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Report

1997 Backfilling Plan for Stockpiled Type II Material

Scope ID: 96F022

Flambeau Mining Company
Ladysmith, Wisconsin

March 1997

Foth & Van Dyke
engineers · architects · scientists

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March 4, 1997

Mr. Lawrence J. Lynch
Mine Reclamation Section
Bureau of Waste Management
Wisconsin Department of Natural Resources
101 South Webster Street, GEF II
Madison, WI 53707

Dear Mr. Lynch:

Re: Flambeau Mining Company - 1997 Backfilling Plan for Stockpiled Type II Material

On behalf of Flambeau Mining Company (Flambeau), Foth & Van Dyke is submitting three copies of the enclosed report titled *1997 Backfilling Plan for Stockpiled Type II Material*. The report provides detailed information regarding the testing that has been performed to refine the limestone addition rate and the quality assurance/quality control procedures to be used by Flambeau in 1997 for pit backfilling using material from the Type II stockpile. The report also includes the results of the testing performed on Type I material.

Flambeau's plan is to commence 1997 backfilling using stored Type II material as soon as weather conditions permit (approximately mid-April). Backfilling of Type II material will take place two shifts per day, six days per week. Backfilling of Type I material, saprolite and overburden, will also take place two shifts per day, six days per week. A "Residential Project Representative Manual" covering the backfilling of the materials will be submitted to the Wisconsin Department of Natural Resources at a later date.

As discussed during our January 23, 1997 meeting in Green Bay, the Type II material limestone amendment rate presented in the enclosed report is based on the results of the column test work through the third pore water displacement. Flambeau fully expects that the limestone availability as calculated from the data generated from the column tests will increase as the tests continue. It is Flambeau's intent to provide the Department with an amendment to this report providing both the final results of the column tests and the final limestone amendment rate proposed for use during 1997 Type II backfilling.

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If you have any comments or questions regarding this submittal, please contact me at (414) 497-2500.

Sincerely,

Foth & Van Dyke

Jerry W. Sevick

Jerry W. Sevick, P.E.
Vice President

JWS:mld2

1997 Backfilling Plan for Stockpiled Type II Material
Flambeau Project

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3/4/97

1997 Backfilling Plan for Stockpiled Type II Material

96F022

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March 1997

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Executive Summary

In the fall of 1996, following Wisconsin Department of Natural Resources approval, Flambeau Mining Company (Flambeau) began the process of backfilling its mined out open pit. By the end of the year approximately 100,000 tons of freshly mined Type II material and material from the Type II stockpile had been backfilled in the east end of the pit. Additional backfilling of fresh Type II waste rock will occur in March 1997. Flambeau is now finalizing preparations for the major phase of the backfilling process which is scheduled to begin in April of 1997. The 1997 backfilling plan involves the relocation of approximately 4,500,000 tons of stockpiled Type II material and approximately 4,000,000 tons of stockpiled Type I material to the mined out open pit. The backfilled material will be placed in approximate 3-ft lifts and compacted.

Backfilling of Type II material includes the application of alkali, in the form of limestone. Testing completed in mid-1996 determined the rate of limestone application to be used during the fall 1996 backfilling program to neutralize stored acidity and control metals release. Oxygen transport modeling also completed in 1996 determined the limestone application rate required to control acidity generated as a result of further oxidation during the backfilling and groundwater recovery periods.

Additional testing was completed during the winter of 1996-97 to refine the limestone addition rate and to optimize field sampling and testing procedures in preparation for the 1997 backfilling program. This testing focused primarily on Type II material although a component of the program was directed at characterizing material contained in the Type I stockpile. Field testing involved the collection of samples from 116 locations on the Type I and Type II stockpiles and from the backfilled pit. The samples underwent 460 paste pH and conductivity tests to gather data regarding the spatial variability of the material in the three locations. When the program ends, 245 different laboratory tests will have been completed on the samples. The tests range from short-term alkali demand tests to long-term column tests.

As a result of the winter 1996-97 work, Flambeau has been able to develop a Type II material sampling and limestone amendment program that can be readily applied in the field. The program consists of sampling and testing ahead of the excavation process on the Type II stockpile; the determination of the appropriate alkali amendment rate for material based on the test results; and the surface application of the alkali amendment to the tested area prior to excavation. The program also involves sampling and testing of backfilled material to document the performance of the alkali amendment program.

The amount of alkali to be added to the Type II material will be established based on the class of the material (e.g., A, B, or C) and the depth within the pit at which the material will be placed. The class of material relates to the amounts of alkali amendment required for neutralization of contained acidity, with class A requiring the least. Class A and B material will be determined based on paste pH and conductivity testing. Class C material will be determined based on paste pH and conductivity and alkali demand testing. Based on results of the winter 1996-97 testing program, it is expected that approximately 80% of the stockpiled Type II material will fall into class A, and approximately 12.5% will fall into class B.

The limestone amendment for class A and B materials would be 5.1 and 10.2 lb/ton, respectively, while the class C material amendment would be determined from alkali demand testing. An additional 1 lb/ton of limestone would be added to material placed below the 1045 ft elevation to neutralize acidity that may be generated during the reflooding period. Above the 1045 ft elevation the additional limestone amendment would be increased to a maximum of 5.4 lb/ton, depending on elevation.

The Type II material sampling and limestone amendment program will result in a conservative application of limestone for the following three reasons. First, a 48% excess addition will result from the use of the <¼-in size fraction for material classification. Second, the application of the maximum limestone amendment rate for class A and B material regardless of the paste parameter test results will result in an excess application of 115% based on the average alkali demand for these two classes. Finally, the upper range of in-place densities when calculating the amount of limestone amendment for any given block of material on the Type II stockpile will result in an additional conservatism of 20% or more in the limestone addition rate. Overall, due to the conservative approach to be taken by Flambeau, approximately 183% more limestone will be added to the backfilled Type II material than that theoretically required.

Testing completed to date has shown that no alkali amendment will be required for the Type I stockpile materials. However, historic water quality at seep location T1-1 suggests that a small volume of material within the Type I stockpile may require alkali amendment prior to backfilling. These materials will be isolated through additional field investigations prior to relocation, and will be handled in the same way as Type II materials, if warranted.

Data from the winter 1996-97 testing program was also used to reassess the results from the MINTEQA2 modeling completed in 1996 regarding the predicted long-term pore water quality of the Type II backfill. The reassessment showed that the predicted pore water concentrations based on the newer data compare favorably with the predictions presented in the October 1996 report.

Flambeau Mining Company
1997 Backfilling Plan for Stockpiled Type II Material

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1 Introduction

As part of its approved 1989 Mine Permit Application (MPA), Flambeau Mining Company (Flambeau) detailed its plan to backfill stored waste rock and overburden into the mined out Flambeau open pit as part of the Flambeau Project's overall reclamation plan. The pit backfilling process actually commenced in early September 1996 following Wisconsin Department of Natural Resources (WDNR) approval. Initial backfilling in 1996 involved the relocation of approximately 90,000 tons of fresh Type II waste rock mined in the west end of the pit to the east end. As part of the process, alkali in the form of limestone was added to the relocated material, which was placed in approximate 3-ft lifts and compacted.

The next phase of the backfilling process involved the relocation, also in the fall of 1996, of approximately 9,000 tons of Type II material from the Type II stockpile to the east end of the pit. In March 1997, additional backfilling of fresh Type II waste rock will take place. This waste rock is currently being removed from the west end of the pit as final mining takes place at the pit base. The excavated fresh Type II waste rock is being temporarily piled in the east end of the pit. The material will ultimately be backfilled during March 1997 into the trench constructed at the base of the west end of the pit. The alkali addition and material placement procedures for both the stockpiled Type II material relocated last fall and the relocation work currently underway are consistent with the plans developed in 1996 and approved by the Wisconsin Department of Natural Resources (WDNR).

The alkali addition rate used for the stockpiled Type II material in 1996 was based on a series of initial field and short-term, rapid laboratory tests performed in the summer of 1996. The specified alkali addition rate was intentionally very conservative. In the report describing the testing work, *Fall 1996 Backfilling Plan for Stockpiled Type II Material*, submitted to the WDNR in October 1996, Flambeau outlined a framework for additional testing during the 1996-97 winter season to prepare for 1997 backfilling. A detailed work plan for this subsequent testing was prepared and submitted to WDNR on October 30, 1996. The work plan and a November 20, 1996 amendment to that plan are included in Appendices A and B, respectively. The primary objectives of the winter 1996-97 work were to gather the data needed to:

1. refine the determination of the proper alkali addition rate for stockpiled Type II material; and

2. develop the sampling and testing protocols to be used in the field to determine the alkali addition rate which during relocation provides the minimum required neutralization potential.

The work plan also outlined a Type I material testing program. The purpose of this program was to complete selected testing to verify the conclusions reached during original waste characterization work that showed that the Type I materials are not reactive.

The following portion of this introduction provides background information on both the Type II and Type I materials. The introduction concludes with a presentation of the detailed objectives of the 1996-97 field and laboratory testing program. Section 2 of the report discusses the field investigation program that was completed in the fall of 1996 and Section 3 discusses the laboratory investigation. The results of the field and laboratory program are presented in Section 4. A detailed description of the alkali application and control program proposed for 1997 is presented in Section 5. Section 6 presents a summary of how the work meets the objectives of the program. Pertinent correspondence, field and laboratory data, and a data base are included in the appendices to this report.

Numerous parties were involved in the planning and completion of field and laboratory work and the development of the backfilling program described in this report. Foth & Van Dyke was primarily responsible for planning the work, coordination of activities, report development, and participation in the completion of field work. Steffen, Robertson, and Kirsten, Inc., of Vancouver, British Columbia, was primarily responsible for developing field and laboratory procedures; data interpretation; and the development of the alkali application and control procedures. Thresher & Son, Inc., was primarily responsible for setting up the laboratory and the completion of a portion of the laboratory work. Paste pH testing was performed by Foth & Van Dyke personnel in Flambeau's on-site laboratory. Flambeau personnel participated in the completion of field work. Other testing was completed at Foth & Van Dyke's Green Bay offices. Analytical laboratory work was performed by Northern Lake Service, Inc., Crandon, Wisconsin.

1.1 Background

During the mining process the material removed from the Flambeau open pit has been classified and stored in two categories. The classification is based on sulfur content. Type I material, which is stored in the unlined Type I stockpile, contains less than 1.0% sulfur and includes Type I waste rock, saprolite, sandstone, and overburden (with the exception of topsoil) that was stripped during the development of the open pit. All other material produced from the open pit was classified as Type II, and is stored in a lined facility.

As detailed in the 1989 Mine Permit Application (MPA), Flambeau's reclamation plan includes backfilling the open pit. The Type II material will be backfilled into the bottom of the mined-out pit. The Type I waste rock will be placed on top of the Type II material. Saprolite, sandstone, and overburden will be placed on top of the Type I waste rock, in that order.

1.1.1 Type II Material

Placement of stockpiled Type II material in the bottom of the open pit, and its subsequent saturation as the groundwater table recovers, will result in the Type II material being located in an environment in which future oxidation and consequent acid generation is controlled. Because the Type II material will be below the future water table, oxygen entry will be limited, and anoxic conditions will develop. During the period of groundwater recovery, groundwater gradients will be directed towards the open pit so that very little release of water from the pit is expected. As the groundwater table recovers, the pore water of the Type II material will rapidly become anoxic, and increased mixing of pore water with groundwater will occur.

Site contact water is treated in a lime treatment system with sulfide polishing to remove metals prior to discharge. The resulting metal oxyhydroxide solids, referred to as clarifier underflow (CUF) solids, have been placed with the Type II material in the Type II material stockpile. The CUF solids are intended to be backfilled into the pit with the Type II material.

As stated in the MPA, the Type II material will be amended with an alkali as part of the backfilling process. The objective of the alkali amendment is to control dissolved metal concentrations in the waste rock pore water after flooding, i.e., after anoxic conditions have developed. The alkali amendment is required to:

- neutralize stored oxidation products and available acidity already contained in the Type II material; and,

- neutralize acidity and oxidation products that may be generated from future oxidation during the reflooding period.

The stored acidity and oxidation products are a result of the oxidation that has already occurred during the on-surface storage. Lime was originally specified as the alkali of choice in the 1989 MPA. At the time of the permit application, a preliminary estimate of the alkali requirement was made on the basis of partially oxidized Type II waste rock which was generated under short-term laboratory testing conditions. However, since that time limestone has replaced lime as the alkali of choice, and the alkali requirement of the oxidized material is to be determined by field testing.

Testing completed by Flambeau in support of the planned Fall 1996 relocation program showed that:

1. limestone can be used as an alternative to lime as an alkali source;
2. variability in alkali demand exists within the Type II material stockpile; and,
3. estimated long-term pore water quality will be similar to that predicted in the MPA.

The investigation completed in support of the Fall 1996 relocation program was based on short-term, rapid test methods. Short-term testing was required in order that the small scale fall relocation program might be undertaken, and as related to that purpose satisfied the objectives of that investigation. As discussed in the October 1996 report, the short-term investigation did not address all of the issues related to the relocation of the Type II stockpile as a whole. As part of that investigation, some issues were identified that required further investigation, and/or confirmation. The October 30, 1996 work plan was developed to address relevant outstanding issues, and identified both field and laboratory investigations that were to be completed in support of the planned 1997 backfilling program. The results of these investigations are discussed in this report.

1.1.2 Type I Stockpile

During the construction of the Type I stockpile, sandstone, saprolite, and Type I waste rock excavated from the open pit was placed in three distinct cells on top of a till (overburden) layer. Type I material is characterized by a sulfur content of less than 1%. Since the Type I material is relatively low in sulfur content, it is not anticipated to be net acid generating. This was determined during the waste characterization work completed in the late 1980s.

In 1996, Flambeau tested on a number of occasions the water produced by seep T1-1 which is located on the south side of the Type I stockpile adjacent to the pile's access road. The quality of the water varied according to the flow rate from the seep. Low pH values and peak copper concentrations were associated with peak seepage rates for the period March to October, 1996. While the average copper concentration was less than 10 mg/l, peak concentrations in excess of 50 mg/l associated with slightly acidic pH values were observed. This has suggested that there are possibly some pockets of material located within the Type I stockpile that may require alkali amendment on relocation.

Also in 1996, as a follow-up to the initial testing of seep T1-1, a geochemical investigation of the Type I stockpile consisting of 11 drillholes was conducted to investigate the sulfur content of the material. Drilling was performed using a percussion drill rig with reverse air circulation to recover samples. Ten drillholes were located in the Type I waste rock area, with one hole located in the saprolite area. The results showed that the sulfur content of the samples was typically less than 0.3% while copper is present predominantly in the oxide form. There were, however, a few pockets of material that exhibited a sulfur content between 0.3% and 0.9%. The investigation of seep T1-1 and the Type I stockpile were discussed on numerous occasions with the WDNR.

As a result of the geochemical investigation of the Type I stockpile, the copper concentration in seep T1-1 appears to be an isolated occurrence, in which case no marked effect is expected on the pore water quality after backfilling and saturation of the Type I material. However, should a significant portion of the Type I materials contain similar soluble constituents or should a portion of the Type I material be potentially acid generating, it may be necessary to add alkalinity to this material during the backfilling process. Furthermore, if the backfilled Type I material were a significant oxygen consumer, the rate of oxygen entry into the underlying Type II materials would be reduced resulting in a lower required alkali amendment rate for the underlying Type II material. Elements of the October 30, 1996 work plan were developed to address these outstanding issues. These elements focused on assessing the reactivity of the Type I materials, and addressing the potential need for alkali amendment to neutralize stored acidity, if required. The results of the work completed on the Type I material are also discussed in this report.

1.2 Winter 1996-97 Testing Program Objectives

As outlined in the October 30, 1996 work plan, both field and laboratory investigations were undertaken during the winter 1996-97 test program. The objectives of the field investigation were to:

1. Provide additional data to assess the spatial variability of paste parameters (pH and conductivity) within the Type II stockpile;

2. Develop sampling and testing protocols to determine the limestone addition rate which during relocation provides the minimum required neutralization potential;

3. Provide necessary samples for continuing laboratory investigations; and,

4. Establish the requirements to implement a variable alkali application rate for future relocation.

The objectives of the laboratory investigation can be summarized as follows:

1. Demonstrate the effectiveness of limestone as an alkali amendment;

2. Determine the availability of the alkali under anticipated short- and long-term conditions in the backfilled pit;

3. Quantify the alkali addition rates to control metal release from stored oxidation products (in pore water) and meta-stable secondary mineral phases;

4. Evaluate the stability of the CUF solids under anticipated long-term saturated (anoxic) conditions; and,

5. Assess field test methods for the control of alkali application rates.

A final program objective was to investigate the reactivity of the Type I materials, and to assess the need for alkali addition, should this become necessary to control metal release during and after resaturation.

A primary objective of the field and test program was to establish the alkali addition rate required to result in a circumneutral pH in the backfilled material pore water. The combination of the carbonate contained in the alkali amendment and the circumneutral pH will result in pore water quality in the reflooded pit which is comparable to that predicted in the 1989 Mine Permit Application.

Reactions between carbonates and dissolved metals are kinetically controlled with some reaction times extending to many weeks or more before equilibrium is reached. The kinetics of these reactions are well understood, and hence it was not the intent of the winter 1996-97 test program to complete testing to an endpoint that produced water of the quality predicted in the equilibrated backfilled pit. It is for this reason that the water quality measured in the test program should therefore not be compared directly to the prediction. Predictions of the water quality in the reflooded mine are presented in Section 4.5.5 of this report.

2 Field Investigations

In preparation for backfilling of stockpiled Type I & II material, a comprehensive sampling and field testing program was conducted by Flambeau Mining Company (Flambeau) and Foth & Van Dyke over a period of seven non-consecutive days. Stockpiled Type I and II material, and previously stockpiled Type II material that was backfilled in late October and early November 1996, were sampled and field tested with a representative sample subsequently stored for future laboratory testing. Sampling was performed primarily through the excavation of test pits, although surface samples of CUF materials were collected from two locations on the Type II stockpile.

Work was performed in general conformance with the methods outlined in Appendices A and B. As with most field programs, some minor modifications were made to methods as dictated by field conditions. These modifications are outlined in the discussion below. Table 2-1 provides a final summary of the field investigation program. A discussion of the sample collection process, field testing methods, and results are presented below.

2.1 Sample Collection

Samples were collected at 116 locations within the Type I and Type II stockpiles and in the backfilled pit over a non-continuous seven day span on October 22, 23, 30, and November 4, 5, 11, and 13, 1996.

2.1.1 Type II Stockpile

Sampling of the Type II stockpile was undertaken to provide information on the spatial variability of the material in the stockpile, and to provide the necessary samples to complete the laboratory investigations.

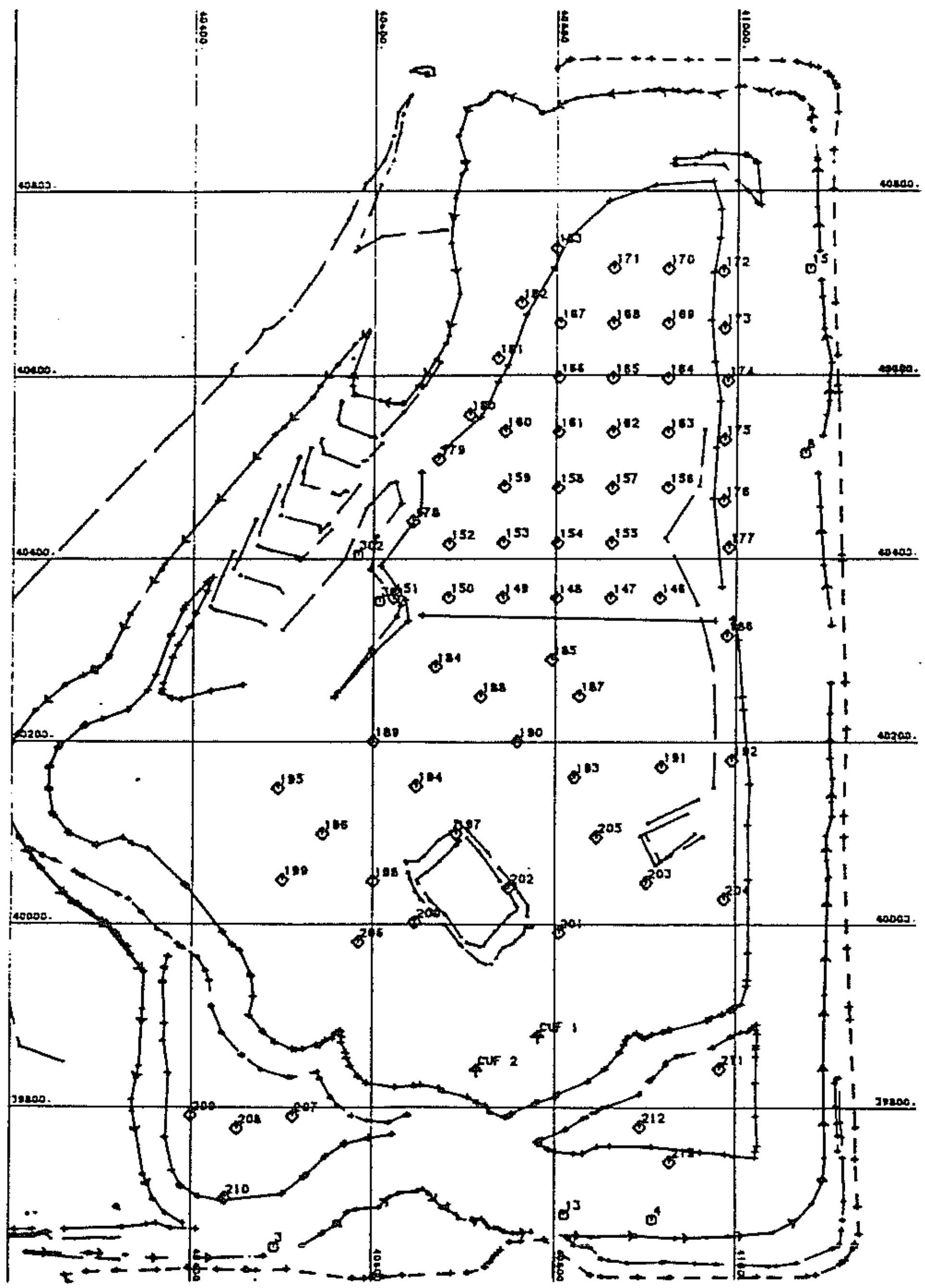
Twenty-six samples (samples 146 to 171) were collected on a 60-ft grid from the planned fall 1996 relocation area on the Type II stockpile. Twelve additional samples (172 to 183) were collected from the stockpile slopes located within the planned fall 1996 relocation area. Thirty additional samples were collected from randomly selected locations across the remaining area of the Type II stockpile (samples 184 to 213). Two samples (301 and 302) were collected from the base of the area where Type II material was previously excavated from the stockpile and relocated to the pit. Two samples (CUF 1 and 2) were collected from areas where the CUF had been placed. CUF 1 was collected from an area where clarifier solids were actively being placed. CUF 2 was collected from an area where solids deposition had ceased in approximately mid-summer 1996. In addition, six samples were collected from locations 3, 4, 8, 13-1, 15-1, and 15-3. These were the same locations used to collect samples for the test work discussed in the October 1996 report, *Fall 1996 Backfilling Plan for the Stockpiled Type II Material*. Sampling locations are shown on Figure 2-1. Grid coordinates are provided in Table 1 in Appendix C.

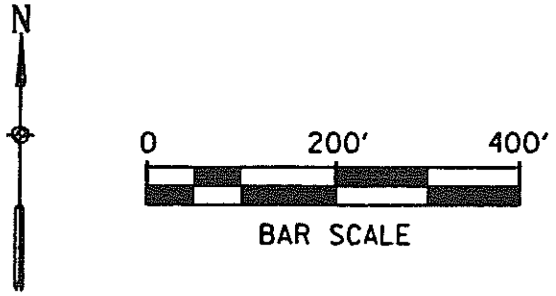
Table 2-1

Summary of Field Investigation Program

	Number of Samples								
	Type II Material						Type I Stockpile		
Material Type	Area Planned for Fall 1996 Excavation[1]	Remainder of Stockpile[2]	Base of Excavation Area of Previous Relocation[3]	Previous Sampling Locations[4]	Fall 1996 Backfill[5]	CUF Solids	Sandstone[7]	Saprolite[8]	Type I Waste Rock[9]
Test Pits	38	30		6	15		5	5	13
Depth (ft)[10]	15	15		15	3		10	10	10
Samples									
<¼ in	38	30	2	4	5	2	5	5	13
<3 in		5		2					
Field Parameters[11]									
Paste pH	164	140	8	28	20		20	24	56
Paste cond.	164	140	8	28	20		20	24	56

[1]Test pits 146 to 183.
[2]Test pits 184 to 213.
[3]Test pits 301 and 302.
[4]Test pits 3, 4, 8, 13-1, 15-1, and 15-3.
[5]Test pits 1 to 15.
[6]Samples CUF 1 and 2.
[7]Test pits 1 to 5.
[8]Test pits 6 to 10.
[9]Test pits 11 to 23.
[10]Vertical test pits extended to a depth of approximately 15 ft and 10 ft on the Type II and Type I stockpiles, respectively. On the stockpile sideslopes the test pit length was 15 and 10 ft long, while each test pit depth ranged from 1 to 3 ft.
[11]Includes duplicates.





FLAMBEAU MINING COMPANY

FIGURE 2-1

TYPE II STOCKPILE SAMPLE LOCATIONS

Scale: SEE BAR SCALE	Date: February, 1997
Prepared By: Steffen, Robertson and Kirsten	By : SGL

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2.1.2 Type I Stockpile

The objectives for sampling the Type I stockpile were to provide information on the current state of the stockpiled materials, and the spatial variability of the field parameters and pore water quality within the stockpile. While the pockets of material which have higher than average sulfur grades, based on the drillhole investigation, are generally below the depth to which test pit excavation was possible, oxidation is expected to be more significant at the near surface. Test pitting and sampling, therefore, provided a good indication of the amount of oxidation products present in the Type I material.

Samples were collected from 23 locations (Figure 2-2) across the Type I stockpile from representative lithologic types. Five samples (1 to 5) were collected from sandstone, five samples (6 to 10) from saprolite and the remaining 13 samples were collected from the balance of the Type I rock. Grid coordinates for each sampling location are provided in Table 1 in Appendix C.

2.1.3 Backfilled Material

The objective for sampling the backfilled material was to confirm that the calculated rate of limestone addition for the fall 1996 relocation was adequate and that the limestone was effectively blended during the relocation process.

Fifteen test pits (1 to 15) were placed in the upper 3-ft lift of previously stockpiled Type II material that was backfilled in late October and early November, 1996. Excavated materials from the test pits were consolidated into groups of three to form five composite samples. Figure 2-3 shows the location of each test pit. Grid locations for each test pit are contained in Table 1 in Appendix C.

2.2 Sampling Methodology

2.2.1 Sample Collection

Samples 146 to 171 and 184, 185, 187 to 191, 193 to 203, 205 to 209, 211, 212, 301, and 302 on the Type II stockpile were collected from approximate 15-ft deep backhoe test pits. With the exception of samples 13, 16, 18, and 19, samples 1 to 23 on the Type I stockpile were collected from approximate 10-ft deep backhoe test pits. Samples were collected from the test pits as follows.

Once a test pit was excavated to the proper depth, the backhoe bucket was used to scrape material from the face of one side of the test pit over its entire depth from the bottom to the top. Material collected in the backhoe bucket from this process was placed in a pile to the side of the test pit away from the spoils excavated during test pit construction. The pile of material scraped from the sidewall was visually quartered. A shovel full of material was then taken from the first quarter and screened using a No. 4 (¼-in) sieve. As the material was screened, a 65 ml sample of

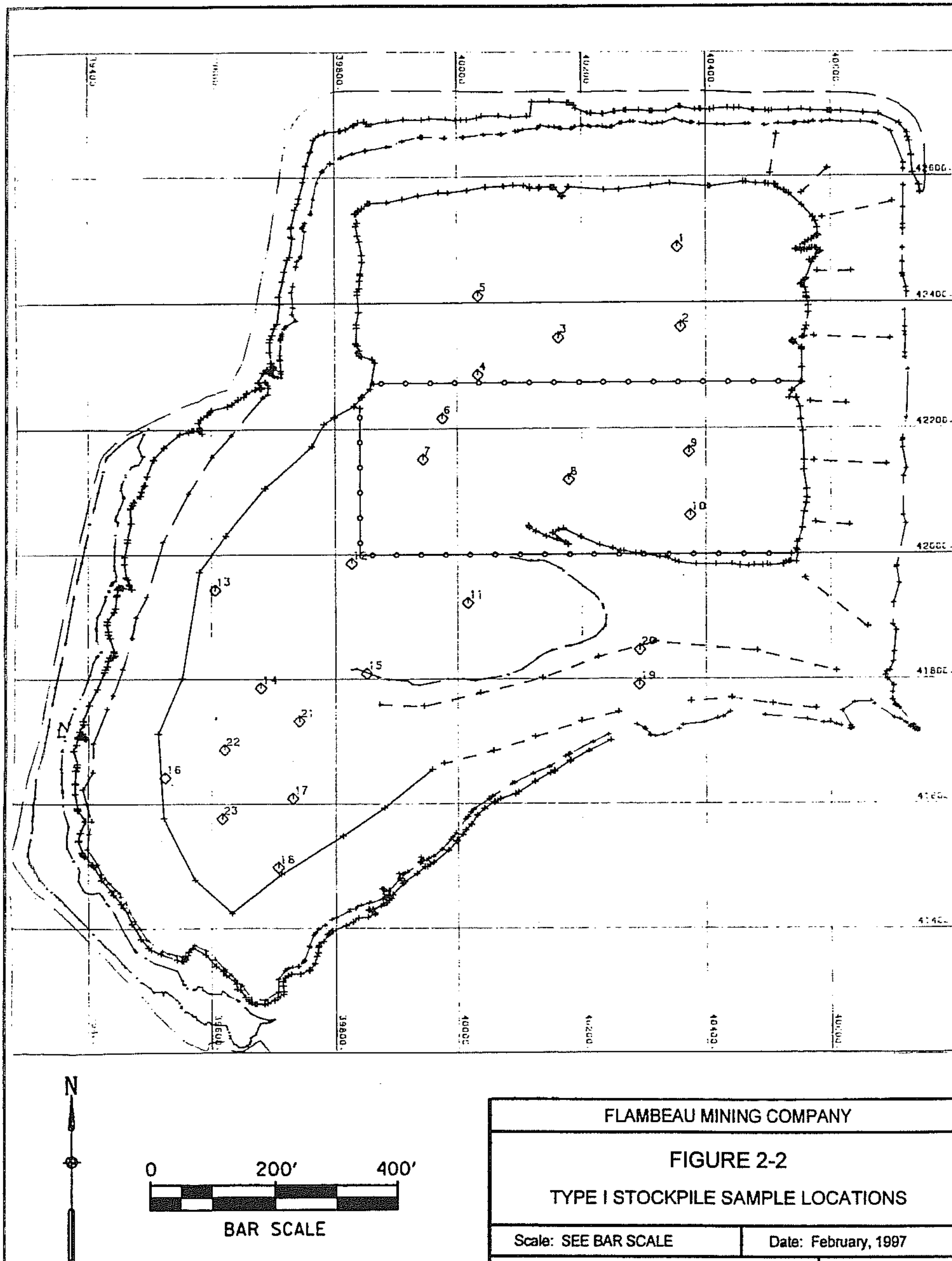

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FIGURE 2-2

TYPE I STOCKPILE SAMPLE LOCATIONS

Scale: SEE BAR SCALE	Date: February, 1997
Prepared By: Steffen, Robertson and Kirsten	By : SGL

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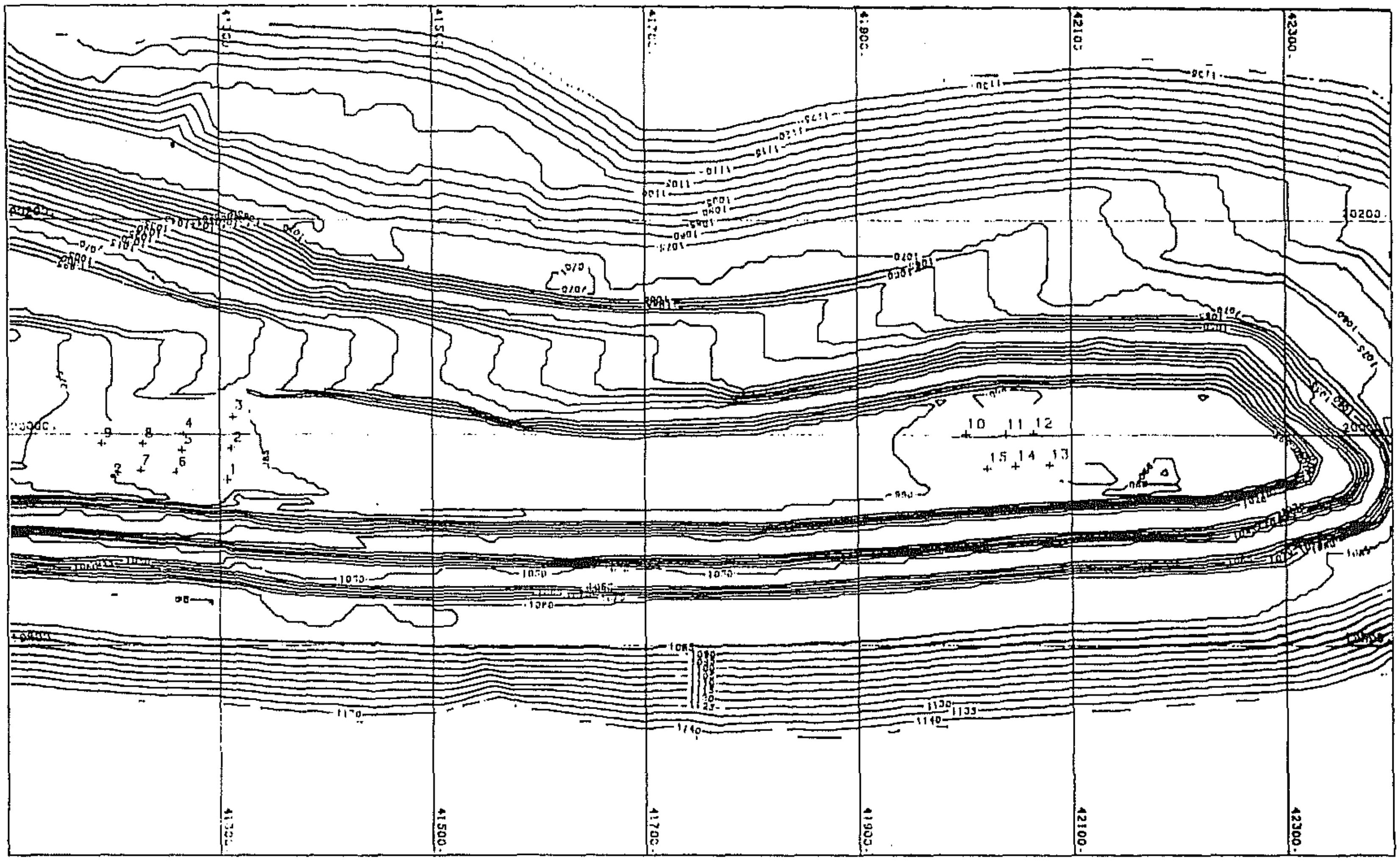
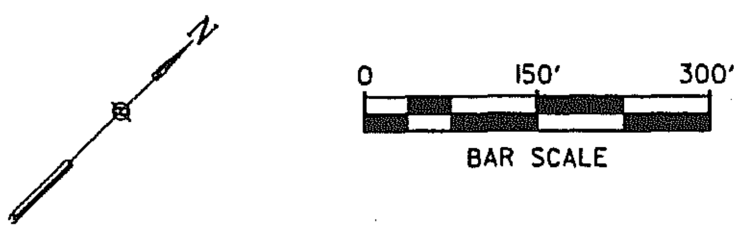




FLAMBEAU MINING COMPANY	
FIGURE 2-3 BACKFILL SAMPLE LOCATIONS	
Scale: SEE BAR SCALE	Date: February, 1997
Prepared By: Steffen, Robertson and Kirsten	By : SGL

<¼-in material was collected and placed in a sealed 250 ml plastic container for use in field parameter (e.g., paste pH, conductivity, and temperature) testing. The container was labeled with the test pit ID number, date, and time. A second shovel of material was then taken from the second quarter of the pile and screened with a second 65 ml sample collected as described above. This process was repeated until a 65 ml sample was collected from all four quarters of the pile. The remaining <¼-in material from each screened shovel of material was placed in a plastic bag used to line a clean 5-gal bucket. Additional shovels of material were successively taken from each quarter of the pile and screened to provide an approximate 40-50 lb sample of <¼-in material in the bucket. After the <¼-in material was placed in the bucket, the bag was tied and the bucket was covered with a tight fitting lid, labeled with the test pit ID number, date, and time. With the exception of the bulk samples from Type II test pits 3, 8, 195, 200, 209, 210, and 212, all material over ¼-in was discarded. For Type II test pits 3, 8, 195, 200, 209, 210, and 212, an approximate 40-50 lb sample of material between ¼ in and 3 in was collected and placed in separate and discrete plastic bag lined 5-gal buckets. The bags were tied, the buckets were covered with a tight fitting lid and then labeled with the test pit ID number, date, and time.

For each of sample locations 172 to 183, 186, 192, 204, 310, and 213 on the Type II stockpile and each of sample locations 13, 16, 18, and 19 on the Type I stockpile approximate 15-ft long and 10-ft long, respectively, 1-3 ft deep test pits were first excavated along the stockpile sideslope using a backhoe. Once a test pit was excavated, the backhoe bucket was used to scrape material from the face of one side of the test pit over its entire length. The collected material was placed on an approximate level area on top of the respective stockpiles and processed as described above.

The two CUF solids samples were collected by scraping the surface of the CUF solids deposition area with a hand shovel. The collected material was placed in plastic bag lined 5-gal buckets. The bags were tied, the buckets were covered with a tight fitting lid and then labeled with the sample ID number, date, and time.

For Type II stockpile locations 3, 4, 8, 13, and 15, samples were collected at or near the surface. The collection process consisted of using a backhoe bucket to excavate a 1-ft deep pit at each location. The excavated material was then processed as described above to obtain field parameters and a sample for subsequent testing. For sample 15-3, the backhoe bucket was used to excavate a 3-ft deep pit after sample 15-1 was collected. Sample 15-3 was then collected from materials removed from the 3-ft depth and processed as described above.

At five locations within the area where stockpiled Type II material was backfilled in the pit, samples were collected as follows. Three test pits were excavated, using a backhoe, at each location, approximately 15 ft from each other to an approximate 3-ft depth, which is equal to the approximate lift placement height. The excavated material was placed to the side of each test pit. A representative sample of material of approximately the same volume was collected from each of the three piles at each location and composited into one bulk sample. The composite bulk sample was processed as described above.

The 65 ml samples of <¼-in material were all transported to the on-site Flambeau laboratory for paste pH analysis. Each representative bulk sample placed in a 5-gal bucket was stored temporarily on-site in a secure area under appropriate chain of custody procedures. At the end of each work week, the 5-gal buckets were transported to the Foth & Van Dyke Green Bay office for further testing.

2.2.2 Lithologic Logging

Upon completion of each Type II and Type I test pit, with the exception of CUF 1 and CUF 2 since these samples were collected directly from the surface, the exposed test pit sidewalls were geologically described by Flambeau's resident ore control geologist who recorded lithologic types, color, areas of secondary mineralization, preferential water flow, and estimated particle size ranges. Dominant lithologies encountered in the Type II stockpile were:

- Andalusite-biotite schist (ABS)
- Quartz sericite schist (QSS)
- Sericite schist (SS)
- Pyrite-massive sulfide (PYMS)
- Biotite schist (BS)

Dominant lithologies encountered in the Type I stockpiles were:

- Sandstone
- Saprolite
- Andalusite-biotite schist (ABS)
- Sericite schist (SS)
- Metadacite (MD)

2.3 Field Testing

Paste pH, conductivity, and temperature readings were measured on the four 65-ml samples taken from each sample location, with the exception of locations CUF 1 and 2. Due to unfavorable weather conditions during field testing activities, sample analyses were performed in the on-site Flambeau laboratory. A portable Corning Checkmate® Multimeter was used to perform the pH, conductivity, and temperature measurements. Each 65-ml sample was prepared for testing by adding 100 ml of distilled water to the individual 250-ml container containing the sample followed by mixing using a spatula for a period of approximately ten seconds. Instrument readings were obtained from each sample and recorded on a test pit data sheet. Information such as calibration times and readings, sample color, and instrument performance was also recorded. The field paste pH, conductivity, and temperature readings measured during the sampling event are shown in Table 1 in Appendix C.

Quality control methods applied during the testing consisted of the calibration of instrumentation (once every 4 hours); the collection and analysis of sample duplicates to provide data to assess the variability of the samples from individual test pit locations; the collection of duplicate field readings on an individual sample at periodic intervals to check the reproducibility of the readings; and checking the instrument accuracy against the calibration solution throughout analysis.

3 Laboratory Investigations

A detailed discussion of the planned winter 1996-97 laboratory test program was presented to the WDNR in the October 30, 1996 work plan contained in Appendix A. An amendment to that work plan was issued on November 20, 1996 (Appendix B). During the performance of the work additional modifications were made to the program. Table 3-1 contains a summary of the final laboratory investigation program. Laboratory test procedures that were modified subsequent to the issuance of the documents in Appendices A and B are contained in Appendix D.

Table 3-1

Summary of Laboratory Investigation Program

	Number of Samples[1]					
	Type II Material			Type I Stockpile		
Test Method	Stockpile	Fall 1996 Backfill	CUF Solids	Sandstone	Saprolite	Type I Waste Rock
Alkali Demand	77	—	—	6	5	14
Anoxic Column - limestone	18	2	2	—	—	—
Anoxic Column - lime	6	—	—	—	—	—
Leach Extraction	12	—	—	2	5	13
Anoxic Extraction	—	5	4	—	—	—
Acid Consumption	48[2]	—	4	—	—	—
ABA	—	—	—	2	6	14

[1]Includes duplicates.
[2]Testing not completed as of the date this report was issued.

3.1 Type II Materials

The laboratory techniques that were employed to investigate the geochemical properties of the Type II stockpile materials included:

- Leach extraction tests;
- Alkali Demand Tests; and,
- Anoxic Column Tests.

Leach extraction tests, in which solids are contacted with water, were used to estimate the soluble stored oxidation products associated with a sample. The stored oxidation products were quantified on the basis of the constituent analysis of the leachate that was generated.

Alkali demand tests are similar to leach extraction tests in that a sample was contacted with water and the soluble oxidation products were allowed to dissolve. An alkali in the form of slaked quicklime was added to neutralize the acidity associated with the sample.

In the anoxic column tests, a sample was placed in a column and the pore space was filled with water. The pore water was then allowed to equilibrate with the sample for a fixed time period before being displaced and analyzed. The primary objective of the anoxic column tests was to establish the availability of the limestone under the conditions that will prevail in the backfilled materials. Because the pore water was extracted from the samples at a fixed, pre-determined time interval, the test does not directly simulate the full equilibration of the pore water that will occur in the field.

Test procedures, and their application to meet the specific objectives of the test program are described in the following sections.

3.1.1 Effects of Size Distribution

The objective of the size distribution testing was to confirm the results from testing reported in the document titled *Fall 1996 Backfilling Plan for Stockpiled Type II Material.* The results from the earlier investigation indicated that the majority of the stored oxidation products are associated with the <¼-in size fraction, and that testing to determine alkali demand using the <¼-in size fraction is conservative. To further test this conclusion six <3-in samples collected during the field investigation described in Section 2 were screened at ¼-in to provide <¼-in, and ¼ to 3-in splits. Leach extraction tests, conducted at a solids-to-liquid ratio of 1:1 using deionized water over a 24 hour period, were conducted on each of the splits. For the larger size fraction, the extraction was conducted on a 5 kg sample, and for the <¼-in fraction the test was completed on a 0.75 kg sample.

3.1.2 Alkali Demand

The objective of the alkali demand testing was to establish the correlation between field characteristics (paste pH and conductivity) and the alkali demand of the Type II material, for the potential implementation of a control program for the application of alkali during relocation at a variable rate. Lime was used to determine the alkali demand in this test because it reacts rapidly. Test results were obtained within 24 hours.

Alkali demand tests were completed on all of the samples obtained from the Type II stockpile. The alkali requirement obtained from the alkali demand test was converted to a limestone equivalent requirement on a molar basis as follows:

Alkali demand as mg $CaCO_3$ eq/g = Alkali demand as mg CaO/g x (100/56)
(note: molecular weight of CaO = 56 g/mole and of $CaCO_3$ = 100 g/mole)

3.1.3 Confirmation of Alkali Amendment Type

The objective of the alkali amendment type confirmation test was to confirm the effectiveness of limestone versus lime as the alkali source for the neutralization of the stored acidity contained in the Type II materials. As discussed in the October 1996 report, limestone was selected as the alkali of choice on the basis of its buffering capacity, and the stability of the secondary minerals phases that are formed.

A total of six samples were selected for confirmation testing of the alkali type. The samples were selected to represent a low, intermediate and high alkali demand. Testing was completed on the <¼-in size fraction, using the anoxic column test procedure. In preparation, a representative sample was taken from the larger bulk sample, blended and then split in half (by cone and quarter method). The first split was amended with lime at the rate indicated by the alkali demand test. The second split was amended with limestone at the stoichiometric requirement, but adjusted for the theoretical availability (95%) and moisture content of the limestone (5%). In addition, an excess of 20% of the adjusted limestone addition rate was added to each second split. The amendment was blended well with the sample prior to placing it in the column. At start-up, the columns were allowed to flood by slowly pumping water into the column from the base. The column overflow was equipped with an air trap such that anoxic conditions were maintained for the duration of the test. Initially, the columns were allowed to remain dormant for a period of 14 days, after which approximately one pore volume was displaced. The leachate was not filtered for the first displacement, but for all subsequent displacements the leachate was passed through a 0.45μm filter medium. Since at the prevailing pH conditions most constituents were in a dissolved state, the absence of filtering the leachate from the first cycle did not significantly affect the results. Field parameters that were measured included conductivity, pH, and redox potential. The leachate samples were preserved as appropriate, and submitted to Northern Lake Service, Inc., in Crandon, Wisconsin, for analysis.

Method

After the second displacement, the column operating procedure was amended. In order to accelerate equilibration, the columns were operated on a continuous recycle mode, recycling approximately one pore volume every eight hours.

3.1.4 Limestone Availability and Amendment Rate

The objective of the limestone availability test program were to determine the appropriate adjustment factor to convert the alkali demand test result to limestone amendment rates, on the basis of the limestone availability under the physico-chemical conditions that will prevail in the backfilled material.

For the anoxic column test assessment, 12 samples were selected from the Type II material samples to represent the full range of alkali demand conditions that were encountered in the sampling program. The limestone amendment was calculated from the alkali demand test results conducted as described in Section 3.1.2. The column tests were completed on the <¼-in size fraction. Limestone was blended with the sample at the calculated rate, e.g., stoichiometric requirement, adjusted for the theoretical availability (95%) and moisture content of the limestone (5%). Since the objective of these tests was to determine the availability of the limestone, a 20% excess was also added to compensate for a potential reduction in the actual availability when compared to theoretical availability. The column tests were initiated and operated as described above in Section 3.1.3.

3.2 Stability of CUF Solids Under Anoxic Conditions

The objective of the testing was to determine the present pore water quality of the CUF solids, and to assess the stability of the CUF solids under anoxic conditions, such as those anticipated after saturation of the backfill. An acidification test was performed to determine the stability of the CUF solids under conditions representing a slight change in pH, and to estimate its neutralization potential, should it be contacted with existing acidity.

Testing of the CUF solids was undertaken in two stages. First, leach extraction tests were completed at a solids to liquid ratio of 1:1, using deionized water. The first of two extraction tests were completed at the natural pH of the materials. In the second set of extractions, the pH was modified to about 6.5 (s.u.) using sulfuric acid. The total amount of acid added to achieve a stable pH was recorded and used to estimate the neutralization potential of the CUF solids. In both instances, the eluates were analyzed for dissolved constituents. In the second stage, column tests were conducted on the two CUF solids samples, using the anoxic column test procedure. The column tests were initiated and operated as described above in Section 3.1.3.

3.3 Fall 1996 Backfilled Material

The objective of testing material that was backfilled in the fall of 1996 was to demonstrate that the limestone amendment was sufficient to satisfy the neutralization requirements, and that expected mixing had been achieved.

Anoxic leach extraction tests were completed on the composite samples taken from the backfilled materials. The extraction tests were conducted at a solids-to-liquid ratio of 1:1 using deionized water, and using argon to maintain anoxic conditions during the extraction period. The eluate was monitored for pH, redox and conductivity in the field. Leachates were submitted to the laboratory for analysis.

Two composite samples were selected for anoxic column testing. The column tests were set up and operated as described in Section 3.1.3 above.

3.4 Type I Materials

3.4.1 Leach Extraction Tests

Leach extraction tests were completed on the <¼-in size fractions of the Type I samples taken from the test pits. The tests were conducted by mixing each sample with deionized water at a solids-to-liquid ratio of 1:1 in a shake flask, which was gently agitated during an extraction period of 24 hours. The leachate from the extractions was analyzed.

3.4.2 Reactivity

Acid base account (ABA) testing was completed on each of the samples taken from the Type I stockpile. The ABA work included a sulfur speciation in which total sulfur and sulfate sulfur were determined analytically, and the sulfide sulfur by difference. The modified Sobek method, as described in Mend Project 1.16.1b (1991), was used to determine the ABA parameters. Carbonate neutralization potential was estimated on the basis of a CO_2 analysis.

4 Results and Discussion

As discussed in Section 2, field investigations were conducted on both the Type I and the Type II stockpiles to verify field sampling and testing methods, and to provide samples for further laboratory assessment. In this section, the results from the field and laboratory investigations are presented. Materials from the Type II stockpile are discussed first, followed by the CUF solids, backfilled Type II material, and the Type I stockpile material.

4.1 Type II Stockpile

4.1.1 Field Investigation

4.1.1.1 Summary of Field Observations

The observations from the test pit logs can be summarized as follows:

- distinguishable horizons or layers of homogeneous or mixed lithological origin are visible in the sidewalls of the test pits;

- weathered horizons occur below surface, and do not necessarily coincide with the surface or near surface layer;

- there are apparent stratigraphic correlations among layers in some adjacent test pits.

Based on the lithological descriptions, the material distribution within the upper 15 ft lift of the Type II stockpile consists predominantly of andalusite-biotite schist (ABS - 34%), and equal amounts of quartz sericite schist (QSS - 26%) and sericite schist (SS - 26%). Metadacite (MD at 5%) is the next most abundant rock type, followed by pyrite massive sulfide (PYMS - 4%), biotite schist (BS - 2%), and undifferentiated hanging wall (HW - 2%) and footwall (FW - 1%) material.

The highest alkali demands were observed for samples where QSS was both abundant and within or near the surface layer. Alkali demands for such material typically exceeded 1.5 mg CaO/g. The ABS material appears to be less reactive, with alkali demands, when near surface, typically at or below 1.5 mg CaO/g. The results indicate that the SS material is the least reactive of the most abundant material types. While the MD material is less abundant, it appears to be relatively reactive.

4.1.1.2 Paste Parameters

As described in Section 2, the paste parameters were obtained for each quarter of the bulk sample that was obtained from each of the test pits. The results are contained in Appendix C, and are summarized in Table 4-1. The majority of the samples are at a pH above 4.5, and exhibit a conductivity of less than 2000 μS/cm. While there is not a clear linear correlation between paste

Table 4-1

Summary of Type II Field Paste Parameters

	Field pH		Field Conductivity	
Test Pit ID	pH	Std.Dev.	(uS)	Std. Dev.
146	5.0	0.1	376	46
147	6.2	0.5	210	62
148	6.2	0.6	243	50
149	5.6	0.3	399	44
150	6.6	0.3	323	47
150-Dupl.	6.5	0.2	310	60
151	5.9	0.4	214	64
152	5.8	0.7	397	73
153	5.1	0.2	360	66
154	5.1	0.6	267	89
155	5.3	0.0	212	20
156	5.0	0.3	289	44
157	4.7	0.2	473	149
158	5.5	0.5	256	161
159	5.3	0.3	334	78
160	5.4	0.4	311	140
161	5.7	0.4	314	91
162	5.7	0.4	335	95
163	6.2	0.5	214	79
164	6.5	0.2	281	62
165	5.6	0.5	381	93
165 -Dupl.	5.3	0.3	638	130
166	5.4	0.3	342	79
166-Dupl.	5.6	0.2	309	82
167	6.2	0.2	246	30
168	7.2	0.3	207	26
169	6.2	0.0	203	6
170	5.2	0.1	593	57
171	6.3	0.3	280	42

Table 4-1 *(Continued)*

Test Pit ID	Field pH		Field Conductivity	
	pH	Std.Dev.	(uS)	Std. Dev.
172	3.5	0.2	1732	88
173	4.9	0.1	805	209
174	6.7	0.5	379	73
175	4.7	0.2	1257	414
176	4.3	0.0	1923	305
177	3.9	0.2	1331	177
178	6.5	0.5	663	151
179	4.2	0.5	1551	588
180	4.7	0.3	1186	430
181	4.1	0.1	1671	139
182	4.5	0.3	1480	596
183	4.4	0.3	1289	204
301	5.7	0.2	268	23
302	5.6	0.3	381	10
184	7.0	0.4	108	30
184-Dupl.	6.6	0.2	110	23
185	7.0	0.3	160	51
186	4.2	0.2	999	590
187	5.5	0.2	255	78
188	5.3	0.2	574	238
189	5.2	0.1	379	82
190	5.9	0.5	360	78
191	6.3	0.5	252	68
192	5.2	0.4	468	127
192- Dup.	4.9	0.5	600	198
193	6.3	0.2	312	72
194	4.7	0.2	656	231
195	5.4	0.2	416	86
196	6.0	0.5	229	62
197	4.9	0.1	753	235
198	5.8	0.2	303	60
199	5.3	0.1	512	50
199 Dupl.	5.2	0.2	554	67

Table 4-1 *(Continued)*

	Field pH		Field Conductivity	
Test Pit ID	pH	Std.Dev.	(uS)	Std. Dev.
200	4.9	0.2	596	189
201	4.7	0.2	770	204
202	5.1	0.4	622	278
203	5.8	0.3	490	104
204	4.1	0.3	1321	276
205	5.5	0.5	537	130
206	5.7	0.1	431	35
207A	5.7	0.5	345	184
207B	5.5	0.1	316	19
208	5.8	0.1	319	98
209	4.9	0.3	492	136
210	4.8	0.2	515	12
211	3.9	0.6	546	192
211	4.0	0.6	580	226
212	4.7	0.1	647	124
213	2.7	0.1	2588	429
3	2.6	0.0	3685	144
3-Dupl.	2.6	0.0	3898	186
13-1	2.4	0.1	3500	621
4	3.0	0.3	2141	275
8	3.0	0.2	954	452
15-1	2.4	0.1	4395	502
15-3	2.7	0.1	3350	466

pH and conductivity as shown in Figure 4-1, it is evident that elevated conductivity values are more frequently associated with acidic pH values (e.g., pH $\leq$4.5).

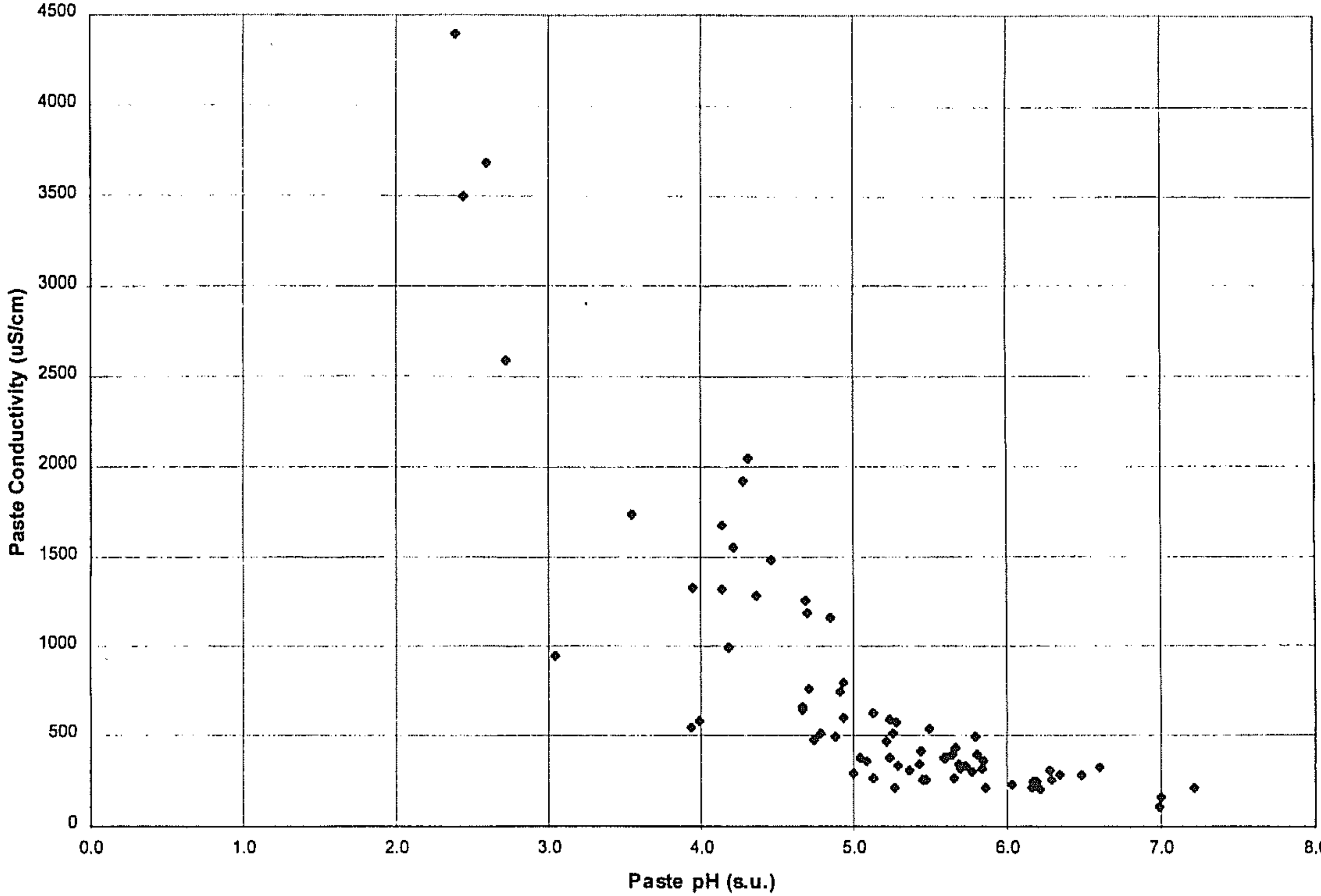
The standard deviations of the paste pH and paste conductivity values from each test pit are illustrated in Figures 4-2 and 4-3, respectively. It is clear from these plots that there is some variability associated with the material taken from each test pit. The variability in the pH readings appears to decrease for the more acidic samples (e.g., pH $\leq$4.5). Material variability appears to increase with an increase in the paste conductivity, i.e. the total amount of stored oxidation products present. There are at least two reasons for the variability in the material. First, while the samples are taken to represent the entire depth of the 15 ft test pit, it is not always possible to achieve a homogeneous sample when dealing with such a large quantity of material at a relatively large particle size distribution. It is therefore possible that any quarter of material may be more representative of either the top or the bottom section of the sidewall. Earlier investigations (Foth & Van Dyke, 1996) have clearly shown a significant difference in the state of oxidation between the near surface materials and those at depth. Secondly, selective flow paths that are typically formed in waste rock piles result in the partial flushing of oxidation products from some areas, while in other areas, oxidation products are accumulated without any significant removal.

The paste parameters are compared with the shake flask extraction parameters in Figures 4-4 and 4-5. The shake flask parameters were obtained after one hour (prior to alkali addition in the alkali demand tests). The comparison shows that paste pH values were consistently equal to or greater than the shake flask values; while paste conductivities were consistently equal to or lower than the shake flask values. A plot of conductivity as a function of pH is provided in Figure 4-6 for the shake flask results. Comparing Figure 4-6 with Figure 4-1 shows that for pH values greater than 5 s.u., the conductivity values measured in the one hour shake flask test are significantly higher than those measured in the paste measurements. These differences indicate the stored oxidation products are not completely dissolved in the short contact time used in the paste tests.

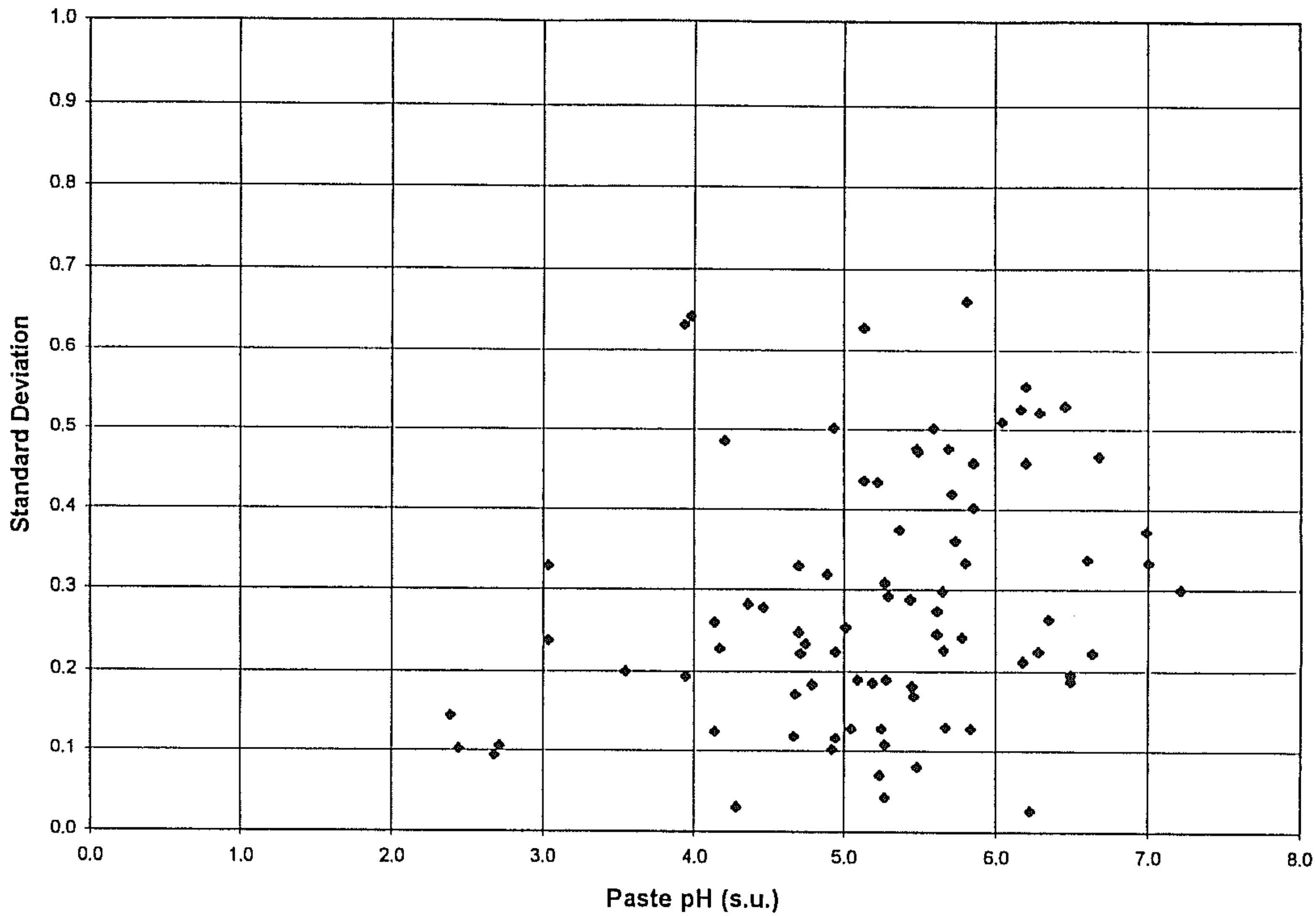
4.1.2 Effect of Particle Size

Detailed particle size analyses were completed on two samples (illustrated in Figure 4-7), and gross estimates were obtained for several samples from the Type II stockpile. The results are summarized in Table 4-2. While the gross estimates of the fines fraction is somewhat less than that indicated by the detailed sieve analyses, the gross estimates are consistent for all the sampling locations investigated. The detailed analyses show that, on average, approximately 52% of the rock is less than ¼ in. in size.

Samples were randomly selected from six test pits to determine the distribution of acidity with particle size. Leach extractions were completed at a 1:1 solids-to-liquid ratio on the <¼-in and ¼ to 3-in size fractions from each sample. A compilation of the test results and laboratory test reports are provided in Appendix E. The data is summarized in Table 4-3. This table compares the extractable total acidity, sulfate and copper from each of the size fractions. The distribution



FLAMBEAU MINING COMPANY	
FIGURE 4-1 RELATIONSHIP BETWEEN FIELD PASTE PARAMETERS	
Scale: NA	Date: February, 1997
Prepared By: Steffen, Robertson and Kirsten	By : SGL

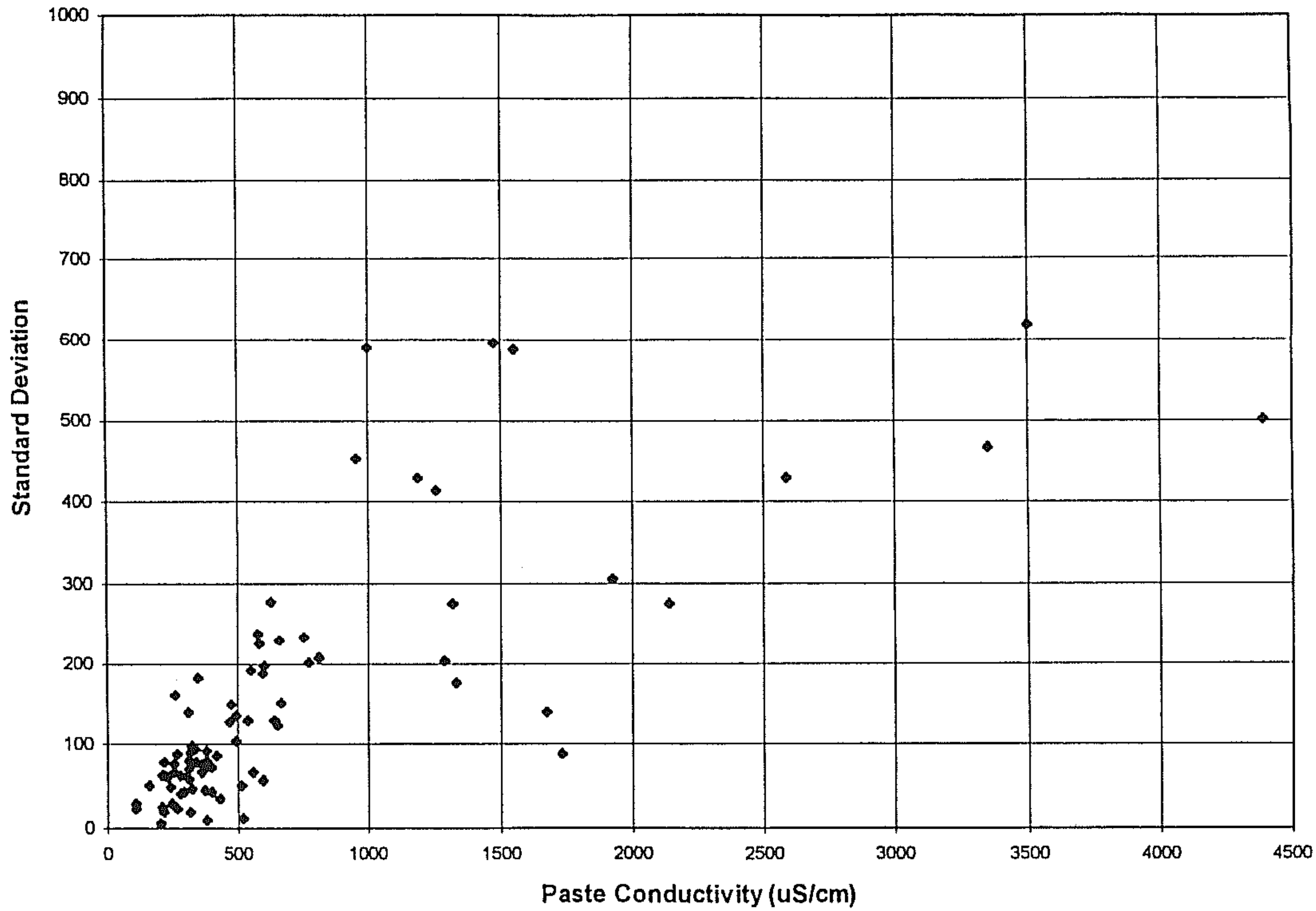


FLAMBEAU MINING COMPANY

FIGURE 4-2

TYPE II MATERIAL: PLOT OF STANDARD DEVIATION VS. AVERAGE FIELD PASTE pH

Scale: NA	Date: February, 1997
Prepared By: Steffen, Robertson and Kirsten	By : SGL

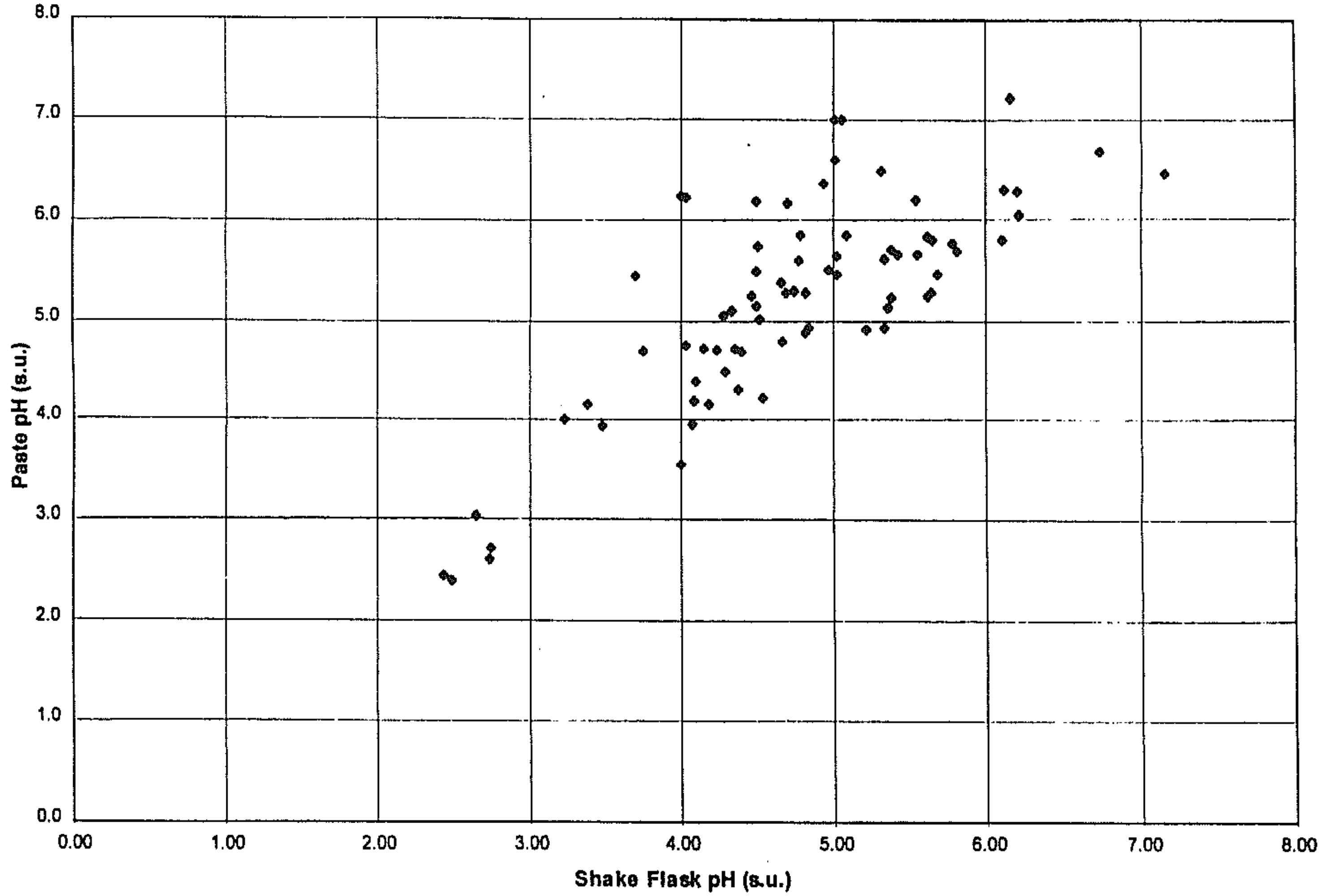


FLAMBEAU MINING COMPANY

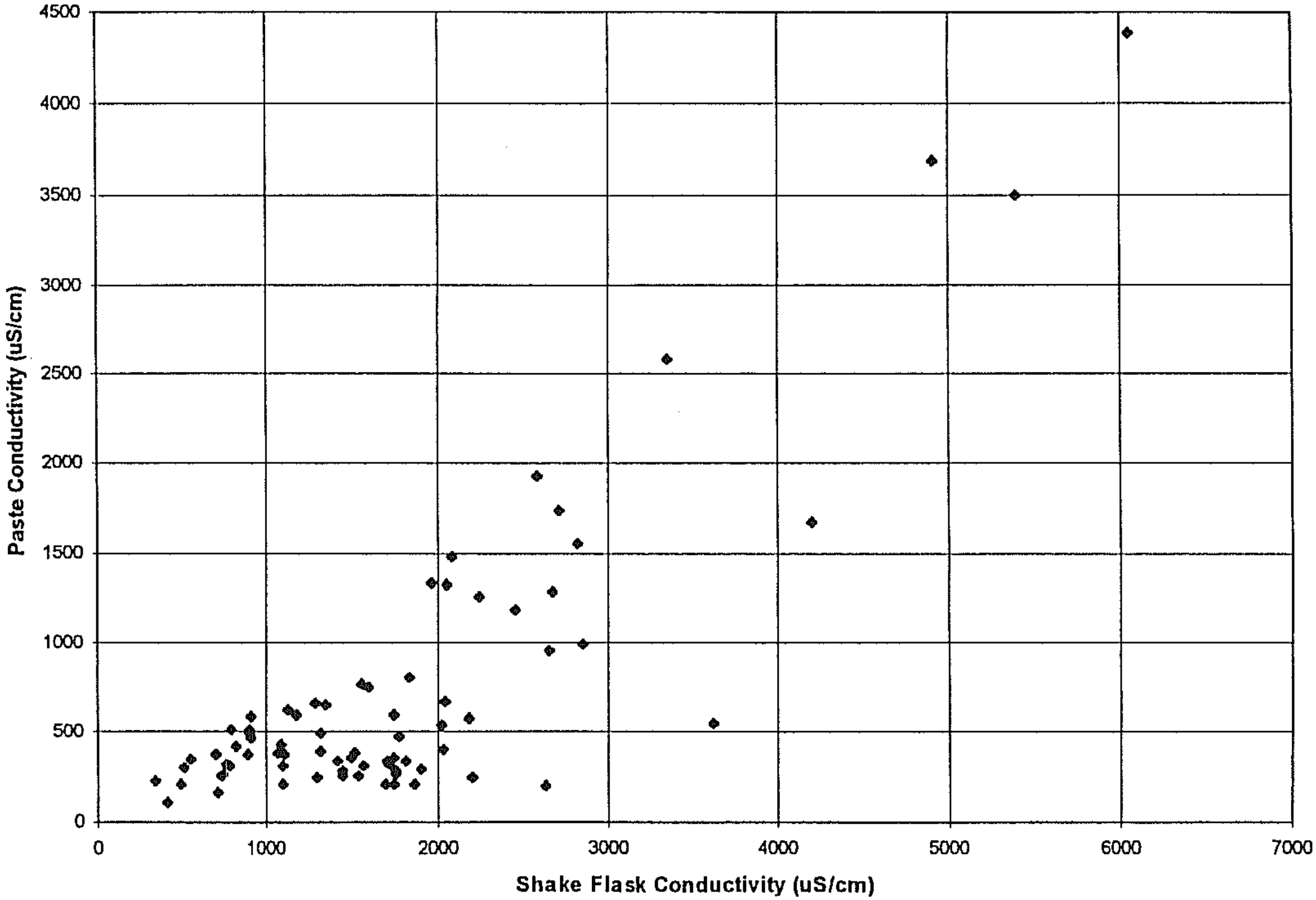
FIGURE 4-3

TYPE II MATERIAL: PLOT OF STANDARD DEVIATION VS. AVERAGE FIELD PASTE CONDUCTIVITY

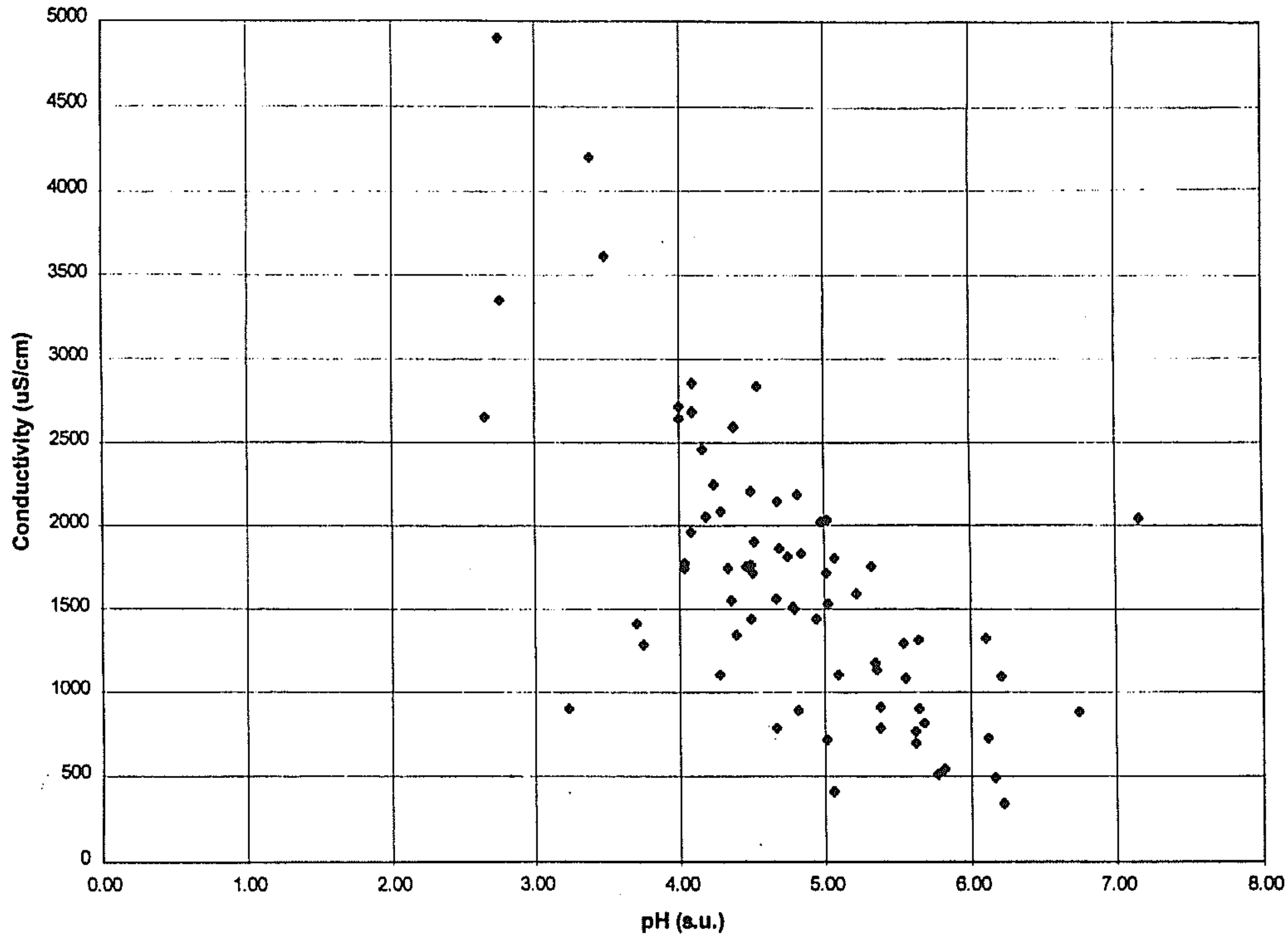
Scale: NA	Date: February, 1997
Prepared By: Steffen, Robertson and Kirsten	By : SGL



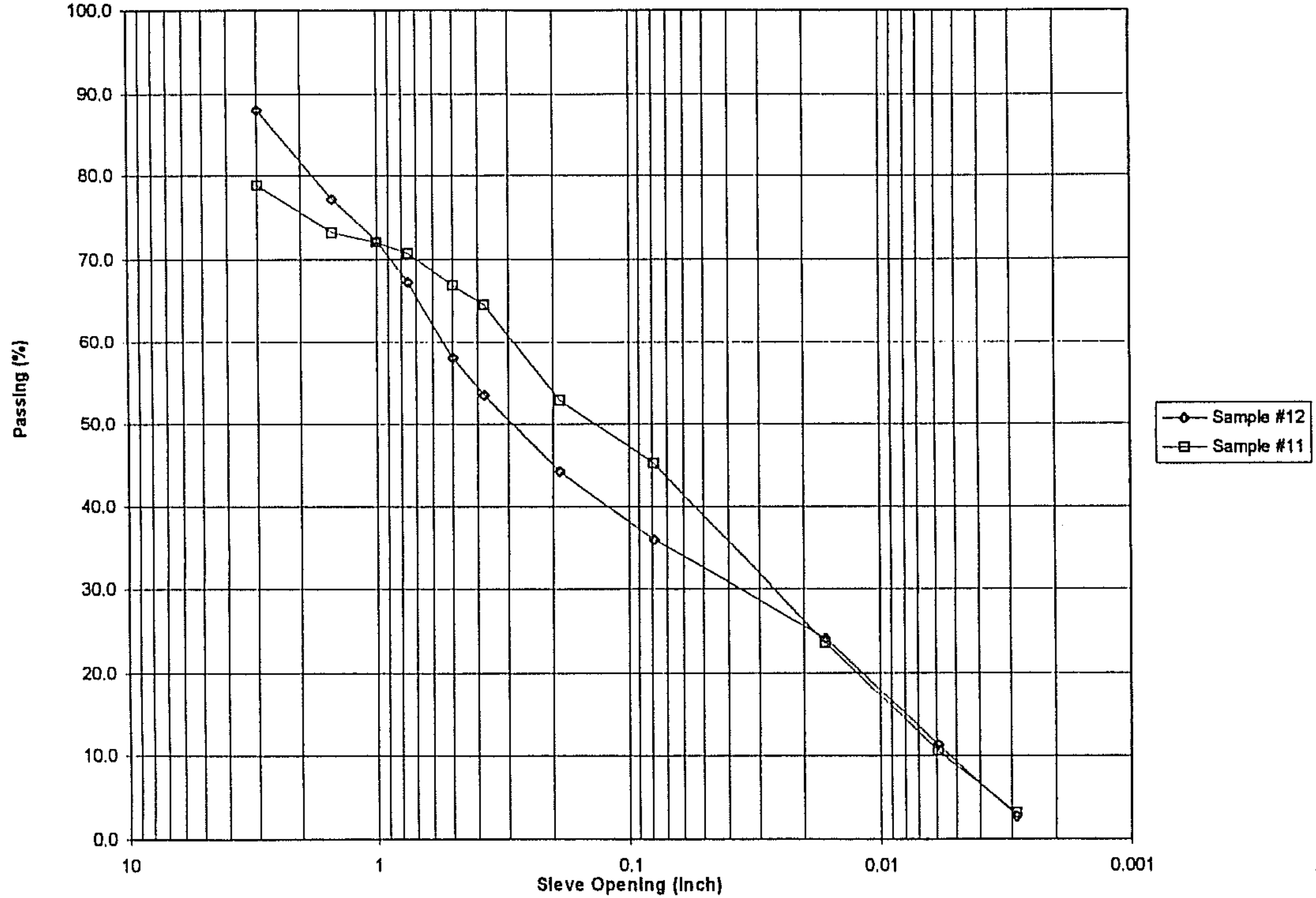
FLAMBEAU MINING COMPANY	
FIGURE 4-4 RELATIONSHIP BETWEEN PASTE AND SHAKE FLASK pH	
Scale: NA	Date: February, 1997
Prepared By: Steffen, Robertson and Kirsten	By : SGL



FLAMBEAU MINING COMPANY	
FIGURE 4-5 RELATIONSHIP BETWEEN PASTE AND SHAKE FLASK CONDUCTIVITY	
Scale: NA	Date: February, 1997
Prepared By: Steffen, Robertson and Kirsten	By : SGL



FLAMBEAU MINING COMPANY	
FIGURE 4-6 RELATIONSHIP BETWEEN SHAKE FLASK CONDUCTIVITY AND pH	
Scale: NA	Date: February, 1997
Prepared By: Steffen, Robertson and Kirsten	By : SGL



FLAMBEAU MINING COMPANY	
FIGURE 4-7 TYPE II STOCKPILE MATERIAL SIZE DISTRIBUTION	
Scale: NA	Date: February, 1997
Prepared By: Steffen, Robertson and Kirsten	By : SGL

Table 4-2

Type II Stockpile Material Size Distributions

Sample		Sample #12 - Type II Stockpile			Sample #11 - Type II Stockpile		
Sieve Size	Opening (inch)	Wt. Retained (g)	Retained (%)	Cumm. Passing (%)	Wt. Retained (g)	Retained (%)	Cumm. Passing (%)
3"	3	300.1	11.9	88.1	694.5	21.0	79.0
1.5"	1.5	276.9	11.0	77.1	190.5	5.8	73.2
1"	1	122.9	4.9	72.2	38.7	1.2	72.0
0.75"	0.75	124.6	4.9	67.3	43.6	1.3	70.7
0.5"	0.5	235.7	9.3	58.0	125.5	3.8	66.9
0.375"	0.375	113.2	4.5	53.5	76.8	2.3	64.6
#4	0.187	233.3	9.3	44.2	390.0	11.8	52.8
#10	0.0787	208.4	8.3	36.0	248.1	7.5	45.3
#40	0.0165	298.8	11.8	24.1	720.6	21.8	23.5
#100	0.0059	324.6	12.9	11.2	426.2	12.9	10.6
#200	0.0029	213.3	8.5	2.8	248.2	7.5	3.1
< #200		69.9	2.8		101.4	3.1	
Total		2521.7			3304.1		

Gross Gradation Estimates

		Estimated Distribution (%)		
Sample	Location	> 3"	No.4 to 3"	< No. 4
13-1	South Slope	40	42	18
13-3	South Slope	25	45	30
14-1	East Slope (south)	33	40	27
14-3	East Slope (south)	60	24	16
15-1	East Slope (north)	25	53	22
15-2	East Slope (north)	20	48	32
16-1	North Slope	25	45	30
16-2	North Slope	25	45	30
17-1	West Slope	35	42	23
17-2	West Slope	40	30	30
	Average	32.8	41.4	25.8

Table 4-3

Distribution of Soluble Constituents

Parameter	Units												
Sample ID		FMC-200A	FMC-200B	FMC-209A	FMC-209B	FMC-210A	FMC-210B	FMC-212A	FMC-212B	FMC-3A	FMC-3B	FMC-8A	FMC-8B
Solids Sample		< 1/4"	1/4" to 3"	< 1/4"	1/4" to 3"	< 1/4"	1/4" to 3"	< 1/4"	1/4" to 3"	< 1/4"	1/4" to 3"	< 1/4"	1/4" to 3"
Date		12/6/96	12/5/96	12/6/96	12/4/96	12/6/96	12/4/96	12/6/96	12/4/96	12/6/96	12/4/96	12/6/96	12/5/96
Extractables[1]													
Acidity	mgCaCO3eq/kg	290	140	340	38	100	36	540	88	2000	750	1200	650
SO4	mg/kg	570	550	570	540	600	540	680	180	7400	1000	620	530
Cu	mg/kg	190	110	180	42	85	4.6	290	70	660	230	160	120
Distributions[2]													
Weight	%	52.0	31.5	52.0	31.5	52.0	31.5	52.0	31.5	52.0	31.5	52.0	31.5
Acidity	%	69.2	20.2	90.6	6.1	75.1	16.4	86.9	8.6	74.3	16.9	66.7	21.9
SO4	%	52.9	30.9	53.3	30.6	54.6	29.8	80.4	12.9	88.9	7.3	55.9	28.9
Cu	%	65.2	22.9	82.3	11.6	95.2	3.1	81.8	12.0	75.7	16.0	59.1	26.8

[1]Extractables are calculated from constituent concentrations in the leach extraction leachates as follows:
Extractable = concentration (mg/l) * leachate volume (l)/sample weight (kg).
Fractional weight distribution is obtained from the size distribution curve.
Extractable for entire sample is obtained as follows:
Extractable = (Extr.(<1/4) * Wt. Distr. (<1/4-in) + Extr. (1/4 - 3-in) * (100 - Wt. Distr. (<1/4-in))/100
where Extr. = extractable constituient for size fraction (mg/kg)
and Wt. Distr. = weight fraction of size fraction as %.
[3]Constituent distributions are obtained from the ratio of the fractional content with that for the entire sample.

of these constituents were then calculated by using the conservative assumption that the >3 in rock will have an extractable content similar to the ¼ to 3-in size fraction. The assumption is conservative, since the results in Table 4-3 clearly indicate that the ¼ to 3-in fraction has less acidity associated with it than the <¼-in fraction, and, since the specific surface area (sq ft/lb) is significantly less for the >3-in fraction when compared to the smaller size fractions. The results show that, in all cases, more than 65% of the extractable acidity is associated with the <¼-in fraction.

To quantify the conservatism that results from using the <¼-in size fraction to estimate the alkali requirements for the entire sample, the ratio of acidity associated with the fines to that associated with the entire sample was calculated, based on the size distribution given in Figure 4-7. These calculations were also carried out for sulfate and copper, and are summarized in Table 4-4. On average, if the alkali demand for the Type II material is estimated from acidity measured in the <¼-in size fraction, the estimate would be 48% greater than the calculated alkali demand.

4.1.3 Alkali Demand Testing

Alkali demand tests were completed on the <¼-in size fraction of each Type II material sample. The test results are provided in Appendix F, and summarized in Table 4-5. The results are also illustrated in Figure 4-8, which shows a histogram of the entire population of samples taken from the Type II stockpile.

Using the data in Table 4-5, the average alkali demand for all the samples taken from the Type II stockpile was 0.75 mg CaO/g, or about 1.8 lb CaO/ton. The maximum alkali demand was 6.7 mg CaO/g, or 16 lb CaO /ton. However, as shown in Figure 4-9, the majority of the samples fell within the lower alkali demand range. Approximately 80% of the samples had an alkali demand of less than 0.8 mg CaO/g (1.9 lb CaO/ton), and approximately 92% fell below 1.6 mg CaO/g (3.8 lb/ton). The histogram also suggests that the data may consist of two distinct populations, one with a range of 0 to 0.8 mg CaO/g, and the second with a range of 0.8 and 1.6 mg CaO/g, with some outliers above this.

4.1.4 Alkali Amendment Type

To provide a comparison between lime and limestone as alkali amendment types, anoxic column tests were completed on the <¼-in size fraction of six samples. The samples for testing were selected to represent the full range of alkali demands encountered for the Type II material. The sample selection and characteristics are summarized in Table 4-6. Representative subsamples were split from each of the selected samples. One split was amended with quicklime and the other with limestone, at the rates indicated in the table. The limestone addition rate was adjusted for moisture content (5%) and theoretical availability (95%). In addition, an excess of 20% of the adjusted limestone addition rate was added to each limestone amended column. As discussed in Section 4.6 of the October 1996 report (Foth & Van Dyke, 1996), the theoretical availability was determined by titrating the limestone with sulfuric acid to an acidic endpoint, and back-

Table 4-4

Overestimation (as a Ratio) of Soluble Constituents Based on Testing the < 1/4-in Size Fraction[1]

	Sample						
Parameter	200	209	210	212	3	8	Ave.
Acidity	1.33	1.74	1.44	1.67	1.43	1.28	1.48
SO4	1.02	1.03	1.05	1.55	1.71	1.07	1.24
Cu	1.25	1.58	1.83	1.57	1.46	1.14	1.47

[1]Ratio = (extractable content for <1/4-in size fraction)/(extractable content for entire sample).

Table 4-5

Summary of Alkali Demand Test Results[1]

Sample	Initial Conditions Average		Calculated Alkali Demand	
	pH (su)	Cond. (uS/cm)	(mg CaO/g)	(mgCaCO3/g)
166	3.70	1413	0.59	1.1
186	4.09	2850	3.16	5.6
194	3.75	1287	0.59	1.1
201	4.35	1552	0.64	1.1
204	4.18	2053	0.56	1.0
209	4.82	894	0.20	0.4
210	4.67	783	0.20	0.4
211	3.48	3620	0.79	1.4
212	4.40	1342	0.20	0.4
213	2.75	3347	1.89	3.4
187	5.03	1536	0.57	1.0
188	4.82	2187	1.57	2.8
189	5.62	696	0.07	0.1
192	5.38	908	0.10	0.2
195	5.68	815	0.11	0.2
197	5.22	1598	0.20	0.4
199	5.64	900	0.08	0.1
200	5.34	1175	0.20	0.4
202	5.37	1130	0.19	0.3
198	5.78	510	0.06	0.1
205	4.98	2023	0.73	1.3
207	5.82	546	0.05	0.1
190	4.79	1500	0.22	0.4
193	6.21	1093	0.02	0.0
196	6.22	342	0.03	0.1
203	5.65	1313	0.06	0.1
206	5.56	1083	0.31	0.6
208	5.62	761	0.04	0.1
172	4.00	2710	0.81	1.4
176	4.38	2583	1.41	2.5
177	4.08	1960	0.39	0.7

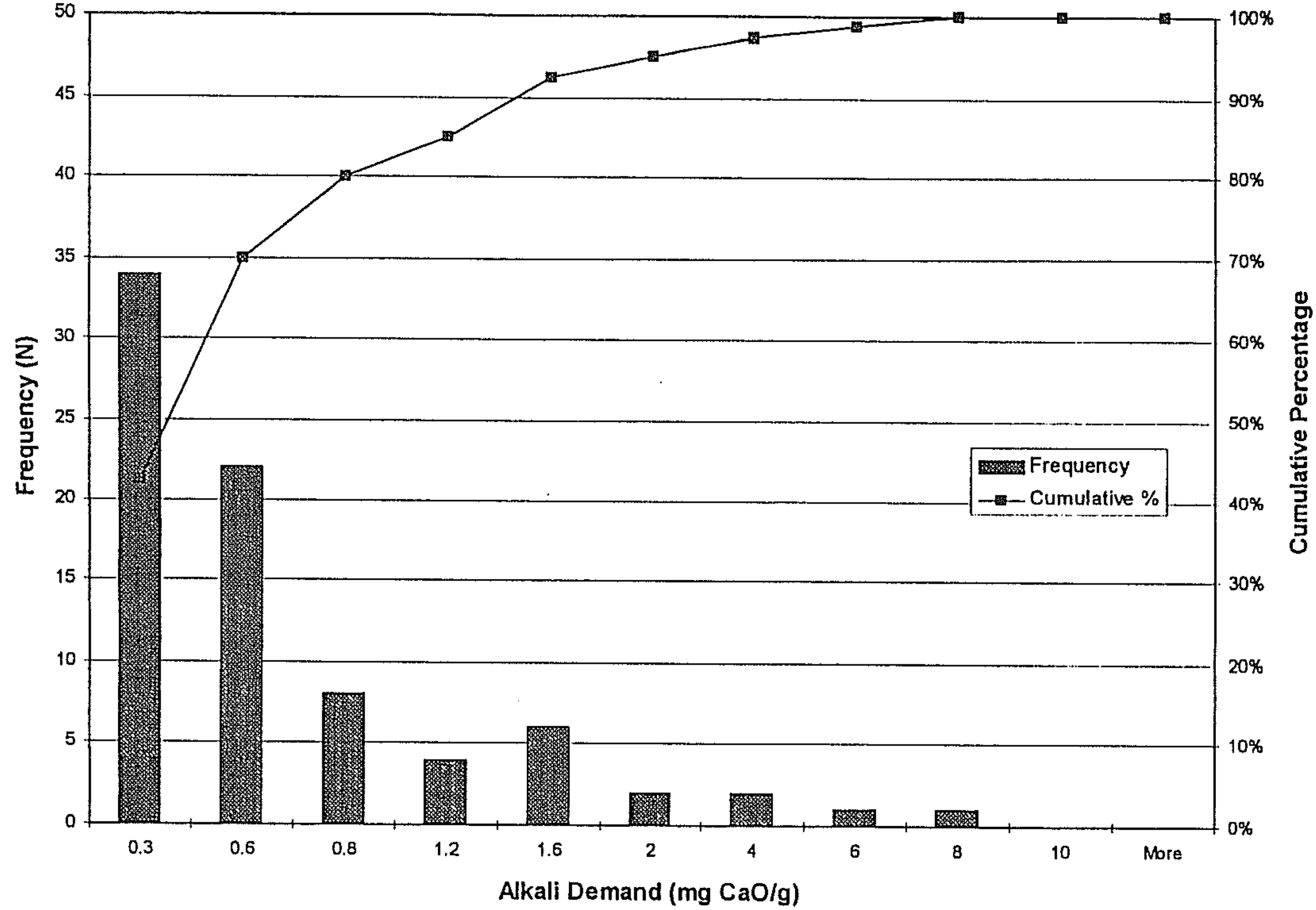
Table 4-5 *(Continued)*

Sample	Initial Conditions Average pH (su)	Initial Conditions Average Cond. (uS/cm)	Calculated Alkali Demand (mg CaO/g)	Calculated Alkali Demand (mgCaCO3/g)
179	4.54	2827	0.69	1.2
181	3.38	4200	1.73	3.1
191	6.12	725	0.05	0.1
146	4.28	1107	0.20	0.4
157	4.04	1773	0.62	1.1
175	4.24	2243	0.49	0.9
180	4.16	2457	1.38	2.5
182	4.29	2087	0.26	0.5
183	4.10	2677	0.65	1.2
153	4.34	1744	0.40	0.7
154	4.49	1760	0.40	0.7
155	4.69	1860	0.61	1.1
156	4.52	1904	0.43	0.8
159	4.75	1816	0.34	0.6
160	4.66	1564	0.69	1.2
165	4.78	1515	0.20	0.4
170	4.46	1749	0.91	1.6
173	4.85	1834	0.48	0.9
147	4.70	1699	0.41	0.7
149	5.02	2030	0.43	0.8
151	5.10	1098	0.20	0.4
158	4.50	1445	0.30	0.5
161	5.39	780	0.03	0.1
168	6.17	488	0.20	0.4
171	4.94	1441	1.15	2.0
163	4.03	1743	0.56	1.0
169	4.00	2633	0.99	1.8
173	4.31	2040	0.44	0.8
178	7.15	2041	0.00	0.0
301	5.43	735	0.10	0.2
302	5.34	1068	0.34	0.6
3	2.74	4903	3.30	5.9
162	4.51	1709	0.45	0.8
167	4.49	2200	0.52	0.9
174	6.74	886	0.00	0.0
4	2.62	2973	1.90	3.4

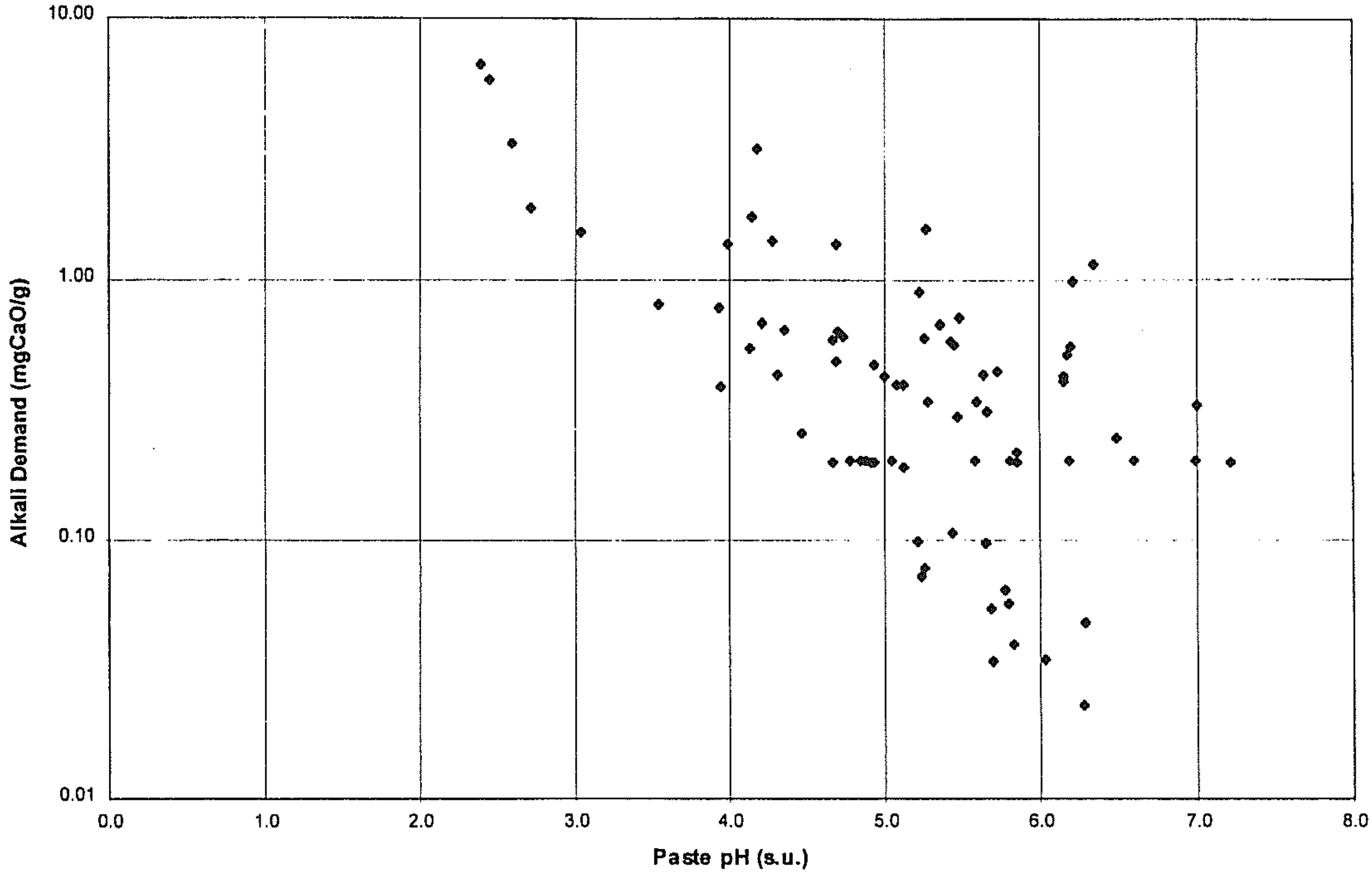
Table 4-5 *(Continued)*

Sample	Initial Conditions Average pH (su)	Initial Conditions Average Cond. (uS/cm)	Calculated Alkali Demand (mg CaO/g)	Calculated Alkali Demand (mgCaCO3/g)
8	2.65	2650	1.52	2.7
15-3	1.80	4550	4.41	7.9
15-1	2.48	6053	6.71	12.0
15-1	1.73	5587	7.10	12.7
147	5.07	1803	0.43	0.8
148	5.54	1296	0.20	0.4
152	6.11	1318	0.20	0.4
164	5.32	1755	0.25	0.4
150	5.02	1718	0.20	0.4
184	5.06	413	0.20	0.4
185	5.01	711	0.33	0.6
13-1	2.43	5390	5.89	10.5

[1]Includes duplicates.



FLAMBEAU MINING COMPANY	
FIGURE 4-8 DISTRIBUTION OF ALKALI DEMAND FOR TYPE II SAMPLES	
Scale: NA	Date: February, 1997
Prepared By: Steffen, Robertson and Kirsten	By : SGL



FLAMBEAU MINING COMPANY

FIGURE 4-9

PLOT OF FIELD pH VERSUS ALKALI DEMAND

Scale: NA	Date: February, 1997
Prepared By: Steffen, Robertson and Kirsten	By : SGL

Table 4-6

Sample Selection for Column Testing
Samples for Alkali Type Testing

Sample Number	pH (su)	Cond. (uS/cm)	Alkali Demand (mg CaO/g)	Alkali Demand (mg CaCO3/g)	Limestone[1] Addition (mg/g)
4-1	2.62	2973	1.9	3.4	4.5
15-3	1.73	4440	4.4	7.9	9.60
15-1	1.57	5587	7.1	12.7	15.53
180	4.16	2457	1.4	2.5	3.01
181	3.38	4200	1.7	3.1	3.75
186	4.09	2850	2.5	4.4	5.35

[1]Moisture content of limestone 5% by wt.
Availability of limestone 95%
Excess over theoretical requirement 20%

calculating the acid consumed to a pH of 6.5 s.u. The grain size of the limestone used in the tests consisted of 100% passing the No. 8 sieve.

The field and laboratory analytical results for consecutive pore water displacements from the columns are contained in Appendix G. The results for the cycle 3 pore water displacement are summarized in Table 4-7. The table also shows the cumulative acidity released from the columns up to and including the third pore water displacement. By the third cycle, the residual acidity in all but one column (sample 181) had been displaced, and pore water pH values had approached near neutral conditions. For these columns (excluding 181), cumulative acidity released from the columns represent less than 8% of the total alkali amendment. The alkali demand for sample 181 appears to be higher than that indicated by the alkali demand test. The paste parameters and corresponding alkali demand for this sample however compare well with other samples. Short range sample variability is believed to be the cause of the anomalous result.

Since the solubility of most of the soluble constituents is pH dependent, the pore water chemistry for both the lime and limestone amended samples were similar for similar pH values. However, pH neutralization was slightly more rapid for the limestone amended samples than for the lime amended samples. This is likely due to the excess limestone that was used in the tests. An excess of limestone will lead to the buffering of the pore water to a near neutral pH. In contrast, excess lime could result in the elevated pH conditions which may complex and redissolve some metals such as copper. Using lime requires that the alkali demand be met precisely, which is quite difficult with the known sample variability.

One disadvantage of using limestone is its lower reactivity. The acidity loss from the limestone amended columns over the three cycles was slightly greater than for the corresponding lime amended columns. However, by the third displacement, three of the limestone amended columns showed a net release of alkalinity, which is offsetting the earlier release of acidity. These results also indicate that:

- Limestone has not been blinded by the acidity;

- Acid neutralization rates are likely limited by the rate at which the limestone dissolves; and

4.1.5 Alkali Availability

4.1.5.1 Limestone and Lime Amended Columns

As noted in the introduction to this report, data from the column test program is still being collected. The data gathered to date provides a basis by which to develop a limestone addition rate for use in 1997 Type II material backfilling. This addition rate is conservative and when the final data is available, an amendment to this report will be provided to WDNR reflecting the final results from the test work and a final amendment rate. The following approach was followed to estimate the limestone availability.

Table 4-7

Comparison of Column Test Results Obtained for Lime and Limestone Amended Samples

Column Number	Sample	Amended	Cycle	pH (s.u.)	Eh (mV)	Cond. (uS/cm)	Lab pH (su)	Alkalinity ($mgCaCO_3$ eq/l)	Lab. Acidity ($mgCaCO_3$ eq/l)	SO_4 (mg/l)	Cu (mg/l)	Mn (mg/l)	Alkali Addition ($mgCaCO_3$eq/g)	Calc. Acidity[1] ($mgCaCO_3$eq/l)	Acidity Release[2] (mgCaCO3eq./g)	Alkalinity Yield[3] (mgCaCO3 eq./g)	Net Acidity Release[4] (mgCaCO3 eq./g)
22	15-1	Lime	3	6.10	7.0	2450	5.8		< 2	730	0.94	0.23	12.74	2	0.15	0.00	0.15
25	15-1	Limestone	3	6.88	32	2960	6.1		< 2	680	0.19	7.1	16.94	0	0.02	0.00	0.02
19	15-3	Lime	3	4.28	58.5	2280	6.2		< 2	560	10	1.4	7.87	15	0.36	0.00	0.36
28	15-3	Limestone	3	6.78	-13.2	2080	6.8	29		630	0.57	1.4	10.47	1	0.85	< 0.01	0.85
20	180	Lime	3	6.06	37.8	1949	6.2		< 2	620	3.7	5.7	2.47	6	0.09	0.00	0.09
27	180	Limestone	3	6.41	62.4	2440	6.7	70		770	1.7	17	3.28	3	0.19	0.01	0.18
21	181	Lime	3	3.75	91.9	3020	4.8		740	710	480	1.1	3.08	740	0.95	0.00	0.95
26	181	Limestone	3	4.05	92.0	3280	4.9		590	830	460	11	4.09	707	1.20	0.00	1.20
2	186	Lime	3	6.24	-14	2460	6.5		< 2	600	1.8	0.45	4.39	3	0.07	0.00	0.07
1	186	Limestone	3	6.68	-7	2560	6.6	47		690	0.52	3.9	5.83	2	0.14	0.03	0.11
23	4-1	Lime	3	5.75	60.2	2070	6.2		< 2	670	8.2	2.6	3.39	13	0.13	0.00	0.13
24	4-1	Limestone	3	6.32	20.1	2200	6.1		< 2	580	0.74	4.2	4.51	1	0.12	0.00	0.12

[1]Calc Acidity = equivalent acidity calculated from the dissolved copper, aluminum and iron concentrations in the corresponding leachate.
[2]Acidity Release = cumulative acidity release over all cycles of testing.
[3]Alkalinity Yield = cumulative alkalinity release over all cycles of testing.
[4]Net Acidity Release = cumulative acidity less cumulative alkalinity released

- First, it was assumed that each of the subsamples tested in the lime and limestone amended columns had a similar initial acidity content to that determined in the alkali demand test.

- The total acidity was calculated for the lime amended columns by assuming that the quicklime used in the alkali demand test was 100% available.

- For each column, alkali demand (as $CaCO_3$ equivalent) was summed with the cumulative release of acidity (as $CaCO_3$ equivalent) from the columns, to provide an estimate of the initial acidity contained in the respective samples. These estimates, less any alkalinity release, were then compared to the total alkali amendment for the corresponding tests to provide an estimate of the overall availability of the lime or limestone.

The test results presented in Table 4-7 indicate that not all of the lime was available for reaction in the column tests. The lime amended column tests were prepared by blending dry quicklime with the Type II material. The columns were then flooded slowly. While flooding occurred slowly, the rising water likely contained dissolved oxidation products that would be precipitated as it contacted the quicklime. Further, the slaking of the quicklime to $Ca(OH)_2$ may not have proceeded to completion. In comparison, for the alkali demand test, the quicklime is first slaked under controlled conditions to maximize the conversion to $Ca(OH)_2$, and the acidity associated with the sample is allowed to dissolve during a one hour extraction period before the slaked lime is added in a dissolved/slurried form. In the alkali demand test, the neutralization reactions proceed in the aqueous phase, and are not limited by dissolution reactions. Susceptibility to lime blinding therefore is small in the alkali demand test, while this may not be the case for the column test conditions.

The results for the six limestone amended samples (for which lime amended tests were also completed) are summarized in Table 4-8. It should be noted that these estimates are likely to result in an under-estimation of the limestone availability, since not all of the alkalinity that may be released has been accounted for. As noted above, the tests are still progressing. Upon completion, complete mass balances will be developed for each column, and the availability of the limestone will be reassessed. Final estimates of the limestone availability may therefore be different than that presented in this report. An amendment to this report will be provided to the WDNR containing the final test data and the reassessment of limestone availability.

The corresponding limestone availability estimates are provided in Table 4-8. The data show that the limestone requirement (the inverse of the availability) in the <¼-in material is approximately 48% higher than indicated by the alkali demand test on the <¼-in material.

4.1.5.2 Supplementary Column Tests

The analytical results for the first three pore water displacements on limestone amended column tests are contained in Appendix G. A summary of these results and field measurements are

Table 4-8

Assessment of Limestone Availability

Column Number	Sample	Alkali Addtn. ($mgCaCO_3/g$)	Initial Acidity[1] ($mgCaCO_3/g$)	Net Acidity Released from Column[2] ($mgCaCO_3eq./g$)	Acidity Neutralized[3] ($mgCaCO_3eq./g$)	Estimated Availability[4]
25	15-1	16.94	12.74	0.02	12.72	75%
28	15-3	10.47	7.87	0.85	7.03	67%
27	180	3.28	2.47	0.18	2.29	70%
26	181	4.09	3.08	1.20	1.87	46%
1	186	5.83	4.39	0.11	4.27	73%
24	4-1	4.51	3.41	0.12	3.29	73%
					Average	67%

[1]From alkali demand test.
[2]Net Acidity Released = Cumulative acidity released over all cycles of testing.
[3]Acidity Neutralized = Initial acidity less acidity released.
[4]Availability = (Acidity Neutralized)/(Limestone Addition)*100%.

provided in Table 4-9. The results indicate that equilibrium conditions have not as yet been reached in these column tests. The alkali demand for sample 190 has apparently been underestimated since the results show that the net acidity released is almost equal to the initial estimate of the alkali requirement. This is likely due to sample variability. If the result for this sample is disregarded, the average limestone to alkali demand ratio is on the order of 1.41, corresponding to an availability of approximately 71%.

4.1.6 Relationship of Field Parameters and Alkali Demand

Figures 4-9 and 4-10 illustrate the relationship of paste pH and paste conductivity to the alkali demand. The figures shows there is variability in the alkali demand for any paste pH or conductivity value, especially for a paste pH below 3 s.u. However, it is clear from the figures that samples within a fixed range of alkali demand exhibit a similar range of paste pH and conductivity.

As discussed above in Section 4.1.3, approximately 80% of the samples from the Type II stockpile have an alkali demand of <0.8 mg CaO/g, and 92% have an alkali demand of <1.6 mg CaO/g. These two groups of samples can also be identified by paste parameters. The low alkali demand material is characterized by a paste pH >5 s.u., and a paste conductivity <2200 μS/cm. The material with an alkali demand between 0.8 and 1.6 mg CaO/g, is characterized by a paste conductivity <2200 μS/cm and a pH <5 s.u. Materials with an alkali demand >1.6 mg CaO/g exhibit a paste pH <5 s.u. and a conductivity >2200 μS/cm.

The characteristics of the material that classified according to the above paste parameters are summarized in Table 4-10. As shown in the table, class A material (paste pH >5 s.u. and paste conductivity <2200 μS/cm) would have an average alkali demand of about 0.35 mg CaO/g, but four out of 47 samples would exceed the 0.8 mg CaO/g upper limit. Of these four, one sample with an alkali demand of 1.57 would be included, with the remaining three falling below 1 mg CaO/g. The class B material (paste pH >5 s.u. and paste conductivity >2200 μS/cm, or paste pH <5 s.u. and paste conductivity <2200 μS/cm) would have an average alkali demand of about 0.77 mg CaO/g. Two of the 25 samples making up the class B population would exceed the 1.6 mg CaO/g upper range for class B material.

The accuracy of the classification improves when the one hour conductivity and pH criteria are used. The results from this assessment are summarized in Table 4-11.

It is clear however from these analyses that it is feasible to classify Type II material according to alkali demand either on the basis of the paste parameters, or the one hour shake flask data . The use of these criteria to support a variable alkali addition rates is discussed further in Section 5.

Table 4-9

Summary of Column Test Results

MISSING a CaCO3 CaO vs. a lit table compare
columns 24-28

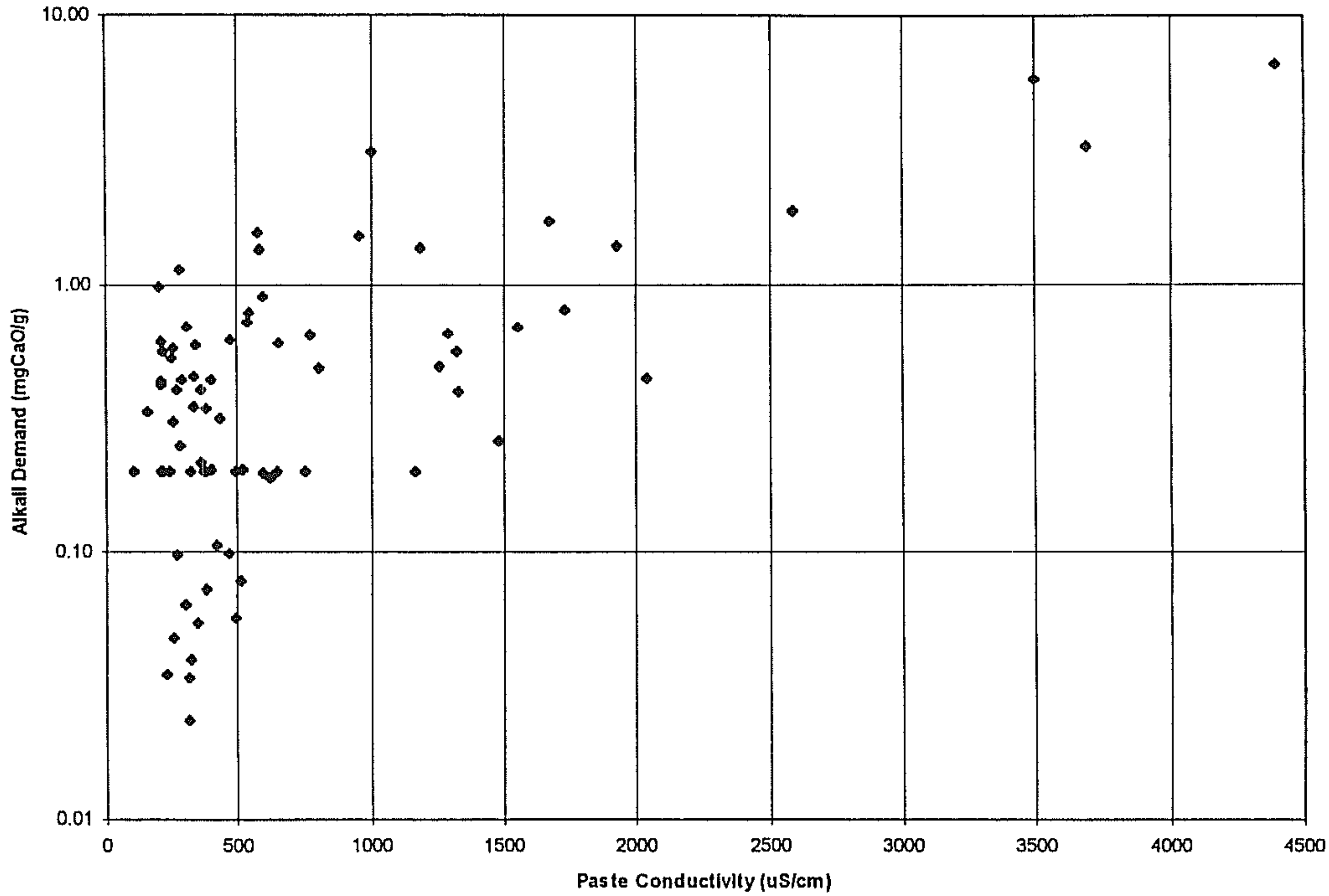
* only represents columns w/ rock amended with CaCO3, not alone or lime

Column Number	3	4	5	6	7	8	9	10	[illegible]	[illegible]	[illegible]	14
Sample	170	13-1	188	183	213	187	194	192	8-1	190	172	176
Cycle	3	3	3	3	3	3	3	3	3	3	3	3
Volume (L)	1.193	1.106	1.259	1.101	1.044	1.233	0.926	1.092	0.858	1.102	1.118	1.011
pH (s.u.)	5.47	4.96	5.26	4.77	6.45	5.55	6.61	5.68	6.95	4.84	5.60	5.63
Eh (mV)	50	53	58	74	-19	46	50	41	41	66.5	73	51.1
Cond. (mS/cm)	2030	2430	2190	2470	713	2230	2240	660	2440	1791	2250	2400
Lab pH (su)	6.00	5.70	5.40	5.00	5.60	5.50	6.00	6.00	5.90	6.10	5.30	5.70
Alkalinity ($mgCaCO_3$ eq/L)	-	-	-	-	-	-	-	-	-	-	-	-
Acidity ($mgCaCO_3$ eq/L)	<2	40	32	190	<2	<2	<2	<2	<2	<2	<2	<2
SO_4 (mg/L)	660	700	610	700	520	580	850	510	560	560	660	680
Al (mg/L)	<0.034	0.075	0.072	<0.034	0.065	<0.034	0.05	<0.034	<0.034	<0.034	<0.034	<0.034
As (mg/L)	<0.016	<0.016	<0.016	<0.016	<0.016	<0.016	<0.016	<0.016	<0.016	<0.016	<0.016	<0.016
Cd (mg/L)	0.045	0.0082	0.19	0.032	0.0047	0.013	0.0091	0.0037	0.0044	0.045	0.013	0.031
Ca (mg/L)	460	570	480	510	130	520	530	94	600	310	520	590
Co (mg/L)	0.24	0.58	0.76	0.48	0.037	0.31	0.16	0.19	0.018	0.94	0.27	0.46
Cu (mg/L)	18	7.9	35	140	0.49	21	0.67	13	0.16	110	18	10
Fe (T) (mg/L)	0.067	0.098	0.073	0.11	<0.01	0.029	<0.01	<0.01	<0.01	0.23	<0.01	<0.01
Mn (mg/L)	1.5	2.8	1.9	1.9	0.14	1.3	1.3	1.4	0.18	3.1	0.81	0.7
Se (mg/L)	<0.037	<0.037	<0.037	<0.037	<0.037	<0.037	<0.037	0.06	<0.037	<0.037	<0.037	0.051
Tl (mg/L)	0.035	<0.025	0.026	<0.025	0.025	0.032	0.026	<0.025	<0.025	<0.025	<0.025	<0.025
Zn (mg/L)	2.2	1.5	10	3.4	0.28	1.4	0.37	0.69	<0.12	5.9	1.5	2.6
Limestone Addition (mg/g)	1.08	10.21	1.78	1.41	4.48	1.51	1.41	0.21	4.33	0.51	1.93	2.82
Acidity Released[1] ($mgCaCO_3$/g)	0.28	1.98	0.45	0.68	0.47	0.53	0.46	0.05	0.09	0.39	0.81	0.57
Net Acidity Release[2] ($mgCaCO_3$/g)	0.28	1.98	0.45	0.68	0.47	0.53	0.46	0.05	0.08	0.39	0.81	0.57
Estimated Limestone Availability[3]	1.35	1.24	1.34	1.94	1.12	1.53	1.49	1.32	1.02		1.72	1.25

[1]Acidity Released = Cumulative acidity released over all cycles of testing.

[2]Net Acidity Release = Cumulative acidity less cumulative alkalinity released.

[3]Limestone Availability = (Limestone addition)/(initial acidity from alkali demand - Net Acidity Release).



FLAMBEAU MINING COMPANY	
FIGURE 4-10 PLOT OF ALKALI DEMAND VERSUS FIELD CONDUCTIVITY	
Scale: NA	Date: February, 1997
Prepared By: Steffen, Robertson and Kirsten	By : SGL

Table 4-10

Summary of Type II Material Classification by Field Test Results

Method	Parameter	units	Class A	Class B	Class C
	Alkali Demand	mg CaO/g	<0.8	0.8 to 1.6	>1.6
Sorted by Alkali Demand	Population Distr.	%	80.0	12.5	7.5
	Average alkali demand	mg CaO/g	0.31	1.25	3.78
	Median	mg CaO/g	0.23	1.38	3.23
Sorted by Paste Parameters	Paste pH	s.u.	> 5	< 5	< 5
	Paste Conductivity	uS/cm	< 2200	< 2200	> 2200
	Population Distr.	%	61.8	32.9	5.3
	Average Alkali Demand	mg CaO/g	0.35	0.77	4.44
	Median	mg CaO/g	0.25	0.59	4.59
	Max	mg CaO/g	1.57	3.16	6.71
	Min	mg CaO/g	0.02	0.20	1.89
	N		47	25	4
	No. Exceedances		4	2	0[1]
	Percent Samples	%	8.5	8.0	0.0

[1]Number of samples below 1.6 mg CaO/g.

Table 4-11

Summary of Type II Material Classification by 1 Hour Shake Flask Results

Method	Parameter	units	Class A	Class B	Class C
	Alkali Demand	mg CaO/g	<0.8	0.8 to 1.6	>1.6
Sorted by Alkali Demand	Population Distr.	%	80.0	12.5	7.5
	Average alkali demand	mg CaO/g	0.31	1.25	3.78
	Median	mg CaO/g	0.23	1.38	3.23
Sorted by Shake Flask Parameters	pH	s.u.	> 4	< 4	< 4
	Conductivity	uS/cm	< 2200	< 2200	> 2200
	Population Distr.	%	76.0	13.3	10.6
	Average Alkali Demand	mg CaO/g	0.34	1.11	2.85
	Median	mg CaO/g	0.20	0.75	1.81
	Max	mg CaO/g	1.57	3.16	6.71
	Min	mg CaO/g	0.00	0.49	0.79
	N		57	10	8
	No. Exceedances		4	1	3[1]
	Percent Samples	%	7	10	38

[1]Number of samples below 1.6 mg CaO/g.

4.2 Stability of Clarifier Underflow (CUF) Solids

The results for all testing completed on the CUF solids, including the column tests, are contained in Appendix H. Table 4-12 summarizes the pore water quality, from the leach extraction tests. This table also contains the results for the acidified samples.

In general, the metal concentrations in the pore water from the CUF solids are low. Since the water treatment process entails lime neutralization, followed by sulfide precipitation, the metal concentrations are primarily controlled by metal hydroxide phases. Very little release of soluble constituents is expected from the CUF solids in the backfilled pit under the expected circumneutral pH conditions.

Table 4-13 summarizes the acid consumption results and shows that very little alkalinity is available. The neutralization potential (NP) of the CUF solids (to a pH of 6.5) is estimated to be in the order of 8 mg CaCO3eq/g. Lime is relatively soluble, and it is likely that any residual lime has been removed from the CUF solids during the pore water displacement after placement on the Type II stockpile. The increase in cadmium, cobalt, copper, manganese and zinc concentrations in the pore water from the acid extraction tests when compared to the unacidified samples clearly illustrates that concentrations in the pore water are controlled by pH sensitive hydroxide or carbonate phases within the CUF solids.

The CUF column test results are summarized in Table 4-14. Pore water from the CUF solids remained slightly alkaline in pH for the three pore volume displacements completed to date. The negative net acidity values indicate a net release of alkalinity. Comparatively low redox potential conditions have been reached in these columns. Soluble constituent concentrations have remained low throughout, and correspond well with the concentrations observed for the leach extraction tests. The results indicate that the CUF solids would remain stable under the anoxic conditions that will be encountered in the backfilled open pit.

4.3 Characterization of Fall 1996 Backfill Type II Material

The Type II stockpiled material that was relocated during the fall of 1996 originated within the vicinity of test pits 301, 302, and 151 (Figure 2-1). The alkali demand for the samples from these test pits is summarized in Table 4-15. The average for the three samples was 0.21 mg CaO/g, or 0.38 mg $CaCO_3$ eq./g. Allowing for the limestone availability of 67% as determined in Section 4.1.5, this represents a total alkali requirement of about 0.57 mg $CaCO_3$/g (0.91 lb/ton). The material that was relocated during the fall 1996 relocation program was amended with limestone at a rate of approximately 17.2 to 20.1 lb/ton (7.2 to 8.4 mg $CaCO_3$/g) which includes 1.1 lb/ton for additional oxidation and acid generation. This amendment rate clearly exceeded the estimated alkali demand.

To assess the effectiveness of the limestone amendment, the backfilled material was sampled and tested. Paste parameters are summarized in Table 4-16. Table 4-17 provides a summary of the results from the leach extraction tests completed on the backfill samples. Detailed results are

Table 4-12

Clarifier Underflow Shake Flask Extraction Test Results

Parameter Comment	Units	Results Recently Produced		Field Aged Sample	
Sample ID		FMC-CUF1-N	FMC-CUF1-6.5	FMC-CUF2-N	FMC-CUF2-6.5
Solids Sample		'As Received'	Acidified	'As Received'	Acidified
Date		12/2/96	12/2/96	12/2/96	12/2/96
Field					
Sample Weight	g	750	750	750	750
Eluate Volume	mL	750	765	750	765
Conductivity	uS/cm	779	3480	943	3280
pH	s.u.	8.64	6.12	7.98	5.8
Eh	mV	-44	61	-22.7	84
Extraction Period	h	48	48	48	48
Laboratory					
pH	s.u.	6.9	6.5	6.8	7.3
Alkalinity	mgCaCO3eq/L	4.0	-	86	9.0
Acidity	mgCaCO3eq/L	-	110	-	-
SO_4	mg/L	520	1200	970	530
Cl	mg/L	6.0	6.5	4.3	6
Al	mg/L	0.0075	<0.34	<0.0034	<0.34
Cd	mg/L	0.00056	0.24	0.0012	0.22
Ca	mg/L	100	620	150	580
Cr	mg/L	0.00051	<0.026	<0.00026	<0.026
Co	mg/L	0.0088	13	0.013	8.5
Cu	mg/L	0.082	1.9	0.12	6.8
Fe^{2+}	mg/L	<0.0091	0.36	<0.0091	0.14
Fe (T)	mg/L	0.015	<0.10	0.006	<0.10
Mg	mg/L	40	300	95	500
Mn	mg/L	0.026	51	0.051	46
K	mg/L	2.1	3.6	2.8	2.2
Tl	mg/L	<0.0028	<0.280	<0.0028	<0.280
Na	mg/L	5.6	7.1	4.3	6.6
Zn	mg/L	0.15	54	0.35	58

Table 4-13

Summary of Acid Consumption Test Results

Sample	Weight (g)	Final pH Field(s.u.)	Final pH Lab.(s.u.)	H_2SO_4 (mL)	H_2SO_4 Normality	Acid Neutralized ($mgCaCO_3eq./g$)
CUF-1	751.5	6.1	5.8	64	2	8.52
CUF-2	759.7	6.5	7.3	60	2	7.90

Table 4-14

Summary of CUF Column Test Results

Column Number	17				18			
Sample	CUF-1				CUF-2			
Cycle	0	1	2	3	0	1	2	3
Volume (L)	0.581	0.643	1.347	1.096	0.322	0.880	1.764	1.077
pH (s.u.)	8.35	8.59	8.54	8.33	8.49	8.93	9.14	8.61
Eh (mV)	-58	-21	-95	-66	-83	-45	-68	-80
Cond. (mS/cm)	1350	1390	1292	1086	972	1060	705	601
Lab pH (su)	6.7	8.6	6.6	6.9	6.7	8.7	8.1	7.4
Alkalinity (mg$CaCO_3$ eq/L)	24	21	25	20	< 1.5	10	10	90
Acidity (mg$CaCO_3$ eq/L)	-	-	-	-	-	-	-	-
SO_4 (mg/L)	670	640	650	560	600	550	540	160
Al (mg/L)	-	0.37	1.2	<0.034	-	0.067	0.39	<0.034
Cd (mg/L)	-	<0.0012	<0.012	0.0027	-	<0.0012	0.018	<0.0012
Cr (mg/L)	-	0.0048	0.09	-	-	<0.0026	0.029	-
Co (mg/L)	-	0.011	0.12	0.0097	-	<0.0043	0.057	<0.0043
Cu (mg/L)	-	0.12	0.2	0.093	-	0.08	0.15	0.036
Fe (T) (mg/L)	-	0.22	0.11	0.053	-	0.027	<0.1	0.025
Mg (mg/L)	67	83	86	63	67	58	44	32
Mn (mg/L)	-	0.22	0.29	0.38	-	0.0098	<0.018	0.033
Zn (mg/L)	-	<0.12	<1.2	<0.12	-	<0.12	<1.2	<0.12
Net Acidity Loss (mg$CaCO_3$/g)	0.00	-0.01	-0.01	-0.02	0.00	0.00	0.00	-0.03

Table 4-15

Summary of Paste Parameters and Alkali Demand for 1996 Backfilled Material Before Relocation

Test Pit		pH (s.u.)	Cond. (uS/cm)	Alkali Demand (mg CaO/g)
151	Average	5.9	214	0.20
	Std. Dev.	0.4	64	
301	Average	5.7	268	0.10
	Std. Dev.	0.2	23	
302	Average	5.6	381	0.34
	Std. Dev.	0.3	10	

Table 4-16

Summary of Backfill Field Paste Parameters

Sample		Elevation	pH (s.u.)	Cond. (uS/cm)
BF-1	Average	1100	6.93	663
	Std. Dev.		0.45	89
BF-2	Average	1105	7.63	471
	Std. Dev.		0.16	103
BF-3	Average	1110	8.01	332
	Std. Dev.		0.25	89
BF-4	Average	1115	6.92	942
	Std. Dev.		0.20	84
BF-5	Average	1120	6.48	899
	Std. Dev.		1.20	399

Table 4-17

Summary of Backfill Sample Leach Extraction Test Results

Parameter	Units	Results				
Sample ID		FMC-1BF	FMC-2BF	FMC-3BF	FMC-4BF	FMC-5BF
Solids Sample						
Date		1/17/97	1/17/97	1/17/97	1/17/97	1/17/97
Field						
Sample Weight (avg)	g	500.7	500.8	500.1	500.5	500.9
Conductivity (avg)	uS/cm	1527	1807	1826	1998	1796
pH (avg)	s.u.	7.31	7.51	7.62	7.1	7.54
Eh (avg)	mV	-38.5	-48.2	-45.7	20.1	-37
Extraction Period	h	72	72	72	72	72
Laboratory						
pH	s.u.	7.4	7.4	7.4	7.3	7.3
Alkalinity	mgCaCO3eq/L	20	21	17	16	13
Acidity	mgCaCO3eq/L	-	-	-	-	-
SO_4	mg/L	810	590	1000	1100	870
Cl	mg/L	5.7	6.4	9.4	9.2	9.0
Al	mg/L	<0.34	<0.34	<0.34	<0.34	<0.34
Cd	mg/L	0.028	0.051	0.023	0.014	0.026
Ca	mg/L	450	550	460	560	560
Cr	mg/L	0.039	<0.026	<0.026	0.029	<0.026
Co	mg/L	0.14	0.23	0.11	0.18	0.16
Cu	mg/L	0.12	0.14	0.22	0.12	0.12
Fe^{2+}	mg/L	0.36	0.10	0.24	0.75	0.20
Fe (T)	mg/L	<0.10	<0.10	0.22	<0.10	<0.10
Pb	mg/L	-	-	-	-	-
Mg	mg/L	39	67	33	49	49
Mn	mg/L	4.8	3.3	1.2	3.2	3.2
Ni	mg/L	-	-	-	-	-
K	mg/L	12	13	10	12	12
Se	mg/L	-	-	-	-	-
Tl	mg/L	<0.025	<0.025	<0.025	<0.025	<0.025
Na	mg/L	3.8	6.0	5.9	4.9	5.3
Zn	mg/L	<1.2	<1.2	<1.2	<1.2	<1.2

included in Appendix I. Detailed column test results are provided in Appendix G, and are summarized in Table 4-18.

The average paste pH values of the four replicate samples were at or above the target of 6.5 s.u.. The lowest average was observed for sample BF-5, for which one replicate had a paste pH of 4.7. The leach extraction test results indicate that a pH of >7 s.u. was achieved in all of the composite samples. The corresponding water quality data show that the solubility of copper is limited to <0.22 mg/l. Manganese, however, is present at a slightly higher dissolved concentration, with a maximum of 4.8 mg/l. The manganese concentration is expected to decrease as equilibrium conditions are approached. In addition to sample BF-4, sample BF-5, which is a composite of the individually tested replicate samples and thus included the low paste pH replicate, was also tested in an anoxic column test. As shown in Table 4-18, the one low paste pH replicate did not appear to adversely affect the pore water quality. Pore water quality determined with the leach extraction tests compare well with that determined with the column tests.

4.4 Type I Stockpile

4.4.1 Field Investigation

Observations from the field investigation of the Type I stockpile are provided in Appendix C. The test pits placed in the sandstone and saprolite areas confirmed that these cells contain only the respective material types. As with the Type II stockpile, layers of homogeneous material with different lithological origins were distinguishable in the Type I test pits. Based on the test pit logs, it is estimated that the upper 10 ft lift of the Type I waste rock consists predominantly of metadacite (MD - 39%), and andalusite-biotite schist (ABS - 34%). The balance of the Type I waste rock is comprised of sericite schist (SS- 14%) and undifferentiated footwall (FW - 9%) assemblages. The material is relatively fine grained and appears weathered.

Field paste pH values are generally near neutral to alkaline, and paste conductivities are low, as summarized in Table 4-19. A comparison of the paste parameters with the relative abundance of the material encountered in each of the test pits suggest that the metadacite is slightly more acidic than the andalusite-biotite schist. The lowest conductivities are consistently associated with the sandstone and saprolite.

4.4.2 Leach Extraction Tests

Results of the leach extraction tests completed on samples from the Type I stockpile are provided in Appendix J. A summary of pertinent concentrations from these tests is provided in Table 4-20.

All except for one sample (sample 11T1) were near neutral in pH and did not show any appreciable metal concentrations. Sample 11T1 had a laboratory pH of 2.9, which is inconsistent with the field paste parameters, the field measurements during extraction testing, and the alkali demand testing as discussed below. It is believed that the sample was inadvertently

Table 4-18

Summary of Column Test Results Conducted on the Limestone Amended Backfill Samples

Column Number	Sample	Cycle	pH (s.u.)	Eh (mV)	Cond. (mS/cm)	Lab pH (su)	Alkalinity (mgCaCO$_3$ eq/L)	Acidity (mgCaCO$_3$ eq/L)	SO$_4$ (mg/L)	Al (mg/L)	Cd (mg/L)	Co (mg/L)	Cu (mg/L)	Fe (T) (mg/L)	Mn (mg/L)	Zn (mg/L)
15	BF-4	0	7.66	-33.6	4160	5.6	-	< 2	3000	-	-	-	-	-	-	-
15	BF-4	1	7.28	-0.5	2220	7.1	36	-	1200	0.091	0.026	0.47	0.26	<0.01	8.9	1.7
15	BF-4	2	7.40	-61.0	868	5.9	-	20	550	<0.34	0.019	0.16	<0.054	0.17	2.6	<1.2
15	BF-4	3	7.58	-33.8	895	6.2	-	<2	540	<0.034	0.014	0.18	0.11	<0.01	3.6	0.93
16	BF-5	0	7.33	-35.1	3780	6.1	-	< 2	2500	-	-	-	-	-	-	-
16	BF-5	1	7.39	88	2740	7.3	22	-	940	0.35	0.017	0.66	0.73	0.4	18	1.3
16	BF-5	2	6.89	1.6	2190	-	-	-	-	-	-	-	-	-	-	-
16	BF-5	3	6.73	-3.3	1261	6.3	-	<2	590	<0.034	0.0096	0.17	0.12	<0.01	4.5	0.44

Table 4-19

Type I Stockpile Test Pit Summary Table

Test Pit ID	Field pH (s.u.) Average	Field pH (s.u.) Std. Dev.	Conductivity (uS/cm) Average	Conductivity (uS/cm) Std. Dev.
1	6.9	0.1	32	8
2	7.3	0.2	10	8
3	6.9	0.4	15	7
4	6.6	0.4	22	12
5	6.3	0.2	21	15
6	7.0	0.4	33	15
7	6.9	0.3	58	11
8	7.7	0.1	41	13
8 (Dupl.)	7.7	0.1	43	11
9	7.1	0.3	43	6
10	7.0	0.1	130	7
11	6.9	0.3	143	42
12	7.1	0.1	68	20
13	7.6	0.3	89	18
14	7.6	0.3	81	5
14 (Dupl.)	7.6	0.3	95	16
15	7.4	0.2	132	66
16	7.6	0.2	111	28
17	7.0	0.4	154	18
18	7.5	0.2	213	10
19	6.5	0.3	294	30
20	6.8	0.3	87	26
21	6.9	0.1	84	14
22	7.3	0.4	124	18
23	7.4	0.4	156	31

Table 4-20

Type I Stockpile Material Leach Extraction Test Results

Sample ID	Sample Description	Lab pH s.u.	Alkalinity mgCaCO3eq/L	Acidity mgCaCO3eq/L	SO4 mg/L	Al mg/L	Cd mg/L	Ca mg/L	Cr mg/L	Co mg/L	Cu mg/L	Mn mg/L	Tl mg/L	Zn mg/L
FMC-2 TI	Sandstone	6.8	7.0	-	5.5	<0.034	<0.0012	3	<0.0026	0.0052	0.0075	0.0075	<0.028	<0.12
FMC-5TI	Sandstone	7.6	2	-	8.4	0.15	<0.0012	3.2	<0.0026	<0.0043	0.011	0.1	<0.025	0.46
FMC-10TI	Saprolite	7.2	3.0	-	140	<0.034	<0.0012	35	<0.0026	<0.0043	<0.0054	0.15	0.03	0.85
FMC-6 TI	Saprolite	7.0	2.0	-	11	<0.034	<0.0012	<3	<0.0026	<0.0043	0.033	0.035	0.035	0.18
FMC-7TI	Saprolite	7.3	<1.5	-	51	0.1	<0.0012	12	0.0031	<0.0043	<0.0054	0.36	<0.012	0.54
FMC-8TI	Saprolite	7.3	<1.5	-	95	0.66	<0.0012	22	<0.0026	<0.0043	0.024	0.85	<0.012	1.8
FMC-9TI	Saprolite	7.7	2	-	5.8	0.095	<0.0012	<3.	<0.0026	<0.0043	0.027	0.07	<0.025	<0.12
FMC-11TI	Type I Rock	2.9	-	100	86	0.063	<0.0012	29	0.0028	<0.0043	<0.0054	0.21	<0.012	0.17
FMC-12 TI	Type I Rock	7.2	<1.5	-	27	0.1	<0.0012	10	0.004	0.012	0.017	0.01	<0.012	<0.12
FMC-13 TI	Type I Rock	6.8	10	-	56	0.18	<0.0012	12	<0.0026	<0.0043	0.011	0.0047	0.035	<0.12
FMC-14 TI	Type I Rock	6.9	<1.5	-	54	0.063	<0.0012	20	0.0035	0.006	<0.0054	0.12	<0.012	0.16
FMC-15 TI	Type I Rock	7.2	2.0	-	61	<0.034	<0.0012	33	<0.0026	<0.0043	<0.0054	0.12	<0.012	<0.12
FMC-16 TI	Type I Rock	7.2	<1.5	-	25	0.044	<0.0012	14	<0.0026	<0.0043	0.0095	0.0067	<0.012	<0.12
FMC-17TI	Type I Rock	7.3	<1.5	-	530	0.16	<0.0012	48	0.0055	<0.0043	0.0078	0.034	<0.012	0.25
FMC-18 TI	Type I Rock	7.2	30	-	130	0.065	<0.0012	50	<0.0026	0.0057	0.014	0.0056	<0.028	<0.12
FMC-19 TI	Type I Rock	7.0	3.0	-	320	0.13	<0.0012	82	0.0059	0.012	0.093	0.34	<0.028	<0.12
FMC-20TI	Type I Rock	7.0	<1.5	-	78	0.15	<0.0012	23	0.0082	0.0074	<0.0054	0.14	<0.025	0.73
FMC-21 TI	Type I Rock	7.0	5.0	-	20	<0.034	0.0015	10	<0.0026	<0.0043	0.017	0.3	0.039	<0.12
FMC-22 TI	Type I Rock	6.9	8.0	-	69	<0.034	<0.0012	18	<0.0026	<0.0043	0.013	0.0085	<0.028	<0.12
FMC-23TI	Type I Rock	6.7	5.0	-	<250	<0.034	<0.0012	37	<0.0026	<0.0043	<0.0054	0.0079	<0.012	0.13

contaminated in the field or laboratory since the acidity is accounted for entirely as free acid, and there are no appreciable metal concentrations.

Sulfate concentrations were relatively low for most samples. The highest observed sulfate concentration was 530 mg/l. These results indicate that the Type I material is comparatively inert.

4.4.3 Alkali Demand

Based on the leach extraction tests, clearly no acidity was leached from the Type I material. Consequently, only three samples were found to show a detectable alkali demand, as shown in Table 4-21. Type I alkali demand test results are contained in Appendix K. The initial pH values for the three samples were marginally below the target minimum of 6.5 s.u. A comparison with the leach extraction results indicated that there is no need for alkali amendment, since metal release from these samples was insignificant.

4.4.4 Reactivity

Acid base account (ABA) tests were completed on the Type I material to assess the potential for oxygen consumption by these materials. The results are summarized in Table 4-22. Detailed results are contained in Appendix L.

The ABA data show that saprolite and sandstone are low in sulfide sulfur, with an average of 0.05%. The average sulfide sulfur content for the Type I waste rock is 0.13%, much of which is likely not available for oxidation, since the pore water sulfate concentrations on average are low. Neither the sandstone or saprolite, nor the Type I waste rock, is potentially acid generating. Due to the relatively low sulfide sulfur, the Type I waste rock is not likely to act as an oxygen consumer after it has been backfilled to the open pit.

4.5 Summary and Conclusions

4.5.1 Type II Stockpile

4.5.1.1 Field Testing and Observations

The conclusions from the field investigations are as follows:

- Effective sampling protocols have been established for obtaining representative samples from the material to be relocated.

- The highest alkali demands were observed for samples where quartz sericite schist (QSS) was abundant and within or near the surface layer. The andalusite-biotite schist (ABS) material appears to be less reactive, while the sericite schist (SS) material is the least reactive of the most abundant material types. While the metadacite (MD) material is less abundant, it appears to be relatively reactive.

Table 4-21

Summary Of Type I Alkali Demand Test Results

Material	Sample	Average 1 hr pH (su)	Average 1 hr Cond. (uS/cm)	Alkali Demand (mg CaO/g)
Sandstone	1	6.55	42	0.00
Sandstone	2	7.08	25	0.00
Sandstone	3	6.92	22	0.00
Sandstone	4	7.23	2290	0.00
Sandstone	4	6.08	50	0.06
Sandstone	5	7.32	1447	0.00
Sandstone	5	6.19	37	0.05
Saprolite	6	6.60	53	0.00
Saprolite	7	6.59	110	0.00
Saprolite	8	6.83	171	0.00
Saprolite	9	7.45	40	0.00
Saprolite	10	6.61	284	0.00
Type I Waste Rock	11	6.09	2523	0.00
Type I Waste Rock	12	6.60	127	0.00
Type I Waste Rock	13	6.82	142	0.00
Type I Waste Rock	14	6.79	156	0.00
Type I Waste Rock	15	6.52	251	0.00
Type I Waste Rock	16	7.19	152	0.00
Type I Waste Rock	17	6.84	355	0.00
Type I Waste Rock	18	7.98	335	0.00
Type I Waste Rock	19	6.42	542	0.08
Type I Waste Rock	19	7.20	165	0.00
Type I Waste Rock	20	6.71	198	0.00
Type I Waste Rock	21	7.42	97	0.00
Type I Waste Rock	22	7.78	169	0.00
Type I Waste Rock	23	7.82	276	0.00

Table 4-22

Summary of Type I Acid Base Account Test Results

Sample ID	Material Description	Paste pH s.u.	Sulfur (T) %	Sulfide %	CO3 %	Sulfate %	NP $kgCaCO_3eq./t$	MPA $kgCaCO_3eq./t$	NP/MPA
FMC-2	Sandstone	7.59	0.03	0.01	<0.050	<0.40	-5.1	0.3	-17
FMC-5	Sandstone	7.36	0.04	0.02	<0.050	<0.40	0	0.6	0
FMC-6	Saprolite	7.38	0.05	0.02	0.3	<0.40	-1.2	0.6	-2
FMC-7	Saprolite	7.23	0.04	0.02	2.5	<0.40	10.3	0.6	17.2
FMC-8	Saprolite	7.28	0.12	0.04	3.3	<0.40	20.6	1.3	15.8
FMC-9	Saprolite	7.58	0.02	<0.01	<0.050	<0.40	6.4	0.3	21.3
FMC-10	Saprolite	7.37	0.15	0.11	2.3	<0.40	11.6	3.4	3.4
FMC-10 Rep	Saprolite	7.37	0.18	0.1	2.3	<0.40	15.5	3.1	5
AVERAGE				0.05			7.26	1.28	5.7
FMC-11	SS-ABS-MD	7.34	0.16	0.1	2.3	<0.40	37.4	3.1	12.1
FMC-12	SS	7.19	0.04	0.02	0.5	<0.40	7.7	0.6	12.8
FMC-13	MD	8.00	0.05	0.03	0.44	<0.40	14.2	0.9	15.8
FMC-14	MD-ABS-FW	7.09	0.06	0.02	2.5	<0.40	29.6	0.6	49.3
FMC-15	SS-ABS-MD	7.43	0.15	0.08	2.1	<0.40	34.8	2.5	13.9
FMC-16	MD-ABS	7.71	0.04	0.02	0.67	<0.40	6.4	0.6	10.7
FMC-17	MD-(ABS)	7.55	0.56	0.45	0.93	<0.40	18	14.1	1.3
FMC-18	MD-ABS	7.74	0.23	0.15	1.6	<0.40	24.5	4.7	5.2
FMC-19	FW-MD&ABS	7.01	0.51	0.33	1.6	<0.40	19.3	10.3	1.9
FMC-20	MD-FW	7.39	0.21	0.13	1.6	<0.40	12.9	4.1	3.1

Table 4-22 *(Continued)*

Sample ID	Material Description	Paste pH s.u.	Sulfur (T) %	Sulfide %	CO3 %	Sulfate %	NP $kgCaCO_3eq./t$	MPA $kgCaCO_3eq./t$	NP/MPA
FMC-21	ABS-SS	7.41	0.08	0.04	1.3	<0.40	6.4	1.3	4.9
FMC-22	ABS	7.78	0.14	0.08	0.54	<0.40	21.9	2.5	8.8
FMC-23	ABS	7.80	0.24	0.16	1.3	<0.40	19.3	5	3.9
FMC-23 (Check)	ABS	7.78	0.22	0.15	1.2	<0.40	19.3	4.7	4.1
AVERAGE				0.13			19.41	3.93	4.9

Note: ABS = Andalusite biotite schist; SS = Sericite schist; MD = Metadacite; FW = Footwall.
NP = Neutralization Potential.
MPA = Maximum Potential Acidity.

- There are apparent stratigraphic continuities among layers in adjacent test pits up to 60 ft apart, which indicates that relatively large blocks of material are likely to have similar geochemical characteristics.

- Field extractions for paste parameter determinations were not fully equilibrated within the time period used, and consequently under-estimated the total amount of acidity associated with the samples. An increase in contact time to approximately 10 minutes is recommended for future paste parameter tests.

4.5.1.2 Effect of Particle Size

The association of total acidity with particle size was estimated by completing leach extractions on <¼-in and ¼ to 3-in fractions of Type II material samples. The results indicated that:

- Using the <¼-in size fraction to determine the alkali demand for the whole sample is conservative, and on average the estimate would be 1.5 times the actual requirement. When related to the total mass of Type II material, using the <¼-in size fraction will result in 48% more limestone being applied than needed.

4.5.1.3 Alkali Demand Testing and Paste Parameters

Conclusions relating to the alkali demand and paste parameter investigations can be summarized as follows:

- Paste parameters using a 10 to 30 minute extraction can be used to estimate the alkali demand for the stockpiled Type II material using the following simple classification method:

  - Samples with paste pH of >5 s.u. and a paste conductivity of <2200 μS/cm have an alkali demand of less than 0.8 mg CaO/g.

  - Samples with a paste pH >5 s.u. and a paste conductivity >2200 μS/cm, or a paste pH <5 s.u. and a paste conductivity of <2200 μS/cm have an alkali demand of less than 1.6 mg CaO/g.

  - All other samples have an alkali demand of greater than 1.6 mg CaO/g.

- Paste parameters using a one hour extraction can be used to estimate the alkali demand for the stockpiled Type II material using the following simple classification method:

  - Samples with paste pH of >4 s.u. and a paste conductivity of <2200 μS/cm have an alkali demand of less than 0.8 mg CaO/g.

- Samples with a paste pH >4 s.u. and a paste conductivity > 2200 μS/cm, or a paste pH <4 s.u. and a paste conductivity of <2200 μS/cm have an alkali demand of less than 1.6 mg CaO/g.

- All other samples have an alkali demand of greater than 1.6 mg CaO/g.

4.5.1.4 Limestone Availability

Results from the anoxic column and the alkali demand testing were used to estimate the alkali availability of the limestone. The conclusions can be summarized as follows:

- Limestone reaction rates are less rapid than lime reaction rates.

- Limestone requirements are conservatively estimated to be in the order of 1.48 times that indicated by the alkali demand test. (This corresponds to an availability of about 67%).

- The above estimate of the limestone availability is conservative since the column test results indicate alkalinity release with time from the limestone amended samples. As noted in Section 4.1.5 above, the limestone availability will be reassessed after completion of the investigation program.

4.5.2 CUF Solids

The laboratory tests completed on the CUF solids lead to the following conclusions:

- No significant metal release is expected from the CUF solids provided that circumneutral pH conditions are maintained in the backfilled pit.

- The CUF solids will not significantly contribute alkalinity for acid neutralization upon backfilling to the open pit with the Type II material.

- The CUF solids should remain stable under the anticipated long-term anoxic conditions after reflooding of the pit is complete.

4.5.3 Backfilled Type II Material

The testing of samples from the backfilled Type II materials lead to the following conclusions:

- Some variability in the paste parameters can be tolerated in the backfill without adversely affecting pore water quality.

- The target pore water pH was met for the backfilled material.

4.5.4 Type I Materials

The investigation of the Type I materials lead to the following conclusions:

- The Type I material pore water does not contain elevated metal concentrations and therefore no limestone amendment is required for these materials prior to backfilling.
- The Type I material is not net acid generating, and will not require alkali amendment to neutralize any future acidity that may be derived from oxidation.
- Sulfide sulfur concentrations are low, and the Type I material cannot be expected to act as an oxygen consumer to the underlying Type II material.
- Historic water quality at seep location T1-1 suggests that a small volume of material within the Type I stockpile may require alkali amendment prior to backfilling. These materials should be isolated through additional field investigations prior to relocation, and should be handled in the same way as Type II materials, if warranted.

4.5.5 Estimated Short and Long Pore Water Quality

An assessment of the long-term Type II backfill pore water quality was provided in Section 5.4 of the October 1996 report (Foth & Van Dyke, 1996). The water quality estimates discussed in that section were based on observed leach extraction results and initial MINTEQA2 (Allison, et al., 1991) modeling. These predictions have been reassessed on the basis of the results from the current investigations. The reassessment is based on the following observations:

- The visual identification of malachite precipitation in the column tests;
- That trace metal concentrations in the pore water including arsenic, lead, mercury and tellurium will be insignificant;
- Bubbles in the columns indicating the presence of carbon dioxide; and,
- The observed pore water quality displaced from samples taken from the 1996 backfilled Type II material.

The MINTEQA2 modeling originally performed for the October 1996 report was repeated with a modification to the gaseous concentration of carbon dioxide. Carbon dioxide gas was visually observed to be generated in the anoxic columns during the neutralization process. Typically, in waste rock pile environments, the carbon dioxide concentration can range from less than 1% to in excess of 10% (Ritchie, et al., 1994). In the supplementary modeling, the carbon dioxide concentration was varied to determine the sensitivity of the water quality to its concentration. Calculations were completed for a carbon dioxide concentration of 1% (partial pressure of 0.01 atm.), 5% (0.05 atm.) and for 10% (0.10 atm.). The input and output files for the

MINTEQA2 runs are provided in Appendix M, and are summarized in Table 4-23. The primary effect of increased carbon dioxide partial pressure, is a decrease in the predicted pore water pH. At a 10% carbon dioxide concentration, the water would be buffered to a pH of about 6.6 s.u. This is likely to be the case in the short term, prior to groundwater recovery. As flooding of the pore space occurs, the carbon dioxide will be displaced, and its effect will be reduced. In the longer term therefore, the water quality would be given by that predicted for a carbon dioxide concentration of 1% or less (atmospheric concentration of carbon dioxide is 375 ppm or 0.03%). The predicted concentrations at 1% carbon dioxide compare favorably with those presented in the October 1996 report.

Table 4-23

Summary of Effect of Carbon Dioxide on Predicted Pore Water Quality

Constituent	Predicted Concentration (mg/L)			Controlling Mineral Phase	
CO_2 (%)	1	5	10		
pH (s.u.)	7.1	6.7	6.6		
Al	0.007	0.007	0.008	Gibbsite	$Al(OH)_3$
Ca	391	428	455	Gypsum	$CaSO_4 \cdot 2H_2O$
Cd	0.007	0.008	0.009	Otavite	$CdCO_3$
Cu	0.18	0.37	0.56	Malachite	$Cu_2CO_3(OH)_2$
Fe	1.6	1.8	1.9	Siderite	$FeCO_3$
Mn	1.9	2.1	2.3	Rhodochrosite	$MnCO_3$
SO4	1158	1087	1043	Gypsum	$CaSO_4 \cdot 2H_2O$

For comparison, the pore water quality for the three displacements completed on the limestone amended samples that were taken from the Type II material that was backfilled in 1996 are summarized in Table 4-24. On the whole, the results compare favorably with the predicted concentrations shown in Table 4-23 for 1% carbon dioxide, with the exception of manganese. With respect to manganese, the formation of rhodochrosite is believed to be kinetically limited, and insufficient reaction time was available in the column tests, which had a retention time of about 14 days, to allow precipitation of this mineral. It is expected that with an extended reaction time manganese levels would decrease to those predicted in Table 4-23.

Table 4-24

Summary of Constituent Concentrations for Pore Water Displaced from Backfill Samples[1]

Sample	BF-4			BF-5		
Cycle	1	2	3	1	2	3
pH	7.28	7.40	7.58	7.39	6.89	6.73
Lab pH	7.1	5.9	6.2	7.3	6.89	6.3
SO_4	1200	550	540	940	—	590
Al	0.091	<0.34	<0.034	0.35	—	<0.034
Cd	0.026	0.019	0.014	0.017	—	0.0096
Ca	330	140	140	450	—	230
Cu	0.26	<0.054	0.11	0.73	—	0.12
Fe (T)	<0.01	0.17	<0.01	0.4	—	<0.01
Mn	8.9	2.6	3.6	18	—	4.5

[1]All concentrations in mg/l, except pH which is s.u.

5 Alkali Application and Control

5.1 Introduction

Flambeau Mining Company intends to relocate the stockpiled Type II material at a rate of approximately 60,000 tons/day (54,500 tonnes/day, or about 30,300 cu m/day). Rock will be excavated at a lift height of about 15 ft, using either a backhoe working from above, or a front end loader working from below. Limestone application will be on the surface of the lift being excavated. The limestone will be placed as a thin layer, approximately one day in advance of relocation. The following sections describe the methods of sampling, testing and investigation to be used that will allow the alkali addition rate to be varied in response to variations in the Type II material.

5.2 Assessment of Sampling Requirements

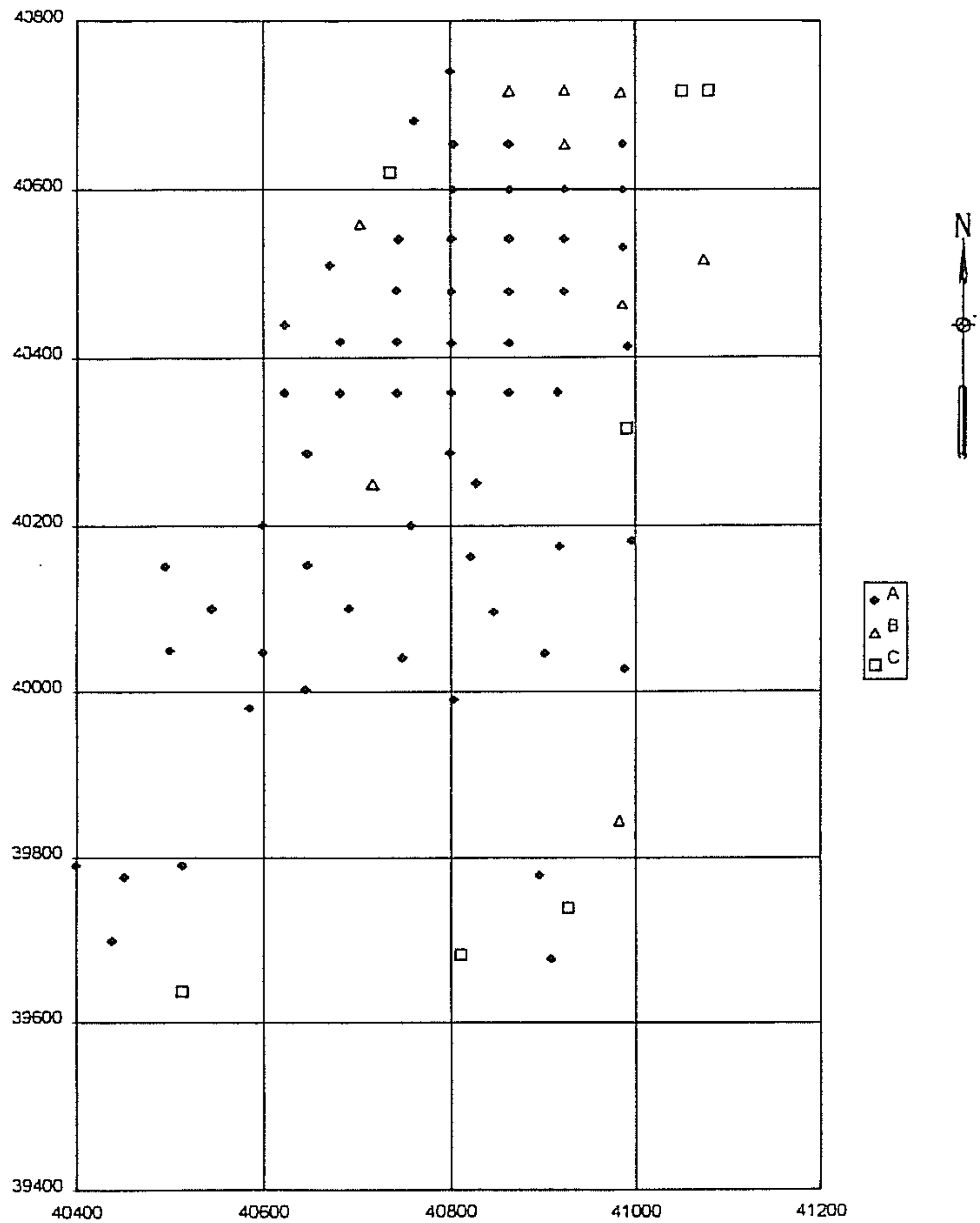
5.2.1 Material Variability

The alkali demand results, classified into the three material categories as described in Section 4.5.1.3, are illustrated in Figure 5-1, which represent the results for each of the test pits sampled during the November/December 1996 sampling program. As anticipated from the sample population distribution from the alkali demand tests, the largest potion of the upper lift of the Type II stockpile has an alkali demand of 0.8 mg CaO/g or less. High alkali demand zones are encountered primarily on the sideslopes of the stockpile. The northernmost tip of the stockpile also has an above average alkali demand, as does a central section of the pile in the vicinity of sample 188.

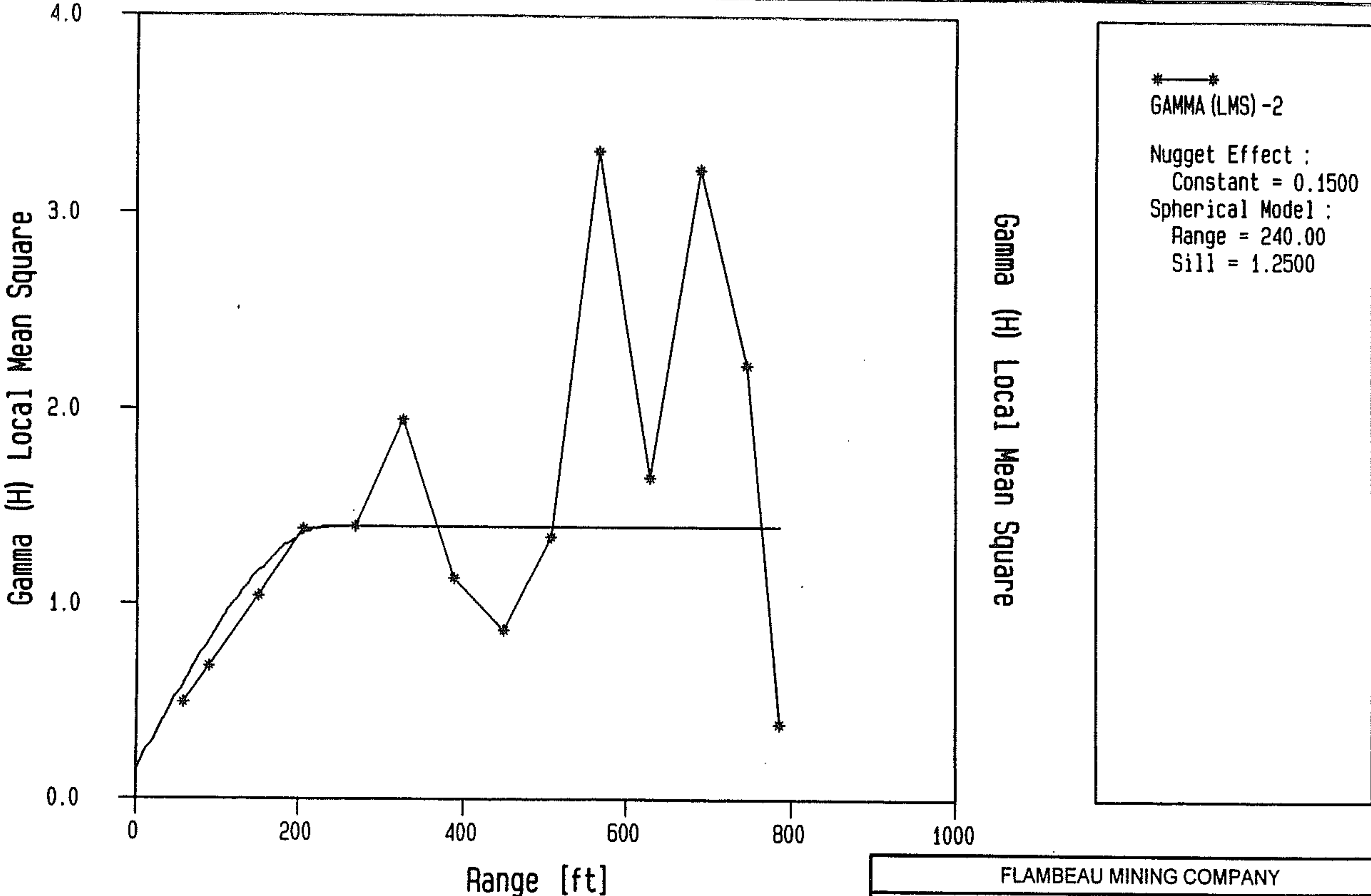
Semi-variograms were calculated for the alkali demand of the samples taken from the upper 15-ft lift of the stockpile. The samples from the lower lifts were excluded from the assessment. The resulting semi-variograms are illustrated in Figures 5-2 and 5-3, and show a dependence range of about 240 ft for a north-south search and about 130 ft for an east-west search. A similar conclusion was drawn from comparing logs from adjacent test pits. These results indicate that similar alkali demand characteristics would be encountered over distances of about 130 ft. A sample spacing at this dimension or less should, therefore, be sufficient for characterizing alkali demand. In the following section, the accuracy of material classification on the basis of sampling undertaken at 120 ft x 120 ft grid is estimated.

5.2.2 Sampling Error at Different Grids

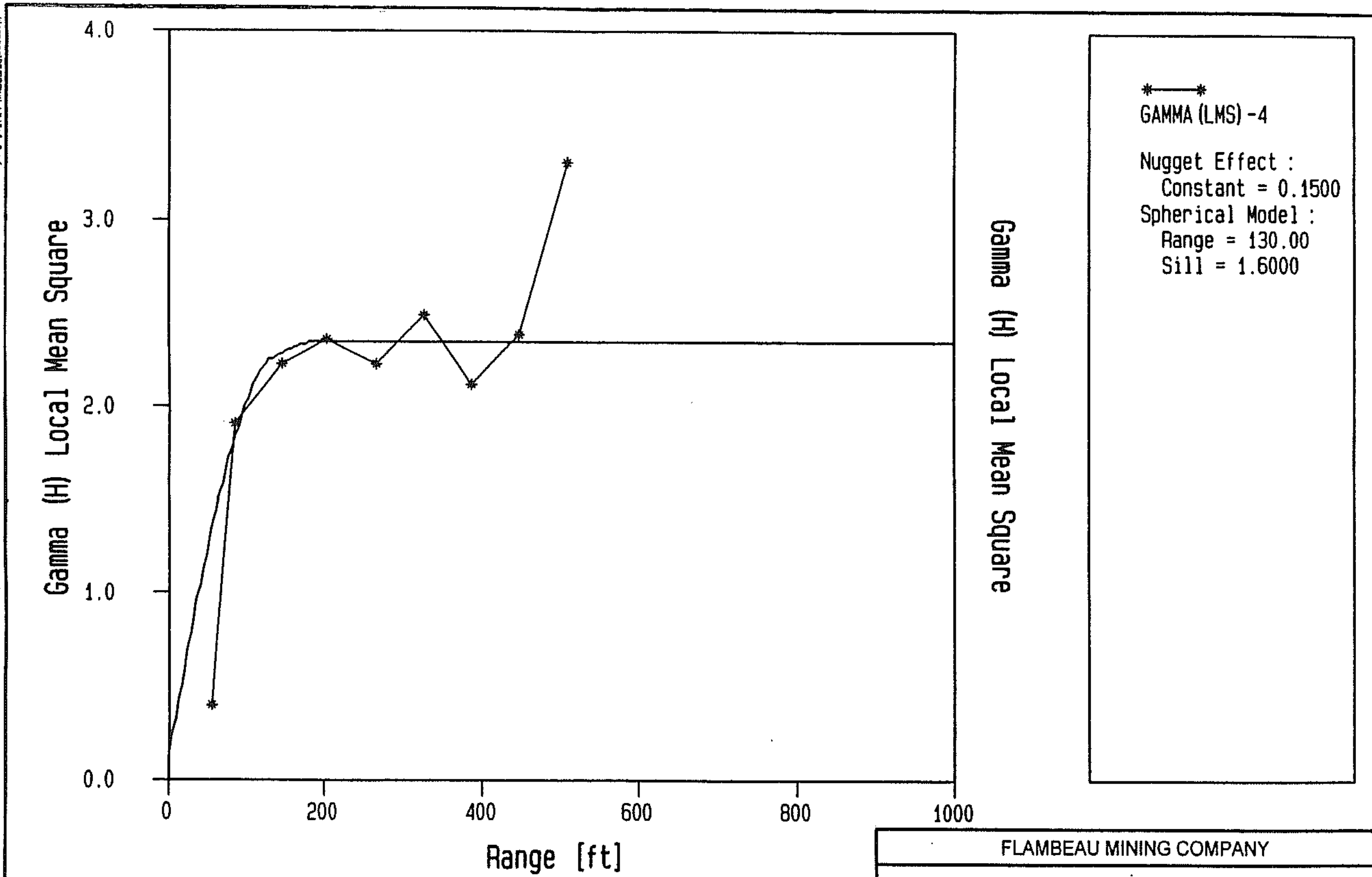
Zones with different alkali demands are distinguishable within the upper 15 ft lift of the Type II stockpile. Optimally, the alkali addition should exactly match the alkali demand for each of the zones. However, to exactly define transition boundaries between dissimilar zones would require an inordinate number of samples and tests.



FLAMBEAU MINING COMPANY	
FIGURE 5-1 CLASSIFICATION OF TYPE II MATERIAL	
Scale: N.T.S.	Date: February, 1997
Prepared By: Steffen, Robertson and Kirsten	By : SGL



FLAMBEAU MINING COMPANY	
FIGURE 5-2 TYPE II STOCKPILE, NORTH-SOUTH 3-D SEMI-VARIOGRAM	
Scale: NA	Date: February, 1997
Prepared By: Steffen, Robertson and Kirsten	By: SGL



FLAMBEAU MINING COMPANY	
FIGURE 5-3 TYPE II STOCKPILE, EAST-WEST 3-D SEMI-VARIOGRAM	
Scale: NA	Date: February, 1997
Prepared By: Steffen, Robertson and Kirsten	By: SGL

Blocks with dimensions of 120 x 120 ft have been superimposed on the northern area of the stockpile, as shown in Figure 5-4, where the sampling intensity was highest. The configuration as shown is one option, and serves to illustrate the sampling requirements. The grid could be superimposed at any angle or location without significantly affecting the results of the analysis.

Each 120 x 120 ft block represents approximately 216,000 cu ft (or about 14,000 tons) of material at an excavation lift height of 15 ft. At the planned relocation rate, the equivalent of approximately four to five blocks would be relocated each production day. The figure of 14,000 tons per 120 x 120 ft block of material was calculated using an in-place density for the material in the Type II stockpile of 130 lb/cu ft. This density was obtained based on proctor tests performed on representative samples of the material and on nuclear density meter (NDM) tests performed on the stockpile. The highest recorded NDM density was approximately 152 lb/cu ft. To be conservative, Flambeau will use an in-place density of 160 lb/cu ft in the field when calculating the amount of limestone to add to each 120 x 120 ft block. The use of the higher density will result in an added conservatism of approximately 23% when calculating the amount of limestone to add to a given block of material.

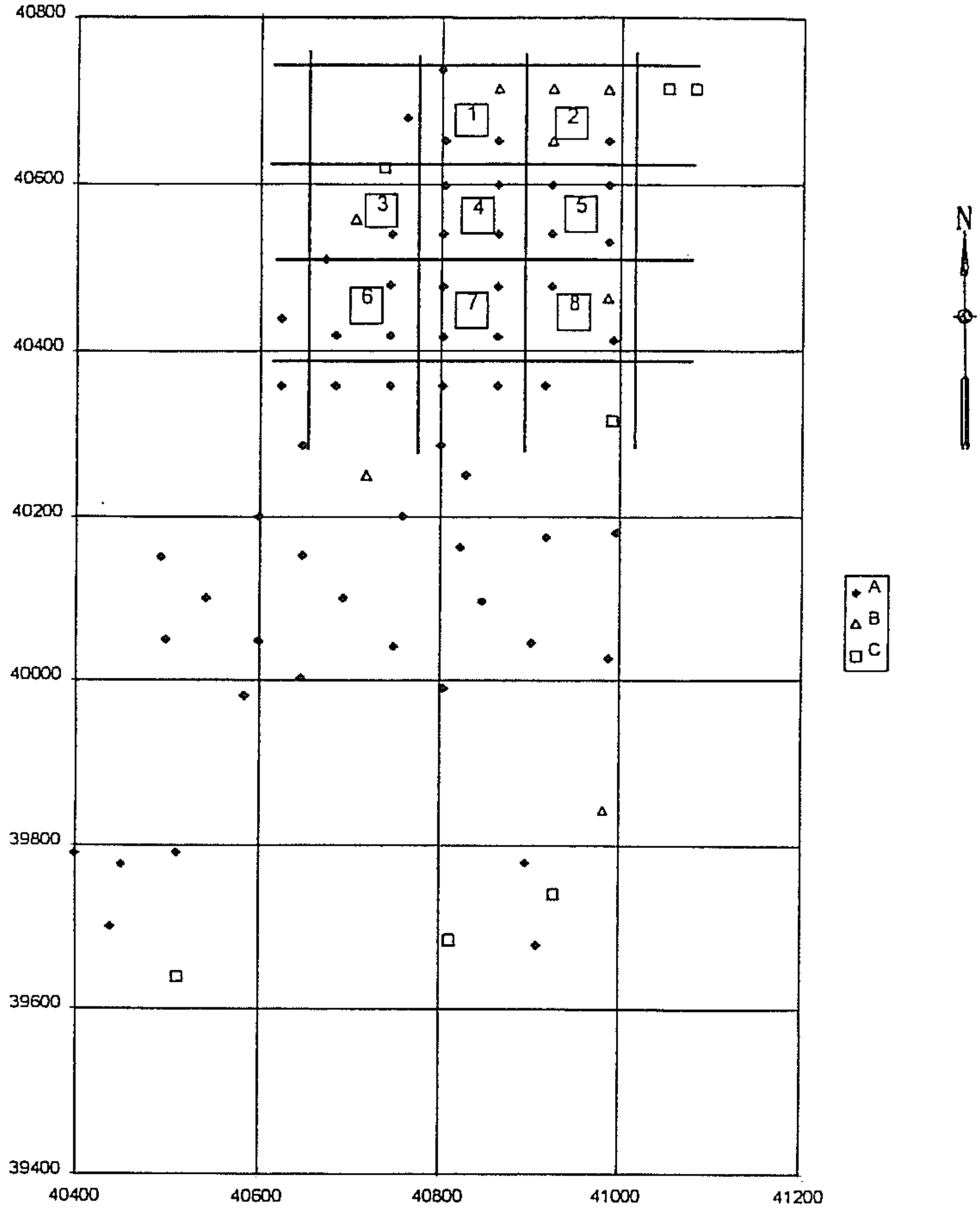
The superimposed blocks have been numbered from 1 to 8 for the area indicated. Blocks 1, 2, 3, 4, 5, 6 and 7 each contain the maximum of four samples. It should be noted, however, that block 3 contains three near surface samples taken along the sideslope of the stockpile. The remainder of the blocks had fewer samples, and were not considered in the following analysis. Blocks 4, 5, 6, and 7 clearly belong to material class A. Blocks 1, 2 and 3 contain dissimilar material and are the focus of the following error analysis. If the average characteristics of the samples are used to define the alkali application rate to these blocks, the categorization as shown in Table 5-1 would result.

Table 5-1

Summary of Block Classification

Block #	Material Class	Average Alkali Demand (mgCaO/g)	Standard Deviation	Number of Samples
1	A	0.63	0.39	4
2	A	0.79	0.22	4
3	B	1.12	0.52	4

Table 5-2 shows the probability, when compared to the four sample average, that the material in a block would be correctly characterized on the basis of using one, two, and three samples, respectively. The error that results can be divided into two groups. A "conservative" error results in an alkali addition rate higher than the average alkali demand, i.e. the material is



FLAMBEAU MINING COMPANY	
FIGURE 5-4 CLASSIFICATION OF TYPE II MATERIAL	
Scale: N.T.S.	Date: February, 1997
Prepared By: Steffen, Robertson and Kirsten	By : SGL

promoted to a class that has a higher addition rate. A "non-conservative" error results if the application rate is a class or more lower than that required to satisfy the alkali demand.

Table 5-2

Summary of Overall Accuracy of up to Three Samples to Characterize a 120 x 120 ft Block

Number of Samples	Accuracy (%)	Conservative (%)	Non-Conservative (%)
1	42	71	29
2	67	83	17
3	92	100	0

The probability of correctly characterizing the material in each of the blocks increases from 42% to 92% by increasing the number of samples from one to three. Increasing the number of samples to four results in a small (8%) increase in characterization accuracy, but does not affect the conservative error which is 100% for three samples. This analysis shows that for sampling blocks containing variable alkali demand (the worst case scenario), three samples would result in a 100% conservative alkali application. Obtaining three samples in a 120 x 120 ft area would result in a sampling grid of about 69 x 69 ft.

The above assessment specifically addresses the relatively homogeneous material representing the bulk of the Type II stockpile. The alkali demand tests and the material distribution shown in Figure 5-4 indicate that the material that would be classified as class C has significant variability. Initial investigations have clearly indicated that zones of consistently high alkali demand are limited to the sideslopes of the stockpile. The sideslopes of the stockpile represent a relatively small volume of material. To illustrate the variability, the results for the sideslope samples are summarized in Table 5-3.

It is evident that the variability in the sideslope material is considerable. The consequence of not providing sufficient alkali amendment to this material could be significant. For example, sample 186, which has an alkali demand of 3.16 mg CaO/g is flanked by samples 177 (approximately 60 ft to the north) and 192 (approximately 120 ft to the south), both with an alkali demand of <0.8 mg CaO/g. A higher sampling frequency is therefore required for the sideslopes of the stockpile, and where class C material is encountered elsewhere. The sampling that will be undertaken is discussed below.

Table 5-3

Summary of Alkali Demand Observed for Sideslope Samples

Parameter	Alkali Demand (mg CaO/g)
Number of Observations	15
Average Demand	3.19
Median Demand	2.12
Minimum Demand	0.46
Maximum Demand	6.71
Standard Deviation	3.34

5.2.3 Proposed Sampling Grid

Control of contaminant release requires that the probability for "non-conservative" error be minimized. From an economical perspective, the conservative error should also be minimized. The results of the above analysis suggest that a sampling frequency of about three per 120 x 120 ft block, or at a sampling grid of 69 x 69 ft, should meet the first objective where material classes A and B are identified. However, where Class C material is identified, results indicate that a significant "non-conservative" error could result since the alkali application rate will be determined directly from the sample characteristics. Further, at the planned production rate, it is likely that insufficient time will be available to go back and resample areas after the initial results have become available. A sampling grid of 60 x 60 ft will, therefore, be used. The first sample location of this regular grid will be within 30 ft of the crest of the stockpile.

Due to the high variability in the alkali demand of the sideslope material, sampling will be undertaken at 30 ft intervals where class C material is encountered. Sampling and testing requirements are described below.

5.3 Sampling Procedures And Requirements

5.3.1 Sampling Ahead of Relocation

5.3.1.1 Sampling on Surface

The sampling protocols used for the field investigation program discussed in Section 2 above will be used in 1997. Briefly, test pits will be excavated by backhoe to a depth equal to the relocation lift (15 ft) and a bulk sample will be obtained for the full height of the lift. A representative subsample of the <¼-in size fraction will be obtained from each quarter of the bulk sample. It is anticipated that in total approximately 4 lb of the <¼-in material will be required. To keep pace with the relocation program, approximately 20 test pits would need to be excavated and sampled each day.

5.3.1.2 Sideslope Sampling

Sideslope samples will be collected for the length of the slope that corresponds to the lift height. Further, a representative sample will be scraped from the sideslope at a depth of 1 ft, 3 ft and 6 ft. Each of the bulk samples will be segregated and tested individually. A representative subsample of the <¼-in size fraction will be obtained from each quarter of each bulk sample. It is anticipated that in total approximately 4 lb of the <¼-in material will be required. A single composite sample from each bulk sample will be prepared by blending equal weights from each of the subsamples. The number of test pits will vary according to where excavation is occurring, and can range from zero to about 12 in a day.

5.3.2 Sampling of Placed Material

Samples of the backfilled material will be collected for each day of placement. Four test pits, evenly distributed over the material that has been placed in a given day, will be excavated to 3 ft in depth (i.e., equal to the placement lift height) by backhoe or similar means. A representative sample of the <¼-in material will be obtained from each of the four test pits. The four samples will be combined in equal proportions (by weight) to provide a single composite sample.

5.4 Testing Procedures

5.4.1 Ahead of Type II Relocation

5.4.1.1 Surface Samples

Paste parameters will be determined on each quarter of the bulk samples taken ahead of relocation. These parameters will be used to establish the alkali demand for that sampling location. All samples that exhibit class C characteristics will be tested for alkali demand. For the balance of the samples, to verify that the relationship established between the paste parameters and the alkali demand is consistent throughout relocation, alkali demand tests will be conducted on the composite of one in every ten sampling locations. Representative samples will also be archived from each of the sampling locations for potential future reference. On the basis of the planned relocation rate, approximately 80 paste parameters and two alkali demand tests will be completed each production day.

5.4.1.2 Sideslope Samples

Paste parameters will be determined on each of the three bulk samples collected from the sideslopes to determine alkali demand. Samples exhibiting characteristics of class C material will be tested for alkali demand. For the balance of the material, to verify that the relationship established between the paste parameters and the alkali demand is consistent throughout relocation, alkali demand tests will be conducted on the composite of one in every ten sampling locations.

5.4.1.3 General Requirements

Representative samples will also be archived from each of the sampling locations for potential future reference. The archived samples will be placed in the final lift of Type II material. On the basis of the planned relocation rate, up to approximately 36 paste parameters and three to four alkali demand tests will be completed on sideslope material each production day.

5.4.2 Backfilled Type II Material

5.4.2.1 Below the 1045 ft Elevation

Paste parameters will be determined for each test pit sample. The four daily samples will be composited on an equal weight basis, and average paste parameters on the composite sample determined. Short-term equilibration tests will also be conducted on each composite sample consisting of shake flask extractions completed at a solids-to-liquid ratio of 1:1. While these are not rapid tests, they will be useful in documenting the performance of the alkali amendment program.

5.4.2.2 Above the 1045 ft Elevation

Testing on the material above the 1045 ft elevation will be as described for that below this elevation (see Section 5.4.2.1), but will also include an assessment of the excess limestone that is available to neutralize future acidity. An acid consumption test, as described in Appendix D, will be used to assess the excess alkali available for acid neutralization after the contained acidity has been neutralized. This testing will be undertaken on each of the composited backfill samples taken from above the 1045 ft elevation. The available alkali will be compared to the dosage requirements discussed in Section 5.5.2 below.

5.5 Interpretation of Alkali Demand Data and Alkali Application Control

5.5.1 Interpretation of Boundaries

Test pits will typically be excavated at least two to three days in advance of the relocation program. Field paste parameters will then be available for interpretation at least one day in advance of relocation. The data interpretation will proceed as follows:

1. The material in each test pit will be classified as A, B, or C as follows:

    - The material will be classified as A if paste pH is >5.0 s.u. and paste conductivity is <2200 μS/cm.

- The material will be classified as B if the paste pH is <5.0 s.u. and paste conductivity is <2200 μS/cm, or if the paste pH is >5.0 s.u. and the conductivity is >2200 μS/cm.

- The material will be classified as C if the pH is <5.0 s.u. and the conductivity is >2200 μS/cm.

An alkali demand test will be immediately performed on all samples identified as class C.

2. Material classes will then be plotted on a plan of the lift that is scheduled for relocation. Areas of the same material class will be identified and delineated.

3. Limestone application rates will be established, as described in Section 5.5.2 below, for zones of class A and B material. For continuous areas of class C material located on the sideslopes of the stockpile, the area to the midpoint of the adjacent sample will be amended at the rate established from the alkali demand test results, which will be adjusted for availability as described in Section 5.5.2 below.

It is anticipated that conditions of isolated single samples of a different material class may be encountered within a larger area of singular class. Data interpretation for these areas will be as follows:

1. Where isolated class B material is encountered on the 60 x 60 ft sampling grid within primarily class A material, the area for limestone application at the class B rate will be delineated at the midpoint with all immediately adjacent class A sample locations.

2. Where isolated class C material is encountered on the 60 x 60 ft sampling grid within predominantly class A or class B material, samples will be obtained at a grid of 30 x 30 ft centered around the sample location where the class C material was encountered. Paste parameters, and if required, alkali demand tests will be performed. This will provide four additional samples around the location of the anomaly, and will enable a better definition of the area. The final alkali demand for the class C material will be established as the average of the alkali demand results for the samples that belong to this class.

5.5.2 Limestone Application Rate

The alkali demand characteristics of the Type II material are discussed in Section 4. On the basis of the field paste parameters, the sample population has been separated into three subgroups having specific alkali demand characteristics. These are summarized in the Table 5-4.

Table 5-4

Material Classification and Distribution

Material Class	Alkali Demand (mg CaO/g)	Limestone Demand[1] (lb $CaCO_3$/ ton)	Fraction of Population (%)
A	<0.8	<3.43	80.0
B	0.8 to 1.6	3.43 to 6.85	12.5
C	>1.6	>6.85	7.5

[1]Does not include adjustment for 67% availability.

With the above classification, the alkali application rate will be 0.8 mg CaO/g for class A material, and 1.6 mg CaO/g for class B material. The material classification will be determined on the basis of the average alkali requirement of Type II material as described above. Therefore, all Type II material will receive at least 0.8 mg CaO/g (or 3.43 lb $CaCO_3$/ton). The application rate for class C material will be determined for each identified zone or area within the Type II stockpile containing this material as discussed in Section 5.5.1 above.

To establish the alkali demand it is necessary to consider the availability of the limestone. Since the column tests are continuing, the estimates of the limestone availability presented in Section 4.1.5 are considered to be conservative, and will likely be revised when the column tests are completed, As a result, the discussion below will be updated with the planned amendment to this report.

The analysis in Section 4.1.2 showed that using the <¼-in size fraction to establish the alkali demand will provide an excess limestone addition of 48%. This excess is felt to be sufficient to allow for inherent material variability, and no additional excess is planned.

The limestone availability, as established to date, is estimated to be on the order of 67%. Therefore, the limestone correction factor is 1.48, on an "as received" basis. If the moisture content of the limestone is greater than 5%, an adjustment for this will also be made.

Limestone application rates for material classes A and B placed below the 1045 ft elevation in the pit are summarized in Table 5-5. The limestone amendment for class C material to be placed below the 1045 ft elevation in the pit will be established directly from the alkali demand test. The conversion to limestone will be made as follows:

$$\text{limestone amendment (lb/ton)} = \boldsymbol{X}(100/56)(2.203*0.907)(1.48) + 1.0.$$

where $\boldsymbol{X}$ = alkali demand test result in mg CaO/g.

The first factor between brackets in the equation converts from lime to limestone. The second converts from kg/tonne to lb/ton, and the third corrects for the availability. The additional 1 lb/ton allows for future oxidation.

Table 5-5

Summary of Limestone Amendment Rates for Class A and B Material Placed Below the 1045 ft Elevation in the Pit[1]

i.e. - Type

Material Class	Contained Acidity	Future Oxidation	Total
A	5.1	1.0	6.1
B	10.2	1.0	11.2

[1]Units are in lb/ton.

Above the 1045 ft elevation, the amendment for the contained acidity would be as above, but the amendment for future oxidation will be different. The amendment for future oxidation will be established in three steps. Table 5-6 summarizes the procedure that will be used.

Table 5-6

Summary of Limestone Amendment Rates for Class A and B Material Placed Above the 1045 ft Elevation in the Pit[1]

Material Class	Contained Acidity	Future Oxidation	Total
I. For material above the 1045 ft but below the 1055 ft elevation in the pit.			
A	5.1	1.8	6.9
B	10.2	1.8	12.0

The limestone amendment for class C material is determined as follows:

$$\text{Amendment (lb/ton)} = X(100/56)(2.203*0.907)(1.48) + 1.8$$

Material Class	Contained Acidity	Future Oxidation	Total
II. For material above the 1055 ft but below the 1065 ft elevation in the pit.			
A	5.1	3.7	8.8
B	10.2	3.7	13.9

The limestone amendment for class C material is determined as follows:

$$\text{Amendment (lb/ton)} = X(100/56)(2.203*0.907)(1.48) + 3.7$$

Material Class	Contained Acidity	Future Oxidation	Total
III. For material above the 1065 ft elevation in the pit.			
A	5.1	5.4	10.5
B	10.2	5.4	15.6

The limestone amendment for class C material is determined as follows:

$$\text{Amendment (lb/ton)} = X(100/56)(2.203*0.907)(1.48) + 5.4$$

[1]Units are in lb/ton.
X = alkali demand test result in mg CaO/g.

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5.6 Summary of Testing Requirements

Table 5-7 summarizes the anticipated minimum and maximum number of test pits that would be excavated, and the associated testing that would be performed for each production day.

Table 5-7

Summary of Estimated Daily Test Pit and Testing Requirements

Location	Component	Test Pits (#)	Paste Parameters	Sieving	Alkali Demand	Leach Extraction	Acid Consumption
Stockpile	Surface	16 - 20	64 - 80	16 - 20	1.6 - 2.0	na	na
	Sideslopes	0 - 12	0 - 48	0 - 12	0 - 1.2	na	na
Pit	Backfill	4 - 5	16 - 20	4 - 5	na	4 - 5	4 - 5
Total		20 - 37	80 - 148	20 - 37	1.6 - 3.2	4 - 5	4 - 5

6 Summary

The field and laboratory work completed during the winter of 1996-97 has met the objectives for the program as outlined in Section 1.2 above. The program has:

- Resulted in an effective assessment of the spatial variability of paste parameters within the Type II stockpile;
- Demonstrated the effectiveness of limestone to produce secondary mineral phases within the backfilled material that will remain stable under anoxic conditions;
- Demonstrated that the CUF solids: i) will be stable under the expected long-term saturated anoxic conditions in the backfilled pit; ii) will not contribute alkalinity to the backfilled pit; and iii) will not leach appreciable concentrations of metals provided that circumneutral pH conditions are maintained in the backfilled pit;
- Verified that the Type I material is not acid generating, and will not require alkali amendment when backfilled into the open pit;
- Demonstrated that the use of <¼-in particle size material to establish alkali demand will result in a limestone application rate 48% higher than that required when the overall particle distribution of Type II material is considered;
- Resulted in the quantification of the alkali addition rates needed to control metal release from stored oxidation products;
- Resulted in the determination through column testing that the limestone to be used in the backfilling process will be at least 67% available;
- Resulted in the development of methodology to simply classify stockpiled material based on paste parameters and alkali demand such that a variable alkali application rate can be used during the relocation process; and
- Resulted in the development of a comprehensive sampling and testing program to: i) define the characteristics of the Type II material prior to relocation so the proper limestone amendment rate can be determined; and ii) assess the characteristics of the relocated Type II material following limestone amendment.

In conclusion, the sampling and limestone amendment program outlined in Section 5 of the report represents a methodology that can be readily applied in the field. This methodology will result in a limestone amendment that will be conservative for the following reasons. First, a 48% excess addition will result from the use of the <¼-in size fraction for material classification. Second, the application of the maximum limestone amendment rate for class A and B material regardless of the paste parameter test results will result in an excess application of 115% based on the average alkali demand for these two classes. Finally, the use of the upper range of in-place densities when calculating the amount of limestone amendment for any given block of material on the Type II stockpile will result in an additional conservatism of 20% or more in the limestone addition rate. Overall, approximately 183% more limestone will be added to the backfilled Type II material than that theoretically required due to the conservative approach to be taken by Flambeau.

7 References

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Appendix A

October 30, 1996 Field and Laboratory Work Plan

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Kennecott
Minerals

October 30, 1996

Mr. Larry Lynch
Wisconsin Department of Natural Resources
Bureau of Waste Management
101 South Webster Street
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Dear Mr. Lynch:

Re: Flambeau Open Pit Backfilling - Field And Laboratory Work Plan

As described in the report titled *Fall 1996 Backfilling Plan for Stockpiled Type II Material* submitted to the Wisconsin Department of Natural Resources earlier this month, Flambeau Mining Company (Flambeau) has completed a series of tests to support limited backfilling of material from the Type II stockpile to its open pit. Flambeau outlined in its report a framework for additional testing during the 1996-97 winter season to prepare for 1997 backfilling. A detailed work plan for this subsequent testing is presented in this letter.

1.0 INTRODUCTION

1.1 Background

The waste rock removed from the Flambeau open pit has been classified and stored in two categories. The categories have been defined on the basis of sulfur content, with Type I rock containing less than 1.0 % sulfur. This category includes the overburden that was stripped during the development of the open pit. All other material produced from the open pit was classified as Type II, and is stored in a lined facility.

As part of the 1989 Mine Permit Application (MPA), Flambeau planned to backfill stored rock and overburden into the open pit during reclamation. The Type II material will be backfilled in the bottom of the mined-out pit followed by the Type I material.

1.1.1 Type II Material

Placement of stockpiled Type II material in the open pit first, and subsequent saturation, will ensure that the Type II rock is located in an environment in which future oxidation and acid generation is controlled. Because the Type II rock will be below the future water table, oxygen entry to the rock will be limited, and anoxic conditions will develop. During the period of groundwater recovery, groundwater gradients will be directed towards the open pit so that very little release of water from the pit is expected. As the groundwater table recovers, the pore water of the waste rock will rapidly become anoxic, and increasing release of pore water to groundwater will occur.

Site water is treated in a lime treatment system with sulfide polishing to remove metals prior to discharge. The resulting metal oxy-hydroxide solids, referred to as clarifier underflow (CUF) solids, have been co-disposed with the Type II material. The CUF solids are to be backfilled with the Type II material.

As stated in the MPA, the Type II rock will be amended with an alkali before backfilling to the open pit. The objective of the alkali amendment is to control dissolved metal concentrations at an acceptably low level in the waste rock pore water after flooding, i.e. after anoxic conditions have developed. The alkali amendment is required to neutralize:

- stored oxidation products and available acidity already contained in the Type II material; and,
- acidity and oxidation products that may be generated from future oxidation during the reflooding period.

The stored acidity and oxidation products are a result of the oxidation that has already occurred during the on-surface storage. Lime was originally specified as the alkali of choice in the 1989 MPA. At the time of the permit application, a preliminary estimate of the alkali requirement was made on the basis of partially oxidized Type II rock which was generated under short term laboratory testing conditions. However, limestone has replaced lime as the alkali of choice, and the alkali requirement of the oxidized material is to be determined directly using an alkali demand test, as described in the October 1996 report.

Co-disposal of the CUF solids may impact the geochemistry of the Type II material after saturation. First, the CUF solids may introduce excess alkalinity in the form of unreacted lime, and second, the sludges contain iron oxy-hydroxides that may become more soluble under anoxic conditions.

Recent testing completed by Flambeau in support of the planned Fall 1996 relocation program has shown that:

1. limestone can be used as an alternative to lime as an alkali source;
2. limestone blinding appears to be insignificant;
3. variability in alkali demand exists within the Type II material stockpile; and,
4. estimated long term pore water quality will be similar to that predicted in the MPA.

The investigation completed in support of the Fall 1996 relocation program was based on short term, rapid test methods. Short term testing was required in order that the small scale fall relocation program might be undertaken, and in that purpose satisfied the objectives of the investigation. As discussed in the October 1996 report, the short term investigation did not address all of the issues related to the relocation of the Type II stockpile as a whole. As part of that investigation, some issues were identified that required further investigation, and/or confirmation. This work plan has been developed to address relevant outstanding issues, and includes both field and laboratory investigations that will be completed in support of the planned 1997 backfilling program.

1.1.2 Type I Stockpile

During the construction of the Type I stockpile, rock has been placed in three distinct cells on top of a till layer, containing respectively sandstone, saprolite, and Type I rock. The Type I stockpile is characterized by a sulfur content of less than 1 %.

To date, a geochemical investigation of the Type I stockpile comprising eleven drillholes has been completed. Drilling was performed using a percussion drill rig with reverse air circulation to recover rock samples. The drillholes were ~~been~~ located outside of the sandstone area, with one hole located in the saprolite area, as shown in Figure 1. The results showed that copper is present predominantly in the oxide form, while sulfur contents are typically less than 0.3%. There are, however, a few pockets of material that exhibit a sulfur content between 0.3% and 1%.

Since the Type I rock is relatively low in sulfur content, it is not anticipated to be net acid generating. However, ongoing oxidation of any sulfides may lead to the release of soluble metals, as indicated by the dissolved copper concentration observed for seep T1-1, location shown in Figure 1. The seepage quality varies according to the flow rate; low pH values and peak copper concentrations are associated with peak flow rates for the period March to October, 1996. While the average copper concentration is less than 10 mg/L, peak concentrations in excess of 50 mg/L associated with slightly acidic pH values have been observed. This suggests that there are probably some pockets of material that may require alkali amendment on relocation.

The copper concentration in this seep may be an isolated occurrence, in which case no marked effect is expected on the pore water quality after backfilling and saturation of the Type I material. However, should a significant portion of the Type I materials contain similar soluble constituents, it may be necessary to add alkalinity during the backfilling. Furthermore, the reactivity of the backfilled Type I material, i.e. oxygen consumption rate, will determine the rate of oxygen entry into the underlying Type II materials. If the Type I rock is highly reactive with oxygen, less oxygen will enter the underlying Type II rock, and its alkali amendment could potentially be reduced. However, should a portion of the Type I rock prove to be potentially acid generating, it will be necessary to amend that material to neutralize acidity generated during groundwater recovery.

The program proposed below, therefore, also includes tests to assess the reactivity of the Type I materials, and, to address the potential need for alkali amendment to neutralize stored acidity if required.

1.2 Work Plan Objectives

Both field and laboratory investigations will be undertaken. The objectives of the field investigation are to:

1. Provide additional data to assess the spatial variability of paste parameters (pH and conductivity) within the Type II stockpile;
2. Develop sampling and testing protocols to determine the limestone addition rate which during relocation provides the minimum required neutralization potential;
3. Provide necessary samples for continuing laboratory investigations; and,
4. Establish the requirements to implement a variable alkali application rate for future relocation;

The objectives of the laboratory investigation can be summarized as follows:

1. Demonstrate the effectiveness of limestone over lime to produce secondary mineral phases that will remain stable under anoxic conditions;
2. Determine the availability of the alkali under anticipated short- and long-term conditions in the backfilled pit;
3. Quantify the alkali addition rates to control metal release from stored oxidation products (in pore water) and meta-stable secondary mineral phases;
4. Evaluate the stability of the CUF solids under anticipated long term saturated (anoxic) conditions; and,
5. Assess field test methods for the control of alkali application rates.

A final objective is to investigate the reactivity of the Type I materials, and to assess the need for alkali addition, should this become necessary to control metal release during and after saturation.

2.0 FIELD INVESTIGATIONS

2.1 Type II Stockpile

Sampling of the Type II stockpile will be undertaken to reconfirm that the calculated limestone addition rate is adequate for the fall 1996 relocation. This will be accomplished by sampling first ahead of the relocation, and second, sampling the excavation face itself. In addition to this, the remainder of the stockpile will be sampled to provide additional information on the spatial variability and to provide the necessary samples to complete the proposed laboratory investigations. The field sampling and investigation programs are described below.

2.1.1 Material Characterization Ahead of Excavation

The Type II stockpile material to be relocated in 1996 will be sampled at a fixed grid of about 60 feet by 60 feet in plan on the plateau, to provide a total of about 26 samples. The slopes will also be sampled by extending the grid pattern laterally to provide an additional 12 samples, for a total of about 38 samples. The sampling locations are shown in Figure 2. The location of each test pit will be surveyed. Test pits will be excavated to a depth of about 15 feet, which is equal to the relocation lift height. A representative sample will be obtained for the entire depth of the test pit by scraping the face of one side of the test pit from bottom to top, at an even 'slice', to provide a bulk sample. The full depth of the test pit will be logged to describe significant variations in material type, coloration, size distribution, moisture content, etc. with depth.

A representative sub-sample will be obtained from each bulk sample, and will be taken from the <1/4 inch size fraction. The sub-sample will be tested under laboratory conditions to determine its alkali demand, as described in Section 3.1 below under the laboratory investigation program.

Paste pH and conductivity will be obtained in the field on each quarter of the bulk sample, to provide a total of four per bulk sample. Methods for obtaining field parameters are provided in Attachment A.

2.1.2 Material Characterization at the Excavation Face

Similar to sampling the test pits, face samples will be obtained, as excavation proceeds during the fall 1996 relocation, by scraping the entire length of the face with the backhoe to provide an even 'slice'. Care will be taken to prevent limestone contamination, or over representation of any portion of the excavation height in the sample. One sample will be taken on every second day of excavation.

The bulk sample will be placed on a clean surface (limestone free) or a tarpaulin, and will be characterized as described above for the test pit samples. A representative sample of the < 1/4 inch material will be removed and a alkali demand test will be completed, as described below. Field parameters (paste pH and conductivity) will be obtained as described in Section 2.1.1.

2.1.3 Additional Samples

An additional 30 test pits will be completed on a random grid (Figure 2) over the remainder of the Type II Stockpile. The test pits will be excavated as described above in Section 2.1.1. Bulk sampling and sub-sampling will be undertaken as described in Section 2.1.1 and the test pit will be logged. Field parameters will also be obtained for the bulk sample as described in Section 2.1.1

At random, representative samples of the < 3 inch size fraction will be taken from six test pits. Leach extraction tests will be completed on these samples to determine the immediately extractable oxidation product distribution, as described below in Section 3.1.4 for the laboratory investigation.

2.1.4 CUF Solids

One representative sample of the CUF solids will be obtained from the deposition location currently in use, and one from a previous deposition location (Figure 2). Should it not be possible to identify a prior deposition location, then two samples will be taken from the current location. The pH and conductivity of the pore water will be obtained in the field, using the procedures described in Attachment A.

Characterization of the CUF solids will be completed as described in the laboratory investigation program described in Section 3.2 below.

2.2 Type I Stockpile

The objectives for sampling the Type I stockpile are to provide information on the current state of the contained materials, and the spatial variability of the field parameters and pore water quality within the stockpile. While the pockets of material which have higher than average sulfur grades, based on the drillhole investigation, are generally below the depth to which test pit excavation is possible, oxidation is expected to be more significant at the near surface. Test pitting and sampling will provide an indication of the amount of oxidation products present in the Type I material.

The sampling program for the Type I stockpile will comprise a total of 20 test pits located on a random grid to represent each of the different rock types. A total of 5 test pits will be excavated within the saprolite, 5 within the sandstone, and 10 within the remainder of the Type I stockpile.

Test pits will be excavated, logged and sampled as described in Section 2.1.1 above for the Type II stockpile sampling program. Test pit excavation will be to a depth of 10 feet. Field parameters (paste pH and conductivity) will be obtained as described in Attachment A. Leach extraction tests will be completed on the representative sub-samples of the less than 1/4 inch material, as described in the laboratory investigation program discussed in Section 3.4.

2.3 Backfilled Material

The objective for sampling the backfilled material is to confirm that the calculated rate of limestone addition for the fall 1996 relocation satisfies the minimum requirements, and that the limestone is effectively blended during the relocation process.

Sampling of the backfilled material will be undertaken for each two days of placement. Three test pits, evenly distributed over the material that has been placed over the two days, will excavated to three feet in depth (i.e. equal to the placement lift height) by backhoe or similar means. The sample will be taken, and the test pits will be logged for material characteristics and variations as discussed in Section 2.1.1. The three <1/4 inch samples obtained will be mixed in equal proportions (by weight) to provide a single composite sample. A confirmation extraction test will be completed for a period of 72 hours on each sample, as described in the laboratory investigation, discussed in Section 3.3.

2.4 Summary of Field Investigations

The field investigation program is summarized in Table 2.1.

TABLE 2.1
Summary of Field Investigation Program

	Number of Samples							
Material type	Type II				CUF Solids	Type I Stockpile		
	Ahead of Relocation	Relocation Face	Remainder	Fall 1996 Backfill		Sandstone	Saprolite	Type I Rock
Test Pits	38	na	30	45	2	5	5	10
Depth (ft)	15	na	10	3	na	10	10	10
Samples								
<1/4 inch	38	15	30	15	2	5	5	10
< 3 inch			6					
Field Parameters								
Paste pH	152	60	120	60	2	20	20	40
Paste cond.	152	60	120	60	2	20	20	40

na - not applicable

3.0 LABORATORY INVESTIGATIONS

3.1 Type II Materials

3.1.1 Effect of Size Distribution

The objective of the testing is to confirm the results from earlier testing which indicated that the majority of the stored oxidation products are associated with the < 1/4 inch size fraction, and that testing to determine alkali demand on this size fraction is conservative.

The six < 3 inch samples will be screened at 1/4 inch to provide < 1/4 inch, and 1/4 to 3 inch splits. Leach extraction tests, conducted at a liquid to solid ratio of 1:1 using distilled water, will be completed on each of the splits. The procedure for the leach extraction test is described in Attachment B.

3.1.2 Alkali Demand

The objective of the testing is to establish the correlation between field characteristics (paste pH and conductivity) and the alkali demand of the Type II material, for the potential implementation of a control program for the application of alkali during relocation at a variable rate. Lime is used to determine the alkali demand in this test because it reacts rapidly. Test results can be obtained within 24 hours, as has been shown in the October 1996 report. As also shown in that report, the alkali requirement obtained from the lime demand test can be easily converted to a limestone requirement.

Alkali demand testing will be undertaken on all the samples from the Type II Stockpile that have a paste pH equal to or lower than 6.5. The method is provided in Attachment B.

3.1.3 Confirmation of Alkali Amendment Type

The objective of the testing is to confirm the effectiveness of limestone versus lime as the alkali source for the neutralization of the stored acidity contained in the Type II materials. Limestone has been selected as the alkali of choice on the basis of its buffering capacity, and the stability of the secondary minerals phases that are formed, as discussed in the October 1996 report. The testing will be completed only to confirm this.

A total of 6 samples will be selected for confirmation testing of the alkali type. The samples will be selected to represent a low, intermediate and high alkali demand. Testing will be completed on the <1/4" size fraction, using the anoxic column test procedure described in Attachment B. A representative sample will be taken from the larger bulk sample, blended and then split in half (by cone and quarter). The first split will be amended with lime at the rate indicated by the alkali demand test. The second split will be amended with limestone at the stoichiometric requirement, but corrected for the availability and moisture content of the limestone.

3.1.4 Alkali Amendment Rate and Long-Term Pore Water Quality Confirmation

The objectives of the testing are first to confirm that the limestone demand calculated on the basis of the alkali demand test results, and appropriate correction factors, is accurate, and secondly that the long term pore water quality will approximate that predicted for the saturated backfill.

A total of 12 samples will be selected from the Type II material samples and tested using the anoxic column test procedure, provided in Attachment B. The limestone amendment will be calculated from the alkali demand, determined as before. The test will be completed on the < 1/4 inch size fraction. Limestone will be blended with the sample at the calculated rate prior to loading into the column.

3.2 Stability of CUF Solids Under Anoxic Conditions

The objective of the testing is to determine the stability of the CUF solids under anoxic conditions, such as those anticipated after saturation of the backfill.

Testing of the CUF solids will be undertaken in two stages. First, leach extraction tests will be completed at a solids to liquid ratio of 1:1, using distilled water. The first of two extraction tests will be completed at the natural pH, and, the second at a pH of about 6.5 using sulfuric acid to modify the leachate pH, recording the total amount of acid added to achieve a stable pH. The eluates will be analyzed for dissolved constituents. The acid consumption to 6.5 will be back-calculated from the amount of acid added. The acidification is completed to determine the stability of the CUF solids for a slight change in pH, and to determine its neutralization potential, should it be contacted with existing acidity. In the second stage, column tests will be completed on the two CUF solids samples, using the anoxic column test procedure provided in Attachment B.

3.3 Fall 1996 Backfilled Material

The objective of the testing is to demonstrate that the limestone amendment for the material relocated during Fall 1996 is sufficient to satisfy the minimum neutralization requirements, and that adequate mixing has been achieved during relocation.

Anoxic leach extraction tests will be completed on the composite samples taken from the placed materials. The extraction tests will be completed at a solids to liquid ratio of 1:1 using distilled water, as described in Attachment B, but using argon to maintain anoxic conditions during the extraction period. The eluate will be monitored for pH, redox and conductivity only. The relationship between pore water composition as a function of the pH will be known from the column testing, and therefore, analysis of dissolved constituents will not be completed on the eluates. Upon completion of the leachate extraction tests, an acid consumption test using sulfuric acid will be performed on the solids using the procedures described in Attachment B.

Three composite samples will be selected for longer term testing, using the anoxic column test procedure provided in Attachment B.

3.4 Type I Materials

3.4.1 Pore Water Quality

The Type I material pore water quality will be established by completing leach extraction tests on the < 1/4 inch size fractions of the samples taken from the test pits. The leach extraction test procedure is provided in Attachment B. The leachate from the extraction will be analyzed for dissolved constituent concentrations.

3.4.2 Reactivity

Acid base account (ABA) testing will be completed on each of the samples taken from the Type I stockpile. The ABA will include a sulfur speciation, i.e. total sulfur and sulfate sulfur will be determined analytically, and the sulfide sulfur by difference.

3.5 Summary of the Laboratory Investigation

The laboratory investigation is summarized in Table 3.1.

TABLE 3.1
Summary of Laboratory Investigation Program

	Number of Samples							
Material Type	Type II				CUF Solids	Type I Stockpile		
Test	Ahead of Relocation	Relocation Face	Remainder of Stockpile	Fall 1996 Backfill		Sandstone	Saprolite	Type I Rock
Alkali Demand	38	15	30	-	-	5	5	10
Anoxic Column - limestone	-	-	18	3	2	-	-	-
Anoxic Column - lime	-	-	6	-	-	-	-	-
Leach Extraction	-	-	12	-	-	5	5	10
Anoxic Extraction	-	-	-	15	-	-	-	-
Acid Consumption	-	-	-	15	2	-	-	-
ABA	-	-	-	-	-	5	5	10

4.0 DATA INTERPRETATION AND PRESENTATION

The work will be performed in accordance with the schedule shown in Figure 3.

Leach extraction results from the <1/4 inch, and 1/4 to 3 inch size fractions will be compared to reconfirm that the small size fraction can be used to conservatively represent the whole sample in further tests. Alkali demand results will be used to estimate limestone and lime requirements for subsequent tests. The alkali demand results will be compared with the field parameters. This will be done to establish if there is a correlation which can be used, as a simple predictive tool, to establish the alkali demand of the weathered rock. The spatial correlation in field parameters will then be determined. Simple statistical analyses are not valid for spatial correlation and therefore visual presentations, e.g. by color coded plots, will be used to assess the feasibility for variable alkali application rates. Also, a manual cross check of the field parameters and alkali demand with the test pit logs and field observations will be completed.

The results from the column tests performed on the test pit samples will be plotted. The trends will be evaluated to establish the effectiveness of limestone to control metal solubility initially, and in the long term. The results from the lime amended and limestone amended column tests will be compared directly, as appropriate, to provide an indication of the relative effectiveness of each alkali to control metal solubility. Some geochemical modeling will be undertaken using the MINTEQA2 model to identify solubility controlling phases.

The variability in the equilibration (extraction) test results performed on the backfilled material will be used to establish the effectiveness of alkali blending during relocation. A determination of whether suitable blending is achieved will be obtained from the combined results of the column tests to be completed on the backfilled material. The combined results will be used to establish future quality assurance sampling and testing requirements.

The acid generation potential will be compared with the acid consumption potential for the Type I samples. The net potential for acid generation will be determined by establishing the NP:AP ratios. The results from the extraction tests to be performed on the Type I materials will be used to quantify the immediately extractable oxidation products, and thus determine the need for alkali amendment to neutralize pore water and stored oxidation products.

A report will be prepared in which the results from the field and laboratory investigations will be summarized and discussed.

5.0 CLOSING COMMENTS

As you know, to avoid confusion once backfilling begins, we have already collected the 38 samples within the Type II stockpile Fall 1996 excavation area. Per the schedule shown in Figure 3, the remaining test pits in both the Type II and Type I stockpiles are to be collected during the week of October 28, 1996, with testing to commence immediately thereafter. Therefore, we would appreciate any comments on our work plan at your earliest convenience. I will contact you shortly to discuss our plan.

Sincerely,

Tom Myatt :jgm

Tom Myatt
Flambeau Mining Company

cc: Al Christianson, City of Ladysmith
Jeff Earnshaw, Flambeau
Daryl Hockley, Steffen Robertson and Kirsten
Jeane Hull, Kennecott Corp.
Jim Hutchison, Foth & Van Dyke
Ken Markart, Wisconsin Department of Natural Resources
Jana E. Murphy, Flambeau
Thure Osuldsen, Rusk County
Tom Riegel, Town of Grant
Jerry Sevick, Foth & Van Dyke
Melvin Spencer, Rusk Co. Zoning

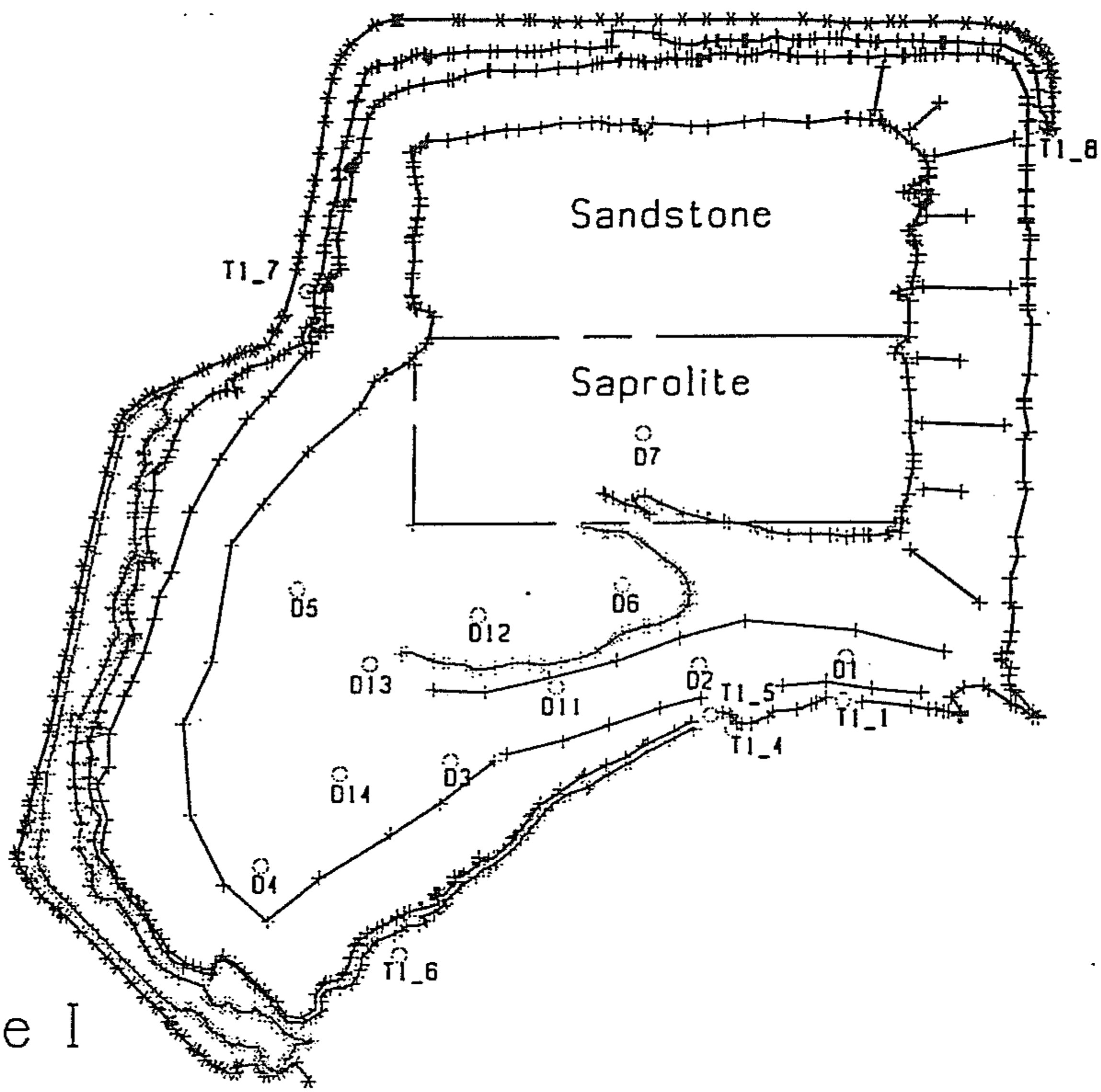
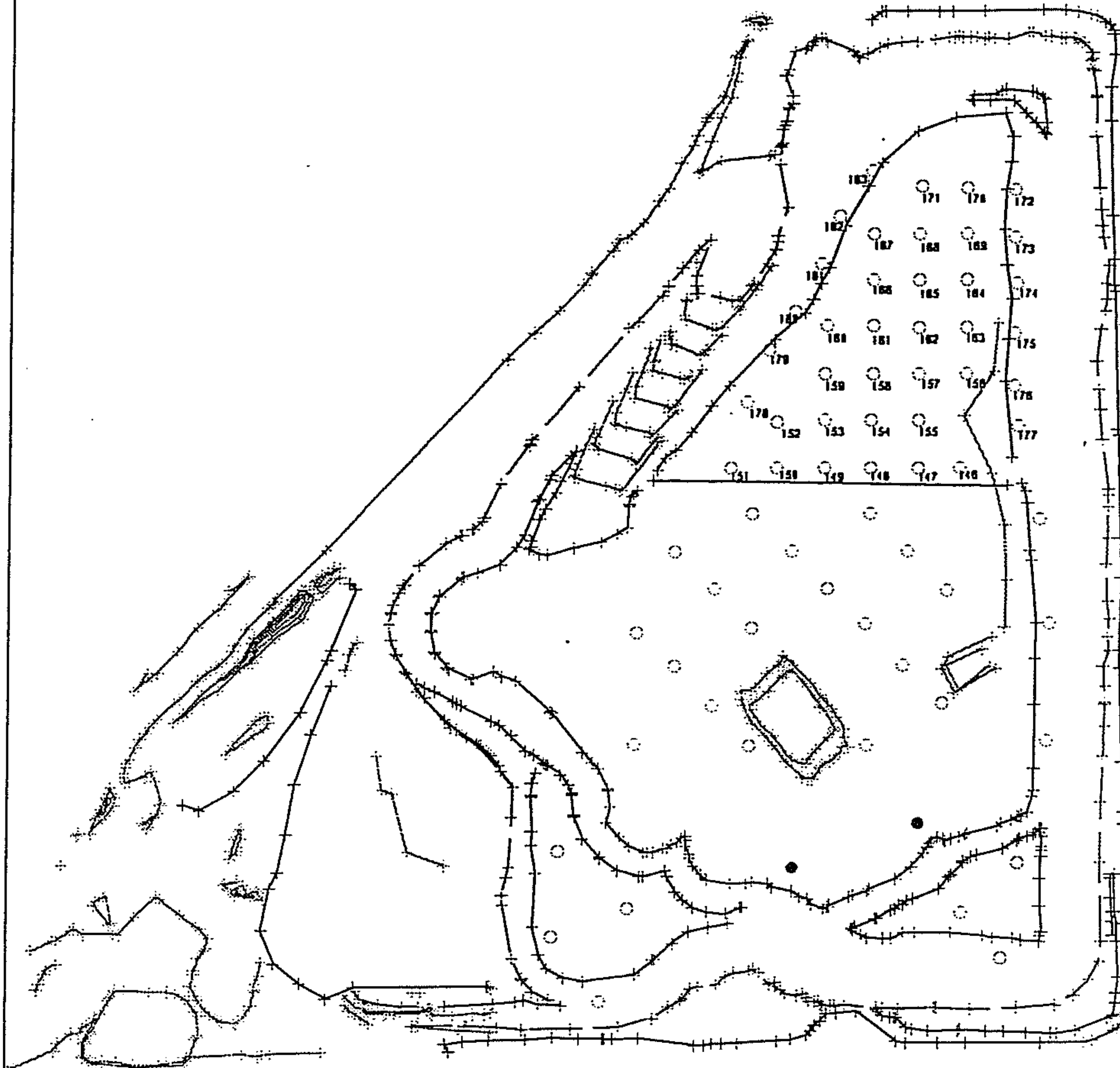


Figure I

Type I Stockpile: Drill Hole & Seep Locations



○ 146 Denotes Sample Number

○ Additional Test Pit

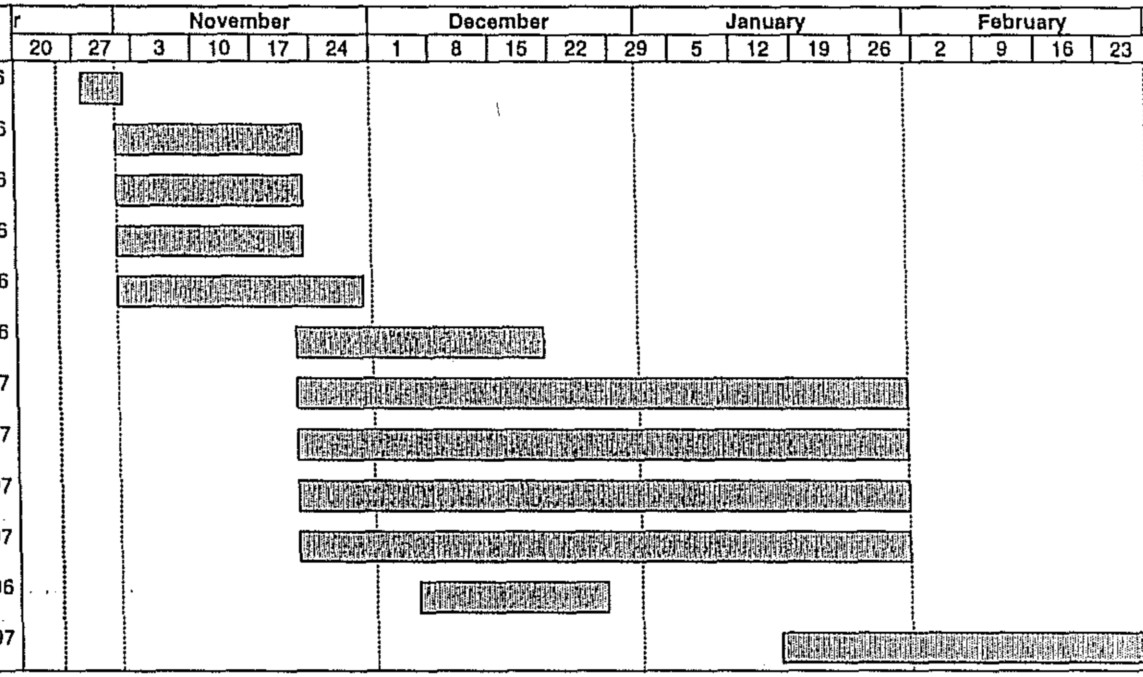
● CUF Solids Test Pit

Figure 2

Type II Test Pits

Figure 3
Flambeau Mining Company
Backfilling Field and Laboratory Work Plan

ID	Task	Start	Finish
1	Sample Collection & Field Testing	10/28/96	11/1/96
2	Size Distribution Extractions	11/1/96	11/22/96
3	Alkali Demand	11/1/96	11/22/96
4	CUF Extractions	11/1/96	11/22/96
5	Type I ABA Tests	11/1/96	11/29/96
6	Type I Extractions	11/22/96	12/20/96
7	Alkali Confirmation Anoxic Column Test	11/22/96	1/31/97
8	Alkali Amendment Anoxic Column Test	11/22/96	1/31/97
9	CUF Anoxic Column Tests	11/22/96	1/31/97
10	Backfill Anoxic Column Tests	11/22/96	1/31/97
11	Acid Consumption Tests	12/6/96	12/27/96
12	Report	1/17/97	2/28/97



Project: Flambeau Mining
Date: 10/25/96

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress

Scope ID: 96F013

ATTACHMENT A
FIELD METHODS

A.1 FIELD SAMPLING AND TESTING

TEST PIT LOGGING

1. Survey the location of the test pit
2. Log horizons in the test pit walls, noting in particular:
   color / weathering
   lithological composition
   primary and secondary mineralization
   particle size distribution
   moisture content
3. Photograph the wall of the test pit

FIELD SAMPLING

A representative sub-sample of the bulk sample is obtained, and the obvious oversize is (i.e. > 3 inches) is discarded. The sample is then screened at 1/4 inch at the field moisture content. Agglomerated material in the oversize should be broken up to maximize recovery of the < 1/4 inch size fraction. The approximate size distribution of the bulk sample is estimated. Approximately 25 - 30 lb (12 to 14 kg) of the <1/4 inch sample is required to complete subsequent laboratory investigations described in Attachment B.

FIELD TESTING

Paste parameters are obtained, using the method described below for one sample from each quarter of the bulk sample. The tests may be performed either in the field, or if inclement weather conditions dictate, in the laboratory. To complete testing in the laboratory, samples of the < 1/4 inch material taken from each quarter of the bulk sample are to be prepared, bagged and marked individually.

A.2 PASTE pH AND CONDUCTIVITY

EQUIPMENT AND REAGENTS

1. Portable pH and conductivity meters

2. 2x Glass/plastic beakers (150 to 250 ml)

3. 1/4 inch hand sieve

4. Measuring cup or scoop (approximately 60 to 65 ml)

5. Distilled water

6. Spatula

METHOD

1. A sample of approximately 1-2 kg is taken with a small shovel, discarding the obvious oversize (> 3 inch) material.

2. The sample is sieved through a 1/4 inch screen, and from the undersize material, a sample of 65 ml, using a scoop that can be scraped level to remove excess sample, is obtained.

3. The sample is placed in a 150 to 250 ml beaker, the scoop is rinsed and the residue is added to the beaker, using exactly 100 ml of water.

4. The prepared sample is mixed thoroughly using a spatula

5. The pH and conductivity of the supernatant is measured with calibrated field equipment. IMPORTANT : Do not contact the solids with the glass pH probe - it is fragile and may scratch. Ensure that the readings have stabilized before recording the values.

ATTACHMENT B
LABORATORY TESTING METHODS

B1 ALKALI DEMAND

EQUIPMENT AND REAGENTS

1. 1.0 to 1.5 liter Erlenmeyer flasks or roll bottles
2. Distilled water
3. Hydrated lime ($Ca(OH)_2$)
4. Sulfuric Acid
5. pH and conductivity meters
6. Rotary shaker or rollers

METHOD

1. Prepare a 200 g/L hydrated lime slurry. The suspension is maintained by continuous mixing. A 10 ml sample of the hydrated lime slurry should be titrated with sulfuric acid at a known molarity, to determine the reactivity (R) of the lime slurry as mols $Ca(OH)_2$ per liter. The reactivity should be determined for each fresh batch of lime slurry that is prepared.

2. In triplicate, place 500 grams of the < 1/4 inch sample in a 1.0 to 1.5 liter Erlenmeyer flask or roll bottle.

3. Add 500 ml distilled water to each sub-sample, and lightly agitate for 1 hour.

4. Allow solids to settle for a few minutes and measure solute pH and conductivity.

5. Calculate the average pH for the three samples, and from Figure B-1 obtain the volumes of lime slurry to be added to each sample.

6. Add the indicated volumes of lime slurry to the respective vessels.

7. Gently agitate the samples for a period of 24 hours and record the final pH and conductivity.

INTERPRETATION

The alkali demand for the sample is determined from the lime addition rate that yields a final pH nearest 7.0, but greater than 6.5. The alkali demand is back-calculated on the basis of the reactivity of the lime slurry and the weight of the sample as follows:

Alkali demand as lime (mg/kg) = R *V*74/m

where: R = reactivity in mols $Ca(OH)_2$ /liter
V = ml lime slurry added
m = weight of sample in grams

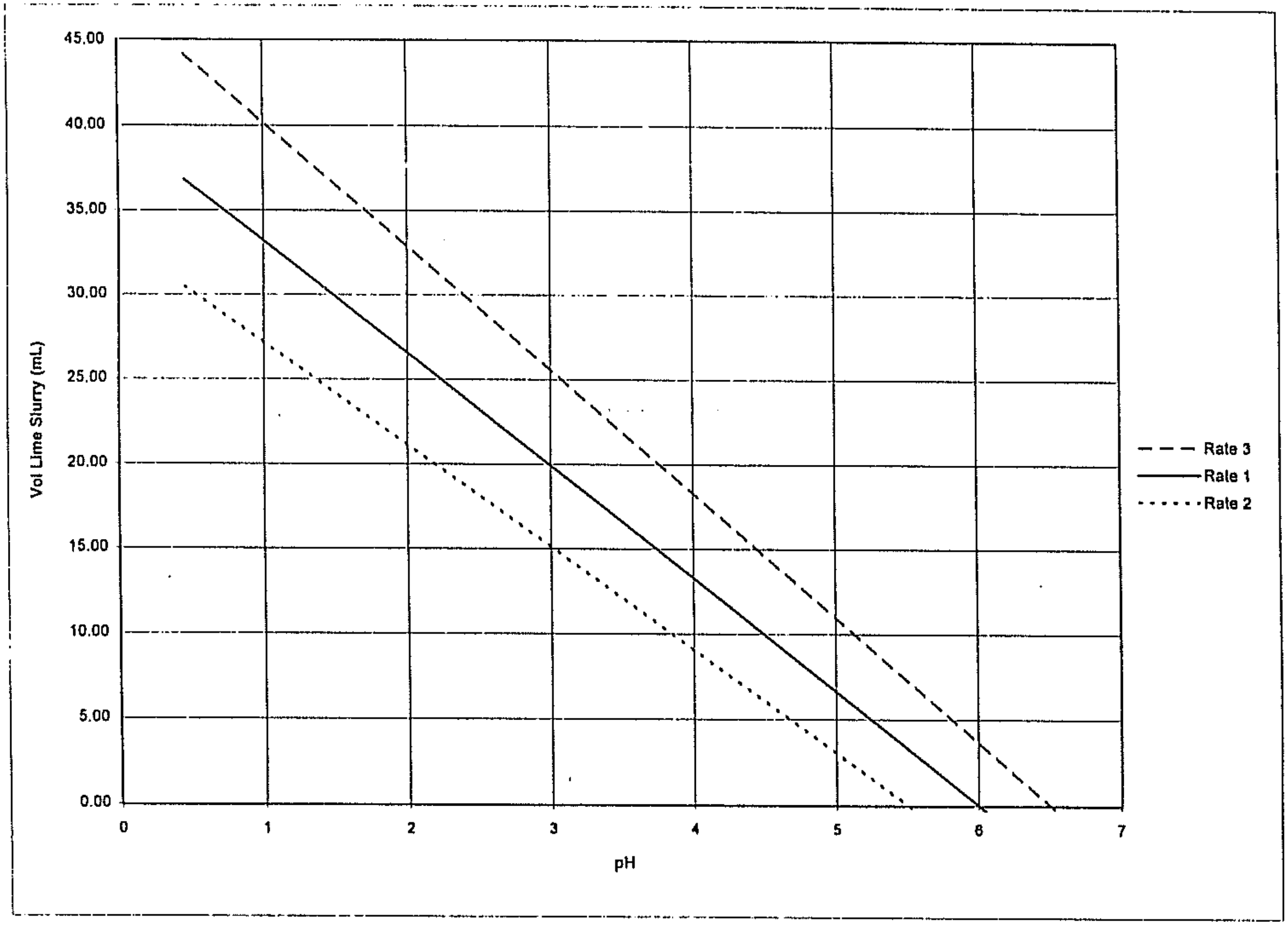


FIGURE B-1. LIME SLURRY ADDITION RATE

Estimated lime addition rates have been established on the basis of the pH - alkali demand obtained in the short term testing program.
The central line represents the best fit to all the data.
The upper limit represents a 15% excess in alklai demand, and captures all samples but 2/29.
The lower is 15 % below the average alkali demand, and only 2/29 samples fall below this line

B.2 ANOXIC SATURATED COLUMN TEST

EQUIPMENT

1. Column: ID = 4 inches
   Height = 16 inches
   sealable top and baseplate within and outlets as shown in Figure B-2.
1. Argon gas
2. Feed water reservoir
3. pH, redox and conductivity meters
4. Tubing and valves as required

METHOD

1. *Column set-up*: The sample of < 1/4 inch material is blended to prevent particle size segregation. Where an amendment is required, approximately 16 lb (7.5 kg) of the amended and blended material is prepared The column is prepared by placing a bottom screen (fine nylon mesh) on the baseplate of the column, as shown in Figure B-2. The weight of the column is obtained, and the sample is loaded to fill the column level with the top. The sample is then lightly compacted to ensure minimal settling during the saturation process. The bulk density of the sample should be checked by calculation prior to sealing the column. The another nylon mesh screen is placed on top of then sample, and the column is sealed.

2. *Operation*: Anoxic testing procedures are to be followed. Prior to flooding, the sample is flushed with argon to displace oxygen from the pore space. The feed solution is introduced from the base of the column and is allowed to percolate up through the sample at a slow rate (approximately 4 hours to fill) to displace contained pore gases. Once the solute is observed in the outlet tube, the inlet is sealed. The column is sealed by placing the outlet tube in a water trap to allow gas to escape from the column, but prevent oxygen entry into the column. The column is allowed to stand stationary for a period of 14 days.

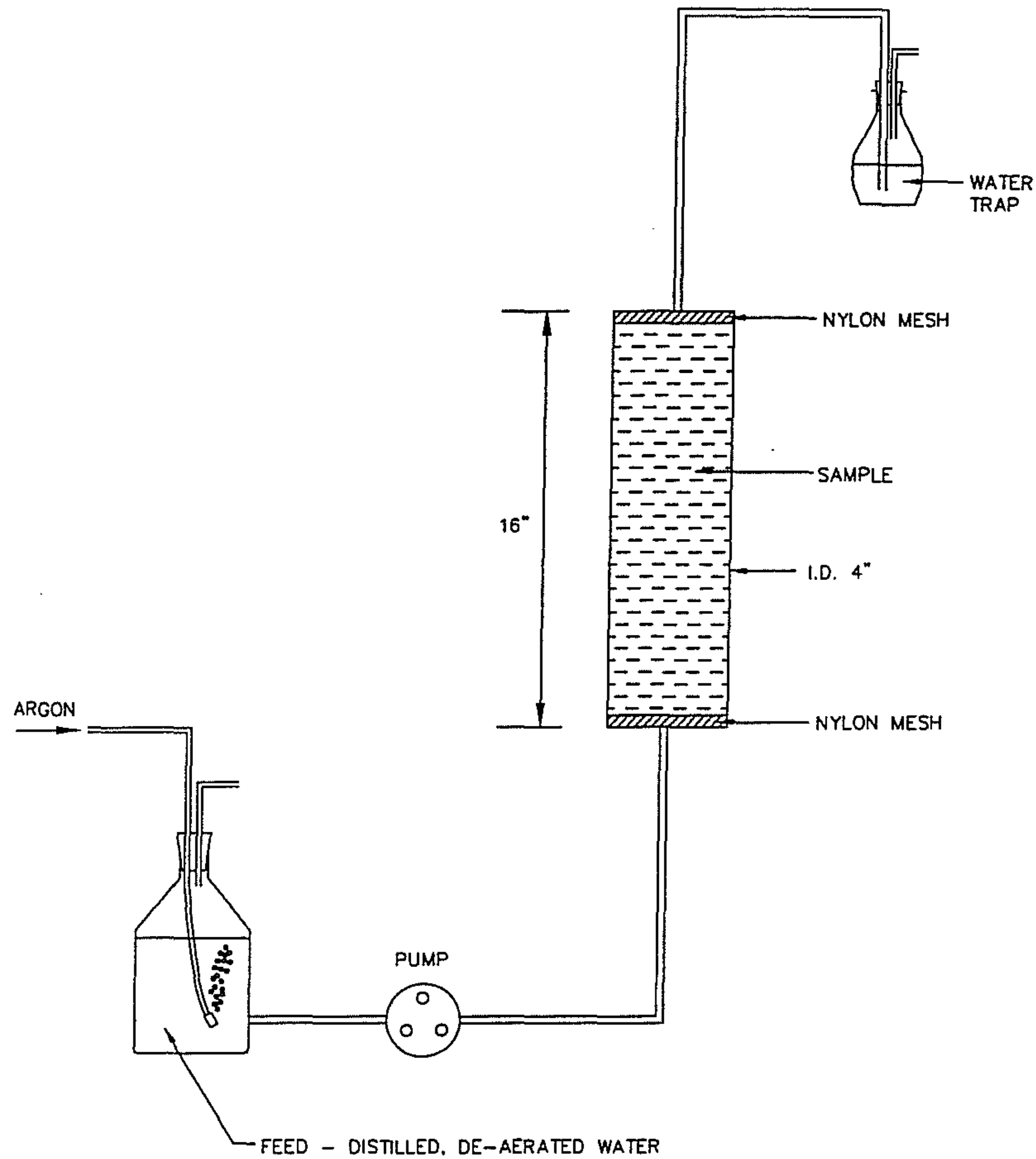
3. *Leachate Displacement*: After the pore water has been allowed to equilibrate for 14 days, the outlet tube is removed from the water trap and placed in the leachate receptacle. To maintain anoxic conditions, the head space of the vessel is continuously flushed with argon gas. The pore water is then slowly displaced from the column with de-aerated (by vacuum) distilled water that is being sparged with argon to remove dissolved oxygen.

The pore water should be displaced at a continuous rate of about 4 ml/min or less (i.e over a 4 hour or greater period), to minimize the effects of channel flow. The column is again sealed as before. The redox potential, pH and conductivity of the displaced pore water is to be obtained while maintaining anoxic conditions. The solute is then split, filtered and preserved as appropriate for dissolved constituent analysis.

Steps 3 is repeated until steady solute concentrations are obtained. It is anticipated that this would be attained in about 3 to 4 cycles.

LIST OF ANALYTES

pH, redox, conductivity, alkalinity/acidity
Anions: SO_4^{2-} ; Cl^-
<u>Cations</u>: Al, Cd, Ca, Cr, Cu, Co, Fe2+, Fe(T), K, Mn, Mg, Na, Tl.



STEFFEN ROBERTSON AND KIRSTEN
Consulting Engineers

FOTH AND VAN DYKE

FLAMBEAU MINE BACKFILLING

TYPICAL ANOXIC COLUMN
TEST SET-UP

PROJECT NO.	DATE	APPROVED	FIGURE
F107108	OCT., 1996		B-2

FILE RPT:FIG-B-1

B.3 LEACH EXTRACTION TEST

EQUIPMENT

1. 1.5 liter Erlenmeyer flasks or roll bottles
2. distilled water
3. pH, redox and conductivity meters
4. rotary shaker or rollers as appropriate
5. filtration equipment and 0.45μm filter membranes

METHOD

1. Weigh out accurately 750 grams of the < 1/4 inch material and place in extraction vessel.

2. Add 750 ml distilled water to extraction vessel.

3. Gently agitate sample for 24 hours.

4. Allow solids to settle and measure solute pH, conductivity and redox potential.

5. Extract leachate, filter and preserve solute samples as required for analysis.

Note: The anoxic extraction test procedure is exactly the same as described above, but the head space of the test vessel is flushed with argon to displace oxygen, and is kept sealed at all times. The duration of the test (item 3) is extended from 24 hours to 72 hours.

LIST OF ANALYTES

pH, redox, conductivity, alkalinity/acidity
Anions: SO_4^{2-} ; Cl^-
Cations: Al, Cd, Ca, Cr, Cu, Co, Fe2+, Fe(T), K, Mn, Mg, Na, Tl.

B.4 ACID CONSUMPTION TEST

EQUIPMENT AND REAGENTS

1. 500 ml Erlenmeyer flask
2. pH meter
3. Burette
4. Spatula or magnetic stirrer
5. Distilled water
6. 0.4 molar sulfuric acid

METHOD

1. The residue from the anoxic leach test is air dried and quartered using a sample splitter to yield a dry weight sample of about 188 grams. The exact weight of the sample is obtained. The moisture content of the sample is determined on a second quarter of the sample.

2. Place the sample in a 500 ml Erlenmeyer flask, and add distilled water to provide a 1:1 solid to liquid ratio (w/w).

3. Titrate the slurry with 0.4 molar sulfuric acid, while continuously stirring the slurry, to a stable endpoint of 4.5. The endpoint should not change within the period of 1 hour to be considered as stable.

4. The total volume of sulfuric added is recorded.

INTERPRETATION

The residual neutralization potential (NP) for the sample is calculated as follows:

$NP = m * V * 100 / w$

where NP = the neutralization potential in mg $CaCO_3$ eq. / g
m = molarity of the sulfuric acid
V = volume titrant added to the sample
w = weight of the sample in grams

Appendix B

November 20, 1996 Field and Laboratory Work Plan Amendment

Flambeau Mining Company
N4100 Highway 27
Ladysmith, WI 54848
(715) 532-6690
FAX (715) 532-6885

Kennecott
Minerals

November 20, 1996

Mr. Larry Lynch
Wisconsin Department of Natural Resources
Bureau of Waste Management
101 South Webster Street
P.O. Box 7921
Madison, WI 53707-7921

Dear Mr. Lynch:

Re: Flambeau Project - Field and Laboratory Work Plan Amendment

With this letter, Flambeau Mining Company (Flambeau) is providing to the Wisconsin Department of Natural Resources (WDNR) the additional information requested during our November 7, 1996, meeting pertaining to Flambeau's October 30, 1996 submittal, Flambeau Open Pit Backfilling - Field and Laboratory Work Plan (Work Plan).

Type II Material Variability

During our meeting you inquired if the planned Type II stockpile sampling program would provide data spanning the variability of material characteristics expected to be encountered during 1997 backfilling. As described in the Work Plan, 68 Type II material test pit samples have been collected. A review of the test pit paste pH data showed a range of paste pH values between approximately 3.3 and 7.5. It is likely, based on earlier work, that areas within the stockpile (especially on the outer slopes) will have paste pH values between 2.0 and 3.0. Therefore, surface and near surface samples from locations 3, 4, 8, 13-1, 15-1, and 15-3, , as shown on Figure 4-1 of the October 1996 report, *Fall 1996 Backfilling Plan for Stockpiled Type II Material*, have been collected for use in the planned test. The paste pH values of these six samples range from approximately 2.4 to approximately 3.0. The six samples will be substituted in the test program for six test pit samples that had paste pH values well above 6.0 s.u.

Since the six new samples were collected from the surface, field collection techniques differed slightly from those outlined in our Work Plan. For instance, at locations 3, 4, and 8, samples were collected right at the surface. For locations 13-1 and 15-1, samples were collected using a shovel at a depth of 1 foot. At ~~locations~~ location 15-3, the samples was collected, also using a shovel, at a depth of 3 feet.

Material Characterization at the Excavation Face

After careful consideration of your comments on November 7 regarding the difficulty of collecting samples from the excavation face that do not contain limestone and the subsequent difficulty in interpreting the results of the tests, we have decided to delete material characterization at the excavation face (Section 2.1.2 of the Work Plan) from the test program.

Column Testing

As we agreed on November 7, Flambeau will review with the WDNR the results of the Type II material alkali demand tests and the selection of samples for column testing prior to charging of the planned columns. As currently envisioned, we should be in a position to discuss this with you on or about November 26th. I will contact you later this week to set a date and time for the discussion.

We also currently anticipate charging the columns on or about December 5th. We will firm up this date when we talk on November 26th so you can arrange to have someone from the WDNR present if you would like.

Type I Material Testing

After considering your comments, we have decided to reduce the number of samples from the sandstone area of the Type I material stockpile from five to two, and increase the number of Type I waste rock samples from ten to 13.

Figure B-1 of Work Plan

Figure 1, attached, is the same figure as that presented in Attachment B of the Work Plan. Figure 2, attached, provides the raw data used to generate Figure 1.

The alkali demand test procedure, B1 as presented in Attachment B of the Work Plan, was developed to eliminate the need for lengthy, and labor intensive titration procedures. The basis for the development of the test protocol is the data that was generated from the earlier investigations reported in the October 1996 *Fall 1996 Backfilling Plan for Stockpiled Type II Material*. As shown in Figure 2, the alkali demand is related to the paste pH. A linear regression fit yielded an r^2 value of 0.82. The spread in the data, however, appears to increase towards the lower end of the pH scale, even though fewer data points are available within this area. The regression was found to intersect the pH-axis at about 6.0 s.u.

The graph that is used in the alkali demand test protocol (Figure 1) was developed as follows. The first addition rate was set at the average addition rate, as indicated by the best fit curve, i.e. by the straight line represented by:

$$A = m * pH + c$$

where: A = alkali demand as mg Ca(OH)2 / g moist soil
m = slope of the line = -2.68
pH = paste pH in s.u.
c = intercept = 16.08

The second and third were set above and below the average, respectively, as shown by the two straight lines in Figure 2, to cover both the spread and trend of the data. To accommodate the spread in the data, the slope in the lines were first adjusted by 15% above and below that obtained for the best fit. Second, the pH-axis intercepts were fixed at values 5.5 and 6.5 s.u. respectively, and the value of c was recalculated accordingly. The straight line formulations for the lower and upper addition rates are as follows:

Rate	Slope (m)	Intercept (c)
Lower	-2.33	12.82
Upper	-3.08	20.03

The above correlations provide the addition rates on the basis of milligrams of lime per gram of moist Type II material. As used in the test protocol, shown in Figure 1, these correlations were corrected for the test conditions, i.e., a lime slurry of 200 g/l, and a test sample of 500 g. The graphs yield a volume of lime slurry required directly on the y-axis.

List of Analytes

As we discussed on November 7, we have added zinc to the list of cations for the planned leachate extraction and column tests.

Protocol for ¼-inch to 3-inch Material

Attached is the leach extraction test protocol for the ¼-inch to 3-inch size fraction. The protocol should be added to Attachment B of the Work Plan as item B5.

Backfilled Material Testing

As discussed on November 7, it is highly unlikely that the planned 100,000 to 150,000 tons of Type II material will be backfilled this year due to the early onset of winter. It is entirely probable that the approximate 10,000 tons moved to date will be the extent moved this year. As originally envisioned, 45 test pits and 15 samples were to be collected from the backfilled area. Due to the limited material actually to be backfilled, the sampling and testing program have been modified to 15 test pits and five samples. The five samples will be tested as discussed in the Work Plan, except two samples will be column tested instead of three as originally planned.

Closing Comments

For your information, I have enclosed revised Tables 2.1 and 3.1 from the Work Plan that reflect the modifications discussed in this letter. If you have any questions regarding these tables or our comments, please contact me at (715) 532-6690.

Sincerely,

Tom Myatt

TomMyatt
Flambeau Mining Company

cc: Al Christianson, City of Ladysmith
Jeff Earnshaw, Flambeau
Daryl Hockley, Steffen Robertson and Kirsten
Jim Hutchison, Foth & Van Dyke
Ken Markart, Wisocnisn Department of Matural Resources
Jana E. Murphy, Flambeau
Thure Osuldsen, Rusk Coutny
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Melvin Spencer, Rusk Co. Zoning

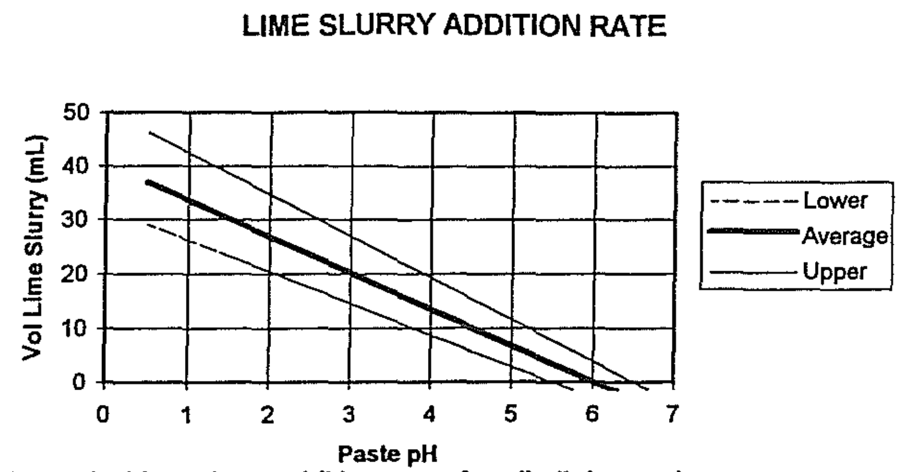

Figure 1. Lime slurry addition rates for alkali demand assessment

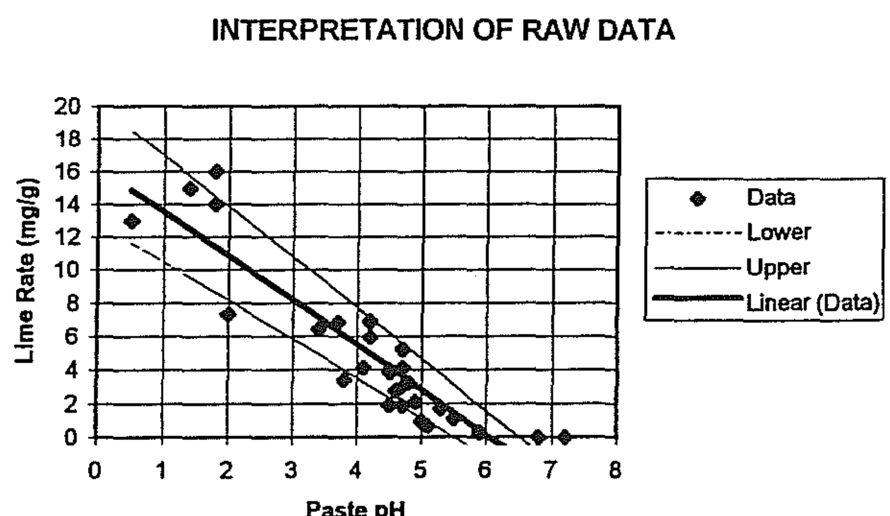

Figure 2. Correlation between lime demand and paste pH

B5 LEACH EXTRACTION TEST

Modified for 1/4 inch to 3 inch size fraction.

EQUIPMENT

1. 10 liter buckets or roll bottles
2. distilled water
3. pH, redox and conductivity meters
4. large spatula or rollers as appropriate
5. filtration equipment and 0.45 μm filter membranes

METHOD

1. Accurately weigh out 5.0 kg of the 1/4 to 3 inch material and place in extraction vessel.
2. Add 5.0 liter distilled water to extraction vessel.
3. Agitate occasionally with spatula if test is conducted in bucket, or place on rollers for 24 hours, as appropriate. Ensure that the slurry is well mixed at 24 hours.
4. Allow solids to settle and measure solute pH, conductivity and redox potential.
5. Extract leachate, filter and preserve solute samples as required for analysis.

LIST OF ANALYTES

pH, redox, conductivity, alkalinity/acidity
Anions: SO_4^{2-}; Cl^-
Cations: Al, Cd, Ca, Cr, Cu, Co, Fe2+, Fe(T), K, Mn, Mg, Na, Tl, Zn.

TABLE 2.1[1]
Summary of Field Investigation Program

	Number of Samples						
Material type	Type II			CUF Solids	Type I Stockpile		
	Ahead of Relocation	Remainder	Fall 1996 Backfill		Sandstone	Saprolite	Type I Rock
Test Pits[2]	38	30	15		2	5	13
Depth (ft)	15	15	3		10	10	10
Samples							
<1/4 inch	38	30	5	2	2	5	13
< 3inch		6					
Field Parameters							
Paste pH	152	120	20	2	8	20	52
Paste cond.	152	120	20	2	8	20	52

na - not applicable
[1]Revised November 18, 1996
[2]Six Type II samples were taken from surface locations in lieu of six test pit locations.

TABLE 3.1[1]
Summary of Laboratory Investigation Program

	Number of Samples						
Material type	Type II			CUF Solids	Type I Stockpile		
Test	Ahead of Relocation	Remainder of Stockpile	Fall 1996 Backfill		Sandstone	Saprolite	Type I Rock
Alkali Demand	38	30	-	-	2	5	13
Anoxic Column - limestone	-	18	2	2	-	-	-
Anoxic Column - lime	-	6	-	-	-	-	-
Leach Extraction	-	12	-	-	2	5	13
Anoxic Extraction	-	-	5	-	-	-	-
Acid Consumption	-	-	5	2	-	-	-
ABA	-	-	-	-	2	5	13

[1]Revised November 18, 1996

Appendix C

Table 1 - Type I and II Stockpile Sample Collection Summary

Table 1
Flambeau Mining Company
Type I & II Stockpile Sample Collection Summary

Test Pit ID	Date Collected	Location[1] northing	easting	Elevation (msl)	Bulk Sample Status	Sample Replicate	Field Paste pH	Conductivity (uS)	Temperature (deg. C)
Type II Material									
3[2]	11/13/96	39647	40493	1153.6	Delivered to FVD	1	2.62	3750	20.7
						2	2.59	3740	20.6
						3	2.62	3780	20.4
						4	2.55	3470	20.3
						1A[3]	2.60	4000	20.7
						2A[3]	2.59	3830	20.6
						3A[3]	2.59	4090	20.3
						4A[3]	2.53	3670	20.3
4	11/13/96	39612	40909	1152.8	Delivered to FVD	1	2.97	2050	21.1
						2	2.85	2550	20.9
						3	3.52	1955	20.9
						4	2.81	2010	20.9
8[2]	11/13/96	40514	41076	1157.9	Delivered to FVD	1	3.05	822	21.2
						2	2.70	1623	21.2
						3	3.22	643	21.2
						4	3.19	728	21.0
13-1	11/13/96	39683	40811	1154.3	Delivered to FVD	1	2.40	4110	20.6
						2	2.34	3930	20.6
						3	2.58	2810	20.6
						4	2.46	3150	20.5

Table 1 *(Continued)*

Test Pit ID	Date Collected	Location[1] northing	easting	Elevation (msl)	Bulk Sample Status	Sample Replicate	Field Paste pH	Conductivity (uS)	Temperature (deg. C)
15-1	11/13/96	40716	41080	1157.1	Delivered to FVD	1	2.22	4660	21.0
						2	2.34	4550	20.6
						3	2.56	3650	20.5
						4	2.43	4720	20.8
15-3	11/13/96	40716	41080	1157.1	Delivered to FVD	1	2.67	3240	21.1
						2	2.64	3910	21.1
						3	2.61	3460	21.1
						4	2.82	2790	21.1
146	10/23/96	40357	40917	1216.9	Delivered to FVD	1	5.23	328	20.8
						2	5.01	344	21.9
						3	4.93	416	22.4
						4	5.01	414	22.5
147	10/23/96	40357	40863	1216.7	Delivered to FVD	1	6.79	154	22.4
						2	6.37	173	22.4
						3	5.87	220	22.6
						4	5.61	294	22.4
148	10/23/96	40357	40802	1217.0	Delivered to FVD	1	6.76	234	20.5
						2	6.37	202	21.5
						3	6.21	219	21.9
						4	5.44	315	22.2
149	10/23/96	40357	40743	1216.8	Delivered to FVD	1	5.34	448	22.3
						2	5.70	421	21.9
						3	6.03	351	21.9
						4	5.50	376	21.7

Table 1 *(Continued)*

Test Pit ID	Date Collected	Location[1] northing	Location[1] easting	Elevation (msl)	Bulk Sample Status	Sample Replicate	Field Paste pH	Conductivity (uS)	Temperature (deg. C)
150A	10/23/96	40358	40683	1217.4	Delivered to FVD	1	6.23	365	20.9
						2	6.99	301	21.9
						3	6.75	267	22.0
						4	6.43	358	21.9
150B[4]	10/23/96	40358	40683	1217.4	Delivered to FVD	1	6.37	352	20.5
						2	6.55	292	21.8
						3	6.29	363	22.1
						4	6.73	234	22.2
151	10/23/96	40358	40623	1215.8	Delivered to FVD	1	6.22	181	21.4
						2	5.38	290	21.9
						3	6.16	145	21.7
						4	5.67	240	21.8
152	10/23/96	40416	40683	1216.5	Delivered to FVD	1	6.02	340	21.6
						2	5.16	503	21.5
						3	6.64	376	21.8
						4	5.42	367	21.8
153	10/23/96	40417	40743	1217.4	Delivered to FVD	1	4.88	439	21.1
						2	5.34	279	22.3
						3	5.04	348	22.6
						4	5.09	375	22.7
154	10/23/96	40417	40803	1217.5	Delivered to FVD	1	6.07	135	21.6
						2	4.75	325	22.2
						3	4.90	289	22.5
						4	4.81	318	22.5

Table 1 *(Continued)*

Test Pit ID	Date Collected	Location[1] northing	Location[1] easting	Elevation (msl)	Bulk Sample Status	Sample Replicate	Field Paste pH	Conductivity (uS)	Temperature (deg. C)
						1A[3]	6.11	139	21.8
						2A[3]	4.97	347	22.2
						3A[3]	5.01	300	22.4
						4A[3]	4.97	303	22.4
155	10/23/96	40476	40925	1217.8	Delivered to FVD	1	5.21	211	22.6
						2	5.27	197	22.6
						3	5.27	241	22.5
						4	5.31	199	22.5
156	10/22/96	40476	40925	1217.8	Delivered to FVD	1	4.68	338	17.6
						2	5.03	313	18.6
						3	5.00	246	19.0
						4	5.30	258	19.1
157	10/22/96	40477	40864	1218.1	Delivered to FVD	1	4.56	567	17.8
						2	4.93	410	18.3
						3	4.52	621	18.5
						4	4.96	294	18.5
158	10/22/96	40477	40804	1217.9	Delivered to FVD	1	5.51	214	17.9
						2	5.52	201	18.2
						3	6.01	120	18.3
						4	4.85	490	18.4
159	10/22/96	40478	40744	1217.9	Delivered to FVD	1	5.72	240	17.7
						2	5.18	386	18.5
						3	5.14	302	18.9
						4	5.10	409	18.9

Table 1 *(Continued)*

Test Pit ID	Date Collected	Location[1] northing	easting	Elevation (msl)	Bulk Sample Status	Sample Replicate	Field Paste pH	Conductivity (uS)	Temperature (deg. C)
160	10/22/96	40538	40745	1218.6	Delivered to FVD	1	5.80	172	18.6
						2	5.04	382	18.6
						3	5.07	472	18.7
						4	5.56	217	18.9
161	10/22/96	40538	40804	1218.5	Delivered to FVD	1	6.30	240	17.9
						2	5.63	310	18.8
						3	5.32	443	18.9
						4	5.56	263	18.9
162	10/22/96	40537	40865	1218.0	Delivered to FVD	1	6.02	280	17.3
						2	5.27	465	18.1
						3	5.63	344	17.9
						4	6.02	251	18.1
163	10/22/96	40537	40925	1218.3	Delivered to FVD	1	6.69	144	17.4
						2	6.49	158	17.9
						3	5.82	314	17.8
						4	5.80	242	17.9
164	10/22/96	40596	40925	1219.2	Delivered to FVD	1	6.26	371	17.8
						2	6.44	232	18.2
						3	6.54	271	18.1
						4	6.71	248	18.2
						1A[3]	6.42	375	NR
						2A[3]	6.53	241	NR
						3A[3]	6.52	282	NR
						4A[3]	6.70	242	NR

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Table 1 *(Continued)*

Test Pit ID	Date Collected	Location[1] northing	Location[1] easting	Elevation (msl)	Bulk Sample Status	Sample Replicate	Field Paste pH	Conductivity (uS)	Temperature (deg. C)
165A[5]	10/22/96	40597	40864	1219.3	Delivered to FVD	1	5.48	376	19.2
						2	5.28	476	18.2
						3	6.33	255	17.8
						4	5.27	415	18.1
165B[5]	10/22/96	40597	40864	1219.3	Delivered to FVD	1	5.20	582	17.3
						2	5.71	483	17.3
						3	5.10	717	17.3
						4	5.03	769	17.8
166A	10/22/96	40597	40804	1219.0	Delivered to FVD	1	5.11	344	19.2
						2	5.77	231	18.2
						3	5.30	378	18.1
						4	5.55	415	17.8
166B[4]	10/22/96	40597	40804	1219.0	Delivered to FVD	1	5.56	281	17.6
						2	5.31	392	18.5
						3	5.90	208	18.6
						4	5.68	355	18.4
167	10/22/96	40657	40806	1219.3	Delivered to FVD	1	6.48	275	18.6
						2	6.05	268	16.7
						3	6.01	229	16.5
						4	6.16	213	16.5
168	10/22/96	40657	40865	1220.0	Delivered to FVD	1	6.79	245	7.9
						2	7.24	190	6.9
						3	7.35	203	7.4
						4	7.48	192	6.8

Table 1 *(Continued)*

		Location[1]		Elevation	Bulk Sample	Sample	Field	Conductivity	Temperature
Test Pit ID	Date Collected	northing	easting	(msl)	Status	Replicate	Paste pH	(uS)	(deg. C)
169	10/22/96	40656	40925	1220.3	Delivered to FVD	1	6.25	198	16.9
						2	6.22	198	16.9
						3	6.20	210	17.1
						4	6.19	206	17.1
170	10/22/96	40716	40925	1219.9	Delivered to FVD	1	5.24	665	8.4
						2	5.24	607	9.7
						3	5.14	531	8.4
						4	5.31	569	8.4
171	10/22/96	40717	40865	1219.4	Delivered to FVD	1	6.57	261	7.2
						2	6.24	261	7.7
						3	6.55	255	7.7
						4	6.02	343	7.3
172	10/23/96	40713	40985	1216.7	Delivered to FVD	1	3.65	1686	21.5
						2	3.60	1776	21.9
						3	3.25	1830	22.0
						4	3.68	1634	21.9
173	10/23/96	40651	40987	1215.5	Delivered to FVD	1	4.93	782	20.6
						2	4.97	688	21.9
						3	4.78	1106	22.0
						4	5.06	644	22.1
174	10/23/96	40593	40990	1214.5	Delivered to FVD	1	7.15	320	20.3
						2	6.98	355	21.5
						3	6.44	354	21.7
						4	6.15	485	21.7

Table 1 *(Continued)*

Test Pit ID	Date Collected	Location[1]		Elevation (msl)	Bulk Sample Status	Sample Replicate	Field Paste pH	Conductivity (uS)	Temperature (deg. C)
		northing	easting						
175	10/23/96	40529	40987	1215.0	Delivered to FVD	1	5.04	644	20.2
						2	4.60	1375	21.6
						3	4.66	1530	21.8
						4	4.46	1479	21.8
176	10/23/96	40463	40987	1214.0	Delivered to FVD	1	4.24	1472	20.8
						2	4.29	1999	21.3
						3	4.28	2110	21.1
						4	4.31	2110	21.2
177	10/23/96	40412	40992	1214.1	Delivered to FVD	1	3.70	1335	20.4
						2	3.89	1578	21.1
						3	4.14	1232	21.2
						4	4.05	1179	21.5
178	10/23/96	40441	40644	1215.9	Delivered to FVD	1	5.72	603	20.6
						2	6.89	787	21.5
						3	6.40	477	21.6
						4	6.79	784	21.5
179	10/23/96	40509	40671	1214.7	Delivered to FVD	1	4.27	1600	20.8
						2	3.53	2210	21.5
						3	4.36	1616	21.7
						4	4.68	779	21.9
180	10/23/96	40557	40706	1212.4	Delivered to FVD	1	4.58	1536	20.1
						2	4.58	1191	21.3
						3	5.18	579	21.5
						4	4.45	1438	21.8

Table 1 *(Continued)*

Test Pit ID	Date Collected	Location[1] northing	Location[1] easting	Elevation (msl)	Bulk Sample Status	Sample Replicate	Field Paste pH	Conductivity (uS)	Temperature (deg. C)
181	10/23/96	40618	40737	1212.1	Delivered to FVD	1	4.28	1668	22.2
						2	3.98	1640	21.9
						3	4.14	1857	21.9
						4	4.16	1520	22.0
182	10/23/96	40738	40801	1212.4	Delivered to FVD	1	4.81	877	21.1
						2	4.25	2110	21.1
						3	4.23	1856	22.6
						4	4.57	1077	22.9
183	10/23/96	40738	40801	1212.4	Delivered to FVD	1	4.01	1576	21.8
						2	4.29	1270	23.1
						3	4.48	1209	22.7
						4	4.67	1100	22.6
184	10/30/96	40282	40668	1213.5	Delivered to FVD	1	7.37	133	20.9
						2	7.14	77	21.2
						3	6.97	89	21.2
						4	6.49	134	20.9
						1A[3]	6.59	131	20.3
						2A[3]	6.89	90	21.0
						3A[3]	6.70	91	20.7
						4A[3]	6.36	129	20.9
185	10/30/96	40289	40797	1216.0	Delivered to FVD	1	6.80	178	20.3
						2	7.21	90	21.1
						3	6.65	211	19.4
						4	7.35	161	20.3

Table 1 *(Continued)*

Test Pit ID	Date Collected	Location[1]		Elevation (msl)	Bulk Sample Status	Sample Replicate	Field Paste pH	Conductivity (uS)	Temperature (deg. C)
		northing	easting						
186	10/30/96	40316	40991	1219.1	Delivered to FVD	1	3.85	168	21.1
						2	4.37	1022	21.5
						3	4.22	1516	20.6
						4	4.27	1290	21.0
187	10/30/96	40249	40828	1214.6	Delivered to FVD	1	5.61	173	20.5
						2	5.21	337	21.1
						3	5.51	207	20.7
						4	5.48	304	20.6
188	10/30/96	40249	40718	1214.0	Delivered to FVD	1	5.51	518	19.3
						2	5.13	604	21.2
						3	5.35	300	21.4
						4	5.11	875	20.6
189	10/30/96	40200	40601	1208.9	Delivered to FVD	1	5.34	376	19.9
						2	5.06	493	21.5
						3	5.24	342	21.8
						4	5.32	304	21.9
190	10/30/96	40200	40759	1216.0	Delivered to FVD	1	6.06	282	19.9
						2	5.24	417	19.0
						3	6.31	306	19.5
						4	5.79	436	19.6
191	10/30/96	40172	40919	1218.1	Delivered to FVD	1	6.79	187	19.3
						2	5.80	302	20.5
						3	5.87	319	20.6
						4	6.68	202	20.9

Table 1 *(Continued)*

Test Pit ID	Date Collected	Location[1] northing	Location[1] easting	Elevation (msl)	Bulk Sample Status	Sample Replicate	Field Paste pH	Conductivity (uS)	Temperature (deg. C)
192	10/30/96	40180	40996	1218.4	Delivered to FVD	1	5.12	466	18.9
						2	5.05	457	20.9
						3	5.85	319	21.0
						4	4.86	630	20.9
192A[4]	10/30/96	40180	40996	1218.4	Delivered to FVD	1	5.66	310	19.0
						2	4.83	649	21.0
						3	4.61	753	21.1
						4	4.60	687	20.6
193	10/30/96	40161	40823	1214.7	Delivered to FVD	1	6.57	237	19.2
						2	6.06	389	21.2
						3	6.32	267	21.5
						4	6.15	355	20.8
194	10/30/96	40151	40648	1211.4	Delivered to FVD	1	4.56	675	20.5
						2	4.68	544	20.5
						3	4.53	970	20.1
						4	4.91	436	20.2
195[2]	10/30/96	40149	40496	1207.9	Delivered to FVD	1	5.24	501	19.6
						2	5.34	415	20.9
						3	5.62	299	20.7
						4	5.57	449	20.8
196	10/30/96	40099	40545	1209.7	Delivered to FVD	1	5.55	264	19.2
						2	6.18	202	20.8
						3	6.69	156	21.0
						4	5.73	293	20.6

Table 1 *(Continued)*

Test Pit ID	Date Collected	Location[1] northing	Location[1] easting	Elevation (msl)	Bulk Sample Status	Sample Replicate	Field Paste pH	Conductivity (uS)	Temperature (deg. C)
197	10/30/96	40099	40692	1214.0	Delivered to FVD	1	5.04	530	19.6
						2	4.95	593	20.6
						3	4.82	852	21.1
						4	4.84	1036	20.9
198	10/30/96	40047	40601	1211.5	Delivered to FVD	1	5.49	333	20.1
						2	5.83	318	20.7
						3	6.07	214	20.7
						4	5.70	346	21.5
199	10/30/96	40049	40501	1211.1	Delivered to FVD	1	5.13	542	19.6
						2	5.34	438	21.4
						3	5.22	544	21.6
						4	5.36	525	21.8
199A[4]	10/30/96	40049	40501	1211.1	Delivered to FVD	1	5.03	466	20.4
						2	5.03	556	21.4
						3	5.30	564	21.7
						4	5.39	628	21.8
200[2]	10/30/96	40002	40647	1212.4	Delivered to FVD	1	5.22	599	19.0
						2	4.75	423	21.0
						3	4.76	858	21.6
						4	5.01	505	21.7
201	10/30/96	39991	40805	1210.6	Delivered to FVD	1	4.50	1030	20.1
						2	4.53	771	21.5
						3	4.93	747	21.7
						4	4.86	533	21.9

Table 1 *(Continued)*

Test Pit ID	Date Collected	Location[1] northing	easting	Elevation (msl)	Bulk Sample Status	Sample Replicate	Field Paste pH	Conductivity (uS)	Temperature (deg. C)
202	10/30/96	40040	40750	1215.3	Delivered to FVD	1	4.58	951	20.8
						2	5.60	402	21.3
						3	5.32	380	21.7
						4	5.02	754	21.9
203	10/30/96	40046	40903	1215.3	Delivered to FVD	1	5.38	575	19.2
						2	5.81	408	21.6
						3	6.19	393	21.9
						4	5.82	585	21.8
204	10/30/96	40027	40988	1215.2	Delivered to FVD	1	3.92	1363	20.9
						2	3.90	1694	21.7
						3	4.37	1087	21.9
						4	4.35	1141	21.9
205	10/30/96	40096	40848	1212.8	Delivered to FVD	1	5.11	542	20.7
						2	6.17	355	21.5
						3	5.25	594	21.7
						4	5.43	658	21.9
206	10/30/96	39980	40585	1212.7	Delivered to FVD	1	5.59	387	19.9
						2	5.52	473	21.3
						3	5.80	431	21.5
						4	5.74	433	21.1
207A	11/4/96	39790	40514	1188.3	Delivered to FVD	1	5.91	300	22.9
						2	6.04	180	21.8
						3	5.82	292	21.9
						4	4.99	609	22.3

Table 1 *(Continued)*

Test Pit ID	Date Collected	Location[1] northing	Location[1] easting	Elevation (msl)	Bulk Sample Status	Sample Replicate	Field Paste pH	Conductivity (uS)	Temperature (deg. C)
207B[4]	11/4/96	39790	40514	1188.3	Delivered to FVD	1	5.40	309	21.8
						2	5.43	326	21.3
						3	5.49	292	22.4
						4	5.58	335	21.3
208	11/4/96	39776	40451	1186.7	Delivered to FVD	1	5.96	239	22.3
						2	5.68	310	22.8
						3	5.92	268	22.9
						4	5.78	459	23.3
209[2]	11/4/96	39791	40400	1186.3	Delivered to FVD	1	5.04	599	21.4
						2	5.07	513	21.5
						3	5.02	560	22.1
						4	4.41	294	20.1
210[2]	11/4/96	39700	40438	1193.3	Delivered to FVD	1	4.86	518	21.7
						2	4.91	520	22.8
						3	4.85	524	22.8
						4	4.51	497	22.7
211	11/4/96	39842	40983	1191.2	Delivered to FVD	1	4.82	283	22.6
						2	3.41	737	22.7
						3	3.95	545	22.5
						4	3.56	619	22.3
						1A[3]	4.87	285	22.6
						2A[3]	3.47	828	22.8
						3A[3]	4.05	562	22.7
						4A[3]	3.56	646	22.8

Table 1 *(Continued)*

Test Pit ID	Date Collected	Location[1] northing	Location[1] easting	Elevation (msl)	Bulk Sample Status	Sample Replicate	Field Paste pH	Conductivity (uS)	Temperature (deg. C)
212[2]	11/4/96	39778	40896	1191.2	Delivered to FVD	1	4.59	771	22.9
						2	4.84	488	23.1
						3	4.61	714	23.3
						4	4.62	616	22.8
213	11/4/96	39740	40928	1195.5	Delivered to FVD	1	2.83	2280	21.5
						2	2.61	3220	20.8
						3	2.65	2470	22.2
						4	2.79	2380	22.1
301	11/11/96	40354	40607	1203.1	Delivered to FVD	1	5.33	270	21.6
						2	5.85	286	21.9
						3	5.72	235	22.3
						4	5.73	281	22.2
302	11/11/96	40404	40583	1201.5	Delivered to FVD	1	5.50	373	22.5
						2	6.01	372	22.4
						3	5.49	392	22.4
						4	5.41	388	22.3
CUF 1	11/04/96	39877	40782	1208.6	Delivered to FVD	NA	NA	NA	NA
CUF 2	11/04/96	39840	40714	1209.5	Delivered to FVD	NA	NA	NA	NA

Table 1 *(Continued)*

Test Pit ID	Date Collected	Location[1] northing	Location[1] easting	Elevation (msl)	Bulk Sample Status	Sample Replicate	Field Paste pH	Conductivity (uS)	Temperature (deg. C)
Type I Material									
1	11/04/96	42487	40355	1202.2	Delivered to FVD	1	6.83	44	22.2
						2	6.76	25	22.2
						3	7.00	28	22.5
						4	6.93	30	22.5
2	11/04/96	42361	40360	1202.6	Delivered to FVD	1	7.45	21	22.8
						2	7.40	11	22.8
						3	7.24	8.5	22.8
						4	7.00	0.25	23.0
3	11/04/96	42344	40163	1203.2	Delivered to FVD	1	7.15	9.8	22.5
						2	7.08	14	22.5
						3	7.10	12	23.1
						4	6.36	26	22.8
4	11/04/96	42285	40034	1199.7	Delivered to FVD	1	5.99	40	23.3
						2	6.65	17	23.3
						3	6.80	19	24.4
						4	6.84	13	23.8
5	11/04/96	42410	40035	1204.6	Delivered to FVD	1	6.31	43	23.4
						2	6.03	19	23.8
						3	6.50	7.6	23.1
						4	6.41	14	23.5
6	11/04/96	42216	39976	1198.2	Delivered to FVD	1	6.46	54	22.5
						2	6.98	24	23.6
						3	7.17	22	23.8
						4	7.28	31	23.8

Table 1 *(Continued)*

Test Pit ID	Date Collected	Location[1] northing	easting	Elevation (msl)	Bulk Sample Status	Sample Replicate	Field Paste pH	Conductivity (uS)	Temperature (deg. C)
7	11/04/96	42151	39944	1198.7	Delivered to FVD	1	6.56	45	23.2
						2	7.12	55	23.1
						3	7.09	59	23.1
						4	6.99	71	23.5
8	11/04/96	42118	40179	1195.5	Delivered to FVD	1	7.66	55	21.9
						2	7.78	28	23.2
						3	7.72	34	22.5
						4	7.74	48	22.6
						1A[3]	7.58	56	20.5
						2A[3]	7.80	32	23.4
						3A[3]	7.69	36	22.8
						4A[3]	7.82	49	23.0
9	11/04/96	42162	40373	1204.5	Delivered to FVD	1	6.98	50	23.2
						2	6.92	42	23.2
						3	7.21	37	23.2
						4	7.47	41	23.1
10	11/04/96	42061	40375	1202.4	Delivered to FVD	1	7.09	138	22.8
						2	7.12	130	23.2
						3	6.84	121	23.2
						4	6.86	130	23.2
11	11/05/96	41922	40017	1195.3	Delivered to FVD	1	7.01	124	21.6
						2	7.26	92	21.2
						3	6.82	176	21.4
						4	6.62	178	20.6

Table 1 *(Continued)*

Test Pit ID	Date Collected	Location[1] northing	easting	Elevation (msl)	Bulk Sample Status	Sample Replicate	Field Paste pH	Conductivity (uS)	Temperature (deg. C)
12	11/05/96	41985	39827	1195.7	Delivered to FVD	1	7.07	93	21.4
						2	7.22	55	22.2
						3	6.99	75	22.0
						4	7.02	48	22.1
13	11/05/96	41943	39606	1195.8	Delivered to FVD	1	7.17	94	21.6
						2	7.58	86	22.2
						3	7.78	67	21.2
						4	7.82	111	21.8
14	11/05/96	41785	39680	1198.4	Delivered to FVD	1	7.29	87	22.6
						2	7.54	84	22.8
						3	7.70	79	22.4
						4	7.88	75	23.0
						1A[3]	7.14	118	22.3
						2A[3]	7.56	91	22.3
						3A[3]	7.78	85	22.4
						4A[3]	7.77	86	22.3
15	11/05/96	41809	39852	1194.6	Delivered to FVD	1	7.36	93	22.7
						2	7.61	93	22.7
						3	7.42	113	22.9
						4	7.16	231	22.9
16	11/05/96	41642	39525	1200.5	Delivered to FVD	1	7.41	97	22.6
						2	7.53	92	22.8
						3	7.79	101	23.0
						4	7.67	152	23.0

Table 1 *(Continued)*

Test Pit ID	Date Collected	Location[1] northing	easting	Elevation (msl)	Bulk Sample Status	Sample Replicate	Field Paste pH	Conductivity (uS)	Temperature (deg. C)
17	11/05/96	41608	39730	1200.8	Delivered to FVD	1	6.62	131	22.2
						2	6.75	176	22.6
						3	7.35	157	22.8
						4	7.39	154	22.8
18	11/05/96	39757	38929	1101.3	Delivered to FVD	1	7.77	203	21.2
						2	7.68	206	22.6
						3	7.40	223	22.8
						4	7.32	219	22.9
19	11/05/96	41791	40293	1176.4	Delivered to FVD	1	6.63	284	21.5
						2	6.20	320	22.7
						3	6.97	256	22.9
						4	6.31	314	23.1
20	11/05/96	41846	40294	1169.5	Delivered to FVD	1	6.99	76	23.0
						2	6.80	90	23.1
						3	7.02	60	23.1
						4	6.46	122	23.1
21	11/13/96	41733	39740	1197.4	Delivered to FVD	1	6.86	67	21.1
						2	6.85	83	21.1
						3	7.08	84	20.9
						4	6.79	102	21.0
22	11/13/96	41687	39621	1200.8	Delivered to FVD	1	7.18	118	21.2
						2	6.77	108	20.8
						3	7.36	121	20.9
						4	7.22	150	20.9

Table 1 *(Continued)*

Test Pit ID	Date Collected	Location[1] northing	easting	Elevation (msl)	Bulk Sample Status	Sample Replicate	Field Paste pH	Conductivity (uS)	Temperature (deg. C)
23	11/13/96	41576	39618	1201.0	Delivered to FVD	1	6.75	166	21.2
						2	7.49	176	21.2
						3	7.37	171	21.2
						4	7.80	110	21.2
<u>Backfilled Type II Material</u>[6]									
1	11/13/96	19957	41308	983.4	Delivered to FVD	1	6.47	562	20.8
2		19987	41311	984.0		2	6.62	754	20.9
3		20017	41313	983.9		3	7.20	720	20.7
						4	7.42	617	20.9
4	11/13/96	20000	41266	981.8	Delivered to FVD	1	7.41	570	21.2
5		19985	41265	981.5		2	7.61	415	21.2
6		19963	41260	980.8		3	7.74	355	21.3
						4	7.75	544	21.2
7	11/13/96	19965	41226	979.8	Delivered to FVD	1	7.65	454	21.2
8		19991	41228	980.4		2	8.04	244	21.0
9		19991	41189	979.6		3	8.22	296	21.0
						4	8.12	335	20.9
10	11/13/96	20002	42001	989.8	Delivered to FVD	1	7.00	1065	21.0
11		20001	42038	989.6		2	7.00	908	21.1
12		20002	42064	990.8		3	6.62	874	21.1
						4	7.05	921	21.1
13	11/13/96	19972	42079	990.6	Delivered to FVD	1	7.00	734	21.0
14		19971	42047	990.9		2	6.97	808	21.1
15		19969	42021	990.5		3	7.26	574	20.9
						4	4.70	1479	21.2

Table 1 *(Continued)*

Test Pit ID	Date Collected	Location[1] northing	Location[1] easting	Elevation (msl)	Bulk Sample Status	Sample Replicate	Field Paste pH	Conductivity (uS)	Temperature (deg. C)

[1]Locations for backfilled Type II material based on mine grid. All other locations based on site grid.

[2]Two samples (<1/4-in and 1/4-in to 3-in) collected at these locations.

[3]Duplicate readings taken from the paste pH sample to check reproducibility.

[4]Duplicate samples collected at the same location to assess variability.

[5]Two separate samplings were done in this test pit since an area of obvious pyrite was noticed at the base of the test pit. The first sampling was conducted on material from 0-9 ft, the second on material from 9-15 ft.

[6]Sample 1 produced from test pits 1, 2, and 3; Sample 2 from test pits 4, 5, and 6; Sample 3 from test pits 7, 8, and 9; Sample 4 from test pits 10, 11, and 12; and Sample 5 from test pits 13, 14, and 15.

NA = Not analyzed due to sample matrix.

NR = No Reading.

Note: Locations rounded to the nearest whole number; elevations rounded to the nearest tenth; and conductivity rounded to two significant figures.

Prepared by: FJA
Checked by: SDJ/JWS

Appendix D

Modifications to Laboratory Test Procedures

FACSIMILE COVER PAGE

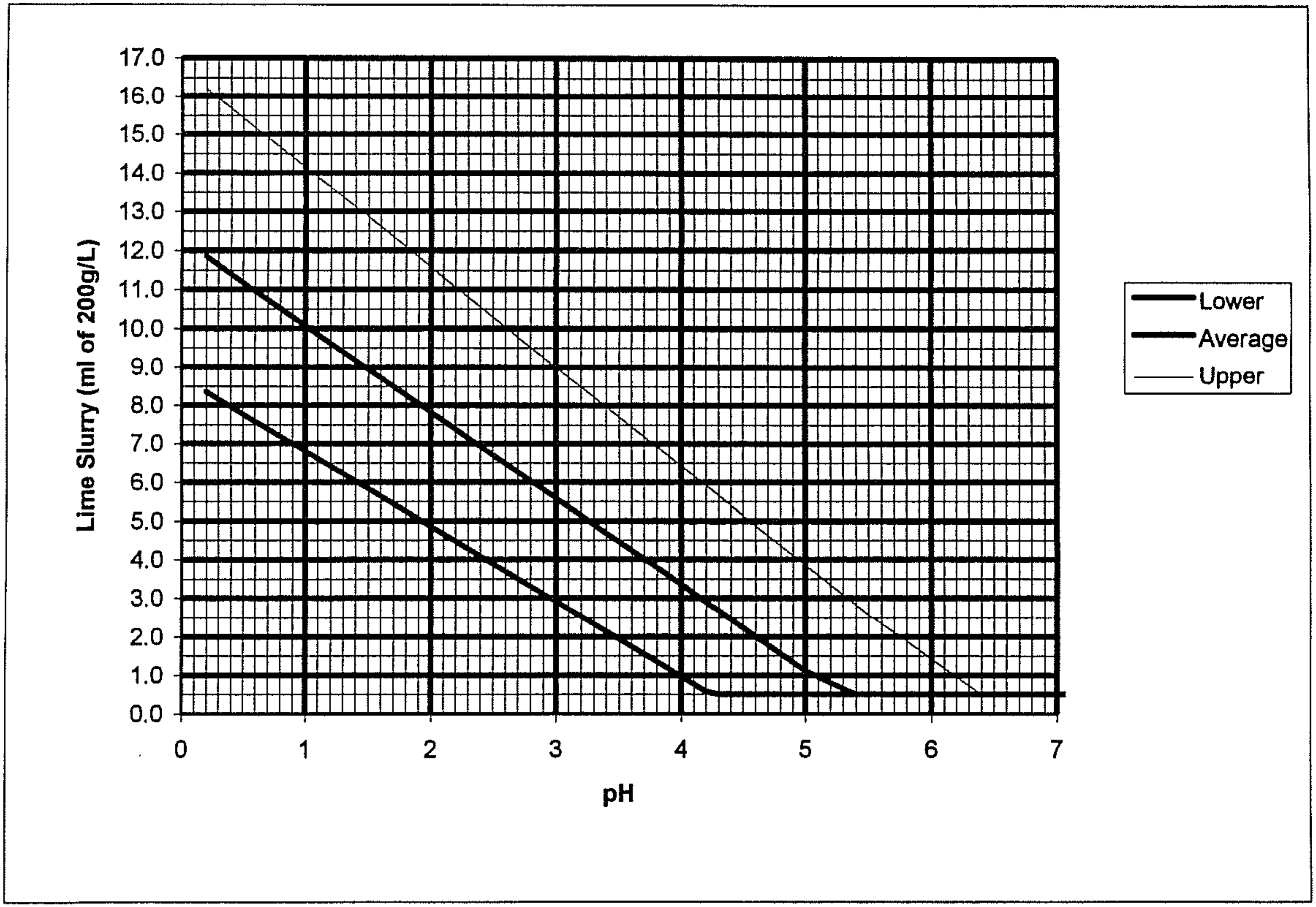
To:	Russ Janeshek	Time:	15:30:46
From :	J.T. Chapman, P.Eng	Date:	24/11/96
Subject:	Microsoft Excel - ALK_DEM2.XLS		
Pages (including cover):	2		

Russ,

Attached is the new graph fo rthe lime additions. Where the start pH falls between 4.5 and 5.5, the minimum dosage to the first test is 0.5 ml, an dthe second and third is as per the two dosage rates. If the pH falls between 5.5 and 6.5, the first flask is not amended, the second receives a dosage of 0.5 ml, and the third as per the upper dosage line. For a pH of greater than 6.5 no amendmend is required.

Hope this is clear. I will ~~the~~ send the file by e-mail as well.

Call if you have any questions,
John C.


Lime Slurry (ml of 200g/L)
17.0
16.0
15.0
14.0
13.0
12.0
11.0
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0
1
2
3
4
5
6
7
pH
Lower
Average
Upper

B.3 LEACH EXTRACTION TEST

EQUIPMENT

1. 1 liter Erlenmeyer flasks or roll bottles
2. distilled water
3. pH, redox and conductivity meters
4. rotary shaker or rollers as appropriate
5. filtration equipment and 0.45µm filter membranes

METHOD

1. Weigh out accurately three 500-gram samples of the < 1/4 inch material and place in extraction vessel.
2. Add 500 ml distilled water to each extraction vessel.
3. Gently agitate sample for 24 hours.
4. Allow solids to settle (0.5 to 1 hour) and measure solute pH, conductivity and redox potential.
5. Extract leachate, combining during filtering gravimetrically, filter and preserve solute samples as required for analysis. Also filter with 0.45µm if filtrate is cloudy.

Note: The anoxic extraction test procedure is exactly the same as described above, but the head space of the test vessel is flushed with argon to displace oxygen, and is kept sealed at all times. The duration of the test (item 3) is extended from 24 hours to 72 hours.

LIST OF ANALYTES

field pH, field redox, field conductivity, alkalinity/acidity
Anions: SO_4^{2-} ; Cl^-
Cations: Al, Cd, Ca, Cr, Cu, Co, Fe2+, Fe(T), K, Mn, Mg, Na, Tl, Zn.

Modified by JET
12/16/96

MLD2\96F022\B3-EXTR.DOC

MEMORANDUM

96

TO: Jerry Sevick BY FAX: 1(414)4[redacted] 6902
From: John Chapman / Daryl Hockley
RE: Flambeau Column Tests - Procedure Modification
Date: 16 January 1997
Project: F107108

Jerry,

As we had discussed yesterday, the problem with the column tests is that the kinetics are very slow in that we have rely on dissolution by diffusive processes to achieve first acid neutralization, and then secondary mineralization. Both of these processes are slow. The following may be a way of 'speeding up' the process the rate limiting steps.

To overcome the transport problem, the column operation should be modified so that the leachate be recycled continuously through the column. The suggested column set-up modifications are illustrated in the attached figure. It is important that anoxic conditions be maintained at all times. The modifications would be as follows.

1. Set up an Erlenmeyer (250 to 500 mL) flask or similar with a stopper that has 4 holes bored through it as follows to serve as (a) Argon inlet, (b) Argon outlet with water trap as before, (c) column discharge in and (d) leachate return to column. The lines for the leachate in, leachate out and argon in should be submerged below the leachate surface. The argon vent should be above the leachate surface.
2. Provide the column feed line and column discharge lines with shut-off valves or clamps as near to the Erlenmeyer flask as possible.

Start-up and operation.

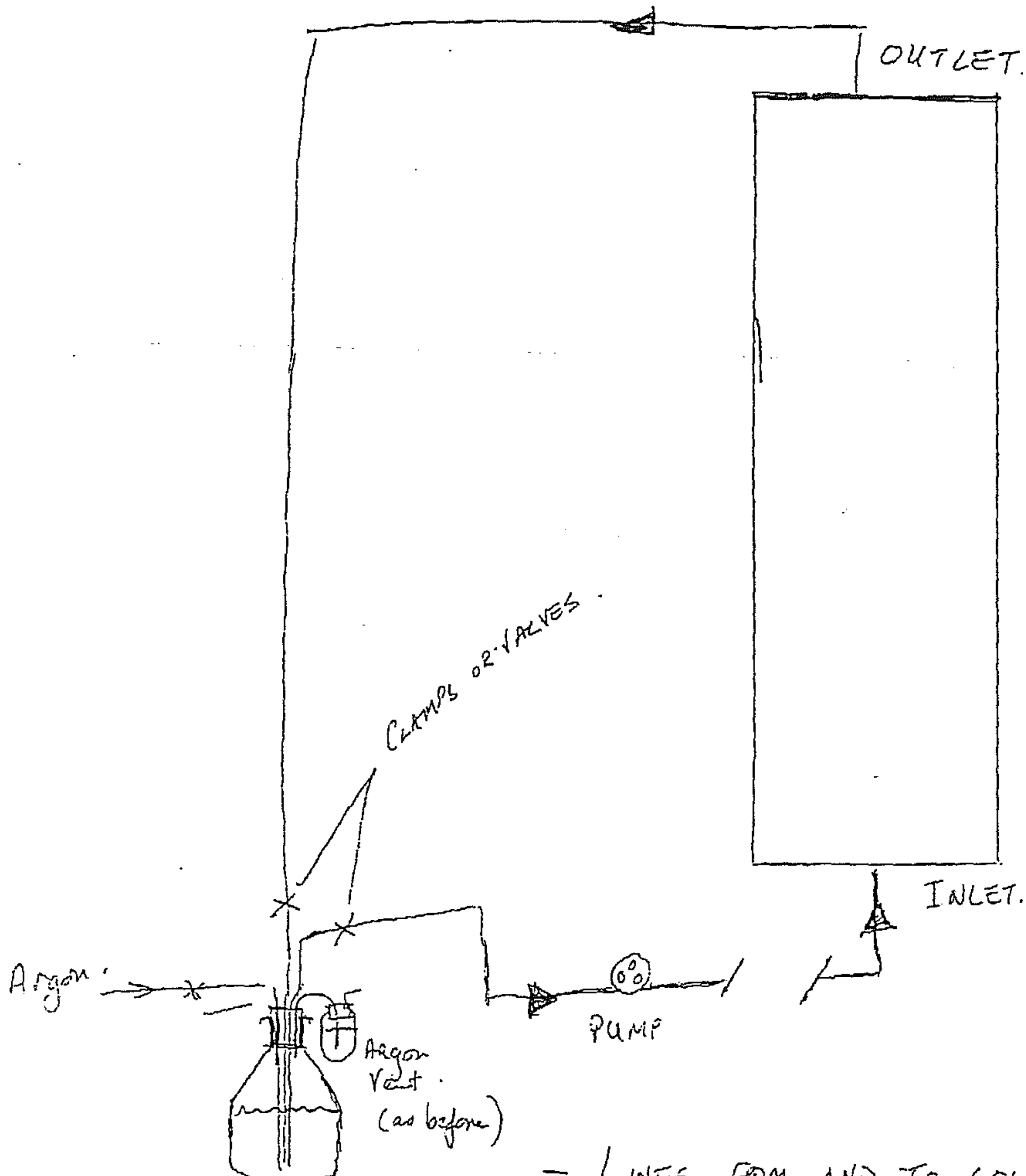
1. Place approximately 200[redacted] ml of distilled de-aerated water in the Erlenmeyer flask.
2. Place stopper firmly in place.
3. Sparge with argon for a few minutes until air has been displaced. Ensure water trap is in place.
4. Seal off column feed and discharge lines in appropriate locations and cut in preparation for connections. Take care to maintain anoxic conditions.
5. Connect feed and discharge lines to the Erlenmeyer flask.
6. Start peristaltic pump to displace approximately 1 litre every eight hours - running continuously.

Daily or every second day:

1. Stop peristaltic pump.
2. Seal off feed leachate lines.
3. Activate argon sparging.
4. Lift of stopper and obtain pH and conductivity measurements, taking care to minimize exposure to atmospheric conditions.
5. Once measurements are complete, replace stopper.
6. Continue argon sparging for a few minutes to ensure all air has been displaced.
7. Terminate argon sparging.
8. Activate pump.

Sampling for analysis

1. Revert to original set-up and complete pore volume displacement as before.



- LINES FROM AND TO COLUMN ALWAYS BELOW LEACHATE SURFACE
- ARGON VENT SETUP AS BEFORE

STEFFEN ROBERTSON AND KIRSTEN (CANADA) INC.
Suite 800, 580 Hornby Street, Vancouver, B.C. Canada V6C 3B6
Phone: (604) 681-4196 Fax: (604) 687-5532

TECHNICAL MEMORANDUM

TO:	G. Sevick	BY FAX: 1(414)496-6902
	R. Janeshek	
CMPANY:	Foth and Van Dyke, Green Bay, WI	
From:	J. Chapman	
Project:	F107108	
Date:	11 February 1997	
RE:	FLAMBEAU ACID DEMAND TEST MODIFICATIONS	

The proposed procedure has been modified to eliminate the need for analysis. A similar method will likely be used to assess the excess alkali present in the samples taken from the backfilled material.

B.4 ACID CONSUMPTION TEST

EQUIPMENT AND REAGENTS

1. 1.0 liter Erlenmeyer flask
2. pH meter
3. Burette
4. Spatula or magnetic stirrer
5. Distilled water
6. 0.05 molar (0.10 N) sulfuric acid (standardized)
7. 0.25 molar (0.25 N) sodium hydroxide (NaOH)
8. 250 ml glass beaker

METHOD

1. The residue from the anoxic leach test is air dried, blended and quartered using a sample splitter to yield a dry weight sample of about 100 grams. The exact weight of the sample is obtained. The moisture content of the sample is determined on a second quarter of the sample.

2. Place the sample in a 1 liter Erlenmeyer flask, and add exactly 500 ml of the 0.05 molar sulphuric acid. Record the total weight of the sample and the flask. Place the sample on a rotary shaker and allow to react for a period of 24 hours.

3. After 24 hours contact time, replace evaporative losses by readjusting the total weight of the flask and sample to that recorded in Step 2. The final pH is obtained and

recorded.

4. Allow the solids to settle, and decant the clear solution. If necessary, filter the solution. Obtain an exact aliquot of 100 ml of the clear solution, and place in the 250 ml beaker. Agitate the sample using a magnetic stirrer. Titrate the solution with the 0.25 N NaOH to a stable endpoint pH of 8.3. Record the amount of titrant added as a function of the pH.

INTERPRETATION

The residual neutralization potential (NP) for the sample is calculated as follows:

$$NP = (25\,000 * N_A - 250 * V * N_B)/w$$

where
- NP = the residual neutralization potential in mg $CaCO_3$ eq./g
- N_A = normality of the sulfuric acid
- N_B = normality of the sodium hydroxide
- V = volume sodium hydroxide required to titrate the 100ml sample to a pH=8.3.
- w = dry weight of the sample in grams

STEFFEN ROBERTSON AND KIRSTEN (CANADA) INC.
Suite 800, 580 Hornby Street, Vancouver, B.C. Canada V6C 3B6
Phone: (604) 681-4196 Fax (604) 687-5532

TECHNICAL MEMORANDUM

TO:	G. Sevick R. Janeshek	BY FAX: 1(414)496-6902 (and by e-mail) Page 1 of 3
COMPANY:	Foth and VanDyke, Green Bay, WI	
From:	J. Chapman	
Project:	F107108	
Date:	19 February 1997	
RE:	FLAMBEAU ACIDCONSUMPTION TEST MODIFICATIONS	

The acid consumption test results for the first 4 residue sample from the column tests have been processed. The results show that:

i. the actual end pH for determining the acid consumption is somewhat lower than the intended target; and,
ii. there is some residual neutralization potential associated with the sample prior to testing.

The consequence of i) is that the acid consumption is overestimated since not only are the carbonates and hydroxide phases dissolved, but mineral phases that would not participate in neutralization reactions within the range operational for the backfill (i.e. >4 s.u.) are also accounted for. (If the originally proposed test was utilized, the solids would have been titrated to a pH of 3.5.). The consequence of ii) is that it is not possible to distinguish the residual alkali that was present in the sample before amendment, and that from the amendment.

The following modification to the test procedure and program are therefor required. In the test procedure, the changes are struck out and the modifications are shown in bold. To accommodate item ii) it will be necessary to complete the acid demand consumption tests on feed material (to the column tests), as well as the residues for the lime amended tests.

B.4 ACID CONSUMPTION TEST

EQUIPMENT AND REAGENTS

1. 1.0 liter Erlenmeyer flask
2. pH meter
3. Burette
4. Spatula or magnetic stirrer
5. Distilled water
6. ~~0.05~~ 0.01 molar (~~0.10~~ 0.02 N) sulfuric acid (standardized)
7. ~~0.25~~ 0.1molar (~~0.25~~ 0.1N) sodium hydroxide (NaOH)
8. 250 ml glass beaker

METHOD

1. The residue from the anoxic leach test is air dried, blended and quartered using a sample splitter to yield a dry weight sample of about ~~100~~ 50 grams. The exact weight of the sample is obtained. The moisture content of the sample is determined on a second quarter of the sample.

2. Place the sample in a 1 liter Erlenmeyer flask, and add exact ~~500~~ 750 ml of the ~~0.05~~ 0.01molar sulphuric acid. Record the total weight of the sample and the flask. Place the sample on a rotary shaker and allow to react for a period of 24 hours.

3. After 24 hours contact time, replace evaporative losses by readjusting the total weight of the flask and sample to that recorded in Step 2. The final pH is obtained and recorded.

4. Allow the solids to settle, and decant the clear solution. If necessary, filter the solution. Obtain an exact aliquot of 100 ml of the clear solution, and place in the 250 ml beaker. Agitate the sample using a magnetic stirrer.Titrate the solution with the ~~0.25~~ 0.10 N NaOH to a stable endpoint pH of 8.3. Record the amount tifrant added as a function of the pH.

INTERPRETATION

The residual neutralization potential (NP) for the sample is calculated as follows:

$$NP = (\cancel{25\,000}\, 7500 * N_A - \cancel{250}\, 100 * V * N_B)/w$$

where
- NP = the residual neutralization potential in mg $CaCO_3$ eq./g
- N_A = normality of the sulfuric acid
- N_B = normality of the sodium hydroxide
- V = volume sodium hydroxide required to titrate the 100ml sample to a pH=8.3.
- w = dry weight of the sample in grams

Appendix E

Size Distribution Effects Test Results

Flambeau Mining Company Shakeflask Test Results									
PARAMETER	UNITS	RESULTS							
Sample ID		FMC-200A	FMC-200B	FMC-209A	FMC-209B	FMC-210A	FMC-210B	FMC-212A	FMC-212B
Solids Sample									
Date		12/6/96	12/5/96	12/6/96	12/4/96	12/6/96	12/4/96	12/6/96	12/4/96
Field									
Sample Weight	g								
Extraction Number									
Eluate Volume	mL								
Conductivity	uS/cm	1422	829	1386	485	1621	402	1683	554
pH	s.u.	4.42	5.32	4.48	4.87	4.43	5.36	4.2	4.93
Eh	mV								
Extraction Period	h	24	24	24	24	24	24	24	24
Laboratory									
pH	s.u.	4.3	4.8	4.5	4.8	4.7	5.1	4.7	4.4
Alkalinity	mgCaCO3eq/L								
Acidity	mgCaCO3eq/L	290	140	340	38	100	36	540	88
SO_4	mg/L	570	550	570	540	600	540	680	180
Cl	mg/L	<0.36	<0.36	0.75	<0.36	1.1	<0.36	0.73	<0.36
Al	mg/L	0.047	<0.034	0.069	<0.034	0.096	<0.034	0.14	<0.034
Cd	mg/L	0.011	0.0082	0.026	0.0086	0.0025	<0.0012	0.054	0.026
Ca	mg/L	130	61	110	37	140	31	170	39
Cr	mg/L	0.0062	<0.0026	0.0048	<0.0026	0.011	<0.0026	<0.0026	<0.0026
Co	mg/L	1.8	0.91	1.6	0.44	1.8	0.31	1.7	0.66
Cu	mg/L	190	110	180	42	85	4.6	290	70
Fe^{2+}	mg/L	<0.0091		<0.0091		<0.0091		0.067	
Fe (T)	mg/L	0.075	<0.010	<0.010	0.016	<0.010	<0.010	0.040	0.092
Pb	mg/L								
Mg	mg/L	40	18	41	14	88	20	44	12
Mn	mg/L	6.7	2.7	17	4.3	30	5.7	7.9	1.7
Ni	mg/L								
K	mg/L	6.4	3.3	6.6	2.4	9.7	3.6	11	3.4
Se	mg/L								
Tl	mg/L	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Na	mg/L	3.6	2.0	3.5	1.3	3.7	0.87	2.9	1.0
Zn	mg/L	4	2	8.3	2.2	1.4	<0.120	9.9	3.7

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Data QA'd through 1/17/97

Flambeau Mining Company
Shakeflask Test Results

PARAMETER	UNITS	RESULTS			
Sample ID		FMC-3A	FMC-3B	FMC-8A	FMC-8B
Solids Sample					
Date		12/6/96	12/4/96	12/6/96	12/5/96
Field					
Sample Weight	g				
Extraction Number					
Eluate Volume	mL				
Conductivity	uS/cm	5870	3010	3120	1962
pH	s.u.	2.53	2.81	2.22	2.67
Eh	mV				
Extraction Period	h	24	24	24	24
Laboratory					
pH	s.u.	2.7	2.8	2.4	2.8
Alkalinity	mgCaCO3eq/L				
Acidity	mgCaCO3eq/L	2000	750	1200	650
SO_4	mg/L	7400	1000	620	530
Cl	mg/L	1.4	0.54	10	<0.36
Al	mg/L	14	4.0	11	4.7
Cd	mg/L	0.16	0.056	<0.0012	<0.0012
Ca	mg/L	290	170	42	16
Cr	mg/L	0.032	0.022	0.015	<0.0026
Co	mg/L	3	1.4	0.38	0.2
Cu	mg/L	660	230	160	120
Fe^{2+}	mg/L	270		1.9	
Fe (T)	mg/L	360	110	290	100
Pb	mg/L				
Mg	mg/L	330	150	9.1	5.1
Mn	mg/L	120	52	1.2	0.56
Ni	mg/L				
K	mg/L	<2.0	<2.0	<2.0	<2.0
Se	mg/L				
Tl	mg/L	<0.025	<0.025	<0.025	<0.025
Na	mg/L	0.63	0.48	0.34	0.37
Zn	mg/L	60	15	3.5	0.7

j:\scopes\96f022\shakflsk\FORM_2_T.XLS

Data QA'd through 1/17/97

NORTHERN LAKE SERVICE, INC.
Analytical Laboratory and Environmental Services
400 North Lake Avenue - Crandon, WI 54520
Tel:(715)478-2777 Fax:(715)478-3060

WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31247

Client: Foth & Van Dyke Associates
Attn: R. Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-3B NLS#: 122422
Ref. Line 1 of COC 23580 Description: FMC-3B
Collected: 12/04/96 Received: 12/06/96 Reported: 01/07/97

Parameter	Result	Units	LOD	LOQ	Method	Date
Acidity, tot. as CaCO3	750	mg/L	2.0	2.0	EPA 305.1	12/11/96
Aluminum, dis. as Al by ICP	4.0	mg/L	0.034	0.12	EPA 200.7	01/02/97
Cadmium, dis. as Cd by ICP	56	ug/L	1.2	3.8	EPA 200.7	01/02/97
Calcium, dis. as Ca by ICP	170	mg/L	3.0	3.0	EPA 200.7	01/02/97
Chloride, as Cl (filtered)	0.54	mg/L	0.36	1.3	EPA 325.2	12/10/96
Chromium, dis. as Cr by ICP	22	ug/L	2.6	9.3	EPA 200.7	01/02/97
Cobalt, dis. as Co by ICP	1400	ug/L	4.3	15	EPA 200.7	01/02/97
Copper, dis. as Cu by ICP	230000	ug/L	270	950	EPA 200.7	01/02/97
Iron, Ferrous	Non reportable value. Turbid yellow/green interference.				SM 3500Fe-D/HA	12/10/96
Iron, dis. as Fe by ICP	110	mg/L	0.010	0.035	EPA 200.7	01/02/97
Magnesium, dis. as Mg by ICP	150	mg/L	3.0	3.0	EPA 200.7	01/02/97
Manganese, dis. as Mn by ICP	52000	ug/L	90	300	EPA 200.7	01/02/97
pH, lab	2.8	s.u.	1.0		EPA 150.1	12/06/96
Potassium, dis. as K	ND	mg/L	2.0	6.6	EPA 200.7	12/10/96
Sodium, dis. as Na by ICP	0.48	mg/L	0.033	0.11	EPA 200.7	01/02/97
Sulfate, as SO4 (filtered)	1000	mg/L	250	250	EPA 375.2	12/24/96
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	12/19/96
Zinc, dis. as Zn by ICP	15000	ug/L	1200	1200	EPA 200.7	01/02/97

Please note that analytical results greater than the LOD but less than the LOQ are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected Date = Date Analysis Performed
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Thomas R Priebe
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: R. Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-212B NLS#: 122423
Ref. Line 2 of COC 23580 Description: FMC-212B
Collected: 12/04/96 Received: 12/06/96 Reported: 01/07/97

Parameter	Result	Units	LOD	LOQ	Method	Date
Acidity, tot. as CaCO3	88	mg/L	2.0	2.0	EPA 305.1	12/11/96
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	01/02/97
Cadmium, dis. as Cd by ICP	26	ug/L	1.2	3.8	EPA 200.7	01/02/97
Calcium, dis. as Ca by ICP	39	mg/L	3.0	3.0	EPA 200.7	01/02/97
Chloride, as Cl (filtered)	ND	mg/L	0.36	1.3	EPA 325.2	12/10/96
Chromium, dis. as Cr by ICP	ND	ug/L	2.6	9.3	EPA 200.7	01/02/97
Cobalt, dis. as Co by ICP	660	ug/L	4.3	15	EPA 200.7	01/02/97
Copper, dis. as Cu by ICP	70000	ug/L	54	190	EPA 200.7	01/02/97
Iron, Ferrous	Non reportable value. Slightly turbid blue interference.				SM 3500Fe-D/HA	12/10/96
Iron, dis. as Fe by ICP	0.092	mg/L	0.010	0.035	EPA 200.7	01/02/97
Magnesium, dis. as Mg by ICP	12	mg/L	3.0	3.0	EPA 200.7	01/02/97
Manganese, dis. as Mn by ICP	1700	ug/L	1.8	6.1	EPA 200.7	01/02/97
pH, lab	4.4	s.u.	1.0		EPA 150.1	12/06/96
Potassium, dis. as K	3.4	mg/L	2.0	6.6	EPA 200.7	12/10/96
Sodium, dis. as Na by ICP	1.0	mg/L	0.033	0.11	EPA 200.7	01/02/97
Sulfate, as SO4 (filtered)	180	mg/L	25	25	EPA 375.2	12/24/96
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	12/19/96
Zinc, dis. as Zn by ICP	3700	ug/L	120	120	EPA 200.7	01/02/97

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LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected Date = Date Analysis Performed
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Thomas R Kriiler
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31247

Client: Foth & Van Dyke Associates
Attn: R. Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-209B NLS#: 122424
Ref. Line 3 of COC 23580 Description: FMC-209B
Collected: 12/04/96 Received: 12/06/96 Reported: 01/07/97

Parameter	Result	Units	LOD	LOQ	Method	Date
Acidity, tot. as CaCO3	38	mg/L	2.0	2.0	EPA 305.1	12/11/96
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	01/02/97
Cadmium, dis. as Cd by ICP	8.6	ug/L	1.2	3.8	EPA 200.7	01/02/97
Calcium, dis. as Ca by ICP	37	mg/L	3.0	3.0	EPA 200.7	01/02/97
Chloride, as Cl (filtered)	ND	mg/L	0.36	1.3	EPA 325.2	12/10/96
Chromium, dis. as Cr by ICP	ND	ug/L	2.6	9.3	EPA 200.7	01/02/97
Cobalt, dis. as Co by ICP	440	ug/L	4.3	15	EPA 200.7	01/02/97
Copper, dis. as Cu by ICP	42000	ug/L	54	190	EPA 200.7	01/02/97
Iron, Ferrous	Non reportable value. light blue interference.				SM 3500Fe-D/HA	12/10/96
Iron, dis. as Fe by ICP	0.016	mg/L	0.010	0.035	EPA 200.7	01/02/97
Magnesium, dis. as Mg by ICP	14	mg/L	3.0	3.0	EPA 200.7	01/02/97
Manganese, dis. as Mn by ICP	4300	ug/L	1.8	6.1	EPA 200.7	01/02/97
pH, lab	4.8	s.u.	1.0		EPA 150.1	12/06/96
Potassium, dis. as K	2.4	mg/L	2.0	6.6	EPA 200.7	12/10/96
Sodium, dis. as Na by ICP	1.3	mg/L	0.033	0.11	EPA 200.7	01/02/97
Sulfate, as SO4 (filtered)	540	mg/L	250	250	EPA 375.2	12/24/96
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	12/19/96
Zinc, dis. as Zn by ICP	2200	ug/L	120	120	EPA 200.7	01/02/97

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LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected Date = Date Analysis Performed
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Reviewed by: Thomas K Priebe

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31247

Client: Foth & Van Dyke Associates
Attn: R. Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-210B NLS#: 122425
Ref. Line 4 of COC 23680 Description: FMC-210B
Collected: 12/04/96 Received: 12/06/96 Reported: 01/07/97

Parameter	Result	Units	LOD	LOQ	Method	Date
Acidity, tot. as CaCO3	36	mg/L	2.0	2.0	EPA 305.1	12/11/96
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	01/02/97
Cadmium, dis. as Cd by ICP	ND	ug/L	1.2	3.8	EPA 200.7	01/02/97
Calcium, dis. as Ca by ICP	31	mg/L	3.0	3.0	EPA 200.7	01/02/97
Chloride, as Cl (filtered)	ND	mg/L	0.36	1.3	EPA 325.2	12/10/96
Chromium, dis. as Cr by ICP	ND	ug/L	2.6	9.3	EPA 200.7	01/02/97
Cobalt, dis. as Co by ICP	310	ug/L	4.3	15	EPA 200.7	01/02/97
Copper, dis. as Cu by ICP	4600	ug/L	5.4	19	EPA 200.7	01/02/97
Iron, Ferrous	ND	Proper color deveopment (orange), but 30% spike recovery	0.0091	0.030	SM 3500Fe-D/HA	12/10/96
Iron, dis. as Fe by ICP	ND	mg/L	0.010	0.035	EPA 200.7	01/02/97
Magnesium, dis. as Mg by ICP	20	mg/L	3.0	3.0	EPA 200.7	01/02/97
Manganese, dis. as Mn by ICP	5700	ug/L	1.8	6.1	EPA 200.7	01/02/97
pH, lab	5.1	s.u.	1.0		EPA 150.1	12/06/96
Potassium, dis. as K	3.6	mg/L	2.0	6.6	EPA 200.7	12/10/96
Sodium, dis. as Na by ICP	0.87	mg/L	0.033	0.11	EPA 200.7	01/02/97
Sulfate, as SO4 (filtered)	540	mg/L	250	250	EPA 375.2	12/24/96
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	12/19/96
Zinc, dis. as Zn by ICP	ND	ug/L	120	120	EPA 200.7	01/02/97

Please note that analytical results greater than the LOD but less than the LOQ are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000
Date = Date Analysis Performed

Thomas R Priebe
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: R. Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-200B NLS#: 122426
Ref. Line 5 of COC 23580 Description: FMC-200B
Collected: 12/05/96 Received: 12/06/96 Reported: 01/07/97

Parameter	Result	Units	LOD	LOQ	Method	Date
Acidity, tot. as CaCO3	140	mg/L	2.0	2.0	EPA 305.1	12/11/96
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	01/02/97
Cadmium, dis. as Cd by ICP	8.2	ug/L	1.2	3.8	EPA 200.7	01/02/97
Calcium, dis. as Ca by ICP	61	mg/L	3.0	3.0	EPA 200.7	01/02/97
Chloride, as Cl (filtered)	ND	mg/L	0.36	1.3	EPA 325.2	12/10/96
Chromium, dis. as Cr by ICP	ND	ug/L	2.6	9.3	EPA 200.7	01/02/97
Cobalt, dis. as Co by ICP	910	ug/L	4.3	15	EPA 200.7	01/02/97
Copper, dis. as Cu by ICP	110000	ug/L	54	190	EPA 200.7	01/02/97
Iron, Ferrous	Non reportable value. Turbid light blue interference.				SM 3500Fe-D/HA	12/10/96
Iron, dis. as Fe by ICP	ND	mg/L	0.010	0.035	EPA 200.7	01/02/97
Magnesium, dis. as Mg by ICP	18	mg/L	3.0	3.0	EPA 200.7	01/02/97
Manganese, dis. as Mn by ICP	2700	ug/L	1.8	6.1	EPA 200.7	01/02/97
pH, lab	4.8	s.u.	1.0		EPA 150.1	12/06/96
Potassium, dis. as K	3.3	mg/L	2.0	6.6	EPA 200.7	12/10/96
Sodium, dis. as Na by ICP	2.0	mg/L	0.033	0.11	EPA 200.7	01/02/97
Sulfate, as SO4 (filtered)	550	mg/L	250	250	EPA 375.2	12/24/96
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	12/19/96
Zinc, dis. as Zn by ICP	2000	ug/L	120	120	EPA 200.7	01/02/97

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LOD = Limit of Detection
LOQ = Limit of Quantitation
ND = Not Detected
Date = Date Analysis Performed
DWB = Dry Weight Basis
NA = Not Applicable
%DWB = (mg/kg DWB)/10000

Reviewed by: Thomas R Prieb

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31247

Client: Foth & Van Dyke Associates
Attn: R. Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-8B NLS#: 122427
Ref. Line 6 of COC 23680 Description: FMC-8B
Collected: 12/05/96 Received: 12/06/96 Reported: 01/07/97

Parameter	Result	Units	LOD	LOQ	Method	Date
Acidity, tot. as CaCO3	650	mg/L	2.0	2.0	EPA 305.1	12/11/96
Aluminum, dis. as Al by ICP	4.7	mg/L	0.034	0.12	EPA 200.7	01/02/97
Cadmium, dis. as Cd by ICP	ND	ug/L	1.2	3.8	EPA 200.7	01/02/97
Calcium, dis. as Ca by ICP	16	mg/L	3.0	3.0	EPA 200.7	01/02/97
Chloride, as Cl (filtered)	ND	mg/L	0.36	1.3	EPA 325.2	12/10/96
Chromium, dis. as Cr by ICP	ND	ug/L	2.6	9.3	EPA 200.7	01/02/97
Cobalt, dis. as Co by ICP	200	ug/L	4.3	15	EPA 200.7	01/02/97
Copper, dis. as Cu by ICP	120000	ug/L	54	190	EPA 200.7	01/02/97
Iron, Ferrous	Non reportable value. Turbid yellow/green interference.				SM 3500Fe-D/HA	12/10/96
Iron, dis. as Fe by ICP	100	mg/L	0.010	0.035	EPA 200.7	01/02/97
Magnesium, dis. as Mg by ICP	5.1	mg/L	3.0	3.0	EPA 200.7	01/02/97
Manganese, dis. as Mn by ICP	560	ug/L	1.8	6.1	EPA 200.7	01/02/97
pH, lab	2.8	s.u.	1.0		EPA 150.1	12/06/96
Potassium, dis. as K	ND	mg/L	2.0	6.6	EPA 200.7	12/10/96
Sodium, dis. as Na by ICP	0.37	mg/L	0.033	0.11	EPA 200.7	01/02/97
Sulfate, as SO4 (filtered)	530	mg/L	250	250	EPA 375.2	12/24/96
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	12/19/96
Zinc, dis. as Zn by ICP	700	ug/L	120	120	EPA 200.7	01/02/97

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LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected Date = Date Analysis Performed
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Reviewed by: Thomas R Priebe

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31304

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-3A NLS#: 122743
Ref. Line 1 of COC 23773 Description: FMC-3A
Collected: 12/06/96 Received: 12/11/96 Reported: 01/07/97

Parameter	Result	Units	LOD	LOQ	Method	Date
Acidity, tot. as CaCO3	2000	mg/L	2.0	2.0	EPA 305.1	12/17/96
Aluminum, dis. as Al by ICP	14	mg/L	0.034	0.12	EPA 200.7	01/02/97
Cadmium, dis. as Cd by ICP	160	ug/L	1.2	3.8	EPA 200.7	01/02/97
Calcium, dis. as Ca by ICP	290	mg/L	3.0	3.0	EPA 200.7	01/02/97
Chloride, as Cl (filtered)	1.4	mg/L	0.36	1.3	EPA 325.2	12/17/96
Chromium, dis. as Cr by ICP	32	ug/L	2.6	9.3	EPA 200.7	01/02/97
Cobalt, dis. as Co by ICP	3000	ug/L	4.3	15	EPA 200.7	01/02/97
Copper, dis. as Cu by ICP	660000	ug/L	1100	3800	EPA 200.7	01/02/97
Iron, Ferrous	270	mg/L	0.91	3.0		12/26/96
	Additional Comments: F&VD modified method					
Iron, dis. as Fe by ICP	360	mg/L	0.010	0.035	EPA 200.7	01/02/97
Magnesium, dis. as Mg by ICP	330	mg/L	3.0	3.0	EPA 200.7	01/02/97
Manganese, dis. as Mn by ICP	120000	ug/L	180	610	EPA 200.7	01/02/97
pH, lab	2.7	s.u.	1.0		EPA 150.1	12/11/96
Potassium, dis. as K	ND	mg/L	2.0	6.6	EPA 200.7	12/27/96
Sodium, dis. as Na by ICP	0.63	mg/L	0.033	0.11	EPA 200.7	01/02/97
Sulfate, as SO4 (filtered)	7400	mg/L	2500	2500	EPA 375.2	12/24/96
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/02/97
Zinc, dis. as Zn by ICP	60000	ug/L	12000	12000	EPA 200.7	01/02/97

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LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000
Date = Date Analysis Performed

Thomas R Priebe
Reviewed by:

Authorized by:
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Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

PAGE: 2 NLS PROJECT# 31304

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-8A NLS#: 122744
Ref. Line 2 of COC 23773 Description: FMC-8A
Collected: 12/06/96 Received: 12/11/96 Reported: 01/07/97

Parameter	Result	Units	LOD	LOQ	Method	Date
Acidity, tot. as CaCO3	1200	mg/L	2.0	2.0	EPA 305.1	12/17/96
Aluminum, dis. as Al by ICP	11	mg/L	0.034	0.12	EPA 200.7	01/02/97
Cadmium, dis. as Cd by ICP	ND	ug/L	1.2	3.8	EPA 200.7	01/02/97
Calcium, dis. as Ca by ICP	42	mg/L	3.0	3.0	EPA 200.7	01/02/97
Chloride, as Cl (filtered)	10	mg/L	0.36	1.3	EPA 325.2	12/17/96
Chromium, dis. as Cr by ICP	15	ug/L	2.6	9.3	EPA 200.7	01/02/97
Cobalt, dis. as Co by ICP	380	ug/L	4.3	15	EPA 200.7	01/02/97
Copper, dis. as Cu by ICP	160000	ug/L	54	190	EPA 200.7	01/02/97
Iron, Ferrous	1.9	mg/L	0.046	0.15		12/26/96
	Additional Comments: F&VD modified method					
Iron, dis. as Fe by ICP	290	mg/L	0.010	0.035	EPA 200.7	01/02/97
Magnesium, dis. as Mg by ICP	9.1	mg/L	3.0	3.0	EPA 200.7	01/02/97
Manganese, dis. as Mn by ICP	1200	ug/L	1.8	6.1	EPA 200.7	01/02/97
pH, lab	2.4	s.u.	1.0		EPA 150.1	12/11/96
Potassium, dis. as K	ND	mg/L	2.0	6.6	EPA 200.7	12/27/96
Sodium, dis. as Na by ICP	0.34	mg/L	0.033	0.11	EPA 200.7	01/02/97
Sulfate, as SO4 (filtered)	620	mg/L	250	250	EPA 375.2	12/24/96
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/02/97
Zinc, dis. as Zn by ICP	3500	ug/L	120	120	EPA 200.7	01/02/97

Please note that analytical results greater than the LOD but less than the LOQ are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000
Date = Date Analysis Performed

Reviewed by: Thomas R Priebe

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31304

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-200A NLS#: 122745
Ref. Line 3 of COC 23773 Description: FMC-200A
Collected: 12/06/96 Received: 12/11/96 Reported: 01/07/97

Parameter	Result	Units	LOD	LOQ	Method	Date
Acidity, tot. as CaCO3	290	mg/L	2.0	2.0	EPA 305.1	12/17/96
Aluminum, dis. as Al by ICP	0.047	mg/L	0.034	0.12	EPA 200.7	01/02/97
Cadmium, dis. as Cd by ICP	11	ug/L	1.2	3.8	EPA 200.7	01/02/97
Calcium, dis. as Ca by ICP	130	mg/L	3.0	3.0	EPA 200.7	01/02/97
Chloride, as Cl (filtered)	ND	mg/L	0.36	1.3	EPA 325.2	12/17/96
Chromium, dis. as Cr by ICP	6.2	ug/L	2.6	9.3	EPA 200.7	01/02/97
Cobalt, dis. as Co by ICP	1800	ug/L	4.3	15	EPA 200.7	01/02/97
Copper, dis. as Cu by ICP	190000	ug/L	54	190	EPA 200.7	01/02/97
Iron, Ferrous	ND	mg/L	0.0091	0.030		12/30/96
	Additional Comments: F&VD modified method					
Iron, dis. as Fe by ICP	0.075	mg/L	0.010	0.035	EPA 200.7	01/02/97
Magnesium, dis. as Mg by ICP	40	mg/L	3.0	3.0	EPA 200.7	01/02/97
Manganese, dis. as Mn by ICP	6700	ug/L	1.8	6.1	EPA 200.7	01/02/97
pH, lab	4.3	s.u.	1.0		EPA 150.1	12/11/96
Potassium, dis. as K	6.4	mg/L	2.0	6.6	EPA 200.7	12/27/96
Sodium, dis. as Na by ICP	3.6	mg/L	0.033	0.11	EPA 200.7	01/02/97
Sulfate, as SO4 (filtered)	570	mg/L	250	250	EPA 375.2	12/24/96
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/02/97
Zinc, dis. as Zn by ICP	4000	ug/L	120	120	EPA 200.7	01/02/97

Please note that analytical results greater than the LOD but less than the LOQ are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected Date = Date Analysis Performed
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Reviewed by: Thomas R Priebe

Authorized by:
R. T. Krueger
Laboratory Manager

NORTHERN LAKE SERVICE, INC.
Analytical Laboratory and Environmental Services
400 North Lake Avenue - Crandon, WI 54520
Tel:(715)478-2777 Fax:(715)478-3060

WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31304

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-209A NLS#: 122746
Ref. Line 4 of COC 23773 Description: FMC-209A
Collected: 12/06/96 Received: 12/11/96 Reported: 01/07/97

Parameter	Result	Units	LOD	LOQ	Method	Date
Acidity, tot. as CaCO3	340	mg/L	2.0	2.0	EPA 305.1	12/17/96
Aluminum, dis. as Al by ICP	0.069	mg/L	0.034	0.12	EPA 200.7	01/02/97
Cadmium, dis. as Cd by ICP	26	ug/L	1.2	3.8	EPA 200.7	01/02/97
Calcium, dis. as Ca by ICP	110	mg/L	3.0	3.0	EPA 200.7	01/02/97
Chloride, as Cl (filtered)	0.75	mg/L	0.36	1.3	EPA 325.2	12/17/96
Chromium, dis. as Cr by ICP	4.8	ug/L	2.6	9.3	EPA 200.7	01/02/97
Cobalt, dis. as Co by ICP	1600	ug/L	4.3	15	EPA 200.7	01/02/97
Copper, dis. as Cu by ICP	180000	ug/L	270	950	EPA 200.7	01/02/97
Iron, Ferrous	ND	mg/L	0.0091	0.030		12/30/96
Additional Comments: F&VD modified method						
Iron, dis. as Fe by ICP	ND	mg/L	0.010	0.035	EPA 200.7	01/02/97
Magnesium, dis. as Mg by ICP	41	mg/L	3.0	3.0	EPA 200.7	01/02/97
Manganese, dis. as Mn by ICP	17000	ug/L	1.8	6.1	EPA 200.7	01/02/97
pH, lab	4.5	s.u.	1.0		EPA 150.1	12/11/96
Potassium, dis. as K	6.6	mg/L	2.0	6.6	EPA 200.7	12/27/96
Sodium, dis. as Na by ICP	3.5	mg/L	0.033	0.11	EPA 200.7	01/02/97
Sulfate, as SO4 (filtered)	570	mg/L	250	250	EPA 375.2	12/24/96
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/02/97
Zinc, dis. as Zn by ICP	8300	ug/L	120	120	EPA 200.7	01/02/97

Please note that analytical results greater than the LOD but less than the LOQ are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection   LOQ = Limit of Quantitation   ND = Not Detected   Date = Date Analysis Performed
DWB = Dry Weight Basis   NA = Not Applicable   %DWB = (mg/kg DWB)/10000

Thomas R Priebe
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

NORTHERN LAKE SERVICE, INC.
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400 North Lake Avenue - Crandon, WI 54520
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

PAGE: 5 NLS PROJECT# 31304

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-210A NLS#: 122747
Ref. Line 5 of COC 23773 Description: FMC-210A
Collected: 12/06/96 Received: 12/11/96 Reported: 01/07/97

Parameter	Result	Units	LOD	LOQ	Method	Date
Acidity, tot. as CaCO3	100	mg/L	2.0	2.0	EPA 305.1	12/17/96
Aluminum, dis. as Al by ICP	0.096	mg/L	0.034	0.12	EPA 200.7	01/02/97
Cadmium, dis. as Cd by ICP	2.5	ug/L	1.2	3.8	EPA 200.7	01/02/97
Calcium, dis. as Ca by ICP	140	mg/L	3.0	3.0	EPA 200.7	01/02/97
Chloride, as Cl (filtered)	1.1	mg/L	0.36	1.3	EPA 325.2	12/17/96
Chromium, dis. as Cr by ICP	11	ug/L	2.6	9.3	EPA 200.7	01/02/97
Cobalt, dis. as Co by ICP	1800	ug/L	4.3	15	EPA 200.7	01/02/97
Copper, dis. as Cu by ICP	85000	ug/L	54	190	EPA 200.7	01/02/97
Iron, Ferrous	ND	mg/L	0.0091	0.030		12/30/96
	Additional Comments: F&VD modified method					
Iron, dis. as Fe by ICP	ND	mg/L	0.010	0.035	EPA 200.7	01/02/97
Magnesium, dis. as Mg by ICP	88	mg/L	3.0	3.0	EPA 200.7	01/02/97
Manganese, dis. as Mn by ICP	30000	ug/L	18	61	EPA 200.7	01/02/97
pH, lab	4.7	s.u.	1.0		EPA 150.1	12/11/96
Potassium, dis. as K	9.7	mg/L	2.0	6.6	EPA 200.7	12/27/96
Sodium, dis. as Na by ICP	3.7	mg/L	0.033	0.11	EPA 200.7	01/02/97
Sulfate, as SO4 (filtered)	600	mg/L	250	250	EPA 375.2	12/24/96
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/02/97
Zinc, dis. as Zn by ICP	1400	ug/L	120	120	EPA 200.7	01/02/97

Please note that analytical results greater than the LOD but less than the LOQ are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected Date = Date Analysis Performed
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Reviewed by: Thomas R Priebe

Authorized by:
R. T. Krueger
Laboratory Manager

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400 North Lake Avenue - Crandon, WI 54520
Tel:(715)478-2777 Fax:(715)478-3060

WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31304

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-212A NLS#: 122748
Ref. Line 6 of COC 23773 Description: FMC-212A
Collected: 12/06/96 Received: 12/11/96 Reported: 01/07/97

Parameter	Result	Units	LOD	LOQ	Method	Date
Acidity, tot. as CaCO3	540	mg/L	2.0	2.0	EPA 305.1	12/17/96
Aluminum, dis. as Al by ICP	0.14	mg/L	0.034	0.12	EPA 200.7	01/02/97
Cadmium, dis. as Cd by ICP	54	ug/L	1.2	3.8	EPA 200.7	01/02/97
Calcium, dis. as Ca by ICP	170	mg/L	3.0	3.0	EPA 200.7	01/02/97
Chloride, as Cl (filtered)	0.73	mg/L	0.36	1.3	EPA 325.2	12/17/96
Chromium, dis. as Cr by ICP	ND	ug/L	2.6	9.3	EPA 200.7	01/02/97
Cobalt, dis. as Co by ICP	1700	ug/L	4.3	15	EPA 200.7	01/02/97
Copper, dis. as Cu by ICP	290000	ug/L	540	1900	EPA 200.7	01/02/97
Iron, Ferrous	0.067	mg/L	0.0091	0.030		12/31/96
	Additional Comments: F&VD modified method					
Iron, dis. as Fe by ICP	0.040	mg/L	0.010	0.035	EPA 200.7	01/02/97
Magnesium, dis. as Mg by ICP	44	mg/L	3.0	3.0	EPA 200.7	01/02/97
Manganese, dis. as Mn by ICP	7900	ug/L	1.8	6.1	EPA 200.7	01/02/97
pH, lab	4.7	s.u.	1.0		EPA 150.1	12/11/96
Potassium, dis. as K	11	mg/L	2.0	6.6	EPA 200.7	12/27/96
Sodium, dis. as Na by ICP	2.9	mg/L	0.033	0.11	EPA 200.7	01/02/97
Sulfate, as SO4 (filtered)	680	mg/L	250	250	EPA 375.2	12/24/96
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/02/97
Zinc, dis. as Zn by ICP	9900	ug/L	120	120	EPA 200.7	01/02/97

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Please note that analytical results greater than the LOD but less than the LOQ are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected Date = Date Analysis Performed
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Reviewed by: Thomas R Priebe

Authorized by:
R. T. Krueger
Laboratory Manager

Appendix F

Type II Alkali Demand Test Results

Alkali Demand Test Results - Type II Material

		Sample Weight			1 hour					
		Flask A	Flask B	Flask C	Flask A		Flask B		Flask C	
Start Date	Sample	(g)	(g)	(g)	pH (su)	Cond. (uS/cm)	pH (su)	Cond. (uS/cm)	pH (su)	Cond. (uS/cm)
11/24/96	4	500.5	500.2	500	2.62	2940	2.63	2930	2.61	3050
11/24/96	15-3	500	500.9	500.5	1.72	4660	1.67	4110	1.8	4550
11/24/96	166	500.6	500.9	500.1	3.78	1391	3.68	1421	3.64	1428
11/25/96	186	498.1	503.9	502.1	4.2	2810	4.05	2900	4.01	2840
11/25/96	194	505.2	502	500.5	3.67	1316	3.86	1243	3.72	1302
11/25/96	201	500.2	496.3	495.5	4.33	1661	4.36	1366	4.37	1628
11/25/96	204	498.5	499.8	499.9	3.93	2060	4.26	2070	4.35	2030
11/25/96	209	501	503.8	498.6	4.77	924	4.82	901	4.86	858
11/25/96	210	497.2	496.6	498.8	4.68	794	4.67	862	4.65	694
11/25/96	211	504.7	498.6	499.9	3.52	775	3.48	9150	3.45	934
11/25/96	212	503.9	499	502	4.36	1265	4.41	1416	4.42	1344
11/25/96	213	502.4	500.3	501.2	2.81	3490	2.75	3240	2.69	3310
11/26/96	187	500.3	500.7	500.8	5.06	1485	5	1626	5.03	1496
11/26/96	188	501	500.1	500.5	4.59	2160	4.94	2150	4.92	2250
11/26/96	189	499.5	504.1	499.7	5.63	645	5.61	680	5.63	763
11/26/96	192	504.2	504.8	496	5.26	918	5.38	900	5.5	907
11/26/96	195	499.2	499	504.6	5.67	832	5.71	842	5.67	771
11/26/96	197	500.6	496.8	502.6	5.2	1480	5.19	1573	5.27	1740
11/26/96	199	500.3	502.5	499.2	5.65	892	5.66	895	5.62	913
11/26/96	200	496.9	498.6	500.4	5.32	1184	5.36	1182	5.35	1158
11/26/96	202	497.9	501.4	500	5.37	1138	5.36	1162	ND	1091
11/27/96	198	500	500.7	500	5.77	425	5.78	528	5.79	576
11/27/96	205	500.7	499.9	500.5	5	2030	4.99	2010	4.94	2030
11/27/96	207	500.6	500	500.5	5.79	582	5.81	514	5.86	542
11/28/96	190	500.1	500.9	500	4.73	1540	4.82	1460	4.83	1500
11/28/96	193	501	500	500.3	6.21	1090	6.24	1010	6.18	1180
11/28/96	196	500.3	499.9	501	6.15	344	6.28	330	6.23	353
11/28/96	203	500.2	500.4	500.2	5.63	1380	5.66	1280	5.67	1280
11/28/96	206	500.3	500.2	500.3	5.59	1070	5.56	1060	5.53	1120
11/28/96	208	500.5	499.8	499.2	5.61	788	5.58	730	5.67	764
11/29/96	172	501.2	499.9	500.5	4.03	2740	3.98	2710	4	2680
11/29/96	176	500.2	500.4	501.2	4.41	2520	4.31	2650	4.43	2580
11/29/96	177	499.8	499.1	501.1	4.15	1930	3.99	2010	4.09	1940
11/29/96	179	500	501.2	500	5.32	2760	4.15	2850	4.16	2870
11/29/96	181	499.3	500.3	500.4	3.37	4330	3.44	4030	3.33	4240
11/29/96	191	501.8	500.4	500.5	6.03	724	6.18	720	6.14	731
11/30/96	146	500.4	500.9	500.1	4.3	1025	4.26	1165	4.28	1130
11/30/96	157	500.5	499.9	498.7	3.99	1834	4.03	1867	4.09	1617
11/30/96	175	501.9	500	501	4.28	2250	4.24	2270	4.2	2210
11/30/96	180	499.6	500	502	4.15	2500	4.16	2500	4.16	2370
11/30/96	182	499.8	499	500.1	4.32	1981	4.27	2200	4.29	2080
11/30/96	183	500.2	499.4	500.3	4.1	2640	4.1	2660	4.09	2730
12/1/96	153	501	499.7	500.2	4.32	1730	4.36	1690	4.33	1812
12/1/96	154	500.1	499.1	501.8	4.52	1745	4.48	1780	4.48	1754
12/1/96	155	499.8	501	499.7	4.8	1976	4.66	1720	4.61	1885
12/1/96	156	501.7	501.6	502.3	4.52	1905	4.52	1886	4.53	1920
12/1/96	159	500.3	501.5	501	4.69	1841	4.78	1791	4.78	1816
12/1/96	160	501.5	499.8	500.5	4.69	1649	4.65	1536	4.65	1506
12/1/96	165	500.4	500.3	500.8	4.79	1504	4.78	1554	4.78	1488
12/1/96	170	500.2	500	500.2	4.49	1741	4.46	1732	4.44	1774

Alkali Demand Test Results - Type II Material

		Sample Weight			1 hour					
		Flask A	Flask B	Flask C	Flask A		Flask B		Flask C	
Start Date	Sample	(g)	(g)	(g)	pH (su)	Cond. (uS/cm)	pH (su)	Cond. (uS/cm)	pH (su)	Cond. (uS/cm)
12/1/96	173	500.8	500.6	499.6	4.84	1857	4.85	1847	4.85	1798
12/2/96	147	501.5	500.6	500	4.7	1667	4.75	1624	4.65	1805
12/2/96	149	500.1	500.6	499.6	5.04	2020	5.03	2010	5	2060
12/2/96	151	500	499.6	500.4	5.04	1217	5.13	990	5.12	1087
12/2/96	158	500	500	500.9	4.51	1459	4.5	1429	4.48	1448
12/2/96	161	500.4	499.7	500.8	5.39	735	5.41	770	5.36	835
12/2/96	166	500.1	499.5	500.1	4.72	1621	4.65	1713	4.67	1771
12/2/96	168	500.9	500.2	501.3	6.16	494	6.13	481	6.21	488
12/2/96	171	500.3	500.5	500.2	4.93	1477	4.9	1455	4.99	1392
12/3/96	163	501.9	500.8	501.9	4.07	1718	4.01	1762	4.01	1748
12/3/96	169	499.9	501.9	500.2	4.04	2610	4	2620	3.95	2670
12/3/96	173	500.1	500.2	501.5	4.34	2060	4.32	2010	4.27	2050
12/3/96	178	500.4	500.9	500.4	7.2	1973	7.14	2080	7.12	2070
12/3/96	301	501	500.1	499.9	5.49	741	5.42	687	5.37	776
12/3/96	302	500.8	500.4	500.6	5.38	1138	5.29	975	5.35	1090
12/6/96	3	500.2	500	500.8	2.78	4760	2.7	4500	2.74	5450
12/6/96	162	500.5	500.4	500	4.52	1818	4.45	1815	4.55	1494
12/6/96	167	500.2	500.4	500	4.47	2220	4.52	2170	4.49	2210
12/6/96	174	500.6	500.5	500.7	6.74	885	6.72	817	6.76	957
12/7/96	8	499.9	500	500.3	2.65	2880	2.65	2870	2.65	2200
12/7/96	13-1	502.6	500.8	500.6	2.56	5110	2.55	4620	2.56	5160
12/7/96	15-1	502.8	501.5	500.1	2.51	6060	2.48	6340	2.46	5760
12/7/96	211	500.5	501.2	500.4	3.33	859	3.15	835	3.21	1014
12/9/96	147	500.3	500.9	500.4	5.04	1767	5.15	1850	5.03	1793
12/9/96	148	501.2	500.9	500.1	5.57	1186	5.54	1536	5.52	1167
12/9/96	152	500.2	497.9	500.3	6.09	1622	6.08	1174	6.16	1159
12/9/96	164	500.5	501.6	501	5.29	1990	5.33	1739	5.34	1537
12/11/96	150	500.1	501	500.6	5	1657	5.02	1768	5.03	1730
12/11/96	171	500.1	500.3	499.9	4.81	1233	4.86	1150	4.88	1107
12/11/96	184	500.2	501	500.9	5.07	408	4.99	449	5.13	383
12/11/96	185	501.3	500	501.3	4.99	655	5.04	724	5.01	755
12/12/96	13-1	500.1	500.3	500.5	2.39	5.71	2.47	5.31	2.43	5.15
12/14/96	166	500.4	500	500.6	4.73	2.19	4.66	1992	4.65	2.26
		Data QA'd through this entry as of 1/30/97								

ND = No Data.

Alkali Demand Test Results - Type II Material

		Volume Lime Slurry			21 hours					
		Flask A	Flask B	Flask C	Flask A		Flask B		Flask C	
Start Date	Sample	(ml)	(ml)	(ml)	pH (su)	Cond. (uS/cm)	pH (su)	Cond. (uS/cm)	pH (su)	Cond. (uS/cm)
11/24/96	4	3.7	6.5	10	8.21	3510	9.57	5110	10.36	7660
11/24/96	15-3	5.5	8.5	12.3	3.57	4120	4.44	2730	8.28	2170
11/24/96	166	1.5	4	7.2	10.21	2220	10.28	6020	10.65	6820
11/25/96	186	0.75	3	6	5.25	2840	5.8	2740	6.94	3880
11/25/96	194	1.5	3.5	7	8.94	2320	9.26	4130	9.77	6230
11/25/96	201	0.5	2.5	5.5	6.09	1689	7.75	2270	10.31	6380
11/25/96	204	0.5	3	6	5.43	2080	9.86	2320	10.35	5060
11/25/96	209	0.5	1.5	4.5	7.74	1258	10.65	2570	10.39	6370
11/25/96	210	0.5	3	4.75	8.9	1088	10.51	5370	10.35	7190
11/25/96	211	2	4.5	7.5	9.97	2050	10.45	4410	10.96	5300
11/25/96	212	0.5	2.5	5.5	7.88	1423	9.8	3500	10.05	6340
11/25/96	213	3.5	6	9.5	4.99	2890	9.09	2720	9.42	2650
11/26/96	187	0.5	1	3.5	4.94	1321	6.05	1719	10.03	4440
11/26/96	188	0.5	1	4	5.37	2110	5.46	2040	10.72	3730
11/26/96	189	0	0.5	2.5	5.53	665	9.61	794	10.51	3110
11/26/96	192	0.5	0.75	2.5	8.29	845	9.56	917	10.01	2600
11/26/96	195	0	0.5	2	5.99	1113	7.89	1157	10.42	2240
11/26/96	197	0.5	0.75	3.5	9.37	1882	9.87	1983	10.26	3990
11/26/96	199	0	0.5	2	6	1020	8.58	1134	10.44	2230
11/26/96	200	0.5	0.75	3	9.83	1370	10.04	1538	9.76	2980
11/26/96	202	0.5	0.75	2.75	7.33	1253	10.16	1519	10.77	3390
11/27/96	198	0	0.5	2	5.74	817	9.7	904	11.38	1620
11/27/96	205	0.5	1.5	4.5	4.66	2250	6.44	2140	11.9	3760
11/27/96	207	0	0.5	2	6.02	717	9.64	759	11.89	2100
11/28/96	190	0	1.5	4.3	5.06	1850	10.46	2110	12.28	5990
11/28/96	193	0	0.5	1	6.44	1210	11.29	2020	11.38	2090
11/28/96	196	0	0.5	1	6.29	387	10.39	702	11.34	1200
11/28/96	203	0	0.5	2.2	5.66	1950	10.4	1530	11.5	2780
11/28/96	206	0	0.5	2.5	5.28	1190	6.38	1140	8.93	3800
11/28/96	208	0	0.5	2.2	5.81	923	11.87	2230	12.02	3390
11/29/96	172	1	3.5	6.5	4.62	2690	10.4	2890	11.34	5130
11/29/96	176	0	2.5	5.5	4.26	2950	6.2	2690	11.28	4050
11/29/96	177	1	3	6	7.03	1988	10.62	2560	11.58	6430
11/29/96	179	0	2	5	4.16	3020	11.28	3540	5.4	2280
11/29/96	181	2	4.5	8	4.72	2600	7.19	4031	11.17	3940
11/29/96	191	0	0.5	1	5.91	792	10.48	937	11.06	1696
11/30/96	146	0.5	2.5	5.5	8.04	979	12.1	1664	12.86	3880
11/30/96	157	1	3.5	6.5	5.53	2050	12.27	3220	12.33	6330
11/30/96	175	0.5	2.8	5.8	5.27	2540	10.78	2480	12.74	5450
11/30/96	180	0.5	3	6	4.54	2840	6.01	2790	12.53	5190
11/30/96	182	0.5	2.7	5.6	6.74	2180	10.59	2530	12.71	5890
11/30/96	183	0.8	3.2	6.2	5.12	2580	10.6	2790	12.58	5090
12/1/96	153	0.5	2.5	5.5	5.6	1842	11.29	2140	12.57	5540
12/1/96	154	0.5	2.5	5.5	5.4	1530	12.03	2680	12.75	5650
12/1/96	155	0.5	1.7	4.5	5.08	2090	7.33	2150	11.59	3840
12/1/96	156	0.5	2.3	5	5.096	1900	10.97	2030	12.49	4200
12/1/96	159	0.5	1.5	4.5	5.6	1979	9.49	2020	12.35	3850
12/1/96	160	0.5	1.7	4.5	5.5	1678	6.98	1710	12.15	3050
12/1/96	165	0.5	1.5	4.5	8.31	1711	8.89	1835	12.49	4000
12/1/96	170	0.5	2.3	5.3	5.2	2020	10.27	2220	12.1	3990

Alkali Demand Test Results - Type II Material										
		Volume Lime Slurry			21 hours					
		Flask A	Flask B	Flask C	Flask A		Flask B		Flask C	
Start Date	Sample	(ml)	(ml)	(ml)	pH (su)	Cond. (uS/cm)	pH (su)	Cond. (uS/cm)	pH (su)	Cond. (uS/cm)
12/1/96	173	0.5	1.5	4.5	5.39	1826	7.7	1962	ND	3430
12/2/96	147	0.5	2	4.75	5.45	1852	9.8	1867	11.62	4280
12/2/96	149	0.5	1	4	4.97	2230	6.7	2370	10.94	3740
12/2/96	151	0.5	1	3.5	9.22	1376	9.99	1401	11.39	3170
12/2/96	158	0.5	1	4	5.54	1214	8.41	1482	10.79	4270
12/2/96	161	0.5	1	3	8.08	935	9.38	1016	11.32	3220
12/2/96	166	0.5	1.5	4.5	6.27	1875	7.77	1895	10.39	4660
12/2/96	168	0	0.5	1	5.76	655	9.45	728	10.69	1284
12/2/96	171	0.5	1	4	5.72	1650	5.99	1568	11.62	2880
12/3/96	163	1	3.25	6.25	6.16	1368	10.87	2770	11.78	4730
12/3/96	169	3.5	1	6.5	8.76	2650	4.47	2260	10.94	3790
12/3/96	173	0.5	5.5	2.5	4.67	1735	10.61	3610	8.15	18.44
12/3/96	178	0	0	0	6.97	2120	7.05	1982	7.14	1922
12/3/96	301	0.5	1	2.75	7.97	845	9.85	1006	10.57	1785
12/3/96	302	3	0.5	0.75	10.4	1582	6.44	1180	7.51	1032
12/6/96	3	3.5	6	9.5	3.9	4070	5.53	3190	8.61	2440
12/6/96	162	0.5	2	5	5.15	1763	9.65	1739	10.83	6500
12/6/96	167	0.5	2	5	4.75	2270	8.92	2340	10.72	2740
12/6/96	174	0	0	0	7.05	1282	7.15	1296	7.13	1005
12/7/96	8	2	4.6	7.5	2.72	2010	8.87	2510	7	3140
12/7/96	13-1	3.5	6.5	10	2.52	5510	2.65	3980	2.98	3720
12/7/96	15-1	8.7	12.6	16	2.52	4260	2.63	3200	6.15	1913
12/7/96	211	0.5	1	2	4.95	1222	5.3	1247	9.34	1515
12/9/96	147	0.5	1	3.5	5.59	2010	6.83	1946	12.57	3080
12/9/96	148	0.5	1	2.5	9.98	1354	9.23	1454	12.22	2.24
12/9/96	152	0	0.5	1	5.52	1563	8.41	1294	9.3	1317
12/9/96	164	0.5	1	3	6.76	1798	7.74	1832	11.88	2020
12/11/96	150	0.5	1	3.5	8.89	2.31	9.15	2180	12.07	3870
12/11/96	171	0.5	1.5	4	8.3	1550	9.59	1625	10.8	4.3
12/11/96	184	0.5	1	3.5	7.82	471	8.69	722	11.95	3720
12/11/96	185	1	0.5	3.5	4.72	940	11.37	988	12.28	2780
12/12/96	13-1	9	11	13	3.08	2.67	4.45	ND	6.18	1729
12/14/96	166	0.5	1.5	4.5	5.44	1702	5.5	1695	11.87	2790
		Data QA'd through this entry as of 1/30/97								

ND = No Data.

Appendix G

Anoxic Columns Test Data Base and Laboratory Reports for the First Three Displacement Tests

[illegible] were sampled Type II Stockpile and $CaCO_3$ amended prior to testing

BF4 and BF5 were sampled from Type III backfill which was amended w/ [illegible] p.51

Table [illegible] [illegible]

Table [illegible] column tests, also here - cross-check chem data - some results have included in Table.

Column Number	Column Name	Date	Displace ment	Sample Volume (mL)	pH (s.u.)	Eh (mV)	Cond. (mS/cm)	Lab pH (su)	Alkalinity (mgCaCO3 mg/L)	Acidity (mgCaCO3 mg/L)	SO_4 (mg/L)	Cl (mg/L)	Al (mg/L)	As (mg/L)	Cd (mg/L)	Ca (mg/L)	Cr (mg/L)
1	186 w/LS	12/29/96	0	741	4.40	111	3720	5.1		840	5100						
2	186 w/Lime	12/29/96	0	652	4.41	136	3460	5.1		440	2800						
3	170 w/LS		0														
4	13-1 w/LS	12/29/96	0	578	1.68	237	13600	2.4		14000	18000	16	260		0.42	<600	<0.52
5	188 w/LS	12/29/96	0	357	4.53	185	7010	4.9		3000	7000						
6	183 w/LS	12/29/96	0	307	3.88	186	8260	4.4		3200	8100						
7	213 w/LS	12/29/96	0	291	3.35	206	11600	3.9		290	9700	18	58		2.7	430	<0.026
8	187 w/LS	12/29/96	0	623	4.76	141	6290	4.8		2700	6000						
9	194 w/LS	12/29/96	0	702	4.61	171	6910	4.8		3300	6800						
10	192 w/LS	12/29/96	0	338	5.22	156	3300	5.3		230	2300						
11	8-1 w/LS	12/29/96	0	296	3.31	282	4310	3.4		1500	5600						
12	190 w/LS	12/29/96	0	360	4.77	102	6120	4.7		2300	6100						
13	172 w/LS	12/29/96	0	372	4.55	116	10400	4.7		5600	6600						
14	176 w/LS	12/29/96	0	571	4.47	113	8500	4.7		4400	9200						
15	BF-4	12/28/96	0	487	7.66	-33.6	4160	5.6		<2	3000						
16	BF-5	12/28/96	0	363	7.33	-35.1	3780	6.1		<2	2500						
17	CUF-1	12/28/96	0	581	8.35	-57.9	1350	6.7	24		670						
18	CUF-2	12/28/96	0	322	8.49	-83.1	972	6.7	<1.5		600						
19	15-3 w/Lime	12/28/96	0	510	2.44	194	8140	3		400	8000						
20	180 w/Lime	12/28/96	0	493	4.41	155	5750	4.3		34	6100						
21	181 w/Lime	12/28/96	0	422	3.49	167	10300	4		94	7700						
22	15-1 w/Lime	12/28/96	0	472	2.27	185	5820	2.9		600	5100						
23	4-1 w/Lime	12/28/96	0	525	3.89	157	5130	5.2		38	5700						
24	4-1 w/LS	12/28/96	0	274	4.51	134	3190	5.2		790	5100						
25	15-1 w/LS	12/28/96	0	246	7.26	-43.1	2550	6.5		<2	1700						
26	181 w/LS	12/28/96	0	474	4.84	47.6	8060	4.8		4200	7800						
27	180 w/LS	12/28/96	0	677	4.95	38.4	4270	5		1000	5300						
28	15-3 w/LS	12/28/96	0	571	3.73	141	7000	3.3		100	7000	11	26		0.14	480	<0.026
1	186 w/LS	12/30/96	1	1065	8.03	-34	2970	6.7	81		620	13	0.37	0.034	0.22	550	0.025
2	186 w/Lime	12/30/96	1	677	5.16	21	2630	5.5		<2	810	16	<0.034		0.041	550	<0.0026
3	170 w/LS	1/7/97	1	1086	4.83	137	415	4.7		1600	1700	4.2	<0.34		1.2	470	<0.026
4	13-1 w/LS	12/30/96	1	642	2.76	180	7130	2.7		3800	2700	9.3	72	<0.16	0.092	470	<0.026
5	188 w/LS	12/30/96	1	658	5.20	126	4540	4.7		1100	1800	8.4	<0.34		2.3	470	<0.026
6	183 w/LS	12/30/96	1	656	5.02	132	5500	4.7		2000	2600	6.7	<0.34		0.38	450	<0.026
7	213 w/LS	12/30/96	1	649	4.57	160	7020	4.2		2700	6300	10	19	<0.16	1.3	470	<0.026
8	187 w/LS	12/30/96	1	544	5.16	142	4220	4.9		1100	2400	6.5	<0.34		0.1	500	<0.026
9	194 w/LS	12/30/96	1	590	5.28	134	2810	5.1		290	1000	2.6	1.8		0.069	490	0.073
10	192 w/LS	12/30/96	1	575	5.75	124	2700	5.4		82	860	3.4	<0.034	0.038	0.018	440	<0.0026
11	8-1 w/LS	12/30/96	1	851	7.55	58	2680	7.1	64		800	3.9	0.19		0.0081	580	0.018
12	190 w/LS	12/30/96	1	653	5.35	130	4270	4.9		1200	1100	8.8	<0.34		0.3	410	<0.026

Column Number	Column Name	Date	Displacement	Co (mg/L)	Cu (mg/L)	Fe^{2+} (mg/L)	Fe (T) (mg/L)	Pb (mg/L)	Mg (mg/L)	Mn (mg/L)	Hg (ug/L)	Ni (mg/L)	K (mg/L)	Se (mg/L)	Tl (mg/L)	Na (mg/L)	Zn (mg/L)
1	186 w/LS	12/29/96	0						110								
2	186 w/Lime	12/29/96	0						130								
3	170 w/LS		0														
4	13-1 w/LS	12/29/96	0	17	4200	160	3100		<600	58			<2		<0.025	10	95
5	188 w/LS	12/29/96	0						240								
6	183 w/LS	12/29/96	0						390								
7	213 w/LS	12/29/96	0	23	4300	2.1	6.4		660	56			<2		0.026	1.4	610
8	187 w/LS	12/29/96	0						270								
9	194 w/LS	12/29/96	0						290								
10	192 w/LS	12/29/96	0						160								
11	8-1 w/LS	12/29/96	0						120								
12	190 w/LS	12/29/96	0						270								
13	172 w/LS	12/29/96	0						480								
14	176 w/LS	12/29/96	0						220								
15	BF-4	12/28/96	0						340								
16	BF-5	12/28/96	0						270								
17	CUF-1	12/28/96	0						67								
18	CUF-2	12/28/96	0						67								
19	15-3 w/Lime	12/28/96	0						430								
20	180 w/Lime	12/28/96	0						380								
21	181 w/Lime	12/28/96	0						460								
22	15-1 w/Lime	12/28/96	0						350								
23	4-1 w/Lime	12/28/96	0						410								
24	4-1 w/LS	12/28/96	0						200								
25	15-1 w/LS	12/28/96	0						63								
26	181 w/LS	12/28/96	0						260								
27	180 w/LS	12/28/96	0						150								
28	15-3 w/LS	12/28/96	0	8.5	2100	0.16	64		280	37			2.4		0.039	2.2	49
1	186 w/LS	12/30/96	1	5.2	62	0.022	0.044	<0.015	120	16	<0.13		10	0.11	<0.025	11	41
2	186 w/Lime	12/30/96	1	0.89	23	0.44	0.28		40	3.1			24		<0.025	8	8.1
3	170 w/LS	1/7/97	1	6.6	950	2.6	<0.1		110	17			17		0.034	7.2	80
4	13-1 w/LS	12/30/96	1	6.7	1600	0.95	700	<0.15	120	24	<0.13		<2	<0.037	<0.025	0.73	38
5	188 w/LS	12/30/96	1	11	880	0.039	1.5		150	22			24		<0.025	8.8	170
6	183 w/LS	12/30/96	1	6.9	1600	0.046	0.56		210	21			13		0.035	9	49
7	213 w/LS	12/30/96	1	11	2100	0.74	2.2	<0.15	320	28	<0.13		<2	0.11	<0.025	1.6	300
8	187 w/LS	12/30/96	1	5.7	850	0.037	<0.1		130	14			24		0.037	5.4	23
9	194 w/LS	12/30/96	1	3.2	250	0.28	0.16		56	16			3.4		<0.025	2	12
10	192 w/LS	12/30/96	1	1.3	88	0.078	0.18	<0.015	110	8.2	<0.13		15	0.14	<0.025	10	3.7
11	8-1 w/LS	12/30/96	1	1	41	0.12	0.15		48	3.8			<2		<0.025	1.5	4.1
12	190 w/LS	12/30/96	1	10	940	0.038	<0.1		150	22			25		<0.025	7.2	54

Column Number	Column Name	Date	Displacement	Sample Volume (mL)	pH (s.u.)	Eh (mV)	Cond. (mS/cm)	Lab pH (su)	Alkalinity (mgCaCO3 mg/L)	Acidity (mgCaCO3 mg/L)	SO_4 (mg/L)	Cl (mg/L)	Al (mg/L)	As (mg/L)	Cd (mg/L)	Ca (mg/L)	Cr (mg/L)
13	172 w/LS	12/30/96	1	737	5.10	134	5810	4.6		2300	2300	6.1	0.74		0.23	480	<0.026
14	176 w/LS	12/30/96	1	640	5.20	130	4480	4.7		1400	2200	8	<0.34		0.47	520	<0.026
15	BF-4	12/29/96	1	986	7.28	-0.5	2220	7.1	36		1200	10	0.091		0.026	330	0.0067
16	BF-5	1/7/97	1	936	7.39	88	2740	7.3	22		940	23	0.35		0.017	450	0.024
17	CUF-1	12/29/96	1	643	8.59	-20.9	1390	8.6	21		640	13	0.37		<0.0012	150	0.0048
18	CUF-2	12/29/96	1	880	8.93	-44.8	1060	8.7	10		550	12	0.067		<0.0012	110	<0.0026
19	15-3 w/Lime	12/29/96	1	1192	2.80	183	4570	3.5		1100	3100	4.2	10		0.062	570	<0.067
20	180 w/Lime	12/29/96	1	884	4.71	142	4040	5		430	2600	6	0.39		0.44	540	<0.067
21	181 w/Lime	12/29/96	1	916	3.52	182	7540	4		3400	5600	8.7	3.3		2.4	450	<0.067
22	15-1 w/Lime	12/29/96	1	940	2.63	185	3670	3.2		400	1800	<0.36	8		<0.039	650	<0.067
23	4-1 w/Lime	12/29/96	1	1226	4.45	140	3780	5.4		440	2700	2.1	0.62		0.39	550	<0.067
24	4-1 w/LS	12/29/96	1	1029	5.24	113	3120	5.4		200	1500	3	0.33		0.23	520	<0.067
25	15-1 w/LS	12/29/96	1	983	6.22	55.6	2440	5.8		76	1100	4.7	<0.073	<0.024	<0.039	470	<0.067
26	181 w/LS	12/29/96	1	875	5.22	52.2	5970	5		2500	3200	7.4	1.3	0.045	1.7	450	<0.067
27	180 w/LS	12/29/96	1	966	5.79	79.8	2620	5.5		220	1100	3.7	0.08		0.26	380	<0.067
28	15-3 w/LS	12/29/96	1	903	4.54	77.4	5750	4.4		2300	3300	9.3	14		0.042	580	<0.067
1	186 w/LS	1/14/97	2	1411	7.23	-53.6	1652	6.5	<1.5		860	3.2	0.65		0.064	320	<0.026
2	186 w/Lime	1/14/97	2	1418	4.65	29.5	2240	4.4		98	1500	20	1.7		0.036	500	0.07
3	170 w/LS	1/21/97	2	1317	4.98	77.2	2610										
4	13-1 w/LS	1/14/97	2	1169	2.96	143.0	3630	2.9		1000	3200	2.7	12		0.049	520	0.057
5	188 w/LS	1/14/97	2	1258	5.29	54.5	2900	4.4		590	2600	2.7	0.59		0.95	460	0.052
6	183 w/LS	1/14/97	2	1190	4.72	69.8	3470	4.4		1100	2900	2.2	0.88		0.17	450	0.049
7	213 w/LS	1/14/97	2	1295	5.24	52.6	2920	4.8		450	2500	4.4	1.7		0.26	530	<0.026
8	187 w/LS	1/14/97	2	1268	5.13	62.3	2880	4.8		490	2400	1.9	<0.34		0.082	520	<0.026
9	194 w/LS	1/14/97	2	1290	7.01	10.1	1374	6		50	800	1	2		0.016	300	0.17
10	192 w/LS	1/14/97	2	1437	5.83	29.8	1537	5.5		36	1100	1.2	0.8		0.022	260	0.072
11	8-1 w/LS	1/14/97	2	1196	7.40	-17.2	1049	6.6	<1.5		590	0.77	0.65		0.025	220	0.052
12	190 w/LS	1/14/97	2	1075	5.11	67.1	2470	5.2		480	1900	2.8	0.76		0.15	340	0.07
13	172 w/LS	1/14/97	2	1272	5.23	69.5	2980	5.2		540	2700	1.7	0.68		0.041	520	0.042
14	176 w/LS	1/14/97	2	925	5.31	67.1	2730	5.3		270	1400	3.9	1.4		0.14	540	0.11
15	BF-4	1/13/97	2	1259	7.40	-61.0	868	5.9		20	550	0.5	<0.34		0.019	140	<0.026
16	BF-5	1/21/97	2	1148	6.89	1.6	2190										
17	CUF-1	1/14/97	2	1347	8.54	-95	1292	6.6	25		650	11	1.2		<0.012	140	0.09
18	CUF-2	1/13/97	2	1764	9.14	-68	705	8.1	10		540	5.3	0.39		0.018	66	0.029
19	15-3 w/Lime	1/13/97	2	1422	3.84	97.8	2770	3.8		250	1900	0.58	1.5		0.037	540	0.076
20	180 w/Lime	1/13/97	2	1411	5.76	27.7	2440	5.1		440	1600	1.1	<0.34		0.18	450	<0.026
21	181 w/Lime	1/13/97	2	1421	3.74	89.3	4460	3.7		1800	6100	2.2	2.8		1.1	460	0.049
22	15-1 w/Lime	1/13/97	2	1548	3.86	93.0	2580	3.8		100	2200	0.42	1		0.026	560	0.037
23	4-1 w/Lime	1/13/97	2	1614	5.52	38.2	2390	5.3		140	1700	<0.36	1		0.098	480	<0.026
24	4-1 w/LS	1/13/97	2	1608	6.06	23.2	2610	5.9		78	1800	2.1	0.97		0.21	430	0.059
25	15-1 w/LS	1/13/97	2	1531	6.58	-14.2	2110	6.7	<1.5		1200	3.1	0.97		<0.012	440	0.056

Column Number	Column Name	Date	Displacement	Co (mg/L)	Cu (mg/L)	Fe^{2+} (mg/L)	Fe (T) (mg/L)	Pb (mg/L)	Mg (mg/L)	Mn (mg/L)	Hg (ug/L)	Ni (mg/L)	K (mg/L)	Se (mg/L)	Tl (mg/L)	Na (mg/L)	Zn (mg/L)
13	172 w/LS	12/30/96	1	6.5	1700	0.042	0.47		240	19			6.2		<0.025	5.7	41
14	176 w/LS	12/30/96	1	12	1000	0.031	<0.1		96	8.4			11		0.1	7.1	94
15	BF-4	12/29/96	1	0.47	0.26	0.19	<0.01		110	8.9			14		<0.025	9.6	1.7
16	BF-5	1/7/97	1	0.66	0.73	2.2	0.4		150	18			24		<0.025	19	1.3
17	CUF-1	12/29/96	1	0.011	0.12	<0.0091	0.22		83	0.22			5.5		<0.025	9.3	<0.12
18	CUF-2	12/29/96	1	<0.0043	0.08	0.031	0.027		58	0.0098			5.8		<0.025	9.8	<0.12
19	15-3 w/Lime	12/29/96	1	4.1	690	0.077	28		220	18			4.1		<0.8	2.9	20
20	180 w/Lime	12/29/96	1	5.8	280	<0.0091	0.21		240	48			13		<0.8	11	110
21	181 w/Lime	12/29/96	1	14	1400	0.065	5.4		280	40			4.8		<0.8	8.2	430
22	15-1 w/Lime	12/29/96	1	2.1	180	0.56	69		160	8.4			33		<0.8	5.1	6
23	4-1 w/Lime	12/29/96	1	3.7	270	0.028	0.46		240	22			8.8		<0.8	2	60
24	4-1 w/LS	12/29/96	1	2.4	140	0.012	0.35		150	14			2.1		<0.8	1.8	37
25	15-1 w/LS	12/29/96	1	1.7	47	<0.0091	<0.079	<0.53	79	7.3	<0.13		<2	<0.037	<0.8	3.9	3.7
26	181 w/LS	12/29/96	1	9.7	1300	0.053	1.8	<0.53	210	27	<0.13		<2	0.13	<0.8	10	230
27	180 w/LS	12/29/96	1	3.1	200	0.013	<0.079		100	24			6.9		<0.8	5.2	58
28	15-3 w/LS	12/29/96	1	6.7	980	0.062	35		260	27			<2		<0.8	2.1	33
1	186 w/LS	1/14/97	2	1.1	5.9	0.3	<0.1		36	4.1			3.1		0.045	5.3	6
2	186 w/Lime	1/14/97	2	0.88	31	0.2	<0.1		<30	1.8			14		<0.025	4.8	8.6
3	170 w/LS	1/21/97	2														
4	13-1 w/LS	1/14/97	2	2.4	300	19	210		48	8.4			<2		<0.025	3.3	12
5	188 w/LS	1/14/97	2	4.4	310	1.4	0.28		65	8.8			13		0.042	6.4	61
6	183 w/LS	1/14/97	2	2.5	670	0.62	0.16		79	7.8			6.5		<0.025	5.6	17
7	213 w/LS	1/14/97	2	2.4	200	0.44	1.3		75	5.9			<2		0.026	5	52
8	187 w/LS	1/14/97	2	1.8	300	<0.046	0.19		47	5			12		<0.025	4.9	6.9
9	194 w/LS	1/14/97	2	0.48	4.4	0.34	0.27		<30	1.5			<2		<0.025	3.2	1.2
10	192 w/LS	1/14/97	2	0.71	38	0.2	<0.1		46	3.7			6.2		<0.025	5.4	1.8
11	8-1 w/LS	1/14/97	2	0.14	0.52	0.06	<0.1		<30	0.18			<2		<0.025	4.4	<1.2
12	190 w/LS	1/14/97	2	3.6	300	<0.046	<0.1		65	8.8			12		<0.025	6.2	19
13	172 w/LS	1/14/97	2	1.7	320	0.05	<0.1		65	4.8			3.7		<0.025	4.8	9.5
14	176 w/LS	1/14/97	2	2.9	210	<0.046	0.12		33	2.8			4.6		<0.025	5.8	18
15	BF-4	1/13/97	2	0.16	<0.054	0.19	0.17		<30	2.6			3.1		<0.025	1.6	<1.2
16	BF-5	1/21/97	2														
17	CUF-1	1/14/97	2	0.12	0.2	0.06	0.11		86	0.29			4.8		<0.025	9.8	<1.2
18	CUF-2	1/13/97	2	0.057	0.15	0.06	<0.1		44	<0.018			2.6		<0.025	5.3	<1.2
19	15-3 w/Lime	1/13/97	2	1.5	130	1.1	3.3		67	6.2			7.9		<0.025	2.8	8
20	180 w/Lime	1/13/97	2	2.2	45	0.64	<0.1		86	19			6.1		0.026	3.9	35
21	181 w/Lime	1/13/97	2	6.2	950	12	14		140	20			3.4		<0.025	2.5	170
22	15-1 w/Lime	1/13/97	2	0.44	23	4	4		43	2			32		<0.025	4.3	<1.2
23	4-1 w/Lime	1/13/97	2	0.76	35	0.66	0.53		72	4.8			9.9		<0.025	6.2	10
24	4-1 w/LS	1/13/97	2	2.2	61	0.1	<0.1		140	13			2.9		<0.025	2.2	28
25	15-1 w/LS	1/13/97	2	0.8	1.9	0.74	<0.1		63	4.8			<2		<0.025	2	<1.2

Column Number	Column Name	Date	Displacement	Sample Volume (mL)	pH (s.u.)	Eh (mV)	Cond. (mS/cm)	Lab pH (su)	Alkalinity (mgCaCO3 mg/L)	Acidity (mgCaCO3 mg/L)	SO_4 (mg/L)	Cl (mg/L)	Al (mg/L)	As (mg/L)	Cd (mg/L)	Ca (mg/L)	Cr (mg/L)
26	181 w/LS	1/13/97	2	1378	4.71	78.7	4370	5.4		1700	5900	4	1		1.4	420	0.064
27	180 w/LS	1/13/97	2	1384	6.52	-21	2130	4.6		100	1200	2.4	1.6		0.18	370	0.13
28	15-3 w/LS	1/13/97	2	1534	5.39	40.4	3060	6.5	<1.5		1200	4	1.8		0.027	510	0.041
1	186 w/LS	2/4/97	3	1103	6.68	-7	2560	6.6	47		690		0.16	<0.016	0.021	570	
2	186 w/Lime	2/4/97	3	935	6.24	-14	2460	6.5		<2	600		<0.034	<0.016	0.0079	590	
3	170 w/LS	2/4/97	3	1193	5.47	50	2030	6		<2	660		<0.034	<0.016	0.045	460	
4	13-1 w/LS	2/4/97	3	1106	4.96	53	2430	5.7		40	700		0.075	<0.016	0.0082	570	
5	188 w/LS	2/4/97	3	1259	5.26	58	2190	5.4		32	610		0.072	<0.016	0.19	480	
6	183 w/LS	2/4/97	3	1101	4.77	74	2470	5		190	700		<0.034	<0.016	0.032	510	
7	213 w/LS	2/4/97	3	1044	6.45	-19	713	5.6		<2	520		0.065	<0.016	0.0047	130	
8	187 w/LS	2/4/97	3	1233	5.55	46	2230	5.5		<2	580		<0.034	<0.016	0.013	520	
9	194 w/LS	2/4/97	3	926	6.61	50	2240	6		<2	850		0.05	<0.016	0.0091	530	
10	192 w/LS	2/4/97	3	1092	5.68	41	660	6		<2	510		<0.034	<0.016	0.0037	94	
11	8-1 w/LS	2/4/97	3	858	6.95	41	2440	5.9		<2	560		<0.034	<0.016	0.0044	600	
12	190 w/LS	2/4/97	3	1102	4.84	66.5	1791	6.1		<2	560		<0.034	<0.016	0.045	310	
13	172 w/LS	2/4/97	3	1118	5.60	73	2250	5.3		<2	660		<0.034	<0.016	0.013	520	
14	176 w/LS	2/4/97	3	1011	5.63	51.1	2400	5.7		<2	680		<0.034	<0.016	0.031	590	
15	BF-4	2/4/97	3	1115	7.58	-33.8	895	6.2		<2	540		<0.034	<0.016	0.014	140	
16	BF-5	2/4/97	3	1134	6.73	-3.3	1261	6.3		<2	590		<0.034	<0.016	0.0096	230	
17	CUF-1	2/4/97	3	1096	8.33	-66.0	1086	6.9	20		560		<0.034	<0.016	0.0027	110	
18	CUF-2	2/4/97	3	1077	8.61	-80.1	601	7.4	90		160		<0.034	<0.016	<0.0012	53	
19	15-3 w/Lime	2/4/97	3	1248	4.28	58.5	2280	6.2		<2	560		<0.034	<0.016	0.0071	480	
20	180 w/Lime	2/4/97	3	1221	6.06	37.8	1949	6.2		<2	620		<0.034	<0.016	0.04	400	
21	181 w/Lime	2/4/97	3	1243	3.75	91.9	3020	4.8		<2	710		0.17	<0.016	0.53	370	
22	15-1 w/Lime	2/4/97	3	1205	6.10	7.0	2450	5.8		740	730		<0.034	<0.016	0.0021	550	
23	4-1 w/Lime	2/4/97	3	1225	5.75	60.2	2070	6.2		<2	670		<0.034	<0.016	0.034	420	
24	4-1 w/LS	2/4/97	3	1173	6.32	20.1	2200	6.1		<2	580		<0.034	<0.016	0.018	430	
25	15-1 w/LS	2/4/97	3	906	6.88	32	2960	6.1		<2	680		<0.034	<0.016	0.0021	560	
26	181 w/LS	2/4/97	3	1067	4.05	92.0	3280	4.9		590	830		0.08	<0.016	0.58	450	
27	180 w/LS	2/4/97	3	1058	6.41	62.4	2440	6.7	70		770		<0.034	<0.016	0.082	450	
28	15-3 w/LS	2/4/97	3	1092	6.78	-13.2	2080	6.8	29		630		<0.034	<0.016	0.0014	460	

Column Number	Column Name	Date	Displacement	Co (mg/L)	Cu (mg/L)	Fe^{2+} (mg/L)	Fe (T) (mg/L)	Pb (mg/L)	Mg (mg/L)	Mn (mg/L)	Hg (ug/L)	Ni (mg/L)	K (mg/L)	Se (mg/L)	Tl (mg/L)	Na (mg/L)	Zn (mg/L)
26	181 w/LS	1/13/97	2	7.7	1000	1.2	1		160	22			2.1		0.029	3.8	220
27	180 w/LS	1/13/97	2	2.4	16	0.76	<0.1		84	19			5.2		<0.025	5.8	31
28	15-3 w/LS	1/13/97	2	2.6	320	0.55	0.46		96	11			<2		<0.025	2.7	10
1	186 w/LS	2/4/97	3	0.43	0.52		0.14		44	3.9			6.4	<0.037	<0.025	3.1	1.3
2	186 w/Lime	2/4/97	3	0.09	1.8		<0.01		12	0.45			9.4	<0.037	<0.025	1.5	0.88
3	170 w/LS	2/4/97	3	0.24	18		0.067		9.5	1.5			3.5	<0.037	0.035	0.47	2.2
4	13-1 w/LS	2/4/97	3	0.58	7.9		0.098		19	2.8			2.5	<0.037	<0.025	1.2	1.5
5	188 w/LS	2/4/97	3	0.76	35		0.073		13	1.9			5.5	<0.037	0.026	0.73	10
6	183 w/LS	2/4/97	3	0.48	140		0.11		17	1.9			4.5	<0.037	<0.025	0.67	3.4
7	213 w/LS	2/4/97	3	0.037	0.49		<0.01		<3	0.14			<2	<0.037	0.025	0.1	0.28
8	187 w/LS	2/4/97	3	0.31	21		0.029		10	1.3			6.6	<0.037	0.032	0.49	1.4
9	194 w/LS	2/4/97	3	0.16	0.67		<0.01		11	1.3			2.9	<0.037	0.026	0.75	0.37
10	192 w/LS	2/4/97	3	0.19	13		<0.01		12	1.4			3.6	0.06	<0.025	0.54	0.69
11	8-1 w/LS	2/4/97	3	0.018	0.16		<0.01		8.8	0.18			6	<0.037	<0.025	0.89	<0.12
12	190 w/LS	2/4/97	3	0.94	110		0.23		21	3.1			6.8	<0.037	<0.025	0.79	5.9
13	172 w/LS	2/4/97	3	0.27	18		<0.01		9.9	0.81			3.9	<0.037	<0.025	0.48	1.5
14	176 w/LS	2/4/97	3	0.46	10		<0.01		7.2	0.7			3.4	0.051	<0.025	0.75	2.6
15	BF-4	2/4/97	3	0.18	0.11		<0.01		18	3.6			3.7	<0.037	<0.025	1	0.93
16	BF-5	2/4/97	3	0.17	0.12		<0.01		16	4.5			4.5	<0.037	<0.025	0.61	0.44
17	CUF-1	2/4/97	3	0.0097	0.093		0.053		63	0.38			3.9	<0.037	<0.025	3.6	<0.12
18	CUF-2	2/4/97	3	<0.0043	0.036		0.025		32	0.033			2.8	<0.037	<0.025	2.5	<0.12
19	15-3 w/Lime	2/4/97	3	0.23	10		0.02		27	1.4			14	<0.037	<0.025	1.3	1.5
20	180 w/Lime	2/4/97	3	0.41	3.7		<0.01		31	5.7			4.8	0.07	<0.025	1.1	6.4
21	181 w/Lime	2/4/97	3	2.7	480		2.5		62	1.1			3.2	0.047	<0.025	1	74
22	15-1 w/Lime	2/4/97	3	0.035	0.94		0.049		11	0.23			33	<0.037	0.025	3.2	0.16
23	4-1 w/Lime	2/4/97	3	0.27	8.2		<0.01		33	2.6			14	<0.037	<0.025	0.89	3.6
24	4-1 w/LS	2/4/97	3	0.25	0.74		<0.01		62	4.2			2.8	<0.037	<0.025	0.84	1.5
25	15-1 w/LS	2/4/97	3	0.42	0.19		<0.01		120	7.1			5.3	<0.037	<0.025	2.8	0.17
26	181 w/LS	2/4/97	3	3.2	460		1.1		68	11			2.9	0.039	<0.025	1.3	80
27	180 w/LS	2/4/97	3	1.3	1.7		<0.01		79	17			7.5	<0.037	<0.025	3.8	12
28	15-3 w/LS	2/4/97	3	0.092	0.57		0.11		21	1.4			7.1	<0.037	<0.025	0.91	0.15

Anoxic Columns First Displacement Test Results

NORTHERN LAKE SERVICE, INC.
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

PAGE: 1 NLS PROJECT# 31692

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-172LS-1 NLS#: 124635
Ref. Line 1 of COC 21618 Description: FMC-172LS-1
Collected: 12/30/96 Received: 01/03/97 Reported: 01/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	2300	mg/L	2.0	2.0	EPA 305.1	07/01/97	721026460
Aluminum, dis. as Al by ICP	< 0.74 >	mg/L	0.34	1.2	EPA 200.7	01/16/97	721026460
Cadmium, dis. as Cd by ICP	230	ug/L	12	38	EPA 200.7	01/16/97	721026460
Calcium, dis. as Ca by ICP	480	mg/L	30	30	EPA 200.7	01/16/97	721026460
Chloride, as Cl (filtered)	6.1	mg/L	0.36	1.3	EPA 325.2	01/08/97	721026460
Chromium, dis. as Cr by ICP	ND	ug/L	26	93	EPA 200.7	01/16/97	721026460
Cobalt, dis. as Co by ICP	6500	ug/L	43	150	EPA 200.7	01/16/97	721026460
Copper, dis. as Cu by ICP	1700000	ug/L	270	950	EPA 200.7	01/16/97	721026460
Iron, Ferrous	0.042	mg/L	0.0091	0.030		01/17/97	721026460
	Additional Comments:	F&VD modified method					
Iron, dis. as Fe by ICP	0.47	mg/L	0.10	0.35	EPA 200.7	01/16/97	721026460
Magnesium, dis. as Mg by ICP	240	mg/L	30	30	EPA 200.7	01/16/97	721026460
Manganese, dis. as Mn by ICP	19000	ug/L	18	61	EPA 200.7	01/16/97	721026460
pH, lab	4.6	s.u.	1.0		EPA 150.1	01/03/97	721026460
Potassium, dis. as K	< 6.2 >	mg/L	2.0	6.6	EPA 200.7	01/10/97	721026460
Sodium, dis. as Na by ICP	5.7	mg/L	0.33	1.1	EPA 200.7	01/16/97	721026460
Sulfate, as SO4 (filtered)	2300	mg/L	250	250	EPA 375.2	01/14/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/15/97	721026460
Zinc, dis. as Zn by ICP	41000	ug/L	1200	1200	EPA 200.7	01/16/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Steven R. Cuper
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-187LS-1 NLS#: 124636
Ref. Line 2 of COC 21618 Description: FMC-187LS-1
Collected: 12/30/96 Received: 01/03/97 Reported: 01/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	1100	mg/L	2.0	2.0	EPA 305.1	07/01/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.34	1.2	EPA 200.7	01/16/97	721026460
Cadmium, dis. as Cd by ICP	100	ug/L	12	38	EPA 200.7	01/16/97	721026460
Calcium, dis. as Ca by ICP	500	mg/L	30	30	EPA 200.7	01/16/97	721026460
Chloride, as Cl (filtered)	6.5	mg/L	0.36	1.3	EPA 325.2	01/08/97	721026460
Chromium, dis. as Cr by ICP	ND	ug/L	26	93	EPA 200.7	01/16/97	721026460
Cobalt, dis. as Co by ICP	5700	ug/L	43	150	EPA 200.7	01/16/97	721026460
Copper, dis. as Cu by ICP	850000	ug/L	270	950	EPA 200.7	01/16/97	721026460
Iron, Ferrous	0.037	mg/L	0.0091	0.030		01/17/97	721026460
	Additional Comments: F&VD modified method						
Iron, dis. as Fe by ICP	ND	mg/L	0.10	0.35	EPA 200.7	01/16/97	721026460
Magnesium, dis. as Mg by ICP	130	mg/L	30	30	EPA 200.7	01/16/97	721026460
Manganese, dis. as Mn by ICP	14000	ug/L	18	61	EPA 200.7	01/16/97	721026460
pH, lab	4.9	s.u.	1.0		EPA 150.1	01/03/97	721026460
Potassium, dis. as K	24	mg/L	2.0	6.6	EPA 200.7	01/10/97	721026460
Sodium, dis. as Na by ICP	< 5.4 >	mg/L	3.3	11	EPA 200.7	01/16/97	721026460
Sulfate, as SO4 (filtered)	2400	mg/L	250	250	EPA 375.2	01/14/97	721026460
Thallium, dis. as Tl by furnace AAS	< 37 >	ug/L	25	87	EPA 279.2	01/15/97	721026460
Zinc, dis. as Zn by ICP	23000	ug/L	1200	1200	EPA 200.7	01/16/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Steven R. Cayn
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-176LS-1 NLS#: 124637
Ref. Line 3 of COC 21618 Description: FMC-176LS-1
Collected: 12/30/96 Received: 01/03/97 Reported: 01/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	1400	mg/L	2.0	2.0	EPA 305.1	07/01/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.34	1.2	EPA 200.7	01/16/97	721026460
Cadmium, dis. as Cd by ICP	470	ug/L	12	38	EPA 200.7	01/16/97	721026460
Calcium, dis. as Ca by ICP	520	mg/L	30	30	EPA 200.7	01/16/97	721026460
Chloride, as Cl (filtered)	8.0	mg/L	0.36	1.3	EPA 325.2	01/08/97	721026460
Chromium, dis. as Cr by ICP	ND	ug/L	26	93	EPA 200.7	01/16/97	721026460
Cobalt, dis. as Co by ICP	12000	ug/L	43	150	EPA 200.7	01/16/97	721026460
Copper, dis. as Cu by ICP	1000000	ug/L	270	950	EPA 200.7	01/16/97	721026460
Iron, Ferrous	0.031	mg/L	0.0091	0.030		01/17/97	721026460
	Additional Comments: F&VD modified method						
Iron, dis. as Fe by ICP	ND	mg/L	0.10	0.35	EPA 200.7	01/16/97	721026460
Magnesium, dis. as Mg by ICP	96	mg/L	30	30	EPA 200.7	01/16/97	721026460
Manganese, dis. as Mn by ICP	8400	ug/L	18	61	EPA 200.7	01/16/97	721026460
pH, lab	4.7	s.u.	1.0		EPA 150.1	01/03/97	721026460
Potassium, dis. as K	11	mg/L	2.0	6.6	EPA 200.7	01/10/97	721026460
Sodium, dis. as Na by ICP	7.1	mg/L	0.33	1.1	EPA 200.7	01/16/97	721026460
Sulfate, as SO4 (filtered)	2200	mg/L	250	250	EPA 375.2	01/14/97	721026460
Thallium, dis. as Tl by furnace AAS	100	ug/L	25	87	EPA 279.2	01/15/97	721026460
Zinc, dis. as Zn by ICP	94000	ug/L	1200	1200	EPA 200.7	01/16/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Steven R. Cuzzi
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-190LS-1 NLS#: 124638
Ref. Line 4 of COC 21618 Description: FMC-190LS-1
Collected: 12/30/96 Received: 01/03/97 Reported: 01/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	1200	mg/L	2.0	2.0	EPA 305.1	07/01/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.34	1.2	EPA 200.7	01/16/97	721026460
Cadmium, dis. as Cd by ICP	300	ug/L	12	38	EPA 200.7	01/16/97	721026460
Calcium, dis. as Ca by ICP	410	mg/L	30	30	EPA 200.7	01/16/97	721026460
Chloride, as Cl (filtered)	8.8	mg/L	0.36	1.3	EPA 325.2	01/08/97	721026460
Chromium, dis. as Cr by ICP	ND	ug/L	26	93	EPA 200.7	01/16/97	721026460
Cobalt, dis. as Co by ICP	10000	ug/L	43	150	EPA 200.7	01/16/97	721026460
Copper, dis. as Cu by ICP	940000	ug/L	270	950	EPA 200.7	01/16/97	721026460
Iron, Ferrous	0.038	mg/L	0.0091	0.030		01/17/97	721026460
	Additional Comments:	F&VD modified method					
Iron, dis. as Fe by ICP	ND	mg/L	0.10	0.35	EPA 200.7	01/16/97	721026460
Magnesium, dis. as Mg by ICP	150	mg/L	30	30	EPA 200.7	01/16/97	721026460
Manganese, dis. as Mn by ICP	22000	ug/L	18	61	EPA 200.7	01/16/97	721026460
pH, lab	4.9	s.u.	1.0		EPA 150.1	01/03/97	721026460
Potassium, dis. as K	25	mg/L	2.0	6.6	EPA 200.7	01/10/97	721026460
Sodium, dis. as Na by ICP	7.2	mg/L	0.33	1.1	EPA 200.7	01/16/97	721026460
Sulfate, as SO4 (filtered)	1100	mg/L	250	250	EPA 375.2	01/16/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/15/97	721026460
Zinc, dis. as Zn by ICP	54000	ug/L	1200	1200	EPA 200.7	01/16/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Steven R. Cergni
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31692

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-13-ILS-1 NLS#: 124639
Ref. Line 5 of COC 21618 Description: FMC-13-ILS-1
Collected: 12/30/96 Received: 01/03/97 Reported: 01/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	3800	mg/L	2.0	2.0	EPA 305.1	07/01/97	721026460
Aluminum, dis. as Al by ICP	72	mg/L	0.34	1.2	EPA 200.7	01/16/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	160	570	EPA 200.7	01/16/97	721026460
Cadmium, dis. as Cd by ICP	92	ug/L	12	38	EPA 200.7	01/16/97	721026460
Calcium, dis. as Ca by ICP	470	mg/L	30	30	EPA 200.7	01/16/97	721026460
Chloride, as Cl (filtered)	9.3	mg/L	0.36	1.3	EPA 325.2	01/08/97	721026460
Chromium, dis. as Cr by ICP	ND	ug/L	26	93	EPA 200.7	01/16/97	721026460
Cobalt, dis. as Co by ICP	6700	ug/L	43	150	EPA 200.7	01/16/97	721026460
Copper, dis. as Cu by ICP	1600000	ug/L	270	950	EPA 200.7	01/16/97	721026460
Iron, Ferrous	0.95	mg/L	0.0091	0.030		01/17/97	721026460
	Additional Comments:	F&VD modified method					
Iron, dis. as Fe by ICP	700	mg/L	0.10	0.35	EPA 200.7	01/16/97	721026460
Lead, dis. as Pb by ICP	ND	ug/L	150	520	EPA 200.7	01/16/97	721026460
Magnesium, dis. as Mg by ICP	120	mg/L	30	30	EPA 200.7	01/16/97	721026460
Manganese, dis. as Mn by ICP	24000	ug/L	18	61	EPA 200.7	01/16/97	721026460
Mercury, dis. as Hg	ND	ug/L	0.13	0.47	EPA 245.1	01/17/97	721026460
pH, lab	2.7	s.u.	1.0		EPA 150.1	01/03/97	721026460
Potassium, dis. as K	ND	mg/L	2.0	6.6	EPA 200.7	01/10/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	01/16/97	721026460
Sodium, dis. as Na by ICP	< 0.73 >	mg/L	0.33	1.1	EPA 200.7	01/16/97	721026460
Sulfate, as SO4 (filtered)	2700	mg/L	250	250	EPA 375.2	01/16/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/15/97	721026460
Zinc, dis. as Zn by ICP	38000	ug/L	1200	1200	EPA 200.7	01/16/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Steven R. Creyn
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-183LS-1 NLS#: 124640
Ref. Line 6 of COC 21618 Description: FMC-183LS-1
Collected: 12/30/96 Received: 01/03/97 Reported: 01/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	2000	mg/L	2.0	2.0	EPA 305.1	07/01/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.34	1.2	EPA 200.7	01/16/97	721026460
Cadmium, dis. as Cd by ICP	380	ug/L	12	38	EPA 200.7	01/16/97	721026460
Calcium, dis. as Ca by ICP	450	mg/L	30	30	EPA 200.7	01/16/97	721026460
Chloride, as Cl (filtered)	6.7	mg/L	0.36	1.3	EPA 325.2	01/08/97	721026460
Chromium, dis. as Cr by ICP	ND	ug/L	26	93	EPA 200.7	01/16/97	721026460
Cobalt, dis. as Co by ICP	6900	ug/L	43	150	EPA 200.7	01/16/97	721026460
Copper, dis. as Cu by ICP	1600000	ug/L	270	950	EPA 200.7	01/16/97	721026460
Iron, Ferrous	0.046	mg/L	0.0091	0.030		01/17/97	721026460
	Additional Comments: F&VD modified method						
Iron, dis. as Fe by ICP	0.56	mg/L	0.10	0.35	EPA 200.7	01/16/97	721026460
Magnesium, dis. as Mg by ICP	210	mg/L	30	30	EPA 200.7	01/16/97	721026460
Manganese, dis. as Mn by ICP	21000	ug/L	18	61	EPA 200.7	01/16/97	721026460
pH, lab	4.7	s.u.	1.0		EPA 150.1	01/03/97	721026460
Potassium, dis. as K	13	mg/L	2.0	6.6	EPA 200.7	01/10/97	721026460
Sodium, dis. as Na by ICP	9.0	mg/L	0.33	1.1	EPA 200.7	01/16/97	721026460
Sulfate, as SO4 (filtered)	2600	mg/L	250	250	EPA 375.2	01/16/97	721026460
Thallium, dis. as Tl by furnace AAS	< 35 >	ug/L	25	87	EPA 279.2	01/15/97	721026460
Zinc, dis. as Zn by ICP	49000	ug/L	1200	1200	EPA 200.7	01/16/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation".
Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Steven R. Cuyer
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31692

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-213LS-1 NLS#: 124641
Ref. Line 7 of COC 21618 Description: FMC-213LS-1
Collected: 12/30/96 Received: 01/03/97 Reported: 01/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	2700	mg/L	2.0	2.0	EPA 305.1	07/01/97	721026460
Aluminum, dis. as Al by ICP	19	mg/L	0.34	1.2	EPA 200.7	01/16/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	160	570	EPA 200.7	01/16/97	721026460
Cadmium, dis. as Cd by ICP	1300	ug/L	12	38	EPA 200.7	01/16/97	721026460
Calcium, dis. as Ca by ICP	470	mg/L	30	30	EPA 200.7	01/16/97	721026460
Chloride, as Cl (filtered)	10	mg/L	0.36	1.3	EPA 325.2	01/08/97	721026460
Chromium, dis. as Cr by ICP	ND	ug/L	26	93	EPA 200.7	01/16/97	721026460
Cobalt, dis. as Co by ICP	11000	ug/L	43	150	EPA 200.7	01/16/97	721026460
Copper, dis. as Cu by ICP	2100000	ug/L	270	950	EPA 200.7	01/16/97	721026460
Iron, Ferrous	0.74	mg/L	0.0091	0.030		01/17/97	721026460
Additional Comments: F&VD modified method. Result may have been affected by sample turbidity.							
Iron, dis. as Fe by ICP	2.2	mg/L	0.10	0.35	EPA 200.7	01/16/97	721026460
Lead, dis. as Pb by ICP	ND	ug/L	150	520	EPA 200.7	01/16/97	721026460
Magnesium, dis. as Mg by ICP	320	mg/L	30	30	EPA 200.7	01/16/97	721026460
Manganese, dis. as Mn by ICP	28000	ug/L	18	61	EPA 200.7	01/16/97	721026460
Mercury, dis. as Hg	ND	ug/L	0.13	0.47	EPA 245.1	01/17/97	721026460
pH, lab	4.2	s.u.	1.0		EPA 150.1	01/03/97	721026460
Potassium, dis. as K	ND	mg/L	2.0	6.6	EPA 200.7	01/10/97	721026460
Selenium, dis. as Se by furnace	< 110 >	ug/L	37	130	EPA 270.2	01/16/97	721026460
Sodium, dis. as Na by ICP	1.6	mg/L	0.33	1.1	EPA 200.7	01/16/97	721026460
Sulfate, as SO4 (filtered)	6300	mg/L	2500	2500	EPA 375.2	01/16/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/15/97	721026460
Zinc, dis. as Zn by ICP	300000	ug/L	6000	6000	EPA 200.7	01/16/97	721026460

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Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Steven R. Krueger
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Authorized by:
R. T. Krueger
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
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Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-188LS-1 NLS#: 124642
Ref. Line 8 of COC 21618 Description: FMC-188LS-1
Collected: 12/30/96 Received: 01/03/97 Reported: 01/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	1100	mg/L	2.0	2.0	EPA 305.1	07/01/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.34	1.2	EPA 200.7	01/16/97	721026460
Cadmium, dis. as Cd by ICP	2300	ug/L	12	38	EPA 200.7	01/16/97	721026460
Calcium, dis. as Ca by ICP	470	mg/L	30	30	EPA 200.7	01/16/97	721026460
Chloride, as Cl (filtered)	8.4	mg/L	0.36	1.3	EPA 325.2	01/08/97	721026460
Chromium, dis. as Cr by ICP	ND	ug/L	26	93	EPA 200.7	01/16/97	721026460
Cobalt, dis. as Co by ICP	11000	ug/L	43	150	EPA 200.7	01/16/97	721026460
Copper, dis. as Cu by ICP	880000	ug/L	270	950	EPA 200.7	01/16/97	721026460
Iron, Ferrous	0.039	mg/L	0.0091	0.030		01/17/97	721026460
	Additional Comments:	F&VD modified method					
Iron, dis. as Fe by ICP	1.5	mg/L	0.10	0.35	EPA 200.7	01/16/97	721026460
Magnesium, dis. as Mg by ICP	150	mg/L	30	30	EPA 200.7	01/16/97	721026460
Manganese, dis. as Mn by ICP	22000	ug/L	18	61	EPA 200.7	01/16/97	721026460
pH, lab	4.7	s.u.	1.0		EPA 150.1	01/03/97	721026460
Potassium, dis. as K	24	mg/L	2.0	6.6	EPA 200.7	01/10/97	721026460
Sodium, dis. as Na by ICP	8.8	mg/L	0.33	1.1	EPA 200.7	01/16/97	721026460
Sulfate, as SO4 (filtered)	1800	mg/L	250	250	EPA 375.2	01/16/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/15/97	721026460
Zinc, dis. as Zn by ICP	170000	ug/L	6000	6000	EPA 200.7	01/16/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
LOQ = Limit of Quantitation
ND = Not Detected
DWB = Dry Weight Basis
NA = Not Applicable
%DWB = (mg/kg DWB)/10000

Steven R. Cayn
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R. T. Krueger
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
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PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-186LS-1 NLS#: 124643
Ref. Line 9 of COC 21618 Description: FMC-186LS-1
Collected: 12/30/96 Received: 01/03/97 Reported: 01/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	81	mg/L	1.5	5.3	EPA 310.1	01/07/97	721026460
Aluminum, dis. as Al by ICP	0.37	mg/L	0.034	0.12	EPA 200.7	01/15/97	721026460
Arsenic, dis. as As by ICP	< 34 >	ug/L	16	57	EPA 200.7	01/15/97	721026460
Cadmium, dis. as Cd by ICP	220	ug/L	1.2	3.8	EPA 200.7	01/15/97	721026460
Calcium, dis. as Ca by ICP	550	mg/L	3.0	3.0	EPA 200.7	01/15/97	721026460
Chloride, as Cl (filtered)	13	mg/L	0.36	1.3	EPA 325.2	01/08/97	721026460
Chromium, dis. as Cr by ICP	25	ug/L	2.6	9.3	EPA 200.7	01/15/97	721026460
Cobalt, dis. as Co by ICP	5200	ug/L	4.3	15	EPA 200.7	01/15/97	721026460
Copper, dis. as Cu by ICP	62000	ug/L	5.4	19	EPA 200.7	01/15/97	721026460
Iron, Ferrous	< 0.022 >	mg/L	0.0091	0.030		01/17/97	721026460
	Additional Comments:	F&VD modified method					
Iron, dis. as Fe by ICP	0.044	mg/L	0.010	0.035	EPA 200.7	01/15/97	721026460
Lead, dis. as Pb by ICP	ND	ug/L	15	52	EPA 200.7	01/15/97	721026460
Magnesium, dis. as Mg by ICP	120	mg/L	3.0	3.0	EPA 200.7	01/15/97	721026460
Manganese, dis. as Mn by ICP	16000	ug/L	1.8	6.1	EPA 200.7	01/15/97	721026460
Mercury, dis. as Hg	ND	ug/L	0.13	0.47	EPA 245.1	01/17/97	721026460
pH, lab	6.7	s.u.	1.0		EPA 150.1	01/03/97	721026460
Potassium, dis. as K	10	mg/L	2.0	6.6	EPA 200.7	01/10/97	721026460
Selenium, dis. as Se by furnace	< 110 >	ug/L	37	130	EPA 270.2	01/16/97	721026460
Sodium, dis. as Na by ICP	11	mg/L	0.033	0.11	EPA 200.7	01/15/97	721026460
Sulfate, as SO4 (filtered)	620	mg/L	250	250	EPA 375.2	01/16/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/15/97	721026460
Zinc, dis. as Zn by ICP	41000	ug/L	120	120	EPA 200.7	01/15/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Steven R. Cuyi
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31692

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-186L-1 NLS#: 124644
Ref. Line 10 of COC 21618 Description: FMC-186L-1
Collected: 12/30/96 Received: 01/03/97 Reported: 01/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as $CaCO_3$	ND	mg/L	2.0	2.0	EPA 305.1	07/01/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	01/15/97	721026460
Cadmium, dis. as Cd by ICP	41	ug/L	1.2	3.8	EPA 200.7	01/15/97	721026460
Calcium, dis. as Ca by ICP	550	mg/L	3.0	3.0	EPA 200.7	01/15/97	721026460
Chloride, as Cl (filtered)	16	mg/L	0.36	1.3	EPA 325.2	01/08/97	721026460
Chromium, dis. as Cr by ICP	ND	ug/L	2.6	9.3	EPA 200.7	01/15/97	721026460
Cobalt, dis. as Co by ICP	890	ug/L	4.3	15	EPA 200.7	01/15/97	721026460
Copper, dis. as Cu by ICP	23000	ug/L	5.4	19	EPA 200.7	01/15/97	721026460
Iron, Ferrous	0.44	mg/L	0.0091	0.030		01/17/97	721026460
	Additional Comments:	F&VD modified method					
Iron, dis. as Fe by ICP	0.28	mg/L	0.010	0.035	EPA 200.7	01/15/97	721026460
Magnesium, dis. as Mg by ICP	40	mg/L	3.0	3.0	EPA 200.7	01/15/97	721026460
Manganese, dis. as Mn by ICP	3100	ug/L	1.8	6.1	EPA 200.7	01/15/97	721026460
pH, lab	5.5	s.u.	1.0		EPA 150.1	01/03/97	721026460
Potassium, dis. as K	24	mg/L	2.0	6.6	EPA 200.7	01/10/97	721026460
Sodium, dis. as Na by ICP	8.0	mg/L	0.033	0.11	EPA 200.7	01/15/97	721026460
Sulfate, as SO_4 (filtered)	810	mg/L	250	250	EPA 375.2	01/16/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/15/97	721026460
Zinc, dis. as Zn by ICP	8100	ug/L	120	120	EPA 200.7	01/15/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Steven R. Cuyn
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Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31692

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-192LS-1 NLS#: 124645
Ref. Line 11 of COC 21618 Description: FMC-192LS-1
Collected: 12/30/96 Received: 01/03/97 Reported: 01/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	82	mg/L	2.0	2.0	EPA 305.1	07/01/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	01/15/97	721026460
Arsenic, dis. as As by ICP	< 38 >	ug/L	16	57	EPA 200.7	01/15/97	721026460
Cadmium, dis. as Cd by ICP	18	ug/L	1.2	3.8	EPA 200.7	01/15/97	721026460
Calcium, dis. as Ca by ICP	440	mg/L	3.0	3.0	EPA 200.7	01/15/97	721026460
Chloride, as Cl (filtered)	3.4	mg/L	0.36	1.3	EPA 325.2	01/08/97	721026460
Chromium, dis. as Cr by ICP	ND	ug/L	2.6	9.3	EPA 200.7	01/15/97	721026460
Cobalt, dis. as Co by ICP	1300	ug/L	4.3	15	EPA 200.7	01/15/97	721026460
Copper, dis. as Cu by ICP	88000	ug/L	5.4	19	EPA 200.7	01/15/97	721026460
Iron, Ferrous	0.078	mg/L	0.0091	0.030		01/17/97	721026460
	Additional Comments:	F&VD modified method					
Iron, dis. as Fe by ICP	0.18	mg/L	0.010	0.035	EPA 200.7	01/15/97	721026460
Lead, dis. as Pb by ICP	ND	ug/L	15	52	EPA 200.7	01/15/97	721026460
Magnesium, dis. as Mg by ICP	110	mg/L	3.0	3.0	EPA 200.7	01/15/97	721026460
Manganese, dis. as Mn by ICP	8200	ug/L	1.8	6.1	EPA 200.7	01/15/97	721026460
Mercury, dis. as Hg	ND	ug/L	0.13	0.47	EPA 245.1	01/17/97	721026460
pH, lab	5.4	s.u.	1.0		EPA 150.1	01/03/97	721026460
Potassium, dis. as K	15	mg/L	2.0	6.6	EPA 200.7	01/10/97	721026460
Selenium, dis. as Se by furnace	140	ug/L	37	130	EPA 270.2	01/16/97	721026460
Sodium, dis. as Na by ICP	10	mg/L	0.033	0.11	EPA 200.7	01/15/97	721026460
Sulfate, as SO4 (filtered)	860	mg/L	250	250	EPA 375.2	01/16/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/15/97	721026460
Zinc, dis. as Zn by ICP	3700	ug/L	120	120	EPA 200.7	01/15/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Steven R. Cuzzi
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-194LS-1 NLS#: 124646
Ref. Line 12 of COC 21618 Description: FMC-194LS-1
Collected: 12/30/96 Received: 01/03/97 Reported: 01/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	290	mg/L	2.0	2.0	EPA 305.1	07/01/97	721026460
Aluminum, dis. as Al by ICP	1.8	mg/L	0.34	1.2	EPA 200.7	01/16/97	721026460
Cadmium, dis. as Cd by ICP	69	ug/L	12	38	EPA 200.7	01/16/97	721026460
Calcium, dis. as Ca by ICP	490	mg/L	30	30	EPA 200.7	01/16/97	721026460
Chloride, as Cl (filtered)	2.6	mg/L	0.36	1.3	EPA 325.2	01/08/97	721026460
Chromium, dis. as Cr by ICP	< 73 >	ug/L	26	93	EPA 200.7	01/16/97	721026460
Cobalt, dis. as Co by ICP	3200	ug/L	43	150	EPA 200.7	01/16/97	721026460
Copper, dis. as Cu by ICP	250000	ug/L	54	190	EPA 200.7	01/16/97	721026460
Iron, Ferrous	0.28	mg/L	0.0091	0.030		01/17/97	721026460
	Additional Comments: F&VD modified method. Result may have been affected by sample turbidity.						
Iron, dis. as Fe by ICP	< 0.16 >	mg/L	0.10	0.35	EPA 200.7	01/16/97	721026460
Magnesium, dis. as Mg by ICP	56	mg/L	30	30	EPA 200.7	01/16/97	721026460
Manganese, dis. as Mn by ICP	16000	ug/L	18	61	EPA 200.7	01/16/97	721026460
pH, lab	5.1	s.u.	1.0		EPA 150.1	01/03/97	721026460
Potassium, dis. as K	< 3.4 >	mg/L	2.0	6.6	EPA 200.7	01/10/97	721026460
Sodium, dis. as Na by ICP	2.0	mg/L	0.33	1.1	EPA 200.7	01/16/97	721026460
Sulfate, as SO4 (filtered)	1000	mg/L	250	250	EPA 375.2	01/16/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/15/97	721026460
Zinc, dis. as Zn by ICP	12000	ug/L	1200	1200	EPA 200.7	01/16/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Steven R. Cayer
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31692

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-8-1LS-1 NLS#: 124647
Ref. Line 13 of COC 21618 Description: FMC-8-1LS-1
Collected: 12/30/96 Received: 01/03/97 Reported: 01/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	64	mg/L	1.5	5.3	EPA 310.1	01/07/97	721026460
Aluminum, dis. as Al by ICP	< 0.19 >	mg/L	0.068	0.24	EPA 200.7	01/15/97	721026460
Cadmium, dis. as Cd by ICP	8.1	ug/L	2.4	7.6	EPA 200.7	01/15/97	721026460
Calcium, dis. as Ca by ICP	580	mg/L	6.0	6.0	EPA 200.7	01/15/97	721026460
Chloride, as Cl (filtered)	3.9	mg/L	0.36	1.3	EPA 325.2	01/08/97	721026460
Chromium, dis. as Cr by ICP	< 18 >	ug/L	5.2	19	EPA 200.7	01/15/97	721026460
Cobalt, dis. as Co by ICP	1000	ug/L	8.6	30	EPA 200.7	01/15/97	721026460
Copper, dis. as Cu by ICP	41000	ug/L	11	38	EPA 200.7	01/15/97	721026460
Iron, Ferrous	0.12	mg/L	0.0091	0.030		01/17/97	721026460
	Additional Comments: F&VD modified method						
Iron, dis. as Fe by ICP	0.15	mg/L	0.020	0.070	EPA 200.7	01/15/97	721026460
Magnesium, dis. as Mg by ICP	48	mg/L	6.0	6.0	EPA 200.7	01/15/97	721026460
Manganese, dis. as Mn by ICP	3800	ug/L	3.6	12	EPA 200.7	01/15/97	721026460
pH, lab	7.1	s.u.	1.0		EPA 150.1	01/03/97	721026460
Potassium, dis. as K	ND	mg/L	2.0	6.6	EPA 200.7	01/10/97	721026460
Sodium, dis. as Na by ICP	1.5	mg/L	0.066	0.22	EPA 200.7	01/15/97	721026460
Sulfate, as SO4 (filtered)	800	mg/L	250	250	EPA 375.2	01/16/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/15/97	721026460
Zinc, dis. as Zn by ICP	4100	ug/L	240	240	EPA 200.7	01/15/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31667

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-181L-1 **NLS#: 124547**
Ref. Line 1 of COC 23952 Description: FMC-181L-1
Collected: 12/29/96 Received: 12/31/96 Reported: 01/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	3400	mg/L	2.0	2.0	EPA 305.1	01/03/97	721026460
Aluminum, dis. as Al	3.3	mg/L	0.073	0.23	EPA 200.7	01/16/97	721026460
Cadmium, dis. as Cd	2.4	mg/L	0.039	0.14	EPA 200.7	01/16/97	721026460
Calcium, dis. as Ca	450	mg/L	3.0	3.0	EPA 200.7	01/15/97	721026460
Chloride, as Cl (filtered)	8.7	mg/L	0.36	1.3	EPA 325.2	01/08/97	721026460
Chromium, dis. as Cr	ND	mg/L	0.067	0.24	EPA 200.7	01/16/97	721026460
Cobalt, dis. as Co	14	mg/L	0.044	0.16	EPA 200.7	01/16/97	721026460
Copper, dis. as Cu	1400	mg/L	3.2	10	EPA 200.7	01/16/97	721026460
Iron, dis. as Fe	5.4	mg/L	0.079	0.26	EPA 200.7	01/15/97	721026460
Iron, Ferrous	0.065	mg/L	0.0091	0.030		01/13/97	721026460
	Additional Comments:	F&VD modified method					
Magnesium, dis. as Mg	280	mg/L	3.0	3.0	EPA 200.7	01/15/97	721026460
Manganese, dis. as Mn	40	mg/L	0.0086	0.031	EPA 200.7	01/16/97	721026460
pH, lab	4.0	s.u.	1.0		EPA 150.1	12/31/96	721026460
Potassium, dis. as K	< 4.8 >	mg/L	2.0	6.6	EPA 200.7	01/10/97	721026460
Sodium, dis. as Na	8.2	mg/L	0.069	0.23	EPA 200.7	01/15/97	721026460
Sulfate, as SO4 (filtered)	5600	mg/L	1200	1200	EPA 375.2	01/14/97	721026460
Thallium, dis. as Tl	ND	mg/L	0.80	2.8	EPA 200.7	01/16/97	721026460
Zinc, dis. as Zn	430	mg/L	1.2	1.2	EPA 200.7	01/16/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Steven R. Cuyn
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R. T. Krueger
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

     NLS PROJECT# 31667

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-180L-1   NLS#: 124548
Ref. Line 2 of COC 23952   Description: FMC-180L-1
Collected: 12/29/96   Received: 12/31/96   Reported: 01/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	430	mg/L	2.0	2.0	EPA 305.1	01/03/97	721026460
Aluminum, dis. as Al	0.39	mg/L	0.073	0.23	EPA 200.7	01/16/97	721026460
Cadmium, dis. as Cd	0.44	mg/L	0.039	0.14	EPA 200.7	01/16/97	721026460
Calcium, dis. as Ca	540	mg/L	3.0	3.0	EPA 200.7	01/15/97	721026460
Chloride, as Cl (filtered)	6.0	mg/L	0.36	1.3	EPA 325.2	01/08/97	721026460
Chromium, dis. as Cr	ND	mg/L	0.067	0.24	EPA 200.7	01/16/97	721026460
Cobalt, dis. as Co	5.8	mg/L	0.044	0.16	EPA 200.7	01/16/97	721026460
Copper, dis. as Cu	280	mg/L	0.32	1.0	EPA 200.7	01/16/97	721026460
Iron, dis. as Fe	< 0.21 >	mg/L	0.079	0.26	EPA 200.7	01/15/97	721026460
Iron, Ferrous	ND	mg/L	0.0091	0.030		01/02/96	721026460
	Additional Comments: F&VD modified Method. Interference may have biased this result low.						
Magnesium, dis. as Mg	240	mg/L	3.0	3.0	EPA 200.7	01/15/97	721026460
Manganese, dis. as Mn	48	mg/L	0.0086	0.031	EPA 200.7	01/16/97	721026460
pH, lab	5.0	s.u.	1.0		EPA 150.1	12/31/96	721026460
Potassium, dis. as K	13	mg/L	2.0	6.6	EPA 200.7	01/10/97	721026460
Sodium, dis. as Na	11	mg/L	0.069	0.23	EPA 200.7	01/15/97	721026460
Sulfate, as SO4 (filtered)	2600	mg/L	250	250	EPA 375.2	01/14/97	721026460
Thallium, dis. as Tl	ND	mg/L	0.80	2.8	EPA 200.7	01/16/97	721026460
Zinc, dis. as Zn	110	mg/L	0.12	0.12	EPA 200.7	01/16/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection   LOQ = Limit of Quantitation   ND = Not Detected
DWB = Dry Weight Basis   NA = Not Applicable   %DWB = (mg/kg DWB)/10000

Steven R. Cerqui
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31667

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-CUF1-1 NLS#: 124549
Ref. Line 3 of COC 23952 Description: FMC-CUF1-1
Collected: 12/29/96 Received: 12/31/96 Reported: 01/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	21	mg/L	1.5	5.3	EPA 310.1	01/07/97	721026460
Aluminum, dis. as Al by ICP	0.37	mg/L	0.034	0.12	EPA 200.7	01/15/97	721026460
Cadmium, dis. as Cd by ICP	ND	ug/L	1.2	3.8	EPA 200.7	01/15/97	721026460
Calcium, dis. as Ca by ICP	150	mg/L	3.0	3.0	EPA 200.7	01/15/97	721026460
Chloride, as Cl (filtered)	13	mg/L	0.36	1.3	EPA 325.2	01/08/97	721026460
Chromium, dis. as Cr by ICP	< 4.8 >	ug/L	2.6	9.3	EPA 200.7	01/15/97	721026460
Cobalt, dis. as Co by ICP	< 11 >	ug/L	4.3	15	EPA 200.7	01/15/97	721026460
Copper, dis. as Cu by ICP	120	ug/L	5.4	19	EPA 200.7	01/15/97	721026460
Iron, Ferrous	ND	mg/L	0.0091	0.030		01/02/96	721026460
	Additional Comments: F&VD modified Method. Interference may have biased this result low.						
Iron, dis. as Fe by ICP	0.22	mg/L	0.010	0.035	EPA 200.7	01/15/97	721026460
Magnesium, dis. as Mg by ICP	83	mg/L	3.0	3.0	EPA 200.7	01/15/97	721026460
Manganese, dis. as Mn by ICP	220	ug/L	1.8	6.1	EPA 200.7	01/15/97	721026460
pH, lab	8.6	s.u.	1.0		EPA 150.1	12/31/96	721026460
Potassium, dis. as K	< 5.5 >	mg/L	2.0	6.6	EPA 200.7	01/10/97	721026460
Sodium, dis. as Na by ICP	9.3	mg/L	0.033	0.11	EPA 200.7	01/15/97	721026460
Sulfate, as SO4 (filtered)	640	mg/L	250	250	EPA 375.2	01/14/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/15/97	721026460
Zinc, dis. as Zn by ICP	ND	ug/L	120	120	EPA 200.7	01/15/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation".
Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Steven R. Ceryn
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31667

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-181LS-1 NLS#: 124550
Ref. Line 4 of COC 23952 Description: FMC-181LS-1
Collected: 12/29/96 Received: 12/31/96 Reported: 01/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	2500	mg/L	2.0	2.0	EPA 305.1	01/03/97	721026460
Aluminum, dis. as Al	1.3	mg/L	0.073	0.23	EPA 200.7	01/16/97	721026460
Arsenic, dis. as As by furnace	< 45 >	ug/L	24	86	EPA 206.2	01/15/97	721026460
Cadmium, dis. as Cd	1.7	mg/L	0.039	0.14	EPA 200.7	01/16/97	721026460
Calcium, dis. as Ca	450	mg/L	3.0	3.0	EPA 200.7	01/15/97	721026460
Chloride, as Cl (filtered)	7.4	mg/L	0.36	1.3	EPA 325.2	01/08/97	721026460
Chromium, dis. as Cr	ND	mg/L	0.067	0.24	EPA 200.7	01/16/97	721026460
Cobalt, dis. as Co	9.7	mg/L	0.044	0.16	EPA 200.7	01/16/97	721026460
Copper, dis. as Cu	1300	mg/L	0.32	1.0	EPA 200.7	01/16/97	721026460
Iron, dis. as Fe	1.8	mg/L	0.079	0.26	EPA 200.7	01/15/97	721026460
Iron, Ferrous	0.053	mg/L	0.0091	0.030		01/13/97	721026460
	Additional Comments:	F&VD modified method					
Lead, dis. as Pb	ND	mg/L	0.53	1.8	EPA 200.7	01/17/97	721026460
Magnesium, dis. as Mg	210	mg/L	3.0	3.0	EPA 200.7	01/15/97	721026460
Manganese, dis. as Mn	27	mg/L	0.0086	0.031	EPA 200.7	01/16/97	721026460
Mercury, dis. as Hg	ND	ug/L	0.13	0.47	EPA 245.1	01/17/97	721026460
pH, lab	5.0	s.u.	1.0		EPA 150.1	12/31/96	721026460
Potassium, dis. as K	ND	mg/L	2.0	6.6	EPA 200.7	01/10/97	721026460
Selenium, dis. as Se by furnace	< 130 >	ug/L	37	130	EPA 270.2	01/16/97	721026460
Sodium, dis. as Na	10	mg/L	0.069	0.23	EPA 200.7	01/15/97	721026460
Sulfate, as SO4 (filtered)	3200	mg/L	1200	1200	EPA 375.2	01/14/97	721026460
Thallium, dis. as Tl	ND	mg/L	0.80	2.8	EPA 200.7	01/16/97	721026460
Zinc, dis. as Zn	230	mg/L	1.2	1.2	EPA 200.7	01/16/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-15-1LS-1 NLS#: 124551
Ref. Line 5 of COC 23952 Description: FMC-15-1LS-1
Collected: 12/29/96 Received: 12/31/96 Reported: 01/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	76	mg/L	2.0	2.0	EPA 305.1	01/03/97	721026460
Aluminum, dis. as Al	ND	mg/L	0.073	0.23	EPA 200.7	01/16/97	721026460
Arsenic, dis. as As by furnace	ND	ug/L	24	86	EPA 206.2	01/15/97	721026460
Cadmium, dis. as Cd	ND	mg/L	0.039	0.14	EPA 200.7	01/16/97	721026460
Calcium, dis. as Ca	470	mg/L	3.0	3.0	EPA 200.7	01/15/97	721026460
Chloride, as Cl (filtered)	4.7	mg/L	0.36	1.3	EPA 325.2	01/08/97	721026460
Chromium, dis. as Cr	ND	mg/L	0.067	0.24	EPA 200.7	01/16/97	721026460
Cobalt, dis. as Co	1.7	mg/L	0.044	0.16	EPA 200.7	01/16/97	721026460
Copper, dis. as Cu	47	mg/L	0.032	0.10	EPA 200.7	01/16/97	721026460
Iron, dis. as Fe	ND	mg/L	0.079	0.26	EPA 200.7	01/15/97	721026460
Iron, Ferrous	ND	mg/L	0.0091	0.030		01/02/96	721026460
	Additional Comments: F&VD modified Method. Interference may have biased this result low.						
Lead, dis. as Pb	ND	mg/L	0.53	1.8	EPA 200.7	01/17/97	721026460
Magnesium, dis. as Mg	79	mg/L	3.0	3.0	EPA 200.7	01/15/97	721026460
Manganese, dis. as Mn	7.3	mg/L	0.0086	0.031	EPA 200.7	01/16/97	721026460
Mercury, dis. as Hg	ND	ug/L	0.13	0.47	EPA 245.1	01/17/97	721026460
pH, lab	5.8	s.u.	1.0		EPA 150.1	12/31/96	721026460
Potassium, dis. as K	ND	mg/L	2.0	6.6	EPA 200.7	01/10/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	01/16/97	721026460
Sodium, dis. as Na	3.9	mg/L	0.069	0.23	EPA 200.7	01/15/97	721026460
Sulfate, as SO4 (filtered)	1100	mg/L	250	250	EPA 375.2	01/14/97	721026460
Thallium, dis. as Tl	ND	mg/L	0.80	2.8	EPA 200.7	01/16/97	721026460
Zinc, dis. as Zn	3.7	mg/L	0.12	0.12	EPA 200.7	01/16/97	721026460

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Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-15-3LS-1 NLS#: 124552
Ref. Line 6 of COC 23952 Description: FMC-15-3LS-1
Collected: 12/29/96 Received: 12/31/96 Reported: 01/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	2300	mg/L	2.0	2.0	EPA 305.1	01/03/97	721026460
Aluminum, dis. as Al	14	mg/L	0.073	0.23	EPA 200.7	01/16/97	721026460
Cadmium, dis. as Cd	< 0.042 >	mg/L	0.039	0.14	EPA 200.7	01/16/97	721026460
Calcium, dis. as Ca	580	mg/L	3.0	3.0	EPA 200.7	01/15/97	721026460
Chloride, as Cl (filtered)	9.3	mg/L	0.36	1.3	EPA 325.2	01/08/97	721026460
Chromium, dis. as Cr	ND	mg/L	0.067	0.24	EPA 200.7	01/16/97	721026460
Cobalt, dis. as Co	6.7	mg/L	0.044	0.16	EPA 200.7	01/16/97	721026460
Copper, dis. as Cu	980	mg/L	0.32	1.0	EPA 200.7	01/16/97	721026460
Iron, dis. as Fe	35	mg/L	0.079	0.26	EPA 200.7	01/15/97	721026460
Iron, Ferrous	0.062	mg/L	0.0091	0.030		01/13/97	721026460
	Additional Comments:	F&VD modified method					
Magnesium, dis. as Mg	260	mg/L	3.0	3.0	EPA 200.7	01/15/97	721026460
Manganese, dis. as Mn	27	mg/L	0.0086	0.031	EPA 200.7	01/16/97	721026460
pH, lab	4.4	s.u.	1.0		EPA 150.1	12/31/96	721026460
Potassium, dis. as K	ND	mg/L	2.0	6.6	EPA 200.7	01/10/97	721026460
Sodium, dis. as Na	2.1	mg/L	0.069	0.23	EPA 200.7	01/15/97	721026460
Sulfate, as SO4 (filtered)	3300	mg/L	1200	1200	EPA 375.2	01/14/97	721026460
Thallium, dis. as Tl	ND	mg/L	0.80	2.8	EPA 200.7	01/16/97	721026460
Zinc, dis. as Zn	33	mg/L	0.12	0.12	EPA 200.7	01/16/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
LOQ = Limit of Quantitation
ND = Not Detected
DWB = Dry Weight Basis
NA = Not Applicable
%DWB = (mg/kg DWB)/10000

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31667

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-4-1LS-1 NLS#: 124553
Ref. Line 7 of COC 23952 Description: FMC-4-1LS-1
Collected: 12/29/96 Received: 12/31/96 Reported: 01/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	200	mg/L	2.0	2.0	EPA 305.1	01/03/97	721026460
Aluminum, dis. as Al	0.33	mg/L	0.073	0.23	EPA 200.7	01/16/97	721026460
Cadmium, dis. as Cd	0.23	mg/L	0.039	0.14	EPA 200.7	01/16/97	721026460
Calcium, dis. as Ca	520	mg/L	3.0	3.0	EPA 200.7	01/15/97	721026460
Chloride, as Cl (filtered)	3.0	mg/L	0.36	1.3	EPA 325.2	01/08/97	721026460
Chromium, dis. as Cr	ND	mg/L	0.067	0.24	EPA 200.7	01/16/97	721026460
Cobalt, dis. as Co	2.4	mg/L	0.044	0.16	EPA 200.7	01/16/97	721026460
Copper, dis. as Cu	140	mg/L	0.32	1.0	EPA 200.7	01/16/97	721026460
Iron, dis. as Fe	0.35	mg/L	0.079	0.26	EPA 200.7	01/15/97	721026460
Iron, Ferrous	< 0.012 >	mg/L	0.0091	0.030		01/13/97	721026460
	Additional Comments: F&VD modified method						
Magnesium, dis. as Mg	150	mg/L	3.0	3.0	EPA 200.7	01/15/97	721026460
Manganese, dis. as Mn	14	mg/L	0.0086	0.031	EPA 200.7	01/16/97	721026460
pH, lab	5.4	s.u.	1.0		EPA 150.1	12/31/96	721026460
Potassium, dis. as K	< 2.1 >	mg/L	2.0	6.6	EPA 200.7	01/10/97	721026460
Sodium, dis. as Na	1.8	mg/L	0.069	0.23	EPA 200.7	01/15/97	721026460
Sulfate, as SO4 (filtered)	1500	mg/L	250	250	EPA 375.2	01/14/97	721026460
Thallium, dis. as Tl	ND	mg/L	0.80	2.8	EPA 200.7	01/16/97	721026460
Zinc, dis. as Zn	37	mg/L	0.12	0.12	EPA 200.7	01/16/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-180LS-1 NLS#: 124554
Ref. Line 8 of COC 23952 Description: FMC-180LS-1
Collected: 12/29/96 Received: 12/31/96 Reported: 01/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	220	mg/L	2.0	2.0	EPA 305.1	01/03/97	721026460
Aluminum, dis. as Al	< 0.080 >	mg/L	0.073	0.23	EPA 200.7	01/16/97	721026460
Cadmium, dis. as Cd	0.26	mg/L	0.039	0.14	EPA 200.7	01/16/97	721026460
Calcium, dis. as Ca	380	mg/L	3.0	3.0	EPA 200.7	01/15/97	721026460
Chloride, as Cl (filtered)	3.7	mg/L	0.36	1.3	EPA 325.2	01/08/97	721026460
Chromium, dis. as Cr	ND	mg/L	0.067	0.24	EPA 200.7	01/16/97	721026460
Cobalt, dis. as Co	3.1	mg/L	0.044	0.16	EPA 200.7	01/16/97	721026460
Copper, dis. as Cu	200	mg/L	0.32	1.0	EPA 200.7	01/16/97	721026460
Iron, dis. as Fe	ND	mg/L	0.079	0.26	EPA 200.7	01/15/97	721026460
Iron, Ferrous	< 0.013 >	mg/L	0.0091	0.030		01/13/97	721026460
	Additional Comments: F&VD modified method						
Magnesium, dis. as Mg	100	mg/L	3.0	3.0	EPA 200.7	01/15/97	721026460
Manganese, dis. as Mn	24	mg/L	0.0086	0.031	EPA 200.7	01/16/97	721026460
pH, lab	5.5	s.u.	1.0		EPA 150.1	12/31/96	721026460
Potassium, dis. as K	6.9	mg/L	2.0	6.6	EPA 200.7	01/10/97	721026460
Sodium, dis. as Na	5.2	mg/L	0.069	0.23	EPA 200.7	01/15/97	721026460
Sulfate, as SO4 (filtered)	1100	mg/L	250	250	EPA 375.2	01/14/97	721026460
Thallium, dis. as Tl	ND	mg/L	0.80	2.8	EPA 200.7	01/16/97	721026460
Zinc, dis. as Zn	58	mg/L	0.12	0.12	EPA 200.7	01/16/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
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Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-CUF2-1 NLS#: 124555
Ref. Line 9 of COC 23952 Description: FMC-CUF2-1
Collected: 12/29/96 Received: 12/31/96 Reported: 01/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	10	mg/L	1.5	5.3	EPA 310.1	01/07/97	721026460
Aluminum, dis. as Al by ICP	< 0.067 >	mg/L	0.034	0.12	EPA 200.7	01/15/97	721026460
Cadmium, dis. as Cd by ICP	ND	ug/L	1.2	3.8	EPA 200.7	01/15/97	721026460
Calcium, dis. as Ca by ICP	110	mg/L	3.0	3.0	EPA 200.7	01/15/97	721026460
Chloride, as Cl (filtered)	12	mg/L	0.36	1.3	EPA 325.2	01/08/97	721026460
Chromium, dis. as Cr by ICP	ND	ug/L	2.6	9.3	EPA 200.7	01/15/97	721026460
Cobalt, dis. as Co by ICP	ND	ug/L	4.3	15	EPA 200.7	01/15/97	721026460
Copper, dis. as Cu by ICP	80	ug/L	5.4	19	EPA 200.7	01/15/97	721026460
Iron, Ferrous	0.031	mg/L	0.0091	0.030		01/13/97	721026460
	Additional Comments: F&VD modified method						
Iron, dis. as Fe by ICP	< 0.027 >	mg/L	0.010	0.035	EPA 200.7	01/15/97	721026460
Magnesium, dis. as Mg by ICP	58	mg/L	3.0	3.0	EPA 200.7	01/15/97	721026460
Manganese, dis. as Mn by ICP	9.8	ug/L	1.8	6.1	EPA 200.7	01/15/97	721026460
pH, lab	8.7	s.u.	1.0		EPA 150.1	12/31/96	721026460
Potassium, dis. as K	< 5.8 >	mg/L	2.0	6.6	EPA 200.7	01/10/97	721026460
Sodium, dis. as Na by ICP	9.8	mg/L	0.033	0.11	EPA 200.7	01/15/97	721026460
Sulfate, as SO4 (filtered)	550	mg/L	250	250	EPA 375.2	01/14/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/15/97	721026460
Zinc, dis. as Zn by ICP	ND	ug/L	120	120	EPA 200.7	01/15/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
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Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-4-1L-1 NLS#: 124556
Ref. Line 10 of COC 23952 Description: FMC-4-1L-1
Collected: 12/29/96 Received: 12/31/96 Reported: 01/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	440	mg/L	2.0	2.0	EPA 305.1	01/03/97	721026460
Aluminum, dis. as Al	0.62	mg/L	0.073	0.23	EPA 200.7	01/16/97	721026460
Cadmium, dis. as Cd	0.39	mg/L	0.039	0.14	EPA 200.7	01/16/97	721026460
Calcium, dis. as Ca	550	mg/L	3.0	3.0	EPA 200.7	01/15/97	721026460
Chloride, as Cl (filtered)	2.1	mg/L	0.36	1.3	EPA 325.2	01/08/97	721026460
Chromium, dis. as Cr	ND	mg/L	0.067	0.24	EPA 200.7	01/16/97	721026460
Cobalt, dis. as Co	3.7	mg/L	0.044	0.16	EPA 200.7	01/16/97	721026460
Copper, dis. as Cu	270	mg/L	0.32	1.0	EPA 200.7	01/16/97	721026460
Iron, dis. as Fe	0.46	mg/L	0.079	0.26	EPA 200.7	01/15/97	721026460
Iron, Ferrous	< 0.028 >	mg/L	0.0091	0.030		01/13/97	721026460
	Additional Comments:	F&VD modified method					
Magnesium, dis. as Mg	240	mg/L	3.0	3.0	EPA 200.7	01/15/97	721026460
Manganese, dis. as Mn	22	mg/L	0.0086	0.031	EPA 200.7	01/16/97	721026460
pH, lab	5.4	s.u.	1.0		EPA 150.1	12/31/96	721026460
Potassium, dis. as K	8.8	mg/L	2.0	6.6	EPA 200.7	01/10/97	721026460
Sodium, dis. as Na	2.0	mg/L	0.069	0.23	EPA 200.7	01/15/97	721026460
Sulfate, as SO4 (filtered)	2700	mg/L	250	250	EPA 375.2	01/14/97	721026460
Thallium, dis. as Tl	ND	mg/L	0.80	2.8	EPA 200.7	01/16/97	721026460
Zinc, dis. as Zn	60	mg/L	0.12	0.12	EPA 200.7	01/16/97	721026460

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Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Steven R. Cayer
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31667

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-15-3L-1 **NLS#: 124557**
Ref. Line 11 of COC 23952 Description: FMC-15-3L-1
Collected: 12/29/96 Received: 12/31/96 Reported: 01/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	1100	mg/L	2.0	2.0	EPA 305.1	01/03/97	721026460
Aluminum, dis. as Al	10	mg/L	0.073	0.23	EPA 200.7	01/16/97	721026460
Cadmium, dis. as Cd	< 0.062 >	mg/L	0.039	0.14	EPA 200.7	01/16/97	721026460
Calcium, dis. as Ca	570	mg/L	3.0	3.0	EPA 200.7	01/15/97	721026460
Chloride, as Cl (filtered)	4.2	mg/L	0.36	1.3	EPA 325.2	01/08/97	721026460
Chromium, dis. as Cr	ND	mg/L	0.067	0.24	EPA 200.7	01/16/97	721026460
Cobalt, dis. as Co	4.1	mg/L	0.044	0.16	EPA 200.7	01/16/97	721026460
Copper, dis. as Cu	690	mg/L	0.32	1.0	EPA 200.7	01/16/97	721026460
Iron, dis. as Fe	28	mg/L	0.079	0.26	EPA 200.7	01/15/97	721026460
Iron, Ferrous	0.077	mg/L	0.0091	0.030		01/13/97	721026460
	Additional Comments:	F&VD modified method					
Magnesium, dis. as Mg	220	mg/L	3.0	3.0	EPA 200.7	01/15/97	721026460
Manganese, dis. as Mn	18	mg/L	0.0086	0.031	EPA 200.7	01/16/97	721026460
pH, lab	3.5	s.u.	1.0		EPA 150.1	12/31/96	721026460
Potassium, dis. as K	< 4.1 >	mg/L	2.0	6.6	EPA 200.7	01/10/97	721026460
Sodium, dis. as Na	2.9	mg/L	0.069	0.23	EPA 200.7	01/15/97	721026460
Sulfate, as SO4 (filtered)	3100	mg/L	250	250	EPA 375.2	01/14/97	721026460
Thallium, dis. as Tl	ND	mg/L	0.80	2.8	EPA 200.7	01/16/97	721026460
Zinc, dis. as Zn	20	mg/L	0.12	0.12	EPA 200.7	01/16/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Steven R. Creyer
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-BF4-1 **NLS#: 124558**
Ref. Line 12 of COC 23952 Description: FMC-BF4-1
Collected: 12/29/96 Received: 12/31/96 Reported: 01/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	36	mg/L	1.5	5.3	EPA 310.1	01/07/97	721026460
Aluminum, dis. as Al by ICP	< 0.091 >	mg/L	0.034	0.12	EPA 200.7	01/15/97	721026460
Cadmium, dis. as Cd by ICP	26	ug/L	1.2	3.8	EPA 200.7	01/15/97	721026460
Calcium, dis. as Ca by ICP	330	mg/L	3.0	3.0	EPA 200.7	01/15/97	721026460
Chloride, as Cl (filtered)	10	mg/L	0.36	1.3	EPA 325.2	01/08/97	721026460
Chromium, dis. as Cr by ICP	< 6.7 >	ug/L	2.6	9.3	EPA 200.7	01/15/97	721026460
Cobalt, dis. as Co by ICP	470	ug/L	4.3	15	EPA 200.7	01/15/97	721026460
Copper, dis. as Cu by ICP	260	ug/L	5.4	19	EPA 200.7	01/15/97	721026460
Iron, Ferrous	0.19	mg/L	0.0091	0.030		01/13/97	721026460
	Additional Comments:	F&VD modified method					
Iron, dis. as Fe by ICP	ND	mg/L	0.010	0.035	EPA 200.7	01/15/97	721026460
Magnesium, dis. as Mg by ICP	110	mg/L	3.0	3.0	EPA 200.7	01/15/97	721026460
Manganese, dis. as Mn by ICP	8900	ug/L	1.8	6.1	EPA 200.7	01/15/97	721026460
pH, lab	7.1	s.u.	1.0		EPA 150.1	12/31/96	721026460
Potassium, dis. as K	14	mg/L	2.0	6.6	EPA 200.7	01/10/97	721026460
Sodium, dis. as Na by ICP	9.6	mg/L	0.033	0.11	EPA 200.7	01/15/97	721026460
Sulfate, as SO4 (filtered)	1200	mg/L	250	250	EPA 375.2	01/14/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/15/97	721026460
Zinc, dis. as Zn by ICP	1700	ug/L	120	120	EPA 200.7	01/15/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31667

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-15-1L-1 **NLS#: 124559**
Ref. Line 13 of COC 23952 Description: FMC-15-1L-1
Collected: 12/29/96 Received: 12/31/96 Reported: 01/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	400	mg/L	2.0	2.0	EPA 305.1	07/01/97	721026460
Aluminum, dis. as Al	8.0	mg/L	0.073	0.23	EPA 200.7	01/16/97	721026460
Cadmium, dis. as Cd	ND	mg/L	0.039	0.14	EPA 200.7	01/16/97	721026460
Calcium, dis. as Ca	650	mg/L	3.0	3.0	EPA 200.7	01/15/97	721026460
Chloride, as Cl (filtered)	ND	mg/L	0.36	1.3	EPA 325.2	01/08/97	721026460
Chromium, dis. as Cr	ND	mg/L	0.067	0.24	EPA 200.7	01/16/97	721026460
Cobalt, dis. as Co	2.1	mg/L	0.044	0.16	EPA 200.7	01/16/97	721026460
Copper, dis. as Cu	180	mg/L	0.032	0.10	EPA 200.7	01/16/97	721026460
Iron, dis. as Fe	69	mg/L	0.079	0.26	EPA 200.7	01/15/97	721026460
Iron, Ferrous	0.56	mg/L	0.0091	0.030		01/13/97	721026460
	Additional Comments:	F&VD modified method					
Magnesium, dis. as Mg	160	mg/L	3.0	3.0	EPA 200.7	01/15/97	721026460
Manganese, dis. as Mn	8.4	mg/L	0.0086	0.031	EPA 200.7	01/16/97	721026460
pH, lab	3.2	s.u.	1.0		EPA 150.1	12/31/96	721026460
Potassium, dis. as K	33	mg/L	2.0	6.6	EPA 200.7	01/10/97	721026460
Sodium, dis. as Na	5.1	mg/L	0.069	0.23	EPA 200.7	01/15/97	721026460
Sulfate, as SO4 (filtered)	1800	mg/L	250	250	EPA 375.2	01/14/97	721026460
Thallium, dis. as Tl	ND	mg/L	0.80	2.8	EPA 200.7	01/16/97	721026460
Zinc, dis. as Zn	6.0	mg/L	0.12	0.12	EPA 200.7	01/16/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Steven R. Cergis
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31804

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-BF5-1 **NLS#: 125057**
Ref. Line 1 of COC 23978 Description: FMC-BF5-1
Collected: 01/07/97 Received: 01/09/97 Reported: 02/03/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	22	mg/L	1.5	5.3	EPA 310.1	01/15/97	721026460
Aluminum, dis. as Al by ICP	0.35	mg/L	0.034	0.12	EPA 200.7	01/31/97	721026460
Cadmium, dis. as Cd by ICP	17	ug/L	1.2	3.8	EPA 200.7	01/31/97	721026460
Calcium, dis. as Ca by ICP	450	mg/L	3.0	3.0	EPA 200.7	01/31/97	721026460
Chloride, as Cl (filtered)	23	mg/L	0.36	1.3	EPA 325.2	01/16/97	721026460
Chromium, dis. as Cr by ICP	24	ug/L	2.6	9.3	EPA 200.7	01/31/97	721026460
Cobalt, dis. as Co by ICP	660	ug/L	4.3	15	EPA 200.7	01/31/97	721026460
Copper, dis. as Cu by ICP	730	ug/L	5.4	19	EPA 200.7	01/31/97	721026460
Iron, Ferrous	2.2	mg/L	0.46	1.5		02/02/97	721026460
	Additional Comments:	F&VD modified method					
Iron, dis. as Fe by ICP	0.40	mg/L	0.010	0.035	EPA 200.7	01/31/97	721026460
Magnesium, dis. as Mg by ICP	150	mg/L	3.0	3.0	EPA 200.7	01/31/97	721026460
Manganese, dis. as Mn by ICP	18000	ug/L	1.8	6.1	EPA 200.7	01/31/97	721026460
pH, lab	7.3	s.u.	1.0		EPA 150.1	01/10/97	721026460
Potassium, dis. as K	24	mg/L	2.0	6.6	EPA 200.7	01/24/97	721026460
Sodium, dis. as Na by ICP	19	mg/L	0.033	0.11	EPA 200.7	01/31/97	721026460
Sulfate, as SO4 (filtered)	940	mg/L	250	250	EPA 375.2	01/23/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/27/97	721026460
Zinc, dis. as Zn by ICP	1300	ug/L	120	120	EPA 200.7	01/31/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Steven R. Cuyn
Reviewed by:

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R. T. Krueger
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31804

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-170LS-1 **NLS#: 125058**
Ref. Line 2 of COC 23978 Description: FMC-170LS-1
Collected: 01/07/97 Received: 01/09/97 Reported: 02/03/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	1600	mg/L	2.0	2.0	EPA 305.1	01/21/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.34	1.2	EPA 200.7	01/31/97	721026460
Cadmium, dis. as Cd by ICP	1200	ug/L	12	38	EPA 200.7	01/31/97	721026460
Calcium, dis. as Ca by ICP	470	mg/L	30	30	EPA 200.7	01/31/97	721026460
Chloride, as Cl (filtered)	4.2	mg/L	0.36	1.3	EPA 325.2	01/16/97	721026460
Chromium, dis. as Cr by ICP	ND	ug/L	26	93	EPA 200.7	01/31/97	721026460
Cobalt, dis. as Co by ICP	6600	ug/L	43	150	EPA 200.7	01/31/97	721026460
Copper, dis. as Cu by ICP	950000	ug/L	540	1900	EPA 200.7	01/31/97	721026460
Iron, Ferrous	2.6	mg/L	0.46	1.5		02/02/97	721026460
	Additional Comments:	F&VD modified method					
Iron, dis. as Fe by ICP	ND	mg/L	0.10	0.35	EPA 200.7	01/31/97	721026460
Magnesium, dis. as Mg by ICP	110	mg/L	30	30	EPA 200.7	01/31/97	721026460
Manganese, dis. as Mn by ICP	17000	ug/L	18	61	EPA 200.7	01/31/97	721026460
pH, lab	4.7	s.u.	1.0		EPA 150.1	01/10/97	721026460
Potassium, dis. as K	17	mg/L	2.0	6.6	EPA 200.7	01/24/97	721026460
Sodium, dis. as Na by ICP	7.2	mg/L	0.33	1.1	EPA 200.7	01/31/97	721026460
Sulfate, as SO4 (filtered)	1700	mg/L	250	250	EPA 375.2	01/23/97	721026460
Thallium, dis. as Tl by furnace AAS	< 34 >	ug/L	25	87	EPA 279.2	01/27/97	721026460
Zinc, dis. as Zn by ICP	80000	ug/L	1200	1200	EPA 200.7	01/31/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Steven R. Cryer
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R. T. Krueger
Laboratory Manager

Anoxic Columns Second Displacement Test Results

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

PAGE: 1 NLS PROJECT# 31905

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-186LS-2 NLS#: 125484
Ref. Line 1 of COC 24224 Description: FMC-186LS-2
Collected: 01/14/97 Received: 01/16/97 Reported: 01/28/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, carbonate as CaCO3	ND	mg/L	1.5	5.3	SM 2320B	01/17/97	721026460
Aluminum, dis. as Al by ICP	< 0.65 >	mg/L	0.34	1.2	EPA 200.7	01/27/97	721026460
Cadmium, dis. as Cd by ICP	64	ug/L	12	38	EPA 200.7	01/27/97	721026460
Calcium, dis. as Ca by ICP	320	mg/L	30	30	EPA 200.7	01/27/97	721026460
Chloride, as Cl (filtered)	3.2	mg/L	0.36	1.3	EPA 325.2	01/22/97	721026460
Chromium, dis. as Cr by ICP	ND	ug/L	26	93	EPA 200.7	01/27/97	721026460
Cobalt, dis. as Co by ICP	1100	ug/L	43	150	EPA 200.7	01/27/97	721026460
Copper, dis. as Cu by ICP	5900	ug/L	54	190	EPA 200.7	01/27/97	721026460
Iron, Ferrous	0.30	mg/L	0.046	0.15		01/27/97	721026460
	Additional Comments: F&VD modified method						
Iron, dis. as Fe by ICP	ND	mg/L	0.10	0.35	EPA 200.7	01/27/97	721026460
Magnesium, dis. as Mg by ICP	36	mg/L	30	30	EPA 200.7	01/27/97	721026460
Manganese, dis. as Mn by ICP	4100	ug/L	18	61	EPA 200.7	01/27/97	721026460
pH, lab	6.5	s.u.	1.0		EPA 150.1	01/16/97	721026460
Potassium, dis. as K	< 3.1 >	mg/L	2.0	6.6	EPA 200.7	01/23/97	721026460
Sodium, dis. as Na by ICP	5.3	mg/L	0.33	1.1	EPA 200.7	01/27/97	721026460
	Additional Comments: The instrument check standard recovery is 113%. See narrative.						
Sulfate, as SO4 (filtered)	860	mg/L	250	250	EPA 375.2	01/20/97	721026460
Thallium, dis. as Tl by furnace AAS	< 45 >	ug/L	25	87	EPA 279.2	01/22/97	721026460
Zinc, dis. as Zn by ICP	6000	ug/L	1200	1200	EPA 200.7	01/27/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Steven R. Cagin
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31905

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-186L-2 NLS#: 125485
Ref. Line 2 of COC 24224 Description: FMC-186L-2
Collected: 01/14/97 Received: 01/16/97 Reported: 01/28/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	98	mg/L	2.0	2.0	EPA 305.1	01/21/97	721026460
Aluminum, dis. as Al by ICP	1.7	mg/L	0.34	1.2	EPA 200.7	01/27/97	721026460
Cadmium, dis. as Cd by ICP	< 36 >	ug/L	12	38	EPA 200.7	01/27/97	721026460
Calcium, dis. as Ca by ICP	500	mg/L	30	30	EPA 200.7	01/27/97	721026460
Chloride, as Cl (filtered)	20	mg/L	0.36	1.3	EPA 325.2	01/22/97	721026460
Chromium, dis. as Cr by ICP	< 70 >	ug/L	26	93	EPA 200.7	01/27/97	721026460
Cobalt, dis. as Co by ICP	880	ug/L	43	150	EPA 200.7	01/27/97	721026460
Copper, dis. as Cu by ICP	31000	ug/L	54	190	EPA 200.7	01/27/97	721026460
Iron, Ferrous	0.20	mg/L	0.046	0.15		01/27/97	721026460
	Additional Comments: F&VD modified method						
Iron, dis. as Fe by ICP	ND	mg/L	0.10	0.35	EPA 200.7	01/27/97	721026460
Magnesium, dis. as Mg by ICP	ND	mg/L	30	30	EPA 200.7	01/27/97	721026460
Manganese, dis. as Mn by ICP	1800	ug/L	18	61	EPA 200.7	01/27/97	721026460
pH, lab	4.4	s.u.	1.0		EPA 150.1	01/16/97	721026460
Potassium, dis. as K	14	mg/L	2.0	6.6	EPA 200.7	01/23/97	721026460
Sodium, dis. as Na by ICP	4.8	mg/L	0.33	1.1	EPA 200.7	01/27/97	721026460
	Additional Comments: The instrument check standard recovery is 113%. See narrative.						
Sulfate, as SO4 (filtered)	1500	mg/L	250	250	EPA 375.2	01/20/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/22/97	721026460
Zinc, dis. as Zn by ICP	8600	ug/L	1200	1200	EPA 200.7	01/27/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Steven R. Cugi
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R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31905

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-13-1LS-2 NLS#: 125486
Ref. Line 3 of COC 24224 Description: FMC-13-1LS-2
Collected: 01/14/97 Received: 01/16/97 Reported: 01/28/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	1000	mg/L	2.0	2.0	EPA 305.1	01/21/97	721026460
Aluminum, dis. as Al by ICP	12	mg/L	0.34	1.2	EPA 200.7	01/27/97	721026460
Cadmium, dis. as Cd by ICP	49	ug/L	12	38	EPA 200.7	01/27/97	721026460
Calcium, dis. as Ca by ICP	520	mg/L	30	30	EPA 200.7	01/27/97	721026460
Chloride, as Cl (filtered)	2.7	mg/L	0.36	1.3	EPA 325.2	01/22/97	721026460
Chromium, dis. as Cr by ICP	< 57 >	ug/L	26	93	EPA 200.7	01/27/97	721026460
Cobalt, dis. as Co by ICP	2400	ug/L	43	150	EPA 200.7	01/27/97	721026460
Copper, dis. as Cu by ICP	300000	ug/L	540	1900	EPA 200.7	01/27/97	721026460
Iron, Ferrous	19	mg/L	0.46	1.5		01/27/97	721026460
	Additional Comments: F&VD modified method						
Iron, dis. as Fe by ICP	210	mg/L	0.10	0.35	EPA 200.7	01/27/97	721026460
Magnesium, dis. as Mg by ICP	48	mg/L	30	30	EPA 200.7	01/27/97	721026460
Manganese, dis. as Mn by ICP	8400	ug/L	18	61	EPA 200.7	01/27/97	721026460
pH, lab	2.9	s.u.	1.0		EPA 150.1	01/16/97	721026460
Potassium, dis. as K	ND	mg/L	2.0	6.6	EPA 200.7	01/23/97	721026460
Sodium, dis. as Na by ICP	3.3	mg/L	0.33	1.1	EPA 200.7	01/27/97	721026460
	Additional Comments: The instrument check standard recovery is 114%. See narrative.						
Sulfate, as SO4 (filtered)	3200	mg/L	250	250	EPA 375.2	01/20/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/22/97	721026460
Zinc, dis. as Zn by ICP	12000	ug/L	1200	1200	EPA 200.7	01/27/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
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Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-188LS-2 NLS#: 125487
Ref. Line 4 of COC 24224 Description: FMC-188LS-2
Collected: 01/14/97 Received: 01/16/97 Reported: 01/28/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	590	mg/L	2.0	2.0	EPA 305.1	01/21/97	721026460
Aluminum, dis. as Al by ICP	< 0.59 >	mg/L	0.34	1.2	EPA 200.7	01/27/97	721026460
Cadmium, dis. as Cd by ICP	950	ug/L	12	38	EPA 200.7	01/27/97	721026460
Calcium, dis. as Ca by ICP	460	mg/L	30	30	EPA 200.7	01/27/97	721026460
Chloride, as Cl (filtered)	2.7	mg/L	0.36	1.3	EPA 325.2	01/22/97	721026460
Chromium, dis. as Cr by ICP	< 52 >	ug/L	26	93	EPA 200.7	01/27/97	721026460
Cobalt, dis. as Co by ICP	4400	ug/L	43	150	EPA 200.7	01/27/97	721026460
Copper, dis. as Cu by ICP	310000	ug/L	540	1900	EPA 200.7	01/27/97	721026460
Iron, Ferrous	1.4	mg/L	0.23	0.75		01/27/97	721026460
	Additional Comments: F&VD modified method						
Iron, dis. as Fe by ICP	< 0.28 >	mg/L	0.10	0.35	EPA 200.7	01/27/97	721026460
Magnesium, dis. as Mg by ICP	65	mg/L	30	30	EPA 200.7	01/27/97	721026460
Manganese, dis. as Mn by ICP	8800	ug/L	18	61	EPA 200.7	01/27/97	721026460
pH, lab	4.4	s.u.	1.0		EPA 150.1	01/16/97	721026460
Potassium, dis. as K	13	mg/L	2.0	6.6	EPA 200.7	01/23/97	721026460
Sodium, dis. as Na by ICP	6.4	mg/L	0.33	1.1	EPA 200.7	01/27/97	721026460
	Additional Comments: The instrument check standard recovery is 114%. See narrative.						
Sulfate, as SO4 (filtered)	2600	mg/L	250	250	EPA 375.2	01/20/97	721026460
Thallium, dis. as Tl by furnace AAS	< 42 >	ug/L	25	87	EPA 279.2	01/22/97	721026460
Zinc, dis. as Zn by ICP	61000	ug/L	1200	1200	EPA 200.7	01/27/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
LOQ = Limit of Quantitation
ND = Not Detected
DWB = Dry Weight Basis
NA = Not Applicable
%DWB = (mg/kg DWB)/10000

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31905

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
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PO Box 19012
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Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-183LS-2 NLS#: 125488
Ref. Line 5 of COC 24224 Description: FMC-183LS-2
Collected: 01/14/97 Received: 01/16/97 Reported: 01/28/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	1100	mg/L	2.0	2.0	EPA 305.1	01/21/97	721026460
Aluminum, dis. as Al by ICP	< 0.88 >	mg/L	0.34	1.2	EPA 200.7	01/27/97	721026460
Cadmium, dis. as Cd by ICP	170	ug/L	12	38	EPA 200.7	01/27/97	721026460
Calcium, dis. as Ca by ICP	450	mg/L	30	30	EPA 200.7	01/27/97	721026460
Chloride, as Cl (filtered)	2.2	mg/L	0.36	1.3	EPA 325.2	01/22/97	721026460
Chromium, dis. as Cr by ICP	< 49 >	ug/L	26	93	EPA 200.7	01/27/97	721026460
Cobalt, dis. as Co by ICP	2500	ug/L	43	150	EPA 200.7	01/27/97	721026460
Copper, dis. as Cu by ICP	670000	ug/L	540	1900	EPA 200.7	01/27/97	721026460
Iron, Ferrous	< 0.62 >	mg/L	0.23	0.75		01/27/97	721026460
	Additional Comments: F&VD modified method						
Iron, dis. as Fe by ICP	< 0.16 >	mg/L	0.10	0.35	EPA 200.7	01/27/97	721026460
Magnesium, dis. as Mg by ICP	79	mg/L	30	30	EPA 200.7	01/27/97	721026460
Manganese, dis. as Mn by ICP	7800	ug/L	18	61	EPA 200.7	01/27/97	721026460
pH, lab	4.4	s.u.	1.0		EPA 150.1	01/16/97	721026460
Potassium, dis. as K	< 6.5 >	mg/L	2.0	6.6	EPA 200.7	01/23/97	721026460
Sodium, dis. as Na by ICP	5.6	mg/L	0.33	1.1	EPA 200.7	01/27/97	721026460
	Additional Comments: The instrument check standard recovery is 114%. See narrative.						
Sulfate, as SO4 (filtered)	2900	mg/L	250	250	EPA 375.2	01/20/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/22/97	721026460
Zinc, dis. as Zn by ICP	17000	ug/L	1200	1200	EPA 200.7	01/27/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

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ANALYTICAL REPORT

 NLS PROJECT# 31905

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
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Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-213LS-3 NLS#: 125489
Ref. Line 6 of COC 24224 Description: FMC-213LS-3
Collected: 01/14/97 Received: 01/16/97 Reported: 01/28/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	450	mg/L	2.0	2.0	EPA 305.1	01/21/97	721026460
Aluminum, dis. as Al by ICP	1.7	mg/L	0.34	1.2	EPA 200.7	01/27/97	721026460
Cadmium, dis. as Cd by ICP	260	ug/L	12	38	EPA 200.7	01/27/97	721026460
Calcium, dis. as Ca by ICP	530	mg/L	30	30	EPA 200.7	01/27/97	721026460
Chloride, as Cl (filtered)	4.4	mg/L	0.36	1.3	EPA 325.2	01/22/97	721026460
Chromium, dis. as Cr by ICP	ND	ug/L	26	93	EPA 200.7	01/27/97	721026460
Cobalt, dis. as Co by ICP	2400	ug/L	43	150	EPA 200.7	01/27/97	721026460
Copper, dis. as Cu by ICP	200000	ug/L	540	1900	EPA 200.7	01/27/97	721026460
Iron, Ferrous	0.44	mg/L	0.046	0.15		01/27/97	721026460
	Additional Comments: F&VD modified method						
Iron, dis. as Fe by ICP	1.3	mg/L	0.10	0.35	EPA 200.7	01/27/97	721026460
Magnesium, dis. as Mg by ICP	75	mg/L	30	30	EPA 200.7	01/27/97	721026460
Manganese, dis. as Mn by ICP	5900	ug/L	18	61	EPA 200.7	01/27/97	721026460
pH, lab	4.8	s.u.	1.0		EPA 150.1	01/16/97	721026460
Potassium, dis. as K	ND	mg/L	2.0	6.6	EPA 200.7	01/23/97	721026460
Sodium, dis. as Na by ICP	5.0	mg/L	0.33	1.1	EPA 200.7	01/27/97	721026460
	Additional Comments: The instrument check standard recovery is 114%. See narrative.						
Sulfate, as SO4 (filtered)	2500	mg/L	250	250	EPA 375.2	01/20/97	721026460
Thallium, dis. as Tl by furnace AAS	< 26 >	ug/L	25	87	EPA 279.2	01/22/97	721026460
Zinc, dis. as Zn by ICP	52000	ug/L	1200	1200	EPA 200.7	01/27/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

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ANALYTICAL REPORT

 NLS PROJECT# 31905

Client: Foth & Van Dyke Associates
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Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-187LS-2 NLS#: 125490
Ref. Line 7 of COC 24224 Description: FMC-187LS-2
Collected: 01/14/97 Received: 01/16/97 Reported: 01/28/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	490	mg/L	2.0	2.0	EPA 305.1	01/21/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.34	1.2	EPA 200.7	01/27/97	721026460
Cadmium, dis. as Cd by ICP	82	ug/L	12	38	EPA 200.7	01/27/97	721026460
Calcium, dis. as Ca by ICP	520	mg/L	30	30	EPA 200.7	01/27/97	721026460
Chloride, as Cl (filtered)	1.9	mg/L	0.36	1.3	EPA 325.2	01/22/97	721026460
Chromium, dis. as Cr by ICP	ND	ug/L	26	93	EPA 200.7	01/27/97	721026460
Cobalt, dis. as Co by ICP	1800	ug/L	43	150	EPA 200.7	01/27/97	721026460
Copper, dis. as Cu by ICP	300000	ug/L	540	1900	EPA 200.7	01/27/97	721026460
Iron, Ferrous	ND	mg/L	0.046	0.15		01/27/97	721026460
	Additional Comments: F&VD modified method						
Iron, dis. as Fe by ICP	< 0.19 >	mg/L	0.10	0.35	EPA 200.7	01/27/97	721026460
Magnesium, dis. as Mg by ICP	47	mg/L	30	30	EPA 200.7	01/27/97	721026460
Manganese, dis. as Mn by ICP	5000	ug/L	18	61	EPA 200.7	01/27/97	721026460
pH, lab	4.8	s.u.	1.0		EPA 150.1	01/16/97	721026460
Potassium, dis. as K	12	mg/L	2.0	6.6	EPA 200.7	01/23/97	721026460
Sodium, dis. as Na by ICP	4.9	mg/L	0.33	1.1	EPA 200.7	01/27/97	721026460
	Additional Comments: The instrument check standard recovery is 114%. See narrative.						
Sulfate, as SO4 (filtered)	2400	mg/L	250	250	EPA 375.2	01/20/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/22/97	721026460
Zinc, dis. as Zn by ICP	6900	ug/L	1200	1200	EPA 200.7	01/27/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
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Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-194LS-2 NLS#: 125491
Ref. Line 8 of COC 24224 Description: FMC-194LS-2
Collected: 01/14/97 Received: 01/16/97 Reported: 01/28/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	50	mg/L	2.0	2.0	EPA 305.1	01/21/97	721026460
Aluminum, dis. as Al by ICP	2.0	mg/L	0.34	1.2	EPA 200.7	01/27/97	721026460
Cadmium, dis. as Cd by ICP	< 16 >	ug/L	12	38	EPA 200.7	01/27/97	721026460
Calcium, dis. as Ca by ICP	300	mg/L	30	30	EPA 200.7	01/27/97	721026460
Chloride, as Cl (filtered)	< 1.0 >	mg/L	0.36	1.3	EPA 325.2	01/22/97	721026460
Chromium, dis. as Cr by ICP	170	ug/L	26	93	EPA 200.7	01/27/97	721026460
Cobalt, dis. as Co by ICP	480	ug/L	43	150	EPA 200.7	01/27/97	721026460
Copper, dis. as Cu by ICP	4400	ug/L	54	190	EPA 200.7	01/27/97	721026460
Iron, Ferrous	0.34	mg/L	0.046	0.15		01/27/97	721026460
	Additional Comments: F&VD modified method						
Iron, dis. as Fe by ICP	< 0.27 >	mg/L	0.10	0.35	EPA 200.7	01/27/97	721026460
Magnesium, dis. as Mg by ICP	ND	mg/L	30	30	EPA 200.7	01/27/97	721026460
Manganese, dis. as Mn by ICP	1500	ug/L	18	61	EPA 200.7	01/27/97	721026460
pH, lab	6.0	s.u.	1.0		EPA 150.1	01/16/97	721026460
Potassium, dis. as K	ND	mg/L	2.0	6.6	EPA 200.7	01/23/97	721026460
Sodium, dis. as Na by ICP	3.2	mg/L	0.33	1.1	EPA 200.7	01/27/97	721026460
	Additional Comments: The instrument check standard recovery is 114%. See narrative.						
Sulfate, as SO4 (filtered)	800	mg/L	250	250	EPA 375.2	01/20/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/22/97	721026460
Zinc, dis. as Zn by ICP	1200	ug/L	1200	1200	EPA 200.7	01/27/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31905

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-192LS-2 NLS#: 125492
Ref. Line 9 of COC 24224 Description: FMC-192LS-2
Collected: 01/14/97 Received: 01/16/97 Reported: 01/28/97

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Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	36	mg/L	2.0	2.0	EPA 305.1	01/21/97	721026460
Aluminum, dis. as Al by ICP	< 0.80 >	mg/L	0.34	1.2	EPA 200.7	01/27/97	721026460
Cadmium, dis. as Cd by ICP	< 22 >	ug/L	12	38	EPA 200.7	01/27/97	721026460
Calcium, dis. as Ca by ICP	260	mg/L	30	30	EPA 200.7	01/27/97	721026460
Chloride, as Cl (filtered)	< 1.2 >	mg/L	0.36	1.3	EPA 325.2	01/22/97	721026460
Chromium, dis. as Cr by ICP	< 72 >	ug/L	26	93	EPA 200.7	01/27/97	721026460
Cobalt, dis. as Co by ICP	710	ug/L	43	150	EPA 200.7	01/27/97	721026460
Copper, dis. as Cu by ICP	38000	ug/L	54	190	EPA 200.7	01/27/97	721026460
Iron, Ferrous	0.20	mg/L	0.046	0.15		01/27/97	721026460
	Additional Comments: F&VD modified method						
Iron, dis. as Fe by ICP	ND	mg/L	0.10	0.35	EPA 200.7	01/27/97	721026460
Magnesium, dis. as Mg by ICP	46	mg/L	30	30	EPA 200.7	01/27/97	721026460
Manganese, dis. as Mn by ICP	3700	ug/L	18	61	EPA 200.7	01/27/97	721026460
pH, lab	5.5	s.u.	1.0		EPA 150.1	01/16/97	721026460
Potassium, dis. as K	< 6.2 >	mg/L	2.0	6.6	EPA 200.7	01/23/97	721026460
Sodium, dis. as Na by ICP	5.4	mg/L	0.33	1.1	EPA 200.7	01/27/97	721026460
	Additional Comments: The instrument check standard recovery is 114%. See narrative.						
Sulfate, as SO4 (filtered)	1100	mg/L	250	250	EPA 375.2	01/20/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/22/97	721026460
Zinc, dis. as Zn by ICP	1800	ug/L	1200	1200	EPA 200.7	01/27/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31905

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-8-1LS-2 NLS#: 125493
Ref. Line 10 of COC 24224 Description: FMC-8-1LS-2
Collected: 01/14/97 Received: 01/16/97 Reported: 01/28/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, carbonate as CaCO3	ND	mg/L	1.5	5.3	SM 2320B	01/17/97	721026460
Aluminum, dis. as Al by ICP	< 0.65 >	mg/L	0.34	1.2	EPA 200.7	01/27/97	721026460
Cadmium, dis. as Cd by ICP	< 25 >	ug/L	12	38	EPA 200.7	01/27/97	721026460
Calcium, dis. as Ca by ICP	220	mg/L	30	30	EPA 200.7	01/27/97	721026460
Chloride, as Cl (filtered)	< 0.77 >	mg/L	0.36	1.3	EPA 325.2	01/22/97	721026460
Chromium, dis. as Cr by ICP	< 52 >	ug/L	26	93	EPA 200.7	01/27/97	721026460
Cobalt, dis. as Co by ICP	< 140 >	ug/L	43	150	EPA 200.7	01/27/97	721026460
Copper, dis. as Cu by ICP	520	ug/L	54	190	EPA 200.7	01/27/97	721026460
Iron, Ferrous	< 0.060 >	mg/L	0.046	0.15		01/27/97	721026460
	Additional Comments: F&VD modified method						
Iron, dis. as Fe by ICP	ND	mg/L	0.10	0.35	EPA 200.7	01/27/97	721026460
Magnesium, dis. as Mg by ICP	ND	mg/L	30	30	EPA 200.7	01/27/97	721026460
Manganese, dis. as Mn by ICP	180	ug/L	18	61	EPA 200.7	01/27/97	721026460
pH, lab	6.6	s.u.	1.0		EPA 150.1	01/16/97	721026460
Potassium, dis. as K	ND	mg/L	2.0	6.6	EPA 200.7	01/23/97	721026460
Sodium, dis. as Na by ICP	4.4	mg/L	0.33	1.1	EPA 200.7	01/27/97	721026460
	Additional Comments: The instrument check standard recovery is 114%. See narrative.						
Sulfate, as SO4 (filtered)	590	mg/L	250	250	EPA 375.2	01/20/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/22/97	721026460
Zinc, dis. as Zn by ICP	ND	ug/L	1200	1200	EPA 200.7	01/27/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Steven R. Cegu
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31905

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-190LS-2 NLS#: 125494
Ref. Line 11 of COC 24224 Description: FMC-190LS-2
Collected: 01/14/97 Received: 01/16/97 Reported: 01/28/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	480	mg/L	2.0	2.0	EPA 305.1	01/21/97	721026460
Aluminum, dis. as Al by ICP	< 0.76 >	mg/L	0.34	1.2	EPA 200.7	01/27/97	721026460
Cadmium, dis. as Cd by ICP	150	ug/L	12	38	EPA 200.7	01/27/97	721026460
Calcium, dis. as Ca by ICP	340	mg/L	30	30	EPA 200.7	01/27/97	721026460
Chloride, as Cl (filtered)	2.8	mg/L	0.36	1.3	EPA 325.2	01/22/97	721026460
Chromium, dis. as Cr by ICP	< 70 >	ug/L	26	93	EPA 200.7	01/27/97	721026460
Cobalt, dis. as Co by ICP	3600	ug/L	43	150	EPA 200.7	01/27/97	721026460
Copper, dis. as Cu by ICP	300000	ug/L	540	1900	EPA 200.7	01/27/97	721026460
Iron, Ferrous	ND	mg/L	0.046	0.15		01/27/97	721026460
	Additional Comments: F&VD modified method						
Iron, dis. as Fe by ICP	ND	mg/L	0.10	0.35	EPA 200.7	01/27/97	721026460
Magnesium, dis. as Mg by ICP	65	mg/L	30	30	EPA 200.7	01/27/97	721026460
Manganese, dis. as Mn by ICP	8800	ug/L	18	61	EPA 200.7	01/27/97	721026460
pH, lab	5.2	s.u.	1.0		EPA 150.1	01/16/97	721026460
Potassium, dis. as K	12	mg/L	2.0	6.6	EPA 200.7	01/23/97	721026460
Sodium, dis. as Na by ICP	6.2	mg/L	0.33	1.1	EPA 200.7	01/27/97	721026460
	Additional Comments: The instrument check standard recovery is 114%. See narrative.						
Sulfate, as SO4 (filtered)	1900	mg/L	250	250	EPA 375.2	01/20/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/22/97	721026460
Zinc, dis. as Zn by ICP	19000	ug/L	1200	1200	EPA 200.7	01/27/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Steven R. Cuyn
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R. T. Krueger
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-172LS-2 NLS#: 125495
Ref. Line 12 of COC 24224 Description: FMC-172LS-2
Collected: 01/14/97 Received: 01/16/97 Reported: 01/28/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	540	mg/L	2.0	2.0	EPA 305.1	01/21/97	721026460
Aluminum, dis. as Al by ICP	< 0.68 >	mg/L	0.34	1.2	EPA 200.7	01/27/97	721026460
Cadmium, dis. as Cd by ICP	41	ug/L	12	38	EPA 200.7	01/27/97	721026460
Calcium, dis. as Ca by ICP	520	mg/L	30	30	EPA 200.7	01/27/97	721026460
Chloride, as Cl (filtered)	1.7	mg/L	0.36	1.3	EPA 325.2	01/22/97	721026460
Chromium, dis. as Cr by ICP	< 42 >	ug/L	26	93	EPA 200.7	01/27/97	721026460
Cobalt, dis. as Co by ICP	1700	ug/L	43	150	EPA 200.7	01/27/97	721026460
Copper, dis. as Cu by ICP	320000	ug/L	540	1900	EPA 200.7	01/27/97	721026460
Iron, Ferrous	< 0.050 >	mg/L	0.046	0.15		01/27/97	721026460
Additional Comments: F&VD modified method							
Iron, dis. as Fe by ICP	ND	mg/L	0.10	0.35	EPA 200.7	01/27/97	721026460
Magnesium, dis. as Mg by ICP	65	mg/L	30	30	EPA 200.7	01/27/97	721026460
Manganese, dis. as Mn by ICP	4800	ug/L	18	61	EPA 200.7	01/27/97	721026460
pH, lab	5.2	s.u.	1.0		EPA 150.1	01/16/97	721026460
Potassium, dis. as K	< 3.7 >	mg/L	2.0	6.6	EPA 200.7	01/23/97	721026460
Sodium, dis. as Na by ICP	4.8	mg/L	0.33	1.1	EPA 200.7	01/27/97	721026460
Additional Comments: The instrument check standard recovery is 114%. See narrative.							
Sulfate, as SO4 (filtered)	2700	mg/L	250	250	EPA 375.2	01/20/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/22/97	721026460
Zinc, dis. as Zn by ICP	9500	ug/L	1200	1200	EPA 200.7	01/27/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Steven R. Cugn
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31905

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-176LS-2 NLS#: 125496
Ref. Line 13 of COC 24224 Description: FMC-176LS-2
Collected: 01/14/97 Received: 01/16/97 Reported: 01/28/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	270	mg/L	2.0	2.0	EPA 305.1	01/21/97	721026460
Aluminum, dis. as Al by ICP	1.4	mg/L	0.34	1.2	EPA 200.7	01/27/97	721026460
Cadmium, dis. as Cd by ICP	140	ug/L	12	38	EPA 200.7	01/27/97	721026460
Calcium, dis. as Ca by ICP	540	mg/L	30	30	EPA 200.7	01/27/97	721026460
Chloride, as Cl (filtered)	3.9	mg/L	0.36	1.3	EPA 325.2	01/22/97	721026460
Chromium, dis. as Cr by ICP	110	ug/L	26	93	EPA 200.7	01/27/97	721026460
Cobalt, dis. as Co by ICP	2900	ug/L	43	150	EPA 200.7	01/27/97	721026460
Copper, dis. as Cu by ICP	210000	ug/L	540	1900	EPA 200.7	01/27/97	721026460
Iron, Ferrous	ND	mg/L	0.046	0.15		01/27/97	721026460
	Additional Comments: F&VD modified method						
Iron, dis. as Fe by ICP	< 0.12 >	mg/L	0.10	0.35	EPA 200.7	01/27/97	721026460
Magnesium, dis. as Mg by ICP	33	mg/L	30	30	EPA 200.7	01/27/97	721026460
Manganese, dis. as Mn by ICP	2800	ug/L	18	61	EPA 200.7	01/27/97	721026460
pH, lab	5.3	s.u.	1.0		EPA 150.1	01/16/97	721026460
Potassium, dis. as K	< 4.6 >	mg/L	2.0	6.6	EPA 200.7	01/23/97	721026460
Sodium, dis. as Na by ICP	5.8	mg/L	0.33	1.1	EPA 200.7	01/27/97	721026460
	Additional Comments: The instrument check standard recovery is 114%. See narrative.						
Sulfate, as SO4 (filtered)	1400	mg/L	250	250	EPA 375.2	01/20/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/22/97	721026460
Zinc, dis. as Zn by ICP	18000	ug/L	1200	1200	EPA 200.7	01/27/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Steven R. Cuyn
Reviewed by:

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31874

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-BF4-2 **NLS#: 125357**
Ref. Line 1 of COC 24223 Description: FMC-BF4-2
Collected: 01/13/97 Received: 01/15/97 Reported: 01/28/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	20	mg/L	2.0	2.0	EPA 305.1	01/21/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.34	1.2	EPA 200.7	01/27/97	721026460
Cadmium, dis. as Cd by ICP	< 19 >	ug/L	12	38	EPA 200.7	01/27/97	721026460
Calcium, dis. as Ca by ICP	140	mg/L	30	30	EPA 200.7	01/27/97	721026460
Chloride, as Cl (filtered)	< 0.50 >	mg/L	0.36	1.3	EPA 325.2	01/16/97	721026460
Chromium, dis. as Cr by ICP	ND	ug/L	26	93	EPA 200.7	01/27/97	721026460
Cobalt, dis. as Co by ICP	160	ug/L	43	150	EPA 200.7	01/27/97	721026460
Copper, dis. as Cu by ICP	ND	ug/L	54	190	EPA 200.7	01/27/97	721026460
Iron, Ferrous	0.19	mg/L	0.0091	0.030		01/27/97	721026460
	Additional Comments:	F&VD modified method					
Iron, dis. as Fe by ICP	< 0.17 >	mg/L	0.10	0.35	EPA 200.7	01/27/97	721026460
Magnesium, dis. as Mg by ICP	ND	mg/L	30	30	EPA 200.7	01/27/97	721026460
Manganese, dis. as Mn by ICP	2600	ug/L	18	61	EPA 200.7	01/27/97	721026460
pH, lab	5.9	s.u.	1.0		EPA 150.1	01/15/97	721026460
Potassium, dis. as K	< 3.1 >	mg/L	2.0	6.6	EPA 200.7	01/23/97	721026460
Sodium, dis. as Na by ICP	1.6	mg/L	0.33	1.1	EPA 200.7	01/27/97	721026460
Sulfate, as SO4 (filtered)	550	mg/L	250	250	EPA 375.2	01/20/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/22/97	721026460
Zinc, dis. as Zn by ICP	ND	ug/L	1200	1200	EPA 200.7	01/27/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Steven R. Cmyn
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31874

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-CUF1-2 NLS#: 125358
Ref. Line 2 of COC 24223 Description: FMC-CUF1-2
Collected: 01/14/97 Received: 01/15/97 Reported: 01/28/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	25	mg/L	1.5	5.3	EPA 310.1	01/21/97	721026460
Aluminum, dis. as Al by ICP	< 1.2 >	mg/L	0.34	1.2	EPA 200.7	01/27/97	721026460
Cadmium, dis. as Cd by ICP	ND	ug/L	12	38	EPA 200.7	01/27/97	721026460
Calcium, dis. as Ca by ICP	140	mg/L	30	30	EPA 200.7	01/27/97	721026460
Chloride, as Cl (filtered)	11	mg/L	0.36	1.3	EPA 325.2	01/16/97	721026460
Chromium, dis. as Cr by ICP	< 90 >	ug/L	26	93	EPA 200.7	01/27/97	721026460
Cobalt, dis. as Co by ICP	< 120 >	ug/L	43	150	EPA 200.7	01/27/97	721026460
Copper, dis. as Cu by ICP	200	ug/L	54	190	EPA 200.7	01/27/97	721026460
Iron, Ferrous	0.060	mg/L	0.0091	0.030		01/27/97	721026460
	Additional Comments: F&VD modified method						
Iron, dis. as Fe by ICP	< 0.11 >	mg/L	0.10	0.35	EPA 200.7	01/27/97	721026460
Magnesium, dis. as Mg by ICP	86	mg/L	30	30	EPA 200.7	01/27/97	721026460
Manganese, dis. as Mn by ICP	290	ug/L	18	61	EPA 200.7	01/27/97	721026460
pH, lab	6.6	s.u.	1.0		EPA 150.1	01/15/97	721026460
Potassium, dis. as K	< 4.8 >	mg/L	2.0	6.6	EPA 200.7	01/23/97	721026460
Sodium, dis. as Na by ICP	9.8	mg/L	0.33	1.1	EPA 200.7	01/27/97	721026460
Sulfate, as SO4 (filtered)	650	mg/L	250	250	EPA 375.2	01/20/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/22/97	721026460
Zinc, dis. as Zn by ICP	ND	ug/L	1200	1200	EPA 200.7	01/27/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Steven R. Cayer
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
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Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-CUF2-2 NLS#: 125359
Ref. Line 3 of COC 24223 Description: FMC-CUF2-2
Collected: 01/13/97 Received: 01/15/97 Reported: 01/28/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	10	mg/L	1.5	5.3	EPA 310.1	01/21/97	721026460
Aluminum, dis. as Al by ICP	< 0.39 >	mg/L	0.34	1.2	EPA 200.7	01/27/97	721026460
Cadmium, dis. as Cd by ICP	< 18 >	ug/L	12	38	EPA 200.7	01/27/97	721026460
Calcium, dis. as Ca by ICP	66	mg/L	30	30	EPA 200.7	01/27/97	721026460
Chloride, as Cl (filtered)	5.3	mg/L	0.36	1.3	EPA 325.2	01/16/97	721026460
Chromium, dis. as Cr by ICP	< 29 >	ug/L	26	93	EPA 200.7	01/27/97	721026460
Cobalt, dis. as Co by ICP	< 57 >	ug/L	43	150	EPA 200.7	01/27/97	721026460
Copper, dis. as Cu by ICP	< 150 >	ug/L	54	190	EPA 200.7	01/27/97	721026460
Iron, Ferrous	0.060	mg/L	0.0091	0.030		01/27/97	721026460
	Additional Comments: F&VD modified method						
Iron, dis. as Fe by ICP	ND	mg/L	0.10	0.35	EPA 200.7	01/27/97	721026460
Magnesium, dis. as Mg by ICP	44	mg/L	30	30	EPA 200.7	01/27/97	721026460
Manganese, dis. as Mn by ICP	ND	ug/L	18	61	EPA 200.7	01/27/97	721026460
pH, lab	8.1	s.u.	1.0		EPA 150.1	01/15/97	721026460
Potassium, dis. as K	< 2.6 >	mg/L	2.0	6.6	EPA 200.7	01/23/97	721026460
Sodium, dis. as Na by ICP	5.3	mg/L	0.33	1.1	EPA 200.7	01/27/97	721026460
Sulfate, as SO4 (filtered)	540	mg/L	250	250	EPA 375.2	01/20/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/22/97	721026460
Zinc, dis. as Zn by ICP	ND	ug/L	1200	1200	EPA 200.7	01/27/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Steven R. Cuyn
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Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31874

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-15-3L-2 NLS#: 125360
Ref. Line 4 of COC 24223 Description: FMC-15-3L-2
Collected: 01/13/97 Received: 01/15/97 Reported: 01/28/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	250	mg/L	2.0	2.0	EPA 305.1	01/21/97	721026460
Aluminum, dis. as Al by ICP	1.5	mg/L	0.34	1.2	EPA 200.7	01/27/97	721026460
Cadmium, dis. as Cd by ICP	< 37 >	ug/L	12	38	EPA 200.7	01/27/97	721026460
Calcium, dis. as Ca by ICP	540	mg/L	30	30	EPA 200.7	01/27/97	721026460
Chloride, as Cl (filtered)	< 0.58 >	mg/L	0.36	1.3	EPA 325.2	01/16/97	721026460
Chromium, dis. as Cr by ICP	< 76 >	ug/L	26	93	EPA 200.7	01/27/97	721026460
Cobalt, dis. as Co by ICP	1500	ug/L	43	150	EPA 200.7	01/27/97	721026460
Copper, dis. as Cu by ICP	130000	ug/L	54	190	EPA 200.7	01/27/97	721026460
Iron, Ferrous	1.1	mg/L	0.0091	0.030		01/27/97	721026460
	Additional Comments:	F&VD modified method					
Iron, dis. as Fe by ICP	3.3	mg/L	0.10	0.35	EPA 200.7	01/27/97	721026460
Magnesium, dis. as Mg by ICP	67	mg/L	30	30	EPA 200.7	01/27/97	721026460
Manganese, dis. as Mn by ICP	6200	ug/L	18	61	EPA 200.7	01/27/97	721026460
pH, lab	3.8	s.u.	1.0		EPA 150.1	01/15/97	721026460
Potassium, dis. as K	7.9	mg/L	2.0	6.6	EPA 200.7	01/23/97	721026460
Sodium, dis. as Na by ICP	2.8	mg/L	0.33	1.1	EPA 200.7	01/27/97	721026460
Sulfate, as SO4 (filtered)	1900	mg/L	250	250	EPA 375.2	01/20/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/22/97	721026460
Zinc, dis. as Zn by ICP	8000	ug/L	1200	1200	EPA 200.7	01/27/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection   LOQ = Limit of Quantitation   ND = Not Detected
DWB = Dry Weight Basis   NA = Not Applicable   %DWB = (mg/kg DWB)/10000

Steven R. Creger
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31874

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-180L-2 NLS#: 125361
Ref. Line 5 of COC 24223 Description: FMC-180L-2
Collected: 01/13/97 Received: 01/15/97 Reported: 01/28/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	440	mg/L	2.0	2.0	EPA 305.1	01/21/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.34	1.2	EPA 200.7	01/27/97	721026460
Cadmium, dis. as Cd by ICP	180	ug/L	12	38	EPA 200.7	01/27/97	721026460
Calcium, dis. as Ca by ICP	450	mg/L	30	30	EPA 200.7	01/27/97	721026460
Chloride, as Cl (filtered)	< 1.1 >	mg/L	0.36	1.3	EPA 325.2	01/16/97	721026460
Chromium, dis. as Cr by ICP	ND	ug/L	26	93	EPA 200.7	01/27/97	721026460
Cobalt, dis. as Co by ICP	2200	ug/L	43	150	EPA 200.7	01/27/97	721026460
Copper, dis. as Cu by ICP	45000	ug/L	54	190	EPA 200.7	01/27/97	721026460
Iron, Ferrous	0.64	mg/L	0.0091	0.030		01/27/97	721026460
	Additional Comments: F&VD modified method						
Iron, dis. as Fe by ICP	ND	mg/L	0.10	0.35	EPA 200.7	01/27/97	721026460
Magnesium, dis. as Mg by ICP	86	mg/L	30	30	EPA 200.7	01/27/97	721026460
Manganese, dis. as Mn by ICP	19000	ug/L	18	61	EPA 200.7	01/27/97	721026460
pH, lab	5.1	s.u.	1.0		EPA 150.1	01/15/97	721026460
Potassium, dis. as K	< 6.1 >	mg/L	2.0	6.6	EPA 200.7	01/23/97	721026460
Sodium, dis. as Na by ICP	3.9	mg/L	0.33	1.1	EPA 200.7	01/27/97	721026460
Sulfate, as SO4 (filtered)	1600	mg/L	250	250	EPA 375.2	01/20/97	721026460
Thallium, dis. as Tl by furnace AAS	< 26 >	ug/L	25	87	EPA 279.2	01/22/97	721026460
Zinc, dis. as Zn by ICP	35000	ug/L	1200	1200	EPA 200.7	01/27/97	721026460

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Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31874

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-181L-2 NLS#: 125362
Ref. Line 6 of COC 24223 Description: FMC-181L-2
Collected: 01/13/97 Received: 01/15/97 Reported: 01/28/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	1800	mg/L	2.0	2.0	EPA 305.1	01/21/97	721026460
Aluminum, dis. as Al by ICP	2.8	mg/L	0.34	1.2	EPA 200.7	01/27/97	721026460
Cadmium, dis. as Cd by ICP	1100	ug/L	12	38	EPA 200.7	01/27/97	721026460
Calcium, dis. as Ca by ICP	460	mg/L	30	30	EPA 200.7	01/27/97	721026460
Chloride, as Cl (filtered)	2.2	mg/L	0.36	1.3	EPA 325.2	01/16/97	721026460
Chromium, dis. as Cr by ICP	< 49 >	ug/L	26	93	EPA 200.7	01/27/97	721026460
Cobalt, dis. as Co by ICP	6200	ug/L	43	150	EPA 200.7	01/27/97	721026460
Copper, dis. as Cu by ICP	950000	ug/L	540	1900	EPA 200.7	01/27/97	721026460
Iron, Ferrous	12	mg/L	0.0091	0.030		01/27/97	721026460
	Additional Comments:	F&VD modified method					
Iron, dis. as Fe by ICP	14	mg/L	0.10	0.35	EPA 200.7	01/27/97	721026460
Magnesium, dis. as Mg by ICP	140	mg/L	30	30	EPA 200.7	01/27/97	721026460
Manganese, dis. as Mn by ICP	20000	ug/L	18	61	EPA 200.7	01/27/97	721026460
pH, lab	3.7	s.u.	1.0		EPA 150.1	01/15/97	721026460
Potassium, dis. as K	< 3.4 >	mg/L	2.0	6.6	EPA 200.7	01/23/97	721026460
Sodium, dis. as Na by ICP	2.5	mg/L	0.33	1.1	EPA 200.7	01/27/97	721026460
Sulfate, as SO4 (filtered)	6100	mg/L	2500	2500	EPA 375.2	01/20/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/22/97	721026460
Zinc, dis. as Zn by ICP	170000	ug/L	12000	12000	EPA 200.7	01/27/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-15-1L-2 NLS#: 125363
Ref. Line 7 of COC 24223 Description: FMC-15-1L-2
Collected: 01/13/97 Received: 01/15/97 Reported: 01/28/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	100	mg/L	2.0	2.0	EPA 305.1	01/21/97	721026460
Aluminum, dis. as Al by ICP	< 1.0 >	mg/L	0.34	1.2	EPA 200.7	01/27/97	721026460
Cadmium, dis. as Cd by ICP	< 26 >	ug/L	12	38	EPA 200.7	01/27/97	721026460
Calcium, dis. as Ca by ICP	560	mg/L	30	30	EPA 200.7	01/27/97	721026460
Chloride, as Cl (filtered)	< 0.42 >	mg/L	0.36	1.3	EPA 325.2	01/16/97	721026460
Chromium, dis. as Cr by ICP	< 37 >	ug/L	26	93	EPA 200.7	01/27/97	721026460
Cobalt, dis. as Co by ICP	440	ug/L	43	150	EPA 200.7	01/27/97	721026460
Copper, dis. as Cu by ICP	23000	ug/L	54	190	EPA 200.7	01/27/97	721026460
Iron, Ferrous	4.0	mg/L	0.0091	0.030		01/27/97	721026460
	Additional Comments:	F&VD modified method					
Iron, dis. as Fe by ICP	4.0	mg/L	0.10	0.35	EPA 200.7	01/27/97	721026460
Magnesium, dis. as Mg by ICP	43	mg/L	30	30	EPA 200.7	01/27/97	721026460
Manganese, dis. as Mn by ICP	2000	ug/L	18	61	EPA 200.7	01/27/97	721026460
pH, lab	3.8	s.u.	1.0		EPA 150.1	01/15/97	721026460
Potassium, dis. as K	32	mg/L	2.0	6.6	EPA 200.7	01/23/97	721026460
Sodium, dis. as Na by ICP	4.3	mg/L	0.33	1.1	EPA 200.7	01/27/97	721026460
Sulfate, as SO4 (filtered)	2200	mg/L	250	250	EPA 375.2	01/20/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/22/97	721026460
Zinc, dis. as Zn by ICP	ND	ug/L	1200	1200	EPA 200.7	01/27/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Steven R. Creyer
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-4-1L-2 NLS#: 125364
Ref. Line 8 of COC 24223 Description: FMC-4-1L-2
Collected: 01/13/97 Received: 01/15/97 Reported: 01/28/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	140	mg/L	2.0	2.0	EPA 305.1	01/21/97	721026460
Aluminum, dis. as Al by ICP	< 1.0 >	mg/L	0.34	1.2	EPA 200.7	01/27/97	721026460
Cadmium, dis. as Cd by ICP	98	ug/L	12	38	EPA 200.7	01/27/97	721026460
Calcium, dis. as Ca by ICP	480	mg/L	30	30	EPA 200.7	01/27/97	721026460
Chloride, as Cl (filtered)	ND	mg/L	0.36	1.3	EPA 325.2	01/16/97	721026460
Chromium, dis. as Cr by ICP	ND	ug/L	26	93	EPA 200.7	01/27/97	721026460
Cobalt, dis. as Co by ICP	760	ug/L	43	150	EPA 200.7	01/27/97	721026460
Copper, dis. as Cu by ICP	35000	ug/L	54	190	EPA 200.7	01/27/97	721026460
Iron, Ferrous	0.66	mg/L	0.0091	0.030		01/27/97	721026460
	Additional Comments: F&VD modified method						
Iron, dis. as Fe by ICP	0.53	mg/L	0.10	0.35	EPA 200.7	01/27/97	721026460
Magnesium, dis. as Mg by ICP	72	mg/L	30	30	EPA 200.7	01/27/97	721026460
Manganese, dis. as Mn by ICP	4800	ug/L	18	61	EPA 200.7	01/27/97	721026460
pH, lab	5.3	s.u.	1.0		EPA 150.1	01/15/97	721026460
Potassium, dis. as K	9.9	mg/L	2.0	6.6	EPA 200.7	01/23/97	721026460
Sodium, dis. as Na by ICP	6.2	mg/L	0.33	1.1	EPA 200.7	01/27/97	721026460
Sulfate, as SO4 (filtered)	1700	mg/L	250	250	EPA 375.2	01/20/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/22/97	721026460
Zinc, dis. as Zn by ICP	10000	ug/L	1200	1200	EPA 200.7	01/27/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31874

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-4-1LS-2 NLS#: 125365
Ref. Line 9 of COC 24223 Description: FMC-4-1LS-2
Collected: 01/13/97 Received: 01/15/97 Reported: 01/28/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	78	mg/L	2.0	2.0	EPA 305.1	01/21/97	721026460
Aluminum, dis. as Al by ICP	< 0.97 >	mg/L	0.34	1.2	EPA 200.7	01/27/97	721026460
Cadmium, dis. as Cd by ICP	210	ug/L	12	38	EPA 200.7	01/27/97	721026460
Calcium, dis. as Ca by ICP	430	mg/L	30	30	EPA 200.7	01/27/97	721026460
Chloride, as Cl (filtered)	2.1	mg/L	0.36	1.3	EPA 325.2	01/16/97	721026460
Chromium, dis. as Cr by ICP	< 59 >	ug/L	26	93	EPA 200.7	01/27/97	721026460
Cobalt, dis. as Co by ICP	2200	ug/L	43	150	EPA 200.7	01/27/97	721026460
Copper, dis. as Cu by ICP	61000	ug/L	54	190	EPA 200.7	01/27/97	721026460
Iron, Ferrous	0.10	mg/L	0.0091	0.030		01/27/97	721026460
	Additional Comments:	F&VD modified method					
Iron, dis. as Fe by ICP	ND	mg/L	0.10	0.35	EPA 200.7	01/27/97	721026460
Magnesium, dis. as Mg by ICP	140	mg/L	30	30	EPA 200.7	01/27/97	721026460
Manganese, dis. as Mn by ICP	13000	ug/L	18	61	EPA 200.7	01/27/97	721026460
pH, lab	5.9	s.u.	1.0		EPA 150.1	01/15/97	721026460
Potassium, dis. as K	< 2.9 >	mg/L	2.0	6.6	EPA 200.7	01/23/97	721026460
Sodium, dis. as Na by ICP	2.2	mg/L	0.33	1.1	EPA 200.7	01/27/97	721026460
Sulfate, as SO4 (filtered)	1800	mg/L	250	250	EPA 375.2	01/20/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/22/97	721026460
Zinc, dis. as Zn by ICP	28000	ug/L	1200	1200	EPA 200.7	01/27/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation".
Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31874

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
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PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-15-1:S-2 NLS#: 125366
Ref. Line 10 of COC 24223 Description: FMC-15-1:S-2
Collected: 01/13/97 Received: 01/15/97 Reported: 01/28/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	ND	mg/L	1.5	5.3	EPA 310.1	01/21/97	721026460
Aluminum, dis. as Al by ICP	< 0.97 >	mg/L	0.34	1.2	EPA 200.7	01/27/97	721026460
Cadmium, dis. as Cd by ICP	ND	ug/L	12	38	EPA 200.7	01/27/97	721026460
Calcium, dis. as Ca by ICP	440	mg/L	30	30	EPA 200.7	01/27/97	721026460
Chloride, as Cl (filtered)	3.1	mg/L	0.36	1.3	EPA 325.2	01/16/97	721026460
Chromium, dis. as Cr by ICP	< 56 >	ug/L	26	93	EPA 200.7	01/27/97	721026460
Cobalt, dis. as Co by ICP	800	ug/L	43	150	EPA 200.7	01/27/97	721026460
Copper, dis. as Cu by ICP	1900	ug/L	54	190	EPA 200.7	01/27/97	721026460
Iron, Ferrous	0.74	mg/L	0.0091	0.030		01/27/97	721026460
	Additional Comments:	F&VD modified method					
Iron, dis. as Fe by ICP	ND	mg/L	0.10	0.35	EPA 200.7	01/27/97	721026460
Magnesium, dis. as Mg by ICP	63	mg/L	30	30	EPA 200.7	01/27/97	721026460
Manganese, dis. as Mn by ICP	4800	ug/L	18	61	EPA 200.7	01/27/97	721026460
pH, lab	6.7	s.u.	1.0		EPA 150.1	01/15/97	721026460
Potassium, dis. as K	ND	mg/L	2.0	6.6	EPA 200.7	01/23/97	721026460
Sodium, dis. as Na by ICP	2.0	mg/L	0.33	1.1	EPA 200.7	01/27/97	721026460
Sulfate, as SO4 (filtered)	1200	mg/L	250	250	EPA 375.2	01/20/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/22/97	721026460
Zinc, dis. as Zn by ICP	ND	ug/L	1200	1200	EPA 200.7	01/27/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Steven R. Cuyt
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31874

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-181LS-2 NLS#: 125367
Ref. Line 11 of COC 24223 Description: FMC-181LS-2
Collected: 01/13/97 Received: 01/15/97 Reported: 01/28/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	1700	mg/L	2.0	2.0	EPA 305.1	01/21/97	721026460
Aluminum, dis. as Al by ICP	< 1.0 >	mg/L	0.34	1.2	EPA 200.7	01/27/97	721026460
Cadmium, dis. as Cd by ICP	1400	ug/L	12	38	EPA 200.7	01/27/97	721026460
Calcium, dis. as Ca by ICP	420	mg/L	30	30	EPA 200.7	01/27/97	721026460
Chloride, as Cl (filtered)	4.0	mg/L	0.36	1.3	EPA 325.2	01/16/97	721026460
Chromium, dis. as Cr by ICP	< 64 >	ug/L	26	93	EPA 200.7	01/27/97	721026460
Cobalt, dis. as Co by ICP	7700	ug/L	43	150	EPA 200.7	01/27/97	721026460
Copper, dis. as Cu by ICP	1000000	ug/L	540	1900	EPA 200.7	01/27/97	721026460
Iron, Ferrous	< 1.2 >	mg/L	0.46	1.5		01/27/97	721026460
	Additional Comments: F&VD modified method						
Iron, dis. as Fe by ICP	1.0	mg/L	0.10	0.35	EPA 200.7	01/27/97	721026460
Magnesium, dis. as Mg by ICP	160	mg/L	30	30	EPA 200.7	01/27/97	721026460
Manganese, dis. as Mn by ICP	22000	ug/L	18	61	EPA 200.7	01/27/97	721026460
pH, lab	5.4	s.u.	1.0		EPA 150.1	01/15/97	721026460
Potassium, dis. as K	< 2.1 >	mg/L	2.0	6.6	EPA 200.7	01/23/97	721026460
Sodium, dis. as Na by ICP	3.8	mg/L	0.33	1.1	EPA 200.7	01/27/97	721026460
	Additional Comments: The instrument check standard recovery is 113%. See narrative.						
Sulfate, as SO4 (filtered)	5900	mg/L	2500	2500	EPA 375.2	01/20/97	721026460
Thallium, dis. as Tl by furnace AAS	< 29 >	ug/L	25	87	EPA 279.2	01/22/97	721026460
Zinc, dis. as Zn by ICP	220000	ug/L	1200	1200	EPA 200.7	01/27/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Steven R. Cenji
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-180LS-2 NLS#: 125368
Ref. Line 12 of COC 24223 Description: FMC-180LS-2
Collected: 01/13/97 Received: 01/15/97 Reported: 01/28/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	100	mg/L	2.0	2.0	EPA 305.1	01/21/97	721026460
Aluminum, dis. as Al by ICP	1.6	mg/L	0.34	1.2	EPA 200.7	01/27/97	721026460
Cadmium, dis. as Cd by ICP	180	ug/L	12	38	EPA 200.7	01/27/97	721026460
Calcium, dis. as Ca by ICP	370	mg/L	30	30	EPA 200.7	01/27/97	721026460
Chloride, as Cl (filtered)	2.4	mg/L	0.36	1.3	EPA 325.2	01/16/97	721026460
Chromium, dis. as Cr by ICP	130	ug/L	26	93	EPA 200.7	01/27/97	721026460
Cobalt, dis. as Co by ICP	2400	ug/L	43	150	EPA 200.7	01/27/97	721026460
Copper, dis. as Cu by ICP	16000	ug/L	54	190	EPA 200.7	01/27/97	721026460
Iron, Ferrous	0.76	mg/L	0.046	0.15		01/27/97	721026460
	Additional Comments: F&VD modified method						
Iron, dis. as Fe by ICP	ND	mg/L	0.10	0.35	EPA 200.7	01/27/97	721026460
Magnesium, dis. as Mg by ICP	84	mg/L	30	30	EPA 200.7	01/27/97	721026460
Manganese, dis. as Mn by ICP	19000	ug/L	18	61	EPA 200.7	01/27/97	721026460
pH, lab	4.6	s.u.	1.0		EPA 150.1	01/15/97	721026460
Potassium, dis. as K	< 5.2 >	mg/L	2.0	6.6	EPA 200.7	01/23/97	721026460
Sodium, dis. as Na by ICP	5.8	mg/L	0.33	1.1	EPA 200.7	01/27/97	721026460
	Additional Comments: The instrument check standard recovery is 113%. See narrative.						
Sulfate, as SO4 (filtered)	1200	mg/L	250	250	EPA 375.2	01/20/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/22/97	721026460
Zinc, dis. as Zn by ICP	31000	ug/L	1200	1200	EPA 200.7	01/27/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Steven R. Cuyn
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31874

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-15-3LS-2 NLS#: 125369
Ref. Line 13 of COC 24223 Description: FMC-15-3LS-2
Collected: 01/13/97 Received: 01/15/97 Reported: 01/28/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	ND	mg/L	1.5	5.3	EPA 310.1	01/15/97	721026460
Aluminum, dis. as Al by ICP	1.8	mg/L	0.34	1.2	EPA 200.7	01/27/97	721026460
Cadmium, dis. as Cd by ICP	< 27 >	ug/L	12	38	EPA 200.7	01/27/97	721026460
Calcium, dis. as Ca by ICP	510	mg/L	30	30	EPA 200.7	01/27/97	721026460
Chloride, as Cl (filtered)	4.0	mg/L	0.36	1.3	EPA 325.2	01/16/97	721026460
Chromium, dis. as Cr by ICP	< 41 >	ug/L	26	93	EPA 200.7	01/27/97	721026460
Cobalt, dis. as Co by ICP	2600	ug/L	43	150	EPA 200.7	01/27/97	721026460
Copper, dis. as Cu by ICP	320000	ug/L	540	1900	EPA 200.7	01/27/97	721026460
Iron, Ferrous	< 0.55 >	mg/L	0.23	0.75		01/27/97	721026460
	Additional Comments: F&VD modified method						
Iron, dis. as Fe by ICP	0.46	mg/L	0.10	0.35	EPA 200.7	01/27/97	721026460
Magnesium, dis. as Mg by ICP	96	mg/L	30	30	EPA 200.7	01/27/97	721026460
Manganese, dis. as Mn by ICP	11000	ug/L	18	61	EPA 200.7	01/27/97	721026460
pH, lab	6.5	s.u.	1.0		EPA 150.1	01/15/97	721026460
Potassium, dis. as K	ND	mg/L	2.0	6.6	EPA 200.7	01/23/97	721026460
Sodium, dis. as Na by ICP	2.7	mg/L	0.33	1.1	EPA 200.7	01/27/97	721026460
	Additional Comments: The instrument check standard recovery is 113%. See narrative.						
Sulfate, as SO4 (filtered)	1200	mg/L	250	250	EPA 375.2	01/20/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/22/97	721026460
Zinc, dis. as Zn by ICP	10000	ug/L	1200	1200	EPA 200.7	01/27/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Steven R. Cuyn
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

Anoxic Columns Third Displacement Test Results

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 32180

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-186LS-3 NLS#: 126406
Ref. Line 1 of COC 24605 Description: FMC-186LS-3
Collected: 02/04/97 Received: 02/05/97 Reported: 02/10/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	47	mg/L	1.5	5.3	EPA 310.1	02/06/97	721026460
Aluminum, dis. as Al by ICP	0.16	mg/L	0.034	0.12	EPA 200.7	02/07/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/07/97	721026460
Cadmium, dis. as Cd by ICP	21	ug/L	1.2	3.8	EPA 200.7	02/07/97	721026460
Calcium, dis. as Ca by ICP	570	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Cobalt, dis. as Co by ICP	430	ug/L	4.3	15	EPA 200.7	02/07/97	721026460
Copper, dis. as Cu by ICP	520	ug/L	5.4	19	EPA 200.7	02/07/97	721026460
Iron, dis. as Fe by ICP	0.14	mg/L	0.010	0.035	EPA 200.7	02/07/97	721026460
Magnesium, dis. as Mg by ICP	44	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Manganese, dis. as Mn by ICP	3900	ug/L	1.8	6.1	EPA 200.7	02/07/97	721026460
pH, lab	6.6	s.u.	1.0		EPA 150.1	02/05/97	721026460
Potassium, dis. as K	< 6.4 >	mg/L	2.0	6.6	EPA 200.7	02/10/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	02/07/97	721026460
Sodium, dis. as Na by ICP	3.1	mg/L	0.033	0.11	EPA 200.7	02/07/97	721026460
Sulfate, as SO4 (filtered)	690	mg/L	250	250	EPA 375.2	02/06/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	02/09/97	721026460
Zinc, dis. as Zn by ICP	1300	ug/L	120	120	EPA 200.7	02/07/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Thomas R Priebe

Reviewed by:

Authorized by:

R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 32180

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-186L-3 NLS#: 126407
Ref. Line 2 of COC 24605 Description: FMC-186L-3
Collected: 02/04/97 Received: 02/05/97 Reported: 02/10/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	ND	mg/L	2.0	2.0	EPA 305.1	02/10/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	02/07/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/07/97	721026460
Cadmium, dis. as Cd by ICP	7.9	ug/L	1.2	3.8	EPA 200.7	02/07/97	721026460
Calcium, dis. as Ca by ICP	590	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Cobalt, dis. as Co by ICP	90	ug/L	4.3	15	EPA 200.7	02/07/97	721026460
Copper, dis. as Cu by ICP	1800	ug/L	5.4	19	EPA 200.7	02/07/97	721026460
Iron, dis. as Fe by ICP	ND	mg/L	0.010	0.035	EPA 200.7	02/07/97	721026460
Magnesium, dis. as Mg by ICP	12	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Manganese, dis. as Mn by ICP	450	ug/L	1.8	6.1	EPA 200.7	02/07/97	721026460
pH, lab	6.5	s.u.	1.0		EPA 150.1	02/05/97	721026460
Potassium, dis. as K	9.4	mg/L	2.0	6.6	EPA 200.7	02/10/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	02/07/97	721026460
Sodium, dis. as Na by ICP	1.5	mg/L	0.033	0.11	EPA 200.7	02/07/97	721026460
Sulfate, as SO4 (filtered)	600	mg/L	250	250	EPA 375.2	02/06/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	02/09/97	721026460
Zinc, dis. as Zn by ICP	880	ug/L	120	120	EPA 200.7	02/07/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Thomas R Priebe
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-170LS-3 NLS#: 126408
Ref. Line 3 of COC 24605 Description: FMC-170LS-3
Collected: 02/04/97 Received: 02/05/97 Reported: 02/10/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	ND	mg/L	2.0	2.0	EPA 305.1	02/10/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	02/07/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/07/97	721026460
Cadmium, dis. as Cd by ICP	45	ug/L	1.2	3.8	EPA 200.7	02/07/97	721026460
Calcium, dis. as Ca by ICP	460	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Cobalt, dis. as Co by ICP	240	ug/L	4.3	15	EPA 200.7	02/07/97	721026460
Copper, dis. as Cu by ICP	18000	ug/L	5.4	19	EPA 200.7	02/07/97	721026460
Iron, dis. as Fe by ICP	0.067	mg/L	0.010	0.035	EPA 200.7	02/07/97	721026460
Magnesium, dis. as Mg by ICP	9.5	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Manganese, dis. as Mn by ICP	1500	ug/L	1.8	6.1	EPA 200.7	02/07/97	721026460
pH, lab	6.0	s.u.	1.0		EPA 150.1	02/05/97	721026460
Potassium, dis. as K	< 3.5 >	mg/L	2.0	6.6	EPA 200.7	02/10/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	02/07/97	721026460
Sodium, dis. as Na by ICP	0.47	mg/L	0.033	0.11	EPA 200.7	02/07/97	721026460
Sulfate, as SO4 (filtered)	660	mg/L	250	250	EPA 375.2	02/06/97	721026460
Thallium, dis. as Tl by furnace AAS	< 35 >	ug/L	25	87	EPA 279.2	02/09/97	721026460
Zinc, dis. as Zn by ICP	2200	ug/L	120	120	EPA 200.7	02/07/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Thomas R. Priebe
Reviewed by:

Authorized by:
R. T. Krueger
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 32180

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-13-ILS-3 NLS#: 126409
Ref. Line 4 of COC 24605 Description: FMC-13-ILS-3
Collected: 02/04/97 Received: 02/05/97 Reported: 02/10/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	40	mg/L	2.0	2.0	EPA 305.1	02/10/97	721026460
Aluminum, dis. as Al by ICP	< 0.075 >	mg/L	0.034	0.12	EPA 200.7	02/07/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/07/97	721026460
Cadmium, dis. as Cd by ICP	8.2	ug/L	1.2	3.8	EPA 200.7	02/07/97	721026460
Calcium, dis. as Ca by ICP	570	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Cobalt, dis. as Co by ICP	580	ug/L	4.3	15	EPA 200.7	02/07/97	721026460
Copper, dis. as Cu by ICP	7900	ug/L	5.4	19	EPA 200.7	02/07/97	721026460
Iron, dis. as Fe by ICP	0.098	mg/L	0.010	0.035	EPA 200.7	02/07/97	721026460
Magnesium, dis. as Mg by ICP	19	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Manganese, dis. as Mn by ICP	2800	ug/L	1.8	6.1	EPA 200.7	02/07/97	721026460
pH, lab	5.7	s.u.	1.0		EPA 150.1	02/05/97	721026460
Potassium, dis. as K	< 2.5 >	mg/L	2.0	6.6	EPA 200.7	02/10/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	02/07/97	721026460
Sodium, dis. as Na by ICP	1.2	mg/L	0.033	0.11	EPA 200.7	02/07/97	721026460
Sulfate, as SO4 (filtered)	700	mg/L	250	250	EPA 375.2	02/06/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	02/09/97	721026460
Zinc, dis. as Zn by ICP	1500	ug/L	120	120	EPA 200.7	02/07/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Thomas R Priebe
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-188LS-3 NLS#: 126410
Ref. Line 5 of COC 24605 Description: FMC-188LS-3
Collected: 02/04/97 Received: 02/05/97 Reported: 02/10/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	32	mg/L	2.0	2.0	EPA 305.1	02/10/97	721026460
Aluminum, dis. as Al by ICP	< 0.072 >	mg/L	0.034	0.12	EPA 200.7	02/07/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/07/97	721026460
Cadmium, dis. as Cd by ICP	190	ug/L	1.2	3.8	EPA 200.7	02/07/97	721026460
Calcium, dis. as Ca by ICP	480	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Cobalt, dis. as Co by ICP	760	ug/L	4.3	15	EPA 200.7	02/07/97	721026460
Copper, dis. as Cu by ICP	35000	ug/L	5.4	19	EPA 200.7	02/07/97	721026460
Iron, dis. as Fe by ICP	0.073	mg/L	0.010	0.035	EPA 200.7	02/07/97	721026460
Magnesium, dis. as Mg by ICP	13	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Manganese, dis. as Mn by ICP	1900	ug/L	1.8	6.1	EPA 200.7	02/07/97	721026460
pH, lab	5.4	s.u.	1.0		EPA 150.1	02/05/97	721026460
Potassium, dis. as K	< 5.5 >	mg/L	2.0	6.6	EPA 200.7	02/10/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	02/07/97	721026460
Sodium, dis. as Na by ICP	0.73	mg/L	0.033	0.11	EPA 200.7	02/07/97	721026460
Sulfate, as SO4 (filtered)	610	mg/L	250	250	EPA 375.2	02/06/97	721026460
Thallium, dis. as Tl by furnace AAS	< 26 >	ug/L	25	87	EPA 279.2	02/09/97	721026460
Zinc, dis. as Zn by ICP	10000	ug/L	120	120	EPA 200.7	02/07/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Thomas R Priebe
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

PAGE: 6   NLS PROJECT# 32180

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-183LS-3   NLS#: 126411
Ref. Line 6 of COC 24605 Description: FMC-183LS-3
Collected: 02/04/97 Received: 02/05/97 Reported: 02/10/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	190	mg/L	2.0	2.0	EPA 305.1	02/10/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	02/07/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/07/97	721026460
Cadmium, dis. as Cd by ICP	32	ug/L	1.2	3.8	EPA 200.7	02/07/97	721026460
Calcium, dis. as Ca by ICP	510	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Cobalt, dis. as Co by ICP	480	ug/L	4.3	15	EPA 200.7	02/07/97	721026460
Copper, dis. as Cu by ICP	140000	ug/L	54	190	EPA 200.7	02/07/97	721026460
Iron, dis. as Fe by ICP	0.11	mg/L	0.010	0.035	EPA 200.7	02/07/97	721026460
Magnesium, dis. as Mg by ICP	17	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Manganese, dis. as Mn by ICP	1900	ug/L	1.8	6.1	EPA 200.7	02/07/97	721026460
pH, lab	5.0	s.u.	1.0		EPA 150.1	02/05/97	721026460
Potassium, dis. as K	< 4.5 >	mg/L	2.0	6.6	EPA 200.7	02/10/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	02/07/97	721026460
Sodium, dis. as Na by ICP	0.67	mg/L	0.033	0.11	EPA 200.7	02/07/97	721026460
Sulfate, as SO4 (filtered)	700	mg/L	250	250	EPA 375.2	02/06/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	02/09/97	721026460
Zinc, dis. as Zn by ICP	3400	ug/L	120	120	EPA 200.7	02/07/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection   LOQ = Limit of Quantitation   ND = Not Detected
DWB = Dry Weight Basis   NA = Not Applicable   %DWB = (mg/kg DWB)/10000

Thomas R Priebe
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-213LS-3 NLS#: 126412
Ref. Line 7 of COC 24605 Description: FMC-213LS-3
Collected: 02/04/97 Received: 02/05/97 Reported: 02/10/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	ND	mg/L	2.0	2.0	EPA 305.1	02/10/97	721026460
Aluminum, dis. as Al by ICP	< 0.065 >	mg/L	0.034	0.12	EPA 200.7	02/07/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/07/97	721026460
Cadmium, dis. as Cd by ICP	4.7	ug/L	1.2	3.8	EPA 200.7	02/07/97	721026460
Calcium, dis. as Ca by ICP	130	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Cobalt, dis. as Co by ICP	37	ug/L	4.3	15	EPA 200.7	02/07/97	721026460
Copper, dis. as Cu by ICP	490	ug/L	5.4	19	EPA 200.7	02/07/97	721026460
Iron, dis. as Fe by ICP	ND	mg/L	0.010	0.035	EPA 200.7	02/07/97	721026460
Magnesium, dis. as Mg by ICP	ND	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Manganese, dis. as Mn by ICP	140	ug/L	1.8	6.1	EPA 200.7	02/07/97	721026460
pH, lab	5.6	s.u.	1.0		EPA 150.1	02/05/97	721026460
Potassium, dis. as K	ND	mg/L	2.0	6.6	EPA 200.7	02/10/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	02/07/97	721026460
Sodium, dis. as Na by ICP	< 0.10 >	mg/L	0.033	0.11	EPA 200.7	02/07/97	721026460
Sulfate, as SO4 (filtered)	520	mg/L	250	250	EPA 375.2	02/06/97	721026460
Thallium, dis. as Tl by furnace AAS	< 25 >	ug/L	25	87	EPA 279.2	02/09/97	721026460
Zinc, dis. as Zn by ICP	280	ug/L	120	120	EPA 200.7	02/07/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Thomas R Priebe
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-187LS-3 NLS#: 126413
Ref. Line 8 of COC 24605 Description: FMC-187LS-3
Collected: 02/04/97 Received: 02/05/97 Reported: 02/10/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	ND	mg/L	2.0	2.0	EPA 305.1	02/10/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	02/07/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/07/97	721026460
Cadmium, dis. as Cd by ICP	13	ug/L	1.2	3.8	EPA 200.7	02/07/97	721026460
Calcium, dis. as Ca by ICP	520	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Cobalt, dis. as Co by ICP	310	ug/L	4.3	15	EPA 200.7	02/07/97	721026460
Copper, dis. as Cu by ICP	21000	ug/L	5.4	19	EPA 200.7	02/07/97	721026460
Iron, dis. as Fe by ICP	< 0.029 >	mg/L	0.010	0.035	EPA 200.7	02/07/97	721026460
Magnesium, dis. as Mg by ICP	10	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Manganese, dis. as Mn by ICP	1300	ug/L	1.8	6.1	EPA 200.7	02/07/97	721026460
pH, lab	5.5	s.u.	1.0		EPA 150.1	02/05/97	721026460
Potassium, dis. as K	< 6.6 >	mg/L	2.0	6.6	EPA 200.7	02/10/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	02/07/97	721026460
Sodium, dis. as Na by ICP	0.49	mg/L	0.033	0.11	EPA 200.7	02/07/97	721026460
Sulfate, as SO4 (filtered)	580	mg/L	250	250	EPA 375.2	02/06/97	721026460
Thallium, dis. as Tl by furnace AAS	< 32 >	ug/L	25	87	EPA 279.2	02/09/97	721026460
Zinc, dis. as Zn by ICP	1400	ug/L	120	120	EPA 200.7	02/07/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Thomas R Prieb

Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-194LS-3 NLS#: 126414
Ref. Line 9 of COC 24605 Description: FMC-194LS-3
Collected: 02/04/97 Received: 02/05/97 Reported: 02/10/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	ND	mg/L	2.0	2.0	EPA 305.1	02/10/97	721026460
Aluminum, dis. as Al by ICP	< 0.050 >	mg/L	0.034	0.12	EPA 200.7	02/07/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/07/97	721026460
Cadmium, dis. as Cd by ICP	9.1	ug/L	1.2	3.8	EPA 200.7	02/07/97	721026460
Calcium, dis. as Ca by ICP	530	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Cobalt, dis. as Co by ICP	160	ug/L	4.3	15	EPA 200.7	02/07/97	721026460
Copper, dis. as Cu by ICP	670	ug/L	5.4	19	EPA 200.7	02/07/97	721026460
Iron, dis. as Fe by ICP	ND	mg/L	0.010	0.035	EPA 200.7	02/07/97	721026460
Magnesium, dis. as Mg by ICP	11	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Manganese, dis. as Mn by ICP	1300	ug/L	1.8	6.1	EPA 200.7	02/07/97	721026460
pH, lab	6.0	s.u.	1.0		EPA 150.1	02/05/97	721026460
Potassium, dis. as K	< 2.9 >	mg/L	2.0	6.6	EPA 200.7	02/10/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	02/08/97	721026460
Sodium, dis. as Na by ICP	0.75	mg/L	0.033	0.11	EPA 200.7	02/07/97	721026460
Sulfate, as SO4 (filtered)	850	mg/L	250	250	EPA 375.2	02/06/97	721026460
Thallium, dis. as Tl by furnace AAS	< 26 >	ug/L	25	87	EPA 279.2	02/09/97	721026460
Zinc, dis. as Zn by ICP	370	ug/L	120	120	EPA 200.7	02/07/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Thomas R Priebe
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-192LS-3 NLS#: 126415
Ref. Line 10 of COC 24605 Description: FMC-192LS-3
Collected: 02/04/97 Received: 02/05/97 Reported: 02/10/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	ND	mg/L	2.0	2.0	EPA 305.1	02/10/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	02/07/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/07/97	721026460
Cadmium, dis. as Cd by ICP	< 3.7 >	ug/L	1.2	3.8	EPA 200.7	02/07/97	721026460
Calcium, dis. as Ca by ICP	94	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Cobalt, dis. as Co by ICP	190	ug/L	4.3	15	EPA 200.7	02/07/97	721026460
Copper, dis. as Cu by ICP	13000	ug/L	5.4	19	EPA 200.7	02/07/97	721026460
Iron, dis. as Fe by ICP	ND	mg/L	0.010	0.035	EPA 200.7	02/07/97	721026460
Magnesium, dis. as Mg by ICP	12	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Manganese, dis. as Mn by ICP	1400	ug/L	1.8	6.1	EPA 200.7	02/07/97	721026460
pH, lab	6.0	s.u.	1.0		EPA 150.1	02/05/97	721026460
Potassium, dis. as K	< 3.6 >	mg/L	2.0	6.6	EPA 200.7	02/10/97	721026460
Selenium, dis. as Se by furnace	< 60 >	ug/L	37	130	EPA 270.2	02/08/97	721026460
Sodium, dis. as Na by ICP	0.54	mg/L	0.033	0.11	EPA 200.7	02/07/97	721026460
Sulfate, as SO4 (filtered)	510	mg/L	250	250	EPA 375.2	02/06/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	02/09/97	721026460
Zinc, dis. as Zn by ICP	690	ug/L	120	120	EPA 200.7	02/07/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Thomas K Priebe

Reviewed by: Authorized by:

R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 32180

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-8-ILS-3 NLS#: 126416
Ref. Line 11 of COC 24605 Description: FMC-8-ILS-3
Collected: 02/04/97 Received: 02/05/97 Reported: 02/10/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	ND	mg/L	2.0	2.0	EPA 305.1	02/10/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	02/07/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/07/97	721026460
Cadmium, dis. as Cd by ICP	4.4	ug/L	1.2	3.8	EPA 200.7	02/07/97	721026460
Calcium, dis. as Ca by ICP	600	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Cobalt, dis. as Co by ICP	18	ug/L	4.3	15	EPA 200.7	02/07/97	721026460
Copper, dis. as Cu by ICP	160	ug/L	5.4	19	EPA 200.7	02/07/97	721026460
Iron, dis. as Fe by ICP	ND	mg/L	0.010	0.035	EPA 200.7	02/07/97	721026460
Magnesium, dis. as Mg by ICP	8.8	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Manganese, dis. as Mn by ICP	180	ug/L	1.8	6.1	EPA 200.7	02/07/97	721026460
pH, lab	5.9	s.u.	1.0		EPA 150.1	02/05/97	721026460
Potassium, dis. as K	< 6.0 >	mg/L	2.0	6.6	EPA 200.7	02/10/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	02/08/97	721026460
Sodium, dis. as Na by ICP	0.89	mg/L	0.033	0.11	EPA 200.7	02/07/97	721026460
Sulfate, as SO4 (filtered)	560	mg/L	250	250	EPA 375.2	02/06/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	02/09/97	721026460
Zinc, dis. as Zn by ICP	ND	ug/L	120	120	EPA 200.7	02/07/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Thomas L Priebe

Reviewed by:

Authorized by:

R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-190LS-3 NLS#: 126417
Ref. Line 12 of COC 24605 Description: FMC-190LS-3
Collected: 02/04/97 Received: 02/05/97 Reported: 02/10/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	ND	mg/L	2.0	2.0	EPA 305.1	02/10/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	02/07/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/07/97	721026460
Cadmium, dis. as Cd by ICP	45	ug/L	1.2	3.8	EPA 200.7	02/07/97	721026460
Calcium, dis. as Ca by ICP	310	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Cobalt, dis. as Co by ICP	940	ug/L	4.3	15	EPA 200.7	02/07/97	721026460
Copper, dis. as Cu by ICP	110000	ug/L	54	190	EPA 200.7	02/07/97	721026460
Iron, dis. as Fe by ICP	0.23	mg/L	0.010	0.035	EPA 200.7	02/07/97	721026460
Magnesium, dis. as Mg by ICP	21	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Manganese, dis. as Mn by ICP	3100	ug/L	1.8	6.1	EPA 200.7	02/07/97	721026460
pH, lab	6.1	s.u.	1.0		EPA 150.1	02/05/97	721026460
Potassium, dis. as K	6.8	mg/L	2.0	6.6	EPA 200.7	02/10/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	02/08/97	721026460
Sodium, dis. as Na by ICP	0.79	mg/L	0.033	0.11	EPA 200.7	02/07/97	721026460
Sulfate, as SO4 (filtered)	560	mg/L	250	250	EPA 375.2	02/06/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	02/09/97	721026460
Zinc, dis. as Zn by ICP	5900	ug/L	120	120	EPA 200.7	02/07/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Thomas R Priebe
Reviewed by:

Authorized by:

R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 32180

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-172LS-3 NLS#: 126418
Ref. Line 1 of COC 24606 Description: FMC-172LS-3
Collected: 02/04/97 Received: 02/05/97 Reported: 02/10/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	ND	mg/L	2.0	2.0	EPA 305.1	02/10/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	02/07/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/07/97	721026460
Cadmium, dis. as Cd by ICP	13	ug/L	1.2	3.8	EPA 200.7	02/07/97	721026460
Calcium, dis. as Ca by ICP	520	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Cobalt, dis. as Co by ICP	270	ug/L	4.3	15	EPA 200.7	02/07/97	721026460
Copper, dis. as Cu by ICP	18000	ug/L	5.4	19	EPA 200.7	02/07/97	721026460
Iron, dis. as Fe by ICP	ND	mg/L	0.010	0.035	EPA 200.7	02/07/97	721026460
Magnesium, dis. as Mg by ICP	9.9	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Manganese, dis. as Mn by ICP	810	ug/L	1.8	6.1	EPA 200.7	02/07/97	721026460
pH, lab	5.3	s.u.	1.0		EPA 150.1	02/05/97	721026460
Potassium, dis. as K	< 3.9 >	mg/L	2.0	6.6	EPA 200.7	02/10/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	02/08/97	721026460
Sodium, dis. as Na by ICP	0.48	mg/L	0.033	0.11	EPA 200.7	02/07/97	721026460
Sulfate, as SO4 (filtered)	660	mg/L	250	250	EPA 375.2	02/06/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	02/09/97	721026460
Zinc, dis. as Zn by ICP	1500	ug/L	120	120	EPA 200.7	02/07/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Thomas R Riele

Reviewed by:

Authorized by:

R. T. Krueger
Laboratory Manager

NORTHERN LAKE SERVICE, INC.
Analytical Laboratory and Environmental Services
400 North Lake Avenue - Crandon, WI 54520
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 32180

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-176LS-3 NLS#: 126419
Ref. Line 2 of COC 24606 Description: FMC-176LS-3
Collected: 02/04/97 Received: 02/05/97 Reported: 02/10/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	ND	mg/L	2.0	2.0	EPA 305.1	02/10/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	02/07/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/07/97	721026460
Cadmium, dis. as Cd by ICP	31	ug/L	1.2	3.8	EPA 200.7	02/07/97	721026460
Calcium, dis. as Ca by ICP	590	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Cobalt, dis. as Co by ICP	460	ug/L	4.3	15	EPA 200.7	02/07/97	721026460
Copper, dis. as Cu by ICP	10000	ug/L	5.4	19	EPA 200.7	02/07/97	721026460
Iron, dis. as Fe by ICP	ND	mg/L	0.010	0.035	EPA 200.7	02/07/97	721026460
Magnesium, dis. as Mg by ICP	7.2	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Manganese, dis. as Mn by ICP	700	ug/L	1.8	6.1	EPA 200.7	02/07/97	721026460
pH, lab	5.7	s.u.	1.0		EPA 150.1	02/05/97	721026460
Potassium, dis. as K	< 3.4 >	mg/L	2.0	6.6	EPA 200.7	02/10/97	721026460
Selenium, dis. as Se by furnace	< 51 >	ug/L	37	130	EPA 270.2	02/08/97	721026460
Sodium, dis. as Na by ICP	0.75	mg/L	0.033	0.11	EPA 200.7	02/07/97	721026460
Sulfate, as SO4 (filtered)	680	mg/L	250	250	EPA 375.2	02/06/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	02/09/97	721026460
Zinc, dis. as Zn by ICP	2600	ug/L	120	120	EPA 200.7	02/07/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
LOQ = Limit of Quantitation
ND = Not Detected
DWB = Dry Weight Basis
NA = Not Applicable
%DWB = (mg/kg DWB)/10000

Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 32180

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-BF4-3 NLS#: 126420
Ref. Line 3 of COC 24606 Description: FMC-BF4-3
Collected: 02/04/97 Received: 02/05/97 Reported: 02/10/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	ND	mg/L	2.0	2.0	EPA 305.1	02/10/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	02/07/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/07/97	721026460
Cadmium, dis. as Cd by ICP	14	ug/L	1.2	3.8	EPA 200.7	02/07/97	721026460
Calcium, dis. as Ca by ICP	140	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Cobalt, dis. as Co by ICP	180	ug/L	4.3	15	EPA 200.7	02/07/97	721026460
Copper, dis. as Cu by ICP	110	ug/L	5.4	19	EPA 200.7	02/07/97	721026460
Iron, dis. as Fe by ICP	ND	mg/L	0.010	0.035	EPA 200.7	02/07/97	721026460
Magnesium, dis. as Mg by ICP	18	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Manganese, dis. as Mn by ICP	3600	ug/L	1.8	6.1	EPA 200.7	02/07/97	721026460
pH, lab	6.2	s.u.	1.0		EPA 150.1	02/05/97	721026460
Potassium, dis. as K	< 3.7 >	mg/L	2.0	6.6	EPA 200.7	02/10/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	02/08/97	721026460
Sodium, dis. as Na by ICP	1.0	mg/L	0.033	0.11	EPA 200.7	02/07/97	721026460
Sulfate, as SO4 (filtered)	540	mg/L	250	250	EPA 375.2	02/06/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	02/09/97	721026460
Zinc, dis. as Zn by ICP	930	ug/L	120	120	EPA 200.7	02/07/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Thomas R Priebe
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-BF5-3 NLS#: 126421
Ref. Line 4 of COC 24606 Description: FMC-BF5-3
Collected: 02/04/97 Received: 02/05/97 Reported: 02/10/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	ND	mg/L	2.0	2.0	EPA 305.1	02/10/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	02/07/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/07/97	721026460
Cadmium, dis. as Cd by ICP	9.6	ug/L	1.2	3.8	EPA 200.7	02/07/97	721026460
Calcium, dis. as Ca by ICP	230	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Cobalt, dis. as Co by ICP	170	ug/L	4.3	15	EPA 200.7	02/07/97	721026460
Copper, dis. as Cu by ICP	120	ug/L	5.4	19	EPA 200.7	02/07/97	721026460
Iron, dis. as Fe by ICP	ND	mg/L	0.010	0.035	EPA 200.7	02/07/97	721026460
Magnesium, dis. as Mg by ICP	16	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Manganese, dis. as Mn by ICP	4500	ug/L	1.8	6.1	EPA 200.7	02/07/97	721026460
pH, lab	6.3	s.u.	1.0		EPA 150.1	02/05/97	721026460
Potassium, dis. as K	< 4.5 >	mg/L	2.0	6.6	EPA 200.7	02/10/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	02/08/97	721026460
Sodium, dis. as Na by ICP	0.61	mg/L	0.033	0.11	EPA 200.7	02/07/97	721026460
Sulfate, as SO4 (filtered)	590	mg/L	250	250	EPA 375.2	02/06/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	02/09/97	721026460
Zinc, dis. as Zn by ICP	440	ug/L	120	120	EPA 200.7	02/07/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Thomas R Priebe
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 32180

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-CUF1-3 NLS#: 126422
Ref. Line 5 of COC 24606 Description: FMC-CUF1-3
Collected: 02/04/97 Received: 02/05/97 Reported: 02/10/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	20	mg/L	1.5	5.3	EPA 310.1	02/06/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	02/07/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/07/97	721026460
Cadmium, dis. as Cd by ICP	< 2.7 >	ug/L	1.2	3.8	EPA 200.7	02/07/97	721026460
Calcium, dis. as Ca by ICP	110	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Cobalt, dis. as Co by ICP	< 9.7 >	ug/L	4.3	15	EPA 200.7	02/07/97	721026460
Copper, dis. as Cu by ICP	93	ug/L	5.4	19	EPA 200.7	02/07/97	721026460
Iron, dis. as Fe by ICP	0.053	mg/L	0.010	0.035	EPA 200.7	02/07/97	721026460
Magnesium, dis. as Mg by ICP	63	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Manganese, dis. as Mn by ICP	380	ug/L	1.8	6.1	EPA 200.7	02/07/97	721026460
pH, lab	6.9	s.u.	1.0		EPA 150.1	02/05/97	721026460
Potassium, dis. as K	< 3.9 >	mg/L	2.0	6.6	EPA 200.7	02/10/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	02/08/97	721026460
Sodium, dis. as Na by ICP	3.6	mg/L	0.033	0.11	EPA 200.7	02/07/97	721026460
Sulfate, as SO4 (filtered)	560	mg/L	250	250	EPA 375.2	02/06/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	02/09/97	721026460
Zinc, dis. as Zn by ICP	ND	ug/L	120	120	EPA 200.7	02/07/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

18

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

PAGE: 18 NLS PROJECT# 32180

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-CUF2-3 NLS#: 126423
Ref. Line 6 of COC 24606 Description: FMC-CUF2-3
Collected: 02/04/97 Received: 02/05/97 Reported: 02/10/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	90	mg/L	1.5	5.3	EPA 310.1	02/06/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	02/07/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/07/97	721026460
Cadmium, dis. as Cd by ICP	ND	ug/L	1.2	3.8	EPA 200.7	02/07/97	721026460
Calcium, dis. as Ca by ICP	53	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Cobalt, dis. as Co by ICP	ND	ug/L	4.3	15	EPA 200.7	02/07/97	721026460
Copper, dis. as Cu by ICP	36	ug/L	5.4	19	EPA 200.7	02/07/97	721026460
Iron, dis. as Fe by ICP	< 0.025 >	mg/L	0.010	0.035	EPA 200.7	02/07/97	721026460
Magnesium, dis. as Mg by ICP	32	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Manganese, dis. as Mn by ICP	33	ug/L	1.8	6.1	EPA 200.7	02/07/97	721026460
pH, lab	7.4	s.u.	1.0		EPA 150.1	02/05/97	721026460
Potassium, dis. as K	< 2.8 >	mg/L	2.0	6.6	EPA 200.7	02/10/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	02/08/97	721026460
Sodium, dis. as Na by ICP	2.5	mg/L	0.033	0.11	EPA 200.7	02/07/97	721026460
Sulfate, as SO4 (filtered)	160	mg/L	25	25	EPA 375.2	02/06/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	02/09/97	721026460
Zinc, dis. as Zn by ICP	ND	ug/L	120	120	EPA 200.7	02/07/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Thomas R Priebe
Reviewed by:

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R. T. Krueger
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 32180

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-15-3L-3 NLS#: 126424
Ref. Line 7 of COC 24606 Description: FMC-15-3L-3
Collected: 02/04/97 Received: 02/05/97 Reported: 02/10/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	ND	mg/L	2.0	2.0	EPA 305.1	02/10/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	02/07/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/07/97	721026460
Cadmium, dis. as Cd by ICP	7.1	ug/L	1.2	3.8	EPA 200.7	02/07/97	721026460
Calcium, dis. as Ca by ICP	480	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Cobalt, dis. as Co by ICP	230	ug/L	4.3	15	EPA 200.7	02/07/97	721026460
Copper, dis. as Cu by ICP	10000	ug/L	5.4	19	EPA 200.7	02/07/97	721026460
Iron, dis. as Fe by ICP	< 0.020 >	mg/L	0.010	0.035	EPA 200.7	02/07/97	721026460
Magnesium, dis. as Mg by ICP	27	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Manganese, dis. as Mn by ICP	1400	ug/L	1.8	6.1	EPA 200.7	02/07/97	721026460
pH, lab	6.2	s.u.	1.0		EPA 150.1	02/05/97	721026460
Potassium, dis. as K	14	mg/L	2.0	6.6	EPA 200.7	02/10/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	02/08/97	721026460
Sodium, dis. as Na by ICP	1.3	mg/L	0.033	0.11	EPA 200.7	02/07/97	721026460
Sulfate, as SO4 (filtered)	560	mg/L	250	250	EPA 375.2	02/06/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	02/09/97	721026460
Zinc, dis. as Zn by ICP	1500	ug/L	120	120	EPA 200.7	02/07/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Thomas R Priebe
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 32180

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-180L-3 NLS#: 126425
Ref. Line 8 of COC 24606 Description: FMC-180L-3
Collected: 02/04/97 Received: 02/05/97 Reported: 02/10/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	ND	mg/L	2.0	2.0	EPA 305.1	02/10/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	02/07/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/07/97	721026460
Cadmium, dis. as Cd by ICP	40	ug/L	1.2	3.8	EPA 200.7	02/07/97	721026460
Calcium, dis. as Ca by ICP	400	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Cobalt, dis. as Co by ICP	410	ug/L	4.3	15	EPA 200.7	02/07/97	721026460
Copper, dis. as Cu by ICP	3700	ug/L	5.4	19	EPA 200.7	02/07/97	721026460
Iron, dis. as Fe by ICP	ND	mg/L	0.010	0.035	EPA 200.7	02/07/97	721026460
Magnesium, dis. as Mg by ICP	31	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Manganese, dis. as Mn by ICP	5700	ug/L	1.8	6.1	EPA 200.7	02/07/97	721026460
pH, lab	6.2	s.u.	1.0		EPA 150.1	02/05/97	721026460
Potassium, dis. as K	< 4.8 >	mg/L	2.0	6.6	EPA 200.7	02/10/97	721026460
Selenium, dis. as Se by furnace	< 70 >	ug/L	37	130	EPA 270.2	02/08/97	721026460
Sodium, dis. as Na by ICP	1.1	mg/L	0.033	0.11	EPA 200.7	02/07/97	721026460
Sulfate, as SO4 (filtered)	620	mg/L	250	250	EPA 375.2	02/06/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	02/09/97	721026460
Zinc, dis. as Zn by ICP	6400	ug/L	120	120	EPA 200.7	02/07/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Thomas R Priebe
Reviewed by:

Authorized by:
R. T. Krueger
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 32180

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-181L-3 NLS#: 126426
Ref. Line 9 of COC 24606 Description: FMC-181L-3
Collected: 02/04/97 Received: 02/05/97 Reported: 02/10/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	ND	mg/L	2.0	2.0	EPA 305.1	02/10/97	721026460
Aluminum, dis. as Al by ICP	0.17	mg/L	0.034	0.12	EPA 200.7	02/07/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/07/97	721026460
Cadmium, dis. as Cd by ICP	530	ug/L	1.2	3.8	EPA 200.7	02/07/97	721026460
Calcium, dis. as Ca by ICP	370	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Cobalt, dis. as Co by ICP	2700	ug/L	4.3	15	EPA 200.7	02/07/97	721026460
Copper, dis. as Cu by ICP	480000	ug/L	540	1900	EPA 200.7	02/10/97	721026460
Iron, dis. as Fe by ICP	2.5	mg/L	0.010	0.035	EPA 200.7	02/07/97	721026460
Magnesium, dis. as Mg by ICP	62	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Manganese, dis. as Mn by ICP	1100	ug/L	1.8	6.1	EPA 200.7	02/07/97	721026460
pH, lab	4.8	s.u.	1.0		EPA 150.1	02/05/97	721026460
Potassium, dis. as K	< 3.2 >	mg/L	2.0	6.6	EPA 200.7	02/10/97	721026460
Selenium, dis. as Se by furnace	< 47 >	ug/L	37	130	EPA 270.2	02/08/97	721026460
Sodium, dis. as Na by ICP	1.0	mg/L	0.033	0.11	EPA 200.7	02/07/97	721026460
Sulfate, as SO4 (filtered)	710	mg/L	250	250	EPA 375.2	02/06/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	02/09/97	721026460
Zinc, dis. as Zn by ICP	74000	ug/L	120	120	EPA 200.7	02/07/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Thomas K Priebe
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

NORTHERN LAKE SERVICE, INC.
Analytical Laboratory and Environmental Services
400 North Lake Avenue - Crandon, WI 54520
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-15-IL-3 NLS#: 126427
Ref. Line 10 of COC 24606 Description: FMC-15-IL-3
Collected: 02/04/97 Received: 02/05/97 Reported: 02/10/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	740	mg/L	2.0	2.0	EPA 305.1	02/10/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	02/07/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/07/97	721026460
Cadmium, dis. as Cd by ICP	< 2.1 >	ug/L	1.2	3.8	EPA 200.7	02/07/97	721026460
Calcium, dis. as Ca by ICP	550	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Cobalt, dis. as Co by ICP	35	ug/L	4.3	15	EPA 200.7	02/07/97	721026460
Copper, dis. as Cu by ICP	940	ug/L	5.4	19	EPA 200.7	02/07/97	721026460
Iron, dis. as Fe by ICP	0.049	mg/L	0.010	0.035	EPA 200.7	02/07/97	721026460
Magnesium, dis. as Mg by ICP	11	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Manganese, dis. as Mn by ICP	230	ug/L	1.8	6.1	EPA 200.7	02/07/97	721026460
pH, lab	5.8	s.u.	1.0		EPA 150.1	02/05/97	721026460
Potassium, dis. as K	33	mg/L	2.0	6.6	EPA 200.7	02/10/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	02/08/97	721026460
Sodium, dis. as Na by ICP	3.2	mg/L	0.033	0.11	EPA 200.7	02/07/97	721026460
Sulfate, as SO4 (filtered)	730	mg/L	250	250	EPA 375.2	02/06/97	721026460
Thallium, dis. as Tl by furnace AAS	< 25 >	ug/L	25	87	EPA 279.2	02/09/97	721026460
Zinc, dis. as Zn by ICP	160	ug/L	120	120	EPA 200.7	02/07/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Thomas R Priebe
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 32180

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-4-IL-3 NLS#: 126428
Ref. Line 11 of COC 24606 Description: FMC-4-IL-3
Collected: 02/04/97 Received: 02/05/97 Reported: 02/10/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	ND	mg/L	2.0	2.0	EPA 305.1	02/10/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	02/07/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/07/97	721026460
Cadmium, dis. as Cd by ICP	34	ug/L	1.2	3.8	EPA 200.7	02/07/97	721026460
Calcium, dis. as Ca by ICP	420	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Cobalt, dis. as Co by ICP	270	ug/L	4.3	15	EPA 200.7	02/07/97	721026460
Copper, dis. as Cu by ICP	8200	ug/L	5.4	19	EPA 200.7	02/07/97	721026460
Iron, dis. as Fe by ICP	ND	mg/L	0.010	0.035	EPA 200.7	02/07/97	721026460
Magnesium, dis. as Mg by ICP	33	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Manganese, dis. as Mn by ICP	2600	ug/L	1.8	6.1	EPA 200.7	02/07/97	721026460
pH, lab	6.2	s.u.	1.0		EPA 150.1	02/05/97	721026460
Potassium, dis. as K	14	mg/L	2.0	6.6	EPA 200.7	02/10/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	02/08/97	721026460
Sodium, dis. as Na by ICP	0.89	mg/L	0.033	0.11	EPA 200.7	02/07/97	721026460
Sulfate, as SO4 (filtered)	670	mg/L	250	250	EPA 375.2	02/06/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	02/09/97	721026460
Zinc, dis. as Zn by ICP	3600	ug/L	120	120	EPA 200.7	02/07/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Thomas R Priebe
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

PAGE: 24 NLS PROJECT# 32180

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-4-ILS-3 NLS#: 126429
Ref. Line 12 of COC 24606 Description: FMC-4-ILS-3
Collected: 02/04/97 Received: 02/05/97 Reported: 02/10/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	ND	mg/L	2.0	2.0	EPA 305.1	02/10/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	02/07/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/07/97	721026460
Cadmium, dis. as Cd by ICP	18	ug/L	1.2	3.8	EPA 200.7	02/07/97	721026460
Calcium, dis. as Ca by ICP	430	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Cobalt, dis. as Co by ICP	250	ug/L	4.3	15	EPA 200.7	02/07/97	721026460
Copper, dis. as Cu by ICP	740	ug/L	5.4	19	EPA 200.7	02/07/97	721026460
Iron, dis. as Fe by ICP	ND	mg/L	0.010	0.035	EPA 200.7	02/07/97	721026460
Magnesium, dis. as Mg by ICP	62	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Manganese, dis. as Mn by ICP	4200	ug/L	1.8	6.1	EPA 200.7	02/07/97	721026460
pH, lab	6.1	s.u.	1.0		EPA 150.1	02/05/97	721026460
Potassium, dis. as K	< 2.8 >	mg/L	2.0	6.6	EPA 200.7	02/10/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	02/08/97	721026460
Sodium, dis. as Na by ICP	0.84	mg/L	0.033	0.11	EPA 200.7	02/07/97	721026460
Sulfate, as SO4 (filtered)	580	mg/L	250	250	EPA 375.2	02/06/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	02/09/97	721026460
Zinc, dis. as Zn by ICP	1500	ug/L	120	120	EPA 200.7	02/07/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Thomas R Priebe
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-15-ILS-3 NLS#: 126430
Ref. Line 1 of COC 24607 Description: FMC-15-ILS-3
Collected: 02/04/97 Received: 02/05/97 Reported: 02/10/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	ND	mg/L	2.0	2.0	EPA 305.1	02/10/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	02/07/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/07/97	721026460
Cadmium, dis. as Cd by ICP	< 2.1 >	ug/L	1.2	3.8	EPA 200.7	02/07/97	721026460
Calcium, dis. as Ca by ICP	560	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Cobalt, dis. as Co by ICP	420	ug/L	4.3	15	EPA 200.7	02/07/97	721026460
Copper, dis. as Cu by ICP	190	ug/L	5.4	19	EPA 200.7	02/07/97	721026460
Iron, dis. as Fe by ICP	ND	mg/L	0.010	0.035	EPA 200.7	02/07/97	721026460
Magnesium, dis. as Mg by ICP	120	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Manganese, dis. as Mn by ICP	7100	ug/L	1.8	6.1	EPA 200.7	02/07/97	721026460
pH, lab	6.1	s.u.	1.0		EPA 150.1	02/05/97	721026460
Potassium, dis. as K	< 5.3 >	mg/L	2.0	6.6	EPA 200.7	02/10/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	02/08/97	721026460
Sodium, dis. as Na by ICP	2.8	mg/L	0.033	0.11	EPA 200.7	02/07/97	721026460
Sulfate, as SO4 (filtered)	680	mg/L	250	250	EPA 375.2	02/06/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	02/09/97	721026460
Zinc, dis. as Zn by ICP	170	ug/L	120	120	EPA 200.7	02/07/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Thomas R Priebe

Reviewed by:

Authorized by:

R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 32180

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-181LS-3 NLS#: 126431
Ref. Line 2 of COC 24607 Description: FMC-181LS-3
Collected: 02/04/97 Received: 02/05/97 Reported: 02/10/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	590	mg/L	2.0	2.0	EPA 305.1	02/10/97	721026460
Aluminum, dis. as Al by ICP	< 0.080 >	mg/L	0.034	0.12	EPA 200.7	02/07/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/07/97	721026460
Cadmium, dis. as Cd by ICP	580	ug/L	1.2	3.8	EPA 200.7	02/07/97	721026460
Calcium, dis. as Ca by ICP	450	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Cobalt, dis. as Co by ICP	3200	ug/L	4.3	15	EPA 200.7	02/07/97	721026460
Copper, dis. as Cu by ICP	460000	ug/L	540	1900	EPA 200.7	02/10/97	721026460
Iron, dis. as Fe by ICP	1.1	mg/L	0.010	0.035	EPA 200.7	02/07/97	721026460
Magnesium, dis. as Mg by ICP	68	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Manganese, dis. as Mn by ICP	11000	ug/L	1.8	6.1	EPA 200.7	02/07/97	721026460
pH, lab	4.9	s.u.	1.0		EPA 150.1	02/05/97	721026460
Potassium, dis. as K	< 2.9 >	mg/L	2.0	6.6	EPA 200.7	02/10/97	721026460
Selenium, dis. as Se by furnace	< 39 >	ug/L	37	130	EPA 270.2	02/08/97	721026460
Sodium, dis. as Na by ICP	1.3	mg/L	0.033	0.11	EPA 200.7	02/07/97	721026460
Sulfate, as SO4 (filtered)	830	mg/L	250	250	EPA 375.2	02/06/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	02/09/97	721026460
Zinc, dis. as Zn by ICP	80000	ug/L	120	120	EPA 200.7	02/07/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Thomas R Priebe
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 32180

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-180LS-3 NLS#: 126432
Ref. Line 3 of COC 24607 Description: FMC-180LS-3
Collected: 02/04/97 Received: 02/05/97 Reported: 02/10/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	70	mg/L	1.5	5.3	EPA 310.1	02/06/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	02/07/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/07/97	721026460
Cadmium, dis. as Cd by ICP	82	ug/L	1.2	3.8	EPA 200.7	02/07/97	721026460
Calcium, dis. as Ca by ICP	450	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Cobalt, dis. as Co by ICP	1300	ug/L	4.3	15	EPA 200.7	02/07/97	721026460
Copper, dis. as Cu by ICP	1700	ug/L	5.4	19	EPA 200.7	02/07/97	721026460
Iron, dis. as Fe by ICP	ND	mg/L	0.010	0.035	EPA 200.7	02/07/97	721026460
Magnesium, dis. as Mg by ICP	79	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Manganese, dis. as Mn by ICP	17000	ug/L	1.8	6.1	EPA 200.7	02/07/97	721026460
pH, lab	6.7	s.u.	1.0		EPA 150.1	02/05/97	721026460
Potassium, dis. as K	7.5	mg/L	2.0	6.6	EPA 200.7	02/10/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	02/08/97	721026460
Sodium, dis. as Na by ICP	3.8	mg/L	0.033	0.11	EPA 200.7	02/07/97	721026460
Sulfate, as SO4 (filtered)	770	mg/L	250	250	EPA 375.2	02/06/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	02/09/97	721026460
Zinc, dis. as Zn by ICP	12000	ug/L	120	120	EPA 200.7	02/07/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Thomas R Priebe
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 32180

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-15-3LS-3 NLS#: 126433
Ref. Line 4 of COC 24607 Description: FMC-15-3LS-3
Collected: 02/04/97 Received: 02/05/97 Reported: 02/10/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	29	mg/L	1.5	5.3	EPA 310.1	02/06/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	02/07/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/07/97	721026460
Cadmium, dis. as Cd by ICP	< 1.4 >	ug/L	1.2	3.8	EPA 200.7	02/07/97	721026460
Calcium, dis. as Ca by ICP	460	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Cobalt, dis. as Co by ICP	92	ug/L	4.3	15	EPA 200.7	02/07/97	721026460
Copper, dis. as Cu by ICP	570	ug/L	5.4	19	EPA 200.7	02/07/97	721026460
Iron, dis. as Fe by ICP	0.11	mg/L	0.010	0.035	EPA 200.7	02/07/97	721026460
Magnesium, dis. as Mg by ICP	21	mg/L	3.0	3.0	EPA 200.7	02/07/97	721026460
Manganese, dis. as Mn by ICP	1400	ug/L	1.8	6.1	EPA 200.7	02/07/97	721026460
pH, lab	6.8	s.u.	1.0		EPA 150.1	02/05/97	721026460
Potassium, dis. as K	7.1	mg/L	2.0	6.6	EPA 200.7	02/10/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	02/08/97	721026460
Sodium, dis. as Na by ICP	0.91	mg/L	0.033	0.11	EPA 200.7	02/07/97	721026460
Sulfate, as SO4 (filtered)	630	mg/L	250	250	EPA 375.2	02/06/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	02/09/97	721026460
Zinc, dis. as Zn by ICP	150	ug/L	120	120	EPA 200.7	02/07/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation".
Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Thomas R Priebe
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

Appendix H

Clarifier Underflow (CUF) Solids Anoxic Extraction Test Results

Memorandum

December 30, 1996

TO: Jerry Sevick, Foth & Van Dyke

CC: Jana Murphy, Flambeau Mining Company
John Chapman, SRK
Russ Janeshek

FR: John Thresher JET mldr

RE: Flambeau Project

Attached is a copy of my final report on the lab results for the clarifier underflow anoxic extraction tests.

Flambeau Mining Company

Clarifier Underflow (CUF) Anoxic Extractions

1.0 Introduction.

Two clarifier underflow (CUF) samples were collected for anoxic extraction analysis. Sample CUF1 consisted of a dark green, clay-sized precipitate which contained a few thin layers of dark reddish brown, clay-sized precipitate. CUF1 had a strong aroma. The second sample, CUF2, consisted of a dark reddish brown, clay-sized precipitate which contained small amounts of <¼" weathered Type II waste rock. CUF2 had a slight aroma.

Two 750 g subsamples of each CUF material were prepared and were placed in a 4 L reaction bottle. One subsample from each CUF sample was reacted with DI water at its natural pH at a solid to liquid ratio of 1:1. The second subsample from each CUF sample was reacted with DI water acidified with 2 N H_2SO_4 to a pH of approximately 6.5 su at a solid to liquid ratio of 1:1.

Prior to reacting the materials referrenced in the above paragraph, an additional 100 g subsample of each CUF material was reacted with DI water at a solid to liquid ratio of 1:1. The leachate was titrated with 2 N H_2SO_4 stepwise to determine the quantity of acid that would be required to acidify the larger CUF subsamples.

2.0 Results.

CUF1

Natural pH Extraction. 750 mL of DI water was added to the first CUF1 subsample. Intensity parameters were measured in the leachate following 24 and 48 hours of equilibration.

1:1 equilibration of a 750.4 g subsample of CUF1

Time (hr)	pH (su)	Conductivity (μS/cm)	T (°C)	Eh (mv)
24	9.13	762	20.4	--
48	8.64	779	20.6	-44.0

pH 6.5 Extraction. The quantity of acid that was added to the second CUF1 subsample was determined separately prior to the addition of DI water to the second CUF1 subsample.

Titration of a 1:1, 102.2 g subsample of CUF1

Cumulative 2 N H_2SO_4 Added (mL)	pH (su)
0	9.43
3	7.15
4	6.81
5	6.73
6	6.48
7	6.49

Based upon the above data, it was concluded that approximately 6.5 mL of 2 N H_2SO_4/100 g (6.5 mL X 7.5 = 49 mL) would be required to produce an acidified leachate in CUF1. Therefore 701 mL of DI water was added to the second 750 g CUF1 subsample, followed by the addition of 49 mL of 2 N H_2SO_4. A slight amount of effervescence was noted when the acid was added to the sample. Upon addition of the DI water to each subsample, the resulting solute was intensely sparged with argon gas and the vessel was tightly sealed.

Intensity parameters were measured at 1, 2 and 24 hours to determine if additional acid would be required to maintain a pH of 6.5 su in the second subsample leachate.

1:1 acidified equilibration of a 751.5 g subsample of CUF1

Time (hr)	pH (su)	Conductivity (μS/cm)	T (°C)	Eh (mv)
1	6.57	3,460	21.1	--
2	6.62	3,270	20.4	--
24	7.06	3,380	20.1	--

Based upon the pH of the 24 hour equilibration pH and the results of the of the 100 g subsample titration an additional 15 mL of 2 N H_2SO_4 was added to the second subsample leachate and the equilibration was extended for another 24 hours.

Time (hr)	pH (su)	Conductivity (μS/cm)	T (°C)	Eh (mv)
25	6.58	3,420	20.4	--
48	6.12	3,480	20.4	+61.0

CUF2

Natural pH Extraction. 750 mL of DI water was added to the first CUF2 subsample. Intensity parameters were measured in the leachate following 24 and 48 hours of equilibration.

1:1 equilibration of a 753.2 g subsample of CUF2

Time (hr)	pH (su)	Conductivity (μS/cm)	T (°C)	Eh (mv)
24	8.89	956	20.7	--
48	7.98	943	20.8	-22.7

pH 6.5 Extraction. The quantity of acid that was added to the second CUF2 subsample was determined separately prior to the addition of DI water to the second CUF2 subsample.

Titration of a 1:1, 104.1 g subsample of CUF2

Cumulative 2 N H_2SO_4 Added (mL)	pH (su)
0	9.53
3	6.85
4	6.80
6	6.39

Based upon the above data, it was concluded that approximately 6 mL of 2 N H_2SO_4/100 g (6 mL X 7.5 = 45 mL) would be required to produce an acidified leachate in CUF2. Therefore 705 mL of DI water was added to the second 750 g CUF2 subsample, followed by the addition of 45 mL of 2 N H_2SO_4. A strong effervescence was noted when the acid was added to the sample. Upon addition of the DI water to each subsample, the resulting solute was intensely sparged with argon gas and the vessel was tightly sealed.

Intensity parameters were measured at 1, 2 and 24 hours to determine if additional acid would be required to maintain a pH of 6.5 su in the second subsample leachate.

1:1 acidified equilibration of a 759.7 g subsample of CUF2

Time (hr)	pH (su)	Conductivity (μS/cm)	T (°C)	Eh (mv)
1	6.68	3,260	21.1	--
2	6.66	3,330	20.4	--
24	6.98	3,290	20.6	--

Based upon the pH of the 24 hour equilibration pH and the results of the of the 100 g subsample titration an additional 15 mL of 2 N H_2SO_4 was added to the second subsample leachate and the equilibration was extended for another 24 hours.

Time (hr)	pH (su)	Conductivity (μS/cm)	T (°C)	Eh (mv)
25	6.49	3,310	20.4	--
48	5.80	3,280	20.8	+84.0

Flambeau Mining Company Shakeflask Test Results					
PARAMETER	UNITS	RESULTS			
Sample ID		FMC-CUF1-N	FMC-CUF1-6.5	FMC-CUF2-N	FMC-CUF2-6.5
Solids Sample		CUF 1			
Date		12/2/96	12/2/96	12/2/96	12/2/96
Field					
Sample Weight	g				
Extraction Number					
Eluate Volume	mL				
Conductivity	uS/cm	779	3480	943	3280
pH	s.u.	8.64	6.12	7.98	5.8
Eh	mV	-44	61	-22.7	84
Extraction Period	h	48	48	48	48
Laboratory					
pH	s.u.	6.9	6.5	6.8	7.3
Alkalinity	mgCaCO3eq/L	4.0		86	9.0
Acidity	mgCaCO3eq/L		110		
SO_4	mg/L	520	1200	970	530
Cl	mg/L	6.0	6.5	4.3	6
Al	mg/L	0.0075	<0.34	<0.0034	<0.34
Cd	mg/L	0.00056	0.24	0.0012	0.22
Ca	mg/L	100	620	150	580
Cr	mg/L	0.00051	<0.026	<0.00026	<0.026
Co	mg/L	0.0088	13	0.013	8.5
Cu	mg/L	0.082	1.9	0.12	6.8
Fe^{2+}	mg/L	<0.0091	0.36	<0.0091	0.14
Fe (T)	mg/L	0.015	<0.10	0.006	<0.10
Pb	mg/L				
Mg	mg/L	40	300	95	500
Mn	mg/L	0.026	51	0.051	46
Ni	mg/L				
K	mg/L	2.1	3.6	2.8	2.2
Se	mg/L				
Tl	mg/L	<0.0028	<0.280	<0.0028	<0.280
Na	mg/L	5.6	7.1	4.3	6.6
Zn	mg/L	0.15	54	0.35	58

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31141

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-CUF1-N NLS#: 122001
Ref. Line 1 of COC 23348 Description: FMC-CUF1-N
Collected: 12/02/96 Received: 12/04/96 Reported: 12/26/96

Parameter	Result	Units	LOD	LOQ	Method	Date
Alkalinity, tot. as CaCO3 (filtered)	4.0	mg/L	1.5	5.3	EPA 310.1	12/10/96
Aluminum, dis. as Al by ICP	0.0075	mg/L	0.0034	0.012	EPA 200.7	12/18/96
Cadmium, dis. as Cd by ICP	0.56	ug/L	0.12	0.38	EPA 200.7	12/18/96
	Additional Comments: QA/QC failure for CCV, 113% recovery @ 500 ug/L. QA/QC for CCB acceptable.					
Calcium, dis. as Ca by ICP	100	mg/L	0.30	0.30	EPA 200.7	12/18/96
Chloride, as Cl (filtered)	6.0	mg/L	0.36	1.3	EPA 325.2	12/10/96
Chromium, dis. as Cr by ICP	0.51	ug/L	0.26	0.93	EPA 200.7	12/18/96
Cobalt, dis. as Co by ICP	8.8	ug/L	0.43	1.5	EPA 200.7	12/18/96
Copper, dis. as Cu by ICP	82	ug/L	0.54	1.9	EPA 200.7	12/18/96
Iron, Ferrous	ND	mg/L	0.0091	0.030	SM 3500Fe-D/HA	12/10/96
Iron, dis. as Fe by ICP	0.015	mg/L	0.0010	0.0035	EPA 200.7	12/18/96
Magnesium, dis. as Mg by ICP	40	mg/L	0.30	0.30	EPA 200.7	12/18/96
Manganese, dis. as Mn by ICP	26	ug/L	0.18	0.61	EPA 200.7	12/18/96
pH, lab	6.9	s.u.	1.0		EPA 150.1	12/06/96
Potassium, dis. as K	2.1	mg/L	2.0	6.6	EPA 200.7	12/10/96
Sodium, dis. as Na by ICP	5.6	mg/L	0.0033	0.011	EPA 200.7	12/18/96
	Additional Comments: QA/QC failure for CCV, 124% recovery @ 500 ug/L. QA/QC for CCB acceptable.					
Sulfate, as SO4 (filtered)	520	mg/L	250	250	EPA 375.2	12/20/96
Thallium, dis. as Tl by ICP	ND	ug/L	2.8	10	EPA 200.7	12/18/96
Zinc, dis. as Zn by ICP	150	ug/L	12	12	EPA 200.7	12/18/96

Please note that analytical results greater than the LOD but less than the LOQ are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected Date = Date Analysis Performed
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Thomas R Priebe
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31141

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-CUF1-6.5 NLS#: 122002
Ref. Line 2 of COC 23348 Description: FMC-CUF1-6.5
Collected: 12/02/96 Received: 12/04/96 Reported: 12/26/96

Parameter	Result	Units	LOD	LOQ	Method	Date
Acidity, tot. as CaCO3	110	mg/L	2.0	2.0	EPA 305.1	12/11/96
Aluminum, dis. as Al by ICP	ND	mg/L	0.34	1.2	EPA 200.7	12/18/96
Cadmium, dis. as Cd by ICP	240	ug/L	12	38	EPA 200.7	12/18/96
	Additional Comments: QA/QC failure for CCV, 113% recovery @ 500 ug/L. QA/QC for CCB acceptable.					
Calcium, dis. as Ca by ICP	620	mg/L	30	30	EPA 200.7	12/18/96
Chloride, as Cl (filtered)	6.5	mg/L	0.36	1.3	EPA 325.2	12/10/96
Chromium, dis. as Cr by ICP	ND	ug/L	26	93	EPA 200.7	12/18/96
Cobalt, dis. as Co by ICP	13000	ug/L	43	150	EPA 200.7	12/18/96
Copper, dis. as Cu by ICP	1900	ug/L	54	190	EPA 200.7	12/18/96
Iron, Ferrous	0.36	mg/L	0.0091	0.030	SM 3500Fe-D/HA	12/10/96
Iron, dis. as Fe by ICP	ND	mg/L	0.10	0.35	EPA 200.7	12/18/96
Magnesium, dis. as Mg by ICP	300	mg/L	30	30	EPA 200.7	12/18/96
Manganese, dis. as Mn by ICP	51000	ug/L	18	61	EPA 200.7	12/18/96
pH, lab	6.5	s.u.	1.0		EPA 150.1	12/06/96
Potassium, dis. as K	3.6	mg/L	2.0	6.6	EPA 200.7	12/10/96
Sodium, dis. as Na by ICP	7.1	mg/L	0.33	1.1	EPA 200.7	12/18/96
	Additional Comments: QA/QC failure for CCV, 124% recovery @ 500 ug/L. QA/QC for CCB acceptable.					
Sulfate, as SO4 (filtered)	1200	mg/L	250	250	EPA 375.2	12/20/96
Thallium, dis. as Tl by ICP	ND	ug/L	280	1000	EPA 200.7	12/18/96
Zinc, dis. as Zn by ICP	54000	ug/L	1200	1200	EPA 200.7	12/18/96

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DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

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Reviewed By:

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ANALYTICAL REPORT

 NLS PROJECT# 31141

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-CUF2-N NLS#: 122003
Ref. Line 3 of COC 23348 Description: FMC-CUF2-N
Collected: 12/02/96 Received: 12/04/96 Reported: 12/26/96

Parameter	Result	Units	LOD	LOQ	Method	Date
Alkalinity, tot. as CaCO3 (filtered)	86	mg/L	1.5	5.3	EPA 310.1	12/10/96
Aluminum, dis. as Al by ICP	ND	mg/L	0.0034	0.012	EPA 200.7	12/18/96
Cadmium, dis. as Cd by ICP	1.2	ug/L	0.12	0.38	EPA 200.7	12/18/96
	Additional Comments: QA/QC failure for CCV, 113% recovery @ 500 ug/L. QA/QC for CCB acceptable.					
Calcium, dis. as Ca by ICP	150	mg/L	0.30	0.30	EPA 200.7	12/18/96
Chloride, as Cl (filtered)	4.3	mg/L	0.36	1.3	EPA 325.2	12/10/96
Chromium, dis. as Cr by ICP	ND	ug/L	0.26	0.93	EPA 200.7	12/18/96
Cobalt, dis. as Co by ICP	13	ug/L	0.43	1.5	EPA 200.7	12/18/96
Copper, dis. as Cu by ICP	120	ug/L	0.54	1.9	EPA 200.7	12/18/96
Iron, Ferrous	ND	mg/L	0.0091	0.030	SM 3500Fe-D/HA	12/10/96
Iron, dis. as Fe by ICP	0.0060	mg/L	0.0010	0.0035	EPA 200.7	12/18/96
Magnesium, dis. as Mg by ICP	95	mg/L	0.30	0.30	EPA 200.7	12/18/96
Manganese, dis. as Mn by ICP	51	ug/L	0.18	0.61	EPA 200.7	12/18/96
pH, lab	6.8	s.u.	1.0		EPA 150.1	12/06/96
Potassium, dis. as K	2.8	mg/L	2.0	6.6	EPA 200.7	12/10/96
Sodium, dis. as Na by ICP	4.3	mg/L	0.0033	0.011	EPA 200.7	12/18/96
	Additional Comments: QA/QC failure for CCV, 124% recovery @ 500 ug/L. QA/QC for CCB acceptable.					
Sulfate, as SO4 (filtered)	970	mg/L	250	250	EPA 375.2	12/20/96
Thallium, dis. as Tl by ICP	ND	ug/L	2.8	10	EPA 200.7	12/18/96
Zinc, dis. as Zn by ICP	350	ug/L	12	12	EPA 200.7	12/18/96

Please note that analytical results greater than the LOD but less than the LOQ are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
LOQ = Limit of Quantitation
ND = Not Detected
Date = Date Analysis Performed
DWB = Dry Weight Basis
NA = Not Applicable
%DWB = (mg/kg DWB)/10000

Reviewed by: Thomas R Priebe

Authorized by:
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Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31141

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-CUF2-6.5 NLS#: 122004
Ref. Line 4 of COC 23348 Description: FMC-CUF2-6.5
Collected: 12/02/96 Received: 12/04/96 Reported: 12/26/96

Parameter	Result	Units	LOD	LOQ	Method	Date
Alkalinity, tot. as CaCO3 (filtered)	9.0	mg/L	1.5	5.3	EPA 310.1	12/10/96
Aluminum, dis. as Al by ICP	ND	mg/L	0.34	1.2	EPA 200.7	12/18/96
Cadmium, dis. as Cd by ICP	220	ug/L	12	38	EPA 200.7	12/18/96
	Additional Comments: QA/QC failure for CCV, 113% recovery @ 500 ug/L. QA/QC for CCB acceptable.					
Calcium, dis. as Ca by ICP	580	mg/L	30	30	EPA 200.7	12/18/96
Chloride, as Cl (filtered)	6.0	mg/L	0.36	1.3	EPA 325.2	12/10/96
Chromium, dis. as Cr by ICP	ND	ug/L	26	93	EPA 200.7	12/18/96
Cobalt, dis. as Co by ICP	8500	ug/L	43	150	EPA 200.7	12/18/96
Copper, dis. as Cu by ICP	6800	ug/L	54	190	EPA 200.7	12/18/96
Iron, Ferrous	0.14	mg/L	0.0091	0.030	SM 3500Fe-D/HA	12/10/96
Iron, dis. as Fe by ICP	ND	mg/L	0.10	0.35	EPA 200.7	12/18/96
Magnesium, dis. as Mg by ICP	500	mg/L	30	30	EPA 200.7	12/18/96
Manganese, dis. as Mn by ICP	46000	ug/L	18	61	EPA 200.7	12/18/96
pH, lab	7.3	s.u.	1.0		EPA 150.1	12/06/96
Potassium, dis. as K	2.2	mg/L	2.0	6.6	EPA 200.7	12/10/96
Sodium, dis. as Na by ICP	6.6	mg/L	0.33	1.1	EPA 200.7	12/18/96
	Additional Comments: QA/QC failure for CCV, 124% recovery @ 500 ug/L. QA/QC for CCB acceptable.					
Sulfate, as SO4 (filtered)	530	mg/L	250	250	EPA 375.2	12/20/96
Thallium, dis. as Tl by ICP	ND	ug/L	280	1000	EPA 200.7	12/18/96
Zinc, dis. as Zn by ICP	58000	ug/L	1200	1200	EPA 200.7	12/18/96

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LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected Date = Date Analysis Performed
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Thomas R Priebe
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

Appendix I

Backfill Leach Extraction Test Results

Flambeau Mining Company Shakeflask Test Results						
PARAMETER	UNITS	RESULTS				
Sample ID		FMC-1BF	FMC-2BF	FMC-3BF	FMC-4BF	FMC-5BF
Solids Sample						
Date		1/17/97	1/17/97	1/17/97	1/17/97	1/17/97
Field						
Sample Weight (avg)	g	500.7	500.8	500.1	500.5	500.9
Extraction Number						
Eluate Volume	mL					
Conductivity (avg)	uS/cm	1527	1807	1826	1998	1796
pH (avg)	s.u.	7.31	7.51	7.62	7.1	7.54
Eh (avg)	mV	-38.5	-48.2	-45.7	20.1	-37
Extraction Period	h	72	72	72	72	72
Laboratory						
pH	s.u.	7.4	7.4	7.4	7.3	7.3
Alkalinity	mgCaCO3eq/L	20	21	17	16	13
Acidity	mgCaCO3eq/L					
SO_4	mg/L	810	590	1000	1100	870
Cl	mg/L	5.7	6.4	9.4	9.2	9.0
Al	mg/L	<0.34	<0.34	<0.34	<0.34	<0.34
Cd	mg/L	0.028	0.051	0.023	0.014	0.026
Ca	mg/L	450	550	460	560	560
Cr	mg/L	0.039	<0.026	<0.026	0.029	<0.026
Co	mg/L	0.14	0.23	0.11	0.18	0.16
Cu	mg/L	0.12	0.14	0.22	0.12	0.12
Fe^{2+}	mg/L	0.36	0.10	0.24	0.75	0.20
Fe (T)	mg/L	<0.10	<0.10	0.22	<0.10	<0.10
Pb	mg/L					
Mg	mg/L	39	67	33	49	49
Mn	mg/L	4.8	3.3	1.2	3.2	3.2
Ni	mg/L					
K	mg/L	12	13	10	12	12
Se	mg/L					
Tl	mg/L	<0.025	<0.025	<0.025	<0.025	<0.025
Na	mg/L	3.8	6.0	5.9	4.9	5.3
Zn	mg/L	<1.2	<1.2	<1.2	<1.2	<1.2

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ANALYTICAL REPORT

 NLS PROJECT# 31933

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining Co.
Project Title: 96F022

Sample ID: FMC-3 BF NLS#: 125577
Ref. Line 1 of COC 24056 Description: FMC-3 BF
Collected: 01/17/97 Received: 01/21/97 Reported: 02/14/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	17	mg/L	1.5	5.3	EPA 310.1	01/24/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.34	1.2	EPA 200.7	02/13/97	721026460
Cadmium, dis. as Cd by ICP	< 23 >	ug/L	12	38	EPA 200.7	02/13/97	721026460
Calcium, dis. as Ca by ICP	460	mg/L	30	30	EPA 200.7	02/13/97	721026460
Chloride, as Cl (filtered)	9.4	mg/L	0.36	1.3	EPA 325.2	01/22/97	721026460
Chromium, dis. as Cr by ICP	ND	ug/L	26	93	EPA 200.7	02/13/97	721026460
Cobalt, dis. as Co by ICP	< 110 >	ug/L	43	150	EPA 200.7	02/13/97	721026460
Copper, dis. as Cu by ICP	220	ug/L	54	190	EPA 200.7	02/13/97	721026460
Iron, Ferrous	0.24	mg/L	0.046	0.15		02/02/97	721026460
	Additional Comments: F&VD modified method						
Iron, dis. as Fe by ICP	< 0.22 >	mg/L	0.10	0.35	EPA 200.7	02/13/97	721026460
Magnesium, dis. as Mg by ICP	33	mg/L	30	30	EPA 200.7	02/13/97	721026460
Manganese, dis. as Mn by ICP	1200	ug/L	18	61	EPA 200.7	02/13/97	721026460
pH, lab	7.4	s.u.	1.0		EPA 150.1	01/21/97	721026460
Potassium, dis. as K	10	mg/L	2.0	6.6	EPA 200.7	01/24/97	721026460
Sodium, dis. as Na by ICP	5.9	mg/L	0.33	1.1	EPA 200.7	02/13/97	721026460
Sulfate, as SO4 (filtered)	1000	mg/L	250	250	EPA 375.2	01/30/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/27/97	721026460
Zinc, dis. as Zn by ICP	ND	ug/L	1200	1200	EPA 200.7	02/13/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation".
Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Steven R. Cuyer

Reviewed by:

Authorized by:

R. T. Krueger
Laboratory Manager

NORTHERN LAKE SERVICE, INC.
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31933

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining Co.
Project Title: 96F022

Sample ID: FMC-1 BF NLS#: 125578
Ref. Line 2 of COC 24056 Description: FMC-1 BF
Collected: 01/17/97 Received: 01/21/97 Reported: 02/14/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	20	mg/L	1.5	5.3	EPA 310.1	01/24/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.34	1.2	EPA 200.7	02/13/97	721026460
Cadmium, dis. as Cd by ICP	< 28 >	ug/L	12	38	EPA 200.7	02/13/97	721026460
Calcium, dis. as Ca by ICP	450	mg/L	30	30	EPA 200.7	02/13/97	721026460
Chloride, as Cl (filtered)	5.7	mg/L	0.36	1.3	EPA 325.2	01/22/97	721026460
Chromium, dis. as Cr by ICP	< 39 >	ug/L	26	93	EPA 200.7	02/13/97	721026460
Cobalt, dis. as Co by ICP	< 140 >	ug/L	43	150	EPA 200.7	02/13/97	721026460
Copper, dis. as Cu by ICP	< 120 >	ug/L	54	190	EPA 200.7	02/13/97	721026460
Iron, Ferrous	0.36	mg/L	0.046	0.15		02/02/97	721026460
	Additional Comments: F&VD modified method						
Iron, dis. as Fe by ICP	ND	mg/L	0.10	0.35	EPA 200.7	02/13/97	721026460
Magnesium, dis. as Mg by ICP	39	mg/L	30	30	EPA 200.7	02/13/97	721026460
Manganese, dis. as Mn by ICP	4800	ug/L	18	61	EPA 200.7	02/13/97	721026460
pH, lab	7.4	s.u.	1.0		EPA 150.1	01/21/97	721026460
Potassium, dis. as K	12	mg/L	2.0	6.6	EPA 200.7	01/30/97	721026460
Sodium, dis. as Na by ICP	3.8	mg/L	0.33	1.1	EPA 200.7	02/13/97	721026460
Sulfate, as SO4 (filtered)	810	mg/L	250	250	EPA 375.2	01/30/97	721026460
Thallium, dis. as Tl by furnace AAS	< 25 >	ug/L	25	87	EPA 279.2	01/27/97	721026460
Zinc, dis. as Zn by ICP	ND	ug/L	1200	1200	EPA 200.7	02/13/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Steven R. Czyn

Reviewed by:

Authorized by:

R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31933

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining Co.
Project Title: 96F022

Sample ID: FMC-5 BF NLS#: 125579
Ref. Line 3 of COC 24056 Description: FMC-5 BF
Collected: 01/17/97 Received: 01/21/97 Reported: 02/14/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	13	mg/L	1.5	5.3	EPA 310.1	01/24/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.34	1.2	EPA 200.7	02/13/97	721026460
Cadmium, dis. as Cd by ICP	< 26 >	ug/L	12	38	EPA 200.7	02/13/97	721026460
Calcium, dis. as Ca by ICP	560	mg/L	30	30	EPA 200.7	02/13/97	721026460
Chloride, as Cl (filtered)	9.0	mg/L	0.36	1.3	EPA 325.2	01/22/97	721026460
Chromium, dis. as Cr by ICP	ND	ug/L	26	93	EPA 200.7	02/13/97	721026460
Cobalt, dis. as Co by ICP	160	ug/L	43	150	EPA 200.7	02/13/97	721026460
Copper, dis. as Cu by ICP	< 120 >	ug/L	54	190	EPA 200.7	02/13/97	721026460
Iron, Ferrous	0.20	mg/L	0.046	0.15		02/02/97	721026460
	Additional Comments: F&VD modified method						
Iron, dis. as Fe by ICP	ND	mg/L	0.10	0.35	EPA 200.7	02/13/97	721026460
Magnesium, dis. as Mg by ICP	49	mg/L	30	30	EPA 200.7	02/13/97	721026460
Manganese, dis. as Mn by ICP	3200	ug/L	18	61	EPA 200.7	02/13/97	721026460
pH, lab	7.3	s.u.	1.0		EPA 150.1	01/21/97	721026460
Potassium, dis. as K	12	mg/L	2.0	6.6	EPA 200.7	01/30/97	721026460
Sodium, dis. as Na by ICP	5.3	mg/L	0.33	1.1	EPA 200.7	02/13/97	721026460
Sulfate, as SO4 (filtered)	870	mg/L	250	250	EPA 375.2	01/30/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	02/09/97	721026460
Zinc, dis. as Zn by ICP	ND	ug/L	1200	1200	EPA 200.7	02/13/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Steven R. Cryer

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31933

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining Co.
Project Title: 96F022

Sample ID: FMC-4 BF NLS#: 125580
Ref. Line 4 of COC 24056 Description: FMC-4 BF
Collected: 01/20/97 Received: 01/21/97 Reported: 02/14/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	16	mg/L	1.5	5.3	EPA 310.1	01/24/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.34	1.2	EPA 200.7	02/13/97	721026460
Cadmium, dis. as Cd by ICP	< 14 >	ug/L	12	38	EPA 200.7	02/13/97	721026460
Calcium, dis. as Ca by ICP	560	mg/L	30	30	EPA 200.7	02/13/97	721026460
Chloride, as Cl (filtered)	9.2	mg/L	0.36	1.3	EPA 325.2	01/22/97	721026460
Chromium, dis. as Cr by ICP	< 29 >	ug/L	26	93	EPA 200.7	02/13/97	721026460
Cobalt, dis. as Co by ICP	180	ug/L	43	150	EPA 200.7	02/13/97	721026460
Copper, dis. as Cu by ICP	< 120 >	ug/L	54	190	EPA 200.7	02/13/97	721026460
Iron, Ferrous	0.75	mg/L	0.046	0.15		02/02/97	721026460
	Additional Comments: F&VD modified method						
Iron, dis. as Fe by ICP	ND	mg/L	0.10	0.35	EPA 200.7	02/13/97	721026460
Magnesium, dis. as Mg by ICP	49	mg/L	30	30	EPA 200.7	02/13/97	721026460
Manganese, dis. as Mn by ICP	3200	ug/L	18	61	EPA 200.7	02/13/97	721026460
pH, lab	7.3	s.u.	1.0		EPA 150.1	01/21/97	721026460
Potassium, dis. as K	12	mg/L	2.0	6.6	EPA 200.7	01/30/97	721026460
Sodium, dis. as Na by ICP	4.9	mg/L	0.33	1.1	EPA 200.7	02/13/97	721026460
Sulfate, as SO4 (filtered)	1100	mg/L	250	250	EPA 375.2	01/30/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	02/09/97	721026460
Zinc, dis. as Zn by ICP	ND	ug/L	1200	1200	EPA 200.7	02/13/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Steven R. Cuyo

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31933

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining Co.
Project Title: 96F022

Sample ID: FMC-2 BF NLS#: 125581
Ref. Line 5 of COC 24056 Description: FMC-2 BF
Collected: 01/17/97 Received: 01/21/97 Reported: 02/14/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	21	mg/L	1.5	5.3	EPA 310.1	01/24/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.34	1.2	EPA 200.7	02/13/97	721026460
Cadmium, dis. as Cd by ICP	51	ug/L	12	38	EPA 200.7	02/13/97	721026460
Calcium, dis. as Ca by ICP	550	mg/L	30	30	EPA 200.7	02/13/97	721026460
Chloride, as Cl (filtered)	6.4	mg/L	0.36	1.3	EPA 325.2	01/22/97	721026460
Chromium, dis. as Cr by ICP	ND	ug/L	26	93	EPA 200.7	02/13/97	721026460
Cobalt, dis. as Co by ICP	230	ug/L	43	150	EPA 200.7	02/13/97	721026460
Copper, dis. as Cu by ICP	< 140 >	ug/L	54	190	EPA 200.7	02/13/97	721026460
Iron, Ferrous	< 0.10 >	mg/L	0.046	0.15		02/02/97	721026460
	Additional Comments: F&VD modified method						
Iron, dis. as Fe by ICP	ND	mg/L	0.10	0.35	EPA 200.7	02/13/97	721026460
Magnesium, dis. as Mg by ICP	67	mg/L	30	30	EPA 200.7	02/13/97	721026460
Manganese, dis. as Mn by ICP	3300	ug/L	18	61	EPA 200.7	02/13/97	721026460
pH, lab	7.4	s.u.	1.0		EPA 150.1	01/21/97	721026460
Potassium, dis. as K	13	mg/L	2.0	6.6	EPA 200.7	01/30/97	721026460
Sodium, dis. as Na by ICP	6.0	mg/L	0.33	1.1	EPA 200.7	02/13/97	721026460
Sulfate, as SO4 (filtered)	590	mg/L	250	250	EPA 375.2	01/30/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	02/09/97	721026460
Zinc, dis. as Zn by ICP	ND	ug/L	1200	1200	EPA 200.7	02/13/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation".
Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Steven R Cuyir

Reviewed by:

Authorized by:

R. T. Krueger
Laboratory Manager

9

Appendix J

Type I Leach Extraction Test Results

Flambeau Mining Company
Shakeflask Test Results

PARAMETER	UNITS	RESULTS							
Sample ID		FMC-2 T1	FMC-5T1	FMC-6 T1	FMC-7T1	FMC-8T1	FMC-9T1	FMC-10T1	FMC-11T1
Solids Sample Date		12/27/96	1/2/97	12/27/96	12/18/96	12/18/96	1/2/97	12/19/96	12/19/96
Field									
Sample Weight (avg)	g	500.6	501.3	500.7	500.3	502.0	500.6	501.6	500.9
Extraction Number									
Eluate Volume	mL								
Conductivity (avg)	uS/cm	42.1	38.9	59.9	128.0	171.4	56.2	327	278
pH (avg)	s.u.	8.08	7.21	7.51	7.37	7.60	7.39	6.96	7.44
Eh (avg)	mV	50.1	77.3	99.9	116.8	79.5	74.7	33.7	67.9
Extraction Period	h	24	24	24	24	24	24	24	24
Laboratory									
pH	s.u.	6.8	7.6	7.0	7.3	7.3	7.7	7.2	2.9
Alkalinity	mgCaCO3eq/L	7.0	2	2.0	<1.5	<1.5	2	3.0	
Acidity	mgCaCO3eq/L								100
SO_4	mg/L	5.5	8.4	11	51	95	5.8	140	86
Cl	mg/L	2.9	3	3.8	2.2	1.1	6.9	2.2	0.8
Al	mg/L	<0.034	0.15	<0.034	0.1	0.66	0.095	<0.034	0.063
Cd	mg/L	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012
Ca	mg/L	3	3.2	<3	12	22	<3	35	29
Cr	mg/L	<0.0026	<0.0026	<0.0026	0.0031	<0.0026	<0.0026	<0.0026	0.0028
Co	mg/L	0.0052	<0.0043	<0.0043	<0.0043	<0.0043	<0.0043	<0.0043	<0.0043
Cu	mg/L	0.0075	0.011	0.033	<0.0054	0.024	0.027	<0.0054	<0.0054
Fe^{2+}	mg/L	0.088	0.74	0.051	<0.0091	0.076	0.79	<0.0091	0.075
Fe (T)	mg/L	<0.01	0.13	<0.01	0.13	0.91	<0.01	0.13	0.031
Pb	mg/L								
Mg	mg/L	<3	<3	<3	4	7.4	<3	16	11
Mn	mg/L	0.0075	0.1	0.035	0.36	0.85	0.07	0.15	0.21
Ni	mg/L								
K	mg/L	<2	<2	<2	2.9	5.2	3.2	3.9	<2
Se	mg/L								
Tl	mg/L	<0.028	<0.025	0.035	<0.012	<0.012	<0.025	0.03	<0.012
Na	mg/L	1.3	1.4	1.8	1	1.2	3.2	2.9	2.6
Zn	mg/L	<0.12	0.46	0.18	0.54	1.8	<0.12	0.85	0.17

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Data QA'd through 1/17/97

Flambeau Mining Company
Shakeflask Test Results

PARAMETER	UNITS	RESULTS							
Sample ID		FMC-12 T1	FMC-13 T1	FMC-14 T1	FMC-15 T1	FMC-16 T1	FMC-17T1	FMC-18 T1	FMC-19 T1
Solids Sample									
Date		12/19/96	12/24/96	12/20/96	12/20/96	12/20/96	12/18/96	12/24/96	12/24/96
Field									
Sample Weight (avg)	g	500.6	500.9	502.4	501.5	500.2	500.2	500.4	500.2
Extraction Number									
Eluate Volume	mL								
Conductivity (avg)	uS/cm	146	170.9	198.1	308.3	161.8	402.7	370.3	592.3
pH (avg)	s.u.	7.47	7.99	7.59	7.43	7.90	7.71	7.72	6.72
Eh (avg)	mV	88.3	70	8.3	53.9	25.8	4.5	2.2	91.5
Extraction Period	h	24	24	24	24	24	24	24	24
Laboratory									
pH	s.u.	7.2	6.8	6.9	7.2	7.2	7.3	7.2	7.0
Alkalinity	mgCaCO3eq/L	<1.5	10	<1.5	2.0	<1.5	<1.5	30	3.0
Acidity	mgCaCO3eq/L								
SO_4	mg/L	27	56	54	61	25	530	130	320
Cl	mg/L	1.8	3	1.7	0.99	1.5	5.3	2.6	3
Al	mg/L	0.1	0.18	0.063	<0.034	0.044	0.16	0.065	0.13
Cd	mg/L	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012
Ca	mg/L	10	12	20	33	14	48	50	82
Cr	mg/L	0.004	<0.0026	0.0035	<0.0026	<0.0026	0.0055	<0.0026	0.0059
Co	mg/L	0.012	<0.0043	0.006	<0.0043	<0.0043	<0.0043	0.0057	0.012
Cu	mg/L	0.017	0.011	<0.0054	<0.0054	0.0095	0.0078	0.014	0.093
Fe^{2+}	mg/L	0.1	0.16	0.09	0.12	0.061	<0.0091	0.046	0.064
Fe (T)	mg/L	<0.01	0.088	0.02	<0.01	<0.01	0.077	0.062	0.14
Pb	mg/L								
Mg	mg/L	4.3	4.2	6.6	12	4.8	14	12	23
Mn	mg/L	0.01	0.0047	0.12	0.12	0.0067	0.034	0.0056	0.34
Ni	mg/L								
K	mg/L	2.9	2.2	4.2	3.2	3.5	9.3	5.3	5.2
Se	mg/L								
Tl	mg/L	<0.012	0.035	<0.012	<0.012	<0.012	<0.012	<0.028	<0.028
Na	mg/L	4	2.3	1.6	2.5	1.7	2.5	2.2	2.6
Zn	mg/L	<0.12	<0.12	0.16	<0.12	<0.12	0.25	<0.12	<0.12

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Data QA'd through 1/17/97

Flambeau Mining Company Shakeflask Test Results					
PARAMETER	UNITS	RESULTS			
Sample ID		FMC-20T1	FMC-21 T1	FMC-22 T1	FMC-23T1
Solids Sample					
Date		1/10/97	12/24/96	12/24/96	12/19/96
Field					
Sample Weight (avg)	g	500.4	500.5	501.8	501.4
Extraction Number					
Eluate Volume	mL				
Conductivity (avg)	uS/cm	258.3	109.3	196	334
pH (avg)	s.u.	7.34	7.43	7.55	7.78
Eh (avg)	mV	-45.8	59.6	57.3	4.9
Extraction Period	h	24	24	24	24
Laboratory					
pH	s.u.	7	7.0	6.9	6.7
Alkalinity	mgCaCO3eq/L	<1.5	5.0	8.0	5.0
Acidity	mgCaCO3eq/L				
SO_4	mg/L	78	20	69	<250
Cl	mg/L	11	1.8	1.8	1.9
Al	mg/L	0.15	<0.034	<0.034	<0.034
Cd	mg/L	<0.0012	0.0015	<0.0012	<0.0012
Ca	mg/L	23	10	18	37
Cr	mg/L	0.0082	<0.0026	<0.0026	<0.0026
Co	mg/L	0.0074	<0.0043	<0.0043	<0.0043
Cu	mg/L	<0.0054	0.017	0.013	<0.0054
Fe^{2+}	mg/L	0.023	0.07	0.073	<0.0091
Fe (T)	mg/L	0.14	0.022	<0.01	0.015
Pb	mg/L				
Mg	mg/L	12	3.4	6.4	10
Mn	mg/L	0.14	0.3	0.0085	0.0079
Ni	mg/L				
K	mg/L	3.5	3.4	7.6	6.1
Se	mg/L				
Tl	mg/L	<0.025	0.039	<0.028	<0.012
Na	mg/L	1.5	1.4	2.2	2.1
Zn	mg/L	0.73	<0.12	<0.12	0.13

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Data QA'd through 1/17/97

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31664

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-2 TI NLS#: 124537
Ref. Line 7 of COC 22543 Description: FMC-2 TI
Collected: 12/27/96 Received: 12/31/96 Reported: 01/23/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	7.0	mg/L	1.5	5.3	EPA 310.1	01/07/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	01/21/97	721026460
Cadmium, dis. as Cd by ICP	ND	ug/L	1.2	3.8	EPA 200.7	01/21/97	721026460
Calcium, dis. as Ca by ICP	< 3.0 >	mg/L	3.0	3.0	EPA 200.7	01/21/97	721026460
Chloride, as Cl (filtered)	2.9	mg/L	0.36	1.3	EPA 325.2	01/08/97	721026460
Chromium, dis. as Cr by ICP	ND	ug/L	2.6	9.3	EPA 200.7	01/21/97	721026460
Cobalt, dis. as Co by ICP	< 5.2 >	ug/L	4.3	15	EPA 200.7	01/21/97	721026460
Copper, dis. as Cu by ICP	< 7.5 >	ug/L	5.4	19	EPA 200.7	01/21/97	721026460
Iron, Ferrous	0.088	mg/L	0.0091	0.030		01/02/96	721026460
	Additional Comments: F&VD modified Method. Interference may have biased this result low.						
Iron, dis. as Fe by ICP	ND	mg/L	0.010	0.035	EPA 200.7	01/21/97	721026460
Magnesium, dis. as Mg by ICP	ND	mg/L	3.0	3.0	EPA 200.7	01/21/97	721026460
Manganese, dis. as Mn by ICP	7.5	ug/L	1.8	6.1	EPA 200.7	01/21/97	721026460
pH, lab	6.8	s.u.	1.0		EPA 150.1	12/31/96	721026460
Potassium, dis. as K	ND	mg/L	2.0	6.6	EPA 200.7	01/10/97	721026460
Sodium, dis. as Na by ICP	1.3	mg/L	0.033	0.11	EPA 200.7	01/21/97	721026460
Sulfate, as SO4 (filtered)	5.5	mg/L	2.5	2.5	EPA 375.2	01/14/97	721026460
Thallium, dis. as Tl by ICP	ND	ug/L	28	100	EPA 200.7	01/21/97	721026460
Zinc, dis. as Zn by ICP	ND	ug/L	120	120	EPA 200.7	01/21/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Thomas R Priebe
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

NORTHERN LAKE SERVICE, INC.
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-5TI NLS#: 124649
Ref. Line 2 of COC 24016 Description: FMC-5TI
Collected: 01/02/97 Received: 01/03/97 Reported: 02/03/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	< 2.0 >	mg/L	1.5	5.3	EPA 310.1	01/08/97	721026460
Aluminum, dis. as Al by ICP	0.15	mg/L	0.034	0.12	EPA 200.7	01/31/97	721026460
Cadmium, dis. as Cd by ICP	ND	ug/L	1.2	3.8	EPA 200.7	01/31/97	721026460
Calcium, dis. as Ca by ICP	3.2	mg/L	3.0	3.0	EPA 200.7	01/31/97	721026460
Chloride, as Cl (filtered)	3.0	mg/L	0.36	1.3	EPA 325.2	01/16/97	721026460
Chromium, dis. as Cr by ICP	ND	ug/L	2.6	9.3	EPA 200.7	01/31/97	721026460
Cobalt, dis. as Co by ICP	ND	ug/L	4.3	15	EPA 200.7	01/31/97	721026460
Copper, dis. as Cu by ICP	< 11 >	ug/L	5.4	19	EPA 200.7	01/31/97	721026460
Iron, Ferrous	0.74	mg/L	0.0091	0.030		01/20/97	721026460
	Additional Comments:	F&VD modified method					
Iron, dis. as Fe by ICP	0.13	mg/L	0.010	0.035	EPA 200.7	01/31/97	721026460
Magnesium, dis. as Mg by ICP	ND	mg/L	3.0	3.0	EPA 200.7	01/31/97	721026460
Manganese, dis. as Mn by ICP	100	ug/L	1.8	6.1	EPA 200.7	01/31/97	721026460
pH, lab	7.6	s.u.	1.0		EPA 150.1	01/03/97	721026460
Potassium, dis. as K	ND	mg/L	2.0	6.6	EPA 200.7	01/10/97	721026460
Sodium, dis. as Na by ICP	1.4	mg/L	0.033	0.11	EPA 200.7	01/31/97	721026460
Sulfate, as SO4 (filtered)	8.4	mg/L	2.5	2.5	EPA 375.2	01/20/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/27/97	721026460
Zinc, dis. as Zn by ICP	460	ug/L	120	120	EPA 200.7	01/31/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-6 TI NLS#: 124536
Ref. Line 6 of COC 22543 Description: FMC-6 TI
Collected: 12/27/96 Received: 12/31/96 Reported: 01/23/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	< 2.0 >	mg/L	1.5	5.3	EPA 310.1	01/07/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	01/21/97	721026460
Cadmium, dis. as Cd by ICP	ND	ug/L	1.2	3.8	EPA 200.7	01/21/97	721026460
Calcium, dis. as Ca by ICP	ND	mg/L	3.0	3.0	EPA 200.7	01/21/97	721026460
Chloride, as Cl (filtered)	3.8	mg/L	0.36	1.3	EPA 325.2	01/08/97	721026460
Chromium, dis. as Cr by ICP	ND	ug/L	2.6	9.3	EPA 200.7	01/21/97	721026460
Cobalt, dis. as Co by ICP	ND	ug/L	4.3	15	EPA 200.7	01/21/97	721026460
Copper, dis. as Cu by ICP	33	ug/L	5.4	19	EPA 200.7	01/21/97	721026460
Iron, Ferrous	0.051	mg/L	0.0091	0.030		01/02/96	721026460
	Additional Comments: F&VD modified Method. Interference may have biased this result low.						
Iron, dis. as Fe by ICP	ND	mg/L	0.010	0.035	EPA 200.7	01/21/97	721026460
Magnesium, dis. as Mg by ICP	ND	mg/L	3.0	3.0	EPA 200.7	01/21/97	721026460
Manganese, dis. as Mn by ICP	35	ug/L	1.8	6.1	EPA 200.7	01/21/97	721026460
pH, lab	7.0	s.u.	1.0		EPA 150.1	12/31/96	721026460
Potassium, dis. as K	ND	mg/L	2.0	6.6	EPA 200.7	01/10/97	721026460
Sodium, dis. as Na by ICP	1.8	mg/L	0.033	0.11	EPA 200.7	01/21/97	721026460
Sulfate, as SO4 (filtered)	11	mg/L	2.5	2.5	EPA 375.2	01/14/97	721026460
Thallium, dis. as Tl by ICP	< 35 >	ug/L	28	100	EPA 200.7	01/21/97	721026460
Zinc, dis. as Zn by ICP	180	ug/L	120	120	EPA 200.7	01/21/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Thomas R Priebe
Reviewed by:

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R. T. Krueger
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

PAGE: 2 NLS PROJECT# 31577

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-7TI NLS#: 124038
Ref. Line 2 of COC 23950 Description: FMC-7TI
Collected: 12/18/96 Received: 12/20/96 Reported: 01/16/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	ND	mg/L	1.5	5.3	EPA 310.1	12/31/96	721026460
Aluminum, dis. as Al by ICP	< 0.10 >	mg/L	0.034	0.12	EPA 200.7	01/13/97	721026460
Cadmium, dis. as Cd by ICP	ND	ug/L	1.2	3.8	EPA 200.7	01/13/97	721026460
Calcium, dis. as Ca by ICP	12	mg/L	3.0	3.0	EPA 200.7	01/13/97	721026460
Chloride, as Cl (filtered)	2.2	mg/L	0.36	1.3	EPA 325.2	01/02/97	721026460
Chromium, dis. as Cr by ICP	< 3.1 >	ug/L	2.6	9.3	EPA 200.7	01/13/97	721026460
Cobalt, dis. as Co by ICP	ND	ug/L	4.3	15	EPA 200.7	01/13/97	721026460
Copper, dis. as Cu by ICP	ND	ug/L	5.4	19	EPA 200.7	01/13/97	721026460
Iron, Ferrous	ND	mg/L	0.0091	0.030		12/30/96	721026460
	Additional Comments: F&VD modified Method. Interference may have biased this result low.						
Iron, dis. as Fe by ICP	0.13	mg/L	0.010	0.035	EPA 200.7	01/13/97	721026460
Magnesium, dis. as Mg by ICP	4.0	mg/L	3.0	3.0	EPA 200.7	01/13/97	721026460
Manganese, dis. as Mn by ICP	360	ug/L	1.8	6.1	EPA 200.7	01/13/97	721026460
pH, lab	7.3	s.u.	1.0		EPA 150.1	12/26/96	721026460
Potassium, dis. as K	< 2.9 >	mg/L	2.0	6.6	EPA 200.7	12/27/96	721026460
Sodium, dis. as Na by ICP	1.0	mg/L	0.033	0.11	EPA 200.7	01/13/97	721026460
Sulfate, as SO4 (filtered)	51	mg/L	25	25	EPA 375.2	01/07/97	721026460
Thallium, tot. as Tl by furnace AAS	ND	ug/L	12	44	EPA 279.2	01/09/97	721026460
Zinc, dis. as Zn by ICP	540	ug/L	120	120	EPA 200.7	01/13/97	721026460

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LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31577

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-8TI NLS#: 124037
Ref. Line 1 of COC 23950 Description: FMC-8TI
Collected: 12/18/96 Received: 12/20/96 Reported: 01/16/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	ND	mg/L	1.5	5.3	EPA 310.1	12/31/96	721026460
Aluminum, dis. as Al by ICP	0.66	mg/L	0.034	0.12	EPA 200.7	01/13/97	721026460
Cadmium, dis. as Cd by ICP	ND	ug/L	1.2	3.8	EPA 200.7	01/13/97	721026460
Calcium, dis. as Ca by ICP	22	mg/L	3.0	3.0	EPA 200.7	01/13/97	721026460
Chloride, as Cl (filtered)	< 1.1 >	mg/L	0.36	1.3	EPA 325.2	01/02/97	721026460
Chromium, dis. as Cr by ICP	ND	ug/L	2.6	9.3	EPA 200.7	01/13/97	721026460
Cobalt, dis. as Co by ICP	ND	ug/L	4.3	15	EPA 200.7	01/13/97	721026460
Copper, dis. as Cu by ICP	24	ug/L	5.4	19	EPA 200.7	01/13/97	721026460
Iron, Ferrous	0.076	mg/L	0.0091	0.030		12/31/96	721026460
	Additional Comments: F&VD modified Method. Interference may have biased this result low.						
Iron, dis. as Fe by ICP	0.91	mg/L	0.010	0.035	EPA 200.7	01/13/97	721026460
Magnesium, dis. as Mg by ICP	7.4	mg/L	3.0	3.0	EPA 200.7	01/13/97	721026460
Manganese, dis. as Mn by ICP	850	ug/L	1.8	6.1	EPA 200.7	01/13/97	721026460
pH, lab	7.3	s.u.	1.0		EPA 150.1	12/26/96	721026460
Potassium, dis. as K	< 5.2 >	mg/L	2.0	6.6	EPA 200.7	12/27/96	721026460
Sodium, dis. as Na by ICP	1.2	mg/L	0.033	0.11	EPA 200.7	01/13/97	721026460
Sulfate, as SO4 (filtered)	95	mg/L	25	25	EPA 375.2	01/07/97	721026460
Thallium, tot. as Tl by furnace AAS	ND	ug/L	12	44	EPA 279.2	01/09/97	721026460
Zinc, dis. as Zn by ICP	1800	ug/L	120	120	EPA 200.7	01/13/97	721026460

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LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
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ND = Not Detected
%DWB = (mg/kg DWB)/10000

Thomas R Priebe
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31693

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-9TI **NLS#: 124648**
Ref. Line 1 of COC 24016 Description: FMC-9TI
Collected: 01/02/97 Received: 01/03/97 Reported: 02/03/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	< 2.0 >	mg/L	1.5	5.3	EPA 310.1	01/08/97	721026460
Aluminum, dis. as Al by ICP	< 0.095 >	mg/L	0.034	0.12	EPA 200.7	01/21/97	721026460
Cadmium, dis. as Cd by ICP	ND	ug/L	1.2	3.8	EPA 200.7	01/21/97	721026460
Calcium, dis. as Ca by ICP	ND	mg/L	3.0	3.0	EPA 200.7	01/21/97	721026460
Chloride, as Cl (filtered)	6.9	mg/L	0.36	1.3	EPA 325.2	01/16/97	721026460
Chromium, dis. as Cr by ICP	ND	ug/L	2.6	9.3	EPA 200.7	01/21/97	721026460
Cobalt, dis. as Co by ICP	ND	ug/L	4.3	15	EPA 200.7	01/21/97	721026460
Copper, dis. as Cu by ICP	27	ug/L	5.4	19	EPA 200.7	01/21/97	721026460
Iron, Ferrous	0.79	mg/L	0.0091	0.030		01/20/97	721026460
	Additional Comments:	F&VD modified method					
Iron, dis. as Fe by ICP	ND	mg/L	0.010	0.035	EPA 200.7	01/21/97	721026460
Magnesium, dis. as Mg by ICP	ND	mg/L	3.0	3.0	EPA 200.7	01/21/97	721026460
Manganese, dis. as Mn by ICP	70	ug/L	1.8	6.1	EPA 200.7	01/21/97	721026460
pH, lab	7.7	s.u.	1.0		EPA 150.1	01/03/97	721026460
Potassium, dis. as K	< 3.2 >	mg/L	2.0	6.6	EPA 200.7	01/10/97	721026460
Sodium, dis. as Na by ICP	3.2	mg/L	0.033	0.11	EPA 200.7	01/21/97	721026460
Sulfate, as SO4 (filtered)	5.8	mg/L	2.5	2.5	EPA 375.2	01/20/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/27/97	721026460
Zinc, dis. as Zn by ICP	ND	ug/L	120	120	EPA 200.7	01/21/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Thomas R Priebe

Reviewed by:

Authorized by:

R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-10TI NLS#: 124040
Ref. Line 4 of COC 23950 Description: FMC-10TI
Collected: 12/19/96 Received: 12/20/96 Reported: 01/16/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	< 3.0 >	mg/L	1.5	5.3	EPA 310.1	12/31/96	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	01/13/97	721026460
Cadmium, dis. as Cd by ICP	ND	ug/L	1.2	3.8	EPA 200.7	01/13/97	721026460
Calcium, dis. as Ca by ICP	35	mg/L	3.0	3.0	EPA 200.7	01/13/97	721026460
Chloride, as Cl (filtered)	2.2	mg/L	0.36	1.3	EPA 325.2	01/02/97	721026460
Chromium, dis. as Cr by ICP	ND	ug/L	2.6	9.3	EPA 200.7	01/13/97	721026460
Cobalt, dis. as Co by ICP	ND	ug/L	4.3	15	EPA 200.7	01/13/97	721026460
Copper, dis. as Cu by ICP	ND	ug/L	5.4	19	EPA 200.7	01/13/97	721026460
Iron, Ferrous	ND	mg/L	0.0091	0.030		12/30/96	721026460
	Additional Comments: F&VD modified Method. Interference may have biased this result low.						
Iron, dis. as Fe by ICP	0.13	mg/L	0.010	0.035	EPA 200.7	01/13/97	721026460
Magnesium, dis. as Mg by ICP	16	mg/L	3.0	3.0	EPA 200.7	01/13/97	721026460
Manganese, dis. as Mn by ICP	150	ug/L	1.8	6.1	EPA 200.7	01/13/97	721026460
pH, lab	7.2	s.u.	1.0		EPA 150.1	12/26/96	721026460
Potassium, dis. as K	< 3.9 >	mg/L	2.0	6.6	EPA 200.7	12/27/96	721026460
Sodium, dis. as Na by ICP	2.9	mg/L	0.033	0.11	EPA 200.7	01/13/97	721026460
Sulfate, as SO4 (filtered)	140	mg/L	25	25	EPA 375.2	01/07/97	721026460
Thallium, tot. as Tl by furnace AAS	< 30 >	ug/L	12	44	EPA 279.2	01/09/97	721026460
Zinc, dis. as Zn by ICP	850	ug/L	120	120	EPA 200.7	01/13/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

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DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
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%DWB = (mg/kg DWB)/10000

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Authorized by:
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31577

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-11TI NLS#: 124041
Ref. Line 5 of COC 23950 Description: FMC-11TI
Collected: 12/19/96 Received: 12/20/96 Reported: 01/16/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	100	mg/L	2.0	2.0	EPA 305.1	12/27/96	721026460
Aluminum, dis. as Al by ICP	< 0.063 >	mg/L	0.034	0.12	EPA 200.7	01/13/97	721026460
Cadmium, dis. as Cd by ICP	ND	ug/L	1.2	3.8	EPA 200.7	01/13/97	721026460
Calcium, dis. as Ca by ICP	29	mg/L	3.0	3.0	EPA 200.7	01/13/97	721026460
Chloride, as Cl (filtered)	< 0.80 >	mg/L	0.36	1.3	EPA 325.2	01/02/97	721026460
Chromium, dis. as Cr by ICP	< 2.8 >	ug/L	2.6	9.3	EPA 200.7	01/13/97	721026460
Cobalt, dis. as Co by ICP	ND	ug/L	4.3	15	EPA 200.7	01/13/97	721026460
Copper, dis. as Cu by ICP	ND	ug/L	5.4	19	EPA 200.7	01/13/97	721026460
Iron, Ferrous	0.075	mg/L	0.0091	0.030		12/31/96	721026460
	Additional Comments: F&VD modified Method. Interference may have biased this result low.						
Iron, dis. as Fe by ICP	< 0.031 >	mg/L	0.010	0.035	EPA 200.7	01/13/97	721026460
Magnesium, dis. as Mg by ICP	11	mg/L	3.0	3.0	EPA 200.7	01/13/97	721026460
Manganese, dis. as Mn by ICP	210	ug/L	1.8	6.1	EPA 200.7	01/13/97	721026460
pH, lab	2.9	s.u.	1.0		EPA 150.1	12/26/96	721026460
Potassium, dis. as K	ND	mg/L	2.0	6.6	EPA 200.7	12/27/96	721026460
Sodium, dis. as Na by ICP	2.6	mg/L	0.033	0.11	EPA 200.7	01/13/97	721026460
Sulfate, as SO4 (filtered)	86	mg/L	25	25	EPA 375.2	01/07/97	721026460
Thallium, tot. as Tl by furnace AAS	ND	ug/L	12	44	EPA 279.2	01/09/97	721026460
Zinc, dis. as Zn by ICP	170	ug/L	120	120	EPA 200.7	01/13/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Thomas R Piele
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31606

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-12 TI NLS#: 124240
Ref. Line 4 of COC 23951 Description: FMC-12 TI
Collected: 12/19/96 Received: 12/24/96 Reported: 01/23/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	ND	mg/L	1.5	5.3	EPA 310.1	12/31/96	721026460
Aluminum, dis. as Al by ICP	< 0.10 >	mg/L	0.034	0.12	EPA 200.7	01/21/97	721026460
Cadmium, dis. as Cd by ICP	ND	ug/L	1.2	3.8	EPA 200.7	01/21/97	721026460
Calcium, dis. as Ca by ICP	10	mg/L	3.0	3.0	EPA 200.7	01/21/97	721026460
Chloride, as Cl (filtered)	1.8	mg/L	0.36	1.3	EPA 325.2	01/02/97	721026460
Chromium, dis. as Cr by ICP	< 4.0 >	ug/L	2.6	9.3	EPA 200.7	01/21/97	721026460
Cobalt, dis. as Co by ICP	< 12 >	ug/L	4.3	15	EPA 200.7	01/21/97	721026460
Copper, dis. as Cu by ICP	< 17 >	ug/L	5.4	19	EPA 200.7	01/21/97	721026460
Iron, Ferrous	0.10	mg/L	0.0091	0.030		12/31/96	721026460
	Additional Comments: F&VD modified Method. Interference may have biased this result low.						
Iron, dis. as Fe by ICP	ND	mg/L	0.010	0.035	EPA 200.7	01/21/97	721026460
Magnesium, dis. as Mg by ICP	4.3	mg/L	3.0	3.0	EPA 200.7	01/21/97	721026460
Manganese, dis. as Mn by ICP	10	ug/L	1.8	6.1	EPA 200.7	01/21/97	721026460
pH, lab	7.2	s.u.	1.0		EPA 150.1	12/26/96	721026460
Potassium, dis. as K	< 2.9 >	mg/L	2.0	6.6	EPA 200.7	12/27/96	721026460
Sodium, dis. as Na by ICP	4.0	mg/L	0.033	0.11	EPA 200.7	01/21/97	721026460
Sulfate, as SO4 (filtered)	27	mg/L	25	25	EPA 375.2	01/07/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	12	44	EPA 279.2	01/09/97	721026460
Zinc, dis. as Zn by ICP	ND	ug/L	120	120	EPA 200.7	01/21/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Thomas R Priebe
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R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31664

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-13 TI NLS#: 124531
Ref. Line 1 of COC 22543 Description: FMC-13 TI
Collected: 12/24/96 Received: 12/31/96 Reported: 01/23/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	10	mg/L	1.5	5.3	EPA 310.1	01/07/97	721026460
Aluminum, dis. as Al by ICP	0.18	mg/L	0.034	0.12	EPA 200.7	01/21/97	721026460
Cadmium, dis. as Cd by ICP	ND	ug/L	1.2	3.8	EPA 200.7	01/21/97	721026460
Calcium, dis. as Ca by ICP	12	mg/L	3.0	3.0	EPA 200.7	01/21/97	721026460
Chloride, as Cl (filtered)	3.0	mg/L	0.36	1.3	EPA 325.2	01/08/97	721026460
Chromium, dis. as Cr by ICP	ND	ug/L	2.6	9.3	EPA 200.7	01/21/97	721026460
Cobalt, dis. as Co by ICP	ND	ug/L	4.3	15	EPA 200.7	01/21/97	721026460
Copper, dis. as Cu by ICP	< 11 >	ug/L	5.4	19	EPA 200.7	01/21/97	721026460
Iron, Ferrous	0.16	mg/L	0.0091	0.030		01/02/97	721026460
	Additional Comments: F&VD modified Method. Interference may have biased this result low.						
Iron, dis. as Fe by ICP	0.088	mg/L	0.010	0.035	EPA 200.7	01/21/97	721026460
Magnesium, dis. as Mg by ICP	4.2	mg/L	3.0	3.0	EPA 200.7	01/21/97	721026460
Manganese, dis. as Mn by ICP	< 4.7 >	ug/L	1.8	6.1	EPA 200.7	01/21/97	721026460
pH, lab	6.8	s.u.	1.0		EPA 150.1	12/31/96	721026460
Potassium, dis. as K	< 2.2 >	mg/L	2.0	6.6	EPA 200.7	01/10/97	721026460
Sodium, dis. as Na by ICP	2.3	mg/L	0.033	0.11	EPA 200.7	01/21/97	721026460
Sulfate, as SO4 (filtered)	56	mg/L	25	25	EPA 375.2	01/14/97	721026460
Thallium, dis. as Tl by ICP	< 35 >	ug/L	28	100	EPA 200.7	01/21/97	721026460
Zinc, dis. as Zn by ICP	ND	ug/L	120	120	EPA 200.7	01/21/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Thomas R Priebe
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Authorized by:
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Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31606

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-14 TI NLS#: 124237
Ref. Line 1 of COC 23951 Description: FMC-14 TI
Collected: 12/20/96 Received: 12/24/96 Reported: 01/23/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	ND	mg/L	1.5	5.3	EPA 310.1	12/31/96	721026460
Aluminum, dis. as Al by ICP	< 0.063 >	mg/L	0.034	0.12	EPA 200.7	01/21/97	721026460
Cadmium, dis. as Cd by ICP	ND	ug/L	1.2	3.8	EPA 200.7	01/21/97	721026460
Calcium, dis. as Ca by ICP	20	mg/L	3.0	3.0	EPA 200.7	01/21/97	721026460
Chloride, as Cl (filtered)	1.7	mg/L	0.36	1.3	EPA 325.2	01/02/97	721026460
Chromium, dis. as Cr by ICP	< 3.5 >	ug/L	2.6	9.3	EPA 200.7	01/21/97	721026460
Cobalt, dis. as Co by ICP	< 6.0 >	ug/L	4.3	15	EPA 200.7	01/21/97	721026460
Copper, dis. as Cu by ICP	ND	ug/L	5.4	19	EPA 200.7	01/21/97	721026460
Iron, Ferrous	0.090	mg/L	0.0091	0.030		12/31/96	721026460
	Additional Comments: F&VD modified Method. Interference may have biased this result low.						
Iron, dis. as Fe by ICP	< 0.020 >	mg/L	0.010	0.035	EPA 200.7	01/21/97	721026460
Magnesium, dis. as Mg by ICP	6.6	mg/L	3.0	3.0	EPA 200.7	01/21/97	721026460
Manganese, dis. as Mn by ICP	120	ug/L	1.8	6.1	EPA 200.7	01/21/97	721026460
pH, lab	6.9	s.u.	1.0		EPA 150.1	12/26/96	721026460
Potassium, dis. as K	< 4.2 >	mg/L	2.0	6.6	EPA 200.7	12/27/96	721026460
Sodium, dis. as Na by ICP	1.6	mg/L	0.033	0.11	EPA 200.7	01/21/97	721026460
Sulfate, as SO4 (filtered)	54	mg/L	25	25	EPA 375.2	01/07/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	12	44	EPA 279.2	01/09/97	721026460
Zinc, dis. as Zn by ICP	160	ug/L	120	120	EPA 200.7	01/21/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Reviewed by: Thomas R Priebe

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-15 TI NLS#: 124238
Ref. Line 2 of COC 23951 Description: FMC-15 TI
Collected: 12/20/96 Received: 12/24/96 Reported: 01/23/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	< 2.0 >	mg/L	1.5	5.3	EPA 310.1	12/31/96	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	01/21/97	721026460
Cadmium, dis. as Cd by ICP	ND	ug/L	1.2	3.8	EPA 200.7	01/21/97	721026460
Calcium, dis. as Ca by ICP	33	mg/L	3.0	3.0	EPA 200.7	01/21/97	721026460
Chloride, as Cl (filtered)	< 0.99 >	mg/L	0.36	1.3	EPA 325.2	01/02/97	721026460
Chromium, dis. as Cr by ICP	ND	ug/L	2.6	9.3	EPA 200.7	01/21/97	721026460
Cobalt, dis. as Co by ICP	ND	ug/L	4.3	15	EPA 200.7	01/21/97	721026460
Copper, dis. as Cu by ICP	ND	ug/L	5.4	19	EPA 200.7	01/21/97	721026460
Iron, Ferrous	0.12	mg/L	0.0091	0.030		12/31/96	721026460
	Additional Comments: F&VD modified Method. Interference may have biased this result low.						
Iron, dis. as Fe by ICP	ND	mg/L	0.010	0.035	EPA 200.7	01/21/97	721026460
Magnesium, dis. as Mg by ICP	12	mg/L	3.0	3.0	EPA 200.7	01/21/97	721026460
Manganese, dis. as Mn by ICP	120	ug/L	1.8	6.1	EPA 200.7	01/21/97	721026460
pH, lab	7.2	s.u.	1.0		EPA 150.1	12/26/96	721026460
Potassium, dis. as K	< 3.2 >	mg/L	2.0	6.6	EPA 200.7	12/27/96	721026460
Sodium, dis. as Na by ICP	2.5	mg/L	0.033	0.11	EPA 200.7	01/21/97	721026460
Sulfate, as SO4 (filtered)	61	mg/L	25	25	EPA 375.2	01/07/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	12	44	EPA 279.2	01/09/97	721026460
Zinc, dis. as Zn by ICP	ND	ug/L	120	120	EPA 200.7	01/21/97	721026460

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Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Thomas R Pirlo
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31606

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-16 TI **NLS#: 124239**
Ref. Line 3 of COC 23951 Description: FMC-16 TI
Collected: 12/20/96 Received: 12/24/96 Reported: 01/23/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	ND	mg/L	1.5	5.3	EPA 310.1	12/31/96	721026460
Aluminum, dis. as Al by ICP	< 0.044 >	mg/L	0.034	0.12	EPA 200.7	01/21/97	721026460
Cadmium, dis. as Cd by ICP	ND	ug/L	1.2	3.8	EPA 200.7	01/21/97	721026460
Calcium, dis. as Ca by ICP	14	mg/L	3.0	3.0	EPA 200.7	01/21/97	721026460
Chloride, as Cl (filtered)	1.5	mg/L	0.36	1.3	EPA 325.2	01/02/97	721026460
Chromium, dis. as Cr by ICP	ND	ug/L	2.6	9.3	EPA 200.7	01/21/97	721026460
Cobalt, dis. as Co by ICP	ND	ug/L	4.3	15	EPA 200.7	01/21/97	721026460
Copper, dis. as Cu by ICP	< 9.5 >	ug/L	5.4	19	EPA 200.7	01/21/97	721026460
Iron, Ferrous	0.061	mg/L	0.0091	0.030		12/31/96	721026460
	Additional Comments: F&VD modified Method. Interference may have biased this result low.						
Iron, dis. as Fe by ICP	ND	mg/L	0.010	0.035	EPA 200.7	01/21/97	721026460
Magnesium, dis. as Mg by ICP	4.8	mg/L	3.0	3.0	EPA 200.7	01/21/97	721026460
Manganese, dis. as Mn by ICP	6.7	ug/L	1.8	6.1	EPA 200.7	01/21/97	721026460
pH, lab	7.2	s.u.	1.0		EPA 150.1	12/26/96	721026460
Potassium, dis. as K	< 3.5 >	mg/L	2.0	6.6	EPA 200.7	12/27/96	721026460
Sodium, dis. as Na by ICP	1.7	mg/L	0.033	0.11	EPA 200.7	01/21/97	721026460
Sulfate, as SO4 (filtered)	< 25 >	mg/L	25	25	EPA 375.2	01/07/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	12	44	EPA 279.2	01/09/97	721026460
Zinc, dis. as Zn by ICP	ND	ug/L	120	120	EPA 200.7	01/21/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Thomas R Priebe
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31577

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-17TI **NLS#: 124039**
Ref. Line 3 of COC 23950 Description: FMC-17TI
Collected: 12/18/96 Received: 12/20/96 Reported: 01/16/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	ND	mg/L	1.5	5.3	EPA 310.1	12/31/96	721026460
Aluminum, dis. as Al by ICP	0.16	mg/L	0.034	0.12	EPA 200.7	01/13/97	721026460
Cadmium, dis. as Cd by ICP	ND	ug/L	1.2	3.8	EPA 200.7	01/13/97	721026460
Calcium, dis. as Ca by ICP	48	mg/L	3.0	3.0	EPA 200.7	01/13/97	721026460
Chloride, as Cl (filtered)	5.3	mg/L	0.36	1.3	EPA 325.2	01/02/97	721026460
Chromium, dis. as Cr by ICP	< 5.5 >	ug/L	2.6	9.3	EPA 200.7	01/13/97	721026460
Cobalt, dis. as Co by ICP	ND	ug/L	4.3	15	EPA 200.7	01/13/97	721026460
Copper, dis. as Cu by ICP	< 7.8 >	ug/L	5.4	19	EPA 200.7	01/13/97	721026460
Iron, Ferrous	ND	mg/L	0.0091	0.030		12/30/96	721026460
	Additional Comments: F&VD modified Method. Interference may have biased this result low.						
Iron, dis. as Fe by ICP	0.077	mg/L	0.010	0.035	EPA 200.7	01/13/97	721026460
Magnesium, dis. as Mg by ICP	14	mg/L	3.0	3.0	EPA 200.7	01/13/97	721026460
Manganese, dis. as Mn by ICP	34	ug/L	1.8	6.1	EPA 200.7	01/13/97	721026460
pH, lab	7.3	s.u.	1.0		EPA 150.1	12/26/96	721026460
Potassium, dis. as K	9.3	mg/L	2.0	6.6	EPA 200.7	12/27/96	721026460
Sodium, dis. as Na by ICP	2.5	mg/L	0.033	0.11	EPA 200.7	01/13/97	721026460
Sulfate, as SO4 (filtered)	530	mg/L	250	250	EPA 375.2	01/07/97	721026460
Thallium, tot. as Tl by furnace AAS	ND	ug/L	12	44	EPA 279.2	01/09/97	721026460
Zinc, dis. as Zn by ICP	250	ug/L	120	120	EPA 200.7	01/13/97	721026460

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Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

PAGE: 2 NLS PROJECT# 31664

Client: Foth & Van Dyke Associates
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Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-18 TI NLS#: 124532
Ref. Line 2 of COC 22543 Description: FMC-18 TI
Collected: 12/24/96 Received: 12/31/96 Reported: 01/23/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	30	mg/L	1.5	5.3	EPA 310.1	01/07/97	721026460
Aluminum, dis. as Al by ICP	< 0.065 >	mg/L	0.034	0.12	EPA 200.7	01/21/97	721026460
Cadmium, dis. as Cd by ICP	ND	ug/L	1.2	3.8	EPA 200.7	01/21/97	721026460
Calcium, dis. as Ca by ICP	50	mg/L	3.0	3.0	EPA 200.7	01/21/97	721026460
Chloride, as Cl (filtered)	2.6	mg/L	0.36	1.3	EPA 325.2	01/08/97	721026460
Chromium, dis. as Cr by ICP	ND	ug/L	2.6	9.3	EPA 200.7	01/21/97	721026460
Cobalt, dis. as Co by ICP	< 5.7 >	ug/L	4.3	15	EPA 200.7	01/21/97	721026460
Copper, dis. as Cu by ICP	< 14 >	ug/L	5.4	19	EPA 200.7	01/21/97	721026460
Iron, Ferrous	0.046	mg/L	0.0091	0.030		01/02/97	721026460
	Additional Comments: F&VD modified Method. Interference may have biased this result low.						
Iron, dis. as Fe by ICP	0.062	mg/L	0.010	0.035	EPA 200.7	01/21/97	721026460
Magnesium, dis. as Mg by ICP	12	mg/L	3.0	3.0	EPA 200.7	01/21/97	721026460
Manganese, dis. as Mn by ICP	< 5.6 >	ug/L	1.8	6.1	EPA 200.7	01/21/97	721026460
pH, lab	7.2	s.u.	1.0		EPA 150.1	12/31/96	721026460
Potassium, dis. as K	< 5.3 >	mg/L	2.0	6.6	EPA 200.7	01/10/97	721026460
Sodium, dis. as Na by ICP	2.2	mg/L	0.033	0.11	EPA 200.7	01/21/97	721026460
Sulfate, as SO4 (filtered)	130	mg/L	25	25	EPA 375.2	01/14/97	721026460
Thallium, dis. as Tl by ICP	ND	ug/L	28	100	EPA 200.7	01/21/97	721026460
Zinc, dis. as Zn by ICP	ND	ug/L	120	120	EPA 200.7	01/21/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Thomas R Priebe
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31664

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-19 TI NLS#: 124533
Ref. Line 3 of COC 22543 Description: FMC-19 TI
Collected: 12/24/96 Received: 12/31/96 Reported: 01/23/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	< 3.0 >	mg/L	1.5	5.3	EPA 310.1	01/07/97	721026460
Aluminum, dis. as Al by ICP	0.13	mg/L	0.034	0.12	EPA 200.7	01/21/97	721026460
Cadmium, dis. as Cd by ICP	ND	ug/L	1.2	3.8	EPA 200.7	01/21/97	721026460
Calcium, dis. as Ca by ICP	82	mg/L	3.0	3.0	EPA 200.7	01/21/97	721026460
Chloride, as Cl (filtered)	3.0	mg/L	0.36	1.3	EPA 325.2	01/08/97	721026460
Chromium, dis. as Cr by ICP	< 5.9 >	ug/L	2.6	9.3	EPA 200.7	01/21/97	721026460
Cobalt, dis. as Co by ICP	< 12 >	ug/L	4.3	15	EPA 200.7	01/21/97	721026460
Copper, dis. as Cu by ICP	93	ug/L	5.4	19	EPA 200.7	01/21/97	721026460
Iron, Ferrous	0.064	mg/L	0.0091	0.030		01/02/97	721026460
	Additional Comments: F&VD modified Method. Interference may have biased this result low.						
Iron, dis. as Fe by ICP	0.14	mg/L	0.010	0.035	EPA 200.7	01/21/97	721026460
Magnesium, dis. as Mg by ICP	23	mg/L	3.0	3.0	EPA 200.7	01/21/97	721026460
Manganese, dis. as Mn by ICP	340	ug/L	1.8	6.1	EPA 200.7	01/21/97	721026460
pH, lab	7.0	s.u.	1.0		EPA 150.1	12/31/96	721026460
Potassium, dis. as K	< 5.2 >	mg/L	2.0	6.6	EPA 200.7	01/10/97	721026460
Sodium, dis. as Na by ICP	2.6	mg/L	0.033	0.11	EPA 200.7	01/21/97	721026460
Sulfate, as SO4 (filtered)	320	mg/L	25	25	EPA 375.2	01/14/97	721026460
Thallium, dis. as Tl by ICP	ND	ug/L	28	100	EPA 200.7	01/21/97	721026460
Zinc, dis. as Zn by ICP	ND	ug/L	120	120	EPA 200.7	01/21/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Thomas R Priebe
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31838

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining Co.
Project Title: 96F022

Sample ID: FMC-20-TI NLS#: 125220
Ref. Line 1 of COC 24051 Description: FMC-20-TI
Collected: 01/10/97 Received: 01/14/97 Reported: 01/24/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	ND	mg/L	1.5	5.3	EPA 310.1	01/21/97	721026460
Aluminum, dis. as Al by ICP	0.15	mg/L	0.034	0.12	EPA 200.7	01/15/97	721026460
Cadmium, dis. as Cd by ICP	ND	ug/L	1.2	3.8	EPA 200.7	01/15/97	721026460
Calcium, dis. as Ca by ICP	23	mg/L	3.0	3.0	EPA 200.7	01/15/97	721026460
Chloride, as Cl (filtered)	11	mg/L	0.36	1.3	EPA 325.2	01/16/97	721026460
Chromium, dis. as Cr by ICP	< 8.2 >	ug/L	2.6	9.3	EPA 200.7	01/15/97	721026460
Cobalt, dis. as Co by ICP	< 7.4 >	ug/L	4.3	15	EPA 200.7	01/15/97	721026460
Copper, dis. as Cu by ICP	ND	ug/L	5.4	19	EPA 200.7	01/15/97	721026460
Iron, Ferrous	< 0.023 >	mg/L	0.0091	0.030		01/21/97	721026460
	Additional Comments: F&VD modified method						
Iron, dis. as Fe by ICP	0.14	mg/L	0.010	0.035	EPA 200.7	01/15/97	721026460
Magnesium, dis. as Mg by ICP	12	mg/L	3.0	3.0	EPA 200.7	01/15/97	721026460
Manganese, dis. as Mn by ICP	140	ug/L	1.8	6.1	EPA 200.7	01/15/97	721026460
pH, lab	7.0	s.u.	1.0		EPA 150.1	01/15/97	721026460
Potassium, dis. as K	< 3.5 >	mg/L	2.0	6.6	EPA 200.7	01/23/97	721026460
Sodium, dis. as Na by ICP	1.5	mg/L	0.033	0.11	EPA 200.7	01/15/97	721026460
Sulfate, as SO4 (filtered)	78	mg/L	25	25	EPA 375.2	01/14/97	721026460
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/15/97	721026460
Zinc, dis. as Zn by ICP	730	ug/L	120	120	EPA 200.7	01/15/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Thomas R Priebe
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 31664

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-21 TI NLS#: 124534
Ref. Line 4 of COC 22543 Description: FMC-21 TI
Collected: 12/24/96 Received: 12/31/96 Reported: 01/23/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	< 5.0 >	mg/L	1.5	5.3	EPA 310.1	01/07/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	01/21/97	721026460
Cadmium, dis. as Cd by ICP	< 1.5 >	ug/L	1.2	3.8	EPA 200.7	01/21/97	721026460
Calcium, dis. as Ca by ICP	10	mg/L	3.0	3.0	EPA 200.7	01/21/97	721026460
Chloride, as Cl (filtered)	1.8	mg/L	0.36	1.3	EPA 325.2	01/08/97	721026460
Chromium, dis. as Cr by ICP	ND	ug/L	2.6	9.3	EPA 200.7	01/21/97	721026460
Cobalt, dis. as Co by ICP	ND	ug/L	4.3	15	EPA 200.7	01/21/97	721026460
Copper, dis. as Cu by ICP	< 17 >	ug/L	5.4	19	EPA 200.7	01/21/97	721026460
Iron, Ferrous	0.070	mg/L	0.0091	0.030		01/02/97	721026460
	Additional Comments: F&VD modified Method. Interference may have biased this result low.						
Iron, dis. as Fe by ICP	< 0.022 >	mg/L	0.010	0.035	EPA 200.7	01/21/97	721026460
Magnesium, dis. as Mg by ICP	3.4	mg/L	3.0	3.0	EPA 200.7	01/21/97	721026460
Manganese, dis. as Mn by ICP	300	ug/L	1.8	6.1	EPA 200.7	01/21/97	721026460
pH, lab	7.0	s.u.	1.0		EPA 150.1	12/31/96	721026460
Potassium, dis. as K	< 3.4 >	mg/L	2.0	6.6	EPA 200.7	01/10/97	721026460
Sodium, dis. as Na by ICP	1.4	mg/L	0.033	0.11	EPA 200.7	01/21/97	721026460
Sulfate, as SO4 (filtered)	20	mg/L	5.0	5.0	EPA 375.2	01/14/97	721026460
Thallium, dis. as Tl by ICP	< 39 >	ug/L	28	100	EPA 200.7	01/21/97	721026460
Zinc, dis. as Zn by ICP	ND	ug/L	120	120	EPA 200.7	01/21/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Reviewed by: Thomas R Krueger

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ANALYTICAL REPORT

 NLS PROJECT# 31664

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
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Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-22 TI NLS#: 124535
Ref. Line 5 of COC 22543 Description: FMC-22 TI
Collected: 12/24/96 Received: 12/31/96 Reported: 01/23/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	8.0	mg/L	1.5	5.3	EPA 310.1	01/07/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	01/21/97	721026460
Cadmium, dis. as Cd by ICP	ND	ug/L	1.2	3.8	EPA 200.7	01/21/97	721026460
Calcium, dis. as Ca by ICP	18	mg/L	3.0	3.0	EPA 200.7	01/21/97	721026460
Chloride, as Cl (filtered)	1.8	mg/L	0.36	1.3	EPA 325.2	01/08/97	721026460
Chromium, dis. as Cr by ICP	ND	ug/L	2.6	9.3	EPA 200.7	01/21/97	721026460
Cobalt, dis. as Co by ICP	ND	ug/L	4.3	15	EPA 200.7	01/21/97	721026460
Copper, dis. as Cu by ICP	< 13 >	ug/L	5.4	19	EPA 200.7	01/21/97	721026460
Iron, Ferrous	0.073	mg/L	0.0091	0.030		01/02/97	721026460
	Additional Comments: F&VD modified Method. Interference may have biased this result low.						
Iron, dis. as Fe by ICP	ND	mg/L	0.010	0.035	EPA 200.7	01/21/97	721026460
Magnesium, dis. as Mg by ICP	6.4	mg/L	3.0	3.0	EPA 200.7	01/21/97	721026460
Manganese, dis. as Mn by ICP	8.5	ug/L	1.8	6.1	EPA 200.7	01/21/97	721026460
pH, lab	6.9	s.u.	1.0		EPA 150.1	12/31/96	721026460
Potassium, dis. as K	7.6	mg/L	2.0	6.6	EPA 200.7	01/10/97	721026460
Sodium, dis. as Na by ICP	2.2	mg/L	0.033	0.11	EPA 200.7	01/21/97	721026460
Sulfate, as SO4 (filtered)	69	mg/L	25	25	EPA 375.2	01/14/97	721026460
Thallium, dis. as Tl by ICP	ND	ug/L	28	100	EPA 200.7	01/21/97	721026460
Zinc, dis. as Zn by ICP	ND	ug/L	120	120	EPA 200.7	01/21/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

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ANALYTICAL REPORT

 NLS PROJECT# 31577

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
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Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-23TI NLS#: 124042
Ref. Line 6 of COC 23950 Description: FMC-23TI
Collected: 12/19/96 Received: 12/20/96 Reported: 01/16/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	< 5.0 >	mg/L	1.5	5.3	EPA 310.1	12/31/96	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	01/13/97	721026460
Cadmium, dis. as Cd by ICP	ND	ug/L	1.2	3.8	EPA 200.7	01/13/97	721026460
Calcium, dis. as Ca by ICP	37	mg/L	3.0	3.0	EPA 200.7	01/13/97	721026460
Chloride, as Cl (filtered)	1.9	mg/L	0.36	1.3	EPA 325.2	01/02/97	721026460
Chromium, dis. as Cr by ICP	ND	ug/L	2.6	9.3	EPA 200.7	01/13/97	721026460
Cobalt, dis. as Co by ICP	ND	ug/L	4.3	15	EPA 200.7	01/13/97	721026460
Copper, dis. as Cu by ICP	ND	ug/L	5.4	19	EPA 200.7	01/13/97	721026460
Iron, Ferrous	ND	mg/L	0.0091	0.030		12/30/96	721026460
	Additional Comments: F&VD modified Method. Interference may have biased this result low.						
Iron, dis. as Fe by ICP	< 0.015 >	mg/L	0.010	0.035	EPA 200.7	01/13/97	721026460
Magnesium, dis. as Mg by ICP	10	mg/L	3.0	3.0	EPA 200.7	01/13/97	721026460
Manganese, dis. as Mn by ICP	7.9	ug/L	1.8	6.1	EPA 200.7	01/13/97	721026460
pH, lab	6.7	s.u.	1.0		EPA 150.1	12/26/96	721026460
Potassium, dis. as K	< 6.1 >	mg/L	2.0	6.6	EPA 200.7	12/27/96	721026460
Sodium, dis. as Na by ICP	2.1	mg/L	0.033	0.11	EPA 200.7	01/13/97	721026460
Sulfate, as SO4 (filtered)	ND	mg/L	250	250	EPA 375.2	01/07/97	721026460
Thallium, tot. as Tl by furnace AAS	ND	ug/L	12	44	EPA 279.2	01/09/97	721026460
Zinc, dis. as Zn by ICP	130	ug/L	120	120	EPA 200.7	01/13/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Thomas R Priebe
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

Appendix K

Type I Alkali Demand Test Results

		Alkali Demand Test Results - Type I Material								
		Sample Weight			1 hour					
		Flask A	Flask B	Flask C	Flask A		Flask B		Flask C	
Start Date	Sample	(g)	(g)	(g)	pH (su)	Cond. (uS/cm)	pH (su)	Cond. (uS/cm)	pH (su)	Cond. (uS/cm)
12/8/96	11	500	502.4	501.8	5.97	2750	6.18	2500	6.12	2320
12/8/96	13	500.5	501.8	500.9	6.71	141.4	6.84	139.3	6.9	144.5
12/8/96	14	500.1	500.1	500.4	6.77	148.8	6.82	156.8	6.79	162.8
12/8/96	15	500.2	500.1	500.1	6.53	249	6.5	253	6.53	252
12/13/96	3	500.3	500.8	500.4	7.2	22.1	6.89	22	6.68	22.1
12/13/96	4	500.2	500.1	500	7.24	2480	7.18	1861	7.26	2530
12/13/96	5	499.9	500.2	500	7.29	1619	7.36	1423	7.31	1299
12/13/96	5	500.1	500.3	500.9	6.07	37	6.22	36.5	6.27	37.9
12/13/96	6	500.4	500.3	500.4	6.62	54.4	6.58	52.3	6.60	51.8
12/13/96	19	500.8	500.6	501	6.39	563	6.44	565	6.44	499
12/13/96	20	500.9	500.4	500.5	6.69	202	6.76	196.3	6.68	196.2
12/14/96	1	499.9	500.3	501.8	6.55	41.5	6.56	39.8	6.53	44.3
12/14/96	4	500.8	500.8	500.4	6.17	49.4	5.99	58	6.07	42
12/14/96	7	501.2	500.3	500.2	6.59	116.2	6.58	106	6.61	107.9
12/14/96	8	500.6	500.3	500.4	6.88	177.4	6.87	150.3	6.75	185.8
12/14/96	9	501.6	500.2	500.4	7.69	39.6	7.41	40.8	7.25	39.1
12/14/96	12	500.7	499.1	500.3	6.68	129.6	6.56	128.3	6.57	124.2
12/14/96	17	500.8	499.9	501.1	6.78	355	6.85	354	6.89	356
12/14/96	19	500.3	501.3	500.4	7.17	165	7.15	163.5	7.27	165.8
12/15/96	18	501.6	499.9	500.1	8.02	336	8.08	337	7.84	331
12/15/96	21	500.3	500.8	500.4	7.48	95.8	7.3	99.8	7.47	94
12/15/96	22	500.4	501.2	500.5	7.77	172.8	7.77	169.8	7.8	165.3
12/15/96	23	500.8	500.7	500	7.76	283	7.78	280	7.92	266
12/16/96	2	502.5	501.2	500	7.13	23.6	7.07	24.9	7.05	27.3
12/16/96	10	501.7	502.1	501.3	6.6	255	6.6	319	6.62	278
12/16/96	16	501.1	500	500.2	7.06	153.4	7.25	147.6	7.27	155.1
		Data QA'd through this entry as of 1/30/97								
ND = No Data.										

Alkali Demand Test Results - Type I Material											
		Volume Lime Slurry			21 hours						
		Flask A	Flask B	Flask C	Flask A		Flask B		Flask C		
Start Date	Sample	(ml)	(ml)	(ml)	pH (su)	Cond. (uS/cm)	pH (su)	Cond. (uS/cm)	pH (su)	Cond. (uS/cm)
12/8/96	11	0	0.5	1	7.63	318	9.81	255	10.72	280
12/8/96	13	0	0	0	7.76	161.9	7.75	163	8.1	160.8
12/8/96	14	0	0	0	8.04	197.1	8.13	181.3	8.1	188.8
12/8/96	15	0	0	0	7.81	287	7.78	297	7.87	295
12/13/96	3	0	0	0	6.36	25.1	6.29	24.7	6.2	25.3
12/13/96	4	0	0	0	7.09	2040	7.06	2690	6.8	2690
12/13/96	5	0	0	0	7.1	1872	7.01	1655	7.05	2250
12/13/96	5	0	0.5	1	6.01	42.3	9.81	194.4	10.31	437
12/13/96	6	0	0	0	6.39	61.7	6.36	60.3	6.42	61.5
12/13/96	19	0	0.5	0.5	5.89	588	8.6	633	8.75	634
12/13/96	20	0	0	0	6.88	229	6.73	223	6.58	224
12/14/96	1	0	0	0	7.61	48.8	7.28	47.1	6.67	50.8
12/14/96	4	0	0.5	1	5.89	51.6	9.71	187.2	10.36	549
12/14/96	7	0	0	0	7.27	126.8	7.08	125.6	7.12	128.8
12/14/96	8	0	0	0	7.24	194.2	7.23	199.2	7.23	201
12/14/96	9	0	0	0	7.37	50.7	7.4	51.8	7.42	50.5
12/14/96	12	0	0	0	6.28	144.7	6.54	144.8	6.62	149.1
12/14/96	17	0	0	0	7.13	372	7.53	416	7.08	393
12/14/96	19	0	0	0	7.86	185	7.82	175.9	7.91	188.6
12/15/96	18	0	0	0	7.62	392	7.36	395	7.64	386
12/15/96	21	0	0	0	6.88	116.8	6.98	114.5	6.9	111.8
12/15/96	22	0	0	0	7.46	199.9	7.44	198.7	7.41	196.6
12/15/96	23	0	0	0	7.69	318	7.77	327	7.79	321
12/16/96	2	0	0	0	7.43	36.7	7.47	40.9	7.51	42.6
12/16/96	10	0	0	0	6.59	417	6.57	422	6.61	410
12/16/96	16	0	0	0	7.09	187.6	7.37	183.6	7.44	182.6
		Data QA'd through this entry as of 1/30/97								
ND = No Data.										

Appendix L

Type I ABA Test Results

Flambeau Mining Company
ABA Test Results

PARAMETER	UNITS	Results							
Sample ID		FMC-11	FMC-12	FMC-13	FMC-14	FMC-15	FMC-16	FMC-17	FMC-18
Date		1/2/97	1/2/97	1/2/97	1/2/97	1/2/97	1/2/97	1/2/97	1/2/97
Constant		1.0088	1.0088	1.0088	1.0088	1.0088	1.0088	1.0088	1.0088
Normality of HCl		0.5155	0.5155	0.5155	0.5155	0.5155	0.5155	0.5155	0.5155
HCl added	mL	40	40	40	40	40	40	40	40
NaOH to pH=7.0		36.80	39.10	38.60	37.40	37.00	39.20	38.30	37.80
HCl Consumed	mL	2.9	0.6	1.1	2.3	2.7	0.5	1.4	1.9
NP		37.4	7.7	14.2	29.6	34.8	6.4	18.0	24.5
MPA		3.1	0.6	0.9	0.6	2.5	0.6	14.1	4.7
CNNP		34.3	7.1	13.3	29.0	32.3	5.8	3.9	19.8
NP/MPA		12.1	12.8	15.8	49.3	13.9	10.7	1.3	5.2
Paste pH	s.u.	7.34	7.19	8.00	7.09	7.43	7.71	7.55	7.74
Sulfur (T)	%	0.16	0.04	0.05	0.06	0.15	0.04	0.56	0.23
Sulfide	%	0.10	0.02	0.03	0.02	0.08	0.02	0.45	0.15
CO3	%	2.3	0.50	0.44	2.5	2.1	0.67	0.93	1.6
Sulfate	%	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40

Flambeau Mining Company
ABA Test Results

PARAMETER	UNITS	Results						
Sample ID		FMC-19	FMC-20	FMC-21	FMC-22	FMC-23	FMC-23 (Check)	FMC-2
Date		1/2/97	1/2/97	1/2/97	1/2/97	1/2/97	1/2/97	1/15/97
Constant		1.0088	1.0088	1.0088	1.0088	1.0088	1.0088	0.9662
Normality of HCl		0.5155	0.5155	0.5155	0.5155	0.5155	0.5155	0.5155
HCl added	mL	40	40	40	40	40	40	40
NaOH to pH=7.0		38.20	38.70	39.15	38.00	38.20	38.20	41.90
HCl Consumed	mL	1.5	1.0	0.5	1.7	1.5	1.5	-0.4
NP		19.3	12.9	6.4	21.9	19.3	19.3	-5.1
MPA		10.3	4.1	1.3	2.5	5.0	4.7	0.3
CNNP		9.0	8.8	5.1	19.4	14.3	14.6	-5.4
NP/MPA		1.9	3.1	4.9	8.8	3.9	4.1	-17.0
Paste pH	s.u.	7.01	7.39	7.41	7.78	7.80	7.78	7.59
Sulfur (T)	%	0.51	0.21	0.08	0.14	0.24	0.22	0.03
Sulfide	%	0.33	0.13	0.04	0.08	0.16	0.15	0.01
CO3	%	1.6	1.6	1.3	0.54	1.3	1.2	<0.050
Sulfate	%	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.4

2

Flambeau Mining Company
ABA Test Results

PARAMETER	UNITS	Results					
Sample ID		FMC-5	FMC-6	FMC-7	FMC-8	FMC-9	FMC-10
Date		1/15/97	1/15/97	1/15/97	1/15/97	1/15/97	1/15/97
Constant		0.9662	0.9662	0.9662	0.9662	0.9662	0.9662
Normality of HCl		0.5155	0.5155	0.5155	0.5155	0.5155	0.5155
HCl added	mL	40	40	40	40	40	40
NaOH to pH=7.0		41.35	41.60	40.60	39.70	40.90	40.50
HCl Consumed	mL	0.0	-0.1	0.8	1.6	0.5	0.9
NP		0.0	-1.2	10.3	20.6	6.4	11.6
MPA		0.6	0.6	0.6	1.3	0.3	3.4
CNNP		-0.6	-1.8	9.7	19.3	6.1	8.2
NP/MPA		0.0	-2.0	17.2	15.8	21.3	3.4
Paste pH	s.u.	7.36	7.38	7.23	7.28	7.58	7.37
Sulfur (T)	%	0.04	0.05	0.04	0.12	0.02	0.15
Sulfide	%	0.02	0.02	0.02	0.04	<0.01	0.11
CO3	%	<0.050	0.30	2.5	3.3	<0.050	2.3
Sulfate	%	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4

3

Flambeau Mining Company **ABA Test Results**		
PARAMETER	UNITS	
Sample ID		FMC-10 Rep
Date		1/15/97
Constant		0.9662
Normality of HCl		0.5155
HCl added	mL	40
NaOH to pH=7.0		40.20
HCl Consumed	mL	1.2
NP		15.5
MPA		3.1
CNNP		12.4
NP/MPA		5.0
Paste pH	s.u.	7.37
Sulfur (T)	%	0.18
Sulfide	%	0.10
CO3	%	2.3
Sulfate	%	<0.4

4

LAKEFIELD RESEARCH LIMITED

P.O. Box 4300, 185 Concession St., Lakefield, Ontario, KOL 2HO
Phone : 705-652-2038 - FAX : 705-652-6441

Foth & Van Dyke Engeering
2737 South Ridge Road Box 19012
Green Bay, WI, 54307-9012

Attn : Russell T. Janeshek
Fax : 414-497-8516

Lakefield, January 23, 1997

Date Rec. : January 2, 1997
LR. Ref. : JAN7500.R97
Reference : Modified ABA
Project : 9609018

CERTIFICATE OF ANALYSIS

EPA Modified Acid-Base Accounting

No.	Sample ID	Constant	Normality of HCl	HCL added mL	NaOH to pH=7.0	HCl (mL) Consumed	NP *	MPA *
9	FMC-11	1.0088	0.5155	40	36.80	2.9	37.4	3.1
10	FMC-12	1.0088	0.5155	40	39.10	0.6	7.7	0.6
11	FMC-13	1.0088	0.5155	40	38.60	1.1	14.2	0.9
12	FMC-14	1.0088	0.5155	40	37.40	2.3	29.6	0.6
13	FMC-15	1.0088	0.5155	40	37.00	2.7	34.8	2.5
14	FMC-16	1.0088	0.5155	40	39.20	0.5	6.4	0.6
15	FMC-17	1.0088	0.5155	40	38.30	1.4	18.0	14.1
16	FMC-18	1.0088	0.5155	40	37.80	1.9	24.5	4.7

No.	Sample ID	CNNP *	NP/MPA *	Paste pH units	S %	S= %	CO3 %	SO4 %
9	FMC-11	34.3	12.1	7.34	0.16	0.10	2.3	< 0.40
10	FMC-12	7.1	12.8	7.19	0.04	0.02	0.50	< 0.40
11	FMC-13	13.3	15.8	8.00	0.05	0.03	0.44	< 0.40
12	FMC-14	29.0	49.3	7.09	0.06	0.02	2.5	< 0.40
13	FMC-15	32.3	13.9	7.43	0.15	0.08	2.1	< 0.40
14	FMC-16	5.8	10.7	7.71	0.04	0.02	0.67	< 0.40
15	FMC-17	3.9	1.3	7.59	0.56	0.45	0.93	< 0.40
16	FMC-18	19.8	5.2	7.74	0.23	0.15	1.6	< 0.40

LAKEFIELD RESEARCH LIMITED

P.O. Box 4300, 185 Concession St., Lakefield, Ontario, KOL 2HO
Phone : 705-652-2038 - FAX : 705-652-6441

JAN7500.R97

No.	Sample ID	Constant	Normality of HCl	HCL added mL	NaOH to pH=7.0	HCl (mL) Consumed	NP *	MPA *
17	FMC-19	1.0088	0.5155	40	38.20	1.5	19.3	10.3
18	FMC-20	1.0088	0.5155	40	38.70	1.0	12.9	4.1
19	FMC-21	1.0088	0.5155	40	39.15	0.5	6.4	1.3
20	FMC-22	1.0088	0.5155	40	38.00	1.7	21.9	2.5
21	FMC-23	1.0088	0.5155	40	38.20	1.5	19.3	5.0
-- Check --								
22	FMC-23	1.0088	0.5155	40	38.20	1.5	19.3	4.7

No.	Sample ID	CNNP *	NP/MPA *	Paste pH units	S %	S= %	CO3 %	SO4 %
17	FMC-19	9.0	1.9	7.01	0.51	0.33	1.6	< 0.40
18	FMC-20	8.8	3.1	7.39	0.21	0.13	1.6	< 0.40
19	FMC-21	5.1	4.9	7.41	0.08	0.04	1.3	< 0.40
20	FMC-22	19.4	8.8	7.78	0.14	0.08	0.54	< 0.40
21	FMC-23	14.3	3.9	7.80	0.24	0.16	1.3	< 0.40
-- Check --								
22	FMC-23	14.6	4.1	7.78	0.22	0.15	1.2	< 0.40

Roch Marion

Roch Marion

LAKEFIELD RESEARCH LIMITED

P.O. Box 4300, 185 Concession St., Lakefield, Ontario, K0L 2H0
Phone : 705-652-2038 - FAX : 705-652-6441

Foth & Van Dyke Engeering
2737 South Ridge Road Box 19012
Green Bay, WI, 54307-9012

Attn : Russell T. Janeshek
Fax : 414-497-8516

Lakefield, February 2, 1997

Date Rec. : January 15, 1997
LR. Ref. : JAN7523.R97
Reference : Modified ABA
Project : LR 9700329

CERTIFICATE OF ANALYSIS

EPA Modified Acid-Base Accounting

No.	Sample ID	Constant	Normality of HCl	HCL added mL	NaOH to pH=7.0	HCl (mL) Consumed	NP *	MPA *
9	SFMC - 2ABA	0.9662	0.5155	40	41.90	-0.4	-5.1	0.3
10	SFMC - 5ABA	0.9662	0.5155	40	41.35	0.0	0.0	0.6
11	SFMC - 6ABA	0.9662	0.5155	40	41.60	-0.1	-1.2	0.6
12	SFMC - 7ABA	0.9662	0.5155	40	40.60	0.8	10.3	0.6
13	SFMC - 8ABA	0.9662	0.5155	40	39.70	1.6	20.6	1.3
14	SFMC - 9ABA	0.9662	0.5155	40	40.90	0.5	6.4	0.3
15	SFMC - 10ABA	0.9662	0.5155	40	40.50	0.9	11.6	3.4
16	SFMC - 10ABA Rep	0.9662	0.5155	40	40.20	1.2	15.5	3.1

No.	Sample ID	CNNP *	NP/MPA *	Paste pH units	S %	S= %	CO3 %	SO4 %
9	SFMC - 2ABA	-5.4	-17.0	7.59	0.03	0.01	< 0.050	< 0.4
10	SFMC - 5ABA	-0.6	0.0	7.36	0.04	0.02	< 0.050	< 0.4
11	SFMC - 6ABA	-1.8	-2.0	7.38	0.05	0.02	0.30	< 0.4
12	SFMC - 7ABA	9.7	17.2	7.23	0.04	0.02	2.5	< 0.4
13	SFMC - 8ABA	19.3	15.8	7.28	0.12	0.04	3.3	< 0.4
14	SFMC - 9ABA	6.1	21.3	7.58	0.02	< 0.01	< 0.050	< 0.4
15	SFMC - 10ABA	8.2	3.4	7.37	0.15	0.11	2.3	< 0.4
16	SFMC - 10ABA Rep	12.4	5.0	7.37	0.18	0.10	2.3	< 0.4

LAKEFIELD RESEARCH LIMITED
P.O. Box 4300, 185 Concession St., Lakefield, Ontario, KOL 2HO
Phone : 705-652-2038 · FAX : 705-652-6441

JAN7523.R97

Constant (C) = (mL acid in blank) / (mL base in blank)
mL acid consumed = (mL acid added) - (mL base added x C)

*NP(Neutralization Potential)
= (mL acid consumed) x (25) x (N of acid)
*MPA(Maximum Potential Acidity)
= % Sulphide Sulphur x 31.25
*CNNP(Common Net Neutralization Potential)
= NP-MPA
*Results expresses as tonnes CaCO3 eq/1000 tonnes material

Sample(s) Received:Jan 15 97
Sample SFMC-9ABA was calculated using a %S= value of 0.01

D. Masson Stogran

Appendix M

MINTEQA2 Input File and Abbreviated Output File

Input File

```
FLAMBEAU MINING COMPANY BF-1 First Displacement
Set-up file - no precipitation of solids
15.00 MG/L   0.000  0.00000E-01
0 0 1 0 3 0 0 0 1 1 0 0 0
0   0   0
    330  0.000E-01   -7.00 y                       /H+1
    732  1.200E+03   -1.90 y                       /SO4-2
     30  3.500E-01   -4.89 y                       /Al+3
    160  2.600E-02   -6.64 y                       /Cd+2
    150  3.300E+02   -2.08 y                       /Ca+2
    231  7.300E-01   -4.94 y                       /Cu+2
    280  2.200E+01   -4.40 y                       /Fe+2
    460  1.100E+02   -2.34 y                       /Mg+2
    470  8.900E+00   -3.79 y                       /Mn+2
    950  1.700E+00   -4.58 y                       /Zn+2
    140  0.000E-01  -16.00                         /CO3-2

  3   1
3301403    19.4610    -0.5300                      /CO2 (g)


FLAMBEAU MINING COMPANY - Equilibration 1
CO2 entered at 5% (0.05 atm)
15.00 MG/L   0.000  0.00000E-01
0 0 1 0 3 0 0 0 1 1 0 0 0
0   0   0
    330  0.000E-01   -7.00 y                       /H+1
    732  1.200E+03   -1.90 y                       /SO4-2
     30  3.500E-01   -4.89 y                       /Al+3
    160  2.600E-02   -6.64 y                       /Cd+2
    150  3.300E+02   -2.08 y                       /Ca+2
    231  7.300E-01   -4.94 y                       /Cu+2
    280  2.200E+01   -4.40 y                       /Fe+2
    460  1.100E+02   -2.34 y                       /Mg+2
    470  8.900E+00   -3.79 y                       /Mn+2
    950  1.700E+00   -4.58 y                       /Zn+2
    140  0.000E-01  -16.00 y                       /CO3-2

  3   1
3301403    19.4610    -0.5300                      /CO2 (g)
  4   1
5015001     8.4750     2.5850   1.000E-02          /CALCITE
  5   6
5023101     5.4800    15.6100                      /MALACHITE
5016000    13.7400     0.5800                      /OTAVITE
5047000    10.9900     2.0790                      /RHODOCHROSIT
6015001     4.8480    -0.2610                      /GYPSUM
2003003    -8.7700    22.8000                      /GIBBSITE (C)
5028000    11.0500     5.3280                      /SIDERITE


FLAMBEAU MINING COMPANY Equilibration 2
CO2 entered at 1 % (0.01 atm)
15.00 MG/L   0.000  0.00000E-01
0 0 1 0 3 0 0 0 1 1 0 0 0
```

```
0    0    0
     330  0.000E-01   -7.00 y                      /H+1
     732  1.200E+03   -1.90 y                      /SO4-2
      30  3.500E-01   -4.89 y                      /Al+3
     160  2.600E-02   -6.64 y                      /Cd+2
     150  3.300E+02   -2.08 y                      /Ca+2
     231  7.300E-01   -4.94 y                      /Cu+2
     280  2.200E+01   -4.40 y                      /Fe+2
     460  1.100E+02   -2.34 y                      /Mg+2
     470  8.900E+00   -3.79 y                      /Mn+2
     950  1.700E+00   -4.58 y                      /Zn+2
     140  0.000E-01  -16.00 y                      /CO3-2

  3   1
3301403    20.1600    -0.5300                      /CO2 (g)
  4   1
5015001     8.4750     2.5850   1.000E-02          /CALCITE
  5   6
5023101     5.4800    15.6100                      /MALACHITE
5016000    13.7400     0.5800                      /OTAVITE
5047000    10.9900     2.0790                      /RHODOCHROSIT
6015001     4.8480    -0.2610                      /GYPSUM
2003003    -8.7700    22.8000                      /GIBBSITE (C)
5028000    11.0500     5.3280                      /SIDERITE


FLAMBEAU MINING COMPANY - Equilibration 2
CO2 entered at 10% (0.10 atm)
15.00 MG/L   0.000   0.00000E-01
0 0 1 0 3 0 0 0 1 1 0 0 0
0    0    0
     330  0.000E-01   -7.00 y                      /H+1
     732  1.200E+03   -1.90 y                      /SO4-2
      30  3.500E-01   -4.89 y                      /Al+3
     160  2.600E-02   -6.64 y                      /Cd+2
     150  3.300E+02   -2.08 y                      /Ca+2
     231  7.300E-01   -4.94 y                      /Cu+2
     280  2.200E+01   -4.40 y                      /Fe+2
     460  1.100E+02   -2.34 y                      /Mg+2
     470  8.900E+00   -3.79 y                      /Mn+2
     950  1.700E+00   -4.58 y                      /Zn+2
     140  0.000E-01  -16.00 y                      /CO3-2

  3   1
3301403    19.1600    -0.5300                      /CO2 (g)
  4   1
5015001     8.4750     2.5850   1.000E-02          /CALCITE
  5   6
5023101     5.4800    15.6100                      /MALACHITE
5016000    13.7400     0.5800                      /OTAVITE
5047000    10.9900     2.0790                      /RHODOCHROSIT
6015001     4.8480    -0.2610                      /GYPSUM
2003003    -8.7700    22.8000                      /GIBBSITE (C)
5028000    11.0500     5.3280                      /SIDERITE
```

Abbreviated Output File

PART 1 of OUTPUT FILE

```
PC MINTEQA2 v3.10   DATE OF CALCULATIONS:  4-MAR-97  TIME:   7: 4:37


FLAMBEAU MINING COMPANY BF-1 First Displacement
Set-up file - no precipitation of solids

------------------------------------------------------------------------------
 Temperature (Celsius):  15.00
 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 only for those solids specified as ALLOWED
   in the input file (if any).
 The maximum number of iterations is: 200
 The method used to compute activity coefficients is: Davies equation
 Intermediate output file

------------------------------------------------------------------------------
   330  0.000E-01   -7.00 y
   732  1.200E+03   -1.90 y
    30  3.500E-01   -4.89 y
   160  2.600E-02   -6.64 y
   150  3.300E+02   -2.08 y
   231  7.300E-01   -4.94 y
   280  2.200E+01   -4.40 y
   460  1.100E+02   -2.34 y
   470  8.900E+00   -3.79 y
   950  1.700E+00   -4.58 y
   140  0.000E-01  -16.00

 H2O has been inserted as a COMPONENT
  3   1
3301403     19.4610    -0.5300

INPUT DATA BEFORE TYPE MODIFICATIONS
```

ID	NAME	ACTIVITY GUESS	LOG GUESS	ANAL TOTAL
330	H+1	1.000E-07	-7.000	0.000E-01
732	SO4-2	1.259E-02	-1.900	1.200E+03
30	Al+3	1.288E-05	-4.890	3.500E-01
160	Cd+2	2.291E-07	-6.640	2.600E-02
150	Ca+2	8.318E-03	-2.080	3.300E+02
231	Cu+2	1.148E-05	-4.940	7.300E-01
280	Fe+2	3.981E-05	-4.400	2.200E+01
460	Mg+2	4.571E-03	-2.340	1.100E+02
470	Mn+2	1.622E-04	-3.790	8.900E+00
950	Zn+2	2.630E-05	-4.580	1.700E+00
140	CO3-2	1.000E-16	-16.000	0.000E-01

```
 2  H2O                1.000E+00          0.000   0.000E-01

Charge Balance: UNSPECIATED

  Sum of CATIONS=  2.679E-02 Sum of ANIONS =  2.503E-02

  PERCENT DIFFERENCE =  3.399E+00  (ANIONS - CATIONS)/(ANIONS + CATIONS)


         ----------------------------------------------------
        | IMPROVED ACTIVITY GUESSES PRIOR TO FIRST ITERATION: |
        |      SO4-2        Log activity guess:    -1.90      |
        |      Al+3         Log activity guess:    -9.95      |
        |      Cu+2         Log activity guess:    -4.99      |
        |      Fe+2         Log activity guess:    -3.40      |
        |      Mn+2         Log activity guess:    -3.79      |
        |      CO3-2        Log activity guess:    -5.47      |
        |                                                     |
         ----------------------------------------------------
```

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

```
H+1                             1.1     PERCENT BOUND IN SPECIES #3301400   HCO3 -
                 97.8     PERCENT BOUND IN SPECIES #3301401   H2CO3 AQ

SO4-2                          70.5     PERCENT BOUND IN SPECIES #    732   SO4-2
                  9.4     PERCENT BOUND IN SPECIES #4607320   MgSO4 AQ
                 18.8     PERCENT BOUND IN SPECIES #1507320   CaSO4 AQ

Al+3                           41.5     PERCENT BOUND IN SPECIES #     30   Al+3
                  3.2     PERCENT BOUND IN SPECIES # 303300   AlOH +2
                  1.1     PERCENT BOUND IN SPECIES # 303301   Al(OH)2 +
                 40.6     PERCENT BOUND IN SPECIES # 307320   AlSO4 +
                 13.5     PERCENT BOUND IN SPECIES # 307321   Al(SO4)2 -

Cd+2                           61.0     PERCENT BOUND IN SPECIES #    160   Cd+2
                 35.2     PERCENT BOUND IN SPECIES #1607320   CdSO4 AQ
                  3.7     PERCENT BOUND IN SPECIES #1607321   Cd(SO4)2-2

Ca+2                           71.5     PERCENT BOUND IN SPECIES #    150   Ca+2
                 28.5     PERCENT BOUND IN SPECIES #1507320   CaSO4 AQ

Cu+2                           70.8     PERCENT BOUND IN SPECIES #    231   Cu+2
                 28.7     PERCENT BOUND IN SPECIES #2317320   CuSO4 AQ

Fe+2                           76.1     PERCENT BOUND IN SPECIES #    280   Fe+2
                 23.9     PERCENT BOUND IN SPECIES #2807320   FeSO4 AQ

Mg+2                           74.1     PERCENT BOUND IN SPECIES #    460   Mg+2
                 25.9     PERCENT BOUND IN SPECIES #4607320   MgSO4 AQ

Mn+2                           74.5     PERCENT BOUND IN SPECIES #    470   Mn+2
                 25.4     PERCENT BOUND IN SPECIES #4707320   MnSO4 AQ

Zn+2                           66.7     PERCENT BOUND IN SPECIES #    950   Zn+2
                 30.7     PERCENT BOUND IN SPECIES #9507320   ZnSO4 AQ
                  2.4     PERCENT BOUND IN SPECIES #9507321   Zn(SO4)2-2

CO3-2                           2.1     PERCENT BOUND IN SPECIES #3301400   HCO3 -
                 97.8     PERCENT BOUND IN SPECIES #3301401   H2CO3 AQ

H2O                            57.8     PERCENT BOUND IN SPECIES # 303300   AlOH +2
                 39.4     PERCENT BOUND IN SPECIES # 303301   Al(OH)2 +
                  2.3     PERCENT BOUND IN SPECIES # 303303   Al(OH)3 AQ
```

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

IDX	NAME	DISSOLVED		SORBED		PRECIPITATED	
		MOL/KG	PERCENT	MOL/KG	PERCENT	MOL/KG	PERCENT
330	H+1	3.721E-03	100.0	0.000E-01	0.0	0.000E-01	0.0
732	SO4-2	1.251E-02	100.0	0.000E-01	0.0	0.000E-01	0.0
30	Al+3	1.299E-05	100.0	0.000E-01	0.0	0.000E-01	0.0
160	Cd+2	2.317E-07	100.0	0.000E-01	0.0	0.000E-01	0.0
150	Ca+2	8.247E-03	100.0	0.000E-01	0.0	0.000E-01	0.0
231	Cu+2	1.151E-05	100.0	0.000E-01	0.0	0.000E-01	0.0
280	Fe+2	3.946E-04	100.0	0.000E-01	0.0	0.000E-01	0.0
460	Mg+2	4.532E-03	100.0	0.000E-01	0.0	0.000E-01	0.0
470	Mn+2	1.623E-04	100.0	0.000E-01	0.0	0.000E-01	0.0
950	Zn+2	2.605E-05	100.0	0.000E-01	0.0	0.000E-01	0.0
140	CO3-2	1.860E-03	100.0	0.000E-01	0.0	0.000E-01	0.0
2	H2O	7.301E-07	100.0	0.000E-01	0.0	0.000E-01	0.0

Charge Balance: SPECIATED

Sum of CATIONS = 1.947E-02 Sum of ANIONS 1.771E-02

PERCENT DIFFERENCE = 4.738E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

EQUILIBRIUM IONIC STRENGTH (m) = 3.714E-02

EQUILIBRIUM pH = 4.570

DATE ID NUMBER: 970304
TIME ID NUMBER: 7043905

PART 6 of OUTPUT FILE

```
PC MINTEQA2 v3.10   DATE OF CALCULATIONS:  4-MAR-97  TIME:  7: 4:39


Saturation indices and stoichiometry of all minerals

  ID #     NAME        Sat. Index        Stoichiometry in [brackets]
2003000 ALOH3(A)         -3.317     [  1.000]  30   [  3.000]   2   [ -3.000] 330
6003000 ALOHSO4          -0.520     [ -1.000] 330   [  1.000]  30   [  1.000] 732
                                    [  1.000]   2
6003001 AL4(OH)10SO4     -3.197     [-10.000] 330   [  4.000]  30   [  1.000] 732
                                    [ 10.000]   2
6015000 ANHYDRITE        -0.356     [  1.000] 150   [  1.000] 732
5015000 ARAGONITE        -4.621     [  1.000] 150   [  1.000] 140
5046000 ARTINITE        -17.088     [ -2.000] 330   [  2.000] 460   [  1.000] 140
                                    [  5.000]   2
2003001 BOEHMITE         -1.542     [ -3.000] 330   [  1.000]  30   [  2.000]   2
2046000 BRUCITE         -11.090     [  1.000] 460   [  2.000]   2   [ -2.000] 330
5015001 CALCITE          -4.448     [  1.000] 150   [  1.000] 140
2003002 DIASPORE          0.252     [ -3.000] 330   [  1.000]  30   [  2.000]   2
5015002 DOLOMITE         -9.197     [  1.000] 150   [  1.000] 460   [  2.000] 140
6046000 EPSOMITE         -2.931     [  1.000] 460   [  1.000] 732   [  7.000]   2
2003003 GIBBSITE (C)     -1.599     [ -3.000] 330   [  1.000]  30   [  3.000]   2
3003000 Al2O3            -7.477     [  2.000]  30   [  3.000]   2   [ -6.000] 330
6015001 GYPSUM           -0.043     [  1.000] 150   [  1.000] 732   [  2.000]   2
5015003 HUNTITE         -22.903     [  3.000] 460   [  1.000] 150   [  4.000] 140
5046001 HYDRMAGNESIT    -38.664     [  5.000] 460   [  4.000] 140   [ -2.000] 330
                                    [  6.000]   2
5046002 MAGNESITE        -5.243     [  1.000] 460   [  1.000] 140
6028000 MELANTERITE      -3.649     [  1.000] 280   [  1.000] 732   [  7.000]   2
5046003 NESQUEHONITE     -7.642     [  1.000] 460   [  1.000] 140   [  3.000]   2
5028000 SIDERITE         -3.249     [  1.000] 280   [  1.000] 140
2047003 PYROCROITE      -10.747     [ -2.000] 330   [  1.000] 470   [  2.000]   2
5047000 RHODOCHROSIT     -3.622     [  1.000] 470   [  1.000] 140
6047000 MNSO4            -9.648     [  1.000] 470   [  1.000] 732
5023100 CUCO3            -6.100     [  1.000] 231   [  1.000] 140
2023100 CU(OH)2          -5.284     [ -2.000] 330   [  1.000] 231   [  2.000]   2
6023100 ANTLERITE        -8.559     [ -4.000] 330   [  3.000] 231   [  4.000]   2
                                    [  1.000] 732
6023101 BROCHANTITE     -11.865     [ -6.000] 330   [  4.000] 231   [  6.000]   2
                                    [  1.000] 732
6023102 LANGITE         -14.323     [ -6.000] 330   [  4.000] 231   [  7.000]   2
                                    [  1.000] 732
2023101 TENORITE         -4.264     [ -2.000] 330   [  1.000] 231   [  1.000]   2
6023103 CUOCUSO4        -16.448     [ -2.000] 330   [  2.000] 231   [  1.000]   2
                                    [  1.000] 732
6023104 CUSO4           -11.229     [  1.000] 231   [  1.000] 732
6023105 CHALCANTHITE     -5.081     [  1.000] 231   [  1.000] 732   [  5.000]   2
5095000 SMITHSONITE      -5.512     [  1.000] 950   [  1.000] 140
5095001 ZNCO3, 1H2O      -5.142     [  1.000] 950   [  1.000] 140   [  1.000]   2
```

ID #	NAME	Sat. Index	Stoichiometry in [brackets]		
2095000	ZN(OH)2 (A)	-8.377	[-2.000] 330	[1.000] 950	[2.000] 2
2095001	ZN(OH)2 (C)	-8.127	[-2.000] 330	[1.000] 950	[2.000] 2
2095002	ZN(OH)2 (B)	-7.677	[-2.000] 330	[1.000] 950	[2.000] 2
2095003	ZN(OH)2 (G)	-7.637	[-2.000] 330	[1.000] 950	[2.000] 2
2095004	ZN(OH)2 (E)	-7.427	[-2.000] 330	[1.000] 950	[2.000] 2
6095000	ZN2(OH)2SO4	-10.855	[-2.000] 330	[2.000] 950	[2.000] 2
			[1.000] 732		
6095001	ZN4(OH)6SO4	-23.609	[-6.000] 330	[4.000] 950	[6.000] 2
			[1.000] 732		
2095005	ZNO(ACTIVE)	-7.237	[-2.000] 330	[1.000] 950	[1.000] 2
2095006	ZINCITE	-7.623	[-2.000] 330	[1.000] 950	[1.000] 2
6095002	ZN3O(SO4)2	-31.380	[-2.000] 330	[3.000] 950	[2.000] 732
			[1.000] 2		
6095003	ZINCOSITE	-10.926	[1.000] 950	[1.000] 732	
6095004	ZNSO4, 1H2O	-7.129	[1.000] 950	[1.000] 732	[1.000] 2
6095005	BIANCHITE	-5.668	[1.000] 950	[1.000] 732	[6.000] 2
6095006	GOSLARITE	-5.385	[1.000] 950	[1.000] 732	[7.000] 2
5016000	OTAVITE	-3.766	[1.000] 160	[1.000] 140	
2016000	CD(OH)2 (A)	-12.275	[-2.000] 330	[1.000] 160	[2.000] 2
2016001	CD(OH)2 (C)	-11.667	[-2.000] 330	[1.000] 160	[2.000] 2
6016000	CD3(OH)4SO4	-28.111	[-4.000] 330	[3.000] 160	[4.000] 2
			[1.000] 732		
6016001	CD3OH2(SO4)2	-23.762	[-2.000] 330	[3.000] 160	[2.000] 2
			[2.000] 732		
6016002	CD4(OH)6SO4	-31.967	[-6.000] 330	[4.000] 160	[6.000] 2
			[1.000] 732		
2016002	MONTEPONITE	-13.766	[-2.000] 330	[1.000] 160	[1.000] 2
6016003	CDSO4	-9.792	[1.000] 160	[1.000] 732	
6016004	CDSO4, 1H2O	-8.052	[1.000] 160	[1.000] 732	[1.000] 2
6016005	CDSO4,2.7H2O	-7.754	[1.000] 160	[1.000] 732	[2.670] 2
5023101	MALACHITE	-6.904	[2.000] 231	[2.000] 2	[1.000] 140
			[-2.000] 330		
5023102	AZURITE	-11.402	[3.000] 231	[2.000] 2	[2.000] 140
			[-2.000] 330		
2015000	LIME	-27.370	[-2.000] 330	[1.000] 150	[1.000] 2
2015001	PORTLANDITE	-16.852	[-2.000] 330	[1.000] 150	[2.000] 2
2028000	WUSTITE	-6.805	[-2.000] 330	[0.947] 280	[1.000] 2
2046001	PERICLASE	-16.070	[-2.000] 330	[1.000] 460	[1.000] 2
3028001	HERCYNITE	-8.342	[-8.000] 330	[1.000] 280	[2.000] 30
			[4.000] 2		
3046000	SPINEL	-16.737	[-8.000] 330	[1.000] 460	[2.000] 30
			[4.000] 2		

FLAMBEAU MINING COMPANY - Equilibration 1
CO2 entered at 5% (0.05 atm)

Temperature (Celsius): 15.00
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 only for those solids specified as ALLOWED
in the input file (if any).
The maximum number of iterations is: 200
The method used to compute activity coefficients is: Davies equation
Intermediate output file

```
   330  0.000E-01   -7.00 y
   732  1.200E+03   -1.90 y
    30  3.500E-01   -4.89 y
   160  2.600E-02   -6.64 y
   150  3.300E+02   -2.08 y
   231  7.300E-01   -4.94 y
   280  2.200E+01   -4.40 y
   460  1.100E+02   -2.34 y
   470  8.900E+00   -3.79 y
   950  1.700E+00   -4.58 y
   140  0.000E-01  -16.00 y

 H2O has been inserted as a COMPONENT
  3   1
3301403    19.4610    -0.5300
  4   1
5015001     8.4750     2.5850   1.000E-02
  5   6
5023101     5.4800    15.6100
5016000    13.7400     0.5800
5047000    10.9900     2.0790
6015001     4.8480    -0.2610
2003003    -8.7700    22.8000
5028000    11.0500     5.3280
```

INPUT DATA BEFORE TYPE MODIFICATIONS

ID	NAME	ACTIVITY GUESS	LOG GUESS	ANAL TOTAL
330	H+1	1.000E-07	-7.000	0.000E-01
732	SO4-2	1.259E-02	-1.900	1.200E+03
30	Al+3	1.288E-05	-4.890	3.500E-01
160	Cd+2	2.291E-07	-6.640	2.600E-02
150	Ca+2	8.318E-03	-2.080	3.300E+02
231	Cu+2	1.148E-05	-4.940	7.300E-01
280	Fe+2	3.981E-05	-4.400	2.200E+01
460	Mg+2	4.571E-03	-2.340	1.100E+02
470	Mn+2	1.622E-04	-3.790	8.900E+00
950	Zn+2	2.630E-05	-4.580	1.700E+00

```
140  CO3-2              1.000E-16      -16.000   0.000E-01
  2  H2O                1.000E+00        0.000   0.000E-01
```

Charge Balance: UNSPECIATED

Sum of CATIONS= 2.679E-02 Sum of ANIONS = 2.503E-02

PERCENT DIFFERENCE = 3.399E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

```
 -----------------------------------------------------
| IMPROVED ACTIVITY GUESSES PRIOR TO FIRST ITERATION: |
|      SO4-2        Log activity guess:    -1.90      |
|      Al+3         Log activity guess:    -9.95      |
|      Cu+2         Log activity guess:    -4.99      |
|      Fe+2         Log activity guess:    -3.40      |
|      Mn+2         Log activity guess:    -3.79      |
|      CO3-2        Log activity guess:    -5.47      |
|                                                     |
 -----------------------------------------------------
```

PART 4 of OUTPUT FILE

```
  PC MINTEQA2 v3.10    DATE OF CALCULATIONS:  4-MAR-97  TIME:  7: 4:40


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

H+1                            1.1      PERCENT BOUND IN SPECIES #4601401   MgHCO3
+
                  1.8     PERCENT BOUND IN SPECIES #1501400    CaHCO3 +
                 60.1     PERCENT BOUND IN SPECIES #3301400    HCO3 -
                 37.3     PERCENT BOUND IN SPECIES #3301401    H2CO3 AQ

SO4-2                         67.8      PERCENT BOUND IN SPECIES #     732   SO4-2
                  8.2     PERCENT BOUND IN SPECIES #4607320    MgSO4 AQ
                 23.0     PERCENT BOUND IN SPECIES #1507320    CaSO4 AQ

Al+3                          14.6      PERCENT BOUND IN SPECIES # 303301   Al(OH)2
+
                  4.0     PERCENT BOUND IN SPECIES # 303302    Al(OH)4 -
                 81.0     PERCENT BOUND IN SPECIES # 303303    Al(OH)3 AQ

Cd+2                          52.1      PERCENT BOUND IN SPECIES #     160   Cd+2
                 26.1     PERCENT BOUND IN SPECIES #1607320    CdSO4 AQ
                 13.4     PERCENT BOUND IN SPECIES #1601400    CdHCO3 +
                  5.9     PERCENT BOUND IN SPECIES #1601401    CdCO3 AQ
                  2.6     PERCENT BOUND IN SPECIES #1607321    Cd(SO4)2-2

Zn+2                          56.1      PERCENT BOUND IN SPECIES #     950   Zn+2
                 22.5     PERCENT BOUND IN SPECIES #9507320    ZnSO4 AQ
                  1.7     PERCENT BOUND IN SPECIES #9507321    Zn(SO4)2-2
                 14.4     PERCENT BOUND IN SPECIES #9501400    ZnHCO3 +
                  5.0     PERCENT BOUND IN SPECIES #9501401    ZnCO3 AQ

Cu+2                          19.6      PERCENT BOUND IN SPECIES #     231   Cu+2
                 47.3     PERCENT BOUND IN SPECIES #2311400    CuCO3 AQ
                  5.5     PERCENT BOUND IN SPECIES #2313301    Cu(OH)2 AQ
                  6.9     PERCENT BOUND IN SPECIES #2317320    CuSO4 AQ
                 20.0     PERCENT BOUND IN SPECIES #2311402    CuHCO3 +

Fe+2                          78.6      PERCENT BOUND IN SPECIES #     280   Fe+2
                 21.4     PERCENT BOUND IN SPECIES #2807320    FeSO4 AQ

Mg+2                          75.0      PERCENT BOUND IN SPECIES #     460   Mg+2
                  2.3     PERCENT BOUND IN SPECIES #4601401    MgHCO3 +
                 22.7     PERCENT BOUND IN SPECIES #4607320    MgSO4 AQ

Mn+2                          74.8      PERCENT BOUND IN SPECIES #     470   Mn+2
                 22.2     PERCENT BOUND IN SPECIES #4707320    MnSO4 AQ
                  3.0     PERCENT BOUND IN SPECIES #4701400    MnHCO3 +
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```
Ca+2                    73.1      PERCENT BOUND IN SPECIES #     150   Ca+2
                1.5     PERCENT BOUND IN SPECIES #1501400   CaHCO3 +
               25.3     PERCENT BOUND IN SPECIES #1507320   CaSO4 AQ

H2O                      9.7      PERCENT BOUND IN SPECIES # 303301   Al(OH)2
+
                5.4     PERCENT BOUND IN SPECIES # 303302   Al(OH)4 -
               80.9     PERCENT BOUND IN SPECIES # 303303   Al(OH)3 AQ
                3.2     PERCENT BOUND IN SPECIES #2313301   Cu(OH)2 AQ

CO3-2                    1.3      PERCENT BOUND IN SPECIES #4601401   MgHCO3
+
                2.2     PERCENT BOUND IN SPECIES #1501400   CaHCO3 +
               73.4     PERCENT BOUND IN SPECIES #3301400   HCO3 -
               22.8     PERCENT BOUND IN SPECIES #3301401   H2CO3 AQ
```

PART 5 of OUTPUT FILE

PC MINTEQA2 v3.10   DATE OF CALCULATIONS: 4-MAR-97 TIME: 7: 4:40

PROVISIONAL MASS DISTRIBUTION

IDX	NAME	DISSOLVED		SORBED		PRECIPITATED	
		MOL/KG	PERCENT	MOL/KG	PERCENT	MOL/KG	PERCENT
330	H+1	9.732E-03	100.0	0.000E-01	0.0	0.000E-01	0.0
732	SO4-2	1.251E-02	100.0	0.000E-01	0.0	0.000E-01	0.0
30	Al+3	1.299E-05	100.0	0.000E-01	0.0	0.000E-01	0.0
160	Cd+2	2.317E-07	100.0	0.000E-01	0.0	0.000E-01	0.0
950	Zn+2	2.605E-05	100.0	0.000E-01	0.0	0.000E-01	0.0
231	Cu+2	1.151E-05	100.0	0.000E-01	0.0	0.000E-01	0.0
280	Fe+2	3.946E-04	100.0	0.000E-01	0.0	0.000E-01	0.0
460	Mg+2	4.532E-03	100.0	0.000E-01	0.0	0.000E-01	0.0
470	Mn+2	1.623E-04	100.0	0.000E-01	0.0	0.000E-01	0.0
150	Ca+2	1.135E-02	62.2	0.000E-01	0.0	6.896E-03	37.8
2	H2O	3.904E-05	100.0	0.000E-01	0.0	0.000E-01	0.0
140	CO3-2	7.970E-03	53.6	0.000E-01	0.0	6.896E-03	46.4

Charge Balance: SPECIATED

Sum of CATIONS = 2.458E-02 Sum of ANIONS   2.282E-02

PERCENT DIFFERENCE =   3.716E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

PROVISIONAL IONIC STRENGTH (m) =   4.433E-02

PART 6 of OUTPUT FILE

PC MINTEQA2 v3.10   DATE OF CALCULATIONS: 4-MAR-97   TIME: 7: 4:40

Saturation indices and stoichiometry of all supersaturated minerals

ID #	NAME	Sat. Index	Stoichiometry in [brackets]					
6003001	AL4(OH)10SO4	5.546	[-10.000]	330	[4.000]	30	[1.000]	732
			[10.000]	2				
2003001	BOEHMITE	1.733	[-3.000]	330	[1.000]	30	[2.000]	2
5015001	CALCITE	0.000	[1.000]	150	[1.000]	140		
2003002	DIASPORE	3.527	[-3.000]	330	[1.000]	30	[2.000]	2
2003003	GIBBSITE (C)	1.677	[-3.000]	330	[1.000]	30	[3.000]	2
6015001	GYPSUM	0.045	[1.000]	150	[1.000]	732	[2.000]	2
5028000	SIDERITE	1.064	[1.000]	280	[1.000]	140		
5047000	RHODOCHROSIT	0.679	[1.000]	470	[1.000]	140		
5016000	OTAVITE	0.464	[1.000]	160	[1.000]	140		
5023101	MALACHITE	0.578	[2.000]	231	[2.000]	2	[1.000]	140
			[-2.000]	330				
3028001	HERCYNITE	2.522	[-8.000]	330	[1.000]	280	[2.000]	30
			[4.000]	2				

PC MINTEQA2 v3.10   DATE OF CALCULATIONS: 4-MAR-97   TIME: 7: 4:40

ITERATIONS= 7: SOLID SIDERITE PRECIPITATES

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

```
H+1                      1.1      PERCENT BOUND IN SPECIES #4601401   MgHCO3
+
               1.7      PERCENT BOUND IN SPECIES #1501400   CaHCO3 +
              60.1      PERCENT BOUND IN SPECIES #3301400   HCO3 -
              37.0      PERCENT BOUND IN SPECIES #3301401   H2CO3 AQ

Zn+2                    56.5      PERCENT BOUND IN SPECIES #     950   Zn+2
              21.4      PERCENT BOUND IN SPECIES #9507320   ZnSO4 AQ
               1.5      PERCENT BOUND IN SPECIES #9507321   Zn(SO4)2-2
              14.9      PERCENT BOUND IN SPECIES #9501400   ZnHCO3 +
               5.3      PERCENT BOUND IN SPECIES #9501401   ZnCO3 AQ

Mg+2                    75.8      PERCENT BOUND IN SPECIES #     460   Mg+2
               2.4      PERCENT BOUND IN SPECIES #4601401   MgHCO3 +
              21.8      PERCENT BOUND IN SPECIES #4607320   MgSO4 AQ

SO4-2                   68.2      PERCENT BOUND IN SPECIES #     732   SO4-2
               8.7      PERCENT BOUND IN SPECIES #4607320   MgSO4 AQ
              22.9      PERCENT BOUND IN SPECIES #1507320   CaSO4 AQ

Cu+2                    19.0      PERCENT BOUND IN SPECIES #     231   Cu+2
              48.3      PERCENT BOUND IN SPECIES #2311400   CuCO3 AQ
               5.6      PERCENT BOUND IN SPECIES #2313301   Cu(OH)2 AQ
               6.3      PERCENT BOUND IN SPECIES #2317320   CuSO4 AQ
              20.0      PERCENT BOUND IN SPECIES #2311402   CuHCO3 +

Cd+2                    52.6      PERCENT BOUND IN SPECIES #     160   Cd+2
              25.0      PERCENT BOUND IN SPECIES #1607320   CdSO4 AQ
              13.9      PERCENT BOUND IN SPECIES #1601400   CdHCO3 +
               6.2      PERCENT BOUND IN SPECIES #1601401   CdCO3 AQ
               2.3      PERCENT BOUND IN SPECIES #1607321   Cd(SO4)2-2

Fe+2                    79.5      PERCENT BOUND IN SPECIES #     280   Fe+2
              20.5      PERCENT BOUND IN SPECIES #2807320   FeSO4 AQ

Al+3                    14.4      PERCENT BOUND IN SPECIES # 303301   Al(OH)2
+
               4.1      PERCENT BOUND IN SPECIES # 303302   Al(OH)4 -
              81.2      PERCENT BOUND IN SPECIES # 303303   Al(OH)3 AQ

Mn+2                    75.6      PERCENT BOUND IN SPECIES #     470   Mn+2
              21.2      PERCENT BOUND IN SPECIES #4707320   MnSO4 AQ
               3.2      PERCENT BOUND IN SPECIES #4701400   MnHCO3 +
```

Ca+2	74.1	PERCENT BOUND IN SPECIES	# 150	Ca+2
	1.6	PERCENT BOUND IN SPECIES	#1501400	CaHCO3 +
	24.3	PERCENT BOUND IN SPECIES	#1507320	CaSO4 AQ
CO3-2	1.3	PERCENT BOUND IN SPECIES	#4601401	MgHCO3
+				
	2.1	PERCENT BOUND IN SPECIES	#1501400	CaHCO3 +
	73.7	PERCENT BOUND IN SPECIES	#3301400	HCO3 -
	22.7	PERCENT BOUND IN SPECIES	#3301401	H2CO3 AQ
H2O	1.9	PERCENT BOUND IN SPECIES	#3300020	OH-
	5.0	PERCENT BOUND IN SPECIES	# 303301	Al(OH)2 +
	2.9	PERCENT BOUND IN SPECIES	# 303302	Al(OH)4 -
	42.8	PERCENT BOUND IN SPECIES	# 303303	Al(OH)3 AQ
	2.2	PERCENT BOUND IN SPECIES	#2313300	CuOH +
	41.8	PERCENT BOUND IN SPECIES	#2313301	Cu(OH)2 AQ
	1.5	PERCENT BOUND IN SPECIES	#9503300	ZnOH +

PART 5 of OUTPUT FILE

PC MINTEQA2 v3.10 DATE OF CALCULATIONS: 4-MAR-97 TIME: 7: 4:42

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

IDX	NAME	DISSOLVED		SORBED		PRECIPITATED	
		MOL/KG	PERCENT	MOL/KG	PERCENT	MOL/KG	PERCENT
330	H+1	9.824E-03	100.0	0.000E-01	0.0	0.000E-01	0.0
950	Zn+2	2.605E-05	100.0	0.000E-01	0.0	0.000E-01	0.0
460	Mg+2	4.532E-03	100.0	0.000E-01	0.0	0.000E-01	0.0
732	SO4-2	1.131E-02	90.4	0.000E-01	0.0	1.202E-03	9.6
231	Cu+2	5.799E-06	50.4	0.000E-01	0.0	5.708E-06	49.6
160	Cd+2	7.494E-08	32.3	0.000E-01	0.0	1.568E-07	67.7
280	Fe+2	3.210E-05	8.1	0.000E-01	0.0	3.625E-04	91.9
30	Al+3	2.730E-07	2.1	0.000E-01	0.0	1.272E-05	97.9
470	Mn+2	3.202E-05	19.7	0.000E-01	0.0	1.302E-04	80.3
150	Ca+2	1.067E-02	58.5	0.000E-01	0.0	7.576E-03	41.5
140	CO3-2	8.021E-03	53.9	0.000E-01	0.0	6.870E-03	46.1
2	H2O	1.554E-06	100.0	0.000E-01	0.0	0.000E-01	0.0

Charge Balance: SPECIATED

Sum of CATIONS = 2.310E-02 Sum of ANIONS 2.134E-02

PERCENT DIFFERENCE = 3.964E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

EQUILIBRIUM IONIC STRENGTH (m) = 4.135E-02

EQUILIBRIUM pH = 6.737

DATE ID NUMBER: 970304
TIME ID NUMBER: 7044235

PART 6 of OUTPUT FILE

PC MINTEQA2 v3.10   DATE OF CALCULATIONS: 4-MAR-97   TIME: 7: 4:42

Saturation indices and stoichiometry of all minerals

ID #	NAME	Sat. Index	Stoichiometry in [brackets]					
2003000	ALOH3(A)	-1.718	[1.000]	30	[3.000]	2	[-3.000]	330
6003000	ALOHSO4	-3.325	[-1.000]	330	[1.000]	30	[1.000]	732
			[1.000]	2				
6003001	AL4(OH)10SO4	-1.206	[-10.000]	330	[4.000]	30	[1.000]	732
			[10.000]	2				
6015000	ANHYDRITE	-0.313	[1.000]	150	[1.000]	732		
5015000	ARAGONITE	-0.173	[1.000]	150	[1.000]	140		
5046000	ARTINITE	-8.427	[-2.000]	330	[2.000]	460	[1.000]	140
			[5.000]	2				
2003001	BOEHMITE	0.057	[-3.000]	330	[1.000]	30	[2.000]	2
2046000	BRUCITE	-6.760	[1.000]	460	[2.000]	2	[-2.000]	330
5015001	CALCITE	0.000	[1.000]	150	[1.000]	140		
2003002	DIASPORE	1.851	[-3.000]	330	[1.000]	30	[2.000]	2
5015002	DOLOMITE	-0.419	[1.000]	150	[1.000]	460	[2.000]	140
6046000	EPSOMITE	-3.006	[1.000]	460	[1.000]	732	[7.000]	2
2003003	GIBBSITE (C)	0.000	[-3.000]	330	[1.000]	30	[3.000]	2
3003000	Al2O3	-4.280	[2.000]	30	[3.000]	2	[-6.000]	330
6015001	GYPSUM	0.000	[1.000]	150	[1.000]	732	[2.000]	2
5015003	HUNTITE	-5.465	[3.000]	460	[1.000]	150	[4.000]	140
5046001	HYDRMAGNESIT	-17.013	[5.000]	460	[4.000]	140	[-2.000]	330
			[6.000]	2				
5046002	MAGNESITE	-0.913	[1.000]	460	[1.000]	140		
6028000	MELANTERITE	-4.804	[1.000]	280	[1.000]	732	[7.000]	2
5046003	NESQUEHONITE	-3.312	[1.000]	460	[1.000]	140	[3.000]	2
5028000	SIDERITE	0.000	[1.000]	280	[1.000]	140		
2047003	PYROCROITE	-7.125	[-2.000]	330	[1.000]	470	[2.000]	2
5047000	RHODOCHROSIT	0.000	[1.000]	470	[1.000]	140		
6047000	MNSO4	-10.431	[1.000]	470	[1.000]	732		
5023100	CUCO3	-2.649	[1.000]	231	[1.000]	140		
2023100	CU(OH)2	-1.832	[-2.000]	330	[1.000]	231	[2.000]	2
6023100	ANTLERITE	-2.608	[-4.000]	330	[3.000]	231	[4.000]	2
			[1.000]	732				
6023101	BROCHANTITE	-2.463	[-6.000]	330	[4.000]	231	[6.000]	2
			[1.000]	732				
6023102	LANGITE	-4.920	[-6.000]	330	[4.000]	231	[7.000]	2
			[1.000]	732				
2023101	TENORITE	-0.812	[-2.000]	330	[1.000]	231	[1.000]	2
6023103	CUOCUSO4	-13.949	[-2.000]	330	[2.000]	231	[1.000]	2
			[1.000]	732				
6023104	CUSO4	-12.181	[1.000]	231	[1.000]	732		
6023105	CHALCANTHITE	-6.034	[1.000]	231	[1.000]	732	[5.000]	2
5095000	SMITHSONITE	-1.264	[1.000]	950	[1.000]	140		
5095001	ZNCO3, 1H2O	-0.893	[1.000]	950	[1.000]	140	[1.000]	2

```
   ID #      NAME       Sat. Index         Stoichiometry in [brackets]
 2095000 ZN(OH)2 (A)     -4.129    [ -2.000] 330  [  1.000] 950  [  2.000]   2
 2095001 ZN(OH)2 (C)     -3.879    [ -2.000] 330  [  1.000] 950  [  2.000]   2
 2095002 ZN(OH)2 (B)     -3.429    [ -2.000] 330  [  1.000] 950  [  2.000]   2
 2095003 ZN(OH)2 (G)     -3.389    [ -2.000] 330  [  1.000] 950  [  2.000]   2
 2095004 ZN(OH)2 (E)     -3.179    [ -2.000] 330  [  1.000] 950  [  2.000]   2
 6095000 ZN2(OH)2SO4     -6.763    [ -2.000] 330  [  2.000] 950  [  2.000]   2
                                   [  1.000] 732
 6095001 ZN4(OH)6SO4    -11.021    [ -6.000] 330  [  4.000] 950  [  6.000]   2
                                   [  1.000] 732
 2095005 ZNO(ACTIVE)     -2.989    [ -2.000] 330  [  1.000] 950  [  1.000]   2
 2095006 ZINCITE         -3.375    [ -2.000] 330  [  1.000] 950  [  1.000]   2
 6095002 ZN3O(SO4)2     -27.445    [ -2.000] 330  [  3.000] 950  [  2.000] 732
                                   [  1.000]   2
 6095003 ZINCOSITE      -11.083    [  1.000] 950  [  1.000] 732
 6095004 ZNSO4, 1H2O     -7.285    [  1.000] 950  [  1.000] 732  [  1.000]   2
 6095005 BIANCHITE       -5.825    [  1.000] 950  [  1.000] 732  [  6.000]   2
 6095006 GOSLARITE       -5.542    [  1.000] 950  [  1.000] 732  [  7.000]   2
 5016000 OTAVITE          0.000    [  1.000] 160  [  1.000] 140
 2016000 CD(OH)2 (A)     -8.509    [ -2.000] 330  [  1.000] 160  [  2.000]   2
 2016001 CD(OH)2 (C)     -7.901    [ -2.000] 330  [  1.000] 160  [  2.000]   2
 6016000 CD3(OH)4SO4    -21.218    [ -4.000] 330  [  3.000] 160  [  4.000]   2
                                   [  1.000] 732
 6016001 CD3OH2(SO4)2   -21.274    [ -2.000] 330  [  3.000] 160  [  2.000]   2
                                   [  2.000] 732
 6016002 CD4(OH)6SO4    -21.309    [ -6.000] 330  [  4.000] 160  [  6.000]   2
                                   [  1.000] 732
 2016002 MONTEPONITE    -10.001    [ -2.000] 330  [  1.000] 160  [  1.000]   2
 6016003 CDSO4          -10.431    [  1.000] 160  [  1.000] 732
 6016004 CDSO4, 1H2O     -8.691    [  1.000] 160  [  1.000] 732  [  1.000]   2
 6016005 CDSO4,2.7H2O    -8.393    [  1.000] 160  [  1.000] 732  [  2.670]   2
 5023101 MALACHITE        0.000    [  2.000] 231  [  2.000]   2  [  1.000] 140
                                   [ -2.000] 330
 5023102 AZURITE         -1.046    [  3.000] 231  [  2.000]   2  [  2.000] 140
                                   [ -2.000] 330
 2015000 LIME           -22.922    [ -2.000] 330  [  1.000] 150  [  1.000]   2
 2015001 PORTLANDITE    -12.404    [ -2.000] 330  [  1.000] 150  [  2.000]   2
 2028000 WUSTITE         -3.499    [ -2.000] 330  [  0.947] 280  [  1.000]   2
 2046001 PERICLASE      -11.740    [ -2.000] 330  [  1.000] 460  [  1.000]   2
 3028001 HERCYNITE       -1.895    [ -8.000] 330  [  1.000] 280  [  2.000]  30
                                   [  4.000]   2
 3046000 SPINEL          -9.209    [ -8.000] 330  [  1.000] 460  [  2.000]  30
                                   [  4.000]   2
```

FLAMBEAU MINING COMPANY Equilibration 2
CO2 entered at 1 % (0.01 atm)

Temperature (Celsius): 15.00
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 only for those solids specified as ALLOWED
  in the input file (if any).
The maximum number of iterations is: 200
The method used to compute activity coefficients is: Davies equation
Intermediate output file

330	0.000E-01	-7.00	y
732	1.200E+03	-1.90	y
30	3.500E-01	-4.89	y
160	2.600E-02	-6.64	y
150	3.300E+02	-2.08	y
231	7.300E-01	-4.94	y
280	2.200E+01	-4.40	y
460	1.100E+02	-2.34	y
470	8.900E+00	-3.79	y
950	1.700E+00	-4.58	y
140	0.000E-01	-16.00	y

H2O has been inserted as a COMPONENT

```
  3   1
3301403    20.1600    -0.5300
  4   1
5015001     8.4750     2.5850   1.000E-02
  5   6
5023101     5.4800    15.6100
5016000    13.7400     0.5800
5047000    10.9900     2.0790
6015001     4.8480    -0.2610
2003003    -8.7700    22.8000
5028000    11.0500     5.3280
```

INPUT DATA BEFORE TYPE MODIFICATIONS

ID	NAME	ACTIVITY GUESS	LOG GUESS	ANAL TOTAL
330	H+1	1.000E-07	-7.000	0.000E-01
732	SO4-2	1.259E-02	-1.900	1.200E+03
30	Al+3	1.288E-05	-4.890	3.500E-01
160	Cd+2	2.291E-07	-6.640	2.600E-02
150	Ca+2	8.318E-03	-2.080	3.300E+02
231	Cu+2	1.148E-05	-4.940	7.300E-01
280	Fe+2	3.981E-05	-4.400	2.200E+01
460	Mg+2	4.571E-03	-2.340	1.100E+02
470	Mn+2	1.622E-04	-3.790	8.900E+00
950	Zn+2	2.630E-05	-4.580	1.700E+00

```
140  CO3-2                1.000E-16        -16.000   0.000E-01
  2  H2O                  1.000E+00          0.000   0.000E-01


 Charge Balance: UNSPECIATED

   Sum of CATIONS=  2.679E-02 Sum of ANIONS =  2.503E-02

   PERCENT DIFFERENCE =  3.399E+00  (ANIONS - CATIONS)/(ANIONS + CATIONS)


          -------------------------------------------------------
         | IMPROVED ACTIVITY GUESSES PRIOR TO FIRST ITERATION: |
         |      SO4-2       Log activity guess:    -1.90        |
         |      Al+3        Log activity guess:    -9.95        |
         |      Cu+2        Log activity guess:    -4.99        |
         |      Fe+2        Log activity guess:    -3.40        |
         |      Mn+2        Log activity guess:    -3.79        |
         |      CO3-2       Log activity guess:    -6.17        |
         |                                                     |
          -------------------------------------------------------
```

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

```
H+1                       1.4     PERCENT BOUND IN SPECIES #4601401   MgHCO3
+
               2.0     PERCENT BOUND IN SPECIES #1501400   CaHCO3 +
              77.5     PERCENT BOUND IN SPECIES #3301400   HCO3 -
              20.2     PERCENT BOUND IN SPECIES #3301401   H2CO3 AQ

SO4-2                    69.2     PERCENT BOUND IN SPECIES #     732   SO4-2
               8.8     PERCENT BOUND IN SPECIES #4607320   MgSO4 AQ
              20.9     PERCENT BOUND IN SPECIES #1507320   CaSO4 AQ

Al+3                      6.3     PERCENT BOUND IN SPECIES # 303301   Al(OH)2
+
               9.9     PERCENT BOUND IN SPECIES # 303302   Al(OH)4 -
              83.8     PERCENT BOUND IN SPECIES # 303303   Al(OH)3 AQ

Cd+2                     54.0     PERCENT BOUND IN SPECIES #     160   Cd+2
              29.1     PERCENT BOUND IN SPECIES #1607320   CdSO4 AQ
               6.8     PERCENT BOUND IN SPECIES #1601400   CdHCO3 +
               7.2     PERCENT BOUND IN SPECIES #1601401   CdCO3 AQ
               3.0     PERCENT BOUND IN SPECIES #1607321   Cd(SO4)2-2

Zn+2                     58.7     PERCENT BOUND IN SPECIES #     950   Zn+2
              25.3     PERCENT BOUND IN SPECIES #9507320   ZnSO4 AQ
               1.9     PERCENT BOUND IN SPECIES #9507321   Zn(SO4)2-2
               7.4     PERCENT BOUND IN SPECIES #9501400   ZnHCO3 +
               6.2     PERCENT BOUND IN SPECIES #9501401   ZnCO3 AQ

Cu+2                     15.5     PERCENT BOUND IN SPECIES #     231   Cu+2
              44.1     PERCENT BOUND IN SPECIES #2311400   CuCO3 AQ
               1.2     PERCENT BOUND IN SPECIES #2313300   CuOH +
              25.6     PERCENT BOUND IN SPECIES #2313301   Cu(OH)2 AQ
               5.8     PERCENT BOUND IN SPECIES #2317320   CuSO4 AQ
               7.7     PERCENT BOUND IN SPECIES #2311402   CuHCO3 +

Fe+2                     77.3     PERCENT BOUND IN SPECIES #     280   Fe+2
              22.6     PERCENT BOUND IN SPECIES #2807320   FeSO4 AQ

Mg+2                     74.6     PERCENT BOUND IN SPECIES #     460   Mg+2
               1.1     PERCENT BOUND IN SPECIES #4601401   MgHCO3 +
              24.3     PERCENT BOUND IN SPECIES #4607320   MgSO4 AQ

Mn+2                     74.7     PERCENT BOUND IN SPECIES #     470   Mn+2
              23.8     PERCENT BOUND IN SPECIES #4707320   MnSO4 AQ
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                  1.5      PERCENT BOUND IN SPECIES #4701400   MnHCO3 +

Ca+2                           72.3      PERCENT BOUND IN SPECIES #    150   Ca+2
                 26.9      PERCENT BOUND IN SPECIES #1507320   CaSO4 AQ

H2O                             3.5      PERCENT BOUND IN SPECIES # 303301   Al(OH)2
+
                 11.2      PERCENT BOUND IN SPECIES # 303302   Al(OH)4 -
                 71.0      PERCENT BOUND IN SPECIES # 303303   Al(OH)3 AQ
                 12.8      PERCENT BOUND IN SPECIES #2313301   Cu(OH)2 AQ

CO3-2                           1.5      PERCENT BOUND IN SPECIES #4601401   MgHCO3
+
                  2.2      PERCENT BOUND IN SPECIES #1501400   CaHCO3 +
                 84.6      PERCENT BOUND IN SPECIES #3301400   HCO3 -
                 11.0      PERCENT BOUND IN SPECIES #3301401   H2CO3 AQ
```

PART 5 of OUTPUT FILE

PC MINTEQA2 v3.10 DATE OF CALCULATIONS: 4-MAR-97 TIME: 7: 4:43

----------- PROVISIONAL MASS DISTRIBUTION -----------

IDX	NAME	DISSOLVED		SORBED		PRECIPITATED	
		MOL/KG	PERCENT	MOL/KG	PERCENT	MOL/KG	PERCENT
330	H+1	3.595E-03	100.0	0.000E-01	0.0	0.000E-01	0.0
732	SO4-2	1.251E-02	100.0	0.000E-01	0.0	0.000E-01	0.0
30	Al+3	1.299E-05	100.0	0.000E-01	0.0	0.000E-01	0.0
160	Cd+2	2.317E-07	100.0	0.000E-01	0.0	0.000E-01	0.0
950	Zn+2	2.605E-05	100.0	0.000E-01	0.0	0.000E-01	0.0
231	Cu+2	1.151E-05	100.0	0.000E-01	0.0	0.000E-01	0.0
280	Fe+2	3.946E-04	100.0	0.000E-01	0.0	0.000E-01	0.0
460	Mg+2	4.532E-03	100.0	0.000E-01	0.0	0.000E-01	0.0
470	Mn+2	1.623E-04	100.0	0.000E-01	0.0	0.000E-01	0.0
150	Ca+2	9.743E-03	53.4	0.000E-01	0.0	8.504E-03	46.6
2	H2O	4.598E-05	100.0	0.000E-01	0.0	0.000E-01	0.0
140	CO3-2	3.292E-03	27.9	0.000E-01	0.0	8.504E-03	72.1

Charge Balance: SPECIATED

Sum of CATIONS = 2.187E-02 Sum of ANIONS 2.011E-02

PERCENT DIFFERENCE = 4.197E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

PROVISIONAL IONIC STRENGTH (m) = 4.051E-02

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PART 6 of OUTPUT FILE
PC MINTEQA2 v3.10   DATE OF CALCULATIONS:  4-MAR-97  TIME:   7: 4:43


Saturation indices and stoichiometry of all supersaturated minerals

  ID #      NAME       Sat. Index        Stoichiometry in [brackets]
6003001 AL4(OH)10SO4     4.864     [-10.000] 330  [  4.000]  30  [  1.000] 732
                                   [ 10.000]   2
2003001 BOEHMITE         1.748     [ -3.000] 330  [  1.000]  30  [  2.000]   2
5015001 CALCITE          0.000     [  1.000] 150  [  1.000] 140
2003002 DIASPORE         3.542     [ -3.000] 330  [  1.000]  30  [  2.000]   2
2003003 GIBBSITE (C)     1.691     [ -3.000] 330  [  1.000]  30  [  3.000]   2
6015001 GYPSUM           0.005     [  1.000] 150  [  1.000] 732  [  2.000]   2
5028000 SIDERITE         1.128     [  1.000] 280  [  1.000] 140
5047000 RHODOCHROSIT     0.750     [  1.000] 470  [  1.000] 140
6023101 BROCHANTITE      0.670     [ -6.000] 330  [  4.000] 231  [  6.000]   2
                                   [  1.000] 732
2023101 TENORITE         0.145     [ -2.000] 330  [  1.000] 231  [  1.000]   2
5016000 OTAVITE          0.551     [  1.000] 160  [  1.000] 140
5023101 MALACHITE        1.215     [  2.000] 231  [  2.000]   2  [  1.000] 140
                                   [ -2.000] 330
5023102 AZURITE          0.426     [  3.000] 231  [  2.000]   2  [  2.000] 140
                                   [ -2.000] 330
3028001 HERCYNITE        3.314     [ -8.000] 330  [  1.000] 280  [  2.000]  30
                                   [  4.000]   2
PC MINTEQA2 v3.10   DATE OF CALCULATIONS:  4-MAR-97  TIME:   7: 4:43


ITERATIONS=   6:  SOLID SIDERITE     PRECIPITATES
```

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

```
H+1                  1.4     PERCENT BOUND IN SPECIES #4601401   MgHCO3
+
             2.0     PERCENT BOUND IN SPECIES #1501400   CaHCO3 +
            76.4     PERCENT BOUND IN SPECIES #3301400   HCO3 -
            20.1     PERCENT BOUND IN SPECIES #3301401   H2CO3 AQ

Zn+2                59.0     PERCENT BOUND IN SPECIES #    950   Zn+2
            25.0     PERCENT BOUND IN SPECIES #9507320   ZnSO4 AQ
             1.9     PERCENT BOUND IN SPECIES #9507321   Zn(SO4)2-2
             7.4     PERCENT BOUND IN SPECIES #9501400   ZnHCO3 +
             6.2     PERCENT BOUND IN SPECIES #9501401   ZnCO3 AQ

Mg+2                74.9     PERCENT BOUND IN SPECIES #    460   Mg+2
             1.1     PERCENT BOUND IN SPECIES #4601401   MgHCO3 +
            24.0     PERCENT BOUND IN SPECIES #4607320   MgSO4 AQ

SO4-2               69.3     PERCENT BOUND IN SPECIES #    732   SO4-2
             9.0     PERCENT BOUND IN SPECIES #4607320   MgSO4 AQ
            21.5     PERCENT BOUND IN SPECIES #1507320   CaSO4 AQ

Cu+2                15.6     PERCENT BOUND IN SPECIES #    231   Cu+2
            44.1     PERCENT BOUND IN SPECIES #2311400   CuCO3 AQ
             1.2     PERCENT BOUND IN SPECIES #2313300   CuOH +
            25.5     PERCENT BOUND IN SPECIES #2313301   Cu(OH)2 AQ
             5.8     PERCENT BOUND IN SPECIES #2317320   CuSO4 AQ
             7.8     PERCENT BOUND IN SPECIES #2311402   CuHCO3 +

Cd+2                54.4     PERCENT BOUND IN SPECIES #    160   Cd+2
            28.8     PERCENT BOUND IN SPECIES #1607320   CdSO4 AQ
             6.8     PERCENT BOUND IN SPECIES #1601400   CdHCO3 +
             7.2     PERCENT BOUND IN SPECIES #1601401   CdCO3 AQ
             2.8     PERCENT BOUND IN SPECIES #1607321   Cd(SO4)2-2

Fe+2                77.6     PERCENT BOUND IN SPECIES #    280   Fe+2
            22.3     PERCENT BOUND IN SPECIES #2807320   FeSO4 AQ

Al+3                 6.3     PERCENT BOUND IN SPECIES # 303301   Al(OH)2
+
             9.8     PERCENT BOUND IN SPECIES # 303302   Al(OH)4 -
            83.8     PERCENT BOUND IN SPECIES # 303303   Al(OH)3 AQ

Mn+2                75.0     PERCENT BOUND IN SPECIES #    470   Mn+2
            23.5     PERCENT BOUND IN SPECIES #4707320   MnSO4 AQ
```

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                    1.5     PERCENT BOUND IN SPECIES #4701400   MnHCO3 +

Ca+2                            72.7      PERCENT BOUND IN SPECIES #    150   Ca+2
                   26.5     PERCENT BOUND IN SPECIES #1507320   CaSO4 AQ

CO3-2                            1.5      PERCENT BOUND IN SPECIES #4601401   MgHCO3
+
                    2.2     PERCENT BOUND IN SPECIES #1501400   CaHCO3 +
                   84.7     PERCENT BOUND IN SPECIES #3301400   HCO3 -
                   11.2     PERCENT BOUND IN SPECIES #3301401   H2CO3 AQ

H2O                              2.8      PERCENT BOUND IN SPECIES #3300020   OH-
                    1.3     PERCENT BOUND IN SPECIES # 303301   Al(OH)2 +
                    4.2     PERCENT BOUND IN SPECIES # 303302   Al(OH)4 -
                   26.7     PERCENT BOUND IN SPECIES # 303303   Al(OH)3 AQ
                    1.3     PERCENT BOUND IN SPECIES #2313300   CuOH +
                   58.2     PERCENT BOUND IN SPECIES #2313301   Cu(OH)2 AQ
                    2.3     PERCENT BOUND IN SPECIES #9503300   ZnOH +
                    1.2     PERCENT BOUND IN SPECIES #9503301   Zn(OH)2 AQ
```

PART 5 of OUTPUT FILE

PC MINTEQA2 v3.10 DATE OF CALCULATIONS: 4-MAR-97 TIME: 7: 4:45

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

IDX	NAME	DISSOLVED		SORBED		PRECIPITATED	
		MOL/KG	PERCENT	MOL/KG	PERCENT	MOL/KG	PERCENT
330	H+1	3.609E-03	100.0	0.000E-01	0.0	0.000E-01	0.0
950	Zn+2	2.605E-05	100.0	0.000E-01	0.0	0.000E-01	0.0
460	Mg+2	4.532E-03	100.0	0.000E-01	0.0	0.000E-01	0.0
732	SO4-2	1.205E-02	96.3	0.000E-01	0.0	4.636E-04	3.7
231	Cu+2	2.844E-06	24.7	0.000E-01	0.0	8.663E-06	75.3
160	Cd+2	6.507E-08	28.1	0.000E-01	0.0	1.666E-07	71.9
280	Fe+2	2.950E-05	7.5	0.000E-01	0.0	3.651E-04	92.5
30	Al+3	2.646E-07	2.0	0.000E-01	0.0	1.273E-05	98.0
470	Mn+2	2.896E-05	17.8	0.000E-01	0.0	1.333E-04	82.2
150	Ca+2	9.764E-03	53.5	0.000E-01	0.0	8.483E-03	46.5
140	CO3-2	3.259E-03	27.7	0.000E-01	0.0	8.522E-03	72.3
2	H2O	2.496E-06	100.0	0.000E-01	0.0	0.000E-01	0.0

Charge Balance: SPECIATED

Sum of CATIONS = 2.123E-02 Sum of ANIONS 1.947E-02

PERCENT DIFFERENCE = 4.329E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

EQUILIBRIUM IONIC STRENGTH (m) = 3.925E-02

EQUILIBRIUM pH = 7.107

DATE ID NUMBER: 970304
TIME ID NUMBER: 7044564

PART 6 of OUTPUT FILE

PC MINTEQA2 v3.10   DATE OF CALCULATIONS: 4-MAR-97   TIME: 7: 4:45

Saturation indices and stoichiometry of all minerals

ID #	NAME	Sat. Index	Stoichiometry in [brackets]		
2003000	ALOH3(A)	-1.718	[1.000] 30	[3.000] 2	[-3.000] 330
6003000	ALOHSO4	-4.024	[-1.000] 330	[1.000] 30	[1.000] 732
			[1.000] 2		
6003001	AL4(OH)10SO4	-1.905	[-10.000] 330	[4.000] 30	[1.000] 732
			[10.000] 2		
6015000	ANHYDRITE	-0.313	[1.000] 150	[1.000] 732	
5015000	ARAGONITE	-0.173	[1.000] 150	[1.000] 140	
5046000	ARTINITE	-7.645	[-2.000] 330	[2.000] 460	[1.000] 140
			[5.000] 2		
2003001	BOEHMITE	0.057	[-3.000] 330	[1.000] 30	[2.000] 2
2046000	BRUCITE	-6.019	[1.000] 460	[2.000] 2	[-2.000] 330
5015001	CALCITE	0.000	[1.000] 150	[1.000] 140	
2003002	DIASPORE	1.851	[-3.000] 330	[1.000] 30	[2.000] 2
5015002	DOLOMITE	-0.377	[1.000] 150	[1.000] 460	[2.000] 140
6046000	EPSOMITE	-2.964	[1.000] 460	[1.000] 732	[7.000] 2
2003003	GIBBSITE (C)	0.000	[-3.000] 330	[1.000] 30	[3.000] 2
3003000	Al2O3	-4.280	[2.000] 30	[3.000] 2	[-6.000] 330
6015001	GYPSUM	0.000	[1.000] 150	[1.000] 732	[2.000] 2
5015003	HUNTITE	-5.340	[3.000] 460	[1.000] 150	[4.000] 140
5046001	HYDRMAGNESIT	-16.106	[5.000] 460	[4.000] 140	[-2.000] 330
			[6.000] 2		
5046002	MAGNESITE	-0.871	[1.000] 460	[1.000] 140	
6028000	MELANTERITE	-4.804	[1.000] 280	[1.000] 732	[7.000] 2
5046003	NESQUEHONITE	-3.270	[1.000] 460	[1.000] 140	[3.000] 2
5028000	SIDERITE	0.000	[1.000] 280	[1.000] 140	
2047003	PYROCROITE	-6.426	[-2.000] 330	[1.000] 470	[2.000] 2
5047000	RHODOCHROSIT	0.000	[1.000] 470	[1.000] 140	
6047000	MNSO4	-10.431	[1.000] 470	[1.000] 732	
5023100	CUCO3	-2.998	[1.000] 231	[1.000] 140	
2023100	CU(OH)2	-1.483	[-2.000] 330	[1.000] 231	[2.000] 2
6023100	ANTLERITE	-2.259	[-4.000] 330	[3.000] 231	[4.000] 2
			[1.000] 732		
6023101	BROCHANTITE	-1.764	[-6.000] 330	[4.000] 231	[6.000] 2
			[1.000] 732		
6023102	LANGITE	-4.221	[-6.000] 330	[4.000] 231	[7.000] 2
			[1.000] 732		
2023101	TENORITE	-0.462	[-2.000] 330	[1.000] 231	[1.000] 2
6023103	CUOCUSO4	-13.949	[-2.000] 330	[2.000] 231	[1.000] 2
			[1.000] 732		
6023104	CUSO4	-12.531	[1.000] 231	[1.000] 732	
6023105	CHALCANTHITE	-6.384	[1.000] 231	[1.000] 732	[5.000] 2
5095000	SMITHSONITE	-1.198	[1.000] 950	[1.000] 140	
5095001	ZNCO3, 1H2O	-0.828	[1.000] 950	[1.000] 140	[1.000] 2

```
  ID #      NAME       Sat. Index        Stoichiometry in [brackets]
2095000 ZN(OH)2  (A)    -3.364     [ -2.000] 330   [  1.000] 950   [  2.000]    2
2095001 ZN(OH)2  (C)    -3.114     [ -2.000] 330   [  1.000] 950   [  2.000]    2
2095002 ZN(OH)2  (B)    -2.664     [ -2.000] 330   [  1.000] 950   [  2.000]    2
2095003 ZN(OH)2  (G)    -2.624     [ -2.000] 330   [  1.000] 950   [  2.000]    2
2095004 ZN(OH)2  (E)    -2.414     [ -2.000] 330   [  1.000] 950   [  2.000]    2
6095000 ZN2(OH)2SO4     -5.933     [ -2.000] 330   [  2.000] 950   [  2.000]    2
                                   [  1.000] 732
6095001 ZN4(OH)6SO4     -8.661     [ -6.000] 330   [  4.000] 950   [  6.000]    2
                                   [  1.000] 732
2095005 ZNO(ACTIVE)     -2.224     [ -2.000] 330   [  1.000] 950   [  1.000]    2
2095006 ZINCITE         -2.610     [ -2.000] 330   [  1.000] 950   [  1.000]    2
6095002 ZN3O(SO4)2     -26.548     [ -2.000] 330   [  3.000] 950   [  2.000]  732
                                   [  1.000]   2
6095003 ZINCOSITE      -11.017     [  1.000] 950   [  1.000] 732
6095004 ZNSO4, 1H2O     -7.219     [  1.000] 950   [  1.000] 732   [  1.000]    2
6095005 BIANCHITE       -5.759     [  1.000] 950   [  1.000] 732   [  6.000]    2
6095006 GOSLARITE       -5.476     [  1.000] 950   [  1.000] 732   [  7.000]    2
5016000 OTAVITE          0.000     [  1.000] 160   [  1.000] 140
2016000 CD(OH)2  (A)    -7.810     [ -2.000] 330   [  1.000] 160   [  2.000]    2
2016001 CD(OH)2  (C)    -7.202     [ -2.000] 330   [  1.000] 160   [  2.000]    2
6016000 CD3(OH)4SO4    -19.820     [ -4.000] 330   [  3.000] 160   [  4.000]    2
                                   [  1.000] 732
6016001 CD3OH2(SO4)2   -20.575     [ -2.000] 330   [  3.000] 160   [  2.000]    2
                                   [  2.000] 732
6016002 CD4(OH)6SO4    -19.212     [ -6.000] 330   [  4.000] 160   [  6.000]    2
                                   [  1.000] 732
2016002 MONTEPONITE     -9.302     [ -2.000] 330   [  1.000] 160   [  1.000]    2
6016003 CDSO4          -10.431     [  1.000] 160   [  1.000] 732
6016004 CDSO4, 1H2O     -8.691     [  1.000] 160   [  1.000] 732   [  1.000]    2
6016005 CDSO4,2.7H2O    -8.393     [  1.000] 160   [  1.000] 732   [  2.670]    2
5023101 MALACHITE        0.000     [  2.000] 231   [  2.000]   2   [  1.000]  140
                                   [ -2.000] 330
5023102 AZURITE         -1.396     [  3.000] 231   [  2.000]   2   [  2.000]  140
                                   [ -2.000] 330
2015000 LIME           -22.223     [ -2.000] 330   [  1.000] 150   [  1.000]    2
2015001 PORTLANDITE    -11.705     [ -2.000] 330   [  1.000] 150   [  2.000]    2
2028000 WUSTITE         -2.797     [ -2.000] 330   [  0.947] 280   [  1.000]    2
2046001 PERICLASE      -10.999     [ -2.000] 330   [  1.000] 460   [  1.000]    2
3028001 HERCYNITE       -1.196     [ -8.000] 330   [  1.000] 280   [  2.000]   30
                                   [  4.000]   2
3046000 SPINEL          -8.469     [ -8.000] 330   [  1.000] 460   [  2.000]   30
                                   [  4.000]   2
```

FLAMBEAU MINING COMPANY - Equilibration 2
CO2 entered at 10% (0.10 atm)

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-------------------------------------------------------------------------------
 Temperature (Celsius):  15.00
 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 only for those solids specified as ALLOWED
   in the input file (if any).
 The maximum number of iterations is: 200
 The method used to compute activity coefficients is: Davies equation
 Intermediate output file

-------------------------------------------------------------------------------
    330  0.000E-01   -7.00 y
    732  1.200E+03   -1.90 y
     30  3.500E-01   -4.89 y
    160  2.600E-02   -6.64 y
    150  3.300E+02   -2.08 y
    231  7.300E-01   -4.94 y
    280  2.200E+01   -4.40 y
    460  1.100E+02   -2.34 y
    470  8.900E+00   -3.79 y
    950  1.700E+00   -4.58 y
    140  0.000E-01  -16.00 y

 H2O has been inserted as a COMPONENT
   3   1
3301403    19.1600    -0.5300
   4   1
5015001     8.4750     2.5850   1.000E-02
   5   6
5023101     5.4800    15.6100
5016000    13.7400     0.5800
5047000    10.9900     2.0790
6015001     4.8480    -0.2610
2003003    -8.7700    22.8000
5028000    11.0500     5.3280
```

INPUT DATA BEFORE TYPE MODIFICATIONS

ID	NAME	ACTIVITY GUESS	LOG GUESS	ANAL TOTAL
330	H+1	1.000E-07	-7.000	0.000E-01
732	SO4-2	1.259E-02	-1.900	1.200E+03
30	Al+3	1.288E-05	-4.890	3.500E-01
160	Cd+2	2.291E-07	-6.640	2.600E-02
150	Ca+2	8.318E-03	-2.080	3.300E+02
231	Cu+2	1.148E-05	-4.940	7.300E-01
280	Fe+2	3.981E-05	-4.400	2.200E+01
460	Mg+2	4.571E-03	-2.340	1.100E+02
470	Mn+2	1.622E-04	-3.790	8.900E+00
950	Zn+2	2.630E-05	-4.580	1.700E+00

```
140  CO3-2               1.000E-16      -16.000    0.000E-01
  2  H2O                 1.000E+00        0.000    0.000E-01


 Charge Balance: UNSPECIATED

   Sum of CATIONS=  2.679E-02 Sum of ANIONS =  2.503E-02

   PERCENT DIFFERENCE =  3.399E+00  (ANIONS - CATIONS)/(ANIONS + CATIONS)


          -----------------------------------------------------
         | IMPROVED ACTIVITY GUESSES PRIOR TO FIRST ITERATION: |
         |      SO4-2        Log activity guess:    -1.90       |
         |      Al+3         Log activity guess:    -9.95       |
         |      Cu+2         Log activity guess:    -4.99       |
         |      Fe+2         Log activity guess:    -3.40       |
         |      Mn+2         Log activity guess:    -3.79       |
         |      CO3-2        Log activity guess:    -5.17       |
         |                                                     |
          -----------------------------------------------------
```

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                                PART 4 of OUTPUT FILE
  PC MINTEQA2 v3.10    DATE OF CALCULATIONS:  4-MAR-97  TIME:   7: 4:46


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

H+1                        1.7      PERCENT BOUND IN SPECIES #1501400   CaHCO3
+
              51.1     PERCENT BOUND IN SPECIES #3301400   HCO3 -
              46.5     PERCENT BOUND IN SPECIES #3301401   H2CO3 AQ

SO4-2                     66.9      PERCENT BOUND IN SPECIES #     732   SO4-2
               7.9     PERCENT BOUND IN SPECIES #4607320   MgSO4 AQ
              24.2     PERCENT BOUND IN SPECIES #1507320   CaSO4 AQ

Al+3                      20.4      PERCENT BOUND IN SPECIES # 303301   Al(OH)2
+
               2.6     PERCENT BOUND IN SPECIES # 303302   Al(OH)4 -
              76.2     PERCENT BOUND IN SPECIES # 303303   Al(OH)3 AQ

Cd+2                      50.7      PERCENT BOUND IN SPECIES #     160   Cd+2
              24.3     PERCENT BOUND IN SPECIES #1607320   CdSO4 AQ
              17.4     PERCENT BOUND IN SPECIES #1601400   CdHCO3 +
               5.2     PERCENT BOUND IN SPECIES #1601401   CdCO3 AQ
               2.4     PERCENT BOUND IN SPECIES #1607321   Cd(SO4)2-2

Zn+2                      54.3      PERCENT BOUND IN SPECIES #     950   Zn+2
              20.8     PERCENT BOUND IN SPECIES #9507320   ZnSO4 AQ
               1.5     PERCENT BOUND IN SPECIES #9507321   Zn(SO4)2-2
              18.7     PERCENT BOUND IN SPECIES #9501400   ZnHCO3 +
               4.4     PERCENT BOUND IN SPECIES #9501401   ZnCO3 AQ

Cu+2                      19.8      PERCENT BOUND IN SPECIES #     231   Cu+2
              43.3     PERCENT BOUND IN SPECIES #2311400   CuCO3 AQ
               2.5     PERCENT BOUND IN SPECIES #2313301   Cu(OH)2 AQ
               6.7     PERCENT BOUND IN SPECIES #2317320   CuSO4 AQ
              27.1     PERCENT BOUND IN SPECIES #2311402   CuHCO3 +

Fe+2                      79.3      PERCENT BOUND IN SPECIES #     280   Fe+2
              20.6     PERCENT BOUND IN SPECIES #2807320   FeSO4 AQ

Mg+2                      75.2      PERCENT BOUND IN SPECIES #     460   Mg+2
               3.0     PERCENT BOUND IN SPECIES #4601401   MgHCO3 +
              21.8     PERCENT BOUND IN SPECIES #4607320   MgSO4 AQ

Mn+2                      74.8      PERCENT BOUND IN SPECIES #     470   Mn+2
              21.2     PERCENT BOUND IN SPECIES #4707320   MnSO4 AQ
               4.1     PERCENT BOUND IN SPECIES #4701400   MnHCO3 +
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Ca+2                     73.6      PERCENT BOUND IN SPECIES #    150   Ca+2
                2.1     PERCENT BOUND IN SPECIES #1501400   CaHCO3 +
               24.3     PERCENT BOUND IN SPECIES #1507320   CaSO4 AQ

H2O                      14.2      PERCENT BOUND IN SPECIES # 303301   Al(OH)2
+
                3.6     PERCENT BOUND IN SPECIES # 303302   Al(OH)4 -
               79.9     PERCENT BOUND IN SPECIES # 303303   Al(OH)3 AQ
                1.6     PERCENT BOUND IN SPECIES #2313301   Cu(OH)2 AQ

CO3-2                     1.1      PERCENT BOUND IN SPECIES #4601401   MgHCO3
+
                2.1     PERCENT BOUND IN SPECIES #1501400   CaHCO3 +
               66.3     PERCENT BOUND IN SPECIES #3301400   HCO3 -
               30.2     PERCENT BOUND IN SPECIES #3301401   H2CO3 AQ
```

PART 5 of OUTPUT FILE

PC MINTEQA2 v3.10 DATE OF CALCULATIONS: 4-MAR-97 TIME: 7: 4:46

----------- PROVISIONAL MASS DISTRIBUTION -----------

IDX	NAME	DISSOLVED		SORBED		PRECIPITATED	
		MOL/KG	PERCENT	MOL/KG	PERCENT	MOL/KG	PERCENT
330	H+1	1.560E-02	100.0	0.000E-01	0.0	0.000E-01	0.0
732	SO4-2	1.251E-02	100.0	0.000E-01	0.0	0.000E-01	0.0
30	Al+3	1.299E-05	100.0	0.000E-01	0.0	0.000E-01	0.0
160	Cd+2	2.317E-07	100.0	0.000E-01	0.0	0.000E-01	0.0
950	Zn+2	2.605E-05	100.0	0.000E-01	0.0	0.000E-01	0.0
231	Cu+2	1.151E-05	100.0	0.000E-01	0.0	0.000E-01	0.0
280	Fe+2	3.946E-04	100.0	0.000E-01	0.0	0.000E-01	0.0
460	Mg+2	4.532E-03	100.0	0.000E-01	0.0	0.000E-01	0.0
470	Mn+2	1.623E-04	100.0	0.000E-01	0.0	0.000E-01	0.0
150	Ca+2	1.247E-02	68.3	0.000E-01	0.0	5.778E-03	31.7
2	H2O	3.720E-05	100.0	0.000E-01	0.0	0.000E-01	0.0
140	CO3-2	1.202E-02	67.5	0.000E-01	0.0	5.778E-03	32.5

Charge Balance: SPECIATED

Sum of CATIONS = 2.648E-02 Sum of ANIONS 2.472E-02

PERCENT DIFFERENCE = 3.440E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

PROVISIONAL IONIC STRENGTH (m) = 4.702E-02

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_________________________________ PART 6 of OUTPUT FILE ______________________________
  PC MINTEQA2 v3.10    DATE OF CALCULATIONS:  4-MAR-97   TIME:   7: 4:46


Saturation indices and stoichiometry of all supersaturated minerals

    ID #       NAME       Sat. Index         Stoichiometry in [brackets]
  6003001 AL4(OH)10SO4     5.766     [-10.000] 330  [  4.000]  30  [  1.000] 732
                                     [ 10.000]   2
  2003001 BOEHMITE         1.707     [ -3.000] 330  [  1.000]  30  [  2.000]   2
  5015001 CALCITE          0.000     [  1.000] 150  [  1.000] 140
  2003002 DIASPORE         3.501     [ -3.000] 330  [  1.000]  30  [  2.000]   2
  2003003 GIBBSITE (C)     1.651     [ -3.000] 330  [  1.000]  30  [  3.000]   2
  6015001 GYPSUM           0.069     [  1.000] 150  [  1.000] 732  [  2.000]   2
  5028000 SIDERITE         1.024     [  1.000] 280  [  1.000] 140
  5047000 RHODOCHROSIT     0.635     [  1.000] 470  [  1.000] 140
  5016000 OTAVITE          0.410     [  1.000] 160  [  1.000] 140
  5023101 MALACHITE        0.201     [  2.000] 231  [  2.000]   2  [  1.000] 140
                                     [ -2.000] 330
  3028001 HERCYNITE        2.130     [ -8.000] 330  [  1.000] 280  [  2.000]  30
                                     [  4.000]   2
  PC MINTEQA2 v3.10    DATE OF CALCULATIONS:  4-MAR-97   TIME:   7: 4:46


  ITERATIONS=    7:  SOLID SIDERITE     PRECIPITATES
```

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                                   PART 4 of OUTPUT FILE
  PC MINTEQA2 v3.10   DATE OF CALCULATIONS:  4-MAR-97  TIME:  7: 4:49


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

H+1                         1.6      PERCENT BOUND IN SPECIES #1501400   CaHCO3
+
                 51.4     PERCENT BOUND IN SPECIES #3301400   HCO3 -
                 46.0     PERCENT BOUND IN SPECIES #3301401   H2CO3 AQ

Zn+2                       54.8      PERCENT BOUND IN SPECIES #    950   Zn+2
                 19.3     PERCENT BOUND IN SPECIES #9507320   ZnSO4 AQ
                  1.3     PERCENT BOUND IN SPECIES #9507321   Zn(SO4)2-2
                 19.7     PERCENT BOUND IN SPECIES #9501400   ZnHCO3 +
                  4.8     PERCENT BOUND IN SPECIES #9501401   ZnCO3 AQ

Mg+2                       76.4      PERCENT BOUND IN SPECIES #    460   Mg+2
                  3.2     PERCENT BOUND IN SPECIES #4601401   MgHCO3 +
                 20.3     PERCENT BOUND IN SPECIES #4607320   MgSO4 AQ

Cu+2                       19.0      PERCENT BOUND IN SPECIES #    231   Cu+2
                 44.8     PERCENT BOUND IN SPECIES #2311400   CuCO3 AQ
                  2.6     PERCENT BOUND IN SPECIES #2313301   Cu(OH)2 AQ
                  5.9     PERCENT BOUND IN SPECIES #2317320   CuSO4 AQ
                 27.2     PERCENT BOUND IN SPECIES #2311402   CuHCO3 +

SO4-2                      67.5      PERCENT BOUND IN SPECIES #    732   SO4-2
                  8.5     PERCENT BOUND IN SPECIES #4607320   MgSO4 AQ
                 23.9     PERCENT BOUND IN SPECIES #1507320   CaSO4 AQ

Cd+2                       51.4      PERCENT BOUND IN SPECIES #    160   Cd+2
                 22.6     PERCENT BOUND IN SPECIES #1607320   CdSO4 AQ
                 18.4     PERCENT BOUND IN SPECIES #1601400   CdHCO3 +
                  5.6     PERCENT BOUND IN SPECIES #1601401   CdCO3 AQ
                  2.0     PERCENT BOUND IN SPECIES #1607321   Cd(SO4)2-2

Fe+2                       80.7      PERCENT BOUND IN SPECIES #    280   Fe+2
                 19.3     PERCENT BOUND IN SPECIES #2807320   FeSO4 AQ

Al+3                       19.9      PERCENT BOUND IN SPECIES # 303301   Al(OH)2
+
                  2.6     PERCENT BOUND IN SPECIES # 303302   Al(OH)4 -
                 76.7     PERCENT BOUND IN SPECIES # 303303   Al(OH)3 AQ

Mn+2                       75.9      PERCENT BOUND IN SPECIES #    470   Mn+2
                 19.8     PERCENT BOUND IN SPECIES #4707320   MnSO4 AQ
                  4.3     PERCENT BOUND IN SPECIES #4701400   MnHCO3 +
```

H2O	1.5	PERCENT BOUND IN SPECIES	#3300020	OH-
	8.4	PERCENT BOUND IN SPECIES	# 303301	Al(OH)2 +
	2.2	PERCENT BOUND IN SPECIES	# 303302	Al(OH)4 -
	48.8	PERCENT BOUND IN SPECIES	# 303303	Al(OH)3 AQ
	2.6	PERCENT BOUND IN SPECIES	#2313300	CuOH +
	33.7	PERCENT BOUND IN SPECIES	#2313301	Cu(OH)2 AQ
	1.1	PERCENT BOUND IN SPECIES	#9503300	ZnOH +
Ca+2	75.0	PERCENT BOUND IN SPECIES	# 150	Ca+2
	2.2	PERCENT BOUND IN SPECIES	#1501400	CaHCO3 +
	22.8	PERCENT BOUND IN SPECIES	#1507320	CaSO4 AQ
CO3-2	1.2	PERCENT BOUND IN SPECIES	#4601401	MgHCO3 +
	2.1	PERCENT BOUND IN SPECIES	#1501400	CaHCO3 +
	66.7	PERCENT BOUND IN SPECIES	#3301400	HCO3 -
	29.9	PERCENT BOUND IN SPECIES	#3301401	H2CO3 AQ

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

IDX	NAME	DISSOLVED		SORBED		PRECIPITATED	
		MOL/KG	PERCENT	MOL/KG	PERCENT	MOL/KG	PERCENT
330	H+1	1.578E-02	100.0	0.000E-01	0.0	0.000E-01	0.0
950	Zn+2	2.605E-05	100.0	0.000E-01	0.0	0.000E-01	0.0
460	Mg+2	4.532E-03	100.0	0.000E-01	0.0	0.000E-01	0.0
231	Cu+2	8.838E-06	76.8	0.000E-01	0.0	2.669E-06	23.2
732	SO4-2	1.085E-02	86.7	0.000E-01	0.0	1.666E-03	13.3
160	Cd+2	8.275E-08	35.7	0.000E-01	0.0	1.490E-07	64.3
280	Fe+2	3.407E-05	8.6	0.000E-01	0.0	3.605E-04	91.4
30	Al+3	2.889E-07	2.2	0.000E-01	0.0	1.270E-05	97.8
470	Mn+2	3.438E-05	21.2	0.000E-01	0.0	1.279E-04	78.8
2	H2O	1.362E-06	100.0	0.000E-01	0.0	0.000E-01	0.0
150	Ca+2	1.137E-02	62.3	0.000E-01	0.0	6.882E-03	37.7
140	CO3-2	1.216E-02	68.1	0.000E-01	0.0	5.706E-03	31.9

Charge Balance: SPECIATED

Sum of CATIONS = 2.452E-02 Sum of ANIONS 2.275E-02

PERCENT DIFFERENCE = 3.727E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

EQUILIBRIUM IONIC STRENGTH (m) = 4.301E-02

EQUILIBRIUM pH = 6.572

DATE ID NUMBER: 970304
TIME ID NUMBER: 7044916

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                         PART 6 of OUTPUT FILE
 PC MINTEQA2 v3.10   DATE OF CALCULATIONS:  4-MAR-97  TIME:  7: 4:49


Saturation indices and stoichiometry of all minerals

    ID #      NAME        Sat. Index        Stoichiometry in [brackets]
 2003000 ALOH3(A)         -1.718     [  1.000]  30   [  3.000]    2   [ -3.000] 330
 6003000 ALOHSO4          -3.024     [ -1.000] 330   [  1.000]   30   [  1.000] 732
                                     [  1.000]   2
 6003001 AL4(OH)10SO4     -0.905     [-10.000] 330   [  4.000]   30   [  1.000] 732
                                     [ 10.000]   2
 6015000 ANHYDRITE        -0.313     [  1.000] 150   [  1.000]  732
 5015000 ARAGONITE        -0.173     [  1.000] 150   [  1.000]  140
 5046000 ARTINITE         -8.787     [ -2.000] 330   [  2.000]  460   [  1.000] 140
                                     [  5.000]   2
 2003001 BOEHMITE          0.057     [ -3.000] 330   [  1.000]   30   [  2.000]   2
 2046000 BRUCITE          -7.090     [  1.000] 460   [  2.000]    2   [ -2.000] 330
 5015001 CALCITE           0.000     [  1.000] 150   [  1.000]  140
 2003002 DIASPORE          1.851     [ -3.000] 330   [  1.000]   30   [  2.000]   2
 5015002 DOLOMITE         -0.448     [  1.000] 150   [  1.000]  460   [  2.000] 140
 6046000 EPSOMITE         -3.035     [  1.000] 460   [  1.000]  732   [  7.000]   2
 2003003 GIBBSITE (C)      0.000     [ -3.000] 330   [  1.000]   30   [  3.000]   2
 3003000 Al2O3            -4.280     [  2.000]  30   [  3.000]    2   [ -6.000] 330
 6015001 GYPSUM            0.000     [  1.000] 150   [  1.000]  732   [  2.000]   2
 5015003 HUNTITE          -5.553     [  3.000] 460   [  1.000]  150   [  4.000] 140
 5046001 HYDRMAGNESIT    -17.461     [  5.000] 460   [  4.000]  140   [ -2.000] 330
                                     [  6.000]   2
 5046002 MAGNESITE        -0.942     [  1.000] 460   [  1.000]  140
 6028000 MELANTERITE      -4.804     [  1.000] 280   [  1.000]  732   [  7.000]   2
 5046003 NESQUEHONITE     -3.341     [  1.000] 460   [  1.000]  140   [  3.000]   2
 5028000 SIDERITE          0.000     [  1.000] 280   [  1.000]  140
 2047003 PYROCROITE       -7.426     [ -2.000] 330   [  1.000]  470   [  2.000]   2
 5047000 RHODOCHROSIT      0.000     [  1.000] 470   [  1.000]  140
 6047000 MNSO4           -10.431     [  1.000] 470   [  1.000]  732
 5023100 CUCO3            -2.498     [  1.000] 231   [  1.000]  140
 2023100 CU(OH)2          -1.983     [ -2.000] 330   [  1.000]  231   [  2.000]   2
 6023100 ANTLERITE        -2.759     [ -4.000] 330   [  3.000]  231   [  4.000]   2
                                     [  1.000] 732
 6023101 BROCHANTITE      -2.764     [ -6.000] 330   [  4.000]  231   [  6.000]   2
                                     [  1.000] 732
 6023102 LANGITE          -5.221     [ -6.000] 330   [  4.000]  231   [  7.000]   2
                                     [  1.000] 732
 2023101 TENORITE         -0.962     [ -2.000] 330   [  1.000]  231   [  1.000]   2
 6023103 CUOCUSO4        -13.949     [ -2.000] 330   [  2.000]  231   [  1.000]   2
                                     [  1.000] 732
 6023104 CUSO4           -12.031     [  1.000] 231   [  1.000]  732
 6023105 CHALCANTHITE     -5.884     [  1.000] 231   [  1.000]  732   [  5.000]   2
 5095000 SMITHSONITE      -1.310     [  1.000] 950   [  1.000]  140
 5095001 ZNCO3, 1H2O      -0.940     [  1.000] 950   [  1.000]  140   [  1.000]   2
```

ID #	NAME	Sat. Index	Stoichiometry in [brackets]					
2095000	ZN(OH)2 (A)	-4.476	[-2.000]	330	[1.000]	950	[2.000]	2
2095001	ZN(OH)2 (C)	-4.226	[-2.000]	330	[1.000]	950	[2.000]	2
2095002	ZN(OH)2 (B)	-3.776	[-2.000]	330	[1.000]	950	[2.000]	2
2095003	ZN(OH)2 (G)	-3.736	[-2.000]	330	[1.000]	950	[2.000]	2
2095004	ZN(OH)2 (E)	-3.526	[-2.000]	330	[1.000]	950	[2.000]	2
6095000	ZN2(OH)2SO4	-7.157	[-2.000]	330	[2.000]	950	[2.000]	2
			[1.000]	732				
6095001	ZN4(OH)6SO4	-12.109	[-6.000]	330	[4.000]	950	[6.000]	2
			[1.000]	732				
2095005	ZNO(ACTIVE)	-3.336	[-2.000]	330	[1.000]	950	[1.000]	2
2095006	ZINCITE	-3.722	[-2.000]	330	[1.000]	950	[1.000]	2
6095002	ZN3O(SO4)2	-27.884	[-2.000]	330	[3.000]	950	[2.000]	732
			[1.000]	2				
6095003	ZINCOSITE	-11.129	[1.000]	950	[1.000]	732		
6095004	ZNSO4, 1H2O	-7.331	[1.000]	950	[1.000]	732	[1.000]	2
6095005	BIANCHITE	-5.871	[1.000]	950	[1.000]	732	[6.000]	2
6095006	GOSLARITE	-5.588	[1.000]	950	[1.000]	732	[7.000]	2
5016000	OTAVITE	0.000	[1.000]	160	[1.000]	140		
2016000	CD(OH)2 (A)	-8.810	[-2.000]	330	[1.000]	160	[2.000]	2
2016001	CD(OH)2 (C)	-8.202	[-2.000]	330	[1.000]	160	[2.000]	2
6016000	CD3(OH)4SO4	-21.820	[-4.000]	330	[3.000]	160	[4.000]	2
			[1.000]	732				
6016001	CD3OH2(SO4)2	-21.575	[-2.000]	330	[3.000]	160	[2.000]	2
			[2.000]	732				
6016002	CD4(OH)6SO4	-22.212	[-6.000]	330	[4.000]	160	[6.000]	2
			[1.000]	732				
2016002	MONTEPONITE	-10.302	[-2.000]	330	[1.000]	160	[1.000]	2
6016003	CDSO4	-10.431	[1.000]	160	[1.000]	732		
6016004	CDSO4, 1H2O	-8.691	[1.000]	160	[1.000]	732	[1.000]	2
6016005	CDSO4,2.7H2O	-8.393	[1.000]	160	[1.000]	732	[2.670]	2
5023101	MALACHITE	0.000	[2.000]	231	[2.000]	2	[1.000]	140
			[-2.000]	330				
5023102	AZURITE	-0.896	[3.000]	231	[2.000]	2	[2.000]	140
			[-2.000]	330				
2015000	LIME	-23.223	[-2.000]	330	[1.000]	150	[1.000]	2
2015001	PORTLANDITE	-12.705	[-2.000]	330	[1.000]	150	[2.000]	2
2028000	WUSTITE	-3.801	[-2.000]	330	[0.947]	280	[1.000]	2
2046001	PERICLASE	-12.070	[-2.000]	330	[1.000]	460	[1.000]	2
3028001	HERCYNITE	-2.196	[-8.000]	330	[1.000]	280	[2.000]	30
			[4.000]	2				
3046000	SPINEL	-9.539	[-8.000]	330	[1.000]	460	[2.000]	30
			[4.000]	2				

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Foth & Van Dyke
engineers · architects · scientists

April 17, 1997

Mr. Lawrence J. Lynch
Mine Reclamation Section
Bureau of Waste Management
Wisconsin Department of Natural Resources
101 South Webster Street
P.O. Box 7921
Madison, WI 53707-7921

Dear Mr. Lynch:

Re: Flambeau Mining Company - Addendum No. 1 to the "1997 Backfilling Plan for Stockpiled Type II Material" Report

On behalf of Flambeau Mining Company (Flambeau), Foth & Van Dyke submitted to the Wisconsin Department of Natural Resources (WDNR) in March 1997 the report titled *1997 Backfilling Plan for Stockpiled Type II Material*. The report provided detailed information regarding the testing that was performed to refine the limestone addition rate and the quality assurance/quality control procedures to be used by Flambeau in 1997 for pit backfilling using material from the Type II stockpile. The report included the results of the testing performed on Type I material.

The report also noted that acid consumption and additional column pore water tests were planned and that the results of these tests would be provided to the WDNR at a later date. On behalf of Flambeau, Foth & Van Dyke is providing your agency with the additional test results through this addendum to the March 1997 report.

The addendum provides details on the acid consumption test results and discusses the relevancy of the test results to the recommended limestone addition rates for stockpiled Type II material. Please note that while the results of the acid consumption tests support the use of a limestone availability higher than the 67% presented in the March 1997 report, Flambeau has chosen to retain the earlier value. The addendum closes by presenting the results of the fourth and fifth column pore water displacement analytical tests. The work documented in this addendum was performed by Foth & Van Dyke and Steffen, Robertson and Kirsten, Inc. of Vancouver, British Columbia.

2737 South Ridge Road · P.O. Box 19012 · Green Bay, WI 54307-9012 · 414-497-2500 · Fax: 414-497-8516

1 Acid Consumption Tests

Acid consumption tests were performed on the three types of materials listed below:

- "Starter materials", i.e., the waste rock prior to the addition of limestone;
- Limestone column residues, i.e., samples of material taken from the limestone amended column tests, after completion of the fifth pore water displacement cycle; and,
- Lime column residues, i.e., samples extracted from the lime amended column tests, after completion of the fifth pore water displacement cycle.

The acid consumption tests were performed to provide a further check on limestone availability, and hence confirm the limestone addition rates for the stockpiled Type II material presented in the March 1997 report. Limestone availability in that report was calculated from the column test data using the following equation:

Limestone Availability = *(Acidity Treated / Limestone Addition)*100%

= *(Initial Acidity - Acidity Release) (100%) / Limestone Addition*

The representation of *Acidity Treated* by the term in parentheses in the above equation is based on the assumption that there is no net storage of acidity or alkalinity in the column. If there is storage of acidity or alkalinity:

Acidity Treated = *Initial Acidity - Acidity Release - Acidity Storage*

or:

Acidity Treated = *Initial Acidity - Acidity Release + Alkalinity Storage*

The acid consumption tests therefore provided a measure of the acidity or alkalinity stored in the columns, and allowed the estimates of *Acidity Treated* and *Limestone Availability* represented in the March 1997 report to be confirmed.

The protocol used for the acid consumption tests is contained in Attachment 1. The test involves immersing a known amount of air dried sample in sulfuric acid for 24 hours and then titrating an aliquot of the resulting solution with sodium hydroxide to a stable endpoint pH. From the test results, the residual neutralization potential is then calculated.

1.1 Test Results

Raw results from the acid consumption tests are presented in Attachments 2 and 3. Tables 1, 2 and 3 present summary results and calculations for the starter materials, limestone amended residues, and lime amended residues, respectively.

The calculations convert the parameters measured during the test to estimates of the alkalinity or acidity in each sample. The steps required were as follows:

- The amount of acid added to the sample material in the units of milligrams of $CaCO_3$ equivalent per gram of waste rock (mg $CaCO_3$/g) was calculated.

- The amount of base required to back-titrate the acidified material to pH 8.3 in the units of milligrams of $CaCO_3$ equivalent per gram of waste rock (mg $CaCO_3$/g) was calculated.

- The converted acid and base quantities were then subtracted to estimate the alkalinity (in mg $CaCO_3$/g) associated with the sample.

A negative value in the last column of the Tables 1 through 3 indicates that the base added in the back-titration was greater than the acidity added in the initial step, i.e. that the sample's acidity exceeded its alkalinity. The alkalinity (or acidity) associated with each sample was used in the calculations below.

1.2 Alkalinity/Acidity Balance Calculations

The results of the acid consumption tests allowed an alkalinity/acidity mass balance to be calculated for each column. The general form of the mass balance was:

Initial Alkalinity + Alkalinity Addition - Alkalinity Release = Alkalinity in Residue

As discussed in Section 1 above, the first three parameters were quantified at the time the March 1997 report was written. Using these values the alkalinity in the residue was estimated. The acid consumption tests on the column residues provide a method to measure the fourth quantity.

Furthermore, the acid consumption tests on the starter materials provide an additional measure of the initial alkalinity/acidity. Prior to completing the mass balance calculations, the results of the acid consumption tests on starter materials (Table 1) were compared to the results of the alkali demand tests. Alkali demand tests were conducted on the starter materials in order to establish the amount of limestone to add to the waste rock placed in the columns. The comparison is shown graphically in Figure 1, which plots both sets of estimates against paste pH values measured in the starter materials. The figure shows a wide scatter in the results from the acid consumption tests when compared to the alkali demand test results, particularly for samples that initially had a low paste pH. In five of the starter material samples, the acid consumption tests indicated a net alkalinity surplus (a negative alkalinity demand), despite the fact that the initial paste pH was clearly acidic. The scatter is probably due to the influence of silicate and hydroxide phases that may have partially dissolved at the low pH reached during the acidification step of the acid consumption test, which then confounded the subsequent back-titration. The alkali demand test, on the other hand, includes only the (forward) titration with base, and is therefore not confounded by the minerals that buffer lower pH reactions.

Tables 4 and 5 show the alkalinity/acidity mass balance calculated by two methods as listed below:

- In Table 4, the initial alkalinity in the sample is estimated from the results of the acid consumption tests on starter materials.
- In Table 5, the initial alkalinity in the column is estimated from results of the alkali demand tests.

In both methods, the alkalinity addition and alkalinity release were obtained from the column test program. Also in both methods, the alkalinity in the residue was obtained from the acid consumption tests.

Results of the acid consumption tests on the starter materials were used in Table 4 to facilitate a direct comparison with the estimates of the residual alkalinity in the residues from the column test program, which was also measured by the acid consumption test. In theory, the low pH buffering should be consistent across both sets of acid consumption tests, and should cancel out when the two sides of the mass balance are compared. However, the mass balance results given in the last column of Table 4 show that, for many of the samples, the effects of the low pH buffering across both sets of acid consumption tests did not cancel out. Samples with the best mass balance (i.e., within 1 mg $CaCO_3$/g) are underlined in the table. It is noteworthy that the samples with the best mass balance generally also showed the best agreement between the two estimates of initial alkalinity.

The estimates of initial alkalinity in Table 5, obtained from the results of the alkali demand test, would be expected to be more accurate than the corresponding estimates obtained from the acid consumption tests performed on the starter materials, given in Table 4. Notwithstanding this factor, given the likely confounding of the back-titration step in the acid consumption test used to measure the residual alkalinity in the column residue, it could be postulated that mass balance differences in Table 5 would also show wide differences. A review of the data in the table shows that the nature and range of mass balance differences are in fact similar to those in Table 4. Samples with the best mass balance (e.g., within 1 mg $CaCO_3$/g) are underlined in the table. Again, the best results are generally reported for samples where the acid consumption and alkali demand tests gave similar results.

Despite the likely confounding effect of the partial dissolution of silicate and hydroxide phases in the acid consumption tests, one third of the columns in each of Tables 4 and 5 show a mass balance within 1 mg $CaCO_3$/g. The results from these columns were used in the subsequent calculations to determine the potential availability of the limestone added to the waste rock charged in each column. Similar calculations were not performed for the remaining columns since the results of the calculations may not be reliable due to the mass balance differences.

2 Limestone Availability Estimates Based on Results from the Acid Consumption Tests

Results from the columns that exhibited the best mass balance were used to calculate estimates of limestone availability from the column test data. The equation used to estimate limestone availability was:

Limestone Availability = *(Acidity Treated / Limestone Addition)*100%

The *Acidity Treated* is the amount of acidity consumed within the column, by reaction with the limestone addition. It was estimated from the mass balance:

Initial Acidity + Acidity Treated - Acidity Release = Acidity Storage i.e.:

Acidity Treated = *Initial Acidity - Acidity Release - Acidity Storage.*

In fact, the calculations were carried out using the alkalinity values shown in Tables 4 and 5, so that the actual equation for *Acidity Treated* was:

Acidity Treated = *- Initial Alkalinity + Alkalinity Release + Alkalinity Storage.*

This methodology follows the convention introduced in Section 1 that acidity is represented by negative alkalinity.

Results of the limestone availability calculations on samples that exhibited the best mass balances are shown in the last columns of Tables 6 and 7. The average of the reported value for both methods combined is 98%. If the reported values above 100% are fixed at 100%, the average is 90%. The lowest value listed in the two tables was 66% for column LS 172 by the second mass balance method. This value is approximately equal to the 67% value derived in the March 1997 report. Tables 6 and 7 also show paste pH values measured in the starter materials and the limestone addition rates calculated from the alkali demand tests. These values indicate that the samples in the tables cover the range of properties expected in the Type II material.

Table 8 summarizes limestone availability estimates for each of the 18 limestone amended columns set up in the column testing program calculated using the method discussed in the March 1997 report. That method does not include the measurement of the residual alkalinity. A comparison of results in Table 8 with corresponding results in Tables 6 and 7 shows that the method used to determine limestone availability in the March 1997 report tends to under-estimate limestone availability, and is therefore conservative. The overall average of the limestone availability estimates in Table 8 is 66%. However, this value is strongly influenced by several cases where the initial release of acidity from the column was high in proportion to the alkalinity addition. In such cases, the method used in the March 1997 report gives an unreliably low estimate, which is very conservative. In columns to which a high or moderate amount of alkalinity was added, or which exhibited a low release in the initial pore volume, the calculated limestone availability is much higher, averaging 82%. This is more consistent with the results shown in Tables 6 and 7.

The March 1997 report conservatively estimated that the limestone added to the columns would be 67% available, and subsequently a factor of 1.48 was used to convert theoretical limestone requirements to recommended limestone addition rates. In spite of the new results suggesting that the limestone availability will be greater than 80%, Flambeau has chosen to retain the earlier assumptions and conversion factor which builds another degree of conservatism into the limestone addition rates to be used during the backfilling of Type II material.

3 Final Cycles of Column Tests

Column pore water test results for the first three displacements were discussed in the March 1997 report. It was clear that some of the expected neutralization and secondary precipitation reactions were not at equilibrium by the time the third cycle was analyzed. As explained in the report, some of the tests were therefore continued for two more cycles to allow further equilibration. Results from these two additional cycles, the fourth and fifth pore water displacements, are discussed below.

Laboratory results of the analyses of the fourth and fifth pore water displacements extracted from each column are included in Attachment 4. Laboratory results for the first three pore water displacements were included in the March 1997 report. A complete data base of analytical results for all five pore volume displacement tests is also included in Attachment 4. As discussed in the March 1997 report, the column tests were continued beyond the third pore water displacements to demonstrate that metal concentrations and pH would further equilibrate. Figures 2 and 3 illustrate the trends in copper and manganese concentrations in the limestone treated columns, respectively. The upper plot in each figure shows concentration vs. pH for the first three pore volumes. The lower plot shows results for the final two pore volumes.

The copper concentrations clearly show a trend toward equilibration with secondary mineral phases. The results from early pore volumes are widely scattered. In contrast, the latter pore volumes show a clear relationship between pH and copper concentration, as would be expected in equilibrium with copper carbonate phases.

The manganese concentrations are also widely scattered in the early pore volumes. In the latter pore volumes, the range of manganese concentrations is slightly diminished. In particular, the higher concentrations in the early pore volumes disappear in the latter pore volumes. At the neutral pH expected in the backfilled pit, manganese concentrations are typically around 1 mg/l, with one set of samples (from column LS-180) consistently higher at around 10 mg/l.

In both Figures 2 and 3, the trends in pH are clear. The latter pore volumes of the column tests generally exhibit more neutral pH values than the earlier pore volumes. The change indicates that the pore water is continuing to equilibrate with the calcite and/or secondary minerals. However, the shift in pH diminishes with each pore volume, suggesting that much longer contact times than used in the column testing would be required to see significant changes in pH after the fourth and fifth pore volume. Finally, the results from the fourth and fifth pore volumes do not show any inconsistencies with the modeled pit pore water quality predictions discussed in Section 4.5.5 of the March 1997 report.

4 Closing Comments

This concludes the discussion of the additional testing performed on stockpiled Type II materials. If you have any questions regarding the discussion please contact me at (414) 496-6834 or Jana Murphy of Flambeau at (715) 532-6690.

Sincerely,

Foth & Van Dyke

Jerry W. Sevick

Jerry W. Sevick, P.E.
Vice President

JWS:mld2

Attachments

cc: Mr. Ken Markart, Wisconsin Department of Natural Resources
Mr. Jeff Earnshaw, Flambeau Mining Company
Ms. Jana Murphy, Flambeau Mining Company
Mr. Thure Osuldsen, Rusk County Board
Mr. Tom Riegel, Town of Grant
Mr. Al Christianson, City of Ladysmith
Mr. Melvin Spencer, Rusk County Zoning Administrator
Mr. Daryl Hockley, Steffen, Robertson and Kirsten, Inc.

Figure 1
Comparison of two methods to estimate Initial Acidity

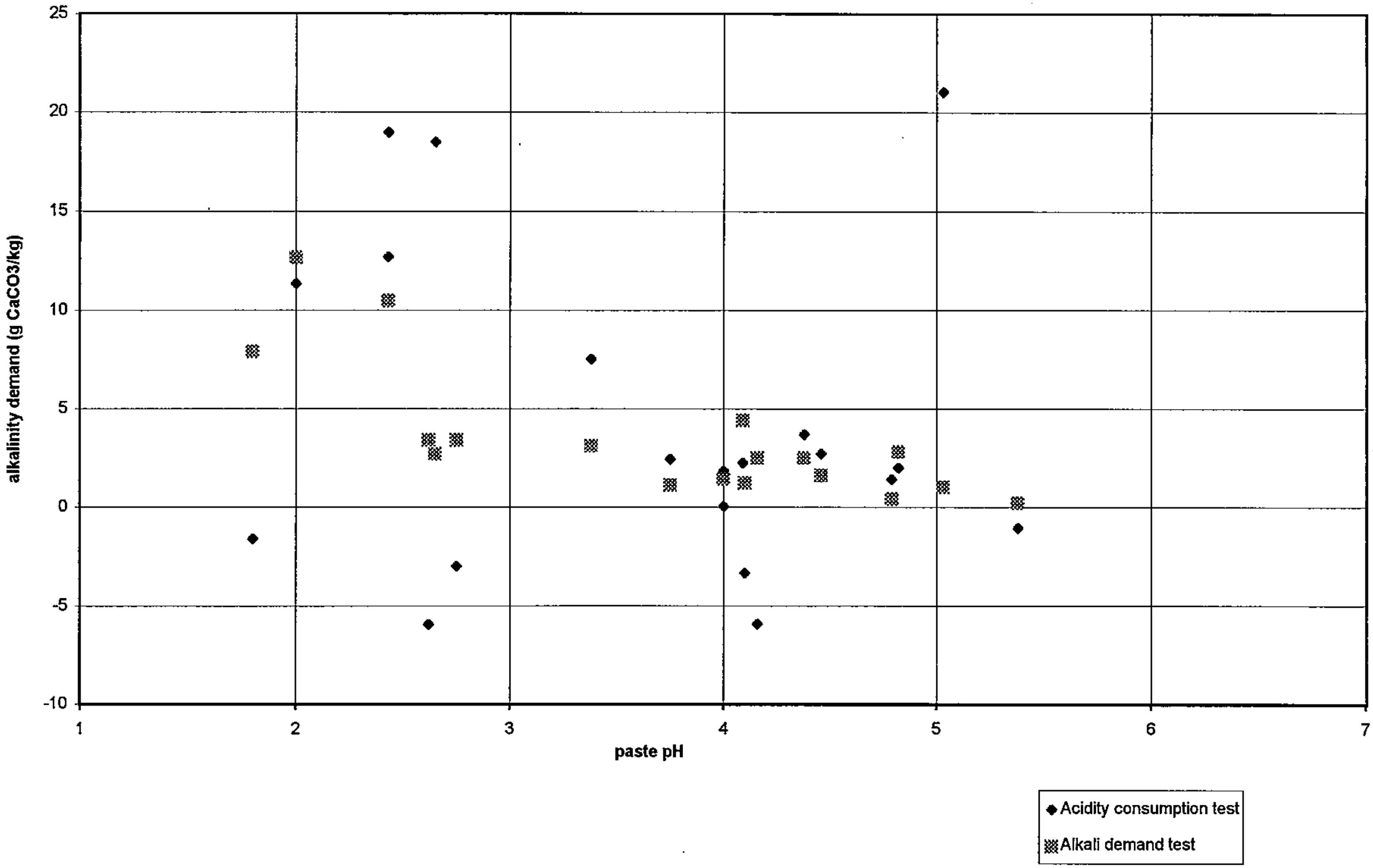


Figure 2
Copper Concentrations in Column Tests

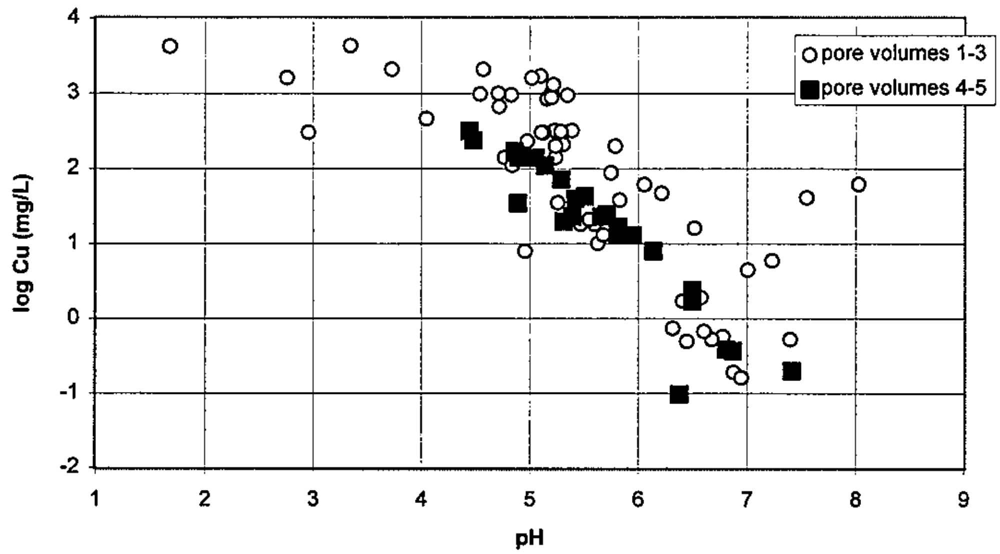


Figure 3
Manganese Concentrations in Column Tests

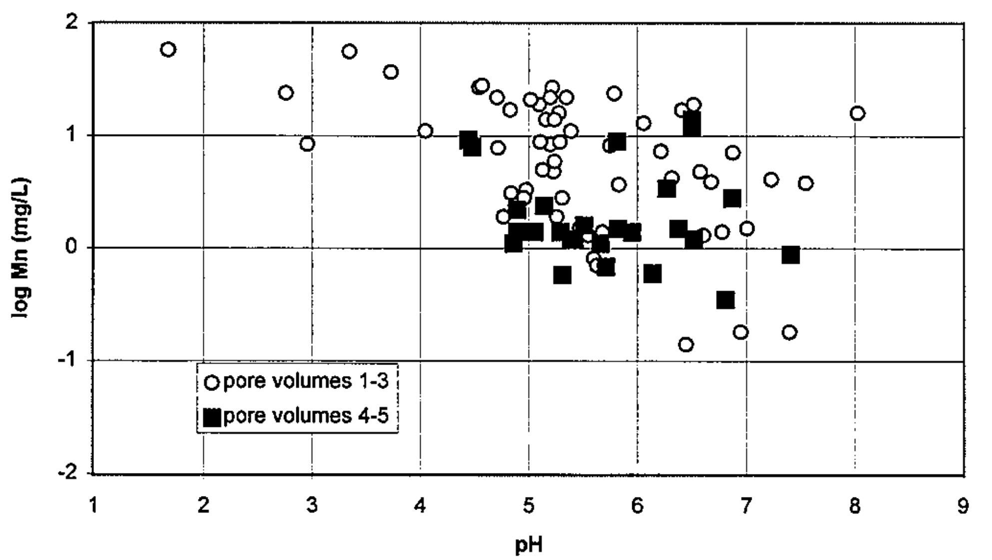


Table 1

Summary Data and Calculations for Acid Consumption Tests on Starter Material

Sample	ACIDIFICATION						BACK-TITRATION						Sample Alkalinity
	Sample Mass	Acid Volume	H_2SO_4 Strength	Acid Added			Volume Titrated	Base to pH 8.3	NaOH Strength	Base Added			
	g	ml	mol/L	mol $CaCO_3$ eq	g $CaCO_3$	mg $CaCO_3$/g	ml	ml	N	mol $CaCO_3$ eq	g $CaCO_3$	mg $CaCO_3$/g	mg $CaCO_3$/g
SM 4-1	50.1	748.2	0.010	0.0075	0.748	14.9	100	12.10	0.0991	0.00060	0.0600	9.0	6.0
SM 8-1	50.0	744.2	0.010	0.0074	0.744	14.9	100	44.80	0.1000	0.00224	0.2240	33.3	-18.5
SM 13-1	50.2	745.5	0.010	0.0075	0.746	14.9	100	46.50	0.0979	0.00228	0.2276	33.8	-19.0
SM 13-1 Dup	50.1	785.8	0.010	0.0079	0.786	15.7	100	36.50	0.0991	0.00181	0.1809	28.4	-12.7
SM 15-1	50.3	743.9	0.010	0.0074	0.744	14.8	100	35.30	0.1000	0.00177	0.1765	26.1	-11.3
SM 15-3	50.5	744.0	0.010	0.0074	0.744	14.7	100	17.95	0.0991	0.00089	0.0889	13.1	1.6
SM 170	50.7	744.4	0.010	0.0074	0.744	14.7	100	24.15	0.0979	0.00118	0.1182	17.4	-2.7
SM 172	50.3	745.4	0.010	0.0075	0.745	14.8	100	22.90	0.0979	0.00112	0.1121	16.6	-1.8
SM 176	50.5	743.4	0.010	0.0074	0.743	14.7	100	25.50	0.0979	0.00125	0.1248	18.4	-3.7
SM 180	50.2	747.5	0.010	0.0075	0.748	14.9	100	12.10	0.0991	0.00060	0.0600	8.9	6.0
SM 181	50.1	744.3	0.010	0.0074	0.744	14.9	100	30.35	0.0991	0.00150	0.1504	22.3	-7.5
SM 183	50.0	742.1	0.010	0.0074	0.742	14.8	100	15.60	0.0991	0.00077	0.0773	11.5	3.4
SM 186	50.4	742.4	0.010	0.0074	0.742	14.7	100	23.00	0.1000	0.00115	0.1150	16.9	-2.2
SM 187	50.2	745.9	0.010	0.0075	0.746	14.9	100	49.30	0.0979	0.00241	0.2413	35.9	-21.0
SM 188	50.0	745.4	0.010	0.0075	0.745	14.9	100	23.10	0.0979	0.00113	0.1131	16.9	-1.9
SM 190	50.4	745.2	0.010	0.0075	0.745	14.8	100	22.30	0.0979	0.00109	0.1092	16.1	-1.4
SM 192	50.0	743.5	0.010	0.0074	0.744	14.9	100	18.95	0.0979	0.00093	0.0928	13.8	1.1
SM 194	50.0	743.1	0.010	0.0074	0.743	14.9	100	23.20	0.1000	0.00116	0.1160	17.2	-2.4
SM 213	50.4	747.1	0.010	0.0075	0.747	14.8	100	16.25	0.0979	0.00080	0.0795	11.8	3.0

Table 2

Summary Data and Calculations for Acid Consumption Tests on Residues from Limestone Amended Columns

Sample	ACIDIFICATION						BACK-TITRATION						Sample Alkalinity
	Sample Mass	Acid Volume	H_2SO_4 Strength	Acid Added			Volume Titrated	Base to pH 8.3	NaOH Atregth	Base Added			
	g	ml	mol/L	mol $CaCO_3$ eq	g $CaCO_3$	mg $CaCO_3$/g	ml	ml	N	mol $CaCO_3$ eq	g $CaCO_3$	mg $CaCO_3$/g	mg $CaCO_3$/g
LS 8-1	50.0	743.5	0.010	0.0074	0.744	14.9	100	17.60	0.0979	0.00086	0.0862	12.8	2.1
LS 13-1	50.6	743.5	0.010	0.0074	0.744	14.7	100	13.00	0.0979	0.00064	0.0636	9.4	5.3
LS 15-1	48.1	746.3	0.010	0.0075	0.746	15.5	100	14.33	0.0979	0.00070	0.0701	10.9	4.6
LS 170	50.2	747.1	0.010	0.0075	0.747	14.9	100	42.50	0.0979	0.00208	0.2080	31.0	-16.1
LS 172	50.2	745.1	0.010	0.0075	0.745	14.8	100	19.50	0.0979	0.00095	0.0955	14.2	0.7
LS 172 Dup	49.9	751.5	0.010	0.0075	0.752	15.1	100	9.50	0.0991	0.00047	0.0471	7.1	8.0
LS 176	50.5	745.1	0.010	0.0075	0.745	14.8	100	20.10	0.0979	0.00098	0.0984	14.5	0.2
LS 180	50.4	742.7	0.010	0.0074	0.743	14.7	100	10.80	0.0979	0.00053	0.0529	7.8	6.9
LS 181	50.3	748.4	0.010	0.0075	0.748	14.9	100	11.30	0.0979	0.00055	0.0553	8.2	6.6
LS 183	50.0	744.5	0.010	0.0074	0.745	14.9	100	19.70	0.0979	0.00096	0.0964	14.4	0.5
LS 186	48.9	745.1	0.010	0.0075	0.745	15.2	100	33.35	0.0979	0.00163	0.1632	24.9	-9.6
LS 187	50.1	746.1	0.010	0.0075	0.746	14.9	100	19.00	0.0979	0.00093	0.0930	13.9	1.0
LS 188	50.5	745.1	0.010	0.0075	0.745	14.8	100	19.50	0.0979	0.00095	0.0955	14.1	0.7
LS 190	50.0	746.5	0.010	0.0075	0.747	14.9	100	47.40	0.0991	0.00235	0.2349	35.1	-20.1
LS 192	50.2	746.8	0.010	0.0075	0.747	14.9	100	45.10	0.0979	0.00221	0.2208	32.8	-18.0
LS 192 Dup	50.2	748.5	0.010	0.0075	0.749	14.9	100	9.10	0.0991	0.00045	0.0451	6.7	8.2
LS 194	48.7	745.9	0.010	0.0075	0.746	15.3	100	19.65	0.0979	0.00096	0.0962	14.7	0.6
LS 213	50.2	743.3	0.010	0.0074	0.743	14.8	100	10.20	0.0991	0.00051	0.0505	7.5	7.3

Table 3

Summary Data and Calculations for Acid Consumption Tests on Residues from Lime Amended Columns

Sample	ACIDIFICATION						BACK-TITRATION						Sample Alkalinity
	Sample Mass	Acid Volume	H_2SO_4 Strength	Acid Added			Volume Titrated	Base to pH 8.3	NaOH Strength	Base Added			
	g	ml	mol/L	mol $CaCO_3$ eq	g $CaCO_3$	mg $CaCO_3$/g	ml	ml	N	mol $CaCO_3$ eq	g $CaCO_3$	mg $CaCO_3$/g	mg $CaCO_3$/g
LM 4-1	50.4	743.2	0.010	0.0074	0.743	14.7	100	18.25	0.0979	0.00089	0.0893	13.2	1.6
LM 15-3	50.0	746.5	0.010	0.0075	0.747	14.9	100	19.10	0.0979	0.00093	0.0935	14.0	1.0
LM 180	50.5	741.1	0.010	0.0074	0.741	14.7	100	11.10	0.0979	0.00054	0.0543	8.0	6.7
LM 181	50.6	743.3	0.010	0.0074	0.743	14.7	100	19.70	0.0979	0.00096	0.0964	14.2	0.5

Table 4

Mass Balance Method 1

Sample	Paste pH	Initial Alkalinity from Acid Consumption Test	Limestone Addition to Column	Alkalinity Released from Column	Initial + Addition - Release	Measured Residual Alkalinity	Mass Balance Difference
	s.u.	(mg $CaCO_3$/g)					
SM 4-1	2.62	5.98	4.51	-0.11	10.60		
LS 8-1	2.65	-17.93	4.33	-0.07	-13.53	2.06	-15.59
LS 13-1	2.43	-18.95	10.21	-2.01	-6.73	5.34	-12.08
SM 31-1 Dup	2.43	-12.68	10.21	-2.01	-0.47		
LS 15-1	2.00	-10.95	15.53	-0.01	4.60	4.63	-0.03
LS 15-3	1.80	1.63	9.6	-0.42	11.65		
LS 170	4.46	-2.67	1.08	-0.37	-1.22	-16.08	14.85
LS 172	4.00	-1.79	1.93	-0.79	0.93	0.67	0.25
LS 172 Dup	4.00	0.00	1.93	-0.79	2.72	7.97	-5.25
LS 176	4.38	-3.65	2.82	-0.55	-0.29	0.24	-0.52
LS 180	4.16	5.96	3.01	-0.18	9.15	6.95	2.21
LS 181	3.38	-7.49	3.75	-1.43	-2.30	6.65	-8.95
LS 183	4.10	3.37	1.41	-0.72	5.50	0.53	4.97
LS 186	4.09	-1.91	5.35	-0.08	3.53	-9.64	13.16
LS 187	5.03	-21.00	1.51	-0.53	-18.96	1.04	-20.00
LS 188	4.82	-1.95	1.78	-0.47	0.30	0.67	-0.37
LS 190	4.79	-1.35	0.51	-0.40	-0.44	-20.14	19.69
LS 192	5.38	1.08	0.21	-0.04	1.32	-17.97	19.29
LS 192 Dup		1.08	0.21	-0.04	1.32	8.19	-6.87
LS 194	3.75	-2.05	1.41	-0.46	-0.18	0.58	-0.77
LS 213	2.75	3.03	4.48	-0.43	7.94	7.32	0.62

Table 5

Mass Balance Method 2

Sample	Paste pH	Initial Alkalinity from Alkali Demand Test	Limestone Addition to Column	Alkalinity Released from Column	Initial + Addition - Release	Measured Residual Alkalinity	Mass Balance Difference
	s.u.	(mg $CaCO_3$/g)					
SM 4-1	2.62	-3.40	4.51	-0.11	1.22		
LS 8-1	2.65	-2.70	4.33	-0.07	1.70	2.06	-0.36
LS 13-1	3.65	-10.50	4.33	-2.01	-4.16	5.34	-9.51
SM 31-1 Dup	2.43	-10.50	10.21	-2.01	1.72		
LS 15-1	2.00	-12.35	15.53	-0.01	3.19	4.63	-1.44
LS 15-3	1.80	-7.90	9.6	-0.42	2.12		
LS 170	4.46	-1.60	1.08	-0.37	-0.15	-16.08	15.93
LS 172	4.00	-1.40	1.93	-0.79	1.32	0.67	0.65
LS 172 Dup	4.00	-1.40	1.93	-0.79	1.32	7.97	-6.65
LS 176	4.38	-2.50	2.82	-0.55	0.87	0.24	0.63
LS 180	4.16	-2.50	3.01	-0.18	0.69	6.95	-6.26
LS 181	3.38	-3.10	3.75	-1.43	2.08	6.65	-4.57
LS 183	4.10	-1.20	1.41	-0.72	0.93	0.53	0.40
LS 186	4.09	-4.40	5.35	-0.08	1.03	-9.64	10.67
LS 187	5.03	-1.00	1.51	-0.53	1.04	1.04	0.00
LS 188	4.82	-2.80	1.78	-0.47	-0.55	0.67	-1.22
LS 190	4.79	-0.40	0.51	-0.40	0.51	-20.14	20.65
LS 192	5.38	-0.20	0.21	-0.04	0.05	-17.97	18.01
LS 192 Dup		-0.20	0.21	-0.04	0.05	8.19	-8.14
LS 194	3.75	-1.10	1.41	-0.46	0.77	0.58	0.18
LS 213	2.75	-3.40	4.48	-0.43	1.51	7.32	-5.81

Table 6

Limestone Availability by Mass Balance Method 1

Sample	Starter Material Paste pH	Initial Alkalinity from Acid Consumption Test	Limestone Addition to Column	Alkalinity Released from Column	Initial + Addition - Release	Measured Residual Alkalinity	Mass Balance Difference	Acidity Treated	Estimated Limestone Availability
	s.u.				(mg $CaCO_3$/g)				%
LS 15-1	2.00	-10.95	15.53	-0.01	4.60	4.63	-0.03	15.56	100
LS 172	4.00	-1.79	1.93	-0.79	0.93	0.67	0.25	1.68	87
LS 176	4.38	-3.65	2.82	-0.55	-0.29	0.24	-0.52	3.34	119
LS 188	4.82	-1.95	1.78	-0.47	0.30	0.67	-0.37	2.15	121
LS 194	3.75	-2.05	1.41	-0.46	-0.18	0.58	-0.77	2.18	155
LS 213	2.75	3.03	4.48	-0.43	7.94	7.32	0.62	3.86	86

Table 7

Limestone Availability by Mass Balance Method 2

Sample	Starter Material Paste pH	Initial Alkalinity from Alkali Demand Test	Limestone Addition to Column	Alkalinity Released from Column	Initial + Addition - Release	Measured Residual Alkalinity	Mass Balance Difference	Acidity Treated	Estimated Limestone Availability
	s.u.				(mg $CaCO_3$/g)				%
LS 8-1	2.65	-2.70	4.33	-0.08	1.71	2.06	-0.35	4.68	108
LS 172	4.00	-1.40	1.93	-0.81	1.34	0.67	0.67	1.26	66
LS 176	4.38	-2.50	2.82	-0.57	0.89	0.24	0.65	2.17	77
LS 183	4.10	-1.20	1.41	-0.68	0.89	0.53	0.36	1.05	75
LS 187	5.03	-1.00	1.51	-0.53	1.04	1.04	0.00	1.51	100
LS 194	3.75	-1.10	1.41	-0.46	0.77	0.58	0.19	1.22	87

Table 8

Limestone Availability by Method Used in March 1997 Report

Sample	Initial Alkalinity from Alkali Demand Test	Alkalinity Released from Column	Acidity Treated	Limestone Addition to Column	Estimated Limestone Availability	Comments
	(mg CaCO3/g)				%	
SM 4-1	-3.400	-0.11	3.289	4.51	73	moderate addition rate
LS 8-1	-2.700	-0.07	2.634	4.33	61	moderate addition rate
LS 13-1	-10.500	-2.01	8.493	10.21	83	high addition rate
LS 15-1	-12.350	-0.01	12.336	15.53	79	high addition rate
LS 15-3	-7.900	-0.42	7.481	9.6	78	high addition rate
LS 170	-1.600	-0.37	1.230	1.08	114	low addition, low release
LS 172	-1.400	-0.79	0.609	1.93	32	low addition, high release
LS 176	-2.500	-0.55	1.952	2.82	69	moderate addition rate
LS 180	-2.500	-0.18	2.321	3.01	77	moderate addition rate
LS 181	-3.100	-1.43	1.669	3.75	45	low addition, high release
LS 183	-1.200	-0.72	0.476	1.41	34	low addition, high release
LS 186	-4.400	-0.08	4.319	5.35	81	moderate addition rate
LS 187	-1.000	-0.53	0.467	1.51	31	low addition, high release
LS 188	-2.800	-0.47	2.332	1.78	131	low addition, low release
LS 190	-0.400	-0.40	0.000	0.51	0	low addition, high release
LS 192	-0.200	-0.04	0.165	0.21	79	low addition, low release
LS 194	-1.100	-0.46	0.643	1.41	46	low addition, high release
LS 213	-3.400	-0.43	2.970	4.48	66	moderate addition rate

Attachment 1

Modified Acid Consumption Test Protocol

Modified Acid Consumption Test Protocol

Equipment and Reagents

1. 1.0 liter Erlenmeyer flask
2. pH meter
3. Burette
4. Spatula or magnetic stirrer
5. Distilled water
6. 0.01 molar (0.02 N) sulfuric acid (standardized)
7. 0.1 molar (0.1 N) sodium hydroxide (NaOH)
8. 250 ml glass beaker

Method

1. The residue from the anoxic leach test is air dried, blended and quartered using a sample splitter to yield a dry weight sample of about 50 grams. The exact weight of the sample is obtained. The moisture content of the sample is determined on a second quarter of the sample.

2. Place the sample in a 1 liter Erlenmeyer flask, and add exactly 750 ml of the 0.01 molar sulfuric acid. Record the total weight of the sample and the flask. Place the sample on a rotary shaker and allow to react for a period of 24 hours.

3. After 24 hours contact time, replace evaporative losses by readjusting the total weight of the flask and sample to that recorded in Step 2. The final pH is obtained and recorded.

4. Allow the solids to settle, and decant the clear solution. If necessary, filter the solution. Obtain an exact aliquot of 100 ml of the clear solution, and place in the 250 ml beaker. Agitate the sample using a magnetic stirrer. Titrate the solution with the 0.10 N NaOH to a stable endpoint pH of 8.3. Record the amount of titrant added as a function of the pH.

Interpretation

The residual neutralization potential (NP) for the sample is calculated as follows:

$$NP = (7500*N_A-100*V*N_B)/w$$

where NP = the residual neutralization potential in mg CaCO3 eq. / g

N_A = normality of the sulfuric acid

N_B = normality of the sodium hydroxide

V = volume sodium hydroxide required to titrate the 100 ml sample to a pH=8.3

w = dry weight of the sample in grams

Attachment 2

Acid Consumption Test Results for Starter Materials

SM 4-1

pH	buret (ml
2.32	0
2.38	1
2.46	2
2.54	3
2.65	4
2.8	5.1
2.98	6
3.11	6.5
3.3	7
3.48	7.95
3.99	8.55
4.84	9
5.18	9.45
5.63	10.1
5.91	10.55
6.18	11.1
6.47	11.5
7.44	11.9
8.08	12
8.33	12.1

SM 8-1

pH	buret (ml
1.71	0.8
1.71	1.7
1.72	3
1.73	4.3
1.76	6
1.79	7.6
1.82	9.3
1.85	10.8
1.88	12.3
1.91	13.6
1.95	15.4
2.01	17.4
2.07	19.1
2.12	20.7
2.22	23.3
2.34	25.6
2.43	27.3
2.53	29
2.66	30.8
2.79	32.9
2.91	35
3.02	37
3.11	38.9
3.41	40.9
4.32	42.2
5.03	42.9
5.75	43.6
6.22	43.9
6.59	44.1
7.05	44.2
7.5	44.4
7.56	44.5
7.68	44.6
8	44.7
8.31	44.8

SM 13-1

pH	buret (ml
1.66	0
1.67	1
1.69	2
1.71	3
1.73	4
1.77	5
1.8	6
1.83	7
1.87	8
1.9	9
1.94	10
1.99	11
2.03	12
2.08	13
2.13	14
2.18	15
2.23	16
2.29	17
2.36	18
2.43	19
2.49	20
2.55	21
2.61	22
2.67	23
2.73	24
2.77	25
2.81	26
2.85	27
2.89	28
2.9	29
2.93	30
2.95	31
3.02	32
3.04	33
3.06	34
3.1	35.1
3.15	36
3.24	37
3.45	38
3.94	39
4.34	40
4.66	41
5	42
5.36	43
5.74	44
6.45	45
7	45.5
7.53	46
7.65	46.1
7.8	46.2
7.95	46.3
8.06	46.4
8.34	46.5

SM 13-1 DUP

pH	buret (ml)
2.38	0
2.4	1.2
2.42	2.1
2.45	3.2
2.48	4.35
2.5	5.2
2.53	6.15
2.56	7.25
2.6	8.1
2.63	9.1
2.66	10.05
2.71	11.1
2.75	12.15
2.78	13
2.82	14.2
2.84	14.9
2.82	16.2
2.82	17.05
2.83	18
2.86	19.1
2.9	20.05
2.91	22.2
2.98	24.15
3.1	26.1
3.22	27.05
3.47	28
3.88	29.05
4.25	30.05
4.48	31.05
4.9	32.1
5.14	33.1
6.58	35
7.92	35.9
9.24	37

SM 15-1

pH	buret (ml
1.86	0
1.9	2.2
1.94	4.2
2	6
2.07	7.8
2.16	10
2.25	11.7
2.33	13
2.43	14.6
2.52	15.9
2.63	17.5
2.72	18.9
2.8	20.7
2.83	22.5
2.9	24
2.98	25.7
3.1	27.1
3.47	28.6
3.99	29.5
4.24	30.4
4.49	31.2
4.89	32
5.11	32.6
5.45	33.3
6.11	33.9
6.55	34.2
6.84	34.4
7.27	34.6
7.39	34.7
7.58	34.8
7.78	35
8.03	35.1
8.16	35.2
8.31	35.3

SM 15-3

pH	buret (ml
2.17	0
2.22	2
2.27	4.1
2.36	6
2.53	8.05
2.63	10.2
3.06	12.1
4.38	14
4.83	15.1
4.97	15.6
5.47	16.65
5.87	17.05
7.47	17.55
7.77	17.65
8.17	17.8
8.48	17.95

SM 170

pH	buret (ml
2.17	0
2.18	0.5
2.2	1.5
2.22	2.4
2.26	3.45
2.29	4.6
2.36	6
2.4	7
2.47	8.1
2.52	9
2.59	10
2.69	11.1
2.79	12
2.95	13.1
3.15	14.2
3.28	14.9
3.48	15.95
3.47	16.5
3.81	17.15
4.23	17.45
4.73	17.8
4.99	18.1
5.09	18.3
5.25	18.6
5.48	19.1
5.52	19.3
5.57	19.5
5.61	19.7
5.66	19.95
5.71	20.25
5.72	20.55
5.88	21.4
6.03	22
6.09	22.15
6.18	22.45
6.31	22.7
6.46	22.95
6.65	23.2
7.04	23.45
7.44	23.65
7.88	23.85
8.38	24
8.95	24.15

SM 172

pH	buret (ml
1.85	0
1.87	0.9
1.91	2
1.96	3
2.01	4
2.06	5
2.12	6
2.19	7
2.27	8
2.36	9
2.46	10
2.61	11.1
2.77	12
2.97	13
3.16	14
3.35	14.9
3.73	16
4.68	17
5.22	18
5.4	18.5
5.53	19
5.63	19.5
5.74	20
5.71	20.5
5.86	21
6.08	21.5
6.46	22
6.72	22.3
6.81	22.4
7.08	22.5
7.42	22.6
7.96	22.7
8.16	22.8
8.42	22.9

SM 176

pH	buret (ml
2.1	0
2.14	1.1
2.2	2
2.29	3
2.39	4
2.52	5
2.7	6
2.95	7
3.4	8
4.59	9
4.89	9.5
5.04	10
5.12	10.5
5.19	11
5.25	11.5
5.28	12
5.29	12.5
5.31	13
5.34	13.5
5.37	14
5.38	14.5
5.41	15
5.43	15.5
5.46	16
5.49	16.6
5.5	17
5.52	17.5
5.56	18
5.59	18.5
5.62	19
5.66	19.5
5.71	20
5.74	20.5
5.77	21
5.8	21.5
5.86	22
5.91	22.5
5.95	23
6.03	23.5
6.14	24
6.36	24.5
6.53	24.6
6.57	24.7
6.98	24.9
7.13	25
7.38	25.1
7.95	25.3
8.09	25.4
8.36	25.5

SM 180

pH	buret (ml
2.44	0
2.53	1
2.63	2
2.76	3
2.94	4
3.26	5
3.68	6
5.16	7
5.28	7.1
5.34	7.2
5.47	7.3
5.46	7.4
5.47	7.6
5.65	8
5.74	8.5
5.83	9
5.85	9.5
6.01	10
6.23	10.5
6.33	11
6.7	11.5
7.99	12
8.42	12.1

SM 181

pH	buret (ml
2.24	0
2.32	2
2.41	4
2.55	6.1
2.71	8.1
2.71	10
2.81	12.05
3	13.95
3.77	16.05
4.33	18
4.56	19
4.75	19.95
4.95	21
5.03	22.05
5.2	22.95
5.27	23.9
5.41	24.95
5.58	26
5.8	27.05
5.9	27.55
6.22	28.15
6.38	28.45
6.71	28.95
7.17	29.6
7.71	30
7.83	30.05
7.98	30.15
8.21	30.2
8.37	30.3
8.39	30.35
8.64	30.55

SM 183

pH	buret (ml
2.47	0
2.52	1.15
2.56	2
2.64	3
2.73	4
2.83	5
2.95	5.95
3.19	7.1
3.36	7.95
3.86	9.1
4.84	9.7
5.07	10.1
5.28	10.3
5.35	10.7
5.46	11
5.5	11.25
5.51	11.8
5.6	12.6
5.65	14.4
5.85	14.75
6.82	15.3
7.8	15.4
8.2	15.5
8.73	15.6

SM 186

pH	buret (ml
2.03	0
2.1	2.2
2.2	4.1
2.31	5.7
2.43	7.1
2.57	8.3
2.77	9.6
3.03	11
3.25	12.2
3.87	13.1
4.24	13.5
4.46	14
4.65	14.5
4.79	14.9
4.93	15.3
5.01	15.8
5.09	16.3
5.13	16.6
5.19	17.2
5.26	17.9
5.32	18.5
5.37	19.1
5.47	19.6
5.61	20.3
5.75	20.9
6.06	21.6
6.43	22.1
6.93	22.3
7.27	22.5
7.58	22.6
7.91	22.7
8.2	22.8
8.45	23

SM 187

pH	buret (ml
1.8	0
1.79	1
1.79	2
1.8	2.9
1.82	4
1.84	5.5
1.89	7.1
1.9	8.1
1.94	9.9
1.95	11
1.98	12
2.01	13.1
2.02	14
2.04	15.1
2.06	16
2.09	17.2
2.12	18.1
2.14	19.05
2.16	20
2.2	21
2.23	22.2
2.26	23.1
2.3	24.1
2.36	25.5
2.39	26.35
2.45	27.5
2.54	29.1
2.68	31
2.76	32
2.87	33
2.97	33.95
3.08	34.9
3.2	36.1
3.21	37
3.34	38.1
3.65	39
4.38	40
4.74	41
5.11	42
5.3	43
5.45	43.9
5.57	45
5.63	46.05
5.85	47.05
6.35	48.05
7.86	49
8.08	49.1
8.2	49.2
8.45	49.3
8.68	49.4

SM 188

pH	buret (ml
2.28	0
2.31	1
2.35	2
2.39	3.2
2.43	4.1
2.47	4.9
2.53	6
2.6	6.9
2.69	8.1
2.8	9.1
2.89	9.8
2.97	10.4
3.07	11
3.18	11.55
3.3	12.1
3.36	12.6
3.5	13.15
3.62	13.6
3.96	14.3
4.5	14.7
4.7	14.95
4.88	15.25
5.05	15.6
5.26	15.95
5.41	16.3
5.53	16.9
5.59	17.3
5.55	17.8
5.55	17.9
5.64	18.4
5.7	18.9
5.73	19.2
5.77	19.6
5.83	20
5.9	20.4
5.97	20.7
6.06	21.1
6.17	21.4
6.37	21.8
6.83	22.3
7.48	22.7
7.72	22.8
8	22.9
8.48	23.1

SM 190

pH	buret (ml
1.99	0
1.98	1
2.02	2
2.07	3
2.12	4
2.19	5.1
2.26	6
2.35	7
2.46	8
2.6	9
2.79	10
3.06	11
3.42	12
4.35	13
5	14
5.22	14.5
5.32	15
5.42	15.5
5.46	16
5.51	16.5
5.55	17
5.6	17.5
5.67	18.5
5.82	19.5
6.03	20.5
6.23	21
6.3	21.1
6.42	21.3
6.57	21.5
6.74	21.6
6.84	21.7
6.95	21.8
7.31	21.9
7.59	22
7.85	22.1
8.09	22.2
8.36	22.3

SM 192

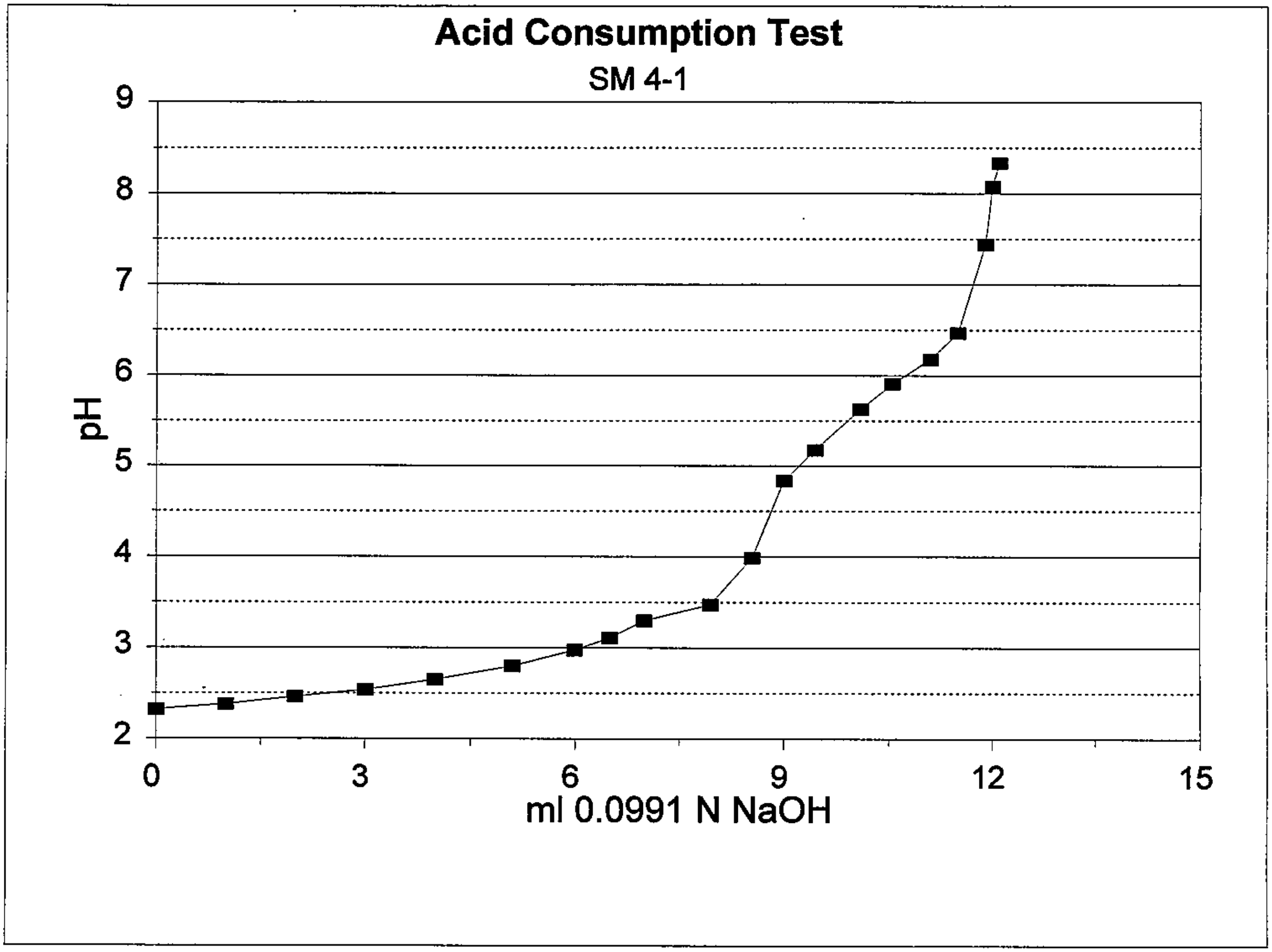
pH	buret (ml
2.66	0
2.76	1.1
2.86	2
3.03	3.1
3.13	3.5
3.27	4.2
3.5	5.1
3.63	5.55
3.78	6
4.22	6.5
4.52	7.1
4.62	7.5
4.73	8.1
4.77	8.4
4.89	9.1
5.03	9.5
5.19	10
5.33	10.5
5.45	11.1
5.5	11.5
5.55	12.1
5.56	12.65
5.62	13.3
5.66	14.15
5.74	15.4
5.83	16
5.95	16.7
6.16	17.1
6.32	17.6
7.1	18.3
7.52	18.5
8.09	18.7
8.4	18.95

SM 194

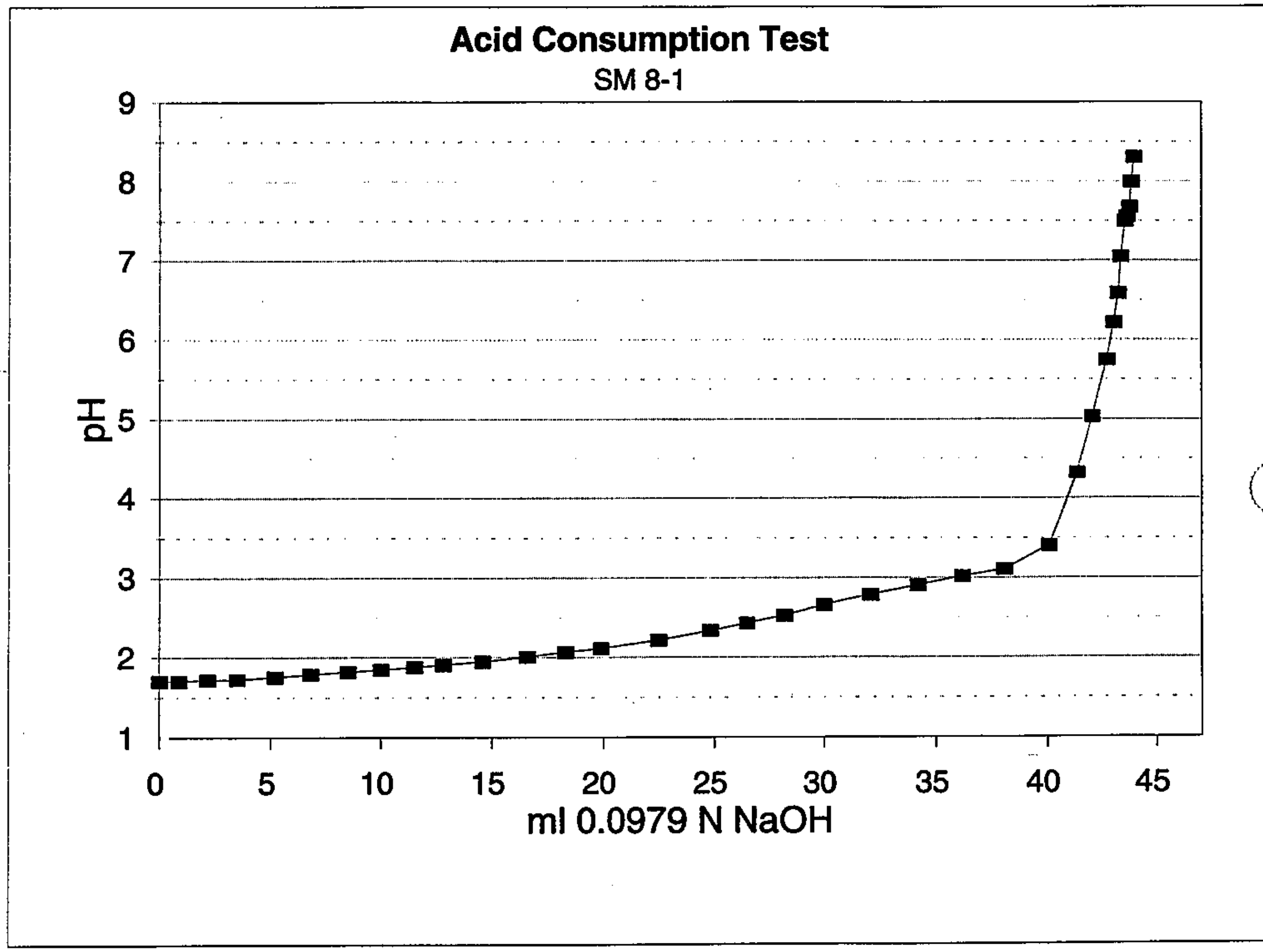
pH	buret (ml
1.83	0
1.88	2.3
1.95	4.5
2.04	6.8
2.14	9
2.31	11.5
2.56	14
2.96	16.2
3.22	17.8
4.29	19
4.72	19.6
5.01	20
5.21	20.4
5.31	20.6
5.43	21
5.63	21.4
5.77	21.8
5.98	22.2
6.53	22.6
8.16	23.1
8.44	23.2

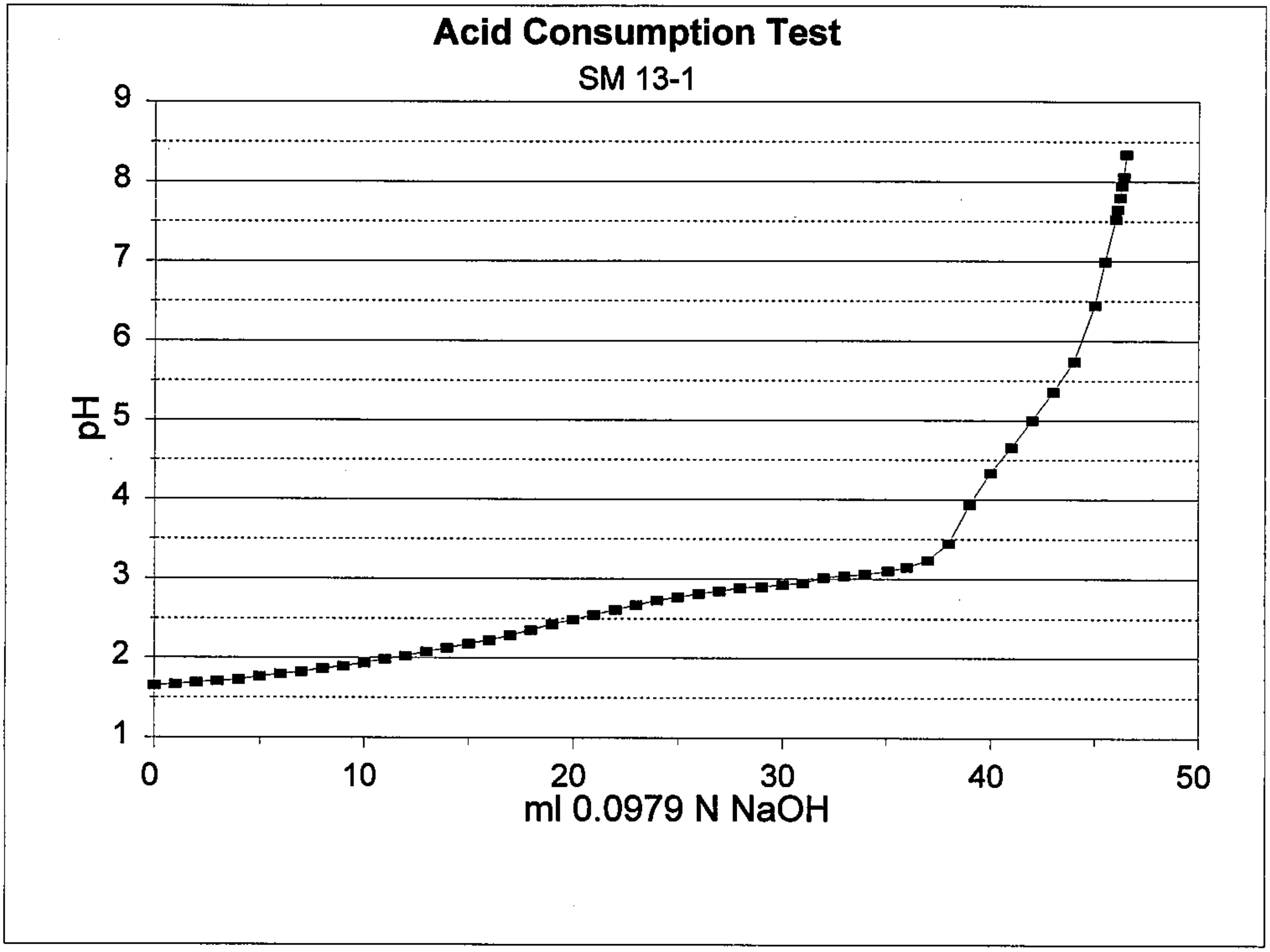
SM 213

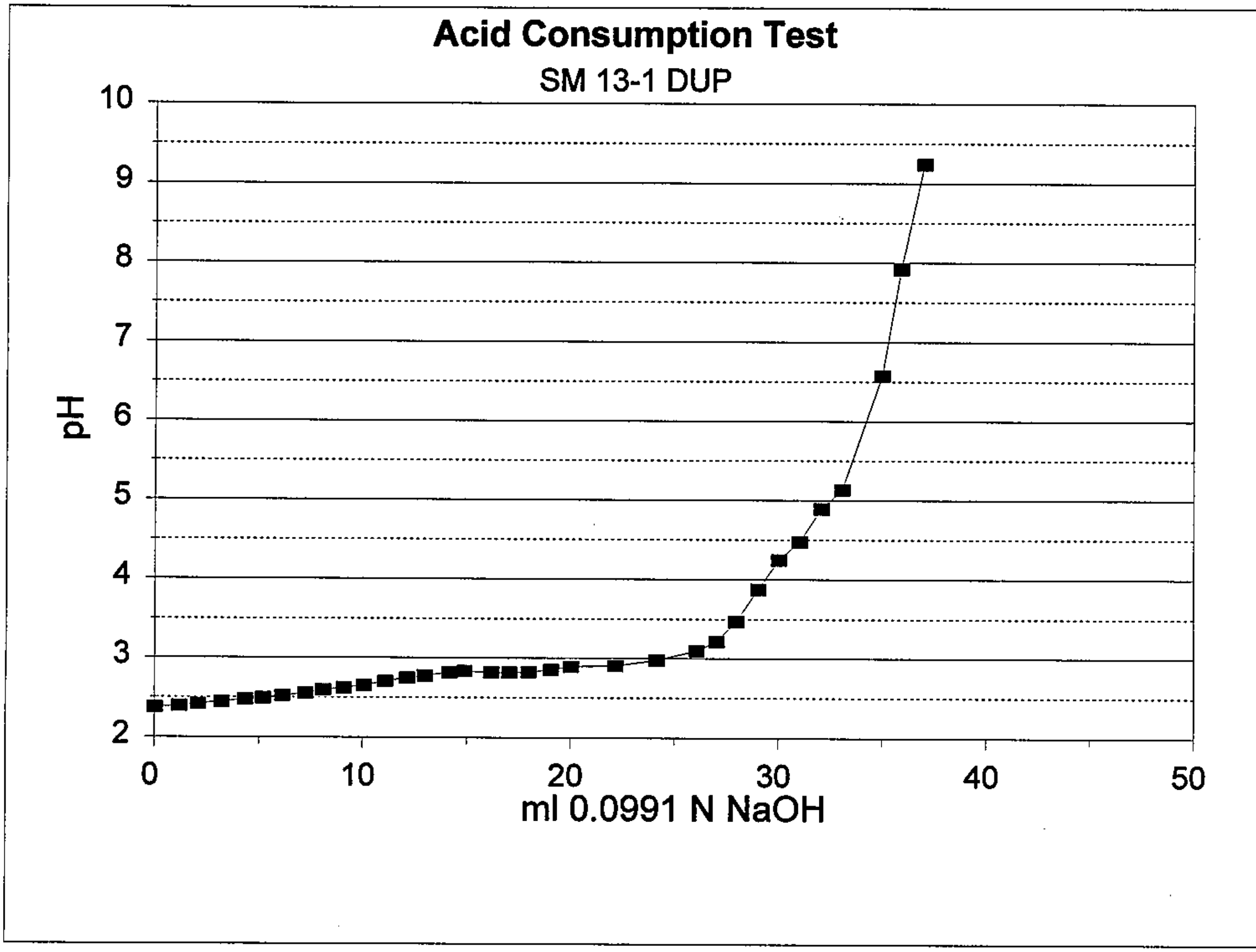
pH	buret (ml
2.41	0
2.45	1
2.51	2
2.57	2.9
2.62	4.05
2.68	4.9
2.78	6.05
2.93	7.15
3.06	8
3.32	9.05
3.57	10
4.13	11
4.75	12
5.23	13
5.53	13.4
5.55	13.7
5.59	14
6.02	15.1
6.26	15.4
6.55	15.65
6.84	15.8
7.2	15.95
7.99	16.1
8.42	16.25

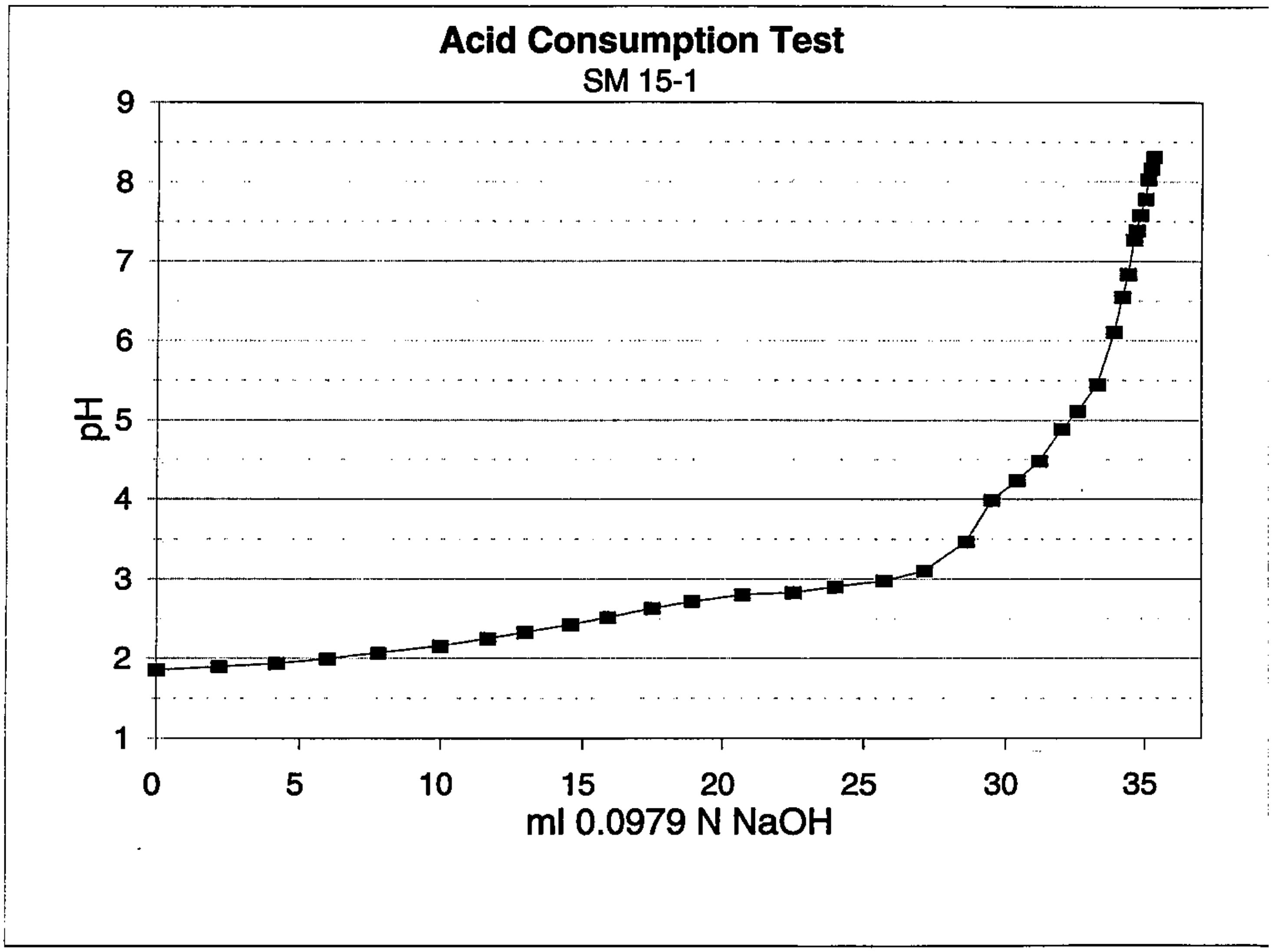


Acid Consumption Test
SM 4-1
pH
9
8
7
6
5
4
3
2
0
3
6
9
12
15
ml 0.0991 N NaOH

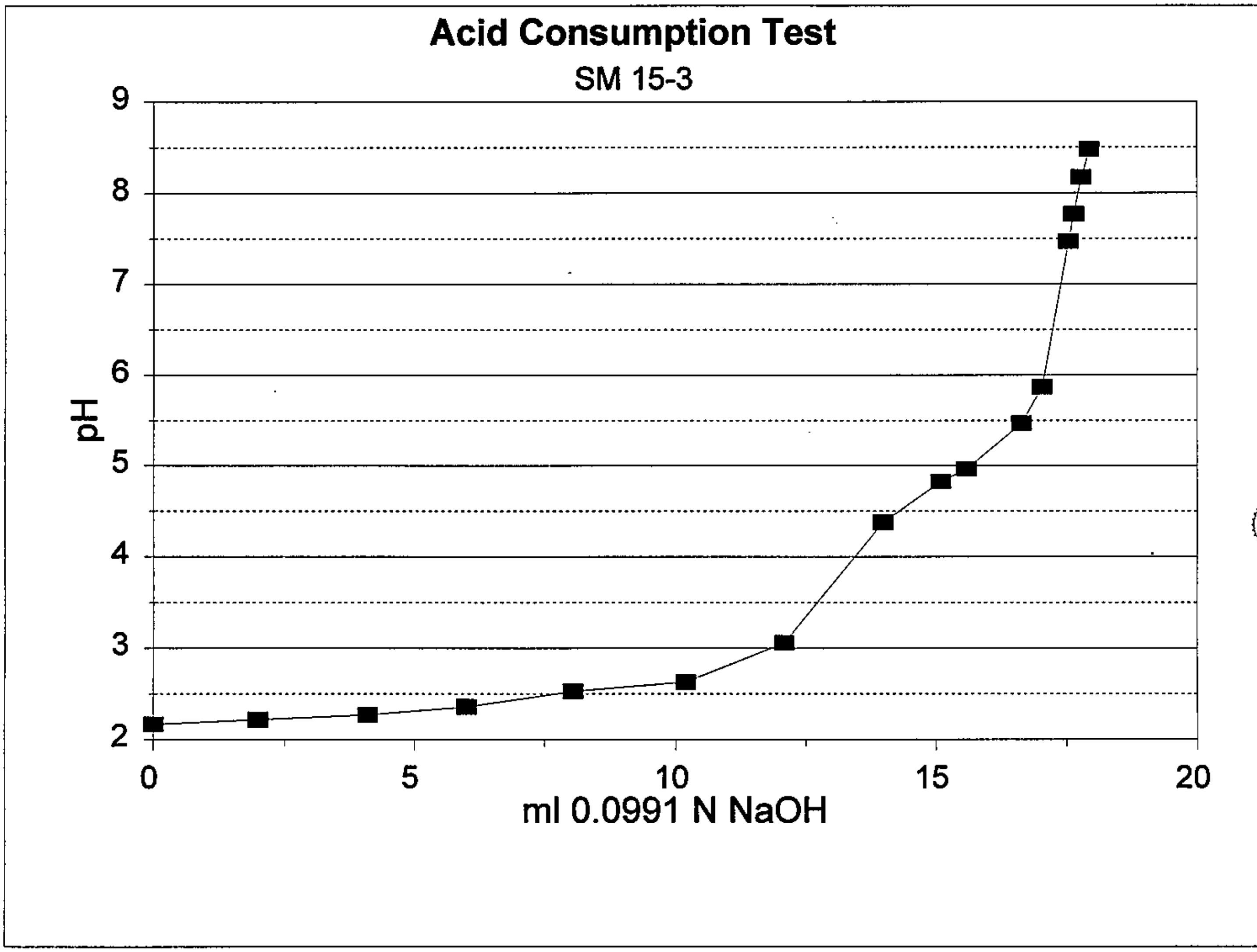

Acid Consumption Test
SM 8-1
pH
ml 0.0979 N NaOH
1
2
3
4
5
6
7
8
9
0
5
10
15
20
25
30
35
40
45

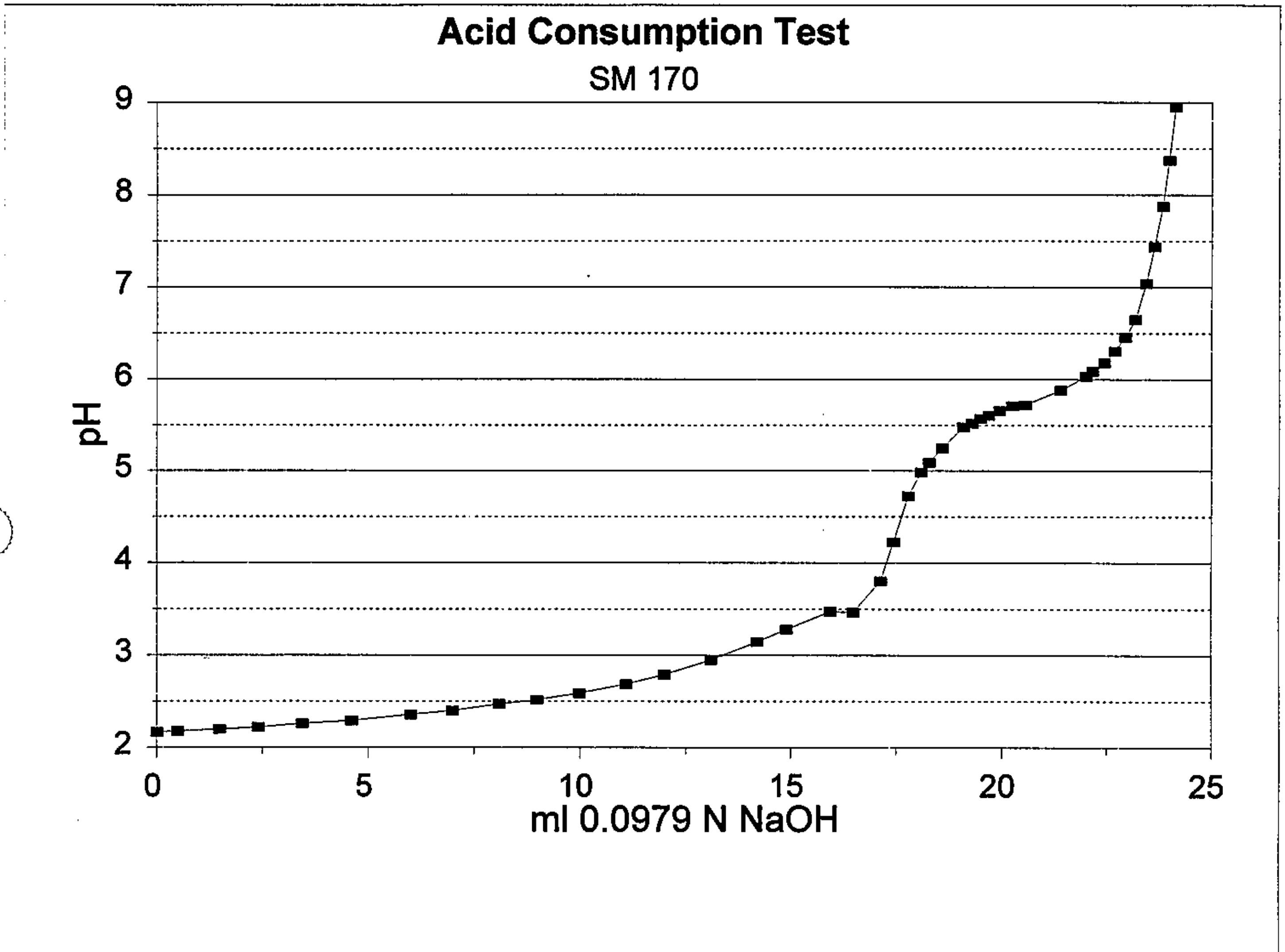

Acid Consumption Test
SM 13-1
pH
ml 0.0979 N NaOH
9
8
7
6
5
4
3
2
1
0
10
20
30
40
50

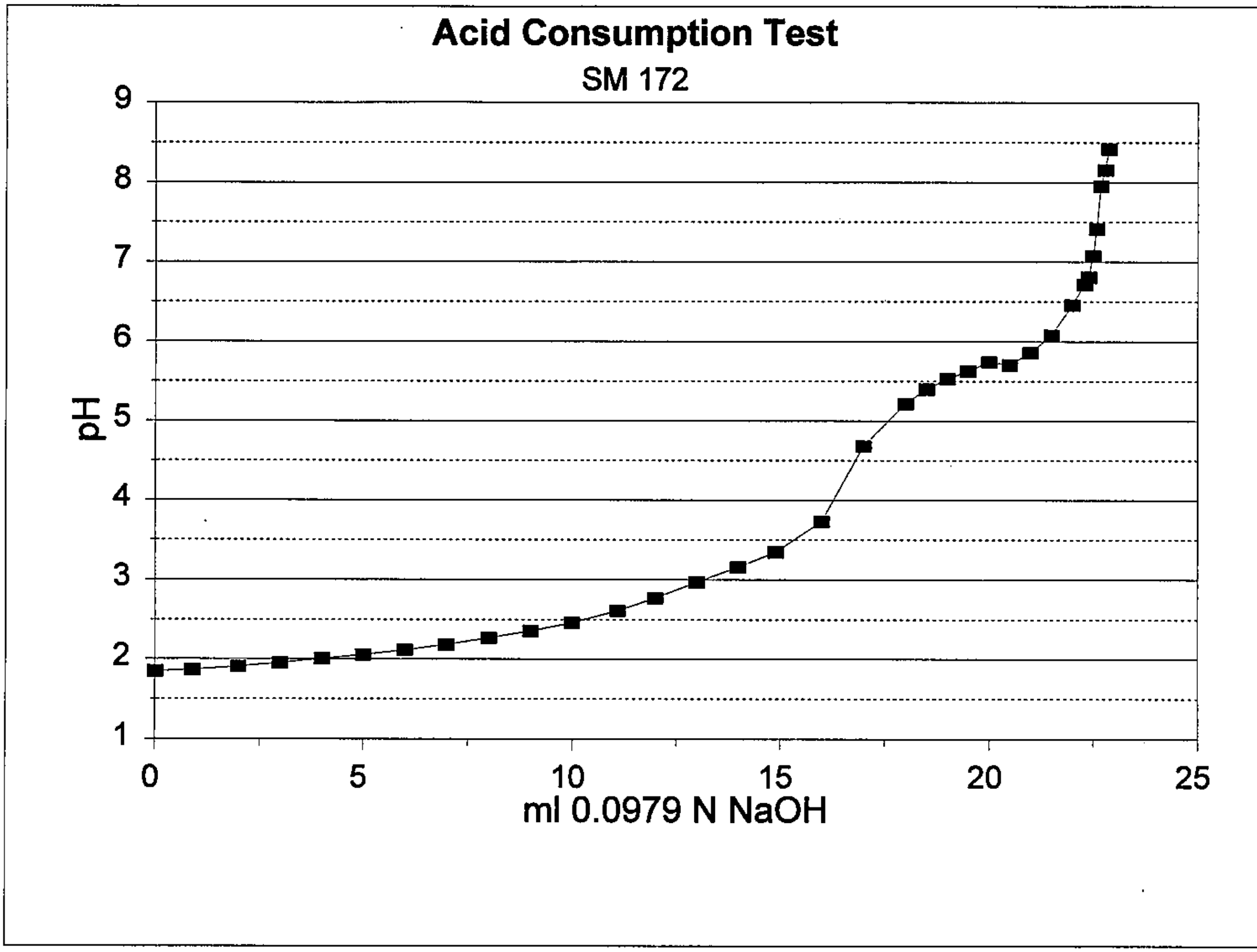

Acid Consumption Test
SM 13-1 DUP
pH
ml 0.0991 N NaOH
10
9
8
7
6
5
4
3
2
0
10
20
30
40
50

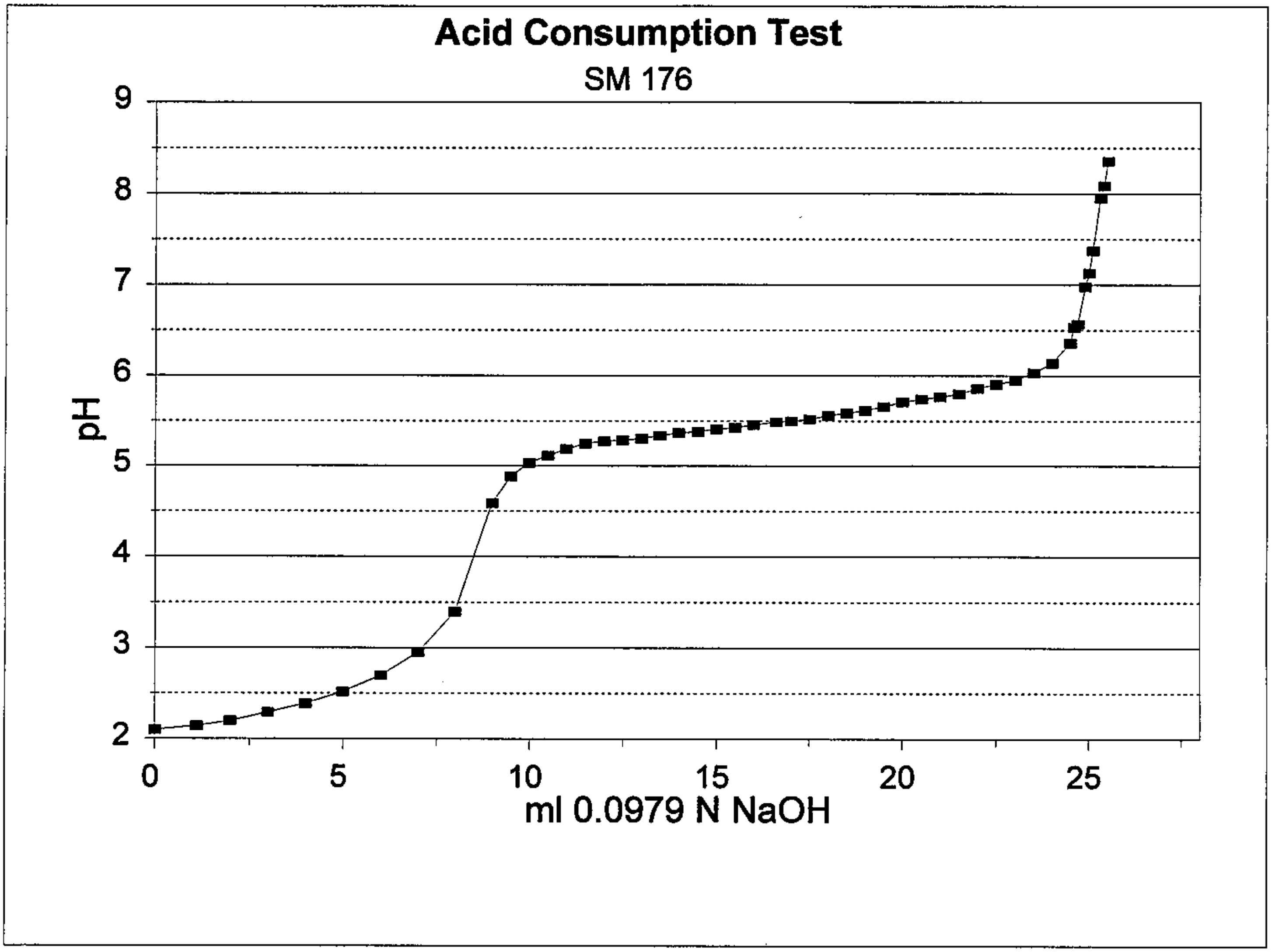


Acid Consumption Test
SM 15-1
pH
9
8
7
6
5
4
3
2
1
0
5
10
15
20
25
30
35
ml 0.0979 N NaOH

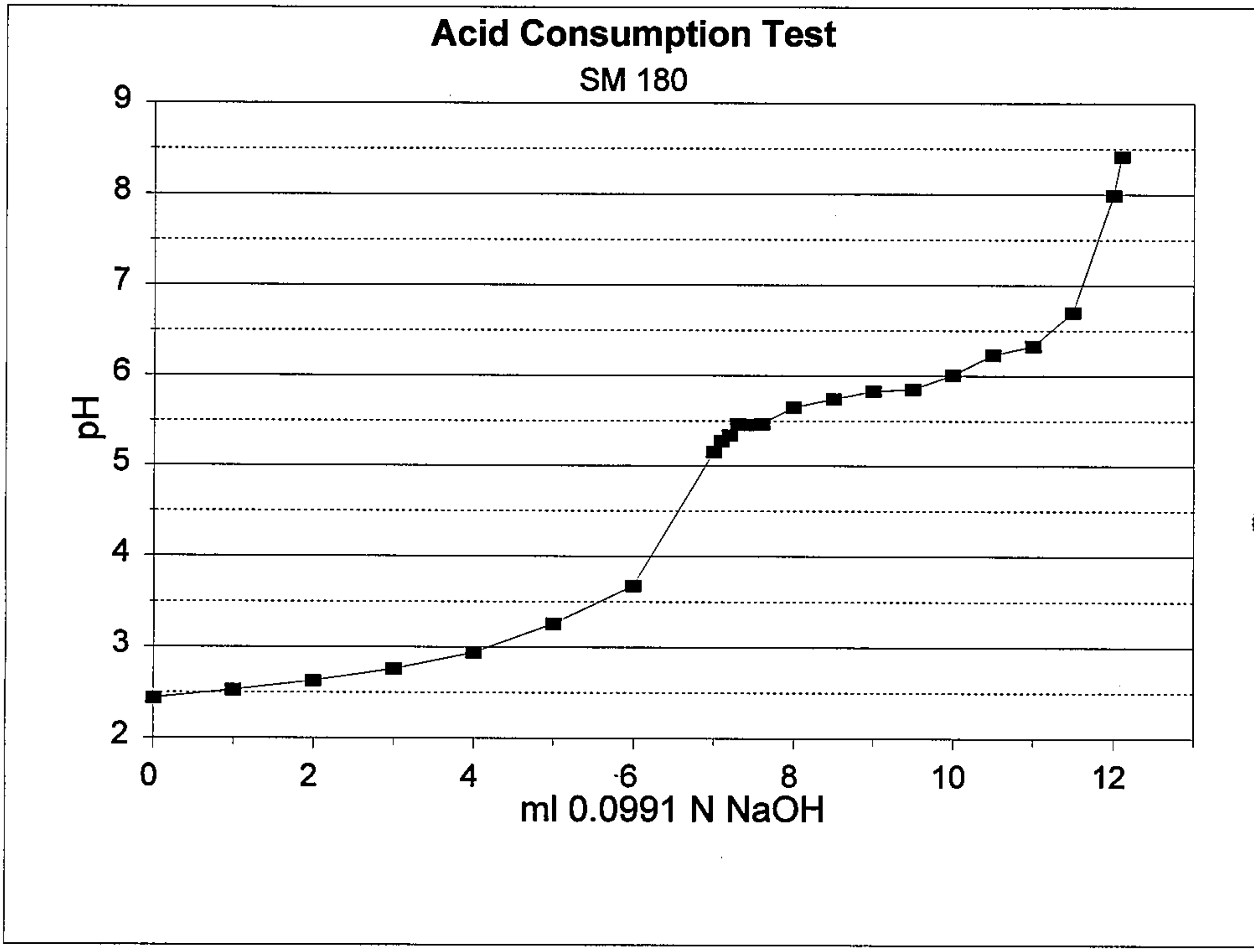

Acid Consumption Test
SM 15-3
pH
ml 0.0991 N NaOH
9
8
7
6
5
4
3
2
0
5
10
15
20


Acid Consumption Test
SM 170
pH
9
8
7
6
5
4
3
2
0
5
10
15
20
25
ml 0.0979 N NaOH

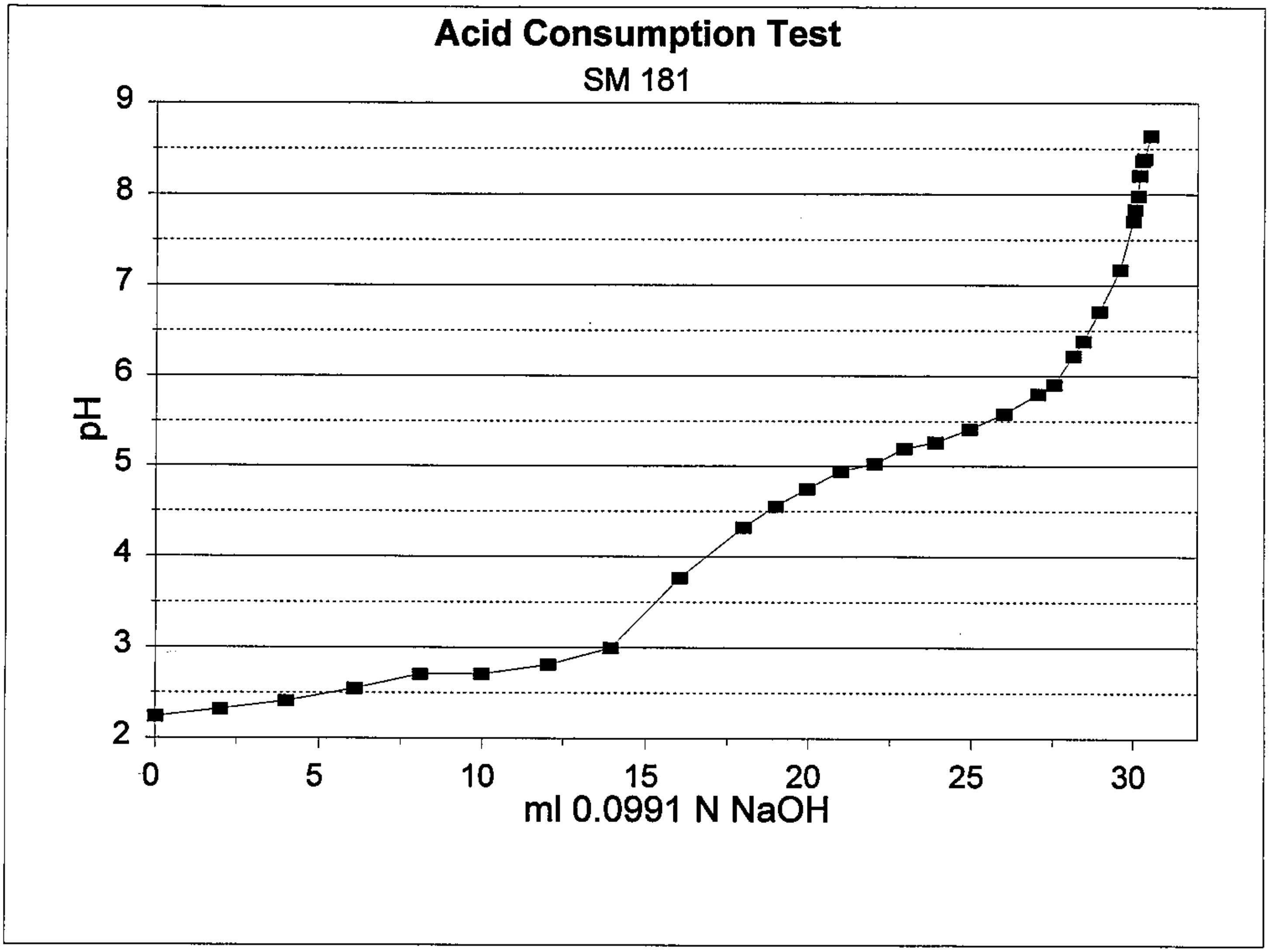

Acid Consumption Test
SM 172
pH
ml 0.0979 N NaOH
9
8
7
6
5
4
3
2
1
0
5
10
15
20
25

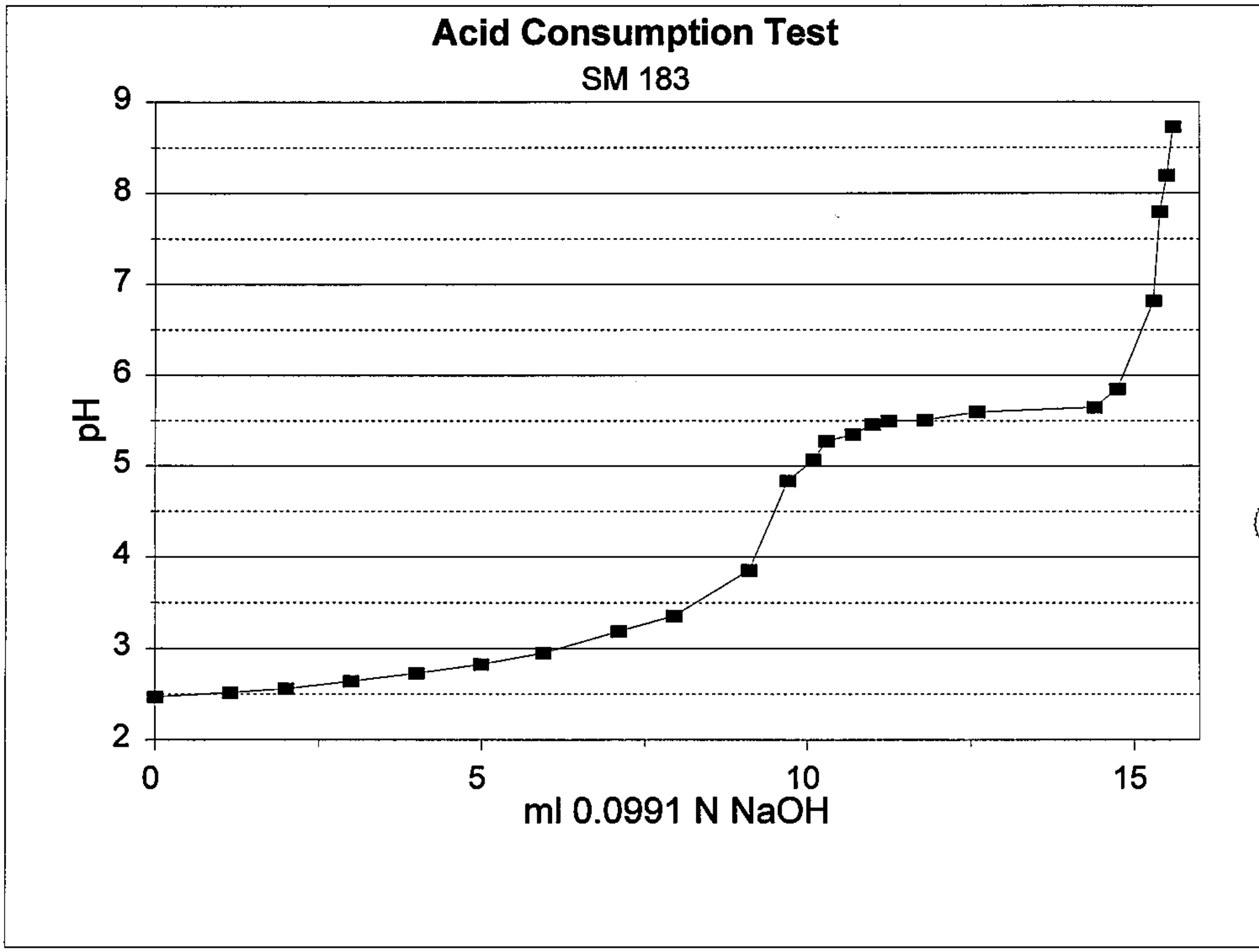


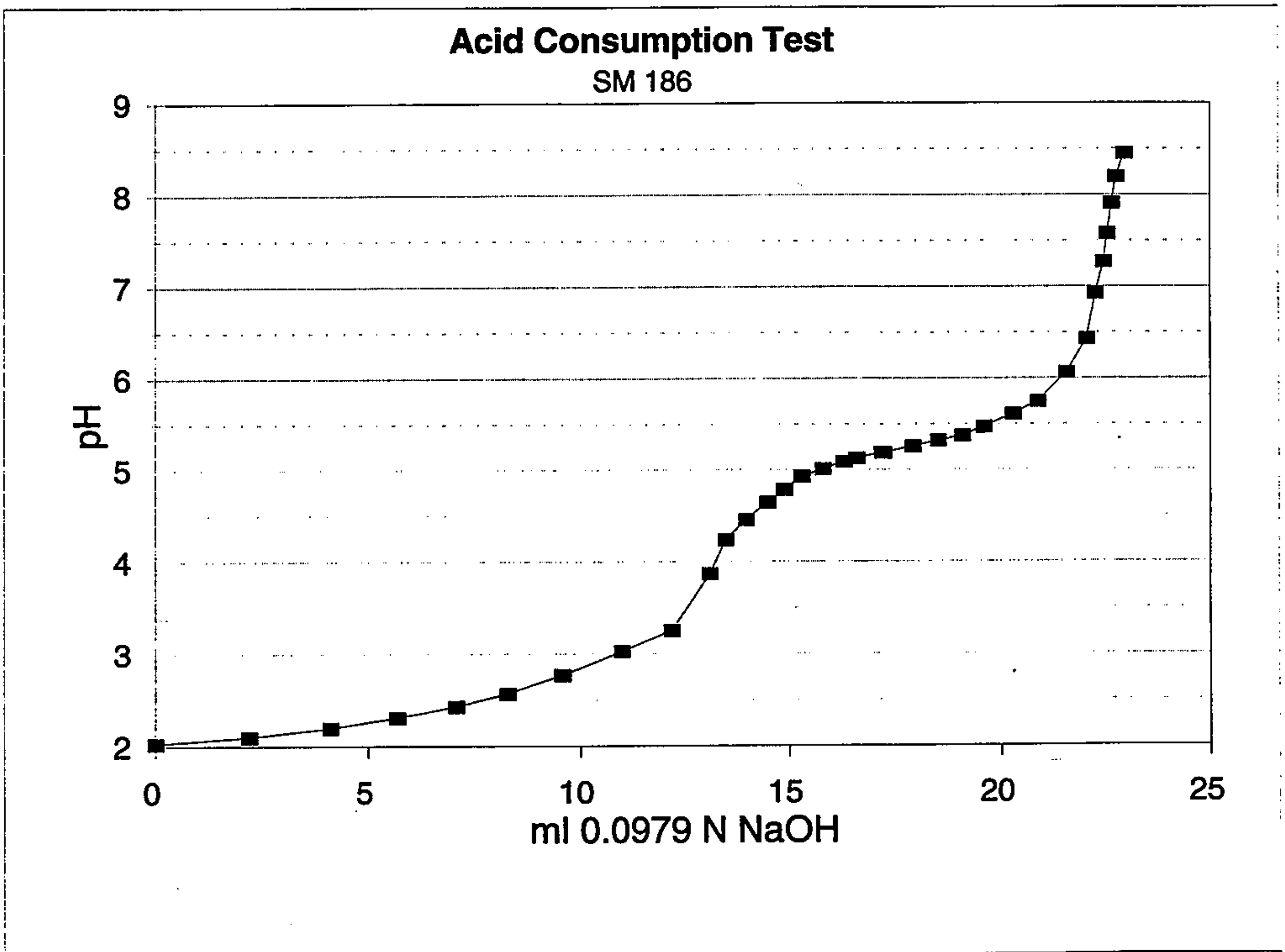
Acid Consumption Test
SM 176
pH
9
8
7
6
5
4
3
2
0
5
10
15
20
25
ml 0.0979 N NaOH



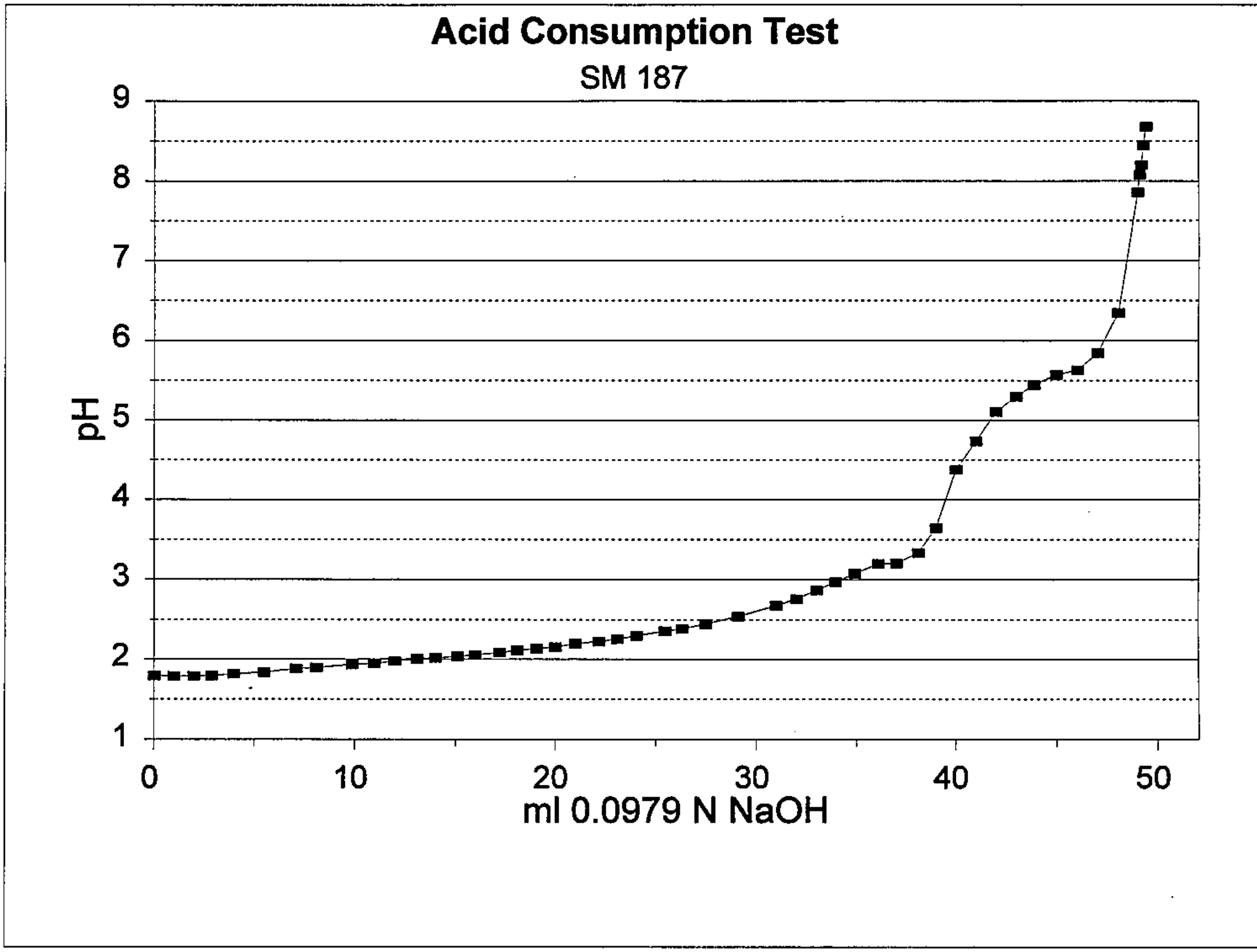
Acid Consumption Test
SM 180
9
8
7
6
5
4
3
2
pH
0
2
4
6
8
10
12
ml 0.0991 N NaOH


Acid Consumption Test
SM 181
pH
9
8
7
6
5
4
3
2
0
5
10
15
20
25
30
ml 0.0991 N NaOH

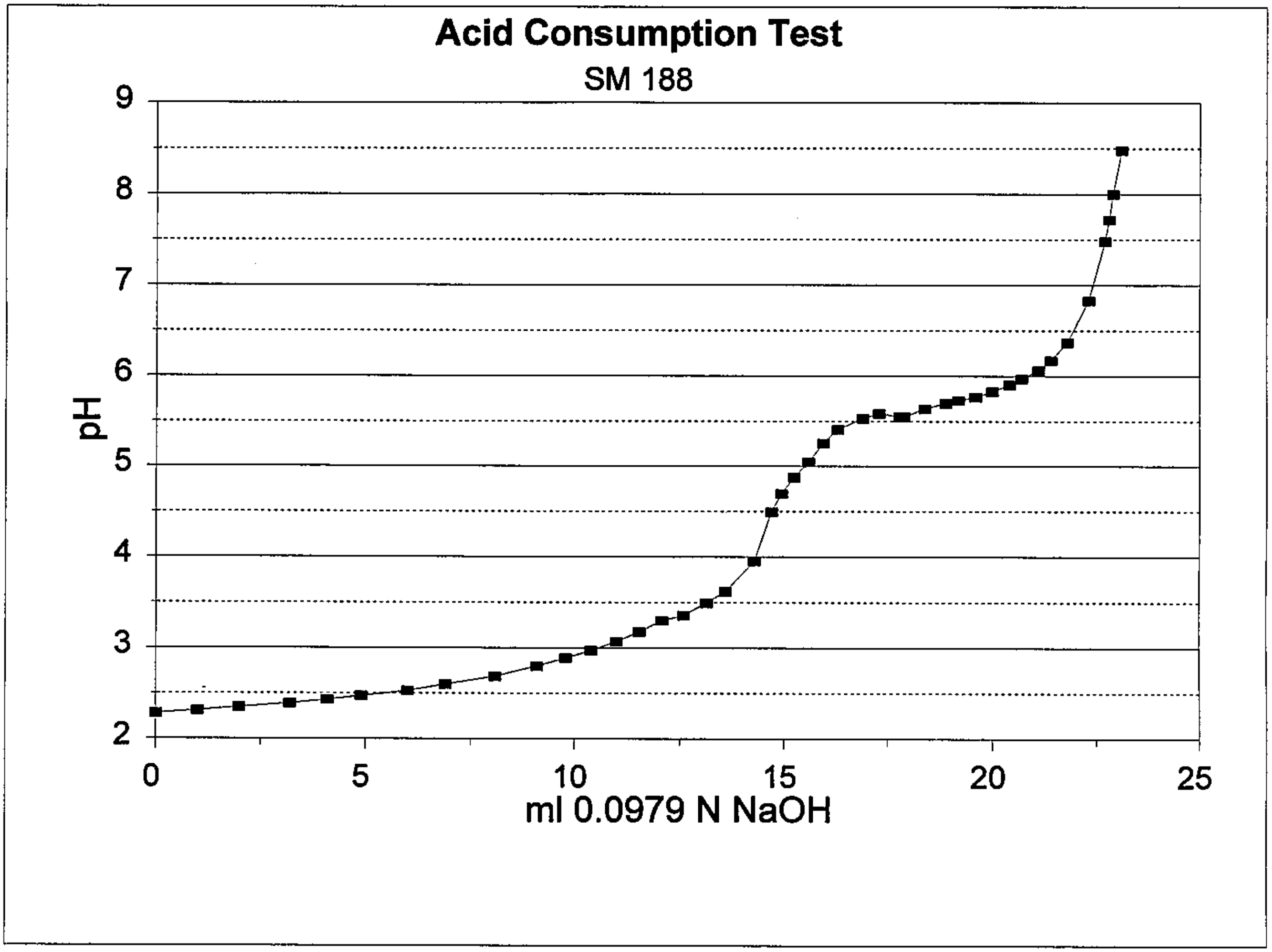

Acid Consumption Test
SM 183
pH
ml 0.0991 N NaOH
9
8
7
6
5
4
3
2
0
5
10
15

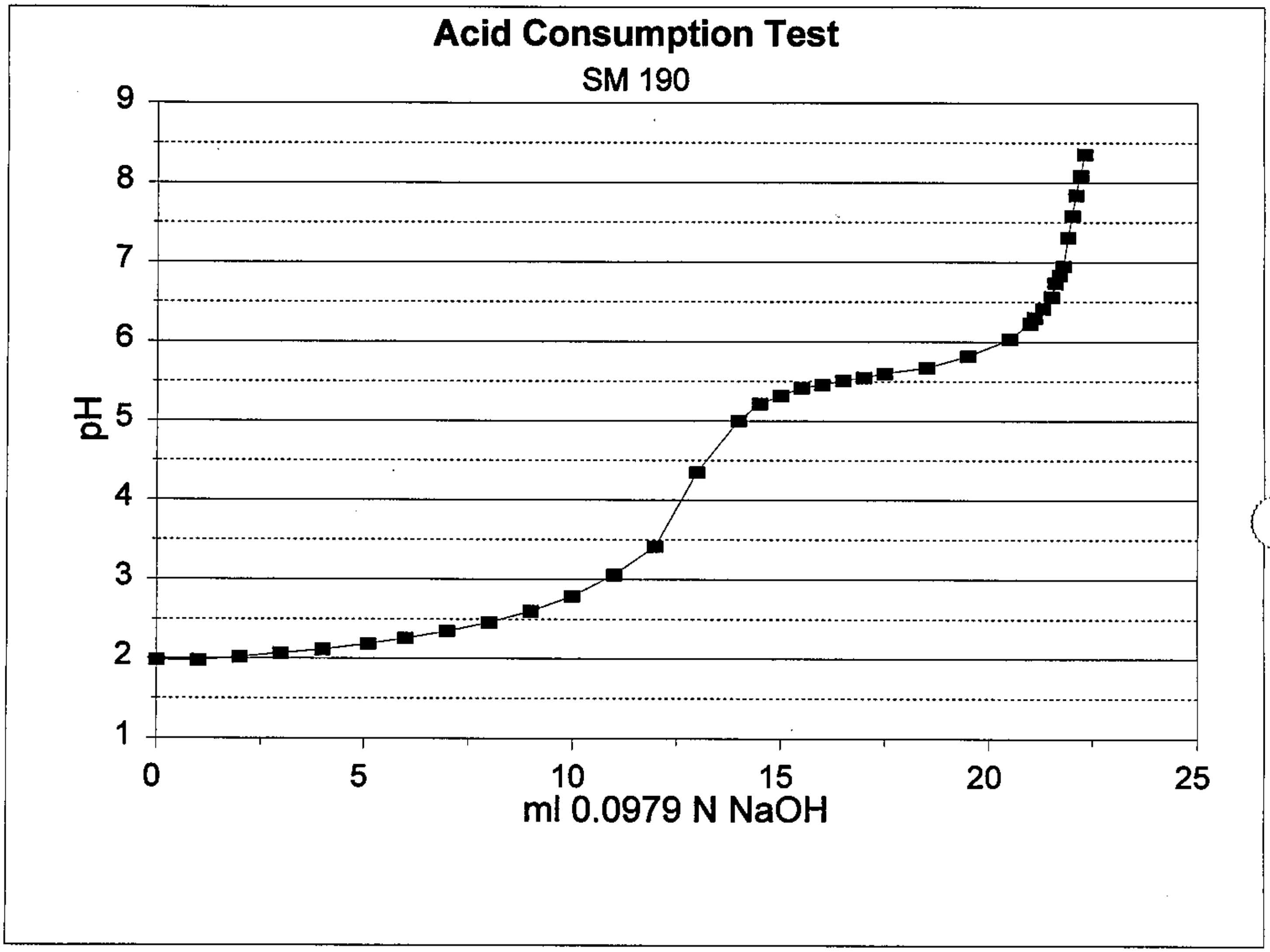


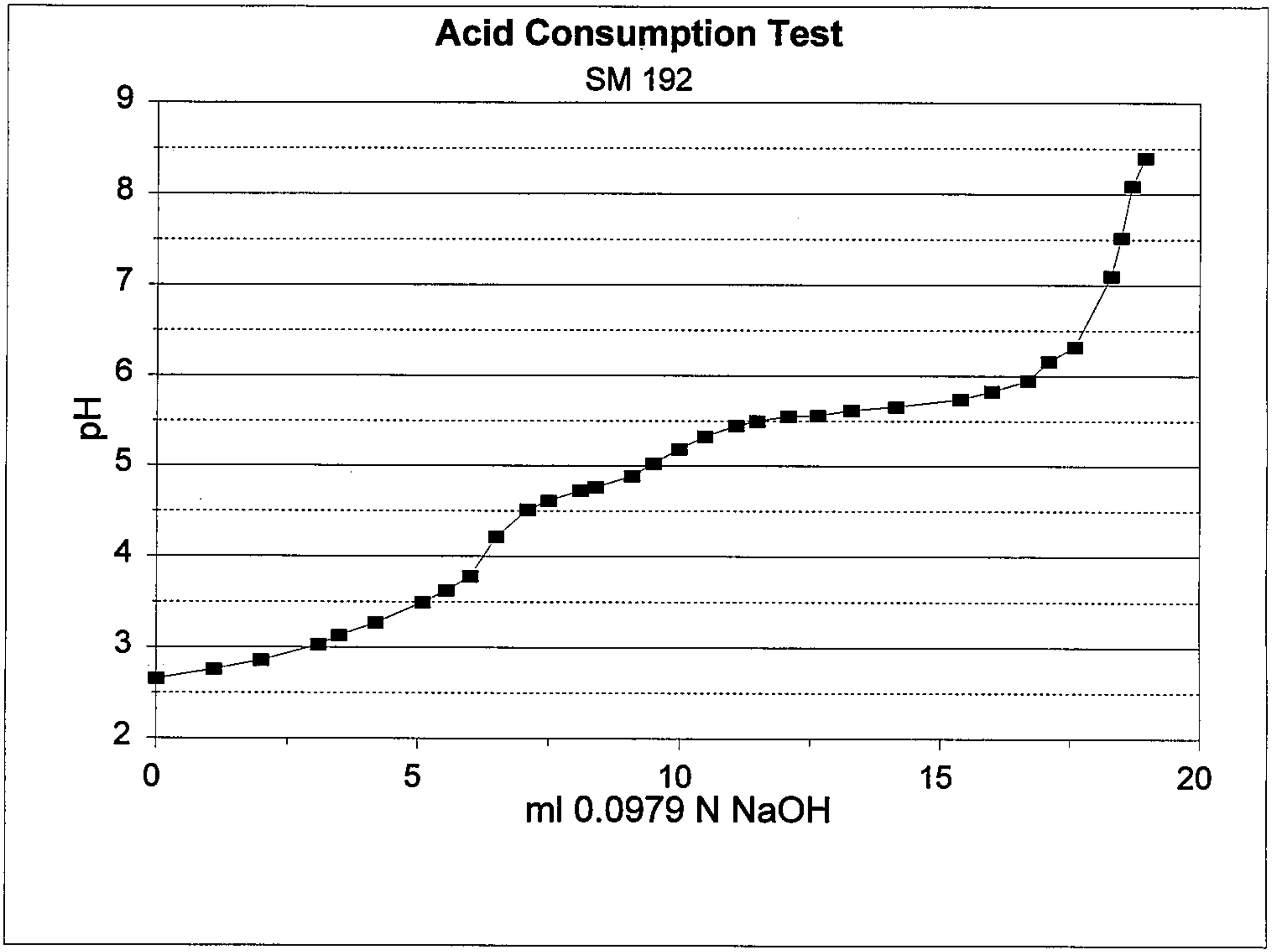
Acid Consumption Test
SM 186
pH
9
8
7
6
5
4
3
2
0
5
10
15
20
25
ml 0.0979 N NaOH

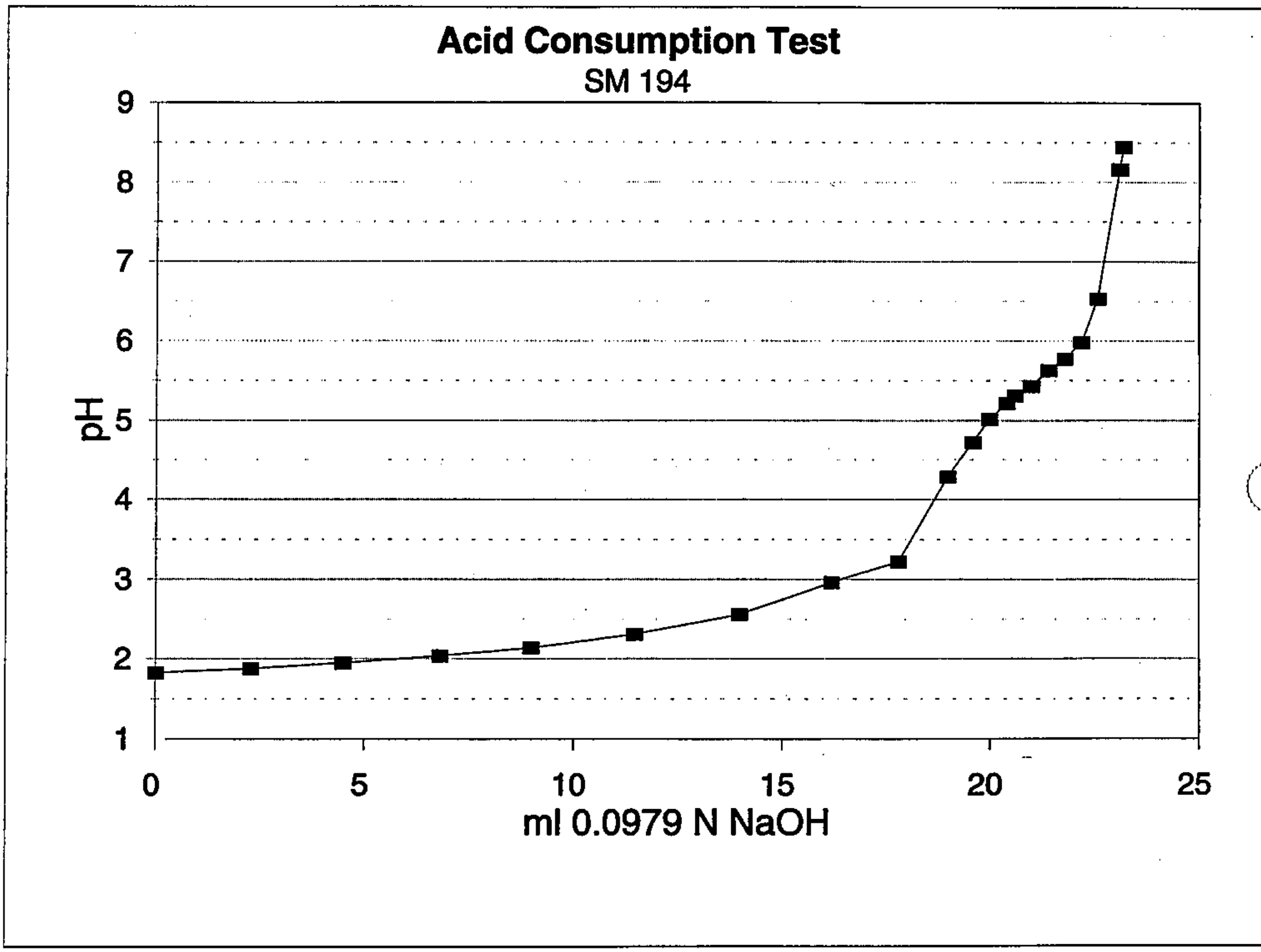


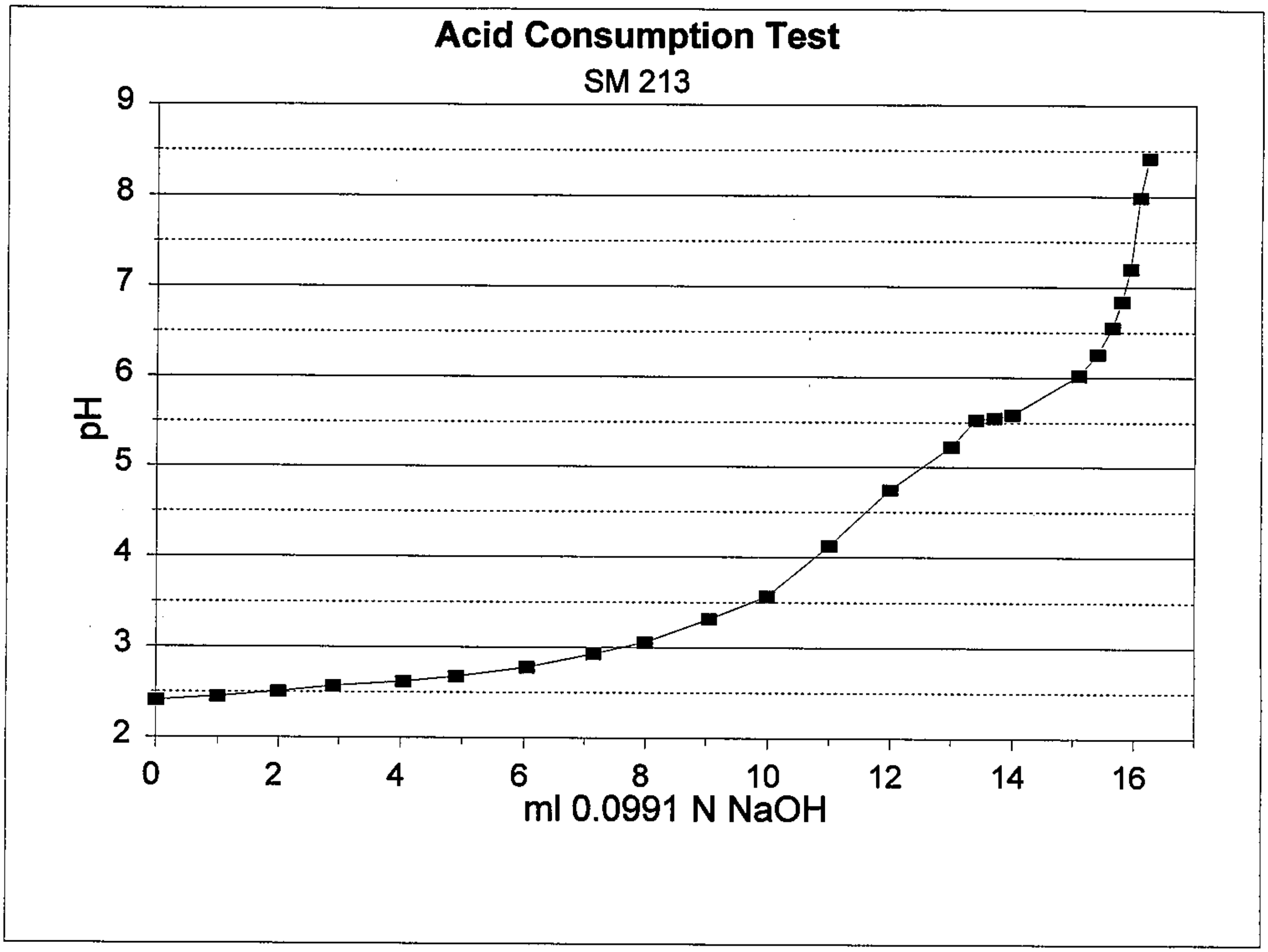
Acid Consumption Test
SM 187
pH
ml 0.0979 N NaOH
9
8
7
6
5
4
3
2
1
0
10
20
30
40
50


Acid Consumption Test
SM 188
pH
ml 0.0979 N NaOH
9
8
7
6
5
4
3
2
0
5
10
15
20
25


Acid Consumption Test
SM 190
pH
9
8
7
6
5
4
3
2
1
0
5
10
15
20
25
ml 0.0979 N NaOH


Acid Consumption Test
SM 192
pH
ml 0.0979 N NaOH
9
8
7
6
5
4
3
2
0
5
10
15
20


Acid Consumption Test
SM 194
pH
ml 0.0979 N NaOH
9
8
7
6
5
4
3
2
1
0
5
10
15
20
25



Acid Consumption Test
SM 213
pH
ml 0.0991 N NaOH
9
8
7
6
5
4
3
2
0
2
4
6
8
10
12
14
16

Attachment 3

Acid Consumption Tests for Limestone and Lime Columns

4-1 Lm

pH	buret (ml
2.27	0
2.29	0.95
2.32	1.9
2.36	3
2.39	4
2.46	5
2.5	6.05
2.55	7
2.63	8
2.73	9.1
2.84	10.1
2.99	10.95
3.22	12.1
3.4	13
3.74	14.1
4.83	15.1
5.18	15.5
5.6	16.1
5.8	16.4
5.97	16.8
6.14	17.1
6.35	17.45
6.78	17.7
7.38	17.95
8.17	18.15
8.61	18.25

8-1 LS

pH	buret (ml
1.96	0.90
1.97	1.50
1.98	1.80
1.98	2.30
2.00	2.90
2.02	3.50
2.05	4.20
2.08	5.00
2.11	5.60
2.16	6.50
2.22	7.60
2.28	8.40
2.33	9.20
2.44	10.30
2.50	11.00
2.56	11.50
2.70	12.50
2.80	13.00
2.92	13.60
3.09	14.40
3.21	14.65
3.30	15.10
3.55	15.90
3.80	16.20
4.28	16.60
5.07	16.80
6.12	17.15
8.09	17.50
8.52	17.60

13-1 LS

pH	buret (ml
2.06	0
2.12	1.2
2.17	2
2.24	3
2.33	4
2.42	5
2.56	6.1
2.7	7
2.91	8
3.15	9
3.42	10
3.75	11
5.48	12
6.67	12.5
7.19	12.6
7.39	12.7
7.55	12.8
8.21	12.9
9.03	13

15-1 LS

pH	buret (ml
2.29	1.10
2.31	1.80
2.35	2.35
2.42	3.10
2.49	3.80
2.61	4.60
2.74	5.45
2.85	6.10
2.95	6.90
3.00	7.50
2.98	8.00
2.96	8.30
3.00	8.80
3.10	9.40
3.08	9.50
3.20	9.90
3.29	10.05
3.42	10.30
3.63	10.50
3.97	10.80
4.25	11.05
4.47	11.40
4.71	11.60
4.98	12.00
5.20	12.20
5.35	12.45
5.47	12.70
5.65	13.00
6.00	13.40
6.27	13.50
6.56	13.70
7.07	13.85
7.60	14.00
8.15	14.15
8.75	14.35

15-3 Lm

pH	buret (ml
2.04	0
2.05	1
2.1	2
2.14	3
2.2	4
2.27	5
2.35	6
2.43	7
2.54	8
2.66	9
2.83	10
3.02	11
3.18	12
3.24	13
3.41	14
3.79	15
4.47	15.5
4.88	16
5.34	16.6
5.6	17
5.87	17.5
6.17	18
6.55	18.5
7.68	19
8.41	19.1

170 LS

pH	buret (ml
2.13	0
2.14	1.1
2.16	2
2.17	3.1
2.18	4
2.21	5.2
2.22	6.1
2.24	7.1
2.25	8.1
2.27	9.05
2.29	10
2.31	11
2.33	12.1
2.35	13.05
2.37	14.1
2.39	15.15
2.41	16
2.43	17
2.46	18.05
2.48	19
2.51	20.2
2.53	20.9
2.57	22
2.6	23.05
2.63	23.95
2.67	25
2.71	26
2.75	27
2.82	28.1
2.89	29.5
3.02	31.5
3.16	33.2
3.4	35.05
3.51	36.1
3.52	37
3.61	38.1
4.06	38.95
5.5	40.1
5.65	40.3
5.82	40.45
5.9	40.6
6.03	40.95
6.18	41.2
6.27	41.5
6.38	41.7
6.58	41.95
7.04	42.2
7.6	42.3
8.34	42.5
8.6	42.6

172 LS

pH	buret (ml
2.2	0
2.2	1.3
2.21	2.2
2.26	4.05
2.3	5
2.35	6
2.41	7
2.47	8
2.58	9.05
2.69	10.1
2.85	11.1
3.04	12.1
3.24	13.05
3.36	13.9
4.51	15.1
4.83	15.6
5.12	16
5.29	17.1
5.41	17.6
5.61	18
5.93	18.55
7.35	19.15
8.22	19.4
8.65	19.5

172 LS DUP

pH	buret (ml
2.54	0
2.63	1.1
2.66	2
2.74	3
2.95	4
3.48	5.2
4.47	5.95
4.65	7
4.76	7.55
5.17	8.05
5.75	8.55
7.05	9
8.01	9.1
8.01	9.3
8.57	9.5

176 LS

pH	buret (ml
2.47	0
2.52	1.1
2.57	1.9
2.67	3.05
2.78	4
2.93	5
3.19	6
3.64	6.9
4.55	7.4
4.97	7.8
5.17	8.1
5.29	8.3
5.37	8.6
5.44	8.9
5.47	9.3
5.5	9.65
5.54	10.1
5.56	10.75
5.58	11.2
5.6	12.1
5.63	12.65
5.67	13.2
5.72	13.8
5.76	14.45
5.78	14.9
5.85	15.6
5.95	16.5
6	17
6.1	17.6
6.18	17.9
6.26	18.2
6.32	18.5
6.47	18.95
6.72	19.35
7.43	19.8
7.78	19.95
8.34	20.1
8.96	20.3

180 LS

pH	buret (ml
2.46	0
2.55	1
2.65	2
2.79	3
3	4
3.34	5
3.84	6
5.3	7
5.69	8
5.92	9
6.14	9.5
6.46	10
7.3	10.5
7.52	10.6
8.18	10.7
8.51	10.8

180 Lm

pH	buret (ml
2.5	0
2.52	1
2.62	2.1
2.75	3
2.98	4
3.31	5
4.56	6
5.18	7.05
5.33	8
5.42	8.95
5.96	10.1
8.19	11.05
8.52	11.1

181 LS

pH	buret (ml
2.41	0
2.49	1
2.59	2
2.72	3
2.91	4
3.18	5
3.61	6
3.78	6.5
4.72	7
5.24	7.5
5.56	8
5.7	8.5
5.85	9
5.86	9.5
5.98	10
6.05	10.1
6.11	10.2
6.27	10.3
6.34	10.5
6.45	10.6
6.55	10.7
6.73	10.8
7.19	11
7.38	11.1
7.75	11.2
8.48	11.3

181 Lm

pH	buret (ml
2.23	0
2.26	1
2.3	2
2.35	3
2.4	4
2.47	5
2.55	6
2.64	7
2.76	8
2.91	9
3.08	10
3.26	11
3.39	12
3.58	13
3.86	13.5
4.51	14
4.85	14.5
5.22	15
5.45	15.5
5.6	16.1
5.66	16.5
5.74	17
5.83	17.5
5.97	18
6.15	18.5
6.58	19
7.75	19.5
7.95	19.6
8.3	19.7

183 LS

pH	buret (ml
2.21	0
2.24	0.95
2.27	2
2.3	2.95
2.34	4
2.38	5
2.43	6.05
2.49	7.1
2.56	8.05
2.63	9.1
2.67	10
2.8	11
2.95	12
3.1	13
3.25	14
3.99	15
4.7	15.6
4.69	15.7
5	16
4.96	16.2
5.12	16.5
5.29	17
5.46	17.6
5.61	18
5.9	18.5
6.26	19
7.76	19.5
8.58	19.7

186 LS

pH	buret (ml
2.19	17.60
2.23	18.40
2.28	19.00
2.34	19.70
2.40	20.50
2.45	21.00
2.51	21.55
2.58	22.15
2.65	22.60
2.76	23.30
2.88	23.90
3.05	24.55
3.21	25.00
3.29	25.30
3.37	25.55
3.42	25.85
3.45	26.10
3.50	26.30
3.60	26.50
3.90	26.85
4.22	27.00
4.47	27.15
4.70	27.35
4.83	27.50
4.94	27.70
5.10	27.90
5.26	28.00
5.36	28.10
5.45	28.30
5.52	28.50
5.60	28.70
5.65	29.00
5.70	29.20
5.76	29.60
5.80	29.90
5.85	30.20
5.88	30.50
5.96	30.90
6.05	31.25
6.16	31.60
6.28	31.90
6.50	32.40
6.81	32.70
7.41	33.00
8.62	33.35

187 LS

pH	buret (ml
2.27	0
2.28	1.1
2.3	2
2.34	3
2.38	4.1
2.43	5.1
2.46	6.1
2.53	7.15
2.58	8
2.65	9.05
2.76	10.15
2.9	11.2
3.06	12.05
3.28	13.1
3.57	14
4.63	15.1
5.4	16
5.71	17.05
5.83	17.4
5.92	17.9
6.06	18.15
6.42	18.5
6.83	18.65
7.58	18.85
8.31	19

188 LS

pH	buret (ml
2.27	0
2.29	1.2
2.31	2
2.35	3
2.38	3.9
2.44	5
2.52	6.1
2.59	7.1
2.68	8
2.82	9
3.01	10.15
3.23	11.1
3.53	12
3.8	12.6
4.55	13.2
5.02	13.9
5.29	14.3
5.42	14.8
5.5	15.2
5.56	15.7
5.62	16.2
5.67	16.7
5.72	17.1
5.77	17.45
5.82	17.75
5.92	18.1
6.13	18.6
6.6	19
7.89	19.4
8.3	19.5
8.65	19.65

190 LS

pH	buret (ml
1.62	0
1.69	1
1.7	2
1.71	3
1.72	4
1.74	5
1.76	6
1.77	7
1.79	8
1.81	9
1.83	10
1.85	11
1.87	12
1.89	13.1
1.91	14
1.93	15
1.96	16
1.98	17
2	18
2.03	19.2
2.06	20
2.09	21
2.12	22
2.15	23
2.18	24
2.22	25
2.25	26
2.3	27
2.33	28
2.39	29
2.44	30
2.49	31
2.56	32
2.63	33
2.71	34
2.82	35
2.94	36
3.11	37
3.3	38
3.52	39
3.72	40
4.5	41
5.11	42
5.47	43
5.77	44
5.91	45
6.02	45.5
6.09	46
6.36	46.5
7.13	47
7.42	47.1
7.64	47.2
8.3	47.4

192 LS

pH	buret (ml
1.33	0
1.4	5
1.48	10
1.57	15
1.67	20
1.79	25
1.93	30
2.11	35
2.38	40
2.79	45
3.16	50
3.86	55
4.36	60
4.62	65
5.15	70
5.38	75
6	80
6.78	85
7.25	90
7.6	92
8.2	94
8.22	94.5
8.3	95.1

192 LS DUP

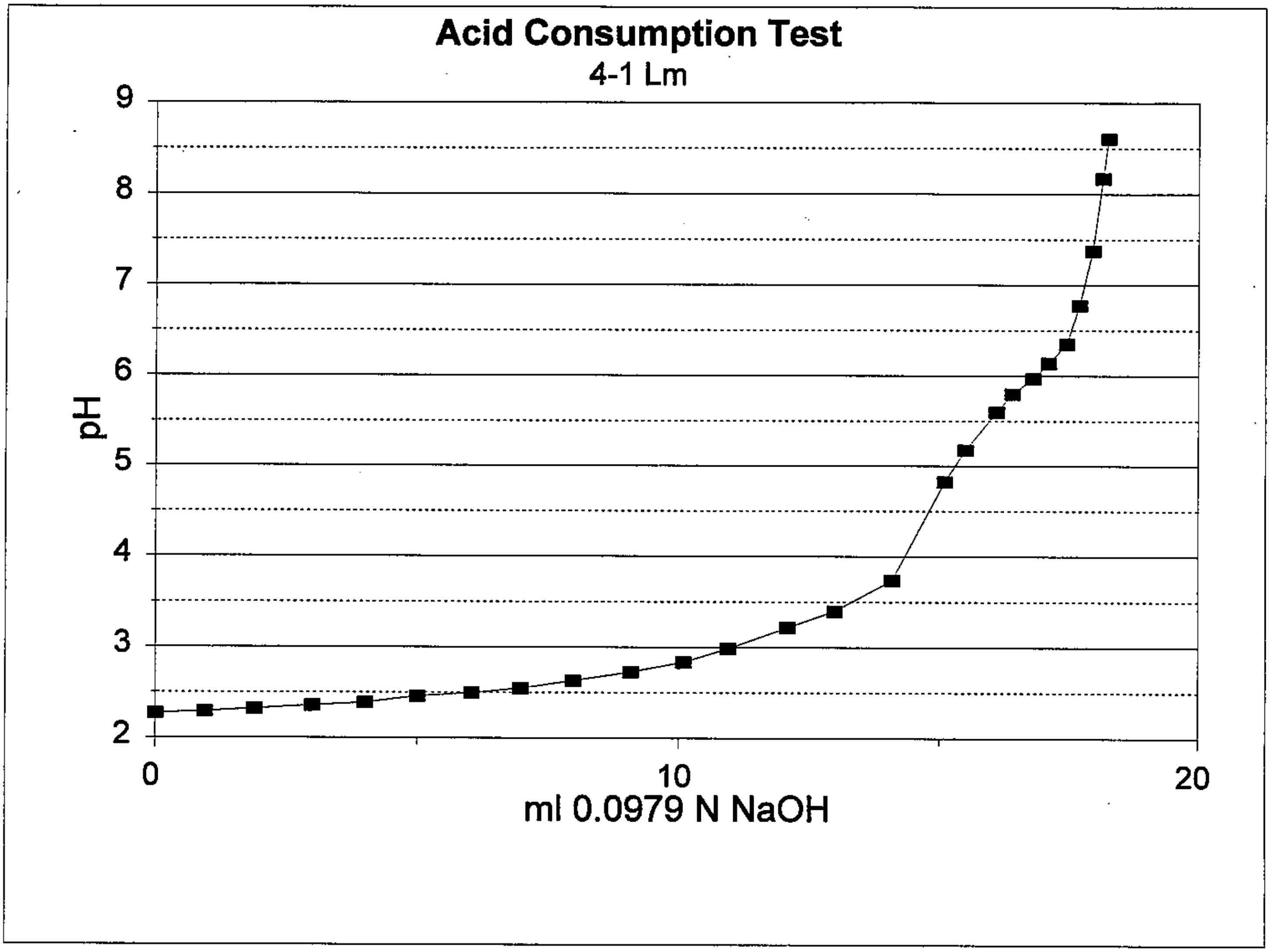
pH	buret (ml
2.73	0
2.95	2.1
3.54	3.9
4.57	6.1
4.79	7.1
5.44	8
8.71	9.1

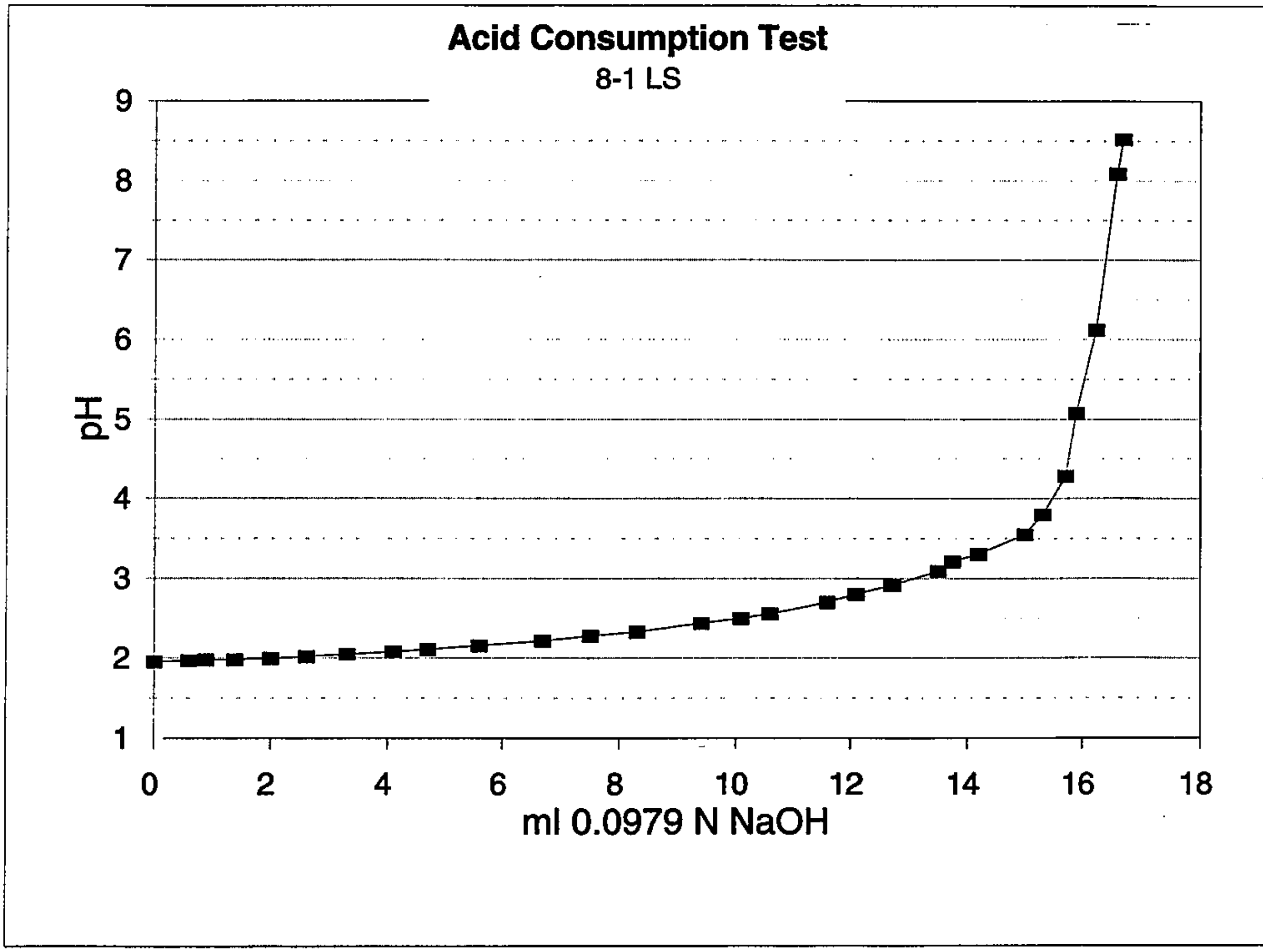
194 LS

pH	buret (ml
1.86	1.20
1.86	1.30
1.87	1.40
1.90	2.50
1.92	3.30
1.94	4.00
1.96	4.80
2.00	5.80
2.06	7.10
2.11	8.20
2.15	8.80
2.22	9.90
2.31	11.00
2.41	12.00
2.58	13.30
2.64	13.80
2.76	14.40
3.03	15.40
3.25	16.20
3.98	17.40
4.87	17.80
5.05	17.90
5.24	18.00
5.41	18.40
5.55	18.50
5.94	18.80
6.24	19.10
6.77	19.30
7.86	19.50
8.25	19.60
8.51	19.65

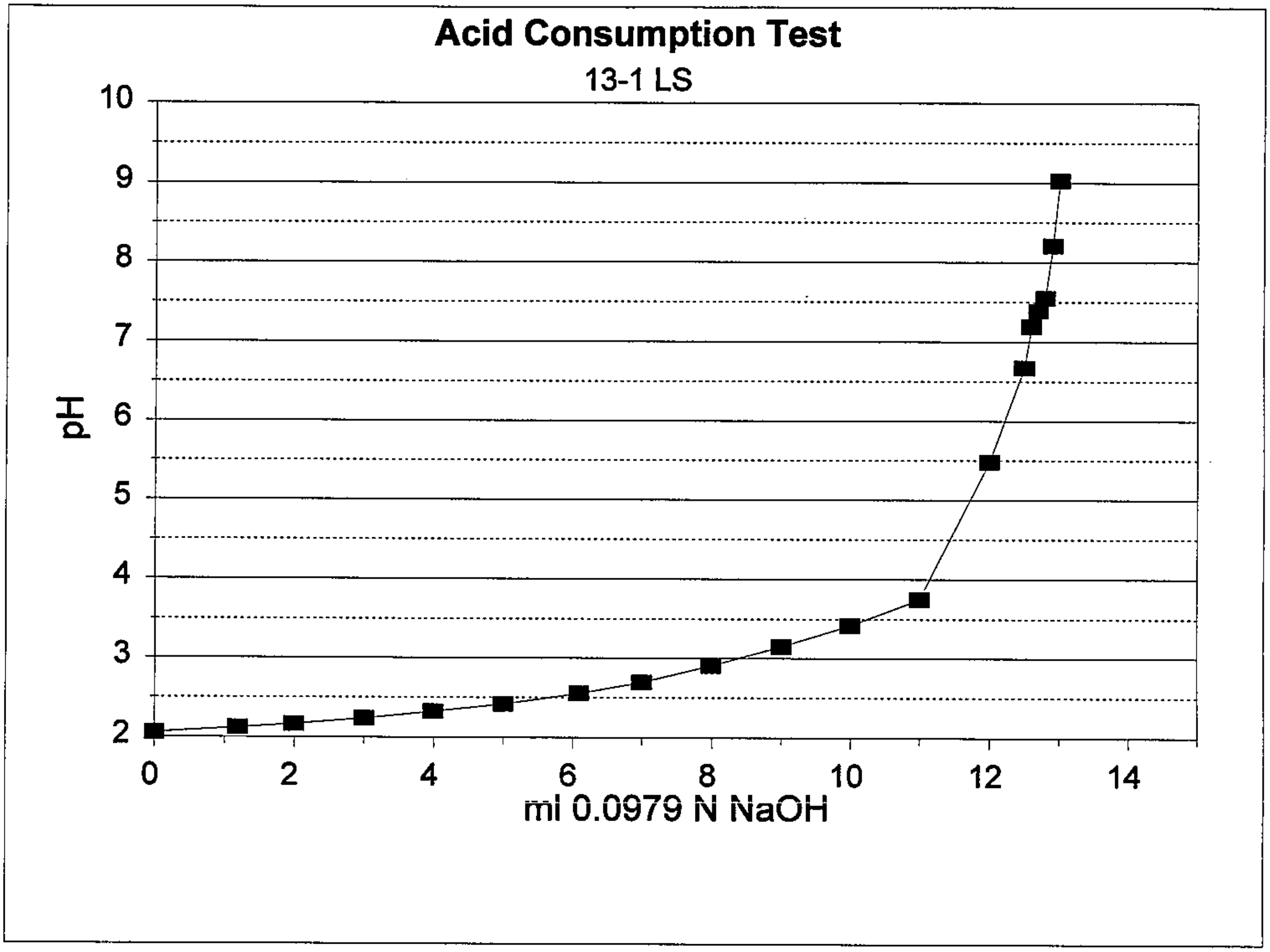
213 LS

pH	buret (ml
2.63	0
2.64	1
2.68	2
2.75	3
2.83	4
2.94	5.1
3.24	6
3.42	7
3.88	8
5.53	9.1
6.07	9.6
7.51	10
8.14	10.1
8.56	10.2

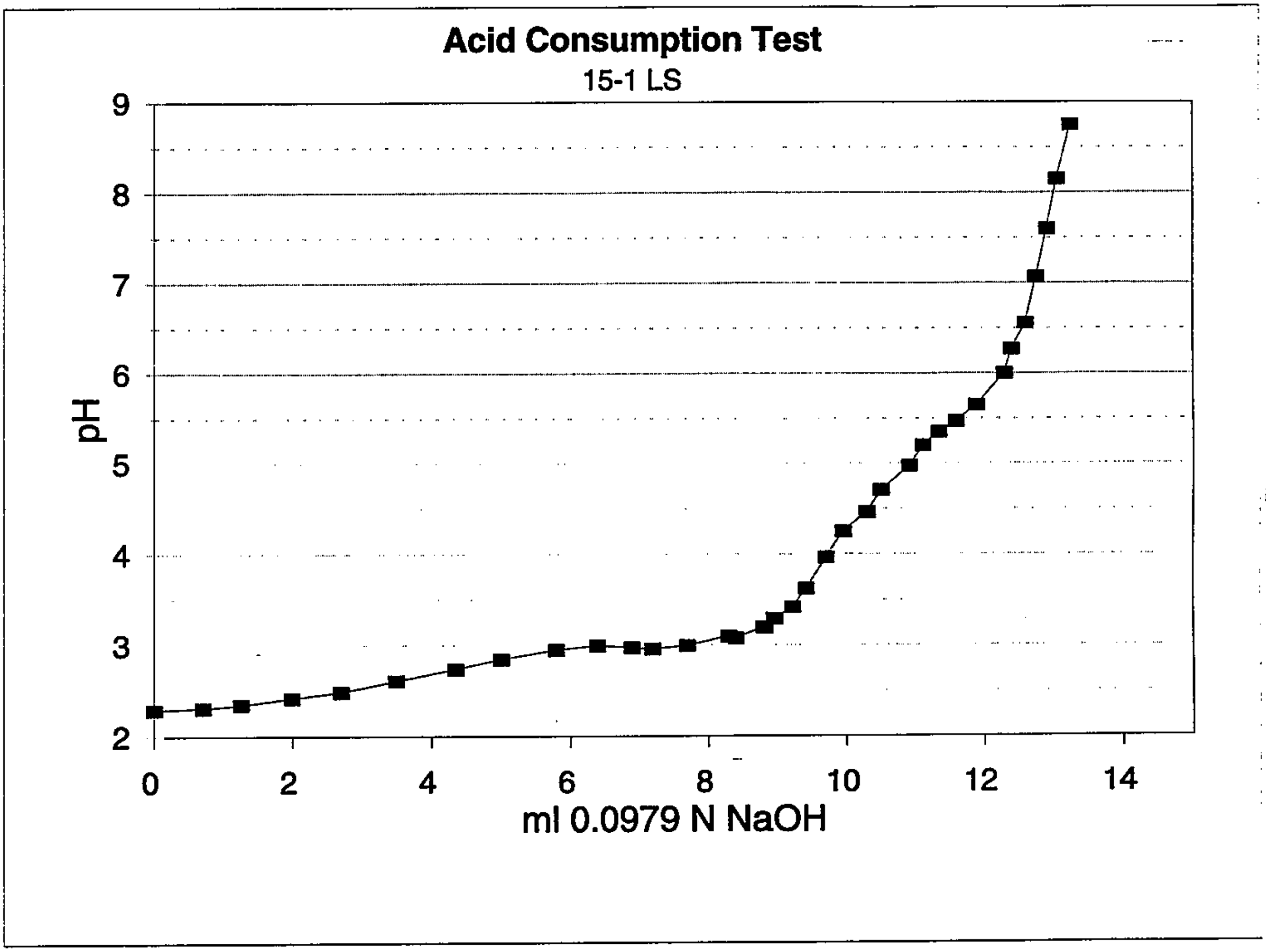

Acid Consumption Test
4-1 Lm
pH
9
8
7
6
5
4
3
2
0
10
20
ml 0.0979 N NaOH



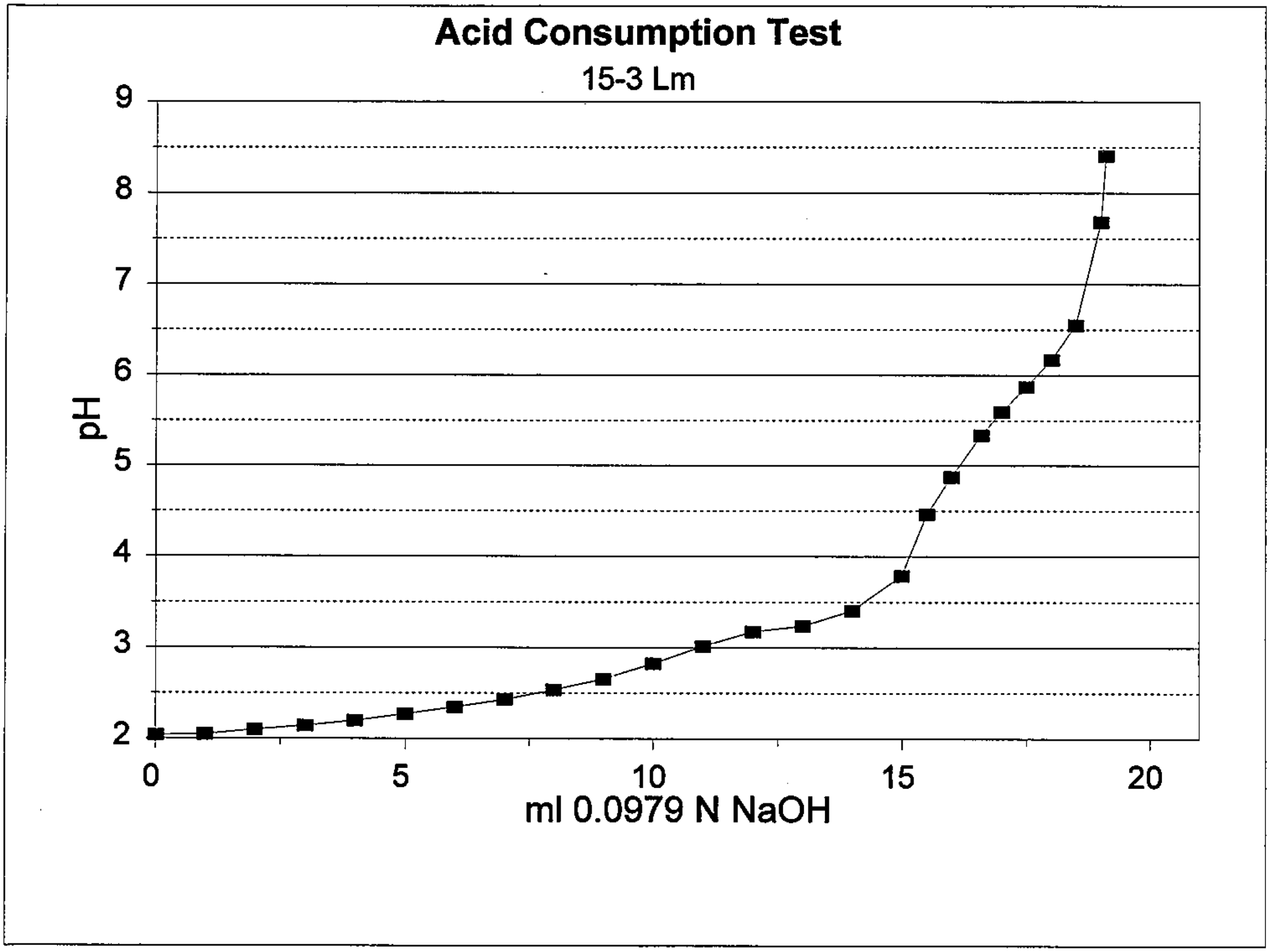
Acid Consumption Test
8-1 LS
pH
9
8
7
6
5
4
3
2
1
0
2
4
6
8
10
12
14
16
18
ml 0.0979 N NaOH

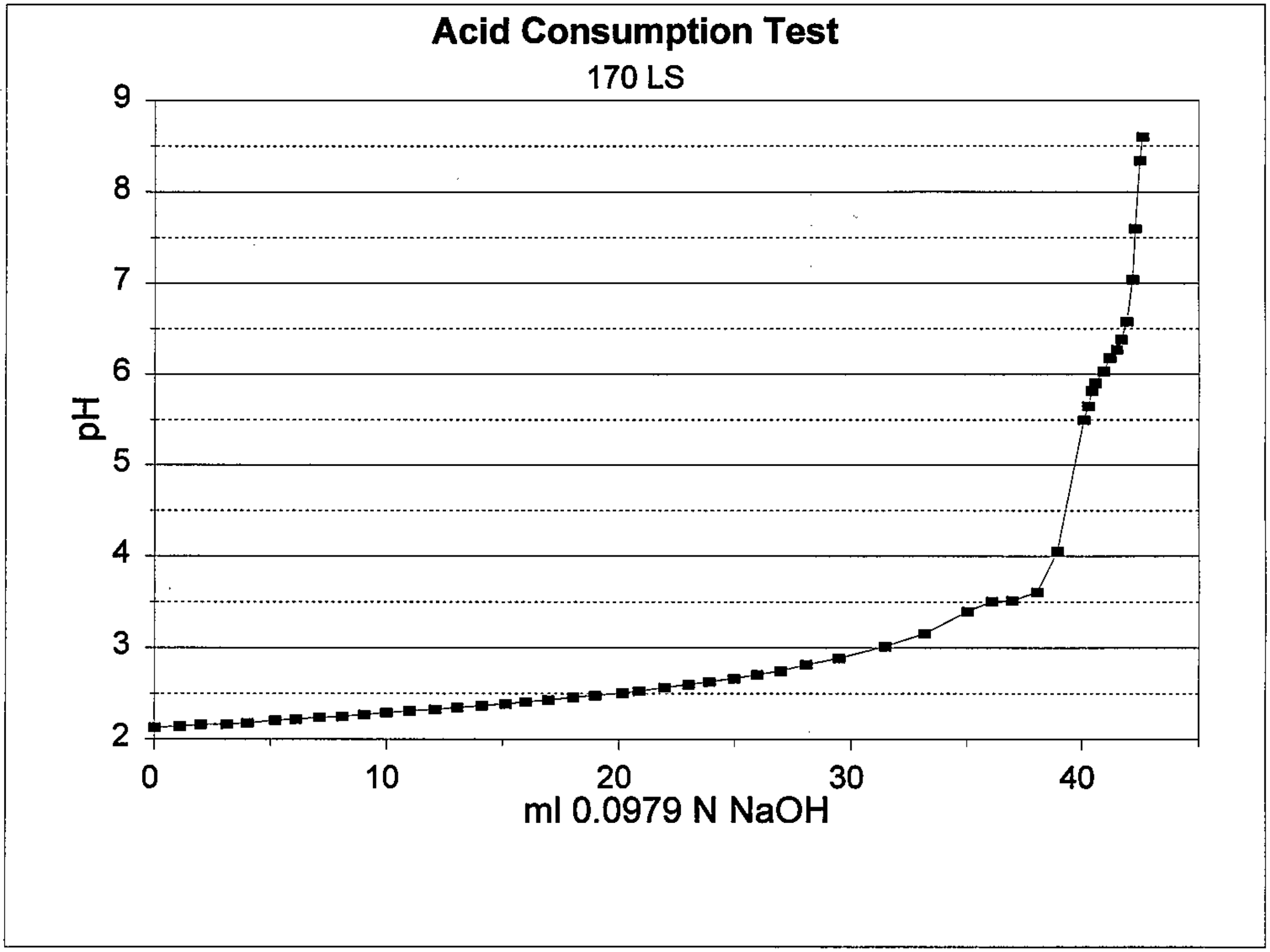


Acid Consumption Test
13-1 LS
pH
10
9
8
7
6
5
4
3
2
0
2
4
6
8
10
12
14
ml 0.0979 N NaOH

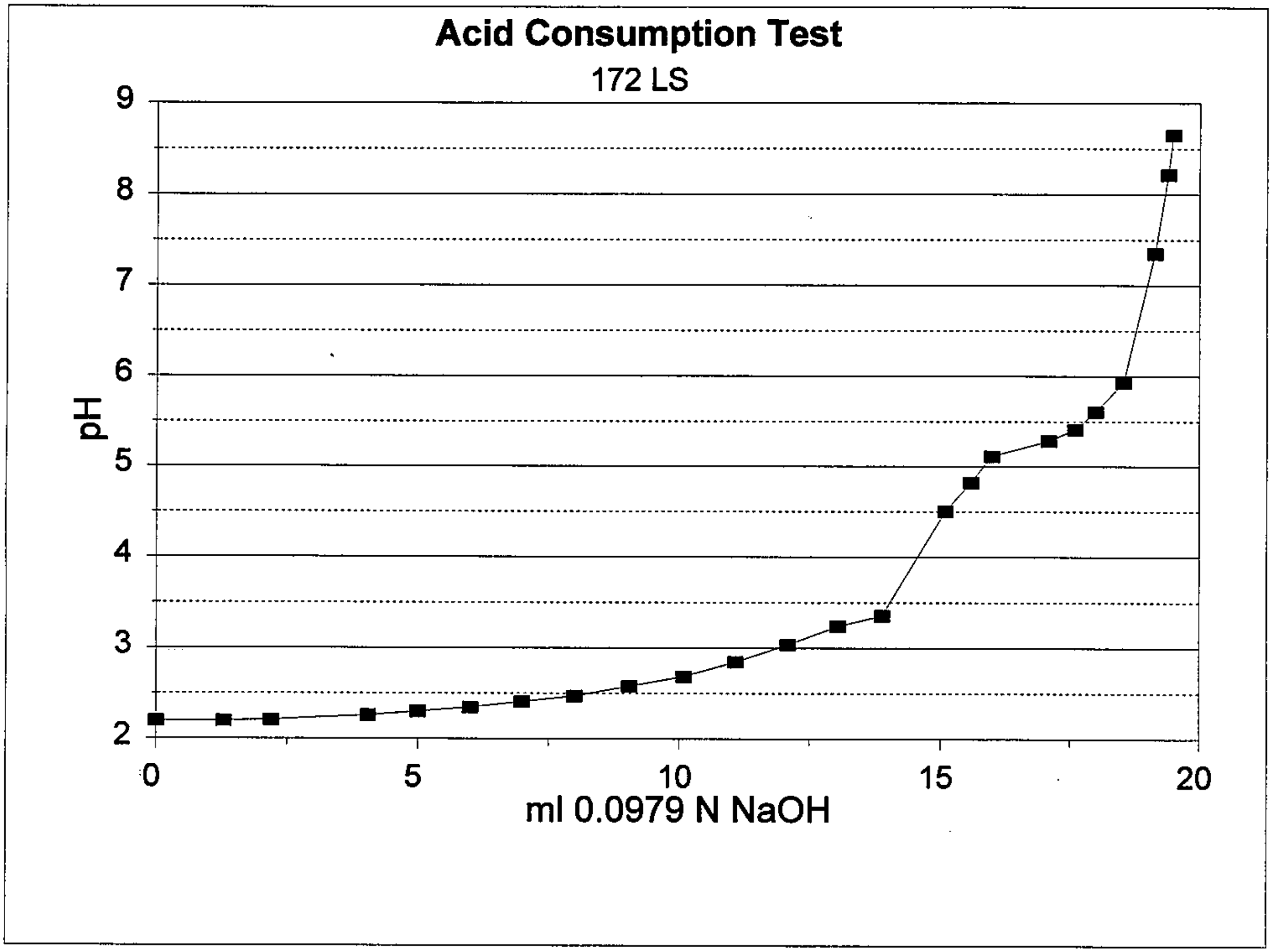


Acid Consumption Test
15-1 LS
pH
9
8
7
6
5
4
3
2
0
2
4
6
8
10
12
14
ml 0.0979 N NaOH

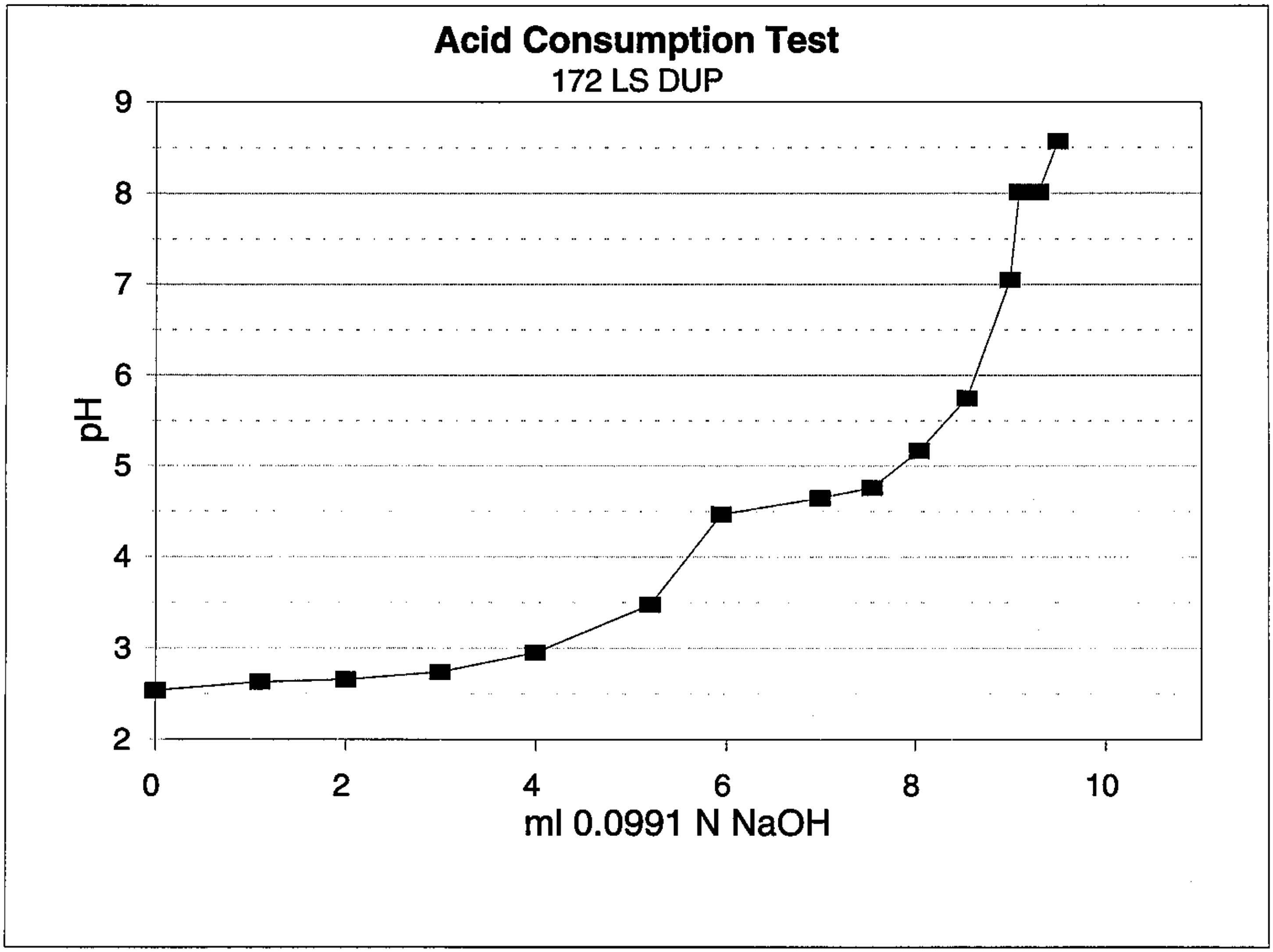

Acid Consumption Test
15-3 Lm
pH
ml 0.0979 N NaOH
9
8
7
6
5
4
3
2
0
5
10
15
20



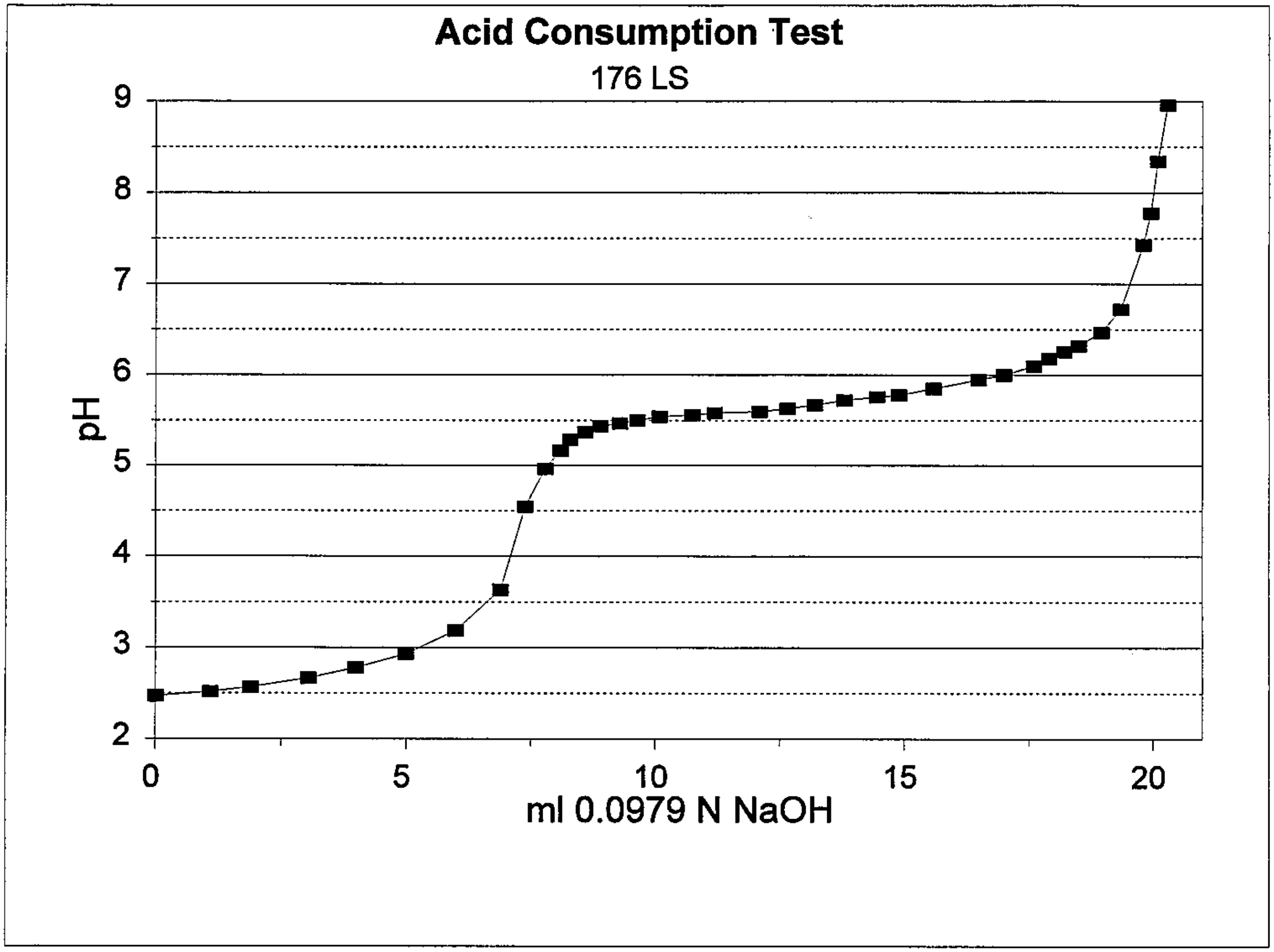
Acid Consumption Test
170 LS
pH
9
8
7
6
5
4
3
2
0
10
20
30
40
ml 0.0979 N NaOH



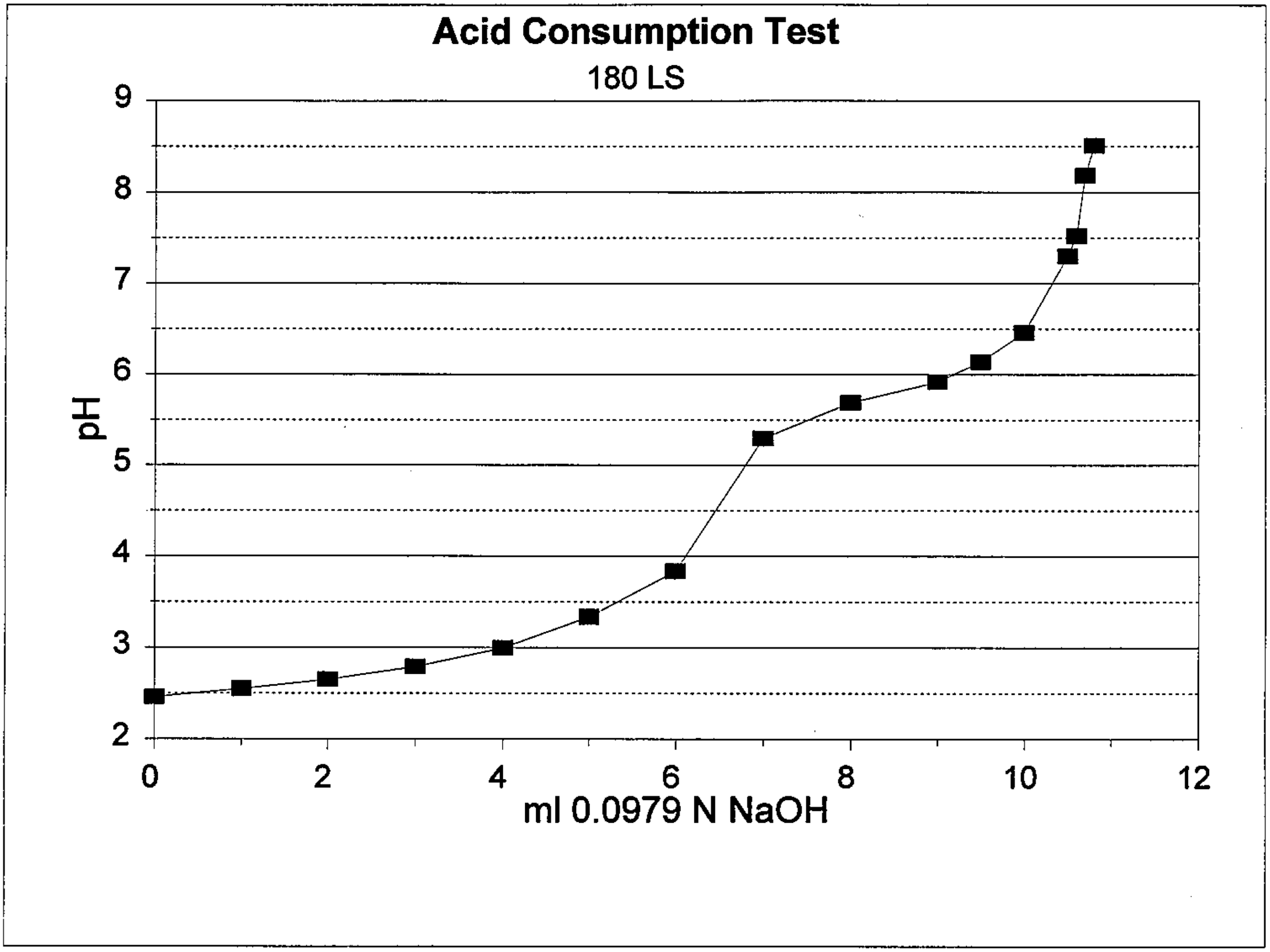
Acid Consumption Test
172 LS
9
8
7
6
5
4
3
2
pH
0
5
10
15
20
ml 0.0979 N NaOH

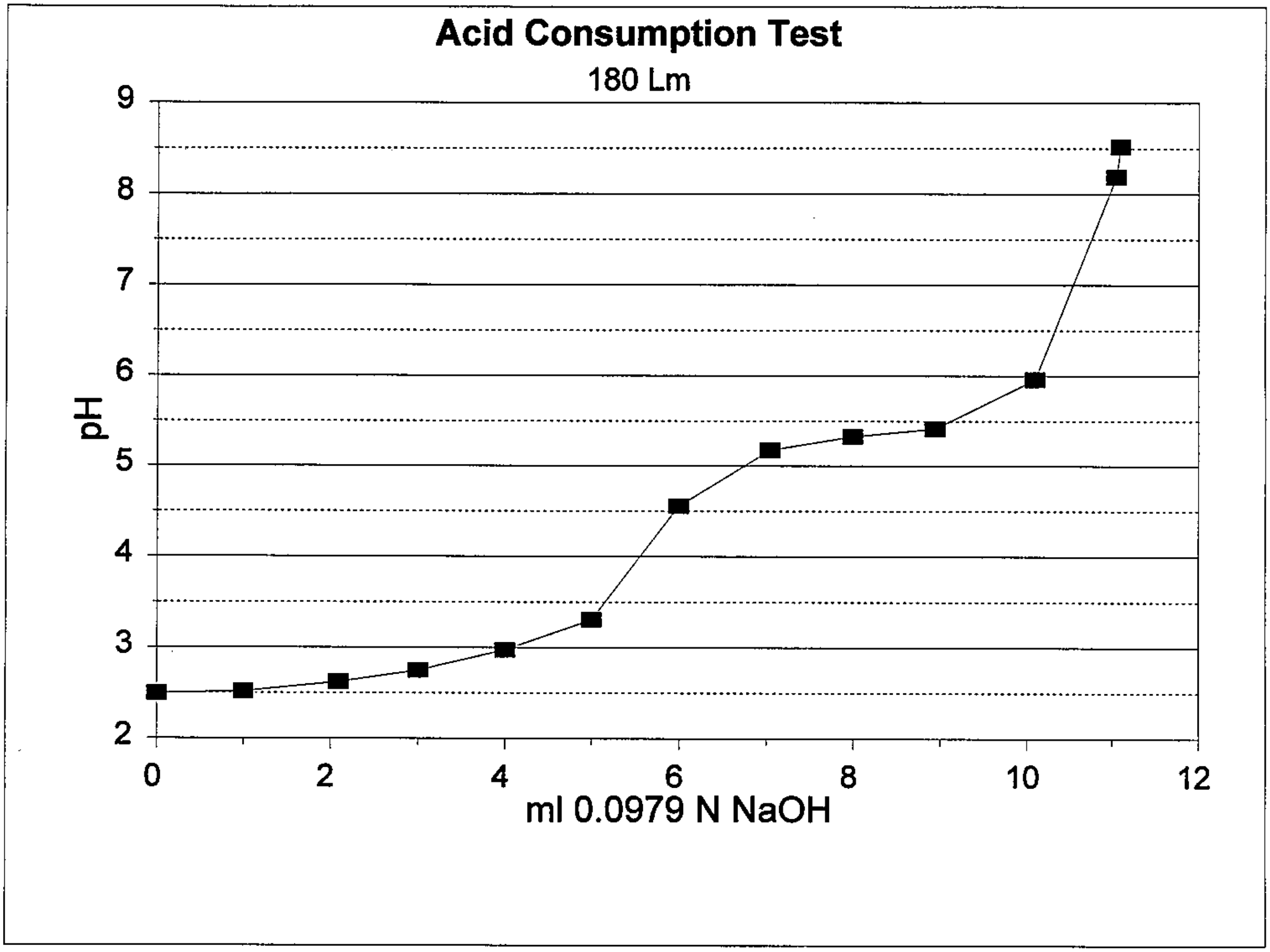


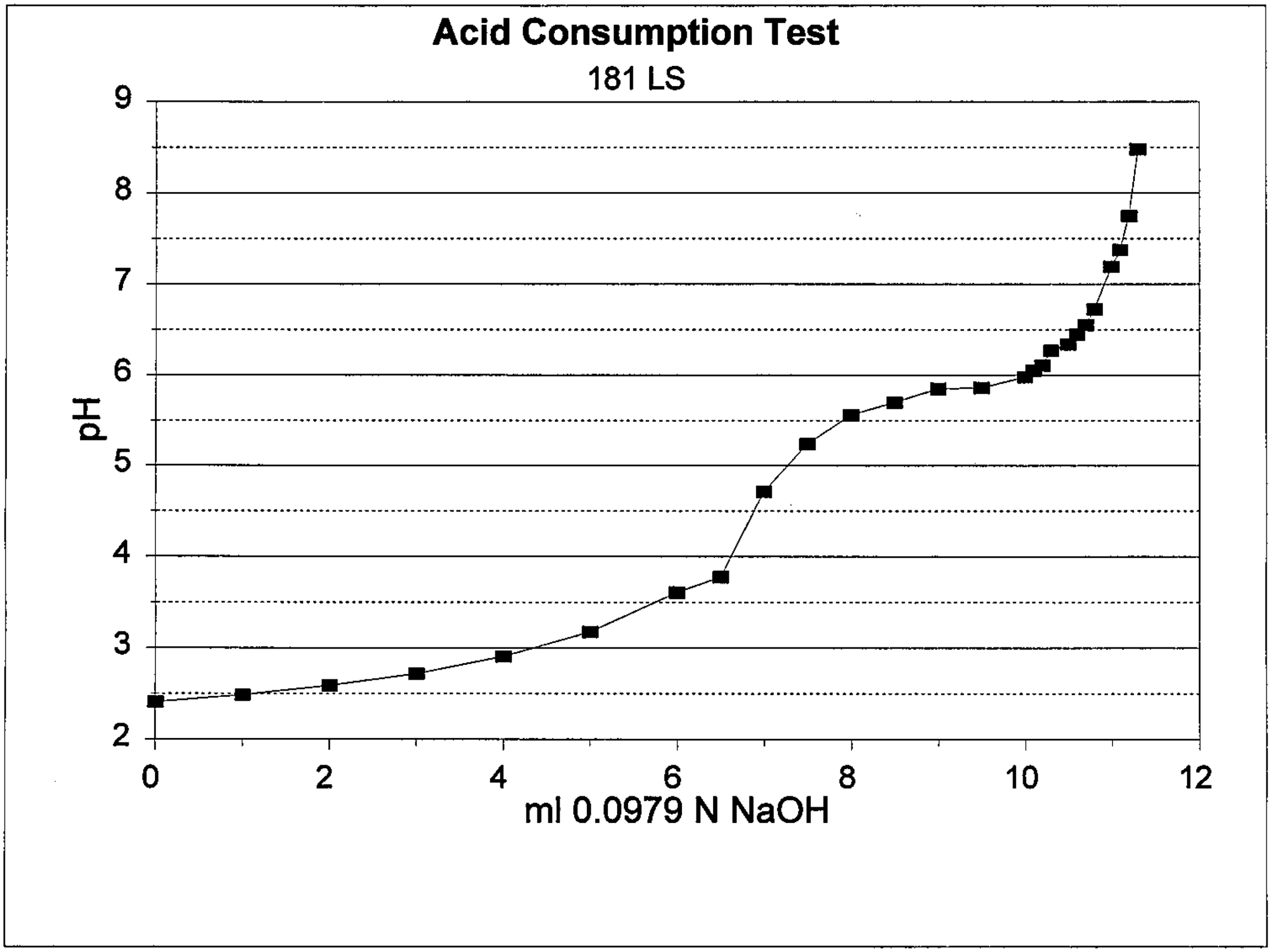
Acid Consumption Test
172 LS DUP
pH
ml 0.0991 N NaOH
9
8
7
6
5
4
3
2
0
2
4
6
8
10



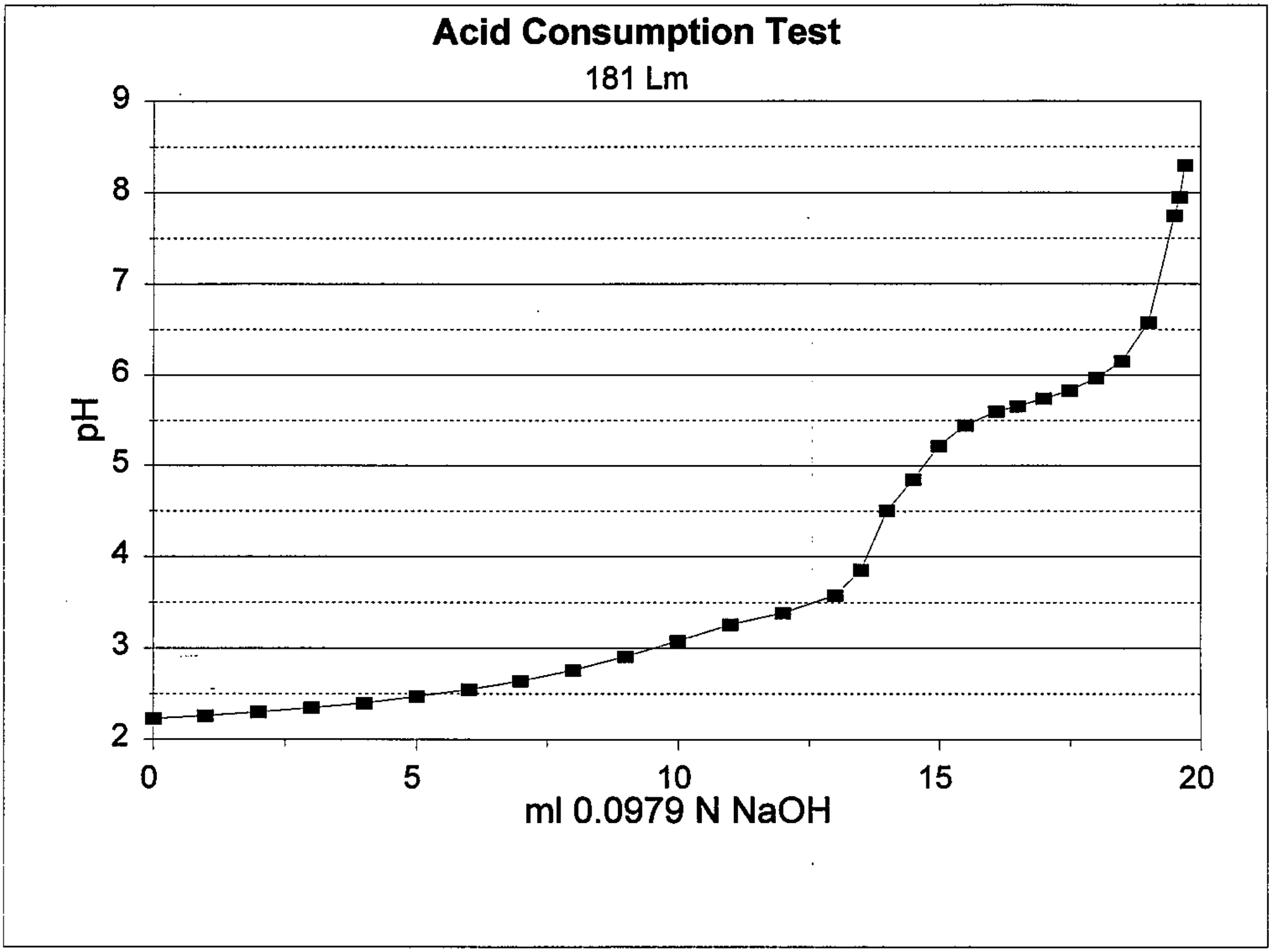
Acid Consumption Test
176 LS
pH
9
8
7
6
5
4
3
2
0
5
10
15
20
ml 0.0979 N NaOH


Acid Consumption Test
180 LS
pH
ml 0.0979 N NaOH
9
8
7
6
5
4
3
2
0
2
4
6
8
10
12

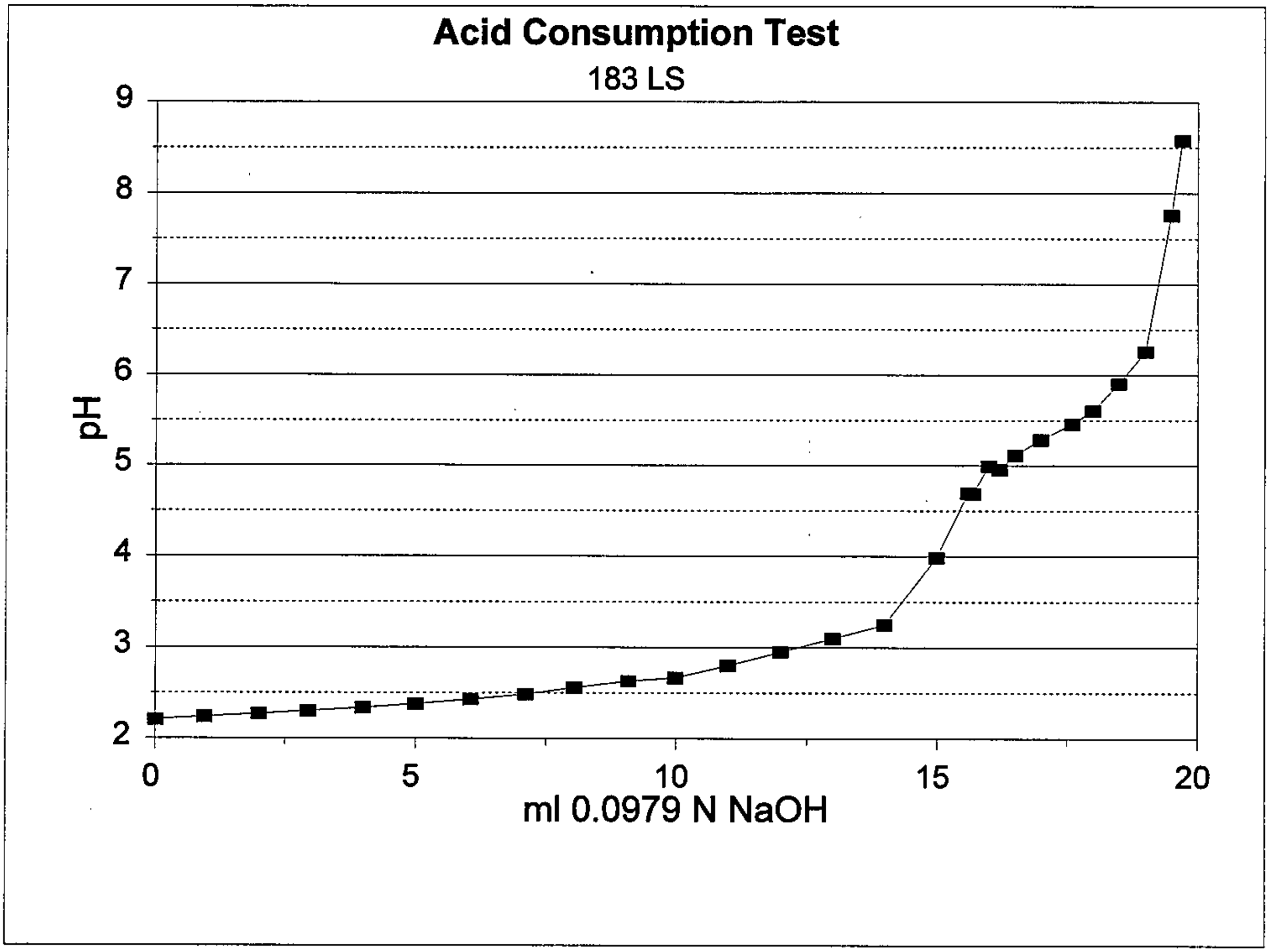

Acid Consumption Test
180 Lm
pH
9
8
7
6
5
4
3
2
0
2
4
6
8
10
12
ml 0.0979 N NaOH

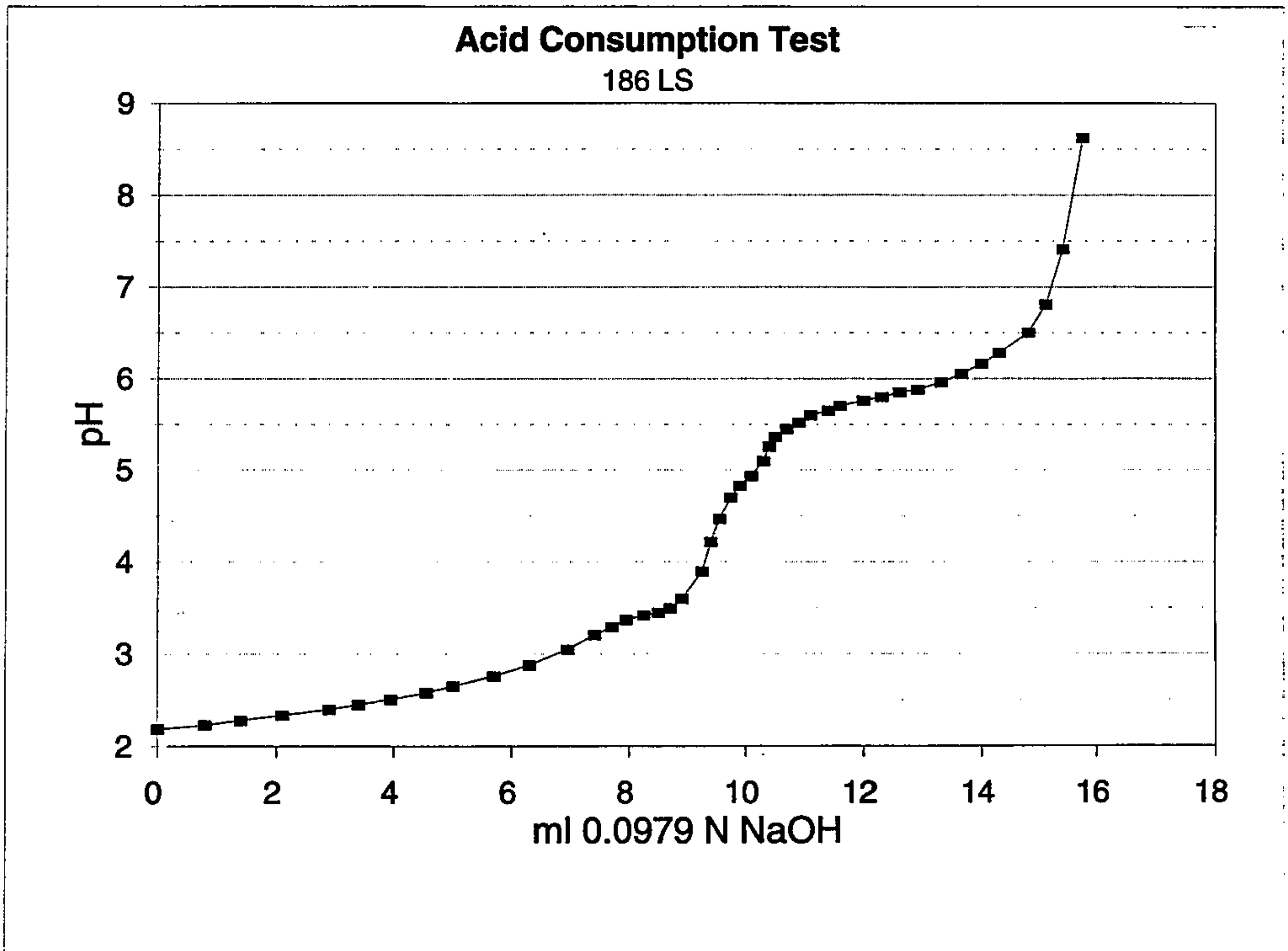


Acid Consumption Test
181 LS
9
8
7
6
5
4
3
2
pH
0
2
4
6
8
10
12
ml 0.0979 N NaOH

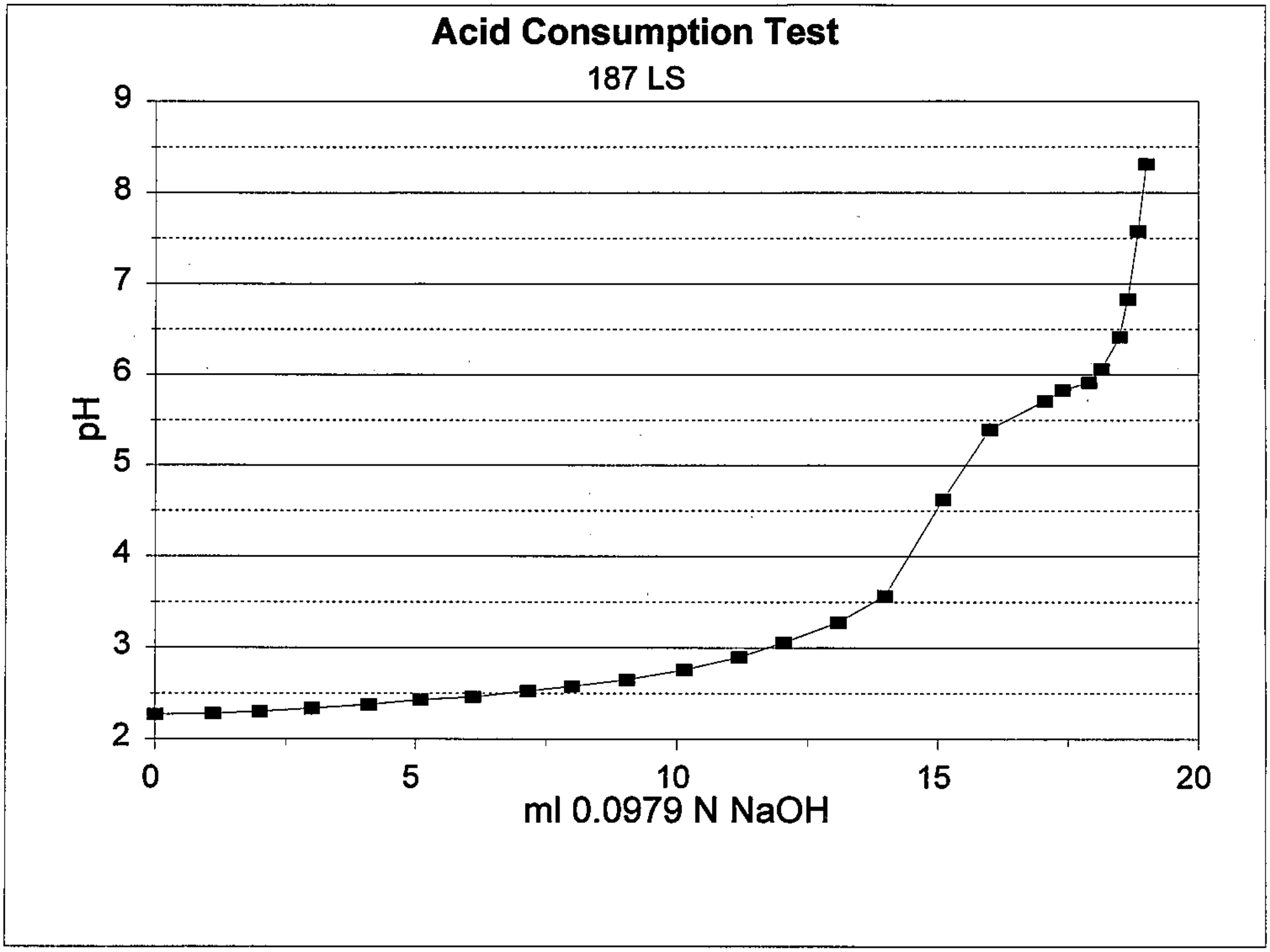


Acid Consumption Test
181 Lm
pH
9
8
7
6
5
4
3
2
0
5
10
15
20
ml 0.0979 N NaOH

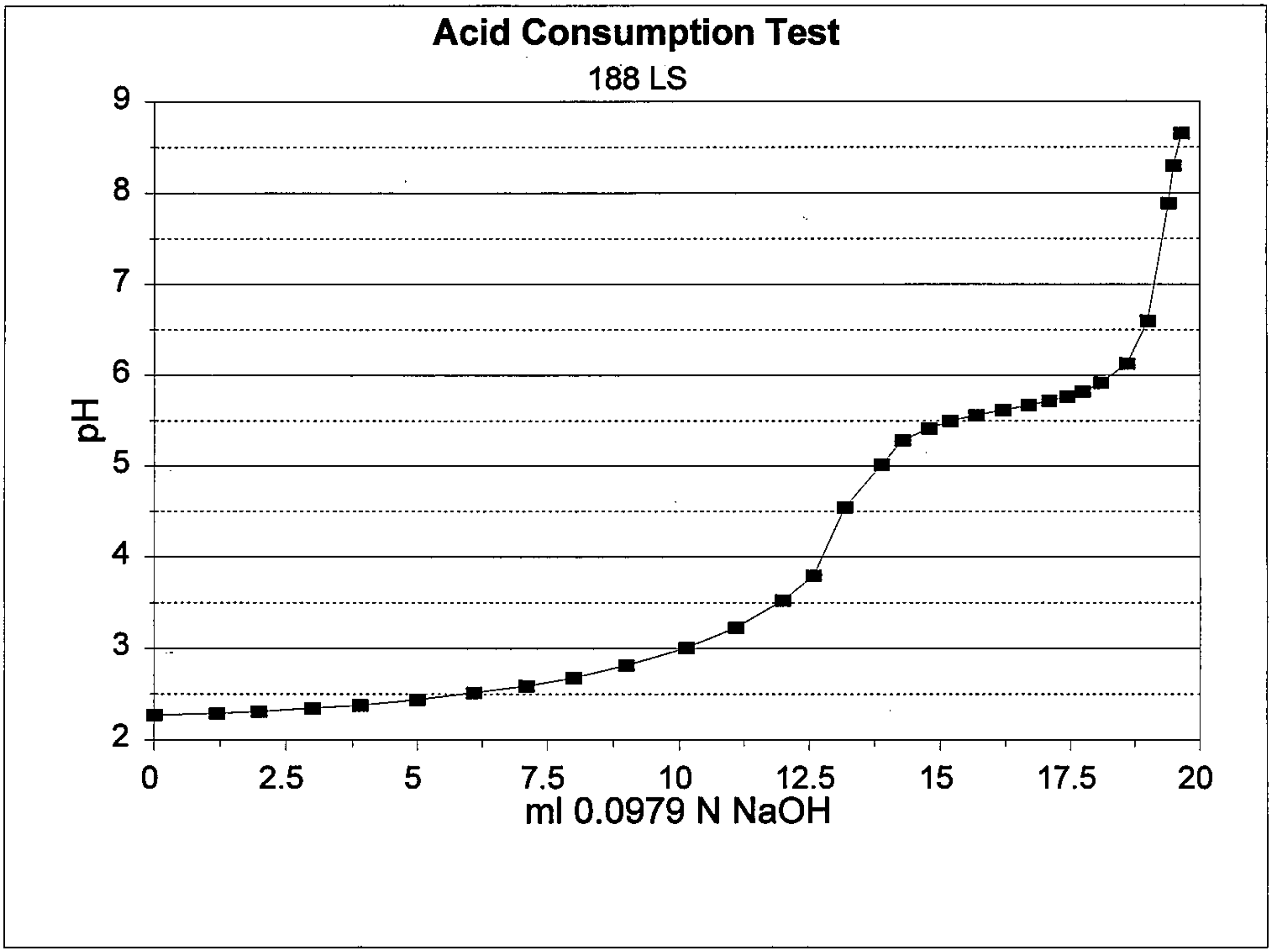

Acid Consumption Test
183 LS
pH
9
8
7
6
5
4
3
2
0
5
10
15
20
ml 0.0979 N NaOH

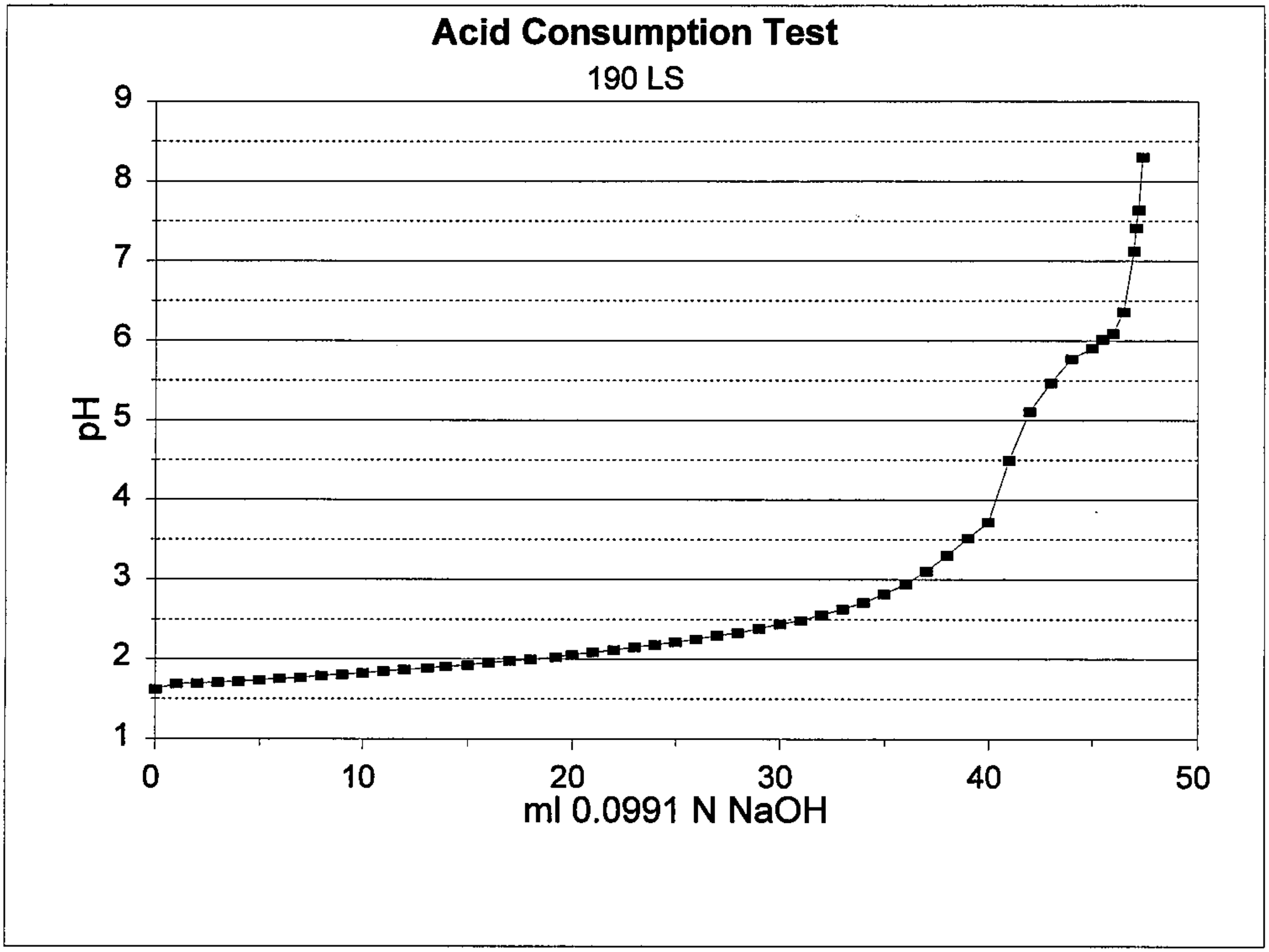


Acid Consumption Test
186 LS
pH
ml 0.0979 N NaOH
9
8
7
6
5
4
3
2
0
2
4
6
8
10
12
14
16
18

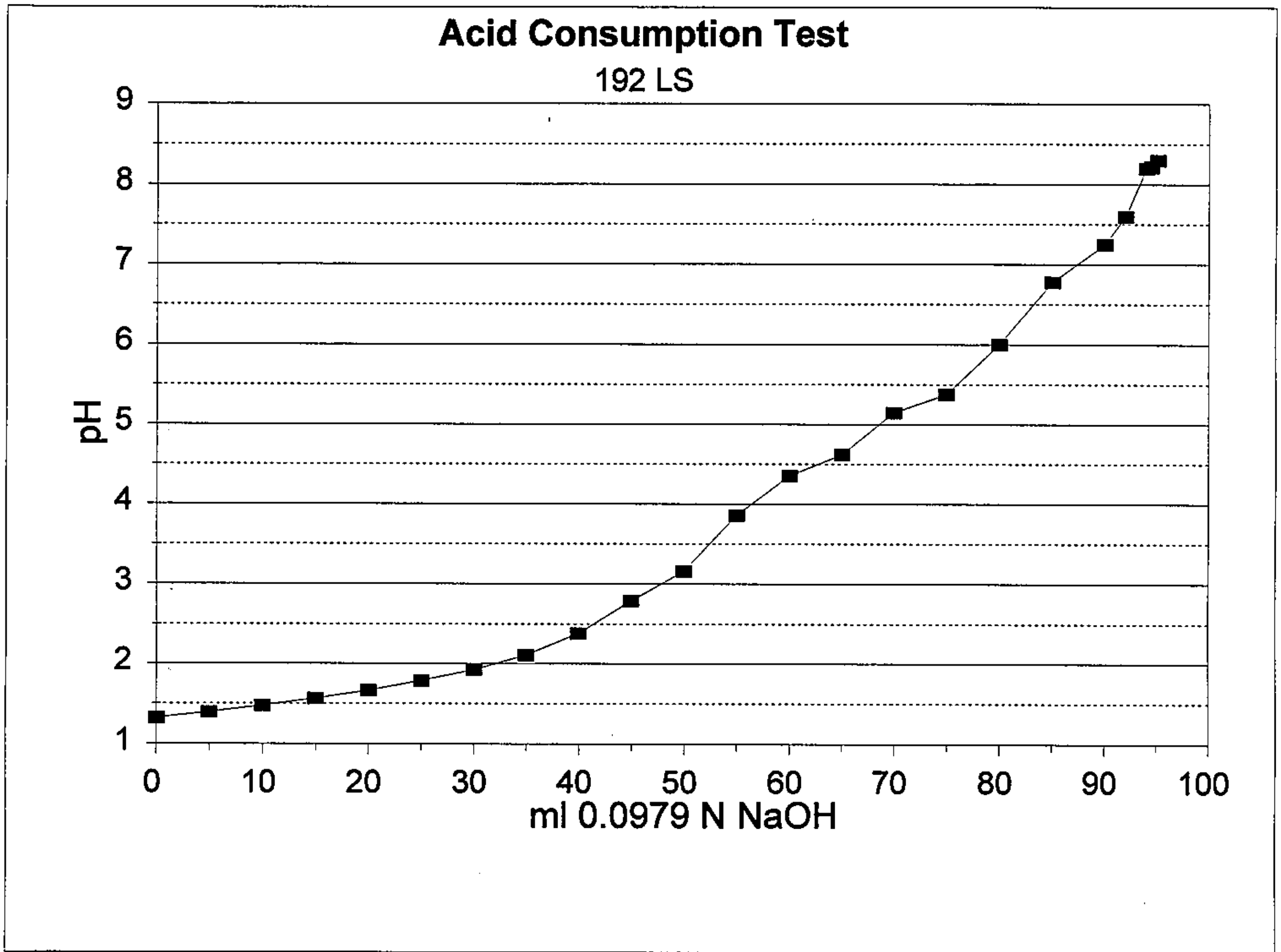


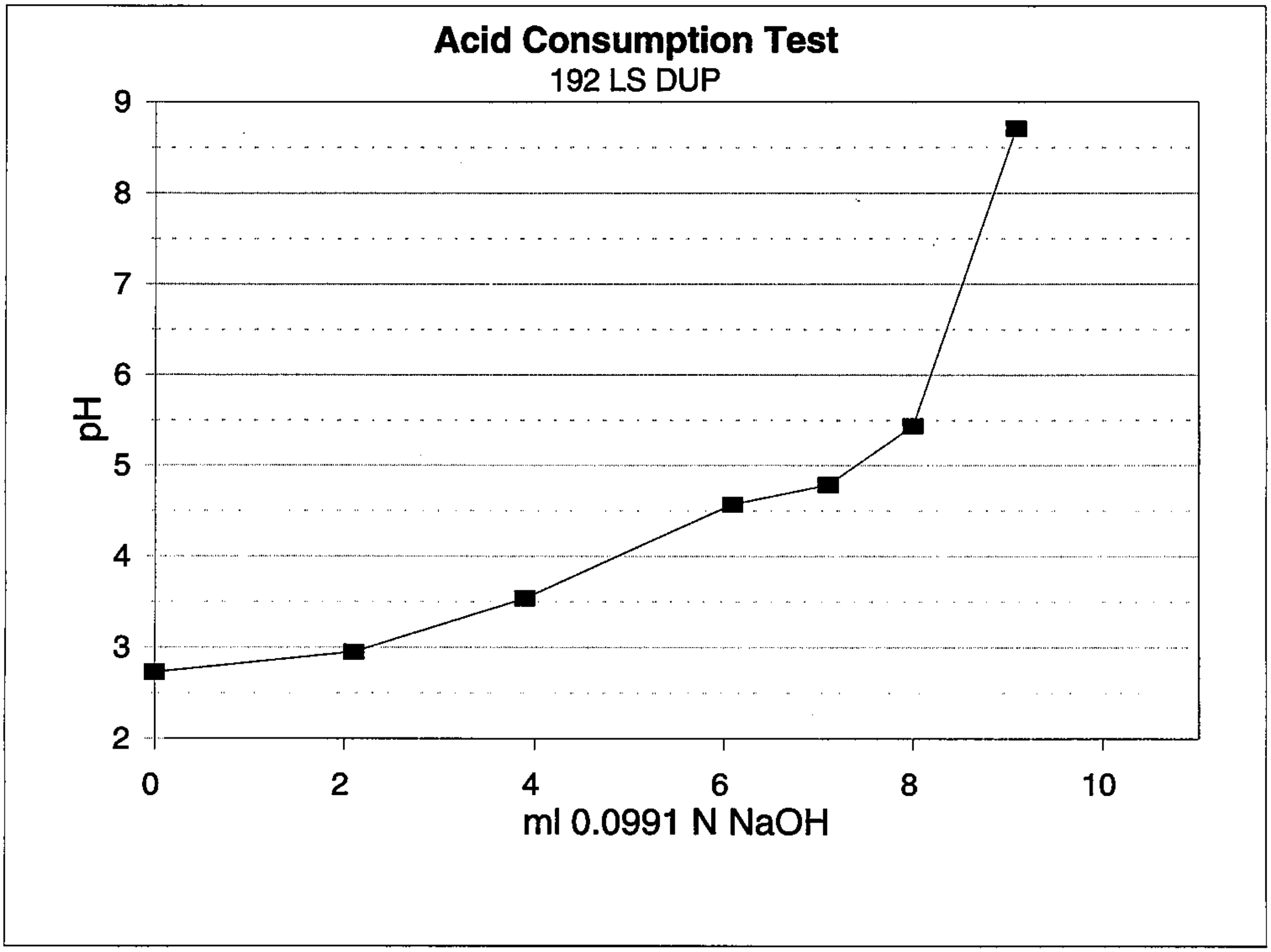
Acid Consumption Test
187 LS
pH
ml 0.0979 N NaOH
9
8
7
6
5
4
3
2
0
5
10
15
20


Acid Consumption Test
188 LS
pH
ml 0.0979 N NaOH
9
8
7
6
5
4
3
2
0
2.5
5
7.5
10
12.5
15
17.5
20

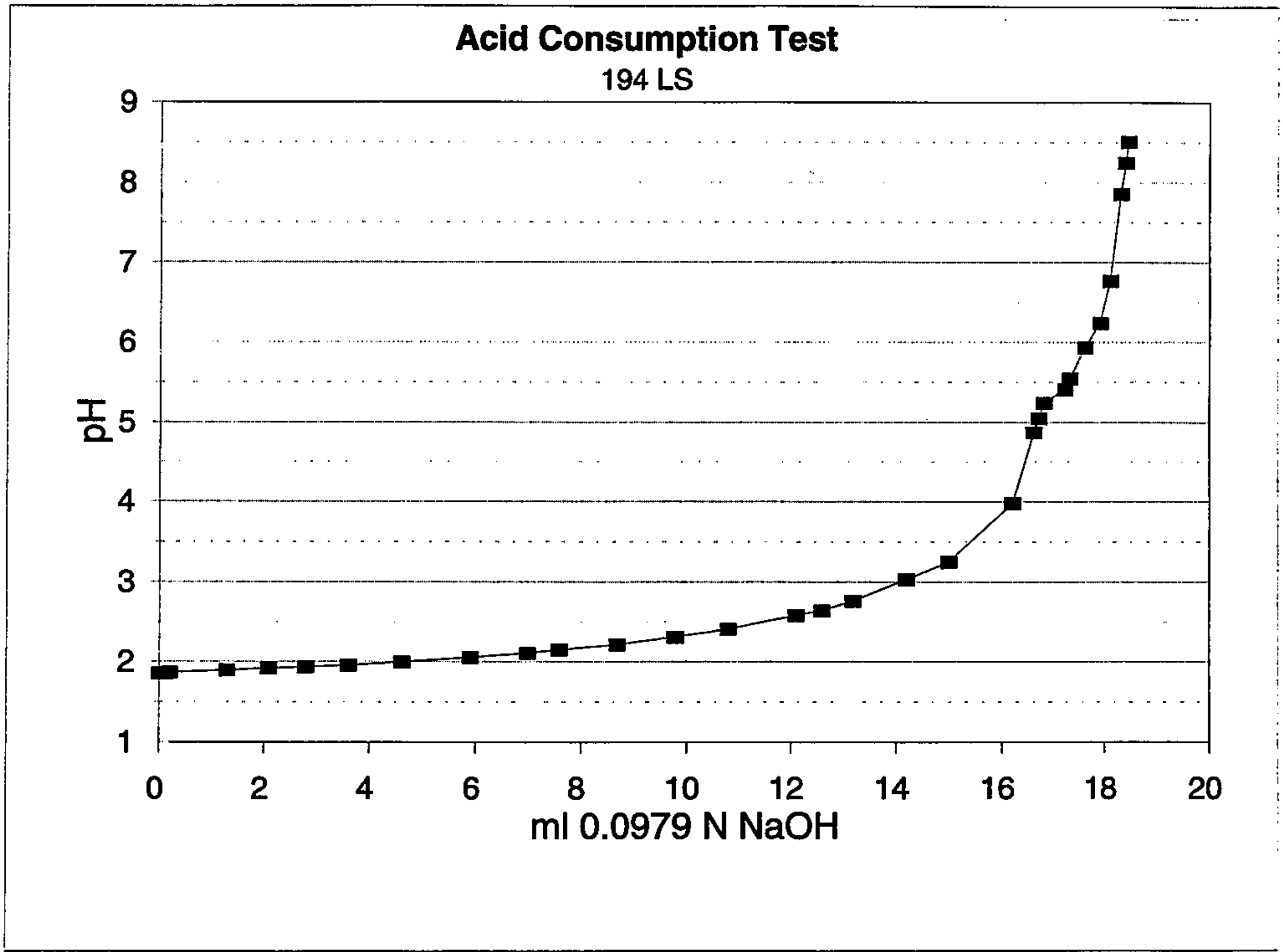


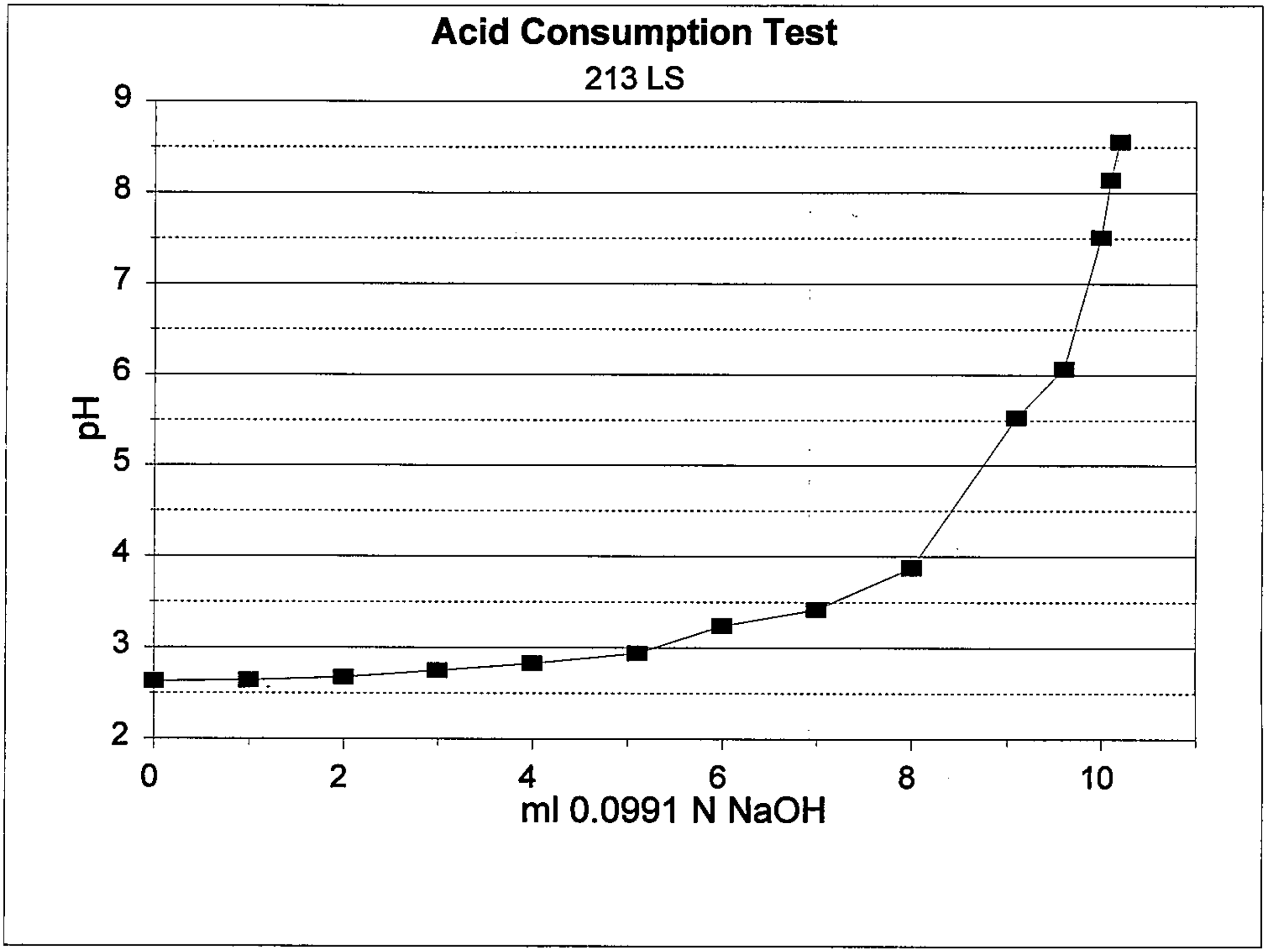
Acid Consumption Test
190 LS
pH
9
8
7
6
5
4
3
2
1
0
10
20
30
40
50
ml 0.0991 N NaOH


Acid Consumption Test
192 LS
pH
9
8
7
6
5
4
3
2
1
0
10
20
30
40
50
60
70
80
90
100
ml 0.0979 N NaOH



Acid Consumption Test
192 LS DUP
pH
9
8
7
6
5
4
3
2
0
2
4
6
8
10
ml 0.0991 N NaOH


Acid Consumption Test
194 LS
pH
ml 0.0979 N NaOH
9
8
7
6
5
4
3
2
1
0
2
4
6
8
10
12
14
16
18
20



Acid Consumption Test
213 LS
pH
9
8
7
6
5
4
3
2
0
2
4
6
8
10
ml 0.0991 N NaOH

Attachment 4

Anoxic Column Test Data Base for Pore Water Displacements One through Five

Laboratory Reports for Pore Water Displacements Four and Five

Column Number	Column Name	Date	Displacement	Sample Volume (mL)	pH (s.u.)	Eh (mV)	Cond. (mS/cm)	Lab pH (su)	Alkalinity (mgCaCO3 mg/L)	Acidity (mgCaCO3 mg/L)	SO_4 (mg/L)	Cl (mg/L)	Al (mg/L)	As (mg/L)	Cd (mg/L)	Ca (mg/L)	Cr (mg/L)
1	186 w/LS	12/29/96	0	741	4.40	111	3720	5.1		840	5100						
2	186 w/Lime	12/29/96	0	652	4.41	136	3460	5.1		440	2800						
3	170 w/LS		0														
4	13-1 w/LS	12/29/96	0	578	1.68	237	13600	2.4		14000	18000	16	260		0.42	<600	<0.52
5	188 w/LS	12/29/96	0	357	4.53	185	7010	4.9		3000	7000						
6	183 w/LS	12/29/96	0	307	3.88	186	8260	4.4		3200	8100						
7	213 w/LS	12/29/96	0	291	3.35	206	11600	3.9		290	9700	18	58		2.7	430	<0.026
8	187 w/LS	12/29/96	0	623	4.76	141	6290	4.8		2700	6000						
9	194 w/LS	12/29/96	0	702	4.61	171	6910	4.8		3300	6800						
10	192 w/LS	12/29/96	0	338	5.22	156	3300	5.3		230	2300						
11	8-1 w/LS	12/29/96	0	296	3.31	282	4310	3.4		1500	5600						
12	190 w/LS	12/29/96	0	360	4.77	102	6120	4.7		2300	6100						
13	172 w/LS	12/29/96	0	372	4.55	116	10400	4.7		5600	6600						
14	176 w/LS	12/29/96	0	571	4.47	113	8500	4.7		4400	9200						
15	BF-4	12/28/96	0	487	7.66	-33.6	4160	5.6		<2	3000						
16	BF-5	12/28/96	0	363	7.33	-35.1	3780	6.1		<2	2500						
17	CUF-1	12/28/96	0	581	8.35	-57.9	1350	6.7	24		670						
18	CUF-2	12/28/96	0	322	8.49	-83.1	972	6.7	<1.5		600						
19	15-3 w/Lime	12/28/96	0	510	2.44	194	8140	3		400	8000						
20	180 w/Lime	12/28/96	0	493	4.41	155	5750	4.3		34	6100						
21	181 w/Lime	12/28/96	0	422	3.49	167	10300	4		94	7700						
22	15-1 w/Lime	12/28/96	0	472	2.27	185	5820	2.9		600	5100						
23	4-1 w/Lime	12/28/96	0	525	3.89	157	5130	5.2		38	5700						
24	4-1 w/LS	12/28/96	0	274	4.51	134	3190	5.2		790	5100						
25	15-1 w/LS	12/28/96	0	246	7.26	-43.1	2550	6.5		<2	1700						
26	181 w/LS	12/28/96	0	474	4.84	47.6	8060	4.8		4200	7800						
27	180 w/LS	12/28/96	0	677	4.95	38.4	4270	5		1000	5300						
28	15-3 w/LS	12/28/96	0	571	3.73	141	7000	3.3		100	7000	11	26		0.14	480	<0.026

Column Number	Column Name	Date	Displacement	Co (mg/L)	Cu (mg/L)	Fe^{2+} (mg/L)	Fe (mg/L)	Pb (mg/L)	Mg (mg/L)	Mn (mg/L)	Hg (ug/L)	Ni (mg/L)	K (mg/L)	Se (mg/L)	Tl (mg/L)	Na (mg/L)	Zn (mg/L)
1	186 w/LS	12/29/96	0						110								
2	186 w/Lime	12/29/96	0						130								
3	170 w/LS		0														
4	13-1 w/LS	12/29/96	0	17	4200	160	3100		<600	58			<2		<0.025	10	95
5	188 w/LS	12/29/96	0						240								
6	183 w/LS	12/29/96	0						390								
7	213 w/LS	12/29/96	0	23	4300	2.1	6.4		660	56			<2		0.026	1.4	610
8	187 w/LS	12/29/96	0						270								
9	194 w/LS	12/29/96	0						290								
10	192 w/LS	12/29/96	0						160								
11	8-1 w/LS	12/29/96	0						120								
12	190 w/LS	12/29/96	0						270								
13	172 w/LS	12/29/96	0						480								
14	176 w/LS	12/29/96	0						220								
15	BF-4	12/28/96	0						340								
16	BF-5	12/28/96	0						270								
17	CUF-1	12/28/96	0						67								
18	CUF-2	12/28/96	0						67								
19	15-3 w/Lime	12/28/96	0						430								
20	180 w/Lime	12/28/96	0						380								
21	181 w/Lime	12/28/96	0						460								
22	15-1 w/Lime	12/28/96	0						350								
23	4-1 w/Lime	12/28/96	0						410								
24	4-1 w/LS	12/28/96	0						200								
25	15-1 w/LS	12/28/96	0						63								
26	181 w/LS	12/28/96	0						260								
27	180 w/LS	12/28/96	0						150								
28	15-3 w/LS	12/28/96	0	8.5	2100	0.16	64		280	37			2.4		0.039	2.2	49

Column Number	Column Name	Date	Displacement	Sample Volume (mL)	pH (s.u.)	Eh (mV)	Cond. (mS/cm)	Lab pH (su)	Alkalinity (mgCaCO3 mg/L)	Acidity (mgCaCO3 mg/L)	SO_4 (mg/L)	Cl (mg/L)	Al (mg/L)	As (mg/L)	Cd (mg/L)	Ca (mg/L)	Cr (mg/L)
1	186 w/LS	12/30/96	1	1065	8.03	-34	2970	6.7	81		620	13	0.37	0.034	0.22	550	0.025
2	186 w/Lime	12/30/96	1	677	5.16	21	2630	5.5		<2	810	16	<0.034		0.041	550	<0.0026
3	170 w/LS	1/7/97	1	1086	4.83	137	415	4.7		1600	1700	4.2	<0.34		1.2	470	<0.026
4	13-1 w/LS	12/30/96	1	642	2.76	180	7130	2.7		3800	2700	9.3	72	<0.16	0.092	470	<0.026
5	188 w/LS	12/30/96	1	658	5.20	126	4540	4.7		1100	1800	8.4	<0.34		2.3	470	<0.026
6	183 w/LS	12/30/96	1	656	5.02	132	5500	4.7		2000	2600	6.7	<0.34		0.38	450	<0.026
7	213 w/LS	12/30/96	1	649	4.57	160	7020	4.2		2700	6300	10	19	<0.16	1.3	470	<0.026
8	187 w/LS	12/30/96	1	544	5.16	142	4220	4.9		1100	2400	6.5	<0.34		0.1	500	<0.026
9	194 w/LS	12/30/96	1	590	5.28	134	2810	5.1		290	1000	2.6	1.8		0.069	490	0.073
10	192 w/LS	12/30/96	1	575	5.75	124	2700	5.4		82	860	3.4	<0.034	0.038	0.018	440	<0.0026
11	8-1 w/LS	12/30/96	1	851	7.55	58	2680	7.1	64		800	3.9	0.19		0.0081	580	0.018
12	190 w/LS	12/30/96	1	653	5.35	130	4270	4.9		1200	1100	8.8	<0.34		0.3	410	<0.026
13	172 w/LS	12/30/96	1	737	5.10	134	5810	4.6		2300	2300	6.1	0.74		0.23	480	<0.026
14	176 w/LS	12/30/96	1	640	5.20	130	4480	4.7		1400	2200	8	<0.34		0.47	520	<0.026
15	BF-4	12/29/96	1	986	7.28	-0.5	2220	7.1	36		1200	10	0.091		0.026	330	0.0067
16	BF-5	1/7/97	1	936	7.39	88	2740	7.3	22		940	23	0.35		0.017	450	0.024
17	CUF-1	12/29/96	1	643	8.59	-20.9	1390	8.6	21		640	13	0.37		<0.0012	150	0.0048
18	CUF-2	12/29/96	1	880	8.93	-44.8	1060	8.7	10		550	12	0.067		<0.0012	110	<0.0026
19	15-3 w/Lime	12/29/96	1	1192	2.80	183	4570	3.5		1100	3100	4.2	10		0.062	570	<0.067
20	180 w/Lime	12/29/96	1	884	4.71	142	4040	5		430	2600	6	0.39		0.44	540	<0.067
21	181 w/Lime	12/29/96	1	916	3.52	182	7540	4		3400	5600	8.7	3.3		2.4	450	<0.067
22	15-1 w/Lime	12/29/96	1	940	2.63	185	3670	3.2		400	1800	<0.36	8		<0.039	650	<0.067
23	4-1 w/Lime	12/29/96	1	1226	4.45	140	3780	5.4		440	2700	2.1	0.62		0.39	550	<0.067
24	4-1 w/LS	12/29/96	1	1029	5.24	113	3120	5.4		200	1500	3	0.33		0.23	520	<0.067
25	15-1 w/LS	12/29/96	1	983	6.22	55.6	2440	5.8		76	1100	4.7	<0.073	<0.024	<0.039	470	<0.067
26	181 w/LS	12/29/96	1	875	5.22	52.2	5970	5		2500	3200	7.4	1.3	0.045	1.7	450	<0.067
27	180 w/LS	12/29/96	1	966	5.79	79.8	2620	5.5		220	1100	3.7	0.08		0.26	380	<0.067
28	15-3 w/LS	12/29/96	1	903	4.54	77.4	5750	4.4		2300	3300	9.3	14		0.042	580	<0.067

Column Number	Column Name	Date	Displacement	Co (mg/L)	Cu (mg/L)	Fe^{2+} (mg/L)	Fe (mg/L)	Pb (mg/L)	Mg (mg/L)	Mn (mg/L)	Hg (ug/L)	Ni (mg/L)	K (mg/L)	Se (mg/L)	Tl (mg/L)	Na (mg/L)	Zn (mg/L)
1	186 w/LS	12/30/96	1	5.2	62	0.022	0.044	<0.015	120	16	<0.13		10	0.11	<0.025	11	41
2	186 w/Lime	12/30/96	1	0.89	23	0.44	0.28		40	3.1			24		<0.025	8	8.1
3	170 w/LS	1/7/97	1	6.6	950	2.6	<0.1		110	17			17		0.034	7.2	80
4	13-1 w/LS	12/30/96	1	6.7	1600	0.95	700	<0.15	120	24	<0.13		<2	<0.037	<0.025	0.73	38
5	188 w/LS	12/30/96	1	11	880	0.039	1.5		150	22			24		<0.025	8.8	170
6	183 w/LS	12/30/96	1	6.9	1600	0.046	0.56		210	21			13		0.035	9	49
7	213 w/LS	12/30/96	1	11	2100	0.74	2.2	<0.15	320	28	<0.13		<2	0.11	<0.025	1.6	300
8	187 w/LS	12/30/96	1	5.7	850	0.037	<0.1		130	14			24		0.037	5.4	23
9	194 w/LS	12/30/96	1	3.2	250	0.28	0.16		56	16			3.4		<0.025	2	12
10	192 w/LS	12/30/96	1	1.3	88	0.078	0.18	<0.015	110	8.2	<0.13		15	0.14	<0.025	10	3.7
11	8-1 w/LS	12/30/96	1	1	41	0.12	0.15		48	3.8			<2		<0.025	1.5	4.1
12	190 w/LS	12/30/96	1	10	940	0.038	<0.1		150	22			25		<0.025	7.2	54
13	172 w/LS	12/30/96	1	6.5	1700	0.042	0.47		240	19			6.2		<0.025	5.7	41
14	176 w/LS	12/30/96	1	12	1000	0.031	<0.1		96	8.4			11		0.1	7.1	94
15	BF-4	12/29/96	1	0.47	0.26	0.19	<0.01		110	8.9			14		<0.025	9.6	1.7
16	BF-5	1/7/97	1	0.66	0.73	2.2	0.4		150	18			24		<0.025	19	1.3
17	CUF-1	12/29/96	1	0.011	0.12	<0.0091	0.22		83	0.22			5.5		<0.025	9.3	<0.12
18	CUF-2	12/29/96	1	<0.0043	0.08	0.031	0.027		58	0.0098			5.8		<0.025	9.8	<0.12
19	15-3 w/Lime	12/29/96	1	4.1	690	0.077	28		220	18			4.1		<0.8	2.9	20
20	180 w/Lime	12/29/96	1	5.8	280	<0.0091	0.21		240	48			13		<0.8	11	110
21	181 w/Lime	12/29/96	1	14	1400	0.065	5.4		280	40			4.8		<0.8	8.2	430
22	15-1 w/Lime	12/29/96	1	2.1	180	0.56	69		160	8.4			33		<0.8	5.1	6
23	4-1 w/Lime	12/29/96	1	3.7	270	0.028	0.46		240	22			8.8		<0.8	2	60
24	4-1 w/LS	12/29/96	1	2.4	140	0.012	0.35		150	14			2.1		<0.8	1.8	37
25	15-1 w/LS	12/29/96	1	1.7	47	<0.0091	<0.079	<0.53	79	7.3	<0.13		<2	<0.037	<0.8	3.9	3.7
26	181 w/LS	12/29/96	1	9.7	1300	0.053	1.8	<0.53	210	27	<0.13		<2	0.13	<0.8	10	230
27	180 w/LS	12/29/96	1	3.1	200	0.013	<0.079		100	24			6.9		<0.8	5.2	58
28	15-3 w/LS	12/29/96	1	6.7	980	0.062	35		260	27			<2		<0.8	2.1	33

Column Number	Column Name	Date	Displace ment	Sample Volume (mL)	pH (s.u.)	Eh (mV)	Cond. (mS/cm)	Lab pH (su)	Alkalinity (mgCaCO3 mg/L)	Acidity (mgCaCO3 mg/L)	SO_4 (mg/L)	Cl (mg/L)	Al (mg/L)	As (mg/L)	Cd (mg/L)	Ca (mg/L)	Cr (mg/L)
1	186 w/LS	1/14/97	2	1411	7.23	-53.6	1652	6.5	<1.5		860	3.2	0.65		0.064	320	<0.026
2	186 w/Lime	1/14/97	2	1418	4.65	29.5	2240	4.4		98	1500	20	1.7		0.036	500	0.07
3	170 w/LS	1/21/97	2	1317	4.98	77.2	2610	5		280	670	1.6	<0.34		0.23	540	<0.026
4	13-1 w/LS	1/14/97	2	1169	2.96	143.0	3630	2.9		1000	3200	2.7	12		0.049	520	0.057
5	188 w/LS	1/14/97	2	1258	5.29	54.5	2900	4.4		590	2600	2.7	0.59		0.95	460	0.052
6	183 w/LS	1/14/97	2	1190	4.72	69.8	3470	4.4		1100	2900	2.2	0.88		0.17	450	0.049
7	213 w/LS	1/14/97	2	1295	5.24	52.6	2920	4.8		450	2500	4.4	1.7		0.26	530	<0.026
8	187 w/LS	1/14/97	2	1268	5.13	62.3	2880	4.8		490	2400	1.9	<0.34		0.082	520	<0.026
9	194 w/LS	1/14/97	2	1290	7.01	10.1	1374	6		50	800	1	2		0.016	300	0.17
10	192 w/LS	1/14/97	2	1437	5.83	29.8	1537	5.5		36	1100	1.2	0.8		0.022	260	0.072
11	8-1 w/LS	1/14/97	2	1196	7.40	-17.2	1049	6.6	<1.5		590	0.77	0.65		0.025	220	0.052
12	190 w/LS	1/14/97	2	1075	5.11	67.1	2470	5.2		480	1900	2.8	0.76		0.15	340	0.07
13	172 w/LS	1/14/97	2	1272	5.23	69.5	2980	5.2		540	2700	1.7	0.68		0.041	520	0.042
14	176 w/LS	1/14/97	2	925	5.31	67.1	2730	5.3		270	1400	3.9	1.4		0.14	540	0.11
15	BF-4	1/13/97	2	1259	7.40	-61.0	868	5.9		20	550	0.5	<0.34		0.019	140	<0.026
16	BF-5	1/21/97	2	1148	6.89	1.6	2190	6.9	29		1000	2.6	<0.34		0.031	480	<0.026
17	CUF-1	1/14/97	2	1347	8.54	-95	1292	6.6	25		650	11	1.2		<0.012	140	0.09
18	CUF-2	1/13/97	2	1764	9.14	-68	705	8.1	10		540	5.3	0.39		0.018	66	0.029
19	15-3 w/Lime	1/13/97	2	1422	3.84	97.8	2770	3.8		250	1900	0.58	1.5		0.037	540	0.076
20	180 w/Lime	1/13/97	2	1411	5.76	27.7	2440	5.1		440	1600	1.1	<0.34		0.18	450	<0.026
21	181 w/Lime	1/13/97	2	1421	3.74	89.3	4460	3.7		1800	6100	2.2	2.8		1.1	460	0.049
22	15-1 w/Lime	1/13/97	2	1548	3.86	93.0	2580	3.8		100	2200	0.42	1		0.026	560	0.037
23	4-1 w/Lime	1/13/97	2	1614	5.52	38.2	2390	5.3		140	1700	<0.36	1		0.098	480	<0.026
24	4-1 w/LS	1/13/97	2	1608	6.06	23.2	2610	5.9		78	1800	2.1	0.97		0.21	430	0.059
25	15-1 w/LS	1/13/97	2	1531	6.58	-14.2	2110	6.7	<1.5		1200	3.1	0.97		<0.012	440	0.056
26	181 w/LS	1/13/97	2	1378	4.71	78.7	4370	5.4		1700	5900	4	1		1.4	420	0.064
27	180 w/LS	1/13/97	2	1384	6.52	-21	2130	4.6		100	1200	2.4	1.6		0.18	370	0.13
28	15-3 w/LS	1/13/97	2	1534	5.39	40.4	3060	6.5	<1.5		1200	4	1.8		0.027	510	0.041
7	213 w/LS	1/29/97	X					6.3		<2	1400	1.1	<0.34		0.037	560	<0.026

X - Column 7 received repairs between the second and third displacements. Displacement "X" refers to the water remaining in the column at the time of repair.

Column Number	Column Name	Date	Displacement	Co (mg/L)	Cu (mg/L)	Fe^{2+} (mg/L)	Fe (mg/L)	Pb (mg/L)	Mg (mg/L)	Mn (mg/L)	Hg (ug/L)	Ni (mg/L)	K (mg/L)	Se (mg/L)	Tl (mg/L)	Na (mg/L)	Zn (mg/L)
1	186 w/LS	1/14/97	2	1.1	5.9	0.3	<0.1		36	4.1			3.1		0.045	5.3	6
2	186 w/Lime	1/14/97	2	0.88	31	0.2	<0.1		<30	1.8			14		<0.025	4.8	8.6
3	170 w/LS	1/21/97	2	0.99	230	1.5	<0.1		<30	3.3			6.8		<0.025	0.92	13
4	13-1 w/LS	1/14/97	2	2.4	300	19	210		48	8.4			<2		<0.025	3.3	12
5	188 w/LS	1/14/97	2	4.4	310	1.4	0.28		65	8.8			13		0.042	6.4	61
6	183 w/LS	1/14/97	2	2.5	670	0.62	0.16		79	7.8			6.5		<0.025	5.6	17
7	213 w/LS	1/14/97	2	2.4	200	0.44	1.3		75	5.9			<2		0.026	5	52
8	187 w/LS	1/14/97	2	1.8	300	<0.046	0.19		47	5			12		<0.025	4.9	6.9
9	194 w/LS	1/14/97	2	0.48	4.4	0.34	0.27		<30	1.5			<2		<0.025	3.2	1.2
10	192 w/LS	1/14/97	2	0.71	38	0.2	<0.1		46	3.7			6.2		<0.025	5.4	1.8
11	8-1 w/LS	1/14/97	2	0.14	0.52	0.06	<0.1		<30	0.18			<2		<0.025	4.4	<1.2
12	190 w/LS	1/14/97	2	3.6	300	<0.046	<0.1		65	8.8			12		<0.025	6.2	19
13	172 w/LS	1/14/97	2	1.7	320	0.05	<0.1		65	4.8			3.7		<0.025	4.8	9.5
14	176 w/LS	1/14/97	2	2.9	210	<0.046	0.12		33	2.8			4.6		<0.025	5.8	18
15	BF-4	1/13/97	2	0.16	<0.054	0.19	0.17		<30	2.6			3.1		<0.025	1.6	<1.2
16	BF-5	1/21/97	2	0.38	0.48	0.85	0.11		46	11			13		<0.025	2.3	<1.2
17	CUF-1	1/14/97	2	0.12	0.2	0.06	0.11		86	0.29			4.8		<0.025	9.8	<1.2
18	CUF-2	1/13/97	2	0.057	0.15	0.06	<0.1		44	<0.018			2.6		<0.025	5.3	<1.2
19	15-3 w/Lime	1/13/97	2	1.5	130	1.1	3.3		67	6.2			7.9		<0.025	2.8	8
20	180 w/Lime	1/13/97	2	2.2	45	0.64	<0.1		86	19			6.1		0.026	3.9	35
21	181 w/Lime	1/13/97	2	6.2	950	12	14		140	20			3.4		<0.025	2.5	170
22	15-1 w/Lime	1/13/97	2	0.44	23	4	4		43	2			32		<0.025	4.3	<1.2
23	4-1 w/Lime	1/13/97	2	0.76	35	0.66	0.53		72	4.8			9.9		<0.025	6.2	10
24	4-1 w/LS	1/13/97	2	2.2	61	0.1	<0.1		140	13			2.9		<0.025	2.2	28
25	15-1 w/LS	1/13/97	2	0.8	1.9	0.74	<0.1		63	4.8			<2		<0.025	2	<1.2
26	181 w/LS	1/13/97	2	7.7	1000	1.2	1		160	22			2.1		0.029	3.8	220
27	180 w/LS	1/13/97	2	2.4	16	0.76	<0.1		84	19			5.2		<0.025	5.8	31
28	15-3 w/LS	1/13/97	2	2.6	320	0.55	0.46		96	11			<2		<0.025	2.7	10
7	213 w/LS	1/29/97	X	0.28	0.96		<0.1		<30	0.96			<2		<0.025	1.3	2.4

X - Column 7 received repairs between the second and third displacements. Displacement "X" refers to the water remaining in the column at the time of repair.

Column Number	Column Name	Date	Displacement	Sample Volume (mL)	pH (s.u.)	Eh (mV)	Cond. (mS/cm)	Lab pH (su)	Alkalinity (mgCaCO3 mg/L)	Acidity (mgCaCO3 mg/L)	SO_4 (mg/L)	Cl (mg/L)	Al (mg/L)	As (mg/L)	Cd (mg/L)	Ca (mg/L)	Cr (mg/L)
1	186 w/LS	2/4/97	3	1103	6.68	-7	2560	6.6	47		690		0.16	<0.016	0.021	570	
2	186 w/Lime	2/4/97	3	935	6.24	-14	2460	6.5		<2	600		<0.034	<0.016	0.0079	590	
3	170 w/LS	2/4/97	3	1193	5.47	50	2030	6		<2	660		<0.034	<0.016	0.045	460	
4	13-1 w/LS	2/4/97	3	1106	4.96	53	2430	5.7		40	700		0.075	<0.016	0.0082	570	
5	188 w/LS	2/4/97	3	1259	5.26	58	2190	5.4		32	610		0.072	<0.016	0.19	480	
6	183 w/LS	2/4/97	3	1101	4.77	74	2470	5		190	700		<0.034	<0.016	0.032	510	
7	213 w/LS	2/4/97	3	1044	6.45	-19	713	5.6		<2	520		0.065	<0.016	0.0047	130	
8	187 w/LS	2/4/97	3	1233	5.55	46	2230	5.5		<2	580		<0.034	<0.016	0.013	520	
9	194 w/LS	2/4/97	3	926	6.61	50	2240	6		<2	850		0.05	<0.016	0.0091	530	
10	192 w/LS	2/4/97	3	1092	5.68	41	660	6		<2	510		<0.034	<0.016	0.0037	94	
11	8-1 w/LS	2/4/97	3	858	6.95	41	2440	5.9		<2	560		<0.034	<0.016	0.0044	600	
12	190 w/LS	2/4/97	3	1102	4.84	66.5	1791	6.1		<2	560		<0.034	<0.016	0.045	310	
13	172 w/LS	2/4/97	3	1118	5.60	73	2250	5.3		<2	660		<0.034	<0.016	0.013	520	
14	176 w/LS	2/4/97	3	1011	5.63	51.1	2400	5.7		<2	680		<0.034	<0.016	0.031	590	
15	BF-4	2/4/97	3	1115	7.58	-33.8	895	6.2		<2	540		<0.034	<0.016	0.014	140	
16	BF-5	2/4/97	3	1134	6.73	-3.3	1261	6.3		<2	590		<0.034	<0.016	0.0096	230	
17	CUF-1	2/4/97	3	1096	8.33	-66.0	1086	6.9	20		560		<0.034	<0.016	0.0027	110	
18	CUF-2	2/4/97	3	1077	8.61	-80.1	601	7.4	90		160		<0.034	<0.016	<0.0012	53	
19	15-3 w/Lime	2/4/97	3	1248	4.28	58.5	2280	6.2		<2	560		<0.034	<0.016	0.0071	480	
20	180 w/Lime	2/4/97	3	1221	6.06	37.8	1949	6.2		<2	620		<0.034	<0.016	0.04	400	
21	181 w/Lime	2/4/97	3	1243	3.75	91.9	3020	4.8		<2	710		0.17	<0.016	0.53	370	
22	15-1 w/Lime	2/4/97	3	1205	6.10	7.0	2450	5.8		740	730		<0.034	<0.016	0.0021	550	
23	4-1 w/Lime	2/4/97	3	1225	5.75	60.2	2070	6.2		<2	670		<0.034	<0.016	0.034	420	
24	4-1 w/LS	2/4/97	3	1173	6.32	20.1	2200	6.1		<2	580		<0.034	<0.016	0.018	430	
25	15-1 w/LS	2/4/97	3	906	6.88	32	2960	6.1		<2	680		<0.034	<0.016	0.0021	560	
26	181 w/LS	2/4/97	3	1067	4.05	92.0	3280	4.9		590	830		0.08	<0.016	0.58	450	
27	180 w/LS	2/4/97	3	1058	6.41	62.4	2440	6.7	70		770		<0.034	<0.016	0.082	450	
28	15-3 w/LS	2/4/97	3	1092	6.78	-13.2	2080	6.8	29		630		<0.034	<0.016	0.0014	460	

Column Number	Column Name	Date	Displacement	Co (mg/L)	Cu (mg/L)	Fe^{2+} (mg/L)	Fe (mg/L)	Pb (mg/L)	Mg (mg/L)	Mn (mg/L)	Hg (ug/L)	Ni (mg/L)	K (mg/L)	Se (mg/L)	Tl (mg/L)	Na (mg/L)	Zn (mg/L)
1	186 w/LS	2/4/97	3	0.43	0.52		0.14		44	3.9			6.4	<0.037	<0.025	3.1	1.3
2	186 w/Lime	2/4/97	3	0.09	1.8		<0.01		12	0.45			9.4	<0.037	<0.025	1.5	0.88
3	170 w/LS	2/4/97	3	0.24	18		0.067		9.5	1.5			3.5	<0.037	0.035	0.47	2.2
4	13-1 w/LS	2/4/97	3	0.58	7.9		0.098		19	2.8			2.5	<0.037	<0.025	1.2	1.5
5	188 w/LS	2/4/97	3	0.76	35		0.073		13	1.9			5.5	<0.037	0.026	0.73	10
6	183 w/LS	2/4/97	3	0.48	140		0.11		17	1.9			4.5	<0.037	<0.025	0.67	3.4
7	213 w/LS	2/4/97	3	0.037	0.49		<0.01		<3	0.14			<2	<0.037	0.025	0.1	0.28
8	187 w/LS	2/4/97	3	0.31	21		0.029		10	1.3			6.6	<0.037	0.032	0.49	1.4
9	194 w/LS	2/4/97	3	0.16	0.67		<0.01		11	1.3			2.9	<0.037	0.026	0.75	0.37
10	192 w/LS	2/4/97	3	0.19	13		<0.01		12	1.4			3.6	0.06	<0.025	0.54	0.69
11	8-1 w/LS	2/4/97	3	0.018	0.16		<0.01		8.8	0.18			6	<0.037	<0.025	0.89	<0.12
12	190 w/LS	2/4/97	3	0.94	110		0.23		21	3.1			6.8	<0.037	<0.025	0.79	5.9
13	172 w/LS	2/4/97	3	0.27	18		<0.01		9.9	0.81			3.9	<0.037	<0.025	0.48	1.5
14	176 w/LS	2/4/97	3	0.46	10		<0.01		7.2	0.7			3.4	0.051	<0.025	0.75	2.6
15	BF-4	2/4/97	3	0.18	0.11		<0.01		18	3.6			3.7	<0.037	<0.025	1	0.93
16	BF-5	2/4/97	3	0.17	0.12		<0.01		16	4.5			4.5	<0.037	<0.025	0.61	0.44
17	CUF-1	2/4/97	3	0.0097	0.093		0.053		63	0.38			3.9	<0.037	<0.025	3.6	<0.12
18	CUF-2	2/4/97	3	<0.0043	0.036		0.025		32	0.033			2.8	<0.037	<0.025	2.5	<0.12
19	15-3 w/Lime	2/4/97	3	0.23	10		0.02		27	1.4			14	<0.037	<0.025	1.3	1.5
20	180 w/Lime	2/4/97	3	0.41	3.7		<0.01		31	5.7			4.8	0.07	<0.025	1.1	6.4
21	181 w/Lime	2/4/97	3	2.7	480		2.5		62	1.1			3.2	0.047	<0.025	1	74
22	15-1 w/Lime	2/4/97	3	0.035	0.94		0.049		11	0.23			33	<0.037	0.025	3.2	0.16
23	4-1 w/Lime	2/4/97	3	0.27	8.2		<0.01		33	2.6			14	<0.037	<0.025	0.89	3.6
24	4-1 w/LS	2/4/97	3	0.25	0.74		<0.01		62	4.2			2.8	<0.037	<0.025	0.84	1.5
25	15-1 w/LS	2/4/97	3	0.42	0.19		<0.01		120	7.1			5.3	<0.037	<0.025	2.8	0.17
26	181 w/LS	2/4/97	3	3.2	460		1.1		68	11			2.9	0.039	<0.025	1.3	80
27	180 w/LS	2/4/97	3	1.3	1.7		<0.01		79	17			7.5	<0.037	<0.025	3.8	12
28	15-3 w/LS	2/4/97	3	0.092	0.57		0.11		21	1.4			7.1	<0.037	<0.025	0.91	0.15

Column Number	Column Name	Date	Displacement	Sample Volume (mL)	pH (s.u.)	Eh (mV)	Cond. (mS/cm)	Lab pH (su)	Alkalinity (mgCaCO3 mg/L)	Acidity (mgCaCO3 mg/L)	SO_4 (mg/L)	Cl (mg/L)	Al (mg/L)	As (mg/L)	Cd (mg/L)	Ca (mg/L)	Cr (mg/L)
1	186 w/LS		4														
2	186 w/Lime		4														
3	170 w/LS	2/17/97	4	1056	5.39	161	1262	4.7		36	510		0.04	<0.016	0.042	260	
4	13-1 w/LS	2/17/97	4	1107	6.38	114	2350	5.7		<2	640		<0.034	<0.016	0.0025	600	
5	188 w/LS	2/17/97	4	1113	5.51	158	2240	5		34	600		<0.034	<0.016	0.18	530	
6	183 w/LS	2/17/97	4	1170	5.05	174	2340	4.7		190	630		<0.034	<0.016	0.027	510	
7	213 w/LS	2/17/97	4	1112	6.81	96	1604	5.7		<2	530		<0.034	<0.016	0.0067	370	
8	187 w/LS	2/17/97	4	1121	5.66	153	2040	5.3		38	590		<0.034	<0.016	0.013	480	
9	194 w/LS		4														
10	192 w/LS	2/17/97	4	1111	5.95	143	625	5.4		<2	200		<0.034	<0.016	0.0035	91	
11	8-1 w/LS		4														
12	190 w/LS	2/17/97	4	1129	5.14	175	1378	4.9		140	500		0.1	<0.016	0.034	220	
13	172 w/LS	2/17/97	4	1150	5.71	147	2160	5.2		<2	600		<0.034	<0.016	0.014	540	
14	176 w/LS	2/17/97	4	847	6.14	129	2320	5.6		<2	680		<0.034	<0.016	0.029	580	
15	BF-4		4														
16	BF-5		4														
17	CUF-1		4														
18	CUF-2		4														
19	15-3 w/Lime	2/18/97	4	1096	4.69	153	2040	5.1		<2	620		<0.034	<0.016	0.0089	450	
20	180 w/Lime	2/18/97	4	1027	5.99	121	1907	5.6		<2	610		<0.034	<0.016	0.044	420	
21	181 w/Lime	2/18/97	4	1094	4.28	184	2880	4.2		<2	710		0.26	<0.016	0.42	430	
22	15-1 w/Lime		4														
23	4-1 w/Lime	2/18/97	4	1092	5.88	133	2160	5.3		36	620		<0.034	<0.016	0.046	470	
24	4-1 w/LS	2/18/97	4	1016	6.87	99	2080	6.7	12		590		0.036	<0.016	0.0034	440	
25	15-1 w/LS		4														
26	181 w/LS	2/18/97	4	1030	4.44	178	2930	4.5		340	870		0.12	<0.016	0.42	480	
27	180 w/LS	2/18/97	4	1082	6.50	103	2360	6.1		<2	510		<0.034	<0.016	0.07	480	
28	15-3 w/LS	2/18/97	4	1051	7.41	76	1942	6.7	19		570		<0.034	<0.016	<0.0012	430	

Column Number	Column Name	Date	Displacement	Co (mg/L)	Cu (mg/L)	Fe^{2+} (mg/L)	Fe (mg/L)	Pb (mg/L)	Mg (mg/L)	Mn (mg/L)	Hg (ug/L)	Ni (mg/L)	K (mg/L)	Se (mg/L)	Tl (mg/L)	Na (mg/L)	Zn (mg/L)
1	186 w/LS		4														
2	186 w/Lime		4														
3	170 w/LS	2/17/97	4	0.18	23		0.24		7.5	1.2				<0.037			2.5
4	13-1 w/LS	2/17/97	4	0.17	0.097		0.019		14	1.5				<0.037			0.24
5	188 w/LS	2/17/97	4	0.63	43		0.091		11	1.6				<0.037			10
6	183 w/LS	2/17/97	4	0.35	140		0.25		13	1.4				<0.037			2.7
7	213 w/LS	2/17/97	4	0.055	0.39		<0.01		6.5	0.35				<0.037			0.37
8	187 w/LS	2/17/97	4	0.25	23		0.087		8.8	1.1				<0.037			1.4
9	194 w/LS		4														
10	192 w/LS	2/17/97	4	0.18	13		<0.01		12	1.4				0.058			0.66
11	8-1 w/LS		4														
12	190 w/LS	2/17/97	4	0.64	110		0.35		16	2.4				<0.037			4.7
13	172 w/LS	2/17/97	4	0.25	25		0.022		8.9	0.69				<0.037			1.6
14	176 w/LS	2/17/97	4	0.38	8		<0.01		6.5	0.6				0.05			2.8
15	BF-4		4														
16	BF-5		4														
17	CUF-1		4														
18	CUF-2		4														
19	15-3 w/Lime	2/18/97	4	0.25	13		0.19		23	1.6				<0.037			1.6
20	180 w/Lime	2/18/97	4	0.39	4.6		<0.01		27	5.9				<0.037			6.7
21	181 w/Lime	2/18/97	4	2.1	390		3.2		51	9.5				<0.037			63
22	15-1 w/Lime		4														
23	4-1 w/Lime	2/18/97	4	0.35	12		<0.01		33	3.1				<0.037			5.1
24	4-1 w/LS	2/18/97	4	0.13	0.37		<0.01		47	2.8				<0.037			0.63
25	15-1 w/LS		4														
26	181 w/LS	2/18/97	4	2.2	320		1.8		53	9.2				<0.037			64
27	180 w/LS	2/18/97	4	0.98	1.7		<0.01		61	14				<0.037			9.3
28	15-3 w/LS	2/18/97	4	0.041	0.2		<0.01		16	0.88				<0.037			<0.12

Column Number	Column Name	Date	Displacement	Sample Volume (mL)	pH (s.u.)	Eh (mV)	Cond. (mS/cm)	Lab pH (su)	Alkalinity (mgCaCO3 mg/L)	Acidity (mgCaCO3 mg/L)	SO_4 (mg/L)	Cl (mg/L)	Al (mg/L)	As (mg/L)	Cd (mg/L)	Ca (mg/L)	Cr (mg/L)
1	186 w/LS		5														
2	186 w/Lime		5														
3	170 w/LS	3/3/97	5	1066	4.89	160	1064	5.3		<2	520		<0.034	<0.016	0.046	190	
4	13-1 w/LS	3/3/97	5	883	6.76	39	2390			<2							
5	188 w/LS	3/3/97	5	1094	5.29	117	1993	5.1		92	660		0.064	0.026	0.17	440	
6	183 w/LS	3/3/97	5	1059	4.86	142	1984	4.8		240	580		<0.034	<0.016	0.02	380	
7	213 w/LS	3/3/97	5	850	6.69	72	2390			<2							
8	187 w/LS	3/3/97	5	1085	5.42	119	1644	5.3		92	560		<0.034	<0.016	0.01	350	
9	194 w/LS		5														
10	192 w/LS	3/3/97	5	1263	5.82	116	613	5.4		<2	140		<0.034	<0.016	0.0028	86	
11	8-1 w/LS		5														
12	190 w/LS	3/3/97	5	1169	4.89	138	1239	4.9		190	520		<0.034	0.034	0.032	160	
13	172 w/LS	3/3/97	5	995	5.31	122	2020	5.1		90	530		<0.034	<0.016	0.037	610	
14	176 w/LS	3/3/97	5	1063	5.81	116	2400	5.4		<2	760		<0.034	<0.016	0.078	580	
15	BF-4		5														
16	BF-5		5														
17	CUF-1		5														
18	CUF-2		5														
19	15-3 w/Lime	3/3/97	5	945	4.27	117	2480	5		44	790		0.076	<0.016	0.012	570	
20	180 w/Lime	3/3/97	5	989	5.85	95	2450	5.3		34	610		<0.034	0.028	0.075	560	
21	181 w/Lime	3/3/97	5	1208	4.02	115	3130	4.4		440	1000		0.31	0.031	0.36	530	
22	15-1 w/Lime		5														
23	4-1 w/Lime	3/3/97	5	1077	5.36	83	2530	4.8		40	830		<0.034	<0.016	0.063	570	
24	4-1 w/LS	3/3/97	5	100	6.27	43	2550										
25	15-1 w/LS		5														
26	181 w/LS	3/3/97	5	1229	4.48	103	2910	4.5		290	840		0.061	<0.016	0.31	540	
27	180 w/LS	3/3/97	5	1125	6.50	25	2590	5.8		12	880		<0.034	<0.016	0.079	580	
28	15-3 w/LS	3/3/97	5	100	6.52	13	2490										

Column Number	Column Name	Date	Displacement	Co (mg/L)	Cu (mg/L)	Fe^{2+} (mg/L)	Fe (mg/L)	Pb (mg/L)	Mg (mg/L)	Mn (mg/L)	Hg (ug/L)	Ni (mg/L)	K (mg/L)	Se (mg/L)	Tl (mg/L)	Na (mg/L)	Zn (mg/L)
1	186 w/LS		5														
2	186 w/Lime		5														
3	170 w/LS	3/3/97	5	0.16	35		0.2		7.7	1.4				<0.037			3.2
4	13-1 w/LS	3/3/97	5														
5	188 w/LS	3/3/97	5	0.51	72		0.05		9.8	1.4				<0.037			11
6	183 w/LS	3/3/97	5	0.26	170		0.18		9.6	1.1				<0.037			2.1
7	213 w/LS	3/3/97	5														
8	187 w/LS	3/3/97	5	0.21	40		0.052		8.4	1.2				<0.037			1.5
9	194 w/LS		5														
10	192 w/LS	3/3/97	5	0.18	17		<0.01		12	1.5				0.04			0.65
11	8-1 w/LS		5														
12	190 w/LS	3/3/97	5	0.51	140		0.31		15	2.2				<0.037			4.6
13	172 w/LS	3/3/97	5	0.037	20		<0.01		6.5	0.58				<0.037			4
14	176 w/LS	3/3/97	5	0.68	13		<0.01		31	9				<0.037			13
15	BF-4		5														
16	BF-5		5														
17	CUF-1		5														
18	CUF-2		5														
19	15-3 w/Lime	3/3/97	5	0.48	26		0.37		27	2.6				<0.037			3.1
20	180 w/Lime	3/3/97	5	0.67	13		<0.01		31	8.9				<0.037			13
21	181 w/Lime	3/3/97	5	1.7	370		3.4		46	9				<0.037			54
22	15-1 w/Lime		5														
23	4-1 w/Lime	3/3/97	5	0.49	25		<0.01		35	4				<0.037			7.7
24	4-1 w/LS	3/3/97	5							3.4							
25	15-1 w/LS		5														
26	181 w/LS	3/3/97	5	1.6	240		1.1		42	8				<0.037			46
27	180 w/LS	3/3/97	5	1	2.4		<0.01		51	12				<0.037			12
28	15-3 w/LS	3/3/97	5							1.2							

NORTHERN LAKE SERVICE, INC.
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February 26, 1997

Russell Janeshek
Foth & Van Dyke
2737 S. Ridge Road
Green Bay, WI 54307

Re: Flambeau Mining, Scope 96F022, NLS 32436 - Fourth Displacement Samples

Dear Mr. Janeshek:

Enclosed is the final analytical report for samples received on February 19, 1997. Results were FAX'd to you earlier today. This report contains the same values as the FAX results.

The assignment of an alkalinity or acidity test to each sample was done at Northern Lake Service (NLS) using a pH of 6.5 as the decision point. For a pH of less than or equal to 6.5, the acidity test was assigned to the sample. For a pH of greater than 6.5, the alkalinity test was assigned to the sample. The titration was conducted to a pH of 6.5 for both acidity and alkalinity.

Some parameters have elevated limits of detection (LOD). The LODs are raised to reflect dilution steps required to bring target analyte levels within the instrument calibration range and/or to reduce the effect of matrix interferences. Some samples were analyzed at a 100-fold dilution due to high levels of copper and/or zinc in the samples.

If you have any questions or require additional information, please feel free to contact me at (715) 478-2777.

Sincerely,

Steven R. Crupi

Steven R. Crupi
Client Services Manager

Enclosures (c:\amipro\docs\crupi\fvdfmc14.sam)

Rcvd: 03.01.97
By: RTJ
cc: GWS DJL
SGL J Chapman

File: 96F022 (10500)
[Flambeau Mining Co]

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 32436

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-170LS-4 NLS#: 128112
Ref. Line 1 of COC 24843 Description: FMC-170LS-4
Collected: 02/17/97 Received: 02/19/97 Reported: 02/26/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	36	mg/L	2.0	2.0	EPA 305.1	02/25/97	721026460
Aluminum, dis. as Al by ICP	< 0.040 >	mg/L	0.034	0.12	EPA 200.7	02/20/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/20/97	721026460
Cadmium, dis. as Cd by ICP	42	ug/L	1.2	3.8	EPA 200.7	02/20/97	721026460
Calcium, dis. as Ca by ICP	260	mg/L	3.0	3.0	EPA 200.7	02/20/97	721026460
Cobalt, dis. as Co by ICP	180	ug/L	4.3	15	EPA 200.7	02/20/97	721026460
Copper, dis. as Cu by ICP	23000	ug/L	54	190	EPA 200.7	02/20/97	721026460
Iron, dis. as Fe by ICP	0.24	mg/L	0.010	0.035	EPA 200.7	02/20/97	721026460
Magnesium, dis. as Mg by ICP	7.5	mg/L	3.0	3.0	EPA 200.7	02/20/97	721026460
Manganese, dis. as Mn by ICP	1200	ug/L	1.8	6.1	EPA 200.7	02/20/97	721026460
pH, lab	4.7	s.u.	1.0		EPA 150.1	02/19/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	02/26/97	721026460
Sulfate, as SO4 (filtered)	510	mg/L	250	250	EPA 375.2	02/25/97	721026460
Zinc, dis. as Zn by ICP	2500	ug/L	120	120	EPA 200.7	02/20/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Steven R. Cergi
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 32436

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-13-ILS-4 NLS#: 128113
Ref. Line 2 of COC 24843 Description: FMC-13-ILS-4
Collected: 02/17/97 Received: 02/19/97 Reported: 02/26/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	ND	mg/L	2.0	2.0	EPA 305.1	02/25/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	02/20/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/20/97	721026460
Cadmium, dis. as Cd by ICP	< 2.5 >	ug/L	1.2	3.8	EPA 200.7	02/20/97	721026460
Calcium, dis. as Ca by ICP	600	mg/L	3.0	3.0	EPA 200.7	02/20/97	721026460
Cobalt, dis. as Co by ICP	170	ug/L	4.3	15	EPA 200.7	02/20/97	721026460
Copper, dis. as Cu by ICP	97	ug/L	5.4	19	EPA 200.7	02/20/97	721026460
Iron, dis. as Fe by ICP	< 0.019 >	mg/L	0.010	0.035	EPA 200.7	02/20/97	721026460
Magnesium, dis. as Mg by ICP	14	mg/L	3.0	3.0	EPA 200.7	02/20/97	721026460
Manganese, dis. as Mn by ICP	1500	ug/L	1.8	6.1	EPA 200.7	02/20/97	721026460
pH, lab	5.7	s.u.	1.0		EPA 150.1	02/19/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	02/26/97	721026460
Sulfate, as SO4 (filtered)	640	mg/L	250	250	EPA 375.2	02/25/97	721026460
Zinc, dis. as Zn by ICP	240	ug/L	120	120	EPA 200.7	02/20/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Steven R. Cuyi
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 32436

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-188LS-4 NLS#: 128114
Ref. Line 3 of COC 24843 Description: FMC-188LS-4
Collected: 02/17/97 Received: 02/19/97 Reported: 02/26/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	34	mg/L	2.0	2.0	EPA 305.1	02/25/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	02/20/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/20/97	721026460
Cadmium, dis. as Cd by ICP	180	ug/L	1.2	3.8	EPA 200.7	02/20/97	721026460
Calcium, dis. as Ca by ICP	530	mg/L	3.0	3.0	EPA 200.7	02/20/97	721026460
Cobalt, dis. as Co by ICP	630	ug/L	4.3	15	EPA 200.7	02/20/97	721026460
Copper, dis. as Cu by ICP	43000	ug/L	54	190	EPA 200.7	02/20/97	721026460
Iron, dis. as Fe by ICP	0.091	mg/L	0.010	0.035	EPA 200.7	02/20/97	721026460
Magnesium, dis. as Mg by ICP	11	mg/L	3.0	3.0	EPA 200.7	02/20/97	721026460
Manganese, dis. as Mn by ICP	1600	ug/L	1.8	6.1	EPA 200.7	02/20/97	721026460
pH, lab	5.0	s.u.	1.0		EPA 150.1	02/19/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	02/26/97	721026460
Sulfate, as SO4 (filtered)	600	mg/L	250	250	EPA 375.2	02/25/97	721026460
Zinc, dis. as Zn by ICP	10000	ug/L	120	120	EPA 200.7	02/20/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Steven R. Cingi
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 32436

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-183LS-4 NLS#: 128115
Ref. Line 4 of COC 24843 Description: FMC-183LS-4
Collected: 02/17/97 Received: 02/19/97 Reported: 02/26/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	190	mg/L	2.0	2.0	EPA 305.1	02/25/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	02/20/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/20/97	721026460
Cadmium, dis. as Cd by ICP	27	ug/L	1.2	3.8	EPA 200.7	02/20/97	721026460
Calcium, dis. as Ca by ICP	510	mg/L	3.0	3.0	EPA 200.7	02/20/97	721026460
Cobalt, dis. as Co by ICP	350	ug/L	4.3	15	EPA 200.7	02/20/97	721026460
Copper, dis. as Cu by ICP	140000	ug/L	54	190	EPA 200.7	02/20/97	721026460
Iron, dis. as Fe by ICP	0.25	mg/L	0.010	0.035	EPA 200.7	02/20/97	721026460
Magnesium, dis. as Mg by ICP	13	mg/L	3.0	3.0	EPA 200.7	02/20/97	721026460
Manganese, dis. as Mn by ICP	1400	ug/L	1.8	6.1	EPA 200.7	02/20/97	721026460
pH, lab	4.7	s.u.	1.0		EPA 150.1	02/19/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	02/24/97	721026460
Sulfate, as SO4 (filtered)	630	mg/L	250	250	EPA 375.2	02/25/97	721026460
Zinc, dis. as Zn by ICP	2700	ug/L	120	120	EPA 200.7	02/20/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection   LOQ = Limit of Quantitation   ND = Not Detected
DWB = Dry Weight Basis   NA = Not Applicable   %DWB = (mg/kg DWB)/10000

Steven R. Cuyi
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-213LS-4 NLS#: 128116
Ref. Line 5 of COC 24843 Description: FMC-213LS-4
Collected: 02/17/97 Received: 02/19/97 Reported: 02/26/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	ND	mg/L	2.0	2.0	EPA 305.1	02/25/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	02/20/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/20/97	721026460
Cadmium, dis. as Cd by ICP	6.7	ug/L	1.2	3.8	EPA 200.7	02/20/97	721026460
Calcium, dis. as Ca by ICP	370	mg/L	3.0	3.0	EPA 200.7	02/20/97	721026460
Cobalt, dis. as Co by ICP	55	ug/L	4.3	15	EPA 200.7	02/20/97	721026460
Copper, dis. as Cu by ICP	390	ug/L	5.4	19	EPA 200.7	02/20/97	721026460
Iron, dis. as Fe by ICP	ND	mg/L	0.010	0.035	EPA 200.7	02/20/97	721026460
Magnesium, dis. as Mg by ICP	6.5	mg/L	3.0	3.0	EPA 200.7	02/20/97	721026460
Manganese, dis. as Mn by ICP	350	ug/L	1.8	6.1	EPA 200.7	02/20/97	721026460
pH, lab	5.7	s.u.	1.0		EPA 150.1	02/19/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	02/24/97	721026460
Sulfate, as SO4 (filtered)	530	mg/L	250	250	EPA 375.2	02/25/97	721026460
Zinc, dis. as Zn by ICP	370	ug/L	120	120	EPA 200.7	02/20/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Steven R. Cuzi
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 32436

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-187LS-4 NLS#: 128117
Ref. Line 6 of COC 24843 Description: FMC-187LS-4
Collected: 02/17/97 Received: 02/19/97 Reported: 02/26/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	38	mg/L	2.0	2.0	EPA 305.1	02/25/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	02/20/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/20/97	721026460
Cadmium, dis. as Cd by ICP	13	ug/L	1.2	3.8	EPA 200.7	02/20/97	721026460
Calcium, dis. as Ca by ICP	480	mg/L	3.0	3.0	EPA 200.7	02/20/97	721026460
Cobalt, dis. as Co by ICP	250	ug/L	4.3	15	EPA 200.7	02/20/97	721026460
Copper, dis. as Cu by ICP	23000	ug/L	54	190	EPA 200.7	02/20/97	721026460
Iron, dis. as Fe by ICP	0.087	mg/L	0.010	0.035	EPA 200.7	02/20/97	721026460
Magnesium, dis. as Mg by ICP	8.8	mg/L	3.0	3.0	EPA 200.7	02/20/97	721026460
Manganese, dis. as Mn by ICP	1100	ug/L	1.8	6.1	EPA 200.7	02/20/97	721026460
pH, lab	5.3	s.u.	1.0		EPA 150.1	02/19/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	02/24/97	721026460
Sulfate, as SO4 (filtered)	590	mg/L	250	250	EPA 375.2	02/25/97	721026460
Zinc, dis. as Zn by ICP	1400	ug/L	120	120	EPA 200.7	02/20/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Steven R. Cuyo
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-192LS-4 **NLS#: 128118**
Ref. Line 7 of COC 24843 Description: FMC-192LS-4
Collected: 02/17/97 Received: 02/19/97 Reported: 02/26/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	ND	mg/L	2.0	2.0	EPA 305.1	02/25/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	02/20/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/20/97	721026460
Cadmium, dis. as Cd by ICP	< 3.5 >	ug/L	1.2	3.8	EPA 200.7	02/20/97	721026460
Calcium, dis. as Ca by ICP	91	mg/L	3.0	3.0	EPA 200.7	02/20/97	721026460
Cobalt, dis. as Co by ICP	180	ug/L	4.3	15	EPA 200.7	02/20/97	721026460
Copper, dis. as Cu by ICP	13000	ug/L	5.4	19	EPA 200.7	02/20/97	721026460
Iron, dis. as Fe by ICP	ND	mg/L	0.010	0.035	EPA 200.7	02/20/97	721026460
Magnesium, dis. as Mg by ICP	12	mg/L	3.0	3.0	EPA 200.7	02/20/97	721026460
Manganese, dis. as Mn by ICP	1400	ug/L	1.8	6.1	EPA 200.7	02/20/97	721026460
pH, lab	5.4	s.u.	1.0		EPA 150.1	02/19/97	721026460
Selenium, dis. as Se by furnace	< 58 >	ug/L	37	130	EPA 270.2	02/24/97	721026460
Sulfate, as SO4 (filtered)	200	mg/L	25	25	EPA 375.2	02/25/97	721026460
Zinc, dis. as Zn by ICP	660	ug/L	120	120	EPA 200.7	02/20/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 32436

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-190LS-4 **NLS#: 128119**
Ref. Line 8 of COC 24843 Description: FMC-190LS-4
Collected: 02/17/97 Received: 02/19/97 Reported: 02/26/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	140	mg/L	2.0	2.0	EPA 305.1	02/25/97	721026460
Aluminum, dis. as Al by ICP	< 0.10 >	mg/L	0.034	0.12	EPA 200.7	02/20/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/20/97	721026460
Cadmium, dis. as Cd by ICP	34	ug/L	1.2	3.8	EPA 200.7	02/20/97	721026460
Calcium, dis. as Ca by ICP	220	mg/L	3.0	3.0	EPA 200.7	02/20/97	721026460
Cobalt, dis. as Co by ICP	640	ug/L	4.3	15	EPA 200.7	02/20/97	721026460
Copper, dis. as Cu by ICP	110000	ug/L	54	190	EPA 200.7	02/20/97	721026460
Iron, dis. as Fe by ICP	0.35	mg/L	0.010	0.035	EPA 200.7	02/20/97	721026460
Magnesium, dis. as Mg by ICP	16	mg/L	3.0	3.0	EPA 200.7	02/20/97	721026460
Manganese, dis. as Mn by ICP	2400	ug/L	1.8	6.1	EPA 200.7	02/20/97	721026460
pH, lab	4.9	s.u.	1.0		EPA 150.1	02/19/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	02/24/97	721026460
Sulfate, as SO4 (filtered)	500	mg/L	250	250	EPA 375.2	02/25/97	721026460
Zinc, dis. as Zn by ICP	4700	ug/L	120	120	EPA 200.7	02/20/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
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PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-172LS-4 NLS#: 128120
Ref. Line 9 of COC 24843 Description: FMC-172LS-4
Collected: 02/17/97 Received: 02/19/97 Reported: 02/26/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	ND	mg/L	2.0	2.0	EPA 305.1	02/25/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	02/20/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/20/97	721026460
Cadmium, dis. as Cd by ICP	14	ug/L	1.2	3.8	EPA 200.7	02/20/97	721026460
Calcium, dis. as Ca by ICP	540	mg/L	3.0	3.0	EPA 200.7	02/20/97	721026460
Cobalt, dis. as Co by ICP	250	ug/L	4.3	15	EPA 200.7	02/20/97	721026460
Copper, dis. as Cu by ICP	25000	ug/L	54	190	EPA 200.7	02/20/97	721026460
Iron, dis. as Fe by ICP	< 0.022 >	mg/L	0.010	0.035	EPA 200.7	02/20/97	721026460
Magnesium, dis. as Mg by ICP	8.9	mg/L	3.0	3.0	EPA 200.7	02/20/97	721026460
Manganese, dis. as Mn by ICP	690	ug/L	1.8	6.1	EPA 200.7	02/20/97	721026460
pH, lab	5.2	s.u.	1.0		EPA 150.1	02/19/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	02/24/97	721026460
Sulfate, as SO4 (filtered)	600	mg/L	250	250	EPA 375.2	02/25/97	721026460
Zinc, dis. as Zn by ICP	1600	ug/L	120	120	EPA 200.7	02/20/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 32436

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-176LS-4 **NLS#: 128121**
Ref. Line 10 of COC 24843 Description: FMC-176LS-4
Collected: 02/17/97 Received: 02/19/97 Reported: 02/26/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	ND	mg/L	2.0	2.0	EPA 305.1	02/25/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	02/20/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/20/97	721026460
Cadmium, dis. as Cd by ICP	29	ug/L	1.2	3.8	EPA 200.7	02/20/97	721026460
Calcium, dis. as Ca by ICP	580	mg/L	3.0	3.0	EPA 200.7	02/20/97	721026460
Cobalt, dis. as Co by ICP	380	ug/L	4.3	15	EPA 200.7	02/20/97	721026460
Copper, dis. as Cu by ICP	8000	ug/L	5.4	19	EPA 200.7	02/20/97	721026460
Iron, dis. as Fe by ICP	ND	mg/L	0.010	0.035	EPA 200.7	02/20/97	721026460
Magnesium, dis. as Mg by ICP	6.5	mg/L	3.0	3.0	EPA 200.7	02/20/97	721026460
Manganese, dis. as Mn by ICP	600	ug/L	1.8	6.1	EPA 200.7	02/20/97	721026460
pH, lab	5.6	s.u.	1.0		EPA 150.1	02/19/97	721026460
Selenium, dis. as Se by furnace	< 50 >	ug/L	37	130	EPA 270.2	02/24/97	721026460
Sulfate, as SO4 (filtered)	680	mg/L	250	250	EPA 375.2	02/25/97	721026460
Zinc, dis. as Zn by ICP	2800	ug/L	120	120	EPA 200.7	02/20/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

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ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
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Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-15-3L-4 NLS#: 128122
Ref. Line 1 of COC 24844 Description: FMC-15-3L-4
Collected: 02/18/97 Received: 02/19/97 Reported: 02/26/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	ND	mg/L	2.0	2.0	EPA 305.1	02/25/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	02/20/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/20/97	721026460
Cadmium, dis. as Cd by ICP	8.9	ug/L	1.2	3.8	EPA 200.7	02/20/97	721026460
Calcium, dis. as Ca by ICP	450	mg/L	3.0	3.0	EPA 200.7	02/20/97	721026460
Cobalt, dis. as Co by ICP	250	ug/L	4.3	15	EPA 200.7	02/20/97	721026460
Copper, dis. as Cu by ICP	13000	ug/L	5.4	19	EPA 200.7	02/20/97	721026460
Iron, dis. as Fe by ICP	0.19	mg/L	0.010	0.035	EPA 200.7	02/20/97	721026460
Magnesium, dis. as Mg by ICP	23	mg/L	3.0	3.0	EPA 200.7	02/20/97	721026460
Manganese, dis. as Mn by ICP	1600	ug/L	1.8	6.1	EPA 200.7	02/20/97	721026460
pH, lab	5.1	s.u.	1.0		EPA 150.1	02/19/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	02/24/97	721026460
Sulfate, as SO4 (filtered)	620	mg/L	250	250	EPA 375.2	02/25/97	721026460
Zinc, dis. as Zn by ICP	1600	ug/L	120	120	EPA 200.7	02/20/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
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Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-180L-4 NLS#: 128123
Ref. Line 2 of COC 24844 Description: FMC-180L-4
Collected: 02/18/97 Received: 02/19/97 Reported: 02/26/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	ND	mg/L	2.0	2.0	EPA 305.1	02/25/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	02/20/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/20/97	721026460
Cadmium, dis. as Cd by ICP	44	ug/L	1.2	3.8	EPA 200.7	02/20/97	721026460
Calcium, dis. as Ca by ICP	420	mg/L	3.0	3.0	EPA 200.7	02/20/97	721026460
Cobalt, dis. as Co by ICP	390	ug/L	4.3	15	EPA 200.7	02/20/97	721026460
Copper, dis. as Cu by ICP	4600	ug/L	5.4	19	EPA 200.7	02/20/97	721026460
Iron, dis. as Fe by ICP	ND	mg/L	0.010	0.035	EPA 200.7	02/20/97	721026460
Magnesium, dis. as Mg by ICP	27	mg/L	3.0	3.0	EPA 200.7	02/20/97	721026460
Manganese, dis. as Mn by ICP	5900	ug/L	1.8	6.1	EPA 200.7	02/20/97	721026460
pH, lab	5.6	s.u.	1.0		EPA 150.1	02/19/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	02/24/97	721026460
Sulfate, as SO4 (filtered)	610	mg/L	250	250	EPA 375.2	02/25/97	721026460
Zinc, dis. as Zn by ICP	6700	ug/L	120	120	EPA 200.7	02/20/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
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PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-181L-4 NLS#: 128124
Ref. Line 3 of COC 24844 Description: FMC-181L-4
Collected: 02/18/97 Received: 02/19/97 Reported: 02/26/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	ND	mg/L	2.0	2.0	EPA 305.1	02/25/97	721026460
Aluminum, dis. as Al by ICP	0.26	mg/L	0.034	0.12	EPA 200.7	02/20/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/20/97	721026460
Cadmium, dis. as Cd by ICP	420	ug/L	1.2	3.8	EPA 200.7	02/20/97	721026460
Calcium, dis. as Ca by ICP	430	mg/L	3.0	3.0	EPA 200.7	02/20/97	721026460
Cobalt, dis. as Co by ICP	2100	ug/L	4.3	15	EPA 200.7	02/20/97	721026460
Copper, dis. as Cu by ICP	390000	ug/L	54	190	EPA 200.7	02/20/97	721026460
Iron, dis. as Fe by ICP	3.2	mg/L	0.010	0.035	EPA 200.7	02/20/97	721026460
Magnesium, dis. as Mg by ICP	51	mg/L	3.0	3.0	EPA 200.7	02/20/97	721026460
Manganese, dis. as Mn by ICP	9500	ug/L	1.8	6.1	EPA 200.7	02/20/97	721026460
pH, lab	4.2	s.u.	1.0		EPA 150.1	02/19/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	02/24/97	721026460
Sulfate, as SO4 (filtered)	710	mg/L	250	250	EPA 375.2	02/25/97	721026460
Zinc, dis. as Zn by ICP	63000	ug/L	1200	1200	EPA 200.7	02/20/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

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ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
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Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-4-IL-4 NLS#: 128125
Ref. Line 4 of COC 24844 Description: FMC-4-IL-4
Collected: 02/18/97 Received: 02/19/97 Reported: 02/26/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	36	mg/L	2.0	2.0	EPA 305.1	02/25/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	02/20/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/20/97	721026460
Cadmium, dis. as Cd by ICP	46	ug/L	1.2	3.8	EPA 200.7	02/20/97	721026460
Calcium, dis. as Ca by ICP	470	mg/L	3.0	3.0	EPA 200.7	02/20/97	721026460
Cobalt, dis. as Co by ICP	350	ug/L	4.3	15	EPA 200.7	02/20/97	721026460
Copper, dis. as Cu by ICP	12000	ug/L	5.4	19	EPA 200.7	02/20/97	721026460
Iron, dis. as Fe by ICP	ND	mg/L	0.010	0.035	EPA 200.7	02/20/97	721026460
Magnesium, dis. as Mg by ICP	33	mg/L	3.0	3.0	EPA 200.7	02/20/97	721026460
Manganese, dis. as Mn by ICP	3100	ug/L	1.8	6.1	EPA 200.7	02/20/97	721026460
pH, lab	5.3	s.u.	1.0		EPA 150.1	02/19/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	02/24/97	721026460
Sulfate, as SO4 (filtered)	620	mg/L	250	250	EPA 375.2	02/25/97	721026460
Zinc, dis. as Zn by ICP	5100	ug/L	120	120	EPA 200.7	02/20/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
LOQ = Limit of Quantitation
ND = Not Detected
DWB = Dry Weight Basis
NA = Not Applicable
%DWB = (mg/kg DWB)/10000

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
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PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-4-ILS-4 NLS#: 128126
Ref. Line 5 of COC 24844 Description: FMC-4-ILS-4
Collected: 02/18/97 Received: 02/19/97 Reported: 02/26/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	12	mg/L	1.5	5.3	EPA 310.1	02/24/97	721026460
Aluminum, dis. as Al by ICP	< 0.036 >	mg/L	0.034	0.12	EPA 200.7	02/20/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/20/97	721026460
Cadmium, dis. as Cd by ICP	< 3.4 >	ug/L	1.2	3.8	EPA 200.7	02/20/97	721026460
Calcium, dis. as Ca by ICP	440	mg/L	3.0	3.0	EPA 200.7	02/20/97	721026460
Cobalt, dis. as Co by ICP	130	ug/L	4.3	15	EPA 200.7	02/20/97	721026460
Copper, dis. as Cu by ICP	370	ug/L	5.4	19	EPA 200.7	02/20/97	721026460
Iron, dis. as Fe by ICP	ND	mg/L	0.010	0.035	EPA 200.7	02/20/97	721026460
Magnesium, dis. as Mg by ICP	47	mg/L	3.0	3.0	EPA 200.7	02/20/97	721026460
Manganese, dis. as Mn by ICP	2800	ug/L	1.8	6.1	EPA 200.7	02/20/97	721026460
pH, lab	6.7	s.u.	1.0		EPA 150.1	02/19/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	02/24/97	721026460
Sulfate, as SO4 (filtered)	590	mg/L	250	250	EPA 375.2	02/25/97	721026460
Zinc, dis. as Zn by ICP	630	ug/L	120	120	EPA 200.7	02/20/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
LOQ = Limit of Quantitation
ND = Not Detected
DWB = Dry Weight Basis
NA = Not Applicable
%DWB = (mg/kg DWB)/10000

Steven R. Cryer
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

NORTHERN LAKE SERVICE, INC.
Analytical Laboratory and Environmental Services
400 North Lake Avenue - Crandon, WI 54520
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 32436

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-181LS-4 NLS#: 128127
Ref. Line 6 of COC 24844 Description: FMC-181LS-4
Collected: 02/18/97 Received: 02/19/97 Reported: 02/26/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	340	mg/L	2.0	2.0	EPA 305.1	02/25/97	721026460
Aluminum, dis. as Al by ICP	< 0.12 >	mg/L	0.034	0.12	EPA 200.7	02/20/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/20/97	721026460
Cadmium, dis. as Cd by ICP	420	ug/L	1.2	3.8	EPA 200.7	02/20/97	721026460
Calcium, dis. as Ca by ICP	480	mg/L	3.0	3.0	EPA 200.7	02/20/97	721026460
Cobalt, dis. as Co by ICP	2200	ug/L	4.3	15	EPA 200.7	02/20/97	721026460
Copper, dis. as Cu by ICP	320000	ug/L	54	190	EPA 200.7	02/20/97	721026460
Iron, dis. as Fe by ICP	1.8	mg/L	0.010	0.035	EPA 200.7	02/20/97	721026460
Magnesium, dis. as Mg by ICP	53	mg/L	3.0	3.0	EPA 200.7	02/20/97	721026460
Manganese, dis. as Mn by ICP	9200	ug/L	1.8	6.1	EPA 200.7	02/20/97	721026460
pH, lab	4.5	s.u.	1.0		EPA 150.1	02/19/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	02/24/97	721026460
Sulfate, as SO4 (filtered)	870	mg/L	250	250	EPA 375.2	02/25/97	721026460
Zinc, dis. as Zn by ICP	64000	ug/L	1200	1200	EPA 200.7	02/20/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Steven R. Cuyi
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-180LS-4 NLS#: 128128
Ref. Line 7 of COC 24844 Description: FMC-180LS-4
Collected: 02/18/97 Received: 02/19/97 Reported: 02/26/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	ND	mg/L	2.0	2.0	EPA 305.1	02/25/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	02/20/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/20/97	721026460
Cadmium, dis. as Cd by ICP	70	ug/L	1.2	3.8	EPA 200.7	02/20/97	721026460
Calcium, dis. as Ca by ICP	480	mg/L	3.0	3.0	EPA 200.7	02/20/97	721026460
Cobalt, dis. as Co by ICP	980	ug/L	4.3	15	EPA 200.7	02/20/97	721026460
Copper, dis. as Cu by ICP	1700	ug/L	5.4	19	EPA 200.7	02/20/97	721026460
Iron, dis. as Fe by ICP	ND	mg/L	0.010	0.035	EPA 200.7	02/20/97	721026460
Magnesium, dis. as Mg by ICP	61	mg/L	3.0	3.0	EPA 200.7	02/20/97	721026460
Manganese, dis. as Mn by ICP	14000	ug/L	1.8	6.1	EPA 200.7	02/20/97	721026460
pH, lab	6.1	s.u.	1.0		EPA 150.1	02/19/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	02/24/97	721026460
Sulfate, as SO4 (filtered)	510	mg/L	250	250	EPA 375.2	02/25/97	721026460
Zinc, dis. as Zn by ICP	9300	ug/L	120	120	EPA 200.7	02/20/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Steven R. Cyr
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-15-3LS-4 NLS#: 128129
Ref. Line 8 of COC 24844 Description: FMC-15-3LS-4
Collected: 02/18/97 Received: 02/19/97 Reported: 02/26/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. as CaCO3 (filtered)	19	mg/L	1.5	5.3	EPA 310.1	02/24/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	02/20/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/20/97	721026460
Cadmium, dis. as Cd by ICP	ND	ug/L	1.2	3.8	EPA 200.7	02/20/97	721026460
Calcium, dis. as Ca by ICP	430	mg/L	3.0	3.0	EPA 200.7	02/20/97	721026460
Cobalt, dis. as Co by ICP	41	ug/L	4.3	15	EPA 200.7	02/20/97	721026460
Copper, dis. as Cu by ICP	200	ug/L	5.4	19	EPA 200.7	02/20/97	721026460
Iron, dis. as Fe by ICP	ND	mg/L	0.010	0.035	EPA 200.7	02/20/97	721026460
Magnesium, dis. as Mg by ICP	16	mg/L	3.0	3.0	EPA 200.7	02/20/97	721026460
Manganese, dis. as Mn by ICP	880	ug/L	1.8	6.1	EPA 200.7	02/20/97	721026460
pH, lab	6.7	s.u.	1.0		EPA 150.1	02/19/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	02/24/97	721026460
Sulfate, as SO4 (filtered)	570	mg/L	250	250	EPA 375.2	02/25/97	721026460
Zinc, dis. as Zn by ICP	ND	ug/L	120	120	EPA 200.7	02/20/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Steven R. Cuyer
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

March 19, 1997

Russell Janeshek
Foth & Van Dyke
2737 S. Ridge Road
Green Bay, WI 54307

Re: Flambeau Mining, Scope 96F022, NLS 32654 - Fifth Displacement Samples

Dear Mr. Janeshek:

Enclosed is the final analytical report for samples received on March 5 19, 1997.

The assignment of an alkalinity or acidity test to each sample was done at Northern Lake Service (NLS) using a pH of 6.5 as the decision point. For a pH of less than or equal to 6.5, the acidity test was assigned to the sample. For a pH of greater than 6.5, the alkalinity test was assigned to the sample. The titration was conducted to a pH of 6.5 for both acidity and alkalinity.

Some parameters have elevated limits of detection (LOD). The LODs are raised to reflect dilution steps required to bring target analyte levels within the instrument calibration range and/or to reduce the effect of matrix interferences. Some samples were analyzed at a 100-fold dilution due to high levels of copper and/or zinc in the samples.

If you have any questions or require additional information, please feel free to contact me at (715) 478-2777.

Sincerely,

R.T. Krueger
Laboratory Manager

Enclosures (c:\amipro\docs\crupi\fvdfmc15.sam)

Rcvd: 03.21.97
By: RTJ
cc: RTJ J Chapman
SGL DJL
GWS
File: 96F022 (10501)
[Flambeau Mining]

NORTHERN LAKE SERVICE, INC.
Analytical Laboratory and Environmental Services
400 North Lake Avenue - Crandon, WI 54520
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 32654

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-170LS-5 NLS#: 129381
Ref. Line 1 of COC 25140 Description: FMC-170LS-5
Collected: 03/03/97 Received: 03/05/97 Reported: 03/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	ND	mg/L	2.0	2.0	EPA 305.1	03/06/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	03/11/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	03/11/97	721026460
Cadmium, dis. as Cd by ICP	46	ug/L	1.2	3.8	EPA 200.7	03/11/97	721026460
Calcium, dis. as Ca by ICP	190	mg/L	3.0	3.0	EPA 200.7	03/11/97	721026460
Cobalt, dis. as Co by ICP	160	ug/L	4.3	15	EPA 200.7	03/11/97	721026460
Copper, dis. as Cu by ICP	35000	ug/L	54	190	EPA 200.7	03/11/97	721026460
Iron, dis. as Fe by ICP	0.20	mg/L	0.010	0.035	EPA 200.7	03/11/97	721026460
Magnesium, dis. as Mg by ICP	7.7	mg/L	3.0	3.0	EPA 200.7	03/11/97	721026460
Manganese, dis. as Mn by ICP	1400	ug/L	1.8	6.1	EPA 200.7	03/11/97	721026460
pH, lab	5.3	s.u.	1.0		EPA 150.1	03/05/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	03/14/97	721026460
Sulfate, as SO4 (filtered)	520	mg/L	250	250	EPA 375.2	03/13/97	721026460
Zinc, dis. as Zn by ICP	3200	ug/L	120	120	EPA 200.7	03/11/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Thomas R Priebe
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

NORTHERN LAKE SERVICE, INC.
Analytical Laboratory and Environmental Services
400 North Lake Avenue - Crandon, WI 54520
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 32654

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-13-1LS-5 NLS#: 129382
Ref. Line 2 of COC 25140 Description: FMC-13-1LS-5
Collected: 03/03/97 Received: 03/05/97 Reported: 03/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	ND	mg/L	2.0	2.0	EPA 305.1	03/06/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Thomas R Prickett

Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-188LS-5 **NLS#: 129383**
Ref. Line 3 of COC 25140 Description: FMC-188LS-5
Collected: 03/03/97 Received: 03/05/97 Reported: 03/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	92	mg/L	2.0	2.0	EPA 305.1	03/06/97	721026460
Aluminum, dis. as Al by ICP	< 0.064 >	mg/L	0.034	0.12	EPA 200.7	03/11/97	721026460
Arsenic, dis. as As by ICP	< 26 >	ug/L	16	57	EPA 200.7	03/11/97	721026460
Cadmium, dis. as Cd by ICP	170	ug/L	1.2	3.8	EPA 200.7	03/11/97	721026460
Calcium, dis. as Ca by ICP	440	mg/L	3.0	3.0	EPA 200.7	03/11/97	721026460
Cobalt, dis. as Co by ICP	510	ug/L	4.3	15	EPA 200.7	03/11/97	721026460
Copper, dis. as Cu by ICP	72000	ug/L	54	190	EPA 200.7	03/11/97	721026460
Iron, dis. as Fe by ICP	0.050	mg/L	0.010	0.035	EPA 200.7	03/11/97	721026460
Magnesium, dis. as Mg by ICP	9.8	mg/L	3.0	3.0	EPA 200.7	03/11/97	721026460
Manganese, dis. as Mn by ICP	1400	ug/L	1.8	6.1	EPA 200.7	03/11/97	721026460
pH, lab	5.1	s.u.	1.0		EPA 150.1	03/05/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	03/14/97	721026460
Sulfate, as SO4 (filtered)	660	mg/L	250	250	EPA 375.2	03/13/97	721026460
Zinc, dis. as Zn by ICP	11000	ug/L	120	120	EPA 200.7	03/11/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation".
Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Thomas R Priebe
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 32654

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-183LS-5 NLS#: 129384
Ref. Line 4 of COC 25140 Description: FMC-183LS-5
Collected: 03/03/97 Received: 03/05/97 Reported: 03/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	240	mg/L	2.0	2.0	EPA 305.1	03/06/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	03/11/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	03/11/97	721026460
Cadmium, dis. as Cd by ICP	20	ug/L	1.2	3.8	EPA 200.7	03/11/97	721026460
Calcium, dis. as Ca by ICP	380	mg/L	3.0	3.0	EPA 200.7	03/11/97	721026460
Cobalt, dis. as Co by ICP	260	ug/L	4.3	15	EPA 200.7	03/11/97	721026460
Copper, dis. as Cu by ICP	170000	ug/L	54	190	EPA 200.7	03/11/97	721026460
Iron, dis. as Fe by ICP	0.18	mg/L	0.010	0.035	EPA 200.7	03/11/97	721026460
Magnesium, dis. as Mg by ICP	9.6	mg/L	3.0	3.0	EPA 200.7	03/11/97	721026460
Manganese, dis. as Mn by ICP	1100	ug/L	1.8	6.1	EPA 200.7	03/11/97	721026460
pH, lab	4.8	s.u.	1.0		EPA 150.1	03/05/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	03/14/97	721026460
Sulfate, as SO4 (filtered)	580	mg/L	250	250	EPA 375.2	03/13/97	721026460
Zinc, dis. as Zn by ICP	2100	ug/L	120	120	EPA 200.7	03/11/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Thomas R Priebe
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-213LS-5 NLS#: 129385
Ref. Line 5 of COC 25140 Description: FMC-213LS-5
Collected: 03/03/97 Received: 03/05/97 Reported: 03/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	ND	mg/L	2.0	2.0	EPA 305.1	03/06/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Thomas R Priebe
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-187LS-5 NLS#: 129386
Ref. Line 6 of COC 25140 Description: FMC-187LS-5
Collected: 03/03/97 Received: 03/05/97 Reported: 03/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	92	mg/L	2.0	2.0	EPA 305.1	03/06/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	03/11/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	03/11/97	721026460
Cadmium, dis. as Cd by ICP	10	ug/L	1.2	3.8	EPA 200.7	03/11/97	721026460
Calcium, dis. as Ca by ICP	350	mg/L	3.0	3.0	EPA 200.7	03/11/97	721026460
Cobalt, dis. as Co by ICP	210	ug/L	4.3	15	EPA 200.7	03/11/97	721026460
Copper, dis. as Cu by ICP	40000	ug/L	54	190	EPA 200.7	03/11/97	721026460
Iron, dis. as Fe by ICP	0.052	mg/L	0.010	0.035	EPA 200.7	03/11/97	721026460
Magnesium, dis. as Mg by ICP	8.4	mg/L	3.0	3.0	EPA 200.7	03/11/97	721026460
Manganese, dis. as Mn by ICP	1200	ug/L	1.8	6.1	EPA 200.7	03/11/97	721026460
pH, lab	5.3	s.u.	1.0		EPA 150.1	03/05/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	03/14/97	721026460
Sulfate, as SO4 (filtered)	560	mg/L	250	250	EPA 375.2	03/13/97	721026460
Zinc, dis. as Zn by ICP	1500	ug/L	120	120	EPA 200.7	03/11/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Thomas R Pielie

Reviewed by:

Authorized by:

R. T. Krueger
Laboratory Manager

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 32654

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-192LS-5 NLS#: 129387
Ref. Line 7 of COC 25140 Description: FMC-192LS-5
Collected: 03/03/97 Received: 03/05/97 Reported: 03/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	ND	mg/L	2.0	2.0	EPA 305.1	03/06/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	03/11/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	03/11/97	721026460
Cadmium, dis. as Cd by ICP	< 2.8 >	ug/L	1.2	3.8	EPA 200.7	03/11/97	721026460
Calcium, dis. as Ca by ICP	86	mg/L	3.0	3.0	EPA 200.7	03/11/97	721026460
Cobalt, dis. as Co by ICP	180	ug/L	4.3	15	EPA 200.7	03/11/97	721026460
Copper, dis. as Cu by ICP	17000	ug/L	54	190	EPA 200.7	03/11/97	721026460
Iron, dis. as Fe by ICP	ND	mg/L	0.010	0.035	EPA 200.7	03/11/97	721026460
Magnesium, dis. as Mg by ICP	12	mg/L	3.0	3.0	EPA 200.7	03/11/97	721026460
Manganese, dis. as Mn by ICP	1500	ug/L	1.8	6.1	EPA 200.7	03/11/97	721026460
pH, lab	5.4	s.u.	1.0		EPA 150.1	03/05/97	721026460
Selenium, dis. as Se by furnace	< 40 >	ug/L	37	130	EPA 270.2	03/14/97	721026460
Sulfate, as SO4 (filtered)	140	mg/L	25	25	EPA 375.2	03/13/97	721026460
Zinc, dis. as Zn by ICP	650	ug/L	120	120	EPA 200.7	03/11/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Thomas R Priebe

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Authorized by:

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 32654

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-190LS-5 NLS#: 129388
Ref. Line 8 of COC 25140 Description: FMC-190LS-5
Collected: 03/03/97 Received: 03/05/97 Reported: 03/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	190	mg/L	2.0	2.0	EPA 305.1	03/06/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	03/11/97	721026460
Arsenic, dis. as As by ICP	< 34 >	ug/L	16	57	EPA 200.7	03/11/97	721026460
Cadmium, dis. as Cd by ICP	32	ug/L	1.2	3.8	EPA 200.7	03/11/97	721026460
Calcium, dis. as Ca by ICP	160	mg/L	3.0	3.0	EPA 200.7	03/11/97	721026460
Cobalt, dis. as Co by ICP	510	ug/L	4.3	15	EPA 200.7	03/11/97	721026460
Copper, dis. as Cu by ICP	140000	ug/L	54	190	EPA 200.7	03/11/97	721026460
Iron, dis. as Fe by ICP	0.31	mg/L	0.010	0.035	EPA 200.7	03/11/97	721026460
Magnesium, dis. as Mg by ICP	15	mg/L	3.0	3.0	EPA 200.7	03/11/97	721026460
Manganese, dis. as Mn by ICP	2200	ug/L	1.8	6.1	EPA 200.7	03/11/97	721026460
pH, lab	4.9	s.u.	1.0		EPA 150.1	03/05/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	03/14/97	721026460
Sulfate, as SO4 (filtered)	520	mg/L	250	250	EPA 375.2	03/13/97	721026460
Zinc, dis. as Zn by ICP	4600	ug/L	120	120	EPA 200.7	03/11/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation".
Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Thomas R Priebe
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-172LS-5 NLS#: 129389
Ref. Line 9 of COC 25140 Description: FMC-172LS-5
Collected: 03/03/97 Received: 03/05/97 Reported: 03/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	90	mg/L	2.0	2.0	EPA 305.1	03/06/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	03/11/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	03/11/97	721026460
Cadmium, dis. as Cd by ICP	37	ug/L	1.2	3.8	EPA 200.7	03/11/97	721026460
Calcium, dis. as Ca by ICP	610	mg/L	3.0	3.0	EPA 200.7	03/11/97	721026460
Cobalt, dis. as Co by ICP	37	ug/L	4.3	15	EPA 200.7	03/11/97	721026460
Copper, dis. as Cu by ICP	20000	ug/L	54	190	EPA 200.7	03/11/97	721026460
Iron, dis. as Fe by ICP	ND	mg/L	0.010	0.035	EPA 200.7	03/11/97	721026460
Magnesium, dis. as Mg by ICP	6.5	mg/L	3.0	3.0	EPA 200.7	03/11/97	721026460
Manganese, dis. as Mn by ICP	580	ug/L	1.8	6.1	EPA 200.7	03/11/97	721026460
pH, lab	5.1	s.u.	1.0		EPA 150.1	03/05/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	03/14/97	721026460
Sulfate, as SO4 (filtered)	530	mg/L	250	250	EPA 375.2	03/13/97	721026460
Zinc, dis. as Zn by ICP	4000	ug/L	120	120	EPA 200.7	03/11/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
LOQ = Limit of Quantitation
ND = Not Detected
DWB = Dry Weight Basis
NA = Not Applicable
%DWB = (mg/kg DWB)/10000

Thomas R Priebe

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Authorized by:

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 32654

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-176LS-5 NLS#: 129390
Ref. Line 10 of COC 25140 Description: FMC-176LS-5
Collected: 03/03/97 Received: 03/05/97 Reported: 03/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	ND	mg/L	2.0	2.0	EPA 305.1	03/06/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	03/11/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	03/11/97	721026460
Cadmium, dis. as Cd by ICP	78	ug/L	1.2	3.8	EPA 200.7	03/11/97	721026460
Calcium, dis. as Ca by ICP	580	mg/L	3.0	3.0	EPA 200.7	03/11/97	721026460
Cobalt, dis. as Co by ICP	680	ug/L	4.3	15	EPA 200.7	03/11/97	721026460
Copper, dis. as Cu by ICP	13000	ug/L	54	190	EPA 200.7	03/11/97	721026460
Iron, dis. as Fe by ICP	ND	mg/L	0.010	0.035	EPA 200.7	03/11/97	721026460
Magnesium, dis. as Mg by ICP	31	mg/L	3.0	3.0	EPA 200.7	03/11/97	721026460
Manganese, dis. as Mn by ICP	9000	ug/L	1.8	6.1	EPA 200.7	03/11/97	721026460
pH, lab	5.4	s.u.	1.0		EPA 150.1	03/05/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	03/14/97	721026460
Sulfate, as SO4 (filtered)	760	mg/L	250	250	EPA 375.2	03/13/97	721026460
Zinc, dis. as Zn by ICP	13000	ug/L	120	120	EPA 200.7	03/11/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Thomas R Priebe
Reviewed by:

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ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
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PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-15-3L-5 NLS#: 129391
Ref. Line 1 of COC 25141 Description: FMC-15-3L-5
Collected: 03/04/97 Received: 03/05/97 Reported: 03/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	44	mg/L	2.0	2.0	EPA 305.1	03/06/97	721026460
Aluminum, dis. as Al by ICP	< 0.076 >	mg/L	0.034	0.12	EPA 200.7	03/11/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	03/11/97	721026460
Cadmium, dis. as Cd by ICP	12	ug/L	1.2	3.8	EPA 200.7	03/11/97	721026460
Calcium, dis. as Ca by ICP	570	mg/L	3.0	3.0	EPA 200.7	03/11/97	721026460
Cobalt, dis. as Co by ICP	480	ug/L	4.3	15	EPA 200.7	03/11/97	721026460
Copper, dis. as Cu by ICP	26000	ug/L	54	190	EPA 200.7	03/11/97	721026460
Iron, dis. as Fe by ICP	0.37	mg/L	0.010	0.035	EPA 200.7	03/11/97	721026460
Magnesium, dis. as Mg by ICP	27	mg/L	3.0	3.0	EPA 200.7	03/11/97	721026460
Manganese, dis. as Mn by ICP	2600	ug/L	1.8	6.1	EPA 200.7	03/11/97	721026460
pH, lab	5.0	s.u.	1.0		EPA 150.1	03/05/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	03/14/97	721026460
Sulfate, as SO4 (filtered)	790	mg/L	250	250	EPA 375.2	03/13/97	721026460
Zinc, dis. as Zn by ICP	3100	ug/L	120	120	EPA 200.7	03/11/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Thomas R Priebe
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 32654

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-180L-5 **NLS#: 129392**
Ref. Line 2 of COC 25141 Description: FMC-180L-5
Collected: 03/04/97 Received: 03/05/97 Reported: 03/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	34	mg/L	2.0	2.0	EPA 305.1	03/06/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	03/11/97	721026460
Arsenic, dis. as As by ICP	< 28 >	ug/L	16	57	EPA 200.7	03/11/97	721026460
Cadmium, dis. as Cd by ICP	75	ug/L	1.2	3.8	EPA 200.7	03/11/97	721026460
Calcium, dis. as Ca by ICP	560	mg/L	3.0	3.0	EPA 200.7	03/11/97	721026460
Cobalt, dis. as Co by ICP	670	ug/L	4.3	15	EPA 200.7	03/11/97	721026460
Copper, dis. as Cu by ICP	13000	ug/L	54	190	EPA 200.7	03/11/97	721026460
Iron, dis. as Fe by ICP	ND	mg/L	0.010	0.035	EPA 200.7	03/11/97	721026460
Magnesium, dis. as Mg by ICP	31	mg/L	3.0	3.0	EPA 200.7	03/11/97	721026460
Manganese, dis. as Mn by ICP	8900	ug/L	1.8	6.1	EPA 200.7	03/11/97	721026460
pH, lab	5.3	s.u.	1.0		EPA 150.1	03/05/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	03/14/97	721026460
Sulfate, as SO4 (filtered)	610	mg/L	250	250	EPA 375.2	03/13/97	721026460
Zinc, dis. as Zn by ICP	13000	ug/L	120	120	EPA 200.7	03/11/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

Thomas R Priebe
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
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PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-181L-5 NLS#: 129393
Ref. Line 3 of COC 25141 Description: FMC-181L-5
Collected: 03/04/97 Received: 03/05/97 Reported: 03/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	440	mg/L	2.0	2.0	EPA 305.1	03/06/97	721026460
Aluminum, dis. as Al by ICP	0.31	mg/L	0.034	0.12	EPA 200.7	03/11/97	721026460
Arsenic, dis. as As by ICP	< 31 >	ug/L	16	57	EPA 200.7	03/11/97	721026460
Cadmium, dis. as Cd by ICP	360	ug/L	1.2	3.8	EPA 200.7	03/11/97	721026460
Calcium, dis. as Ca by ICP	530	mg/L	3.0	3.0	EPA 200.7	03/11/97	721026460
Cobalt, dis. as Co by ICP	1700	ug/L	4.3	15	EPA 200.7	03/11/97	721026460
Copper, dis. as Cu by ICP	370000	ug/L	54	190	EPA 200.7	03/11/97	721026460
Iron, dis. as Fe by ICP	3.4	mg/L	0.010	0.035	EPA 200.7	03/11/97	721026460
Magnesium, dis. as Mg by ICP	46	mg/L	3.0	3.0	EPA 200.7	03/11/97	721026460
Manganese, dis. as Mn by ICP	9000	ug/L	1.8	6.1	EPA 200.7	03/11/97	721026460
pH, lab	4.4	s.u.	1.0		EPA 150.1	03/05/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	03/14/97	721026460
Sulfate, as SO4 (filtered)	1000	mg/L	250	250	EPA 375.2	03/13/97	721026460
Zinc, dis. as Zn by ICP	54000	ug/L	1200	1200	EPA 200.7	03/11/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Thomas R Priebe

Reviewed by:

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 32654

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-4-1L-5 **NLS#: 129394**
Ref. Line 4 of COC 25141 Description: FMC-4-1L-5
Collected: 03/04/97 Received: 03/05/97 Reported: 03/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	40	mg/L	2.0	2.0	EPA 305.1	03/06/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	03/11/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	03/11/97	721026460
Cadmium, dis. as Cd by ICP	63	ug/L	1.2	3.8	EPA 200.7	03/11/97	721026460
Calcium, dis. as Ca by ICP	570	mg/L	3.0	3.0	EPA 200.7	03/11/97	721026460
Cobalt, dis. as Co by ICP	490	ug/L	4.3	15	EPA 200.7	03/11/97	721026460
Copper, dis. as Cu by ICP	25000	ug/L	54	190	EPA 200.7	03/11/97	721026460
Iron, dis. as Fe by ICP	ND	mg/L	0.010	0.035	EPA 200.7	03/11/97	721026460
Magnesium, dis. as Mg by ICP	35	mg/L	3.0	3.0	EPA 200.7	03/11/97	721026460
Manganese, dis. as Mn by ICP	4000	ug/L	1.8	6.1	EPA 200.7	03/11/97	721026460
pH, lab	4.8	s.u.	1.0		EPA 150.1	03/05/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	03/14/97	721026460
Sulfate, as SO4 (filtered)	830	mg/L	250	250	EPA 375.2	03/13/97	721026460
Zinc, dis. as Zn by ICP	7700	ug/L	120	120	EPA 200.7	03/11/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 32654

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-4-1LS-5 NLS#: 129395
Ref. Line 5 of COC 25141 Description: FMC-4-1LS-5
Collected: 03/04/97 Received: 03/05/97 Reported: 03/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Manganese, dis. as Mn by ICP	3400	ug/L	1.8	6.1	EPA 200.7	03/11/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation".
Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

Thomas R Prielo
Reviewed by:

Authorized by:
R. T. Krueger
Laboratory Manager

NORTHERN LAKE SERVICE, INC.
Analytical Laboratory and Environmental Services
400 North Lake Avenue - Crandon, WI 54520
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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-181LS-5 NLS#: 129396
Ref. Line 6 of COC 25141 Description: FMC-181LS-5
Collected: 03/04/97 Received: 03/05/97 Reported: 03/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	290	mg/L	2.0	2.0	EPA 305.1	03/06/97	721026460
Aluminum, dis. as Al by ICP	< 0.061 >	mg/L	0.034	0.12	EPA 200.7	03/11/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	03/11/97	721026460
Cadmium, dis. as Cd by ICP	310	ug/L	1.2	3.8	EPA 200.7	03/11/97	721026460
Calcium, dis. as Ca by ICP	540	mg/L	3.0	3.0	EPA 200.7	03/11/97	721026460
Cobalt, dis. as Co by ICP	1600	ug/L	4.3	15	EPA 200.7	03/11/97	721026460
Copper, dis. as Cu by ICP	240000	ug/L	54	190	EPA 200.7	03/11/97	721026460
Iron, dis. as Fe by ICP	1.1	mg/L	0.010	0.035	EPA 200.7	03/11/97	721026460
Magnesium, dis. as Mg by ICP	42	mg/L	3.0	3.0	EPA 200.7	03/11/97	721026460
Manganese, dis. as Mn by ICP	8000	ug/L	1.8	6.1	EPA 200.7	03/11/97	721026460
pH, lab	4.5	s.u.	1.0		EPA 150.1	03/05/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	03/14/97	721026460
Sulfate, as SO4 (filtered)	840	mg/L	250	250	EPA 375.2	03/13/97	721026460
Zinc, dis. as Zn by ICP	46000	ug/L	1200	1200	EPA 200.7	03/11/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000

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WIS. LAB CERT. NO. 721026460

ANALYTICAL REPORT

 NLS PROJECT# 32654

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-180LS-5 NLS#: 129397
Ref. Line 7 of COC 25141 Description: FMC-180LS-5
Collected: 03/04/97 Received: 03/05/97 Reported: 03/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3	12	mg/L	2.0	2.0	EPA 305.1	03/06/97	721026460
Aluminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	03/11/97	721026460
Arsenic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	03/11/97	721026460
Cadmium, dis. as Cd by ICP	79	ug/L	1.2	3.8	EPA 200.7	03/11/97	721026460
Calcium, dis. as Ca by ICP	580	mg/L	3.0	3.0	EPA 200.7	03/11/97	721026460
Cobalt, dis. as Co by ICP	1000	ug/L	4.3	15	EPA 200.7	03/11/97	721026460
Copper, dis. as Cu by ICP	2400	ug/L	5.4	19	EPA 200.7	03/11/97	721026460
Iron, dis. as Fe by ICP	ND	mg/L	0.010	0.035	EPA 200.7	03/11/97	721026460
Magnesium, dis. as Mg by ICP	51	mg/L	3.0	3.0	EPA 200.7	03/11/97	721026460
Manganese, dis. as Mn by ICP	12000	ug/L	1.8	6.1	EPA 200.7	03/11/97	721026460
pH, lab	5.8	s.u.	1.0		EPA 150.1	03/05/97	721026460
Selenium, dis. as Se by furnace	ND	ug/L	37	130	EPA 270.2	03/14/97	721026460
Sulfate, as SO4 (filtered)	880	mg/L	250	250	EPA 375.2	03/13/97	721026460
Zinc, dis. as Zn by ICP	12000	ug/L	120	120	EPA 200.7	03/11/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection   LOQ = Limit of Quantitation   ND = Not Detected
DWB = Dry Weight Basis   NA = Not Applicable   %DWB = (mg/kg DWB)/10000

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ANALYTICAL REPORT

 NLS PROJECT# 32654

Client: Foth & Van Dyke Associates
Attn: Russ Janeshek
2737 S. Ridge Road
PO Box 19012
Green Bay, WI 54307

Project Description: Flambeau Mining
Project Title: 96F022

Sample ID: FMC-15-3LS-5 NLS#: 129398
Ref. Line 8 of COC 25141 Description: FMC-15-3LS-5
Collected: 03/04/97 Received: 03/05/97 Reported: 03/17/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Manganese, dis. as Mn by ICP	1200	ug/L	1.8	6.1	EPA 200.7	03/11/97	721026460

Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection
DWB = Dry Weight Basis
LOQ = Limit of Quantitation
NA = Not Applicable
ND = Not Detected
%DWB = (mg/kg DWB)/10000

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