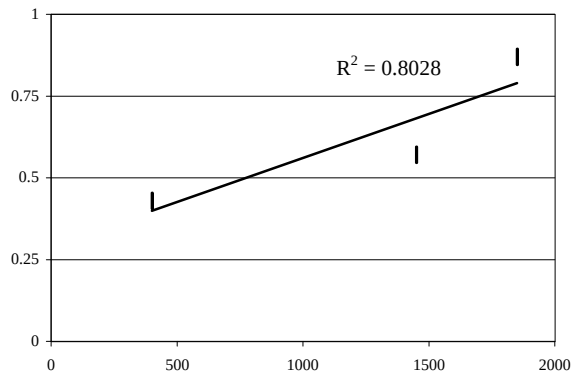
QA/QC
Sodium (Post-Test)



QA/QC
Titanium (Pre-Test)



QA/QC
Titanium (Post-Test)



Appendix D-1
Petrographic Data

◎ Table of Contents

Harris
EXPLORATION
SERVICES

MINERALOGY AND GEOCHEMISTRY

534 ELLIS STREET, NORTH VANCOUVER, B.C., CANADA V7H 2G6 TELEPHONE (604) 929-5867

Report for: Rescan Environmental Services Ltd.,
6th Floor,
1111 West Hastings St.,
VANCOUVER, B.C.
V6E 2J3

Report 97-164

October 9, 1997

PETROGRAPHIC EXAMINATION OF SAMPLES FROM PROJECT 526-1

Introduction:

6 samples of crushed rock, numbered as below, were forwarded from Chemex Labs at the request of Darcy McDonald. Small portions of each were briquetted with epoxy and prepared as polished thin sections (slide numbers as shown).

9210160	97-22383
9357170	97-22384
9357195	97-22385
9357230	97-22386
94113145	97-22387
94120210	97-22388

Summary:

These samples are all made up of variants of a rock type of meta-sedimentary (or possibly meta-volcaniclastic or meta-exhalite) aspect. The dominant constituent, in all cases, is carbonate, the estimated contents of which range from about 60-75%.

The carbonate is generally unreactive to dilute acid, and is probably of dolomite or ankerite composition. Exceptions are Samples 9357230 and possibly 94120210 which exhibit locallized effervescence with acid, indicating the presence of a minor accessory component of calcite.

It had been intended to obtain a definitive identification of the carbonate species by XRD, but the sample amounts provided were so small that none remained for this purpose after thin section preparation.

The other principal constituents of the rocks making up these samples are sericite, chlorite and quartz, in varied proportions and modes of intimate intergrowth with the carbonate.

Sulfides (pyrite plus traces of chalcopyrite and possible arsenopyrite) are very minor in all cases. Their total abundance is estimated as in the 0.1 - 1.0% range, except in Sample 94120210 which contains about 3% pyrite and is unique in also including a little sphalerite.

The large excess of carbonate over sulfides in all these samples should render them fully self-buffering in the event of exposure to actively oxidizing conditions.

Individual sample descriptions and a set of illustrative photo-micrographs are attached.

J.F. Harris Ph.D.

◎ Table of Contents

SAMPLE 9210160 (Slide 97-22383)

Estimated mode

Quartz	17
Carbonate	66
Sericite	12
Chlorite	2
Rutile	2
Pyrite	1
Chalcopyrite	trace

This sample is made up of variants of a single lithotype.

This is a fine-grained, more or less strongly foliated rock of meta-sedimentary aspect, made up dominantly of carbonate, of grain size 30 - 150 microns, with varied proportions of intimately intergrown sericite, cherty quartz and chlorite. Dust-sized rutile is a minor but widespread accessory.

There are also a few fragments composed of non-foliated granular carbonate with pockets and bands of strained, recrystallized quartz.

The sparse sulfides consist of pyrite and lesser chalcopyrite. These occur as minute disseminated specks, 10 - 50 microns in size in the foliated carbonate/sericite rock, plus very rare coarser grains (to 0.5 mm), including an augen-like segregation mantled by chlorite, and a cluster in a coarse carbonate/quartz fragment.

◎ Table of Contents

SAMPLE 9357170 (Slide 97-22384)

Estimated mode

Quartz	20
Carbonate	72
Sericite	5
Chlorite	1
Rutile	1
Pyrite	1
Arsenopyrite(?)	trace
Chalcopyrite	trace

This sample is made up dominantly of a lithotype consisting of an aggregate of carbonate, of grain size 0.1 - 1.0 mm, with intergrown pockets and networks of microgranular quartz and wispy sericite. Coarser carbonate/quartz intergrowths (of the type described in 9210160) are significantly more abundant in this sample than in the previous one.

Sulfides are of similar (or slightly greater) abundance to those in the previous sample. They consist mainly of pyrite, plus minor amounts of a white, weakly anisotropic phase which is probably arsenopyrite (though lacking the characteristic crystal form of that mineral) and very rare chalcopyrite. They occur as sparsely scattered individual grains, 20 - 150 microns in size, plus (in the case of the pyrite) occasional coarser grains to 700 microns.

◎ Table of Contents

SAMPLE 9357195 (Slide 97-22385)

Estimated mode

Quartz	10
Carbonate	76
Sericite	1
Chlorite	13
Rutile	trace
Pyrite)	
Chalcopyrite)	trace
Arsenopyrite(?))	

The dominant lithotype in this sample is composed of fine-grained aggregates of carbonate with more or less abundant intergrown chlorite of compact, minutely foliaceous form. The chlorite occurs as streaks and pockets delineating a clumpy crypto-fragmental texture in the carbonate. In a few cases chlorite is the dominant component, forming a matrix to pods and lenses of carbonate. Sericite is notably rare.

A minor component of a granular carbonate rock with diffuse clusters of quartz is also present.

Sulfides are extremely sparse. They consist of scattered disseminated, individual specks of pyrite, chalcopyrite and probable arsenopyrite, 10 - 100 microns in size.

◎ Table of Contents

SAMPLE 9357230 (Slide 97-22386)

Estimated mode

Quartz	5
Carbonate	74
Sericite	0.5
Chlorite	20
Rutile	trace
Pyrite)	
Chalcopyrite)	trace
Arsenopyrite(?))	

This sample is lithologically similar to the previous one (9357195), consisting largely of intergrowths of carbonate and chlorite - including a variant composed of strings of semi-coalescent carbonate rhombs in a matrix of minutely fine-grained foliaceous chlorite.

A minor accessory lithotype consists of microgranular carbonate with interstitial cherty quartz. As in the previous sample, sericite is notably minor.

This is also true of sulfides, which are confined to a very few discrete grains of pyrite, 50 - 200 microns in size, plus lesser chalcopyrite and rare arsenopyrite.

SAMPLE 94113145 (Slide 97-22387)

Estimated mode

Quartz	13
Carbonate	59
Sericite	15
Chlorite	7
Chloritoid(?)	3
Rutile)	3
Leucoxene)	
Pyrite)	trace
Chalcopyrite)	

The rocks making up this sample are variants of the carbonate-rich types described in the previous samples of the suite. Sericite is a relatively abundant accessory constituent (as in 9210160). The overall proportion of carbonate - though still major - is perceptibly lower than in the other samples, and a proportion of the constituent rock fragments are lensy/foliaceous, cryptofragmental intergrowths of sericite and minutely cherty silica, sometimes with minor chlorite and/or carbonate.

This sample is distinctive for the widespread occurrence of individual, slender porphyroblasts (up to 0.3 mm in length) of a mineral thought to be chloritoid. Rutile/leucoxene is also a prominent accessory, as sporadic clumps and wisps.

Sulfides are extremely sparse, consisting of scattered individual specks of pyrite and chalcopyrite, 10 - 100 microns in size (or, in one or two instances, to 300 microns).

◎ Table of Contents

SAMPLE 94120210 (Slide 97-22388)

Estimated mode

Quartz	25
Carbonate	65
Sericite	5
Chlorite	1
Tourmaline	trace
Rutile	0.5
Pyrite	3
Arsenopyrite	trace
Chalcopyrite	trace
Sphalerite	0.2

As can be seen from macroscopic examination of the polished thin section, this sample has a perceptibly higher sulfide content than others of the suite.

Petrographic examination shows that it is of similar general lithologic character to the other samples.

It somewhat resembles 9210160 in the paucity of chlorite, and includes foliated fine-grained carbonate/sericite rocks as in that sample. However, it is distinctive for the much higher proportion of fragments of coarse carbonate/quartz and of monomineralic quartz aggregates. This quartz is typically intensely strained and shows crenulate grain boundaries with intergranular recrystallization.

Rare traces of tourmaline were also noted in this sample.

The sulfides are dominantly pyrite, as individual anhedral/subhedral grains ranging up to 1.5 mm in size. Pyrite also occurs in minutely fine-grained disseminated form, as clusters of grains down to a few microns in size.

The sulfide suite is distinctive for including traces of sphalerite, as a couple of discrete pockets 0.2 - 0.5 mm in size. These are monomineralic except for a light dusting of micron-sized exsolved chalcopyrite. Chalcopyrite also occurs as tiny specks peripherally moulded on to the coarser pyrite individuals in this sample.

Appendix D-2
Kinetic Test Data - Altered Basalt

◎ Table of Contents

Boston Property Whole Rock Data
Altered Basalt

Pre-Test Whole Rock Data Boston Property Altered basalt	
Analysis Date:	11-Oct-97
Method:	XRF/ICP
Al2O3 (%)	9.77
CaO (%)	10.12
Cr2O3 (%)	0.11
Fe2O3 (%)	10.2
K2O (%)	0.29
MgO (%)	7.4
MnO (%)	0.17
Na2O (%)	0.96
P2O5 (%)	0.06
SiO2 (%)	41.6
TiO2 (%)	0.56
LOI (%)	18.32
Total (%)	99.56
Ba (ppm)	136
Cs (ppm)	3
Hf (ppm)	2
La (ppm)	7
Nb (ppm)	4
Rb (ppm)	37
Sr (ppm)	101
Ta (ppm)	1
Y (ppm)	27
Zr (ppm)	68

Post-Test Whole Rock Data Boston Property Altered basalt	
Analysis Date:	22-Jul-98
Method:	XRF/ICP
Al2O3 (%)	9.57
CaO (%)	9.94
Cr2O3 (%)	0.14
Fe2O3 (%)	10.37
K2O (%)	0.31
MgO (%)	7.25
MnO (%)	0.17
Na2O (%)	0.93
P2O5 (%)	0.05
SiO2 (%)	42.38
TiO2 (%)	0.57
LOI (%)	18.19
Total (%)	99.87
Ba (ppm)	84
Cs (ppm)	1
Hf (ppm)	1
La (ppm)	2.5
Nb (ppm)	1
Rb (ppm)	9.8
Sr (ppm)	100
Ta (ppm)	<0.5
Y (ppm)	13.5
Zr (ppm)	38

◎ Table of Contents

Boston Property ABA and ICP Metals Data
Altered Basalt

Pre-Test ABA & ICP Metals Data Boston Altered basalt		
ABA Results:		
Paste pH		9.6
% S (Total)		0.07
% S (SO_4)		***0.01***
% S (Sulphide)		0.05
% del S (SO_4)		0.01
TAP (kg $CaCO_3$/t)		2.19
SAP (kg $CaCO_3$/t)		1.88
NP (kg $CaCO_3$/t)		313
CO2 (%)		16.3
CaNP (kg $CaCO_3$/t)		370.7
TNNP (kg $CaCO_3$/t)		310.8
SNNP (kg $CaCO_3$/t)		311.1
TNPR		143.1
SNPR		166.9
Metals: (ppm)		
Aluminum	Al	51050
Antimony	Sb	2.4
Arsenic	As	128
Barium	Ba	80
Beryllium	Be	***0.25***
Bismuth	Bi	***1***
Cadmium	Cd	***0.25***
Calcium	Ca	62700
Chromium	Cr	619
Cobalt	Co	59
Copper	Cu	74.5
Iron	Fe	59250
Lead	Pb	5
Magnesium	Mg	41600
Manganese	Mn	1142.5
Mercury	Hg	***0.005***
Molybdenum	Mo	***0.5***
Nickel	Ni	270
Phosphorus	P	140
Potassium	K	2750
Silver	Ag	***0.1***
Sodium	Na	8850
Strontium	Sr	94
Titanium	Ti	1050
Vanadium	V	172.5
Tungsten	W	***5***
Zinc	Zn	75

Post-Test ABA & ICP Metals Data Boston Altered basalt			% Remaining At End Of Testing**
ABA Results:			
Paste pH		9.30	
% S (Total)		0.06	85.7
% S (SO_4)		0.01	100.0
% S (Sulphide)		0.06	120.0
% del S (SO_4)		-0.01	
TAP (kg $CaCO_3$/t)		1.88	
SAP (kg $CaCO_3$/t)		1.88	
NP (kg $CaCO_3$/t)		334	106.7
CO2 (%)		16.7	102.5
CaNP (kg $CaCO_3$/t)		379.8	
TNNP (kg $CaCO_3$/t)		332.1	
SNNP (kg $CaCO_3$/t)		332.1	
TNPR		178.1	
SNPR		178.1	
Metals: (ppm)			
Aluminum	Al	52650	103.1
Antimony	Sb	1.2	50.0
Arsenic	As	113	88.3
Barium	Ba	80	100.0
Beryllium	Be	***0.25***	100.0
Bismuth	Bi	***1***	100.0
Cadmium	Cd	***0.25***	100.0
Calcium	Ca	63800	101.8
Chromium	Cr	570.5	92.2
Cobalt	Co	61	103.4
Copper	Cu	79.5	106.7
Iron	Fe	60150	101.5
Lead	Pb	4	80.0
Magnesium	Mg	38900	93.5
Manganese	Mn	1200	105.0
Mercury	Hg	***0.005***	100.0
Molybdenum	Mo	***0.5***	100.0
Nickel	Ni	278	103.0
Phosphorus	P	115	82.1
Potassium	K	2950	107.3
Silver	Ag	***0.1***	100.0
Sodium	Na	8750	98.9
Strontium	Sr	95	101.1
Titanium	Ti	1450	138.1
Vanadium	V	174.5	101.2
Tungsten	W	***5***	100.0
Zinc	Zn	84	112.0

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

** % Remaining At End Of Testing = (Post-Test / Pre-Test) * 100

Table of Contents

Weekly Humidity Cell Data: Boston Property (Altered Basalt)

PROJECT: Boston
SAMPLE: 93NOD57 195 - Altered Basalt

Original Dry Sample wt = 953.7 | Orig Ttl %S 0.07 | Original NP 313.0
Final Dry Sample wt = 940.0 | Orig Sulphide 0.06

		Analytical Results:									Sulphate Production:				Molar Ratios:				
Week No.	Date	Water Added (mL)	Leachate Recovered (mL)	Weekly pH (pH units)	Conductivity (umohs/cm)	Alkalinity (CaCO3 mg/L)*	Acidity (CaCO3 mg/L)*	Sulphate (SO4 mg/L)*	Acidity Production Rate (mg/kg/wk)**	Alkalinity Production Rate (mg/kg/wk)**	SO4 Production Rate (mg/kg/wk)**	Cumulative SO4 Production (mg/kg)	Remaining S (% of original)	Remaining S (Sulphide) (% of original)	Alk /SO4	Ca+Mg /Alk	Ca/SO4	Carbonate (Ca+Mg) /SO4	Feldspar (Ca+(K/2)+ (Na/2)) /SO4
0	09-Oct-97	750	610	8.7	170	64	***0***	7.42	0.00	40.94	4.75	5	99.77	99.74	8.27	0.35	1.47	2.89	10.39
1	14-Oct-97	500	485	8.1	119	46	***0***	6.52	0.00	23.39	3.32	8	99.62	99.55	6.77	0.54	1.69	3.66	6.57
2	17-Oct-97	500	500	8.2	105	47	***0.5***	3.82	0.26	24.64	2.00	10	99.52	99.44	11.80	0.75	4.35	8.82	10.15
3	24-Oct-97	500	485	7.9	95	42	1	2.72	0.51	21.36	1.39	11	99.45	99.36	14.80	0.82	6.11	12.09	11.42
4	29-Oct-97	500	485	7.9	91	48	1	2.82	0.51	24.41	1.44	13	99.39	99.28	16.31	0.84	6.53	13.62	10.30
5	27-Oct-97	500	485	7.9	86	40	1	3.82	0.51	20.34	1.94	15	99.29	99.17	10.04	0.96	4.79	9.66	6.47
6	14-Nov-97	500	490	7.7	87	40	2	4.92	1.03	20.55	2.53	17	99.17	99.03	7.80	0.97	3.89	7.57	4.80
7	22-Nov-97	500	485	7.5	68	34	4	4.62	2.03	17.29	2.35	20	99.06	98.90	7.06	1.05	3.57	7.43	4.20
8	17-Nov-97	500	360	8.3	59	23	***0***	7.02	0.00	8.68	2.65	22	98.93	98.76	3.14	1.07	1.17	3.35	1.69
9	24-Nov-97	500	370	8.4	50	22	***0***	4.52	0.00	8.54	1.76	24	98.85	98.66	4.67	0.93	1.59	4.35	2.29
10	01-Dec-97	500	400	9.0	102	49	***0***	5.52	0.00	20.55	2.32	26	98.74	98.53	8.51	0.94	3.01	7.97	3.96
11	08-Dec-97	500	390	8.2	78	36	***0.5***	4.42	0.20	14.72	1.81	28	98.65	98.43	7.81	1.02	3.54	7.99	4.32
12	15-Dec-97	500	400	8.3	74	34	***0***	4.12	0.00	14.26	1.73	30	98.57	98.33	7.91	0.96	3.42	7.63	3.99
13	22-Dec-97	500	385	8.5	78	33	***0***	4.32	0.00	13.32	1.75	32	98.49	98.24	7.32	1.13	3.49	8.29	4.17
14	29-Dec-97	500	380	8.2	77	36	***0.5***	3.02	0.20	14.34	1.20	33	98.43	98.17	11.43	1.11	6.18	12.70	7.04
15	16-Jan-98	500	380	8.3	72	33	***0***	3.12	0.00	13.15	1.24	34	98.37	98.10	10.14	1.07	4.98	10.86	5.74
16	19-Jan-98	500	400	8.1	73	34	***0.5***	3.92	0.21	14.26	1.65	36	98.29	98.01	8.32	1.02	4.06	8.47	4.63
17	22-Jan-98	500	400	8.8	66	30	***0***	4.22	0.00	12.58	1.77	38	98.21	97.91	6.82	1.07	3.37	7.30	3.85
18	26-Jan-98	500	420	8.7	63	24	***0***	3.52	0.00	10.57	1.55	39	98.13	97.82	6.54	1.20	3.53	7.83	4.06
19	02-Feb-98	500	405	8.4	79	37	***0***	3.32	0.00	15.71	1.41	41	98.07	97.74	10.68	1.19	5.87	12.66	6.98
20	09-Feb-98	500	410	8.9	56	27	***0***	2.12	0.00	11.61	0.91	41	98.02	97.69	12.20	0.91	6.03	11.16	7.05
21	16-Feb-98	500	400	8.6	50	23	***0***	1.72	0.00	9.65	0.72	42	97.99	97.65	12.81	1.08	7.15	13.77	8.37
22	23-Feb-98	500	475	8.5	45	22	***0***	1.82	0.00	10.96	0.91	43	97.95	97.60	11.58	1.03	6.43	11.98	7.26
23	02-Mar-98	500	480	8.4	49	23	***0***	2.42	0.00	11.58	1.22	44	97.89	97.53	9.11	1.05	4.99	9.52	5.61
24	09-Mar-98	500	480	8.2	49	23	***0***	2.42	0.00	11.58	1.22	46	97.83	97.47	9.11	1.03	5.09	9.37	5.58
25	16-Mar-98	500	470	8.2	76	33	***0.5***	5.62	0.25	16.26	2.77	48	97.70	97.31	5.63	1.02	3.09	5.76	3.38
26	23-Mar-98	500	505	8.3	68	37	***0.5***	4.42	0.26	19.59	2.34	51	97.58	97.18	8.03	0.82	3.57	6.61	3.84
27	08-Apr-98	500	480	8.2	66	31	***0.5***	3.52	0.25	15.60	1.77	52	97.50	97.08	8.44	0.93	4.45	7.81	4.78
28	15-Apr-98	500	490	8.2	71	32	***0.5***	3.22	0.26	16.44	1.66	54	97.42	96.99	9.53	1.10	5.83	10.45	6.28
29	21-Apr-98	500	500	8.3	56	27	***0.5***	2.42	0.26	14.16	1.27	55	97.36	96.92	10.69	0.89	5.63	9.49	5.97
30	28-Apr-98	500	500	8.3	84	38	***0.5***	4.42	0.26	19.92	2.32	58	97.25	96.79	8.24	1.01	4.71	8.34	5.20
31	06-May-98	500	500	8.4	68	32	***0***	3.12	0.00	16.78	1.64	59	97.17	96.70	9.83	1.08	5.86	10.58	6.30
32	13-May-98	500	500	8.6	53	25	***0***	2.62	0.00	13.11	1.38	61	97.11	96.62	9.14	1.16	5.84	10.58	6.25
33	20-May-98	500	510	8.4	51	24	***0***	2.52	0.00	12.83	1.35	62	97.04	96.55	9.13	1.23	6.02	11.24	6.46
34	29-May-98	500	500	8.4	40	19	***0***	1.42	0.00	9.96	0.75	63	97.01	96.51	12.81	1.03	7.56	13.17	7.98
35	02-Jun-98	500	505	8.5	53	27	***0***	2.22	0.00	14.30	1.18	64	96.95	96.44	11.65	1.01	6.62	11.81	7.01
36	10-Jun-98	500	510	8.4	48	24	***0***	1.72	0.00	12.83	0.92	65	96.91	96.39	13.36	0.98	7.50	13.04	7.97
37	16-Jun-98	500	500	8.6	46	23	***0***	1.52	0.00	12.06	0.80	66	96.87	96.35	14.49	1.06	9.03	15.36	9.57
38	22-Jun-98	500	500	8.6	58	28	***0***	2.12	0.00	14.68	1.11	67	96.82	96.28	12.65	1.08	7.89	13.68	8.38
39	03-Jul-98	500	485	8.5	52	22	***0***	1.62	0.00	11.19	0.83	68	96.78	96.24	13.00	1.15	8.77	14.95	9.34
40	09-Jul-98	500	505	8.5	47	26	***0***	1.22	0.00	13.77	0.65	68	96.75	96.20	20.39	0.87	10.66	17.73	11.50
41	16-Jul-98	500	500	8.6	56	28	***0***	1.92	0.00	14.68	1.01	69	96.70	96.15	13.97	0.93	7.40	12.99	8.07
42	23-Jul-98	500	480	8.6	53	28	***0***	1.62	0.00	14.09	0.82	70	96.66	96.10	16.55	0.93	9.14	15.32	9.81
Maximum			610	9	170	64	4.00	7.42	2.03	40.94	4.7	70.1	99.8	99.7	20.4	1.2	10.7	17.7	11.5
Minimum			360	7.5	40	19	0.00	1.22	0.00	8.54	0.6	4.7	96.7	96.1	3.1	0.3	1.2	2.9	1.7
Mean			463	8.2	69	32	0.33	3.39	0.16	15.61	1.6	41.8	98.0	97.7	10.2	1.0	5.3	10.0	6.5
Median			485	8.2	66	31	0.00	3.12	0.00	14.26	1.4	42.2	98.0	97.7	9.5	1.0	5.1	9.7	6.3
Mean Last 5 Weeks			494	9	53	26	0	1.70	0.00	13.68	0.9	68.4	96.7	96.2	15.3	1.0	8.8	14.9	9.4

* if values were reported as less than detection limit, one half the detection limit is shown in bold italics and was used in subsequent calculations.

Table of Contents

Weekly Humidity Cell Data: Boston Property (Altered Basalt)

PROJECT: Boston
SAMPLE: 93NOD57 19

Week No.	Date	NP Consumption: Theoretical NP Consumption At pH 6 (mg/kg/wk)	Empirical Open-System NP Consumption At Measured pH (mg/kg/wk)	Cum NP Consumption Open-System (mg/kg)	Remaining NP Open-System (%)	Carbonate NP Consumption/ Sulphate Prod.	Carbonate Molar Ratio NP Consumption (mg/kg/wk)***	Cum NP Consumption Molar Ratio (mg/kg)	Remaining NP Molar Ratio (%)	Feldspar Molar Ratio NP Consumption (mg/kg/wk)***	Cum NP Consumption Molar Ratio (mg/kg)	Remaining NP Feldspar (%)	Theoretical Closed-System NP Consumption Above pH 6.5 (mg/kg/wk)	Cum NP Consumption Closed-System (mg/kg)	Remaining NP Closed-System (%)
0	09-Oct-97	4.9	45.9	45.9	99.99	3.01	14.3	14	100.00	51.4	51	99.98	9.9	9.9	100.00
1	14-Oct-97	3.5	26.8	72.7	99.98	3.82	12.7	27	99.99	22.7	74	99.98	6.9	16.8	99.99
2	17-Oct-97	2.1	26.5	99.2	99.97	9.19	18.4	45	99.99	21.2	95	99.97	3.9	20.7	99.99
3	24-Oct-97	1.4	22.3	121.5	99.96	12.59	17.4	63	99.98	16.5	112	99.96	2.4	23.1	99.99
4	29-Oct-97	1.5	25.4	146.9	99.95	14.20	20.4	83	99.97	15.4	127	99.96	2.5	25.6	99.99
5	27-Oct-97	2.0	21.9	168.8	99.95	10.06	19.6	103	99.97	13.1	140	99.96	3.5	29.1	99.99
6	14-Nov-97	2.6	22.2	190.9	99.94	7.89	20.0	123	99.96	12.7	153	99.95	4.2	33.4	99.99
7	22-Nov-97	2.5	17.7	208.6	99.93	7.74	18.2	141	99.95	10.3	163	99.95	2.9	36.2	99.99
8	17-Nov-97	2.8	11.4	220.1	99.93	3.49	9.3	150	99.95	4.7	168	99.95	5.5	41.8	99.99
9	24-Nov-97	1.8	10.4	230.4	99.93	4.53	7.9	158	99.95	4.2	172	99.95	3.7	45.4	99.99
10	01-Dec-97	2.4	23.0	253.4	99.92	8.30	19.2	177	99.94	9.6	182	99.94	4.8	50.3	99.98
11	08-Dec-97	1.9	16.4	269.8	99.91	8.33	15.1	192	99.94	8.2	190	99.94	3.6	53.8	99.98
12	15-Dec-97	1.8	16.1	285.9	99.91	7.95	13.8	206	99.93	7.2	197	99.94	3.6	57.4	99.98
13	22-Dec-97	1.8	15.1	301.0	99.90	8.63	15.1	221	99.93	7.6	205	99.93	3.6	61.1	99.98
14	29-Dec-97	1.3	15.4	316.4	99.90	13.23	15.9	237	99.92	8.8	213	99.93	2.3	63.4	99.98
15	16-Jan-98	1.3	14.4	330.8	99.89	11.32	14.1	251	99.92	7.4	221	99.93	2.6	66.0	99.98
16	19-Jan-98	1.7	15.8	346.6	99.89	8.82	14.5	266	99.92	7.9	229	99.93	3.2	69.2	99.98
17	22-Jan-98	1.8	14.4	361.0	99.88	7.61	13.5	279	99.91	7.1	236	99.92	3.7	72.9	99.98
18	26-Jan-98	1.6	12.2	373.2	99.88	8.15	12.7	292	99.91	6.6	242	99.92	3.2	76.1	99.98
19	02-Feb-98	1.5	17.2	390.4	99.88	13.19	18.6	311	99.90	10.3	253	99.92	2.9	79.1	99.97
20	09-Feb-98	1.0	12.6	403.0	99.87	11.63	10.6	321	99.90	6.7	259	99.92	1.9	81.0	99.97
21	16-Feb-98	0.8	10.4	413.4	99.87	14.35	10.4	332	99.89	6.3	266	99.92	1.5	82.5	99.97
22	23-Feb-98	0.9	11.9	425.3	99.86	12.48	11.3	343	99.89	6.9	273	99.91	1.9	84.4	99.97
23	02-Mar-98	1.3	12.8	438.1	99.86	9.92	12.1	355	99.89	7.1	280	99.91	2.5	86.9	99.97
24	09-Mar-98	1.3	12.8	451.0	99.86	9.77	11.9	367	99.88	7.1	287	99.91	2.5	89.4	99.97
25	16-Mar-98	2.9	18.9	469.9	99.85	6.01	16.6	384	99.88	9.8	297	99.91	5.5	95.0	99.97
26	23-Mar-98	2.4	21.8	491.6	99.84	6.89	16.1	400	99.87	9.4	306	99.90	4.6	99.6	99.97
27	08-Apr-98	1.8	17.2	508.8	99.84	8.14	14.4	414	99.87	8.8	315	99.90	3.4	103.0	99.97
28	15-Apr-98	1.7	17.9	526.7	99.83	10.89	18.0	432	99.86	10.8	326	99.90	3.2	106.2	99.97
29	21-Apr-98	1.3	15.2	542.0	99.83	9.89	12.6	445	99.86	7.9	334	99.89	2.4	108.6	99.97
30	28-Apr-98	2.4	22.1	564.0	99.82	8.69	20.1	465	99.85	12.6	346	99.89	4.6	113.2	99.96
31	06-May-98	1.7	18.5	582.5	99.81	11.03	18.1	483	99.85	10.7	357	99.89	3.4	116.6	99.96
32	13-May-98	1.4	14.5	597.1	99.81	11.03	15.2	498	99.84	9.0	366	99.88	2.9	119.5	99.96
33	20-May-98	1.4	14.2	611.3	99.80	11.71	15.8	514	99.84	9.1	375	99.88	2.8	122.3	99.96
34	29-May-98	0.8	10.7	622.0	99.80	13.72	10.2	524	99.83	6.2	381	99.88	1.6	123.8	99.96
35	02-Jun-98	1.2	15.5	637.6	99.80	12.30	14.5	539	99.83	8.6	390	99.88	2.5	126.3	99.96
36	10-Jun-98	1.0	13.8	651.4	99.79	13.59	12.5	551	99.82	7.7	397	99.87	1.9	128.2	99.96
37	16-Jun-98	0.8	12.9	664.3	99.79	16.00	12.8	564	99.82	8.0	405	99.87	1.7	129.9	99.96
38	22-Jun-98	1.2	15.8	680.1	99.78	14.25	15.9	580	99.81	9.7	415	99.87	2.3	132.2	99.96
39	03-Jul-98	0.9	12.0	692.1	99.78	15.58	12.9	593	99.81	8.0	423	99.86	1.7	133.9	99.96
40	09-Jul-98	0.7	14.4	706.6	99.77	18.47	12.0	605	99.81	7.8	431	99.86	1.4	135.3	99.96
41	16-Jul-98	1.1	15.7	722.3	99.77	13.53	13.7	618	99.80	8.5	439	99.86	2.1	137.4	99.96
42	23-Jul-98	0.9	14.9	737.3	99.76	15.96	13.0	631	99.80	8.4	448	99.86	1.7	139.1	99.96
Maximum		4.9	45.9	737.3	100.0	18.5	20.4	631.3	100.0	51.4	447.7	100.0	9.9	139.1	100.0
Minimum		0.7	10.4	45.9	99.8	3.0	7.9	14.3	99.8	4.2	51.4	99.9	1.4	9.9	100.0
Mean		1.7	17.1	415.6	99.9	10.4	14.7	332.5	99.9	10.4	268.3	99.9	3.2	82.0	100.0
Median		1.5	15.5	413.4	99.9	10.1	14.4	331.6	99.9	8.5	265.8	99.9	2.9	82.5	100.0
Mean Last 5 Weeks		0.9	14.6	707.7	99.8	15.6	13.5	605.3	99.8	8.5	431.2	99.9	1.8	135.6	100.0

* if values were reported as less than detection limit, one half the detection limit is shown in bold italics and was used in subsequent calculations.

Weekly Humidity Cell Data: Boston Property (Altered Basalt)

PROJECT: Boston
SAMPLE: 93NOD57 19

Week No.	Date	Comparative Ratios: Weekly Carb. NP Cons. /SO_4 Prod.	Cumulative Carb. NP Cons. /S04 Prod.	Weekly Ca/Mg Leach Rate	Cumulative Ca/Mg Leach Rate	Weekly Ca/Mn Leach Rate	Cumulative Ca/Mn Leach Rate
0	09-Oct-97	3.01	3.01	1.70	1.70	4077	4077
1	14-Oct-97	3.82	3.34	1.41	1.56	1429	2233
2	17-Oct-97	9.19	4.50	1.61	1.58	1371	1775
3	24-Oct-97	12.59	5.48	1.69	1.61	1194	1559
4	29-Oct-97	14.20	6.45	1.52	1.58	914	1334
5	27-Oct-97	10.06	6.93	1.62	1.59	867	1209
6	14-Nov-97	7.89	7.07	1.74	1.62	836	1124
7	22-Nov-97	7.74	7.15	1.53	1.60	695	1043
8	17-Nov-97	3.49	6.71	0.89	1.55	1951	1065
9	24-Nov-97	4.53	6.55	0.95	1.51	1563	1078
10	01-Dec-97	8.30	6.71	1.00	1.45	2876	1141
11	08-Dec-97	8.33	6.81	1.31	1.44	2245	1184
12	15-Dec-97	7.95	6.88	1.34	1.43	1152	1182
13	22-Dec-97	8.63	6.97	1.20	1.41	2842	1227
14	29-Dec-97	13.23	7.20	1.56	1.42	997	1207
15	16-Jan-98	11.32	7.35	1.40	1.42	1126	1202
16	19-Jan-98	8.82	7.42	1.52	1.43	1095	1196
17	22-Jan-98	7.61	7.43	1.42	1.43	1331	1202
18	26-Jan-98	8.15	7.46	1.36	1.42	1138	1199
19	02-Feb-98	13.19	7.66	1.43	1.42	1354	1207
20	09-Feb-98	11.63	7.75	1.94	1.44	1110	1203
21	16-Feb-98	14.35	7.86	1.78	1.45	1423	1210
22	23-Feb-98	12.48	7.96	1.91	1.46	698	1177
23	02-Mar-98	9.92	8.01	1.81	1.47	589	1134
24	09-Mar-98	9.77	8.06	1.96	1.49	535	1089
25	16-Mar-98	6.01	7.94	1.90	1.50	765	1067
26	23-Mar-98	6.89	7.89	1.94	1.52	596	1030
27	08-Apr-98	8.14	7.90	2.18	1.54	605	1001
28	15-Apr-98	10.89	7.99	2.08	1.56	722	983
29	21-Apr-98	9.89	8.03	2.40	1.57	614	963
30	28-Apr-98	8.69	8.06	2.14	1.60	823	955
31	06-May-98	11.03	8.14	2.05	1.61	608	932
32	13-May-98	11.03	8.21	2.03	1.62	886	931
33	20-May-98	11.71	8.28	1.91	1.63	720	922
34	29-May-98	13.72	8.35	2.23	1.64	425	898
35	02-Jun-98	12.30	8.42	2.10	1.65	689	890
36	10-Jun-98	13.59	8.49	2.23	1.66	561	877
37	16-Jun-98	16.00	8.59	2.35	1.68	551	863
38	22-Jun-98	14.25	8.68	2.25	1.69	662	855
39	03-Jul-98	15.58	8.76	2.34	1.70	596	846
40	09-Jul-98	18.47	8.86	2.49	1.71	473	831
41	16-Jul-98	13.53	8.92	2.19	1.72	796	830
42	23-Jul-98	15.96	9.01	2.44	1.73	507	817
Maximum		18.5	9.0	2.5	1.7	4076.9	4076.9
Minimum		3.0	3.0	0.9	1.4	425.3	817.1
Mean		10.4	7.4	1.8	1.6	1093.2	1180.1
Median		10.1	7.9	1.8	1.6	835.7	1088.6
Mean Last 5 Weeks		15.6	8.8	2.3	1.7	606.8	835.7

* if values were reported as less than detection limit, one half the detection limit is shown in bold italics and was used in subsequent calculations.

Altered Basalt
Sulphate/Calcium Ratio vs Sulphate Concentration

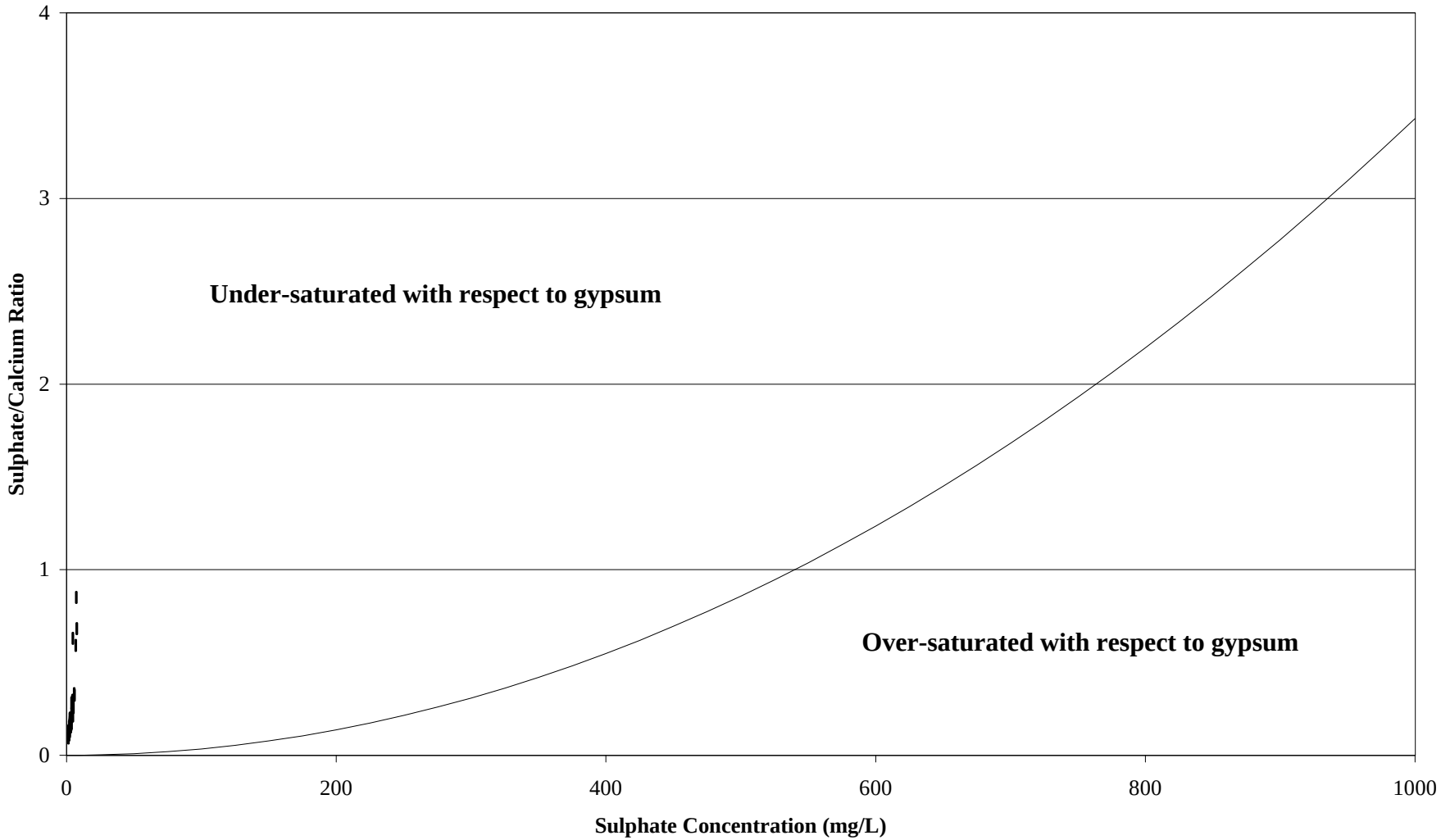


Table of Contents

Weekly Humidity Cell Data: Boston Property (Altered Basalt)

Boston		**Dissolved Metals*:**															
93NOD57 195 - Altered Basalt		**(including final leach contribution)**															
Week No.	Date	Aluminum Al (ug/L)	Antimony Sb (ug/L)	Arsenic As (ug/L)	Barium Ba (ug/L)	Beryllium Be (ug/L)	Bismuth Bi (ug/L)	Cadmium Cd (ug/L)	Calcium Ca (ug/L)	Chromium Cr (ug/L)	Cobalt Co (ug/L)	Copper Cu (ug/L)	Iron Fe (ug/L)	Lead Pb (ug/L)	Magnesium Mg (ug/L)	Manganese Mn (ug/L)	Mercury Hg (ug/L)
0	09-Oct-97	318.74	21.25	169.36	2.26	***0.25***	***0.025***	***0.05***	4543	4.07	0.22	2.40	***5***	***1***	2669	1.11	***0.5***
1	16-Oct-97	61.74	38.45	139.36	2.36	***0.25***	***0.025***	***0.05***	4593	***0.25***	0.52	1.50	***5***	2	3259	3.21	***0.5***
2	23-Oct-97	62.74	44.45	248.36	4.51	***0.25***	***0.025***	***0.05***	6943	***0.25***	0.66	4.60	***5***	2	4319	5.06	***0.5***
3	30-Oct-97	93.74	46.65	360.36	5.06	***0.25***	***0.025***	***0.05***	6943	2.57	1.68	4.80	***5***	***1***	4119	5.81	***0.5***
4	06-Nov-97	63.74	47.35	484.36	6.51	***0.25***	***0.025***	***0.05***	7693	1.57	1.92	4.80	***5***	12	5069	8.41	***0.5***
5	13-Nov-97	50.74	40.25	469.36	6.31	***0.25***	***0.025***	***0.05***	7643	3.57	1.48	0.80	***5***	***1***	4709	8.81	***0.5***
6	20-Nov-97	24.74	36.75	446.36	6.16	***0.25***	***0.025***	***0.05***	7993	2.57	0.20	0.60	***5***	***1***	4589	9.56	***0.5***
7	27-Nov-97	47.74	29.15	299.36	5.71	***0.25***	***0.025***	***0.05***	6893	***0.25***	2.84	4.60	***5***	***1***	4509	9.91	***0.5***
8	04-Dec-97	104.74	29.85	486.36	3.76	***0.25***	***0.025***	***0.05***	3443	0.57	0.48	3.30	***5***	***1***	3869	1.76	***0.5***
9	11-Dec-97	102.74	28.85	509.36	2.31	***0.25***	***0.025***	***0.05***	2993	0.57	0.46	0.20	***5***	2	3159	1.91	***0.5***
10	18-Dec-97	127.74	61.35	1007.36	5.01	***0.25***	***0.025***	***0.05***	6943	4.07	0.40	4.70	10	2	6929	2.41	***0.5***
11	25-Dec-97	114.74	46.85	710.36	4.01	***0.25***	***0.025***	***0.05***	6543	1.57	0.60	2.40	***5***	4	4979	2.91	***0.5***
12	01-Jan-98	77.74	42.55	698.36	6.46	***0.25***	***0.025***	***0.05***	5893	1.57	1.62	1.60	***5***	***1***	4389	5.11	***0.5***
13	08-Jan-98	92.74	37.45	737.36	5.51	***0.25***	***0.025***	***0.05***	6293	***0.25***	0.72	3.50	***5***	***1***	5249	2.21	***0.5***
14	15-Jan-98	63.74	28.75	599.36	4.01	***0.25***	***0.025***	***0.05***	7793	***0.25***	2.38	5.90	***5***	***1***	4989	7.81	***0.5***
15	22-Jan-98	52.74	26.65	532.36	6.41	***0.25***	***0.025***	***0.05***	6493	0.57	1.78	2.90	***5***	***1***	4649	5.76	***0.5***
16	29-Jan-98	64.74	26.35	553.36	4.16	***0.25***	***0.025***	***0.05***	6643	1.57	1.84	3.20	***5***	6	4379	6.06	***0.5***
17	05-Feb-98	106.74	26.15	628.36	3.81	***0.25***	***0.025***	***0.05***	5943	0.57	1.18	3.50	***5***	2	4199	4.46	***0.5***
18	12-Feb-98	75.74	22.45	528.36	4.66	***0.25***	***0.025***	***0.05***	5193	***0.25***	0.94	2.80	***5***	***1***	3829	4.56	***0.5***
19	19-Feb-98	114.74	28.95	715.36	1.66	***0.25***	***0.025***	***0.05***	8143	***0.25***	1.48	2.00	***5***	***1***	5709	6.01	***0.5***
20	26-Feb-98	127.74	15.65	415.36	2.91	***0.25***	***0.025***	***0.05***	5343	0.57	0.74	1.20	***5***	2	2759	4.81	***0.5***
21	05-Mar-98	108.74	12.90	367.36	3.76	***0.25***	***0.025***	***0.05***	5143	***0.25***	0.62	1.90	***5***	***1***	2889	3.61	***0.5***
22	12-Mar-98	84.74	11.95	266.36	2.86	***0.25***	***0.025***	***0.05***	4893	1.07	0.90	***0.05***	***5***	***1***	2559	7.01	***0.5***
23	19-Mar-98	72.74	15.40	310.36	18.81	***0.25***	***0.025***	***0.05***	5043	0.57	1.44	2.00	***5***	6	2779	8.56	***0.5***
24	26-Mar-98	70.74	14.20	319.36	3.41	***0.25***	***0.025***	***0.05***	5143	1.57	1.40	2.60	***5***	***1***	2629	9.61	***0.5***
25	02-Apr-98	42.74	24.35	597.36	5.01	***0.25***	***0.025***	***0.05***	7243	1.07	2.08	7.00	***5***	***1***	3809	9.46	***0.5***
26	09-Apr-98	15.74	19.80	527.36	7.36	***0.25***	***0.025***	***0.05***	6593	1.07	3.56	4.80	***5***	***1***	3399	11.06	***0.5***
27	16-Apr-98	48.74	20.35	608.36	4.26	***0.25***	***0.025***	***0.05***	6543	1.57	4.12	8.20	20	***1***	2999	10.81	***0.5***
28	23-Apr-98	42.74	21.25	749.36	1.86	***0.25***	***0.025***	***0.05***	7843	1.57	3.56	4.10	10	***1***	3769	10.86	***0.5***
29	30-Apr-98	30.74	15.35	495.36	1.96	***0.25***	***0.025***	***0.05***	5693	***0.25***	3.18	3.80	***5***	***1***	2369	9.26	***0.5***
30	07-May-98	40.74	27.35	1047.36	6.06	***0.25***	***0.025***	***0.05***	8693	1.57	3.94	11.20	***5***	***1***	4059	10.56	***0.5***
31	14-May-98	43.74	16.05	648.36	2.61	***0.25***	***0.025***	***0.05***	7643	2.07	3.22	2.20	***5***	***1***	3729	12.56	***0.5***
32	21-May-98	70.74	14.40	489.36	1.61	***0.25***	***0.025***	***0.05***	6393	2.07	2.42	5.30	***5***	***1***	3149	7.21	***0.5***
33	28-May-98	79.74	13.80	439.36	2.06	***0.25***	***0.025***	***0.05***	6343	1.57	3.58	5.80	***5***	4	3329	8.81	***0.5***
34	04-Jun-98	104.74	8.50	254.36	3.26	***0.25***	***0.025***	***0.05***	4493	1.57	3.68	12.30	***5***	***1***	2019	10.56	***0.5***
35	11-Jun-98	65.74	13.85	413.36	2.56	***0.25***	***0.025***	***0.05***	6143	0.57	2.84	8.70	***5***	***1***	2919	8.91	***0.5***
36	18-Jun-98	69.74	11.05	364.36	3.66	***0.25***	***0.025***	***0.05***	5393	***0.25***	3.42	6.00	10	***1***	2419	9.61	***0.5***
37	25-Jun-98	75.74	8.75	289.36	3.06	***0.25***	***0.025***	***0.05***	5743	1.07	3.12	2.60	10	***1***	2439	10.41	***0.5***
38	02-Jul-98	71.74	13.30	414.36	3.91	***0.25***	***0.025***	***0.05***	6993	1.57	3.16	5.10	20	***1***	3109	10.56	***0.5***
39	09-Jul-98	80.74	10.75	288.36	3.91	***0.25***	***0.025***	***0.05***	5943	1.07	2.76	6.80	20	2	2539	9.96	***0.5***
40	16-Jul-98	136.74	7.85	187.36	2.26	***0.25***	***0.025***	***0.05***	5443	2.07	3.00	9.50	40	***1***	2189	11.51	***0.5***
41	23-Jul-98	99.74	10.65	258.36	3.11	***0.25***	***0.025***	***0.05***	5943	0.57	2.12	5.80	***5***	***1***	2719	7.46	***0.5***
42	30-Jul-98	87.74	9.10	218.36	5.51	***0.25***	***0.025***	***0.05***	6193	2.07	2.58	2.80	10	2	2539	12.21	***0.5***
Maximum		318.74	61.35	1047.36	18.81	0.25	0.025	0.05	8693	4.07	4.12	12.30	40.0	12.0	6929	12.56	0.50
Minimum		15.74	7.85	139.36	1.61	0.25	0.025	0.05	2993	0.25	0.20	0.05	5.0	1.0	2019	1.11	0.50
Mean		81.30	24.35	471.92	4.34	0.25	0.025	0.05	6195	1.28	1.98	4.18	7.4	1.8	3644	7.40	0.50
Median		72.74	21.25	469.36	3.91	0.25	0.025	0.05	6293	1.07	1.84	3.50	5.0	1.0	3399	8.41	0.50
Mean Last 5 Weeks		95.34	10.33	273.36	3.74	0.25	0.025	0.05	6103	1.47	2.73	6.00	19.0	1.4	2619	10.34	0.50

Sample mass - start (kg) 0.9537
Sample mass - end (kg) 0.94

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

Table of Contents

Weekly Humidity Cell Data: Boston Property (Altered Basalt)

Boston 93NOD57 195 - Altered Basalt Week No.	Date	Molybdenum Mo (ug/L)	Nickel Ni (ug/L)	Phosphorus P (ug/L)	Potassium K (ug/L)	Selenium Se (ug/L)	Silver Ag (ug/L)	Sodium Na (ug/L)	Strontium Sr (ug/L)	Tin Sn (ug/L)	Titanium Ti (ug/L)	Thallium Tl (ug/L)	Uranium U (ug/L)	Vanadium V (ug/L)	Zinc Zn (ug/L)	Leachate Recovered (mL)
0	09-Oct-97	0.2	3.61	***50***	3401	***0.5***	***0.025***	29704	31.12	***0.25***	***0.5***	***0.025***	***0.025***	3.1	***0.25***	610
1	16-Oct-97	0.1	7.81	***50***	2451	***0.5***	***0.025***	13804	35.62	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	0.5	485
2	23-Oct-97	0.1	9.61	***50***	2501	***0.5***	***0.025***	9154	43.72	1.0	***0.5***	***0.025***	***0.025***	***0.5***	2.5	500
3	30-Oct-97	0.1	13.61	***50***	2251	1	***0.025***	5604	48.32	***0.25***	***0.5***	***0.025***	***0.025***	1.1	3.0	485
4	06-Nov-97	***0.05***	14.41	***50***	2451	1	***0.025***	3654	54.42	***0.25***	***0.5***	***0.025***	***0.025***	1.1	3.0	485
5	13-Nov-97	***0.05***	11.01	***50***	1651	1	***0.025***	2104	49.92	***0.25***	***0.5***	***0.025***	***0.025***	1.1	2.0	485
6	20-Nov-97	***0.05***	19.41	***50***	1351	***0.5***	***0.025***	1354	46.82	***0.25***	***0.5***	***0.025***	***0.025***	1.1	1.5	490
7	27-Nov-97	***0.05***	11.21	***50***	901	3	***0.025***	854	38.22	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	***0.25***	485
8	04-Dec-97	***0.05***	4.01	***50***	1051	1	***0.025***	1104	25.32	***0.25***	***0.5***	***0.025***	***0.025***	1.1	2.0	360
9	11-Dec-97	***0.05***	3.01	***50***	901	1	***0.025***	1004	20.82	***0.25***	***0.5***	***0.025***	***0.025***	1.1	***0.25***	370
10	18-Dec-97	***0.05***	3.81	***50***	1551	2	***0.025***	1604	51.52	***0.25***	***0.5***	***0.025***	***0.025***	3.1	0.5	400
11	25-Dec-97	***0.05***	3.21	***50***	1101	1	***0.025***	1004	38.82	***0.25***	***0.5***	***0.025***	***0.025***	1.1	5.5	390
12	01-Jan-98	***0.05***	8.81	***50***	701	1	***0.025***	704	38.12	***0.25***	***0.5***	***0.025***	***0.025***	1.1	0.5	400
13	08-Jan-98	***0.05***	4.81	***50***	951	1	***0.025***	854	35.72	0.5	***0.5***	***0.025***	***0.025***	1.1	1.0	385
14	15-Jan-98	***0.05***	10.41	***50***	751	1	***0.025***	804	37.02	***0.25***	***0.5***	***0.025***	***0.025***	1.1	***0.25***	380
15	22-Jan-98	***0.05***	7.61	***50***	651	1	***0.025***	754	33.42	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	0.51	380
16	29-Jan-98	***0.05***	6.61	***50***	551	1	***0.025***	754	34.12	***0.25***	***0.5***	***0.025***	***0.025***	1.1	***0.25***	400
17	05-Feb-98	***0.05***	4.81	***50***	451	1	***0.025***	704	29.22	0.5	***0.5***	***0.025***	***0.025***	1.1	1.5	400
18	12-Feb-98	***0.05***	3.81	***50***	401	1	***0.025***	654	25.42	***0.25***	***0.5***	***0.025***	***0.025***	1.1	0.5	420
19	19-Feb-98	***0.05***	8.01	***50***	601	1	***0.025***	1404	34.22	***0.25***	***0.5***	***0.025***	***0.025***	1.1	3.0	405
20	26-Feb-98	0.1	3.81	***50***	401	1	***0.025***	804	21.62	***0.25***	***0.5***	***0.025***	***0.025***	1.1	0.5	410
21	05-Mar-98	***0.05***	2.81	***50***	351	1	***0.025***	804	20.62	0.5	***0.5***	***0.025***	***0.025***	1.1	0.5	400
22	12-Mar-98	***0.05***	3.81	***50***	201	***0.5***	***0.025***	604	17.17	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	***0.25***	475
23	19-Mar-98	***0.05***	3.81	***50***	201	***0.5***	***0.025***	604	18.57	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	2.0	480
24	26-Mar-98	***0.05***	4.41	***50***	201	***0.5***	***0.025***	454	19.17	0.5	***0.5***	***0.025***	***0.025***	1.1	1.0	480
25	02-Apr-98	0.1	4.81	***50***	301	1	***0.025***	604	29.52	0.5	***0.5***	***0.025***	***0.025***	1.1	0.5	470
26	09-Apr-98	***0.05***	8.41	***50***	201	***0.5***	***0.025***	454	27.12	***0.25***	***0.5***	***0.025***	***0.025***	1.1	2.0	505
27	16-Apr-98	***0.05***	10.41	***50***	251	***0.5***	***0.025***	404	24.12	***0.25***	***0.5***	***0.025***	***0.025***	1.1	1.5	480
28	23-Apr-98	***0.05***	8.41	***50***	251	1	***0.025***	554	26.12	1.5	1	***0.025***	***0.025***	1.1	1.5	490
29	30-Apr-98	***0.05***	7.21	***50***	151	***0.5***	***0.025***	304	19.77	***0.25***	***0.5***	***0.025***	***0.025***	1.1	2.0	500
30	07-May-98	***0.05***	10.01	***50***	401	3	***0.025***	804	33.92	0.5	***0.5***	***0.025***	***0.025***	3.1	5.0	500
31	14-May-98	***0.05***	6.01	***50***	251	1	***0.025***	504	23.12	***0.25***	***0.5***	***0.025***	***0.025***	1.1	3.5	500
32	21-May-98	***0.05***	4.41	***50***	201	***0.5***	***0.025***	404	19.37	***0.25***	***0.5***	***0.025***	***0.025***	1.1	1.5	500
33	28-May-98	***0.05***	5.81	***50***	201	1	***0.025***	404	18.47	1	***0.5***	***0.025***	***0.025***	1.1	1.5	510
34	04-Jun-98	0.1	7.81	***50***	51	***0.5***	***0.025***	254	13.62	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	0.5	500
35	11-Jun-98	0.1	6.21	***50***	101	***0.5***	***0.025***	354	18.72	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	***0.25***	505
36	18-Jun-98	0.2	6.21	***50***	151	***0.5***	***0.025***	304	17.47	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	1.5	510
37	25-Jun-98	0.3	5.21	***50***	151	***0.5***	***0.025***	304	16.42	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	1.5	500
38	02-Jul-98	0.1	7.01	***50***	151	***0.5***	***0.025***	404	19.97	***0.25***	***0.5***	***0.025***	***0.025***	1.1	0.5	500
39	09-Jul-98	***0.05***	5.41	***50***	151	1	***0.025***	354	16.62	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	1.5	485
40	16-Jul-98	0.1	6.41	***50***	151	***0.5***	***0.025***	404	14.22	***0.25***	1	***0.025***	***0.025***	***0.5***	1.5	505
41	23-Jul-98	0.2	4.61	***50***	101	***0.5***	***0.025***	554	16.32	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	0.5	500
42	30-Jul-98	0.2	5.41	***50***	201	***0.5***	***0.025***	404	15.57	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	1.5	480
Maximum		0.30	19.41	50.0	3401	3.0	0.025	29704	54.42	1.50	1.00	0.025	0.025	3.07	5.51	610
Minimum		0.05	2.81	50.0	51	0.5	0.025	254	13.62	0.25	0.50	0.025	0.025	0.50	0.25	360
Mean		0.08	6.94	50.0	730	0.9	0.025	2061	28.36	0.35	0.52	0.025	0.025	1.02	1.43	463
Median		0.05	6.21	50.0	401	1.0	0.025	704	25.42	0.25	0.50	0.025	0.025	1.07	1.51	485
Mean Last 5 Weeks		0.13	5.77	50.0	151	0.6	0.025	424	16.54	0.25	0.60	0.025	0.025	0.61	1.11	494

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

Table of Contents

Weekly Humidity Cell Data: Boston Property (Altered Basalt)

Boston
93NOD57 195 - Altered Basalt

Metal Loading/Leaching Rates

Week No.	Date	Aluminum Al (mg/kg/wk)	Antimony Sb (mg/kg/wk)	Arsenic As (mg/kg/wk)	Barium Ba (mg/kg/wk)	Beryllium Be (mg/kg/wk)	Bismuth Bi (mg/kg/wk)	Cadmium Cd (mg/kg/wk)	Calcium Ca (mg/kg/wk)	Chromium Cr (mg/kg/wk)	Cobalt Co (mg/kg/wk)	Copper Cu (mg/kg/wk)	Iron Fe (mg/kg/wk)	Lead Pb (mg/kg/wk)	Magnesium Mg (mg/kg/wk)
0	09-Oct-97	0.2039	0.0136	0.1083	0.0014	0.00016	0.00002	0.00003	2.9057	0.0026	0.0001	0.0015	0.0032	0.0006	1.7072
1	16-Oct-97	0.0314	0.0196	0.0709	0.0012	0.00013	0.00001	0.00003	2.3357	0.0001	0.0003	0.0008	0.0025	0.0010	1.6574
2	23-Oct-97	0.0329	0.0233	0.1302	0.0024	0.00013	0.00001	0.00003	3.6400	0.0001	0.0003	0.0024	0.0026	0.0010	2.2644
3	30-Oct-97	0.0477	0.0237	0.1833	0.0026	0.00013	0.00001	0.00003	3.5308	0.0013	0.0009	0.0024	0.0025	0.0005	2.0947
4	06-Nov-97	0.0324	0.0241	0.2463	0.0033	0.00013	0.00001	0.00003	3.9122	0.0008	0.0010	0.0024	0.0025	0.0061	2.5778
5	13-Nov-97	0.0258	0.0205	0.2387	0.0032	0.00013	0.00001	0.00003	3.8867	0.0018	0.0008	0.0004	0.0025	0.0005	2.3948
6	20-Nov-97	0.0127	0.0189	0.2293	0.0032	0.00013	0.00001	0.00003	4.1066	0.0013	0.0001	0.0003	0.0026	0.0005	2.3578
7	27-Nov-97	0.0243	0.0148	0.1522	0.0029	0.00013	0.00001	0.00003	3.5053	0.0001	0.0014	0.0023	0.0025	0.0005	2.2931
8	04-Dec-97	0.0395	0.0113	0.1836	0.0014	0.00009	0.00001	0.00002	1.2996	0.0002	0.0002	0.0012	0.0019	0.0004	1.4605
9	11-Dec-97	0.0399	0.0112	0.1976	0.0009	0.00010	0.00001	0.00002	1.1611	0.0002	0.0002	0.0001	0.0019	0.0008	1.2256
10	18-Dec-97	0.0536	0.0257	0.4225	0.0021	0.00010	0.00001	0.00002	2.9120	0.0017	0.0002	0.0020	0.0042	0.0008	2.9062
11	25-Dec-97	0.0469	0.0192	0.2905	0.0016	0.00010	0.00001	0.00002	2.6756	0.0006	0.0002	0.0010	0.0020	0.0016	2.0361
12	01-Jan-98	0.0326	0.0178	0.2929	0.0027	0.00010	0.00001	0.00002	2.4716	0.0007	0.0007	0.0007	0.0021	0.0004	1.8409
13	08-Jan-98	0.0374	0.0151	0.2977	0.0022	0.00010	0.00001	0.00002	2.5404	0.0001	0.0003	0.0014	0.0020	0.0004	2.1190
14	15-Jan-98	0.0254	0.0115	0.2388	0.0016	0.00010	0.00001	0.00002	3.1050	0.0001	0.0009	0.0023	0.0020	0.0004	1.9879
15	22-Jan-98	0.0210	0.0106	0.2121	0.0026	0.00010	0.00001	0.00002	2.5871	0.0002	0.0007	0.0012	0.0020	0.0004	1.8524
16	29-Jan-98	0.0272	0.0110	0.2321	0.0017	0.00010	0.00001	0.00002	2.7861	0.0007	0.0008	0.0013	0.0021	0.0025	1.8367
17	05-Feb-98	0.0448	0.0110	0.2635	0.0016	0.00010	0.00001	0.00002	2.4925	0.0002	0.0005	0.0015	0.0021	0.0008	1.7612
18	12-Feb-98	0.0334	0.0099	0.2327	0.0021	0.00011	0.00001	0.00002	2.2869	0.0001	0.0004	0.0012	0.0022	0.0004	1.6863
19	19-Feb-98	0.0487	0.0123	0.3038	0.0007	0.00011	0.00001	0.00002	3.4580	0.0001	0.0006	0.0008	0.0021	0.0004	2.4244
20	26-Feb-98	0.0549	0.0067	0.1786	0.0013	0.00011	0.00001	0.00002	2.2969	0.0002	0.0003	0.0005	0.0021	0.0009	1.1861
21	05-Mar-98	0.0456	0.0054	0.1541	0.0016	0.00010	0.00001	0.00002	2.1570	0.0001	0.0003	0.0008	0.0021	0.0004	1.2117
22	12-Mar-98	0.0422	0.0059	0.1327	0.0014	0.00012	0.00001	0.00002	2.4369	0.0005	0.0005	0.0000	0.0025	0.0005	1.2746
23	19-Mar-98	0.0366	0.0077	0.1562	0.0095	0.00013	0.00001	0.00003	2.5381	0.0003	0.0007	0.0010	0.0025	0.0030	1.3987
24	26-Mar-98	0.0356	0.0071	0.1607	0.0017	0.00013	0.00001	0.00003	2.5884	0.0008	0.0007	0.0013	0.0025	0.0005	1.3232
25	02-Apr-98	0.0211	0.0120	0.2944	0.0025	0.00012	0.00001	0.00002	3.5694	0.0005	0.0010	0.0034	0.0025	0.0005	1.8772
26	09-Apr-98	0.0083	0.0105	0.2792	0.0039	0.00013	0.00001	0.00003	3.4910	0.0006	0.0019	0.0025	0.0026	0.0005	1.7999
27	16-Apr-98	0.0245	0.0102	0.3062	0.0021	0.00013	0.00001	0.00003	3.2930	0.0008	0.0021	0.0041	0.0101	0.0005	1.5094
28	23-Apr-98	0.0220	0.0109	0.3850	0.0010	0.00013	0.00001	0.00003	4.0296	0.0008	0.0018	0.0021	0.0051	0.0005	1.9365
29	30-Apr-98	0.0161	0.0080	0.2597	0.0010	0.00013	0.00001	0.00003	2.9846	0.0001	0.0017	0.0020	0.0026	0.0005	1.2420
30	07-May-98	0.0214	0.0143	0.5491	0.0032	0.00013	0.00001	0.00003	4.5574	0.0008	0.0021	0.0059	0.0026	0.0005	2.1281
31	14-May-98	0.0229	0.0084	0.3399	0.0014	0.00013	0.00001	0.00003	4.0070	0.0011	0.0017	0.0012	0.0026	0.0005	1.9550
32	21-May-98	0.0371	0.0075	0.2566	0.0008	0.00013	0.00001	0.00003	3.3516	0.0011	0.0013	0.0028	0.0026	0.0005	1.6510
33	28-May-98	0.0426	0.0074	0.2350	0.0011	0.00013	0.00001	0.00003	3.3919	0.0008	0.0019	0.0031	0.0027	0.0021	1.7802
34	04-Jun-98	0.0549	0.0045	0.1334	0.0017	0.00013	0.00001	0.00003	2.3555	0.0008	0.0019	0.0064	0.0026	0.0005	1.0585
35	11-Jun-98	0.0348	0.0073	0.2189	0.0014	0.00013	0.00001	0.00003	3.2527	0.0003	0.0015	0.0046	0.0026	0.0005	1.5457
36	18-Jun-98	0.0373	0.0059	0.1948	0.0020	0.00013	0.00001	0.00003	2.8839	0.0001	0.0018	0.0032	0.0053	0.0005	1.2936
37	25-Jun-98	0.0397	0.0046	0.1517	0.0016	0.00013	0.00001	0.00003	3.0108	0.0006	0.0016	0.0014	0.0052	0.0005	1.2787
38	02-Jul-98	0.0376	0.0070	0.2172	0.0021	0.00013	0.00001	0.00003	3.6662	0.0008	0.0017	0.0027	0.0105	0.0005	1.6300
39	09-Jul-98	0.0411	0.0055	0.1466	0.0020	0.00013	0.00001	0.00003	3.0222	0.0005	0.0014	0.0035	0.0102	0.0010	1.2912
40	16-Jul-98	0.0724	0.0042	0.0992	0.0012	0.00013	0.00001	0.00003	2.8821	0.0011	0.0016	0.0050	0.0212	0.0005	1.1591
41	23-Jul-98	0.0523	0.0056	0.1354	0.0016	0.00013	0.00001	0.00003	3.1157	0.0003	0.0011	0.0030	0.0026	0.0005	1.4255
42	30-Jul-98	0.0442	0.0046	0.1099	0.0028	0.00013	0.00001	0.00003	3.1169	0.0010	0.0013	0.0014	0.0050	0.0010	1.2779
Maximum		0.2039	0.0257	0.5491	0.0095	0.00016	0.00002	0.00003	4.5574	0.0026	0.0021	0.0064	0.0212	0.0061	2.9062
Minimum		0.0083	0.0042	0.0709	0.0007	0.00009	0.00001	0.00002	1.1611	0.0001	0.0001	0.0000	0.0019	0.0004	1.0585
Mean		0.0397	0.0115	0.2238	0.0021	0.00012	0.00001	0.00002	3.0139	0.0006	0.0010	0.0021	0.0037	0.0009	1.7376
Median		0.0371	0.0106	0.2189	0.0017	0.00013	0.00001	0.00003	3.0108	0.0006	0.0009	0.0015	0.0025	0.0005	1.7072
Mean Last 5 Weeks		0.0495	0.0053	0.1417	0.0019	0.00013	0.00001	0.00003	3.1606	0.0008	0.0014	0.0031	0.0099	0.0007	1.3568

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

Table of Contents

Weekly Humidity Cell Data: Boston Property (Altered Basalt)

Boston
93NOD57 195 - Altered Basalt

Week No.	Date	Manganese Mn (mg/kg/wk)
0	09-Oct-97	0.0007
1	16-Oct-97	0.0016
2	23-Oct-97	0.0027
3	30-Oct-97	0.0030
4	06-Nov-97	0.0043
5	13-Nov-97	0.0045
6	20-Nov-97	0.0049
7	27-Nov-97	0.0050
8	04-Dec-97	0.0007
9	11-Dec-97	0.0007
10	18-Dec-97	0.0010
11	25-Dec-97	0.0012
12	01-Jan-98	0.0021
13	08-Jan-98	0.0009
14	15-Jan-98	0.0031
15	22-Jan-98	0.0023
16	29-Jan-98	0.0025
17	05-Feb-98	0.0019
18	12-Feb-98	0.0020
19	19-Feb-98	0.0026
20	26-Feb-98	0.0021
21	05-Mar-98	0.0015
22	12-Mar-98	0.0035
23	19-Mar-98	0.0043
24	26-Mar-98	0.0048
25	02-Apr-98	0.0047
26	09-Apr-98	0.0059
27	16-Apr-98	0.0054
28	23-Apr-98	0.0056
29	30-Apr-98	0.0049
30	07-May-98	0.0055
31	14-May-98	0.0066
32	21-May-98	0.0038
33	28-May-98	0.0047
34	04-Jun-98	0.0055
35	11-Jun-98	0.0047
36	18-Jun-98	0.0051
37	25-Jun-98	0.0055
38	02-Jul-98	0.0055
39	09-Jul-98	0.0051
40	16-Jul-98	0.0061
41	23-Jul-98	0.0039
42	30-Jul-98	0.0061
Maximum		0.0066
Minimum		0.0007
Mean		0.0037
Median		0.0043
Mean Last 5 Weeks		0.0054

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

Weekly Humidity Cell Data: Boston Property (Altered Basalt)

Boston
93NOD57 195 - Altered Basalt

Week No.	Date	Mercury Hg (mg/kg/wk)	Molybdenum Mo (mg/kg/wk)	Nickel Ni (mg/kg/wk)	Phosphorus P (mg/kg/wk)	Potassium K (mg/kg/wk)	Selenium Se (mg/kg/wk)	Silver Ag (mg/kg/wk)	Sodium Na (mg/kg/wk)	Strontium Sr (mg/kg/wk)	Tin Sn (mg/kg/wk)	Titanium Ti (mg/kg/wk)	Thallium Tl (mg/kg/wk)	Uranium U (mg/kg/wk)	Vanadium V (mg/kg/wk)
0	09-Oct-97	0.0003	0.00013	0.0023	0.0320	2.1754	0.00032	0.00002	18.9988	0.0199	0.00016	0.00032	0.00002	0.00002	0.00196
1	16-Oct-97	0.0003	0.00005	0.0040	0.0254	1.2465	0.00025	0.00001	7.0197	0.0181	0.00013	0.00025	0.00001	0.00001	0.00025
2	23-Oct-97	0.0003	0.00005	0.0050	0.0262	1.3113	0.00026	0.00001	4.7990	0.0229	0.00052	0.00026	0.00001	0.00001	0.00026
3	30-Oct-97	0.0003	0.00005	0.0069	0.0254	1.1448	0.00051	0.00001	2.8497	0.0246	0.00013	0.00025	0.00001	0.00001	0.00054
4	06-Nov-97	0.0003	0.00003	0.0073	0.0254	1.2465	0.00051	0.00001	1.8580	0.0277	0.00013	0.00025	0.00001	0.00001	0.00054
5	13-Nov-97	0.0003	0.00003	0.0056	0.0254	0.8397	0.00051	0.00001	1.0698	0.0254	0.00013	0.00025	0.00001	0.00001	0.00054
6	20-Nov-97	0.0003	0.00003	0.0100	0.0257	0.6942	0.00026	0.00001	0.6954	0.0241	0.00013	0.00026	0.00001	0.00001	0.00055
7	27-Nov-97	0.0003	0.00003	0.0057	0.0254	0.4583	0.00153	0.00001	0.4341	0.0194	0.00013	0.00025	0.00001	0.00001	0.00025
8	04-Dec-97	0.0002	0.00002	0.0015	0.0189	0.3968	0.00038	0.00001	0.4166	0.0096	0.00009	0.00019	0.00001	0.00001	0.00040
9	11-Dec-97	0.0002	0.00002	0.0012	0.0194	0.3496	0.00039	0.00001	0.3893	0.0081	0.00010	0.00019	0.00001	0.00001	0.00042
10	18-Dec-97	0.0002	0.00002	0.0016	0.0210	0.6506	0.00084	0.00001	0.6726	0.0216	0.00010	0.00021	0.00001	0.00001	0.00129
11	25-Dec-97	0.0002	0.00002	0.0013	0.0204	0.4503	0.00041	0.00001	0.4104	0.0159	0.00010	0.00020	0.00001	0.00001	0.00044
12	01-Jan-98	0.0002	0.00002	0.0037	0.0210	0.2941	0.00042	0.00001	0.2951	0.0160	0.00010	0.00021	0.00001	0.00001	0.00045
13	08-Jan-98	0.0002	0.00002	0.0019	0.0202	0.3840	0.00040	0.00001	0.3446	0.0144	0.00020	0.00020	0.00001	0.00001	0.00043
14	15-Jan-98	0.0002	0.00002	0.0041	0.0199	0.2993	0.00040	0.00001	0.3202	0.0148	0.00010	0.00020	0.00001	0.00001	0.00043
15	22-Jan-98	0.0002	0.00002	0.0030	0.0199	0.2595	0.00040	0.00001	0.3003	0.0133	0.00010	0.00020	0.00001	0.00001	0.00020
16	29-Jan-98	0.0002	0.00002	0.0028	0.0210	0.2312	0.00042	0.00001	0.3161	0.0143	0.00010	0.00021	0.00001	0.00001	0.00045
17	05-Feb-98	0.0002	0.00002	0.0020	0.0210	0.1892	0.00042	0.00001	0.2951	0.0123	0.00021	0.00021	0.00001	0.00001	0.00045
18	12-Feb-98	0.0002	0.00002	0.0017	0.0220	0.1767	0.00044	0.00001	0.2878	0.0112	0.00011	0.00022	0.00001	0.00001	0.00047
19	19-Feb-98	0.0002	0.00002	0.0034	0.0212	0.2553	0.00042	0.00001	0.5960	0.0145	0.00011	0.00021	0.00001	0.00001	0.00045
20	26-Feb-98	0.0002	0.00004	0.0016	0.0215	0.1725	0.00043	0.00001	0.3455	0.0093	0.00011	0.00021	0.00001	0.00001	0.00046
21	05-Mar-98	0.0002	0.00002	0.0012	0.0210	0.1473	0.00042	0.00001	0.3370	0.0087	0.00021	0.00021	0.00001	0.00001	0.00045
22	12-Mar-98	0.0002	0.00002	0.0019	0.0249	0.1002	0.00025	0.00001	0.3006	0.0086	0.00012	0.00025	0.00001	0.00001	0.00025
23	19-Mar-98	0.0003	0.00003	0.0019	0.0252	0.1013	0.00025	0.00001	0.3038	0.0093	0.00013	0.00025	0.00001	0.00001	0.00025
24	26-Mar-98	0.0003	0.00003	0.0022	0.0252	0.1013	0.00025	0.00001	0.2283	0.0097	0.00025	0.00025	0.00001	0.00001	0.00054
25	02-Apr-98	0.0002	0.00005	0.0024	0.0246	0.1484	0.00049	0.00001	0.2975	0.0145	0.00025	0.00025	0.00001	0.00001	0.00053
26	09-Apr-98	0.0003	0.00003	0.0045	0.0265	0.1065	0.00026	0.00001	0.2402	0.0144	0.00013	0.00026	0.00001	0.00001	0.00057
27	16-Apr-98	0.0003	0.00003	0.0052	0.0252	0.1264	0.00025	0.00001	0.2031	0.0121	0.00013	0.00025	0.00001	0.00001	0.00054
28	23-Apr-98	0.0003	0.00003	0.0043	0.0257	0.1291	0.00051	0.00001	0.2844	0.0134	0.00077	0.00051	0.00001	0.00001	0.00055
29	30-Apr-98	0.0003	0.00003	0.0038	0.0262	0.0793	0.00026	0.00001	0.1592	0.0104	0.00013	0.00026	0.00001	0.00001	0.00056
30	07-May-98	0.0003	0.00003	0.0053	0.0262	0.2103	0.00157	0.00001	0.4213	0.0178	0.00026	0.00026	0.00001	0.00001	0.00161
31	14-May-98	0.0003	0.00003	0.0032	0.0262	0.1317	0.00052	0.00001	0.2640	0.0121	0.00013	0.00026	0.00001	0.00001	0.00056
32	21-May-98	0.0003	0.00003	0.0023	0.0262	0.1055	0.00026	0.00001	0.2116	0.0102	0.00013	0.00026	0.00001	0.00001	0.00056
33	28-May-98	0.0003	0.00003	0.0031	0.0267	0.1076	0.00053	0.00001	0.2158	0.0099	0.00053	0.00027	0.00001	0.00001	0.00057
34	04-Jun-98	0.0003	0.00005	0.0041	0.0262	0.0268	0.00026	0.00001	0.1329	0.0071	0.00013	0.00026	0.00001	0.00001	0.00026
35	11-Jun-98	0.0003	0.00005	0.0033	0.0265	0.0536	0.00026	0.00001	0.1872	0.0099	0.00013	0.00026	0.00001	0.00001	0.00026
36	18-Jun-98	0.0003	0.00011	0.0033	0.0267	0.0809	0.00027	0.00001	0.1623	0.0093	0.00013	0.00027	0.00001	0.00001	0.00027
37	25-Jun-98	0.0003	0.00016	0.0027	0.0262	0.0793	0.00026	0.00001	0.1592	0.0086	0.00013	0.00026	0.00001	0.00001	0.00026
38	02-Jul-98	0.0003	0.00005	0.0037	0.0262	0.0793	0.00026	0.00001	0.2116	0.0105	0.00013	0.00026	0.00001	0.00001	0.00056
39	09-Jul-98	0.0003	0.00003	0.0028	0.0254	0.0769	0.00051	0.00001	0.1798	0.0085	0.00013	0.00025	0.00001	0.00001	0.00025
40	16-Jul-98	0.0003	0.00005	0.0034	0.0265	0.0801	0.00026	0.00001	0.2137	0.0075	0.00013	0.00053	0.00001	0.00001	0.00026
41	23-Jul-98	0.0003	0.00010	0.0024	0.0262	0.0531	0.00026	0.00001	0.2902	0.0086	0.00013	0.00026	0.00001	0.00001	0.00026
42	30-Jul-98	0.0003	0.00010	0.0027	0.0252	0.1013	0.00025	0.00001	0.2031	0.0078	0.00013	0.00025	0.00001	0.00001	0.00025
Maximum		0.0003	0.00016	0.0100	0.0320	2.1754	0.00157	0.00002	18.9988	0.0277	0.00077	0.00053	0.00002	0.00002	0.00196
Minimum		0.0002	0.00002	0.0012	0.0189	0.0268	0.00025	0.00001	0.1329	0.0071	0.00009	0.00019	0.00001	0.00001	0.00020
Mean		0.0002	0.00004	0.0034	0.0243	0.3593	0.00043	0.00001	1.1144	0.0136	0.00017	0.00025	0.00001	0.00001	0.00050
Median		0.0003	0.00003	0.0031	0.0254	0.1725	0.00040	0.00001	0.3003	0.0121	0.00013	0.00025	0.00001	0.00001	0.00045
Mean Last 5 Weeks		0.0003	0.00007	0.0030	0.0259	0.0781	0.00031	0.00001	0.2197	0.0086	0.00013	0.00031	0.00001	0.00001	0.00032

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Table of Contents

Weekly Humidity Cell Data: Boston Property (Altered Basalt)

Boston
93NOD57 195 - Altered Basalt

Week No.	Date	Zinc Zn (mg/kg/wk)
0	09-Oct-97	0.0002
1	16-Oct-97	0.0003
2	23-Oct-97	0.0013
3	30-Oct-97	0.0015
4	06-Nov-97	0.0015
5	13-Nov-97	0.0010
6	20-Nov-97	0.0008
7	27-Nov-97	0.0001
8	04-Dec-97	0.0008
9	11-Dec-97	0.0001
10	18-Dec-97	0.0002
11	25-Dec-97	0.0023
12	01-Jan-98	0.0002
13	08-Jan-98	0.0004
14	15-Jan-98	0.0001
15	22-Jan-98	0.0002
16	29-Jan-98	0.0001
17	05-Feb-98	0.0006
18	12-Feb-98	0.0002
19	19-Feb-98	0.0013
20	26-Feb-98	0.0002
21	05-Mar-98	0.0002
22	12-Mar-98	0.0001
23	19-Mar-98	0.0010
24	26-Mar-98	0.0005
25	02-Apr-98	0.0003
26	09-Apr-98	0.0011
27	16-Apr-98	0.0008
28	23-Apr-98	0.0008
29	30-Apr-98	0.0011
30	07-May-98	0.0026
31	14-May-98	0.0018
32	21-May-98	0.0008
33	28-May-98	0.0008
34	04-Jun-98	0.0003
35	11-Jun-98	0.0001
36	18-Jun-98	0.0008
37	25-Jun-98	0.0008
38	02-Jul-98	0.0003
39	09-Jul-98	0.0008
40	16-Jul-98	0.0008
41	23-Jul-98	0.0003
42	30-Jul-98	0.0008
Maximum		0.0026
Minimum		0.0001
Mean		0.0007
Median		0.0008
Mean Last 5 Weeks		0.0006

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

Table of Contents

Weekly Humidity Cell Data: Boston Property (Altered Basalt)

Boston 93NOD57 195 - Altered Basalt		**Cumulative Metal Loading/Leaching**															
Week No.	Date	Aluminum Al (mg/kg)	Antimony Sb (mg/kg)	Arsenic As (mg/kg)	Barium Ba (mg/kg)	Beryllium Be (mg/kg)	Bismuth Bi (mg/kg)	Cadmium Cd (mg/kg)	Calcium Ca (mg/kg)	Chromium Cr (mg/kg)	Cobalt Co (mg/kg)	Copper Cu (mg/kg)	Iron Fe (mg/kg)	Lead Pb (mg/kg)	Magnesium Mg (mg/kg)	Manganese Mn (mg/kg)	Mercury Hg (mg/kg)
0	09-Oct-97	0.2039	0.0136	0.1083	0.0014	0.0002	0.00002	0.00003	2.9057	0.0026	0.0001	0.0015	0.0032	0.0006	1.7072	0.0007	0.0003
1	16-Oct-97	0.2353	0.0331	0.1792	0.0027	0.0003	0.00003	0.00006	5.2414	0.0027	0.0004	0.0023	0.0057	0.0017	3.3645	0.0023	0.0006
2	23-Oct-97	0.2682	0.0564	0.3094	0.0050	0.0004	0.00004	0.00008	8.8813	0.0029	0.0008	0.0047	0.0084	0.0027	5.6289	0.0050	0.0008
3	30-Oct-97	0.3158	0.0802	0.4927	0.0076	0.0005	0.00005	0.00011	12.4121	0.0042	0.0016	0.0071	0.0109	0.0032	7.7236	0.0080	0.0011
4	06-Nov-97	0.3482	0.1042	0.7390	0.0109	0.0007	0.00007	0.00013	16.3242	0.0050	0.0026	0.0096	0.0134	0.0093	10.3015	0.0122	0.0013
5	13-Nov-97	0.3740	0.1247	0.9777	0.0141	0.0008	0.00008	0.00016	20.2110	0.0068	0.0033	0.0100	0.0160	0.0098	12.6962	0.0167	0.0016
6	20-Nov-97	0.3868	0.1436	1.2070	0.0173	0.0009	0.00009	0.00019	24.3176	0.0081	0.0035	0.0103	0.0186	0.0103	15.0540	0.0216	0.0019
7	27-Nov-97	0.4110	0.1584	1.3592	0.0202	0.0011	0.00011	0.00021	27.8230	0.0082	0.0049	0.0126	0.0211	0.0108	17.3471	0.0267	0.0021
8	04-Dec-97	0.4506	0.1697	1.5428	0.0216	0.0011	0.00011	0.00023	29.1226	0.0084	0.0051	0.0139	0.0230	0.0112	18.8076	0.0273	0.0023
9	11-Dec-97	0.4904	0.1809	1.7404	0.0225	0.0012	0.00012	0.00025	30.2837	0.0087	0.0053	0.0139	0.0249	0.0120	20.0332	0.0281	0.0025
10	18-Dec-97	0.5440	0.2066	2.1629	0.0246	0.0014	0.00014	0.00027	33.1956	0.0104	0.0054	0.0159	0.0291	0.0128	22.9393	0.0291	0.0027
11	25-Dec-97	0.5909	0.2258	2.4534	0.0263	0.0015	0.00015	0.00029	35.8712	0.0110	0.0057	0.0169	0.0312	0.0145	24.9754	0.0303	0.0029
12	01-Jan-98	0.6235	0.2436	2.7463	0.0290	0.0016	0.00016	0.00031	38.3428	0.0117	0.0064	0.0176	0.0333	0.0149	26.8163	0.0324	0.0031
13	08-Jan-98	0.6610	0.2587	3.0440	0.0312	0.0017	0.00017	0.00033	40.8832	0.0118	0.0066	0.0190	0.0353	0.0153	28.9353	0.0333	0.0033
14	15-Jan-98	0.6864	0.2702	3.2828	0.0328	0.0018	0.00018	0.00035	43.9882	0.0119	0.0076	0.0213	0.0373	0.0157	30.9232	0.0364	0.0035
15	22-Jan-98	0.7074	0.2808	3.4949	0.0353	0.0019	0.00019	0.00037	46.5753	0.0121	0.0083	0.0225	0.0393	0.0161	32.7756	0.0387	0.0037
16	29-Jan-98	0.7345	0.2918	3.7270	0.0371	0.0020	0.00020	0.00039	49.3614	0.0128	0.0091	0.0238	0.0414	0.0186	34.6122	0.0413	0.0039
17	05-Feb-98	0.7793	0.3028	3.9906	0.0387	0.0021	0.00021	0.00041	51.8540	0.0130	0.0096	0.0253	0.0435	0.0195	36.3734	0.0432	0.0041
18	12-Feb-98	0.8126	0.3127	4.2232	0.0407	0.0022	0.00022	0.00044	54.1409	0.0131	0.0100	0.0265	0.0457	0.0199	38.0596	0.0452	0.0044
19	19-Feb-98	0.8614	0.3250	4.5270	0.0415	0.0023	0.00023	0.00046	57.5988	0.0132	0.0106	0.0274	0.0478	0.0203	40.4841	0.0477	0.0046
20	26-Feb-98	0.9163	0.3317	4.7056	0.0427	0.0024	0.00024	0.00048	59.8957	0.0135	0.0109	0.0279	0.0499	0.0212	41.6702	0.0498	0.0048
21	05-Mar-98	0.9619	0.3371	4.8597	0.0443	0.0025	0.00025	0.00050	62.0528	0.0136	0.0112	0.0287	0.0520	0.0216	42.8819	0.0513	0.0050
22	12-Mar-98	1.0041	0.3431	4.9923	0.0457	0.0026	0.00026	0.00052	64.4897	0.0141	0.0117	0.0287	0.0545	0.0221	44.1565	0.0548	0.0052
23	19-Mar-98	1.0407	0.3508	5.1485	0.0552	0.0027	0.00027	0.00055	67.0278	0.0144	0.0124	0.0297	0.0570	0.0251	45.5552	0.0591	0.0055
24	26-Mar-98	1.0763	0.3579	5.3093	0.0569	0.0029	0.00029	0.00057	69.6162	0.0152	0.0131	0.0310	0.0596	0.0256	46.8784	0.0639	0.0057
25	02-Apr-98	1.0974	0.3699	5.6037	0.0594	0.0030	0.00030	0.00060	73.1856	0.0157	0.0141	0.0345	0.0620	0.0261	48.7555	0.0686	0.0060
26	09-Apr-98	1.1057	0.3804	5.8829	0.0633	0.0031	0.00031	0.00063	76.6766	0.0163	0.0160	0.0370	0.0647	0.0266	50.5554	0.0745	0.0063
27	16-Apr-98	1.1302	0.3907	6.1891	0.0654	0.0033	0.00033	0.00065	79.9697	0.0171	0.0181	0.0411	0.0747	0.0271	52.0648	0.0799	0.0065
28	23-Apr-98	1.1522	0.4016	6.5741	0.0664	0.0034	0.00034	0.00068	83.9992	0.0179	0.0199	0.0432	0.0799	0.0277	54.0013	0.0855	0.0068
29	30-Apr-98	1.1683	0.4096	6.8338	0.0674	0.0035	0.00035	0.00070	86.9839	0.0180	0.0216	0.0452	0.0825	0.0282	55.2434	0.0904	0.0070
30	07-May-98	1.1897	0.4240	7.3829	0.0706	0.0036	0.00036	0.00073	91.5413	0.0188	0.0236	0.0511	0.0851	0.0287	57.3714	0.0959	0.0073
31	14-May-98	1.2126	0.4324	7.7228	0.0720	0.0038	0.00038	0.00076	95.5482	0.0199	0.0253	0.0522	0.0877	0.0292	59.3264	0.1025	0.0076
32	21-May-98	1.2497	0.4399	7.9794	0.0728	0.0039	0.00039	0.00078	98.8998	0.0210	0.0266	0.0550	0.0904	0.0298	60.9774	0.1063	0.0078
33	28-May-98	1.2923	0.4473	8.2143	0.0739	0.0040	0.00040	0.00081	102.2918	0.0218	0.0285	0.0581	0.0930	0.0319	62.7576	0.1110	0.0081
34	04-Jun-98	1.3472	0.4518	8.3477	0.0756	0.0042	0.00042	0.00083	104.6472	0.0227	0.0305	0.0646	0.0957	0.0324	63.8162	0.1165	0.0083
35	11-Jun-98	1.3820	0.4591	8.5666	0.0770	0.0043	0.00043	0.00086	107.9000	0.0230	0.0320	0.0692	0.0983	0.0329	65.3619	0.1212	0.0086
36	18-Jun-98	1.4193	0.4650	8.7614	0.0789	0.0044	0.00044	0.00089	110.7839	0.0231	0.0338	0.0724	0.1036	0.0335	66.6555	0.1264	0.0089
37	25-Jun-98	1.4590	0.4696	8.9131	0.0805	0.0046	0.00046	0.00091	113.7947	0.0237	0.0354	0.0737	0.1089	0.0340	67.9342	0.1318	0.0091
38	02-Jul-98	1.4967	0.4765	9.1303	0.0826	0.0047	0.00047	0.00094	117.4609	0.0245	0.0371	0.0764	0.1194	0.0345	69.5642	0.1374	0.0094
39	09-Jul-98	1.5377	0.4820	9.2770	0.0846	0.0048	0.00048	0.00097	120.4831	0.0250	0.0385	0.0798	0.1295	0.0355	70.8554	0.1424	0.0097
40	16-Jul-98	1.6101	0.4862	9.3762	0.0858	0.0050	0.00050	0.00099	123.3652	0.0261	0.0401	0.0849	0.1507	0.0361	72.0146	0.1485	0.0099
41	23-Jul-98	1.6624	0.4917	9.5116	0.0874	0.0051	0.00051	0.00102	126.4808	0.0264	0.0412	0.0879	0.1534	0.0366	73.4401	0.1524	0.0102
42	30-Jul-98	1.7066	0.4963	9.6215	0.0902	0.0052	0.00052	0.00104	129.5977	0.0275	0.0425	0.0893	0.1584	0.0376	74.7180	0.1586	0.0104
Maximum		1.7066	0.4963	9.6215	0.0902	0.0052	0.00052	0.00104	129.5977	0.0275	0.0425	0.0893	0.1584	0.0376	74.7180	0.1586	0.0104
Minimum		0.2039	0.0136	0.1083	0.0014	0.0002	0.00002	0.00003	2.9057	0.0026	0.0001	0.0015	0.0032	0.0006	1.7072	0.0007	0.0003
Mean		0.9233	0.3134	4.9119	0.0479	0.0026	0.00026	0.00052	65.0239	0.0148	0.0161	0.0364	0.0614	0.0215	41.3050	0.0664	0.0052
Median		0.9619	0.3371	4.8597	0.0443	0.0025	0.00025	0.00050	62.0528	0.0136	0.0112	0.0287	0.0520	0.0216	42.8819	0.0513	0.0050
Mean Last 5 Weeks		1.6027	0.4866	9.3833	0.0861	0.0050	0.00050	0.00099	123.4775	0.0259	0.0399	0.0837	0.1423	0.0361	72.1184	0.1479	0.0099

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

Table of Contents

Weekly Humidity Cell Data: Boston Property (Altered Basalt)

Boston
93NOD57 195 - Altered Basalt

Week No.	Date	Molybdenum Mo (mg/kg)	Nickel Ni (mg/kg)	Phosphorus P (mg/kg)	Potassium K (mg/kg)	Selenium Se (mg/kg)	Silver Ag (mg/kg)	Sodium Na (mg/kg)	Strontium Sr (mg/kg)	Tin Sn (mg/kg)	Titanium Ti (mg/kg)	Thallium Tl (mg/kg)	Uranium U (mg/kg)	Vanadium V (mg/kg)	Zinc Zn (mg/kg)
0	09-Oct-97	0.00013	0.0023	0.0320	2.1754	0.0003	0.00002	18.9988	0.0199	0.0002	0.0003	0.00002	0.00002	0.0020	0.0002
1	16-Oct-97	0.00018	0.0063	0.0574	3.4220	0.0006	0.00003	26.0186	0.0380	0.0003	0.0006	0.00003	0.00003	0.0022	0.0004
2	23-Oct-97	0.00023	0.0113	0.0836	4.7333	0.0008	0.00004	30.8175	0.0609	0.0008	0.0008	0.00004	0.00004	0.0025	0.0017
3	30-Oct-97	0.00028	0.0182	0.1090	5.8781	0.0013	0.00005	33.6672	0.0855	0.0009	0.0011	0.00005	0.00005	0.0030	0.0033
4	06-Nov-97	0.00031	0.0256	0.1345	7.1247	0.0019	0.00007	35.5252	0.1132	0.0011	0.0013	0.00007	0.00007	0.0036	0.0048
5	13-Nov-97	0.00033	0.0312	0.1599	7.9644	0.0024	0.00008	36.5950	0.1386	0.0012	0.0016	0.00008	0.00008	0.0041	0.0058
6	20-Nov-97	0.00036	0.0412	0.1856	8.6586	0.0026	0.00009	37.2904	0.1626	0.0013	0.0019	0.00009	0.00009	0.0047	0.0066
7	27-Nov-97	0.00038	0.0469	0.2110	9.1169	0.0041	0.00011	37.7245	0.1821	0.0014	0.0021	0.00011	0.00011	0.0049	0.0067
8	04-Dec-97	0.00040	0.0484	0.2299	9.5137	0.0045	0.00011	38.1411	0.1916	0.0015	0.0023	0.00011	0.00011	0.0053	0.0075
9	11-Dec-97	0.00042	0.0495	0.2493	9.8633	0.0049	0.00012	38.5304	0.1997	0.0016	0.0025	0.00012	0.00012	0.0057	0.0076
10	18-Dec-97	0.00044	0.0511	0.2703	10.5139	0.0057	0.00014	39.2030	0.2213	0.0017	0.0027	0.00014	0.00014	0.0070	0.0078
11	25-Dec-97	0.00046	0.0525	0.2907	10.9642	0.0062	0.00015	39.6134	0.2372	0.0018	0.0029	0.00015	0.00015	0.0075	0.0101
12	01-Jan-98	0.00048	0.0562	0.3117	11.2583	0.0066	0.00016	39.9085	0.2532	0.0020	0.0031	0.00016	0.00016	0.0079	0.0103
13	08-Jan-98	0.00050	0.0581	0.3319	11.6423	0.0070	0.00017	40.2531	0.2676	0.0022	0.0033	0.00017	0.00017	0.0083	0.0107
14	15-Jan-98	0.00052	0.0622	0.3518	11.9416	0.0074	0.00018	40.5733	0.2824	0.0023	0.0035	0.00018	0.00018	0.0088	0.0108
15	22-Jan-98	0.00054	0.0653	0.3717	12.2011	0.0078	0.00019	40.8735	0.2957	0.0024	0.0037	0.00019	0.00019	0.0090	0.0110
16	29-Jan-98	0.00057	0.0681	0.3927	12.4323	0.0082	0.00020	41.1896	0.3100	0.0025	0.0039	0.00020	0.00020	0.0094	0.0111
17	05-Feb-98	0.00059	0.0701	0.4137	12.6215	0.0086	0.00021	41.4847	0.3223	0.0027	0.0041	0.00021	0.00021	0.0099	0.0117
18	12-Feb-98	0.00061	0.0718	0.4357	12.7982	0.0091	0.00022	41.7725	0.3335	0.0028	0.0044	0.00022	0.00022	0.0103	0.0119
19	19-Feb-98	0.00063	0.0752	0.4569	13.0535	0.0095	0.00023	42.3685	0.3480	0.0029	0.0046	0.00023	0.00023	0.0108	0.0132
20	26-Feb-98	0.00067	0.0768	0.4784	13.2260	0.0099	0.00024	42.7140	0.3573	0.0030	0.0048	0.00024	0.00024	0.0113	0.0134
21	05-Mar-98	0.00069	0.0780	0.4994	13.3733	0.0103	0.00025	43.0510	0.3659	0.0032	0.0050	0.00025	0.00025	0.0117	0.0137
22	12-Mar-98	0.00072	0.0799	0.5243	13.4735	0.0106	0.00026	43.3516	0.3745	0.0033	0.0052	0.00026	0.00026	0.0120	0.0138
23	19-Mar-98	0.00074	0.0818	0.5494	13.5747	0.0108	0.00027	43.6554	0.3838	0.0035	0.0055	0.00027	0.00027	0.0122	0.0148
24	26-Mar-98	0.00077	0.0840	0.5746	13.6760	0.0111	0.00029	43.8837	0.3935	0.0037	0.0057	0.00029	0.00029	0.0128	0.0153
25	02-Apr-98	0.00082	0.0864	0.5992	13.8244	0.0116	0.00030	44.1812	0.4080	0.0039	0.0060	0.00030	0.00030	0.0133	0.0156
26	09-Apr-98	0.00084	0.0908	0.6257	13.9310	0.0118	0.00031	44.4213	0.4224	0.0041	0.0063	0.00031	0.00031	0.0138	0.0166
27	16-Apr-98	0.00087	0.0961	0.6509	14.0574	0.0121	0.00033	44.6245	0.4345	0.0042	0.0065	0.00033	0.00033	0.0144	0.0174
28	23-Apr-98	0.00090	0.1004	0.6766	14.1864	0.0126	0.00034	44.9089	0.4480	0.0050	0.0070	0.00034	0.00034	0.0149	0.0182
29	30-Apr-98	0.00092	0.1042	0.7028	14.2657	0.0129	0.00035	45.0680	0.4583	0.0051	0.0073	0.00035	0.00035	0.0155	0.0192
30	07-May-98	0.00095	0.1094	0.7290	14.4760	0.0144	0.00036	45.4893	0.4761	0.0054	0.0075	0.00036	0.00036	0.0171	0.0218
31	14-May-98	0.00097	0.1126	0.7552	14.6077	0.0150	0.00038	45.7533	0.4882	0.0055	0.0078	0.00038	0.00038	0.0177	0.0237
32	21-May-98	0.00100	0.1149	0.7814	14.7132	0.0152	0.00039	45.9649	0.4984	0.0056	0.0081	0.00039	0.00039	0.0182	0.0245
33	28-May-98	0.00103	0.1180	0.8082	14.8208	0.0158	0.00040	46.1807	0.5083	0.0062	0.0083	0.00040	0.00040	0.0188	0.0253
34	04-Jun-98	0.00108	0.1221	0.8344	14.8476	0.0160	0.00042	46.3137	0.5154	0.0063	0.0086	0.00042	0.00042	0.0191	0.0256
35	11-Jun-98	0.00113	0.1254	0.8609	14.9012	0.0163	0.00043	46.5009	0.5253	0.0064	0.0089	0.00043	0.00043	0.0193	0.0257
36	18-Jun-98	0.00124	0.1287	0.8876	14.9821	0.0166	0.00044	46.6632	0.5347	0.0066	0.0091	0.00044	0.00044	0.0196	0.0265
37	25-Jun-98	0.00140	0.1315	0.9138	15.0613	0.0168	0.00046	46.8224	0.5433	0.0067	0.0094	0.00046	0.00046	0.0199	0.0273
38	02-Jul-98	0.00145	0.1351	0.9400	15.1406	0.0171	0.00047	47.0340	0.5538	0.0068	0.0097	0.00047	0.00047	0.0204	0.0276
39	09-Jul-98	0.00147	0.1379	0.9655	15.2175	0.0176	0.00048	47.2138	0.5622	0.0070	0.0099	0.00048	0.00048	0.0207	0.0283
40	16-Jul-98	0.00153	0.1413	0.9919	15.2976	0.0179	0.00050	47.4275	0.5697	0.0071	0.0104	0.00050	0.00050	0.0209	0.0291
41	23-Jul-98	0.00163	0.1437	1.0181	15.3506	0.0181	0.00051	47.7177	0.5783	0.0072	0.0107	0.00051	0.00051	0.0212	0.0294
42	30-Jul-98	0.00173	0.1464	1.0433	15.4519	0.0184	0.00052	47.9208	0.5861	0.0073	0.0110	0.00052	0.00052	0.0215	0.0302
Maximum		0.00173	0.1464	1.0433	15.4519	0.0184	0.00052	47.9208	0.5861	0.0073	0.0110	0.00052	0.00052	0.0215	0.0302
Minimum		0.00013	0.0023	0.0320	2.1754	0.0003	0.00002	18.9988	0.0199	0.0002	0.0003	0.00002	0.00002	0.0020	0.0002
Mean		0.00077	0.0804	0.5230	12.1008	0.0100	0.00026	41.5677	0.3500	0.0036	0.0053	0.00026	0.00026	0.0119	0.0153
Median		0.00069	0.0780	0.4994	13.3733	0.0103	0.00025	43.0510	0.3659	0.0032	0.0050	0.00025	0.00025	0.0117	0.0137
Mean Last 5 Weeks		0.00156	0.1409	0.9918	15.2916	0.0178	0.00050	47.4627	0.5700	0.0071	0.0103	0.00050	0.00050	0.0209	0.0289

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

Table of Contents

Weekly Humidity Cell Data: Boston Property (Altered Basalt)

Boston 93NOD57 195 - Altered Basalt		**Remaining Metal (%):**															
Week No.	Date	Aluminum Al	Antimony Sb	Arsenic As	Barium Ba	Beryllium Be	Bismuth Bi	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Mercury Hg
0	09-Oct-97	100.000	99.434	99.915	99.998	N/A	N/A	N/A	99.995	100.000	100.000	99.998	100.000	N/A	99.996	100.000	N/A
1	16-Oct-97	100.000	98.619	99.860	99.997	N/A	N/A	N/A	99.992	100.000	99.999	99.997	100.000	N/A	99.992	100.000	N/A
2	23-Oct-97	99.999	97.648	99.758	99.994	N/A	N/A	N/A	99.986	100.000	99.999	99.994	100.000	N/A	99.986	100.000	N/A
3	30-Oct-97	99.999	96.660	99.615	99.991	N/A	N/A	N/A	99.980	99.999	99.997	99.990	100.000	N/A	99.981	99.999	N/A
4	06-Nov-97	99.999	95.657	99.423	99.986	N/A	N/A	N/A	99.974	99.999	99.996	99.987	100.000	N/A	99.975	99.999	N/A
5	13-Nov-97	99.999	94.804	99.236	99.982	N/A	N/A	N/A	99.968	99.999	99.994	99.987	100.000	N/A	99.969	99.999	N/A
6	20-Nov-97	99.999	94.017	99.057	99.978	N/A	N/A	N/A	99.961	99.999	99.994	99.986	100.000	N/A	99.964	99.998	N/A
7	27-Nov-97	99.999	93.400	98.938	99.975	N/A	N/A	N/A	99.956	99.999	99.992	99.983	100.000	N/A	99.958	99.998	N/A
8	04-Dec-97	99.999	92.930	98.795	99.973	N/A	N/A	N/A	99.954	99.999	99.991	99.981	100.000	N/A	99.955	99.998	N/A
9	11-Dec-97	99.999	92.464	98.640	99.972	N/A	N/A	N/A	99.952	99.999	99.991	99.981	100.000	N/A	99.952	99.998	N/A
10	18-Dec-97	99.999	91.392	98.310	99.969	N/A	N/A	N/A	99.947	99.998	99.991	99.979	100.000	N/A	99.945	99.997	N/A
11	25-Dec-97	99.999	90.594	98.083	99.967	N/A	N/A	N/A	99.943	99.998	99.990	99.977	100.000	N/A	99.940	99.997	N/A
12	01-Jan-98	99.999	89.850	97.854	99.964	N/A	N/A	N/A	99.939	99.998	99.989	99.976	100.000	N/A	99.936	99.997	N/A
13	08-Jan-98	99.999	89.220	97.622	99.961	N/A	N/A	N/A	99.935	99.998	99.989	99.975	100.000	N/A	99.930	99.997	N/A
14	15-Jan-98	99.999	88.743	97.435	99.959	N/A	N/A	N/A	99.930	99.998	99.987	99.971	100.000	N/A	99.926	99.997	N/A
15	22-Jan-98	99.999	88.301	97.270	99.956	N/A	N/A	N/A	99.926	99.998	99.986	99.970	100.000	N/A	99.921	99.997	N/A
16	29-Jan-98	99.999	87.840	97.088	99.954	N/A	N/A	N/A	99.921	99.998	99.985	99.968	100.000	N/A	99.917	99.996	N/A
17	05-Feb-98	99.998	87.383	96.882	99.952	N/A	N/A	N/A	99.917	99.998	99.984	99.966	100.000	N/A	99.913	99.996	N/A
18	12-Feb-98	99.998	86.972	96.701	99.949	N/A	N/A	N/A	99.914	99.998	99.983	99.964	100.000	N/A	99.909	99.996	N/A
19	19-Feb-98	99.998	86.459	96.463	99.948	N/A	N/A	N/A	99.908	99.998	99.982	99.963	100.000	N/A	99.903	99.996	N/A
20	26-Feb-98	99.998	86.179	96.324	99.947	N/A	N/A	N/A	99.904	99.998	99.981	99.963	100.000	N/A	99.900	99.996	N/A
21	05-Mar-98	99.998	85.954	96.203	99.945	N/A	N/A	N/A	99.901	99.998	99.981	99.962	100.000	N/A	99.897	99.996	N/A
22	12-Mar-98	99.998	85.706	96.100	99.943	N/A	N/A	N/A	99.897	99.998	99.980	99.961	100.000	N/A	99.894	99.995	N/A
23	19-Mar-98	99.998	85.383	95.978	99.931	N/A	N/A	N/A	99.893	99.998	99.979	99.960	100.000	N/A	99.890	99.995	N/A
24	26-Mar-98	99.998	85.085	95.852	99.929	N/A	N/A	N/A	99.889	99.998	99.978	99.958	100.000	N/A	99.887	99.994	N/A
25	02-Apr-98	99.998	84.586	95.622	99.926	N/A	N/A	N/A	99.883	99.997	99.976	99.954	100.000	N/A	99.883	99.994	N/A
26	09-Apr-98	99.998	84.149	95.404	99.921	N/A	N/A	N/A	99.878	99.997	99.973	99.950	100.000	N/A	99.878	99.993	N/A
27	16-Apr-98	99.998	83.722	95.165	99.918	N/A	N/A	N/A	99.872	99.997	99.969	99.945	100.000	N/A	99.875	99.993	N/A
28	23-Apr-98	99.998	83.267	94.864	99.917	N/A	N/A	N/A	99.866	99.997	99.966	99.942	100.000	N/A	99.870	99.993	N/A
29	30-Apr-98	99.998	82.932	94.661	99.916	N/A	N/A	N/A	99.861	99.997	99.963	99.939	100.000	N/A	99.867	99.992	N/A
30	07-May-98	99.998	82.335	94.232	99.912	N/A	N/A	N/A	99.854	99.997	99.960	99.931	100.000	N/A	99.862	99.992	N/A
31	14-May-98	99.998	81.984	93.967	99.910	N/A	N/A	N/A	99.848	99.997	99.957	99.930	100.000	N/A	99.857	99.991	N/A
32	21-May-98	99.998	81.670	93.766	99.909	N/A	N/A	N/A	99.842	99.997	99.955	99.926	100.000	N/A	99.853	99.991	N/A
33	28-May-98	99.997	81.362	93.583	99.908	N/A	N/A	N/A	99.837	99.996	99.952	99.922	100.000	N/A	99.849	99.990	N/A
34	04-Jun-98	99.997	81.177	93.478	99.905	N/A	N/A	N/A	99.833	99.996	99.948	99.913	100.000	N/A	99.847	99.990	N/A
35	11-Jun-98	99.997	80.871	93.307	99.904	N/A	N/A	N/A	99.828	99.996	99.946	99.907	100.000	N/A	99.843	99.989	N/A
36	18-Jun-98	99.997	80.625	93.155	99.901	N/A	N/A	N/A	99.823	99.996	99.943	99.903	100.000	N/A	99.840	99.989	N/A
37	25-Jun-98	99.997	80.434	93.037	99.899	N/A	N/A	N/A	99.819	99.996	99.940	99.901	100.000	N/A	99.837	99.988	N/A
38	02-Jul-98	99.997	80.144	92.867	99.897	N/A	N/A	N/A	99.813	99.996	99.937	99.897	100.000	N/A	99.833	99.988	N/A
39	09-Jul-98	99.997	79.916	92.752	99.894	N/A	N/A	N/A	99.808	99.996	99.935	99.893	100.000	N/A	99.830	99.988	N/A
40	16-Jul-98	99.997	79.743	92.675	99.893	N/A	N/A	N/A	99.803	99.996	99.932	99.886	100.000	N/A	99.827	99.987	N/A
41	23-Jul-98	99.997	79.510	92.569	99.891	N/A	N/A	N/A	99.798	99.996	99.930	99.882	100.000	N/A	99.823	99.987	N/A
42	30-Jul-98	99.997	79.320	92.483	99.887	N/A	N/A	N/A	99.793	99.996	99.928	99.880	100.000	N/A	99.820	99.986	N/A
Maximum		100.00	99.43	99.92	100.00	N/A	N/A	N/A	100.00	100.00	100.00	100.00	100.00	N/A	100.00	100.00	N/A
Minimum		100.00	79.32	92.48	99.89	N/A	N/A	N/A	99.79	100.00	99.93	99.88	100.00	N/A	99.82	99.99	N/A
Mean		100.00	86.94	96.16	99.94	N/A	N/A	N/A	99.90	100.00	99.97	99.95	100.00	N/A	99.90	99.99	N/A
Median		100.00	85.95	96.20	99.94	N/A	N/A	N/A	99.90	100.00	99.98	99.96	100.00	N/A	99.90	100.00	N/A
Mean Last 5 Weeks		100.00	79.73	92.67	99.89	N/A	N/A	N/A	99.80	100.00	99.93	99.89	100.00	N/A	99.83	99.99	N/A

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

Table of Contents

Weekly Humidity Cell Data: Boston Property (Altered Basalt)

Boston 93NOD57 195 - Altered Basalt Week No.	Date	Molybdenum Mo	Nickel Ni	Phosphorus P	Potassium K	Selenium Se	Silver Ag	Sodium Na	Strontium Sr	Tin Sn	Titanium Ti	Thallium Tl	Uranium U	Vanadium V	Zinc Zn
0	09-Oct-97	N/A	99.999	N/A	99.921	N/A	99.984	99.785	99.979	N/A	100.000	N/A	N/A	99.999	100.000
1	16-Oct-97	N/A	99.998	N/A	99.876	N/A	99.971	99.706	99.960	N/A	100.000	N/A	N/A	99.999	99.999
2	23-Oct-97	N/A	99.996	N/A	99.828	N/A	99.958	99.652	99.935	N/A	100.000	N/A	N/A	99.999	99.998
3	30-Oct-97	N/A	99.993	N/A	99.786	N/A	99.945	99.620	99.909	N/A	100.000	N/A	N/A	99.998	99.996
4	06-Nov-97	N/A	99.991	N/A	99.741	N/A	99.933	99.599	99.880	N/A	100.000	N/A	N/A	99.998	99.994
5	13-Nov-97	N/A	99.988	N/A	99.710	N/A	99.920	99.586	99.853	N/A	100.000	N/A	N/A	99.998	99.992
6	20-Nov-97	N/A	99.985	N/A	99.685	N/A	99.907	99.579	99.827	N/A	100.000	N/A	N/A	99.997	99.991
7	27-Nov-97	N/A	99.983	N/A	99.668	N/A	99.894	99.574	99.806	N/A	100.000	N/A	N/A	99.997	99.991
8	04-Dec-97	N/A	99.982	N/A	99.654	N/A	99.885	99.569	99.796	N/A	100.000	N/A	N/A	99.997	99.990
9	11-Dec-97	N/A	99.982	N/A	99.641	N/A	99.875	99.565	99.788	N/A	100.000	N/A	N/A	99.997	99.990
10	18-Dec-97	N/A	99.981	N/A	99.618	N/A	99.865	99.557	99.765	N/A	100.000	N/A	N/A	99.996	99.990
11	25-Dec-97	N/A	99.981	N/A	99.601	N/A	99.855	99.552	99.748	N/A	100.000	N/A	N/A	99.996	99.987
12	01-Jan-98	N/A	99.979	N/A	99.591	N/A	99.844	99.549	99.731	N/A	100.000	N/A	N/A	99.995	99.986
13	08-Jan-98	N/A	99.978	N/A	99.577	N/A	99.834	99.545	99.715	N/A	100.000	N/A	N/A	99.995	99.986
14	15-Jan-98	N/A	99.977	N/A	99.566	N/A	99.824	99.542	99.700	N/A	100.000	N/A	N/A	99.995	99.986
15	22-Jan-98	N/A	99.976	N/A	99.556	N/A	99.814	99.538	99.685	N/A	100.000	N/A	N/A	99.995	99.985
16	29-Jan-98	N/A	99.975	N/A	99.548	N/A	99.804	99.535	99.670	N/A	100.000	N/A	N/A	99.995	99.985
17	05-Feb-98	N/A	99.974	N/A	99.541	N/A	99.793	99.531	99.657	N/A	100.000	N/A	N/A	99.994	99.984
18	12-Feb-98	N/A	99.973	N/A	99.535	N/A	99.782	99.528	99.645	N/A	100.000	N/A	N/A	99.994	99.984
19	19-Feb-98	N/A	99.972	N/A	99.525	N/A	99.772	99.521	99.630	N/A	100.000	N/A	N/A	99.994	99.982
20	26-Feb-98	N/A	99.972	N/A	99.519	N/A	99.761	99.517	99.620	N/A	100.000	N/A	N/A	99.993	99.982
21	05-Mar-98	N/A	99.971	N/A	99.514	N/A	99.750	99.514	99.611	N/A	100.000	N/A	N/A	99.993	99.982
22	12-Mar-98	N/A	99.970	N/A	99.510	N/A	99.738	99.510	99.602	N/A	100.000	N/A	N/A	99.993	99.982
23	19-Mar-98	N/A	99.970	N/A	99.506	N/A	99.725	99.507	99.592	N/A	99.999	N/A	N/A	99.993	99.980
24	26-Mar-98	N/A	99.969	N/A	99.503	N/A	99.713	99.504	99.581	N/A	99.999	N/A	N/A	99.993	99.980
25	02-Apr-98	N/A	99.968	N/A	99.497	N/A	99.700	99.501	99.566	N/A	99.999	N/A	N/A	99.992	99.979
26	09-Apr-98	N/A	99.966	N/A	99.493	N/A	99.687	99.498	99.551	N/A	99.999	N/A	N/A	99.992	99.978
27	16-Apr-98	N/A	99.964	N/A	99.489	N/A	99.675	99.496	99.538	N/A	99.999	N/A	N/A	99.992	99.977
28	23-Apr-98	N/A	99.963	N/A	99.484	N/A	99.662	99.493	99.523	N/A	99.999	N/A	N/A	99.991	99.976
29	30-Apr-98	N/A	99.961	N/A	99.481	N/A	99.649	99.491	99.512	N/A	99.999	N/A	N/A	99.991	99.974
30	07-May-98	N/A	99.959	N/A	99.474	N/A	99.635	99.486	99.493	N/A	99.999	N/A	N/A	99.990	99.971
31	14-May-98	N/A	99.958	N/A	99.469	N/A	99.622	99.483	99.481	N/A	99.999	N/A	N/A	99.990	99.968
32	21-May-98	N/A	99.957	N/A	99.465	N/A	99.609	99.481	99.470	N/A	99.999	N/A	N/A	99.989	99.967
33	28-May-98	N/A	99.956	N/A	99.461	N/A	99.596	99.478	99.459	N/A	99.999	N/A	N/A	99.989	99.966
34	04-Jun-98	N/A	99.955	N/A	99.460	N/A	99.583	99.477	99.452	N/A	99.999	N/A	N/A	99.989	99.966
35	11-Jun-98	N/A	99.954	N/A	99.458	N/A	99.570	99.475	99.441	N/A	99.999	N/A	N/A	99.989	99.966
36	18-Jun-98	N/A	99.952	N/A	99.455	N/A	99.556	99.473	99.431	N/A	99.999	N/A	N/A	99.989	99.965
37	25-Jun-98	N/A	99.951	N/A	99.452	N/A	99.543	99.471	99.422	N/A	99.999	N/A	N/A	99.988	99.964
38	02-Jul-98	N/A	99.950	N/A	99.449	N/A	99.530	99.469	99.411	N/A	99.999	N/A	N/A	99.988	99.963
39	09-Jul-98	N/A	99.949	N/A	99.447	N/A	99.517	99.467	99.402	N/A	99.999	N/A	N/A	99.988	99.962
40	16-Jul-98	N/A	99.948	N/A	99.444	N/A	99.504	99.464	99.394	N/A	99.999	N/A	N/A	99.988	99.961
41	23-Jul-98	N/A	99.947	N/A	99.442	N/A	99.491	99.461	99.385	N/A	99.999	N/A	N/A	99.988	99.961
42	30-Jul-98	N/A	99.946	N/A	99.438	N/A	99.478	99.459	99.376	N/A	99.999	N/A	N/A	99.988	99.960
Maximum		N/A	100.00	N/A	99.92	N/A	99.98	99.79	99.98	N/A	100.00	N/A	N/A	100.00	100.00
Minimum		N/A	99.95	N/A	99.44	N/A	99.48	99.46	99.38	N/A	100.00	N/A	N/A	99.99	99.96
Mean		N/A	99.97	N/A	99.56	N/A	99.74	99.53	99.63	N/A	100.00	N/A	N/A	99.99	99.98
Median		N/A	99.97	N/A	99.51	N/A	99.75	99.51	99.61	N/A	100.00	N/A	N/A	99.99	99.98
Mean Last 5 Weeks		N/A	99.95	N/A	99.44	N/A	99.50	99.46	99.39	N/A	100.00	N/A	N/A	99.99	99.96

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

Appendix D-3
Kinetic Test Data - B2 Mineralized Zone

◎ Table of Contents

Boston Property Whole Rock Data
B2 Mineralized Zone

Pre-Test Whole Rock Data Boston Property B2 mineralized zone	
Analysis Date: Method:	11-Oct-97 XRF/ICP
Al2O3 (%)	10.12
CaO (%)	10.97
Cr2O3 (%)	<0.01
Fe2O3 (%)	12.9
K2O (%)	0.72
MgO (%)	3.97
MnO (%)	0.21
Na2O (%)	1
P2O5 (%)	0.08
SiO2 (%)	42.06
TiO2 (%)	0.84
LOI (%)	16.25
Total (%)	99.12
Ba (ppm)	136
Cs (ppm)	3
Hf (ppm)	2
La (ppm)	7
Nb (ppm)	4
Rb (ppm)	37
Sr (ppm)	101
Ta (ppm)	1
Y (ppm)	27
Zr (ppm)	68

Post-Test Whole Rock Data Boston Property B2 mineralized zone	
Analysis Date: Method:	15-Sep-98 XRF/ICP
Al2O3 (%)	10.06
CaO (%)	10.99
Cr2O3 (%)	<0.01
Fe2O3 (%)	12.84
K2O (%)	0.77
MgO (%)	4
MnO (%)	0.22
Na2O (%)	1.03
P2O5 (%)	0.08
SiO2 (%)	40.25
TiO2 (%)	0.87
LOI (%)	14.65
Total (%)	95.76
Ba (ppm)	108.5
Cs (ppm)	2.1
Hf (ppm)	1
La (ppm)	5.5
Nb (ppm)	1
Rb (ppm)	22.8
Sr (ppm)	98.1
Ta (ppm)	<0.5
Y (ppm)	8
Zr (ppm)	62.5

◎ Table of Contents

Boston Property ABA and ICP Metals Data
B2 Mineralized Zone

Pre-Test ABA & ICP Metals Data Boston B2 mineralized zone		
ABA Results:		
Paste pH		8.8
% S (Total)		3.09
% S (SO_4)		***0.01***
% S (Sulphide)		3.06
% del S (SO_4)		0.02
TAP (kg $CaCO_3$/t)		96.56
SAP (kg $CaCO_3$/t)		96.25
NP (kg $CaCO_3$/t)		301
CO2 (%)		15.8
CaNP (kg $CaCO_3$/t)		359.3
TNNP (kg $CaCO_3$/t)		204.4
SNNP (kg $CaCO_3$/t)		204.8
TNPR		3.1
SNPR		3.1
Metals: (ppm)		
Aluminum	Al	51650
Antimony	Sb	1.8
Arsenic	As	320
Barium	Ba	95
Beryllium	Be	***0.25***
Bismuth	Bi	3
Cadmium	Cd	0.5
Calcium	Ca	68500
Chromium	Cr	169
Cobalt	Co	34
Copper	Cu	176.5
Iron	Fe	78050
Lead	Pb	5
Magnesium	Mg	22750
Manganese	Mn	1525
Mercury	Hg	***0.005***
Molybdenum	Mo	***0.5***
Nickel	Ni	40.5
Phosphorus	P	255
Potassium	K	6250
Silver	Ag	2.1
Sodium	Na	9600
Strontium	Sr	100.5
Titanium	Ti	1800
Vanadium	V	216
Tungsten	W	***5***
Zinc	Zn	174

Post-Test ABA & ICP Metals Data Boston B2 mineralized zone			% Remaining At End Of Testing**
ABA Results:			
Paste pH		8.9	
% S (Total)		2.96	95.8
% S (SO_4)		0.05	500.0
% S (Sulphide)		2.91	95.1
% del S (SO_4)		0.00	
TAP (kg $CaCO_3$/t)		92.50	
SAP (kg $CaCO_3$/t)		90.94	
NP (kg $CaCO_3$/t)		295	98.0
CO2 (%)		16.5	104.4
CaNP (kg $CaCO_3$/t)		375.3	
TNNP (kg $CaCO_3$/t)		202.5	
SNNP (kg $CaCO_3$/t)		204.1	
TNPR		3.2	
SNPR		3.2	
Metals: (ppm)			
Aluminum	Al	52400	101.5
Antimony	Sb	2.4	133.3
Arsenic	As	276	86.3
Barium	Ba	95	100.0
Beryllium	Be	***0.25***	100.0
Bismuth	Bi	2	66.7
Cadmium	Cd	***0.25***	50.0
Calcium	Ca	67200	98.1
Chromium	Cr	167.5	99.1
Cobalt	Co	38	111.8
Copper	Cu	148	83.9
Iron	Fe	74100	94.9
Lead	Pb	12	240.0
Magnesium	Mg	22750	100.0
Manganese	Mn	1552.5	101.8
Mercury	Hg	0.07	1400.0
Molybdenum	Mo	***0.5***	100.0
Nickel	Ni	41.5	102.5
Phosphorus	P	260	102.0
Potassium	K	6500	104.0
Silver	Ag	2.7	128.6
Sodium	Na	10100	105.2
Strontium	Sr	100.5	100.0
Titanium	Ti	1850	102.8
Vanadium	V	217.5	100.7
Tungsten	W	***5***	100.0
Zinc	Zn	162	93.1

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

Table of Contents

Weekly Humidity Cell Data: Boston Property (B2 Mineralized Zone)

PROJECT: Boston — Original Dry Sample wt = 879 — Orig Ttl %S = 3.09 — Original NP = 301.0

SAMPLE: 94NOD120 210 - B2 Mineralized Zone — Final Dry Sample wt = 860.9 — Orig Sulphide = 3.06

		Analytical Results:									Sulphate Production:				Molar Ratios:				
Week No.	Date	Water Added (mL)	Leachate Recovered (mL)	Weekly pH (pH units)	Conductivity (umohs/cm)	Alkalinity (CaCO3 mg/L)*	Acidity (CaCO3 mg/L)*	Sulphate (SO4 mg/L)*	Acidity Production Rate (mg/kg/wk)**	Alkalinity Production Rate (mg/kg/wk)**	SO4 Production Rate (mg/kg/wk)**	Cumulative SO4 Production (mg/kg)	Remaining S (% of original)	Remaining S (Sulphide) (% of original)	Alk /SO4	Ca+Mg /Alk	Ca/SO4	Carbonate (Ca+Mg) /SO4	Feldspar (Ca+(K/2)+ (Na/2)) /SO4
0	09-Oct-97	750	615	8.5	265	72	***0***	40.43	0.00	50.38	28.29	28	99.97	99.97	1.71	0.51	0.53	0.87	2.84
1	14-Oct-97	500	465	8.3	169	50	***0.5***	23.73	0.26	26.45	12.55	41	99.96	99.96	2.02	0.71	0.84	1.43	2.77
2	17-Oct-97	500	500	8.2	174	59	***0.5***	25.83	0.28	33.56	14.69	56	99.94	99.94	2.19	0.95	1.25	2.09	2.70
3	24-Oct-97	500	490	8	155	48	2	21.53	1.11	26.76	12.00	68	99.93	99.93	2.14	1.16	1.53	2.48	2.62
4	29-Oct-97	500	480	8.0	194	72	2	26.43	1.09	39.32	14.43	82	99.91	99.91	2.61	1.10	1.69	2.87	2.50
5	27-Oct-97	500	490	7.9	154	53	1	19.53	0.56	29.54	10.89	93	99.90	99.90	2.60	1.31	2.01	3.40	2.58
6	14-Nov-97	500	500	7.9	123	42	1	15.93	0.57	23.89	9.06	102	99.89	99.89	2.53	1.30	1.97	3.29	2.36
7	22-Nov-97	500	490	7.8	148	51	2	22.23	1.11	28.43	12.39	114	99.88	99.88	2.20	1.44	1.82	3.17	2.10
8	17-Nov-97	500	370	8.1	100	24	1	20.53	0.42	10.10	8.64	123	99.87	99.87	1.12	1.77	0.95	1.99	1.24
9	24-Nov-97	500	360	8.4	84	25	***0***	13.43	0.00	10.24	5.50	128	99.86	99.86	1.79	1.27	1.03	2.27	1.40
10	01-Dec-97	500	380	8.5	97	35	***0***	11.73	0.00	15.13	5.07	134	99.86	99.85	2.86	1.20	1.56	3.43	2.08
11	08-Dec-97	500	370	7.9	86	32.0	***0.5***	8.23	0.21	13.47	3.46	137	99.85	99.85	3.73	1.19	2.18	4.45	2.75
12	15-Dec-97	500	390	8.2	105	37	***0.5***	10.53	0.22	16.42	4.67	142	99.85	99.85	3.37	1.14	1.96	3.83	2.36
13	22-Dec-97	500	400	8.1	83	31	***0***	7.53	0.00	14.11	3.43	145	99.84	99.84	3.95	1.23	2.33	4.86	2.83
14	29-Dec-97	500	380	8.3	81	33	***0***	5.53	0.00	14.27	2.39	147	99.84	99.84	5.73	1.21	3.78	6.93	4.40
15	16-Jan-98	500	390	8.5	81	32	***0***	6.13	0.00	14.20	2.72	150	99.84	99.84	5.01	1.16	2.90	5.83	3.48
16	19-Jan-98	500	350	8.2	89	37	***0.5***	5.63	0.20	14.73	2.24	152	99.84	99.83	6.31	1.13	3.67	7.11	4.33
17	22-Jan-98	500	390	8.4	111	49	***0***	5.83	0.00	21.74	2.59	155	99.83	99.83	8.07	1.02	4.59	8.26	5.28
18	26-Jan-98	500	405	8.4	77	27	***0***	4.63	0.00	12.44	2.13	157	99.83	99.83	5.60	1.32	3.92	7.41	4.50
19	02-Feb-98	500	400	8.5	97	43	***0***	5.33	0.00	19.57	2.42	160	99.83	99.83	7.74	1.20	5.25	9.29	6.05
20	09-Feb-98	500	390	8.4	97	44	***0***	4.63	0.00	19.52	2.05	162	99.83	99.82	9.12	0.99	5.45	9.02	6.26
21	16-Feb-98	500	410	8.5	84	39	***0***	3.43	0.00	18.19	1.60	163	99.82	99.82	10.92	1.08	7.07	11.74	7.95
22	23-Feb-98	500	460	8.5	82	37	***0***	4.53	0.00	19.36	2.37	166	99.82	99.82	7.84	1.07	5.01	8.43	5.50
23	02-Mar-98	500	480	8.4	87	39	***0***	5.93	0.00	21.30	3.24	169	99.82	99.82	6.31	1.11	4.01	7.01	4.38
24	09-Mar-98	500	500	8.5	87	38	***0***	6.43	0.00	21.62	3.66	172	99.81	99.81	5.67	1.08	3.72	6.10	3.99
25	16-Mar-98	500	460	8.5	98	39	***0***	9.43	0.00	20.41	4.93	177	99.81	99.81	3.97	1.18	2.93	4.69	3.13
26	23-Mar-98	500	505	8.5	88	37	***0***	7.53	0.00	21.26	4.33	182	99.80	99.80	4.72	1.08	3.16	5.08	3.35
27	08-Apr-98	500	500	8.5	93	40	***0***	7.33	0.00	22.75	4.17	186	99.80	99.80	5.24	1.05	3.56	5.49	3.76
28	15-Apr-98	500	480	8.4	101	43	***0***	7.13	0.00	23.48	3.89	190	99.79	99.79	5.79	1.13	4.16	6.53	4.42
29	21-Apr-98	500	430	8.5	88	40	***0***	5.73	0.00	19.57	2.80	193	99.79	99.79	6.70	1.03	4.55	6.88	4.78
30	28-Apr-98	500	490	8.4	115	50	***0***	8.43	0.00	27.87	4.70	197	99.79	99.78	5.69	1.10	3.99	6.29	4.27
31	06-May-98	500	510	8.5	91	41	***0***	5.43	0.00	23.79	3.15	200	99.78	99.78	7.25	1.19	5.51	8.61	5.80
32	13-May-98	500	505	8.7	74	33	***0***	4.43	0.00	18.96	2.54	203	99.78	99.78	7.15	1.19	5.37	8.48	5.64
33	20-May-98	500	490	8.6	76	34	***0***	4.13	0.00	18.95	2.30	205	99.78	99.78	7.90	1.31	6.48	10.39	6.80
34	29-May-98	500	490	8.5	57	26	***0***	2.73	0.00	14.49	1.52	207	99.78	99.77	9.15	1.08	6.52	9.91	6.81
35	02-Jun-98	500	510	8.6	73	35	***0***	3.63	0.00	20.31	2.11	209	99.77	99.77	9.26	1.00	5.96	9.27	6.21
36	10-Jun-98	500	480	8.6	71	33	***0***	3.23	0.00	18.02	1.76	211	99.77	99.77	9.81	1.06	6.81	10.36	7.12
37	16-Jun-98	500	495	8.6	65	32	***0***	2.73	0.00	18.02	1.54	212	99.77	99.77	11.26	1.08	8.19	12.21	8.52
38	22-Jun-98	500	480	8.6	77	35	***0***	3.73	0.00	19.11	2.04	214	99.77	99.77	9.01	1.15	6.89	10.37	7.19
39	03-Jul-98	500	475	8.6	75	37	***0***	3.33	0.00	19.99	1.80	216	99.77	99.76	10.67	0.95	6.64	10.09	6.96
40	09-Jul-98	500	440	8.5	60	20	***0***	2.63	0.00	10.01	1.32	217	99.77	99.76	7.30	1.45	7.18	10.60	7.62
41	16-Jul-98	500	510	8.6	78	39	***0***	3.73	0.00	22.63	2.16	220	99.76	99.76	10.04	0.92	5.99	9.27	6.31
42	23-Jul-98	500	475	8.6	70	34	***0***	3.43	0.00	18.37	1.85	221	99.76	99.76	9.52	1.01	6.38	9.59	6.70
43	30-Jul-98	500	455	8.5	76	37	***0***	3.83	0.00	19.15	1.98	223	99.76	99.76	9.28	1.02	6.09	9.44	6.46
44	07-Aug-98	500	485	8.4	65	32	***0***	2.53	0.00	17.66	1.40	225	99.76	99.75	12.15	1.01	8.22	12.32	8.60
45	14-Aug-98	500	490	8.2	83	39	***0.5***	4.63	0.28	21.74	2.58	227	99.75	99.75	8.09	1.00	5.32	8.07	5.58
46	21-Aug-98	500	475	8.6	67	32	***0***	3.03	0.00	17.29	1.64	229	99.75	99.75	10.14	0.99	7.02	10.08	7.37
47	02-Sep-98	500	450	8.7	71	31	***0***	4.33	0.00	15.87	2.22	231	99.75	99.75	6.87	1.13	4.72	7.80	5.01
48	02-Sep-98	500	440	8.6	72	34	***0***	3.73	0.00	17.02	1.87	233	99.75	99.75	8.75	0.96	5.67	8.40	6.00
49	14-Sep-98	500	485	8.2	84	37	***0.5***	4.23	0.28	20.42	2.33	235	99.75	99.74	8.40	1.06	5.65	8.94	5.95
Maximum			615	8.7	265	50	0.5	40.4	1.11	50.38	28.29	235	99.97	99.97	12.15	1.77	8.22	12.32	8.60
Minimum			360	7.8	57	20	0.0	2.5	0.00	10.01	1.32	28	99.75	99.74	1.12	0.51	0.53	0.87	1.24
Mean			450	8.4	98	36	0.0	8.8	0.13	20.44	4.71	168	99.82	99.82	6.35	1.12	4.28	6.93	4.79
Median			473	8.5	85	37	0.0	5.6	0.00	19.44	2.58	175	99.81	99.81	6.51	1.10	4.35	7.26	4.64
Mean Last 5 Weeks			468	8.5	75	35	0.2	4.0	0.11	18.47	2.13	231.20	99.75	99.75	8.45	1.03	5.68	8.66	5.98

* if values were reported as less than detection limit, one half the detection limit is shown in bold italics and was used in subsequent calculations

Table of Contents

Weekly Humidity Cell Data: Boston Property (B2 Mineralized Zone)

PROJECT: Boston
SAMPLE: 94NOD120 210

Week No.	Date	NP Consumption: Theoretical NP Consumption At pH 6 (mg/kg/wk)	Open-System NP Consumption At Measured pH (mg/kg/wk)	Cum NP Consumption Open-System (mg/kg)	Remaining NP Open-System (%)	Carbonate NP Consumption/ Sulphate Prod.	Molar Ratio NP Consumption (mg/kg/wk)***	Cum NP Consumption Molar Ratio (mg/kg)	Remaining NP Molar Ratio (%)	Molar Ratio NP Consumption (mg/kg/wk)***	Cum NP Consumption Molar Ratio (mg/kg)	Remaining NP Feldspar (%)	Closed-System NP Consumption Above pH 6.5 (mg/kg/wk)	Cum NP Consumption Closed-System (mg/kg)	Remaining NP Closed-System (%)
0	09-Oct-97	29.5	79.8	79.8	99.97	0.90	25.5	25.5	99.99	83.7	83.7	99.97	58.9	58.9	99.98
1	14-Oct-97	13.1	39.3	119.1	99.96	1.49	18.7	44.2	99.99	36.3	119.9	99.96	25.9	84.8	99.97
2	17-Oct-97	15.3	48.6	167.7	99.94	2.17	31.9	76.2	99.97	41.3	161.3	99.95	30.3	115.2	99.96
3	24-Oct-97	12.5	38.1	205.8	99.93	2.59	31.1	107.3	99.96	32.8	194.1	99.94	23.9	139.1	99.95
4	29-Oct-97	15.0	53.3	259.1	99.91	2.99	43.1	150.4	99.95	37.6	231.6	99.92	29.0	168.0	99.94
5	27-Oct-97	11.3	40.3	299.4	99.90	3.55	38.6	189.0	99.94	29.2	260.9	99.91	22.1	190.2	99.94
6	14-Nov-97	9.4	32.8	332.2	99.89	3.43	31.0	220.0	99.93	22.2	283.1	99.91	18.3	208.5	99.93
7	22-Nov-97	12.9	40.2	372.4	99.88	3.30	40.9	261.0	99.91	27.1	310.2	99.90	24.7	233.2	99.92
8	17-Nov-97	9.0	18.7	391.1	99.87	2.07	17.9	278.8	99.91	11.1	321.3	99.89	17.6	250.8	99.92
9	24-Nov-97	5.7	16.0	407.1	99.86	2.36	13.0	291.8	99.90	8.1	329.4	99.89	11.5	262.2	99.91
10	01-Dec-97	5.3	20.4	427.5	99.86	3.58	18.1	310.0	99.90	11.0	340.4	99.89	10.6	272.8	99.91
11	08-Dec-97	3.6	16.9	444.4	99.85	4.63	16.0	326.0	99.89	9.9	350.3	99.88	7.0	279.8	99.91
12	15-Dec-97	4.9	21.1	465.4	99.85	3.99	18.7	344.7	99.89	11.5	361.8	99.88	9.5	289.3	99.90
13	22-Dec-97	3.6	17.7	483.1	99.84	5.07	17.4	362.0	99.88	10.1	371.9	99.88	7.1	296.5	99.90
14	29-Dec-97	2.5	16.8	499.9	99.83	7.22	17.3	379.3	99.87	11.0	382.8	99.87	5.0	301.5	99.90
15	16-Jan-98	2.8	17.0	516.9	99.83	6.08	16.5	395.8	99.87	9.9	392.7	99.87	5.7	307.1	99.90
16	19-Jan-98	2.3	16.9	533.8	99.82	7.41	16.6	412.4	99.86	10.1	402.8	99.87	4.5	311.6	99.90
17	22-Jan-98	2.7	24.4	558.2	99.81	8.61	22.3	434.7	99.86	14.2	417.0	99.86	5.4	317.0	99.89
18	26-Jan-98	2.2	14.7	572.9	99.81	7.72	16.5	451.2	99.85	10.0	427.0	99.86	4.4	321.4	99.89
19	02-Feb-98	2.5	22.1	595.0	99.80	9.68	23.5	474.6	99.84	15.3	442.3	99.85	5.1	326.5	99.89
20	09-Feb-98	2.1	21.7	616.6	99.80	9.40	19.3	493.9	99.84	13.4	455.7	99.85	4.3	330.8	99.89
21	16-Feb-98	1.7	19.9	636.5	99.79	12.23	19.6	513.5	99.83	13.2	468.9	99.84	3.3	334.1	99.89
22	23-Feb-98	2.5	21.8	658.3	99.78	8.78	20.8	534.3	99.82	13.6	482.5	99.84	4.9	339.0	99.89
23	02-Mar-98	3.4	24.7	683.0	99.77	7.31	23.7	558.0	99.81	14.8	497.3	99.83	6.7	345.8	99.89
24	09-Mar-98	3.8	25.4	708.4	99.76	6.36	23.2	581.2	99.81	15.2	512.5	99.83	7.6	353.4	99.88
25	16-Mar-98	5.1	25.6	733.9	99.76	4.89	24.1	605.3	99.80	16.1	528.6	99.82	10.3	363.7	99.88
26	23-Mar-98	4.5	25.8	759.7	99.75	5.30	22.9	628.2	99.79	15.1	543.7	99.82	9.0	372.7	99.88
27	08-Apr-98	4.3	27.1	786.8	99.74	5.72	23.9	652.1	99.78	16.3	560.0	99.81	8.7	381.4	99.87
28	15-Apr-98	4.1	27.5	814.3	99.73	6.80	26.5	678.6	99.77	17.9	577.9	99.81	8.1	389.5	99.87
29	21-Apr-98	2.9	22.5	836.8	99.72	7.17	20.1	698.7	99.77	13.9	591.9	99.80	5.8	395.3	99.87
30	28-Apr-98	4.9	32.8	869.6	99.71	6.55	30.8	729.5	99.76	20.9	612.7	99.80	9.8	405.1	99.87
31	06-May-98	3.3	27.1	896.7	99.70	8.97	28.3	757.7	99.75	19.0	631.8	99.79	6.6	411.7	99.86
32	13-May-98	2.7	21.6	918.3	99.69	8.83	22.5	780.2	99.74	14.9	646.7	99.79	5.3	417.0	99.86
33	20-May-98	2.4	21.4	939.6	99.69	10.82	24.9	805.1	99.73	16.3	663.0	99.78	4.8	421.8	99.86
34	29-May-98	1.6	16.1	955.7	99.68	10.33	15.7	820.8	99.73	10.8	673.8	99.78	3.2	425.0	99.86
35	02-Jun-98	2.2	22.5	978.2	99.68	9.66	20.3	841.1	99.72	13.6	687.4	99.77	4.4	429.3	99.86
36	10-Jun-98	1.8	19.9	998.1	99.67	10.80	19.0	860.2	99.71	13.1	700.5	99.77	3.7	433.0	99.86
37	16-Jun-98	1.6	19.6	1017.7	99.66	12.72	19.5	879.7	99.71	13.6	714.2	99.76	3.2	436.2	99.86
38	22-Jun-98	2.1	21.2	1038.9	99.65	10.81	22.0	901.7	99.70	15.3	729.4	99.76	4.2	440.5	99.85
39	03-Jul-98	1.9	21.9	1060.8	99.65	10.51	18.9	920.6	99.69	13.0	742.5	99.75	3.7	444.2	99.85
40	09-Jul-98	1.4	11.4	1072.2	99.64	11.04	14.5	935.2	99.69	10.4	752.9	99.75	2.7	446.9	99.85
41	16-Jul-98	2.3	24.9	1097.1	99.64	9.66	20.9	956.1	99.68	14.2	767.1	99.75	4.5	451.5	99.85
42	23-Jul-98	1.9	20.3	1117.4	99.63	9.99	18.5	974.6	99.68	12.9	780.1	99.74	3.9	455.3	99.85
43	30-Jul-98	2.1	21.2	1138.6	99.62	9.84	19.5	994.1	99.67	13.3	793.4	99.74	4.1	459.4	99.85
44	07-Aug-98	1.5	19.1	1157.7	99.62	12.84	17.9	1012.0	99.66	12.5	805.9	99.73	2.9	462.4	99.85
45	14-Aug-98	2.7	24.2	1181.8	99.61	8.41	21.7	1033.7	99.66	15.0	820.9	99.73	5.1	467.5	99.84
46	21-Aug-98	1.7	19.0	1200.8	99.60	10.50	17.2	1050.9	99.65	12.6	833.5	99.72	3.4	470.9	99.84
47	02-Sep-98	2.3	18.2	1219.0	99.60	8.13	18.0	1068.9	99.64	11.6	845.1	99.72	4.6	475.5	99.84
48	02-Sep-98	1.9	19.0	1238.0	99.59	8.75	16.3	1085.2	99.64	11.7	856.7	99.72	3.9	479.4	99.84
49	14-Sep-98	2.4	22.6	1260.6	99.58	9.31	21.7	1106.9	99.63	14.5	871.2	99.71	4.6	484.0	99.84
Maximum		29.5	79.8	1260.6	100.0	12.8	43.12	1107	99.99	83.7	871.2	99.97	58.9	484.0	99.98
Minimum		1.4	11.4	79.8	99.6	0.9	12.99	26	99.63	8.1	83.7	99.71	2.7	58.9	99.84
Mean		4.9	25.2	726.4	99.8	7.2	22.14	600	99.80	17.4	526.7	99.83	9.7	345.1	99.89
Median		2.7	21.7	721.2	99.8	7.6	20.22	593	99.80	13.8	520.5	99.83	5.3	358.5	99.88
Mean Last 5 Weeks		2.2	20.6	1220.0	99.6	9.0	18.99	1069	99.64	13.1	845.5	99.72	4.3	475.4	99.84

* if values were reported as less than detection limit, one half the detection limit is shown in bold italics and was used in subsequent calculations

Table of Contents

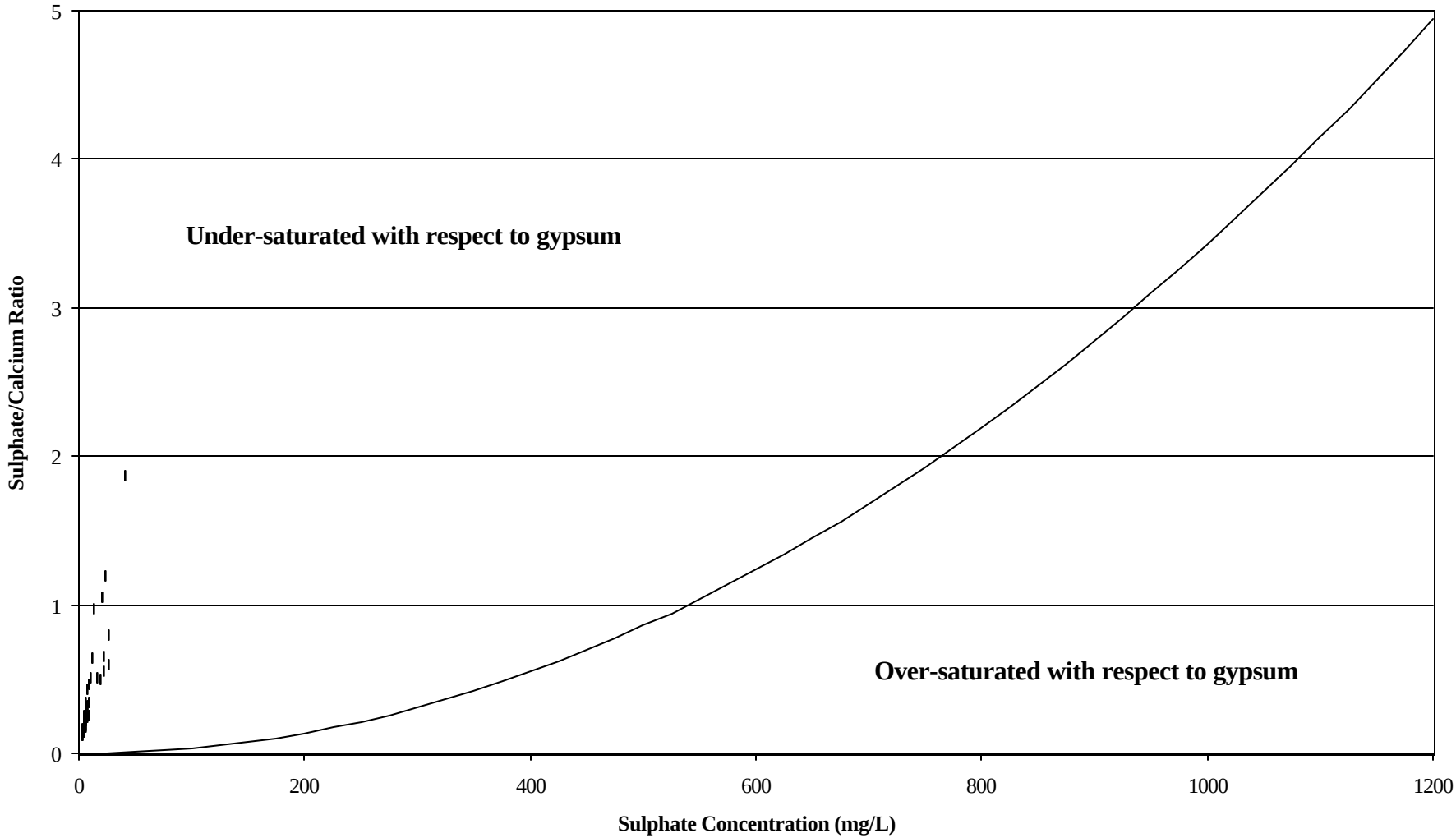
Weekly Humidity Cell Data: Boston Property (B2 Mineralized Zone)

PROJECT: Boston
SAMPLE: 94NOD120 210

Week No.	Date	Comparative Ratios: Carb. NP Cons. /SO_4 Prod.	Carb. NP Cons. /S04 Prod.	Ca/Mg Leach Rate	Ca/Mg Leach Rate	Ca/Mn Leach Rate	Ca/Mn Leach Rate
0	09-Oct-97	0.90	0.90	2.67	2.67	1076	1076
1	14-Oct-97	1.49	1.08	2.31	2.51	616	824
2	17-Oct-97	2.17	1.37	2.49	2.50	543	677
3	24-Oct-97	2.59	1.59	2.63	2.54	461	595
4	29-Oct-97	2.99	1.83	2.36	2.48	516	570
5	27-Oct-97	3.55	2.04	2.39	2.46	417	531
6	14-Nov-97	3.43	2.16	2.45	2.46	371	501
7	22-Nov-97	3.30	2.28	2.24	2.43	475	497
8	17-Nov-97	2.07	2.27	1.52	2.35	806	507
9	24-Nov-97	2.36	2.27	1.37	2.30	642	511
10	01-Dec-97	3.58	2.32	1.37	2.23	533	512
11	08-Dec-97	4.63	2.38	1.58	2.19	530	513
12	15-Dec-97	3.99	2.43	1.73	2.16	407	506
13	22-Dec-97	5.07	2.50	1.52	2.12	593	509
14	29-Dec-97	7.22	2.57	1.98	2.12	465	507
15	16-Jan-98	6.08	2.64	1.63	2.09	516	507
16	19-Jan-98	7.41	2.71	1.76	2.08	432	504
17	22-Jan-98	8.61	2.80	2.06	2.08	387	496
18	26-Jan-98	7.72	2.87	1.85	2.07	401	492
19	02-Feb-98	9.68	2.97	2.14	2.07	423	488
20	09-Feb-98	9.40	3.06	2.51	2.09	359	481
21	16-Feb-98	12.23	3.15	2.50	2.10	420	478
22	23-Feb-98	8.78	3.23	2.42	2.11	443	477
23	02-Mar-98	7.31	3.30	2.20	2.12	451	475
24	09-Mar-98	6.36	3.37	2.57	2.13	369	470
25	16-Mar-98	4.89	3.41	2.74	2.15	454	469
26	23-Mar-98	5.30	3.46	2.71	2.17	349	463
27	08-Apr-98	5.72	3.51	3.02	2.20	349	456
28	15-Apr-98	6.80	3.58	2.89	2.22	390	453
29	21-Apr-98	7.17	3.63	3.21	2.24	337	448
30	28-Apr-98	6.55	3.70	2.86	2.27	395	445
31	06-May-98	8.97	3.78	2.92	2.29	325	439
32	13-May-98	8.83	3.84	2.85	2.30	385	437
33	20-May-98	10.82	3.92	2.74	2.31	366	434
34	29-May-98	10.33	3.97	3.16	2.33	289	429
35	02-Jun-98	9.66	4.03	2.96	2.34	339	426
36	10-Jun-98	10.80	4.08	3.16	2.36	253	419
37	16-Jun-98	12.72	4.15	3.36	2.37	308	415
38	22-Jun-98	10.81	4.21	3.26	2.39	306	411
39	03-Jul-98	10.51	4.26	3.17	2.41	260	406
40	09-Jul-98	11.04	4.30	3.46	2.42	245	401
41	16-Jul-98	9.66	4.35	3.01	2.43	333	399
42	23-Jul-98	9.99	4.40	3.28	2.44	269	395
43	30-Jul-98	9.84	4.45	2.99	2.45	246	390
44	07-Aug-98	12.84	4.50	3.30	2.46	238	385
45	14-Aug-98	8.41	4.55	3.18	2.48	230	380
46	21-Aug-98	10.50	4.59	3.78	2.49	257	376
47	02-Sep-98	8.13	4.62	2.52	2.49	306	375
48	02-Sep-98	8.75	4.66	3.43	2.51	266	372
49	14-Sep-98	9.31	4.70	2.84	2.51	266	369
Maximum		12.84	4.70	3.78	2.67	1075.6	1075.6
Minimum		0.90	0.90	1.37	2.07	230.3	369.1
Mean		7.23	3.25	2.58	2.31	408.3	482.0
Median		7.57	3.39	2.65	2.32	385.7	469.3
Mean Last 5 Weeks		9.02	4.62	3.15	2.50	265.0	374.3

* if values were reported as less than detection limit, one half the detection limit is shown in bold italics and was used in subsequent calculations

B2 Mineralized Zone
Sulphate/Calcium Ratio vs Sulphate Concentration



Weekly Humidity Cell Data: Boston Property (B2 Mineralized Zone)

Boston
94NOD120 210 - B2 Mineralized Zone

Dissolved Metals*:
(including final leach contribution)

Sample mass - start (kg) 0.879
Sample mass - end (kg) 0.8609

Week No.	Date	Aluminum Al (ug/L)	Antimony Sb (ug/L)	Arsenic As (ug/L)	Barium Ba (ug/L)	Beryllium Be (ug/L)	Bismuth Bi (ug/L)	Cadmium Cd (ug/L)	Calcium Ca (ug/L)	Chromium Cr (ug/L)	Cobalt Co (ug/L)	Copper Cu (ug/L)	Iron Fe (ug/L)	Lead Pb (ug/L)	Magnesium Mg (ug/L)	Manganese Mn (ug/L)	Mercury Hg (ug/L)
0	09-Oct-97	272.1	5.71	15.14	1.33	***0.25***	***0.025***	***0.05***	9020	4.57	2.31	2.06	***5.00***	12	3385	8.39	***0.5***
1	14-Oct-97	82.1	4.91	5.14	1.53	***0.25***	***0.025***	***0.05***	8270	***0.25***	1.17	3.66	***5.00***	10	3585	13.44	***0.5***
2	17-Oct-97	85.1	5.16	5.14	5.73	***0.25***	***0.025***	***0.05***	13520	1.07	1.39	31.56	***5.00***	2	5435	24.89	***0.5***
3	24-Oct-97	107.1	4.21	11.14	2.68	***0.25***	***0.025***	***0.05***	13720	2.57	1.97	2.86	***5.00***	***1***	5215	29.79	***0.5***
4	29-Oct-97	168.1	5.51	5.14	4.63	***0.25***	***0.025***	***0.05***	18620	2.57	2.11	9.66	30.61	4	7885	36.09	***0.5***
5	27-Oct-97	46.1	3.86	3.14	2.38	***0.25***	***0.025***	***0.05***	16400	4.07	2.55	5.86	***5.00***	***1***	6875	39.29	***0.5***
6	14-Nov-97	32.1	2.26	4.14	1.13	***0.25***	***0.025***	***0.05***	13070	2.07	2.75	1.36	***5.00***	***1***	5325	35.19	***0.5***
7	22-Nov-97	60.1	3.11	4.14	1.98	***0.25***	***0.025***	***0.05***	16920	0.57	2.23	5.46	10.61	4	7565	35.59	***0.5***
8	17-Nov-97	184.1	3.01	15.14	3.03	***0.25***	***0.025***	***0.05***	8170	***0.25***	0.61	4.06	10.61	***1***	5365	10.14	***0.5***
9	24-Nov-97	156.1	2.81	10.14	0.68	***0.25***	***0.025***	***0.05***	5770	0.57	0.45	0.36	10.61	***1***	4205	8.99	***0.5***
10	01-Dec-97	123.1	3.96	11.14	1.18	***0.25***	***0.025***	***0.05***	7620	2.57	0.55	5.36	20.61	4	5565	14.29	***0.5***
11	08-Dec-97	107.1	3.31	11.14	0.93	***0.25***	***0.025***	***0.05***	7470	1.57	0.67	7.66	***5.00***	8	4725	14.09	***0.5***
12	15-Dec-97	71.1	3.76	9.14	2.93	***0.25***	***0.025***	***0.05***	8620	1.57	1.39	1.56	***5.00***	***1***	4985	21.19	***0.5***
13	22-Dec-97	133.1	2.91	10.14	0.58	***0.25***	***0.025***	***0.05***	7320	0.57	0.53	0.56	***5.00***	***1***	4825	12.34	***0.5***
14	29-Dec-97	98.1	2.31	13.14	0.58	***0.25***	***0.025***	***0.05***	8720	***0.25***	0.83	4.96	***5.00***	4	4405	18.74	***0.5***
15	16-Jan-98	96.1	2.51	8.14	0.93	***0.25***	***0.025***	***0.05***	7420	0.57	0.69	2.86	***5.00***	***1***	4545	14.39	***0.5***
16	19-Jan-98	80.1	2.46	8.14	0.88	***0.25***	***0.025***	***0.05***	8620	1.57	0.81	7.16	***5.00***	2	4905	19.94	***0.5***
17	22-Jan-98	100.1	3.11	10.14	0.78	***0.25***	***0.025***	***0.05***	11170	**0.25**	1.27	4.16	***5.00***	2	5415	28.89	***0.5***
18	26-Jan-98	107.1	2.21	11.14	0.93	***0.25***	***0.025***	***0.05***	7570	0.57	0.77	2.66	***5.00***	26	4085	18.89	***0.5***
19	02-Feb-98	112.1	2.76	15.14	0.83	***0.25***	***0.025***	***0.05***	11670	**0.25**	1.63	7.16	***5.00***	***1***	5455	27.59	***0.5***
20	09-Feb-98	97.1	2.26	12.14	1.43	***0.25***	***0.025***	***0.05***	10520	1.57	1.33	1.76	***5.00***	***1***	4185	29.29	***0.5***
21	16-Feb-98	92.1	1.91	9.14	5.33	***0.25***	***0.025***	***0.05***	10120	1.57	0.87	2.66	***5.00***	***1***	4045	24.09	4
22	23-Feb-98	108.1	1.41	9.14	3.03	***0.25***	***0.025***	***0.05***	9470	***0.25***	0.67	1.86	***5.00***	***1***	3915	21.39	***0.5***
23	02-Mar-98	58.1	1.86	12.14	1.08	***0.25***	***0.025***	***0.05***	9920	***0.25***	0.93	9.66	***5.00***	***1***	4505	21.99	***0.5***
24	09-Mar-98	86.1	1.61	16.14	1.33	***0.25***	***0.025***	***0.05***	9970	***0.25***	0.93	2.56	30.61	***1***	3875	26.99	***0.5***
25	16-Mar-98	31.1	1.71	26.14	4.03	***0.25***	***0.025***	0.10	11520	1.57	0.85	2.26	***5.00***	***1***	4205	25.39	***0.5***
26	23-Mar-98	27.1	1.31	27.14	4.28	***0.25***	***0.025***	0.10	9920	1.07	1.15	2.56	20.61	***1***	3665	28.39	***0.5***
27	08-Apr-98	56.1	1.51	29.14	2.28	***0.25***	***0.025***	***0.05***	10870	2.07	1.55	7.06	40.61	***1***	3595	31.19	***0.5***
28	15-Apr-98	59.1	1.66	32.14	1.03	***0.25***	***0.025***	0.10	12370	2.07	2.39	3.46	30.61	***1***	4275	31.69	***0.5***
29	21-Apr-98	40.1	1.61	34.14	0.63	***0.25***	***0.025***	***0.05***	10870	***0.25***	2.17	6.46	10.61	***1***	3385	32.29	***0.5***
30	28-Apr-98	51.1	2.01	35.14	4.83	***0.25***	***0.025***	0.10	14020	2.07	2.63	3.46	10.61	***1***	4905	35.49	***0.5***
31	06-May-98	35.1	1.21	35.14	2.13	***0.25***	***0.025***	***0.05***	12470	2.57	2.11	15.96	***5.00***	***1***	4265	38.39	***0.5***
32	13-May-98	93.1	1.16	15.14	0.83	***0.25***	***0.025***	***0.05***	9920	2.07	1.61	20.96	***5.00***	***1***	3485	25.79	***0.5***
33	20-May-98	60.1	1.16	12.14	0.88	***0.25***	***0.025***	***0.05***	11170	2.07	1.79	5.66	10.61	***1***	4075	30.49	***0.5***
34	29-May-98	80.1	0.81	10.14	1.43	***0.25***	***0.025***	***0.05***	7420	***0.25***	1.65	7.36	***5.00***	***1***	2345	25.69	***0.5***
35	02-Jun-98	87.1	1.06	10.14	0.98	***0.25***	***0.025***	***0.05***	9020	0.57	1.89	9.36	***5.00***	***1***	3045	26.59	***0.5***
36	10-Jun-98	77.1	0.96	9.14	0.58	***0.25***	***0.025***	***0.05***	9170	0.57	2.19	3.56	30.61	***1***	2905	36.19	***0.5***
37	16-Jun-98	61.1	0.76	7.14	0.78	***0.25***	***0.025***	***0.05***	9320	***0.25***	1.77	6.46	20.61	***1***	2775	30.29	***0.5***
38	22-Jun-98	76.1	1.06	8.14	4.13	***0.25***	***0.025***	***0.05***	10720	2.07	1.97	16.36	30.61	***1***	3285	34.99	***0.5***
39	03-Jul-98	81.1	0.91	6.14	0.93	***0.25***	***0.025***	***0.05***	9220	1.57	2.03	6.26	30.61	2	2905	35.49	***0.5***
40	09-Jul-98	97.1	0.66	5.14	0.48	***0.25***	***0.025***	***0.05***	7870	2.07	1.79	7.26	30.61	***1***	2275	32.19	***0.5***
41	16-Jul-98	97.1	0.96	6.14	0.58	***0.25***	***0.025***	***0.05***	9320	0.57	1.65	3.56	10.61	***1***	3095	27.99	***0.5***
42	23-Jul-98	86.1	0.81	8.14	0.58	***0.25***	***0.025***	***0.05***	9120	2.07	1.63	12.16	10.61	***1***	2785	33.89	***0.5***
43	30-Jul-98	84.1	0.91	6.14	0.73	***0.25***	***0.025***	***0.05***	9720	1.57	2.29	9.86	30.61	***1***	3255	39.59	***0.5***
44	07-Aug-98	82.1	0.71	7.14	0.68	***0.25***	***0.025***	***0.05***	8670	0.57	1.89	5.46	30.61	8	2625	36.49	***0.5***
45	14-Aug-98	66.1	0.96	6.14	2.33	***0.25***	***0.025***	***0.05***	10270	1.57	2.51	10.46	30.61	2	3225	44.59	***0.5***
46	21-Aug-98	84.1	0.71	6.14	0.38	***0.25***	***0.025***	***0.05***	8870	0.57	1.75	6.86	***5.00***	***1***	2345	34.49	***0.5***
47	02-Sep-98	100.1	0.86	6.14	0.53	***0.25***	***0.025***	***0.05***	8520	1.07	1.69	9.46	30.61	***1***	3375	27.89	***0.5***
48	02-Sep-98	112.1	0.86	6.14	0.63	***0.25***	***0.025***	***0.05***	8820	2.07	1.93	14.96	20.61	***1***	2575	33.19	***0.5***
49	14-Sep-98	68.1	0.86	5.14	0.58	***0.25***	***0.025***	***0.05***	9970	1.57	2.17	13.86	***5.00***	***1***	3515	37.49	***0.5***
Maximum		272.08	5.71	35.14	5.73	0.25	0.025	0.100	18620	4.571	2.75	31.56	40.61	26.0	7885	44.59	4.00
Minimum		27.08	0.66	3.14	0.38	0.25	0.025	0.050	5770	0.250	0.45	0.36	5.00	1.0	2275	8.39	0.50
Mean		89.08	2.12	12.08	1.71	0.25	0.025	0.054	10177	1.341	1.57	6.81	13.49	2.5	4129	27.44	0.57
Median		84.58	1.68	9.64	1.01	0.25	0.025	0.050	9595	1.571	1.65	5.56	5.00	1.0	4060	28.64	0.50
Mean Last 5 Weeks		86.08	0.85	5.94	0.89	0.25	0.025	0.050	9290	1.371	2.01	11.12	18.37	1.2	3007	35.53	0.50

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

Weekly Humidity Cell Data: Boston Property (B2 Mineralized Zone)

Boston 94NOD120 210 - B2 Mineralized Zone Week No.	Date	Molybdenum Mo (ug/L)	Nickel Ni (ug/L)	Phosphorus P (ug/L)	Potassium K (ug/L)	Selenium Se (ug/L)	Silver Ag (ug/L)	Sodium Na (ug/L)	Strontium Sr (ug/L)	Tin Sn (ug/L)	Titanium Ti (ug/L)	Thallium Tl (ug/L)	Uranium U (ug/L)	Vanadium V (ug/L)	Zinc Zn (ug/L)	Leachate Recovered (mL)
0	09-Oct-97	0.80	4.21	***50***	6114	2.0	***0.025***	41005	49.43	***0.25***	***0.5***	***0.025***	0.10	1.0	***0.25***	615
1	14-Oct-97	0.60	2.01	***50***	4314	1.0	***0.025***	19455	43.53	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	2.51	465
2	17-Oct-97	0.60	2.41	***50***	5214	2.0	***0.025***	14805	61.43	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	3.51	500
3	24-Oct-97	0.50	5.61	***50***	4464	1.0	***0.025***	8655	62.93	***0.25***	***0.5***	***0.025***	0.05	***0.5***	2.51	490
4	29-Oct-97	0.60	2.41	***50***	6114	2.0	***0.025***	6655	84.23	***0.25***	***0.5***	***0.025***	0.05	***0.5***	6.51	480
5	27-Oct-97	***0.05***	1.81	***50***	3714	1.0	***0.025***	3105	65.13	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	2.51	490
6	14-Nov-97	***0.05***	2.61	***50***	2414	***0.5***	***0.025***	1555	47.83	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	2.51	500
7	22-Nov-97	0.10	1.41	***50***	2564	3.0	***0.025***	1405	56.53	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	***0.25***	490
8	17-Nov-97	***0.05***	0.41	***50***	2314	1.0	***0.025***	1405	32.73	0.5	***0.5***	***0.025***	***0.025***	***0.5***	2.51	370
9	24-Nov-97	***0.05***	0.21	***50***	1964	***0.5***	***0.025***	1255	23.23	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	***0.25***	360
10	01-Dec-97	0.10	0.41	***50***	2314	1.0	***0.025***	1555	30.73	1.0	***0.5***	***0.025***	***0.025***	***0.5***	4.01	380
11	08-Dec-97	0.10	0.81	***50***	1914	***0.5***	***0.025***	1155	24.53	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	9.01	370
12	15-Dec-97	***0.05***	0.21	***50***	1714	***0.5***	***0.025***	1005	33.73	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	0.51	390
13	22-Dec-97	***0.05***	0.81	***50***	1664	1.0	***0.025***	805	22.53	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	1.51	400
14	29-Dec-97	***0.05***	3.81	***50***	1414	***0.5***	***0.025***	805	23.93	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	***0.25***	380
15	16-Jan-98	***0.05***	0.41	***50***	1414	***0.5***	***0.025***	855	22.13	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	3.51	390
16	19-Jan-98	***0.05***	0.61	***50***	1464	***0.5***	***0.025***	905	25.03	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	***0.25***	350
17	22-Jan-98	0.10	0.61	***50***	1364	***0.5***	***0.025***	1105	31.33	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	***0.25***	390
18	26-Jan-98	***0.05***	4.41	***50***	914	***0.5***	***0.025***	755	21.23	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	***0.25***	405
19	02-Feb-98	0.10	7.61	***50***	1264	1	***0.025***	1305	27.63	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	***0.25***	400
20	09-Feb-98	0.10	7.21	***50***	1164	***0.5***	***0.025***	1105	27.53	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	0.51	390
21	16-Feb-98	***0.05***	0.81	***50***	814	***0.5***	0.15	955	24.73	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	1.01	410
22	23-Feb-98	***0.05***	0.61	***50***	614	***0.5***	***0.025***	705	21.33	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	2.01	460
23	02-Mar-98	0.10	0.21	***50***	664	***0.5***	***0.025***	655	23.33	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	1.51	480
24	09-Mar-98	***0.05***	0.41	***50***	564	***0.5***	***0.025***	505	24.23	1.0	***0.5***	***0.025***	***0.025***	***0.5***	1.51	500
25	16-Mar-98	0.20	0.21	***50***	664	***0.5***	***0.025***	505	26.63	1.0	***0.5***	***0.025***	***0.025***	***0.5***	4.01	460
26	23-Mar-98	0.10	1.01	***50***	464	***0.5***	***0.025***	405	22.53	0.5	***0.5***	***0.025***	***0.025***	***0.5***	3.01	505
27	08-Apr-98	0.10	1.21	***50***	514	***0.5***	***0.025***	405	22.23	***0.25***	***0.5***	***0.025***	***0.025***	1.0	2.51	500
28	15-Apr-98	0.10	1.21	***50***	564	***0.5***	***0.025***	555	24.73	2.5	***0.5***	***0.025***	***0.025***	1.0	3.01	480
29	21-Apr-98	***0.05***	1.41	***50***	464	***0.5***	***0.025***	355	21.03	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	1.51	430
30	28-Apr-98	0.30	1.21	***50***	714	***0.5***	***0.025***	705	30.83	0.5	***0.5***	***0.025***	***0.025***	1.0	5.01	490
31	06-May-98	0.10	1.01	***50***	514	***0.5***	***0.025***	455	21.63	***0.25***	***0.5***	***0.025***	***0.025***	1.0	3.01	510
32	13-May-98	0.10	0.61	***50***	364	***0.5***	***0.025***	355	16.78	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	2.01	505
33	20-May-98	0.20	0.61	***50***	364	1	***0.025***	405	17.48	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	1.01	490
34	29-May-98	0.20	1.01	***50***	214	***0.5***	***0.025***	255	12.98	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	1.51	490
35	02-Jun-98	0.10	0.81	***50***	214	***0.5***	***0.025***	305	15.43	0.5	***0.5***	***0.025***	***0.025***	***0.5***	0.26	510
36	10-Jun-98	0.20	0.81	***50***	314	***0.5***	***0.025***	305	16.08	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	2.51	480
37	16-Jun-98	0.20	0.61	***50***	314	***0.5***	***0.025***	255	14.68	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	1.51	495
38	22-Jun-98	***0.05***	1.01	***50***	314	***0.5***	***0.025***	355	16.88	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	2.51	480
39	03-Jul-98	0.10	1.21	***50***	264	***0.5***	***0.025***	355	14.78	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	1.01	475
40	09-Jul-98	***0.05***	1.21	***50***	264	***0.5***	***0.025***	405	11.83	***0.25***	***0.5***	***0.025***	0.050	***0.5***	1.01	440
41	16-Jul-98	0.10	0.81	***50***	264	***0.5***	***0.025***	405	14.73	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	0.51	510
42	23-Jul-98	0.50	3.41	***50***	314	***0.5***	***0.025***	355	12.53	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	***0.25***	475
43	30-Jul-98	0.10	2.21	***50***	314	***0.5***	***0.025***	505	14.98	***0.25***	***0.5***	***0.025***	0.050	***0.5***	2.51	455
44	07-Aug-98	0.10	1.41	***50***	264	***0.5***	***0.025***	305	13.88	***0.25***	***0.5***	***0.025***	0.050	***0.5***	2.51	485
45	14-Aug-98	0.10	1.21	***50***	314	***0.5***	***0.025***	405	15.78	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	***0.25***	490
46	21-Aug-98	***0.05***	1.21	***50***	264	***0.5***	***0.025***	355	12.78	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	0.51	475
47	02-Sep-98	0.60	1.21	***50***	264	***0.5***	***0.025***	455	11.83	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	***0.25***	450
48	02-Sep-98	0.10	1.01	***50***	314	***0.5***	***0.025***	405	12.73	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	1.51	440
49	14-Sep-98	0.10	1.21	***50***	264	***0.5***	***0.025***	455	15.03	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	1.51	485
Maximum		0.80	7.61	50.0	6114	3.00	0.150	41005	84.229	2.50	0.50	0.025	0.100	1.00	9.01	615.0
Minimum		0.05	0.21	50.0	214	0.50	0.025	255	11.829	0.25	0.50	0.025	0.025	0.50	0.25	350.0
Mean		0.17	1.62	50.0	1351	0.72	0.028	2470	26.834	0.36	0.50	0.025	0.029	0.55	1.90	457.2
Median		0.10	1.11	50.0	639	0.50	0.025	605	22.529	0.25	0.50	0.025	0.025	0.50	1.51	477.5
Mean Last 5 Weeks		0.19	1.17	50.0	284	0.50	0.025	415	13.629	0.25	0.50	0.025	0.025	0.50	0.81	468.0

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

Table of Contents

Weekly Humidity Cell Data: Boston Property (B2 Mineralized Zone)

Boston 94NOD120 210 - B2 Mineralized Zone		**Metal Loading/Leaching Rates**														
Week No.	Date	Aluminum Al (mg/kg/wk)	Antimony Sb (mg/kg/wk)	Arsenic As (mg/kg/wk)	Barium Ba (mg/kg/wk)	Beryllium Be (mg/kg/wk)	Bismuth Bi (mg/kg/wk)	Cadmium Cd (mg/kg/wk)	Calcium Ca (mg/kg/wk)	Chromium Cr (mg/kg/wk)	Cobalt Co (mg/kg/wk)	Copper Cu (mg/kg/wk)	Iron Fe (mg/kg/wk)	Lead Pb (mg/kg/wk)	Magnesium Mg (mg/kg/wk)	Manganese Mn (mg/kg/wk)
0	09-Oct-97	0.19	0.0040	0.0106	0.0009	0.00017	0.00002	0.00003	6.311	0.0032	0.0016	0.0014	0.0035	0.0084	2.368	0.0059
1	14-Oct-97	0.04	0.0026	0.0027	0.0008	0.00013	0.00001	0.00003	4.375	0.0001	0.0006	0.0019	0.0026	0.0053	1.896	0.0071
2	17-Oct-97	0.05	0.0029	0.0029	0.0033	0.00014	0.00001	0.00003	7.691	0.0006	0.0008	0.0180	0.0028	0.0011	3.091	0.0142
3	24-Oct-97	0.06	0.0023	0.0062	0.0015	0.00014	0.00001	0.00003	7.648	0.0014	0.0011	0.0016	0.0028	0.0006	2.907	0.0166
4	29-Oct-97	0.09	0.0030	0.0028	0.0025	0.00014	0.00001	0.00003	10.168	0.0014	0.0012	0.0053	0.0167	0.0022	4.306	0.0197
5	27-Oct-97	0.03	0.0021	0.0018	0.0013	0.00014	0.00001	0.00003	9.142	0.0023	0.0014	0.0033	0.0028	0.0006	3.832	0.0219
6	14-Nov-97	0.02	0.0013	0.0024	0.0006	0.00014	0.00001	0.00003	7.435	0.0012	0.0016	0.0008	0.0028	0.0006	3.029	0.0200
7	22-Nov-97	0.03	0.0017	0.0023	0.0011	0.00014	0.00001	0.00003	9.432	0.0003	0.0012	0.0030	0.0059	0.0022	4.217	0.0198
8	17-Nov-97	0.08	0.0013	0.0064	0.0013	0.00011	0.00001	0.00002	3.439	0.0001	0.0003	0.0017	0.0045	0.0004	2.258	0.0043
9	24-Nov-97	0.06	0.0011	0.0042	0.0003	0.00010	0.00001	0.00002	2.363	0.0002	0.0002	0.0001	0.0043	0.0004	1.722	0.0037
10	01-Dec-97	0.05	0.0017	0.0048	0.0005	0.00011	0.00001	0.00002	3.294	0.0011	0.0002	0.0023	0.0089	0.0017	2.406	0.0062
11	08-Dec-97	0.05	0.0014	0.0047	0.0004	0.00011	0.00001	0.00002	3.145	0.0007	0.0003	0.0032	0.0021	0.0034	1.989	0.0059
12	15-Dec-97	0.03	0.0017	0.0041	0.0013	0.00011	0.00001	0.00002	3.825	0.0007	0.0006	0.0007	0.0022	0.0004	2.212	0.0094
13	22-Dec-97	0.06	0.0013	0.0046	0.0003	0.00011	0.00001	0.00002	3.331	0.0003	0.0002	0.0003	0.0023	0.0005	2.196	0.0056
14	29-Dec-97	0.04	0.0010	0.0057	0.0003	0.00011	0.00001	0.00002	3.770	0.0001	0.0004	0.0021	0.0022	0.0017	1.904	0.0081
15	16-Jan-98	0.04	0.0011	0.0036	0.0004	0.00011	0.00001	0.00002	3.292	0.0003	0.0003	0.0013	0.0022	0.0004	2.016	0.0064
16	19-Jan-98	0.03	0.0010	0.0032	0.0004	0.00010	0.00001	0.00002	3.432	0.0006	0.0003	0.0029	0.0020	0.0008	1.953	0.0079
17	22-Jan-98	0.04	0.0014	0.0045	0.0003	0.00011	0.00001	0.00002	4.956	0.0001	0.0006	0.0018	0.0022	0.0009	2.402	0.0128
18	26-Jan-98	0.05	0.0010	0.0051	0.0004	0.00012	0.00001	0.00002	3.488	0.0003	0.0004	0.0012	0.0023	0.0120	1.882	0.0087
19	02-Feb-98	0.05	0.0013	0.0069	0.0004	0.00011	0.00001	0.00002	5.311	0.0001	0.0007	0.0033	0.0023	0.0005	2.482	0.0126
20	09-Feb-98	0.04	0.0010	0.0054	0.0006	0.00011	0.00001	0.00002	4.668	0.0007	0.0006	0.0008	0.0022	0.0004	1.857	0.0130
21	16-Feb-98	0.04	0.0009	0.0043	0.0025	0.00012	0.00001	0.00002	4.721	0.0007	0.0004	0.0012	0.0023	0.0005	1.887	0.0112
22	23-Feb-98	0.06	0.0007	0.0048	0.0016	0.00013	0.00001	0.00003	4.956	0.0001	0.0003	0.0010	0.0026	0.0005	2.049	0.0112
23	02-Mar-98	0.03	0.0010	0.0066	0.0006	0.00014	0.00001	0.00003	5.417	0.0001	0.0005	0.0053	0.0027	0.0005	2.460	0.0120
24	09-Mar-98	0.05	0.0009	0.0092	0.0008	0.00014	0.00001	0.00003	5.671	0.0001	0.0005	0.0015	0.0174	0.0006	2.204	0.0154
25	16-Mar-98	0.02	0.0009	0.0137	0.0021	0.00013	0.00001	0.00005	6.029	0.0008	0.0004	0.0012	0.0026	0.0005	2.200	0.0133
26	23-Mar-98	0.02	0.0008	0.0156	0.0025	0.00014	0.00001	0.00006	5.699	0.0006	0.0007	0.0015	0.0118	0.0006	2.105	0.0163
27	08-Apr-98	0.03	0.0009	0.0166	0.0013	0.00014	0.00001	0.00003	6.183	0.0012	0.0009	0.0040	0.0231	0.0006	2.045	0.0177
28	15-Apr-98	0.03	0.0009	0.0176	0.0006	0.00014	0.00001	0.00005	6.755	0.0011	0.0013	0.0019	0.0167	0.0005	2.334	0.0173
29	21-Apr-98	0.02	0.0008	0.0167	0.0003	0.00012	0.00001	0.00002	5.318	0.0001	0.0011	0.0032	0.0052	0.0005	1.656	0.0158
30	28-Apr-98	0.03	0.0011	0.0196	0.0027	0.00014	0.00001	0.00006	7.816	0.0012	0.0015	0.0019	0.0059	0.0006	2.734	0.0198
31	06-May-98	0.02	0.0007	0.0204	0.0012	0.00015	0.00001	0.00003	7.235	0.0015	0.0012	0.0093	0.0029	0.0006	2.474	0.0223
32	13-May-98	0.05	0.0007	0.0087	0.0005	0.00014	0.00001	0.00003	5.699	0.0012	0.0009	0.0120	0.0029	0.0006	2.002	0.0148
33	20-May-98	0.03	0.0006	0.0068	0.0005	0.00014	0.00001	0.00003	6.227	0.0012	0.0010	0.0032	0.0059	0.0006	2.271	0.0170
34	29-May-98	0.04	0.0004	0.0057	0.0008	0.00014	0.00001	0.00003	4.137	0.0001	0.0009	0.0041	0.0028	0.0006	1.307	0.0143
35	02-Jun-98	0.05	0.0006	0.0059	0.0006	0.00015	0.00001	0.00003	5.234	0.0003	0.0011	0.0054	0.0029	0.0006	1.767	0.0154
36	10-Jun-98	0.04	0.0005	0.0050	0.0003	0.00014	0.00001	0.00003	5.008	0.0003	0.0012	0.0019	0.0167	0.0005	1.586	0.0198
37	16-Jun-98	0.03	0.0004	0.0040	0.0004	0.00014	0.00001	0.00003	5.249	0.0001	0.0010	0.0036	0.0116	0.0006	1.563	0.0171
38	22-Jun-98	0.04	0.0006	0.0044	0.0023	0.00014	0.00001	0.00003	5.854	0.0011	0.0011	0.0089	0.0167	0.0005	1.794	0.0191
39	03-Jul-98	0.04	0.0005	0.0033	0.0005	0.00014	0.00001	0.00003	4.983	0.0008	0.0011	0.0034	0.0165	0.0011	1.570	0.0192
40	09-Jul-98	0.05	0.0003	0.0026	0.0002	0.00013	0.00001	0.00003	3.940	0.0010	0.0009	0.0036	0.0153	0.0005	1.139	0.0161
41	16-Jul-98	0.06	0.0006	0.0036	0.0003	0.00015	0.00001	0.00003	5.408	0.0003	0.0010	0.0021	0.0062	0.0006	1.796	0.0162
42	23-Jul-98	0.05	0.0004	0.0044	0.0003	0.00014	0.00001	0.00003	4.929	0.0011	0.0009	0.0066	0.0057	0.0005	1.505	0.0183
43	30-Jul-98	0.04	0.0005	0.0032	0.0004	0.00013	0.00001	0.00003	5.032	0.0008	0.0012	0.0051	0.0158	0.0005	1.685	0.0205
44	07-Aug-98	0.05	0.0004	0.0039	0.0004	0.00014	0.00001	0.00003	4.784	0.0003	0.0010	0.0030	0.0169	0.0044	1.448	0.0201
45	14-Aug-98	0.04	0.0005	0.0034	0.0013	0.00014	0.00001	0.00003	5.725	0.0009	0.0014	0.0058	0.0171	0.0011	1.798	0.0249
46	21-Aug-98	0.05	0.0004	0.0033	0.0002	0.00014	0.00001	0.00003	4.793	0.0003	0.0009	0.0037	0.0027	0.0005	1.267	0.0186
47	02-Sep-98	0.05	0.0004	0.0031	0.0003	0.00013	0.00001	0.00003	4.362	0.0005	0.0009	0.0048	0.0157	0.0005	1.728	0.0143
48	02-Sep-98	0.06	0.0004	0.0031	0.0003	0.00013	0.00001	0.00003	4.415	0.0010	0.0010	0.0075	0.0103	0.0005	1.289	0.0166
49	14-Sep-98	0.04	0.0005	0.0028	0.0003	0.00014	0.00001	0.00003	5.501	0.0009	0.0012	0.0076	0.0028	0.0006	1.939	0.0207
Maximum		0.1904	0.0040	0.0204	0.0033	0.00017	0.00002	0.00006	10.168	0.0032	0.0016	0.0180	0.0231	0.0120	4.306	0.0249
Minimum		0.0156	0.0003	0.0018	0.0002	0.00010	0.00001	0.00002	2.363	0.0001	0.0002	0.0001	0.0020	0.0004	1.139	0.0037
Mean		0.0461	0.0011	0.0063	0.0009	0.00013	0.00001	0.00003	5.352	0.0007	0.0008	0.0036	0.0072	0.0013	2.131	0.0145
Median		0.0437	0.0009	0.0046	0.0005	0.00014	0.00001	0.00003	5.133	0.0006	0.0009	0.0030	0.0032	0.0006	1.995	0.0156
Mean Last 5 Weeks		0.0454	0.0005	0.0032	0.0005	0.00013	0.00001	0.00003	4.959	0.0007	0.0011	0.0059	0.0097	0.0006	1.604	0.0190

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

Weekly Humidity Cell Data: Boston Property (B2 Mineralized Zone)

Boston
94NOD120 210 - B2 Mineralized Zone

Week No.	Date	Mercury Hg (mg/kg/wk)	Molybdenum Mo (mg/kg/wk)	Nickel Ni (mg/kg/wk)	Phosphorus P (mg/kg/wk)	Potassium K (mg/kg/wk)	Selenium Se (mg/kg/wk)	Silver Ag (mg/kg/wk)	Sodium Na (mg/kg/wk)	Strontium Sr (mg/kg/wk)	Tin Sn (mg/kg/wk)	Titanium Ti (mg/kg/wk)	Thallium Tl (mg/kg/wk)	Uranium U (mg/kg/wk)	Vanadium V (mg/kg/wk)	Zinc Zn (mg/kg/wk)
0	09-Oct-97	0.00035	0.00056	0.0029	0.0350	4.278	0.0014	0.00002	28.690	0.0346	0.00017	0.00035	0.00002	0.00007	0.00070	0.0002
1	14-Oct-97	0.00026	0.00032	0.0011	0.0265	2.282	0.0005	0.00001	10.292	0.0230	0.00013	0.00026	0.00001	0.00001	0.00026	0.0013
2	17-Oct-97	0.00028	0.00034	0.0014	0.0284	2.966	0.0011	0.00001	8.422	0.0349	0.00014	0.00028	0.00001	0.00001	0.00028	0.0020
3	24-Oct-97	0.00028	0.00028	0.0031	0.0279	2.489	0.0006	0.00001	4.825	0.0351	0.00014	0.00028	0.00001	0.00003	0.00028	0.0014
4	29-Oct-97	0.00027	0.00033	0.0013	0.0273	3.339	0.0011	0.00001	3.634	0.0460	0.00014	0.00027	0.00001	0.00003	0.00027	0.0036
5	27-Oct-97	0.00028	0.00003	0.0010	0.0279	2.071	0.0006	0.00001	1.731	0.0363	0.00014	0.00028	0.00001	0.00001	0.00028	0.0014
6	14-Nov-97	0.00028	0.00003	0.0015	0.0284	1.373	0.0003	0.00001	0.885	0.0272	0.00014	0.00028	0.00001	0.00001	0.00028	0.0014
7	22-Nov-97	0.00028	0.00006	0.0008	0.0279	1.429	0.0017	0.00001	0.783	0.0315	0.00014	0.00028	0.00001	0.00001	0.00028	0.0001
8	17-Nov-97	0.00021	0.00002	0.0002	0.0210	0.974	0.0004	0.00001	0.591	0.0138	0.00021	0.00021	0.00001	0.00001	0.00021	0.0011
9	24-Nov-97	0.00020	0.00002	0.0001	0.0205	0.804	0.0002	0.00001	0.514	0.0095	0.00010	0.00020	0.00001	0.00001	0.00020	0.0001
10	01-Dec-97	0.00022	0.00004	0.0002	0.0216	1.000	0.0004	0.00001	0.672	0.0133	0.00043	0.00022	0.00001	0.00001	0.00022	0.0017
11	08-Dec-97	0.00021	0.00004	0.0003	0.0210	0.806	0.0002	0.00001	0.486	0.0103	0.00011	0.00021	0.00001	0.00001	0.00021	0.0038
12	15-Dec-97	0.00022	0.00002	0.0001	0.0222	0.761	0.0002	0.00001	0.446	0.0150	0.00011	0.00022	0.00001	0.00001	0.00022	0.0002
13	22-Dec-97	0.00023	0.00002	0.0004	0.0228	0.757	0.0005	0.00001	0.366	0.0103	0.00011	0.00023	0.00001	0.00001	0.00023	0.0007
14	29-Dec-97	0.00022	0.00002	0.0016	0.0216	0.611	0.0002	0.00001	0.348	0.0103	0.00011	0.00022	0.00001	0.00001	0.00022	0.0001
15	16-Jan-98	0.00022	0.00002	0.0002	0.0222	0.627	0.0002	0.00001	0.379	0.0098	0.00011	0.00022	0.00001	0.00001	0.00022	0.0016
16	19-Jan-98	0.00020	0.00002	0.0002	0.0199	0.583	0.0002	0.00001	0.360	0.0100	0.00010	0.00020	0.00001	0.00001	0.00020	0.0001
17	22-Jan-98	0.00022	0.00005	0.0003	0.0222	0.605	0.0002	0.00001	0.490	0.0139	0.00011	0.00022	0.00001	0.00001	0.00022	0.0001
18	26-Jan-98	0.00023	0.00002	0.0020	0.0230	0.421	0.0002	0.00001	0.348	0.0098	0.00012	0.00023	0.00001	0.00001	0.00023	0.0001
19	02-Feb-98	0.00023	0.00005	0.0035	0.0228	0.575	0.0005	0.00001	0.594	0.0126	0.00011	0.00023	0.00001	0.00001	0.00023	0.0001
20	09-Feb-98	0.00022	0.00005	0.0032	0.0222	0.517	0.0002	0.00001	0.490	0.0122	0.00011	0.00022	0.00001	0.00001	0.00022	0.0002
21	16-Feb-98	0.00187	0.00002	0.0004	0.0233	0.380	0.0002	0.00007	0.445	0.0115	0.00012	0.00023	0.00001	0.00001	0.00023	0.0005
22	23-Feb-98	0.00026	0.00003	0.0003	0.0262	0.321	0.0003	0.00001	0.369	0.0112	0.00013	0.00026	0.00001	0.00001	0.00026	0.0011
23	02-Mar-98	0.00027	0.00006	0.0001	0.0273	0.363	0.0003	0.00001	0.358	0.0127	0.00014	0.00027	0.00001	0.00001	0.00027	0.0008
24	09-Mar-98	0.00028	0.00003	0.0002	0.0284	0.321	0.0003	0.00001	0.287	0.0138	0.00057	0.00028	0.00001	0.00001	0.00028	0.0009
25	16-Mar-98	0.00026	0.00011	0.0001	0.0262	0.348	0.0003	0.00001	0.264	0.0139	0.00052	0.00026	0.00001	0.00001	0.00026	0.0021
26	23-Mar-98	0.00029	0.00006	0.0006	0.0287	0.267	0.0003	0.00001	0.233	0.0129	0.00029	0.00029	0.00001	0.00001	0.00029	0.0017
27	08-Apr-98	0.00028	0.00006	0.0007	0.0284	0.293	0.0003	0.00001	0.230	0.0126	0.00014	0.00028	0.00001	0.00001	0.00057	0.0014
28	15-Apr-98	0.00027	0.00006	0.0007	0.0273	0.308	0.0003	0.00001	0.303	0.0135	0.00137	0.00027	0.00001	0.00001	0.00055	0.0016
29	21-Apr-98	0.00024	0.00002	0.0007	0.0245	0.227	0.0002	0.00001	0.174	0.0103	0.00012	0.00024	0.00001	0.00001	0.00024	0.0007
30	28-Apr-98	0.00028	0.00017	0.0007	0.0279	0.398	0.0003	0.00001	0.393	0.0172	0.00028	0.00028	0.00001	0.00001	0.00056	0.0028
31	06-May-98	0.00029	0.00006	0.0006	0.0290	0.298	0.0003	0.00001	0.264	0.0125	0.00015	0.00029	0.00001	0.00001	0.00058	0.0017
32	13-May-98	0.00029	0.00006	0.0003	0.0287	0.209	0.0003	0.00001	0.204	0.0096	0.00014	0.00029	0.00001	0.00001	0.00029	0.0012
33	20-May-98	0.00028	0.00011	0.0003	0.0279	0.203	0.0006	0.00001	0.226	0.0097	0.00014	0.00028	0.00001	0.00001	0.00028	0.0006
34	29-May-98	0.00028	0.00011	0.0006	0.0279	0.119	0.0003	0.00001	0.142	0.0072	0.00014	0.00028	0.00001	0.00001	0.00028	0.0008
35	02-Jun-98	0.00029	0.00006	0.0005	0.0290	0.124	0.0003	0.00001	0.177	0.0090	0.00029	0.00029	0.00001	0.00001	0.00029	0.0002
36	10-Jun-98	0.00027	0.00011	0.0004	0.0273	0.172	0.0003	0.00001	0.167	0.0088	0.00014	0.00027	0.00001	0.00001	0.00027	0.0014
37	16-Jun-98	0.00028	0.00011	0.0003	0.0282	0.177	0.0003	0.00001	0.144	0.0083	0.00014	0.00028	0.00001	0.00001	0.00028	0.0009
38	22-Jun-98	0.00027	0.00003	0.0006	0.0273	0.172	0.0003	0.00001	0.194	0.0092	0.00014	0.00027	0.00001	0.00001	0.00027	0.0014
39	03-Jul-98	0.00027	0.00006	0.0007	0.0270	0.143	0.0003	0.00001	0.192	0.0080	0.00014	0.00027	0.00001	0.00001	0.00027	0.0005
40	09-Jul-98	0.00025	0.00003	0.0006	0.0250	0.132	0.0003	0.00001	0.203	0.0059	0.00013	0.00025	0.00001	0.00003	0.00025	0.0005
41	16-Jul-98	0.00029	0.00006	0.0005	0.0290	0.153	0.0003	0.00001	0.235	0.0085	0.00015	0.00029	0.00001	0.00001	0.00029	0.0003
42	23-Jul-98	0.00027	0.00027	0.0018	0.0270	0.170	0.0003	0.00001	0.192	0.0068	0.00014	0.00027	0.00001	0.00001	0.00027	0.0001
43	30-Jul-98	0.00026	0.00005	0.0011	0.0259	0.163	0.0003	0.00001	0.261	0.0078	0.00013	0.00026	0.00001	0.00003	0.00026	0.0013
44	07-Aug-98	0.00028	0.00006	0.0008	0.0276	0.146	0.0003	0.00001	0.168	0.0077	0.00014	0.00028	0.00001	0.00003	0.00028	0.0014
45	14-Aug-98	0.00028	0.00006	0.0007	0.0279	0.175	0.0003	0.00001	0.226	0.0088	0.00014	0.00028	0.00001	0.00001	0.00028	0.0001
46	21-Aug-98	0.00027	0.00003	0.0007	0.0270	0.143	0.0003	0.00001	0.192	0.0069	0.00014	0.00027	0.00001	0.00001	0.00027	0.0003
47	02-Sep-98	0.00026	0.00031	0.0006	0.0256	0.135	0.0003	0.00001	0.233	0.0061	0.00013	0.00026	0.00001	0.00001	0.00026	0.0001
48	02-Sep-98	0.00025	0.00005	0.0005	0.0250	0.157	0.0003	0.00001	0.203	0.0064	0.00013	0.00025	0.00001	0.00001	0.00025	0.0008
49	14-Sep-98	0.00028	0.00006	0.0007	0.0276	0.146	0.0003	0.00001	0.251	0.0083	0.00014	0.00028	0.00001	0.00001	0.00028	0.0008
Maximum		0.00187	0.00056	0.0035	0.0350	4.278	0.0017	0.00007	28.690	0.0460	0.00137	0.00035	0.00002	0.00007	0.00070	0.0038
Minimum		0.00020	0.00002	0.0001	0.0199	0.119	0.0002	0.00001	0.142	0.0059	0.00010	0.00020	0.00001	0.00001	0.00020	0.0001
Mean		0.00029	0.00009	0.0008	0.0260	0.713	0.0004	0.00001	1.446	0.0141	0.00019	0.00026	0.00001	0.00002	0.00029	0.0010
Median		0.00027	0.00006	0.0006	0.0272	0.335	0.0003	0.00001	0.326	0.0103	0.00014	0.00027	0.00001	0.00001	0.00027	0.0008
Mean Last 5 Weeks		0.00027	0.00010	0.0006	0.0266	0.151	0.0003	0.00001	0.221	0.0073	0.00013	0.00027	0.00001	0.00001	0.00027	0.0004

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

Weekly Humidity Cell Data: Boston Property (B2 Mineralized Zone)

Boston
94NOD120 210 - B2 Mineralized Zone

Cumulative Metal Loading/Leaching

Week No.	Date	Aluminum Al (mg/kg)	Antimony Sb (mg/kg)	Arsenic As (mg/kg)	Barium Ba (mg/kg)	Beryllium Be (mg/kg)	Bismuth Bi (mg/kg)	Cadmium Cd (mg/kg)	Calcium Ca (mg/kg)	Chromium Cr (mg/kg)	Cobalt Co (mg/kg)	Copper Cu (mg/kg)	Iron Fe (mg/kg)	Lead Pb (mg/kg)	Magnesium Mg (mg/kg)	Manganese Mn (mg/kg)	Mercury Hg (mg/kg)
0	09-Oct-97	0.190	0.004	0.011	0.0009	0.0002	0.00002	0.00003	6.311	0.0032	0.0016	0.0014	0.0035	0.0084	2.368	0.006	0.0003
1	14-Oct-97	0.234	0.007	0.013	0.0017	0.0003	0.00003	0.00006	10.686	0.0033	0.0022	0.0034	0.0061	0.0137	4.264	0.013	0.0006
2	17-Oct-97	0.282	0.010	0.016	0.0050	0.0004	0.00004	0.00009	18.377	0.0039	0.0030	0.0213	0.0090	0.0148	7.356	0.027	0.0009
3	24-Oct-97	0.342	0.012	0.022	0.0065	0.0006	0.00006	0.00012	26.026	0.0054	0.0041	0.0229	0.0118	0.0154	10.263	0.044	0.0012
4	29-Oct-97	0.434	0.015	0.025	0.0090	0.0007	0.00007	0.00015	36.194	0.0068	0.0053	0.0282	0.0285	0.0176	14.568	0.063	0.0015
5	27-Oct-97	0.459	0.017	0.027	0.0104	0.0009	0.00009	0.00017	45.336	0.0090	0.0067	0.0315	0.0313	0.0181	18.401	0.085	0.0017
6	14-Nov-97	0.478	0.018	0.029	0.0110	0.0010	0.00010	0.00020	52.771	0.0102	0.0083	0.0322	0.0341	0.0187	21.430	0.105	0.0020
7	22-Nov-97	0.511	0.020	0.032	0.0121	0.0011	0.00011	0.00023	62.203	0.0105	0.0095	0.0353	0.0400	0.0209	25.647	0.125	0.0023
8	17-Nov-97	0.589	0.021	0.038	0.0134	0.0013	0.00013	0.00025	65.642	0.0106	0.0098	0.0370	0.0445	0.0213	27.905	0.129	0.0025
9	24-Nov-97	0.653	0.022	0.042	0.0137	0.0014	0.00014	0.00027	68.006	0.0109	0.0099	0.0371	0.0489	0.0218	29.627	0.133	0.0027
10	01-Dec-97	0.706	0.024	0.047	0.0142	0.0015	0.00015	0.00029	71.300	0.0120	0.0102	0.0395	0.0578	0.0235	32.032	0.139	0.0029
11	08-Dec-97	0.751	0.026	0.052	0.0146	0.0016	0.00016	0.00031	74.445	0.0127	0.0105	0.0427	0.0599	0.0268	34.021	0.145	0.0031
12	15-Dec-97	0.782	0.027	0.056	0.0159	0.0017	0.00017	0.00034	78.269	0.0134	0.0111	0.0434	0.0621	0.0273	36.233	0.155	0.0034
13	22-Dec-97	0.843	0.029	0.060	0.0161	0.0018	0.00018	0.00036	81.601	0.0136	0.0113	0.0436	0.0644	0.0277	38.428	0.160	0.0036
14	29-Dec-97	0.885	0.030	0.066	0.0164	0.0019	0.00019	0.00038	85.371	0.0137	0.0117	0.0458	0.0665	0.0295	40.333	0.168	0.0038
15	16-Jan-98	0.928	0.031	0.070	0.0168	0.0020	0.00020	0.00040	88.663	0.0140	0.0120	0.0470	0.0687	0.0299	42.349	0.175	0.0040
16	19-Jan-98	0.960	0.032	0.073	0.0172	0.0021	0.00021	0.00042	92.095	0.0146	0.0123	0.0499	0.0707	0.0307	44.302	0.183	0.0042
17	22-Jan-98	1.004	0.033	0.077	0.0175	0.0022	0.00022	0.00044	97.052	0.0147	0.0129	0.0517	0.0730	0.0316	46.704	0.196	0.0044
18	26-Jan-98	1.054	0.034	0.083	0.0179	0.0023	0.00023	0.00047	100.540	0.0150	0.0132	0.0530	0.0753	0.0436	48.586	0.204	0.0047
19	02-Feb-98	1.105	0.035	0.089	0.0183	0.0025	0.00025	0.00049	105.850	0.0151	0.0140	0.0562	0.0775	0.0440	51.069	0.217	0.0049
20	09-Feb-98	1.148	0.036	0.095	0.0190	0.0026	0.00026	0.00051	110.518	0.0158	0.0145	0.0570	0.0797	0.0445	52.925	0.230	0.0051
21	16-Feb-98	1.191	0.037	0.099	0.0214	0.0027	0.00027	0.00054	115.239	0.0165	0.0150	0.0582	0.0821	0.0449	54.812	0.241	0.0070
22	23-Feb-98	1.247	0.038	0.104	0.0230	0.0028	0.00028	0.00056	120.195	0.0167	0.0153	0.0592	0.0847	0.0455	56.861	0.252	0.0072
23	02-Mar-98	1.279	0.039	0.111	0.0236	0.0029	0.00029	0.00059	125.612	0.0168	0.0158	0.0645	0.0874	0.0460	59.320	0.264	0.0075
24	09-Mar-98	1.328	0.040	0.120	0.0244	0.0031	0.00031	0.00062	131.284	0.0169	0.0163	0.0659	0.1048	0.0466	61.525	0.280	0.0078
25	16-Mar-98	1.344	0.041	0.133	0.0265	0.0032	0.00032	0.00067	137.312	0.0178	0.0168	0.0671	0.1075	0.0471	63.725	0.293	0.0081
26	23-Mar-98	1.360	0.041	0.149	0.0290	0.0034	0.00034	0.00073	143.012	0.0184	0.0174	0.0686	0.1193	0.0477	65.830	0.309	0.0084
27	08-Apr-98	1.392	0.042	0.166	0.0302	0.0035	0.00035	0.00076	149.195	0.0195	0.0183	0.0726	0.1424	0.0483	67.875	0.327	0.0086
28	15-Apr-98	1.424	0.043	0.183	0.0308	0.0036	0.00036	0.00081	155.950	0.0207	0.0196	0.0745	0.1591	0.0488	70.209	0.344	0.0089
29	21-Apr-98	1.443	0.044	0.200	0.0311	0.0038	0.00038	0.00083	161.268	0.0208	0.0207	0.0777	0.1643	0.0493	71.865	0.360	0.0092
30	28-Apr-98	1.472	0.045	0.219	0.0338	0.0039	0.00039	0.00089	169.084	0.0220	0.0222	0.0796	0.1702	0.0498	74.599	0.380	0.0094
31	06-May-98	1.492	0.046	0.240	0.0351	0.0040	0.00040	0.00092	176.319	0.0234	0.0234	0.0888	0.1731	0.0504	77.074	0.402	0.0097
32	13-May-98	1.546	0.047	0.248	0.0355	0.0042	0.00042	0.00095	182.019	0.0246	0.0243	0.1009	0.1760	0.0510	79.076	0.417	0.0100
33	20-May-98	1.579	0.047	0.255	0.0360	0.0043	0.00043	0.00098	188.246	0.0258	0.0253	0.1040	0.1819	0.0516	81.347	0.434	0.0103
34	29-May-98	1.624	0.048	0.261	0.0368	0.0045	0.00045	0.00100	192.382	0.0259	0.0262	0.1081	0.1847	0.0521	82.654	0.448	0.0106
35	02-Jun-98	1.674	0.048	0.267	0.0374	0.0046	0.00046	0.00103	197.616	0.0263	0.0273	0.1136	0.1876	0.0527	84.421	0.464	0.0109
36	10-Jun-98	1.716	0.049	0.272	0.0377	0.0048	0.00048	0.00106	202.624	0.0266	0.0285	0.1155	0.2043	0.0532	86.007	0.483	0.0111
37	16-Jun-98	1.751	0.049	0.276	0.0382	0.0049	0.00049	0.00109	207.872	0.0267	0.0295	0.1192	0.2159	0.0538	87.569	0.500	0.0114
38	22-Jun-98	1.792	0.050	0.280	0.0404	0.0050	0.00050	0.00112	213.726	0.0278	0.0306	0.1281	0.2326	0.0544	89.363	0.519	0.0117
39	03-Jul-98	1.836	0.050	0.284	0.0409	0.0052	0.00052	0.00114	218.709	0.0287	0.0317	0.1315	0.2492	0.0554	90.933	0.539	0.0120
40	09-Jul-98	1.885	0.051	0.286	0.0412	0.0053	0.00053	0.00117	222.649	0.0297	0.0326	0.1351	0.2645	0.0559	92.071	0.555	0.0122
41	16-Jul-98	1.941	0.051	0.290	0.0415	0.0054	0.00054	0.00120	228.056	0.0301	0.0335	0.1372	0.2707	0.0565	93.867	0.571	0.0125
42	23-Jul-98	1.988	0.052	0.294	0.0418	0.0056	0.00056	0.00122	232.985	0.0312	0.0344	0.1437	0.2764	0.0571	95.372	0.589	0.0128
43	30-Jul-98	2.031	0.052	0.297	0.0422	0.0057	0.00057	0.00125	238.017	0.0320	0.0356	0.1488	0.2922	0.0576	97.057	0.610	0.0130
44	07-Aug-98	2.076	0.052	0.301	0.0426	0.0058	0.00058	0.00128	242.801	0.0323	0.0366	0.1519	0.3091	0.0620	98.505	0.630	0.0133
45	14-Aug-98	2.113	0.053	0.305	0.0439	0.0060	0.00060	0.00131	248.526	0.0332	0.0380	0.1577	0.3262	0.0631	100.302	0.655	0.0136
46	21-Aug-98	2.159	0.053	0.308	0.0441	0.0061	0.00061	0.00133	253.319	0.0335	0.0390	0.1614	0.3289	0.0636	101.569	0.673	0.0139
47	02-Sep-98	2.210	0.054	0.311	0.0444	0.0062	0.00062	0.00136	257.681	0.0340	0.0398	0.1662	0.3446	0.0642	103.297	0.688	0.0141
48	02-Sep-98	2.266	0.054	0.314	0.0447	0.0064	0.00064	0.00138	262.097	0.0351	0.0408	0.1737	0.3549	0.0647	104.586	0.704	0.0144
49	14-Sep-98	2.304	0.055	0.317	0.0450	0.0065	0.00065	0.00141	267.598	0.0359	0.0420	0.1814	0.3577	0.0652	106.525	0.725	0.0146
Maximum		2.304	0.055	0.317	0.0450	0.0065	0.00065	0.00141	267.598	0.0359	0.0420	0.1814	0.3577	0.0652	106.525	0.725	0.0146
Minimum		0.190	0.004	0.011	0.0009	0.0002	0.00002	0.00003	6.311	0.0032	0.0016	0.0014	0.0035	0.0084	2.368	0.006	0.0003
Mean		1.276	0.037	0.158	0.0262	0.0033	0.00033	0.00070	140.373	0.0195	0.0198	0.0807	0.1433	0.0418	60.541	0.327	0.0075
Median		1.336	0.040	0.127	0.0254	0.0032	0.00032	0.00064	134.298	0.0173	0.0166	0.0665	0.1061	0.0468	62.625	0.286	0.0079
Mean Last 5 Weeks		2.210	0.054	0.311	0.0444	0.0062	0.00062	0.00136	257.844	0.0344	0.0399	0.1681	0.3424	0.0642	103.256	0.689	0.0141

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

Table of Contents

Weekly Humidity Cell Data: Boston Property (B2 Mineralized Zone)

Boston
94NOD120 210 - B2 Mineralized Zone

Week No.	Date	Molybdenum Mo (mg/kg)	Nickel Ni (mg/kg)	Phosphorus P (mg/kg)	Potassium K (mg/kg)	Selenium Se (mg/kg)	Silver Ag (mg/kg)	Sodium Na (mg/kg)	Strontium Sr (mg/kg)	Tin Sn (mg/kg)	Titanium Ti (mg/kg)	Thallium Tl (mg/kg)	Uranium U (mg/kg)	Vanadium V (mg/kg)	Zinc Zn (mg/kg)
0	09-Oct-97	0.0006	0.0029	0.0350	4.278	0.0014	0.00002	28.690	0.0346	0.0002	0.0003	0.00002	0.00007	0.0007	0.0002
1	14-Oct-97	0.0009	0.0040	0.0614	6.560	0.0019	0.00003	38.982	0.0576	0.0003	0.0006	0.00003	0.00008	0.0010	0.0015
2	17-Oct-97	0.0012	0.0054	0.0899	9.526	0.0031	0.00004	47.403	0.0926	0.0004	0.0009	0.00004	0.00010	0.0012	0.0035
3	24-Oct-97	0.0015	0.0085	0.1177	12.015	0.0036	0.00006	52.228	0.1276	0.0006	0.0012	0.00006	0.00013	0.0015	0.0049
4	29-Oct-97	0.0018	0.0098	0.1451	15.354	0.0047	0.00007	55.862	0.1736	0.0007	0.0015	0.00007	0.00015	0.0018	0.0085
5	27-Oct-97	0.0019	0.0108	0.1729	17.424	0.0053	0.00009	57.593	0.2099	0.0009	0.0017	0.00009	0.00017	0.0021	0.0099
6	14-Nov-97	0.0019	0.0123	0.2014	18.798	0.0056	0.00010	58.478	0.2371	0.0010	0.0020	0.00010	0.00018	0.0024	0.0113
7	22-Nov-97	0.0019	0.0131	0.2292	20.227	0.0072	0.00011	59.261	0.2687	0.0011	0.0023	0.00011	0.00019	0.0026	0.0114
8	17-Nov-97	0.0020	0.0133	0.2503	21.201	0.0077	0.00013	59.852	0.2824	0.0014	0.0025	0.00013	0.00021	0.0029	0.0125
9	24-Nov-97	0.0020	0.0134	0.2708	22.006	0.0079	0.00014	60.366	0.2919	0.0015	0.0027	0.00014	0.00022	0.0031	0.0126
10	01-Dec-97	0.0020	0.0135	0.2924	23.006	0.0083	0.00015	61.039	0.3052	0.0019	0.0029	0.00015	0.00023	0.0033	0.0143
11	08-Dec-97	0.0021	0.0139	0.3134	23.812	0.0085	0.00016	61.525	0.3156	0.0020	0.0031	0.00016	0.00024	0.0035	0.0181
12	15-Dec-97	0.0021	0.0140	0.3356	24.573	0.0087	0.00017	61.971	0.3305	0.0021	0.0034	0.00017	0.00025	0.0037	0.0183
13	22-Dec-97	0.0021	0.0143	0.3584	25.330	0.0092	0.00018	62.337	0.3408	0.0022	0.0036	0.00018	0.00026	0.0039	0.0190
14	29-Dec-97	0.0021	0.0160	0.3800	25.941	0.0094	0.00019	62.685	0.3511	0.0023	0.0038	0.00019	0.00027	0.0041	0.0191
15	16-Jan-98	0.0022	0.0162	0.4022	26.569	0.0096	0.00020	63.065	0.3609	0.0024	0.0040	0.00020	0.00028	0.0044	0.0207
16	19-Jan-98	0.0022	0.0164	0.4221	27.152	0.0098	0.00021	63.425	0.3709	0.0025	0.0042	0.00021	0.00029	0.0046	0.0208
17	22-Jan-98	0.0022	0.0167	0.4443	27.757	0.0100	0.00022	63.915	0.3848	0.0027	0.0044	0.00022	0.00030	0.0048	0.0209
18	26-Jan-98	0.0022	0.0187	0.4673	28.178	0.0103	0.00023	64.263	0.3946	0.0028	0.0047	0.00023	0.00031	0.0050	0.0210
19	02-Feb-98	0.0023	0.0222	0.4900	28.754	0.0107	0.00025	64.857	0.4071	0.0029	0.0049	0.00025	0.00033	0.0053	0.0211
20	09-Feb-98	0.0023	0.0254	0.5122	29.270	0.0109	0.00026	65.347	0.4194	0.0030	0.0051	0.00026	0.00034	0.0055	0.0214
21	16-Feb-98	0.0024	0.0257	0.5356	29.650	0.0112	0.00033	65.793	0.4309	0.0031	0.0054	0.00027	0.00035	0.0057	0.0218
22	23-Feb-98	0.0024	0.0261	0.5617	29.972	0.0114	0.00034	66.162	0.4421	0.0032	0.0056	0.00028	0.00036	0.0060	0.0229
23	02-Mar-98	0.0024	0.0262	0.5890	30.334	0.0117	0.00035	66.520	0.4548	0.0034	0.0059	0.00029	0.00037	0.0062	0.0237
24	09-Mar-98	0.0025	0.0264	0.6175	30.655	0.0120	0.00037	66.807	0.4686	0.0039	0.0062	0.00031	0.00039	0.0065	0.0246
25	16-Mar-98	0.0026	0.0265	0.6436	31.003	0.0123	0.00038	67.071	0.4825	0.0045	0.0064	0.00032	0.00040	0.0068	0.0267
26	23-Mar-98	0.0026	0.0271	0.6724	31.270	0.0125	0.00039	67.304	0.4955	0.0048	0.0067	0.00034	0.00042	0.0071	0.0284
27	08-Apr-98	0.0027	0.0278	0.7008	31.562	0.0128	0.00041	67.535	0.5081	0.0049	0.0070	0.00035	0.00043	0.0076	0.0298
28	15-Apr-98	0.0028	0.0284	0.7281	31.870	0.0131	0.00042	67.838	0.5216	0.0063	0.0073	0.00036	0.00044	0.0082	0.0315
29	21-Apr-98	0.0028	0.0291	0.7526	32.098	0.0133	0.00043	68.011	0.5319	0.0064	0.0075	0.00038	0.00046	0.0084	0.0322
30	28-Apr-98	0.0029	0.0298	0.7804	32.496	0.0136	0.00045	68.404	0.5491	0.0067	0.0078	0.00039	0.00047	0.0090	0.0350
31	06-May-98	0.0030	0.0304	0.8094	32.794	0.0139	0.00046	68.668	0.5616	0.0068	0.0081	0.00040	0.00048	0.0096	0.0367
32	13-May-98	0.0031	0.0307	0.8382	33.003	0.0142	0.00048	68.873	0.5713	0.0070	0.0084	0.00042	0.00050	0.0099	0.0379
33	20-May-98	0.0032	0.0311	0.8660	33.206	0.0148	0.00049	69.098	0.5810	0.0071	0.0087	0.00043	0.00051	0.0101	0.0385
34	29-May-98	0.0033	0.0316	0.8939	33.326	0.0150	0.00051	69.241	0.5882	0.0072	0.0089	0.00045	0.00053	0.0104	0.0393
35	02-Jun-98	0.0033	0.0321	0.9229	33.450	0.0153	0.00052	69.418	0.5972	0.0075	0.0092	0.00046	0.00054	0.0107	0.0394
36	10-Jun-98	0.0035	0.0325	0.9502	33.622	0.0156	0.00053	69.584	0.6060	0.0077	0.0095	0.00048	0.00056	0.0110	0.0408
37	16-Jun-98	0.0036	0.0329	0.9784	33.799	0.0159	0.00055	69.728	0.6142	0.0078	0.0098	0.00049	0.00057	0.0113	0.0417
38	22-Jun-98	0.0036	0.0334	1.0057	33.971	0.0162	0.00056	69.922	0.6235	0.0079	0.0101	0.00050	0.00058	0.0115	0.0430
39	03-Jul-98	0.0037	0.0341	1.0327	34.113	0.0164	0.00057	70.114	0.6314	0.0081	0.0103	0.00052	0.00060	0.0118	0.0436
40	09-Jul-98	0.0037	0.0347	1.0577	34.246	0.0167	0.00059	70.316	0.6374	0.0082	0.0106	0.00053	0.00062	0.0121	0.0441
41	16-Jul-98	0.0037	0.0352	1.0867	34.399	0.0170	0.00060	70.551	0.6459	0.0083	0.0109	0.00054	0.00064	0.0123	0.0444
42	23-Jul-98	0.0040	0.0370	1.1138	34.569	0.0172	0.00062	70.743	0.6527	0.0085	0.0111	0.00056	0.00065	0.0126	0.0445
43	30-Jul-98	0.0041	0.0381	1.1396	34.731	0.0175	0.00063	71.005	0.6604	0.0086	0.0114	0.00057	0.00068	0.0129	0.0458
44	07-Aug-98	0.0041	0.0389	1.1672	34.877	0.0178	0.00064	71.173	0.6681	0.0087	0.0117	0.00058	0.00070	0.0131	0.0472
45	14-Aug-98	0.0042	0.0396	1.1951	35.052	0.0180	0.00066	71.399	0.6769	0.0089	0.0120	0.00060	0.00072	0.0134	0.0473
46	21-Aug-98	0.0042	0.0403	1.2221	35.195	0.0183	0.00067	71.591	0.6838	0.0090	0.0122	0.00061	0.00073	0.0137	0.0476
47	02-Sep-98	0.0045	0.0409	1.2477	35.331	0.0186	0.00068	71.824	0.6899	0.0091	0.0125	0.00062	0.00074	0.0140	0.0477
48	02-Sep-98	0.0046	0.0414	1.2728	35.488	0.0188	0.00069	72.027	0.6962	0.0093	0.0127	0.00064	0.00076	0.0142	0.0485
49	14-Sep-98	0.0046	0.0420	1.3003	35.634	0.0191	0.00071	72.278	0.7045	0.0094	0.0130	0.00065	0.00077	0.0145	0.0493
Maximum		0.0046	0.0420	1.3003	35.634	0.0191	0.00071	72.278	0.7045	0.0094	0.0130	0.00065	0.00077	0.0145	0.0493
Minimum		0.0006	0.0029	0.0350	4.278	0.0014	0.00002	28.690	0.0346	0.0002	0.0003	0.00002	0.00007	0.0007	0.0002
Mean		0.0027	0.0246	0.6535	27.989	0.0119	0.00036	64.443	0.4546	0.0047	0.0065	0.00033	0.00041	0.0074	0.0279
Median		0.0025	0.0265	0.6305	30.829	0.0121	0.00037	66.939	0.4755	0.0042	0.0063	0.00032	0.00040	0.0067	0.0256
Mean Last 5 Weeks		0.0044	0.0408	1.2476	35.340	0.0186	0.00068	71.824	0.6903	0.0091	0.0125	0.00062	0.00074	0.0140	0.0481

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

Weekly Humidity Cell Data: Boston Property (B2 Mineralized Zone)

Boston
94NOD120 210 - B2 Mineralized Zone

Remaining Metal (%):

Week No.	Date	Aluminum Al	Antimony Sb	Arsenic As	Barium Ba	Beryllium Be	Bismuth Bi	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn
0	09-Oct-97	100.00	99.78	100.00	100.00	N/A	N/A	N/A	99.99	100.00	100.00	100.00	100.00	N/A	99.99	100.00
1	14-Oct-97	100.00	99.63	100.00	100.00	N/A	N/A	N/A	99.98	100.00	99.99	100.00	100.00	N/A	99.98	100.00
2	17-Oct-97	100.00	99.47	99.99	99.99	N/A	N/A	N/A	99.97	100.00	99.99	99.99	100.00	N/A	99.97	100.00
3	24-Oct-97	100.00	99.34	99.99	99.99	N/A	N/A	N/A	99.96	100.00	99.99	99.99	100.00	N/A	99.95	100.00
4	29-Oct-97	100.00	99.17	99.99	99.99	N/A	N/A	N/A	99.95	100.00	99.98	99.98	100.00	N/A	99.94	100.00
5	27-Oct-97	100.00	99.05	99.99	99.99	N/A	N/A	N/A	99.93	99.99	99.98	99.98	100.00	N/A	99.92	99.99
6	14-Nov-97	100.00	98.98	99.99	99.99	N/A	N/A	N/A	99.92	99.99	99.98	99.98	100.00	N/A	99.91	99.99
7	22-Nov-97	100.00	98.89	99.99	99.99	N/A	N/A	N/A	99.91	99.99	99.97	99.98	100.00	N/A	99.89	99.99
8	17-Nov-97	100.00	98.82	99.99	99.99	N/A	N/A	N/A	99.90	99.99	99.97	99.98	100.00	N/A	99.88	99.99
9	24-Nov-97	100.00	98.75	99.99	99.99	N/A	N/A	N/A	99.90	99.99	99.97	99.98	100.00	N/A	99.87	99.99
10	01-Dec-97	100.00	98.66	99.99	99.99	N/A	N/A	N/A	99.90	99.99	99.97	99.98	100.00	N/A	99.86	99.99
11	08-Dec-97	100.00	98.58	99.98	99.98	N/A	N/A	N/A	99.89	99.99	99.97	99.98	100.00	N/A	99.85	99.99
12	15-Dec-97	100.00	98.49	99.98	99.98	N/A	N/A	N/A	99.89	99.99	99.97	99.98	100.00	N/A	99.84	99.99
13	22-Dec-97	100.00	98.41	99.98	99.98	N/A	N/A	N/A	99.88	99.99	99.97	99.98	100.00	N/A	99.83	99.99
14	29-Dec-97	100.00	98.36	99.98	99.98	N/A	N/A	N/A	99.88	99.99	99.97	99.97	100.00	N/A	99.82	99.99
15	16-Jan-98	100.00	98.30	99.98	99.98	N/A	N/A	N/A	99.87	99.99	99.96	99.97	100.00	N/A	99.81	99.99
16	19-Jan-98	100.00	98.24	99.98	99.98	N/A	N/A	N/A	99.87	99.99	99.96	99.97	100.00	N/A	99.81	99.99
17	22-Jan-98	100.00	98.17	99.98	99.98	N/A	N/A	N/A	99.86	99.99	99.96	99.97	100.00	N/A	99.79	99.99
18	26-Jan-98	100.00	98.11	99.97	99.98	N/A	N/A	N/A	99.85	99.99	99.96	99.97	100.00	N/A	99.79	99.99
19	02-Feb-98	100.00	98.04	99.97	99.98	N/A	N/A	N/A	99.85	99.99	99.96	99.97	100.00	N/A	99.78	99.99
20	09-Feb-98	100.00	97.98	99.97	99.98	N/A	N/A	N/A	99.84	99.99	99.96	99.97	100.00	N/A	99.77	99.98
21	16-Feb-98	100.00	97.94	99.97	99.98	N/A	N/A	N/A	99.83	99.99	99.96	99.97	100.00	N/A	99.76	99.98
22	23-Feb-98	100.00	97.89	99.97	99.98	N/A	N/A	N/A	99.82	99.99	99.95	99.97	100.00	N/A	99.75	99.98
23	02-Mar-98	100.00	97.84	99.97	99.98	N/A	N/A	N/A	99.82	99.99	99.95	99.96	100.00	N/A	99.74	99.98
24	09-Mar-98	100.00	97.79	99.96	99.97	N/A	N/A	N/A	99.81	99.99	99.95	99.96	100.00	N/A	99.73	99.98
25	16-Mar-98	100.00	97.74	99.96	99.97	N/A	N/A	N/A	99.80	99.99	99.95	99.96	100.00	N/A	99.72	99.98
26	23-Mar-98	100.00	97.70	99.95	99.97	N/A	N/A	N/A	99.79	99.99	99.95	99.96	100.00	N/A	99.71	99.98
27	08-Apr-98	100.00	97.65	99.95	99.97	N/A	N/A	N/A	99.78	99.99	99.95	99.96	100.00	N/A	99.70	99.98
28	15-Apr-98	100.00	97.60	99.94	99.97	N/A	N/A	N/A	99.77	99.99	99.94	99.96	100.00	N/A	99.69	99.98
29	21-Apr-98	100.00	97.55	99.94	99.97	N/A	N/A	N/A	99.76	99.99	99.94	99.96	100.00	N/A	99.68	99.98
30	28-Apr-98	100.00	97.49	99.93	99.96	N/A	N/A	N/A	99.75	99.99	99.93	99.95	100.00	N/A	99.67	99.98
31	06-May-98	100.00	97.45	99.93	99.96	N/A	N/A	N/A	99.74	99.99	99.93	99.95	100.00	N/A	99.66	99.97
32	13-May-98	100.00	97.42	99.92	99.96	N/A	N/A	N/A	99.73	99.99	99.93	99.94	100.00	N/A	99.65	99.97
33	20-May-98	100.00	97.38	99.92	99.96	N/A	N/A	N/A	99.73	99.98	99.93	99.94	100.00	N/A	99.64	99.97
34	29-May-98	100.00	97.36	99.92	99.96	N/A	N/A	N/A	99.72	99.98	99.92	99.94	100.00	N/A	99.64	99.97
35	02-Jun-98	100.00	97.32	99.92	99.96	N/A	N/A	N/A	99.71	99.98	99.92	99.94	100.00	N/A	99.63	99.97
36	10-Jun-98	100.00	97.29	99.92	99.96	N/A	N/A	N/A	99.70	99.98	99.92	99.93	100.00	N/A	99.62	99.97
37	16-Jun-98	100.00	97.27	99.91	99.96	N/A	N/A	N/A	99.70	99.98	99.91	99.93	100.00	N/A	99.62	99.97
38	22-Jun-98	100.00	97.24	99.91	99.96	N/A	N/A	N/A	99.69	99.98	99.91	99.93	100.00	N/A	99.61	99.97
39	03-Jul-98	100.00	97.21	99.91	99.96	N/A	N/A	N/A	99.68	99.98	99.91	99.93	100.00	N/A	99.60	99.96
40	09-Jul-98	100.00	97.19	99.91	99.96	N/A	N/A	N/A	99.67	99.98	99.90	99.92	100.00	N/A	99.60	99.96
41	16-Jul-98	100.00	97.16	99.91	99.96	N/A	N/A	N/A	99.67	99.98	99.90	99.92	100.00	N/A	99.59	99.96
42	23-Jul-98	100.00	97.14	99.91	99.96	N/A	N/A	N/A	99.66	99.98	99.90	99.92	100.00	N/A	99.58	99.96
43	30-Jul-98	100.00	97.11	99.91	99.96	N/A	N/A	N/A	99.65	99.98	99.90	99.92	100.00	N/A	99.57	99.96
44	07-Aug-98	100.00	97.09	99.91	99.96	N/A	N/A	N/A	99.65	99.98	99.89	99.91	100.00	N/A	99.57	99.96
45	14-Aug-98	100.00	97.06	99.90	99.95	N/A	N/A	N/A	99.64	99.98	99.89	99.91	100.00	N/A	99.56	99.96
46	21-Aug-98	100.00	97.04	99.90	99.95	N/A	N/A	N/A	99.63	99.98	99.89	99.91	100.00	N/A	99.55	99.96
47	02-Sep-98	100.00	97.01	99.90	99.95	N/A	N/A	N/A	99.62	99.98	99.88	99.91	100.00	N/A	99.55	99.95
48	02-Sep-98	100.00	96.99	99.90	99.95	N/A	N/A	N/A	99.62	99.98	99.88	99.90	100.00	N/A	99.54	99.95
49	14-Sep-98	100.00	96.96	99.90	99.95	N/A	N/A	N/A	99.61	99.98	99.88	99.90	100.00	N/A	99.53	99.95
Maximum		99.9996	99.7782	99.9967	99.9990	N/A	N/A	N/A	99.9908	99.9981	99.9952	99.9992	100.0000	N/A	99.9896	99.9996
Minimum		99.9955	96.9636	99.9009	99.9526	N/A	N/A	N/A	99.6093	99.9787	99.8765	99.8972	99.9995	N/A	99.5318	99.9525
Mean		99.9975	97.9420	99.9505	99.9724	N/A	N/A	N/A	99.7951	99.9884	99.9417	99.9543	99.9998	N/A	99.7339	99.9785
Median		99.9974	97.7624	99.9605	99.9732	N/A	N/A	N/A	99.8039	99.9897	99.9513	99.9623	99.9999	N/A	99.7247	99.9812
Mean Last 5 Weeks		99.9957	97.0128	99.9028	99.9533	N/A	N/A	N/A	99.6236	99.9797	99.8826	99.9048	99.9996	N/A	99.5461	99.9548

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

Table of Contents

Weekly Humidity Cell Data: Boston Property (B2 Mineralized Zone)

Boston 94NOD120 210 - B2 Mineralized Zone Week No.	Date	Mercury Hg	Molybdenum Mo	Nickel Ni	Phosphorus P	Potassium K	Selenium Se	Silver Ag	Sodium Na	Strontium Sr	Tin Sn	Titanium Ti	Thallium Tl	Uranium U	Vanadium V	Zinc Zn
0	09-Oct-97	N/A	99.89	99.99	N/A	99.93	N/A	N/A	99.70	99.97	N/A	N/A	N/A	N/A	N/A	100.00
1	14-Oct-97	N/A	99.82	99.99	N/A	99.90	N/A	N/A	99.59	99.94	N/A	N/A	N/A	N/A	N/A	100.00
2	17-Oct-97	N/A	99.76	99.99	N/A	99.85	N/A	N/A	99.51	99.91	N/A	N/A	N/A	N/A	N/A	100.00
3	24-Oct-97	N/A	99.70	99.98	N/A	99.81	N/A	N/A	99.46	99.87	N/A	N/A	N/A	N/A	N/A	100.00
4	29-Oct-97	N/A	99.63	99.98	N/A	99.75	N/A	N/A	99.42	99.83	N/A	N/A	N/A	N/A	N/A	100.00
5	27-Oct-97	N/A	99.63	99.97	N/A	99.72	N/A	N/A	99.40	99.79	N/A	N/A	N/A	N/A	N/A	99.99
6	14-Nov-97	N/A	99.62	99.97	N/A	99.70	N/A	N/A	99.39	99.76	N/A	N/A	N/A	N/A	N/A	99.99
7	22-Nov-97	N/A	99.61	99.97	N/A	99.68	N/A	N/A	99.38	99.73	N/A	N/A	N/A	N/A	N/A	99.99
8	17-Nov-97	N/A	99.61	99.97	N/A	99.66	N/A	N/A	99.38	99.72	N/A	N/A	N/A	N/A	N/A	99.99
9	24-Nov-97	N/A	99.60	99.97	N/A	99.65	N/A	N/A	99.37	99.71	N/A	N/A	N/A	N/A	N/A	99.99
10	01-Dec-97	N/A	99.59	99.97	N/A	99.63	N/A	N/A	99.36	99.70	N/A	N/A	N/A	N/A	N/A	99.99
11	08-Dec-97	N/A	99.59	99.97	N/A	99.62	N/A	N/A	99.36	99.69	N/A	N/A	N/A	N/A	N/A	99.99
12	15-Dec-97	N/A	99.58	99.97	N/A	99.61	N/A	N/A	99.35	99.67	N/A	N/A	N/A	N/A	N/A	99.99
13	22-Dec-97	N/A	99.58	99.96	N/A	99.59	N/A	N/A	99.35	99.66	N/A	N/A	N/A	N/A	N/A	99.99
14	29-Dec-97	N/A	99.57	99.96	N/A	99.58	N/A	N/A	99.35	99.65	N/A	N/A	N/A	N/A	N/A	99.99
15	16-Jan-98	N/A	99.57	99.96	N/A	99.57	N/A	N/A	99.34	99.64	N/A	N/A	N/A	N/A	N/A	99.99
16	19-Jan-98	N/A	99.56	99.96	N/A	99.57	N/A	N/A	99.34	99.63	N/A	N/A	N/A	N/A	N/A	99.99
17	22-Jan-98	N/A	99.55	99.96	N/A	99.56	N/A	N/A	99.33	99.62	N/A	N/A	N/A	N/A	N/A	99.99
18	26-Jan-98	N/A	99.55	99.95	N/A	99.55	N/A	N/A	99.33	99.61	N/A	N/A	N/A	N/A	N/A	99.99
19	02-Feb-98	N/A	99.54	99.95	N/A	99.54	N/A	N/A	99.32	99.59	N/A	N/A	N/A	N/A	N/A	99.99
20	09-Feb-98	N/A	99.53	99.94	N/A	99.53	N/A	N/A	99.32	99.58	N/A	N/A	N/A	N/A	N/A	99.99
21	16-Feb-98	N/A	99.53	99.94	N/A	99.53	N/A	N/A	99.31	99.57	N/A	N/A	N/A	N/A	N/A	99.99
22	23-Feb-98	N/A	99.52	99.94	N/A	99.52	N/A	N/A	99.31	99.56	N/A	N/A	N/A	N/A	N/A	99.99
23	02-Mar-98	N/A	99.51	99.94	N/A	99.51	N/A	N/A	99.31	99.55	N/A	N/A	N/A	N/A	N/A	99.99
24	09-Mar-98	N/A	99.51	99.93	N/A	99.51	N/A	N/A	99.30	99.53	N/A	N/A	N/A	N/A	N/A	99.99
25	16-Mar-98	N/A	99.48	99.93	N/A	99.50	N/A	N/A	99.30	99.52	N/A	N/A	N/A	N/A	N/A	99.98
26	23-Mar-98	N/A	99.47	99.93	N/A	99.50	N/A	N/A	99.30	99.51	N/A	N/A	N/A	N/A	N/A	99.98
27	08-Apr-98	N/A	99.46	99.93	N/A	99.50	N/A	N/A	99.30	99.49	N/A	N/A	N/A	N/A	N/A	99.98
28	15-Apr-98	N/A	99.45	99.93	N/A	99.49	N/A	N/A	99.29	99.48	N/A	N/A	N/A	N/A	N/A	99.98
29	21-Apr-98	N/A	99.44	99.93	N/A	99.49	N/A	N/A	99.29	99.47	N/A	N/A	N/A	N/A	N/A	99.98
30	28-Apr-98	N/A	99.41	99.93	N/A	99.48	N/A	N/A	99.29	99.45	N/A	N/A	N/A	N/A	N/A	99.98
31	06-May-98	N/A	99.40	99.92	N/A	99.48	N/A	N/A	99.28	99.44	N/A	N/A	N/A	N/A	N/A	99.98
32	13-May-98	N/A	99.39	99.92	N/A	99.47	N/A	N/A	99.28	99.43	N/A	N/A	N/A	N/A	N/A	99.98
33	20-May-98	N/A	99.36	99.92	N/A	99.47	N/A	N/A	99.28	99.42	N/A	N/A	N/A	N/A	N/A	99.98
34	29-May-98	N/A	99.34	99.92	N/A	99.47	N/A	N/A	99.28	99.41	N/A	N/A	N/A	N/A	N/A	99.98
35	02-Jun-98	N/A	99.33	99.92	N/A	99.46	N/A	N/A	99.28	99.41	N/A	N/A	N/A	N/A	N/A	99.98
36	10-Jun-98	N/A	99.31	99.92	N/A	99.46	N/A	N/A	99.28	99.40	N/A	N/A	N/A	N/A	N/A	99.98
37	16-Jun-98	N/A	99.29	99.92	N/A	99.46	N/A	N/A	99.27	99.39	N/A	N/A	N/A	N/A	N/A	99.98
38	22-Jun-98	N/A	99.28	99.92	N/A	99.46	N/A	N/A	99.27	99.38	N/A	N/A	N/A	N/A	N/A	99.98
39	03-Jul-98	N/A	99.27	99.92	N/A	99.45	N/A	N/A	99.27	99.37	N/A	N/A	N/A	N/A	N/A	99.97
40	09-Jul-98	N/A	99.26	99.91	N/A	99.45	N/A	N/A	99.27	99.37	N/A	N/A	N/A	N/A	N/A	99.97
41	16-Jul-98	N/A	99.25	99.91	N/A	99.45	N/A	N/A	99.27	99.36	N/A	N/A	N/A	N/A	N/A	99.97
42	23-Jul-98	N/A	99.20	99.91	N/A	99.45	N/A	N/A	99.26	99.35	N/A	N/A	N/A	N/A	N/A	99.97
43	30-Jul-98	N/A	99.19	99.91	N/A	99.44	N/A	N/A	99.26	99.34	N/A	N/A	N/A	N/A	N/A	99.97
44	07-Aug-98	N/A	99.18	99.90	N/A	99.44	N/A	N/A	99.26	99.34	N/A	N/A	N/A	N/A	N/A	99.97
45	14-Aug-98	N/A	99.16	99.90	N/A	99.44	N/A	N/A	99.26	99.33	N/A	N/A	N/A	N/A	N/A	99.97
46	21-Aug-98	N/A	99.16	99.90	N/A	99.44	N/A	N/A	99.25	99.32	N/A	N/A	N/A	N/A	N/A	99.97
47	02-Sep-98	N/A	99.10	99.90	N/A	99.43	N/A	N/A	99.25	99.31	N/A	N/A	N/A	N/A	N/A	99.97
48	02-Sep-98	N/A	99.09	99.90	N/A	99.43	N/A	N/A	99.25	99.31	N/A	N/A	N/A	N/A	N/A	99.97
49	14-Sep-98	N/A	99.08	99.90	N/A	99.43	N/A	N/A	99.25	99.30	N/A	N/A	N/A	N/A	N/A	99.97
Maximum		N/A	99.8878	99.9927	N/A	99.9316	N/A	N/A	99.7012	99.9656	N/A	N/A	N/A	N/A	N/A	99.9999
Minimum		N/A	99.0762	99.8962	N/A	99.4299	N/A	N/A	99.2471	99.2990	N/A	N/A	N/A	N/A	N/A	99.9716
Mean		N/A	99.4501	99.9392	N/A	99.5522	N/A	N/A	99.3287	99.5476	N/A	N/A	N/A	N/A	N/A	99.9840
Median		N/A	99.4945	99.9347	N/A	99.5067	N/A	N/A	99.3027	99.5268	N/A	N/A	N/A	N/A	N/A	99.9853
Mean Last 5 Weeks		N/A	99.1171	99.8992	N/A	99.4346	N/A	N/A	99.2518	99.3132	N/A	N/A	N/A	N/A	N/A	99.9723

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

Appendix D-4
Kinetic Test Data - B3 Alteration Halo

◎ Table of Contents

Boston Property Whole Rock Data
B3 Alteration Halo

Pre-Test Whole Rock Data Boston B3 alteration halo	
Analysis Date:	11-Oct-97
Method:	XRF/ICP
Al2O3 (%)	7.26
CaO (%)	4.68
Cr2O3 (%)	0.17
Fe2O3 (%)	10.92
K2O (%)	0.38
MgO (%)	17.15
MnO (%)	0.15
Na2O (%)	0.74
P2O5 (%)	0.01
SiO2 (%)	32.38
TiO2 (%)	0.44
LOI (%)	25.64
Total (%)	99.92
Ba (ppm)	136
Cs (ppm)	3
Hf (ppm)	2
La (ppm)	7
Nb (ppm)	4
Rb (ppm)	37
Sr (ppm)	101
Ta (ppm)	1
Y (ppm)	27
Zr (ppm)	68

Post-Test Whole Rock Data Boston B3 alteration halo	
Analysis Date:	15-Sep-98
Method:	XRF/ICP
Al2O3 (%)	6.46
CaO (%)	4.22
Cr2O3 (%)	0.17
Fe2O3 (%)	11.33
K2O (%)	0.36
MgO (%)	17.24
MnO (%)	0.15
Na2O (%)	0.65
P2O5 (%)	0.01
SiO2 (%)	32.73
TiO2 (%)	0.43
LOI (%)	25.88
Total (%)	99.63
Ba (ppm)	67
Cs (ppm)	1.7
Hf (ppm)	<1
La (ppm)	2
Nb (ppm)	1
Rb (ppm)	17.8
Sr (ppm)	88.4
Ta (ppm)	<0.5
Y (ppm)	8
Zr (ppm)	22

◎ Table of Contents

Boston Property ABA and ICP Metals Data
B3 Alteration Halo

Pre-Test ABA & ICP Metals Data Boston B3 alteration halo		
ABA Results:		
Paste pH		9.5
% S (Total)		0.21
% S (SO_4)		***0.01***
% S (Sulphide)		0.2
% del S (SO_4)		0
TAP (kg $CaCO_3$/t)		6.56
SAP (kg $CaCO_3$/t)		6.25
NP (tonne $CaCO_3$/ktonne)		340
CO2 (%)		21.1
CaNP (kg $CaCO_3$/t)		479.9
TNNP (kg $CaCO_3$/t)		333.4
SNNP (kg $CaCO_3$/t)		333.8
TNPR		51.8
SNPR		54.4
Metals: (ppm)		
Aluminum	Al	40850
Antimony	Sb	19.6
Arsenic	As	760
Barium	Ba	60
Beryllium	Be	***0.25***
Bismuth	Bi	3.00
Cadmium	Cd	***0.25***
Calcium	Ca	29250
Chromium	Cr	1215
Cobalt	Co	81.5
Copper	Cu	23.5
Iron	Fe	63300
Lead	Pb	4.0
Magnesium	Mg	98800
Manganese	Mn	1020
Mercury	Hg	***0.005***
Molybdenum	Mo	***0.5***
Nickel	Ni	595
Phosphorus	P	15
Potassium	K	3800
Silver	Ag	0.6
Sodium	Na	8150
Strontium	Sr	97.5
Titanium	Ti	300.0
Vanadium	V	135.5
Tungsten	W	***5***
Zinc	Zn	67

Post-Test ABA & ICP Metals Data Boston B3 alteration halo			% Remaining At End Of Testing**
ABA Results:			
Paste pH		9.3	
% S (Total)		0.16	76.2
% S (SO_4)		0.03	300.0
% S (Sulphide)		0.13	65.0
% del S (SO_4)		0	
TAP (kg $CaCO_3$/t)		5.00	
SAP (kg $CaCO_3$/t)		4.06	
NP (tonne $CaCO_3$/ktonne)		310	91.2
CO2 (%)		19.3	91.5
CaNP (kg $CaCO_3$/t)		438.9	
TNNP (kg $CaCO_3$/t)		305.0	
SNNP (kg $CaCO_3$/t)		305.9	
TNPR		62.0	
SNPR		76.3	
Metals: (ppm)			
Aluminum	Al	39050	95.6
Antimony	Sb	17	86.7
Arsenic	As	485	63.8
Barium	Ba	50	83.3
Beryllium	Be	***0.25***	100.0
Bismuth	Bi	3	100.0
Cadmium	Cd	***0.25***	100.0
Calcium	Ca	27850	95.2
Chromium	Cr	1102.5	90.7
Cobalt	Co	75	92.0
Copper	Cu	22	93.6
Iron	Fe	65400	103.3
Lead	Pb	6	150.0
Magnesium	Mg	106500	107.8
Manganese	Mn	1102.5	108.1
Mercury	Hg	***0.005***	100.0
Molybdenum	Mo	***0.5***	100.0
Nickel	Ni	482.5	81.1
Phosphorus	P	10	66.7
Potassium	K	3750	98.7
Silver	Ag	0.6	100.0
Sodium	Na	8100	99.4
Strontium	Sr	94	96.4
Titanium	Ti	400	133.3
Vanadium	V	129	95.2
Tungsten	W	***5***	100.0
Zinc	Zn	79	117.9

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

** % Remaining At End Of Testing = (Post-Test / Pre-Test) * 100

Table of Contents

PROJECT: Boston — Original Dry Sample wt = 1001.1 — Orig Ttl %S = 0.21 — Original NP = 340

SAMPLE: 93NOD57 170 - B3 alteration halo — Final Dry Sample wt = 877.3 — Orig Sulphide = 0.20

		Analytical Results:									Sulphate Production:				Molar Ratios:				
Week No.	Date	Water Added (mL)	Leachate Recovered (mL)	Weekly pH (pH units)	Conductivity (umohs/cm)	Alkalinity (CaCO3 mg/L)*	Acidity (CaCO3 mg/L)*	Sulphate (SO4 mg/L)*	Acidity Production Rate (mg/kg/wk)**	Alkalinity Production Rate (mg/kg/wk)**	SO4 Production Rate (mg/kg/wk)**	Cumulative SO4 Production (mg/kg)	Remaining S (% of original)	Remaining S (Sulphide) (% of original)	Alk /SO4	Ca+Mg /Alk	Ca/SO4	Carbonate (Ca+Mg) /SO4	Feldspar (Ca+(K/2)+ (Na/2)) /SO4
0	09-Oct-97	750	630	8.6	169	57	***0***	7.3	0.00	35.87	4.59	5	99.93	99.92	7.49	0.23	0.61	1.73	9.59
1	14-Oct-97	500	445	7.7	151	42	4	9.8	1.78	18.67	4.36	9	99.86	99.85	4.11	0.53	0.65	2.18	4.87
2	17-Oct-97	500	490	7.6	173	48	4	10.3	1.96	23.49	5.04	14	99.78	99.77	4.47	0.98	1.34	4.38	5.38
3	24-Oct-97	500	500	7.5	146	39	5	8.7	2.50	19.48	4.35	18	99.71	99.69	4.30	1.07	1.60	4.61	4.27
4	29-Oct-97	500	500	7.4	140	43	5	7.7	2.50	21.48	3.85	22	99.65	99.63	5.36	1.18	2.01	6.33	4.15
5	27-Oct-97	500	480	7.3	128	34	2	7.3	0.96	16.30	3.50	26	99.59	99.57	4.47	1.49	2.05	6.66	3.55
6	14-Nov-97	500	480	7.3	123	38	3	6.9	1.44	18.22	3.31	29	99.54	99.52	5.29	1.36	2.24	7.17	3.37
7	22-Nov-97	500	450	7.1	115	35	3	6.5	1.35	15.73	2.92	32	99.49	99.47	5.17	1.63	2.77	8.42	3.46
8	17-Nov-97	500	510	6.8	84	23	4	5.2	2.04	11.72	2.65	35	99.45	99.42	4.24	1.42	2.14	6.03	2.80
9	24-Nov-97	500	465	7.0	77	20	3	5.2	1.39	9.29	2.42	37	99.41	99.38	3.69	1.48	1.87	5.46	2.48
10	01-Dec-97	500	480	7.1	82	22	2	5.3	0.96	10.55	2.54	40	99.37	99.34	3.98	1.29	1.83	5.16	2.31
11	08-Dec-97	500	430	6.8	90	17	2	7.6	0.86	7.30	3.26	43	99.32	99.29	2.15	2.30	1.96	4.94	2.49
12	15-Dec-97	500	400	7.2	109	25	4	8.0	1.60	9.99	3.20	46	99.27	99.23	3.00	1.57	1.77	4.71	2.12
13	22-Dec-97	500	390	7.1	84	18	***0.5***	6.5	0.19	7.01	2.53	49	99.23	99.19	2.66	1.89	1.88	5.02	2.27
14	29-Dec-97	500	390	7.4	77	21	4	4.1	1.56	8.18	1.60	50	99.20	99.16	4.92	1.62	3.01	7.97	3.74
15	16-Jan-98	500	405	7.4	73	15	5	4.9	2.02	6.07	1.98	52	99.17	99.13	2.94	1.93	2.13	5.66	2.66
16	19-Jan-98	500	360	7.3	75	13	6	5.9	2.16	4.67	2.12	54	99.14	99.10	2.11	2.32	1.83	4.90	2.29
17	22-Jan-98	500	400	7.8	76	19	2	4.2	0.80	7.59	1.68	56	99.11	99.07	4.34	1.60	2.80	6.96	3.38
18	26-Jan-98	500	415	7.8	64	12	1	3.6	0.41	4.97	1.49	57	99.09	99.04	3.20	2.02	2.50	6.46	3.08
19	02-Feb-98	500	415	7.5	70	20	1	2.9	0.41	8.29	1.20	59	99.07	99.02	6.62	1.52	3.97	10.03	4.99
20	09-Feb-98	500	410	7.8	76	24	2	3.1	0.82	9.83	1.27	60	99.05	99.00	7.43	1.20	3.71	8.93	4.69
21	16-Feb-98	500	380	7.7	76	25	1	2.6	0.38	9.49	0.99	61	99.03	98.98	9.23	1.33	4.93	12.23	6.02
22	23-Feb-98	500	460	7.6	62	22	2	2.3	0.92	10.11	1.06	62	99.02	98.97	9.18	1.26	4.85	11.53	5.53
23	02-Mar-98	500	500	7.6	83	27	4	4.3	2.00	13.49	2.15	64	98.98	98.93	6.03	1.32	3.26	7.95	3.71
24	09-Mar-98	500	480	7.7	64	22	3	3.3	1.44	10.55	1.58	66	98.96	98.90	6.40	1.23	3.34	7.88	3.74
25	16-Mar-98	500	475	7.8	83	28	3	5.6	1.42	13.29	2.66	68	98.91	98.86	4.80	1.34	2.74	6.44	3.06
26	23-Mar-98	500	510	8.0	79	28	3	5.1	1.53	14.26	2.60	71	98.87	98.82	5.27	1.21	2.56	6.40	2.82
27	08-Apr-98	500	300	8.0	64	23	1	3.6	0.30	6.89	1.08	72	98.86	98.80	6.13	1.07	2.76	6.55	3.02
28	15-Apr-98	500	480	7.8	77	26	2	4.8	0.96	12.47	2.30	74	98.82	98.76	5.20	1.32	2.72	6.89	3.07
29	21-Apr-98	500	500	7.9	71	26	2	4.7	1.00	12.99	2.35	77	98.78	98.72	5.31	1.11	2.50	5.87	2.69
30	28-Apr-98	500	485	7.8	97	34	3	6.8	1.45	16.47	3.29	80	98.73	98.67	4.80	1.26	2.36	6.02	2.88
31	06-May-98	500	500	8.0	84	31	1	6.3	0.50	15.48	3.15	83	98.68	98.61	4.72	1.36	2.40	6.42	2.62
32	13-May-98	500	500	8.1	71	27	2	6.0	1.00	13.49	3.00	86	98.63	98.56	4.32	1.36	2.16	5.85	2.34
33	20-May-98	500	505	8.0	70	26	2	6.7	1.01	13.12	3.38	89	98.58	98.51	3.72	1.52	2.04	5.66	2.20
34	29-May-98	500	475	7.8	48	17	4	4.2	1.90	8.07	1.99	91	98.55	98.47	3.88	1.30	2.00	5.04	2.13
35	02-Jun-98	500	510	8.0	71	26	1	7.0	0.51	13.25	3.57	95	98.49	98.41	3.56	1.27	1.73	4.54	1.84
36	10-Jun-98	500	480	8.1	64	24	1	6.1	0.48	11.51	2.92	98	98.44	98.37	3.78	1.21	1.77	4.56	1.91
37	16-Jun-98	500	500	8.0	55	21	2	4.7	1.00	10.49	2.35	100	98.41	98.33	4.29	1.26	2.22	5.39	2.36
38	22-Jun-98	500	480	8.1	75	27	1	7.4	0.48	12.95	3.55	104	98.35	98.27	3.50	1.34	1.89	4.69	2.05
39	03-Jul-98	500	495	8.1	68	22	1	5.9	0.49	10.88	2.92	107	98.30	98.22	3.58	1.32	1.89	4.74	2.04
40	09-Jul-98	500	470	8.4	52	22	1	3.6	0.47	10.33	1.69	108	98.28	98.19	5.87	0.98	2.46	5.75	2.69
41	16-Jul-98	500	475	8.1	60	24	***0.5***	5.3	0.24	11.39	2.51	111	98.24	98.15	4.35	1.06	1.85	4.59	2.01
42	23-Jul-98	500	475	8.1	61	24	***0.5***	5.2	0.24	11.39	2.47	113	98.20	98.11	4.43	1.09	2.03	4.82	2.22
43	30-Jul-98	500	490	8.1	67	27	1	6.0	0.49	13.22	2.94	116	98.15	98.06	4.32	1.11	1.96	4.81	2.17
44	07-Aug-98	500	490	7.7	44	16	1	3.8	0.49	7.83	1.86	118	98.12	98.03	4.04	1.25	2.08	5.06	2.27
45	14-Aug-98	500	470	7.7	66	25	1	6.7	0.47	11.74	3.15	121	98.07	97.98	3.58	1.05	1.56	3.77	1.68
46	21-Aug-98	500	505	8.1	55	21	1	4.8	0.50	10.59	2.42	124	98.03	97.93	4.20	1.04	1.90	4.37	2.05
47	02-Sep-98	500	475	8.2	60	23	2	5.5	0.95	10.91	2.61	126	97.99	97.89	4.01	1.17	1.90	4.69	2.10
48	02-Sep-98	500	505	8.0	55	21	2	4.1	1.01	10.59	2.07	128	97.96	97.86	4.92	1.11	2.37	5.43	2.55
49	14-Sep-98	500	485	7.8	69	26	1	6.0	0.48	12.60	2.91	131	97.91	97.81	4.16	1.16	1.90	4.84	2.04
Maximum			630	8.60	173.00	57.00	6.00	10.30	2.50	35.87	5.04	131.35	99.93	99.92	9.23	2.32	4.93	12.23	9.59
Minimum			300	6.80	44.00	12.00	0.00	2.30	0.19	4.67	0.99	4.59	97.91	97.81	2.11	0.23	0.61	1.73	1.68
Mean			466	7.72	82.66	25.92	2.25	5.59	1.06	12.29	2.63	70.75	98.88	98.82	4.67	1.32	2.29	5.93	3.11
Median			480	7.80	75.00	24.00	2.00	5.40	0.96	11.39	2.57	66.96	98.94	98.88	4.33	1.28	2.07	5.56	2.67
Mean Last 5 Weeks			488	7.96	61.00	23.20	1.40	5.42	0.68	11.29	2.63	126.25	97.99	97.89	4.17	1.11	1.92	4.62	2.08

Table of Contents

PROJECT: Boston
SAMPLE: 93NOD57 17

Week No.	Date	NP Consumption: Theoretical NP Consumption At pH 6 (mg/kg/wk)	Open-System NP Consumption At Measured pH (mg/kg/wk)	Cum NP Consumption Open-System (mg/kg)	Remaining NP Open-System (%)	Carbonate NP Consumption/ Sulphate Prod.	Molar Ratio NP Consumption (mg/kg/wk)***	Cum NP Consumption Molar Ratio (mg/kg)	Remaining NP Molar Ratio (%)	Molar Ratio NP Consumption (mg/kg/wk)***	Cum NP Consumption Molar Ratio (mg/kg)	Remaining NP Feldspar (%)	Closed-System NP Consumption Above pH 6.5 (mg/kg/wk)	Cum NP Consumption Closed-System (mg/kg)	Remaining NP Closed-System (%)
0	09-Oct-97	4.8	40.7	40.7	99.99	1.81	8.3	8.3	100.00	45.9	45.9	99.99	9.6	9.6	100.00
1	14-Oct-97	4.5	21.4	21.4	99.99	2.27	9.9	18.2	99.99	22.1	68.0	99.98	7.3	16.9	100.00
2	17-Oct-97	5.3	26.8	48.2	99.99	4.56	23.0	41.2	99.99	28.3	96.3	99.97	8.5	25.4	99.99
3	24-Oct-97	4.5	21.5	69.7	99.98	4.80	20.9	62.1	99.98	19.3	115.6	99.97	6.6	32.0	99.99
4	29-Oct-97	4.0	23.0	92.7	99.97	6.60	25.4	87.4	99.97	16.6	132.3	99.96	5.5	37.5	99.99
5	27-Oct-97	3.6	19.0	111.7	99.97	6.94	24.3	111.7	99.97	13.0	145.2	99.96	6.3	43.8	99.99
6	14-Nov-97	3.4	20.2	131.9	99.96	7.47	24.7	136.5	99.96	11.6	156.8	99.95	5.5	49.3	99.99
7	22-Nov-97	3.0	17.4	149.4	99.96	8.77	25.6	162.1	99.95	10.5	167.4	99.95	4.7	54.0	99.98
8	17-Nov-97	2.8	12.4	161.8	99.95	6.29	16.7	178.8	99.95	7.7	175.1	99.95	3.5	57.5	99.98
9	24-Nov-97	2.5	10.4	172.2	99.95	5.69	13.7	192.5	99.94	6.2	181.3	99.95	3.6	61.1	99.98
10	01-Dec-97	2.6	12.2	184.5	99.95	5.37	13.7	206.2	99.94	6.1	187.4	99.94	4.3	65.5	99.98
11	08-Dec-97	3.4	9.8	194.3	99.94	5.14	16.8	222.9	99.93	8.5	195.9	99.94	5.9	71.4	99.98
12	15-Dec-97	3.3	11.7	206.0	99.94	4.90	15.7	238.6	99.93	7.0	203.0	99.94	5.1	76.5	99.98
13	22-Dec-97	2.6	9.5	215.5	99.94	5.23	13.2	251.9	99.93	6.0	209.0	99.94	5.1	81.6	99.98
14	29-Dec-97	1.7	8.3	223.8	99.93	8.30	13.3	265.1	99.92	6.2	215.2	99.94	1.8	83.3	99.98
15	16-Jan-98	2.1	6.1	229.9	99.93	5.90	11.7	276.8	99.92	5.5	220.7	99.94	2.1	85.5	99.97
16	19-Jan-98	2.2	4.7	234.6	99.93	5.11	10.8	287.7	99.92	5.1	225.7	99.93	2.3	87.7	99.97
17	22-Jan-98	1.7	8.5	243.1	99.93	7.25	12.2	299.8	99.91	5.9	231.6	99.93	2.7	90.4	99.97
18	26-Jan-98	1.6	6.1	249.3	99.93	6.73	10.0	309.9	99.91	4.8	236.4	99.93	2.7	93.1	99.97
19	02-Feb-98	1.3	9.1	258.4	99.92	10.45	12.6	322.4	99.91	6.2	242.7	99.93	2.1	95.2	99.97
20	09-Feb-98	1.3	10.3	268.7	99.92	9.30	11.8	334.2	99.90	6.2	248.9	99.93	1.8	97.0	99.97
21	16-Feb-98	1.0	10.1	278.9	99.92	12.74	12.6	346.8	99.90	6.2	255.1	99.92	1.7	98.7	99.97
22	23-Feb-98	1.1	10.3	289.1	99.91	12.01	12.7	359.5	99.89	6.1	261.1	99.92	1.3	100.0	99.97
23	02-Mar-98	2.2	13.7	302.9	99.91	8.28	17.8	377.3	99.89	8.3	269.4	99.92	2.5	102.5	99.97
24	09-Mar-98	1.6	10.8	313.6	99.91	8.21	13.0	390.3	99.89	6.2	275.6	99.92	1.9	104.3	99.97
25	16-Mar-98	2.8	14.6	328.3	99.90	6.71	17.8	408.1	99.88	8.5	284.1	99.92	4.1	108.4	99.97
26	23-Mar-98	2.7	15.4	343.7	99.90	6.67	17.3	425.4	99.87	7.6	291.7	99.91	3.9	112.3	99.97
27	08-Apr-98	1.1	7.7	351.4	99.90	6.83	7.4	432.8	99.87	3.4	295.1	99.91	1.9	114.3	99.97
28	15-Apr-98	2.4	13.9	365.3	99.89	7.18	16.5	449.3	99.87	7.4	302.5	99.91	3.8	118.1	99.97
29	21-Apr-98	2.4	14.4	379.8	99.89	6.12	14.4	463.7	99.86	6.6	309.0	99.91	3.9	122.0	99.96
30	28-Apr-98	3.4	18.5	398.2	99.88	6.28	20.7	484.3	99.86	9.9	318.9	99.91	5.4	127.4	99.96
31	06-May-98	3.3	18.3	416.5	99.88	6.69	21.0	505.4	99.85	8.6	327.5	99.90	6.1	133.5	99.96
32	13-May-98	3.1	15.6	432.1	99.87	6.10	18.3	523.7	99.85	7.3	334.8	99.90	5.2	138.7	99.96
33	20-May-98	3.5	15.6	447.7	99.87	5.89	19.9	543.6	99.84	7.7	342.6	99.90	6.0	144.8	99.96
34	29-May-98	2.1	8.2	456.0	99.87	5.25	10.5	554.0	99.84	4.4	347.0	99.90	2.3	147.0	99.96
35	02-Jun-98	3.7	16.5	472.4	99.86	4.73	16.9	570.9	99.83	6.8	353.8	99.90	6.9	153.9	99.95
36	10-Jun-98	3.0	14.1	486.5	99.86	4.75	13.9	584.8	99.83	5.8	359.6	99.89	5.6	159.5	99.95
37	16-Jun-98	2.4	11.9	498.4	99.85	5.61	13.2	598.0	99.82	5.8	365.4	99.89	3.9	163.4	99.95
38	22-Jun-98	3.7	16.2	514.6	99.85	4.89	17.4	615.3	99.82	7.6	373.0	99.89	6.9	170.4	99.95
39	03-Jul-98	3.0	13.4	528.0	99.84	4.93	14.4	629.7	99.81	6.2	379.2	99.89	5.6	175.9	99.95
40	09-Jul-98	1.8	11.6	539.6	99.84	5.99	10.1	639.8	99.81	4.7	383.9	99.89	3.1	179.0	99.95
41	16-Jul-98	2.6	13.8	553.4	99.84	4.78	12.0	651.9	99.81	5.3	389.2	99.89	5.0	184.0	99.95
42	23-Jul-98	2.6	13.7	567.1	99.83	5.03	12.4	664.3	99.80	5.7	394.9	99.88	4.9	188.9	99.94
43	30-Jul-98	3.1	15.8	582.9	99.83	5.01	14.7	679.0	99.80	6.6	401.5	99.88	5.6	194.5	99.94
44	07-Aug-98	1.9	9.3	592.2	99.83	5.27	9.8	688.8	99.80	4.4	405.9	99.88	3.4	197.9	99.94
45	14-Aug-98	3.3	14.5	606.7	99.82	3.93	12.4	701.2	99.79	5.5	411.5	99.88	6.1	204.0	99.94
46	21-Aug-98	2.5	12.6	619.3	99.82	4.55	11.0	712.2	99.79	5.2	416.6	99.88	4.5	208.5	99.94
47	02-Sep-98	2.7	12.7	632.0	99.81	4.89	12.8	724.9	99.79	5.7	422.3	99.88	4.5	213.0	99.94
48	02-Sep-98	2.2	11.7	643.8	99.81	5.66	11.7	736.6	99.78	5.5	427.8	99.87	3.3	216.3	99.94
49	14-Sep-98	3.0	15.1	658.9	99.81	5.04	14.7	751.3	99.78	6.2	434.0	99.87	5.6	221.9	99.93
Maximum		5.25	26.79	658.90	99.99	12.74	25.63	751.30	100.00	45.92	433.99	99.99	8.55	221.90	100.00
Minimum		1.03	4.73	21.43	99.81	2.27	7.36	8.30	99.78	3.39	45.92	99.87	1.28	16.87	99.93
Mean		2.74	13.45	348.29	99.90	6.27	15.03	404.54	99.88	8.68	276.67	99.92	4.33	118.53	99.97
Median		2.68	13.42	328.26	99.90	5.89	13.70	399.19	99.88	6.23	279.84	99.92	4.49	108.44	99.97
Mean Last 5 Weeks		2.74	13.34	632.15	99.81	4.82	12.50	725.24	99.79	5.61	422.44	99.88	4.80	212.76	99.94

PROJECT: Boston
SAMPLE: 93NOD57 17

Week No.	Date	Comparative Ratios: Weekly Carb. NP Cons. /SO_4 Prod.	Cumulative Carb. NP Cons. /S04 Prod.	Weekly Ca/Mg Leach Rate	Cumulative Ca/Mg Leach Rate	Weekly Ca/Mn Leach Rate	Cumulative Ca/Mn Leach Rate
0	09-Oct-97	1.81	1.81	0.89	0.89	2467	2467
1	14-Oct-97	2.27	2.03	0.70	0.78	2524	2495
2	17-Oct-97	4.56	2.95	0.73	0.75	4259	3224
3	24-Oct-97	4.80	3.39	0.87	0.79	3742	3393
4	29-Oct-97	6.60	3.94	0.77	0.78	2932	3247
5	27-Oct-97	6.94	4.35	0.73	0.77	-	4096
6	14-Nov-97	7.47	4.71	0.75	0.77	-	4966
7	22-Nov-97	8.77	5.08	0.81	0.77	3191	4554
8	17-Nov-97	6.29	5.17	0.91	0.79	1177	3519
9	24-Nov-97	5.69	5.21	0.86	0.79	1038	2983
10	01-Dec-97	5.37	5.22	0.91	0.80	871	2539
11	08-Dec-97	5.14	5.21	1.08	0.82	1494	2389
12	15-Dec-97	4.90	5.19	0.99	0.83	1873	2341
13	22-Dec-97	5.23	5.19	0.99	0.84	7286	2438
14	29-Dec-97	8.30	5.29	1.00	0.84	1839	2394
15	16-Jan-98	5.90	5.31	0.99	0.85	1176	2284
16	19-Jan-98	5.11	5.31	0.98	0.85	3913	2324
17	22-Jan-98	7.25	5.36	1.11	0.86	1960	2303
18	26-Jan-98	6.73	5.40	1.04	0.87	2778	2318
19	02-Feb-98	10.45	5.50	1.08	0.88	1352	2247
20	09-Feb-98	9.30	5.58	1.17	0.89	1280	2177
21	16-Feb-98	12.74	5.70	1.11	0.89	1551	2141
22	23-Feb-98	12.01	5.81	1.20	0.90	1409	2096
23	02-Mar-98	8.28	5.89	1.15	0.91	1983	2089
24	09-Mar-98	8.21	5.95	1.21	0.92	1195	2030
25	16-Mar-98	6.71	5.98	1.22	0.93	2783	2058
26	23-Mar-98	6.67	6.00	1.10	0.94	1239	1999
27	08-Apr-98	6.83	6.01	1.20	0.95	933	1955
28	15-Apr-98	7.18	6.05	1.08	0.95	865	1862
29	21-Apr-98	6.12	6.05	1.22	0.96	1140	1820
30	28-Apr-98	6.28	6.06	1.06	0.96	1523	1804
31	06-May-98	6.69	6.09	0.98	0.96	1416	1784
32	13-May-98	6.10	6.09	0.96	0.96	1862	1786
33	20-May-98	5.89	6.08	0.93	0.96	1129	1750
34	29-May-98	5.25	6.06	1.08	0.96	1000	1723
35	02-Jun-98	4.73	6.01	1.01	0.97	1443	1713
36	10-Jun-98	4.75	5.97	1.04	0.97	1216	1696
37	16-Jun-98	5.61	5.96	1.15	0.97	1074	1672
38	22-Jun-98	4.89	5.93	1.12	0.97	1300	1658
39	03-Jul-98	4.93	5.90	1.09	0.98	1148	1640
40	09-Jul-98	5.99	5.90	1.24	0.98	1000	1621
41	16-Jul-98	4.78	5.88	1.12	0.98	1414	1616
42	23-Jul-98	5.03	5.86	1.20	0.99	926	1591
43	30-Jul-98	5.01	5.84	1.13	0.99	1021	1571
44	07-Aug-98	5.27	5.83	1.15	0.99	825	1549
45	14-Aug-98	3.93	5.78	1.16	0.99	879	1526
46	21-Aug-98	4.55	5.75	1.27	1.00	1041	1514
47	02-Sep-98	4.89	5.74	1.12	1.00	837	1491
48	02-Sep-98	5.66	5.74	1.27	1.00	1038	1479
49	14-Sep-98	5.04	5.72	1.06	1.01	941	1462
Maximum		12.74	6.09	1.27	1.01	7286	4966
Minimum		1.81	1.81	0.70	0.75	825	1462
Mean		6.18	5.38	1.04	0.90	1735	2228
Median		5.79	5.75	1.08	0.93	1290	2044
Mean Last 5 Weeks		4.82	5.74	1.18	1.00	947	1495

B3 Alteration Halo
Sulphate/Calcium Ratio vs Sulphate Concentration

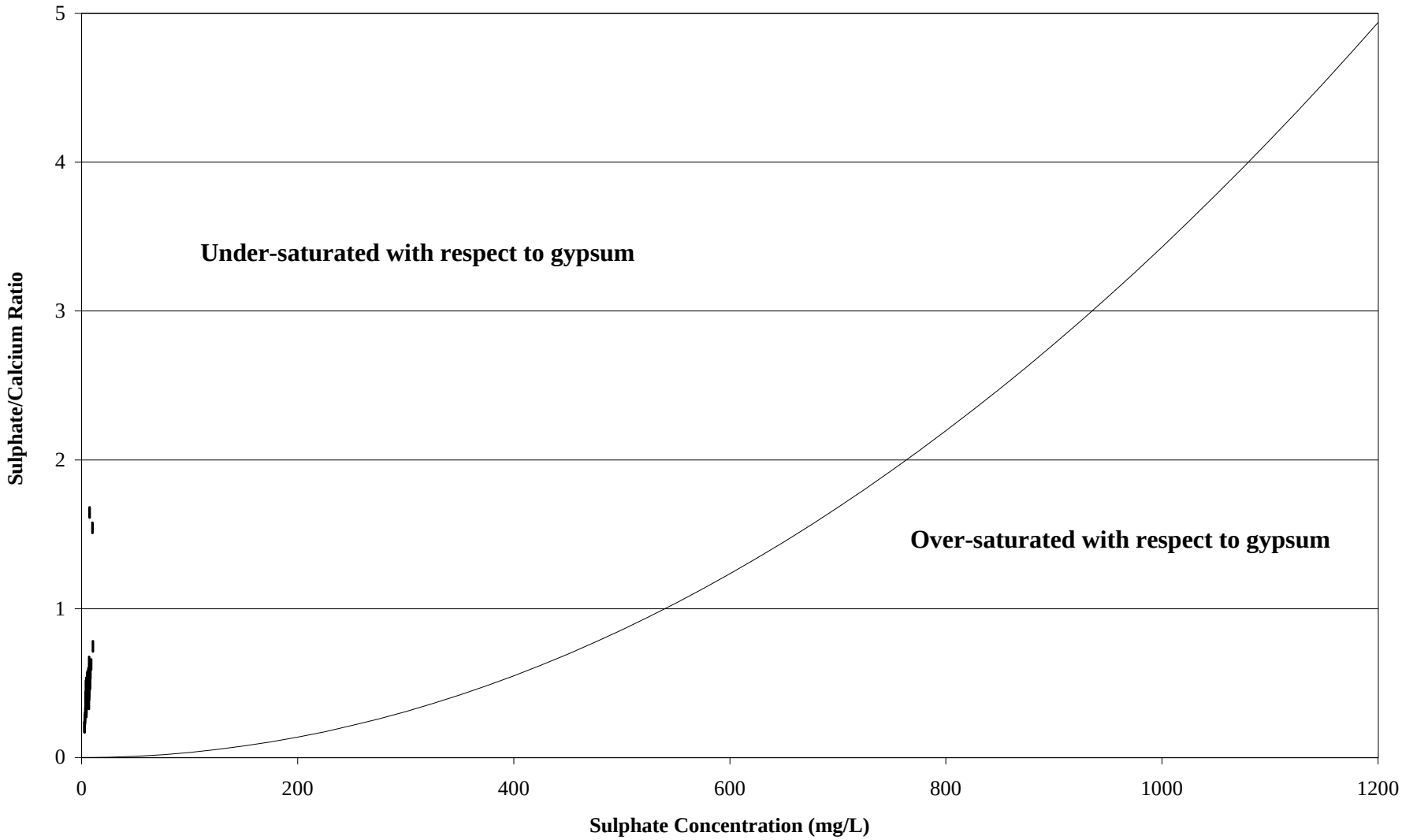


Table of Contents

Weekly Humidity Cell Data: Boston Property (B3 Alteration Halo)

Boston
93NOD57 170 - B3 alteration halo

Dissolved Metals*:

Sample mass - start (kg) 1.0011
Sample mass - end (kg) 0.8773

Week No.	Date	Aluminum Al (ug/L)	Antimony Sb (ug/L)	Arsenic As (ug/L)	Barium Ba (ug/L)	Beryllium Be (ug/L)	Bismuth Bi (ug/L)	Cadmium Cd (ug/L)	Calcium Ca (ug/L)	Chromium Cr (ug/L)	Cobalt Co (ug/L)	Copper Cu (ug/L)	Iron Fe (ug/L)	Lead Pb (ug/L)	Magnesium Mg (ug/L)	Manganese Mn (ug/L)	Mercury Hg (ug/L)
0	09-Oct-97	176	40.0	1045	0.30	***0.25***	***0.025***	***0.05***	1850	4.5	0.16	1.4	***5***	4	2080	0.75	***0.5***
1	14-Oct-97	18	131.0	5290	1.50	***0.25***	***0.025***	***0.05***	2650	0.5	1.22	2.3	***5***	8	3800	1.05	***0.5***
2	17-Oct-97	7	212.0	13440	3.80	***0.25***	***0.025***	***0.05***	5750	1	2.80	8.8	***5***	4	7930	1.35	***0.5***
3	24-Oct-97	***0.5***	198.5	9000	4.40	***0.25***	***0.025***	***0.05***	5800	1.5	3.88	2.2	***5***	***1***	6630	1.55	***0.5***
4	29-Oct-97	***0.5***	215.0	11720	2.40	***0.25***	***0.025***	***0.05***	6450	2	4.80	13.5	***5***	***1***	8420	2.20	***0.5***
5	27-Oct-97	***0.5***	227.0	16590	***0.025***	***0.25***	***0.025***	***0.05***	6250	1.5	7.44	***0.05***	***5***	***1***	8520	***0.025***	***0.5***
6	14-Nov-97	***0.5***	193.5	15020	1.75	***0.25***	***0.025***	***0.05***	6450	***0.25***	8.46	0.25	***5***	***1***	8610	***0.025***	***0.5***
7	22-Nov-97	6	188.5	13960	1.00	***0.25***	***0.025***	***0.05***	7500	1.5	2.84	2.1	***5***	16	9300	2.35	***0.5***
8	17-Nov-97	10	116.0	12130	1.15	***0.25***	***0.025***	***0.05***	4650	***0.25***	18.45	1.3	40	2	5120	3.95	***0.5***
9	24-Nov-97	69	115.5	10670	3.25	***0.25***	***0.025***	***0.05***	4050	***0.25***	14.05	***0.05***	***5***	***1***	4730	3.90	***0.5***
10	01-Dec-97	8	124.0	9800	0.80	***0.25***	***0.025***	***0.05***	4050	0.5	12.45	5.5	***5***	***1***	4460	4.65	***0.5***
11	08-Dec-97	16	119.0	10850	2.60	***0.25***	***0.025***	***0.05***	6200	***0.25***	7.10	1.6	***5***	16	5730	4.15	***0.5***
12	15-Dec-97	***0.5***	167.0	12480	1.75	***0.25***	***0.025***	***0.05***	5900	0.5	13.90	1.7	***5***	***1***	5950	3.15	***0.5***
13	22-Dec-97	***0.5***	101.5	8690	2.25	***0.25***	***0.025***	***0.05***	5100	0.5	3.30	0.8	***5***	***1***	5160	0.70	***0.5***
14	29-Dec-97	***0.5***	102.0	10530	0.35	***0.25***	***0.025***	***0.05***	5150	***0.25***	16.80	15.2	***5***	***1***	5140	2.80	***0.5***
15	16-Jan-98	***0.5***	89.1	8530	1.95	***0.25***	***0.025***	***0.05***	4350	***0.25***	13.20	2.9	***5***	***1***	4380	3.70	***0.5***
16	19-Jan-98	***0.5***	95.9	9430	3.20	***0.25***	***0.025***	0.10	4500	0.5	3.34	4.5	***5***	***1***	4590	1.15	***0.5***
17	22-Jan-98	***0.5***	109.5	10970	1.55	***0.25***	***0.025***	***0.05***	4900	0.5	6.36	3.6	***5***	***1***	4420	2.50	***0.5***
18	26-Jan-98	***0.5***	84.80	7570	1.45	***0.25***	***0.025***	***0.05***	3750	0.50	4.48	2.1	***5***	***1***	3610	1.35	***0.5***
19	02-Feb-98	***0.5***	98.90	9610	1.60	***0.25***	***0.025***	***0.05***	4800	0.50	8.90	5.3	***5***	***1***	4450	3.55	***0.5***
20	09-Feb-98	***0.5***	97.20	11220	2.80	***0.25***	***0.025***	***0.05***	4800	0.50	7.46	0.7	***5***	***1***	4090	3.75	***0.5***
21	16-Feb-98	***0.5***	97.90	9940	0.60	***0.25***	***0.025***	***0.05***	5350	1.50	6.44	1.8	***5***	***1***	4800	3.45	***0.5***
22	23-Feb-98	***0.5***	66.80	6610	3.85	***0.25***	***0.025***	0.10	4650	***0.25***	7.58	3.3	***5***	***1***	3890	3.30	***0.5***
23	02-Mar-98	***0.5***	101.00	9040	8.10	***0.25***	***0.025***	***0.05***	5850	0.50	7.20	8.6	***5***	***1***	5100	2.95	***0.5***
24	09-Mar-98	***0.5***	66.80	6260	1.15	***0.25***	***0.025***	***0.05***	4600	0.50	7.04	5.6	***5***	2	3790	3.85	***0.5***
25	16-Mar-98	***0.5***	93.20	6690	6.25	***0.25***	***0.025***	***0.05***	6400	0.50	4.62	***0.05***	***5***	***1***	5240	2.30	***0.5***
26	23-Mar-98	***0.5***	79.90	7850	1.05	***0.25***	***0.025***	***0.05***	5450	0.50	8.04	0.7	***5***	***1***	4950	4.40	***0.5***
27	08-Apr-98	5	58.10	5250	1.00	***0.25***	***0.025***	***0.05***	4150	1.00	6.78	***0.05***	10	***1***	3450	4.45	***0.5***
28	15-Apr-98	19	76.90	6450	***0.025***	***0.25***	***0.025***	***0.05***	5450	1.00	10.80	5.3	***5***	***1***	5060	6.30	***0.5***
29	21-Apr-98	***0.5***	69.80	5630	2.00	***0.25***	***0.025***	***0.05***	4900	***0.25***	10.60	14.1	***5***	***1***	4010	4.30	***0.5***
30	28-Apr-98	***0.5***	99.20	7630	***0.025***	***0.25***	***0.025***	0.20	6700	2.00	8.98	16.3	***5***	4	6300	4.40	***0.5***
31	06-May-98	***0.5***	67.00	5940	***0.025***	***0.25***	***0.025***	***0.05***	6300	2.00	10.40	2.1	***5***	***1***	6410	4.45	***0.5***
32	13-May-98	197	54.30	4600	***0.025***	***0.25***	***0.025***	***0.05***	5400	2.50	9.30	3.9	***5***	***1***	5610	2.90	***0.5***
33	20-May-98	10	53.50	4690	0.70	***0.25***	***0.025***	***0.05***	5700	1.50	7.34	6.8	***5***	***1***	6130	5.05	***0.5***
34	29-May-98	14	31.10	2910	1.00	***0.25***	***0.025***	***0.05***	3500	0.50	8.70	3.8	***5***	***1***	3230	3.50	***0.5***
35	02-Jun-98	1	49.90	5380	0.45	***0.25***	***0.025***	***0.05***	5050	0.50	6.74	6.4	***5***	***1***	4980	3.50	***0.5***
36	10-Jun-98	19	44.20	4300	1.85	***0.25***	***0.025***	***0.05***	4500	***0.25***	7.90	7.3	10	***1***	4310	3.70	***0.5***
37	16-Jun-98	10	31.10	3450	1.95	***0.25***	***0.025***	***0.05***	4350	***0.25***	6.56	3.0	10	***1***	3770	4.05	***0.5***
38	22-Jun-98	16	47.80	4630	1.85	***0.25***	***0.025***	***0.05***	5850	1.50	7.48	13.6	10	***1***	5240	4.50	***0.5***
39	03-Jul-98	11	41.50	3870	1.60	***0.25***	***0.025***	***0.05***	4650	1.00	5.72	8.1	10	***1***	4250	4.05	***0.5***
40	09-Jul-98	14	26.20	2960	0.35	***0.25***	***0.025***	***0.05***	3700	1.50	5.74	16.8	20	2	2990	3.70	***0.5***
41	16-Jul-98	16	32.20	2980	1.10	***0.25***	***0.025***	***0.05***	4100	***0.25***	4.30	7.0	***5***	***1***	3670	2.90	***0.5***
42	23-Jul-98	8	31.10	3090	1.10	***0.25***	***0.025***	***0.05***	4400	1.50	7.44	5.4	***5***	***1***	3680	4.75	***0.5***
43	30-Jul-98	14	32.30	3170	4.00	***0.25***	***0.025***	***0.05***	4900	1.00	8.16	7.1	***5***	***1***	4330	4.80	***0.5***
44	07-Aug-98	16	22.50	2310	0.80	***0.25***	***0.025***	***0.05***	3300	***0.25***	7.00	3.6	***5***	***1***	2860	4.00	***0.5***
45	14-Aug-98	10	32.30	3540	3.00	***0.25***	***0.025***	***0.05***	4350	0.50	7.84	9.3	***5***	2	3760	4.95	***0.5***
46	21-Aug-98	15	25.70	2860	0.80	***0.25***	***0.025***	***0.05***	3800	0.50	5.40	6.6	***5***	***1***	3000	3.65	***0.5***
47	02-Sep-98	188	29.00	3350	1.30	***0.25***	***0.025***	***0.05***	4350	6.00	6.92	6.9	90	***1***	3890	5.20	***0.5***
48	02-Sep-98	13	28.70	3510	1.10	***0.25***	***0.025***	***0.05***	4050	1.00	5.48	12.5	10	***1***	3180	3.90	***0.5***
49	14-Sep-98	20	33.70	3220	0.60	***0.25***	***0.025***	***0.05***	4750	1.50	7.96	9.9	***5***	***1***	4470	5.05	***0.5***
Maximum		197.00	227.00	16590	8.10	0.25	0.025	0.20	7500	6.00	18.45	16.80	90.00	16.00	9300	6.30	0.50
Minimum		0.50	22.50	1045	0.03	0.25	0.025	0.05	1850	0.25	0.16	0.05	5.00	1.00	2080	0.03	0.50
Mean		18.71	88.08	7295	1.77	0.25	0.025	0.06	4911	0.99	7.51	5.34	8.37	2.02	4878	3.30	0.50

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

Table of Contents

Weekly Humidity Cell Data: Boston Property (B3 Alteration Halo)

Boston 93NOD57 170 - B3 alteration halo															
Week No.	Date	Molybdenum Mo (ug/L)	Nickel Ni (ug/L)	Phosphorus P (ug/L)	Potassium K (ug/L)	Selenium Se (ug/L)	Silver Ag (ug/L)	Sodium Na (ug/L)	Strontium Sr (ug/L)	Tin Sn (ug/L)	Titanium Ti (ug/L)	Thallium Tl (ug/L)	Uranium U (ug/L)	Vanadium V (ug/L)	Zinc Zn (ug/L)	Leachate Recovered (mL)
0	09-Oct-97	0.10	13.4	***50***	3400	***0.5***	***0.03***	29400	15.9	***0.25***	***0.5***	***0.025***	***0.025***	4.0	***0.3***	630
1	14-Oct-97	0.10	91	***50***	3550	***0.5***	0.50	17700	27.4	***0.25***	***0.5***	***0.025***	***0.025***	3.0	1.5	445
2	17-Oct-97	0.20	280	***50***	5400	***0.5***	0.55	16750	53.1	1.50	***0.5***	***0.025***	***0.025***	6.0	10.0	490
3	24-Oct-97	0.20	362	***50***	4400	***0.5***	0.45	8550	56.2	***0.25***	***0.5***	***0.025***	***0.025***	6.0	22.5	500
4	29-Oct-97	0.20	497	***50***	4700	***0.5***	0.40	5150	60.9	0.50	***0.5***	***0.025***	***0.025***	6.0	20.5	500
5	27-Oct-97	1.20	650	***50***	3400	3.0	0.10	3250	53.3	***0.25***	***0.5***	***0.025***	***0.025***	3.0	49.0	480
6	14-Nov-97	***0.05***	745	***50***	3050	***0.5***	0.60	1950	51.9	***0.25***	***0.5***	***0.025***	***0.025***	3.0	24.0	480
7	22-Nov-97	0.60	560	***50***	2300	18.0	***0.03***	800	50.5	0.50	***0.5***	***0.025***	***0.025***	4.0	13.0	450
8	17-Nov-97	***0.05***	1155	***50***	1750	1.0	0.55	600	41.7	***0.25***	***0.5***	***0.025***	***0.025***	3.0	3.5	510
9	24-Nov-97	1.80	926	***50***	1650	***0.5***	0.45	550	34.4	***0.25***	2	***0.025***	***0.025***	***0.5***	***0.3***	465
10	01-Dec-97	0.20	958	***50***	1300	***0.5***	0.35	450	36.6	***0.25***	***0.5***	***0.025***	***0.025***	2.0	2.0	480
11	08-Dec-97	0.20	545	***50***	1600	1.0	1.50	1000	46.9	***0.25***	***0.5***	***0.025***	***0.025***	1.0	10.0	430
12	15-Dec-97	***0.05***	1090	***50***	1500	***0.5***	0.60	450	48.9	***0.25***	***0.5***	***0.025***	***0.025***	3.0	0.5	400
13	22-Dec-97	0.60	317	***50***	1300	***0.5***	0.75	450	36.3	***0.25***	***0.5***	***0.025***	***0.025***	1.0	1.0	390
14	29-Dec-97	0.30	1160	***50***	1400	***0.5***	1.00	600	32.3	***0.25***	***0.5***	***0.025***	***0.025***	1.0	***0.25***	390
15	16-Jan-98	0.30	862	***50***	1100	***0.5***	1.55	600	29.7	***0.25***	***0.5***	***0.025***	***0.025***	1.0	2.0	405
16	19-Jan-98	***0.05***	379	***50***	1200	***0.5***	0.85	600	32.7	***0.25***	***0.5***	***0.025***	***0.025***	1.0	21.0	360
17	22-Jan-98	0.20	618.0	***50***	1050	***0.5***	0.80	550	31.9	***0.25***	***0.5***	***0.025***	***0.025***	2.0	3.5	400
18	26-Jan-98	0.50	397.0	***50***	850	1.0	0.80	500	25.80	***0.25***	***0.5***	***0.025***	***0.025***	1.0	0.5	415
19	02-Feb-98	0.30	709.0	***50***	1050	***0.5***	0.75	800	26.00	***0.25***	***0.5***	***0.025***	***0.025***	2.0	1.0	415
20	09-Feb-98	0.40	572.0	***50***	1100	***0.5***	1.05	800	30.30	***0.25***	***0.5***	***0.025***	***0.025***	1.0	2.0	410
21	16-Feb-98	0.60	474.0	***50***	950	***0.5***	1.25	800	32.00	***0.25***	***0.5***	***0.025***	***0.025***	1.0	0.5	380
22	23-Feb-98	***0.05***	500.0	***50***	600	***0.5***	0.30	400	25.40	***0.25***	***0.5***	***0.025***	***0.025***	1.0	5.5	460
23	02-Mar-98	0.10	454.0	***50***	800	***0.5***	0.30	450	34.40	***0.25***	***0.5***	***0.025***	***0.025***	2.0	3.0	500
24	09-Mar-98	0.10	433.0	***50***	550	***0.5***	0.10	300	26.00	0.50	***0.5***	***0.025***	***0.025***	1.0	0.5	480
25	16-Mar-98	1.50	303.0	***50***	800	1.0	0.20	400	37.70	1.50	***0.5***	***0.025***	***0.025***	1.0	8.0	475
26	23-Mar-98	0.10	406.0	***50***	550	***0.5***	0.30	300	29.50	1.50	***0.5***	***0.025***	***0.025***	1.0	2.5	510
27	08-Apr-98	0.10	314.0	***50***	400	***0.5***	0.20	200	20.60	***0.25***	***0.5***	***0.025***	***0.025***	1.0	2.5	300
28	15-Apr-98	***0.05***	398.0	***50***	600	3.0	***0.025***	450	15.05	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	3.0	480
29	21-Apr-98	***0.05***	403.0	***50***	300	2.0	***0.025***	250	22.60	0.50	***0.5***	***0.025***	***0.025***	1.0	9.0	500
30	28-Apr-98	0.10	360.0	***50***	1250	3.0	***0.025***	950	31.90	1.50	***0.5***	***0.025***	***0.025***	3.0	47.0	485
31	06-May-98	0.10	317.0	***50***	550	4.0	***0.025***	350	20.70	***0.25***	***0.5***	***0.025***	***0.025***	1.0	13.0	500
32	13-May-98	0.10	274.0	***50***	400	***0.5***	***0.025***	300	18.85	***0.25***	***0.5***	***0.025***	***0.025***	1.0	8.5	500
33	20-May-98	0.10	256.0	***50***	450	2	***0.025***	250	21.80	***0.25***	***0.5***	***0.025***	***0.025***	1.0	5.5	505
34	29-May-98	***0.05***	269.0	***50***	200	***0.5***	***0.025***	150	14.80	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	2.5	475
35	02-Jun-98	0.05	243.0	***50***	300	***0.5***	***0.025***	200	20.10	***0.25***	***0.5***	***0.025***	***0.025***	0.5	***0.25***	510
36	10-Jun-98	0.50	291.0	***50***	350	***0.5***	***0.025***	200	20.50	***0.25***	***0.5***	***0.025***	***0.025***	1.0	1.5	480
37	16-Jun-98	1.30	231.0	***50***	300	***0.5***	0.20	150	17.25	***0.25***	***0.5***	***0.025***	***0.025***	1.0	2.0	500
38	22-Jun-98	***0.05***	312.0	***50***	400	***0.5***	***0.025***	300	23.40	***0.25***	***0.5***	***0.025***	***0.025***	1.0	2.0	480
39	03-Jul-98	***0.05***	235.0	***50***	300	***0.5***	***0.025***	250	19.35	***0.25***	***0.5***	***0.025***	***0.025***	1.0	1.0	495
40	09-Jul-98	0.10	244.0	***50***	250	***0.5***	***0.025***	250	14.45	***0.25***	***0.5***	***0.025***	***0.025***	1.0	1.5	470
41	16-Jul-98	0.30	177.5	***50***	250	***0.5***	***0.025***	250	16.20	***0.25***	***0.5***	***0.025***	***0.025***	1.0	0.5	475
42	23-Jul-98	1.10	281.0	***50***	300	***0.5***	***0.025***	300	16.40	***0.25***	***0.5***	***0.025***	***0.025***	1.0	0.5	475
43	30-Jul-98	0.10	304.0	***50***	350	***0.5***	***0.025***	400	18.75	***0.25***	***0.5***	***0.025***	***0.025***	1.0	3.5	490
44	07-Aug-98	0.10	221.0	***50***	250	***0.5***	***0.025***	200	13.60	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	2.5	490
45	14-Aug-98	***0.05***	273.0	***50***	250	***0.5***	***0.025***	250	18.35	***0.25***	***0.5***	***0.025***	***0.025***	***0.5***	2.0	470
46	21-Aug-98	***0.05***	203.0	***50***	250	***0.5***	***0.025***	200	14.70	***0.25***	***0.5***	***0.025***	***0.025***	1.0	0.5	505
47	02-Sep-98	0.30	226.0	***50***	300	***0.5***	0.050	350	16.25	***0.25***	1	***0.025***	***0.025***	2.0	***0.3***	475
48	02-Sep-98	0.20	206.0	***50***	200	***0.5***	***0.025***	250	15.00	***0.25***	***0.5***	***0.025***	***0.025***	1.0	0.5	505
49	14-Sep-98	***0.05***	279.0	***50***	250	***0.5***	***0.025***	250	18.25	0.50	***0.5***	***0.025***	***0.025***	1.0	0.5	485
Maximum		1.80	1160	50	5400	18.00	1.55	29400	60.90	1.50	2.00	0.025	0.025	6.00	49.00	630.00
Minimum		0.05	13	50	200	0.50	0.03	150	13.60	0.25	0.50	0.025	0.025	0.50	0.25	300.00
Mean		0.31	439	50	1214	1.18	0.35	2053	28.94	0.37	0.54	0.025	0.025	1.71	6.48	465.61

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

Table of Contents

Weekly Humidity Cell Data: Boston Property (B3 Alteration Halo)

Boston 93NOD57 170 - B3 alteration halo		**Metal Loading/Leaching Rates****														
Week No.	Date	Aluminum Al (mg/kg/wk)	Antimony Sb (mg/kg/wk)	Arsenic As (mg/kg/wk)	Barium Ba (mg/kg/wk)	Beryllium Be (mg/kg/wk)	Bismuth Bi (mg/kg/wk)	Cadmium Cd (mg/kg/wk)	Calcium Ca (mg/kg/wk)	Chromium Cr (mg/kg/wk)	Cobalt Co (mg/kg/wk)	Copper Cu (mg/kg/wk)	Iron Fe (mg/kg/wk)	Lead Pb (mg/kg/wk)	Magnesium Mg (mg/kg/wk)	Manganese Mn (mg/kg/wk)
0	09-Oct-97	0.1108	0.0252	0.658	0.00019	0.00016	0.00002	0.00003	1.164	0.0028	0.0001	0.0009	0.0031	0.0025	1.309	0.00047
1	14-Oct-97	0.0080	0.0582	2.351	0.00067	0.00011	0.00001	0.00002	1.178	0.0002	0.0005	0.0010	0.0022	0.0036	1.689	0.00047
2	17-Oct-97	0.0034	0.1038	6.578	0.00186	0.00012	0.00001	0.00002	2.814	0.0005	0.0014	0.0043	0.0024	0.0020	3.881	0.00066
3	24-Oct-97	0.0002	0.0991	4.495	0.00220	0.00012	0.00001	0.00002	2.897	0.0007	0.0019	0.0011	0.0025	0.0005	3.311	0.00077
4	29-Oct-97	0.0002	0.1074	5.854	0.00120	0.00012	0.00001	0.00002	3.221	0.0010	0.0024	0.0067	0.0025	0.0005	4.205	0.00110
5	27-Oct-97	0.0002	0.1088	7.954	0.00001	0.00012	0.00001	0.00002	2.997	0.0007	0.0036	0.0000	0.0024	0.0005	4.085	0.00001
6	14-Nov-97	0.0002	0.0928	7.202	0.00084	0.00012	0.00001	0.00002	3.093	0.0001	0.0041	0.0001	0.0024	0.0005	4.128	0.00001
7	22-Nov-97	0.0027	0.0847	6.275	0.00045	0.00011	0.00001	0.00002	3.371	0.0007	0.0013	0.0009	0.0022	0.0072	4.180	0.00106
8	17-Nov-97	0.0051	0.0591	6.180	0.00059	0.00013	0.00001	0.00003	2.369	0.0001	0.0094	0.0007	0.0204	0.0010	2.608	0.00201
9	24-Nov-97	0.0320	0.0536	4.956	0.00151	0.00012	0.00001	0.00002	1.881	0.0001	0.0065	0.0000	0.0023	0.0005	2.197	0.00181
10	01-Dec-97	0.0038	0.0595	4.699	0.00038	0.00012	0.00001	0.00002	1.942	0.0002	0.0060	0.0026	0.0024	0.0005	2.138	0.00223
11	08-Dec-97	0.0069	0.0511	4.660	0.00112	0.00011	0.00001	0.00002	2.663	0.0001	0.0030	0.0007	0.0021	0.0069	2.461	0.00178
12	15-Dec-97	0.0002	0.0667	4.987	0.00070	0.00010	0.00001	0.00002	2.357	0.0002	0.0056	0.0007	0.0020	0.0004	2.377	0.00126
13	22-Dec-97	0.0002	0.0395	3.385	0.00088	0.00010	0.00001	0.00002	1.987	0.0002	0.0013	0.0003	0.0019	0.0004	2.010	0.00027
14	29-Dec-97	0.0002	0.0397	4.102	0.00014	0.00010	0.00001	0.00002	2.006	0.0001	0.0065	0.0059	0.0019	0.0004	2.002	0.00109
15	16-Jan-98	0.0002	0.0360	3.451	0.00079	0.00010	0.00001	0.00002	1.760	0.0001	0.0053	0.0012	0.0020	0.0004	1.772	0.00150
16	19-Jan-98	0.0002	0.0345	3.391	0.00115	0.00009	0.00001	0.00004	1.618	0.0002	0.0012	0.0016	0.0018	0.0004	1.651	0.00041
17	22-Jan-98	0.0002	0.0438	4.383	0.00062	0.00010	0.00001	0.00002	1.958	0.0002	0.0025	0.0014	0.0020	0.0004	1.766	0.00100
18	26-Jan-98	0.0002	0.0352	3.138	0.00060	0.00010	0.00001	0.00002	1.555	0.0002	0.0019	0.0009	0.0021	0.0004	1.497	0.00056
19	02-Feb-98	0.0002	0.0410	3.984	0.00066	0.00010	0.00001	0.00002	1.990	0.0002	0.0037	0.0022	0.0021	0.0004	1.845	0.00147
20	09-Feb-98	0.0002	0.0398	4.595	0.00115	0.00010	0.00001	0.00002	1.966	0.0002	0.0031	0.0003	0.0020	0.0004	1.675	0.00154
21	16-Feb-98	0.0002	0.0372	3.773	0.00023	0.00009	0.00001	0.00002	2.031	0.0006	0.0024	0.0007	0.0019	0.0004	1.822	0.00131
22	23-Feb-98	0.0002	0.0307	3.037	0.00177	0.00011	0.00001	0.00005	2.137	0.0001	0.0035	0.0015	0.0023	0.0005	1.787	0.00152
23	02-Mar-98	0.0002	0.0504	4.515	0.00405	0.00012	0.00001	0.00002	2.922	0.0002	0.0036	0.0043	0.0025	0.0005	2.547	0.00147
24	09-Mar-98	0.0002	0.0320	3.001	0.00055	0.00012	0.00001	0.00002	2.206	0.0002	0.0034	0.0027	0.0024	0.0010	1.817	0.00185
25	16-Mar-98	0.0002	0.0442	3.174	0.00297	0.00012	0.00001	0.00002	3.037	0.0002	0.0022	0.0000	0.0024	0.0005	2.486	0.00109
26	23-Mar-98	0.0003	0.0407	3.999	0.00053	0.00013	0.00001	0.00003	2.776	0.0003	0.0041	0.0004	0.0025	0.0005	2.522	0.00224
27	08-Apr-98	0.0015	0.0174	1.573	0.00030	0.00007	0.00001	0.00001	1.244	0.0003	0.0020	0.0000	0.0030	0.0003	1.034	0.00133
28	15-Apr-98	0.0091	0.0369	3.093	0.00001	0.00012	0.00001	0.00002	2.613	0.0005	0.0052	0.0025	0.0024	0.0005	2.426	0.00302
29	21-Apr-98	0.0002	0.0349	2.812	0.00100	0.00012	0.00001	0.00002	2.447	0.0001	0.0053	0.0070	0.0025	0.0005	2.003	0.00215
30	28-Apr-98	0.0002	0.0481	3.696	0.00001	0.00012	0.00001	0.00010	3.246	0.0010	0.0044	0.0079	0.0024	0.0019	3.052	0.00213
31	06-May-98	0.0002	0.0335	2.967	0.00001	0.00012	0.00001	0.00002	3.147	0.0010	0.0052	0.0010	0.0025	0.0005	3.201	0.00222
32	13-May-98	0.0984	0.0271	2.297	0.00001	0.00012	0.00001	0.00002	2.697	0.0012	0.0046	0.0019	0.0025	0.0005	2.802	0.00145
33	20-May-98	0.0050	0.0270	2.366	0.00035	0.00013	0.00001	0.00003	2.875	0.0008	0.0037	0.0034	0.0025	0.0005	3.092	0.00255
34	29-May-98	0.0066	0.0148	1.381	0.00047	0.00012	0.00001	0.00002	1.661	0.0002	0.0041	0.0018	0.0024	0.0005	1.533	0.00166
35	02-Jun-98	0.0005	0.0254	2.741	0.00023	0.00013	0.00001	0.00003	2.573	0.0003	0.0034	0.0033	0.0025	0.0005	2.537	0.00178
36	10-Jun-98	0.0091	0.0212	2.062	0.00089	0.00012	0.00001	0.00002	2.158	0.0001	0.0038	0.0035	0.0048	0.0005	2.067	0.00177
37	16-Jun-98	0.0050	0.0155	1.723	0.00097	0.00012	0.00001	0.00002	2.173	0.0001	0.0033	0.0015	0.0050	0.0005	1.883	0.00202
38	22-Jun-98	0.0077	0.0229	2.220	0.00089	0.00012	0.00001	0.00002	2.805	0.0007	0.0036	0.0065	0.0048	0.0005	2.512	0.00216
39	03-Jul-98	0.0054	0.0205	1.914	0.00079	0.00012	0.00001	0.00002	2.299	0.0005	0.0028	0.0040	0.0049	0.0005	2.101	0.00200
40	09-Jul-98	0.0066	0.0123	1.390	0.00016	0.00012	0.00001	0.00002	1.737	0.0007	0.0027	0.0079	0.0094	0.0009	1.404	0.00174
41	16-Jul-98	0.0076	0.0153	1.414	0.00052	0.00012	0.00001	0.00002	1.945	0.0001	0.0020	0.0033	0.0024	0.0005	1.741	0.00138
42	23-Jul-98	0.0038	0.0148	1.466	0.00052	0.00012	0.00001	0.00002	2.088	0.0007	0.0035	0.0026	0.0024	0.0005	1.746	0.00225
43	30-Jul-98	0.0069	0.0158	1.552	0.00196	0.00012	0.00001	0.00002	2.398	0.0005	0.0040	0.0035	0.0024	0.0005	2.119	0.00235
44	07-Aug-98	0.0078	0.0110	1.131	0.00039	0.00012	0.00001	0.00002	1.615	0.0001	0.0034	0.0018	0.0024	0.0005	1.400	0.00196
45	14-Aug-98	0.0047	0.0152	1.662	0.00141	0.00012	0.00001	0.00002	2.042	0.0002	0.0037	0.0044	0.0023	0.0009	1.765	0.00232
46	21-Aug-98	0.0076	0.0130	1.443	0.00040	0.00013	0.00001	0.00003	1.917	0.0003	0.0027	0.0033	0.0025	0.0005	1.513	0.00184
47	02-Sep-98	0.0892	0.0138	1.590	0.00062	0.00012	0.00001	0.00002	2.064	0.0028	0.0033	0.0033	0.0427	0.0005	1.846	0.00247
48	02-Sep-98	0.0066	0.0145	1.771	0.00055	0.00013	0.00001	0.00003	2.043	0.0005	0.0028	0.0063	0.0050	0.0005	1.604	0.00197
49	14-Sep-98	0.0097	0.0163	1.560	0.00029	0.00012	0.00001	0.00002	2.301	0.0007	0.0039	0.0048	0.0024	0.0005	2.166	0.00245
Maximum		0.1108	0.1088	7.954	0.00405	0.00016	0.00002	0.00010	3.371	0.0028	0.0094	0.0079	0.0427	0.0072	4.205	0.00302
Minimum		0.0002	0.0110	0.658	0.00001	0.00007	0.00001	0.00001	1.164	0.0001	0.0001	0.0000	0.0018	0.0003	1.034	0.00001
Mean		0.0095	0.0405	3.327	0.00082	0.00012	0.00001	0.00003	2.279	0.0005	0.0035	0.0025	0.0039	0.0009	2.268	0.00154

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

Table of Contents

Weekly Humidity Cell Data: Boston Property (B3 Alteration Halo)

Boston
93NOD57 170 - B3 alteration halo

Week No.	Date	Mercury Hg (mg/kg/wk)	Molybdenum Mo (mg/kg/wk)	Nickel Ni (mg/kg/wk)	Phosphorus P (mg/kg/wk)	Potassium K (mg/kg/wk)	Selenium Se (mg/kg/wk)	Silver Ag (mg/kg/wk)	Sodium Na (mg/kg/wk)	Strontium Sr (mg/kg/wk)	Tin Sn (mg/kg/wk)	Titanium Ti (mg/kg/wk)	Thallium Tl (mg/kg/wk)	Uranium U (mg/kg/wk)	Vanadium V (mg/kg/wk)	Zinc Zn (mg/kg/wk)
0	09-Oct-97	0.00031	0.00006	0.008	0.031	2.140	0.00031	0.00002	18.502	0.010	0.00016	0.00031	0.00002	0.00002	0.0025	0.0002
1	14-Oct-97	0.00022	0.00004	0.040	0.022	1.578	0.00022	0.00022	7.868	0.012	0.00011	0.00022	0.00001	0.00001	0.0013	0.0007
2	17-Oct-97	0.00024	0.00010	0.137	0.024	2.643	0.00024	0.00027	8.198	0.026	0.00073	0.00024	0.00001	0.00001	0.0029	0.0049
3	24-Oct-97	0.00025	0.00010	0.181	0.025	2.198	0.00025	0.00022	4.270	0.028	0.00012	0.00025	0.00001	0.00001	0.0030	0.0112
4	29-Oct-97	0.00025	0.00010	0.248	0.025	2.347	0.00025	0.00020	2.572	0.030	0.00025	0.00025	0.00001	0.00001	0.0030	0.0102
5	27-Oct-97	0.00024	0.00058	0.312	0.024	1.630	0.00144	0.00005	1.558	0.026	0.00012	0.00024	0.00001	0.00001	0.0014	0.0235
6	14-Nov-97	0.00024	0.00002	0.357	0.024	1.462	0.00024	0.00029	0.935	0.025	0.00012	0.00024	0.00001	0.00001	0.0014	0.0115
7	22-Nov-97	0.00022	0.00027	0.252	0.022	1.034	0.00809	0.00001	0.360	0.023	0.00022	0.00022	0.00001	0.00001	0.0018	0.0058
8	17-Nov-97	0.00025	0.00003	0.588	0.025	0.892	0.00051	0.00028	0.306	0.021	0.00013	0.00025	0.00001	0.00001	0.0015	0.0018
9	24-Nov-97	0.00023	0.00084	0.430	0.023	0.766	0.00023	0.00021	0.255	0.016	0.00012	0.00093	0.00001	0.00001	0.0002	0.0001
10	01-Dec-97	0.00024	0.00010	0.459	0.024	0.623	0.00024	0.00017	0.216	0.018	0.00012	0.00024	0.00001	0.00001	0.0010	0.0010
11	08-Dec-97	0.00021	0.00009	0.234	0.021	0.687	0.00043	0.00064	0.430	0.020	0.00011	0.00021	0.00001	0.00001	0.0004	0.0043
12	15-Dec-97	0.00020	0.00002	0.436	0.020	0.599	0.00020	0.00024	0.180	0.020	0.00010	0.00020	0.00001	0.00001	0.0012	0.0002
13	22-Dec-97	0.00019	0.00023	0.123	0.019	0.506	0.00019	0.00029	0.175	0.014	0.00010	0.00019	0.00001	0.00001	0.0004	0.0004
14	29-Dec-97	0.00019	0.00012	0.452	0.019	0.545	0.00019	0.00039	0.234	0.013	0.00010	0.00019	0.00001	0.00001	0.0004	0.0001
15	16-Jan-98	0.00020	0.00012	0.349	0.020	0.445	0.00020	0.00063	0.243	0.012	0.00010	0.00020	0.00001	0.00001	0.0004	0.0008
16	19-Jan-98	0.00018	0.00002	0.136	0.018	0.432	0.00018	0.00031	0.216	0.012	0.00009	0.00018	0.00001	0.00001	0.0004	0.0076
17	22-Jan-98	0.00020	0.00008	0.247	0.020	0.420	0.00020	0.00032	0.220	0.013	0.00010	0.00020	0.00001	0.00001	0.0008	0.0014
18	26-Jan-98	0.00021	0.00021	0.165	0.021	0.352	0.00041	0.00033	0.207	0.011	0.00010	0.00021	0.00001	0.00001	0.0004	0.0002
19	02-Feb-98	0.00021	0.00012	0.294	0.021	0.435	0.00021	0.00031	0.332	0.011	0.00010	0.00021	0.00001	0.00001	0.0008	0.0004
20	09-Feb-98	0.00020	0.00016	0.234	0.020	0.451	0.00020	0.00043	0.328	0.012	0.00010	0.00020	0.00001	0.00001	0.0004	0.0008
21	16-Feb-98	0.00019	0.00023	0.180	0.019	0.361	0.00019	0.00047	0.304	0.012	0.00009	0.00019	0.00001	0.00001	0.0004	0.0002
22	23-Feb-98	0.00023	0.00002	0.230	0.023	0.276	0.00023	0.00014	0.184	0.012	0.00011	0.00023	0.00001	0.00001	0.0005	0.0025
23	02-Mar-98	0.00025	0.00005	0.227	0.025	0.400	0.00025	0.00015	0.225	0.017	0.00012	0.00025	0.00001	0.00001	0.0010	0.0015
24	09-Mar-98	0.00024	0.00005	0.208	0.024	0.264	0.00024	0.00005	0.144	0.012	0.00024	0.00024	0.00001	0.00001	0.0005	0.0002
25	16-Mar-98	0.00024	0.00071	0.144	0.024	0.380	0.00047	0.00009	0.190	0.018	0.00071	0.00024	0.00001	0.00001	0.0005	0.0038
26	23-Mar-98	0.00025	0.00005	0.207	0.025	0.280	0.00025	0.00015	0.153	0.015	0.00076	0.00025	0.00001	0.00001	0.0005	0.0013
27	08-Apr-98	0.00015	0.00003	0.094	0.015	0.120	0.00015	0.00006	0.060	0.006	0.00007	0.00015	0.00001	0.00001	0.0003	0.0007
28	15-Apr-98	0.00024	0.00002	0.191	0.024	0.288	0.00144	0.00001	0.216	0.007	0.00012	0.00024	0.00001	0.00001	0.0002	0.0014
29	21-Apr-98	0.00025	0.00002	0.201	0.025	0.150	0.00100	0.00001	0.125	0.011	0.00025	0.00025	0.00001	0.00001	0.0005	0.0045
30	28-Apr-98	0.00024	0.00005	0.174	0.024	0.606	0.00145	0.00001	0.460	0.015	0.00073	0.00024	0.00001	0.00001	0.0015	0.0228
31	06-May-98	0.00025	0.00005	0.158	0.025	0.275	0.00200	0.00001	0.175	0.010	0.00012	0.00025	0.00001	0.00001	0.0005	0.0065
32	13-May-98	0.00025	0.00005	0.137	0.025	0.200	0.00025	0.00001	0.150	0.009	0.00012	0.00025	0.00001	0.00001	0.0005	0.0042
33	20-May-98	0.00025	0.00005	0.129	0.025	0.227	0.00101	0.00001	0.126	0.011	0.00013	0.00025	0.00001	0.00001	0.0005	0.0028
34	29-May-98	0.00024	0.00002	0.128	0.024	0.095	0.00024	0.00001	0.071	0.007	0.00012	0.00024	0.00001	0.00001	0.0002	0.0012
35	02-Jun-98	0.00025	0.00003	0.124	0.025	0.153	0.00025	0.00001	0.102	0.010	0.00013	0.00025	0.00001	0.00001	0.0003	0.0001
36	10-Jun-98	0.00024	0.00024	0.140	0.024	0.168	0.00024	0.00001	0.096	0.010	0.00012	0.00024	0.00001	0.00001	0.0005	0.0007
37	16-Jun-98	0.00025	0.00065	0.115	0.025	0.150	0.00025	0.00010	0.075	0.009	0.00012	0.00025	0.00001	0.00001	0.0005	0.0010
38	22-Jun-98	0.00024	0.00002	0.150	0.024	0.192	0.00024	0.00001	0.144	0.011	0.00012	0.00024	0.00001	0.00001	0.0005	0.0010
39	03-Jul-98	0.00025	0.00002	0.116	0.025	0.148	0.00025	0.00001	0.124	0.010	0.00012	0.00025	0.00001	0.00001	0.0005	0.0005
40	09-Jul-98	0.00023	0.00005	0.115	0.023	0.117	0.00023	0.00001	0.117	0.007	0.00012	0.00023	0.00001	0.00001	0.0005	0.0007
41	16-Jul-98	0.00024	0.00014	0.084	0.024	0.119	0.00024	0.00001	0.119	0.008	0.00012	0.00024	0.00001	0.00001	0.0005	0.0002
42	23-Jul-98	0.00024	0.00052	0.133	0.024	0.142	0.00024	0.00001	0.142	0.008	0.00012	0.00024	0.00001	0.00001	0.0005	0.0002
43	30-Jul-98	0.00024	0.00005	0.149	0.024	0.171	0.00024	0.00001	0.196	0.009	0.00012	0.00024	0.00001	0.00001	0.0005	0.0017
44	07-Aug-98	0.00024	0.00005	0.108	0.024	0.122	0.00024	0.00001	0.098	0.007	0.00012	0.00024	0.00001	0.00001	0.0002	0.0012
45	14-Aug-98	0.00023	0.00002	0.128	0.023	0.117	0.00023	0.00001	0.117	0.009	0.00012	0.00023	0.00001	0.00001	0.0002	0.0009
46	21-Aug-98	0.00025	0.00003	0.102	0.025	0.126	0.00025	0.00001	0.101	0.007	0.00013	0.00025	0.00001	0.00001	0.0005	0.0003
47	02-Sep-98	0.00024	0.00014	0.107	0.024	0.142	0.00024	0.00002	0.166	0.008	0.00012	0.00047	0.00001	0.00001	0.0009	0.0001
48	02-Sep-98	0.00025	0.00010	0.104	0.025	0.101	0.00025	0.00001	0.126	0.008	0.00013	0.00025	0.00001	0.00001	0.0005	0.0003
49	14-Sep-98	0.00024	0.00002	0.135	0.024	0.121	0.00024	0.00001	0.121	0.009	0.00024	0.00024	0.00001	0.00001	0.0005	0.0002
Maximum		0.00031	0.00084	0.588	0.031	2.643	0.00809	0.00064	18.502	0.030	0.00076	0.00093	0.00002	0.00002	0.0030	0.0235
Minimum		0.00015	0.00002	0.008	0.015	0.095	0.00015	0.00001	0.060	0.006	0.00007	0.00015	0.00001	0.00001	0.0002	0.0001
Mean		0.00023	0.00014	0.199	0.023	0.573	0.00055	0.00015	1.059	0.013	0.00018	0.00025	0.00001	0.00001	0.0008	0.0031

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

Table of Contents

Weekly Humidity Cell Data: Boston Property (B3 Alteration Halo)

Boston 93NOD57 170 - B3 alteration halo		**Cumulative Metal Loading/Leaching**														
Week No.	Date	Aluminum Al (mg/kg)	Antimony Sb (mg/kg)	Arsenic As (mg/kg)	Barium Ba (mg/kg)	Beryllium Be (mg/kg)	Bismuth Bi (mg/kg)	Cadmium Cd (mg/kg)	Calcium Ca (mg/kg)	Chromium Cr (mg/kg)	Cobalt Co (mg/kg)	Copper Cu (mg/kg)	Iron Fe (mg/kg)	Lead Pb (mg/kg)	Magnesium Mg (mg/kg)	Manganese Mn (mg/kg)
0	09-Oct-97	0.111	0.025	0.658	0.0002	0.0002	0.00002	0.00003	1.164	0.0028	0.0001	0.0009	0.0031	0.0025	1.309	0.0005
1	14-Oct-97	0.119	0.083	3.009	0.0009	0.0003	0.00003	0.00005	2.342	0.0031	0.0006	0.0019	0.0054	0.0061	2.998	0.0009
2	17-Oct-97	0.122	0.187	9.587	0.0027	0.0004	0.00004	0.00008	5.157	0.0035	0.0020	0.0062	0.0078	0.0080	6.880	0.0016
3	24-Oct-97	0.122	0.286	14.083	0.0049	0.0005	0.00005	0.00010	8.053	0.0043	0.0040	0.0073	0.0103	0.0085	10.191	0.0024
4	29-Oct-97	0.123	0.394	19.936	0.0061	0.0006	0.00006	0.00013	11.275	0.0053	0.0063	0.0141	0.0128	0.0090	14.396	0.0035
5	27-Oct-97	0.123	0.503	27.891	0.0061	0.0008	0.00008	0.00015	14.272	0.0060	0.0099	0.0141	0.0152	0.0095	18.481	0.0035
6	14-Nov-97	0.123	0.595	35.092	0.0070	0.0009	0.00009	0.00018	17.364	0.0061	0.0140	0.0142	0.0176	0.0100	22.610	0.0035
7	22-Nov-97	0.126	0.680	41.367	0.0074	0.0010	0.00010	0.00020	20.735	0.0068	0.0152	0.0151	0.0199	0.0172	26.790	0.0046
8	17-Nov-97	0.131	0.739	47.547	0.0080	0.0011	0.00011	0.00022	23.104	0.0069	0.0246	0.0158	0.0402	0.0182	29.398	0.0066
9	24-Nov-97	0.163	0.793	52.503	0.0095	0.0012	0.00012	0.00025	24.986	0.0070	0.0312	0.0158	0.0426	0.0187	31.595	0.0084
10	01-Dec-97	0.167	0.852	57.202	0.0099	0.0014	0.00014	0.00027	26.927	0.0073	0.0371	0.0185	0.0450	0.0191	33.734	0.0106
11	08-Dec-97	0.174	0.903	61.862	0.0110	0.0015	0.00015	0.00029	29.590	0.0074	0.0402	0.0191	0.0471	0.0260	36.195	0.0124
12	15-Dec-97	0.174	0.970	66.849	0.0117	0.0016	0.00016	0.00031	31.948	0.0076	0.0457	0.0198	0.0491	0.0264	38.572	0.0136
13	22-Dec-97	0.174	1.010	70.234	0.0126	0.0017	0.00017	0.00033	33.935	0.0078	0.0470	0.0201	0.0510	0.0268	40.583	0.0139
14	29-Dec-97	0.174	1.049	74.336	0.0127	0.0018	0.00018	0.00035	35.941	0.0079	0.0536	0.0261	0.0530	0.0272	42.585	0.0150
15	16-Jan-98	0.175	1.085	77.787	0.0135	0.0019	0.00019	0.00037	37.701	0.0080	0.0589	0.0272	0.0550	0.0276	44.357	0.0165
16	19-Jan-98	0.175	1.120	81.178	0.0147	0.0019	0.00019	0.00041	39.319	0.0082	0.0601	0.0289	0.0568	0.0280	46.008	0.0169
17	22-Jan-98	0.175	1.164	85.561	0.0153	0.0020	0.00020	0.00043	41.277	0.0084	0.0627	0.0303	0.0588	0.0284	47.774	0.0179
18	26-Jan-98	0.175	1.199	88.699	0.0159	0.0022	0.00022	0.00045	42.831	0.0086	0.0645	0.0312	0.0609	0.0288	49.270	0.0185
19	02-Feb-98	0.175	1.240	92.683	0.0165	0.0023	0.00023	0.00047	44.821	0.0088	0.0682	0.0334	0.0630	0.0292	51.115	0.0200
20	09-Feb-98	0.176	1.280	97.278	0.0177	0.0024	0.00024	0.00049	46.787	0.0090	0.0713	0.0336	0.0650	0.0296	52.790	0.0215
21	16-Feb-98	0.176	1.317	101.051	0.0179	0.0025	0.00025	0.00051	48.818	0.0096	0.0737	0.0343	0.0669	0.0300	54.612	0.0228
22	23-Feb-98	0.176	1.347	104.089	0.0197	0.0026	0.00026	0.00055	50.954	0.0097	0.0772	0.0358	0.0692	0.0304	56.399	0.0243
23	02-Mar-98	0.176	1.398	108.604	0.0237	0.0027	0.00027	0.00058	53.876	0.0099	0.0808	0.0401	0.0717	0.0309	58.947	0.0258
24	09-Mar-98	0.176	1.430	111.605	0.0243	0.0028	0.00028	0.00060	56.082	0.0102	0.0842	0.0428	0.0741	0.0319	60.764	0.0276
25	16-Mar-98	0.177	1.474	114.779	0.0272	0.0029	0.00029	0.00063	59.118	0.0104	0.0864	0.0428	0.0765	0.0324	63.250	0.0287
26	23-Mar-98	0.177	1.515	118.778	0.0278	0.0031	0.00031	0.00065	61.895	0.0107	0.0904	0.0432	0.0790	0.0329	65.772	0.0310
27	08-Apr-98	0.178	1.532	120.352	0.0281	0.0031	0.00031	0.00067	63.139	0.0110	0.0925	0.0432	0.0820	0.0332	66.806	0.0323
28	15-Apr-98	0.188	1.569	123.444	0.0281	0.0033	0.00033	0.00069	65.752	0.0114	0.0977	0.0458	0.0844	0.0337	69.232	0.0353
29	21-Apr-98	0.188	1.604	126.256	0.0291	0.0034	0.00034	0.00072	68.199	0.0116	0.1030	0.0528	0.0869	0.0342	71.234	0.0375
30	28-Apr-98	0.188	1.652	129.953	0.0291	0.0035	0.00035	0.00081	71.445	0.0125	0.1073	0.0607	0.0893	0.0361	74.287	0.0396
31	06-May-98	0.188	1.686	132.919	0.0291	0.0036	0.00036	0.00084	74.591	0.0135	0.1125	0.0618	0.0918	0.0366	77.488	0.0418
32	13-May-98	0.287	1.713	135.217	0.0291	0.0037	0.00037	0.00086	77.288	0.0148	0.1171	0.0637	0.0943	0.0371	80.290	0.0433
33	20-May-98	0.292	1.740	137.583	0.0295	0.0039	0.00039	0.00089	80.164	0.0155	0.1208	0.0671	0.0968	0.0376	83.382	0.0458
34	29-May-98	0.298	1.754	138.964	0.0300	0.0040	0.00040	0.00091	81.824	0.0158	0.1250	0.0689	0.0992	0.0381	84.915	0.0475
35	02-Jun-98	0.299	1.780	141.704	0.0302	0.0041	0.00041	0.00094	84.397	0.0160	0.1284	0.0722	0.1018	0.0386	87.452	0.0493
36	10-Jun-98	0.308	1.801	143.766	0.0311	0.0042	0.00042	0.00096	86.555	0.0161	0.1322	0.0757	0.1066	0.0391	89.518	0.0510
37	16-Jun-98	0.313	1.817	145.489	0.0320	0.0044	0.00044	0.00099	88.727	0.0163	0.1355	0.0772	0.1116	0.0396	91.401	0.0531
38	22-Jun-98	0.321	1.839	147.709	0.0329	0.0045	0.00045	0.00101	91.532	0.0170	0.1391	0.0837	0.1163	0.0400	93.914	0.0552
39	03-Jul-98	0.326	1.860	149.623	0.0337	0.0046	0.00046	0.00104	93.832	0.0175	0.1419	0.0877	0.1213	0.0405	96.015	0.0572
40	09-Jul-98	0.333	1.872	151.012	0.0339	0.0047	0.00047	0.00106	95.569	0.0182	0.1446	0.0956	0.1307	0.0415	97.419	0.0590
41	16-Jul-98	0.340	1.888	152.426	0.0344	0.0048	0.00048	0.00108	97.514	0.0183	0.1466	0.0989	0.1331	0.0419	99.160	0.0603
42	23-Jul-98	0.344	1.902	153.892	0.0349	0.0050	0.00050	0.00111	99.602	0.0190	0.1502	0.1015	0.1354	0.0424	100.906	0.0626
43	30-Jul-98	0.351	1.918	155.444	0.0369	0.0051	0.00051	0.00113	102.000	0.0195	0.1541	0.1050	0.1379	0.0429	103.026	0.0649
44	07-Aug-98	0.359	1.929	156.575	0.0373	0.0052	0.00052	0.00116	103.615	0.0196	0.1576	0.1067	0.1403	0.0434	104.426	0.0669
45	14-Aug-98	0.363	1.944	158.237	0.0387	0.0053	0.00053	0.00118	105.658	0.0199	0.1613	0.1111	0.1427	0.0443	106.191	0.0692
46	21-Aug-98	0.371	1.957	159.679	0.0391	0.0055	0.00055	0.00120	107.574	0.0201	0.1640	0.1144	0.1452	0.0448	107.704	0.0711
47	02-Sep-98	0.460	1.971	161.269	0.0397	0.0056	0.00056	0.00123	109.638	0.0230	0.1673	0.1177	0.1879	0.0453	109.550	0.0735
48	02-Sep-98	0.467	1.985	163.039	0.0403	0.0057	0.00057	0.00125	111.681	0.0235	0.1700	0.1240	0.1929	0.0458	111.154	0.0755
49	14-Sep-98	0.476	2.002	164.599	0.0406	0.0058	0.00058	0.00128	113.983	0.0242	0.1739	0.1288	0.1954	0.0463	113.320	0.0779
Maximum		0.467	1.985	163.039	0.0403	0.0057	0.00057	0.00125	111.681	0.0235	0.1700	0.1240	0.1929	0.0458	111.154	0.0755
Minimum		0.111	0.025	0.658	0.0002	0.0002	0.00002	0.00003	1.164	0.0028	0.0001	0.0009	0.0031	0.0025	1.309	0.0005
Mean		0.224	1.313	100.996	0.0219	0.0029	0.00029	0.00063	57.767	0.0117	0.0853	0.0504	0.0785	0.0300	61.487	0.0319

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

Table of Contents

Weekly Humidity Cell Data: Boston Property (B3 Alteration Halo)

Boston
93NOD57 170 - B3 alteration halo

Week No.	Date	Mercury Hg (mg/kg)	Molybdenum Mo (mg/kg)	Nickel Ni (mg/kg)	Phosphorus P (mg/kg)	Potassium K (mg/kg)	Selenium Se (mg/kg)	Silver Ag (mg/kg)	Sodium Na (mg/kg)	Strontium Sr (mg/kg)	Tin Sn (mg/kg)	Titanium Ti (mg/kg)	Thallium Tl (mg/kg)	Uranium U (mg/kg)	Vanadium V (mg/kg)	Zinc Zn (mg/kg)
0	09-Oct-97	0.0003	0.0001	0.008	0.031	2.140	0.0003	0.0000	18.502	0.010	0.00016	0.00031	0.00002	0.00002	0.00252	0.00016
1	14-Oct-97	0.0005	0.0001	0.049	0.054	3.718	0.0005	0.0002	26.369	0.022	0.00027	0.00054	0.00003	0.00003	0.00385	0.00082
2	17-Oct-97	0.0008	0.0002	0.186	0.078	6.361	0.0008	0.0005	34.568	0.048	0.00100	0.00078	0.00004	0.00004	0.00679	0.00572
3	24-Oct-97	0.0010	0.0003	0.367	0.103	8.558	0.0010	0.0007	38.838	0.076	0.00113	0.00103	0.00005	0.00005	0.00978	0.01696
4	29-Oct-97	0.0013	0.0004	0.615	0.128	10.906	0.0013	0.0009	41.410	0.107	0.00138	0.00128	0.00006	0.00006	0.01278	0.02720
5	27-Oct-97	0.0015	0.0010	0.927	0.152	12.536	0.0027	0.0010	42.969	0.132	0.00150	0.00152	0.00008	0.00008	0.01422	0.05069
6	14-Nov-97	0.0018	0.0010	1.284	0.176	13.998	0.0030	0.0013	43.904	0.157	0.00162	0.00176	0.00009	0.00009	0.01566	0.06220
7	22-Nov-97	0.0020	0.0013	1.536	0.199	15.032	0.0111	0.0013	44.263	0.180	0.00184	0.00199	0.00010	0.00010	0.01746	0.06804
8	17-Nov-97	0.0022	0.0013	2.124	0.224	15.924	0.0116	0.0016	44.569	0.201	0.00197	0.00224	0.00011	0.00011	0.01898	0.06982
9	24-Nov-97	0.0025	0.0021	2.554	0.247	16.690	0.0118	0.0018	44.824	0.217	0.00209	0.00317	0.00012	0.00012	0.01922	0.06994
10	01-Dec-97	0.0027	0.0022	3.013	0.271	17.313	0.0120	0.0019	45.040	0.235	0.00221	0.00341	0.00014	0.00014	0.02018	0.07090
11	08-Dec-97	0.0029	0.0023	3.247	0.293	18.001	0.0125	0.0026	45.470	0.255	0.00231	0.00362	0.00015	0.00015	0.02060	0.07519
12	15-Dec-97	0.0031	0.0023	3.683	0.313	18.600	0.0127	0.0028	45.650	0.274	0.00241	0.00382	0.00016	0.00016	0.02180	0.07539
13	22-Dec-97	0.0033	0.0026	3.807	0.332	19.106	0.0129	0.0031	45.825	0.288	0.00251	0.00402	0.00017	0.00017	0.02219	0.07578
14	29-Dec-97	0.0035	0.0027	4.258	0.352	19.652	0.0131	0.0035	46.059	0.301	0.00261	0.00421	0.00018	0.00018	0.02258	0.07588
15	16-Jan-98	0.0037	0.0028	4.607	0.372	20.097	0.0133	0.0041	46.301	0.313	0.00271	0.00442	0.00019	0.00019	0.02299	0.07669
16	19-Jan-98	0.0039	0.0028	4.743	0.390	20.528	0.0134	0.0044	46.517	0.325	0.00280	0.00459	0.00019	0.00019	0.02335	0.08424
17	22-Jan-98	0.0041	0.0029	4.990	0.410	20.948	0.0136	0.0048	46.737	0.338	0.00290	0.00479	0.00020	0.00020	0.02415	0.08564
18	26-Jan-98	0.0043	0.0031	5.155	0.431	21.300	0.0140	0.0051	46.944	0.348	0.00300	0.00500	0.00022	0.00022	0.02456	0.08585
19	02-Feb-98	0.0045	0.0032	5.449	0.451	21.736	0.0143	0.0054	47.276	0.359	0.00311	0.00521	0.00023	0.00023	0.02539	0.08626
20	09-Feb-98	0.0047	0.0034	5.683	0.472	22.186	0.0145	0.0058	47.603	0.371	0.00321	0.00541	0.00024	0.00024	0.02580	0.08708
21	16-Feb-98	0.0049	0.0036	5.863	0.491	22.547	0.0146	0.0063	47.907	0.384	0.00330	0.00560	0.00025	0.00025	0.02618	0.08727
22	23-Feb-98	0.0051	0.0037	6.093	0.514	22.822	0.0149	0.0064	48.091	0.395	0.00342	0.00583	0.00026	0.00026	0.02664	0.08980
23	02-Mar-98	0.0054	0.0037	6.320	0.539	23.222	0.0151	0.0066	48.316	0.412	0.00354	0.00608	0.00027	0.00027	0.02764	0.09130
24	09-Mar-98	0.0056	0.0038	6.527	0.563	23.486	0.0154	0.0066	48.459	0.425	0.00378	0.00632	0.00028	0.00028	0.02812	0.09154
25	16-Mar-98	0.0059	0.0045	6.671	0.586	23.865	0.0158	0.0067	48.649	0.443	0.00449	0.00656	0.00029	0.00029	0.02859	0.09533
26	23-Mar-98	0.0061	0.0045	6.878	0.612	24.145	0.0161	0.0069	48.802	0.458	0.00526	0.00682	0.00031	0.00031	0.02910	0.09660
27	08-Apr-98	0.0063	0.0045	6.972	0.627	24.265	0.0162	0.0069	48.862	0.464	0.00533	0.00696	0.00031	0.00031	0.02940	0.09735
28	15-Apr-98	0.0065	0.0046	7.163	0.651	24.553	0.0177	0.0070	49.078	0.471	0.00545	0.00720	0.00033	0.00033	0.02964	0.09879
29	21-Apr-98	0.0068	0.0046	7.364	0.676	24.703	0.0187	0.0070	49.203	0.482	0.00570	0.00745	0.00034	0.00034	0.03014	0.10329
30	28-Apr-98	0.0070	0.0046	7.538	0.700	25.308	0.0201	0.0070	49.663	0.498	0.00643	0.00770	0.00035	0.00035	0.03159	0.12606
31	06-May-98	0.0072	0.0047	7.697	0.725	25.583	0.0221	0.0070	49.838	0.508	0.00655	0.00795	0.00036	0.00036	0.03209	0.13255
32	13-May-98	0.0075	0.0047	7.834	0.750	25.783	0.0224	0.0070	49.988	0.518	0.00668	0.00820	0.00037	0.00037	0.03259	0.13680
33	20-May-98	0.0078	0.0048	7.963	0.775	26.010	0.0234	0.0070	50.114	0.529	0.00681	0.00845	0.00039	0.00039	0.03310	0.13957
34	29-May-98	0.0080	0.0048	8.090	0.799	26.105	0.0236	0.0070	50.185	0.536	0.00692	0.00869	0.00040	0.00040	0.03333	0.14076
35	02-Jun-98	0.0082	0.0048	8.214	0.824	26.258	0.0239	0.0070	50.287	0.546	0.00705	0.00894	0.00041	0.00041	0.03359	0.14088
36	10-Jun-98	0.0085	0.0051	8.354	0.848	26.425	0.0241	0.0071	50.383	0.556	0.00717	0.00918	0.00042	0.00042	0.03407	0.14160
37	16-Jun-98	0.0087	0.0057	8.469	0.873	26.575	0.0244	0.0072	50.457	0.564	0.00730	0.00943	0.00044	0.00044	0.03457	0.14260
38	22-Jun-98	0.0090	0.0058	8.619	0.897	26.767	0.0246	0.0072	50.601	0.576	0.00742	0.00967	0.00045	0.00045	0.03505	0.14356
39	03-Jul-98	0.0092	0.0058	8.735	0.922	26.915	0.0249	0.0072	50.725	0.585	0.00754	0.00992	0.00046	0.00046	0.03554	0.14406
40	09-Jul-98	0.0095	0.0058	8.849	0.945	27.033	0.0251	0.0072	50.842	0.592	0.00766	0.01015	0.00047	0.00047	0.03601	0.14476
41	16-Jul-98	0.0097	0.0060	8.934	0.969	27.151	0.0253	0.0072	50.961	0.600	0.00778	0.01039	0.00048	0.00048	0.03648	0.14500
42	23-Jul-98	0.0099	0.0065	9.067	0.993	27.294	0.0256	0.0072	51.103	0.607	0.00789	0.01063	0.00050	0.00050	0.03696	0.14523
43	30-Jul-98	0.0102	0.0065	9.216	1.017	27.465	0.0258	0.0072	51.299	0.617	0.00802	0.01087	0.00051	0.00051	0.03745	0.14695
44	07-Aug-98	0.0104	0.0066	9.324	1.042	27.587	0.0261	0.0072	51.397	0.623	0.00814	0.01112	0.00052	0.00052	0.03769	0.14817
45	14-Aug-98	0.0107	0.0066	9.452	1.065	27.705	0.0263	0.0073	51.514	0.632	0.00826	0.01135	0.00053	0.00053	0.03793	0.14911
46	21-Aug-98	0.0109	0.0066	9.554	1.091	27.831	0.0265	0.0073	51.615	0.639	0.00838	0.01160	0.00055	0.00055	0.03843	0.14936
47	02-Sep-98	0.0111	0.0068	9.662	1.114	27.973	0.0268	0.0073	51.781	0.647	0.00850	0.01208	0.00056	0.00056	0.03938	0.14948
48	02-Sep-98	0.0114	0.0069	9.766	1.139	28.074	0.0270	0.0073	51.907	0.655	0.00863	0.01233	0.00057	0.00057	0.03989	0.14973
49	14-Sep-98	0.0116	0.0069	9.901	1.164	28.195	0.0273	0.0073	52.029	0.663	0.00887	0.01257	0.00058	0.00058	0.04037	0.14998
Maximum		0.0114	0.0069	9.766	1.139	28.074	0.0270	0.0073	51.907	0.655	0.00863	0.01233	0.00057	0.00057	0.03989	0.14973
Minimum		0.0003	0.0001	0.008	0.031	2.140	0.0003	0.0000	18.502	0.010	0.00016	0.00031	0.00002	0.00002	0.00252	0.00016
Mean		0.0058	0.0038	5.785	0.576	21.404	0.0164	0.0051	46.769	0.398	0.00461	0.00634	0.00029	0.00029	0.02665	0.09833

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

Table of Contents

Weekly Humidity Cell Data: Boston Property (B3 Alteration Halo)

Boston 93NOD57 170 - B3 alteration halo		**Remaining Metal (%):**														
Week No.	Date	Aluminum Al	Antimony Sb	Arsenic As	Barium Ba	Beryllium Be	Bismuth Bi	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn
0	09-Oct-97	100.000	99.872	99.913	100.000	N/A	N/A	N/A	99.996	100.000	100.000	99.996	100.0000	N/A	99.999	100.000
1	14-Oct-97	100.000	99.574	99.604	99.999	N/A	N/A	N/A	99.992	100.000	99.999	99.992	100.0000	N/A	99.997	100.000
2	17-Oct-97	100.000	99.045	98.738	99.995	N/A	N/A	N/A	99.982	100.000	99.998	99.974	100.0000	N/A	99.993	100.000
3	24-Oct-97	100.000	98.539	98.147	99.992	N/A	N/A	N/A	99.972	100.000	99.995	99.969	100.0000	N/A	99.990	100.000
4	29-Oct-97	100.000	97.991	97.377	99.990	N/A	N/A	N/A	99.961	100.000	99.992	99.940	100.0000	N/A	99.985	100.000
5	27-Oct-97	100.000	97.436	96.330	99.990	N/A	N/A	N/A	99.951	100.000	99.988	99.940	100.0000	N/A	99.981	100.000
6	14-Nov-97	100.000	96.963	95.383	99.988	N/A	N/A	N/A	99.941	99.999	99.983	99.940	100.0000	N/A	99.977	100.000
7	22-Nov-97	100.000	96.530	94.557	99.988	N/A	N/A	N/A	99.929	99.999	99.981	99.936	100.0000	N/A	99.973	100.000
8	17-Nov-97	100.000	96.229	93.744	99.987	N/A	N/A	N/A	99.921	99.999	99.970	99.933	99.9999	N/A	99.970	99.999
9	24-Nov-97	100.000	95.955	93.092	99.984	N/A	N/A	N/A	99.915	99.999	99.962	99.933	99.9999	N/A	99.968	99.999
10	01-Dec-97	100.000	95.652	92.473	99.984	N/A	N/A	N/A	99.908	99.999	99.954	99.921	99.9999	N/A	99.966	99.999
11	08-Dec-97	100.000	95.391	91.860	99.982	N/A	N/A	N/A	99.899	99.999	99.951	99.919	99.9999	N/A	99.963	99.999
12	15-Dec-97	100.000	95.051	91.204	99.980	N/A	N/A	N/A	99.891	99.999	99.944	99.916	99.9999	N/A	99.961	99.999
13	22-Dec-97	100.000	94.849	90.759	99.979	N/A	N/A	N/A	99.884	99.999	99.942	99.914	99.9999	N/A	99.959	99.999
14	29-Dec-97	100.000	94.646	90.219	99.979	N/A	N/A	N/A	99.877	99.999	99.934	99.889	99.9999	N/A	99.957	99.999
15	16-Jan-98	100.000	94.462	89.765	99.977	N/A	N/A	N/A	99.871	99.999	99.928	99.884	99.9999	N/A	99.955	99.998
16	19-Jan-98	100.000	94.286	89.319	99.976	N/A	N/A	N/A	99.866	99.999	99.926	99.877	99.9999	N/A	99.953	99.998
17	22-Jan-98	100.000	94.063	88.742	99.975	N/A	N/A	N/A	99.859	99.999	99.923	99.871	99.9999	N/A	99.952	99.998
18	26-Jan-98	100.000	93.884	88.329	99.974	N/A	N/A	N/A	99.854	99.999	99.921	99.867	99.9999	N/A	99.950	99.998
19	02-Feb-98	100.000	93.675	87.805	99.972	N/A	N/A	N/A	99.847	99.999	99.916	99.858	99.9999	N/A	99.948	99.998
20	09-Feb-98	100.000	93.471	87.200	99.971	N/A	N/A	N/A	99.840	99.999	99.913	99.857	99.9999	N/A	99.947	99.998
21	16-Feb-98	100.000	93.282	86.704	99.970	N/A	N/A	N/A	99.833	99.999	99.910	99.854	99.9999	N/A	99.945	99.998
22	23-Feb-98	100.000	93.125	86.304	99.967	N/A	N/A	N/A	99.826	99.999	99.905	99.847	99.9999	N/A	99.943	99.998
23	02-Mar-98	100.000	92.868	85.710	99.960	N/A	N/A	N/A	99.816	99.999	99.901	99.829	99.9999	N/A	99.940	99.997
24	09-Mar-98	100.000	92.704	85.315	99.960	N/A	N/A	N/A	99.808	99.999	99.897	99.818	99.9999	N/A	99.938	99.997
25	16-Mar-98	100.000	92.479	84.897	99.955	N/A	N/A	N/A	99.798	99.999	99.894	99.818	99.9999	N/A	99.936	99.997
26	23-Mar-98	100.000	92.271	84.371	99.954	N/A	N/A	N/A	99.788	99.999	99.889	99.816	99.9999	N/A	99.933	99.997
27	08-Apr-98	100.000	92.182	84.164	99.953	N/A	N/A	N/A	99.784	99.999	99.887	99.816	99.9999	N/A	99.932	99.997
28	15-Apr-98	100.000	91.994	83.757	99.953	N/A	N/A	N/A	99.775	99.999	99.880	99.805	99.9999	N/A	99.930	99.997
29	21-Apr-98	100.000	91.816	83.387	99.952	N/A	N/A	N/A	99.767	99.999	99.874	99.775	99.9999	N/A	99.928	99.996
30	28-Apr-98	100.000	91.571	82.901	99.951	N/A	N/A	N/A	99.756	99.999	99.868	99.742	99.9999	N/A	99.925	99.996
31	06-May-98	100.000	91.400	82.511	99.951	N/A	N/A	N/A	99.745	99.999	99.862	99.737	99.9999	N/A	99.922	99.996
32	13-May-98	99.999	91.262	82.208	99.951	N/A	N/A	N/A	99.736	99.999	99.856	99.729	99.9999	N/A	99.919	99.996
33	20-May-98	99.999	91.124	81.897	99.951	N/A	N/A	N/A	99.726	99.999	99.852	99.714	99.9998	N/A	99.916	99.996
34	29-May-98	99.999	91.049	81.715	99.950	N/A	N/A	N/A	99.720	99.999	99.847	99.707	99.9998	N/A	99.914	99.995
35	02-Jun-98	99.999	90.919	81.355	99.950	N/A	N/A	N/A	99.711	99.999	99.842	99.693	99.9998	N/A	99.911	99.995
36	10-Jun-98	99.999	90.811	81.083	99.948	N/A	N/A	N/A	99.704	99.999	99.838	99.678	99.9998	N/A	99.909	99.995
37	16-Jun-98	99.999	90.732	80.857	99.947	N/A	N/A	N/A	99.697	99.999	99.834	99.672	99.9998	N/A	99.907	99.995
38	22-Jun-98	99.999	90.615	80.565	99.945	N/A	N/A	N/A	99.687	99.999	99.829	99.644	99.9998	N/A	99.905	99.995
39	03-Jul-98	99.999	90.510	80.313	99.944	N/A	N/A	N/A	99.679	99.999	99.826	99.627	99.9998	N/A	99.903	99.994
40	09-Jul-98	99.999	90.448	80.130	99.944	N/A	N/A	N/A	99.673	99.999	99.823	99.593	99.9998	N/A	99.901	99.994
41	16-Jul-98	99.999	90.370	79.944	99.943	N/A	N/A	N/A	99.667	99.998	99.820	99.579	99.9998	N/A	99.900	99.994
42	23-Jul-98	99.999	90.294	79.751	99.942	N/A	N/A	N/A	99.659	99.998	99.816	99.568	99.9998	N/A	99.898	99.994
43	30-Jul-98	99.999	90.214	79.547	99.939	N/A	N/A	N/A	99.651	99.998	99.811	99.553	99.9998	N/A	99.896	99.994
44	07-Aug-98	99.999	90.158	79.398	99.938	N/A	N/A	N/A	99.646	99.998	99.807	99.546	99.9998	N/A	99.894	99.993
45	14-Aug-98	99.999	90.080	79.179	99.936	N/A	N/A	N/A	99.639	99.998	99.802	99.527	99.9998	N/A	99.893	99.993
46	21-Aug-98	99.999	90.014	78.990	99.935	N/A	N/A	N/A	99.632	99.998	99.799	99.513	99.9998	N/A	99.891	99.993
47	02-Sep-98	99.999	89.944	78.780	99.934	N/A	N/A	N/A	99.625	99.998	99.795	99.499	99.9997	N/A	99.889	99.993
48	02-Sep-98	99.999	89.870	78.547	99.933	N/A	N/A	N/A	99.618	99.998	99.791	99.472	99.9997	N/A	99.887	99.993
49	14-Sep-98	99.999	89.787	78.342	99.932	N/A	N/A	N/A	99.610	99.998	99.787	99.452	99.9997	N/A	99.885	99.992
Maximum		100.000	99.872	99.913	100.000	N/A	N/A	N/A	99.996	100.000	100.000	99.996	100.0000	N/A	99.999	100.000
Minimum		99.999	89.870	78.547	99.933	N/A	N/A	N/A	99.618	99.998	99.791	99.472	99.9997	N/A	99.887	99.993
Mean		99.999	93.299	86.711	99.964	N/A	N/A	N/A	99.803	99.999	99.895	99.786	99.9999	N/A	99.938	99.997

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Table of Contents

Weekly Humidity Cell Data: Boston Property (B3 Alteration Halo)

Boston 93NOD57 170 - B3 alteration halo																
Week No.	Date	Mercury Hg	Molybdenum Mo	Nickel Ni	Phosphorus P	Potassium K	Selenium Se	Silver Ag	Sodium Na	Strontium Sr	Tin Sn	Titanium Ti	Thallium Tl	Uranium U	Vanadium V	Zinc Zn
0	09-Oct-97	N/A	99.987	99.999	N/A	99.944	N/A	99.997	99.773	99.990	N/A	N/A	N/A	N/A	99.998	100.000
1	14-Oct-97	N/A	99.979	99.992	N/A	99.902	N/A	99.960	99.676	99.977	N/A	N/A	N/A	N/A	99.997	99.999
2	17-Oct-97	N/A	99.959	99.969	N/A	99.833	N/A	99.915	99.576	99.951	N/A	N/A	N/A	N/A	99.995	99.991
3	24-Oct-97	N/A	99.939	99.938	N/A	99.775	N/A	99.878	99.523	99.922	N/A	N/A	N/A	N/A	99.993	99.975
4	29-Oct-97	N/A	99.919	99.897	N/A	99.713	N/A	99.845	99.492	99.891	N/A	N/A	N/A	N/A	99.991	99.959
5	27-Oct-97	N/A	99.804	99.844	N/A	99.670	N/A	99.837	99.473	99.864	N/A	N/A	N/A	N/A	99.990	99.924
6	14-Nov-97	N/A	99.799	99.784	N/A	99.632	N/A	99.789	99.461	99.839	N/A	N/A	N/A	N/A	99.988	99.907
7	22-Nov-97	N/A	99.745	99.742	N/A	99.604	N/A	99.787	99.457	99.816	N/A	N/A	N/A	N/A	99.987	99.898
8	17-Nov-97	N/A	99.740	99.643	N/A	99.581	N/A	99.740	99.453	99.794	N/A	N/A	N/A	N/A	99.986	99.896
9	24-Nov-97	N/A	99.573	99.571	N/A	99.561	N/A	99.705	99.450	99.777	N/A	N/A	N/A	N/A	99.986	99.896
10	01-Dec-97	N/A	99.554	99.494	N/A	99.544	N/A	99.677	99.447	99.759	N/A	N/A	N/A	N/A	99.985	99.894
11	08-Dec-97	N/A	99.537	99.454	N/A	99.526	N/A	99.570	99.442	99.739	N/A	N/A	N/A	N/A	99.985	99.888
12	15-Dec-97	N/A	99.533	99.381	N/A	99.511	N/A	99.530	99.440	99.719	N/A	N/A	N/A	N/A	99.984	99.887
13	22-Dec-97	N/A	99.486	99.360	N/A	99.497	N/A	99.481	99.438	99.704	N/A	N/A	N/A	N/A	99.984	99.887
14	29-Dec-97	N/A	99.462	99.284	N/A	99.483	N/A	99.416	99.435	99.691	N/A	N/A	N/A	N/A	99.983	99.887
15	16-Jan-98	N/A	99.438	99.226	N/A	99.471	N/A	99.312	99.432	99.679	N/A	N/A	N/A	N/A	99.983	99.886
16	19-Jan-98	N/A	99.435	99.203	N/A	99.460	N/A	99.261	99.429	99.667	N/A	N/A	N/A	N/A	99.983	99.874
17	22-Jan-98	N/A	99.419	99.161	N/A	99.449	N/A	99.208	99.427	99.654	N/A	N/A	N/A	N/A	99.982	99.872
18	26-Jan-98	N/A	99.377	99.134	N/A	99.439	N/A	99.152	99.424	99.643	N/A	N/A	N/A	N/A	99.982	99.872
19	02-Feb-98	N/A	99.352	99.084	N/A	99.428	N/A	99.101	99.420	99.632	N/A	N/A	N/A	N/A	99.981	99.871
20	09-Feb-98	N/A	99.319	99.045	N/A	99.416	N/A	99.029	99.416	99.619	N/A	N/A	N/A	N/A	99.981	99.870
21	16-Feb-98	N/A	99.274	99.015	N/A	99.407	N/A	98.950	99.412	99.607	N/A	N/A	N/A	N/A	99.981	99.870
22	23-Feb-98	N/A	99.269	98.976	N/A	99.399	N/A	98.927	99.410	99.595	N/A	N/A	N/A	N/A	99.980	99.866
23	02-Mar-98	N/A	99.259	98.938	N/A	99.389	N/A	98.902	99.407	99.577	N/A	N/A	N/A	N/A	99.980	99.864
24	09-Mar-98	N/A	99.250	98.903	N/A	99.382	N/A	98.894	99.405	99.564	N/A	N/A	N/A	N/A	99.979	99.863
25	16-Mar-98	N/A	99.107	98.879	N/A	99.372	N/A	98.878	99.403	99.546	N/A	N/A	N/A	N/A	99.979	99.858
26	23-Mar-98	N/A	99.097	98.844	N/A	99.365	N/A	98.853	99.401	99.530	N/A	N/A	N/A	N/A	99.979	99.856
27	08-Apr-98	N/A	99.091	98.828	N/A	99.361	N/A	98.843	99.400	99.524	N/A	N/A	N/A	N/A	99.978	99.855
28	15-Apr-98	N/A	99.086	98.796	N/A	99.354	N/A	98.841	99.398	99.517	N/A	N/A	N/A	N/A	99.978	99.853
29	21-Apr-98	N/A	99.081	98.762	N/A	99.350	N/A	98.839	99.396	99.505	N/A	N/A	N/A	N/A	99.978	99.846
30	28-Apr-98	N/A	99.072	98.733	N/A	99.334	N/A	98.837	99.391	99.489	N/A	N/A	N/A	N/A	99.977	99.812
31	06-May-98	N/A	99.062	98.706	N/A	99.327	N/A	98.834	99.388	99.479	N/A	N/A	N/A	N/A	99.976	99.802
32	13-May-98	N/A	99.052	98.683	N/A	99.322	N/A	98.832	99.387	99.469	N/A	N/A	N/A	N/A	99.976	99.796
33	20-May-98	N/A	99.042	98.662	N/A	99.316	N/A	98.830	99.385	99.458	N/A	N/A	N/A	N/A	99.976	99.792
34	29-May-98	N/A	99.037	98.640	N/A	99.313	N/A	98.828	99.384	99.451	N/A	N/A	N/A	N/A	99.975	99.790
35	02-Jun-98	N/A	99.032	98.619	N/A	99.309	N/A	98.826	99.383	99.440	N/A	N/A	N/A	N/A	99.975	99.790
36	10-Jun-98	N/A	98.984	98.596	N/A	99.305	N/A	98.824	99.382	99.430	N/A	N/A	N/A	N/A	99.975	99.789
37	16-Jun-98	N/A	98.854	98.577	N/A	99.301	N/A	98.808	99.381	99.421	N/A	N/A	N/A	N/A	99.974	99.787
38	22-Jun-98	N/A	98.849	98.551	N/A	99.296	N/A	98.806	99.379	99.410	N/A	N/A	N/A	N/A	99.974	99.786
39	03-Jul-98	N/A	98.844	98.532	N/A	99.292	N/A	98.803	99.378	99.400	N/A	N/A	N/A	N/A	99.974	99.785
40	09-Jul-98	N/A	98.835	98.513	N/A	99.289	N/A	98.802	99.376	99.393	N/A	N/A	N/A	N/A	99.973	99.784
41	16-Jul-98	N/A	98.806	98.499	N/A	99.285	N/A	98.800	99.375	99.385	N/A	N/A	N/A	N/A	99.973	99.784
42	23-Jul-98	N/A	98.702	98.476	N/A	99.282	N/A	98.798	99.373	99.377	N/A	N/A	N/A	N/A	99.973	99.783
43	30-Jul-98	N/A	98.692	98.451	N/A	99.277	N/A	98.796	99.371	99.368	N/A	N/A	N/A	N/A	99.972	99.781
44	07-Aug-98	N/A	98.682	98.433	N/A	99.274	N/A	98.793	99.369	99.361	N/A	N/A	N/A	N/A	99.972	99.779
45	14-Aug-98	N/A	98.678	98.411	N/A	99.271	N/A	98.792	99.368	99.352	N/A	N/A	N/A	N/A	99.972	99.777
46	21-Aug-98	N/A	98.673	98.394	N/A	99.268	N/A	98.789	99.367	99.344	N/A	N/A	N/A	N/A	99.972	99.777
47	02-Sep-98	N/A	98.644	98.376	N/A	99.264	N/A	98.785	99.365	99.336	N/A	N/A	N/A	N/A	99.971	99.777
48	02-Sep-98	N/A	98.624	98.359	N/A	99.261	N/A	98.783	99.363	99.329	N/A	N/A	N/A	N/A	99.971	99.777
49	14-Sep-98	N/A	98.619	98.336	N/A	99.258	N/A	98.781	99.362	99.320	N/A	N/A	N/A	N/A	99.970	99.776
Maximum		N/A	99.987	99.999	N/A	99.944	N/A	99.997	99.773	99.990	N/A	N/A	N/A	N/A	99.998	100.000
Minimum		N/A	98.624	98.359	N/A	99.261	N/A	98.783	99.363	99.329	N/A	N/A	N/A	N/A	99.971	99.777
Mean		N/A	99.246	99.028	N/A	99.437	N/A	99.153	99.426	99.591	N/A	N/A	N/A	N/A	99.980	99.853

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Table of Contents

Weekly Humidity Cell Data: Boston Property (B3 Alteration Halo)

Boston 93NOD57 170 - B3 alteration halo	**Dissolved Metals*:**				Sample mass - start (kg) Sample mass - end (kg)			1.0011 0.8773								
Week No. Date	Aluminum Al (ug/L)	Antimony Sb (ug/L)	Arsenic As (ug/L)	Barium Ba (ug/L)	Beryllium Be (ug/L)	Bismuth Bi (ug/L)	Cadmium Cd (ug/L)	Calcium Ca (ug/L)	Chromium Cr (ug/L)	Cobalt Co (ug/L)	Copper Cu (ug/L)	Iron Fe (ug/L)	Lead Pb (ug/L)	Magnesium Mg (ug/L)	Manganese Mn (ug/L)	Mercury Hg (ug/L)
Median	6.00	79.90	6610	1.45	0.25	0.025	0.05	4800	0.50	7.20	3.90	5.00	1.00	4460	3.70	0.50
Mean Last 5 Weeks	49.20	29.88	3296	1.36	0.25	0.025	0.05	4260	1.90	6.72	9.04	23.00	1.20	3660	4.55	0.50

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Weekly Humidity Cell Data: Boston Property (B3 Alteration Halo)

Boston 93NOD57 170 - B3 alteration halo															
Week No.	Date	Molybdenum Mo (ug/L)	Nickel Ni (ug/L)	Phosphorus P (ug/L)	Potassium K (ug/L)	Selenium Se (ug/L)	Silver Ag (ug/L)	Sodium Na (ug/L)	Strontium Sr (ug/L)	Tin Sn (ug/L)	Titanium Ti (ug/L)	Thallium Tl (ug/L)	Uranium U (ug/L)	Vanadium V (ug/L)	Zinc Zn (ug/L)	Leachate Recovered (mL)
Median		0.10	360	50	800	0.50	0.20	450	26.00	0.25	0.50	0.025	0.025	1.00	2.00	480.00
Mean Last 5 Weeks		0.13	237	50	250	0.50	0.03	260	16.51	0.30	0.60	0.025	0.025	1.10	0.75	488.00

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Table of Contents

Weekly Humidity Cell Data: Boston Property (B3 Alteration Halo)

Boston 93NOD57 170 - B3 alteration halo	**Metal Loading/Leaching Rates****														
Week No. Date	Aluminum Al (mg/kg/wk)	Antimony Sb (mg/kg/wk)	Arsenic As (mg/kg/wk)	Barium Ba (mg/kg/wk)	Beryllium Be (mg/kg/wk)	Bismuth Bi (mg/kg/wk)	Cadmium Cd (mg/kg/wk)	Calcium Ca (mg/kg/wk)	Chromium Cr (mg/kg/wk)	Cobalt Co (mg/kg/wk)	Copper Cu (mg/kg/wk)	Iron Fe (mg/kg/wk)	Lead Pb (mg/kg/wk)	Magnesium Mg (mg/kg/wk)	Manganese Mn (mg/kg/wk)
Median	0.0027	0.0352	3.093	0.00062	0.00012	0.00001	0.00002	2.158	0.0002	0.0034	0.0018	0.0024	0.0005	2.010	0.00166
Mean Last 5 Weeks	0.0235	0.0145	1.605	0.00065	0.00012	0.00001	0.00002	2.073	0.0009	0.0033	0.0044	0.0110	0.0006	1.779	0.00221

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Table of Contents

Weekly Humidity Cell Data: Boston Property (B3 Alteration Halo)

Boston 93NOD57 170 - B3 alteration halo															
Week No.	Date	Mercury Hg (mg/kg/wk)	Molybdenum Mo (mg/kg/wk)	Nickel Ni (mg/kg/wk)	Phosphorus P (mg/kg/wk)	Potassium K (mg/kg/wk)	Selenium Se (mg/kg/wk)	Silver Ag (mg/kg/wk)	Sodium Na (mg/kg/wk)	Strontium Sr (mg/kg/wk)	Tin Sn (mg/kg/wk)	Titanium Ti (mg/kg/wk)	Thallium Tl (mg/kg/wk)	Uranium U (mg/kg/wk)	Vanadium V (mg/kg/wk)	Zinc Zn (mg/kg/wk)
Median		0.00024	0.00005	0.158	0.024	0.352	0.00024	0.00006	0.190	0.012	0.00012	0.00024	0.00001	0.00001	0.0005	0.0010
Mean Last 5 Weeks		0.00024	0.00006	0.115	0.024	0.122	0.00024	0.00001	0.126	0.008	0.00015	0.00029	0.00001	0.00001	0.0005	0.0004

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Table of Contents

Weekly Humidity Cell Data: Boston Property (B3 Alteration Halo)

Boston 93NOD57 170 - B3 alteration halo		**Cumulative Metal Loading/Leaching**														
Week No.	Date	Aluminum Al (mg/kg)	Antimony Sb (mg/kg)	Arsenic As (mg/kg)	Barium Ba (mg/kg)	Beryllium Be (mg/kg)	Bismuth Bi (mg/kg)	Cadmium Cd (mg/kg)	Calcium Ca (mg/kg)	Chromium Cr (mg/kg)	Cobalt Co (mg/kg)	Copper Cu (mg/kg)	Iron Fe (mg/kg)	Lead Pb (mg/kg)	Magnesium Mg (mg/kg)	Manganese Mn (mg/kg)
Median		0.176	1.430	111.605	0.0243	0.0028	0.00028	0.00060	56.082	0.0102	0.0842	0.0428	0.0741	0.0319	60.764	0.0276
Mean Last 5 Weeks		0.428	1.972	161.365	0.0397	0.0056	0.00056	0.00123	109.707	0.0221	0.1673	0.1192	0.1728	0.0453	109.584	0.0734

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Table of Contents

Weekly Humidity Cell Data: Boston Property (B3 Alteration Halo)

Boston 93NOD57 170 - B3 alteration halo															
Week No.	Date	Mercury Hg (mg/kg)	Molybdenum Mo (mg/kg)	Nickel Ni (mg/kg)	Phosphorus P (mg/kg)	Potassium K (mg/kg)	Selenium Se (mg/kg)	Silver Ag (mg/kg)	Sodium Na (mg/kg)	Strontium Sr (mg/kg)	Tin Sn (mg/kg)	Titanium Ti (mg/kg)	Thallium Tl (mg/kg)	Uranium U (mg/kg)	Vanadium V (mg/kg)	Zinc Zn (mg/kg)
Median		0.0056	0.0038	6.527	0.563	23.486	0.0154	0.0066	48.459	0.425	0.00378	0.00632	0.00028	0.00028	0.02812	0.09154
Mean Last 5 Weeks		0.0111	0.0068	9.667	1.115	27.956	0.0268	0.0073	51.769	0.647	0.00853	0.01199	0.00056	0.00056	0.03920	0.14953

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Table of Contents

Weekly Humidity Cell Data: Boston Property (B3 Alteration Halo)

Boston 93NOD57 170 - B3 alteration halo		**Remaining Metal (%):**													
Week No.	Date	Aluminum Al	Antimony Sb	Arsenic As	Barium Ba	Beryllium Be	Bismuth Bi	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn
Median		100.000	92.704	85.315	99.960	N/A	N/A	N/A	99.808	99.999	99.897	99.818	99.9999	N/A	99.938	99.997
Mean Last 5 Weeks		99.999	89.939	78.768	99.934	N/A	N/A	N/A	99.625	99.998	99.795	99.493	99.9997	N/A	99.889	99.993

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Table of Contents

Weekly Humidity Cell Data: Boston Property (B3 Alteration Halo)

Boston 93NOD57 170 - B3 alteration halo															
Week No.	Date	Mercury Hg	Molybdenum Mo	Nickel Ni	Phosphorus P	Potassium K	Selenium Se	Silver Ag	Sodium Na	Strontium Sr	Tin Sn	Titanium Ti	Thallium Tl	Uranium U	Vanadium V	Zinc Zn
Median		N/A	99.250	98.903	N/A	99.382	N/A	98.894	99.405	99.564	N/A	N/A	N/A	N/A	99.979	99.863
Mean Last 5 Weeks		N/A	98.648	98.375	N/A	99.264	N/A	98.786	99.365	99.336	N/A	N/A	N/A	N/A	99.971	99.777

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Appendix E-1
Geochemical Modelling - MINTEQA2

_____ PART 1 of OUTPUT FILE _____
PC MINTEQA2 v3.10 DATE OF CALCULATIONS: 20-OCT-98 TIME: 16:20:33

Altered Basalt
Using value for CO3, after specifying alkalinity

Temperature (Celsius): 4.00
Units of concentration: MG/L
Ionic strength to be computed.
If specified, carbonate concentration represents total inorganic carbon.
Do not automatically terminate if charge imbalance exceeds 30%
Precipitation is allowed for all solids in the thermodynamic database and
the print option for solids is set to: 1
The maximum number of iterations is: 100
The method used to compute activity coefficients is: Davies equation
Full output file

330	0.000E-01	-8.55	y
30	9.530E-02	-5.45	y
100	4.000E-03	-7.54	y
150	6.103E+00	-3.82	y
212	1.500E-03	-7.89	y
231	6.000E-03	-7.02	y
281	1.900E-02	-6.47	y
460	2.620E+00	-3.97	y
470	1.000E-02	-6.74	y
540	6.000E-03	-6.99	y
410	1.510E-01	-5.41	y
500	4.240E-01	-4.73	y

```
   800  1.650E-02   -6.73 y
   950  1.100E-03   -7.77 y
   140  1.589E+01   -3.58
   732  1.680E+00   -4.76

 H2O has been inserted as a COMPONENT
  3   1
   330     8.5500     0.0000

INPUT DATA BEFORE TYPE MODIFICATIONS

   ID        NAME       ACTIVITY GUESS    LOG GUESS   ANAL TOTAL
    330  H+1                 2.818E-09        -8.550   0.000E-01
     30  Al+3                3.548E-06        -5.450   9.530E-02
    100  Ba+2                2.884E-08        -7.540   4.000E-03
    150  Ca+2                1.514E-04        -3.820   6.103E+00
    212  CrO4-2              1.288E-08        -7.890   1.500E-03
    231  Cu+2                9.550E-08        -7.020   6.000E-03
    281  Fe+3                3.388E-07        -6.470   1.900E-02
    460  Mg+2                1.072E-04        -3.970   2.620E+00
    470  Mn+2                1.820E-07        -6.740   1.000E-02
    540  Ni+2                1.023E-07        -6.990   6.000E-03
    410  K+1                 3.890E-06        -5.410   1.510E-01
    500  Na+1                1.862E-05        -4.730   4.240E-01
    800  Sr+2                1.862E-07        -6.730   1.650E-02
    950  Zn+2                1.698E-08        -7.770   1.100E-03
    140  CO3-2               2.630E-04        -3.580   1.589E+01
    732  SO4-2               1.738E-05        -4.760   1.680E+00
      2  H2O                 1.000E+00         0.000   0.000E-01

_____________________________________________________________________________
_____________________________ PART 2 of OUTPUT FILE ____________________________
  PC MINTEQA2 v3.10   DATE OF CALCULATIONS: 20-OCT-98  TIME: 16:20:34


 ALL SPECIES CONSIDERED IN THIS PROBLEM
```

Type I - COMPONENTS AS SPECIES IN SOLUTION

ID	NAME	DH	LOGK	MIN LOGK	MAX LOGK	Z	DHA	DHB	GFW
330	H+1	0.0000	0.0000	0.000	0.000	1.00	9.00	0.00	1.0080
30	Al+3	0.0000	0.0000	0.000	0.000	3.00	9.00	0.00	26.9815
100	Ba+2	0.0000	0.0000	0.000	0.000	2.00	5.00	0.00	137.3400
150	Ca+2	0.0000	0.0000	0.000	0.000	2.00	6.00	0.17	40.0800
212	CrO4-2	0.0000	0.0000	0.000	0.000	-2.00	4.00	0.00	115.9940
231	Cu+2	0.0000	0.0000	0.000	0.000	2.00	6.00	0.00	63.5460
281	Fe+3	0.0000	0.0000	0.000	0.000	3.00	9.00	0.00	55.8470
460	Mg+2	0.0000	0.0000	0.000	0.000	2.00	6.50	0.20	24.3120
470	Mn+2	0.0000	0.0000	0.000	0.000	2.00	6.00	0.00	54.9380
540	Ni+2	0.0000	0.0000	0.000	0.000	2.00	0.00	0.00	58.7100
410	K+1	0.0000	0.0000	0.000	0.000	1.00	3.00	0.01	39.1020
500	Na+1	0.0000	0.0000	0.000	0.000	1.00	4.00	0.08	22.9898
800	Sr+2	0.0000	0.0000	0.000	0.000	2.00	5.00	0.00	87.6200
950	Zn+2	0.0000	0.0000	0.000	0.000	2.00	6.00	0.00	65.3699
140	CO3-2	0.0000	0.0000	0.000	0.000	-2.00	5.40	0.00	60.0094
732	SO4-2	0.0000	0.0000	0.000	0.000	-2.00	4.00	-0.04	96.0616

Type II - OTHER SPECIES IN SOLUTION OR ADSORBED

ID	NAME	DH	LOGK	MIN LOGK	MAX LOGK	Z	DHA	DHB	GFW
5002120	NaCrO4-	0.0000	0.6963	0.000	0.000	-1.00	0.00	0.00	138.9834
4102120	KCrO4-	0.0000	0.7990	0.000	0.000	-1.00	0.00	0.00	155.0919
3300020	OH-	13.3450	-13.9980	0.000	0.000	-1.00	3.50	0.00	17.0074
4603300	MgOH +	15.9350	-11.7900	0.000	0.000	1.00	6.50	0.00	41.3190
4601400	MgCO3 AQ	2.0220	2.9800	0.000	0.000	0.00	0.00	0.00	84.3210
4601401	MgHCO3 +	-2.4300	11.4000	0.000	0.000	1.00	4.00	0.00	85.3290
4607320	MgSO4 AQ	1.3990	2.2500	0.000	0.000	0.00	0.00	0.00	120.3730
1503300	CaOH +	14.5350	-12.5980	0.000	0.000	1.00	6.00	0.00	57.0870

1501400	CaHCO3 +	1.7900	11.3300	0.000	0.000	1.00	6.00	0.00	101.0970
1501401	CaCO3 AQ	4.0300	3.1500	0.000	0.000	0.00	0.00	0.00	100.0890
1507320	CaSO4 AQ	1.4700	2.3090	0.000	0.000	0.00	0.00	0.00	136.1410
5001400	NaCO3 -	8.9110	1.2680	0.000	0.000	-1.00	5.40	0.00	82.9990
5001401	NaHCO3 AQ	0.0000	10.0800	0.000	0.000	0.00	0.00	0.00	84.0070
5007320	NaSO4 -	1.1200	0.7000	0.000	0.000	-1.00	5.40	0.00	119.0510
4107320	KSO4 -	2.2500	0.8500	0.000	0.000	-1.00	5.40	0.00	135.1630
303300	AlOH +2	11.8990	-4.9900	0.000	0.000	2.00	5.40	0.00	43.9880
303301	Al(OH)2 +	0.0000	-10.1000	0.000	0.000	1.00	5.40	0.00	60.9960
303302	Al(OH)4 -	44.0600	-23.0000	0.000	0.000	-1.00	4.50	0.00	95.0110
307320	AlSO4 +	2.1500	3.0200	0.000	0.000	1.00	4.50	0.00	123.0430
307321	Al(SO4)2 -	2.8400	4.9200	0.000	0.000	-1.00	4.50	0.00	219.1040
303303	Al(OH)3 AQ	0.0000	-16.0000	0.000	0.000	0.00	0.00	0.00	78.0030
2813300	FeOH +2	10.3990	-2.1900	0.000	0.000	2.00	5.00	0.00	72.8540
2817320	FeSO4 +	3.9100	3.9200	0.000	0.000	1.00	5.00	0.00	151.9080
2813301	FeOH2 +	0.0000	-5.6700	0.000	0.000	1.00	5.40	0.00	89.8610
2813302	FeOH3 AQ	0.0000	-13.6000	0.000	0.000	0.00	0.00	0.00	106.8690
2813303	FeOH4 -	0.0000	-21.6000	0.000	0.000	-1.00	5.40	0.00	123.8760
2817321	Fe(SO4)2 -	4.6000	5.4200	0.000	0.000	-1.00	0.00	0.00	247.9700
2813304	Fe2(OH)2+4	13.5000	-2.9500	0.000	0.000	4.00	0.00	0.00	145.7080
2813305	Fe3(OH)4+5	14.3000	-6.3000	0.000	0.000	5.00	0.00	0.00	235.5700
8003300	SrOH +	14.4950	-13.1780	0.000	0.000	1.00	5.00	0.00	104.6270
1003300	BaOH +	15.0950	-13.3580	0.000	0.000	1.00	5.00	0.00	154.3470
4703300	MnOH +	14.3990	-10.5900	0.000	0.000	1.00	5.00	0.00	161.2970
4703301	Mn(OH)3 -1	0.0000	-34.8000	0.000	0.000	-1.00	5.00	0.00	105.9600
4707320	MnSO4 AQ	2.1700	2.2600	0.000	0.000	0.00	0.00	0.00	150.9990
4701400	MnHCO3 +	0.0000	11.6000	0.000	0.000	1.00	5.00	0.00	115.9550
2311400	CuCO3 AQ	0.0000	6.7300	0.000	0.000	0.00	0.00	0.00	123.5550
2311401	Cu(CO3)2-2	0.0000	9.8300	0.000	0.000	-2.00	0.00	0.00	183.5640
2313300	CuOH +	0.0000	-8.0000	0.000	0.000	1.00	4.00	0.00	80.5530
2313301	Cu(OH)2 AQ	0.0000	-13.6800	0.000	0.000	0.00	0.00	0.00	97.5600
2313302	Cu(OH)3 -	0.0000	-26.8990	0.000	0.000	-1.00	0.00	0.00	114.5680
2313303	Cu(OH)4 -2	0.0000	-39.6000	0.000	0.000	-2.00	0.00	0.00	131.5750
2313304	Cu2(OH)2+2	17.5390	-10.3590	0.000	0.000	2.00	0.00	0.00	161.1060
2317320	CuSO4 AQ	1.2200	2.3100	0.000	0.000	0.00	0.00	0.00	159.6070
2311402	CuHCO3 +	0.0000	13.0000	0.000	0.000	1.00	0.00	0.00	124.5630

9503300	ZnOH +	13.3990	-8.9600	0.000	0.000	1.00	0.00	0.00	82.3770
9503301	Zn(OH)2 AQ	0.0000	-16.8990	0.000	0.000	0.00	0.00	0.00	99.3840
9503302	Zn(OH)3 -	0.0000	-28.3990	0.000	0.000	-1.00	0.00	0.00	116.3920
9503303	Zn(OH)4 -2	0.0000	-41.1990	0.000	0.000	-2.00	0.00	0.00	133.3990
9507320	ZnSO4 AQ	1.3600	2.3700	0.000	0.000	0.00	0.00	0.00	161.4310
9507321	Zn(SO4)2-2	0.0000	3.2800	0.000	0.000	-2.00	0.00	0.00	257.4930
9501400	ZnHCO3 +	0.0000	12.4000	0.000	0.000	1.00	0.00	0.00	126.3570
9501401	ZnCO3 AQ	0.0000	5.3000	0.000	0.000	0.00	0.00	0.00	125.3790
9501402	Zn(CO3)2-2	0.0000	9.6300	0.000	0.000	-2.00	0.00	0.00	185.3580
5403300	NiOH +	12.4200	-9.8600	0.000	0.000	1.00	0.00	0.00	75.7170
5403301	Ni(OH)2 AQ	0.0000	-19.0000	0.000	0.000	0.00	0.00	0.00	92.7240
5403302	Ni(OH)3 -	0.0000	-30.0000	0.000	0.000	-1.00	0.00	0.00	109.7320
5407320	NiSO4 AQ	1.5200	2.2900	0.000	0.000	0.00	0.00	0.00	154.7710
5401400	NiHCO3 +	0.0000	12.4700	0.000	0.000	1.00	0.00	0.00	119.7270
5401401	NiCO3 AQ	0.0000	6.8700	0.000	0.000	0.00	0.00	0.00	118.7190
5401402	Ni(CO3)2-2	0.0000	10.1100	0.000	0.000	-2.00	0.00	0.00	178.7280
5407321	Ni(SO4)2-2	0.0000	1.0200	0.000	0.000	-2.00	0.00	0.00	250.8330
3301400	HCO3 -	-3.6170	10.3300	0.000	0.000	-1.00	5.40	0.00	61.0170
3301401	H2CO3 AQ	-2.2470	16.6810	0.000	0.000	0.00	0.00	0.00	62.0250
3307320	HSO4 -	4.9100	1.9870	0.000	0.000	-1.00	4.50	0.00	97.0690
2123300	HCrO4 -	0.9000	6.5089	0.000	0.000	-1.00	0.00	0.00	117.0015
2123301	H2CrO4 AQ	0.0000	5.6513	0.000	0.000	0.00	0.00	0.00	118.0094
2123302	Cr2O7 -2	-2.9950	14.5571	0.000	0.000	-2.00	0.00	0.00	215.9878
2127320	CrO3SO4-2	0.0000	8.9937	0.000	0.000	-2.00	0.00	0.00	196.0518

Type III - SPECIES WITH FIXED ACTIVITY

ID	NAME	DH	LOGK	MIN LOGK	MAX LOGK	Z	DHA	DHB	GFW
2	H2O	0.0000	0.0000	0.000	0.000	0.00	0.00	0.00	18.0153
330	H+1	0.0000	8.5500	0.000	0.000	1.00	9.00	0.00	1.0080

Type V - POSSIBLE SOLIDS

Table of Contents

ID	NAME	DH	LOGK	MIN LOGK	MAX LOGK	Z	DHA	DHB	GFW
2003000	ALOH3(A)	27.0450	-10.3800	-9.690	0.000	0.00	0.00	0.00	78.0073
6003000	ALOHSO4	0.0000	3.2300	3.390	3.070	0.00	0.00	0.00	140.0505
6003001	AL4(OH)10SO4	0.0000	-22.7000	0.000	0.000	0.00	0.00	0.00	374.0616
6041000	ALUM K	-7.2200	5.1700	0.000	0.000	0.00	0.00	0.00	438.3597
6041001	ALUNITE	-3.9180	1.3460	0.000	0.000	0.00	0.00	0.00	414.2141
6015000	ANHYDRITE	3.7690	4.6370	0.000	0.000	0.00	0.00	0.00	136.1416
5015000	ARAGONITE	2.6150	8.3600	0.000	0.000	0.00	0.00	0.00	100.0894
5046000	ARTINITE	28.7420	-9.6000	0.000	0.000	0.00	0.00	0.00	196.6941
6010000	BARITE	-6.2800	9.9760	0.000	9.773	0.00	0.00	0.00	233.4016
2003001	BOEHMITE	28.1300	-8.5780	-8.065	0.000	0.00	0.00	0.00	59.9884
2046000	BRUCITE	25.8400	-16.7920	0.000	0.000	0.00	0.00	0.00	58.3268
5015001	CALCITE	2.5850	8.4750	8.560	0.000	0.00	0.00	0.00	100.0894
6080000	CELESTITE	0.4700	6.4650	0.000	6.349	0.00	0.00	0.00	183.6816
2003002	DIASPORE	24.6300	-6.8730	0.000	0.000	0.00	0.00	0.00	59.9884
5015002	DOLOMITE	8.2900	17.0000	0.000	0.000	0.00	0.00	0.00	184.4108
6046000	EPSOMITE	-2.8200	2.1400	0.000	0.000	0.00	0.00	0.00	246.4807
2028100	FERRIHYDRITE	0.0000	-4.8910	-1.557	-4.996	0.00	0.00	0.00	104.8692
6028100	FE2(SO4)3	59.1200	-3.5800	0.650	0.000	0.00	0.00	0.00	395.8788
2003003	GIBBSITE (C)	22.8000	-8.7700	-8.487	-9.440	0.00	0.00	0.00	78.0037
3003000	Al2O3	0.0000	-22.9800	0.000	0.000	0.00	0.00	0.00	101.9504
2028102	GOETHITE	14.4800	-0.5000	0.000	0.000	0.00	0.00	0.00	86.8536
6015001	GYPSUM	-0.2610	4.8480	0.000	0.000	0.00	0.00	0.00	172.1722
3028100	HEMATITE	30.8450	4.0080	0.000	0.000	0.00	0.00	0.00	155.6919
5015003	HUNTITE	25.7600	29.9680	0.000	0.000	0.00	0.00	0.00	353.0536
5046001	HYDRMAGNESIT	52.2100	8.7660	0.000	0.000	0.00	0.00	0.00	467.6736
6050000	JAROSITE NA	36.1800	11.2000	0.000	0.000	0.00	0.00	0.00	478.6978
6041002	JAROSITE K	31.2800	14.8000	0.000	0.000	0.00	0.00	0.00	494.8100
6028101	JAROSITE H	55.1500	12.1000	0.000	0.000	0.00	0.00	0.00	480.7320
3028101	MAGHEMITE	0.0000	-6.3860	0.000	0.000	0.00	0.00	0.00	159.6922
5046002	MAGNESITE	6.1690	8.0290	8.279	7.779	0.00	0.00	0.00	84.3214
6050001	MIRABILITE	-18.9870	1.1140	0.000	0.000	0.00	0.00	0.00	322.1942
3050000	NATRON	-15.7450	1.3110	0.000	0.000	0.00	0.00	0.00	286.1420
5046003	NESQUEHONITE	5.7890	5.6210	5.133	4.546	0.00	0.00	0.00	138.3673
5080000	STRONTIANITE	0.6900	9.2500	11.789	0.000	0.00	0.00	0.00	147.6294

6050002	THENARDITE	0.5720	0.1790	0.000	0.000	0.00	0.00	0.00	142.0412
5050001	THERMONATR	2.8020	-0.1250	0.000	0.000	0.00	0.00	0.00	124.0043
5010000	WITHERITE	-0.3600	8.5850	13.335	0.000	0.00	0.00	0.00	197.3494
2047003	PYROCROITE	22.5900	-15.0880	0.000	-15.381	0.00	0.00	0.00	88.9528
5047000	RHODOCHROSIT	2.0790	10.4100	11.019	9.993	0.00	0.00	0.00	114.9474
6047000	MNSO4	15.4800	-2.6690	0.000	0.000	0.00	0.00	0.00	150.9996
5023100	CUCO3	0.0000	9.6300	9.650	9.610	0.00	0.00	0.00	123.5552
2023100	CU(OH)2	15.2500	-8.6400	0.000	-9.200	0.00	0.00	0.00	97.5606
6023100	ANTLERITE	0.0000	-8.2900	0.000	-8.900	0.00	0.00	0.00	354.7248
6023101	BROCHANTITE	0.0000	-15.3400	-15.150	-15.500	0.00	0.00	0.00	452.2854
6023102	LANGITE	39.6100	-16.7900	0.000	-17.400	0.00	0.00	0.00	470.3006
2023101	TENORITE	15.2400	-7.6200	-7.350	-7.890	0.00	0.00	0.00	79.5454
6023103	CUOCUSO4	35.5750	-11.5300	0.000	0.000	0.00	0.00	0.00	239.1490
6023104	CUSO4	18.1400	-3.0100	-2.630	-3.420	0.00	0.00	0.00	159.6036
6023105	CHALCANTHITE	-1.4400	2.6400	2.960	2.135	0.00	0.00	0.00	249.6796
3023100	CUPRICFERIT	38.6900	-5.8800	-5.350	0.000	0.00	0.00	0.00	239.2376
5095000	SMITHSONITE	4.3600	10.0000	10.810	9.820	0.00	0.00	0.00	125.3892
5095001	ZNCO3, 1H2O	0.0000	10.2600	0.000	0.000	0.00	0.00	0.00	143.4044
2095000	ZN(OH)2 (A)	0.0000	-12.4500	-12.260	-12.480	0.00	0.00	0.00	99.3946
2095001	ZN(OH)2 (C)	0.0000	-12.2000	0.000	0.000	0.00	0.00	0.00	99.3946
2095002	ZN(OH)2 (B)	0.0000	-11.7500	-11.320	-11.890	0.00	0.00	0.00	99.3946
2095003	ZN(OH)2 (G)	0.0000	-11.7100	-11.190	-11.840	0.00	0.00	0.00	99.3946
2095004	ZN(OH)2 (E)	0.0000	-11.5000	-10.950	-11.620	0.00	0.00	0.00	99.3946
6095000	ZN2(OH)2SO4	0.0000	-7.5000	0.000	0.000	0.00	0.00	0.00	260.8322
6095001	ZN4(OH)6SO4	0.0000	-28.4000	0.000	0.000	0.00	0.00	0.00	459.6214
2095005	ZNO(ACTIVE)	0.0000	-11.3100	-11.570	-11.860	0.00	0.00	0.00	81.3794
2095006	ZINCITE	21.8600	-11.1400	-10.990	-11.540	0.00	0.00	0.00	81.3794
6095002	ZN3O(SO4)2	62.0000	-19.0200	0.000	0.000	0.00	0.00	0.00	404.2546
6095003	ZINCOSITE	19.2000	-3.0100	0.000	-3.930	0.00	0.00	0.00	161.4376
6095004	ZNSO4, 1H2O	10.6400	0.5700	0.000	0.500	0.00	0.00	0.00	179.4528
6095005	BIANCHITE	0.1600	1.7650	0.000	1.020	0.00	0.00	0.00	269.5288
6095006	GOSLARITE	-3.3000	1.9600	0.000	1.870	0.00	0.00	0.00	287.5440
5054000	NICO3	9.9400	6.8400	0.000	0.000	0.00	0.00	0.00	118.7092
2054000	NI(OH)2	-30.4500	-10.8000	-10.590	-13.300	0.00	0.00	0.00	92.7146
6054000	NI4(OH)6SO4	0.0000	-32.0000	0.000	0.000	0.00	0.00	0.00	432.9014
2054001	BUNSENITE	23.9200	-12.4500	0.000	-12.390	0.00	0.00	0.00	74.6994

6054001	RETGERSITE	-1.1000	2.0400	0.000	0.000	0.00	0.00	0.00	262.8488
6054002	MORENOSITE	-2.9400	2.3600	0.000	0.000	0.00	0.00	0.00	280.8640
5023101	MALACHITE	15.6100	5.1800	0.000	3.940	0.00	0.00	0.00	221.1162
5023102	AZURITE	23.7700	16.9200	0.000	0.000	0.00	0.00	0.00	344.6716
2015000	LIME	46.2650	-32.7970	0.000	0.000	0.00	0.00	0.00	56.0800
2015001	PORTLANDITE	30.6900	-22.6750	0.000	0.000	0.00	0.00	0.00	73.0880
2046001	PERICLASE	36.1350	-21.5100	0.000	0.000	0.00	0.00	0.00	40.3200
3046000	SPINEL	89.0890	-36.3330	0.000	0.000	0.00	0.00	0.00	142.2800
3046001	MAG-FERRITE	66.6390	-16.7650	0.000	0.000	0.00	0.00	0.00	200.0200
3028102	LEPIDOCROCIT	0.0000	-1.3710	0.000	0.000	0.00	0.00	0.00	72.8600
3021201	BACRO4	-6.3900	9.6681	0.000	0.000	0.00	0.00	0.00	253.3236
3021204	CUCRO4	0.0000	5.4754	0.000	0.000	0.00	0.00	0.00	179.5396
3021205	K2CRO4	-4.2500	-0.0073	0.000	0.000	0.00	0.00	0.00	194.1902
3021206	K2CR2O7	-18.1250	15.6712	0.000	0.000	0.00	0.00	0.00	294.1844
3021208	MGCRO4	21.2600	-5.3801	0.000	0.000	0.00	0.00	0.00	140.2986
3021210	NA2CRO4	4.6100	-3.2618	0.000	0.000	0.00	0.00	0.00	161.9731
3021211	NA2CR2O7	-5.3050	9.8953	0.000	0.000	0.00	0.00	0.00	261.9673
3021214	SRCRO4	2.4200	4.8443	0.000	0.000	0.00	0.00	0.00	203.6136
2021200	CrO3	1.2450	3.2105	0.000	0.000	0.00	0.00	0.00	99.9942
3015000	CaCrO4	6.4400	2.2657	0.000	0.000	0.00	0.00	0.00	156.0736

Type VI - EXCLUDED SPECIES (not included in mole balance)

ID	NAME	DH	LOGK	MIN LOGK	MAX LOGK	Z	DHA	DHB	GFW
3301403	CO2 (g)	-0.5300	18.1600	0.000	0.000	0.00	0.00	0.00	41.0100

Charge Balance: UNSPECIATED

Sum of CATIONS= 5.552E-04 Sum of ANIONS = 5.646E-04

PERCENT DIFFERENCE = 8.365E-01 (ANIONS - CATIONS)/(ANIONS + CATIONS)

◎ Table of Contents

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|  IMPROVED ACTIVITY GUESSES PRIOR TO FIRST ITERATION: |
|       Al+3        Log activity guess:   -15.15       |
|       CrO4-2      Log activity guess:    -7.89       |
|       Cu+2        Log activity guess:    -7.69       |
|       Fe+3        Log activity guess:   -19.20       |
|       Mn+2        Log activity guess:    -6.74       |
|       CO3-2       Log activity guess:    -5.60       |
|       SO4-2       Log activity guess:    -4.76       |
|                                                      |
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PARAMETERS OF THE COMPONENT MOST OUT OF BALANCE:

ITER	NAME	TOTAL MOL	DIFF FXN	LOG ACTVTY	RESIDUAL
0	CO3-2	2.648E-04	3.301E-06	-5.60086	3.274E-06
1	Zn+2	1.683E-08	3.161E-11	-8.27911	2.992E-11
2	CO3-2	2.648E-04	7.999E-06	-5.60281	7.972E-06
3	Zn+2	1.683E-08	3.735E-12	-8.29478	2.052E-12

PC MINTEQA2 v3.10 DATE OF CALCULATIONS: 20-OCT-98 TIME: 16:20:34

ITERATIONS= 4: SOLID HEMATITE PRECIPITATES

_____ PART 3 of OUTPUT FILE _____
PC MINTEQA2 v3.10 DATE OF CALCULATIONS: 20-OCT-98 TIME: 16:20:34

PARAMETERS OF THE COMPONENT MOST OUT OF BALANCE:

ITER	NAME	TOTAL MOL	DIFF FXN	LOG ACTVTY	RESIDUAL
4	Zn+2	1.683E-08	-6.543E-10	-8.29487	6.526E-10
5	Zn+2	1.683E-08	6.808E-10	-8.27985	6.791E-10
6	Zn+2	1.683E-08	3.733E-12	-8.29478	2.051E-12

PC MINTEQA2 v3.10 DATE OF CALCULATIONS: 20-OCT-98 TIME: 16:20:34

ITERATIONS= 7: SOLID DIASPORE PRECIPITATES

PC MINTEQA2 v3.10 DATE OF CALCULATIONS: 20-OCT-98 TIME: 16:20:34

PARAMETERS OF THE COMPONENT MOST OUT OF BALANCE:

ITER	NAME	TOTAL MOL	DIFF FXN	LOG ACTVTY	RESIDUAL
7	Sr+2	1.883E-07	-2.072E-08	-6.77572	2.070E-08
8	Sr+2	1.883E-07	2.325E-08	-6.72511	2.323E-08
9	Ni+2	1.022E-07	-5.894E-11	-8.27451	4.872E-11

ID	NAME	ANAL MOL	CALC MOL	LOG ACTVTY	GAMMA	DIFF FXN
732	SO4-2	1.749E-05	1.693E-05	-4.82192	0.890008	-5.132E-11
950	Zn+2	1.683E-08	5.698E-09	-8.29487	0.890008	-1.796E-14
100	Ba+2	2.913E-08	2.913E-08	-7.58633	0.890008	-8.836E-14
150	Ca+2	1.523E-04	1.514E-04	-3.87049	0.890008	-4.594E-10
212	CrO4-2	1.293E-08	1.284E-08	-7.94220	0.890008	-3.901E-14
231	Cu+2	9.442E-08	4.007E-11	-10.44780	0.890008	5.875E-16
140	CO3-2	2.648E-04	2.723E-06	-5.61555	0.890008	-2.056E-10
460	Mg+2	1.078E-04	1.071E-04	-4.02071	0.890008	-3.252E-10
470	Mn+2	1.820E-07	1.810E-07	-6.79292	0.890008	-5.496E-13
540	Ni+2	1.022E-07	5.975E-09	-8.27425	0.890008	-2.106E-14

410	K+1	3.862E-06	3.862E-06	-5.42589	0.971289	-2.929E-12
500	Na+1	1.844E-05	1.844E-05	-4.74688	0.971289	-1.399E-11
800	Sr+2	1.883E-07	1.883E-07	-6.77572	0.890008	-5.713E-13
30	Al+3	3.532E-06	5.067E-18	-17.40911	0.769372	-9.430E-23
281	Fe+3	3.402E-07	2.072E-27	-26.79747	0.769372	-1.763E-20
2	H2O	0.000E-01	-8.477E-06	0.00000	1.000000	0.000E-01
330	H+1	0.000E-01	2.902E-09	-8.55000	0.971289	0.000E-01

Type I - COMPONENTS AS SPECIES IN SOLUTION

ID	NAME	CALC MOL	ACTIVITY	LOG ACTVTY	GAMMA	NEW LOGK
330	H+1	2.902E-09	2.818E-09	-8.55000	0.97129	0.013
30	Al+3	5.067E-18	3.898E-18	-17.40911	0.76937	0.114
100	Ba+2	2.913E-08	2.592E-08	-7.58633	0.89001	0.051
150	Ca+2	1.514E-04	1.347E-04	-3.87049	0.89001	0.051
212	CrO4-2	1.284E-08	1.142E-08	-7.94220	0.89001	0.051
231	Cu+2	4.007E-11	3.566E-11	-10.44780	0.89001	0.051
281	Fe+3	2.072E-27	1.594E-27	-26.79747	0.76937	0.114
460	Mg+2	1.071E-04	9.534E-05	-4.02071	0.89001	0.051
470	Mn+2	1.810E-07	1.611E-07	-6.79292	0.89001	0.051
540	Ni+2	5.975E-09	5.318E-09	-8.27425	0.89001	0.051
410	K+1	3.862E-06	3.751E-06	-5.42589	0.97129	0.013
500	Na+1	1.844E-05	1.791E-05	-4.74688	0.97129	0.013
800	Sr+2	1.883E-07	1.676E-07	-6.77572	0.89001	0.051
950	Zn+2	5.698E-09	5.071E-09	-8.29487	0.89001	0.051
140	CO3-2	2.723E-06	2.424E-06	-5.61555	0.89001	0.051
732	SO4-2	1.693E-05	1.507E-05	-4.82192	0.89001	0.051

Type II - OTHER SPECIES IN SOLUTION OR ADSORBED

ID	NAME	CALC MOL	ACTIVITY	LOG ACTVTY	GAMMA	NEW LOGK
5002120	NaCrO4-	1.047E-12	1.017E-12	-11.99278	0.97129	0.709

4102120	KCrO4-	2.777E-13	2.697E-13	-12.56909	0.97129	0.812
3300020	OH-	6.660E-07	6.469E-07	-6.18915	0.97129	-14.726
4603300	MgOH +	8.106E-09	7.873E-09	-8.10385	0.97129	-12.620
4601400	MgCO3 AQ	1.597E-07	1.597E-07	-6.79660	1.00016	2.840
4601401	MgHCO3 +	2.594E-07	2.520E-07	-6.59865	0.97129	11.600
4607320	MgSO4 AQ	2.136E-07	2.136E-07	-6.67032	1.00016	2.172
1503300	CaOH +	1.936E-09	1.881E-09	-8.72573	0.97129	-13.393
1501400	CaHCO3 +	1.907E-07	1.852E-07	-6.73228	0.97129	11.316
1501401	CaCO3 AQ	3.407E-07	3.408E-07	-6.46755	1.00016	3.018
1507320	CaSO4 AQ	3.427E-07	3.427E-07	-6.46505	1.00016	2.227
5001400	NaCO3 -	2.650E-10	2.574E-10	-9.58933	0.97129	0.786
5001401	NaHCO3 AQ	1.471E-09	1.471E-09	-8.83243	1.00016	10.080
5007320	NaSO4 -	1.207E-09	1.172E-09	-8.93100	0.97129	0.650
4107320	KSO4 -	2.757E-10	2.678E-10	-9.57218	0.97129	0.688
303300	AlOH +2	3.473E-15	3.091E-15	-14.50995	0.89001	-5.600
303301	Al(OH)2 +	4.014E-11	3.898E-11	-10.40912	0.97129	-10.087
303302	Al(OH)4 -	2.273E-09	2.207E-09	-8.65610	0.97129	-25.434
307320	AlSO4 +	4.811E-20	4.673E-20	-19.33043	0.97129	2.913
307321	Al(SO4)2 -	5.272E-23	5.121E-23	-22.29068	0.97129	4.775
303303	Al(OH)3 AQ	1.741E-08	1.741E-08	-7.75912	1.00016	-16.000
2813300	FeOH +2	1.085E-21	9.660E-22	-21.01501	0.89001	-2.717
2817320	FeSO4 +	1.248E-28	1.212E-28	-27.91654	0.97129	3.716
2813301	FeOH2 +	4.417E-16	4.291E-16	-15.36748	0.97129	-5.657
2813302	FeOH3 AQ	1.788E-15	1.789E-15	-14.74748	1.00016	-13.600
2813303	FeOH4 -	6.534E-15	6.346E-15	-14.19749	0.97129	-21.587
2817321	Fe(SO4)2 -	5.443E-32	5.287E-32	-31.27678	0.97129	5.177
2813304	Fe2(OH)2+4	1.018E-40	6.387E-41	-40.19470	0.62744	-3.497
2813305	Fe3(OH)4+5	1.071E-53	5.169E-54	-53.28662	0.48274	-6.778
8003300	SrOH +	6.367E-13	6.184E-13	-12.20873	0.97129	-13.970
1003300	BaOH +	6.025E-14	5.852E-14	-13.23267	0.97129	-14.184
4703300	MnOH +	2.399E-10	2.330E-10	-9.63261	0.97129	-11.377
4703301	Mn(OH)3 -1	1.174E-16	1.140E-16	-15.94294	0.97129	-34.787
4707320	MnSO4 AQ	3.346E-10	3.347E-10	-9.47536	1.00016	2.139
4701400	MnHCO3 +	4.510E-10	4.380E-10	-9.35848	0.97129	11.613
2311400	CuCO3 AQ	4.641E-10	4.641E-10	-9.33336	1.00016	6.730
2311401	Cu(CO3)2-2	1.591E-12	1.416E-12	-11.84891	0.89001	9.881

2313300	CuOH +	1.303E-10	1.265E-10	-9.89781	0.97129	-7.987
2313301	Cu(OH)2 AQ	9.378E-08	9.380E-08	-7.02781	1.00016	-13.680
2313302	Cu(OH)3 -	2.069E-12	2.010E-12	-11.69682	0.97129	-26.886
2313303	Cu(OH)4 -2	1.595E-16	1.420E-16	-15.84782	0.89001	-39.549
2313304	Cu2(OH)2+2	8.364E-16	7.444E-16	-15.12817	0.89001	-11.282
2317320	CuSO4 AQ	9.385E-14	9.387E-14	-13.02748	1.00016	2.242
2311402	CuHCO3 +	2.508E-12	2.436E-12	-11.61336	0.97129	13.013
9503300	ZnOH +	3.661E-10	3.556E-10	-9.44902	0.97129	-9.691
9503301	Zn(OH)2 AQ	8.055E-09	8.056E-09	-8.09388	1.00016	-16.899
9503302	Zn(OH)3 -	9.306E-12	9.039E-12	-11.04388	0.97129	-28.386
9503303	Zn(OH)4 -2	5.711E-16	5.083E-16	-15.29389	0.89001	-41.148
9507320	ZnSO4 AQ	1.505E-11	1.506E-11	-10.82232	1.00016	2.294
9507321	Zn(SO4)2-2	2.465E-15	2.194E-15	-14.65871	0.89001	3.331
9501400	ZnHCO3 +	8.958E-11	8.701E-11	-10.06042	0.97129	12.413
9501401	ZnCO3 AQ	2.452E-09	2.452E-09	-8.61042	1.00016	5.300
9501402	Zn(CO3)2-2	1.428E-10	1.271E-10	-9.89598	0.89001	9.681
5403300	NiOH +	5.478E-11	5.321E-11	-10.27403	0.97129	-10.537
5403301	Ni(OH)2 AQ	6.694E-11	6.695E-11	-10.17426	1.00016	-19.000
5403302	Ni(OH)3 -	2.446E-13	2.375E-13	-12.62426	0.97129	-29.987
5407320	NiSO4 AQ	1.286E-11	1.287E-11	-10.89059	1.00016	2.206
5401400	NiHCO3 +	1.104E-10	1.072E-10	-9.96980	0.97129	12.483
5401401	NiCO3 AQ	9.553E-08	9.554E-08	-7.01980	1.00016	6.870
5401402	Ni(CO3)2-2	4.521E-10	4.024E-10	-9.39536	0.89001	10.161
5407321	Ni(SO4)2-2	1.421E-17	1.264E-17	-16.89809	0.89001	1.071
3301400	HCO3 -	2.598E-04	2.523E-04	-3.59802	0.97129	10.580
3301401	H2CO3 AQ	1.231E-06	1.231E-06	-5.90976	1.00016	16.806
3307320	HSO4 -	2.422E-12	2.353E-12	-11.62842	0.97129	1.756
2123300	HCrO4 -	9.536E-11	9.262E-11	-10.03328	0.97129	6.472
2123301	H2CrO4 AQ	4.065E-20	4.065E-20	-19.39090	1.00016	5.651
2123302	Cr2O7 -2	6.161E-19	5.483E-19	-18.26096	0.89001	14.774
2127320	CrO3SO4-2	1.514E-21	1.348E-21	-20.87042	0.89001	9.044

Type III - SPECIES WITH FIXED ACTIVITY

ID	NAME	CALC MOL	LOG MOL	NEW LOGK	DH
2	H2O	-8.477E-06	-5.072	0.000	0.000
330	H+1	-2.502E-04	-3.602	8.550	0.000

Type IV - FINITE SOLIDS (present at equilibrium)

ID	NAME	CALC MOL	LOG MOL	NEW LOGK	DH
3028100	HEMATITE	1.701E-07	-6.769	2.295	30.845
2003002	DIASPORE	3.512E-06	-5.454	-8.241	24.630

Type V - UNDERSATURATED SOLIDS (not present at equilibrium)

ID	NAME	CALC MOL	LOG MOL	NEW LOGK	DH
6003001	AL4(OH)10SO4	2.196E-12	-11.658	-22.700	0.000
6041000	ALUM K	1.236E-27	-26.908	5.571	-7.220
6041001	ALUNITE	3.686E-15	-14.433	1.564	-3.918
6015000	ANHYDRITE	5.436E-05	-4.265	4.428	3.769
5015000	ARAGONITE	4.798E-02	-1.319	8.167	2.615
5046000	ARTINITE	1.765E-08	-7.753	-11.196	28.742
6010000	BARITE	8.251E-03	-2.083	10.325	-6.280
2003001	BOEHMITE	1.261E-02	-1.899	-10.140	28.130
2046000	BRUCITE	7.115E-06	-5.148	-18.227	25.840
5015001	CALCITE	8.112E-02	-1.091	8.395	2.585
6080000	CELESTITE	6.938E-06	-5.159	6.439	0.470
6003000	ALOHSO4	3.540E-11	-10.451	3.230	0.000
5015002	DOLOMITE	2.614E-03	-2.583	16.540	8.290
6046000	EPSOMITE	2.844E-07	-6.546	2.297	-2.820
2028100	FERRIHYDRITE	9.152E-07	-6.038	-4.891	0.000
6028100	FE2(SO4)3	0.000E-01	-74.924	-6.863	59.120
2003003	GIBBSITE (C)	1.602E-02	-1.795	-10.036	22.800
3003000	Al2O3	3.175E-07	-6.498	-22.980	0.000
2028102	GOETHITE	3.535E-03	-2.452	-1.304	14.480

6015001	GYPSUM	1.479E-04	-3.830	4.862	-0.261
2003000	ALOH3(A)	2.285E-04	-3.641	-11.882	27.045
5015003	HUNTITE	1.388E-10	-9.857	28.537	25.760
5046001	HYDRMAGNESIT	2.516E-20	-19.599	5.866	52.210
6050000	JAROSITE NA	5.099E-35	-34.292	9.191	36.180
6041002	JAROSITE K	7.955E-32	-31.099	13.063	31.280
6028101	JAROSITE H	0.000E-01	-38.249	9.037	55.150
3028101	MAGHEMITE	2.085E-09	-8.681	-6.386	0.000
5046002	MAGNESITE	1.122E-02	-1.950	7.686	6.169
6050001	MIRABILITE	7.125E-13	-12.147	2.168	-18.987
3050000	NATRON	1.191E-13	-12.924	2.185	-15.745
5046003	NESQUEHONITE	4.605E-05	-4.337	5.299	5.789
5080000	STRONTIANITE	6.613E-04	-3.180	9.212	0.690
6050002	THENARDITE	6.785E-15	-14.168	0.147	0.572
5050001	THERMONATR	4.074E-16	-15.390	-0.281	2.802
5010000	WITHERITE	2.530E-05	-4.597	8.605	-0.360
2047003	PYROCROITE	9.215E-07	-6.036	-16.343	22.590
5047000	RHODOCHROSIT	7.692E-03	-2.114	10.295	2.079
6047000	MNSO4	7.185E-16	-15.144	-3.529	15.480
5023100	CUCO3	3.687E-07	-6.433	9.630	0.000
2023100	CU(OH)2	1.463E-03	-2.835	-9.487	15.250
6023100	ANTLERITE	5.555E-11	-10.255	-8.290	0.000
6023101	BROCHANTITE	2.223E-11	-10.653	-15.340	0.000
6023102	LANGITE	4.977E-15	-14.303	-18.990	39.610
2023101	TENORITE	1.534E-02	-1.814	-8.466	15.240
6023103	CUOCUSO4	7.529E-23	-22.123	-13.506	35.575
6023104	CUSO4	5.162E-20	-19.287	-4.017	18.140
6023105	CHALCANTHITE	2.820E-13	-12.550	2.720	-1.440
3023100	CUPRICFERIT	2.131E-04	-3.671	-8.029	38.690
5095000	SMITHSONITE	7.038E-05	-4.153	9.758	4.360
5095001	ZNCO3, 1H2O	2.237E-04	-3.650	10.260	0.000
2095000	ZN(OH)2 (A)	2.265E-04	-3.645	-12.450	0.000
2095001	ZN(OH)2 (C)	4.028E-04	-3.395	-12.200	0.000
2095002	ZN(OH)2 (B)	1.135E-03	-2.945	-11.750	0.000
2095003	ZN(OH)2 (G)	1.245E-03	-2.905	-11.710	0.000
2095004	ZN(OH)2 (E)	2.019E-03	-2.695	-11.500	0.000

6095000	ZN2(OH)2SO4	1.543E-12	-11.812	-7.500	0.000
6095001	ZN4(OH)6SO4	7.917E-16	-15.101	-28.400	0.000
2095005	ZNO(ACTIVE)	3.127E-03	-2.505	-11.310	0.000
2095006	ZINCITE	2.825E-04	-3.549	-12.354	21.860
6095002	ZN3O(SO4)2	0.000E-01	-39.892	-22.463	62.000
6095003	ZINCOSITE	6.411E-18	-17.193	-4.076	19.200
6095004	ZNSO4, 1H2O	7.283E-14	-13.138	-0.021	10.640
6095005	BIANCHITE	4.358E-12	-11.361	1.756	0.160
6095006	GOSLARITE	1.063E-11	-10.974	2.143	-3.300
5054000	NICO3	2.501E-08	-7.602	6.288	9.940
2054000	NI(OH)2	5.210E-01	-0.283	-9.109	-30.450
6054000	NI4(OH)6SO4	2.405E-19	-18.619	-32.000	0.000
2054001	BUNSENITE	1.115E-05	-4.953	-13.778	23.920
6054001	RETGERSITE	1.011E-11	-10.995	2.101	-1.100
6054002	MORENOSITE	2.673E-11	-10.573	2.523	-2.940
5023101	MALACHITE	7.978E-06	-5.098	4.313	15.610
5023102	AZURITE	1.335E-10	-9.875	15.600	23.770
2015000	LIME	7.296E-23	-22.137	-35.366	46.265
2015001	PORTLANDITE	7.081E-12	-11.150	-24.379	30.690
2046001	PERICLASE	3.651E-11	-10.438	-23.517	36.135
3046000	SPINEL	1.907E-12	-11.720	-41.281	89.089
3046001	MAG-FERRITE	2.082E-10	-9.682	-20.466	66.639
3028102	LEPIDOCROCIT	3.031E-03	-2.518	-1.371	0.000
3021201	BACRO4	3.122E-06	-5.506	10.023	-6.390
3021204	CUCRO4	1.217E-13	-12.915	5.475	0.000
3021205	K2CRO4	2.721E-19	-18.565	0.229	-4.250
3021206	K2CR2O7	6.944E-28	-27.158	16.678	-18.125
3021208	MGCRO4	2.994E-19	-18.524	-6.561	21.260
3021210	NA2CRO4	1.112E-21	-20.954	-3.518	4.610
3021211	NA2CR2O7	5.150E-33	-32.288	10.190	-5.305
3021214	SRCRO4	9.817E-11	-10.008	4.710	2.420
2021200	CrO3	1.257E-22	-21.901	3.141	1.245
3015000	CaCrO4	1.246E-10	-9.905	1.908	6.440

Type VI - EXCLUDED SPECIES (not included in mole balance)

ID	NAME	CALC MOL	LOG MOL	NEW LOGK	DH
3301403	CO2 (g)	2.978E-05	-4.526	18.189	-0.530

PERCENTAGE DISTRIBUTION OF COMPONENTS AMONG
TYPE I and TYPE II (dissolved and adsorbed) species

SO4-2

96.8	PERCENT BOUND IN SPECIES #	732	SO4-2
1.2	PERCENT BOUND IN SPECIES #	4607320	MgSO4 AQ
2.0	PERCENT BOUND IN SPECIES #	1507320	CaSO4 AQ

Zn+2

33.9	PERCENT BOUND IN SPECIES #	950	Zn+2
2.2	PERCENT BOUND IN SPECIES #	9503300	ZnOH +
47.9	PERCENT BOUND IN SPECIES #	9503301	Zn(OH)2 AQ
14.6	PERCENT BOUND IN SPECIES #	9501401	ZnCO3 AQ

Ba+2

100.0	PERCENT BOUND IN SPECIES #	100	Ba+2

Ca+2

99.4	PERCENT BOUND IN SPECIES #	150	Ca+2

CrO4-2

99.3	PERCENT BOUND IN SPECIES #	212	CrO4-2

Cu+2

99.3	PERCENT BOUND IN SPECIES #	2313301	Cu(OH)2 AQ

CO3-2

1.0	PERCENT BOUND IN SPECIES #	140	CO3-2
98.1	PERCENT BOUND IN SPECIES #	3301400	HCO3 -

Mg+2

99.4	PERCENT BOUND IN SPECIES #	460	Mg+2

Mn+2

99.4	PERCENT BOUND IN SPECIES #	470	Mn+2

Ni+2

5.8	PERCENT BOUND IN SPECIES #	540	Ni+2
93.5	PERCENT BOUND IN SPECIES #	5401401	NiCO3 AQ

K+1

100.0	PERCENT BOUND IN SPECIES #	410	K+1

Na+1

100.0	PERCENT BOUND IN SPECIES #	500	Na+1

Sr+2

100.0	PERCENT BOUND IN SPECIES #	800	Sr+2

Al+3

11.5	PERCENT BOUND IN SPECIES #	303302	Al(OH)4 -
88.3	PERCENT BOUND IN SPECIES #	303303	Al(OH)3 AQ

Fe+3

5.0	PERCENT BOUND IN SPECIES #	2813301	FeOH2 +
20.4	PERCENT BOUND IN SPECIES #	2813302	FeOH3 AQ
74.6	PERCENT BOUND IN SPECIES #	2813303	FeOH4 -

H2O

70.7	PERCENT BOUND IN SPECIES #	3300020	OH-
5.5	PERCENT BOUND IN SPECIES #	303303	Al(OH)3 AQ
19.9	PERCENT BOUND IN SPECIES #	2313301	Cu(OH)2 AQ
1.7	PERCENT BOUND IN SPECIES #	9503301	Zn(OH)2 AQ

H+1

99.2	PERCENT BOUND IN SPECIES #	3301400	HCO3 -

_____ PART 5 of OUTPUT FILE _____

PC MINTEQA2 v3.10 DATE OF CALCULATIONS: 20-OCT-98 TIME: 16:20:34

---------- EQUILIBRATED MASS DISTRIBUTION ----------

IDX	NAME	DISSOLVED		SORBED		PRECIPITATED	
		MOL/KG	PERCENT	MOL/KG	PERCENT	MOL/KG	PERCENT
732	SO4-2	1.749E-05	100.0	0.000E-01	0.0	0.000E-01	0.0
950	Zn+2	1.683E-08	100.0	0.000E-01	0.0	0.000E-01	0.0
100	Ba+2	2.913E-08	100.0	0.000E-01	0.0	0.000E-01	0.0
150	Ca+2	1.523E-04	100.0	0.000E-01	0.0	0.000E-01	0.0
212	CrO4-2	1.293E-08	100.0	0.000E-01	0.0	0.000E-01	0.0
231	Cu+2	9.442E-08	100.0	0.000E-01	0.0	0.000E-01	0.0
140	CO3-2	2.648E-04	100.0	0.000E-01	0.0	0.000E-01	0.0
460	Mg+2	1.078E-04	100.0	0.000E-01	0.0	0.000E-01	0.0
470	Mn+2	1.820E-07	100.0	0.000E-01	0.0	0.000E-01	0.0
540	Ni+2	1.022E-07	100.0	0.000E-01	0.0	0.000E-01	0.0
410	K+1	3.862E-06	100.0	0.000E-01	0.0	0.000E-01	0.0
500	Na+1	1.844E-05	100.0	0.000E-01	0.0	0.000E-01	0.0
800	Sr+2	1.883E-07	100.0	0.000E-01	0.0	0.000E-01	0.0
30	Al+3	1.972E-08	0.6	0.000E-01	0.0	3.512E-06	99.4
281	Fe+3	8.764E-15	0.0	0.000E-01	0.0	3.402E-07	100.0
2	H2O	9.421E-07	100.0	0.000E-01	0.0	0.000E-01	0.0
330	H+1	2.618E-04	100.0	0.000E-01	0.0	0.000E-01	0.0

Charge Balance: SPECIATED

Sum of CATIONS = 5.406E-04 Sum of ANIONS 2.998E-04

PERCENT DIFFERENCE = 2.866E+01 (ANIONS - CATIONS)/(ANIONS + CATIONS)

EQUILIBRIUM IONIC STRENGTH (m) = 6.988E-04

EQUILIBRIUM pH = 8.550

DATE ID NUMBER: 981020
TIME ID NUMBER: 16203465

PART 6 of OUTPUT FILE

PC MINTEQA2 v3.10 DATE OF CALCULATIONS: 20-OCT-98 TIME: 16:20:34

Saturation indices and stoichiometry of all minerals

ID #	NAME	Sat. Index	Stoichiometry in [brackets]
2003000	ALOH3(A)	-3.641	[1.000] 30 [3.000] 2 [-3.000] 330
6003000	ALOHSO4	-10.451	[-1.000] 330 [1.000] 30 [1.000] 732 [1.000] 2
6003001	AL4(OH)10SO4	-11.658	[-10.000] 330 [4.000] 30 [1.000] 732 [10.000] 2
6041000	ALUM K	-26.908	[1.000] 410 [1.000] 30 [2.000] 732 [12.000] 2
6041001	ALUNITE	-14.433	[1.000] 410 [3.000] 30 [2.000] 732 [6.000] 2 [-6.000] 330
6015000	ANHYDRITE	-4.265	[1.000] 150 [1.000] 732
5015000	ARAGONITE	-1.319	[1.000] 150 [1.000] 140
5046000	ARTINITE	-7.753	[-2.000] 330 [2.000] 460 [1.000] 140 [5.000] 2
6010000	BARITE	-2.083	[1.000] 100 [1.000] 732
2003001	BOEHMITE	-1.899	[-3.000] 330 [1.000] 30 [2.000] 2
2046000	BRUCITE	-5.148	[1.000] 460 [2.000] 2 [-2.000] 330
5015001	CALCITE	-1.091	[1.000] 150 [1.000] 140
6080000	CELESTITE	-5.159	[1.000] 800 [1.000] 732

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2003002 DIASPORE        0.000    [ -3.000] 330  [  1.000]  30  [  2.000]   2
5015002 DOLOMITE       -2.583    [  1.000] 150  [  1.000] 460  [  2.000] 140
6046000 EPSOMITE       -6.546    [  1.000] 460  [  1.000] 732  [  7.000]   2
2028100 FERRIHYDRITE   -6.038    [ -3.000] 330  [  1.000] 281  [  3.000]   2
6028100 FE2(SO4)3     -74.924    [  2.000] 281  [  3.000] 732
2003003 GIBBSITE (C)   -1.795    [ -3.000] 330  [  1.000]  30  [  3.000]   2
3003000 Al2O3          -6.498    [  2.000]  30  [  3.000]   2  [ -6.000] 330
2028102 GOETHITE       -2.452    [ -3.000] 330  [  1.000] 281  [  2.000]   2
6015001 GYPSUM         -3.830    [  1.000] 150  [  1.000] 732  [  2.000]   2
3028100 HEMATITE        0.000    [ -6.000] 330  [  2.000] 281  [  3.000]   2
5015003 HUNTITE        -9.857    [  3.000] 460  [  1.000] 150  [  4.000] 140
5046001 HYDRMAGNESIT  -19.599    [  5.000] 460  [  4.000] 140  [ -2.000] 330
                                  [  6.000]   2
6050000 JAROSITE NA   -34.292    [ -6.000] 330  [  1.000] 500  [  3.000] 281
                                  [  2.000] 732  [  6.000]   2
6041002 JAROSITE K    -31.099    [ -6.000] 330  [  1.000] 410  [  3.000] 281
                                  [  2.000] 732  [  6.000]   2
6028101 JAROSITE H    -38.249    [ -5.000] 330  [  3.000] 281  [  2.000] 732
                                  [  7.000]   2
3028101 MAGHEMITE      -8.681    [ -6.000] 330  [  2.000] 281  [  3.000]   2
5046002 MAGNESITE      -1.950    [  1.000] 460  [  1.000] 140
6050001 MIRABILITE    -12.147    [  2.000] 500  [  1.000] 732  [ 10.000]   2
3050000 NATRON        -12.924    [  2.000] 500  [  1.000] 140  [ 10.000]   2
5046003 NESQUEHONITE   -4.337    [  1.000] 460  [  1.000] 140  [  3.000]   2
5080000 STRONTIANITE   -3.180    [  1.000] 800  [  1.000] 140


  ID #     NAME      Sat. Index        Stoichiometry in [brackets]
6050002 THENARDITE    -14.168    [  2.000] 500  [  1.000] 732
5050001 THERMONATR    -15.390    [  2.000] 500  [  1.000] 140  [  1.000]   2
5010000 WITHERITE      -4.597    [  1.000] 100  [  1.000] 140
2047003 PYROCROITE     -6.036    [ -2.000] 330  [  1.000] 470  [  2.000]   2
5047000 RHODOCHROSIT   -2.114    [  1.000] 470  [  1.000] 140
6047000 MNSO4         -15.144    [  1.000] 470  [  1.000] 732
5023100 CUCO3          -6.433    [  1.000] 231  [  1.000] 140
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◎ Table of Contents

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2023100 CU(OH)2          -2.835    [ -2.000] 330  [  1.000] 231  [  2.000]   2
6023100 ANTLERITE       -10.255    [ -4.000] 330  [  3.000] 231  [  4.000]   2
                                   [  1.000] 732
6023101 BROCHANTITE     -10.653    [ -6.000] 330  [  4.000] 231  [  6.000]   2
                                   [  1.000] 732
6023102 LANGITE         -14.303    [ -6.000] 330  [  4.000] 231  [  7.000]   2
                                   [  1.000] 732
2023101 TENORITE         -1.814    [ -2.000] 330  [  1.000] 231  [  1.000]   2
6023103 CUOCUSO4        -22.123    [ -2.000] 330  [  2.000] 231  [  1.000]   2
                                   [  1.000] 732
6023104 CUSO4           -19.287    [  1.000] 231  [  1.000] 732
6023105 CHALCANTHITE    -12.550    [  1.000] 231  [  1.000] 732  [  5.000]   2
3023100 CUPRICFERIT      -3.671    [ -8.000] 330  [  1.000] 231  [  2.000] 281
                                   [  4.000]   2
5095000 SMITHSONITE      -4.153    [  1.000] 950  [  1.000] 140
5095001 ZNCO3, 1H2O      -3.650    [  1.000] 950  [  1.000] 140  [  1.000]   2
2095000 ZN(OH)2 (A)      -3.645    [ -2.000] 330  [  1.000] 950  [  2.000]   2
2095001 ZN(OH)2 (C)      -3.395    [ -2.000] 330  [  1.000] 950  [  2.000]   2
2095002 ZN(OH)2 (B)      -2.945    [ -2.000] 330  [  1.000] 950  [  2.000]   2
2095003 ZN(OH)2 (G)      -2.905    [ -2.000] 330  [  1.000] 950  [  2.000]   2
2095004 ZN(OH)2 (E)      -2.695    [ -2.000] 330  [  1.000] 950  [  2.000]   2
6095000 ZN2(OH)2SO4     -11.812    [ -2.000] 330  [  2.000] 950  [  2.000]   2
                                   [  1.000] 732
6095001 ZN4(OH)6SO4     -15.101    [ -6.000] 330  [  4.000] 950  [  6.000]   2
                                   [  1.000] 732
2095005 ZNO(ACTIVE)      -2.505    [ -2.000] 330  [  1.000] 950  [  1.000]   2
2095006 ZINCITE          -3.549    [ -2.000] 330  [  1.000] 950  [  1.000]   2
6095002 ZN3O(SO4)2      -39.892    [ -2.000] 330  [  3.000] 950  [  2.000] 732
                                   [  1.000]   2
6095003 ZINCOSITE       -17.193    [  1.000] 950  [  1.000] 732
6095004 ZNSO4, 1H2O     -13.138    [  1.000] 950  [  1.000] 732  [  1.000]   2
6095005 BIANCHITE       -11.361    [  1.000] 950  [  1.000] 732  [  6.000]   2
6095006 GOSLARITE       -10.974    [  1.000] 950  [  1.000] 732  [  7.000]   2
5054000 NICO3            -7.602    [  1.000] 540  [  1.000] 140
2054000 NI(OH)2          -0.283    [ -2.000] 330  [  1.000] 540  [  2.000]   2
6054000 NI4(OH)6SO4     -18.619    [ -6.000] 330  [  4.000] 540  [  1.000] 732
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                                [  6.000]   2
2054001 BUNSENITE      -4.953   [ -2.000] 330  [  1.000] 540  [  1.000]   2
6054001 RETGERSITE    -10.995   [  1.000] 540  [  1.000] 732  [  6.000]   2
6054002 MORENOSITE    -10.573   [  1.000] 540  [  1.000] 732  [  7.000]   2
5023101 MALACHITE      -5.098   [  2.000] 231  [  2.000]   2  [  1.000] 140
                                [ -2.000] 330
5023102 AZURITE        -9.875   [  3.000] 231  [  2.000]   2  [  2.000] 140
                                [ -2.000] 330


  ID #     NAME      Sat. Index        Stoichiometry in [brackets]
2015000 LIME           -22.137   [ -2.000] 330  [  1.000] 150  [  1.000]   2
2015001 PORTLANDITE    -11.150   [ -2.000] 330  [  1.000] 150  [  2.000]   2
2046001 PERICLASE      -10.438   [ -2.000] 330  [  1.000] 460  [  1.000]   2
3046000 SPINEL         -11.720   [ -8.000] 330  [  1.000] 460  [  2.000]  30
                                [  4.000]   2
3046001 MAG-FERRITE     -9.682   [ -8.000] 330  [  1.000] 460  [  2.000] 281
                                [  4.000]   2
3028102 LEPIDOCROCIT    -2.518   [ -3.000] 330  [  1.000] 281  [  2.000]   2
3021201 BACRO4          -5.506   [  1.000] 212  [  1.000] 100
3021204 CUCRO4         -12.915   [  1.000] 212  [  1.000] 231
3021205 K2CRO4         -18.565   [  1.000] 212  [  2.000] 410
3021206 K2CR2O7        -27.158   [  2.000] 212  [  2.000] 410  [  2.000] 330
                                [ -1.000]   2
3021208 MGCRO4         -18.524   [  1.000] 212  [  1.000] 460
3021210 NA2CRO4        -20.954   [  1.000] 212  [  2.000] 500
3021211 NA2CR2O7       -32.288   [  2.000] 212  [  2.000] 500  [  2.000] 330
                                [ -1.000]   2
3021214 SRCRO4         -10.008   [  1.000] 212  [  1.000] 800
2021200 CrO3           -21.901   [  1.000] 212  [  2.000] 330  [ -1.000]   2
3015000 CaCrO4          -9.905   [  1.000] 150  [  1.000] 212
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_____________________________________________________________________________
_____________________________ PART 1 of OUTPUT FILE ______________________________
  PC MINTEQA2 v3.10   DATE OF CALCULATIONS: 21-OCT-98  TIME:  9:43:56


B3 Alteration Halo
Using value for CO3, after specifying alkalinity

-----------------------------------------------------------------------------
 Temperature (Celsius):   4.00
 Units of concentration: MG/L
 Ionic strength to be computed.
 If specified, carbonate concentration represents total inorganic carbon.
 Do not automatically terminate if charge imbalance exceeds 30%
 Precipitation is allowed for all solids in the thermodynamic database and
   the print option for solids is set to: 1
 The maximum number of iterations is: 100
 The method used to compute activity coefficients is: Davies equation
 Full output file

-----------------------------------------------------------------------------
    330  0.000E-01   -8.00 y
     30  1.800E-03   -7.18 y
    100  1.000E-03   -8.14 y
    150  4.260E+00   -3.97 y
    231  7.500E-03   -6.93 y
    460  3.660E+00   -3.82 y
    470  4.500E-03   -7.09 y
    540  2.370E-01   -5.39 y
    410  2.500E-01   -5.19 y
    500  2.600E-01   -4.95 y
    800  1.650E-02   -6.73 y
    950  7.500E-04   -7.94 y
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    732  5.420E+00   -4.25
    140  1.391E+01   -5.28

 H2O has been inserted as a COMPONENT
  3   1
    330     8.0000     0.0000

INPUT DATA BEFORE TYPE MODIFICATIONS

   ID        NAME       ACTIVITY GUESS    LOG GUESS   ANAL TOTAL
    330  H+1                 1.000E-08        -8.000   0.000E-01
     30  Al+3                6.607E-08        -7.180   1.800E-03
    100  Ba+2                7.244E-09        -8.140   1.000E-03
    150  Ca+2                1.072E-04        -3.970   4.260E+00
    231  Cu+2                1.175E-07        -6.930   7.500E-03
    460  Mg+2                1.514E-04        -3.820   3.660E+00
    470  Mn+2                8.128E-08        -7.090   4.500E-03
    540  Ni+2                4.074E-06        -5.390   2.370E-01
    410  K+1                 6.457E-06        -5.190   2.500E-01
    500  Na+1                1.122E-05        -4.950   2.600E-01
    800  Sr+2                1.862E-07        -6.730   1.650E-02
    950  Zn+2                1.148E-08        -7.940   7.500E-04
    732  SO4-2               5.623E-05        -4.250   5.420E+00
    140  CO3-2               5.248E-06        -5.280   1.391E+01
      2  H2O                 1.000E+00         0.000   0.000E-01

_____________________________________________________________________________
_____________________________ PART 2 of OUTPUT FILE ______________________________
  PC MINTEQA2 v3.10   DATE OF CALCULATIONS: 21-OCT-98  TIME:  9:43:57


 ALL SPECIES CONSIDERED IN THIS PROBLEM

-------------------------------------------------------------------------------

 Type I - COMPONENTS AS SPECIES IN SOLUTION
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ID	NAME	DH	LOGK	MIN LOGK	MAX LOGK	Z	DHA	DHB	GFW
330	H+1	0.0000	0.0000	0.000	0.000	1.00	9.00	0.00	1.0080
30	Al+3	0.0000	0.0000	0.000	0.000	3.00	9.00	0.00	26.9815
100	Ba+2	0.0000	0.0000	0.000	0.000	2.00	5.00	0.00	137.3400
150	Ca+2	0.0000	0.0000	0.000	0.000	2.00	6.00	0.17	40.0800
231	Cu+2	0.0000	0.0000	0.000	0.000	2.00	6.00	0.00	63.5460
460	Mg+2	0.0000	0.0000	0.000	0.000	2.00	6.50	0.20	24.3120
470	Mn+2	0.0000	0.0000	0.000	0.000	2.00	6.00	0.00	54.9380
540	Ni+2	0.0000	0.0000	0.000	0.000	2.00	0.00	0.00	58.7100
410	K+1	0.0000	0.0000	0.000	0.000	1.00	3.00	0.01	39.1020
500	Na+1	0.0000	0.0000	0.000	0.000	1.00	4.00	0.08	22.9898
800	Sr+2	0.0000	0.0000	0.000	0.000	2.00	5.00	0.00	87.6200
950	Zn+2	0.0000	0.0000	0.000	0.000	2.00	6.00	0.00	65.3699
732	SO4-2	0.0000	0.0000	0.000	0.000	-2.00	4.00	-0.04	96.0616
140	CO3-2	0.0000	0.0000	0.000	0.000	-2.00	5.40	0.00	60.0094

Type II - OTHER SPECIES IN SOLUTION OR ADSORBED

ID	NAME	DH	LOGK	MIN LOGK	MAX LOGK	Z	DHA	DHB	GFW
3301401	H2CO3 AQ	-2.2470	16.6810	0.000	0.000	0.00	0.00	0.00	62.0250
3307320	HSO4 -	4.9100	1.9870	0.000	0.000	-1.00	4.50	0.00	97.0690
3300020	OH-	13.3450	-13.9980	0.000	0.000	-1.00	3.50	0.00	17.0074
4603300	MgOH +	15.9350	-11.7900	0.000	0.000	1.00	6.50	0.00	41.3190
4601400	MgCO3 AQ	2.0220	2.9800	0.000	0.000	0.00	0.00	0.00	84.3210
4601401	MgHCO3 +	-2.4300	11.4000	0.000	0.000	1.00	4.00	0.00	85.3290
4607320	MgSO4 AQ	1.3990	2.2500	0.000	0.000	0.00	0.00	0.00	120.3730
1503300	CaOH +	14.5350	-12.5980	0.000	0.000	1.00	6.00	0.00	57.0870
1501400	CaHCO3 +	1.7900	11.3300	0.000	0.000	1.00	6.00	0.00	101.0970
1501401	CaCO3 AQ	4.0300	3.1500	0.000	0.000	0.00	0.00	0.00	100.0890
1507320	CaSO4 AQ	1.4700	2.3090	0.000	0.000	0.00	0.00	0.00	136.1410
5001400	NaCO3 -	8.9110	1.2680	0.000	0.000	-1.00	5.40	0.00	82.9990
5001401	NaHCO3 AQ	0.0000	10.0800	0.000	0.000	0.00	0.00	0.00	84.0070
5007320	NaSO4 -	1.1200	0.7000	0.000	0.000	-1.00	5.40	0.00	119.0510

4107320	KSO4 -	2.2500	0.8500	0.000	0.000	-1.00	5.40	0.00	135.1630
303300	AlOH +2	11.8990	-4.9900	0.000	0.000	2.00	5.40	0.00	43.9880
303301	Al(OH)2 +	0.0000	-10.1000	0.000	0.000	1.00	5.40	0.00	60.9960
303302	Al(OH)4 -	44.0600	-23.0000	0.000	0.000	-1.00	4.50	0.00	95.0110
307320	AlSO4 +	2.1500	3.0200	0.000	0.000	1.00	4.50	0.00	123.0430
307321	Al(SO4)2 -	2.8400	4.9200	0.000	0.000	-1.00	4.50	0.00	219.1040
303303	Al(OH)3 AQ	0.0000	-16.0000	0.000	0.000	0.00	0.00	0.00	78.0030
8003300	SrOH +	14.4950	-13.1780	0.000	0.000	1.00	5.00	0.00	104.6270
1003300	BaOH +	15.0950	-13.3580	0.000	0.000	1.00	5.00	0.00	154.3470
4703300	MnOH +	14.3990	-10.5900	0.000	0.000	1.00	5.00	0.00	161.2970
4703301	Mn(OH)3 -1	0.0000	-34.8000	0.000	0.000	-1.00	5.00	0.00	105.9600
4707320	MnSO4 AQ	2.1700	2.2600	0.000	0.000	0.00	0.00	0.00	150.9990
4701400	MnHCO3 +	0.0000	11.6000	0.000	0.000	1.00	5.00	0.00	115.9550
2311400	CuCO3 AQ	0.0000	6.7300	0.000	0.000	0.00	0.00	0.00	123.5550
2311401	Cu(CO3)2-2	0.0000	9.8300	0.000	0.000	-2.00	0.00	0.00	183.5640
2313300	CuOH +	0.0000	-8.0000	0.000	0.000	1.00	4.00	0.00	80.5530
2313301	Cu(OH)2 AQ	0.0000	-13.6800	0.000	0.000	0.00	0.00	0.00	97.5600
2313302	Cu(OH)3 -	0.0000	-26.8990	0.000	0.000	-1.00	0.00	0.00	114.5680
2313303	Cu(OH)4 -2	0.0000	-39.6000	0.000	0.000	-2.00	0.00	0.00	131.5750
2313304	Cu2(OH)2+2	17.5390	-10.3590	0.000	0.000	2.00	0.00	0.00	161.1060
2317320	CuSO4 AQ	1.2200	2.3100	0.000	0.000	0.00	0.00	0.00	159.6070
2311402	CuHCO3 +	0.0000	13.0000	0.000	0.000	1.00	0.00	0.00	124.5630
9503300	ZnOH +	13.3990	-8.9600	0.000	0.000	1.00	0.00	0.00	82.3770
9503301	Zn(OH)2 AQ	0.0000	-16.8990	0.000	0.000	0.00	0.00	0.00	99.3840
9503302	Zn(OH)3 -	0.0000	-28.3990	0.000	0.000	-1.00	0.00	0.00	116.3920
9503303	Zn(OH)4 -2	0.0000	-41.1990	0.000	0.000	-2.00	0.00	0.00	133.3990
9507320	ZnSO4 AQ	1.3600	2.3700	0.000	0.000	0.00	0.00	0.00	161.4310
9507321	Zn(SO4)2-2	0.0000	3.2800	0.000	0.000	-2.00	0.00	0.00	257.4930
9501400	ZnHCO3 +	0.0000	12.4000	0.000	0.000	1.00	0.00	0.00	126.3570
9501401	ZnCO3 AQ	0.0000	5.3000	0.000	0.000	0.00	0.00	0.00	125.3790
9501402	Zn(CO3)2-2	0.0000	9.6300	0.000	0.000	-2.00	0.00	0.00	185.3580
5403300	NiOH +	12.4200	-9.8600	0.000	0.000	1.00	0.00	0.00	75.7170
5403301	Ni(OH)2 AQ	0.0000	-19.0000	0.000	0.000	0.00	0.00	0.00	92.7240
5403302	Ni(OH)3 -	0.0000	-30.0000	0.000	0.000	-1.00	0.00	0.00	109.7320
5407320	NiSO4 AQ	1.5200	2.2900	0.000	0.000	0.00	0.00	0.00	154.7710
5401400	NiHCO3 +	0.0000	12.4700	0.000	0.000	1.00	0.00	0.00	119.7270

5401401	NiCO3 AQ	0.0000	6.8700	0.000	0.000	0.00	0.00	0.00	118.7190
5401402	Ni(CO3)2-2	0.0000	10.1100	0.000	0.000	-2.00	0.00	0.00	178.7280
5407321	Ni(SO4)2-2	0.0000	1.0200	0.000	0.000	-2.00	0.00	0.00	250.8330
3301400	HCO3 -	-3.6170	10.3300	0.000	0.000	-1.00	5.40	0.00	61.0170

Type III - SPECIES WITH FIXED ACTIVITY

ID	NAME	DH	LOGK	MIN LOGK	MAX LOGK	Z	DHA	DHB	GFW
2	H2O	0.0000	0.0000	0.000	0.000	0.00	0.00	0.00	18.0153
330	H+1	0.0000	8.0000	0.000	0.000	1.00	9.00	0.00	1.0080

Type V - POSSIBLE SOLIDS

ID	NAME	DH	LOGK	MIN LOGK	MAX LOGK	Z	DHA	DHB	GFW
2003000	ALOH3(A)	27.0450	-10.3800	-9.690	0.000	0.00	0.00	0.00	78.0073
6003000	ALOHSO4	0.0000	3.2300	3.390	3.070	0.00	0.00	0.00	140.0505
6003001	AL4(OH)10SO4	0.0000	-22.7000	0.000	0.000	0.00	0.00	0.00	374.0616
6041000	ALUM K	-7.2200	5.1700	0.000	0.000	0.00	0.00	0.00	438.3597
6041001	ALUNITE	-3.9180	1.3460	0.000	0.000	0.00	0.00	0.00	414.2141
6015000	ANHYDRITE	3.7690	4.6370	0.000	0.000	0.00	0.00	0.00	136.1416
5015000	ARAGONITE	2.6150	8.3600	0.000	0.000	0.00	0.00	0.00	100.0894
5046000	ARTINITE	28.7420	-9.6000	0.000	0.000	0.00	0.00	0.00	196.6941
6010000	BARITE	-6.2800	9.9760	0.000	9.773	0.00	0.00	0.00	233.4016
2003001	BOEHMITE	28.1300	-8.5780	-8.065	0.000	0.00	0.00	0.00	59.9884
2046000	BRUCITE	25.8400	-16.7920	0.000	0.000	0.00	0.00	0.00	58.3268
5015001	CALCITE	2.5850	8.4750	8.560	0.000	0.00	0.00	0.00	100.0894
6080000	CELESTITE	0.4700	6.4650	0.000	6.349	0.00	0.00	0.00	183.6816
2003002	DIASPORE	24.6300	-6.8730	0.000	0.000	0.00	0.00	0.00	59.9884
5015002	DOLOMITE	8.2900	17.0000	0.000	0.000	0.00	0.00	0.00	184.4108
6046000	EPSOMITE	-2.8200	2.1400	0.000	0.000	0.00	0.00	0.00	246.4807
2003003	GIBBSITE (C)	22.8000	-8.7700	-8.487	-9.440	0.00	0.00	0.00	78.0037
3003000	Al2O3	0.0000	-22.9800	0.000	0.000	0.00	0.00	0.00	101.9504

6015001	GYPSUM	-0.2610	4.8480	0.000	0.000	0.00	0.00	0.00	172.1722
5015003	HUNTITE	25.7600	29.9680	0.000	0.000	0.00	0.00	0.00	353.0536
5046001	HYDRMAGNESIT	52.2100	8.7660	0.000	0.000	0.00	0.00	0.00	467.6736
5046002	MAGNESITE	6.1690	8.0290	8.279	7.779	0.00	0.00	0.00	84.3214
6050001	MIRABILITE	-18.9870	1.1140	0.000	0.000	0.00	0.00	0.00	322.1942
3050000	NATRON	-15.7450	1.3110	0.000	0.000	0.00	0.00	0.00	286.1420
5046003	NESQUEHONITE	5.7890	5.6210	5.133	4.546	0.00	0.00	0.00	138.3673
5080000	STRONTIANITE	0.6900	9.2500	11.789	0.000	0.00	0.00	0.00	147.6294
6050002	THENARDITE	0.5720	0.1790	0.000	0.000	0.00	0.00	0.00	142.0412
5050001	THERMONATR	2.8020	-0.1250	0.000	0.000	0.00	0.00	0.00	124.0043
5010000	WITHERITE	-0.3600	8.5850	13.335	0.000	0.00	0.00	0.00	197.3494
2047003	PYROCROITE	22.5900	-15.0880	0.000	-15.381	0.00	0.00	0.00	88.9528
5047000	RHODOCHROSIT	2.0790	10.4100	11.019	9.993	0.00	0.00	0.00	114.9474
6047000	MNSO4	15.4800	-2.6690	0.000	0.000	0.00	0.00	0.00	150.9996
5023100	CUCO3	0.0000	9.6300	9.650	9.610	0.00	0.00	0.00	123.5552
2023100	CU(OH)2	15.2500	-8.6400	0.000	-9.200	0.00	0.00	0.00	97.5606
6023100	ANTLERITE	0.0000	-8.2900	0.000	-8.900	0.00	0.00	0.00	354.7248
6023101	BROCHANTITE	0.0000	-15.3400	-15.150	-15.500	0.00	0.00	0.00	452.2854
6023102	LANGITE	39.6100	-16.7900	0.000	-17.400	0.00	0.00	0.00	470.3006
2023101	TENORITE	15.2400	-7.6200	-7.350	-7.890	0.00	0.00	0.00	79.5454
6023103	CUOCUSO4	35.5750	-11.5300	0.000	0.000	0.00	0.00	0.00	239.1490
6023104	CUSO4	18.1400	-3.0100	-2.630	-3.420	0.00	0.00	0.00	159.6036
6023105	CHALCANTHITE	-1.4400	2.6400	2.960	2.135	0.00	0.00	0.00	249.6796
5095000	SMITHSONITE	4.3600	10.0000	10.810	9.820	0.00	0.00	0.00	125.3892
5095001	ZNCO3, 1H2O	0.0000	10.2600	0.000	0.000	0.00	0.00	0.00	143.4044
2095000	ZN(OH)2 (A)	0.0000	-12.4500	-12.260	-12.480	0.00	0.00	0.00	99.3946
2095001	ZN(OH)2 (C)	0.0000	-12.2000	0.000	0.000	0.00	0.00	0.00	99.3946
2095002	ZN(OH)2 (B)	0.0000	-11.7500	-11.320	-11.890	0.00	0.00	0.00	99.3946
2095003	ZN(OH)2 (G)	0.0000	-11.7100	-11.190	-11.840	0.00	0.00	0.00	99.3946
2095004	ZN(OH)2 (E)	0.0000	-11.5000	-10.950	-11.620	0.00	0.00	0.00	99.3946
6095000	ZN2(OH)2SO4	0.0000	-7.5000	0.000	0.000	0.00	0.00	0.00	260.8322
6095001	ZN4(OH)6SO4	0.0000	-28.4000	0.000	0.000	0.00	0.00	0.00	459.6214
2095005	ZNO(ACTIVE)	0.0000	-11.3100	-11.570	-11.860	0.00	0.00	0.00	81.3794
2095006	ZINCITE	21.8600	-11.1400	-10.990	-11.540	0.00	0.00	0.00	81.3794
6095002	ZN3O(SO4)2	62.0000	-19.0200	0.000	0.000	0.00	0.00	0.00	404.2546
6095003	ZINCOSITE	19.2000	-3.0100	0.000	-3.930	0.00	0.00	0.00	161.4376

6095004	ZNSO4, 1H2O	10.6400	0.5700	0.000	0.500	0.00	0.00	0.00	179.4528
6095005	BIANCHITE	0.1600	1.7650	0.000	1.020	0.00	0.00	0.00	269.5288
6095006	GOSLARITE	-3.3000	1.9600	0.000	1.870	0.00	0.00	0.00	287.5440
5054000	NICO3	9.9400	6.8400	0.000	0.000	0.00	0.00	0.00	118.7092
2054000	NI(OH)2	-30.4500	-10.8000	-10.590	-13.300	0.00	0.00	0.00	92.7146
6054000	NI4(OH)6SO4	0.0000	-32.0000	0.000	0.000	0.00	0.00	0.00	432.9014
2054001	BUNSENITE	23.9200	-12.4500	0.000	-12.390	0.00	0.00	0.00	74.6994
6054001	RETGERSITE	-1.1000	2.0400	0.000	0.000	0.00	0.00	0.00	262.8488
6054002	MORENOSITE	-2.9400	2.3600	0.000	0.000	0.00	0.00	0.00	280.8640
5023101	MALACHITE	15.6100	5.1800	0.000	3.940	0.00	0.00	0.00	221.1162
5023102	AZURITE	23.7700	16.9200	0.000	0.000	0.00	0.00	0.00	344.6716
2015000	LIME	46.2650	-32.7970	0.000	0.000	0.00	0.00	0.00	56.0800
2015001	PORTLANDITE	30.6900	-22.6750	0.000	0.000	0.00	0.00	0.00	73.0880
2046001	PERICLASE	36.1350	-21.5100	0.000	0.000	0.00	0.00	0.00	40.3200
3046000	SPINEL	89.0890	-36.3330	0.000	0.000	0.00	0.00	0.00	142.2800

Type VI - EXCLUDED SPECIES (not included in mole balance)

ID	NAME	DH	LOGK	MIN LOGK	MAX LOGK	Z	DHA	DHB	GFW
3301403	CO2 (g)	-0.5300	18.1600	0.000	0.000	0.00	0.00	0.00	41.0100

Charge Balance: UNSPECIATED

Sum of CATIONS= 5.405E-04 Sum of ANIONS = 5.765E-04

PERCENT DIFFERENCE = 3.222E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

IMPROVED ACTIVITY GUESSES PRIOR TO FIRST ITERATION:		
Al+3	Log activity guess:	-15.19
Cu+2	Log activity guess:	-7.23

◎ Table of Contents

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             |       Mn+2        Log activity guess:    -7.09       |
             |       SO4-2       Log activity guess:    -4.25       |
             |       CO3-2       Log activity guess:    -6.21       |
             |                                                      |
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PARAMETERS OF THE COMPONENT MOST OUT OF BALANCE:

ITER	NAME	TOTAL MOL	DIFF FXN	LOG ACTVTY	RESIDUAL
0	SO4-2	5.642E-05	2.333E-06	-4.24854	2.327E-06
1	Zn+2	1.147E-08	7.270E-12	-8.05201	6.122E-12
2	SO4-2	5.642E-05	6.908E-06	-4.26561	6.901E-06
3	SO4-2	5.642E-05	3.562E-08	-4.31392	2.998E-08

ITERATIONS= 4: SOLID NI(OH)2 PRECIPITATES

PARAMETERS OF THE COMPONENT MOST OUT OF BALANCE:

ITER	NAME	TOTAL MOL	DIFF FXN	LOG ACTVTY	RESIDUAL
4	Zn+2	1.147E-08	-1.042E-09	-8.09190	1.041E-09
5	Zn+2	1.147E-08	1.144E-09	-8.05263	1.143E-09
6	Zn+2	1.147E-08	5.561E-12	-8.09217	4.413E-12

◎ Table of Contents

PC MINTEQA2 v3.10 DATE OF CALCULATIONS: 21-OCT-98 TIME: 9:43:57

ITERATIONS= 7: SOLID DIASPORE PRECIPITATES

PC MINTEQA2 v3.10 DATE OF CALCULATIONS: 21-OCT-98 TIME: 9:43:57

PARAMETERS OF THE COMPONENT MOST OUT OF BALANCE:

ITER	NAME	TOTAL MOL	DIFF FXN	LOG ACTVTY	RESIDUAL
7	Sr+2	1.883E-07	-2.130E-08	-6.77724	2.128E-08
8	Sr+2	1.883E-07	2.398E-08	-6.72511	2.396E-08
9	Sr+2	1.883E-07	3.118E-11	-6.77717	1.235E-11

ID	NAME	ANAL MOL	CALC MOL	LOG ACTVTY	GAMMA	DIFF FXN
140	CO3-2	2.318E-04	6.700E-07	-6.22603	0.886892	-4.486E-10
950	Zn+2	1.147E-08	9.115E-09	-8.09238	0.886892	-7.192E-14
100	Ba+2	7.281E-09	7.281E-09	-8.18992	0.886892	-5.699E-14
150	Ca+2	1.063E-04	1.054E-04	-4.02949	0.886892	-8.246E-10
231	Cu+2	1.180E-07	6.210E-10	-9.25906	0.886892	-3.353E-15
460	Mg+2	1.505E-04	1.492E-04	-3.87830	0.886892	-1.168E-09
470	Mn+2	8.191E-08	8.122E-08	-7.14244	0.886892	-6.360E-13
732	SO4-2	5.642E-05	5.470E-05	-4.31415	0.886892	-4.278E-10
410	K+1	6.394E-06	6.392E-06	-5.20738	0.970438	-1.251E-11
500	Na+1	1.131E-05	1.131E-05	-4.95971	0.970438	-2.213E-11
800	Sr+2	1.883E-07	1.883E-07	-6.77724	0.886892	-1.474E-12
30	Al+3	6.671E-08	2.281E-16	-15.75911	0.763324	0.000E-01
540	Ni+2	4.037E-06	1.449E-07	-6.89110	0.886892	0.000E-01
2	H2O	0.000E-01	-7.220E-06	0.00000	1.000000	-1.228E-22
330	H+1	0.000E-01	1.030E-08	-8.00000	0.970438	-6.617E-24

Type I - COMPONENTS AS SPECIES IN SOLUTION

ID	NAME	CALC MOL	ACTIVITY	LOG ACTVTY	GAMMA	NEW LOGK
330	H+1	1.030E-08	1.000E-08	-8.00000	0.97044	0.013
30	Al+3	2.281E-16	1.741E-16	-15.75911	0.76332	0.117
100	Ba+2	7.281E-09	6.458E-09	-8.18992	0.88689	0.052
150	Ca+2	1.054E-04	9.344E-05	-4.02949	0.88689	0.052
231	Cu+2	6.210E-10	5.507E-10	-9.25906	0.88689	0.052
460	Mg+2	1.492E-04	1.323E-04	-3.87830	0.88689	0.052
470	Mn+2	8.122E-08	7.204E-08	-7.14244	0.88689	0.052
540	Ni+2	1.449E-07	1.285E-07	-6.89110	0.88689	0.052
410	K+1	6.392E-06	6.203E-06	-5.20738	0.97044	0.013
500	Na+1	1.131E-05	1.097E-05	-4.95971	0.97044	0.013
800	Sr+2	1.883E-07	1.670E-07	-6.77724	0.88689	0.052
950	Zn+2	9.115E-09	8.084E-09	-8.09238	0.88689	0.052
732	SO4-2	5.470E-05	4.851E-05	-4.31415	0.88689	0.052
140	CO3-2	6.700E-07	5.942E-07	-6.22603	0.88689	0.052

Type II - OTHER SPECIES IN SOLUTION OR ADSORBED

ID	NAME	CALC MOL	ACTIVITY	LOG ACTVTY	GAMMA	NEW LOGK
3301401	H2CO3 AQ	3.799E-06	3.800E-06	-5.42024	1.00017	16.806
3307320	HSO4 -	2.769E-11	2.688E-11	-10.57065	0.97044	1.757
3300020	OH-	1.879E-07	1.823E-07	-6.73915	0.97044	-14.726
4603300	MgOH +	3.174E-09	3.080E-09	-8.51144	0.97044	-12.620
4601400	MgCO3 AQ	5.436E-08	5.437E-08	-7.26468	1.00017	2.840
4601401	MgHCO3 +	3.136E-07	3.043E-07	-6.51672	0.97044	11.601
4607320	MgSO4 AQ	9.545E-07	9.547E-07	-6.02015	1.00017	2.172
1503300	CaOH +	3.787E-10	3.675E-10	-9.43473	0.97044	-13.392
1501400	CaHCO3 +	1.152E-07	1.117E-07	-6.95176	0.97044	11.317
1501401	CaCO3 AQ	5.793E-08	5.794E-08	-7.23703	1.00017	3.018
1507320	CaSO4 AQ	7.650E-07	7.651E-07	-6.11628	1.00017	2.227
5001400	NaCO3 -	3.985E-11	3.867E-11	-10.41263	0.97044	0.786

5001401	NaHCO3 AQ	7.838E-10	7.839E-10	-9.10574	1.00017	10.080
5007320	NaSO4 -	2.382E-09	2.312E-09	-8.63606	0.97044	0.651
4107320	KSO4 -	1.469E-09	1.426E-09	-8.84590	0.97044	0.689
303300	AlOH +2	4.387E-14	3.891E-14	-13.40995	0.88689	-5.599
303301	Al(OH)2 +	1.425E-10	1.383E-10	-9.85912	0.97044	-10.087
303302	Al(OH)4 -	6.411E-10	6.222E-10	-9.20610	0.97044	-25.434
307320	AlSO4 +	6.924E-18	6.719E-18	-17.17267	0.97044	2.914
307321	Al(SO4)2 -	2.443E-20	2.371E-20	-19.62515	0.97044	4.775
303303	Al(OH)3 AQ	1.741E-08	1.741E-08	-7.75912	1.00017	-16.000
8003300	SrOH +	1.790E-13	1.737E-13	-12.76026	0.97044	-13.970
1003300	BaOH +	4.234E-15	4.109E-15	-14.38626	0.97044	-14.183
4703300	MnOH +	3.026E-11	2.937E-11	-10.53213	0.97044	-11.377
4703301	Mn(OH)3 -1	1.176E-18	1.142E-18	-17.94245	0.97044	-34.787
4707320	MnSO4 AQ	4.817E-10	4.818E-10	-9.31711	1.00017	2.139
4701400	MnHCO3 +	1.756E-10	1.704E-10	-9.76847	0.97044	11.613
2311400	CuCO3 AQ	1.757E-09	1.758E-09	-8.75509	1.00017	6.730
2311401	Cu(CO3)2-2	1.483E-12	1.315E-12	-11.88113	0.88689	9.882
2313300	CuOH +	5.675E-10	5.507E-10	-9.25907	0.97044	-7.987
2313301	Cu(OH)2 AQ	1.150E-07	1.151E-07	-6.93907	1.00017	-13.680
2313302	Cu(OH)3 -	7.161E-13	6.949E-13	-12.15807	0.97044	-26.886
2313303	Cu(OH)4 -2	1.560E-17	1.383E-17	-16.85908	0.88689	-39.548
2313304	Cu2(OH)2+2	1.590E-14	1.410E-14	-13.85069	0.88689	-11.280
2317320	CuSO4 AQ	4.666E-12	4.667E-12	-11.33097	1.00017	2.242
2311402	CuHCO3 +	3.372E-11	3.273E-11	-10.48509	0.97044	13.013
9503300	ZnOH +	1.646E-10	1.598E-10	-9.79652	0.97044	-9.691
9503301	Zn(OH)2 AQ	1.020E-09	1.020E-09	-8.99139	1.00017	-16.899
9503302	Zn(OH)3 -	3.324E-13	3.226E-13	-12.49139	0.97044	-28.386
9503303	Zn(OH)4 -2	5.764E-18	5.112E-18	-17.29139	0.88689	-41.147
9507320	ZnSO4 AQ	7.724E-11	7.726E-11	-10.11206	1.00017	2.294
9507321	Zn(SO4)2-2	4.087E-14	3.625E-14	-13.44069	0.88689	3.332
9501400	ZnHCO3 +	1.243E-10	1.207E-10	-9.91841	0.97044	12.413
9501401	ZnCO3 AQ	9.583E-10	9.585E-10	-9.01841	1.00017	5.300
9501402	Zn(CO3)2-2	1.373E-11	1.218E-11	-10.91444	0.88689	9.682
5403300	NiOH +	3.734E-10	3.623E-10	-9.44088	0.97044	-10.537
5403301	Ni(OH)2 AQ	1.285E-10	1.285E-10	-9.89111	1.00017	-19.000
5403302	Ni(OH)3 -	1.324E-13	1.285E-13	-12.89111	0.97044	-29.987

5407320	NiSO4 AQ	1.001E-09	1.001E-09	-8.99967	1.00017	2.206
5401400	NiHCO3 +	2.322E-09	2.254E-09	-8.64713	0.97044	12.483
5401401	NiCO3 AQ	5.660E-07	5.661E-07	-6.24713	1.00017	6.870
5401402	Ni(CO3)2-2	6.591E-10	5.846E-10	-9.23317	0.88689	10.162
5407321	Ni(SO4)2-2	3.570E-15	3.167E-15	-14.49941	0.88689	1.072
3301400	HCO3 -	2.262E-04	2.195E-04	-3.65850	0.97044	10.581

Type III - SPECIES WITH FIXED ACTIVITY

ID	NAME	CALC MOL	LOG MOL	NEW LOGK	DH
2	H2O	-7.220E-06	-5.141	0.000	0.000
330	H+1	-2.270E-04	-3.644	8.000	0.000

Type IV - FINITE SOLIDS (present at equilibrium)

ID	NAME	CALC MOL	LOG MOL	NEW LOGK	DH
2054000	NI(OH)2	3.322E-06	-5.479	-9.109	-30.450
2003002	DIASPORE	4.852E-08	-7.314	-8.241	24.630

Type V - UNDERSATURATED SOLIDS (not present at equilibrium)

ID	NAME	CALC MOL	LOG MOL	NEW LOGK	DH
6003001	AL4(OH)10SO4	8.899E-11	-10.051	-22.700	0.000
6041000	ALUM K	9.465E-25	-24.024	5.571	-7.220
6041001	ALUNITE	2.822E-12	-11.549	1.564	-3.918
6015000	ANHYDRITE	1.213E-04	-3.916	4.428	3.769
5015000	ARAGONITE	8.158E-03	-2.088	8.167	2.615
5046000	ARTINITE	6.624E-10	-9.179	-11.196	28.742
6010000	BARITE	6.618E-03	-2.179	10.325	-6.280
2003001	BOEHMITE	1.261E-02	-1.899	-10.140	28.130

2046000	BRUCITE	7.845E-07	-6.105	-18.227	25.840
5015001	CALCITE	1.379E-02	-1.860	8.395	2.585
6080000	CELESTITE	2.226E-05	-4.652	6.439	0.470
6003000	ALOHSO4	1.435E-09	-8.843	3.230	0.000
5015002	DOLOMITE	1.513E-04	-3.820	16.540	8.290
6046000	EPSOMITE	1.271E-06	-5.896	2.297	-2.820
2003003	GIBBSITE (C)	1.602E-02	-1.795	-10.036	22.800
3003000	Al2O3	3.175E-07	-6.498	-22.980	0.000
6015001	GYPSUM	3.302E-04	-3.481	4.862	-0.261
5015003	HUNTITE	9.308E-13	-12.031	28.537	25.760
5046001	HYDRMAGNESIT	3.722E-23	-22.429	5.866	52.210
5046002	MAGNESITE	3.820E-03	-2.418	7.686	6.169
6050001	MIRABILITE	8.607E-13	-12.065	2.168	-18.987
3050000	NATRON	1.096E-14	-13.960	2.185	-15.745
5046003	NESQUEHONITE	1.567E-05	-4.805	5.299	5.789
5080000	STRONTIANITE	1.616E-04	-3.792	9.212	0.690
6050002	THENARDITE	8.197E-15	-14.086	0.147	0.572
5050001	THERMONATR	3.749E-17	-16.426	-0.281	2.802
5010000	WITHERITE	1.545E-06	-5.811	8.605	-0.360
2047003	PYROCROITE	3.273E-08	-7.485	-16.343	22.590
5047000	RHODOCHROSIT	8.435E-04	-3.074	10.295	2.079
6047000	MNSO4	1.034E-15	-14.985	-3.529	15.480
5023100	CUCO3	1.396E-06	-5.855	9.630	0.000
2023100	CU(OH)2	1.795E-03	-2.746	-9.487	15.250
6023100	ANTLERITE	4.156E-09	-8.381	-8.290	0.000
6023101	BROCHANTITE	2.040E-09	-8.690	-15.340	0.000
6023102	LANGITE	4.568E-13	-12.340	-18.990	39.610
2023101	TENORITE	1.882E-02	-1.725	-8.466	15.240
6023103	CUOCUSO4	4.592E-21	-20.338	-13.506	35.575
6023104	CUSO4	2.566E-18	-17.591	-4.017	18.140
6023105	CHALCANTHITE	1.402E-11	-10.853	2.720	-1.440
5095000	SMITHSONITE	2.751E-05	-4.561	9.758	4.360
5095001	ZNCO3, 1H2O	8.741E-05	-4.058	10.260	0.000
2095000	ZN(OH)2 (A)	2.868E-05	-4.542	-12.450	0.000
2095001	ZN(OH)2 (C)	5.101E-05	-4.292	-12.200	0.000
2095002	ZN(OH)2 (B)	1.438E-04	-3.842	-11.750	0.000

2095003	ZN(OH)2 (G)	1.576E-04	-3.802	-11.710	0.000
2095004	ZN(OH)2 (E)	2.556E-04	-3.592	-11.500	0.000
6095000	ZN2(OH)2SO4	1.002E-12	-11.999	-7.500	0.000
6095001	ZN4(OH)6SO4	8.247E-18	-17.084	-28.400	0.000
2095005	ZNO(ACTIVE)	3.959E-04	-3.402	-11.310	0.000
2095006	ZINCITE	3.577E-05	-4.446	-12.354	21.860
6095002	ZN3O(SO4)2	0.000E-01	-39.369	-22.463	62.000
6095003	ZINCOSITE	3.290E-17	-16.483	-4.076	19.200
6095004	ZNSO4, 1H2O	3.737E-13	-12.427	-0.021	10.640
6095005	BIANCHITE	2.236E-11	-10.650	1.756	0.160
6095006	GOSLARITE	5.454E-11	-10.263	2.143	-3.300
5054000	NICO3	1.482E-07	-6.829	6.288	9.940
2003000	ALOH3(A)	2.285E-04	-3.641	-11.882	27.045
6054000	NI4(OH)6SO4	1.323E-16	-15.879	-32.000	0.000
2054001	BUNSENITE	2.140E-05	-4.670	-13.778	23.920
6054001	RETGERSITE	7.867E-10	-9.104	2.101	-1.100
6054002	MORENOSITE	2.080E-09	-8.682	2.523	-2.940
5023101	MALACHITE	3.706E-05	-4.431	4.313	15.610
5023102	AZURITE	2.348E-09	-8.629	15.600	23.770
2015000	LIME	4.019E-24	-23.396	-35.366	46.265
2015001	PORTLANDITE	3.900E-13	-12.409	-24.379	30.690
2046001	PERICLASE	4.026E-12	-11.395	-23.517	36.135
3046000	SPINEL	2.102E-13	-12.677	-41.281	89.089

Type VI - EXCLUDED SPECIES (not included in mole balance)

ID	NAME	CALC MOL	LOG MOL	NEW LOGK	DH
3301403	CO2 (g)	9.192E-05	-4.037	18.189	-0.530

PERCENTAGE DISTRIBUTION OF COMPONENTS AMONG
TYPE I and TYPE II (dissolved and adsorbed) species

CO3-2

1.6	PERCENT BOUND IN SPECIES	#3301401	H2CO3 AQ
97.6	PERCENT BOUND IN SPECIES	#3301400	HCO3 -

Zn+2

79.4	PERCENT BOUND IN SPECIES	# 950	Zn+2
1.4	PERCENT BOUND IN SPECIES	#9503300	ZnOH +
8.9	PERCENT BOUND IN SPECIES	#9503301	Zn(OH)2 AQ
1.1	PERCENT BOUND IN SPECIES	#9501400	ZnHCO3 +
8.4	PERCENT BOUND IN SPECIES	#9501401	ZnCO3 AQ

Ba+2

100.0	PERCENT BOUND IN SPECIES	# 100	Ba+2

Ca+2

99.1	PERCENT BOUND IN SPECIES	# 150	Ca+2

Cu+2

1.5	PERCENT BOUND IN SPECIES	#2311400	CuCO3 AQ
97.5	PERCENT BOUND IN SPECIES	#2313301	Cu(OH)2 AQ

```
Mg+2
              99.1     PERCENT BOUND IN SPECIES #    460   Mg+2

Mn+2
              99.2     PERCENT BOUND IN SPECIES #    470   Mn+2

SO4-2
              96.9     PERCENT BOUND IN SPECIES #    732   SO4-2
               1.7     PERCENT BOUND IN SPECIES #4607320   MgSO4 AQ
               1.4     PERCENT BOUND IN SPECIES #1507320   CaSO4 AQ

K+1
             100.0     PERCENT BOUND IN SPECIES #    410   K+1

Na+1
             100.0     PERCENT BOUND IN SPECIES #    500   Na+1

Sr+2
             100.0     PERCENT BOUND IN SPECIES #    800   Sr+2

Al+3
               3.5     PERCENT BOUND IN SPECIES # 303302   Al(OH)4 -
              95.7     PERCENT BOUND IN SPECIES # 303303   Al(OH)3 AQ

Ni+2
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```
                20.3     PERCENT BOUND IN SPECIES #    540   Ni+2

                79.1     PERCENT BOUND IN SPECIES #5401401   NiCO3 AQ


H2O
                39.1     PERCENT BOUND IN SPECIES #3300020   OH-

                10.9     PERCENT BOUND IN SPECIES # 303303   Al(OH)3 AQ

                47.9     PERCENT BOUND IN SPECIES #2313301   Cu(OH)2 AQ


H+1
                 3.3     PERCENT BOUND IN SPECIES #3301401   H2CO3 AQ

                96.8     PERCENT BOUND IN SPECIES #3301400   HCO3 -
```


EQUILIBRATED MASS DISTRIBUTION

IDX	NAME	DISSOLVED		SORBED		PRECIPITATED	
		MOL/KG	PERCENT	MOL/KG	PERCENT	MOL/KG	PERCENT
140	CO3-2	2.318E-04	100.0	0.000E-01	0.0	0.000E-01	0.0
950	Zn+2	1.147E-08	100.0	0.000E-01	0.0	0.000E-01	0.0
100	Ba+2	7.281E-09	100.0	0.000E-01	0.0	0.000E-01	0.0
150	Ca+2	1.063E-04	100.0	0.000E-01	0.0	0.000E-01	0.0

231	Cu+2	1.180E-07	100.0	0.000E-01	0.0	0.000E-01	0.0
460	Mg+2	1.505E-04	100.0	0.000E-01	0.0	0.000E-01	0.0
470	Mn+2	8.191E-08	100.0	0.000E-01	0.0	0.000E-01	0.0
732	SO4-2	5.642E-05	100.0	0.000E-01	0.0	0.000E-01	0.0
410	K+1	6.394E-06	100.0	0.000E-01	0.0	0.000E-01	0.0
500	Na+1	1.131E-05	100.0	0.000E-01	0.0	0.000E-01	0.0
800	Sr+2	1.883E-07	100.0	0.000E-01	0.0	0.000E-01	0.0
30	Al+3	1.819E-08	27.3	0.000E-01	0.0	4.852E-08	72.7
540	Ni+2	7.153E-07	17.7	0.000E-01	0.0	3.322E-06	82.3
2	H2O	4.800E-07	100.0	0.000E-01	0.0	0.000E-01	0.0
330	H+1	2.338E-04	100.0	0.000E-01	0.0	0.000E-01	0.0

Charge Balance: SPECIATED

Sum of CATIONS = 5.282E-04 Sum of ANIONS 3.372E-04

PERCENT DIFFERENCE = 2.207E+01 (ANIONS - CATIONS)/(ANIONS + CATIONS)

EQUILIBRIUM IONIC STRENGTH (m) = 7.430E-04

EQUILIBRIUM pH = 8.000

DATE ID NUMBER: 981021
TIME ID NUMBER: 9435735

PART 6 of OUTPUT FILE

PC MINTEQA2 v3.10 DATE OF CALCULATIONS: 21-OCT-98 TIME: 9:43:57

Saturation indices and stoichiometry of all minerals

ID #	NAME	Sat. Index	Stoichiometry in [brackets]							
2003000	ALOH3(A)	-3.641	[1.000]	30	[3.000]	2	[-3.000]	330		
6003000	ALOHSO4	-8.843	[-1.000]	330	[1.000]	30	[1.000]	732		

			[1.000]	2							
6003001	AL4(OH)10SO4	-10.051	[-10.000]	330	[4.000]	30	[1.000]	732			
			[10.000]	2							
6041000	ALUM K	-24.024	[1.000]	410	[1.000]	30	[2.000]	732			
			[12.000]	2							
6041001	ALUNITE	-11.549	[1.000]	410	[3.000]	30	[2.000]	732			
			[6.000]	2	[-6.000]	330					
6015000	ANHYDRITE	-3.916	[1.000]	150	[1.000]	732					
5015000	ARAGONITE	-2.088	[1.000]	150	[1.000]	140					
5046000	ARTINITE	-9.179	[-2.000]	330	[2.000]	460	[1.000]	140			
			[5.000]	2							
6010000	BARITE	-2.179	[1.000]	100	[1.000]	732					
2003001	BOEHMITE	-1.899	[-3.000]	330	[1.000]	30	[2.000]	2			
2046000	BRUCITE	-6.105	[1.000]	460	[2.000]	2	[-2.000]	330			
5015001	CALCITE	-1.860	[1.000]	150	[1.000]	140					
6080000	CELESTITE	-4.652	[1.000]	800	[1.000]	732					
2003002	DIASPORE	0.000	[-3.000]	330	[1.000]	30	[2.000]	2			
5015002	DOLOMITE	-3.820	[1.000]	150	[1.000]	460	[2.000]	140			
6046000	EPSOMITE	-5.896	[1.000]	460	[1.000]	732	[7.000]	2			
2003003	GIBBSITE (C)	-1.795	[-3.000]	330	[1.000]	30	[3.000]	2			
3003000	Al2O3	-6.498	[2.000]	30	[3.000]	2	[-6.000]	330			
6015001	GYPSUM	-3.481	[1.000]	150	[1.000]	732	[2.000]	2			
5015003	HUNTITE	-12.031	[3.000]	460	[1.000]	150	[4.000]	140			
5046001	HYDRMAGNESIT	-22.429	[5.000]	460	[4.000]	140	[-2.000]	330			
			[6.000]	2							
5046002	MAGNESITE	-2.418	[1.000]	460	[1.000]	140					
6050001	MIRABILITE	-12.065	[2.000]	500	[1.000]	732	[10.000]	2			
3050000	NATRON	-13.960	[2.000]	500	[1.000]	140	[10.000]	2			
5046003	NESQUEHONITE	-4.805	[1.000]	460	[1.000]	140	[3.000]	2			
5080000	STRONTIANITE	-3.792	[1.000]	800	[1.000]	140					
6050002	THENARDITE	-14.086	[2.000]	500	[1.000]	732					
5050001	THERMONATR	-16.426	[2.000]	500	[1.000]	140	[1.000]	2			
5010000	WITHERITE	-5.811	[1.000]	100	[1.000]	140					
2047003	PYROCROITE	-7.485	[-2.000]	330	[1.000]	470	[2.000]	2			
5047000	RHODOCHROSIT	-3.074	[1.000]	470	[1.000]	140					
6047000	MNSO4	-14.985	[1.000]	470	[1.000]	732					

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5023100 CUCO3          -5.855    [  1.000] 231  [  1.000] 140
2023100 CU(OH)2        -2.746    [ -2.000] 330  [  1.000] 231  [  2.000]   2
6023100 ANTLERITE      -8.381    [ -4.000] 330  [  3.000] 231  [  4.000]   2
                                 [  1.000] 732
6023101 BROCHANTITE    -8.690    [ -6.000] 330  [  4.000] 231  [  6.000]   2
                                 [  1.000] 732


  ID #     NAME      Sat. Index        Stoichiometry in [brackets]
6023102 LANGITE       -12.340    [ -6.000] 330  [  4.000] 231  [  7.000]   2
                                 [  1.000] 732
2023101 TENORITE       -1.725    [ -2.000] 330  [  1.000] 231  [  1.000]   2
6023103 CUOCUSO4      -20.338    [ -2.000] 330  [  2.000] 231  [  1.000]   2
                                 [  1.000] 732
6023104 CUSO4         -17.591    [  1.000] 231  [  1.000] 732
6023105 CHALCANTHITE  -10.853    [  1.000] 231  [  1.000] 732  [  5.000]   2
5095000 SMITHSONITE    -4.561    [  1.000] 950  [  1.000] 140
5095001 ZNCO3, 1H2O    -4.058    [  1.000] 950  [  1.000] 140  [  1.000]   2
2095000 ZN(OH)2 (A)    -4.542    [ -2.000] 330  [  1.000] 950  [  2.000]   2
2095001 ZN(OH)2 (C)    -4.292    [ -2.000] 330  [  1.000] 950  [  2.000]   2
2095002 ZN(OH)2 (B)    -3.842    [ -2.000] 330  [  1.000] 950  [  2.000]   2
2095003 ZN(OH)2 (G)    -3.802    [ -2.000] 330  [  1.000] 950  [  2.000]   2
2095004 ZN(OH)2 (E)    -3.592    [ -2.000] 330  [  1.000] 950  [  2.000]   2
6095000 ZN2(OH)2SO4   -11.999    [ -2.000] 330  [  2.000] 950  [  2.000]   2
                                 [  1.000] 732
6095001 ZN4(OH)6SO4   -17.084    [ -6.000] 330  [  4.000] 950  [  6.000]   2
                                 [  1.000] 732
2095005 ZNO(ACTIVE)    -3.402    [ -2.000] 330  [  1.000] 950  [  1.000]   2
2095006 ZINCITE        -4.446    [ -2.000] 330  [  1.000] 950  [  1.000]   2
6095002 ZN3O(SO4)2    -39.369    [ -2.000] 330  [  3.000] 950  [  2.000] 732
                                 [  1.000]   2
6095003 ZINCOSITE     -16.483    [  1.000] 950  [  1.000] 732
6095004 ZNSO4, 1H2O   -12.427    [  1.000] 950  [  1.000] 732  [  1.000]   2
6095005 BIANCHITE     -10.650    [  1.000] 950  [  1.000] 732  [  6.000]   2
6095006 GOSLARITE     -10.263    [  1.000] 950  [  1.000] 732  [  7.000]   2
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Table of Contents

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5054000 NICO3          -6.829    [  1.000] 540  [  1.000] 140
2054000 NI(OH)2         0.000    [ -2.000] 330  [  1.000] 540  [  2.000]   2
6054000 NI4(OH)6SO4   -15.879    [ -6.000] 330  [  4.000] 540  [  1.000] 732
                                 [  6.000]   2
2054001 BUNSENITE      -4.670    [ -2.000] 330  [  1.000] 540  [  1.000]   2
6054001 RETGERSITE     -9.104    [  1.000] 540  [  1.000] 732  [  6.000]   2
6054002 MORENOSITE     -8.682    [  1.000] 540  [  1.000] 732  [  7.000]   2
5023101 MALACHITE      -4.431    [  2.000] 231  [  2.000]   2  [  1.000] 140
                                 [ -2.000] 330
5023102 AZURITE        -8.629    [  3.000] 231  [  2.000]   2  [  2.000] 140
                                 [ -2.000] 330
2015000 LIME          -23.396    [ -2.000] 330  [  1.000] 150  [  1.000]   2
2015001 PORTLANDITE   -12.409    [ -2.000] 330  [  1.000] 150  [  2.000]   2
2046001 PERICLASE     -11.395    [ -2.000] 330  [  1.000] 460  [  1.000]   2
3046000 SPINEL        -12.677    [ -8.000] 330  [  1.000] 460  [  2.000]  30
                                 [  4.000]   2
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_____________________________________________________________________________
_____________________________ PART 1 of OUTPUT FILE ______________________________
  PC MINTEQA2 v3.10   DATE OF CALCULATIONS: 21-OCT-98  TIME:  8:21:25


B2 Mineralized Zone
Using value for CO3, after specifying alkalinity

-----------------------------------------------------------------------------
 Temperature (Celsius):   4.00
 Units of concentration: MG/L
 Ionic strength to be computed.
 If specified, carbonate concentration represents total inorganic carbon.
 Do not automatically terminate if charge imbalance exceeds 30%
 Precipitation is allowed for all solids in the thermodynamic database and
   the print option for solids is set to: 1
 The maximum number of iterations is: 100
 The method used to compute activity coefficients is: Davies equation
 Full output file

-----------------------------------------------------------------------------
    330  0.000E-01   -8.50 y
     30  8.600E-02   -5.50
    100  9.000E-04   -8.18 y
    150  9.290E+00   -3.63 y
    212  1.400E-03   -7.92 y
    231  1.110E-02   -6.76 y
    281  1.840E-02   -6.48 y
    460  3.010E+00   -3.91 y
    470  3.600E-02   -6.18 y
    540  1.200E-03   -7.69 y
    410  2.840E-01   -5.14 y
    500  4.150E-01   -4.74 y
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    800  1.360E-02   -6.81 y
    740  8.500E-04   -8.31 y
    950  8.000E-04   -7.91 y
    732  3.860E+00   -4.40
    140  2.053E+01   -4.61

 H2O has been inserted as a COMPONENT
  3   1
    330     8.5000     0.0000

INPUT DATA BEFORE TYPE MODIFICATIONS

   ID        NAME       ACTIVITY GUESS    LOG GUESS   ANAL TOTAL
    330  H+1                 3.162E-09        -8.500   0.000E-01
     30  Al+3                3.162E-06        -5.500   8.600E-02
    100  Ba+2                6.607E-09        -8.180   9.000E-04
    150  Ca+2                2.344E-04        -3.630   9.290E+00
    212  CrO4-2              1.202E-08        -7.920   1.400E-03
    231  Cu+2                1.738E-07        -6.760   1.110E-02
    281  Fe+3                3.311E-07        -6.480   1.840E-02
    460  Mg+2                1.230E-04        -3.910   3.010E+00
    470  Mn+2                6.607E-07        -6.180   3.600E-02
    540  Ni+2                2.042E-08        -7.690   1.200E-03
    410  K+1                 7.244E-06        -5.140   2.840E-01
    500  Na+1                1.820E-05        -4.740   4.150E-01
    800  Sr+2                1.549E-07        -6.810   1.360E-02
    740  Sb(OH)3             4.898E-09        -8.310   8.500E-04
    950  Zn+2                1.230E-08        -7.910   8.000E-04
    732  SO4-2               3.981E-05        -4.400   3.860E+00
    140  CO3-2               2.455E-05        -4.610   2.053E+01
      2  H2O                 1.000E+00         0.000   0.000E-01
```

ALL SPECIES CONSIDERED IN THIS PROBLEM

Type I - COMPONENTS AS SPECIES IN SOLUTION

ID	NAME	DH	LOGK	MIN LOGK	MAX LOGK	Z	DHA	DHB	GFW
330	H+1	0.0000	0.0000	0.000	0.000	1.00	9.00	0.00	1.0080
30	Al+3	0.0000	0.0000	0.000	0.000	3.00	9.00	0.00	26.9815
100	Ba+2	0.0000	0.0000	0.000	0.000	2.00	5.00	0.00	137.3400
150	Ca+2	0.0000	0.0000	0.000	0.000	2.00	6.00	0.17	40.0800
212	CrO4-2	0.0000	0.0000	0.000	0.000	-2.00	4.00	0.00	115.9940
231	Cu+2	0.0000	0.0000	0.000	0.000	2.00	6.00	0.00	63.5460
281	Fe+3	0.0000	0.0000	0.000	0.000	3.00	9.00	0.00	55.8470
460	Mg+2	0.0000	0.0000	0.000	0.000	2.00	6.50	0.20	24.3120
470	Mn+2	0.0000	0.0000	0.000	0.000	2.00	6.00	0.00	54.9380
540	Ni+2	0.0000	0.0000	0.000	0.000	2.00	0.00	0.00	58.7100
410	K+1	0.0000	0.0000	0.000	0.000	1.00	3.00	0.01	39.1020
500	Na+1	0.0000	0.0000	0.000	0.000	1.00	4.00	0.08	22.9898
800	Sr+2	0.0000	0.0000	0.000	0.000	2.00	5.00	0.00	87.6200
740	Sb(OH)3	0.0000	0.0000	0.000	0.000	0.00	0.00	0.00	172.7719
950	Zn+2	0.0000	0.0000	0.000	0.000	2.00	6.00	0.00	65.3699
732	SO4-2	0.0000	0.0000	0.000	0.000	-2.00	4.00	-0.04	96.0616
140	CO3-2	0.0000	0.0000	0.000	0.000	-2.00	5.40	0.00	60.0094

Type II - OTHER SPECIES IN SOLUTION OR ADSORBED

ID	NAME	DH	LOGK	MIN LOGK	MAX LOGK	Z	DHA	DHB	GFW
5002120	NaCrO4-	0.0000	0.6963	0.000	0.000	-1.00	0.00	0.00	138.9834
4102120	KCrO4-	0.0000	0.7990	0.000	0.000	-1.00	0.00	0.00	155.0919
3300020	OH-	13.3450	-13.9980	0.000	0.000	-1.00	3.50	0.00	17.0074
4603300	MgOH +	15.9350	-11.7900	0.000	0.000	1.00	6.50	0.00	41.3190
4601400	MgCO3 AQ	2.0220	2.9800	0.000	0.000	0.00	0.00	0.00	84.3210

4601401	MgHCO3 +	-2.4300	11.4000	0.000	0.000	1.00	4.00	0.00	85.3290
4607320	MgSO4 AQ	1.3990	2.2500	0.000	0.000	0.00	0.00	0.00	120.3730
1503300	CaOH +	14.5350	-12.5980	0.000	0.000	1.00	6.00	0.00	57.0870
1501400	CaHCO3 +	1.7900	11.3300	0.000	0.000	1.00	6.00	0.00	101.0970
1501401	CaCO3 AQ	4.0300	3.1500	0.000	0.000	0.00	0.00	0.00	100.0890
1507320	CaSO4 AQ	1.4700	2.3090	0.000	0.000	0.00	0.00	0.00	136.1410
5001400	NaCO3 -	8.9110	1.2680	0.000	0.000	-1.00	5.40	0.00	82.9990
5001401	NaHCO3 AQ	0.0000	10.0800	0.000	0.000	0.00	0.00	0.00	84.0070
5007320	NaSO4 -	1.1200	0.7000	0.000	0.000	-1.00	5.40	0.00	119.0510
4107320	KSO4 -	2.2500	0.8500	0.000	0.000	-1.00	5.40	0.00	135.1630
303300	AlOH +2	11.8990	-4.9900	0.000	0.000	2.00	5.40	0.00	43.9880
303301	Al(OH)2 +	0.0000	-10.1000	0.000	0.000	1.00	5.40	0.00	60.9960
303302	Al(OH)4 -	44.0600	-23.0000	0.000	0.000	-1.00	4.50	0.00	95.0110
307320	AlSO4 +	2.1500	3.0200	0.000	0.000	1.00	4.50	0.00	123.0430
307321	Al(SO4)2 -	2.8400	4.9200	0.000	0.000	-1.00	4.50	0.00	219.1040
303303	Al(OH)3 AQ	0.0000	-16.0000	0.000	0.000	0.00	0.00	0.00	78.0030
2813300	FeOH +2	10.3990	-2.1900	0.000	0.000	2.00	5.00	0.00	72.8540
2817320	FeSO4 +	3.9100	3.9200	0.000	0.000	1.00	5.00	0.00	151.9080
2813301	FeOH2 +	0.0000	-5.6700	0.000	0.000	1.00	5.40	0.00	89.8610
2813302	FeOH3 AQ	0.0000	-13.6000	0.000	0.000	0.00	0.00	0.00	106.8690
2813303	FeOH4 -	0.0000	-21.6000	0.000	0.000	-1.00	5.40	0.00	123.8760
2817321	Fe(SO4)2 -	4.6000	5.4200	0.000	0.000	-1.00	0.00	0.00	247.9700
2813304	Fe2(OH)2+4	13.5000	-2.9500	0.000	0.000	4.00	0.00	0.00	145.7080
2813305	Fe3(OH)4+5	14.3000	-6.3000	0.000	0.000	5.00	0.00	0.00	235.5700
8003300	SrOH +	14.4950	-13.1780	0.000	0.000	1.00	5.00	0.00	104.6270
1003300	BaOH +	15.0950	-13.3580	0.000	0.000	1.00	5.00	0.00	154.3470
4703300	MnOH +	14.3990	-10.5900	0.000	0.000	1.00	5.00	0.00	161.2970
4703301	Mn(OH)3 -1	0.0000	-34.8000	0.000	0.000	-1.00	5.00	0.00	105.9600
4707320	MnSO4 AQ	2.1700	2.2600	0.000	0.000	0.00	0.00	0.00	150.9990
4701400	MnHCO3 +	0.0000	11.6000	0.000	0.000	1.00	5.00	0.00	115.9550
2311400	CuCO3 AQ	0.0000	6.7300	0.000	0.000	0.00	0.00	0.00	123.5550
2311401	Cu(CO3)2-2	0.0000	9.8300	0.000	0.000	-2.00	0.00	0.00	183.5640
2313300	CuOH +	0.0000	-8.0000	0.000	0.000	1.00	4.00	0.00	80.5530
2313301	Cu(OH)2 AQ	0.0000	-13.6800	0.000	0.000	0.00	0.00	0.00	97.5600
2313302	Cu(OH)3 -	0.0000	-26.8990	0.000	0.000	-1.00	0.00	0.00	114.5680
2313303	Cu(OH)4 -2	0.0000	-39.6000	0.000	0.000	-2.00	0.00	0.00	131.5750

2313304	Cu2(OH)2+2	17.5390	-10.3590	0.000	0.000	2.00	0.00	0.00	161.1060
2317320	CuSO4 AQ	1.2200	2.3100	0.000	0.000	0.00	0.00	0.00	159.6070
2311402	CuHCO3 +	0.0000	13.0000	0.000	0.000	1.00	0.00	0.00	124.5630
9503300	ZnOH +	13.3990	-8.9600	0.000	0.000	1.00	0.00	0.00	82.3770
9503301	Zn(OH)2 AQ	0.0000	-16.8990	0.000	0.000	0.00	0.00	0.00	99.3840
9503302	Zn(OH)3 -	0.0000	-28.3990	0.000	0.000	-1.00	0.00	0.00	116.3920
9503303	Zn(OH)4 -2	0.0000	-41.1990	0.000	0.000	-2.00	0.00	0.00	133.3990
9507320	ZnSO4 AQ	1.3600	2.3700	0.000	0.000	0.00	0.00	0.00	161.4310
9507321	Zn(SO4)2-2	0.0000	3.2800	0.000	0.000	-2.00	0.00	0.00	257.4930
9501400	ZnHCO3 +	0.0000	12.4000	0.000	0.000	1.00	0.00	0.00	126.3570
9501401	ZnCO3 AQ	0.0000	5.3000	0.000	0.000	0.00	0.00	0.00	125.3790
9501402	Zn(CO3)2-2	0.0000	9.6300	0.000	0.000	-2.00	0.00	0.00	185.3580
5403300	NiOH +	12.4200	-9.8600	0.000	0.000	1.00	0.00	0.00	75.7170
5403301	Ni(OH)2 AQ	0.0000	-19.0000	0.000	0.000	0.00	0.00	0.00	92.7240
5403302	Ni(OH)3 -	0.0000	-30.0000	0.000	0.000	-1.00	0.00	0.00	109.7320
5407320	NiSO4 AQ	1.5200	2.2900	0.000	0.000	0.00	0.00	0.00	154.7710
5401400	NiHCO3 +	0.0000	12.4700	0.000	0.000	1.00	0.00	0.00	119.7270
5401401	NiCO3 AQ	0.0000	6.8700	0.000	0.000	0.00	0.00	0.00	118.7190
5401402	Ni(CO3)2-2	0.0000	10.1100	0.000	0.000	-2.00	0.00	0.00	178.7280
5407321	Ni(SO4)2-2	0.0000	1.0200	0.000	0.000	-2.00	0.00	0.00	250.8330
7400021	HSbO2	-0.0150	-0.0073	0.000	0.000	0.00	0.00	0.00	154.7567
7403300	SbO+	1.9700	0.9228	0.000	0.000	1.00	0.00	0.00	137.7494
7403301	SbO2-	16.7750	-11.8011	0.000	0.000	-1.00	0.00	0.00	153.7488
7403302	Sb(OH)2+	0.0000	1.3853	0.000	0.000	1.00	0.00	0.00	155.7647
7400020	Sb(OH)4-1	16.6950	-12.0429	0.000	0.000	-1.00	0.00	0.00	189.7794
3301400	HCO3 -	-3.6170	10.3300	0.000	0.000	-1.00	5.40	0.00	61.0170
3301401	H2CO3 AQ	-2.2470	16.6810	0.000	0.000	0.00	0.00	0.00	62.0250
3307320	HSO4 -	4.9100	1.9870	0.000	0.000	-1.00	4.50	0.00	97.0690
2123300	HCrO4 -	0.9000	6.5089	0.000	0.000	-1.00	0.00	0.00	117.0015
2123301	H2CrO4 AQ	0.0000	5.6513	0.000	0.000	0.00	0.00	0.00	118.0094
2123302	Cr2O7 -2	-2.9950	14.5571	0.000	0.000	-2.00	0.00	0.00	215.9878
2127320	CrO3SO4-2	0.0000	8.9937	0.000	0.000	-2.00	0.00	0.00	196.0518

Type III - SPECIES WITH FIXED ACTIVITY

ID	NAME	DH	LOGK	MIN LOGK	MAX LOGK	Z	DHA	DHB	GFW
2	H2O	0.0000	0.0000	0.000	0.000	0.00	0.00	0.00	18.0153
330	H+1	0.0000	8.5000	0.000	0.000	1.00	9.00	0.00	1.0080

Type V - POSSIBLE SOLIDS

ID	NAME	DH	LOGK	MIN LOGK	MAX LOGK	Z	DHA	DHB	GFW
2003000	ALOH3(A)	27.0450	-10.3800	-9.690	0.000	0.00	0.00	0.00	78.0073
6003000	ALOHSO4	0.0000	3.2300	3.390	3.070	0.00	0.00	0.00	140.0505
6003001	AL4(OH)10SO4	0.0000	-22.7000	0.000	0.000	0.00	0.00	0.00	374.0616
6041000	ALUM K	-7.2200	5.1700	0.000	0.000	0.00	0.00	0.00	438.3597
6041001	ALUNITE	-3.9180	1.3460	0.000	0.000	0.00	0.00	0.00	414.2141
6015000	ANHYDRITE	3.7690	4.6370	0.000	0.000	0.00	0.00	0.00	136.1416
5015000	ARAGONITE	2.6150	8.3600	0.000	0.000	0.00	0.00	0.00	100.0894
5046000	ARTINITE	28.7420	-9.6000	0.000	0.000	0.00	0.00	0.00	196.6941
6010000	BARITE	-6.2800	9.9760	0.000	9.773	0.00	0.00	0.00	233.4016
2003001	BOEHMITE	28.1300	-8.5780	-8.065	0.000	0.00	0.00	0.00	59.9884
2046000	BRUCITE	25.8400	-16.7920	0.000	0.000	0.00	0.00	0.00	58.3268
5015001	CALCITE	2.5850	8.4750	8.560	0.000	0.00	0.00	0.00	100.0894
6080000	CELESTITE	0.4700	6.4650	0.000	6.349	0.00	0.00	0.00	183.6816
2003002	DIASPORE	24.6300	-6.8730	0.000	0.000	0.00	0.00	0.00	59.9884
5015002	DOLOMITE	8.2900	17.0000	0.000	0.000	0.00	0.00	0.00	184.4108
6046000	EPSOMITE	-2.8200	2.1400	0.000	0.000	0.00	0.00	0.00	246.4807
2028100	FERRIHYDRITE	0.0000	-4.8910	-1.557	-4.996	0.00	0.00	0.00	104.8692
6028100	FE2(SO4)3	59.1200	-3.5800	0.650	0.000	0.00	0.00	0.00	395.8788
2003003	GIBBSITE (C)	22.8000	-8.7700	-8.487	-9.440	0.00	0.00	0.00	78.0037
3003000	Al2O3	0.0000	-22.9800	0.000	0.000	0.00	0.00	0.00	101.9504
2028102	GOETHITE	14.4800	-0.5000	0.000	0.000	0.00	0.00	0.00	86.8536
6015001	GYPSUM	-0.2610	4.8480	0.000	0.000	0.00	0.00	0.00	172.1722
3028100	HEMATITE	30.8450	4.0080	0.000	0.000	0.00	0.00	0.00	155.6919
5015003	HUNTITE	25.7600	29.9680	0.000	0.000	0.00	0.00	0.00	353.0536
5046001	HYDRMAGNESIT	52.2100	8.7660	0.000	0.000	0.00	0.00	0.00	467.6736
6050000	JAROSITE NA	36.1800	11.2000	0.000	0.000	0.00	0.00	0.00	478.6978

6041002	JAROSITE K	31.2800	14.8000	0.000	0.000	0.00	0.00	0.00	494.8100
6028101	JAROSITE H	55.1500	12.1000	0.000	0.000	0.00	0.00	0.00	480.7320
3028101	MAGHEMITE	0.0000	-6.3860	0.000	0.000	0.00	0.00	0.00	159.6922
5046002	MAGNESITE	6.1690	8.0290	8.279	7.779	0.00	0.00	0.00	84.3214
6050001	MIRABILITE	-18.9870	1.1140	0.000	0.000	0.00	0.00	0.00	322.1942
3050000	NATRON	-15.7450	1.3110	0.000	0.000	0.00	0.00	0.00	286.1420
5046003	NESQUEHONITE	5.7890	5.6210	5.133	4.546	0.00	0.00	0.00	138.3673
5080000	STRONTIANITE	0.6900	9.2500	11.789	0.000	0.00	0.00	0.00	147.6294
6050002	THENARDITE	0.5720	0.1790	0.000	0.000	0.00	0.00	0.00	142.0412
5050001	THERMONATR	2.8020	-0.1250	0.000	0.000	0.00	0.00	0.00	124.0043
5010000	WITHERITE	-0.3600	8.5850	13.335	0.000	0.00	0.00	0.00	197.3494
2047003	PYROCROITE	22.5900	-15.0880	0.000	-15.381	0.00	0.00	0.00	88.9528
5047000	RHODOCHROSIT	2.0790	10.4100	11.019	9.993	0.00	0.00	0.00	114.9474
6047000	MNSO4	15.4800	-2.6690	0.000	0.000	0.00	0.00	0.00	150.9996
5023100	CUCO3	0.0000	9.6300	9.650	9.610	0.00	0.00	0.00	123.5552
2023100	CU(OH)2	15.2500	-8.6400	0.000	-9.200	0.00	0.00	0.00	97.5606
6023100	ANTLERITE	0.0000	-8.2900	0.000	-8.900	0.00	0.00	0.00	354.7248
6023101	BROCHANTITE	0.0000	-15.3400	-15.150	-15.500	0.00	0.00	0.00	452.2854
6023102	LANGITE	39.6100	-16.7900	0.000	-17.400	0.00	0.00	0.00	470.3006
2023101	TENORITE	15.2400	-7.6200	-7.350	-7.890	0.00	0.00	0.00	79.5454
6023103	CUOCUSO4	35.5750	-11.5300	0.000	0.000	0.00	0.00	0.00	239.1490
6023104	CUSO4	18.1400	-3.0100	-2.630	-3.420	0.00	0.00	0.00	159.6036
6023105	CHALCANTHITE	-1.4400	2.6400	2.960	2.135	0.00	0.00	0.00	249.6796
3023100	CUPRICFERIT	38.6900	-5.8800	-5.350	0.000	0.00	0.00	0.00	239.2376
5095000	SMITHSONITE	4.3600	10.0000	10.810	9.820	0.00	0.00	0.00	125.3892
5095001	ZNCO3, 1H2O	0.0000	10.2600	0.000	0.000	0.00	0.00	0.00	143.4044
2095000	ZN(OH)2 (A)	0.0000	-12.4500	-12.260	-12.480	0.00	0.00	0.00	99.3946
2095001	ZN(OH)2 (C)	0.0000	-12.2000	0.000	0.000	0.00	0.00	0.00	99.3946
2095002	ZN(OH)2 (B)	0.0000	-11.7500	-11.320	-11.890	0.00	0.00	0.00	99.3946
2095003	ZN(OH)2 (G)	0.0000	-11.7100	-11.190	-11.840	0.00	0.00	0.00	99.3946
2095004	ZN(OH)2 (E)	0.0000	-11.5000	-10.950	-11.620	0.00	0.00	0.00	99.3946
6095000	ZN2(OH)2SO4	0.0000	-7.5000	0.000	0.000	0.00	0.00	0.00	260.8322
6095001	ZN4(OH)6SO4	0.0000	-28.4000	0.000	0.000	0.00	0.00	0.00	459.6214
2095005	ZNO(ACTIVE)	0.0000	-11.3100	-11.570	-11.860	0.00	0.00	0.00	81.3794
2095006	ZINCITE	21.8600	-11.1400	-10.990	-11.540	0.00	0.00	0.00	81.3794
6095002	ZN3O(SO4)2	62.0000	-19.0200	0.000	0.000	0.00	0.00	0.00	404.2546

6095003	ZINCOSITE	19.2000	-3.0100	0.000	-3.930	0.00	0.00	0.00	161.4376
6095004	ZNSO4, 1H2O	10.6400	0.5700	0.000	0.500	0.00	0.00	0.00	179.4528
6095005	BIANCHITE	0.1600	1.7650	0.000	1.020	0.00	0.00	0.00	269.5288
6095006	GOSLARITE	-3.3000	1.9600	0.000	1.870	0.00	0.00	0.00	287.5440
5054000	NICO3	9.9400	6.8400	0.000	0.000	0.00	0.00	0.00	118.7092
2054000	NI(OH)2	-30.4500	-10.8000	-10.590	-13.300	0.00	0.00	0.00	92.7146
6054000	NI4(OH)6SO4	0.0000	-32.0000	0.000	0.000	0.00	0.00	0.00	432.9014
2054001	BUNSENITE	23.9200	-12.4500	0.000	-12.390	0.00	0.00	0.00	74.6994
6054001	RETGERSITE	-1.1000	2.0400	0.000	0.000	0.00	0.00	0.00	262.8488
6054002	MORENOSITE	-2.9400	2.3600	0.000	0.000	0.00	0.00	0.00	280.8640
5023101	MALACHITE	15.6100	5.1800	0.000	3.940	0.00	0.00	0.00	221.1162
5023102	AZURITE	23.7700	16.9200	0.000	0.000	0.00	0.00	0.00	344.6716
2074002	Sb4O6 II,CUB	-14.6000	19.6586	0.000	0.000	0.00	0.00	0.00	582.9964
2074003	Sb4O6 I,ORTH	-8.9900	17.0346	0.000	0.000	0.00	0.00	0.00	582.9964
2074004	Sb(OH)3 (s)	-7.2000	7.1099	0.000	0.000	0.00	0.00	0.00	172.7719
2074006	Sb2O3 SENARM	-7.3250	12.3654	0.000	0.000	0.00	0.00	0.00	291.4982
2074007	Sb2O3 VALENT	-4.5450	8.4806	0.000	0.000	0.00	0.00	0.00	291.4982
2015000	LIME	46.2650	-32.7970	0.000	0.000	0.00	0.00	0.00	56.0800
2015001	PORTLANDITE	30.6900	-22.6750	0.000	0.000	0.00	0.00	0.00	73.0880
2046001	PERICLASE	36.1350	-21.5100	0.000	0.000	0.00	0.00	0.00	40.3200
3046000	SPINEL	89.0890	-36.3330	0.000	0.000	0.00	0.00	0.00	142.2800
3046001	MAG-FERRITE	66.6390	-16.7650	0.000	0.000	0.00	0.00	0.00	200.0200
3028102	LEPIDOCROCIT	0.0000	-1.3710	0.000	0.000	0.00	0.00	0.00	72.8600
3021201	BACRO4	-6.3900	9.6681	0.000	0.000	0.00	0.00	0.00	253.3236
3021204	CUCRO4	0.0000	5.4754	0.000	0.000	0.00	0.00	0.00	179.5396
3021205	K2CRO4	-4.2500	-0.0073	0.000	0.000	0.00	0.00	0.00	194.1902
3021206	K2CR2O7	-18.1250	15.6712	0.000	0.000	0.00	0.00	0.00	294.1844
3021208	MGCRO4	21.2600	-5.3801	0.000	0.000	0.00	0.00	0.00	140.2986
3021210	NA2CRO4	4.6100	-3.2618	0.000	0.000	0.00	0.00	0.00	161.9731
3021211	NA2CR2O7	-5.3050	9.8953	0.000	0.000	0.00	0.00	0.00	261.9673
3021214	SRCRO4	2.4200	4.8443	0.000	0.000	0.00	0.00	0.00	203.6136
2021200	CrO3	1.2450	3.2105	0.000	0.000	0.00	0.00	0.00	99.9942
3015000	CaCrO4	6.4400	2.2657	0.000	0.000	0.00	0.00	0.00	156.0736

Type VI - EXCLUDED SPECIES (not included in mole balance)

ID	NAME	DH	LOGK	MIN LOGK	MAX LOGK	Z	DHA	DHB	GFW
3301403	CO2 (g)	-0.5300	18.1600	0.000	0.000	0.00	0.00	0.00	41.0100

Charge Balance: UNSPECIATED

Sum of CATIONS= 7.491E-04 Sum of ANIONS = 7.646E-04

PERCENT DIFFERENCE = 1.025E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

IMPROVED ACTIVITY GUESSES PRIOR TO FIRST ITERATION:		
Al+3	Log activity guess:	-15.04
CrO4-2	Log activity guess:	-7.92
Cu+2	Log activity guess:	-7.38
Fe+3	Log activity guess:	-19.03
Mn+2	Log activity guess:	-6.18
Sb(OH)3	Log activity guess:	-8.61
SO4-2	Log activity guess:	-4.40
CO3-2	Log activity guess:	-5.54

PARAMETERS OF THE COMPONENT MOST OUT OF BALANCE:

ITER	NAME	TOTAL MOL	DIFF FXN	LOG ACTVTY	RESIDUAL

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     0   SO4-2          4.018E-05   2.334E-06    -4.39595    2.330E-06
     1   Zn+2           1.224E-08   3.235E-11    -8.38304    3.113E-11
     2   SO4-2          4.018E-05   5.554E-06    -4.42006    5.549E-06
     3   SO4-2          4.018E-05   3.976E-08    -4.47335    3.574E-08
  PC MINTEQA2 v3.10   DATE OF CALCULATIONS: 21-OCT-98  TIME:  8:21:26


  ITERATIONS=   4:  SOLID HEMATITE     PRECIPITATES

_____________________________________________________________________________
_________________________________ PART 3 of OUTPUT FILE _____________________________________
  PC MINTEQA2 v3.10   DATE OF CALCULATIONS: 21-OCT-98  TIME:  8:21:26


PARAMETERS OF THE COMPONENT MOST OUT OF BALANCE:

     ITER      NAME       TOTAL MOL    DIFF FXN   LOG ACTVTY    RESIDUAL
      4   Zn+2           1.224E-08  -6.080E-10    -8.40291    6.068E-10
      5   Zn+2           1.224E-08   6.396E-10    -8.38404    6.384E-10
      6   Zn+2           1.224E-08   5.261E-12    -8.40273    4.038E-12
  PC MINTEQA2 v3.10   DATE OF CALCULATIONS: 21-OCT-98  TIME:  8:21:26


  ITERATIONS=   7:  SOLID DIASPORE     PRECIPITATES

_____________________________________________________________________________
_________________________________ PART 3 of OUTPUT FILE _____________________________________
  PC MINTEQA2 v3.10   DATE OF CALCULATIONS: 21-OCT-98  TIME:  8:21:26


PARAMETERS OF THE COMPONENT MOST OUT OF BALANCE:

     ITER      NAME       TOTAL MOL    DIFF FXN   LOG ACTVTY    RESIDUAL
      7   Sb(OH)3        4.920E-09   1.092E-12    -8.60577    6.004E-13
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8	Sb(OH)3	4.920E-09	-1.089E-12	-8.60587	5.966E-13
9	Sr+2	1.552E-07	3.210E-11	-6.86827	1.658E-11

ID	NAME	ANAL MOL	CALC MOL	LOG ACTVTY	GAMMA	DIFF FXN
140	CO3-2	3.421E-04	3.183E-06	-5.55652	0.872355	-7.971E-10
950	Zn+2	1.224E-08	4.533E-09	-8.40290	0.872355	-4.326E-14
100	Ba+2	6.553E-09	6.553E-09	-8.24285	0.872355	-5.986E-14
150	Ca+2	2.318E-04	2.297E-04	-3.69813	0.872355	-2.099E-09
212	CrO4-2	1.207E-08	1.197E-08	-7.98120	0.872355	-1.096E-13
231	Cu+2	1.747E-07	9.498E-11	-10.08168	0.872355	3.864E-15
732	SO4-2	4.018E-05	3.851E-05	-4.47377	0.872355	-3.512E-10
460	Mg+2	1.238E-04	1.227E-04	-3.97051	0.872355	-1.121E-09
470	Mn+2	6.553E-07	6.499E-07	-6.24648	0.872355	-5.942E-12
540	Ni+2	2.044E-08	1.070E-09	-9.02973	0.872355	-1.150E-14
410	K+1	7.263E-06	7.262E-06	-5.15376	0.966436	-1.659E-11
500	Na+1	1.805E-05	1.805E-05	-4.75841	0.966436	-4.122E-11
800	Sr+2	1.552E-07	1.552E-07	-6.86836	0.872355	-1.418E-12
740	Sb(OH)3	4.920E-09	2.478E-09	-8.60577	1.000224	1.525E-16
30	Al+3	3.187E-06	7.487E-18	-17.25910	0.735461	-2.482E-23
281	Fe+3	3.295E-07	3.062E-27	-26.64747	0.735461	-1.183E-20
2	H2O	0.000E-01	-7.853E-06	-0.00001	1.000000	0.000E-01
330	H+1	0.000E-01	3.272E-09	-8.50000	0.966436	4.235E-22

Type I - COMPONENTS AS SPECIES IN SOLUTION

ID	NAME	CALC MOL	ACTIVITY	LOG ACTVTY	GAMMA	NEW LOGK
330	H+1	3.272E-09	3.162E-09	-8.50000	0.96644	0.015
30	Al+3	7.487E-18	5.507E-18	-17.25910	0.73546	0.133
100	Ba+2	6.553E-09	5.717E-09	-8.24285	0.87235	0.059
150	Ca+2	2.297E-04	2.004E-04	-3.69813	0.87235	0.059
212	CrO4-2	1.197E-08	1.044E-08	-7.98120	0.87235	0.059
231	Cu+2	9.498E-11	8.286E-11	-10.08168	0.87235	0.059
281	Fe+3	3.062E-27	2.252E-27	-26.64747	0.73546	0.133
460	Mg+2	1.227E-04	1.070E-04	-3.97051	0.87235	0.059

470	Mn+2	6.499E-07	5.669E-07	-6.24648	0.87235	0.059
540	Ni+2	1.070E-09	9.338E-10	-9.02973	0.87235	0.059
410	K+1	7.262E-06	7.018E-06	-5.15376	0.96644	0.015
500	Na+1	1.805E-05	1.744E-05	-4.75841	0.96644	0.015
800	Sr+2	1.552E-07	1.354E-07	-6.86836	0.87235	0.059
740	Sb(OH)3	2.478E-09	2.479E-09	-8.60577	1.00022	0.000
950	Zn+2	4.533E-09	3.955E-09	-8.40290	0.87235	0.059
732	SO4-2	3.851E-05	3.359E-05	-4.47377	0.87235	0.059
140	CO3-2	3.183E-06	2.776E-06	-5.55652	0.87235	0.059

Type II - OTHER SPECIES IN SOLUTION OR ADSORBED

ID	NAME	CALC MOL	ACTIVITY	LOG ACTVTY	GAMMA	NEW LOGK
5002120	NaCrO4-	9.365E-13	9.051E-13	-12.04332	0.96644	0.711
4102120	KCrO4-	4.774E-13	4.614E-13	-12.33597	0.96644	0.814
3300020	OH-	5.966E-07	5.766E-07	-6.23915	0.96644	-14.724
4603300	MgOH +	8.150E-09	7.877E-09	-8.10365	0.96644	-12.618
4601400	MgCO3 AQ	2.054E-07	2.054E-07	-6.68737	1.00022	2.840
4601401	MgHCO3 +	3.762E-07	3.636E-07	-6.43942	0.96644	11.602
4607320	MgSO4 AQ	5.345E-07	5.346E-07	-6.27198	1.00022	2.172
1503300	CaOH +	2.579E-09	2.492E-09	-8.60337	0.96644	-13.390
1501400	CaHCO3 +	3.664E-07	3.541E-07	-6.45089	0.96644	11.319
1501401	CaCO3 AQ	5.804E-07	5.805E-07	-6.23616	1.00022	3.018
1507320	CaSO4 AQ	1.136E-06	1.136E-06	-5.94454	1.00022	2.227
5001400	NaCO3 -	2.972E-10	2.872E-10	-9.54183	0.96644	0.788
5001401	NaHCO3 AQ	1.841E-09	1.841E-09	-8.73493	1.00022	10.080
5007320	NaSO4 -	2.633E-09	2.545E-09	-8.59438	0.96644	0.653
4107320	KSO4 -	1.156E-09	1.117E-09	-8.95190	0.96644	0.690
303300	AlOH +2	4.460E-15	3.891E-15	-14.40995	0.87235	-5.592
303301	Al(OH)2 +	4.526E-11	4.374E-11	-10.35912	0.96644	-10.085
303302	Al(OH)4 -	2.036E-09	1.967E-09	-8.70610	0.96644	-25.432
307320	AlSO4 +	1.522E-19	1.471E-19	-18.83228	0.96644	2.915
307321	Al(SO4)2 -	3.719E-22	3.594E-22	-21.44437	0.96644	4.777
303303	Al(OH)3 AQ	1.741E-08	1.741E-08	-7.75912	1.00022	-16.000

2813300	FeOH +2	1.394E-21	1.216E-21	-20.91501	0.87235	-2.708
2817320	FeSO4 +	3.949E-28	3.816E-28	-27.41839	0.96644	3.718
2813301	FeOH2 +	4.981E-16	4.814E-16	-15.31748	0.96644	-5.655
2813302	FeOH3 AQ	1.788E-15	1.789E-15	-14.74749	1.00022	-13.600
2813303	FeOH4 -	5.852E-15	5.656E-15	-14.24749	0.96644	-21.585
2817321	Fe(SO4)2 -	3.840E-31	3.711E-31	-30.43048	0.96644	5.179
2813304	Fe2(OH)2+4	1.748E-40	1.012E-40	-39.99470	0.57913	-3.463
2813305	Fe3(OH)4+5	2.158E-53	9.191E-54	-53.03661	0.42592	-6.724
8003300	SrOH +	4.607E-13	4.453E-13	-12.35138	0.96644	-13.968
1003300	BaOH +	1.190E-14	1.150E-14	-13.93919	0.96644	-14.182
4703300	MnOH +	7.562E-10	7.309E-10	-9.13617	0.96644	-11.375
4703301	Mn(OH)3 -1	2.940E-16	2.841E-16	-15.54650	0.96644	-34.785
4707320	MnSO4 AQ	2.625E-09	2.626E-09	-8.58076	1.00022	2.139
4701400	MnHCO3 +	2.050E-09	1.982E-09	-8.70300	0.96644	11.615
2311400	CuCO3 AQ	1.235E-09	1.235E-09	-8.90820	1.00022	6.730
2311401	Cu(CO3)2-2	4.950E-12	4.318E-12	-11.36472	0.87235	9.889
2313300	CuOH +	2.711E-10	2.620E-10	-9.58169	0.96644	-7.985
2313301	Cu(OH)2 AQ	1.731E-07	1.731E-07	-6.76169	1.00022	-13.680
2313302	Cu(OH)3 -	3.421E-12	3.306E-12	-11.48070	0.96644	-26.884
2313303	Cu(OH)4 -2	2.386E-16	2.081E-16	-15.68171	0.87235	-39.541
2313304	Cu2(OH)2+2	3.659E-15	3.192E-15	-14.49593	0.87235	-11.273
2317320	CuSO4 AQ	4.861E-13	4.862E-13	-12.31320	1.00022	2.242
2311402	CuHCO3 +	7.527E-12	7.274E-12	-11.13820	0.96644	13.015
9503300	ZnOH +	2.557E-10	2.471E-10	-9.60705	0.96644	-9.689
9503301	Zn(OH)2 AQ	4.989E-09	4.990E-09	-8.30192	1.00022	-16.899
9503302	Zn(OH)3 -	5.163E-12	4.990E-12	-11.30192	0.96644	-28.384
9503303	Zn(OH)4 -2	2.867E-16	2.501E-16	-15.60193	0.87235	-41.140
9507320	ZnSO4 AQ	2.616E-11	2.617E-11	-10.58220	1.00022	2.294
9507321	Zn(SO4)2-2	9.747E-15	8.503E-15	-14.07044	0.87235	3.339
9501400	ZnHCO3 +	9.024E-11	8.721E-11	-10.05942	0.96644	12.415
9501401	ZnCO3 AQ	2.190E-09	2.191E-09	-8.65942	1.00022	5.300
9501402	Zn(CO3)2-2	1.491E-10	1.300E-10	-9.88594	0.87235	9.689
5403300	NiOH +	8.616E-12	8.327E-12	-11.07951	0.96644	-10.535
5403301	Ni(OH)2 AQ	9.336E-12	9.338E-12	-11.02975	1.00022	-19.000
5403302	Ni(OH)3 -	3.055E-14	2.953E-14	-13.52975	0.96644	-29.985
5407320	NiSO4 AQ	5.035E-12	5.036E-12	-11.29792	1.00022	2.205

5401400	NiHCO3 +	2.504E-11	2.420E-11	-10.61625	0.96644	12.485
5401401	NiCO3 AQ	1.922E-08	1.922E-08	-7.71625	1.00022	6.870
5401402	Ni(CO3)2-2	1.063E-10	9.273E-11	-10.03277	0.87235	10.169
5407321	Ni(SO4)2-2	1.265E-17	1.103E-17	-16.95727	0.87235	1.079
7400021	HSbO2	2.442E-09	2.442E-09	-8.61223	1.00022	-0.007
7403300	SbO+	5.278E-17	5.101E-17	-16.29237	0.96644	0.828
7403301	SbO2-	1.501E-13	1.450E-13	-12.83851	0.96644	-12.718
7403302	Sb(OH)2+	1.970E-16	1.903E-16	-15.72047	0.96644	1.400
7400020	Sb(OH)4-1	8.689E-14	8.397E-14	-13.07587	0.96644	-12.955
3301400	HCO3 -	3.356E-04	3.243E-04	-3.48899	0.96644	10.582
3301401	H2CO3 AQ	1.775E-06	1.775E-06	-5.75073	1.00022	16.806
3307320	HSO4 -	6.089E-12	5.885E-12	-11.23026	0.96644	1.758
2123300	HCrO4 -	9.830E-11	9.500E-11	-10.02229	0.96644	6.474
2123301	H2CrO4 AQ	4.677E-20	4.678E-20	-19.32990	1.00022	5.651
2123302	Cr2O7 -2	6.612E-19	5.768E-19	-18.23897	0.87235	14.783
2127320	CrO3SO4-2	3.963E-21	3.457E-21	-20.46127	0.87235	9.053

Type III - SPECIES WITH FIXED ACTIVITY

ID	NAME	CALC MOL	LOG MOL	NEW LOGK	DH
2	H2O	-7.853E-06	-5.105	0.000	0.000
330	H+1	-3.284E-04	-3.484	8.500	0.000

Type IV - FINITE SOLIDS (present at equilibrium)

ID	NAME	CALC MOL	LOG MOL	NEW LOGK	DH
3028100	HEMATITE	1.647E-07	-6.783	2.295	30.845
2003002	DIASPORE	3.168E-06	-5.499	-8.241	24.630

Type V - UNDERSATURATED SOLIDS (not present at equilibrium)

◎ Table of Contents

ID	NAME	CALC MOL	LOG MOL	NEW LOGK	DH
6003001	AL4(OH)10SO4	6.162E-12	-11.210	-22.700	0.000
6041000	ALUM K	1.624E-26	-25.789	5.571	-7.220
6041001	ALUNITE	4.841E-14	-13.315	1.564	-3.918
6015000	ANHYDRITE	1.802E-04	-3.744	4.428	3.769
5015000	ARAGONITE	8.174E-02	-1.088	8.167	2.615
5046000	ARTINITE	2.024E-08	-7.694	-11.196	28.742
6010000	BARITE	4.057E-03	-2.392	10.325	-6.280
2003001	BOEHMITE	1.261E-02	-1.899	-10.140	28.130
2046000	BRUCITE	6.344E-06	-5.198	-18.227	25.840
5015001	CALCITE	1.382E-01	-0.859	8.395	2.585
6080000	CELESTITE	1.250E-05	-4.903	6.439	0.470
6003000	ALOHSO4	9.934E-11	-10.003	3.230	0.000
5015002	DOLOMITE	5.727E-03	-2.242	16.540	8.290
6046000	EPSOMITE	7.117E-07	-6.148	2.297	-2.820
2028100	FERRIHYDRITE	9.152E-07	-6.038	-4.891	0.000
6028100	FE2(SO4)3	0.000E-01	-73.580	-6.863	59.120
2003003	GIBBSITE (C)	1.602E-02	-1.795	-10.036	22.800
3003000	Al2O3	3.175E-07	-6.498	-22.980	0.000
2028102	GOETHITE	3.535E-03	-2.452	-1.304	14.480
6015001	GYPSUM	4.904E-04	-3.309	4.862	-0.261
2003000	ALOH3(A)	2.285E-04	-3.641	-11.882	27.045
5015003	HUNTITE	5.031E-10	-9.298	28.537	25.760
5046001	HYDRMAGNESIT	6.134E-20	-19.212	5.866	52.210
6050000	JAROSITE NA	3.486E-34	-33.458	9.191	36.180
6041002	JAROSITE K	1.045E-30	-29.981	13.063	31.280
6028101	JAROSITE H	4.438E-38	-37.353	9.037	55.150
3028101	MAGHEMITE	2.085E-09	-8.681	-6.386	0.000
5046002	MAGNESITE	1.443E-02	-1.841	7.686	6.169
6050001	MIRABILITE	1.506E-12	-11.822	2.168	-18.987
3050000	NATRON	1.294E-13	-12.888	2.185	-15.745
5046003	NESQUEHONITE	5.922E-05	-4.228	5.299	5.789
5080000	STRONTIANITE	6.121E-04	-3.213	9.212	0.690
6050002	THENARDITE	1.434E-14	-13.843	0.147	0.572
5050001	THERMONATR	4.426E-16	-15.354	-0.281	2.802

5010000	WITHERITE	6.392E-06	-5.194	8.605	-0.360
2047003	PYROCROITE	2.576E-06	-5.589	-16.343	22.590
5047000	RHODOCHROSIT	3.101E-02	-1.508	10.295	2.079
6047000	MNSO4	5.637E-15	-14.249	-3.529	15.480
5023100	CUCO3	9.813E-07	-6.008	9.630	0.000
2023100	CU(OH)2	2.700E-03	-2.569	-9.487	15.250
6023100	ANTLERITE	9.799E-10	-9.009	-8.290	0.000
6023101	BROCHANTITE	7.236E-10	-9.141	-15.340	0.000
6023102	LANGITE	1.620E-13	-12.790	-18.990	39.610
2023101	TENORITE	2.831E-02	-1.548	-8.466	15.240
6023103	CUOCUSO4	7.197E-22	-21.143	-13.506	35.575
6023104	CUSO4	2.674E-19	-18.573	-4.017	18.140
6023105	CHALCANTHITE	1.460E-12	-11.836	2.720	-1.440
3023100	CUPRICFERIT	3.932E-04	-3.405	-8.029	38.690
5095000	SMITHSONITE	6.287E-05	-4.202	9.758	4.360
5095001	ZNCO3, 1H2O	1.998E-04	-3.699	10.260	0.000
2095000	ZN(OH)2 (A)	1.403E-04	-3.853	-12.450	0.000
2095001	ZN(OH)2 (C)	2.495E-04	-3.603	-12.200	0.000
2095002	ZN(OH)2 (B)	7.032E-04	-3.153	-11.750	0.000
2095003	ZN(OH)2 (G)	7.711E-04	-3.113	-11.710	0.000
2095004	ZN(OH)2 (E)	1.251E-03	-2.903	-11.500	0.000
6095000	ZN2(OH)2SO4	1.661E-12	-11.780	-7.500	0.000
6095001	ZN4(OH)6SO4	3.270E-16	-15.485	-28.400	0.000
2095005	ZNO(ACTIVE)	1.937E-03	-2.713	-11.310	0.000
2095006	ZINCITE	1.750E-04	-3.757	-12.354	21.860
6095002	ZN3O(SO4)2	0.000E-01	-39.620	-22.463	62.000
6095003	ZINCOSITE	1.114E-17	-16.953	-4.076	19.200
6095004	ZNSO4, 1H2O	1.266E-13	-12.898	-0.021	10.640
6095005	BIANCHITE	7.575E-12	-11.121	1.756	0.160
6095006	GOSLARITE	1.847E-11	-10.733	2.143	-3.300
5054000	NICO3	5.032E-09	-8.298	6.288	9.940
2054000	NI(OH)2	7.267E-02	-1.139	-9.109	-30.450
6054000	NI4(OH)6SO4	2.554E-22	-21.593	-32.000	0.000
2054001	BUNSENITE	1.555E-06	-5.808	-13.778	23.920
6054001	RETGERSITE	3.959E-12	-11.402	2.101	-1.100
6054002	MORENOSITE	1.046E-11	-10.980	2.523	-2.940

5023101	MALACHITE	3.919E-05	-4.407	4.313	15.610
5023102	AZURITE	1.745E-09	-8.758	15.600	23.770
2074002	Sb4O6 II,CUB	1.113E-14	-13.954	20.469	-14.600
2074003	Sb4O6 I,ORTH	1.291E-17	-16.889	17.534	-8.990
2074004	Sb(OH)3 (s)	8.017E-02	-1.096	7.510	-7.200
2074006	Sb2O3 SENARM	3.636E-05	-4.439	12.772	-7.325
2074007	Sb2O3 VALENT	3.323E-09	-8.479	8.733	-4.545
2015000	LIME	8.618E-23	-22.065	-35.366	46.265
2015001	PORTLANDITE	8.364E-12	-11.078	-24.379	30.690
2046001	PERICLASE	3.256E-11	-10.487	-23.517	36.135
3046000	SPINEL	1.700E-12	-11.770	-41.281	89.089
3046001	MAG-FERRITE	1.856E-10	-9.731	-20.466	66.639
3028102	LEPIDOCROCIT	3.031E-03	-2.518	-1.371	0.000
3021201	BACRO4	6.294E-07	-6.201	10.023	-6.390
3021204	CUCRO4	2.585E-13	-12.587	5.475	0.000
3021205	K2CRO4	8.710E-19	-18.060	0.229	-4.250
3021206	K2CR2O7	2.558E-27	-26.592	16.678	-18.125
3021208	MGCRO4	3.072E-19	-18.513	-6.561	21.260
3021210	NA2CRO4	9.641E-22	-21.016	-3.518	4.610
3021211	NA2CR2O7	5.137E-33	-32.289	10.190	-5.305
3021214	SRCRO4	7.250E-11	-10.140	4.710	2.420
2021200	CrO3	1.446E-22	-21.840	3.141	1.245
3015000	CaCrO4	1.693E-10	-9.771	1.908	6.440

Type VI - EXCLUDED SPECIES (not included in mole balance)

ID	NAME	CALC MOL	LOG MOL	NEW LOGK	DH
3301403	CO2 (g)	4.295E-05	-4.367	18.189	-0.530

PERCENTAGE DISTRIBUTION OF COMPONENTS AMONG
TYPE I and TYPE II (dissolved and adsorbed) species

CO3-2

98.1	PERCENT BOUND IN SPECIES	#3301400	HCO3 -

Zn+2

37.0	PERCENT BOUND IN SPECIES	# 950	Zn+2
2.1	PERCENT BOUND IN SPECIES	#9503300	ZnOH +
40.8	PERCENT BOUND IN SPECIES	#9503301	Zn(OH)2 AQ
17.9	PERCENT BOUND IN SPECIES	#9501401	ZnCO3 AQ
1.2	PERCENT BOUND IN SPECIES	#9501402	Zn(CO3)2-2

Ba+2

100.0	PERCENT BOUND IN SPECIES	# 100	Ba+2

Ca+2

99.1	PERCENT BOUND IN SPECIES	# 150	Ca+2

CrO4-2

99.2	PERCENT BOUND IN SPECIES	# 212	CrO4-2

Cu+2

99.1	PERCENT BOUND IN SPECIES	#2313301	Cu(OH)2 AQ

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SO4-2
               95.8     PERCENT BOUND IN SPECIES #    732   SO4-2
                1.3     PERCENT BOUND IN SPECIES #4607320   MgSO4 AQ
                2.8     PERCENT BOUND IN SPECIES #1507320   CaSO4 AQ

Mg+2
               99.1     PERCENT BOUND IN SPECIES #    460   Mg+2

Mn+2
               99.2     PERCENT BOUND IN SPECIES #    470   Mn+2

Ni+2
                5.2     PERCENT BOUND IN SPECIES #    540   Ni+2
               94.0     PERCENT BOUND IN SPECIES #5401401   NiCO3 AQ

K+1
              100.0     PERCENT BOUND IN SPECIES #    410   K+1

Na+1
              100.0     PERCENT BOUND IN SPECIES #    500   Na+1

Sr+2
              100.0     PERCENT BOUND IN SPECIES #    800   Sr+2

Sb(OH)3
```

	50.4	PERCENT BOUND IN SPECIES # 740	Sb(OH)3
	49.6	PERCENT BOUND IN SPECIES #7400021	HSbO2
Al+3			
	10.4	PERCENT BOUND IN SPECIES # 303302	Al(OH)4 -
	89.3	PERCENT BOUND IN SPECIES # 303303	Al(OH)3 AQ
Fe+3			
	6.1	PERCENT BOUND IN SPECIES #2813301	FeOH2 +
	22.0	PERCENT BOUND IN SPECIES #2813302	FeOH3 AQ
	71.9	PERCENT BOUND IN SPECIES #2813303	FeOH4 -
H2O			
	58.3	PERCENT BOUND IN SPECIES #3300020	OH-
	5.1	PERCENT BOUND IN SPECIES # 303303	Al(OH)3 AQ
	33.8	PERCENT BOUND IN SPECIES #2313301	Cu(OH)2 AQ
H+1			
	99.0	PERCENT BOUND IN SPECIES #3301400	HCO3 -
	1.0	PERCENT BOUND IN SPECIES #3301401	H2CO3 AQ

---------- EQUILIBRATED MASS DISTRIBUTION ----------

IDX	NAME	DISSOLVED MOL/KG	DISSOLVED PERCENT	SORBED MOL/KG	SORBED PERCENT	PRECIPITATED MOL/KG	PRECIPITATED PERCENT
140	CO3-2	3.421E-04	100.0	0.000E-01	0.0	0.000E-01	0.0
950	Zn+2	1.224E-08	100.0	0.000E-01	0.0	0.000E-01	0.0
100	Ba+2	6.553E-09	100.0	0.000E-01	0.0	0.000E-01	0.0
150	Ca+2	2.318E-04	100.0	0.000E-01	0.0	0.000E-01	0.0
212	CrO4-2	1.207E-08	100.0	0.000E-01	0.0	0.000E-01	0.0
231	Cu+2	1.747E-07	100.0	0.000E-01	0.0	0.000E-01	0.0
732	SO4-2	4.018E-05	100.0	0.000E-01	0.0	0.000E-01	0.0
460	Mg+2	1.238E-04	100.0	0.000E-01	0.0	0.000E-01	0.0
470	Mn+2	6.553E-07	100.0	0.000E-01	0.0	0.000E-01	0.0
540	Ni+2	2.044E-08	100.0	0.000E-01	0.0	0.000E-01	0.0
410	K+1	7.263E-06	100.0	0.000E-01	0.0	0.000E-01	0.0
500	Na+1	1.805E-05	100.0	0.000E-01	0.0	0.000E-01	0.0
800	Sr+2	1.552E-07	100.0	0.000E-01	0.0	0.000E-01	0.0
740	Sb(OH)3	4.920E-09	100.0	0.000E-01	0.0	0.000E-01	0.0
30	Al+3	1.949E-08	0.6	0.000E-01	0.0	3.168E-06	99.4
281	Fe+3	8.139E-15	0.0	0.000E-01	0.0	3.295E-07	100.0
2	H2O	1.023E-06	100.0	0.000E-01	0.0	0.000E-01	0.0
330	H+1	3.389E-04	100.0	0.000E-01	0.0	0.000E-01	0.0

Charge Balance: SPECIATED

Sum of CATIONS = 7.325E-04 Sum of ANIONS 4.196E-04

PERCENT DIFFERENCE = 2.716E+01 (ANIONS - CATIONS)/(ANIONS + CATIONS)

EQUILIBRIUM IONIC STRENGTH (m) = 9.710E-04

EQUILIBRIUM pH = 8.500

DATE ID NUMBER: 981021
TIME ID NUMBER: 8212631

PART 6 of OUTPUT FILE

PC MINTEQA2 v3.10 DATE OF CALCULATIONS: 21-OCT-98 TIME: 8:21:26

Saturation indices and stoichiometry of all minerals

ID #	NAME	Sat. Index	Stoichiometry in [brackets]
2003000	ALOH3(A)	-3.641	[1.000] 30 [3.000] 2 [-3.000] 330
6003000	ALOHSO4	-10.003	[-1.000] 330 [1.000] 30 [1.000] 732 [1.000] 2
6003001	AL4(OH)10SO4	-11.210	[-10.000] 330 [4.000] 30 [1.000] 732 [10.000] 2
6041000	ALUM K	-25.789	[1.000] 410 [1.000] 30 [2.000] 732 [12.000] 2
6041001	ALUNITE	-13.315	[1.000] 410 [3.000] 30 [2.000] 732 [6.000] 2 [-6.000] 330
6015000	ANHYDRITE	-3.744	[1.000] 150 [1.000] 732
5015000	ARAGONITE	-1.088	[1.000] 150 [1.000] 140
5046000	ARTINITE	-7.694	[-2.000] 330 [2.000] 460 [1.000] 140 [5.000] 2
6010000	BARITE	-2.392	[1.000] 100 [1.000] 732
2003001	BOEHMITE	-1.899	[-3.000] 330 [1.000] 30 [2.000] 2
2046000	BRUCITE	-5.198	[1.000] 460 [2.000] 2 [-2.000] 330
5015001	CALCITE	-0.859	[1.000] 150 [1.000] 140
6080000	CELESTITE	-4.903	[1.000] 800 [1.000] 732
2003002	DIASPORE	0.000	[-3.000] 330 [1.000] 30 [2.000] 2
5015002	DOLOMITE	-2.242	[1.000] 150 [1.000] 460 [2.000] 140
6046000	EPSOMITE	-6.148	[1.000] 460 [1.000] 732 [7.000] 2

◎ Table of Contents

2028100	FERRIHYDRITE	-6.038	[-3.000]	330	[1.000]	281	[3.000]	2			
6028100	FE2(SO4)3	-73.580	[2.000]	281	[3.000]	732					
2003003	GIBBSITE (C)	-1.795	[-3.000]	330	[1.000]	30	[3.000]	2			
3003000	Al2O3	-6.498	[2.000]	30	[3.000]	2	[-6.000]	330			
2028102	GOETHITE	-2.452	[-3.000]	330	[1.000]	281	[2.000]	2			
6015001	GYPSUM	-3.309	[1.000]	150	[1.000]	732	[2.000]	2			
3028100	HEMATITE	0.000	[-6.000]	330	[2.000]	281	[3.000]	2			
5015003	HUNTITE	-9.298	[3.000]	460	[1.000]	150	[4.000]	140			
5046001	HYDRMAGNESIT	-19.212	[5.000]	460	[4.000]	140	[-2.000]	330			
			[6.000]	2							
6050000	JAROSITE NA	-33.458	[-6.000]	330	[1.000]	500	[3.000]	281			
			[2.000]	732	[6.000]	2					
6041002	JAROSITE K	-29.981	[-6.000]	330	[1.000]	410	[3.000]	281			
			[2.000]	732	[6.000]	2					
6028101	JAROSITE H	-37.353	[-5.000]	330	[3.000]	281	[2.000]	732			
			[7.000]	2							
3028101	MAGHEMITE	-8.681	[-6.000]	330	[2.000]	281	[3.000]	2			
5046002	MAGNESITE	-1.841	[1.000]	460	[1.000]	140					
6050001	MIRABILITE	-11.822	[2.000]	500	[1.000]	732	[10.000]	2			
3050000	NATRON	-12.888	[2.000]	500	[1.000]	140	[10.000]	2			
5046003	NESQUEHONITE	-4.228	[1.000]	460	[1.000]	140	[3.000]	2			
5080000	STRONTIANITE	-3.213	[1.000]	800	[1.000]	140					

ID #	NAME	Sat. Index	Stoichiometry in [brackets]								
6050002	THENARDITE	-13.843	[2.000]	500	[1.000]	732					
5050001	THERMONATR	-15.354	[2.000]	500	[1.000]	140	[1.000]	2			
5010000	WITHERITE	-5.194	[1.000]	100	[1.000]	140					
2047003	PYROCROITE	-5.589	[-2.000]	330	[1.000]	470	[2.000]	2			
5047000	RHODOCHROSIT	-1.508	[1.000]	470	[1.000]	140					
6047000	MNSO4	-14.249	[1.000]	470	[1.000]	732					
5023100	CUCO3	-6.008	[1.000]	231	[1.000]	140					
2023100	CU(OH)2	-2.569	[-2.000]	330	[1.000]	231	[2.000]	2			
6023100	ANTLERITE	-9.009	[-4.000]	330	[3.000]	231	[4.000]	2			
			[1.000]	732							

◎ Table of Contents

```
6023101 BROCHANTITE    -9.141    [ -6.000] 330  [  4.000] 231  [  6.000]   2
                                 [  1.000] 732
6023102 LANGITE       -12.790    [ -6.000] 330  [  4.000] 231  [  7.000]   2
                                 [  1.000] 732
2023101 TENORITE       -1.548    [ -2.000] 330  [  1.000] 231  [  1.000]   2
6023103 CUOCUSO4      -21.143    [ -2.000] 330  [  2.000] 231  [  1.000]   2
                                 [  1.000] 732
6023104 CUSO4         -18.573    [  1.000] 231  [  1.000] 732
6023105 CHALCANTHITE  -11.836    [  1.000] 231  [  1.000] 732  [  5.000]   2
3023100 CUPRICFERIT    -3.405    [ -8.000] 330  [  1.000] 231  [  2.000] 281
                                 [  4.000]   2
5095000 SMITHSONITE    -4.202    [  1.000] 950  [  1.000] 140
5095001 ZNCO3, 1H2O    -3.699    [  1.000] 950  [  1.000] 140  [  1.000]   2
2095000 ZN(OH)2 (A)    -3.853    [ -2.000] 330  [  1.000] 950  [  2.000]   2
2095001 ZN(OH)2 (C)    -3.603    [ -2.000] 330  [  1.000] 950  [  2.000]   2
2095002 ZN(OH)2 (B)    -3.153    [ -2.000] 330  [  1.000] 950  [  2.000]   2
2095003 ZN(OH)2 (G)    -3.113    [ -2.000] 330  [  1.000] 950  [  2.000]   2
2095004 ZN(OH)2 (E)    -2.903    [ -2.000] 330  [  1.000] 950  [  2.000]   2
6095000 ZN2(OH)2SO4   -11.780    [ -2.000] 330  [  2.000] 950  [  2.000]   2
                                 [  1.000] 732
6095001 ZN4(OH)6SO4   -15.485    [ -6.000] 330  [  4.000] 950  [  6.000]   2
                                 [  1.000] 732
2095005 ZNO(ACTIVE)    -2.713    [ -2.000] 330  [  1.000] 950  [  1.000]   2
2095006 ZINCITE        -3.757    [ -2.000] 330  [  1.000] 950  [  1.000]   2
6095002 ZN3O(SO4)2    -39.620    [ -2.000] 330  [  3.000] 950  [  2.000] 732
                                 [  1.000]   2
6095003 ZINCOSITE     -16.953    [  1.000] 950  [  1.000] 732
6095004 ZNSO4, 1H2O   -12.898    [  1.000] 950  [  1.000] 732  [  1.000]   2
6095005 BIANCHITE     -11.121    [  1.000] 950  [  1.000] 732  [  6.000]   2
6095006 GOSLARITE     -10.733    [  1.000] 950  [  1.000] 732  [  7.000]   2
5054000 NICO3          -8.298    [  1.000] 540  [  1.000] 140
2054000 NI(OH)2        -1.139    [ -2.000] 330  [  1.000] 540  [  2.000]   2
6054000 NI4(OH)6SO4   -21.593    [ -6.000] 330  [  4.000] 540  [  1.000] 732
                                 [  6.000]   2
2054001 BUNSENITE      -5.808    [ -2.000] 330  [  1.000] 540  [  1.000]   2
6054001 RETGERSITE    -11.402    [  1.000] 540  [  1.000] 732  [  6.000]   2
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6054002 MORENOSITE    -10.980    [  1.000] 540  [  1.000] 732  [  7.000]   2
5023101 MALACHITE      -4.407    [  2.000] 231  [  2.000]   2  [  1.000] 140
                                 [ -2.000] 330
5023102 AZURITE        -8.758    [  3.000] 231  [  2.000]   2  [  2.000] 140
                                 [ -2.000] 330


  ID #     NAME      Sat. Index        Stoichiometry in [brackets]
2074002 Sb4O6 II,CUB  -13.954    [  4.000] 740  [ -6.000]   2
2074003 Sb4O6 I,ORTH  -16.889    [  4.000] 740  [ -6.000]   2
2074004 Sb(OH)3 (s)    -1.096    [  1.000] 740
2074006 Sb2O3 SENARM   -4.439    [  2.000] 740  [ -3.000]   2
2074007 Sb2O3 VALENT   -8.479    [  2.000] 740  [ -3.000]   2
2015000 LIME          -22.065    [ -2.000] 330  [  1.000] 150  [  1.000]   2
2015001 PORTLANDITE   -11.078    [ -2.000] 330  [  1.000] 150  [  2.000]   2
2046001 PERICLASE     -10.487    [ -2.000] 330  [  1.000] 460  [  1.000]   2
3046000 SPINEL        -11.770    [ -8.000] 330  [  1.000] 460  [  2.000]  30
                                 [  4.000]   2
3046001 MAG-FERRITE    -9.731    [ -8.000] 330  [  1.000] 460  [  2.000] 281
                                 [  4.000]   2
3028102 LEPIDOCROCIT   -2.518    [ -3.000] 330  [  1.000] 281  [  2.000]   2
3021201 BACRO4         -6.201    [  1.000] 212  [  1.000] 100
3021204 CUCRO4        -12.587    [  1.000] 212  [  1.000] 231
3021205 K2CRO4        -18.060    [  1.000] 212  [  2.000] 410
3021206 K2CR2O7       -26.592    [  2.000] 212  [  2.000] 410  [  2.000] 330
                                 [ -1.000]   2
3021208 MGCRO4        -18.513    [  1.000] 212  [  1.000] 460
3021210 NA2CRO4       -21.016    [  1.000] 212  [  2.000] 500
3021211 NA2CR2O7      -32.289    [  2.000] 212  [  2.000] 500  [  2.000] 330
                                 [ -1.000]   2
3021214 SRCRO4        -10.140    [  1.000] 212  [  1.000] 800
2021200 CrO3          -21.840    [  1.000] 212  [  2.000] 330  [ -1.000]   2
3015000 CaCrO4         -9.771    [  1.000] 150  [  1.000] 212
```

Appendix E-2
Geochemical Modelling - PHREEQC

◎ Table of Contents

```
------------------
Reading data base.
------------------

      SOLUTION_MASTER_SPECIES
      SOLUTION_SPECIES
      PHASES
      EXCHANGE_MASTER_SPECIES
      EXCHANGE_SPECIES
      SURFACE_MASTER_SPECIES
      SURFACE_SPECIES
      END
-----------------------------------
Reading input data for simulation 1.
-----------------------------------

      SOLUTION 1 Altered Basalt
            temp  4
            pH    8.55
            pe    4
            redox pe
            units ug/l
            density     1
            Al    95.34
            Ba    3.74
            Ca    6103
            Cd    0.05
            Cu(2) 6
            Fe(3) 19
            K     151
            Mg    2619
            Mn(2) 10.34
            Na    424
            P     50
            Pb    1.4
            S(6)  1680
            Alkalinity  26000 gfw 50.04
            Sr    16.54
            Zn    1.11
      SAVE solution 1
      END
----------------------------------------
Beginning of initial solution calculations.
----------------------------------------

Initial solution 1.     Altered Basalt

-----------------------------Solution composition------------------------------

      Elements           Molality       Moles

      Al                 3.534e-06   3.534e-06
      Alkalinity         5.196e-04   5.196e-04
      Ba                 2.723e-08   2.723e-08
      Ca                 1.523e-04   1.523e-04
      Cd                 4.449e-10   4.449e-10
      Cu(2)              9.442e-08   9.442e-08
      Fe(3)              3.402e-07   3.402e-07
```

```
      K                 3.862e-06   3.862e-06
      Mg                1.077e-04   1.077e-04
      Mn(2)             1.882e-07   1.882e-07
      Na                1.844e-05   1.844e-05
      P                 1.614e-06   1.614e-06
      Pb                6.757e-09   6.757e-09
      S(6)              1.749e-05   1.749e-05
      Sr                1.888e-07   1.888e-07
      Zn                1.698e-08   1.698e-08

----------------------------Description of solution----------------------------

                            pH  =   8.550
                            pe  =   4.000
              Activity of water  =   1.000
                 Ionic strength  =   8.204e-04
             Mass of water (kg)  =   1.000e+00
          Total carbon (mol/kg)  =   5.009e-04
             Total CO2 (mol/kg)  =   5.009e-04
           Temperature (deg C)  =   4.000
    Electrical balance (eq)  =  -1.894e-06
                    Iterations  =   8
                       Total H  = 1.110129e+02
                       Total O  = 5.550781e+01

----------------------------Distribution of species----------------------------

                                                 Log       Log         Log
      Species             Molality    Activity  Molality  Activity     Gamma

      OH-               6.172e-07   5.980e-07    -6.210    -6.223    -0.014
      H+                2.904e-09   2.818e-09    -8.537    -8.550    -0.013
      H2O               5.551e+01   1.000e+00     0.000     0.000     0.000
Al                3.534e-06
      Al(OH)4-          3.527e-06   3.418e-06    -5.453    -5.466    -0.014
      Al(OH)3           5.921e-09   5.922e-09    -8.228    -8.227     0.000
      Al(OH)2+          6.987e-10   6.771e-10    -9.156    -9.169    -0.014
      AlOH+2            2.219e-12   1.958e-12   -11.654   -11.708    -0.054
      Al+3              3.043e-15   2.322e-15   -14.517   -14.634    -0.117
      AlSO4+            8.476e-17   8.214e-17   -16.072   -16.085    -0.014
      Al(SO4)2-         3.618e-20   3.507e-20   -19.441   -19.455    -0.014
      AlHSO4+2          2.060e-26   1.817e-26   -25.686   -25.741    -0.054
Ba                2.723e-08
      Ba+2              2.696e-08   2.381e-08    -7.569    -7.623    -0.054
      BaSO4             1.788e-10   1.789e-10    -9.748    -9.747     0.000
      BaHCO3+           5.764e-11   5.586e-11   -10.239   -10.253    -0.014
      BaCO3             3.663e-11   3.664e-11   -10.436   -10.436     0.000
      BaOH+             2.953e-13   2.862e-13   -12.530   -12.543    -0.014
C(4)              5.009e-04
      HCO3-             4.890e-04   4.741e-04    -3.311    -3.324    -0.013
      CO3-2             5.141e-06   4.542e-06    -5.289    -5.343    -0.054
      CO2               4.506e-06   4.507e-06    -5.346    -5.346     0.000
      CaCO3             8.119e-07   8.120e-07    -6.091    -6.090     0.000
      MgHCO3+           5.166e-07   5.006e-07    -6.287    -6.300    -0.014
      CaHCO3+           5.000e-07   4.847e-07    -6.301    -6.315    -0.013
      MgCO3             2.958e-07   2.959e-07    -6.529    -6.529     0.000
      MnCO3             4.412e-08   4.413e-08    -7.355    -7.355     0.000
      PbCO3             5.954e-09   5.955e-09    -8.225    -8.225     0.000
```

	MnHCO3+	5.333e-09	5.168e-09	-8.273	-8.287	-0.014
	NaHCO3	4.763e-09	4.764e-09	-8.322	-8.322	0.000
	ZnCO3	3.984e-09	3.985e-09	-8.400	-8.400	0.000
	SrHCO3+	6.040e-10	5.855e-10	-9.219	-9.232	-0.013
	NaCO3-	4.991e-10	4.836e-10	-9.302	-9.315	-0.014
	Zn(CO3)2-2	4.387e-10	3.870e-10	-9.358	-9.412	-0.054
	ZnHCO3+	2.708e-10	2.625e-10	-9.567	-9.581	-0.014
	SrCO3	2.583e-10	2.584e-10	-9.588	-9.588	0.000
	Pb(CO3)2-2	7.702e-11	6.794e-11	-10.113	-10.168	-0.054
	BaHCO3+	5.764e-11	5.586e-11	-10.239	-10.253	-0.014
	BaCO3	3.663e-11	3.664e-11	-10.436	-10.436	0.000
	PbHCO3+	2.932e-11	2.841e-11	-10.533	-10.546	-0.014
	CdHCO3+	5.918e-12	5.735e-12	-11.228	-11.241	-0.014
	CdCO3	1.380e-12	1.380e-12	-11.860	-11.860	0.000
	Cd(CO3)2-2	2.247e-14	1.982e-14	-13.648	-13.703	-0.054
Ca		1.523e-04				
	Ca+2	1.505e-04	1.330e-04	-3.822	-3.876	-0.054
	CaCO3	8.119e-07	8.120e-07	-6.091	-6.090	0.000
	CaHCO3+	5.000e-07	4.847e-07	-6.301	-6.315	-0.013
	CaSO4	3.220e-07	3.221e-07	-6.492	-6.492	0.000
	CaHPO4	5.785e-08	5.786e-08	-7.238	-7.238	0.000
	CaPO4-	3.274e-08	3.173e-08	-7.485	-7.499	-0.014
	CaOH+	8.079e-09	7.830e-09	-8.093	-8.106	-0.014
	CaH2PO4+	1.417e-10	1.373e-10	-9.849	-9.862	-0.014
	CaHSO4+	4.476e-15	4.337e-15	-14.349	-14.363	-0.014
Cd		4.449e-10				
	Cd+2	4.337e-10	3.826e-10	-9.363	-9.417	-0.054
	CdHCO3+	5.918e-12	5.735e-12	-11.228	-11.241	-0.014
	CdOH+	2.182e-12	2.114e-12	-11.661	-11.675	-0.014
	CdSO4	1.440e-12	1.441e-12	-11.841	-11.841	0.000
	CdCO3	1.380e-12	1.380e-12	-11.860	-11.860	0.000
	Cd(OH)2	2.151e-13	2.151e-13	-12.667	-12.667	0.000
	Cd(CO3)2-2	2.247e-14	1.982e-14	-13.648	-13.703	-0.054
	Cd(SO4)2-2	3.083e-16	2.719e-16	-15.511	-15.566	-0.054
	Cd(OH)3-	8.837e-18	8.564e-18	-17.054	-17.067	-0.014
	Cd(OH)4-2	3.070e-23	2.708e-23	-22.513	-22.567	-0.054
Cu(2)		9.442e-08				
	Cu(OH)2	9.425e-08	9.427e-08	-7.026	-7.026	0.000
	CuOH+	1.312e-10	1.272e-10	-9.882	-9.896	-0.014
	Cu+2	4.054e-11	3.584e-11	-10.392	-10.446	-0.054
	Cu(OH)3-	2.080e-12	2.015e-12	-11.682	-11.696	-0.014
	CuSO4	9.384e-14	9.386e-14	-13.028	-13.028	0.000
	Cu(OH)4-2	1.617e-16	1.427e-16	-15.791	-15.846	-0.054
Fe(3)		3.402e-07				
	Fe(OH)3	2.847e-07	2.847e-07	-6.546	-6.546	0.000
	Fe(OH)4-	3.835e-08	3.716e-08	-7.416	-7.430	-0.014
	Fe(OH)2+	1.721e-08	1.668e-08	-7.764	-7.778	-0.014
	FeOH+2	3.790e-13	3.344e-13	-12.421	-12.476	-0.054
	Fe+3	7.231e-19	5.518e-19	-18.141	-18.258	-0.117
	FeHPO4+	8.880e-20	8.606e-20	-19.052	-19.065	-0.014
	FeSO4+	5.677e-20	5.502e-20	-19.246	-19.259	-0.014
	FeH2PO4+2	1.050e-20	9.262e-21	-19.979	-20.033	-0.054
	Fe(SO4)2-	1.705e-23	1.652e-23	-22.768	-22.782	-0.014
	Fe2(OH)2+4	1.264e-23	7.653e-24	-22.898	-23.116	-0.218
	FeHSO4+2	5.126e-28	4.521e-28	-27.290	-27.345	-0.054
	Fe3(OH)4+5	4.696e-28	2.144e-28	-27.328	-27.669	-0.341
H(0)		1.408e-28				
	H2	7.041e-29	7.042e-29	-28.152	-28.152	0.000

K	3.862e-06					
K+		3.862e-06	3.742e-06	-5.413	-5.427	-0.014
KSO4-		2.742e-10	2.658e-10	-9.562	-9.576	-0.014
KHPO4-		9.112e-12	8.830e-12	-11.040	-11.054	-0.014
KOH		4.603e-12	4.603e-12	-11.337	-11.337	0.000
Mg	1.077e-04					
Mg+2		1.066e-04	9.424e-05	-3.972	-4.026	-0.054
MgHCO3+		5.166e-07	5.006e-07	-6.287	-6.300	-0.014
MgCO3		2.958e-07	2.959e-07	-6.529	-6.529	0.000
MgSO4		1.851e-07	1.851e-07	-6.733	-6.733	0.000
MgHPO4		5.543e-08	5.545e-08	-7.256	-7.256	0.000
MgPO4-		3.130e-08	3.033e-08	-7.504	-7.518	-0.014
MgOH+		1.629e-08	1.579e-08	-7.788	-7.802	-0.014
MgH2PO4+		1.279e-10	1.240e-10	-9.893	-9.907	-0.014
Mn(2)	1.882e-07					
Mn+2		1.384e-07	1.223e-07	-6.859	-6.913	-0.054
MnCO3		4.412e-08	4.413e-08	-7.355	-7.355	0.000
MnHCO3+		5.333e-09	5.168e-09	-8.273	-8.287	-0.014
MnSO4		2.119e-10	2.119e-10	-9.674	-9.674	0.000
MnOH+		1.825e-10	1.769e-10	-9.739	-9.752	-0.014
Na	1.844e-05					
Na+		1.844e-05	1.787e-05	-4.734	-4.748	-0.014
NaHCO3		4.763e-09	4.764e-09	-8.322	-8.322	0.000
NaSO4-		1.201e-09	1.164e-09	-8.921	-8.934	-0.014
NaCO3-		4.991e-10	4.836e-10	-9.302	-9.315	-0.014
NaHPO4-		4.352e-11	4.217e-11	-10.361	-10.375	-0.014
NaOH		4.188e-11	4.189e-11	-10.378	-10.378	0.000
O(0)	0.000e+00					
O2		0.000e+00	0.000e+00	-43.366	-43.366	0.000
P	1.614e-06					
HPO4-2		1.372e-06	1.210e-06	-5.863	-5.917	-0.055
H2PO4-		6.434e-08	6.236e-08	-7.192	-7.205	-0.014
CaHPO4		5.785e-08	5.786e-08	-7.238	-7.238	0.000
MgHPO4		5.543e-08	5.545e-08	-7.256	-7.256	0.000
CaPO4-		3.274e-08	3.173e-08	-7.485	-7.499	-0.014
MgPO4-		3.130e-08	3.033e-08	-7.504	-7.518	-0.014
PO4-3		1.635e-10	1.233e-10	-9.786	-9.909	-0.123
CaH2PO4+		1.417e-10	1.373e-10	-9.849	-9.862	-0.014
MgH2PO4+		1.279e-10	1.240e-10	-9.893	-9.907	-0.014
NaHPO4-		4.352e-11	4.217e-11	-10.361	-10.375	-0.014
KHPO4-		9.112e-12	8.830e-12	-11.040	-11.054	-0.014
FeHPO4+		8.880e-20	8.606e-20	-19.052	-19.065	-0.014
FeH2PO4+2		1.050e-20	9.262e-21	-19.979	-20.033	-0.054
Pb	6.757e-09					
PbCO3		5.954e-09	5.955e-09	-8.225	-8.225	0.000
PbOH+		5.386e-10	5.219e-10	-9.269	-9.282	-0.014
Pb+2		8.553e-11	7.545e-11	-10.068	-10.122	-0.054
Pb(CO3)2-2		7.702e-11	6.794e-11	-10.113	-10.168	-0.054
Pb(OH)2		7.203e-11	7.205e-11	-10.142	-10.142	0.000
PbHCO3+		2.932e-11	2.841e-11	-10.533	-10.546	-0.014
PbSO4		6.359e-13	6.361e-13	-12.197	-12.197	0.000
Pb(OH)3-		3.029e-13	2.935e-13	-12.519	-12.532	-0.014
Pb(OH)4-2		2.705e-16	2.386e-16	-15.568	-15.622	-0.054
Pb(SO4)2-2		5.673e-17	5.005e-17	-16.246	-16.301	-0.054
Pb2OH+3		1.169e-18	8.816e-19	-17.932	-18.055	-0.123
S(6)	1.749e-05					
SO4-2		1.698e-05	1.499e-05	-4.770	-4.824	-0.054
CaSO4		3.220e-07	3.221e-07	-6.492	-6.492	0.000

```
      MgSO4              1.851e-07   1.851e-07    -6.733    -6.733     0.000
      NaSO4-             1.201e-09   1.164e-09    -8.921    -8.934    -0.014
      SrSO4              3.712e-10   3.712e-10    -9.430    -9.430     0.000
      KSO4-              2.742e-10   2.658e-10    -9.562    -9.576    -0.014
      MnSO4              2.119e-10   2.119e-10    -9.674    -9.674     0.000
      BaSO4              1.788e-10   1.789e-10    -9.748    -9.747     0.000
      ZnSO4              1.299e-11   1.299e-11   -10.887   -10.886     0.000
      HSO4-              2.799e-12   2.713e-12   -11.553   -11.567    -0.014
      CdSO4              1.440e-12   1.441e-12   -11.841   -11.841     0.000
      PbSO4              6.359e-13   6.361e-13   -12.197   -12.197     0.000
      CuSO4              9.384e-14   9.386e-14   -13.028   -13.028     0.000
      CaHSO4+            4.476e-15   4.337e-15   -14.349   -14.363    -0.014
      Zn(SO4)2-2         2.135e-15   1.883e-15   -14.671   -14.725    -0.054
      Cd(SO4)2-2         3.083e-16   2.719e-16   -15.511   -15.566    -0.054
      AlSO4+             8.476e-17   8.214e-17   -16.072   -16.085    -0.014
      Pb(SO4)2-2         5.673e-17   5.005e-17   -16.246   -16.301    -0.054
      FeSO4+             5.677e-20   5.502e-20   -19.246   -19.259    -0.014
      Al(SO4)2-          3.618e-20   3.507e-20   -19.441   -19.455    -0.014
      Fe(SO4)2-          1.705e-23   1.652e-23   -22.768   -22.782    -0.014
      AlHSO4+2           2.060e-26   1.817e-26   -25.686   -25.741    -0.054
      FeHSO4+2           5.126e-28   4.521e-28   -27.290   -27.345    -0.054
Sr                1.888e-07
      Sr+2               1.875e-07   1.657e-07    -6.727    -6.781    -0.054
      SrHCO3+            6.040e-10   5.855e-10    -9.219    -9.232    -0.013
      SrSO4              3.712e-10   3.712e-10    -9.430    -9.430     0.000
      SrCO3              2.583e-10   2.584e-10    -9.588    -9.588     0.000
      SrOH+              3.110e-12   3.015e-12   -11.507   -11.521    -0.014
Zn                1.698e-08
      Zn(OH)2            6.968e-09   6.969e-09    -8.157    -8.157     0.000
      Zn+2               4.980e-09   4.397e-09    -8.303    -8.357    -0.054
      ZnCO3              3.984e-09   3.985e-09    -8.400    -8.400     0.000
      Zn(CO3)2-2         4.387e-10   3.870e-10    -9.358    -9.412    -0.054
      ZnOH+              3.181e-10   3.083e-10    -9.497    -9.511    -0.014
      ZnHCO3+            2.708e-10   2.625e-10    -9.567    -9.581    -0.014
      ZnSO4              1.299e-11   1.299e-11   -10.887   -10.886     0.000
      Zn(OH)3-           8.069e-12   7.819e-12   -11.093   -11.107    -0.014
      Zn(SO4)2-2         2.135e-15   1.883e-15   -14.671   -14.725    -0.054
      Zn(OH)4-2          4.985e-16   4.397e-16   -15.302   -15.357    -0.054

------------------------------Saturation indices-------------------------------

      Phase               SI log IAP  log KT

      Al(OH)3(a)       -1.26   11.02   12.27  Al(OH)3
      Alunite          -9.07   -7.68    1.39  KAl3(SO4)2(OH)6
      Anglesite        -7.04  -14.95   -7.91  PbSO4
      Anhydrite        -4.35   -8.70   -4.35  CaSO4
      Aragonite        -0.99   -9.22   -8.23  CaCO3
      Barite           -2.07  -12.45  -10.38  BaSO4
      Calcite          -0.83   -9.22   -8.39  CaCO3
      Cd(OH)2          -5.97    7.68   13.65  Cd(OH)2
      CdSO4           -14.96  -14.24    0.72  CdSO4
      Celestite        -4.94  -11.60   -6.66  SrSO4
      Cerrusite        -2.07  -15.47  -13.40  PbCO3
      CO2(g)           -4.17  -22.44  -18.27  CO2
      Dolomite         -2.02  -18.59  -16.57  CaMg(CO3)2
      Fe(OH)3(a)        2.50    7.39    4.89  Fe(OH)3
      Gibbsite          1.64   11.02    9.38  Al(OH)3
```

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      Goethite          7.59    7.39   -0.20  FeOOH
      Gypsum           -4.10   -8.70   -4.60  CaSO4:2H2O
      H2(g)           -25.10  -25.10    0.00  H2
      Hausmannite     -10.96   55.66   66.62  Mn3O4
      Hematite         17.08   14.78   -2.29  Fe2O3
      Hydroxyapatite   -1.52  -40.56  -39.04  Ca5(PO4)3OH
      Jarosite-K      -11.08  -18.55   -7.47  KFe3(SO4)2(OH)6
      Manganite        -2.60   22.74   25.34  MnOOH
      O2(g)           -40.51   50.20   90.71  O2
      Otavite          -2.66  -14.76  -12.10  CdCO3
      Pb(OH)2          -1.95    6.98    8.93  Pb(OH)2
      Pyrochroite      -5.01   10.19   15.20  Mn(OH)2
      Pyrolusite       -9.71   35.29   45.00  MnO2
      Rhodochrosite    -1.20  -12.26  -11.05  MnCO3
      Smithsonite      -3.94  -13.70   -9.76  ZnCO3
      Strontianite     -2.81  -12.12   -9.32  SrCO3
      Witherite        -4.28  -12.97   -8.69  BaCO3
      Zn(OH)2(e)       -2.76    8.74   11.50  Zn(OH)2

------------------
End of simulation.
------------------

------------------------------------
Reading input data for simulation 2.
------------------------------------

      SOLUTION 2 Rain water
            temp  4
            pH    7     CO2(g) 0
            pe    4
            redox pe
            units ug/l
            density     1
      EQUILIBRIUM_PHASES 1
            CO2(g)      -3.5        10
      SAVE solution 2
      END
----------------------------------------
Beginning of initial solution calculations.
----------------------------------------

Initial solution 2.     Rain water

-----------------------------Solution composition------------------------------

      Elements           Molality       Moles

      Pure water

----------------------------Description of solution----------------------------

                              pH  =   6.465      Equilibrium with CO2(g)
                              pe  =   4.000
                 Activity of water  =   1.000
                    Ionic strength  =   1.740e-07
                 Mass of water (kg)  =   1.000e+00
          Total alkalinity (eq/kg)  =  -3.381e-07
```

```
          Total carbon (mol/kg)  =   0.000e+00
             Total CO2 (mol/kg)  =   0.000e+00
           Temperature (deg C)  =   4.000
        Electrical balance (eq)  =   3.381e-07
                    Iterations  =   3
                       Total H  = 1.110124e+02
                       Total O  = 5.550622e+01

----------------------------Distribution of species----------------------------

                                                 Log       Log         Log
      Species            Molality    Activity  Molality  Activity     Gamma

      H+                 3.430e-07   3.429e-07    -6.465    -6.465     0.000
      OH-                4.918e-09   4.916e-09    -8.308    -8.308     0.000
      H2O                5.551e+01   1.000e+00     0.000     0.000     0.000
H(0)             2.085e-24
      H2                 1.042e-24   1.042e-24   -23.982   -23.982     0.000
O(0)             0.000e+00
      O2                 0.000e+00   0.000e+00   -51.707   -51.707     0.000

------------------------------Saturation indices------------------------------

      Phase               SI log IAP  log KT

      H2(g)           -20.93  -20.93    0.00  H2
      O2(g)           -48.85   41.86   90.71  O2

-----------------------------------
Beginning of reaction calculations.
-----------------------------------

Reaction step 1.

Using solution 2. Rain water

Using pure phase assemblage 1.

-------------------------------Phase assemblage-------------------------------

                                                      Moles in assemblage
      Phase               SI log IAP  log KT    Initial      Final      Delta

      CO2(g)          -3.50  -21.77  -18.27  1.000e+01  1.000e+01 -2.343e-05

----------------------------Solution composition----------------------------

      Elements           Molality       Moles

      C                  2.343e-05   2.343e-05

----------------------------Description of solution----------------------------

                            pH  =   5.573      Charge balance
                            pe  =   3.978      Adjusted to redox equilibrium
               Activity of water  =   1.000
                  Ionic strength  =   2.511e-06
              Mass of water (kg)  =   1.000e+00
```

```
       Total alkalinity (eq/kg)  =  -3.381e-07
             Total CO2 (mol/kg)  =   2.343e-05
            Temperature (deg C)  =   4.000
        Electrical balance (eq)  =   3.381e-07
                     Iterations  =   7
                        Total H  = 1.110124e+02
                        Total O  = 5.550626e+01

----------------------------Distribution of species----------------------------

                                                 Log       Log         Log
      Species            Molality    Activity  Molality  Activity     Gamma

      H+                 2.680e-06   2.676e-06    -5.572    -5.573    -0.001
      OH-                6.311e-10   6.300e-10    -9.200    -9.201    -0.001
      H2O                5.551e+01   1.000e+00     0.000     0.000     0.000
C(-4)            0.000e+00
      CH4                0.000e+00   0.000e+00   -53.713   -53.713     0.000
C(4)             2.343e-05
      CO2                2.109e-05   2.109e-05    -4.676    -4.676     0.000
      HCO3-              2.342e-06   2.337e-06    -5.630    -5.631    -0.001
      CO3-2              2.376e-11   2.359e-11   -10.624   -10.627    -0.003
H(0)             1.407e-22
      H2                 7.035e-23   7.035e-23   -22.153   -22.153     0.000
O(0)             0.000e+00
      O2                 0.000e+00   0.000e+00   -55.365   -55.365     0.000

------------------------------Saturation indices-------------------------------

      Phase               SI log IAP  log KT

      CH4(g)          -51.04  -98.17  -47.13  CH4
      CO2(g)           -3.50  -21.77  -18.27  CO2
      H2(g)           -19.10  -19.10    0.00  H2
      O2(g)           -52.51   38.20   90.71  O2

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End of simulation.
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-----------------------------------
Reading input data for simulation 3.
-----------------------------------

      MIX 1 Mixing Alt Basalt and Rain Water
            1     0.5
            2     0.5
      SAVE solution 3
      END
-----------------------------------
Beginning of reaction calculations.
-----------------------------------

Reaction step 1.

Using mixture 1.  Mixing Alt Basalt and Rain Water

       5.000e-01 Solution 1   Altered Basalt
```

5.000e-01 Solution 2 Solution after simulation 2.

----------Solution composition----------

Elements	Molality	Moles
Al	1.767e-06	1.767e-06
Ba	1.362e-08	1.362e-08
C	2.621e-04	2.621e-04
Ca	7.614e-05	7.614e-05
Cd	2.224e-10	2.224e-10
Cu	4.721e-08	4.721e-08
Fe	1.701e-07	1.701e-07
K	1.931e-06	1.931e-06
Mg	5.386e-05	5.386e-05
Mn	9.411e-08	9.411e-08
Na	9.222e-06	9.222e-06
P	8.072e-07	8.072e-07
Pb	3.379e-09	3.379e-09
S	8.744e-06	8.744e-06
Sr	9.439e-08	9.439e-08
Zn	8.490e-09	8.490e-09

----------Description of solution----------

pH	=	7.869	Charge balance
pe	=	9.814	Adjusted to redox equilibrium
Activity of water	=	1.000	
Ionic strength	=	4.107e-04	
Mass of water (kg)	=	1.000e+00	
Total alkalinity (eq/kg)	=	2.596e-04	
Total CO2 (mol/kg)	=	2.621e-04	
Temperature (deg C)	=	4.000	
Electrical balance (eq)	=	-7.780e-07	
Iterations	=	19	
Total H	=	1.110127e+02	
Total O	=	5.550704e+01	

----------Distribution of species----------

Species	Molality	Activity	Log Molality	Log Activity	Log Gamma
OH-	1.274e-07	1.245e-07	-6.895	-6.905	-0.010
H+	1.383e-08	1.353e-08	-7.859	-7.869	-0.009
H2O	5.551e+01	1.000e+00	0.000	0.000	0.000
Al	1.767e-06				
Al(OH)4-	1.745e-06	1.706e-06	-5.758	-5.768	-0.010
Al(OH)3	1.419e-08	1.419e-08	-7.848	-7.848	0.000
Al(OH)2+	7.970e-09	7.793e-09	-8.099	-8.108	-0.010
AlOH+2	1.184e-10	1.082e-10	-9.927	-9.966	-0.039
Al+3	7.495e-13	6.163e-13	-12.125	-12.210	-0.085
AlSO4+	1.170e-14	1.145e-14	-13.932	-13.941	-0.010
Al(SO4)2-	2.623e-18	2.565e-18	-17.581	-17.591	-0.010
AlHSO4+2	1.330e-23	1.216e-23	-22.876	-22.915	-0.039
Ba	1.362e-08				
Ba+2	1.355e-08	1.239e-08	-7.868	-7.907	-0.039
BaSO4	4.888e-11	4.889e-11	-10.311	-10.311	0.000

	BaHCO3+	1.535e-11	1.500e-11	-10.814	-10.824	-0.010
	BaCO3	2.049e-12	2.049e-12	-11.688	-11.688	0.000
	BaOH+	3.173e-14	3.103e-14	-13.498	-13.508	-0.010
C(-4)	0.000e+00					
	CH4	0.000e+00	0.000e+00	-119.049	-119.049	0.000
C(4)	2.621e-04					
	HCO3-	2.501e-04	2.446e-04	-3.602	-3.612	-0.010
	CO2	1.116e-05	1.117e-05	-4.952	-4.952	0.000
	CO3-2	5.334e-07	4.880e-07	-6.273	-6.312	-0.039
	MgHCO3+	1.376e-07	1.345e-07	-6.861	-6.871	-0.010
	CaHCO3+	1.334e-07	1.305e-07	-6.875	-6.884	-0.010
	CaCO3	4.552e-08	4.553e-08	-7.342	-7.342	0.000
	MgCO3	1.656e-08	1.656e-08	-7.781	-7.781	0.000
	MnCO3	3.158e-09	3.158e-09	-8.501	-8.501	0.000
	PbCO3	2.535e-09	2.535e-09	-8.596	-8.596	0.000
	MnHCO3+	1.817e-09	1.776e-09	-8.741	-8.750	-0.010
	NaHCO3	1.240e-09	1.240e-09	-8.907	-8.907	0.000
	ZnCO3	6.317e-10	6.318e-10	-9.199	-9.199	0.000
	ZnHCO3+	2.044e-10	1.998e-10	-9.690	-9.699	-0.010
	SrHCO3+	1.605e-10	1.570e-10	-9.794	-9.804	-0.010
	PbHCO3+	5.940e-11	5.808e-11	-10.226	-10.236	-0.010
	NaCO3-	2.681e-11	2.622e-11	-10.572	-10.581	-0.010
	BaHCO3+	1.535e-11	1.500e-11	-10.814	-10.824	-0.010
	SrCO3	1.442e-11	1.443e-11	-10.841	-10.841	0.000
	Zn(CO3)2-2	7.210e-12	6.591e-12	-11.142	-11.181	-0.039
	Pb(CO3)2-2	3.399e-12	3.107e-12	-11.469	-11.508	-0.039
	BaCO3	2.049e-12	2.049e-12	-11.688	-11.688	0.000
	CdHCO3+	1.592e-12	1.557e-12	-11.798	-11.808	-0.010
	CdCO3	7.799e-14	7.800e-14	-13.108	-13.108	0.000
	FeHCO3+	3.847e-15	3.762e-15	-14.415	-14.425	-0.010
	FeCO3	1.800e-15	1.800e-15	-14.745	-14.745	0.000
	Cd(CO3)2-2	1.317e-16	1.204e-16	-15.881	-15.920	-0.039
Ca	7.614e-05					
	Ca+2	7.585e-05	6.939e-05	-4.120	-4.159	-0.039
	CaHCO3+	1.334e-07	1.305e-07	-6.875	-6.884	-0.010
	CaSO4	8.823e-08	8.824e-08	-7.054	-7.054	0.000
	CaCO3	4.552e-08	4.553e-08	-7.342	-7.342	0.000
	CaHPO4	1.436e-08	1.436e-08	-7.843	-7.843	0.000
	CaPO4-	1.677e-09	1.640e-09	-8.775	-8.785	-0.010
	CaOH+	8.702e-10	8.509e-10	-9.060	-9.070	-0.010
	CaH2PO4+	1.674e-10	1.637e-10	-9.776	-9.786	-0.010
	CaHSO4+	5.836e-15	5.706e-15	-14.234	-14.244	-0.010
Cd	2.224e-10					
	Cd+2	2.201e-10	2.012e-10	-9.657	-9.696	-0.039
	CdHCO3+	1.592e-12	1.557e-12	-11.798	-11.808	-0.010
	CdSO4	3.978e-13	3.978e-13	-12.400	-12.400	0.000
	CdOH+	2.368e-13	2.316e-13	-12.626	-12.635	-0.010
	CdCO3	7.799e-14	7.800e-14	-13.108	-13.108	0.000
	Cd(OH)2	4.906e-15	4.907e-15	-14.309	-14.309	0.000
	Cd(CO3)2-2	1.317e-16	1.204e-16	-15.881	-15.920	-0.039
	Cd(SO4)2-2	4.312e-17	3.942e-17	-16.365	-16.404	-0.039
	Cd(OH)3-	4.160e-20	4.068e-20	-19.381	-19.391	-0.010
	Cd(OH)4-2	2.930e-26	2.679e-26	-25.533	-25.572	-0.039
Cu(1)	2.717e-17					
	Cu+	2.717e-17	2.656e-17	-16.566	-16.576	-0.010
Cu(2)	4.721e-08					
	Cu(OH)2	4.646e-08	4.646e-08	-7.333	-7.333	0.000
	Cu+2	4.451e-10	4.074e-10	-9.352	-9.390	-0.038

CuOH+	3.078e-10	3.010e-10	-9.512	-9.521	-0.010
CuSO4	5.600e-13	5.601e-13	-12.252	-12.252	0.000
Cu(OH)3-	2.115e-13	2.068e-13	-12.675	-12.684	-0.010
Cu(OH)4-2	3.336e-18	3.049e-18	-17.477	-17.516	-0.039
Fe(2)	1.749e-13				
Fe+2	1.680e-13	1.538e-13	-12.775	-12.813	-0.038
FeHCO3+	3.847e-15	3.762e-15	-14.415	-14.425	-0.010
FeCO3	1.800e-15	1.800e-15	-14.745	-14.745	0.000
FeOH+	6.794e-16	6.643e-16	-15.168	-15.178	-0.010
FeHPO4	3.525e-16	3.525e-16	-15.453	-15.453	0.000
FeSO4	1.424e-16	1.424e-16	-15.846	-15.846	0.000
FeH2PO4+	1.123e-17	1.098e-17	-16.950	-16.959	-0.010
FeHSO4+	1.293e-23	1.265e-23	-22.888	-22.898	-0.010
Fe(HS)2	0.000e+00	0.000e+00	-238.750	-238.750	0.000
Fe(HS)3-	0.000e+00	0.000e+00	-354.147	-354.157	-0.010
Fe(3)	1.701e-07				
Fe(OH)3	1.293e-07	1.293e-07	-6.888	-6.888	0.000
Fe(OH)2+	3.720e-08	3.637e-08	-7.429	-7.439	-0.010
Fe(OH)4-	3.595e-09	3.515e-09	-8.444	-8.454	-0.010
FeOH+2	3.831e-12	3.502e-12	-11.417	-11.456	-0.039
Fe+3	3.376e-17	2.776e-17	-16.472	-16.557	-0.085
FeHPO4+	2.106e-18	2.059e-18	-17.677	-17.686	-0.010
FeSO4+	1.486e-18	1.453e-18	-17.828	-17.838	-0.010
FeH2PO4+2	1.164e-18	1.064e-18	-17.934	-17.973	-0.039
Fe2(OH)2+4	1.202e-21	8.397e-22	-20.920	-21.076	-0.156
Fe(SO4)2-	2.342e-22	2.290e-22	-21.630	-21.640	-0.010
Fe3(OH)4+5	8.991e-26	5.131e-26	-25.046	-25.290	-0.244
FeHSO4+2	6.272e-26	5.734e-26	-25.203	-25.242	-0.039
H(0)	7.645e-39				
H2	3.823e-39	3.823e-39	-38.418	-38.418	0.000
K	1.931e-06				
K+	1.931e-06	1.888e-06	-5.714	-5.724	-0.010
KSO4-	7.199e-11	7.039e-11	-10.143	-10.152	-0.010
KHPO4-	2.167e-12	2.119e-12	-11.664	-11.674	-0.010
KOH	4.836e-13	4.836e-13	-12.316	-12.315	0.000
Mg	5.386e-05				
Mg+2	5.364e-05	4.909e-05	-4.270	-4.309	-0.039
MgHCO3+	1.376e-07	1.345e-07	-6.861	-6.871	-0.010
MgSO4	5.061e-08	5.061e-08	-7.296	-7.296	0.000
MgCO3	1.656e-08	1.656e-08	-7.781	-7.781	0.000
MgHPO4	1.374e-08	1.374e-08	-7.862	-7.862	0.000
MgOH+	1.751e-09	1.712e-09	-8.757	-8.766	-0.010
MgPO4-	1.601e-09	1.565e-09	-8.796	-8.805	-0.010
MgH2PO4+	1.508e-10	1.475e-10	-9.821	-9.831	-0.010
Mn(2)	9.411e-08				
Mn+2	8.904e-08	8.148e-08	-7.050	-7.089	-0.038
MnCO3	3.158e-09	3.158e-09	-8.501	-8.501	0.000
MnHCO3+	1.817e-09	1.776e-09	-8.741	-8.750	-0.010
MnSO4	7.411e-11	7.412e-11	-10.130	-10.130	0.000
MnOH+	2.510e-11	2.454e-11	-10.600	-10.610	-0.010
Mn(3)	7.412e-25				
Mn+3	7.412e-25	6.057e-25	-24.130	-24.218	-0.088
Na	9.222e-06				
Na+	9.220e-06	9.016e-06	-5.035	-5.045	-0.010
NaHCO3	1.240e-09	1.240e-09	-8.907	-8.907	0.000
NaSO4-	3.152e-10	3.082e-10	-9.501	-9.511	-0.010
NaCO3-	2.681e-11	2.622e-11	-10.572	-10.581	-0.010
NaHPO4-	1.035e-11	1.012e-11	-10.985	-10.995	-0.010

	NaOH	4.401e-12	4.401e-12	-11.356	-11.356	0.000
O(0)	2.920e-23					
	O2	1.460e-23	1.460e-23	-22.836	-22.836	0.000
P	8.072e-07					
	HPO4-2	6.298e-07	5.757e-07	-6.201	-6.240	-0.039
	H2PO4-	1.457e-07	1.424e-07	-6.837	-6.846	-0.010
	CaHPO4	1.436e-08	1.436e-08	-7.843	-7.843	0.000
	MgHPO4	1.374e-08	1.374e-08	-7.862	-7.862	0.000
	CaPO4-	1.677e-09	1.640e-09	-8.775	-8.785	-0.010
	MgPO4-	1.601e-09	1.565e-09	-8.796	-8.805	-0.010
	CaH2PO4+	1.674e-10	1.637e-10	-9.776	-9.786	-0.010
	MgH2PO4+	1.508e-10	1.475e-10	-9.821	-9.831	-0.010
	PO4-3	1.494e-11	1.221e-11	-10.826	-10.913	-0.088
	NaHPO4-	1.035e-11	1.012e-11	-10.985	-10.995	-0.010
	KHPO4-	2.167e-12	2.119e-12	-11.664	-11.674	-0.010
	FeHPO4	3.525e-16	3.525e-16	-15.453	-15.453	0.000
	FeH2PO4+	1.123e-17	1.098e-17	-16.950	-16.959	-0.010
	FeHPO4+	2.106e-18	2.059e-18	-17.677	-17.686	-0.010
	FeH2PO4+2	1.164e-18	1.064e-18	-17.934	-17.973	-0.039
Pb	3.379e-09					
	PbCO3	2.535e-09	2.535e-09	-8.596	-8.596	0.000
	PbOH+	4.404e-10	4.306e-10	-9.356	-9.366	-0.010
	Pb+2	3.270e-10	2.989e-10	-9.485	-9.524	-0.039
	PbHCO3+	5.940e-11	5.808e-11	-10.226	-10.236	-0.010
	Pb(OH)2	1.238e-11	1.238e-11	-10.907	-10.907	0.000
	Pb(CO3)2-2	3.399e-12	3.107e-12	-11.469	-11.508	-0.039
	PbSO4	1.323e-12	1.323e-12	-11.878	-11.878	0.000
	Pb(OH)3-	1.074e-14	1.050e-14	-13.969	-13.979	-0.010
	Pb(SO4)2-2	5.978e-17	5.465e-17	-16.223	-16.262	-0.039
	Pb2OH+3	3.527e-18	2.882e-18	-17.453	-17.540	-0.088
	Pb(OH)4-2	1.944e-18	1.777e-18	-17.711	-17.750	-0.039
S(-2)	0.000e+00					
	HS-	0.000e+00	0.000e+00	-117.434	-117.444	-0.010
	H2S	0.000e+00	0.000e+00	-118.038	-118.038	0.000
	S-2	0.000e+00	0.000e+00	-123.126	-123.165	-0.039
	Fe(HS)2	0.000e+00	0.000e+00	-238.750	-238.750	0.000
	Fe(HS)3-	0.000e+00	0.000e+00	-354.147	-354.157	-0.010
S(6)	8.744e-06					
	SO4-2	8.605e-06	7.870e-06	-5.065	-5.104	-0.039
	CaSO4	8.823e-08	8.824e-08	-7.054	-7.054	0.000
	MgSO4	5.061e-08	5.061e-08	-7.296	-7.296	0.000
	NaSO4-	3.152e-10	3.082e-10	-9.501	-9.511	-0.010
	SrSO4	1.013e-10	1.013e-10	-9.995	-9.994	0.000
	MnSO4	7.411e-11	7.412e-11	-10.130	-10.130	0.000
	KSO4-	7.199e-11	7.039e-11	-10.143	-10.152	-0.010
	BaSO4	4.888e-11	4.889e-11	-10.311	-10.311	0.000
	ZnSO4	1.006e-11	1.006e-11	-10.997	-10.997	0.000
	HSO4-	6.995e-12	6.840e-12	-11.155	-11.165	-0.010
	PbSO4	1.323e-12	1.323e-12	-11.878	-11.878	0.000
	CuSO4	5.600e-13	5.601e-13	-12.252	-12.252	0.000
	CdSO4	3.978e-13	3.978e-13	-12.400	-12.400	0.000
	AlSO4+	1.170e-14	1.145e-14	-13.932	-13.941	-0.010
	CaHSO4+	5.836e-15	5.706e-15	-14.234	-14.244	-0.010
	Zn(SO4)2-2	8.378e-16	7.659e-16	-15.077	-15.116	-0.039
	FeSO4	1.424e-16	1.424e-16	-15.846	-15.846	0.000
	Pb(SO4)2-2	5.978e-17	5.465e-17	-16.223	-16.262	-0.039
	Cd(SO4)2-2	4.312e-17	3.942e-17	-16.365	-16.404	-0.039
	Al(SO4)2-	2.623e-18	2.565e-18	-17.581	-17.591	-0.010

	FeSO4+	1.486e-18	1.453e-18	-17.828	-17.838	-0.010
	Fe(SO4)2-	2.342e-22	2.290e-22	-21.630	-21.640	-0.010
	AlHSO4+2	1.330e-23	1.216e-23	-22.876	-22.915	-0.039
	FeHSO4+	1.293e-23	1.265e-23	-22.888	-22.898	-0.010
	FeHSO4+2	6.272e-26	5.734e-26	-25.203	-25.242	-0.039
Sr		9.439e-08				
	Sr+2	9.411e-08	8.610e-08	-7.026	-7.065	-0.039
	SrHCO3+	1.605e-10	1.570e-10	-9.794	-9.804	-0.010
	SrSO4	1.013e-10	1.013e-10	-9.995	-9.994	0.000
	SrCO3	1.442e-11	1.443e-11	-10.841	-10.841	0.000
	SrOH+	3.336e-13	3.263e-13	-12.477	-12.486	-0.010
Zn		8.490e-09				
	Zn+2	7.094e-09	6.489e-09	-8.149	-8.188	-0.039
	ZnCO3	6.317e-10	6.318e-10	-9.199	-9.199	0.000
	Zn(OH)2	4.459e-10	4.459e-10	-9.351	-9.351	0.000
	ZnHCO3+	2.044e-10	1.998e-10	-9.690	-9.699	-0.010
	ZnOH+	9.688e-11	9.473e-11	-10.014	-10.024	-0.010
	ZnSO4	1.006e-11	1.006e-11	-10.997	-10.997	0.000
	Zn(CO3)2-2	7.210e-12	6.591e-12	-11.142	-11.181	-0.039
	Zn(OH)3-	1.066e-13	1.042e-13	-12.972	-12.982	-0.010
	Zn(SO4)2-2	8.378e-16	7.659e-16	-15.077	-15.116	-0.039
	Zn(OH)4-2	1.335e-18	1.220e-18	-17.875	-17.914	-0.039

-------------------------------Saturation indices--------------------------------

Phase	SI	log IAP	log KT	
Al(OH)3(a)	-0.88	11.40	12.27	Al(OH)3
Alunite	-6.74	-5.35	1.39	KAl3(SO4)2(OH)6
Anglesite	-6.72	-14.63	-7.91	PbSO4
Anhydrite	-4.91	-9.26	-4.35	CaSO4
Aragonite	-2.24	-10.47	-8.23	CaCO3
Barite	-2.63	-13.01	-10.38	BaSO4
Calcite	-2.08	-10.47	-8.39	CaCO3
Cd(OH)2	-7.61	6.04	13.65	Cd(OH)2
CdSO4	-15.52	-14.80	0.72	CdSO4
Celestite	-5.50	-12.17	-6.66	SrSO4
Cerrusite	-2.44	-15.84	-13.40	PbCO3
CH4(g)	-116.38	-163.51	-47.13	CH4
CO2(g)	-3.78	-22.05	-18.27	CO2
Dolomite	-4.52	-21.09	-16.57	CaMg(CO3)2
Fe(OH)3(a)	2.16	20.61	18.45	Fe(OH)3
FeS(ppt)	-118.47	-159.38	-40.91	FeS
Gibbsite	2.02	11.40	9.38	Al(OH)3
Goethite	7.24	20.61	13.36	FeOOH
Gypsum	-4.66	-9.26	-4.60	CaSO4:2H2O
H2(g)	-35.37	-35.37	0.00	H2
H2S(g)	-117.29	-162.30	-45.01	H2S
Hausmannite	-5.31	61.31	66.62	Mn3O4
Hematite	16.39	41.21	24.82	Fe2O3
Hydroxyapatite	-6.63	-45.66	-39.04	Ca5(PO4)3OH
Jarosite-K	-10.92	22.28	33.20	KFe3(SO4)2(OH)6
Mackinawite	-117.74	-159.38	-41.64	FeS
Manganite	0.99	26.33	25.34	MnOOH
Melanterite	-15.41	-17.92	-2.50	FeSO4:7H2O
O2(g)	-19.98	70.73	90.71	O2
Otavite	-3.91	-16.01	-12.10	CdCO3
Pb(OH)2	-2.71	6.21	8.93	Pb(OH)2

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      Pyrite         -193.23 -286.32  -93.09  FeS2
      Pyrochroite      -6.55    8.65   15.20  Mn(OH)2
      Pyrolusite       -0.98   44.01   45.00  MnO2
      Rhodochrosite    -2.35  -13.40  -11.05  MnCO3
      Siderite         -8.37  -19.12  -10.75  FeCO3
      Smithsonite      -4.74  -14.50   -9.76  ZnCO3
      Sphalerite     -105.69 -154.75  -49.07  ZnS
      Strontianite     -4.06  -13.38   -9.32  SrCO3
      Sulfur          -88.08 -126.94  -38.85  S
      Vivianite       -24.27  -60.27  -36.00  Fe3(PO4)2:8H2O
      Witherite        -5.53  -14.22   -8.69  BaCO3
      Zn(OH)2(e)       -3.95    7.55   11.50  Zn(OH)2

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End of simulation.
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Reading input data for simulation 4.
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      SOLUTION 4 Stickleback Lake
            temp  4.0
            pH    7.14
            pe    4.0
            redox pe
            units ug/l
            density     1.0
            Alkalinity  30330 ug/l  gfw 50.04
            Al    2.5   ug/l
            B     50    ug/l
            Ba    5.0   ug/l
            Ca    13967 ug/l
            Cd    0.1   ug/l
            Cl    38433 ug/l
            Cu    0.5   ug/l
            F     7.67  ug/l
            Fe    5     ug/l
            K     1443  ug/l
            Li    5.0   ug/l
            Mg    4890  ug/l
            Mn    2.5   ug/l
            N(-3) 9.0   ug/l
            N(3)  0.5   ug/l
            N(5)  2.67  ug/l
            Na    10900 ug/l
            P     150   ug/l
            Pb    0.5   ug/l
            S(6)  500   ug/l
            Si    548   ug/l
            Sr    90    ug/l
            Zn    2.5   ug/l
      SAVE solution 4
      END
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Beginning of initial solution calculations.
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◎ Table of Contents

Initial solution 4. Stickleback Lake

----------Solution composition----------

Elements	Molality	Moles
Al	9.267e-08	9.267e-08
Alkalinity	6.062e-04	6.062e-04
B	4.626e-06	4.626e-06
Ba	3.641e-08	3.641e-08
Ca	3.485e-04	3.485e-04
Cd	8.898e-10	8.898e-10
Cl	1.084e-03	1.084e-03
Cu	7.869e-09	7.869e-09
F	4.038e-07	4.038e-07
Fe	8.954e-08	8.954e-08
K	3.691e-05	3.691e-05
Li	7.206e-07	7.206e-07
Mg	2.012e-04	2.012e-04
Mn	4.551e-08	4.551e-08
N(-3)	6.426e-07	6.426e-07
N(3)	3.570e-08	3.570e-08
N(5)	1.906e-07	1.906e-07
Na	4.742e-04	4.742e-04
P	4.843e-06	4.843e-06
Pb	2.413e-09	2.413e-09
S(6)	5.205e-06	5.205e-06
Si	9.121e-06	9.121e-06
Sr	1.027e-06	1.027e-06
Zn	3.825e-08	3.825e-08

----------Description of solution----------

pH	=	7.140
pe	=	4.000
Activity of water	=	1.000
Ionic strength	=	2.211e-03
Mass of water (kg)	=	1.000e+00
Total carbon (mol/kg)	=	7.425e-04
Total CO2 (mol/kg)	=	7.425e-04
Temperature (deg C)	=	4.000
Electrical balance (eq)	=	-9.167e-05
Iterations	=	9
Total H	=	1.110131e+02
Total O	=	5.550840e+01

----------Redox couples----------

Redox couple	pe	Eh (volts)
N(-3)/N(3)	6.6818	0.3674
N(-3)/N(5)	7.1924	0.3955
N(3)/N(5)	8.7240	0.4797

----------Distribution of species----------

Species	Molality	Activity	Log Molality	Log Activity	Log Gamma

	H+	7.593e-08	7.244e-08	-7.120	-7.140	-0.020
	OH-	2.448e-08	2.327e-08	-7.611	-7.633	-0.022
	H2O	5.551e+01	1.000e+00	0.000	0.000	0.000
Al		9.267e-08				
	Al(OH)4-	7.811e-08	7.428e-08	-7.107	-7.129	-0.022
	Al(OH)2+	1.022e-08	9.723e-09	-7.990	-8.012	-0.022
	Al(OH)3	3.307e-09	3.308e-09	-8.481	-8.480	0.000
	AlOH+2	8.836e-10	7.226e-10	-9.054	-9.141	-0.087
	AlF+2	8.946e-11	7.316e-11	-10.048	-10.136	-0.087
	Al+3	3.362e-11	2.203e-11	-10.473	-10.657	-0.184
	AlF2+	1.303e-11	1.240e-11	-10.885	-10.907	-0.022
	AlSO4+	2.206e-13	2.098e-13	-12.656	-12.678	-0.022
	AlF3	5.796e-14	5.799e-14	-13.237	-13.237	0.000
	Al(SO4)2-	2.535e-17	2.411e-17	-16.596	-16.618	-0.022
	AlF4-	9.184e-18	8.734e-18	-17.037	-17.059	-0.022
	AlHSO4+2	1.459e-21	1.193e-21	-20.836	-20.923	-0.087
	AlF5-2	6.740e-23	5.512e-23	-22.171	-22.259	-0.087
	AlF6-3	5.162e-29	3.283e-29	-28.287	-28.484	-0.197
B		4.626e-06				
	H3BO3	4.600e-06	4.603e-06	-5.337	-5.337	0.000
	H2BO3-	2.546e-08	2.421e-08	-7.594	-7.616	-0.022
	BF(OH)3-	5.783e-13	5.500e-13	-12.238	-12.260	-0.022
	BF2(OH)2-	1.759e-18	1.672e-18	-17.755	-17.777	-0.022
	BF3OH-	8.031e-26	7.637e-26	-25.095	-25.117	-0.022
	BF4-	9.285e-33	8.830e-33	-32.032	-32.054	-0.022
Ba		3.641e-08				
	Ba+2	3.626e-08	2.973e-08	-7.441	-7.527	-0.086
	BaHCO3+	8.838e-11	8.405e-11	-10.054	-10.075	-0.022
	BaSO4	6.010e-11	6.013e-11	-10.221	-10.221	0.000
	BaCO3	2.144e-12	2.145e-12	-11.669	-11.669	0.000
	BaOH+	1.462e-14	1.390e-14	-13.835	-13.857	-0.022
C(4)		7.425e-04				
	HCO3-	6.001e-04	5.712e-04	-3.222	-3.243	-0.021
	CO2	1.395e-04	1.396e-04	-3.855	-3.855	0.000
	CaHCO3+	1.313e-06	1.250e-06	-5.882	-5.903	-0.021
	MgHCO3+	1.105e-06	1.051e-06	-5.957	-5.978	-0.022
	CO3-2	2.594e-07	2.129e-07	-6.586	-6.672	-0.086
	NaHCO3	1.448e-07	1.448e-07	-6.839	-6.839	0.000
	CaCO3	8.140e-08	8.144e-08	-7.089	-7.089	0.000
	MgCO3	2.415e-08	2.416e-08	-7.617	-7.617	0.000
	FeHCO3+	4.093e-09	3.892e-09	-8.388	-8.410	-0.022
	SrHCO3+	3.757e-09	3.576e-09	-8.425	-8.447	-0.021
	ZnHCO3+	2.150e-09	2.045e-09	-8.668	-8.689	-0.022
	MnHCO3+	1.886e-09	1.794e-09	-8.724	-8.746	-0.022
	PbCO3	1.563e-09	1.563e-09	-8.806	-8.806	0.000
	ZnCO3	1.207e-09	1.208e-09	-8.918	-8.918	0.000
	NaCO3-	6.015e-10	5.720e-10	-9.221	-9.243	-0.022
	MnCO3	5.955e-10	5.958e-10	-9.225	-9.225	0.000
	FeCO3	3.478e-10	3.480e-10	-9.459	-9.458	0.000
	PbHCO3+	2.016e-10	1.917e-10	-9.695	-9.717	-0.022
	BaHCO3+	8.838e-11	8.405e-11	-10.054	-10.075	-0.022
	SrCO3	6.136e-11	6.139e-11	-10.212	-10.212	0.000
	CdHCO3+	1.262e-11	1.200e-11	-10.899	-10.921	-0.022
	Zn(CO3)2-2	6.722e-12	5.498e-12	-11.172	-11.260	-0.087
	BaCO3	2.144e-12	2.145e-12	-11.669	-11.669	0.000
	Pb(CO3)2-2	1.022e-12	8.360e-13	-11.990	-12.078	-0.087
	CdCO3	1.123e-13	1.123e-13	-12.950	-12.950	0.000

	Cd(CO3)2-2	9.247e-17	7.562e-17	-16.034	-16.121	-0.087
Ca		3.485e-04				
	Ca+2	3.467e-04	2.845e-04	-3.460	-3.546	-0.086
	CaHCO3+	1.313e-06	1.250e-06	-5.882	-5.903	-0.021
	CaSO4	1.854e-07	1.855e-07	-6.732	-6.732	0.000
	CaHPO4	1.760e-07	1.761e-07	-6.755	-6.754	0.000
	CaCO3	8.140e-08	8.144e-08	-7.089	-7.089	0.000
	CaH2PO4+	1.130e-08	1.074e-08	-7.947	-7.969	-0.022
	CaPO4-	3.949e-09	3.756e-09	-8.403	-8.425	-0.022
	CaOH+	6.854e-10	6.518e-10	-9.164	-9.186	-0.022
	CaF+	5.851e-10	5.564e-10	-9.233	-9.255	-0.022
	CaHSO4+	6.753e-14	6.422e-14	-13.170	-13.192	-0.022
Cd		8.898e-10				
	Cd+2	8.122e-10	6.642e-10	-9.090	-9.178	-0.087
	CdCl+	6.375e-11	6.063e-11	-10.196	-10.217	-0.022
	CdHCO3+	1.262e-11	1.200e-11	-10.899	-10.921	-0.022
	CdSO4	6.731e-13	6.734e-13	-12.172	-12.172	0.000
	CdCl2	2.396e-13	2.397e-13	-12.621	-12.620	0.000
	CdOH+	1.502e-13	1.428e-13	-12.823	-12.845	-0.022
	CdCO3	1.123e-13	1.123e-13	-12.950	-12.950	0.000
	Cd(OH)2	5.650e-16	5.653e-16	-15.248	-15.248	0.000
	CdCl3-	1.166e-16	1.109e-16	-15.933	-15.955	-0.022
	Cd(CO3)2-2	9.247e-17	7.562e-17	-16.034	-16.121	-0.087
	Cd(SO4)2-2	4.184e-17	3.421e-17	-16.378	-16.466	-0.087
	Cd(OH)3-	9.207e-22	8.755e-22	-21.036	-21.058	-0.022
	Cd(OH)4-2	1.317e-28	1.077e-28	-27.880	-27.968	-0.087
Cl		1.084e-03				
	Cl-	1.084e-03	1.031e-03	-2.965	-2.987	-0.022
	MnCl+	1.556e-10	1.479e-10	-9.808	-9.830	-0.022
	FeCl+	1.019e-10	9.694e-11	-9.992	-10.014	-0.022
	CdCl+	6.375e-11	6.063e-11	-10.196	-10.217	-0.022
	ZnCl+	3.063e-11	2.913e-11	-10.514	-10.536	-0.022
	PbCl+	1.041e-11	9.902e-12	-10.982	-11.004	-0.022
	CdCl2	2.396e-13	2.397e-13	-12.621	-12.620	0.000
	MnCl2	6.652e-14	6.655e-14	-13.177	-13.177	0.000
	ZnCl2	2.869e-14	2.871e-14	-13.542	-13.542	0.000
	PbCl2	2.465e-14	2.467e-14	-13.608	-13.608	0.000
	CdCl3-	1.166e-16	1.109e-16	-15.933	-15.955	-0.022
	ZnCl3-	3.048e-17	2.899e-17	-16.516	-16.538	-0.022
	MnCl3-	1.987e-17	1.889e-17	-16.702	-16.724	-0.022
	PbCl3-	1.847e-17	1.757e-17	-16.733	-16.755	-0.022
	FeCl+2	3.509e-19	2.870e-19	-18.455	-18.542	-0.087
	ZnCl4-2	1.531e-20	1.252e-20	-19.815	-19.902	-0.087
	PbCl4-2	8.904e-21	7.282e-21	-20.050	-20.138	-0.087
	FeCl2+	2.843e-21	2.704e-21	-20.546	-20.568	-0.022
	FeCl3	2.785e-25	2.787e-25	-24.555	-24.555	0.000
Cu(1)		6.537e-11				
	Cu+	6.537e-11	6.210e-11	-10.185	-10.207	-0.022
Cu(2)		7.804e-09				
	Cu(OH)2	5.813e-09	5.816e-09	-8.236	-8.235	0.000
	Cu+2	1.777e-09	1.461e-09	-8.750	-8.835	-0.085
	CuOH+	2.121e-10	2.017e-10	-9.673	-9.695	-0.022
	CuSO4	1.030e-12	1.030e-12	-11.987	-11.987	0.000
	Cu(OH)3-	5.087e-15	4.838e-15	-14.294	-14.315	-0.022
	Cu(OH)4-2	1.629e-20	1.332e-20	-19.788	-19.875	-0.087
F		4.038e-07				
	F-	4.000e-07	3.803e-07	-6.398	-6.420	-0.022
	MgF+	2.881e-09	2.740e-09	-8.540	-8.562	-0.022

	CaF+	5.851e-10	5.564e-10	-9.233	-9.255	-0.022
	NaF	9.862e-11	9.867e-11	-10.006	-10.006	0.000
	AlF+2	8.946e-11	7.316e-11	-10.048	-10.136	-0.087
	HF	2.880e-11	2.881e-11	-10.541	-10.540	0.000
	AlF2+	1.303e-11	1.240e-11	-10.885	-10.907	-0.022
	BF(OH)3-	5.783e-13	5.500e-13	-12.238	-12.260	-0.022
	FeF+	2.725e-13	2.591e-13	-12.565	-12.587	-0.022
	MnF+	9.747e-14	9.269e-14	-13.011	-13.033	-0.022
	AlF3	5.796e-14	5.799e-14	-13.237	-13.237	0.000
	HF2-	3.542e-17	3.369e-17	-16.451	-16.473	-0.022
	FeF+2	9.846e-18	8.052e-18	-17.007	-17.094	-0.087
	AlF4-	9.184e-18	8.734e-18	-17.037	-17.059	-0.022
	BF2(OH)2-	1.759e-18	1.672e-18	-17.755	-17.777	-0.022
	FeF2+	9.799e-20	9.319e-20	-19.009	-19.031	-0.022
	AlF5-2	6.740e-23	5.512e-23	-22.171	-22.259	-0.087
	FeF3	5.199e-23	5.201e-23	-22.284	-22.284	0.000
	BF3OH-	8.031e-26	7.637e-26	-25.095	-25.117	-0.022
	AlF6-3	5.162e-29	3.283e-29	-28.287	-28.484	-0.197
	BF4-	9.285e-33	8.830e-33	-32.032	-32.054	-0.022
	SiF6-2	0.000e+00	0.000e+00	-40.949	-41.036	-0.087
Fe(2)		8.806e-08				
	Fe+2	8.287e-08	6.814e-08	-7.082	-7.167	-0.085
	FeHCO3+	4.093e-09	3.892e-09	-8.388	-8.410	-0.022
	FeHPO4	4.666e-10	4.669e-10	-9.331	-9.331	0.000
	FeCO3	3.478e-10	3.480e-10	-9.459	-9.458	0.000
	FeCl+	1.019e-10	9.694e-11	-9.992	-10.014	-0.022
	FeH2PO4+	8.185e-11	7.783e-11	-10.087	-10.109	-0.022
	FeOH+	5.782e-11	5.499e-11	-10.238	-10.260	-0.022
	FeSO4	3.234e-11	3.235e-11	-10.490	-10.490	0.000
	FeF+	2.725e-13	2.591e-13	-12.565	-12.587	-0.022
	FeHSO4+	1.617e-17	1.538e-17	-16.791	-16.813	-0.022
Fe(3)		1.484e-09				
	Fe(OH)2+	9.075e-10	8.630e-10	-9.042	-9.064	-0.022
	Fe(OH)3	5.729e-10	5.732e-10	-9.242	-9.242	0.000
	Fe(OH)4-	3.061e-12	2.911e-12	-11.514	-11.536	-0.022
	FeOH+2	5.439e-13	4.448e-13	-12.265	-12.352	-0.087
	Fe+3	2.880e-17	1.887e-17	-16.541	-16.724	-0.184
	FeH2PO4+2	1.415e-17	1.158e-17	-16.849	-16.936	-0.087
	FeF+2	9.846e-18	8.052e-18	-17.007	-17.094	-0.087
	FeHPO4+	4.400e-18	4.185e-18	-17.357	-17.378	-0.022
	FeSO4+	5.326e-19	5.065e-19	-18.274	-18.295	-0.022
	FeCl+2	3.509e-19	2.870e-19	-18.455	-18.542	-0.087
	FeF2+	9.799e-20	9.319e-20	-19.009	-19.031	-0.022
	FeCl2+	2.843e-21	2.704e-21	-20.546	-20.568	-0.022
	FeF3	5.199e-23	5.201e-23	-22.284	-22.284	0.000
	Fe(SO4)2-	4.305e-23	4.094e-23	-22.366	-22.388	-0.022
	Fe2(OH)2+4	3.028e-23	1.354e-23	-22.519	-22.868	-0.349
	FeCl3	2.785e-25	2.787e-25	-24.555	-24.555	0.000
	FeHSO4+2	1.308e-25	1.070e-25	-24.883	-24.971	-0.087
	Fe3(OH)4+5	6.902e-29	1.963e-29	-28.161	-28.707	-0.546
H(0)		9.300e-26				
	H2	4.650e-26	4.653e-26	-25.333	-25.332	0.000
K		3.691e-05				
	K+	3.691e-05	3.508e-05	-4.433	-4.455	-0.022
	KSO4-	7.054e-10	6.708e-10	-9.152	-9.173	-0.022
	KHPO4-	1.238e-10	1.177e-10	-9.907	-9.929	-0.022
	KOH	1.678e-12	1.679e-12	-11.775	-11.775	0.000
Li		7.206e-07				

	Li+	7.206e-07	6.862e-07	-6.142	-6.164	-0.021
	LiSO4-	1.271e-11	1.209e-11	-10.896	-10.918	-0.022
	LiOH	2.169e-13	2.170e-13	-12.664	-12.664	0.000
Mg		2.012e-04				
	Mg+2	1.998e-04	1.642e-04	-3.699	-3.785	-0.085
	MgHCO3+	1.105e-06	1.051e-06	-5.957	-5.978	-0.022
	MgHPO4	1.373e-07	1.374e-07	-6.862	-6.862	0.000
	MgSO4	8.678e-08	8.682e-08	-7.062	-7.061	0.000
	MgCO3	2.415e-08	2.416e-08	-7.617	-7.617	0.000
	MgH2PO4+	8.302e-09	7.894e-09	-8.081	-8.103	-0.022
	MgPO4-	3.075e-09	2.924e-09	-8.512	-8.534	-0.022
	MgF+	2.881e-09	2.740e-09	-8.540	-8.562	-0.022
	MgOH+	1.125e-09	1.070e-09	-8.949	-8.971	-0.022
Mn(2)		4.551e-08				
	Mn+2	4.285e-08	3.523e-08	-7.368	-7.453	-0.085
	MnHCO3+	1.886e-09	1.794e-09	-8.724	-8.746	-0.022
	MnCO3	5.955e-10	5.958e-10	-9.225	-9.225	0.000
	MnCl+	1.556e-10	1.479e-10	-9.808	-9.830	-0.022
	MnSO4	1.643e-11	1.643e-11	-10.784	-10.784	0.000
	MnOH+	2.085e-12	1.982e-12	-11.681	-11.703	-0.022
	MnF+	9.747e-14	9.269e-14	-13.011	-13.033	-0.022
	MnCl2	6.652e-14	6.655e-14	-13.177	-13.177	0.000
	MnCl3-	1.987e-17	1.889e-17	-16.702	-16.724	-0.022
	Mn(NO3)2	4.839e-21	4.842e-21	-20.315	-20.315	0.000
Mn(3)		6.318e-31				
	Mn+3	6.318e-31	4.018e-31	-30.199	-30.396	-0.197
N(-3)		6.426e-07				
	NH4+	6.416e-07	6.094e-07	-6.193	-6.215	-0.022
	NH3	9.672e-10	9.677e-10	-9.014	-9.014	0.000
	NH4SO4-	3.332e-11	3.169e-11	-10.477	-10.499	-0.022
N(3)		3.570e-08				
	NO2-	3.570e-08	3.392e-08	-7.447	-7.470	-0.022
N(5)		1.906e-07				
	NO3-	1.906e-07	1.811e-07	-6.720	-6.742	-0.022
	PbNO3+	1.191e-15	1.132e-15	-14.924	-14.946	-0.022
	Mn(NO3)2	4.839e-21	4.842e-21	-20.315	-20.315	0.000
Na		4.742e-04				
	Na+	4.740e-04	4.509e-04	-3.324	-3.346	-0.022
	NaHCO3	1.448e-07	1.448e-07	-6.839	-6.839	0.000
	NaSO4-	8.311e-09	7.904e-09	-8.080	-8.102	-0.022
	NaHPO4-	1.591e-09	1.513e-09	-8.798	-8.820	-0.022
	NaCO3-	6.015e-10	5.720e-10	-9.221	-9.243	-0.022
	NaF	9.862e-11	9.867e-11	-10.006	-10.006	0.000
	NaOH	4.110e-11	4.112e-11	-10.386	-10.386	0.000
O(0)		0.000e+00				
	O2	0.000e+00	0.000e+00	-49.006	-49.006	0.000
P		4.843e-06				
	H2PO4-	2.396e-06	2.279e-06	-5.621	-5.642	-0.022
	HPO4-2	2.105e-06	1.721e-06	-5.677	-5.764	-0.087
	CaHPO4	1.760e-07	1.761e-07	-6.755	-6.754	0.000
	MgHPO4	1.373e-07	1.374e-07	-6.862	-6.862	0.000
	CaH2PO4+	1.130e-08	1.074e-08	-7.947	-7.969	-0.022
	MgH2PO4+	8.302e-09	7.894e-09	-8.081	-8.103	-0.022
	CaPO4-	3.949e-09	3.756e-09	-8.403	-8.425	-0.022
	MgPO4-	3.075e-09	2.924e-09	-8.512	-8.534	-0.022
	NaHPO4-	1.591e-09	1.513e-09	-8.798	-8.820	-0.022
	FeHPO4	4.666e-10	4.669e-10	-9.331	-9.331	0.000
	KHPO4-	1.238e-10	1.177e-10	-9.907	-9.929	-0.022

	FeH2PO4+	8.185e-11	7.783e-11	-10.087	-10.109	-0.022
	PO4-3	1.073e-11	6.819e-12	-10.969	-11.166	-0.197
	FeH2PO4+2	1.415e-17	1.158e-17	-16.849	-16.936	-0.087
	FeHPO4+	4.400e-18	4.185e-18	-17.357	-17.378	-0.022
Pb		2.413e-09				
	PbCO3	1.563e-09	1.563e-09	-8.806	-8.806	0.000
	Pb+2	5.167e-10	4.226e-10	-9.287	-9.374	-0.087
	PbHCO3+	2.016e-10	1.917e-10	-9.695	-9.717	-0.022
	PbOH+	1.196e-10	1.137e-10	-9.922	-9.944	-0.022
	PbCl+	1.041e-11	9.902e-12	-10.982	-11.004	-0.022
	Pb(CO3)2-2	1.022e-12	8.360e-13	-11.990	-12.078	-0.087
	PbSO4	9.586e-13	9.590e-13	-12.018	-12.018	0.000
	Pb(OH)2	6.104e-13	6.107e-13	-12.214	-12.214	0.000
	PbCl2	2.465e-14	2.467e-14	-13.608	-13.608	0.000
	PbNO3+	1.191e-15	1.132e-15	-14.924	-14.946	-0.022
	Pb(OH)3-	1.018e-16	9.679e-17	-15.992	-16.014	-0.022
	Pb(SO4)2-2	2.484e-17	2.031e-17	-16.605	-16.692	-0.087
	PbCl3-	1.847e-17	1.757e-17	-16.733	-16.755	-0.022
	Pb2OH+3	1.692e-18	1.076e-18	-17.772	-17.968	-0.197
	PbCl4-2	8.904e-21	7.282e-21	-20.050	-20.138	-0.087
	Pb(OH)4-2	3.742e-21	3.061e-21	-20.427	-20.514	-0.087
S(6)		5.205e-06				
	SO4-2	4.923e-06	4.036e-06	-5.308	-5.394	-0.086
	CaSO4	1.854e-07	1.855e-07	-6.732	-6.732	0.000
	MgSO4	8.678e-08	8.682e-08	-7.062	-7.061	0.000
	NaSO4-	8.311e-09	7.904e-09	-8.080	-8.102	-0.022
	KSO4-	7.054e-10	6.708e-10	-9.152	-9.173	-0.022
	SrSO4	5.063e-10	5.065e-10	-9.296	-9.295	0.000
	BaSO4	6.010e-11	6.013e-11	-10.221	-10.221	0.000
	NH4SO4-	3.332e-11	3.169e-11	-10.477	-10.499	-0.022
	FeSO4	3.234e-11	3.235e-11	-10.490	-10.490	0.000
	ZnSO4	2.260e-11	2.261e-11	-10.646	-10.646	0.000
	HSO4-	1.974e-11	1.877e-11	-10.705	-10.726	-0.022
	MnSO4	1.643e-11	1.643e-11	-10.784	-10.784	0.000
	LiSO4-	1.271e-11	1.209e-11	-10.896	-10.918	-0.022
	CuSO4	1.030e-12	1.030e-12	-11.987	-11.987	0.000
	PbSO4	9.586e-13	9.590e-13	-12.018	-12.018	0.000
	CdSO4	6.731e-13	6.734e-13	-12.172	-12.172	0.000
	AlSO4+	2.206e-13	2.098e-13	-12.656	-12.678	-0.022
	CaHSO4+	6.753e-14	6.422e-14	-13.170	-13.192	-0.022
	Zn(SO4)2-2	1.079e-15	8.825e-16	-14.967	-15.054	-0.087
	Cd(SO4)2-2	4.184e-17	3.421e-17	-16.378	-16.466	-0.087
	Al(SO4)2-	2.535e-17	2.411e-17	-16.596	-16.618	-0.022
	Pb(SO4)2-2	2.484e-17	2.031e-17	-16.605	-16.692	-0.087
	FeHSO4+	1.617e-17	1.538e-17	-16.791	-16.813	-0.022
	FeSO4+	5.326e-19	5.065e-19	-18.274	-18.295	-0.022
	AlHSO4+2	1.459e-21	1.193e-21	-20.836	-20.923	-0.087
	Fe(SO4)2-	4.305e-23	4.094e-23	-22.366	-22.388	-0.022
	FeHSO4+2	1.308e-25	1.070e-25	-24.883	-24.971	-0.087
Si		9.121e-06				
	H4SiO4	9.113e-06	9.118e-06	-5.040	-5.040	0.000
	H3SiO4-	8.406e-09	7.994e-09	-8.075	-8.097	-0.022
	H2SiO4-2	1.945e-15	1.591e-15	-14.711	-14.798	-0.087
	SiF6-2	0.000e+00	0.000e+00	-40.949	-41.036	-0.087
Sr		1.027e-06				
	Sr+2	1.023e-06	8.398e-07	-5.990	-6.076	-0.086
	SrHCO3+	3.757e-09	3.576e-09	-8.425	-8.447	-0.021
	SrSO4	5.063e-10	5.065e-10	-9.296	-9.295	0.000

```
      SrCO3             6.136e-11   6.139e-11   -10.212   -10.212     0.000
      SrOH+             6.248e-13   5.945e-13   -12.204   -12.226    -0.022
Zn               3.825e-08
      Zn+2              3.468e-08   2.843e-08    -7.460    -7.546    -0.086
      ZnHCO3+           2.150e-09   2.045e-09    -8.668    -8.689    -0.022
      ZnCO3             1.207e-09   1.208e-09    -8.918    -8.918     0.000
      ZnOH+             8.155e-11   7.755e-11   -10.089   -10.110    -0.022
      Zn(OH)2           6.817e-11   6.820e-11   -10.166   -10.166     0.000
      ZnCl+             3.063e-11   2.913e-11   -10.514   -10.536    -0.022
      ZnSO4             2.260e-11   2.261e-11   -10.646   -10.646     0.000
      Zn(CO3)2-2        6.722e-12   5.498e-12   -11.172   -11.260    -0.087
      ZnCl2             2.869e-14   2.871e-14   -13.542   -13.542     0.000
      Zn(OH)3-          3.131e-15   2.977e-15   -14.504   -14.526    -0.022
      Zn(SO4)2-2        1.079e-15   8.825e-16   -14.967   -15.054    -0.087
      ZnCl3-            3.048e-17   2.899e-17   -16.516   -16.538    -0.022
      ZnCl4-2           1.531e-20   1.252e-20   -19.815   -19.902    -0.087
      Zn(OH)4-2         7.964e-21   6.513e-21   -20.099   -20.186    -0.087

-----------------------------Saturation indices-------------------------------

      Phase               SI log IAP  log KT

      Al(OH)3(a)       -1.51   10.76   12.27  Al(OH)3
      Albite           -6.15   -0.56    5.59  NaAlSi3O8
      Alunite          -5.76   -4.37    1.39  KAl3(SO4)2(OH)6
      Anglesite        -6.86  -14.77   -7.91  PbSO4
      Anhydrite        -4.59   -8.94   -4.35  CaSO4
      Anorthite        -7.53   22.18   29.71  CaAl2Si2O8
      Aragonite        -1.99  -10.22   -8.23  CaCO3
      Barite           -2.54  -12.92  -10.38  BaSO4
      Ca-Montmorillonite  -1.70    8.35   10.06  Ca0.165Al2.33Si3.67O10(OH)2
      Calcite          -1.83  -10.22   -8.39  CaCO3
      Cd(OH)2          -8.55    5.10   13.65  Cd(OH)2
      CdSiO3           -9.92    0.06    9.98  CdSiO3
      CdSO4           -15.29  -14.57    0.72  CdSO4
      Celestite        -4.81  -11.47   -6.66  SrSO4
      Cerrusite        -2.65  -16.05  -13.40  PbCO3
      Chalcedony       -1.23   -5.04   -3.81  SiO2
      Chlorite(14A)   -17.91   58.88   76.79  Mg5Al2Si3O10(OH)8
      Chrysotile      -13.59   21.41   34.99  Mg3Si2O5(OH)4
      CO2(g)           -2.68  -20.95  -18.27  CO2
      Dolomite         -4.11  -20.67  -16.57  CaMg(CO3)2
      Fe(OH)3(a)       -0.20   18.25   18.45  Fe(OH)3
      Fluorite         -5.50  -16.39  -10.89  CaF2
      Gibbsite          1.39   10.76    9.38  Al(OH)3
      Goethite          4.89   18.25   13.36  FeOOH
      Gypsum           -4.34   -8.94   -4.60  CaSO4:2H2O
      H2(g)           -22.28  -22.28    0.00  H2
      Hausmannite     -23.86   42.76   66.62  Mn3O4
      Hematite         11.69   36.51   24.82  Fe2O3
      Hydroxyapatite   -5.05  -44.09  -39.04  Ca5(PO4)3OH
      Illite           -2.92   11.35   14.27  K0.6Mg0.25Al2.3Si3.5O10(OH)2
      Jarosite-K      -15.10   18.10   33.20  KFe3(SO4)2(OH)6
      K-feldspar       -4.42   -1.67    2.75  KAlSi3O8
      K-mica            3.85   19.85   16.00  KAl3Si3O10(OH)2
      Kaolinite         2.05   11.45    9.40  Al2Si2O5(OH)4
      Manganite        -7.37   17.97   25.34  MnOOH
      Melanterite     -10.06  -12.56   -2.50  FeSO4:7H2O
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      NH3(g)          -11.24    0.92   12.16  NH3
      O2(g)           -46.15   44.56   90.71  O2
      Otavite          -3.75  -15.85  -12.10  CdCO3
      Pb(OH)2          -4.02    4.91    8.93  Pb(OH)2
      Pyrochroite      -8.37    6.83   15.20  Mn(OH)2
      Pyrolusite      -15.89   29.11   45.00  MnO2
      Quartz           -0.73   -5.04   -4.31  SiO2
      Rhodochrosite    -3.07  -14.12  -11.05  MnCO3
      Sepiolite       -10.48    5.87   16.35  Mg2Si3O7.5OH:3H2O
      Sepiolite(d)    -12.79    5.87   18.66  Mg2Si3O7.5OH:3H2O
      Siderite         -3.09  -13.84  -10.75  FeCO3
      SiO2(a)          -2.14   -5.04   -2.90  SiO2
      Smithsonite      -4.46  -14.22   -9.76  ZnCO3
      Strontianite     -3.43  -12.75   -9.32  SrCO3
      Talc            -12.65   11.33   23.97  Mg3Si4O10(OH)2
      Vivianite        -7.83  -43.83  -36.00  Fe3(PO4)2:8H2O
      Willemite        -8.76    8.43   17.18  Zn2SiO4
      Witherite        -5.51  -14.20   -8.69  BaCO3
      Zn(OH)2(e)       -4.77    6.73   11.50  Zn(OH)2

------------------
End of simulation.
------------------

-----------------------------------
Reading input data for simulation 5.
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      MIX 2 Mixing AltBasa/Rain with Stickleback (1:1)
            3     0.5
            4     0.5
      SAVE solution 5
      END
-----------------------------------
Beginning of reaction calculations.
-----------------------------------

Reaction step 1.

Using mixture 2.  Mixing AltBasa/Rain with Stickleback (1:1)

       5.000e-01 Solution 3   Solution after simulation 3.
       5.000e-01 Solution 4   Stickleback Lake

-----------------------------Solution composition------------------------------

      Elements           Molality       Moles

      Al                9.297e-07   9.297e-07
      B                 2.313e-06   2.313e-06
      Ba                2.501e-08   2.501e-08
      C                 5.023e-04   5.023e-04
      Ca                2.123e-04   2.123e-04
      Cd                5.561e-10   5.561e-10
      Cl                5.421e-04   5.421e-04
      Cu                2.754e-08   2.754e-08
      F                 2.019e-07   2.019e-07
      Fe                1.298e-07   1.298e-07
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      K                1.942e-05   1.942e-05
      Li               3.603e-07   3.603e-07
      Mg               1.275e-04   1.275e-04
      Mn               6.981e-08   6.981e-08
      N                4.345e-07   4.345e-07
      Na               2.417e-04   2.417e-04
      P                2.825e-06   2.825e-06
      Pb               2.896e-09   2.896e-09
      S                6.975e-06   6.975e-06
      Si               4.561e-06   4.561e-06
      Sr               5.608e-07   5.608e-07
      Zn               2.337e-08   2.337e-08

----------------------------Description of solution----------------------------

                            pH  =   7.266      Charge balance
                            pe  =  -2.736      Adjusted to redox equilibrium
               Activity of water  =   1.000
                  Ionic strength  =   1.311e-03
               Mass of water (kg)  =   1.000e+00
        Total alkalinity (eq/kg)  =   4.329e-04
              Total CO2 (mol/kg)  =   5.023e-04
           Temperature (deg C)  =   4.000
         Electrical balance (eq)  =  -4.623e-05
                     Iterations  =  19
                        Total H  = 1.110129e+02
                        Total O  = 5.550772e+01

----------------------------Distribution of species----------------------------

                                                 Log       Log         Log
      Species             Molality    Activity  Molality  Activity     Gamma

      H+                5.627e-08   5.422e-08    -7.250    -7.266    -0.016
      OH-               3.234e-08   3.109e-08    -7.490    -7.507    -0.017
      H2O               5.551e+01   1.000e+00     0.000     0.000     0.000
Al               9.297e-07
      Al(OH)4-          8.374e-07   8.052e-07    -6.077    -6.094    -0.017
      Al(OH)2+          6.139e-08   5.903e-08    -7.212    -7.229    -0.017
      Al(OH)3           2.683e-08   2.684e-08    -7.571    -7.571     0.000
      AlOH+2            3.842e-09   3.283e-09    -8.415    -8.484    -0.068
      AlF+2             1.476e-10   1.261e-10    -9.831    -9.899    -0.068
      Al+3              1.047e-10   7.492e-11    -9.980   -10.125    -0.145
      AlF2+             1.126e-11   1.083e-11   -10.948   -10.965    -0.017
      AlSO4+            1.057e-12   1.016e-12   -11.976   -11.993    -0.017
      AlF3              2.568e-14   2.568e-14   -13.590   -13.590     0.000
      Al(SO4)2-         1.731e-16   1.664e-16   -15.762   -15.779    -0.017
      AlF4-             2.039e-18   1.961e-18   -17.690   -17.708    -0.017
      AlHSO4+2          5.061e-21   4.325e-21   -20.296   -20.364    -0.068
      AlF5-2            7.340e-24   6.273e-24   -23.134   -23.203    -0.068
      AlF6-3            2.697e-30   1.894e-30   -29.569   -29.723    -0.153
B                2.313e-06
      H3BO3             2.296e-06   2.297e-06    -5.639    -5.639     0.000
      H2BO3-            1.679e-08   1.614e-08    -7.775    -7.792    -0.017
      BF(OH)3-          1.447e-13   1.391e-13   -12.840   -12.857    -0.017
      BF2(OH)2-         1.669e-19   1.605e-19   -18.778   -18.795    -0.017
      BF3OH-            2.892e-27   2.780e-27   -26.539   -26.556    -0.017
      BF4-              1.268e-34   1.219e-34   -33.897   -33.914    -0.017
```

◎ Table of Contents

Ba	2.501e-08					
Ba+2		2.491e-08	2.132e-08	-7.604	-7.671	-0.068
BaSO4		6.142e-11	6.144e-11	-10.212	-10.212	0.000
BaHCO3+		4.497e-11	4.324e-11	-10.347	-10.364	-0.017
BaCO3		1.474e-12	1.474e-12	-11.832	-11.831	0.000
BaOH+		1.386e-14	1.332e-14	-13.858	-13.875	-0.017
C(-4)	1.002e-13					
CH4		1.002e-13	1.003e-13	-12.999	-12.999	0.000
C(4)	5.023e-04					
HCO3-		4.259e-04	4.098e-04	-3.371	-3.387	-0.017
CO2		7.491e-05	7.493e-05	-4.125	-4.125	0.000
CaHCO3+		5.930e-07	5.705e-07	-6.227	-6.244	-0.017
MgHCO3+		5.192e-07	4.992e-07	-6.285	-6.302	-0.017
CO3-2		2.382e-07	2.041e-07	-6.623	-6.690	-0.067
NaHCO3		5.353e-08	5.355e-08	-7.271	-7.271	0.000
CaCO3		4.967e-08	4.968e-08	-7.304	-7.304	0.000
MgCO3		1.533e-08	1.534e-08	-7.814	-7.814	0.000
FeHCO3+		4.529e-09	4.354e-09	-8.344	-8.361	-0.017
MnHCO3+		2.168e-09	2.084e-09	-8.664	-8.681	-0.017
PbCO3		1.885e-09	1.885e-09	-8.725	-8.725	0.000
SrHCO3+		1.520e-09	1.462e-09	-8.818	-8.835	-0.017
ZnHCO3+		9.853e-10	9.474e-10	-9.006	-9.023	-0.017
MnCO3		9.247e-10	9.250e-10	-9.034	-9.034	0.000
ZnCO3		7.475e-10	7.478e-10	-9.126	-9.126	0.000
FeCO3		5.200e-10	5.202e-10	-9.284	-9.284	0.000
NaCO3-		2.939e-10	2.826e-10	-9.532	-9.549	-0.017
PbHCO3+		1.800e-10	1.730e-10	-9.745	-9.762	-0.017
BaHCO3+		4.497e-11	4.324e-11	-10.347	-10.364	-0.017
SrCO3		3.354e-11	3.355e-11	-10.474	-10.474	0.000
CdHCO3+		6.076e-12	5.842e-12	-11.216	-11.233	-0.017
Zn(CO3)2-2		3.817e-12	3.262e-12	-11.418	-11.486	-0.068
BaCO3		1.474e-12	1.474e-12	-11.832	-11.831	0.000
Pb(CO3)2-2		1.131e-12	9.663e-13	-11.947	-12.015	-0.068
CdCO3		7.305e-14	7.308e-14	-13.136	-13.136	0.000
Cd(CO3)2-2		5.518e-17	4.716e-17	-16.258	-16.326	-0.068
Ca	2.123e-04					
Ca+2		2.114e-04	1.811e-04	-3.675	-3.742	-0.067
CaHCO3+		5.930e-07	5.705e-07	-6.227	-6.244	-0.017
CaSO4		1.682e-07	1.682e-07	-6.774	-6.774	0.000
CaHPO4		7.896e-08	7.898e-08	-7.103	-7.102	0.000
CaCO3		4.967e-08	4.968e-08	-7.304	-7.304	0.000
CaH2PO4+		3.751e-09	3.607e-09	-8.426	-8.443	-0.017
CaPO4-		2.341e-09	2.251e-09	-8.631	-8.648	-0.017
CaOH+		5.764e-10	5.543e-10	-9.239	-9.256	-0.017
CaF+		1.867e-10	1.795e-10	-9.729	-9.746	-0.017
CaHSO4+		4.532e-14	4.358e-14	-13.344	-13.361	-0.017
Cd	5.561e-10					
Cd+2		5.275e-10	4.508e-10	-9.278	-9.346	-0.068
CdCl+		2.164e-11	2.080e-11	-10.665	-10.682	-0.017
CdHCO3+		6.076e-12	5.842e-12	-11.216	-11.233	-0.017
CdSO4		6.509e-13	6.511e-13	-12.186	-12.186	0.000
CdOH+		1.347e-13	1.295e-13	-12.871	-12.888	-0.017
CdCO3		7.305e-14	7.308e-14	-13.136	-13.136	0.000
CdCl2		4.157e-14	4.159e-14	-13.381	-13.381	0.000
Cd(OH)2		6.848e-16	6.850e-16	-15.164	-15.164	0.000
Cd(CO3)2-2		5.518e-17	4.716e-17	-16.258	-16.326	-0.068
Cd(SO4)2-2		5.515e-17	4.713e-17	-16.258	-16.327	-0.068
CdCl3-		1.012e-17	9.731e-18	-16.995	-17.012	-0.017

	Cd(OH)3-	1.474e-21	1.417e-21	-20.831	-20.848	-0.017
	Cd(OH)4-2	2.726e-28	2.330e-28	-27.564	-27.633	-0.068
Cl		5.421e-04				
	Cl-	5.421e-04	5.211e-04	-3.266	-3.283	-0.017
	MnCl+	1.260e-10	1.211e-10	-9.900	-9.917	-0.017
	FeCl+	7.950e-11	7.644e-11	-10.100	-10.117	-0.017
	CdCl+	2.164e-11	2.080e-11	-10.665	-10.682	-0.017
	ZnCl+	9.892e-12	9.512e-12	-11.005	-11.022	-0.017
	PbCl+	6.550e-12	6.298e-12	-11.184	-11.201	-0.017
	CdCl2	4.157e-14	4.159e-14	-13.381	-13.381	0.000
	MnCl2	2.755e-14	2.756e-14	-13.560	-13.560	0.000
	PbCl2	7.930e-15	7.933e-15	-14.101	-14.101	0.000
	ZnCl2	4.738e-15	4.740e-15	-14.324	-14.324	0.000
	CdCl3-	1.012e-17	9.731e-18	-16.995	-17.012	-0.017
	MnCl3-	4.113e-18	3.955e-18	-17.386	-17.403	-0.017
	PbCl3-	2.971e-18	2.856e-18	-17.527	-17.544	-0.017
	ZnCl3-	2.517e-18	2.420e-18	-17.599	-17.616	-0.017
	PbCl4-2	7.005e-22	5.987e-22	-21.155	-21.223	-0.068
	ZnCl4-2	6.183e-22	5.284e-22	-21.209	-21.277	-0.068
	FeCl+2	4.862e-26	4.155e-26	-25.313	-25.381	-0.068
	FeCl2+	2.059e-28	1.979e-28	-27.686	-27.703	-0.017
	FeCl3	1.031e-32	1.031e-32	-31.987	-31.987	0.000
Cu(1)		2.754e-08				
	Cu+	2.754e-08	2.646e-08	-7.560	-7.577	-0.017
Cu(2)		9.676e-13				
	Cu(OH)2	8.122e-13	8.125e-13	-12.090	-12.090	0.000
	Cu+2	1.333e-13	1.143e-13	-12.875	-12.942	-0.067
	CuOH+	2.193e-14	2.108e-14	-13.659	-13.676	-0.017
	CuSO4	1.148e-16	1.148e-16	-15.940	-15.940	0.000
	Cu(OH)3-	9.391e-19	9.029e-19	-18.027	-18.044	-0.017
	Cu(OH)4-2	3.888e-24	3.323e-24	-23.410	-23.479	-0.068
F		2.019e-07				
	F-	2.005e-07	1.928e-07	-6.698	-6.715	-0.017
	MgF+	9.564e-10	9.196e-10	-9.019	-9.036	-0.017
	CaF+	1.867e-10	1.795e-10	-9.729	-9.746	-0.017
	AlF+2	1.476e-10	1.261e-10	-9.831	-9.899	-0.068
	NaF	2.577e-11	2.578e-11	-10.589	-10.589	0.000
	AlF2+	1.126e-11	1.083e-11	-10.948	-10.965	-0.017
	HF	1.093e-11	1.093e-11	-10.961	-10.961	0.000
	FeF+	2.130e-13	2.048e-13	-12.672	-12.689	-0.017
	BF(OH)3-	1.447e-13	1.391e-13	-12.840	-12.857	-0.017
	MnF+	7.915e-14	7.610e-14	-13.102	-13.119	-0.017
	AlF3	2.568e-14	2.568e-14	-13.590	-13.590	0.000
	HF2-	6.738e-18	6.478e-18	-17.171	-17.189	-0.017
	AlF4-	2.039e-18	1.961e-18	-17.690	-17.708	-0.017
	BF2(OH)2-	1.669e-19	1.605e-19	-18.778	-18.795	-0.017
	AlF5-2	7.340e-24	6.273e-24	-23.134	-23.203	-0.068
	FeF+2	1.368e-24	1.169e-24	-23.864	-23.932	-0.068
	FeF2+	7.131e-27	6.857e-27	-26.147	-26.164	-0.017
	BF3OH-	2.892e-27	2.780e-27	-26.539	-26.556	-0.017
	AlF6-3	2.697e-30	1.894e-30	-29.569	-29.723	-0.153
	FeF3	1.939e-30	1.940e-30	-29.712	-29.712	0.000
	BF4-	1.268e-34	1.219e-34	-33.897	-33.914	-0.017
	SiF6-2	0.000e+00	0.000e+00	-43.543	-43.612	-0.068
Fe(2)		1.298e-07				
	Fe+2	1.239e-07	1.063e-07	-6.907	-6.974	-0.067
	FeHCO3+	4.529e-09	4.354e-09	-8.344	-8.361	-0.017
	FeCO3	5.200e-10	5.202e-10	-9.284	-9.284	0.000

	FeHPO4	5.131e-10	5.132e-10	-9.290	-9.290	0.000
	FeOH+	1.192e-10	1.146e-10	-9.924	-9.941	-0.017
	FeCl+	7.950e-11	7.644e-11	-10.100	-10.117	-0.017
	FeSO4	7.187e-11	7.189e-11	-10.143	-10.143	0.000
	FeH2PO4+	6.661e-11	6.404e-11	-10.176	-10.194	-0.017
	FeF+	2.130e-13	2.048e-13	-12.672	-12.689	-0.017
	FeHSO4+	2.660e-17	2.557e-17	-16.575	-16.592	-0.017
	Fe(HS)2	2.939e-22	2.940e-22	-21.532	-21.532	0.000
	Fe(HS)3-	5.867e-32	5.641e-32	-31.232	-31.249	-0.017
Fe(3)		8.533e-16				
	Fe(OH)2+	4.589e-16	4.412e-16	-15.338	-15.355	-0.017
	Fe(OH)3	3.915e-16	3.916e-16	-15.407	-15.407	0.000
	Fe(OH)4-	2.763e-18	2.657e-18	-17.559	-17.576	-0.017
	FeOH+2	1.991e-19	1.702e-19	-18.701	-18.769	-0.068
	Fe+3	7.553e-24	5.403e-24	-23.122	-23.267	-0.145
	FeH2PO4+2	2.046e-24	1.749e-24	-23.689	-23.757	-0.068
	FeF+2	1.368e-24	1.169e-24	-23.864	-23.932	-0.068
	FeHPO4+	8.785e-25	8.447e-25	-24.056	-24.073	-0.017
	FeSO4+	2.149e-25	2.066e-25	-24.668	-24.685	-0.017
	FeCl+2	4.862e-26	4.155e-26	-25.313	-25.381	-0.068
	FeF2+	7.131e-27	6.857e-27	-26.147	-26.164	-0.017
	FeCl2+	2.059e-28	1.979e-28	-27.686	-27.703	-0.017
	Fe(SO4)2-	2.475e-29	2.380e-29	-28.606	-28.624	-0.017
	FeF3	1.939e-30	1.940e-30	-29.712	-29.712	0.000
	FeHSO4+2	3.822e-32	3.266e-32	-31.418	-31.486	-0.068
	FeCl3	1.031e-32	1.031e-32	-31.987	-31.987	0.000
	Fe2(OH)2+4	3.716e-36	1.983e-36	-35.430	-35.703	-0.273
	Fe3(OH)4+5	0.000e+00	0.000e+00	-47.406	-47.833	-0.426
H(0)		1.546e-12				
	H2	7.728e-13	7.730e-13	-12.112	-12.112	0.000
K		1.942e-05				
	K+	1.942e-05	1.867e-05	-4.712	-4.729	-0.017
	KSO4-	5.288e-10	5.085e-10	-9.277	-9.294	-0.017
	KHPO4-	4.593e-11	4.416e-11	-10.338	-10.355	-0.017
	KOH	1.193e-12	1.194e-12	-11.923	-11.923	0.000
Li		3.603e-07				
	Li+	3.603e-07	3.467e-07	-6.443	-6.460	-0.017
	LiSO4-	9.051e-12	8.702e-12	-11.043	-11.060	-0.017
	LiOH	1.465e-13	1.465e-13	-12.834	-12.834	0.000
Mg		1.275e-04				
	Mg+2	1.268e-04	1.087e-04	-3.897	-3.964	-0.067
	MgHCO3+	5.192e-07	4.992e-07	-6.285	-6.302	-0.017
	MgSO4	8.187e-08	8.190e-08	-7.087	-7.087	0.000
	MgHPO4	6.410e-08	6.412e-08	-7.193	-7.193	0.000
	MgCO3	1.533e-08	1.534e-08	-7.814	-7.814	0.000
	MgH2PO4+	2.868e-09	2.758e-09	-8.542	-8.559	-0.017
	MgPO4-	1.896e-09	1.823e-09	-8.722	-8.739	-0.017
	MgOH+	9.846e-10	9.467e-10	-9.007	-9.024	-0.017
	MgF+	9.564e-10	9.196e-10	-9.019	-9.036	-0.017
Mn(2)		6.981e-08				
	Mn+2	6.655e-08	5.706e-08	-7.177	-7.244	-0.067
	MnHCO3+	2.168e-09	2.084e-09	-8.664	-8.681	-0.017
	MnCO3	9.247e-10	9.250e-10	-9.034	-9.034	0.000
	MnCl+	1.260e-10	1.211e-10	-9.900	-9.917	-0.017
	MnSO4	3.791e-11	3.792e-11	-10.421	-10.421	0.000
	MnOH+	4.462e-12	4.290e-12	-11.350	-11.368	-0.017
	MnF+	7.915e-14	7.610e-14	-13.102	-13.119	-0.017
	MnCl2	2.755e-14	2.756e-14	-13.560	-13.560	0.000

	MnCl3-	4.113e-18	3.955e-18	-17.386	-17.403	-0.017
	Mn(NO3)2	0.000e+00	0.000e+00	-177.994	-177.993	0.000
Mn(3)		1.702e-37				
	Mn+3	1.702e-37	1.195e-37	-36.769	-36.923	-0.153
N(-3)		1.068e-07				
	NH4+	1.066e-07	1.024e-07	-6.972	-6.990	-0.017
	NH3	2.172e-10	2.173e-10	-9.663	-9.663	0.000
	NH4SO4-	7.889e-12	7.585e-12	-11.103	-11.120	-0.017
N(0)		3.277e-07				
	N2	1.638e-07	1.639e-07	-6.786	-6.785	0.000
N(3)		0.000e+00				
	NO2-	0.000e+00	0.000e+00	-63.728	-63.745	-0.017
N(5)		0.000e+00				
	NO3-	0.000e+00	0.000e+00	-85.669	-85.686	-0.017
	PbNO3+	0.000e+00	0.000e+00	-93.773	-93.790	-0.017
	Mn(NO3)2	0.000e+00	0.000e+00	-177.994	-177.993	0.000
Na		2.417e-04				
	Na+	2.416e-04	2.324e-04	-3.617	-3.634	-0.017
	NaHCO3	5.353e-08	5.355e-08	-7.271	-7.271	0.000
	NaSO4-	6.035e-09	5.803e-09	-8.219	-8.236	-0.017
	NaHPO4-	5.717e-10	5.497e-10	-9.243	-9.260	-0.017
	NaCO3-	2.939e-10	2.826e-10	-9.532	-9.549	-0.017
	NaOH	2.831e-11	2.832e-11	-10.548	-10.548	0.000
	NaF	2.577e-11	2.578e-11	-10.589	-10.589	0.000
O(0)		0.000e+00				
	O2	0.000e+00	0.000e+00	-75.447	-75.447	0.000
P		2.825e-06				
	HPO4-2	1.420e-06	1.213e-06	-5.848	-5.916	-0.068
	H2PO4-	1.250e-06	1.202e-06	-5.903	-5.920	-0.017
	CaHPO4	7.896e-08	7.898e-08	-7.103	-7.102	0.000
	MgHPO4	6.410e-08	6.412e-08	-7.193	-7.193	0.000
	CaH2PO4+	3.751e-09	3.607e-09	-8.426	-8.443	-0.017
	MgH2PO4+	2.868e-09	2.758e-09	-8.542	-8.559	-0.017
	CaPO4-	2.341e-09	2.251e-09	-8.631	-8.648	-0.017
	MgPO4-	1.896e-09	1.823e-09	-8.722	-8.739	-0.017
	NaHPO4-	5.717e-10	5.497e-10	-9.243	-9.260	-0.017
	FeHPO4	5.131e-10	5.132e-10	-9.290	-9.290	0.000
	FeH2PO4+	6.661e-11	6.404e-11	-10.176	-10.194	-0.017
	KHPO4-	4.593e-11	4.416e-11	-10.338	-10.355	-0.017
	PO4-3	9.149e-12	6.423e-12	-11.039	-11.192	-0.154
	FeH2PO4+2	2.046e-24	1.749e-24	-23.689	-23.757	-0.068
	FeHPO4+	8.785e-25	8.447e-25	-24.056	-24.073	-0.017
Pb		2.896e-09				
	PbCO3	1.885e-09	1.885e-09	-8.725	-8.725	0.000
	Pb+2	6.220e-10	5.316e-10	-9.206	-9.274	-0.068
	PbOH+	1.988e-10	1.912e-10	-9.702	-9.719	-0.017
	PbHCO3+	1.800e-10	1.730e-10	-9.745	-9.762	-0.017
	PbCl+	6.550e-12	6.298e-12	-11.184	-11.201	-0.017
	PbSO4	1.718e-12	1.719e-12	-11.765	-11.765	0.000
	Pb(OH)2	1.371e-12	1.372e-12	-11.863	-11.863	0.000
	Pb(CO3)2-2	1.131e-12	9.663e-13	-11.947	-12.015	-0.068
	PbCl2	7.930e-15	7.933e-15	-14.101	-14.101	0.000
	Pb(OH)3-	3.021e-16	2.905e-16	-15.520	-15.537	-0.017
	Pb(SO4)2-2	6.068e-17	5.186e-17	-16.217	-16.285	-0.068
	Pb2OH+3	3.239e-18	2.275e-18	-17.490	-17.643	-0.153
	PbCl3-	2.971e-18	2.856e-18	-17.527	-17.544	-0.017
	Pb(OH)4-2	1.436e-20	1.227e-20	-19.843	-19.911	-0.068
	PbCl4-2	7.005e-22	5.987e-22	-21.155	-21.223	-0.068

	PbNO3+	0.000e+00	0.000e+00	-93.773	-93.790	-0.017
S(-2)	3.627e-12					
	HS-	1.833e-12	1.762e-12	-11.737	-11.754	-0.017
	H2S	1.795e-12	1.795e-12	-11.746	-11.746	0.000
	S-2	9.758e-19	8.353e-19	-18.011	-18.078	-0.068
	Fe(HS)2	2.939e-22	2.940e-22	-21.532	-21.532	0.000
	Fe(HS)3-	5.867e-32	5.641e-32	-31.232	-31.249	-0.017
S(6)	6.975e-06					
	SO4-2	6.718e-06	5.750e-06	-5.173	-5.240	-0.068
	CaSO4	1.682e-07	1.682e-07	-6.774	-6.774	0.000
	MgSO4	8.187e-08	8.190e-08	-7.087	-7.087	0.000
	NaSO4-	6.035e-09	5.803e-09	-8.219	-8.236	-0.017
	KSO4-	5.288e-10	5.085e-10	-9.277	-9.294	-0.017
	SrSO4	4.113e-10	4.114e-10	-9.386	-9.386	0.000
	FeSO4	7.187e-11	7.189e-11	-10.143	-10.143	0.000
	BaSO4	6.142e-11	6.144e-11	-10.212	-10.212	0.000
	MnSO4	3.791e-11	3.792e-11	-10.421	-10.421	0.000
	HSO4-	2.082e-11	2.002e-11	-10.682	-10.699	-0.017
	ZnSO4	2.080e-11	2.080e-11	-10.682	-10.682	0.000
	LiSO4-	9.051e-12	8.702e-12	-11.043	-11.060	-0.017
	NH4SO4-	7.889e-12	7.585e-12	-11.103	-11.120	-0.017
	PbSO4	1.718e-12	1.719e-12	-11.765	-11.765	0.000
	AlSO4+	1.057e-12	1.016e-12	-11.976	-11.993	-0.017
	CdSO4	6.509e-13	6.511e-13	-12.186	-12.186	0.000
	CaHSO4+	4.532e-14	4.358e-14	-13.344	-13.361	-0.017
	Zn(SO4)2-2	1.354e-15	1.157e-15	-14.868	-14.937	-0.068
	Al(SO4)2-	1.731e-16	1.664e-16	-15.762	-15.779	-0.017
	CuSO4	1.148e-16	1.148e-16	-15.940	-15.940	0.000
	Pb(SO4)2-2	6.068e-17	5.186e-17	-16.217	-16.285	-0.068
	Cd(SO4)2-2	5.515e-17	4.713e-17	-16.258	-16.327	-0.068
	FeHSO4+	2.660e-17	2.557e-17	-16.575	-16.592	-0.017
	AlHSO4+2	5.061e-21	4.325e-21	-20.296	-20.364	-0.068
	FeSO4+	2.149e-25	2.066e-25	-24.668	-24.685	-0.017
	Fe(SO4)2-	2.475e-29	2.380e-29	-28.606	-28.624	-0.017
	FeHSO4+2	3.822e-32	3.266e-32	-31.418	-31.486	-0.068
Si	4.561e-06					
	H4SiO4	4.555e-06	4.557e-06	-5.341	-5.341	0.000
	H3SiO4-	5.552e-09	5.338e-09	-8.256	-8.273	-0.017
	H2SiO4-2	1.661e-15	1.419e-15	-14.780	-14.848	-0.068
	SiF6-2	0.000e+00	0.000e+00	-43.543	-43.612	-0.068
Sr	5.608e-07					
	Sr+2	5.589e-07	4.788e-07	-6.253	-6.320	-0.067
	SrHCO3+	1.520e-09	1.462e-09	-8.818	-8.835	-0.017
	SrSO4	4.113e-10	4.114e-10	-9.386	-9.386	0.000
	SrCO3	3.354e-11	3.355e-11	-10.474	-10.474	0.000
	SrOH+	4.708e-13	4.529e-13	-12.327	-12.344	-0.017
Zn	2.337e-08					
	Zn+2	2.145e-08	1.836e-08	-7.669	-7.736	-0.068
	ZnHCO3+	9.853e-10	9.474e-10	-9.006	-9.023	-0.017
	ZnCO3	7.475e-10	7.478e-10	-9.126	-9.126	0.000
	Zn(OH)2	7.862e-11	7.864e-11	-10.104	-10.104	0.000
	ZnOH+	6.961e-11	6.693e-11	-10.157	-10.174	-0.017
	ZnSO4	2.080e-11	2.080e-11	-10.682	-10.682	0.000
	ZnCl+	9.892e-12	9.512e-12	-11.005	-11.022	-0.017
	Zn(CO3)2-2	3.817e-12	3.262e-12	-11.418	-11.486	-0.068
	Zn(OH)3-	4.770e-15	4.587e-15	-14.321	-14.338	-0.017
	ZnCl2	4.738e-15	4.740e-15	-14.324	-14.324	0.000
	Zn(SO4)2-2	1.354e-15	1.157e-15	-14.868	-14.937	-0.068

ZnCl3-	2.517e-18	2.420e-18	-17.599	-17.616	-0.017
Zn(OH)4-2	1.569e-20	1.341e-20	-19.804	-19.873	-0.068
ZnCl4-2	6.183e-22	5.284e-22	-21.209	-21.277	-0.068

----------Saturation indices----------

Phase	SI	log IAP	log KT	
Al(OH)3(a)	-0.60	11.67	12.27	Al(OH)3
Albite	-6.31	-0.72	5.59	NaAlSi3O8
Alunite	-3.38	-1.99	1.39	KAl3(SO4)2(OH)6
Anglesite	-6.61	-14.51	-7.91	PbSO4
Anhydrite	-4.63	-8.98	-4.35	CaSO4
Anorthite	-6.26	23.45	29.71	CaAl2Si2O8
Aragonite	-2.20	-10.43	-8.23	CaCO3
Barite	-2.53	-12.91	-10.38	BaSO4
Ca-Montmorillonite	-0.68	9.37	10.06	Ca0.165Al2.33Si3.67O10(OH)2
Calcite	-2.04	-10.43	-8.39	CaCO3
Cd(OH)2	-8.46	5.19	13.65	Cd(OH)2
CdSiO3	-10.14	-0.16	9.98	CdSiO3
CdSO4	-15.31	-14.59	0.72	CdSO4
Celestite	-4.90	-11.56	-6.66	SrSO4
Cerrusite	-2.56	-15.96	-13.40	PbCO3
CH4(g)	-10.33	-57.46	-47.13	CH4
Chalcedony	-1.53	-5.34	-3.81	SiO2
Chlorite(14A)	-16.63	60.16	76.79	Mg5Al2Si3O10(OH)8
Chrysotile	-13.97	21.02	34.99	Mg3Si2O5(OH)4
CO2(g)	-2.95	-21.22	-18.27	CO2
Dolomite	-4.52	-21.09	-16.57	CaMg(CO3)2
Fe(OH)3(a)	-6.36	12.09	18.45	Fe(OH)3
FeS(ppt)	-7.55	-48.45	-40.91	FeS
Fluorite	-6.28	-17.17	-10.89	CaF2
Gibbsite	2.30	11.67	9.38	Al(OH)3
Goethite	-1.27	12.09	13.36	FeOOH
Gypsum	-4.38	-8.98	-4.60	CaSO4:2H2O
H2(g)	-9.06	-9.06	0.00	H2
H2S(g)	-11.00	-56.01	-45.01	H2S
Hausmannite	-35.70	30.92	66.62	Mn3O4
Hematite	-0.64	24.18	24.82	Fe2O3
Hydroxyapatite	-5.98	-45.02	-39.04	Ca5(PO4)3OH
Illite	-1.95	12.32	14.27	K0.6Mg0.25Al2.3Si3.5O10(OH)2
Jarosite-K	-33.94	-0.74	33.20	KFe3(SO4)2(OH)6
K-feldspar	-4.56	-1.81	2.75	KAlSi3O8
K-mica	5.53	21.53	16.00	KAl3Si3O10(OH)2
Kaolinite	3.27	12.66	9.40	Al2Si2O5(OH)4
Mackinawite	-6.81	-48.45	-41.64	FeS
Manganite	-13.52	11.82	25.34	MnOOH
Melanterite	-9.71	-12.21	-2.50	FeSO4:7H2O
N2(g)	-3.60	-6.79	-3.18	N2
NH3(g)	-11.89	-16.98	-5.10	NH3
O2(g)	-72.59	18.12	90.71	O2
Otavite	-3.94	-16.04	-12.10	CdCO3
Pb(OH)2	-3.67	5.26	8.93	Pb(OH)2
Pyrite	-2.32	-95.40	-93.09	FeS2
Pyrochroite	-7.91	7.29	15.20	Mn(OH)2
Pyrolusite	-28.65	16.35	45.00	MnO2
Quartz	-1.03	-5.34	-4.31	SiO2
Rhodochrosite	-2.88	-13.93	-11.05	MnCO3

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      Sepiolite       -11.24    5.11   16.35  Mg2Si3O7.5OH:3H2O
      Sepiolite(d)    -13.55    5.11   18.66  Mg2Si3O7.5OH:3H2O
      Siderite         -2.91  -13.66  -10.75  FeCO3
      SiO2(a)          -2.44   -5.34   -2.90  SiO2
      Smithsonite      -4.67  -14.43   -9.76  ZnCO3
      Sphalerite       -0.15  -49.21  -49.07  ZnS
      Strontianite     -3.69  -13.01   -9.32  SrCO3
      Sulfur           -8.10  -46.95  -38.85  S
      Talc            -13.63   10.34   23.97  Mg3Si4O10(OH)2
      Vivianite        -7.31  -43.31  -36.00  Fe3(PO4)2:8H2O
      Willemite        -8.93    8.25   17.18  Zn2SiO4
      Witherite        -5.67  -14.36   -8.69  BaCO3
      Zn(OH)2(e)       -4.70    6.80   11.50  Zn(OH)2

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End of simulation.
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Reading input data for simulation 6.
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      MIX 3 Mixing AltBasa/Rain with Stickleback (1:1000)
            3     0.001
            4     0.999
      SAVE solution 6
      END
-----------------------------------
Beginning of reaction calculations.
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Reaction step 1.

Using mixture 3.  Mixing AltBasa/Rain with Stickleback (1:1000)

       1.000e-03 Solution 3   Solution after simulation 3.
       9.990e-01 Solution 4   Stickleback Lake

-----------------------------Solution composition------------------------------

      Elements           Molality       Moles

      Al                 9.434e-08   9.434e-08
      B                  4.621e-06   4.621e-06
      Ba                 3.639e-08   3.639e-08
      C                  7.420e-04   7.420e-04
      Ca                 3.482e-04   3.482e-04
      Cd                 8.891e-10   8.891e-10
      Cl                 1.083e-03   1.083e-03
      Cu                 7.908e-09   7.908e-09
      F                  4.034e-07   4.034e-07
      Fe                 8.962e-08   8.962e-08
      K                  3.687e-05   3.687e-05
      Li                 7.199e-07   7.199e-07
      Mg                 2.010e-04   2.010e-04
      Mn                 4.556e-08   4.556e-08
      N                  8.681e-07   8.681e-07
      Na                 4.737e-04   4.737e-04
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      P                 4.839e-06   4.839e-06
      Pb                2.414e-09   2.414e-09
      S                 5.209e-06   5.209e-06
      Si                9.112e-06   9.112e-06
      Sr                1.026e-06   1.026e-06
      Zn                3.822e-08   3.822e-08

----------------------------Description of solution----------------------------

                            pH  =   7.140      Charge balance
                            pe  =  -2.667      Adjusted to redox equilibrium
               Activity of water  =   1.000
                  Ionic strength  =   2.209e-03
               Mass of water (kg)  =   1.000e+00
        Total alkalinity (eq/kg)  =   6.057e-04
              Total CO2 (mol/kg)  =   7.420e-04
             Temperature (deg C)  =   4.000
         Electrical balance (eq)  =  -9.158e-05
                     Iterations  =  14
                        Total H  = 1.110131e+02
                        Total O  = 5.550840e+01

----------------------------Distribution of species----------------------------

                                                  Log       Log         Log
      Species             Molality    Activity  Molality  Activity     Gamma

      H+                 7.598e-08   7.249e-08    -7.119    -7.140    -0.020
      OH-                2.446e-08   2.325e-08    -7.612    -7.634    -0.022
      H2O                5.551e+01   1.000e+00     0.000     0.000     0.000
Al                9.434e-08
      Al(OH)4-           7.951e-08   7.561e-08    -7.100    -7.121    -0.022
      Al(OH)2+           1.042e-08   9.911e-09    -7.982    -8.004    -0.022
      Al(OH)3            3.368e-09   3.370e-09    -8.473    -8.472     0.000
      AlOH+2             9.012e-10   7.370e-10    -9.045    -9.133    -0.087
      AlF+2              9.122e-11   7.460e-11   -10.040   -10.127    -0.087
      Al+3               3.432e-11   2.249e-11   -10.465   -10.648    -0.184
      AlF2+              1.328e-11   1.263e-11   -10.877   -10.899    -0.022
      AlSO4+             2.254e-13   2.143e-13   -12.647   -12.669    -0.022
      AlF3               5.899e-14   5.902e-14   -13.229   -13.229     0.000
      Al(SO4)2-          2.592e-17   2.465e-17   -16.586   -16.608    -0.022
      AlF4-              9.338e-18   8.880e-18   -17.030   -17.052    -0.022
      AlHSO4+2           1.491e-21   1.219e-21   -20.827   -20.914    -0.087
      AlF5-2             6.845e-23   5.598e-23   -22.165   -22.252    -0.087
      AlF6-3             5.238e-29   3.332e-29   -28.281   -28.477    -0.196
B                 4.621e-06
      H3BO3              4.596e-06   4.598e-06    -5.338    -5.337     0.000
      H2BO3-             2.541e-08   2.417e-08    -7.595    -7.617    -0.022
      BF(OH)3-           5.772e-13   5.489e-13   -12.239   -12.261    -0.022
      BF2(OH)2-          1.755e-18   1.669e-18   -17.756   -17.778    -0.022
      BF3OH-             8.011e-26   7.618e-26   -25.096   -25.118    -0.022
      BF4-               9.259e-33   8.805e-33   -32.033   -32.055    -0.022
Ba                3.639e-08
      Ba+2               3.624e-08   2.971e-08    -7.441    -7.527    -0.086
      BaHCO3+            8.826e-11   8.394e-11   -10.054   -10.076    -0.022
      BaSO4              6.012e-11   6.015e-11   -10.221   -10.221     0.000
      BaCO3              2.139e-12   2.140e-12   -11.670   -11.670     0.000
      BaOH+              1.460e-14   1.389e-14   -13.836   -13.857    -0.022
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C(-4)	5.349e-13					
	CH4	5.349e-13	5.351e-13	-12.272	-12.272	0.000
C(4)	7.420e-04					
	HCO3-	5.996e-04	5.708e-04	-3.222	-3.244	-0.021
	CO2	1.395e-04	1.396e-04	-3.855	-3.855	0.000
	CaHCO3+	1.311e-06	1.248e-06	-5.882	-5.904	-0.021
	MgHCO3+	1.104e-06	1.049e-06	-5.957	-5.979	-0.022
	CO3-2	2.590e-07	2.126e-07	-6.587	-6.672	-0.086
	NaHCO3	1.445e-07	1.446e-07	-6.840	-6.840	0.000
	CaCO3	8.122e-08	8.127e-08	-7.090	-7.090	0.000
	MgCO3	2.410e-08	2.411e-08	-7.618	-7.618	0.000
	FeHCO3+	4.163e-09	3.959e-09	-8.381	-8.402	-0.022
	SrHCO3+	3.751e-09	3.570e-09	-8.426	-8.447	-0.021
	ZnHCO3+	2.147e-09	2.042e-09	-8.668	-8.690	-0.022
	MnHCO3+	1.887e-09	1.794e-09	-8.724	-8.746	-0.022
	PbCO3	1.563e-09	1.563e-09	-8.806	-8.806	0.000
	ZnCO3	1.205e-09	1.205e-09	-8.919	-8.919	0.000
	NaCO3-	6.000e-10	5.706e-10	-9.222	-9.244	-0.022
	MnCO3	5.954e-10	5.957e-10	-9.225	-9.225	0.000
	FeCO3	3.535e-10	3.537e-10	-9.452	-9.451	0.000
	PbHCO3+	2.017e-10	1.919e-10	-9.695	-9.717	-0.022
	BaHCO3+	8.826e-11	8.394e-11	-10.054	-10.076	-0.022
	SrCO3	6.122e-11	6.125e-11	-10.213	-10.213	0.000
	CdHCO3+	1.260e-11	1.198e-11	-10.900	-10.921	-0.022
	Zn(CO3)2-2	6.698e-12	5.478e-12	-11.174	-11.261	-0.087
	BaCO3	2.139e-12	2.140e-12	-11.670	-11.670	0.000
	Pb(CO3)2-2	1.021e-12	8.348e-13	-11.991	-12.078	-0.087
	CdCO3	1.120e-13	1.121e-13	-12.951	-12.950	0.000
	Cd(CO3)2-2	9.214e-17	7.536e-17	-16.036	-16.123	-0.087
Ca	3.482e-04					
	Ca+2	3.465e-04	2.843e-04	-3.460	-3.546	-0.086
	CaHCO3+	1.311e-06	1.248e-06	-5.882	-5.904	-0.021
	CaSO4	1.855e-07	1.856e-07	-6.732	-6.732	0.000
	CaHPO4	1.757e-07	1.757e-07	-6.755	-6.755	0.000
	CaCO3	8.122e-08	8.127e-08	-7.090	-7.090	0.000
	CaH2PO4+	1.128e-08	1.073e-08	-7.948	-7.969	-0.022
	CaPO4-	3.940e-09	3.747e-09	-8.405	-8.426	-0.022
	CaOH+	6.844e-10	6.509e-10	-9.165	-9.186	-0.022
	CaF+	5.841e-10	5.555e-10	-9.234	-9.255	-0.022
	CaHSO4+	6.758e-14	6.427e-14	-13.170	-13.192	-0.022
Cd	8.891e-10					
	Cd+2	8.117e-10	6.638e-10	-9.091	-9.178	-0.087
	CdCl+	6.365e-11	6.053e-11	-10.196	-10.218	-0.022
	CdHCO3+	1.260e-11	1.198e-11	-10.900	-10.921	-0.022
	CdSO4	6.732e-13	6.736e-13	-12.172	-12.172	0.000
	CdCl2	2.390e-13	2.391e-13	-12.622	-12.621	0.000
	CdOH+	1.500e-13	1.426e-13	-12.824	-12.846	-0.022
	CdCO3	1.120e-13	1.121e-13	-12.951	-12.950	0.000
	Cd(OH)2	5.639e-16	5.642e-16	-15.249	-15.249	0.000
	CdCl3-	1.162e-16	1.105e-16	-15.935	-15.957	-0.022
	Cd(CO3)2-2	9.214e-17	7.536e-17	-16.036	-16.123	-0.087
	Cd(SO4)2-2	4.188e-17	3.425e-17	-16.378	-16.465	-0.087
	Cd(OH)3-	9.182e-22	8.732e-22	-21.037	-21.059	-0.022
	Cd(OH)4-2	1.312e-28	1.073e-28	-27.882	-27.969	-0.087
Cl	1.083e-03					
	Cl-	1.083e-03	1.030e-03	-2.965	-2.987	-0.022
	MnCl+	1.556e-10	1.480e-10	-9.808	-9.830	-0.022
	FeCl+	1.037e-10	9.858e-11	-9.984	-10.006	-0.022

	CdCl+	6.365e-11	6.053e-11	-10.196	-10.218	-0.022
	ZnCl+	3.058e-11	2.908e-11	-10.515	-10.536	-0.022
	PbCl+	1.042e-11	9.907e-12	-10.982	-11.004	-0.022
	CdCl2	2.390e-13	2.391e-13	-12.622	-12.621	0.000
	MnCl2	6.647e-14	6.650e-14	-13.177	-13.177	0.000
	ZnCl2	2.862e-14	2.863e-14	-13.543	-13.543	0.000
	PbCl2	2.464e-14	2.465e-14	-13.608	-13.608	0.000
	CdCl3-	1.162e-16	1.105e-16	-15.935	-15.957	-0.022
	ZnCl3-	3.037e-17	2.888e-17	-16.518	-16.539	-0.022
	MnCl3-	1.983e-17	1.886e-17	-16.703	-16.724	-0.022
	PbCl3-	1.844e-17	1.754e-17	-16.734	-16.756	-0.022
	ZnCl4-2	1.524e-20	1.246e-20	-19.817	-19.904	-0.087
	PbCl4-2	8.882e-21	7.264e-21	-20.052	-20.139	-0.087
	FeCl+2	7.680e-26	6.281e-26	-25.115	-25.202	-0.087
	FeCl2+	6.217e-28	5.912e-28	-27.206	-27.228	-0.022
	FeCl3	6.084e-32	6.087e-32	-31.216	-31.216	0.000
Cu(1)		7.908e-09				
	Cu+	7.908e-09	7.512e-09	-8.102	-8.124	-0.022
Cu(2)		2.030e-13				
	Cu(OH)2	1.511e-13	1.512e-13	-12.821	-12.820	0.000
	Cu+2	4.627e-14	3.804e-14	-13.335	-13.420	-0.085
	CuOH+	5.518e-15	5.248e-15	-14.258	-14.280	-0.022
	CuSO4	2.683e-17	2.684e-17	-16.571	-16.571	0.000
	Cu(OH)3-	1.322e-19	1.257e-19	-18.879	-18.901	-0.022
	Cu(OH)4-2	4.230e-25	3.459e-25	-24.374	-24.461	-0.087
F		4.034e-07				
	F-	3.996e-07	3.799e-07	-6.398	-6.420	-0.022
	MgF+	2.876e-09	2.735e-09	-8.541	-8.563	-0.022
	CaF+	5.841e-10	5.555e-10	-9.234	-9.255	-0.022
	NaF	9.843e-11	9.848e-11	-10.007	-10.007	0.000
	AlF+2	9.122e-11	7.460e-11	-10.040	-10.127	-0.087
	HF	2.879e-11	2.880e-11	-10.541	-10.541	0.000
	AlF2+	1.328e-11	1.263e-11	-10.877	-10.899	-0.022
	BF(OH)3-	5.772e-13	5.489e-13	-12.239	-12.261	-0.022
	FeF+	2.771e-13	2.635e-13	-12.557	-12.579	-0.022
	MnF+	9.749e-14	9.271e-14	-13.011	-13.033	-0.022
	AlF3	5.899e-14	5.902e-14	-13.229	-13.229	0.000
	HF2-	3.538e-17	3.364e-17	-16.451	-16.473	-0.022
	AlF4-	9.338e-18	8.880e-18	-17.030	-17.052	-0.022
	BF2(OH)2-	1.755e-18	1.669e-18	-17.756	-17.778	-0.022
	AlF5-2	6.845e-23	5.598e-23	-22.165	-22.252	-0.087
	FeF+2	2.155e-24	1.762e-24	-23.667	-23.754	-0.087
	BF3OH-	8.011e-26	7.618e-26	-25.096	-25.118	-0.022
	FeF2+	2.143e-26	2.038e-26	-25.669	-25.691	-0.022
	AlF6-3	5.238e-29	3.332e-29	-28.281	-28.477	-0.196
	FeF3	1.136e-29	1.136e-29	-28.945	-28.945	0.000
	BF4-	9.259e-33	8.805e-33	-32.033	-32.055	-0.022
	SiF6-2	0.000e+00	0.000e+00	-40.951	-41.038	-0.087
Fe(2)		8.962e-08				
	Fe+2	8.435e-08	6.936e-08	-7.074	-7.159	-0.085
	FeHCO3+	4.163e-09	3.959e-09	-8.381	-8.402	-0.022
	FeHPO4	4.745e-10	4.747e-10	-9.324	-9.324	0.000
	FeCO3	3.535e-10	3.537e-10	-9.452	-9.451	0.000
	FeCl+	1.037e-10	9.858e-11	-9.984	-10.006	-0.022
	FeH2PO4+	8.328e-11	7.920e-11	-10.079	-10.101	-0.022
	FeOH+	5.881e-11	5.593e-11	-10.231	-10.252	-0.022
	FeSO4	3.294e-11	3.296e-11	-10.482	-10.482	0.000
	FeF+	2.771e-13	2.635e-13	-12.557	-12.579	-0.022

	FeHSO4+	1.649e-17	1.568e-17	-16.783	-16.805	-0.022
	Fe(HS)2	1.390e-21	1.390e-21	-20.857	-20.857	0.000
	Fe(HS)3-	7.551e-31	7.181e-31	-30.122	-30.144	-0.022
Fe(3)		3.246e-16				
	Fe(OH)2+	1.985e-16	1.888e-16	-15.702	-15.724	-0.022
	Fe(OH)3	1.253e-16	1.253e-16	-15.902	-15.902	0.000
	Fe(OH)4-	6.687e-19	6.359e-19	-18.175	-18.197	-0.022
	FeOH+2	1.191e-19	9.737e-20	-18.924	-19.012	-0.087
	Fe+3	6.308e-24	4.134e-24	-23.200	-23.384	-0.184
	FeH2PO4+2	3.100e-24	2.535e-24	-23.509	-23.596	-0.087
	FeF+2	2.155e-24	1.762e-24	-23.667	-23.754	-0.087
	FeHPO4+	9.630e-25	9.158e-25	-24.016	-24.038	-0.022
	FeSO4+	1.168e-25	1.110e-25	-24.933	-24.954	-0.022
	FeCl+2	7.680e-26	6.281e-26	-25.115	-25.202	-0.087
	FeF2+	2.143e-26	2.038e-26	-25.669	-25.691	-0.022
	FeCl2+	6.217e-28	5.912e-28	-27.206	-27.228	-0.022
	FeF3	1.136e-29	1.136e-29	-28.945	-28.945	0.000
	Fe(SO4)2-	9.447e-30	8.984e-30	-29.025	-29.047	-0.022
	FeCl3	6.084e-32	6.087e-32	-31.216	-31.216	0.000
	FeHSO4+2	2.870e-32	2.347e-32	-31.542	-31.629	-0.087
	Fe2(OH)2+4	1.451e-36	6.491e-37	-35.838	-36.188	-0.349
	Fe3(OH)4+5	0.000e+00	0.000e+00	-48.141	-48.686	-0.546
H(0)		2.011e-12				
	H2	1.005e-12	1.006e-12	-11.998	-11.998	0.000
K		3.687e-05				
	K+	3.687e-05	3.505e-05	-4.433	-4.455	-0.022
	KSO4-	7.053e-10	6.707e-10	-9.152	-9.173	-0.022
	KHPO4-	1.236e-10	1.175e-10	-9.908	-9.930	-0.022
	KOH	1.676e-12	1.676e-12	-11.776	-11.776	0.000
Li		7.199e-07				
	Li+	7.199e-07	6.855e-07	-6.143	-6.164	-0.021
	LiSO4-	1.271e-11	1.209e-11	-10.896	-10.918	-0.022
	LiOH	2.165e-13	2.166e-13	-12.665	-12.664	0.000
Mg		2.010e-04				
	Mg+2	1.996e-04	1.641e-04	-3.700	-3.785	-0.085
	MgHCO3+	1.104e-06	1.049e-06	-5.957	-5.979	-0.022
	MgHPO4	1.371e-07	1.371e-07	-6.863	-6.863	0.000
	MgSO4	8.679e-08	8.683e-08	-7.062	-7.061	0.000
	MgCO3	2.410e-08	2.411e-08	-7.618	-7.618	0.000
	MgH2PO4+	8.293e-09	7.886e-09	-8.081	-8.103	-0.022
	MgPO4-	3.067e-09	2.917e-09	-8.513	-8.535	-0.022
	MgF+	2.876e-09	2.735e-09	-8.541	-8.563	-0.022
	MgOH+	1.124e-09	1.069e-09	-8.949	-8.971	-0.022
Mn(2)		4.556e-08				
	Mn+2	4.290e-08	3.528e-08	-7.368	-7.453	-0.085
	MnHCO3+	1.887e-09	1.794e-09	-8.724	-8.746	-0.022
	MnCO3	5.954e-10	5.957e-10	-9.225	-9.225	0.000
	MnCl+	1.556e-10	1.480e-10	-9.808	-9.830	-0.022
	MnSO4	1.646e-11	1.647e-11	-10.784	-10.783	0.000
	MnOH+	2.086e-12	1.983e-12	-11.681	-11.703	-0.022
	MnF+	9.749e-14	9.271e-14	-13.011	-13.033	-0.022
	MnCl2	6.647e-14	6.650e-14	-13.177	-13.177	0.000
	MnCl3-	1.983e-17	1.886e-17	-16.703	-16.724	-0.022
	Mn(NO3)2	0.000e+00	0.000e+00	-178.777	-178.776	0.000
Mn(3)		1.361e-37				
	Mn+3	1.361e-37	8.659e-38	-36.866	-37.063	-0.196
N(-3)		2.857e-07				
	NH4+	2.852e-07	2.709e-07	-6.545	-6.567	-0.022

	NH3	4.297e-10	4.299e-10	-9.367	-9.367	0.000
	NH4SO4-	1.483e-11	1.410e-11	-10.829	-10.851	-0.022
N(0)	5.824e-07					
	N2	2.912e-07	2.913e-07	-6.536	-6.536	0.000
N(3)	0.000e+00					
	NO2-	0.000e+00	0.000e+00	-63.895	-63.918	-0.022
N(5)	0.000e+00					
	NO3-	0.000e+00	0.000e+00	-85.951	-85.973	-0.022
	PbNO3+	0.000e+00	0.000e+00	-94.155	-94.176	-0.022
	Mn(NO3)2	0.000e+00	0.000e+00	-178.777	-178.776	0.000
Na	4.737e-04					
	Na+	4.736e-04	4.505e-04	-3.325	-3.346	-0.022
	NaHCO3	1.445e-07	1.446e-07	-6.840	-6.840	0.000
	NaSO4-	8.310e-09	7.902e-09	-8.080	-8.102	-0.022
	NaHPO4-	1.588e-09	1.510e-09	-8.799	-8.821	-0.022
	NaCO3-	6.000e-10	5.706e-10	-9.222	-9.244	-0.022
	NaF	9.843e-11	9.848e-11	-10.007	-10.007	0.000
	NaOH	4.103e-11	4.105e-11	-10.387	-10.387	0.000
O(0)	0.000e+00					
	O2	0.000e+00	0.000e+00	-75.676	-75.676	0.000
P	4.839e-06					
	H2PO4-	2.395e-06	2.278e-06	-5.621	-5.642	-0.022
	HPO4-2	2.103e-06	1.719e-06	-5.677	-5.765	-0.087
	CaHPO4	1.757e-07	1.757e-07	-6.755	-6.755	0.000
	MgHPO4	1.371e-07	1.371e-07	-6.863	-6.863	0.000
	CaH2PO4+	1.128e-08	1.073e-08	-7.948	-7.969	-0.022
	MgH2PO4+	8.293e-09	7.886e-09	-8.081	-8.103	-0.022
	CaPO4-	3.940e-09	3.747e-09	-8.405	-8.426	-0.022
	MgPO4-	3.067e-09	2.917e-09	-8.513	-8.535	-0.022
	NaHPO4-	1.588e-09	1.510e-09	-8.799	-8.821	-0.022
	FeHPO4	4.745e-10	4.747e-10	-9.324	-9.324	0.000
	KHPO4-	1.236e-10	1.175e-10	-9.908	-9.930	-0.022
	FeH2PO4+	8.328e-11	7.920e-11	-10.079	-10.101	-0.022
	PO4-3	1.071e-11	6.807e-12	-10.970	-11.167	-0.197
	FeH2PO4+2	3.100e-24	2.535e-24	-23.509	-23.596	-0.087
	FeHPO4+	9.630e-25	9.158e-25	-24.016	-24.038	-0.022
Pb	2.414e-09					
	PbCO3	1.563e-09	1.563e-09	-8.806	-8.806	0.000
	Pb+2	5.174e-10	4.232e-10	-9.286	-9.373	-0.087
	PbHCO3+	2.017e-10	1.919e-10	-9.695	-9.717	-0.022
	PbOH+	1.197e-10	1.138e-10	-9.922	-9.944	-0.022
	PbCl+	1.042e-11	9.907e-12	-10.982	-11.004	-0.022
	Pb(CO3)2-2	1.021e-12	8.348e-13	-11.991	-12.078	-0.087
	PbSO4	9.607e-13	9.612e-13	-12.017	-12.017	0.000
	Pb(OH)2	6.105e-13	6.108e-13	-12.214	-12.214	0.000
	PbCl2	2.464e-14	2.465e-14	-13.608	-13.608	0.000
	Pb(OH)3-	1.017e-16	9.673e-17	-15.993	-16.014	-0.022
	Pb(SO4)2-2	2.491e-17	2.038e-17	-16.604	-16.691	-0.087
	PbCl3-	1.844e-17	1.754e-17	-16.734	-16.756	-0.022
	Pb2OH+3	1.695e-18	1.078e-18	-17.771	-17.967	-0.196
	PbCl4-2	8.882e-21	7.264e-21	-20.052	-20.139	-0.087
	Pb(OH)4-2	3.737e-21	3.057e-21	-20.427	-20.515	-0.087
	PbNO3+	0.000e+00	0.000e+00	-94.155	-94.176	-0.022
S(-2)	1.145e-11					
	H2S	6.457e-12	6.461e-12	-11.190	-11.190	0.000
	HS-	4.989e-12	4.743e-12	-11.302	-11.324	-0.022
	S-2	2.051e-18	1.682e-18	-17.688	-17.774	-0.086
	Fe(HS)2	1.390e-21	1.390e-21	-20.857	-20.857	0.000

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      Fe(HS)3-          7.551e-31   7.181e-31   -30.122   -30.144    -0.022
S(6)              5.209e-06
      SO4-2             4.927e-06   4.039e-06    -5.307    -5.394    -0.086
      CaSO4             1.855e-07   1.856e-07    -6.732    -6.732     0.000
      MgSO4             8.679e-08   8.683e-08    -7.062    -7.061     0.000
      NaSO4-            8.310e-09   7.902e-09    -8.080    -8.102    -0.022
      KSO4-             7.053e-10   6.707e-10    -9.152    -9.173    -0.022
      SrSO4             5.063e-10   5.065e-10    -9.296    -9.295     0.000
      BaSO4             6.012e-11   6.015e-11   -10.221   -10.221     0.000
      FeSO4             3.294e-11   3.296e-11   -10.482   -10.482     0.000
      ZnSO4             2.260e-11   2.261e-11   -10.646   -10.646     0.000
      HSO4-             1.977e-11   1.880e-11   -10.704   -10.726    -0.022
      MnSO4             1.646e-11   1.647e-11   -10.784   -10.783     0.000
      NH4SO4-           1.483e-11   1.410e-11   -10.829   -10.851    -0.022
      LiSO4-            1.271e-11   1.209e-11   -10.896   -10.918    -0.022
      PbSO4             9.607e-13   9.612e-13   -12.017   -12.017     0.000
      CdSO4             6.732e-13   6.736e-13   -12.172   -12.172     0.000
      AlSO4+            2.254e-13   2.143e-13   -12.647   -12.669    -0.022
      CaHSO4+           6.758e-14   6.427e-14   -13.170   -13.192    -0.022
      Zn(SO4)2-2        1.080e-15   8.834e-16   -14.967   -15.054    -0.087
      Cd(SO4)2-2        4.188e-17   3.425e-17   -16.378   -16.465    -0.087
      CuSO4             2.683e-17   2.684e-17   -16.571   -16.571     0.000
      Al(SO4)2-         2.592e-17   2.465e-17   -16.586   -16.608    -0.022
      Pb(SO4)2-2        2.491e-17   2.038e-17   -16.604   -16.691    -0.087
      FeHSO4+           1.649e-17   1.568e-17   -16.783   -16.805    -0.022
      AlHSO4+2          1.491e-21   1.219e-21   -20.827   -20.914    -0.087
      FeSO4+            1.168e-25   1.110e-25   -24.933   -24.954    -0.022
      Fe(SO4)2-         9.447e-30   8.984e-30   -29.025   -29.047    -0.022
      FeHSO4+2          2.870e-32   2.347e-32   -31.542   -31.629    -0.087
Si                9.112e-06
      H4SiO4            9.104e-06   9.109e-06    -5.041    -5.041     0.000
      H3SiO4-           8.392e-09   7.980e-09    -8.076    -8.098    -0.022
      H2SiO4-2          1.940e-15   1.587e-15   -14.712   -14.799    -0.087
      SiF6-2            0.000e+00   0.000e+00   -40.951   -41.038    -0.087
Sr                1.026e-06
      Sr+2              1.022e-06   8.392e-07    -5.991    -6.076    -0.086
      SrHCO3+           3.751e-09   3.570e-09    -8.426    -8.447    -0.021
      SrSO4             5.063e-10   5.065e-10    -9.296    -9.295     0.000
      SrCO3             6.122e-11   6.125e-11   -10.213   -10.213     0.000
      SrOH+             6.238e-13   5.936e-13   -12.205   -12.226    -0.022
Zn                3.822e-08
      Zn+2              3.466e-08   2.842e-08    -7.460    -7.546    -0.086
      ZnHCO3+           2.147e-09   2.042e-09    -8.668    -8.690    -0.022
      ZnCO3             1.205e-09   1.205e-09    -8.919    -8.919     0.000
      ZnOH+             8.145e-11   7.745e-11   -10.089   -10.111    -0.022
      Zn(OH)2           6.803e-11   6.807e-11   -10.167   -10.167     0.000
      ZnCl+             3.058e-11   2.908e-11   -10.515   -10.536    -0.022
      ZnSO4             2.260e-11   2.261e-11   -10.646   -10.646     0.000
      Zn(CO3)2-2        6.698e-12   5.478e-12   -11.174   -11.261    -0.087
      ZnCl2             2.862e-14   2.863e-14   -13.543   -13.543     0.000
      Zn(OH)3-          3.122e-15   2.969e-15   -14.506   -14.527    -0.022
      Zn(SO4)2-2        1.080e-15   8.834e-16   -14.967   -15.054    -0.087
      ZnCl3-            3.037e-17   2.888e-17   -16.518   -16.539    -0.022
      ZnCl4-2           1.524e-20   1.246e-20   -19.817   -19.904    -0.087
      Zn(OH)4-2         7.936e-21   6.491e-21   -20.100   -20.188    -0.087

-----------------------------Saturation indices-------------------------------
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◎ Table of Contents

Phase	SI	log IAP	log KT	
Al(OH)3(a)	-1.50	10.77	12.27	Al(OH)3
Albite	-6.15	-0.56	5.59	NaAlSi3O8
Alunite	-5.74	-4.35	1.39	KAl3(SO4)2(OH)6
Anglesite	-6.86	-14.77	-7.91	PbSO4
Anhydrite	-4.59	-8.94	-4.35	CaSO4
Anorthite	-7.51	22.19	29.71	CaAl2Si2O8
Aragonite	-1.99	-10.22	-8.23	CaCO3
Barite	-2.54	-12.92	-10.38	BaSO4
Ca-Montmorillonite	-1.69	8.37	10.06	Ca0.165Al2.33Si3.67O10(OH)2
Calcite	-1.83	-10.22	-8.39	CaCO3
Cd(OH)2	-8.55	5.10	13.65	Cd(OH)2
CdSiO3	-9.92	0.06	9.98	CdSiO3
CdSO4	-15.29	-14.57	0.72	CdSO4
Celestite	-4.81	-11.47	-6.66	SrSO4
Cerrusite	-2.65	-16.05	-13.40	PbCO3
CH4(g)	-9.60	-56.73	-47.13	CH4
Chalcedony	-1.23	-5.04	-3.81	SiO2
Chlorite(14A)	-17.90	58.89	76.79	Mg5Al2Si3O10(OH)8
Chrysotile	-13.59	21.40	34.99	Mg3Si2O5(OH)4
CO2(g)	-2.68	-20.95	-18.27	CO2
Dolomite	-4.11	-20.68	-16.57	CaMg(CO3)2
Fe(OH)3(a)	-6.86	11.59	18.45	Fe(OH)3
FeS(ppt)	-7.43	-48.33	-40.91	FeS
Fluorite	-5.50	-16.39	-10.89	CaF2
Gibbsite	1.39	10.77	9.38	Al(OH)3
Goethite	-1.77	11.59	13.36	FeOOH
Gypsum	-4.34	-8.94	-4.60	CaSO4:2H2O
H2(g)	-8.95	-8.95	0.00	H2
H2S(g)	-10.45	-55.45	-45.01	H2S
Hausmannite	-37.19	29.43	66.62	Mn3O4
Hematite	-1.63	23.19	24.82	Fe2O3
Hydroxyapatite	-5.05	-44.09	-39.04	Ca5(PO4)3OH
Illite	-2.90	11.37	14.27	K0.6Mg0.25Al2.3Si3.5O10(OH)2
Jarosite-K	-35.08	-1.88	33.20	KFe3(SO4)2(OH)6
K-feldspar	-4.41	-1.67	2.75	KAlSi3O8
K-mica	3.88	19.88	16.00	KAl3Si3O10(OH)2
Kaolinite	2.07	11.46	9.40	Al2Si2O5(OH)4
Mackinawite	-6.70	-48.33	-41.64	FeS
Manganite	-14.04	11.30	25.34	MnOOH
Melanterite	-10.05	-12.55	-2.50	FeSO4:7H2O
N2(g)	-3.35	-6.54	-3.18	N2
NH3(g)	-11.59	-16.69	-5.10	NH3
O2(g)	-72.82	17.89	90.71	O2
Otavite	-3.75	-15.85	-12.10	CdCO3
Pb(OH)2	-4.02	4.91	8.93	Pb(OH)2
Pyrite	-1.76	-94.84	-93.09	FeS2
Pyrochroite	-8.37	6.83	15.20	Mn(OH)2
Pyrolusite	-29.22	15.77	45.00	MnO2
Quartz	-0.73	-5.04	-4.31	SiO2
Rhodochrosite	-3.07	-14.12	-11.05	MnCO3
Sepiolite	-10.49	5.87	16.35	Mg2Si3O7.5OH:3H2O
Sepiolite(d)	-12.79	5.87	18.66	Mg2Si3O7.5OH:3H2O
Siderite	-3.08	-13.83	-10.75	FeCO3
SiO2(a)	-2.14	-5.04	-2.90	SiO2
Smithsonite	-4.46	-14.22	-9.76	ZnCO3
Sphalerite	0.35	-48.72	-49.07	ZnS

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      Strontianite     -3.43  -12.75   -9.32  SrCO3
      Sulfur           -7.65  -46.51  -38.85  S
      Talc            -12.65   11.32   23.97  Mg3Si4O10(OH)2
      Vivianite        -7.81  -43.81  -36.00  Fe3(PO4)2:8H2O
      Willemite        -8.76    8.43   17.18  Zn2SiO4
      Witherite        -5.51  -14.20   -8.69  BaCO3
      Zn(OH)2(e)       -4.77    6.73   11.50  Zn(OH)2

------------------
End of simulation.
------------------

------------------------------------
Reading input data for simulation 7.
------------------------------------

      MIX 4 Mixing AltBasa/Rain with Stickleback (1:1000000)
            3     0.000001
            4     0.999999
      SAVE solution 7
      END
----------------------------------
Beginning of reaction calculations.
----------------------------------

Reaction step 1.

Using mixture 4.  Mixing AltBasa/Rain with Stickleback (1:1000000)

       1.000e-06 Solution 3   Solution after simulation 3.
       1.000e+00 Solution 4   Stickleback Lake

-----------------------------Solution composition------------------------------

      Elements           Molality       Moles

      Al                9.267e-08   9.267e-08
      B                 4.626e-06   4.626e-06
      Ba                3.641e-08   3.641e-08
      C                 7.425e-04   7.425e-04
      Ca                3.485e-04   3.485e-04
      Cd                8.898e-10   8.898e-10
      Cl                1.084e-03   1.084e-03
      Cu                7.869e-09   7.869e-09
      F                 4.038e-07   4.038e-07
      Fe                8.954e-08   8.954e-08
      K                 3.691e-05   3.691e-05
      Li                7.206e-07   7.206e-07
      Mg                2.012e-04   2.012e-04
      Mn                4.551e-08   4.551e-08
      N                 8.690e-07   8.690e-07
      Na                4.742e-04   4.742e-04
      P                 4.843e-06   4.843e-06
      Pb                2.413e-09   2.413e-09
      S                 5.205e-06   5.205e-06
      Si                9.121e-06   9.121e-06
      Sr                1.027e-06   1.027e-06
      Zn                3.825e-08   3.825e-08
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◎ Table of Contents

----------Description of solution----------

```
                            pH  =   7.140      Charge balance
                            pe  =  -2.667      Adjusted to redox equilibrium
               Activity of water  =   1.000
                  Ionic strength  =   2.211e-03
               Mass of water (kg)  =   1.000e+00
        Total alkalinity (eq/kg)  =   6.060e-04
              Total CO2 (mol/kg)  =   7.425e-04
             Temperature (deg C)  =   4.000
         Electrical balance (eq)  =  -9.167e-05
                     Iterations   =  14
                        Total H   = 1.110131e+02
                        Total O   = 5.550840e+01
```

----------Distribution of species----------

	Species	Molality	Activity	Log Molality	Log Activity	Log Gamma
	H+	7.601e-08	7.252e-08	-7.119	-7.140	-0.020
	OH-	2.445e-08	2.324e-08	-7.612	-7.634	-0.022
	H2O	5.551e+01	1.000e+00	0.000	0.000	0.000
Al		9.267e-08				
	Al(OH)4-	7.809e-08	7.426e-08	-7.107	-7.129	-0.022
	Al(OH)2+	1.024e-08	9.741e-09	-7.990	-8.011	-0.022
	Al(OH)3	3.309e-09	3.311e-09	-8.480	-8.480	0.000
	AlOH+2	8.861e-10	7.247e-10	-9.053	-9.140	-0.087
	AlF+2	8.981e-11	7.345e-11	-10.047	-10.134	-0.087
	Al+3	3.376e-11	2.212e-11	-10.472	-10.655	-0.184
	AlF2+	1.309e-11	1.244e-11	-10.883	-10.905	-0.022
	AlSO4+	2.215e-13	2.106e-13	-12.655	-12.676	-0.022
	AlF3	5.819e-14	5.822e-14	-13.235	-13.235	0.000
	Al(SO4)2-	2.546e-17	2.421e-17	-16.594	-16.616	-0.022
	AlF4-	9.221e-18	8.769e-18	-17.035	-17.057	-0.022
	AlHSO4+2	1.466e-21	1.199e-21	-20.834	-20.921	-0.087
	AlF5-2	6.766e-23	5.534e-23	-22.170	-22.257	-0.087
	AlF6-3	5.183e-29	3.296e-29	-28.285	-28.482	-0.197
B		4.626e-06				
	H3BO3	4.600e-06	4.603e-06	-5.337	-5.337	0.000
	H2BO3-	2.543e-08	2.418e-08	-7.595	-7.617	-0.022
	BF(OH)3-	5.783e-13	5.500e-13	-12.238	-12.260	-0.022
	BF2(OH)2-	1.761e-18	1.674e-18	-17.754	-17.776	-0.022
	BF3OH-	8.049e-26	7.654e-26	-25.094	-25.116	-0.022
	BF4-	9.315e-33	8.858e-33	-32.031	-32.053	-0.022
Ba		3.641e-08				
	Ba+2	3.626e-08	2.973e-08	-7.441	-7.527	-0.086
	BaHCO3+	8.836e-11	8.403e-11	-10.054	-10.076	-0.022
	BaSO4	6.011e-11	6.014e-11	-10.221	-10.221	0.000
	BaCO3	2.141e-12	2.142e-12	-11.669	-11.669	0.000
	BaOH+	1.461e-14	1.389e-14	-13.835	-13.857	-0.022
C(-4)		5.360e-13				
	CH4	5.360e-13	5.363e-13	-12.271	-12.271	0.000
C(4)		7.425e-04				
	HCO3-	6.000e-04	5.711e-04	-3.222	-3.243	-0.021
	CO2	1.396e-04	1.397e-04	-3.855	-3.855	0.000
	CaHCO3+	1.313e-06	1.249e-06	-5.882	-5.903	-0.021

	MgHCO3+	1.105e-06	1.051e-06	-5.957	-5.979	-0.022
	CO3-2	2.590e-07	2.126e-07	-6.587	-6.672	-0.086
	NaHCO3	1.447e-07	1.448e-07	-6.839	-6.839	0.000
	CaCO3	8.130e-08	8.134e-08	-7.090	-7.090	0.000
	MgCO3	2.412e-08	2.413e-08	-7.618	-7.617	0.000
	FeHCO3+	4.161e-09	3.957e-09	-8.381	-8.403	-0.022
	SrHCO3+	3.756e-09	3.575e-09	-8.425	-8.447	-0.021
	ZnHCO3+	2.150e-09	2.044e-09	-8.668	-8.689	-0.022
	MnHCO3+	1.886e-09	1.793e-09	-8.724	-8.746	-0.022
	PbCO3	1.562e-09	1.563e-09	-8.806	-8.806	0.000
	ZnCO3	1.206e-09	1.206e-09	-8.919	-8.919	0.000
	NaCO3-	6.007e-10	5.713e-10	-9.221	-9.243	-0.022
	MnCO3	5.948e-10	5.951e-10	-9.226	-9.225	0.000
	FeCO3	3.532e-10	3.534e-10	-9.452	-9.452	0.000
	PbHCO3+	2.017e-10	1.919e-10	-9.695	-9.717	-0.022
	BaHCO3+	8.836e-11	8.403e-11	-10.054	-10.076	-0.022
	SrCO3	6.128e-11	6.131e-11	-10.213	-10.212	0.000
	CdHCO3+	1.261e-11	1.200e-11	-10.899	-10.921	-0.022
	Zn(CO3)2-2	6.706e-12	5.484e-12	-11.174	-11.261	-0.087
	BaCO3	2.141e-12	2.142e-12	-11.669	-11.669	0.000
	Pb(CO3)2-2	1.021e-12	8.346e-13	-11.991	-12.078	-0.087
	CdCO3	1.121e-13	1.122e-13	-12.950	-12.950	0.000
	Cd(CO3)2-2	9.224e-17	7.543e-17	-16.035	-16.122	-0.087
Ca		3.485e-04				
	Ca+2	3.467e-04	2.845e-04	-3.460	-3.546	-0.086
	CaHCO3+	1.313e-06	1.249e-06	-5.882	-5.903	-0.021
	CaSO4	1.855e-07	1.855e-07	-6.732	-6.732	0.000
	CaHPO4	1.759e-07	1.760e-07	-6.755	-6.755	0.000
	CaCO3	8.130e-08	8.134e-08	-7.090	-7.090	0.000
	CaH2PO4+	1.130e-08	1.075e-08	-7.947	-7.969	-0.022
	CaPO4-	3.943e-09	3.750e-09	-8.404	-8.426	-0.022
	CaOH+	6.847e-10	6.511e-10	-9.165	-9.186	-0.022
	CaF+	5.851e-10	5.564e-10	-9.233	-9.255	-0.022
	CaHSO4+	6.761e-14	6.429e-14	-13.170	-13.192	-0.022
Cd		8.898e-10				
	Cd+2	8.122e-10	6.642e-10	-9.090	-9.178	-0.087
	CdCl+	6.375e-11	6.063e-11	-10.196	-10.217	-0.022
	CdHCO3+	1.261e-11	1.200e-11	-10.899	-10.921	-0.022
	CdSO4	6.731e-13	6.734e-13	-12.172	-12.172	0.000
	CdCl2	2.396e-13	2.397e-13	-12.621	-12.620	0.000
	CdOH+	1.500e-13	1.427e-13	-12.824	-12.846	-0.022
	CdCO3	1.121e-13	1.122e-13	-12.950	-12.950	0.000
	Cd(OH)2	5.638e-16	5.641e-16	-15.249	-15.249	0.000
	CdCl3-	1.166e-16	1.109e-16	-15.933	-15.955	-0.022
	Cd(CO3)2-2	9.224e-17	7.543e-17	-16.035	-16.122	-0.087
	Cd(SO4)2-2	4.184e-17	3.422e-17	-16.378	-16.466	-0.087
	Cd(OH)3-	9.177e-22	8.727e-22	-21.037	-21.059	-0.022
	Cd(OH)4-2	1.311e-28	1.072e-28	-27.882	-27.970	-0.087
Cl		1.084e-03				
	Cl-	1.084e-03	1.031e-03	-2.965	-2.987	-0.022
	MnCl+	1.556e-10	1.479e-10	-9.808	-9.830	-0.022
	FeCl+	1.037e-10	9.857e-11	-9.984	-10.006	-0.022
	CdCl+	6.375e-11	6.063e-11	-10.196	-10.217	-0.022
	ZnCl+	3.063e-11	2.913e-11	-10.514	-10.536	-0.022
	PbCl+	1.042e-11	9.911e-12	-10.982	-11.004	-0.022
	CdCl2	2.396e-13	2.397e-13	-12.621	-12.620	0.000
	MnCl2	6.652e-14	6.656e-14	-13.177	-13.177	0.000
	ZnCl2	2.869e-14	2.871e-14	-13.542	-13.542	0.000

	PbCl2	2.468e-14	2.469e-14	-13.608	-13.607	0.000
	CdCl3-	1.166e-16	1.109e-16	-15.933	-15.955	-0.022
	ZnCl3-	3.048e-17	2.899e-17	-16.516	-16.538	-0.022
	MnCl3-	1.987e-17	1.889e-17	-16.702	-16.724	-0.022
	PbCl3-	1.849e-17	1.758e-17	-16.733	-16.755	-0.022
	ZnCl4-2	1.531e-20	1.252e-20	-19.815	-19.902	-0.087
	PbCl4-2	8.912e-21	7.288e-21	-20.050	-20.137	-0.087
	FeCl+2	7.682e-26	6.282e-26	-25.115	-25.202	-0.087
	FeCl2+	6.224e-28	5.919e-28	-27.206	-27.228	-0.022
	FeCl3	6.097e-32	6.100e-32	-31.215	-31.215	0.000
Cu(1)	7.869e-09					
	Cu+	7.869e-09	7.474e-09	-8.104	-8.126	-0.022
Cu(2)	2.019e-13					
	Cu(OH)2	1.503e-13	1.504e-13	-12.823	-12.823	0.000
	Cu+2	4.605e-14	3.786e-14	-13.337	-13.422	-0.085
	CuOH+	5.490e-15	5.221e-15	-14.260	-14.282	-0.022
	CuSO4	2.668e-17	2.669e-17	-16.574	-16.574	0.000
	Cu(OH)3-	1.314e-19	1.250e-19	-18.881	-18.903	-0.022
	Cu(OH)4-2	4.203e-25	3.438e-25	-24.376	-24.464	-0.087
F	4.038e-07					
	F-	4.000e-07	3.803e-07	-6.398	-6.420	-0.022
	MgF+	2.881e-09	2.740e-09	-8.540	-8.562	-0.022
	CaF+	5.851e-10	5.564e-10	-9.233	-9.255	-0.022
	NaF	9.862e-11	9.867e-11	-10.006	-10.006	0.000
	AlF+2	8.981e-11	7.345e-11	-10.047	-10.134	-0.087
	HF	2.883e-11	2.884e-11	-10.540	-10.540	0.000
	AlF2+	1.309e-11	1.244e-11	-10.883	-10.905	-0.022
	BF(OH)3-	5.783e-13	5.500e-13	-12.238	-12.260	-0.022
	FeF+	2.771e-13	2.635e-13	-12.557	-12.579	-0.022
	MnF+	9.748e-14	9.270e-14	-13.011	-13.033	-0.022
	AlF3	5.819e-14	5.822e-14	-13.235	-13.235	0.000
	HF2-	3.546e-17	3.372e-17	-16.450	-16.472	-0.022
	AlF4-	9.221e-18	8.769e-18	-17.035	-17.057	-0.022
	BF2(OH)2-	1.761e-18	1.674e-18	-17.754	-17.776	-0.022
	AlF5-2	6.766e-23	5.534e-23	-22.170	-22.257	-0.087
	FeF+2	2.155e-24	1.763e-24	-23.666	-23.754	-0.087
	BF3OH-	8.049e-26	7.654e-26	-25.094	-25.116	-0.022
	FeF2+	2.145e-26	2.040e-26	-25.669	-25.690	-0.022
	AlF6-3	5.183e-29	3.296e-29	-28.285	-28.482	-0.197
	FeF3	1.138e-29	1.139e-29	-28.944	-28.944	0.000
	BF4-	9.315e-33	8.858e-33	-32.031	-32.053	-0.022
	SiF6-2	0.000e+00	0.000e+00	-40.947	-41.035	-0.087
Fe(2)	8.954e-08					
	Fe+2	8.427e-08	6.929e-08	-7.074	-7.159	-0.085
	FeHCO3+	4.161e-09	3.957e-09	-8.381	-8.403	-0.022
	FeHPO4	4.742e-10	4.745e-10	-9.324	-9.324	0.000
	FeCO3	3.532e-10	3.534e-10	-9.452	-9.452	0.000
	FeCl+	1.037e-10	9.857e-11	-9.984	-10.006	-0.022
	FeH2PO4+	8.327e-11	7.919e-11	-10.079	-10.101	-0.022
	FeOH+	5.873e-11	5.585e-11	-10.231	-10.253	-0.022
	FeSO4	3.288e-11	3.290e-11	-10.483	-10.483	0.000
	FeF+	2.771e-13	2.635e-13	-12.557	-12.579	-0.022
	FeHSO4+	1.646e-17	1.566e-17	-16.783	-16.805	-0.022
	Fe(HS)2	1.390e-21	1.391e-21	-20.857	-20.857	0.000
	Fe(HS)3-	7.560e-31	7.189e-31	-30.121	-30.143	-0.022
Fe(3)	3.240e-16					
	Fe(OH)2+	1.982e-16	1.885e-16	-15.703	-15.725	-0.022
	Fe(OH)3	1.250e-16	1.251e-16	-15.903	-15.903	0.000

	Fe(OH)4-	6.672e-19	6.345e-19	-18.176	-18.198	-0.022
	FeOH+2	1.189e-19	9.726e-20	-18.925	-19.012	-0.087
	Fe+3	6.304e-24	4.131e-24	-23.200	-23.384	-0.184
	FeH2PO4+2	3.100e-24	2.535e-24	-23.509	-23.596	-0.087
	FeF+2	2.155e-24	1.763e-24	-23.666	-23.754	-0.087
	FeHPO4+	9.628e-25	9.156e-25	-24.016	-24.038	-0.022
	FeSO4+	1.166e-25	1.109e-25	-24.933	-24.955	-0.022
	FeCl+2	7.682e-26	6.282e-26	-25.115	-25.202	-0.087
	FeF2+	2.145e-26	2.040e-26	-25.669	-25.690	-0.022
	FeCl2+	6.224e-28	5.919e-28	-27.206	-27.228	-0.022
	FeF3	1.138e-29	1.139e-29	-28.944	-28.944	0.000
	Fe(SO4)2-	9.425e-30	8.963e-30	-29.026	-29.048	-0.022
	FeCl3	6.097e-32	6.100e-32	-31.215	-31.215	0.000
	FeHSO4+2	2.867e-32	2.344e-32	-31.543	-31.630	-0.087
	Fe2(OH)2+4	1.448e-36	6.476e-37	-35.839	-36.189	-0.349
	Fe3(OH)4+5	0.000e+00	0.000e+00	-48.142	-48.688	-0.546
H(0)		2.011e-12				
	H2	1.006e-12	1.006e-12	-11.998	-11.997	0.000
K		3.691e-05				
	K+	3.691e-05	3.508e-05	-4.433	-4.455	-0.022
	KSO4-	7.054e-10	6.708e-10	-9.152	-9.173	-0.022
	KHPO4-	1.237e-10	1.177e-10	-9.907	-9.929	-0.022
	KOH	1.676e-12	1.677e-12	-11.776	-11.775	0.000
Li		7.206e-07				
	Li+	7.206e-07	6.862e-07	-6.142	-6.164	-0.021
	LiSO4-	1.271e-11	1.209e-11	-10.896	-10.918	-0.022
	LiOH	2.166e-13	2.168e-13	-12.664	-12.664	0.000
Mg		2.012e-04				
	Mg+2	1.998e-04	1.642e-04	-3.699	-3.785	-0.085
	MgHCO3+	1.105e-06	1.051e-06	-5.957	-5.979	-0.022
	MgHPO4	1.372e-07	1.373e-07	-6.863	-6.862	0.000
	MgSO4	8.678e-08	8.682e-08	-7.062	-7.061	0.000
	MgCO3	2.412e-08	2.413e-08	-7.618	-7.617	0.000
	MgH2PO4+	8.306e-09	7.899e-09	-8.081	-8.102	-0.022
	MgPO4-	3.070e-09	2.919e-09	-8.513	-8.535	-0.022
	MgF+	2.881e-09	2.740e-09	-8.540	-8.562	-0.022
	MgOH+	1.124e-09	1.069e-09	-8.949	-8.971	-0.022
Mn(2)		4.551e-08				
	Mn+2	4.286e-08	3.524e-08	-7.368	-7.453	-0.085
	MnHCO3+	1.886e-09	1.793e-09	-8.724	-8.746	-0.022
	MnCO3	5.948e-10	5.951e-10	-9.226	-9.225	0.000
	MnCl+	1.556e-10	1.479e-10	-9.808	-9.830	-0.022
	MnSO4	1.643e-11	1.643e-11	-10.784	-10.784	0.000
	MnOH+	2.082e-12	1.980e-12	-11.681	-11.703	-0.022
	MnF+	9.748e-14	9.270e-14	-13.011	-13.033	-0.022
	MnCl2	6.652e-14	6.656e-14	-13.177	-13.177	0.000
	MnCl3-	1.987e-17	1.889e-17	-16.702	-16.724	-0.022
	Mn(NO3)2	0.000e+00	0.000e+00	-178.778	-178.777	0.000
Mn(3)		1.360e-37				
	Mn+3	1.360e-37	8.651e-38	-36.866	-37.063	-0.197
N(-3)		2.860e-07				
	NH4+	2.856e-07	2.713e-07	-6.544	-6.567	-0.022
	NH3	4.301e-10	4.303e-10	-9.366	-9.366	0.000
	NH4SO4-	1.483e-11	1.410e-11	-10.829	-10.851	-0.022
N(0)		5.829e-07				
	N2	2.915e-07	2.916e-07	-6.535	-6.535	0.000
N(3)		0.000e+00				
	NO2-	0.000e+00	0.000e+00	-63.896	-63.918	-0.022

N(5)	0.000e+00					
NO3-		0.000e+00	0.000e+00	-85.951	-85.973	-0.022
PbNO3+		0.000e+00	0.000e+00	-94.155	-94.177	-0.022
Mn(NO3)2		0.000e+00	0.000e+00	-178.778	-178.777	0.000
Na	4.742e-04					
Na+		4.740e-04	4.509e-04	-3.324	-3.346	-0.022
NaHCO3		1.447e-07	1.448e-07	-6.839	-6.839	0.000
NaSO4-		8.311e-09	7.904e-09	-8.080	-8.102	-0.022
NaHPO4-		1.590e-09	1.512e-09	-8.799	-8.820	-0.022
NaCO3-		6.007e-10	5.713e-10	-9.221	-9.243	-0.022
NaF		9.862e-11	9.867e-11	-10.006	-10.006	0.000
NaOH		4.106e-11	4.108e-11	-10.387	-10.386	0.000
O(0)	0.000e+00					
O2		0.000e+00	0.000e+00	-75.676	-75.676	0.000
P	4.843e-06					
H2PO4-		2.397e-06	2.280e-06	-5.620	-5.642	-0.022
HPO4-2		2.104e-06	1.720e-06	-5.677	-5.764	-0.087
CaHPO4		1.759e-07	1.760e-07	-6.755	-6.755	0.000
MgHPO4		1.372e-07	1.373e-07	-6.863	-6.862	0.000
CaH2PO4+		1.130e-08	1.075e-08	-7.947	-7.969	-0.022
MgH2PO4+		8.306e-09	7.899e-09	-8.081	-8.102	-0.022
CaPO4-		3.943e-09	3.750e-09	-8.404	-8.426	-0.022
MgPO4-		3.070e-09	2.919e-09	-8.513	-8.535	-0.022
NaHPO4-		1.590e-09	1.512e-09	-8.799	-8.820	-0.022
FeHPO4		4.742e-10	4.745e-10	-9.324	-9.324	0.000
KHPO4-		1.237e-10	1.177e-10	-9.907	-9.929	-0.022
FeH2PO4+		8.327e-11	7.919e-11	-10.079	-10.101	-0.022
PO4-3		1.071e-11	6.808e-12	-10.970	-11.167	-0.197
FeH2PO4+2		3.100e-24	2.535e-24	-23.509	-23.596	-0.087
FeHPO4+		9.628e-25	9.156e-25	-24.016	-24.038	-0.022
Pb	2.413e-09					
PbCO3		1.562e-09	1.563e-09	-8.806	-8.806	0.000
Pb+2		5.172e-10	4.229e-10	-9.286	-9.374	-0.087
PbHCO3+		2.017e-10	1.919e-10	-9.695	-9.717	-0.022
PbOH+		1.196e-10	1.137e-10	-9.922	-9.944	-0.022
PbCl+		1.042e-11	9.911e-12	-10.982	-11.004	-0.022
Pb(CO3)2-2		1.021e-12	8.346e-13	-11.991	-12.078	-0.087
PbSO4		9.594e-13	9.599e-13	-12.018	-12.018	0.000
Pb(OH)2		6.097e-13	6.100e-13	-12.215	-12.215	0.000
PbCl2		2.468e-14	2.469e-14	-13.608	-13.607	0.000
Pb(OH)3-		1.015e-16	9.657e-17	-15.993	-16.015	-0.022
Pb(SO4)2-2		2.486e-17	2.033e-17	-16.604	-16.692	-0.087
PbCl3-		1.849e-17	1.758e-17	-16.733	-16.755	-0.022
Pb2OH+3		1.693e-18	1.077e-18	-17.771	-17.968	-0.197
PbCl4-2		8.912e-21	7.288e-21	-20.050	-20.137	-0.087
Pb(OH)4-2		3.730e-21	3.050e-21	-20.428	-20.516	-0.087
PbNO3+		0.000e+00	0.000e+00	-94.155	-94.177	-0.022
S(-2)	1.146e-11					
H2S		6.464e-12	6.468e-12	-11.189	-11.189	0.000
HS-		4.993e-12	4.746e-12	-11.302	-11.324	-0.022
S-2		2.052e-18	1.682e-18	-17.688	-17.774	-0.086
Fe(HS)2		1.390e-21	1.391e-21	-20.857	-20.857	0.000
Fe(HS)3-		7.560e-31	7.189e-31	-30.121	-30.143	-0.022
S(6)	5.205e-06					
SO4-2		4.923e-06	4.036e-06	-5.308	-5.394	-0.086
CaSO4		1.855e-07	1.855e-07	-6.732	-6.732	0.000
MgSO4		8.678e-08	8.682e-08	-7.062	-7.061	0.000
NaSO4-		8.311e-09	7.904e-09	-8.080	-8.102	-0.022

```
      KSO4-              7.054e-10   6.708e-10    -9.152    -9.173    -0.022
      SrSO4              5.063e-10   5.066e-10    -9.296    -9.295     0.000
      BaSO4              6.011e-11   6.014e-11   -10.221   -10.221     0.000
      FeSO4              3.288e-11   3.290e-11   -10.483   -10.483     0.000
      ZnSO4              2.260e-11   2.261e-11   -10.646   -10.646     0.000
      HSO4-              1.976e-11   1.879e-11   -10.704   -10.726    -0.022
      MnSO4              1.643e-11   1.643e-11   -10.784   -10.784     0.000
      NH4SO4-            1.483e-11   1.410e-11   -10.829   -10.851    -0.022
      LiSO4-             1.271e-11   1.209e-11   -10.896   -10.918    -0.022
      PbSO4              9.594e-13   9.599e-13   -12.018   -12.018     0.000
      CdSO4              6.731e-13   6.734e-13   -12.172   -12.172     0.000
      AlSO4+             2.215e-13   2.106e-13   -12.655   -12.676    -0.022
      CaHSO4+            6.761e-14   6.429e-14   -13.170   -13.192    -0.022
      Zn(SO4)2-2         1.079e-15   8.826e-16   -14.967   -15.054    -0.087
      Cd(SO4)2-2         4.184e-17   3.422e-17   -16.378   -16.466    -0.087
      CuSO4              2.668e-17   2.669e-17   -16.574   -16.574     0.000
      Al(SO4)2-          2.546e-17   2.421e-17   -16.594   -16.616    -0.022
      Pb(SO4)2-2         2.486e-17   2.033e-17   -16.604   -16.692    -0.087
      FeHSO4+            1.646e-17   1.566e-17   -16.783   -16.805    -0.022
      AlHSO4+2           1.466e-21   1.199e-21   -20.834   -20.921    -0.087
      FeSO4+             1.166e-25   1.109e-25   -24.933   -24.955    -0.022
      Fe(SO4)2-          9.425e-30   8.963e-30   -29.026   -29.048    -0.022
      FeHSO4+2           2.867e-32   2.344e-32   -31.543   -31.630    -0.087
Si                9.121e-06
      H4SiO4             9.113e-06   9.118e-06    -5.040    -5.040     0.000
      H3SiO4-            8.397e-09   7.985e-09    -8.076    -8.098    -0.022
      H2SiO4-2           1.941e-15   1.587e-15   -14.712   -14.799    -0.087
      SiF6-2             0.000e+00   0.000e+00   -40.947   -41.035    -0.087
Sr                1.027e-06
      Sr+2               1.023e-06   8.399e-07    -5.990    -6.076    -0.086
      SrHCO3+            3.756e-09   3.575e-09    -8.425    -8.447    -0.021
      SrSO4              5.063e-10   5.066e-10    -9.296    -9.295     0.000
      SrCO3              6.128e-11   6.131e-11   -10.213   -10.212     0.000
      SrOH+              6.241e-13   5.939e-13   -12.205   -12.226    -0.022
Zn                3.825e-08
      Zn+2               3.468e-08   2.844e-08    -7.460    -7.546    -0.086
      ZnHCO3+            2.150e-09   2.044e-09    -8.668    -8.689    -0.022
      ZnCO3              1.206e-09   1.206e-09    -8.919    -8.919     0.000
      ZnOH+              8.147e-11   7.748e-11   -10.089   -10.111    -0.022
      Zn(OH)2            6.803e-11   6.806e-11   -10.167   -10.167     0.000
      ZnCl+              3.063e-11   2.913e-11   -10.514   -10.536    -0.022
      ZnSO4              2.260e-11   2.261e-11   -10.646   -10.646     0.000
      Zn(CO3)2-2         6.706e-12   5.484e-12   -11.174   -11.261    -0.087
      ZnCl2              2.869e-14   2.871e-14   -13.542   -13.542     0.000
      Zn(OH)3-           3.121e-15   2.968e-15   -14.506   -14.528    -0.022
      Zn(SO4)2-2         1.079e-15   8.826e-16   -14.967   -15.054    -0.087
      ZnCl3-             3.048e-17   2.899e-17   -16.516   -16.538    -0.022
      ZnCl4-2            1.531e-20   1.252e-20   -19.815   -19.902    -0.087
      Zn(OH)4-2          7.930e-21   6.485e-21   -20.101   -20.188    -0.087

-----------------------------Saturation indices-------------------------------

      Phase               SI log IAP  log KT

      Al(OH)3(a)       -1.51   10.76   12.27  Al(OH)3
      Albite           -6.16   -0.56    5.59  NaAlSi3O8
      Alunite          -5.76   -4.37    1.39  KAl3(SO4)2(OH)6
      Anglesite        -6.86  -14.77   -7.91  PbSO4
```

◎ Table of Contents

Anhydrite	-4.59	-8.94	-4.35	CaSO4
Anorthite	-7.53	22.18	29.71	CaAl2Si2O8
Aragonite	-1.99	-10.22	-8.23	CaCO3
Barite	-2.54	-12.92	-10.38	BaSO4
Ca-Montmorillonite	-1.70	8.35	10.06	Ca0.165Al2.33Si3.67O10(OH)2
Calcite	-1.83	-10.22	-8.39	CaCO3
Cd(OH)2	-8.55	5.10	13.65	Cd(OH)2
CdSiO3	-9.92	0.06	9.98	CdSiO3
CdSO4	-15.29	-14.57	0.72	CdSO4
Celestite	-4.81	-11.47	-6.66	SrSO4
Cerrusite	-2.65	-16.05	-13.40	PbCO3
CH4(g)	-9.60	-56.73	-47.13	CH4
Chalcedony	-1.23	-5.04	-3.81	SiO2
Chlorite(14A)	-17.92	58.88	76.79	Mg5Al2Si3O10(OH)8
Chrysotile	-13.59	21.40	34.99	Mg3Si2O5(OH)4
CO2(g)	-2.68	-20.95	-18.27	CO2
Dolomite	-4.11	-20.68	-16.57	CaMg(CO3)2
Fe(OH)3(a)	-6.86	11.59	18.45	Fe(OH)3
FeS(ppt)	-7.43	-48.33	-40.91	FeS
Fluorite	-5.50	-16.39	-10.89	CaF2
Gibbsite	1.39	10.76	9.38	Al(OH)3
Goethite	-1.77	11.59	13.36	FeOOH
Gypsum	-4.34	-8.94	-4.60	CaSO4:2H2O
H2(g)	-8.95	-8.95	0.00	H2
H2S(g)	-10.45	-55.45	-45.01	H2S
Hausmannite	-37.20	29.42	66.62	Mn3O4
Hematite	-1.64	23.18	24.82	Fe2O3
Hydroxyapatite	-5.05	-44.09	-39.04	Ca5(PO4)3OH
Illite	-2.92	11.35	14.27	K0.6Mg0.25Al2.3Si3.5O10(OH)2
Jarosite-K	-35.09	-1.88	33.20	KFe3(SO4)2(OH)6
K-feldspar	-4.42	-1.67	2.75	KAlSi3O8
K-mica	3.85	19.85	16.00	KAl3Si3O10(OH)2
Kaolinite	2.05	11.45	9.40	Al2Si2O5(OH)4
Mackinawite	-6.70	-48.33	-41.64	FeS
Manganite	-14.04	11.30	25.34	MnOOH
Melanterite	-10.05	-12.55	-2.50	FeSO4:7H2O
N2(g)	-3.35	-6.54	-3.18	N2
NH3(g)	-11.59	-16.69	-5.10	NH3
O2(g)	-72.82	17.89	90.71	O2
Otavite	-3.75	-15.85	-12.10	CdCO3
Pb(OH)2	-4.02	4.91	8.93	Pb(OH)2
Pyrite	-1.76	-94.84	-93.09	FeS2
Pyrochroite	-8.37	6.83	15.20	Mn(OH)2
Pyrolusite	-29.23	15.77	45.00	MnO2
Quartz	-0.73	-5.04	-4.31	SiO2
Rhodochrosite	-3.07	-14.13	-11.05	MnCO3
Sepiolite	-10.49	5.87	16.35	Mg2Si3O7.5OH:3H2O
Sepiolite(d)	-12.79	5.87	18.66	Mg2Si3O7.5OH:3H2O
Siderite	-3.08	-13.83	-10.75	FeCO3
SiO2(a)	-2.14	-5.04	-2.90	SiO2
Smithsonite	-4.46	-14.22	-9.76	ZnCO3
Sphalerite	0.35	-48.72	-49.07	ZnS
Strontianite	-3.43	-12.75	-9.32	SrCO3
Sulfur	-7.65	-46.51	-38.85	S
Talc	-12.65	11.32	23.97	Mg3Si4O10(OH)2
Vivianite	-7.81	-43.81	-36.00	Fe3(PO4)2:8H2O
Willemite	-8.76	8.43	17.18	Zn2SiO4
Witherite	-5.51	-14.20	-8.69	BaCO3

```
      Zn(OH)2(e)       -4.77    6.73   11.50  Zn(OH)2

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End of simulation.
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------------------------------------
Reading input data for simulation 8.
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End of run.
-----------
```

◎ Table of Contents

```
------------------
Reading data base.
------------------

      SOLUTION_MASTER_SPECIES
      SOLUTION_SPECIES
      PHASES
      EXCHANGE_MASTER_SPECIES
      EXCHANGE_SPECIES
      SURFACE_MASTER_SPECIES
      SURFACE_SPECIES
      END
-----------------------------------
Reading input data for simulation 1.
-----------------------------------

      SOLUTION 1 B2 Mineralized Zone
            temp  4
            pH    8.46
            pe    4
            redox pe
            units ug/l
            density     1
            Alkalinity  34000 gfw 50.04
            Al    86.1
            Ba    0.89
            Ca    9290
            Cd    0.05
            Cu(2) 11.12
            Fe(3) 18.37
            K     284
            Mg    3007
            Mn(2) 35.53
            Pb    1.2
            S(6)  3860
            Sr    13.63
            Zn    0.81
            Na    415
            P     50
      SAVE solution 1
      END
----------------------------------------
Beginning of initial solution calculations.
----------------------------------------

Initial solution 1.     B2 Mineralized Zone

-----------------------------Solution composition------------------------------

      Elements           Molality       Moles

      Al                 3.191e-06   3.191e-06
      Alkalinity         6.795e-04   6.795e-04
      Ba                 6.481e-09   6.481e-09
      Ca                 2.318e-04   2.318e-04
      Cd                 4.449e-10   4.449e-10
      Cu(2)              1.750e-07   1.750e-07
      Fe(3)              3.290e-07   3.290e-07
```

```
      K                 7.263e-06   7.263e-06
      Mg                1.237e-04   1.237e-04
      Mn(2)             6.468e-07   6.468e-07
      Na                1.805e-05   1.805e-05
      P                 1.614e-06   1.614e-06
      Pb                5.792e-09   5.792e-09
      S(6)              4.018e-05   4.018e-05
      Sr                1.556e-07   1.556e-07
      Zn                1.239e-08   1.239e-08

----------------------------Description of solution----------------------------

                            pH  =   8.460
                            pe  =   4.000
               Activity of water  =   1.000
                  Ionic strength  =   1.132e-03
              Mass of water (kg)  =   1.000e+00
         Total carbon (mol/kg)    =   6.638e-04
            Total CO2 (mol/kg)    =   6.638e-04
           Temperature (deg C)    =   4.000
    Electrical balance (eq)       =  -1.327e-05
                    Iterations    =   8
                       Total H    = 1.110131e+02
                       Total O    = 5.550838e+01

----------------------------Distribution of species----------------------------

                                                 Log       Log         Log
      Species             Molality    Activity  Molality  Activity     Gamma

      OH-               5.043e-07   4.861e-07    -6.297    -6.313    -0.016
      H+                3.590e-09   3.467e-09    -8.445    -8.460    -0.015
      H2O               5.551e+01   1.000e+00     0.000     0.000     0.000
Al                3.191e-06
      Al(OH)4-          3.184e-06   3.069e-06    -5.497    -5.513    -0.016
      Al(OH)3           6.541e-09   6.543e-09    -8.184    -8.184     0.000
      Al(OH)2+          9.546e-10   9.203e-10    -9.020    -9.036    -0.016
      AlOH+2            3.790e-12   3.273e-12   -11.421   -11.485    -0.064
      Al+3              6.534e-15   4.777e-15   -14.185   -14.321    -0.136
      AlSO4+            3.908e-16   3.768e-16   -15.408   -15.424    -0.016
      Al(SO4)2-         3.720e-19   3.586e-19   -18.429   -18.445    -0.016
      AlHSO4+2          1.187e-25   1.025e-25   -24.926   -24.989    -0.064
Ba                6.481e-09
      Ba+2              6.362e-09   5.503e-09    -8.196    -8.259    -0.063
      BaSO4             9.217e-11   9.219e-11   -10.035   -10.035     0.000
      BaHCO3+           1.764e-11   1.700e-11   -10.754   -10.769    -0.016
      BaCO3             9.063e-12   9.066e-12   -11.043   -11.043     0.000
      BaOH+             5.578e-14   5.378e-14   -13.254   -13.269    -0.016
C(4)              6.638e-04
      HCO3-             6.473e-04   6.243e-04    -3.189    -3.205    -0.016
      CO2               7.299e-06   7.301e-06    -5.137    -5.137     0.000
      CO3-2             5.617e-06   4.862e-06    -5.250    -5.313    -0.063
      CaCO3             1.291e-06   1.292e-06    -5.889    -5.889     0.000
      CaHCO3+           9.833e-07   9.485e-07    -6.007    -6.023    -0.016
      MgHCO3+           7.667e-07   7.392e-07    -6.115    -6.131    -0.016
      MgCO3             3.550e-07   3.551e-07    -6.450    -6.450     0.000
      MnCO3             1.557e-07   1.558e-07    -6.808    -6.807     0.000
      MnHCO3+           2.328e-08   2.245e-08    -7.633    -7.649    -0.016
```

	NaHCO3	6.106e-09	6.108e-09	-8.214	-8.214	0.000
	PbCO3	5.215e-09	5.216e-09	-8.283	-8.283	0.000
	ZnCO3	3.496e-09	3.497e-09	-8.456	-8.456	0.000
	SrHCO3+	6.433e-10	6.205e-10	-9.192	-9.207	-0.016
	NaCO3-	5.228e-10	5.040e-10	-9.282	-9.298	-0.016
	Zn(CO3)2-2	4.208e-10	3.635e-10	-9.376	-9.440	-0.064
	ZnHCO3+	2.939e-10	2.833e-10	-9.532	-9.548	-0.016
	SrCO3	2.225e-10	2.226e-10	-9.653	-9.653	0.000
	Pb(CO3)2-2	7.374e-11	6.370e-11	-10.132	-10.196	-0.064
	PbHCO3+	3.176e-11	3.062e-11	-10.498	-10.514	-0.016
	BaHCO3+	1.764e-11	1.700e-11	-10.754	-10.769	-0.016
	BaCO3	9.063e-12	9.066e-12	-11.043	-11.043	0.000
	CdHCO3+	7.620e-12	7.346e-12	-11.118	-11.134	-0.016
	CdCO3	1.437e-12	1.437e-12	-11.843	-11.843	0.000
	Cd(CO3)2-2	2.558e-14	2.209e-14	-13.592	-13.656	-0.064
Ca		2.318e-04				
	Ca+2	2.283e-04	1.976e-04	-3.641	-3.704	-0.063
	CaCO3	1.291e-06	1.292e-06	-5.889	-5.889	0.000
	CaSO4	1.067e-06	1.067e-06	-5.972	-5.972	0.000
	CaHCO3+	9.833e-07	9.485e-07	-6.007	-6.023	-0.016
	CaHPO4	8.172e-08	8.174e-08	-7.088	-7.088	0.000
	CaPO4-	3.779e-08	3.643e-08	-7.423	-7.439	-0.016
	CaOH+	9.810e-09	9.457e-09	-8.008	-8.024	-0.016
	CaH2PO4+	2.476e-10	2.387e-10	-9.606	-9.622	-0.016
	CaHSO4+	1.834e-14	1.768e-14	-13.737	-13.753	-0.016
Cd		4.449e-10				
	Cd+2	4.308e-10	3.721e-10	-9.366	-9.429	-0.064
	CdHCO3+	7.620e-12	7.346e-12	-11.118	-11.134	-0.016
	CdSO4	3.124e-12	3.124e-12	-11.505	-11.505	0.000
	CdOH+	1.734e-12	1.671e-12	-11.761	-11.777	-0.016
	CdCO3	1.437e-12	1.437e-12	-11.843	-11.843	0.000
	Cd(OH)2	1.382e-13	1.382e-13	-12.859	-12.859	0.000
	Cd(CO3)2-2	2.558e-14	2.209e-14	-13.592	-13.656	-0.064
	Cd(SO4)2-2	1.522e-15	1.315e-15	-14.818	-14.881	-0.064
	Cd(OH)3-	4.640e-18	4.473e-18	-17.333	-17.349	-0.016
	Cd(OH)4-2	1.331e-23	1.150e-23	-22.876	-22.939	-0.064
Cu(2)		1.750e-07				
	Cu(OH)2	1.746e-07	1.746e-07	-6.758	-6.758	0.000
	CuOH+	3.006e-10	2.898e-10	-9.522	-9.538	-0.016
	Cu+2	1.160e-10	1.005e-10	-9.936	-9.998	-0.062
	Cu(OH)3-	3.148e-12	3.035e-12	-11.502	-11.518	-0.016
	CuSO4	5.866e-13	5.868e-13	-12.232	-12.232	0.000
	Cu(OH)4-2	2.022e-16	1.746e-16	-15.694	-15.758	-0.064
Fe(3)		3.290e-07				
	Fe(OH)3	2.776e-07	2.777e-07	-6.557	-6.556	0.000
	Fe(OH)4-	3.056e-08	2.946e-08	-7.515	-7.531	-0.016
	Fe(OH)2+	2.076e-08	2.001e-08	-7.683	-7.699	-0.016
	FeOH+2	5.714e-13	4.936e-13	-12.243	-12.307	-0.064
	Fe+3	1.371e-18	1.002e-18	-17.863	-17.999	-0.136
	FeSO4+	2.311e-19	2.228e-19	-18.636	-18.652	-0.016
	FeHPO4+	1.541e-19	1.486e-19	-18.812	-18.828	-0.016
	FeH2PO4+2	2.278e-20	1.967e-20	-19.642	-19.706	-0.064
	Fe(SO4)2-	1.547e-22	1.492e-22	-21.810	-21.826	-0.016
	Fe2(OH)2+4	2.996e-23	1.668e-23	-22.523	-22.778	-0.254
	FeHSO4+2	2.608e-27	2.253e-27	-26.584	-26.647	-0.064
	Fe3(OH)4+5	1.400e-27	5.607e-28	-26.854	-27.251	-0.397
H(0)		2.131e-28				
	H2	1.066e-28	1.066e-28	-27.972	-27.972	0.000

K	7.263e-06					
K+		7.262e-06	7.000e-06	-5.139	-5.155	-0.016
KSO4-		1.150e-09	1.109e-09	-8.939	-8.955	-0.016
KHPO4-		1.629e-11	1.570e-11	-10.788	-10.804	-0.016
KOH		6.998e-12	7.000e-12	-11.155	-11.155	0.000
Mg	1.237e-04					
Mg+2		1.220e-04	1.057e-04	-3.914	-3.976	-0.062
MgHCO3+		7.667e-07	7.392e-07	-6.115	-6.131	-0.016
MgSO4		4.626e-07	4.627e-07	-6.335	-6.335	0.000
MgCO3		3.550e-07	3.551e-07	-6.450	-6.450	0.000
MgHPO4		5.909e-08	5.910e-08	-7.229	-7.228	0.000
MgPO4-		2.726e-08	2.628e-08	-7.564	-7.580	-0.016
MgOH+		1.492e-08	1.439e-08	-7.826	-7.842	-0.016
MgH2PO4+		1.686e-10	1.626e-10	-9.773	-9.789	-0.016
Mn(2)	6.468e-07					
Mn+2		4.657e-07	4.034e-07	-6.332	-6.394	-0.062
MnCO3		1.557e-07	1.558e-07	-6.808	-6.807	0.000
MnHCO3+		2.328e-08	2.245e-08	-7.633	-7.649	-0.016
MnSO4		1.558e-09	1.558e-09	-8.807	-8.807	0.000
MnOH+		4.919e-10	4.742e-10	-9.308	-9.324	-0.016
Na	1.805e-05					
Na+		1.804e-05	1.740e-05	-4.744	-4.760	-0.016
NaHCO3		6.106e-09	6.108e-09	-8.214	-8.214	0.000
NaSO4-		2.620e-09	2.526e-09	-8.582	-8.598	-0.016
NaCO3-		5.228e-10	5.040e-10	-9.282	-9.298	-0.016
NaHPO4-		4.049e-11	3.903e-11	-10.393	-10.409	-0.016
NaOH		3.314e-11	3.315e-11	-10.480	-10.480	0.000
O(0)	0.000e+00					
O2		0.000e+00	0.000e+00	-43.726	-43.726	0.000
P	1.614e-06					
HPO4-2		1.332e-06	1.151e-06	-5.875	-5.939	-0.064
CaHPO4		8.172e-08	8.174e-08	-7.088	-7.088	0.000
H2PO4-		7.564e-08	7.293e-08	-7.121	-7.137	-0.016
MgHPO4		5.909e-08	5.910e-08	-7.229	-7.228	0.000
CaPO4-		3.779e-08	3.643e-08	-7.423	-7.439	-0.016
MgPO4-		2.726e-08	2.628e-08	-7.564	-7.580	-0.016
CaH2PO4+		2.476e-10	2.387e-10	-9.606	-9.622	-0.016
MgH2PO4+		1.686e-10	1.626e-10	-9.773	-9.789	-0.016
PO4-3		1.325e-10	9.526e-11	-9.878	-10.021	-0.143
NaHPO4-		4.049e-11	3.903e-11	-10.393	-10.409	-0.016
KHPO4-		1.629e-11	1.570e-11	-10.788	-10.804	-0.016
FeHPO4+		1.541e-19	1.486e-19	-18.812	-18.828	-0.016
FeH2PO4+2		2.278e-20	1.967e-20	-19.642	-19.706	-0.064
Pb	5.792e-09					
PbCO3		5.215e-09	5.216e-09	-8.283	-8.283	0.000
PbOH+		3.601e-10	3.472e-10	-9.444	-9.459	-0.016
Pb(CO3)2-2		7.374e-11	6.370e-11	-10.132	-10.196	-0.064
Pb+2		7.147e-11	6.174e-11	-10.146	-10.209	-0.064
Pb(OH)2		3.894e-11	3.895e-11	-10.410	-10.409	0.000
PbHCO3+		3.176e-11	3.062e-11	-10.498	-10.514	-0.016
PbSO4		1.160e-12	1.161e-12	-11.935	-11.935	0.000
Pb(OH)3-		1.338e-13	1.290e-13	-12.874	-12.889	-0.016
Pb(SO4)2-2		2.357e-16	2.036e-16	-15.628	-15.691	-0.064
Pb(OH)4-2		9.866e-17	8.522e-17	-16.006	-16.069	-0.064
Pb2OH+3		6.671e-19	4.799e-19	-18.176	-18.319	-0.143
S(6)	4.018e-05					
SO4-2		3.865e-05	3.343e-05	-4.413	-4.476	-0.063
CaSO4		1.067e-06	1.067e-06	-5.972	-5.972	0.000

```
      MgSO4              4.626e-07   4.627e-07    -6.335    -6.335     0.000
      NaSO4-             2.620e-09   2.526e-09    -8.582    -8.598    -0.016
      MnSO4              1.558e-09   1.558e-09    -8.807    -8.807     0.000
      KSO4-              1.150e-09   1.109e-09    -8.939    -8.955    -0.016
      SrSO4              6.659e-10   6.661e-10    -9.177    -9.176     0.000
      BaSO4              9.217e-11   9.219e-11   -10.035   -10.035     0.000
      ZnSO4              2.373e-11   2.374e-11   -10.625   -10.625     0.000
      HSO4-              7.719e-12   7.442e-12   -11.112   -11.128    -0.016
      CdSO4              3.124e-12   3.124e-12   -11.505   -11.505     0.000
      PbSO4              1.160e-12   1.161e-12   -11.935   -11.935     0.000
      CuSO4              5.866e-13   5.868e-13   -12.232   -12.232     0.000
      CaHSO4+            1.834e-14   1.768e-14   -13.737   -13.753    -0.016
      Zn(SO4)2-2         8.885e-15   7.675e-15   -14.051   -14.115    -0.064
      Cd(SO4)2-2         1.522e-15   1.315e-15   -14.818   -14.881    -0.064
      AlSO4+             3.908e-16   3.768e-16   -15.408   -15.424    -0.016
      Pb(SO4)2-2         2.357e-16   2.036e-16   -15.628   -15.691    -0.064
      Al(SO4)2-          3.720e-19   3.586e-19   -18.429   -18.445    -0.016
      FeSO4+             2.311e-19   2.228e-19   -18.636   -18.652    -0.016
      Fe(SO4)2-          1.547e-22   1.492e-22   -21.810   -21.826    -0.016
      AlHSO4+2           1.187e-25   1.025e-25   -24.926   -24.989    -0.064
      FeHSO4+2           2.608e-27   2.253e-27   -26.584   -26.647    -0.064
Sr                1.556e-07
      Sr+2               1.540e-07   1.333e-07    -6.812    -6.875    -0.063
      SrSO4              6.659e-10   6.661e-10    -9.177    -9.176     0.000
      SrHCO3+            6.433e-10   6.205e-10    -9.192    -9.207    -0.016
      SrCO3              2.225e-10   2.226e-10    -9.653    -9.653     0.000
      SrOH+              2.045e-12   1.972e-12   -11.689   -11.705    -0.016
Zn                1.239e-08
      Zn+2               4.167e-09   3.605e-09    -8.380    -8.443    -0.063
      Zn(OH)2            3.773e-09   3.774e-09    -8.423    -8.423     0.000
      ZnCO3              3.496e-09   3.497e-09    -8.456    -8.456     0.000
      Zn(CO3)2-2         4.208e-10   3.635e-10    -9.376    -9.440    -0.064
      ZnHCO3+            2.939e-10   2.833e-10    -9.532    -9.548    -0.016
      ZnOH+              2.131e-10   2.054e-10    -9.671    -9.687    -0.016
      ZnSO4              2.373e-11   2.374e-11   -10.625   -10.625     0.000
      Zn(OH)3-           3.571e-12   3.442e-12   -11.447   -11.463    -0.016
      Zn(SO4)2-2         8.885e-15   7.675e-15   -14.051   -14.115    -0.064
      Zn(OH)4-2          1.822e-16   1.573e-16   -15.740   -15.803    -0.064

------------------------------Saturation indices-------------------------------

      Phase               SI log IAP  log KT

      Al(OH)3(a)       -1.21   11.06   12.27  Al(OH)3
      Alunite          -7.70   -6.31    1.39  KAl3(SO4)2(OH)6
      Anglesite        -6.78  -14.69   -7.91  PbSO4
      Anhydrite        -3.83   -8.18   -4.35  CaSO4
      Aragonite        -0.79   -9.02   -8.23  CaCO3
      Barite           -2.35  -12.74  -10.38  BaSO4
      Calcite          -0.63   -9.02   -8.39  CaCO3
      Cd(OH)2          -6.16    7.49   13.65  Cd(OH)2
      CdSO4           -14.62  -13.91    0.72  CdSO4
      Celestite        -4.69  -11.35   -6.66  SrSO4
      Cerrusite        -2.12  -15.52  -13.40  PbCO3
      CO2(g)           -3.96  -22.23  -18.27  CO2
      Dolomite         -1.74  -18.31  -16.57  CaMg(CO3)2
      Fe(OH)3(a)        2.49    7.38    4.89  Fe(OH)3
      Gibbsite          1.68   11.06    9.38  Al(OH)3
```

```
      Goethite          7.58    7.38   -0.20  FeOOH
      Gypsum           -3.58   -8.18   -4.60  CaSO4:2H2O
      H2(g)           -24.92  -24.92    0.00  H2
      Hausmannite     -10.12   56.50   66.62  Mn3O4
      Hematite         17.06   14.76   -2.29  Fe2O3
      Hydroxyapatite   -1.09  -40.12  -39.04  Ca5(PO4)3OH
      Jarosite-K       -9.87  -17.34   -7.47  KFe3(SO4)2(OH)6
      Manganite        -2.35   22.99   25.34  MnOOH
      O2(g)           -40.87   49.84   90.71  O2
      Otavite          -2.64  -14.74  -12.10  CdCO3
      Pb(OH)2          -2.22    6.71    8.93  Pb(OH)2
      Pyrochroite      -4.67   10.53   15.20  Mn(OH)2
      Pyrolusite       -9.55   35.45   45.00  MnO2
      Rhodochrosite    -0.66  -11.71  -11.05  MnCO3
      Smithsonite      -4.00  -13.76   -9.76  ZnCO3
      Strontianite     -2.87  -12.19   -9.32  SrCO3
      Witherite        -4.88  -13.57   -8.69  BaCO3
      Zn(OH)2(e)       -3.02    8.48   11.50  Zn(OH)2

------------------
End of simulation.
------------------

------------------------------------
Reading input data for simulation 2.
------------------------------------

      SOLUTION 2 Rain Water
            temp  4
            pH    7.0   CO2(g) 0.0
            pe    4.0
            redox pe
            units ug/l
            density     1.0
      EQUILIBRIUM_PHASES 1
            CO2(g)      -3.5        10.0
      SAVE solution 2
      END
-----------------------------------------
Beginning of initial solution calculations.
-----------------------------------------

Initial solution 2.     Rain Water

-----------------------------Solution composition------------------------------

      Elements           Molality       Moles

      Pure water

----------------------------Description of solution----------------------------

                              pH  =   6.480      Equilibrium with CO2(g)
                              pe  =   4.000
                 Activity of water  =   1.000
                    Ionic strength  =   1.683e-07
                 Mass of water (kg)  =   1.000e+00
          Total alkalinity (eq/kg)  =  -3.265e-07
```

◎ Table of Contents

```
          Total carbon (mol/kg)  =   0.000e+00
             Total CO2 (mol/kg)  =   0.000e+00
           Temperature (deg C)  =   4.000
        Electrical balance (eq)  =   3.265e-07
                    Iterations  =   3
                       Total H  = 1.110124e+02
                       Total O  = 5.550622e+01

----------------------------Distribution of species----------------------------

                                                 Log       Log         Log
      Species            Molality    Activity  Molality  Activity     Gamma

      H+                3.316e-07   3.314e-07    -6.479    -6.480     0.000
      OH-               5.088e-09   5.086e-09    -8.293    -8.294     0.000
      H2O               5.551e+01   1.000e+00     0.000     0.000     0.000
H(0)            1.948e-24
      H2                9.738e-25   9.738e-25   -24.012   -24.012     0.000
O(0)            0.000e+00
      O2                0.000e+00   0.000e+00   -51.648   -51.648     0.000

------------------------------Saturation indices------------------------------

      Phase               SI log IAP  log KT

      H2(g)           -20.96  -20.96    0.00  H2
      O2(g)           -48.79   41.92   90.71  O2

-----------------------------------
Beginning of reaction calculations.
-----------------------------------

Reaction step 1.

Using solution 2. Rain Water

Using pure phase assemblage 1.

------------------------------Phase assemblage------------------------------

                                                      Moles in assemblage
      Phase               SI log IAP  log KT    Initial      Final      Delta

      CO2(g)          -3.50  -21.77  -18.27  1.000e+01  1.000e+01 -2.344e-05

----------------------------Solution composition----------------------------

      Elements           Molality       Moles

      C                 2.344e-05   2.344e-05

----------------------------Description of solution----------------------------

                            pH  =   5.574      Charge balance
                            pe  =   4.003      Adjusted to redox equilibrium
             Activity of water  =   1.000
                Ionic strength  =   2.511e-06
            Mass of water (kg)  =   1.000e+00
```

```
       Total alkalinity (eq/kg)  =  -3.265e-07
             Total CO2 (mol/kg)  =   2.344e-05
            Temperature (deg C)  =   4.000
        Electrical balance (eq)  =   3.265e-07
                     Iterations  =   7
                        Total H  = 1.110124e+02
                        Total O  = 5.550626e+01

----------------------------Distribution of species----------------------------

                                                 Log       Log         Log
      Species            Molality    Activity  Molality  Activity     Gamma

      H+                 2.674e-06   2.669e-06    -5.573    -5.574    -0.001
      OH-                6.326e-10   6.314e-10    -9.199    -9.200    -0.001
      H2O                5.551e+01   1.000e+00     0.000     0.000     0.000
C(-4)            0.000e+00
      CH4                0.000e+00   0.000e+00   -53.922   -53.922     0.000
C(4)             2.344e-05
      CO2                2.109e-05   2.109e-05    -4.676    -4.676     0.000
      HCO3-              2.347e-06   2.343e-06    -5.629    -5.630    -0.001
      CO3-2              2.387e-11   2.370e-11   -10.622   -10.625    -0.003
H(0)             1.247e-22
      H2                 6.237e-23   6.237e-23   -22.205   -22.205     0.000
O(0)             0.000e+00
      O2                 0.000e+00   0.000e+00   -55.261   -55.261     0.000

------------------------------Saturation indices-------------------------------

      Phase               SI log IAP  log KT

      CH4(g)          -51.25  -98.38  -47.13  CH4
      CO2(g)           -3.50  -21.77  -18.27  CO2
      H2(g)           -19.15  -19.15    0.00  H2
      O2(g)           -52.40   38.31   90.71  O2

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End of simulation.
------------------

-----------------------------------
Reading input data for simulation 3.
-----------------------------------

      MIX 1 Mixing B2 Minzo and Rain Water
            1     0.5
            2     0.5
      SAVE solution 3
      END
-----------------------------------
Beginning of reaction calculations.
-----------------------------------

Reaction step 1.

Using mixture 1.  Mixing B2 Minzo and Rain Water

       5.000e-01 Solution 1   B2 Mineralized Zone
```

◎ Table of Contents

5.000e-01 Solution 2 Solution after simulation 2.

----------Solution composition----------

Elements	Molality	Moles
Al	1.596e-06	1.596e-06
Ba	3.240e-09	3.240e-09
C	3.436e-04	3.436e-04
Ca	1.159e-04	1.159e-04
Cd	2.224e-10	2.224e-10
Cu	8.750e-08	8.750e-08
Fe	1.645e-07	1.645e-07
K	3.632e-06	3.632e-06
Mg	6.185e-05	6.185e-05
Mn	3.234e-07	3.234e-07
Na	9.026e-06	9.026e-06
P	8.072e-07	8.072e-07
Pb	2.896e-09	2.896e-09
S	2.009e-05	2.009e-05
Sr	7.778e-08	7.778e-08
Zn	6.196e-09	6.196e-09

----------Description of solution----------

pH	=	7.937	Charge balance
pe	=	9.906	Adjusted to redox equilibrium
Activity of water	=	1.000	
Ionic strength	=	5.687e-04	
Mass of water (kg)	=	1.000e+00	
Total alkalinity (eq/kg)	=	3.396e-04	
Total CO2 (mol/kg)	=	3.436e-04	
Temperature (deg C)	=	4.000	
Electrical balance (eq)	=	-6.473e-06	
Iterations	=	21	
Total H	=	1.110128e+02	
Total O	=	5.550732e+01	

----------Distribution of species----------

Species	Molality	Activity	Log Molality	Log Activity	Log Gamma
OH-	1.498e-07	1.459e-07	-6.825	-6.836	-0.011
H+	1.185e-08	1.155e-08	-7.926	-7.937	-0.011
H2O	5.551e+01	1.000e+00	0.000	0.000	0.000
Al	1.596e-06				
Al(OH)4-	1.579e-06	1.538e-06	-5.802	-5.813	-0.011
Al(OH)3	1.093e-08	1.093e-08	-7.962	-7.961	0.000
Al(OH)2+	5.258e-09	5.121e-09	-8.279	-8.291	-0.011
AlOH+2	6.743e-11	6.070e-11	-10.171	-10.217	-0.046
Al+3	3.708e-13	2.952e-13	-12.431	-12.530	-0.099
AlSO4+	1.267e-14	1.234e-14	-13.897	-13.909	-0.011
Al(SO4)2-	6.389e-18	6.223e-18	-17.195	-17.206	-0.011
AlHSO4+2	1.243e-23	1.119e-23	-22.906	-22.951	-0.046
Ba	3.240e-09				
Ba+2	3.209e-09	2.891e-09	-8.494	-8.539	-0.045
BaSO4	2.567e-11	2.567e-11	-10.591	-10.591	0.000

	BaHCO3+	4.718e-12	4.596e-12	-11.326	-11.338	-0.011
	BaCO3	7.352e-13	7.353e-13	-12.134	-12.134	0.000
	BaOH+	8.705e-15	8.479e-15	-14.060	-14.072	-0.011
C(-4)		0.000e+00				
	CH4	0.000e+00	0.000e+00	-120.284	-120.283	0.000
C(4)		3.436e-04				
	HCO3-	3.296e-04	3.212e-04	-3.482	-3.493	-0.011
	CO2	1.251e-05	1.252e-05	-4.903	-4.903	0.000
	CO3-2	8.329e-07	7.506e-07	-6.079	-6.125	-0.045
	CaHCO3+	2.631e-07	2.564e-07	-6.580	-6.591	-0.011
	MgHCO3+	2.047e-07	1.994e-07	-6.689	-6.700	-0.011
	CaCO3	1.047e-07	1.048e-07	-6.980	-6.980	0.000
	MgCO3	2.874e-08	2.874e-08	-7.542	-7.541	0.000
	MnCO3	1.606e-08	1.606e-08	-7.794	-7.794	0.000
	MnHCO3+	7.916e-09	7.710e-09	-8.102	-8.113	-0.011
	PbCO3	2.326e-09	2.326e-09	-8.633	-8.633	0.000
	NaHCO3	1.587e-09	1.588e-09	-8.799	-8.799	0.000
	ZnCO3	6.537e-10	6.538e-10	-9.185	-9.185	0.000
	ZnHCO3+	1.812e-10	1.765e-10	-9.742	-9.753	-0.011
	SrHCO3+	1.714e-10	1.670e-10	-9.766	-9.777	-0.011
	PbHCO3+	4.670e-11	4.549e-11	-10.331	-10.342	-0.011
	NaCO3-	4.036e-11	3.931e-11	-10.394	-10.405	-0.011
	SrCO3	1.798e-11	1.798e-11	-10.745	-10.745	0.000
	Zn(CO3)2-2	1.165e-11	1.049e-11	-10.934	-10.979	-0.046
	Pb(CO3)2-2	4.871e-12	4.385e-12	-11.312	-11.358	-0.046
	BaHCO3+	4.718e-12	4.596e-12	-11.326	-11.338	-0.011
	CdHCO3+	2.057e-12	2.003e-12	-11.687	-11.698	-0.011
	BaCO3	7.352e-13	7.353e-13	-12.134	-12.134	0.000
	CdCO3	1.176e-13	1.176e-13	-12.930	-12.930	0.000
	FeHCO3+	2.539e-15	2.473e-15	-14.595	-14.607	-0.011
	FeCO3	1.386e-15	1.386e-15	-14.858	-14.858	0.000
	Cd(CO3)2-2	3.100e-16	2.791e-16	-15.509	-15.554	-0.046
Ca		1.159e-04				
	Ca+2	1.152e-04	1.038e-04	-3.939	-3.984	-0.045
	CaSO4	2.971e-07	2.971e-07	-6.527	-6.527	0.000
	CaHCO3+	2.631e-07	2.564e-07	-6.580	-6.591	-0.011
	CaCO3	1.047e-07	1.048e-07	-6.980	-6.980	0.000
	CaHPO4	2.149e-08	2.150e-08	-7.668	-7.668	0.000
	CaPO4-	2.952e-09	2.875e-09	-8.530	-8.541	-0.011
	CaOH+	1.531e-09	1.491e-09	-8.815	-8.826	-0.011
	CaH2PO4+	2.148e-10	2.092e-10	-9.668	-9.679	-0.011
	CaHSO4+	1.684e-14	1.640e-14	-13.774	-13.785	-0.011
Cd		2.224e-10				
	Cd+2	2.191e-10	1.972e-10	-9.659	-9.705	-0.046
	CdHCO3+	2.057e-12	2.003e-12	-11.687	-11.698	-0.011
	CdSO4	8.776e-13	8.777e-13	-12.057	-12.057	0.000
	CdOH+	2.730e-13	2.659e-13	-12.564	-12.575	-0.011
	CdCO3	1.176e-13	1.176e-13	-12.930	-12.930	0.000
	Cd(OH)2	6.599e-15	6.600e-15	-14.181	-14.180	0.000
	Cd(CO3)2-2	3.100e-16	2.791e-16	-15.509	-15.554	-0.046
	Cd(SO4)2-2	2.174e-16	1.957e-16	-15.663	-15.708	-0.046
	Cd(OH)3-	6.580e-20	6.409e-20	-19.182	-19.193	-0.011
	Cd(OH)4-2	5.492e-26	4.944e-26	-25.260	-25.306	-0.046
Cu(1)		2.992e-17				
	Cu+	2.992e-17	2.914e-17	-16.524	-16.536	-0.012
Cu(2)		8.750e-08				
	Cu(OH)2	8.640e-08	8.641e-08	-7.064	-7.063	0.000
	Cu+2	6.123e-10	5.521e-10	-9.213	-9.258	-0.045

CuOH+	4.906e-10	4.778e-10	-9.309	-9.321	-0.011
CuSO4	1.708e-12	1.708e-12	-11.767	-11.767	0.000
Cu(OH)3-	4.626e-13	4.506e-13	-12.335	-12.346	-0.011
Cu(OH)4-2	8.644e-18	7.782e-18	-17.063	-17.109	-0.046
Fe(2)	9.007e-14				
Fe+2	8.540e-14	7.700e-14	-13.069	-13.114	-0.045
FeHCO3+	2.539e-15	2.473e-15	-14.595	-14.607	-0.011
FeCO3	1.386e-15	1.386e-15	-14.858	-14.858	0.000
FeOH+	4.000e-16	3.896e-16	-15.398	-15.409	-0.011
FeHPO4	1.765e-16	1.766e-16	-15.753	-15.753	0.000
FeSO4	1.605e-16	1.605e-16	-15.795	-15.795	0.000
FeH2PO4+	4.820e-18	4.695e-18	-17.317	-17.328	-0.011
FeHSO4+	1.249e-23	1.217e-23	-22.903	-22.915	-0.011
Fe(HS)2	0.000e+00	0.000e+00	-241.052	-241.052	0.000
Fe(HS)3-	0.000e+00	0.000e+00	-357.448	-357.459	-0.011
Fe(3)	1.645e-07				
Fe(OH)3	1.286e-07	1.286e-07	-6.891	-6.891	0.000
Fe(OH)2+	3.170e-08	3.087e-08	-7.499	-7.510	-0.011
Fe(OH)4-	4.203e-09	4.094e-09	-8.376	-8.388	-0.011
FeOH+2	2.819e-12	2.538e-12	-11.550	-11.596	-0.046
Fe+3	2.157e-17	1.717e-17	-16.666	-16.765	-0.099
FeSO4+	2.077e-18	2.023e-18	-17.683	-17.694	-0.011
FeHPO4+	1.308e-18	1.274e-18	-17.883	-17.895	-0.011
FeH2PO4+2	6.245e-19	5.622e-19	-18.204	-18.250	-0.046
Fe(SO4)2-	7.368e-22	7.177e-22	-21.133	-21.144	-0.011
Fe2(OH)2+4	6.713e-22	4.409e-22	-21.173	-21.356	-0.183
FeHSO4+2	7.570e-26	6.814e-26	-25.121	-25.167	-0.046
Fe3(OH)4+5	4.410e-26	2.287e-26	-25.356	-25.641	-0.285
H(0)	3.650e-39				
H2	1.825e-39	1.825e-39	-38.739	-38.739	0.000
K	3.632e-06				
K+	3.631e-06	3.537e-06	-5.440	-5.451	-0.011
KSO4-	3.047e-10	2.968e-10	-9.516	-9.527	-0.011
KHPO4-	4.078e-12	3.972e-12	-11.390	-11.401	-0.011
KOH	1.061e-12	1.061e-12	-11.974	-11.974	0.000
Mg	6.185e-05				
Mg+2	6.146e-05	5.541e-05	-4.211	-4.256	-0.045
MgHCO3+	2.047e-07	1.994e-07	-6.689	-6.700	-0.011
MgSO4	1.286e-07	1.286e-07	-6.891	-6.891	0.000
MgCO3	2.874e-08	2.874e-08	-7.542	-7.541	0.000
MgHPO4	1.551e-08	1.551e-08	-7.809	-7.809	0.000
MgOH+	2.324e-09	2.264e-09	-8.634	-8.645	-0.011
MgPO4-	2.125e-09	2.070e-09	-8.673	-8.684	-0.011
MgH2PO4+	1.460e-10	1.422e-10	-9.836	-9.847	-0.011
Mn(2)	3.234e-07				
Mn+2	2.988e-07	2.694e-07	-6.525	-6.570	-0.045
MnCO3	1.606e-08	1.606e-08	-7.794	-7.794	0.000
MnHCO3+	7.916e-09	7.710e-09	-8.102	-8.113	-0.011
MnSO4	5.514e-10	5.514e-10	-9.259	-9.258	0.000
MnOH+	9.756e-11	9.503e-11	-10.011	-10.022	-0.011
Mn(3)	3.134e-24				
Mn+3	3.134e-24	2.474e-24	-23.504	-23.607	-0.103
Na	9.026e-06				
Na+	9.024e-06	8.791e-06	-5.045	-5.056	-0.011
NaHCO3	1.587e-09	1.588e-09	-8.799	-8.799	0.000
NaSO4-	6.943e-10	6.763e-10	-9.158	-9.170	-0.011
NaCO3-	4.036e-11	3.931e-11	-10.394	-10.405	-0.011
NaHPO4-	1.014e-11	9.872e-12	-10.994	-11.006	-0.011

	NaOH	5.026e-12	5.027e-12	-11.299	-11.299	0.000
O(0)	1.281e-22					
	O2	6.405e-23	6.406e-23	-22.193	-22.193	0.000
P	8.072e-07					
	HPO4-2	6.398e-07	5.760e-07	-6.194	-6.240	-0.046
	H2PO4-	1.249e-07	1.216e-07	-6.904	-6.915	-0.011
	CaHPO4	2.149e-08	2.150e-08	-7.668	-7.668	0.000
	MgHPO4	1.551e-08	1.551e-08	-7.809	-7.809	0.000
	CaPO4-	2.952e-09	2.875e-09	-8.530	-8.541	-0.011
	MgPO4-	2.125e-09	2.070e-09	-8.673	-8.684	-0.011
	CaH2PO4+	2.148e-10	2.092e-10	-9.668	-9.679	-0.011
	MgH2PO4+	1.460e-10	1.422e-10	-9.836	-9.847	-0.011
	PO4-3	1.813e-11	1.431e-11	-10.742	-10.844	-0.103
	NaHPO4-	1.014e-11	9.872e-12	-10.994	-11.006	-0.011
	KHPO4-	4.078e-12	3.972e-12	-11.390	-11.401	-0.011
	FeHPO4	1.765e-16	1.766e-16	-15.753	-15.753	0.000
	FeH2PO4+	4.820e-18	4.695e-18	-17.317	-17.328	-0.011
	FeHPO4+	1.308e-18	1.274e-18	-17.883	-17.895	-0.011
	FeH2PO4+2	6.245e-19	5.622e-19	-18.204	-18.250	-0.046
Pb	2.896e-09					
	PbCO3	2.326e-09	2.326e-09	-8.633	-8.633	0.000
	PbOH+	3.089e-10	3.009e-10	-9.510	-9.522	-0.011
	Pb+2	1.981e-10	1.783e-10	-9.703	-9.749	-0.046
	PbHCO3+	4.670e-11	4.549e-11	-10.331	-10.342	-0.011
	Pb(OH)2	1.013e-11	1.013e-11	-10.994	-10.994	0.000
	Pb(CO3)2-2	4.871e-12	4.385e-12	-11.312	-11.358	-0.046
	PbSO4	1.776e-12	1.776e-12	-11.751	-11.750	0.000
	Pb(OH)3-	1.034e-14	1.007e-14	-13.986	-13.997	-0.011
	Pb(SO4)2-2	1.834e-16	1.651e-16	-15.736	-15.782	-0.046
	Pb(OH)4-2	2.218e-18	1.996e-18	-17.654	-17.700	-0.046
	Pb2OH+3	1.522e-18	1.201e-18	-17.818	-17.920	-0.103
S(-2)	0.000e+00					
	HS-	0.000e+00	0.000e+00	-118.433	-118.444	-0.011
	H2S	0.000e+00	0.000e+00	-119.108	-119.108	0.000
	S-2	0.000e+00	0.000e+00	-124.052	-124.097	-0.045
	Fe(HS)2	0.000e+00	0.000e+00	-241.052	-241.052	0.000
	Fe(HS)3-	0.000e+00	0.000e+00	-357.448	-357.459	-0.011
S(6)	2.009e-05					
	SO4-2	1.966e-05	1.771e-05	-4.706	-4.752	-0.045
	CaSO4	2.971e-07	2.971e-07	-6.527	-6.527	0.000
	MgSO4	1.286e-07	1.286e-07	-6.891	-6.891	0.000
	NaSO4-	6.943e-10	6.763e-10	-9.158	-9.170	-0.011
	MnSO4	5.514e-10	5.514e-10	-9.259	-9.258	0.000
	KSO4-	3.047e-10	2.968e-10	-9.516	-9.527	-0.011
	SrSO4	1.847e-10	1.847e-10	-9.734	-9.734	0.000
	BaSO4	2.567e-11	2.567e-11	-10.591	-10.591	0.000
	ZnSO4	1.523e-11	1.523e-11	-10.817	-10.817	0.000
	HSO4-	1.349e-11	1.314e-11	-10.870	-10.881	-0.011
	PbSO4	1.776e-12	1.776e-12	-11.751	-11.750	0.000
	CuSO4	1.708e-12	1.708e-12	-11.767	-11.767	0.000
	CdSO4	8.776e-13	8.777e-13	-12.057	-12.057	0.000
	CaHSO4+	1.684e-14	1.640e-14	-13.774	-13.785	-0.011
	AlSO4+	1.267e-14	1.234e-14	-13.897	-13.909	-0.011
	Zn(SO4)2-2	2.900e-15	2.610e-15	-14.538	-14.583	-0.046
	Cd(SO4)2-2	2.174e-16	1.957e-16	-15.663	-15.708	-0.046
	Pb(SO4)2-2	1.834e-16	1.651e-16	-15.736	-15.782	-0.046
	FeSO4	1.605e-16	1.605e-16	-15.795	-15.795	0.000
	Al(SO4)2-	6.389e-18	6.223e-18	-17.195	-17.206	-0.011

```
      FeSO4+            2.077e-18   2.023e-18   -17.683   -17.694    -0.011
      Fe(SO4)2-         7.368e-22   7.177e-22   -21.133   -21.144    -0.011
      FeHSO4+           1.249e-23   1.217e-23   -22.903   -22.915    -0.011
      AlHSO4+2          1.243e-23   1.119e-23   -22.906   -22.951    -0.046
      FeHSO4+2          7.570e-26   6.814e-26   -25.121   -25.167    -0.046
Sr                7.778e-08
      Sr+2              7.741e-08   6.976e-08    -7.111    -7.156    -0.045
      SrSO4             1.847e-10   1.847e-10    -9.734    -9.734     0.000
      SrHCO3+           1.714e-10   1.670e-10    -9.766    -9.777    -0.011
      SrCO3             1.798e-11   1.798e-11   -10.745   -10.745     0.000
      SrOH+             3.178e-13   3.097e-13   -12.498   -12.509    -0.011
Zn                6.196e-09
      Zn+2              4.846e-09   4.365e-09    -8.315    -8.360    -0.045
      ZnCO3             6.537e-10   6.538e-10    -9.185    -9.185     0.000
      Zn(OH)2           4.116e-10   4.117e-10    -9.385    -9.385     0.000
      ZnHCO3+           1.812e-10   1.765e-10    -9.742    -9.753    -0.011
      ZnOH+             7.665e-11   7.466e-11   -10.116   -10.127    -0.011
      ZnSO4             1.523e-11   1.523e-11   -10.817   -10.817     0.000
      Zn(CO3)2-2        1.165e-11   1.049e-11   -10.934   -10.979    -0.046
      Zn(OH)3-          1.157e-13   1.127e-13   -12.937   -12.948    -0.011
      Zn(SO4)2-2        2.900e-15   2.610e-15   -14.538   -14.583    -0.046
      Zn(OH)4-2         1.717e-18   1.546e-18   -17.765   -17.811    -0.046

------------------------------Saturation indices--------------------------------

      Phase               SI log IAP  log KT

      Al(OH)3(a)       -0.99   11.28   12.27  Al(OH)3
      Alunite          -6.31   -4.92    1.39  KAl3(SO4)2(OH)6
      Anglesite        -6.59  -14.50   -7.91  PbSO4
      Anhydrite        -4.39   -8.74   -4.35  CaSO4
      Aragonite        -1.88  -10.11   -8.23  CaCO3
      Barite           -2.91  -13.29  -10.38  BaSO4
      Calcite          -1.72  -10.11   -8.39  CaCO3
      Cd(OH)2          -7.48    6.17   13.65  Cd(OH)2
      CdSO4           -15.18  -14.46    0.72  CdSO4
      Celestite        -5.24  -11.91   -6.66  SrSO4
      Cerrusite        -2.47  -15.87  -13.40  PbCO3
      CH4(g)         -117.61 -164.74  -47.13  CH4
      CO2(g)           -3.73  -22.00  -18.27  CO2
      Dolomite         -3.92  -20.49  -16.57  CaMg(CO3)2
      Fe(OH)3(a)        2.16   20.60   18.45  Fe(OH)3
      FeS(ppt)       -119.71 -160.61  -40.91  FeS
      Gibbsite          1.91   11.28    9.38  Al(OH)3
      Goethite          7.24   20.60   13.36  FeOOH
      Gypsum           -4.13   -8.74   -4.60  CaSO4:2H2O
      H2(g)           -35.69  -35.69    0.00  H2
      H2S(g)         -118.36 -163.37  -45.01  H2S
      Hausmannite      -3.02   63.60   66.62  Mn3O4
      Hematite         16.39   41.21   24.82  Fe2O3
      Hydroxyapatite   -5.48  -44.51  -39.04  Ca5(PO4)3OH
      Jarosite-K      -10.15   23.05   33.20  KFe3(SO4)2(OH)6
      Mackinawite    -118.97 -160.61  -41.64  FeS
      Manganite         1.81   27.15   25.34  MnOOH
      Melanterite     -15.36  -17.87   -2.50  FeSO4:7H2O
      O2(g)           -19.34   71.37   90.71  O2
      Otavite          -3.73  -15.83  -12.10  CdCO3
      Pb(OH)2          -2.80    6.13    8.93  Pb(OH)2
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      Pyrite         -195.21 -288.30  -93.09  FeS2
      Pyrochroite      -5.90    9.30   15.20  Mn(OH)2
      Pyrolusite        0.00   44.99   45.00  MnO2
      Rhodochrosite    -1.64  -12.69  -11.05  MnCO3
      Siderite         -8.49  -19.24  -10.75  FeCO3
      Smithsonite      -4.73  -14.48   -9.76  ZnCO3
      Sphalerite     -106.79 -155.86  -49.07  ZnS
      Strontianite     -3.97  -13.28   -9.32  SrCO3
      Sulfur          -88.83 -127.69  -38.85  S
      Vivianite       -25.03  -61.03  -36.00  Fe3(PO4)2:8H2O
      Witherite        -5.97  -14.66   -8.69  BaCO3
      Zn(OH)2(e)       -3.99    7.51   11.50  Zn(OH)2

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End of simulation.
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Reading input data for simulation 4.
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      SOLUTION 4 Stickleback Lake
            temp  4.0
            pH    7.14
            pe    4.0
            redox pe
            units ug/l
            density     1.0
            Alkalinity  30330 ug/l  gfw 50.04
            Al    2.5   ug/l
            B     50    ug/l
            Ba    5.0   ug/l
            Ca    13967 ug/l
            Cd    0.1   ug/l
            Cl    38433 ug/l
            Cu    0.5   ug/l
            F     7.67  ug/l
            Fe    5     ug/l
            K     1443  ug/l
            Li    5.0   ug/l
            Mg    4890  ug/l
            Mn    2.5   ug/l
            N(-3) 9.0   ug/l
            N(3)  0.5   ug/l
            N(5)  2.67  ug/l
            Na    10900 ug/l
            P     150   ug/l
            Pb    0.5   ug/l
            S(6)  500   ug/l
            Si    548   ug/l
            Sr    90    ug/l
            Zn    2.5   ug/l
      SAVE solution 4
      END
-----------------------------------------
Beginning of initial solution calculations.
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◎ Table of Contents

Initial solution 4. Stickleback Lake

----------Solution composition----------

Elements	Molality	Moles
Al	9.267e-08	9.267e-08
Alkalinity	6.062e-04	6.062e-04
B	4.626e-06	4.626e-06
Ba	3.641e-08	3.641e-08
Ca	3.485e-04	3.485e-04
Cd	8.898e-10	8.898e-10
Cl	1.084e-03	1.084e-03
Cu	7.869e-09	7.869e-09
F	4.038e-07	4.038e-07
Fe	8.954e-08	8.954e-08
K	3.691e-05	3.691e-05
Li	7.206e-07	7.206e-07
Mg	2.012e-04	2.012e-04
Mn	4.551e-08	4.551e-08
N(-3)	6.426e-07	6.426e-07
N(3)	3.570e-08	3.570e-08
N(5)	1.906e-07	1.906e-07
Na	4.742e-04	4.742e-04
P	4.843e-06	4.843e-06
Pb	2.413e-09	2.413e-09
S(6)	5.205e-06	5.205e-06
Si	9.121e-06	9.121e-06
Sr	1.027e-06	1.027e-06
Zn	3.825e-08	3.825e-08

----------Description of solution----------

pH	=	7.140
pe	=	4.000
Activity of water	=	1.000
Ionic strength	=	2.211e-03
Mass of water (kg)	=	1.000e+00
Total carbon (mol/kg)	=	7.425e-04
Total CO2 (mol/kg)	=	7.425e-04
Temperature (deg C)	=	4.000
Electrical balance (eq)	=	-9.167e-05
Iterations	=	9
Total H	=	1.110131e+02
Total O	=	5.550840e+01

----------Redox couples----------

Redox couple	pe	Eh (volts)
N(-3)/N(3)	6.6818	0.3674
N(-3)/N(5)	7.1924	0.3955
N(3)/N(5)	8.7240	0.4797

----------Distribution of species----------

Species	Molality	Activity	Log Molality	Log Activity	Log Gamma

	H+	7.593e-08	7.244e-08	-7.120	-7.140	-0.020
	OH-	2.448e-08	2.327e-08	-7.611	-7.633	-0.022
	H2O	5.551e+01	1.000e+00	0.000	0.000	0.000
Al		9.267e-08				
	Al(OH)4-	7.811e-08	7.428e-08	-7.107	-7.129	-0.022
	Al(OH)2+	1.022e-08	9.723e-09	-7.990	-8.012	-0.022
	Al(OH)3	3.307e-09	3.308e-09	-8.481	-8.480	0.000
	AlOH+2	8.836e-10	7.226e-10	-9.054	-9.141	-0.087
	AlF+2	8.946e-11	7.316e-11	-10.048	-10.136	-0.087
	Al+3	3.362e-11	2.203e-11	-10.473	-10.657	-0.184
	AlF2+	1.303e-11	1.240e-11	-10.885	-10.907	-0.022
	AlSO4+	2.206e-13	2.098e-13	-12.656	-12.678	-0.022
	AlF3	5.796e-14	5.799e-14	-13.237	-13.237	0.000
	Al(SO4)2-	2.535e-17	2.411e-17	-16.596	-16.618	-0.022
	AlF4-	9.184e-18	8.734e-18	-17.037	-17.059	-0.022
	AlHSO4+2	1.459e-21	1.193e-21	-20.836	-20.923	-0.087
	AlF5-2	6.740e-23	5.512e-23	-22.171	-22.259	-0.087
	AlF6-3	5.162e-29	3.283e-29	-28.287	-28.484	-0.197
B		4.626e-06				
	H3BO3	4.600e-06	4.603e-06	-5.337	-5.337	0.000
	H2BO3-	2.546e-08	2.421e-08	-7.594	-7.616	-0.022
	BF(OH)3-	5.783e-13	5.500e-13	-12.238	-12.260	-0.022
	BF2(OH)2-	1.759e-18	1.672e-18	-17.755	-17.777	-0.022
	BF3OH-	8.031e-26	7.637e-26	-25.095	-25.117	-0.022
	BF4-	9.285e-33	8.830e-33	-32.032	-32.054	-0.022
Ba		3.641e-08				
	Ba+2	3.626e-08	2.973e-08	-7.441	-7.527	-0.086
	BaHCO3+	8.838e-11	8.405e-11	-10.054	-10.075	-0.022
	BaSO4	6.010e-11	6.013e-11	-10.221	-10.221	0.000
	BaCO3	2.144e-12	2.145e-12	-11.669	-11.669	0.000
	BaOH+	1.462e-14	1.390e-14	-13.835	-13.857	-0.022
C(4)		7.425e-04				
	HCO3-	6.001e-04	5.712e-04	-3.222	-3.243	-0.021
	CO2	1.395e-04	1.396e-04	-3.855	-3.855	0.000
	CaHCO3+	1.313e-06	1.250e-06	-5.882	-5.903	-0.021
	MgHCO3+	1.105e-06	1.051e-06	-5.957	-5.978	-0.022
	CO3-2	2.594e-07	2.129e-07	-6.586	-6.672	-0.086
	NaHCO3	1.448e-07	1.448e-07	-6.839	-6.839	0.000
	CaCO3	8.140e-08	8.144e-08	-7.089	-7.089	0.000
	MgCO3	2.415e-08	2.416e-08	-7.617	-7.617	0.000
	FeHCO3+	4.093e-09	3.892e-09	-8.388	-8.410	-0.022
	SrHCO3+	3.757e-09	3.576e-09	-8.425	-8.447	-0.021
	ZnHCO3+	2.150e-09	2.045e-09	-8.668	-8.689	-0.022
	MnHCO3+	1.886e-09	1.794e-09	-8.724	-8.746	-0.022
	PbCO3	1.563e-09	1.563e-09	-8.806	-8.806	0.000
	ZnCO3	1.207e-09	1.208e-09	-8.918	-8.918	0.000
	NaCO3-	6.015e-10	5.720e-10	-9.221	-9.243	-0.022
	MnCO3	5.955e-10	5.958e-10	-9.225	-9.225	0.000
	FeCO3	3.478e-10	3.480e-10	-9.459	-9.458	0.000
	PbHCO3+	2.016e-10	1.917e-10	-9.695	-9.717	-0.022
	BaHCO3+	8.838e-11	8.405e-11	-10.054	-10.075	-0.022
	SrCO3	6.136e-11	6.139e-11	-10.212	-10.212	0.000
	CdHCO3+	1.262e-11	1.200e-11	-10.899	-10.921	-0.022
	Zn(CO3)2-2	6.722e-12	5.498e-12	-11.172	-11.260	-0.087
	BaCO3	2.144e-12	2.145e-12	-11.669	-11.669	0.000
	Pb(CO3)2-2	1.022e-12	8.360e-13	-11.990	-12.078	-0.087
	CdCO3	1.123e-13	1.123e-13	-12.950	-12.950	0.000

	Cd(CO3)2-2	9.247e-17	7.562e-17	-16.034	-16.121	-0.087
Ca		3.485e-04				
	Ca+2	3.467e-04	2.845e-04	-3.460	-3.546	-0.086
	CaHCO3+	1.313e-06	1.250e-06	-5.882	-5.903	-0.021
	CaSO4	1.854e-07	1.855e-07	-6.732	-6.732	0.000
	CaHPO4	1.760e-07	1.761e-07	-6.755	-6.754	0.000
	CaCO3	8.140e-08	8.144e-08	-7.089	-7.089	0.000
	CaH2PO4+	1.130e-08	1.074e-08	-7.947	-7.969	-0.022
	CaPO4-	3.949e-09	3.756e-09	-8.403	-8.425	-0.022
	CaOH+	6.854e-10	6.518e-10	-9.164	-9.186	-0.022
	CaF+	5.851e-10	5.564e-10	-9.233	-9.255	-0.022
	CaHSO4+	6.753e-14	6.422e-14	-13.170	-13.192	-0.022
Cd		8.898e-10				
	Cd+2	8.122e-10	6.642e-10	-9.090	-9.178	-0.087
	CdCl+	6.375e-11	6.063e-11	-10.196	-10.217	-0.022
	CdHCO3+	1.262e-11	1.200e-11	-10.899	-10.921	-0.022
	CdSO4	6.731e-13	6.734e-13	-12.172	-12.172	0.000
	CdCl2	2.396e-13	2.397e-13	-12.621	-12.620	0.000
	CdOH+	1.502e-13	1.428e-13	-12.823	-12.845	-0.022
	CdCO3	1.123e-13	1.123e-13	-12.950	-12.950	0.000
	Cd(OH)2	5.650e-16	5.653e-16	-15.248	-15.248	0.000
	CdCl3-	1.166e-16	1.109e-16	-15.933	-15.955	-0.022
	Cd(CO3)2-2	9.247e-17	7.562e-17	-16.034	-16.121	-0.087
	Cd(SO4)2-2	4.184e-17	3.421e-17	-16.378	-16.466	-0.087
	Cd(OH)3-	9.207e-22	8.755e-22	-21.036	-21.058	-0.022
	Cd(OH)4-2	1.317e-28	1.077e-28	-27.880	-27.968	-0.087
Cl		1.084e-03				
	Cl-	1.084e-03	1.031e-03	-2.965	-2.987	-0.022
	MnCl+	1.556e-10	1.479e-10	-9.808	-9.830	-0.022
	FeCl+	1.019e-10	9.694e-11	-9.992	-10.014	-0.022
	CdCl+	6.375e-11	6.063e-11	-10.196	-10.217	-0.022
	ZnCl+	3.063e-11	2.913e-11	-10.514	-10.536	-0.022
	PbCl+	1.041e-11	9.902e-12	-10.982	-11.004	-0.022
	CdCl2	2.396e-13	2.397e-13	-12.621	-12.620	0.000
	MnCl2	6.652e-14	6.655e-14	-13.177	-13.177	0.000
	ZnCl2	2.869e-14	2.871e-14	-13.542	-13.542	0.000
	PbCl2	2.465e-14	2.467e-14	-13.608	-13.608	0.000
	CdCl3-	1.166e-16	1.109e-16	-15.933	-15.955	-0.022
	ZnCl3-	3.048e-17	2.899e-17	-16.516	-16.538	-0.022
	MnCl3-	1.987e-17	1.889e-17	-16.702	-16.724	-0.022
	PbCl3-	1.847e-17	1.757e-17	-16.733	-16.755	-0.022
	FeCl+2	3.509e-19	2.870e-19	-18.455	-18.542	-0.087
	ZnCl4-2	1.531e-20	1.252e-20	-19.815	-19.902	-0.087
	PbCl4-2	8.904e-21	7.282e-21	-20.050	-20.138	-0.087
	FeCl2+	2.843e-21	2.704e-21	-20.546	-20.568	-0.022
	FeCl3	2.785e-25	2.787e-25	-24.555	-24.555	0.000
Cu(1)		6.537e-11				
	Cu+	6.537e-11	6.210e-11	-10.185	-10.207	-0.022
Cu(2)		7.804e-09				
	Cu(OH)2	5.813e-09	5.816e-09	-8.236	-8.235	0.000
	Cu+2	1.777e-09	1.461e-09	-8.750	-8.835	-0.085
	CuOH+	2.121e-10	2.017e-10	-9.673	-9.695	-0.022
	CuSO4	1.030e-12	1.030e-12	-11.987	-11.987	0.000
	Cu(OH)3-	5.087e-15	4.838e-15	-14.294	-14.315	-0.022
	Cu(OH)4-2	1.629e-20	1.332e-20	-19.788	-19.875	-0.087
F		4.038e-07				
	F-	4.000e-07	3.803e-07	-6.398	-6.420	-0.022
	MgF+	2.881e-09	2.740e-09	-8.540	-8.562	-0.022

	CaF+	5.851e-10	5.564e-10	-9.233	-9.255	-0.022
	NaF	9.862e-11	9.867e-11	-10.006	-10.006	0.000
	AlF+2	8.946e-11	7.316e-11	-10.048	-10.136	-0.087
	HF	2.880e-11	2.881e-11	-10.541	-10.540	0.000
	AlF2+	1.303e-11	1.240e-11	-10.885	-10.907	-0.022
	BF(OH)3-	5.783e-13	5.500e-13	-12.238	-12.260	-0.022
	FeF+	2.725e-13	2.591e-13	-12.565	-12.587	-0.022
	MnF+	9.747e-14	9.269e-14	-13.011	-13.033	-0.022
	AlF3	5.796e-14	5.799e-14	-13.237	-13.237	0.000
	HF2-	3.542e-17	3.369e-17	-16.451	-16.473	-0.022
	FeF+2	9.846e-18	8.052e-18	-17.007	-17.094	-0.087
	AlF4-	9.184e-18	8.734e-18	-17.037	-17.059	-0.022
	BF2(OH)2-	1.759e-18	1.672e-18	-17.755	-17.777	-0.022
	FeF2+	9.799e-20	9.319e-20	-19.009	-19.031	-0.022
	AlF5-2	6.740e-23	5.512e-23	-22.171	-22.259	-0.087
	FeF3	5.199e-23	5.201e-23	-22.284	-22.284	0.000
	BF3OH-	8.031e-26	7.637e-26	-25.095	-25.117	-0.022
	AlF6-3	5.162e-29	3.283e-29	-28.287	-28.484	-0.197
	BF4-	9.285e-33	8.830e-33	-32.032	-32.054	-0.022
	SiF6-2	0.000e+00	0.000e+00	-40.949	-41.036	-0.087
Fe(2)		8.806e-08				
	Fe+2	8.287e-08	6.814e-08	-7.082	-7.167	-0.085
	FeHCO3+	4.093e-09	3.892e-09	-8.388	-8.410	-0.022
	FeHPO4	4.666e-10	4.669e-10	-9.331	-9.331	0.000
	FeCO3	3.478e-10	3.480e-10	-9.459	-9.458	0.000
	FeCl+	1.019e-10	9.694e-11	-9.992	-10.014	-0.022
	FeH2PO4+	8.185e-11	7.783e-11	-10.087	-10.109	-0.022
	FeOH+	5.782e-11	5.499e-11	-10.238	-10.260	-0.022
	FeSO4	3.234e-11	3.235e-11	-10.490	-10.490	0.000
	FeF+	2.725e-13	2.591e-13	-12.565	-12.587	-0.022
	FeHSO4+	1.617e-17	1.538e-17	-16.791	-16.813	-0.022
Fe(3)		1.484e-09				
	Fe(OH)2+	9.075e-10	8.630e-10	-9.042	-9.064	-0.022
	Fe(OH)3	5.729e-10	5.732e-10	-9.242	-9.242	0.000
	Fe(OH)4-	3.061e-12	2.911e-12	-11.514	-11.536	-0.022
	FeOH+2	5.439e-13	4.448e-13	-12.265	-12.352	-0.087
	Fe+3	2.880e-17	1.887e-17	-16.541	-16.724	-0.184
	FeH2PO4+2	1.415e-17	1.158e-17	-16.849	-16.936	-0.087
	FeF+2	9.846e-18	8.052e-18	-17.007	-17.094	-0.087
	FeHPO4+	4.400e-18	4.185e-18	-17.357	-17.378	-0.022
	FeSO4+	5.326e-19	5.065e-19	-18.274	-18.295	-0.022
	FeCl+2	3.509e-19	2.870e-19	-18.455	-18.542	-0.087
	FeF2+	9.799e-20	9.319e-20	-19.009	-19.031	-0.022
	FeCl2+	2.843e-21	2.704e-21	-20.546	-20.568	-0.022
	FeF3	5.199e-23	5.201e-23	-22.284	-22.284	0.000
	Fe(SO4)2-	4.305e-23	4.094e-23	-22.366	-22.388	-0.022
	Fe2(OH)2+4	3.028e-23	1.354e-23	-22.519	-22.868	-0.349
	FeCl3	2.785e-25	2.787e-25	-24.555	-24.555	0.000
	FeHSO4+2	1.308e-25	1.070e-25	-24.883	-24.971	-0.087
	Fe3(OH)4+5	6.902e-29	1.963e-29	-28.161	-28.707	-0.546
H(0)		9.300e-26				
	H2	4.650e-26	4.653e-26	-25.333	-25.332	0.000
K		3.691e-05				
	K+	3.691e-05	3.508e-05	-4.433	-4.455	-0.022
	KSO4-	7.054e-10	6.708e-10	-9.152	-9.173	-0.022
	KHPO4-	1.238e-10	1.177e-10	-9.907	-9.929	-0.022
	KOH	1.678e-12	1.679e-12	-11.775	-11.775	0.000
Li		7.206e-07				

	Li+	7.206e-07	6.862e-07	-6.142	-6.164	-0.021
	LiSO4-	1.271e-11	1.209e-11	-10.896	-10.918	-0.022
	LiOH	2.169e-13	2.170e-13	-12.664	-12.664	0.000
Mg		2.012e-04				
	Mg+2	1.998e-04	1.642e-04	-3.699	-3.785	-0.085
	MgHCO3+	1.105e-06	1.051e-06	-5.957	-5.978	-0.022
	MgHPO4	1.373e-07	1.374e-07	-6.862	-6.862	0.000
	MgSO4	8.678e-08	8.682e-08	-7.062	-7.061	0.000
	MgCO3	2.415e-08	2.416e-08	-7.617	-7.617	0.000
	MgH2PO4+	8.302e-09	7.894e-09	-8.081	-8.103	-0.022
	MgPO4-	3.075e-09	2.924e-09	-8.512	-8.534	-0.022
	MgF+	2.881e-09	2.740e-09	-8.540	-8.562	-0.022
	MgOH+	1.125e-09	1.070e-09	-8.949	-8.971	-0.022
Mn(2)		4.551e-08				
	Mn+2	4.285e-08	3.523e-08	-7.368	-7.453	-0.085
	MnHCO3+	1.886e-09	1.794e-09	-8.724	-8.746	-0.022
	MnCO3	5.955e-10	5.958e-10	-9.225	-9.225	0.000
	MnCl+	1.556e-10	1.479e-10	-9.808	-9.830	-0.022
	MnSO4	1.643e-11	1.643e-11	-10.784	-10.784	0.000
	MnOH+	2.085e-12	1.982e-12	-11.681	-11.703	-0.022
	MnF+	9.747e-14	9.269e-14	-13.011	-13.033	-0.022
	MnCl2	6.652e-14	6.655e-14	-13.177	-13.177	0.000
	MnCl3-	1.987e-17	1.889e-17	-16.702	-16.724	-0.022
	Mn(NO3)2	4.839e-21	4.842e-21	-20.315	-20.315	0.000
Mn(3)		6.318e-31				
	Mn+3	6.318e-31	4.018e-31	-30.199	-30.396	-0.197
N(-3)		6.426e-07				
	NH4+	6.416e-07	6.094e-07	-6.193	-6.215	-0.022
	NH3	9.672e-10	9.677e-10	-9.014	-9.014	0.000
	NH4SO4-	3.332e-11	3.169e-11	-10.477	-10.499	-0.022
N(3)		3.570e-08				
	NO2-	3.570e-08	3.392e-08	-7.447	-7.470	-0.022
N(5)		1.906e-07				
	NO3-	1.906e-07	1.811e-07	-6.720	-6.742	-0.022
	PbNO3+	1.191e-15	1.132e-15	-14.924	-14.946	-0.022
	Mn(NO3)2	4.839e-21	4.842e-21	-20.315	-20.315	0.000
Na		4.742e-04				
	Na+	4.740e-04	4.509e-04	-3.324	-3.346	-0.022
	NaHCO3	1.448e-07	1.448e-07	-6.839	-6.839	0.000
	NaSO4-	8.311e-09	7.904e-09	-8.080	-8.102	-0.022
	NaHPO4-	1.591e-09	1.513e-09	-8.798	-8.820	-0.022
	NaCO3-	6.015e-10	5.720e-10	-9.221	-9.243	-0.022
	NaF	9.862e-11	9.867e-11	-10.006	-10.006	0.000
	NaOH	4.110e-11	4.112e-11	-10.386	-10.386	0.000
O(0)		0.000e+00				
	O2	0.000e+00	0.000e+00	-49.006	-49.006	0.000
P		4.843e-06				
	H2PO4-	2.396e-06	2.279e-06	-5.621	-5.642	-0.022
	HPO4-2	2.105e-06	1.721e-06	-5.677	-5.764	-0.087
	CaHPO4	1.760e-07	1.761e-07	-6.755	-6.754	0.000
	MgHPO4	1.373e-07	1.374e-07	-6.862	-6.862	0.000
	CaH2PO4+	1.130e-08	1.074e-08	-7.947	-7.969	-0.022
	MgH2PO4+	8.302e-09	7.894e-09	-8.081	-8.103	-0.022
	CaPO4-	3.949e-09	3.756e-09	-8.403	-8.425	-0.022
	MgPO4-	3.075e-09	2.924e-09	-8.512	-8.534	-0.022
	NaHPO4-	1.591e-09	1.513e-09	-8.798	-8.820	-0.022
	FeHPO4	4.666e-10	4.669e-10	-9.331	-9.331	0.000
	KHPO4-	1.238e-10	1.177e-10	-9.907	-9.929	-0.022

	FeH2PO4+	8.185e-11	7.783e-11	-10.087	-10.109	-0.022
	PO4-3	1.073e-11	6.819e-12	-10.969	-11.166	-0.197
	FeH2PO4+2	1.415e-17	1.158e-17	-16.849	-16.936	-0.087
	FeHPO4+	4.400e-18	4.185e-18	-17.357	-17.378	-0.022
Pb		2.413e-09				
	PbCO3	1.563e-09	1.563e-09	-8.806	-8.806	0.000
	Pb+2	5.167e-10	4.226e-10	-9.287	-9.374	-0.087
	PbHCO3+	2.016e-10	1.917e-10	-9.695	-9.717	-0.022
	PbOH+	1.196e-10	1.137e-10	-9.922	-9.944	-0.022
	PbCl+	1.041e-11	9.902e-12	-10.982	-11.004	-0.022
	Pb(CO3)2-2	1.022e-12	8.360e-13	-11.990	-12.078	-0.087
	PbSO4	9.586e-13	9.590e-13	-12.018	-12.018	0.000
	Pb(OH)2	6.104e-13	6.107e-13	-12.214	-12.214	0.000
	PbCl2	2.465e-14	2.467e-14	-13.608	-13.608	0.000
	PbNO3+	1.191e-15	1.132e-15	-14.924	-14.946	-0.022
	Pb(OH)3-	1.018e-16	9.679e-17	-15.992	-16.014	-0.022
	Pb(SO4)2-2	2.484e-17	2.031e-17	-16.605	-16.692	-0.087
	PbCl3-	1.847e-17	1.757e-17	-16.733	-16.755	-0.022
	Pb2OH+3	1.692e-18	1.076e-18	-17.772	-17.968	-0.197
	PbCl4-2	8.904e-21	7.282e-21	-20.050	-20.138	-0.087
	Pb(OH)4-2	3.742e-21	3.061e-21	-20.427	-20.514	-0.087
S(6)		5.205e-06				
	SO4-2	4.923e-06	4.036e-06	-5.308	-5.394	-0.086
	CaSO4	1.854e-07	1.855e-07	-6.732	-6.732	0.000
	MgSO4	8.678e-08	8.682e-08	-7.062	-7.061	0.000
	NaSO4-	8.311e-09	7.904e-09	-8.080	-8.102	-0.022
	KSO4-	7.054e-10	6.708e-10	-9.152	-9.173	-0.022
	SrSO4	5.063e-10	5.065e-10	-9.296	-9.295	0.000
	BaSO4	6.010e-11	6.013e-11	-10.221	-10.221	0.000
	NH4SO4-	3.332e-11	3.169e-11	-10.477	-10.499	-0.022
	FeSO4	3.234e-11	3.235e-11	-10.490	-10.490	0.000
	ZnSO4	2.260e-11	2.261e-11	-10.646	-10.646	0.000
	HSO4-	1.974e-11	1.877e-11	-10.705	-10.726	-0.022
	MnSO4	1.643e-11	1.643e-11	-10.784	-10.784	0.000
	LiSO4-	1.271e-11	1.209e-11	-10.896	-10.918	-0.022
	CuSO4	1.030e-12	1.030e-12	-11.987	-11.987	0.000
	PbSO4	9.586e-13	9.590e-13	-12.018	-12.018	0.000
	CdSO4	6.731e-13	6.734e-13	-12.172	-12.172	0.000
	AlSO4+	2.206e-13	2.098e-13	-12.656	-12.678	-0.022
	CaHSO4+	6.753e-14	6.422e-14	-13.170	-13.192	-0.022
	Zn(SO4)2-2	1.079e-15	8.825e-16	-14.967	-15.054	-0.087
	Cd(SO4)2-2	4.184e-17	3.421e-17	-16.378	-16.466	-0.087
	Al(SO4)2-	2.535e-17	2.411e-17	-16.596	-16.618	-0.022
	Pb(SO4)2-2	2.484e-17	2.031e-17	-16.605	-16.692	-0.087
	FeHSO4+	1.617e-17	1.538e-17	-16.791	-16.813	-0.022
	FeSO4+	5.326e-19	5.065e-19	-18.274	-18.295	-0.022
	AlHSO4+2	1.459e-21	1.193e-21	-20.836	-20.923	-0.087
	Fe(SO4)2-	4.305e-23	4.094e-23	-22.366	-22.388	-0.022
	FeHSO4+2	1.308e-25	1.070e-25	-24.883	-24.971	-0.087
Si		9.121e-06				
	H4SiO4	9.113e-06	9.118e-06	-5.040	-5.040	0.000
	H3SiO4-	8.406e-09	7.994e-09	-8.075	-8.097	-0.022
	H2SiO4-2	1.945e-15	1.591e-15	-14.711	-14.798	-0.087
	SiF6-2	0.000e+00	0.000e+00	-40.949	-41.036	-0.087
Sr		1.027e-06				
	Sr+2	1.023e-06	8.398e-07	-5.990	-6.076	-0.086
	SrHCO3+	3.757e-09	3.576e-09	-8.425	-8.447	-0.021
	SrSO4	5.063e-10	5.065e-10	-9.296	-9.295	0.000

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      SrCO3             6.136e-11   6.139e-11   -10.212   -10.212     0.000
      SrOH+             6.248e-13   5.945e-13   -12.204   -12.226    -0.022
Zn               3.825e-08
      Zn+2              3.468e-08   2.843e-08    -7.460    -7.546    -0.086
      ZnHCO3+           2.150e-09   2.045e-09    -8.668    -8.689    -0.022
      ZnCO3             1.207e-09   1.208e-09    -8.918    -8.918     0.000
      ZnOH+             8.155e-11   7.755e-11   -10.089   -10.110    -0.022
      Zn(OH)2           6.817e-11   6.820e-11   -10.166   -10.166     0.000
      ZnCl+             3.063e-11   2.913e-11   -10.514   -10.536    -0.022
      ZnSO4             2.260e-11   2.261e-11   -10.646   -10.646     0.000
      Zn(CO3)2-2        6.722e-12   5.498e-12   -11.172   -11.260    -0.087
      ZnCl2             2.869e-14   2.871e-14   -13.542   -13.542     0.000
      Zn(OH)3-          3.131e-15   2.977e-15   -14.504   -14.526    -0.022
      Zn(SO4)2-2        1.079e-15   8.825e-16   -14.967   -15.054    -0.087
      ZnCl3-            3.048e-17   2.899e-17   -16.516   -16.538    -0.022
      ZnCl4-2           1.531e-20   1.252e-20   -19.815   -19.902    -0.087
      Zn(OH)4-2         7.964e-21   6.513e-21   -20.099   -20.186    -0.087

-----------------------------Saturation indices-------------------------------

      Phase               SI log IAP  log KT

      Al(OH)3(a)       -1.51   10.76   12.27  Al(OH)3
      Albite           -6.15   -0.56    5.59  NaAlSi3O8
      Alunite          -5.76   -4.37    1.39  KAl3(SO4)2(OH)6
      Anglesite        -6.86  -14.77   -7.91  PbSO4
      Anhydrite        -4.59   -8.94   -4.35  CaSO4
      Anorthite        -7.53   22.18   29.71  CaAl2Si2O8
      Aragonite        -1.99  -10.22   -8.23  CaCO3
      Barite           -2.54  -12.92  -10.38  BaSO4
      Ca-Montmorillonite  -1.70    8.35   10.06  Ca0.165Al2.33Si3.67O10(OH)2
      Calcite          -1.83  -10.22   -8.39  CaCO3
      Cd(OH)2          -8.55    5.10   13.65  Cd(OH)2
      CdSiO3           -9.92    0.06    9.98  CdSiO3
      CdSO4           -15.29  -14.57    0.72  CdSO4
      Celestite        -4.81  -11.47   -6.66  SrSO4
      Cerrusite        -2.65  -16.05  -13.40  PbCO3
      Chalcedony       -1.23   -5.04   -3.81  SiO2
      Chlorite(14A)   -17.91   58.88   76.79  Mg5Al2Si3O10(OH)8
      Chrysotile      -13.59   21.41   34.99  Mg3Si2O5(OH)4
      CO2(g)           -2.68  -20.95  -18.27  CO2
      Dolomite         -4.11  -20.67  -16.57  CaMg(CO3)2
      Fe(OH)3(a)       -0.20   18.25   18.45  Fe(OH)3
      Fluorite         -5.50  -16.39  -10.89  CaF2
      Gibbsite          1.39   10.76    9.38  Al(OH)3
      Goethite          4.89   18.25   13.36  FeOOH
      Gypsum           -4.34   -8.94   -4.60  CaSO4:2H2O
      H2(g)           -22.28  -22.28    0.00  H2
      Hausmannite     -23.86   42.76   66.62  Mn3O4
      Hematite         11.69   36.51   24.82  Fe2O3
      Hydroxyapatite   -5.05  -44.09  -39.04  Ca5(PO4)3OH
      Illite           -2.92   11.35   14.27  K0.6Mg0.25Al2.3Si3.5O10(OH)2
      Jarosite-K      -15.10   18.10   33.20  KFe3(SO4)2(OH)6
      K-feldspar       -4.42   -1.67    2.75  KAlSi3O8
      K-mica            3.85   19.85   16.00  KAl3Si3O10(OH)2
      Kaolinite         2.05   11.45    9.40  Al2Si2O5(OH)4
      Manganite        -7.37   17.97   25.34  MnOOH
      Melanterite     -10.06  -12.56   -2.50  FeSO4:7H2O
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      NH3(g)          -11.24    0.92   12.16  NH3
      O2(g)           -46.15   44.56   90.71  O2
      Otavite          -3.75  -15.85  -12.10  CdCO3
      Pb(OH)2          -4.02    4.91    8.93  Pb(OH)2
      Pyrochroite      -8.37    6.83   15.20  Mn(OH)2
      Pyrolusite      -15.89   29.11   45.00  MnO2
      Quartz           -0.73   -5.04   -4.31  SiO2
      Rhodochrosite    -3.07  -14.12  -11.05  MnCO3
      Sepiolite       -10.48    5.87   16.35  Mg2Si3O7.5OH:3H2O
      Sepiolite(d)    -12.79    5.87   18.66  Mg2Si3O7.5OH:3H2O
      Siderite         -3.09  -13.84  -10.75  FeCO3
      SiO2(a)          -2.14   -5.04   -2.90  SiO2
      Smithsonite      -4.46  -14.22   -9.76  ZnCO3
      Strontianite     -3.43  -12.75   -9.32  SrCO3
      Talc            -12.65   11.33   23.97  Mg3Si4O10(OH)2
      Vivianite        -7.83  -43.83  -36.00  Fe3(PO4)2:8H2O
      Willemite        -8.76    8.43   17.18  Zn2SiO4
      Witherite        -5.51  -14.20   -8.69  BaCO3
      Zn(OH)2(e)       -4.77    6.73   11.50  Zn(OH)2

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End of simulation.
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Reading input data for simulation 5.
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      MIX 2 Mixing B2/Rain with Stickleback (1:1)
            3     0.5
            4     0.5
      SAVE solution 5
      END
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Beginning of reaction calculations.
-----------------------------------

Reaction step 1.

Using mixture 2.  Mixing B2/Rain with Stickleback (1:1)

       5.000e-01 Solution 3   Solution after simulation 3.
       5.000e-01 Solution 4   Stickleback Lake

-----------------------------Solution composition------------------------------

      Elements           Molality       Moles

      Al                8.441e-07   8.441e-07
      B                 2.313e-06   2.313e-06
      Ba                1.982e-08   1.982e-08
      C                 5.431e-04   5.431e-04
      Ca                2.322e-04   2.322e-04
      Cd                5.561e-10   5.561e-10
      Cl                5.421e-04   5.421e-04
      Cu                4.768e-08   4.768e-08
      F                 2.019e-07   2.019e-07
      Fe                1.270e-07   1.270e-07
```

```
      K                 2.027e-05   2.027e-05
      Li                3.603e-07   3.603e-07
      Mg                1.315e-04   1.315e-04
      Mn                1.844e-07   1.844e-07
      N                 4.345e-07   4.345e-07
      Na                2.416e-04   2.416e-04
      P                 2.825e-06   2.825e-06
      Pb                2.655e-09   2.655e-09
      S                 1.265e-05   1.265e-05
      Si                4.561e-06   4.561e-06
      Sr                5.525e-07   5.525e-07
      Zn                2.222e-08   2.222e-08

----------------------------Description of solution----------------------------

                            pH  =   7.301      Charge balance
                            pe  =  -2.773      Adjusted to redox equilibrium
               Activity of water  =   1.000
                  Ionic strength  =   1.390e-03
               Mass of water (kg)  =   1.000e+00
        Total alkalinity (eq/kg)  =   4.728e-04
              Total CO2 (mol/kg)  =   5.431e-04
           Temperature (deg C)  =   4.000
         Electrical balance (eq)  =  -4.907e-05
                     Iterations  =  19
                        Total H  = 1.110129e+02
                        Total O  = 5.550786e+01

----------------------------Distribution of species----------------------------

                                                 Log       Log         Log
      Species             Molality    Activity  Molality  Activity     Gamma

      H+                5.199e-08   5.004e-08    -7.284    -7.301    -0.017
      OH-               3.508e-08   3.368e-08    -7.455    -7.473    -0.018
      H2O               5.551e+01   1.000e+00     0.000     0.000     0.000
Al                8.441e-07
      Al(OH)4-          7.703e-07   7.398e-07    -6.113    -6.131    -0.018
      Al(OH)2+          4.810e-08   4.620e-08    -7.318    -7.335    -0.018
      Al(OH)3           2.275e-08   2.276e-08    -7.643    -7.643     0.000
      AlOH+2            2.787e-09   2.371e-09    -8.555    -8.625    -0.070
      AlF+2             9.869e-11   8.397e-11   -10.006   -10.076    -0.070
      Al+3              7.043e-11   4.994e-11   -10.152   -10.302    -0.149
      AlF2+             7.501e-12   7.205e-12   -11.125   -11.142    -0.018
      AlSO4+            1.271e-12   1.221e-12   -11.896   -11.913    -0.018
      AlF3              1.706e-14   1.707e-14   -13.768   -13.768     0.000
      Al(SO4)2-         3.748e-16   3.600e-16   -15.426   -15.444    -0.018
      AlF4-             1.355e-18   1.302e-18   -17.868   -17.885    -0.018
      AlHSO4+2          5.633e-21   4.793e-21   -20.249   -20.319    -0.070
      AlF5-2            4.889e-24   4.160e-24   -23.311   -23.381    -0.070
      AlF6-3            1.805e-30   1.255e-30   -29.744   -29.901    -0.158
B                 2.313e-06
      H3BO3             2.295e-06   2.295e-06    -5.639    -5.639     0.000
      H2BO3-            1.820e-08   1.748e-08    -7.740    -7.757    -0.018
      BF(OH)3-          1.446e-13   1.389e-13   -12.840   -12.857    -0.018
      BF2(OH)2-         1.538e-19   1.477e-19   -18.813   -18.831    -0.018
      BF3OH-            2.457e-27   2.359e-27   -26.610   -26.627    -0.018
      BF4-              9.933e-35   9.540e-35   -34.003   -34.020    -0.018
```

Ba	1.982e-08					
	Ba+2	1.970e-08	1.679e-08	-7.706	-7.775	-0.069
	BaSO4	8.713e-11	8.716e-11	-10.060	-10.060	0.000
	BaHCO3+	3.873e-11	3.720e-11	-10.412	-10.429	-0.018
	BaCO3	1.374e-12	1.374e-12	-11.862	-11.862	0.000
	BaOH+	1.184e-14	1.137e-14	-13.927	-13.944	-0.018
C(-4)	1.050e-13					
	CH4	1.050e-13	1.051e-13	-12.979	-12.979	0.000
C(4)	5.431e-04					
	HCO3-	4.658e-04	4.477e-04	-3.332	-3.349	-0.017
	CO2	7.552e-05	7.555e-05	-4.122	-4.122	0.000
	CaHCO3+	7.056e-07	6.781e-07	-6.151	-6.169	-0.017
	MgHCO3+	5.826e-07	5.595e-07	-6.235	-6.252	-0.018
	CO3-2	2.832e-07	2.416e-07	-6.548	-6.617	-0.069
	CaCO3	6.396e-08	6.398e-08	-7.194	-7.194	0.000
	NaHCO3	5.839e-08	5.841e-08	-7.234	-7.234	0.000
	MgCO3	1.862e-08	1.862e-08	-7.730	-7.730	0.000
	MnHCO3+	6.202e-09	5.957e-09	-8.207	-8.225	-0.018
	FeHCO3+	4.804e-09	4.614e-09	-8.318	-8.336	-0.018
	MnCO3	2.864e-09	2.865e-09	-8.543	-8.543	0.000
	PbCO3	1.805e-09	1.806e-09	-8.744	-8.743	0.000
	SrHCO3+	1.629e-09	1.566e-09	-8.788	-8.805	-0.017
	ZnHCO3+	1.009e-09	9.692e-10	-8.996	-9.014	-0.018
	ZnCO3	8.286e-10	8.289e-10	-9.082	-9.082	0.000
	FeCO3	5.970e-10	5.972e-10	-9.224	-9.224	0.000
	NaCO3-	3.477e-10	3.340e-10	-9.459	-9.476	-0.018
	PbHCO3+	1.593e-10	1.529e-10	-9.798	-9.815	-0.018
	SrCO3	3.891e-11	3.892e-11	-10.410	-10.410	0.000
	BaHCO3+	3.873e-11	3.720e-11	-10.412	-10.429	-0.018
	CdHCO3+	6.604e-12	6.342e-12	-11.180	-11.198	-0.018
	Zn(CO3)2-2	5.031e-12	4.281e-12	-11.298	-11.368	-0.070
	BaCO3	1.374e-12	1.374e-12	-11.862	-11.862	0.000
	Pb(CO3)2-2	1.288e-12	1.096e-12	-11.890	-11.960	-0.070
	CdCO3	8.594e-14	8.597e-14	-13.066	-13.066	0.000
	Cd(CO3)2-2	7.718e-17	6.567e-17	-16.113	-16.183	-0.070
Ca	2.322e-04					
	Ca+2	2.310e-04	1.970e-04	-3.636	-3.706	-0.069
	CaHCO3+	7.056e-07	6.781e-07	-6.151	-6.169	-0.017
	CaSO4	3.296e-07	3.297e-07	-6.482	-6.482	0.000
	CaHPO4	8.839e-08	8.842e-08	-7.054	-7.053	0.000
	CaCO3	6.396e-08	6.398e-08	-7.194	-7.194	0.000
	CaH2PO4+	3.880e-09	3.726e-09	-8.411	-8.429	-0.018
	CaPO4-	2.843e-09	2.731e-09	-8.546	-8.564	-0.018
	CaOH+	6.803e-10	6.534e-10	-9.167	-9.185	-0.018
	CaF+	2.031e-10	1.951e-10	-9.692	-9.710	-0.018
	CaHSO4+	8.207e-14	7.882e-14	-13.086	-13.103	-0.018
Cd	5.561e-10					
	Cd+2	5.266e-10	4.480e-10	-9.279	-9.349	-0.070
	CdCl+	2.150e-11	2.065e-11	-10.667	-10.685	-0.018
	CdHCO3+	6.604e-12	6.342e-12	-11.180	-11.198	-0.018
	CdSO4	1.165e-12	1.166e-12	-11.934	-11.933	0.000
	CdOH+	1.452e-13	1.395e-13	-12.838	-12.856	-0.018
	CdCO3	8.594e-14	8.597e-14	-13.066	-13.066	0.000
	CdCl2	4.123e-14	4.124e-14	-13.385	-13.385	0.000
	Cd(OH)2	7.990e-16	7.993e-16	-15.097	-15.097	0.000
	Cd(SO4)2-2	1.787e-16	1.520e-16	-15.748	-15.818	-0.070
	Cd(CO3)2-2	7.718e-17	6.567e-17	-16.113	-16.183	-0.070
	CdCl3-	1.004e-17	9.639e-18	-16.998	-17.016	-0.018

	Cd(OH)3-	1.866e-21	1.792e-21	-20.729	-20.747	-0.018
	Cd(OH)4-2	3.751e-28	3.192e-28	-27.426	-27.496	-0.070
Cl		5.421e-04				
	Cl-	5.421e-04	5.205e-04	-3.266	-3.284	-0.018
	MnCl+	3.296e-10	3.166e-10	-9.482	-9.499	-0.018
	FeCl+	7.711e-11	7.405e-11	-10.113	-10.130	-0.018
	CdCl+	2.150e-11	2.065e-11	-10.667	-10.685	-0.018
	ZnCl+	9.264e-12	8.897e-12	-11.033	-11.051	-0.018
	PbCl+	5.300e-12	5.091e-12	-11.276	-11.293	-0.018
	MnCl2	7.191e-14	7.194e-14	-13.143	-13.143	0.000
	CdCl2	4.123e-14	4.124e-14	-13.385	-13.385	0.000
	PbCl2	6.403e-15	6.405e-15	-14.194	-14.194	0.000
	ZnCl2	4.427e-15	4.429e-15	-14.354	-14.354	0.000
	MnCl3-	1.074e-17	1.031e-17	-16.969	-16.987	-0.018
	CdCl3-	1.004e-17	9.639e-18	-16.998	-17.016	-0.018
	PbCl3-	2.398e-18	2.304e-18	-17.620	-17.638	-0.018
	ZnCl3-	2.352e-18	2.259e-18	-17.629	-17.646	-0.018
	ZnCl4-2	5.789e-22	4.926e-22	-21.237	-21.307	-0.070
	PbCl4-2	5.668e-22	4.823e-22	-21.247	-21.317	-0.070
	FeCl+2	4.345e-26	3.697e-26	-25.362	-25.432	-0.070
	FeCl2+	1.832e-28	1.759e-28	-27.737	-27.755	-0.018
	FeCl3	9.154e-33	9.157e-33	-32.038	-32.038	0.000
Cu(1)		4.768e-08				
	Cu+	4.768e-08	4.576e-08	-7.322	-7.339	-0.018
Cu(2)		1.766e-12				
	Cu(OH)2	1.515e-12	1.515e-12	-11.820	-11.820	0.000
	Cu+2	2.127e-13	1.816e-13	-12.672	-12.741	-0.069
	CuOH+	3.779e-14	3.629e-14	-13.423	-13.440	-0.018
	CuSO4	3.285e-16	3.286e-16	-15.484	-15.483	0.000
	Cu(OH)3-	1.900e-18	1.825e-18	-17.721	-17.739	-0.018
	Cu(OH)4-2	8.550e-24	7.275e-24	-23.068	-23.138	-0.070
F		2.019e-07				
	F-	2.005e-07	1.926e-07	-6.698	-6.715	-0.018
	MgF+	9.814e-10	9.425e-10	-9.008	-9.026	-0.018
	CaF+	2.031e-10	1.951e-10	-9.692	-9.710	-0.018
	AlF+2	9.869e-11	8.397e-11	-10.006	-10.076	-0.070
	NaF	2.570e-11	2.571e-11	-10.590	-10.590	0.000
	HF	1.007e-11	1.008e-11	-10.997	-10.997	0.000
	AlF2+	7.501e-12	7.205e-12	-11.125	-11.142	-0.018
	MnF+	2.071e-13	1.989e-13	-12.684	-12.701	-0.018
	FeF+	2.066e-13	1.985e-13	-12.685	-12.702	-0.018
	BF(OH)3-	1.446e-13	1.389e-13	-12.840	-12.857	-0.018
	AlF3	1.706e-14	1.707e-14	-13.768	-13.768	0.000
	HF2-	6.212e-18	5.966e-18	-17.207	-17.224	-0.018
	AlF4-	1.355e-18	1.302e-18	-17.868	-17.885	-0.018
	BF2(OH)2-	1.538e-19	1.477e-19	-18.813	-18.831	-0.018
	AlF5-2	4.889e-24	4.160e-24	-23.311	-23.381	-0.070
	FeF+2	1.222e-24	1.040e-24	-23.913	-23.983	-0.070
	FeF2+	6.346e-27	6.095e-27	-26.197	-26.215	-0.018
	BF3OH-	2.457e-27	2.359e-27	-26.610	-26.627	-0.018
	AlF6-3	1.805e-30	1.255e-30	-29.744	-29.901	-0.158
	FeF3	1.722e-30	1.723e-30	-29.764	-29.764	0.000
	BF4-	9.933e-35	9.540e-35	-34.003	-34.020	-0.018
	SiF6-2	0.000e+00	0.000e+00	-43.684	-43.754	-0.070
Fe(2)		1.270e-07				
	Fe+2	1.207e-07	1.031e-07	-6.918	-6.987	-0.069
	FeHCO3+	4.804e-09	4.614e-09	-8.318	-8.336	-0.018
	FeCO3	5.970e-10	5.972e-10	-9.224	-9.224	0.000

	FeHPO4	5.121e-10	5.123e-10	-9.291	-9.291	0.000
	FeSO4	1.256e-10	1.256e-10	-9.901	-9.901	0.000
	FeOH+	1.254e-10	1.204e-10	-9.902	-9.919	-0.018
	FeCl+	7.711e-11	7.405e-11	-10.113	-10.130	-0.018
	FeH2PO4+	6.142e-11	5.899e-11	-10.212	-10.229	-0.018
	FeF+	2.066e-13	1.985e-13	-12.685	-12.702	-0.018
	FeHSO4+	4.294e-17	4.124e-17	-16.367	-16.385	-0.018
	Fe(HS)2	8.513e-22	8.515e-22	-21.070	-21.070	0.000
	Fe(HS)3-	2.940e-31	2.823e-31	-30.532	-30.549	-0.018
Fe(3)		9.276e-16				
	Fe(OH)2+	4.804e-16	4.614e-16	-15.318	-15.336	-0.018
	Fe(OH)3	4.436e-16	4.438e-16	-15.353	-15.353	0.000
	Fe(OH)4-	3.397e-18	3.262e-18	-17.469	-17.486	-0.018
	FeOH+2	1.930e-19	1.643e-19	-18.714	-18.784	-0.070
	Fe+3	6.788e-24	4.813e-24	-23.168	-23.318	-0.149
	FeH2PO4+2	1.739e-24	1.479e-24	-23.760	-23.830	-0.070
	FeF+2	1.222e-24	1.040e-24	-23.913	-23.983	-0.070
	FeHPO4+	8.062e-25	7.743e-25	-24.094	-24.111	-0.018
	FeSO4+	3.452e-25	3.316e-25	-24.462	-24.479	-0.018
	FeCl+2	4.345e-26	3.697e-26	-25.362	-25.432	-0.070
	FeF2+	6.346e-27	6.095e-27	-26.197	-26.215	-0.018
	FeCl2+	1.832e-28	1.759e-28	-27.737	-27.755	-0.018
	Fe(SO4)2-	7.163e-29	6.879e-29	-28.145	-28.162	-0.018
	FeF3	1.722e-30	1.723e-30	-29.764	-29.764	0.000
	FeHSO4+2	5.685e-32	4.838e-32	-31.245	-31.315	-0.070
	FeCl3	9.154e-33	9.157e-33	-32.038	-32.038	0.000
	Fe2(OH)2+4	3.524e-36	1.847e-36	-35.453	-35.734	-0.281
	Fe3(OH)4+5	0.000e+00	0.000e+00	-47.406	-47.844	-0.438
H(0)		1.561e-12				
	H2	7.803e-13	7.805e-13	-12.108	-12.108	0.000
K		2.027e-05				
	K+	2.027e-05	1.946e-05	-4.693	-4.711	-0.018
	KSO4-	9.944e-10	9.551e-10	-9.002	-9.020	-0.018
	KHPO4-	4.933e-11	4.738e-11	-10.307	-10.324	-0.018
	KOH	1.348e-12	1.349e-12	-11.870	-11.870	0.000
Li		3.603e-07				
	Li+	3.603e-07	3.464e-07	-6.443	-6.460	-0.017
	LiSO4-	1.631e-11	1.566e-11	-10.788	-10.805	-0.018
	LiOH	1.585e-13	1.586e-13	-12.800	-12.800	0.000
Mg		1.315e-04				
	Mg+2	1.307e-04	1.115e-04	-3.884	-3.953	-0.069
	MgHCO3+	5.826e-07	5.595e-07	-6.235	-6.252	-0.018
	MgSO4	1.513e-07	1.514e-07	-6.820	-6.820	0.000
	MgHPO4	6.767e-08	6.770e-08	-7.170	-7.169	0.000
	MgCO3	1.862e-08	1.862e-08	-7.730	-7.730	0.000
	MgH2PO4+	2.798e-09	2.687e-09	-8.553	-8.571	-0.018
	MgPO4-	2.172e-09	2.086e-09	-8.663	-8.681	-0.018
	MgOH+	1.096e-09	1.052e-09	-8.960	-8.978	-0.018
	MgF+	9.814e-10	9.425e-10	-9.008	-9.026	-0.018
Mn(2)		1.844e-07				
	Mn+2	1.749e-07	1.493e-07	-6.757	-6.826	-0.069
	MnHCO3+	6.202e-09	5.957e-09	-8.207	-8.225	-0.018
	MnCO3	2.864e-09	2.865e-09	-8.543	-8.543	0.000
	MnCl+	3.296e-10	3.166e-10	-9.482	-9.499	-0.018
	MnSO4	1.787e-10	1.787e-10	-9.748	-9.748	0.000
	MnOH+	1.266e-11	1.216e-11	-10.897	-10.915	-0.018
	MnF+	2.071e-13	1.989e-13	-12.684	-12.701	-0.018
	MnCl2	7.191e-14	7.194e-14	-13.143	-13.143	0.000

	MnCl3-	1.074e-17	1.031e-17	-16.969	-16.987	-0.018
	Mn(NO3)2	0.000e+00	0.000e+00	-177.520	-177.519	0.000
Mn(3)		4.130e-37				
	Mn+3	4.130e-37	2.872e-37	-36.384	-36.542	-0.158
N(-3)		1.010e-07				
	NH4+	1.008e-07	9.673e-08	-6.997	-7.014	-0.018
	NH3	2.223e-10	2.224e-10	-9.653	-9.653	0.000
	NH4SO4-	1.344e-11	1.291e-11	-10.872	-10.889	-0.018
N(0)		3.335e-07				
	N2	1.667e-07	1.668e-07	-6.778	-6.778	0.000
N(3)		0.000e+00				
	NO2-	0.000e+00	0.000e+00	-63.695	-63.713	-0.018
N(5)		0.000e+00				
	NO3-	0.000e+00	0.000e+00	-85.640	-85.658	-0.018
	PbNO3+	0.000e+00	0.000e+00	-93.837	-93.854	-0.018
	Mn(NO3)2	0.000e+00	0.000e+00	-177.520	-177.519	0.000
Na		2.416e-04				
	Na+	2.415e-04	2.320e-04	-3.617	-3.634	-0.017
	NaHCO3	5.839e-08	5.841e-08	-7.234	-7.234	0.000
	NaSO4-	1.087e-08	1.044e-08	-7.964	-7.981	-0.018
	NaHPO4-	5.881e-10	5.648e-10	-9.231	-9.248	-0.018
	NaCO3-	3.477e-10	3.340e-10	-9.459	-9.476	-0.018
	NaOH	3.062e-11	3.063e-11	-10.514	-10.514	0.000
	NaF	2.570e-11	2.571e-11	-10.590	-10.590	0.000
O(0)		0.000e+00				
	O2	0.000e+00	0.000e+00	-75.456	-75.456	0.000
P		2.825e-06				
	HPO4-2	1.467e-06	1.248e-06	-5.833	-5.904	-0.070
	H2PO4-	1.189e-06	1.142e-06	-5.925	-5.942	-0.017
	CaHPO4	8.839e-08	8.842e-08	-7.054	-7.053	0.000
	MgHPO4	6.767e-08	6.770e-08	-7.170	-7.169	0.000
	CaH2PO4+	3.880e-09	3.726e-09	-8.411	-8.429	-0.018
	CaPO4-	2.843e-09	2.731e-09	-8.546	-8.564	-0.018
	MgH2PO4+	2.798e-09	2.687e-09	-8.553	-8.571	-0.018
	MgPO4-	2.172e-09	2.086e-09	-8.663	-8.681	-0.018
	NaHPO4-	5.881e-10	5.648e-10	-9.231	-9.248	-0.018
	FeHPO4	5.121e-10	5.123e-10	-9.291	-9.291	0.000
	FeH2PO4+	6.142e-11	5.899e-11	-10.212	-10.229	-0.018
	KHPO4-	4.933e-11	4.738e-11	-10.307	-10.324	-0.018
	PO4-3	1.030e-11	7.162e-12	-10.987	-11.145	-0.158
	FeH2PO4+2	1.739e-24	1.479e-24	-23.760	-23.830	-0.070
	FeHPO4+	8.062e-25	7.743e-25	-24.094	-24.111	-0.018
Pb		2.655e-09				
	PbCO3	1.805e-09	1.806e-09	-8.744	-8.743	0.000
	Pb+2	5.055e-10	4.301e-10	-9.296	-9.366	-0.070
	PbOH+	1.745e-10	1.676e-10	-9.758	-9.776	-0.018
	PbHCO3+	1.593e-10	1.529e-10	-9.798	-9.815	-0.018
	PbCl+	5.300e-12	5.091e-12	-11.276	-11.293	-0.018
	PbSO4	2.505e-12	2.506e-12	-11.601	-11.601	0.000
	Pb(OH)2	1.303e-12	1.303e-12	-11.885	-11.885	0.000
	Pb(CO3)2-2	1.288e-12	1.096e-12	-11.890	-11.960	-0.070
	PbCl2	6.403e-15	6.405e-15	-14.194	-14.194	0.000
	Pb(OH)3-	3.113e-16	2.990e-16	-15.507	-15.524	-0.018
	Pb(SO4)2-2	1.601e-16	1.362e-16	-15.796	-15.866	-0.070
	PbCl3-	2.398e-18	2.304e-18	-17.620	-17.638	-0.018
	Pb2OH+3	2.321e-18	1.614e-18	-17.634	-17.792	-0.158
	Pb(OH)4-2	1.609e-20	1.369e-20	-19.794	-19.864	-0.070
	PbCl4-2	5.668e-22	4.823e-22	-21.247	-21.317	-0.070

	PbNO3+	0.000e+00	0.000e+00	-93.837	-93.854	-0.018
S(-2)		6.033e-12				
	HS-	3.171e-12	3.045e-12	-11.499	-11.516	-0.018
	H2S	2.862e-12	2.863e-12	-11.543	-11.543	0.000
	S-2	1.835e-18	1.564e-18	-17.736	-17.806	-0.069
	Fe(HS)2	8.513e-22	8.515e-22	-21.070	-21.070	0.000
	Fe(HS)3-	2.940e-31	2.823e-31	-30.532	-30.549	-0.018
S(6)		1.265e-05				
	SO4-2	1.215e-05	1.036e-05	-4.915	-4.985	-0.069
	CaSO4	3.296e-07	3.297e-07	-6.482	-6.482	0.000
	MgSO4	1.513e-07	1.514e-07	-6.820	-6.820	0.000
	NaSO4-	1.087e-08	1.044e-08	-7.964	-7.981	-0.018
	KSO4-	9.944e-10	9.551e-10	-9.002	-9.020	-0.018
	SrSO4	7.262e-10	7.265e-10	-9.139	-9.139	0.000
	MnSO4	1.787e-10	1.787e-10	-9.748	-9.748	0.000
	FeSO4	1.256e-10	1.256e-10	-9.901	-9.901	0.000
	BaSO4	8.713e-11	8.716e-11	-10.060	-10.060	0.000
	ZnSO4	3.508e-11	3.509e-11	-10.455	-10.455	0.000
	HSO4-	3.465e-11	3.328e-11	-10.460	-10.478	-0.018
	LiSO4-	1.631e-11	1.566e-11	-10.788	-10.805	-0.018
	NH4SO4-	1.344e-11	1.291e-11	-10.872	-10.889	-0.018
	PbSO4	2.505e-12	2.506e-12	-11.601	-11.601	0.000
	AlSO4+	1.271e-12	1.221e-12	-11.896	-11.913	-0.018
	CdSO4	1.165e-12	1.166e-12	-11.934	-11.933	0.000
	CaHSO4+	8.207e-14	7.882e-14	-13.086	-13.103	-0.018
	Zn(SO4)2-2	4.132e-15	3.516e-15	-14.384	-14.454	-0.070
	Al(SO4)2-	3.748e-16	3.600e-16	-15.426	-15.444	-0.018
	CuSO4	3.285e-16	3.286e-16	-15.484	-15.483	0.000
	Cd(SO4)2-2	1.787e-16	1.520e-16	-15.748	-15.818	-0.070
	Pb(SO4)2-2	1.601e-16	1.362e-16	-15.796	-15.866	-0.070
	FeHSO4+	4.294e-17	4.124e-17	-16.367	-16.385	-0.018
	AlHSO4+2	5.633e-21	4.793e-21	-20.249	-20.319	-0.070
	FeSO4+	3.452e-25	3.316e-25	-24.462	-24.479	-0.018
	Fe(SO4)2-	7.163e-29	6.879e-29	-28.145	-28.162	-0.018
	FeHSO4+2	5.685e-32	4.838e-32	-31.245	-31.315	-0.070
Si		4.561e-06				
	H4SiO4	4.555e-06	4.556e-06	-5.342	-5.341	0.000
	H3SiO4-	6.021e-09	5.783e-09	-8.220	-8.238	-0.018
	H2SiO4-2	1.958e-15	1.666e-15	-14.708	-14.778	-0.070
	SiF6-2	0.000e+00	0.000e+00	-43.684	-43.754	-0.070
Sr		5.525e-07				
	Sr+2	5.501e-07	4.693e-07	-6.260	-6.329	-0.069
	SrHCO3+	1.629e-09	1.566e-09	-8.788	-8.805	-0.017
	SrSO4	7.262e-10	7.265e-10	-9.139	-9.139	0.000
	SrCO3	3.891e-11	3.892e-11	-10.410	-10.410	0.000
	SrOH+	5.006e-13	4.810e-13	-12.301	-12.318	-0.017
Zn		2.222e-08				
	Zn+2	2.018e-08	1.720e-08	-7.695	-7.765	-0.069
	ZnHCO3+	1.009e-09	9.692e-10	-8.996	-9.014	-0.018
	ZnCO3	8.286e-10	8.289e-10	-9.082	-9.082	0.000
	Zn(OH)2	8.644e-11	8.647e-11	-10.063	-10.063	0.000
	ZnOH+	7.071e-11	6.791e-11	-10.151	-10.168	-0.018
	ZnSO4	3.508e-11	3.509e-11	-10.455	-10.455	0.000
	ZnCl+	9.264e-12	8.897e-12	-11.033	-11.051	-0.018
	Zn(CO3)2-2	5.031e-12	4.281e-12	-11.298	-11.368	-0.070
	Zn(OH)3-	5.690e-15	5.464e-15	-14.245	-14.262	-0.018
	ZnCl2	4.427e-15	4.429e-15	-14.354	-14.354	0.000
	Zn(SO4)2-2	4.132e-15	3.516e-15	-14.384	-14.454	-0.070

ZnCl3-	2.352e-18	2.259e-18	-17.629	-17.646	-0.018
Zn(OH)4-2	2.034e-20	1.731e-20	-19.692	-19.762	-0.070
ZnCl4-2	5.789e-22	4.926e-22	-21.237	-21.307	-0.070

----------Saturation indices----------

Phase	SI	log IAP	log KT	
Al(OH)3(a)	-0.67	11.60	12.27	Al(OH)3
Albite	-6.35	-0.76	5.59	NaAlSi3O8
Alunite	-3.17	-1.78	1.39	KAl3(SO4)2(OH)6
Anglesite	-6.44	-14.35	-7.91	PbSO4
Anhydrite	-4.34	-8.69	-4.35	CaSO4
Anorthite	-6.29	23.41	29.71	CaAl2Si2O8
Aragonite	-2.09	-10.32	-8.23	CaCO3
Barite	-2.38	-12.76	-10.38	BaSO4
Ca-Montmorillonite	-0.83	9.22	10.06	Ca0.165Al2.33Si3.67O10(OH)2
Calcite	-1.93	-10.32	-8.39	CaCO3
Cd(OH)2	-8.40	5.25	13.65	Cd(OH)2
CdSiO3	-10.07	-0.09	9.98	CdSiO3
CdSO4	-15.05	-14.33	0.72	CdSO4
Celestite	-4.65	-11.31	-6.66	SrSO4
Cerrusite	-2.58	-15.98	-13.40	PbCO3
CH4(g)	-10.31	-57.44	-47.13	CH4
Chalcedony	-1.53	-5.34	-3.81	SiO2
Chlorite(14A)	-16.37	60.42	76.79	Mg5Al2Si3O10(OH)8
Chrysotile	-13.73	21.26	34.99	Mg3Si2O5(OH)4
CO2(g)	-2.95	-21.22	-18.27	CO2
Dolomite	-4.33	-20.89	-16.57	CaMg(CO3)2
Fe(OH)3(a)	-6.31	12.14	18.45	Fe(OH)3
FeS(ppt)	-7.29	-48.19	-40.91	FeS
Fluorite	-6.25	-17.14	-10.89	CaF2
Gibbsite	2.22	11.60	9.38	Al(OH)3
Goethite	-1.22	12.14	13.36	FeOOH
Gypsum	-4.09	-8.69	-4.60	CaSO4:2H2O
H2(g)	-9.06	-9.06	0.00	H2
H2S(g)	-10.80	-55.81	-45.01	H2S
Hausmannite	-34.24	32.38	66.62	Mn3O4
Hematite	-0.54	24.28	24.82	Fe2O3
Hydroxyapatite	-5.62	-44.66	-39.04	Ca5(PO4)3OH
Illite	-2.07	12.20	14.27	K0.6Mg0.25Al2.3Si3.5O10(OH)2
Jarosite-K	-33.36	-0.16	33.20	KFe3(SO4)2(OH)6
K-feldspar	-4.58	-1.83	2.75	KAlSi3O8
K-mica	5.37	21.37	16.00	KAl3Si3O10(OH)2
Kaolinite	3.12	12.52	9.40	Al2Si2O5(OH)4
Mackinawite	-6.55	-48.19	-41.64	FeS
Manganite	-13.04	12.30	25.34	MnOOH
Melanterite	-9.47	-11.97	-2.50	FeSO4:7H2O
N2(g)	-3.59	-6.78	-3.18	N2
NH3(g)	-11.88	-16.97	-5.10	NH3
O2(g)	-72.60	18.11	90.71	O2
Otavite	-3.87	-15.97	-12.10	CdCO3
Pb(OH)2	-3.69	5.23	8.93	Pb(OH)2
Pyrite	-1.86	-94.94	-93.09	FeS2
Pyrochroite	-7.42	7.78	15.20	Mn(OH)2
Pyrolusite	-28.17	16.83	45.00	MnO2
Quartz	-1.03	-5.34	-4.31	SiO2
Rhodochrosite	-2.39	-13.44	-11.05	MnCO3

Sepiolite	-11.08	5.27	16.35	Mg2Si3O7.5OH:3H2O
Sepiolite(d)	-13.39	5.27	18.66	Mg2Si3O7.5OH:3H2O
Siderite	-2.85	-13.60	-10.75	FeCO3
SiO2(a)	-2.44	-5.34	-2.90	SiO2
Smithsonite	-4.62	-14.38	-9.76	ZnCO3
Sphalerite	0.10	-48.97	-49.07	ZnS
Strontianite	-3.63	-12.95	-9.32	SrCO3
Sulfur	-7.90	-46.75	-38.85	S
Talc	-13.39	10.58	23.97	Mg3Si4O10(OH)2
Vivianite	-7.25	-43.25	-36.00	Fe3(PO4)2:8H2O
Willemite	-8.85	8.33	17.18	Zn2SiO4
Witherite	-5.70	-14.39	-8.69	BaCO3
Zn(OH)2(e)	-4.66	6.84	11.50	Zn(OH)2

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End of simulation.
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Reading input data for simulation 6.
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      MIX 3 Mixing B2/Rain with Stickleback (1:1000)
            3     0.001
            4     0.999
      SAVE solution 6
      END
-----------------------------------
Beginning of reaction calculations.
-----------------------------------

Reaction step 1.

Using mixture 3.  Mixing B2/Rain with Stickleback (1:1000)

       1.000e-03 Solution 3   Solution after simulation 3.
       9.990e-01 Solution 4   Stickleback Lake

-----------------------------Solution composition------------------------------
```

Elements	Molality	Moles
Al	9.417e-08	9.417e-08
B	4.621e-06	4.621e-06
Ba	3.638e-08	3.638e-08
C	7.421e-04	7.421e-04
Ca	3.483e-04	3.483e-04
Cd	8.891e-10	8.891e-10
Cl	1.083e-03	1.083e-03
Cu	7.949e-09	7.949e-09
F	4.034e-07	4.034e-07
Fe	8.961e-08	8.961e-08
K	3.687e-05	3.687e-05
Li	7.199e-07	7.199e-07
Mg	2.010e-04	2.010e-04
Mn	4.579e-08	4.579e-08
N	8.681e-07	8.681e-07
Na	4.737e-04	4.737e-04

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      P                 4.839e-06   4.839e-06
      Pb                2.414e-09   2.414e-09
      S                 5.220e-06   5.220e-06
      Si                9.112e-06   9.112e-06
      Sr                1.026e-06   1.026e-06
      Zn                3.822e-08   3.822e-08

----------------------------Description of solution----------------------------

                            pH  =   7.140      Charge balance
                            pe  =  -2.667      Adjusted to redox equilibrium
               Activity of water  =   1.000
                  Ionic strength  =   2.209e-03
               Mass of water (kg)  =   1.000e+00
        Total alkalinity (eq/kg)  =   6.058e-04
              Total CO2 (mol/kg)  =   7.421e-04
             Temperature (deg C)  =   4.000
         Electrical balance (eq)  =  -9.159e-05
                     Iterations  =  14
                        Total H  = 1.110131e+02
                        Total O  = 5.550840e+01

----------------------------Distribution of species----------------------------

                                                  Log       Log         Log
      Species             Molality    Activity  Molality  Activity     Gamma

      H+                7.597e-08   7.249e-08    -7.119    -7.140    -0.020
      OH-               2.446e-08   2.325e-08    -7.612    -7.634    -0.022
      H2O               5.551e+01   1.000e+00     0.000     0.000     0.000
Al              9.417e-08
      Al(OH)4-          7.937e-08   7.548e-08    -7.100    -7.122    -0.022
      Al(OH)2+          1.040e-08   9.891e-09    -7.983    -8.005    -0.022
      Al(OH)3           3.362e-09   3.364e-09    -8.473    -8.473     0.000
      AlOH+2            8.992e-10   7.355e-10    -9.046    -9.133    -0.087
      AlF+2             9.101e-11   7.443e-11   -10.041   -10.128    -0.087
      Al+3              3.424e-11   2.244e-11   -10.465   -10.649    -0.184
      AlF2+             1.325e-11   1.260e-11   -10.878   -10.900    -0.022
      AlSO4+            2.253e-13   2.143e-13   -12.647   -12.669    -0.022
      AlF3              5.885e-14   5.888e-14   -13.230   -13.230     0.000
      Al(SO4)2-         2.597e-17   2.470e-17   -16.585   -16.607    -0.022
      AlF4-             9.317e-18   8.860e-18   -17.031   -17.053    -0.022
      AlHSO4+2          1.491e-21   1.219e-21   -20.827   -20.914    -0.087
      AlF5-2            6.830e-23   5.586e-23   -22.166   -22.253    -0.087
      AlF6-3            5.226e-29   3.324e-29   -28.282   -28.478    -0.196
B               4.621e-06
      H3BO3             4.596e-06   4.598e-06    -5.338    -5.337     0.000
      H2BO3-            2.542e-08   2.417e-08    -7.595    -7.617    -0.022
      BF(OH)3-          5.772e-13   5.489e-13   -12.239   -12.261    -0.022
      BF2(OH)2-         1.754e-18   1.668e-18   -17.756   -17.778    -0.022
      BF3OH-            8.009e-26   7.616e-26   -25.096   -25.118    -0.022
      BF4-              9.255e-33   8.802e-33   -32.034   -32.055    -0.022
Ba              3.638e-08
      Ba+2              3.623e-08   2.970e-08    -7.441    -7.527    -0.086
      BaHCO3+           8.825e-11   8.392e-11   -10.054   -10.076    -0.022
      BaSO4             6.023e-11   6.026e-11   -10.220   -10.220     0.000
      BaCO3             2.139e-12   2.140e-12   -11.670   -11.670     0.000
      BaOH+             1.460e-14   1.388e-14   -13.836   -13.857    -0.022
```

C(-4)	5.350e-13					
	CH4	5.350e-13	5.353e-13	-12.272	-12.271	0.000
C(4)	7.421e-04					
	HCO3-	5.997e-04	5.708e-04	-3.222	-3.243	-0.021
	CO2	1.395e-04	1.396e-04	-3.855	-3.855	0.000
	CaHCO3+	1.311e-06	1.248e-06	-5.882	-5.904	-0.021
	MgHCO3+	1.104e-06	1.050e-06	-5.957	-5.979	-0.022
	CO3-2	2.590e-07	2.126e-07	-6.587	-6.672	-0.086
	NaHCO3	1.445e-07	1.446e-07	-6.840	-6.840	0.000
	CaCO3	8.125e-08	8.130e-08	-7.090	-7.090	0.000
	MgCO3	2.411e-08	2.412e-08	-7.618	-7.618	0.000
	FeHCO3+	4.163e-09	3.959e-09	-8.381	-8.402	-0.022
	SrHCO3+	3.751e-09	3.570e-09	-8.426	-8.447	-0.021
	ZnHCO3+	2.147e-09	2.042e-09	-8.668	-8.690	-0.022
	MnHCO3+	1.897e-09	1.804e-09	-8.722	-8.744	-0.022
	PbCO3	1.562e-09	1.563e-09	-8.806	-8.806	0.000
	ZnCO3	1.205e-09	1.206e-09	-8.919	-8.919	0.000
	NaCO3-	6.002e-10	5.708e-10	-9.222	-9.244	-0.022
	MnCO3	5.985e-10	5.988e-10	-9.223	-9.223	0.000
	FeCO3	3.536e-10	3.538e-10	-9.452	-9.451	0.000
	PbHCO3+	2.017e-10	1.918e-10	-9.695	-9.717	-0.022
	BaHCO3+	8.825e-11	8.392e-11	-10.054	-10.076	-0.022
	SrCO3	6.123e-11	6.126e-11	-10.213	-10.213	0.000
	CdHCO3+	1.260e-11	1.198e-11	-10.900	-10.921	-0.022
	Zn(CO3)2-2	6.701e-12	5.481e-12	-11.174	-11.261	-0.087
	BaCO3	2.139e-12	2.140e-12	-11.670	-11.670	0.000
	Pb(CO3)2-2	1.021e-12	8.349e-13	-11.991	-12.078	-0.087
	CdCO3	1.121e-13	1.121e-13	-12.951	-12.950	0.000
	Cd(CO3)2-2	9.218e-17	7.539e-17	-16.035	-16.123	-0.087
Ca	3.483e-04					
	Ca+2	3.465e-04	2.844e-04	-3.460	-3.546	-0.086
	CaHCO3+	1.311e-06	1.248e-06	-5.882	-5.904	-0.021
	CaSO4	1.859e-07	1.860e-07	-6.731	-6.731	0.000
	CaHPO4	1.757e-07	1.758e-07	-6.755	-6.755	0.000
	CaCO3	8.125e-08	8.130e-08	-7.090	-7.090	0.000
	CaH2PO4+	1.128e-08	1.073e-08	-7.948	-7.969	-0.022
	CaPO4-	3.941e-09	3.748e-09	-8.404	-8.426	-0.022
	CaOH+	6.846e-10	6.510e-10	-9.165	-9.186	-0.022
	CaF+	5.842e-10	5.555e-10	-9.233	-9.255	-0.022
	CaHSO4+	6.773e-14	6.441e-14	-13.169	-13.191	-0.022
Cd	8.891e-10					
	Cd+2	8.117e-10	6.638e-10	-9.091	-9.178	-0.087
	CdCl+	6.365e-11	6.053e-11	-10.196	-10.218	-0.022
	CdHCO3+	1.260e-11	1.198e-11	-10.900	-10.921	-0.022
	CdSO4	6.747e-13	6.750e-13	-12.171	-12.171	0.000
	CdCl2	2.390e-13	2.391e-13	-12.622	-12.621	0.000
	CdOH+	1.500e-13	1.426e-13	-12.824	-12.846	-0.022
	CdCO3	1.121e-13	1.121e-13	-12.951	-12.950	0.000
	Cd(OH)2	5.640e-16	5.643e-16	-15.249	-15.248	0.000
	CdCl3-	1.162e-16	1.105e-16	-15.935	-15.957	-0.022
	Cd(CO3)2-2	9.218e-17	7.539e-17	-16.035	-16.123	-0.087
	Cd(SO4)2-2	4.206e-17	3.440e-17	-16.376	-16.463	-0.087
	Cd(OH)3-	9.185e-22	8.735e-22	-21.037	-21.059	-0.022
	Cd(OH)4-2	1.313e-28	1.074e-28	-27.882	-27.969	-0.087
Cl	1.083e-03					
	Cl-	1.083e-03	1.030e-03	-2.965	-2.987	-0.022
	MnCl+	1.564e-10	1.487e-10	-9.806	-9.828	-0.022
	FeCl+	1.036e-10	9.857e-11	-9.984	-10.006	-0.022

	CdCl+	6.365e-11	6.053e-11	-10.196	-10.218	-0.022
	ZnCl+	3.058e-11	2.908e-11	-10.515	-10.536	-0.022
	PbCl+	1.041e-11	9.903e-12	-10.982	-11.004	-0.022
	CdCl2	2.390e-13	2.391e-13	-12.622	-12.621	0.000
	MnCl2	6.680e-14	6.684e-14	-13.175	-13.175	0.000
	ZnCl2	2.862e-14	2.863e-14	-13.543	-13.543	0.000
	PbCl2	2.463e-14	2.465e-14	-13.608	-13.608	0.000
	CdCl3-	1.162e-16	1.105e-16	-15.935	-15.957	-0.022
	ZnCl3-	3.037e-17	2.888e-17	-16.518	-16.539	-0.022
	MnCl3-	1.993e-17	1.895e-17	-16.700	-16.722	-0.022
	PbCl3-	1.844e-17	1.753e-17	-16.734	-16.756	-0.022
	ZnCl4-2	1.524e-20	1.246e-20	-19.817	-19.904	-0.087
	PbCl4-2	8.878e-21	7.261e-21	-20.052	-20.139	-0.087
	FeCl+2	7.678e-26	6.280e-26	-25.115	-25.202	-0.087
	FeCl2+	6.215e-28	5.911e-28	-27.207	-27.228	-0.022
	FeCl3	6.082e-32	6.086e-32	-31.216	-31.216	0.000
Cu(1)	7.949e-09					
	Cu+	7.949e-09	7.550e-09	-8.100	-8.122	-0.022
Cu(2)	2.040e-13					
	Cu(OH)2	1.519e-13	1.520e-13	-12.818	-12.818	0.000
	Cu+2	4.650e-14	3.823e-14	-13.333	-13.418	-0.085
	CuOH+	5.546e-15	5.274e-15	-14.256	-14.278	-0.022
	CuSO4	2.702e-17	2.703e-17	-16.568	-16.568	0.000
	Cu(OH)3-	1.329e-19	1.264e-19	-18.877	-18.898	-0.022
	Cu(OH)4-2	4.253e-25	3.478e-25	-24.371	-24.459	-0.087
F	4.034e-07					
	F-	3.996e-07	3.799e-07	-6.398	-6.420	-0.022
	MgF+	2.877e-09	2.736e-09	-8.541	-8.563	-0.022
	CaF+	5.842e-10	5.555e-10	-9.233	-9.255	-0.022
	NaF	9.843e-11	9.848e-11	-10.007	-10.007	0.000
	AlF+2	9.101e-11	7.443e-11	-10.041	-10.128	-0.087
	HF	2.879e-11	2.880e-11	-10.541	-10.541	0.000
	AlF2+	1.325e-11	1.260e-11	-10.878	-10.900	-0.022
	BF(OH)3-	5.772e-13	5.489e-13	-12.239	-12.261	-0.022
	FeF+	2.770e-13	2.635e-13	-12.557	-12.579	-0.022
	MnF+	9.798e-14	9.318e-14	-13.009	-13.031	-0.022
	AlF3	5.885e-14	5.888e-14	-13.230	-13.230	0.000
	HF2-	3.537e-17	3.364e-17	-16.451	-16.473	-0.022
	AlF4-	9.317e-18	8.860e-18	-17.031	-17.053	-0.022
	BF2(OH)2-	1.754e-18	1.668e-18	-17.756	-17.778	-0.022
	AlF5-2	6.830e-23	5.586e-23	-22.166	-22.253	-0.087
	FeF+2	2.154e-24	1.762e-24	-23.667	-23.754	-0.087
	BF3OH-	8.009e-26	7.616e-26	-25.096	-25.118	-0.022
	FeF2+	2.142e-26	2.037e-26	-25.669	-25.691	-0.022
	AlF6-3	5.226e-29	3.324e-29	-28.282	-28.478	-0.196
	FeF3	1.135e-29	1.136e-29	-28.945	-28.945	0.000
	BF4-	9.255e-33	8.802e-33	-32.034	-32.055	-0.022
	SiF6-2	0.000e+00	0.000e+00	-40.951	-41.038	-0.087
Fe(2)	8.961e-08					
	Fe+2	8.434e-08	6.935e-08	-7.074	-7.159	-0.085
	FeHCO3+	4.163e-09	3.959e-09	-8.381	-8.402	-0.022
	FeHPO4	4.744e-10	4.747e-10	-9.324	-9.324	0.000
	FeCO3	3.536e-10	3.538e-10	-9.452	-9.451	0.000
	FeCl+	1.036e-10	9.857e-11	-9.984	-10.006	-0.022
	FeH2PO4+	8.327e-11	7.918e-11	-10.080	-10.101	-0.022
	FeOH+	5.882e-11	5.593e-11	-10.230	-10.252	-0.022
	FeSO4	3.301e-11	3.303e-11	-10.481	-10.481	0.000
	FeF+	2.770e-13	2.635e-13	-12.557	-12.579	-0.022

FeHSO4+	1.652e-17	1.571e-17	-16.782	-16.804	-0.022
Fe(HS)2	1.396e-21	1.397e-21	-20.855	-20.855	0.000
Fe(HS)3-	7.601e-31	7.228e-31	-30.119	-30.141	-0.022
Fe(3)	3.246e-16				
Fe(OH)2+	1.985e-16	1.888e-16	-15.702	-15.724	-0.022
Fe(OH)3	1.253e-16	1.253e-16	-15.902	-15.902	0.000
Fe(OH)4-	6.688e-19	6.361e-19	-18.175	-18.197	-0.022
FeOH+2	1.190e-19	9.736e-20	-18.924	-19.012	-0.087
Fe+3	6.307e-24	4.133e-24	-23.200	-23.384	-0.184
FeH2PO4+2	3.099e-24	2.534e-24	-23.509	-23.596	-0.087
FeF+2	2.154e-24	1.762e-24	-23.667	-23.754	-0.087
FeHPO4+	9.628e-25	9.156e-25	-24.016	-24.038	-0.022
FeSO4+	1.170e-25	1.113e-25	-24.932	-24.954	-0.022
FeCl+2	7.678e-26	6.280e-26	-25.115	-25.202	-0.087
FeF2+	2.142e-26	2.037e-26	-25.669	-25.691	-0.022
FeCl2+	6.215e-28	5.911e-28	-27.207	-27.228	-0.022
FeF3	1.135e-29	1.136e-29	-28.945	-28.945	0.000
Fe(SO4)2-	9.486e-30	9.021e-30	-29.023	-29.045	-0.022
FeCl3	6.082e-32	6.086e-32	-31.216	-31.216	0.000
FeHSO4+2	2.875e-32	2.352e-32	-31.541	-31.629	-0.087
Fe2(OH)2+4	1.450e-36	6.490e-37	-35.838	-36.188	-0.349
Fe3(OH)4+5	0.000e+00	0.000e+00	-48.141	-48.686	-0.546
H(0)	2.011e-12				
H2	1.005e-12	1.006e-12	-11.998	-11.997	0.000
K	3.687e-05				
K+	3.687e-05	3.505e-05	-4.433	-4.455	-0.022
KSO4-	7.069e-10	6.722e-10	-9.151	-9.172	-0.022
KHPO4-	1.236e-10	1.175e-10	-9.908	-9.930	-0.022
KOH	1.676e-12	1.677e-12	-11.776	-11.776	0.000
Li	7.199e-07				
Li+	7.199e-07	6.855e-07	-6.143	-6.164	-0.021
LiSO4-	1.274e-11	1.211e-11	-10.895	-10.917	-0.022
LiOH	2.165e-13	2.166e-13	-12.664	-12.664	0.000
Mg	2.010e-04				
Mg+2	1.996e-04	1.641e-04	-3.700	-3.785	-0.085
MgHCO3+	1.104e-06	1.050e-06	-5.957	-5.979	-0.022
MgHPO4	1.371e-07	1.371e-07	-6.863	-6.863	0.000
MgSO4	8.698e-08	8.702e-08	-7.061	-7.060	0.000
MgCO3	2.411e-08	2.412e-08	-7.618	-7.618	0.000
MgH2PO4+	8.293e-09	7.886e-09	-8.081	-8.103	-0.022
MgPO4-	3.068e-09	2.917e-09	-8.513	-8.535	-0.022
MgF+	2.877e-09	2.736e-09	-8.541	-8.563	-0.022
MgOH+	1.124e-09	1.069e-09	-8.949	-8.971	-0.022
Mn(2)	4.579e-08				
Mn+2	4.312e-08	3.545e-08	-7.365	-7.450	-0.085
MnHCO3+	1.897e-09	1.804e-09	-8.722	-8.744	-0.022
MnCO3	5.985e-10	5.988e-10	-9.223	-9.223	0.000
MnCl+	1.564e-10	1.487e-10	-9.806	-9.828	-0.022
MnSO4	1.658e-11	1.659e-11	-10.780	-10.780	0.000
MnOH+	2.096e-12	1.994e-12	-11.679	-11.700	-0.022
MnF+	9.798e-14	9.318e-14	-13.009	-13.031	-0.022
MnCl2	6.680e-14	6.684e-14	-13.175	-13.175	0.000
MnCl3-	1.993e-17	1.895e-17	-16.700	-16.722	-0.022
Mn(NO3)2	0.000e+00	0.000e+00	-178.774	-178.774	0.000
Mn(3)	1.368e-37				
Mn+3	1.368e-37	8.701e-38	-36.864	-37.060	-0.196
N(-3)	2.857e-07				
NH4+	2.852e-07	2.709e-07	-6.545	-6.567	-0.022

	NH3	4.298e-10	4.300e-10	-9.367	-9.367	0.000
	NH4SO4-	1.486e-11	1.413e-11	-10.828	-10.850	-0.022
N(0)	5.824e-07					
	N2	2.912e-07	2.914e-07	-6.536	-6.536	0.000
N(3)	0.000e+00					
	NO2-	0.000e+00	0.000e+00	-63.895	-63.918	-0.022
N(5)	0.000e+00					
	NO3-	0.000e+00	0.000e+00	-85.951	-85.973	-0.022
	PbNO3+	0.000e+00	0.000e+00	-94.155	-94.177	-0.022
	Mn(NO3)2	0.000e+00	0.000e+00	-178.774	-178.774	0.000
Na	4.737e-04					
	Na+	4.736e-04	4.505e-04	-3.325	-3.346	-0.022
	NaHCO3	1.445e-07	1.446e-07	-6.840	-6.840	0.000
	NaSO4-	8.328e-09	7.920e-09	-8.079	-8.101	-0.022
	NaHPO4-	1.588e-09	1.510e-09	-8.799	-8.821	-0.022
	NaCO3-	6.002e-10	5.708e-10	-9.222	-9.244	-0.022
	NaF	9.843e-11	9.848e-11	-10.007	-10.007	0.000
	NaOH	4.104e-11	4.106e-11	-10.387	-10.387	0.000
O(0)	0.000e+00					
	O2	0.000e+00	0.000e+00	-75.676	-75.676	0.000
P	4.839e-06					
	H2PO4-	2.395e-06	2.278e-06	-5.621	-5.642	-0.022
	HPO4-2	2.103e-06	1.719e-06	-5.677	-5.765	-0.087
	CaHPO4	1.757e-07	1.758e-07	-6.755	-6.755	0.000
	MgHPO4	1.371e-07	1.371e-07	-6.863	-6.863	0.000
	CaH2PO4+	1.128e-08	1.073e-08	-7.948	-7.969	-0.022
	MgH2PO4+	8.293e-09	7.886e-09	-8.081	-8.103	-0.022
	CaPO4-	3.941e-09	3.748e-09	-8.404	-8.426	-0.022
	MgPO4-	3.068e-09	2.917e-09	-8.513	-8.535	-0.022
	NaHPO4-	1.588e-09	1.510e-09	-8.799	-8.821	-0.022
	FeHPO4	4.744e-10	4.747e-10	-9.324	-9.324	0.000
	KHPO4-	1.236e-10	1.175e-10	-9.908	-9.930	-0.022
	FeH2PO4+	8.327e-11	7.918e-11	-10.080	-10.101	-0.022
	PO4-3	1.071e-11	6.808e-12	-10.970	-11.167	-0.197
	FeH2PO4+2	3.099e-24	2.534e-24	-23.509	-23.596	-0.087
	FeHPO4+	9.628e-25	9.156e-25	-24.016	-24.038	-0.022
Pb	2.414e-09					
	PbCO3	1.562e-09	1.563e-09	-8.806	-8.806	0.000
	Pb+2	5.172e-10	4.230e-10	-9.286	-9.374	-0.087
	PbHCO3+	2.017e-10	1.918e-10	-9.695	-9.717	-0.022
	PbOH+	1.197e-10	1.138e-10	-9.922	-9.944	-0.022
	PbCl+	1.041e-11	9.903e-12	-10.982	-11.004	-0.022
	Pb(CO3)2-2	1.021e-12	8.349e-13	-11.991	-12.078	-0.087
	PbSO4	9.624e-13	9.629e-13	-12.017	-12.016	0.000
	Pb(OH)2	6.104e-13	6.107e-13	-12.214	-12.214	0.000
	PbCl2	2.463e-14	2.465e-14	-13.608	-13.608	0.000
	Pb(OH)3-	1.017e-16	9.673e-17	-15.993	-16.014	-0.022
	Pb(SO4)2-2	2.501e-17	2.046e-17	-16.602	-16.689	-0.087
	PbCl3-	1.844e-17	1.753e-17	-16.734	-16.756	-0.022
	Pb2OH+3	1.694e-18	1.078e-18	-17.771	-17.968	-0.196
	PbCl4-2	8.878e-21	7.261e-21	-20.052	-20.139	-0.087
	Pb(OH)4-2	3.738e-21	3.057e-21	-20.427	-20.515	-0.087
	PbNO3+	0.000e+00	0.000e+00	-94.155	-94.177	-0.022
S(-2)	1.147e-11					
	H2S	6.471e-12	6.474e-12	-11.189	-11.189	0.000
	HS-	5.000e-12	4.753e-12	-11.301	-11.323	-0.022
	S-2	2.056e-18	1.685e-18	-17.687	-17.773	-0.086
	Fe(HS)2	1.396e-21	1.397e-21	-20.855	-20.855	0.000

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      Fe(HS)3-          7.601e-31   7.228e-31   -30.119   -30.141    -0.022
S(6)              5.220e-06
      SO4-2             4.938e-06   4.048e-06    -5.306    -5.393    -0.086
      CaSO4             1.859e-07   1.860e-07    -6.731    -6.731     0.000
      MgSO4             8.698e-08   8.702e-08    -7.061    -7.060     0.000
      NaSO4-            8.328e-09   7.920e-09    -8.079    -8.101    -0.022
      KSO4-             7.069e-10   6.722e-10    -9.151    -9.172    -0.022
      SrSO4             5.074e-10   5.076e-10    -9.295    -9.294     0.000
      BaSO4             6.023e-11   6.026e-11   -10.220   -10.220     0.000
      FeSO4             3.301e-11   3.303e-11   -10.481   -10.481     0.000
      ZnSO4             2.265e-11   2.266e-11   -10.645   -10.645     0.000
      HSO4-             1.981e-11   1.884e-11   -10.703   -10.725    -0.022
      MnSO4             1.658e-11   1.659e-11   -10.780   -10.780     0.000
      NH4SO4-           1.486e-11   1.413e-11   -10.828   -10.850    -0.022
      LiSO4-            1.274e-11   1.211e-11   -10.895   -10.917    -0.022
      PbSO4             9.624e-13   9.629e-13   -12.017   -12.016     0.000
      CdSO4             6.747e-13   6.750e-13   -12.171   -12.171     0.000
      AlSO4+            2.253e-13   2.143e-13   -12.647   -12.669    -0.022
      CaHSO4+           6.773e-14   6.441e-14   -13.169   -13.191    -0.022
      Zn(SO4)2-2        1.085e-15   8.872e-16   -14.965   -15.052    -0.087
      Cd(SO4)2-2        4.206e-17   3.440e-17   -16.376   -16.463    -0.087
      CuSO4             2.702e-17   2.703e-17   -16.568   -16.568     0.000
      Al(SO4)2-         2.597e-17   2.470e-17   -16.585   -16.607    -0.022
      Pb(SO4)2-2        2.501e-17   2.046e-17   -16.602   -16.689    -0.087
      FeHSO4+           1.652e-17   1.571e-17   -16.782   -16.804    -0.022
      AlHSO4+2          1.491e-21   1.219e-21   -20.827   -20.914    -0.087
      FeSO4+            1.170e-25   1.113e-25   -24.932   -24.954    -0.022
      Fe(SO4)2-         9.486e-30   9.021e-30   -29.023   -29.045    -0.022
      FeHSO4+2          2.875e-32   2.352e-32   -31.541   -31.629    -0.087
Si                9.112e-06
      H4SiO4            9.104e-06   9.109e-06    -5.041    -5.041     0.000
      H3SiO4-           8.393e-09   7.981e-09    -8.076    -8.098    -0.022
      H2SiO4-2          1.941e-15   1.587e-15   -14.712   -14.799    -0.087
      SiF6-2            0.000e+00   0.000e+00   -40.951   -41.038    -0.087
Sr                1.026e-06
      Sr+2              1.022e-06   8.391e-07    -5.991    -6.076    -0.086
      SrHCO3+           3.751e-09   3.570e-09    -8.426    -8.447    -0.021
      SrSO4             5.074e-10   5.076e-10    -9.295    -9.294     0.000
      SrCO3             6.123e-11   6.126e-11   -10.213   -10.213     0.000
      SrOH+             6.239e-13   5.937e-13   -12.205   -12.226    -0.022
Zn                3.822e-08
      Zn+2              3.465e-08   2.842e-08    -7.460    -7.546    -0.086
      ZnHCO3+           2.147e-09   2.042e-09    -8.668    -8.690    -0.022
      ZnCO3             1.205e-09   1.206e-09    -8.919    -8.919     0.000
      ZnOH+             8.145e-11   7.746e-11   -10.089   -10.111    -0.022
      Zn(OH)2           6.804e-11   6.808e-11   -10.167   -10.167     0.000
      ZnCl+             3.058e-11   2.908e-11   -10.515   -10.536    -0.022
      ZnSO4             2.265e-11   2.266e-11   -10.645   -10.645     0.000
      Zn(CO3)2-2        6.701e-12   5.481e-12   -11.174   -11.261    -0.087
      ZnCl2             2.862e-14   2.863e-14   -13.543   -13.543     0.000
      Zn(OH)3-          3.123e-15   2.970e-15   -14.505   -14.527    -0.022
      Zn(SO4)2-2        1.085e-15   8.872e-16   -14.965   -15.052    -0.087
      ZnCl3-            3.037e-17   2.888e-17   -16.518   -16.539    -0.022
      ZnCl4-2           1.524e-20   1.246e-20   -19.817   -19.904    -0.087
      Zn(OH)4-2         7.939e-21   6.493e-21   -20.100   -20.188    -0.087

------------------------------Saturation indices-------------------------------
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◎ Table of Contents

Phase	SI	log IAP	log KT	
Al(OH)3(a)	-1.50	10.77	12.27	Al(OH)3
Albite	-6.15	-0.56	5.59	NaAlSi3O8
Alunite	-5.74	-4.35	1.39	KAl3(SO4)2(OH)6
Anglesite	-6.86	-14.77	-7.91	PbSO4
Anhydrite	-4.59	-8.94	-4.35	CaSO4
Anorthite	-7.51	22.19	29.71	CaAl2Si2O8
Aragonite	-1.99	-10.22	-8.23	CaCO3
Barite	-2.54	-12.92	-10.38	BaSO4
Ca-Montmorillonite	-1.69	8.37	10.06	Ca0.165Al2.33Si3.67O10(OH)2
Calcite	-1.83	-10.22	-8.39	CaCO3
Cd(OH)2	-8.55	5.10	13.65	Cd(OH)2
CdSiO3	-9.92	0.06	9.98	CdSiO3
CdSO4	-15.29	-14.57	0.72	CdSO4
Celestite	-4.80	-11.47	-6.66	SrSO4
Cerrusite	-2.65	-16.05	-13.40	PbCO3
CH4(g)	-9.60	-56.73	-47.13	CH4
Chalcedony	-1.23	-5.04	-3.81	SiO2
Chlorite(14A)	-17.90	58.89	76.79	Mg5Al2Si3O10(OH)8
Chrysotile	-13.59	21.40	34.99	Mg3Si2O5(OH)4
CO2(g)	-2.68	-20.95	-18.27	CO2
Dolomite	-4.11	-20.68	-16.57	CaMg(CO3)2
Fe(OH)3(a)	-6.86	11.59	18.45	Fe(OH)3
FeS(ppt)	-7.43	-48.33	-40.91	FeS
Fluorite	-5.50	-16.39	-10.89	CaF2
Gibbsite	1.39	10.77	9.38	Al(OH)3
Goethite	-1.77	11.59	13.36	FeOOH
Gypsum	-4.33	-8.94	-4.60	CaSO4:2H2O
H2(g)	-8.95	-8.95	0.00	H2
H2S(g)	-10.45	-55.45	-45.01	H2S
Hausmannite	-37.19	29.43	66.62	Mn3O4
Hematite	-1.63	23.19	24.82	Fe2O3
Hydroxyapatite	-5.05	-44.09	-39.04	Ca5(PO4)3OH
Illite	-2.91	11.36	14.27	K0.6Mg0.25Al2.3Si3.5O10(OH)2
Jarosite-K	-35.08	-1.88	33.20	KFe3(SO4)2(OH)6
K-feldspar	-4.41	-1.67	2.75	KAlSi3O8
K-mica	3.87	19.87	16.00	KAl3Si3O10(OH)2
Kaolinite	2.06	11.46	9.40	Al2Si2O5(OH)4
Mackinawite	-6.69	-48.33	-41.64	FeS
Manganite	-14.04	11.30	25.34	MnOOH
Melanterite	-10.05	-12.55	-2.50	FeSO4:7H2O
N2(g)	-3.35	-6.54	-3.18	N2
NH3(g)	-11.59	-16.69	-5.10	NH3
O2(g)	-72.82	17.89	90.71	O2
Otavite	-3.75	-15.85	-12.10	CdCO3
Pb(OH)2	-4.02	4.91	8.93	Pb(OH)2
Pyrite	-1.75	-94.84	-93.09	FeS2
Pyrochroite	-8.37	6.83	15.20	Mn(OH)2
Pyrolusite	-29.22	15.77	45.00	MnO2
Quartz	-0.73	-5.04	-4.31	SiO2
Rhodochrosite	-3.07	-14.12	-11.05	MnCO3
Sepiolite	-10.49	5.87	16.35	Mg2Si3O7.5OH:3H2O
Sepiolite(d)	-12.79	5.87	18.66	Mg2Si3O7.5OH:3H2O
Siderite	-3.08	-13.83	-10.75	FeCO3
SiO2(a)	-2.14	-5.04	-2.90	SiO2
Smithsonite	-4.46	-14.22	-9.76	ZnCO3
Sphalerite	0.35	-48.72	-49.07	ZnS

```
      Strontianite     -3.43  -12.75   -9.32  SrCO3
      Sulfur           -7.65  -46.51  -38.85  S
      Talc            -12.65   11.32   23.97  Mg3Si4O10(OH)2
      Vivianite        -7.81  -43.81  -36.00  Fe3(PO4)2:8H2O
      Willemite        -8.76    8.43   17.18  Zn2SiO4
      Witherite        -5.51  -14.20   -8.69  BaCO3
      Zn(OH)2(e)       -4.77    6.73   11.50  Zn(OH)2

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End of simulation.
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Reading input data for simulation 7.
-----------------------------------

      MIX 4 Mixing B2/Rain with Stickleback (1:1000000)
            3     0.000001
            4     0.999999
      SAVE solution 7
      END
-----------------------------------
Beginning of reaction calculations.
-----------------------------------

Reaction step 1.

Using mixture 4.  Mixing B2/Rain with Stickleback (1:1000000)

       1.000e-06 Solution 3   Solution after simulation 3.
       1.000e+00 Solution 4   Stickleback Lake

-----------------------------Solution composition------------------------------

      Elements           Molality       Moles

      Al                9.267e-08   9.267e-08
      B                 4.626e-06   4.626e-06
      Ba                3.641e-08   3.641e-08
      C                 7.425e-04   7.425e-04
      Ca                3.485e-04   3.485e-04
      Cd                8.898e-10   8.898e-10
      Cl                1.084e-03   1.084e-03
      Cu                7.869e-09   7.869e-09
      F                 4.038e-07   4.038e-07
      Fe                8.954e-08   8.954e-08
      K                 3.691e-05   3.691e-05
      Li                7.206e-07   7.206e-07
      Mg                2.012e-04   2.012e-04
      Mn                4.551e-08   4.551e-08
      N                 8.690e-07   8.690e-07
      Na                4.742e-04   4.742e-04
      P                 4.843e-06   4.843e-06
      Pb                2.413e-09   2.413e-09
      S                 5.205e-06   5.205e-06
      Si                9.121e-06   9.121e-06
      Sr                1.027e-06   1.027e-06
      Zn                3.825e-08   3.825e-08
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◎ Table of Contents

----------Description of solution----------

```
                            pH  =   7.140      Charge balance
                            pe  =  -2.667      Adjusted to redox equilibrium
               Activity of water  =   1.000
                  Ionic strength  =   2.211e-03
               Mass of water (kg)  =   1.000e+00
        Total alkalinity (eq/kg)  =   6.060e-04
              Total CO2 (mol/kg)  =   7.425e-04
             Temperature (deg C)  =   4.000
         Electrical balance (eq)  =  -9.167e-05
                     Iterations   =  14
                        Total H   = 1.110131e+02
                        Total O   = 5.550840e+01
```

----------Distribution of species----------

	Species	Molality	Activity	Log Molality	Log Activity	Log Gamma
	H+	7.601e-08	7.252e-08	-7.119	-7.140	-0.020
	OH-	2.445e-08	2.324e-08	-7.612	-7.634	-0.022
	H2O	5.551e+01	1.000e+00	0.000	0.000	0.000
Al		9.267e-08				
	Al(OH)4-	7.809e-08	7.426e-08	-7.107	-7.129	-0.022
	Al(OH)2+	1.024e-08	9.741e-09	-7.990	-8.011	-0.022
	Al(OH)3	3.309e-09	3.311e-09	-8.480	-8.480	0.000
	AlOH+2	8.861e-10	7.247e-10	-9.053	-9.140	-0.087
	AlF+2	8.981e-11	7.345e-11	-10.047	-10.134	-0.087
	Al+3	3.376e-11	2.212e-11	-10.472	-10.655	-0.184
	AlF2+	1.309e-11	1.244e-11	-10.883	-10.905	-0.022
	AlSO4+	2.215e-13	2.106e-13	-12.655	-12.676	-0.022
	AlF3	5.819e-14	5.822e-14	-13.235	-13.235	0.000
	Al(SO4)2-	2.546e-17	2.421e-17	-16.594	-16.616	-0.022
	AlF4-	9.221e-18	8.769e-18	-17.035	-17.057	-0.022
	AlHSO4+2	1.466e-21	1.199e-21	-20.834	-20.921	-0.087
	AlF5-2	6.766e-23	5.534e-23	-22.170	-22.257	-0.087
	AlF6-3	5.183e-29	3.296e-29	-28.285	-28.482	-0.197
B		4.626e-06				
	H3BO3	4.600e-06	4.603e-06	-5.337	-5.337	0.000
	H2BO3-	2.543e-08	2.418e-08	-7.595	-7.617	-0.022
	BF(OH)3-	5.783e-13	5.500e-13	-12.238	-12.260	-0.022
	BF2(OH)2-	1.761e-18	1.674e-18	-17.754	-17.776	-0.022
	BF3OH-	8.049e-26	7.654e-26	-25.094	-25.116	-0.022
	BF4-	9.315e-33	8.858e-33	-32.031	-32.053	-0.022
Ba		3.641e-08				
	Ba+2	3.626e-08	2.973e-08	-7.441	-7.527	-0.086
	BaHCO3+	8.836e-11	8.403e-11	-10.054	-10.076	-0.022
	BaSO4	6.011e-11	6.014e-11	-10.221	-10.221	0.000
	BaCO3	2.141e-12	2.142e-12	-11.669	-11.669	0.000
	BaOH+	1.461e-14	1.389e-14	-13.835	-13.857	-0.022
C(-4)		5.360e-13				
	CH4	5.360e-13	5.363e-13	-12.271	-12.271	0.000
C(4)		7.425e-04				
	HCO3-	6.000e-04	5.711e-04	-3.222	-3.243	-0.021
	CO2	1.396e-04	1.397e-04	-3.855	-3.855	0.000
	CaHCO3+	1.313e-06	1.249e-06	-5.882	-5.903	-0.021

	MgHCO3+	1.105e-06	1.051e-06	-5.957	-5.979	-0.022
	CO3-2	2.590e-07	2.126e-07	-6.587	-6.672	-0.086
	NaHCO3	1.447e-07	1.448e-07	-6.839	-6.839	0.000
	CaCO3	8.130e-08	8.134e-08	-7.090	-7.090	0.000
	MgCO3	2.412e-08	2.413e-08	-7.618	-7.617	0.000
	FeHCO3+	4.161e-09	3.957e-09	-8.381	-8.403	-0.022
	SrHCO3+	3.756e-09	3.575e-09	-8.425	-8.447	-0.021
	ZnHCO3+	2.150e-09	2.044e-09	-8.668	-8.689	-0.022
	MnHCO3+	1.886e-09	1.793e-09	-8.724	-8.746	-0.022
	PbCO3	1.562e-09	1.563e-09	-8.806	-8.806	0.000
	ZnCO3	1.206e-09	1.206e-09	-8.919	-8.919	0.000
	NaCO3-	6.007e-10	5.713e-10	-9.221	-9.243	-0.022
	MnCO3	5.948e-10	5.951e-10	-9.226	-9.225	0.000
	FeCO3	3.532e-10	3.534e-10	-9.452	-9.452	0.000
	PbHCO3+	2.017e-10	1.919e-10	-9.695	-9.717	-0.022
	BaHCO3+	8.836e-11	8.403e-11	-10.054	-10.076	-0.022
	SrCO3	6.128e-11	6.131e-11	-10.213	-10.212	0.000
	CdHCO3+	1.261e-11	1.200e-11	-10.899	-10.921	-0.022
	Zn(CO3)2-2	6.706e-12	5.484e-12	-11.174	-11.261	-0.087
	BaCO3	2.141e-12	2.142e-12	-11.669	-11.669	0.000
	Pb(CO3)2-2	1.021e-12	8.346e-13	-11.991	-12.078	-0.087
	CdCO3	1.121e-13	1.122e-13	-12.950	-12.950	0.000
	Cd(CO3)2-2	9.224e-17	7.543e-17	-16.035	-16.122	-0.087
Ca		3.485e-04				
	Ca+2	3.467e-04	2.845e-04	-3.460	-3.546	-0.086
	CaHCO3+	1.313e-06	1.249e-06	-5.882	-5.903	-0.021
	CaSO4	1.855e-07	1.855e-07	-6.732	-6.732	0.000
	CaHPO4	1.759e-07	1.760e-07	-6.755	-6.755	0.000
	CaCO3	8.130e-08	8.134e-08	-7.090	-7.090	0.000
	CaH2PO4+	1.130e-08	1.075e-08	-7.947	-7.969	-0.022
	CaPO4-	3.943e-09	3.750e-09	-8.404	-8.426	-0.022
	CaOH+	6.847e-10	6.511e-10	-9.165	-9.186	-0.022
	CaF+	5.851e-10	5.564e-10	-9.233	-9.255	-0.022
	CaHSO4+	6.761e-14	6.429e-14	-13.170	-13.192	-0.022
Cd		8.898e-10				
	Cd+2	8.122e-10	6.642e-10	-9.090	-9.178	-0.087
	CdCl+	6.375e-11	6.063e-11	-10.196	-10.217	-0.022
	CdHCO3+	1.261e-11	1.200e-11	-10.899	-10.921	-0.022
	CdSO4	6.731e-13	6.734e-13	-12.172	-12.172	0.000
	CdCl2	2.396e-13	2.397e-13	-12.621	-12.620	0.000
	CdOH+	1.500e-13	1.427e-13	-12.824	-12.846	-0.022
	CdCO3	1.121e-13	1.122e-13	-12.950	-12.950	0.000
	Cd(OH)2	5.638e-16	5.641e-16	-15.249	-15.249	0.000
	CdCl3-	1.166e-16	1.109e-16	-15.933	-15.955	-0.022
	Cd(CO3)2-2	9.224e-17	7.543e-17	-16.035	-16.122	-0.087
	Cd(SO4)2-2	4.184e-17	3.422e-17	-16.378	-16.466	-0.087
	Cd(OH)3-	9.177e-22	8.727e-22	-21.037	-21.059	-0.022
	Cd(OH)4-2	1.311e-28	1.072e-28	-27.882	-27.970	-0.087
Cl		1.084e-03				
	Cl-	1.084e-03	1.031e-03	-2.965	-2.987	-0.022
	MnCl+	1.556e-10	1.479e-10	-9.808	-9.830	-0.022
	FeCl+	1.037e-10	9.857e-11	-9.984	-10.006	-0.022
	CdCl+	6.375e-11	6.063e-11	-10.196	-10.217	-0.022
	ZnCl+	3.063e-11	2.913e-11	-10.514	-10.536	-0.022
	PbCl+	1.042e-11	9.911e-12	-10.982	-11.004	-0.022
	CdCl2	2.396e-13	2.397e-13	-12.621	-12.620	0.000
	MnCl2	6.652e-14	6.656e-14	-13.177	-13.177	0.000
	ZnCl2	2.869e-14	2.871e-14	-13.542	-13.542	0.000

	PbCl2	2.468e-14	2.469e-14	-13.608	-13.607	0.000
	CdCl3-	1.166e-16	1.109e-16	-15.933	-15.955	-0.022
	ZnCl3-	3.048e-17	2.899e-17	-16.516	-16.538	-0.022
	MnCl3-	1.987e-17	1.889e-17	-16.702	-16.724	-0.022
	PbCl3-	1.849e-17	1.758e-17	-16.733	-16.755	-0.022
	ZnCl4-2	1.531e-20	1.252e-20	-19.815	-19.902	-0.087
	PbCl4-2	8.912e-21	7.288e-21	-20.050	-20.137	-0.087
	FeCl+2	7.682e-26	6.282e-26	-25.115	-25.202	-0.087
	FeCl2+	6.224e-28	5.919e-28	-27.206	-27.228	-0.022
	FeCl3	6.097e-32	6.100e-32	-31.215	-31.215	0.000
Cu(1)	7.869e-09					
	Cu+	7.869e-09	7.474e-09	-8.104	-8.126	-0.022
Cu(2)	2.019e-13					
	Cu(OH)2	1.503e-13	1.504e-13	-12.823	-12.823	0.000
	Cu+2	4.605e-14	3.786e-14	-13.337	-13.422	-0.085
	CuOH+	5.490e-15	5.221e-15	-14.260	-14.282	-0.022
	CuSO4	2.668e-17	2.669e-17	-16.574	-16.574	0.000
	Cu(OH)3-	1.314e-19	1.250e-19	-18.881	-18.903	-0.022
	Cu(OH)4-2	4.204e-25	3.438e-25	-24.376	-24.464	-0.087
F	4.038e-07					
	F-	4.000e-07	3.803e-07	-6.398	-6.420	-0.022
	MgF+	2.881e-09	2.740e-09	-8.540	-8.562	-0.022
	CaF+	5.851e-10	5.564e-10	-9.233	-9.255	-0.022
	NaF	9.862e-11	9.867e-11	-10.006	-10.006	0.000
	AlF+2	8.981e-11	7.345e-11	-10.047	-10.134	-0.087
	HF	2.883e-11	2.884e-11	-10.540	-10.540	0.000
	AlF2+	1.309e-11	1.244e-11	-10.883	-10.905	-0.022
	BF(OH)3-	5.783e-13	5.500e-13	-12.238	-12.260	-0.022
	FeF+	2.771e-13	2.635e-13	-12.557	-12.579	-0.022
	MnF+	9.748e-14	9.270e-14	-13.011	-13.033	-0.022
	AlF3	5.819e-14	5.822e-14	-13.235	-13.235	0.000
	HF2-	3.546e-17	3.372e-17	-16.450	-16.472	-0.022
	AlF4-	9.221e-18	8.769e-18	-17.035	-17.057	-0.022
	BF2(OH)2-	1.761e-18	1.674e-18	-17.754	-17.776	-0.022
	AlF5-2	6.766e-23	5.534e-23	-22.170	-22.257	-0.087
	FeF+2	2.155e-24	1.763e-24	-23.666	-23.754	-0.087
	BF3OH-	8.049e-26	7.654e-26	-25.094	-25.116	-0.022
	FeF2+	2.145e-26	2.040e-26	-25.669	-25.690	-0.022
	AlF6-3	5.183e-29	3.296e-29	-28.285	-28.482	-0.197
	FeF3	1.138e-29	1.139e-29	-28.944	-28.944	0.000
	BF4-	9.315e-33	8.858e-33	-32.031	-32.053	-0.022
	SiF6-2	0.000e+00	0.000e+00	-40.947	-41.035	-0.087
Fe(2)	8.954e-08					
	Fe+2	8.427e-08	6.929e-08	-7.074	-7.159	-0.085
	FeHCO3+	4.161e-09	3.957e-09	-8.381	-8.403	-0.022
	FeHPO4	4.742e-10	4.745e-10	-9.324	-9.324	0.000
	FeCO3	3.532e-10	3.534e-10	-9.452	-9.452	0.000
	FeCl+	1.037e-10	9.857e-11	-9.984	-10.006	-0.022
	FeH2PO4+	8.327e-11	7.919e-11	-10.079	-10.101	-0.022
	FeOH+	5.873e-11	5.585e-11	-10.231	-10.253	-0.022
	FeSO4	3.289e-11	3.290e-11	-10.483	-10.483	0.000
	FeF+	2.771e-13	2.635e-13	-12.557	-12.579	-0.022
	FeHSO4+	1.646e-17	1.566e-17	-16.783	-16.805	-0.022
	Fe(HS)2	1.390e-21	1.391e-21	-20.857	-20.857	0.000
	Fe(HS)3-	7.560e-31	7.189e-31	-30.121	-30.143	-0.022
Fe(3)	3.240e-16					
	Fe(OH)2+	1.982e-16	1.885e-16	-15.703	-15.725	-0.022
	Fe(OH)3	1.250e-16	1.251e-16	-15.903	-15.903	0.000

	Fe(OH)4-	6.672e-19	6.345e-19	-18.176	-18.198	-0.022
	FeOH+2	1.189e-19	9.726e-20	-18.925	-19.012	-0.087
	Fe+3	6.304e-24	4.131e-24	-23.200	-23.384	-0.184
	FeH2PO4+2	3.100e-24	2.535e-24	-23.509	-23.596	-0.087
	FeF+2	2.155e-24	1.763e-24	-23.666	-23.754	-0.087
	FeHPO4+	9.628e-25	9.156e-25	-24.016	-24.038	-0.022
	FeSO4+	1.166e-25	1.109e-25	-24.933	-24.955	-0.022
	FeCl+2	7.682e-26	6.282e-26	-25.115	-25.202	-0.087
	FeF2+	2.145e-26	2.040e-26	-25.669	-25.690	-0.022
	FeCl2+	6.224e-28	5.919e-28	-27.206	-27.228	-0.022
	FeF3	1.138e-29	1.139e-29	-28.944	-28.944	0.000
	Fe(SO4)2-	9.425e-30	8.963e-30	-29.026	-29.048	-0.022
	FeCl3	6.097e-32	6.100e-32	-31.215	-31.215	0.000
	FeHSO4+2	2.867e-32	2.344e-32	-31.543	-31.630	-0.087
	Fe2(OH)2+4	1.448e-36	6.476e-37	-35.839	-36.189	-0.349
	Fe3(OH)4+5	0.000e+00	0.000e+00	-48.142	-48.688	-0.546
H(0)		2.011e-12				
	H2	1.006e-12	1.006e-12	-11.998	-11.997	0.000
K		3.691e-05				
	K+	3.691e-05	3.508e-05	-4.433	-4.455	-0.022
	KSO4-	7.054e-10	6.708e-10	-9.152	-9.173	-0.022
	KHPO4-	1.237e-10	1.177e-10	-9.907	-9.929	-0.022
	KOH	1.676e-12	1.677e-12	-11.776	-11.775	0.000
Li		7.206e-07				
	Li+	7.206e-07	6.862e-07	-6.142	-6.164	-0.021
	LiSO4-	1.271e-11	1.209e-11	-10.896	-10.918	-0.022
	LiOH	2.166e-13	2.168e-13	-12.664	-12.664	0.000
Mg		2.012e-04				
	Mg+2	1.998e-04	1.642e-04	-3.699	-3.785	-0.085
	MgHCO3+	1.105e-06	1.051e-06	-5.957	-5.979	-0.022
	MgHPO4	1.372e-07	1.373e-07	-6.863	-6.862	0.000
	MgSO4	8.678e-08	8.682e-08	-7.062	-7.061	0.000
	MgCO3	2.412e-08	2.413e-08	-7.618	-7.617	0.000
	MgH2PO4+	8.306e-09	7.899e-09	-8.081	-8.102	-0.022
	MgPO4-	3.070e-09	2.919e-09	-8.513	-8.535	-0.022
	MgF+	2.881e-09	2.740e-09	-8.540	-8.562	-0.022
	MgOH+	1.124e-09	1.069e-09	-8.949	-8.971	-0.022
Mn(2)		4.551e-08				
	Mn+2	4.286e-08	3.524e-08	-7.368	-7.453	-0.085
	MnHCO3+	1.886e-09	1.793e-09	-8.724	-8.746	-0.022
	MnCO3	5.948e-10	5.951e-10	-9.226	-9.225	0.000
	MnCl+	1.556e-10	1.479e-10	-9.808	-9.830	-0.022
	MnSO4	1.643e-11	1.643e-11	-10.784	-10.784	0.000
	MnOH+	2.082e-12	1.980e-12	-11.681	-11.703	-0.022
	MnF+	9.748e-14	9.270e-14	-13.011	-13.033	-0.022
	MnCl2	6.652e-14	6.656e-14	-13.177	-13.177	0.000
	MnCl3-	1.987e-17	1.889e-17	-16.702	-16.724	-0.022
	Mn(NO3)2	0.000e+00	0.000e+00	-178.778	-178.777	0.000
Mn(3)		1.360e-37				
	Mn+3	1.360e-37	8.651e-38	-36.866	-37.063	-0.197
N(-3)		2.860e-07				
	NH4+	2.856e-07	2.713e-07	-6.544	-6.567	-0.022
	NH3	4.301e-10	4.303e-10	-9.366	-9.366	0.000
	NH4SO4-	1.483e-11	1.410e-11	-10.829	-10.851	-0.022
N(0)		5.829e-07				
	N2	2.915e-07	2.916e-07	-6.535	-6.535	0.000
N(3)		0.000e+00				
	NO2-	0.000e+00	0.000e+00	-63.896	-63.918	-0.022

N(5)	0.000e+00					
NO3-		0.000e+00	0.000e+00	-85.951	-85.973	-0.022
PbNO3+		0.000e+00	0.000e+00	-94.155	-94.177	-0.022
Mn(NO3)2		0.000e+00	0.000e+00	-178.778	-178.777	0.000
Na	4.742e-04					
Na+		4.740e-04	4.509e-04	-3.324	-3.346	-0.022
NaHCO3		1.447e-07	1.448e-07	-6.839	-6.839	0.000
NaSO4-		8.311e-09	7.904e-09	-8.080	-8.102	-0.022
NaHPO4-		1.590e-09	1.512e-09	-8.799	-8.820	-0.022
NaCO3-		6.007e-10	5.713e-10	-9.221	-9.243	-0.022
NaF		9.862e-11	9.867e-11	-10.006	-10.006	0.000
NaOH		4.106e-11	4.108e-11	-10.387	-10.386	0.000
O(0)	0.000e+00					
O2		0.000e+00	0.000e+00	-75.676	-75.676	0.000
P	4.843e-06					
H2PO4-		2.397e-06	2.280e-06	-5.620	-5.642	-0.022
HPO4-2		2.104e-06	1.720e-06	-5.677	-5.764	-0.087
CaHPO4		1.759e-07	1.760e-07	-6.755	-6.755	0.000
MgHPO4		1.372e-07	1.373e-07	-6.863	-6.862	0.000
CaH2PO4+		1.130e-08	1.075e-08	-7.947	-7.969	-0.022
MgH2PO4+		8.306e-09	7.899e-09	-8.081	-8.102	-0.022
CaPO4-		3.943e-09	3.750e-09	-8.404	-8.426	-0.022
MgPO4-		3.070e-09	2.919e-09	-8.513	-8.535	-0.022
NaHPO4-		1.590e-09	1.512e-09	-8.799	-8.820	-0.022
FeHPO4		4.742e-10	4.745e-10	-9.324	-9.324	0.000
KHPO4-		1.237e-10	1.177e-10	-9.907	-9.929	-0.022
FeH2PO4+		8.327e-11	7.919e-11	-10.079	-10.101	-0.022
PO4-3		1.071e-11	6.808e-12	-10.970	-11.167	-0.197
FeH2PO4+2		3.100e-24	2.535e-24	-23.509	-23.596	-0.087
FeHPO4+		9.628e-25	9.156e-25	-24.016	-24.038	-0.022
Pb	2.413e-09					
PbCO3		1.562e-09	1.563e-09	-8.806	-8.806	0.000
Pb+2		5.172e-10	4.229e-10	-9.286	-9.374	-0.087
PbHCO3+		2.017e-10	1.919e-10	-9.695	-9.717	-0.022
PbOH+		1.196e-10	1.137e-10	-9.922	-9.944	-0.022
PbCl+		1.042e-11	9.911e-12	-10.982	-11.004	-0.022
Pb(CO3)2-2		1.021e-12	8.346e-13	-11.991	-12.078	-0.087
PbSO4		9.594e-13	9.599e-13	-12.018	-12.018	0.000
Pb(OH)2		6.097e-13	6.100e-13	-12.215	-12.215	0.000
PbCl2		2.468e-14	2.469e-14	-13.608	-13.607	0.000
Pb(OH)3-		1.015e-16	9.657e-17	-15.993	-16.015	-0.022
Pb(SO4)2-2		2.486e-17	2.033e-17	-16.604	-16.692	-0.087
PbCl3-		1.849e-17	1.758e-17	-16.733	-16.755	-0.022
Pb2OH+3		1.693e-18	1.077e-18	-17.771	-17.968	-0.197
PbCl4-2		8.912e-21	7.288e-21	-20.050	-20.137	-0.087
Pb(OH)4-2		3.730e-21	3.050e-21	-20.428	-20.516	-0.087
PbNO3+		0.000e+00	0.000e+00	-94.155	-94.177	-0.022
S(-2)	1.146e-11					
H2S		6.464e-12	6.468e-12	-11.189	-11.189	0.000
HS-		4.993e-12	4.746e-12	-11.302	-11.324	-0.022
S-2		2.052e-18	1.682e-18	-17.688	-17.774	-0.086
Fe(HS)2		1.390e-21	1.391e-21	-20.857	-20.857	0.000
Fe(HS)3-		7.560e-31	7.189e-31	-30.121	-30.143	-0.022
S(6)	5.205e-06					
SO4-2		4.923e-06	4.036e-06	-5.308	-5.394	-0.086
CaSO4		1.855e-07	1.855e-07	-6.732	-6.732	0.000
MgSO4		8.678e-08	8.682e-08	-7.062	-7.061	0.000
NaSO4-		8.311e-09	7.904e-09	-8.080	-8.102	-0.022

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      KSO4-             7.054e-10   6.708e-10    -9.152    -9.173    -0.022
      SrSO4             5.063e-10   5.066e-10    -9.296    -9.295     0.000
      BaSO4             6.011e-11   6.014e-11   -10.221   -10.221     0.000
      FeSO4             3.289e-11   3.290e-11   -10.483   -10.483     0.000
      ZnSO4             2.260e-11   2.261e-11   -10.646   -10.646     0.000
      HSO4-             1.976e-11   1.879e-11   -10.704   -10.726    -0.022
      MnSO4             1.643e-11   1.643e-11   -10.784   -10.784     0.000
      NH4SO4-           1.483e-11   1.410e-11   -10.829   -10.851    -0.022
      LiSO4-            1.271e-11   1.209e-11   -10.896   -10.918    -0.022
      PbSO4             9.594e-13   9.599e-13   -12.018   -12.018     0.000
      CdSO4             6.731e-13   6.734e-13   -12.172   -12.172     0.000
      AlSO4+            2.215e-13   2.106e-13   -12.655   -12.676    -0.022
      CaHSO4+           6.761e-14   6.429e-14   -13.170   -13.192    -0.022
      Zn(SO4)2-2        1.079e-15   8.826e-16   -14.967   -15.054    -0.087
      Cd(SO4)2-2        4.184e-17   3.422e-17   -16.378   -16.466    -0.087
      CuSO4             2.668e-17   2.669e-17   -16.574   -16.574     0.000
      Al(SO4)2-         2.546e-17   2.421e-17   -16.594   -16.616    -0.022
      Pb(SO4)2-2        2.486e-17   2.033e-17   -16.604   -16.692    -0.087
      FeHSO4+           1.646e-17   1.566e-17   -16.783   -16.805    -0.022
      AlHSO4+2          1.466e-21   1.199e-21   -20.834   -20.921    -0.087
      FeSO4+            1.166e-25   1.109e-25   -24.933   -24.955    -0.022
      Fe(SO4)2-         9.425e-30   8.963e-30   -29.026   -29.048    -0.022
      FeHSO4+2          2.867e-32   2.344e-32   -31.543   -31.630    -0.087
Si                9.121e-06
      H4SiO4            9.113e-06   9.118e-06    -5.040    -5.040     0.000
      H3SiO4-           8.397e-09   7.985e-09    -8.076    -8.098    -0.022
      H2SiO4-2          1.941e-15   1.587e-15   -14.712   -14.799    -0.087
      SiF6-2            0.000e+00   0.000e+00   -40.947   -41.035    -0.087
Sr                1.027e-06
      Sr+2              1.023e-06   8.399e-07    -5.990    -6.076    -0.086
      SrHCO3+           3.756e-09   3.575e-09    -8.425    -8.447    -0.021
      SrSO4             5.063e-10   5.066e-10    -9.296    -9.295     0.000
      SrCO3             6.128e-11   6.131e-11   -10.213   -10.212     0.000
      SrOH+             6.241e-13   5.939e-13   -12.205   -12.226    -0.022
Zn                3.825e-08
      Zn+2              3.468e-08   2.844e-08    -7.460    -7.546    -0.086
      ZnHCO3+           2.150e-09   2.044e-09    -8.668    -8.689    -0.022
      ZnCO3             1.206e-09   1.206e-09    -8.919    -8.919     0.000
      ZnOH+             8.147e-11   7.748e-11   -10.089   -10.111    -0.022
      Zn(OH)2           6.803e-11   6.806e-11   -10.167   -10.167     0.000
      ZnCl+             3.063e-11   2.913e-11   -10.514   -10.536    -0.022
      ZnSO4             2.260e-11   2.261e-11   -10.646   -10.646     0.000
      Zn(CO3)2-2        6.706e-12   5.484e-12   -11.174   -11.261    -0.087
      ZnCl2             2.869e-14   2.871e-14   -13.542   -13.542     0.000
      Zn(OH)3-          3.121e-15   2.968e-15   -14.506   -14.528    -0.022
      Zn(SO4)2-2        1.079e-15   8.826e-16   -14.967   -15.054    -0.087
      ZnCl3-            3.048e-17   2.899e-17   -16.516   -16.538    -0.022
      ZnCl4-2           1.531e-20   1.252e-20   -19.815   -19.902    -0.087
      Zn(OH)4-2         7.930e-21   6.485e-21   -20.101   -20.188    -0.087

-----------------------------Saturation indices-------------------------------

      Phase               SI log IAP  log KT

      Al(OH)3(a)       -1.51   10.76   12.27  Al(OH)3
      Albite           -6.16   -0.56    5.59  NaAlSi3O8
      Alunite          -5.76   -4.37    1.39  KAl3(SO4)2(OH)6
      Anglesite        -6.86  -14.77   -7.91  PbSO4
```

◎ Table of Contents

Anhydrite	-4.59	-8.94	-4.35	CaSO4
Anorthite	-7.53	22.18	29.71	CaAl2Si2O8
Aragonite	-1.99	-10.22	-8.23	CaCO3
Barite	-2.54	-12.92	-10.38	BaSO4
Ca-Montmorillonite	-1.70	8.35	10.06	Ca0.165Al2.33Si3.67O10(OH)2
Calcite	-1.83	-10.22	-8.39	CaCO3
Cd(OH)2	-8.55	5.10	13.65	Cd(OH)2
CdSiO3	-9.92	0.06	9.98	CdSiO3
CdSO4	-15.29	-14.57	0.72	CdSO4
Celestite	-4.81	-11.47	-6.66	SrSO4
Cerrusite	-2.65	-16.05	-13.40	PbCO3
CH4(g)	-9.60	-56.73	-47.13	CH4
Chalcedony	-1.23	-5.04	-3.81	SiO2
Chlorite(14A)	-17.92	58.88	76.79	Mg5Al2Si3O10(OH)8
Chrysotile	-13.59	21.40	34.99	Mg3Si2O5(OH)4
CO2(g)	-2.68	-20.95	-18.27	CO2
Dolomite	-4.11	-20.68	-16.57	CaMg(CO3)2
Fe(OH)3(a)	-6.86	11.59	18.45	Fe(OH)3
FeS(ppt)	-7.43	-48.33	-40.91	FeS
Fluorite	-5.50	-16.39	-10.89	CaF2
Gibbsite	1.39	10.76	9.38	Al(OH)3
Goethite	-1.77	11.59	13.36	FeOOH
Gypsum	-4.34	-8.94	-4.60	CaSO4:2H2O
H2(g)	-8.95	-8.95	0.00	H2
H2S(g)	-10.45	-55.45	-45.01	H2S
Hausmannite	-37.20	29.42	66.62	Mn3O4
Hematite	-1.64	23.18	24.82	Fe2O3
Hydroxyapatite	-5.05	-44.09	-39.04	Ca5(PO4)3OH
Illite	-2.92	11.35	14.27	K0.6Mg0.25Al2.3Si3.5O10(OH)2
Jarosite-K	-35.09	-1.88	33.20	KFe3(SO4)2(OH)6
K-feldspar	-4.42	-1.67	2.75	KAlSi3O8
K-mica	3.85	19.85	16.00	KAl3Si3O10(OH)2
Kaolinite	2.05	11.45	9.40	Al2Si2O5(OH)4
Mackinawite	-6.70	-48.33	-41.64	FeS
Manganite	-14.04	11.30	25.34	MnOOH
Melanterite	-10.05	-12.55	-2.50	FeSO4:7H2O
N2(g)	-3.35	-6.54	-3.18	N2
NH3(g)	-11.59	-16.69	-5.10	NH3
O2(g)	-72.82	17.89	90.71	O2
Otavite	-3.75	-15.85	-12.10	CdCO3
Pb(OH)2	-4.02	4.91	8.93	Pb(OH)2
Pyrite	-1.75	-94.84	-93.09	FeS2
Pyrochroite	-8.37	6.83	15.20	Mn(OH)2
Pyrolusite	-29.23	15.77	45.00	MnO2
Quartz	-0.73	-5.04	-4.31	SiO2
Rhodochrosite	-3.07	-14.13	-11.05	MnCO3
Sepiolite	-10.49	5.87	16.35	Mg2Si3O7.5OH:3H2O
Sepiolite(d)	-12.79	5.87	18.66	Mg2Si3O7.5OH:3H2O
Siderite	-3.08	-13.83	-10.75	FeCO3
SiO2(a)	-2.14	-5.04	-2.90	SiO2
Smithsonite	-4.46	-14.22	-9.76	ZnCO3
Sphalerite	0.35	-48.72	-49.07	ZnS
Strontianite	-3.43	-12.75	-9.32	SrCO3
Sulfur	-7.65	-46.51	-38.85	S
Talc	-12.65	11.32	23.97	Mg3Si4O10(OH)2
Vivianite	-7.81	-43.81	-36.00	Fe3(PO4)2:8H2O
Willemite	-8.76	8.43	17.18	Zn2SiO4
Witherite	-5.51	-14.20	-8.69	BaCO3

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      Zn(OH)2(e)       -4.77    6.73   11.50  Zn(OH)2

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End of simulation.
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Reading input data for simulation 8.
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End of run.
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◎ Table of Contents

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------------------
Reading data base.
------------------

      SOLUTION_MASTER_SPECIES
      SOLUTION_SPECIES
      PHASES
      EXCHANGE_MASTER_SPECIES
      EXCHANGE_SPECIES
      SURFACE_MASTER_SPECIES
      SURFACE_SPECIES
      END
-----------------------------------
Reading input data for simulation 1.
-----------------------------------

      SOLUTION 1 B3 Alteration Halo
            temp  4
            pH    7.96
            pe    4
            redox pe
            units ug/l
            density     1
            Alkalinity  23200 gfw 50.04
            Al    12.8
            Ba    1.36
            Ca    4260
            Cd    0.025
            Cu(2) 9.04
            Fe(3) 23
            K     250
            Mg    3660
            Mn(2) 4.55
            Na    260
            P     50
            Pb    1.0
            S(6)  5420
            Sr    16.51
            Zn    0.75
      SAVE solution 1
      END
-----------------------------------------
Beginning of initial solution calculations.
-----------------------------------------

Initial solution 1.     B3 Alteration Halo

-----------------------------Solution composition------------------------------

      Elements           Molality       Moles

      Al                 4.744e-07   4.744e-07
      Alkalinity         4.636e-04   4.636e-04
      Ba                 9.903e-09   9.903e-09
      Ca                 1.063e-04   1.063e-04
      Cd                 2.224e-10   2.224e-10
      Cu(2)              1.423e-07   1.423e-07
      Fe(3)              4.119e-07   4.119e-07
```

K	6.394e-06	6.394e-06
Mg	1.505e-04	1.505e-04
Mn(2)	8.282e-08	8.282e-08
Na	1.131e-05	1.131e-05
P	1.614e-06	1.614e-06
Pb	4.827e-09	4.827e-09
S(6)	5.642e-05	5.642e-05
Sr	1.884e-07	1.884e-07
Zn	1.147e-08	1.147e-08

----------Description of solution----------

pH	=	7.960
pe	=	4.000
Activity of water	=	1.000
Ionic strength	=	8.608e-04
Mass of water (kg)	=	1.000e+00
Total carbon (mol/kg)	=	4.744e-04
Total CO2 (mol/kg)	=	4.744e-04
Temperature (deg C)	=	4.000
Electrical balance (eq)	=	-4.401e-05
Iterations	=	8
Total H	=	1.110129e+02
Total O	=	5.550786e+01

----------Distribution of species----------

Species	Molality	Activity	Log Molality	Log Activity	Log Gamma
OH-	1.588e-07	1.537e-07	-6.799	-6.813	-0.014
H+	1.131e-08	1.096e-08	-7.947	-7.960	-0.013
H2O	5.551e+01	1.000e+00	0.000	0.000	0.000
Al	4.744e-07				
Al(OH)4-	4.699e-07	4.551e-07	-6.328	-6.342	-0.014
Al(OH)3	3.067e-09	3.068e-09	-8.513	-8.513	0.000
Al(OH)2+	1.409e-09	1.364e-09	-8.851	-8.865	-0.014
AlOH+2	1.745e-11	1.535e-11	-10.758	-10.814	-0.056
Al+3	9.337e-14	7.082e-14	-13.030	-13.150	-0.120
AlSO4+	8.335e-15	8.072e-15	-14.079	-14.093	-0.014
Al(SO4)2-	1.146e-17	1.110e-17	-16.941	-16.955	-0.014
AlHSO4+2	7.898e-24	6.946e-24	-23.102	-23.158	-0.056
Ba	9.903e-09				
Ba+2	9.674e-09	8.518e-09	-8.014	-8.070	-0.055
BaSO4	2.062e-10	2.062e-10	-9.686	-9.686	0.000
BaHCO3+	1.922e-11	1.861e-11	-10.716	-10.730	-0.014
BaCO3	3.137e-12	3.137e-12	-11.504	-11.503	0.000
BaOH+	2.718e-14	2.632e-14	-13.566	-13.580	-0.014
C(4)	4.744e-04				
HCO3-	4.556e-04	4.414e-04	-3.341	-3.355	-0.014
CO2	1.632e-05	1.632e-05	-4.787	-4.787	0.000
CO3-2	1.234e-06	1.087e-06	-5.909	-5.964	-0.055
MgHCO3+	6.700e-07	6.489e-07	-6.174	-6.188	-0.014
CaHCO3+	3.242e-07	3.141e-07	-6.489	-6.503	-0.014
CaCO3	1.352e-07	1.352e-07	-6.869	-6.869	0.000
MgCO3	9.855e-08	9.856e-08	-7.006	-7.006	0.000
MnCO3	5.641e-09	5.642e-09	-8.249	-8.249	0.000
PbCO3	4.075e-09	4.076e-09	-8.390	-8.390	0.000

	NaHCO3	2.717e-09	2.718e-09	-8.566	-8.566	0.000
	MnHCO3+	2.655e-09	2.571e-09	-8.576	-8.590	-0.014
	ZnCO3	1.607e-09	1.607e-09	-8.794	-8.794	0.000
	SrHCO3+	5.584e-10	5.409e-10	-9.253	-9.267	-0.014
	ZnHCO3+	4.251e-10	4.117e-10	-9.371	-9.385	-0.014
	PbHCO3+	7.812e-11	7.565e-11	-10.107	-10.121	-0.014
	NaCO3-	7.323e-11	7.091e-11	-10.135	-10.149	-0.014
	SrCO3	6.134e-11	6.136e-11	-10.212	-10.212	0.000
	Zn(CO3)2-2	4.246e-11	3.734e-11	-10.372	-10.428	-0.056
	BaHCO3+	1.922e-11	1.861e-11	-10.716	-10.730	-0.014
	Pb(CO3)2-2	1.265e-11	1.113e-11	-10.898	-10.954	-0.056
	BaCO3	3.137e-12	3.137e-12	-11.504	-11.503	0.000
	CdHCO3+	2.750e-12	2.663e-12	-11.561	-11.575	-0.014
	CdCO3	1.647e-13	1.647e-13	-12.783	-12.783	0.000
	Cd(CO3)2-2	6.437e-16	5.662e-16	-15.191	-15.247	-0.056
Ca		1.063e-04				
	Ca+2	1.051e-04	9.254e-05	-3.979	-4.034	-0.055
	CaSO4	7.221e-07	7.222e-07	-6.141	-6.141	0.000
	CaHCO3+	3.242e-07	3.141e-07	-6.489	-6.503	-0.014
	CaCO3	1.352e-07	1.352e-07	-6.869	-6.869	0.000
	CaHPO4	3.688e-08	3.688e-08	-7.433	-7.433	0.000
	CaPO4-	5.368e-09	5.199e-09	-8.270	-8.284	-0.014
	CaOH+	1.446e-09	1.401e-09	-8.840	-8.854	-0.014
	CaH2PO4+	3.517e-10	3.406e-10	-9.454	-9.468	-0.014
	CaHSO4+	3.907e-14	3.783e-14	-13.408	-13.422	-0.014
Cd		2.224e-10				
	Cd+2	2.169e-10	1.908e-10	-9.664	-9.719	-0.056
	CdHCO3+	2.750e-12	2.663e-12	-11.561	-11.575	-0.014
	CdSO4	2.314e-12	2.315e-12	-11.636	-11.635	0.000
	CdOH+	2.798e-13	2.710e-13	-12.553	-12.567	-0.014
	CdCO3	1.647e-13	1.647e-13	-12.783	-12.783	0.000
	Cd(OH)2	7.086e-15	7.088e-15	-14.150	-14.149	0.000
	Cd(SO4)2-2	1.600e-15	1.408e-15	-14.796	-14.852	-0.056
	Cd(CO3)2-2	6.437e-16	5.662e-16	-15.191	-15.247	-0.056
	Cd(OH)3-	7.489e-20	7.253e-20	-19.126	-19.139	-0.014
	Cd(OH)4-2	6.703e-26	5.895e-26	-25.174	-25.230	-0.056
Cu(2)		1.423e-07				
	Cu(OH)2	1.406e-07	1.406e-07	-6.852	-6.852	0.000
	Cu+2	9.179e-10	8.091e-10	-9.037	-9.092	-0.055
	CuOH+	7.620e-10	7.379e-10	-9.118	-9.132	-0.014
	CuSO4	6.826e-12	6.827e-12	-11.166	-11.166	0.000
	Cu(OH)3-	7.979e-13	7.727e-13	-12.098	-12.112	-0.014
	Cu(OH)4-2	1.599e-17	1.406e-17	-16.796	-16.852	-0.056
Fe(3)		4.119e-07				
	Fe(OH)3	3.243e-07	3.244e-07	-6.489	-6.489	0.000
	Fe(OH)2+	7.632e-08	7.391e-08	-7.117	-7.131	-0.014
	Fe(OH)4-	1.124e-08	1.088e-08	-7.949	-7.963	-0.014
	FeOH+2	6.555e-12	5.765e-12	-11.183	-11.239	-0.056
	Fe+3	4.880e-17	3.702e-17	-16.312	-16.432	-0.120
	FeSO4+	1.228e-17	1.189e-17	-16.911	-16.925	-0.014
	FeHPO4+	5.461e-18	5.288e-18	-17.263	-17.277	-0.014
	FeH2PO4+2	2.517e-18	2.214e-18	-17.599	-17.655	-0.056
	Fe(SO4)2-	1.188e-20	1.151e-20	-19.925	-19.939	-0.014
	Fe2(OH)2+4	3.803e-21	2.275e-21	-20.420	-20.643	-0.223
	Fe3(OH)4+5	6.302e-25	2.825e-25	-24.200	-24.549	-0.348
	FeHSO4+2	4.323e-25	3.802e-25	-24.364	-24.420	-0.056
H(0)		2.131e-27				
	H2	1.066e-27	1.066e-27	-26.972	-26.972	0.000

K	6.394e-06					
K+		6.392e-06	6.190e-06	-5.194	-5.208	-0.014
KSO4-		1.463e-09	1.416e-09	-8.835	-8.849	-0.014
KHPO4-		1.382e-11	1.338e-11	-10.860	-10.874	-0.014
KOH		1.957e-12	1.957e-12	-11.708	-11.708	0.000
Mg	1.505e-04					
Mg+2		1.489e-04	1.312e-04	-3.827	-3.882	-0.055
MgSO4		8.301e-07	8.302e-07	-6.081	-6.081	0.000
MgHCO3+		6.700e-07	6.489e-07	-6.174	-6.188	-0.014
MgCO3		9.855e-08	9.856e-08	-7.006	-7.006	0.000
MgHPO4		7.069e-08	7.070e-08	-7.151	-7.151	0.000
MgPO4-		1.027e-08	9.943e-09	-7.989	-8.003	-0.014
MgOH+		5.833e-09	5.649e-09	-8.234	-8.248	-0.014
MgH2PO4+		6.351e-10	6.150e-10	-9.197	-9.211	-0.014
Mn(2)	8.282e-08					
Mn+2		7.414e-08	6.535e-08	-7.130	-7.185	-0.055
MnCO3		5.641e-09	5.642e-09	-8.249	-8.249	0.000
MnHCO3+		2.655e-09	2.571e-09	-8.576	-8.590	-0.014
MnSO4		3.647e-10	3.648e-10	-9.438	-9.438	0.000
MnOH+		2.509e-11	2.429e-11	-10.601	-10.615	-0.014
Na	1.131e-05					
Na+		1.130e-05	1.095e-05	-4.947	-4.961	-0.014
NaHCO3		2.717e-09	2.718e-09	-8.566	-8.566	0.000
NaSO4-		2.372e-09	2.297e-09	-8.625	-8.639	-0.014
NaCO3-		7.323e-11	7.091e-11	-10.135	-10.149	-0.014
NaHPO4-		2.444e-11	2.367e-11	-10.612	-10.626	-0.014
NaOH		6.596e-12	6.597e-12	-11.181	-11.181	0.000
O(0)	0.000e+00					
O2		0.000e+00	0.000e+00	-45.726	-45.726	0.000
P	1.614e-06					
HPO4-2		1.261e-06	1.109e-06	-5.899	-5.955	-0.056
H2PO4-		2.294e-07	2.222e-07	-6.639	-6.653	-0.014
MgHPO4		7.069e-08	7.070e-08	-7.151	-7.151	0.000
CaHPO4		3.688e-08	3.688e-08	-7.433	-7.433	0.000
MgPO4-		1.027e-08	9.943e-09	-7.989	-8.003	-0.014
CaPO4-		5.368e-09	5.199e-09	-8.270	-8.284	-0.014
MgH2PO4+		6.351e-10	6.150e-10	-9.197	-9.211	-0.014
CaH2PO4+		3.517e-10	3.406e-10	-9.454	-9.468	-0.014
PO4-3		3.875e-11	2.902e-11	-10.412	-10.537	-0.126
NaHPO4-		2.444e-11	2.367e-11	-10.612	-10.626	-0.014
KHPO4-		1.382e-11	1.338e-11	-10.860	-10.874	-0.014
FeHPO4+		5.461e-18	5.288e-18	-17.263	-17.277	-0.014
FeH2PO4+2		2.517e-18	2.214e-18	-17.599	-17.655	-0.056
Pb	4.827e-09					
PbCO3		4.075e-09	4.076e-09	-8.390	-8.390	0.000
PbOH+		3.962e-10	3.837e-10	-9.402	-9.416	-0.014
Pb+2		2.453e-10	2.158e-10	-9.610	-9.666	-0.056
PbHCO3+		7.812e-11	7.565e-11	-10.107	-10.121	-0.014
Pb(OH)2		1.361e-11	1.361e-11	-10.866	-10.866	0.000
Pb(CO3)2-2		1.265e-11	1.113e-11	-10.898	-10.954	-0.056
PbSO4		5.860e-12	5.861e-12	-11.232	-11.232	0.000
Pb(OH)3-		1.472e-14	1.426e-14	-13.832	-13.846	-0.014
Pb(SO4)2-2		1.689e-15	1.486e-15	-14.772	-14.828	-0.056
Pb(OH)4-2		3.386e-18	2.978e-18	-17.470	-17.526	-0.056
Pb2OH+3		2.474e-18	1.853e-18	-17.607	-17.732	-0.125
S(6)	5.642e-05					
SO4-2		5.486e-05	4.830e-05	-4.261	-4.316	-0.055
MgSO4		8.301e-07	8.302e-07	-6.081	-6.081	0.000

```
      CaSO4              7.221e-07   7.222e-07    -6.141    -6.141     0.000
      NaSO4-             2.372e-09   2.297e-09    -8.625    -8.639    -0.014
      KSO4-              1.463e-09   1.416e-09    -8.835    -8.849    -0.014
      SrSO4              1.187e-09   1.187e-09    -8.926    -8.926     0.000
      MnSO4              3.647e-10   3.648e-10    -9.438    -9.438     0.000
      BaSO4              2.062e-10   2.062e-10    -9.686    -9.686     0.000
      ZnSO4              7.049e-11   7.051e-11   -10.152   -10.152     0.000
      HSO4-              3.512e-11   3.401e-11   -10.454   -10.468    -0.014
      CuSO4              6.826e-12   6.827e-12   -11.166   -11.166     0.000
      PbSO4              5.860e-12   5.861e-12   -11.232   -11.232     0.000
      CdSO4              2.314e-12   2.315e-12   -11.636   -11.635     0.000
      CaHSO4+            3.907e-14   3.783e-14   -13.408   -13.422    -0.014
      Zn(SO4)2-2         3.745e-14   3.294e-14   -13.427   -13.482    -0.056
      AlSO4+             8.335e-15   8.072e-15   -14.079   -14.093    -0.014
      Pb(SO4)2-2         1.689e-15   1.486e-15   -14.772   -14.828    -0.056
      Cd(SO4)2-2         1.600e-15   1.408e-15   -14.796   -14.852    -0.056
      FeSO4+             1.228e-17   1.189e-17   -16.911   -16.925    -0.014
      Al(SO4)2-          1.146e-17   1.110e-17   -16.941   -16.955    -0.014
      Fe(SO4)2-          1.188e-20   1.151e-20   -19.925   -19.939    -0.014
      AlHSO4+2           7.898e-24   6.946e-24   -23.102   -23.158    -0.056
      FeHSO4+2           4.323e-25   3.802e-25   -24.364   -24.420    -0.056
Sr                1.884e-07
      Sr+2               1.866e-07   1.644e-07    -6.729    -6.784    -0.055
      SrSO4              1.187e-09   1.187e-09    -8.926    -8.926     0.000
      SrHCO3+            5.584e-10   5.409e-10    -9.253    -9.267    -0.014
      SrCO3              6.134e-11   6.136e-11   -10.212   -10.212     0.000
      SrOH+              7.939e-13   7.690e-13   -12.100   -12.114    -0.014
Zn                1.147e-08
      Zn+2               8.415e-09   7.409e-09    -8.075    -8.130    -0.055
      ZnCO3              1.607e-09   1.607e-09    -8.794    -8.794     0.000
      Zn(OH)2            7.757e-10   7.758e-10    -9.110    -9.110     0.000
      ZnHCO3+            4.251e-10   4.117e-10    -9.371    -9.385    -0.014
      ZnOH+              1.379e-10   1.335e-10    -9.861    -9.874    -0.014
      ZnSO4              7.049e-11   7.051e-11   -10.152   -10.152     0.000
      Zn(CO3)2-2         4.246e-11   3.734e-11   -10.372   -10.428    -0.056
      Zn(OH)3-           2.310e-13   2.237e-13   -12.636   -12.650    -0.014
      Zn(SO4)2-2         3.745e-14   3.294e-14   -13.427   -13.482    -0.056
      Zn(OH)4-2          3.677e-18   3.234e-18   -17.434   -17.490    -0.056

------------------------------Saturation indices-------------------------------

      Phase               SI log IAP  log KT

      Al(OH)3(a)       -1.54   10.73   12.27  Al(OH)3
      Alunite          -6.92   -5.53    1.39  KAl3(SO4)2(OH)6
      Anglesite        -6.07  -13.98   -7.91  PbSO4
      Anhydrite        -4.00   -8.35   -4.35  CaSO4
      Aragonite        -1.77  -10.00   -8.23  CaCO3
      Barite           -2.00  -12.39  -10.38  BaSO4
      Calcite          -1.61  -10.00   -8.39  CaCO3
      Cd(OH)2          -7.45    6.20   13.65  Cd(OH)2
      CdSO4           -14.75  -14.04    0.72  CdSO4
      Celestite        -4.44  -11.10   -6.66  SrSO4
      Cerrusite        -2.23  -15.63  -13.40  PbCO3
      CO2(g)           -3.61  -21.88  -18.27  CO2
      Dolomite         -3.28  -19.84  -16.57  CaMg(CO3)2
      Fe(OH)3(a)        2.56    7.45    4.89  Fe(OH)3
      Gibbsite          1.35   10.73    9.38  Al(OH)3
```

```
      Goethite          7.64    7.45   -0.20  FeOOH
      Gypsum           -3.75   -8.35   -4.60  CaSO4:2H2O
      H2(g)           -23.92  -23.92    0.00  H2
      Hausmannite     -16.49   50.13   66.62  Mn3O4
      Hematite         17.19   14.90   -2.29  Fe2O3
      Hydroxyapatite   -4.78  -43.82  -39.04  Ca5(PO4)3OH
      Jarosite-K       -7.90  -15.38   -7.47  KFe3(SO4)2(OH)6
      Manganite        -4.64   20.70   25.34  MnOOH
      O2(g)           -42.87   47.84   90.71  O2
      Otavite          -3.58  -15.68  -12.10  CdCO3
      Pb(OH)2          -2.67    6.25    8.93  Pb(OH)2
      Pyrochroite      -6.46    8.74   15.20  Mn(OH)2
      Pyrolusite      -12.34   32.66   45.00  MnO2
      Rhodochrosite    -2.10  -13.15  -11.05  MnCO3
      Smithsonite      -4.34  -14.09   -9.76  ZnCO3
      Strontianite     -3.43  -12.75   -9.32  SrCO3
      Witherite        -5.34  -14.03   -8.69  BaCO3
      Zn(OH)2(e)       -3.71    7.79   11.50  Zn(OH)2

------------------
End of simulation.
------------------

------------------------------------
Reading input data for simulation 2.
------------------------------------

      SOLUTION 2 Rain Water
            temp  4
            pH    7     CO2(g) 0.0
            pe    4
            redox pe
            units ug/l
            density     1
      EQUILIBRIUM_PHASES 1
            CO2(g)      -3.5        10.0
      SAVE solution 2
      END
-----------------------------------------
Beginning of initial solution calculations.
-----------------------------------------

Initial solution 2.     Rain Water

-----------------------------Solution composition------------------------------

      Elements           Molality       Moles

      Pure water

----------------------------Description of solution----------------------------

                              pH  =   6.154      Equilibrium with CO2(g)
                              pe  =   4.000
                 Activity of water  =   1.000
                    Ionic strength  =   3.519e-07
                 Mass of water (kg)  =   1.000e+00
          Total alkalinity (eq/kg)  =  -6.990e-07
```

```
          Total carbon (mol/kg)  =   0.000e+00
             Total CO2 (mol/kg)  =   0.000e+00
           Temperature (deg C)  =   4.000
        Electrical balance (eq)  =   6.990e-07
                    Iterations  =   3
                       Total H  = 1.110124e+02
                       Total O  = 5.550622e+01

----------------------------Distribution of species----------------------------

                                                 Log       Log         Log
      Species            Molality    Activity  Molality  Activity     Gamma

      H+                 7.014e-07   7.009e-07    -6.154    -6.154     0.000
      OH-                2.406e-09   2.405e-09    -8.619    -8.619     0.000
      H2O                5.551e+01   1.000e+00     0.000     0.000     0.000
H(0)             8.711e-24
      H2                 4.355e-24   4.355e-24   -23.361   -23.361     0.000
O(0)             0.000e+00
      O2                 0.000e+00   0.000e+00   -52.949   -52.949     0.000

------------------------------Saturation indices------------------------------

      Phase               SI log IAP  log KT

      H2(g)           -20.31  -20.31    0.00  H2
      O2(g)           -50.09   40.62   90.71  O2

-----------------------------------
Beginning of reaction calculations.
-----------------------------------

Reaction step 1.

Using solution 2. Rain Water

Using pure phase assemblage 1.

-------------------------------Phase assemblage-------------------------------

                                                      Moles in assemblage
      Phase               SI log IAP  log KT    Initial      Final      Delta

      CO2(g)           -3.50  -21.77  -18.27  1.000e+01  1.000e+01 -2.327e-05

----------------------------Solution composition----------------------------

      Elements           Molality       Moles

      C                  2.327e-05   2.327e-05

----------------------------Description of solution----------------------------

                            pH  =   5.541      Charge balance
                            pe  =   3.981      Adjusted to redox equilibrium
             Activity of water  =   1.000
                Ionic strength  =   2.530e-06
             Mass of water (kg)  =   1.000e+00
```

```
       Total alkalinity (eq/kg)  =  -6.990e-07
             Total CO2 (mol/kg)  =   2.327e-05
            Temperature (deg C)  =   4.000
        Electrical balance (eq)  =   6.990e-07
                     Iterations  =   6
                        Total H  = 1.110124e+02
                        Total O  = 5.550626e+01

----------------------------Distribution of species----------------------------

                                                 Log       Log         Log
      Species            Molality    Activity  Molality  Activity     Gamma

      H+                 2.879e-06   2.874e-06    -5.541    -5.541    -0.001
      OH-                5.875e-10   5.864e-10    -9.231    -9.232    -0.001
      H2O                5.551e+01   1.000e+00     0.000     0.000     0.000
C(-4)            0.000e+00
      CH4                0.000e+00   0.000e+00   -53.492   -53.492     0.000
C(4)             2.327e-05
      CO2                2.109e-05   2.109e-05    -4.676    -4.676     0.000
      HCO3-              2.180e-06   2.176e-06    -5.662    -5.662    -0.001
      CO3-2              2.059e-11   2.044e-11   -10.686   -10.690    -0.003
H(0)             1.598e-22
      H2                 7.988e-23   7.988e-23   -22.098   -22.098     0.000
O(0)             0.000e+00
      O2                 0.000e+00   0.000e+00   -55.476   -55.476     0.000

------------------------------Saturation indices-------------------------------

      Phase               SI log IAP  log KT

      CH4(g)          -50.82  -97.95  -47.13  CH4
      CO2(g)           -3.50  -21.77  -18.27  CO2
      H2(g)           -19.05  -19.05    0.00  H2
      O2(g)           -52.62   38.09   90.71  O2

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End of simulation.
------------------

-----------------------------------
Reading input data for simulation 3.
-----------------------------------

      MIX 1 Mixing B3 Altha and Rain Water
            1     0.5
            2     0.5
      SAVE solution 3
      END
-----------------------------------
Beginning of reaction calculations.
-----------------------------------

Reaction step 1.

Using mixture 1.  Mixing B3 Altha and Rain Water

       5.000e-01 Solution 1   B3 Alteration Halo
```

◎ Table of Contents

5.000e-01 Solution 2 Solution after simulation 2.

----------Solution composition----------

Elements	Molality	Moles
Al	2.372e-07	2.372e-07
Ba	4.951e-09	4.951e-09
C	2.488e-04	2.488e-04
Ca	5.315e-05	5.315e-05
Cd	1.112e-10	1.112e-10
Cu	7.113e-08	7.113e-08
Fe	2.059e-07	2.059e-07
K	3.197e-06	3.197e-06
Mg	7.527e-05	7.527e-05
Mn	4.141e-08	4.141e-08
Na	5.655e-06	5.655e-06
P	8.072e-07	8.072e-07
Pb	2.413e-09	2.413e-09
S	2.821e-05	2.821e-05
Sr	9.422e-08	9.422e-08
Zn	5.737e-09	5.737e-09

----------Description of solution----------

pH	= 7.588	Charge balance
pe	= 10.859	Adjusted to redox equilibrium
Activity of water	= 1.000	
Ionic strength	= 4.321e-04	
Mass of water (kg)	= 1.000e+00	
Total alkalinity (eq/kg)	= 2.315e-04	
Total CO2 (mol/kg)	= 2.488e-04	
Temperature (deg C)	= 4.000	
Electrical balance (eq)	= -2.165e-05	
Iterations	= 22	
Total H	= 1.110127e+02	
Total O	= 5.550706e+01	

----------Distribution of species----------

Species	Molality	Activity	Log Molality	Log Activity	Log Gamma
OH-	6.681e-08	6.528e-08	-7.175	-7.185	-0.010
H+	2.640e-08	2.582e-08	-7.578	-7.588	-0.010
H2O	5.551e+01	1.000e+00	0.000	0.000	0.000
Al	2.372e-07				
Al(OH)4-	2.297e-07	2.245e-07	-6.639	-6.649	-0.010
Al(OH)2+	3.819e-09	3.732e-09	-8.418	-8.428	-0.010
Al(OH)3	3.563e-09	3.563e-09	-8.448	-8.448	0.000
AlOH+2	1.084e-10	9.884e-11	-9.965	-10.005	-0.040
Al+3	1.312e-12	1.074e-12	-11.882	-11.969	-0.087
AlSO4+	6.575e-14	6.426e-14	-13.182	-13.192	-0.010
Al(SO4)2-	4.748e-17	4.640e-17	-16.324	-16.334	-0.010
AlHSO4+2	1.428e-22	1.302e-22	-21.845	-21.885	-0.040
Ba	4.951e-09				
Ba+2	4.889e-09	4.462e-09	-8.311	-8.350	-0.040
BaSO4	5.670e-11	5.671e-11	-10.246	-10.246	0.000

	BaHCO3+	5.055e-12	4.940e-12	-11.296	-11.306	-0.010
	BaCO3	3.537e-13	3.537e-13	-12.451	-12.451	0.000
	BaOH+	5.992e-15	5.856e-15	-14.222	-14.232	-0.010
C(-4)		0.000e+00				
	CH4	0.000e+00	0.000e+00	-124.921	-124.921	0.000
C(4)		2.488e-04				
	HCO3-	2.288e-04	2.237e-04	-3.641	-3.650	-0.010
	CO2	1.947e-05	1.948e-05	-4.711	-4.710	0.000
	CO3-2	2.562e-07	2.339e-07	-6.591	-6.631	-0.040
	MgHCO3+	1.752e-07	1.713e-07	-6.756	-6.766	-0.010
	CaHCO3+	8.486e-08	8.294e-08	-7.071	-7.081	-0.010
	CaCO3	1.517e-08	1.517e-08	-7.819	-7.819	0.000
	MgCO3	1.105e-08	1.105e-08	-7.957	-7.957	0.000
	PbCO3	1.597e-09	1.597e-09	-8.797	-8.797	0.000
	MnHCO3+	7.428e-10	7.260e-10	-9.129	-9.139	-0.010
	NaHCO3	6.949e-10	6.950e-10	-9.158	-9.158	0.000
	MnCO3	6.766e-10	6.767e-10	-9.170	-9.170	0.000
	ZnCO3	2.225e-10	2.225e-10	-9.653	-9.653	0.000
	SrHCO3+	1.460e-10	1.427e-10	-9.836	-9.846	-0.010
	ZnHCO3+	1.374e-10	1.343e-10	-9.862	-9.872	-0.010
	PbHCO3+	7.141e-11	6.979e-11	-10.146	-10.156	-0.010
	NaCO3-	7.880e-12	7.701e-12	-11.103	-11.113	-0.010
	SrCO3	6.872e-12	6.873e-12	-11.163	-11.163	0.000
	BaHCO3+	5.055e-12	4.940e-12	-11.296	-11.306	-0.010
	Zn(CO3)2-2	1.220e-12	1.113e-12	-11.914	-11.954	-0.040
	Pb(CO3)2-2	1.029e-12	9.382e-13	-11.988	-12.028	-0.040
	CdHCO3+	7.246e-13	7.082e-13	-12.140	-12.150	-0.010
	BaCO3	3.537e-13	3.537e-13	-12.451	-12.451	0.000
	CdCO3	1.860e-14	1.860e-14	-13.730	-13.730	0.000
	FeHCO3+	2.245e-15	2.194e-15	-14.649	-14.659	-0.010
	FeCO3	5.503e-16	5.503e-16	-15.259	-15.259	0.000
	Cd(CO3)2-2	1.509e-17	1.376e-17	-16.821	-16.861	-0.040
Ca		5.315e-05				
	Ca+2	5.284e-05	4.823e-05	-4.277	-4.317	-0.040
	CaSO4	1.976e-07	1.976e-07	-6.704	-6.704	0.000
	CaHCO3+	8.486e-08	8.294e-08	-7.071	-7.081	-0.010
	CaCO3	1.517e-08	1.517e-08	-7.819	-7.819	0.000
	CaHPO4	8.564e-09	8.565e-09	-8.067	-8.067	0.000
	CaPO4-	5.246e-10	5.127e-10	-9.280	-9.290	-0.010
	CaOH+	3.172e-10	3.100e-10	-9.499	-9.509	-0.010
	CaH2PO4+	1.906e-10	1.863e-10	-9.720	-9.730	-0.010
	CaHSO4+	2.494e-14	2.438e-14	-13.603	-13.613	-0.010
Cd		1.112e-10				
	Cd+2	1.098e-10	1.001e-10	-9.960	-9.999	-0.040
	CdHCO3+	7.246e-13	7.082e-13	-12.140	-12.150	-0.010
	CdSO4	6.377e-13	6.378e-13	-12.195	-12.195	0.000
	CdOH+	6.181e-14	6.040e-14	-13.209	-13.219	-0.010
	CdCO3	1.860e-14	1.860e-14	-13.730	-13.730	0.000
	Cd(OH)2	6.709e-16	6.709e-16	-15.173	-15.173	0.000
	Cd(SO4)2-2	2.232e-16	2.036e-16	-15.651	-15.691	-0.040
	Cd(CO3)2-2	1.509e-17	1.376e-17	-16.821	-16.861	-0.040
	Cd(OH)3-	2.983e-21	2.916e-21	-20.525	-20.535	-0.010
	Cd(OH)4-2	1.103e-27	1.006e-27	-26.957	-26.997	-0.040
Cu(1)		1.304e-17				
	Cu+	1.304e-17	1.274e-17	-16.885	-16.895	-0.010
Cu(2)		7.113e-08				
	Cu(OH)2	6.789e-08	6.790e-08	-7.168	-7.168	0.000
	Cu+2	2.372e-09	2.166e-09	-8.625	-8.664	-0.039

CuOH+	8.586e-10	8.391e-10	-9.066	-9.076	-0.010
CuSO4	9.595e-12	9.596e-12	-11.018	-11.018	0.000
Cu(OH)3-	1.621e-13	1.585e-13	-12.790	-12.800	-0.010
Cu(OH)4-2	1.343e-18	1.225e-18	-17.872	-17.912	-0.040
Fe(2)	1.109e-13				
Fe+2	1.074e-13	9.808e-14	-12.969	-13.008	-0.039
FeHCO3+	2.245e-15	2.194e-15	-14.649	-14.659	-0.010
FeCO3	5.503e-16	5.503e-16	-15.259	-15.259	0.000
FeSO4	2.926e-16	2.926e-16	-15.534	-15.534	0.000
FeOH+	2.273e-16	2.221e-16	-15.643	-15.653	-0.010
FeHPO4	1.929e-16	1.929e-16	-15.715	-15.715	0.000
FeH2PO4+	1.173e-17	1.146e-17	-16.931	-16.941	-0.010
FeHSO4+	5.072e-23	4.957e-23	-22.295	-22.305	-0.010
Fe(HS)2	0.000e+00	0.000e+00	-249.596	-249.596	0.000
Fe(HS)3-	0.000e+00	0.000e+00	-370.318	-370.328	-0.010
Fe(3)	2.059e-07				
Fe(OH)3	1.317e-07	1.317e-07	-6.880	-6.880	0.000
Fe(OH)2+	7.230e-08	7.066e-08	-7.141	-7.151	-0.010
Fe(OH)4-	1.920e-09	1.876e-09	-8.717	-8.727	-0.010
FeOH+2	1.423e-11	1.298e-11	-10.847	-10.887	-0.040
Fe+3	2.398e-16	1.962e-16	-15.620	-15.707	-0.087
FeSO4+	3.386e-17	3.309e-17	-16.470	-16.480	-0.010
FeH2PO4+2	1.350e-17	1.231e-17	-16.870	-16.910	-0.040
FeHPO4+	1.278e-17	1.249e-17	-16.893	-16.903	-0.010
Fe(SO4)2-	1.720e-20	1.681e-20	-19.765	-19.775	-0.010
Fe2(OH)2+4	1.666e-20	1.153e-20	-19.778	-19.938	-0.160
FeHSO4+2	2.731e-24	2.491e-24	-23.564	-23.604	-0.040
Fe3(OH)4+5	2.432e-24	1.369e-24	-23.614	-23.864	-0.250
H(0)	2.264e-40				
H2	1.132e-40	1.132e-40	-39.946	-39.946	0.000
K	3.197e-06				
K+	3.196e-06	3.124e-06	-5.495	-5.505	-0.010
KSO4-	3.840e-10	3.752e-10	-9.416	-9.426	-0.010
KHPO4-	3.079e-12	3.009e-12	-11.512	-11.522	-0.010
KOH	4.195e-13	4.195e-13	-12.377	-12.377	0.000
Mg	7.527e-05				
Mg+2	7.484e-05	6.834e-05	-4.126	-4.165	-0.039
MgSO4	2.270e-07	2.270e-07	-6.644	-6.644	0.000
MgHCO3+	1.752e-07	1.713e-07	-6.756	-6.766	-0.010
MgHPO4	1.641e-08	1.641e-08	-7.785	-7.785	0.000
MgCO3	1.105e-08	1.105e-08	-7.957	-7.957	0.000
MgOH+	1.279e-09	1.250e-09	-8.893	-8.903	-0.010
MgPO4-	1.003e-09	9.800e-10	-8.999	-9.009	-0.010
MgH2PO4+	3.439e-10	3.361e-10	-9.464	-9.474	-0.010
Mn(2)	4.141e-08				
Mn+2	3.988e-08	3.642e-08	-7.399	-7.439	-0.039
MnHCO3+	7.428e-10	7.260e-10	-9.129	-9.139	-0.010
MnCO3	6.766e-10	6.767e-10	-9.170	-9.170	0.000
MnSO4	1.067e-10	1.067e-10	-9.972	-9.972	0.000
MnOH+	5.883e-12	5.749e-12	-11.230	-11.240	-0.010
Mn(3)	3.691e-24				
Mn+3	3.691e-24	3.001e-24	-23.433	-23.523	-0.090
Na	5.655e-06				
Na+	5.654e-06	5.525e-06	-5.248	-5.258	-0.010
NaHCO3	6.949e-10	6.950e-10	-9.158	-9.158	0.000
NaSO4-	6.227e-10	6.085e-10	-9.206	-9.216	-0.010
NaCO3-	7.880e-12	7.701e-12	-11.103	-11.113	-0.010
NaHPO4-	5.446e-12	5.322e-12	-11.264	-11.274	-0.010

	NaOH	1.414e-12	1.414e-12	-11.850	-11.850	0.000
O(0)		3.329e-20				
	O2	1.665e-20	1.665e-20	-19.779	-19.779	0.000
P		8.072e-07				
	HPO4-2	5.416e-07	4.940e-07	-6.266	-6.306	-0.040
	H2PO4-	2.385e-07	2.331e-07	-6.622	-6.632	-0.010
	MgHPO4	1.641e-08	1.641e-08	-7.785	-7.785	0.000
	CaHPO4	8.564e-09	8.565e-09	-8.067	-8.067	0.000
	MgPO4-	1.003e-09	9.800e-10	-8.999	-9.009	-0.010
	CaPO4-	5.246e-10	5.127e-10	-9.280	-9.290	-0.010
	MgH2PO4+	3.439e-10	3.361e-10	-9.464	-9.474	-0.010
	CaH2PO4+	1.906e-10	1.863e-10	-9.720	-9.730	-0.010
	PO4-3	6.755e-12	5.492e-12	-11.170	-11.260	-0.090
	NaHPO4-	5.446e-12	5.322e-12	-11.264	-11.274	-0.010
	KHPO4-	3.079e-12	3.009e-12	-11.512	-11.522	-0.010
	FeHPO4	1.929e-16	1.929e-16	-15.715	-15.715	0.000
	FeH2PO4+2	1.350e-17	1.231e-17	-16.870	-16.910	-0.040
	FeHPO4+	1.278e-17	1.249e-17	-16.893	-16.903	-0.010
	FeH2PO4+	1.173e-17	1.146e-17	-16.931	-16.941	-0.010
Pb		2.413e-09				
	PbCO3	1.597e-09	1.597e-09	-8.797	-8.797	0.000
	Pb+2	4.307e-10	3.928e-10	-9.366	-9.406	-0.040
	PbOH+	3.036e-10	2.967e-10	-9.518	-9.528	-0.010
	PbHCO3+	7.141e-11	6.979e-11	-10.146	-10.156	-0.010
	PbSO4	5.601e-12	5.601e-12	-11.252	-11.252	0.000
	Pb(OH)2	4.470e-12	4.470e-12	-11.350	-11.350	0.000
	Pb(CO3)2-2	1.029e-12	9.382e-13	-11.988	-12.028	-0.040
	Pb(OH)3-	2.034e-15	1.988e-15	-14.692	-14.702	-0.010
	Pb(SO4)2-2	8.172e-16	7.454e-16	-15.088	-15.128	-0.040
	Pb2OH+3	3.209e-18	2.609e-18	-17.494	-17.584	-0.090
	Pb(OH)4-2	1.934e-19	1.764e-19	-18.714	-18.754	-0.040
S(-2)		0.000e+00				
	HS-	0.000e+00	0.000e+00	-122.759	-122.769	-0.010
	H2S	0.000e+00	0.000e+00	-123.083	-123.083	0.000
	S-2	0.000e+00	0.000e+00	-128.731	-128.771	-0.040
	Fe(HS)2	0.000e+00	0.000e+00	-249.596	-249.596	0.000
	Fe(HS)3-	0.000e+00	0.000e+00	-370.318	-370.328	-0.010
S(6)		2.821e-05				
	SO4-2	2.779e-05	2.536e-05	-4.556	-4.596	-0.040
	MgSO4	2.270e-07	2.270e-07	-6.644	-6.644	0.000
	CaSO4	1.976e-07	1.976e-07	-6.704	-6.704	0.000
	NaSO4-	6.227e-10	6.085e-10	-9.206	-9.216	-0.010
	KSO4-	3.840e-10	3.752e-10	-9.416	-9.426	-0.010
	SrSO4	3.243e-10	3.243e-10	-9.489	-9.489	0.000
	MnSO4	1.067e-10	1.067e-10	-9.972	-9.972	0.000
	BaSO4	5.670e-11	5.671e-11	-10.246	-10.246	0.000
	HSO4-	4.301e-11	4.204e-11	-10.366	-10.376	-0.010
	ZnSO4	2.382e-11	2.382e-11	-10.623	-10.623	0.000
	CuSO4	9.595e-12	9.596e-12	-11.018	-11.018	0.000
	PbSO4	5.601e-12	5.601e-12	-11.252	-11.252	0.000
	CdSO4	6.377e-13	6.378e-13	-12.195	-12.195	0.000
	AlSO4+	6.575e-14	6.426e-14	-13.182	-13.192	-0.010
	CaHSO4+	2.494e-14	2.438e-14	-13.603	-13.613	-0.010
	Zn(SO4)2-2	6.405e-15	5.842e-15	-14.194	-14.233	-0.040
	Pb(SO4)2-2	8.172e-16	7.454e-16	-15.088	-15.128	-0.040
	FeSO4	2.926e-16	2.926e-16	-15.534	-15.534	0.000
	Cd(SO4)2-2	2.232e-16	2.036e-16	-15.651	-15.691	-0.040
	Al(SO4)2-	4.748e-17	4.640e-17	-16.324	-16.334	-0.010

	FeSO4+	3.386e-17	3.309e-17	-16.470	-16.480	-0.010
	Fe(SO4)2-	1.720e-20	1.681e-20	-19.765	-19.775	-0.010
	AlHSO4+2	1.428e-22	1.302e-22	-21.845	-21.885	-0.040
	FeHSO4+	5.072e-23	4.957e-23	-22.295	-22.305	-0.010
	FeHSO4+2	2.731e-24	2.491e-24	-23.564	-23.604	-0.040
Sr		9.422e-08				
	Sr+2	9.374e-08	8.558e-08	-7.028	-7.068	-0.040
	SrSO4	3.243e-10	3.243e-10	-9.489	-9.489	0.000
	SrHCO3+	1.460e-10	1.427e-10	-9.836	-9.846	-0.010
	SrCO3	6.872e-12	6.873e-12	-11.163	-11.163	0.000
	SrOH+	1.739e-13	1.700e-13	-12.760	-12.770	-0.010
Zn		5.737e-09				
	Zn+2	5.224e-09	4.768e-09	-8.282	-8.322	-0.040
	ZnCO3	2.225e-10	2.225e-10	-9.653	-9.653	0.000
	ZnHCO3+	1.374e-10	1.343e-10	-9.862	-9.872	-0.010
	Zn(OH)2	9.004e-11	9.005e-11	-10.046	-10.046	0.000
	ZnOH+	3.734e-11	3.649e-11	-10.428	-10.438	-0.010
	ZnSO4	2.382e-11	2.382e-11	-10.623	-10.623	0.000
	Zn(CO3)2-2	1.220e-12	1.113e-12	-11.914	-11.954	-0.040
	Zn(OH)3-	1.129e-14	1.103e-14	-13.947	-13.957	-0.010
	Zn(SO4)2-2	6.405e-15	5.842e-15	-14.194	-14.233	-0.040
	Zn(OH)4-2	7.423e-20	6.770e-20	-19.129	-19.169	-0.040

----------Saturation indices----------

Phase	SI	log IAP	log KT	
Al(OH)3(a)	-1.48	10.80	12.27	Al(OH)3
Alunite	-6.47	-5.08	1.39	KAl3(SO4)2(OH)6
Anglesite	-6.09	-14.00	-7.91	PbSO4
Anhydrite	-4.56	-8.91	-4.35	CaSO4
Aragonite	-2.72	-10.95	-8.23	CaCO3
Barite	-2.57	-12.95	-10.38	BaSO4
Calcite	-2.56	-10.95	-8.39	CaCO3
Cd(OH)2	-8.47	5.18	13.65	Cd(OH)2
CdSO4	-15.31	-14.60	0.72	CdSO4
Celestite	-5.00	-11.66	-6.66	SrSO4
Cerrusite	-2.64	-16.04	-13.40	PbCO3
CH4(g)	-122.25	-169.38	-47.13	CH4
CO2(g)	-3.53	-21.81	-18.27	CO2
Dolomite	-5.18	-21.74	-16.57	CaMg(CO3)2
Fe(OH)3(a)	2.17	20.61	18.45	Fe(OH)3
FeS(ppt)	-124.27	-165.18	-40.91	FeS
Gibbsite	1.42	10.80	9.38	Al(OH)3
Goethite	7.25	20.61	13.36	FeOOH
Gypsum	-4.31	-8.91	-4.60	CaSO4:2H2O
H2(g)	-36.89	-36.89	0.00	H2
H2S(g)	-122.34	-167.35	-45.01	H2S
Hausmannite	-6.51	60.11	66.62	Mn3O4
Hematite	16.41	41.23	24.82	Fe2O3
Hydroxyapatite	-8.74	-47.78	-39.04	Ca5(PO4)3OH
Jarosite-K	-8.82	24.38	33.20	KFe3(SO4)2(OH)6
Mackinawite	-123.54	-165.18	-41.64	FeS
Manganite	0.84	26.18	25.34	MnOOH
Melanterite	-15.10	-17.60	-2.50	FeSO4:7H2O
O2(g)	-16.92	73.79	90.71	O2
Otavite	-4.53	-16.63	-12.10	CdCO3
Pb(OH)2	-3.16	5.77	8.93	Pb(OH)2

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      Pyrite         -202.55 -295.63  -93.09  FeS2
      Pyrochroite      -7.46    7.74   15.20  Mn(OH)2
      Pyrolusite       -0.36   44.63   45.00  MnO2
      Rhodochrosite    -3.02  -14.07  -11.05  MnCO3
      Siderite         -8.89  -19.64  -10.75  FeCO3
      Smithsonite      -5.19  -14.95   -9.76  ZnCO3
      Sphalerite     -111.43 -160.49  -49.07  ZnS
      Strontianite     -4.38  -13.70   -9.32  SrCO3
      Sulfur          -91.60 -130.45  -38.85  S
      Vivianite       -25.55  -61.55  -36.00  Fe3(PO4)2:8H2O
      Witherite        -6.29  -14.98   -8.69  BaCO3
      Zn(OH)2(e)       -4.65    6.85   11.50  Zn(OH)2

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End of simulation.
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Reading input data for simulation 4.
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      SOLUTION 4 Stickleback Lake
            temp  4.0
            pH    7.14
            pe    4.0
            redox pe
            units ug/l
            density     1.0
            Alkalinity  30330 ug/l  gfw 50.04
            Al    2.5   ug/l
            B     50    ug/l
            Ba    5.0   ug/l
            Ca    13967 ug/l
            Cd    0.1   ug/l
            Cl    38433 ug/l
            Cu    0.5   ug/l
            F     7.67  ug/l
            Fe    5     ug/l
            K     1443  ug/l
            Li    5.0   ug/l
            Mg    4890  ug/l
            Mn    2.5   ug/l
            N(-3) 9.0   ug/l
            N(3)  0.5   ug/l
            N(5)  2.67  ug/l
            Na    10900 ug/l
            P     150   ug/l
            Pb    0.5   ug/l
            S(6)  500   ug/l
            Si    548   ug/l
            Sr    90    ug/l
            Zn    2.5   ug/l
      SAVE solution 4
      END
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Beginning of initial solution calculations.
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◎ Table of Contents

Initial solution 4. Stickleback Lake

----------Solution composition----------

Elements	Molality	Moles
Al	9.267e-08	9.267e-08
Alkalinity	6.062e-04	6.062e-04
B	4.626e-06	4.626e-06
Ba	3.641e-08	3.641e-08
Ca	3.485e-04	3.485e-04
Cd	8.898e-10	8.898e-10
Cl	1.084e-03	1.084e-03
Cu	7.869e-09	7.869e-09
F	4.038e-07	4.038e-07
Fe	8.954e-08	8.954e-08
K	3.691e-05	3.691e-05
Li	7.206e-07	7.206e-07
Mg	2.012e-04	2.012e-04
Mn	4.551e-08	4.551e-08
N(-3)	6.426e-07	6.426e-07
N(3)	3.570e-08	3.570e-08
N(5)	1.906e-07	1.906e-07
Na	4.742e-04	4.742e-04
P	4.843e-06	4.843e-06
Pb	2.413e-09	2.413e-09
S(6)	5.205e-06	5.205e-06
Si	9.121e-06	9.121e-06
Sr	1.027e-06	1.027e-06
Zn	3.825e-08	3.825e-08

----------Description of solution----------

pH	=	7.140
pe	=	4.000
Activity of water	=	1.000
Ionic strength	=	2.211e-03
Mass of water (kg)	=	1.000e+00
Total carbon (mol/kg)	=	7.425e-04
Total CO2 (mol/kg)	=	7.425e-04
Temperature (deg C)	=	4.000
Electrical balance (eq)	=	-9.167e-05
Iterations	=	9
Total H	=	1.110131e+02
Total O	=	5.550840e+01

----------Redox couples----------

Redox couple	pe	Eh (volts)
N(-3)/N(3)	6.6818	0.3674
N(-3)/N(5)	7.1924	0.3955
N(3)/N(5)	8.7240	0.4797

----------Distribution of species----------

Species	Molality	Activity	Log Molality	Log Activity	Log Gamma

	H+	7.593e-08	7.244e-08	-7.120	-7.140	-0.020
	OH-	2.448e-08	2.327e-08	-7.611	-7.633	-0.022
	H2O	5.551e+01	1.000e+00	0.000	0.000	0.000
Al		9.267e-08				
	Al(OH)4-	7.811e-08	7.428e-08	-7.107	-7.129	-0.022
	Al(OH)2+	1.022e-08	9.723e-09	-7.990	-8.012	-0.022
	Al(OH)3	3.307e-09	3.308e-09	-8.481	-8.480	0.000
	AlOH+2	8.836e-10	7.226e-10	-9.054	-9.141	-0.087
	AlF+2	8.946e-11	7.316e-11	-10.048	-10.136	-0.087
	Al+3	3.362e-11	2.203e-11	-10.473	-10.657	-0.184
	AlF2+	1.303e-11	1.240e-11	-10.885	-10.907	-0.022
	AlSO4+	2.206e-13	2.098e-13	-12.656	-12.678	-0.022
	AlF3	5.796e-14	5.799e-14	-13.237	-13.237	0.000
	Al(SO4)2-	2.535e-17	2.411e-17	-16.596	-16.618	-0.022
	AlF4-	9.184e-18	8.734e-18	-17.037	-17.059	-0.022
	AlHSO4+2	1.459e-21	1.193e-21	-20.836	-20.923	-0.087
	AlF5-2	6.740e-23	5.512e-23	-22.171	-22.259	-0.087
	AlF6-3	5.162e-29	3.283e-29	-28.287	-28.484	-0.197
B		4.626e-06				
	H3BO3	4.600e-06	4.603e-06	-5.337	-5.337	0.000
	H2BO3-	2.546e-08	2.421e-08	-7.594	-7.616	-0.022
	BF(OH)3-	5.783e-13	5.500e-13	-12.238	-12.260	-0.022
	BF2(OH)2-	1.759e-18	1.672e-18	-17.755	-17.777	-0.022
	BF3OH-	8.031e-26	7.637e-26	-25.095	-25.117	-0.022
	BF4-	9.285e-33	8.830e-33	-32.032	-32.054	-0.022
Ba		3.641e-08				
	Ba+2	3.626e-08	2.973e-08	-7.441	-7.527	-0.086
	BaHCO3+	8.838e-11	8.405e-11	-10.054	-10.075	-0.022
	BaSO4	6.010e-11	6.013e-11	-10.221	-10.221	0.000
	BaCO3	2.144e-12	2.145e-12	-11.669	-11.669	0.000
	BaOH+	1.462e-14	1.390e-14	-13.835	-13.857	-0.022
C(4)		7.425e-04				
	HCO3-	6.001e-04	5.712e-04	-3.222	-3.243	-0.021
	CO2	1.395e-04	1.396e-04	-3.855	-3.855	0.000
	CaHCO3+	1.313e-06	1.250e-06	-5.882	-5.903	-0.021
	MgHCO3+	1.105e-06	1.051e-06	-5.957	-5.978	-0.022
	CO3-2	2.594e-07	2.129e-07	-6.586	-6.672	-0.086
	NaHCO3	1.448e-07	1.448e-07	-6.839	-6.839	0.000
	CaCO3	8.140e-08	8.144e-08	-7.089	-7.089	0.000
	MgCO3	2.415e-08	2.416e-08	-7.617	-7.617	0.000
	FeHCO3+	4.093e-09	3.892e-09	-8.388	-8.410	-0.022
	SrHCO3+	3.757e-09	3.576e-09	-8.425	-8.447	-0.021
	ZnHCO3+	2.150e-09	2.045e-09	-8.668	-8.689	-0.022
	MnHCO3+	1.886e-09	1.794e-09	-8.724	-8.746	-0.022
	PbCO3	1.563e-09	1.563e-09	-8.806	-8.806	0.000
	ZnCO3	1.207e-09	1.208e-09	-8.918	-8.918	0.000
	NaCO3-	6.015e-10	5.720e-10	-9.221	-9.243	-0.022
	MnCO3	5.955e-10	5.958e-10	-9.225	-9.225	0.000
	FeCO3	3.478e-10	3.480e-10	-9.459	-9.458	0.000
	PbHCO3+	2.016e-10	1.917e-10	-9.695	-9.717	-0.022
	BaHCO3+	8.838e-11	8.405e-11	-10.054	-10.075	-0.022
	SrCO3	6.136e-11	6.139e-11	-10.212	-10.212	0.000
	CdHCO3+	1.262e-11	1.200e-11	-10.899	-10.921	-0.022
	Zn(CO3)2-2	6.722e-12	5.498e-12	-11.172	-11.260	-0.087
	BaCO3	2.144e-12	2.145e-12	-11.669	-11.669	0.000
	Pb(CO3)2-2	1.022e-12	8.360e-13	-11.990	-12.078	-0.087
	CdCO3	1.123e-13	1.123e-13	-12.950	-12.950	0.000

	Cd(CO3)2-2	9.247e-17	7.562e-17	-16.034	-16.121	-0.087
Ca		3.485e-04				
	Ca+2	3.467e-04	2.845e-04	-3.460	-3.546	-0.086
	CaHCO3+	1.313e-06	1.250e-06	-5.882	-5.903	-0.021
	CaSO4	1.854e-07	1.855e-07	-6.732	-6.732	0.000
	CaHPO4	1.760e-07	1.761e-07	-6.755	-6.754	0.000
	CaCO3	8.140e-08	8.144e-08	-7.089	-7.089	0.000
	CaH2PO4+	1.130e-08	1.074e-08	-7.947	-7.969	-0.022
	CaPO4-	3.949e-09	3.756e-09	-8.403	-8.425	-0.022
	CaOH+	6.854e-10	6.518e-10	-9.164	-9.186	-0.022
	CaF+	5.851e-10	5.564e-10	-9.233	-9.255	-0.022
	CaHSO4+	6.753e-14	6.422e-14	-13.170	-13.192	-0.022
Cd		8.898e-10				
	Cd+2	8.122e-10	6.642e-10	-9.090	-9.178	-0.087
	CdCl+	6.375e-11	6.063e-11	-10.196	-10.217	-0.022
	CdHCO3+	1.262e-11	1.200e-11	-10.899	-10.921	-0.022
	CdSO4	6.731e-13	6.734e-13	-12.172	-12.172	0.000
	CdCl2	2.396e-13	2.397e-13	-12.621	-12.620	0.000
	CdOH+	1.502e-13	1.428e-13	-12.823	-12.845	-0.022
	CdCO3	1.123e-13	1.123e-13	-12.950	-12.950	0.000
	Cd(OH)2	5.650e-16	5.653e-16	-15.248	-15.248	0.000
	CdCl3-	1.166e-16	1.109e-16	-15.933	-15.955	-0.022
	Cd(CO3)2-2	9.247e-17	7.562e-17	-16.034	-16.121	-0.087
	Cd(SO4)2-2	4.184e-17	3.421e-17	-16.378	-16.466	-0.087
	Cd(OH)3-	9.207e-22	8.755e-22	-21.036	-21.058	-0.022
	Cd(OH)4-2	1.317e-28	1.077e-28	-27.880	-27.968	-0.087
Cl		1.084e-03				
	Cl-	1.084e-03	1.031e-03	-2.965	-2.987	-0.022
	MnCl+	1.556e-10	1.479e-10	-9.808	-9.830	-0.022
	FeCl+	1.019e-10	9.694e-11	-9.992	-10.014	-0.022
	CdCl+	6.375e-11	6.063e-11	-10.196	-10.217	-0.022
	ZnCl+	3.063e-11	2.913e-11	-10.514	-10.536	-0.022
	PbCl+	1.041e-11	9.902e-12	-10.982	-11.004	-0.022
	CdCl2	2.396e-13	2.397e-13	-12.621	-12.620	0.000
	MnCl2	6.652e-14	6.655e-14	-13.177	-13.177	0.000
	ZnCl2	2.869e-14	2.871e-14	-13.542	-13.542	0.000
	PbCl2	2.465e-14	2.467e-14	-13.608	-13.608	0.000
	CdCl3-	1.166e-16	1.109e-16	-15.933	-15.955	-0.022
	ZnCl3-	3.048e-17	2.899e-17	-16.516	-16.538	-0.022
	MnCl3-	1.987e-17	1.889e-17	-16.702	-16.724	-0.022
	PbCl3-	1.847e-17	1.757e-17	-16.733	-16.755	-0.022
	FeCl+2	3.509e-19	2.870e-19	-18.455	-18.542	-0.087
	ZnCl4-2	1.531e-20	1.252e-20	-19.815	-19.902	-0.087
	PbCl4-2	8.904e-21	7.282e-21	-20.050	-20.138	-0.087
	FeCl2+	2.843e-21	2.704e-21	-20.546	-20.568	-0.022
	FeCl3	2.785e-25	2.787e-25	-24.555	-24.555	0.000
Cu(1)		6.537e-11				
	Cu+	6.537e-11	6.210e-11	-10.185	-10.207	-0.022
Cu(2)		7.804e-09				
	Cu(OH)2	5.813e-09	5.816e-09	-8.236	-8.235	0.000
	Cu+2	1.777e-09	1.461e-09	-8.750	-8.835	-0.085
	CuOH+	2.121e-10	2.017e-10	-9.673	-9.695	-0.022
	CuSO4	1.030e-12	1.030e-12	-11.987	-11.987	0.000
	Cu(OH)3-	5.087e-15	4.838e-15	-14.294	-14.315	-0.022
	Cu(OH)4-2	1.629e-20	1.332e-20	-19.788	-19.875	-0.087
F		4.038e-07				
	F-	4.000e-07	3.803e-07	-6.398	-6.420	-0.022
	MgF+	2.881e-09	2.740e-09	-8.540	-8.562	-0.022

	CaF+	5.851e-10	5.564e-10	-9.233	-9.255	-0.022
	NaF	9.862e-11	9.867e-11	-10.006	-10.006	0.000
	AlF+2	8.946e-11	7.316e-11	-10.048	-10.136	-0.087
	HF	2.880e-11	2.881e-11	-10.541	-10.540	0.000
	AlF2+	1.303e-11	1.240e-11	-10.885	-10.907	-0.022
	BF(OH)3-	5.783e-13	5.500e-13	-12.238	-12.260	-0.022
	FeF+	2.725e-13	2.591e-13	-12.565	-12.587	-0.022
	MnF+	9.747e-14	9.269e-14	-13.011	-13.033	-0.022
	AlF3	5.796e-14	5.799e-14	-13.237	-13.237	0.000
	HF2-	3.542e-17	3.369e-17	-16.451	-16.473	-0.022
	FeF+2	9.846e-18	8.052e-18	-17.007	-17.094	-0.087
	AlF4-	9.184e-18	8.734e-18	-17.037	-17.059	-0.022
	BF2(OH)2-	1.759e-18	1.672e-18	-17.755	-17.777	-0.022
	FeF2+	9.799e-20	9.319e-20	-19.009	-19.031	-0.022
	AlF5-2	6.740e-23	5.512e-23	-22.171	-22.259	-0.087
	FeF3	5.199e-23	5.201e-23	-22.284	-22.284	0.000
	BF3OH-	8.031e-26	7.637e-26	-25.095	-25.117	-0.022
	AlF6-3	5.162e-29	3.283e-29	-28.287	-28.484	-0.197
	BF4-	9.285e-33	8.830e-33	-32.032	-32.054	-0.022
	SiF6-2	0.000e+00	0.000e+00	-40.949	-41.036	-0.087
Fe(2)		8.806e-08				
	Fe+2	8.287e-08	6.814e-08	-7.082	-7.167	-0.085
	FeHCO3+	4.093e-09	3.892e-09	-8.388	-8.410	-0.022
	FeHPO4	4.666e-10	4.669e-10	-9.331	-9.331	0.000
	FeCO3	3.478e-10	3.480e-10	-9.459	-9.458	0.000
	FeCl+	1.019e-10	9.694e-11	-9.992	-10.014	-0.022
	FeH2PO4+	8.185e-11	7.783e-11	-10.087	-10.109	-0.022
	FeOH+	5.782e-11	5.499e-11	-10.238	-10.260	-0.022
	FeSO4	3.234e-11	3.235e-11	-10.490	-10.490	0.000
	FeF+	2.725e-13	2.591e-13	-12.565	-12.587	-0.022
	FeHSO4+	1.617e-17	1.538e-17	-16.791	-16.813	-0.022
Fe(3)		1.484e-09				
	Fe(OH)2+	9.075e-10	8.630e-10	-9.042	-9.064	-0.022
	Fe(OH)3	5.729e-10	5.732e-10	-9.242	-9.242	0.000
	Fe(OH)4-	3.061e-12	2.911e-12	-11.514	-11.536	-0.022
	FeOH+2	5.439e-13	4.448e-13	-12.265	-12.352	-0.087
	Fe+3	2.880e-17	1.887e-17	-16.541	-16.724	-0.184
	FeH2PO4+2	1.415e-17	1.158e-17	-16.849	-16.936	-0.087
	FeF+2	9.846e-18	8.052e-18	-17.007	-17.094	-0.087
	FeHPO4+	4.400e-18	4.185e-18	-17.357	-17.378	-0.022
	FeSO4+	5.326e-19	5.065e-19	-18.274	-18.295	-0.022
	FeCl+2	3.509e-19	2.870e-19	-18.455	-18.542	-0.087
	FeF2+	9.799e-20	9.319e-20	-19.009	-19.031	-0.022
	FeCl2+	2.843e-21	2.704e-21	-20.546	-20.568	-0.022
	FeF3	5.199e-23	5.201e-23	-22.284	-22.284	0.000
	Fe(SO4)2-	4.305e-23	4.094e-23	-22.366	-22.388	-0.022
	Fe2(OH)2+4	3.028e-23	1.354e-23	-22.519	-22.868	-0.349
	FeCl3	2.785e-25	2.787e-25	-24.555	-24.555	0.000
	FeHSO4+2	1.308e-25	1.070e-25	-24.883	-24.971	-0.087
	Fe3(OH)4+5	6.902e-29	1.963e-29	-28.161	-28.707	-0.546
H(0)		9.300e-26				
	H2	4.650e-26	4.653e-26	-25.333	-25.332	0.000
K		3.691e-05				
	K+	3.691e-05	3.508e-05	-4.433	-4.455	-0.022
	KSO4-	7.054e-10	6.708e-10	-9.152	-9.173	-0.022
	KHPO4-	1.238e-10	1.177e-10	-9.907	-9.929	-0.022
	KOH	1.678e-12	1.679e-12	-11.775	-11.775	0.000
Li		7.206e-07				

	Li+	7.206e-07	6.862e-07	-6.142	-6.164	-0.021
	LiSO4-	1.271e-11	1.209e-11	-10.896	-10.918	-0.022
	LiOH	2.169e-13	2.170e-13	-12.664	-12.664	0.000
Mg		2.012e-04				
	Mg+2	1.998e-04	1.642e-04	-3.699	-3.785	-0.085
	MgHCO3+	1.105e-06	1.051e-06	-5.957	-5.978	-0.022
	MgHPO4	1.373e-07	1.374e-07	-6.862	-6.862	0.000
	MgSO4	8.678e-08	8.682e-08	-7.062	-7.061	0.000
	MgCO3	2.415e-08	2.416e-08	-7.617	-7.617	0.000
	MgH2PO4+	8.302e-09	7.894e-09	-8.081	-8.103	-0.022
	MgPO4-	3.075e-09	2.924e-09	-8.512	-8.534	-0.022
	MgF+	2.881e-09	2.740e-09	-8.540	-8.562	-0.022
	MgOH+	1.125e-09	1.070e-09	-8.949	-8.971	-0.022
Mn(2)		4.551e-08				
	Mn+2	4.285e-08	3.523e-08	-7.368	-7.453	-0.085
	MnHCO3+	1.886e-09	1.794e-09	-8.724	-8.746	-0.022
	MnCO3	5.955e-10	5.958e-10	-9.225	-9.225	0.000
	MnCl+	1.556e-10	1.479e-10	-9.808	-9.830	-0.022
	MnSO4	1.643e-11	1.643e-11	-10.784	-10.784	0.000
	MnOH+	2.085e-12	1.982e-12	-11.681	-11.703	-0.022
	MnF+	9.747e-14	9.269e-14	-13.011	-13.033	-0.022
	MnCl2	6.652e-14	6.655e-14	-13.177	-13.177	0.000
	MnCl3-	1.987e-17	1.889e-17	-16.702	-16.724	-0.022
	Mn(NO3)2	4.839e-21	4.842e-21	-20.315	-20.315	0.000
Mn(3)		6.318e-31				
	Mn+3	6.318e-31	4.018e-31	-30.199	-30.396	-0.197
N(-3)		6.426e-07				
	NH4+	6.416e-07	6.094e-07	-6.193	-6.215	-0.022
	NH3	9.672e-10	9.677e-10	-9.014	-9.014	0.000
	NH4SO4-	3.332e-11	3.169e-11	-10.477	-10.499	-0.022
N(3)		3.570e-08				
	NO2-	3.570e-08	3.392e-08	-7.447	-7.470	-0.022
N(5)		1.906e-07				
	NO3-	1.906e-07	1.811e-07	-6.720	-6.742	-0.022
	PbNO3+	1.191e-15	1.132e-15	-14.924	-14.946	-0.022
	Mn(NO3)2	4.839e-21	4.842e-21	-20.315	-20.315	0.000
Na		4.742e-04				
	Na+	4.740e-04	4.509e-04	-3.324	-3.346	-0.022
	NaHCO3	1.448e-07	1.448e-07	-6.839	-6.839	0.000
	NaSO4-	8.311e-09	7.904e-09	-8.080	-8.102	-0.022
	NaHPO4-	1.591e-09	1.513e-09	-8.798	-8.820	-0.022
	NaCO3-	6.015e-10	5.720e-10	-9.221	-9.243	-0.022
	NaF	9.862e-11	9.867e-11	-10.006	-10.006	0.000
	NaOH	4.110e-11	4.112e-11	-10.386	-10.386	0.000
O(0)		0.000e+00				
	O2	0.000e+00	0.000e+00	-49.006	-49.006	0.000
P		4.843e-06				
	H2PO4-	2.396e-06	2.279e-06	-5.621	-5.642	-0.022
	HPO4-2	2.105e-06	1.721e-06	-5.677	-5.764	-0.087
	CaHPO4	1.760e-07	1.761e-07	-6.755	-6.754	0.000
	MgHPO4	1.373e-07	1.374e-07	-6.862	-6.862	0.000
	CaH2PO4+	1.130e-08	1.074e-08	-7.947	-7.969	-0.022
	MgH2PO4+	8.302e-09	7.894e-09	-8.081	-8.103	-0.022
	CaPO4-	3.949e-09	3.756e-09	-8.403	-8.425	-0.022
	MgPO4-	3.075e-09	2.924e-09	-8.512	-8.534	-0.022
	NaHPO4-	1.591e-09	1.513e-09	-8.798	-8.820	-0.022
	FeHPO4	4.666e-10	4.669e-10	-9.331	-9.331	0.000
	KHPO4-	1.238e-10	1.177e-10	-9.907	-9.929	-0.022

	FeH2PO4+	8.185e-11	7.783e-11	-10.087	-10.109	-0.022
	PO4-3	1.073e-11	6.819e-12	-10.969	-11.166	-0.197
	FeH2PO4+2	1.415e-17	1.158e-17	-16.849	-16.936	-0.087
	FeHPO4+	4.400e-18	4.185e-18	-17.357	-17.378	-0.022
Pb		2.413e-09				
	PbCO3	1.563e-09	1.563e-09	-8.806	-8.806	0.000
	Pb+2	5.167e-10	4.226e-10	-9.287	-9.374	-0.087
	PbHCO3+	2.016e-10	1.917e-10	-9.695	-9.717	-0.022
	PbOH+	1.196e-10	1.137e-10	-9.922	-9.944	-0.022
	PbCl+	1.041e-11	9.902e-12	-10.982	-11.004	-0.022
	Pb(CO3)2-2	1.022e-12	8.360e-13	-11.990	-12.078	-0.087
	PbSO4	9.586e-13	9.590e-13	-12.018	-12.018	0.000
	Pb(OH)2	6.104e-13	6.107e-13	-12.214	-12.214	0.000
	PbCl2	2.465e-14	2.467e-14	-13.608	-13.608	0.000
	PbNO3+	1.191e-15	1.132e-15	-14.924	-14.946	-0.022
	Pb(OH)3-	1.018e-16	9.679e-17	-15.992	-16.014	-0.022
	Pb(SO4)2-2	2.484e-17	2.031e-17	-16.605	-16.692	-0.087
	PbCl3-	1.847e-17	1.757e-17	-16.733	-16.755	-0.022
	Pb2OH+3	1.692e-18	1.076e-18	-17.772	-17.968	-0.197
	PbCl4-2	8.904e-21	7.282e-21	-20.050	-20.138	-0.087
	Pb(OH)4-2	3.742e-21	3.061e-21	-20.427	-20.514	-0.087
S(6)		5.205e-06				
	SO4-2	4.923e-06	4.036e-06	-5.308	-5.394	-0.086
	CaSO4	1.854e-07	1.855e-07	-6.732	-6.732	0.000
	MgSO4	8.678e-08	8.682e-08	-7.062	-7.061	0.000
	NaSO4-	8.311e-09	7.904e-09	-8.080	-8.102	-0.022
	KSO4-	7.054e-10	6.708e-10	-9.152	-9.173	-0.022
	SrSO4	5.063e-10	5.065e-10	-9.296	-9.295	0.000
	BaSO4	6.010e-11	6.013e-11	-10.221	-10.221	0.000
	NH4SO4-	3.332e-11	3.169e-11	-10.477	-10.499	-0.022
	FeSO4	3.234e-11	3.235e-11	-10.490	-10.490	0.000
	ZnSO4	2.260e-11	2.261e-11	-10.646	-10.646	0.000
	HSO4-	1.974e-11	1.877e-11	-10.705	-10.726	-0.022
	MnSO4	1.643e-11	1.643e-11	-10.784	-10.784	0.000
	LiSO4-	1.271e-11	1.209e-11	-10.896	-10.918	-0.022
	CuSO4	1.030e-12	1.030e-12	-11.987	-11.987	0.000
	PbSO4	9.586e-13	9.590e-13	-12.018	-12.018	0.000
	CdSO4	6.731e-13	6.734e-13	-12.172	-12.172	0.000
	AlSO4+	2.206e-13	2.098e-13	-12.656	-12.678	-0.022
	CaHSO4+	6.753e-14	6.422e-14	-13.170	-13.192	-0.022
	Zn(SO4)2-2	1.079e-15	8.825e-16	-14.967	-15.054	-0.087
	Cd(SO4)2-2	4.184e-17	3.421e-17	-16.378	-16.466	-0.087
	Al(SO4)2-	2.535e-17	2.411e-17	-16.596	-16.618	-0.022
	Pb(SO4)2-2	2.484e-17	2.031e-17	-16.605	-16.692	-0.087
	FeHSO4+	1.617e-17	1.538e-17	-16.791	-16.813	-0.022
	FeSO4+	5.326e-19	5.065e-19	-18.274	-18.295	-0.022
	AlHSO4+2	1.459e-21	1.193e-21	-20.836	-20.923	-0.087
	Fe(SO4)2-	4.305e-23	4.094e-23	-22.366	-22.388	-0.022
	FeHSO4+2	1.308e-25	1.070e-25	-24.883	-24.971	-0.087
Si		9.121e-06				
	H4SiO4	9.113e-06	9.118e-06	-5.040	-5.040	0.000
	H3SiO4-	8.406e-09	7.994e-09	-8.075	-8.097	-0.022
	H2SiO4-2	1.945e-15	1.591e-15	-14.711	-14.798	-0.087
	SiF6-2	0.000e+00	0.000e+00	-40.949	-41.036	-0.087
Sr		1.027e-06				
	Sr+2	1.023e-06	8.398e-07	-5.990	-6.076	-0.086
	SrHCO3+	3.757e-09	3.576e-09	-8.425	-8.447	-0.021
	SrSO4	5.063e-10	5.065e-10	-9.296	-9.295	0.000

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      SrCO3             6.136e-11   6.139e-11   -10.212   -10.212     0.000
      SrOH+             6.248e-13   5.945e-13   -12.204   -12.226    -0.022
Zn               3.825e-08
      Zn+2              3.468e-08   2.843e-08    -7.460    -7.546    -0.086
      ZnHCO3+           2.150e-09   2.045e-09    -8.668    -8.689    -0.022
      ZnCO3             1.207e-09   1.208e-09    -8.918    -8.918     0.000
      ZnOH+             8.155e-11   7.755e-11   -10.089   -10.110    -0.022
      Zn(OH)2           6.817e-11   6.820e-11   -10.166   -10.166     0.000
      ZnCl+             3.063e-11   2.913e-11   -10.514   -10.536    -0.022
      ZnSO4             2.260e-11   2.261e-11   -10.646   -10.646     0.000
      Zn(CO3)2-2        6.722e-12   5.498e-12   -11.172   -11.260    -0.087
      ZnCl2             2.869e-14   2.871e-14   -13.542   -13.542     0.000
      Zn(OH)3-          3.131e-15   2.977e-15   -14.504   -14.526    -0.022
      Zn(SO4)2-2        1.079e-15   8.825e-16   -14.967   -15.054    -0.087
      ZnCl3-            3.048e-17   2.899e-17   -16.516   -16.538    -0.022
      ZnCl4-2           1.531e-20   1.252e-20   -19.815   -19.902    -0.087
      Zn(OH)4-2         7.964e-21   6.513e-21   -20.099   -20.186    -0.087

-----------------------------Saturation indices-------------------------------

      Phase               SI log IAP  log KT

      Al(OH)3(a)       -1.51   10.76   12.27  Al(OH)3
      Albite           -6.15   -0.56    5.59  NaAlSi3O8
      Alunite          -5.76   -4.37    1.39  KAl3(SO4)2(OH)6
      Anglesite        -6.86  -14.77   -7.91  PbSO4
      Anhydrite        -4.59   -8.94   -4.35  CaSO4
      Anorthite        -7.53   22.18   29.71  CaAl2Si2O8
      Aragonite        -1.99  -10.22   -8.23  CaCO3
      Barite           -2.54  -12.92  -10.38  BaSO4
      Ca-Montmorillonite  -1.70    8.35   10.06  Ca0.165Al2.33Si3.67O10(OH)2
      Calcite          -1.83  -10.22   -8.39  CaCO3
      Cd(OH)2          -8.55    5.10   13.65  Cd(OH)2
      CdSiO3           -9.92    0.06    9.98  CdSiO3
      CdSO4           -15.29  -14.57    0.72  CdSO4
      Celestite        -4.81  -11.47   -6.66  SrSO4
      Cerrusite        -2.65  -16.05  -13.40  PbCO3
      Chalcedony       -1.23   -5.04   -3.81  SiO2
      Chlorite(14A)   -17.91   58.88   76.79  Mg5Al2Si3O10(OH)8
      Chrysotile      -13.59   21.41   34.99  Mg3Si2O5(OH)4
      CO2(g)           -2.68  -20.95  -18.27  CO2
      Dolomite         -4.11  -20.67  -16.57  CaMg(CO3)2
      Fe(OH)3(a)       -0.20   18.25   18.45  Fe(OH)3
      Fluorite         -5.50  -16.39  -10.89  CaF2
      Gibbsite          1.39   10.76    9.38  Al(OH)3
      Goethite          4.89   18.25   13.36  FeOOH
      Gypsum           -4.34   -8.94   -4.60  CaSO4:2H2O
      H2(g)           -22.28  -22.28    0.00  H2
      Hausmannite     -23.86   42.76   66.62  Mn3O4
      Hematite         11.69   36.51   24.82  Fe2O3
      Hydroxyapatite   -5.05  -44.09  -39.04  Ca5(PO4)3OH
      Illite           -2.92   11.35   14.27  K0.6Mg0.25Al2.3Si3.5O10(OH)2
      Jarosite-K      -15.10   18.10   33.20  KFe3(SO4)2(OH)6
      K-feldspar       -4.42   -1.67    2.75  KAlSi3O8
      K-mica            3.85   19.85   16.00  KAl3Si3O10(OH)2
      Kaolinite         2.05   11.45    9.40  Al2Si2O5(OH)4
      Manganite        -7.37   17.97   25.34  MnOOH
      Melanterite     -10.06  -12.56   -2.50  FeSO4:7H2O
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      NH3(g)          -11.24    0.92   12.16  NH3
      O2(g)           -46.15   44.56   90.71  O2
      Otavite          -3.75  -15.85  -12.10  CdCO3
      Pb(OH)2          -4.02    4.91    8.93  Pb(OH)2
      Pyrochroite      -8.37    6.83   15.20  Mn(OH)2
      Pyrolusite      -15.89   29.11   45.00  MnO2
      Quartz           -0.73   -5.04   -4.31  SiO2
      Rhodochrosite    -3.07  -14.12  -11.05  MnCO3
      Sepiolite       -10.48    5.87   16.35  Mg2Si3O7.5OH:3H2O
      Sepiolite(d)    -12.79    5.87   18.66  Mg2Si3O7.5OH:3H2O
      Siderite         -3.09  -13.84  -10.75  FeCO3
      SiO2(a)          -2.14   -5.04   -2.90  SiO2
      Smithsonite      -4.46  -14.22   -9.76  ZnCO3
      Strontianite     -3.43  -12.75   -9.32  SrCO3
      Talc            -12.65   11.33   23.97  Mg3Si4O10(OH)2
      Vivianite        -7.83  -43.83  -36.00  Fe3(PO4)2:8H2O
      Willemite        -8.76    8.43   17.18  Zn2SiO4
      Witherite        -5.51  -14.20   -8.69  BaCO3
      Zn(OH)2(e)       -4.77    6.73   11.50  Zn(OH)2

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End of simulation.
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Reading input data for simulation 5.
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      MIX 2 Mixing B3/Rain with Stickleback (1:1)
            3     0.5
            4     0.5
      SAVE solution 5
      END
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Beginning of reaction calculations.
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Reaction step 1.

Using mixture 2.  Mixing B3/Rain with Stickleback (1:1)

       5.000e-01 Solution 3   Solution after simulation 3.
       5.000e-01 Solution 4   Stickleback Lake

-----------------------------Solution composition------------------------------

      Elements           Molality       Moles

      Al                1.649e-07   1.649e-07
      B                 2.313e-06   2.313e-06
      Ba                2.068e-08   2.068e-08
      C                 4.957e-04   4.957e-04
      Ca                2.008e-04   2.008e-04
      Cd                5.005e-10   5.005e-10
      Cl                5.421e-04   5.421e-04
      Cu                3.950e-08   3.950e-08
      F                 2.019e-07   2.019e-07
      Fe                1.477e-07   1.477e-07
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      K                 2.005e-05   2.005e-05
      Li                3.603e-07   3.603e-07
      Mg                1.382e-04   1.382e-04
      Mn                4.346e-08   4.346e-08
      N                 4.345e-07   4.345e-07
      Na                2.399e-04   2.399e-04
      P                 2.825e-06   2.825e-06
      Pb                2.413e-09   2.413e-09
      S                 1.671e-05   1.671e-05
      Si                4.561e-06   4.561e-06
      Sr                5.607e-07   5.607e-07
      Zn                2.199e-08   2.199e-08

----------------------------Description of solution----------------------------

                              pH  =   7.230      Charge balance
                              pe  =  -2.671      Adjusted to redox equilibrium
                 Activity of water  =   1.000
                    Ionic strength  =   1.321e-03
                 Mass of water (kg)  =   1.000e+00
          Total alkalinity (eq/kg)  =   4.188e-04
                 Total CO2 (mol/kg)  =   4.957e-04
               Temperature (deg C)  =   4.000
           Electrical balance (eq)  =  -5.666e-05
                       Iterations  =  17
                          Total H  = 1.110129e+02
                          Total O  = 5.550773e+01

----------------------------Distribution of species----------------------------

                                                 Log       Log         Log
      Species             Molality    Activity  Molality  Activity     Gamma

      H+                6.117e-08   5.893e-08    -7.213    -7.230    -0.016
      OH-               2.976e-08   2.860e-08    -7.526    -7.544    -0.017
      H2O               5.551e+01   1.000e+00     0.000     0.000     0.000
Al                1.649e-07
      Al(OH)4-          1.463e-07   1.406e-07    -6.835    -6.852    -0.017
      Al(OH)2+          1.267e-08   1.218e-08    -7.897    -7.914    -0.017
      Al(OH)3           5.092e-09   5.094e-09    -8.293    -8.293     0.000
      AlOH+2            8.619e-10   7.362e-10    -9.065    -9.133    -0.068
      AlF+2             3.599e-11   3.074e-11   -10.444   -10.512    -0.068
      Al+3              2.555e-11   1.826e-11   -10.593   -10.739    -0.146
      AlF2+             2.747e-12   2.641e-12   -11.561   -11.578    -0.017
      AlSO4+            6.172e-13   5.933e-13   -12.210   -12.227    -0.017
      AlF3              6.261e-15   6.263e-15   -14.203   -14.203     0.000
      Al(SO4)2-         2.420e-16   2.327e-16   -15.616   -15.633    -0.017
      AlF4-             4.974e-19   4.782e-19   -18.303   -18.320    -0.017
      AlHSO4+2          3.213e-21   2.744e-21   -20.493   -20.562    -0.068
      AlF5-2            1.791e-24   1.530e-24   -23.747   -23.815    -0.068
      AlF6-3            6.588e-31   4.621e-31   -30.181   -30.335    -0.154
B                 2.313e-06
      H3BO3             2.297e-06   2.298e-06    -5.639    -5.639     0.000
      H2BO3-            1.546e-08   1.486e-08    -7.811    -7.828    -0.017
      BF(OH)3-          1.448e-13   1.392e-13   -12.839   -12.856    -0.017
      BF2(OH)2-         1.816e-19   1.746e-19   -18.741   -18.758    -0.017
      BF3OH-            3.420e-27   3.288e-27   -26.466   -26.483    -0.017
      BF4-              1.631e-34   1.568e-34   -33.788   -33.805    -0.017
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Ba	2.068e-08					
	Ba+2	2.052e-08	1.756e-08	-7.688	-7.756	-0.068
	BaSO4	1.211e-10	1.212e-10	-9.917	-9.917	0.000
	BaHCO3+	3.608e-11	3.469e-11	-10.443	-10.460	-0.017
	BaCO3	1.088e-12	1.088e-12	-11.963	-11.963	0.000
	BaOH+	1.050e-14	1.009e-14	-13.979	-13.996	-0.017
C(-4)	6.287e-14					
	CH4	6.287e-14	6.289e-14	-13.202	-13.201	0.000
C(4)	4.957e-04					
	HCO3-	4.149e-04	3.991e-04	-3.382	-3.399	-0.017
	CO2	7.931e-05	7.934e-05	-4.101	-4.101	0.000
	MgHCO3+	5.475e-07	5.264e-07	-6.262	-6.279	-0.017
	CaHCO3+	5.456e-07	5.248e-07	-6.263	-6.280	-0.017
	CO3-2	2.136e-07	1.829e-07	-6.670	-6.738	-0.067
	NaHCO3	5.175e-08	5.176e-08	-7.286	-7.286	0.000
	CaCO3	4.203e-08	4.205e-08	-7.376	-7.376	0.000
	MgCO3	1.487e-08	1.488e-08	-7.828	-7.827	0.000
	FeHCO3+	5.022e-09	4.828e-09	-8.299	-8.316	-0.017
	PbCO3	1.520e-09	1.520e-09	-8.818	-8.818	0.000
	SrHCO3+	1.478e-09	1.422e-09	-8.830	-8.847	-0.017
	MnHCO3+	1.316e-09	1.265e-09	-8.881	-8.898	-0.017
	ZnHCO3+	9.065e-10	8.714e-10	-9.043	-9.060	-0.017
	ZnCO3	6.326e-10	6.328e-10	-9.199	-9.199	0.000
	FeCO3	5.304e-10	5.306e-10	-9.275	-9.275	0.000
	MnCO3	5.164e-10	5.165e-10	-9.287	-9.287	0.000
	NaCO3-	2.614e-10	2.513e-10	-9.583	-9.600	-0.017
	PbHCO3+	1.577e-10	1.516e-10	-9.802	-9.819	-0.017
	BaHCO3+	3.608e-11	3.469e-11	-10.443	-10.460	-0.017
	SrCO3	3.000e-11	3.001e-11	-10.523	-10.523	0.000
	CdHCO3+	5.317e-12	5.112e-12	-11.274	-11.291	-0.017
	Zn(CO3)2-2	2.897e-12	2.474e-12	-11.538	-11.607	-0.068
	BaCO3	1.088e-12	1.088e-12	-11.963	-11.963	0.000
	Pb(CO3)2-2	8.175e-13	6.983e-13	-12.088	-12.156	-0.068
	CdCO3	5.881e-14	5.883e-14	-13.231	-13.230	0.000
	Cd(CO3)2-2	3.983e-17	3.402e-17	-16.400	-16.468	-0.068
Ca	2.008e-04					
	Ca+2	1.998e-04	1.710e-04	-3.699	-3.767	-0.068
	CaHCO3+	5.456e-07	5.248e-07	-6.263	-6.280	-0.017
	CaSO4	3.804e-07	3.805e-07	-6.420	-6.420	0.000
	CaHPO4	7.175e-08	7.177e-08	-7.144	-7.144	0.000
	CaCO3	4.203e-08	4.205e-08	-7.376	-7.376	0.000
	CaH2PO4+	3.705e-09	3.562e-09	-8.431	-8.448	-0.017
	CaPO4-	1.958e-09	1.882e-09	-8.708	-8.725	-0.017
	CaOH+	5.009e-10	4.816e-10	-9.300	-9.317	-0.017
	CaF+	1.764e-10	1.695e-10	-9.754	-9.771	-0.017
	CaHSO4+	1.114e-13	1.071e-13	-12.953	-12.970	-0.017
Cd	5.005e-10					
	Cd+2	4.741e-10	4.050e-10	-9.324	-9.393	-0.068
	CdCl+	1.944e-11	1.869e-11	-10.711	-10.728	-0.017
	CdHCO3+	5.317e-12	5.112e-12	-11.274	-11.291	-0.017
	CdSO4	1.401e-12	1.401e-12	-11.854	-11.854	0.000
	CdOH+	1.113e-13	1.070e-13	-12.953	-12.970	-0.017
	CdCO3	5.881e-14	5.883e-14	-13.231	-13.230	0.000
	CdCl2	3.734e-14	3.735e-14	-13.428	-13.428	0.000
	Cd(OH)2	5.207e-16	5.208e-16	-15.283	-15.283	0.000
	Cd(SO4)2-2	2.843e-16	2.429e-16	-15.546	-15.615	-0.068
	Cd(CO3)2-2	3.983e-17	3.402e-17	-16.400	-16.468	-0.068
	CdCl3-	9.089e-18	8.738e-18	-17.041	-17.059	-0.017

Cd(OH)3-	1.031e-21	9.916e-22	-20.987	-21.004	-0.017
Cd(OH)4-2	1.756e-28	1.500e-28	-27.756	-27.824	-0.068
Cl	5.421e-04				
Cl-	5.421e-04	5.210e-04	-3.266	-3.283	-0.017
FeCl+	9.049e-11	8.699e-11	-10.043	-10.061	-0.017
MnCl+	7.851e-11	7.548e-11	-10.105	-10.122	-0.017
CdCl+	1.944e-11	1.869e-11	-10.711	-10.728	-0.017
ZnCl+	9.342e-12	8.981e-12	-11.030	-11.047	-0.017
PbCl+	5.894e-12	5.666e-12	-11.230	-11.247	-0.017
CdCl2	3.734e-14	3.735e-14	-13.428	-13.428	0.000
MnCl2	1.716e-14	1.717e-14	-13.765	-13.765	0.000
PbCl2	7.134e-15	7.136e-15	-14.147	-14.147	0.000
ZnCl2	4.473e-15	4.474e-15	-14.349	-14.349	0.000
CdCl3-	9.089e-18	8.738e-18	-17.041	-17.059	-0.017
PbCl3-	2.672e-18	2.569e-18	-17.573	-17.590	-0.017
MnCl3-	2.562e-18	2.463e-18	-17.591	-17.608	-0.017
ZnCl3-	2.376e-18	2.284e-18	-17.624	-17.641	-0.017
PbCl4-2	6.303e-22	5.384e-22	-21.200	-21.269	-0.068
ZnCl4-2	5.838e-22	4.987e-22	-21.234	-21.302	-0.068
FeCl+2	6.424e-26	5.487e-26	-25.192	-25.261	-0.068
FeCl2+	2.719e-28	2.613e-28	-27.566	-27.583	-0.017
FeCl3	1.361e-32	1.362e-32	-31.866	-31.866	0.000
Cu(1)	3.950e-08				
Cu+	3.950e-08	3.795e-08	-7.403	-7.421	-0.017
Cu(2)	1.400e-12				
Cu(OH)2	1.144e-12	1.144e-12	-11.942	-11.941	0.000
Cu+2	2.220e-13	1.902e-13	-12.654	-12.721	-0.067
CuOH+	3.358e-14	3.228e-14	-13.474	-13.491	-0.017
CuSO4	4.575e-16	4.577e-16	-15.340	-15.339	0.000
Cu(OH)3-	1.217e-18	1.170e-18	-17.915	-17.932	-0.017
Cu(OH)4-2	4.638e-24	3.962e-24	-23.334	-23.402	-0.068
F	2.019e-07				
F-	2.006e-07	1.928e-07	-6.698	-6.715	-0.017
MgF+	1.036e-09	9.957e-10	-8.985	-9.002	-0.017
CaF+	1.764e-10	1.695e-10	-9.754	-9.771	-0.017
AlF+2	3.599e-11	3.074e-11	-10.444	-10.512	-0.068
NaF	2.558e-11	2.558e-11	-10.592	-10.592	0.000
HF	1.188e-11	1.188e-11	-10.925	-10.925	0.000
AlF2+	2.747e-12	2.641e-12	-11.561	-11.578	-0.017
FeF+	2.425e-13	2.332e-13	-12.615	-12.632	-0.017
BF(OH)3-	1.448e-13	1.392e-13	-12.839	-12.856	-0.017
MnF+	4.933e-14	4.743e-14	-13.307	-13.324	-0.017
AlF3	6.261e-15	6.263e-15	-14.203	-14.203	0.000
HF2-	7.327e-18	7.044e-18	-17.135	-17.152	-0.017
AlF4-	4.974e-19	4.782e-19	-18.303	-18.320	-0.017
BF2(OH)2-	1.816e-19	1.746e-19	-18.741	-18.758	-0.017
FeF+2	1.808e-24	1.544e-24	-23.743	-23.811	-0.068
AlF5-2	1.791e-24	1.530e-24	-23.747	-23.815	-0.068
FeF2+	9.423e-27	9.059e-27	-26.026	-26.043	-0.017
BF3OH-	3.420e-27	3.288e-27	-26.466	-26.483	-0.017
FeF3	2.563e-30	2.563e-30	-29.591	-29.591	0.000
AlF6-3	6.588e-31	4.621e-31	-30.181	-30.335	-0.154
BF4-	1.631e-34	1.568e-34	-33.788	-33.805	-0.017
SiF6-2	0.000e+00	0.000e+00	-43.398	-43.466	-0.068
Fe(2)	1.477e-07				
Fe+2	1.411e-07	1.209e-07	-6.850	-6.917	-0.067
FeHCO3+	5.022e-09	4.828e-09	-8.299	-8.316	-0.017
FeHPO4	5.619e-10	5.621e-10	-9.250	-9.250	0.000

	FeCO3	5.304e-10	5.306e-10	-9.275	-9.275	0.000
	FeSO4	1.959e-10	1.960e-10	-9.708	-9.708	0.000
	FeOH+	1.248e-10	1.200e-10	-9.904	-9.921	-0.017
	FeCl+	9.049e-11	8.699e-11	-10.043	-10.061	-0.017
	FeH2PO4+	7.930e-11	7.623e-11	-10.101	-10.118	-0.017
	FeF+	2.425e-13	2.332e-13	-12.615	-12.632	-0.017
	FeHSO4+	7.882e-17	7.577e-17	-16.103	-16.120	-0.017
	Fe(HS)2	7.958e-22	7.960e-22	-21.099	-21.099	0.000
	Fe(HS)3-	2.450e-31	2.355e-31	-30.611	-30.628	-0.017
Fe(3)		9.186e-16				
	Fe(OH)2+	5.131e-16	4.932e-16	-15.290	-15.307	-0.017
	Fe(OH)3	4.026e-16	4.028e-16	-15.395	-15.395	0.000
	Fe(OH)4-	2.615e-18	2.514e-18	-17.583	-17.600	-0.017
	FeOH+2	2.421e-19	2.068e-19	-18.616	-18.684	-0.068
	Fe+3	9.987e-24	7.137e-24	-23.001	-23.146	-0.146
	FeH2PO4+2	2.828e-24	2.416e-24	-23.548	-23.617	-0.068
	FeF+2	1.808e-24	1.544e-24	-23.743	-23.811	-0.068
	FeHPO4+	1.117e-24	1.073e-24	-23.952	-23.969	-0.017
	FeSO4+	6.799e-25	6.536e-25	-24.168	-24.185	-0.017
	FeCl+2	6.424e-26	5.487e-26	-25.192	-25.261	-0.068
	FeF2+	9.423e-27	9.059e-27	-26.026	-26.043	-0.017
	FeCl2+	2.719e-28	2.613e-28	-27.566	-27.583	-0.017
	Fe(SO4)2-	1.875e-28	1.803e-28	-27.727	-27.744	-0.017
	FeF3	2.563e-30	2.563e-30	-29.591	-29.591	0.000
	FeHSO4+2	1.315e-31	1.123e-31	-30.881	-30.950	-0.068
	FeCl3	1.361e-32	1.362e-32	-31.866	-31.866	0.000
	Fe2(OH)2+4	5.500e-36	2.928e-36	-35.260	-35.533	-0.274
	Fe3(OH)4+5	0.000e+00	0.000e+00	-47.187	-47.615	-0.428
H(0)		1.356e-12				
	H2	6.780e-13	6.782e-13	-12.169	-12.169	0.000
K		2.005e-05				
	K+	2.005e-05	1.927e-05	-4.698	-4.715	-0.017
	KSO4-	1.308e-09	1.257e-09	-8.883	-8.901	-0.017
	KHPO4-	4.563e-11	4.387e-11	-10.341	-10.358	-0.017
	KOH	1.134e-12	1.134e-12	-11.946	-11.945	0.000
Li		3.603e-07				
	Li+	3.603e-07	3.467e-07	-6.443	-6.460	-0.017
	LiSO4-	2.168e-11	2.084e-11	-10.664	-10.681	-0.017
	LiOH	1.347e-13	1.348e-13	-12.871	-12.870	0.000
Mg		1.382e-04				
	Mg+2	1.374e-04	1.177e-04	-3.862	-3.929	-0.067
	MgHCO3+	5.475e-07	5.264e-07	-6.262	-6.279	-0.017
	MgSO4	2.123e-07	2.123e-07	-6.673	-6.673	0.000
	MgHPO4	6.677e-08	6.679e-08	-7.175	-7.175	0.000
	MgCO3	1.487e-08	1.488e-08	-7.828	-7.827	0.000
	MgH2PO4+	3.248e-09	3.122e-09	-8.488	-8.506	-0.017
	MgPO4-	1.818e-09	1.747e-09	-8.740	-8.758	-0.017
	MgF+	1.036e-09	9.957e-10	-8.985	-9.002	-0.017
	MgOH+	9.807e-10	9.428e-10	-9.008	-9.026	-0.017
Mn(2)		4.346e-08				
	Mn+2	4.149e-08	3.556e-08	-7.382	-7.449	-0.067
	MnHCO3+	1.316e-09	1.265e-09	-8.881	-8.898	-0.017
	MnCO3	5.164e-10	5.165e-10	-9.287	-9.287	0.000
	MnCl+	7.851e-11	7.548e-11	-10.105	-10.122	-0.017
	MnSO4	5.657e-11	5.659e-11	-10.247	-10.247	0.000
	MnOH+	2.558e-12	2.459e-12	-11.592	-11.609	-0.017
	MnF+	4.933e-14	4.743e-14	-13.307	-13.324	-0.017
	MnCl2	1.716e-14	1.717e-14	-13.765	-13.765	0.000

	MnCl3-	2.562e-18	2.463e-18	-17.591	-17.608	-0.017
	Mn(NO3)2	0.000e+00	0.000e+00	-177.974	-177.974	0.000
Mn(3)		1.232e-37				
	Mn+3	1.232e-37	8.641e-38	-36.909	-37.063	-0.154
N(-3)		9.685e-08				
	NH4+	9.665e-08	9.285e-08	-7.015	-7.032	-0.017
	NH3	1.812e-10	1.812e-10	-9.742	-9.742	0.000
	NH4SO4-	1.713e-11	1.647e-11	-10.766	-10.783	-0.017
N(0)		3.376e-07				
	N2	1.688e-07	1.689e-07	-6.773	-6.772	0.000
N(3)		0.000e+00				
	NO2-	0.000e+00	0.000e+00	-63.672	-63.689	-0.017
N(5)		0.000e+00				
	NO3-	0.000e+00	0.000e+00	-85.556	-85.573	-0.017
	PbNO3+	0.000e+00	0.000e+00	-93.707	-93.724	-0.017
	Mn(NO3)2	0.000e+00	0.000e+00	-177.974	-177.974	0.000
Na		2.399e-04				
	Na+	2.398e-04	2.306e-04	-3.620	-3.637	-0.017
	NaHCO3	5.175e-08	5.176e-08	-7.286	-7.286	0.000
	NaSO4-	1.435e-08	1.379e-08	-7.843	-7.860	-0.017
	NaHPO4-	5.460e-10	5.249e-10	-9.263	-9.280	-0.017
	NaCO3-	2.614e-10	2.513e-10	-9.583	-9.600	-0.017
	NaOH	2.585e-11	2.585e-11	-10.588	-10.587	0.000
	NaF	2.558e-11	2.558e-11	-10.592	-10.592	0.000
O(0)		0.000e+00				
	O2	0.000e+00	0.000e+00	-75.334	-75.333	0.000
P		2.825e-06				
	HPO4-2	1.367e-06	1.167e-06	-5.864	-5.933	-0.069
	H2PO4-	1.308e-06	1.258e-06	-5.883	-5.900	-0.017
	CaHPO4	7.175e-08	7.177e-08	-7.144	-7.144	0.000
	MgHPO4	6.677e-08	6.679e-08	-7.175	-7.175	0.000
	CaH2PO4+	3.705e-09	3.562e-09	-8.431	-8.448	-0.017
	MgH2PO4+	3.248e-09	3.122e-09	-8.488	-8.506	-0.017
	CaPO4-	1.958e-09	1.882e-09	-8.708	-8.725	-0.017
	MgPO4-	1.818e-09	1.747e-09	-8.740	-8.758	-0.017
	FeHPO4	5.619e-10	5.621e-10	-9.250	-9.250	0.000
	NaHPO4-	5.460e-10	5.249e-10	-9.263	-9.280	-0.017
	FeH2PO4+	7.930e-11	7.623e-11	-10.101	-10.118	-0.017
	KHPO4-	4.563e-11	4.387e-11	-10.341	-10.358	-0.017
	PO4-3	8.109e-12	5.686e-12	-11.091	-11.245	-0.154
	FeH2PO4+2	2.828e-24	2.416e-24	-23.548	-23.617	-0.068
	FeHPO4+	1.117e-24	1.073e-24	-23.952	-23.969	-0.017
Pb		2.413e-09				
	PbCO3	1.520e-09	1.520e-09	-8.818	-8.818	0.000
	Pb+2	5.600e-10	4.783e-10	-9.252	-9.320	-0.068
	PbOH+	1.646e-10	1.583e-10	-9.784	-9.801	-0.017
	PbHCO3+	1.577e-10	1.516e-10	-9.802	-9.819	-0.017
	PbCl+	5.894e-12	5.666e-12	-11.230	-11.247	-0.017
	PbSO4	3.703e-12	3.704e-12	-11.431	-11.431	0.000
	Pb(OH)2	1.044e-12	1.045e-12	-11.981	-11.981	0.000
	Pb(CO3)2-2	8.175e-13	6.983e-13	-12.088	-12.156	-0.068
	PbCl2	7.134e-15	7.136e-15	-14.147	-14.147	0.000
	Pb(SO4)2-2	3.134e-16	2.677e-16	-15.504	-15.572	-0.068
	Pb(OH)3-	2.117e-16	2.035e-16	-15.674	-15.691	-0.017
	PbCl3-	2.672e-18	2.569e-18	-17.573	-17.590	-0.017
	Pb2OH+3	2.416e-18	1.695e-18	-17.617	-17.771	-0.154
	Pb(OH)4-2	9.262e-21	7.912e-21	-20.033	-20.102	-0.068
	PbCl4-2	6.303e-22	5.384e-22	-21.200	-21.269	-0.068

	PbNO3+	0.000e+00	0.000e+00	-93.707	-93.724	-0.017
S(-2)	5.836e-12					
	H2S	3.008e-12	3.009e-12	-11.522	-11.522	0.000
	HS-	2.827e-12	2.717e-12	-11.549	-11.566	-0.017
	S-2	1.385e-18	1.185e-18	-17.858	-17.926	-0.068
	Fe(HS)2	7.958e-22	7.960e-22	-21.099	-21.099	0.000
	Fe(HS)3-	2.450e-31	2.355e-31	-30.611	-30.628	-0.017
S(6)	1.671e-05					
	SO4-2	1.610e-05	1.377e-05	-4.793	-4.861	-0.068
	CaSO4	3.804e-07	3.805e-07	-6.420	-6.420	0.000
	MgSO4	2.123e-07	2.123e-07	-6.673	-6.673	0.000
	NaSO4-	1.435e-08	1.379e-08	-7.843	-7.860	-0.017
	KSO4-	1.308e-09	1.257e-09	-8.883	-8.901	-0.017
	SrSO4	9.834e-10	9.837e-10	-9.007	-9.007	0.000
	FeSO4	1.959e-10	1.960e-10	-9.708	-9.708	0.000
	BaSO4	1.211e-10	1.212e-10	-9.917	-9.917	0.000
	MnSO4	5.657e-11	5.659e-11	-10.247	-10.247	0.000
	HSO4-	5.420e-11	5.211e-11	-10.266	-10.283	-0.017
	ZnSO4	4.703e-11	4.705e-11	-10.328	-10.327	0.000
	LiSO4-	2.168e-11	2.084e-11	-10.664	-10.681	-0.017
	NH4SO4-	1.713e-11	1.647e-11	-10.766	-10.783	-0.017
	PbSO4	3.703e-12	3.704e-12	-11.431	-11.431	0.000
	CdSO4	1.401e-12	1.401e-12	-11.854	-11.854	0.000
	AlSO4+	6.172e-13	5.933e-13	-12.210	-12.227	-0.017
	CaHSO4+	1.114e-13	1.071e-13	-12.953	-12.970	-0.017
	Zn(SO4)2-2	7.337e-15	6.267e-15	-14.134	-14.203	-0.068
	CuSO4	4.575e-16	4.577e-16	-15.340	-15.339	0.000
	Pb(SO4)2-2	3.134e-16	2.677e-16	-15.504	-15.572	-0.068
	Cd(SO4)2-2	2.843e-16	2.429e-16	-15.546	-15.615	-0.068
	Al(SO4)2-	2.420e-16	2.327e-16	-15.616	-15.633	-0.017
	FeHSO4+	7.882e-17	7.577e-17	-16.103	-16.120	-0.017
	AlHSO4+2	3.213e-21	2.744e-21	-20.493	-20.562	-0.068
	FeSO4+	6.799e-25	6.536e-25	-24.168	-24.185	-0.017
	Fe(SO4)2-	1.875e-28	1.803e-28	-27.727	-27.744	-0.017
	FeHSO4+2	1.315e-31	1.123e-31	-30.881	-30.950	-0.068
Si	4.561e-06					
	H4SiO4	4.556e-06	4.557e-06	-5.341	-5.341	0.000
	H3SiO4-	5.109e-09	4.911e-09	-8.292	-8.309	-0.017
	H2SiO4-2	1.407e-15	1.201e-15	-14.852	-14.920	-0.068
	SiF6-2	0.000e+00	0.000e+00	-43.398	-43.466	-0.068
Sr	5.607e-07					
	Sr+2	5.582e-07	4.780e-07	-6.253	-6.321	-0.067
	SrHCO3+	1.478e-09	1.422e-09	-8.830	-8.847	-0.017
	SrSO4	9.834e-10	9.837e-10	-9.007	-9.007	0.000
	SrCO3	3.000e-11	3.001e-11	-10.523	-10.523	0.000
	SrOH+	4.325e-13	4.160e-13	-12.364	-12.381	-0.017
Zn	2.199e-08					
	Zn+2	2.027e-08	1.734e-08	-7.693	-7.761	-0.068
	ZnHCO3+	9.065e-10	8.714e-10	-9.043	-9.060	-0.017
	ZnCO3	6.326e-10	6.328e-10	-9.199	-9.199	0.000
	Zn(OH)2	6.284e-11	6.286e-11	-10.202	-10.202	0.000
	ZnOH+	6.048e-11	5.815e-11	-10.218	-10.235	-0.017
	ZnSO4	4.703e-11	4.705e-11	-10.328	-10.327	0.000
	ZnCl+	9.342e-12	8.981e-12	-11.030	-11.047	-0.017
	Zn(CO3)2-2	2.897e-12	2.474e-12	-11.538	-11.607	-0.068
	Zn(SO4)2-2	7.337e-15	6.267e-15	-14.134	-14.203	-0.068
	ZnCl2	4.473e-15	4.474e-15	-14.349	-14.349	0.000
	Zn(OH)3-	3.509e-15	3.373e-15	-14.455	-14.472	-0.017

ZnCl3-	2.376e-18	2.284e-18	-17.624	-17.641	-0.017
Zn(OH)4-2	1.062e-20	9.071e-21	-19.974	-20.042	-0.068
ZnCl4-2	5.838e-22	4.987e-22	-21.234	-21.302	-0.068

----------Saturation indices----------

Phase	SI	log IAP	log KT	
Al(OH)3(a)	-1.32	10.95	12.27	Al(OH)3
Albite	-7.07	-1.48	5.59	NaAlSi3O8
Alunite	-4.67	-3.27	1.39	KAl3(SO4)2(OH)6
Anglesite	-6.27	-14.18	-7.91	PbSO4
Anhydrite	-4.28	-8.63	-4.35	CaSO4
Anorthite	-7.80	21.91	29.71	CaAl2Si2O8
Aragonite	-2.27	-10.50	-8.23	CaCO3
Barite	-2.24	-12.62	-10.38	BaSO4
Ca-Montmorillonite	-2.38	7.68	10.06	Ca0.165Al2.33Si3.67O10(OH)2
Calcite	-2.11	-10.50	-8.39	CaCO3
Cd(OH)2	-8.58	5.07	13.65	Cd(OH)2
CdSiO3	-10.26	-0.27	9.98	CdSiO3
CdSO4	-14.97	-14.25	0.72	CdSO4
Celestite	-4.52	-11.18	-6.66	SrSO4
Cerrusite	-2.66	-16.06	-13.40	PbCO3
CH4(g)	-10.53	-57.66	-47.13	CH4
Chalcedony	-1.53	-5.34	-3.81	SiO2
Chlorite(14A)	-18.27	58.53	76.79	Mg5Al2Si3O10(OH)8
Chrysotile	-14.09	20.91	34.99	Mg3Si2O5(OH)4
CO2(g)	-2.92	-21.20	-18.27	CO2
Dolomite	-4.61	-21.17	-16.57	CaMg(CO3)2
Fe(OH)3(a)	-6.35	12.10	18.45	Fe(OH)3
FeS(ppt)	-7.34	-48.24	-40.91	FeS
Fluorite	-6.31	-17.20	-10.89	CaF2
Gibbsite	1.57	10.95	9.38	Al(OH)3
Goethite	-1.26	12.10	13.36	FeOOH
Gypsum	-4.02	-8.63	-4.60	CaSO4:2H2O
H2(g)	-9.12	-9.12	0.00	H2
H2S(g)	-10.78	-55.79	-45.01	H2S
Hausmannite	-36.47	30.15	66.62	Mn3O4
Hematite	-0.62	24.20	24.82	Fe2O3
Hydroxyapatite	-6.30	-45.34	-39.04	Ca5(PO4)3OH
Illite	-3.64	10.63	14.27	K0.6Mg0.25Al2.3Si3.5O10(OH)2
Jarosite-K	-33.03	0.17	33.20	KFe3(SO4)2(OH)6
K-feldspar	-5.31	-2.56	2.75	KAlSi3O8
K-mica	3.34	19.34	16.00	KAl3Si3O10(OH)2
Kaolinite	1.82	11.22	9.40	Al2Si2O5(OH)4
Mackinawite	-6.61	-48.24	-41.64	FeS
Manganite	-13.77	11.57	25.34	MnOOH
Melanterite	-9.28	-11.78	-2.50	FeSO4:7H2O
N2(g)	-3.59	-6.77	-3.18	N2
NH3(g)	-11.97	-17.06	-5.10	NH3
O2(g)	-72.48	18.23	90.71	O2
Otavite	-4.03	-16.13	-12.10	CdCO3
Pb(OH)2	-3.79	5.14	8.93	Pb(OH)2
Pyrite	-1.83	-94.91	-93.09	FeS2
Pyrochroite	-8.19	7.01	15.20	Mn(OH)2
Pyrolusite	-28.87	16.13	45.00	MnO2
Quartz	-1.03	-5.34	-4.31	SiO2
Rhodochrosite	-3.14	-14.19	-11.05	MnCO3

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      Sepiolite       -11.32    5.04   16.35  Mg2Si3O7.5OH:3H2O
      Sepiolite(d)    -13.62    5.04   18.66  Mg2Si3O7.5OH:3H2O
      Siderite         -2.90  -13.66  -10.75  FeCO3
      SiO2(a)          -2.44   -5.34   -2.90  SiO2
      Smithsonite      -4.74  -14.50   -9.76  ZnCO3
      Sphalerite       -0.02  -49.09  -49.07  ZnS
      Strontianite     -3.74  -13.06   -9.32  SrCO3
      Sulfur           -7.81  -46.67  -38.85  S
      Talc            -13.75   10.22   23.97  Mg3Si4O10(OH)2
      Vivianite        -7.24  -43.24  -36.00  Fe3(PO4)2:8H2O
      Willemite        -9.13    8.06   17.18  Zn2SiO4
      Witherite        -5.80  -14.49   -8.69  BaCO3
      Zn(OH)2(e)       -4.80    6.70   11.50  Zn(OH)2

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End of simulation.
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Reading input data for simulation 6.
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      MIX 3 Mixing B3/Rain with Stickleback (1:1000)
            3     0.001
            4     0.999
      SAVE solution 6
      END
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Beginning of reaction calculations.
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Reaction step 1.

Using mixture 3.  Mixing B3/Rain with Stickleback (1:1000)

       1.000e-03 Solution 3   Solution after simulation 3.
       9.990e-01 Solution 4   Stickleback Lake

-----------------------------Solution composition------------------------------

      Elements           Molality       Moles

      Al                9.281e-08   9.281e-08
      B                 4.621e-06   4.621e-06
      Ba                3.638e-08   3.638e-08
      C                 7.420e-04   7.420e-04
      Ca                3.482e-04   3.482e-04
      Cd                8.890e-10   8.890e-10
      Cl                1.083e-03   1.083e-03
      Cu                7.932e-09   7.932e-09
      F                 4.034e-07   4.034e-07
      Fe                8.966e-08   8.966e-08
      K                 3.687e-05   3.687e-05
      Li                7.199e-07   7.199e-07
      Mg                2.010e-04   2.010e-04
      Mn                4.551e-08   4.551e-08
      N                 8.681e-07   8.681e-07
      Na                4.737e-04   4.737e-04
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      P                 4.839e-06   4.839e-06
      Pb                2.413e-09   2.413e-09
      S                 5.228e-06   5.228e-06
      Si                9.112e-06   9.112e-06
      Sr                1.026e-06   1.026e-06
      Zn                3.822e-08   3.822e-08

----------------------------Description of solution----------------------------

                            pH  =   7.140      Charge balance
                            pe  =  -2.667      Adjusted to redox equilibrium
               Activity of water  =   1.000
                  Ionic strength  =   2.209e-03
               Mass of water (kg)  =   1.000e+00
        Total alkalinity (eq/kg)  =   6.057e-04
              Total CO2 (mol/kg)  =   7.420e-04
             Temperature (deg C)  =   4.000
         Electrical balance (eq)  =  -9.160e-05
                     Iterations  =  14
                        Total H  = 1.110131e+02
                        Total O  = 5.550840e+01

----------------------------Distribution of species----------------------------

                                                  Log       Log         Log
      Species             Molality    Activity  Molality  Activity     Gamma

      H+                 7.599e-08   7.250e-08    -7.119    -7.140    -0.020
      OH-                2.446e-08   2.325e-08    -7.612    -7.634    -0.022
      H2O                5.551e+01   1.000e+00     0.000     0.000     0.000
Al                9.281e-08
      Al(OH)4-           7.822e-08   7.438e-08    -7.107    -7.129    -0.022
      Al(OH)2+           1.025e-08   9.752e-09    -7.989    -8.011    -0.022
      Al(OH)3            3.314e-09   3.316e-09    -8.480    -8.479     0.000
      AlOH+2             8.868e-10   7.253e-10    -9.052    -9.139    -0.087
      AlF+2              8.977e-11   7.342e-11   -10.047   -10.134    -0.087
      Al+3               3.377e-11   2.213e-11   -10.471   -10.655    -0.184
      AlF2+              1.307e-11   1.243e-11   -10.884   -10.906    -0.022
      AlSO4+             2.226e-13   2.117e-13   -12.652   -12.674    -0.022
      AlF3               5.805e-14   5.808e-14   -13.236   -13.236     0.000
      Al(SO4)2-          2.570e-17   2.444e-17   -16.590   -16.612    -0.022
      AlF4-              9.190e-18   8.740e-18   -17.037   -17.059    -0.022
      AlHSO4+2           1.473e-21   1.205e-21   -20.832   -20.919    -0.087
      AlF5-2             6.737e-23   5.510e-23   -22.172   -22.259    -0.087
      AlF6-3             5.155e-29   3.279e-29   -28.288   -28.484    -0.196
B                 4.621e-06
      H3BO3              4.596e-06   4.598e-06    -5.338    -5.337     0.000
      H2BO3-             2.541e-08   2.416e-08    -7.595    -7.617    -0.022
      BF(OH)3-           5.772e-13   5.489e-13   -12.239   -12.261    -0.022
      BF2(OH)2-          1.755e-18   1.669e-18   -17.756   -17.778    -0.022
      BF3OH-             8.013e-26   7.620e-26   -25.096   -25.118    -0.022
      BF4-               9.262e-33   8.808e-33   -32.033   -32.055    -0.022
Ba                3.638e-08
      Ba+2               3.623e-08   2.971e-08    -7.441    -7.527    -0.086
      BaHCO3+            8.824e-11   8.391e-11   -10.054   -10.076    -0.022
      BaSO4              6.033e-11   6.036e-11   -10.219   -10.219     0.000
      BaCO3              2.139e-12   2.140e-12   -11.670   -11.670     0.000
      BaOH+              1.460e-14   1.388e-14   -13.836   -13.858    -0.022
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C(-4)	5.346e-13					
	CH4	5.346e-13	5.349e-13	-12.272	-12.272	0.000
C(4)	7.420e-04					
	HCO3-	5.996e-04	5.707e-04	-3.222	-3.244	-0.021
	CO2	1.395e-04	1.396e-04	-3.855	-3.855	0.000
	CaHCO3+	1.311e-06	1.248e-06	-5.882	-5.904	-0.021
	MgHCO3+	1.104e-06	1.049e-06	-5.957	-5.979	-0.022
	CO3-2	2.589e-07	2.126e-07	-6.587	-6.673	-0.086
	NaHCO3	1.445e-07	1.446e-07	-6.840	-6.840	0.000
	CaCO3	8.121e-08	8.125e-08	-7.090	-7.090	0.000
	MgCO3	2.410e-08	2.411e-08	-7.618	-7.618	0.000
	FeHCO3+	4.164e-09	3.960e-09	-8.380	-8.402	-0.022
	SrHCO3+	3.751e-09	3.570e-09	-8.426	-8.447	-0.021
	ZnHCO3+	2.147e-09	2.042e-09	-8.668	-8.690	-0.022
	MnHCO3+	1.885e-09	1.792e-09	-8.725	-8.747	-0.022
	PbCO3	1.562e-09	1.563e-09	-8.806	-8.806	0.000
	ZnCO3	1.204e-09	1.205e-09	-8.919	-8.919	0.000
	NaCO3-	5.999e-10	5.705e-10	-9.222	-9.244	-0.022
	MnCO3	5.946e-10	5.949e-10	-9.226	-9.226	0.000
	FeCO3	3.536e-10	3.538e-10	-9.451	-9.451	0.000
	PbHCO3+	2.017e-10	1.918e-10	-9.695	-9.717	-0.022
	BaHCO3+	8.824e-11	8.391e-11	-10.054	-10.076	-0.022
	SrCO3	6.121e-11	6.124e-11	-10.213	-10.213	0.000
	CdHCO3+	1.260e-11	1.198e-11	-10.900	-10.922	-0.022
	Zn(CO3)2-2	6.696e-12	5.476e-12	-11.174	-11.262	-0.087
	BaCO3	2.139e-12	2.140e-12	-11.670	-11.670	0.000
	Pb(CO3)2-2	1.020e-12	8.343e-13	-11.991	-12.079	-0.087
	CdCO3	1.120e-13	1.121e-13	-12.951	-12.951	0.000
	Cd(CO3)2-2	9.210e-17	7.533e-17	-16.036	-16.123	-0.087
Ca	3.482e-04					
	Ca+2	3.464e-04	2.843e-04	-3.460	-3.546	-0.086
	CaHCO3+	1.311e-06	1.248e-06	-5.882	-5.904	-0.021
	CaSO4	1.861e-07	1.862e-07	-6.730	-6.730	0.000
	CaHPO4	1.756e-07	1.757e-07	-6.755	-6.755	0.000
	CaCO3	8.121e-08	8.125e-08	-7.090	-7.090	0.000
	CaH2PO4+	1.128e-08	1.073e-08	-7.948	-7.969	-0.022
	CaPO4-	3.939e-09	3.746e-09	-8.405	-8.426	-0.022
	CaOH+	6.843e-10	6.508e-10	-9.165	-9.187	-0.022
	CaF+	5.841e-10	5.554e-10	-9.234	-9.255	-0.022
	CaHSO4+	6.784e-14	6.451e-14	-13.169	-13.190	-0.022
Cd	8.890e-10					
	Cd+2	8.116e-10	6.638e-10	-9.091	-9.178	-0.087
	CdCl+	6.364e-11	6.052e-11	-10.196	-10.218	-0.022
	CdHCO3+	1.260e-11	1.198e-11	-10.900	-10.922	-0.022
	CdSO4	6.757e-13	6.760e-13	-12.170	-12.170	0.000
	CdCl2	2.389e-13	2.391e-13	-12.622	-12.622	0.000
	CdOH+	1.499e-13	1.426e-13	-12.824	-12.846	-0.022
	CdCO3	1.120e-13	1.121e-13	-12.951	-12.951	0.000
	Cd(OH)2	5.637e-16	5.640e-16	-15.249	-15.249	0.000
	CdCl3-	1.162e-16	1.105e-16	-15.935	-15.957	-0.022
	Cd(CO3)2-2	9.210e-17	7.533e-17	-16.036	-16.123	-0.087
	Cd(SO4)2-2	4.218e-17	3.450e-17	-16.375	-16.462	-0.087
	Cd(OH)3-	9.178e-22	8.728e-22	-21.037	-21.059	-0.022
	Cd(OH)4-2	1.312e-28	1.073e-28	-27.882	-27.969	-0.087
Cl	1.083e-03					
	Cl-	1.083e-03	1.030e-03	-2.965	-2.987	-0.022
	MnCl+	1.554e-10	1.478e-10	-9.809	-9.830	-0.022
	FeCl+	1.037e-10	9.862e-11	-9.984	-10.006	-0.022

	CdCl+	6.364e-11	6.052e-11	-10.196	-10.218	-0.022
	ZnCl+	3.058e-11	2.908e-11	-10.515	-10.536	-0.022
	PbCl+	1.041e-11	9.904e-12	-10.982	-11.004	-0.022
	CdCl2	2.389e-13	2.391e-13	-12.622	-12.622	0.000
	MnCl2	6.639e-14	6.643e-14	-13.178	-13.178	0.000
	ZnCl2	2.862e-14	2.863e-14	-13.543	-13.543	0.000
	PbCl2	2.463e-14	2.465e-14	-13.608	-13.608	0.000
	CdCl3-	1.162e-16	1.105e-16	-15.935	-15.957	-0.022
	ZnCl3-	3.037e-17	2.888e-17	-16.518	-16.539	-0.022
	MnCl3-	1.981e-17	1.884e-17	-16.703	-16.725	-0.022
	PbCl3-	1.844e-17	1.753e-17	-16.734	-16.756	-0.022
	ZnCl4-2	1.524e-20	1.246e-20	-19.817	-19.904	-0.087
	PbCl4-2	8.879e-21	7.262e-21	-20.052	-20.139	-0.087
	FeCl+2	7.684e-26	6.285e-26	-25.114	-25.202	-0.087
	FeCl2+	6.220e-28	5.915e-28	-27.206	-27.228	-0.022
	FeCl3	6.087e-32	6.090e-32	-31.216	-31.215	0.000
Cu(1)	7.932e-09					
	Cu+	7.932e-09	7.534e-09	-8.101	-8.123	-0.022
Cu(2)	2.036e-13					
	Cu(OH)2	1.516e-13	1.517e-13	-12.819	-12.819	0.000
	Cu+2	4.641e-14	3.816e-14	-13.333	-13.418	-0.085
	CuOH+	5.535e-15	5.264e-15	-14.257	-14.279	-0.022
	CuSO4	2.701e-17	2.703e-17	-16.568	-16.568	0.000
	Cu(OH)3-	1.326e-19	1.261e-19	-18.878	-18.899	-0.022
	Cu(OH)4-2	4.241e-25	3.469e-25	-24.373	-24.460	-0.087
F	4.034e-07					
	F-	3.997e-07	3.799e-07	-6.398	-6.420	-0.022
	MgF+	2.877e-09	2.736e-09	-8.541	-8.563	-0.022
	CaF+	5.841e-10	5.554e-10	-9.234	-9.255	-0.022
	NaF	9.843e-11	9.848e-11	-10.007	-10.007	0.000
	AlF+2	8.977e-11	7.342e-11	-10.047	-10.134	-0.087
	HF	2.879e-11	2.881e-11	-10.541	-10.540	0.000
	AlF2+	1.307e-11	1.243e-11	-10.884	-10.906	-0.022
	BF(OH)3-	5.772e-13	5.489e-13	-12.239	-12.261	-0.022
	FeF+	2.772e-13	2.636e-13	-12.557	-12.579	-0.022
	MnF+	9.738e-14	9.261e-14	-13.012	-13.033	-0.022
	AlF3	5.805e-14	5.808e-14	-13.236	-13.236	0.000
	HF2-	3.538e-17	3.365e-17	-16.451	-16.473	-0.022
	AlF4-	9.190e-18	8.740e-18	-17.037	-17.059	-0.022
	BF2(OH)2-	1.755e-18	1.669e-18	-17.756	-17.778	-0.022
	AlF5-2	6.737e-23	5.510e-23	-22.172	-22.259	-0.087
	FeF+2	2.156e-24	1.763e-24	-23.666	-23.754	-0.087
	BF3OH-	8.013e-26	7.620e-26	-25.096	-25.118	-0.022
	FeF2+	2.144e-26	2.039e-26	-25.669	-25.691	-0.022
	AlF6-3	5.155e-29	3.279e-29	-28.288	-28.484	-0.196
	FeF3	1.136e-29	1.137e-29	-28.945	-28.944	0.000
	BF4-	9.262e-33	8.808e-33	-32.033	-32.055	-0.022
	SiF6-2	0.000e+00	0.000e+00	-40.951	-41.038	-0.087
Fe(2)	8.966e-08					
	Fe+2	8.438e-08	6.939e-08	-7.074	-7.159	-0.085
	FeHCO3+	4.164e-09	3.960e-09	-8.380	-8.402	-0.022
	FeHPO4	4.746e-10	4.749e-10	-9.324	-9.323	0.000
	FeCO3	3.536e-10	3.538e-10	-9.451	-9.451	0.000
	FeCl+	1.037e-10	9.862e-11	-9.984	-10.006	-0.022
	FeH2PO4+	8.332e-11	7.923e-11	-10.079	-10.101	-0.022
	FeOH+	5.883e-11	5.595e-11	-10.230	-10.252	-0.022
	FeSO4	3.308e-11	3.310e-11	-10.480	-10.480	0.000
	FeF+	2.772e-13	2.636e-13	-12.557	-12.579	-0.022

FeHSO4+	1.656e-17	1.574e-17	-16.781	-16.803	-0.022
Fe(HS)2	1.400e-21	1.400e-21	-20.854	-20.854	0.000
Fe(HS)3-	7.630e-31	7.256e-31	-30.117	-30.139	-0.022
Fe(3)	3.247e-16				
Fe(OH)2+	1.986e-16	1.889e-16	-15.702	-15.724	-0.022
Fe(OH)3	1.253e-16	1.254e-16	-15.902	-15.902	0.000
Fe(OH)4-	6.688e-19	6.360e-19	-18.175	-18.197	-0.022
FeOH+2	1.191e-19	9.742e-20	-18.924	-19.011	-0.087
Fe+3	6.312e-24	4.136e-24	-23.200	-23.383	-0.184
FeH2PO4+2	3.101e-24	2.537e-24	-23.508	-23.596	-0.087
FeF+2	2.156e-24	1.763e-24	-23.666	-23.754	-0.087
FeHPO4+	9.635e-25	9.163e-25	-24.016	-24.038	-0.022
FeSO4+	1.173e-25	1.115e-25	-24.931	-24.953	-0.022
FeCl+2	7.684e-26	6.285e-26	-25.114	-25.202	-0.087
FeF2+	2.144e-26	2.039e-26	-25.669	-25.691	-0.022
FeCl2+	6.220e-28	5.915e-28	-27.206	-27.228	-0.022
FeF3	1.136e-29	1.137e-29	-28.945	-28.944	0.000
Fe(SO4)2-	9.523e-30	9.057e-30	-29.021	-29.043	-0.022
FeCl3	6.087e-32	6.090e-32	-31.216	-31.215	0.000
FeHSO4+2	2.883e-32	2.358e-32	-31.540	-31.628	-0.087
Fe2(OH)2+4	1.452e-36	6.497e-37	-35.838	-36.187	-0.349
Fe3(OH)4+5	0.000e+00	0.000e+00	-48.140	-48.686	-0.546
H(0)	2.010e-12				
H2	1.005e-12	1.006e-12	-11.998	-11.998	0.000
K	3.687e-05				
K+	3.687e-05	3.505e-05	-4.433	-4.455	-0.022
KSO4-	7.080e-10	6.733e-10	-9.150	-9.172	-0.022
KHPO4-	1.236e-10	1.175e-10	-9.908	-9.930	-0.022
KOH	1.675e-12	1.676e-12	-11.776	-11.776	0.000
Li	7.199e-07				
Li+	7.199e-07	6.855e-07	-6.143	-6.164	-0.021
LiSO4-	1.276e-11	1.213e-11	-10.894	-10.916	-0.022
LiOH	2.165e-13	2.166e-13	-12.665	-12.664	0.000
Mg	2.010e-04				
Mg+2	1.997e-04	1.641e-04	-3.700	-3.785	-0.085
MgHCO3+	1.104e-06	1.049e-06	-5.957	-5.979	-0.022
MgHPO4	1.371e-07	1.371e-07	-6.863	-6.863	0.000
MgSO4	8.712e-08	8.717e-08	-7.060	-7.060	0.000
MgCO3	2.410e-08	2.411e-08	-7.618	-7.618	0.000
MgH2PO4+	8.294e-09	7.888e-09	-8.081	-8.103	-0.022
MgPO4-	3.067e-09	2.917e-09	-8.513	-8.535	-0.022
MgF+	2.877e-09	2.736e-09	-8.541	-8.563	-0.022
MgOH+	1.124e-09	1.069e-09	-8.949	-8.971	-0.022
Mn(2)	4.551e-08				
Mn+2	4.285e-08	3.524e-08	-7.368	-7.453	-0.085
MnHCO3+	1.885e-09	1.792e-09	-8.725	-8.747	-0.022
MnCO3	5.946e-10	5.949e-10	-9.226	-9.226	0.000
MnCl+	1.554e-10	1.478e-10	-9.809	-9.830	-0.022
MnSO4	1.650e-11	1.651e-11	-10.782	-10.782	0.000
MnOH+	2.083e-12	1.981e-12	-11.681	-11.703	-0.022
MnF+	9.738e-14	9.261e-14	-13.012	-13.033	-0.022
MnCl2	6.639e-14	6.643e-14	-13.178	-13.178	0.000
MnCl3-	1.981e-17	1.884e-17	-16.703	-16.725	-0.022
Mn(NO3)2	0.000e+00	0.000e+00	-178.777	-178.777	0.000
Mn(3)	1.360e-37				
Mn+3	1.360e-37	8.651e-38	-36.866	-37.063	-0.196
N(-3)	2.857e-07				
NH4+	2.852e-07	2.709e-07	-6.545	-6.567	-0.022

	NH3	4.296e-10	4.299e-10	-9.367	-9.367	0.000
	NH4SO4-	1.488e-11	1.415e-11	-10.827	-10.849	-0.022
N(0)	5.824e-07					
	N2	2.912e-07	2.914e-07	-6.536	-6.536	0.000
N(3)	0.000e+00					
	NO2-	0.000e+00	0.000e+00	-63.895	-63.918	-0.022
N(5)	0.000e+00					
	NO3-	0.000e+00	0.000e+00	-85.951	-85.973	-0.022
	PbNO3+	0.000e+00	0.000e+00	-94.155	-94.176	-0.022
	Mn(NO3)2	0.000e+00	0.000e+00	-178.777	-178.777	0.000
Na	4.737e-04					
	Na+	4.735e-04	4.505e-04	-3.325	-3.346	-0.022
	NaHCO3	1.445e-07	1.446e-07	-6.840	-6.840	0.000
	NaSO4-	8.341e-09	7.932e-09	-8.079	-8.101	-0.022
	NaHPO4-	1.588e-09	1.510e-09	-8.799	-8.821	-0.022
	NaCO3-	5.999e-10	5.705e-10	-9.222	-9.244	-0.022
	NaF	9.843e-11	9.848e-11	-10.007	-10.007	0.000
	NaOH	4.103e-11	4.105e-11	-10.387	-10.387	0.000
O(0)	0.000e+00					
	O2	0.000e+00	0.000e+00	-75.676	-75.676	0.000
P	4.839e-06					
	H2PO4-	2.395e-06	2.278e-06	-5.621	-5.642	-0.022
	HPO4-2	2.103e-06	1.719e-06	-5.677	-5.765	-0.087
	CaHPO4	1.756e-07	1.757e-07	-6.755	-6.755	0.000
	MgHPO4	1.371e-07	1.371e-07	-6.863	-6.863	0.000
	CaH2PO4+	1.128e-08	1.073e-08	-7.948	-7.969	-0.022
	MgH2PO4+	8.294e-09	7.888e-09	-8.081	-8.103	-0.022
	CaPO4-	3.939e-09	3.746e-09	-8.405	-8.426	-0.022
	MgPO4-	3.067e-09	2.917e-09	-8.513	-8.535	-0.022
	NaHPO4-	1.588e-09	1.510e-09	-8.799	-8.821	-0.022
	FeHPO4	4.746e-10	4.749e-10	-9.324	-9.323	0.000
	KHPO4-	1.236e-10	1.175e-10	-9.908	-9.930	-0.022
	FeH2PO4+	8.332e-11	7.923e-11	-10.079	-10.101	-0.022
	PO4-3	1.071e-11	6.806e-12	-10.970	-11.167	-0.197
	FeH2PO4+2	3.101e-24	2.537e-24	-23.508	-23.596	-0.087
	FeHPO4+	9.635e-25	9.163e-25	-24.016	-24.038	-0.022
Pb	2.413e-09					
	PbCO3	1.562e-09	1.563e-09	-8.806	-8.806	0.000
	Pb+2	5.173e-10	4.231e-10	-9.286	-9.374	-0.087
	PbHCO3+	2.017e-10	1.918e-10	-9.695	-9.717	-0.022
	PbOH+	1.196e-10	1.138e-10	-9.922	-9.944	-0.022
	PbCl+	1.041e-11	9.904e-12	-10.982	-11.004	-0.022
	Pb(CO3)2-2	1.020e-12	8.343e-13	-11.991	-12.079	-0.087
	PbSO4	9.640e-13	9.645e-13	-12.016	-12.016	0.000
	Pb(OH)2	6.102e-13	6.105e-13	-12.215	-12.214	0.000
	PbCl2	2.463e-14	2.465e-14	-13.608	-13.608	0.000
	Pb(OH)3-	1.017e-16	9.667e-17	-15.993	-16.015	-0.022
	Pb(SO4)2-2	2.509e-17	2.052e-17	-16.600	-16.688	-0.087
	PbCl3-	1.844e-17	1.753e-17	-16.734	-16.756	-0.022
	Pb2OH+3	1.694e-18	1.078e-18	-17.771	-17.968	-0.196
	PbCl4-2	8.879e-21	7.262e-21	-20.052	-20.139	-0.087
	Pb(OH)4-2	3.735e-21	3.054e-21	-20.428	-20.515	-0.087
	PbNO3+	0.000e+00	0.000e+00	-94.155	-94.176	-0.022
S(-2)	1.149e-11					
	H2S	6.479e-12	6.483e-12	-11.188	-11.188	0.000
	HS-	5.006e-12	4.759e-12	-11.301	-11.323	-0.022
	S-2	2.057e-18	1.687e-18	-17.687	-17.773	-0.086
	Fe(HS)2	1.400e-21	1.400e-21	-20.854	-20.854	0.000

Fe(HS)3-	7.630e-31	7.256e-31	-30.117	-30.139	-0.022
S(6)	5.228e-06				
SO4-2	4.945e-06	4.054e-06	-5.306	-5.392	-0.086
CaSO4	1.861e-07	1.862e-07	-6.730	-6.730	0.000
MgSO4	8.712e-08	8.717e-08	-7.060	-7.060	0.000
NaSO4-	8.341e-09	7.932e-09	-8.079	-8.101	-0.022
KSO4-	7.080e-10	6.733e-10	-9.150	-9.172	-0.022
SrSO4	5.082e-10	5.084e-10	-9.294	-9.294	0.000
BaSO4	6.033e-11	6.036e-11	-10.219	-10.219	0.000
FeSO4	3.308e-11	3.310e-11	-10.480	-10.480	0.000
ZnSO4	2.268e-11	2.270e-11	-10.644	-10.644	0.000
HSO4-	1.985e-11	1.887e-11	-10.702	-10.724	-0.022
MnSO4	1.650e-11	1.651e-11	-10.782	-10.782	0.000
NH4SO4-	1.488e-11	1.415e-11	-10.827	-10.849	-0.022
LiSO4-	1.276e-11	1.213e-11	-10.894	-10.916	-0.022
PbSO4	9.640e-13	9.645e-13	-12.016	-12.016	0.000
CdSO4	6.757e-13	6.760e-13	-12.170	-12.170	0.000
AlSO4+	2.226e-13	2.117e-13	-12.652	-12.674	-0.022
CaHSO4+	6.784e-14	6.451e-14	-13.169	-13.190	-0.022
Zn(SO4)2-2	1.088e-15	8.900e-16	-14.963	-15.051	-0.087
Cd(SO4)2-2	4.218e-17	3.450e-17	-16.375	-16.462	-0.087
CuSO4	2.701e-17	2.703e-17	-16.568	-16.568	0.000
Al(SO4)2-	2.570e-17	2.444e-17	-16.590	-16.612	-0.022
Pb(SO4)2-2	2.509e-17	2.052e-17	-16.600	-16.688	-0.087
FeHSO4+	1.656e-17	1.574e-17	-16.781	-16.803	-0.022
AlHSO4+2	1.473e-21	1.205e-21	-20.832	-20.919	-0.087
FeSO4+	1.173e-25	1.115e-25	-24.931	-24.953	-0.022
Fe(SO4)2-	9.523e-30	9.057e-30	-29.021	-29.043	-0.022
FeHSO4+2	2.883e-32	2.358e-32	-31.540	-31.628	-0.087
Si	9.112e-06				
H4SiO4	9.104e-06	9.109e-06	-5.041	-5.041	0.000
H3SiO4-	8.391e-09	7.979e-09	-8.076	-8.098	-0.022
H2SiO4-2	1.940e-15	1.587e-15	-14.712	-14.800	-0.087
SiF6-2	0.000e+00	0.000e+00	-40.951	-41.038	-0.087
Sr	1.026e-06				
Sr+2	1.022e-06	8.392e-07	-5.991	-6.076	-0.086
SrHCO3+	3.751e-09	3.570e-09	-8.426	-8.447	-0.021
SrSO4	5.082e-10	5.084e-10	-9.294	-9.294	0.000
SrCO3	6.121e-11	6.124e-11	-10.213	-10.213	0.000
SrOH+	6.238e-13	5.936e-13	-12.205	-12.227	-0.022
Zn	3.822e-08				
Zn+2	3.465e-08	2.842e-08	-7.460	-7.546	-0.086
ZnHCO3+	2.147e-09	2.042e-09	-8.668	-8.690	-0.022
ZnCO3	1.204e-09	1.205e-09	-8.919	-8.919	0.000
ZnOH+	8.143e-11	7.744e-11	-10.089	-10.111	-0.022
Zn(OH)2	6.801e-11	6.805e-11	-10.167	-10.167	0.000
ZnCl+	3.058e-11	2.908e-11	-10.515	-10.536	-0.022
ZnSO4	2.268e-11	2.270e-11	-10.644	-10.644	0.000
Zn(CO3)2-2	6.696e-12	5.476e-12	-11.174	-11.262	-0.087
ZnCl2	2.862e-14	2.863e-14	-13.543	-13.543	0.000
Zn(OH)3-	3.121e-15	2.968e-15	-14.506	-14.528	-0.022
Zn(SO4)2-2	1.088e-15	8.900e-16	-14.963	-15.051	-0.087
ZnCl3-	3.037e-17	2.888e-17	-16.518	-16.539	-0.022
ZnCl4-2	1.524e-20	1.246e-20	-19.817	-19.904	-0.087
Zn(OH)4-2	7.932e-21	6.488e-21	-20.101	-20.188	-0.087

----------Saturation indices----------

◎ Table of Contents

Phase	SI	log IAP	log KT	
Al(OH)3(a)	-1.51	10.76	12.27	Al(OH)3
Albite	-6.16	-0.56	5.59	NaAlSi3O8
Alunite	-5.76	-4.37	1.39	KAl3(SO4)2(OH)6
Anglesite	-6.86	-14.77	-7.91	PbSO4
Anhydrite	-4.59	-8.94	-4.35	CaSO4
Anorthite	-7.53	22.18	29.71	CaAl2Si2O8
Aragonite	-1.99	-10.22	-8.23	CaCO3
Barite	-2.54	-12.92	-10.38	BaSO4
Ca-Montmorillonite	-1.70	8.35	10.06	Ca0.165Al2.33Si3.67O10(OH)2
Calcite	-1.83	-10.22	-8.39	CaCO3
Cd(OH)2	-8.55	5.10	13.65	Cd(OH)2
CdSiO3	-9.92	0.06	9.98	CdSiO3
CdSO4	-15.29	-14.57	0.72	CdSO4
Celestite	-4.80	-11.47	-6.66	SrSO4
Cerrusite	-2.65	-16.05	-13.40	PbCO3
CH4(g)	-9.60	-56.73	-47.13	CH4
Chalcedony	-1.23	-5.04	-3.81	SiO2
Chlorite(14A)	-17.92	58.88	76.79	Mg5Al2Si3O10(OH)8
Chrysotile	-13.59	21.40	34.99	Mg3Si2O5(OH)4
CO2(g)	-2.68	-20.95	-18.27	CO2
Dolomite	-4.11	-20.68	-16.57	CaMg(CO3)2
Fe(OH)3(a)	-6.86	11.59	18.45	Fe(OH)3
FeS(ppt)	-7.43	-48.33	-40.91	FeS
Fluorite	-5.50	-16.39	-10.89	CaF2
Gibbsite	1.39	10.76	9.38	Al(OH)3
Goethite	-1.77	11.59	13.36	FeOOH
Gypsum	-4.33	-8.94	-4.60	CaSO4:2H2O
H2(g)	-8.95	-8.95	0.00	H2
H2S(g)	-10.45	-55.45	-45.01	H2S
Hausmannite	-37.20	29.42	66.62	Mn3O4
Hematite	-1.63	23.19	24.82	Fe2O3
Hydroxyapatite	-5.05	-44.09	-39.04	Ca5(PO4)3OH
Illite	-2.92	11.35	14.27	K0.6Mg0.25Al2.3Si3.5O10(OH)2
Jarosite-K	-35.08	-1.88	33.20	KFe3(SO4)2(OH)6
K-feldspar	-4.42	-1.67	2.75	KAlSi3O8
K-mica	3.85	19.85	16.00	KAl3Si3O10(OH)2
Kaolinite	2.05	11.45	9.40	Al2Si2O5(OH)4
Mackinawite	-6.69	-48.33	-41.64	FeS
Manganite	-14.04	11.30	25.34	MnOOH
Melanterite	-10.05	-12.55	-2.50	FeSO4:7H2O
N2(g)	-3.35	-6.54	-3.18	N2
NH3(g)	-11.59	-16.69	-5.10	NH3
O2(g)	-72.82	17.89	90.71	O2
Otavite	-3.75	-15.85	-12.10	CdCO3
Pb(OH)2	-4.02	4.91	8.93	Pb(OH)2
Pyrite	-1.75	-94.84	-93.09	FeS2
Pyrochroite	-8.37	6.83	15.20	Mn(OH)2
Pyrolusite	-29.22	15.77	45.00	MnO2
Quartz	-0.73	-5.04	-4.31	SiO2
Rhodochrosite	-3.07	-14.13	-11.05	MnCO3
Sepiolite	-10.49	5.87	16.35	Mg2Si3O7.5OH:3H2O
Sepiolite(d)	-12.79	5.87	18.66	Mg2Si3O7.5OH:3H2O
Siderite	-3.08	-13.83	-10.75	FeCO3
SiO2(a)	-2.14	-5.04	-2.90	SiO2
Smithsonite	-4.46	-14.22	-9.76	ZnCO3
Sphalerite	0.35	-48.72	-49.07	ZnS

```
      Strontianite     -3.43  -12.75   -9.32  SrCO3
      Sulfur           -7.65  -46.51  -38.85  S
      Talc            -12.65   11.32   23.97  Mg3Si4O10(OH)2
      Vivianite        -7.81  -43.81  -36.00  Fe3(PO4)2:8H2O
      Willemite        -8.76    8.43   17.18  Zn2SiO4
      Witherite        -5.51  -14.20   -8.69  BaCO3
      Zn(OH)2(e)       -4.77    6.73   11.50  Zn(OH)2

------------------
End of simulation.
------------------

-----------------------------------
Reading input data for simulation 7.
-----------------------------------

      MIX 4 Mixing B3/Rain with Stickleback (1:1000000)
            3     0.000001
            4     0.999999
      SAVE solution 7
      END
----------------------------------
Beginning of reaction calculations.
----------------------------------

Reaction step 1.

Using mixture 4.  Mixing B3/Rain with Stickleback (1:1000000)

       1.000e-06 Solution 3   Solution after simulation 3.
       1.000e+00 Solution 4   Stickleback Lake

-----------------------------Solution composition------------------------------

      Elements           Molality       Moles

      Al                9.267e-08   9.267e-08
      B                 4.626e-06   4.626e-06
      Ba                3.641e-08   3.641e-08
      C                 7.425e-04   7.425e-04
      Ca                3.485e-04   3.485e-04
      Cd                8.898e-10   8.898e-10
      Cl                1.084e-03   1.084e-03
      Cu                7.869e-09   7.869e-09
      F                 4.038e-07   4.038e-07
      Fe                8.954e-08   8.954e-08
      K                 3.691e-05   3.691e-05
      Li                7.206e-07   7.206e-07
      Mg                2.012e-04   2.012e-04
      Mn                4.551e-08   4.551e-08
      N                 8.690e-07   8.690e-07
      Na                4.742e-04   4.742e-04
      P                 4.843e-06   4.843e-06
      Pb                2.413e-09   2.413e-09
      S                 5.205e-06   5.205e-06
      Si                9.121e-06   9.121e-06
      Sr                1.027e-06   1.027e-06
      Zn                3.825e-08   3.825e-08
```

◎ Table of Contents

----------Description of solution----------

```
                            pH  =   7.140      Charge balance
                            pe  =  -2.667      Adjusted to redox equilibrium
               Activity of water  =   1.000
                  Ionic strength  =   2.211e-03
               Mass of water (kg)  =   1.000e+00
        Total alkalinity (eq/kg)  =   6.060e-04
              Total CO2 (mol/kg)  =   7.425e-04
             Temperature (deg C)  =   4.000
         Electrical balance (eq)  =  -9.167e-05
                     Iterations   =  14
                        Total H   = 1.110131e+02
                        Total O   = 5.550840e+01
```

----------Distribution of species----------

	Species	Molality	Activity	Log Molality	Log Activity	Log Gamma
	H+	7.601e-08	7.252e-08	-7.119	-7.140	-0.020
	OH-	2.445e-08	2.324e-08	-7.612	-7.634	-0.022
	H2O	5.551e+01	1.000e+00	0.000	0.000	0.000
Al		9.267e-08				
	Al(OH)4-	7.809e-08	7.426e-08	-7.107	-7.129	-0.022
	Al(OH)2+	1.024e-08	9.741e-09	-7.990	-8.011	-0.022
	Al(OH)3	3.309e-09	3.311e-09	-8.480	-8.480	0.000
	AlOH+2	8.861e-10	7.247e-10	-9.053	-9.140	-0.087
	AlF+2	8.981e-11	7.345e-11	-10.047	-10.134	-0.087
	Al+3	3.376e-11	2.212e-11	-10.472	-10.655	-0.184
	AlF2+	1.309e-11	1.244e-11	-10.883	-10.905	-0.022
	AlSO4+	2.215e-13	2.106e-13	-12.655	-12.676	-0.022
	AlF3	5.819e-14	5.822e-14	-13.235	-13.235	0.000
	Al(SO4)2-	2.546e-17	2.421e-17	-16.594	-16.616	-0.022
	AlF4-	9.221e-18	8.769e-18	-17.035	-17.057	-0.022
	AlHSO4+2	1.466e-21	1.199e-21	-20.834	-20.921	-0.087
	AlF5-2	6.766e-23	5.534e-23	-22.170	-22.257	-0.087
	AlF6-3	5.183e-29	3.296e-29	-28.285	-28.482	-0.197
B		4.626e-06				
	H3BO3	4.600e-06	4.603e-06	-5.337	-5.337	0.000
	H2BO3-	2.543e-08	2.418e-08	-7.595	-7.617	-0.022
	BF(OH)3-	5.783e-13	5.500e-13	-12.238	-12.260	-0.022
	BF2(OH)2-	1.761e-18	1.674e-18	-17.754	-17.776	-0.022
	BF3OH-	8.049e-26	7.654e-26	-25.094	-25.116	-0.022
	BF4-	9.315e-33	8.858e-33	-32.031	-32.053	-0.022
Ba		3.641e-08				
	Ba+2	3.626e-08	2.973e-08	-7.441	-7.527	-0.086
	BaHCO3+	8.836e-11	8.403e-11	-10.054	-10.076	-0.022
	BaSO4	6.011e-11	6.014e-11	-10.221	-10.221	0.000
	BaCO3	2.141e-12	2.142e-12	-11.669	-11.669	0.000
	BaOH+	1.461e-14	1.389e-14	-13.835	-13.857	-0.022
C(-4)		5.360e-13				
	CH4	5.360e-13	5.363e-13	-12.271	-12.271	0.000
C(4)		7.425e-04				
	HCO3-	6.000e-04	5.711e-04	-3.222	-3.243	-0.021
	CO2	1.396e-04	1.397e-04	-3.855	-3.855	0.000
	CaHCO3+	1.313e-06	1.249e-06	-5.882	-5.903	-0.021

	MgHCO3+	1.105e-06	1.051e-06	-5.957	-5.979	-0.022
	CO3-2	2.590e-07	2.126e-07	-6.587	-6.672	-0.086
	NaHCO3	1.447e-07	1.448e-07	-6.839	-6.839	0.000
	CaCO3	8.130e-08	8.134e-08	-7.090	-7.090	0.000
	MgCO3	2.412e-08	2.413e-08	-7.618	-7.617	0.000
	FeHCO3+	4.161e-09	3.957e-09	-8.381	-8.403	-0.022
	SrHCO3+	3.756e-09	3.575e-09	-8.425	-8.447	-0.021
	ZnHCO3+	2.150e-09	2.044e-09	-8.668	-8.689	-0.022
	MnHCO3+	1.886e-09	1.793e-09	-8.724	-8.746	-0.022
	PbCO3	1.562e-09	1.563e-09	-8.806	-8.806	0.000
	ZnCO3	1.206e-09	1.206e-09	-8.919	-8.919	0.000
	NaCO3-	6.007e-10	5.713e-10	-9.221	-9.243	-0.022
	MnCO3	5.948e-10	5.951e-10	-9.226	-9.225	0.000
	FeCO3	3.532e-10	3.534e-10	-9.452	-9.452	0.000
	PbHCO3+	2.017e-10	1.919e-10	-9.695	-9.717	-0.022
	BaHCO3+	8.836e-11	8.403e-11	-10.054	-10.076	-0.022
	SrCO3	6.128e-11	6.131e-11	-10.213	-10.212	0.000
	CdHCO3+	1.261e-11	1.200e-11	-10.899	-10.921	-0.022
	Zn(CO3)2-2	6.706e-12	5.484e-12	-11.174	-11.261	-0.087
	BaCO3	2.141e-12	2.142e-12	-11.669	-11.669	0.000
	Pb(CO3)2-2	1.021e-12	8.346e-13	-11.991	-12.078	-0.087
	CdCO3	1.121e-13	1.122e-13	-12.950	-12.950	0.000
	Cd(CO3)2-2	9.224e-17	7.543e-17	-16.035	-16.122	-0.087
Ca		3.485e-04				
	Ca+2	3.467e-04	2.845e-04	-3.460	-3.546	-0.086
	CaHCO3+	1.313e-06	1.249e-06	-5.882	-5.903	-0.021
	CaSO4	1.855e-07	1.855e-07	-6.732	-6.732	0.000
	CaHPO4	1.759e-07	1.760e-07	-6.755	-6.755	0.000
	CaCO3	8.130e-08	8.134e-08	-7.090	-7.090	0.000
	CaH2PO4+	1.130e-08	1.075e-08	-7.947	-7.969	-0.022
	CaPO4-	3.943e-09	3.750e-09	-8.404	-8.426	-0.022
	CaOH+	6.847e-10	6.511e-10	-9.165	-9.186	-0.022
	CaF+	5.851e-10	5.564e-10	-9.233	-9.255	-0.022
	CaHSO4+	6.761e-14	6.429e-14	-13.170	-13.192	-0.022
Cd		8.898e-10				
	Cd+2	8.122e-10	6.642e-10	-9.090	-9.178	-0.087
	CdCl+	6.375e-11	6.063e-11	-10.196	-10.217	-0.022
	CdHCO3+	1.261e-11	1.200e-11	-10.899	-10.921	-0.022
	CdSO4	6.731e-13	6.734e-13	-12.172	-12.172	0.000
	CdCl2	2.396e-13	2.397e-13	-12.621	-12.620	0.000
	CdOH+	1.500e-13	1.427e-13	-12.824	-12.846	-0.022
	CdCO3	1.121e-13	1.122e-13	-12.950	-12.950	0.000
	Cd(OH)2	5.638e-16	5.641e-16	-15.249	-15.249	0.000
	CdCl3-	1.166e-16	1.109e-16	-15.933	-15.955	-0.022
	Cd(CO3)2-2	9.224e-17	7.543e-17	-16.035	-16.122	-0.087
	Cd(SO4)2-2	4.184e-17	3.422e-17	-16.378	-16.466	-0.087
	Cd(OH)3-	9.177e-22	8.727e-22	-21.037	-21.059	-0.022
	Cd(OH)4-2	1.311e-28	1.072e-28	-27.882	-27.970	-0.087
Cl		1.084e-03				
	Cl-	1.084e-03	1.031e-03	-2.965	-2.987	-0.022
	MnCl+	1.556e-10	1.479e-10	-9.808	-9.830	-0.022
	FeCl+	1.037e-10	9.857e-11	-9.984	-10.006	-0.022
	CdCl+	6.375e-11	6.063e-11	-10.196	-10.217	-0.022
	ZnCl+	3.063e-11	2.913e-11	-10.514	-10.536	-0.022
	PbCl+	1.042e-11	9.911e-12	-10.982	-11.004	-0.022
	CdCl2	2.396e-13	2.397e-13	-12.621	-12.620	0.000
	MnCl2	6.652e-14	6.656e-14	-13.177	-13.177	0.000
	ZnCl2	2.869e-14	2.871e-14	-13.542	-13.542	0.000

	PbCl2	2.468e-14	2.469e-14	-13.608	-13.607	0.000
	CdCl3-	1.166e-16	1.109e-16	-15.933	-15.955	-0.022
	ZnCl3-	3.048e-17	2.899e-17	-16.516	-16.538	-0.022
	MnCl3-	1.987e-17	1.889e-17	-16.702	-16.724	-0.022
	PbCl3-	1.849e-17	1.758e-17	-16.733	-16.755	-0.022
	ZnCl4-2	1.531e-20	1.252e-20	-19.815	-19.902	-0.087
	PbCl4-2	8.912e-21	7.288e-21	-20.050	-20.137	-0.087
	FeCl+2	7.682e-26	6.282e-26	-25.115	-25.202	-0.087
	FeCl2+	6.224e-28	5.919e-28	-27.206	-27.228	-0.022
	FeCl3	6.097e-32	6.100e-32	-31.215	-31.215	0.000
Cu(1)	7.869e-09					
	Cu+	7.869e-09	7.474e-09	-8.104	-8.126	-0.022
Cu(2)	2.019e-13					
	Cu(OH)2	1.503e-13	1.504e-13	-12.823	-12.823	0.000
	Cu+2	4.605e-14	3.786e-14	-13.337	-13.422	-0.085
	CuOH+	5.490e-15	5.221e-15	-14.260	-14.282	-0.022
	CuSO4	2.668e-17	2.669e-17	-16.574	-16.574	0.000
	Cu(OH)3-	1.314e-19	1.250e-19	-18.881	-18.903	-0.022
	Cu(OH)4-2	4.203e-25	3.438e-25	-24.376	-24.464	-0.087
F	4.038e-07					
	F-	4.000e-07	3.803e-07	-6.398	-6.420	-0.022
	MgF+	2.881e-09	2.740e-09	-8.540	-8.562	-0.022
	CaF+	5.851e-10	5.564e-10	-9.233	-9.255	-0.022
	NaF	9.862e-11	9.867e-11	-10.006	-10.006	0.000
	AlF+2	8.981e-11	7.345e-11	-10.047	-10.134	-0.087
	HF	2.883e-11	2.884e-11	-10.540	-10.540	0.000
	AlF2+	1.309e-11	1.244e-11	-10.883	-10.905	-0.022
	BF(OH)3-	5.783e-13	5.500e-13	-12.238	-12.260	-0.022
	FeF+	2.771e-13	2.635e-13	-12.557	-12.579	-0.022
	MnF+	9.748e-14	9.270e-14	-13.011	-13.033	-0.022
	AlF3	5.819e-14	5.822e-14	-13.235	-13.235	0.000
	HF2-	3.546e-17	3.372e-17	-16.450	-16.472	-0.022
	AlF4-	9.221e-18	8.769e-18	-17.035	-17.057	-0.022
	BF2(OH)2-	1.761e-18	1.674e-18	-17.754	-17.776	-0.022
	AlF5-2	6.766e-23	5.534e-23	-22.170	-22.257	-0.087
	FeF+2	2.155e-24	1.763e-24	-23.666	-23.754	-0.087
	BF3OH-	8.049e-26	7.654e-26	-25.094	-25.116	-0.022
	FeF2+	2.145e-26	2.040e-26	-25.669	-25.690	-0.022
	AlF6-3	5.183e-29	3.296e-29	-28.285	-28.482	-0.197
	FeF3	1.138e-29	1.139e-29	-28.944	-28.944	0.000
	BF4-	9.315e-33	8.858e-33	-32.031	-32.053	-0.022
	SiF6-2	0.000e+00	0.000e+00	-40.947	-41.035	-0.087
Fe(2)	8.954e-08					
	Fe+2	8.427e-08	6.929e-08	-7.074	-7.159	-0.085
	FeHCO3+	4.161e-09	3.957e-09	-8.381	-8.403	-0.022
	FeHPO4	4.742e-10	4.745e-10	-9.324	-9.324	0.000
	FeCO3	3.532e-10	3.534e-10	-9.452	-9.452	0.000
	FeCl+	1.037e-10	9.857e-11	-9.984	-10.006	-0.022
	FeH2PO4+	8.327e-11	7.919e-11	-10.079	-10.101	-0.022
	FeOH+	5.873e-11	5.585e-11	-10.231	-10.253	-0.022
	FeSO4	3.289e-11	3.290e-11	-10.483	-10.483	0.000
	FeF+	2.771e-13	2.635e-13	-12.557	-12.579	-0.022
	FeHSO4+	1.646e-17	1.566e-17	-16.783	-16.805	-0.022
	Fe(HS)2	1.390e-21	1.391e-21	-20.857	-20.857	0.000
	Fe(HS)3-	7.560e-31	7.189e-31	-30.121	-30.143	-0.022
Fe(3)	3.240e-16					
	Fe(OH)2+	1.982e-16	1.885e-16	-15.703	-15.725	-0.022
	Fe(OH)3	1.250e-16	1.251e-16	-15.903	-15.903	0.000

	Fe(OH)4-	6.672e-19	6.345e-19	-18.176	-18.198	-0.022
	FeOH+2	1.189e-19	9.726e-20	-18.925	-19.012	-0.087
	Fe+3	6.304e-24	4.131e-24	-23.200	-23.384	-0.184
	FeH2PO4+2	3.100e-24	2.535e-24	-23.509	-23.596	-0.087
	FeF+2	2.155e-24	1.763e-24	-23.666	-23.754	-0.087
	FeHPO4+	9.628e-25	9.156e-25	-24.016	-24.038	-0.022
	FeSO4+	1.166e-25	1.109e-25	-24.933	-24.955	-0.022
	FeCl+2	7.682e-26	6.282e-26	-25.115	-25.202	-0.087
	FeF2+	2.145e-26	2.040e-26	-25.669	-25.690	-0.022
	FeCl2+	6.224e-28	5.919e-28	-27.206	-27.228	-0.022
	FeF3	1.138e-29	1.139e-29	-28.944	-28.944	0.000
	Fe(SO4)2-	9.425e-30	8.963e-30	-29.026	-29.048	-0.022
	FeCl3	6.097e-32	6.100e-32	-31.215	-31.215	0.000
	FeHSO4+2	2.867e-32	2.344e-32	-31.543	-31.630	-0.087
	Fe2(OH)2+4	1.448e-36	6.476e-37	-35.839	-36.189	-0.349
	Fe3(OH)4+5	0.000e+00	0.000e+00	-48.142	-48.688	-0.546
H(0)		2.011e-12				
	H2	1.006e-12	1.006e-12	-11.998	-11.997	0.000
K		3.691e-05				
	K+	3.691e-05	3.508e-05	-4.433	-4.455	-0.022
	KSO4-	7.054e-10	6.708e-10	-9.152	-9.173	-0.022
	KHPO4-	1.237e-10	1.177e-10	-9.907	-9.929	-0.022
	KOH	1.676e-12	1.677e-12	-11.776	-11.775	0.000
Li		7.206e-07				
	Li+	7.206e-07	6.862e-07	-6.142	-6.164	-0.021
	LiSO4-	1.271e-11	1.209e-11	-10.896	-10.918	-0.022
	LiOH	2.166e-13	2.168e-13	-12.664	-12.664	0.000
Mg		2.012e-04				
	Mg+2	1.998e-04	1.642e-04	-3.699	-3.785	-0.085
	MgHCO3+	1.105e-06	1.051e-06	-5.957	-5.979	-0.022
	MgHPO4	1.372e-07	1.373e-07	-6.863	-6.862	0.000
	MgSO4	8.678e-08	8.682e-08	-7.062	-7.061	0.000
	MgCO3	2.412e-08	2.413e-08	-7.618	-7.617	0.000
	MgH2PO4+	8.306e-09	7.899e-09	-8.081	-8.102	-0.022
	MgPO4-	3.070e-09	2.919e-09	-8.513	-8.535	-0.022
	MgF+	2.881e-09	2.740e-09	-8.540	-8.562	-0.022
	MgOH+	1.124e-09	1.069e-09	-8.949	-8.971	-0.022
Mn(2)		4.551e-08				
	Mn+2	4.286e-08	3.524e-08	-7.368	-7.453	-0.085
	MnHCO3+	1.886e-09	1.793e-09	-8.724	-8.746	-0.022
	MnCO3	5.948e-10	5.951e-10	-9.226	-9.225	0.000
	MnCl+	1.556e-10	1.479e-10	-9.808	-9.830	-0.022
	MnSO4	1.643e-11	1.643e-11	-10.784	-10.784	0.000
	MnOH+	2.082e-12	1.980e-12	-11.681	-11.703	-0.022
	MnF+	9.748e-14	9.270e-14	-13.011	-13.033	-0.022
	MnCl2	6.652e-14	6.656e-14	-13.177	-13.177	0.000
	MnCl3-	1.987e-17	1.889e-17	-16.702	-16.724	-0.022
	Mn(NO3)2	0.000e+00	0.000e+00	-178.778	-178.777	0.000
Mn(3)		1.360e-37				
	Mn+3	1.360e-37	8.651e-38	-36.866	-37.063	-0.197
N(-3)		2.860e-07				
	NH4+	2.856e-07	2.713e-07	-6.544	-6.567	-0.022
	NH3	4.301e-10	4.303e-10	-9.366	-9.366	0.000
	NH4SO4-	1.483e-11	1.410e-11	-10.829	-10.851	-0.022
N(0)		5.829e-07				
	N2	2.915e-07	2.916e-07	-6.535	-6.535	0.000
N(3)		0.000e+00				
	NO2-	0.000e+00	0.000e+00	-63.896	-63.918	-0.022

N(5)	0.000e+00					
NO3-		0.000e+00	0.000e+00	-85.951	-85.973	-0.022
PbNO3+		0.000e+00	0.000e+00	-94.155	-94.177	-0.022
Mn(NO3)2		0.000e+00	0.000e+00	-178.778	-178.777	0.000
Na	4.742e-04					
Na+		4.740e-04	4.509e-04	-3.324	-3.346	-0.022
NaHCO3		1.447e-07	1.448e-07	-6.839	-6.839	0.000
NaSO4-		8.311e-09	7.904e-09	-8.080	-8.102	-0.022
NaHPO4-		1.590e-09	1.512e-09	-8.799	-8.820	-0.022
NaCO3-		6.007e-10	5.713e-10	-9.221	-9.243	-0.022
NaF		9.862e-11	9.867e-11	-10.006	-10.006	0.000
NaOH		4.106e-11	4.108e-11	-10.387	-10.386	0.000
O(0)	0.000e+00					
O2		0.000e+00	0.000e+00	-75.676	-75.676	0.000
P	4.843e-06					
H2PO4-		2.397e-06	2.280e-06	-5.620	-5.642	-0.022
HPO4-2		2.104e-06	1.720e-06	-5.677	-5.764	-0.087
CaHPO4		1.759e-07	1.760e-07	-6.755	-6.755	0.000
MgHPO4		1.372e-07	1.373e-07	-6.863	-6.862	0.000
CaH2PO4+		1.130e-08	1.075e-08	-7.947	-7.969	-0.022
MgH2PO4+		8.306e-09	7.899e-09	-8.081	-8.102	-0.022
CaPO4-		3.943e-09	3.750e-09	-8.404	-8.426	-0.022
MgPO4-		3.070e-09	2.919e-09	-8.513	-8.535	-0.022
NaHPO4-		1.590e-09	1.512e-09	-8.799	-8.820	-0.022
FeHPO4		4.742e-10	4.745e-10	-9.324	-9.324	0.000
KHPO4-		1.237e-10	1.177e-10	-9.907	-9.929	-0.022
FeH2PO4+		8.327e-11	7.919e-11	-10.079	-10.101	-0.022
PO4-3		1.071e-11	6.808e-12	-10.970	-11.167	-0.197
FeH2PO4+2		3.100e-24	2.535e-24	-23.509	-23.596	-0.087
FeHPO4+		9.628e-25	9.156e-25	-24.016	-24.038	-0.022
Pb	2.413e-09					
PbCO3		1.562e-09	1.563e-09	-8.806	-8.806	0.000
Pb+2		5.172e-10	4.229e-10	-9.286	-9.374	-0.087
PbHCO3+		2.017e-10	1.919e-10	-9.695	-9.717	-0.022
PbOH+		1.196e-10	1.137e-10	-9.922	-9.944	-0.022
PbCl+		1.042e-11	9.911e-12	-10.982	-11.004	-0.022
Pb(CO3)2-2		1.021e-12	8.346e-13	-11.991	-12.078	-0.087
PbSO4		9.594e-13	9.599e-13	-12.018	-12.018	0.000
Pb(OH)2		6.097e-13	6.100e-13	-12.215	-12.215	0.000
PbCl2		2.468e-14	2.469e-14	-13.608	-13.607	0.000
Pb(OH)3-		1.015e-16	9.657e-17	-15.993	-16.015	-0.022
Pb(SO4)2-2		2.486e-17	2.033e-17	-16.604	-16.692	-0.087
PbCl3-		1.849e-17	1.758e-17	-16.733	-16.755	-0.022
Pb2OH+3		1.693e-18	1.077e-18	-17.771	-17.968	-0.197
PbCl4-2		8.912e-21	7.288e-21	-20.050	-20.137	-0.087
Pb(OH)4-2		3.730e-21	3.050e-21	-20.428	-20.516	-0.087
PbNO3+		0.000e+00	0.000e+00	-94.155	-94.177	-0.022
S(-2)	1.146e-11					
H2S		6.464e-12	6.468e-12	-11.189	-11.189	0.000
HS-		4.993e-12	4.746e-12	-11.302	-11.324	-0.022
S-2		2.052e-18	1.682e-18	-17.688	-17.774	-0.086
Fe(HS)2		1.390e-21	1.391e-21	-20.857	-20.857	0.000
Fe(HS)3-		7.560e-31	7.189e-31	-30.121	-30.143	-0.022
S(6)	5.205e-06					
SO4-2		4.923e-06	4.036e-06	-5.308	-5.394	-0.086
CaSO4		1.855e-07	1.855e-07	-6.732	-6.732	0.000
MgSO4		8.678e-08	8.682e-08	-7.062	-7.061	0.000
NaSO4-		8.311e-09	7.904e-09	-8.080	-8.102	-0.022

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      KSO4-             7.054e-10   6.708e-10    -9.152    -9.173    -0.022
      SrSO4             5.063e-10   5.066e-10    -9.296    -9.295     0.000
      BaSO4             6.011e-11   6.014e-11   -10.221   -10.221     0.000
      FeSO4             3.289e-11   3.290e-11   -10.483   -10.483     0.000
      ZnSO4             2.260e-11   2.261e-11   -10.646   -10.646     0.000
      HSO4-             1.976e-11   1.879e-11   -10.704   -10.726    -0.022
      MnSO4             1.643e-11   1.643e-11   -10.784   -10.784     0.000
      NH4SO4-           1.483e-11   1.410e-11   -10.829   -10.851    -0.022
      LiSO4-            1.271e-11   1.209e-11   -10.896   -10.918    -0.022
      PbSO4             9.594e-13   9.599e-13   -12.018   -12.018     0.000
      CdSO4             6.731e-13   6.734e-13   -12.172   -12.172     0.000
      AlSO4+            2.215e-13   2.106e-13   -12.655   -12.676    -0.022
      CaHSO4+           6.761e-14   6.429e-14   -13.170   -13.192    -0.022
      Zn(SO4)2-2        1.079e-15   8.826e-16   -14.967   -15.054    -0.087
      Cd(SO4)2-2        4.184e-17   3.422e-17   -16.378   -16.466    -0.087
      CuSO4             2.668e-17   2.669e-17   -16.574   -16.574     0.000
      Al(SO4)2-         2.546e-17   2.421e-17   -16.594   -16.616    -0.022
      Pb(SO4)2-2        2.486e-17   2.033e-17   -16.604   -16.692    -0.087
      FeHSO4+           1.646e-17   1.566e-17   -16.783   -16.805    -0.022
      AlHSO4+2          1.466e-21   1.199e-21   -20.834   -20.921    -0.087
      FeSO4+            1.166e-25   1.109e-25   -24.933   -24.955    -0.022
      Fe(SO4)2-         9.425e-30   8.963e-30   -29.026   -29.048    -0.022
      FeHSO4+2          2.867e-32   2.344e-32   -31.543   -31.630    -0.087
Si                9.121e-06
      H4SiO4            9.113e-06   9.118e-06    -5.040    -5.040     0.000
      H3SiO4-           8.397e-09   7.985e-09    -8.076    -8.098    -0.022
      H2SiO4-2          1.941e-15   1.587e-15   -14.712   -14.799    -0.087
      SiF6-2            0.000e+00   0.000e+00   -40.947   -41.035    -0.087
Sr                1.027e-06
      Sr+2              1.023e-06   8.399e-07    -5.990    -6.076    -0.086
      SrHCO3+           3.756e-09   3.575e-09    -8.425    -8.447    -0.021
      SrSO4             5.063e-10   5.066e-10    -9.296    -9.295     0.000
      SrCO3             6.128e-11   6.131e-11   -10.213   -10.212     0.000
      SrOH+             6.241e-13   5.939e-13   -12.205   -12.226    -0.022
Zn                3.825e-08
      Zn+2              3.468e-08   2.844e-08    -7.460    -7.546    -0.086
      ZnHCO3+           2.150e-09   2.044e-09    -8.668    -8.689    -0.022
      ZnCO3             1.206e-09   1.206e-09    -8.919    -8.919     0.000
      ZnOH+             8.147e-11   7.748e-11   -10.089   -10.111    -0.022
      Zn(OH)2           6.803e-11   6.806e-11   -10.167   -10.167     0.000
      ZnCl+             3.063e-11   2.913e-11   -10.514   -10.536    -0.022
      ZnSO4             2.260e-11   2.261e-11   -10.646   -10.646     0.000
      Zn(CO3)2-2        6.706e-12   5.484e-12   -11.174   -11.261    -0.087
      ZnCl2             2.869e-14   2.871e-14   -13.542   -13.542     0.000
      Zn(OH)3-          3.121e-15   2.968e-15   -14.506   -14.528    -0.022
      Zn(SO4)2-2        1.079e-15   8.826e-16   -14.967   -15.054    -0.087
      ZnCl3-            3.048e-17   2.899e-17   -16.516   -16.538    -0.022
      ZnCl4-2           1.531e-20   1.252e-20   -19.815   -19.902    -0.087
      Zn(OH)4-2         7.930e-21   6.485e-21   -20.101   -20.188    -0.087

-----------------------------Saturation indices-------------------------------

      Phase               SI log IAP  log KT

      Al(OH)3(a)       -1.51   10.76   12.27  Al(OH)3
      Albite           -6.16   -0.56    5.59  NaAlSi3O8
      Alunite          -5.76   -4.37    1.39  KAl3(SO4)2(OH)6
      Anglesite        -6.86  -14.77   -7.91  PbSO4
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◎ Table of Contents

Anhydrite	-4.59	-8.94	-4.35	CaSO4
Anorthite	-7.53	22.18	29.71	CaAl2Si2O8
Aragonite	-1.99	-10.22	-8.23	CaCO3
Barite	-2.54	-12.92	-10.38	BaSO4
Ca-Montmorillonite	-1.70	8.35	10.06	Ca0.165Al2.33Si3.67O10(OH)2
Calcite	-1.83	-10.22	-8.39	CaCO3
Cd(OH)2	-8.55	5.10	13.65	Cd(OH)2
CdSiO3	-9.92	0.06	9.98	CdSiO3
CdSO4	-15.29	-14.57	0.72	CdSO4
Celestite	-4.81	-11.47	-6.66	SrSO4
Cerrusite	-2.65	-16.05	-13.40	PbCO3
CH4(g)	-9.60	-56.73	-47.13	CH4
Chalcedony	-1.23	-5.04	-3.81	SiO2
Chlorite(14A)	-17.92	58.88	76.79	Mg5Al2Si3O10(OH)8
Chrysotile	-13.59	21.40	34.99	Mg3Si2O5(OH)4
CO2(g)	-2.68	-20.95	-18.27	CO2
Dolomite	-4.11	-20.68	-16.57	CaMg(CO3)2
Fe(OH)3(a)	-6.86	11.59	18.45	Fe(OH)3
FeS(ppt)	-7.43	-48.33	-40.91	FeS
Fluorite	-5.50	-16.39	-10.89	CaF2
Gibbsite	1.39	10.76	9.38	Al(OH)3
Goethite	-1.77	11.59	13.36	FeOOH
Gypsum	-4.34	-8.94	-4.60	CaSO4:2H2O
H2(g)	-8.95	-8.95	0.00	H2
H2S(g)	-10.45	-55.45	-45.01	H2S
Hausmannite	-37.20	29.42	66.62	Mn3O4
Hematite	-1.64	23.18	24.82	Fe2O3
Hydroxyapatite	-5.05	-44.09	-39.04	Ca5(PO4)3OH
Illite	-2.92	11.35	14.27	K0.6Mg0.25Al2.3Si3.5O10(OH)2
Jarosite-K	-35.09	-1.88	33.20	KFe3(SO4)2(OH)6
K-feldspar	-4.42	-1.67	2.75	KAlSi3O8
K-mica	3.85	19.85	16.00	KAl3Si3O10(OH)2
Kaolinite	2.05	11.45	9.40	Al2Si2O5(OH)4
Mackinawite	-6.70	-48.33	-41.64	FeS
Manganite	-14.04	11.30	25.34	MnOOH
Melanterite	-10.05	-12.55	-2.50	FeSO4:7H2O
N2(g)	-3.35	-6.54	-3.18	N2
NH3(g)	-11.59	-16.69	-5.10	NH3
O2(g)	-72.82	17.89	90.71	O2
Otavite	-3.75	-15.85	-12.10	CdCO3
Pb(OH)2	-4.02	4.91	8.93	Pb(OH)2
Pyrite	-1.75	-94.84	-93.09	FeS2
Pyrochroite	-8.37	6.83	15.20	Mn(OH)2
Pyrolusite	-29.23	15.77	45.00	MnO2
Quartz	-0.73	-5.04	-4.31	SiO2
Rhodochrosite	-3.07	-14.13	-11.05	MnCO3
Sepiolite	-10.49	5.87	16.35	Mg2Si3O7.5OH:3H2O
Sepiolite(d)	-12.79	5.87	18.66	Mg2Si3O7.5OH:3H2O
Siderite	-3.08	-13.83	-10.75	FeCO3
SiO2(a)	-2.14	-5.04	-2.90	SiO2
Smithsonite	-4.46	-14.22	-9.76	ZnCO3
Sphalerite	0.35	-48.72	-49.07	ZnS
Strontianite	-3.43	-12.75	-9.32	SrCO3
Sulfur	-7.65	-46.51	-38.85	S
Talc	-12.65	11.32	23.97	Mg3Si4O10(OH)2
Vivianite	-7.81	-43.81	-36.00	Fe3(PO4)2:8H2O
Willemite	-8.76	8.43	17.18	Zn2SiO4
Witherite	-5.51	-14.20	-8.69	BaCO3

```
      Zn(OH)2(e)       -4.77    6.73   11.50  Zn(OH)2

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End of simulation.
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------------------------------------
Reading input data for simulation 8.
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End of run.
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◎ Table of Contents

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------------------
Reading data base.
------------------

      SOLUTION_MASTER_SPECIES
      SOLUTION_SPECIES
      PHASES
      EXCHANGE_MASTER_SPECIES
      EXCHANGE_SPECIES
      SURFACE_MASTER_SPECIES
      SURFACE_SPECIES
      END
-----------------------------------
Reading input data for simulation 1.
-----------------------------------

      SOLUTION 1 B2 Mineralized Zone
            temp  4
            pH    8.46
            pe    4
            redox pe
            units ug/l
            density     1
            Alkalinity  34000 gfw 50.04
            Al    86.1  ug/l
            Ba    0.89  ug/l
            Ca    9290  ug/l
            Cd    0.05  ug/l
            Cu(2) 11.12 ug/l
            Fe(3) 18.37 ug/l
            K     284   ug/l
            Mg    3007  ug/l
            Mn(2) 35.53 ug/l
            Pb    1.2   ug/l
            S(6)  3860  ug/l
            Sr    13.63 ug/l
            Zn    0.81  ug/l
            Na    415   ug/l
            P     50    ug/l
      SAVE solution 1
      END
----------------------------------------
Beginning of initial solution calculations.
----------------------------------------

Initial solution 1.     B2 Mineralized Zone

-----------------------------Solution composition------------------------------

      Elements           Molality       Moles

      Al                 3.191e-06   3.191e-06
      Alkalinity         6.795e-04   6.795e-04
      Ba                 6.481e-09   6.481e-09
      Ca                 2.318e-04   2.318e-04
      Cd                 4.449e-10   4.449e-10
      Cu(2)              1.750e-07   1.750e-07
      Fe(3)              3.290e-07   3.290e-07
```

```
      K                 7.263e-06   7.263e-06
      Mg                1.237e-04   1.237e-04
      Mn(2)             6.468e-07   6.468e-07
      Na                1.805e-05   1.805e-05
      P                 1.614e-06   1.614e-06
      Pb                5.792e-09   5.792e-09
      S(6)              4.018e-05   4.018e-05
      Sr                1.556e-07   1.556e-07
      Zn                1.239e-08   1.239e-08

----------------------------Description of solution----------------------------

                            pH  =   8.460
                            pe  =   4.000
               Activity of water  =   1.000
                  Ionic strength  =   1.132e-03
              Mass of water (kg)  =   1.000e+00
         Total carbon (mol/kg)    =   6.638e-04
            Total CO2 (mol/kg)    =   6.638e-04
           Temperature (deg C)    =   4.000
    Electrical balance (eq)       =  -1.327e-05
                    Iterations    =   8
                       Total H    = 1.110131e+02
                       Total O    = 5.550838e+01

----------------------------Distribution of species----------------------------

                                                 Log       Log         Log
      Species             Molality    Activity  Molality  Activity     Gamma

      OH-               5.043e-07   4.861e-07    -6.297    -6.313    -0.016
      H+                3.590e-09   3.467e-09    -8.445    -8.460    -0.015
      H2O               5.551e+01   1.000e+00     0.000     0.000     0.000
Al                3.191e-06
      Al(OH)4-          3.184e-06   3.069e-06    -5.497    -5.513    -0.016
      Al(OH)3           6.541e-09   6.543e-09    -8.184    -8.184     0.000
      Al(OH)2+          9.546e-10   9.203e-10    -9.020    -9.036    -0.016
      AlOH+2            3.790e-12   3.273e-12   -11.421   -11.485    -0.064
      Al+3              6.534e-15   4.777e-15   -14.185   -14.321    -0.136
      AlSO4+            3.908e-16   3.768e-16   -15.408   -15.424    -0.016
      Al(SO4)2-         3.720e-19   3.586e-19   -18.429   -18.445    -0.016
      AlHSO4+2          1.187e-25   1.025e-25   -24.926   -24.989    -0.064
Ba                6.481e-09
      Ba+2              6.362e-09   5.503e-09    -8.196    -8.259    -0.063
      BaSO4             9.217e-11   9.219e-11   -10.035   -10.035     0.000
      BaHCO3+           1.764e-11   1.700e-11   -10.754   -10.769    -0.016
      BaCO3             9.063e-12   9.066e-12   -11.043   -11.043     0.000
      BaOH+             5.578e-14   5.378e-14   -13.254   -13.269    -0.016
C(4)              6.638e-04
      HCO3-             6.473e-04   6.243e-04    -3.189    -3.205    -0.016
      CO2               7.299e-06   7.301e-06    -5.137    -5.137     0.000
      CO3-2             5.617e-06   4.862e-06    -5.250    -5.313    -0.063
      CaCO3             1.291e-06   1.292e-06    -5.889    -5.889     0.000
      CaHCO3+           9.833e-07   9.485e-07    -6.007    -6.023    -0.016
      MgHCO3+           7.667e-07   7.392e-07    -6.115    -6.131    -0.016
      MgCO3             3.550e-07   3.551e-07    -6.450    -6.450     0.000
      MnCO3             1.557e-07   1.558e-07    -6.808    -6.807     0.000
      MnHCO3+           2.328e-08   2.245e-08    -7.633    -7.649    -0.016
```

	NaHCO3	6.106e-09	6.108e-09	-8.214	-8.214	0.000
	PbCO3	5.215e-09	5.216e-09	-8.283	-8.283	0.000
	ZnCO3	3.496e-09	3.497e-09	-8.456	-8.456	0.000
	SrHCO3+	6.433e-10	6.205e-10	-9.192	-9.207	-0.016
	NaCO3-	5.228e-10	5.040e-10	-9.282	-9.298	-0.016
	Zn(CO3)2-2	4.208e-10	3.635e-10	-9.376	-9.440	-0.064
	ZnHCO3+	2.939e-10	2.833e-10	-9.532	-9.548	-0.016
	SrCO3	2.225e-10	2.226e-10	-9.653	-9.653	0.000
	Pb(CO3)2-2	7.374e-11	6.370e-11	-10.132	-10.196	-0.064
	PbHCO3+	3.176e-11	3.062e-11	-10.498	-10.514	-0.016
	BaHCO3+	1.764e-11	1.700e-11	-10.754	-10.769	-0.016
	BaCO3	9.063e-12	9.066e-12	-11.043	-11.043	0.000
	CdHCO3+	7.620e-12	7.346e-12	-11.118	-11.134	-0.016
	CdCO3	1.437e-12	1.437e-12	-11.843	-11.843	0.000
	Cd(CO3)2-2	2.558e-14	2.209e-14	-13.592	-13.656	-0.064
Ca		2.318e-04				
	Ca+2	2.283e-04	1.976e-04	-3.641	-3.704	-0.063
	CaCO3	1.291e-06	1.292e-06	-5.889	-5.889	0.000
	CaSO4	1.067e-06	1.067e-06	-5.972	-5.972	0.000
	CaHCO3+	9.833e-07	9.485e-07	-6.007	-6.023	-0.016
	CaHPO4	8.172e-08	8.174e-08	-7.088	-7.088	0.000
	CaPO4-	3.779e-08	3.643e-08	-7.423	-7.439	-0.016
	CaOH+	9.810e-09	9.457e-09	-8.008	-8.024	-0.016
	CaH2PO4+	2.476e-10	2.387e-10	-9.606	-9.622	-0.016
	CaHSO4+	1.834e-14	1.768e-14	-13.737	-13.753	-0.016
Cd		4.449e-10				
	Cd+2	4.308e-10	3.721e-10	-9.366	-9.429	-0.064
	CdHCO3+	7.620e-12	7.346e-12	-11.118	-11.134	-0.016
	CdSO4	3.124e-12	3.124e-12	-11.505	-11.505	0.000
	CdOH+	1.734e-12	1.671e-12	-11.761	-11.777	-0.016
	CdCO3	1.437e-12	1.437e-12	-11.843	-11.843	0.000
	Cd(OH)2	1.382e-13	1.382e-13	-12.859	-12.859	0.000
	Cd(CO3)2-2	2.558e-14	2.209e-14	-13.592	-13.656	-0.064
	Cd(SO4)2-2	1.522e-15	1.315e-15	-14.818	-14.881	-0.064
	Cd(OH)3-	4.640e-18	4.473e-18	-17.333	-17.349	-0.016
	Cd(OH)4-2	1.331e-23	1.150e-23	-22.876	-22.939	-0.064
Cu(2)		1.750e-07				
	Cu(OH)2	1.746e-07	1.746e-07	-6.758	-6.758	0.000
	CuOH+	3.006e-10	2.898e-10	-9.522	-9.538	-0.016
	Cu+2	1.160e-10	1.005e-10	-9.936	-9.998	-0.062
	Cu(OH)3-	3.148e-12	3.035e-12	-11.502	-11.518	-0.016
	CuSO4	5.866e-13	5.868e-13	-12.232	-12.232	0.000
	Cu(OH)4-2	2.022e-16	1.746e-16	-15.694	-15.758	-0.064
Fe(3)		3.290e-07				
	Fe(OH)3	2.776e-07	2.777e-07	-6.557	-6.556	0.000
	Fe(OH)4-	3.056e-08	2.946e-08	-7.515	-7.531	-0.016
	Fe(OH)2+	2.076e-08	2.001e-08	-7.683	-7.699	-0.016
	FeOH+2	5.714e-13	4.936e-13	-12.243	-12.307	-0.064
	Fe+3	1.371e-18	1.002e-18	-17.863	-17.999	-0.136
	FeSO4+	2.311e-19	2.228e-19	-18.636	-18.652	-0.016
	FeHPO4+	1.541e-19	1.486e-19	-18.812	-18.828	-0.016
	FeH2PO4+2	2.278e-20	1.967e-20	-19.642	-19.706	-0.064
	Fe(SO4)2-	1.547e-22	1.492e-22	-21.810	-21.826	-0.016
	Fe2(OH)2+4	2.996e-23	1.668e-23	-22.523	-22.778	-0.254
	FeHSO4+2	2.608e-27	2.253e-27	-26.584	-26.647	-0.064
	Fe3(OH)4+5	1.400e-27	5.607e-28	-26.854	-27.251	-0.397
H(0)		2.131e-28				
	H2	1.066e-28	1.066e-28	-27.972	-27.972	0.000

K	7.263e-06					
K+		7.262e-06	7.000e-06	-5.139	-5.155	-0.016
KSO4-		1.150e-09	1.109e-09	-8.939	-8.955	-0.016
KHPO4-		1.629e-11	1.570e-11	-10.788	-10.804	-0.016
KOH		6.998e-12	7.000e-12	-11.155	-11.155	0.000
Mg	1.237e-04					
Mg+2		1.220e-04	1.057e-04	-3.914	-3.976	-0.062
MgHCO3+		7.667e-07	7.392e-07	-6.115	-6.131	-0.016
MgSO4		4.626e-07	4.627e-07	-6.335	-6.335	0.000
MgCO3		3.550e-07	3.551e-07	-6.450	-6.450	0.000
MgHPO4		5.909e-08	5.910e-08	-7.229	-7.228	0.000
MgPO4-		2.726e-08	2.628e-08	-7.564	-7.580	-0.016
MgOH+		1.492e-08	1.439e-08	-7.826	-7.842	-0.016
MgH2PO4+		1.686e-10	1.626e-10	-9.773	-9.789	-0.016
Mn(2)	6.468e-07					
Mn+2		4.657e-07	4.034e-07	-6.332	-6.394	-0.062
MnCO3		1.557e-07	1.558e-07	-6.808	-6.807	0.000
MnHCO3+		2.328e-08	2.245e-08	-7.633	-7.649	-0.016
MnSO4		1.558e-09	1.558e-09	-8.807	-8.807	0.000
MnOH+		4.919e-10	4.742e-10	-9.308	-9.324	-0.016
Na	1.805e-05					
Na+		1.804e-05	1.740e-05	-4.744	-4.760	-0.016
NaHCO3		6.106e-09	6.108e-09	-8.214	-8.214	0.000
NaSO4-		2.620e-09	2.526e-09	-8.582	-8.598	-0.016
NaCO3-		5.228e-10	5.040e-10	-9.282	-9.298	-0.016
NaHPO4-		4.049e-11	3.903e-11	-10.393	-10.409	-0.016
NaOH		3.314e-11	3.315e-11	-10.480	-10.480	0.000
O(0)	0.000e+00					
O2		0.000e+00	0.000e+00	-43.726	-43.726	0.000
P	1.614e-06					
HPO4-2		1.332e-06	1.151e-06	-5.875	-5.939	-0.064
CaHPO4		8.172e-08	8.174e-08	-7.088	-7.088	0.000
H2PO4-		7.564e-08	7.293e-08	-7.121	-7.137	-0.016
MgHPO4		5.909e-08	5.910e-08	-7.229	-7.228	0.000
CaPO4-		3.779e-08	3.643e-08	-7.423	-7.439	-0.016
MgPO4-		2.726e-08	2.628e-08	-7.564	-7.580	-0.016
CaH2PO4+		2.476e-10	2.387e-10	-9.606	-9.622	-0.016
MgH2PO4+		1.686e-10	1.626e-10	-9.773	-9.789	-0.016
PO4-3		1.325e-10	9.526e-11	-9.878	-10.021	-0.143
NaHPO4-		4.049e-11	3.903e-11	-10.393	-10.409	-0.016
KHPO4-		1.629e-11	1.570e-11	-10.788	-10.804	-0.016
FeHPO4+		1.541e-19	1.486e-19	-18.812	-18.828	-0.016
FeH2PO4+2		2.278e-20	1.967e-20	-19.642	-19.706	-0.064
Pb	5.792e-09					
PbCO3		5.215e-09	5.216e-09	-8.283	-8.283	0.000
PbOH+		3.601e-10	3.472e-10	-9.444	-9.459	-0.016
Pb(CO3)2-2		7.374e-11	6.370e-11	-10.132	-10.196	-0.064
Pb+2		7.147e-11	6.174e-11	-10.146	-10.209	-0.064
Pb(OH)2		3.894e-11	3.895e-11	-10.410	-10.409	0.000
PbHCO3+		3.176e-11	3.062e-11	-10.498	-10.514	-0.016
PbSO4		1.160e-12	1.161e-12	-11.935	-11.935	0.000
Pb(OH)3-		1.338e-13	1.290e-13	-12.874	-12.889	-0.016
Pb(SO4)2-2		2.357e-16	2.036e-16	-15.628	-15.691	-0.064
Pb(OH)4-2		9.866e-17	8.522e-17	-16.006	-16.069	-0.064
Pb2OH+3		6.671e-19	4.799e-19	-18.176	-18.319	-0.143
S(6)	4.018e-05					
SO4-2		3.865e-05	3.343e-05	-4.413	-4.476	-0.063
CaSO4		1.067e-06	1.067e-06	-5.972	-5.972	0.000

```
      MgSO4              4.626e-07   4.627e-07    -6.335    -6.335     0.000
      NaSO4-             2.620e-09   2.526e-09    -8.582    -8.598    -0.016
      MnSO4              1.558e-09   1.558e-09    -8.807    -8.807     0.000
      KSO4-              1.150e-09   1.109e-09    -8.939    -8.955    -0.016
      SrSO4              6.659e-10   6.661e-10    -9.177    -9.176     0.000
      BaSO4              9.217e-11   9.219e-11   -10.035   -10.035     0.000
      ZnSO4              2.373e-11   2.374e-11   -10.625   -10.625     0.000
      HSO4-              7.719e-12   7.442e-12   -11.112   -11.128    -0.016
      CdSO4              3.124e-12   3.124e-12   -11.505   -11.505     0.000
      PbSO4              1.160e-12   1.161e-12   -11.935   -11.935     0.000
      CuSO4              5.866e-13   5.868e-13   -12.232   -12.232     0.000
      CaHSO4+            1.834e-14   1.768e-14   -13.737   -13.753    -0.016
      Zn(SO4)2-2         8.885e-15   7.675e-15   -14.051   -14.115    -0.064
      Cd(SO4)2-2         1.522e-15   1.315e-15   -14.818   -14.881    -0.064
      AlSO4+             3.908e-16   3.768e-16   -15.408   -15.424    -0.016
      Pb(SO4)2-2         2.357e-16   2.036e-16   -15.628   -15.691    -0.064
      Al(SO4)2-          3.720e-19   3.586e-19   -18.429   -18.445    -0.016
      FeSO4+             2.311e-19   2.228e-19   -18.636   -18.652    -0.016
      Fe(SO4)2-          1.547e-22   1.492e-22   -21.810   -21.826    -0.016
      AlHSO4+2           1.187e-25   1.025e-25   -24.926   -24.989    -0.064
      FeHSO4+2           2.608e-27   2.253e-27   -26.584   -26.647    -0.064
Sr                1.556e-07
      Sr+2               1.540e-07   1.333e-07    -6.812    -6.875    -0.063
      SrSO4              6.659e-10   6.661e-10    -9.177    -9.176     0.000
      SrHCO3+            6.433e-10   6.205e-10    -9.192    -9.207    -0.016
      SrCO3              2.225e-10   2.226e-10    -9.653    -9.653     0.000
      SrOH+              2.045e-12   1.972e-12   -11.689   -11.705    -0.016
Zn                1.239e-08
      Zn+2               4.167e-09   3.605e-09    -8.380    -8.443    -0.063
      Zn(OH)2            3.773e-09   3.774e-09    -8.423    -8.423     0.000
      ZnCO3              3.496e-09   3.497e-09    -8.456    -8.456     0.000
      Zn(CO3)2-2         4.208e-10   3.635e-10    -9.376    -9.440    -0.064
      ZnHCO3+            2.939e-10   2.833e-10    -9.532    -9.548    -0.016
      ZnOH+              2.131e-10   2.054e-10    -9.671    -9.687    -0.016
      ZnSO4              2.373e-11   2.374e-11   -10.625   -10.625     0.000
      Zn(OH)3-           3.571e-12   3.442e-12   -11.447   -11.463    -0.016
      Zn(SO4)2-2         8.885e-15   7.675e-15   -14.051   -14.115    -0.064
      Zn(OH)4-2          1.822e-16   1.573e-16   -15.740   -15.803    -0.064

------------------------------Saturation indices-------------------------------

      Phase               SI log IAP  log KT

      Al(OH)3(a)       -1.21   11.06   12.27  Al(OH)3
      Alunite          -7.70   -6.31    1.39  KAl3(SO4)2(OH)6
      Anglesite        -6.78  -14.69   -7.91  PbSO4
      Anhydrite        -3.83   -8.18   -4.35  CaSO4
      Aragonite        -0.79   -9.02   -8.23  CaCO3
      Barite           -2.35  -12.74  -10.38  BaSO4
      Calcite          -0.63   -9.02   -8.39  CaCO3
      Cd(OH)2          -6.16    7.49   13.65  Cd(OH)2
      CdSO4           -14.62  -13.91    0.72  CdSO4
      Celestite        -4.69  -11.35   -6.66  SrSO4
      Cerrusite        -2.12  -15.52  -13.40  PbCO3
      CO2(g)           -3.96  -22.23  -18.27  CO2
      Dolomite         -1.74  -18.31  -16.57  CaMg(CO3)2
      Fe(OH)3(a)        2.49    7.38    4.89  Fe(OH)3
      Gibbsite          1.68   11.06    9.38  Al(OH)3
```

```
      Goethite          7.58    7.38   -0.20  FeOOH
      Gypsum           -3.58   -8.18   -4.60  CaSO4:2H2O
      H2(g)           -24.92  -24.92    0.00  H2
      Hausmannite     -10.12   56.50   66.62  Mn3O4
      Hematite         17.06   14.76   -2.29  Fe2O3
      Hydroxyapatite   -1.09  -40.12  -39.04  Ca5(PO4)3OH
      Jarosite-K       -9.87  -17.34   -7.47  KFe3(SO4)2(OH)6
      Manganite        -2.35   22.99   25.34  MnOOH
      O2(g)           -40.87   49.84   90.71  O2
      Otavite          -2.64  -14.74  -12.10  CdCO3
      Pb(OH)2          -2.22    6.71    8.93  Pb(OH)2
      Pyrochroite      -4.67   10.53   15.20  Mn(OH)2
      Pyrolusite       -9.55   35.45   45.00  MnO2
      Rhodochrosite    -0.66  -11.71  -11.05  MnCO3
      Smithsonite      -4.00  -13.76   -9.76  ZnCO3
      Strontianite     -2.87  -12.19   -9.32  SrCO3
      Witherite        -4.88  -13.57   -8.69  BaCO3
      Zn(OH)2(e)       -3.02    8.48   11.50  Zn(OH)2

------------------
End of simulation.
------------------

------------------------------------
Reading input data for simulation 2.
------------------------------------

      SOLUTION 2 B3 Alteration Halo
            temp  4
            pH    7.96
            pe    4
            redox pe
            units ug/l
            density     1
            Alkalinity  23200 gfw 50.04
            Al    12.8
            Ba    1.36
            Ca    4260
            Cd    0.025
            Cu(2) 9.04
            Fe(3) 23
            K     250
            Mg    3660
            Mn(2) 4.55
            Na    260
            P     50
            Pb    1.2
            S(6)  5420
            Sr    16.51
            Zn    0.75
      SAVE solution 2
      END
-----------------------------------------
Beginning of initial solution calculations.
-----------------------------------------

Initial solution 2.     B3 Alteration Halo
```

◎ Table of Contents

----------Solution composition----------

Elements	Molality	Moles
Al	4.744e-07	4.744e-07
Alkalinity	4.636e-04	4.636e-04
Ba	9.903e-09	9.903e-09
Ca	1.063e-04	1.063e-04
Cd	2.224e-10	2.224e-10
Cu(2)	1.423e-07	1.423e-07
Fe(3)	4.119e-07	4.119e-07
K	6.394e-06	6.394e-06
Mg	1.505e-04	1.505e-04
Mn(2)	8.282e-08	8.282e-08
Na	1.131e-05	1.131e-05
P	1.614e-06	1.614e-06
Pb	5.792e-09	5.792e-09
S(6)	5.642e-05	5.642e-05
Sr	1.884e-07	1.884e-07
Zn	1.147e-08	1.147e-08

----------Description of solution----------

pH	=	7.960
pe	=	4.000
Activity of water	=	1.000
Ionic strength	=	8.608e-04
Mass of water (kg)	=	1.000e+00
Total carbon (mol/kg)	=	4.744e-04
Total CO2 (mol/kg)	=	4.744e-04
Temperature (deg C)	=	4.000
Electrical balance (eq)	=	-4.401e-05
Iterations	=	8
Total H	=	1.110129e+02
Total O	=	5.550786e+01

----------Distribution of species----------

Species	Molality	Activity	Log Molality	Log Activity	Log Gamma
OH-	1.588e-07	1.537e-07	-6.799	-6.813	-0.014
H+	1.131e-08	1.096e-08	-7.947	-7.960	-0.013
H2O	5.551e+01	1.000e+00	0.000	0.000	0.000
Al	4.744e-07				
Al(OH)4-	4.699e-07	4.551e-07	-6.328	-6.342	-0.014
Al(OH)3	3.067e-09	3.068e-09	-8.513	-8.513	0.000
Al(OH)2+	1.409e-09	1.364e-09	-8.851	-8.865	-0.014
AlOH+2	1.745e-11	1.535e-11	-10.758	-10.814	-0.056
Al+3	9.337e-14	7.082e-14	-13.030	-13.150	-0.120
AlSO4+	8.335e-15	8.072e-15	-14.079	-14.093	-0.014
Al(SO4)2-	1.146e-17	1.110e-17	-16.941	-16.955	-0.014
AlHSO4+2	7.898e-24	6.946e-24	-23.102	-23.158	-0.056
Ba	9.903e-09				
Ba+2	9.674e-09	8.518e-09	-8.014	-8.070	-0.055
BaSO4	2.062e-10	2.062e-10	-9.686	-9.686	0.000
BaHCO3+	1.922e-11	1.861e-11	-10.716	-10.730	-0.014
BaCO3	3.137e-12	3.137e-12	-11.504	-11.503	0.000

	BaOH+	2.718e-14	2.632e-14	-13.566	-13.580	-0.014
C(4)		4.744e-04				
	HCO3-	4.556e-04	4.414e-04	-3.341	-3.355	-0.014
	CO2	1.632e-05	1.632e-05	-4.787	-4.787	0.000
	CO3-2	1.234e-06	1.087e-06	-5.909	-5.964	-0.055
	MgHCO3+	6.700e-07	6.489e-07	-6.174	-6.188	-0.014
	CaHCO3+	3.242e-07	3.141e-07	-6.489	-6.503	-0.014
	CaCO3	1.352e-07	1.352e-07	-6.869	-6.869	0.000
	MgCO3	9.854e-08	9.856e-08	-7.006	-7.006	0.000
	MnCO3	5.641e-09	5.642e-09	-8.249	-8.249	0.000
	PbCO3	4.890e-09	4.891e-09	-8.311	-8.311	0.000
	NaHCO3	2.717e-09	2.718e-09	-8.566	-8.566	0.000
	MnHCO3+	2.655e-09	2.571e-09	-8.576	-8.590	-0.014
	ZnCO3	1.607e-09	1.607e-09	-8.794	-8.794	0.000
	SrHCO3+	5.584e-10	5.409e-10	-9.253	-9.267	-0.014
	ZnHCO3+	4.251e-10	4.117e-10	-9.371	-9.385	-0.014
	PbHCO3+	9.374e-11	9.078e-11	-10.028	-10.042	-0.014
	NaCO3-	7.323e-11	7.091e-11	-10.135	-10.149	-0.014
	SrCO3	6.134e-11	6.136e-11	-10.212	-10.212	0.000
	Zn(CO3)2-2	4.246e-11	3.734e-11	-10.372	-10.428	-0.056
	BaHCO3+	1.922e-11	1.861e-11	-10.716	-10.730	-0.014
	Pb(CO3)2-2	1.518e-11	1.335e-11	-10.819	-10.874	-0.056
	BaCO3	3.137e-12	3.137e-12	-11.504	-11.503	0.000
	CdHCO3+	2.750e-12	2.663e-12	-11.561	-11.575	-0.014
	CdCO3	1.647e-13	1.647e-13	-12.783	-12.783	0.000
	Cd(CO3)2-2	6.437e-16	5.661e-16	-15.191	-15.247	-0.056
Ca		1.063e-04				
	Ca+2	1.051e-04	9.254e-05	-3.979	-4.034	-0.055
	CaSO4	7.221e-07	7.222e-07	-6.141	-6.141	0.000
	CaHCO3+	3.242e-07	3.141e-07	-6.489	-6.503	-0.014
	CaCO3	1.352e-07	1.352e-07	-6.869	-6.869	0.000
	CaHPO4	3.688e-08	3.688e-08	-7.433	-7.433	0.000
	CaPO4-	5.368e-09	5.199e-09	-8.270	-8.284	-0.014
	CaOH+	1.446e-09	1.401e-09	-8.840	-8.854	-0.014
	CaH2PO4+	3.517e-10	3.406e-10	-9.454	-9.468	-0.014
	CaHSO4+	3.907e-14	3.783e-14	-13.408	-13.422	-0.014
Cd		2.224e-10				
	Cd+2	2.169e-10	1.908e-10	-9.664	-9.719	-0.056
	CdHCO3+	2.750e-12	2.663e-12	-11.561	-11.575	-0.014
	CdSO4	2.314e-12	2.315e-12	-11.636	-11.635	0.000
	CdOH+	2.798e-13	2.710e-13	-12.553	-12.567	-0.014
	CdCO3	1.647e-13	1.647e-13	-12.783	-12.783	0.000
	Cd(OH)2	7.086e-15	7.088e-15	-14.150	-14.149	0.000
	Cd(SO4)2-2	1.600e-15	1.408e-15	-14.796	-14.852	-0.056
	Cd(CO3)2-2	6.437e-16	5.661e-16	-15.191	-15.247	-0.056
	Cd(OH)3-	7.489e-20	7.253e-20	-19.126	-19.139	-0.014
	Cd(OH)4-2	6.703e-26	5.895e-26	-25.174	-25.230	-0.056
Cu(2)		1.423e-07				
	Cu(OH)2	1.406e-07	1.406e-07	-6.852	-6.852	0.000
	Cu+2	9.179e-10	8.091e-10	-9.037	-9.092	-0.055
	CuOH+	7.620e-10	7.379e-10	-9.118	-9.132	-0.014
	CuSO4	6.826e-12	6.827e-12	-11.166	-11.166	0.000
	Cu(OH)3-	7.979e-13	7.727e-13	-12.098	-12.112	-0.014
	Cu(OH)4-2	1.599e-17	1.406e-17	-16.796	-16.852	-0.056
Fe(3)		4.119e-07				
	Fe(OH)3	3.243e-07	3.244e-07	-6.489	-6.489	0.000
	Fe(OH)2+	7.632e-08	7.391e-08	-7.117	-7.131	-0.014
	Fe(OH)4-	1.124e-08	1.088e-08	-7.949	-7.963	-0.014

	FeOH+2	6.555e-12	5.765e-12	-11.183	-11.239	-0.056
	Fe+3	4.880e-17	3.702e-17	-16.312	-16.432	-0.120
	FeSO4+	1.228e-17	1.189e-17	-16.911	-16.925	-0.014
	FeHPO4+	5.461e-18	5.288e-18	-17.263	-17.277	-0.014
	FeH2PO4+2	2.517e-18	2.214e-18	-17.599	-17.655	-0.056
	Fe(SO4)2-	1.188e-20	1.151e-20	-19.925	-19.939	-0.014
	Fe2(OH)2+4	3.803e-21	2.275e-21	-20.420	-20.643	-0.223
	Fe3(OH)4+5	6.302e-25	2.825e-25	-24.200	-24.549	-0.348
	FeHSO4+2	4.323e-25	3.802e-25	-24.364	-24.420	-0.056
H(0)		2.131e-27				
	H2	1.066e-27	1.066e-27	-26.972	-26.972	0.000
K		6.394e-06				
	K+	6.392e-06	6.190e-06	-5.194	-5.208	-0.014
	KSO4-	1.463e-09	1.416e-09	-8.835	-8.849	-0.014
	KHPO4-	1.382e-11	1.338e-11	-10.860	-10.874	-0.014
	KOH	1.957e-12	1.957e-12	-11.708	-11.708	0.000
Mg		1.505e-04				
	Mg+2	1.489e-04	1.312e-04	-3.827	-3.882	-0.055
	MgSO4	8.301e-07	8.302e-07	-6.081	-6.081	0.000
	MgHCO3+	6.700e-07	6.489e-07	-6.174	-6.188	-0.014
	MgCO3	9.854e-08	9.856e-08	-7.006	-7.006	0.000
	MgHPO4	7.069e-08	7.070e-08	-7.151	-7.151	0.000
	MgPO4-	1.027e-08	9.943e-09	-7.989	-8.003	-0.014
	MgOH+	5.833e-09	5.649e-09	-8.234	-8.248	-0.014
	MgH2PO4+	6.351e-10	6.150e-10	-9.197	-9.211	-0.014
Mn(2)		8.282e-08				
	Mn+2	7.414e-08	6.535e-08	-7.130	-7.185	-0.055
	MnCO3	5.641e-09	5.642e-09	-8.249	-8.249	0.000
	MnHCO3+	2.655e-09	2.571e-09	-8.576	-8.590	-0.014
	MnSO4	3.647e-10	3.648e-10	-9.438	-9.438	0.000
	MnOH+	2.509e-11	2.429e-11	-10.601	-10.615	-0.014
Na		1.131e-05				
	Na+	1.130e-05	1.095e-05	-4.947	-4.961	-0.014
	NaHCO3	2.717e-09	2.718e-09	-8.566	-8.566	0.000
	NaSO4-	2.372e-09	2.297e-09	-8.625	-8.639	-0.014
	NaCO3-	7.323e-11	7.091e-11	-10.135	-10.149	-0.014
	NaHPO4-	2.444e-11	2.367e-11	-10.612	-10.626	-0.014
	NaOH	6.596e-12	6.597e-12	-11.181	-11.181	0.000
O(0)		0.000e+00				
	O2	0.000e+00	0.000e+00	-45.726	-45.726	0.000
P		1.614e-06				
	HPO4-2	1.261e-06	1.109e-06	-5.899	-5.955	-0.056
	H2PO4-	2.294e-07	2.222e-07	-6.639	-6.653	-0.014
	MgHPO4	7.069e-08	7.070e-08	-7.151	-7.151	0.000
	CaHPO4	3.688e-08	3.688e-08	-7.433	-7.433	0.000
	MgPO4-	1.027e-08	9.943e-09	-7.989	-8.003	-0.014
	CaPO4-	5.368e-09	5.199e-09	-8.270	-8.284	-0.014
	MgH2PO4+	6.351e-10	6.150e-10	-9.197	-9.211	-0.014
	CaH2PO4+	3.517e-10	3.406e-10	-9.454	-9.468	-0.014
	PO4-3	3.875e-11	2.902e-11	-10.412	-10.537	-0.126
	NaHPO4-	2.444e-11	2.367e-11	-10.612	-10.626	-0.014
	KHPO4-	1.382e-11	1.338e-11	-10.860	-10.874	-0.014
	FeHPO4+	5.461e-18	5.288e-18	-17.263	-17.277	-0.014
	FeH2PO4+2	2.517e-18	2.214e-18	-17.599	-17.655	-0.056
Pb		5.792e-09				
	PbCO3	4.890e-09	4.891e-09	-8.311	-8.311	0.000
	PbOH+	4.755e-10	4.604e-10	-9.323	-9.337	-0.014
	Pb+2	2.944e-10	2.589e-10	-9.531	-9.587	-0.056

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      PbHCO3+           9.374e-11   9.078e-11   -10.028   -10.042    -0.014
      Pb(OH)2           1.633e-11   1.634e-11   -10.787   -10.787     0.000
      Pb(CO3)2-2        1.518e-11   1.335e-11   -10.819   -10.874    -0.056
      PbSO4             7.032e-12   7.033e-12   -11.153   -11.153     0.000
      Pb(OH)3-          1.766e-14   1.711e-14   -13.753   -13.767    -0.014
      Pb(SO4)2-2        2.027e-15   1.783e-15   -14.693   -14.749    -0.056
      Pb(OH)4-2         4.064e-18   3.574e-18   -17.391   -17.447    -0.056
      Pb2OH+3           3.563e-18   2.669e-18   -17.448   -17.574    -0.125
S(6)              5.642e-05
      SO4-2             5.486e-05   4.830e-05    -4.261    -4.316    -0.055
      MgSO4             8.301e-07   8.302e-07    -6.081    -6.081     0.000
      CaSO4             7.221e-07   7.222e-07    -6.141    -6.141     0.000
      NaSO4-            2.372e-09   2.297e-09    -8.625    -8.639    -0.014
      KSO4-             1.463e-09   1.416e-09    -8.835    -8.849    -0.014
      SrSO4             1.187e-09   1.187e-09    -8.926    -8.926     0.000
      MnSO4             3.647e-10   3.648e-10    -9.438    -9.438     0.000
      BaSO4             2.062e-10   2.062e-10    -9.686    -9.686     0.000
      ZnSO4             7.049e-11   7.051e-11   -10.152   -10.152     0.000
      HSO4-             3.512e-11   3.401e-11   -10.454   -10.468    -0.014
      PbSO4             7.032e-12   7.033e-12   -11.153   -11.153     0.000
      CuSO4             6.826e-12   6.827e-12   -11.166   -11.166     0.000
      CdSO4             2.314e-12   2.315e-12   -11.636   -11.635     0.000
      CaHSO4+           3.907e-14   3.783e-14   -13.408   -13.422    -0.014
      Zn(SO4)2-2        3.745e-14   3.294e-14   -13.427   -13.482    -0.056
      AlSO4+            8.335e-15   8.072e-15   -14.079   -14.093    -0.014
      Pb(SO4)2-2        2.027e-15   1.783e-15   -14.693   -14.749    -0.056
      Cd(SO4)2-2        1.600e-15   1.408e-15   -14.796   -14.852    -0.056
      FeSO4+            1.228e-17   1.189e-17   -16.911   -16.925    -0.014
      Al(SO4)2-         1.146e-17   1.110e-17   -16.941   -16.955    -0.014
      Fe(SO4)2-         1.188e-20   1.151e-20   -19.925   -19.939    -0.014
      AlHSO4+2          7.898e-24   6.946e-24   -23.102   -23.158    -0.056
      FeHSO4+2          4.323e-25   3.802e-25   -24.364   -24.420    -0.056
Sr                1.884e-07
      Sr+2              1.866e-07   1.644e-07    -6.729    -6.784    -0.055
      SrSO4             1.187e-09   1.187e-09    -8.926    -8.926     0.000
      SrHCO3+           5.584e-10   5.409e-10    -9.253    -9.267    -0.014
      SrCO3             6.134e-11   6.136e-11   -10.212   -10.212     0.000
      SrOH+             7.939e-13   7.690e-13   -12.100   -12.114    -0.014
Zn                1.147e-08
      Zn+2              8.415e-09   7.409e-09    -8.075    -8.130    -0.055
      ZnCO3             1.607e-09   1.607e-09    -8.794    -8.794     0.000
      Zn(OH)2           7.757e-10   7.758e-10    -9.110    -9.110     0.000
      ZnHCO3+           4.251e-10   4.117e-10    -9.371    -9.385    -0.014
      ZnOH+             1.379e-10   1.335e-10    -9.861    -9.874    -0.014
      ZnSO4             7.049e-11   7.051e-11   -10.152   -10.152     0.000
      Zn(CO3)2-2        4.246e-11   3.734e-11   -10.372   -10.428    -0.056
      Zn(OH)3-          2.310e-13   2.237e-13   -12.636   -12.650    -0.014
      Zn(SO4)2-2        3.745e-14   3.294e-14   -13.427   -13.482    -0.056
      Zn(OH)4-2         3.677e-18   3.234e-18   -17.434   -17.490    -0.056

------------------------------Saturation indices-------------------------------

      Phase               SI log IAP  log KT

      Al(OH)3(a)       -1.54   10.73   12.27  Al(OH)3
      Alunite          -6.92   -5.53    1.39  KAl3(SO4)2(OH)6
      Anglesite        -5.99  -13.90   -7.91  PbSO4
      Anhydrite        -4.00   -8.35   -4.35  CaSO4
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      Aragonite        -1.77  -10.00   -8.23  CaCO3
      Barite           -2.00  -12.39  -10.38  BaSO4
      Calcite          -1.61  -10.00   -8.39  CaCO3
      Cd(OH)2          -7.45    6.20   13.65  Cd(OH)2
      CdSO4           -14.75  -14.04    0.72  CdSO4
      Celestite        -4.44  -11.10   -6.66  SrSO4
      Cerrusite        -2.15  -15.55  -13.40  PbCO3
      CO2(g)           -3.61  -21.88  -18.27  CO2
      Dolomite         -3.28  -19.84  -16.57  CaMg(CO3)2
      Fe(OH)3(a)        2.56    7.45    4.89  Fe(OH)3
      Gibbsite          1.35   10.73    9.38  Al(OH)3
      Goethite          7.64    7.45   -0.20  FeOOH
      Gypsum           -3.75   -8.35   -4.60  CaSO4:2H2O
      H2(g)           -23.92  -23.92    0.00  H2
      Hausmannite     -16.49   50.13   66.62  Mn3O4
      Hematite         17.19   14.90   -2.29  Fe2O3
      Hydroxyapatite   -4.78  -43.82  -39.04  Ca5(PO4)3OH
      Jarosite-K       -7.90  -15.38   -7.47  KFe3(SO4)2(OH)6
      Manganite        -4.64   20.70   25.34  MnOOH
      O2(g)           -42.87   47.84   90.71  O2
      Otavite          -3.58  -15.68  -12.10  CdCO3
      Pb(OH)2          -2.59    6.33    8.93  Pb(OH)2
      Pyrochroite      -6.46    8.74   15.20  Mn(OH)2
      Pyrolusite      -12.34   32.66   45.00  MnO2
      Rhodochrosite    -2.10  -13.15  -11.05  MnCO3
      Smithsonite      -4.34  -14.09   -9.76  ZnCO3
      Strontianite     -3.43  -12.75   -9.32  SrCO3
      Witherite        -5.34  -14.03   -8.69  BaCO3
      Zn(OH)2(e)       -3.71    7.79   11.50  Zn(OH)2

------------------
End of simulation.
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Reading input data for simulation 3.
-----------------------------------

      MIX 1 Mixing B2 Minzo and B3 Altha
            1     0.5
            2     0.5
      SAVE solution 3
      END
-----------------------------------
Beginning of reaction calculations.
-----------------------------------

Reaction step 1.

Using mixture 1.  Mixing B2 Minzo and B3 Altha

       5.000e-01 Solution 1   B2 Mineralized Zone
       5.000e-01 Solution 2   B3 Alteration Halo

----------------------------Solution composition------------------------------

      Elements           Molality       Moles
```

```
      Al                1.833e-06   1.833e-06
      Ba                8.192e-09   8.192e-09
      C                 5.691e-04   5.691e-04
      Ca                1.690e-04   1.690e-04
      Cd                3.336e-10   3.336e-10
      Cu                1.586e-07   1.586e-07
      Fe                3.704e-07   3.704e-07
      K                 6.829e-06   6.829e-06
      Mg                1.371e-04   1.371e-04
      Mn                3.648e-07   3.648e-07
      Na                1.468e-05   1.468e-05
      P                 1.614e-06   1.614e-06
      Pb                5.792e-09   5.792e-09
      S                 4.830e-05   4.830e-05
      Sr                1.720e-07   1.720e-07
      Zn                1.193e-08   1.193e-08

----------------------------Description of solution----------------------------

                            pH  =   8.222      Charge balance
                            pe  =   9.238      Adjusted to redox equilibrium
               Activity of water  =   1.000
                  Ionic strength  =   9.966e-04
                Mass of water (kg)  =   1.000e+00
         Total alkalinity (eq/kg)  =   5.716e-04
               Total CO2 (mol/kg)  =   5.691e-04
             Temperature (deg C)  =   4.000
          Electrical balance (eq)  =  -2.864e-05
                     Iterations  =  20
                        Total H  = 1.110130e+02
                        Total O  = 5.550812e+01

----------------------------Distribution of species----------------------------

                                                 Log       Log         Log
      Species            Molality    Activity  Molality  Activity     Gamma

      OH-               2.909e-07   2.810e-07    -6.536    -6.551    -0.015
      H+                6.198e-09   5.998e-09    -8.208    -8.222    -0.014
      H2O               5.551e+01   1.000e+00     0.000     0.000     0.000
Al                1.833e-06
      Al(OH)4-          1.825e-06   1.763e-06    -5.739    -5.754    -0.015
      Al(OH)3           6.499e-09   6.501e-09    -8.187    -8.187     0.000
      Al(OH)2+          1.637e-09   1.582e-09    -8.786    -8.801    -0.015
      AlOH+2            1.117e-11   9.732e-12   -10.952   -11.012    -0.060
      Al+3              3.302e-14   2.457e-14   -13.481   -13.610    -0.128
      AlSO4+            2.444e-15   2.362e-15   -14.612   -14.627    -0.015
      Al(SO4)2-         2.836e-18   2.740e-18   -17.547   -17.562    -0.015
      AlHSO4+2          1.276e-24   1.112e-24   -23.894   -23.954    -0.060
Ba                8.192e-09
      Ba+2              8.024e-09   7.000e-09    -8.096    -8.155    -0.059
      BaSO4             1.429e-10   1.429e-10    -9.845    -9.845     0.000
      BaHCO3+           1.918e-11   1.853e-11   -10.717   -10.732    -0.015
      BaCO3             5.711e-12   5.712e-12   -11.243   -11.243     0.000
      BaOH+             4.093e-14   3.954e-14   -13.388   -13.403    -0.015
C(-4)             0.000e+00
      CH4               0.000e+00   0.000e+00  -117.284  -117.284     0.000
C(4)              5.691e-04
```

	HCO3-	5.534e-04	5.349e-04	-3.257	-3.272	-0.015
	CO2	1.082e-05	1.082e-05	-4.966	-4.966	0.000
	CO3-2	2.759e-06	2.408e-06	-5.559	-5.618	-0.059
	MgHCO3+	7.340e-07	7.091e-07	-6.134	-6.149	-0.015
	CaHCO3+	6.199e-07	5.991e-07	-6.208	-6.222	-0.015
	CaCO3	4.715e-07	4.716e-07	-6.327	-6.326	0.000
	MgCO3	1.969e-07	1.969e-07	-6.706	-6.706	0.000
	MnCO3	5.016e-08	5.017e-08	-7.300	-7.300	0.000
	MnHCO3+	1.294e-08	1.251e-08	-7.888	-7.903	-0.015
	PbCO3	5.122e-09	5.123e-09	-8.291	-8.290	0.000
	NaHCO3	4.264e-09	4.265e-09	-8.370	-8.370	0.000
	ZnCO3	2.708e-09	2.708e-09	-8.567	-8.567	0.000
	SrHCO3+	6.135e-10	5.930e-10	-9.212	-9.227	-0.015
	ZnHCO3+	3.929e-10	3.796e-10	-9.406	-9.421	-0.015
	NaCO3-	2.106e-10	2.035e-10	-9.677	-9.692	-0.015
	Zn(CO3)2-2	1.600e-10	1.394e-10	-9.796	-9.856	-0.060
	SrCO3	1.229e-10	1.230e-10	-9.910	-9.910	0.000
	PbHCO3+	5.384e-11	5.201e-11	-10.269	-10.284	-0.015
	Pb(CO3)2-2	3.556e-11	3.099e-11	-10.449	-10.509	-0.060
	BaHCO3+	1.918e-11	1.853e-11	-10.717	-10.732	-0.015
	BaCO3	5.711e-12	5.712e-12	-11.243	-11.243	0.000
	CdHCO3+	4.950e-12	4.782e-12	-11.305	-11.320	-0.015
	CdCO3	5.406e-13	5.408e-13	-12.267	-12.267	0.000
	FeCO3	6.991e-15	6.993e-15	-14.155	-14.155	0.000
	FeHCO3+	6.702e-15	6.475e-15	-14.174	-14.189	-0.015
	Cd(CO3)2-2	4.726e-15	4.118e-15	-14.326	-14.385	-0.060
Ca		1.690e-04				
	Ca+2	1.669e-04	1.457e-04	-3.778	-3.837	-0.059
	CaSO4	9.587e-07	9.590e-07	-6.018	-6.018	0.000
	CaHCO3+	6.199e-07	5.991e-07	-6.208	-6.222	-0.015
	CaCO3	4.715e-07	4.716e-07	-6.327	-6.326	0.000
	CaHPO4	6.033e-08	6.034e-08	-7.219	-7.219	0.000
	CaPO4-	1.609e-08	1.555e-08	-7.793	-7.808	-0.015
	CaOH+	4.172e-09	4.031e-09	-8.380	-8.395	-0.015
	CaH2PO4+	3.155e-10	3.048e-10	-9.501	-9.516	-0.015
	CaHSO4+	2.844e-14	2.748e-14	-13.546	-13.561	-0.015
Cd		3.336e-10				
	Cd+2	3.245e-10	2.827e-10	-9.489	-9.549	-0.060
	CdHCO3+	4.950e-12	4.782e-12	-11.305	-11.320	-0.015
	CdSO4	2.893e-12	2.893e-12	-11.539	-11.539	0.000
	CdOH+	7.598e-13	7.341e-13	-12.119	-12.134	-0.015
	CdCO3	5.406e-13	5.408e-13	-12.267	-12.267	0.000
	Cd(OH)2	3.509e-14	3.510e-14	-13.455	-13.455	0.000
	Cd(CO3)2-2	4.726e-15	4.118e-15	-14.326	-14.385	-0.060
	Cd(SO4)2-2	1.703e-15	1.484e-15	-14.769	-14.829	-0.060
	Cd(OH)3-	6.796e-19	6.566e-19	-18.168	-18.183	-0.015
	Cd(OH)4-2	1.120e-24	9.756e-25	-23.951	-24.011	-0.060
Cu(1)		6.911e-17				
	Cu+	6.911e-17	6.674e-17	-16.160	-16.176	-0.015
Cu(2)		1.586e-07				
	Cu(OH)2	1.578e-07	1.579e-07	-6.802	-6.802	0.000
	CuOH+	4.692e-10	4.533e-10	-9.329	-9.344	-0.015
	Cu+2	3.112e-10	2.719e-10	-9.507	-9.566	-0.059
	CuSO4	1.935e-12	1.935e-12	-11.713	-11.713	0.000
	Cu(OH)3-	1.642e-12	1.586e-12	-11.785	-11.800	-0.015
	Cu(OH)4-2	6.055e-17	5.276e-17	-16.218	-16.278	-0.060
Fe(2)		1.546e-13				
	Fe+2	1.386e-13	1.211e-13	-12.858	-12.917	-0.059

	FeCO3	6.991e-15	6.993e-15	-14.155	-14.155	0.000
	FeHCO3+	6.702e-15	6.475e-15	-14.174	-14.189	-0.015
	FeOH+	1.221e-15	1.180e-15	-14.913	-14.928	-0.015
	FeSO4	5.802e-16	5.803e-16	-15.236	-15.236	0.000
	FeHPO4	5.552e-16	5.553e-16	-15.256	-15.255	0.000
	FeH2PO4+	7.933e-18	7.665e-18	-17.101	-17.115	-0.015
	FeHSO4+	2.364e-23	2.284e-23	-22.626	-22.641	-0.015
	Fe(HS)2	0.000e+00	0.000e+00	-234.576	-234.576	0.000
	Fe(HS)3-	0.000e+00	0.000e+00	-347.829	-347.844	-0.015
Fe(3)		3.704e-07				
	Fe(OH)3	3.106e-07	3.107e-07	-6.508	-6.508	0.000
	Fe(OH)2+	4.008e-08	3.872e-08	-7.397	-7.412	-0.015
	Fe(OH)4-	1.972e-08	1.905e-08	-7.705	-7.720	-0.015
	FeOH+2	1.896e-12	1.652e-12	-11.722	-11.782	-0.060
	Fe+3	7.800e-18	5.804e-18	-17.108	-17.236	-0.128
	FeSO4+	1.628e-18	1.573e-18	-17.788	-17.803	-0.015
	FeHPO4+	8.919e-19	8.617e-19	-18.050	-18.065	-0.015
	FeH2PO4+2	2.265e-19	1.974e-19	-18.645	-18.705	-0.060
	Fe(SO4)2-	1.328e-21	1.283e-21	-20.877	-20.892	-0.015
	Fe2(OH)2+4	3.243e-22	1.869e-22	-21.489	-21.728	-0.239
	FeHSO4+2	3.156e-26	2.750e-26	-25.501	-25.561	-0.060
	Fe3(OH)4+5	2.876e-26	1.216e-26	-25.541	-25.915	-0.374
H(0)		2.128e-38				
	H2	1.064e-38	1.064e-38	-37.973	-37.973	0.000
K		6.829e-06				
	K+	6.827e-06	6.595e-06	-5.166	-5.181	-0.015
	KSO4-	1.318e-09	1.273e-09	-8.880	-8.895	-0.015
	KHPO4-	1.534e-11	1.482e-11	-10.814	-10.829	-0.015
	KOH	3.812e-12	3.812e-12	-11.419	-11.419	0.000
Mg		1.371e-04				
	Mg+2	1.355e-04	1.183e-04	-3.868	-3.927	-0.059
	MgHCO3+	7.340e-07	7.091e-07	-6.134	-6.149	-0.015
	MgSO4	6.314e-07	6.315e-07	-6.200	-6.200	0.000
	MgCO3	1.969e-07	1.969e-07	-6.706	-6.706	0.000
	MgHPO4	6.625e-08	6.627e-08	-7.179	-7.179	0.000
	MgPO4-	1.763e-08	1.703e-08	-7.754	-7.769	-0.015
	MgOH+	9.639e-09	9.312e-09	-8.016	-8.031	-0.015
	MgH2PO4+	3.263e-10	3.153e-10	-9.486	-9.501	-0.015
Mn(2)		3.648e-07				
	Mn+2	3.003e-07	2.623e-07	-6.522	-6.581	-0.059
	MnCO3	5.016e-08	5.017e-08	-7.300	-7.300	0.000
	MnHCO3+	1.294e-08	1.251e-08	-7.888	-7.903	-0.015
	MnSO4	1.235e-09	1.235e-09	-8.908	-8.908	0.000
	MnOH+	1.845e-10	1.782e-10	-9.734	-9.749	-0.015
Mn(3)		7.061e-25				
	Mn+3	7.061e-25	5.179e-25	-24.151	-24.286	-0.135
Na		1.468e-05				
	Na+	1.467e-05	1.418e-05	-4.833	-4.848	-0.015
	NaHCO3	4.264e-09	4.265e-09	-8.370	-8.370	0.000
	NaSO4-	2.597e-09	2.509e-09	-8.586	-8.600	-0.015
	NaCO3-	2.106e-10	2.035e-10	-9.677	-9.692	-0.015
	NaHPO4-	3.297e-11	3.186e-11	-10.482	-10.497	-0.015
	NaOH	1.562e-11	1.562e-11	-10.806	-10.806	0.000
O(0)		3.769e-24				
	O2	1.884e-24	1.885e-24	-23.725	-23.725	0.000
P		1.614e-06				
	HPO4-2	1.323e-06	1.152e-06	-5.879	-5.938	-0.060
	H2PO4-	1.307e-07	1.263e-07	-6.884	-6.898	-0.015

	MgHPO4	6.625e-08	6.627e-08	-7.179	-7.179	0.000
	CaHPO4	6.033e-08	6.034e-08	-7.219	-7.219	0.000
	MgPO4-	1.763e-08	1.703e-08	-7.754	-7.769	-0.015
	CaPO4-	1.609e-08	1.555e-08	-7.793	-7.808	-0.015
	MgH2PO4+	3.263e-10	3.153e-10	-9.486	-9.501	-0.015
	CaH2PO4+	3.155e-10	3.048e-10	-9.501	-9.516	-0.015
	PO4-3	7.519e-11	5.514e-11	-10.124	-10.259	-0.135
	NaHPO4-	3.297e-11	3.186e-11	-10.482	-10.497	-0.015
	KHPO4-	1.534e-11	1.482e-11	-10.814	-10.829	-0.015
	FeHPO4	5.552e-16	5.553e-16	-15.256	-15.255	0.000
	FeH2PO4+	7.933e-18	7.665e-18	-17.101	-17.115	-0.015
	FeHPO4+	8.919e-19	8.617e-19	-18.050	-18.065	-0.015
	FeH2PO4+2	2.265e-19	1.974e-19	-18.645	-18.705	-0.060
Pb		5.792e-09				
	PbCO3	5.122e-09	5.123e-09	-8.291	-8.290	0.000
	PbOH+	4.119e-10	3.979e-10	-9.385	-9.400	-0.015
	Pb+2	1.405e-10	1.224e-10	-9.852	-9.912	-0.060
	PbHCO3+	5.384e-11	5.201e-11	-10.269	-10.284	-0.015
	Pb(CO3)2-2	3.556e-11	3.099e-11	-10.449	-10.509	-0.060
	Pb(OH)2	2.581e-11	2.581e-11	-10.588	-10.588	0.000
	PbSO4	2.804e-12	2.805e-12	-11.552	-11.552	0.000
	Pb(OH)3-	5.114e-14	4.941e-14	-13.291	-13.306	-0.015
	Pb(SO4)2-2	6.883e-16	5.997e-16	-15.162	-15.222	-0.060
	Pb(OH)4-2	2.166e-17	1.887e-17	-16.664	-16.724	-0.060
	Pb2OH+3	1.487e-18	1.091e-18	-17.828	-17.962	-0.135
S(-2)		0.000e+00				
	HS-	0.000e+00	0.000e+00	-115.290	-115.305	-0.015
	H2S	0.000e+00	0.000e+00	-116.253	-116.253	0.000
	S-2	0.000e+00	0.000e+00	-120.613	-120.673	-0.059
	Fe(HS)2	0.000e+00	0.000e+00	-234.576	-234.576	0.000
	Fe(HS)3-	0.000e+00	0.000e+00	-347.829	-347.844	-0.015
S(6)		4.830e-05				
	SO4-2	4.671e-05	4.074e-05	-4.331	-4.390	-0.059
	CaSO4	9.587e-07	9.590e-07	-6.018	-6.018	0.000
	MgSO4	6.314e-07	6.315e-07	-6.200	-6.200	0.000
	NaSO4-	2.597e-09	2.509e-09	-8.586	-8.600	-0.015
	KSO4-	1.318e-09	1.273e-09	-8.880	-8.895	-0.015
	MnSO4	1.235e-09	1.235e-09	-8.908	-8.908	0.000
	SrSO4	9.053e-10	9.055e-10	-9.043	-9.043	0.000
	BaSO4	1.429e-10	1.429e-10	-9.845	-9.845	0.000
	ZnSO4	4.523e-11	4.524e-11	-10.345	-10.344	0.000
	HSO4-	1.624e-11	1.569e-11	-10.789	-10.804	-0.015
	CdSO4	2.893e-12	2.893e-12	-11.539	-11.539	0.000
	PbSO4	2.804e-12	2.805e-12	-11.552	-11.552	0.000
	CuSO4	1.935e-12	1.935e-12	-11.713	-11.713	0.000
	CaHSO4+	2.844e-14	2.748e-14	-13.546	-13.561	-0.015
	Zn(SO4)2-2	2.046e-14	1.783e-14	-13.689	-13.749	-0.060
	AlSO4+	2.444e-15	2.362e-15	-14.612	-14.627	-0.015
	Cd(SO4)2-2	1.703e-15	1.484e-15	-14.769	-14.829	-0.060
	Pb(SO4)2-2	6.883e-16	5.997e-16	-15.162	-15.222	-0.060
	FeSO4	5.802e-16	5.803e-16	-15.236	-15.236	0.000
	Al(SO4)2-	2.836e-18	2.740e-18	-17.547	-17.562	-0.015
	FeSO4+	1.628e-18	1.573e-18	-17.788	-17.803	-0.015
	Fe(SO4)2-	1.328e-21	1.283e-21	-20.877	-20.892	-0.015
	FeHSO4+	2.364e-23	2.284e-23	-22.626	-22.641	-0.015
	AlHSO4+2	1.276e-24	1.112e-24	-23.894	-23.954	-0.060
	FeHSO4+2	3.156e-26	2.750e-26	-25.501	-25.561	-0.060
Sr		1.720e-07				

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      Sr+2              1.704e-07   1.487e-07    -6.769    -6.828    -0.059
      SrSO4             9.053e-10   9.055e-10    -9.043    -9.043     0.000
      SrHCO3+           6.135e-10   5.930e-10    -9.212    -9.227    -0.015
      SrCO3             1.229e-10   1.230e-10    -9.910    -9.910     0.000
      SrOH+             1.316e-12   1.272e-12   -11.881   -11.896    -0.015
Zn              1.193e-08
      Zn+2              6.461e-09   5.637e-09    -8.190    -8.249    -0.059
      ZnCO3             2.708e-09   2.708e-09    -8.567    -8.567     0.000
      Zn(OH)2           1.972e-09   1.972e-09    -8.705    -8.705     0.000
      ZnHCO3+           3.929e-10   3.796e-10    -9.406    -9.421    -0.015
      ZnOH+             1.922e-10   1.857e-10    -9.716    -9.731    -0.015
      Zn(CO3)2-2        1.600e-10   1.394e-10    -9.796    -9.856    -0.060
      ZnSO4             4.523e-11   4.524e-11   -10.345   -10.344     0.000
      Zn(OH)3-          1.076e-12   1.040e-12   -11.968   -11.983    -0.015
      Zn(SO4)2-2        2.046e-14   1.783e-14   -13.689   -13.749    -0.060
      Zn(OH)4-2         3.154e-17   2.748e-17   -16.501   -16.561    -0.060

------------------------------Saturation indices-------------------------------

      Phase               SI log IAP  log KT

      Al(OH)3(a)       -1.22   11.06   12.27  Al(OH)3
      Alunite          -6.85   -5.46    1.39  KAl3(SO4)2(OH)6
      Anglesite        -6.39  -14.30   -7.91  PbSO4
      Anhydrite        -3.88   -8.23   -4.35  CaSO4
      Aragonite        -1.22   -9.45   -8.23  CaCO3
      Barite           -2.16  -12.54  -10.38  BaSO4
      Calcite          -1.06   -9.45   -8.39  CaCO3
      Cd(OH)2          -6.75    6.90   13.65  Cd(OH)2
      CdSO4           -14.66  -13.94    0.72  CdSO4
      Celestite        -4.55  -11.22   -6.66  SrSO4
      Cerrusite        -2.13  -15.53  -13.40  PbCO3
      CH4(g)         -114.61 -161.75  -47.13  CH4
      CO2(g)           -3.79  -22.06  -18.27  CO2
      Dolomite         -2.43  -19.00  -16.57  CaMg(CO3)2
      Fe(OH)3(a)        2.54   20.99   18.45  Fe(OH)3
      FeS(ppt)       -116.08 -156.99  -40.91  FeS
      Gibbsite          1.68   11.06    9.38  Al(OH)3
      Goethite          7.63   20.99   13.36  FeOOH
      Gypsum           -3.62   -8.23   -4.60  CaSO4:2H2O
      H2(g)           -34.92  -34.92    0.00  H2
      H2S(g)         -115.51 -160.52  -45.01  H2S
      Hausmannite      -2.11   64.51   66.62  Mn3O4
      Hematite         17.15   41.97   24.82  Fe2O3
      Hydroxyapatite   -2.70  -41.74  -39.04  Ca5(PO4)3OH
      Jarosite-K       -8.86   24.34   33.20  KFe3(SO4)2(OH)6
      Mackinawite    -115.35 -156.99  -41.64  FeS
      Manganite         1.98   27.32   25.34  MnOOH
      Melanterite     -14.80  -17.31   -2.50  FeSO4:7H2O
      O2(g)           -20.87   69.84   90.71  O2
      Otavite          -3.07  -15.17  -12.10  CdCO3
      Pb(OH)2          -2.40    6.53    8.93  Pb(OH)2
      Pyrite         -189.50 -282.59  -93.09  FeS2
      Pyrochroite      -5.34    9.86   15.20  Mn(OH)2
      Pyrolusite       -0.21   44.78   45.00  MnO2
      Rhodochrosite    -1.15  -12.20  -11.05  MnCO3
      Siderite         -7.78  -18.54  -10.75  FeCO3
      Smithsonite      -4.11  -13.87   -9.76  ZnCO3
```

```
      Sphalerite     -103.26 -152.32  -49.07  ZnS
      Strontianite     -3.13  -12.45   -9.32  SrCO3
      Sulfur          -86.74 -125.60  -38.85  S
      Vivianite       -23.27  -59.27  -36.00  Fe3(PO4)2:8H2O
      Witherite        -5.08  -13.77   -8.69  BaCO3
      Zn(OH)2(e)       -3.30    8.20   11.50  Zn(OH)2

------------------
End of simulation.
------------------

------------------------------------
Reading input data for simulation 4.
------------------------------------

      SOLUTION 4 Rain Water
            temp  4
            pH    7.0   CO2(g) 0.0
            pe    4.0
            redox pe
            units ug/l
            density     1.0
      EQUILIBRIUM_PHASES 1
            CO2(g)      -3.5        10.0
      SAVE solution 4
      END
-----------------------------------------
Beginning of initial solution calculations.
-----------------------------------------

Initial solution 4.     Rain Water

-----------------------------Solution composition------------------------------

      Elements           Molality       Moles

      Pure water

----------------------------Description of solution----------------------------

                              pH  =   6.327      Equilibrium with CO2(g)
                              pe  =   4.000
               Activity of water  =   1.000
                  Ionic strength  =   2.374e-07
                 Mass of water (kg)  =   1.000e+00
          Total alkalinity (eq/kg)  =  -4.676e-07
             Total carbon (mol/kg)  =   0.000e+00
                Total CO2 (mol/kg)  =   0.000e+00
               Temperature (deg C)  =   4.000
           Electrical balance (eq)  =   4.676e-07
                       Iterations  =   3
                          Total H  = 1.110124e+02
                          Total O  = 5.550622e+01

----------------------------Distribution of species----------------------------

                                                 Log       Log         Log
      Species           Molality    Activity  Molality  Activity     Gamma
```

```
      H+                4.712e-07   4.709e-07    -6.327    -6.327     0.000
      OH-               3.581e-09   3.579e-09    -8.446    -8.446     0.000
      H2O               5.551e+01   1.000e+00     0.000     0.000     0.000
H(0)             3.932e-24
      H2                1.966e-24   1.966e-24   -23.706   -23.706     0.000
O(0)             0.000e+00
      O2                0.000e+00   0.000e+00   -52.258   -52.258     0.000

-----------------------------Saturation indices-------------------------------

      Phase               SI log IAP  log KT

      H2(g)           -20.65  -20.65    0.00  H2
      O2(g)           -49.40   41.31   90.71  O2

-----------------------------------
Beginning of reaction calculations.
-----------------------------------

Reaction step 1.

Using solution 4. Rain Water

Using pure phase assemblage 1.

-------------------------------Phase assemblage--------------------------------

                                                      Moles in assemblage
      Phase               SI log IAP  log KT    Initial      Final      Delta

      CO2(g)          -3.50  -21.77  -18.27  1.000e+01  1.000e+01 -2.338e-05

-----------------------------Solution composition-----------------------------

      Elements           Molality       Moles

      C                 2.338e-05   2.338e-05

----------------------------Description of solution----------------------------

                            pH  =   5.561      Charge balance
                            pe  =   4.001      Adjusted to redox equilibrium
             Activity of water  =   1.000
                Ionic strength  =   2.517e-06
             Mass of water (kg)  =   1.000e+00
       Total alkalinity (eq/kg)  =  -4.676e-07
             Total CO2 (mol/kg)  =   2.338e-05
            Temperature (deg C)  =   4.000
        Electrical balance (eq)  =   4.676e-07
                    Iterations  =   6
                       Total H  = 1.110124e+02
                       Total O  = 5.550626e+01

---------------------------Distribution of species----------------------------

                                            Log       Log         Log
      Species            Molality    Activity  Molality  Activity     Gamma
```

```
      H+                2.750e-06   2.745e-06    -5.561    -5.561    -0.001
      OH-               6.151e-10   6.139e-10    -9.211    -9.212    -0.001
      H2O               5.551e+01   1.000e+00     0.000     0.000     0.000
C(-4)             0.000e+00
      CH4               0.000e+00   0.000e+00   -53.813   -53.813     0.000
C(4)              2.338e-05
      CO2               2.109e-05   2.109e-05    -4.676    -4.676     0.000
      HCO3-             2.282e-06   2.278e-06    -5.642    -5.642    -0.001
      CO3-2             2.257e-11   2.240e-11   -10.647   -10.650    -0.003
H(0)              1.329e-22
      H2                6.644e-23   6.644e-23   -22.178   -22.178     0.000
O(0)              0.000e+00
      O2                0.000e+00   0.000e+00   -55.316   -55.316     0.000

-----------------------------Saturation indices-------------------------------

      Phase               SI log IAP  log KT

      CH4(g)          -51.14  -98.27  -47.13  CH4
      CO2(g)           -3.50  -21.77  -18.27  CO2
      H2(g)           -19.13  -19.13    0.00  H2
      O2(g)           -52.46   38.25   90.71  O2

------------------
End of simulation.
------------------

------------------------------------
Reading input data for simulation 5.
------------------------------------

      MIX 2 Mixing B2/B3 with Rain Water
            3     0.5
            4     0.5
      SAVE solution 5
      END
-----------------------------------
Beginning of reaction calculations.
-----------------------------------

Reaction step 1.

Using mixture 2.  Mixing B2/B3 with Rain Water

       5.000e-01 Solution 3   Solution after simulation 3.
       5.000e-01 Solution 4   Solution after simulation 4.

----------------------------Solution composition------------------------------

      Elements           Molality       Moles

      Al                9.164e-07   9.164e-07
      Ba                4.096e-09   4.096e-09
      C                 2.962e-04   2.962e-04
      Ca                8.452e-05   8.452e-05
      Cd                1.668e-10   1.668e-10
      Cu                7.932e-08   7.932e-08
```

```
      Fe                1.852e-07   1.852e-07
      K                 3.414e-06   3.414e-06
      Mg                6.856e-05   6.856e-05
      Mn                1.824e-07   1.824e-07
      Na                7.341e-06   7.341e-06
      P                 8.072e-07   8.072e-07
      Pb                2.896e-09   2.896e-09
      S                 2.415e-05   2.415e-05
      Sr                8.600e-08   8.600e-08
      Zn                5.966e-09   5.966e-09

----------------------------Description of solution----------------------------

                            pH  =   7.763      Charge balance
                            pe  =  10.232      Adjusted to redox equilibrium
               Activity of water  =   1.000
                  Ionic strength  =   5.004e-04
                Mass of water (kg)  =   1.000e+00
       Total alkalinity (eq/kg)  =   2.856e-04
             Total CO2 (mol/kg)  =   2.962e-04
           Temperature (deg C)  =   4.000
        Electrical balance (eq)  =  -1.409e-05
                     Iterations  =  15
                        Total H  = 1.110127e+02
                        Total O  = 5.550719e+01

----------------------------Distribution of species----------------------------

                                                  Log       Log         Log
      Species            Molality    Activity  Molality  Activity     Gamma

      OH-               1.001e-07   9.760e-08    -7.000    -7.011    -0.011
      H+                1.769e-08   1.727e-08    -7.752    -7.763    -0.010
      H2O               5.551e+01   1.000e+00     0.000     0.000     0.000
Al              9.164e-07
      Al(OH)4-          9.003e-07   8.783e-07    -6.046    -6.056    -0.011
      Al(OH)3           9.323e-09   9.324e-09    -8.030    -8.030     0.000
      Al(OH)2+          6.695e-09   6.532e-09    -8.174    -8.185    -0.011
      AlOH+2            1.277e-10   1.157e-10    -9.894    -9.937    -0.043
      Al+3              1.042e-12   8.410e-13   -11.982   -12.075    -0.093
      AlSO4+            4.372e-14   4.265e-14   -13.359   -13.370    -0.011
      Al(SO4)2-         2.676e-17   2.611e-17   -16.573   -16.583    -0.011
      AlHSO4+2          6.381e-23   5.781e-23   -22.195   -22.238    -0.043
Ba              4.096e-09
      Ba+2              4.051e-09   3.672e-09    -8.392    -8.435    -0.043
      BaSO4             3.955e-11   3.956e-11   -10.403   -10.403     0.000
      BaHCO3+           5.080e-12   4.956e-12   -11.294   -11.305    -0.011
      BaCO3             5.305e-13   5.306e-13   -12.275   -12.275     0.000
      BaOH+             7.385e-15   7.205e-15   -14.132   -14.142    -0.011
C(-4)           0.000e+00
      CH4               0.000e+00   0.000e+00  -121.395  -121.395     0.000
C(4)            2.962e-04
      HCO3-             2.795e-04   2.727e-04    -3.554    -3.564    -0.011
      CO2               1.588e-05   1.588e-05    -4.799    -4.799     0.000
      CO3-2             4.702e-07   4.264e-07    -6.328    -6.370    -0.042
      MgHCO3+           1.936e-07   1.889e-07    -6.713    -6.724    -0.011
      CaHCO3+           1.637e-07   1.598e-07    -6.786    -6.797    -0.011
      CaCO3             4.367e-08   4.368e-08    -7.360    -7.360     0.000
```

	MgCO3	1.822e-08	1.822e-08	-7.740	-7.739	0.000
	MnCO3	5.307e-09	5.308e-09	-8.275	-8.275	0.000
	MnHCO3+	3.904e-09	3.809e-09	-8.408	-8.419	-0.011
	PbCO3	2.159e-09	2.159e-09	-8.666	-8.666	0.000
	NaHCO3	1.098e-09	1.098e-09	-8.959	-8.959	0.000
	ZnCO3	3.958e-10	3.958e-10	-9.403	-9.403	0.000
	ZnHCO3+	1.637e-10	1.597e-10	-9.786	-9.797	-0.011
	SrHCO3+	1.617e-10	1.577e-10	-9.791	-9.802	-0.011
	PbHCO3+	6.470e-11	6.312e-11	-10.189	-10.200	-0.011
	NaCO3-	1.865e-11	1.819e-11	-10.729	-10.740	-0.011
	SrCO3	1.136e-11	1.136e-11	-10.945	-10.945	0.000
	BaHCO3+	5.080e-12	4.956e-12	-11.294	-11.305	-0.011
	Zn(CO3)2-2	3.983e-12	3.608e-12	-11.400	-11.443	-0.043
	Pb(CO3)2-2	2.553e-12	2.313e-12	-11.593	-11.636	-0.043
	CdHCO3+	1.317e-12	1.285e-12	-11.880	-11.891	-0.011
	BaCO3	5.305e-13	5.306e-13	-12.275	-12.275	0.000
	CdCO3	5.047e-14	5.048e-14	-13.297	-13.297	0.000
	FeHCO3+	3.512e-15	3.427e-15	-14.454	-14.465	-0.011
	FeCO3	1.285e-15	1.285e-15	-14.891	-14.891	0.000
	Cd(CO3)2-2	7.512e-17	6.806e-17	-16.124	-16.167	-0.043
Ca		8.452e-05				
	Ca+2	8.403e-05	7.619e-05	-4.076	-4.118	-0.043
	CaSO4	2.646e-07	2.646e-07	-6.577	-6.577	0.000
	CaHCO3+	1.637e-07	1.598e-07	-6.786	-6.797	-0.011
	CaCO3	4.367e-08	4.368e-08	-7.360	-7.360	0.000
	CaHPO4	1.483e-08	1.483e-08	-7.829	-7.829	0.000
	CaPO4-	1.360e-09	1.327e-09	-8.866	-8.877	-0.011
	CaOH+	7.505e-10	7.322e-10	-9.125	-9.135	-0.011
	CaH2PO4+	2.211e-10	2.157e-10	-9.655	-9.666	-0.011
	CaHSO4+	2.238e-14	2.183e-14	-13.650	-13.661	-0.011
Cd		1.668e-10				
	Cd+2	1.645e-10	1.490e-10	-9.784	-9.827	-0.043
	CdHCO3+	1.317e-12	1.285e-12	-11.880	-11.891	-0.011
	CdSO4	8.046e-13	8.047e-13	-12.094	-12.094	0.000
	CdOH+	1.378e-13	1.344e-13	-12.861	-12.872	-0.011
	CdCO3	5.047e-14	5.048e-14	-13.297	-13.297	0.000
	Cd(OH)2	2.232e-15	2.232e-15	-14.651	-14.651	0.000
	Cd(SO4)2-2	2.403e-16	2.177e-16	-15.619	-15.662	-0.043
	Cd(CO3)2-2	7.512e-17	6.806e-17	-16.124	-16.167	-0.043
	Cd(OH)3-	1.487e-20	1.450e-20	-19.828	-19.839	-0.011
	Cd(OH)4-2	8.262e-27	7.485e-27	-26.083	-26.126	-0.043
Cu(1)		2.821e-17				
	Cu+	2.821e-17	2.751e-17	-16.550	-16.560	-0.011
Cu(2)		7.932e-08				
	Cu(OH)2	7.744e-08	7.745e-08	-7.111	-7.111	0.000
	Cu+2	1.219e-09	1.105e-09	-8.914	-8.956	-0.042
	CuOH+	6.561e-10	6.401e-10	-9.183	-9.194	-0.011
	CuSO4	4.150e-12	4.151e-12	-11.382	-11.382	0.000
	Cu(OH)3-	2.770e-13	2.702e-13	-12.558	-12.568	-0.011
	Cu(OH)4-2	3.446e-18	3.122e-18	-17.463	-17.506	-0.043
Fe(2)		1.444e-13				
	Fe+2	1.385e-13	1.257e-13	-12.858	-12.901	-0.042
	FeHCO3+	3.512e-15	3.427e-15	-14.454	-14.465	-0.011
	FeCO3	1.285e-15	1.285e-15	-14.891	-14.891	0.000
	FeOH+	4.360e-16	4.254e-16	-15.360	-15.371	-0.011
	FeSO4	3.177e-16	3.178e-16	-15.498	-15.498	0.000
	FeHPO4	2.708e-16	2.708e-16	-15.567	-15.567	0.000
	FeH2PO4+	1.103e-17	1.076e-17	-16.957	-16.968	-0.011

	FeHSO4+	3.691e-23	3.601e-23	-22.433	-22.444	-0.011
	Fe(HS)2	0.000e+00	0.000e+00	-242.753	-242.753	0.000
	Fe(HS)3-	0.000e+00	0.000e+00	-360.106	-360.117	-0.011
Fe(3)		1.852e-07				
	Fe(OH)3	1.333e-07	1.333e-07	-6.875	-6.875	0.000
	Fe(OH)2+	4.902e-08	4.783e-08	-7.310	-7.320	-0.011
	Fe(OH)4-	2.910e-09	2.839e-09	-8.536	-8.547	-0.011
	FeOH+2	6.486e-12	5.876e-12	-11.188	-11.231	-0.043
	Fe+3	7.366e-17	5.942e-17	-16.133	-16.226	-0.093
	FeSO4+	8.706e-18	8.494e-18	-17.060	-17.071	-0.011
	FeHPO4+	4.249e-18	4.145e-18	-17.372	-17.382	-0.011
	FeH2PO4+2	3.017e-18	2.733e-18	-17.520	-17.563	-0.043
	Fe(SO4)2-	3.748e-21	3.657e-21	-20.426	-20.437	-0.011
	Fe2(OH)2+4	3.509e-21	2.364e-21	-20.455	-20.626	-0.172
	FeHSO4+2	4.721e-25	4.277e-25	-24.326	-24.369	-0.043
	Fe3(OH)4+5	3.521e-25	1.899e-25	-24.453	-24.721	-0.268
H(0)		1.813e-39				
	H2	9.067e-40	9.068e-40	-39.043	-39.042	0.000
K		3.414e-06				
	K+	3.414e-06	3.330e-06	-5.467	-5.478	-0.011
	KSO4-	3.476e-10	3.391e-10	-9.459	-9.470	-0.011
	KHPO4-	3.603e-12	3.516e-12	-11.443	-11.454	-0.011
	KOH	6.686e-13	6.687e-13	-12.175	-12.175	0.000
Mg		6.856e-05				
	Mg+2	6.815e-05	6.182e-05	-4.167	-4.209	-0.042
	MgHCO3+	1.936e-07	1.889e-07	-6.713	-6.724	-0.011
	MgSO4	1.741e-07	1.741e-07	-6.759	-6.759	0.000
	MgCO3	1.822e-08	1.822e-08	-7.740	-7.739	0.000
	MgHPO4	1.627e-08	1.627e-08	-7.789	-7.789	0.000
	MgOH+	1.732e-09	1.690e-09	-8.761	-8.772	-0.011
	MgPO4-	1.489e-09	1.453e-09	-8.827	-8.838	-0.011
	MgH2PO4+	2.284e-10	2.229e-10	-9.641	-9.652	-0.011
Mn(2)		1.824e-07				
	Mn+2	1.728e-07	1.567e-07	-6.763	-6.805	-0.042
	MnCO3	5.307e-09	5.308e-09	-8.275	-8.275	0.000
	MnHCO3+	3.904e-09	3.809e-09	-8.408	-8.419	-0.011
	MnSO4	3.893e-10	3.893e-10	-9.410	-9.410	0.000
	MnOH+	3.792e-11	3.699e-11	-10.421	-10.432	-0.011
Mn(3)		3.812e-24				
	Mn+3	3.812e-24	3.052e-24	-23.419	-23.515	-0.097
Na		7.341e-06				
	Na+	7.339e-06	7.160e-06	-5.134	-5.145	-0.011
	NaHCO3	1.098e-09	1.098e-09	-8.959	-8.959	0.000
	NaSO4-	6.851e-10	6.684e-10	-9.164	-9.175	-0.011
	NaCO3-	1.865e-11	1.819e-11	-10.729	-10.740	-0.011
	NaHPO4-	7.747e-12	7.558e-12	-11.111	-11.122	-0.011
	NaOH	2.739e-12	2.739e-12	-11.562	-11.562	0.000
O(0)		5.191e-22				
	O2	2.595e-22	2.596e-22	-21.586	-21.586	0.000
P		8.072e-07				
	HPO4-2	5.976e-07	5.414e-07	-6.224	-6.267	-0.043
	H2PO4-	1.752e-07	1.709e-07	-6.757	-6.767	-0.011
	MgHPO4	1.627e-08	1.627e-08	-7.789	-7.789	0.000
	CaHPO4	1.483e-08	1.483e-08	-7.829	-7.829	0.000
	MgPO4-	1.489e-09	1.453e-09	-8.827	-8.838	-0.011
	CaPO4-	1.360e-09	1.327e-09	-8.866	-8.877	-0.011
	MgH2PO4+	2.284e-10	2.229e-10	-9.641	-9.652	-0.011
	CaH2PO4+	2.211e-10	2.157e-10	-9.655	-9.666	-0.011

	PO4-3	1.124e-11	8.998e-12	-10.949	-11.046	-0.097
	NaHPO4-	7.747e-12	7.558e-12	-11.111	-11.122	-0.011
	KHPO4-	3.603e-12	3.516e-12	-11.443	-11.454	-0.011
	FeHPO4	2.708e-16	2.708e-16	-15.567	-15.567	0.000
	FeH2PO4+	1.103e-17	1.076e-17	-16.957	-16.968	-0.011
	FeHPO4+	4.249e-18	4.145e-18	-17.372	-17.382	-0.011
	FeH2PO4+2	3.017e-18	2.733e-18	-17.520	-17.563	-0.043
Pb		2.896e-09				
	PbCO3	2.159e-09	2.159e-09	-8.666	-8.666	0.000
	PbOH+	3.372e-10	3.290e-10	-9.472	-9.483	-0.011
	Pb+2	3.217e-10	2.914e-10	-9.493	-9.536	-0.043
	PbHCO3+	6.470e-11	6.312e-11	-10.189	-10.200	-0.011
	Pb(OH)2	7.411e-12	7.412e-12	-11.130	-11.130	0.000
	PbSO4	3.522e-12	3.522e-12	-11.453	-11.453	0.000
	Pb(CO3)2-2	2.553e-12	2.313e-12	-11.593	-11.636	-0.043
	Pb(OH)3-	5.051e-15	4.928e-15	-14.297	-14.307	-0.011
	Pb(SO4)2-2	4.386e-16	3.973e-16	-15.358	-15.401	-0.043
	Pb2OH+3	2.681e-18	2.146e-18	-17.572	-17.668	-0.097
	Pb(OH)4-2	7.216e-19	6.537e-19	-18.142	-18.185	-0.043
S(-2)		0.000e+00				
	HS-	0.000e+00	0.000e+00	-119.390	-119.401	-0.011
	H2S	0.000e+00	0.000e+00	-119.890	-119.890	0.000
	S-2	0.000e+00	0.000e+00	-125.186	-125.228	-0.043
	Fe(HS)2	0.000e+00	0.000e+00	-242.753	-242.753	0.000
	Fe(HS)3-	0.000e+00	0.000e+00	-360.106	-360.117	-0.011
S(6)		2.415e-05				
	SO4-2	2.371e-05	2.149e-05	-4.625	-4.668	-0.043
	CaSO4	2.646e-07	2.646e-07	-6.577	-6.577	0.000
	MgSO4	1.741e-07	1.741e-07	-6.759	-6.759	0.000
	NaSO4-	6.851e-10	6.684e-10	-9.164	-9.175	-0.011
	MnSO4	3.893e-10	3.893e-10	-9.410	-9.410	0.000
	KSO4-	3.476e-10	3.391e-10	-9.459	-9.470	-0.011
	SrSO4	2.493e-10	2.493e-10	-9.603	-9.603	0.000
	BaSO4	3.955e-11	3.956e-11	-10.403	-10.403	0.000
	HSO4-	2.443e-11	2.383e-11	-10.612	-10.623	-0.011
	ZnSO4	1.970e-11	1.970e-11	-10.706	-10.706	0.000
	CuSO4	4.150e-12	4.151e-12	-11.382	-11.382	0.000
	PbSO4	3.522e-12	3.522e-12	-11.453	-11.453	0.000
	CdSO4	8.046e-13	8.047e-13	-12.094	-12.094	0.000
	AlSO4+	4.372e-14	4.265e-14	-13.359	-13.370	-0.011
	CaHSO4+	2.238e-14	2.183e-14	-13.650	-13.661	-0.011
	Zn(SO4)2-2	4.521e-15	4.096e-15	-14.345	-14.388	-0.043
	Pb(SO4)2-2	4.386e-16	3.973e-16	-15.358	-15.401	-0.043
	FeSO4	3.177e-16	3.178e-16	-15.498	-15.498	0.000
	Cd(SO4)2-2	2.403e-16	2.177e-16	-15.619	-15.662	-0.043
	Al(SO4)2-	2.676e-17	2.611e-17	-16.573	-16.583	-0.011
	FeSO4+	8.706e-18	8.494e-18	-17.060	-17.071	-0.011
	Fe(SO4)2-	3.748e-21	3.657e-21	-20.426	-20.437	-0.011
	AlHSO4+2	6.381e-23	5.781e-23	-22.195	-22.238	-0.043
	FeHSO4+	3.691e-23	3.601e-23	-22.433	-22.444	-0.011
	FeHSO4+2	4.721e-25	4.277e-25	-24.326	-24.369	-0.043
Sr		8.600e-08				
	Sr+2	8.558e-08	7.760e-08	-7.068	-7.110	-0.042
	SrSO4	2.493e-10	2.493e-10	-9.603	-9.603	0.000
	SrHCO3+	1.617e-10	1.577e-10	-9.791	-9.802	-0.011
	SrCO3	1.136e-11	1.136e-11	-10.945	-10.945	0.000
	SrOH+	2.362e-13	2.305e-13	-12.627	-12.637	-0.011
Zn		5.966e-09				

Zn+2	5.132e-09	4.653e-09	-8.290	-8.332	-0.043
ZnCO3	3.958e-10	3.958e-10	-9.403	-9.403	0.000
Zn(OH)2	1.964e-10	1.964e-10	-9.707	-9.707	0.000
ZnHCO3+	1.637e-10	1.597e-10	-9.786	-9.797	-0.011
ZnOH+	5.457e-11	5.323e-11	-10.263	-10.274	-0.011
ZnSO4	1.970e-11	1.970e-11	-10.706	-10.706	0.000
Zn(CO3)2-2	3.983e-12	3.608e-12	-11.400	-11.443	-0.043
Zn(OH)3-	3.686e-14	3.596e-14	-13.433	-13.444	-0.011
Zn(SO4)2-2	4.521e-15	4.096e-15	-14.345	-14.388	-0.043
Zn(OH)4-2	3.643e-19	3.301e-19	-18.439	-18.481	-0.043

----------Saturation indices----------

Phase	SI	log IAP	log KT	
Al(OH)3(a)	-1.06	11.21	12.27	Al(OH)3
Alunite	-5.85	-4.46	1.39	KAl3(SO4)2(OH)6
Anglesite	-6.29	-14.20	-7.91	PbSO4
Anhydrite	-4.44	-8.79	-4.35	CaSO4
Aragonite	-2.26	-10.49	-8.23	CaCO3
Barite	-2.72	-13.10	-10.38	BaSO4
Calcite	-2.10	-10.49	-8.39	CaCO3
Cd(OH)2	-7.95	5.70	13.65	Cd(OH)2
CdSO4	-15.21	-14.49	0.72	CdSO4
Celestite	-5.11	-11.78	-6.66	SrSO4
Cerrusite	-2.51	-15.91	-13.40	PbCO3
CH4(g)	-118.72	-165.86	-47.13	CH4
CO2(g)	-3.62	-21.90	-18.27	CO2
Dolomite	-4.50	-21.07	-16.57	CaMg(CO3)2
Fe(OH)3(a)	2.17	20.62	18.45	Fe(OH)3
FeS(ppt)	-120.62	-161.53	-40.91	FeS
Gibbsite	1.84	11.21	9.38	Al(OH)3
Goethite	7.26	20.62	13.36	FeOOH
Gypsum	-4.18	-8.79	-4.60	CaSO4:2H2O
H2(g)	-35.99	-35.99	0.00	H2
H2S(g)	-119.15	-164.15	-45.01	H2S
Hausmannite	-4.47	62.15	66.62	Mn3O4
Hematite	16.42	41.24	24.82	Fe2O3
Hydroxyapatite	-6.93	-45.97	-39.04	Ca5(PO4)3OH
Jarosite-K	-9.44	23.76	33.20	KFe3(SO4)2(OH)6
Mackinawite	-119.89	-161.53	-41.64	FeS
Manganite	1.38	26.72	25.34	MnOOH
Melanterite	-15.07	-17.57	-2.50	FeSO4:7H2O
O2(g)	-18.73	71.98	90.71	O2
Otavite	-4.10	-16.20	-12.10	CdCO3
Pb(OH)2	-2.94	5.99	8.93	Pb(OH)2
Pyrite	-196.61	-289.69	-93.09	FeS2
Pyrochroite	-6.48	8.72	15.20	Mn(OH)2
Pyrolusite	-0.29	44.71	45.00	MnO2
Rhodochrosite	-2.12	-13.18	-11.05	MnCO3
Siderite	-8.52	-19.27	-10.75	FeCO3
Smithsonite	-4.94	-14.70	-9.76	ZnCO3
Sphalerite	-107.89	-156.96	-49.07	ZnS
Strontianite	-4.16	-13.48	-9.32	SrCO3
Sulfur	-89.31	-128.16	-38.85	S
Vivianite	-24.79	-60.79	-36.00	Fe3(PO4)2:8H2O
Witherite	-6.12	-14.81	-8.69	BaCO3
Zn(OH)2(e)	-4.31	7.19	11.50	Zn(OH)2

◎ Table of Contents

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End of simulation.
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Reading input data for simulation 6.
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      SOLUTION 6 Stickleback Lake
            temp  4.0
            pH    7.14
            pe    4.0
            redox pe
            units ug/l
            density     1.0
            Alkalinity  30330 ug/l  gfw 50.04
            Al    2.5   ug/l
            B     50    ug/l
            Ba    5.0   ug/l
            Ca    13967 ug/l
            Cd    0.1   ug/l
            Cl    38433 ug/l
            Cu    0.5   ug/l
            F     7.67  ug/l
            Fe    5     ug/l
            K     1443  ug/l
            Li    5.0   ug/l
            Mg    4890  ug/l
            Mn    2.5   ug/l
            N(-3) 9.0   ug/l
            N(3)  0.5   ug/l
            N(5)  2.67  ug/l
            Na    10900 ug/l
            P     150   ug/l
            Pb    0.5   ug/l
            S(6)  500   ug/l
            Si    548   ug/l
            Sr    90    ug/l
            Zn    2.5   ug/l
      SAVE solution 6
      END
-----------------------------------------
Beginning of initial solution calculations.
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Initial solution 6.     Stickleback Lake

-----------------------------Solution composition------------------------------

      Elements           Molality       Moles

      Al                 9.267e-08   9.267e-08
      Alkalinity         6.062e-04   6.062e-04
      B                  4.626e-06   4.626e-06
      Ba                 3.641e-08   3.641e-08
      Ca                 3.485e-04   3.485e-04
      Cd                 8.898e-10   8.898e-10
```

Cl	1.084e-03	1.084e-03
Cu	7.869e-09	7.869e-09
F	4.038e-07	4.038e-07
Fe	8.954e-08	8.954e-08
K	3.691e-05	3.691e-05
Li	7.206e-07	7.206e-07
Mg	2.012e-04	2.012e-04
Mn	4.551e-08	4.551e-08
N(-3)	6.426e-07	6.426e-07
N(3)	3.570e-08	3.570e-08
N(5)	1.906e-07	1.906e-07
Na	4.742e-04	4.742e-04
P	4.843e-06	4.843e-06
Pb	2.413e-09	2.413e-09
S(6)	5.205e-06	5.205e-06
Si	9.121e-06	9.121e-06
Sr	1.027e-06	1.027e-06
Zn	3.825e-08	3.825e-08

----------Description of solution----------

pH	=	7.140
pe	=	4.000
Activity of water	=	1.000
Ionic strength	=	2.211e-03
Mass of water (kg)	=	1.000e+00
Total carbon (mol/kg)	=	7.425e-04
Total CO2 (mol/kg)	=	7.425e-04
Temperature (deg C)	=	4.000
Electrical balance (eq)	=	-9.167e-05
Iterations	=	9
Total H	=	1.110131e+02
Total O	=	5.550840e+01

----------Redox couples----------

Redox couple	pe	Eh (volts)
N(-3)/N(3)	6.6818	0.3674
N(-3)/N(5)	7.1924	0.3955
N(3)/N(5)	8.7240	0.4797

----------Distribution of species----------

Species	Molality	Activity	Log Molality	Log Activity	Log Gamma
H+	7.593e-08	7.244e-08	-7.120	-7.140	-0.020
OH-	2.448e-08	2.327e-08	-7.611	-7.633	-0.022
H2O	5.551e+01	1.000e+00	0.000	0.000	0.000
Al	9.267e-08				
Al(OH)4-	7.811e-08	7.428e-08	-7.107	-7.129	-0.022
Al(OH)2+	1.022e-08	9.723e-09	-7.990	-8.012	-0.022
Al(OH)3	3.307e-09	3.308e-09	-8.481	-8.480	0.000
AlOH+2	8.836e-10	7.226e-10	-9.054	-9.141	-0.087
AlF+2	8.946e-11	7.316e-11	-10.048	-10.136	-0.087
Al+3	3.362e-11	2.203e-11	-10.473	-10.657	-0.184
AlF2+	1.303e-11	1.240e-11	-10.885	-10.907	-0.022

	AlSO4+	2.206e-13	2.098e-13	-12.656	-12.678	-0.022
	AlF3	5.796e-14	5.799e-14	-13.237	-13.237	0.000
	Al(SO4)2-	2.535e-17	2.411e-17	-16.596	-16.618	-0.022
	AlF4-	9.184e-18	8.734e-18	-17.037	-17.059	-0.022
	AlHSO4+2	1.459e-21	1.193e-21	-20.836	-20.923	-0.087
	AlF5-2	6.740e-23	5.512e-23	-22.171	-22.259	-0.087
	AlF6-3	5.162e-29	3.283e-29	-28.287	-28.484	-0.197
B		4.626e-06				
	H3BO3	4.600e-06	4.603e-06	-5.337	-5.337	0.000
	H2BO3-	2.546e-08	2.421e-08	-7.594	-7.616	-0.022
	BF(OH)3-	5.783e-13	5.500e-13	-12.238	-12.260	-0.022
	BF2(OH)2-	1.759e-18	1.672e-18	-17.755	-17.777	-0.022
	BF3OH-	8.031e-26	7.637e-26	-25.095	-25.117	-0.022
	BF4-	9.285e-33	8.830e-33	-32.032	-32.054	-0.022
Ba		3.641e-08				
	Ba+2	3.626e-08	2.973e-08	-7.441	-7.527	-0.086
	BaHCO3+	8.838e-11	8.405e-11	-10.054	-10.075	-0.022
	BaSO4	6.010e-11	6.013e-11	-10.221	-10.221	0.000
	BaCO3	2.144e-12	2.145e-12	-11.669	-11.669	0.000
	BaOH+	1.462e-14	1.390e-14	-13.835	-13.857	-0.022
C(4)		7.425e-04				
	HCO3-	6.001e-04	5.712e-04	-3.222	-3.243	-0.021
	CO2	1.395e-04	1.396e-04	-3.855	-3.855	0.000
	CaHCO3+	1.313e-06	1.250e-06	-5.882	-5.903	-0.021
	MgHCO3+	1.105e-06	1.051e-06	-5.957	-5.978	-0.022
	CO3-2	2.594e-07	2.129e-07	-6.586	-6.672	-0.086
	NaHCO3	1.448e-07	1.448e-07	-6.839	-6.839	0.000
	CaCO3	8.140e-08	8.144e-08	-7.089	-7.089	0.000
	MgCO3	2.415e-08	2.416e-08	-7.617	-7.617	0.000
	FeHCO3+	4.093e-09	3.892e-09	-8.388	-8.410	-0.022
	SrHCO3+	3.757e-09	3.576e-09	-8.425	-8.447	-0.021
	ZnHCO3+	2.150e-09	2.045e-09	-8.668	-8.689	-0.022
	MnHCO3+	1.886e-09	1.794e-09	-8.724	-8.746	-0.022
	PbCO3	1.563e-09	1.563e-09	-8.806	-8.806	0.000
	ZnCO3	1.207e-09	1.208e-09	-8.918	-8.918	0.000
	NaCO3-	6.015e-10	5.720e-10	-9.221	-9.243	-0.022
	MnCO3	5.955e-10	5.958e-10	-9.225	-9.225	0.000
	FeCO3	3.478e-10	3.480e-10	-9.459	-9.458	0.000
	PbHCO3+	2.016e-10	1.917e-10	-9.695	-9.717	-0.022
	BaHCO3+	8.838e-11	8.405e-11	-10.054	-10.075	-0.022
	SrCO3	6.136e-11	6.139e-11	-10.212	-10.212	0.000
	CdHCO3+	1.262e-11	1.200e-11	-10.899	-10.921	-0.022
	Zn(CO3)2-2	6.722e-12	5.498e-12	-11.172	-11.260	-0.087
	BaCO3	2.144e-12	2.145e-12	-11.669	-11.669	0.000
	Pb(CO3)2-2	1.022e-12	8.360e-13	-11.990	-12.078	-0.087
	CdCO3	1.123e-13	1.123e-13	-12.950	-12.950	0.000
	Cd(CO3)2-2	9.247e-17	7.562e-17	-16.034	-16.121	-0.087
Ca		3.485e-04				
	Ca+2	3.467e-04	2.845e-04	-3.460	-3.546	-0.086
	CaHCO3+	1.313e-06	1.250e-06	-5.882	-5.903	-0.021
	CaSO4	1.854e-07	1.855e-07	-6.732	-6.732	0.000
	CaHPO4	1.760e-07	1.761e-07	-6.755	-6.754	0.000
	CaCO3	8.140e-08	8.144e-08	-7.089	-7.089	0.000
	CaH2PO4+	1.130e-08	1.074e-08	-7.947	-7.969	-0.022
	CaPO4-	3.949e-09	3.756e-09	-8.403	-8.425	-0.022
	CaOH+	6.854e-10	6.518e-10	-9.164	-9.186	-0.022
	CaF+	5.851e-10	5.564e-10	-9.233	-9.255	-0.022
	CaHSO4+	6.753e-14	6.422e-14	-13.170	-13.192	-0.022

◎ Table of Contents

Cd	8.898e-10					
	Cd+2	8.122e-10	6.642e-10	-9.090	-9.178	-0.087
	CdCl+	6.375e-11	6.063e-11	-10.196	-10.217	-0.022
	CdHCO3+	1.262e-11	1.200e-11	-10.899	-10.921	-0.022
	CdSO4	6.731e-13	6.734e-13	-12.172	-12.172	0.000
	CdCl2	2.396e-13	2.397e-13	-12.621	-12.620	0.000
	CdOH+	1.502e-13	1.428e-13	-12.823	-12.845	-0.022
	CdCO3	1.123e-13	1.123e-13	-12.950	-12.950	0.000
	Cd(OH)2	5.650e-16	5.653e-16	-15.248	-15.248	0.000
	CdCl3-	1.166e-16	1.109e-16	-15.933	-15.955	-0.022
	Cd(CO3)2-2	9.247e-17	7.562e-17	-16.034	-16.121	-0.087
	Cd(SO4)2-2	4.184e-17	3.421e-17	-16.378	-16.466	-0.087
	Cd(OH)3-	9.207e-22	8.755e-22	-21.036	-21.058	-0.022
	Cd(OH)4-2	1.317e-28	1.077e-28	-27.880	-27.968	-0.087
Cl	1.084e-03					
	Cl-	1.084e-03	1.031e-03	-2.965	-2.987	-0.022
	MnCl+	1.556e-10	1.479e-10	-9.808	-9.830	-0.022
	FeCl+	1.019e-10	9.694e-11	-9.992	-10.014	-0.022
	CdCl+	6.375e-11	6.063e-11	-10.196	-10.217	-0.022
	ZnCl+	3.063e-11	2.913e-11	-10.514	-10.536	-0.022
	PbCl+	1.041e-11	9.902e-12	-10.982	-11.004	-0.022
	CdCl2	2.396e-13	2.397e-13	-12.621	-12.620	0.000
	MnCl2	6.652e-14	6.655e-14	-13.177	-13.177	0.000
	ZnCl2	2.869e-14	2.871e-14	-13.542	-13.542	0.000
	PbCl2	2.465e-14	2.467e-14	-13.608	-13.608	0.000
	CdCl3-	1.166e-16	1.109e-16	-15.933	-15.955	-0.022
	ZnCl3-	3.048e-17	2.899e-17	-16.516	-16.538	-0.022
	MnCl3-	1.987e-17	1.889e-17	-16.702	-16.724	-0.022
	PbCl3-	1.847e-17	1.757e-17	-16.733	-16.755	-0.022
	FeCl+2	3.509e-19	2.870e-19	-18.455	-18.542	-0.087
	ZnCl4-2	1.531e-20	1.252e-20	-19.815	-19.902	-0.087
	PbCl4-2	8.904e-21	7.282e-21	-20.050	-20.138	-0.087
	FeCl2+	2.843e-21	2.704e-21	-20.546	-20.568	-0.022
	FeCl3	2.785e-25	2.787e-25	-24.555	-24.555	0.000
Cu(1)	6.537e-11					
	Cu+	6.537e-11	6.210e-11	-10.185	-10.207	-0.022
Cu(2)	7.804e-09					
	Cu(OH)2	5.813e-09	5.816e-09	-8.236	-8.235	0.000
	Cu+2	1.777e-09	1.461e-09	-8.750	-8.835	-0.085
	CuOH+	2.121e-10	2.017e-10	-9.673	-9.695	-0.022
	CuSO4	1.030e-12	1.030e-12	-11.987	-11.987	0.000
	Cu(OH)3-	5.087e-15	4.838e-15	-14.294	-14.315	-0.022
	Cu(OH)4-2	1.629e-20	1.332e-20	-19.788	-19.875	-0.087
F	4.038e-07					
	F-	4.000e-07	3.803e-07	-6.398	-6.420	-0.022
	MgF+	2.881e-09	2.740e-09	-8.540	-8.562	-0.022
	CaF+	5.851e-10	5.564e-10	-9.233	-9.255	-0.022
	NaF	9.862e-11	9.867e-11	-10.006	-10.006	0.000
	AlF+2	8.946e-11	7.316e-11	-10.048	-10.136	-0.087
	HF	2.880e-11	2.881e-11	-10.541	-10.540	0.000
	AlF2+	1.303e-11	1.240e-11	-10.885	-10.907	-0.022
	BF(OH)3-	5.783e-13	5.500e-13	-12.238	-12.260	-0.022
	FeF+	2.725e-13	2.591e-13	-12.565	-12.587	-0.022
	MnF+	9.747e-14	9.269e-14	-13.011	-13.033	-0.022
	AlF3	5.796e-14	5.799e-14	-13.237	-13.237	0.000
	HF2-	3.542e-17	3.369e-17	-16.451	-16.473	-0.022
	FeF+2	9.846e-18	8.052e-18	-17.007	-17.094	-0.087
	AlF4-	9.184e-18	8.734e-18	-17.037	-17.059	-0.022

	BF2(OH)2-	1.759e-18	1.672e-18	-17.755	-17.777	-0.022
	FeF2+	9.799e-20	9.319e-20	-19.009	-19.031	-0.022
	AlF5-2	6.740e-23	5.512e-23	-22.171	-22.259	-0.087
	FeF3	5.199e-23	5.201e-23	-22.284	-22.284	0.000
	BF3OH-	8.031e-26	7.637e-26	-25.095	-25.117	-0.022
	AlF6-3	5.162e-29	3.283e-29	-28.287	-28.484	-0.197
	BF4-	9.285e-33	8.830e-33	-32.032	-32.054	-0.022
	SiF6-2	0.000e+00	0.000e+00	-40.949	-41.036	-0.087
Fe(2)		8.806e-08				
	Fe+2	8.287e-08	6.814e-08	-7.082	-7.167	-0.085
	FeHCO3+	4.093e-09	3.892e-09	-8.388	-8.410	-0.022
	FeHPO4	4.666e-10	4.669e-10	-9.331	-9.331	0.000
	FeCO3	3.478e-10	3.480e-10	-9.459	-9.458	0.000
	FeCl+	1.019e-10	9.694e-11	-9.992	-10.014	-0.022
	FeH2PO4+	8.185e-11	7.783e-11	-10.087	-10.109	-0.022
	FeOH+	5.782e-11	5.499e-11	-10.238	-10.260	-0.022
	FeSO4	3.234e-11	3.235e-11	-10.490	-10.490	0.000
	FeF+	2.725e-13	2.591e-13	-12.565	-12.587	-0.022
	FeHSO4+	1.617e-17	1.538e-17	-16.791	-16.813	-0.022
Fe(3)		1.484e-09				
	Fe(OH)2+	9.075e-10	8.630e-10	-9.042	-9.064	-0.022
	Fe(OH)3	5.729e-10	5.732e-10	-9.242	-9.242	0.000
	Fe(OH)4-	3.061e-12	2.911e-12	-11.514	-11.536	-0.022
	FeOH+2	5.439e-13	4.448e-13	-12.265	-12.352	-0.087
	Fe+3	2.880e-17	1.887e-17	-16.541	-16.724	-0.184
	FeH2PO4+2	1.415e-17	1.158e-17	-16.849	-16.936	-0.087
	FeF+2	9.846e-18	8.052e-18	-17.007	-17.094	-0.087
	FeHPO4+	4.400e-18	4.185e-18	-17.357	-17.378	-0.022
	FeSO4+	5.326e-19	5.065e-19	-18.274	-18.295	-0.022
	FeCl+2	3.509e-19	2.870e-19	-18.455	-18.542	-0.087
	FeF2+	9.799e-20	9.319e-20	-19.009	-19.031	-0.022
	FeCl2+	2.843e-21	2.704e-21	-20.546	-20.568	-0.022
	FeF3	5.199e-23	5.201e-23	-22.284	-22.284	0.000
	Fe(SO4)2-	4.305e-23	4.094e-23	-22.366	-22.388	-0.022
	Fe2(OH)2+4	3.028e-23	1.354e-23	-22.519	-22.868	-0.349
	FeCl3	2.785e-25	2.787e-25	-24.555	-24.555	0.000
	FeHSO4+2	1.308e-25	1.070e-25	-24.883	-24.971	-0.087
	Fe3(OH)4+5	6.902e-29	1.963e-29	-28.161	-28.707	-0.546
H(0)		9.300e-26				
	H2	4.650e-26	4.653e-26	-25.333	-25.332	0.000
K		3.691e-05				
	K+	3.691e-05	3.508e-05	-4.433	-4.455	-0.022
	KSO4-	7.054e-10	6.708e-10	-9.152	-9.173	-0.022
	KHPO4-	1.238e-10	1.177e-10	-9.907	-9.929	-0.022
	KOH	1.678e-12	1.679e-12	-11.775	-11.775	0.000
Li		7.206e-07				
	Li+	7.206e-07	6.862e-07	-6.142	-6.164	-0.021
	LiSO4-	1.271e-11	1.209e-11	-10.896	-10.918	-0.022
	LiOH	2.169e-13	2.170e-13	-12.664	-12.664	0.000
Mg		2.012e-04				
	Mg+2	1.998e-04	1.642e-04	-3.699	-3.785	-0.085
	MgHCO3+	1.105e-06	1.051e-06	-5.957	-5.978	-0.022
	MgHPO4	1.373e-07	1.374e-07	-6.862	-6.862	0.000
	MgSO4	8.678e-08	8.682e-08	-7.062	-7.061	0.000
	MgCO3	2.415e-08	2.416e-08	-7.617	-7.617	0.000
	MgH2PO4+	8.302e-09	7.894e-09	-8.081	-8.103	-0.022
	MgPO4-	3.075e-09	2.924e-09	-8.512	-8.534	-0.022
	MgF+	2.881e-09	2.740e-09	-8.540	-8.562	-0.022

MgOH+	1.125e-09	1.070e-09	-8.949	-8.971	-0.022
Mn(2)	4.551e-08				
Mn+2	4.285e-08	3.523e-08	-7.368	-7.453	-0.085
MnHCO3+	1.886e-09	1.794e-09	-8.724	-8.746	-0.022
MnCO3	5.955e-10	5.958e-10	-9.225	-9.225	0.000
MnCl+	1.556e-10	1.479e-10	-9.808	-9.830	-0.022
MnSO4	1.643e-11	1.643e-11	-10.784	-10.784	0.000
MnOH+	2.085e-12	1.982e-12	-11.681	-11.703	-0.022
MnF+	9.747e-14	9.269e-14	-13.011	-13.033	-0.022
MnCl2	6.652e-14	6.655e-14	-13.177	-13.177	0.000
MnCl3-	1.987e-17	1.889e-17	-16.702	-16.724	-0.022
Mn(NO3)2	4.839e-21	4.842e-21	-20.315	-20.315	0.000
Mn(3)	6.318e-31				
Mn+3	6.318e-31	4.018e-31	-30.199	-30.396	-0.197
N(-3)	6.426e-07				
NH4+	6.416e-07	6.094e-07	-6.193	-6.215	-0.022
NH3	9.672e-10	9.677e-10	-9.014	-9.014	0.000
NH4SO4-	3.332e-11	3.169e-11	-10.477	-10.499	-0.022
N(3)	3.570e-08				
NO2-	3.570e-08	3.392e-08	-7.447	-7.470	-0.022
N(5)	1.906e-07				
NO3-	1.906e-07	1.811e-07	-6.720	-6.742	-0.022
PbNO3+	1.191e-15	1.132e-15	-14.924	-14.946	-0.022
Mn(NO3)2	4.839e-21	4.842e-21	-20.315	-20.315	0.000
Na	4.742e-04				
Na+	4.740e-04	4.509e-04	-3.324	-3.346	-0.022
NaHCO3	1.448e-07	1.448e-07	-6.839	-6.839	0.000
NaSO4-	8.311e-09	7.904e-09	-8.080	-8.102	-0.022
NaHPO4-	1.591e-09	1.513e-09	-8.798	-8.820	-0.022
NaCO3-	6.015e-10	5.720e-10	-9.221	-9.243	-0.022
NaF	9.862e-11	9.867e-11	-10.006	-10.006	0.000
NaOH	4.110e-11	4.112e-11	-10.386	-10.386	0.000
O(0)	0.000e+00				
O2	0.000e+00	0.000e+00	-49.006	-49.006	0.000
P	4.843e-06				
H2PO4-	2.396e-06	2.279e-06	-5.621	-5.642	-0.022
HPO4-2	2.105e-06	1.721e-06	-5.677	-5.764	-0.087
CaHPO4	1.760e-07	1.761e-07	-6.755	-6.754	0.000
MgHPO4	1.373e-07	1.374e-07	-6.862	-6.862	0.000
CaH2PO4+	1.130e-08	1.074e-08	-7.947	-7.969	-0.022
MgH2PO4+	8.302e-09	7.894e-09	-8.081	-8.103	-0.022
CaPO4-	3.949e-09	3.756e-09	-8.403	-8.425	-0.022
MgPO4-	3.075e-09	2.924e-09	-8.512	-8.534	-0.022
NaHPO4-	1.591e-09	1.513e-09	-8.798	-8.820	-0.022
FeHPO4	4.666e-10	4.669e-10	-9.331	-9.331	0.000
KHPO4-	1.238e-10	1.177e-10	-9.907	-9.929	-0.022
FeH2PO4+	8.185e-11	7.783e-11	-10.087	-10.109	-0.022
PO4-3	1.073e-11	6.819e-12	-10.969	-11.166	-0.197
FeH2PO4+2	1.415e-17	1.158e-17	-16.849	-16.936	-0.087
FeHPO4+	4.400e-18	4.185e-18	-17.357	-17.378	-0.022
Pb	2.413e-09				
PbCO3	1.563e-09	1.563e-09	-8.806	-8.806	0.000
Pb+2	5.167e-10	4.226e-10	-9.287	-9.374	-0.087
PbHCO3+	2.016e-10	1.917e-10	-9.695	-9.717	-0.022
PbOH+	1.196e-10	1.137e-10	-9.922	-9.944	-0.022
PbCl+	1.041e-11	9.902e-12	-10.982	-11.004	-0.022
Pb(CO3)2-2	1.022e-12	8.360e-13	-11.990	-12.078	-0.087
PbSO4	9.586e-13	9.590e-13	-12.018	-12.018	0.000

	Pb(OH)2	6.104e-13	6.107e-13	-12.214	-12.214	0.000
	PbCl2	2.465e-14	2.467e-14	-13.608	-13.608	0.000
	PbNO3+	1.191e-15	1.132e-15	-14.924	-14.946	-0.022
	Pb(OH)3-	1.018e-16	9.679e-17	-15.992	-16.014	-0.022
	Pb(SO4)2-2	2.484e-17	2.031e-17	-16.605	-16.692	-0.087
	PbCl3-	1.847e-17	1.757e-17	-16.733	-16.755	-0.022
	Pb2OH+3	1.692e-18	1.076e-18	-17.772	-17.968	-0.197
	PbCl4-2	8.904e-21	7.282e-21	-20.050	-20.138	-0.087
	Pb(OH)4-2	3.742e-21	3.061e-21	-20.427	-20.514	-0.087
S(6)	5.205e-06					
	SO4-2	4.923e-06	4.036e-06	-5.308	-5.394	-0.086
	CaSO4	1.854e-07	1.855e-07	-6.732	-6.732	0.000
	MgSO4	8.678e-08	8.682e-08	-7.062	-7.061	0.000
	NaSO4-	8.311e-09	7.904e-09	-8.080	-8.102	-0.022
	KSO4-	7.054e-10	6.708e-10	-9.152	-9.173	-0.022
	SrSO4	5.063e-10	5.065e-10	-9.296	-9.295	0.000
	BaSO4	6.010e-11	6.013e-11	-10.221	-10.221	0.000
	NH4SO4-	3.332e-11	3.169e-11	-10.477	-10.499	-0.022
	FeSO4	3.234e-11	3.235e-11	-10.490	-10.490	0.000
	ZnSO4	2.260e-11	2.261e-11	-10.646	-10.646	0.000
	HSO4-	1.974e-11	1.877e-11	-10.705	-10.726	-0.022
	MnSO4	1.643e-11	1.643e-11	-10.784	-10.784	0.000
	LiSO4-	1.271e-11	1.209e-11	-10.896	-10.918	-0.022
	CuSO4	1.030e-12	1.030e-12	-11.987	-11.987	0.000
	PbSO4	9.586e-13	9.590e-13	-12.018	-12.018	0.000
	CdSO4	6.731e-13	6.734e-13	-12.172	-12.172	0.000
	AlSO4+	2.206e-13	2.098e-13	-12.656	-12.678	-0.022
	CaHSO4+	6.753e-14	6.422e-14	-13.170	-13.192	-0.022
	Zn(SO4)2-2	1.079e-15	8.825e-16	-14.967	-15.054	-0.087
	Cd(SO4)2-2	4.184e-17	3.421e-17	-16.378	-16.466	-0.087
	Al(SO4)2-	2.535e-17	2.411e-17	-16.596	-16.618	-0.022
	Pb(SO4)2-2	2.484e-17	2.031e-17	-16.605	-16.692	-0.087
	FeHSO4+	1.617e-17	1.538e-17	-16.791	-16.813	-0.022
	FeSO4+	5.326e-19	5.065e-19	-18.274	-18.295	-0.022
	AlHSO4+2	1.459e-21	1.193e-21	-20.836	-20.923	-0.087
	Fe(SO4)2-	4.305e-23	4.094e-23	-22.366	-22.388	-0.022
	FeHSO4+2	1.308e-25	1.070e-25	-24.883	-24.971	-0.087
Si	9.121e-06					
	H4SiO4	9.113e-06	9.118e-06	-5.040	-5.040	0.000
	H3SiO4-	8.406e-09	7.994e-09	-8.075	-8.097	-0.022
	H2SiO4-2	1.945e-15	1.591e-15	-14.711	-14.798	-0.087
	SiF6-2	0.000e+00	0.000e+00	-40.949	-41.036	-0.087
Sr	1.027e-06					
	Sr+2	1.023e-06	8.398e-07	-5.990	-6.076	-0.086
	SrHCO3+	3.757e-09	3.576e-09	-8.425	-8.447	-0.021
	SrSO4	5.063e-10	5.065e-10	-9.296	-9.295	0.000
	SrCO3	6.136e-11	6.139e-11	-10.212	-10.212	0.000
	SrOH+	6.248e-13	5.945e-13	-12.204	-12.226	-0.022
Zn	3.825e-08					
	Zn+2	3.468e-08	2.843e-08	-7.460	-7.546	-0.086
	ZnHCO3+	2.150e-09	2.045e-09	-8.668	-8.689	-0.022
	ZnCO3	1.207e-09	1.208e-09	-8.918	-8.918	0.000
	ZnOH+	8.155e-11	7.755e-11	-10.089	-10.110	-0.022
	Zn(OH)2	6.817e-11	6.820e-11	-10.166	-10.166	0.000
	ZnCl+	3.063e-11	2.913e-11	-10.514	-10.536	-0.022
	ZnSO4	2.260e-11	2.261e-11	-10.646	-10.646	0.000
	Zn(CO3)2-2	6.722e-12	5.498e-12	-11.172	-11.260	-0.087
	ZnCl2	2.869e-14	2.871e-14	-13.542	-13.542	0.000

Zn(OH)3-	3.131e-15	2.977e-15	-14.504	-14.526	-0.022
Zn(SO4)2-2	1.079e-15	8.825e-16	-14.967	-15.054	-0.087
ZnCl3-	3.048e-17	2.899e-17	-16.516	-16.538	-0.022
ZnCl4-2	1.531e-20	1.252e-20	-19.815	-19.902	-0.087
Zn(OH)4-2	7.964e-21	6.513e-21	-20.099	-20.186	-0.087

----------Saturation indices----------

Phase	SI	log IAP	log KT	
Al(OH)3(a)	-1.51	10.76	12.27	Al(OH)3
Albite	-6.15	-0.56	5.59	NaAlSi3O8
Alunite	-5.76	-4.37	1.39	KAl3(SO4)2(OH)6
Anglesite	-6.86	-14.77	-7.91	PbSO4
Anhydrite	-4.59	-8.94	-4.35	CaSO4
Anorthite	-7.53	22.18	29.71	CaAl2Si2O8
Aragonite	-1.99	-10.22	-8.23	CaCO3
Barite	-2.54	-12.92	-10.38	BaSO4
Ca-Montmorillonite	-1.70	8.35	10.06	Ca0.165Al2.33Si3.67O10(OH)2
Calcite	-1.83	-10.22	-8.39	CaCO3
Cd(OH)2	-8.55	5.10	13.65	Cd(OH)2
CdSiO3	-9.92	0.06	9.98	CdSiO3
CdSO4	-15.29	-14.57	0.72	CdSO4
Celestite	-4.81	-11.47	-6.66	SrSO4
Cerrusite	-2.65	-16.05	-13.40	PbCO3
Chalcedony	-1.23	-5.04	-3.81	SiO2
Chlorite(14A)	-17.91	58.88	76.79	Mg5Al2Si3O10(OH)8
Chrysotile	-13.59	21.41	34.99	Mg3Si2O5(OH)4
CO2(g)	-2.68	-20.95	-18.27	CO2
Dolomite	-4.11	-20.67	-16.57	CaMg(CO3)2
Fe(OH)3(a)	-0.20	18.25	18.45	Fe(OH)3
Fluorite	-5.50	-16.39	-10.89	CaF2
Gibbsite	1.39	10.76	9.38	Al(OH)3
Goethite	4.89	18.25	13.36	FeOOH
Gypsum	-4.34	-8.94	-4.60	CaSO4:2H2O
H2(g)	-22.28	-22.28	0.00	H2
Hausmannite	-23.86	42.76	66.62	Mn3O4
Hematite	11.69	36.51	24.82	Fe2O3
Hydroxyapatite	-5.05	-44.09	-39.04	Ca5(PO4)3OH
Illite	-2.92	11.35	14.27	K0.6Mg0.25Al2.3Si3.5O10(OH)2
Jarosite-K	-15.10	18.10	33.20	KFe3(SO4)2(OH)6
K-feldspar	-4.42	-1.67	2.75	KAlSi3O8
K-mica	3.85	19.85	16.00	KAl3Si3O10(OH)2
Kaolinite	2.05	11.45	9.40	Al2Si2O5(OH)4
Manganite	-7.37	17.97	25.34	MnOOH
Melanterite	-10.06	-12.56	-2.50	FeSO4:7H2O
NH3(g)	-11.24	0.92	12.16	NH3
O2(g)	-46.15	44.56	90.71	O2
Otavite	-3.75	-15.85	-12.10	CdCO3
Pb(OH)2	-4.02	4.91	8.93	Pb(OH)2
Pyrochroite	-8.37	6.83	15.20	Mn(OH)2
Pyrolusite	-15.89	29.11	45.00	MnO2
Quartz	-0.73	-5.04	-4.31	SiO2
Rhodochrosite	-3.07	-14.12	-11.05	MnCO3
Sepiolite	-10.48	5.87	16.35	Mg2Si3O7.5OH:3H2O
Sepiolite(d)	-12.79	5.87	18.66	Mg2Si3O7.5OH:3H2O
Siderite	-3.09	-13.84	-10.75	FeCO3
SiO2(a)	-2.14	-5.04	-2.90	SiO2

```
      Smithsonite      -4.46  -14.22   -9.76  ZnCO3
      Strontianite     -3.43  -12.75   -9.32  SrCO3
      Talc            -12.65   11.33   23.97  Mg3Si4O10(OH)2
      Vivianite        -7.83  -43.83  -36.00  Fe3(PO4)2:8H2O
      Willemite        -8.76    8.43   17.18  Zn2SiO4
      Witherite        -5.51  -14.20   -8.69  BaCO3
      Zn(OH)2(e)       -4.77    6.73   11.50  Zn(OH)2

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End of simulation.
------------------

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Reading input data for simulation 7.
------------------------------------

      MIX 3 Mixing B2/B3/Rain with Stickleback (1:1)
            5     0.5
            6     0.5
      SAVE solution 7
      END
----------------------------------
Beginning of reaction calculations.
----------------------------------

Reaction step 1.

Using mixture 3.  Mixing B2/B3/Rain with Stickleback (1:1)

       5.000e-01 Solution 5   Solution after simulation 5.
       5.000e-01 Solution 6   Stickleback Lake

-----------------------------Solution composition------------------------------

      Elements           Molality       Moles

      Al                5.045e-07   5.045e-07
      B                 2.313e-06   2.313e-06
      Ba                2.025e-08   2.025e-08
      C                 5.194e-04   5.194e-04
      Ca                2.165e-04   2.165e-04
      Cd                5.283e-10   5.283e-10
      Cl                5.421e-04   5.421e-04
      Cu                4.359e-08   4.359e-08
      F                 2.019e-07   2.019e-07
      Fe                1.374e-07   1.374e-07
      K                 2.016e-05   2.016e-05
      Li                3.603e-07   3.603e-07
      Mg                1.349e-04   1.349e-04
      Mn                1.140e-07   1.140e-07
      N                 4.345e-07   4.345e-07
      Na                2.408e-04   2.408e-04
      P                 2.825e-06   2.825e-06
      Pb                2.655e-09   2.655e-09
      S                 1.468e-05   1.468e-05
      Si                4.561e-06   4.561e-06
      Sr                5.566e-07   5.566e-07
      Zn                2.211e-08   2.211e-08
```

◎ Table of Contents

----------Description of solution----------

```
                            pH  =   7.266      Charge balance
                            pe  =  -2.723      Adjusted to redox equilibrium
               Activity of water  =   1.000
                  Ionic strength  =   1.356e-03
               Mass of water (kg)  =   1.000e+00
        Total alkalinity (eq/kg)  =   4.458e-04
              Total CO2 (mol/kg)  =   5.194e-04
             Temperature (deg C)  =   4.000
         Electrical balance (eq)  =  -5.288e-05
                     Iterations   =  18
                        Total H   = 1.110129e+02
                        Total O   = 5.550779e+01
```

----------Distribution of species----------

	Species	Molality	Activity	Log Molality	Log Activity	Log Gamma
	H+	5.630e-08	5.422e-08	-7.249	-7.266	-0.016
	OH-	3.236e-08	3.109e-08	-7.490	-7.507	-0.017
	H2O	5.551e+01	1.000e+00	0.000	0.000	0.000
Al		5.045e-07				
	Al(OH)4-	4.544e-07	4.367e-07	-6.343	-6.360	-0.017
	Al(OH)2+	3.331e-08	3.201e-08	-7.477	-7.495	-0.017
	Al(OH)3	1.455e-08	1.455e-08	-7.837	-7.837	0.000
	AlOH+2	2.088e-09	1.780e-09	-8.680	-8.750	-0.069
	AlF+2	8.016e-11	6.834e-11	-10.096	-10.165	-0.069
	Al+3	5.707e-11	4.062e-11	-10.244	-10.391	-0.148
	AlF2+	6.105e-12	5.866e-12	-11.214	-11.232	-0.017
	AlSO4+	1.203e-12	1.156e-12	-11.920	-11.937	-0.017
	AlF3	1.390e-14	1.390e-14	-13.857	-13.857	0.000
	Al(SO4)2-	4.130e-16	3.969e-16	-15.384	-15.401	-0.017
	AlF4-	1.104e-18	1.061e-18	-17.957	-17.974	-0.017
	AlHSO4+2	5.769e-21	4.918e-21	-20.239	-20.308	-0.069
	AlF5-2	3.979e-24	3.392e-24	-23.400	-23.469	-0.069
	AlF6-3	1.466e-30	1.024e-30	-29.834	-29.990	-0.156
B		2.313e-06				
	H3BO3	2.296e-06	2.297e-06	-5.639	-5.639	0.000
	H2BO3-	1.680e-08	1.614e-08	-7.775	-7.792	-0.017
	BF(OH)3-	1.447e-13	1.390e-13	-12.840	-12.857	-0.017
	BF2(OH)2-	1.668e-19	1.603e-19	-18.778	-18.795	-0.017
	BF3OH-	2.889e-27	2.776e-27	-26.539	-26.557	-0.017
	BF4-	1.266e-34	1.217e-34	-33.897	-33.915	-0.017
Ba		2.025e-08				
	Ba+2	2.011e-08	1.717e-08	-7.697	-7.765	-0.069
	BaSO4	1.038e-10	1.038e-10	-9.984	-9.984	0.000
	BaHCO3+	3.745e-11	3.599e-11	-10.426	-10.444	-0.017
	BaCO3	1.227e-12	1.227e-12	-11.911	-11.911	0.000
	BaOH+	1.117e-14	1.073e-14	-13.952	-13.969	-0.017
C(-4)		8.167e-14				
	CH4	8.167e-14	8.170e-14	-13.088	-13.088	0.000
C(4)		5.194e-04				
	HCO3-	4.404e-04	4.234e-04	-3.356	-3.373	-0.017
	CO2	7.740e-05	7.743e-05	-4.111	-4.111	0.000
	CaHCO3+	6.231e-07	5.991e-07	-6.205	-6.222	-0.017

	MgHCO3+	5.659e-07	5.438e-07	-6.247	-6.265	-0.017
	CO3-2	2.468e-07	2.109e-07	-6.608	-6.676	-0.068
	NaHCO3	5.506e-08	5.508e-08	-7.259	-7.259	0.000
	CaCO3	5.216e-08	5.218e-08	-7.283	-7.283	0.000
	MgCO3	1.670e-08	1.671e-08	-7.777	-7.777	0.000
	FeHCO3+	4.934e-09	4.741e-09	-8.307	-8.324	-0.017
	MnHCO3+	3.642e-09	3.500e-09	-8.439	-8.456	-0.017
	PbCO3	1.741e-09	1.742e-09	-8.759	-8.759	0.000
	SrHCO3+	1.555e-09	1.495e-09	-8.808	-8.825	-0.017
	MnCO3	1.553e-09	1.554e-09	-8.809	-8.809	0.000
	ZnHCO3+	9.583e-10	9.208e-10	-9.019	-9.036	-0.017
	ZnCO3	7.266e-10	7.268e-10	-9.139	-9.139	0.000
	FeCO3	5.662e-10	5.664e-10	-9.247	-9.247	0.000
	NaCO3-	3.025e-10	2.907e-10	-9.519	-9.537	-0.017
	PbHCO3+	1.664e-10	1.599e-10	-9.779	-9.796	-0.017
	BaHCO3+	3.745e-11	3.599e-11	-10.426	-10.444	-0.017
	SrCO3	3.428e-11	3.429e-11	-10.465	-10.465	0.000
	CdHCO3+	5.944e-12	5.711e-12	-11.226	-11.243	-0.017
	Zn(CO3)2-2	3.844e-12	3.277e-12	-11.415	-11.485	-0.069
	BaCO3	1.227e-12	1.227e-12	-11.911	-11.911	0.000
	Pb(CO3)2-2	1.082e-12	9.228e-13	-11.966	-12.035	-0.069
	CdCO3	7.143e-14	7.145e-14	-13.146	-13.146	0.000
	Cd(CO3)2-2	5.589e-17	4.765e-17	-16.253	-16.322	-0.069
Ca		2.165e-04				
	Ca+2	2.154e-04	1.840e-04	-3.667	-3.735	-0.068
	CaHCO3+	6.231e-07	5.991e-07	-6.205	-6.222	-0.017
	CaSO4	3.584e-07	3.586e-07	-6.446	-6.445	0.000
	CaHPO4	7.998e-08	8.000e-08	-7.097	-7.097	0.000
	CaCO3	5.216e-08	5.218e-08	-7.283	-7.283	0.000
	CaH2PO4+	3.802e-09	3.653e-09	-8.420	-8.437	-0.017
	CaPO4-	2.373e-09	2.280e-09	-8.625	-8.642	-0.017
	CaOH+	5.862e-10	5.633e-10	-9.232	-9.249	-0.017
	CaF+	1.897e-10	1.823e-10	-9.722	-9.739	-0.017
	CaHSO4+	9.666e-14	9.288e-14	-13.015	-13.032	-0.017
Cd		5.283e-10				
	Cd+2	5.003e-10	4.266e-10	-9.301	-9.370	-0.069
	CdCl+	2.047e-11	1.967e-11	-10.689	-10.706	-0.017
	CdHCO3+	5.944e-12	5.711e-12	-11.226	-11.243	-0.017
	CdSO4	1.292e-12	1.292e-12	-11.889	-11.889	0.000
	CdOH+	1.275e-13	1.225e-13	-12.894	-12.912	-0.017
	CdCO3	7.143e-14	7.145e-14	-13.146	-13.146	0.000
	CdCl2	3.929e-14	3.930e-14	-13.406	-13.406	0.000
	Cd(OH)2	6.480e-16	6.482e-16	-15.188	-15.188	0.000
	Cd(SO4)2-2	2.301e-16	1.962e-16	-15.638	-15.707	-0.069
	Cd(CO3)2-2	5.589e-17	4.765e-17	-16.253	-16.322	-0.069
	CdCl3-	9.564e-18	9.190e-18	-17.019	-17.037	-0.017
	Cd(OH)3-	1.396e-21	1.341e-21	-20.855	-20.872	-0.017
	Cd(OH)4-2	2.587e-28	2.205e-28	-27.587	-27.657	-0.069
Cl		5.421e-04				
	Cl-	5.421e-04	5.208e-04	-3.266	-3.283	-0.017
	MnCl+	2.048e-10	1.968e-10	-9.689	-9.706	-0.017
	FeCl+	8.377e-11	8.049e-11	-10.077	-10.094	-0.017
	CdCl+	2.047e-11	1.967e-11	-10.689	-10.706	-0.017
	ZnCl+	9.305e-12	8.941e-12	-11.031	-11.049	-0.017
	PbCl+	5.858e-12	5.629e-12	-11.232	-11.250	-0.017
	MnCl2	4.471e-14	4.473e-14	-13.350	-13.349	0.000
	CdCl2	3.929e-14	3.930e-14	-13.406	-13.406	0.000
	PbCl2	7.082e-15	7.085e-15	-14.150	-14.150	0.000

	ZnCl2	4.451e-15	4.452e-15	-14.352	-14.351	0.000
	CdCl3-	9.564e-18	9.190e-18	-17.019	-17.037	-0.017
	MnCl3-	6.676e-18	6.415e-18	-17.175	-17.193	-0.017
	PbCl3-	2.653e-18	2.549e-18	-17.576	-17.594	-0.017
	ZnCl3-	2.364e-18	2.272e-18	-17.626	-17.644	-0.017
	PbCl4-2	6.264e-22	5.340e-22	-21.203	-21.272	-0.069
	ZnCl4-2	5.815e-22	4.957e-22	-21.235	-21.305	-0.069
	FeCl+2	5.287e-26	4.507e-26	-25.277	-25.346	-0.069
	FeCl2+	2.233e-28	2.146e-28	-27.651	-27.668	-0.017
	FeCl3	1.117e-32	1.117e-32	-31.952	-31.952	0.000
Cu(1)		4.359e-08				
	Cu+	4.359e-08	4.186e-08	-7.361	-7.378	-0.018
Cu(2)		1.578e-12				
	Cu(OH)2	1.324e-12	1.324e-12	-11.878	-11.878	0.000
	Cu+2	2.178e-13	1.863e-13	-12.662	-12.730	-0.068
	CuOH+	3.576e-14	3.436e-14	-13.447	-13.464	-0.017
	CuSO4	3.923e-16	3.924e-16	-15.406	-15.406	0.000
	Cu(OH)3-	1.531e-18	1.471e-18	-17.815	-17.832	-0.017
	Cu(OH)4-2	6.352e-24	5.415e-24	-23.197	-23.266	-0.069
F		2.019e-07				
	F-	2.006e-07	1.927e-07	-6.698	-6.715	-0.017
	MgF+	1.008e-09	9.690e-10	-8.996	-9.014	-0.017
	CaF+	1.897e-10	1.823e-10	-9.722	-9.739	-0.017
	AlF+2	8.016e-11	6.834e-11	-10.096	-10.165	-0.069
	NaF	2.564e-11	2.564e-11	-10.591	-10.591	0.000
	HF	1.092e-11	1.092e-11	-10.962	-10.962	0.000
	AlF2+	6.105e-12	5.866e-12	-11.214	-11.232	-0.017
	FeF+	2.245e-13	2.157e-13	-12.649	-12.666	-0.017
	BF(OH)3-	1.447e-13	1.390e-13	-12.840	-12.857	-0.017
	MnF+	1.286e-13	1.236e-13	-12.891	-12.908	-0.017
	AlF3	1.390e-14	1.390e-14	-13.857	-13.857	0.000
	HF2-	6.735e-18	6.471e-18	-17.172	-17.189	-0.017
	AlF4-	1.104e-18	1.061e-18	-17.957	-17.974	-0.017
	BF2(OH)2-	1.668e-19	1.603e-19	-18.778	-18.795	-0.017
	AlF5-2	3.979e-24	3.392e-24	-23.400	-23.469	-0.069
	FeF+2	1.487e-24	1.268e-24	-23.828	-23.897	-0.069
	FeF2+	7.737e-27	7.434e-27	-26.111	-26.129	-0.017
	BF3OH-	2.889e-27	2.776e-27	-26.539	-26.557	-0.017
	FeF3	2.102e-30	2.102e-30	-29.677	-29.677	0.000
	AlF6-3	1.466e-30	1.024e-30	-29.834	-29.990	-0.156
	BF4-	1.266e-34	1.217e-34	-33.897	-33.915	-0.017
	SiF6-2	0.000e+00	0.000e+00	-43.544	-43.613	-0.069
Fe(2)		1.374e-07				
	Fe+2	1.309e-07	1.120e-07	-6.883	-6.951	-0.068
	FeHCO3+	4.934e-09	4.741e-09	-8.307	-8.324	-0.017
	FeCO3	5.662e-10	5.664e-10	-9.247	-9.247	0.000
	FeHPO4	5.388e-10	5.390e-10	-9.269	-9.268	0.000
	FeSO4	1.588e-10	1.589e-10	-9.799	-9.799	0.000
	FeOH+	1.257e-10	1.207e-10	-9.901	-9.918	-0.017
	FeCl+	8.377e-11	8.049e-11	-10.077	-10.094	-0.017
	FeH2PO4+	6.999e-11	6.725e-11	-10.155	-10.172	-0.017
	FeF+	2.245e-13	2.157e-13	-12.649	-12.666	-0.017
	FeHSO4+	5.881e-17	5.651e-17	-16.231	-16.248	-0.017
	Fe(HS)2	8.470e-22	8.472e-22	-21.072	-21.072	0.000
	Fe(HS)3-	2.798e-31	2.688e-31	-30.553	-30.571	-0.017
Fe(3)		9.266e-16				
	Fe(OH)2+	4.984e-16	4.789e-16	-15.302	-15.320	-0.017
	Fe(OH)3	4.250e-16	4.251e-16	-15.372	-15.372	0.000

	Fe(OH)4-	3.002e-18	2.884e-18	-17.523	-17.540	-0.017
	FeOH+2	2.167e-19	1.847e-19	-18.664	-18.733	-0.069
	Fe+3	8.239e-24	5.865e-24	-23.084	-23.232	-0.148
	FeH2PO4+2	2.219e-24	1.892e-24	-23.654	-23.723	-0.069
	FeF+2	1.487e-24	1.268e-24	-23.828	-23.897	-0.069
	FeHPO4+	9.510e-25	9.138e-25	-24.022	-24.039	-0.017
	FeSO4+	4.895e-25	4.703e-25	-24.310	-24.328	-0.017
	FeCl+2	5.287e-26	4.507e-26	-25.277	-25.346	-0.069
	FeF2+	7.737e-27	7.434e-27	-26.111	-26.129	-0.017
	FeCl2+	2.233e-28	2.146e-28	-27.651	-27.668	-0.017
	Fe(SO4)2-	1.182e-28	1.136e-28	-27.927	-27.945	-0.017
	FeF3	2.102e-30	2.102e-30	-29.677	-29.677	0.000
	FeHSO4+2	8.721e-32	7.435e-32	-31.059	-31.129	-0.069
	FeCl3	1.117e-32	1.117e-32	-31.952	-31.952	0.000
	Fe2(OH)2+4	4.422e-36	2.336e-36	-35.354	-35.632	-0.277
	Fe3(OH)4+5	0.000e+00	0.000e+00	-47.293	-47.726	-0.433
H(0)		1.456e-12				
	H2	7.282e-13	7.285e-13	-12.138	-12.138	0.000
K		2.016e-05				
	K+	2.016e-05	1.937e-05	-4.696	-4.713	-0.017
	KSO4-	1.151e-09	1.106e-09	-8.939	-8.956	-0.017
	KHPO4-	4.752e-11	4.566e-11	-10.323	-10.340	-0.017
	KOH	1.238e-12	1.239e-12	-11.907	-11.907	0.000
Li		3.603e-07				
	Li+	3.603e-07	3.465e-07	-6.443	-6.460	-0.017
	LiSO4-	1.898e-11	1.824e-11	-10.722	-10.739	-0.017
	LiOH	1.464e-13	1.464e-13	-12.835	-12.834	0.000
Mg		1.349e-04				
	Mg+2	1.340e-04	1.146e-04	-3.873	-3.941	-0.068
	MgHCO3+	5.659e-07	5.438e-07	-6.247	-6.265	-0.017
	MgSO4	1.810e-07	1.811e-07	-6.742	-6.742	0.000
	MgHPO4	6.735e-08	6.737e-08	-7.172	-7.172	0.000
	MgCO3	1.670e-08	1.671e-08	-7.777	-7.777	0.000
	MgH2PO4+	3.015e-09	2.897e-09	-8.521	-8.538	-0.017
	MgPO4-	1.994e-09	1.916e-09	-8.700	-8.718	-0.017
	MgOH+	1.039e-09	9.980e-10	-8.984	-9.001	-0.017
	MgF+	1.008e-09	9.690e-10	-8.996	-9.014	-0.017
Mn(2)		1.140e-07				
	Mn+2	1.084e-07	9.274e-08	-6.965	-7.033	-0.068
	MnHCO3+	3.642e-09	3.500e-09	-8.439	-8.456	-0.017
	MnCO3	1.553e-09	1.554e-09	-8.809	-8.809	0.000
	MnCl+	2.048e-10	1.968e-10	-9.689	-9.706	-0.017
	MnSO4	1.292e-10	1.293e-10	-9.889	-9.889	0.000
	MnOH+	7.256e-12	6.972e-12	-11.139	-11.157	-0.017
	MnF+	1.286e-13	1.236e-13	-12.891	-12.908	-0.017
	MnCl2	4.471e-14	4.473e-14	-13.350	-13.349	0.000
	MnCl3-	6.676e-18	6.415e-18	-17.175	-17.193	-0.017
	Mn(NO3)2	0.000e+00	0.000e+00	-177.643	-177.643	0.000
Mn(3)		2.865e-37				
	Mn+3	2.865e-37	2.000e-37	-36.543	-36.699	-0.156
N(-3)		9.894e-08				
	NH4+	9.872e-08	9.479e-08	-7.006	-7.023	-0.018
	NH3	2.011e-10	2.011e-10	-9.697	-9.697	0.000
	NH4SO4-	1.533e-11	1.473e-11	-10.815	-10.832	-0.017
N(0)		3.355e-07				
	N2	1.678e-07	1.678e-07	-6.775	-6.775	0.000
N(3)		0.000e+00				
	NO2-	0.000e+00	0.000e+00	-63.684	-63.701	-0.018

N(5)	0.000e+00					
NO3-		0.000e+00	0.000e+00	-85.599	-85.616	-0.018
PbNO3+		0.000e+00	0.000e+00	-93.752	-93.769	-0.017
Mn(NO3)2		0.000e+00	0.000e+00	-177.643	-177.643	0.000
Na	2.408e-04					
Na+		2.407e-04	2.313e-04	-3.619	-3.636	-0.017
NaHCO3		5.506e-08	5.508e-08	-7.259	-7.259	0.000
NaSO4-		1.261e-08	1.212e-08	-7.899	-7.917	-0.017
NaHPO4-		5.676e-10	5.454e-10	-9.246	-9.263	-0.017
NaCO3-		3.025e-10	2.907e-10	-9.519	-9.537	-0.017
NaOH		2.818e-11	2.819e-11	-10.550	-10.550	0.000
NaF		2.564e-11	2.564e-11	-10.591	-10.591	0.000
O(0)	0.000e+00					
O2		0.000e+00	0.000e+00	-75.396	-75.396	0.000
P	2.825e-06					
HPO4-2		1.419e-06	1.209e-06	-5.848	-5.918	-0.069
H2PO4-		1.247e-06	1.198e-06	-5.904	-5.921	-0.017
CaHPO4		7.998e-08	8.000e-08	-7.097	-7.097	0.000
MgHPO4		6.735e-08	6.737e-08	-7.172	-7.172	0.000
CaH2PO4+		3.802e-09	3.653e-09	-8.420	-8.437	-0.017
MgH2PO4+		3.015e-09	2.897e-09	-8.521	-8.538	-0.017
CaPO4-		2.373e-09	2.280e-09	-8.625	-8.642	-0.017
MgPO4-		1.994e-09	1.916e-09	-8.700	-8.718	-0.017
NaHPO4-		5.676e-10	5.454e-10	-9.246	-9.263	-0.017
FeHPO4		5.388e-10	5.390e-10	-9.269	-9.268	0.000
FeH2PO4+		6.999e-11	6.725e-11	-10.155	-10.172	-0.017
KHPO4-		4.752e-11	4.566e-11	-10.323	-10.340	-0.017
PO4-3		9.170e-12	6.402e-12	-11.038	-11.194	-0.156
FeH2PO4+2		2.219e-24	1.892e-24	-23.654	-23.723	-0.069
FeHPO4+		9.510e-25	9.138e-25	-24.022	-24.039	-0.017
Pb	2.655e-09					
PbCO3		1.741e-09	1.742e-09	-8.759	-8.759	0.000
Pb+2		5.576e-10	4.753e-10	-9.254	-9.323	-0.069
PbOH+		1.779e-10	1.710e-10	-9.750	-9.767	-0.017
PbHCO3+		1.664e-10	1.599e-10	-9.779	-9.796	-0.017
PbCl+		5.858e-12	5.629e-12	-11.232	-11.250	-0.017
PbSO4		3.223e-12	3.224e-12	-11.492	-11.492	0.000
Pb(OH)2		1.226e-12	1.227e-12	-11.911	-11.911	0.000
Pb(CO3)2-2		1.082e-12	9.228e-13	-11.966	-12.035	-0.069
PbCl2		7.082e-15	7.085e-15	-14.150	-14.150	0.000
Pb(OH)3-		2.704e-16	2.598e-16	-15.568	-15.585	-0.017
Pb(SO4)2-2		2.393e-16	2.040e-16	-15.621	-15.690	-0.069
PbCl3-		2.653e-18	2.549e-18	-17.576	-17.594	-0.017
Pb2OH+3		2.605e-18	1.819e-18	-17.584	-17.740	-0.156
Pb(OH)4-2		1.288e-20	1.098e-20	-19.890	-19.960	-0.069
PbCl4-2		6.264e-22	5.340e-22	-21.203	-21.272	-0.069
PbNO3+		0.000e+00	0.000e+00	-93.752	-93.769	-0.017
S(-2)	6.001e-12					
HS-		3.033e-12	2.914e-12	-11.518	-11.536	-0.017
H2S		2.967e-12	2.968e-12	-11.528	-11.527	0.000
S-2		1.618e-18	1.381e-18	-17.791	-17.860	-0.069
Fe(HS)2		8.470e-22	8.472e-22	-21.072	-21.072	0.000
Fe(HS)3-		2.798e-31	2.688e-31	-30.553	-30.571	-0.017
S(6)	1.468e-05					
SO4-2		1.412e-05	1.206e-05	-4.850	-4.919	-0.069
CaSO4		3.584e-07	3.586e-07	-6.446	-6.445	0.000
MgSO4		1.810e-07	1.811e-07	-6.742	-6.742	0.000
NaSO4-		1.261e-08	1.212e-08	-7.899	-7.917	-0.017

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      KSO4-             1.151e-09   1.106e-09    -8.939    -8.956    -0.017
      SrSO4             8.533e-10   8.536e-10    -9.069    -9.069     0.000
      FeSO4             1.588e-10   1.589e-10    -9.799    -9.799     0.000
      MnSO4             1.292e-10   1.293e-10    -9.889    -9.889     0.000
      BaSO4             1.038e-10   1.038e-10    -9.984    -9.984     0.000
      HSO4-             4.369e-11   4.198e-11   -10.360   -10.377    -0.017
      ZnSO4             4.102e-11   4.104e-11   -10.387   -10.387     0.000
      LiSO4-            1.898e-11   1.824e-11   -10.722   -10.739    -0.017
      NH4SO4-           1.533e-11   1.473e-11   -10.815   -10.832    -0.017
      PbSO4             3.223e-12   3.224e-12   -11.492   -11.492     0.000
      CdSO4             1.292e-12   1.292e-12   -11.889   -11.889     0.000
      AlSO4+            1.203e-12   1.156e-12   -11.920   -11.937    -0.017
      CaHSO4+           9.666e-14   9.288e-14   -13.015   -13.032    -0.017
      Zn(SO4)2-2        5.615e-15   4.787e-15   -14.251   -14.320    -0.069
      Al(SO4)2-         4.130e-16   3.969e-16   -15.384   -15.401    -0.017
      CuSO4             3.923e-16   3.924e-16   -15.406   -15.406     0.000
      Pb(SO4)2-2        2.393e-16   2.040e-16   -15.621   -15.690    -0.069
      Cd(SO4)2-2        2.301e-16   1.962e-16   -15.638   -15.707    -0.069
      FeHSO4+           5.881e-17   5.651e-17   -16.231   -16.248    -0.017
      AlHSO4+2          5.769e-21   4.918e-21   -20.239   -20.308    -0.069
      FeSO4+            4.895e-25   4.703e-25   -24.310   -24.328    -0.017
      Fe(SO4)2-         1.182e-28   1.136e-28   -27.927   -27.945    -0.017
      FeHSO4+2          8.721e-32   7.435e-32   -31.059   -31.129    -0.069
Si                4.561e-06
      H4SiO4            4.555e-06   4.557e-06    -5.341    -5.341     0.000
      H3SiO4-           5.555e-09   5.338e-09    -8.255    -8.273    -0.017
      H2SiO4-2          1.665e-15   1.420e-15   -14.779   -14.848    -0.069
      SiF6-2            0.000e+00   0.000e+00   -43.544   -43.613    -0.069
Sr                5.566e-07
      Sr+2              5.542e-07   4.736e-07    -6.256    -6.325    -0.068
      SrHCO3+           1.555e-09   1.495e-09    -8.808    -8.825    -0.017
      SrSO4             8.533e-10   8.536e-10    -9.069    -9.069     0.000
      SrCO3             3.428e-11   3.429e-11   -10.465   -10.465     0.000
      SrOH+             4.661e-13   4.480e-13   -12.332   -12.349    -0.017
Zn                2.211e-08
      Zn+2              2.023e-08   1.727e-08    -7.694    -7.763    -0.069
      ZnHCO3+           9.583e-10   9.208e-10    -9.019    -9.036    -0.017
      ZnCO3             7.266e-10   7.268e-10    -9.139    -9.139     0.000
      Zn(OH)2           7.396e-11   7.398e-11   -10.131   -10.131     0.000
      ZnOH+             6.552e-11   6.295e-11   -10.184   -10.201    -0.017
      ZnSO4             4.102e-11   4.104e-11   -10.387   -10.387     0.000
      ZnCl+             9.305e-12   8.941e-12   -11.031   -11.049    -0.017
      Zn(CO3)2-2        3.844e-12   3.277e-12   -11.415   -11.485    -0.069
      Zn(SO4)2-2        5.615e-15   4.787e-15   -14.251   -14.320    -0.069
      Zn(OH)3-          4.491e-15   4.315e-15   -14.348   -14.365    -0.017
      ZnCl2             4.451e-15   4.452e-15   -14.352   -14.351     0.000
      ZnCl3-            2.364e-18   2.272e-18   -17.626   -17.644    -0.017
      Zn(OH)4-2         1.480e-20   1.261e-20   -19.830   -19.899    -0.069
      ZnCl4-2           5.815e-22   4.957e-22   -21.235   -21.305    -0.069

------------------------------Saturation indices-------------------------------

      Phase               SI log IAP  log KT

      Al(OH)3(a)       -0.87   11.41   12.27  Al(OH)3
      Albite           -6.58   -0.99    5.59  NaAlSi3O8
      Alunite          -3.52   -2.13    1.39  KAl3(SO4)2(OH)6
      Anglesite        -6.33  -14.24   -7.91  PbSO4
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◎ Table of Contents

Anhydrite	-4.30	-8.65	-4.35	CaSO4
Anorthite	-6.78	22.93	29.71	CaAl2Si2O8
Aragonite	-2.18	-10.41	-8.23	CaCO3
Barite	-2.30	-12.68	-10.38	BaSO4
Ca-Montmorillonite	-1.30	8.76	10.06	Ca0.165Al2.33Si3.67O10(OH)2
Calcite	-2.02	-10.41	-8.39	CaCO3
Cd(OH)2	-8.49	5.16	13.65	Cd(OH)2
CdSiO3	-10.16	-0.18	9.98	CdSiO3
CdSO4	-15.01	-14.29	0.72	CdSO4
Celestite	-4.58	-11.24	-6.66	SrSO4
Cerrusite	-2.60	-16.00	-13.40	PbCO3
CH4(g)	-10.42	-57.55	-47.13	CH4
Chalcedony	-1.53	-5.34	-3.81	SiO2
Chlorite(14A)	-17.05	59.74	76.79	Mg5Al2Si3O10(OH)8
Chrysotile	-13.90	21.09	34.99	Mg3Si2O5(OH)4
CO2(g)	-2.94	-21.21	-18.27	CO2
Dolomite	-4.46	-21.03	-16.57	CaMg(CO3)2
Fe(OH)3(a)	-6.33	12.12	18.45	Fe(OH)3
FeS(ppt)	-7.31	-48.21	-40.91	FeS
Fluorite	-6.28	-17.17	-10.89	CaF2
Gibbsite	2.03	11.41	9.38	Al(OH)3
Goethite	-1.24	12.12	13.36	FeOOH
Gypsum	-4.05	-8.65	-4.60	CaSO4:2H2O
H2(g)	-9.09	-9.09	0.00	H2
H2S(g)	-10.78	-55.79	-45.01	H2S
Hausmannite	-35.04	31.58	66.62	Mn3O4
Hematite	-0.57	24.25	24.82	Fe2O3
Hydroxyapatite	-5.95	-44.99	-39.04	Ca5(PO4)3OH
Illite	-2.55	11.72	14.27	K0.6Mg0.25Al2.3Si3.5O10(OH)2
Jarosite-K	-33.18	0.02	33.20	KFe3(SO4)2(OH)6
K-feldspar	-4.81	-2.06	2.75	KAlSi3O8
K-mica	4.75	20.75	16.00	KAl3Si3O10(OH)2
Kaolinite	2.73	12.13	9.40	Al2Si2O5(OH)4
Mackinawite	-6.57	-48.21	-41.64	FeS
Manganite	-13.30	12.04	25.34	MnOOH
Melanterite	-9.37	-11.87	-2.50	FeSO4:7H2O
N2(g)	-3.59	-6.78	-3.18	N2
NH3(g)	-11.92	-17.02	-5.10	NH3
O2(g)	-72.54	18.17	90.71	O2
Otavite	-3.95	-16.05	-12.10	CdCO3
Pb(OH)2	-3.72	5.21	8.93	Pb(OH)2
Pyrite	-1.83	-94.92	-93.09	FeS2
Pyrochroite	-7.70	7.50	15.20	Mn(OH)2
Pyrolusite	-28.41	16.58	45.00	MnO2
Quartz	-1.03	-5.34	-4.31	SiO2
Rhodochrosite	-2.66	-13.71	-11.05	MnCO3
Sepiolite	-11.20	5.16	16.35	Mg2Si3O7.5OH:3H2O
Sepiolite(d)	-13.50	5.16	18.66	Mg2Si3O7.5OH:3H2O
Siderite	-2.87	-13.63	-10.75	FeCO3
SiO2(a)	-2.44	-5.34	-2.90	SiO2
Smithsonite	-4.68	-14.44	-9.76	ZnCO3
Sphalerite	0.04	-49.02	-49.07	ZnS
Strontianite	-3.69	-13.00	-9.32	SrCO3
Sulfur	-7.85	-46.71	-38.85	S
Talc	-13.57	10.41	23.97	Mg3Si4O10(OH)2
Vivianite	-7.24	-43.24	-36.00	Fe3(PO4)2:8H2O
Willemite	-8.99	8.20	17.18	Zn2SiO4
Witherite	-5.75	-14.44	-8.69	BaCO3

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      Zn(OH)2(e)       -4.73    6.77   11.50  Zn(OH)2

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End of simulation.
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Reading input data for simulation 8.
-----------------------------------

      MIX 4 Mixing B2/B3/Rain with Stickleback (1:1000)
            5     0.001
            6     0.999
      SAVE solution 8
      END
-----------------------------------
Beginning of reaction calculations.
-----------------------------------

Reaction step 1.

Using mixture 4.  Mixing B2/B3/Rain with Stickleback (1:1000)

       1.000e-03 Solution 5   Solution after simulation 5.
       9.990e-01 Solution 6   Stickleback Lake

-----------------------------Solution composition------------------------------

      Elements           Molality       Moles

      Al                9.349e-08   9.349e-08
      B                 4.621e-06   4.621e-06
      Ba                3.638e-08   3.638e-08
      C                 7.421e-04   7.421e-04
      Ca                3.482e-04   3.482e-04
      Cd                8.890e-10   8.890e-10
      Cl                1.083e-03   1.083e-03
      Cu                7.941e-09   7.941e-09
      F                 4.034e-07   4.034e-07
      Fe                8.964e-08   8.964e-08
      K                 3.687e-05   3.687e-05
      Li                7.199e-07   7.199e-07
      Mg                2.010e-04   2.010e-04
      Mn                4.565e-08   4.565e-08
      N                 8.681e-07   8.681e-07
      Na                4.737e-04   4.737e-04
      P                 4.839e-06   4.839e-06
      Pb                2.414e-09   2.414e-09
      S                 5.224e-06   5.224e-06
      Si                9.112e-06   9.112e-06
      Sr                1.026e-06   1.026e-06
      Zn                3.822e-08   3.822e-08

----------------------------Description of solution----------------------------

                              pH  =   7.140      Charge balance
                              pe  =  -2.667      Adjusted to redox equilibrium
                 Activity of water  =   1.000
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◎ Table of Contents

```
           Ionic strength  =   2.209e-03
         Mass of water (kg)  =   1.000e+00
 Total alkalinity (eq/kg)  =   6.057e-04
       Total CO2 (mol/kg)  =   7.421e-04
     Temperature (deg C)  =   4.000
  Electrical balance (eq)  =  -9.160e-05
                Iterations  =  14
                   Total H  = 1.110131e+02
                   Total O  = 5.550840e+01
```

----------Distribution of species----------

Species	Molality	Activity	Log Molality	Log Activity	Log Gamma
H+	7.598e-08	7.249e-08	-7.119	-7.140	-0.020
OH-	2.446e-08	2.325e-08	-7.612	-7.634	-0.022
H2O	5.551e+01	1.000e+00	0.000	0.000	0.000
Al	9.349e-08				
Al(OH)4-	7.879e-08	7.493e-08	-7.104	-7.125	-0.022
Al(OH)2+	1.033e-08	9.821e-09	-7.986	-8.008	-0.022
Al(OH)3	3.338e-09	3.340e-09	-8.477	-8.476	0.000
AlOH+2	8.930e-10	7.304e-10	-9.049	-9.136	-0.087
AlF+2	9.039e-11	7.393e-11	-10.044	-10.131	-0.087
Al+3	3.401e-11	2.229e-11	-10.468	-10.652	-0.184
AlF2+	1.316e-11	1.251e-11	-10.881	-10.903	-0.022
AlSO4+	2.240e-13	2.130e-13	-12.650	-12.672	-0.022
AlF3	5.845e-14	5.848e-14	-13.233	-13.233	0.000
Al(SO4)2-	2.584e-17	2.457e-17	-16.588	-16.610	-0.022
AlF4-	9.253e-18	8.800e-18	-17.034	-17.056	-0.022
AlHSO4+2	1.482e-21	1.212e-21	-20.829	-20.917	-0.087
AlF5-2	6.783e-23	5.548e-23	-22.169	-22.256	-0.087
AlF6-3	5.190e-29	3.302e-29	-28.285	-28.481	-0.196
B	4.621e-06				
H3BO3	4.596e-06	4.598e-06	-5.338	-5.337	0.000
H2BO3-	2.541e-08	2.417e-08	-7.595	-7.617	-0.022
BF(OH)3-	5.772e-13	5.489e-13	-12.239	-12.261	-0.022
BF2(OH)2-	1.755e-18	1.669e-18	-17.756	-17.778	-0.022
BF3OH-	8.011e-26	7.618e-26	-25.096	-25.118	-0.022
BF4-	9.258e-33	8.805e-33	-32.033	-32.055	-0.022
Ba	3.638e-08				
Ba+2	3.623e-08	2.970e-08	-7.441	-7.527	-0.086
BaHCO3+	8.824e-11	8.392e-11	-10.054	-10.076	-0.022
BaSO4	6.028e-11	6.031e-11	-10.220	-10.220	0.000
BaCO3	2.139e-12	2.140e-12	-11.670	-11.670	0.000
BaOH+	1.460e-14	1.388e-14	-13.836	-13.857	-0.022
C(-4)	5.348e-13				
CH4	5.348e-13	5.351e-13	-12.272	-12.272	0.000
C(4)	7.421e-04				
HCO3-	5.996e-04	5.708e-04	-3.222	-3.244	-0.021
CO2	1.395e-04	1.396e-04	-3.855	-3.855	0.000
CaHCO3+	1.311e-06	1.248e-06	-5.882	-5.904	-0.021
MgHCO3+	1.104e-06	1.050e-06	-5.957	-5.979	-0.022
CO3-2	2.590e-07	2.126e-07	-6.587	-6.672	-0.086
NaHCO3	1.445e-07	1.446e-07	-6.840	-6.840	0.000
CaCO3	8.123e-08	8.127e-08	-7.090	-7.090	0.000
MgCO3	2.410e-08	2.411e-08	-7.618	-7.618	0.000
FeHCO3+	4.164e-09	3.959e-09	-8.381	-8.402	-0.022

	SrHCO3+	3.751e-09	3.570e-09	-8.426	-8.447	-0.021
	ZnHCO3+	2.147e-09	2.042e-09	-8.668	-8.690	-0.022
	MnHCO3+	1.891e-09	1.798e-09	-8.723	-8.745	-0.022
	PbCO3	1.562e-09	1.563e-09	-8.806	-8.806	0.000
	ZnCO3	1.205e-09	1.205e-09	-8.919	-8.919	0.000
	NaCO3-	6.001e-10	5.706e-10	-9.222	-9.244	-0.022
	MnCO3	5.966e-10	5.969e-10	-9.224	-9.224	0.000
	FeCO3	3.536e-10	3.538e-10	-9.452	-9.451	0.000
	PbHCO3+	2.017e-10	1.918e-10	-9.695	-9.717	-0.022
	BaHCO3+	8.824e-11	8.392e-11	-10.054	-10.076	-0.022
	SrCO3	6.122e-11	6.125e-11	-10.213	-10.213	0.000
	CdHCO3+	1.260e-11	1.198e-11	-10.900	-10.921	-0.022
	Zn(CO3)2-2	6.698e-12	5.478e-12	-11.174	-11.261	-0.087
	BaCO3	2.139e-12	2.140e-12	-11.670	-11.670	0.000
	Pb(CO3)2-2	1.021e-12	8.347e-13	-11.991	-12.078	-0.087
	CdCO3	1.120e-13	1.121e-13	-12.951	-12.950	0.000
	Cd(CO3)2-2	9.214e-17	7.536e-17	-16.036	-16.123	-0.087
Ca	3.482e-04					
	Ca+2	3.465e-04	2.843e-04	-3.460	-3.546	-0.086
	CaHCO3+	1.311e-06	1.248e-06	-5.882	-5.904	-0.021
	CaSO4	1.860e-07	1.861e-07	-6.730	-6.730	0.000
	CaHPO4	1.757e-07	1.757e-07	-6.755	-6.755	0.000
	CaCO3	8.123e-08	8.127e-08	-7.090	-7.090	0.000
	CaH2PO4+	1.128e-08	1.073e-08	-7.948	-7.969	-0.022
	CaPO4-	3.940e-09	3.747e-09	-8.405	-8.426	-0.022
	CaOH+	6.845e-10	6.509e-10	-9.165	-9.186	-0.022
	CaF+	5.841e-10	5.555e-10	-9.233	-9.255	-0.022
	CaHSO4+	6.778e-14	6.446e-14	-13.169	-13.191	-0.022
Cd	8.890e-10					
	Cd+2	8.116e-10	6.638e-10	-9.091	-9.178	-0.087
	CdCl+	6.365e-11	6.053e-11	-10.196	-10.218	-0.022
	CdHCO3+	1.260e-11	1.198e-11	-10.900	-10.921	-0.022
	CdSO4	6.752e-13	6.755e-13	-12.171	-12.170	0.000
	CdCl2	2.389e-13	2.391e-13	-12.622	-12.621	0.000
	CdOH+	1.500e-13	1.426e-13	-12.824	-12.846	-0.022
	CdCO3	1.120e-13	1.121e-13	-12.951	-12.950	0.000
	Cd(OH)2	5.639e-16	5.642e-16	-15.249	-15.249	0.000
	CdCl3-	1.162e-16	1.105e-16	-15.935	-15.957	-0.022
	Cd(CO3)2-2	9.214e-17	7.536e-17	-16.036	-16.123	-0.087
	Cd(SO4)2-2	4.212e-17	3.445e-17	-16.376	-16.463	-0.087
	Cd(OH)3-	9.181e-22	8.731e-22	-21.037	-21.059	-0.022
	Cd(OH)4-2	1.312e-28	1.073e-28	-27.882	-27.969	-0.087
Cl	1.083e-03					
	Cl-	1.083e-03	1.030e-03	-2.965	-2.987	-0.022
	MnCl+	1.559e-10	1.483e-10	-9.807	-9.829	-0.022
	FeCl+	1.037e-10	9.859e-11	-9.984	-10.006	-0.022
	CdCl+	6.365e-11	6.053e-11	-10.196	-10.218	-0.022
	ZnCl+	3.058e-11	2.908e-11	-10.515	-10.536	-0.022
	PbCl+	1.042e-11	9.905e-12	-10.982	-11.004	-0.022
	CdCl2	2.389e-13	2.391e-13	-12.622	-12.621	0.000
	MnCl2	6.660e-14	6.663e-14	-13.177	-13.176	0.000
	ZnCl2	2.862e-14	2.863e-14	-13.543	-13.543	0.000
	PbCl2	2.464e-14	2.465e-14	-13.608	-13.608	0.000
	CdCl3-	1.162e-16	1.105e-16	-15.935	-15.957	-0.022
	ZnCl3-	3.037e-17	2.888e-17	-16.518	-16.539	-0.022
	MnCl3-	1.987e-17	1.890e-17	-16.702	-16.724	-0.022
	PbCl3-	1.844e-17	1.754e-17	-16.734	-16.756	-0.022
	ZnCl4-2	1.524e-20	1.246e-20	-19.817	-19.904	-0.087

	PbCl4-2	8.879e-21	7.262e-21	-20.052	-20.139	-0.087
	FeCl+2	7.681e-26	6.282e-26	-25.115	-25.202	-0.087
	FeCl2+	6.218e-28	5.913e-28	-27.206	-27.228	-0.022
	FeCl3	6.085e-32	6.088e-32	-31.216	-31.216	0.000
Cu(1)		7.940e-09				
	Cu+	7.940e-09	7.542e-09	-8.100	-8.123	-0.022
Cu(2)		2.038e-13				
	Cu(OH)2	1.518e-13	1.518e-13	-12.819	-12.819	0.000
	Cu+2	4.646e-14	3.820e-14	-13.333	-13.418	-0.085
	CuOH+	5.541e-15	5.269e-15	-14.256	-14.278	-0.022
	CuSO4	2.702e-17	2.703e-17	-16.568	-16.568	0.000
	Cu(OH)3-	1.327e-19	1.262e-19	-18.877	-18.899	-0.022
	Cu(OH)4-2	4.247e-25	3.473e-25	-24.372	-24.459	-0.087
F		4.034e-07				
	F-	3.996e-07	3.799e-07	-6.398	-6.420	-0.022
	MgF+	2.877e-09	2.736e-09	-8.541	-8.563	-0.022
	CaF+	5.841e-10	5.555e-10	-9.233	-9.255	-0.022
	NaF	9.843e-11	9.848e-11	-10.007	-10.007	0.000
	AlF+2	9.039e-11	7.393e-11	-10.044	-10.131	-0.087
	HF	2.879e-11	2.880e-11	-10.541	-10.541	0.000
	AlF2+	1.316e-11	1.251e-11	-10.881	-10.903	-0.022
	BF(OH)3-	5.772e-13	5.489e-13	-12.239	-12.261	-0.022
	FeF+	2.771e-13	2.635e-13	-12.557	-12.579	-0.022
	MnF+	9.768e-14	9.289e-14	-13.010	-13.032	-0.022
	AlF3	5.845e-14	5.848e-14	-13.233	-13.233	0.000
	HF2-	3.538e-17	3.364e-17	-16.451	-16.473	-0.022
	AlF4-	9.253e-18	8.800e-18	-17.034	-17.056	-0.022
	BF2(OH)2-	1.755e-18	1.669e-18	-17.756	-17.778	-0.022
	AlF5-2	6.783e-23	5.548e-23	-22.169	-22.256	-0.087
	FeF+2	2.155e-24	1.763e-24	-23.667	-23.754	-0.087
	BF3OH-	8.011e-26	7.618e-26	-25.096	-25.118	-0.022
	FeF2+	2.143e-26	2.038e-26	-25.669	-25.691	-0.022
	AlF6-3	5.190e-29	3.302e-29	-28.285	-28.481	-0.196
	FeF3	1.136e-29	1.136e-29	-28.945	-28.944	0.000
	BF4-	9.258e-33	8.805e-33	-32.033	-32.055	-0.022
	SiF6-2	0.000e+00	0.000e+00	-40.951	-41.038	-0.087
Fe(2)		8.964e-08				
	Fe+2	8.436e-08	6.937e-08	-7.074	-7.159	-0.085
	FeHCO3+	4.164e-09	3.959e-09	-8.381	-8.402	-0.022
	FeHPO4	4.745e-10	4.748e-10	-9.324	-9.324	0.000
	FeCO3	3.536e-10	3.538e-10	-9.452	-9.451	0.000
	FeCl+	1.037e-10	9.859e-11	-9.984	-10.006	-0.022
	FeH2PO4+	8.329e-11	7.921e-11	-10.079	-10.101	-0.022
	FeOH+	5.882e-11	5.594e-11	-10.230	-10.252	-0.022
	FeSO4	3.305e-11	3.306e-11	-10.481	-10.481	0.000
	FeF+	2.771e-13	2.635e-13	-12.557	-12.579	-0.022
	FeHSO4+	1.654e-17	1.573e-17	-16.782	-16.803	-0.022
	Fe(HS)2	1.398e-21	1.398e-21	-20.855	-20.854	0.000
	Fe(HS)3-	7.615e-31	7.242e-31	-30.118	-30.140	-0.022
Fe(3)		3.246e-16				
	Fe(OH)2+	1.986e-16	1.888e-16	-15.702	-15.724	-0.022
	Fe(OH)3	1.253e-16	1.253e-16	-15.902	-15.902	0.000
	Fe(OH)4-	6.688e-19	6.360e-19	-18.175	-18.197	-0.022
	FeOH+2	1.191e-19	9.739e-20	-18.924	-19.011	-0.087
	Fe+3	6.309e-24	4.135e-24	-23.200	-23.384	-0.184
	FeH2PO4+2	3.100e-24	2.535e-24	-23.509	-23.596	-0.087
	FeF+2	2.155e-24	1.763e-24	-23.667	-23.754	-0.087
	FeHPO4+	9.632e-25	9.159e-25	-24.016	-24.038	-0.022

	FeSO4+	1.171e-25	1.114e-25	-24.931	-24.953	-0.022
	FeCl+2	7.681e-26	6.282e-26	-25.115	-25.202	-0.087
	FeF2+	2.143e-26	2.038e-26	-25.669	-25.691	-0.022
	FeCl2+	6.218e-28	5.913e-28	-27.206	-27.228	-0.022
	FeF3	1.136e-29	1.136e-29	-28.945	-28.944	0.000
	Fe(SO4)2-	9.505e-30	9.039e-30	-29.022	-29.044	-0.022
	FeCl3	6.085e-32	6.088e-32	-31.216	-31.216	0.000
	FeHSO4+2	2.879e-32	2.355e-32	-31.541	-31.628	-0.087
	Fe2(OH)2+4	1.451e-36	6.494e-37	-35.838	-36.188	-0.349
	Fe3(OH)4+5	0.000e+00	0.000e+00	-48.140	-48.686	-0.546
H(0)		2.010e-12				
	H2	1.005e-12	1.006e-12	-11.998	-11.998	0.000
K		3.687e-05				
	K+	3.687e-05	3.505e-05	-4.433	-4.455	-0.022
	KSO4-	7.074e-10	6.727e-10	-9.150	-9.172	-0.022
	KHPO4-	1.236e-10	1.175e-10	-9.908	-9.930	-0.022
	KOH	1.676e-12	1.676e-12	-11.776	-11.776	0.000
Li		7.199e-07				
	Li+	7.199e-07	6.855e-07	-6.143	-6.164	-0.021
	LiSO4-	1.275e-11	1.212e-11	-10.895	-10.916	-0.022
	LiOH	2.165e-13	2.166e-13	-12.665	-12.664	0.000
Mg		2.010e-04				
	Mg+2	1.997e-04	1.641e-04	-3.700	-3.785	-0.085
	MgHCO3+	1.104e-06	1.050e-06	-5.957	-5.979	-0.022
	MgHPO4	1.371e-07	1.371e-07	-6.863	-6.863	0.000
	MgSO4	8.705e-08	8.710e-08	-7.060	-7.060	0.000
	MgCO3	2.410e-08	2.411e-08	-7.618	-7.618	0.000
	MgH2PO4+	8.293e-09	7.887e-09	-8.081	-8.103	-0.022
	MgPO4-	3.067e-09	2.917e-09	-8.513	-8.535	-0.022
	MgF+	2.877e-09	2.736e-09	-8.541	-8.563	-0.022
	MgOH+	1.124e-09	1.069e-09	-8.949	-8.971	-0.022
Mn(2)		4.565e-08				
	Mn+2	4.299e-08	3.534e-08	-7.367	-7.452	-0.085
	MnHCO3+	1.891e-09	1.798e-09	-8.723	-8.745	-0.022
	MnCO3	5.966e-10	5.969e-10	-9.224	-9.224	0.000
	MnCl+	1.559e-10	1.483e-10	-9.807	-9.829	-0.022
	MnSO4	1.654e-11	1.655e-11	-10.781	-10.781	0.000
	MnOH+	2.090e-12	1.987e-12	-11.680	-11.702	-0.022
	MnF+	9.768e-14	9.289e-14	-13.010	-13.032	-0.022
	MnCl2	6.660e-14	6.663e-14	-13.177	-13.176	0.000
	MnCl3-	1.987e-17	1.890e-17	-16.702	-16.724	-0.022
	Mn(NO3)2	0.000e+00	0.000e+00	-178.776	-178.775	0.000
Mn(3)		1.364e-37				
	Mn+3	1.364e-37	8.676e-38	-36.865	-37.062	-0.196
N(-3)		2.857e-07				
	NH4+	2.852e-07	2.709e-07	-6.545	-6.567	-0.022
	NH3	4.297e-10	4.299e-10	-9.367	-9.367	0.000
	NH4SO4-	1.487e-11	1.414e-11	-10.828	-10.850	-0.022
N(0)		5.824e-07				
	N2	2.912e-07	2.914e-07	-6.536	-6.536	0.000
N(3)		0.000e+00				
	NO2-	0.000e+00	0.000e+00	-63.895	-63.918	-0.022
N(5)		0.000e+00				
	NO3-	0.000e+00	0.000e+00	-85.951	-85.973	-0.022
	PbNO3+	0.000e+00	0.000e+00	-94.155	-94.176	-0.022
	Mn(NO3)2	0.000e+00	0.000e+00	-178.776	-178.775	0.000
Na		4.737e-04				
	Na+	4.735e-04	4.505e-04	-3.325	-3.346	-0.022

	NaHCO3	1.445e-07	1.446e-07	-6.840	-6.840	0.000
	NaSO4-	8.334e-09	7.926e-09	-8.079	-8.101	-0.022
	NaHPO4-	1.588e-09	1.510e-09	-8.799	-8.821	-0.022
	NaCO3-	6.001e-10	5.706e-10	-9.222	-9.244	-0.022
	NaF	9.843e-11	9.848e-11	-10.007	-10.007	0.000
	NaOH	4.103e-11	4.105e-11	-10.387	-10.387	0.000
O(0)	0.000e+00					
	O2	0.000e+00	0.000e+00	-75.676	-75.676	0.000
P	4.839e-06					
	H2PO4-	2.395e-06	2.278e-06	-5.621	-5.642	-0.022
	HPO4-2	2.103e-06	1.719e-06	-5.677	-5.765	-0.087
	CaHPO4	1.757e-07	1.757e-07	-6.755	-6.755	0.000
	MgHPO4	1.371e-07	1.371e-07	-6.863	-6.863	0.000
	CaH2PO4+	1.128e-08	1.073e-08	-7.948	-7.969	-0.022
	MgH2PO4+	8.293e-09	7.887e-09	-8.081	-8.103	-0.022
	CaPO4-	3.940e-09	3.747e-09	-8.405	-8.426	-0.022
	MgPO4-	3.067e-09	2.917e-09	-8.513	-8.535	-0.022
	NaHPO4-	1.588e-09	1.510e-09	-8.799	-8.821	-0.022
	FeHPO4	4.745e-10	4.748e-10	-9.324	-9.324	0.000
	KHPO4-	1.236e-10	1.175e-10	-9.908	-9.930	-0.022
	FeH2PO4+	8.329e-11	7.921e-11	-10.079	-10.101	-0.022
	PO4-3	1.071e-11	6.807e-12	-10.970	-11.167	-0.197
	FeH2PO4+2	3.100e-24	2.535e-24	-23.509	-23.596	-0.087
	FeHPO4+	9.632e-25	9.159e-25	-24.016	-24.038	-0.022
Pb	2.414e-09					
	PbCO3	1.562e-09	1.563e-09	-8.806	-8.806	0.000
	Pb+2	5.173e-10	4.231e-10	-9.286	-9.374	-0.087
	PbHCO3+	2.017e-10	1.918e-10	-9.695	-9.717	-0.022
	PbOH+	1.197e-10	1.138e-10	-9.922	-9.944	-0.022
	PbCl+	1.042e-11	9.905e-12	-10.982	-11.004	-0.022
	Pb(CO3)2-2	1.021e-12	8.347e-13	-11.991	-12.078	-0.087
	PbSO4	9.633e-13	9.638e-13	-12.016	-12.016	0.000
	Pb(OH)2	6.103e-13	6.106e-13	-12.214	-12.214	0.000
	PbCl2	2.464e-14	2.465e-14	-13.608	-13.608	0.000
	Pb(OH)3-	1.017e-16	9.671e-17	-15.993	-16.015	-0.022
	Pb(SO4)2-2	2.505e-17	2.049e-17	-16.601	-16.688	-0.087
	PbCl3-	1.844e-17	1.754e-17	-16.734	-16.756	-0.022
	Pb2OH+3	1.694e-18	1.078e-18	-17.771	-17.967	-0.196
	PbCl4-2	8.879e-21	7.262e-21	-20.052	-20.139	-0.087
	Pb(OH)4-2	3.736e-21	3.056e-21	-20.428	-20.515	-0.087
	PbNO3+	0.000e+00	0.000e+00	-94.155	-94.176	-0.022
S(-2)	1.148e-11					
	H2S	6.475e-12	6.478e-12	-11.189	-11.189	0.000
	HS-	5.003e-12	4.756e-12	-11.301	-11.323	-0.022
	S-2	2.056e-18	1.686e-18	-17.687	-17.773	-0.086
	Fe(HS)2	1.398e-21	1.398e-21	-20.855	-20.854	0.000
	Fe(HS)3-	7.615e-31	7.242e-31	-30.118	-30.140	-0.022
S(6)	5.224e-06					
	SO4-2	4.942e-06	4.051e-06	-5.306	-5.392	-0.086
	CaSO4	1.860e-07	1.861e-07	-6.730	-6.730	0.000
	MgSO4	8.705e-08	8.710e-08	-7.060	-7.060	0.000
	NaSO4-	8.334e-09	7.926e-09	-8.079	-8.101	-0.022
	KSO4-	7.074e-10	6.727e-10	-9.150	-9.172	-0.022
	SrSO4	5.078e-10	5.080e-10	-9.294	-9.294	0.000
	BaSO4	6.028e-11	6.031e-11	-10.220	-10.220	0.000
	FeSO4	3.305e-11	3.306e-11	-10.481	-10.481	0.000
	ZnSO4	2.267e-11	2.268e-11	-10.645	-10.644	0.000
	HSO4-	1.983e-11	1.886e-11	-10.703	-10.725	-0.022

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      MnSO4             1.654e-11   1.655e-11   -10.781   -10.781     0.000
      NH4SO4-           1.487e-11   1.414e-11   -10.828   -10.850    -0.022
      LiSO4-            1.275e-11   1.212e-11   -10.895   -10.916    -0.022
      PbSO4             9.633e-13   9.638e-13   -12.016   -12.016     0.000
      CdSO4             6.752e-13   6.755e-13   -12.171   -12.170     0.000
      AlSO4+            2.240e-13   2.130e-13   -12.650   -12.672    -0.022
      CaHSO4+           6.778e-14   6.446e-14   -13.169   -13.191    -0.022
      Zn(SO4)2-2        1.086e-15   8.886e-16   -14.964   -15.051    -0.087
      Cd(SO4)2-2        4.212e-17   3.445e-17   -16.376   -16.463    -0.087
      CuSO4             2.702e-17   2.703e-17   -16.568   -16.568     0.000
      Al(SO4)2-         2.584e-17   2.457e-17   -16.588   -16.610    -0.022
      Pb(SO4)2-2        2.505e-17   2.049e-17   -16.601   -16.688    -0.087
      FeHSO4+           1.654e-17   1.573e-17   -16.782   -16.803    -0.022
      AlHSO4+2          1.482e-21   1.212e-21   -20.829   -20.917    -0.087
      FeSO4+            1.171e-25   1.114e-25   -24.931   -24.953    -0.022
      Fe(SO4)2-         9.505e-30   9.039e-30   -29.022   -29.044    -0.022
      FeHSO4+2          2.879e-32   2.355e-32   -31.541   -31.628    -0.087
Si                9.112e-06
      H4SiO4            9.104e-06   9.109e-06    -5.041    -5.041     0.000
      H3SiO4-           8.392e-09   7.980e-09    -8.076    -8.098    -0.022
      H2SiO4-2          1.940e-15   1.587e-15   -14.712   -14.799    -0.087
      SiF6-2            0.000e+00   0.000e+00   -40.951   -41.038    -0.087
Sr                1.026e-06
      Sr+2              1.022e-06   8.391e-07    -5.991    -6.076    -0.086
      SrHCO3+           3.751e-09   3.570e-09    -8.426    -8.447    -0.021
      SrSO4             5.078e-10   5.080e-10    -9.294    -9.294     0.000
      SrCO3             6.122e-11   6.125e-11   -10.213   -10.213     0.000
      SrOH+             6.238e-13   5.936e-13   -12.205   -12.226    -0.022
Zn                3.822e-08
      Zn+2              3.465e-08   2.842e-08    -7.460    -7.546    -0.086
      ZnHCO3+           2.147e-09   2.042e-09    -8.668    -8.690    -0.022
      ZnCO3             1.205e-09   1.205e-09    -8.919    -8.919     0.000
      ZnOH+             8.144e-11   7.745e-11   -10.089   -10.111    -0.022
      Zn(OH)2           6.803e-11   6.806e-11   -10.167   -10.167     0.000
      ZnCl+             3.058e-11   2.908e-11   -10.515   -10.536    -0.022
      ZnSO4             2.267e-11   2.268e-11   -10.645   -10.644     0.000
      Zn(CO3)2-2        6.698e-12   5.478e-12   -11.174   -11.261    -0.087
      ZnCl2             2.862e-14   2.863e-14   -13.543   -13.543     0.000
      Zn(OH)3-          3.122e-15   2.969e-15   -14.506   -14.527    -0.022
      Zn(SO4)2-2        1.086e-15   8.886e-16   -14.964   -15.051    -0.087
      ZnCl3-            3.037e-17   2.888e-17   -16.518   -16.539    -0.022
      ZnCl4-2           1.524e-20   1.246e-20   -19.817   -19.904    -0.087
      Zn(OH)4-2         7.936e-21   6.490e-21   -20.100   -20.188    -0.087

------------------------------Saturation indices-------------------------------

      Phase               SI log IAP  log KT

      Al(OH)3(a)       -1.50   10.77   12.27  Al(OH)3
      Albite           -6.15   -0.56    5.59  NaAlSi3O8
      Alunite          -5.75   -4.36    1.39  KAl3(SO4)2(OH)6
      Anglesite        -6.86  -14.77   -7.91  PbSO4
      Anhydrite        -4.59   -8.94   -4.35  CaSO4
      Anorthite        -7.52   22.19   29.71  CaAl2Si2O8
      Aragonite        -1.99  -10.22   -8.23  CaCO3
      Barite           -2.54  -12.92  -10.38  BaSO4
      Ca-Montmorillonite  -1.70    8.36   10.06  Ca0.165Al2.33Si3.67O10(OH)2
      Calcite          -1.83  -10.22   -8.39  CaCO3
```

Cd(OH)2	-8.55	5.10	13.65	Cd(OH)2
CdSiO3	-9.92	0.06	9.98	CdSiO3
CdSO4	-15.29	-14.57	0.72	CdSO4
Celestite	-4.80	-11.47	-6.66	SrSO4
Cerrusite	-2.65	-16.05	-13.40	PbCO3
CH4(g)	-9.60	-56.73	-47.13	CH4
Chalcedony	-1.23	-5.04	-3.81	SiO2
Chlorite(14A)	-17.91	58.89	76.79	Mg5Al2Si3O10(OH)8
Chrysotile	-13.59	21.40	34.99	Mg3Si2O5(OH)4
CO2(g)	-2.68	-20.95	-18.27	CO2
Dolomite	-4.11	-20.68	-16.57	CaMg(CO3)2
Fe(OH)3(a)	-6.86	11.59	18.45	Fe(OH)3
FeS(ppt)	-7.43	-48.33	-40.91	FeS
Fluorite	-5.50	-16.39	-10.89	CaF2
Gibbsite	1.39	10.77	9.38	Al(OH)3
Goethite	-1.77	11.59	13.36	FeOOH
Gypsum	-4.33	-8.94	-4.60	CaSO4:2H2O
H2(g)	-8.95	-8.95	0.00	H2
H2S(g)	-10.45	-55.45	-45.01	H2S
Hausmannite	-37.19	29.43	66.62	Mn3O4
Hematite	-1.63	23.19	24.82	Fe2O3
Hydroxyapatite	-5.05	-44.09	-39.04	Ca5(PO4)3OH
Illite	-2.91	11.36	14.27	K0.6Mg0.25Al2.3Si3.5O10(OH)2
Jarosite-K	-35.08	-1.88	33.20	KFe3(SO4)2(OH)6
K-feldspar	-4.42	-1.67	2.75	KAlSi3O8
K-mica	3.86	19.86	16.00	KAl3Si3O10(OH)2
Kaolinite	2.06	11.45	9.40	Al2Si2O5(OH)4
Mackinawite	-6.69	-48.33	-41.64	FeS
Manganite	-14.04	11.30	25.34	MnOOH
Melanterite	-10.05	-12.55	-2.50	FeSO4:7H2O
N2(g)	-3.35	-6.54	-3.18	N2
NH3(g)	-11.59	-16.69	-5.10	NH3
O2(g)	-72.82	17.89	90.71	O2
Otavite	-3.75	-15.85	-12.10	CdCO3
Pb(OH)2	-4.02	4.91	8.93	Pb(OH)2
Pyrite	-1.75	-94.84	-93.09	FeS2
Pyrochroite	-8.37	6.83	15.20	Mn(OH)2
Pyrolusite	-29.22	15.77	45.00	MnO2
Quartz	-0.73	-5.04	-4.31	SiO2
Rhodochrosite	-3.07	-14.12	-11.05	MnCO3
Sepiolite	-10.49	5.87	16.35	Mg2Si3O7.5OH:3H2O
Sepiolite(d)	-12.79	5.87	18.66	Mg2Si3O7.5OH:3H2O
Siderite	-3.08	-13.83	-10.75	FeCO3
SiO2(a)	-2.14	-5.04	-2.90	SiO2
Smithsonite	-4.46	-14.22	-9.76	ZnCO3
Sphalerite	0.35	-48.72	-49.07	ZnS
Strontianite	-3.43	-12.75	-9.32	SrCO3
Sulfur	-7.65	-46.51	-38.85	S
Talc	-12.65	11.32	23.97	Mg3Si4O10(OH)2
Vivianite	-7.81	-43.81	-36.00	Fe3(PO4)2:8H2O
Willemite	-8.76	8.43	17.18	Zn2SiO4
Witherite	-5.51	-14.20	-8.69	BaCO3
Zn(OH)2(e)	-4.77	6.73	11.50	Zn(OH)2

End of simulation.

◎ Table of Contents

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Reading input data for simulation 9.
------------------------------------

      MIX 5 Mixing B2/B3/Rain with Stickleback (1:1000000)
            5     0.000001
            6     0.999999
      SAVE solution 9
      END
------------------------------------
Beginning of reaction calculations.
------------------------------------

Reaction step 1.

Using mixture 5.  Mixing B2/B3/Rain with Stickleback (1:1000000)

       1.000e-06 Solution 5   Solution after simulation 5.
       1.000e+00 Solution 6   Stickleback Lake

-----------------------------Solution composition------------------------------

      Elements           Molality       Moles

      Al                9.267e-08   9.267e-08
      B                 4.626e-06   4.626e-06
      Ba                3.641e-08   3.641e-08
      C                 7.425e-04   7.425e-04
      Ca                3.485e-04   3.485e-04
      Cd                8.898e-10   8.898e-10
      Cl                1.084e-03   1.084e-03
      Cu                7.869e-09   7.869e-09
      F                 4.038e-07   4.038e-07
      Fe                8.954e-08   8.954e-08
      K                 3.691e-05   3.691e-05
      Li                7.206e-07   7.206e-07
      Mg                2.012e-04   2.012e-04
      Mn                4.551e-08   4.551e-08
      N                 8.690e-07   8.690e-07
      Na                4.742e-04   4.742e-04
      P                 4.843e-06   4.843e-06
      Pb                2.413e-09   2.413e-09
      S                 5.205e-06   5.205e-06
      Si                9.121e-06   9.121e-06
      Sr                1.027e-06   1.027e-06
      Zn                3.825e-08   3.825e-08

----------------------------Description of solution----------------------------

                              pH  =   7.140      Charge balance
                              pe  =  -2.667      Adjusted to redox equilibrium
             Activity of water  =   1.000
                Ionic strength  =   2.211e-03
             Mass of water (kg)  =   1.000e+00
       Total alkalinity (eq/kg)  =   6.060e-04
             Total CO2 (mol/kg)  =   7.425e-04
            Temperature (deg C)  =   4.000
        Electrical balance (eq)  =  -9.167e-05
```

Iterations = 14
Total H = 1.110131e+02
Total O = 5.550840e+01

----------Distribution of species----------

Species	Molality	Activity	Log Molality	Log Activity	Log Gamma
H+	7.601e-08	7.252e-08	-7.119	-7.140	-0.020
OH-	2.445e-08	2.324e-08	-7.612	-7.634	-0.022
H2O	5.551e+01	1.000e+00	0.000	0.000	0.000
Al	9.267e-08				
Al(OH)4-	7.809e-08	7.426e-08	-7.107	-7.129	-0.022
Al(OH)2+	1.024e-08	9.741e-09	-7.990	-8.011	-0.022
Al(OH)3	3.309e-09	3.311e-09	-8.480	-8.480	0.000
AlOH+2	8.861e-10	7.247e-10	-9.053	-9.140	-0.087
AlF+2	8.981e-11	7.345e-11	-10.047	-10.134	-0.087
Al+3	3.376e-11	2.212e-11	-10.472	-10.655	-0.184
AlF2+	1.309e-11	1.244e-11	-10.883	-10.905	-0.022
AlSO4+	2.215e-13	2.106e-13	-12.655	-12.676	-0.022
AlF3	5.819e-14	5.822e-14	-13.235	-13.235	0.000
Al(SO4)2-	2.546e-17	2.421e-17	-16.594	-16.616	-0.022
AlF4-	9.221e-18	8.769e-18	-17.035	-17.057	-0.022
AlHSO4+2	1.466e-21	1.199e-21	-20.834	-20.921	-0.087
AlF5-2	6.766e-23	5.534e-23	-22.170	-22.257	-0.087
AlF6-3	5.183e-29	3.296e-29	-28.285	-28.482	-0.197
B	4.626e-06				
H3BO3	4.600e-06	4.603e-06	-5.337	-5.337	0.000
H2BO3-	2.543e-08	2.418e-08	-7.595	-7.617	-0.022
BF(OH)3-	5.783e-13	5.500e-13	-12.238	-12.260	-0.022
BF2(OH)2-	1.761e-18	1.674e-18	-17.754	-17.776	-0.022
BF3OH-	8.049e-26	7.654e-26	-25.094	-25.116	-0.022
BF4-	9.315e-33	8.858e-33	-32.031	-32.053	-0.022
Ba	3.641e-08				
Ba+2	3.626e-08	2.973e-08	-7.441	-7.527	-0.086
BaHCO3+	8.836e-11	8.403e-11	-10.054	-10.076	-0.022
BaSO4	6.011e-11	6.014e-11	-10.221	-10.221	0.000
BaCO3	2.141e-12	2.142e-12	-11.669	-11.669	0.000
BaOH+	1.461e-14	1.389e-14	-13.835	-13.857	-0.022
C(-4)	5.360e-13				
CH4	5.360e-13	5.363e-13	-12.271	-12.271	0.000
C(4)	7.425e-04				
HCO3-	6.000e-04	5.711e-04	-3.222	-3.243	-0.021
CO2	1.396e-04	1.397e-04	-3.855	-3.855	0.000
CaHCO3+	1.313e-06	1.249e-06	-5.882	-5.903	-0.021
MgHCO3+	1.105e-06	1.051e-06	-5.957	-5.979	-0.022
CO3-2	2.590e-07	2.126e-07	-6.587	-6.672	-0.086
NaHCO3	1.447e-07	1.448e-07	-6.839	-6.839	0.000
CaCO3	8.130e-08	8.134e-08	-7.090	-7.090	0.000
MgCO3	2.412e-08	2.413e-08	-7.618	-7.617	0.000
FeHCO3+	4.161e-09	3.957e-09	-8.381	-8.403	-0.022
SrHCO3+	3.756e-09	3.575e-09	-8.425	-8.447	-0.021
ZnHCO3+	2.150e-09	2.044e-09	-8.668	-8.689	-0.022
MnHCO3+	1.886e-09	1.793e-09	-8.724	-8.746	-0.022
PbCO3	1.562e-09	1.563e-09	-8.806	-8.806	0.000
ZnCO3	1.206e-09	1.206e-09	-8.919	-8.919	0.000
NaCO3-	6.007e-10	5.713e-10	-9.221	-9.243	-0.022

	MnCO3	5.948e-10	5.951e-10	-9.226	-9.225	0.000
	FeCO3	3.532e-10	3.534e-10	-9.452	-9.452	0.000
	PbHCO3+	2.017e-10	1.919e-10	-9.695	-9.717	-0.022
	BaHCO3+	8.836e-11	8.403e-11	-10.054	-10.076	-0.022
	SrCO3	6.128e-11	6.131e-11	-10.213	-10.212	0.000
	CdHCO3+	1.261e-11	1.200e-11	-10.899	-10.921	-0.022
	Zn(CO3)2-2	6.706e-12	5.484e-12	-11.174	-11.261	-0.087
	BaCO3	2.141e-12	2.142e-12	-11.669	-11.669	0.000
	Pb(CO3)2-2	1.021e-12	8.346e-13	-11.991	-12.078	-0.087
	CdCO3	1.121e-13	1.122e-13	-12.950	-12.950	0.000
	Cd(CO3)2-2	9.224e-17	7.543e-17	-16.035	-16.122	-0.087
Ca		3.485e-04				
	Ca+2	3.467e-04	2.845e-04	-3.460	-3.546	-0.086
	CaHCO3+	1.313e-06	1.249e-06	-5.882	-5.903	-0.021
	CaSO4	1.855e-07	1.855e-07	-6.732	-6.732	0.000
	CaHPO4	1.759e-07	1.760e-07	-6.755	-6.755	0.000
	CaCO3	8.130e-08	8.134e-08	-7.090	-7.090	0.000
	CaH2PO4+	1.130e-08	1.075e-08	-7.947	-7.969	-0.022
	CaPO4-	3.943e-09	3.750e-09	-8.404	-8.426	-0.022
	CaOH+	6.847e-10	6.511e-10	-9.165	-9.186	-0.022
	CaF+	5.851e-10	5.564e-10	-9.233	-9.255	-0.022
	CaHSO4+	6.761e-14	6.429e-14	-13.170	-13.192	-0.022
Cd		8.898e-10				
	Cd+2	8.122e-10	6.642e-10	-9.090	-9.178	-0.087
	CdCl+	6.375e-11	6.063e-11	-10.196	-10.217	-0.022
	CdHCO3+	1.261e-11	1.200e-11	-10.899	-10.921	-0.022
	CdSO4	6.731e-13	6.734e-13	-12.172	-12.172	0.000
	CdCl2	2.396e-13	2.397e-13	-12.621	-12.620	0.000
	CdOH+	1.500e-13	1.427e-13	-12.824	-12.846	-0.022
	CdCO3	1.121e-13	1.122e-13	-12.950	-12.950	0.000
	Cd(OH)2	5.638e-16	5.641e-16	-15.249	-15.249	0.000
	CdCl3-	1.166e-16	1.109e-16	-15.933	-15.955	-0.022
	Cd(CO3)2-2	9.224e-17	7.543e-17	-16.035	-16.122	-0.087
	Cd(SO4)2-2	4.184e-17	3.422e-17	-16.378	-16.466	-0.087
	Cd(OH)3-	9.177e-22	8.727e-22	-21.037	-21.059	-0.022
	Cd(OH)4-2	1.311e-28	1.072e-28	-27.882	-27.970	-0.087
Cl		1.084e-03				
	Cl-	1.084e-03	1.031e-03	-2.965	-2.987	-0.022
	MnCl+	1.556e-10	1.479e-10	-9.808	-9.830	-0.022
	FeCl+	1.037e-10	9.857e-11	-9.984	-10.006	-0.022
	CdCl+	6.375e-11	6.063e-11	-10.196	-10.217	-0.022
	ZnCl+	3.063e-11	2.913e-11	-10.514	-10.536	-0.022
	PbCl+	1.042e-11	9.911e-12	-10.982	-11.004	-0.022
	CdCl2	2.396e-13	2.397e-13	-12.621	-12.620	0.000
	MnCl2	6.652e-14	6.656e-14	-13.177	-13.177	0.000
	ZnCl2	2.869e-14	2.871e-14	-13.542	-13.542	0.000
	PbCl2	2.468e-14	2.469e-14	-13.608	-13.607	0.000
	CdCl3-	1.166e-16	1.109e-16	-15.933	-15.955	-0.022
	ZnCl3-	3.048e-17	2.899e-17	-16.516	-16.538	-0.022
	MnCl3-	1.987e-17	1.889e-17	-16.702	-16.724	-0.022
	PbCl3-	1.849e-17	1.758e-17	-16.733	-16.755	-0.022
	ZnCl4-2	1.531e-20	1.252e-20	-19.815	-19.902	-0.087
	PbCl4-2	8.912e-21	7.288e-21	-20.050	-20.137	-0.087
	FeCl+2	7.682e-26	6.282e-26	-25.115	-25.202	-0.087
	FeCl2+	6.224e-28	5.919e-28	-27.206	-27.228	-0.022
	FeCl3	6.097e-32	6.100e-32	-31.215	-31.215	0.000
Cu(1)		7.869e-09				
	Cu+	7.869e-09	7.474e-09	-8.104	-8.126	-0.022

◎ Table of Contents

Cu(2)	2.019e-13					
Cu(OH)2	1.503e-13	1.504e-13	-12.823	-12.823	0.000
Cu+2	4.605e-14	3.786e-14	-13.337	-13.422	-0.085
CuOH+	5.490e-15	5.221e-15	-14.260	-14.282	-0.022
CuSO4	2.668e-17	2.669e-17	-16.574	-16.574	0.000
Cu(OH)3-	1.314e-19	1.250e-19	-18.881	-18.903	-0.022
Cu(OH)4-2	4.203e-25	3.438e-25	-24.376	-24.464	-0.087
F	4.038e-07					
F-	4.000e-07	3.803e-07	-6.398	-6.420	-0.022
MgF+	2.881e-09	2.740e-09	-8.540	-8.562	-0.022
CaF+	5.851e-10	5.564e-10	-9.233	-9.255	-0.022
NaF	9.862e-11	9.867e-11	-10.006	-10.006	0.000
AlF+2	8.981e-11	7.345e-11	-10.047	-10.134	-0.087
HF	2.883e-11	2.884e-11	-10.540	-10.540	0.000
AlF2+	1.309e-11	1.244e-11	-10.883	-10.905	-0.022
BF(OH)3-	5.783e-13	5.500e-13	-12.238	-12.260	-0.022
FeF+	2.771e-13	2.635e-13	-12.557	-12.579	-0.022
MnF+	9.748e-14	9.270e-14	-13.011	-13.033	-0.022
AlF3	5.819e-14	5.822e-14	-13.235	-13.235	0.000
HF2-	3.546e-17	3.372e-17	-16.450	-16.472	-0.022
AlF4-	9.221e-18	8.769e-18	-17.035	-17.057	-0.022
BF2(OH)2-	1.761e-18	1.674e-18	-17.754	-17.776	-0.022
AlF5-2	6.766e-23	5.534e-23	-22.170	-22.257	-0.087
FeF+2	2.155e-24	1.763e-24	-23.666	-23.754	-0.087
BF3OH-	8.049e-26	7.654e-26	-25.094	-25.116	-0.022
FeF2+	2.145e-26	2.040e-26	-25.669	-25.690	-0.022
AlF6-3	5.183e-29	3.296e-29	-28.285	-28.482	-0.197
FeF3	1.138e-29	1.139e-29	-28.944	-28.944	0.000
BF4-	9.315e-33	8.858e-33	-32.031	-32.053	-0.022
SiF6-2	0.000e+00	0.000e+00	-40.947	-41.035	-0.087
Fe(2)	8.954e-08					
Fe+2	8.427e-08	6.929e-08	-7.074	-7.159	-0.085
FeHCO3+	4.161e-09	3.957e-09	-8.381	-8.403	-0.022
FeHPO4	4.742e-10	4.745e-10	-9.324	-9.324	0.000
FeCO3	3.532e-10	3.534e-10	-9.452	-9.452	0.000
FeCl+	1.037e-10	9.857e-11	-9.984	-10.006	-0.022
FeH2PO4+	8.327e-11	7.919e-11	-10.079	-10.101	-0.022
FeOH+	5.873e-11	5.585e-11	-10.231	-10.253	-0.022
FeSO4	3.289e-11	3.290e-11	-10.483	-10.483	0.000
FeF+	2.771e-13	2.635e-13	-12.557	-12.579	-0.022
FeHSO4+	1.646e-17	1.566e-17	-16.783	-16.805	-0.022
Fe(HS)2	1.390e-21	1.391e-21	-20.857	-20.857	0.000
Fe(HS)3-	7.560e-31	7.189e-31	-30.121	-30.143	-0.022
Fe(3)	3.240e-16					
Fe(OH)2+	1.982e-16	1.885e-16	-15.703	-15.725	-0.022
Fe(OH)3	1.250e-16	1.251e-16	-15.903	-15.903	0.000
Fe(OH)4-	6.672e-19	6.345e-19	-18.176	-18.198	-0.022
FeOH+2	1.189e-19	9.726e-20	-18.925	-19.012	-0.087
Fe+3	6.304e-24	4.131e-24	-23.200	-23.384	-0.184
FeH2PO4+2	3.100e-24	2.535e-24	-23.509	-23.596	-0.087
FeF+2	2.155e-24	1.763e-24	-23.666	-23.754	-0.087
FeHPO4+	9.628e-25	9.156e-25	-24.016	-24.038	-0.022
FeSO4+	1.166e-25	1.109e-25	-24.933	-24.955	-0.022
FeCl+2	7.682e-26	6.282e-26	-25.115	-25.202	-0.087
FeF2+	2.145e-26	2.040e-26	-25.669	-25.690	-0.022
FeCl2+	6.224e-28	5.919e-28	-27.206	-27.228	-0.022
FeF3	1.138e-29	1.139e-29	-28.944	-28.944	0.000
Fe(SO4)2-	9.425e-30	8.963e-30	-29.026	-29.048	-0.022

	FeCl3	6.097e-32	6.100e-32	-31.215	-31.215	0.000
	FeHSO4+2	2.867e-32	2.344e-32	-31.543	-31.630	-0.087
	Fe2(OH)2+4	1.448e-36	6.476e-37	-35.839	-36.189	-0.349
	Fe3(OH)4+5	0.000e+00	0.000e+00	-48.142	-48.688	-0.546
H(0)		2.011e-12				
	H2	1.006e-12	1.006e-12	-11.998	-11.997	0.000
K		3.691e-05				
	K+	3.691e-05	3.508e-05	-4.433	-4.455	-0.022
	KSO4-	7.054e-10	6.708e-10	-9.152	-9.173	-0.022
	KHPO4-	1.237e-10	1.177e-10	-9.907	-9.929	-0.022
	KOH	1.676e-12	1.677e-12	-11.776	-11.775	0.000
Li		7.206e-07				
	Li+	7.206e-07	6.862e-07	-6.142	-6.164	-0.021
	LiSO4-	1.271e-11	1.209e-11	-10.896	-10.918	-0.022
	LiOH	2.166e-13	2.168e-13	-12.664	-12.664	0.000
Mg		2.012e-04				
	Mg+2	1.998e-04	1.642e-04	-3.699	-3.785	-0.085
	MgHCO3+	1.105e-06	1.051e-06	-5.957	-5.979	-0.022
	MgHPO4	1.372e-07	1.373e-07	-6.863	-6.862	0.000
	MgSO4	8.678e-08	8.682e-08	-7.062	-7.061	0.000
	MgCO3	2.412e-08	2.413e-08	-7.618	-7.617	0.000
	MgH2PO4+	8.306e-09	7.899e-09	-8.081	-8.102	-0.022
	MgPO4-	3.070e-09	2.919e-09	-8.513	-8.535	-0.022
	MgF+	2.881e-09	2.740e-09	-8.540	-8.562	-0.022
	MgOH+	1.124e-09	1.069e-09	-8.949	-8.971	-0.022
Mn(2)		4.551e-08				
	Mn+2	4.286e-08	3.524e-08	-7.368	-7.453	-0.085
	MnHCO3+	1.886e-09	1.793e-09	-8.724	-8.746	-0.022
	MnCO3	5.948e-10	5.951e-10	-9.226	-9.225	0.000
	MnCl+	1.556e-10	1.479e-10	-9.808	-9.830	-0.022
	MnSO4	1.643e-11	1.643e-11	-10.784	-10.784	0.000
	MnOH+	2.082e-12	1.980e-12	-11.681	-11.703	-0.022
	MnF+	9.748e-14	9.270e-14	-13.011	-13.033	-0.022
	MnCl2	6.652e-14	6.656e-14	-13.177	-13.177	0.000
	MnCl3-	1.987e-17	1.889e-17	-16.702	-16.724	-0.022
	Mn(NO3)2	0.000e+00	0.000e+00	-178.778	-178.777	0.000
Mn(3)		1.360e-37				
	Mn+3	1.360e-37	8.651e-38	-36.866	-37.063	-0.197
N(-3)		2.860e-07				
	NH4+	2.856e-07	2.713e-07	-6.544	-6.567	-0.022
	NH3	4.301e-10	4.303e-10	-9.366	-9.366	0.000
	NH4SO4-	1.483e-11	1.410e-11	-10.829	-10.851	-0.022
N(0)		5.829e-07				
	N2	2.915e-07	2.916e-07	-6.535	-6.535	0.000
N(3)		0.000e+00				
	NO2-	0.000e+00	0.000e+00	-63.896	-63.918	-0.022
N(5)		0.000e+00				
	NO3-	0.000e+00	0.000e+00	-85.951	-85.973	-0.022
	PbNO3+	0.000e+00	0.000e+00	-94.155	-94.177	-0.022
	Mn(NO3)2	0.000e+00	0.000e+00	-178.778	-178.777	0.000
Na		4.742e-04				
	Na+	4.740e-04	4.509e-04	-3.324	-3.346	-0.022
	NaHCO3	1.447e-07	1.448e-07	-6.839	-6.839	0.000
	NaSO4-	8.311e-09	7.904e-09	-8.080	-8.102	-0.022
	NaHPO4-	1.590e-09	1.512e-09	-8.799	-8.820	-0.022
	NaCO3-	6.007e-10	5.713e-10	-9.221	-9.243	-0.022
	NaF	9.862e-11	9.867e-11	-10.006	-10.006	0.000
	NaOH	4.106e-11	4.108e-11	-10.387	-10.386	0.000

◎ Table of Contents

O(0)	0.000e+00					
O2		0.000e+00	0.000e+00	-75.676	-75.676	0.000
P	4.843e-06					
H2PO4-		2.397e-06	2.280e-06	-5.620	-5.642	-0.022
HPO4-2		2.104e-06	1.720e-06	-5.677	-5.764	-0.087
CaHPO4		1.759e-07	1.760e-07	-6.755	-6.755	0.000
MgHPO4		1.372e-07	1.373e-07	-6.863	-6.862	0.000
CaH2PO4+		1.130e-08	1.075e-08	-7.947	-7.969	-0.022
MgH2PO4+		8.306e-09	7.899e-09	-8.081	-8.102	-0.022
CaPO4-		3.943e-09	3.750e-09	-8.404	-8.426	-0.022
MgPO4-		3.070e-09	2.919e-09	-8.513	-8.535	-0.022
NaHPO4-		1.590e-09	1.512e-09	-8.799	-8.820	-0.022
FeHPO4		4.742e-10	4.745e-10	-9.324	-9.324	0.000
KHPO4-		1.237e-10	1.177e-10	-9.907	-9.929	-0.022
FeH2PO4+		8.327e-11	7.919e-11	-10.079	-10.101	-0.022
PO4-3		1.071e-11	6.808e-12	-10.970	-11.167	-0.197
FeH2PO4+2		3.100e-24	2.535e-24	-23.509	-23.596	-0.087
FeHPO4+		9.628e-25	9.156e-25	-24.016	-24.038	-0.022
Pb	2.413e-09					
PbCO3		1.562e-09	1.563e-09	-8.806	-8.806	0.000
Pb+2		5.172e-10	4.229e-10	-9.286	-9.374	-0.087
PbHCO3+		2.017e-10	1.919e-10	-9.695	-9.717	-0.022
PbOH+		1.196e-10	1.137e-10	-9.922	-9.944	-0.022
PbCl+		1.042e-11	9.911e-12	-10.982	-11.004	-0.022
Pb(CO3)2-2		1.021e-12	8.346e-13	-11.991	-12.078	-0.087
PbSO4		9.594e-13	9.599e-13	-12.018	-12.018	0.000
Pb(OH)2		6.097e-13	6.100e-13	-12.215	-12.215	0.000
PbCl2		2.468e-14	2.469e-14	-13.608	-13.607	0.000
Pb(OH)3-		1.015e-16	9.657e-17	-15.993	-16.015	-0.022
Pb(SO4)2-2		2.486e-17	2.033e-17	-16.604	-16.692	-0.087
PbCl3-		1.849e-17	1.758e-17	-16.733	-16.755	-0.022
Pb2OH+3		1.693e-18	1.077e-18	-17.771	-17.968	-0.197
PbCl4-2		8.912e-21	7.288e-21	-20.050	-20.137	-0.087
Pb(OH)4-2		3.730e-21	3.050e-21	-20.428	-20.516	-0.087
PbNO3+		0.000e+00	0.000e+00	-94.155	-94.177	-0.022
S(-2)	1.146e-11					
H2S		6.464e-12	6.468e-12	-11.189	-11.189	0.000
HS-		4.993e-12	4.746e-12	-11.302	-11.324	-0.022
S-2		2.052e-18	1.682e-18	-17.688	-17.774	-0.086
Fe(HS)2		1.390e-21	1.391e-21	-20.857	-20.857	0.000
Fe(HS)3-		7.560e-31	7.189e-31	-30.121	-30.143	-0.022
S(6)	5.205e-06					
SO4-2		4.923e-06	4.036e-06	-5.308	-5.394	-0.086
CaSO4		1.855e-07	1.855e-07	-6.732	-6.732	0.000
MgSO4		8.678e-08	8.682e-08	-7.062	-7.061	0.000
NaSO4-		8.311e-09	7.904e-09	-8.080	-8.102	-0.022
KSO4-		7.054e-10	6.708e-10	-9.152	-9.173	-0.022
SrSO4		5.063e-10	5.066e-10	-9.296	-9.295	0.000
BaSO4		6.011e-11	6.014e-11	-10.221	-10.221	0.000
FeSO4		3.289e-11	3.290e-11	-10.483	-10.483	0.000
ZnSO4		2.260e-11	2.261e-11	-10.646	-10.646	0.000
HSO4-		1.976e-11	1.879e-11	-10.704	-10.726	-0.022
MnSO4		1.643e-11	1.643e-11	-10.784	-10.784	0.000
NH4SO4-		1.483e-11	1.410e-11	-10.829	-10.851	-0.022
LiSO4-		1.271e-11	1.209e-11	-10.896	-10.918	-0.022
PbSO4		9.594e-13	9.599e-13	-12.018	-12.018	0.000
CdSO4		6.731e-13	6.734e-13	-12.172	-12.172	0.000
AlSO4+		2.215e-13	2.106e-13	-12.655	-12.676	-0.022

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      CaHSO4+           6.761e-14   6.429e-14   -13.170   -13.192    -0.022
      Zn(SO4)2-2        1.079e-15   8.826e-16   -14.967   -15.054    -0.087
      Cd(SO4)2-2        4.184e-17   3.422e-17   -16.378   -16.466    -0.087
      CuSO4             2.668e-17   2.669e-17   -16.574   -16.574     0.000
      Al(SO4)2-         2.546e-17   2.421e-17   -16.594   -16.616    -0.022
      Pb(SO4)2-2        2.486e-17   2.033e-17   -16.604   -16.692    -0.087
      FeHSO4+           1.646e-17   1.566e-17   -16.783   -16.805    -0.022
      AlHSO4+2          1.466e-21   1.199e-21   -20.834   -20.921    -0.087
      FeSO4+            1.166e-25   1.109e-25   -24.933   -24.955    -0.022
      Fe(SO4)2-         9.425e-30   8.963e-30   -29.026   -29.048    -0.022
      FeHSO4+2          2.867e-32   2.344e-32   -31.543   -31.630    -0.087
Si              9.121e-06
      H4SiO4            9.113e-06   9.118e-06    -5.040    -5.040     0.000
      H3SiO4-           8.397e-09   7.985e-09    -8.076    -8.098    -0.022
      H2SiO4-2          1.941e-15   1.587e-15   -14.712   -14.799    -0.087
      SiF6-2            0.000e+00   0.000e+00   -40.947   -41.035    -0.087
Sr              1.027e-06
      Sr+2              1.023e-06   8.399e-07    -5.990    -6.076    -0.086
      SrHCO3+           3.756e-09   3.575e-09    -8.425    -8.447    -0.021
      SrSO4             5.063e-10   5.066e-10    -9.296    -9.295     0.000
      SrCO3             6.128e-11   6.131e-11   -10.213   -10.212     0.000
      SrOH+             6.241e-13   5.939e-13   -12.205   -12.226    -0.022
Zn              3.825e-08
      Zn+2              3.468e-08   2.844e-08    -7.460    -7.546    -0.086
      ZnHCO3+           2.150e-09   2.044e-09    -8.668    -8.689    -0.022
      ZnCO3             1.206e-09   1.206e-09    -8.919    -8.919     0.000
      ZnOH+             8.147e-11   7.748e-11   -10.089   -10.111    -0.022
      Zn(OH)2           6.803e-11   6.806e-11   -10.167   -10.167     0.000
      ZnCl+             3.063e-11   2.913e-11   -10.514   -10.536    -0.022
      ZnSO4             2.260e-11   2.261e-11   -10.646   -10.646     0.000
      Zn(CO3)2-2        6.706e-12   5.484e-12   -11.174   -11.261    -0.087
      ZnCl2             2.869e-14   2.871e-14   -13.542   -13.542     0.000
      Zn(OH)3-          3.121e-15   2.968e-15   -14.506   -14.528    -0.022
      Zn(SO4)2-2        1.079e-15   8.826e-16   -14.967   -15.054    -0.087
      ZnCl3-            3.048e-17   2.899e-17   -16.516   -16.538    -0.022
      ZnCl4-2           1.531e-20   1.252e-20   -19.815   -19.902    -0.087
      Zn(OH)4-2         7.930e-21   6.485e-21   -20.101   -20.188    -0.087

------------------------------Saturation indices-------------------------------

      Phase               SI log IAP  log KT

      Al(OH)3(a)       -1.51   10.76   12.27  Al(OH)3
      Albite           -6.16   -0.56    5.59  NaAlSi3O8
      Alunite          -5.76   -4.37    1.39  KAl3(SO4)2(OH)6
      Anglesite        -6.86  -14.77   -7.91  PbSO4
      Anhydrite        -4.59   -8.94   -4.35  CaSO4
      Anorthite        -7.53   22.18   29.71  CaAl2Si2O8
      Aragonite        -1.99  -10.22   -8.23  CaCO3
      Barite           -2.54  -12.92  -10.38  BaSO4
      Ca-Montmorillonite  -1.70    8.35   10.06  Ca0.165Al2.33Si3.67O10(OH)2
      Calcite          -1.83  -10.22   -8.39  CaCO3
      Cd(OH)2          -8.55    5.10   13.65  Cd(OH)2
      CdSiO3           -9.92    0.06    9.98  CdSiO3
      CdSO4           -15.29  -14.57    0.72  CdSO4
      Celestite        -4.81  -11.47   -6.66  SrSO4
      Cerrusite        -2.65  -16.05  -13.40  PbCO3
      CH4(g)           -9.60  -56.73  -47.13  CH4
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Chalcedony	-1.23	-5.04	-3.81	SiO2
Chlorite(14A)	-17.92	58.88	76.79	Mg5Al2Si3O10(OH)8
Chrysotile	-13.59	21.40	34.99	Mg3Si2O5(OH)4
CO2(g)	-2.68	-20.95	-18.27	CO2
Dolomite	-4.11	-20.68	-16.57	CaMg(CO3)2
Fe(OH)3(a)	-6.86	11.59	18.45	Fe(OH)3
FeS(ppt)	-7.43	-48.33	-40.91	FeS
Fluorite	-5.50	-16.39	-10.89	CaF2
Gibbsite	1.39	10.76	9.38	Al(OH)3
Goethite	-1.77	11.59	13.36	FeOOH
Gypsum	-4.34	-8.94	-4.60	CaSO4:2H2O
H2(g)	-8.95	-8.95	0.00	H2
H2S(g)	-10.45	-55.45	-45.01	H2S
Hausmannite	-37.20	29.42	66.62	Mn3O4
Hematite	-1.64	23.18	24.82	Fe2O3
Hydroxyapatite	-5.05	-44.09	-39.04	Ca5(PO4)3OH
Illite	-2.92	11.35	14.27	K0.6Mg0.25Al2.3Si3.5O10(OH)2
Jarosite-K	-35.09	-1.88	33.20	KFe3(SO4)2(OH)6
K-feldspar	-4.42	-1.67	2.75	KAlSi3O8
K-mica	3.85	19.85	16.00	KAl3Si3O10(OH)2
Kaolinite	2.05	11.45	9.40	Al2Si2O5(OH)4
Mackinawite	-6.70	-48.33	-41.64	FeS
Manganite	-14.04	11.30	25.34	MnOOH
Melanterite	-10.05	-12.55	-2.50	FeSO4:7H2O
N2(g)	-3.35	-6.54	-3.18	N2
NH3(g)	-11.59	-16.69	-5.10	NH3
O2(g)	-72.82	17.89	90.71	O2
Otavite	-3.75	-15.85	-12.10	CdCO3
Pb(OH)2	-4.02	4.91	8.93	Pb(OH)2
Pyrite	-1.75	-94.84	-93.09	FeS2
Pyrochroite	-8.37	6.83	15.20	Mn(OH)2
Pyrolusite	-29.23	15.77	45.00	MnO2
Quartz	-0.73	-5.04	-4.31	SiO2
Rhodochrosite	-3.07	-14.13	-11.05	MnCO3
Sepiolite	-10.49	5.87	16.35	Mg2Si3O7.5OH:3H2O
Sepiolite(d)	-12.79	5.87	18.66	Mg2Si3O7.5OH:3H2O
Siderite	-3.08	-13.83	-10.75	FeCO3
SiO2(a)	-2.14	-5.04	-2.90	SiO2
Smithsonite	-4.46	-14.22	-9.76	ZnCO3
Sphalerite	0.35	-48.72	-49.07	ZnS
Strontianite	-3.43	-12.75	-9.32	SrCO3
Sulfur	-7.65	-46.51	-38.85	S
Talc	-12.65	11.32	23.97	Mg3Si4O10(OH)2
Vivianite	-7.81	-43.81	-36.00	Fe3(PO4)2:8H2O
Willemite	-8.76	8.43	17.18	Zn2SiO4
Witherite	-5.51	-14.20	-8.69	BaCO3
Zn(OH)2(e)	-4.77	6.73	11.50	Zn(OH)2

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End of simulation.
------------------

------------------------------------
Reading input data for simulation 10.
------------------------------------

-----------
End of run.
```