

Report

1997 Backfilling Plan for Stockpiled Type II Material

Scope ID: 96F022

Flambeau Mining Company Ladysmith, Wisconsin



March 1997





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.

MLD2\96F022\GBAPP\44722.61\10000

Mr. Lawrence J. Lynch Wisconsin Department of Natural Resources March 4, 1997 Page 2

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

Sincerely,

Foth & Van Dyke

OIIIA

Jerry W. Sevick, P.E. Vice President

JWS:mld2

MLD2\96F022\GBAPP\44722.61\10000

1997 Backfilling Plan for Stockpiled Type II Material Flambeau Project

Distribution

No. of Copies

. 3

1

4

1

1

1

1

Sent To

Mr. Lawrence J. Lynch Wisconsin Department of Natural Resources 101 South Webster Street, GEF II Madison, WI 53707

Mr. Ken Markart Wisconsin Department of Natural Resources P.O. Box 838 Rhinelander, WI 54501

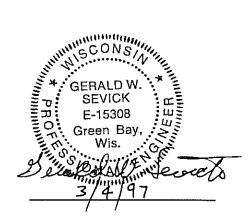
Mr. Tom Myatt General Manager Flambeau Mining Company N4100 Highway 27 Ladysmith, WI 54848

Mr. Thure Osuldsen, Chairman Rusk County Board 115 West Miner Avenue Ladysmith, WI 54848

Mr. Tom Riegel, Chairman Town of Grant N3356 Plantz Road Ladysmith, WI 54848

Mr. Al Christianson City Administrator City of Ladysmith P.O. Box 431 Ladysmith, WI 54848

Mr. Melvin Spencer Rusk County Zoning Administrator 311 East Miner Avenue Ladysmith, WI 54848



1997 Backfilling Plan for Stockpiled Type II Material

96F022

Prepared for Flambeau Mining Company N4100 Highway 27 Ladysmith, Wisconsin 54848

Prepared by Foth & Van Dyke and Associates Inc.

March 1997

REUSE OF DOCUMENTS

This document has been developed for a specific application and not for general use; therefore, it may not be used without the written approval of Foth & Van Dyke and Associates. Unapproved use is at the sole responsibility of the unauthorized user.

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

Contents

				Page
1	Intro	duction		1
1	1.1		ound	
	1.1	1.1.1	Type II Material	
		1.1.1	Type I Stockpile	
	1.2		1996-97 Testing Program Objectives	
	1.2	winter		
2	Field	Investiga	ations	6
	2.1	Sample	Collection	6
		2.1.1	Type II Stockpile	6
		2.1.2	Type I Stockpile	9
		2.1.3	Backfilled Material	9
	2.2	Sampli	ng Methodology	9
		2.2.1	Sample Collection	9
		2.2.2	Lithologic Logging	13
	2.3	Field T	esting	13
3	Labo	notom In	vestigations	15
د	3.1	-	Materials	
	5.1	3.1.1	Effects of Size Distribution	
		3.1.2	Alkali Demand	
		3.1.2	Confirmation of Alkali Amendment Type	
	3.2	3.1.4	Limestone Availability and Amendment Rate	
	3.2 3.3		y of CUF Solids Under Anoxic Conditions	
			96 Backfilled Material	
	3.4		Materials	
		3.4.1	Leach Extraction Tests	
		3.4.2	Reactivity	19
4	Resu	lts and D	iscussion	20
	4.1	Type II	Stockpile	20
		4.1.1	Field Investigation	20
			4.1.1.1 Summary of Field Observations	
			4.1.1.2 Paste Parameters	
		4.1.2	Effect of Particle Size	
		4.1.3	Alkali Demand Testing	
		4.1.4	Alkali Amendment Type	
		4.1.5	Alkali Availability	
			4.1.5.1 Limestone and Lime Amended Columns	

			4.1.5.2 Supplementary Column Tests	44
		4.1.6	Relationship of Field Parameters and Alkali Demand	46
	4.2	Stabilit	y of Clarifier Underflow (CUF) Solids	51
	4.3		terization of Fall 1996 Backfill Type II Material	
	4.4		Stockpile	
		4.4.1	Field Investigation	57
		4.4.2	Leach Extraction Tests	57
		4.4.3	Alkali Demand	61
		4.4.4	Reactivity	61
	4.5	Summa	ary and Conclusions	61
		4.5.1	Type II Stockpile	61
			4.5.1.1 Field Testing and Observations	61
			4.5.1.2 Effect of Particle Size	65
			4.5.1.3 Alkali Demand Testing and Paste Parameters	65
			4.5.1.4 Limestone Availability	66
		4.5.2	CUF Solids	66
		4.5.3	Backfilled Type II Material	66
		4.5.4	Type I Materials	67
		4.5.5	Estimated Short and Long Pore Water Quality	67
5	Alkal	i Applic	ation and Control	70
	5.1		lction	
	5.2		ment of Sampling Requirements	
		5.2.1	Material Variability	
		5.2.2	Sampling Error at Different Grids	
		5.2.3	Proposed Sampling Grid	
	5.3	-	ng Procedures And Requirements	
		5.3.1	Sampling Ahead of Relocation	
			5.3.1.1 Sampling on Surface	
			5.3.1.2 Sideslope Sampling	
		5.3.2	Sampling of Placed Material	
	5.4	-	g Procedures	
		5.4.1	Ahead of Type II Relocation	
			5.4.1.1 Surface Samples	
			5.4.1.2 Sideslope Samples	
			5.4.1.3 General Requirements	
	~	5.4.2	Backfilled Type II Material	
			5.4.2.1 Below the 1045 ft Elevation	
			5.4.2.2 Above the 1045 ft Elevation	
	5.5	Interpr	etation of Alkali Demand Data and Alkali Application Control	. 79

4

v

Page

	5.6	5.5.2	Interpretation of Boundaries)
6	Sum	nary		;
7	Refer	ences.		,

Tables

Table 2-1	Summary of Field Investigation Program	7
Table 3-1	Summary of Laboratory Investigation Program	15
Table 4-1	Summary of Type II Field Paste Parameters	21
Table 4-2	Type II Stockpile Material Size Distributions and Gross Gradation	
	Estimates	32
Table 4-3	Distribution of Soluble Constituents	
Table 4-4	Overestimation (as a Ratio) of Soluble Constituents Based on Testing the	
	<¼-in Size Fraction	
Table 4-5	Summary of Alkali Demand Test Results	36
Table 4-6	Sample Selection for Column Testing, Samples for Alkali Type Testing	
Table 4-7	Comparison of Column Test Results Obtained for Lime and Limestone	
	Amended Samples	43
Table 4-8	Assessment of Limestone Availability	45
Table 4-9	Summary of Column Test Results	. 47
Table 4-10	Summary of Type II Material Classification by Field Test Results	. 49
Table 4-11	Summary of Type II Material Classification by 1 Hour Shake Flask	
	Results	. 50
Table 4-12	Clarifier Underflow Shake Flask Extraction Test Results	. 52
Table 4-13	Summary of Acid Consumption Test Results	. 53
Table 4-14	Summary of CUF Column Test Results	. 54
Table 4-15	Summary of Paste Parameters and Alkali Demand for 1996 Backfilled	
	Material Before Relocation	. 55
Table 4-16	Summary of Backfill Field Paste Parameters	. 55
Table 4-17	Summary of Backfill Sample Leach Extraction Test Results	
Table 4-18	Summary of Column Test Results Conducted on the Limestone Amended	
	Backfill Samples	. 58
Table 4-19	Type I Stockpile Test Pit Summary Table	
Table 4-20	Type I Stockpile Material Leach Extraction Test Results	
Table 4-21	Summary of Type I Alkali Demand Test Results	

Table 4-22	Summary of Type I Acid Base Account Test Results
Table 4-23	Summary of Effect of Carbon Dioxide on Predicted Pore Water Quality 68
Table 4-24	Summary of Constituent Concentrations for Pore Water Displaced from
	Backfill Samples
Table 5-1	Summary of Block Classification
Table 5-2	Summary of Overall Accuracy of up to Three Samples to Characterize a
	120 x 120 ft Block
Table 5-3	Summary of Alkali Demand Observed for Sideslope Samples
Table 5-4	Material Classification and Distribution
Table 5-5	Summary of Limestone Amendment Rates for Class A and B Material
	Placed Below the 1045 ft Elevation in the Pit
Table 5-6	Summary of Limestone Amendment Rates for Class A and B Material
	Placed Above the 1045 ft Elevation in the Pit
Table 5-7	Summary of Estimated Daily Test Pit and Testing Requirements

Figures

Figure 2-1	Type II Stockpile Sample Locations 8
Figure 2-2	Type I Stockpile Sample Locations 10
Figure 2-3	Backfill Sample Locations 11
Figure 4-1	Relationship Between Field Paste Parameters
Figure 4-2	Type II Material: Plot of Standard Deviation vs. Average Field Paste pH26
Figure 4-3	Type II Material: Plot of Standard Deviation vs. Average Field Paste
	Conductivity
Figure 4-4	Relationship Between Paste and Shake Flask pH
Figure 4-5	Relationship Between Paste and Shake Flask Conductivity
Figure 4-6	Relationship Between Shake Flask Conductivity and pH 30
Figure 4-7	Type II Stockpile Material Size Distribution
Figure 4-8	Distribution of Alkali Demand for Type II Samples
Figure 4-9	Plot of Field pH vs. Alkali Demand
Figure 4-10	Plot of Alkali Demand vs. Field Conductivity
Figure 5-1	Classification of Type II Material
Figure 5-2	Type II Stockpile, North-South 3-D Semi-Variogram
Figure 5-3	Type II Stockpile, East-West 3-D Semi-Variogram
Figure 5-4	Classification of Type II Material75

Appendices

Appendix A	October 30, 1996 Field and Laboratory Work Plan
Appendix B	November 20, 1996 Field and Laboratory Work Plan Amendment

Contents (continued)

Appendix C	Table 1 - Type I and II Stockpile Sample Collection Summary
Appendix D	Modifications to Laboratory Test Procedures
Appendix E	Size Distribution Effects Test Results
Appendix F	Type II Alkali Demand Test Results
Appendix G	Anoxic Column Test Data Base and Laboratory Reports for the First Three
	Displacement Tests
Appendix H	Clarifier Underflow (CUF) Solids Anoxic Extraction Test Results
Appendix I	Backfill Leach Extraction Test Results
Appendix J	Type I Leach Extraction Test Results
Appendix K	Type I Alkali Demand Test Results
Appendix L	Type I ABA Test Results
Appendix M	MINTEQA2 Input and Output Files

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 shortterm, 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 materials 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			·····		
		Ту	pe 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 ³	CUF Solids	Sandstone ⁷	Saprolites	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 <3 in	38	30 5	2	4 2	5	2	5	5	13	
Field Parameters ¹¹										
Paste pH	164	140	8	28	20		20	24	56	
Paste cond.	164	140	8	28	20		20	24	56	

'Test pits 146 to 183.

²Test pits 184 to 213. ³Test pits 301 and 302.

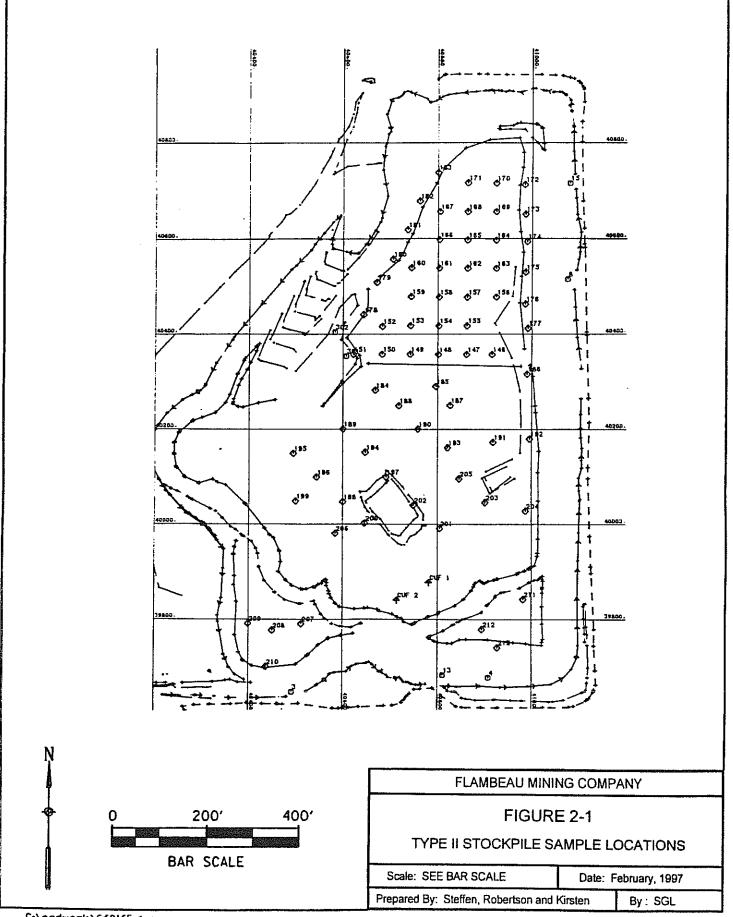
⁴Test pits 3, 4, 8, 13-1, 15-1, and 15-3. ⁵Test pits 1 to 15.

"Samples CUF 1 and 2.

'Test pits 1 to 5.

*Test pits 6 to 10.

⁹Test pits 0 to 10. ⁹Test pits 11 to 23. ¹⁰Vertical 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. ¹¹Includes duplicates.



C:\cadwork\6f0lf5.dgn

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.

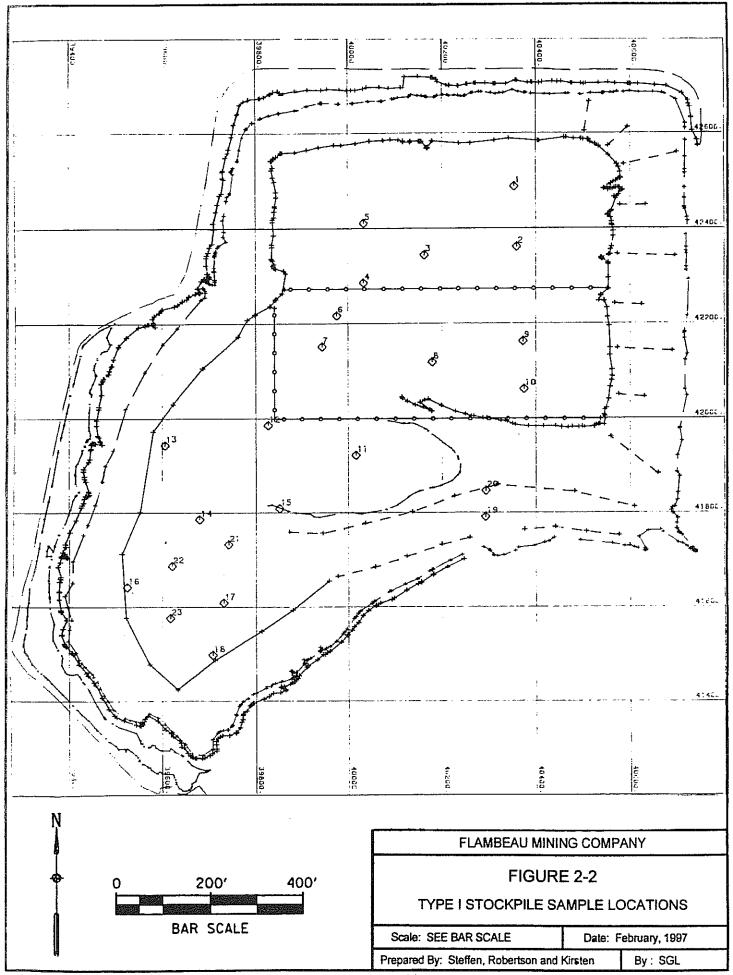
Fifteen test pits (1 to 15) were placed in the upper 3-ft lift of previously stockpiled Type II material that was backfilled in late October and early November, 1996. Excavated materials from the test pits were consolidated into groups of three to form five composite samples. Figure 2-3 shows the location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

2.2 Sampling Methodology

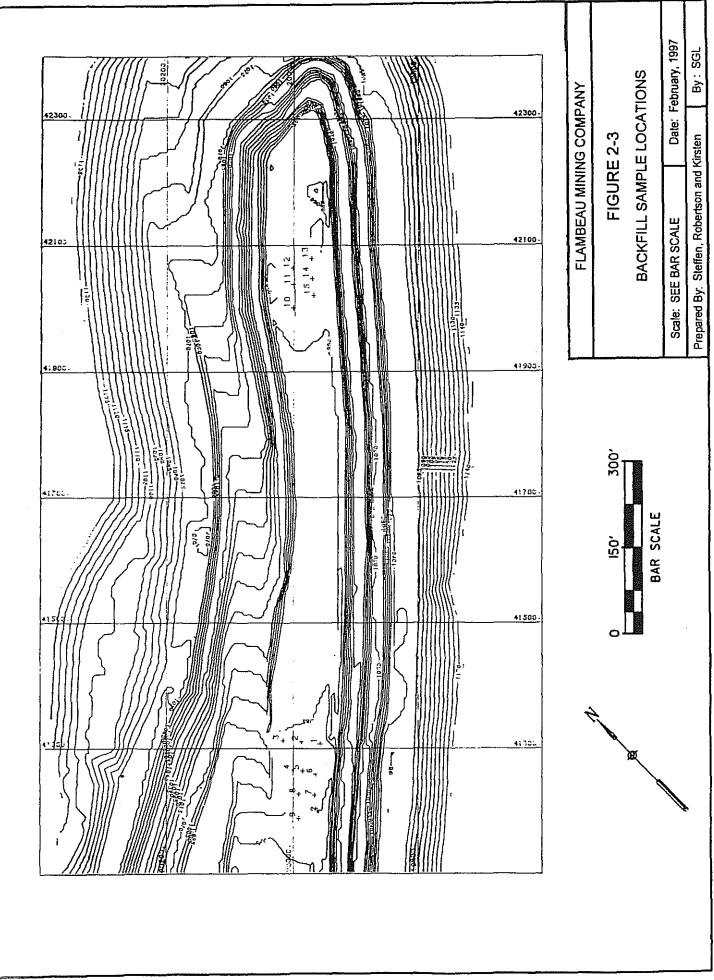
2.2.1 Sample Collection

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



C:\cadwork\6f0lf5.dgn



<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.</p>

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

	Number of Samples'					
	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	_		- <u></u>	2	б	14

Summary of Laboratory Investigation Program

¹Includes duplicates.

²Testing 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 $<\frac{1}{4}$ -in size fraction, and that testing to determine alkali demand using the $<\frac{1}{4}$ -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 $\frac{1}{4}$ -in to provide $<\frac{1}{4}$ -in, and $\frac{1}{4}$ 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 $<\frac{1}{4}$ -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 CaCO₃ eq/g = Alkali demand as mg CaO/g x (100/56) (note: molecular weight of CaO = 56 g/mole and of CaCO₃ = 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 <1/4-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 0.45μ m 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.

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

Matherd 大学

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 <¹/₄-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.

MLD2\96F022\CBAPP\43134.61\10000 1997 Backfilling Plan for Stockpiled Type II Material March 1997

3.4 Type I Materials

3.4.1 Leach Extraction Tests

Leach extraction tests were completed on the $<\frac{1}{4}$ -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 CO₂ 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 μ S/cm. While there is not a clear linear correlation between paste

Table 4-1

	Fie	eld pH	Field Co	onductivity
Test Pit ID	pН	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

. .

Summary of Type II Field Paste Parameters

Table 4-1 (Continued)

·	Fie	ld pH	Field Co	onductivity
Test Pit ID	pН	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	
	pН	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).

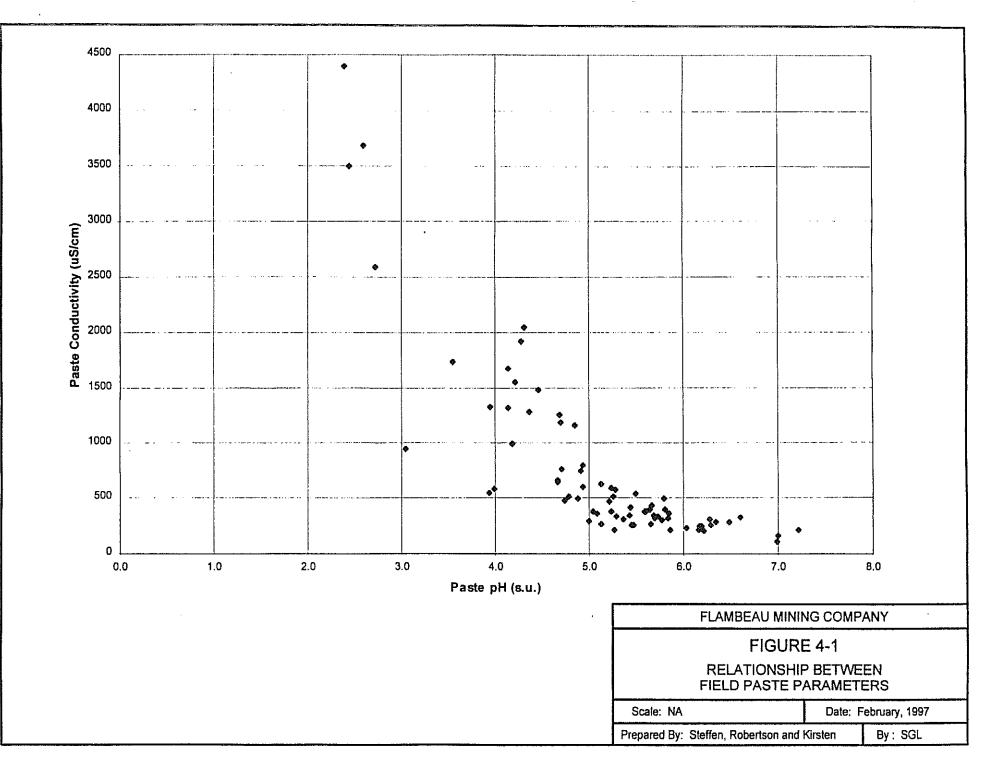
The standard deviations of the paste pH and paste conductivity values from each test pit are illustrated in Figures 4-2 and 4-3, respectively. It is clear from these plots that there is some variability associated with the material taken from each test pit. The variability in the pH readings appears to decrease for the more acidic samples (e.g., $pH \le 4.5$). 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.

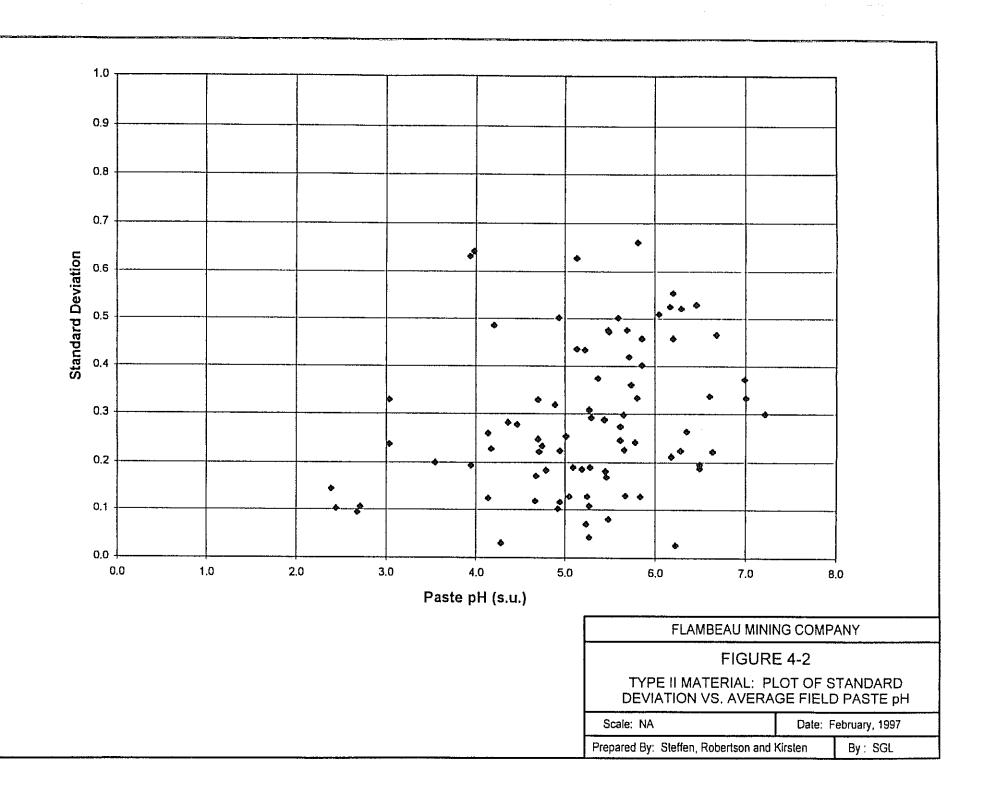
Samples were randomly selected from six test pits to determine the distribution of acidity with particle size. Leach extractions were completed at a 1:1 solids-to-liquid ratio on the $<\frac{1}{4}$ -in and $\frac{1}{4}$ to 3-in size fractions from each sample. A compilation of the test results and laboratory 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



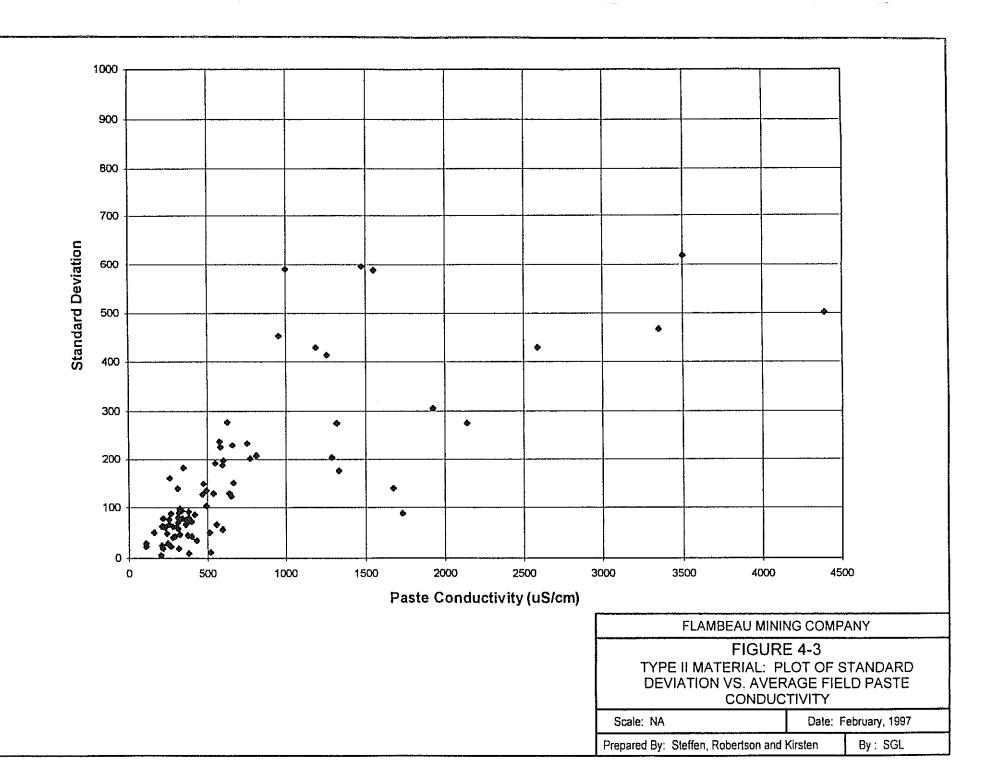
W6R1225ccleb&Vfg4_1.sr1

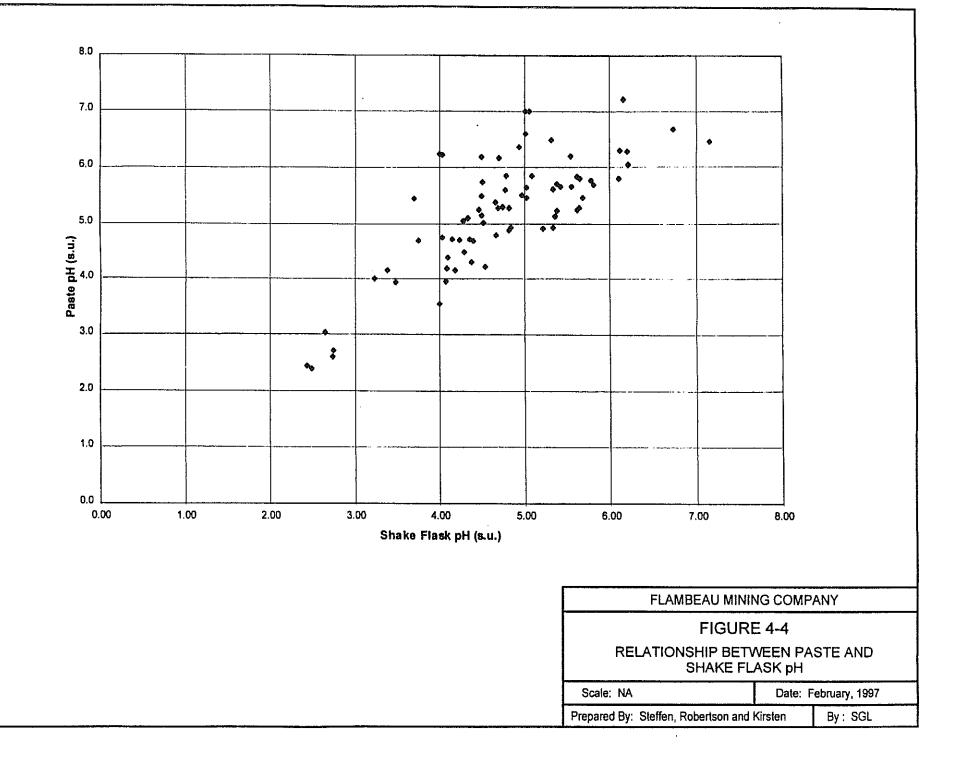
25

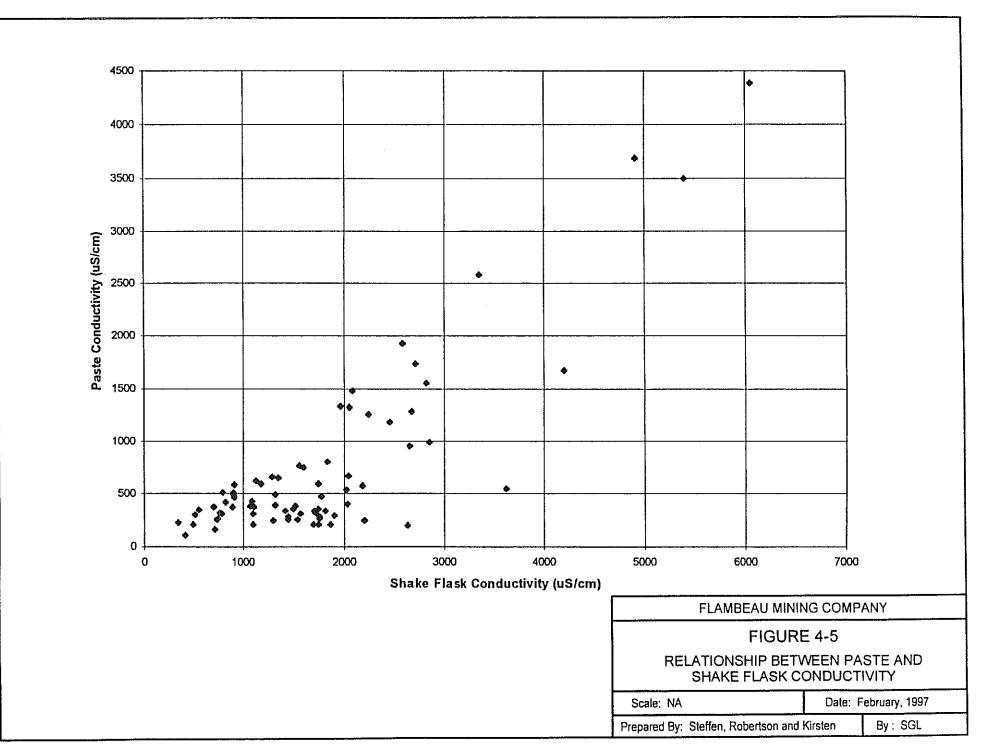
y hacopes VBGFD22 \ndie bits \ng 4_2. srf











pa si96/0224/stabikVig4_5

E C

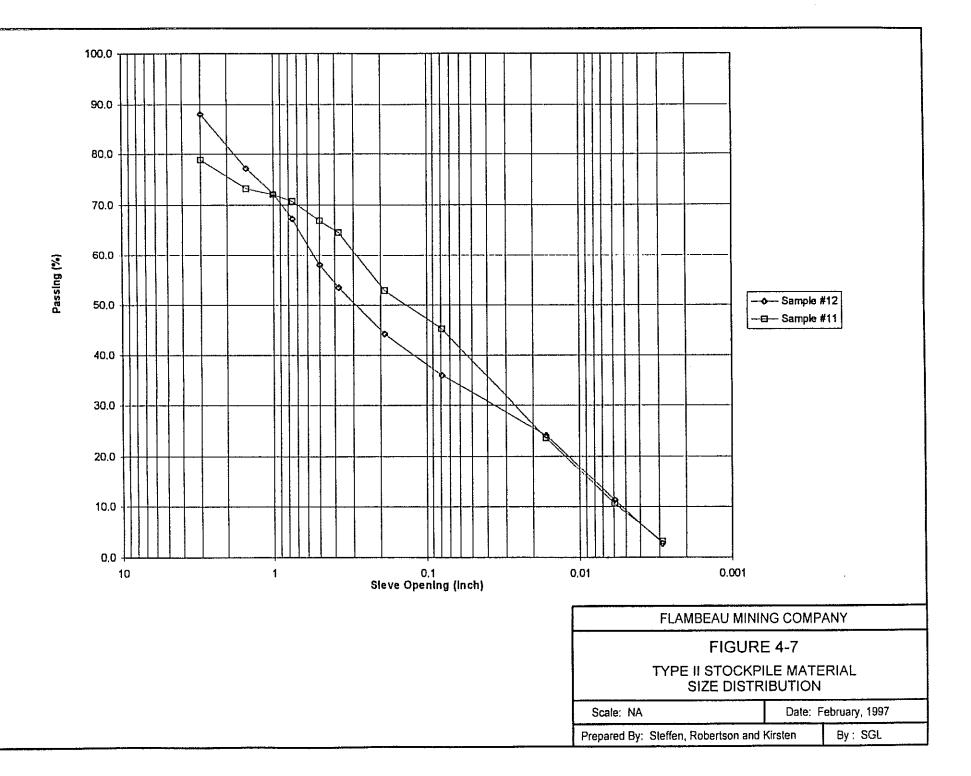
29

5000 ٠ 4500 4 4000 • 3500 ٠ Conductivity (uS/cm) 3000 ٠ 2500 2000 1500 ¢ ٠ đ ٠ 1000 ٠ ø Φ Ŷ • ¢ 500 , 6 ٠ 0 4.00 5.00 6.00 7.00 0.00 1.00 2.00 3.00 8.00 pH (s.u.) 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

9540222838b841g4_5.srf

Ю

3 15C0 pa 105/022120a bit Vg 4_7 . srf



Sam	ple	Sample #12	- Type II S	tockpile	Sample #11	- Type Il S	tockpile
<u></u>				Cumm.			Cumm.
	Opening	Wt. Retained	Retained	Passing	Wt. Retained	Retained	Passing
Sieve Size	(inch)	(g)	(%)	(%)	(g)	(%)	(%)
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		

Type II Stockpile Material Size Distributions

Gross Gradation Estimates

		Estim	ated Distributi	on (%)
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

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"						
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													
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	L												
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	⁰∕₀	65,2	22.9	82,3	11.6	95.2	3.1	81.8	12.0	75.7	16.0	59.1	26.8

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 %.

²Constituent 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 $\frac{1}{4}$ to 3-in size fraction. The assumption is conservative, since the results in Table 4-3 clearly indicate that the $\frac{1}{4}$ to 3-in fraction has less acidity associated with it than the $\frac{1}{4}$ -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 $\frac{1}{4}$ -in fraction.

To quantify the conservatism that results from using the $<\frac{1}{4}$ -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 $<\frac{1}{4}$ -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 $<\frac{1}{4}$ -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-

Overestimation (as a Ratio) of Soluble Constituents Based on Testing the < 1/4-in Size Fraction¹

			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

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

	Initia	l Conditions	Calci	ulated
		Average	Alkali	Demand
Sample	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
	-			

Summary of Alkali Demand Test Results¹

Table 4-5 (Continued)

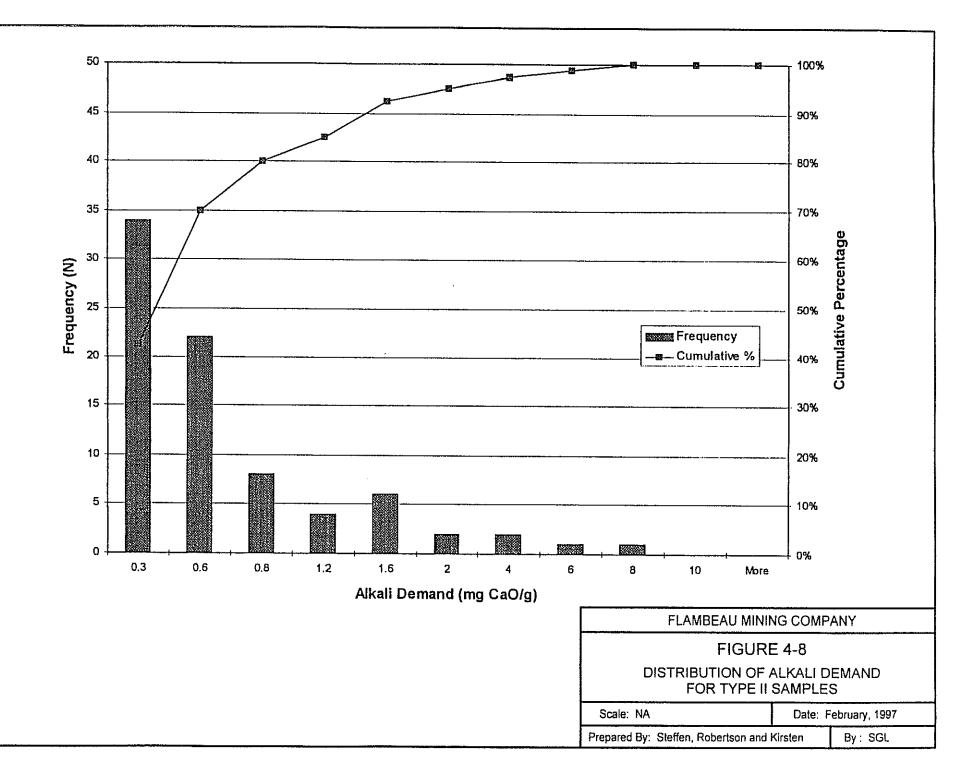
""ţ	Initia	I Conditions	Calci	ulated
		Average	Alkali	Demand
Sample	pH (su)	Cond. (uS/cm)	(mg CaO/g)	(mgCaCO3/g)
179	4.54	2827	0.69	1.2
181	3.38	4200	1.73	3.1
191	6.12	725	0.05	0.1
146	4.28	1107	0.20	0.4
157	4.04	1773	0.62	1.1
175	4.24	2243	0.49	0.9
180	4.16	2457	1.38	2.5
182	4.29	2087	0.26	0.5
183	4.10	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)

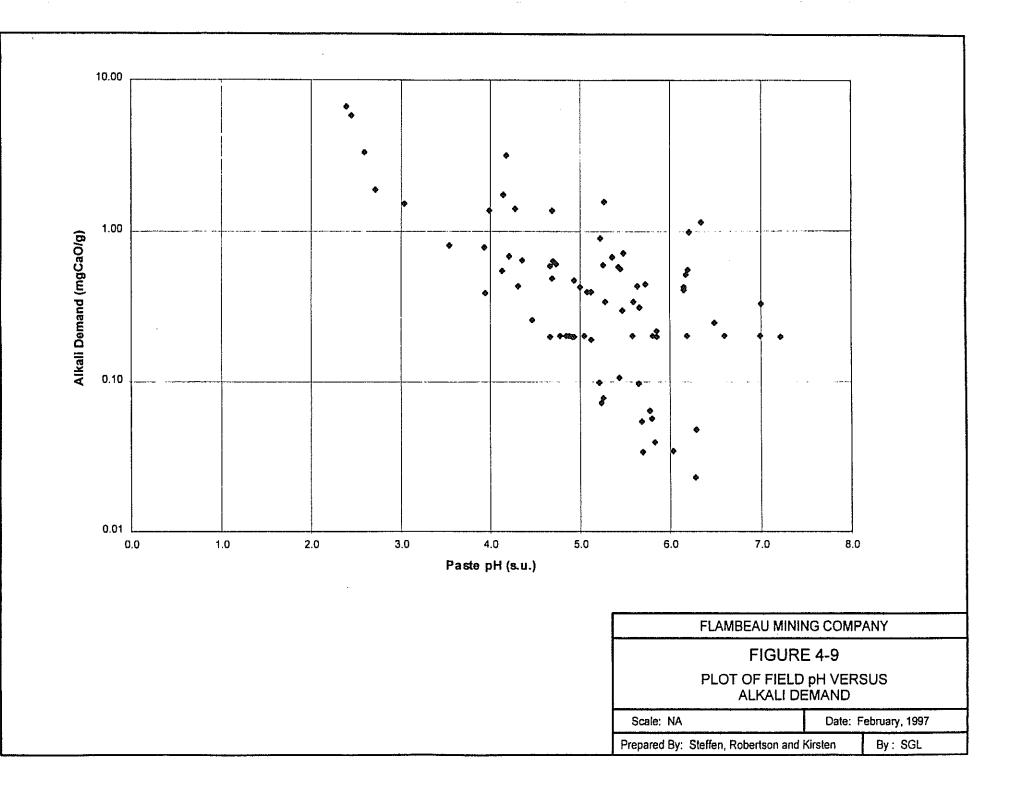
	Initia	l Conditions	Calc	ulated			
	Ā	Average	Alkali Demand				
Sample	pH (su)	Cond. (uS/cm)	(mg CaO/g)	(mgCaCO3/g)			
8	2.65	2650	1.52	2.7			
15-3	1.80	4550	4.41	7.9			
15-1	2.48	6053	6.71	12.0			
15-1	1.73	5587	7.10	12.7			
147	5.07	1803	0.43	0.8			
148	5.54	1296	0.20	0.4			
152	6.11	1318	0.20	0.4			
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			

¹Includes duplicates.





250000221224256254004_9.s



40

		Cond.	Alkali Demand	Alkali Demand	Limestone ¹
Sample Number	pH (su)	(uS/cm)	(mg CaO/g)	(mg CaCO3/g)	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

Sample Selection for Column Testing Samples for Alkali Type Testing

¹Moisture 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.

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

Column						Cond.	Lab pH	Alkalinity	Lab. Acidity	SO4	Cu	Mn	Alkali Addition	Calc. Acidity ¹	Acidity Release ²	Alkalinity Yield ³	Net Acidity Release
Number	Sample	Amended	Cycle	pH (s.u.)	Eh (mV)	(uS/cm)	(su)	(mgCaCO ₃ eq/l)	(mgCaCO ₃ eq/l)	(mg/l)	(mg/l)	(mg/l)	(mgCaCO ₁ cq/g)	(mgCaCO ₁ cq/l)	(mgCaCO3eq./g)	(mgCaCO3 eq./g)	(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.B		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	46D	П	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
ł	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

Cale Acidity = equivalent acidity calculated from the dissolved copper, aluminum and iron concentrations in the coresponding leachate.

¹Acidity Release = cumulative acidity release over all cycles of testing.

Alkalinity Yield + cumulative alkalinity release over all cycles of testing.

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 CaCO₃ equivalent) was summed with the cumulative release of acidity (as CaCO₃ 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

<u></u>				Net Acidity Released from	Acidity	, , , , , , , , , , , , , , , , , , ,
Column		Alkali Addtn.	Initial Acidity ¹	Column ²	Neutralized ³	Estimated
Number	Sample	(mgCaCO ₃ /g)	(mgCaCO ₃ /g)	(mgCaCO ₃ eq./g)	(mgCaCO ₃ eq./g)	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%

Assessment of Limestone Availability

¹From alkali demand test.

²Net Acidity Released = Cumulative acidity released over all cycles of testing.

³Acidity Neutralized = Initial acidity less acidity released.

⁴Availability = (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

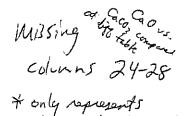
Figures 4-9 and 4-10 illustrate the relationship of paste pH and paste conductivity to the alkali demand. The figures shows there is variability in the alkali demand for any paste pH or conductivity value, especially for a paste pH below 3 s.u. However, it is clear from the figures that samples within 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 μ S/cm. The material with an alkali demand between 0.8 and 1.6 mg CaO/g, is characterized by a paste conductivity <2200 μ S/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 μ S/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 μ S/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 μ S/cm, or paste pH <5 s.u. and paste conductivity <2200 μ S/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.



				/					TONGA	apreges	nt)	
Column Number	3	4	5	6	7	8	9	10		inf ru	the amende	a <u></u>
Sample	170	13-1	188	183	213	187	194	192	δ-1	יזאר פו נאט	114 114	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
T1 (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

Summary of Column Test Results

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

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

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

10.00 đ ¢ ¢ * æ ÷ ۰ 1.00 4 • Alkall Demand (mgCaO/g) ٠ 4 0.10 0.01 500 1000 1500 2000 3500 4000 0 2500 3000 4500 Paste Conductivity (uS/cm) 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

48

9670ZZWMabikUrg4_10.srf

				Class	
Method	Parameter	units	A	В	С
	Alkali Demand	mg CaO/g	<0.8	0.8 to 1.6	>1.6
Sorted by	Population Distr.	%	80.0	12.5	7.5
Alkali Demand	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 pH	s.u.	> 5	< 5	< 5
Paste Parameters	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
	Ν		47	25	
	No. Exceedances		4	2	0 ¹
	Percent Samples	%	8.5	8.0	0.0

Summary of Type II Material Classification by Field Test Results

¹Number of samples below 1.6 mg CaO/g.

)

				Class	
Method	Parameter	units	A	В	С
	Alkali Demand	mg CaO/g	<0.8	0.8 to 1.6	>1.6
	· ·				
Sorted by	Population Distr.	%	80.0	12.5	7.5
Alkali Demand	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	pН	s.u.	> 4	< 4	< 4
Flask Parameters	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
	Ν		57	10	8
	No. Exceedances		4	1	3 ¹
	Percent Samples	%	7	10	38

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

¹Number 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 CaCO₃ 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 CaCO₃/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 CaCO₃/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

Parameter	<u></u>		Res	sults	
Comment	Units	Recently	Produced	Field Ag	ed 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					
pН	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
Cď	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
Си	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

Clarifier Underflow Shake Flask Extraction Test Results

Table	4-13
-------	------

Summary of Acid Consumption Test Results

		Final pH	Final pH	H ₂ SO ₄	H ₂ SO ₄	Acid Neutralized
Sample	Weight (g)	Field(s.u.)	Lab.(s.u.)	(mL)	Normality	(mgCaCO ₃ eq./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

March 1997	MLD2\96F022\CBAPP\43134.61\10000
	MLD2\96F022\CBAPP\43134.61\10000 1997 Backfilling Plan for Stockpiled Type II Material

Summary of CUF Column Test Results

Column Number	<u></u>	1	7		18				
Sample		CU	F-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 (mgCaCO ₃ eq/L)	24	21	25	20	< 1.5	10	10	90	
Acidity (mgCaCO3 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 (mgCaCO ₃ /g)	0.00	-0.01	-0.01	-0.02	0.00	0.00	0.00	-0.03	

Table	4-1	5
-------	-----	---

(

Τe	est 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	

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

Table 4-16

Summary of Backfill Field Paste Parameters

Sa	mple	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

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						
pН	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	-	-	-	-	<u>'</u>
К	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

Summary of Backfill Sample Leach Extraction Test Results

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

MLD2\96F022\CBAPP\43134.61\10000 1997 Backfilling Plan for Stockpiled Type II Material March 1997

Foth & Van Dyke • 58

Table 4-18

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

							Alkalinity	Acidity								
Column				Eh	Cond.	Lab pH	(mgCaCO ₃	(mgCaCO ₃	SO_4	Al	Cd	Co	Cu	Fe (T)	Mn	Zn
Number	Sample	Cycle	pH (s.u.)	(mV)	(mS/cm)	(su)	eq/L)	eq/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(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

an an dina an ann an deirin an ann an deirin an	Field	pH (s.u.)	Conductiv	ity (uS/cm)	
Test Pit ID	Average	Std. Dev.	Average	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	

Type I Stockpile Test Pit Summary Table

		Lab pH	Alkalinity	Acidity	SO4	Al	Cd	Ca	 Cr	Со	Cu	Mn	TI	 Zn
Sample ID	Sample Description	5.u.	mgCaCO3eq/L	mgCaCO3eq/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
FMC-2 T1	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-5T1	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-10T1	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-7T1	Saprolite	7.3	<1.5	-	51	0.1	< 0.0012	12	0.0031	<0.0043	<0.0054	0.36	< 0.012	0.54
FMC-8T1	Saprolite	7.3	<1.5	-	95	0.66	< 0.0012	22	<0.0026	<0.0043	0.024	0.85	< 0.012	1.8
FMC-9T1	Saprolite	7.7	2	-	5.8	0.095	<0.0012	<3,	<0.0026	<0.0043	0.027	0.07	<0.025	<0.12
FMC-11T1	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 T1	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 T1	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 T1	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 T1	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 T1	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-17T1	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 T1	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 T1	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-20T1	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 T1	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 T1	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-23T1	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

Type I Stockpile Material Leach Extraction Test Results

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.

		Av	erage 1 hr	Alkali
Material	Sample	pH (su)	Cond. (uS/cm)	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

Summary Of Type I Alkali Demand Test Results

	Material	Paste pH	Sulfur (T)	Sulfide	CO3	Sulfate	NP	MPA	
Sample ID	Description	s.u.	%	%	%	%	kgCaCO ₃ eq./t	kgCaCO3eq./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

Summary of Type I Acid Base Account Test Results

Table 4-22 (Continued)

Sample ID	Material Description	Paste pH s.u.	Sulfur (T) %	Sulfide %	CO3 %	Sulfate %	NP kgCaCO ₃ eq./t	MPA kgCaCO ₃ eq./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 (Chec	k) 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 $<\frac{1}{4}$ -in and $\frac{1}{4}$ 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 μ S/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 μ S/cm, or a paste pH <5 s.u. and a paste conductivity of <2200 μ S/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 μ S/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 μ S/cm, or a paste pH <4 s.u. and a paste conductivity of <2200 μ S/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

Constituent	Predicte	Predicted Concentration (mg/L)			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 ₂ CO 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 •2H ₂ O

Summary of Effect of Carbon Dioxide on Predicted Pore Water Quality

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

Sample		BF-4			BF-5	
Cycle	1	2	3	1	2	3
pН	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

Summary of Constituent Concentrations for Pore Water Displaced from Backfill Samples¹

'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

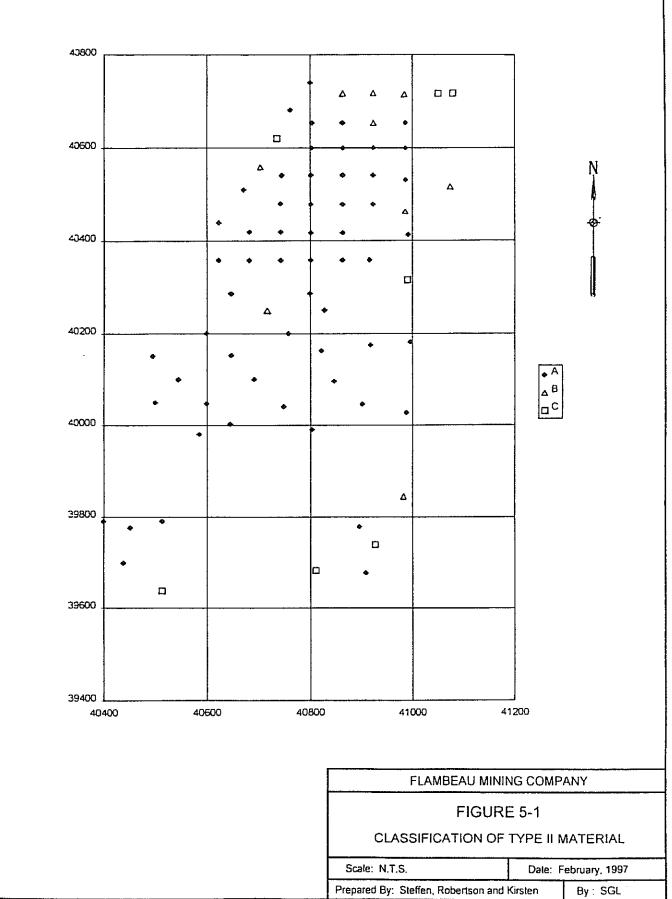
5.2.1 Material Variability

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.

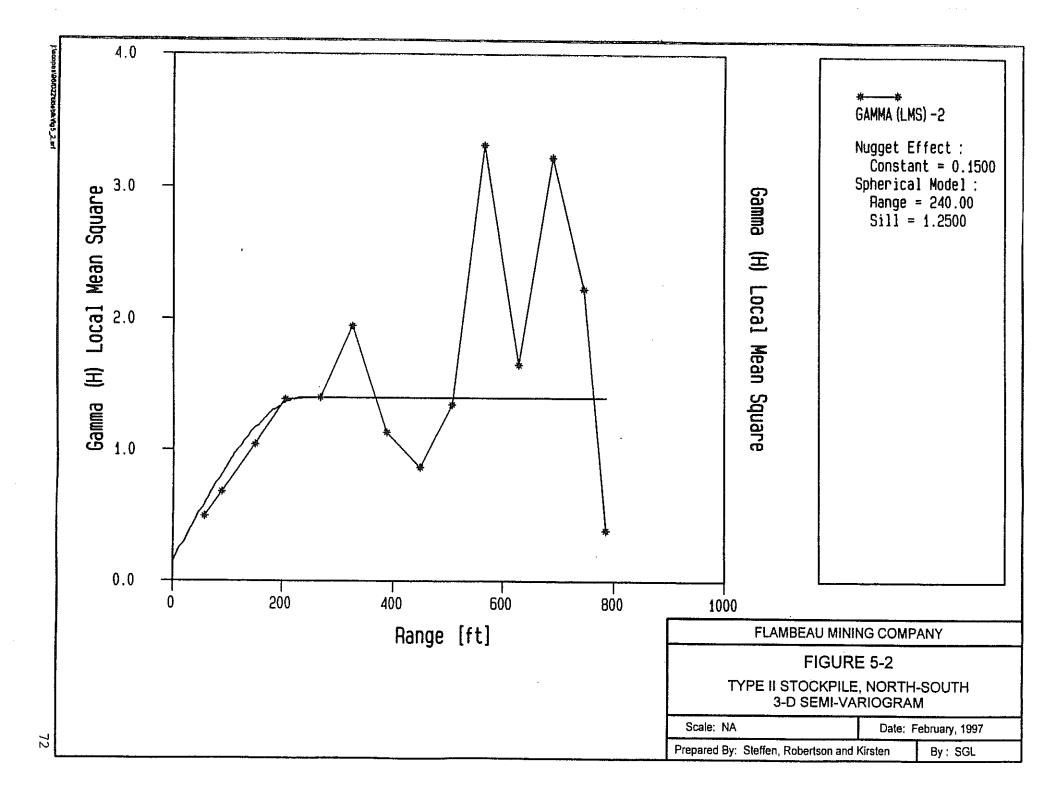
Semi-variograms were calculated for the alkali demand of the samples taken from the upper 15-ft lift of the stockpile. The samples from the lower lifts were excluded from the assessment. The resulting semi-variograms are illustrated in Figures 5-2 and 5-3, and show a dependence range of about 240 ft 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.

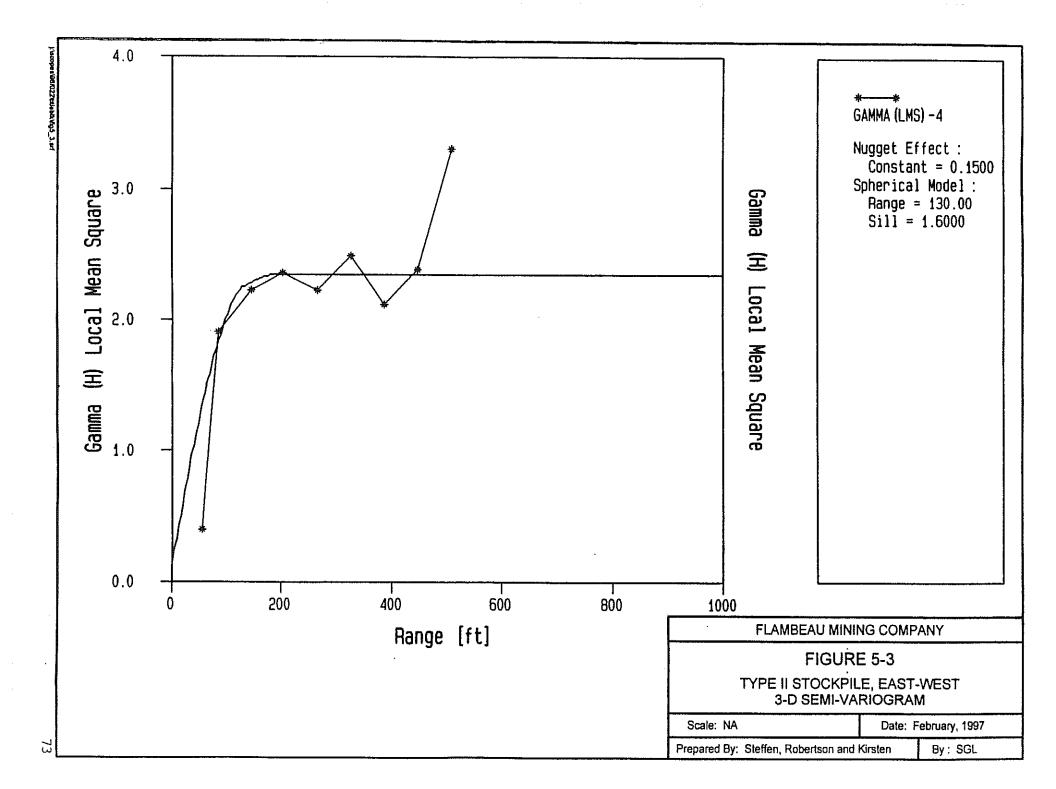
5.2.2 Sampling Error at Different Grids

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.



1 Wcopes@6/022W8eblsVig5_1 art





Blocks with dimensions of 120×120 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.

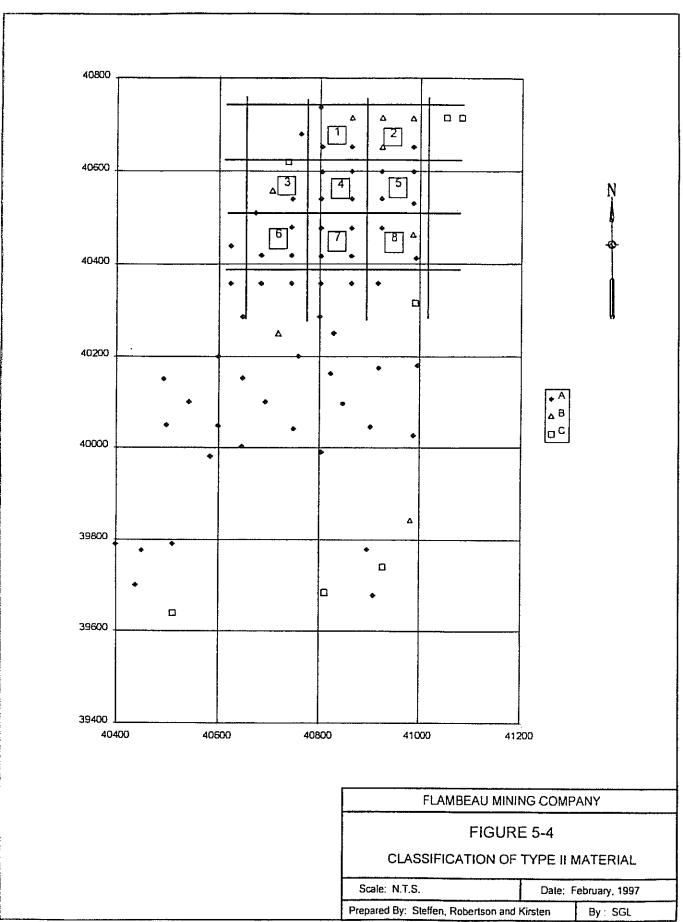
The superimposed blocks have been numbered from 1 to 8 for the area indicated. Blocks 1, 2, 3, 4, 5, 6 and 7 each contain the maximum of four samples. It should be noted, however, that block 3 contains three near surface samples taken along the sideslope of the stockpile. The remainder of the blocks 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

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

Summary of Block Classification

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



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.

MLD2\96F022\GBAPP\43134.61\10000_1997 Backfilling Plan for Stockpiled Type II Material March 1997

Table	5-3
-------	-----

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

Summary of Alkali Demand Observed for Sideslope Samples

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 $<\frac{1}{4}$ -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 $<\frac{1}{4}$ -in size fraction will be obtained from each quarter of each bulk sample. It is anticipated that in total approximately 4 lb of the $<\frac{1}{4}$ -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 $<\frac{1}{4}$ -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 μ S/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 $>2200 \ \mu$ S/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 Class	Alkali Demand (mg CaO/g)	Limestone Demand ¹ (lb CaCO ₃ / ton)	Fraction of Population (%)
А	<0.8	<3.43	80.0
В	0.8 to 1.6	3.43 to 6.85	12.5
С	>1.6	>6.85	7.5

Material Classification and Distribution

¹Does 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 CaCO₃/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:

limestone amendment (lb/ton) = X(100/56)(2.203*0.907)(1.48) + 1.0.

where 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 Pit¹

Material Class	Contained Acidity	Future Oxidation	Total
А	5.1	1.0	6.1
В	10.2	1.0	11.2

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 Pit¹

Material Class	Contained Acidity	Future Oxidation	Total	
I. For material abov	e the 1045 ft but below th	e 1055 ft elevation in the	pit.	
А	5.1	1.8	6.9	
В	10.2	1.8	12.0	
The limestone amend	ment for class C material	is determined as follows:		
Ame	endment (lb/ton) = $X(100)$	/56)(2.203*0.907)(1.48) +	1.8	
II. For material above	e the 1055 ft but below th	e 1065 ft elevation in the p	pit.	
Α	5.1	3.7	8.8	
В	10.2	3.7	13.9	
The limestone amendr	ment for class C material	s determined as follows:		
Ame	endment (lb/ton) = $X(100/$	/56)(2.203*0.907)(1.48) +	3.7	
III. For material above	e the 1065 ft elevation in t	he pit.		
А	5.1	5.4	10.5	
В	10.2	5.4	15.6	
The limestone amendr	nent for class C material i	s determined as follows:		
Ame	endment (lb/ton) = $X(100/$	56)(2.203*0.907)(1.48) +	5.4	

¹Units are in lb/ton.

X = alkali demand test result in mg CaO/g.

15

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	па	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 <1/4-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 inplace 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

Allison, et al., 1991. *MINTEQA2 Version 3.11*. U.S. Environmental Protection Agency, Center for Exposure Assessment Modeling, Athens, GA.

Foth & Van Dyke, October 1996. Fall 1996 Backfilling Plan for Stockpile Type II Material.

- Mend (1991), Project No. 1.16.1b, *Acid Rock Drainage Prediction Manual*, Coastech Research Inc., CANMET.
- Ritchie, A.I.M., 1994. Sulphide Oxidation Mechanisms: Controls and Rates of Oxygen Transport. Published in Short Course Handbook on Environmental Geochemistry of Sulphide Mine Wastes, Mineralogical Association of Canada, Editors J.L. Jambor and D.W. Blowes.

Appendix A

October 30, 1996 Field and Laboratory Work Plan

MLD2\96F022\GBAPP\43134 .61

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

October 30, 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

Kennecott Minerals

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.

1

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

ي ۽ و

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.

3

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 <u>re</u>confirm 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.

. **,** ł

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.

]			Number	of Samples			
Material type	Туре II				CUF Solids	Type I Stockpile		
	Ahead of Relocation	Relocation Face	Remainder	Fall 1996 Backfill		Sandstone	Saprolite	Type I Rock
Test Pits	38	па	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	50	12	6	15		د	د	10
Field Parameters								
Paste pH	152	60	120	60	2	20	20	40
Paste cond.	152	60	120	60	2	20	20	40

TABLE 2.1 Summary of Field Investigation Program

na - not applicable

, , ,,

15

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

.,

and a start

200

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.

				Number	of Samples			_	
Material Type	Туре П				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	

TABLE 3.1 Summary of Laboratory Investigation Program

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,

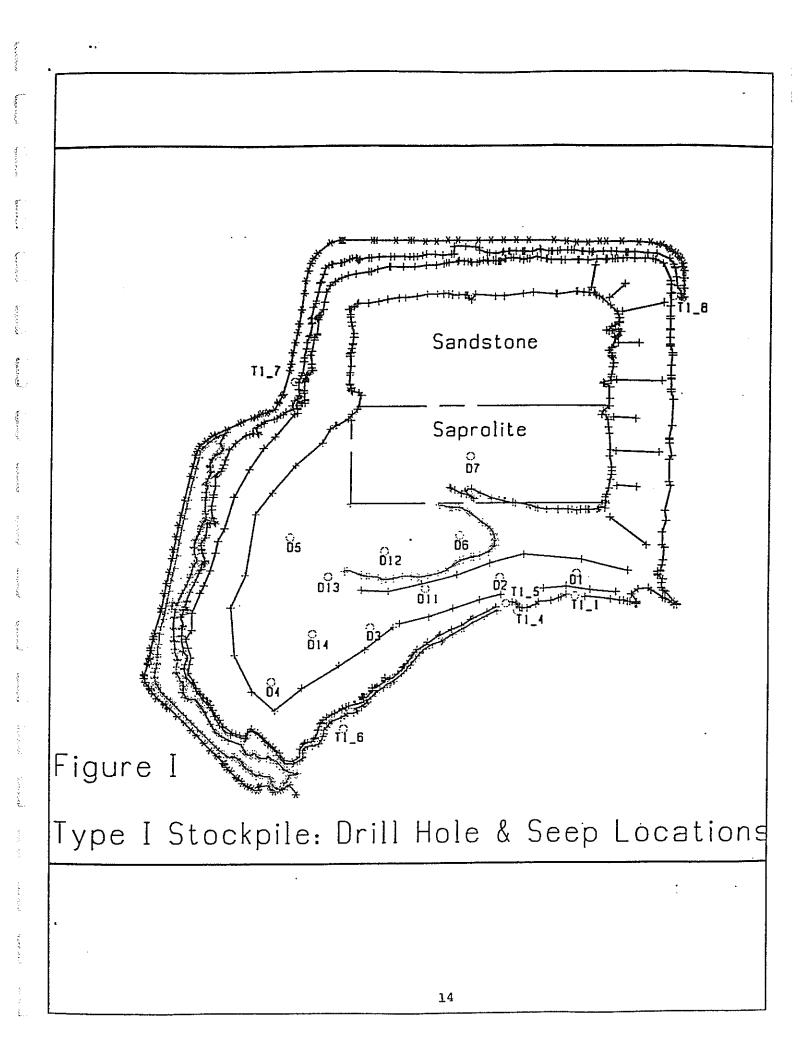
Tom Myattigm

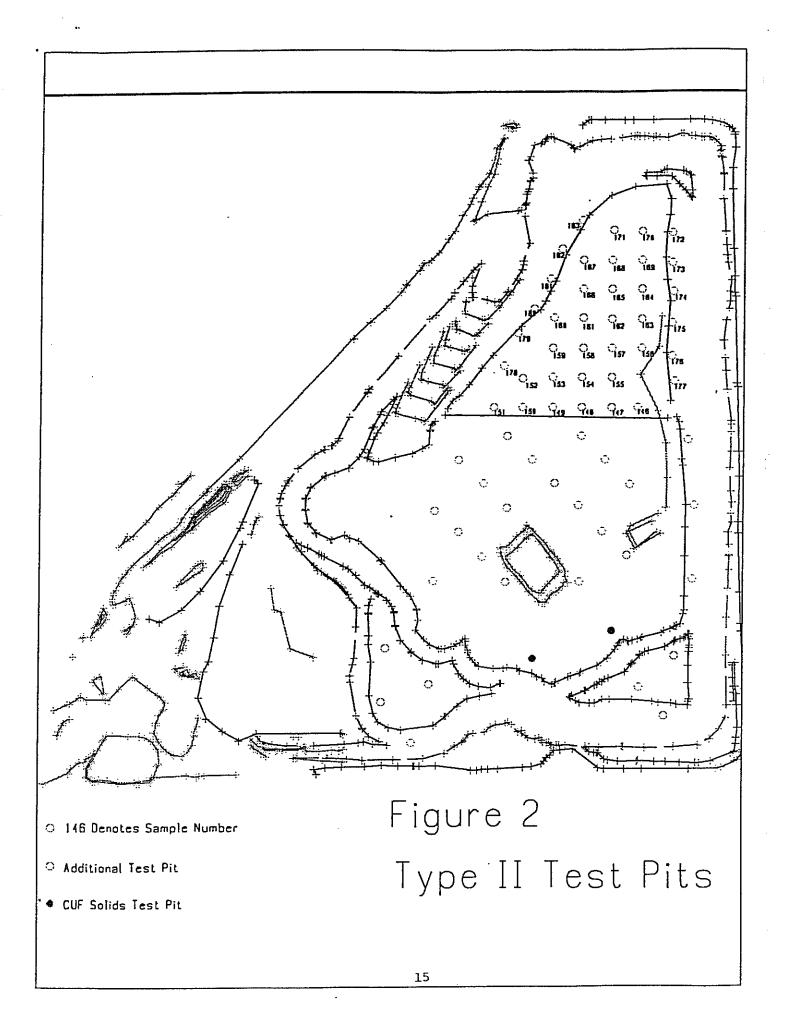
Tom Myatt Flambeau Mining Company

. .

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

·





Γ								Figu	ire 3			<u> </u>		<u>.</u>	<u> </u>			 	·····	<u></u>		
					Bac	rı kfillinş	g Fie	eau Mi Id and	ning Co Laborat	mpany ory Worl	k Plan											
	ID	Task	Start	Finish	r 20	2	7		vembe 10 1		1	Dec 8	ember 15	22	29	5	Janu 12	26	2	Febr	uary 16	23
ľ		Sample Collection & Field Testing	10/28/96	11/1/96							-	L L							1, <u>-</u>	L		1.22
	2	Size Distribution Extractions	11/1/96	11/22/96									(
	3	Alkall 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	Alkall Confirmation Anoxic Column Test	11/22/96	1/31/97										PD.0]			
	8	Alkall Amendment Anoxic Column Test	11/22/96	1/31/97															1			
	9	CUF Anoxic Column Tests	11/22/96	1/31/97															P			
	10	Backlill Anoxic Column Tests	11/22/96	1/31/97												師師開		H (II) A				
	11	Acid Consumption Tests	12/6/96	12/27/96																		
16	12	Report	1/17/97	2/28/97	'																	
ወ						<u> </u>													•			
		· []						Summa				say talahan		Bolle	 nt 1 In	Progree						
		roject: Flambeau Mining	rogress						Jp Task					1,040	-4 oh							
	U	ale: 10/20/90	lilestone	•					•	stone 🤇			لبنتيه									
	s	соре ID: 96F013						 	Page 1			<u></u>					•	 				

.

· · · ·

۰.

ATTACHMENT A FIELD METHODS

A.1 FIELD SAMPLING AND TESTING

TEST PIT LOGGING

· • • • •

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

1.1 . 2

- 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

1.1.1

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

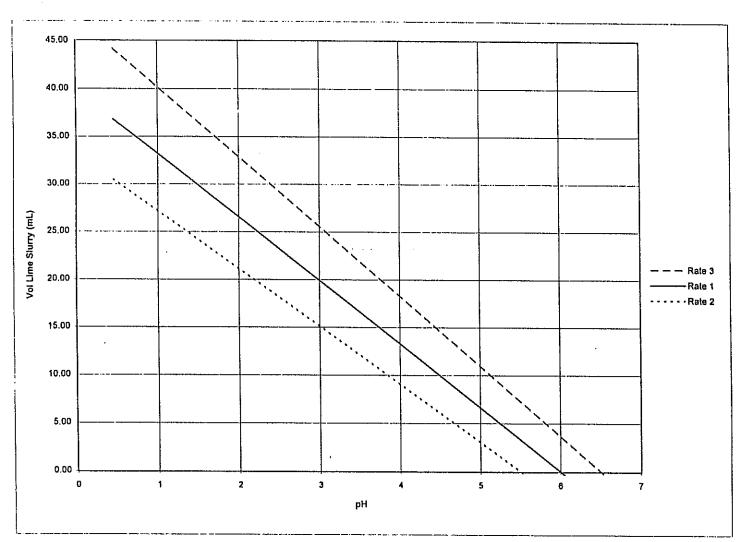


FIGURE B-1. LIME SLURRY ADDITION RATE

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 ls 15 % below the average alkali demand, and only 2/29 samples fall below this line

B.2 ANOXIC SATURATED COLUMN TEST

EQUIPMENT

u+ i Éta*

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.

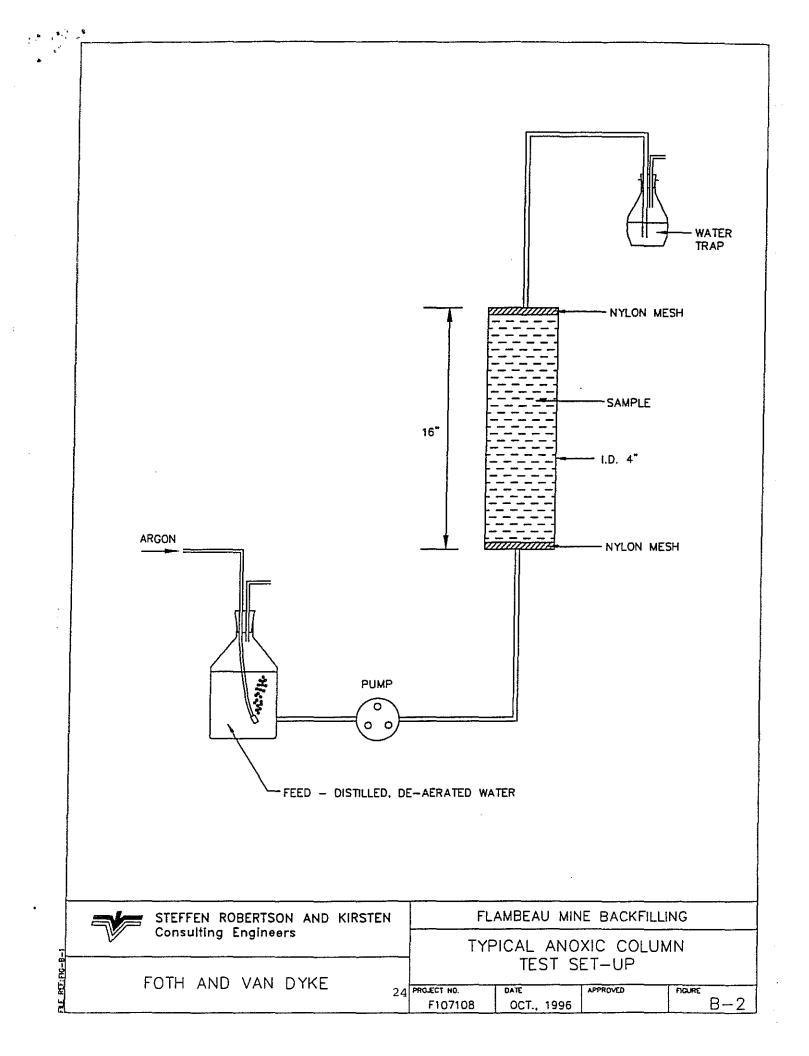
Ś.

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.



B.3 LEACH EXTRACTION TEST

EQUIPMENT

Net of

- 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 <u>extraction</u> test procedure is exactly the same as described <u>above</u>, 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: SO₄²⁻; 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 CaCO3 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

MLD2\96F022\GBAPP\43134 .61

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

November 20, 1996

Kennecott Minerals

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 15-3, the samples was collected, also using a shovel, at a depth of 3 feet.

\$

Mr. Larry Lynch Wisconsin Department of Natural Resources November 20, 1996 Page 2

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.

ş

Mr. Larry Lynch Wisconsin Department of Natural Resources November 20, 1996 Page 3

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:

re: 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 ¹/₄-inch to 3-inch size fraction. The protocol should be added to Attachment B of the Work Plan as item B5.

Mr. Larry Lynch Wisconsin Department of Natural Resources November 20, 1996 Page 4

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

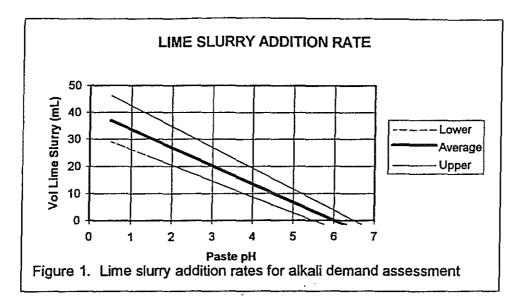
For your information, I have enclosed revised Tables 2.1 and 3.1 from the Work Plan that reflect the modifications discussed in this letter. If you have any questions regarding these tables or our comments, please contact me at (715) 532-6690.

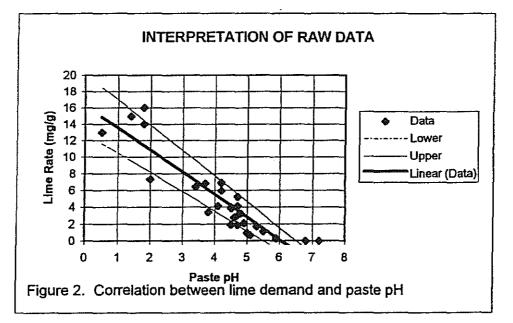
Sincerely,

Tom Mydt

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 Tom Riegel, Town of Grant Jerry Sevick, Foth & Van Dyke Melvin Spencer, Rusk Co. Zoning





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: SO₄²⁻; Cl⁻ Cations: Al, Cd, Ca, Cr, Cu, Co, Fe2+, Fe(T), K, Mn, Mg, Na, Tl, Zn.

	Number of Samples										
Material type	Ту	ре П		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				

TABLE 2.1¹ **Summary of Field Investigation Program**

ļ

na - not applicable

2

£Ω 1111

A PARTICIPALITY

3

3 · · · · ·

1000 Contraction

and sources

ĉ

¹Revised November 18, 1996 ²Six Type II samples were taken from surface locations in lieu of six test pit locations.

· · · · · · · · · · · · · · · · · · ·			Numbe	r of Samples				
Material type		Туре II		CUF Solids	Тур	e I Stockpi	Stockpile	
Test	Ahead of Relocation	Remainder of Stockpile	Fall 1996 Backfill		Sandstone	Saprolite 5 - 5 - 5 - 5 - 5	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	

 TABLE 3.1¹

 Summary of Laboratory Investigation Program

¹Revised November 18, 1996

e

Appendix C

Table 1 - Type I and II Stockpile Sample Collection Summary

MLD2\96F022\GBAPP\43134 .61

Type I & II Stockpile Sample Collection Summary										
Test Pit ID	Date Collected	Loca northing	tion ¹ easting	Elevation (msl)	Bulk Sample Status	Sample Replicate	Field Paste pH	Conductivity (uS)	Temperature (deg. C)	
Type II Material		<u></u>			400		and an and a second			
3 ²	11/13/96	39647	40493	1153.6	Delivered to FVD	1	2.62	3750	20.7	
Ū						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	
	11/13/96	39612	40909	1152.8	Delivered to FVD	1	2.97	2050	21.1	
4	11/15/90	39012	40909	1102.0	Delivered to 1 vD	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	
0	11/13/90	40314	41070	1101.0	Delivered to 1 VD	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	
13-1		00000				2	2.34	3930	20.6	
						3	2.58	2810	20.6	
						4	2.46	3150	20.5	

Table 1Flambeau Mining CompanyType I & II Stockpile Sample Collection Summary

and the second

ger a concetta

second second

and the task

construction of the second second

product in the second

Acres 1. Conta

2000.00.00

politication physical states

and a state

щ

1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 -

لمقتله فالتحير والمقاج

Test Pit ID	Date Collected	Loca northing	ition ¹ 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	146 10/23/96 40357 40917 1216.9 Deliv	Delivered to FVD	1	5.23	328	20.8			
1.0						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
1-71	10.20.00					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
170				· · - · -		2	5.70	421	21.9
						3	6.03	351	21.9
						4	5.50	376	21.7

Table 1 (Continued)

Ν

Table 1 (Continued)

		Loca	tion ¹	Elevation	Bulk Sample	Sample	Field		Temperature	
Test Pit ID	Date Collected	northing	easting	(msi)	Status	Replicate	Paste pH	(uS)	(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	150B ⁴ 10/23/96 40358 40683 1217.4 Delivered to I	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	

and the second second

photo and the

, water and

din a taka ang ka

644 C. S. M.

maning

Sec. 14

Table	1	(Continued)
-------	---	-------------

Test Pit ID	Date Collected	Loca northing	tion 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
							5.27	197	22.6
						2 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

FJA\MLD2\96F013\FLAMBEAU\TYPE2PH.XLS\5000

en andere here

 $f \in \mathbb{R}^{n \times n} \setminus \{x^{n},y^{n}\} \in$

1000 1000

e en en estate

apprentice productions approximately

Test Pit ID	Date Collected	Loca northing	tion ¹ 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
						44	0.70	242	INIT

street and

A wards (Call

PROPERTY PROPERTY

sine en sang

C = 116 - 2 7/184

an Color Albag

an anna

··· ·

provement provide the second of the second o

Test Pit ID	Date Collected	Loca northing	tion 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
1007	TOPEEROO	10001				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
1050	10/22/30	40007	10001			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
TOOA	10/22/90	40007	40004	1210.0			5.77	231	18.2
						2 3	5.30	378	18.1
						4	5.55	415	17.8
(0054	10/22/96	40597	40804	1219.0	Delivered to FVD	1	5,56	281	17.6
166B ⁴	10/22/96	40597	40004	1210.0		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
167	10/22/90	40057	40000	1210.4		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
100	10/22/30	-0007	10000	+		2	7.24	190	6.9
						3	7.35	203	7.4
						4	7.48	192	6.8

.

Table 1 (Continued)

σ

ay tit da th	$(T_{n-n})^{n} \in (T_{n-n})^{n}$	Charles and the	in the Applicanese A	e.	$p_{i} = 0, \dots, m \in \mathcal{M}_{n_{i}}$	$\hat{\rho}(x) = e^{i x - i x}$	8 8.835.587,547,54 1.	and the second s	Zészere elete	y 22 year on Ay	and the second second	المهيد بمطغا	ja stra - tettaj	KARANTA STA	وهديده مخاص	d a thright and share	1

warnes

Table 1 (Continued)

	Test Pit ID	Date Collected	Loca northing	tion ¹ easting	Elevation (msl)	Bulk Sample Status	Sample Replicate	Field Paste pH	Conductivity (uS)	Temperature (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
1							4	6.02	343	7.3
	172	10/23/96	40713	40985	1216.7	Delivered to FVD	1	3.65	1686	21.5
	172	10/20/00	40710	10000	12,0		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
	175	10/20/00	40001	40001	1210.0		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
	1/4	10/20/50	40000	40000	14.17.0		2	6.98	355	21.5
							3	6.44	354	21.7
							4	6.15	485	21.7
							-7	0.10		

7

14

Table 1	(Continued)
---------	-------------

Test Pit ID	Date Collected	Loca northing	ition ¹ easting	Elevation (msl)	Buik Sample Status	Sample Replicate	Field Paste pH	Conductivity (uS)	Temperature (deg. C)
175	10/23/96	40529	40987	1215.0	Delivered to FVD		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
110	10.20.00		,,			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
	(0) = = = = =					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

FJA\MLD2\96F013\FLAMBEAU\TYPE2PH.XLS\5000

بالمنتوجية لتجيين

الالحجاج بي

a conservation

yn ar soar

9

and a straight of the straight

196751 446-1

The second of

	Test Pit ID	Date Collected	Loca northing	tion ¹ easting	Elevation (msl)	Bulk Sample Status	Sample Replicate	Field Paste pH	Conductivity (uS)	Temperature (deg. C)
_		10/22/06	40618	40737	1212.1	Delivered to FVD		4.28	1668	22.2
	181	10/23/96	40010	40757	1212.1		2	3.98	1640	21.9
							3	4.14	1857	21.9
							4	4.16	1520	22.0
	490	10/23/96	40738	40801	1212.4	Delivered to FVD	1	4.81	877	21.1
	182	10/23/90	40750	40001	1214.1		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
	103	10/23/90	40700	40001			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
	104	10/50/50	TOLOL	,			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		129	20.9
							4A -	6.36	125	20.0
	185	10/30/96	40289	40797	1216.0	Delivered to FVD	1	6.80	178	20.3
	100	10/04/00	70200				2	7.21	90	21.1
							3	6,65	211	19.4
							4	7.35	161	20.3

Construction and an analy and the state of the

"an an earliert

and the second

e e e e e e a cara e

person and

····•

Junanessa

Test Pit ID	Date Collected	Loca northing	tion ¹ easting	Elevation (msl)	Bulk Sample Status	Sample Replicate	Field Paste pH	Conductivity (uS)	Temperature (deg. C)
186	10/30/96	40316	40991	1219.1	Delivered to FVD		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

10

FJA\MLD2\96F013\FLAMBEAU\TYPE2PH.XLS\5000

Sec. Sec.

second data

ودميرو ورجو

Test Pit ID	Date Collected	Loca northing	ition 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
(02),	(0,00,00					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
100						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
104	10/00/00					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
190	10/00/00	10110					5.34	415	20.9
						2 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
100	10,00,00					2	6.18	202	20.8
						3	6.69	156	21.0
						4	5.73	293	20.6

ووديديور

 $e^{\left(e^{-e^{i \phi_{\alpha} \sigma_{\alpha} \sigma$

يافحه بمجمر

 $d(a,a,b) \in \{a,b\}_{0}$

484,750,7354

And a reason

1405-04 mg

and the second second

Alton works

MALL CLARENCE

when consider

Factor - + + 74

FJA\MLD2\96F013\FLAMBEAU\TYPE2PH.XLS\5000

Test Pit ID	Date Collected	Loca northing	ition ¹ easting	Elevation (msl)	Bulk Sample Status	Sample Replicate	Field Paste pH	Conductivity (uS)	Temperatur (deg. C)
197	10/30/96	40099	40692	1214.0	Delivered to FVD	1	5.04	530	19.6
101						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
100	10.00.00					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
199	10/00/00	40010		,		2	5,34	438	21.4
						3	5.22	544	21.6
						4	5.36	525	21.8
400.44	10/30/96	40049	40501	1211.1	Delivered to FVD	1	5.03	466	20.4
199A ⁴	10/30/90	40045	40301	1211.1	Delivered to 1 PD	2	5.03	556	21.4
						3	5.30	564	21.7
						4	5.39	628	21.8
2	40/00/00	40002	40647	1212.4	Delivered to FVD	1	5.22	599	19.0
200 ²	10/30/96	40002	40047	1212.7		2	4.75	423	21.0
						3	4.76	858	21.6
						4	5.01	505	21.7
004	10/30/96	39991	40805	1210.6	Delivered to FVD	1	4.50	1030	20.1
201	10/20/90	39991		, _ 10.0		2	4.53	771	21.5
						3	4.93	747	21.7
						4	4.86	533	21.9

12

FJA\MLD2\96F013\FLAMBEAU\TYPE2PH.XLS\5000

An Section Sec.

States and server

10-12-14-

Preserve and

. **4**53 Marsha

RADIOLOGIC

process.Ch.

والمتحج والمرود بالم

and section to the section of the se

A CONTRACT OF A DESCRIPTION

and we when a

pinner og

.

01-15-130

وسفتو متعاصري

8.12.12.1

		Loca	ation ¹	Elevation	Bulk Sample	Sample	Field	Conductivity	Temperature
Test Pit ID	Date Collected	northing	easting	(msl)	Status	Replicate	Paste pH	(uS)	(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

Test Pit ID	Date Collected	Loca northing	tion 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
210	1.1.1.00		, , , , , , , , , , , , , , , , , , , ,			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

14

Page 14

1

.

Table '	1	(Continued)
---------	---	-------------

الشائل والمعاقري

ويشتعهن والعو

2510.000

4100000000

61005347

602411-010-04

945.000

Stear wearing

distance inter

- المراجع المحجور

Test Pit ID	Date Collected	Loca northing	tion 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
615	114.00	00770	10000			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
215	1114/00	00110				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
501	1111100					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
302	11/11/00	40404	10000			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

Sector Content

a - er cardag

451.2.2.2.5.5%

production and the

a still with the

t was seen to be a find

Test Pit ID	Date Collected	Loca northing	ition 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
Ŭ						2	6,98	24	23.6
						3	7.17	22	23.8
						4	7.28	31	23.8

FJA\MLD2\96F013\FLAMBEAU\TYPE2PH.XLS\5000

•

16

personal second	i. Djenovice	dia anti-anti-anti-anti-a	el territor de la constance Constance de la constance de la Constance de la constance de la	gift of all the s	An instance of	Anthony of the s	Conversion ware	glana di contan L	أمريه والمعيومة ألم	407.0451-175	م و موجوع ما ما الما الما الما الم	9 ⁷ 9-7375 74	Non-tain tain T	ana su conse Ka	alanto: y = +3a	ale a contrac	and the second	an an ing the

		Loca	tion ¹	Elevation	Bulk Sample	Sample	Field	Conductivity	Temperature
Test Pit ID	Date Collected	northing	easting	(msl)	Status	Replicate	Paste pH	(uS)	(deg. C)
	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
-	1110.000					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

FJA\MLD2\96F013\FLAMBEAU\TYPE2PH.XLS\5000

	Test Pit ID	Date Collected	Loca northing	ition ¹ 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
	10	11.00.00					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
	1-4	1,,00,00					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
							4	7.00	93	22.7
	15	11/05/96	41809	39852	1194.6	Delivered to FVD	1	7.36 7.61	93 93	22.7
							2	7.61	113	22.9
							3 4	7.42	231	22.9
							4	7.10	231	22.5
	16	11/05/96	41642	39525	1200.5	Delivered to FVD	1	7.41	97	22.6
	.0			+ +	–		2	7.53	92	22.8
							3	7.79	101	23.0
							4	7.67	152	23.0

FJA\MLD2\96F013\FLAMBEAU\TYPE2PH.XLS\5000

•

-	Table 1	(Continued)	

press production production and

Test Pit	ID Date Collected	Loca northing	ition ¹ 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
15	11/00/00	41101	10200			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
20	11/03/30	41040	-+0420-+	1100.0		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
21	11/10/50	41100	00740	1107.11	20110/02/07/70	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
22	11/13/90	41007	00021	1200.0		2	6.77	108	20.8
						3	7.36	121	20.9
						4	7.22	150	20.9

 $\theta_{i}(x,x,z,y,z,z)$

ويجبد متتحده

and a second

from crising

والعند مدر ويحتر

personally successive provides providence providences and

a series and the series of the

is a second

presenting propagies

Test Pit ID	Date Collected	Loca northing	tion ¹ easting	Elevation (msl)	Bulk Sample Status	Sample Replicate	Field Paste pH	Conductivity (uS)	
				(1131)	Status	Replicate		(us)	(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
ckfilled Type I	<u>Material</u> ⁶								
1	11/13/96	19957	41308	983.4	Delivered to FVD	1	6.47	562	20.8
2 3		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

20

FJA\MLD2\96F013\FLAMBEAU\TYPE2PH.XLS\5000

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

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

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

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

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

⁵Two 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.

⁶Sample 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.

21

Prepared by: FJA Checked by: SDJ/JWS

Appendix D

Modifications to Laboratory Test Procedures

MLD2\96F022\GBAPP\43134 .61

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 (in	ncluding cover): 2		

Russ,

Same was

1 10051310.10

a by season

Same and

é

Ę,

10.00

5 () 1

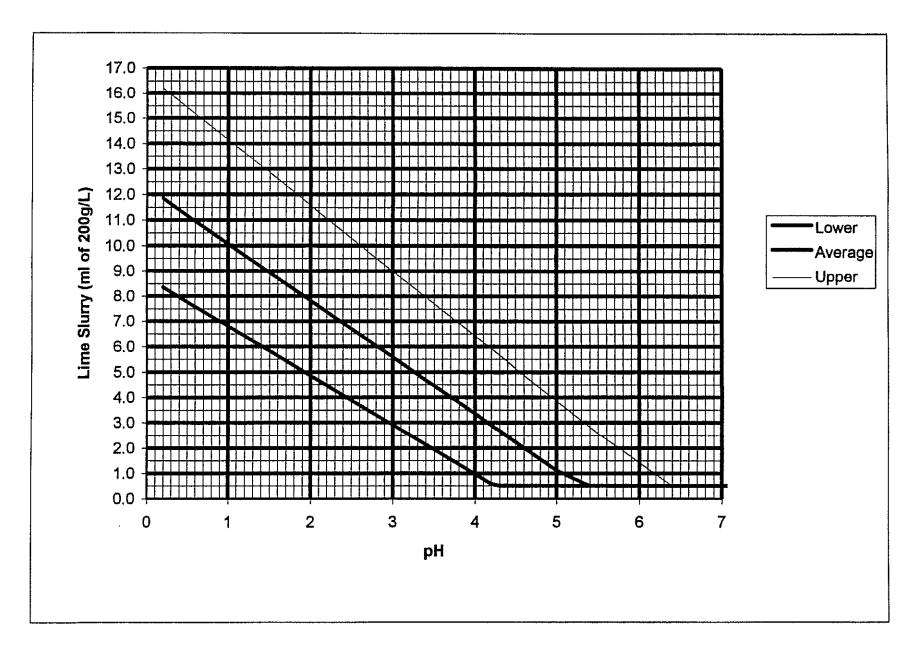
ģ.

Attached is the new graph for the 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.

1

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

Call if you have any questions, John C.



Ν

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: SO₄²⁻; 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

qĩ

TO:	Jerry Sevick	BY FAX: 1(414)4 9 6902	<u></u>
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.

- 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.

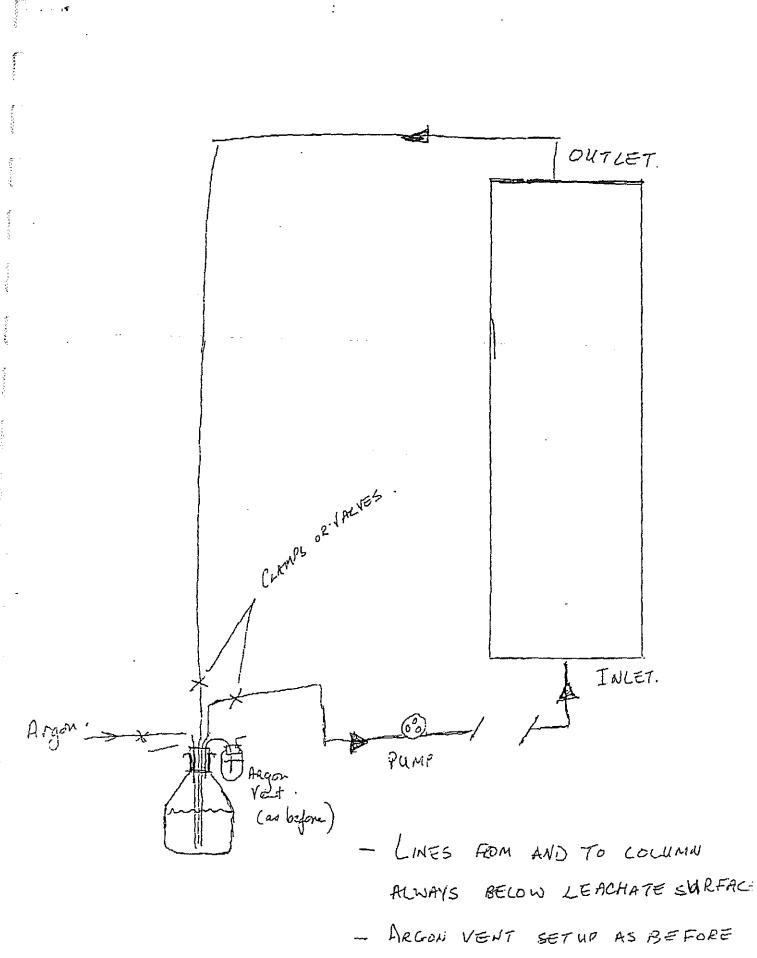
- 1. Place approximately 20072500 ml of distilled de-aerated water in the Erlenmeyer flask.
- 2. Place stopper firmly in place.
- 3. Sparge with argon for a few minutes until air has been displaced. Ensure water trap is in place.
- 4. Seal off column feed and discharge lines in appropriate locations 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. Scal 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.





STEFFEN ROBERTSON AND KIRSTEN (CANADA) INC.

Suite 800, 580 Homby Street, Vancouver, B.C. Canada V6C 3B8 . 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 N	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

MEMORANDUM

:

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

N.

- 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 100ml sample to a pH=8.3.
- w = dry weight of the sample in grams



١

STEFFEN ROBERTSON AND KIRSTEN (CANADA) INC.

Suite 800, 580 Homby Street, Vancouver, B.C. Canada V6C 3B6 Phone: (604) 681-4198 Fax: (604) 687-5532

TECHNICAL MEMORANDUM

TO:	G. Sevick	BY FAX: 1(414)496-6902
	R. Janeshek	(and by e-mail) Page 1 of 3
COMPANY:	Foth and VanDyke, Green Bay, WI	
From:	J. Chapman	
Project:F1071	08	
Date:	19 February 1997	
RE:	FLAMBEAU ACIDCONSUMPTION TE	ST 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.

Hereterine

MEMORANDUM

Page 2

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

- 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 400 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.
- Place the sample in a 1 liter Erlenmeyer flask, and add exact500 750 ml of the0.05
 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:

9

 $NP = (25-000-7500*N_{A} - 250-100*V*N_{B})/w$

where

NP = the residual neutralization potential in mg CaCO2q./g

 N_A = normality of the sulfuric acid

 N_B = normality of the sodium hydroxide

V = volume sodium hydroxide required titrate the 100ml sample to a pH=8.3.

w = dry weight of the sample in grams

Appendix E

Size Distribution Effects Test Results

MLD2\96F022\GBAPP\43134 .61

Flambeau Mining Company Shakeflask Test Results									
PARAMETER	UNITS			1	RESU	JLTS			
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
pН	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									
рН	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
504	mg/L	570	550	570	540	600	540	680	180
CI	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
Са	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	0.070	-0.010	-0.010	0.010	0.010			
	mg/L	40	18	41	14	88	20	44	12
Mg		6.7	2.7	17	4.3	30	5.7	7.9	1.7
Mn	mg/L	0.7	<i>6</i>	, , ,	0		U.,		1
Ni	mg/L	6,4	3.3	6.6	2.4	9.7	3.6	11	3.4
K	mg/L	0,4	5.5	0.0	£.7	5.7	5,5		U . 1
Se	mg/L	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
TI	mg/L	<0.025		<0.025 3.5	1.3	3.7	0.87	2.9	1.0
Na	mg/L	3.6	2.0		•		<0.120	9.9	3.7
Zn	mg/L	4	2	8.3	2.2	1.4	NU. 120	5.5	5.7

and a constraint of a constraint and a second straint and a second strai

and the star

 $a^{*} \in [1, \cdots, N_{k}]$

process process

F

and 20 at 45.

1. 1. 1. 1. 1. 1.

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

Data QA'd through 1/17/97

Sector and the

1977-138-139

67 K 60 K 65

4.8.200.4.890

Flambeau Mining Company Shakeflask Test Results					
PARAMETER	UNITS		RES	ULTS	
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
SO4	mg/L	7400	1000	620	530
cı İ	mg/L	1.4	0.54	10	<0.36
AI	mg/L	14	4.0	11	4.7
Cd	mg/L	0.16	0.056	<0.0012	<0.0012
Са	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				
TI	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
	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,				
	<u> </u>	· · · · · · · · · · · · · · · · · · ·	l	£	1

•

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

Data QA'd through 1/17/97

Ν

NORTHERN LAKE SERVICE, INC. Analytical Laboratory and Environmental Services 400 North Lake Avenue - Crandon, WI 54520 Tel:(715)478-2777 Fax:(715)478-3060		ANALYTICA		WIS. LAB CERT. NO. 721026460 PAGE: 1 NLS PROJECT# 31247			
Client:	Foth & Van Dyke Assoc Attn: R. Janashek 2737 S. Ridge Road FO Box 19012 Green Bay, WI 54307 tion: Flambeau Mining			PAGE	: 1 114	S PROJECT# 3:	1277
ample ID: FMC- f. Line 1 of COC 2358 illected: 12/04/96 arameter		97 <u>Regult</u>	Units	LOD	roð	Method	Date
	Cd by ICP Ca by ICP (filtered) As Cr by ICP Co by ICP	750 4.0 56 170 0.54 22 1400 230000 Non reportabl Turbid yellow interference.	/green	2.0 0.034 1.2 3.0 0.36 2.6 4.3 270	2.0 0.12 3.8 3.0 1.3 9.3 15 950	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 SM 3500Fe-D/Hi	12/11/ 01/02/ 01/02/ 01/02/ 12/10/ 01/02/ 01/02/ 01/02/ 12/10/ A
ron, dis. as Fe agnesium, dis. anganese, dis. H, lab otassium, dis. odium, dis. as sulfate, as SO4 hallium, dis. a	as Mg by ICP as Mn by ICP as K Na by ICP	110 150 52000 2.8 ND 0.48 1000 ND 15000	mg/L mg/L g.u. mg/L mg/L mg/L ug/L ug/L	0.010 3.0 90 1.0 2.0 0.033 250 25 1200	0.035 3.0 300 6.6 0.11 250 87 1200	EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7 EPA 375.2 EPA 279.2 EPA 200.7	01/02/ 01/02/ 12/06/ 12/10/ 01/02/ 12/24/ 12/24/ 12/19/ 01/02/

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

1.304.1000.00

LOQ = Limit of Quantitation NA = Not Applicable

5-6 600 6

ND = Not Detected Date = Date Analysis Performed \$DWB = (mg/kg DWB)/10000

والأجباد وزناهم

والمالية والمراجع

Illomas/ Reviewed by:

Authorized by: R. T. Krueger Laboratory Manager

NORTHERN LAKE SERVICE, INC. Analytical Laboratory and Environmental Serv 400 North Lake Avenue - Crandon, WI 54520 Tel:(715)478-2777 Fax:(715)478-3060		L REPORT	WIS. PAGE :		NO. 721026460 S project# 3:	1247
Attn: R 2737 S. PO Box	Van Dyke Associates . Janeshek Ridge Road 19012 ay, WI 54307					
Project Description: Flambe Project Title: 96F022						
Sample ID: FMC-212B N Ref. Line 2 of COC 23580 Description: F Collected: 12/04/98 Received: 12/06/9						
Parameter	Result	Units	LOD	roð	Method	Date
Acidity, tot. as CaCO3 Aluminum, dis. as Al by ICP Cadmium, dis. as Cd by ICP Calcium, dis. as Ca by ICP Chloride, as Cl (filtered) Chromium, dis. as Cr by ICP Cobalt, dis. as Co by ICP Copper, dis. as Cu by ICP Iron, Ferrous	88 ND 26 39 ND ND 660 70000 Non reportabl Slightly turb interference.	oid blue	2.0 0.034 1.2 3.0 0.36 2.6 4.3 54	2.0 0.12 3.8 3.0 1.3 9.3 15 190	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 SM 3500Fe-D/HA	12/11/96 01/02/97 01/02/97 12/10/96 01/02/97 01/02/97 01/02/97 01/02/97 12/10/96
Iron, dis. as Fe by ICP Magnesium, dis. as Mg by ICP Manganese, dis. as Mn by ICP pH, lab Potassium, dis. as K Sodium, dis. as Na by ICP Sulfate, as SO4 (filtered) Thallium, dis. as Tl by furna Zinc, dis. as Zn by ICP	0.092 12 1700 4.4 3.4 1.0 180	mg/L mg/L ug/L s.u. mg/L mg/L ug/L ug/L	0.010 3.0 1.8 1.0 2.0 0.033 25 25 120	0.035 3.0 6.1 6.6 0.11 25 87 120	EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7 EPA 375.2 EPA 375.2 EPA 279.2 EPA 200.7	01/02/97 01/02/97 01/02/97 12/06/96 12/10/96 01/02/97 12/24/96 12/19/96 01/02/97

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

nomas Reviewed by:

NORTHERN LAKE Si malytical Laboratory and I 00 North Lake Avenue - C: 'el:(715)478-2777 Fax:(715	Environmental Services randon, WI 54520	ANALYTICAL	REPORT	WIS. PAGE :		NO. 721026460	1047
Client:	Foth & Van Dyke Associate Attn: R. Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307				3 NL	S PROJECT# 3	1247
Project Descript Project Title: 9	ion: Flambeau Mining 6F022						
	09B NLS#: 122424 D Description: FMC-209B leceived: 12/06/96 Reported: 01/07/97	Result	Units	LOD	LOQ	Method	Date
	Cd by ICP Ca by ICP filtered) s Cr by ICP Co by ICP	38 ND 8.6 37 ND ND 440 42000 Non reportable light blue interference.	mg/L mg/L ug/L mg/L ug/L ug/L ug/L	1005 2.0 0.034 1.2 3.0 0.36 2.6 4.3 54	2.0 0.12 3.8 3.0 1.3 9.3 15 190	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 SM 3500Fe-D/H	12/11/96 01/02/97 01/02/97 01/02/97 12/10/96 01/02/97 01/02/97 01/02/97 12/10/96
Sodium, dis. as Sulfate, as SO4 (as Mg by ICP as Mn by ICP as K Na by ICP filtered) s Tl by furnace AAS	0,016 14 4300 4.8 2.4 1.3 540 ND 2200	mg/L mg/L g.u. mg/L mg/L mg/L ug/L ug/L	0.010 3.0 1.8 1.0 2.0 0.033 250 25 120	0.035 3.0 6.1 6.6 0.11 250 87 120	EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 375.2 EPA 279.2 EPA 200.7	01/02/9 01/02/9 01/02/9 12/06/9 12/10/9 01/02/9 12/24/9 12/19/9 01/02/9

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

Reviewed

NORTHERN LAKE SERVICE, INC. Analytical Laboratory and Environmental Services 400 North Lake Avenue - Crandon, WI 54520 Tel:(715)478-2777 Fax:(715)478-3060	ANALYTICAL REI	PORT	WIS. PAGE :	LAB CERT. NO	9. 721026460 PROJECT# 31	247
Client: Foth & Van Dyke Associat Attn: R. Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307	9 6					
Project Description: Flambeau Mining Project Title: 96F022						
Sample ID: FMC-210B NLS#: 122425 Ref. Line 4 of COC 23580 Description: FMC-210B Collected: 12/04/96 Received: 12/06/96 Reported: 01/07/97						
Parameter	Result	Units	LOD	rod	Method	Date
Acidity, tot. as CaCO3 Aluminum, dis. as Al by ICP Cadmium, dis. as Cd by ICP Calcium, dis. as Ca by ICP Chloride, as Cl (filtered) Chromium, dis. as Cr by ICP Cobalt, dis. as Co by ICP Copper, dis. as Cu by ICP Iron, Ferrous	36 ND ND 31 ND 310 4600 ND	mg/L mg/L ug/L mg/L ug/L ug/L ug/L Proper color deveopment (orange but 30% spike recovery	2.0 0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091	2.0 0.12 3.8 3.0 1.3 9.3 15 19 0.030	EPA 305.1 EPA 200.7 EPA 200.7 EPA 325.2 BPA 200.7 EPA 200.7 EPA 200.7 SM 3500Fe-D/HF	12/11/96 01/02/97 01/02/97 12/10/96 01/02/97 01/02/97 01/02/97 01/02/97 12/10/96
Iron, dis. as Fe by ICP Magnesium, dis. as Mg by ICP Manganese, dis. as Mn by ICP pH, lab Potassium, dis. as K Sodium, dis. as Na by ICP Sulfate, as SO4 (filtered) Thallium, dis. as Tl by furnace AAS Zinc, dis. as Zn by ICP	ND 20 5700 5.1 3.6 0.87 540 ND ND	mg/L mg/L s.u. mg/L mg/L mg/L ug/L ug/L	0.010 3.0 1.8 1.0 2.0 0.033 250 25 120	0.035 3.0 6.1 6.6 0.11 250 87 120	EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7 EPA 375.2 EPA 279.2 EPA 200.7	01/02/97 01/02/97 12/06/96 12/10/96 01/02/97 12/24/96 12/19/96 01/02/97

LOD = Limit of Detection DWB = Dry Weight Basis

LOQ = Limit of Quantitation NA = Not Applicable ND = Not Detected Date = Date Analysis Performed \$DWB = (mg/kg DWB)/10000

Reviewed by:

Inalytical Laboratory and I 00 North Lake Avenue - C	randon, WI 54520			WIS.	LAB CERT. N	O. 721026460	
el:(715)478-2777 Fax:(715)478-3060	ANALYTICA	AL REPORT	PAGE:	5 NLS	PROJECT# 3	1247
Client:	Foth & Van Dyke Associa Attn: R. Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307	tes		,			
roject Descript roject Title: S	ion: Flambeau Mining 6F022						
	00B NLS#: 122426 0 Description: FMC-200B Received: 12/06/96 Reported: 01/07/97	Result	Units	LOD	1.00	Wethod	De 4 -
Acidity, tot. as Aluminum, dis. as Cadmium, dis. as Calcium, dis. as Chloride, as Cl (Chromium, dis. as Cobalt, dis. as Copper, dis. as Iron, Ferrous	Cd by ICP Ca by ICP filtered) 8 Cr by ICP Co by ICP Cu by ICP	140 ND 8.2 61 ND 910 110000 Non reportab Turbid light interference	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L blue	LOD 2.0 0.034 1.2 3.0 0.36 2.6 4.3 54	LOQ 2.0 0.12 3.8 3.0 1.3 9.3 15 15	Method EPA 305.1 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 SM 3500Fe-D/HP	Date 12/11/96 01/02/97 01/02/97 12/10/96 01/02/97 01/02/97 01/02/97 12/10/96
Iron, dis. as Fe Magnesium, dis. Manganese, dis. pH, lab Potassium, dis. Sodium, dis. as I Sulfate, as SO4 (as Mg by ICP as Mn by ICP as K Na by ICP	ND 18 2700 4.8 3.3 2.0 550	mg/L mg/L ug/L s.u. mg/L mg/L mg/L	0.010 3.0 1.8 1.0 2.0 0.033 250	0.035 3.0 6.1 6.6 0.11 250	EPA 200.7 BPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7 EPA 375.2	01/02/97 01/02/97 01/02/97 12/06/96 12/10/96 01/02/97 12/24/96

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

NORTHERN LAKE SERVIC Analytical Laboratory and Environ 400 North Lake Avenue - Crandon Tel:(715)478-2777 Fax:(715)478-30	mental Services , WI 54520	ANALYTICA	L REPORT	WIS PAGE	5. LAB CERT. I : 6 NL	NO. 721026460 8 Project# 3:	1247
	Foth & Van Dyke Associat Attn: R. Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307	8 8					
Project Description: Project Title: 96F02	Flambeau Mining 2			•			
Sample ID: FMC-8B Ref. Line 6 of COC 23580 De Collected: 12/05/96 Receive	NLS#: 122427 scription: FMC-8B d: 12/06/96 Reported: 01/07/97	•		, <u>,, , , , , , , , , , , , , , , ,</u>			
Parameter		Result	Units	LOD	LOQ	Method	Date
Acidity, tot. as CaCO Aluminum, dis. as Al Cadmium, dis. as Cd b Calcium, dis. as Ca b Chloride, as Cl (filte Chromium, dis. as Cr Cobalt, dis. as Co by Copper, dis. as Cu by Iron, Ferrous	by ICP y ICP y ICP red) by ICP · ICP · ICP	650 4.7 ND 16 ND 200 120000 Non reportabl Turbid yellow interference.	/green	2.0 0.034 1.2 3.0 0.36 2.6 4.3 54	2.0 0.12 3.8 3.0 1.3 9.3 15 190	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 SM 3500Fe-D/H2	12/11/96 01/02/97 01/02/97 12/10/96 01/02/97 01/02/97 01/02/97 12/10/96
Iron, dis. as Fe by I Magnesium, dis. as Mg Manganese, dis. as Mg PH, lab Potassium, dis. as K Sodium, dis. as Na by Sulfate, as SO4 (filte Thallium, dis. as Tl Zinc, dis. as Zn by I	by ICP by ICP ICP red) by furnace AAS	100 5.1 560 2.8 ND 0.37 530 ND 700	mg/L mg/L ug/L s.u. mg/L mg/L ug/L ug/L	0.010 3.0 1.8 1.0 2.0 0.033 250 25 120	0.035 3.0 6.1 6.6 0.11 250 87 120	EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7 EPA 375.2 EPA 279.2 EPA 200.7	01/02/97 01/02/97 12/06/96 12/10/96 01/02/97 12/24/96 12/19/96 01/02/97

LOD = Limit of Detection DWB = Dry Weight Basis LOQ = Limit of Quantitation NA = Not Applicable

ND = Not Detected Date = Date Analysis Performed \$DWB = (mg/kg DWB)/10000

Reviewed by:

IORTHERN LAKE Si usiyiical Laboratory and I 0 North Lake Avenue - Ci li:(715)478-2777 Fax:(715	Invironmental Services randon, WI 54520	ANALYTICA		WIS	LAB CERT. N	O. 721026460 9 project# 31	1304
Client:	Foth & Van Dyke Associat Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307				· - ····		
roject Descript roject Title: 9	ion: Flambeau Mining 6F022	·			·····		
ample ID: FMC-3	A NLS#: 122743						
af. Line 1 of COC 2377 ollected: 12/06/96 1	3 Description: FMC-3A Received: 12/11/96 Reported: 01/07/97	B	17— Å h =	top	1.00	Mathod	Date
of. Line 1 of COC 2377 ollected: 12/06/96	3 Description: FMC-3A Received: 12/11/96 Reported: 01/07/97	Result	Units	LOD	roð	Method	Date
f. Line 1 of COC 2377 illected: 12/06/96 f arameter	Received: 12/11/96 Reported: 01/07/97	<u>Result</u> 2000	mg/L	2.0	2.0	EPA 305.1	12/17/9
Line 1 of COC 2377 Nected: 12/06/96 arameter cidity, tot. as	Received: 12/11/96 Reported: 01/07/97		mg/L mg/L	2.0 0.034	2.0 0.12	EPA 305.1 EPA 200.7	12/17/9 01/02/9
Line 1 of COC 2377 Nected: 12/06/96 4 arameter cidity, tot. as huminum, dis. a	CaCO3 B Al by ICP	2000 14 160	mg/L mg/L ug/L	2.0 0.034 1.2	2.0 0.12 3.8	EPA 305.1 EPA 200.7 EPA 200.7	12/17/9 01/02/9 01/02/9
I. Line 1 of COC 2377 Nected: 12/06/96 I arameter cidity, tot. as luminum, dis. as admium. dis. as	CaCO3 B Al by ICP Cd by ICP	2000 14 160 290	mg/L mg/L ug/L mg/L	2.0 0.034 1.2 3.0	2.0 0.12 3.8 3.0	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7	12/17/9 01/02/9 01/02/9 01/02/9
Line 1 of COC 2377 Nected: 12/06/96 arameter cidity, tot. as luminum, dis. as admium, dis. as alcium. dis. as	CaCO3 B Al by ICP Ca by ICP Ca by ICP	2000 14 160 290 1.4	mg/L mg/L ug/L mg/L mg/L	2.0 0.034 1.2 3.0 0.36	2.0 0.12 3.8 3.0 1.3	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2	12/17/9 01/02/9 01/02/9 01/02/9 12/17/9
Line 1 of COC 2377 Nected: 12/06/96 cidity, tot. as luminum, dis. as admium, dis. as alcium, dis. as hloride, as Cl (CaCO3 s Al by ICP Cd by ICP Cd by ICP Ca by ICP filtered)	2000 14 160 290 1.4 32	mg/L mg/L ug/L mg/L mg/L ug/L	2.0 0.034 1.2 3.0 0.36 2.6	2.0 0.12 3.8 3.0 1.3 9.3	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 BPA 200.7	12/17/9 01/02/9 01/02/9 01/02/9 12/17/9 01/02/9
Line 1 of COC 2377 Nected: 12/06/96 luminum, dis. as admium, dis. as alcium, dis. as alcium, dis. as hloride, as Cl (hromium, dis. as	CaCO3 B Al by ICP Cd by ICP Ca by ICP Ca by ICP filtered) S Cr by ICP Co by ICP	2000 14 160 290 1.4 32 3000	mg/L mg/L ug/L mg/L ug/L ug/L	2.0 0.034 1.2 3.0 0.36 2.6 4.3	2.0 0.12 3.8 3.0 1.3 9.3 15	BPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 BPA 325.2 BPA 200.7 BPA 200.7	12/17/9 01/02/9 01/02/9 01/02/9 12/17/9 01/02/9 01/02/9
f. Line 1 of COC 2377 Marameter cidity, tot. as luminum, dis. as admium, dis. as alcium, dis. as cibalt, dis. as copalt, dis. as copper, dis. as	CaCO3 B Al by ICP Cd by ICP Ca by ICP Ca by ICP filtered) S Cr by ICP Co by ICP	2000 14 160 290 1.4 32 3000 660000	mg/L mg/L ug/L mg/L mg/L ug/L ug/L	2.0 0.034 1.2 3.0 0.36 2.6 4.3 1100	2.0 0.12 3.8 3.0 1.3 9.3 15 3800	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 BPA 200.7	12/17/9 01/02/9 01/02/9 01/02/9 12/17/9 01/02/9 01/02/9 01/02/9
Line 1 of COC 2377 Hected: 12/06/96 luminum, dis. as admium, dis. as alcium, dis. as alcium, dis. as hloride, as Cl (hromium, dis. as obalt, dis. as opper, dis. as	CaCO3 B Al by ICP Cd by ICP Ca by ICP Ca by ICP filtered) S Cr by ICP Co by ICP	2000 14 160 290 1.4 32 3000 660000 270	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L	2.0 0.034 1.2 3.0 0.36 2.6 4.3 1100 0.91	2.0 0.12 3.8 3.0 1.3 9.3 15	BPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 BPA 325.2 BPA 200.7 BPA 200.7	12/17/9 01/02/9 01/02/9 01/02/9 12/17/9 01/02/9 01/02/9 01/02/9
Line 1 of COC 2377 Hected: 12/06/96 I hrameter cidity, tot. as luminum, dis. as admium, dis. as alcium, dis. as hloride, as Cl (hromium, dis. as obalt, dis. as opper, dis. as ron, Ferrous	CaCO3 s Al by ICP Cd by ICP Cd by ICP Ca by ICP filtered) s Cr by ICP Co by ICP Co by ICP Cu by ICP	2000 14 160 290 1.4 32 3000 660000 270 Additional	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L Comments: F&VD modifi	2.0 0.034 1.2 3.0 0.36 2.6 4.3 1100 0.91 Led method	2.0 0.12 3.8 3.0 1.3 9.3 15 3800 3.0	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 BPA 200.7 BPA 200.7 EPA 200.7 EPA 200.7	12/17/9 01/02/9 01/02/9 01/02/9 12/17/9 01/02/9 01/02/9 01/02/9 12/26/9
Line 1 of COC 2377 lected: 12/06/96 f urameter uminum, dis. as admium, dis. as alcium, dis. as alcium, dis. as alcium, dis. as alcoride, as Cl (hromium, dis. as opper, dis. as ron, Ferrous ron. dis. as Fe	CaCO3 B Al by ICP Cd by ICP Ca by ICP Ca by ICP filtered) S Cr by ICP Co by ICP Co by ICP Cu by ICP	2000 14 160 290 1.4 32 3000 660000 270 Additional 360	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L F&VD modifi mg/L	2.0 0.034 1.2 3.0 0.36 2.6 4.3 1100 0.91 ied method 0.010	2.0 0.12 3.8 3.0 1.3 9.3 15 3800 3.0 0.035	EPA 305.1 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 BPA 200.7 BPA 200.7 EPA 200.7 EPA 200.7	12/17/9 01/02/9 01/02/9 01/02/9 01/02/9 01/02/9 01/02/9 01/02/9 01/02/9
Line 1 of COC 2377 lected: 12/06/96 f irameter cidity, tot. as uminum, dis. as alcium, dis. as alcium, dis. as alcium, dis. as hloride, as Cl (hromium, dis. as opper, dis. as ron, Ferrous ron, dis. as Fe	CaCO3 B Al by ICP Cd by ICP Cd by ICP Ca by ICP filtered) S Cr by ICP Co by ICP Cu by ICP Cu by ICP Cu by ICP	2000 14 160 290 1.4 32 3000 660000 270 Additional 360 330	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L comments: F&VD modifi mg/L mg/L	2.0 0.034 1.2 3.0 0.36 2.6 4.3 1100 0.91 ied method 0.010 3.0	2.0 0.12 3.8 3.0 1.3 9.3 15 3800 3.0 0.035 3.0	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 BPA 200.7 BPA 200.7 EPA 200.7 EPA 200.7	12/17/9 01/02/9 01/02/9 01/02/9 01/02/9 01/02/9 01/02/9 01/02/9 01/02/9 01/02/9
Line 1 of COC 2377 Hected: 12/06/96 I arameter cidity, tot. as luminum, dis. as alcium, dis. as alcium, dis. as hloride, as Cl (hromium, dis. as obalt, dis. as ron, Ferrous ron, dis. as Fe agnesium, dis. anganese, dis.	CaCO3 B Al by ICP Cd by ICP Cd by ICP Ca by ICP filtered) S Cr by ICP Co by ICP Cu by ICP Cu by ICP Cu by ICP	2000 14 160 290 1.4 32 3000 660000 270 Additional 360 330 120000	mg/L mg/L ug/L mg/L mg/L ug/L ug/L ug/L mg/L comments: F&VD modifi mg/L mg/L ug/L	2.0 0.034 1.2 3.0 0.36 2.6 4.3 1100 0.91 ied method 0.010 3.0 180	2.0 0.12 3.8 3.0 1.3 9.3 15 3800 3.0 0.035	EPA 305.1 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	12/17/99 01/02/99 01/02/99 12/17/99 01/02/99 01/02/9 01/02/9 01/02/9 01/02/9 01/02/9 01/02/9 01/02/9
Line 1 of COC 2377 Hected: 12/06/96 I irameter cidity, tot. as luminum, dis. as admium, dis. as alcium, dis. as hloride, as Cl (hromium, dis. as obalt, dis. as opper, dis. as ron, Ferrous ron, dis. as Fe agnesium, dis. anganese, dis. H. lab	CaCO3 s Al by ICP Cd by ICP Cd by ICP Ca by ICP filtered) s Cr by ICP Co by ICP Co by ICP Cu by ICP cu by ICP as Mg by ICP as Mn by ICP	2000 14 160 290 1.4 32 3000 660000 270 Additional 360 330 120000 2.7	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L mg/L mg/L ug/L ug/L s.u.	2.0 0.034 1.2 3.0 0.36 2.6 4.3 1100 0.91 ied method 0.010 3.0	2.0 0.12 3.8 3.0 1.3 9.3 15 3800 3.0 0.035 3.0	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 BPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	12/17/9 01/02/9 01/02/9 12/17/9 01/02/9 01/02/9 01/02/9 12/26/9 01/02/9 01/02/9 01/02/9 01/02/9 01/02/9 01/02/9 12/11/9
I. Line 1 of COC 2377 illected: 12/06/96 I arameter cidity, tot. as luminum, dis. as addmium, dis. as cidity, tot. as inloride, as Cl (fromium, dis. as cobalt, dis. as copper, dis. as icopper, dis. as fron, ferrous fron, dis. as Fe lagnesium, dis. anganese, dis. otassium, dis.	CaCO3 s Al by ICP Cd by ICP Cd by ICP Ca by ICP filtered) s Cr by ICP Co by ICP Co by ICP Cu by ICP cu by ICP as Mg by ICP as Mn by ICP as K	2000 14 160 290 1.4 32 3000 660000 270 Additional 360 330 120000 2.7 ND	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L mg/L mg/L ug/L s.u. mg/L	2.0 0.034 1.2 3.0 0.36 2.6 4.3 1100 0.91 ied method 0.010 3.0 180 1.0 2.0	2.0 0.12 3.8 3.0 1.3 9.3 15 3800 3.0 0.035 3.0 610	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 BPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	12/17/90 01/02/9° 01/02/9° 01/02/9° 01/02/9° 01/02/9° 01/02/9° 01/02/9° 01/02/9° 01/02/9° 01/02/9° 01/02/9° 01/02/9° 12/11/9° 12/27/9° 01/02/9°
S. Line 1 of COC 2377 person of CoC 23777 person of CoC 23777 person of CoC 23777 person of CoC 23777	CaCO3 B Al by ICP Cd by ICP Cd by ICP Cd by ICP Ca by ICP filtered) S Cr by ICP Co by ICP Cu by ICP Cu by ICP as Mg by ICP as Mn by ICP as K Na by ICP	2000 14 160 290 1.4 32 3000 660000 270 Additional 360 330 120000 2.7 ND 0.63	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L comments: F&VD modifi mg/L ug/L s.u. mg/L s.u. mg/L	2.0 0.034 1.2 3.0 0.36 2.6 4.3 1100 0.91 ied method 0.010 3.0 180 1.0	2.0 0.12 3.8 3.0 1.3 9.3 15 3800 3.0 0.035 3.0 610 6.6	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 BPA 200.7 EPA 200.7	12/17/90 01/02/9 01/02/9 01/02/9 12/17/9 01/02/9 01/02/9 01/02/9 01/02/9 01/02/9 01/02/9 01/02/9 12/11/9 01/02/9 12/27/9 01/02/9
ef. Line 1 of COC 2377 ollected: 12/06/96 I Parameter Acidity, tot. as Aluminum, dis. as Calcium, dis. as Chloride, as Cl (Chromium, dis. as Copper, dis. as Copper, dis. as Iron, Ferrous Iron, dis. as Fe Magnesium, dis. Maganese, dis. pH, lab Potassium, dis. as Sodium, dis. as Soliate. as SO4	CaCO3 B Al by ICP Cd by ICP Cd by ICP Cd by ICP Ca by ICP filtered) S Cr by ICP Co by ICP Cu by ICP Cu by ICP as Mg by ICP as Mn by ICP as K Na by ICP	2000 14 160 290 1.4 32 3000 660000 270 Additional 360 330 120000 2.7 ND	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L mg/L mg/L ug/L s.u. mg/L	2.0 0.034 1.2 3.0 0.36 2.6 4.3 1100 0.91 ied method 0.010 3.0 180 1.0 2.0 0.033	2.0 0.12 3.8 3.0 1.3 9.3 15 3800 3.0 0.035 3.0 610 6.6 0.11	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 BPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7	12/17/9 01/02/9 01/02/9 01/02/9 01/02/9 01/02/9 01/02/9 01/02/9 01/02/9 01/02/9 01/02/9 01/02/9 01/02/9 12/11/9 12/27/9 01/02/9

53531923

2000 000

REPARTANCE

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

A Section

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

personal and

ورود د و مارو

15-1-1-20

ANDERING

NORTHERN LAKE SERVICE, INC. Analytical Laboratory and Environmental Services 400 North Lake Avenue - Craudon, WI 54520			WIS.	LAB CERT.	. NO. 721026460	
Tel:(715)478-2777 Fax:(715)478-3060	ANALYTIC	AL REPORT	PAGE :	2 NI	LS PROJECT# 3	1304
Client: Foth & Van Dyke Associat Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307	.e <i>5</i>					
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: 01/07/87	Remult		TOD 1	1.00	Vathad	
Parameter	Result	Units	LOD	roð	Method	Date
Acidity, tot. as CaCO3 Aluminum, dis. as Al by ICP Cadmium, dis. as Cd by ICP Calcium, dis. as Ca by ICP Chloride, as Cl (filtered) Chromium, dis. as Cr by ICP Cobalt, dis. as Co by ICP Copper, dis. as Cu by ICP		mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L Comments: F&VD modified m		2.0 0.12 3.8 3.0 1.3 9.3 15 190 0.15	EPA 305.1 BPA 200.7 EPA 200.7 EPA 200.7 BPA 325.2 EPA 200.7 BPA 200.7 BPA 200.7 EPA 200.7	12/17/96 01/02/97 01/02/97 12/17/96 01/02/97 01/02/97 01/02/97 12/26/96
Iron, dis. as Fe by ICP Magnesium, dis. as Mg by ICP Manganese, dis. as Mn by ICP pH, lab Potassium, dis. as K Sodium, dis. as Na by ICP Sulfate, as SO4 (filtered) Thallium, dis. as Tl by furnace AAS Zinc, dis. as Zn by ICP	290 9.1 1200 2.4 ND 0.34 620 ND 3500	mg/L mg/L ug/L s.u. mg/L mg/L ug/L ug/L	0.010 3.0 1.8 1.0 2.0 0.033 250 25 120	0.035 3.0 6.1 6.6 0.11 250 87 120	EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7 EPA 375.2 EPA 279.2 EPA 200.7	01/02/97 01/02/97 01/02/97 12/11/96 12/27/96 01/02/97 12/24/96 01/02/97 01/02/97

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

Homas RPriebe

NORTHERN LAKE S Analytical Laboratory and 100 North Lake Avenue - C	Environmental Services			WIS	. LAB CERT.	NO. 721026460	
el:(715)478-2777 Fax:(71)		ANALYTICAI	L REPORT	PAGE	: 3 NI	LS PROJECT# 3	1304
Client:	Foth & Van Dyke Associa Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307	tes.					
Project Descrip Project Title:	cion: Flambeau Mining 96F022						
ample ID: FMC-	200A NL9#: 122745						
	3 Description: FMC-200A Received: 12/11/98 Reported: 01/07/97	Result	<u>Units</u>	LOD	LOQ	Method	Date
ollected: 12/06/96 <u>Arameter</u> Acidity, tot. as Aluminum, dis. as Calcium, dis. as Calcium, dis. as Chloride, as Cl (Received: 12/11/96 Reported: 01/07/97 © CaCO3 s Al by ICP © Cd by ICP © Ca by ICP filtered) % Cr by ICP Co by ICP Cu by ICP Cu by ICP	Result 290 0.047 11 130 ND 6.2 1800 190000 ND Additional Co	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L	2.0 0.034 1.2 3.0 0.36 2.6 4.3 54 0.0091	LOQ 2.0 0.12 3.8 3.0 1.3 9.3 15 190 0.030	Method EPA 305.1 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	Date 12/17/96 01/02/97 01/02/97 12/17/96 01/02/97 01/02/97 01/02/97 12/30/96

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

wed by:

Authorized by: R. T. Krueger Laboratory Manager

NORTHERN LAKE SE Analytical Laboratory and E4 400 North Lake Avenue - Cra Tel:(715)478-2777 Fax:(715)4	nvironmental Services andon, WI 54520	ANALYTICA	L REPORT	WIS PAGE		NO. 721026460 S PROJECT# 3	1304
Client:	Foth & Van Dyke Assoc Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307	iates		1			
Project Title: 96 Sample ID: FMC-20	9A NLS#: 122746				_, _ ,,		
Ref. Line 4 of COC 23773 Collected: 12/06/96 Re	Description: FMC-209A ceived: 12/11/96 Reported: 01/07/	97					
Parameter		Result	Units	LOD	LOQ	Method	Date
Acidity, tot. as Aluminum, dis. as Cadmium, dis. as Calcium, dis. as Chloride, as Cl (f. Chromium, dis. as Cobalt, dis. as Co Copper, dis. as Iron, Ferrous	Al by ICP Cd by ICP Ca by ICP iltered) Cr by ICP o by ICP u by ICP	340 0.069 26 110 0.75 4.8 1600 180000 ND Additional C	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L cmments: F&VD modified		2.0 0.12 3.8 3.0 1.3 9.3 15 950 0.030	EPA 305.1 EPA 200.7 BPA 200.7 BPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	12/17/96 01/02/97 01/02/97 01/02/97 12/17/96 01/02/97 01/02/97 01/02/97 12/30/96
Magnesium, dis. as Fel Magnesium, dis. as pH, lab Potassium, dis. as N Sodium, dis. as N Sulfate, as SO4 (f Thallium, dis. as Zinc, dis. as Zn 1	B Mg by ICP B Mn by ICP B X a by ICP iltered) Tl by furnace AAS	ND 41 170000 4.5 6.6 3.5 570 ND 8300	mg/L mg/L ug/L s.u. mg/L mg/L ug/L ug/L ug/L	0.010 3.0 1.8 1.0 2.0 0.033 250 25 120	0.035 3.0 6.1 6.6 0.11 250 87 120	EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7 EPA 375.2 EPA 279.2 EPA 200.7	01/02/97 01/02/97 12/11/96 12/27/96 01/02/97 12/24/96 01/02/97 01/02/97

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

Thomas R Printe

NORTHERN LAKE SER	vironmental Services			WIS.	LAB CERT. I	NO. 721026460	
0 North Lake Avenue - Crar 1:(715)478-2777 Fax:(715)47		ANALYTICA	L REPORT	PAGE:	5 NL	S PROJECT# 3	1304
Client:	Foth & Van Dyke Associat Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307	09					
roject Descriptio roject Title: 96	on: Flambeau Mining F022						
ample ID: FMC-21 of Line 5 of COC 23773	0A NLS#: 122747 Description: FMC-210A	•					···· • · · · · · · · · · · · · · · · ·
	ceived: 12/11/96 Reported: 01/07/97	Result	Units	LOD	rođ	Method	Date
arameter cidity, tot. as C luminum, dis. as admium, dis. as C alcium, dis. as C alcium, dis. as C hloride, as Cl (fi hromium, dis. as cobalt, dis. as Co	ceived: 12/11/96 Reported: 01/07/97 Al by ICP d by ICP ta by ICP ltered) Cr by ICP	Result 100 0.096 2.5 140 1.1 11 1800 85000 ND Additional C	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L	2.0 0.034 1.2 3.0 0.36 4.3 54 0.0091	LOQ 2.0 0.12 3.8 3.0 1.3 9.3 15 190 0.030	Method EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 325.2 EPA 200.7 EPA 200.7	Date 12/17/96 01/02/97 01/02/97 12/17/96 01/02/97 01/02/97 01/02/97 12/30/96

LOD = Limit of Detection DWB = Dry Weight Basis LOQ = Limit of Quantitation NA = Not Applicable

ND = Not Detected Date = Date Analysis Performed \$DWB = (mg/kg DWB)/10000

Authorized by: R. T. Krueger Laboratory Manager

i

	NORTHERN LAKE SERV Analytical Laboratory and Envir 100 North Lake Avenue - Crand	onmental Services on, WI 54520			wis	LAB CERT.	NO. 721026460	
	Tel:(715)478-2777 Fax:(715)478-	-3060	ANALYTICAL	REPORT	PAGE	: 6 NL	S PROJECT# 3	1304
	Client:	Foth & Van Dyke Associate Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307	8					
	Project Description Project Title: 96F(
	Parameter		Result	Units	LOD	roð	Method	Date
	Acidity, tot. as Cat Aluminum, dis. as A Cadmium, dis. as Cd Calcium, dis. as Ca Chloride, as Cl (fil) Chromium, dis. as C Cobalt, dis. as Co Copper, dis. as Cu Iron, Ferrous	l by ICP by ICP by ICP tered) r by ICP by ICP	540 0.14 54 170 0.73 ND 1700 290000 0.067 Additional Comm	mg/L mg/L mg/L mg/L ug/L ug/L ug/L mg/L mg/L mg/L mg/L	2.0 0.034 1.2 3.0 0.36 2.6 4.3 540 0.0091 ed method	2.0 0.12 3.8 3.0 1.3 9.3 15 1900 0.030	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7	12/17/96 01/02/97 01/02/97 12/17/96 01/02/97 01/02/97 01/02/97 01/02/97 12/31/96
4	Iron, dis. as Fe by Magnesium, dis. as Manganese, dis. as pH, lab Potassium, dis. as Sodium, dis. as Na Sulfate, as SO4 (fil Thallium, dis. as T Zinc, dis. as Zn by	Mg by ICP Mn by ICP K by ICP tered) '1 by furnace AAS	0,040 44 7900 4.7 11 2.9 680 ND 9900	mg/L mg/L ug/L s.u. mg/L mg/L ug/L ug/L ug/L	0.010 3.0 1.8 1.0 2.0 0.033 250 25 120	0.035 3.0 6.1 6.6 0.11 250 87 120	EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7 EPA 375.2 EPA 375.2 EPA 279.2 EPA 200.7	01/02/97 01/02/97 01/02/97 12/11/96 12/27/96 01/02/97 12/24/96 01/02/97 01/02/97

.

LOD = Limit of Detection DWB = Dry Weight Basis

۲.

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

Human RPrile

Appendix F

Type II Alkali Demand Test Results

MLD2\96F022\GBAPP\43134.61

		6.	mple Weig	ht	·	·····	1 h	our		
		Flask A	Flask B	Flask C	Fla	sk A		sk B	Ela	sk C
Start			T Idak D	1 10 3 1 0	1 101	Cond.	110	Cond.		Cond.
Date	Sample	(g)	(g)	(g)	pH (su)	(uS/cm)	pH (su)	(uS/cm)	pH (su)	(uS/cm)
11/24/96	4	500.5	500.2	500		2940				305
11/24/96	15-3	500	500.9	500.5	1.72	4660		4110		
11/24/96	166	500.6	500.9	500.1	3.78	1391	3.68	1421	3.64	14
11/25/96	186	498.1	503.9	502.1	4.2	2810	4.05	2900		284
11/25/96	194	505.2	502	500.5	3.67	1316	3.86	1243	The second se	13
11/25/96	201	500.2	496.3	495.5	4.33	1661	4.36	1366		16
11/25/96	204	498.5	499.8	499.9	3.93	2060	4.26	2070	4.35	20
11/25/96	209	501	503.8	498.6	4.77	924	4.82	901	4.86	8
11/25/96	210	497.2	496.6	498.8	4.68	794	4.67	862	4.65	6
11/25/96	211	504.7	498.6	499.9	3.52	775	3.48	9150	3.45	9
11/25/96	212	50 3 .9	499	502	4.36	1265	4.41	1416		13-
11/25/96	213	502:4	500.3	501.2	2.81	3490	2.75	3240	2.69	33
11/26/96	187	500.3	500.7	500.8	5.06	1485	5	1626	5.03	14
11/26/96	188	501	500.1	500.5	4.59	2160	4.94	2150	4.92	22
11/26/96	189	499.5	504.1	499.7	5.63	645	5.61	680	5.63	7
11/26/96	192	504.2	504.8	496	5.26	918	5.38	900	5.5	9
11/26/96	195	499.2	499	504.6	5.67	832	5.71	842	5.67	7
11/26/96	197	500.6	496.8	502.6	5.2	1480	5.19	1573	5.27	17
11/26/96	199	500.3	502.5	499.2	5.65	892	5.66	895	5.62	9
11/26/96	200	496.9	498.6	500.4	5.32	1184	5.36	1182	5.35	11
11/26/96 11/27/96	202 198	497.9 500	501.4	500 500	5.37	1138 425	5.36	1162	ND	10
11/27/96	205	500.7	500.7 499.9	500.5	5.77 5	425 2030	5.78 4.99	528	5.79	5
11/27/96	203	500.6	500	500.5	5.79	2030	<u>4.99</u> 5.81	2010 514	4.94 5.86	203 54
11/28/96	190	500.0	500.9	500.5	4.73	1540	4.82	1460	4.83	15
11/28/96	193	501	500	500.3	6.21	1090	6.24	1400	6.18	11
11/28/96	196	500.3	499.9	501	6.15	344	6.28	330	6.23	3
11/28/96	203	500.2	500.4	500.2	5.63	1380	5.66	1280	5.67	12
11/28/96	206	500.3	500.2	500.3	5.59	1070	5.56	1060	5.53	11
11/28/96	208	500.5	499.8	499.2	5.61	788	5.58	730	5.67	7
11/29/96	172	501.2	499.9	500.5	4.03	2740	3.98	2710	4	26
11/29/96	176	500.2	500.4	501.2	4.41	2520	4.31	2650	4.43	25
11/29/96	177	499.8	499.1	501.1	4.15	1930	3.99	2010	4.09	19-
11/29/96	179	500	501.2	500		2760	4.15	2850		
11/29/96	181	499.3	500.3	500.4	3.37	4330	3.44	4030		42
11/29/96	191	501.8	500.4	500.5	6.03	724	6.18	720		7
11/30/96	146	500.4	500.9	500.1	4.3	1025	4.26	1165	4.28	11:
11/30/96	157	500.5	499.9	498.7	3.99	1834	4.03	1867	4.09	16
11/30/96	175	501.9	500	501	4.28	2250	4.24	2270		22
11/30/96	180	499.6	500	502	4.15	2500	4 16	2500		23
11/30/96	182	499.8	499	500.1	4.32	1981	4.27	2200		20
11/30/96	183	500.2	499.4	500.3	4.1	2640	4.1	2660		27
12/1/96	153	501	499.7	500.2	4.32	1730	4.36	1690	4.33	18
12/1/96	154	500.1	499.1	501.8	4.52	1745	4.48	1780		17:
12/1/96	155	499.8	501	499.7	4.8	1976	4.66	1720	4.61	18
12/1/96	156	501.7	501.6	502.3	4.52	1905	4.52	1886	4.53	19
12/1/96	159	500.3	501.5	501	4.69	1841	4.78	1791	4.78	18
12/1/96	160	501.5	499.8	500.5	4.69	1649	4.65	1536	4.65	150
12/1/96	165	500.4	500.3	500.8	4.79	1504	4.78	1554	4.78	14
12/1/96	170	500.2	500	500.2	4.49	1741	4.46	1732	4.44	17

สาราราร

Pr. Banky V.S. m

State and

The second second

.

19.10

ŝ

н Цар

2

1.1.2.1.2.1.1.A

	i									<u> </u>
			imple Weig					our		
		Flask A	Flask B	Flask C	Fla	sk A	Flas	sk B	Fla	sk C
Start						Cond.		Cond.		Cond.
Date	Sample	(g)	(g)	(g)	pH (su)	(uS/cm)	pH (su)	(uS/cm)	pH (su)	(uS/cm)
12/1/96	173	500.8	500.6	499.6		1857	4.85	1847	4.85	179
12/2/96	147	501.5	500.6	500	4.7	1667	4.75	1624	4.65	180
12/2/96	149	500.1	500.6	499.6	5.04	2020	5.03	2010	5	206
12/2/96	151	500	499.6	500.4	5.04	1217	5.13	990	5.12	108
12/2/96	158	500	500	500.9	4.51	1459	4.5	1429	4.48	144
12/2/96	161	500.4	499.7	500.8	5.39	735	5.41	770		83
12/2/96		500.1	499.5	500.1	4.72	1621	4.65	1713	4.67	177
12/2/96	168	500.9	500.2	501.3	6.16	494	6.13	481	6.21	48
12/2/96	171	500.3	500.5	500.2	4.93	1477	4.9	1455	4.99	139
12/3/96	163	501.9	500.8	501.9	4.07	1718	4.01	1762	4.01	174
12/3/96	169	49 9. 9	501.9	500.2	4.04	2610	4	2620	3.95	267
12/3/96	173	500.1	500.2	501.5	4.34	2060		2010		205
12/3/96	178	500.4	500.9	500.4	7.2	1973	7.14	2080		207
12/3/96	301	501	500.1	499.9	5.49	741	5.42	687	5.37	77
12/3/96	302	500.8	500.4	500.6	5.38	1138		975		109
12/6/96	3	500.2	500	500.8		4760		4500		545
12/6/96	162	500.5	500.4	500	4.52	1818		1815		149
12/6/96	167	500.2	500.4	500	4.47	2220		2170		221
12/6/96	174	500.6	500.5	500.7	6.74	885	6.72	817	6.76	
12/7/96	8	499.9	500	500.3	2.65	2880	2.65	2870		220
12/7/96	13-1	502.6	500.8	500.6	2.56	5110		4620		
12/7/96		502.8	501.5	500.1	2.51	6060		6340		
12/7/96		500.5	501.2	500.4	3.33	859	3.15	835		101
12/9/96	147	500.3	500.9	500.4	5.04	1767	5.15			
12/9/96		501.2	500.9	500.1	5.57	1186		1536		
12/9/96		500.2	497.9	500.3		1622	6.08	1174	6.16	
12/9/96	164	500.5	501.6	501	5.29	1990		1739		153
12/11/96		500.1	501	500.6		1657	5.02	1768		
12/11/96		500.1	500.3	499.9	4.81	1233		1150		
12/11/96		500.2	501	500.9		408				
12/11/96		501.3	500	501.3		655				
12/12/96		500.1	500.3	500.5		5.71	2.47	5.31	2.43	
12/14/96	166	500.4	500	500.6		2.19	4.66	1992	4.65	2.2
		Data QA'd	through this	s entry as c	of 1/30/97					
							1		[<u> </u>

						1				-
·			me Lime S					ours		
		Flask A	Flask B	Flask C	Fla	sk A	Fla	sk B	Fla	sk C
Start						Cond.		Cond.		Cond.
Date	Sample	(ml)	(ml)	(ml)	pH (su)	(uS/cm)	pH (su)	(uS/cm)	pH (su)	(uS/cm)
11/24/96	4	3.7	6.5	10	8.21	3510	9.57	5110		
11/24/96		5.5	8.5	12.3	3.57	4120	4.44	2730		
11/24/96	166	1.5	4	7.2	10.21	2220	10.28	6020	10.65	682
11/25/96	186	0.75	3	6	5.25	2840	5.8	2740	6.94	388
11/25/96	194	1.5	3.5	7	8.94	2320	9.26	4130	9.77	623
11/25/96	201	0.5	2.5	5.5	6.09	1689	7.75	2270	10.31	638
11/25/96	204	0.5	3	6	5.43	2080	9.86	2320	10.35	
11/25/96	209	0.5	1.5	4.5	7.74	1258	10.65	2570	10.39	637
11/25/96	210	0.5	3	4.75	8.9	1088	10.51	5370	10.35	719
11/25/96	211	2	4.5	7.5	9.97	2050	10.45	4410	10.96	530
11/25/96	212	. 0.5	2.5	5.5	7.88	1423	9.8	3500	10.05	634
11/25/96	213	3.5	6	9.5	4.99	2890	9.09	2720	9.42	265
11/26/96	187	0.5	1	3.5	4.94	1321	6.05	1719	10.03	444
11/26/96	188	0.5	1	4	5.37	2110	5.46	2040	10.72	373
11/26/96	189	0	0.5	2.5	5.53	665	9.61	794	10.51	311
11/26/96	192	0.5	0.75	2.5	8.29	845	9.56	917	10.01	260
11/26/96	195	0	0.5	2	5.99	1113	7.89	1157	10.42	224
11/26/96	197	0.5	0.75	3.5	9.37	1882	9.87	1983	10.26	399
11/26/96	199	0	0.5	2	6	1020	8.58	1134	10.44	223
11/26/96	200	0.5	0.75	3	9.83	1370	10.04	1538	9.76	298
11/26/96	202	0.5	0.75	2.75	7.33	1253	10.16	1519	10.77	339
11/27/96	198	0	0.5	2	5.74	817	9.7	904	11.38	162
11/27/96	205	0.5	1.5	4.5	4.66	2250	6.44	2140	11.9	376
11/27/96	207	0	0.5	2	6.02	717	9.64	759	11.89	210
11/28/96	190	0	1.5	4.3	5.06	1850	10.46	2110	12.28	599
11/28/96	193	0	0.5	1	6.44	1210	11.29	2020	11.38	209
11/28/96	196	0	0.5	1	6.29	387	10.39	702	11.34	120
11/28/96	203	0	0.5	2.2	5.66	1950	10.4	1530	11.5	278
11/28/96	206	0	0.5	2.5	5.28	1190	6.38	1140	8.93	380
11/28/96	208	0	0.5	2.2	5.81	923	11.87	2230	12.02	339
11/29/96	172	1	3.5	6.5	4.62	2690	10.4	2890	11.34	513
11/29/96	176	0	2.5	5.5	4.26	2950	6.2	2690	11.28	405
11/29/96	177	1	3	6	7.03	1988	10.62	2560	11.58	643
11/29/96	179	0	2	5	4.16	3020		3540		
11/29/96	181	2	4.5	8	4.72	2600	7.19	4031	11.17	394
11/29/96	191	0	0.5	1	5.91	792	10.48	937	11.06	169
11/30/96	146	0.5	2.5	5.5	8.04	979	12.1	1664	12.86	388
11/30/96	157		3.5	6.5	5.53	2050	12.27	3220	12.33	633
11/30/96	175	0.5	2.8	5.8	5.27	2540	10.78	2480	12.74	545
11/30/96	180	0.5	3	6	4.54	2840	6.01	2790	12.53	519
11/30/96	182	0.5	2.7	5.6	6.74	2180	10.59	2530	12.71	589
11/30/96	183	0.8	3.2	6.2	5.12	2580	10.6	2790	12.58	509
12/1/96	153	0.5	2.5	5.5	5.6	1842	11.29	2140	12.57	554
12/1/96	154	0.5	2.5	5.5	5.4	1530	12.03	2680	12.75	565
12/1/96	155	0.5	1.7	4.5	5.08	2090	7.33	2150	11.59	384
12/1/96	156	0.5	2.3	5	5.096	1900	10.97	2030	12.49	420
12/1/96	159	0.5	1.5	4.5	5.6	1979	9.49	2020	12.35	385
12/1/96	160	0.5	1.5	4.5	5.5	1678	6.98	1710	12.00	305
12/1/96	165	0.5	1.5	4.5	8.31	1711	8.89	1835	12.13	400
12/1/96	105	0.5	2.3	5.3	5.2	2020	10.27	2220	12.45	399

and the second

http://www.

Contraction and

2

ŝ

20-20 C

ŝ

Star West

And the state of

		Volu	ime Lime S	lurry			21 h	ours		
		Flask A	Flask B		Fla	sk A		sk B	Fla	sk C
Start						Cond.		Cond.		Cond.
Date	Sample	(ml)	(ml)	(mł)	pH (su)	(uS/cm)	pH (su)	(uS/cm)	pH (su)	(uS/cm)
12/1/96	173	0.5	1.5	4.5	5.39	1826		1962	ND	343
12/2/96	147	0.5	2	4.75	5.45	1852	9.8	1867	11.62	428
12/2/96	149	0.5	1	4	4.97	2230	6.7	2370	10.94	374
12/2/96	151	0.5	1	3.5	9.22	1376	9.99	1401	11.39	317
12/2/96	158	0.5	1	4		1214	8.41	1482	10.79	427
12/2/96	161	0.5	1	3	8.08	935	9.38	1016	11.32	322
12/2/96	166	0.5	1.5	4.5	6.27	1875	7.77	1895	10.39	466
12/2/96	168	0	0.5	1	5,76	655	9.45	728	10.69	128
12/2/96	171	0.5	1	4	5.72	1650	5.99	1568	11.62	288
12/3/96	163	1	3.25	6.25	6.16	1368	10.87	2770	11.78	473
12/3/96	169	3.5	1	6.5	8.76	2650	4.47	2260	10.94	379
12/3/96		0.5	5.5	2.5	4.67	1735	10.61	3610	8.15	18.4
12/3/96	178	0	0	0	6.97	2120	7.05	1982	7.14	192
12/3/96	301	0.5	1	2.75	7.97	845	9.85	1006	10.57	178
12/3/96	302	3	0.5	0.75	10.4	1582	6.44	1180	7.51	103
12/6/96	3	3.5	6	9.5	3.9	4070	5.53	3190	8.61	244
12/6/96	162	0.5	2	5	5.15	1763	9.65	1739	10.83	650
12/6/96	167	0.5	2	5	4.75	2270	8.92	2340	10.72	274
12/6/96	174	0	0	0	7.05	1282	7.15	1296	7.13	100
12/7/96	8	2	4.6	7.5	2.72	2010	8.87	2510	7	314
12/7/96	13-1	3.5	6.5	10	2.52	5510	2.65	3980	2.98	372
12/7/96	15-1	8.7	12.6	16	2.52	4260	2.63	3200	6.15	191
12/7/96	211	0.5	1	2	4.95	1222	5.3	1247	9.34	151
12/9/96	147	0.5	1	3.5	5.59	2010	6.83	1946	12.57	308
12/9/96	148	0.5	1	2.5	9.98	1354	9.23	1454	12.22	2.2
12/9/96	152	0	0.5	1	5.52	1563	8.41	1294	9.3	131
12/9/96	164	0.5	1	3	6.76	1798	7.74	1832	11.88	202
12/11/96	150	0.5	1	3.5	8.89	2.31	9.15	2180	12.07	387
12/11/96	171	0.5	1.5	4	8.3	1550	9.59	1625	10.8	4
12/11/96	184	0.5	1	3.5	7.82	471	8.69	722	11.95	372
12/11/96	185	1	0.5	3.5	4.72	940	11.37	988	12.28	278
12/12/96	13-1	9	11	13	3.08	2.67	4.45	ND	6.18	172
12/14/96	166	0.5	1.5	4.5	5.44	1702	5.5	1695	11.87	279
		Data QA'd t	hrough this	entry as o	f 1/30/97					
				-						

Appendix G

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

MLD2\96F022\GBAPP\43134 .61

		 *	5 × 783.			- e ²	171-12. S o	مي ^{ين ت} كشور حدا	Sheet1	Stockpi	le ann	/ C., C	o) and	robl	Price	h kuh	5
		B	SFY of Tab	H BF	5 w Vesi color	вар 15 15 15	Sangles Seat Sea JAT, 20	l Atm 160 Ar	Tiope . E Car	st beel	fill int 2 che	m de	nie s ca. Jär s So	tucale me. see	J - (4, 3302; L	2457- 3-20 /2 8 pre 16	- p. 5)
Column Number	Column Name	Date	Displace ment	Sample	рН (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	o	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	40	r 0		2.7	430	<0.026
7	213 w/LS	12/29/96	0	291	3.35	206	11600	3.9		290	9700	18	58		2.1	430	-0.020
8	187 w/LS	12/29/96	0	623	4.76	141	6290	4.8		2700 3300	6000 6800						
9	194 w/LS	12/29/96	0	702	4.61	171	6910	4.8 5.3		230	2300						
10	192 w/LS	12/29/96	0	338	5.22 3.31	156 282	3300 4310	3.4		1500	2300						
11	8-1 w/LS	12/29/96 12/29/96	0	296 360	3.31 4.77	102	6120	4.7		2300	6100						
12	190 w/LS		0	372	4.55	116	10400	4.7		5600	6600						
13	172 w/LS 176 w/LS	12/29/96 12/29/96	0	571	4.33	113	8500	4.7		4400	9200						
14 15	BF-4	12/28/96	Ö	487	7.66	-33.6	4160	5.6		<2	3000						
15	BF-5	12/28/96	õ	363	7.33	-35.1	3780	6.1		<2	2500						
10	CUF-1	12/28/96	õ	581	8.35	-57.9	1350	6.7	24		670						
18	CUF-2	12/28/96	õ	322	8.49	-83,1	972	6.7	<1.5		600						
19	15-3 w/Lime		0	510	2.44	194	8140	3		400	8000						
20	180 w/Lime	12/28/96	ō	493	4,41	155	5750	4.3		34	6100						
21	181 w/Lime	12/28/96	D	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	4.4	26		0.14	480	<0.026
28	15-3 w/LS	12/28/96	0	571	3.73	141	7000	3.3	0.1	100	7000	11 13	26 0.37	0.034	0.14	480 550	0.025
1	186 w/LS	12/30/96	1	1065	8.03	-34	2970	6.7	81	~?	620 810	13	<0.034	Ų.U34	0.22	550	<0.023
2	186 w/Lime	12/30/96	1	677	5.16	21	2630	5.5		<2 1600	1700	4.2	< 0.034		1.2	470	<0.026
3	170 w/LS	1/7/97	1	1086	4.83	137	415	4.7 2.7		3800	2700	4.2 9.3	72	<0.16	0.092	470	<0.026
4	13-1 w/LS	12/30/96	1	642	2.76	180 126	7130 4540	4.7		1100	1800	9.3 8.4	< 0.34	-0.10	2,3	470	<0.026
5	188 w/LS	12/30/96	1	658	5.20 5.02	120	4540 5500	4.7		2000	2600	6.7	<0.34		0.38	450	<0.026
6	183 w/LS	12/30/96	1	656 649	5.02 4.57	160	7020	4.7		2700	6300	10	19	<0.16	1.3	470	<0.026
7	213 w/LS	12/30/96	1	649 544	4.57 5.16	142	4220	4.9		1100	2400	6.5	<0.34	\$, 1	0.1	500	<0.026
8	187 w/LS	12/30/96 12/30/96	1	544 590	5.28	134	2810	5.1		290	1000	2.6	1.8		0.069	490	0.073
9	194 w/LS	12/30/96	1	575	5.20	124	2700	5.4		82	860	3,4	<0.034	0.038	0.018	440	<0.0026
10	192 w/LS 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
11	0-IWILO	12/30/96	1	653	5.35	130	4270	4.9	÷.	1200	1100	8.8	< 0.34		0.3	410	<0.026

Page 1

Shee	11

Column Number	Column Name	Date	Displace ment	Co (mg/L)	Cu (mg/L)	Fe ^{z+} (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)	TI (mg/L)	Na (mg/L)	Zn (mg/L
1	186 w/LS	12/29/96	0						110								
2	186 w/Lime	12/29/96	Ō						130								
3	170 w/LS		ō														
4	13-1 w/LS	12/29/96	Ō	17	4200	160	3100		<600	58			<2		<0.025	10	95
5	188 w/LS	12/29/96	ō						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	Ó						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

Page 2

.

Column	Column		Displace	Sample Volume	pН	Eħ	Cond.	Lab pH	Alkalinity (mgCaCO3	AcIdity (mgCaCO3	SO₄	СІ	AI	As	Cď	Са	Cr
Number	Name	Date	ment	(mL)	(s.u.)	(mV)	(mS/cm)	(su)	mg/L)	mg/L}	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
13	172 w/LS	12/30/96	1	737	5.10	134	5810	4.6	<u> </u>	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	8F-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	8F-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

Sheet1

And the second s

 $w \sim e^{-\epsilon + \epsilon \gamma}$

6. 44. 1 m 24. 24

pr + 7 + - + - 4 + 4 +

and a second

1000 W 2000

A CARLES AND A CAR

a server server and a server server

Page 3

Shee	et1
------	-----

Column Number	Column Name	Date	Displace ment	Co (mg/L)	Cu (mg/L)	Fe ¹⁺ (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)	TI (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	0.08	<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

4

Page 4

Sheet1

1.00000000

10,000

يديده فالمحربو

 $(h, a) = (a) a^{2} a^{2} (h = 1)$

حكانا حادثهم فر

 يسدقنا وربوتهم

Section and

وفقات بالمحر والمر

genes with

1000

 $(A_{i,n})$

. exercised

والأخلاج والمرور والمراجع

وجديد والاروج

يوها المتحدين ورواري

ancer

.....

			Displace	Sample		Ëh	Cond.	Lab pH	Alkalinity (mgCaCO3	Acidity (mgCaCO3	SO4	CI	A1	As	Cd	Са	Cr
Column	Column	m -4-	Displace	Volume	pH	(mV)	(mS/cm)	(su)	(ingeaces mg/L)	mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Number	Name	Date	ment	(mL)	(8.u.)	78.7	4370	5.4	mgrer	1700	5900	4	1	(1.4	420	0.064
26	181 w/LS	1/13/97	2	1378	4.71 6.52	-21	4370 2130	5.4 4,6		100	1200	2.4	1,6		0.18	370	0.13
27	180 w/LS	1/13/97	2	1384	6.52 5.39	40.4	3060	4,0 6,5	<1.5	100	1200	4	1.8		0.027	510	0.041
28	15-3 w/LS	1/13/97	2	1534 1103	5.59 6.68	40. 4 -7	2560	6.6	47		690	-	0.16	<0.016	0.021	570	
1	186 w/LS	2/4/97	3	935	6.24	-7 -14	2360	6.5	11	<2	600		<0.034	<0.016	0.0079	590	
2	186 w/Lime	2/4/97	3	935 1193	0.24 5.47	50	2480	6		<2	660		<0.034	<0.016	0.045	460	
3	170 w/LS	2/4/97	3	1193	5.47 4.96	53	2030	5.7		40	700		0.075	<0.016	0.0082	570	
4	13-1 w/LS	2/4/97	3	1259	4.90	58	2430	5,4		32	610		0.072	<0.016	0.19	480	
5	188 w/LS	2/4/97	3 3	1259	5.20 4.77	74	2470	5		190	700		<0.034	<0.016	0.032	510	
6	183 w/LS	2/4/97	3	1044	6.45	-19	713	5.6		<2	520		0.065	<0.016	0.0047	130	
7	213 w/LS	2/4/97	-	1233	5.55	46	2230	5.5		<2	580		< 0.034	<0.016	0.013	520	
8	187 w/LS	2/4/97	3 3	926	6.61	50	2240	6		<2	850		0.05	<0.016	0.0091	530	
9	194 w/LS	2/4/97 2/4/97	3	1092	5.68	41	660	6		<2	510		<0.034	<0.016	0.0037	94	
10	192 w/LS		3	858	6.95	41	2440	5.9		<2	560		<0.034	<0.016	0.0044	600	
11	8-1 w/LS	2/4/97 2/4/97	3	1102	4.84	66.5	1791	6.1		<2	560		<0.034	<0.016	0.045	310	
12	190 w/LS 172 w/LS	2/4/97	3	1118	5.60	73	2250	5.3		<2	660		<0.034	<0.018	0.013	520	
13	172 W/LS 176 w/LS	2/4/97	3	1011	5.63	51.1	2400	5.7		<2	680		<0.034	<0.016	0.031	590	
14	BF-4	2/4/97	3	1115	7.58	-33.8	895	6.2		<2	540		<0.034	<0.016	0.014	140	
15	BF-4 BF-5	2/4/97	3	1134	6.73	-3.3	1261	6.3		<2	590		<0.034	<0.016	0.0096	230	
16 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-1 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	
20	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	<0.01 6	0.0014	460	

Press and see

1994 - A.C. -

Sheet1

Column Number	Column Name	Date	Displace ment	Co (mg/L)	Cu (mg/L)	Fe ¹⁺ (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)	Ti (mg/L)	Na (mg/L)	Zn (mg/L)
26	181 w/LS	1/13/97	2	7.7	1000	1.2	1	(8)	160	22	(18)	(11181-1	2.1	(ingre)	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	8F-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

MLD2\96F022\GBAPP\43134 .61

NORTHERN LAKE S analytical Laboratory and I 00 North Lake Avenue - C	Environmental Services				WIS. LAB	CERT. NO. 72102	6460
el:(715)478-2777 Fax:(715		ANALYTIC	AL REPORT		PAGE: 1	NLS PROJ	ECT# 31692
Client:	Foth & Van Dyke Ass Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 5430						
Project Descript Project Title: 9 Sample ID: FMC-1		35	<u></u>				
Ref. Line 1 of COC 2161 Collected: 12/30/96 F	3 Description: FMC-172LS-1 leceived: 01/03/97 Reported: 01/					N (1 1	
arameter		Result	Units	LOD	LOQ	Method	Analyzed Lab
Acidity, tot. as Aluminum, dis. as Cadmium, dis. as Calcium, dis. as Chloride, as Cl (f. Chromium, dis. as Cobalt, dis. as Co Copper, dis. as Co Fron, Ferrous	Cd by ICP Ca by ICP iltered) Cr by ICP o by ICP	2300 < 0.74 > 230 480 6.1 ND 6500 1700000 0.042 Additional	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L Commenta: F&VD mod	2.0 0.34 12 30 0,36 26 43 270 0.0091 dified method	2.0 1.2 38 30 1.3 93 150 950 0.030	EPA 200.7	07/01/97 721026 01/16/97 721026 01/16/97 721026 01/08/97 721026 01/08/97 721026 01/16/97 721026 01/16/97 721026 01/16/97 721026 01/16/97 721026
ron, dis. as Fe l Magnesium, dis. as Manganese, dis. as MH, lab Potassium, dis. as	s Mg by ICP s Mn by ICP	4.6 5.7	mg/L mg/L ug/L s.u. mg/L mg/L mg/L	0.10 30 18 1.0 2.0 0.33 250	0.35 30 61 6.6 1.1 250	EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7	01/16/97 721026 01/16/97 721026 01/16/97 721026 01/03/97 721026 01/10/97 721026 01/16/97 721026 01/14/97 721026

en risen el a

655.55

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

gere war it allow

Status Case

والشيشي وسرجها

بهشتخفته بالتحام

Atum R. Cuyin 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 Tel:(715)478-2777 Fax:(715)478-3060

ANALYTICAL REPORT

WIS. LAB CERT. NO. 721026460

PAGE: 2 NLS PROJECT# 31692

Client: Foth & Van Dyke Associates Attn: Russ Janeshek

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	<u>Units</u>	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 mo	dified method			
Tron, 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 DWB = Dry Weight Basis LOQ = Limit of Quantitation NA = Not Applicable ND = Not Detected %DWB = (mg/kg DWB)/10000

in R. Cum

Authorized by: R. T. Krueger Laboratory Manager

.

NORTHERN LAKE SERVICE, INC. Malytical Laboratory and Environmental Services 00 North Lake Avenue - Crandon, WI 54520				WIS. LAB (CERT. NO. 72102	6460
Fel:(715)478-2777 Fax:(715)478-3060	ANALYTI	CAL REPORT		PAGE: 3	NLS PROJ	ECT# 31692
Client: Foth & Van Attn: Russ 2737 S. R PO Box 190 Green Bay,	idge Road 12					
Project Description: Flambeau Project Title: 96F022	Mining					
Sample ID: FMC-176LS-1 N Ref. Line 3 of COC 21618 Description: FMC-1 Collected: 12/30/96 Received: 01/03/97	LS#: 124637 76LS-1 Reported: 01/17/97					
Parameter	Result	Units	LOD	FOO	Method	Analyzed Lab
Acidity, tot. as CaCO3 Aluminum, dis. as Al by ICP Cadmium, dis. as Cd by ICP Calcium, dis. as Ca by ICP Chloride, as Cl (filtered) Chromium, dis. as Cr by ICP Cobalt, dis. as Co by ICP Copper, dis. as Cu by ICP Iron, Ferrous	1400 ND 470 520 8.0 ND 12000 1000000 0.031 additional	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L l Comments: F&VD mo	2.0 0.34 12 30 0.36 26 43 270 0.0091 dified method	2.0 1.2 38 30 1.3 93 150 950 0.030	EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7	07/01/97 7210264 01/16/97 7210264 01/16/97 7210264 01/16/97 7210264 01/08/97 7210264 01/16/97 7210264 01/16/97 7210264 01/16/97 7210264 01/16/97 7210264
Iron, dis. as Fe by ICP Magnesium, dis. as Mg by ICP Manganese, dis. as Mn by ICP pH, lab Potassium, dis. as K Sodium, dis. as Na by ICP Sulfate, as SO4 (filtered) Thallium, dis. as Tl by furnace A Zinc, dis. as Zn by ICP	ND 96 8400 4.7 11 7.1 2200	mg/L mg/L ug/L s.u. mg/L mg/L mg/L ug/L ug/L ug/L	0.10 30 18 1.0 2.0 0.33 250 25 1200	0.35 30 61 6.6 1.1 250 87 1200	EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7 EPA 375.2 EPA 279.2	01/16/97 7210264 01/16/97 7210264 01/16/97 7210264 01/03/97 7210264 01/10/97 7210264 01/16/97 7210264 01/16/97 7210264 01/15/97 7210264 01/16/97 7210264
Values in brackets represent resul Results greater than the LOQ are c	ts greater than the LOD but I onsidered to be in the region	less than the LOQ an n of "Certain Quanti	d are within a : tation".	region of "	Less-Certair	Quantitation".
LOD = Limit of Detection DWB = Dry Weight Basis	LOQ = Limit of Quantitation NA = Not Applicable	ND = Not Detect %DWB = (mg/kg D	ed WB)/10000			
		Atum R! Reviewed by:	Cuyi	Authorize R. T. K Laborator		

....

.....

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

ANALYTICAL REPORT

WIS. LAB CERT. NO. 721026460

PAGE: 4 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-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 Aluminum, dis. as Al by ICP Cadmium, dis. as Cd by ICP Calcium, dis. as Ca by ICP Chloride, as Cl (filtered) Chromium, dis. as Cr by ICP Cobalt, dis. as Co by ICP	1200 ND 300 410 8.8 ND 10000	mg/L mg/L mg/L mg/L ug/L ug/L ug/L	2.0 0.34 12 30 0.36 26 43	2.0 1.2 38 30 1.3 93 150	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	07/01/97 721026460 01/16/97 721026460 01/16/97 721026460 01/16/97 721026460 01/08/97 721026460 01/16/97 721026460 01/16/97 721026460
-	Copper, dis. as Co by ICP Iron, Ferrous Iron, dis. as Fe by ICP	940000 0.038 Additional Co ND	ug/L mg/L	270 0.0091	950 0.030 0.35	EPA 200.7	01/16/97 721026460 01/17/97 721026460 01/16/97 721026460
-	Magnesium, dis. as Mg by ICP Manganese, dis. as Mn by ICP pH, lab Potassium, dis. as K	150 22000 4.9 25	mğ/L ug/L s.u. mg/L	30 18 1.0 2.0	30 61 6.6	EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7	01/16/97 721026460 01/16/97 721026460 01/03/97 721026460 01/10/97 721026460
	Sodium, dis. as Na by ICP Sulfate, as SO4 (filtered) Thallium, dis. as Tl by furnace AAS Zinc, dis. as Zn by ICP	7.2 1100 ND 54000	mg/L mg/L ug/L ug/L	0.33 250 25 1200	1.1 250 87 1200	EPA 200.7 EPA 375.2 EPA 279.2 EPA 200.7	01/16/97 721026460 01/16/97 721026460 01/15/97 721026460 01/15/97 721026460 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

Ш

LOQ = Limit of Quantitation NA = Not Applicable ND = Not Detected %DWB = (mg/kg DWB)/10000

Theun R. Cenyn Reviewed by:

Authorized by: R. T. Krueger Laboratory Manager

.

NORTHERN LAKE SEF Analytical Laboratory and En 400 North Lake Avenue - Crai	vironmental Services				WIS. LAB (CERT. NO. 72102	6460
Tel:(715)478-2777 Fax:(715)4		ANALYTICA	L REPORT		PAGE: 5	NLS PROJ	ECT# 31692
Client:	Foth & Van Dyke As: Attn: Russ Janeshe 2737 S. Ridge Roa PO Box 19012 Green Bay, WI 5430	k d					
Project Title: 961		462.0					
Sample ID: FMC-13 Ref. Line 5 of COC 21618 Collected: 12/30/96 Rec	Description: FMC-13-ILS-1	/17/97			* 00		Inclused tob
Parameter		Result	Units	LOD	roð	Method	Analyzed Lab
Acidity, tot. as Ca Aluminum, dis. as A Arsenic, dis. as As Cadmium, dis. as Ca Calcium, dis. as Ca Chloride, as Cl (fil Chromium, dis. as C Cobalt, dis. as Co Copper, dis. as Cu Iron, Ferrous	l by ICP by ICP by ICP tered) r by ICP by ICP by ICP		mg/L mg/L ug/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L mg/L comments: F&VD mod		2.0 1.2 570 30 1.3 93 150 950 0.030	EPA 200.7 EPA 200.7 EPA 200.7 EPA 202.7 EPA 200.7 EPA 200.7 EPA 200.7	01/16/97 721026 01/16/97 721026 01/16/97 721026 01/16/97 721026 01/08/97 721026 01/16/97 721026 01/16/97 721026 01/16/97 721026 01/16/97 721026
Iron, dis. as Fe by Lead, dis. as Pb by Magnesium, dis. as Manganese, dis. as Mercury, dis. as Hg pH, lab Potassium, dis. as Selenium, dis. as S	ICP Mg by ICP Mn by ICP K	700 ND 120 24000 ND 2.7 ND ND < 0.73 >	mg/L ug/L mg/L ug/L ug/L s.u. mg/L ug/L mg/L mg/L	0.10 150 30 18 0.13 1.0 2.0 37 0.33 250	0.35 520 30 61 0.47 6.6 130 1.1 250	EPA 200.7 EPA 200.7 EPA 245.1 EPA 150.1 EPA 200.7 EPA 270 2	01/16/97 721026 01/16/97 721026 01/16/97 721026 01/16/97 721026 01/17/97 721026 01/03/97 721026 01/10/97 721026 01/16/97 721026 01/16/97 721026

generalized experience and the support of the state of the

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

والمحافظ والمح

** 7.5 ×

LOQ = Limit of Quantitation NA = Not Applicable

and the second

والاختلافي والالتي المراجع

ND = Not Detected %DWB = (mg/kg DWB)/10000

lyn - K -Reviewed by:

Authorized by: R. T. Krueger Laboratory Manager

and the second s

يوجعه ومرور

100.000

	NORTHERN LAKE SERVI Analytical Laboratory and Enviro 400 North Lake Avenue - Crandor	nmental Services				WIS. LAB (CERT. NO. 72102	:6460
1	Tel:(715)478-2777 Fax:(715)478-3		ANALYTIC	AL REPORT		PAGE: 6	NLS PROJ	ECT# 31692
		Foth & Van Dyke Associa Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307	ates					
	Project Description: Project Title: 96F02 Sample ID: FMC-183LS Ref. Line 6 of COC 21618 De	2 -1 NLS#: 124640 scription: FMC-183LS-1						
	Collected: 12/30/96 Receive Parameter	d: 01/03/97 Reported: 01/17/97	Result	Units	LOD	LOQ	Method	Analyzed Lab
	Acidity, tot. as CaCO3 Aluminum, dis. as Al b Cadmium, dis. as Cd by Calcium, dis. as Ca by Chloride, as Cl (filter Chromium, dis. as Cr b Cobalt, dis. as Co by Copper, dis. as Cu by Iron, Ferrous	Y ICP ICP ed) y ICP ICP	2000 ND 380 450 6.7 ND 6900 1600000 0.046 Additional	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L mg/L	2.0 0,34 12 30 0.36 26 43 270 0.0091 ified method	2.0 1.2 38 30 1.3 93 150 950 0.030	EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7	07/01/97 721026460
13	Iron, dis. as Fe by IC Magnesium, dis. as Mg Manganese, dis. as Mn pH, lab Potassium, dis. as K Sodium, dis. as Na by Sulfate, as SO4 (filter Thallium, dis. as Tl b Zinc, dis. as Zn by IC	by ICP by ICP ICP ed) y furnace AAS	0.56 210 21000 4.7 13 9.0 2600 < 35 > 49000	mg/L mg/L s.u. mg/L mg/L mg/L mg/L ug/L ug/L	0,10 30 18 1.0 2.0 0,33 250 25 1200	0.35 30 61 6.6 1.1 250 87 1200	EPA 150.1 EPA 200.7 EPA 200.7 EPA 375.2 EPA 279.2	01/16/97 721026460 01/16/97 721026460 01/16/97 721026460 01/03/97 721026460 01/10/97 721026460 01/16/97 721026460 01/16/97 721026460 01/15/97 721026460

LOD = Limit of Detection DWB = Dry Weight Basis LOQ = Limit of Quantitation NA = Not Applicable

ND = Not Detected %DWB = (mg/kg DWB)/10000

Alter R. Cenyn Reviewed by:

·- ..

مروادها بما بالمنابي ومستجرونا الراالي

Authorized by: R. T. Krueger Laboratory Manager

NORTHERN LAKE SERVICE, INC.				WIS. LAB	CERT. NO. 72102	6460
100 North Lake Avenue - Crandon, WI 54520 Fel:(715)478-2777 Fax:(715)478-3060	ANALYTIC	AL REPORT		PAGE: 7	NLS PROJ	ECT# 31692
Client: Foth & Van Dyke Ass Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 5430						
Project Description: Flambeau Mining Project Title: 96F022						,
Sample ID: FMC-213LS-1 NLS#: 1246 Ref. Line 7 of COC 21618 Description: FMC-213LS-1 Collected: 12/30/96 Received: 01/03/97 Reported: 01/						
Parameter	Result	Units	LOD	LOQ	Method	Analyzed Lab
Acidity, tot. as CaCO3	2700	mg/L	2.0	2.0	EPA 305.1	
Aluminum, dis. as Al by ICP	19 ND	mg/L ug/L	0.34 160	1.2 570	EPA 200.7 EPA 200.7	01/16/97 721026
Arsenic, dis. as As by ICP	ND 1300	ug/L	12	38	EPA 200.7	01/16/97 721020
Cadmium, dis. as Cd by ICP Calcium, dis. as Ca by ICP	470	mg/L	30	30	EPA 200.7	01/16/97 721020
Chloride, as Cl (filtered)	10	mg/L	0.36	1.3	EPA 325.2	01/08/97 721020
Chromium, dis. as Cr by ICP	ND	ug/L	26	93 150	EPA 200.7	01/16/97 72102
Cobalt, dis, as Co by ICP	11000 2100000	ug/L ug/L	43 270	950	EPA 200.7	01/16/97 721026
Copper, dis. as Cu by ICP	0.74	mg/L	0.0091	0.030	2011 20217	01/17/97 721020
Iron, Ferrous	Additional	Comments: F&VD mc	dified method.	Result may	have	
	been affecte	d by sample turbic	lity.			$n_1/1c/n_2$ 70100
Iron, dis. as Fe by ICP	2.2	mg/L	0.10	0.35 520	EPA 200.7	01/16/97 72102
Lead, dis. as Pb by ICP	ND 320	ug/L mg/L	30	30	EPA 200.7	01/16/97 72102
Magnesium, dis. as Mg by ICP Manganese, dis. as Mn by ICP	28000	ug/L	18	61	EPA 200.7	01/16/97 721020
Manganese, dis. as Min by icr Mercury, dis. as Hg	ND	ug/L	0.13	0.47	EPA 245.1	01/17/97 72102
pH, lab	4,2	s.u.	1.0	c c	EPA 150.1	01/03/97 721020 01/10/97 721020
Potassium, dis. as K Selenium, dis. as Se by furnace	ND < 110 >	mg/L ug/L	2.0 37	6.6 130	EPA 200.7 EPA 270 2	01/16/97 721026
Selenium, dis. as Se by furnace	< 110 > 1.6	mg/L	0.33	1,1	EPA 200.7	01/16/97 721020
Sodium, dis. as Na by ICP	6300	mg/L	2500	2500	EPA 375.2	01/16/97 72102
				87	100x 370 7	01/15/97 721020
Sulfate, as SO4 (filtered) Thallium, dis. as Tl by furnace AAS	ND 300000	ug/L ug/L	25 6000	6000	EPA 2/9.2	01/16/97 72102

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

ويحيد المتعتين

Doint white

ND = Not Detected %DWB = (mg/kg DWB)/10000

Attenen R. Guyen

.

.

Authorized by: R. T. Krueger Laboratory Manager

the second se

.

.

er an start

والأشير والإيجاز كالعو

.. .

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

ANALYTICAL REPORT

WIS. LAB CERT. NO. 721026460

PAGE: 8 NLS PROJECT# 31692

	ANALTIN	AL NEFONI		PAGE: 8	NLS PROJ	ECT# 31692
Client: Foth & Van Dyke Ase Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 5430	l					
Project Description: Flambeau Mining Project Title: 96F022						
Sample ID: FMC-188LS-1 NLS#: 1246 Ref. Line 8 of COC 21618 Description: FMC-188LS-1 Collected: 12/30/96 Received: 01/03/97 Reported: 01/ Parameter		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	
Cadmium, dis. as Cd by ICP	2300 470	ug/L	12 30	38	EPA 200.7	
Calcium, dis. as Ca by ICP	8.4	mg/L	0.36	30	EPA 200.7	
Chloride, as Cl (filtered) Chromium, dis. as Cr by ICP	ND	mg/L	26	1.3 93	EPA 325.2	
Cobalt, dis. as Co by ICP	11000	ug/L ug/L	43	150	EPA 200.7 EPA 200.7	
Copper, dis. as Cu by ICP	880000	ug/L	270	950	EPA 200.7	
Iron, Ferrous	0.039	mg/L	0.0091	0.030	BER 200.1	01/17/97 721026460
ilon, tolloub	Additional	Comments: F&VD mo	dified method	0.030		01/1//07 /21020400
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	
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	
Sodium, dis. as Na by ICP	8.8	mg/L	0.33	1.1	EPA 200.7	
Sulfate, as SO4 (filtered)	1800	mg/L	250	250	EPA 375.2	
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	
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 DWB = Dry Weight Basis

片

LOQ = Limit of Quantitation NA = Not Applicable

ND = Not Detected %DWB = (mg/kg DWB)/10000

Reviewed by:

Authorized by: R. T. Krueger Laboratory Manager

NORTHERN LAKE SE Analytical Laboratory and Er	vironmental Services				WIS. LAB	CERT. NO. 72102	6460
400 North Lake Avenue - Cra Tel:(715)478-2777 Fax:(715)4		ANALYTIC	AL REPORT		PAGE: 9	NLS PROJ	ECT# 31692
Client:	Foth & Van Dyke Ass Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 5430						
Project Title: 96							
Sample ID: FMC-18 Ref. Line 9 of COC 21618 Collected: 12/30/96 Re	Description: FMC-186LS-1						
Parameter		Result	Units	LOD	LOQ	Method	Analyzed Lab
Alkalinity, tot. as Aluminum, dis. as A Arsenic, dis. as As Cadmium, dis. as Co Calcium, dis. as Co Chloride, as Cl (fil Chromium, dis. as C Cobalt, dis. as Co Copper, dis. as Cu Iron, Ferrous	Al by ICP by ICP d by ICP tered) Cr by ICP by ICP by ICP by ICP		mg/L mg/L ug/L ug/L mg/L ug/L ug/L ug/L mg/L Comments: F&VD mo		5.3 0.12 57 3.8 3.0 1.3 9.3 15 19 0.030	EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/07/97 721026 01/15/97 721026 01/15/97 721026 01/15/97 721026 01/15/97 721026 01/08/97 721026 01/15/97 721026 01/15/97 721026 01/15/97 721026 01/15/97 721026
Iron, dis. as Fe by Lead, dis. as Pb by Magnesium, dis. as Manganese, dis. as Mercury, dis. as He pH, lab Potassium, dis. as S Solium, dis. as Na Sulfate, as SO4 {fil Thallium, dis. as T Zinc, dis. as Zn by	r ICP Mg by ICP Mn by ICP K Se by furnace by ICP tered) Yl by furnace AAS	0.044 ND 120 6000 ND 6.7 10 < 110 > 11 620 ND 41000	mg/L ug/L mg/L ug/L ug/L s.u. mg/L ug/L ug/L ug/L ug/L	0.010 15 3.0 1.8 0.13 1.0 2.0 37 0.033 250 25 120	0.035 52 3.0 6.1 0.47 6.6 130 0.11 250 87 120	EPA 200.7 EPA 200.7 EPA 200.7 EPA 245.1 EPA 150.1 EPA 200.7 EPA 270.2 EPA 200.7 EPA 200.7 EPA 270.2 EPA 279.2	01/15/97 721026 01/15/97 721026 01/15/97 721026 01/15/97 721026 01/15/97 721026 01/03/97 721026 01/10/97 721026 01/16/97 721026 01/15/97 721026 01/15/97 721026 01/15/97 721026

LOD = Limit of Detection DWB = Dry Weight Basis

- - . .

, · · ·

Aneres

LOQ = Limit of Quantitation NA = Not Applicable

. .

ND = Not Detected %DWB = (mg/kg DWB)/10000

Atturn R. Cum Reviewed by:

Authorized by: R. T. Krueger Laboratory Manager

ورجارت والمرجع

free opening

and the second s

Analytical Laboratory and 400 North Lake Avenue - Tel:(715)478-2777 Fax:(7	l Environmental Service: Crandon, WI 54520 15)478-3060	S	ANALYTIC	AL REPORT		PAGE: 10	NLS PRO	JECT# 316	592
Client:	Attn: Rus 2737 S. PO Box 19	n Dyke Associat s Janeshek Ridge Road 012 , WI 54307	Ce8						
Project Descrip Project Title:	tion: Flambeau 96F022	Mining							
Sample ID: FMC- Ref. Line 10 of COC 21 Collected: 12/30/96	618 Description: FM	LS#: 124644 C-186L-1 Reported: 01/17/97							
Parameter			Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as Aluminum, dis. as Cadmium, dis. as Calcium, dis. as Chloride, as Cl { Chromium, dis. as Cobalt, dis. as Copper, dis. as Iron, Ferrous	s Al by ICP Cd by ICP Ca by ICP filtered) s Cr by ICP Co by ICP		ND ND 41 550 16 ND 890 23000 0.44	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L Comments: F&VD mo	2.0 0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091 dified method	2.0 0.12 3.8 3.0 1.3 9.3 15 19 0.030	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7	01/15/97 01/15/97 01/15/97 01/08/97 01/15/97 01/15/97	72102 72102 72102 72102 72102 72102 72102
Iron, dis. as Fe Magnesium, dis. Manganese, dis. pH, lab Potassium, dis. Sodium, dis. as Sulfate, as SO4 (Thallium, dis. a Zinc, dis. as Zn	as Mg by ICP as Mn by ICP as K Na by ICP filtered) s Tl by furnace		Additional 0.28 40 3100 5.5 24 8.0 810 ND 8100	mg/L mg/L ug/L s.u. mg/L mg/L mg/L ug/L ug/L ug/L	0.010 3.0 1.8 1.0 2.0 0.033 250 25 120	0.035 3.0 6.1 6.6 0.11 250 87 120	EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7 EPA 150.1 EPA 200.7 EPA 375.2 EPA 375.2 EPA 279.2 EPA 200.7	01/15/97 01/15/97 01/03/97 01/10/97 01/15/97 01/16/97 01/15/97	72102 72102 72102 72102 72102 72102 72102 72102
Values in bracket Results greater t	s represent resu han the LOQ are	lts greater than considered to be	the LOD but la in the region	ess than the LOQ an of "Certain Quanti	d are within a tation".	region of "I	Less-Certain	u Quantita	tion".
LOD = Limit of De DWB = Dry Weight		LOQ = Limit of Q NA = Not Applica	Quantitation able	ND = Not Detect %DWB = (mg/kg D	WB)/10000				
				Atum R. Reviewed by:	Cenyn	Authorized R. T. Ki Laboratory	rueger		

.

<u>`</u>,

NORTHERN LAKE SERVICE, INC. nalytical Laboratory and Environmental Services				WIS. LAB C	ERT. NO. 72102	6460
00 North Lake Avenue - Crandon, WI 54520 el:(715)478-2777 Fax:(715)478-3060	ANALYTIC	CAL REPORT		PAGE: 11	NLS PRO	JECT# 31692
Client: Foth & Van Dy Attn: Russ Ja 2737 S. Ridg PO Box 19012 Green Bay, WI	neshek e Road					
ef. Line 11 of COC 21618 Description: FMC-1921	: 124645					
arameter	Result	Units	LOD	LOQ	Method	Analyzed Lab
cidity, tot. as CaCO3 luminum, dis. as Al by ICP rsenic, dis. as As by ICP admium, dis. as Cd by ICP alcium, dis. as Cd by ICP hloride, as Cl (filtered) hromium, dis. as Cr by ICP obalt, dis. as Co by ICP opper, dis. as Cu by ICP ron, Ferrous			2.0 0.034 16 1.2 3.0 0.36 2.6 4.3 5.4 0.0091 dified method	2.0 0.12 57 3.8 3.0 1.3 9.3 15 19 0.030	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7	07/01/97 7210266 01/15/97 7210266 01/15/97 7210266 01/15/97 7210266 01/15/97 7210266 01/15/97 7210266 01/15/97 7210266 01/15/97 7210266 01/15/97 7210266 01/15/97 7210266
ron, dis. as Fe by ICP ead, dis. as Pb by ICP agnesium, dis. as Mg by ICP anganese, dis. as Mn by ICP ercury, dis. as Hg H, lab otassium, dis. as K elenium, dis. as Se by furnace odium, dis. as Na by ICP ulfate, as SO4 (filtered) hallium, dis. as Tl by furnace AAS	0.18 ND 110 8200 ND 5.4 15 140 10 860 ND	mg/L ug/L mg/L ug/L ug/L s.u. mg/L mg/L mg/L ug/L ug/L	0.010 15 3.0 1.8 0.13 1.0 2.0 37 0.033 250 25	0.035 52 3.0 6.1 0.47 6.6 130 0.11 250 87	EPA 200.7 EPA 200.7 EPA 200.7 EPA 245.1 EPA 245.1 EPA 150.1 EPA 200.7 EPA 270.2 EPA 270.2 EPA 270.2 EPA 279.2	01/15/97 721026 01/15/97 721026 01/15/97 721026 01/15/97 721026 01/03/97 721026 01/03/97 721026 01/16/97 721026 01/16/97 721026 01/16/97 721026 01/16/97 721026

ара сладов поли или автомото доболого разлики то сладов и сладовода јаниото бака и сладовода јаниото бода ублакото бо При сладов поли или сладовода и сладовод

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

Sec. Sec. Sec.

LOQ = Limit of Quantitation NA = Not Applicable

ND = Not Detected %DWB = (mg/kg DWB)/10000

Reviewed by:

Authorized by: R. T. Krueger Laboratory Manager

.

and the second
and the second states

NORTHERN LAKE SERVICE, INC. Analytical Laboratory and Environmental Services				WIS, LAB	CERT. NO. 72102	6460
100 North Lake Avenue - Crandon, WI 54520 Fel:(715)478-2777 Fax:(715)478-3060	ANALYTIC	AL REPORT		PAGE: 12	NLS PRO	JECT# 31692
Client: Foth & Van E Attn: Russ J 2737 S. Rid PO Box 19012 Green Bay, W	lge Road					
Ref. Line 12 of COC 21618 Description: FMC-19	3#: 124646 44LS-1	.				
Collected: 12/30/96 Received: 01/03/97 Re Parameter	ported: 01/17/97 <u>Result</u>	Unita	LOD	LOQ	Method	Analyzed Lab
Acidity, tot. as CaCO3 Aluminum, dis. as Al by ICP Cadmium, dis. as Cd by ICP Calcium, dis. as Ca by ICP Chloride, as Cl (filtered) Chromium, dis. as Cr by ICP Cobalt, dis. as Co by ICP Copper, dis. as Cu by ICP Iron, Ferrous	290 1.8 69 490 2.6 < 73 > 3200 250000 0.28 Additional	mg/L mg/L ug/L mg/L ug/L ug/L ug/L mg/L mg/L comments: F&VD mo	2.0 0.34 12 30 0.36 26 43 54 0.0091 dified method.	2.0 1.2 38 30 1.3 93 150 190 0.030 Result may	EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7	07/01/97 7210264 01/16/97 7210264 01/16/97 7210264 01/16/97 7210264 01/08/97 7210264 01/16/97 7210264 01/16/97 7210264 01/16/97 7210264 01/17/97 7210264
Iron, dis. as Fe by ICP Magnesium, dis. as Mg by ICP Manganese, dis. as Mn by ICP pH, lab Potassium, dis. as K Sodium, dis. as Na by ICP Sulfate, as SO4 (filtered)	been affecte < 0.16 > 56 16000 5.1 < 3.4 > 2.0 1000 ND	ed by sample turbid mg/L ug/L s.u. mg/L mg/L mg/L ug/L ug/L	1119. 0.10 30 18 1.0 2.0 0.33 250 25	0.35 30 61 6.6 1.1 250 87	EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7 EPA 375.2	01/16/97 7210264 01/16/97 7210264 01/16/97 7210264 01/03/97 7210264 01/10/97 7210264 01/16/97 7210264 01/16/97 7210264 01/15/97 7210264

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

.

Analytical Laboratory and 400 North Lake Avenue - C	ERVICE, INC. Environmental Services				WIS, LAB (CERT. NO. 72102	6460
Tel:(715)478-2777 Fax:(71)	i)478-3060						
		ANALYTIC	AL REPORT		PAGE: 13	NLS PRO	JECT# 31692
Client:	Foth & Van Dyke As Attn: Russ Janeshe 2737 S. Ridge Roa PO Box 19012 Green Bay, WI 543	k d					
Project Descript Project Title: 9	ion: Flambeau Mining 6F022						
	-1LS-1 NLS#: 124 18 Description: FMC-8-1LS-1 Received: 01/03/97 Reported: 01		,				<u></u>
Parameter		Result	Units	LOD	LOQ	Method	Analyzed Lab
	as CaCO3 (filtered)	64	mg/L	1.5	5.3		01/07/97 721026
Aluminum, dis. as Cadmium, dis. as	Al by ICP Cd by ICP Ca by ICP iltered) Cr by ICP by ICP a by ICP	< 0.19 >	mg/L ug/L	0.068 2.4	0.24 7.6		01/15/97 721026 01/15/97 721026
Calcium, dis. as	Ta by ICP	580	mg/L	6.0	6.0	EPA 200.7	01/15/97 721026
Chloride, as Cl (f	iltered)	3,9	mg/L	0.36	1.3	EPA 325.2	01/08/97 721026
Chromium, dis. as	Cr by ICP	< 18 >	ug/L	5.2	19	EPA 200.7	01/15/97 721026
Cobalt, dis. as C	b by ICP	1000	ug/L	8.6	30	EPA 200.7	01/15/97 721026
Copper, dis. as C	1 by ICP	41000	uq/L	11	38	EPA 200.7	01/15/97 721026
copper, ara, as c		0.12	mg/L	0.0091	0.030		01/17/97 721026
Iron, Ferrous		Additional 0.15	Comments: F&VD mod mg/L	dified method 0.020	0.070	20% 300 7	01/15/97 721026
Iron, Ferrous	TCP			0.020	U.U/U	EPA 200./	01/15/9/ /21026
Iron, Ferrous Iron, dis. as Fe	y ICP 3 Ma by ICP					EPA 200 7	01/16/97 721026
Iron, Ferrous Iron, dis. as Fe Magnesium, dis. a	Ma by ICP	48	mg/L	6.0	6.0	EPA 200.7 EPA 200.7	01/15/97 721026
Iron, Ferrous Iron, dis. as Fe Magnesium, dis. a Manganese, dis. a pH, lab	s Mg by ICP s Mn by ICP	48 3800 7.1				EPA 200.7 EPA 200.7 EPA 150.1	01/15/97 721026 01/15/97 721026 01/03/97 721026
Iron, Ferrous Iron, dis. as Fe Magnesium, dis. a Manganese, dis. a pH, lab Potassium, dis. a	s Mg by ICP s Mn by ICP	48 3800 7.1	mg/L ug/L s.u, mg/L	6.0 3.6 1.0 2.0	6.0 12 6.6	EPA 200.7 EPA 150.1 EPA 200.7	01/15/97 721026 01/03/97 721026 01/10/97 721026
Iron, Ferrous Iron, dis. as Fe Magnesium, dis. a Manganese, dis. a pH, lab Potassium, dis. a Sodium. dis. as N	3 Mg by ICP 3 Mn by ICP 3 K 4 by ICP	48 3800 7.1	mg/L ug/L s.u. mg/L mg/L	6.0 3.6 1,0 2.0 0.066	6.0 12 6.6 0.22	EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7	01/15/97 721026 01/03/97 721026 01/10/97 721026 01/15/97 721026
Iron, Ferrous Iron, dis. as Fe Magnesium, dis. a Manganese, dis. a pH, lab Potassium, dis. a Sodium, dis. as N Sulfate, as SO4 (f	3 Mg by ICP 3 Mn by ICP 3 K 4 by ICP iltered)	48 3800 7.1 ND 1.5 800	mg/L ug/L s.u. mg/L mg/L mg/L	6.0 3.6 1.0 2.0 0.666 250	6.0 12 6.6 0.22 250	EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7 EPA 375.2	01/15/97 721026 01/15/97 721026 01/03/97 721026 01/03/97 721026 01/15/97 721026 01/15/97 721026
Iron, Ferrous Iron, dis. as Fe Magnesium, dis. a Manganese, dis. a pH, lab Potassium, dis. a Sodium, dis. as N	B Mg by ICP Mn by ICP K A by ICP iltered) Tl by furnace AAS	48 3800 7.1	mg/L ug/L s.u. mg/L mg/L	6.0 3.6 1,0 2.0 0.066	6.0 12 6.6 0.22	EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7 EPA 375.2 EPA 279.2	01/15/97 721026 01/03/97 721026 01/10/97 721026 01/15/97 721026

اليبة المناصفين وهام محصص الأشام محصوم المنا المحصوصة المحاد المراجع ومحادثاتهم ومحادثا فتقر والمحافظ والأخر ومعاص

LOD = Limit of Detection DWB = Dry Weight Basis

 $(a,b) \in \{a,b\} \in \mathbb{R}^n$

energenten gehorden g

.

LOQ = Limit of Quantitation NA = Not Applicable ND = Not Detected %DWB = (mg/kg DWB)/10000

Reviewed by:

and the second sec

Authorized by: R. T. Krueger Laboratory Manager

- -- - ----

.....

......

pression of the second second

and a state of the
NORTHERN LAKE SERVICE, INC. WIS, LAB CERT, NO. 721026469 Analytical Laboratory and Environmental Services 400 North Lake Avenue - Crandon, WI 54520 Tel:(715)478-2777 Fax:(715)478-3060 ANALYTICAL REPORT PAGE: 1 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 Method Analyzed Lab Result Units LOD LOQ Parameter EPA 305.1 01/03/97 721026460 EPA 200.7 01/16/97 721026460 mg/L Acidity, tot. as CaCO3 3400 2.0 2.0 mg/L 0.073 0.23 Aluminum, dis. as Al 3.3 01/16/97 721026460 Cadmium, dis. as Cd EPA 200.7 2.4 mg/L 0.039 0.14 01/15/97 721026460 EPA 200.7 Calcium, dis. as Ca 450 mg/L 3.0 3,0 01/08/97 721026460 01/16/97 721026460 mg/L EPA 325.2 Chloride, as Cl (filtered) 8.7 0.36 1.3 Chromium, dis. as Cr Cobalt, dis. as Co mg/L 0.067 0.24 EPA 200.7 ND EPA 200.7 01/16/97 721026460 EPA 200.7 01/16/97 721026460 mg/L 0.044 0.16 14 Copper, dis. as Cu Iron, dis. as Fe mq/L 3.2 10 1400 EPA 200.7 01/15/97 721026460 0.079 0.26 mg/L 5.4 01/13/97 721026460 0.0091 0.030 0.065 mg/L Iron, Ferrous Additional Comments: F&VD modified method mg/L 3.0 EPA 200.7 01/15/97 721026460 280 3.0 Magnesium, dis. as Mg EPA 200.7 01/16/97 721026460 0.0086 0.031 Manganese, dis. as Mn 40 mg∕L EPA 150.1 12/31/96 721026460 EPA 200.7 01/10/97 721026460 pH, lab 4.0 s.u. 1.0 mg/L 2.0 6.6 Potassium, dis. as K < 4.8 >01/15/97 721026460 8.2 mg/L 0.069 0.23 EPA 200.7 Sodium, dis. as Na 01/14/97 721026460 mg/L 1200 EPA 375.2 5600 1200 Sulfate, as SO4 (filtered) EPA 200.7 01/16/97 721026460 ND mg/L 0.80 2.8 Thallium, dis. as Tl EPA 200.7 01/16/97 721026460 1.2 430 mg/L 1.2 Zinc, dis. as Zn 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". LOQ = Limit of Quantitation LOD = Limit of Detection

DWB = Dry Weight Basis

. .

2

NA = Not Applicable

ND = Not Detected DWB = (mq/kq DWB)/10000

Atrum R. Cuyn Reviewed by:

NORTHERN LAKE SE Analytical Laboratory and Er 100 North Lake Avenue - Cra	vironmental Services				WIS. LAE	CERT. NO. 72102	6460
el:(715)478-2777 Fax:(715)4		ANALYTIC	AL REPORT		PAGE: 2	NLS PROT	ECT# 31667
Client:	Foth & Van Dyke Asso Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307	ociates					
Project Descripti Project Title: 96	on: Flambeau Mining F022						
	0L-1 NLS#: 124548 Description: FMC-180L-1 ceived: 12/31/96 Reported: 01/1						
arameter		Result	Units	LOD	LOQ	Method	Analyzed Lab
cidity, tot. as Ca luminum, dis. as Ca admium, dis. as Ca alcium, dis. as Ca hloride, as Cl (fil hromium, dis. as Co obalt, dis. as Co obalt, dis. as Cu ron, dis. as Fe ron, Ferrous agnesium, dis. as anganese, dis. as H, lab otassium, dis. as Na ulfate, as SO4 (fil hallium, dis. as Ta	Al d tered) Cr Mg Mn K Ltered)		mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	2.0 0.073 0.039 3.0 0.36 0.067 0.044 0.32 0.079 0.0091	2.0 0.23 0.14 3.0 1.3 0.24 0.16 1.0 0.26 0.030 Interfere: 3.0 0.031 6.6 0.23 250 2.8 0.12	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/03/97 72102646 01/16/97 72102646 01/16/97 72102646 01/15/97 72102646 01/15/97 72102646 01/16/97 72102646 01/16/97 72102646 01/16/97 72102646 01/15/97 72102646 01/15/97 72102646 01/16/97 72102646 01/10/97 72102646 01/10/97 72102646 01/15/97 72102646 01/14/97 72102646 01/14/97 72102646
alues in brackets r esults greater thar DD = Limit of Detec WB = Dry Weight Bas		o be in the region of Quantitation	ess than the LOQ an of "Certain Quanti ND = Not Detect %DWB = (mg/kg D Atuun R. Reviewed by:	tation". ed WB)/10000	Authoriza R. T. 1	ed by:	Quantitation".

atten some ing

- - -

- -

yers and particulars and and a

್ರಕಷ್ಟ ಬೇಕಿಕ್ಕ

 $\mu_{2,2}^{(n)}(a_{2,2}^{(n)},a_{2,2}^{(n)})=0$

er:200-204

the second se

9 T. C. 7 19

ومعادرة ومروحي

we are worthy

.

. . .

-

.

8.0. *****

Sec. Star

11-1-708.80 a

No and the

22

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

ANALYTICAL REPORT

WIS, LAB CERT, NO. 721026460

PAGE: 3 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	Unite	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		lified Method.	Interfere	nce may	
		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

. . . .

23

LOQ = Limit of Quantitation NA = Not Applicable

.

.....

ND = Not Detected %DWB = (mg/kg DWB)/10000

Atum R. Cenyn Reviewed by:

NORTHERN LAKE SERVICE, INC. Analytical Laboratory and Environmental Services 100 North Lake Avenue - Crandon, WI 54520				WIS. LAB	CERT. NO. 72102	6460
Fel:(715)478-2777 Fax:(715)478-3060	ANALYTIC	AL REPORT		PAGE: 4	NLS PROJ	BCT# 31667
Client: Foth & Van Dy Attn: Russ Ja 2737 S. Rido PO Box 19012 Green Bay, Wi	je Road					
Project Description: Flambeau Mir Project Title: 96F022	ning					
Ref. Line 4 of COC 23952 Description: FMC-181L	#: 124550 S-1 ported: 01/17/97					
Parameter	Result	Units	LOD	roð	Method	Analyzed Lab
Acidity, tot. as CaCO3 Aluminum, dis. as Al Arsenic, dis. as As by furnace Cadmium, dis. as Cd	2500 1.3 < 45 > 1.7	mg/L mg/L ug/L mg/L	2.0 0.073 24 0.039	2.0 0.23 86 0.14	EPA 200.7	01/16/97 7210264 01/15/97 7210264 01/16/97 7210264
Calcium, dis. as Ca Chloride, as Cl (filtered) Chromium, dis. as Cr Cobalt, dis. as Co	450 7.4 ND 9.7	mg/L mg/L mg/L mg/L	3,0 0,36 0,067 0,044	3.0 1.3 0.24 0.16 1.0	EPA 200.7	01/15/97 7210264 01/08/97 7210264 01/16/97 7210264 01/16/97 7210264 01/16/97 7210264 01/16/97 7210264
Copper, dis. as Cu Iron, dis. as Fe Iron, Ferrous		mg/L mg/L mg/L Comments: F&VD mod	0.32 0.079 0.0091 dified method 0.53	0.26 0.030 1.8		01/15/97 721026 01/13/97 721026 01/17/97 721026
Lead, dis. as Pb Magnesium, dis. as Mg Manganese, dis. as Mn Mercury, dis. as Hg	ND 210 27 ND	mg/L mg/L mg/L ug/L	0.53 3.0 0.0086 0.13 1.0	3.0 0.031 0.47	EPA 200.7 EPA 200.7 EPA 245.1	01/15/97 721026
pH, lab Potassium, dis. as K Selenium, dis. as Se by furnace Sodium, dis. as Na	5.0 ND < 130 > 10	s.u. mg/L ug/L mg/L	2.0 37 0.069 1200	6.6 130 0.23 1200	EPA 200.7	01/10/97 721026 01/16/97 721026 01/15/97 721026
Sulfate, as SO4 (filtered) Thallium, dis. as Tl Zinc, dis. as Zn	3200 ND 230	mg/L mg/L mg/L	0.80 1.2	2.8 1.2	EPA 200.7	01/16/97 7210264 01/16/97 7210264
Values in brackets represent results Results greater than the LOQ are cons	idered to be in the region	ess than the LOQ and of "Certain Quanti	d are within a m tation".	region of '	'Less-Certair	n Quantitation".
LOD = Limit of Detection LOQ DWB = Dry Weight Basis NA	Limit of Quantitation Not Applicable	ND = Not Detect %DWB = (mg/kg D				

a second a second and the second as the s

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

ANALYTICAL REPORT

WIS. LAB CERT. NO. 721026460

PAGE: 5 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-15-1LS-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
- 1	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
ပ္စု	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
			Comments: F&VD modi	fied Method.	Interfere	nce may	
			l 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	5.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

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

Atum R. Cinn Reviewed by:

Authorized by: R. T. Krueger Laboratory Manager

NORTHERN LAKE SER Analytical Laboratory and Env 400 North Lake Avenue - Cran Tel:(715)478-2777 Fax:(715)47	rironmental Services Idon, WI 54520				WIS. LAB	CERT. NO. 72102	6460
Client:	Foth & Van Dyke As: Attn: Russ Janeshel 2737 S. Ridge Road PO Box 19012 Green Bay, WI 5430	sociates c l	CAL REPORT		PAGE: 6	NLS PROJ	RCT# 31667
Project Descriptic Project Title: 969	on: Flambeau Mining 1022						
Sample ID: FMC-15- Ref. Line 6 of COC 23952 Collected: 12/29/96 Rec	-3LS-1 NLS#: 124 Description: FMC-15-3LS-1 eived: 12/31/96 Reported: 01		· · · · · · · · · · · · · · · · · · ·				
Parameter		Result	Units	LOD	LOD	Method	Analyzed Lab
Acidity, tot. as Cat Aluminum, dis. as Al Cadmium, dis. as Al Cadmium, dis. as Ca Chloride, as Cl (filt Chromium, dis. as Co Copper, dis. as Co Copper, dis. as Cu Iron, dis. as Fe Iron, Ferrous Magnesium, dis. as N Manganese, dis. as N PH, lab Potassium, dis. as Na Sulfate, as SO4 (filt Thallium, dis. as T Zinc, dis. as Zn	L tered) r Mg Mn K tered) L	260 27 4.4 ND 2.1 3300 ND 33	mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	3.0 0.0086 1.0 2.0 0.069 1200 0.80 0.12	2.0 0.23 0.14 3.0 1.3 0.24 0.16 1.0 0.26 0.030 3.0 0.031 6.6 0.23 1200 2.8 0.12	EPA 305.1 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/10/97 721026 01/15/97 721026 01/14/97 721026 01/16/97 721026 01/16/97 721026
Values in brackets re Results greater than	present results greater the LOQ are considered	than the LOD but le to be in the region	ess than the LOQ and a of "Certain Quantitat	re within a m ion".	region of "	Less-Certain	Quantitation".
LOD = Limit of Detect DWB ≈ Dry Weight Basi		t of Quantitation oplicable	ND = Not Detected %DWB = (mg/kg DWB) Attuur R.C. Reviewed by:		Authorize R. T. K Laborator	rueger	

and a second and a second a second and a second
WIS. LAB CERT. NO. 721026460

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

ANALYTICAL REPORT

PAGE: 7 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, dís. 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 m	odified 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 DWB = Dry Weight Basis

27

LOQ = Limit of Quantitation NA = Not Applicable

ND = Not Detected %DWB = (mg/kg DWB)/10000

Alum R. Ceyn Reviewed by:

ANALYTICAL REPORT PAGE: 8 NLS PROJECT# 31667 Client: Foth & Van Dyke Associates Attn: Rues Janeshek 20 Jos. 1911 Green Bay, WI 54307 Project Jos. 1911 Green Bay, WI 54307 Project Description: Flambeau Mining Project Title: 95F022 Sample TD: PMC-180L51 Collectd: 12/29/96 Received: 12/31/96 Reported: 01/17/97 Sample TD: PMC-180L52 NLS#: 124554 Recline do CC0 23552 Description: Flambeau Mining Project Title: 95F022 Sample TD: PMC-180L51 Collectd: 12/29/96 Received: 12/31/96 Reported: 01/17/97 Parameter Cadmium, dis. as Cd Cadmium, dis. as Ma Manganese, dis. as Ma Mangenesium, dis. as Ma Cadmium, dis. as Ma Cadmium, dis. as Ma Mangenesium, dis. as Ma Mangenesium, dis. as Ma Cadmium, dis	Analytical Laboratory and 1 400 North Lake Avenue - C Tel:(715)478-2777 Fax:(715	randon, WI 54520					CERT. NO. 72102		_
Project Title: 95F022 Sample ID: FMC-180LS-1 NLS#: 124554 Reference in the integration of the inte	Client:	Attn: Russ Janeshe) 2737 S. Ridge Road PO Box 19012	sociates C 1	CAL REPORT		PAGE: 8	NLS PROJ.	ECT# 3166	7
Hef. Line 8 of COC 23952 Description: FMC.180LS.1 Collected: 12/31/96 Reported: 01/17/97 Parameter Result Units LOD LOQ Method Analyzed Lak Acidity, tot. as CaC03 220 mg/L 2.0 2.0 EPA 305.1 01/03/97 721 Aluminum, dis. as Al < 0.080 > mg/L 0.073 0.23 EPA 305.1 01/16/97 721 Cadmium, dis. as Cd 0.26 mg/L 0.39 0.4 EPA 200.7 01/16/97 721 Calcium, dis. as Cd 0.26 mg/L 0.36 1.3 EPA 305.1 01/16/97 721 Calcium, dis. as Cd 0.37 mg/L 0.36 1.4 EPA 200.7 01/16/97 721 Cobalt, dis. as Co 3.0 mg/L 0.36 1.4 EPA 200.7 01/16/97 721 Cobalt, dis. as Co 3.1 mg/L 0.36 1.24 EPA 200.7 01/16/97 721 Cobalt, dis. as Co 3.1 mg/L 0.37 0.091 EPA 200.7 01/16/97 721 Icon, dis. as Co 0.0 mg/L 0.33 0.0 EPA 200.7 01/15/97 721 Magnese, di	Project Descript Project Title: 9	ion: Flambeau Mining 6F022							
Acidity, tot. as CaC03 220 mg/L 2.0 2.0 EPA 305.1 $01/03/97$ 721 Aluminum, dis. as Al 0.26 mg/L 0.073 0.23 EPA 200.7 $01/16/97$ 721 Cadmium, dis. as Cd 0.26 mg/L 0.039 0.14 EPA 200.7 $01/16/97$ 721 Calcium, dis. as Ca 380 mg/L 0.36 1.3 EPA 200.7 $01/16/97$ 721 Calcium, dis. as Ca 380 mg/L 0.36 1.3 EPA 200.7 $01/16/97$ 721 Cobalt, dis. as Ca 3.1 mg/L 0.361 1.3 EPA 200.7 $01/16/97$ 721 Cobalt, dis. as Ca 3.1 mg/L 0.067 0.24 EPA 200.7 $01/16/97$ 721 Cobalt, dis. as Ca 200 mg/L 0.067 0.24 EPA 200.7 $01/16/97$ 721 Cobalt, dis. as Re 200 mg/L 0.079 0.26 EPA 200.7 $01/15/97$ 721 Copper, dis. as Rg ND mg/L 0.0091 0.30 01/13/97 $01/13/97$ 721 Maganese, dis. as Mg 100 mg/L 0.0065 0.031	Ref. Line 8 of COC 2395	2 Description: FMC-180LS-1							. <u></u>
Alumini, dis. as Nation (a) (b) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c	Parameter		Result	Units	LOD	LOQ	Method	Analyzed	Lab
Magnesium, dis. as Mg100mg/L 3.0 3.0 $EPA \ 200.7$ $01/15/97 \ 723$ Manganese, dis. as Mn24mg/L 0.0086 0.031 $EPA \ 200.7$ $01/15/97 \ 723$ PH, lab 5.5 $s.u$ 1.0 $EPA \ 150.1$ $12/31/96 \ 723$ Potassium, dis. as K 6.9 mg/L 2.0 6.6 $EPA \ 200.7$ $01/16/97 \ 723$ Sodium, dis. as Na 5.2 mg/L 0.069 0.23 $EPA \ 200.7$ $01/16/97 \ 723$ Sulfate, as SO4 (filtered) 1100 mg/L 250 250 $EPA \ 375.2$ $01/14/97 \ 723$ Thallium, dis. as TlNDmg/L 0.80 2.8 $EPA \ 200.7$ $01/16/97 \ 723$ Zinc, dis. as ZnS8mg/L 0.12 0.12 $EPA \ 200.7$ $01/16/97 \ 723$ Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation".ND = Not DetectedValues in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation".ND = Not DetectedWB = Dry Weight BasisNA = Not ApplicableND = Not Detected $VWB = (mg/kg \ DWB)/10000$ $Authorized \ by:$ Reviewed by:R. T. Krueger	Aluminum, dis. as Cadmium, dis. as Calcium, dis. as Chloride, as Cl (f Chromium, dis. as Cobalt, dis. as C Copper, dis. as C Iron, dis. as Fe	Al Cd Ca iltered) Cr C	< 0.080 > 0.26 380 3.7 ND 3.1 200 ND < 0.013 >	mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	0.073 0.039 3.0 0.36 0.067 0.044 0.32 0.079 0.0091	0.23 0.14 3.0 1.3 0.24 0.16 1.0 0.26	EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7	01/16/97 01/16/97 01/08/97 01/08/97 01/16/97 01/16/97 01/16/97 01/16/97	72102646 72102646 72102646 72102646 72102646 72102646 72102646 72102646 72102646
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 Authorized by: Reviewed by: R. T. Krueger	Manganese, dis. a pH, lab Potassium, dis. a Sodium, dis. as N Sulfate, as SO4 (f Thallium, dis. as	s Mn s K a iltered)	100 24 5.5 6.9 5.2 1100 ND	mg/L mg/L s.u. mg/L mg/L mg/L mg/L	3.0 0.0086 1.0 2.0 0.069 250 0.80	0.031 6.6 0.23 250 2.8	EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7 EPA 375.2 EPA 200.7	01/16/97 12/31/96 01/10/97 01/15/97 01/14/97 01/16/97	72102640 72102640 72102640 72102640 72102640 72102640 72102640
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000 Authorized by: Reviewed by: R. T. Krueger	Values in brackets Results greater th	represent results greater an the LOQ are considered	than the LOD but l to be in the region	ess than the LOQ and of "Certain Quantit	d are within a tation".	region of "	Less-Certain	Quantitat	ion".
Laboratory Manager	LOD = Limit of Det DWB = Dry Weight B			%DWB = (mg/kg DN	NB)/10000	R. T. F	trueger		

property and the second

مورد به موجع ورور ا

penerana iku penerahang penerahang penerahang

per en la consegución de consector provinción presentation presentation

٠.

••

موادمين والمواجد المسوح ال

providently provide planticity advanticity advanticity advanticity

All a constants

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 PAGE: 9 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-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) Aluminum, dis. as Al by ICP Cadmium, dis. as Cd by ICP Calcium, dis. as Ca by ICP 10 mg/L 1.5 5.3 EPA 310.1 01/07/97 721026460 mg/L 0.12 EPA 200.7 01/15/97 721026460 < 0.067 >0.034 ND ug/L 1.2 3.8 EPA 200.7 01/15/97 721026460 EPA 200.7 01/15/97 721026460 110 mg/L 3.0 3.0 Chloride, as Cl (filtered) 0.36 EPA 325.2 01/08/97 721026460 12 mg/L 1.3 EPA 200.7 01/15/97 721026460 Chromium, dis. as Cr by ICP ug/L ND 2.6 9.3 EPA 200.7 01/15/97 721026460 Cobalt, dis. as Co by ICP ND uq/L 4.3 15 Copper, dis. as Cu by ICP 80 ug/L 5.4 19 EPA 200.7 01/15/97 721026460 0.030 01/13/97 721026460 Iron, Ferrous 0.031 mq/L 0.0091 Additional Comments: F&VD modified method 0.010 0.035 EPA 200.7 01/15/97 721026460 Iron, dis. as Fe by ICP < 0.027 > mg/L Magnesium, dis. as Mg by ICP Manganese, dis. as Mn by ICP EPA 200.7 01/15/97 721026460 58 mg/L 3.0 3.0 ug/L 1.8 EPA 200.7 01/15/97 721026460 9.8 6.1 EPA 150.1 12/31/96 721026460 pH, lab 8.7 1.0 s.u. EPA 200.7 01/10/97 721026460 Potassium, dis. as K 2.0 < 5.8 > mg/L 6.6 EPA 200.7 01/15/97 721026460 0.033 0.11 Sodium, dis. as Na by ICP 9.8 mq/L EPA 375.2 01/14/97 721026460 Sulfate, as SO4 (filtered) 250 550 mg/L 250 Thallium, dis. as TI by furnace AAS Zinc, dis. as Zn by ICP EPA 279.2 01/15/97 721026460 ND ug/L 25 87 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

TULLIN R. Curry Reviewed by:

NORTHERN LAKE SERVICE, INC. Analytical Laboratory and Environmental Services 400 North Lake Avenue - Crandon, WI 54520				WIS. LAB C	CERT. NO. 72102	6460
Tel:(715)478-2777 Fax:(715)478-3060	ANALYT	ICAL REPORT		PAGE: 10	NLS PRO	JECT# 31667
Attn: Russ 2737 S. F PO Box 190	lidge Road					
Project Description: Flambeau Project Title: 96F022	Mining					
Ref. Line 10 of COC 23952 Description: FMC	.S#: 124556 -4-1L-1 Reported: 01/17/97					
Parameter	Result	Units	LOD	LOQ	Method	Analyzed Lab
Acidity, tot. as CaCO3 Aluminum, dis. as Al Cadmium, dis. as Cd Calcium, dis. as Ca Chloride, as Cl (filtered) Chromium, dis. as Cr Cobalt, dis. as Co Copper, dis. as Cu Iron, dis. as Fe Iron, Ferrous	440 0.62 0.39 550 2.1 ND 3.7 270 0.46 < 0.028 > Additiona	mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	2.0 0.073 0.039 3.0 0.36 0.067 0.044 0.32 0.079 0.0091 dified method	2.0 0.23 0.14 3.0 1.3 0.24 0.16 1.0 0.26 0.030	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/03/97 7210264 01/16/97 7210264 01/15/97 7210264 01/15/97 7210264 01/15/97 7210264 01/16/97 7210264 01/16/97 7210264 01/16/97 7210264 01/15/97 7210264 01/15/97 7210264
Magnesium, dis. as Mg Manganese, dis. as Mn pH, lab Potassium, dis. as K Sodium, dis. as Na Sulfate, as SO4 (filtered) Thallium, dis. as Tl Zinc, dis. as Zn	240 22 5.4 8.8 2.0 2700 ND 60	mg/L mg/L s.u. mg/L mg/L mg/L mg/L mg/L	3.0 0.0086 1.0 2.0 0.069 250 0.80 0.12	3.0 0.031 6.6 0.23 250 2.8 0.12	EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/10/97 7210264 01/15/97 7210264 01/14/97 7210264 01/14/97 7210264 01/16/97 7210264
Values in brackets represent resul Results greater than the LOQ are c	ts greater than the LOD but onsidered to be in the regio	less than the LOQ an n of "Certain Quanti	d are within a n tation".	region of "I	Less-Certain	Quantitation".
LOD = Limit of Detection DWB = Dry Weight Basis	LOQ = Limit of Quantitation NA = Not Applicable	ND = Not Detect %DWB = (mg/kg D				
		Attenue R Reviewed by:	Ciryn	Authorized R. T. Kı Laboratory	rueger	

.

المالة المستعالية

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

ANALYTICAL REPORT

WIS, LAB CERT, NO. 721026460

NLS PROJECT# 31667 PAGE: 11 Foth & Van Dyke Associates Client: Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307 Project Description: Flambeau Mining Project Title: 96F022 NLS#: 124557 Sample ID: FMC-15-3L-1 Ref. Line 11 of COC 23952 Description: FMC-15-3L-1 Collected: 12/29/96 Received: 12/31/96 Reported: 01/17/97 Analyzed Lab Method LOD LOQ Result Units Parameter EPA 305.1 01/03/97 721026460 mg/L 2.0 2.0 1100 Acidity, tot. as CaCO3 EPA 200.7 01/16/97 721026460 mg/L 0.073 0.23 10 Aluminum, dis. as Al EPA 200.7 01/16/97 721026460 0.14 mg/L 0.039 < 0.062 >Cadmium, dis. as Cd EPA 200.7 01/15/97 721026460 mg/L 3.0 3.0 Calcium, dis. as Ca Chloride, as Cl (filtered) 570 01/08/97 721026460 mg/L 1.3 EPA 325.2 0.36 4.2 01/16/97 721026460 EPA 200.7 Chromium, dis. as Cr Cobalt, dis. as Co 0.067 0.24 mg/L ND EPA 200.7 01/16/97 721026460 0.16 mg/L 0.044 4.1 01/16/97 721026460 EPA 200.7 mg/L 1.0 0.32 Copper, dis. as Cu Iron, dis. as Fe 690 EPA 200.7 01/15/97 721026460 0.26 0.079 28 mg/L 01/13/97 721026460 0.030 0.0091 0.077 mq/L Iron, Ferrous Additional Comments: F&VD modified method EPA 200.7 01/15/97 721026460 mg/L 3.0 3.0 220 Magnesium, dis. as Mg EPA 200.7 01/16/97 721026460 mg/L 0.0086 0.031 18 Manganese, dis. as Mn EPA 150.1 12/31/96 721026460 1.0 3.5 s.u. pH, lab EPA 200.7 01/10/97 721026460 2.0 6.6 mg/L < 4.1 >Potassium, dis. as K EPA 200.7 01/15/97 721026460 EPA 375.2 01/14/97 721026460 0.069 0.23 mg/L 2.9 Sodium, dis. as Na 250 250 Sulfate, as SO4 (filtered) mq/L 3100 EPA 200.7 01/16/97 721026460 EPA 200.7 01/16/97 721026460 0.80 2.8 ND mg/L Thallium, dis. as Tl 0.12 0.12 20 mg/L Zinc, dis. as Zn

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".

والمراجع والمراجع والمراجع والمناطق والمناطقة والمتعود والمراجع والمراجع والمراجع

LOD = Limit of Detection DWB = Dry Weight Basis

LOO = Limit of Quantitation NA = Not Applicable

ND = Not Detected DWB = (mg/kg DWB)/10000

Aturn R. Cunn

NORTHERN LAKE SE Analytical Laboratory and E 400 North Lake Avenue - Cr	nvironmental Services andon, WI 54520				WIS. LAB C	ERT. NO. 72102	6460	
Tel:(715)478-2777 Fax:(715)	478-3060	ANALYTIC	CAL REPORT		PAGE: 12	NLS PRO	JECT# 31(567
Client:	Foth & Van Dyke Ass Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 5430							
Project Descripti Project Title: 96	on: Flambeau Mining F022							
Sample ID: FMC-BI Ref. Line 12 of COC 2395 Collected: 12/29/96 Ref	74-1 NLS#: 124558 2 Description: FMC-BF4-1 :ceived: 12/31/96 Reported: 01/							
Parameter		Result	Units	LOD	LOQ	Method	Analyzed	Lab
Alkalinity, tot. a Aluminum, dis. as . Cadmium, dis. as C Calcium, dis. as C Chloride, as Cl (fi Chromium, dis. as C Cobalt, dis. as Co Copper, dis. as Cu Iron, Ferrous	Al by ICP d by ICP a by ICP ltered) Cr by ICP by ICP by ICP	36 < 0.091 > 26 330 10 < 6.7 > 470 260 0.19 Additional	mg/L mg/L ug/L mg/L ug/L ug/L ug/L mg/L Comments: F&VD mod	1.5 0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091 dified method	5.3 0.12 3.8 3.0 1.3 9.3 15 19 0.030	EPA 310.1 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/15/97 01/15/97 01/08/97 01/15/97 01/15/97	7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264
Iron, dis. as Fe b Magnesium, dis. as Manganese, dis. as pH, lab Potassium, dis. as Sodium, dis. as Na Sulfate, as SO4 (fi Thallium, dis. as ' Zinc, dis. as Zn by	Mg by ICP Mn by ICP K by ICP ltered) Fl by furnace AAS	ND 110 8900 7.1 14 9.6 1200 ND 1700	mg/L mg/L s.u. mg/L mg/L mg/L ug/L ug/L	0.010 3.0 1.8 1.0 2.0 0.033 250 25 120	0.035 3.0 6.1 6.6 0.11 250 87 120	EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7 EPA 375.2 EPA 279.2 EPA 200.7	12/31/96 01/10/97 01/15/97 01/14/97 01/15/97	7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264
Values in brackets : Results greater than	represent results greater the LOQ are considered t	than the LOD but le o be in the region	ess than the LOQ and of "Certain Quantit	l are within a m ation".	egion of "I	ess-Certain	Quantitat	ion".
LOD = Limit of Deter DWB = Dry Weight Bar		of Quantitation plicable	ND = Not Detecte %DWB ≈ (mg/kg DV					
			Ateuen R.	Cuyen	Authorized R. T. Kr Laboratory	ueger		
			•					

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

WIS. LAB CERT. NO. 721026460

PAGE: 13 NLS PROJECT# 31667

Client: 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

Acidity, tot. as CaCO3 400 mg/L 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 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 200.7 01/16/97 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 0.032 0.10 EPA 200.7 01/15/97 7210
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 200.7 01/16/97 721026460 Chloride, as Cl (filtered) ND mg/L 0.36 1.3 EPA 200.7 01/16/97 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 0.032 0.10 EPA 200.7 01/16/97 721026460 Iron, Ferrous 0.56 mg/L 0.079 0.26 EPA 200.7 01/15/97 721026460 Additional Comments: F&VD modified method 01/13/97 721026460 01/13/97 72102
Calcium, dis. as Ca 650 mg/L 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 0.067 0.24 EPA 200.7 01/16/97 721026460 Copper, 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 0.1/13/97 721026460 01/13/97 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 56
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 0.032 0.10 EPA 200.7 01/16/97 721026460 Iron, Ferrous 0.56 mg/L 0.0091 0.030 01/13/97 721026460 Additional Comments: F&VD modified method F&VD F&VD F&VD F&VD
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 59 mg/L 0.079 0.26 EPA 200.7 01/16/97 721026460 Iron, Ferrous 0.56 mg/L 0.0091 0.030 01/13/97 721026460 Additional Comments: F&VD modified method F&VD F&VD F&VD F&VD
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 0.030 01/13/97 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 56
Iron, Ferrous 0.56 mg/L 0.0091 0.030 01/13/97 721025460 Additional Comments: F&VD modified method
Iron, Ferrous 0.56 mg/L 0.0091 0.030 01/13/97 721026460 Additional Comments: F&VD modified method
Magnesium, dia 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
Potagsium, 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 DWB = Dry Weight Basis LOQ = Limit of Quantitation NA = Not Applicable

ND = Not Detected %DWB = (mg/kg DWB)/10000

Ateun R. Cenyri Reviewed by:

Authorized by: R. T. Krueger Laboratory Manager

the second se

NORTHERN LAKE SER Analytical Laboratory and Env 400 North Lake Avenue - Cran Tel:(715)478-2777 Fax:(715)47	ironmental Services don, WI 54520		ANALYTICAL REPORT			WIS. LAB CERT. NO. 721026460		
ch(/15)4/6-2/// 1021(/15)4/		ANALYTIC	CAL REPORT		PAGE: 1	NLS PROJ	ECT# 31804	
Client:	Foth & Van Dyke As Attn: Russ Janeshe 2737 S. Ridge Ros PO Box 19012 Green Bay, WI 543	k d						
Project Descriptic Project Title: 96F	n: Flambeau Mining 022							
Sample ID: FMC-BF5 Ref. Line 1 of COC 23978 Collected: 01/07/97 Rec								
Parameter		Result	Units	LOD	roð	Method	Analyzed Lab	
lkalinity, tot. as	CaCO3 (filtered)	22	mg/L	1.5	5.3	EPA 310.1	01/15/97 7210264	
luminum, dis. as Al	. by ICP	0.35 17	mg/L ug/L	0.034 1.2	0.12 3.8	EPA 200.7 EPA 200.7	01/31/97 7210264	
admium, dis. as Cd alcium, dis. as Ca	by ICP	450	mg/L	3.0	3.0	EPA 200.7	01/31/97 7210264	
hloride, as Cl (filt	ered)	23	mg/L	0.36	1.3	EPA 325.2	01/16/97 7210264	
hromium, dis. as Ci	r by ICP	24	ug/L	2.6	9.3	EPA 200.7	01/31/97 7210264	
obalt, dis. as Co l	DY ICP	660 730	ug/L	4.3 5.4	15 19	EPA 200.7 EPA 200.7	01/31/97 7210264	
Copper, dis. as Cu h ron, Ferrous	бу ТСР	2.2	ug/L mg/L	0.46	1.5	EFA 200.7	02/02/97 7210264	
TON, PELLOUS			Comments: F&VD mo					
ron, dis. as Fe by		0.40	mg/L	0.010	0.035	EPA 200.7	01/31/97 7210264	
lagnesium, dis. as l	1g by ICP	150 18000	mg/L	3.0 1.8	3.0 6.1	EPA 200.7 EPA 200.7	01/31/97 7210264 01/31/97 7210264	
Manganese, dis. as M	In by ICP	7.3	ug/L s.u.	1.0	0.1	EPA 150.1	01/10/97 7210264	
PH, lab Potassium, dis. as H	ζ	24	mg/L	2.0	б.б	EPA 200.7	01/24/97 7210264	
odium, dis. as Na h	DY ICP	19	mg/L	0,033	0.11	EPA 200.7	01/31/97 7210264	
Sulfate, as SO4 (filt	ered)	940	mg/L	250 25	250 87	EPA 375.2	01/23/97 7210264 01/27/97 7210264	
'hallium, dis. as T. Linc, dis. as Zn by		ND 1300	ug/L ug/L	120	120	EPA 279.2 EPA 200,7	01/21/97 7210264	
	. 9		+> +>- 100	Jawa within a	vegion of "	toon Cortain		
aiues in brackets re esults greater than	present results greate the LOQ are considered	to be in the region	of "Certain Quanti	tation".	regrou or	DUGG-CGIUAIN	Quantitation .	
OD = Limit of Detect WB = Dry Weight Basi		it of Quantitation Applicable	ND = Not Detect %DWB = (mg/kg D					
			At o	<u> </u>				
			Alum R.	light	Authorize			
			Developed by	•	R. T. K	rueger		

NORTHERN LAKE SERVICE, INC. Analytical Laboratory and Environmental Services				WIS. LAB	CERT. NO. 72102	6460
400 North Lake Avenue - Crandon, WI 54520 Tel:(715)478-2777 Fax:(715)478-3060	ANALYTIC	CAL REPORT		PAGE: 2	NLS PROJ	ECT# 31804
Client: Foth & Van Dyke A Attn: Russ Janesh 2737 S. Ridge Ro PO Box 19012 Green Bay, WI 543	ek ad					
Project Description: Flambeau Mining Project Title: 96F022						
Sample ID: FMC-170LS-1 NLS#: 12 Ref. Line 2 of COC 23978 Description: FMC-170LS-1 Collected: 01/07/97 Received: 01/09/97 Reported: C				<u></u> .		
Parameter	Result	Units	LOD	LOQ	Method	Analyzed Lab
Acidity, tot. as CaCO3 Aluminum, dis. as Al by ICP Cadmium, dis. as Cd by ICP Calcium, dis. as Ca by ICP Chloride, as Cl (filtered) Chromium, dis. as Cr by ICP Cobalt, dis. as Co by ICP Copper, dis. as Cu by ICP Iron, Ferrous	1600 ND 1200 470 4.2 ND 6600 950000 2.6 Additional	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L Comments: F&VD mod	2.0 0.34 12 30 0.36 26 43 54 0.46 dified method	2.0 1.2 38 30 1.3 93 150 1900 1.5	EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7	01/21/97 721026460 01/31/97 721026460 01/31/97 721026460 01/31/97 721026460 01/16/97 721026460 01/31/97 721026460 01/31/97 721026460 01/31/97 721026460 02/02/97 721026460
Iron, dis. as Fe by ICP Magnesium, dis. as Mg by ICP Manganese, dis. as Mn by ICP pH, lab Potassium, dis. as K Sodium, dis. as Na by ICP Sulfate, as SO4 (filtered) Thallium, dis. as Tl by furnace AAS Zinc, dis. as Zn by ICP	ND 110 17000 4.7 17 7.2 1700 < 34 > 80000	mg/L mg/L g.u. mg/L mg/L mg/L ug/L ug/L	0.10 30 18 1.0 2.0 0.33 250 25 1200	0.35 30 61 6.6 1.1 250 87 1200	EPA 150.1 EPA 200.7 EPA 200.7 EPA 375.2 EPA 279.2	01/31/97 721026460 01/31/97 721026460 01/31/97 721026460 01/10/97 721026460 01/24/97 721026460 01/31/97 721026460 01/23/97 721026460 01/27/97 721026460 01/31/97 721026460
Values in brackets represent results greate Results greater than the LOQ are considered	to be in the region	of "Certain Quantit	tation".	region of "	Less-Certain	Quantitation".
	it of Quantitation Applicable	ND = Not Detecto %DWB = (mg/kg D)				

ω σ

Reviewed by:

Authorized by: R. T. Krueger Laboratory Manager

- • • • •

and a second
.

.

Anoxic Columns Second Displacement Test Results

.

MLD2\96F022\GBAPP\43134 .61

NORTHERN LAKE S Analytical Laboratory and I 400 North Lake Avenue - C	Environmental Services				WIS. LAB	CERT. NO. 72102	6460
400 North Lake Avenue - C Tel:(715)478-2777 Fax:(715		ANALYTIC	AL REPORT		PAGE: 1	NLS PROJ	ECT# 31905
Client:	Foth & Van Dyke Ass Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 5430						
Project Title: 9	L86LS-2 NLS#: 1254 4 Description: FMC-186LS-2			<u></u>			
Parameter		Result	<u>Units</u>	LOD	LOQ	Method	Analyzed Lab
Alkalinity, carbon		ND < 0.65 >	mg∕L mg/L ug/L	1.5 0.34 12	5.3 1.2 38	SM 2320B EPA 200.7 EPA 200.7	01/17/97 7210264 01/27/97 7210264 01/27/97 7210264
Aluminum, dis. as Cadmium, dis. as Calcium, dis. as Chloride, as Cl (f Chromium, dis. as Cobalt, dis. as C Copper, dis. as C Iron, Ferrous	Cd by ICP Ca by ICP iltered) Cr by ICP	64 320 3.2 ND 1100 5900 0.30	mg/L mg/L ug/L ug/L ug/L mg/L	30 0.36 26 43 54 0.046	30 1.3 93 150 190 0.15	EPA 200.7 EPA 325.2 EPA 200.7	01/27/97 7210264 01/22/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264
Cadmium, dis. as Calcium, dis. as Chloride, as Cl (f Chromium, dis. as Cobalt, dis. as C Copper. dis. as C	Cd by ICP Ca by ICP iltered) Cr by ICP o by ICP u by ICP by ICP s Mg by ICP s Mn by ICP s K	320 3.2 ND 1100 5900 0.30 Additional ND 36 4100 6.5 < 3.1 > 5 3	mg/L mg/L ug/L ug/L ug/L mg/L	30 0.36 26 43 54 0.046 dified method 0.10 30 18 1.0 2.0 0.33	30 1.3 93 150 190 0.15 0.35 30 61 6.6 1.1	EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7	01/27/97 7210264 01/22/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/16/97 7210264

Acres 644

Sec. Carl

Sec. 16. 18

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

the second way

A State of the State

Allun R. Cingn Reviewed by:

Authorized by: R. T. Krueger Laboratory Manager et a tra servicia

يتأخذ خدما وتهتن

Client:			IALYTICAL REPOR	RT	PAGE: 2	NLS PROJ	ECT# 319	05
Client:	Forn & Van) Attn: Russ (2737 S. Ric PO Box 1901) Green Bay, N	lge Road						
Project Descripti Project Title: 96	on: Flambeau M: F022	ning						
Sample ID: FMC-18 Ref. Line 2 of COC 24224 Collected: 01/14/97 Ref	Description: FMC-186	: 125485 SL-2 sported: 01/28/97						
Parameter		Result	<u>Unit</u>	<u>e</u> <u>Lod</u>	LOQ	Method	Analyzed	Lab
Acidity, tot. as Ca Aluminum, dis. as A Cadmium, dis. as Ca Calcium, dis. as Ca Chloride, as Cl (fil Chromium, dis. as C Cobalt, dis. as Co Copper, dis. as Cu Iron, Ferrous	l by ICP by ICP by ICP tered) r by ICP by ICP by ICP	98 1.7 < 36 : 500 20 < 70 : 880 3100 0.20 Add	> ug/L mg/L mg/L ug/L ug/L 0 ug/L ug/L	0.34 12 30 0.36 26 43 54	38 30 1.3 93 150 190 5 0 15	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7	01/27/97 01/27/97 01/27/97 01/22/97 01/27/97 01/27/97	721026 721026 721026 721026 721026 721026 721026 721026
Iron, dis. as Fe by Magnesium, dis. as Manganese, dis. as pH, lab Potassium, dis. as Sodium, dis. as Na	Mg by ICP Mn by ICP K	ND ND 1800 4.4 14 4.8 Add	mg/L mg/L ug/L s.u. mg/L mg/L ittional Comments:	0.10 30 18 1.0 2.0	0.35 30 61 6.6	EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7 EPA 200.7	01/27/97 01/27/97 01/16/97 01/23/97	721026 721026 721026 721026
Sulfate, as SO4 (fil Thallium, dis. as T		1500		250	250	EPA 375.2	01/20/97	721026
Zinc, dis. as Zn by	ICP	ND B600	ug/L ug/L	25 1200	87 1200	EPA 279.2 EPA 200.7	01/22/97 01/27/97	721026 721026
Values in brackets ro Results greater than	epresent results the LOQ are cons	greater than the LC idered to be in the	D but less than the region of "Certain	LOQ and are within Quantitation".	a region of "]	Less-Certain	Quantitat	ion".
LOD = Limit of Detect DWB = Dry Weight Bas:	ion LOQ s NA	= Limit of Quantit = Not Applicable	%DWB = (Detected mg/kg DWB)/10000				
			Reviewed	in R-Ceyn	Authorized R. T. Kr Laboratory	ueger		

•

NORTHERN LAKE SE Analytical Laboratory and E 400 North Lake Avenue - Cra Tel:(715)478-2777 Fax:(715)	nvironmental Services andon, WI 54520	ANALYTIC	ANALYTICAL REPORT			CERT. NO. 72192 NLS PROJ	NLS PROJECT# 31905		
Client: Project Descript: Project Title: 96	Foth & Van Dyke Asso Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307 on: Flambeau Mining								
	-1LS-2 NLS#: 1254 Description: FMC-13-1LS-2 ceived: 01/16/97 Reported: 01/2								
Parameter		Result	Units	LOD	roō	Method	Analyzed Lab		
arameter cidity, tot. as C luminum, dis. as C admium, dis. as C alcium, dis. as C hloride, as Cl (fi bromium, dis. as C obalt, dis. as Co opper, dis. as Cu ron, Ferrous	aCO3 Al by ICP a by ICP a by ICP Ltered) Cr by ICP by ICP	Result 1000 12 49 520 2.7 < 57 > 2400 300000 19	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L	2.0 0.34 12 30 0.36 26 43 540 0.46	LOQ 2.0 1.2 38 30 1.3 93 150 1900 1.5	Method EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7	Analyzed Lab 01/21/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/22/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264		
cidity, tot. as C luminum, dis. as C admium, dis. as C alcium, dis. as C hloride, as Cl (fi hromium, dis. as C obalt, dis. as Co opper, dis. as Cu	aCO3 Al by ICP d by ICP a by ICP ttered) Cr by ICP by ICP by ICP y ICP Mg by ICP Mg by ICP Mn by ICP K	Result 1000 12 49 520 2.7 < 57 > 2400 300000 19 Additional 210 48 8400 2.9 ND 3.3 Additional	mg/L mg/L ug/L mg/L mg/L ug/L ug/L ug/L	2.0 0.34 12 30 0.36 26 43 540 0.46 ied method 0.10 30 18 1.0 2.0 0.33	2.0 1.2 38 30 1.3 93 150 1900 1.5 0.35 30 61 6.6 1.1	EPA 305.1 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7	01/21/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/22/97 7210264 01/22/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264		

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

ω

Hand

Alshep della

LOQ = Limit of Quantitation NA = Not Applicable

12 contraction of the

#16.000 1000 AM

122 - 11 1234

ND = Not Detected %DWB = (mg/kg DWB)/10000

Alexandra Station

41.127.734

16 1.19 2.19

Second Second

المقارعة والالجام

1.555 M. O. B. D.

4+1-2-25

Atecan R. Cuyin Reviewed by:

NORTHERN LAKE SERVICE, INC. Analytical Laboratory and Environmental Services 400 North Lake Avenue - Crandon, WI 54520 Tel:(715)478-2777 Fax:(715)478-3060	ΑΝΑΙ ΥΤΙ	CAL REPORT		WIS. LAB	CERT. NO. 72102	6460 ECT# 31905
Client: Foth & Van Dyke A Attn: Russ Janesh 2737 S. Ridge Ro PO Box 19012 Green Bay, WI 54	ssociates ek ad			<i>I</i> N J4, 1	MIB FROU	FCI# JT202
Project Description: Flambeau Mining Project Title: 96F022						
Sample ID: FMC-188LS-2 NLS#: 12 Ref. Line 4 of COC 24224 Description: FMC-188LS-2 Collected: 01/14/97 Received: 01/16/97 Reported:						
Parameter	Result	Units	LOD	LOQ	Method	Analyzed Lab
Acidity, tot. as CaCO3 Aluminum, dis. as Al by ICP Cadmium, dis. as Cd by ICP Calcium, dis. as Ca by ICP Chloride, as Cl (filtered) Chromium, dis. as Cr by ICP Cobalt, dis. as Co by ICP Copper, dis. as Cu by ICP Iron, Ferrous	590 < 0.59 > 950 460 2.7 < 52 > 4400 310000 1.4 Additional	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L mg/L Comments: F&VD mo	2.0 0.34 12 30 0.36 26 43 540 0.23 dified method	2.0 1.2 38 30 1.3 93 150 1900 0.75	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7	01/27/97 721026460 01/27/97 721026460 01/22/97 721026460 01/22/97 721026460 01/27/97 721026460 01/27/97 721026460
Iron, dis. as Fe by ICP Magnesium, dis. as Mg by ICP Manganese, dis. as Mn by ICP pH, lab Potassium, dis. as K Sodium, dis. as Na by ICP	< 0.28 > 65 8800 4.4 13 6.4	mg/L mg/L ug/L s.u. mg/L mg/L Comments: The ins	0.10 30 18 1.0 2.0 0.33	0.35 30 61 6.6 1.1 andard rec	EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7	01/27/97 721026460 01/27/97 721026460 01/27/97 721026460 01/27/97 721026460 01/23/97 721026460 01/23/97 721026460
Sulfate, as SO4 (filtered) Thallium, dis. as Tl by furnace AAS Zinc, dis. as Zn by ICP	2600 < 42 > 61000	mg/L ug/L ug/L	250 25 1200	250 87 1200	EPA 279.2	01/20/97 721026460 01/22/97 721026460 01/27/97 721026460
Values in brackets represent results greate Results greater than the LOQ are considered	er than the LOD but l I to be in the region	ess than the LOQ an of "Certain Quanti	d are within a m tation".	egion of "	Less-Certain	Quantitation".
	nit of Quantitation Applicable	ND = Not Detect %DWB = (mg/kg D				
		Atun R Reviewed by:	Cenzi	Authorize R. T. K Laborator	rueger	

.

المحاصر والمترجين والمترجين

. . . .

. .

. .

40

....

....

بالمتسابية المستحيلات

NORTHERN LAKE SERVICE, Analytical Laboratory and Environme 400 North Lake Avenue - Crandon, W	ntal Services				WIS. LAB	CERT. NO. 72102	6460
Tel:(715)478-2777 Fax:(715)478-3060		ANALYTIC	AL REPORT		PAGE: 5	NLS PROJI	ECT# 31905
At 27 PO	th & Van Dyke Ass tn: Russ Janeshel 37 S. Ridge Road Box 19012 een Bay, WI 5430	k đ					
Project Description: F Project Title: 96F022 Sample ID: FMC-183LS-2	NLS#: 1254	488		<u></u>			
Ref Line 5 of COC 24224 Descri							
Ref. Line 5 of COC 24224 Descri Collected: 01/14/97 Received: (D1/16/97 Reported: 01	/28/97				1	le-lund tob
Collected: 01/14/97 Received: (01/16/97 Reported: 01	/28/97 <u>Result</u>	Units	LOD	LOQ	Method	Analyzed Lab
Collected: 01/14/97 Received: (01/16/97 Reported: 01	Result		<u>LOD</u> 2.0	<u>LOQ</u> 2.0	<u>Method</u> EPA 305.1	01/21/97 7210264
Collected: 01/14/97 Received: (<u>arameter</u> cidity, tot. as CaCO3	01/16/97 Reported: 01	_	<u>Units</u> mg/L mg/L	2.0 0.34	2.0	EPA 305.1 EPA 200.7	01/21/97 7210264 01/27/97 7210264
Collected: 01/14/97 Received: (<u>arameter</u> cidity, tot. as CaCO3 luminum, dis. as Al by 1	D1/16/97 Reported: 01	<u>Result</u> 1100	mg/L mg/L	2.0 0.34 12	2.0 1.2 38	EPA 305.1 EPA 200.7 EPA 200.7	01/21/97 7210264 01/27/97 7210264 01/27/97 7210264
Collected: 01/14/97 Received: (arameter cidity, tot. as CaCO3 luminum, dis. as Al by I admium, dis. as Cd by I	D1/16/97 Reported: 01 ICP CP	<u>Result</u> 1100 < 0.88 >	mg/L mg/L ug/L	2.0 0.34 12 30	2.0 1.2 38 30	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264
Collected: 01/14/97 Received: (arameter cidity, tot. as CaCO3 luminum, dis. as Al by I admium, dis. as Cd by I alcium, dis. as Ca by I	D1/16/97 Reported: 01 ICP CP CP	Result 1100 < 0.88 > 170	mg/L mg/L ug/L mg/L mg/L	2.0 0.34 12 30 0.36	2.0 1.2 38 30 1.3	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2	01/21/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/22/97 7210264
Collected: 01/14/97 Received: (arameter cidity, tot. as CaCO3 luminum, dis. as Al by I admium, dis. as Cd by I alcium, dis. as Ca by I hloride. as Cl (filtered	D1/16/97 Reported: 01 ICP CP CP)	Result 1100 < 0.88 > 170 450	mg/L mg/L ug/L mg/L mg/L ug/L ug/L	2.0 0.34 12 30 0.36 26	2.0 1.2 38 30 1.3 93	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7	01/21/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/22/97 7210264 01/22/97 7210264 01/27/97 7210264
Collected: 01/14/97 Received: (arameter cidity, tot. as CaCO3 luminum, dis. as Al by 1 admium, dis. as Cd by 1 alcium, dis. as Cd by 1 hloride, as Cl (filtered hromium, dis. as Cr by	D1/16/97 Reported: 01 ICP CP CP ICP	Result 1100 < 0.88 > 170 450 2.2 < 49 > 2500	mg/L mg/L ug/L mg/L mg/L ug/L ug/L	2.0 0.34 12 30 0.36 25 43	2.0 1.2 38 30 1.3 93 150	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7	01/21/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/22/97 7210264 01/22/97 7210264 01/27/97 7210264
Collected: 01/14/97 Received: (arameter cidity, tot. as CaCO3 luminum, dis. as Al by I admium, dis. as Cd by I alcium, dis. as Ca by I hloride, as Cl (filtered hromium, dis. as Cr by I obalt. dis. as Co by IC	D1/16/97 Reported: 01 CP CP CP 1 ICP P	Result 1100 < 0.88 > 170 450 2.2 < 49 > 2500 670000	mg/L mg/L ug/L mg/L mg/L ug/L ug/L ug/L	2.0 0.34 12 30 0.36 26 43 540	2.0 1.2 38 30 1.3 93 150 1900	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7	01/21/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/22/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264
Collected: 01/14/97 Received: (arameter cidity, tot. as CaCO3 luminum, dis. as Al by I admium, dis. as Cd by I alcium, dis. as Ca by I hloride, as Cl (filtered hromium, dis. as Cr by I obalt, dis. as Co by IC	D1/16/97 Reported: 01 CP CP CP 1 ICP P	Result 1100 < 0.88 > 170 450 2.2 < 49 > 2500 6700000 < 0.62 >	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L	2.0 0.34 12 30 0.36 26 43 540 0.23	2.0 1.2 38 30 1.3 93 150	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7	01/21/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/22/97 7210264 01/22/97 7210264 01/27/97 7210264
collected: 01/14/97 Received: (arameter cidity, tot. as CaCO3 luminum, dis. as Al by 1 admium, dis. as Cd by 1 alcium, dis. as Ca by 1 hloride, as Cl (filtered hromium, dis. as Cr by 1 obalt, dis. as Co by IC opper, dis. as Cu by IC ron, Ferrous	D1/16/97 Reported: 01 CP CP CP 1 ICP P	Result 1100 < 0.88 > 170 450 2.2 < 49 > 2500 670000 < 0.62 > Additional	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L Comments: F&VD mod	2.0 0.34 12 30 0.36 26 43 540 0.23 ified method	2.0 1.2 38 30 1.3 93 150 1900 0.75	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/22/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264
collected: 01/14/97 Received: (arameter cidity, tot. as CaCO3 luminum, dis. as Al by 1 admium, dis. as Cd by 1 alcium, dis. as Cd by 1 hloride, as Cl (filtered hromium, dis. as Cr by 1 obalt, dis. as Co by IC opper, dis. as Cu by IC ron, Ferrous ron. dis. as Fe by ICP	D1/16/97 Reported: 01 ICP CP CP ICP P P	Result 1100 < 0.88 > 170 450 2.2 < 49 > 2500 670000 < 0.62 > Additional < 0.16 >	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L Comments: F&VD mod mg/L	2.0 0.34 12 30 0.36 26 43 540 0.23 ified method 0.10	2.0 1.2 38 30 1.3 93 150 1900 0.75 0.35	EPA 305.1 EPA 200.7 EPA 200.7 EPA 325.2 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/22/97 7210264 01/22/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264
Collected: 01/14/97 Received: (arameter cidity, tot. as CaCO3 luminum, dis. as Al by I admium, dis. as Cd by I alcium, dis. as Ca by I hloride, as Cl (filtered hromium, dis. as Cr by obalt, dis. as Co by IC opper, dis. as Cu by IC ron, Ferrous ron, dis. as Fe by ICP agnesium, dis. as Mg by	D1/16/97 Reported: 01 CP CP CP ICP P P ICP	Result 1100 < 0.88 > 170 450 2.2 < 49 > 2500 670000 < 0.62 > Additional < 0.16 > 79	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L mg/L Comments: F&VD mod mg/L	2.0 0.34 12 30 0.36 26 43 540 0.23 ified method 0.10 30	2,0 1,2 38 30 1,3 93 150 1900 0,75 0,35 30	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/22/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264
Collected: 01/14/97 Received: (arameter cidity, tot. as CaCO3 luminum, dis. as Al by I admium, dis. as Cd by I alcium, dis. as Ca by IC hloride, as Cl (filtered hromium, dis. as Cr by cobalt, dis. as Co by IC copper, dis. as Co by IC ron, Ferrous ron, dis. as Fe by ICP lagnesium, dis. as Mg by anganese, dis. as Mn by	D1/16/97 Reported: 01 CP CP CP ICP P P ICP	Result 1100 < 0.88 > 170 450 2.2 < 49 > 2500 670000 < 0.62 > Additional < 0.16 > 79 7800	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L mg/L mg/L mg/L ug/L ug/L	2.0 0.34 12 30 0.36 26 43 540 0.23 ified method 0.10 30 18	2.0 1.2 38 30 1.3 93 150 1900 0.75 0.35	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/22/97 7210264 01/22/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264
Collected: 01/14/97 Received: (arameter cidity, tot. as CaCO3 luminum, dis. as Al by I admium, dis. as Cd by I alcium, dis. as Cd by I hloride, as Cl (filtered hromium, dis. as Co by IC opper, dis. as Co by IC opper, dis. as Cu by IC ron, Ferrous ron, dis. as Fe by ICP agnesium, dis. as Mg by anganese, dis. as Mn by H. lab	D1/16/97 Reported: 01 CP CP CP ICP P P ICP	Result 1100 < 0.88 > 170 450 2.2 < 49 > 2500 670000 < 0.62 > Additional < 0.16 > 79 7800 4.4	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L mg/L mg/L ug/L ug/L s.u.	2.0 0.34 12 30 0.36 25 43 540 0.23 ified method 0.10 30 18 1.0	2.0 1.2 38 30 1.3 93 150 1900 0.75 0.35 30 61	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/22/97 7210264 01/22/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264
Collected: 01/14/97 Received: (arameter cidity, tot. as CaCO3 luminum, dis. as Al by 1 admium, dis. as Cd by 1 alcium, dis. as Ca by 1 hloride, as Cl (filtered hromium, dis. as Cr by 1 obalt, dis. as Co by IC opper, dis. as Co by IC ron, Ferrous ron, dis. as Fe by ICP agnesium, dis. as Mg by anganese, dis. as Mn by H, lab otassium. dis. as K	D1/16/97 Reported: 01	<pre>Result 1100 0.88 > 170 450 2.2 49 > 2500 670000 0.62 > Additional 0.16 > 79 7800 4.4 6.5 ></pre>	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L mg/L mg/L ug/L s.u. mg/L	2.0 0.34 12 30 0.36 26 43 540 0.23 ified method 0.10 30 18 1.0 2.0	2.0 1.2 38 30 1.3 93 150 1900 0.75 0.35 30 61 6.6	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7	01/21/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/22/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/23/97 7210264
Collected: 01/14/97 Received: (arameter cidity, tot. as CaCO3 luminum, dis. as Al by J admium, dis. as Cd by I alcium, dis. as Ca by I alcium, dis. as Ca by I hloride, as Cl (filtered hromium, dis. as Cr by J obalt, dis. as Co by IC opper, dis. as Co by IC ron, Ferrous ron, dis. as Fe by ICP agnesium, dis. as Mg by anganese, dis. as Mn by h, lab otassium. dis. as K	D1/16/97 Reported: 01	Result 1100 < 0.88 > 170 450 2.2 < 49 > 2500 670000 < 0.62 > Additional < 0.16 > 79 7800 4.4 < 6.5 > 5 6	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L mg/L mg/L ug/L ug/L s.u. mg/L g/L	2.0 0.34 12 30 0.36 26 43 540 0.23 ified method 0.10 30 18 1.0 2.0 0.33	2,0 1,2 38 30 1,3 93 150 1900 0,75 0,35 30 61 6.6 1,1	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 150.1 EPA 200.7	01/21/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/22/97 7210264 01/22/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264
Collected: 01/14/97 Received: (arameter cidity, tot. as CaCO3 luminum, dis. as Al by J admium, dis. as Cd by I alcium, dis. as Ca by I alcium, dis. as Ca by I hloride, as Cl (filtered hromium, dis. as Cr by J obalt, dis. as Co by IC opper, dis. as Co by IC ron, Ferrous ron, dis. as Fe by ICP agnesium, dis. as Mg by anganese, dis. as Mn by h, lab otassium. dis. as K	D1/16/97 Reported: 01	Result 1100 < 0.88 > 170 450 2.2 < 49 > 2500 670000 < 0.62 > Additional < 0.16 > 79 7800 4.4 < 5.5 > 5.6 Additional	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L mg/L mg/L ug/L s.u. mg/L mg/L s.u. mg/L mg/L tormments: The inst	2.0 0.34 12 30 0.36 26 43 540 0.23 ified method 0.10 30 18 1.0 2.0 0.33	2,0 1,2 38 30 1,3 93 150 1900 0,75 0,35 30 61 6.6 1,1	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 150.1 EPA 200.7	01/21/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/22/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/23/97 7210264
Collected: 01/14/97 Received: (arameter cidity, tot. as CaCO3 luminum, dis. as Al by I admium, dis. as Cd by I alcium, dis. as Cd by I alcium, dis. as Ca by IC alcium, dis. as Co by IC hloride, as Cl (filtered hromium, dis. as Co by IC copper, dis. as Co by IC ron, Ferrous ron, dis. as Fe by ICP lagnesium, dis. as Mg by langanese, dis. as Mn by H, lab cotassium, dis. as K codium, dis. as Na by IC	D1/16/97 Reported: 01	<pre>Result 1100 < 0.88 > 170 450 2.2 < 49 > 2500 670000 < 0.62 > Additional < 0.16 > 79 7800 4.4 < 6.5 > 5.6 Additional 14%. See m</pre>	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L mg/L mg/L ug/L s.u. mg/L s.u. mg/L comments: The inst arrative,	2.0 0.34 12 30 0.36 26 43 540 0.23 ified method 0.10 30 18 1.0 2.0 0.33 rument check s	2.0 1.2 38 30 1.3 93 150 1900 0.75 0.35 30 61 6.6 1.1 tandard rea	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/22/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/23/97 7210264
Ref. Line 5 of COC 24224 Descri Collected: 01/14/97 Received: (arameter addity, tot. as CaCO3 .luminum, dis. as Al by 1 addium, dis. as Cd by 1 Calcium, dis. as Cd by 1 Calcium, dis. as Ca by 1 Chloride, as Cl (filtered hromium, dis. as Co by 1 Copper, dis. as Co by 1 Copper, dis. as Co by 1 Copper, dis. as Cu by 1 Copper, dis. as Cu by 1 Copper, dis. as K sodium, dis. as Na by 1 Cotassium, dis. as Na by 1 Sulfate, as SO4 (filtered challium, dis. as Tl by	D1/16/97 Reported: 01	Result 1100 < 0.88 > 170 450 2.2 < 49 > 2500 670000 < 0.62 > Additional < 0.16 > 79 7800 4.4 < 5.5 > 5.6 Additional	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L mg/L mg/L ug/L s.u. mg/L mg/L s.u. mg/L mg/L tormments: The inst	2.0 0.34 12 30 0.36 26 43 540 0.23 ified method 0.10 30 18 1.0 2.0 0.33	2,0 1,2 38 30 1,3 93 150 1900 0,75 0,35 30 61 6.6 1,1	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 150.1 EPA 200.7	01/21/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/22/97 7210264 01/22/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/23/97 7210264 01/23/97 7210264

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

41

LOQ = Limit of Quantitation NA = Not Applicable

Sugar Sector

differences to the

Sec. Ash

addeed maintain

North Contraction of the

100000

ND = Not Detected %DWB = (mg/kg DWB)/10000

Same

Allow Same

Reviewed by:

Authorized by: R. T. Krueger Laboratory Manager

when an Wester

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

42

ANALYTICAL REPORT

WIS. LAB CERT. NO. 721026460

and the second
يي يوم مديد الادم المصف ومصودية الابتراء بموضوعة ماد

PAGE: 6 NLS PROJECT# 31905

Foth & Van Dyke As Attn: Russ Janeshe 2737 S. Ridge Roa PO Box 19012 Green Bay, WI 543 Flambeau Mining 2	k d					
2						
-3 NLS#: 125 scription: FMC-213LS-3 d: 01/16/97 Reported: 01		na i prospiti posici i		, <u></u> ,		
	Result	Units	LOD	LOQ	Method	Analyzed Lab
ICP ICP ed) y ICP ICP	450 1.7 260 530 4.4 ND 2400 200000 0.44	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L	2.0 0.34 12 30 0.36 26 43 540 0.046	2.0 1.2 38 30 1.3 93 150 1500 0.15	EPA 200.7	
by ICP by ICP	1.3 75 5900 4.8 ND 5.0	mg/L mg/L ug/L s.u. mg/L mg/L	0.10 30 18 1.0 2.0 0.33	0.35 30 61 6.6 1.1	EPA 150.1 EPA 200.7 EPA 200.7	01/27/97 721026460 01/27/97 721026460 01/27/97 721026460 01/16/97 721026460 01/23/97 721026460
/ furnace AAS	114%. See n 2500 < 26 > 52000	arrative. mg/L ug/L ug/L	250 25 1200	250 87 1200	EPA 375.2	01/22/97 721026460
esent results greater LOQ are considered	than the LOD but lea to be in the region (ss than the LOQ and of "Certain Ouanti	d are within a ptation".	region of '	'Less-Certain	Quantitation".
LOQ = Limit	t of Quantitation	ND = Not Detect	ed			
		Atumn R. Reviewed by:	Cuyn	R. T. F	lrueger	
	y ICP ICP ICP ed) y ICP ICP by ICP by ICP by ICP ICP ICP ed) y furnace AAS P esent results greater = LOQ are considered for LOQ = Limit	Result 450 1CP 260 ed) 4.4 y ICP ND ed) 4.4 y ICP ND ICP 2400 ICP 200000 0.44 Additional P 1.3 by ICP 5900 4.8 ND ICP 5.0 Additional 114%. See n 2500 y furnace AAS 26 > p esent results greater than the LOD but lege actoQ are considered to be in the region of	ResultUnitsy ICP1.7 mg/L ICP260 ug/L ed)4.4 mg/L y ICPND ug/L ICP2400 ug/L ICP2400 ug/L ICP2400 ug/L ICP200000 ug/L ICP200000 ug/L ICP200000 ug/L ICP200000 ug/L ICP200000 ug/L by ICP75 mg/L by ICP5900 ug/L ICP5900 ug/L ed)2500 mg/L y furnace AAS< 26 > ug/L ed)22000 ug/L seent results greater than the LOD but less than the LOQ and a LOQ are considered to be in the region of "Certain Quantit NA = Not ApplicableND = Not Detected %DWB = (mg/kg DW	ResultUnitsLOD $y \ ICP$ 1.7 mg/L 2.0 ICP 1.7 mg/L 0.34 ICP 260 ug/L 12 ed 4.4 mg/L 0.36 $y \ ICP$ 2400 ug/L 26 ICP 2400 ug/L 43 ICP 200000 ug/L 540 ICP 2400 ug/L 540 ICP 2400 ug/L 540 ICP 2400 ug/L 0.046 $hdditional Comments:F&VD modified methodP1.3mg/L30by ICP75mg/L30by ICP5.0mg/L2.0ICP52000ug/L184.8s.u.1.0NDmg/L2.0generational Comments:The instrument check stI14%.See narrative.250ed250ug/L25p< 26 > ug/L25generation considered to be in the region of "Certain Quantitation".1200uccolsecondereduccolsecondered considered to be in the region of "Certain Quantitation".uccolsecondereduccolsecondereduccolsecondereduccolsecondereduccolsecondereduccolsecondereduccolsecondereduccolsecondereduccolsecondereduccolsecondereduccolsecondereduccolsecondereduccolsecondereduccolsecondereduccolsecondereduccolsecondereduccolsecondered<$	ResultUnitsLODLOQY ICP1.7mg/L2.02.0ICP260ug/L1238ICP500ug/L3030ed)4.4mg/L0.361.3y ICPNDug/L2693ICP2400ug/L43150ICP24000ug/L43150ICP24000ug/L54019000.44mg/L3030by ICP75mg/L30by ICP5900ug/L18ICP25059001.0ICP5200ug/L120by ICP5200ug/L250by ICP5200ug/L250by ICP5200ug/L250ced)2500ug/L250y furnace AAS< 26 >ug/L250ed)2500ug/L1200y furnace AAS< 26 >ug/Lced)1.0Q = Limit of QuantitationND = Not Detectedw furnace AAS< 26 >ug/L250e LOQ are considered to be in the region of "Certain Quantitation".ND = Not Detectedw furnace AAS< 1.0P	ResultUnitsLODLOQMethody ICP1.7mg/L2.02.0EPA 305.1ICP260ug/L1238EPA 200.7ed)4.4mg/L3030EPA 200.7y ICPNDug/L2693EPA 200.7iCP2400ug/L2693EPA 200.7iCP2400ug/L2693EPA 200.7iCP2400ug/L43150EPA 200.7iCP2400ug/L5401900EPA 200.7iCP2400ug/L5401900EPA 200.7iCP2400ug/L5401900EPA 200.7iCP2400ug/L5401900EPA 200.7iCP25000ug/L3030EPA 200.7icp5500ug/L0.0460.15Interventionicp5.0mg/L0.06.6EPA 200.7icp4.8s.u.1.0EPA 200.7icp5.0mg/L2.06.6EPA 200.7icp4.8s.u.1.0EPA 200.7icpicpicpicp2.50EPA 200.7icpicpicpmg/L2.06.6icp<

NORTHERN LAKE SE Analytical Laboratory and En 100 North Lake Avenue - Cra Fel:(715)478-2777 Fax:(715)4	wironmental Services Indon, WI 54520				WIS. LAB	CERT. NO. 72102	6460
Ch(rto)410-2111 Euxi(110)	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	ANALYTIC	AL REPORT		PAGE: 7	NLS PROJ	ECT# 31905
Client:	Foth & Van Dyke Ass Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 5430	i					
Project Title: 96							
	7LS-2 NLS#: 1254 Description: FMC-187LS-2 ceived: 01/16/97 Reported: 01/						
		-	• ·				
arameter		Result	Units	LOD	LOQ	Method	Analyzed Lab
	aC03	490	mg/L	2.0	2.0	EPA 305.1	01/21/97 7210264
idity, tot. as Ca uminum, dis. as J	Al by ICP	490 ND	mg/L mg/L	2.0 0.34	2.0 1.2	EPA 305.1 EPA 200.7	01/21/97 721026 01/27/97 721026
idity, tot. as Ca uminum, dis. as J dmium, dis. as Co	Al by ICP d by ICP	490 ND 82	mg/L mg/L ug/L	2.0 0.34 12	2.0 1.2 38	EPA 305.1 EPA 200.7 EPA 200.7	01/21/97 721026 01/27/97 721026 01/27/97 721026
idity, tot. as Ca uminum, dis. as J dmium, dis. as Ca lcium, dis. as Ca	Al by ICP d by ICP a by ICP	490 ND 82 520	mg/L mg/L ug/L mg/L	2.0 0.34 12 30	2.0 1.2 38 30	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026
idity, tot. as Ca uminum, dis. as Ca dmium, dis. as Ca lcium, dis. as Ca loride, as Cl (fi	Al by ICP 1 by ICP a by ICP ltered)	490 ND 82 520 1.9	mg/L mg/L ug/L mg/L mg/L	2.0 0.34 12 30 0.36	2.0 1.2 38 30 1.3	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2	01/21/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/22/97 721026
idity, tot. as Ca uminum, dis. as Ca dmium, dis. as Ca lcium, dis. as Ca loride, as Cl (fi romium, dis. as C	Al by ICP d by ICP a by ICP ltered) Tr by ICP	490 ND 82 520 1.9 ND	mg/L mg/L ug/L mg/L mg/L ug/L	2.0 0.34 12 30 0.36 26	2.0 1.2 38 30 1.3 93	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7	01/21/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/22/97 721026 01/22/97 721026
idity, tot. as Ca uminum, dis. as Ca dmium, dis. as Ca lcium, dis. as Ca loride, as Cl (fi romium, dis. as Ca balt, dis. as Co	Al by ICP d by ICP a by ICP ltered) Cr by ICP by ICP	490 ND 82 520 1.9 ND 1800	mg/L mg/L ug/L mg/L mg/L ug/L ug/L	2.0 0.34 12 30 0.36 26 43	2.0 1.2 38 30 1.3 93 150	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 325.2 EPA 200.7 EPA 200.7	01/21/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/22/97 721026 01/27/97 721026 01/27/97 721026
idity, tot. as Cauminum, dis. as Cauminum, dis. as Calcium, dis. as Cobalt, dis. as Copper, dis. as Cu	Al by ICP d by ICP a by ICP ltered) Cr by ICP by ICP	490 ND 82 520 1.9 ND 1800 300000	mg/L mg/L mg/L mg/L ug/L ug/L ug/L	2.0 0.34 12 30 0.36 26 43 540	2.0 1.2 38 30 1.3 93 150 1900	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7	01/21/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/22/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026
idity, tot. as Cauminum, dis. as Cauminum, dis. as Calcium, dis. as Cobalt, dis. as Copper, dis. as Cu	Al by ICP d by ICP a by ICP ltered) Cr by ICP by ICP	490 ND 82 520 1.9 ND 1800 300000 ND	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L	2.0 0.34 12 30 0.36 26 43	2.0 1.2 38 30 1.3 93 150	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 325.2 EPA 200.7 EPA 200.7	01/21/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/22/97 721026 01/22/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026
idity, tot. as Cauminum, dis. as Cauminum, dis. as Ca dmium, dis. as Ca lcium, dis. as Ca loride, as Cl (fi romium, dis. as Ca balt, dis. as Co pper, dis. as Cu on, Ferrous	Al by ICP d by ICP a by ICP ltered) Tr by ICP by ICP by ICP	490 ND 82 520 1.9 ND 1800 300000	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L mg/L Comments: F&VD mod	2.0 0.34 12 30 0.36 26 43 540 0.046	2.0 1.2 38 30 1.3 93 150 1900	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 325.2 EPA 200.7 EPA 200.7	01/21/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/22/97 721026 01/22/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026
idity, tot. as Cauminum, dis. as Cauminum, dis. as Calcium, dis. as Calcium, dis. as Calcium, dis. as Calcium, dis. as Coloride, dis. as Coloride, dis. as Coloride, dis. as Culor, Ferrous on, dis. as Fe by gnesium, dis.	Al by ICP i by ICP a by ICP ltered) Cr by ICP by ICP by ICP / ICP Mg by ICP	490 ND 82 520 1.9 ND 1800 300000 ND Additional	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L ug/L mg/L Comments: F&VD mod mg/L	2.0 0.34 12 0.36 26 43 540 0.046 Hified method	2.0 1.2 38 30 1.3 93 150 1900 0.15	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/22/97 721026 01/22/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026
idity, tot. as Cauminum, dis. as Cauminum, dis. as Calcium, dis. as Calcium, dis. as Calcium, dis. as Calcium, dis. as Coloride, dis. as Coloride, dis. as Coloride, dis. as Culor, Ferrous on, dis. as Fe by gnesium, dis.	Al by ICP i by ICP a by ICP ltered) Cr by ICP by ICP by ICP / ICP Mg by ICP	490 ND 82 520 1.9 ND 1800 300000 ND Additional < 0.19 > 47 5000	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L ug/L mg/L Comments: F&VD mod mg/L	2.0 0.34 12 30 0.36 26 43 540 0.046 Hified method 0.10 30 18	2.0 1.2 38 30 1.3 93 150 1900 0.15 0.35	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/22/97 721026 01/22/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026
idity, tot. as Cauminum, dis. as Cauminum, dis. as Calcium, dis. as Calcium, dis. as Calcium, dis. as Coloride, as Cl (firomium, dis. as Colbalt, dis. as Copper, dis. as Cuon, Ferrous on, dis. as Fe by gnesium, dis. as Inganese, dis. as	Al by ICP i by ICP a by ICP ltered) Cr by ICP by ICP by ICP / ICP Mg by ICP	490 ND 82 520 1.9 ND 1800 300000 ND Additional < 0.19 > 47 5000 4.8	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L mg/L mg/L mg/L ug/L ug/L s.u.	2.0 0.34 12 30 0.36 26 43 540 0.046 Nified method 0.10 30 18 1.0	2.0 1.2 38 30 1.3 93 150 1900 0.15 0.35 30 61	EPA 305.1 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/22/97 7210264 01/22/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264
idity, tot. as C uminum, dis. as C dmium, dis. as C lcium, dis. as C loride, as Cl (fi romium, dis. as C balt, dis. as Co opper, dis. as Co on, Ferrous on, Ferrous on, dis. as Fe by gnesium, dis. as nganese, dis. as 1, lab	Al by ICP d by ICP a by ICP ltered) Tr by ICP by ICP by ICP / ICP Mg by ICP Mn by ICP	490 ND 82 520 1.9 ND 1800 300000 ND Additional < 0.19 > 47 5000 4.8 12	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L mg/L mg/L mg/L ug/L s.u. mg/L	2.0 0.34 12 30 0.36 26 43 540 0.046 Hified method 0.10 30 18 1.0 2.0	2.0 1.2 38 30 1.3 93 150 1900 0.15 0.35 30 61 6.6	EPA 305.1 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7	01/21/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/22/97 7210264 01/22/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/23/97 7210264
idity, tot. as Cauminum, dis. as Cauminum, dis. as Calcium, dis. as Calcium, dis. as Calcium, dis. as Calcium, dis. as Coloride, as Cl (firromium, dis. as Coloride, dis. as Coloride, dis. as Coloride, dis. as Culor, Ferrous on, dis. as Fe by gnesium, dis. as nganese, dis. as nganese, dis. as lab tassium, dis. as	Al by ICP i by ICP a by ICP ltered) Tr by ICP by ICP by ICP / ICP Mg by ICP Mn by ICP K	490 ND 82 520 1.9 ND 1800 300000 ND Additional < 0.19 > 47 5000 4.8 12 4.9	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L mg/L mg/L ug/L s.u. mg/L g/L g/L	2.0 0.34 12 30 0.36 26 43 540 0.046 Hified method 0.10 30 18 1.0 2.0 0.33	2.0 1.2 38 30 1.3 93 150 1900 0.15 0.35 30 61 6.6 1.1	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/22/97 721026 01/22/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026
idity, tot. as Cauminum, dis. as Cauminum, dis. as Calcium, dis. as Calcium, dis. as Calcium, dis. as Calcium, dis. as Coloride, as Cl (firromium, dis. as Coloride, dis. as Coloride, dis. as Coloride, dis. as Culor, Ferrous on, dis. as Fe by gnesium, dis. as nganese, dis. as nganese, dis. as lab tassium, dis. as	Al by ICP i by ICP a by ICP ltered) Tr by ICP by ICP by ICP / ICP Mg by ICP Mn by ICP K	490 ND 82 520 1.9 ND 1800 300000 ND Additional < 0.19 > 47 5000 4.8 12 4.9 Additional	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L mg/L mg/L ug/L s.u. mg/L ug/L s.u. mg/L mg/L torments: The inst	2.0 0.34 12 30 0.36 26 43 540 0.046 Hified method 0.10 30 18 1.0 2.0 0.33	2.0 1.2 38 30 1.3 93 150 1900 0.15 0.35 30 61 6.6 1.1	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/22/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/23/97 721026
idity, tot. as Cauminum, dis. as Cauminum, dis. as Ca dmium, dis. as Ca lcium, dis. as Ca loride, as Cl (fil romium, dis. as Co poper, dis. as Co on, Ferrous on, Ferrous on, dis. as Fe by gnesium, dis. as nganese, dis. as t, lab tassium, dis. as Na	Al by ICP d by ICP a by ICP ltered) Cr by ICP by ICP by ICP y ICP Mn by ICP K by ICP	490 ND 82 520 1.9 ND 1800 300000 ND Additional < 0.19 > 47 5000 4.8 12 4.9 Additional 114%. See r	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L comments: F&VD mod mg/L ug/L s.u. mg/L s.u. mg/L comments: The inst harrative.	2.0 0.34 12 30 0.36 26 43 540 0.046 Hified method 0.10 30 18 1.0 2.0 0.33 crument check s	2.0 1.2 38 30 1.3 93 150 1900 0.15 0.35 30 61 61 1.1 rec	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7	01/21/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/22/97 721026 01/22/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/23/97 721026 01/23/97 721026
cidity, tot. as Ca luminum, dis. as Ca admium, dis. as Ca alcium, dis. as Ca hloride, as Cl (fi hromium, dis. as Co obalt, dis. as Co opper, dis. as Co ron, Ferrous ron, dis. as Fe by agnesium, dis. as anganese, dis. as H, lab otassium, dis. as Na odium, dis. as Na	Al by ICP d by ICP a by ICP ltered) Cr by ICP by ICP y ICP Mg by ICP Mn by ICP K by ICP K by ICP	490 ND 82 520 1.9 ND 1800 300000 ND Additional < 0.19 > 47 5000 4.8 12 4.9 Additional 114%. See r 2400	mg/L mg/L ug/L mg/L mg/L ug/L ug/L ug/L mg/L mg/L mg/L g/L s.u. mg/L s.u. mg/L s.u. mg/L s.u. mg/L mg/L s.u. mg/L	2.0 0.34 12 30 0.36 26 43 540 0.046 lified method 0.10 30 18 1.0 2.0 0.33 crument check s	2.0 1.2 38 30 1.3 93 150 1900 0.15 0.15 0.35 30 61 6.6 1.1 standard rec 250	EPA 305.1 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7 EPA 375.2	01/21/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/22/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/23/97 721026 01/23/97 721026 01/27/97 721026
Carameter cidity, tot. as Ca luminum, dis. as Ca luminum, dis. as Ca Calcium, dis. as Ca Calcium, dis. as Ca Chloride, as Cl (fi Cobalt, dis. as Co Copper, dis. as Cu cron, ferrous cron, dis. as Fe by lagnesium, dis. as langanese, dis. as codium, dis. as Na codium, dis. as Na culfate, as SO4 (fi challium, dis. as Zn by con dis. as Zn by culfate, as SO4 (fi culfate, as Zn by culfate, as Culfate,	Al by ICP i by ICP A by ICP ltered) Cr by ICP by ICP y ICP Mg by ICP Mn by ICP K by ICP K by ICP K ltered) Fl by furnace AAS	490 ND 82 520 1.9 ND 1800 300000 ND Additional < 0.19 > 47 5000 4.8 12 4.9 Additional 114%. See r	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L comments: F&VD mod mg/L ug/L s.u. mg/L s.u. mg/L comments: The inst harrative.	2.0 0.34 12 30 0.36 26 43 540 0.046 Hified method 0.10 30 18 1.0 2.0 0.33 crument check s	2.0 1.2 38 30 1.3 93 150 1900 0.15 0.35 30 61 61 1.1 rec	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7	01/21/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/22/97 721026 01/22/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/23/97 721026 01/23/97 721026

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

43

CALENCE N

LOQ = Limit of Quantitation NA = Not Applicable ND = Not Detected %DWB = (mg/kg DWB)/10000

Ateun R.L tum Reviewed by:

NORTHERN LAKE SE Analytical Laboratory and Er 400 North Lake Avenue - Cra	nvironmental Services Indon, WI 54520				WIS. LAB	CERT. NO. 72102	6460	
Tel:(715)478-2777 Fax:(715)-	178-3060	ANALYTIC	AL REPORT		PAGE: 8	NLS PROJ	ECT# 3190	5
Client:	Foth & Van Dyke A Attn: Russ Janesh 2737 S. Ridge Ro PO Box 19012 Green Bay, WI 54	ek ad						
Project Descripti Project Title: 96	on: Flambeau Mining F022							
Sample ID: FMC-15 Ref. Line 8 of COC 24224 Collected: 01/14/97 Ref.	4LS-2 NLS#: 12 Description: FMC-194LS-2 ceived: 01/16/97 Reported:							
Parameter		Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as C Aluminum, dis. as C Cadmium, dis. as C Calcium, dis. as C Chloride, as Cl (fi Chromium, dis. as C Copper, dis. as Co Copper, dis. as Cu Iron, Ferrous Iron, dis. as Fe b Magnesium, dis. as Manganese, dis. as pH, lab Potassium, dis. as Na	Al by ICP d by ICP d by ICP ltered) Cr by ICP by ICP by ICP Y ICP Mg by ICP Mn by ICP K	< 0.27 > ND 1500 6.0 ND 3.2	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L mg/L mg/L ug/L s.u. mg/L mg/L g/L ug/L s.u. mg/L mg/L ug/L ug/L	0.10 30 18 1.0 2.0 0.33	2.0 1.2 38 30 1.3 93 150 190 0.15 0.35 30 61 6.6 1.1 tandard rea	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7 EPA 200.7	01/22/97 01/27/97 01/27/97 01/27/97 01/27/97 01/27/97 01/27/97 01/27/97 01/27/97 01/26/97 01/26/97	72102646 72102646 72102646 72102646 72102646 72102646 72102646 72102646 72102646 72102646 72102646 72102646 72102646
Sulfate, as SO4 (fi Thallium, dis. as Zinc, dis. as Zn b	Fl by furnace AAS	114%, See 800 ND 1200	narrative. mg/L ug/L ug/L	250 25 1200	250 87 1200	EPA 375.2 EPA 279.2 EPA 200.7	01/22/97	72102646
Values in brackets Results greater that LOD = Limit of Dete DWB = Dry Weight Ba	represent results great n the LOQ are considere ction LOQ = Lin sis NA = Not	er than the LOD but l d to be in the region mit of Quantitation Applicable	ess than the LOQ and of "Certain Quantif ND = Not Detecto %DWB = (mg/kg DW Attuin R Reviewed by:	ed NB)/10000	Authorize R. T. 1	ad by:	Quantitat	ion".

مستعاده فاستناده والترجير والمستاد س

...

44

المستعمدة بصما فتستاك بماكرة الماكسينية التكريون كوروري

NORTHERN LAKE SEP Analytical Laboratory and En 400 North Lake Avenue - Cran	ironmental Services				WIS. LAB	CERT. NO. 72102	6460
Tel:(715)478-2777 Fax:(715)4		ANALYTIC	AL REPORT		PAGE: 9	NLS PROJ	ECT# 31905
Client:	Foth & Van Dyke Ass Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 5430	i					
Project Descriptic Project Title: 96) 	2LS-2 NLS#: 1254 Description: FMC-192LS-2		-				
Parameter		Result	Units	LOD	LOQ	Method	Analyzed Lab
Acidity, tot. as Ca Aluminum, dis. as A	l by ICP	36 < 0.80 > < 22 >	mg/L mg/L ug/L	2.0 0.34 12	2.0 1.2 38		01/21/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264
Cadmium, dis. as Cd Calcium, dis. as Ca Chloride, as Cl (fil Chromium, dis. as C	by ICP tered) r by ICP	260 < 1.2 > < 72 >	mg/L mg/L ug/L	30 0,36 26	30 1.3 93	EPA 325.2 EPA 200.7	01/22/97 7210264
Cadmium, dis. as Cd Calcium, dis. as Ca Chloride, as Cl (fil Chromium, dis. as C Cobalt, dis. as Co Copper, dis. as Cu	by ICP tered) r by ICP by ICP	260 < 1.2 > < 72 > 710 38000 0.20	mg/L mg/L ug/L ug/L ug/L mg/L	0.36 26 43 54 0.046	1.3	EPA 325.2 EPA 200.7 EPA 200.7	01/22/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264
Cadmium, dis. as Cd Calcium, dis. as Ca Chloride, as Cl (fil Chromium, dis. as C Cobalt, dis. as Co Copper, dis. as Cu Iron, Ferrous Iron, dis. as Fe by Magnesium, dis. as Manganese, dis. as	by ICP tered) r by ICP by ICP by ICP ICP Mg by ICP	260 < 1.2 > < 72 > 710 38000 0.20	mg/L mg/L ug/L ug/L ug/L	0.36 26 43 54 0.046	1,3 93 150 190 0.15 0.35 30 61	EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1	01/22/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/16/97 7210264
Cadmium, dis. as Cd Calcium, dis. as Ca Chloride, as Cl (fil Chromium, dis. as C Cobalt, dis. as Co Copper, dis. as Cu Iron, Ferrous Iron, dis. as Fe by Magnesium, dis. as	by ICP tered) r by ICP by ICP by ICP ICP Mg by ICP Mn by ICP K	260 < 1.2 > < 72 > 710 3B000 0.20 Additional (ND 46 3700 5.5 < 6.2 > 5.4	mg/L mg/L ug/L ug/L ug/L mg/L F&VD mo mg/L mg/L ug/L s.u. mg/L mg/L Comments: The ins	0.36 26 43 54 0.046 dified method 0.10 30 18 1.0 2.0 0.33	1.3 93 150 190 0.15 0.35 30 61 6.6 1.1	EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7	01/22/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264

states contra-

6-9-1-FA

10.000 (0.000)

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

2124-1445

Action System)

ND = Not Detected %DWB = (mg/kg DWB)/10000

Atum R. Cenyn Reviewed by:

Authorized by: R. T. Krueger Laboratory Manager

 $f_{i} \in \mathcal{C}_{i} \subset \mathcal{C}_{i} \in \mathcal{C}_{i}$

NORTHERN LAKE SERVICE, INC. Analytical Laboratory and Environmental Services 400 North Lake Avenue - Crandon, WI 54520				WIS. LAB	CERT. NO. 7210	26460
Tel:(715)478-2777 Fax:(715)478-3060	ANALYTI	CAL REPORT		PAGE: 10	NLS PRO	JECT# 31905
Client: Foth & Van Dyke Asso Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307	ciates					
Project Description: Flambeau Mining Project Title: 96F022						
Sample ID: FMC-8-1LS-2 NLS#: 12549 Ref. Line 10 of COC 24224 Description: FMC-8-1LS-2 Collected: 01/14/97 Received: 01/16/97					•	
Parameter	Result	Units	LOD	roð	Method	Analyzed Lab
Alkalinity, carbonate as CaCO3 Aluminum, dis. as Al by ICP Cadmium, dis. as Cd by ICP Calcium, dis. as Cd by ICP Chloride, as Cl (filtered) Chromium, dis. as Cr by ICP Cobalt, dis. as Co by ICP Copper, dis. as Cu by ICP Iron, ferrous Iron, dis. as Fe by ICP Magnesium, dis. as Mg by ICP Magnese, dis. as Mn by ICP Ph, lab Potassium, dis. as K Sodium, dis. as Na by ICP Sulfate, as SO4 (filtered) Thallium, dis. as Tl by furnace AAS Zinc, dis. as Zn by ICP	ND ND 180 6.6 ND 4.4	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L mg/L mg/L ug/L s.u. mg/L mg/L mg/L mg/L ug/L ug/L ug/L ug/L ug/L ug/L ug/L	0.10 30 18 1.0 2.0 0.33	5.3 1.2 38 30 1.3 93 150 190 0.15 0.35 30 61 6.6 1.1 tandard reco 87 1200	EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7	01/27/97 721026460 01/27/97 721026460 01/22/97 721026460 01/27/97 721026460 01/27/97 721026460 01/27/97 721026460 01/27/97 721026460 01/27/97 721026460 01/27/97 721026460 01/27/97 721026460 01/23/97 721026460 01/23/97 721026460
Values in brackets represent results greater th Results greater than the LOQ are considered to LOD = Limit of Detection LOQ = Limit of DWB = Dry Weight Basis NA = Not App	be in the region of Quantitation	ess than the LOQ and of "Certain Quantit ND = Not Detecte %DWB = (mg/kg DW Atuun R Reviewed by:	ation". d B)/10000	region of "I Authorized R. T. Kr Laboratory	l by: rueger	Quantitation".

46

NORTHERN LAKE SERVIC Analytical Laboratory and Envirour 400 North Lake Avenue - Crandon, Tel:(715)478-2777 Fax:(715)478-300	nental Services WI 54520	ANALYTIC	AL REPORT		WIS. LAB	CERT. NO. 72102 NLS PRO	26460 JECT# 31905
Project Description:		ciates					
Project Title: 96F022 Sample ID: FMC-190LS- Ref. Line 11 of COC 24224 De	•2 NLS#: 12549 scription: FMC-190LS-2						
Collected: 01/14/97 Received	I: 01/16/97 Reported: 01/28	N97					
	1: 01/16/97 Reported: 01/26	<u>Result</u>	Units	LOD	LOQ	Method	Analyzed Lab
Parameter Acidity, tot. as CaCO3 Aluminum, dis. as Al by Cadmium, dis. as Cd by Calcium, dis. as Ca by	ICP ICP ICP	Result 480 < 0.76	mg/L mg/L ug/L mg/L	2.0 0.34 12 30	2.0 1.2 38 30	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264
Parameter Acidity, tot. as CaCO3 Aluminum, dis. as Al by Cadmium, dis. as Cd by Calcium, dis. as Ca by Chloride, as Cl (filtere Chromium, dis. as Cr by Cobalt, dis. as Co by I Copper, dis. as Cu by J	/ ICP ICP ICP ICP ICP ICP ICP	Result 480 < 0.76 > 150 340 2.8 < 70 > 3600 300000 ND	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L	2.0 0.34 12 30 0.36 26 43 540 0.046	2.0 1.2 38	EPA 305.1 EPA 200.7 EPA 200.7	01/21/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264
Parameter Acidity, tot. as CaCO3 Aluminum, dis. as Al by Cadmium, dis. as Cd by Calcium, dis. as Ca by Chloride, as Cl (filtere Chromium, dis. as Cr by Cobalt, dis. as Co by I Copper, dis. as Cu by I Fron, Ferrous	ICP ICP ICP id) ICP CP CP	Result 480 < 0.76 > 150 340 2.8 < 70 > 3600 300000 ND Additional	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L Comments: F&VD mod:	2.0 0.34 12 30 0.36 26 43 540 0.046 ified method	2.0 1.2 38 30 1.3 93 150 1900 0.15	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/22/97 7210264 01/22/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264
Parameter Acidity, tot. as CaCO3 Aluminum, dis. as Al by Cadmium, dis. as Cd by Calcium, dis. as Ca by Chloride, as Cl (filtere Chromium, dis. as Cr by Cobalt, dis. as Co by I Copper, dis. as Cu by I Fron, Ferrous Fron, dis. as Fe by ICF Magnesium, dis. as Mg b Manganese, dis. as Mn b	· ICP ICP ICP iCP CCP CCP CCP	Result 480 0.76 > 150 340 2.8 70 > 3600 300000 ND Additional ND 65 8800	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L mg/L mg/L ug/L ug/L	2.0 0.34 12 30 0.36 26 43 540 0.046 ified method 0.10 30 18	2.0 1.2 38 30 1.3 93 150 1900	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/22/97 7210264 01/22/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264
arameter cidity, tot. as CaCO3 luminum, dis. as Al by admium, dis. as Cd by alcium, dis. as Cd by hloride, as Cl (filtere hromium, dis. as Cr by obalt, dis. as Co by I opper, dis. as Co by I opper, dis. as Cu by I ron, Ferrous ron, dis. as Fe by ICF agnesium, dis. as Mg b anganese, dis. as Mn b H, lab otassium, dis. as K	ICP ICP ICP icp icp icp icp icp icp icp icp icp icp	Result 480 0.76 > 150 340 2.8 70 > 3600 300000 ND Additional ND 65 8800 5.2 12 6.2	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L mg/L mg/L ug/L s.u. mg/L mg/L g/L	2.0 0.34 12 30 0.36 26 43 540 0.046 ified method 0.10 30 18 1.0 2.0 0.33	2.0 1.2 38 30 1.3 93 150 1900 0.15 0.35 30 61 6.6 1.1	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/22/97 7210264 01/22/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264
arameter cidity, tot. as CaCO3 luminum, dis. as Al by admium, dis. as Cd by alcium, dis. as Cd by hloride, as Cl (filtere hromium, dis. as Cr by bobalt, dis. as Co by I opper, dis. as Co by I ron, Ferrous ron, dis. as Fe by ICF agnesium, dis. as Mg b anganese, dis. as Mn b H, lab otassium, dis. as K	ICP ICP ICP icp icp icp icp icp icp icp icp icp icp	Result 480 0.76 > 150 340 2.8 70 > 3600 300000 ND Additional ND 65 8800 5.2 12 6.2 Additional	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L mg/L ug/L s.u. mg/L gg/L s.u. mg/L mg/L mg/L	2.0 0.34 12 30 0.36 26 43 540 0.046 ified method 0.10 30 18 1.0 2.0 0.33	2.0 1.2 38 30 1.3 93 150 1900 0.15 0.35 30 61 6.6 1.1	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/22/97 7210264 01/22/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/23/97 7210264
Parameter	ICP ICP ICP id) ICP CP CP CP Y ICP Y ICP	Result 480 0.76 > 150 340 2.8 70 > 3600 300000 ND Additional ND 65 8800 5.2 12 6.2 Additional	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L mg/L mg/L ug/L s.u. mg/L mg/L g/L	2.0 0.34 12 30 0.36 26 43 540 0.046 ified method 0.10 30 18 1.0 2.0 0.33	2.0 1.2 38 30 1.3 93 150 1900 0.15 0.35 30 61 6.6 1.1	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/22/97 7210264 01/22/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/23/97 7210264

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

diamon the

diamente da la

Sec. Sec.

Here and and

17. 1

er er sen er som

##TAN18-15-15-34

10.0000

15 Advention

والمسترجعة والمعالية

ND = Not Detected %DWB = (mg/kg DWB)/10000

Reviewed by:

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

ANALYTICAL REPORT

.

.

WIS, LAB CERT, NO. 721026460

the second se

PAGE: 12 NLS PROJECT# 31905

Attn: Russ Janesh 2737 S. Ridge Ro PO Box 19012 Green Bay, WI 54	ađ						
Project Description: Flambeau Mining Project Title: 96F022							
Sample ID: FMC-172LS-2 NLS#: 12 Ref. Line 12 of COC 24224 Description: FMC-172LS-2 Collected: 01/14/97 Received: 01/16/97 Reported: 0							
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	
luminum, dis. as Al by ICP	< 0.68 >	mg/L	0.34	1.2	EPA 200.7	01/27/97	
admium, dis, as Cd by ICP	41	uq/L	12	38	EPA 200.7	01/27/97	
alcium, dis. as Ca by ICP	520	mg/L	30	30	EPA 200.7	01/27/97	
hloride, as Cl (filtered)	1.7	mg/L	0.36	1.3	EPA 325.2	01/22/97	
hromium, dis. as Cr by ICP	< 42 >	ug/L	26	93	EPA 200.7	01/27/97	
Tobalt, dis. as Co by ICP	1700	ug/L	43	150	EPA 200.7	01/27/97	
Copper, dis. as Cu by ICP	320000	ug/L	540	1900	EPA 200.7	01/27/97 01/27/97	
ron, Ferrous	< 0.050 >	mg/L	0.046	0.15		01/2//9/	/2102040
		Comments: F&VD mo	0.10	0.35	EPA 200.7	01/27/97	72102646
ron, dis. as Fe by ICP	ND 65	mg/L mg/L	30	30	EPA 200.7	01/27/97	
lagnesium, dis. as Mg by ICP	4800	ug/L	18	61	EFA 200.7	01/27/97	
langanese, dis. as Mn by ICP	5.2	а <u>,</u> и.	1.0	01	EPA 150.1	01/16/97	
oH, lab	< 3.7 >	mg/L	2.0	6.6	EPA 200.7	01/23/97	
Potassium, dis. as K	4.8	mg/L	0.33	1.1	EPA 200.7	01/27/97	
Godium, dis. as Na by ICP	Additional	Comments: The ins					
	114%. See r	arrative.					
Sulfate, as SO4 (filtered)	2700	mg/L	250	250	EPA 375.2	01/20/97	72102646
Thallium, dis. as Tl by furnace AAS	ND	ug/L	25	87	EPA 279.2	01/22/97	
INDITIONS 412. 45 II WA IMPINAN	9500	ug/L	1200	1200	EPA 200.7	01/27/97	72102646

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

48

LOQ = Limit of Quantitation NA = Not Applicable

ND = Not Detected %DWB = (mg/kg DWB)/10000

۰.

R. Cinn Reviewed by:

NORTHERN LAKE SE Analytical Laboratory and Er 400 North Lake Avenue - Cra	ivironmental Services indon, WI 54520				WIS. LAB CE	RT. NO. 721020	5460
Tel:(715)478-2777 Fax:(715)4	78-3060	ANALYTIC	AL REPORT	PA	GE: 13	NLS PROJ	JECT# 31905
Client:	Foth & Van Dyke A Attn: Russ Janesh 2737 S. Ridge Ro PO Box 19012 Green Bay, WI 54	ek ad					
Project Descripti Project Title: 96	on: Flambeau Mining F022						
Sample ID: FMC-17 Ref.Line 13 of COC 24224 Collected: 01/14/97 Re	6LS-2 NLS#: 12 4 Description: FMC-176LS-2 ceived: 01/16/97 Reported: (MUN	,		
Parameter		Result	Units	LOD	ΓΟ <u>Ο</u>	Method	Analyzed Lab
Acidity, tot. as Ca Aluminum, dis. as Ca Cadmium, dis. as Ca Calcium, dis. as Ca Chloride, as Cl (fi Chromium, dis. as Co Cobalt, dis. as Co Copper, dis. as Cu Iron, Ferrous	Al by ICP i by ICP a by ICP ltered) Cr by ICP by ICP	270 1.4 140 540 3.9 110 2900 210000 ND	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L	0.34 12 30 0.36 26 43 540 0.046	1.2 38 30 1.3	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 721026460 01/27/97 721026460 01/27/97 721026460 01/27/97 721026460 01/22/97 721026460 01/27/97 721026460 01/27/97 721026460 01/27/97 721026460 01/27/97 721026460
Iron, dis. as Fe by	/ ICP	< 0.12 >	Comments: F&VD mo mg/L	0.10	0.35	EPA 200.7	01/27/97 72102646
Magnesium, dis. as Manganese, dis. as pH, lab Potassium, dis. as	Mg by ICP Mn by ICP K	33 2800 5.3 < 4.6 >	mg/L ug/L s.u. mg/L	18 1.0 2.0	30 61 6.6	EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7	01/27/97 72102646(01/27/97 72102646(01/16/97 72102646(01/23/97 72102646(01/27/97 72102646)
Sodium, dis. as Na	by ICP	5.8 Additional	mg/L Comments: The ins	0.33 trument check stan	1.1 dard recov	ery is	01/2//5/ /21020400
Sulfate, as SO4 (fi Thallium, dis. as 7 Zinc, dis. as Zn by	Tl by furnace AAS	114%. See n 1400 ND 18000	arrative. mg/L ug/L ug/L	250 25	250 87 1200	EPA 375.2 EPA 279.2 EPA 200.7	01/20/97 721026460 01/22/97 721026460 01/27/97 721026460
toluce in brockets	represent results greate the LOQ are considered	er than the LOD but le to be in the region	ss than the LOQ an of "Certain Quanti	d are within a reg tation".	ion of "Le	ss-Certain	Quantitation".
LOD = Limit of Deter DWB = Dry Weight Bas	ction LOQ = Lir	uit of Quantitation Applicable	ND = Not Detect %DWB = {mg/kg D	ed			
			Steum R.	Curra .	uthorized	b	

NORTHERN LAKE SERVICE, INC. Analytical Laboratory and Environmental Services 400 North Lake Avenue - Crandon, WI 54520				WIS. LAB	CERT. NO. 7210	26460
Tel:(715)478-2777 Fax:(715)478-3060 Client: Foth & Van Dyke Asso Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307		AL REPORT		PAGE: 1	NLS PROJ	ECT# 31874
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 Parameter Acidity, tot. as CaCO3 Aluminum, dis. as Al by ICP Cadmium, dis. as Cd by ICP	Result 20 ND < 19 >	<u>Units</u> mg/L mg/L ug/L	LOD 2.0 0.34 12	<u>LOQ</u> 2.0 1.2 38	Method EPA 305.1 EPA 200.7 EPA 200.7	Analyzed Lab 01/21/97 721026460 01/27/97 721026460 01/27/97 721026460 01/27/97 721026460
Calcium, dis. as Ca by ICP Chloride, as Cl (filtered) Chromium, dis. as Cr by ICP Cobalt, dis. as Co by ICP Copper, dis. as Cu by ICP Iron, Ferrous Iron, dis. as Fe by ICP	140 < 0.50 > ND 160 ND 0.19 Additional (< 0.17 >	mg/L mg/L ug/L ug/L ug/L mg/L	30 0.36 26 43 54 0.0091 fied method 0.10	30 1.3 93 150 190 0.030 0.35	EPA 200.7 EPA 325.2	01/27/97 721026460 01/16/97 721026460 01/27/97 721026460 01/27/97 721026460 01/27/97 721026460 01/27/97 721026460 01/27/97 721026460
Magnesium, dis. as Mg by ICP Manganese, dis. as Mn by ICP pH, lab Potassium, dis. as K Sodium, dis. as Na by ICP Sulfate, as SO4 (filtered) Thallium, dis. as Tl by furnace AAS Zinc, dis. as Zn by ICP	ND 2600 5.9 < 3.1 > 1.6 550 ND ND ND	mg/L ug/L s.u. mg/L mg/L mg/L ug/L ug/L ug/L	30 18 1.0 2.0 0.33 250 25 1200	30 61 6.6 1.1 250 87 1200	EPA 200.7 EPA 200.7 EPA 150.1	01/23/97 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

· · · ·

Tek:(715)478-2777 Fax:(715)478-3060 ANALYTICAL REPORT PAGE: 2 NLS PROJECT# 31874 Client: Foth & Van Dyke Associates Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307 Page: 2 NLS PROJECT# 31874 Project Description: Flambeau Mining Project Title: 96F022 Project Title: 96F022 Ventor Ventor Sample ID: FMC-CUF1-2 NLS#: 125358 Ref. Line 2 of COC 24223 Description: FMC-CUF1-2 Collected: 01/16/97 Received: 01/16/97 Received: 01/16/97 PReceived: 01/16/97 PRECEIVERS LOD LOD LOD Method Analyzed Line 2 Signal Project Alkalinity, tot. as CaC03 (filtered) 25 mg/L 1.5 5.3 EDA 310.1 01/21/97 PREceived: 01/27/97	NORTHERN LAKE SE Analytical Laboratory and E 400 North Lake Avenue - Cra	wironmental Services				WIS. LAB	CERT. NO. 72102	26460
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 Collected: 0/1/497 Received: 0/128/97 Parameter LOD LOQ Method Analyzed L Alkalinity, tot. as CaC03 (filtered) 25 mg/L 1.5 5.3 EPA 310.1 01/21/97 Alkalinity, tot. as CaC03 (filtered) 25 mg/L 0.34 1.2 EPA 200.7 01/27/97 Cadmium, dis. as Al by ICP ND ug/L 12 36 EPA 200.7 01/27/97 Cadmium, dis. as Ca by ICP ND ug/L 0.36 1.3 EPA 200.7 01/27/97 Cholard, dis. as Ca by ICP 11 mg/L 0.36 1.3 EPA 200.7 01/27/97 Cholard, dis. as Ca by ICP 200 ug/L 31 150 EPA 200.7 01/27/97 Cobalt, dis. as Ca by ICP <0.0 ug/L 36 1.3 EPA 200.7 01/27/97 Cobalt, dis. as Ca by ICP <00 ug/L 36 1.5 EPA 200.7 01/27/97 Cobalt, dis. as Ca by ICP <00 ug/L 36 </th <th></th> <th></th> <th>ANALYTI</th> <th>CAL REPORT</th> <th></th> <th>PAGE: 2</th> <th>NLS PROJ</th> <th>ECT# 31874</th>			ANALYTI	CAL REPORT		PAGE: 2	NLS PROJ	ECT# 31874
Project Title: 96F022 Sample ID: FMC-CUF1-2 NLS#: 125358 Collected: 01/14/97 Received: 01/15/97 Reported: 01/28/97 Parameter LOD LOQ Method Analyzed L Alkalinity, tot. as CaCO3 (filtered) 25 mg/L 1.5 5.3 EFA 310.1 01/21/97 7 Alkalinity, tot. as CaCO3 (filtered) 25 mg/L 1.5 5.3 EFA 310.1 01/21/97 7 Cadmium, dis. as CaCO3 (filtered) 25 mg/L 1.5 5.3 EFA 310.1 01/21/97 7 Calcium, dis. as Ca by ICP A 10 mg/L 1.5 5.3 EFA 310.1 01/27/97 7 Calcium, dis. as Ca by ICP 10 ug/L 1.5 5.3 EFA 310.1 01/27/97 7 Calcium, dis. as Ca by ICP Calcium, dis. Cas colspan="2" Calciu	Client:	Attn: Russ Janesh 2737 S. Ridge Ro PO Box 19012	ek ad					
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 L Alkalinity, tot. as CaCO3 (filtered) 25 mg/L 1.5 5.3 EPA 310.1 01/21/97 7 Alkalinity, tot. as CaCO3 (filtered) 25 mg/L 0.34 1.2 EPA 200.7 01/27/97 7 Cadnium, dis. as Ca by ICP ND ug/L 12 38 EPA 200.7 01/27/97 7 Chloride, as Cl (filtered) 11 mg/L 0.36 1.3 EPA 320.7 01/27/97 7 Cobalt, dis. as Co by ICP 200 ug/L 26 93 EPA 200.7 01/27/97 7 Cobalt, dis. as Co by ICP 200 ug/L 43 150 EPA 200.7 01/27/97 7 Coper, dis. as Fe by ICP 0.060 mg/L 0.0091 0.030 01/27/97 7 Iron, Ferrous Additional Comments: FWD modified method 6.6 s.u. 1.0	Project Descripti Project Title: 96	on: Flambeau Mining F022						
Alkalinity, tot. as CaCO3 (filtered) 25 mg/L 1.5 5.3 EPA 310.1 01/21/97 7 Alkalinity, tot. as CaCO3 (filtered) 25 mg/L 0.34 1.2 EPA 200.7 01/27/97 7 Cadmium, dis. as Cd by ICP ND ug/L 12 38 EPA 200.7 01/27/97 7 Calcium, dis. as Cd by ICP 140 mg/L 30 30 EFA 200.7 01/27/97 7 Chloride, as Cl (filtered) 11 mg/L 0.36 1.3 EPA 200.7 01/27/97 7 Cobalt, dis. as Cr by ICP < 90 ug/L 26 93 EPA 200.7 01/27/97 7 Cobalt, dis. as Cu by ICP < 200 ug/L 43 150 EPA 200.7 01/27/97 7 Iron, dis. as Fe by ICP < 0.060 mg/L 0.0091 0.030 0.030 EPA 200.7 01/27/97 7 Magnesium, dis. as Me by ICP 86 mg/L 0.10 0.35 EPA 200.7 01/27/97 7 Magnesium, dis. as K < 6.6 s.u. 1.0 EPA 200.7 01/27/97	Ref. Line 2 of COC 24223	Description: FMC-CUF1-2						
Aluminum, dis. as Al by ICP < 1.2 > mg/L 0.34 1.2 EPA 200.7 01/27/97 Cadmium, dis. as Cd by ICP ND ug/L 12 38 EPA 200.7 01/27/97 Calcium, dis. as Cd by ICP 140 mg/L 30 30 EPA 200.7 01/27/97 Chloride, as Cl (filtered) 11 mg/L 0.36 1.3 EPA 200.7 01/27/97 Chomium, dis. as Cr by ICP < 90 > ug/L 26 93 EPA 200.7 01/27/97 Cobalt, dis. as Co by ICP < 100 > ug/L 43 150 EPA 200.7 01/27/97 Cobat, dis. as Cu by ICP < 100 > ug/L 43 150 EPA 200.7 01/27/97 Iron, Ferrous 0.660 mg/L 0.0091 0.30 01/27/97 01/27/97 Mangaenese, dis. as Mg by ICP 86 mg/L 30 30 EPA 200.7 01/27/97 Mangaenese, dis. as Mn by ICP 290 ug/L 18 61 EPA 200.7 01/27/97 Mangaenese, dis. as K < 4.8 > mg/L 0.33 1.1 EPA 200.7 01/27/97	Parameter		Result	Units	TOD	LOQ	Method	Analyzed Lab
Additional Comments: F&VD modified methodIron, dis. as Fe by ICP< $0.11 > mg/L$ 0.10 0.35 EPA 200.7 $01/27/97$ Magnesium, dis. as Mg by ICP86mg/L3030EPA 200.7 $01/27/97$ Manganese, dis. as Mn by ICP290ug/L1861EPA 200.7 $01/27/97$ pH, lab6.6s.u.1.0EPA 150.1 $01/15/97$ Potassium, dis. as K< 4.8 >mg/L2.06.6EPA 200.7 $01/27/97$ Sodium, dis. as Na by ICP9.8mg/L0.331.1EPA 200.7 $01/27/97$ Sulfate, as SO4 (filtered)650mg/L250250EPA 375.2 $01/22/97$ Thallium, dis. as Tl by furnace AASNDug/L2587EPA 200.7 $01/27/97$ Zinc, dis. as Zn by ICPNDug/L12001200EPA 200.7 $01/27/97$	Aluminum, dis. as Cadmium, dis. as C Calcium, dis. as C Chloride, as Cl (fi Chromium, dis. as Cobalt, dis. as Co Copper, dis. as Cu	Al by ICP d by ICP a by ICP Ltered) Cr by ICP by ICP	<pre>< 1.2 > ND 140 11 < 90 > < 120 > 200 0.060</pre>	mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L	0.34 12 30 0.36 26 43 54 0.0091	1.2 38 30 1.3 93 150 190	EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7	01/21/97 72102 01/27/97 72102 01/27/97 72102 01/27/97 72102 01/16/97 72102 01/27/97 72102 01/27/97 72102 01/27/97 72102 01/27/97 72102
Magnesium, dis. as Mg by ICP 86 mg/L 30 30 EPA 200.7 $01/27/97$ 7 Manganese, dis. as Mn by ICP 290 ug/L 18 61 EPA 200.7 $01/27/97$ 7 pH, lab 6.6 s.u. 1.0 EPA 150.1 $01/15/97$ 7 Potassium, dis. as K < 4.8 > mg/L 2.0 6.6 EPA 200.7 $01/27/97$ 7 Sodium, dis. as Na by ICP 9.8 mg/L 0.33 1.1 EPA 200.7 $01/27/97$ 7 Sulfate, as SO4 (filtered) 650 mg/L 250 250 EPA 375.2 $01/27/97$ 7 Thallium, dis. as Tl by furnace AAS ND ug/L 25 87 EPA 279.2 $01/27/97$ 7 Zinc, dis. as Zn by ICP ND ug/L 1200 1200 EPA 200.7 $01/27/97$ 7 Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitati		/ ICP		Comments: F&VD mod mg/L				01/27/97 72102
Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitati Results greater than the LOQ are considered to be in the region of "Certain Quantitation".	Magnesium, dis. as Manganese, dis. as pH, lab Potassium, dis. as Sodium, dis. as Na Sulfate, as SO4 (fi Fhallium, dis. as	Mg by ICP Mn by ICP K by ICP ltered) Fl by furnace AAS	290 6.6 < 4.8 > 9.8 650 ND	mg/L ug/L s.u. mg/L mg/L mg/L ug/L	18 1.0 2.0 0.33 250 25	61 6.6 1.1 250 87	EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7 EPA 375.2 EPA 279.2	01/27/97 72102 01/27/97 72102 01/15/97 72102 01/23/97 72102 01/23/97 72102 01/27/97 72102 01/20/97 72102 01/22/97 72102
	Values in brackets Results greater tha	represent results greate the LOQ are considered	er than the LOD but l l to be in the region	ess than the LOQ and of "Certain Quanti	d are within a tation".	region of	"Less-Certair	Quantitation".
GD = Limit of Detection LOQ = Limit of Quantitation ND = Not Detected DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000				%DWB = {mg/kg D	WB)/10000			
Authorized by: Reviewed by: R. T. Krueger Laboratory Manager				Reviewed by:	Engri	R. T. 1	Krueger	

ուսություն համանատարին հայտություն կարող ու նա նա ուսության ուսություն անհանդի հայտարիստի հայտություն հանդին է են ինք աստերի է։

the second se

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

52

ANALYTICAL REPORT

WIS. LAB CERT. NO. 721026460

PAGE: 3 NLS PROJECT# 31874

1. <u>. .</u>

Attn: Ru	an Dyke Associates ss Janeshek					
PO Box 1	Ridge Road 9012 y, WI 54307					
Project Description: Flambea Project Title: 96F022	u Mining					
Sample ID: FMC-CUF2-2 Ref. Line 3 of COC 24223 Description: FM Collected: 01/13/97 Received: 01/15/97						
Parameter	Result	Units	LOD	TOÖ	Method	Analyzed Lab
Alkalinity, tot. as CaCO3 (filt Aluminum, dis. as Al by ICP Cadmium, dis. as Cd by ICP Calcium, dis. as Ca by ICP Chloride, as Cl (filtered) Chromium, dis. as Cr by ICP Cobalt, dis. as Co by ICP Copper, dis. as Cu by ICP Iron, Ferrous	<pre>< 0.39 > < 18 > 66 5.3 < 29 > < 57 > < 150 > 0.060</pre>	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L	1.5 0.34 12 30 0.36 26 43 54 0.0091	5.3 1.2 38 30 1.3 93 150 190 0.030	EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7	
Iron, dis. as Fe by ICP Magnesium, dis. as Mg by ICP Manganese, dis. as Mn by ICP pH, lab Potassium, dis. as K Sodium, dis. as Na by ICP Sulfate, as SO4 (filtered) Thallium, dis. as Tl by furnace Zinc, dis. as Zn by ICP	ND 44 ND 8.1 < 2.6 > 5.3 540	Comments: F&VD modi mg/L mg/L ug/L s.u. mg/L mg/L mg/L ug/L ug/L ug/L	1120 method 0.10 30 18 1.0 2.0 0.33 250 25 1200	0.35 30 61 6.6 1.1 250 87 1200	EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7 EPA 375.2 EPA 279.2	01/27/97 721026460 01/27/97 721026460 01/27/97 721026460 01/15/97 721026460 01/23/97 721026460 01/27/97 721026460 01/20/97 721026460 01/22/97 721026460 01/22/97 721026460
Values in brackets represent rest Results greater than the LOQ are	ults greater than the LOD but les considered to be in the region o	ss than the LOQ and of "Certain Quantita	are within a reation".	egion of "L	ess-Certain	Quantitation".
LOD = Limit of Detection DWB = Dry Weight Basis	LOQ = Limit of Quantitation NA = Not Applicable	ND = Not Detected %DWB = (mg/kg DWE				
		Atum R.C. Reviewed by:	luju	Authorized R. T. Kr Laboratory	ueger	

NORTHERN LAKE SERVICE, INC. Analytical Laboratory and Environmental Ser 400 North Lake Avenue - Crandon, WI 54524				WIS. LAB	CERT. NO. 72102	6460	
Fel:(715)478-2777 Fax:(715)478-3060		YTICAL REPORT		PAGE: 4	NLS PROJ	ECT# 3187	4
Attn: 1 2737 S PO Box	Van Dyke Associates Russ Janeshek . Ridge Road 19012 Bay, WI 54307						
Project Description: Flambo Project Title: 96F022	eau Mining						
Sample ID: FMC-15-3L-2 Ref. Line 4 of COC 24223 Description: I Collected: 01/13/97 Received: 01/15/9						,	
arameter	Result	Unita	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as CaCO3 Aluminum, dis. as Al by ICP Calcium, dis. as Cd by ICP Calcium, dis. as Ca by ICP Chloride, as Cl (filtered) Chromium, dis. as Cr by ICP Cobalt, dis. as Co by ICP Copper, dis. as Cu by ICP Fron, Ferrous	250 1.5 < 37 > 540 < 0.58 > < 76 > 1500 130000 1.1 Addtt	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L mg/L mg/L	2.0 0.34 12 30 0.36 26 43 54 0.0091 lified method	2.0 1.2 38 30 1.3 93 150 190 0.030	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 01/27/97 01/27/97 01/27/97 01/27/97 01/27/97 01/27/97 01/27/97 01/27/97	72102640 72102640 72102640 72102640 72102640 72102640 72102640 72102640
ron, dis. as Fe by ICP agnesium, dis. as Mg by ICP anganese, dis. as Mn by ICP H, lab otassium, dis. as K odium, dis. as Na by ICP ulfate, as SO4 (filtered)	3,3 67 6200 3,8 7,9 2,8 1900	mg/L mg/L ug/L s.u. mg/L mg/L mg/L ug/L ug/L	0.10 30 18 1.0 2.0 0.33 250 25 1200	0.35 30 61 6.6 1.1 250 87 1200	EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 375.2 EPA 279.2 EPA 200.7	01/27/97 01/27/97 01/27/97 01/23/97 01/23/97 01/27/97 01/20/97 01/22/97 01/22/97	7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264
hallium, dis. as Tl by furnad inc, dis. as Zn by ICP			are uithis a w	region of "	Less-Certain	Quantitat	ion".
	sults greater than the LOD h ce considered to be in the re	out less than the LOQ and gion of "Certain Quantit	ation".	-3			

..-

ភ្ល

400 North Lake Avenue Tel:(715)478-2777 Fax:			ANALYTIC	L REPORT		PAGE: 5	NLS PROJ	ECT# 3187	4
Client:	Attn: Ru 2737 S. PO Box 19	an Dyke Associate s Janeshek Ridge Road 9012 y, WI 54307	3						-
Project Descri Project Title:	ption: Flambeau 96F022	u Mining							
Sample ID: FMC Ref. Line 5 of COC 24 Collected: 01/13/97	2-1801-2 1223 Description: FM0 Received: 01/15/97	NLS#: 125361 C-180L-2 Reported: 01/28/97							
Parameter		Re	sult	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. a Aluminum, dis. Cadmium, dis. a Calcium, dis. a Chloride, as Cl Chromium, dis. Cobalt, dis. as Copper, dis. as Iron, Ferrous	as Al by ICP s Cd by ICP s Ca by ICP (filtered) as Cr by ICP Co by ICP	<	440 ND 180 450 1.1 > ND 2200 45000 0.64 Additional C	mg/L mg/L ug/L mg/L ug/L ug/L ug/L mg/L onments: F&VD modij	2.0 0.34 12 30 0.36 26 43 54 0.0091 fied method	2.0 1.2 38 30 1.3 93 150 190 0.030	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/27/97 01/27/97 01/27/97 01/16/97 01/27/97 01/27/97	72102646 72102646 72102646 72102646 72102646 72102646 72102646 72102646
Iron, dis. as F Magnesium, dis. Manganese, dis. pH, lab Potassium, dis. Sodium, dis. as Sulfate, as SO4 Thallium, dis. Zinc, dis. as Z	as Mg by ICP as Mn by ICP as K Na by ICP (filtered) as Tl by furnace	< < AAS <	ND 86 19000 5.1 5.1 > 3.9 1600 26 > 35000	mg/L mg/L ug/L s.u. mg/L mg/L mg/L ug/L ug/L ug/L	0.10 30 18 1.0 2.0 0.33 250 25 1200	0.35 30 61 6.6 1.1 250 87 1200	EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 375.2 EPA 279.2 EPA 200.7	01/27/97 01/27/97 01/15/97 01/23/97 01/27/97 01/20/97 01/22/97	72102646 72102646 72102646 72102646 72102646 72102646 72102646 72102646
Values in bracke Results greater	ts represent resu than the LOQ are	lts greater than the considered to be in	e LOD but les the region o	s than the LOQ and a f "Certain Quantitat	are within a n Lion".	region of "L	ess-Certain	Quantitat	ion".
LOD = Limit of D DWB = Dry Weight		LOQ = Limit of Quar NA = Not Applicable	ntitation	ND = Not Detected %DWB = (mg/kg DWB)	/10000				
				Atum R. Cu Reviewed by:	yn	Authorized R. T. Kr Laboratory	ueger		

ŧ.

NORTHERN LAKE Analytical Laboratory and	I Environmental Services				WIS. LAB C	CERT. NO. 72102	6460
400 North Lake Avenue - Tel:(715)478-2777 Fax:(7	Crandon, WI 54520 15)478-3060	ANALYTIC	AL REPORT		PAGE: 6	NLS PROJ	ECT# 31874
Client:	Foth & Van Dyke Attn: Russ Janes 2737 S. Ridge H PO Box 19012 Green Bay, WI !	ihek load					
Project Descri <u>p</u> Project Title:	tion: Flambeau Mining 96F022	J					
Sample ID: FMC- Ref. Line 6 of COC 242 Collected: 01/13/97	23 Description: FMC-181L-2	25362 I: 01/28/97					
Parameter		Result	Units	LOD	LOQ	Method	Analyzed Lab
Zinc, dis. as Zr	s Al by ICP Cd by ICP filtered) s Cr by ICP Co by ICP Cu by ICP as Mg by ICP as Mn by ICP as K Na by ICP filtered) ts Tl by furnace AAS h by ICP	14 140 20000 3.7 < 3.4 > 2.5 6100 ND 170000	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L mg/L ug/L s.u. mg/L mg/L ug/L ug/L ug/L ug/L ug/L	0.10 30 18 1.0 2.0 0.33 2500 25 12000	2.0 1.2 38 30 1.3 93 150 1900 0.030 0.35 30 61 6.6 1.1 2500 87 12000	EPA 200.7 EPA 279.2 EPA 279.2 EPA 200.7	01/27/97 721026 01/27/97 721026 01/27/97 721026 01/16/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/23/97 721026 01/22/97 721026 01/22/97 721026 01/22/97 721026
Values in bracket Results greater t	s represent results greathan the LOQ are consider		ess than the LOQ an of "Certain Quanti	d are within a m tation".	region of "	Less-Certair	n Quantitation".
LOD = Limit of De DWB = Dry Weight		Jimit of Quantitation ot Applicable	ND = Not Detect \$DWB = (mg/kg D Atturn R.C Reviewed by:	WB)/10000	Authorize R. T. K Laborator	rueger	

Tel:(715)478-2777 Fax:(7)	5)478-5000		ANALYTI	CAL REPORT		PAGE: 7	NLS PROJ	ECT# 3187	4
Client:	Attn: Rus 2737 S. PO Box 19	an Dyke Associat ss Janeshek Ridge Road 9012 r, WI 54307	es						
Project Descrip Project Title:		1 Mining							
Sample ID: FMC- Ref. Line 7 of COC 242; Collected: 01/13/97	23 Description: FMC	NLS#: 125363 -15-1L-2 Reported: 01/28/97							
Parameter		<u>1</u>	Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as Aluminum, dis. as Cadmium, dis. as Calcium, dis. as Chloride, as Cl (i Chromium, dis. as Cobalt, dis. as C Copper, dis. as C Iron, Ferrous	Al by ICP Cd by ICP Ca by ICP Filtered) & Cr by ICP To by ICP	•	100 1.0 > 26 > 560 37 > 440 23000 4.0 Additional	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L Comments: F&VD mod	2.0 0.34 12 30 0.36 26 43 54 0.0091 ified method	2.0 1.2 38 30 1.3 93 150 190 0.030	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/27/97 01/27/97 01/27/97 01/16/97 01/27/97 01/27/97	721026 721026 721026 721026 721026 721026 721026 721026
Iron, dis. as Fe Magnesium, dis. a Manganese, dis. a pH, lab Potassium, dis. as Sodium, dis. as M Sulfate, as SO4 (f Thallium, dis. as Zinc, dis. as Zn	as Mg by ICP as Mn by ICP as K Ja by ICP filtered) s Tl by furnace	AAS	4.0 43 2000 3.8 32 4.3 2200 ND ND	mg/L mg/L ug/L s.u. mg/L mg/L mg/L ug/L ug/L	0.10 30 18 1.0 2.0 0.33 250 25 1200	0.35 30 61 6.6 1.1 250 87 1200	EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 375.2 EPA 279.2 EPA 200.7	01/27/97 01/27/97 01/15/97 01/23/97 01/27/97 01/20/97 01/22/97	721026 721026 721026 721026 721026 721026 721026 721026
Values in brackets Results greater th	represent resu an the LOQ are	lts greater than t considered to be i	he LOD but l n the region	ess than the LOQ and of "Certain Quantit	are within a : ation".	region of "	Less-Certain	Quantitat	ion".
LOD = Limit of Det DWB = Dry Weight B		LOQ = Limit of Qu NA = Not Applicab	antitation le	ND = Not Detecte %DWB = (mg/kg DW	d B)/10000				
				Alturn R.C. Reviewed by:	enjen_	Authorized R. T. K Laboratory	rueger		

. -

Analytical Laboratory and Er 400 North Lake Avenue - Cra Fel:(715)478-2777 Fax:(715)4		ΔΝΔΙ ΥΤ	ICAL REPORT		PAGE: 8	CERT. NO. 72102	
Client:	Foth & Van Dyke A Attn: Russ Janesh 2737 S. Ridge Ro PO Box 19012 Green Bay, WI 54	ssociates ek ad			PAGE: 0	NLS PROU	ECT# 31874
Project Title: 96							
Sample ID: FMC-4- Ref. Line 8 of COC 24223 Collected: 01/13/97 Re	Description: FMC-4-1L-2						
Parameter		Result	Units	LOD	LOQ	Method	Analyzed Lab
Acidity, tot. as Ca Aluminum, dis. as Ca Cadmium, dis. as Ca Calcium, dis. as Ca Chloride, as Cl (fil Chromium, dis. as Co Cobalt, dis. as Co Copper, dis. as Co Cron, Ferrous Gron, Ferrous Gron, dis. as Fe by Magnesium, dis. as Manganese, dis. as OH, lab	Al by ICP by ICP by ICP tered) by ICP by ICP by ICP r ICP Mg by ICP Mn by ICP	0,53 72 4800 5.3	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L 1 Comments: F&VD mod mg/L mg/L ug/L ug/L ug/L s.u.	0.10 30 18 1.0	2.0 1.2 38 1.3 93 150 190 0.030 0.35 30 61	EPA 305.1 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/16/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026
Potassium, dis. as Sodium, dis. as Na Sulfate, as SO4 (fil Challium, dis. as T Zinc, dis. as Zn by	by ICP tered) 'l by furnace AAS	9.9 6.2 1700 ND 10000	mg/L mg/L mg/L ug/L ug/L	2.0 0.33 250 25 1200	6.6 1.1 250 87 1200	EPA 279.2	01/23/97 721026 01/27/97 721026 01/20/97 721026 01/22/97 721026 01/22/97 721026
Results greater than	epresent results greate the LOQ are considered	l to be in the regio	n of "Certain Quantit	ation".	region of "	Less-Certain	Quantitation".
LOD = Limit of Detec DWB = Dry Weight Bas		it of Quantitation Applicable	ND = Not Detecte %DWB = (mg/kg D)				
			Atum R.C. Reviewed by:	Luyin	Authorize R. T. K Laborator	d by: rueger y 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 PAGE: 9 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 Result Units LOD LOQ Method Analyzed Lab Parameter EPA 305.1 01/21/97 721026460 Acidity, tot. as CaCO3 78 mg/L 2.0 2.0 Aluminum, dis. as Al by ICP Cadmium, dis. as Cd by ICP < 0.97 > mg/L 0.34 1.2 EPA 200.7 01/27/97 721026460 ug/L 210 12 38 EPA 200.7 01/27/97 721026460 Calcium, dis. as Ca by ICP Chloride, as Cl (filtered) EPA 200.7 01/27/97 721026460 30 430 mq/L 30 EPA 200.7 01/27/97 721026460 EPA 200.7 01/27/97 721026460 EPA 200.7 01/27/97 721026460 mg/L 2.1 0.36 1.3 Chromium, dis. as Cr by ICP ug/L < 59 > 26 93 Cobalt, dis. as Co by ICP ug/L 2200 43 150 Copper, dis. as Cu by ICP 61000 uq/L 54 190 EPA 200.7 01/27/97 721026460 0.030 01/27/97 721026460 Iron, Ferrous 0.10 mg/L 0.0091 Additional Comments: F&VD modified method mg/L Iron, dis. as Fe by ICP ND 0.10 0.35 EPA 200.7 01/27/97 721026460 EPA 200.7 01/27/97 721026460 Magnesium, dis. as Mg by ICP 140 mg/L 30 30 13000 EPA 200.7 01/27/97 721026460 ug/L Manganese, dis, as Mn by ICP 18 61 5.9 1.0 EPA 150.1 01/15/97 721026460 pH, lab s.u.
 EPA
 150.1
 01/15/97
 721026460

 EPA
 200.7
 01/23/97
 721026460

 EPA
 375.2
 01/20/97
 721026460

 EPA
 279.2
 01/22/97
 721026460

 EPA
 279.2
 01/22/97
 721026460

 EPA
 200.7
 01/27/97
 721026460
 2.0 Potassium, dis. as K < 2.9 > mg/L 6.6 Sodium, dis. as Na by ICP 2.2 mg/L 0.33 1.1 Sulfate, as SO4 (filtered) 1800 mg/L 250 250 Thallium, dis. as Tl by furnace AAS ND 25 87 ug/L Zinc, dis. as Zn by ICP 28000 uq/L 1200 1200

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

58

LOQ = Limit of Quantitation NA = Not Applicable ND = Not Detected %DWB = (mg/kg DWB)/10000

Iteun R. Ceyn Reviewed by:

Authorized by: R. T. Krueger Laboratory Manager

NORTHERN LAKE S Analytical Laboratory and I 400 North Lake Avenue - Cr Tel:(715)478-2777 Fax:(715	Environmental Services randon, WI 54520	ANALYTIC	AL REPORT		WIS. LAB	CERT. NO. 72102 NLS PRO	36460 JECT# 31874
Client:	Foth & Van Dyke Ass Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 5430	1					
Project Descript Project Title: 9 		366					
Collected: 01/13/97 R	23 Description: FMC-15-1:S-2 leceived: 01/15/97 Reported: 01/		77 _ 1 L _		T 00	Matsha a	•••• ¹ ·································
Collected: 01/13/97 R	23 Description: FMC-15-1:S-2 leceived: 01/15/97 Reported: 01/	28/97 <u>Result</u>	Units	LOD	FOO	Method	Analyzed Lab
Collected: 01/13/97 R <u>Parameter</u> Alkalinity, tot. a	leceived: 01/15/97 Reported: 01/	Result ND	mg/L	1.5	5.3	EPA 310.1	01/21/97 7210264
Collected: 01/13/97 R Parameter Alkalinity, tot. a Aluminum, dis. as	leceived: 01/15/97 Reported: 01/ ns CaCO3 (filtered) Al by ICP	Result ND < 0.97 >	mg/L mg/L	1.5 0.34	5.3 1.2	EPA 310.1 EPA 200.7	01/21/97 7210264 01/27/97 7210264
Collected: 01/13/97 R Parameter Alkalinity, tot. a Aluminum, dis. as Cadmium, dis. as C	leceived: 01/15/97 Reported: 01/ as CaCO3 (filtered) Al by ICP Cd by ICP	Result ND < 0.97 > ND	mg/L mg/L ug/L	1.5 0.34 12	5.3 1.2 38	EPA 310.1 EPA 200.7 EPA 200.7	01/21/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264
Collected: 01/13/97 R Parameter Ikalinity, tot. a Iuminum, dis. as Cadmium, dis. as C Calcium, dis. as C	leceived: 01/15/97 Reported: 01/ 19 CaCO3 (filtered) Al by ICP 2d by ICP 2a by ICP	Result ND < 0.97 > ND 440	mg/L mg/L ug/L mg/L	1.5 0.34 12 30	5.3 1.2 3B 30	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264
Collected: 01/13/97 R Parameter Alkalinity, tot. a Aluminum, dis. as C Cadmium, dis. as C Calcium, dis. as C Chloride, as Cl (fi	leceived: 01/15/97 Reported: 01/ As CaCO3 (filtered) Al by ICP Cd by ICP Ca by ICP Ca by ICP Litered)	Result ND < 0.97 > ND 440 3.1	mg/L mg/L ug/L mg/L mg/L mg/L	1.5 0.34 12 30 0.36	5.3 1.2 38 30 1.3	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2	01/21/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/16/97 7210264
Collected: 01/13/97 R Parameter Alkalinity, tot. a Aluminum, dis. as Cadnium, dis. as (Calcium, dis. as (Chloride, as Cl (fi Chromium, dis. as	leceived: 01/15/97 Reported: 01/ as CaCO3 (filtered) Al by ICP Cd by ICP Ca by ICP Lltered) Cr by ICP	Result ND < 0.97 > ND 440 3.1 < 56 >	mg/L mg/L ug/L mg/L mg/L ug/L ug/L	1.5 0.34 12 30 0.36 26	5.3 1.2 38 30 1.3 93	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7	01/21/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/16/97 7210264 01/27/97 7210264
Collected: 01/13/97 R Parameter Alkalinity, tot. a Aluminum, dis. as C Calcium, dis. as C Calcium, dis. as C Chloride, as Cl (fi Chromium, dis. as C Cobalt, dis. as C	leceived: 01/15/97 Reported: 01/ as CaCO3 (filtered) Al by ICP Cd by ICP Ca by ICP Litered) Cr by ICP o by ICP	Result ND < 0.97 > ND 440 3.1 < 56 > 800	mg/L mg/L ug/L mg/L mg/L ug/L ug/L	1.5 0.34 12 30 0.36 26 43	5.3 1.2 38 30 1.3 93 150	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 325.2 EPA 200.7	01/21/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264
Collected: 01/13/97 R Parameter Alkalinity, tot. as Cadmium, dis. as C Calcium, dis. as C Chloride, as Cl (fi Chromium, dis. as Cobalt, dis. as Cu Copper, dis. as Cu	leceived: 01/15/97 Reported: 01/ as CaCO3 (filtered) Al by ICP Cd by ICP Ca by ICP Litered) Cr by ICP o by ICP	Result ND < 0.97 > ND 440 3.1 < 56 > 800 1900	mg/L mg/L ug/L mg/L mg/L ug/L ug/L ug/L	1.5 0.34 12 30 0.36 26 43 54	5.3 1.2 38 30 1.3 93 150 190	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7	01/21/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/16/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264
Collected: 01/13/97 R <u>Parameter</u> Alkalinity, tot. as Aluminum, dis. as C Calcium, dis. as C Chloride, as Cl (fi Chromium, dis. as Cobalt, dis. as Cc Copper, dis. as Cu	leceived: 01/15/97 Reported: 01/ as CaCO3 (filtered) Al by ICP Cd by ICP Ca by ICP Litered) Cr by ICP o by ICP	Result ND < 0.97 > ND 440 3.1 < 56 > 800 1900 0.74	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L	1.5 0.34 12 30 0.36 26 43 54 0.0091	5.3 1.2 38 30 1.3 93 150	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 325.2 EPA 200.7	01/21/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/16/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264
Collected: 01/13/97 R Parameter Alkalinity, tot. a Aluminum, dis. as C Calcium, dis. as C Calcium, dis. as C Chloride, as Cl (fi Chromium, dis. as Cobalt, dis. as Cc Copper, dis. as Cu Iron, Ferrous	leceived: 01/15/97 Reported: 01/ As CaCO3 (filtered) Al by ICP Cd by ICP Ca by ICP Lltered) Cr by ICP o by ICP o by ICP	Result ND < 0.97 > ND 440 3.1 < 56 > 800 1900	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L Comments: F&VD mod	1.5 0.34 12 30 0.36 26 43 54 0.0091 lified method	5.3 1.2 38 30 1.3 93 150 190	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/16/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264
Collected: 01/13/97 R Parameter Alkalinity, tot. a Aluminum, dis. as Calcium, dis. as (C Calcium, dis. as (C Chloride, as Cl (fi Chromium, dis. as Cobalt, dis. as Cc Copper, dis. as Cc Fron, Ferrous Cron, dis. as Fe fi	leceived: 01/15/97 Reported: 01/ As CaCO3 (filtered) Al by ICP Cd by ICP Ca by ICP Cr by ICP Cr by ICP b by ICP b by ICP b by ICP	Result ND < 0.97 > ND 440 3.1 < 56 > 800 1900 0.74 Additional	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L mg/L Comments: F&VD mod mg/L	1.5 0.34 12 30 0.36 26 43 54 0.0091	5.3 1.2 38 30 1.3 93 150 190 0.030	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 325.2 EPA 200.7	01/21/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/16/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264
Collected: 01/13/97 R Parameter Alkalinity, tot. as Luminum, dis. as C Cadmium, dis. as C Calcium, dis. as C Chloride, as Cl (fi Chromium, dis. as C Copper, dis. as Cc Copper, dis. as Cc Copn, dis. as Fe f Magnesium, dis. as Langanese, dis. as	leceived: 01/15/97 Reported: 01/ As CaCO3 (filtered) Al by ICP Cd by ICP Ca by ICP Cr by ICP Cr by ICP b by ICP b by ICP b by ICP	Result ND < 0.97 > ND 440 3.1 < 56 > 800 1900 0.74 Additional ND	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L Comments: F&VD mod	1.5 0.34 12 30 0.36 26 43 54 0.0091 dified method 0.10	5.3 1.2 38 30 1.3 93 150 190 0.030 0.35	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264 01/27/97 7210264
Collected: 01/13/97 R Parameter Alkalinity, tot. as Cadmium, dis. as C Cadmium, dis. as C Calcium, dis. as C Chloride, as Cl (fi Chromium, dis. as Cc Copper, dis. as Cc Lron, Ferrous Lron, dis. as Fe M Magnesium, dis. as Aanganese, dis. as	Al by ICP as CaCO3 (filtered) Al by ICP Cd by ICP Cd by ICP Cr by ICP o by ICP o by ICP o by ICP o by ICP a by ICP a by ICP by ICP a by ICP a by ICP by ICP a by ICP	Result ND < 0.97 > ND 440 3.1 < 56 > 800 1900 0.74 Additional ND 63	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L mg/L mg/L ug/L s.u.	1.5 0.34 12 30 0.36 26 43 54 0.0091 lified method 0,10 30	5.3 1.2 38 30 1.3 93 150 190 0.030 0.35 30 61	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 7210264 01/27/97 7210264
Collected: 01/13/97 R Parameter Alkalinity, tot. a Aluminum, dis. as Calcium, dis. as (C Calcium, dis. as (C Chloride, as Cl (fi Chromium, dis. as Cobalt, dis. as CC Copper, dis. as CC Cron, Ferrous Iron, dis. as Fe M Agnesium, dis. as Anganese, dis. as OH, lab	leceived: 01/15/97 Reported: 01/ As CaCO3 (filtered) Al by ICP Cd by ICP Ca by ICP Litered) Cr by ICP o by ICP o by ICP by ICP a Mg by ICP a Mg by ICP a Mn by ICP a K	Result ND < 0.97 > ND 440 3.1 < 56 > 800 1900 0.74 Additional ND 63 4800 6.7 ND	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L mg/L mg/L ug/L s.u.	1.5 0.34 12 30 0.36 26 43 54 0.0091 Hified method 0.10 30 18	5.3 1.2 38 30 1.3 93 150 190 0.030 0.35 30	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7	01/21/97 7210264 01/27/97 7210264 01/23/97 7210264
Collected: 01/13/97 R Parameter Alkalinity, tot. a Aluminum, dis. as Cadrium, dis. as O Calcium, dis. as O Chloride, as Cl (fi Chromium, dis. as Cobalt, dis. as Cc Copper, dis. as Cc Iron, Ferrous Iron, dis. as Fe H Magnesium, dis. as Magnesium, dis. as OH, lab Potassium, dis. as Na Sodium, dis. as Na	Al by ICP as CaCO3 (filtered) Al by ICP Cd by ICP Cd by ICP Cr by ICP by ICP by ICP by ICP by ICP construction constr	Result ND < 0.97 > ND 440 3.1 < 56 > 800 1900 0.74 Additional ND 63 4800 6.7 ND 2.0	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L mg/L mg/L ug/L ug/L s.u. mg/L s.u. mg/L	1.5 0.34 12 30 0.36 26 43 54 0.0091 lified method 0.10 30 18 1.0 2.0 0.33	5.3 1.2 38 30 1.3 93 150 190 0.030 0.35 30 61 6.6 1.1	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 7210264 01/27/97 7210264 01/23/97 7210264
Collected: 01/13/97 R Parameter Alkalinity, tot. a Aluminum, dis. as Cadmium, dis. as C Calcium, dis. as C Chloride, as Cl (fi Chromium, dis. as Cobalt, dis. as Cc Copper, dis. as Cc Iron, Ferrous Iron, dis. as Fe H Magnesium, dis. as Magnesium, dis. as Potassium, dis. as Sodium, dis. as Na	Al by ICP as CaCO3 (filtered) Al by ICP Cd by ICP Cd by ICP Cr by ICP by ICP by ICP by ICP by ICP construction constr	Result ND < 0.97 > ND 440 3.1 < 56 > 800 1900 0.74 Additional ND 63 4800 6.7 ND 2.0 1200	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L mg/L mg/L ug/L ug/L s.u. mg/L s.u. mg/L	1.5 0.34 12 30 0.36 26 43 54 0.0091 dified method 0.10 30 18 1.0 2.0 0.33 250	5.3 1.2 38 30 1.3 93 150 190 0.030 0.35 30 61 6.6 1.1 250	EPA 310.1 EPA 200.7 EPA 375.2	01/21/97 7210264 01/27/97 7210264 01/23/97 7210264 01/23/97 7210264 01/27/97 7210264 01/20/97 7210264
Collected: 01/13/97 R Parameter Alkalinity, tot. a Aluminum, dis. as C Cadmium, dis. as C Calcium, dis. as C Chloride, as Cl (fi Chromium, dis. as Cc Copper, dis. as Cc Iron, Ferrous Iron, dis. as Fe h Magnesium, dis. as	leceived: 01/15/97 Reported: 01/ Al by ICP Cd by ICP Ca by ICP Ca by ICP Cr by ICP	Result ND < 0.97 > ND 440 3.1 < 56 > 800 1900 0.74 Additional ND 63 4800 6.7 ND 2.0	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L g/L mg/L mg/L mg/L ug/L s.u. mg/L	1.5 0.34 12 30 0.36 26 43 54 0.0091 lified method 0.10 30 18 1.0 2.0 0.33	5.3 1.2 38 30 1.3 93 150 190 0.030 0.35 30 61 6.6 1.1	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 7210264 01/27/97 7210264 01/23/97 7210264 01/15/97 7210264

LOD = Limit of Detection DWB = Dry Weight Basis

ц

LOQ = Limit of Quantitation NA = Not Applicable ND = Not Detected %DWB = (mg/kg DWB)/10000

1000000000

\$251.003.60

CALLY & LOCAR

n K. Ceny 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 Tel:(715)478-2777 Fax:(715)478-3060

ANALYTICAL REPORT

WIS, LAB CERT, NO, 721026460

PAGE: 11 NLS PROJECT# 31874

					1100, 4.	L NUS FRU	UECI# 318/4
Client:	Foth & Van Dyke A Attn: Russ Janesh 2737 S. Ridge Ro PO Box 19012 Green Bay, WI 543	ek ad					
Project Descriptio Project Title: 96F	n: Flambeau Mining 022						
Sample ID: FMC-181	LS-2 NLS#: 125	5367					
Ref. Line 11 of COC 24223 Collected: 01/13/97 Rece	Description: FMC-181LS-2 ived: 01/15/97 Reported: 0	1/28/97					
Parameter		Result	Units	LOD	LOQ	Method	Analyzed Lab
Acidity, tot. as CaO	53	1700	mg/L	2.0	2.0	EPA 305.1	01/21/97 72102646
Aluminum, dis. as Al	by ICP	< 1.0 >	mg/L	0.34	1.2	EPA 200.7	01/27/97 72102646
Cadmium, dis. as Cd	by ICP	1400	ug/L	12	38	EPA 200.7	
Calcium, dis. as Ca		420	mg/L	30	30	EPA 200.7	01/27/97 72102646
Chloride, as Cl (filt		4.0	mg/L	0.36	1.3	EPA 325.2	01/16/97 72102646
Chromium, dis. as Cr		< 64 >	ug/L	26	93	EPA 200.7	01/27/97 72102646
Cobalt, dis. as Co b	/ ICP	7700	ug/L	43	150	EPA 200.7	01/27/97 72102646
Copper, dis. as Cu b	Y ICP	100000	ug/L	540	1900	EPA 200.7	01/27/97 72102646
Iron, Ferrous		< 1.2 >	mg/L	0.46	1.5		01/27/97 72102646
waa dia ay Rahaa		Additional	Comments: F&VD mo				
ron, dis. as Fe by		1.0	mg/L	0,10	0.35	EPA 200.7	01/27/97 72102640
lagnesium, dis. as M		160	mg/L	30	30	EPA 200.7	01/27/97 72102646
anganese, dis. as Mi	i by ICP	22000	ug/L	18	61	EPA 200.7	01/27/97 7210264
H, lab		5.4	s.u.	1.0		EPA 150.1	01/15/97 72102640
Potassium, dis. as K	. 100	< 2.1 >	mg/L	2.0	6.6	EPA 200.7	01/23/97 72102646
odium, dis. as Na b	/ ICP	3.8	mg/L	0.33	1.1	EDA 200 7	01/27/97 72102646
		Additional	Comments: The ins	trument check s	tandard re	covery is	
Sulfate on DOA (file.		113%. See r				-	
Sulfate, as SO4 (filte		5900	mg/L	2500	2500	EPA 375.2	01/20/97 72102646
Challium, dis. as Tl		< 29 > 220000	ug/L ug/L	25 1200	87	EPA 279.2	
Zinc, dis. as Zn by 🕻					1200	EPA 200.7	01/27/97 72102646

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

60

LOQ = Limit of Quantitation NA = Not Applicable

ND = Not Detected %DWB = (mg/kg DWB)/10000

Reviewed by:

Authorized by: R. T. Krueger Laboratory Manager

NORTHERN LAKE Analytical Laboratory a 400 North Lake Avenue Tel:(715)478-2777 Fax:		ANALYTI	CAL REPORT		WIS. LAB	CERT. NO. 72102 NLS PRO	6460 JECT# 31874
Client:	Foth & Van Dyke Attn: Russ Jane 2737 S. Ridge PO Box 19012 Green Bay, WI	shek Road 54307					
Project Descri Project Title:	ption: Flambeau Minin 96F022	19		· · ·		·	. <u></u>
Sample ID: FMC Ref. Line 12 of COC 2 Collected: 01/13/97	-180LS-2 NLS#: 4223 Description: FMC-180LS Received: 01/15/97 Report	125368 2 ed: 01/28/97					
Parameter		Result	Units	LOD	LOQ	Method	Analyzed Lab
Acidity, tot. a Aluminum, dis. Cadmium, dis. a Calcium, dis. a Chloride, as Cl Chromium, dis. Cobalt, dis. as Copper, dis. as Iron, Ferrous	as Al by ICP s Cd by ICP s Ca by ICP (filtered) as Cr by ICP Co by ICP	100 1.6 180 370 2.4 130 2400 16000 0.76	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L	2.0 0.34 12 30 0.36 26 43 54 0.046	2.0 1.2 38 30 1.3 93 150 190 0.15	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 72102646 01/27/97 72102646 01/27/97 72102646 01/27/97 72102646 01/27/97 72102646 01/27/97 72102646 01/27/97 72102646 01/27/97 72102646 01/27/97 72102646
Iron, dis. as F Magnesium, dis. Manganese, dis. pH, lab Potassium, dis. Sodium, dis. as	as Mg by ICP as Mn by ICP as K	ND 84 19000 4.6 < 5.2 > 5.8 Additiona	l Comments: F&VD mc mg/L mg/L ug/L s.u. mg/L mg/L l Comments: The ins	0.10 30 1B 1.0 2.0 0.33	0.35 30 61 6.6 1.1 standard rec	EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7 EPA 200.7 :overy is	01/27/97 72102646 01/27/97 72102646 01/27/97 72102646 01/27/97 72102646 01/15/97 72102646 01/23/97 72102646 01/27/97 72102646
Sulfate, as SO4 Thallium, dis. Zinc, dis. as 2	as Tl by furnace AAS	113%. See 1200 ND 31000	narrative. mg/L ug/L ug/L	250 25 1200	250 87 1200	EPA 375.2 EPA 279.2 EPA 200.7	01/20/97 72102646 01/22/97 72102646 01/27/97 72102646
Values in bracks Results greater	ts represent results gr than the LOQ are consid	eater than the LOD but ered to be in the regio	less than the LOQ an n of "Certain Quanti	d are within a tation".	region of "	Less-Certain	Quantitation".
LOD = Limit of E DWB = Dry Weight		Limit of Quantitation Not Applicable	$ \begin{array}{l} \text{ND} = \text{Not Detect} \\ & \text{& DWB} = (mg/kg D \\ & & \\ & & \\ \hline \\ & & \\ \hline \\ & & \\ \hline \\ & \text{Reviewed by:} \end{array} $	WB)/10000	Authorize R. T. H Laborator	d by: Irueger Ty Manager	

NORTHERN LAKE SE Analytical Laboratory and E 400 North Lake Avenue - Cr Tel:(715)478-2777 Fax:(715)	avironmental Services andon, WI 54520	ANALYTIC	CAL REPORT		PAGE: 13	CERT. NO. 7210 NLS PRO	JECT# 31874
Client:	Foth & Van Dyke A Attn: Russ Janesh 2737 S. Ridge Ro PO Box 19012 Green Bay, WI 54	ek ad					
Project Descripti Project Title: 96	lon: Flambeau Mining 5F022						
Ref. Line 13 of COC 2422	5-3LS-2 NLS#: 1 3 Description: FMC-15-3LS-2 cceived: 01/15/97 Reported: 0						
Parameter		Result	Units	LOD	LOQ	Method	Analyzed Lab
Alkalinity, tot. a. Aluminum, dis. as J Cadmium, dis. as C Calcium, dis. as C Chloride, as Cl (fi Chromium, dis. as C Cobalt, dis. as Co Copper, dis. as Cu Iron, Ferrous	s CaCO3 (filtered) Al by ICP d by ICP a by ICP ltered) Cr by ICP by ICP by ICP Mg by ICP Mn by ICP K by ICP K by ICP ltered) Fl by furnace AAS (ICP	ND 1.8 < 27 > 510 4.0 < 41 > 2600 320000 < 0.55 > Additional	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L Comments: F&VD mod	1.5 0.34 12 30 0.36 26 43 540 0.23 dified method	5.3 1.2 38 30 1.3 93 150 1900 0.75	EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7	01/15/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026 01/27/97 721026
Iron, dis. as Fe by Magnesium, dis. as Manganese, dis. as pH, lab Potassium, dis. as Sodium, dis. as Na	Y ICP Mg by ICP Mn by ICP K by ICP	0.46 96 11000 6.5 ND 2.7 Additional	mg/L mg/L ug/L s.u. mg/L mg/L Comments: The inst	0.10 30 18 1.0 2.0 0.33	0.35 30 61 6.6 1.1 standard reco	EPA 150.1 EPA 200.7 EPA 200.7	01/27/97 721026 01/27/97 721026 01/27/97 721026 01/15/97 721026 01/23/97 721026 01/23/97 721026 01/27/97 721026
Sulfate, as SO4 (fi Thallium, dis. as T Zinc, dis. as Zn by	ltered) Fl by furnace AAS / ICP	113%. See r 1200 ND 10000	arrative. mg/L ug/L ug/L	250 25 1200	250 87 1200	EPA 279.2	01/20/97 721026 01/22/97 721026 01/27/97 721026
Values in brackets :	represent results greate the LOQ are considered	r than the LOD but le	ess than the LOQ and of "Certain Quantit	d are within a cation".	region of "I	Jess-Certain	Quantitation".
LOD = Limit of Detec DWB = Dry Weight Bas	stion LOQ ∞ Lim sis NA ≃ Not	it of Quantitation Applicable					
			Reviewed by:	-uyn_	Authorized R. T. Kr Laboratory	ueger	

Anoxic Columns Third Displacement Test Results

MLD2\96F022\GBAPP\43134 .61

Analytical Laboratory and Environmental Services 400 North Lake Avenue - Crandon, WI 54520				WIS. LAB	CERT. NO. 72102	6460
Tel:(715)478-2777 Fax:(715)478-3060	ANALYTI	CAL REPORT		PAGE: 1	NLS PROJ	ECT# 32180
Client: Foth & Van Dyke Attn: Russ Jane 2737 S. Ridge PO Box 19012 Green Bay, WI	eshek					
Project Description: Flambeau Minim Project Title: 96F022	Jġ					
Ref. Line 1 of COC 24605 Description: FMC-186LS-3 Collected: 02/04/97 Received: 02/05/97 Report	ed: 02/10/97				Wath	
Parameter	Result	Units	LOD	LOQ	Method	Analyzed Lab
Alkalinity, tot. as CaCO3 (filtered) Aluminum, dis. as Al by ICP	47 0.16 ND 21	mg/L mg/L ug/L ug/L	1.5 0.034 16 1.2	5.3 0.12 57 3.8 3.0	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	02/06/97 7210264 02/07/97 7210264 02/07/97 7210264 02/07/97 7210264 02/07/97 7210264 02/07/97 7210264

AT ALCONG N

6.111.111.111

Grand and set

G 1002000

reaction and store

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

10.000

advector of the

LOQ = Limit of Quantitation NA = Not Applicable ND = Not Detected %DWB = (mg/kg DWB)/10000

Reviewed by:

Authorized by:

R. T. Krueger Laboratory Manager

NORTHERN LAKE SERV Analytical Laboratory and Envi 400 North Lake Avenue - Cranc	rommental Services				WIS. LAB	CERT. NO. 72102	26460
Tel:(715)478-2777 Fax:(715)478		ANALYTI	CAL REPORT		PAGE: 2	NLS PROJ	ECT# 32180
Client:	Foth & Van Dyke Ass Attn: Russ Janeshel 2737 S. Ridge Road PO Box 19012 Green Bay, WI 5430	5 1					
Project Description Project Title: 96F Sample ID: FMC-186)	D22	07					
Ref. Line 2 of COC 24605	Description: FMC-186L-3 ived: 02/05/97 Reported: 02	/10/97					
Parameter		Result	Units	LOD	LOQ	Method	Analyzed Lab
Acidity, tot. as CaC Aluminum, dis. as Al Arsenic, dis. as As Cadmium, dis. as Cd Calcium, dis. as Cd Cobalt, dis. as Co Copper, dis. as Co Iron, dis. as Fe by Magnesium, dis. as M Manganese, dis. as M Potassium, dis. as M Selenium, dis. as Se Sodium, dis. as Na by Sulfate, as SO4 (filt Thallium, dis. as Tl Zinc, dis. as Zn by	by ICP by ICP by ICP by ICP y ICP y ICP ICP g by ICP h by ICP by furnace y ICP ared) by furnace AAS	ND ND 7.9 590 90 1800 ND 12 450 6.5 9.4 ND 1.5 600 ND 880	mg/L mgg/L ugg/L ugg/L mgg/L ugg/L mgg/L s.gg/L mgg/L mgg/L ugg/L ugg/L	2.0 0.034 16 1.2 3.0 4.3 5.4 0.010 3.0 1.8 1.0 2.0 37 0.033 250 25 120	2.0 0.12 57 3.8 3.0 15 19 0.035 3.0 6.1 6.6 130 0.11 250 87 120	EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7	02/07/97 721026460 02/07/97 721026460 02/07/97 721026460 02/07/97 721026460 02/07/97 721026460 02/07/97 721026460 02/07/97 721026460 02/05/97 721026460 02/07/97 721026460 02/07/97 721026460

LOD = Limit of Detection DWB = Dry Weight Basis

5

LOQ = Limit of Quantitation NA = Not Applicable

ND = Not Detected %DWB = (mg/kg DWB)/10000

inte

Authorized by:

Reviewed by:

R. T. Krueger Laboratory Manager

NORTHERN LAKE SE Analytical Laboratory and En 400 North Lake Avenue - Cra	nvironmental Services Indon, WI 54520				WIS. LAB	CERT, NO. 72102	:6460
Tel:(715)478-2777 Fax:(715)4	178-3060	ANALYTI	CAL REPORT		PAGE: 3	NLS PROJ	ECT# 32180
Client:	Foth & Van Dyke A Attn: Russ Janesh 2737 S. Ridge Ro PO Box 19012 Green Bay, WI 54	ek ad					
Project Title: 96					<u></u>		
Sample ID: FMC-17 Ref. Line 3 of COC 24605 Collected: 02/04/97 Re	0LS-3 NLS#: 12 Description: FMC-170LS-3 ceived: 02/05/97 Reported: 0						
Parameter		Result	Units	LOD	LOQ	Method	Analyzed Lab
Acidity, tot. as Ca Aluminum, dis. as A Arsenic, dis. as As Cadmium, dis. as Co Calcium, dis. as Co Cobalt, dis. as Co Copper, dis. as Co Copper, dis. as Cu Iron, dis. as Fe by Magnesium, dis. as Manganese, dis. as pH, lab Potassium, dis. as S Sodium, dis. as Na Sulfate, as SO4 (fill Thallium, dis. as T Zinc, dis. as Zn by	s by ICP d by ICP by ICP by ICP by ICP / ICP Mg by ICP Mn by ICP K Se by furnace by ICP ttered) Cl by furnace AAS	ND ND 45 460 240 18000 0.067 9.5 1500 6.0 < 3.5 > ND 0.47 660 < 35 > 2200	mg/L mg/L ug/L ug/L ug/L ug/L mg/L ug/L s.u. mg/L ug/L ug/L ug/L ug/L ug/L ug/L ug/L	2.0 0.034 16 1.2 3.0 4.3 5.4 0.010 3.0 1.8 1.0 2.0 37 0.033 250 25 120	2.0 0.12 57 3.8 3.0 15 19 0.035 3.0 6.1 6.1 6.6 130 0.11 250 87 120	EPA 200.7 EPA 270.2 EPA 375.2	02/07/97 7210264 02/07/97 7210264 02/07/97 7210264 02/07/97 7210264 02/07/97 7210264
Results greater than	the LOQ are considered	er than the LOD but 1 I to be in the region wit of Quantitation	ess than the LOQ and ar of "Certain Quantitati ND = Not Detected	e within a on".	region of "	Less-Certain	Quantitation".
LOD = Limit of Detec DWB = Dry Weight Bas	is NA = Not	Applicable	<pre>ND = NOt Detected %DWB = (mg/kg DWB)/1</pre>	0000			
			Thomas Phin	ke	Authorize	d by:	
			Reviewed by:		R. T. K Laborator	rueger y Manager	

80.000 (AND

\$1000001243

C 2528. 31 TANA

is formation and and

182424-2-128

فعسويدها

1967 - 1.1. - 1.1. - 1.1. A

and the second second second second second second

and the second second

gest scenaria

 $\mathcal{D}_{1}^{2}((n)) \leq 2\pi n$

64405458

2211000.0000

10 1 24

ي المطلق به وزوله ا

el:(715)478-2777 Fax:(715)478-3060	ANALYTI	CAL REPORT		PAGE: 4	NLS PROJ	ECT# 32180
Attn: Ru 2737 S. PO Box 1	an Dyke Associates ss Janeshek Ridge Road 9012 y, WI 54307					
roject Description: Flambea roject Title: 96F022 ample ID: FMC-13-ILS-3	u Mining NLS#: 126409	<u></u>				
ef. Line 4 of COC 24605 Description: FM ollected: 02/04/97 Received: 02/05/97	C-13-ILS-3 Reported: 02/10/97	** -	t op	100	Votios	
rameter	Result	Units	LOD	<u>roð</u>	Method	Analyzed Lab
		,				A A
ridity, tot. as CaCO3 Luminum, dis. as Al by ICP	40 < 0.075 >	mg/L mg/L	2.0 0.034	2.0 0.12	EPA 305.1 EPA 200.7	02/07/97 7210264
luminum, dis. as Al by ICP senic. dis. as As by ICP	< 0.075 > ND	mg/L ug/L	0.034 16	0.12 57	EPA 200.7 EPA 200.7	02/07/97 721026
Luminum, dis. as Al by ICP rsenic, dis. as As by ICP admium, dis. as Cd by ICP Alcium, dis. as Ca by ICP	< 0.075 > ND 8.2 570	ng/L ug/L ug/L ng/L	0.034 16 1.2 3.0	0.12 57 3.8 3.0	EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026
Luminum, dis. as Al by ICP rsenic, dis. as As by ICP admium, dis. as Cd by ICP alcium, dis. as Ca by ICP obalt, dis. as Co by ICP opper. dis. as Cu by ICP	< 0.075 > ND 8.2	mg/L ug/L ug/L mg/L ug/L ug/L	0.034 16 1.2	0.12 57 3,8	EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026
Luminum, dis. as Al by ICP rsenic, dis. as As by ICP admium, dis. as Cd by ICP alcium, dis. as Ca by ICP obalt, dis. as Co by ICP opper, dis. as Cu by ICP ron, dis. as Fe by ICP	<pre>< 0.075 > ND 8.2 570 580 7900 0.098</pre>	mg/L ug/L ug/L mg/L ug/L ug/L mg/L	0.034 16 1.2 3.0 4.3 5.4 0.010	0.12 57 3.8 3.0 15 19 0.035	EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026
Luminum, dis. as Al by ICP rsenic, dis. as As by ICP admium, dis. as Cd by ICP alcium, dis. as Ca by ICP obalt, dis. as Co by ICP opper, dis. as Co by ICP con, dis. as Fe by ICP areasium, dis. as Mg by ICP	<pre>< 0.075 > ND 8.2 570 580 7900 0.098 19 2800</pre>	mg/L ug/L ug/L mg/L ug/L ug/L	0.034 16 1.2 3.0 4.3 5.4	0.12 57 3.8 3.0 15 19	EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026
Luminum, dis. as Al by ICP rsenic, dis. as As by ICP admium, dis. as Cd by ICP alcium, dis. as Ca by ICP balt, dis. as Co by ICP opper, dis. as Cu by ICP ron, dis. as Fe by ICP agnesium, dis. as Mg by ICP anganese, dis. as Mn by ICP 1. lab	<pre>< 0.075 > ND 8.2 570 580 7900 0.098 19 2800 5.7</pre>	mg/L ug/L mg/L ug/L ug/L mg/L mg/L ug/L s.u.	0.034 16 1.2 3.0 4.3 5.4 0.010 3.0 1.8 1.0	0.12 57 3.8 3.0 15 19 0.035 3.0 6.1	EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1	02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/05/97 721026
Luminum, dis. as Al by ICP rsenic, dis. as As by ICP admium, dis. as Cd by ICP admium, dis. as Cd by ICP obalt, dis. as Co by ICP opper, dis. as Co by ICP ron, dis. as Fe by ICP agnesium, dis. as Mg by ICP anganese, dis. as Mn by ICP I, lab otassium, dis. as K elenium, dis. as Se by furnace	<pre>< 0.075 > ND 8.2 570 580 7900 0.098 19 2800 5.7 < 2.5 > ND</pre>	mg/L ug/L ug/L ug/L ug/L ug/L mg/L mg/L ug/L s.u. mg/L ug/L	0.034 16 1.2 3.0 4.3 5.4 0.010 3.0 1.8 1.0 2.0 37	0.12 57 3.8 3.0 15 19 0.035 3.0 6.1 6.6 130	EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.2	02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/05/97 721026 02/10/97 721026 02/07/97 721026
Luminum, dis. as Al by ICP rsenic, dis. as As by ICP admium, dis. as Cd by ICP admium, dis. as Cd by ICP admium, dis. as Co by ICP obalt, dis. as Co by ICP opper, dis. as Fe by ICP agnesium, dis. as Mg by ICP anganese, dis. as Mn by ICP I, lab btassium, dis. as K elenium, dis. as Se by furnace dium, dis. as Na by ICP	<pre>< 0.075 > ND 8.2 570 580 7900 0.098 19 2800 5.7 < 2.5 > ND 1.2</pre>	mg/L ug/L mg/L ug/L ug/L mg/L mg/L ug/L s.u. mg/L ug/L ug/L ug/L ug/L mg/L	0.034 16 1.2 3.0 4.3 5.4 0.010 3.0 1.8 1.0 2.0 37 0.033	0.12 57 3.8 3.0 15 19 0.035 3.0 6.1 6.6 130 0.11	EPA 200.7 EPA 150.1 EPA 200.7 EPA 270.2 EPA 200.7	02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/05/97 721026 02/10/97 721026 02/07/97 721026
Luminum, dis. as Al by ICP rsenic, dis. as As by ICP admium, dis. as Cd by ICP admium, dis. as Cd by ICP obalt, dis. as Co by ICP opper, dis. as Co by ICP ron, dis. as Fe by ICP agnesium, dis. as Mg by ICP anganese, dis. as Mn by ICP I, lab otassium, dis. as K elenium, dis. as Se by furnace	<pre>< 0.075 > ND 8.2 570 580 7900 0.098 19 2800 5.7 < 2.5 > ND 1.2 700</pre>	mg/L ug/L ug/L ug/L ug/L ug/L mg/L mg/L ug/L s.u. mg/L ug/L	0.034 16 1.2 3.0 4.3 5.4 0.010 3.0 1.8 1.0 2.0 37	0.12 57 3.8 3.0 15 19 0.035 3.0 6.1 6.6 130	EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	02/10/97 7210264

Thomas Rhile

Authorized by:

R. T. Krueger Laboratory Manager

Reviewed by:

NORTHERN LAKE	Environmental Service	5				WIS. LAB	CERT. NO. 72102	6460
400 North Lake Avenue - Tel:(715)478-2777 Fax:(7	Crandon, W1 54520 (5)478-3060		ANALYTI	CAL REPORT		PAGE: 5	NLS PROJ	ECT# 32180
Client:	Attn: Rus 2737 S. PO Box 19	n Dyke Associa s Janeshek Ridge Road 012 7, WI 54307	tes					
Project Descrip Project Title:	tion: Flambeau 96F022	1 Mining						
Sample ID: FMC- Ref. Line 5 of COC 246 Collected: 02/04/97	05 Description: FMC	NLS#: 126410 C-188LS-3 Reported: 02/10/97						
Parameter			Result	Units	LOD	<u>100</u>	Method	Analyzed Lab
Aluminum, dis. a Arsenic, dis. as Cadmium, dis. as Cobalt, dis. as Cobalt, dis. as Copper, dis. as Iron, dis. as Fe Magnesium, dis. Manganese, dis. pH, lab Potassium, dis. as Selenium, dis. as Sulfate, as SO4 (Thallium, dis. as Zinc, dis. as Zn	As by ICP Cd by ICP Ca by ICP Co by ICP Cu by ICP by ICP as Mg by ICP as Mn by ICP as K S Se by furnace Na by ICP filtered) s Tl by furnace by ICP		32 < 0.072 > ND 190 480 760 35000 0.073 13 1900 5.4 < 5.5 > ND 0.73 610 < 26 > 10000	mg/L mg/L ug/L mg/L ug/L ug/L mg/L ug/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L	2.0 0.034 16 1.2 3.0 4.3 5.4 0.010 3.0 1.8 1.0 2.0 37 0.033 250 25 120	2.0 0.12 57 3.8 3.0 15 19 0.035 3.0 6.1 6.1 6.6 130 0.11 250 87 120	EPA 305.1 EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7 EPA 270.2 EPA 270.2 EPA 279.2 EPA 279.2	02/10/97 721026 02/07/97 721026 02/07/97 721026 02/06/97 721026 02/09/97 721026 02/09/97 721026
Values in bracket Results greater t	s represent resu han the LOQ are			less than the LOQ and n of "Certain Quantita		region of '	Less-Certair	ı Quantitation".
LOD = Limit of De DWB = Dry Weight		LOQ = Limit of NA = Not Applic	Quantitation able	ND = Not Detected %DWB = (mg/kg DWB)				
-				Shomas R Paul	ile	Authorize	ed by:	
				Reviewed by:		R. T. H Laborato:	lrueger Ty Manager	
				Reviewed by:		R. T. H Laborato:	Trueger Ty Manager	

NORTHERN LAKE SE Analytical Laboratory and El 400 North Lake Avenue - Cra	wironmental Services				WIS. LAB	CERT. NO. 72102	6460
Tel:(715)478-2777 Fax:(715)4		ANALYTIC	AL REPORT		PAGE: 6	NLS PROJ	ECT# 32180
Client:	Foth & Van Dyke Ass Attn: Russ Janeshe 2737 S. Ridge Road PO Box 19012 Green Bay, WI 5430	c 1					
Project Descripti Project Title: 96 	·····	417					
	Description: FMC-183LS-3						
Parameter		Result	Units	LOD	LOQ	Method	Analyzed Lab
Acidity, tot. as Ca Aluminum, dis. as A Arsenic, dis. as As Cadmium, dis. as Co Calcium, dis. as Co Copper, dis. as Co Copper, dis. as Co Iron, dis. as Fe by Magnesium, dis. as Manganese, dis. as pH, lab Potassium, dis. as S Selenium, dis. as S Sodium, dis. as S Sulfate, as SO4 (fil Thallium, dis. as S	Al by ICP 5 by ICP 6 by ICP by ICP by ICP by ICP Mg by ICP Mn by ICP K Se by furnace by ICP t.tered)	190 ND ND 32 510 480 140000 0.11 17 1900 5.0 < 4.5 > ND 0.67 700 ND 3400	mg/L mg/L ug/L ug/L ug/L ug/L mg/L ug/L s.u. mg/L ug/L ug/L mg/L ug/L ug/L	2.0 0.034 16 1.2 3.0 4.3 54 0.010 3.0 1.8 1.0 2.0 37 0.033 250 25	2.0 0.12 57 3.8 3.0 15 190 0.035 3.0 6.1 6.6 130 0.11 250 87	EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7	02/07/97 721026460 02/07/97 721026460 02/07/97 721026460 02/07/97 721026460 02/07/97 721026460 02/07/97 721026460 02/07/97 721026460 02/05/97 721026460 02/10/97 721026460 02/07/97 721026460

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

Umuan

Authorized by:

R. T. Krueger Laboratory Manager

Reviewed by:

NORTHERN LAKE SERVICE, INC. Analytical Laboratory and Environmental Services 100 North Lake Avenue - Crandon, WI 54520				WIS. LAB	CERT, NO, 7210	26460
Fel:(715)478-2777 Fax:(715)478-3060	ANALYTIC	CAL REPORT		PAGE: 7	NLS PROJ	ECT# 32180
Client: Foth & Van Dyke A Attn: Russ Janesh 2737 S. Ridge Ro PO Box 19012 Green Bay, WI 54	ek ad					
Project Description: Flambeau Mining Project Title: 96F022						
Sample ID: FMC-213LS-3 NLS#: 12 Ref. Line 7 of COC 24605 Description: FMC-213LS-3 Collected: 02/04/97 Received: 02/05/97 Reported; 0						
arameter	Result	Units	LOD	LOQ	Method	Analyzed Lab
cidity, tot. as CaCO3 luminum, dis. as Al by ICP rsenic, dis. as As by ICP admium, dis. as Cd by ICP alcium, dis. as Cd by ICP obalt, dis. as Co by ICP opper, dis. as Cu by ICP ron, dis. as Fe by ICP agnesium, dis. as Mg by ICP anganese, dis. as Mn by ICP H, lab otassium, dis. as Se by furnace odium, dis. as Se by furnace odium, dis. as Na by ICP ulfate, as SO4 (filtered) hallium, dis. as Tl by furnace AAS inc, dis. as Zn by ICP	ND < 0.065 > ND 4.7 130 37 490 ND ND 140 5.6 ND ND 0.10 > 520 < 25 > 280	mg/L mg/L ug/L ug/L ug/L ug/L ug/L mg/L ug/L mg/L mg/L ug/L ug/L ug/L ug/L	2.0 0.034 16 1.2 3.0 4.3 5.4 0.010 3.0 1.8 1.0 2.0 37 0.033 250 25 120	2.0 0.12 57 3.8 3.0 15 19 0.035 3.0 6.1 6.6 130 0.11 250 87 120	EPA 305.1 EPA 200.7 EPA 270.2 EPA 375.2 EPA 279.2 EPA 200.7	02/10/97 72102646 02/07/97 72102646 02/07/97 72102646 02/07/97 72102646 02/07/97 72102646 02/07/97 72102646 02/07/97 72102646 02/07/97 72102646 02/07/97 72102646 02/05/97 72102646 02/05/97 72102646 02/07/97 72102646 02/07/97 72102646 02/06/97 72102646 02/06/97 72102646 02/09/97 72102646
	to be in the region	of "Certain Quantit ND = Not Detecte	ation".	region of "	Less-Certair	Quantitation".
	it of Quantitation Applicable	ND = Not Detecte %DWB = (mg/kg DWB				
		Thomas K Ku		Authorize	-	
		Reviewed by:		R. T. K	rueger v Manager	

مجادفة المتشيين يههون ورز فلنظر ليداد اليا

70

NORTHERN LAKE SE Analytical Laboratory and E 400 North Lake Avenue - Cr Tel: (715)478-2777 Fax: (715)	nvironmental Services andon, WI 54520				WIS. LAB	CERT. NO. 72102	.6460
1et:(/15)4/6-2/// Fux:(/15)	4/0-2000	ANALYTI	CAL REPORT		PAGE: 8	NLS PROJ	ECT# 32180
Client:	Foth & Van Dyke A Attn: Russ Janesh 2737 S. Ridge Ro PO Box 19012 Green Bay, WI 54	lek ad					
Project Descripti Project Title: 96	on: Flambeau Mining F022						
Sample ID: FMC-18 Ref. Line 8 of COC 24605 Collected: 02/04/97 Ref	37LS-3 NLS#: 12 Description: FMC-187LS-3 ceived: 02/05/97 Reported:						
Parameter		Result	Units	LOD	LOQ	Method	Analyzed Lab
Acidity, tot. as C Aluminum, dis. as A Arsenic, dis. as A Cadmium, dis. as C Calcium, dis. as C Cobalt, dis. as Co Copper, dis. as Co Iron, dis. as Fe b Magnesium, dis. as Manganese, dis. as PH, lab Potassium, dis. as Selenium, dis. as Sodium, dis. as Na Sulfate, as SO4 (fi Thallium, dis. as Zn b	Al by ICP s by ICP d by ICP by ICP by ICP y ICP Mg by ICP Mn by ICP K Se by furnace by ICP ltered) Il by furnace AAS	ND ND 13 520 310 21000 < 0.029 > 10 1300 5.5 < 6.6 > ND 0.49 580 < 32 > 1400	mg/L mg/L ug/L ug/L ug/L ug/L mg/L ug/L s.u. mg/L ug/L ug/L ug/L ug/L ug/L ug/L	2.0 0.034 16 1.2 3.0 4.3 5.4 0.010 3.0 1.8 1.0 2.0 37 0.033 250 25 120	2.0 0.12 57 3.8 3.0 15 19 0.035 3.0 6.1 6.6 130 0.11 250 87 120	EPA 200.7 EPA 270.2 EPA 375.2	02/10/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/05/97 721026 02/05/97 721026 02/07/97 721026 02/07/97 721026 02/06/97 721026 02/06/97 721026
Values in brackets Results greater tha LOD = Limit of Dete	represent results great n the LOQ are considere ction LOQ = Li	er than the LOD but d to be in the regio mit of Quantitation	less than the LOQ and a n of "Certain Quantitat ND = Not Detected	are within a tion".	region of "	Less-Certair	Quantitation".
DWB = Dry Weight Ba		Applicable	<pre>%DWB = (mg/kg DWB)/</pre>				
			Thomas R Print	be	Authorize	d by:	
			Reviewed by:		R. T. K Laborator	rueger y Manager	

and and a second sec Include second
NORTHERN LAKE SERVICE, INC. nalytical Laboratory and Environmental Servic 00 North Lake Avenue - Crandon, WI 54520 el:(715)478-2777 Fax:(715)478-3060		NALYTICAL REI	PORT	WI	5. LAB CERT. NO. 72102	6460 ECT# 3218	0
Attn: Ru 2737 S. PO Box 1 Green Ba	an Dyke Associates ss Janeshek Ridge Road 9012 y, WI 54307			FAGE	, 5 115 28001	301# 5210	U
Project Description: Flambea Project Title: 96F022	NLS#: 126414						<u></u>
Sample ID: FMC-194LS-3 Ref. Line 9 of COC 24605 Description; FM Collected: 02/04/97 Received: 02/05/97	C-194LS-3						
arameter	Resu	<u>1t</u> <u>u</u>	Jnits LC		Method	Analyzed	Lab
cidity, tot. as CaCO3 luminum, dis. as Al by ICP rsenic, dis. as As by ICP admium, dis. as Cd by ICP alcium, dis. as Ca by ICP obalt, dis. as Co by ICP opper, dis. as Co by ICP ron, dis. as Fe by ICP agnesium, dis. as Mg by ICP anganese, dis. as Mn by ICP H, lab otassium, dis. as K elenium, dis. as Se by furnace odium, dis. as Na by ICP ulfate, as SO4 (filtered) hallium, dis. as Tl by furnace inc, dis. as Zn by ICP	NE 9. 53 16 67 NE 11 13 6. < 2. NE 0. 85 AAS < 26 37	050 > m U U U U U U U U U U U U U	ng/L 0 ig/L 16 ig/L 1 ng/L 3 ig/L 5 ig/L 3 ig/L 3 ig/L 1 ig/L 3 ig/L 1 ig/L 3 ig/L 2 ig/L 2 ig/L 2 ig/L 2 ig/L 1 ig/L 2 ig/L 1 ig/L 1 ig/L 1 ig/L 1	$\begin{array}{cccccccccccccccccccccccccccccccccccc$.2 EPA 200.7 EPA 270.2 1 EPA 270.2 EPA 375.2 EPA 200.7 EPA 200.7	02/10/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/05/97 02/05/97 02/06/97 02/06/97 02/06/97 02/07/97	72102646 72102646 72102646 72102646 72102646 72102646 72102646 72102646 72102646 72102646 72102646 72102646 72102646 72102646 72102646
alues in brackets represent res esults greater than the LOQ are	ults greater than the considered to be in t	LOD but less than he region of "Cer	1 the LOQ and are with rtain Quantitation".	hin a region	a of "Less-Certain	Quantitat	ion".
OD = Limit of Detection WB = Dry Weight Basis	LOQ = Limit of Quant NA = Not Applicable	itation ND = %DWB	= Not Detected = (mg/kg DWB)/10000				
		J	homas & Puelo	Auth	orized by:		
		Revi	lewed by:	R. Labo	T. Krueger pratory Manager		

· ····

72

NORTHERN LAKE SE Analytical Laboratory and Er 400 North Lake Avenue - Cra	vironmental Services				WIS. LAB	CERT. NO. 72102	6460	
Tel:(715)478-2777 Fax:(715)4		ANALYTIC	AL REPORT		PAGE: 10	NLS PRO	JECT# 321	80
Client:	Foth & Van Dyke A Attn: Russ Janesh 2737 S. Ridge Ro PO Box 19012 Green Bay, WI 54	nek bad						
Project Descripti Project Title: 96	on: Flambeau Mining F022							
	2LS-3 NLS#: 12 Description: FMC-192LS-3 ceived: 02/05/97 Reported:							
Parameter		Result	Units	LOD	LOQ	Method	Analyzed	Lab
Acidity, tot. as Ca Aluminum, dis. as A Arsenic, dis. as As Cadmium, dis. as Co Calcium, dis. as Co Cobalt, dis. as Co Copper, dis. as Cu Iron, dis. as Fe by Magnesium, dis. as Manganese, dis. as PH, lab Potassium, dis. as S Selenium, dis. as S Sodium, dis. as S Soligate, as SO4 (fil Thallium, dis. as T Zinc, dis. as Zn by Values in brackets r Results greater than	l by ICP by ICP by ICP by ICP by ICP MJ DY ICP MD by ICP MD by ICP K e by furnace by ICP tered) l by furnace AAS	ND ND 94 190 13000 ND 12 1400 6.0 < 3.6 > < 60 > 0.54 510 ND 690 er than the LOD but le d to be in the region	mg/L mg/L ug/L ug/L ug/L ug/L mg/L ug/L s.u. mg/L ug/L ug/L ug/L ug/L ug/L ug/L ug/L u	2.0 0.034 16 1.2 3.0 4.3 5.4 0.010 3.0 1.8 1.0 2.0 37 0.033 250 25 120 are within a r	2.0 0.12 57 3.8 3.0 15 19 0.035 3.0 6.1 6.1 6.6 130 0.11 250 87 120 region of "	EPA 305.1 EPA 200.7 EPA 375.2 EPA 375.2 EPA 200.7 EPA 200.7	02/07/97 02/06/97 02/09/97 02/07/97	72102646 72102646 72102646 72102646 72102646 72102646 72102646 72102646 72102646 72102646 72102646 72102646 72102646 72102646 72102646
LOD = Limit of Detec DWB = Dry Weight Bas		mit of Quantitation Applicable	ND = Not Detected \$DWB = (mg/kg DWB)/	10000	Authorize	d by:		
			Reviewed by:	<u> </u>	R. T. K Laborator	rueger		

-- |

- ----

....

and a second
.

NORTHERN LAKE SEF nalytical Laboratory and Em 00 North Lake Avenue - Crai	vironmental Services				WIS. LAB (CERT. NO. 72102	6460
el:(715)478-2777 Fax:(715)4'	78-3060	ANALYTIC	AL REPORT		PAGE: 11	NLS PRO	JECT# 32180
Client:	Foth & Van Dyke As Attn: Russ Janeshe 2737 S. Ridge Roa PO Box 19012 Green Bay, WI 543	k d					
ample ID: FMC-8- ef.Line 11 of COC 24605 ollected: 02/04/97 Rec arameter	ILS-3 NLS#: 126 Description: FMC-8-ILS-3 ceived: 02/05/97 Reported: 02		Units	LOD	LOQ	Method	Analyzed Lab
		ND	mg/L	2.0	2.0	EPA 305.1	02/10/97 721026

et in a presentation

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

74

a sura cha sa

to a constant

4,2444343.05

LOQ = Limit of Quantitation NA = Not Applicable ND = Not Detected %DWB = (mg/kg DWB)/10000

Reviewed by:

Authorized by:

R. T. Krueger Laboratory Manager 87.5.5.5.5.5°C

Tel:(715)478-2777 Fax:(715)478-3060 ANALYTICAL REPORT PAGE: 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 Project Description: Flambeau Mining Project CC 24605 Description: FMC-190LS-3 Collected: 02/04/97 Received: 02/05/97 Reported: 02/10/97 Dot LOD LOD LOD LOD Acidity, tot. as CaC03 ND mg/L 2.0 2.0 Acidity, tot. as CaC03 ND mg/L 0.034 0.12 Acidity, tot. as CaC03 ND mg/L 1.2 3.6 Cadmium, dis. as Al by ICP ND mg/L 3.0 3.0 Cobalt, dis. as Co by ICP 9400 ug/L 4.3 15 Copper, dis. as Cu by ICP 0.23 mg/L 3.0 3.0 Manganese, dis. as M by ICP 3100 ug/L 3.0 3.0 Manganese, dis. as Na by ICP 0.79 mg/L 3.0 3.0 Manganese, dis. as Na by ICP 0.79 mg/L 3.0 3.0 Manganese, dis. as Ma by ICP 0.79 mg/L 3.0 3.0 Manganese, dis. as	Method EPA 305. 2 EPA 200. EPA 20.	Analyzed Lab 1 02/10/97 721026 7 02/07/97 721026 1 02/05/97 721026 2 02/08/97 721026 2 02/08/97 721026 2 02/08/97 721026 2 02/08/97 721026 2 02/08/97 721026 2 02/08/97 721026
Attm: Russ Jäneshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307Project Description: Flambeau Mining Project Title: 96F022Sample ID: FMC-190LS-3 Collected: 02/04/97NLS#: 126417 Reported: 02/10/97ParameterResult UnitsUnitsAcidity, tot. as CaC03 Calcium, dis. as Ab by ICPND HO Mg/Lmg/L Units2.0 2.0 2.0Calcular, dis. as Ca by ICPND HO Mg/Lmg/L Units1.6 2.0 2.0Cobert, dis. as Ca by ICP110 Mg/Lmg/L Units3.0 3.0 3.0 3.0Cobalt, dis. as Ca by ICP110 Mg/L1.2 3.0 3.0 3.03.0 3.0 3.0 3.0 3.0Potassium, dis. as Ca by ICP0.23 Mg/Lmg/L 3.0 3.0 3.0 3.0 3.0 3.0 3.03.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0Manganese, dis. as Mg by ICP11000 4.1 	EPA 305. 2 EPA 200. EPA 200. EPA 200. EPA 200. EPA 200. EPA 200. 35 EPA 200. EPA 375.	1 02/10/97 721026 7 02/07/97 721026
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 LoD LOD LOD Parameter Result Units LoD LOD LOQ Acidity, tot. as CaC03 ND mg/L 0.034 0.12 Arsenic, dis. as As by ICP ND ug/L 16 57 Cadmium, dis. as Ca by ICP 45 ug/L 1.2 3.6 Calcium, dis. as Ca by ICP 940 ug/L 4.3 15 Copper, dis. as Cu by ICP 110000 ug/L 54 190 Iron, dis. as Fe by ICP 0.23 mg/L 0.010 0.01 Magnesium, dis. as M by ICP 3100 ug/L 1.8 6.1 PH, lab 6.1 s.u. 1.0 1.0 1.0 Pdtassium, dis. as Ne by ICP 0.79 mg/L 0.033 0.30 Selenium, dis. as K 6.8 mg/L 2.0 6.6 Selenium, dis. as Ne by ICP 0.79 mg/L 0.033 0.1 Sodium, dis.	EPA 305. 2 EPA 200. EPA 200. EPA 200. EPA 200. EPA 200. EPA 200. 35 EPA 200. EPA 375.	1 02/10/97 721026 7 02/07/97 721026
Ref. Line 12 of COC 24605 Description: FMC-190LS-3 Collected: 02/04/97 LOD LOD LOD Parameter Result Units LOD LOQ Acidity, tot. as CaCO3 ND mg/L 2.0 2.0 Aluminum, dis. as Al by ICP ND mg/L 0.034 0.12 Arsenic, dis. as As by ICP ND ug/L 16 57 Cadmium, dis. as Ca by ICP 45 ug/L 1.2 3.8 Calcium, dis. as Co by ICP 940 ug/L 4.3 15 Copper, dis. as Co by ICP 940 ug/L 54 190 Iron, dis. as Fe by ICP 0.23 mg/L 3.0 3.0 Manganesum, dis. as Mg by ICP 3100 ug/L 1.8 6.1 pH, lab 6.1 s.u. 1.0 1.0 Potassium, dis. as Se by furnace ND ug/L 37 130 Sodium, dis. as Na by ICP 0.79 mg/L 2.0 6.6 Tron, dis. as Mg by ICP 0.79 mg/L 2.0 6.6 pH, lab 6.1 s.u. 1.0	EPA 305. 2 EPA 200. EPA 200. EPA 200. EPA 200. EPA 200. EPA 200. 35 EPA 200. EPA 375.	1 02/10/97 721026 7 02/07/97 721026
Acidity, tot. as CaCO3 ND mg/L 2.0 2.0 Aluminum, dis. as Al by ICP ND mg/L 0.034 0.12 Arsenic, dis. as As by ICP ND ug/L 16 57 Cadmium, dis. as Cd by ICP ND ug/L 1.2 3.8 Calcium, dis. as Cd by ICP 310 mg/L 3.0 3.0 Cobalt, dis. as Co by ICP 940 ug/L 4.3 15 Copper, dis. as Co by ICP 940 ug/L 54 190 Iron, dis. as Fe by ICP 0.23 mg/L 0.010 0.00 Magnesium, dis. as Mg by ICP 21 mg/L 3.0 3.0 Magnese, dis. as Mn by ICP 3100 ug/L 1.8 6.1 PH, lab 6.1 s.u. 1.0 1.0 Potassium, dis. as Se by furnace ND ug/L 37 130 Sodium, dis. as Na by ICP 0.79 mg/L 0.033 0.11 Sulfate, as S04 (filtered) 560 mg/L 250 25 Sulfate, as Zn by ICP 5900 ug/L 120 120 <td>EPA 305. 2 EPA 200. EPA 200. EPA 200. EPA 200. EPA 200. EPA 200. 35 EPA 200. EPA 375.</td> <td>1 02/10/97 721026 7 02/07/97 721026</td>	EPA 305. 2 EPA 200. EPA 200. EPA 200. EPA 200. EPA 200. EPA 200. 35 EPA 200. EPA 375.	1 02/10/97 721026 7 02/07/97 721026
Aluminum, dis. as Al by ICP ND mg/L 0.034 0.1: Arsenic, dis. as As by ICP ND ug/L 16 57 Cadmium, dis. as Cd by ICP 45 ug/L 1.2 3.0 Cobalt, dis. as Co by ICP 310 mg/L 3.0 3.0 Cobalt, dis. as Co by ICP 940 ug/L 4.3 15 Copper, dis. as Cu by ICP 0.23 mg/L 0.010 0.01 Magnesium, dis. as Mg by ICP 0.23 mg/L 3.0 3.0 Manganese, dis. as Mg by ICP 3100 ug/L 1.8 6.1 pH, lab 6.1 s.u. 1.0 Potassium, dis. as K 6.8 mg/L 2.0 6.6 Selenium, dis. as Na by ICP 0.79 mg/L 0.033 0.11 Sodium, dis. as Na by ICP 0.79 mg/L 0.033 0.11 Sulfate, as SO4 (filtered) 560 mg/L 250 250 Thallium, dis. as Tl by furnace AAS ND ug/L 120 120	2 EPA 200. EPA 200. EPA 200. EPA 200. EPA 200. EPA 200. 35 EPA 200. EPA 200.	7 02/07/97 721026 7 02/07/97 721026
Values in brackets represent results greater than the LOD but less than the LOO and are within a region	EPA 200.	2 02/06/97 721026 2 02/09/97 721026 2 02/09/97 721026 7 02/07/97 721026
Values in brackets represent results greater than the LOD but less than the LOQ and are within a region Results greater than the LOQ are considered to be in the region of "Certain Quantitation".	of "Less-Certa:	in Quantitation".
LOD = Limit of DetectionLOQ = Limit of QuantitationND = Not DetectedDWB = Dry Weight BasisNA = Not Applicable%DWB = (mg/kg DWB)/10000		
Thomas Rhille Author	orized by:	
Reviewed by: R. T	F. Krueger ratory Manager	

NORTHERN LAKE SE Analytical Laboratory and E 400 North Lake Avenue - Cr: Fel:(715)478-2777 Fax:(715)	nvironmental Services andon, WI 54520	ANALYTIC	CAL REPORT		WIS. LAB	CERT. NO. 72102	6460 JECT# 32180
Client:	Foth & Van Dyke A Attn: Russ Janesh 2737 S. Ridge Ro PO Box 19012 Green Bay, WI 54	ek ad					
Project Title: 96 Sample ID: FMC-17 Ref. Line 1 of COC 24606							
Parameter		Result	Units	LOD	LOQ	Method	Analyzed Lab
Acidity, tot. as C Aluminum, dis. as A Arsenic, dis. as A Cadmium, dis. as C Calcium, dis. as C Cobalt, dis. as Co Copper, dis. as Co Copper, dis. as Cu Iron, dis. as Fe b Magnesium, dis. as Ma Golassium, dis. as S Selenium, dis. as S Soliate, as SO4 (fi Challium, dis. as Ma Zinc, dis. as Zn b	Al by ICP s by ICP d by ICP a by ICP by ICP by ICP Mg by ICP Mn by ICP K Se by furnace by ICP ltered) Tl by furnace AAS	ND ND 13 520 270 18000 ND 9.9 810 5.3 < 3.9 > ND 0.48 660 ND 1500	mg/L mg/L ug/L ug/L ug/L ug/L ug/L ug/L s.u. mg/L ug/L ug/L ug/L ug/L ug/L ug/L ug/L	2.0 0.034 16 1.2 3.0 4.3 5.4 0.010 3.0 1.8 1.0 2.0 37 0.033 250 25 120	2.0 0.12 57 3.8 3.0 15 19 0.035 3.0 6.1 6.6 130 0.11 250 87 120	EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7 EPA 270.2 EPA 275.2 EPA 275.2	02/07/97 721026460 02/07/97 721026460 02/07/97 721026460 02/07/97 721026460 02/07/97 721026460 02/07/97 721026460 02/07/97 721026460 02/07/97 721026460
Values in brackets Results greater tha	represent results greate n the LOQ are considered	er than the LOD but lo l to be in the region	ess than the LOQ and of "Certain Quantita	are within a mation".	region of	'Less-Certain	Quantitation".
LOD = Limit of Dete DWB = Dry Weight Ba		nit of Quantitation Applicable	ND = Not Detected %DWB = (mg/kg DWB <i>Juomas R Ha</i> Reviewed by:)/10000	Authoriza R. T. 1 Laborator	-	

والمراجب والمستعمل بتنبي التراج المتناجة فيستعال عيديا والمراج

- 1

.

Analytical Laboratory and Environmental Services 400 North Lake Avenue - Crandon, WI 54520 Fel:(715)478-2777 Fax:(715)478-3060						
	ANALYTIC	CAL REPORT		PAGE: 14	NLS PRO	JECT# 32180
Client: Foth & Van Dy Attn: Russ Ja 2737 S. Ridg PO Box 19012 Green Bay, WI	neshek e Road					
roject Description: Flambeau Min roject Title: 96F022 ample ID: FMC-176LS-3 NLS#	: 126419		<u></u>			
ef. Line 2 of COC 24606 Description: FMC-176LS	5-3 orted: 02/10/97					
ef. Line 2 of COC 24606 Description: FMC-176LS ollected: 02/04/97 Received: 02/05/97 Repo		Units	LOD	<u>LOO</u>	Method	Analyzed Lab
of. Line 2 of COC 24606 Description: FMC-176LS Nected: 02/04/97 Received: 02/05/97 Repo rameter idity, tot. as CaCO3	nted: 02/10/97 <u>Result</u> ND	mg/L	2.0	2.0	EPA 305.1	02/10/97 721026
f. Line 2 of COC 24606 Description: FMC-176LS Mected: 02/04/97 Received: 02/05/97 Repo rameter idity, tot. as CaCO3 uminum, dis. as Al by ICP	orted: 02/10/97 <u>Result</u> ND ND	mg/L mg/L	2.0 0.034	2.0	EPA 305.1 EPA 200.7	02/10/97 721026 02/07/97 721026
f. Line 2 of COC 24606 Description: FMC-176L5 Nected: 02/04/97 Received: 02/05/97 Repo rameter idity, tot. as CaCO3 uminum, dis. as Al by ICP senic, dis. as As by ICP	nted: 02/10/97 <u>Result</u> ND	mg/L mg/L ug/L	2.0	2.0	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7	02/10/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026
f. Line 2 of COC 24606 Description: FMC-176LS Hected: 02/04/97 Received: 02/05/97 Repo rameter idity, tot. as CaCO3 uminum, dis. as Al by ICP senic, dis. as As by ICP dmium, dis. as Cd by ICP lcium, dis. as Ca by ICP	nrted: 02/10/97 <u>Result</u> ND ND ND 31 590	mg/L mg/L ug/L ug/L mg/L	2.0 0.034 16 1.2 3.0	2.0 0.12 57 3.8 3.0	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	02/10/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026
f. Line 2 of COC 24606 Description: FMC-176LS llected: 02/04/97 Received: 02/05/97 Repo rameter idity, tot. as CaCO3 uminum, dis. as Al by ICP senic, dis. as As by ICP dmium, dis. as Cd by ICP lcium, dis. as Ca by ICP balt, dis. as Co by ICP	nted: 02/10/97 <u>Result</u> ND ND ND 31 590 460	mg/L mg/L ug/L ug/L mg/L ug/L	2.0 0.034 16 1.2 3.0 4.3	2.0 0.12 57 3.8 3.0 15	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	02/10/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026
f. Line 2 of COC 24606 Description: FMC-176L5 llected: 02/04/97 Received: 02/05/97 Repo cameter idity, tot. as CaCO3 uminum, dis. as Al by ICP senic, dis. as As by ICP dmium, dis. as Ca by ICP lcium, dis. as Ca by ICP balt, dis. as Co by ICP oper, dis. as Cu by ICP	nted: 02/10/97 <u>Result</u> ND ND 31 590 460 10000	mg/L mg/L ug/L ug/L mg/L ug/L ug/L	2.0 0.034 16 1.2 3.0 4.3 5.4	2.0 0.12 57 3.8 3.0 15 19	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	02/10/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026
f. Line 2 of COC 24606 Description: FMC-176LS llected: 02/04/97 Received: 02/05/97 Repo rameter idity, tot. as CaCO3 uminum, dis. as Al by ICP senic, dis. as As by ICP dmium, dis. as Cd by ICP lcium, dis. as Ca by ICP balt, dis. as Co by ICP oper, dis. as Fe by ICP	nrted: 02/10/97 Result ND ND 31 590 460 10000 ND	mg/L mg/L ug/L ug/L mg/L ug/L ug/L mg/L	2.0 0.034 16 1.2 3.0 4.3 5.4 0.010	2.0 0.12 57 3.8 3.0 15 19 0.035	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	02/10/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026
f. Line 2 of COC 24606 Description: FMC-176LS llected: 02/04/97 Received: 02/05/97 Repo rameter idity, tot. as CaCO3 uminum, dis. as Al by ICP senic, dis. as As by ICP dmium, dis. as Cd by ICP dcium, dis. as Cd by ICP balt, dis. as Co by ICP oper, dis. as Co by ICP oper, dis. as Fe by ICP gnesium, dis. as Mg by ICP	nted: 02/10/97 <u>Result</u> ND ND 31 590 460 10000	mg/L mg/L ug/L ug/L mg/L ug/L ug/L mg/L mg/L	2.0 0.034 16 1.2 3.0 4.3 5.4	2.0 0.12 57 3.8 3.0 15 19	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	02/10/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026
ef. Line 2 of COC 24606 Description: FMC-176LS ollected: 02/04/97 Received: 02/05/97 Repo rameter idity, tot. as CaCO3 uminum, dis. as Al by ICP senic, dis. as As by ICP dmium, dis. as Cd by ICP dmium, dis. as Cd by ICP balt, dis. as Co by ICP pper, dis. as Cu by ICP on, dis. as Fe by ICP on, dis. as Fe by ICP nganese, dis. as Mn by ICP , lab	nrted: 02/10/97 <u>Result</u> ND ND 31 590 460 10000 ND 7.2 700 5.7	mg/L mg/L ug/L ug/L ug/L ug/L ug/L mg/L mg/L ug/L ug/L	2.0 0.034 16 1.2 3.0 4.3 5.4 0.010 3.0 1.8 1.0	2.0 0.12 57 3.8 3.0 15 19 0.035 3.0 6.1	EPA 305.1 EPA 200.7 EPA 200.7	02/10/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/05/97 721026
M. Line 2 of COC 24606 Description: FMC-176LS Dilected: 02/04/97 Received: 02/05/97 Repo rameter idity, tot. as CaCO3 uminum, dis. as Al by ICP senic, dis. as As by ICP dmium, dis. as Cd by ICP dmium, dis. as Cd by ICP lcium, dis. as Co by ICP balt, dis. as Co by ICP pper, dis. as Co by ICP on, dis. as Fe by ICP gnesium, dis. as Mg by ICP nganese, dis. as Mn by ICP , lab tassium, dis. as K	rted: 02/10/97 <u>Result</u> ND ND 31 590 460 10000 ND 7.2 700 5.7 < 3.4 >	mg/L mg/L ug/L mg/L ug/L ug/L mg/L mg/L ug/L ug/L ug/L ug/L ug/L	2.0 0.034 16 1.2 3.0 4.3 5.4 0.010 3.0 1.8 1.0 2.0	2.0 0.12 57 3.8 3.0 15 19 0.035 3.0 6.1 6.6	EPA 305.1 EPA 200.7 EPA 150.1 EPA 200.7	02/10/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/05/97 721026 02/05/97 721026
M. Line 2 of COC 24606 Description: FMC-176LS Dilected: 02/04/97 Received: 02/05/97 Repo rameter idity, tot. as CaCO3 uminum, dis. as Al by ICP senic, dis. as As by ICP dmium, dis. as Cd by ICP dmium, dis. as Cd by ICP lcium, dis. as Co by ICP balt, dis. as Co by ICP pper, dis. as Co by ICP on, dis. as Fe by ICP gnesium, dis. as Mg by ICP nganese, dis. as Mn by ICP , lab tassium, dis. as Se by furnace	rted: 02/10/97 Result ND ND 31 590 460 10000 ND 7.2 700 5.7 < 3.4 > < 51 >	mg/L mg/L ug/L ug/L ug/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L ug/L	2.0 0.034 16 1.2 3.0 4.3 5.4 0.010 3.0 1.8 1.0 2.0 37	2.0 0.12 57 3.8 3.0 15 19 0.035 3.0 6.1 6.1	EPA 305.1 EPA 200.7 EPA 200.7	02/10/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/05/97 721026 02/10/97 721026 02/08/97 721026
ef. Line 2 of COC 24606 Description: FMC-176LS ollected: 02/04/97 Received: 02/05/97 Repo trameter eidity, tot. as CaCO3 uminum, dis. as Al by ICP senic, dis. as As by ICP ddmium, dis. as Cd by ICP ddmium, dis. as Cd by ICP olcium, dis. as Co by ICP obalt, dis. as Co by ICP obalt, dis. as Co by ICP on, dis. as Fe by ICP gnesium, dis. as Mg by ICP nganese, dis. as Mn by ICP 1, lab trassium, dis. as K lenium, dis. as Na by ICP	rted: 02/10/97 Result ND ND 31 590 460 10000 ND 7.2 700 5.7 3.4 > < 51 > 0.75	mg/L mg/L ug/L ug/L ug/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L ug/L ug/L	2.0 0.034 16 1.2 3.0 4.3 5.4 0.010 3.0 1.8 1.0 2.0 37 0.033	2.0 0.12 57 3.8 3.0 15 19 0.035 3.0 6.1 6.6 130 0.11	EPA 305.1 EPA 200.7 EPA 200.7	02/10/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/05/97 721026 02/05/97 721026 02/08/97 721026 02/08/97 721026
Nef. Line 2 of COC 24606 Description: FMC-176LS Collected: 02/04/97 Received: 02/05/97 Repo arameter cidity, tot. as CaCO3 luminum, dis. as Al by ICP rsenic, dis. as As by ICP admium, dis. as Cd by ICP admium, dis. as Ca by ICP alcium, dis. as Ca by ICP opper, dis. as Co by ICP opper, dis. as Cu by ICP ron, dis. as Fe by ICP agnesium, dis. as Mg by ICP anganese, dis. as Mn by ICP H, lab	rted: 02/10/97 Result ND ND 31 590 460 10000 ND 7.2 700 5.7 < 3.4 > < 51 >	mg/L mg/L ug/L ug/L ug/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L ug/L	2.0 0.034 16 1.2 3.0 4.3 5.4 0.010 3.0 1.8 1.0 2.0 37	2.0 0.12 57 3.8 3.0 15 19 0.035 3.0 6.1 6.1	EPA 305.1 EPA 200.7 EPA 200.7	Analyzed Lab 02/10/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/05/97 721026 02/05/97 721026 02/05/97 721026 02/08/97 721026 02/06/97 721026 02/06/97 721026

LOD = Limit of Detection DWB = Dry Weight Basis

77

LOQ = Limit of Quantitation NA = Not Applicable

جيد السدحية العبر الاروروس

ND = Not Detected %DWB = (mg/kg DWB)/10000

.

Authorized by:

Reviewed by:

R. T. Krueger Laboratory Manager

.

j.

.....

NORTHERN LAKE SI Analytical Laboratory and E					WIS, LAB	CERT. NO. 72102	6460
400 North Lake Avenue - Cr Tel:(715)478-2777 Fax:(715	andon, WI 54520	ANALYTIC	CAL REPORT		PAGE: 15	NLS PRO	JECT# 32180
Client:	Foth & Van Dyke A Attn: Russ Janesh 2737 S. Ridge Ro PO Box 19012 Green Bay, WI 54	ek ad					
Project Descript Project Title: 9	ion: Flambeau Mining 6F022						
	F4-3 NLS#: 1264	20					
Sample ID: FMC-B Ref. Line 3 of COC 24600 Collected: 02/04/97 R	Description: FMC-BF4-3 eceived: 02/05/97 Reported: 0	02/10/97					
Ref. Line 3 of COC 24606	Description: FMC-BF4-3	2/10/97 <u>Result</u>	<u>Units</u>	LOD	LOQ	Method	Analyzed Lab

Thomas Rhule

. . .

Authorized by:

.....

Reviewed by:

--- --

.

· -

...

R. T. Krueger Laboratory Manager

.

• -

478-3060	ANALYTI	CAL REPORT		PAGE: 16	NLS PRO	JECT# 32180
Attn: Russ Janeshe 2737 S. Ridge Roa PO Box 19012	ek ad					
F022 '5-3 NLS#: 1264:	21					
		The it is	top	100	Votbod	Analyzed Lab
	<u></u>					
aCO3						02/10/97 721026 02/07/97 721026
a by ICP	ND		16	57	EPA 200.7	02/07/97 721026
	9.6	ug/L	1.2	3.8	EPA 200.7	02/07/97 721026
a by ICP	230	mg/L				02/07/97 721026
by ICP					EPA 200.7	02/07/97 721026 02/07/97 721026
by ICP						02/07/97 721026
Ma by ICP					EPA 200.7	02/07/97 721026
Mn by ICP	4500	ug/L	1.8	6.1	EPA 200,7	02/07/97 721026
	6.3	s.u.	1.0		EPA 150.1	02/05/97 721026
ĸ					EPA 200.7	02/10/97 721026
Se by furnace	ND	ug/L	37 0.033	130 0.11	EPA 270.2	02/08/97 721026 02/07/97 721026
1	0.61	mg/L	250	250	EPA 375.2	02/06/97 721026
by ICP	590	mm/l.				
by ICP ltered) Fl by furnace AAS	590 ND	mg/L ug/L	25	87	EPA 279.2 EPA 200.7	02/09/97 721026
	Attn: Russ Janeshe 2737 S. Ridge Ros PO Box 19012 Green Bay, WI 543 on: Flambeau Mining F022 75-3 NLS#: 12643 Description: FMC-BF5-3 sceived: 02/05/97 Reported: 0 aCO3 Al by ICP s by ICP d by ICP by ICP by ICP by ICP Mg by ICP Mg by ICP	Foth & Van Dyke Associates Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307 Jon: Flambeau Mining 5F022 F5-3 NLS#: 126421 Description: FMC-BF5-3 Description: FMC-BF5-3 <tr< td=""><td>Foth & Van Dyke Associates Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307 Lon: Flambeau Mining 5F022</td><td>Foth & Van Dyke Associates Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307 Lon: Flambeau Mining F022 75-3 NLS#: 126421 Description: FMC-BF5-3 sceived: 02/05/97 Reported: 02/10/97 $\frac{Result}{Description: FMC-BF5-3} Units LODaCO3 ND mg/L 2.0Al by ICP ND mg/L 0.034s by ICP ND mg/L 0.034d by ICP 9.6 ug/L 1.2a by ICP 9.6 ug/L 1.2a by ICP 170 ug/L 4.3by ICP 170 ug/L 4.3by ICP 120 ug/L 5.4y ICP ND mg/L 0.010Mg by ICP 16 mg/L 3.0Mn by ICP 16 mg/L 3.0Mn by ICP 16 mg/L 3.0$</td><td>Roth & Van Dyke Associates Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307 .con: Flambeau Mining SF022 "5-3 NLS#: 126421 Description: FMC-BF5-3 received: 02/05/97 Reported: 02/10/97 Result Units LOD LOQ aCO3 Al by ICP ND mg/L 2.0 2.0 s by ICP ND mg/L 0.034 0.12 aby ICP 9.6 ug/L 1.6 57 aby ICP 230 mg/L 3.0 3.0 by ICP 170 ug/L 4.3 15 by ICP 120 ug/L 5.4 19 y ICP ND mg/L 3.0 3.0 by ICP 16 mg/L 3.0 3.0 by ICP 120 ug/L 1.8 6.1 mb y ICP 16 mg/L 3.0 3.0 mb y ICP 16 mg/L 3.0 3.0</td><td>Foth & Van Dyke Associates Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307 </td></tr<>	Foth & Van Dyke Associates Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307 Lon: Flambeau Mining 5F022	Foth & Van Dyke Associates Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307 Lon: Flambeau Mining F022 75-3 NLS#: 126421 Description: FMC-BF5-3 sceived: 02/05/97 Reported: 02/10/97 $\frac{Result}{Description: FMC-BF5-3} Units LODaCO3 ND mg/L 2.0Al by ICP ND mg/L 0.034s by ICP ND mg/L 0.034d by ICP 9.6 ug/L 1.2a by ICP 9.6 ug/L 1.2a by ICP 170 ug/L 4.3by ICP 170 ug/L 4.3by ICP 120 ug/L 5.4y ICP ND mg/L 0.010Mg by ICP 16 mg/L 3.0Mn by ICP 16 mg/L 3.0Mn by ICP 16 mg/L 3.0$	Roth & Van Dyke Associates Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307 .con: Flambeau Mining SF022 "5-3 NLS#: 126421 Description: FMC-BF5-3 received: 02/05/97 Reported: 02/10/97 Result Units LOD LOQ aCO3 Al by ICP ND mg/L 2.0 2.0 s by ICP ND mg/L 0.034 0.12 aby ICP 9.6 ug/L 1.6 57 aby ICP 230 mg/L 3.0 3.0 by ICP 170 ug/L 4.3 15 by ICP 120 ug/L 5.4 19 y ICP ND mg/L 3.0 3.0 by ICP 16 mg/L 3.0 3.0 by ICP 120 ug/L 1.8 6.1 mb y ICP 16 mg/L 3.0 3.0 mb y ICP 16 mg/L 3.0 3.0	Foth & Van Dyke Associates Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307

-

....

.

.

Thomas K Printe

Authorized by:

· · · · · · ·

R. T. Krueger Laboratory Manager

.

- - ----

. .

.....

Reviewed by:

.

Fel:(715)478-2777 Fax:(715)478-3060	20				113. EAD C	CERT. NO. 72102	<u>5460</u>
		ANALYTIC	CAL REPORT		PAGE: 17	NLS PRO	JECT# 32180
Attn: 2737 ; PO Bo:	& Van Dyke Associate Russ Janeshek 5. Ridge Road x 19012 Bay, WI 54307	38					
Project Description: Flam Project Title: 96F022	beau Mining						
Sample ID: FMC-CUF1-3 Ref. Line 5 of COC 24606 Description Collected: 02/04/97 Received: 02/05	NLS#: 126422 : FMC-CUF1-3 i/97 Reported: 02/10/97				-		
Parameter	<u>न</u>	lesult	Units	LOD	roð	Method	Analyzed Lab
Alkalinity, tot. as CaCO3 (f Aluminum, dis. as Al by ICP Arsenic, dis. as As by ICP Cadmium, dis. as Cd by ICP Calcium, dis. as Cd by ICP Cobalt, dis. as Co by ICP Copper, dis. as Co by ICP fron, dis. as Fe by ICP fron, dis. as Fe by ICP Aagganese, dis. as Mg by ICP Aagganese, dis. as Mg by ICP Aagganese, dis. as K Selenium, dis. as K Selenium, dis. as Se by furn Sodium, dis. as Na by ICP Sulfate, as SO4 (filtered) Challium, dis. as Tl by furn Zinc, dis. as Zn by ICP	ace ace AAS	20 ND ND 2.7 > 110 59.7 > 93 0.053 63 380 6.9 3.80 6.9 3.6 560 ND ND ND	mg/L mg/L ug/L ug/L ug/L ug/L ug/L s.u. mg/L ug/L ug/L ug/L ug/L ug/L	1.5 0.034 16 1.2 3.0 4.3 5.4 0.010 3.0 1.8 1.0 2.0 37 0.033 250 25 120	5.3 0.12 57 3.8 3.0 15 19 0.035 3.0 6.1 6.6 130 0.11 250 87 120	EPA 310.1 EPA 200.7 EPA 375.2 EPA 279.2 EPA 200.7	02/06/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/05/97 721026 02/05/97 721026 02/08/97 721026 02/08/97 721026 02/06/97 721026 02/09/97 721026
Values in brackets represent Results greater than the LOQ	results greater than t are considered to be i	he LOD but le n the region	of "Certain Quantit.	ation".	region of "I	Jess-Certain	Quantitation".
LOD = Limit of Detection DWB = Dry Weight Basis	LOQ = Limit of Qu NA = Not Applicab	antitation	ND = Not Detecte %DWB = (mg/kg DWB				

•

NORTHERN LAKE SE Analytical Laboratory and Er 400 North Lake Avenue - Cra	vironmental Services ndon, WI 54520				WIS. LAB (CERT. NO. 72102	6460
Tel:(715)478-2777 Fax:(715)4	10-3000	ANALYTIC	AL REPORT		PAGE: 18	NLS PRO	JECT# 32180
Client:	Foth & Van Dyke Ass Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 5430						
Project Title: 96		3				1017	
Collected: 02/04/97 Re	ceived: 02/05/97 Reported: 02/						
Parameter		Result	Units	LOD	LOQ	Method	Analyzed Lab
Alkalinity, tot. as Aluminum, dis. as A Arsenic, dis. as A Cadmium, dis. as C Calcium, dis. as C Cobalt, dis. as C Copper, dis. as C Uron, dis. as Fe Magnesium, dis. as PH, lab Potassium, dis. as Selenium, dis. as S Sodium, dis. as S Sulfate, as SO4 (fi Thallium, dis. as Z	Al by ICP 5 by ICP 6 by ICP by ICP by ICP by ICP 7 ICP Mg by ICP Mn by ICP K Se by furnace by ICP Itered) Fl by furnace AAS	90 ND ND 53 ND 36 < 0.025 > 32 33 7.4 < 2.8 > ND 2.5 160 ND ND	mg/L mg/L ug/L ug/L ug/L ug/L mg/L mg/L ug/L s.u. mg/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L	1.5 0.034 16 1.2 3.0 4.3 5.4 0.010 3.0 1.8 1.0 2.0 37 0.033 25 25 120	5.3 0.12 57 3.8 3.0 15 19 0.035 3.0 6.1 6.6 130 0.11 25 87 120	EPA 310.1 EPA 200.7 EPA 200.7	02/07/97 721026460 02/07/97 721026460 02/07/97 721026460 02/07/97 721026460 02/07/97 721026460 02/07/97 721026460 02/07/97 721026460 02/05/97 721026460 02/10/97 721026460 02/08/97 721026460

LOD = Limit of Detection DWB = Dry Weight Basis LOQ = Limit of Quantitation NA = Not Applicable

ND = Not Detected %DWB = (mg/kg DWB)/10000

Authorized by:

Reviewed by:

R. T. Krueger Laboratory Manager

and the second
Analytical Laboratory and El 100 North Lake Avenue - Cra Fel:(715)478-2777 Fax:(715)4	andon, WI 54520					CERT. NO. 72102	
Client:	Foth & Van Dyke As Attn: Russ Janeshe 2737 S. Ridge Roa PO Box 19012 Green Bay, WI 543 on: Flambeau Mining	ik Id			PAGE: 19	NLS PRO	JECT# 32180
	5-3L-3 NLS#: 126 Description: FMC-15-3L-3 cceived: 02/05/97 Reported: 02		Units	LOD	FOD	Method	Analyzed Lab
cidity, tot. as Ca	aCO3 Al by ICP	ND ND ND	mg/L mg/L ug/L	2.0 0.034 16 1.2	2.0 0.12 57 3.8	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	02/10/97 7210264 02/07/97 7210264 02/07/97 7210264 02/07/97 7210264 02/07/97 7210264 02/07/97 7210264

LOD = Limit of Detection DWB = Dry Weight Basis

West 1

82

والمتحج والمراجع

Sugar Sec. 18

|A| = |A| + |A|

Association -

100 C 100 C 100

1803 8 640

97.2 Sec. 1. Sec. 1. Sec.

etano consta

and the second

LOQ = Limit of Quantitation NA = Not Applicable

ND = Not Detected %DWB = (mg/kg DWB)/10000

e o San de Lag

A Greek St.

and excession

Reviewed by:

Authorized by:

R. T. Krueger Laboratory Manager

Analytical Laboratory and En	RVICE, INC. nvironmental Services				WIS. LAB C	ERT. NO. 72102	6460
400 North Lake Avenue - Cra Tel:(715)478-2777 Fax:(715)4		ANALYTIC	AL REPORT		PAGE: 20	NLS PRO	JECT# 32180
Client:	Foth & Van Dyke As Attn: Russ Janeshe 2737 S. Ridge Roa PO Box 19012 Green Bay, WI 543	ek .d					
Sample ID: FMC-18 Ref. Line 8 of COC 24606 Collected: 02/04/97 Re	30L-3 NLS#: 1264 Description: FMC-180L-3		Units	LOD	LOQ	Method	Analyzed Lab
Parameter		Resurc	UNICO				

لحايين المتراجر المراجع فتصفين بالترجيب بتومر التراج

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

Authorized by:

Reviewed by:

R. T. Krueger Laboratory Manager

Client: Poth & Van Dyke Associates Attn: Rues Janeshek 2737 S. Ridge Road FO Box 19012 Green Bay. WI 54307 Project Description: Flambeau Mining Project Description: Flambeau Mining Project 024807 Besciption: FMC-1811-3 Collected: 02/0497 Rescived: 02/0597 Reported: 02/10/97 Parameter Auminum, dis. as AL by ICP ND mg/L 2.0 2.0 EPA 305.1 02/10/97 7210264 Auminum, dis. as AL by ICP ND mg/L 2.0 2.0 EPA 305.1 02/10/97 7210264 Auminum, dis. as AL by ICP ND mg/L 2.0 2.0 EPA 305.1 02/10/97 7210264 Collect. 602/04/97 Rescived: 02/05/97 Reported: 02/10/97 7210264 Auminum, dis. as AL by ICP ND mg/L 3.0 SEPA 305.1 02/10/97 7210264 Calcium, dis. as Ca Dy ICP 2700 ug/L 4.3 IS EPA 200.7 02/07/97 7210264 Collect. 61. as Ca Dy ICP 2700 ug/L 4.3 IS EPA 200.7 02/07/97 7210264 Collect. 61. as Ca Dy ICP 40000 ug/L 540 1500 EPA 200.7 02/07/97 7210264 Collect. 61. as Ca Dy ICP 40000 ug/L 540 1500 EPA 200.7 02/07/97 7210264 Collect. 61. as Ca Dy ICP 40000 ug/L 540 1500 EPA 200.7 02/07/97 7210264 Collect. 61. as Ca Dy ICP 40000 ug/L 540 1500 EPA 200.7 02/07/97 7210264 Manganese, dis. as M by ICP 1100 ug/L 1.8 6.1 EPA 200.7 02/07/97 7210264 Manganese, dis. as M by ICP 100 ug/L 2.0 Gio EPA 200.7 02/07/97 7210264 Sulfat, as SO My ICP 2.2 mg/L 2.0 Gio EPA 200.7 02/07/97 7210264 Manganese, dis. as M by ICP 100 ug/L 2.0 Gio EPA 200.7 02/07/97 7210264 Manganese, dis. as M by ICP 100 ug/L 2.0 Gio EPA 200.7 02/07/97 7210264 Manganese, dis. as M by ICP 100 ug/L 2.0 Gio EPA 200.7 02/07/97 7210264 Manganese, dis. as M by ICP 721027 71000 ug/L 2.5 Zio EPA 100.7 02/07/97 7210264 Manganese, dis. as N by ICP 721027 71000 ug/L 2.5 Zio 200 EPA 200.7 02/07/97 7210264 Manganese, dis. as N by ICP 721027 71000 ug/L 2.5 Zio EPA 200.7 02/07/97 7210264 Manganese, dis. as N by ICP 721027 71000 ug/L 2.5 Zio EPA 270.7 02/07/97 7210264 Sulfat, as SOA (Filtered) 710 mg/L 2.5 Zio EPA 270.7 02/07/97 7210264 Manganese, dis. as T by ICP 721027 71000 ug/L 2.5 Zio EPA 270.7 02/07/97 7210264 Manganese Ada M by ICP 721000 by IEPA 200.7 02/07/97 7210264 Manganese Ada M by I	4	NORTHERN LAKE SERVIO Analytical Laboratory and Enviror 400 North Lake Avenue - Crandon Tel:(715)478-2777 Fax:(715)478-30	mental Services , WI 54520	ANALYTI	CAL REPORT		WIS. LAB	CERT. NO. 72102 NLS PRO	26460 JECT# 32180
Project Title: 96F022 Sample ID: FMC-181L-3 Collected: 02/04/07 NLS#: 126426 Ref. Line 9 of COC 24606 Description: FMC-181L-3 Collected: 02/06/97 Parameter Result Units LOD LOQ Method Analyzed Lab Acidity, tot. as CaCO3 Aluminum, dis. as Alby ICP ND mg/L 2.0 2.0 EFA 305.1 02/10/97 7210264 Arsenic, dis. as Ca by ICP ND mg/L 16 57 EFA 200.7 02/07/97 7210264 Cadmium, dis. as Ca by ICP ND mg/L 3.3 3.0 EFA 200.7 02/07/97 7210264 Cadmium, dis. as Ca by ICP 530 ug/L 3.3 3.0 EFA 200.7 02/07/97 7210264 Cadmium, dis. as Fe by ICP 2.5 mg/L 3.0 EFA 200.7 02/07/97 7210264 Iron, dis. as Fe by ICP 2.5 mg/L 0.010 0.035 EFA 200.7 02/07/97 7210264 Magnessium, dis. as M Mby ICP 62 mg/L 0.010 0.035 EFA 200.7 02/07/97 7210264 Selenium, dis. as Se by furnace <47.7 ug/L 1.0 EFA 200.7 <th></th> <th></th> <th>Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012</th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th>			Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012						
Bef. Line 9 of COC 24606 Description: FMC-181L-3 Collected: 02/05/97 Received: 02/05/97 Reported: 02/10/97 Parameter Result Units LOD LOQ Method Analyzed Lab Acidity, tot. as CaC03 ND mg/L 2.0 2.0 EPA 305.1 02/10/97 7210254 Aluminum, dis. as Al by ICP 0.17 mg/L 0.034 0.12 EPA 200.7 02/07/97 7210254 Arsenic, dis. as Al by ICP ND ug/L 16 57 EPA 200.7 02/07/97 7210254 Cadmium, dis. as Ab by ICP ND ug/L 1.2 5.8 EPA 200.7 02/07/97 7210254 Cadmium, dis. as Cd by ICP 570 mg/L 1.2 5.8 EPA 200.7 02/07/97 7210254 Cobself, dis. as Cd by ICP 2700 ug/L 4.3 5 EPA 200.7 02/07/97 7210254 Magneseium, dis. as Mg by ICP 480000 ug/L 5.40 1500 EPA 200.7 02/07/97 7210254 Magneseium, dis. as K < 3.2 mg/L 3.0 3.0 EPA 200.7 02/07/97 7210254 Selenium, dis. as K < 3.2 mg/L 3.0 3.0 EPA 200.7		Project Description: Project Title: 96F02	Flambeau Mining 2						
Acidity, tot. as CaC03 ND mg/L 2.0 2.0 EPA 305.1 02/10/97 7210264 Aluminum, dis. as Ab by ICP 0.17 mg/L 0.034 0.12 EPA 200.7 02/07/97 7210264 Cadmium, dis. as Ab by ICP ND ug/L 16 57 EPA 200.7 02/07/97 7210264 Cadcium, dis. as Ca by ICP 530 ug/L 1.2 3.8 EPA 200.7 02/07/97 7210264 Cobalt, dis. as Ca by ICP 530 ug/L 1.2 3.8 EPA 200.7 02/07/97 7210264 Cobalt, dis. as Ca by ICP 370 mg/L 3.0 0.0 EPA 200.7 02/07/97 7210264 Cobalt, dis. as Ca by ICP 480000 ug/L 4.0 100 EPA 200.7 02/07/97 7210264 Margenesium, dis. as Mg by ICP 62 mg/L 3.0 1.0 EPA 200.7 02/07/97 7210264 Mangenesium, dis. as Mg by ICP 62 mg/L 3.0 0.0 EPA 200.7 02/07/97 7210264 Mangenesium, dis. as Mg by ICP 62 mg/L 3.0 0.0 EPA 200.7 02/07/97 7210264 Potassium, dis. as SM by ICP 100		Ref. Line 9 of COC 24606 De	scription: FMC-181L-3						
Aluminum, dis. as Al by ICP 0.17 mg/L 0.034 0.12 EPA 200.7 02/07/97 7210264 Arsenic, dis. as As by ICP ND ug/L 16 57 EPA 200.7 02/07/97 7210264 Calcium, dis. as Ca by ICP 530 ug/L 1.2 3.8 EPA 200.7 02/07/97 7210264 Colledium, dis. as Ca by ICP 370 mg/L 1.0 3.0 EPA 200.7 02/07/97 7210264 Copper, dis. as Cu by ICP 2700 ug/L 4.3 15 EPA 200.7 02/07/97 7210264 Copper, dis. as Cu by ICP 480000 ug/L 540 1900 EPA 200.7 02/07/97 7210264 Magnesium, dis. as Mg by ICP 2.5 mg/L 0.010 0.035 EPA 200.7 02/07/97 7210264 Manganese, dis. as Mn by ICP 1100 ug/L 1.8 6.1 EPA 200.7 02/07/97 7210264 PH (ab 4.8 s.u. 1.0 EPA 200.7 02/07/97 7210264 Sodium, dis. as Na by ICP 1.0 mg/L 0.033 0.1 EPA 200.7 02/07/97 7210264 Sodium, dis. as Soly furnace 47 > ug/L 0.0	Ē	Parameter		Result	Units	LOD	LOQ	Method	Analyzed Lab
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 WB = Dry Weight Basis NA = Not Applicable DWB = (mg/kg DWB)/10000 Marking Reviewed by: R. T. Krueger	AACCCCINN HHSSSUZ -	Aluminum, dis. as Al b Arsenic, dis. as As by Cadmium, dis. as Cd by Calcium, dis. as Ca by Cobalt, dis. as Co by Copper, dis. as Co by Iron, dis. as Fe by IC Magnesium, dis. as Mg Manganese, dis. as Mn oH, lab Potassium, dis. as Ka Selenium, dis. as Se b Sodium, dis. as Na by Sulfate, as SO4 (filter Thallium, dis. as Th b Zinc, dis. as Zn by IC	ICP ICP ICP ICP ICP by ICP by ICP by ICP y furnace ICP ed) y furnace AAS P	0.17 ND 530 370 2700 480000 2.5 62 1100 4.8 < 3.2 > < 47 > 1.0 710 ND 74000	mg/L ug/L mg/L ug/L ug/L mg/L ug/L s.u. mg/L ug/L mg/L ug/L ug/L ug/L ug/L	0.034 16 1.2 3.0 4.3 540 0.010 3.0 1.8 1.0 2.0 37 0.033 250 25 120	0.12 57 3.8 3.0 15 1900 0.035 3.0 6.1 6.6 130 0.11 250 87 120	EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7 EPA 270.2 EPA 375.2 EPA 279.2 EPA 200.7	02/07/97 7210264 02/07/97 7210264 02/07/97 7210264 02/07/97 7210264 02/07/97 7210264 02/07/97 7210264 02/07/97 7210264 02/07/97 7210264 02/05/97 7210264 02/06/97 7210264 02/06/97 7210264 02/06/97 7210264 02/09/97 7210264 02/09/97 7210264
DWB = Dry Weight Basis NA = Not Applicable %DWB = (mg/kg DWB)/10000 Momaskhuide Authorized by: Reviewed by: R. T. Krueger	F	Results greater than th	e LOQ are considered t	o be in the region	of "Certain Quantitati	re within a i ion".	region of "	Less-Certain	Quantitation".
Reviewed by: R. T. Krueger				plicable	DWB = (mg/kg DWB)/1	L0000			
Reviewed by: R. T. Krueger Laboratory Manager					Shomas Khill	1	Authorize	d by:	
					Reviewed by:		R. T. K Laborator	rueger Y Manager	

. . . .

......

. . . .

Tel:(715)478-2777 Fax:(715)	478-3060	ANALYTIC	AL REPORT		PAGE: 22	NLS PRO	JECT# 32180
Client:	Foth & Van Dyke A Attn: Russ Janesh 2737 S. Ridge Ro PO Box 19012 Green Bay, WI 543	ek ad					
Project Title: 96 Sample ID: FMC-15 Ref. Line 10 of COC 2460	5-IL-3 NLS#: 12 6 Description: FMC-15-IL-3						
Collected: 02/04/97 Re Parameter	ceived: 02/05/97 Reported: C	Result	Units	LOD	FOD	Method	Analyzed Lab
		740	mg/L	2.0	2.0	EPA 305.1	02/10/97 7210264

-- ----

LOD = Limit of Detection DWB = Dry Weight Basis LOQ = Limit of Quantitation NA = Not Applicable

-

ND = Not Detected %DWB = (mg/kg DWB)/10000

Authorized by:

Reviewed by:

R. T. Krueger Laboratory Manager

.

. . ..

NORTHERN LAKE SERV Analytical Laboratory and Envir	ICE, INC.				WIS, LAB	CERT, NO. 72102	6460	
100 North Lake Avenue - Crand Fel:(715)478-2777 Fax:(715)478-	on, WI 54520	ANALYTIC	CAL REPORT		PAGE: 23	NLS PRO	JECT# 321	.80
Client:	Foth & Van Dyke As Attn: Russ Janeshe 2737 S. Ridge Roa FO Box 19012 Green Bay, WI 543	k đ						
Project Description Project Title: 96F0	1: Flambeau Mining 222							
Ref. Line 11 of COC 24606	Description: FMC-4-IL-3							
lef. Line 11 of COC 24606 Collected: 02/04/97 Recei			Units	LOD	LOQ	Method	Analyzed	Lab
ef. Line 11 of COC 24606 ollected: 02/04/97 Recei <u>trameter</u>	Description: FMC-4-IL-3 ved: 02/05/97 Reported: 02	2/10/97		<u>LOD</u> 2.0	<u>LOQ</u> 2.0	<u>Method</u> EPA 305.1	<u>Analyzed</u> 02/10/97	
ef. Line 11 of COC 24606 ollected: 02/04/97 Recei <u>grameter</u> ridity, tot. as CaCC	Description: FMC-4-IL-3 ved: 02/05/97 Reported: 02	2/10/97 <u>Result</u> ND ND	mg/L mg/L	2.0 0.034	2.0	EPA 305.1 EPA 200.7	02/10/97 02/07/97	7210264 7210264
ef. Line 11 of COC 24606 ollected: 02/04/97 Recei ridity, tot. as CaCC uminum, dis. as Al senic, dis. as As b	Description: FMC-4-IL-3 ved: 02/05/97 Reported: 02 D3 by ICP oy ICP	2/10/97 Result ND ND ND ND	mg/L mg/L ug/L	2.0 0.034 16	2.0 0.12 57	EPA 305.1 EPA 200.7 EPA 200.7	02/10/97 02/07/97 02/07/97	7210264 7210264 7210264
ef. Line 11 of COC 24606 Sllected: 02/04/97 Recei <u>rameter</u> idity, tot. as CaCC uminum, dis. as Al senic, dis. as As b dmium, dis. as Cd b	Description: FMC-4-IL-3 ved: 02/05/97 Reported: 02 by ICP by ICP by ICP	2/10/97 <u>Result</u> ND ND ND 34	mg/L mg/L ug/L ug/L	2.0 0.034 16 1.2	2.0 0,12 57 3.8	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7	02/10/97 02/07/97 02/07/97 02/07/97 02/07/97	7210264 7210264 7210264 7210264 7210264
ef. Line 11 of COC 24606 Sected: 02/04/97 Recei <u>rameter</u> idity, tot. as CaCC uminum, dis. as Al senic, dis. as As b dmium, dis. as Cd b lcium, dis. as Cd b	Description: FMC-4-IL-3 ved: 02/05/97 Reported: 02 by ICP oy ICP oy ICP oy ICP oy ICP	2/10/97 Result ND ND ND 34 420	mg/L mg/L ug/L ug/L mg/L	2.0 0.034 16 1.2 3.0	2.0 0,12 57 3.8 3.0	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	02/10/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97	7210264 7210264 7210264 7210264 7210264 7210264
ef. Line 11 of COC 24606 Mected: 02/04/97 Recei <u>rameter</u> idity, tot. as CaCC uminum, dis. as As A senic, dis. as As A dmium, dis. as Cd A balt. dis. as Ca A balt. dis. as Co by	Description: FMC-4-IL-3 ved: 02/05/97 Reported: 02 by ICP by ICP by ICP by ICP cP v ICP v ICP	2/10/97 Result ND ND 34 420 270	mg/L mg/L ug/L ug/L mg/L ug/L	2.0 0.034 16 1.2 3.0 4.3	2.0 0,12 57 3.8 3.0 15	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	02/10/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97	7210264 7210264 7210264 7210264 7210264 7210264 7210264
ef. Line 11 of COC 24606 ollected: 02/04/97 Recei rameter idity, tot. as CaCC uminum, dis. as As b dmium, dis. as Ca b dmium, dis. as Ca b lcium, dis. as Ca b balt, dis. as Co by pper, dis. as Cu by	Description: FMC-4-IL-3 ved: 02/05/97 Reported: 02 by ICP by ICP by ICP y ICP y ICP y ICP y ICP r ICP r ICP	2/10/97 Result ND ND 34 420 270 8200	mg/L mg/L ug/L ug/L ug/L ug/L ug/L	2.0 0.034 16 1.2 3.0 4.3 5.4	2.0 0.12 57 3.8 3.0 15 19	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	02/10/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97	7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264
ef. Line 11 of COC 24606 ollected: 02/04/97 Recei <u>rameter</u> sidity, tot. as CaCC uminum, dis. as Al senic, dis. as As b dmium, dis. as Cd b dmium, dis. as Cd b lcium, dis. as Cd b balt, dis. as Co by opper, dis. as Fe by J	Description: FMC-4-IL-3 ved: 02/05/97 Reported: 02 by ICP by ICP y ICP y ICP y ICP / ICP / ICP / ICP	2/10/97 Result ND ND 34 420 270 8200 ND	mg/L mg/L ug/L ug/L mg/L ug/L ug/L mg/L	2.0 0.034 16 1.2 3.0 4.3 5.4 0.010	2.0 0,12 57 3.8 3.0 15 19 0.035	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	02/10/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97	7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264
ef. Line 11 of COC 24606 ollected: 02/04/97 Recei ridity, tot. as CaCC uminum, dis. as Al senic, dis. as As A dmium, dis. as Cd H dcium, dis. as Cd H lcium, dis. as Cd H balt, dis. as Co by oper, dis. as Cu by on, dis. as Fe by J	Description: FMC-4-IL-3 ved: 02/05/97 Reported: 02 by ICP oy ICP oy ICP oy ICP / ICP / ICP / ICP / ICP / ICP / ICP	2/10/97 Result ND ND 34 420 270 8200 ND 33	mg/L mg/L ug/L ug/L ug/L ug/L mg/L mg/L	2.0 0.034 16 1.2 3.0 4.3 5.4 0.010 3.0	2.0 0.12 57 3.8 3.0 15 19 0.035 3.0	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	02/10/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97	7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264
ef. Line 11 of COC 24606 ollected: 02/04/97 Recei rrameter cidity, tot. as CaCC cuminum, dis. as Al csenic, dis. as As h ddmium, dis. as Cd h dclium, dis. as Cd h bbalt, dis. as Cd by opper, dis. as Co by opper, dis. as Co by opper, dis. as Fe by J con, dis. as Ma inganese, dis. as Ma	Description: FMC-4-IL-3 ved: 02/05/97 Reported: 02 by ICP oy ICP oy ICP oy ICP / ICP / ICP / ICP / ICP / ICP / ICP	2/10/97 Result ND ND ND 34 420 270 8200 ND 33 2600	mg/L mg/L ug/L ug/L ug/L ug/L mg/L mg/L ug/L	2.0 0.034 16 1.2 3.0 4.3 5.4 0.010 3.0 1.8	2.0 0,12 57 3.8 3.0 15 19 0.035	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	02/10/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97	7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264
ef. Line 11 of COC 24606 ollected: 02/04/97 Recei trameter sidity, tot. as CaCC uminum, dis. as As f idmium, dis. as Ca f idmium, dis. as Ca f balt, dis. as Ca f bbalt, dis. as Ca by opper, dis. as Ca by opper, dis. as Ca by on, dis. as Fe by J ugnesium, dis. as Me unganese, dis. as Me inganese, dis. as Me inganese, dis. as Me	Description: FMC-4-IL-3 ved: 02/05/97 Reported: 02 by ICP oy ICP oy ICP oy ICP / ICP / ICP / ICP / ICP / ICP / ICP	2/10/97 Result ND ND ND 34 420 270 8200 ND 33 2600 6.2	mg/L mg/L ug/L ug/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L	2.0 0.034 16 1.2 3.0 4.3 5.4 0.010 3.0 1.8 1.0	2.0 0,12 57 3.8 3.0 15 19 0.035 3.0 6.1	EPA 305.1 EPA 200.7 EPA 200.7	02/10/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97	7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264
Af. Line 11 of COC 24606 offected: 02/04/97 Recei- crameter cidity, tot. as CaCC uminum, dis. as Al senic, dis. as As h idmium, dis. as Cd h idmium, dis. as Ma idmium, dis. as Ma inganese, dis. as Ma inganese, dis. as K	Description: FMC-4-IL-3 ved: 02/05/97 Reported: 02 by ICP by ICP by ICP r ICP r ICP r ICP r ICP g by ICP h by ICP	2/10/97 Result ND ND 34 420 270 8200 ND 33 2600 6.2 14	mg/L mg/L ug/L ug/L mg/L ug/L mg/L mg/L ug/L s.u. mg/L	2.0 0.034 16 1.2 3.0 4.3 5.4 0.010 3.0 1.8 1.0 2.0	2.0 0,12 57 3.8 3.0 15 19 0.035 3.0 6.1 6.6	EPA 305.1 EPA 200.7 EPA 200.7	02/10/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/05/97 02/05/97 02/10/97	7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264
ef. Line 11 of COC 24606 ollected: 02/04/97 Recei arameter cidity, tot. as CaCC luminum, dis. as Al csenic, dis. as As b admium, dis. as Cd b alcium, dis. as Cd b obalt, dis. as Cd b obalt, dis. as Co by opper, dis. as Co by opper, dis. as Co by agnesium, dis. as Ke anganese, dis. as Mr 1 ab btassium, dis. as Ke elenium, dis. as Se	Description: FMC-4-IL-3 ved: 02/05/97 Reported: 02 by ICP by ICP by ICP c ICP c ICP c ICP f Dy ICP by ICP by ICP by ICP by ICP by ICP	2/10/97 Result ND ND 34 420 270 8200 ND 33 2600 6.2 14 ND	mg/L mg/L ug/L ug/L ug/L ug/L mg/L mg/L s.u. mg/L s.u. mg/L	2.0 0.034 16 1.2 3.0 4.3 5.4 0.010 3.0 1.8 1.0 2.0 37	2.0 0.12 57 3.8 3.0 15 19 0.035 3.0 6.1 6.6 130	EPA 305.1 EPA 200.7 EPA 200.7	02/10/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/05/97 02/05/97 02/10/97 02/08/97	7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264
Nef. Line 11 of COC 24606 collected: 02/04/97 Recei arameter cidity, tot. as CaCC luminum, dis. as Al rsenic, dis. as As h admium, dis. as Cd h admium, dis. as Cd h obalt, dis. as Co by opper, dis. as Co by con, dis. as Co by con, dis. as Me anganese, dis. as Me otassium, dis. as Se odium, dis. as Na by	Description: FMC-4-IL-3 ved: 02/05/97 Reported: 02 by ICP by ICP by ICP v ICP / ICP / ICP / ICP f by ICP h by ICP h by ICP / ICP	2/10/97 Result ND ND ND 34 420 270 8200 ND 33 2600 6.2 14 ND 0.89	mg/L mg/L ug/L ug/L ug/L ug/L mg/L ug/L s.u. mg/L ug/L mg/L	2.0 0.034 16 1.2 3.0 4.3 5.4 0.010 3.0 1.8 1.0 2.0 37 0.033	2.0 0.12 57 3.8 3.0 15 19 0.035 3.0 6.1 6.6 130 0.11	EPA 305.1 EPA 200.7 EPA 150.1 EPA 150.1 EPA 200.7 EPA 200.7	02/10/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/05/97 02/05/97 02/08/97 02/07/97	7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264
Parameter	Description: FMC-4-IL-3 ved: 02/05/97 Reported: 02 by ICP by ICP by ICP cP cP cP g by ICP h by ICP h by ICP h by ICP cP cP cP g by ICP cP cP cP cP cP cP cP cP cP cP cP cP cP	2/10/97 Result ND ND 34 420 270 8200 ND 33 2600 6.2 14 ND	mg/L mg/L ug/L ug/L ug/L ug/L mg/L mg/L s.u. mg/L s.u. mg/L	2.0 0.034 16 1.2 3.0 4.3 5.4 0.010 3.0 1.8 1.0 2.0 37	2.0 0.12 57 3.8 3.0 15 19 0.035 3.0 6.1 6.6 130	EPA 305.1 EPA 200.7 EPA 200.7	02/10/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/07/97 02/05/97 02/05/97 02/10/97 02/08/97	7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264

LOD = Limit of Detection DWB = Dry Weight Basis LOQ = Limit of Quantitation NA = Not Applicable

Service and

ND = Not Detected %DWB = (mg/kg DWB)/10000

Huomas 10

Reviewed by:

Authorized by:

R. T. Krueger Laboratory Manager p 7.57.5.678.88

NORTHERN LAKE SERVICE, INC. Analytical Laboratory and Environmental Services 400 North Lake Avenue - Crandon, WI 54520		WIS. LAB CERT. NO. 721026460			6460	
Tel:(715)478-2777 Fax:(715)478-3060	ANALYTIC	CAL REPORT		PAGE: 24	NLS PRO	JECT# 32180
Client: Foth & Van Dyke Asso Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307	ciates					
Project Description: Flambeau Mining Project Title: 96F022						
Sample ID: FMC-4-ILS-3 NLS#: 12642 Ref. Line 12 of COC 24606 Description: FMC-4-ILS-3 Collected: 02/04/97 Received: 02/05/97 Reported: 02/14						
Parameter	Result	Units	LOD	LOQ	Method	Analyzed Lab
 Acidity, tot. as CaCO3 Aluminum, dis. as Al by ICP Arsenic, dis. as As by ICP Cadmium, dis. as Cd by ICP Calcium, dis. as Ca by ICP Cobalt, dis. as Co by ICP Copper, dis. as Co by ICP Iron, dis. as Fe by ICP Magnesium, dis. as Mg by ICP Manganese, dis. as Mn by ICP pH, lab Potassium, dis. as K Selenium, dis. as Se by furnace Sodium, dis. as Na by ICP Sulfate, as SO4 (filtered) Thallium, dis. as Tl by furnace AAS Zinc, dis. as Zn by ICP	ND ND 18 430 250 740 ND 62 4200 6.1 < 2.8 > ND 0.84 580 ND 1500	mg/L mg/L ug/L mg/L ug/L ug/L mg/L ug/L s.u. mg/L ug/L mg/L ug/L ug/L ug/L	2.0 0.034 16 1.2 3.0 4.3 5.4 0.010 3.0 1.8 1.0 2.0 37 0.033 250 25 120	2.0 0.12 57 3.8 3.0 15 19 0.035 3.0 6.1 6.6 130 0.11 250 87 120	EPA 200.7 EPA 270.2 EPA 270.2 EPA 279.2	02/07/97 721026460 02/07/97 721026460 02/07/97 721026460 02/07/97 721026460 02/07/97 721026460 02/07/97 721026460 02/07/97 721026460

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

Authorized by:

Reviewed by:

R. T. Krueger Laboratory Manager

NORTHERN LAKE S Analytical Laboratory and 400 North Lake Avenue - (Tele(15)478, 3777, Ferm(7)	Environmental Services trandon, WI 54520				WIS. LAB	CERT. NO. 72102	26460
Tel:(715)478-2777 Fax:(715)478-3060		ANALYTIC	CAL REPORT		PAGE: 25 NLS PROJECT# 32180		
Client:	Foth & Van Dyke As; Attn: Russ Janeshel 2737 S. Ridge Road PO Box 19012 Green Bay, WI 5434	k d					
Project Descrip Project Title:	ion: Flambeau Mining 96F022						
	5-ILS-3 NLS#: 12 7 Description: FMC-15-ILS-3 Received: 02/05/97 Reported: 02		Units	LOD	FOD	Method	Analyzed Lab
Acidity, tot. as	CaCO3 Al by ICP As by ICP	ND ND ND < 2.1 >	mg/L mg/L ug/L ug/L	2.0 0.034 16 1.2	2.0 0.12 57 3.8 3.0		02/10/97 7210264 02/07/97 7210264 02/07/97 7210264 02/07/97 7210264 02/07/97 7210264

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

NORTHERN LAKE SERVIC Analytical Laboratory and Environm			WIS. LAB CERT. NO. 721026460			6460	
400 North Lake Avenue - Crandon, Tel:(715)478-2777 Fax:(715)478-306		ANALYTIC	AL REPORT		PAGE: 26	NLS PRO	JECT# 32180
A 2 F	oth & Van Dyke Asso ttn: Russ Janeshek 737 S. Ridge Road O Box 19012 reen Bay, WI 54307						
Sample ID: FMC-181LS- Ref. Line 2 of COC 24607 Des Collected; 02/04/97 Received	3 NLS#: 12643						
Parameter		Result	Units	LOD	<u>LOO</u>	Method	Analyzed Lab
Acidity, tot. as CaCO3 Aluminum, dis. as Al by Arsenic, dis. as As by Cadmium, dis. as Cd by Calcium, dis. as Cd by Cobalt, dis. as Co by I Copper, dis. as Co by I Copper, dis. as Co by I Iron, dis. as Fe by ICF Magnesium, dis. as Mg b Manganese, dis. as Mg b Potassium, dis. as K Selenium, dis. as K Selenium, dis. as Se by Sodium, dis. as Na by I Sulfate, as SO4 (filtere Thallium, dis. as Tl by Zinc, dis. as Zn by ICF	ICP ICP CP CP y ICP y ICP y ICP furnace CP d) furnace AAS	590 < 0.080 > ND 580 450 3200 460000 1.1 68 11000 4.9 < 2.9 > < 39 > 1.3 830 ND 80000	mg/L mg/L ug/L mg/L ug/L ug/L mg/L ug/L s.u. mg/L ug/L ug/L ug/L ug/L ug/L ug/L	2.0 0.034 16 1.2 3.0 4.3 540 0.010 3.0 1.8 1.0 2.0 37 0.033 250 25 120	2.0 0.12 57 3.8 3.0 15 1900 0.035 3.0 6.1 6.6 130 0.11 250 87 120	EPA 200.7 EPA 270.2 EPA 279.2	02/10/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/07/97 721026 02/05/97 721026 02/05/97 721026 02/08/97 721026 02/07/97 721026 02/06/97 721026 02/09/97 721026
Values in brackets repre Results greater than the LOD = Limit of Detection DWB = Dry Weight Basis	LOQ are considered to	of Quantitation	ND = Not Detect %DWB = (mg/kg DW	ed	region of "	Less-Certair	Quantitation".

a construction of the second second second

.

1

Shomas K Pulle 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 Tel:(715)478-2777 Fax:(715)478-3060				WIS. LAB C	ERT. NO. 72102	6460
Ten(/15)4/0-2/// Fax.(/15)4/0-5000	ANALYT	ICAL REPORT		PAGE: 27	NLS PRO	JECT# 32180
Client: Foth & Van Dyl Attn: Russ Jan 2737 S. Ridge PO Box 19012 Green Bay, WI	neshek 9 Road					
Project Description: Flambeau Min: Project Title: 96F022	ing					
Sample ID: FMC-180LS-3 NLS# Ref. Line 3 of COC 24607 Description: FMC-180LS Collected: 02/04/97 Received: 02/05/97 Repo						
Parameter	Result	Units	LOD	LOQ	Method	Analyzed Lab
Alkalinity, tot. as CaCO3 (filtered) Aluminum, dis. as Al by ICP Arsenic, dis. as As by ICP Cadmium, dis. as Cd by ICP Cobalt, dis. as Co by ICP Cobalt, dis. as Co by ICP Copper, dis. as Cu by ICP Iron, dis. as Fe by ICP Magnesium, dis. as Mg by ICP Manganese, dis. as Mn by ICP pH, lab Potassium, dis. as Se by furnace Sodium, dis. as Se by furnace Sodium, dis. as Na by ICP Sulfate, as SO4 (filtered) Thallium, dis. as Tl by furnace AAS Zinc, dis. as Zn by ICP	70 ND ND 82 450 1300 1700 ND 79 17000 6.7 7.5 ND 3.8 770 ND 12000	mg/L mg/L ug/L ug/L ug/L ug/L ug/L mg/L ug/L s.u. mg/L ug/L ug/L ug/L ug/L	1.5 0.034 16 1.2 3.0 4.3 5.4 0.010 3.0 1.8 1.0 2.0 37 0.033 250 25 120	5.3 0.12 57 3.8 3.0 15 19 0.035 3.0 6.1 6.6 130 0.11 250 87 120	EPA 200.7	02/05/97 7210264 02/10/97 7210264 02/08/97 7210264 02/07/97 7210264 02/06/97 7210264 02/06/97 7210264 02/09/97 7210264 02/07/97 7210264
Values in brackets represent results g Results greater than the LOQ are considered and the LOQ	lered to be in the regio	n of "Certain Quantit.	ation".	region of "L	ess-Certain	Quantitation".
	= Limit of Quantitation Not Applicable	ND = Not Detecter %DWB = (mg/kg DWB				
		Thomas K /	iibe	Authorized	by:	
		Reviewed by:		R. T. Kr Laboratory		

······

. :

ĺ	NORTHERN LAKE SERV Analytical Laboratory and Enviro 400 North Lake Avenue - Crande Tel:(715)478-2777 Fax:(715)478-	ANALYTIC	CAL REPORT		WIS. LAB C	ERT. NO. 72102	6460 JECT# 32180	
	Client:	Foth & Van Dyke Assoc Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307	iates					
	Project Description Project Title: 96F0 Sample ID: FMC-15-3 Ref. Line 4 of COC 24607 D Collected: 02/04/97 Receiv Parameter	22 		Units	LOD	LOQ	Method	Analyzed Lab
	Alkalinity, tot. as C Aluminum, dis. as Al Arsenic, dis. as As b Cadmium, dis. as Cd b Calcium, dis. as Cd b Cobalt, dis. as Co by Copper, dis. as Co by Copper, dis. as Co by Iron, dis. as Fe by I Magnesium, dis. as Mg Manganese, dis. as Mn pH, lab Potassium, dis. as K Selenium, dis. as Se Sodium, dis. as Na by Sulfate, as SO4 (filte Thallium, dis. as Tl Zinc, dis. as Zn by I	by ICP by ICP by ICP r ICP r ICP r ICP by ICP by ICP by ICP by furnace r ICP rred) by furnace AAS	29 ND ND < 1.4 > 460 92 570 0.11 21 1400 6.8 7.1 ND 0.91 630 ND 150	mg/L mg/L ug/L ug/L ug/L ug/L mg/L ug/L s.u. mg/L ug/L mg/L ug/L ug/L ug/L ug/L	1.5 0.034 16 1.2 3.0 4.3 5.4 0.010 3.0 1.8 1.0 2.0 37 0.033 250 25 120	5.3 0.12 57 3.8 3.0 15 19 0.035 3.0 6.1 6.6 130 0.11 250 87 120	EPA 310.1 EPA 200.7 EPA 270.2 EPA 279.2 EPA 200.7	02/06/97 721026460 02/07/97 721026460 02/07/97 721026460 02/07/97 721026460 02/07/97 721026460 02/07/97 721026460 02/07/97 721026460 02/07/97 721026460 02/07/97 721026460 02/07/97 721026460 02/05/97 721026460 02/08/97 721026460 02/06/97 721026460 02/06/97 721026460

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

Authorized by:

R. T. Krueger Laboratory Manager

Reviewed by:

16

Appendix H

Clarifier Underflow (CUF) Solids Anoxic Extraction Test Results

MLD2\96F022\CBAPP\43134.61

Memorandum

December 30, 1996

TO: Jerry Sevick, Foth & Van Dyke

CC: Jana Murphy, Flambeau Mining Company John Chapman, SRK Russ Janeshek

FR: John Thresher

RE: Flambeau Project

Attached is a copy of my final report on the lab results for the clarifier underflow anoxic extraction tests.

à.

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 referenced 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

<u>Natural pH Extraction</u>. 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.

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

1:1 equilibration of a 750.4 g subsample of CUF1

<u>pH 6.5 Extraction</u>. 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.

Cumulative 2 N H ₂ SO ₄ Added (mL)	pH (su)
0	9.43
3	7.15
4	6.81
5	6.73
6	6.48
7	6.49

Titration of a 1:1, 102.2 g subsample of CUF1

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.

Time (hr)	pH (su)	Conductivity (µS/cm)	т (°С)	Eh (mv)
1	6.57	3,460	21.1	-
2	6.62	3,270	20.4	
24	7.06	3,380	20.1	

1:1 acidified equilibration of a 751.5 g subsample of CUF1

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

<u>Natural pH Extraction</u>. 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.

Time (hr)	pH (su)	Conductivity (µS/cm)	т (°С)	Eh (mv)
24	8.89	956	20.7	
48	7.98	943	20.8	-22.7

1:1 equilibration of a 753.2 g subsample of CUF2

<u>pH 6.5 Extraction</u>. 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.

Cumulative 2 N H₂SO₄ Added (mL)	pH (su)
0	9.53
3	6.85
4	6.80
6	6.39

Titration of a 1:1, 104.1 g subsample of CUF2

Based upon the above data, it was concluded that approximately 6 mL of 2 N $H_2SO_4/100$ g (6 mL \times 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.

;

Section of the

Constraint of

A Transformed

6 P. C.

CD-1

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.

Time (hr)	pH (su)	Conductivity (µS/cm)	T (℃)	Eh (mv)
1	6,68	3,260	21.1	
2	6,66	3,330	20.4	
24	6,98	3,290	20.6	

1:1 acidified equilibration of a 759.7 g subsample of CUF2

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		RES	ULTS	
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
pН	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	. .	
SO4	mg/L	520	1200	970	530
CI	mg/L	6.0	6.5	4.3	6
AI	mg/L	0.0075	<0.34	<0.0034	<0.34
Cd	mg/L	0.00056	0.24	0.0012	0.22
Са	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	0.010	0,10	0.000	-0.10
Mg	mg/L	40	300	95	500
Mn	mg/L	0.026	51	0.051	46
Ni	mg/L	0.020		0,001	,0
K	mg/L	2.1	3.6	2.8	2.2
Se	mg/L			2,0	Ann y Any
TI	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
	ingr-	0.10	<u>.</u>	0.00	55

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

Data QA'd through 1/17/97

.

IORTHERN LAKE SERVIC nalytical Laboratory and Envirom 0 North Lake Avenue - Crandon, nl:(715)478-2777 Fax:(715)478-30	mental Services WI 54520	ANALYTICAL REF	ORT	WIS PAGE :	LAB CERT. NO	D.721026460 PROJECT# 3	1141
1	Foth & Van Dyke Associate Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Freen Bay, WI 54307	8					
roject Description: roject Title: 96F022 ample ID: FMC-CUF1-1 ef.Line 1 of COC 23348 Des	NLS#: 122001						
	1: 12/04/96 Reported: 12/26/96						
			·				
arameter		Result	Units	LOD	LOQ	Method	Date
arameter lkalinity, tot. as Ca luminum, dis. as Al k admium, dis. as Cd by	DV ICP	4.0 0.0075 0.56 Additional Comment.	mg/L mg/L ug/L s: QA/QC failure for	1.5 0.0034 0.12	5.3 0.012 0.38	EPA 310.1 EPA 200.7 EPA 200.7	<u>Date</u> 12/10/96 12/18/96 12/18/96
lkalinity, tot. as Ca luminum, dis. as Al b admium, dis. as Cd by	DY ICP / ICP	4.0 0.0075 0.56 Additional Comment. ug/L. QA/QC for CC	mg/L mg/L ug/L s: QA/QC failure for acceptable.	1.5 0.0034 0.12 CCV, 113% :	5.3 0.012 0.38 recovery @ !	EPA 310.1 EPA 200.7 EPA 200.7 500	12/10/96 12/18/96 12/18/96
lkalinity, tot. as Ca luminum, dis. as Al b admium, dis. as Cd by alcium, dis. as Ca by hloride, as Cl (filter	y ICP / ICP / ICP red)	4.0 0.0075 0.56 Additional Comment. ug/L. QA/QC for CC 100 6.0	mg/L mg/L ug/L s: QA/QC failure for 3 acceptable. mg/L mg/L	1.5 0.0034 0.12	5.3 0.012 0.38	EPA 310.1 EPA 200.7 EPA 200.7 500 EPA 200.7	12/10/96 12/18/96 12/18/96 12/18/96
Ikalinity, tot. as Ca luminum, dis. as Al b admium, dis. as Cd by alcium, dis. as Ca by nloride, as Cl (filter nromium, dis. as Cr b	y ICP / ICP red) y ICP	4.0 0.0075 0.56 Additional Comment. ug/L. QA/QC for CC: 100 6.0 0.51	mg/L mg/L ug/L s: QA/QC failure for acceptable. mg/L ug/L	1.5 0.0034 0.12 CCV, 113% : 0.30 0.36 0.26	5.3 0.012 0.38 recovery @ 9 0.30 1.3 0.93	EPA 310.1 EPA 200.7 EPA 200.7 500 EPA 200.7 EPA 325.2 EPA 200.7	12/10/96 12/18/96 12/18/96 12/18/96 12/18/96 12/10/96 12/18/96
kalinity, tot. as Ca uminum, dis. as Al b udmium, dis. as Cd by alcium, dis. as Ca by alcride, as Cl (filter nomium, dis. as Cr b boalt, dis. as Co by	y ICP / ICP red) by ICP ICP	4.0 0.0075 0.56 Additional Comment. ug/L. QA/QC for CC 100 6.0 0.51 8.8	mg/L mg/L ug/L s: QA/QC failure for acceptable. mg/L mg/L ug/L ug/L	1.5 0.0034 0.12 CCV, 113% : 0.30 0.36 0.26 0.43	5.3 0.012 0.38 recovery @ ! 0.30 1.3 0.93 1.5	EPA 310.1 EPA 200.7 EPA 200.7 500 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7	12/10/96 12/18/96 12/18/96 12/18/96 12/18/96 12/10/96 12/18/96 12/18/96
Lkalinity, tot. as Ca Luminum, dis. as Al b admium, dis. as Cd by alcium, dis. as Ca by noride, as Cl (filter promium, dis. as Cr by obalt, dis. as Co by opper, dis. as Cu by	y ICP / ICP red) by ICP ICP	4.0 0.0075 0.56 Additional Comment. ug/L. QA/QC for CC 100 6.0 0.51 8.8 82	mg/L mg/L ug/L s: QA/QC failure for acceptable. mg/L mg/L ug/L ug/L ug/L	1.5 0.0034 0.12 CCV, 113% : 0.30 0.36 0.26 0.43 0.54	5.3 0.012 0.38 recovery @ ! 0.30 1.3 0.93 1.5 1.9	EPA 310.1 EPA 200.7 EPA 200.7 500 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7	12/10/96 12/18/96 12/18/96 12/18/96 12/10/96 12/18/96 12/18/96 12/18/96
Ikalinity, tot. as Ca luminum, dis. as Al b admium, dis. as Cd by alcium, dis. as Ca by aloride, as Cl (filter aromium, dis. as Cr b obalt, dis. as Co by opper, dis. as Cu by ron, Ferrous	y ICP / ICP red) py ICP ICP ICP ICP	4.0 0.0075 0.56 Additional Comment. ug/L. QA/QC for CC 100 6.0 0.51 8.8	mg/L mg/L ug/L s: QA/QC failure for acceptable. mg/L ug/L ug/L ug/L ug/L ug/L	1.5 0.0034 0.12 CCV, 113% : 0.30 0.36 0.26 0.43	5.3 0.012 0.38 recovery @ ! 0.30 1.3 0.93 1.5	EPA 310.1 EPA 200.7 EPA 200.7 500 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 SM	12/10/96 12/18/96 12/18/96 12/18/96 12/10/96 12/18/96 12/18/96 12/18/96 12/18/96
Lkalinity, tot. as Ca Luminum, dis. as Al h admium, dis. as Cd by alcium, dis. as Ca by nloride, as Cl (filter nromium, dis. as Cr h boalt, dis. as Co by opper, dis. as Cu by con, Ferrous	y ICP / ICP red) by ICP ICP ICP	4.0 0.0075 0.56 Additional Comment. ug/L. QA/QC for CC: 100 6.0 0.51 8.8 82 ND 0.015	mg/L mg/L ug/L s: QA/QC failure for acceptable. mg/L ug/L ug/L ug/L ug/L mg/L mg/L	1.5 0.0034 0.12 CCV, 113% : 0.30 0.36 0.26 0.43 0.54 0.0091 0.0010	5.3 0.012 0.38 recovery @ ! 0.30 1.3 0.93 1.5 1.9 0.030 0.0035	EPA 310.1 EPA 200.7 EPA 200.7 500 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7	12/10/96 12/18/96 12/18/96 12/18/96 12/10/96 12/18/96 12/18/96 12/18/96
kalinity, tot. as Ca uminum, dis. as Al b udmium, dis. as Cd by alcium, dis. as Ca by aloride, as Cl (filter bromium, dis. as Cr b boalt, dis. as Co by opper, dis. as Cu by con, Ferrous con, dis. as Fe by IC gnesium, dis. as Mq	y ICP / ICP red) by ICP ICP ICP ICP ICP	4.0 0.0075 0.56 Additional Comment. ug/L. QA/QC for CC 100 6.0 0.51 8.8 82 ND 0.015 40	mg/L mg/L ug/L s: QA/QC failure for acceptable. mg/L mg/L ug/L ug/L ug/L mg/L mg/L mg/L	1.5 0.0034 0.12 CCV, 113% : 0.30 0.36 0.26 0.43 0.54 0.0091 0.0010 0.30	5.3 0.012 0.38 recovery @ ! 0.30 1.3 0.93 1.5 1.9 0.030 0.0035 0.30	EPA 310.1 EPA 200.7 EPA 200.7 500 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 SM 3500Fe-D/HA EPA 200.7 EPA 200.7	12/10/96 12/18/96 12/18/96 12/18/96 12/10/96 12/18/96 12/18/96 12/18/96 12/18/96 12/18/96 12/18/96 12/18/96
kalinity, tot. as Ca uminum, dis. as Al b admium, dis. as Cd by alcium, dis. as Ca by alcium, dis. as Ca by formium, dis. as C by opper, dis. as Co by con, Ferrous con, dis. as Fe by IC agnesium, dis. as Mg anganese, dis. as Mn	y ICP / ICP red) by ICP ICP ICP ICP ICP	4.0 0.0075 0.56 Additional Comment. ug/L. QA/QC for CC 100 6.0 0.51 8.8 82 ND 0.015 40 26	mg/L mg/L ug/L s: QA/QC failure for acceptable. mg/L mg/L ug/L ug/L ug/L mg/L mg/L mg/L ug/L	1.5 0.0034 0.12 CCV, 113% : 0.30 0.36 0.26 0.43 0.54 0.0091 0.0010 0.30 0.18	5.3 0.012 0.38 recovery @ ! 0.30 1.3 0.93 1.5 1.9 0.030 0.0035	EPA 310.1 EPA 200.7 EPA 200.7 500 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 SM 3500Fe-D/HA EPA 200.7 EPA 200.7 EPA 200.7	12/10/96 12/18/96 12/18/96 12/18/96 12/10/96 12/18/96 12/18/96 12/18/96 12/18/96 12/18/96 12/18/96 12/18/96
Lkalinity, tot. as Ca Luminum, dis. as Al b admium, dis. as Cd by alcium, dis. as Cd by alcride, as Cl (filter promium, dis. as Cr by obalt, dis. as Co by poper, dis. as Co by con, Ferrous con, ferrous con, dis. as Fe by IC agnesium, dis. as Mg anganese, dis. as Mn 4, lab	y ICP / ICP red) by ICP ICP ICP ICP ICP	4.0 0.0075 0.56 Additional Comment. ug/L. QA/QC for CC: 100 6.0 0.51 8.8 82 ND 0.015 40 26 6.9	mg/L mg/L ug/L s: QA/QC failure for acceptable. mg/L ug/L ug/L ug/L ug/L mg/L mg/L ug/L s.u.	1.5 0.0034 0.12 CCV, 113% : 0.30 0.36 0.26 0.43 0.54 0.0091 0.0010 0.30 0.30 0.18 1.0	5.3 0.012 0.38 recovery @ 9 1.3 0.93 1.5 1.9 0.030 0.0035 0.30 0.61	EPA 310.1 EPA 200.7 EPA 200.7 500 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 SM 3500Fe-D/HA EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1	12/10/96 12/18/96 12/18/96 12/18/96 12/10/96 12/18/96 12/18/96 12/18/96 12/18/96 12/18/96 12/18/96 12/18/96 12/18/96
Lkalinity, tot. as Ca Luminum, dis. as Al b admium, dis. as Cd by alcium, dis. as Cd by alcride, as Cl (filter iromium, dis. as Cr b obalt, dis. as Co by opper, dis. as Co by con, Ferrous con, Ferrous con, dis. as Fe by IC agnesium, dis. as Mg anganese, dis. as Mn 4, lab otassium, dis. as K	y ICP / ICP red) by ICP ICP ICP ICP by ICP by ICP	4.0 0.0075 0.56 Additional Comment. ug/L. QA/QC for CC 100 6.0 0.51 8.8 82 ND 0.015 40 26	mg/L mg/L ug/L s: QA/QC failure for acceptable. mg/L ug/L ug/L ug/L ug/L mg/L mg/L mg/L ug/L s.u. mg/L	1.5 0.0034 0.12 CCV, 113% : 0.30 0.36 0.26 0.43 0.54 0.0091 0.0010 0.30 0.18 1.0 2.0	5.3 0.012 0.38 recovery @ 9 0.30 1.3 0.93 1.5 1.9 0.030 0.0035 0.30 0.61 6.6	EPA 310.1 EPA 200.7 EPA 200.7 500 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 SM 3500Fe-D/HA EPA 200.7 EPA 200.7 EPA 200.7	12/10/96 12/18/96 12/18/96 12/18/96 12/10/96 12/18/96 12/18/96 12/18/96 12/18/96 12/18/96 12/18/96 12/18/96 12/18/96 12/18/96 12/18/96
Lkalinity, tot. as Ca Luminum, dis. as Al b admium, dis. as Cd by alcium, dis. as Cd by alcride, as Cl (filter fromium, dis. as Cr b obalt, dis. as Co by opper, dis. as Co by opper, dis. as Cu by fron, Ferrous con, ferrous con, dis. as Fe by IC agnesium, dis. as Mg anganese, dis. as Mn 1, lab otassium, dis. as K	y ICP / ICP red) by ICP ICP ICP ICP by ICP by ICP	4.0 0.0075 0.56 Additional Comment. ug/L. QA/QC for CC 100 6.0 0.51 8.8 82 ND 0.015 40 26 6.9 2.1 5.6 Additional Comment.	<pre>mg/L mg/L ug/L s: QA/QC failure for acceptable. mg/L ug/L ug/L ug/L ug/L mg/L mg/L s.u. mg/L s.u. mg/L s: QA/QC failure for</pre>	1.5 0.0034 0.12 CCV, 113% : 0.30 0.36 0.26 0.43 0.54 0.0091 0.0010 0.30 0.18 1.0 2.0 0.0033	5.3 0.012 0.38 recovery @ ! 0.30 1.3 0.93 1.5 1.9 0.030 0.0035 0.30 0.61 6.6 0.011	EPA 310.1 EPA 200.7 EPA 200.7 500 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 SM 3500Fe-D/HA EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7	12/10/96 12/18/96 12/18/96 12/18/96 12/10/96 12/18/96 12/18/96 12/18/96 12/18/96 12/18/96 12/18/96 12/18/96 12/18/96 12/18/96 12/18/96 12/18/96
Ikalinity, tot. as Ca luminum, dis. as Al h admium, dis. as Cd by alcium, dis. as Cd by nloride, as Cl (filter nromium, dis. as Co by popper, dis. as Co by ron, Ferrous ron, dis. as Fe by IC agnesium, dis. as Mg anganese, dis. as Mn 4, lab otassium, dis. as K bdium, dis. as Na by	y ICP , ICP red) y ICP ICP ICP ICP by ICP by ICP by ICP	4.0 0.0075 0.56 Additional Comment. ug/L. QA/QC for CC: 100 6.0 0.51 8.8 82 ND 0.015 40 0.015 40 26 6.9 2.1 5.6 Additional Comment. ug/L. QA/QC for CC: 40 40 40 40 40 40 40 40 40 40	<pre>mg/L mg/L ug/L s: QA/QC failure for acceptable. mg/L ug/L ug/L ug/L ug/L mg/L ug/L s.u. mg/L s.u. mg/L g/L s.u. mg/L as: QA/QC failure for acceptable.</pre>	1.5 0.0034 0.12 CCV, 113% : 0.30 0.36 0.26 0.43 0.54 0.0091 0.0010 0.30 0.0010 0.30 0.18 1.0 2.0 0.0033 CCV, 124% :	5.3 0.012 0.38 recovery @ 9 0.30 1.3 0.93 1.5 1.9 0.030 0.0035 0.30 0.61 6.6 0.011 recovery @ 9	EPA 310.1 EPA 200.7 EPA 200.7 500 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 SM 3500Fe-D/HA EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7 500	12/10/96 12/18/96 12/18/96 12/18/96 12/10/96 12/18/96 12/18/96 12/18/96 12/18/96 12/18/96 12/18/96 12/18/96 12/18/96 12/10/96 12/18/96
lkalinity, tot. as Ca luminum, dis. as Al b	y ICP , ICP red) by ICP ICP ICP by ICP by ICP ICP	4.0 0.0075 0.56 Additional Comment. ug/L. QA/QC for CC 100 6.0 0.51 8.8 82 ND 0.015 40 26 6.9 2.1 5.6 Additional Comment.	<pre>mg/L mg/L ug/L s: QA/QC failure for acceptable. mg/L ug/L ug/L ug/L ug/L mg/L mg/L s.u. mg/L s.u. mg/L s: QA/QC failure for</pre>	1.5 0.0034 0.12 CCV, 113% : 0.30 0.36 0.26 0.43 0.54 0.0091 0.0010 0.30 0.18 1.0 2.0 0.0033	5.3 0.012 0.38 recovery @ ! 0.30 1.3 0.93 1.5 1.9 0.030 0.0035 0.30 0.61 6.6 0.011	EPA 310.1 EPA 200.7 EPA 200.7 500 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 SM 3500Fe-D/HA EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7	12/10/96 12/18/96 12/18/96 12/18/96 12/10/96 12/18/96 12/18/96 12/18/96 12/18/96 12/18/96 12/18/96 12/18/96 12/18/96

LOD = Limit of Detection DWB = Dry Weight Basis

merico

LOQ = Limit of Quantitation NA = Not Applicable

Ŧ

Barrenauch

47.000.0142

Although contains

Atom & State

eres and

ara ana ana ang

A Company Sector

ND = Not Detected Date = Date Analysis Performed %DWB = (mg/kg DWB)/10000

Authorized by: R. T. Krueger Laboratory Manager

	NORTHERN LAKE SERV	ronmental Services			WIS.	LAB CERT, N), 721026460	•
	400 North Lake Avenue - Crand Tel:(715)478-2777 Fax:(715)478		ANALYTICAL REP	ORT	PAGE:	2 NLS	PROJECT#	31141
	Client:	Foth & Van Dyke Associate Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307	5					
	Project Descriptio Project Title: 96F	n: Flambeau Mining 022						
	Sample ID: FMC-CUF Ref.Line 2 of COC 23348 Collected: 12/02/96 Rece	Description: FMC-CUF1-6.5						
	Parameter		Result	Units	LOD	LOQ	Method	Date
	Acidity, tot. as Ca Aluminum, dis. as A Cadmium, dis. as Cd	1 by ICP	110 ND 240 Additional Comments	mg/L mg/L ug/L : QA/QC failure for	2.0 0.34 12 CCV, 113% r	2.0 1.2 38 ecovery @	EPA 305.1 EPA 200.7 EPA 200.7 500	12/11/96 12/18/96 12/18/96
8	Calcium, dis. as Ca Chloride, as Cl (fil Chromium, dis. as C Cobalt, dis. as Co Copper, dis. as Cu Iron, Ferrous	tered) Yr by ICP by ICP	ug/L. QA/QC for CCE 620 6.5 ND 13000 1900 0.36	acceptable. mg/L mg/L ug/L ug/L ug/L ug/L mg/L	30 0.36 26 43 54 0.0091	30 1.3 93 150 190 0.030	EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 SM 3500Fe-D/1	12/10/96 12/18/96 12/18/96 12/18/96 12/18/96 12/10/96
	Iron, dis. as Fe by Magnesium, dis. as Manganese, dis. as pH, lab Potassium, dis. as Sodium, dis. as Na	Mg by ICP Mn by ICP K	ND 300 51000 6.5 3.6 7.1 Additional Comments	mg/L mg/L ug/L s.u. mg/L mg/L s: QA/QC failure for	0.10 30 18 1.0 2.0 0.33 CCV, 124% r	0.35 30 61 6.6 1.1 recovery @	EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7 500	12/18/96 12/18/96 12/06/96 12/10/96
	Sulfate, as SO4 (fil Thallium, dis. as 7 Zinc, dis. as Zn by	l by ICP	ug/L. QA/QC for CCI 1200 ND 54000	B acceptable. mg/L ug/L ug/L ug/L	250 280 1200	250 1000 1200	EPA 375.2 EPA 200.7 EPA 200.7	12/18/96

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

1

Thomas R Puile Reviewed by:

Authorized by: R. T. Krueger Laboratory Manager

. .

NORTHERN LAKE SE nalytical Laboratory and E 00 North Lake Avenue - Cra el:(715)478-2777 Fax:(715)	nvironmental Services andon, WI 54520	ANALYTICAL	REPORT	WIS Page		. NO. 721026460 LS PROJECT# 33	1141
Client:	Foth & Van Dyke Associa Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307	tes					
ample ID: FMC-CU	JF2-N NLS#: 122003 Description: FMC-CUF2-N						
Collected: 12/02/96 Re	ceived: 12/04/96 Reported: 12/26/96						
Collected: 12/02/96 Rf Parameter	ceived: 12/04/96 Reported: 12/26/96	Result	Units	LOD	LOQ	Method	Date
Parameter Alkalinity, tot. Aluminum, dis. as	as CaCO3 (filtered) Al by ICP	B6 ND 1.2 Additional Com	mg/L mg/L ug/L ments: QA/QC failu	1.5 0.0034 0.12	5.3 0.012 0.3B	EPA 310.1 EPA 200.7 EPA 200.7	12/10/96 12/18/96
Parameter Alkalinity, tot. Aluminum, dis. as Cadmium, dis. as Calcium, dis. as Chloride, as Cl (f Chromium, dis. as Cobalt, dis. as C Copper, dis. as C	as CaCO3 (filtered) Al by ICP Cd by ICP Ca by ICP iltered) Cr by ICP o by ICP	B6 ND 1.2 Additional Com	mg/L mg/L ug/L	1.5 0.0034 0.12	5.3 0.012 0.3B	EPA 310.1 EPA 200.7 EPA 200.7 © 500 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 SM	12/10/90 12/18/90 12/18/90 12/18/90 12/18/90 12/18/90 12/18/90 12/18/90 12/18/90
Parameter	as CaCO3 (filtered) Al by ICP Cd by ICP Ca by ICP iltered) Cr by ICP o by ICP u by ICP by ICP s Mg by ICP s Mg by ICP s Mn by ICP s K	B6 ND 1.2 Additional Com ug/L. QA/QC fo 150 4.3 ND 13 120 ND 0.0060 95 51 6.8 2.8 4.3 Additional Com	mg/L mg/L ug/L gr CCB acceptable. mg/L mg/L ug/L ug/L ug/L ug/L	1.5 0.0034 0.12 ure for CCV, 113% 0.30 0.36 0.26 0.43 0.54 0.0091 0.0010 0.30 0.18 1.0 2.0 0.0033	5.3 0.012 0.38 recovery 0.30 1.3 0.93 1.5 1.9 0.030 0.0035 0.30 0.61 6.6 0.011	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 SM 3500Fe-D/HF EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	12/10/96 12/18/96 12/18/96 12/18/96 12/10/96 12/18/96 12/18/96 12/18/96 12/18/96

LOD = Limit of Detection DWB = Dry Weight Basis

LOQ = Limit of Quantitation NA = Not Applicable

ND = Not Detected Da %DWB = (mg/kg DWB)/10000 Date = Date Analysis Performed

.

Thomas R Pille

Authorized by: R. T. Krueger Laboratory Manager

	NORTHERN LAKE SERVICE, INC. Analytical Laboratory and Environmental Services 400 North Lake Avenue - Crandon, WI 54520			WIS. I	LAB CERT. NO), 721026460	;
	Tel:(715)478-2777 Fax:(715)478-3060	ANALYTICAL REPO	DRT	PAGE:	4 NLS	PROJECT#	31141
	Client: Foth & Van Dyke Associate Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307	85					
	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						<u>an an pulawan sa an sa sa</u>
	Parameter	Result	Units	LOD	LOQ	Method	Date
	Alkalinity, tot. as CaCO3 (filtered) Aluminum, dis. as Al by ICP Cadmium, dis. as Cd by ICP	9.0 ND 220 Additional Comments	mg/L mg/L ug/L : QA/QC failure for (1.5 0.34 12 CCV, 113% re	5.3 1.2 38 ecovery @ 5	EPA 310.1 EPA 200.7 EPA 200.7 500	12/18/96
01	Calcium, dis. as Ca by ICP Chloride, as Cl (filtered) Chromium, dis. as Cr by ICP Cobalt, dis. as Co by ICP Copper, dis. as Cu by ICP Iron, Ferrous	ug/L. QA/QC for CCB 580 6.0 ND 8500 6800 0.14	mg/L ug/L ug/L ug/L ug/L ug/L	30 0.36 26 43 54 0.0091	30 1.3 93 150 190 0.030	EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 SM 3500Fe-D/3	12/10/96 12/18/96 12/18/96 12/18/96 12/18/96 12/10/96
0	Iron, dis. as Fe by ICP Magnesium, dis. as Mg by ICP Manganese, dis. as Mn by ICP pH, lab Potassium, dis. as K Sodium, dis. as Na by ICP	ND 500 46000 7.3 2.2 6.6 Additional Comments	mg/L mg/L ug/L s.u. mg/L mg/L : QA/QC failure for t	0.10 30 18 1.0 2.0 0.33 CCV, 124% r	0.35 30 61 6.6 1.1 ecovery @ !	EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7	12/18/96 12/18/96 12/18/96 12/06/96 12/10/96
	Sulfate, as SO4 (filtered) Thallium, dis. as Tl by ICP Zinc, dis. as Zn by ICP	ug/L. QA/QC for CCB 530 ND 58000	acceptable, mg/L ug/L ug/L	250 280 1200	250 1000 1200	EPA 375.2 EPA 200.7 EPA 200.7	12/18/96

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

Reviewed by:

Authorized by: R. T. Krueger Laboratory Manager

Appendix I

Backfill Leach Extraction Test Results

MLD2\96F022\GBAPP\43134.61

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				· <u>-</u>		7.0
pH	s.u.	7.4	7.4	7.4	7.3	7.3
Alkalinity	mgCaCO3eq/L	20	_21	17	16	13
Acidity	mgCaCO3eq/L	<u>.</u>		4000	4400	870
SO4	mg/L	810	590	1000	1100	
CI	mg/L	5.7	6.4	9.4	9.2	9.0
AI	mg/L	<0.34	<0.34	< 0.34	< 0.34	< 0.34
Cd	mg/L	0.028	0.051	0.023	0.014	0.026 560
Са	mg/L	450	550	460	560	<0.026
Cr	mg/L	0.039	<0.026	<0.026	0.029	<0.026 0.16
Co	mg/L	0.14	0.23	0.11	0.18 0.12	0.18
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	<0.10
Fe (T)	mg/L	<0.10	<0,10	0.22	<0.10	~0.10
Pb	mg/L		67	33	49	49
Mg	mg/L	39	67	1.2	3,2	3.2
Mn	mg/L	4.8	3.3	1.4	5,2	9.2
Ni	mg/L	10	13	10	12	12
К	mg/L	12	13	10		
Se	mg/L	<0.025	<0.025	<0.025	<0.025	<0.025
TI	mg/L	<0.025 3.8	<0.025 6.0	5.9	4.9	5.3
Na	mg/L	3.0 <1.2	<1.2	<1.2	<1.2	<1.2
Zn	mg/L	\$1,2	N 1.2	>1.2	N	

an last strateg

for some

12. Carlos 19. Carlos

 $p_{\rm e} = p_{\rm e} p_{\rm e} p_{\rm e}$

do- to any

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

10.000

general des

1.00

Data QA'd through 1/17/97

.

· · · · · -

, de la constant

ومعرجيهم

general and the

Second Sec.

ومعادرة بريادي

your and

a constant of

NORTHERN LAKE Si Analytical Laboratory and H 400 North Lake Avenue - Ci Tel:(715)478-2777 Fax:(715	Invironmental Services andon, WI 54520		,		WIS. LAB	CERT. NO. 72102	26460
	0000	ANALYTIC	AL REPORT		PAGE: 1	NLS PROJ	ECT# 31933
Client:	Foth & Van Dyke Asso Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 5430						
Sample ID: FMC-3 Ref. Line 1 of COC 24056	BF NLS#: 125577 Description: FMC-3 BF		•		.		,
Parameter	eceived: 01/21/97 Reported: 02/1		- • •				
		Result	Units	LOD	LOQ	Mathod	Analyzed Lab
ron, Ferrous	a by ICP ltered) Cr by ICP by ICP by ICP	17 ND < 23 > 460 9.4 ND < 110 > 220 0.24 Additional	mg/L mg/L ug/L mg/L ug/L ug/L ug/L mg/L Comments: F&VD modi		5.3 1.2 38 30 1.3 93 150 190 0.15	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7	01/24/97 7210264 02/13/97 7210264 02/13/97 7210264 02/13/97 7210264 01/22/97 7210264 02/13/97 7210264 02/13/97 7210264 02/13/97 7210264 02/13/97 7210264
ron, dis. as Fe b lagnesium, dis. as langanese, dis. as H, lab otassium, dis. as codium, dis. as Na culfate, as SO4 (fi hallium, dis. as inc, dis. as Zn b	Mg by ICP Mn by ICP K by ICP ltered) Tl by furnace AAS	<pre>< 0.22 > 33 1200 7.4 10 5.9 1000 ND ND ND</pre>	mg/L mg/L s.u. mg/L mg/L mg/L ug/L ug/L	0.10 30 18 1.0 2.0 0.33 250 25 1200	0.35 30 61 6.6 1.1 250 87 1200	EPA 200.7 EPA 150.1 EPA 200.7	02/13/97 7210264 02/13/97 7210264 02/13/97 7210264 01/21/97 7210264 01/24/97 7210264 02/13/97 7210264 01/30/97 7210264 01/27/97 7210264 02/13/97 7210264

LOD = Limit of Detection DWB = Dry Weight Basis

 \mathbf{N}

LOQ = Limit of Quantitation NA = Not Applicable

ND = Not Detected %DWB = (mg/kg DWB)/10000

un R. Cinger

Reviewed by:

Authorized by:

R. T. Krueger Laboratory Manager

NORTHERN LAKE SER Analytical Laboratory and Env 400 North Lake Avenue - Cran Tel:(715)478-2777 Fax:(715)47	don, WI 54520				WIS. LAB C	CERT. NO. 72102	6460
1e:(/15)4/0-2/// FWX:(/15)4/	0-2000	ANALYTIC	AL REPORT		PAGE: 2	NLS PROJI	ECT# 31933
Client:	Foth & Van Dyke Ass Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 5430						
Project Descriptic Project Title: 96F	on: Flambeau Mining Co 022						
Sample ID: FMC-1 E Ref. Line 2 of COC 24056	Description: EMC-1 BE						
Collected: 01/17/97 Rec	eived: 01/21/97 Reported: 02/		The data at	* • • •	100	W - 43 - 4	.
Collected: 01/17/97 Rec		14/97 <u>Reault</u>	Units	LOD	LOQ	Method	Analyzed Lab
Collected: 01/17/97 Rec Parameter Alkalinity, tot. as	eived: 01/21/97 Reported: 02/	Result 20	mg/L	1.5	5.3	EPA 310.1	01/24/97 72102
Collected: 01/17/97 Rec Parameter Alkalinity, tot. as	eived: 01/21/97 Reported: 02/	Result 20 ND	mg/L mg/L	1.5	5.3 1,2	EPA 310.1 EPA 200.7	01/24/97 72102 02/13/97 72102
Collected: 01/17/97 Rec Parameter Alkalinity, tot. as Aluminum, dis. as Al Cadmium, dis. as Cd	eived: 01/21/97 Reported: 02/ CaCO3 (filtered) L by ICP by ICP	Result 20 ND < 28 >	mg/L mg/L ug/L	1.5 0.34 12	5.3 1,2 38	EPA 310.1 EPA 200.7 EPA 200.7	01/24/97 72102 02/13/97 72102 02/13/97 72102
Collected: 01/17/97 Rec Parameter Alkalinity, tot. as Aluminum, dis. as Al Tadmium, dis. as Cd Calcium, dis. as Ca	eived: 01/21/97 Reported: 02/ CaCO3 (filtered) L by ICP by ICP by ICP	Result 20 ND < 28 > 450	mg/L mg/L ug/L mg/L	1.5 0.34 12 30	5.3 1.2 38 30	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7	01/24/97 72102 02/13/97 72102 02/13/97 72102
Collected: 01/17/97 Rec Parameter Alkalinity, tot. as Aluminum, dis. as Al Cadmium, dis. as Cd Calcium, dis. as Ca Chloride, as Cl (filt	elved: 01/21/97 Reported: 02/ CaCO3 (filtered) L by ICP by ICP by ICP :ered)	Result 20 ND < 28 > 450 5.7	mg/L mg/L ug/L mg/L mg/L	1.5 0.34 12 30 0.36	5.3 1,2 38 30 1.3	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2	01/24/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 01/22/97 72102
Collected: 01/17/97 Rec <u>Parameter</u> Alkalinity, tot. as Aluminum, dis. as Al Cadmium, dis. as Cd Calcium, dis. as Cl Chloride, as Cl (filt Chromium, dis. as Cl	elved: 01/21/97 Reported: 02/ CaCO3 (filtered) by ICP by ICP by ICP :ered) c by ICP	Result 20 ND < 28 > 450 5.7 < 39 >	mg/L mg/L ug/L mg/L mg/L ug/L	1.5 0.34 12 30 0.36 26	5.3 1.2 38 30 1.3 93	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7	01/24/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 01/22/97 72102 02/13/97 72102
Collected: 01/17/97 Rec <u>Parameter</u> Alkalinity, tot. as Aluminum, dis. as Al Cadmium, dis. as Cd Calcium, dis. as Ca Chloride, as Cl (filt Chromium, dis. as Co Cobalt, dis. as Co	eived: 01/21/97 Reported: 02/ CaCO3 (filtered) by ICP by ICP by ICP cered) c by ICP ov ICP	Result 20 ND < 28 > 450 5.7 < 39 > < 140 >	mg/L mg/L ug/L mg/L ug/L ug/L ug/L	1.5 0.34 12 30 0.36 26 43	5.3 1.2 30 1.3 93 150	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 325.2 EPA 200.7	01/24/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 01/22/97 72102 02/13/97 72102 02/13/97 72102
Collected: 01/17/97 Rec Parameter Alkalinity, tot. as Aluminum, dis. as Al Cadmium, dis. as Cd Calcium, dis. as Cd Chloride, as Cl (filt Chromium, dis. as Co Lobalt, dis. as Cu H	eived: 01/21/97 Reported: 02/ CaCO3 (filtered) by ICP by ICP by ICP cered) c by ICP ov ICP	Remult 20 ND < 28 > 450 5,7 < 39 > < 140 > < 120 >	mg/L mg/L ug/L mg/L mg/L ug/L ug/L ug/L	1.5 0.34 12 30 0.36 26 43 54	5.3 1,2 38 30 1.3 93 150 190	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7	01/24/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 01/22/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102
Collected: 01/17/97 Rec Parameter Alkalinity, tot. as Aluminum, dis. as Al Cadmium, dis. as Cd Calcium, dis. as Cd Chloride, as Cl (filt Chromium, dis. as Co Lobalt, dis. as Cu Copper, dis. as Cu	eived: 01/21/97 Reported: 02/ CaCO3 (filtered) by ICP by ICP by ICP cered) c by ICP ov ICP	Result 20 ND < 28 > 450 5.7 < 39 > < 120 > 0.36	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L	1.5 0.34 12 30 0.36 26 43 54 0.046	5.3 1.2 30 1.3 93 150	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 325.2 EPA 200.7	01/24/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 01/22/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102
Collected: 01/17/97 Rec Parameter Alkalinity, tot. as Aluminum, dis. as Al Cadmium, dis. as Ca Calcium, dis. as Ca Chloride, as Cl (filt Chromium, dis. as Co Cobalt, dis. as Co h Copper, dis. as Cu h Fron, Ferrous	elved: 01/21/97 Reported: 02/ CaCO3 (filtered) by ICP by ICP by ICP cered) c by ICP cy ICP cy ICP cy ICP	Result 20 ND < 28 > 450 5,7 < 39 > < 140 > < 120 > 0,36 Additional	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L Comments: F&VD mod	1.5 0.34 12 30 0.36 26 43 54 0.046 dified method	5.3 1,2 38 30 1.3 93 150 190 0.15	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7	01/24/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 01/22/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 02/02/97 72102
Collected: 01/17/97 Rec Parameter Alkalinity, tot. as Aluminum, dis. as Al Cadmium, dis. as Cd Calcium, dis. as Cd Calcium, dis. as Cd Choride, as Cl (filt Chromium, dis. as Co Cobalt, dis. as Co Copper, dis. as Cu Fron, Ferrous Fron, dis. as Fe by	elved: 01/21/97 Reported: 02/ CaCO3 (filtered) by ICP by ICP by ICP cred) c by ICP cy ICP by ICP by ICP	Result 20 ND < 28 > 450 5.7 < 39 > < 140 > < 120 > 0.36 Additional ND	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L Comments: F&VD mod mg/L	1.5 0.34 12 30 0.36 26 43 54 0.046 lified method 0.10	5.3 1.2 38 30 1.3 93 150 190 0.15 0.35	EPA 310.1 EPA 200.7 EPA 200.7 EPA 325.2 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/24/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 01/22/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 02/02/97 72102 02/13/97 72102
Collected: 01/17/97 Rec Parameter Alkalinity, tot. as Aluminum, dis. as Al Cadmium, dis. as Cd Calcium, dis. as Cd Calcium, dis. as Cd Chloride, as Cl (filt Copper, dis. as Co H Copper, dis. as Co H Iron, Ferrous Iron, dis. as Fe by Aggnesium, dis. as N	eived: 01/21/97 Reported: 02/ CaCO3 (filtered) by ICP by ICP by ICP cered) c by ICP by ICP by ICP fCP ICP ICP	Result 20 ND < 28 > 450 5.7 < 39 > < 140 > < 120 > 0.36 Additional ND 39	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L mg/L Comments: F&VD mod mg/L	1.5 0.34 12 30 0.36 26 43 54 0.046 dified method 0,10 30	5.3 1,2 38 30 1.3 93 150 190 0.15 0.35 30	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/24/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 01/22/97 72102 02/13/97 72102 02/13/97 72102 02/02/97 72102 02/02/97 72102 02/13/97 72102 02/13/97 72102
Collected: 01/17/97 Rec Parameter Alkalinity, tot. as Aluminum, dis. as Al Cadmium, dis. as Ca Calcium, dis. as Ca Chloride, as Cl (filt Chromium, dis. as Co H Cobper, dis. as Co H Copper, dis. as Cu H Gron, Ferrous Gron, dis. as Fe by Magnesium, dis. as M Magnesium, dis. as M	eived: 01/21/97 Reported: 02/ CaCO3 (filtered) by ICP by ICP by ICP cered) c by ICP by ICP by ICP fCP ICP ICP	Result 20 ND < 28 > 450 5,7 < 39 > < 140 > < 120 > 0.36 Additional ND 39 4800	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L Comments: F&VD mod mg/L mg/L ug/L	1.5 0.34 12 30 0.36 26 43 54 0.046 lified method 0.10 30 18	5.3 1.2 38 30 1.3 93 150 190 0.15 0.35	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/24/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 02/02/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102
Collected: 01/17/97 Rec Parameter Alkalinity, tot. as Aluminum, dis. as Al Cadmium, dis. as Ca Calcium, dis. as Ca Chloride, as Cl (filt Chromium, dis. as Co Copper, dis. as Co Copper, dis. as Co Iron, Ferrous Iron, dis. as Fe by Maganesium, dis. as M Manganese, dis. as M SH, lab	elved: 01/21/97 Reported: 02/ CaCO3 (filtered) by ICP by ICP by ICP cred) c by ICP cred) c by ICP oy ICP ICP ICP Mg by ICP	Result 20 ND < 28 > 450 5,7 < 39 > < 140 > < 120 > 0,36 Additional ND 39 4800 7.4	mg/L mg/L ug/L mg/L ug/L ug/L ug/L mg/L Comments: F&VD mod mg/L mg/L ug/L ug/L s.u.	1.5 0.34 12 30 0.36 26 43 54 0.046 dified method 0.10 30 18 1.0	5.3 1,2 38 30 1.3 93 150 190 0.15 0.35 30 61	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/24/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 01/22/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 02/02/97 72102 02/02/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102
Collected: 01/17/97 Rec Parameter Alkalinity, tot. as Aluminum, dis. as Al Cadmium, dis. as Cd Calcium, dis. as Cd Chloride, as Cl (filt Chromium, dis. as Co H Cobalt, dis. as Co H Copper, dis. as Co H Iron, Ferrous Iron, dis. as Fe by Magnesium, dis. as M Manganese, dis. as M Potassium, dis. as H	eived: 01/21/97 Reported: 02/ CaCO3 (filtered) by ICP by ICP by ICP cered) c by ICP oy ICP oy ICP oy ICP for by ICP for by ICP	Result 20 ND < 28 > 450 5,7 < 39 > < 140 > < 120 > 0.36 Additional ND 39 4800	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L mg/L mg/L ug/L s.u. mg/L	1.5 0.34 12 30 0.36 26 43 54 0.046 dified method 0.10 30 18 1.0 2.0	5.3 1,2 38 30 1.3 93 150 190 0.15 0.35 30 61 6.6	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/24/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 02/02/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 01/21/97 72102 01/30/97 72102
Collected: 01/17/97 Rec Parameter Alkalinity, tot. as Aluminum, dis. as Al Cadmium, dis. as Cd Calcium, dis. as Cd Chloride, as Cl (filt Chromium, dis. as Co H Cobalt, dis. as Co H Cobalt, dis. as Co H Iron, Ferrous Iron, dis. as Fe by Magnesium, dis. as M Manganese, dis. as M Ph, lab Potassium, dis. as Na H	elved: 01/21/97 Reported: 02/ CaCO3 (filtered) by ICP by ICP by ICP cred) c by ICP cy ICP by ICP for ICP for ICP for ICP for ICP	Result 20 ND < 28 > 450 5.7 < 39 > < 140 > < 120 > 0.36 Additional ND 39 4800 7.4 12	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L mg/L ug/L ug/L ug/L s.u. mg/L g/L	1.5 0.34 12 30 0.36 26 43 54 0.046 dified method 0.10 30 18 1.0 2.0 0.33	5.3 1,2 38 30 1.3 93 150 190 0.15 0.35 30 61 6.6 1.1	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7	01/24/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 02/02/97 72102 02/13/97 72102 02/13/97 72102 01/21/97 72102 01/30/97 72102 02/13/97 72102
	eived: 01/21/97 Reported: 02/ CaCO3 (filtered) by ICP by ICP by ICP cered) r by ICP by ICP oy ICP ICP 4g by ICP fm by ICP fm by ICP coy ICP cered)	Result 20 ND < 28 > 450 5.7 < 39 > < 140 > < 120 > 0.36 Additional ND 39 4800 7.4 12 3.8	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L mg/L mg/L ug/L s.u. mg/L	1.5 0.34 12 30 0.36 26 43 54 0.046 dified method 0.10 30 18 1.0 2.0	5.3 1,2 38 30 1.3 93 150 190 0.15 0.35 30 61 6.6	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/24/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 02/02/97 72102 02/02/97 72102 02/13/97 72102 02/13/97 72102 01/21/97 72102 01/30/97 72102 01/30/97 72102

1

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

teren R.Cum

Authorized by:

Reviewed by:

R. T. Krueger Laboratory Manager

NORTHERN LAKE Si Analytical Laboratory and I 400 North Lake Avenue - Ci Tel:(715)478-2777 Fax:(715	Environmental Services randon, WI 54520	ANALYTICA	- REPORT		WIS. LAB	CERT. NO. 72102 NLS PROJ	6460 ECT# 31933
Client:	Foth & Van Dyke Asso Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307	ciates					
Project Title: 9 Sample ID: FMC-5 Ref. Line 3 of COC 24056 Collected: 01/17/97 R		4/97 Regult	Units	1.0D		Method	Analyzed Lab
Parameter		Rebuic	UNICE	LOD	LOQ	Method	
Alkalinity, tot. a Aluminum, dis. as Cadmium, dis. as C Calcium, dis. as C Chloride, as Cl (fi Chromium, dis. as Cobalt, dis. as Cc Copper, dis. as Cu Iron, Ferrous	Al by ICP Cd by ICP Ca by ICP (ltered) Cr by ICP b by ICP	13 ND < 26 > 560 9.0 ND 160 < 120 > 0.20 Additional Co		1.5 0.34 12 0.36 26 43 54 0.046 lified method	5.3 1.2 38 30 1.3 93 150 190 0.15	EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7	01/22/97 72102646 02/13/97 72102646 02/13/97 72102646 02/13/97 72102646 02/13/97 72102646 02/02/97 72102646
Iron, dis. as Fe h Magnesium, dis. as Manganese, dis. as PH, lab Potassium, dis. as Sodium, dis. as Na Sulfate, as SO4 (f: Thallium, dis. as Zinc, dis. as Zn h	a Mg by ICP a Mn by ICP a by ICP iltered) Tl by furnace AAS	ND 49 3200 7.3 12 5.3 870 ND ND	mg/L mg/L g/L s.u. mg/L mg/L mg/L ug/L ug/L	0.10 30 18 1.0 2.0 0.33 250 25 1200	0.35 30 61 6.6 1.1 250 87 1200	EPA 200.7 EPA 200.7	02/13/97 72102646 02/13/97 72102646 01/21/97 72102646 01/30/97 72102646 02/13/97 72102646 01/30/97 72102646 01/30/97 72102646 02/09/97 72102646

I.

LOD = Limit of Detection DWB = Dry Weight Basis

LOQ = Limit of Quantitation NA = Not Applicable

ND = Not Detected %DWB = (mg/kg DWB)/10000

them R. Cum

Authorized by:

R. T. Krueger Laboratory Manager

.

Reviewed by:

4

NORTHERN LAKE SI Analytical Laboratory and I 400 North Lake Avenue - Ca	Invironmental Services				WIS. LAB C	CERT. NO. 72102	5460
Tel:(715)478-2777 Fax:(715		ANALYTIC	AL REPORT		PAGE: 4	NLS PROJI	ECT# 31933
Client:	Foth & Van Dyke Assoc Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307	iates					
Project Descript Project Title: 9	ion: Flambeau Mining Co. 6F022						
Sample ID: FMC-4							
Collected: 01/20/97 R	Description: FMC-4 BF eceived: 01/21/97 Reported: 02/14/	/97					
Collected: 01/20/97 R	eceived: 01/21/97 Reported: 02/14.	/97 <u>Result</u>	<u>Units</u>	LOD	roð	Method	Analyzed Lab
Collected: 01/20/97 R arameter Ikalinity, tot. a luminum, dis. as admium, dis. as (alcium, dis. as (hloride, as Cl (fi hromium, dis. as cobalt, dis. as Cc copper, dis. as Cc	eceived: 01/21/97 Reported: 02/14, as CaCO3 (filtered) Al by ICP Cd by ICP Ca by ICP Itered) Cr by ICP by ICP	Result 16 ND < 14 > 560 9.2 < 29 > 180 < 120 > 0.75	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L	LOD 1.5 0.34 12 30 0.36 26 43 54 0.046 lified method	LOQ 5.3 1.2 30 1.3 93 150 190 0.15	Method EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7	01/24/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 01/22/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102
Collected: 01/20/97 R Parameter	eceived: 01/21/97 Reported: 02/14 Al by ICP Ca by ICP Ca by ICP Cr by ICP Cr by ICP by ICP by ICP by ICP a Mn by ICP a Mn by ICP a K a by ICP	Result 16 ND < 14 > 560 9.2 < 29 > 180 < 120 >	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L	1.5 0.34 12 30 0.36 26 43 54 0.046	5.3 1.2 38 30 1.3 93 150 190	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 325.2 EPA 200.7 EPA 200.7	01/24/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 01/22/97 72102 02/13/97 72102 02/13/97 72102 02/13/97 72102 02/02/97 72102 02/13/97 72102 02/13/97 72102 01/21/97 72102 01/30/97 72102

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

NORTHERN LAKE Analytical Laboratory an 400 North Lake Avenue Tel:(715)478-2777 Fax:(d Environmental Services Crandon, WI 54520				WIS. LAB C	CERT. NO. 72102	6460
		ANALYTICA	L REPORT		PAGE: 5	NLS PROJ	BCT# 31933
Client:	Foth & Van Dyke Assoc: Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307	lates '					
Project Descri Project Title:	ption: Flambeau Mining Co. 96F022						
	-2 BF NLS#: 125581 056 Description: FMC-2 BF Received: 01/21/97 Reported: 02/14/5	37					
Parameter		Result	Units	LOD	LOQ	Method	Analyzed Lab
Alkalinity, tot. Aluminum, dis. as Cadmium, dis. as Calcium, dis. as Chloride, as Cl Chromium, dis. as Cobalt, dis. as Copper, dis. as Iron, Ferrous	(filtered) As Cr by ICP Co by ICP	21 ' ND 51 550 6.4 ND 230 < 140 > < 0.10 > Additional C	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L comments: F&VD mod	1.5 0.34 12 30 0.36 26 43 54 0.046 dified method	5.3 1.2 38 30 1.3 93 150 190 0.15	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7	02/13/97 72102646 02/13/97 72102646 02/13/97 72102646 01/22/97 72102646 02/13/97 72102646 02/13/97 72102646
Iron, dis. as Fe Magnesium, dis. Manganese, dis. pH, lab	as Mg by ICP	ND 67 3300 7.4 13 6.0	mg/L mg/L ug/L s.u. mg/L mg/L	0,10 30 18 1.0 2.0 0,33	0.35 30 61 6.6 1.1	EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 150.1 EPA 200.7	02/13/97 72102640 02/13/97 72102640 01/21/97 72102640

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. Cinji

Authorized by:

R. T. Krueger Laboratory Manager

۰.

Reviewed by:

Appendix J

Type I Leach Extraction Test Results

MLD2\96F022\GBAPP\43134 .61

Flambeau Mining Company									
Shakeflask Test Results									
PARAMETER	UNITS			1	RES	ULTS	· · · · · · · · · · · · · · · · · · ·		
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									
рН	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
SO4	mg/L	5.5	8.4	11	51	95	5.8	140	86
CI	mg/L	2.9	3	3.8	2.2	1.1	6.9	2.2	0.8
AI	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
Са	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
Со	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								
К	mg/L	<2	<2	<2	2.9	5.2	3.2	3.9	<2
Se	mg/L								
TI	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
				<u> </u>					<u> </u>

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

......

щ

and see a

presidents

a harring of the state of the s

9¹⁴ 4.54 (14.64)

performance and

بالمحتلية والمسترجة

part and a stag

27 a 18 1 a 22.

processing the

entration and a second state

Data QA'd through 1/17/97

ana totragi

1220.000000

Flambeau Mining Company Shakeflask Test Results									
PARAMETER	UNITS				RES	ULTS			
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								
SO4	mg/L	27	56	54	61	25	530	130	320
CI	mg/L	1.8	3	1.7	0.99	1.5	5.3	2.6	3
AI	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
Са	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								
К	mg/L	2.9	2,2	4,2	3.2	3.5	9.3	5.3	5.2
Se	mg/L	2.10			, , , , , ,	0.0			
TI	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
h=1 (,			~~					

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

Ν

Data QA'd through 1/17/97

Flambeau Mining Company Shakeflask Test Results		· · · · · · · · · · · · · · · · · · ·			
PARAMETER	UNITS		RES	ULTS	
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		· ·		
SO4	mg/L	78	20	69	<250
CI	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
Са	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
IMn	mg/L	0.14	0.3	0.0085	0.0079
Ni	mg/L				
к	mg/L	3.5	3.4	7.6	6.1
Se	mg/L				<u> </u>
	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
	ing/c	0.70	0.12		0.,0

ω

5. A. S.

N 1997 W.M.S.

A. 1945.

Harris

here the end of the

ere e correcte

Server starts

244.272

25.337.532%

 $(e^{i_1}e^{i_2}e^{i_1}e^{i_2}e^{i_1}e^{i_2}e^{i_1}e^{i_2}e^{i_1}e^{i_2}e^{i_1}e^{i_2}e^{i_1}e^{i_2}e^{i_1}e^{i_2}e^{i_1}e^{i_2}e^{i_1$

 $p_{1} \in \mathbb{R}^{n} \to \mathbb{R} \times \mathbb{R}$

 (a, \cdots, a, a)

малалар

, a minimizer and the

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

water creak

WIS. LAB CERT. NO. 721026460

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

ANALYTICAL REPORT

PAGE: 7 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
		Comments: F&VD mod	lified Method.	Interfere	nce may	
4	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	1.6	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 DWB = Dry Weight Basis LOQ = Limit of Quantitation NA = Not Applicable ND = Not Detected %DWB = (mg/kg DWB)/10000

homas Refield

Authorized by: R. T. Krueger Laboratory Manager

NORTHERN LAKE S Analytical Laboratory and I 400 North Lake Avenue - C	Environmental Services				WIS. LAB	CERT. NO. 72102	86460
Tel:(715)478-2777 Fax:(715		ANALYTIC	AL REPORT		PAGE: 2	NLS PROJ	ECT# 31693
Client:	Foth & Van Dyke Ass Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 5430						
Project Descript Project Title: 9	ion: Flambeau Mining 6F022						
Sample ID: FMC-5							
Ref. Line 2 of COC 24010 Collected: 01/02/97 F	6 Description: FMC-511 leceived: 01/03/97 Reported: 02/	03/97					
Collected: 01/02/97 F	B Description: FMC-511 Received: 01/03/97 Reported: 02/	03/97 <u>Result</u>	<u>Units</u>	LOD	LOQ	Method	Analyzed Lab
Collected: 01/02/97 F Parameter	leceived: 01/03/97 Reported: 02/	Result			<u>LOQ</u> 5,3	<u>Method</u> EPA 310.1	
Collected: 01/02/97 F Parameter	Received: 01/03/97 Reported: 02/		mg/L mg/L	1.5 0.034	5.3 0.12	EPA 310.1	01/08/97 721026
Collected: 01/02/97 F Parameter Alkalinity, tot. as Aluminum, dis. as Padmium, dis. as	Received: 01/03/97 Reported: 02/ as CaCO3 (filtered) Al by ICP Cd by ICP	Result < 2.0 > 0.15 ND	mg/L mg/L ug/L	1.5 0.034 1.2	5.3 0.12 3.8	EPA 310.1 EPA 200.7 EPA 200.7	01/08/97 721026 01/31/97 721026 01/31/97 721026 01/31/97 721026
Collected: 01/02/97 F Parameter Alkalinity, tot. as Aluminum, dis. as Padmium, dis. as (Received: 01/03/97 Reported: 02/ as CaCO3 (filtered) Al by ICP Cd by ICP	Result < 2.0 > 0.15 ND 3.2	mg/L mg/L ug/L mg/L	1.5 0.034 1.2 3.0	5.3 0.12 3.8 3.0	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7	01/08/97 721026 01/31/97 721026 01/31/97 721026 01/31/97 721026 01/31/97 721026
Collected: 01/02/97 F Parameter Alkalinity, tot. as Aluminum, dis. as Cadmium, dis. as (Calcium, dis. as (Chloride, as Cl (f)	Received: 01/03/97 Reported: 02/ As CaCO3 (filtered) Al by ICP Cd by ICP Ca by ICP La by ICP Litered)	Result < 2.0 > 0.15 ND 3.2 3.0	mg/L mg/L ug/L mg/L mg/L	1.5 0.034 1.2 3.0 0.36	5.3 0.12 3.8 3.0 1.3	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2	01/08/97 721026 01/31/97 721026 01/31/97 721026 01/31/97 721026 01/31/97 721026 01/16/97 721026
Collected: 01/02/97 F Parameter Alkalinity, tot. as Aluminum, dis. as Cadmium, dis. as (Calcium, dis. as (Chloride, as Cl (f: Chromium, dis. as	Received: 01/03/97 Reported: 02/ As CaCO3 (filtered) Al by ICP Cd by ICP Ca by ICP iltered) Cr by ICP	Result < 2.0 > 0.15 ND 3.2 3.0 ND	mg/L mg/L ug/L mg/L ug/L	1.5 0.034 1.2 3.0 0.36 2.6	5.3 0.12 3.8 3.0 1.3 9.3	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7	01/08/97 721026 01/31/97 721026 01/31/97 721026 01/31/97 721026 01/16/97 721026 01/31/97 721026
Collected: 01/02/97 F Parameter Alkalinity, tot. as Luminum, dis. as Cadmium, dis. as (Calcium, dis. as (Chloride, as Cl (f: Chromium, dis. as Cobalt. dis. as (Received: 01/03/97 Reported: 02/ as CaCO3 (filtered) Al by ICP Cd by ICP Ca by ICP Ca by ICP Cr by ICP Cr by ICP o by ICP	Result < 2.0 > 0.15 ND 3.2 3.0 ND ND ND	mg/L mg/L ug/L mg/L ug/L ug/L	1.5 0.034 1.2 3.0 0.36 2.6 4.3	5.3 0.12 3.8 3.0 1.3 9.3 15	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 325.2 EPA 200.7	01/08/97 721026 01/31/97 721026 01/31/97 721026 01/31/97 721026 01/31/97 721026 01/16/97 721026 01/31/97 721026
Collected: 01/02/97 F Parameter Alkalinity, tot. as Cadmium, dis. as (Calcium, dis. as (Chloride, as Cl (f: Chromium, dis. as C Cobalt, dis. as C	Received: 01/03/97 Reported: 02/ as CaCO3 (filtered) Al by ICP Cd by ICP Ca by ICP Ca by ICP Cr by ICP Cr by ICP o by ICP	Result < 2.0 > 0.15 ND 3.2 3.0 ND ND < 11 >	mg/L mg/L mg/L mg/L ug/L ug/L ug/L	1.5 0.034 1.2 3.0 0.36 2.6 4.3 5.4	5.3 0.12 3.8 3.0 1.3 9.3 15 19	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7	01/08/97 721026 01/31/97 721026 01/31/97 721026 01/31/97 721026 01/16/97 721026 01/16/97 721026 01/31/97 721026 01/31/97 721026
Collected: 01/02/97 F Parameter Alkalinity, tot. as Luminum, dis. as (Cadmium, dis. as (Calcium, dis. as (Chloride, as Cl (f: Chromium, dis. as Cl Copper, dis. as Cl Copper, dis. as Cl	Received: 01/03/97 Reported: 02/ as CaCO3 (filtered) Al by ICP Cd by ICP Ca by ICP Ca by ICP Cr by ICP Cr by ICP o by ICP	Result < 2.0 > 0.15 ND 3.2 3.0 ND ND ND 0.74	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L	1.5 0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091	5.3 0.12 3.8 3.0 1.3 9.3 15	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 325.2 EPA 200.7	01/08/97 721026 01/31/97 721026 01/31/97 721026 01/31/97 721026 01/16/97 721026 01/16/97 721026 01/31/97 721026 01/31/97 721026
Collected: 01/02/97 F Parameter Alkalinity, tot. as luminum, dis. as (Calcium, dis. as (Calcium, dis. as (Chloride, as Cl (f Chromium, dis. as Cobalt, dis. as Cu Copper, dis. as Cu Fron, Ferrous	Received: 01/03/97 Reported: 02/ Al by ICP Cd by ICP Ca by ICP Ca by ICP Litered) Cr by ICP b by ICP b by ICP	Result < 2.0 > 0.15 ND 3.2 3.0 ND ND ND 0.74	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L mg/L Comments: F&VD mod	1.5 0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091	5.3 0.12 3.8 3.0 1.3 9.3 15 19	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 325.2 EPA 200.7	01/08/97 721026 01/31/97 721026 01/31/97 721026 01/31/97 721026 01/16/97 721026 01/31/97 721026 01/31/97 721026 01/31/97 721026 01/31/97 721026 01/20/97 721026
Collected: 01/02/97 F Parameter Alkalinity, tot. as Admium, dis. as (Calcium, dis. as (Calcium, dis. as (Chloride, as Cl (f: Chromium, dis. as Cl Copper, dis. as Co Copper, dis. as Co Forn, Ferrous Cron, dis. as Fellor	Received: 01/03/97 Reported: 02/ As CaCO3 (filtered) Al by ICP Cd by ICP Ca by ICP iltered) Cr by ICP o by ICP u by ICP	Result < 2.0 > 0.15 ND 3.2 3.0 ND ND < 11 > 0.74 Additional	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L mg/L Comments: F&VD mod	1.5 0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091 dified method 0.010 3.0	5.3 0.12 3.8 3.0 1.3 9.3 15 19 0.030 0.035 3.0	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/08/97 721026 01/31/97 721026 01/31/97 721026 01/31/97 721026 01/31/97 721026 01/31/97 721026 01/31/97 721026 01/31/97 721026 01/20/97 721026 01/31/97 721026 01/31/97 721026
Collected: 01/02/97 F Parameter Alkalinity, tot. as Aluminum, dis. as (Cadmium, dis. as (Calcium, dis. as (Chloride, as Cl (f: Chromium, dis. as Cl Cobalt, dis. as Cl Copper, dis. as Cl Fron, Ferrous Fron, dis. as Fe M Magnesium. dis. as	Received: 01/03/97 Reported: 02/ Al by ICP Cd by ICP Ca by ICP iltered) Cr by ICP b by ICP b by ICP b by ICP b by ICP cr by ICP	<pre>Result < 2.0 > 0.15 ND 3.2 3.0 ND ND < 11 > 0.74 Additional 0.13</pre>	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L mg/L Comments: F&VD mod mg/L	1.5 0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091 Hified method 0.010 3.0 1.8	5.3 0.12 3.8 3.0 1.3 9.3 15 19 0.030 0.035	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/08/97 721026 01/31/97 721026 01/31/97 721026 01/31/97 721026 01/16/97 721026 01/16/97 721026 01/31/97 721026 01/31/97 721026 01/31/97 721026 01/31/97 721026 01/31/97 721026 01/31/97 721026
Collected: 01/02/97 F Parameter Alkalinity, tot. as Aluminum, dis. as (Cadcium, dis. as (Calcium, dis. as (Chloride, as Cl (f: Chromium, dis. as (Copper, dis. as Co Iron, Ferrous Cron, dis. as Fe M Aggnesium, dis. as Anganese, dis. as	Received: 01/03/97 Reported: 02/ Al by ICP Cd by ICP Ca by ICP iltered) Cr by ICP b by ICP b by ICP b by ICP b by ICP cr by ICP	<pre>Result < 2.0 > 0.15 ND 3.2 3.0 ND ND < 11 > 0.74 Additional 0.13 ND 100 7.6</pre>	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L mg/L mg/L ug/L ug/L s.u.	1.5 0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091 Hified method 0.010 3.0 1.8 1.0	5.3 0.12 3.8 3.0 1.3 9.3 15 19 0.030 0.035 3.0 6.1	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/08/97 721026 01/31/97 721026 01/31/97 721026 01/31/97 721026 01/16/97 721026 01/31/97 721026 01/31/97 721026 01/31/97 721026 01/31/97 721026 01/31/97 721026 01/31/97 721026
Collected: 01/02/97 F Parameter Alkalinity, tot. as Cadmium, dis. as (Calcium, dis. as (Chloride, as Cl (f: Chromium, dis. as Cl Copper, dis. as Cl Iron, Ferrous Iron, Gis. as Fe M Magnesium, dis. as Magnese, dis. as OH, lab	Acceived: 01/03/97 Reported: 02/ Al by ICP Cd by ICP Ca by ICP Ca by ICP Litered) Cr by ICP b by ICP b by ICP b Mg by ICP s Mg by ICP s Mn by ICP	<pre>Result < 2.0 > 0.15 ND 3.2 3.0 ND ND < 11 > 0.74 Additional 0.13 ND 100 7.6 ND</pre>	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L mg/L mg/L ug/L s.u. mg/L	1.5 0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091 dified method 0.010 3.0 1.8 1.0 2.0	5.3 0.12 3.8 3.0 1.3 9.3 15 19 0.030 0.035 3.0 6.1 6.6	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/08/97 721026 01/31/97 721026 01/03/97 721026
Collected: 01/02/97 F Parameter Alkalinity, tot. as Cadmium, dis. as Cadmium, dis. as (Calcium, dis. as (Chloride, as Cl (f: Chromium, dis. as Cobalt, dis. as Cc Copper, dis. as Cc Iron, Ferrous Iron, dis. as Fe H Magnesium, dis. as Magnesium, dis. as Potassium, dis. as	Received: 01/03/97 Reported: 02/ As CaCO3 (filtered) Al by ICP Cd by ICP Ca by ICP iltered) Cr by ICP by ICP by ICP by ICP s Mg by ICP s Mg by ICP s K	Result < 2.0 > 0.15 ND 3.2 3.0 ND ND < 11 > 0.74 Additional 0.13 ND 100 7.6 ND 1.4	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L mg/L mg/L mg/L ug/L s.u. mg/L g/L	1.5 0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091 dified method 0.010 3.0 1.8 1.0 2.0 0.033	5.3 0.12 3.8 3.0 1.3 9.3 15 19 0.030 0.035 3.0 6.1 6.1	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/08/97 721026 01/31/97 721026 01/03/97 721026
Collected: 01/02/97 F Parameter Alkalinity, tot. as Cadmium, dis. as (Cadmium, dis. as (Calcium, dis. as (Chloride, as Cl (f: Chromium, dis. as Cc Copper, dis. as Cc Copper, dis. as Cc Iron, Ferrous Iron, dis. as Fe i Magnesium, dis. as Manganese, dis. as pH, lab Potassium, dis. as NE Sodium, dis. as NE	Aleceived: 01/03/97 Reported: 02/ Al by ICP Cd by ICP Ca by ICP Ca by ICP D J CP D J CP D J CP D J CP D J CP D J C	Result < 2.0 > 0.15 ND 3.2 3.0 ND < 11 > 0.74 Additional 0.13 ND 100 7.6 ND 1.4 8.4	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L mg/L ug/L s.u. mg/L s.u. mg/L mg/L mg/L mg/L	1.5 0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091 dified method 0.010 3.0 1.8 1.0 2.0 0.033 2.5	5.3 0.12 3.8 3.0 1.3 9.3 15 19 0.030 0.035 3.0 6.1 6.6 0.11 2.5	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7 EPA 375.2	01/08/97 721026 01/31/97 721026 01/03/97 721026 01/31/97 721026 01/31/97 721026
Parameter	Aleceived: 01/03/97 Reported: 02/ Al by ICP Cd by ICP Cd by ICP Ca by ICP iltered) Cr by ICP b by ICP b J CP by ICP s Mg by ICP s Mg by ICP s Mg by ICP s K a by ICP iltered) Tl by furnace AAS	<pre>Result < 2.0 > 0.15 ND 3.2 3.0 ND ND < 11 > 0.74 Additional 0.13 ND 100 7.6 ND 1.4</pre>	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L mg/L mg/L mg/L ug/L s.u. mg/L mg/L	1.5 0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091 dified method 0.010 3.0 1.8 1.0 2.0 0.033	5.3 0.12 3.8 3.0 1.3 9.3 15 19 0.030 0.035 3.0 6.1 6.1	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7 EPA 375.2	01/08/97 721026 01/31/97 721026 01/20/97 721026

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

Authorized by:

1.55 - 5 25.5

67927777777777

prine Palatte

000000000

1. Section and a star

R. T. Krueger Laboratory Manager

Reviewed by:

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

ANALYTICAL REPORT

WIS. LAB CERT, NO. 721026460

PAGE: 6 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-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	DIA 200.7	01/02/96 721026460
		Comments: F&VD mod	lified Method	Interfere	nce mav	01/02/00 /21020400
רכ	have biased	this result low.		ANGOLICIC.	ace may	
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	4.2	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	1.9	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 DWB = Dry Weight Basis

C

LOQ = Limit of Quantitation NA = Not Applicable ND = Not Detected %DWB = (mg/kg DWB)/10000

Authorized by: R. T. Krueger Laboratory Manager

Analytical Laboratory and En 400 North Lake Avenue - Cra Tel:(715)478-2777 Fax:(715)4	ndon, WI 54520	ANALYTI	CAL REPORT		PAGE: 2	NLS PROJ	ECT# 31577
Client:	Foth & Van Dyke Ass Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 5430						
Project Description Project Title: 960 Sample ID: FMC-7T: Ref. Line 2 of COC 23950					Unior		
Collected: 12/18/96 Rec Parameter	eived: 12/20/96 Reported: 01/	16/97 Result	Units	LOD	LOQ	Method	Analyzed Lab
Alkalinity, tot. as Aluminum, dis. as A Cadmium, dis. as Cd Calcium, dis. as Ca Chloride, as Cl (fil Chromium, dis. as C Cobalt, dis. as Co Copper, dis. as Cu Iron, Ferrous	l by ICP by ICP by ICP tered) r by ICP by ICP	ND < 0.10 > ND 12 2.2 < 3.1 > ND ND ND ND ND	mg/L mg/L ug/L mg/L mg/L ug/L ug/L ug/L mg/L	1.5 0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091	5.3 0.12 3.8 3.0 1.3 9.3 15 19 0.030	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7	12/31/96 7210264 01/13/97 7210264 01/13/97 7210264 01/13/97 7210264 01/02/97 7210264 01/13/97 7210264 01/13/97 7210264 01/13/97 7210264 01/13/97 7210264 12/30/96 7210264
Iron, dis. as Fe by Magnesium, dis. as I Manganese, dis. as I pH, lab Potassium, dis. as I Sodium, dis. as Na I Sulfate, as SO4 (fil Thallium, tot. as T	Mg by ICP Mn by ICP K cy ICP cered)		. Comments: F&VD mod this result low. mg/L ug/L s.u. mg/L mg/L mg/L ug/L ug/L	lified Method. 0.010 3.0 1.8 1.0 2.0 0.033 25 12	Interferen 0.035 3.0 6.1 6.6 0.11 25 44	EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7 EPA 200.7	01/13/97 7210264 01/13/97 7210264 01/13/97 7210264 12/26/96 7210264 12/27/96 7210264 01/13/97 7210264 01/07/97 7210264 01/09/97 7210264

6-12.8 S + 12.23

007567603

1734 A.Constant

0004000

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

والمردي والمؤدي

Sec. Sec. 1923

ND = Not Detected %DWB = (mg/kg DWB)/10000

.....

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
Tel:(715)478-2777 Fax:(715)478-3060

ANALYTICAL REPORT

WIS. LAB CERT, NO. 721026460

PAGE: 1 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-8TINLS#: 124037Ref. Line 1 of COC 23950Description: FMC-8TiCollected: 12/18/96Received: 12/20/96Reported: 01/16/97

Parameter	Result	Units	LOD	LOQ	Method	Analyzed Lab
Alkalinity, tot. as CaCO3 (filtered) Aluminum, dis. as Al by ICP Cadmium, dis. as Cd by ICP Calcium, dis. as Ca by ICP Chloride, as Cl (filtered) Chromium, dis. as Cr by ICP Cobalt, dis. as Co by ICP Copper, dis. as Cu by ICP Iron, Ferrous	ND 0.66 ND 22 < 1.1 > ND ND 24 0.076	mg/L mg/L ug/L mg/L mg/L ug/L ug/L ug/L ug/L	1.5 0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091	5.3 0.12 3.8 3.0 1.3 9.3 15 19 0.030	EPA 310.1 EPA 200.7 EPA 200.7 EPA 325.2 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7	12/31/96 721026460 01/13/97 721026460 01/13/97 721026460 01/13/97 721026460 01/02/97 721026460 01/13/97 721026460 01/13/97 721026460 01/13/97 721026460 01/13/97 721026460
Iron, dis. as Fe by ICP Magnesium, dis. as Mg by ICP Manganese, dis. as Mn by ICP pH, lab Potassium, dis. as K Sodium, dis. as Na by ICP Sulfate, as SO4 (filtered) Thallium, tot. as Tl by furnace AAS Zinc, dis. as Zn by ICP	Additional C	omments: F&VD modi his result low. mg/L mg/L ug/L s.u. mg/L mg/L mg/L ug/L ug/L ug/L		0.035 3.0 6.1 6.6 0.11 25 44 120	LCE may EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7 EPA 375.2 EPA 279.2 EPA 200.7	12/31/96 721026460 01/13/97 721026460 01/13/97 721026460 01/13/97 721026460 12/26/96 721026460 01/27/96 721026460 01/13/97 721026460 01/09/97 721026460 01/09/97 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".

1

LOD = Limit of Detection DWB = Dry Weight Basis

ω

LOQ = Limit of Quantitation NA = Not Applicable

.....

ND = Not Detected %DWB = (mg/kg DWB)/10000

Kulle Reviewed by:

Authorized by: R. T. Krueger Laboratory Manager

. . . .

NORTHERN LAKE SERVIO Analytical Laboratory and Environ 400 North Lake Avenue - Crandon	unental Services				WIS. LAB	CERT, NO. 72102	6460
Tel:(715)478-2777 Fax:(715)478-3	060	ANALYTIC	AL REPORT		PAGE: 1	NLS PROJ	ECT# 31693
	Foth & Van Dyke Ass Attn: Russ Janeshey 2737 S. Ridge Road PO Box 19012 Green Bay, WI 5430	t 1					
Project Description: Project Title: 96F02	Flambeau Mining 2						
		· · · · · · · · · · · · · · · · · · ·					
Ref. Line 1 of COC 24016 De	NLS#: 124648 escription: FMC-9TI ed: 01/03/97 Reported: 02	/03/97					
Ref. Line 1 of COC 24016 De Collected; 01/02/97 Receive	scription: FMC-9T1	/03/97 <u>Result</u>	<u>Units</u>	LOD	LOD	Method	Analyzed Lab
Ref.Line 1 of COC 24016 De Collected: 01/02/97 Receive <u>arameter</u> lkalinity, tot. as Ca	escription: FMC-9TI ad: 01/03/97 Reported: 02 CO3 (filtered)	Result	mg/L	1.5	5.3	EPA 310,1	01/08/97 721026
Ref.Line 1 of COC 24016 De Collected: 01/02/97 Receive <u>arameter</u> lkalinity, tot. as Ca luminum, dis. as Al b	escription: FMC-9TI ad: 01/03/97 Reported: 02 CO3 (filtered) by ICP	Result < 2.0 > < 0.095 >	mg/L mg/L	1.5 0.034	5.3 0.12	EPA 310.1 EPA 200.7	01/08/97 721026 01/21/97 721026
ef.Line 1 of COC 24016 De ollected: 01/02/97 Receive <u>arameter</u> Lkalinity, tot. as Ca Luminum, dis. as Al b admium, dis. as Cd by	escription: FMC-9Tl ad: 01/03/97 Reported: 02 CO3 (filtered) by ICP / ICP	<u>Result</u> < 2.0 > < 0.095 > ND	mg/L mg/L ug/L	1.5 0.034 1.2	5.3 0.12 3.8	EPA 310.1 EPA 200.7 EPA 200.7	01/08/97 721026 01/21/97 721026 01/21/97 721026
ef.Line 1 of COC 24016 De ollected: 01/02/97 Receive <u>arameter</u> Lkalinity, tot. as Ca Luminum, dis. as Al b admium, dis. as Ca by alcium. dis. as Ca by	escription: FMC-9T1 ad: 01/03/97 Reported: 02 CO3 (filtered) by ICP r ICP r ICP	Result < 2.0 > < 0.095 >	mg/L mg/L	1.5 0.034 1.2 3.0 0.36	5.3 0.12 3.8 3.0 1.3	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2	01/08/97 721026 01/21/97 721026 01/21/97 721026 01/21/97 721026 01/21/97 721026 01/16/97 721026
ef.Line 1 of COC 24016 De collected: 01/02/97 Receive <u>arameter</u> lkalinity, tot. as Ca luminum, dis. as Al b admium, dis. as Cd by alcium, dis. as Cd by alcium, dis. as Cd by nloride, as Cl (filter hromium, dis. as Cr b	escription: FMC-9T ad: 01/03/97 Reported: 02 CO3 (filtered) y ICP / ICP / ICP / ICP / ICP / JCP	Result < 2.0 > < 0.095 > ND ND 6.9 ND	mg/L mg/L mg/L mg/L mg/L ug/L	1.5 0.034 1.2 3.0 0.36 2.6	5.3 0.12 3.8 3.0 1.3 9.3	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 325.2	01/08/97 721026 01/21/97 721026 01/21/97 721026 01/21/97 721026 01/21/97 721026 01/16/97 721026
ef.Line 1 of COC 24016 De ollected: 01/02/97 Receive arameter lkalinity, tot. as Ca luminum, dis. as Al b admium, dis. as Cd by alcium, dis. as Ca by alcium, dis. as Ca by alcinide, as Cl (filter aromium, dis. as Co by	escription: FMC-9Tl ad: 01/03/97 Reported: 02 CO3 (filtered) by ICP / ICP / ICP / ICP ed) by ICP Ed) ICP	Result < 2.0 > < 0.095 > ND ND 6.9 ND ND ND	mg/L mg/L ug/L mg/L ug/L ug/L ug/L	1.5 0.034 1.2 3.0 0.36 2.6 4.3	5.3 0.12 3.8 3.0 1.3 9.3 15	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 325.2 EPA 200.7	01/08/97 721026 01/21/97 721026 01/21/97 721026 01/21/97 721026 01/21/97 721026 01/16/97 721026 01/21/97 721026
ef. Line 1 of COC 24016 De ollected: 01/02/97 Receive arameter .kalinity, tot. as Ca .uminum, dis. as Al b admium, dis. as Cd by alcium, dis. as Ca by aloride, as Cl (filter aromium, dis. as Cr by obper, dis. as Cu by	escription: FMC-9Tl ad: 01/03/97 Reported: 02 CO3 (filtered) by ICP / ICP / ICP / ICP ed) by ICP Ed) ICP	Result < 2.0 > < 0.095 > ND ND 6.9 ND ND 27	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L	1.5 0.034 1.2 3.0 0.36 2.6 4.3 5.4	5.3 0.12 3.0 3.0 1.3 9.3 15 19	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 325.2	01/08/97 721026 01/21/97 721026 01/21/97 721026 01/21/97 721026 01/21/97 721026 01/16/97 721026 01/21/97 721026 01/21/97 721026
ef.Line 1 of COC 24016 De collected: 01/02/97 Receive <u>arameter</u> lkalinity, tot. as Ca luminum, dis. as Al b admium, dis. as Cd by alcium, dis. as Ca by hloride, as Cl (filter hromium, dis. as Cr b obalt, dis. as Co by opper, dis. as Cu by	escription: FMC-9Tl ad: 01/03/97 Reported: 02 CO3 (filtered) by ICP / ICP / ICP / ICP ed) by ICP Ed) ICP	Result < 2.0 > < 0.095 > ND ND 6.9 ND ND 27 0.79	mg/L mg/L ug/L mg/L ug/L ug/L ug/L	1.5 0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091	5.3 0.12 3.8 3.0 1.3 9.3 15	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 325.2 EPA 200.7	01/08/97 721026 01/21/97 721026 01/21/97 721026 01/21/97 721026 01/21/97 721026 01/16/97 721026 01/21/97 721026
ef. Line 1 of COC 24016 De ollected: 01/02/97 Receive arameter Lkalinity, tot. as Ca Luminum, dis. as Al b admium, dis. as Cd by alcium, dis. as Ca by alcium, dis. as Ca by loride, as Cl (filter promium, dis. as Co by obalt, dis. as Co by con, Ferrous con, dis. as Fe by IC	escription: FMC-9Tl ad: 01/03/97 Reported: 02. (filtered) y ICP / ICP / ICP / ICP ed) by ICP ed) Dy ICP ICP ICP	Result < 2.0 > < 0.095 > ND ND 6.9 ND ND 27 0.79 Additional (ND)	mg/L mg/L ug/L mg/L mg/L ug/L ug/L ug/L ug/L commenta: F&VD mod	1.5 0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091 dified method 0.010	5.3 0.12 3.8 3.0 1.3 9.3 15 19 0.030 0.035	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7	01/08/97 721026 01/21/97 721026 01/21/97 721026 01/21/97 721026 01/21/97 721026 01/21/97 721026 01/21/97 721026 01/21/97 721026 01/20/97 721026 01/20/97 721026
ef. Line 1 of COC 24016 De ollected: 01/02/97 Receive arameter lkalinity, tot. as Ca luminum, dis. as Al b admium, dis. as Cd by alcium, dis. as Ca by nloride, as Cl (filter nromium, dis. as Cr b obalt, dis. as Co by opper, dis. as Cu by ron, Ferrous ron, dis. as Fe by IC agnesium, dis. as Mq	escription: FMC-9T1 ad: 01/03/97 Reported: 02 CO3 (filtered) ry ICP rICP red) y ICP ICP ICP ICP ICP ICP ICP	Result < 2.0 > < 0.095 > ND 6.9 ND 27 0.79 Additional (ND) ND	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L mg/L mg/L mg/L mg/L	1.5 0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091 dified method 0.010 3.0	5.3 0.12 3.8 3.0 1.3 9.3 15 19 0.030 0.035 3.0	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/08/97 721026 01/21/97 721026 01/21/97 721026 01/21/97 721026 01/21/97 721026 01/21/97 721026 01/21/97 721026 01/21/97 721026 01/20/97 721026 01/21/97 721026 01/21/97 721026
lef. Line 1 of COC 24016 De collected: 01/02/97 Receive arameter lkalinity, tot. as Ca luminum, dis. as Ca by admium, dis. as Ca by alcium, dis. as Ca by hloride, as Cl (filter hromium, dis. as Cr b obalt, dis. as Co by opper, dis. as Co by opper, dis. as Cu by ron, Ferrous ron, ferrous ron, dis. as Fe by IC agnesium, dis. as Mg anganese, dis. as Mn	escription: FMC-9T1 ad: 01/03/97 Reported: 02 CO3 (filtered) ry ICP rICP red) y ICP ICP ICP ICP ICP ICP ICP	Result < 2.0 > < 0.095 > ND ND 6.9 ND 27 0.79 Additional (ND) ND 70	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L mg/L mg/L mg/L ug/L	1.5 0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091 dified method 0.010 3.0 1.8	5.3 0.12 3.8 3.0 1.3 9.3 15 19 0.030 0.035	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/08/97 721026 01/21/97 721026
Ref. Line 1 of COC 24016 De Collected: 01/02/97 Receive arameter lkalinity, tot. as Ca luminum, dis. as Al b admium, dis. as Ca by alcium, dis. as Ca by hloride, as Cl (filter hromium, dis. as Cr b obalt, dis. as Co by opper, dis. as Co by opper, dis. as Co by ron, Ferrous ron, dis. as Fe by IC agnesium, dis. as Mg anganese, dis. as Mn H, lab	escription: FMC-9T1 ad: 01/03/97 Reported: 02 CO3 (filtered) ry ICP rICP red) y ICP ICP ICP ICP ICP ICP ICP	Result < 2.0 > < 0.095 > ND ND 6.9 ND 27 0.79 Additional (ND) ND 70 70 70 7.7	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L mg/L ug/L ug/L ug/L ug/L ug/L ug/L ug/L	1.5 0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091 dified method 0.010 3.0	5.3 0.12 3.8 3.0 1.3 9.3 15 19 0.030 0.035 3.0 6.1	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/08/97 721026 01/21/97 721026
Ref. Line 1 of COC 24016 De Collected: 01/02/97 Receive Parameter Alkalinity, tot. as Ca Aluminum, dis. as Ca by Cadmium, dis. as Ca by Calcium, dis. as Ca by Chloride, as Cl (filter Chromium, dis. as Cr b Cobalt, dis. as Co by Copper, dis. as Co by Copper, dis. as Cu by Iron, Ferrous Iron, dis. as Fe by IC Magnesium, dis. as Mg Manganese, dis. as Mn DH, lab	escription: FMC-9T ad: 01/03/97 Reported: 02 acCO3 (filtered) by ICP FICP FicP Fed) by ICP ICP ICP ICP ICP ICP ICP ICP ICP ICP	Result < 2.0 > < 0.095 > ND ND 6.9 ND 27 0.79 Additional (ND 70 7.7 < 3.2 > 3.2	mg/L mg/L ug/L ug/L ug/L ug/L ug/L ug/L mg/L comments: F&VD mod mg/L ug/L ug/L s.u. mg/L	1.5 0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091 dified method 0.010 3.0 1.8 1.0 2.0 0.033	5.3 0.12 3.8 3.0 1.3 9.3 15 19 0.030 0.035 3.0 6.1 6.1 6.6 0.11	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/08/97 721026 01/21/97 721026 01/21/97 721026 01/21/97 721026 01/21/97 721026 01/21/97 721026 01/21/97 721026 01/21/97 721026 01/20/97 721026 01/21/97 721026 01/21/97 721026 01/21/97 721026 01/21/97 721026 01/10/97 721026
Sample ID: FMC-9TI Ref. Line 1 of COC 24016 De Collected: 01/02/97 Receive Parameter Alkalinity, tot. as Ca Aluminum, dis. as Ca by Calcium, dis. as Ca by Calcium, dis. as Ca by Chloride, as Cl (filter Chromium, dis. as Cc by Copper, dis. as Co by Copper, dis. as Co by Iron, Ferrous Iron, dis. as Fe by IC Magnesium, dis. as Mg Manganese, dis. as Mg Manganese, dis. as Mg Potassium, dis. as K Sodium, dis. as Na by Sulfate, as SO4 (filter Thallium, dis. as Th	escription: FMC-9T1 ad: 01/03/97 Reported: 02 (CO3 (filtered) by ICP FICP Fed) by ICP ICP ICP ICP ICP by ICP ICP by ICP icP	Result < 2.0 > < 0.095 > ND ND 6.9 ND ND 27 0.79 Additional (ND ND 70 7.7 < 3.2 >	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L mg/L ug/L ug/L ug/L ug/L ug/L ug/L ug/L	1.5 0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091 dified method 0.010 3.0 1.8 1.0 2.0	5.3 0.12 3.8 3.0 1.3 9.3 15 19 0.030 0.035 3.0 6.1 6.6	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1	01/08/97 721026 01/21/97 721026

1 Same Sta

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

Q

LOQ = Limit of Quantitation NA = Not Applicable ND = Not Detected %DWB = (mg/kg DWB)/10000

Puilo Mornos K.

Reviewed by:

Authorized by:

ويتحدث والمرجو

1. ST 1. ST

R. T. Krueger Laboratory Manager

NORTHERN LAKE SE Analytical Laboratory and Er	vironmental Services				WIS. LAB	CERT. NO. 72102	6460
400 North Lake Avenue - Cra Tel:(715)478-2777 Fax:(715)4		ANALYTIC	CAL REPORT		PAGE: 4	NLS PROJ	ECT# 31577
Client:	Foth & Van Dyke As Attn: Russ Janeshe 2737 S. Ridge Roa PO Box 19012 Green Bay, WI 543	k d					
Sample ID: FMC-10 Ref. Line 4 of COC 23950	TI NLS#: 124040 Description: FMC-10TI						
Collected: 12/19/96 He Parameter	ceived: 12/20/96 Reported: 0	<u>Result</u>	Units	LOD	LOO	Method	Analyzed Lab
Alkalinity, tot. as Aluminum, dis. as C Cadmium, dis. as C Calcium, dis. as C Chloride, as Cl (fil Chromium, dis. as C Cobalt, dis. as Co Copper, dis. as Cu Iron, Ferrous	l by ICP by ICP by ICP tered) r by ICP by ICP	<pre>< 3.0 > ND ND 35 2.2 ND ND ND ND ND Additional</pre>	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L comments: F&VD mod	1.5 0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091 dified Method.	5.3 0.12 3.8 3.0 1.3 9.3 15 19 0.030 Interferer	EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7	12/31/96 7210264 01/13/97 7210264 01/13/97 7210264 01/13/97 7210264 01/02/97 7210264 01/13/97 7210264 01/13/97 7210264 01/13/97 7210264 12/30/96 7210264
Iron, dis. as Fe by Magnesium, dis. as Manganese, dis. as pH, lab Potassium, dis. as Sodium, dis. as Na Sulfate, as SO4 (fil Thallium, tot. as 7 Zinc, dis. as Zn by	Mg by ICP Mn by ICP K by ICP tered) 1 by furnace AAS	have biased 0.13 16 150 7.2 < 3.9 > 2.9 140 < 30 > 850	this result low. mg/L mg/L ug/L s.u. mg/L mg/L ug/L ug/L ug/L	0.010 3.0 1.8 1.0 2.0 0.033 25 12 12	0,035 3.0 6.1 6.6 0.11 25 44 120	EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7 EPA 375.2 EPA 279.2	01/13/97 7210264 01/13/97 7210264 01/13/97 7210264 12/26/96 7210264 12/27/96 7210264 01/13/97 7210264 01/07/97 7210264 01/09/97 7210264 01/13/97 7210264

.

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

the subscription of the second s

NORTHERN LAKE S Analytical Laboratory and 400 North Lake Avenue - C	Environmental Services				WIS. LAB	CERT, NO. 72102	6460
'el:(715)478-2777 Fax:(71		ANALYTIC	AL REPORT		PAGE: 5	NLS PROJ	ECT# 31577
Client:	Foth & Van Dyke Asso Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307	ociates					
Project Descript Project Title: 9	tion: Flambeau Mining 96F022						
	LITI NLS#: 124041 0 Description: FMC-11TI Received: 12/20/96 Reported: 01/1	6/97					
Parameter		Result	Units	LOD	LOQ	Method	Analyzed Lab
cidity, tot. as luminum, dis. as admium, dis. as alcium, dis. as hloride, as Cl (f hromium, dis. as obalt, dis. as C opper, dis. as C	Cd by ICP Ca by ICP iltered) Cr by ICP	100 < 0.063 > ND 29 < 0.80 > < 2.8 > ND ND 0.075	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L	2.0 0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091	2.0 0.12 3.8 3.0 1.3 9.3 15 19 0.030	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	12/27/96 7210264 01/13/97 7210264 01/13/97 7210264 01/13/97 7210264 01/02/97 7210264 01/02/97 7210264 01/13/97 7210264 01/13/97 7210264
cidity, tot. as luminum, dis. as admium, dis. as alcium, dis. as hloride, as Cl (f hromium, dis. as obalt, dis. as C opper, dis. as C	Al by ICP Cd by ICP Ca by ICP iltered) Cr by ICP o by ICP	100 < 0.063 > ND 29 < 0.80 > < 2.8 > ND ND 0.075 Additional	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L Comments: F&VD mod	2.0 0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091	2.0 0.12 3.8 3.0 1.3 9.3 15 19	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	Analyzed Lab 12/27/96 72102646 01/13/97 72102646 01/13/97 72102646 01/02/97 72102646 01/02/97 72102646 01/13/97 72102646 01/13/97 72102646 01/13/97 72102646 12/31/96 72102646
Acidity, tot. as aluminum, dis. as admium, dis. as Calcium, dis. as Chloride, as Cl (f Chromium, dis. as Cobalt, dis. as C Copper, dis. as C Cron, Ferrous Cron, dis. as Fe lagnesium, dis. a	Al by ICP Cd by ICP Ca by ICP iltered) Cr by ICP o by ICP u by ICP by ICP s Mg by ICP s Mn by ICP	100 < 0.063 > ND 29 < 0.80 > < 2.8 > ND ND 0.075 Additional	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L	2.0 0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091	2.0 0.12 3.8 3.0 1.3 9.3 15 19 0.030	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	12/27/96 7210264 01/13/97 7210264 01/13/97 7210264 01/13/97 7210264 01/02/97 7210264 01/02/97 7210264 01/13/97 7210264 01/13/97 7210264

10-21-2-2-

1.000

Acres 1444

pear the sta

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

Н

personal de la c

ers, tea ar

LOQ = Limit of Quantitation NA = Not Applicable ND = Not Detected %DWB = (mg/kg DWB)/10000

noma Chomas Reviewed by:

Authorized by: R. T. Krueger Laboratory Manager

.

.

те и и водите и от траниции	NORTHERN LAKE SERVICE, INC. Analytical Laboratory and Environmental Services 400 North Lake Avenue - Crandon, WI 54520 Tel:(715)478-2777 Fax:(715)478-3060 Client: Foth & Van Dyke As Attn: Russ Janeshe 2737 S. Ridge Roa PO Box 19012 Green Bay, WI 543 Project Description: Flambeau Mining Project Title: 96F022	sociates k d	CAL REPORT		WIS. LAB PAGE: 4	CERT. NO. 72102	26460 ECT# 31606
	Sample ID: FMC-12 TI NLS#: 12424 Ref. Line 4 of COC 23951 Description: FMC-12 TI Collected: 12/19/96 Received: 12/24/96 Reported: 01						
	Parameter	Result	Units	LOD	LOQ	Method	Analyzed Lab
<u>ct</u>	Alkalinity, tot. as CaCO3 (filtered) Aluminum, dis. as Al by ICP Cadmium, dis. as Cd by ICP Calcium, dis. as Ca by ICP Chloride, as Cl (filtered) Chromium, dis. as Cr by ICP Cobalt, dis. as Co by ICP Copper, dis. as Cu by ICP Iron, Ferrous		mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L mg/L Comments: F&VD modif this result low.	1.5 0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091 Fied Method.	5.3 0.12 3.8 3.0 1.3 9.3 15 19 0.030 Interferer	EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	12/31/96 721026460 01/21/97 721026460 01/21/97 721026460 01/21/97 721026460 01/02/97 721026460 01/21/97 721026460 01/21/97 721026460 01/21/97 721026460 12/31/96 721026460
	Iron, dis. as Fe by ICP Magnesium, dis. as Mg by ICP Manganese, dis. as Mn by ICP pH, lab Potassium, dis. as K Sodium, dis. as Na by ICP Sulfate, as SO4 (filtered) Thallium, dis. as Tl by furnace AAS Zinc, dis. as Zn by ICP	ND 4.3 10 7.2 < 2.9 > 4.0 27 ND ND	mg/L mg/L ug/L s.u. mg/L mg/L mg/L ug/L ug/L	0.010 3.0 1.8 1.0 2.0 0.033 25 12 120	0.035 3.0 6.1 6.6 0.11 25 44 120	EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 375.2 EPA 279.2 EPA 200.7	01/21/97 721026460 01/21/97 721026460 01/21/97 721026460 12/26/96 721026460 12/27/96 721026460 01/21/97 721026460 01/07/97 721026460 01/09/97 721026460 01/21/97 721026460

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

Analytical Laboratory and E 400 North Lake Avenue - Cra Tel:(715)478-2777 Fax:(715)	andon, WI 54520					CERT. NO. 72102	
Client:	Foth & Van Dyke Assoc Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307		CAL REPORT		PAGE: 1	NLS PROJ.	ECT# 31664
Sample ID: FMC-13 Ref. Line 1 of COC 22543	3 TI NLS#: 124531 Description: FMC-13 TI	10-10-m-					
Collected: 12/24/96 Re Parameter	aceived: 12/31/96 Reported: 01/23/	97 <u>Result</u>	<u>Units</u>	LOD	<u>roð</u>	Method	Analyzed Lab
Alkalinity, tot. a Aluminum, dis. as . Cadmium, dis. as C Calcium, dis. as C Chloride, as Cl (fi	Al by ICP d by ICP a by ICP ltered) Cr by ICP	10 0.18 ND 12 3.0 ND ND < 11 >	mg/L mg/L ug/L mg/L ug/L ug/L ug/L	1.5 0.034 1.2 3.0 0.36 2.6 4.3 5.4	5.3 0.12 3.8 3.0 1.3 9.3 15 19	EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7	01/07/97 7210264 01/21/97 7210264 01/21/97 7210264 01/21/97 7210264 01/08/97 7210264 01/21/97 7210264 01/21/97 7210264 01/21/97 7210264 01/02/97 7210264
Chromium, dis. as Cobalt, dis. as Co Copper, dis. as Cu	by ICP		mer/L	0.0091	0.030		
Chromium, dis. as Cobalt, dis. as Co Copper, dis. as Cu Iron, Ferrous	by ICP by ICP	0.16 Additional	mg/L Comments: F&VD mod		0.030 Interferen	ice may	
Chromium, dis. as Cobalt, dis. as Co Copper, dis. as Cu	bỳ ICP Y ICP Ma by ICP	0.16 Additional	mer/L			- EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 721026 01/21/97 721026 01/21/97 721026 12/31/96 721026 01/10/97 721026

activity of the

and the second second

Acres Collins

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

Authorized by: R. T. Krueger Laboratory Manager

. . .

NORTHERN LAKE SERVICE, INC. Analytical Laboratory and Environmental Services 400 North Lake Avenue - Crandon, WI 54520				WIS. LAB	CERT. NO. 72102	6460
Tel:(715)478-2777 Fax:(715)478-3060	ANALYTI	CAL REPORT		PAGE: 1	NLS PROJ	ECT# 31606
Client: Foth & Van Dyke Associa Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307	ltes					
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						r in Part- des
Parameter	Result	Units	LOD	LOQ	Method	Analyzed Lab
Alkalinity, tot. as CaCO3 (filtered) Aluminum, dis. as Al by ICP Cadmium, dis. as Cd by ICP Calcium, dis. as Ca by ICP Chloride, as Cl (filtered) Chromium, dis. as Cr by ICP Cobalt, dis. as Co by ICP Copper, dis. as Cu by ICP Iron, Ferrous	ND < 0.063 > ND 20 1.7 < 3.5 > < 6.0 > ND 0.090 Additional	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L Comments: F&VD mod:	1.5 0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091 ified Method	5.3 0.12 3.8 3.0 1.3 9.3 15 19 0.030 Interfere	EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7	12/31/96 721026460 01/21/97 721026460 01/21/97 721026460 01/21/97 721026460 01/02/97 721026460 01/21/97 721026460 01/21/97 721026460 01/21/97 721026460 12/31/96 721026460
	have biased	l this result low.			-	
Iron, dis. as Fe by ICP Magnesium, dis. as Mg by ICP Manganese, dis. as Mn by ICP pH, lab Potassium, dis. as K Sodium, dis. as Na by ICP Sulfate, as SO4 (filtered)	< 0.020 > 6.6 120 6.9 < 4.2 > 1.6 54	mg/L mg/L ug/L s.u. mg/L mg/L mg/L	0.010 3.0 1.8 1.0 2.0 0.033 25	0.035 3.0 6.1 6.6 0.11 25	EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7	01/21/97 721026460 01/21/97 721026460 01/21/97 721026460 12/26/96 721026460 12/27/96 721026460 01/21/97 721026460 01/07/97 721026460
Thallium, dis. as Tl by furnace AAS Zinc, dis. as Zn by ICP	ND 160	ug/L ug/L	12 120	44 120	EPA 279.2 EPA 200.7	01/09/97 721026460

LOD = Limit of Detection DWB = Dry Weight Basis

14

LOQ = Limit of Quantitation NA = Not Applicable ND = Not Detected %DWB = (mg/kg DWB)/10000

Reviewed by:

Authorized by: R. T. Krueger Laboratory Manager

NORTHERN LAKE S Analytical Laboratory and 400 North Lake Avenue - C Tel:(715)478-2777 Fax:(71	Environmental Services Crandon, WI 54520		AL REPORT		WIS. LAB	CERT. NO. 72102	6460 ECT# 31606
Client:	Foth & Van Dyke Ass Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 5430	ociates			PAGE: 2	NLS PROU	EC1# 31606
Sample ID: FMC- Ref. Line 2 of COC 2395		23/97					
Parameter		Result	Units	LOD	<u>roō</u>	Method	Analyzed Lab
Alkalinity, tot. Aluminum, dis. as Cadmium, dis. as Calcium, dis. as Chloride, as Cl (f Chromium, dis. as Cobalt, dis. as C Copper, dis. as C Iron, Ferrous	Cd by ICP Ca by ICP Filtered) Cr by ICP So by ICP	< 2.0 > ND ND 33 < 0.99 > ND ND ND 0.12 Additional	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L Comments: F&VD mod	1.5 0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091 dified Method.	5.3 0.12 3.8 3.0 1.3 9.3 15 19 0.030 Interfere:	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 72102646 01/02/97 72102646 01/21/97 72102646 01/21/97 72102646 01/21/97 72102646
Iron, dís. as Fe Magnesium, dís. a Manganese, dís. a pH, lab Potassium, dís. as Sodium, dís. as N Sulfate, as SO4 (f Thallium, dís. as Zinc, dís. as Zn	s Mg by ICP s Mn by ICP s K la by ICP iltered) i Tl by furnace AAS	have biased ND 12 7.2 < 3.2 > 2.5 61 ND ND	this result low. mg/L mg/L s.u. mg/L mg/L mg/L ug/L ug/L ug/L	0.010 3.0 1.8 1.0 2.0 0.033 25 12 120	0.035 3.0 6.1 6.6 0.11 25 44 120	EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7 EPA 375.2 EPA 279.2 EPA 200.7	01/21/97 72102646 12/26/96 72102646 12/27/96 72102646 01/21/97 72102646 01/07/97 72102646

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

b Reviewed by:

Authorized by: R. T. Krueger Laboratory Manager Service and

NORTHERN LAKE SERVICE, Analytical Laboratory and Environmer 400 North Lake Avenue - Crandon, WI	tal Services				WIS. LAB	CERT. NO. 72102	6460
Tel:(715)478-2777 Fax:(715)478-3060	34320	ANALYTIC	AL REPORT		PAGE: 3	NLS PROJ	ECT# 31606
Att 273 PO	ch & Van Dyke Associa n: Russ Janeshek 7 S. Ridge Road Box 19012 een Bay, WI 54307	ltes					
Project Description: F] Project Title: 96F022	ambeau Mining.						
Sample ID: FMC-16 TI Ref. Line 3 of COC 23951 Descrip Collected: 12/20/96 Received: 1							
Parameter		Result	Units	LOD	LOQ	Method	Analyzed Lab
Alkalinity, tot. as CaCO3 Aluminum, dis. as Al by I Cadmium, dis. as Cd by IC Calcium, dis. as Ca by IC Chloride, as Cl (filtered) Chromium, dis. as Cr by I Cobalt, dis. as Co by ICP Copper, dis. as Cu by ICP Iron, Ferrous	CP P P		mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L comments: F&VD mod this result low.	1.5 0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091 ifled Method.	5.3 0.12 3.8 3.0 1.3 9.3 15 19 0.030 Interferen	EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 721026 01/21/97 721026 01/21/97 721026 01/02/97 721026 01/21/97 721026 01/21/97 721026
Iron, dis. as Fe by ICP Magnesium, dis. as Mg by Manganese, dis. as Mn by	ICP ICP	nave blased ND 4.8 6.7 7.2	mg/L mg/L ug/L s.u. mg/L	0.010 3.0 1.8 1.0 2.0	0.035 3.0 6.1 6.6	EPA 200.7 EPA 200.7 EPA 150.1	01/21/97 7210264 01/21/97 7210264 01/21/97 7210264 12/26/96 7210264 12/27/96 7210264

LOD = Limit of Detection DWB = Dry Weight Basis

16

LOQ = Limit of Quantitation NA = Not Applicable

للمصفح والمار المتحاج والمواجع والمراجع والمعرو

ND = Not Detected %DWB = (mg/kg DWB)/10000

Reviewed by:

رد سرره مرسرت اور د و

Authorized by: R. T. Krueger Laboratory Manager

and the second s

......

NORTHERN LAKE SE Analytical Laboratory and Er 400 North Lake Avenue - Cra	vironmental Services ndon, WI 54520				WIS. LAB	CERT. NO. 72102	6460
Tel:(715)478-2777 Fax:(715)4	78-3060	ANALYTI	CAL REPORT		PAGE: 3	NLS PROJ	ECT# 31577
Client:	Foth & Van Dyke Associ Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307	ates					
Project Descripti Project Title: 96	on: Flambeau Mining F022						
Sample ID: FMC-17 Ref. Line 3 of COC 23950 Collected: 12/18/96 Re	Description: FMC-17TI						
Parameter		Result	Units	LOD	LOQ	Method	Analyzed Lab
Alkalinity, tot. as Aluminum, dis. as A Cadmium, dis. as C Calcium, dis. as C Chloride, as Cl (fil Chromium, dis. as C Cobalt, dis. as Co Copper, dis. as Cu Iron, Ferrous	l by ICP by ICP by ICP tered) r by ICP by ICP	ND 0.16 ND 48 5.3 < 5.5 > ND < 7.8 > ND	mg/L mg/L, ug/L mg/L ug/L ug/L ug/L ug/L ug/L	1.5 0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091	5.3 0.12 3.8 3.0 1.3 9.3 15 19 0.030	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7	12/31/96 7210264 01/13/97 7210264 01/13/97 7210264 01/13/97 7210264 01/02/97 7210264 01/03/97 7210264 01/13/97 7210264 01/13/97 7210264 12/30/96 7210264
,,			. Comments: F&VD mod this result low.	dified Method.	Interferen	ce may	
Iron, dis. as Fe by Magnesium, dis. as	/ ICP Mg by ICP Mn by ICP	0.077 14 34 7.3	mg/L mg/L ug/L s.u.	0.010 3.0 1.8 1.0	0.035 3.0 6.1	EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1	01/13/97 7210264 01/13/97 7210264 01/13/97 7210264 12/26/96 7210264

LOD = Limit of Detection DWB = Dry Weight Basis

production of the

LOQ = Limit of Quantitation NA = Not Applicable

. .

e con e la conse

post of a

21.2 1 2 3

ND = Not Detected %DWB = (mg/kg DWB)/10000

Acres Cart

ويحاد بالمرجو

4,1 - 5 - 5 - 5 -

Reviewed by:

Authorized by: R. T. Krueger Laboratory Manager

.

.

NORTHERN LAKE SERVICE, INC. Analytical Laboratory and Environmental Ser 400 North Lake Avenue - Crandon, WI 5452 Tel:(715)478-2777 Fax:(715)478-3060	0				CERT. NO. 72102	
Attn: 2737 S PO Box	Van Dyke Associates Russ Janeshek . Ridge Road	CAL REPORT		PAGE: 2	NLS PROJ	ECT# 31664
Project Description: Flamb Project Title: 96F022 Sample ID: FMC-18 TI Ref. Line 2 of COC 22543 Description: Collected: 12/24/96 Received: 12/31/3	NLS#: 124532 FMC-18 TI					
Parameter	Result	Units	LOD	LOQ	Method	Analyzed Lab
Alkalinity, tot. as CaCO3 (fi Aluminum, dis. as Al by ICP Cadmium, dis. as Cd by ICP Calcium, dis. as Ca by ICP Chloride, as Cl (filtered) Chromium, dis. as Cr by ICP Cobalt, dis. as Co by ICP Copper, dis. as Cu by ICP Iron, Ferrous	< 0.065 > ND 50 2.6 ND < 5.7 > < 14 > 0.046 Additional	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L Comments: F&VD modi	1,5 0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091 fied Method.	5.3 0.12 3.8 3.0 1.3 9.3 15 19 0.030 Interferen	EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 721026460 01/21/97 721026460
Iron, dis. as Fe by ICP Magnesium, dis. as Mg by ICP Manganese, dis. as Mn by ICP pH, lab Potassium, dis. as K Sodium, dis. as Na by ICP Sulfate, as SO4 (filtered) Thallium, dis. as Tl by ICP Zinc, dis. as Zn by ICP	have biased 0.062 12 < 5.6 > 7.2 < 5.3 > 2.2 130 ND ND	this result low. mg/L mg/L s.u. mg/L mg/L mg/L mg/L ug/L ug/L	0.010 3.0 1.8 1.0 2.0 0.033 25 28 120	0.035 3.0 6.1 0.11 25 100 120	EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7	01/21/97 721026460 01/21/97 721026460 12/31/96 721026460 01/10/97 721026460 01/21/97 721026460 01/14/97 721026460 01/21/97 721026460

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

NORTHERN LAKE SERVICE, II Analytical Laboratory and Environmenta 400 North Lake Avenue - Crandon, WI 4 rel:(715)478-2777 Fax:(715)478-3060	al Services				WIS. LAB	CERT. NO. 72102	6460	
Tel:(/15)4/8-2/// Fax:(/15)4/8-3000		ANALYTIC	CAL REPORT		PAGE: 3	NLS PROJ	ECT# 3166	4
Attr 2737 PO E	n & Van Dyke Associ; 1: Russ Janeshek 7 S. Ridge Road 30x 19012 2n Bay, WI 54307	ates						
Project Description: Fla Project Title: 96F022	ambeau Mining						- 100 - 1 00	
Sample ID: FMC-19 TI Ref. Line 3 of COC 22543 Descripti Collected: 12/24/96 Received: 12/	NLS#: 124533 ion: FMC-19 Tl /31/96 Reported: 01/23/97	,						
arameter		Result	Units	LOD	LOQ	Method	Analyzed	Lab
						ED7 310 1	01/07/97	721026460
lkalinity, tot. as CaCO3	(filtered)	< 3.0 >	mg/L	1.5	5.3	EPA 310.1		
uminum, dis. as Al by IC	P	0.13	mg/L	0.034	0.12	EPA 200.7	01/21/97	721026460
uminum, dis. as Al by IC dmium, dis. as Cd by ICP	P	0.13 ND	mg/L ug/L	0.034 1.2	0.12 3.8	EPA 200.7 EPA 200.7	01/21/97 01/21/97	721026460
uminum, dis. as Al by IC dmium, dis. as Cd by ICP lcium, dis. as Ca by ICP	P	0.13 ND 82	mǵ∕L ug∕L mg∕L	0.034 1.2 3.0	0.12 3.8 3.0	EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 01/21/97 01/21/97	721026460 721026460 721026460
uminum, dis. as Al by IC dmium, dis. as Cd by ICP lcium, dis. as Ca by ICP loride, as Cl (filtered)	P	0.13 ND 82 3.0	mg/L ug/L mg/L mg/L	0.034 1.2 3.0 0.36	0.12 3.8 3.0 1.3	EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2	01/21/97 01/21/97 01/21/97 01/08/97	721026460 721026460 721026460 721026460
uminum, dis. as Al by IC dmium, dis. as Cd by ICP llcium, dis. as Ca by ICP lloride, as Cl (filtered) lromium, dis. as Cr by IC	P	0.13 ND 82 3.0 < 5.9 >	mg/L ug/L mg/L mg/L ug/L	0.034 1.2 3.0 0.36 2.6	0.12 3.8 3.0 1.3 9.3	EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7	01/21/97 01/21/97 01/21/97 01/08/97 01/21/97	721026460 721026460 721026460 721026460 721026460 721026460
uminum, dis. as Al by IC dmium, dis. as Cd by ICP lcium, dis. as Ca by ICP loride, as Cl (filtered) romium, dis. as Cr by IC balt, dis. as Co by ICP	P	0.13 ND 82 3.0 < 5.9 > < 12 >	mg/L ug/L mg/L mg/L ug/L ug/L	0.034 1.2 3.0 0.36 2.6 4.3	0.12 3.8 3.0 1.3 9.3 15	EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7	01/21/97 01/21/97 01/21/97 01/08/97 01/21/97 01/21/97	721026460 721026460 721026460 721026460 721026460 721026460 721026460
uminum, dis. as Al by IC dmium, dis. as Cd by ICP lcium, dis. as Ca by ICP loride, as Cl (filtered) romium, dis. as Cr by IC balt, dis. as Co by ICP pper, dis. as Cu by ICP	P	0.13 ND 82 3.0 < 5.9 > < 12 > 93	mg/L ug/L mg/L ug/L ug/L ug/L ug/L	0.034 1.2 3.0 0.36 2.6	0.12 3.8 3.0 1.3 9.3	EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7	01/21/97 01/21/97 01/21/97 01/08/97 01/21/97 01/21/97	721026460 721026460 721026460 721026460 721026460 721026460 721026460 721026460
uminum, dis. as Al by IC dmium, dis. as Cd by ICP lcium, dis. as Ca by ICP loride, as Cl (filtered) romium, dis. as Cr by IC balt, dis. as Co by ICP pper, dis. as Cu by ICP	P	0.13 ND 82 3.0 < 5.9 > < 12 > 93 0.064	mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L	0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091	0.12 3.8 3.0 1.3 9.3 15 19	EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 01/21/97 01/21/97 01/08/97 01/21/97 01/21/97 01/21/97	721026460 721026460 721026460 721026460 721026460 721026460 721026460 721026460
uminum, dis. as Al by IC dmium, dis. as Cd by ICP llcium, dis. as Ca by ICP lloride, as Cl (filtered) momium, dis. as Cr by IC bbalt, dis. as Co by ICP poper, dis. as Cu by ICP	P	0.13 ND 82 3.0 < 5.9 > < 12 > 93 0.064 Additional	mg/L ug/L mg/L ug/L ug/L ug/L ug/L	0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091	0.12 3.8 3.0 1.3 9.3 15 19 0.030 Interferer	EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 01/21/97 01/21/97 01/08/97 01/21/97 01/21/97 01/21/97 01/22/97	721026466 721026466 721026466 721026466 721026466 721026466 721026466 721026466
uminum, dis. as Al by IC dmium, dis. as Cd by ICP lcium, dis. as Ca by ICP loride, as Cl (filtered) romium, dis. as Cr by IC balt, dis. as Co by ICP pper, dis. as Cu by ICP on, Ferrous	P	0.13 ND 82 3.0 < 5.9 > < 12 > 93 0.064 Additional	mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L Comments: F&VD modifi this result low. mg/L	0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091 .ed Method. 0.010	0.12 3.8 3.0 1.3 9.3 15 19 0.030 Interferer 0.035	EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 01/21/97 01/21/97 01/08/97 01/21/97 01/21/97 01/21/97 01/02/97	72102646 72102646 72102646 72102646 72102646 72102646 72102646 72102646 72102646
uminum, dis. as Al by IC dmium, dis. as Cd by ICP lcium, dis. as Ca by ICP loride, as Cl (filtered) romium, dis. as Cr by IC balt, dis. as Co by ICP pper, dis. as Cu by ICP on, Ferrous on, dis. as Fe by ICP gnesium, dis. as Mg by I	P	0.13 ND 82 3.0 < 5.9 > < 12 > 93 0.064 Additional have biased	mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L Comments: F&VD modifi this result low. mg/L mg/L	0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091 .ed Method. 0.010 3.0	0.12 3.8 3.0 1.3 9.3 15 19 0.030 Interferer 0.035 3.0	EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 01/21/97 01/21/97 01/08/97 01/21/97 01/21/97 01/21/97 01/22/97 01/22/97	721026466 721026466 721026466 721026466 721026466 721026466 721026466 721026466 721026466 721026466
uminum, dis. as Al by IC dmium, dis. as Cd by ICP lcium, dis. as Ca by ICP loride, as Cl (filtered) romium, dis. as Cr by IC balt, dis. as Co by ICP pper, dis. as Cu by ICP on, Ferrous on, dis. as Fe by ICP gnesium, dis. as Mg by I	P	0.13 ND 82 3.0 < 5.9 > < 12 > 93 0.064 Additional have biased 0.14 23 340	mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L Comments: F&VD modifi this result low. mg/L	0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091 .ed Method. 0.010 3.0 1.8	0.12 3.8 3.0 1.3 9.3 15 19 0.030 Interferer 0.035	EPA 200.7 EPA 200.7	01/21/97 01/21/97 01/21/97 01/08/97 01/21/97 01/21/97 01/21/97 01/02/97 01/21/97 01/21/97 01/21/97	721026466 721026466 721026466 721026466 721026466 721026466 721026466 721026466 721026466 721026466
uminum, dis. as Al by IC dmium, dis. as Cd by ICP lcium, dis. as Ca by ICP loride, as Cl (filtered) romium, dis. as Cr by IC balt, dis. as Co by ICP pper, dis. as Cu by ICP on, Ferrous on, dis. as Fe by ICP gnesium, dis. as Mg by I nganese, dis. as Mn by I	P	0.13 ND 82 3.0 < 5.9 > < 12 > 93 0.064 Additional have biased 0.14 23 340 7.0	mg/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L Conments: F&VD modifi this result low. mg/L ug/L s.u.	0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091 .ed Method. 0.010 3.0 1.8 1.0	0.12 3.8 3.0 1.3 9.3 15 19 0.030 Interferer 0.035 3.0 6.1	EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1	01/21/97 01/21/97 01/08/97 01/21/97 01/21/97 01/21/97 01/21/97 01/21/97 01/21/97 01/21/97 01/21/97 01/21/97 12/31/96	721026466 721026466 721026466 721026466 721026466 721026466 721026466 721026466 721026466 721026466 721026466
uminum, dis. as Al by IC dmium, dis. as Cd by ICP lcium, dis. as Ca by ICP loride, as Cl (filtered) rromium, dis. as Cr by IC bbalt, dis. as Co by ICP opper, dis. as Cu by ICP on, Ferrous con, dis. as Fe by ICP ignesium, dis. as Mg by I inganese, dis. as Mn by I I, lab	P	0.13 ND 82 3.0 < 5.9 > < 12 > 93 0.064 Additional have biased 0.14 23 340 7.0 < 5.2 >	mg/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L mg/L this result low. mg/L mg/L ug/L s.u. mg/L	0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091 .ed Method. 0.010 3.0 1.8 1.0 2.0	0.12 3.8 3.0 1.3 9.3 15 19 0.030 Interferer 0.035 3.0 6.1 6.6	EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7	01/21/97 01/21/97 01/21/97 01/08/97 01/21/97 01/21/97 01/21/97 01/21/97 01/21/97 01/21/97 01/21/97 01/21/97 12/31/96 01/10/97	721026466 721026466 721026466 721026466 721026466 721026466 721026466 721026466 721026466 721026466 721026466 721026466 721026466
Luminum, dis. as Al by IC admium, dis. as Cd by ICP alcium, dis. as Cd by ICP alcium, dis. as Ca by ICP nromium, dis. as Cr by IC obalt, dis. as Co by ICP opper, dis. as Co by ICP con, Ferrous con, dis. as Fe by ICP agnesium, dis. as Mg by I anganese, dis. as Mn by I I, lab otassium, dis. as K odium, dis. as Na by ICP	P	0.13 ND 82 3.0 < 5.9 > < 12 > 93 0.064 Additional have biased 0.14 23 340 7.0 < 5.2 > 2.6	mg/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L mg/L this result low. mg/L mg/L ug/L s.u. mg/L g/L g/L	0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091 .ed Method. 0.010 3.0 1.8 1.0 2.0 0.033	0.12 3.8 3.0 1.3 9.3 15 19 0.030 Interferer 0.035 3.0 6.1 6.6 0.11	EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 01/21/97 01/21/97 01/08/97 01/21/97 01/21/97 01/21/97 01/22/97 01/221/97 01/21/97 01/21/97 12/31/96 01/10/97 01/221/97	721026466 721026466 721026466 721026466 721026466 721026466 721026466 721026466 721026466 721026466 721026466 721026466 721026466
luminum, dis. as Al by IC admium, dis. as Cd by ICP alcium, dis. as Ca by ICP hloride, as Cl (filtered) hromium, dis. as Cr by IC obalt, dis. as Co by ICP opper, dis. as Cu by ICP ron, Ferrous ron, dis. as Fe by ICP agnesium, dis. as Mg by I anganese, dis. as Mg by I H, lab otassium, dis. as K odium, dis. as Na by ICP ulfate, as SO4 (filtered)	P CP CP	0.13 ND 82 3.0 < 5.9 > < 12 > 93 0.064 Additional have biased 0.14 23 340 7.0 < 5.2 > 2.6 320	mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L Comments: F&VD modifing this result low. mg/L ug/L s.u. mg/L ug/L s.u. mg/L mg/L mg/L	0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091 .ed Method. 0.010 3.0 1.8 1.0 2.0 0.033 25	0.12 3.8 3.0 1.3 9.3 15 0.030 Interferen 0.035 3.0 6.1 6.6 0.11 25	EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7 EPA 375.2	01/21/97 01/21/97 01/21/97 01/21/97 01/21/97 01/21/97 01/21/97 01/02/97 01/21/97 01/21/97 01/21/97 12/31/96 01/10/97 01/21/97	721026466 721026466 721026466 721026466 721026466 721026466 721026466 721026466 721026466 721026466 721026466 721026466 721026466
Alkalinity, tot. as CaCO3 Aluminum, dis. as Al by IC Cadmium, dis. as Cd by ICP Calcium, dis. as Ca by ICP Chloride, as Cl (filtered) Cobalt, dis. as Cr by IC Cobalt, dis. as Co by ICP Copper, dis. as Cu by ICP Copper, dis. as Cu by ICP Fron, Ferrous Cron, dis. as Fe by ICP Magnese, dis. as Mg by I Manganese, dis. as Mg by I Sanganese, dis. as Mn by I Cotassium, dis. as K Codium, dis. as Na by ICP Sulfate, as SO4 (filtered) Challum, dis. as Tl by ICP Cinc, dis. as Zn by ICP	P CP CP	0.13 ND 82 3.0 < 5.9 > < 12 > 93 0.064 Additional have biased 0.14 23 340 7.0 < 5.2 > 2.6	mg/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L mg/L this result low. mg/L mg/L ug/L s.u. mg/L g/L g/L	0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091 .ed Method. 0.010 3.0 1.8 1.0 2.0 0.033	0.12 3.8 3.0 1.3 9.3 15 19 0.030 Interferer 0.035 3.0 6.1 6.6 0.11	EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 01/21/97 01/21/97 01/08/97 01/21/97 01/21/97 01/21/97 01/22/97 01/221/97 01/21/97 01/21/97 12/31/96 01/10/97 01/221/97	721026466 721026466 721026466 721026466 721026466 721026466 721026466 721026466 721026466 721026466 721026466 721026466 721026466 721026466

Results greater than the LOQ are considered to be in the region of "Certain Quantitation".

LOD = Limit of Detection DWB = Dry Weight Basis

61

LOQ = Limit of Quantitation NA = Not Applicable

ND = Not Detected %DWB = (mg/kg DWB)/10000

Reviewed by:

.

Authorized by: R. T. Krueger Laboratory Manager

NORTHERN LAKE SERVICE, INC. WIS. LAB CERT, NO. 721026460 Analytical Laboratory and Environmental Services 400 North Lake Avenue - Crandon, WI 54520 Tel:(715)478-2777 Fax:(715)478-3060 ANALYTICAL REPORT PAGE: 1 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 NLS#: 125220 Sample ID: FMC-20-TI Ref. Line 1 of COC 24051 Description: FMC-20-TI Collected: 01/10/97 Received: 01/14/97 Reported: 01/24/97 LOD LOQ Method Analyzed Lab Result Units Parameter Alkalinity, tot. as CaCO3 (filtered) Aluminum, dis. as Al by ICP Cadmium, dis. as Cd by ICP mg/L ND 1.5 5.3 EPA 310.1 01/21/97 721026460 01/15/97 721026460 mg/L 0.034 0.12 EPA 200.7 0,15 EPA 200.7 01/15/97 721026460 ND ug/L 1.2 3.8 EPA 200.7 01/15/97 721026460 3.0 3.0 Calcium, dis. as Ca by ICP Chloride, as Cl (filtered) 23 mq/L 01/16/97 721026460 01/15/97 721026460 01/15/97 721026460 01/15/97 721026460 01/15/97 721026460 EPA 325.2 mg/L 0.36 1.3 11 Chromium, dis. as Cr by ICP Cobalt, dis. as Co by ICP EPA 200.7 2.6 9.3 < 8.2 >ug/L EPA 200.7 15 4.3 < 7.4 > ug/L 19 EPA 200.7 5.4 Copper, dis. as Cu by ICP ND uq/L 01/21/97 721026460 0.030 0.0091 < 0.023 >mg/L Iron, Ferrous Additional Comments: F&VD modified method EPA 200.7 0.035 01/15/97 721026460 0.14 mg/L 0.010 Iron, dis. as Fe by ICP EPA 200.7 01/15/97 721026460 mg/L 3.0 3.0 Magnesium, dis. as Mg by ICP 12 01/15/97 721026460 140 ug/L 1.8 6.1 EPA 200.7 Manganese, dis. as Mn by ICP 01/15/97 721026460 7.0 1.0 EPA 150.1 в.u. pH, lab 01/23/97 721026460 01/15/97 721026460 mg/L 6.6 EPA 200.7 < 3.5 > 2.0 Potassium, dis. as K Sodium, dis. as Na by ICP 0.033 0.11 EPA 200.7 mg/L 1.5 01/14/97 721026460 25 25 EPA 375.2 mg/L 78 Sulfate, as SO4 (filtered) EPA 279.2 01/15/97 721026460 25 87 ND uq/L Thallium, dis. as Tl by furnace AAS EPA 200.7 01/15/97 721026460 120 120 ug/L Zinc, dis. as Zn by ICP 730

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

Homes Kluibe

Reviewed by:

Authorized by:

R. T. Krueger Laboratory Manager

20

	<u></u>		··•				
NORTHERN LAKE SERVICE, INC. Analytical Laboratory and Environmental Se 400 North Lake Avenue - Crandon, WI 5452 Tel:(715)478-2777 Fax:(715)478-3060	0	ICAL REPORT		WIS. LAB	CERT. NO. 72102 NLS PROJ	6460 ECT# 31664	
Attn: 2737 S PO Box	Van Dyke Associates Russ Janeshek . Ridge Road						
Project Description: Flamb Project Title: 96F022	eau Mining						
Sample ID: FMC-21 TI Ref.Line 4 of COC 22543 Description: Collected: 12/24/96 Received: 12/31/	NLS#: 124534 FMC-21 Tl 96 Reported: 01/23/97						
Parameter	Result	Units	LOD	LOQ	Method	Analyzed La	<u>.b</u>
Alkalinity, tot. as CaCO3 (fi Aluminum, dis. as Al by ICP Cadmium, dis. as Cd by ICP Calcium, dis. as Ca by ICP Chloride, as Cl (filtered) Chromium, dis. as Cr by ICP Cobalt, dis. as Co by ICP Copper, dis. as Cu by ICP Iron, Ferrous	ND < 1.5 > 10 1.8 ND ND < 17 > 0.070	mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L mg/L sl Comments: F&VD mod	1.5 0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091 dified Method	5.3 0.12 3.8 3.0 1.3 9.3 15 19 0.030 Interfere)	EPA 310.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	01/21/97 72 01/21/97 72 01/21/97 72 01/08/97 72 01/21/97 72 01/21/97 72	1026460 1026460 1026460 1026460 1026460 1026460 1026460
	have biase	ed this result low.	0.010	0.035	EPA 200.7	01/21/97 72	01026460
Iron, dis. as Fe by ICP Magnesium, dis. as Mg by ICP Manganese, dis. as Mn by ICP pH, lab Potassium, dis. as K Sodium, dis. as Na by ICP Sulfate, as SO4 (filtered) Thallium, dis. as Tl by ICP Zinc, dis. as Zn by ICP	< 0.022 > 3.4 300 7.0 < 3.4 > 1.4 20 < 39 > ND	mg/L mg/L s.u. mg/L mg/L mg/L ug/L ug/L	0.010 3.0 1.8 1.0 2.0 0.033 5.0 28 120	0.035 3.0 6.1 6.6 0.11 5.0 100 120	EPA 200.7 EPA 200.7	01/21/97 72 01/21/97 72 12/31/96 73 01/10/97 73 01/21/97 73 01/14/97 73 01/21/97 73	21026460 21026460 21026460 21026460 21026460 21026460 21026460 21026460
Values in brackets represent a Results greater than the LOQ a	esults greater than the LOD but are considered to be in the region	less than the LOQ and on of "Certain Quanti	d are within a tation".	region of	"Less-Certair	Quantitatio	on".
LOD = Limit of Detection DWB = Dry Weight Basis	LOQ = Limit of Quantitation NA = Not Applicable	ND = Not Detect %DWB = (mg/kg D	ed WB)/10000				
		Allemas KV	hube	Authoriz R. T. Laborato			

And a substan

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

ANALYTICAL REPORT

WIS. LAB CERT. NO. 721026460

PAGE: 5 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-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
		Comments: F&VD mod		Interfere	nce 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	1,9	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

22

LOQ = Limit of Quantitation NA = Not Applicable ND = Not Detected %DWB = (mg/kg DWB)/10000

Reviewed by:

Authorized by: R. T. Krueger Laboratory Manager

A service of the serv

.

 $\frac{1}{2}$

NORTHERN LAKE SERVICE, INC. Analytical Laboratory and Environmental Services 400 North Lake Avenue - Crandon, WI 54520				WIS. LAB	CERT. NO. 72102	6460
Tel:(715)478-2777 Fax:(715)478-3060	ANALYTIC	AL REPORT		PAGE: 6	NLS PROJ	ECT# 31577
Client: Foth & Van Dyke Attn: Russ Janes 2737 S. Ridge F PO Box 19012 Green Bay, WI 5	shek Road					
Project Description: Flambeau Mining Project Title: 96F022 Sample ID: FMC-23TI NLS#: 1240 Ref. Line 6 of COC 23950 Description: FMC-23TI Collected: 12/19/96 Received: 12/20/96 Reported			<u></u>			
Parameter	Result	Unite	LOD	LOQ	Method	Analyzed Lab
Alkalinity, tot. as CaCO3 (filtered) Aluminum, dis. as Al by ICP Cadmium, dis. as Cd by ICP Calcium, dis. as Ca by ICP Chloride, as Cl (filtered) Chromium, dis. as Cr by ICP Cobalt, dis. as Co by ICP Copper, dis. as Cu by ICP Iron, Ferrous		mg/L mg/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L comments: F&VD mod	1.5 0.034 1.2 3.0 0.36 2.6 4.3 5.4 0.0091 lified Method.	5.3 0.12 3.8 3.0 1.3 9.3 15 19 0.030 Interferen	EPA 200.7 EPA 325.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	12/31/96 7210264 01/13/97 7210264 01/13/97 7210264 01/13/97 7210264 01/02/97 7210264 01/13/97 7210264 01/13/97 7210264 01/13/97 7210264 01/13/97 7210264 12/30/96 7210264
Iron, dis. as Fe by ICP Magnesium, dis. as Mg by ICP Manganese, dis. as Mn by ICP pH, lab Potassium, dis. as K Sodium, dis. as Na by ICP Sulfate, as SO4 (filtered) Thallium, tot. as Tl by furnace AAS Zinc, dis. as Zn by ICP	have biased < 0.015 > 10 7.9 6.7 < 6.1 > 2.1 ND ND 130	this result low. mg/L ug/L s.u. mg/L mg/L mg/L ug/L ug/L ug/L	0.010 3.0 1.8 1.0 2.0 0.033 250 12 120	0.035 3.0 6.1 6.6 0.11 250 44 120	EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 200.7 EPA 200.7 EPA 200.7	01/13/97 7210264 01/13/97 72102644 12/26/96 72102644 12/27/96 72102644 12/27/96 72102644 01/13/97 72102644 01/07/97 72102644 01/09/97 72102644 01/13/97 72102644

المراجع والمراجع والمناصب والمتحادية والمحاصين والمتعارين والمتعار

LOD = Limit of Detection DWB = Dry Weight Basis

. .

23

LOQ = Limit of Quantitation NA = Not Applicable

---- **-** ---

ND = Not Detected %DWB = (mg/kg DWB)/10000

Chomas KP Reviewed by:

Authorized by: R. T. Krueger Laboratory Manager

.

Appendix K

Type I Alkali Demand Test Results

MLD2\96F022\GBAPP\43134 .61

		Sa	ample Weig	ht			1 h	олг		
		Flask A	Flask B	Flask C	Fla	sk A	Fla	sk B	Fla	sk C
Start			***************************************		·····	Cond.		Cond.		Cond.
Date	Sample	(g)	(g)	(g)	pH (su)	(uS/cm)	pH (su)	(uS/cm)	pH (su)	(uS/cm)
12/8/96	11	500	502.4	501.8	5.97	2750	6.18	2500	6.12	232
12/8/96	13	500.5	501.8	500.9	6.71	141.4	6.84	139.3	6.9	144
12/8/96	14	500.1	500.1	500.4	6.77	148.8	6.82	156.8	6.79	162
12/8/96	15	500.2	500.1	500.1	6.53	249	6.5	253	6.53	25
12/13/96	3	500.3	500.8	500.4	7.2	22.1	6.89	22	6.68	22
12/13/96	4	500.2	500.1	500	7.24	2480	7.18	1861	7.26	253
12/13/96	5	499.9	500.2	500	7.29	1619	7.36	1423	7.31	129
12/13/96	5	500.1	500.3	500.9	6.07	37	6.22	36.5	6.27	37
12/13/96	6	500.4	500.3	500.4	6.62	54.4	6.58	52.3	6.60	51
12/13/96	19	500.8	500.6	501	6.39	563	6.44	565	6.44	49
12/13/96	20	500.9	500.4	500.5	6.69	202	6.76	196.3	6.68	196
12/14/96	1	499.9	500.3	501.8	6.55	41.5	6.56	39.8	6.53	44
12/14/96	4	500.8	500.8	500.4	6.17	49.4	5.99	58	6.07	4
12/14/96	7	501.2	500.3	500.2	6.59	116.2	6.58	106	6.61	107
12/14/96	8	500.6	500.3	500.4	6.88	177.4	6.87	150.3	6.75	185
12/14/96	9	501.6	500.2	500.4	7.69	39.6	7.41	40.8	7.25	39
12/14/96	12	500.7	499.1	500.3	6.68	129.6	6.56	128.3	6.57	124
12/14/96	17	500.8	499.9	501.1	6.78	355	6.85	354	6.89	35
12/14/96	19	500.3	501.3	500.4	7.17	165	7.15	163.5	7.27	165
12/15/96	18	501.6	499.9	500.1	8.02	336	8.08	· 337	7.84	33
12/15/96	21	500.3	500.8	500.4	7.48	95.8	7.3	99.8	7.47	9
12/15/96	22	500.4	501.2	500.5	7.77	172.8	7.77	169.8	7.8	165
12/15/96	23	500.8	500.7	500	7.76	283	7.78	280	7.92	26
12/16/96	2	502.5	501.2	500	7.13	23.6	7.07	24.9	7.05	27
12/16/96	10	501.7	502.1	501.3	6.6	255	6.6	319	6.62	27
12/16/96	16	501.1	500	500.2	7.06	153.4	7.25	147.6	7.27	155
		Data QA'd	through this	entry as o	f 1/30/97					

.

Mary Street

(1,1,2,1)

÷.

1

Alkali Demand

	-		1							
		Volu	ime Lime S	илу				ours		
		Flask A	Flask B	Flask C	Flas	sk A	Flas	sk B	Flas	sk C
Start						Cond.		Cond.		Cond.
Date	Sample	(ml)	(ml)	(ml)	pH (su)	(uS/cm)	pH (su)	(uS/cm)	pH (su)	(uS/cm)
12/8/96	11	0	0.5	1	7.63	318		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	50.0
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	20 [.]
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	188.0
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.
12/15/96	22	0	0	0	7.46	199.9	7.44	198.7	7.41	196.0
12/15/96	23	0	0	0	7.69	318	7.77	327	7.79	32
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	41
12/16/96	16	0	0	0	7.09	187.6	7.37	183.6	7.44	182.0
		Data QA'd	through this	s entry as o	f 1/30/97					
									<u> </u>	

.

.

Appendix L

Type I ABA Test Results

MLD2\96F022\GBAPP\43134.61

Flambeau Mining Company		}	[[
ABA Test Results									
PARAMETER	UNITS			<u> </u>	Res	sults			<u></u>
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 HCI	· -	0.5155	0.5155	0.5155	0.5155	0.5155	0.5155	0.5155	0.5155
HCI 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
HCI 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	· <i>·</i> · ·	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
003	%	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
	-					· · · · ·			

in second to the

1999 A. 1997 A.

Persona in

The contra

1 . Ce . 12.

per contra

 $(w_{1},v_{2},\ldots,v_{n}) \in \mathbb{R}^{n}$

 $w_i \sim w_i \, A_i \sim T \, w^2 M_{\rm H}$

يعالوه مرد معتقق

يعرب ومشاهم

ومصادر ما مرجع

والمتراجع والمروا المتحاو

100003233

1400000

1.1

5 FMC-19 1/2/97 1.0088 0.5155 40 38.20	FMC-20 1/2/97 1.0088 0.5155 40 38.70	FMC-21 1/2/97 1.0088 0.5155 40	Resul FMC-22 1/2/97 1.0088 0.5155 40	FMC-23 1/2/97 1.0088 0.5155	FMC-23 (Check) 1/2/97 1.0088 0.5155	FMC-2 1/15/97 0.9662
FMC-19 1/2/97 1.0088 0.5155 40 38.20	1/2/97 1.0088 0.5155 40	1/2/97 1.0088 0.5155 40	FMC-22 1/2/97 1.0088 0.5155	FMC-23 1/2/97 1.0088 0.5155	1/2/97 1.0088	1/15/97 0.9662
1/2/97 1.0088 0.5155 40 38.20	1/2/97 1.0088 0.5155 40	1/2/97 1.0088 0.5155 40	FMC-22 1/2/97 1.0088 0.5155	FMC-23 1/2/97 1.0088 0.5155	1/2/97 1.0088	1/15/97 0.9662
1.0088 0.5155 40 38.20	1.0088 0.5155 40	1.0088 0.5155 40	1/2/97 1.0088 0.5155	1/2/97 1.0088 0.5155	1/2/97 1.0088	1/15/97 0.9662
0.5155 40 38.20	0.5155 40	0.5155 40	1.0088 0.5155	1.0088 0.5155	1.0088	0.9662
0.5155 40 38.20	40	40	0.5155	0.5155		
38.20			- · · · · · · · · · · · · · · · · · · ·	· · · · ·		0.5155
	38.70	1		40	40	40
		39.15	38.00	38.20	38.20	41.90
1.5	1.0	0.5	1.7	1.5	1.5	-0.4
19.3	12.9	6.4	21.9	19.3	19.3	-5.1
10.3	4.1	1.3	2.5	5.0	4.7	0.3
9.0	8.8	5.1	19.4	14.3	14.6	-5.4
1.9	3.1	4.9				-17.0
7.01	7.39	7.41				7.59
0.51			1		1 1	0.03
0.33	0.13	0.04				0.01
1.6	1.6					< 0.050
	< 0.40		· · · · · · · · · · · · · · · · · · ·			<0.4
	1.9 7.01 0.51 0.33	1.9 3.1 7.01 7.39 0.51 0.21 0.33 0.13 1.6 1.6	1.9 3.1 4.9 7.01 7.39 7.41 0.51 0.21 0.08 0.33 0.13 0.04 1.6 1.6 1.3	1.93.14.98.87.017.397.417.780.510.210.080.140.330.130.040.081.61.61.30.54	1.93.14.98.83.97.017.397.417.787.800.510.210.080.140.240.330.130.040.080.161.61.61.30.541.3	1.93.14.98.83.94.17.017.397.417.787.807.780.510.210.080.140.240.220.330.130.040.080.160.151.61.61.30.541.31.2

j:\scopes\96f022\shakflsk\FORM_3.XLS

Flambeau Mining Company ABA Test Results	/	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · ·	· · · · · · · · · · · · ·			
PARAMETER	UNITS	·····		Res	ults		
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 HCI		0.5155	0.5155	0.5155	0.5155	0.5155	0.5155
HCI 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
HCI 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		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
СОЗ	%	<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

ann ia sanann ann an priosta priosta denata fiterra de priosta de contra priosta priosta anteria destructu

- Vit State State

for a company

Flambeau Mining Company ABA Test Results	· · · · · · · · · · · · · · · · · · ·	44 Mart 44 Anna 26 Anna
PARAMETER	UNITS	a the second
Sample ID		FMC-10 Rep
Date		1/15/97
Constant	···· • • •	0.9662
Normality of HCI		0.5155
HCI added	mL,	40
NaOH to pH=7.0	· · ·	40.20
HCI 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

j:\scopes\96f022\shakflsk\FORM_3.XLS

LAKEFIELD RESEARCH LIMITED P.O. Box 4300, 185 Concession St., Lakefield, Ontarlo, KOL 2HO

4.270 6 x = 16.61

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

1.20

march et anner

Date Rec. : January 2, 1997 LR. Ref. : JAN7500.R97 Reference : Modified ABA Project : 9609018

CERTIFICATE OF ANALYSIS

EPA Modified Acid-Base Accounting

MPA #	NP *	HCl (mL) Consumed	NaOH to pH=7.0	HCL added	Normality of HCl	Constant	Sample ID	No.
3.1	37.4	2.9	36.80	40	0.5155	1.0088	FMC-11	9
0.6	7.7	0.6	39.10	40	0.5155	1.0088	FNC-12	10
0,9	14.2	1,1 -	30.60	40	0,5155	1.0088	FMC-13	11
0.6	29.6	2.3	37 40	40	0.5155	1.0088	FMC-14	12
2.5	34.8	2.7	37.00	40	0.5155	1,0088	FHC-1S	13
0.6	6.4	0.5	39.20	40	0,5155	1.0088	FMC-16	14
14.1	18,0	1.4	38.30	40	0,5155	1.0088	FMC - 17	19
4.7	24.5	1.9	37.80	40	0.5155	1.0088	FMC-18	15
504	CO3	3=	S	Paste pH	NP/MPA	CNNP	Sample ID	No.
9	8	95	4	units	*	*		
< 0.40	2.3	0.10	0.16	7.34	12.1	34.3	FMC-11	9
< 0.40	0.50	0.02	0.04	7 19	12.8	7.1	FMC - 12	10
< 0.40	0.44	0.03	0.05	8,00	15.8	13.3	FHC-13	11
< 0.40	2.5	0.02	0.06	7.09	49.3	29.0	FMC-14	12
< 0.40	2,1	0.08	0.15	7.43	13.9	32.3	FMC-15	13
< 0.40	0.67	0.02	0.04	7.71	10.7	5.8	FMC-16	14
	0.93	0.45	0.56	7.55	1.3	3.9	PMC-17	15
< 0.40								

л

LEFLD RESEARCH

(right)

Q 002 RESEARCH LIMITED LAK ELD

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 (nL) Consumed	NP *	МРА *
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	FHC-23	1,0088	0.5155	40	38.20	1.5	19.3	5.0
C	heck	·						
22	FHC-23	1.0088	0.5155	40	38.20	1.5	19.3	4.7
No.	Sample ID	CNNP	NP/MPA	Paste pH	5 *	8= %	CO3	ំ ៨០4 %
			· 	7.01	0.51	0,33	1.6	< 0.40
17	FMC-19	9.0	1.9	7.39	0.31	0.13	1.6	< 0.40
18	FMC-20	8.8		7.41	0.21	0.04	1.J	< 0.40
19	FMC-21	5.1						< 0.40
20	FИC - 22	19.4			0.14	0.08	0,54	· · ·
21	FHC-23	14.3	3.9	7.80	0.24	0.16	1.3	< 0.40
C	heck		-					
22	FMC-23	14.6	4.1	7.78	0.22	0.15	1.2	< 0.40

Roch Marion

A MEMBER OF IAETL CANADA

Accredited by the Standards Council of Canada and CAEAL for specific registered tests.

The analytical results reported herein refer to the samples as received. Reproduction of this analytical report in full or in part is prohibited without prior written approval.

σ

^I ■ LAKEFIELD RESEARCH LIMITED

P.O. Box 4300, 185 Concession St., Lakefield, Ontaria, 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 : Altself J. Janeshek } Fax : 414-497-8516

100

LKULD RESEARCH

8441

652

705

MON 11:39 FAI

02/03/97

 \neg

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	מו	Constant	Normality of HCl	HCL added mL	NaOH to pH=7.0	HCl (mL) Consumed	NP +	мра *
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	Ç.O	0.6
11	SFMC -	6ABA	0.9662	0.5155	40	41.60	-0.1	-1.2	0.6
12	SFMC -	7ABA	0.9652	0.5155	40	40.60	0.8	10.3	C.5
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	-	-	ġ	54	C03	504
No.	Sample	ID	CNNP *	NP/MPA *	Paste pH units	່ S ຈູ	ទីដ %	CO3 %	504 %
No. 9	Sample SFMC -	·		*	-	-			
		2ABA	#	-17.0	units	8	¥	\$; 	¥
	SFMC -	2ABA 5ABA	-5.4	+ -17.0 0.0	units 7,59	9 0.03	% 0.01	\$ < 0.050	ا ح 0.4
9 10	SFMC - SFMC -	2ABA 5ABA 6ABA	+ -5.4 -C.6	+ -17.0 0.0 -2.0	units 7,59 7.36	% 0.03 0.04	% 0.01 0.02	₹ 0.050 < 0.050	¥ < 0.4 < 0.4
9 10 11	SFMC - SFMC - SFMC -	2ABA 5ABA 6ABA 7ABA	+ -5.4 -C.6 -1.8	+ -17.0 0.0 -2.0 17.2	un1ts 7,59 7.36 7.38	% 0.03 0.04 0.05	% 0.01 0.02 0.02	₹ 0.050 < 0.050 0.30	¥ < 0.4 < 0.4 < 0.4
9 10 11 12	SFMC - SFMC - SFMC - SFMC -	2ABA 5ABA 6ABA 7ABA 8ABA	+ -5.4 -C.6 -1.8 9.7	+ -17.0 0.0 -2.0 17.2 15.8	unita 7,59 7.36 7.38 7.23	0.03 0.04 0.05 0.04	\$ 0.01 0.02 0.02 0.02	<pre>% < 0.050 < 0.050 0.30 2.5</pre>	* < 0.4 < 0.4 < 0.4 < 0.4
9 10 11 12 13	SFMC - SFMC - SFMC - SFMC - SFMC -	2ABA 5ABA 6ABA 7ABA 8ABA 9ABA	+ -5.4 -C.6 -1.8 9.7 19.3	+ -17.0 0.0 -2.0 17.2 15.8 21.3	units 7,59 7.36 7.38 7.23 7.28	8 0.03 0.04 0.05 0.04 0.12	% 0.01 0.02 0.02 0.02 0.02 0.04	<pre>% < 0.050 < 0.050 0.30 2.5 3.3</pre>	4 < 0.4 < 0.4 < 0.4 < 0.4 < 0.4

page 1/2

، سیست کار د

LAKEFIELD RESEARCH LIMITED

P.O. Box 4300, 185 Concession St., Lakeileid, 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)
*NPA(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 3S= value of 0.01

lasa

Accredited by the Standard A ONEMBER AND LAFOXEANA PLATIC registered tests.

The analytical results reported herein rater to the samples as received. Reproduction of this analytical report in full for in part is prohibited without prior written approval.

LKUD RESEARCH

02/03/87 MON 11:40 FAT 705 852 8441

G 002

Appendix M

MINTEQA2 Input File and Abbreviated Output File

MLD2\96F022\GBAPP\43134 .61

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
                                            /H+1
   330 0.000E-01
                 -7.00 y
                                            /SO4-2
   732 1.200E+03 -1.90 y
                                            /Al+3
    30 3.500E-01 -4.89 y
   160 2.600E-02
                                            /Cd+2
                  -6.64 y
   150 3.300E+02 -2.08 y
                                            /Ca+2
   231 7.300E-01 -4.94 y
                                            /Cu+2
   280 2.200E+01
                                            /Fe+2
                 -4.40 y
   460 1.100E+02
                                            /Mg+2
                 -2.34 y
                                            /Mn+2
   470 8.900E+00
                  -3.79 y
                                            /Zn+2
   950 1.700E+00
                 -4.58 y
                                            /CO3-2
   140 0.000E-01 -16.00
 31
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
                                            /Cu+2
                 -4.94 y
   280 2.200E+01
                                            /Fe+2
                  -4.40 y
   460 1.100E+02 -2.34 y
                                            /Mg+2
                                            /Mn+2
   470 8.900E+00 -3.79 y
   950 1.700E+00 -4.58 y
                                            /Zn+2
                                            /CO3-2
   140 0.000E-01 -16.00 y
 31
3301403 19.4610 -0.5300
                                            /CO2 (g)
 4 1
                            1.000E-02
                                            /CALCITE
5015001
       8.4750
                 2.5850
  56
5023101
          5.4800
                 15.6100
                                            /MALACHITE
5016000 13.7400
                   0.5800
                                            /OTAVITE
5047000 10.9900
                    2.0790
                                            /RHODOCHROSIT
                                            /GYPSUM
6015001
          4.8480
                    -0.2610
                  22.8000
                                            /GIBBSITE (C)
2003003
         -8.7700
                                            /SIDERITE
5028000
          11.0500
                    5.3280
```

Č,

A CALL AND AND A

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			
33	30	0.000E-01	-7.00 y		/H+l
7:	32	1.200E+03	-1.90 y		/504-2
	30	3.500E-01	-4.89 Y		/Al+3
10	60	2.600E-02	-6.64 y		/Cd+2
1	50	3.300E+02	-2.08 y		/Ca+2
23	31	7.300E-01	-4.94 y		/Cu+2
21	80	2.200E+01	-4.40 y		/Fe+2
40	60	1.100E+02	-2.34 y		/Mg+2
4	70	8.900E+00	-3.79 y		/Mn+2
95	50	1.700E+00	-4.58 y		/Zn+2
14	40	0.000E-01	-16.00 y		/CO3-2
З	1				
33014	03	20.1600	-0.5300		/CO2 (g)
4	1				
50150	01	8.4750	2.5850	1.000E-02	/CALCITE
5	6				
50231	01	5.4800	15.6100		/MALACHITE
50160	00	13.7400	0.5800		/OTAVITE
50470	00	10.9900	2.0790		/RHODOCHROSIT
60150	01	4.8480	-0.2610		/GYPSUM
20030	03	-8.7700	22.8000		/GIBBSITE (C)
50280	00	11.0500	5.3280		/SIDERITE

1.

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 732 1.200E+03 -1.90 y 30 3.500E-01 -4.89 y 160 2.600E-02 -б.64 у 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 -3.79 y 470 B.900E+00

-4.58 y

950 1.700E+00

.

140	0.000E-01	-16.00 Y		/CO3-2
3 1 3301403 4 1 5015001 5 6	19.1600 8.4750	-0.5300 2.5850	1.000E-02	/CO2 (g) /CALCITE
5023101 5016000 5047000 6015001 2003003 5028000	5.4800 13.7400 10.9900 4.8480 -8.7700 11.0500	15.6100 0.5800 2.0790 -0.2610 22.8000 5.3280		/MALACHITE /OTAVITE /RHODOCHROSIT /GYPSUM /GIBBSITE (C) /SIDERITE

/H+1

/s04-2

/Al+3

/Cd+2

/Ca+2

/Cu+2

/Fe+2

/Mg+2

/Mn+2

/Zn+2

Abbreviated Output File

MLD2\96F022\GBAPP\43134.61

{...;

PART 1 of OUTPUT FILE DATE OF CALCULATIONS: 4-MAR-97 TIME: PC MINTEOA2 v3.10 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 F 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 -4.890 30 Al+3 1.288E-05 3.500E-01 Cd+2 160 2.291E-07 -6.640 2.600E-02 150 Ca+2 8.318E-03 -2.080 3.300E+02 231 Cu+2 ~4.940 1.148E-05 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)

-			
l	IMPROVED ACTIVIT	TY GUESSES PRIOR TO FIRST ITERATION:	
Í	SO4-2	Log activity guess: -1.90	
1	Al+3	Log activity guess: -9.95	
Ì	Cu+2	Log activity guess: -4.99	
Ì	Fe+2	Log activity guess: -3.40	
İ	Mn+2	Log activity guess: -3.79	
Ì	CO3-2	Log activity guess: -5.47	
Ì			
-			

PC MINTE	PART 4 OF OUTPUT FILE QA2 v3.10 DATE OF CALCULATIONS: 4-MAR-97 TIME:	7: 4:39	
	PERCENTAGE DISTRIBUTION OF COMPONENTS AMONG TYPE I and TYPE II (dissolved and adsorbed) spe	cies	
H+1	1.1 PERCENT BOUND IN SPECIES		нсоз -
	97.8 PERCENT BOUND IN SPECIES #3301401		neos
SO4-2	70.5 PERCENT BOUND IN SPECIES		S04-2
	9.4 PERCENT BOUND IN SPECIES #4607320		
	18.8 PERCENT BOUND IN SPECIES #1507320	CaSO4 AQ	
Al+3	41.5 PERCENT BOUND IN SPECIES	3 # 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	Als04 +	
	13.5 PERCENT BOUND IN SPECIES # 307321	AI(SO4)2 -	
Cd+2	61.0 PERCENT BOUND IN SPECIES	3 # 160	Cd+2
	35.2 PERCENT BOUND IN SPECIES #1607320	CdSO4 AO	
	3.7 PERCENT BOUND IN SPECIES #1607321	Cd(SO4)2-2	
Ca+2	71.5 PERCENT BOUND IN SPECIES	3 # 150	Ca+2
	28.5 PERCENT BOUND IN SPECIES #1507320	CaSO4 AQ	
Cu+2	70.8 PERCENT BOUND IN SPECIES	3 # 231	Cu+2
	28.7 PERCENT BOUND IN SPECIES #2317320	CuSO4 AQ	
Fe+2	76.1 PERCENT BOUND IN SPECIES	3 # 280	Fe+2
	23.9 PERCENT BOUND IN SPECIES #2807320	FeSO4 AQ	
Mg+2	74.1 PERCENT BOUND IN SPECIES	3# 460	Mg+2
5	25.9 PERCENT BOUND IN SPECIES #4607320		2
Mn+2	74.5 PERCENT BOUND IN SPECIES	5 # 470	Mn+2
	25.4 PERCENT BOUND IN SPECIES #4707320	MnSO4 AQ	
Zn+2	66.7 PERCENT BOUND IN SPECIES	3 # 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	нсоз
	97.8 PERCENT BOUND IN SPECIES #3301401		
H2O	57.8 PERCENT BOUND IN SPECIES	3 # 303300	AlOH ·
	39.4 PERCENT BOUND IN SPECIES # 303301		
	2.3 PERCENT BOUND IN SPECIES # 303303	Al(OH)3 AQ	

PART 5 of OUTPUT FILE

PC MINTEQA2 v3.10 DATE OF CALCULATIONS: 4-MAR-97 TIME: 7: 4:39

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

£1.

IDX	NAME	DISSOL	VED	SORBE	D	PRECIPI	TATED
		MOL/KG	PERCENT	MOL/KG	PERCENT	MOL/KG	PERCENT
330	H+l	3 <i>.</i> 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

a tarana pa se

と見ていたいたち

Addition of the

÷.

ID #	NAME	Sat. Index		Sto	ichic	met:	ry in []	orack	ets	3]	
2003000	ALOH3 (A)	-3.317	Ε	1.000]	30	Ε	3.000]	2	[-3.000]	330
6003000	ALOHSO4	-0.520]	-1.000]	330	[1.000]	30	I	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	Ε	1.000]	150	Ľ	1.000]	732			
5015000	ARAGONITE	-4.621	[1.000]	150	[1.000]	140			
5046000	ARTINITE	-17.088	[-2.000]	330	E	2.000]	460	[1.000]	140
			ľ	5.000]	2						
2003001	BOEHMITE	-1.542	[-3.000]	330	[1.000]	30	Ľ	2.000]	2
2046000	BRUCITE	-11.090	E	1.000]	460	[2.000]	2	I	-2.000]	330
5015001	CALCITE	-4.448	Ι	1.000]	150]	1.000]	140			
2003002	DIASPORE	0.252	[-3.000]	330	[1.000]	30	E	2.000]	2
5015002	DOLOMITE	-9.197	Į	1.000]	150	J	1.000]	460]	2.000]	140
6046000	EPSOMITE	-2.931]	1.000]	460	[1.000]	732	Ε	_	2
2003003	GIBBSITE (C)	-1.599	ľ	-3.000]	330	[1.000]	30]	3.000]	2
3003000	Al2O3	-7.477	I	2.000]	30	[3.000]	2]	-6.000]	330
6015001	GYPSUM	-0.043	[1.000]	150	ſ	1.000]	732	Ľ	2.000]	2
5015003	HUNTITE	-22.903	Ε	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	Ε	1.000]	732]	7.000]	2
5046003	NESQUEHONITE	-7.642	E	1.000]	460	[1.000]	140	E	3.000]	2
5028000	SIDERITE	-3.249	[1.000]	280	E	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	Ĩ	1.000]	231]	2.000]	2
6023100	ANTLERITE	~8.559]	-4.000]	330	[3.000]	231	E	4.000]	2
			Ε	1.000]	732						
6023101	BROCHANTITE	-11.865	[-6.000]	330]	4.000]	231	[6.000]	2
			[1.000]	732						
6023102	LANGITE	-14.323	I	-6.000]	330	E	4.000]	231	[7.000]	2
			I	1.000]	732						
2023101	TENORITE	-4.264	ľ	-2.000]	330	Ē	1.000]	231]	1.000]	2
6023103	CUOCUSO4	-16.448]	-2.000]	330]	2.000]	231	[1.000]	2
			E	1.000]	732						
6023104	CUSO4	-11.229	[1.000]	231]	1.000]	732			
6023105	CHALCANTHITE	-5.081	[-		Ε	1.000]	732	I	5.000]	2
5095000	SMITHSONITE	-5.512	Ε	1.000]	950	Į	1.000]	140			
5095001	ZNCO3, 1H2O	-5.142]	1.000]	950	[1.000]	140	Ε	1.000]	2

ID #	NAME	Sat. Index		Sto:	ichio	meti	ry in []	orack	ets]	
2095000	ZN (OH) 2 (A)	-8.377	I	-2.000]	330	Ι	1.000]	950]	2.000]	2
	ZN (OH) 2 (C)	-8.127	Ι	-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	E	2.000]	2
2095004	ZN (OH) 2 (E)	-7.427	Ε	-2.000]	330	[1.000]	950	[2.000]	2
6095000	ZN2 (OH) 2SO4	-10.855	[-2.000]	330	E	2.000]	950	[2.000]	2
			Γ	1.000]	732						
6095001	ZN4 (OH) 6SO4	-23.609	Ε	-6.000]	330	[4.000]	950]	6.000]	2
			Ε	1.000]	732						
2095005	ZNO (ACTIVE)	-7.237	Ē	-2.000]	330	[1.000]	950	[1.000]	2
2095006	ZINCITE	-7.623	[-2.000]	330	[1.000]	950	Ε	1.000]	2
6095002	ZN30 (SO4) 2	-31.380	Ε	-2.000]	330]	3.000]	950	Ε	2.000]	732
			I	1.000]	2						
6095003	ZINCOSITE	-10.926	Ε	1.000]	950	[1.000]	732			
6095004	ZNSO4, 1H2O	-7.129	I	1.000]	950	E	1.000]	732	Ĺ	1.000]	2
6095005	BIANCHITE	-5.668	Ē	1.000]	950	[1.000]	732	[6.000]	2
6095006	GOSLARITE	-5.385	Ε	1.000]	950	[1.000]	732	[7.000]	2
5016000	OTAVITE	-3.766	Ε	1.000]	160	[1.000]	140			
2016000	CD (OH) 2 (A)	-12.275	ſ	-2.000]	330	[1.000]	160	Γ	2.000]	2
2016001	CD(OH)2(C)	-11.667	E	-2.000]	330	[1.000]	160	[2.000]	2
6016000	CD3 (OH) 4SO4	-28.111	E	-4.000]	330	[3.000]	160	Ε	4.000]	2
			Ĺ	1.000]	732						
6016001	CD30H2 (SO4) 2	-23.762]	-2.000]	330	Ε	3.000]	160	[2.000]	2
			E	2.000]	732						
6016002	CD4 (OH) 6SO4	-31.967	E	-6.000]	330	[4.000]	160	[6.000]	2
			E	1.000]	732						
2016002	MONTEPONITE	-13.766	Ε	-2.000]	330	Į	1.000]	160	[1.000]	2
6016003	CDSO4	-9.792	[1.000]	160	[1.000]	732			
6016004	CDSO4, 1H2O	-8.052	ľ	1.000]	160	[1.000]	732	[1.000]	2
6016005	CDSO4,2.7H2O	-7.754	Γ	1.000]	160]	1.000]	732	[2.670]	2
5023101	MALACHITE	-6.904	[-		ĺ	2.000]	2	[1.000]	140
			-	-2.000]							
5023102	AZURITE	-11.402	Γ	-		[2.000]	2	[2.000]	140
			-	-2.000]							
2015000		-27.370	-	-2.000]		[1.000]		[1.000]	2
	PORTLANDITE	-16.852	-	-2.000]]	1.000]		Ĺ	2.000]	2
	WUSTITE	-6.805	-	-2.000]		E	0.947]		I	1.000]	2
	PERICLASE	-16.070		-2.000]		[1.000]]	1.000]	2
3028001	HERCYNITE	-8.342		-8.000]		Ĩ	1.000]	280	[2.000]	30
			[-	2		_		_		
3046000	SPINEL	-16.737	-	-8.000]		[1.000]	460	[2.000]	30
			[4.000]	2						

PART 1 of OUTPUT FILE _____ PC MINTEQA2 v3.10 DATE OF CALCULATIONS: 4-MAR-97 TIME: 7: 4:39

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 -4.58 y 950 1.700E+00 140 0.000E-01 -16.00 y H2O has been inserted as a COMPONENT 3 1 3301403 19.4610 -0.5300 41 5015001 8.4750 2.5850 1.000E-02 56 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

INPUT DATA BEFORE TYPE MODIFICATIONS

5.3280

11.0500

ŗ.

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: Log activity guess: -1.90 SO4-2 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

PC MINTEQ	A2 v3.10 E				OUTPUT F 5: 4-MAI		: 7:4	:40	
	PERCEN	TAGE DIST	RIBUTIC	ON C	OF COMPO	NENTS AMONO	G		
	TYPE I ar	nd TYPE II	(disso	olve	ed and a	dsorbed) s	pecies		
H+1		1.1	PI	ERCI	ENT BOUN	D IN SPECI	ES #460	1401	MgHCO3
+	1.8	חייאייייייייייייייייי	POIND	TN	COPOTEC	#1501400	CaHCO.	÷.	
	60.1					#1301400 #3301400			
	37.3					#3301401			
		CD 0	.				DO ¹¹	800	
504-2	8.2	67.8				<pre>D IN SPECII #4607320</pre>		732	504-2
							_		
	23.0	PERCENT	ROUND	ΤN	SPECIES	#1507320	CaSO4	AQ	
Al+3		14.6	PI	ERCI	ENT BOUN	D IN SPECI	ES # 30	3301	Al (OH)
÷	4.0	DEDCOM		T N T	OPPOTEC	# 202202	N] (OU	\ ^	
	4.0 81.0					# 303302 # 303303	•		
	81.0	PERCENT	BUUD	TIN	SPECIES	# 303303	AI (UH	IS AQ	
Cd+2		52.1	PI	ERCI	ENT BOUN	D IN SPECI	ES #	160	Cd+2
	26.1	PERCENT	BOUND	IN	SPECIES	#1607320	CdSO4	AQ	
	13.4	PERCENT	BOUND	IN	SPECIES	#1601400			
	5.9					#1601401			
	2.6					#1607321			
Zn+2		56.1	Iq	FRCI	ENT BOUN	D IN SPECI	RS #	950	Zn+2
	22.5	PERCENT				#9507320			
	1.7					#9507321			
	14.4					#9501400			
	5.0					#9501401			
Cu+2		19.6	זס	*P.C1		D IN SPECI	FC #	231	Cu+2
54.5	47.3					#2311400			Curz
	5.5					#2313301			
	6.9					#2317320			
	20.0					#2311402			
7- 10		70 C	7 33	- 2 01		D TH 0000T			D . 2
Fe+2	21.4					D IN SPECI #2807320			Fe+2
	21.4	PERCENT	BOOND	TIV	SPECIES	#2807320	Fe504	AQ	
Mg+2		75.0	PI	ERCI	ENT BOUN	D IN SPECI	ES #	460	Mg+2
	2.3	PERCENT				#4601401			-
	22.7					#4607320	-		
Mn+2		74 R	וק	ERCI	ENT BOIN	D IN SPECI	ES #	470	Mn+2
	22.2					#4707320			
	3.0					#4701400			

41-1-1-1-1-1

あらりていても、う

E------

1 - 11 I V

116.0

1982-1772

11.00

or several

 $\frac{1}{2}$

a 11 M

1.11.1

1.14

Ca+2	1.5 25.3	73.1 PERCENT BOUND IN SPECIES # 150 PERCENT BOUND IN SPECIES #1501400 CaHCO3 + PERCENT BOUND IN SPECIES #1507320 CaSO4 AQ) Ca+2
H2O +		9.7 PERCENT BOUND IN SPECIES # 303301	Al (OH) 2
	5.4 80.9 3.2	PERCENT BOUND IN SPECIES # 303302Al (OH) 4PERCENT BOUND IN SPECIES # 303303Al (OH) 3PERCENT BOUND IN SPECIES #2313301Cu (OH) 2	Q
CO3-2 +		1.3 PERCENT BOUND IN SPECIES #4601401	MgHCO3
	2.2 73.4 22.8	PERCENT BOUND IN SPECIES #1501400CaHCO3 +PERCENT BOUND IN SPECIES #3301400HCO3 -PERCENT BOUND IN SPECIES #3301401H2CO3 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	DISSOL	VED	SORBE	D	PRECIPI	TATED
		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

1

.

.

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] 7	32
		[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] 1	.40
		[-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 CALC	TULATIONS: 4-MAR-97 TIME: 7:4:40	

ITERATIONS= 7: SOLID SIDERITE PRECIPITATES

		·····			UTPUT F			40	
PC MINTEQA2	v3.10 1	DATE OF CAI	LCULATI	ONS	: 4-MAI	R-97 TIME	: 7:4:	42	
	PERCE	NTAGE DISTR	TBITTC	N C		JENTS AMON	G		
		nd TYPE II							
H+1		1.1	PE	RCE	NT BOUN	O IN SPECI	ES #4601	401	MgHCO3
+	- - 7			TNT	CORCTRO	#1501400	CaHCO3		
	1.7 60.1					#1301400			
	37.0					#3301401 #3301401			
	57.0	FERCENT	DOOMD	714	OFECIED	#230T40T	nzcos	ny	
Zn+2		56.5				O IN SPECI		950	Zn+2
	21.4					#9507320		-	
	1.5					#9507321	•)2-2	
	14.9					#9501400			
	5.3	PERCENT	BOUND	IN	SPECIES	#9501401	ZnCO3	AQ	
Mg+2		75.8	PE	RCE	NT BOUN	D IN SPECI	ES #	460	Mg+2
···;	2.4					#4601401	MgHCO3		
	21.8	PERCENT	BOUND	IN	SPECIES	#4607320			
504 - 2		68.2	नव	ER CE	NT BOIN	D IN SPECI	ES #	732	SO4-2
	8.7					#4607320			
	22.9					#1507320	-		
Cu+2		19.0	PE	RCF	NT BOUN	D IN SPECI	ES #	231	Cu+2
	48.3					#2311400			
	5.6					#2313301			
	6.3					#2317320			
	20.0	PERCENT	BOUND	IN	SPECIES	#2311402	CuHCO	3 +	
Cd+2		52.6	PE	ERCE	INT BOUN	D IN SPECI	ES #	160	Cd+2
	25.0	PERCENT	BOUND	IN	SPECIES	#1607320	CdSO4	AQ	
	13.9	PERCENT	BOUND	IN	SPECIES	#1601400	CdHCO	3 +	
	6.2	PERCENT	BOUND	IN	SPECIES	#1601401	CdC03	AQ	
	2.3	PERCENT	BOUND	IN	SPECIES	#1607321	Cd (SO4	1)2-2	
Fe+2		79.5	PH	ERCH	INT BOUN	D IN SPECI	ES #	280	Fe+2
	20.5	PERCENT							
Al+3		14.4	PH	ERCE	NT BOUN	D IN SPECI	ES # 303	3301	Al (OH)
+							.,		
	4.1	PERCENT	BOUND	IN	SPECIES	# 303302	Al (OH)	4 -	
	81.2					# 303303			
Mn+2		75.6	PI	ERCI	INT BOUN	D IN SPECI	ES #	470	Mn+2
	21.2	PERCENT	BOUND	IN	SPECIES	#4707320	MnSO4	AO	

.

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 +	

f

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		VED	SORBE	PRECIPITATED		
		MOL/KG	PERCENT	MOL/KG	PERCENT	MOL/KG	PERCENT
330	H+l	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	Н2О	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

2003000 ALOH3 (A) -1.718 [1.000] 30 [3.000] 2 [-3.000] 3 6003000 ALOHS04 -3.325 [-1.000] 330 [1.000] 30 [1.000] 7 [1.000] 2 [1.000] 2 [1.000] 30 [1.000] 30 [1.000] 7 6003001 AL4 (OH) 10SO4 -1.206 [-10.000] 330 [4.000] 30 [1.000] 7 [10.000] 2 [10.000] 30 [1.000] 7 [10.000] 2 [10.000] 7	32
6003000 ALOHSO4 -3.325 [-1.000] 330 [1.000] 30 [1.000] 7 [1.000] 2 [1.000] 2 6003001 AL4 (OH) 10SO4 -1.206 [-10.000] 330 [4.000] 30 [1.000] 7	
[1.000] 2 6003001 AL4(OH)10SO4 -1.206 [-10.000] 330 [4.000] 30 [1.000] 7	'32
	32
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] 1	.40
[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] 3	30
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] 3	L40
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 A1203 -4.280 [2.000] 30 [3.000] 2 [-6.000] 3	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		Sto.	ichic	meti	ry in []	brack	tets]	
2095000	ZN (OH) 2 (A)	-4.129	Į	-2.000]	330	[1.000]	950	Ε	2.000]	2
	ZN (OH) 2 (C)	-3.879		-2.000]]	1.000]		Ī	2.000]	2
	ZN (OH) 2 (B)	-3.429		-2.000]		Ē	1.000]		[2.000]	2
2095003	ZN (OH) 2 (G)	-3.389		-2.000]		ī	1.000]	950	Ē	2.000]	2
2095004	ZN (OH) 2 (E)	-3.179	Ē	-2.000]	330	ſ	1.000]	950	1	2.000]	2
	ZN2 (OH) 2504	-6.763	-	-2.000]		ſ	2.000]	-	F	2.000]	2
			ī	-		•			-		
6095001	ZN4 (OH) 6SO4	-11.021	-	-6.000]		ſ	4.000]	950	Г	6.000]	2
			ī	-		·	• •		•		
2095005	ZNO (ACTIVE)	-2.989	-	-2.000]		Į	1.000]	950	ſ	1.000]	2
	ZINCITE	-3.375		-2.000]		[1.000]		ī	1.000]	2
	ZN30 (SO4) 2	-27.445	-	-2.000]		ſ	3.000]		Ĩ	2.000]	
	- •- •		Ē		2	-	· · · ·		-		
6095003	ZINCOSITE	-11.083]	-	950	[1.000]	732			
	ZNSO4, 1H2O	-7.285	Ī			Į	1.000]		[1.000]	2
	BIANCHITE	-5.825	Ī			ī	1.000]		ī	6.000]	2
6095006	GOSLARITE	-5.542	[1.000]	950	Ē	1.000]	732	Ĩ	7.000]	2
5016000	OTAVITE	0.000	E			1	1.000]	140	-	_	
2016000	CD (OH) 2 (A)	-8.509]	-2.000]	330	Ē	1.000]	160	[2.000]	2
2016001	CD (OH) 2 (C)	-7.901	[-2.000]	330	[1.000]	160	Ē	2.000]	2
6016000	CD3 (OH) 4SO4	-21.218	[-4.000]	330	[3.000]	160	[4.000]	2
			[1.000]	732						
6016001	CD30H2 (SO4) 2	-21.274	E	-2.000]	330	[3.000]	160	[2.000]	2
				2.000]							
6016002	CD4 (OH) 6SO4	-21.309	Ε	-6.000]	330	I	4.000]	160	Ε	6.000]	2
			Ι	1.000]	732						
2016002	MONTEPONITE	-10.001	[-2.000]	330	[1.000]	160	I	1.000]	2
6016003	CDSO4	-10.431	Γ	1.000]	160]	1.000]	732			
6016004	CDSO4, 1H2O	-8.691	Ε	1.000]	160	[1.000]	732	Į	1.000]	2
6016005	CDSO4,2.7H20	-8.393]	1.000]	160	I	1.000]	732	[2.670]	2
5023101	MALACHITE	0.000	[2.000]	231]	2.000]	2	E	1.000]	140
			[-2.000]	330						
5023102	AZURITE	-1.046]	3.000]	231	[2.000]	2	[2.000]	140
				-2.000]							
2015000	LIME	-22.922	I	-2.000]	330	[1.000]	150]	1.000]	2
2015001	PORTLANDITE	-12.404	[-2.000]	330	[1.000]		[2.000]	2
2028000	WUSTITE	-3.499	ľ	-2.000]	330	Ε	0.947]	280	[1.000]	2
2046001	PERICLASE	-11.740	Į	-2.000]	330	[1.000]]	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	Ε	2.000]	30
			[4.000]	2						

5

New York Control of Co

And the state

ł

е 20. г

10/2 mar 11

and an other states of the

F

÷,

à.

т. 12

ζ.

÷

PART 1 OF OUTPUT FILE PC MINTEQA2 v3.10 DATE OF CALCULATIONS: 4-MAR-97 TIME: 7:4:42 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 -3.79 y 470 8.900E+00 950 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 56 15.6100 5023101 5.4800 0.5800 5016000 13.7400 5047000 10.9900 2.0790 6015001 4.8480 -0.2610 -8.7700 22.8000 2003003

INPUT DATA BEFORE TYPE MODIFICATIONS

5.3280

11.0500

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 -9.95 Al+3 Log activity guess: Cu+2 Log activity guess: -4.99 Log activity guess: -3.40 Fe+2 Log activity guess: Mn+2 -3.79 CO3-2 -6.17 Log activity guess: ______

PART 4 OF OUTPUT FILE _____ PC MINTEQA2 v3.10 DATE OF CALCULATIONS: 4-MAR-97 TIME: 7:4:43

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

H+1		1.4 PERCENT BOUND IN SPECIES #460140	1 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 # 73	2 SO4-2
	8.8	PERCENT BOUND IN SPECIES #4607320 MgSO4 AQ	
	20.9	PERCENT BOUND IN SPECIES #1507320 CaSO4 AQ	1
A1+3		6.3 PERCENT BOUND IN SPECIES # 30330	1 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 # 16	0 Cd+2
	29.1	PERCENT BOUND IN SPECIES #1607320 CdSO4 AQ	2
	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	
Zn+2		58.7 PERCENT BOUND IN SPECIES # 95	0 Zn+2
	25.3		-
	1.9	PERCENT BOUND IN SPECIES #9507321 Zn(SO4)2	
	7.4	PERCENT BOUND IN SPECIES #9501400 ZnHCO3 +	
	6.2	PERCENT BOUND IN SPECIES #9501401 ZnCO3 AC	2
Cu+2		15.5 PERCENT BOUND IN SPECIES # 23	31 Cu+2
CUTZ	44.1		2
	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 AC	2
	7.7	PERCENT BOUND IN SPECIES #2311402 CuHCO3 4	i r
Fe+2			30 Fe+2
	22.6	PERCENT BOUND IN SPECIES #2807320 FeSO4 AC	2
Mg+2		74.6 PERCENT BOUND IN SPECIES # 46	
	1.1	PERCENT BOUND IN SPECIES #4601401 MgHC03 -	
	24.3	PERCENT BOUND IN SPECIES #4607320 MgSO4 A(2
Ném I O		74.7 PERCENT BOUND IN SPECIES # 4	70 Mn+2
Mn+2	22 8	PERCENT BOUND IN SPECIES #4707320 MnS04 A	
	43.0	INCIMI DOMP IN CLUCIDO HIGGIO, MUDOJ W	

	1.5	PERCENT BOUND IN SPECIES #4701400 MnHCO3 +	
Ca+2	26.9	72.3 PERCENT BOUND IN SPECIES # 150 PERCENT BOUND IN SPECIES #1507320 CaSO4 AQ	Ca+2
H2O +		3.5 PERCENT BOUND IN SPECIES # 303301	Al (OH) 2
	11.2	PERCENT BOUND IN SPECIES # 303302 Al (OH) 4 -	
	71.0 12.8	PERCENT BOUND IN SPECIES # 303303 Al(OH)3 AQ PERCENT BOUND IN SPECIES #2313301 Cu(OH)2 AQ	
CO3-2 +		1.5 PERCENT BOUND IN SPECIES #4601401	MgHCO3
	2.2 84.6	PERCENT BOUND IN SPECIES #1501400 CaHCO3 + PERCENT BOUND IN SPECIES #3301400 HCO3 -	
	11.0	PERCENT BOUND IN SPECIES #3301400 HCO3 - 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		VED	SORBE	D	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	Mq+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

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	Sto	ichiome	try in [bracke	ts]		
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	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 MINTE	QA2 V3.10 I	DATE OF CALCU	ULATIONS:	4-MAR-	97 TIME	: 7:	4:4	3	

ITERATIONS= 6: SOLID SIDERITE PRECIPITATES

÷.

đ

ł

PART 4 of OUTPUT FILE PC MINTEQA2 v3.10 DATE OF CALCULATIONS: 4-MAR-97 TIME: 7: 4:45

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

H+1 +		1.4	PERCENT BOUND IN SPECIES #460	1401 MgHCO3
•	2.0	PERCENT	BOUND IN SPECIES #1501400 CaHCO	3 +
	76.4		BOUND IN SPECIES #3301400 HCO3	
	20.1		BOUND IN SPECIES #3301401 H2CO3	
			· · · · · · · · · · · · · · · · · · ·	
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(SO	4)2-2
	7.4	PERCENT	BOUND IN SPECIES #9501400 ZnHCO	3 +
	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 MqHCO	~
	24.0	PERCENT	BOUND IN SPECIES #4607320 MgSO4	
SO4-2		69.3	PERCENT BOUND IN SPECIES #	732 SO4-2
	9.0		BOUND IN SPECIES #4607320 MgSO4	
	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	
	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 CuHCO	3 +
Cd+2				
Cu+2	28.8	54.4		160 Cd+2
	∠8.8 6.8		BOUND IN SPECIES #1607320 CdSO4 BOUND IN SPECIES #1601400 CdHCO	~
	7.2		BOUND IN SPECIES #1601400 CdHCO BOUND IN SPECIES #1601401 CdCO3	
	2.8		BOUND IN SPECIES #1607321 Cd(SO	-
	2.0	I DICLINI	COMP IN SECTES #100/321 CU(SO	±)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 # 30	3301 Al(OH)2
+				
	9.8		BOUND IN SPECIES # 303302 Al (OH	
	83.8	PERCENT	BOUND IN SPECIES # 303303 Al (OH))3 AQ
Mn+2		75.0	PERCENT BOUND IN SPECIES #	470 Mn+2
· 	23.5		BOUND IN SPECIES #4707320 MnSO4	
				• • ×

	1.5	PERCENT BOUND IN SPECIES #4701400 MnHCO3 +	
Ca+2	26.5	72.7 PERCENT BOUND IN SPECIES # 150 Ca+2 PERCENT BOUND IN SPECIES #1507320 CaSO4 AO	
CO3-2		1.5 PERCENT BOUND IN SPECIES #4601401 MgHCO3	3
+			
	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	
Н2О		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	

12. C. A

1

Â

2

19

29

• ·

-

PART 5 of OUTPUT FILE ____

PC MINTEQA2 v3.10 DATE OF CALCULATIONS: 4-MAR-97 TIME: 7:4:45

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

IDX	NAME	DISSOL	VED	SORBE	D	PRECIPI	TATED
		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	Mri+2	2.896E-05	17.8	0.000E-01	0.0	1.333E-04	82.2
1.50	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

ż

2

ID #	NAME	Sat. Index		Sto	ichic	meti	cy in []	orack	ets	5]	
2003000	ALOH3 (A)	-1.718	Ľ	1.000]	30	[3.000]	2	E	-3.000]	330
6003000	ALOHSO4	-4.024	Ĺ	-1.000]	330	Ε	1.000]	30	[1.000]	732
			I	1.000]	2						
6003001	AL4 (OH) 10SO4	-1.905	Į	-10.000]	330]	4.000]	30]	1.000]	732
			[10.000]	2						
6015000	ANHYDRITE	-0.313	I	1.000]	150	Ε	1.000]	732			
5015000	ARAGONITE	-0.173	Ε	1.000]	150	I	1.000]	140			
5046000	ARTINITE	-7.645	I	-2.000]	330]	2.000]	460	[1.000]	140
			E	5.000]	2						
2003001	BOEHMITE	0.057	I	-3.000]	330	Ε	1.000]	30]	2.000]	2
2046000	BRUCITE	-6.019	E	1.000]	460]	2.000]	2	[-2.000]	330
5015001	CALCITE	0.000	Ţ	1.000]	150	[1.000]	140			
2003002	DIASPORE	1.851	[-3.000]	330	E	1.000]	30	J	2.000]	2
5015002	DOLOMITE	-0.377	Ε	1.000]	150	Į	1.000]	460]	2.000]	140
6046000	EPSOMITE	-2.964	I	1.000]	460	Ľ	1.000]	732	[7.000]	2
2003003	GIBBSITE (C)	0.000	[-3.000]	330	[1.000]	30	[3.000]	2
3003000	Al2O3	~4.280	Ľ	2.000]	30	[3.000]	2	[-6.000]	330
6015001	GYPSUM	0.000	I	1.000]	150	[1.000]	732	[2.000]	2
5015003	HUNTITE	-5.340]	3.000]	460]	1.000]	150	Ε	4.000]	140
5046001	HYDRMAGNESIT	-16.106	[5.000]	460	[4.000]	140	Ē	-2.000]	330
			Ε	6.000]	2						
5046002	MAGNESITE	-0.871	l	1.000]	460	Į	1.000]	140			
6028000	MELANTERITE	-4.804]	1.000]	280	[1.000]	732	[7.000]	2
5046003	NESQUEHONITE	-3.270	Γ	1.000]	460	[1.000]	140	[3.000]	2
5028000	SIDERITE	0.000	Ε	1.000]	280	[1.000]	140			
2047003	PYROCROITE	-6.426	E	-2.000]	330	[1.000]	470	[2.000]	2
5047000	RHODOCHROSIT	0.000	ſ	1.000]	470	[1.000]	140			
6047000		-10.431	Γ	1.000]	470	E	1.000]	732			
5023100		-2.998	Ε	_		[1.000]	140			
	CU (OH) 2	-1.483		-2.000]]	1.000]		Ľ	2.000]	2
6023100	ANTLERITE	-2.259]	-4.000]	330	Ε	3.000]	231]	4.000]	2
			[-							
6023101	BROCHANTITE	-1.764	Ĺ	-6.000]]	4.000]	231	ľ	6.000]	2
			I	-							
6023102	LANGITE	-4.221	ſ	-	330	[4.000]	231	[7.000]	2
			E	-	732						
	TENORITE	-0.462	-	-2.000]	330	I	1.000]		[1.000]	2
6023103	CUOCUSO4	-13.949.	I	-2.000]		E E	2.000]	231	I	1.000]	2
			Ι	1.000]							
6023104		-12.531	[=		[1.000]				
	CHALCANTHITE		Ι	-		I	1.000]		ĺ	5.000]	2
	SMITHSONITE	-1.198]	-]	1.000]		_		
5095001	ZNCO3, 1H2O	-0.828	[1.000]	950	[1.000]	140	[1.000]	2

ID #	NAME	Sat. Index		Sto	ichic	metry	/ in	[brack	ets]	
2095000	ZN (OH) 2 (A)	-3.364	[-2.000]	330	[:		950	[2.000]	2
2095001	ZN (OH) 2 (C)	-3.114	Ε	-2.000]	330	[]	L.000]	950	[2.000]	2
2095002	ZN (OH) 2 (B)	-2.664	I	-2.000]	330	[:	L.000]	950	Ε	2.000]	2
	ZN (OH) 2 (G)	-2.624		-2.000]	330	[:	1.000]	950	E	2.000]	2
	ZN (OH) 2 (E)	-2.414	Γ	-2.000]	330	[]	1.000]	950	[2.000]	2
6095000	ZN2 (OH) 2SO4	-5.933	Γ	-2.000]	330	[2	2.000]	950	[2.000]	2
			[1.000]	732						
6095001	ZN4 (OH) 6504	-8,661	Ε	-6.000]	330	[4	1.000]	950	[6.000]	2
			[1.000]	732						
2095005	ZNO (ACTIVE)	-2.224	Ε	-2.000]	330	[:	1.000	950	Ε	1.000]	2
	ZINCITE	-2.610	E	-2.000]	330	ĩ:	1.000	950	[1.000]	2
6095002	ZN30 (SO4) 2	-26.548	Γ	-2.000]	330	[]	3.000	950	[2.000]	732
			E	1.000]	2						
6095003	ZINCOSITE	-11.017	I	1.000]	950	[:	1.000	732			
6095004	ZNSO4, 1H2O	-7.219	[1.000]	950	[:	1.000]	732	Ε	1.000]	2
6095005	BIANCHITE	-5.759	[1.000]	950	[]	1.000	732	Ε	6.000]	2
6095006	GOSLARITE	-5.476	E	1.000]	950	[]	1.000	732	[7.000]	2
5016000	OTAVITE	0.000	E	1.000]	160	Ĺ	1.000	140			
2016000	CD (OH) 2 (A)	-7.810	[-2.000]	330	[]	1.000	160	l	2.000]	2
2016001	CD (OH) 2 (C)	-7.202	l	-2.000]	330	[]	1.000	160	[2.000]	2
6016000	CD3 (OH) 4SO4	-19.820	[-4.000]	330	E :	3.000	160	I	4.000]	2
			ſ	1.000]	732						
6016001	CD30H2 (SO4) 2	-20.575	Γ	-2.000]	330	[3.000] 160	[2.000]	2
			Ę	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	Ε	-2.000]	330	[1.000] 160	[1.000]	2
6016003	CDSO4	-10.431]	-		-	1.000	-			
	CDSO4, 1H2O	-8.691	[_		-	1.000	-	[1.000]	2
	CDSO4,2.7H2O		[-			1.000		[2.670]	2
5023101	MALACHITE	0.000	I	-		[2.000] 2]	1.000]	140
			-	-2.000]		_		_	-		
5023102	AZURITE	-1.396	Ľ	-		[2.000] 2	[2.000]	140
			-	-2.000]		_		_	_		
2015000		-22.223	-	-2.000]		-] 150	[1.000]	2
	PORTLANDITE	-11.705		-2.000]			1.000		[2.000]	2
	WUSTITE	-2.797	-	-2.000]		-	0.947	-	[1.000]	2
	PERICLASE	-10.999	-	-2.000]		-	1.000	•]	1.000]	2
3028001	HERCYNITE	-1.196	-	-8.000]		ſ	1.000] 280	E	2.000]	30
			[-	2	۲		• • • •	-		
3046000	SPINEL	-8.469	-	-8.000]		ľ	1.000] 460	[2.000]	30
			E	4.000]	2						

PART 1 OF OUTPUT FILE _____ PC MINTEQA2 v3.10 DATE OF CALCULATIONS: 4-MAR-97 TIME: 7: 4:45

FLAMBEAU MINING COMPANY - Equilibration 2 CO2 entered at 10% (0.10 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 19.1600 -0.5300 4 1 8.4750 2.5850 5015001 1.000E-02 5 6 5.4800 15.6100 5023101 5016000 13.7400 0.5800 10.9900 5047000 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

ŝ,

ģ.

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)

ť.

______ IMPROVED ACTIVITY GUESSES PRIOR TO FIRST ITERATION: | SO4-2 Log activity guess: -1.90 Log activity guess: -9.95 Al+3 Log activity guess: -4.99 Cu+2 Fe+2 Log activity guess: -3.40 -3.79 Mn+2 Log activity guess: CO3-2 Log activity guess: -5.17 ______

PC MINTEQA2	v3.10 I				UTPUT F: : 4-MAI		: 7:4	:46	
	DEDOEN	TAGE DISTR	TRUTT	N O	F COMPO	JENT'S AMON	IC.		
		nd TYPE II		-	-				
I +1		1.7	PE	ERCE	NT BOUNI) IN SPECI	ES #150	L400	CaHCO:
*									
		PERCENT							
	46.5	PERCENT	BOUND	IN	SPECIES	#3301401	H2CO3	AQ	
304-2		66.9	PE	ERCE	NT BOUN	D IN SPECI	ES #	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	PI	ERCE	NT BOUN	O IN SPECI	ES # 30	3301	Al (OH
-	2.6	PERCENT	BOUND	IN	SPECIES	# 303302	Al (OH)4 -	
		PERCENT							
							•	~	
2d+2		50.7	PI	ERCE	NT BOUN	D IN SPECI	ES #	160	Cd+2
	24.3	PERCENT	BOUND	IN	SPECIES	#1607320	CdSO4	AQ	
	17.4	PERCENT	BOUND	IN	SPECIES	#1601400	CdHCO:	3 +	
	5.2	PERCENT	BOUND	IN	SPECIES	#1601401	CdC03	AQ	
	2.4	PERCENT	BOUND	IN	SPECIES	#1607321	Cd (SO	4)2-2	
In+2		54.3	PI	SRCE	NT BOUN	D IN SPECI	ES #	950	Zn+2
	20.8	PERCENT	BOUND	IN	SPECIES	#9507320	ZnSO4	AQ	
	1.5	PERCENT							
	18.7	PERCENT	BOUND	IN	SPECIES	#9501400	ZnHCO	3 +	
	4.4	PERCENT	BOUND	IN	SPECIES	#9501401	ZnCO3	AQ	
2u+2		19.8	PI	ERCE	NT BOUN	D IN SPECI	IES #	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	CuHCO	3 +	
re+2		79.3	PI	ERCE	NT BOUN	D IN SPECI	IES #	280	Fe+2
	20.6	PERCENT	BOUND	IN	SPECIES	#2807320	FeSO4	AQ	
1q+2		75.2	PI	ERCE	INT BOUN	D IN SPECI	ES #	460	Mq+2
-	3.0					#4601401			~
	21.8					#4607320	-		
1n+2		74.8	PI	ERCE	INT BOUN	D IN SPEC	ES #	470	Mn+2
	21.2					#4707320			
		_	-						

8

:

ومالية والإساط

..... į

ł

100 C 100

2010-2010-201

and and

22

. .

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
ł			
	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	

ţ

PART 5 OF OUTPUT FILE PC MINTEQA2 v3.10 DATE OF CALCULATIONS: 4-MAR-97 TIME: 7:4:46

----- PROVISIONAL MASS DISTRIBUTION ------

IDX	NAME	DISSOL	VED	SORBE	D	PRECIPI	TATED
		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

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	Sto	ichiomet	ry in [t	racket	s]	
6003001 AL4 (OH) 1	LOSO4 5.766	[-10.000]	330 [4.000]	30	[1.000]	732
		[10.000]	2				
2003001 BOEHMITH	5 1.707	[-3.000]	330 [1.000]	30	[2.000]	2
5015001 CALCITE	0.000	[1.000]	150 [1.000]	140		
2003002 DIASPORE	2 3.501	[-3.000]	330 [1.000]	30	[2.000]	2
2003003 GIBBSITE	E (C) 1.651	[-3.000]	330 [1.000]	30	[3.000]	2
5015001 GYPSUM	0.069	[1.000]	150 [1.000]	732	[2.000]	2
5028000 SIDERITE	1.024	[1.000]	280 [1.000]	140		
5047000 RHODOCHE	ROSIT 0.635	[1.000]	470 [1.000]	140		
5016000 OTAVITE	0.410	[1.000]	160 [1.000]	140		
5023101 MALACHIT	TE 0.201	[2.000]	231 [2.000]	2	[1.000]	140
		[-2.000]	330				
3028001 HERCYNI	TE 2.130	[-8.000]	330 [1.000]	280	[2.000]	30
		[4.000]	2				
PC MINTEQA2 v3.1	LO DATE OF CALC	ULATIONS:	4-MAR-9	97 TIME:	7:4	4:46	

ITERATIONS= 7: SOLID SIDERITE PRECIPITATES

		P#						<u>-</u>		
PC MINTEQA2	v3.10 1	DATE OF CAI	LCULATI	ONS :	4 - MAI	R-97	TIME:	7:4	:49	
	ספסרפי	NTAGE DISTR		NOF	COMPOI	VENTO		2		
		nd TYPE II								
			-							a.
H+1 +		1.6	PE	RCEN	T. BOUN	D IN	SPECIE	S #150.	1400	CaHCO3
т	51.4	PERCENT	BOUND	IN S	PECIES	#330	1400	нсоз	-	
		PERCENT								
Zn+2		54.8	PE	RCEN	T BOUN	D IN	SPECIE	IS #	950	Zn+2
	19.3	PERCENT								
	1.3	PERCENT								
	19.7	PERCENT								
	4.8	PERCENT	BOUND	IN S	PECIES	#950	1401	ZnCO3	AQ	
Mg+2		76.4	PE	RCEN	T BOUN	D IN	SPECIE	s#	460	Mg+2
-	3.2	PERCENT	BOUND	IN S	PECIES	#460	1401	MgHCO:	3 +	-
	20.3	PERCENT	BOUND	IN S	PECIES	#460	7320	MgSO4	AQ	
Cu+2		19.0	PE	RCEN	T BOUN	D IN	SPECIE	s #	231	Cu+2
	44.8	PERCENT	BOUND	IN S	PECIES	#231	1400	CuCO3	AQ	
	2.6	PERCENT	BOUND	IN S	PECIES	#231	3301	Cu (OH)2 AQ	
	5.9	PERCENT	BOUND	IN S	PECIES	#231	7320	CuSO4	AQ	
	27.2	PERCENT	BOUND	IN S	PECIES	#231	1402	CuHCO	3 +	
504-2		67.5	PE	IRCEN	T BOUN	D IN	SPECIE	:s #	732	SO4-2
	8.5	PERCENT	BOUND	IN S	PECIES	#460	7320	MgSO4	AQ	
	23.9	PERCENT	BOUND	IN S	PECIES	#150	7320	CaSO4	AQ	
Cd+2								s #		Cd+2
		PERCENT								
		PERCENT								
		PERCENT								
	2.0	PERCENT	BOUND	IN S	PECIES	#160	7321	Cd (SO	4)2-2	
Fe+2		80.7	PE	RCEN	T BOUN	D IN	SPECIE	2s #	280	Fe+2
	19.3	PERCENT	BOUND	IN S	PECIES	#280	7320	FeSO4	AQ	
Al+3		19.9	PE	RCEN	T BOUN	D IN	SPECIE	IS # 30.	3301	Al (OH)
+										
	2.6	PERCENT	BOUND	IN S	PECIES	# 30	3302	Al (OH)4 -	
	76.7	PERCENT	BOUND	IN S	PECIES	# 3C	3303	Al (OH)3 AQ	
Mn+2		75.9	PE	RCEN	T BOUN	D IN	SPECIE	es #	470	Mn+2
	19.8	PERCENT	BOUND	IN S	PECIES	#470	7320	MnSO4	AQ	
	4.3	PERCENT	BOUND	IN S	PECIES	#470	1400	MnHCO	3 +	

in the second of the

Н2О		1.5 PERCENT BOUND IN SPECIES #3300020 OF	-1-
	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	a+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 Mg	д НСОЗ
÷			
	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	

heaters.

PART 5 of OUTPUT FILE PC MINTEQA2 v3.10 DATE OF CALCULATIONS: 4-MAR-97 TIME: 7:4:49

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

IDX	NAME	DISSOL	VED	SORBE	D	PRECIPI	TATED
		MOL/KG	PERCENT	MOL/KG	PERCENT	MOL/KG	PERCENT
330	H+l	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

à.

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 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		Sto	ichic	met:	ry in []	orack	ets	3]	
2003000	ALOH3 (A)	-1.718	I	1.000]	30]	3.000]	2	1	-3.000]	330
6003000	ALOHSO4	-3.024	I	-1.000]	330	[1.000]	30	[1.000]	732
			I	1.000]	2						
6003001	AL4 (OH) 10SO4	-0.905	Γ	-10.000]	330	[4.000]	30	[1.000]	732
			[10.000]	2						
6015000	ANHYDRITE	-0.313	Ľ	1.000]	150	[1.000]	732			
501,5000	ARAGONITE	-0.173	[1.000]	150	Ĩ	1.000]	140			
5046000	ARTINITE	-8.787	Ε	-2.000]	330	[2.000]	460	[1.000]	140
			Ε	5.000]	2						
2003001	BOEHMITE	0.057	E	-3.000]	330	[1.000]	30	[2.000]	2
2046000	BRUCITE	-7.090	Ε	1.000]	460	[2.000]	2	Ē	-2.000]	330
5015001	CALCITE	0.000	E	1.000]	150	Ε	1.000]	140			
2003002	DIASPORE	1.851	E	-3.000]	330	I	1.000]	30	[2.000]	2
5015002	DOLOMITE	-0.448	Γ	1.000]	150	[1.000]	460	Ē	2.000]	140
6046000	EPSOMITE	-3.035	[1.000]	460	[1.000]	732	Ι	7.000]	2
2003003	GIBBSITE (C)	0.000	[-3.000]	330	Ε	1.000]	30	[3.000]	2
3003000	A1203	-4.280	[2.000]	30	E	3.000]	2]	-6.000]	330
6015001	GYPSUM	0.000	ſ	1.000]	150	Ĩ	1.000]	732	[2.000]	2
5015003	HUNTITE	-5.553	Γ	3.000]	460	[1.000]	150	[4.000]	140
5046001	HYDRMAGNESIT	-17.461	[5.000]	460	[4.000]	140	Ι	-2.000]	330
]	6.000]	2		-		-	_	
5046002	MAGNESITE	-0.942	[1.000]	460	[1.000]	140			
6028000	MELANTERITE	-4.804	ſ	1.000]	280]	1.000]	732	[7.000]	2
5046003	NESQUEHONITE	-3.341	Ε	1.000]	460	[1.000]	140	[3.000]	2
5028000	SIDERITE	0.000	E	1.000]	280	[1.000]	140			
2047003	PYROCROITE	-7.426	Ε	-2.000]	330	[1.000]	470	[2.000]	2
5047000	RHODOCHROSIT	0.000	E	1.000]	470	ĺ	1.000]	140			
6047000	MNSO4	-10.431	Ε	1.000]	470	I	1.000]	732			
5023100	CUCO3	-2.498	[1.000]	231	[1.000]	140			
2023100	CU (OH) 2	-1.983	Γ	-2.000]	330]	1.000]	231	Ι	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	I	6.000]	2
]	1.000]	732						
6023102	LANGITE	-5.221	Ι	-6.000]	330	[4.000]	231	[7.000]	2
			[1.000]	732						
2023101	TENORITE	-0.962	I	-2.000]	330]	1.000]	231	[1.000]	2
6023103	CUOCUSO4	-13.949	I	-2.000]	330	[2.000]	231	[1.000]	2
			l	1.000]	732						
6023104	CUSO4	-12.031	ſ	1.000]	231	[1.000]	732			
6023105	CHALCANTHITE	-5.884	I	1.000]	231	[1.000]	732	[5.000]	2
5095000	SMITHSONITE	-1.310	[1.000]	950]	1.000]	140			
5095001	ZNCO3, 1H2O	-0.940	l	1.000]	950]	1.000]	140	[1.000]	2

42

ID #	NAME	Sat. Index		Sto	ichic	met	ry in [brack	ets	1	
2095000	ZN (OH) 2 (A)	-4.476	F	-2.000]		[1.000]			2.000]	2
2095001	ZN (OH) 2 (C)	-4.226	-	-2.000]		[1.000]		Ĩ	2.000]	2
	ZN (OH) 2 (B)	-3.776	-	-2.000]		ſ	1.000]		Ē	2.000]	2
	ZN (OH) 2 (G)	-3.736	-	-2.000]		ĺ	1.000]		Ē	2.000]	2
	ZN(OH)2 (E)	-3.526		-2.000]		[1.000]		ſ	2.000]	2
	ZN2 (OH) 2SO4	-7.157	-	-2.000]		ſ	2.000]		ĺ	2.000]	2
			[1.000]		L	2.000]	200		2.0003	-
6095001	ZN4 (OH) 6504	-12.109	-	-6.000]		[4.000]	950	E	6.000]	2
		10.109	[1.000]	732	L	1.000]	220	L	0.0001	4
2095005	ZNO (ACTIVE)	-3.336	ſ		330	[1.000]	950	ľ	1.000]	2
	ZINCITE	-3.722	-	-2.000]		[1.000]		[1.000]	2
	ZN30(S04)2	-27,884		~2.000]	330	ĺ	3.000]		[2.000]	
		27.001	Ē	1.000]	2	Ľ	1.0001	220	L	2.0005	201
6095003	ZINCOSITE	-11.129	[-	_	[1.000]	720			
	ZNSO4, 1H2O	~7.331	[1.000]		ſ	1.000]		[1,000]	2
	BIANCHITE	-5.871	ſ	-		[1.000]		ן [6.000]	2
	GOSLARITE	-5.588	1	1.000]		۲ آ	1.000]		ſ	8.000] 7.000]	2
	OTAVITE	0.000	[1.000]		[1.000]		L	/.000]	2
	CD (OH) 2 (A)	-8.810	-	-2.000]		۲ [1.000]		ſ	2.000]	2
	CD (OH) 2 (C)	-8.202		-2.000]		[1.000]		L [2.000]	2
	CD3 (OH) 4SO4	-21.820		-4.000]		ι Γ	3.000]	160	L [2.000] 4.000]	2
	020 (000) 1001	21.020	ſ	1.000]	732	L	5.000]	100	L	4.000]	4
6016001	CD30H2 (SO4) 2	-21.575	•	-2.000]		ſ	3.000]	160	[2.000]	2
	0000112 (001/2	22.070	ſ	2.000]	732	L	5.000]	100	L	2.000	2
6016002	CD4 (OH) 6 SO4	-22.212	ſ	-	330	ſ	4.000]	160	ſ	6.000]	2
			1	1.000]		1	4.000]	100	L	0.000]	2
2016002	MONTEPONITE	-10.302	-	-2.000]		Ε	1.000]	160	Ε	1.000]	2
6016003		-10.431	Ī	1.000]	160	ſ	-	732	L	1.0001	2
	CDSO4, 1H2O	-8.691	[1.000]	160	[1.000]	732	ſ	1.000]	2
	CDSO4,2.7H20	-8.393	[1.000]	160	Į		732	[2.670]	2
	MALACHITE	0.000	ĺ	2.000]		[2.000]	2	[1.000]	_
		0.000	-	-2.000]	330	L	2.0001	2	L	1.000]	140
5023102	AZURITE	-0.896	ſ	3.000]		[2.000]	2	[2.000]	140
		0.000	•	-2.000]	330	L	2.000]	2	ι	2.000]	140
2015000	LIME	-23.223	-	~2.000]	330	[1.000]	150	[1.000]	2
	PORTLANDITE	-12.705		-2.000]	330	ſ		150	[2.000]	2
2028000		-3.801	-	-2.000]	330	[0.947]		[1.000]	∠ 2
	PERICLASE	-12.070	-	-2.000]	330	ĩ	1.000]			-	2
	HERCYNITE	-2.196	-	-8.000]	330	1 F	1.000]	460 280	С Г	1.000] 2.000]	
5020001		2.120	ľ	4.000]	330 2	L	T.000]	200	L	2.000]	30
3046000	SPINEI.	-9.539	-	-8.000]	∠ 330	1	1.000]	460	ſ	2 0003	20
2010000	55 TH TH		ſ	4.000]	330 2	L	T.000]	460	L	2.000]	30
			ι	4.000]	4						

• .

ī.

.

43

i

.



ריז ד נ

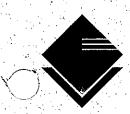
. i

. . .

с J

2.1

2737 South Ridge Road Po. Box 19012 Green Bay, WI 54307-9012 414-497-2500 Fax: 414-497-8516





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.

MLD2\96F022\GBAPP\46229.61\4000

2737 South Ridge Road · P.O. Box 19012 · Green Bay, WI 54307-9012 · 414-497-2500 · Fax: 414-497-8516

Acid Consumption Tests

1

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

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

MLD2\96F022\GBAPP\46229.61\4000

or:

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.

Test Results

1.1

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 CaCO₃/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.

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

Deny W. faile Jerry W. Sevick, P.E.

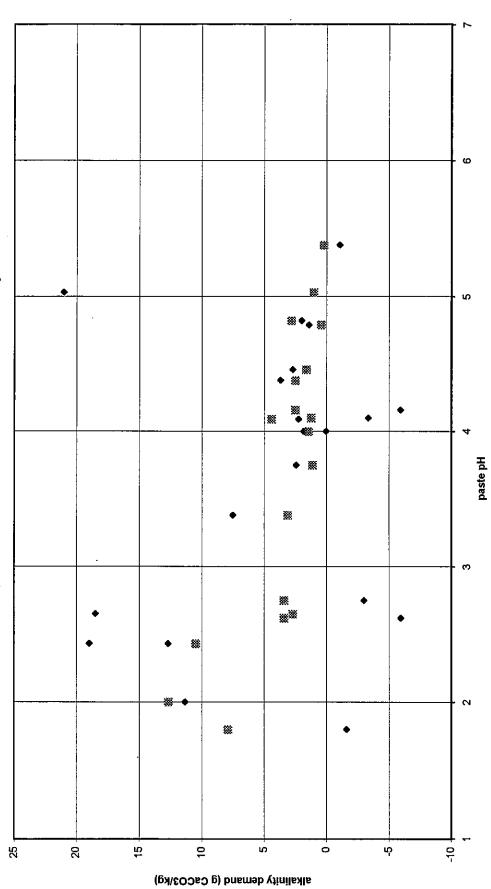
Vice President

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



Acidity consumption test

WAlkali demand test

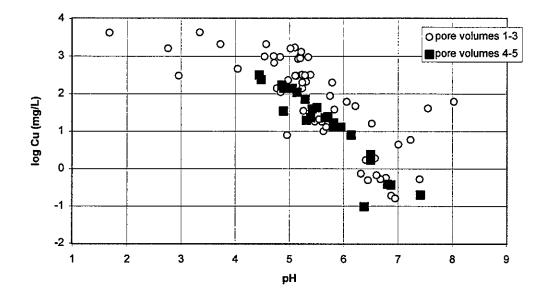
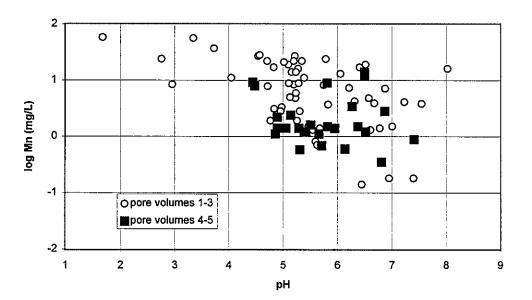


Figure 2 Copper Concentrations in Column Tests

Figure 3 Manganese Concentrations in Column Tests



.

Summary Data and Calculations for Acid Consumption Tests on Starter Material

				ACIDIFICATION					BAC	BACK-TITRATION			
Sample	Sample Mass	Acid Volume	H ₂ SO ₄ Strength		Acid Added		Volume	Base to pH 8.3	NaOH Strength		Base Added		. Sample Alkalinity
		ml		mol CaCO ₃ eq	g CaCO ₃	mg CaCO ₃ /g	E	Ē	N	mol CaCO ₃ eq	g CaCO ₃	mg CaCO ₃ /g	mg CaCO ₃ /g
SM 4-1	50.1	748.2	010.0	0.0075	0.748	14.9	100	12.10	1660'0	090000	0.0600		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		•
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		-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		0.748	14.9	100	12.10	1660.0	0.00060	0.0600	8.9	6.0
SM 181	50.1	744.3	0.010		0.744	14.9	100	30.35	1660.0	0.00150	0.1504	22.3	-7.5
SM 183	50.0	742.1	0.010		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		0.742	14.7	001	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-
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

Summary Data and Calculations for Acid Consumption Tests on Residues from Limestone Amended Columns

			•	ACIDIFICATION					BACI	BACK-TITRATION			
	Sample	Acid	H ₂ SO ₄				Volume I	Base to pH	NaOH				Sample
Sample	Mass	Volume	Strength	4	Acid Added		Titrated	8.3	Atregth	H	Base Added		Alkalinity
	g	ľ	mol/L	mol CaCO ₃ eq	g CaCO ₃	mg CaCO ₃ /g	ml	ml	N	mol CaCO ₃ eq	g CaCO3	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	1660.0	0.00047	0.0471	7.1	8.0
LS 176	50.5	745.1			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	9.9
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		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		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	1660.0	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

SRK/MLD2\96F022\TABLES~1.XLS\Tables 1-3\10000

Summary Data and Calculations for Acid Consumption Tests on Residues from Lime Amended Columns

			~	ACIDIFICATION					BAC	BACK-TITRATION			
•	Sample	Sample Acid	H ₂ SO ₄				Volume E	/olume Base to pH	NaOH				Sample
Sample	Mass	Volume Strength	Strength	1	Acid Added		Titrated	8.3	Strength	I	Base Added		Alkalinity
	8	ш	mol/L	mol CaCO3 eq g	g CaCO ₃	mg CaCO ₃ /g	ml	ш	N	mol CaCO ₃ eq g CaCO ₃		mg CaCO ₃ /g	Ξ
LM 4-1	50.4	743.2	0.010	0.0074	0.743	14.7	100	18.25	0.0979			13.2	
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

SRK/MLD2\96F022\TABLE5~1.XLS\Tables 1-3\10000

•

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
<u></u>	s.u.			(mg CaC	CO 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		
<u>LS 15-1</u>	2.00	-10.95	15.53	-0.01	4.60	4.63	<u>-0.03</u>
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
<u>LS 172</u>	4.00	-1.79	1.93	-0.79	0.93	0.67	<u>0.25</u>
LS 172 Dup	4.00	0.00	1.93	-0.79	2.72	7.97	-5.25
<u>LS 176</u>	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
<u>LS 188</u>	4.82	-1.95	1.78	-0.47	0.30	0.67	<u>-0.37</u>
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
<u>LS 194</u>	3.75	-2.05	1.41	-0.46	-0.18	0.58	<u>-0.77</u>
<u>LS 213</u>	2.75	3.03	4.48	-0.43	7.94	7.32	<u>0.62</u>

.

.

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 CaC	CO ₃ /g)		
SM 4-1	2.62	-3.40	4.51	-0.11	1.22	÷	
<u>LS 8-1</u>	2.65	-2.70	4.33	-0.07	1.70	2.06	<u>-0.36</u>
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
<u>LS 172</u>	4.00	-1.40	1.93	-0.79	1.32	0.67	<u>0.65</u>
LS 172 Dup	4.00	-1.40	1.93	-0.79	1.32	7.97	-6.65
<u>LS 176</u>	4.38	-2.50	2.82	-0.55	0.87	0.24	<u>0.63</u>
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
<u>LS 183</u>	4.10	-1.20	1.41	-0.72	0.93	0.53	<u>0.40</u>
LS 186	4.09	-4.40	5.35	-0.08	1.03	-9.64	10.67
<u>LS 187</u>	5.03	-1.00	1.51	-0.53	1.04	1.04	<u>0.00</u>
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
<u>LS 194</u>	3.75	-1.10	1.41	-0.46	0.77	0.58	<u>0.18</u>
LS 213	2.75	-3.40	4.48	-0.43	1.51	7.32	-5.81

•

-

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.			(m	g 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

•

.

Limestone Availability by Mass Balance Method 1

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.			(m	g 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

	Initial Alkalinity from					
Sample	Alkali Demand Test	Alkalinity Released from Column	Acidity Treated	Limestone Addition to Column	Estimated Limestone Availability	Comments
		(mg CaCO	03/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

Limestone Availability by Method Used in March 1997 Report

Attachment 1

Modified Acid Consumption Test Protocol

MLD2\96F022\GBAPP\46229.61\4000

 $\langle \cdot \rangle$

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
		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

MLD2\96F022\GBAPP\46229.61\4000

()

		buret (mi 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
\bigcirc	SM 180	PH 2.4 2.53 2.54 2.55 2.56 2.57 2.56 2.57 2.56 2.57 2.56 2.57 2.56 2.57 2.56 2.57 2.56 2.57 2.56 2.57 2.56 2.57 2.57 2.57 2.58
\bigcirc		burret (m) 0 1.1 1.1 1.1 1.1 1.1 1.1 1.1
	SM 176	$\begin{array}{c c} \hline PH \\ \hline PH \hline \hline PH \\ \hline PH \hline \hline PH \\ \hline PH \hline \hline PH \\ \hline PH \hline $
		burdt (m) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
	SM 172	$\begin{array}{c c} \hline pH \\ \hline 1.87 \\ \hline 1.87 \\ \hline 1.87 \\ \hline 1.87 \\ \hline 1.87 \\ \hline 1.87 \\ \hline 1.87 \\ \hline 1.91 \\ \hline 2.05 \\ \hline 2.0$
		burtet (m) 0 1.5 1.5 1.5 1.1 1.1 1.1 1.1 1.1
	SM 170	$\begin{array}{r c c c c c c c c c c c c c c c c c c c$
	SM 15-3	buret (mi 4.1 4.1 8.05 10.2 11.1 15.6 17.65
		PH 2.17 2.17 2.17 2.23 2.254 2.253 2.254 2.253 2.253 2.254 2.254 2.254 2.254 2.254 2.254 2.254 2.254 2.254 2.254 2.254 2.254 2.254 2.254 2.254 2.254 2.254 2.254 2.254
		buret (m) 7.8 7.8 7.8 11.7 12.6 11.7 12.6 11.7 12.6 11.7 12.6 13.7 14.6 15.9 11.7 12.8 13.9 14.6 15.9 15.9 16.0 17.5 17.5 18.9 19.9 11.7 12.8 13.9 14.6 15.9 15.9 16.0 17.5 17.5 18.5 19.6 11.7 11.7 12.8 13.4 12.5 13.5 13.5 14.6 15.7 15.7 16.8 17.7 17.7 18.7 19.8
	1-51 MS	pH 1.86 1.87 1.86 1.86 1.86 1.86 1.86 1.86 1.86 1.86 1.86 1.86 1.86 1.86 1.86 1.87 1.86 1.18 1.18 1.18 1.18 1.18 1.18 1.18 1.18 1.18 1.18 1.18 1.18 1.18 1.18 1.18 1.19 1.11 1.12 1.12 1.13 1.13 1.13 1.13 1.13 1.13 1.14 1.15 1.15 1.15 1.15 1.110 1.110
	aua	Burret (ml) 0 1.2 2.1 2.1 2.1 3.2 3.2 3.2 3.2 3.2 3.2 3.2 3.2 3.2 3.2 3.2 3.2 3.105
	SM 13-1 D(PH PH 2.238 2.245 2.25 2.25 2.25 2.25 2.25 2.25 2.25 2.25 2.25 2.25 2.25 2.25 2.25 2.25 2.25 2.25 2.25 2.25 2.25 2.25 2.25 2.25 2.25 2.25 2.25 2.25 2.25 2.25 3.31 2.25 3.32 3.32 3.32 3.32 3.33 3.32 3.33 3.32 3.33 3.32 3.33 3.32 3.33 3.32 3.33 3.32 3.33 3.32 3.34 3.32 3.35 3.32 3.44 3.33 3.45 3.33 3.45 3.33 3.45 3.33 3.45
		$\frac{1}{1000} \frac{1}{10000} = \frac{1}{10000000000000000000000000000000000$
	SM 13-1	$\begin{array}{r c c c c c c c c c c c c c c c c c c c$
		burtet fburtet 1.7 1.7 1.7 1.7 1.7 1.7 1.7 1.7 1.7 1.7 1.7 1.7 1.7 1.7 1.7 1.7 1.7 1.7 1.7 1.7 1.7 1.1 1.7 1.1 1.7 1.1 1.1
	I-8 WS	$\begin{array}{r c c c c c c c c c c c c c c c c c c c$
\bigcirc		buret (m) 0 1 2 3 5.1 6.5 6.5 8.55 9.45 10.1 11.2 11.9 11.1 11.2 11.2 12.1 12.1
	SM 4-1	pH 2.32 2.33 2.46 3.11 2.55 3.11 3.11 2.55 3.11 3.11 2.55 3.11 </th

.

.

-

	buret (ml]0	- (2.9	4.05	4.9	7.15	80	9.05	10	= 9	1 1	13.4	13.7	14	15.1	15.4	15.65	15.8	56.51 1.21	10.1	C7-01																								{
SM 213		2.41	2.45	2.57	2.62	2.68	2.93	3.06	3.32	3.57	4.13	C1.4 C1.4	5.53	5.55	5.59	6.02	6.26	6.55	6.84 7.0	7.1	66.1 CF 8	710																								
	buret (m]	0	23	4 0.8	6	11.5	16.2	17.8	61	19.6	22	20.4 20.6	21	21.4	21.8	22.2	22.6	23.1 23.2	23.2																											
SM 194		1.83	1.88	2.04	2.14	2.31	2.96	3.22	4.29	4.72	5.01	17.0	5.43	5.63	5.77	5.98	6.53	8.16	8.44																		•									
	buret (m]	0		3.1	3.5	4.2	5.55	9	6.5	7.1	7.5	0.1 8 4	9.1	9.5	10	10.5	11.1	2 1 2 2	12.1	C0.21	14.15	15.4	16	16.7	17.1	17.6	18.3	18.5	18.7	18.95																
SM 192		2.66	2.76	3.03	3.13	3.27	3.63	3.78	4.22	4.52	4 67 7	C1.4 77 A	4.89	5.03	5.19	5.33	5.45	ខ្ល	37	90°°C	70'C	5.74	5.83	5.95	6.16	6.32	7.1	7.52	8.09	8.4																
	buret (ml	0	(d tu	4	5.1	~	~	6	10	= 2	1 1	5 4	14.5	15	15.5	16	<u>.</u>	2	C/1 2 01	10.5	20.5	21	21.1	21.3	21.5	21.6	21.7	21.8	21.9		1.22	223													
061 WS		1.99	1.98	2.07	2.12	2.19	235	2.46	2.6	2.79	3.06	24.C	5	5.22	5.32	5.42	5.46	10.5	3	0.0	2.0.0 2.82	6.03	6.23	6.3	6.42	6.57	6.74	6.84	6.95	7.31	7.59	C8./	836													
	buret (m)	0	— (3.2	4.1	4 6 4	6.9	8.1	9.1	9.8	10.4	11 55	12.1	12.6	13.15	13.6	14.3	14.1	CC-11	67.CI	15.05	16.3	16.9	17.3	17.8	17.9	18.4	18.9	19.2	19.6 20	22	20.4	21.1	21.4	21.8	22.3	22.7	22.9	23.1							,
SM 188	d Hq	2.28	2.31	2.39	2.43	2.47	2.6	2.69	2.8	2.89	2.97	3.18	5.5 5.5 5.5	3.36	3.5	3.62	3.96	4 t	4.7	4.88 5 05	90.5	5.41	5.53	5.59	5.55	5.55	5.64	5.7	5.73	5.77	5.83	ور ۲0 ک	6.06	6.17	6.37	6.83	7.48	1 00	8.48							{
	buret (ml	0		2.9	4	5.5 2.5		9.9	11	12	13.1	15.1	16	17.2	18.1	19.05	50	17	777	1.52	25.5	26.35	27.5	29.1	31	32	33	33.95	34.9	36.1 22	15	1.8.	6	41	42	43	43.9 AS	46.05	47.05	48.05	49	49.1	49.2	49.3 40.4	1.64	
SM 187	d Hd		1.79	1.8	1.82	1.84	1.9	1.94	1.95	1.98	2.01	2.04	2.06	2.09	2.12	2.14	2.16	7.7	2.23	07.7	17 71 91 91	2.39	2.45	2.54	2.68	2.76	2.87	2.97	3.08	3.2	3.21	45.5 7.6	438	4.74	5.11	5.3	0.4.0 7.5.2	5.63	5.85	6.35	7.86	8.08	8.2	8.45 e ke	0.00	
	buret (ml	0	2.2	5.7	7.1	5.8 2.9	(II	12.2	13.1	13.5	145	14.9	15.3	15.8	16.3	16.6	17.2	10.2	C.81	19.1	20.3	20.9	21.6	22.1	22.3	22.5	22.6	22.7	22.8	53																
SM 186		2.03	2.1	2.31	2.43	2.57	3.03	3.25	3.87	4.24	4.46 1.65	4.79	4.93	5.01	5.09	5.13	5.19	07.0	20.0	10.0	561	5.75	6.06	6.43	6.93	7.27	7.58	7.91	8.2	8.45																
	buret (m)	0	1.15	1 10	4	د م د م	7.1	7.95	9.1	1.6	10.1	10.7	Ξ	11.25	11.8	12.6	14.4	C/.4I	2.01	15.5	15.6																					i				
SM 183		2.47	2.52	2.64	2.73	2.83	3.19	3.36	3.86	4.84	5.07	5.35	5.46	5.5	5.51	5.6	5.65	(9.0 (9.0	70.0	0.7 C 8	73 8 73																									
	buret (ml	0	~ ~	6.1	8.1	01 10 05	13.95	16.05	I8	61	59.91 15	22.05	22.95	23.9	24.95	26	27.05	21.00	21.02	26.42 28.05	20.6	е С	30.05	30.15	30.2	30.3	30.35	30.55																		
SM 181		2.24	2.32	2.55	2.71	2.71		3.77	4.33	4.56	4.75 4 05	5.03	5.2	5.27	5.41	5.58	50 U	4.C	77.0	0.0 17.3	7.17	17.7	7.83	7.98	8.21	8.37	8.39	8.64																		4

· .

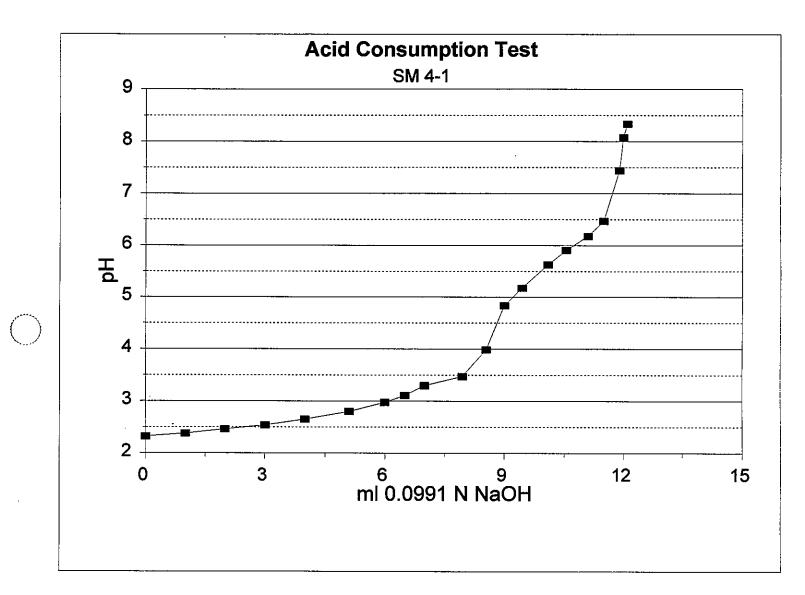
.

 \bigcirc

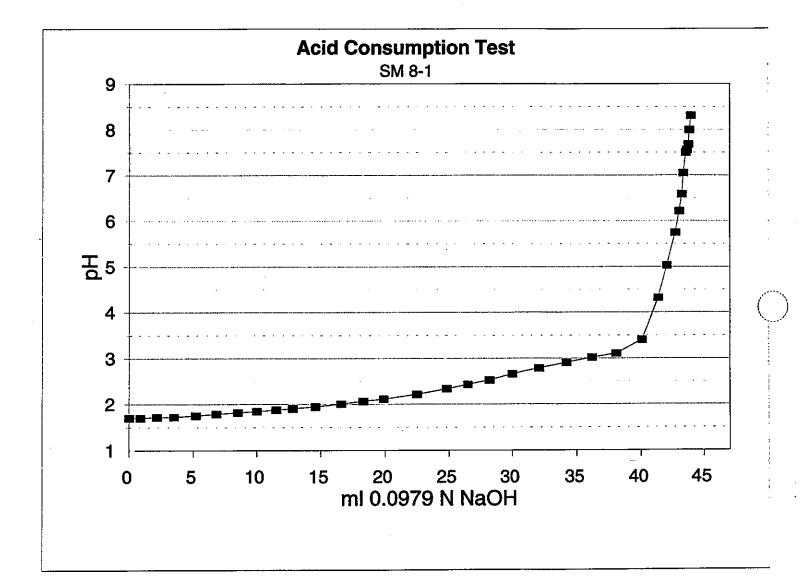
 \bigcirc

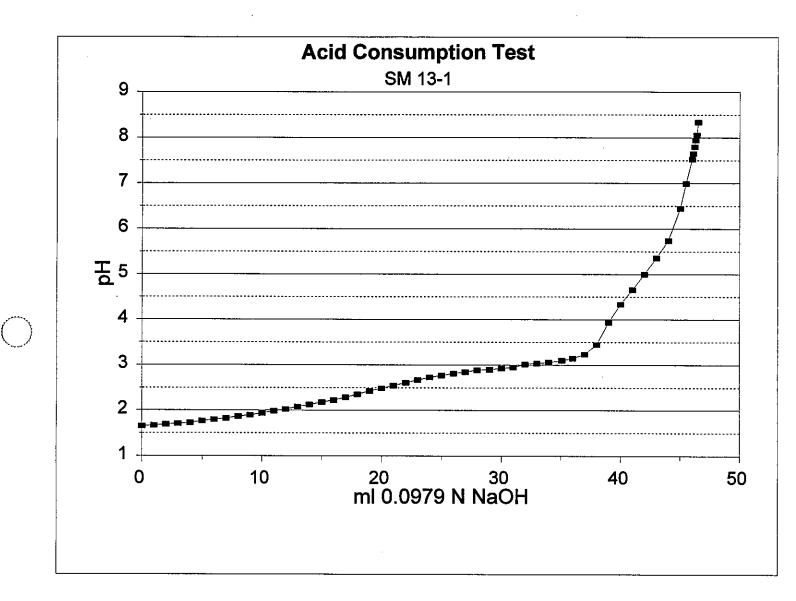
 \bigcirc

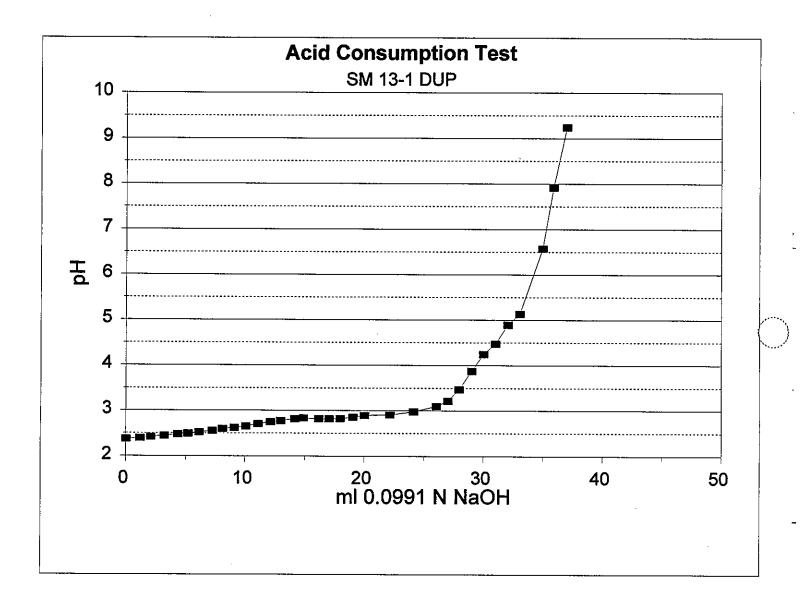
.

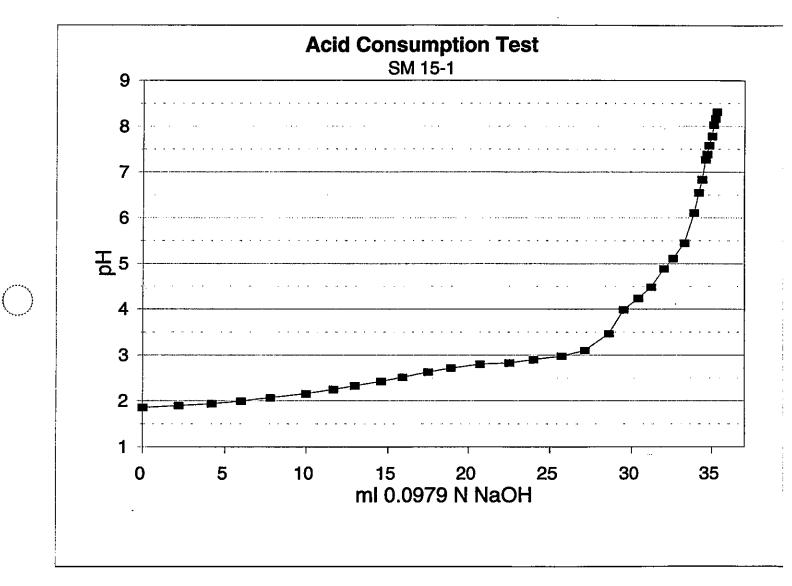


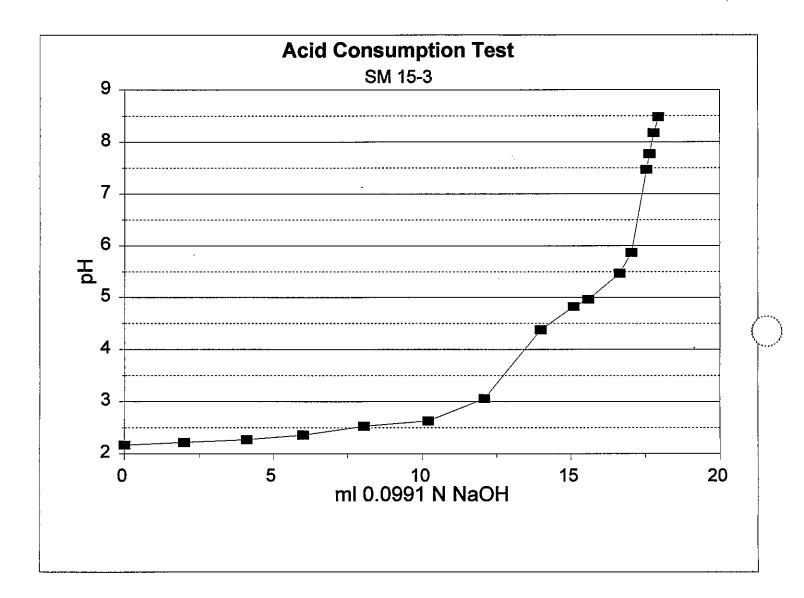
<u>.</u>



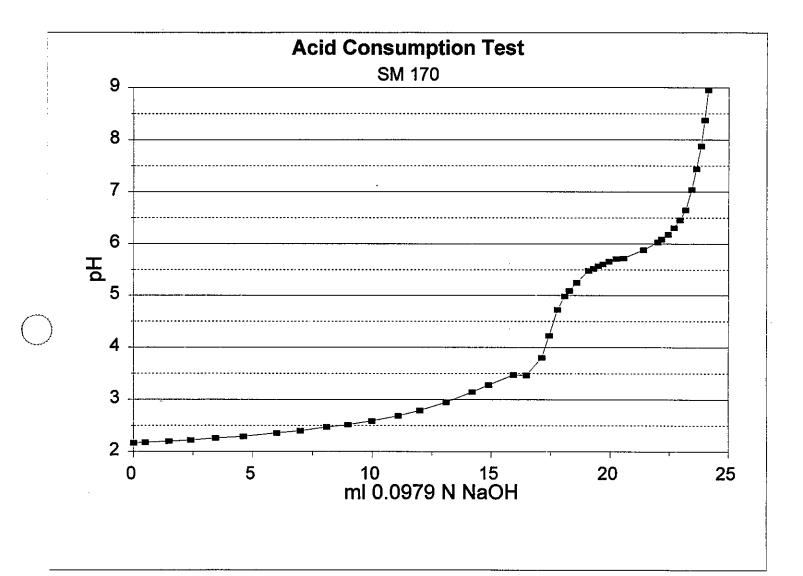


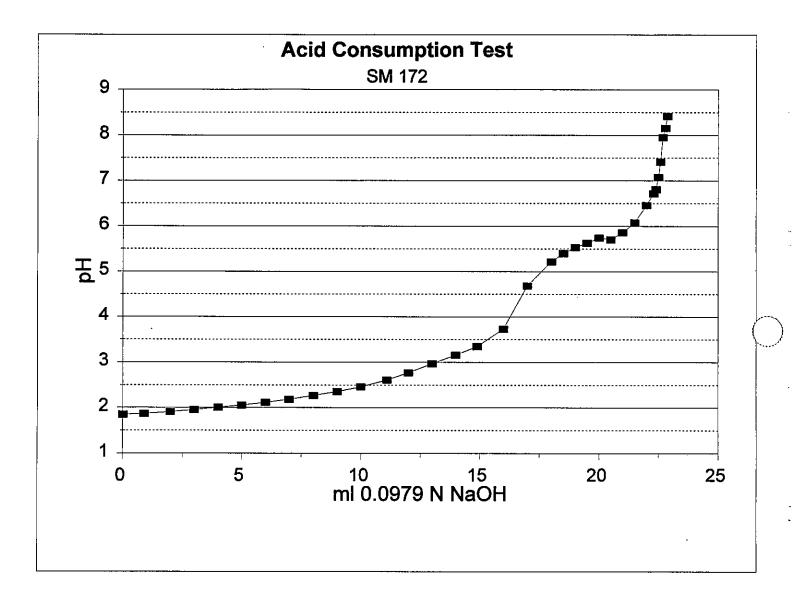




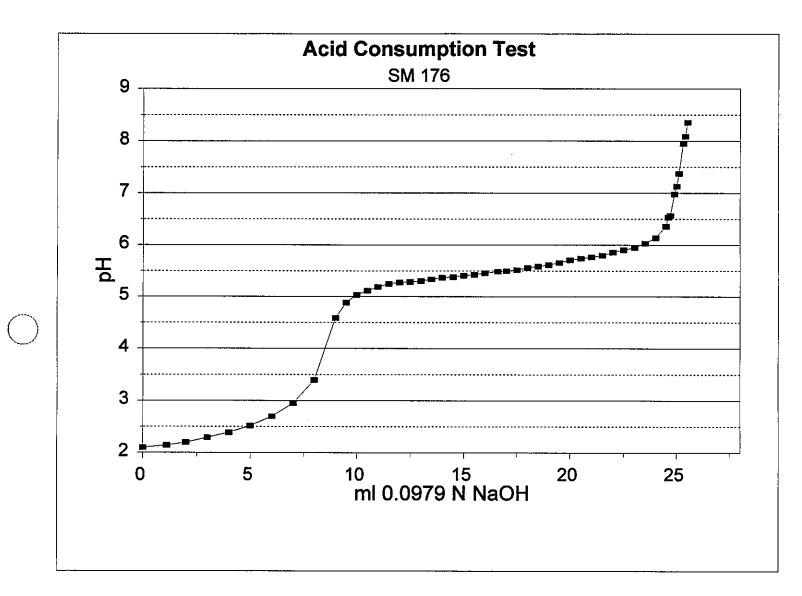


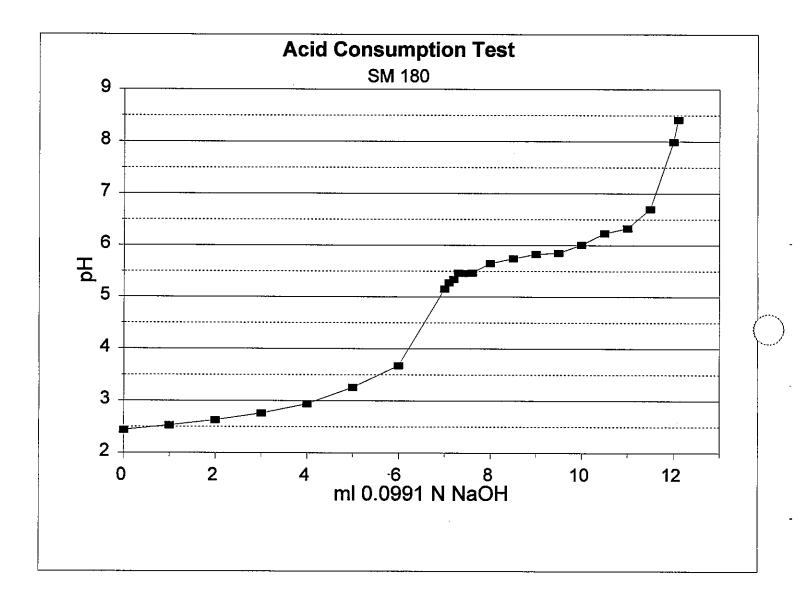
•

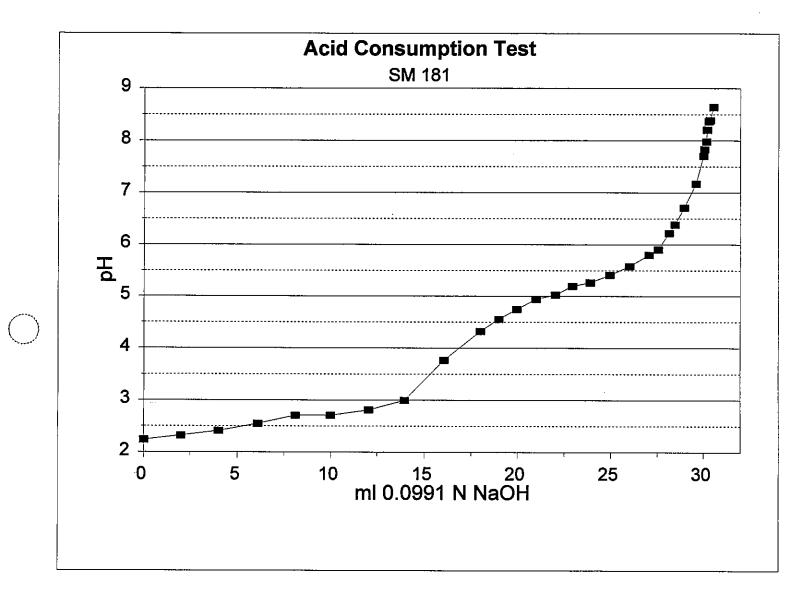


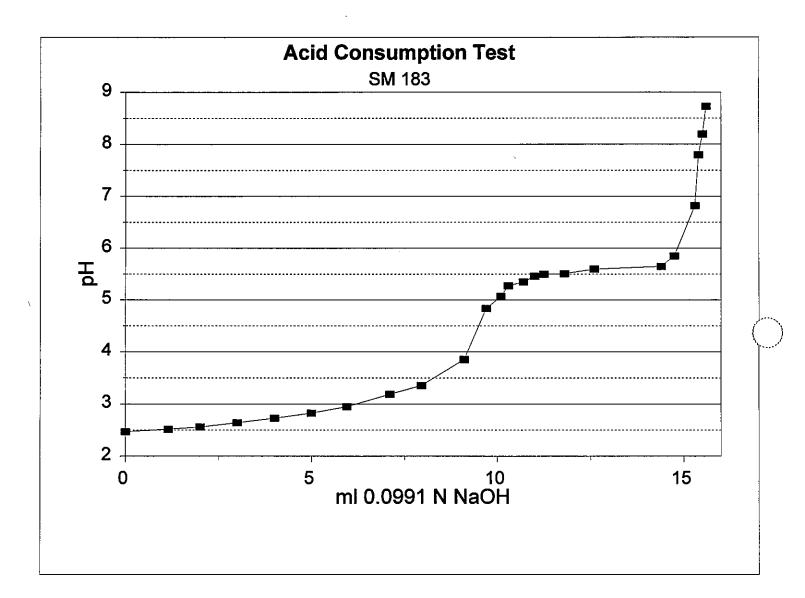


/***** ^{*}

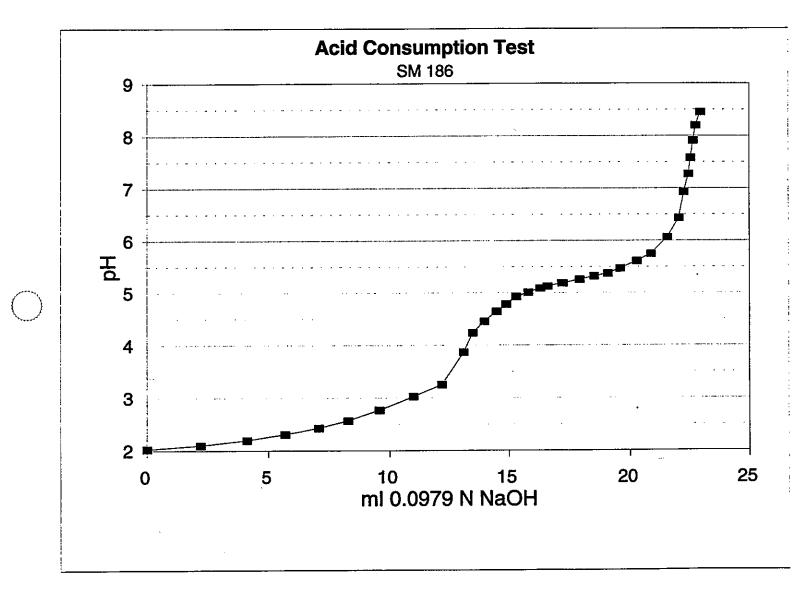




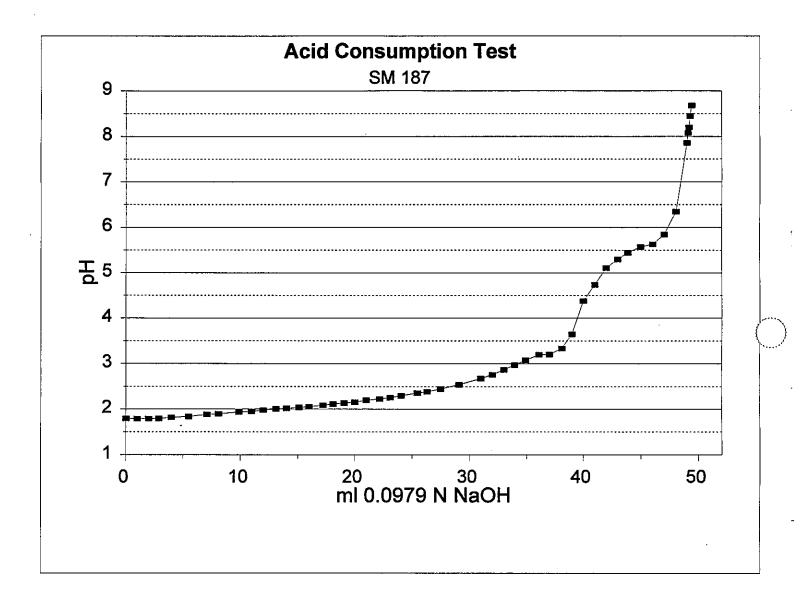


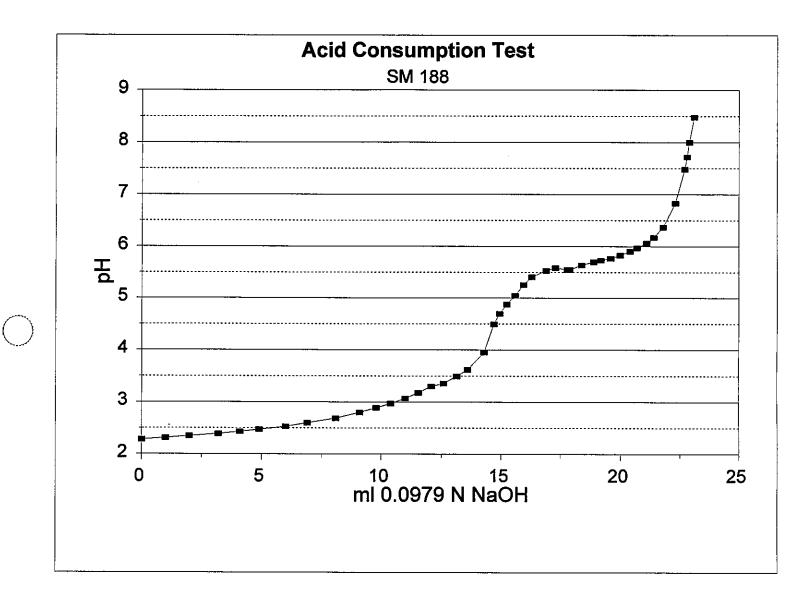


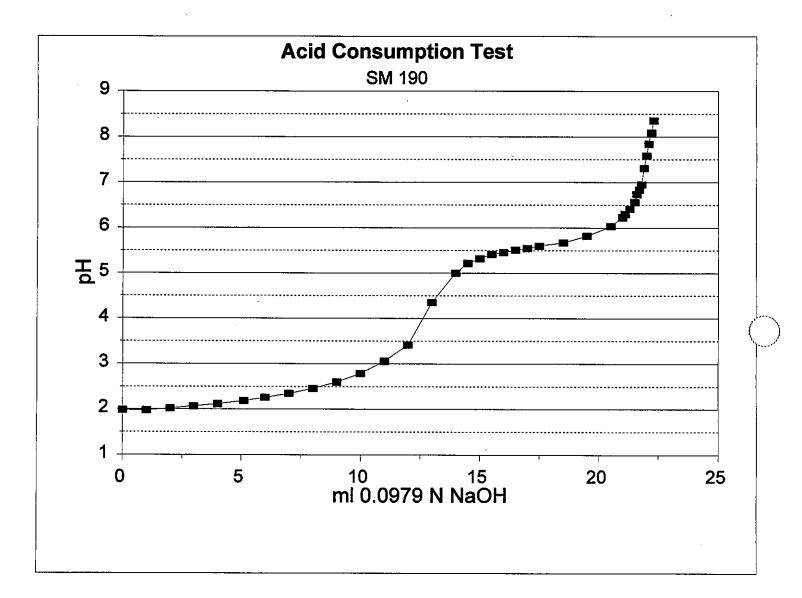
¢.

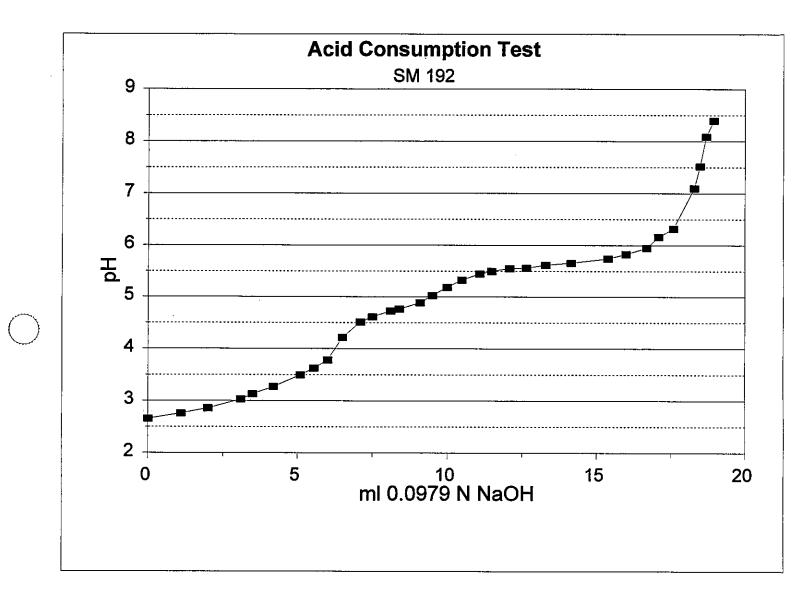


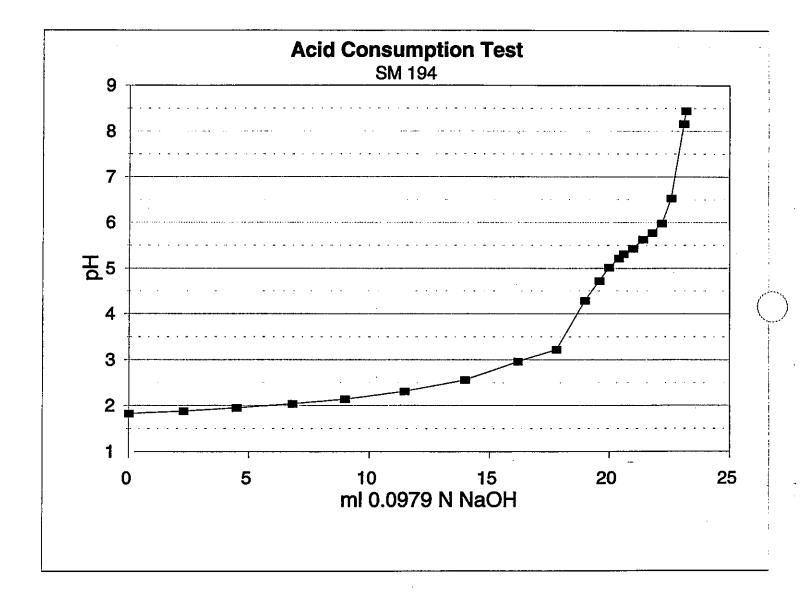
۳.

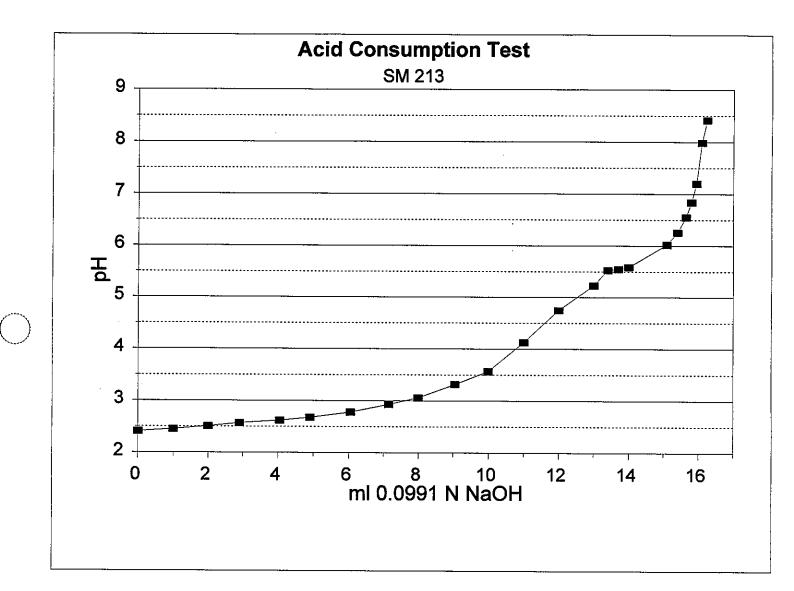












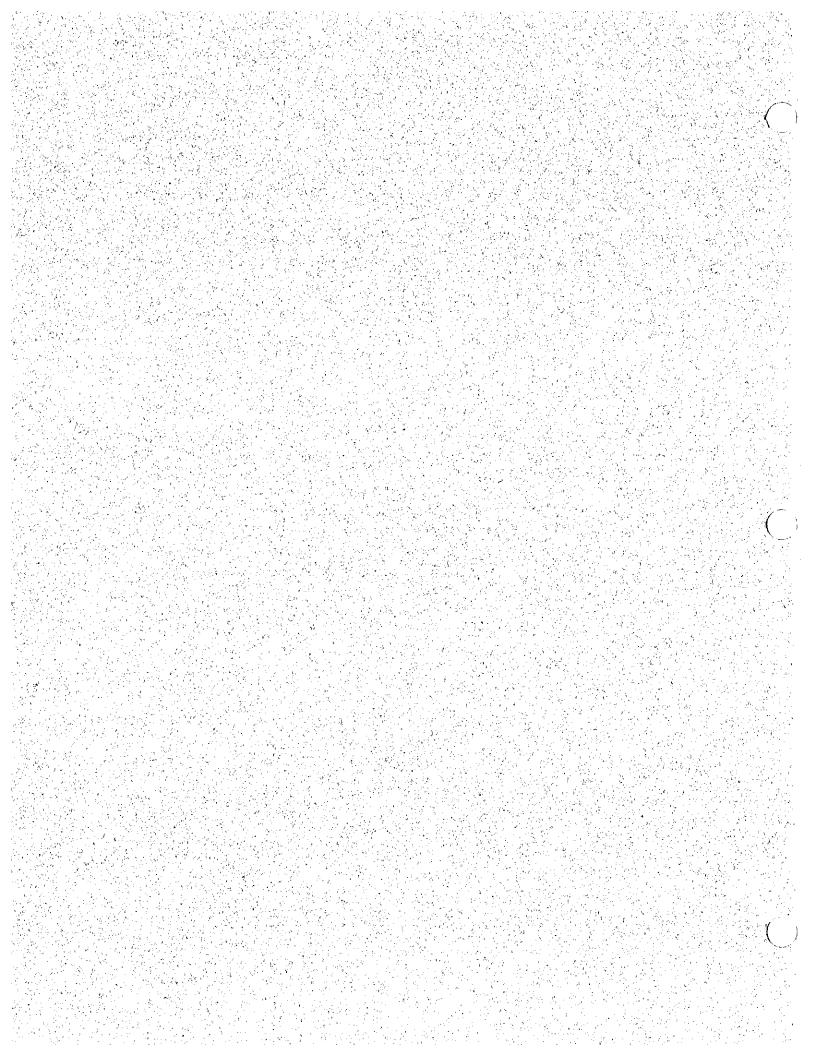
•...

Attachment 3

Acid Consumption Tests for Limestone and Lime Columns

MLD2\96F022\GBAPP\46229.61\4000

 $\left(\begin{array}{c} \\ \end{array} \right)$



)		$\begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} $
	176 LS	pH 2.47 </td
. ·		Durret (m) 1.1 1.1 2.5 2.5 2.5 2.7 2.2 9.3 9.1 9.3 9.1
	172 LS DUP	pH 2.54 2.53 2.54 2.55 2.54 2.55 2.55 2.56 2.57 2.53 2.54 2.55 2.55 2.74 2.75 </td
		burret (m) 0 1.3 4.05 4.05 4.05 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.
	172 LS	PH 2.2 <
		$\begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} $
	S1071	pH 2.13 2.14 2.13 2.14 2.13 2.14 2.15 2.14 2.15 2.14 2.15 2.15 2.14 2.15 2.14 2.15 2.14 2.15 2.14 2.15 2.14 2.15 2.14 2.14 2.14 2.14 2.15 2.14 2.14 2.14 2.14 2.14 2.14 2.14 2.14 2.14 2.14 2.14 2.14 2.14 2.15 2.14 2.15 2.16 2.17 2.18 2.19 2.10 2.10 </td
		buret (m) 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
)	15-3 Lm	pH 2.05 2.05 2.05 2.05 2.14 2.15 2.14 2.15 2.14 2.15 2.14 2.15 2.14 2.15 2.14 2.15 2.14 2.15 2.14 2.15 2.14 2.15 2.14 2.15 2.14 2.15 2.14 2.14 2.15 2.14 2.15 2.14 2.15 2.14 2.15 2.14 2.15 2.14 2.14 2.15 2.14 2.15 2.14 2.15 2.14 2.15 2.14 2.15 2.14 </td
		$\begin{array}{c} \begin{array}{c} 1.10\\ $
	15-1 LS	pH 2.33 2.34 2.35 2.35 2.36 2.37 2.33 2.34 2.35 2.35 2.35 2.35 2.36 3.300
		Durret (m) 0 1 1 1 1 1 1 1 1 1 1 1 1 1
	13-1 LS	PH 2.10 2.11 2.12 2.13 2.14 2.15 2.15 2.16 2.17 2.17 2.17 2.18 2.19 2.11 2.12 2.13 2.14 2.15 2.16 2.17 2.17 2.18 2.19 2.19 2.11 </td
		burret (m] 1.50 1.50 1.50 1.50 2.30 2.30 3.50 5.50 5.50 5.50 5.50 5.50 5.50 5
	8-1 LS	PH 1-19 </td
		burret (mil 0.05 1.9 1.9 1.9 1.9 1.0 1.1 1.1 1.1 1.1 1.1 1.1 1.1
·····	4-1 Lm	PH 223 223 223 223 223 223 223 223 223 223 223 223 223 223 223 233 233 233 233 233 233 233 233 233 233 233 233 233 233 233 258 <

k

	$\frac{1}{1}$	47.4
190 L.S		49. 2.8 2.1
	buret (m] 1.2 5 5 6.1 7.1 8 8 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2	
188 LS	pH 223 233 233 233 233 233 233 233 233 233 233 233 233 233 234 255 253 254 255 255 256 257 258 258 258 258 258 258 258 258 258	
	Burret (m] 0 1.1 2 5.1 5.1 5.1 6.1 7.15 6.1 6.1 7.15 1.12 1.13 1.13 1.13 1.13 1.17.4 1.17.4 1.17.4 1.17.4 1.17.4 1.17.4 1.17.4 1.17.4 1.17.4 1.17.4 1.17.4 1.17.4 1.17.4 <td></td>	
187 LS	рн 2.27 2.23 2.23 2.23 2.246 2.243 2.255 2.245 2.2555 2.255 2.2555 2.2555 2.2555 2.2555 2.2555	
	Duret (m) 17.60 19.70 19.70 19.70 19.70 19.70 19.70 19.70 19.70 19.70 19.70 19.70 19.70 19.70 21.55 21.55 21.55 21.55 21.55 21.55 21.55 21.55 21.55 21.55 21.55 21.55 21.55 21.55 22.55 23.30 24.55 25.55 26.60 27.50 27.50 28.50 28.50 28.50 28.50 28.50 28.50 28.50 29.50 29.50 29.50 29.50 29.50 29.	
186 LS	PH 2.19 2.19 2.19 2.19 2.19 2.19 2.19 2.19 2.19 2.19 2.13 2.13 2.13 2.14 2.15 2.15 2.15 2.15 2.15 2.15 2.15 2.15 2.15 2.15 2.15 2.15 2.15 2.15 2.15 2.15 2.16 2.17 2.18 2.19 2.10 2.11 2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12 </td <td></td>	
	Burret (mi) 0.95 0.95 2.95 2.95 2.95 3.1 10 11 12 13 14 15.6 15.6 16.5 17 18 17.6 18 17.6 16.5 17.6 18 19.5 19.5 19.5 19.5 19.5 19.5 19.5 19.5 19.5 19.5 19.5 19.5	
183 LS	<u> 日</u>	\bigcirc
	burtet (m) 0 1 2 3 4 6 1 <	
181 Lm	□ 日 日 日 日 日 日 日 日 日 日 日 日 日	
	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	
181 LS	pH 2.41 2.43 2.44 2.45 3.18 3.19 3.113 5.13 5.14 5.15 5.13 5.14 5.13 5.13 5.14 5.13 5.14 5.14 5.15 5.16 5.17 5.17 5.17 5.18 5.19 <	
	Duret (mil 0 1 2.1 2.1 3	
180 Lm	PH 252 252 252 253 253 253 253 253 252 252	
	buret (m) 0 1 0 2 2 2 4 2 3 2 4 2 3 2 4 2 3 2 1 10.5 2 9 2 5 2 1 10.5 2 1 10.5 2 1 10.5 2 1 10.5 2 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	
180 LS	PH 2.46 2.45 3.334 3.334 3.334 3.334 3.334 3.334 3.35 3.34 3.35 3.34 3.34 3.35 3.35 3.35 3.36 3.37 3.37 3.37 3.37 3.37 3.37 3.37	\bigcirc

.

-

•

213 LS	pH bure	2.63	2.64	2.68	2.75	2.83	2.94	3.24	3.42	3.88	5.53	6.07	7.51	8.14	8.56																	
	buret (ml	1.20	1.30	1.40	2.50	3.30	4.00	4.80	5.80	7.10	8.20	8.80	9.90	11.00	12.00	13.30	13.80	14.40	15.40	16.20	17.40	17.80	17.90	18.00	18.40	18.50	I 8.80	19.10	19.30	19.50	19.60	19.65
194 LS		-	1.86	1.87	1.90	1.92	1.94	1.96	2.00	2.06	2.11	2.15	2.22	2.31	2.41	2.58	2.64	2.76	3.03	3.25	3.98	4.87	5.05	5.24	5.41	5.55	5.94	6.24	6.77	7.86	8.25	8.51
<u>م</u>	buret (ml	0	2.1	3.9	6.1	7.1	~	9.1																								
192 LS DUP	ld Hq	2.73	2.95	3.54	4.57	4.79	5.44	8.71																								
	buret (ml	0	ŝ	01	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	92	94	94.5	95.1								
192 LS		1.33	1.4	1.48	1.57	1.67	1.79	1.93	2.11	2.38	2.79	3.16	3.86	4.36	4.62	5.15	5.38	ę	6.78	7.25	7.6	8.2	8.22	8.3								

•

.

:

•

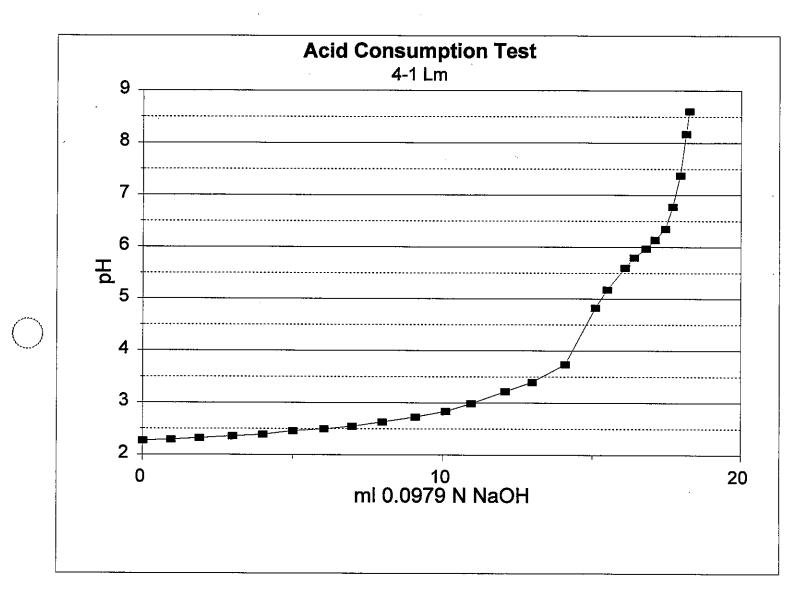
٠

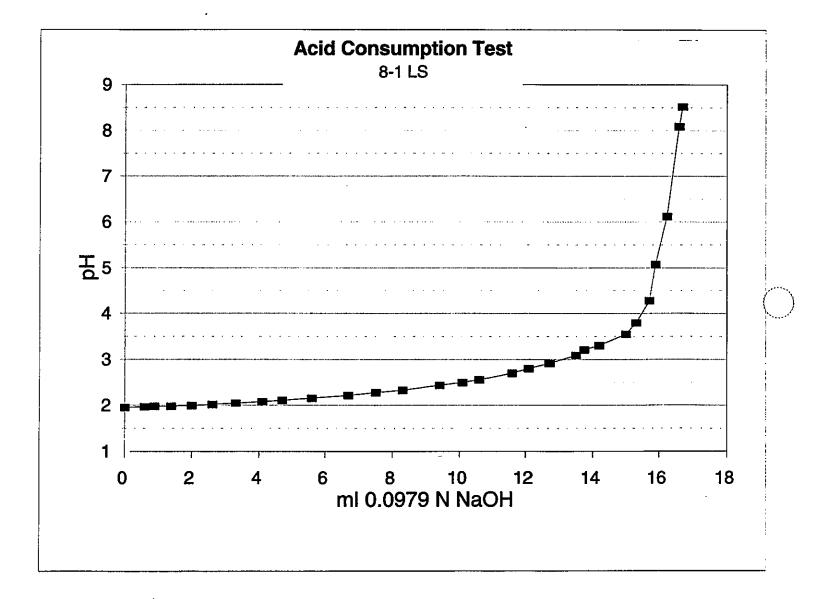
ret (m) 0 1 2 2 3 3 3 3 4 6 6 6 8 8 9.6 9.1 10 1001 1002

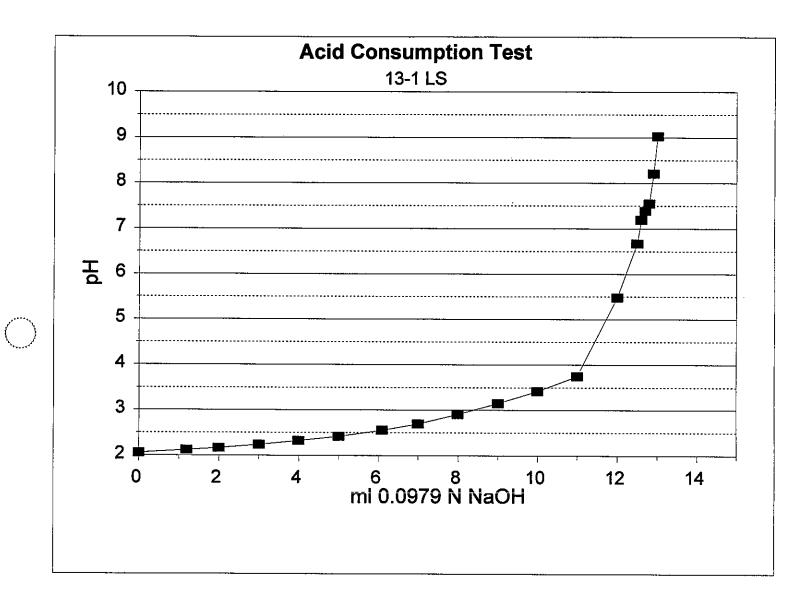
٠

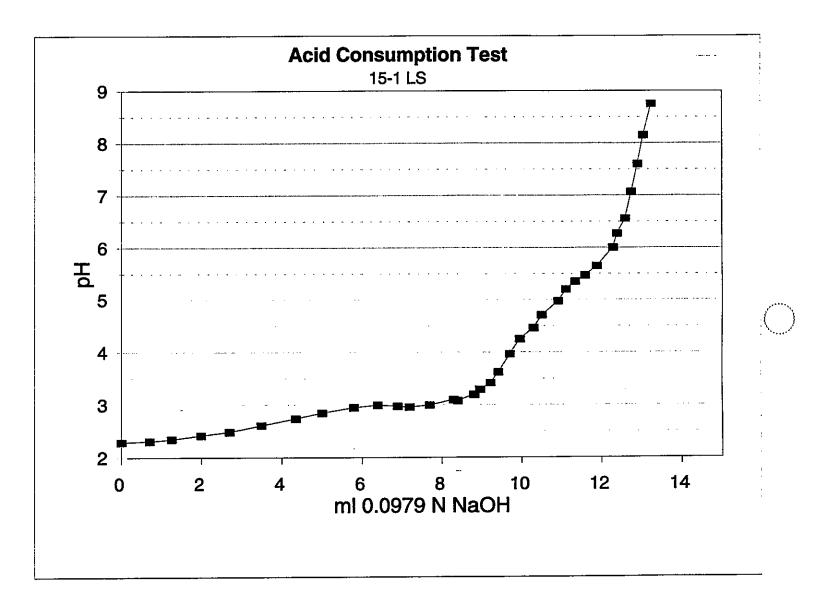
•

(

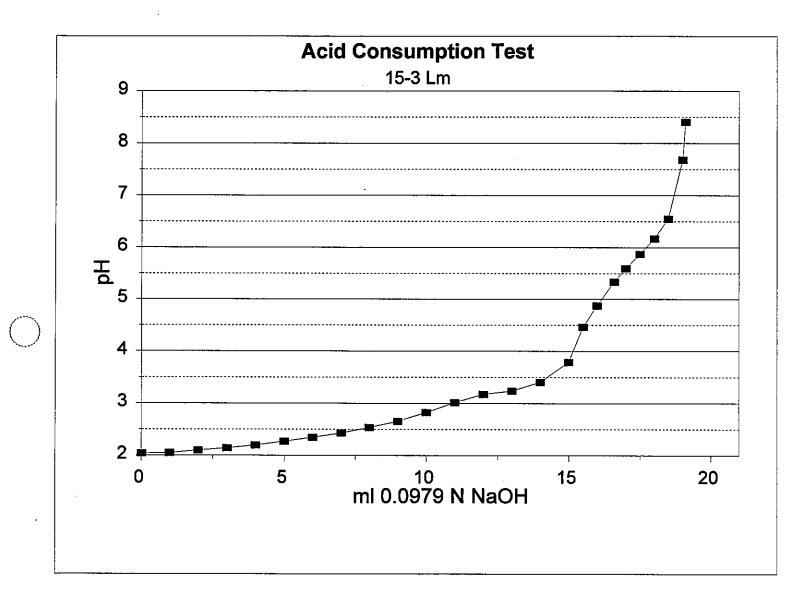


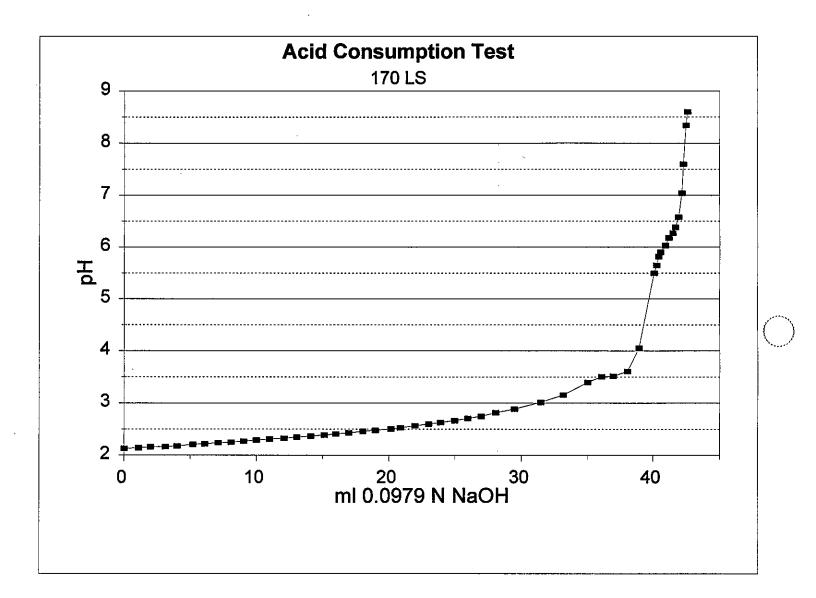


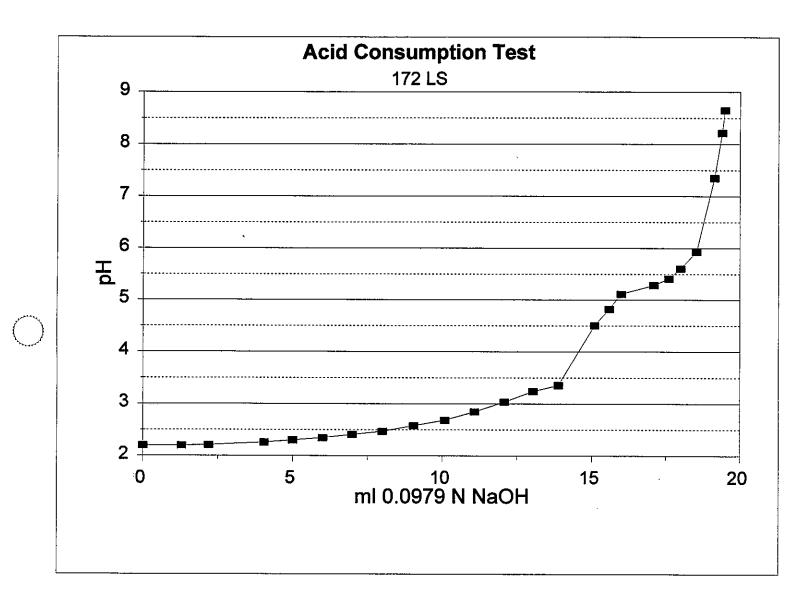


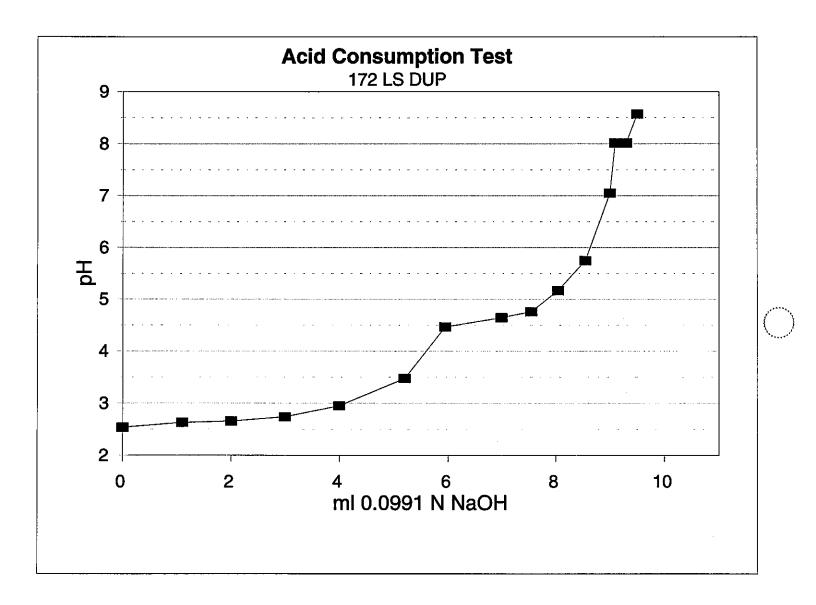


×.

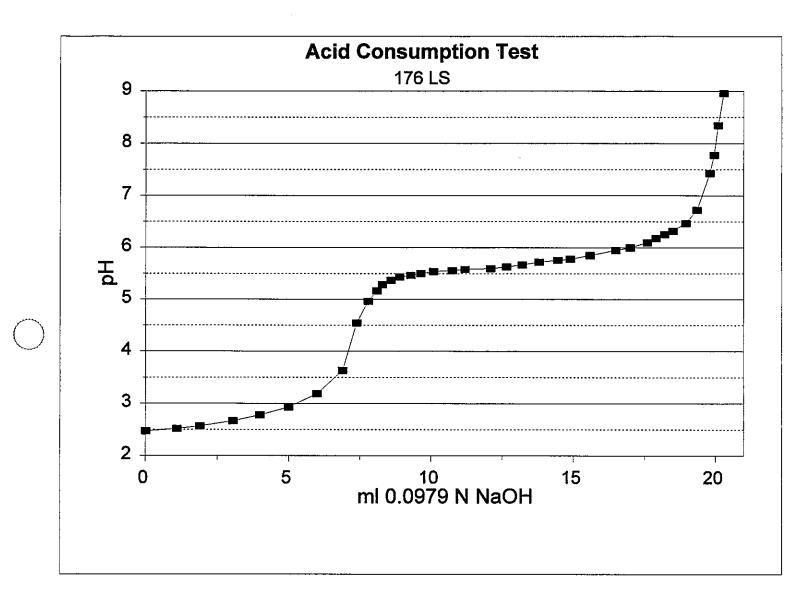


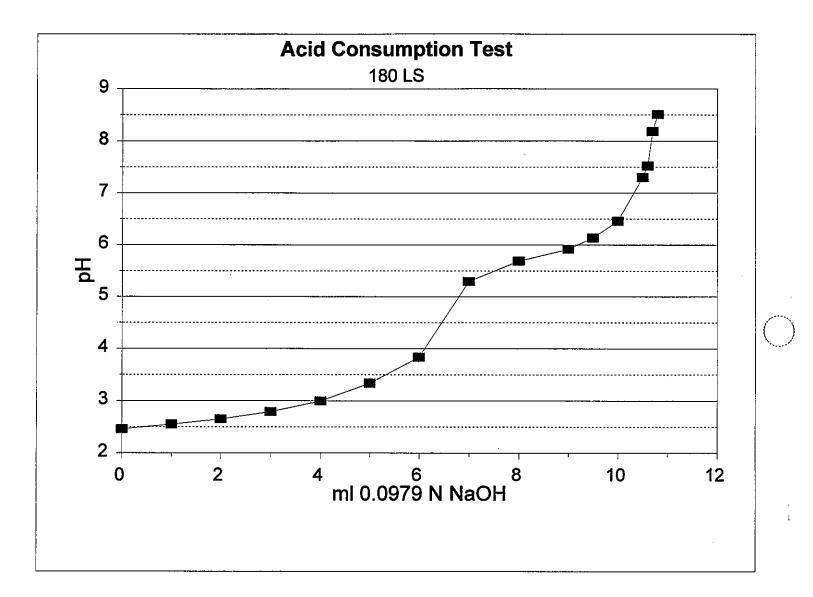




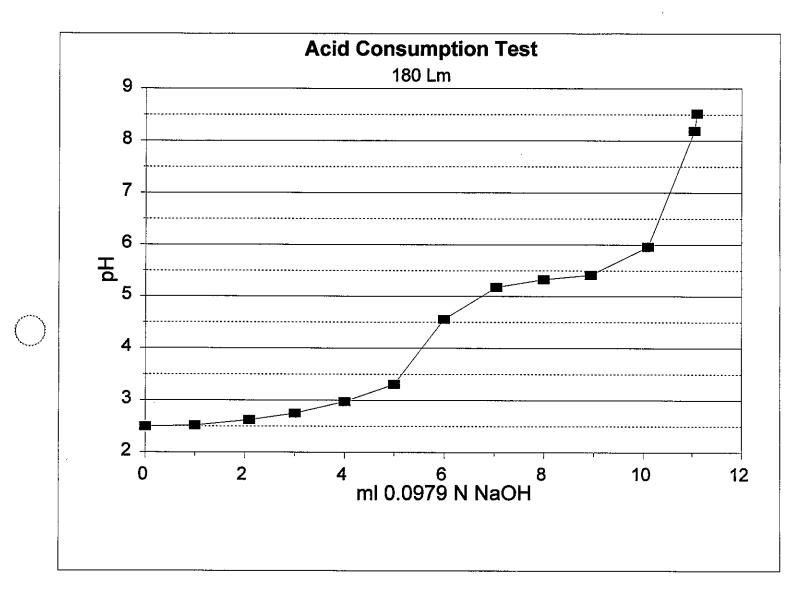


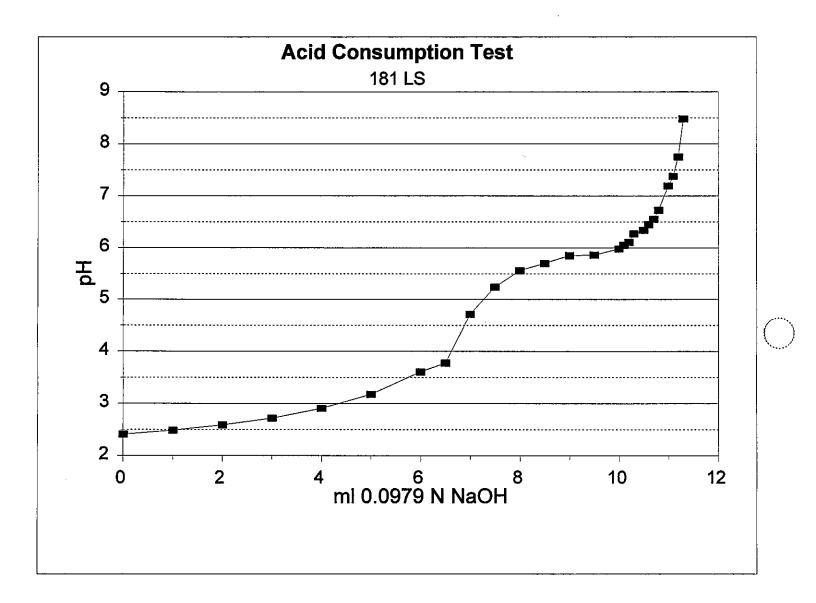
)

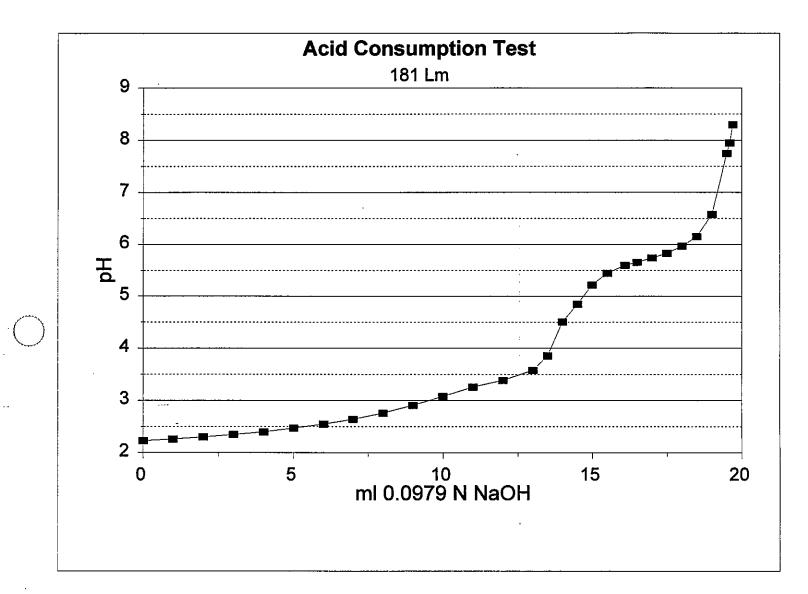


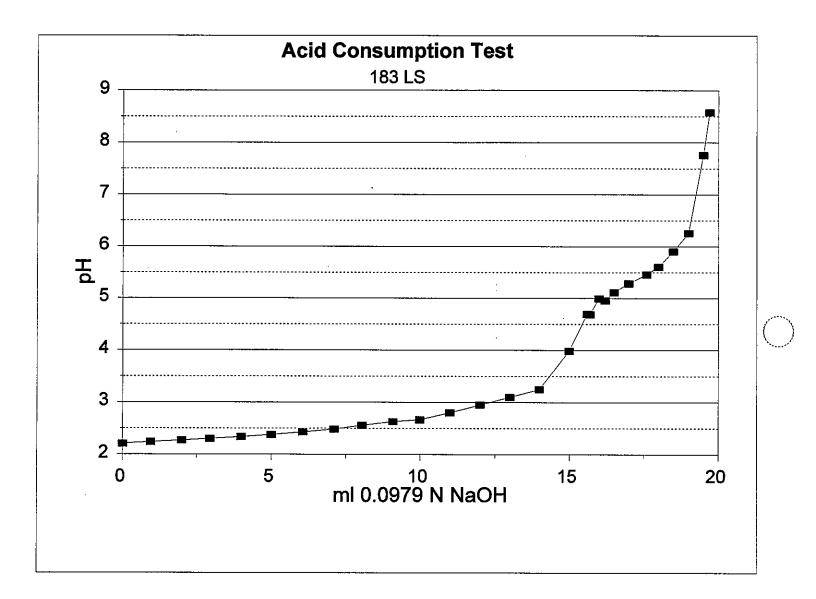


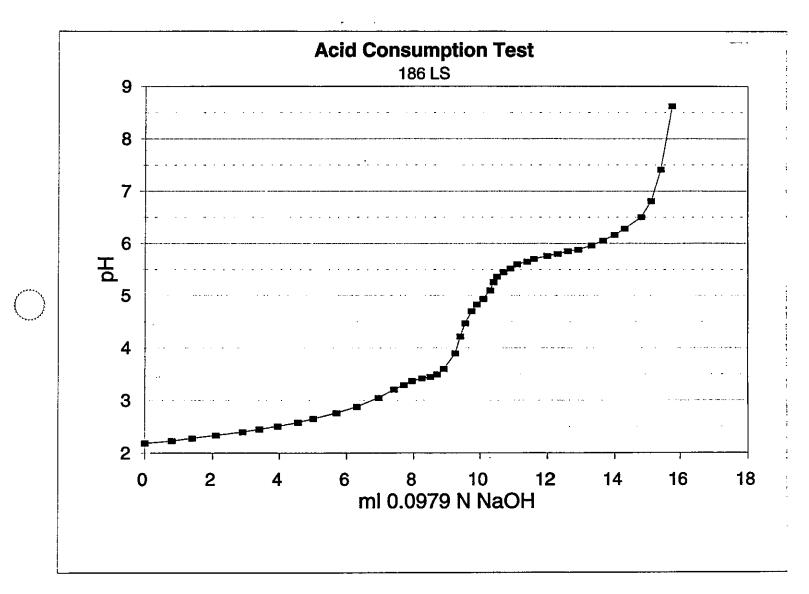
х. -



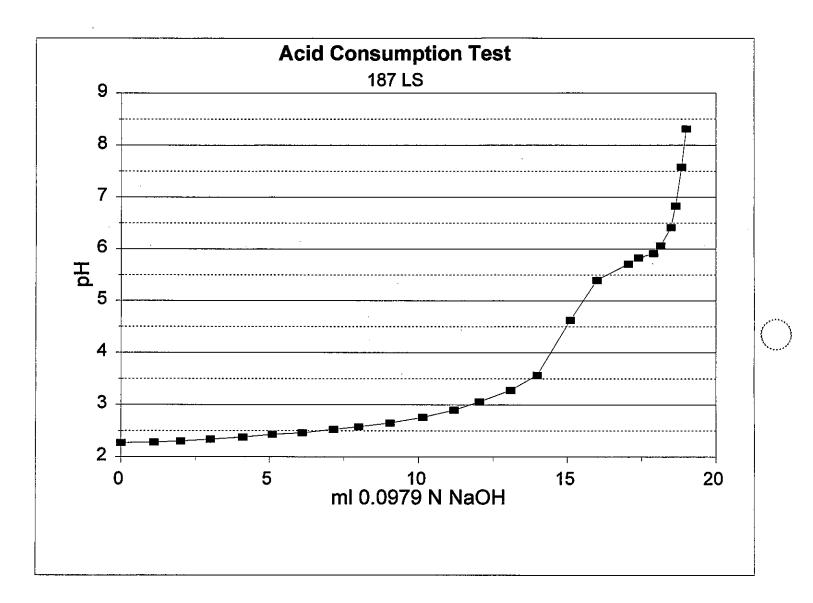






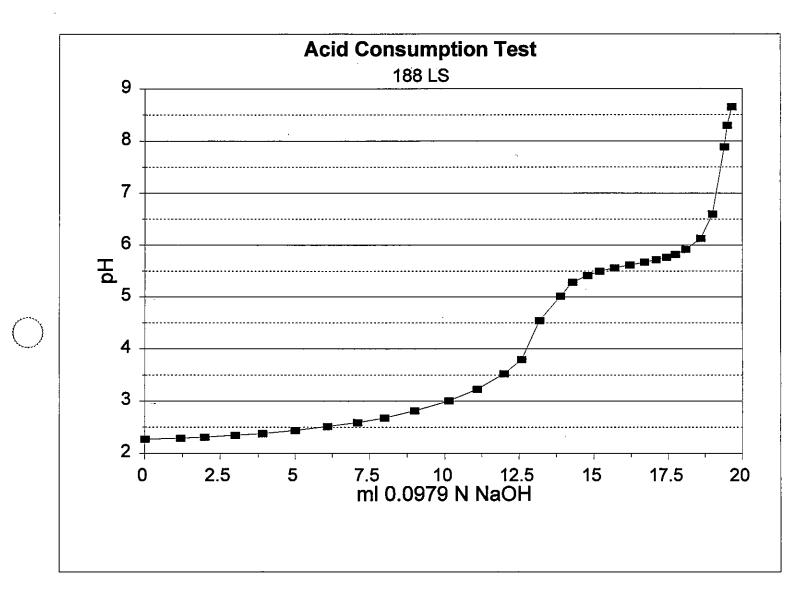


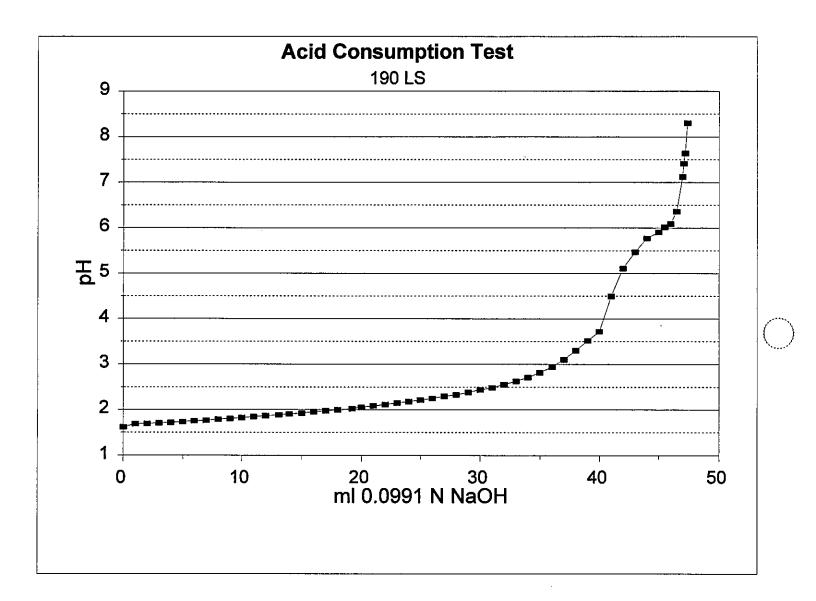
. .



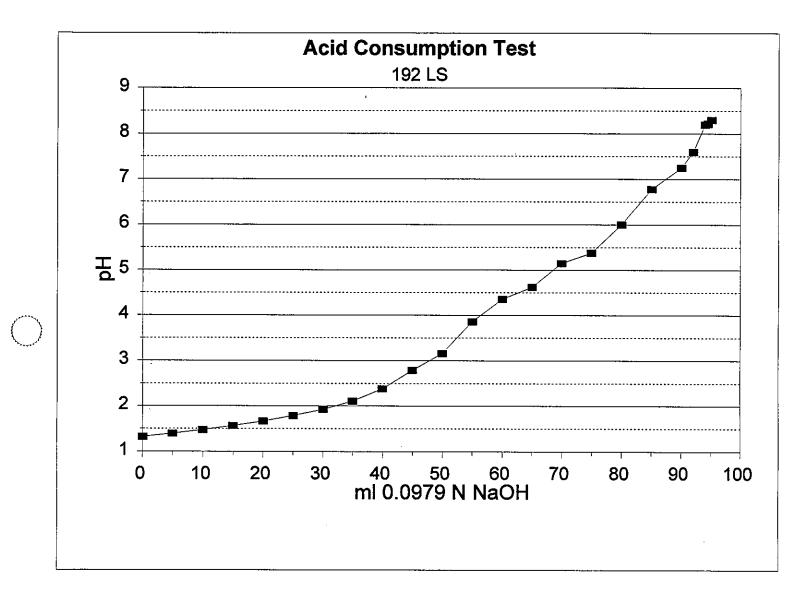
• •

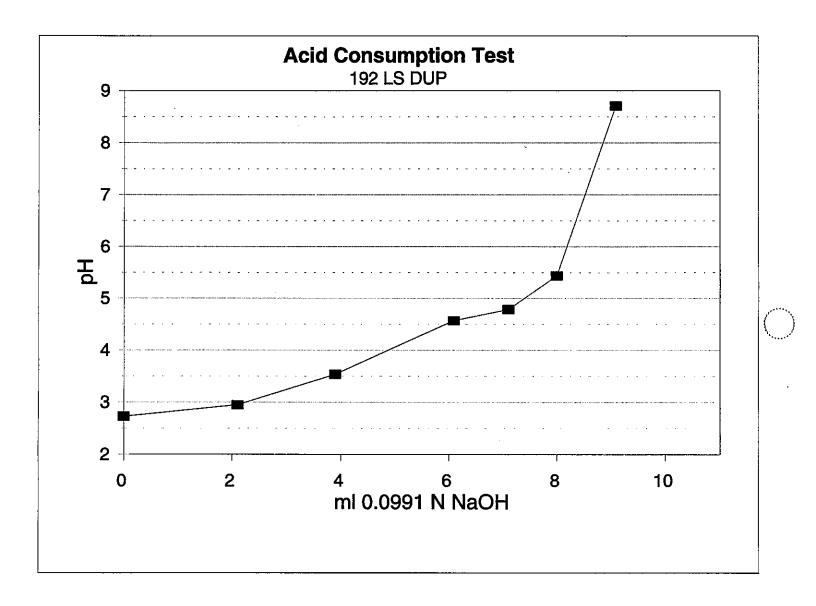
۰**۰**,



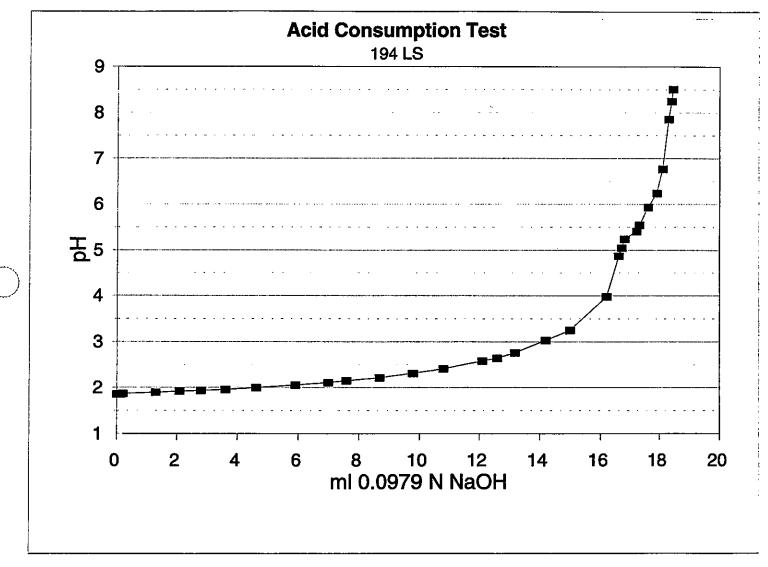


(

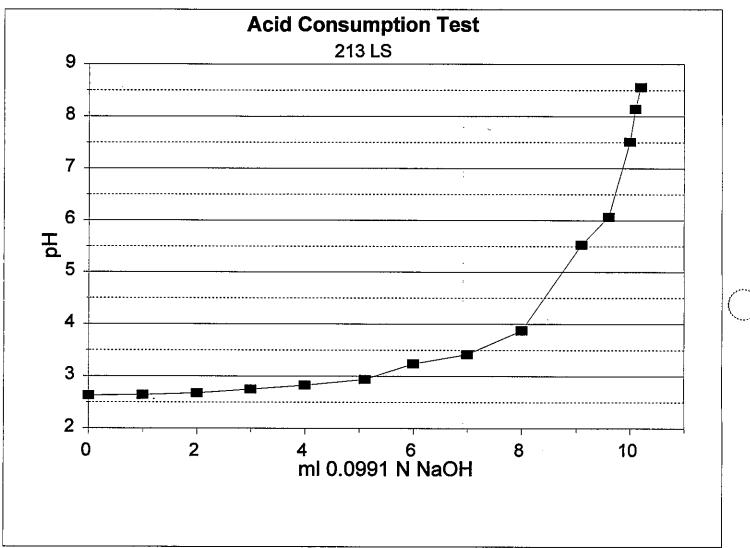




 $\langle \gamma \rangle$



.



. ·

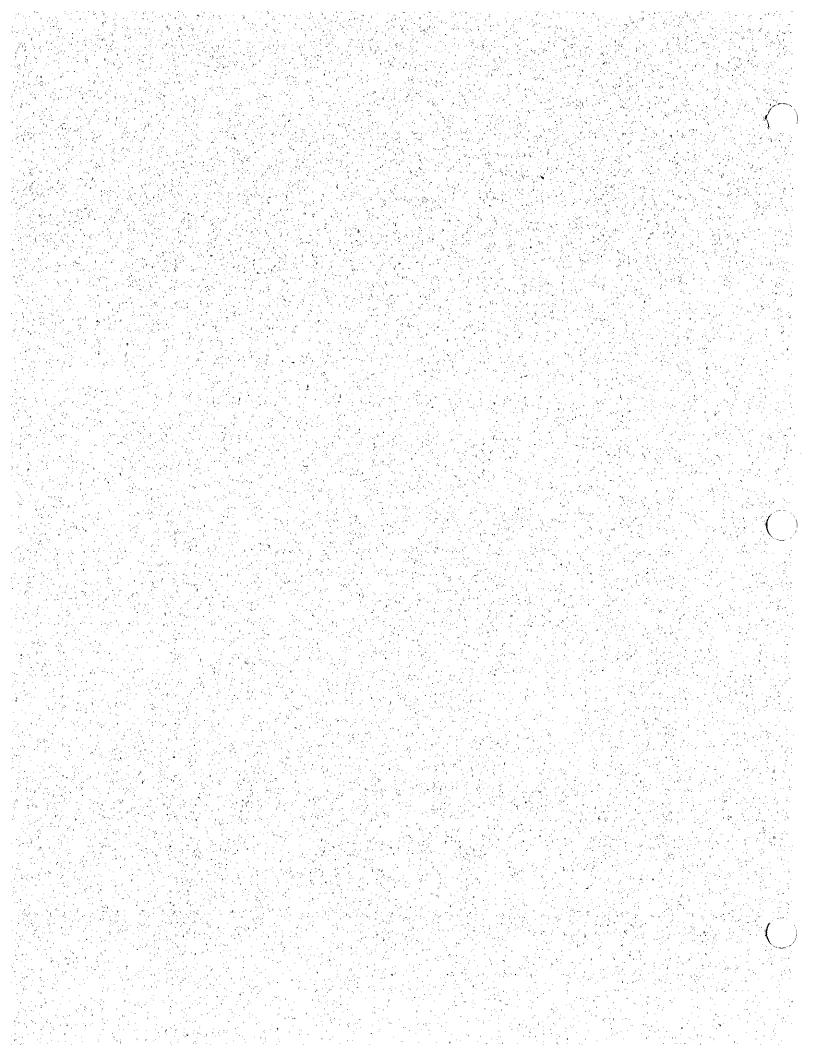
. .

Attachment 4

Anoxic Column Test Data Base for Pore Water Displacements One through Five

Laboratory Reports for Pore Water Displacements Four and Five

MLD2\96F022\GBAPP\46229.61\4000



Sample Alkalinity Acidity Column SO4 Displace Volume pН Eh Cond. Lab pH (mgCaCO3 (mgCaCO3 CI Al As Cd Ca Cr Number Column Name Date (mL) (s.u.) (mV) (mS/cm) ment (su) mg/L) mg/L) (mg/L) (mg/L) (mg/L) (mg/L) (mg/L) (mg/L) (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 0 652 136 4.41 5.1 3460 440 2800 170 w/LS 3 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 183 w/LS 12/29/96 307 3.88 186 6 0 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 0 702 171 3300 4.61 6910 4.8 6800 10 192 w/LS 12/29/96 0 338 5.22 156 3300 5.3 230 2300 8-1 w/LS 11 12/29/96 282 0 296 3.31 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 -33.6 5.6 487 7.66 4160 <2 3000 BF-5 12/28/96 16 0 363 7.33 -35.1 3780 <2 6.1 2500 17 CUF-1 12/28/96 -57.9 0 581 8.35 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 12/28/96 525 157 5130 5.2 38 5700 0 3.89 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 2550 0 246 7.26 -43.1 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 Û 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

Data QA'd Through Displacement 5

ł

Column Number	Column Name	Date	Dispiace ment	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)	TI (mg/L)	Na (mg/L)	Zn (mg/L)
1	186 w/LS	12/29/96	o						110								
2	186 w/Lime	12/29/96	ō						130								
3	170 w/LS		ō														
4	13-1 w/LS	12/29/96	ō	17	4200	160	3100		<600	58			<2		<0.025	10	95
5	188 w/LS	12/29/96	õ						240				-		0.010		
6	183 w/LS	12/29/96	Ō						390								
7	213 w/LS	12/29/96	Ō	23	4300	2.1	6.4		660	56			<2		0.026	1.4	610
8	187 w/LS	12/29/96	Ō						270				-				
9	194 w/LS	12/29/96	Ō						290								1
10	192 w/LS	12/29/96	Ō						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

Data QA'd Through Displacement 5

Page 2

.

j:\scopes\96f022\shakflsk\FORM_1.XLS

Alkalinity (mgCaCO3 Sample Acidity (mgCaCO3 Displace Volume pН Eh Cond. Lab pH S04 CI Date (mV) (mS/cm) mg/L) 81 ment (mL) (s.u.) (su) mg/L) (mg/L) 620 (mg/L) 12/30/96 1 1065 8.03 -34 21 2970 6.7 13 12/30/08 4 E 16

		100 4/23	12/50/50	•	1005	0.03	-34	2970	0.7	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
1	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
ļ	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
1	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
ſ	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

1

Number Column Name

186 w/LS

Al

(mg/L)

0.37

As

(mg/L)

0.034

Cd

(mg/L)

0.22

Ca

(mg/L)

550

Cr

(mg/L)

0.025

. .

Column			Displace	Co	Cu	Fe ²⁺	Fe	РЬ	Mg	Mn	Hg	Ni		Se		Na	Zn
Number	Column Name	Date	ment	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(mg/L)	K (mg/L)	(mg/L)	TI (mg/L)	(mg/L)	(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)	рН (s.u.)	Eh (mV)	Cond. (mS/cm)	Lab pH (su)	Alkalinity (mgCaCO3 mg/L)	Acidity (mgCaCO3 mg/L)	SO4 (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	х					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			Displace	Co	Cu	Fe ²⁺	Fe	РЬ	Mg	Mn	Hg	NI		Se		Na	Zn
Number	Column Name	Date	ment	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(mg/L)	K (mg/L)	(mg/L)	TI (mg/L)	(mg/L)	(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.

Alkalinity Sample Acidity S04 Column Displace рΗ Eh Cond. Lab pH (mgCaCO3 CI AI Volume (mgCaCO3 Cd Ca Cr As Number Column Name ment (mV) (mS/cm) Date (mL) (s.u.) (su) mg/L) mg/L) (mg/L) (mg/L) (mg/L) (mg/L) (mg/L) (mg/L) (mg/L) 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 2/4/97 935 3 6.24 -14 2460 6.5 <2 600 < 0.034 < 0.016 0.0079 590 3 170 w/LS 2/4/97 2030 <2 3 1193 5.47 50 6 660 < 0.034 < 0.016 0.045 460 13-1 w/LS 4 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 1101 4.77 74 2470 5 190 700 < 0.034 <0.016 3 0.032 510 213 w/LS <2 7 2/4/97 3 1044 6.45 -19 713 5.6 520 0.065 < 0.016 0.0047 130 <2 8 187 w/LS 2/4/97 3 1233 5.55 46 2230 5.5 580 < 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 2/4/97 858 6.95 41 2440 <2 560 < 0.034 <0.016 0.0044 600 3 5.9 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 <2 13 172 w/LS 2/4/97 3 1118 5.60 73 2250 5.3 660 < 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 BF-5 1134 6.73 -3.3 1261 <2 590 < 0.034 < 0.016 0.0096 230 16 2/4/97 3 6.3 560 0.0027 17 CUF-1 2/4/97 3 1096 8.33 -66.0 1086 6.9 20 < 0.034 < 0.016 110 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 480 180 w/Lime 1221 37.8 <2 620 < 0.034 < 0.016 20 2/4/97 3 6.06 1949 6.2 0.04 400 <2 21 181 w/Lime 2/4/97 3 1243 3.75 91.9 3020 4.8 710 0.17 < 0.016 0.53 370 740 22 15-1 w/Lime 2/4/97 3 1205 6.10 7.0 2450 5.8 730 < 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 4-1 w/LS 24 2/4/97 3 1173 6.32 20.1 2200 <2 580 < 0.034 < 0.016 0.018 430 6.1 25 15-1 w/LS 2/4/97 906 6.88 32 2960 <2 680 < 0.034 < 0.016 0.0021 560 3 6.1 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	Column Name	Date	Displace ment	Co (mail)	Cu	Fe ²⁺	Fe	Pb	Mg	Mn (mail)	Hg	Ni	× (Se		Na	Zn
1	186 w/LS	2/4/97	3	(mg/L) 0.43	(mg/L) 0.52	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(mg/L)	K (mg/L)	(mg/L)	TI (mg/L)	(mg/L)	(mg/L)
2	186 w/Lime	2/4/97	3	0.43			0.14		44	3.9			6.4	<0.037	<0.025	3.1	1.3
2	170 w/LS	2/4/97	3	0.09	1.8 18		< 0.01		12	0.45			9.4	<0.037	<0.025	1.5	0.88
3	13-1 w/LS	2/4/97	3	0.24			0.067		9.5	1.5			3.5	<0.037	0.035	0.47	2.2
	188 w/LS	2/4/97	3	0.56	7.9 35		0.098		19	2.8			2.5	<0.037	<0.025	1.2	1.5
5 6	183 w/LS	2/4/97	3	0.78	35 140		0.073		13	1.9			5.5	<0.037	0.026	0.73	10
07	213 w/LS	2/4/97	3	0.48			0.11		17	1.9			4.5	<0.037	<0.025	0.67	3.4
8	213 W/LS 187 W/LS	2/4/97	3		0.49		< 0.01		<3	0.14			<2	<0.037	0.025	0.1	0.28
0				0.31	21		0.029		10	1.3			6.6	<0.037	0.032	0.49	1.4
40	194 w/LS 192 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		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

.

Data QA'd Through Displacement 5

Page 8

.

j:\scopes\96f022\shakflsk\FORM_1.XLS

•

	<u> </u>
	.
•	1
- f -	
- 1. I.	}
· · ·	
· · ·	
-	

Column Number	Column Name	Date	Displace ment	Sample Volume (mL)	рН (s.u.)	Eh (mV)	Cond. (mS/cm)	LabpH (su)	Alkalinity (mgCaCO3 mg/L)	Acidity (mgCaCO3 mg/L)	SO4 (mg/L)	CI (mg/L)	A! (mg/L)	As (mg/L)	Cd (mg/L)	Ca (mg/L)	Cr (mg/L)
1	186 w/LS		4									(***••			···· <i>a</i> ·-/	((
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			Displace	Co	Cu	Fe ²⁺	Fe	Pb	Mg	Mn	Hg	NI		Se		Na	Zn
Number	Column Name	Date	ment	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(mg/L)	K (mg/L)		TI (mg/L)		(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

.

j:\scopes\96f022\shakflsk\FORM_1.XLS

 \bigcirc

.

	- }
	3
`••	المم س

Column Number	Column Name	Date	Displace ment	Sample Volume (mL)	рН (s.u.)	Eh (mV)	Cond. (mS/cm)	Lab pH (su)	Alkalinity (mgCaCO3 mg/L)	Acidity (mgCaCO3 mg/L)	SO4 (mg/L)	Ct (mg/L)	Al (mg/L)	As (mg/L)	Cd (mg/L)	Ca (mg/L)	Cr (mg/L)
1	186 w/LS		5														<u> </u>
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	6 10	
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			Displace	Co	Cu	Fe ²⁺	Fe	Pb	Mg	Mo	Hgi	Ni		Se		Na	Zn
Number	Column Name	Date	ment	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(mg/L)	K (mg/L)	(mg/L)	TI (mg/L)	(mg/L)	(mg/L)
1	186 w/LS		5			<u>`</u>	· • /				(-0-/	((((
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														0.11
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							••=							1.0
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											0.01			0.00
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				••••		•	v				-0.001			10
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				••••			•				-0.007			
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				·v.vu/			1.1
25	15-1 w/LS		5							V . T							
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			
28	15-3 w/LS	3/3/97	5	•	4 .7		-0.01		51	1.2				~0.037			12

Page 12

j:\scopes\96f022\shakflsk\FORM_1.XLS

.



NORTHERN LAKE SERVICE, INC.

Analytical Laboratory and Environmental Services

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

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.

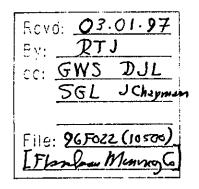
If you have any questions or require additional information, please feel free to contact me at (715) 478-2777.

Sincerely,

Atum R. Cum

Steven R. Crupi Client Services Manager

Enclosures (c:\amipro\docs\crupi\fvdfmc14.sam)



·

$\left(\right)$							
NORTHERN LAKE SERVICE Analytical Laboratory and Environm 400 North Lake Avenue - Crandon, V Tel:(715)478-2777 Fax:(715)478-306	ental Services VI 54520				WIS. LAB (CERT. NO. 72102	6460
Ku.(13)*/0*2/// Fax.(/13)*/0*300	,	ANALYTIC	AL REPORT		PAGE: 1	NLS PROJ	ECT# 32436
A 2' P	oth & Van Dyke Associate ttn: Russ Janeshek 737 S. Ridge Road D Box 19012 reen Bay, WI 54307	98					
Project Description: 1 Project Title: 96F022	lambeau Mining?						
Sample ID: FMC-170LS- Ref. Line 1 of COC 24843 Desc Collected: 02/17/97 Received:	ription: FMC-170LS-4						
Parameter	R	esult	Units	LOD	LOQ	Method	Analyzed Lab
Acidity, tot. as CaCO3 Aluminum, dis. as Al by Arsenic, dis. as As by J Cadmium, dis. as Cd by J Calcium, dis. as Ca by J Cobalt, dis. as Co by IC Copper, dis. as Co by IC Copper, dis. as Co by IC Iron, dis. as Fe by ICP Magnesium, dis. as Mg by Manganese, dis. as Mn by pH, lab Selenium, dis. as Se by Sulfate, as SO4 (filtered Zinc, dis. as Zn by ICP	CP CP CP P P ICP ICP furnace	36 0.040 > ND 42 260 180 23000 0.24 7.5 1200 4.7 ND 510 2500	mg/L mg/L ug/L mg/L ug/L ug/L mg/L ug/L s.u. ug/L mg/L ug/L	2.0 0.034 16 1.2 3.0 4.3 54 0.010 3.0 1.8 1.0 37 250 120	2.0 0.12 57 3.8 3.0 15 190 0.035 3.0 6.1 130 250 120	EPA 305.1 EPA 200.7 EPA 150.1 EPA 375.2 EPA 200.7	02/25/97 721026460 02/20/97 721026460 02/20/97 721026460 02/20/97 721026460 02/20/97 721026460 02/20/97 721026460 02/20/97 721026460 02/20/97 721026460 02/20/97 721026460 02/20/97 721026460 02/19/97 721026460 02/25/97 721026460 02/25/97 721026460

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

Atuen R. Cenyi Reviewed by:

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

ANALYTICAL REPORT

WIS. LAB CERT. NO. 721026460

PAGE: 2 NLS PROJECT# 32436

						TAND ANTRA
Attn: Rus 2737 S. 1 PO Box 19	n Dyke Associates s Janeshek Ridge Road 012 , WI 54307					
Project Description: Flambeau Project Title: 96F022	Mining					
Sample ID: FMC-13-ILS-4 Ref. Line 2 of COC 24843 Description: FMC- Collected: 02/17/97 Received: 02/19/97	NLS#: 128113 13-ILS-4 Reported: 02/26/97					
Parameter	Result	Units	LOD	LOQ	Method	Analyzed Lab
Acidity, tot. as CaCO3 Aluminum, dis. as Al by ICP Arsenic, dis. as As by ICP Cadmium, dis. as Cd by ICP Calcium, dis. as Cd by ICP Cobalt, dis. as Co by ICP Copper, dis. as Cu by ICP Iron, dis. as Fe by ICP Magnesium, dis. as Mg by ICP Magnesium, dis. as Mg by ICP pH, lab Selenium, dis. as Se by furnace Sulfate, as SO4 (filtered) Zinc, dis. as Zn by ICP	ND ND 2.5 > 600 170 97 < 0.019 > 14 1500 5.7 ND 640 240	mg/L mg/L ug/L ug/L ug/L ug/L mg/L ug/L s.u. ug/L mg/L ug/L ug/L ug/L	2.0 0.034 16 1.2 3.0 4.3 5.4 0.010 3.0 1.8 1.0 37 250 120	2.0 0.12 57 3.8 3.0 15 19 0.035 3.0 6.1 130 250 120	EPA 305.1 EPA 200.7 EPA 150.1 EPA 375.2 EPA 375.2	02/25/97 72102646 02/20/97 72102646 02/20/97 72102646 02/20/97 72102646 02/20/97 72102646 02/20/97 72102646 02/20/97 72102646 02/20/97 72102646 02/20/97 72102646 02/20/97 72102646 02/26/97 72102646 02/25/97 72102646 02/20/97 72102646

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:

NORTHERN LAKE SERVICE, II Analytical Laboratory and Environmenta	l Services				WIS. LAB	CERT. NO. 72102	6460
400 North Lake Avenue - Crandon, WI 4 Tel:(715)478-2777 Fax:(715)478-3060		ANALYTICAL	REPORT		PAGE: 3	NLS PROJ	ECT# 32436
Attn 2737 PO E	a & Van Dyke Associate 1: Russ Janeshek 2 S. Ridge Road 20x 19012 20n Bay, WI 54307	8					
Project Description: Fla Project Title: 96F022	mbeau Mining						
Sample ID: FMC-188LS-4 Ref. Line 3 of COC 24843 Description Collected: 02/17/97 Received: 02/	NLS#: 128114 on: FMC-188LS-4 19/97 Reported: 02/26/97						· · ·
Parameter	Re	sult	Units	LOD	LOQ	Method	Analyzed Lab
Acidity, tot. as CaCO3 Aluminum, dis. as Al by ICP Arsenic, dis. as As by ICP Cadmium, dis. as Cd by ICP Calcium, dis. as Cd by ICP Cobalt, dis. as Co by ICP Copper, dis. as Co by ICP Iron, dis. as Fe by ICP Magnesium, dis. as Mg by IC Manganese, dis. as Mn by IC pH, lab Selenium, dis. as Se by fur Sulfate, as SO4 (filtered) Zinc, dis. as Zn by ICP	P IP Inace	34 ND ND 180 530 630 43000 0.091 11 1600 5.0 ND 600 10000	mg/L mg/L ug/L ug/L ug/L ug/L mg/L ug/L ug/L ug/L ug/L ug/L ug/L	2.0 0.034 16 1.2 3.0 4.3 54 0.010 3.0 1.8 1.0 37 250 120	2.0 0.12 57 3.8 3.0 15 190 0.035 3.0 6.1 130 250 120	EPA 305.1 EPA 200.7 EPA 150.1 EPA 375.2 EPA 375.2	02/20/97 721026460 02/20/97 721026460 02/20/97 721026460 02/20/97 721026460 02/20/97 721026460 02/20/97 721026460 02/19/97 721026460

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

1

Atter R. Cuyi Reviewed by:

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

ANALYTICAL REPORT

WIS. LAB CERT. NO. 721026460

PAGE: 4 NLS PROJECT# 32436

						HED ENOU	TCIA JEHIO
Client:	Foth & Van Dyke Asso Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307	ciates					
Project Description Project Title: 96F(
Sample ID: FMC-1831 Ref. Line 4 of COC 24843 I Collected: 02/17/97 Recei					•		
Parameter		Result	Units	LOD	LOQ	Method	Analyzed Lab
Acidity, tot. as CaCC Aluminum, dis. as Al Arsenic, dis. as As f Cadmium, dis. as Cd f Calcium, dis. as Ca f Cobalt, dis. as Co by Copper, dis. as Co by Iron, dis. as Fe by I Magnesium, dis. as Mr Manganese, dis. as Mr pH, lab	by ICP by ICP by ICP iCP iCP iCP iCP iCP iCP	190 ND 27 510 350 140000 0.25 13 1400 4.7 ND	mg/L mg/L ug/L mg/L ug/L ug/L mg/L ug/L s.u. ug/L	2.0 0.034 16 1.2 3.0 4.3 54 0.010 3.0 1.8 1.0 37	2.0 0.12 57 3.8 3.0 15 190 0.035 3.0 6.1 130	EPA 305.1 EPA 200.7 EPA 150.1 EPA 270.2	02/25/97 72102646 02/20/97 72102646

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

.

NORTHERN LAKE SEI Analytical Laboratory and En 100 North Lake Avenue - Cra Fel:(715)478-2777 Fax:(715)4	vironmental Services adon. WI 54520				WI3, LAD	CERT. NO. 72102	2040U
		ANALYTI	CAL REPORT		PAGE: 5	NLS PROJ	ЕСТ# 32436
Client:	Foth & Van Dyke J Attn: Russ Janes 2737 S. Ridge Ro PO Box 19012 Green Bay, WI 54	hek oad					
Ref. Line 5 of COC 24843 Collected: 02/17/97 Red	Description: FMC-213LS-4	02/26/97	11 -14-				
Ref. Line 5 of COC 24843 Collected: 02/17/97 Rec Parameter	Description: FMC-213LS-4 eived: 02/19/97 Reported:		Units	TOD	FOÖ	Method	Analyzed Lab
Ref. Line 5 of COC 24843 Collected: 02/17/97 Rec Parameter	Description: FMC-213LS-4 eived: 02/19/97 Reported:	02/26/97 <u>Result</u> ND	mg/L	2.0	2.0	EPA 305.1	02/25/97 721026
Ref.Line 5 of COC 24843 Collected: 02/17/97 Red Carameter cidity, tot. as Ca luminum, dis. as A	Description: FMC-213LS-4 evived: 02/19/97 Reported: CO3 1 by ICP	02/26/97 <u>Result</u> ND ND	mg/L mg/L	2.0 0.034	2.0 0.12	EPA 305.1 EPA 200.7	02/25/97 721026 02/20/97 721026
Ref.Line 5 of COC 24843 Collected: 02/17/97 Red arameter cidity, tot. as Ca luminum, dis. as A rsenic, dis. as As	Description: FMC-213LS-4 evived: 02/19/97 Reported: CO3 1 by ICP by ICP	02/26/97 Result ND ND ND ND	mg/L mg/L ug/L	2.0 0.034 16	2.0 0.12 57	EPA 305.1 EPA 200.7 EPA 200.7	02/25/97 721026 02/20/97 721026 02/20/97 721026
Mef.Line 5 of COC 24843 Collected: 02/17/97 Red cidity, tot. as Ca luminum, dis. as As rsenic, dis. as As admium, dis. as Cd	Description: FMC-213LS-4 evived: 02/19/97 Reported: CO3 1 by ICP by ICP by ICP	02/26/97 Result ND 6.7	mg/L mg/L ug/L ug/L ug/L	2.0 0.034 16 1.2	2.0 0.12 57 3.8	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7	02/25/97 721026 02/20/97 721026 02/20/97 721026
Nef. Line 5 of COC 24843 Collected: 02/17/97 Rec arameter cidity, tot. as Ca luminum, dis. as As admium, dis. as Ca alcium, dis. as Ca obalt. dis. as Co	Description: FMC-213LS-4 evived: 02/19/97 Reported: CO3 1 by ICP by ICP by ICP by ICP by ICP by ICP	02/26/97 Result ND ND ND SOURCE	mg/L mg/L ug/L ug/L mg/L	2.0 0.034 16 1.2 3.0	2.0 0.12 57 3.8 3.0	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	02/25/97 721026 02/20/97 721026 02/20/97 721026
lef. Line 5 of COC 24843 Collected: 02/17/97 Rec arameter cidity, tot. as Ca luminum, dis. as As admium, dis. as Ca alcium, dis. as Ca obalt. dis. as Co	Description: FMC-213LS-4 evived: 02/19/97 Reported: CO3 1 by ICP by ICP by ICP by ICP by ICP by ICP	02/26/97 Result ND 6.7	mg/L mg/L ug/L ug/L mg/L ug/L ug/L	2.0 0.034 16 1.2	2.0 0.12 57 3.8 3.0 15	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	02/25/97 721026 02/20/97 721026 02/20/97 721026 02/20/97 721026 02/20/97 721026 02/20/97 721026
tef. Line 5 of COC 24843 collected: 02/17/97 Rec arameter cidity, tot. as Ca luminum, dis. as As admium, dis. as Ca admium, dis. as Ca alcium, dis. as Ca obalt, dis. as Co opper, dis. as Cu	Description: FMC-213LS-4 evived: 02/19/97 Reported: CO3 1 by ICP by ICP by ICP by ICP by ICP by ICP by ICP ICP ICP	02/26/97 Result ND ND ND 6.7 370 55 390 ND	mg/L mg/L ug/L ug/L mg/L ug/L ug/L	2.0 0.034 16 1.2 3.0 4.3 5.4 0.010	2.0 0.12 57 3.8 3.0	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	02/25/97 721026 02/20/97 721026 02/20/97 721026 02/20/97 721026 02/20/97 721026 02/20/97 721026 02/20/97 721026 02/20/97 721026
tef. Line 5 of COC 24843 collected: 02/17/97 Rec arameter cidity, tot. as Ca luminum, dis. as A rsenic, dis. as A admium, dis. as Cd alcium, dis. as Cd alcium, dis. as Co opper, dis. as Cu ron, dis. as Fe by aqmesium, dis. as	Description: FMC-213LS-4 evived: 02/19/97 Reported: CO3 1 by ICP by ICP by ICP by ICP by ICP by ICP ICP ICP Mg by ICP	02/26/97 Result ND ND ND 6.7 370 55 390 ND 6.5	mg/L mg/L ug/L ug/L ug/L ug/L ug/L mg/L mg/L	2.0 0.034 16 1.2 3.0 4.3 5.4 0.010 3.0	2.0 0.12 57 3.8 3.0 15 19 0.035 3.0	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	02/25/97 721026 02/20/97 721026 02/20/97 721026 02/20/97 721026 02/20/97 721026 02/20/97 721026 02/20/97 721026 02/20/97 721026
Ref. Line 5 of COC 24843 Collected: 02/17/97 Ref Acidity, tot. as Ca Aursenic, dis. as A Arsenic, dis. as A Cadmium, dis. as Ca Calcium, dis. as Ca Cobalt, dis. as Co Copper, dis. as Cu Fron, dis. as Fe by Lagnesium, dis. as Langanese, dis. as	Description: FMC-213LS-4 evived: 02/19/97 Reported: CO3 1 by ICP by ICP by ICP by ICP by ICP by ICP ICP ICP Mg by ICP	02/26/97 <u>Result</u> ND ND ND 6.7 370 55 390 ND 6.5 350	mg/L mg/L ug/L ug/L ug/L ug/L mg/L mg/L ug/L	2.0 0.034 16 1.2 3.0 4.3 5.4 0.010 3.0 1.8	2.0 0.12 57 3.8 3.0 15 19 0.035	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	02/25/97 721026 02/20/97 721026 02/20/97 721026 02/20/97 721026 02/20/97 721026 02/20/97 721026 02/20/97 721026 02/20/97 721026
Ref. Line 5 of COC 24843 Collected: 02/17/97 Red Acidity, tot. as Ca Aluminum, dis. as A Arsenic, dis. as As Cadmium, dis. as Ca Cadmium, dis. as Ca Cobalt, dis. as Co Copper, dis. as Co Copper, dis. as Co Copper, dis. as fe by Magnesium, dis. as fo Magnesium, dis. as fo Magnese, dis. as fo Magnese, dis. as fo Magnese, dis. as for the set of the set	Description: FMC-213LS-4 evived: 02/19/97 Reported: 02/19/97 Reported: by ICP by ICP by ICP by ICP by ICP ICP ICP ICP Mg by ICP	02/26/97 Result ND ND 6.7 370 55 390 ND 6.5 350 5.7	mg/L mg/L ug/L ug/L ug/L ug/L ug/L ug/L ug/L u	2.0 0.034 16 1.2 3.0 4.3 5.4 0.010 3.0 1.8 1.0	2.0 0.12 57 3.8 3.0 15 19 0.035 3.0 6.1	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	02/25/97 721026 02/20/97 721026 02/20/97 721026 02/20/97 721026 02/20/97 721026 02/20/97 721026 02/20/97 721026 02/20/97 721026
Sample ID: FMC-21: Ref. Line 5 of COC 24843 Collected: 02/17/97 Red Parameter Acidity, tot. as Ca Aluminum, dis. as Ca Calcium, dis. as Ca Cobalt, dis. as Ca Cobalt, dis. as Ca Cobalt, dis. as Cu Iron, dis. as Fe by Magnesium, dis. as Magnesium, dis. as OH, lab Selenium, dis. as Soulfate, as Soulfate, as Sou (fil	Description: FMC-213LS-4 evived: 02/19/97 Reported: CO3 1 by ICP by ICP by ICP by ICP by ICP by ICP ICP ICP Mg by ICP Mn by ICP e by furnace	02/26/97 <u>Result</u> ND ND ND 6.7 370 55 390 ND 6.5 350	mg/L mg/L ug/L ug/L ug/L ug/L mg/L mg/L ug/L	2.0 0.034 16 1.2 3.0 4.3 5.4 0.010 3.0 1.8	2.0 0.12 57 3.8 3.0 15 19 0.035 3.0	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	02/25/97 721026 02/20/97 721026 02/20/97 721026 02/20/97 721026 02/20/97 721026 02/20/97 721026 02/20/97 721026 02/20/97 721026 02/20/97 721026 02/20/97 721026 02/19/97 721026

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:

ł

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

PAGE: 6 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 Aluminum, dis. as Al by ICP Arsenic, dis. as As by ICP Cadmium, dis. as Cd by ICP Calcium, dis. as Cd by ICP Cobalt, dis. as Co by ICP Copper, dis. as Co by ICP Iron, dis. as Fe by ICP Magnesium, dis. as Mg by ICP Manganese, dis. as Mn by ICP pH, lab Selenium, dis. as Se by furnace Sulfate, as SO4 (filtered) Zinc, dis. as Zn by ICP	38 ND ND 13 480 250 23000 0.087 8.8 1100 5.3 ND 590 1400	mg/L mg/L ug/L ug/L mg/L ug/L mg/L ug/L s.u. ug/L ug/L ug/L ug/L	2.0 0.034 16 1.2 3.0 4.3 54 0.010 3.0 1.8 1.0 37 250 120	2.0 0.12 57 3.8 3.0 15 190 0.035 3.0 6.1 130 250 120	EPA 305.1 EPA 200.7 EPA 150.1 EPA 375.2 EPA 375.2	02/25/97 721026460 02/20/97 721026460 02/20/97 721026460 02/20/97 721026460 02/20/97 721026460 02/20/97 721026460 02/20/97 721026460 02/20/97 721026460 02/20/97 721026460 02/20/97 721026460 02/19/97 721026460 02/24/97 721026460 02/25/97 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:

NORTHERN LAKE SERV Analytical Laboratory and Envi 400 North Lake Avenue - Crand	ronmental Services Ion. WI 54520				WIS. LAB	CERT. NO. 72102	26460
Fel:(715)478-2777 Fax:(715)478	3-3060	ANALYTIC	CAL REPORT		PAGE: 7	NLS PROJ	ECT# 32436
Client:	Foth & Van Dyke A Attn: Russ Janesh 2737 S. Ridge Ro PO Box 19012 Green Bay, WI 54	hek Dad					
roject Title: 96F							
lef. Line 7 of COC 24843	LS-4 NLS#: 12 Description: FMC-192LS-4 ived: 02/19/97 Reported:						
Sample ID: FMC-1921 Ref. Line 7 of COC 24843 Collected: 02/17/97 Rece arameter	Description: FMC-192LS-4		Units	LOD	FOO	Method	Analyzed Lab

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:

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

PAGE: 8 NLS PROJECT# 32436

						n
Client: Foth & Van Dyke As Attn: Russ Janeshe 2737 S. Ridge Roa PO Box 19012 Green Bay, WI 543	k d					
Project Description: Flambeau Mining Project Title: 96F022						
Sample ID: FMC-190LS-4 NLS#: 128 Ref. Line 8 of COC 24843 Description: FMC-190LS-4 Collected: 02/17/97 Received: 02/19/97						
Parameter	Result	Units	LOD	LOQ	Method	Analyzed Lab
Acidity, tot. as CaCO3 Aluminum, dis. as Al by ICP Arsenic, dis. as As by ICP Cadmium, dis. as Cd by ICP Calcium, dis. as Ca by ICP	140 < 0.10 > ND 34 220 640	mg/L mg/L ug/L ug/L mg/L ug/L	2.0 0.034 16 1.2 3.0 4.3	2.0 0.12 57 3.8 3.0 15	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	02/25/97 72102646 02/20/97 72102646 02/20/97 72102646 02/20/97 72102646 02/20/97 72102646 02/20/97 72102646 02/20/97 72102646

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

Tewen R. Cinjin iewed by:

NORTHERN LAKE SER Analytical Laboratory and Envi 400 North Lake Avenue - Cran	ironmental Services don. WI 54520				WIS. LAB (CERT. NO. 72102	26460
Fel:(715)478-2777 Fax:(715)47	8-3060	ANALYTIC	CAL REPORT		PAGE: 9	NLS PROJ	BCT# 32436
Client:	Foth & Van Dyke A Attn: Russ Janesh 2737 S. Ridge Ro PO Box 19012 Green Bay, WI 54	ek ad		• •			
Project Descriptio Project Title: 96F	n: Flambeau Mining 022						
		8120				•	
Ref. Line 9 of COC 24843		-	· ·				
Sample ID: FMC-172 Ref. Line 9 of COC 24843 Collected: 02/17/97 Rece Parameter	Description: FMC-172LS-4	-	Units	LOD	roð	Method	Analyzed Lab

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:

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

ANALYTICAL REPORT

WIS. LAB CERT. NO. 721026460

PAGE: 10 NLS PROJECT# 32436

				LYGU: TO	MLS PRO	OPCI# 27420
Client: Foth & Van Dyke Attn: Russ Jane 2737 S. Ridge PO Box 19012 Green Bay, WI	shek Road					
Project Description: Flambeau Minin Project Title: 96F022	g					
Ref. Line 10 of COC 24843 Description: FMC-176LS-	128121 4 d: 02/26/97					
Parameter	Result	Units	LOD	LOQ	Method	Analyzed Lab
Acidity, tot. as CaCO3 Aluminum, dis. as Al by ICP Arsenic, dis. as As by ICP Cadmium, dis. as Cd by ICP Calcium, dis. as Cd by ICP Cobalt, dis. as Co by ICP Copper, dis. as Co by ICP Iron, dis. as Fe by ICP Magnesium, dis. as Mg by ICP Manganese, dis. as Mn by ICP pH, lab Selenium, dis. as Se by furnace Sulfate, as SO4 (filtered) Zinc, dis. as Zn by ICP	ND ND 29 580 380 8000 ND 6.5 600 5.6 < 50 > 680 2800	mg/L mg/L ug/L ug/L ug/L ug/L mg/L mg/L s.u. ug/L mg/L ug/L mg/L ug/L	2.0 0.034 16 1.2 3.0 4.3 5.4 0.010 3.0 1.8 1.0 37 250 120	2.0 0.12 57 3.8 3.0 15 19 0.035 3.0 6.1 130 250 120	EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 150.1 EPA 270.2	

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

Them R.C Reviewed by:

NORTHERN LAKE SERVIC Analytical Laboratory and Environ 400 North Lake Avenue - Crandon, Tel:(715)478-2777 Fax:(715)478-30	mental Services WI 54520		ANALYTICAL REPORT			WIS. LAB CERT. NO. 721026460			
2 2 1	Foth & Van Dyke Ass Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 5430	ociates			PAGE: 11	NLS PRO	JECT# 324	136	
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									
Ref. Line 1 of COC 24844 Des Collected: 02/18/97 Received	cription: FMC-15-3L-4								
Ref. Line 1 of COC 24844 Des	cription: FMC-15-3L-4		<u>Units</u>	LOD	LOQ	Method	Analyzed	Lab	

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

1

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

Reviewed by:

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

PAGE: 12

NLS PROJECT# 32436

Project Description: Flambe Project Title: 96F022	au Mining					
Sample ID: FMC-180L-4 Ref. Line 2 of COC 24844 Description: F Collected: 02/18/97 Received: 02/19/9	NLS#: 128123 MC-180L-4 7 Reported: 02/26/97					
arameter	Result	Units	LOD	LOQ	Mathod	Analyzed Lab
cidity, tot. as CaCO3	ND	mg/L	2.0	2.0	EPA 305.1	02/25/97 7210264
uminum, dis. as Al by ICP	ND	mg/L	0.034	0.12	EPA 200.7	02/20/97 7210264
senic, dis. as As by ICP	ND	ug/L	16	57	EPA 200.7	02/20/97 7210264
dmium, dis. as Cd by ICP lcium, dis. as Ca by ICP	44	ug/L	1.2	3.8	EPA 200.7	02/20/97 7210264
balt, dis. as Co by ICP	420	mg/L	3.0	3.0	EPA 200.7	02/20/97 7210264
opper, dis. as Cu by ICP	4600	ug/L ug/L	4.3 5.4	15	EPA 200.7	02/20/97 7210264
on, dis. as Fe by ICP	ND	mg/L	0.010	19 0.035	EPA 200.7 EPA 200.7	02/20/97 7210264
gnesium, dis. as Mq by ICP	27	mg/L	3.0	3.0	EPA 200.7	02/20/97 7210264 02/20/97 7210264
anganese, dis. as Mn by ICP	5900	ug/L	1.8	6.1		02/20/97 7210264
I, lab	5.6	s.u.	1.0	•••		02/19/97 7210264
elenium, dis. as Se by furnac	e ND	ug/L	37	130		02/24/97 7210264
lfate, as SO4 (filtered)	610	mg/L	250	250	EPA 375.2	
inc, dis. as Zn by ICP	6700	ug/L	120	120	EPA 200.7	02/20/97 7210264

Reviewed by: yr.

i

NORTHERN LAKE SERVICE, INC. Analytical Laboratory and Environmental Services 400 North Lake Avenue - Crandon, WI 54520 Tel:(715)478-2777 Fax:(715)478-3060			ANALYTICAL REPORT		WIS. LAB CERT. NO. 721026460		
Client:	Foth & Van Dyke J Attn: Russ Janes 2737 S. Ridge Ro PO Box 19012 Green Bay, WI 54	Associates hek oad			PAGE: 13	NLS PRO	JECT# 32436
ample ID: FMC-1	L81L-4 NLS#: 12	8124					
Ref. Line 3 of COC 2484 Collected: 02/18/97 arameter	4 Description: FMC-181L-4 Received: 02/19/97 Reported:		Units	LOD	Toð	Method	Analyzed Lab

LOD = Limit of Detection DWB = Dry Weight Basis LOQ = Limit of Quantitation NA = Not Applicable

ND = Not Detected %DWB = (mg/kg DWB)/10000

i

Reviewed by:

NORTHERN LAKE SERVICE, INC. Analytical Laboratory and Environmental Services WIS. LAB CERT. NO. 721026460 400 North Lake Avenue - Crandon, WI 54520 Tel:(715)478-2777 Fax:(715)478-3060 ANALYTICAL REPORT PAGE: 14 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	-4-IL-4 N	LS#: 128125
Ref. Line 4 of COC 24	344 Description: FMC	:-4-IL-4
Collected: 02/18/97	Received: 02/19/97	Reported: 02/26/97

Parameter	Result	<u>Units</u>	LOD	LÓŨ	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 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 DWB = Dry Weight Basis

LOQ = Limit of Quantitation NA = Not Applicable

ND = Not Detected %DWB = (mg/kg DWB)/10000

:

um R Reviewed by:

00 North Lake Avenue - Crandon, WI 54520 el:(715)478-2777 Fax:(715)478-3060	ANALYTIC	AL REPORT		PAGE: 15	NLS PRO	JECT# 3243	6
Client: Foth & Van Dyke Attn: Russ Janes 2737 S. Ridge R PO Box 19012 Green Bay, WI 55	hek oad						
ample ID: FMC-4-ILS-4 NLS#: 1: ef. Line 5 of COC 24844 Description: FMC-4-ILS-4 ollected: 02/18/97 Received: 02/19/97 Reported: arameter	28126 : 02/26/97 Result	Units	LOD	100	Method	Analyzed L	ab

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:

1

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

PAGE: 16

NLS PROJECT# 32436

Client: Foth & Van Dyke Attn: Russ Jane 2737 S. Ridge PO Box 19012 Green Bay, WI	shek Road						
Project Description: Flambeau Minin Project Title: 96F022	g						
Sample ID: FMC-181LS-4 NLS#: Ref. Line 6 of COC 24844 Description: FMC-181LS-4							
Collected: 02/18/97 Received: 02/19/97 Reporte Parameter	Result	Units	LOD	LOQ	Method	Analyzed 1	Lab
Collected: 02/18/97 Received: 02/19/97 Reporte Parameter	Result	Units	LOD	<u>100</u>	Method	Analyzed 1	
Collected: 02/18/97 Received: 02/19/97 Reporte Parameter Acidity, tot. as CaCO3	<u>Result</u> 340	mg/L	2.0	2.0	EPA 305.1	02/25/97	7210264
Collected: 02/18/97 Received: 02/19/97 Reporte <u>arameter</u> cidity, tot. as CaCO3 luminum, dis. as Al by ICP	Result 340 < 0.12	mg/L mg/L	2.0 0.034	2.0 0.12	EPA 305.1 EPA 200.7	02/25/97 [·] 02/20/97 ·	7210264 7210264
Collected: 02/18/97 Received: 02/19/97 Reporte arameter cidity, tot. as CaCO3 luminum, dis. as Al by ICP rsenic, dis. as As by ICP	Result 340 < 0.12 > ND	mg/L mg/L ug/L	2.0 0.034 16	2.0 0.12 57	EPA 305.1 EPA 200.7 EPA 200.7	02/25/97 [·] 02/20/97 · 02/20/97 ·	7210264 7210264 7210264
Collected: 02/18/97 Received: 02/19/97 Reporte arameter cidity, tot. as CaCO3 luminum, dis. as Al by ICP rsenic, dis. as As by ICP admium, dis. as Cd by ICP	Result 340 < 0.12 > ND 420	mg/L mg/L ug/L ug/L	2.0 0.034 16 1.2	2.0 0.12 57 3.8	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7	02/25/97 02/20/97 02/20/97 02/20/97 02/20/97	7210264 7210264 7210264 7210264
Collected: 02/18/97 Received: 02/19/97 Reporte arameter cidity, tot. as CaCO3 luminum, dis. as Al by ICP rsenic, dis. as As by ICP admium, dis. as Cd by ICP alcium, dis. as Ca by ICP	340 < 0.12 > ND 420 480	mg/L mg/L ug/L ug/L mg/L	2.0 0.034 16 1.2 3.0	2.0 0.12 57 3.8 3.0	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	02/25/97 [·] 02/20/97 [·] 02/20/97 [·] 02/20/97 [·] 02/20/97 [·]	7210264 7210264 7210264 7210264 7210264
Collected: 02/18/97 Received: 02/19/97 Reporte arameter cidity, tot. as CaCO3 luminum, dis. as Al by ICP rsenic, dis. as As by ICP admium, dis. as Ca by ICP alcium, dis. as Ca by ICP obalt, dis. as Co by ICP	Result 340 < 0.12 > ND 420 480 2200	mg/L mg/L ug/L ug/L mg/L ug/L	2.0 0.034 16 1.2 3.0 4.3	2.0 0.12 57 3.8 3.0 15	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	02/25/97 02/20/97 02/20/97 02/20/97 02/20/97 02/20/97	7210264 7210264 7210264 7210264 7210264 7210264 7210264
Collected: 02/18/97 Received: 02/19/97 Reporte arameter cidity, tot. as CaCO3 luminum, dis. as Al by ICP rsenic, dis. as As by ICP admium, dis. as Cd by ICP alcium, dis. as Ca by ICP obalt, dis. as Co by ICP opper, dis. as Cu by ICP	Result 340 < 0.12 > ND 420 480 2200 320000	mg/L mg/L ug/L ug/L mg/L ug/L ug/L	2.0 0.034 16 1.2 3.0 4.3 54	2.0 0.12 57 3.8 3.0 15 190	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	02/25/97 02/20/97 02/20/97 02/20/97 02/20/97 02/20/97 02/20/97	7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264
Collected: 02/18/97 Received: 02/19/97 Reporte arameter cidity, tot. as CaCO3 luminum, dis. as Al by ICP rsenic, dis. as As by ICP admium, dis. as Cd by ICP alcium, dis. as Ca by ICP obalt, dis. as Co by ICP opper, dis. as Fe by ICP	Result 340 < 0.12 > ND 420 480 2200 320000 1.8	mg/L mg/L ug/L ug/L mg/L ug/L ug/L ug/L	2.0 0.034 16 1.2 3.0 4.3 54 0.010	2.0 0.12 57 3.8 3.0 15 190 0.035	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	02/25/97 02/20/97 02/20/97 02/20/97 02/20/97 02/20/97 02/20/97 02/20/97	7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264
Collected: 02/18/97 Received: 02/19/97 Reporte arameter cidity, tot. as CaCO3 luminum, dis. as Al by ICP rsenic, dis. as As by ICP admium, dis. as Cd by ICP alcium, dis. as Ca by ICP obalt, dis. as Co by ICP opper, dis. as Co by ICP agnesium, dis. as Mg by ICP	Result 340 < 0.12 > ND 420 480 2200 320000 1.8 53	mg/L mg/L ug/L ug/L mg/L ug/L ug/L mg/L mg/L	2.0 0.034 16 1.2 3.0 4.3 54 0.010 3.0	2.0 0.12 57 3.8 3.0 15 190 0.035 3.0	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	02/25/97 02/20/97 02/20/97 02/20/97 02/20/97 02/20/97 02/20/97 02/20/97 02/20/97	7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264
Collected: 02/18/97 Received: 02/19/97 Reports arameter cidity, tot. as CaCO3 luminum, dis. as Al by ICP rsenic, dis. as As by ICP admium, dis. as Cd by ICP alcium, dis. as Ca by ICP obalt, dis. as Co by ICP opper, dis. as Cu by ICP ron, dis. as Fe by ICP agnesium, dis. as Mg by ICP anganese, dis. as Mn by ICP	340 340 < 0.12 > ND 420 480 22000 3200000 1.8 53 9200	mg/L mg/L ug/L ug/L ug/L ug/L ug/L mg/L ug/L ug/L	2.0 0.034 16 1.2 3.0 4.3 54 0.010 3.0 1.8	2.0 0.12 57 3.8 3.0 15 190 0.035	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	02/25/97 02/20/97 02/20/97 02/20/97 02/20/97 02/20/97 02/20/97 02/20/97 02/20/97	7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264
Collected: 02/18/97 Received: 02/19/97 Reports arameter cidity, tot. as CaCO3 luminum, dis. as Al by ICP rsenic, dis. as As by ICP admium, dis. as Cd by ICP alcium, dis. as Ca by ICP obalt, dis. as Co by ICP opper, dis. as Cu by ICP ron, dis. as Fe by ICP agnesium, dis. as Mg by ICP anganese, dis. as Mn by ICP H, lab	Result 340 < 0.12 > ND 420 480 2200 320000 1.8 53 9200 4.5	mg/L mg/L ug/L ug/L ug/L ug/L ug/L ug/L ug/L u	2.0 0.034 16 1.2 3.0 4.3 54 0.010 3.0 1.8 1.0	2.0 0.12 57 3.8 3.0 15 190 0.035 3.0 6.1	EPA 305.1 EPA 200.7 EPA 200.7	02/25/97 02/20/97 02/20/97 02/20/97 02/20/97 02/20/97 02/20/97 02/20/97 02/20/97 02/20/97 02/20/97	7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264
Collected: 02/18/97 Received: 02/19/97 Reporte Parameter	340 340 < 0.12 > ND 420 480 22000 3200000 1.8 53 9200	mg/L mg/L ug/L ug/L ug/L ug/L ug/L mg/L ug/L ug/L	2.0 0.034 16 1.2 3.0 4.3 54 0.010 3.0 1.8	2.0 0.12 57 3.8 3.0 15 190 0.035 3.0	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	02/25/97 02/20/97 02/20/97 02/20/97 02/20/97 02/20/97 02/20/97 02/20/97 02/20/97 02/20/97 02/20/97 02/20/97 02/20/97	7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264

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

Ateum R - Cenye Reviewed by:

Authorized by: R. T. Krueger Laboratory Manager

Analytical Laboratory and En 00 North Lake Avenue - Cran Fel:(715)478-2777 Fax:(715)4	1don, WI 54520	ANALYTIC	CAL REPORT		PAGE: 17	NLS PRO	JECT# 32436
Client:	Foth & Van Dyke As Attn: Russ Janeshe 2737 S. Ridge Roa PO Box 19012 Green Bay, WI 543	lk Id					
roject Title: 96							
	DLS-4 NLS#: 128 Description: FMC-180LS-4 eived: 02/19/97 Reported: 02		Units	LOD	LOQ	Method	Analyzed Lab

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

Client: Foth & Van Dyke Associates Attn: Russ Janashek 2737 S. Ridge Road FO Box 19012 Green Bay, WI 54307 Project Description: Flambeau Mining Project Title: 96F022 Sample ID: FMC-15-3LS-4 NLS#: 128129 Ref.Lme 8 of COC 24844 Description: FMC-15-3LS-4 Collected: 0210897 Reported: 02128/97 Units LOD LOD Mathematication: FLambeau Mining Project Title: 96F022 Ref.Lme 8 of COC 24844 Description: FMC-15-3LS-4 Collected: 0210897 Reported: 02128/97 NLS#: 128129 Reported: 02128/97 Analyzed Lab Alkalinity, tot. as CaCO3 (filtered) 19 mg/L 1.5 5.3 EPA 310.1 02/24/97 71202 Arsenic, dis. as CaCO3 (filtered) 19 mg/L 1.6 57 EPA 200.7 02/20/97 71202 Arsenic, dis. as CaCO3 (filtered) 19 mg/L 1.0 3.0 EPA 200.7 02/20/97 71202 Arsenic, dis. as CaCO3 (filtered) 19 mg/L 1.0 3.0 EPA 200.7 02/20/97 71202 Arsenic, dis. as CaCO 10.7 02/24/97 71202 Arsenic, dis. as CaCO 10.7								
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: 02/26/97 Project Title: 96F022 Project Title: 96F022 Project Title: 96F024 Project Title: 96F024 Description: FMC-15-3LS-4 Collected: 02/18/97 Received: 02/26/97 Project Title: 02/26/97 Project Title: 02/26/97 Project Title: 02/24/97 72102 Project Title: 0.034 0.12 Project Title: 0.034 Old 22/24/97 72102 Project Title: 0.034 Digner distance Project Title: 0.034 Old 22/24/97 72102 Project Title: 0.010 Digner distance Project Title: 0.0310 Project Title: 0.02/20/97 72102 Projectitle: 0.02 Projectitle: 0.02	Attn: Russ Janesh 2737 S. Ridge Ro PO Box 19012	lek það						
Ref. Line 8 of COC 24844 Description: FMC-15-3L5-4 Collected: 02/18/97 Received: 02/19/97 Reported: 02/26/97 Parameter Received: 02/18/97 Reported: 02/26/97 Parameter Line 8 of COC 24844 Description: FMC-15-3L5-4 Alkalinity, tot. as CaCO3 (filtered) 19 mg/L 1.5 5.3 EFA 310.1 02/24/97 72102/ Aluminum, dis. as Al by ICP ND mg/L 0.034 0.12 EFA 200.7 02/20/97 72102/ Treenic, dis. as Ca by ICP ND ug/L 1.2 3.8 EFA 200.7 02/20/97 72102/ Calcium, dis. as Ca by ICP ND ug/L 1.2 3.8 EFA 200.7 02/20/97 72102/ Calcium, dis. as Ca by ICP 430 mg/L 3.0 3.0 EFA 200.7 02/20/97 72102/ Copper, dis. as Ca by ICP 411 ug/L 4.3 15 EFA 200.7 02/20/97 72102/ Copper, dis. as Ca by ICP 10 mg/L 0.010 0.035 EFA 200.7 02/20/97 72102/ Canganesum, dis. as Mg by ICP 16 mg/L 3.0 3.0 EFA 200.7 02/20/97 72102/ Asganesum, dis. as Mg by ICP 16 mg/L 3.0 3.0 EFA 200.7 02/20/97 72102/ Manganese, dis. as Mg by ICP 16 mg/L 3.0 3.0 EFA 200.7 02/20/97 72102/ Manganese, dis. as Seb y furnace ND ug/L 3.0 3.0 EFA 200.7 02/20/97 72102/ Sulfate, as Sol (filtered) 570 mg/L 250 250 EFA 375.2 02/25/97 72102/ Values in brackets represent results greater than the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". COD = Limit of Detection NA = Not Applicable NA = Not Applic								
Mikalinity, tot. as CaCO3 (filtered) 19 mg/L 0.004 0.12 EPA 310.1 02/24/97 72102/ Aluminum, dis. as Al by ICP ND mg/L 0.034 0.12 EPA 200.7 02/20/97 72102/ Aluminum, dis. as Al by ICP ND ug/L 16 57 EPA 200.7 02/20/97 72102/ Schum, dis. as Cd by ICP ND ug/L 1.2 3.8 EPA 200.7 02/20/97 72102/ Talcium, dis. as Cd by ICP ND ug/L 1.2 3.8 EPA 200.7 02/20/97 72102/ Cobalt, dis. as Co by ICP 430 mg/L 3.0 3.0 EPA 200.7 02/20/97 72102/ Copper, dis. as Co by ICP 41 ug/L 4.3 15 EPA 200.7 02/20/97 72102/ Toron, dis. as Fe by ICP ND mg/L 0.010 0.035 EPA 200.7 02/20/97 72102/ tagnesium, dis. as Mg by ICP 16 mg/L 3.0 EPA 200.7 02/20/97 72102/ tagnesium, dis. as Se by ICP ND ug/L 3.0 EPA 200.7 02/20/97	Description: FMC-15-3LS-4							
Aluminum, dis.as Al by ICPND mg/L 0.0340.12EPA 200.702/20/9772102/Arsenic, dis.as As by ICPNDug/L1657EPA 200.702/20/9772102/Cadmium, dis.as Cd by ICPNDug/L1.23.8EPA 200.702/20/9772102/Calcium, dis.as Cd by ICPMDug/L1.23.8EPA 200.702/20/9772102/Calcium, dis.as Co by ICP430mg/L3.03.0EPA 200.702/20/9772102/Cobalt, dis.as Co by ICP41ug/L4.315EPA 200.702/20/9772102/Copper, dis.as Co by ICP200ug/L5.419EPA 200.702/20/9772102/Copper, dis.as Mg by ICPNDmg/L0.0100.035EPA 200.702/20/9772102/Magnesium, dis.as Mg by ICP16mg/L3.03.0EPA 200.702/20/9772102/Magnese, dis.as Mg by ICP16mg/L3.03.0EPA 200.702/20/9772102/Magnese, dis.as Mn by ICP860ug/L1.86.1EPA 200.702/20/9772102/Selenium, dis.as Set furnaceNDug/L3.01.0EPA 200.702/20/9772102/Sulfate, as S04 (filtered)570mg/L250250EPA 370.202/21/9772102/Zinc, dis.as Zn by ICPNDug/L120 <td< th=""><th></th><th>Result</th><th>Units</th><th>LOD</th><th>LOQ</th><th>Method</th><th>Analyzed</th><th>Lab</th></td<>		Result	Units	LOD	LOQ	Method	Analyzed	Lab
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 & & & & & & & & & & & & & & & & & & &	by ICP by ICP by ICP y ICP y ICP y ICP y ICP CP by ICP by ICP by ICP by ICP by ICP	ND ND 430 41 200 ND 16 880 6.7 ND 570	mg/L ug/L ug/L ug/L ug/L mg/L mg/L ug/L s.u. ug/L mg/L	0.034 16 1.2 3.0 4.3 5.4 0.010 3.0 1.8 1.0 37 250	0.12 57 3.8 3.0 15 19 0.035 3.0 6.1 130 250	EPA 200.7 EPA 150.1 EPA 270.2 EPA 375.2	02/20/97 02/20/97 02/20/97 02/20/97 02/20/97 02/20/97 02/20/97 02/20/97 02/20/97 02/20/97 02/20/97 02/20/97 02/20/97 02/20/97	72102646 72102646 72102646 72102646 72102646 72102646 72102646 72102646 72102646 72102646 72102646 72102646
	he LOQ are considere. .on	d to be in the region mit of Quantitation	of "Certain Quantit ND = Not Detecte %DWB = (mg/kg DW	ation". d B)/10000	Authorize R. T. K	d by: rueger	Quantita	tion".
				1				
-								
		2737 S. Ridge Rc PO Box 19012 Green Bay, WI 54 a: Flambeau Mining 022 BLS-4 NLS#: 1 Description: FMC-15-3LS-4 ved: 02/19/97 Reported: CaCO3 (filtered) by ICP oy ICP oy ICP oy ICP oy ICP f Dy ICP f Dy ICP f by I	2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307 h: Flambeau Mining 022 BLS-4 NLS#: 128129 Description: FMC-15-3LS-4 ved: 02/19/97 Reported: 02/26/97 Result CaCO3 (filtered) 19 by ICP ND oy ICP ND oy ICP ND oy ICP 410 / ICP 411 / ICP 200 ICP 16 h by ICP 16 h by ICP 570 CP ND y ICP 570 CP 570	2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307 A: Flambeau Mining D22 DLS-4 NLS#: 128129 Description: FMC-15-3LS-4 ved: 02/19/97 Reported: 02/26/97 Result Units CaCO3 (filtered) 19 mg/L by ICP ND ug/L by ICP ND ug/L created ND ug/L by ICP 430 mg/L created ND ug/L created ND ug/L created ND ug/L created ND ug/L by ICP 6 created ND ug/L created ND ug/L created ND ug/L created ND ug/L created ND ug/L created ND ug/L by ICP 880 ug/L created ND ug/L created ND ug/L created ND ug/L created ND ug/L created ND ug/L by furnace ND ug/L created S70 mg/L created S70 mg/L	2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307 h: Flambeau Mining 22 H_S-4 NLS#: 128129 Description: FMC-15-3LS-4 ved: 02/19/97 Reported: 02/26/97 Result Units LOD CaCO3 (filtered) 19 mg/L 1.5 by ICP ND ug/L 16 Dy ICP ND ug/L 1.2 Dy ICP MD ug/L 1.2 Dy ICP 430 mg/L 3.0 r ICP 41 ug/L 4.3 r ICP 200 ug/L 5.4 r ICP 16 mg/L 3.0 r ICP 880 ug/L 1.8 for mg/L 3.0 r ICP 880 ug/L 1.8 for mg/L 3.0 r ICP 16 mg/L 3.0 r ICP 16 mg/L 3.0 r ICP 16 mg/L 3.0 r ICP 16 mg/L 3.0 h by ICP 16 mg/L 3.0 h by ICP 16 mg/L 3.0 h by ICP 16 mg/L 3.0 h by ICP 16 mg/L 3.0 h by ICP 16 mg/L 3.0 h by ICP 16 mg/L 3.0 h by ICP 16 mg/L 3.0 h by ICP 16 mg/L 3.0 h by ICP 16 mg/L 3.0 h by ICP 16 mg/L 3.0 h by furnace ND ug/L 37 by furnace ND ug/L 37 by furnace ND ug/L 250 ICP ND ug/L 120 by furnace ND ug/L	2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307 1: Flambeau Mining 122 ULS-4 NLS#: 128129 Description: FMC-15-315-4 ved: 02/19/97 Reported: 02/26/97 $\begin{array}{c ccccccccccccccccccccccccccccccccccc$	2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307 h: Flambeau Mining 222 HLS-4 NLS#: 128129 Description: FMC-15-315-4 ved: 02/19/97 Reported: 02/26/97 $\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$

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)

Rovd: 03-21.97 5y: _ **次**T CC: <u>BTJ JChappen</u> SGL GWS File: % F022 Flambeeu Min

.

(

,...,

 \bigcirc

NORTHERN LAKE SE Analytical Laboratory and E	Invironmental Services				WIS. LAB	CERT. NO. 72102	26460
400 North Lake Avenue - Cr Fel:(715)478-2777 Fax:(715)		ANALYTIC	CAL REPORT		PAGE: 1	NLS PROJ	BCT# 32654
Client:	Foth & Van Dyke Attn: Russ Janes 2737 S. Ridge R PO Box 19012 Green Bay, WI 5	hek . oad					
Project Title: 9 Sample ID: FMC-1							
Collected: 03/03/97 Representation Representatio Representation Representation Representation Re	eceived: 03/05/97 Reported:	:03/17/97 <u>Result</u>	Units	LOD	<u>roō</u>	Method	Analyzed Lab

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

Authorized by:

Reviewed by:

NORTHERN LAKE SERVICE, IN Analytical Laboratory and Environmental 400 North Lake Avenue - Crandon, WI 54 Tel:(715)478-2777 Fax:(715)478-3060	Services	ANALYTIC	AL REPORT		WIS. LAB	CERT. NO. 721020 NLS PROJI	5460 SCT# 32654
Attn 2737 PO Bo	& Van Dyke Associate : Russ Janeshek S. Ridge Road ox 19012 h Bay, WI 54307	38			·		
Project Description: Flam Project Title: 96F022	nbeau Mining						
Sample ID: FMC-13-1LS-5 Ref. Line 2 of COC 25140 Descriptio Collected: 03/03/97 Received: 03/0							
Parameter	<u>R</u>	esult	<u>Units</u>	LOD	<u>LOQ</u>	Method	Analyzed Lab
Acidity, tot. as CaCO3 .		ND	mg/L	2.0	2.0	EPA 305.1	03/06/97 721026460

LOD = Limit of Detection DWB = Dry Weight Basis

•

LOQ = Limit of Quantitation NA = Not Applicable ND = Not Detected %DWB = (mg/kg DWB)/10000

into

Authorized by:

R. T. Krueger Laboratory Manager

Reviewed by:

~~vy

NORTHERN LAKE SE malytical Laboratory and E 00 North Lake Avenue - Cr 'el:(715)478-2777 Fax:(715)	nvironmental Services andon, WI 54520				WIS. LAB	CERT. NO. 72102	26460	
•••(••••)		ANALYTIC	AL REPORT		PAGE: 3	NLS PROJ	ECT# 32654	ł
Client:	Foth & Van Dyke : Attn: Russ Janes: 2737 S. Ridge R PO Box 19012 Green Bay, WI 5	hek						
Project Title: 90	52022							
Sample ID: FMC-18		29383	- · · · · · · · · · · · · · · · ·				· · · · · · · · · · · · · · · · · · ·	
Sample ID: FMC-18 Ref. Line 3 of COC 25140	38LS-5 NLS#: 1 Description: FMC-188LS-5	29383 03/17/97	•					
Sample ID: FMC-18 Ref. Line 3 of COC 25140	38LS-5 NLS#: 1 Description: FMC-188LS-5		Units	LOD	Foð	Method	Analyzed L	ab

LOD = Limit of Detection DWB = Dry Weight Basis

•

LOQ = Limit of Quantitation NA = Not Applicable ND = Not Detected %DWB = (mg/kg DWB)/10000

Shomas

Authorized by:

Reviewed by:

Analytical Laboratory and Environ 400 North Lake Avenue - Crandon					WIS. LAB	CERT. NO. 72102	26460
Tel:(715)478-2777 Fax:(715)478-36		ANALYTIC	AL REPORT		PAGE: 4	NLS PROJ	BCT# 32654
	Foth & Van Dyke Associat Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307	85					
Project Description: Project Title: 96F02	Flambeau Mining 2						
Sample ID: FMC-183LS Ref. Line 4 of COC 25140 De Collected: 03/03/97 Receive Parameter	scription: FMC-183LS-5 d: 03/05/97 Reported: 03/17/97	Result	Units	LOD	TOÖ		
	-				цоў	Method	Analyzed Lab

LOD = Limit of Detection DWB = Dry Weight Basis

•

LOQ = Limit of Quantitation NA = Not Applicable ND = Not Detected %DWB = (mg/kg DWB)/10000

): ly

Authorized by:

R. T. Krueger Laboratory Manager

Reviewed by:

•

e haart				<u>X</u>				
NORTHERN LAKE S Inalytical Laboratory and F 00 North Lake Avenue - Cr iel:(715)478-2777 Fax:(715	Invironmental Service randon, WI 54520	8	ANALYT	ICAL REPORT		WIS. LAB	CERT. NO. 7210	26460 JECT# 32654
Client:	Attn: Rua 2737 S. PO Box 1	an Dyke Associa ss Janeshek Ridge Road 9012 y, WI 54307	ltes					
Project Descript Project Title: 9	ion: Flambeau 6F022	ı Mining						
Sample ID: FMC-2 Ref. Line 5 of COC 25140 Collected: 03/03/97 R	13LS-5 Description: FM(eceived: 03/05/97	NLS#: 129385 C-213LS-5 Reported: 03/17/97	,			w		
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 7210264
/alues in brackets Results greater that	represent resu in the LOQ are	ilts greater than considered to be	the LOD but in the regic	less than the LOQ and on of "Certain Quantita	are within a ation".	region of "	Less-Certair	a Quantitation".
LOD = Limit of Dete		LOQ = Limit of		ND = Not Detected	đ			
	asis	NA = Not Applic	able ·	<pre>%DWB = (mg/kg DWB)</pre>)/10000			
	asis		cable ·	*DWB = (mg/kg DWB Monas R H	10000	Authorize	d by:	
DWB = Dry Weight Ba	asis		cable ·	<pre>\$DWB = (mg/kg DWB) Shomas K H Reviewed by:</pre>)/10000 D. (Mile	R. T. K	-	
	asis		cable .	Shomas KH	Auto	R. T. K	rueger	
	asis		cable	Shomas KH	ALLA	R. T. K	rueger	·
	asis		cable	Shomas KH)/10000 D. J.	R. T. K	rueger	·

ł.

•.

.

NORTHERN LAKE SERVICE, INC. nalytical Laboratory and Environmental Service 00 North Lake Avenue - Crandon, WI 54520	S			WIS. LAB	CERT. NO. 72102	26460
el:(715)478-2777 Fax:(715)478-3060	ANALYTIC	AL REPORT		PAGE: 6	NLS PROJ	ECT# 32654
Attn: Rus						
Project Description: Flambeau Project Title: 96F022	1 Mining					
Sample ID: FMC-187LS-5	NLS#: 129386				<u> </u>	
Sample ID: FMC~187LS-5 Ref. Line 6 of COC 25140 Description: FMC Collected: 03/03/97 Received: 03/05/97	NLS#: 129386 C-187LS-5 Reported: 03/17/97					
Ref. Line 6 of COC 25140 Description: FMC	-187LS-5	Units	LOD	LOQ	Method	Analyzed Lab
Ref. Line 6 of COC 25140 Description: FMC Collected: 03/03/97 Received: 03/05/97 <u>arameter</u> cidity, tot. as CaCO3	C-187LS-5 Reported: 03/17/97 <u>Result</u> 92	mg/L	<u>LOD</u> 2.0	<u>LOQ</u> 2.0	Method EPA 305.1	
ef. Line 6 of COC 25140 Description: FMC collected: 03/03/97 Received: 03/05/97 arameter cidity, tot. as CaCO3 Luminum, dis. as Al by ICP	C-187LS-5 Reported: 03/17/97 <u>Result</u> 92 ND	mg/L mg/L	2.0 0.034	2.0 0.12	EPA 305.1 EPA 200.7	03/06/97 721026 03/11/97 721026
ef. Line 6 of COC 25140 Description: FMC collected: 03/03/97 Received: 03/05/97 arameter cidity, tot. as CaCO3 luminum, dis. as Al by ICP rsenic, dis. as As by ICP	C-187LS-5 Reported: 03/17/97 <u>Result</u> 92 ND ND	mg/L mg/L ug/L	2.0 0.034 16	2.0 0.12 57	EPA 305.1 EPA 200.7 EPA 200.7	03/06/97 721026 03/11/97 721026 03/11/97 721026
ef. Line 6 of COC 25140 Description: FMC ollected: 03/03/97 Received: 03/05/97 arameter cidity, tot. as CaCO3 luminum, dis. as Al by ICP csenic, dis. as As by ICP admium, dis. as Cd by ICP	C-187LS-5 Reported: 03/17/97 <u>Result</u> 92 ND ND ND 10	mg/L mg/L ug/L ug/L	2.0 0.034 16 1.2	2.0 0.12 57 3.8	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7	03/06/97 721026 03/11/97 721026 03/11/97 721026 03/11/97 721026 03/11/97 721026
ef. Line 6 of COC 25140 Description: FMC ollected: 03/03/97 Received: 03/05/97 arameter cidity, tot. as CaCO3 luminum, dis. as Al by ICP csenic, dis. as As by ICP admium, dis. as Cd by ICP alcium, dis. as Ca by ICP	C-187LS-5 Reported: 03/17/97 <u>Result</u> 92 ND ND 10 350	mg/L mg/L ug/L ug/L mg/L	2.0 0.034 16 1.2 3.0	2.0 0.12 57 3.8 3.0	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	03/06/97 721026 03/11/97 721026 03/11/97 721026 03/11/97 721026 03/11/97 721026
ef. Line 6 of COC 25140 Description: FMC ollected: 03/03/97 Received: 03/05/97 arameter cidity, tot. as CaCO3 luminum, dis. as Al by ICP rsenic, dis. as As by ICP admium, dis. as Ca by ICP alcium, dis. as Ca by ICP obalt, dis. as Co by ICP	C-187LS-5 Reported: 03/17/97 <u>Result</u> 92 ND ND ND 10	mg/L mg/L ug/L ug/L mg/L ug/L	2.0 0.034 16 1.2 3.0 4.3	2.0 0.12 57 3.8 3.0 15	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	03/06/97 721026 03/11/97 721026 03/11/97 721026 03/11/97 721026 03/11/97 721026 03/11/97 721026
ef. Line 6 of COC 25140 Description: FMC ollected: 03/03/97 Received: 03/05/97 arameter cidity, tot. as CaCO3 Luminum, dis. as Al by ICP csenic, dis. as As by ICP admium, dis. as Cd by ICP alcium, dis. as Cd by ICP obalt, dis. as Co by ICP obalt, dis. as Co by ICP	C-187LS-5 Reported: 03/17/97 <u>Result</u> 92 ND ND 10 350 210	mg/L mg/L ug/L ug/L ug/L ug/L ug/L	2.0 0.034 16 1.2 3.0 4.3 54	2.0 0.12 57 3.8 3.0 15 190	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	03/06/97 721026 03/11/97 721026 03/11/97 721026 03/11/97 721026 03/11/97 721026 03/11/97 721026 03/11/97 721026
ef. Line 6 of COC 25140 Description: FMC collected: 03/03/97 Received: 03/05/97 arameter cidity, tot. as CaCO3 luminum, dis. as Al by ICP rsenic, dis. as As by ICP admium, dis. as Cd by ICP alcium, dis. as Cd by ICP obalt, dis. as Co by ICP opper, dis. as Cu by ICP con, dis. as Fe by ICP	C-187LS-5 Reported: 03/17/97 <u>Result</u> 92 ND ND 10 350 210 40000	mg/L mg/L ug/L ug/L mg/L ug/L ug/L ug/L	2.0 0.034 16 1.2 3.0 4.3	2.0 0.12 57 3.8 3.0 15	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	03/06/97 721026 03/11/97 721026 03/11/97 721026 03/11/97 721026 03/11/97 721026 03/11/97 721026 03/11/97 721026 03/11/97 721026
Arrian Series and Arrived Series	C-187LS-5 Reported: 03/17/97	mg/L mg/L ug/L ug/L ug/L ug/L ug/L	2.0 0.034 16 1.2 3.0 4.3 54 0.010 3.0 1.8	2.0 0.12 57 3.8 3.0 15 190 0.035	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	03/06/97 721026 03/11/97 721026 03/11/97 721026 03/11/97 721026 03/11/97 721026 03/11/97 721026 03/11/97 721026 03/11/97 721026 03/11/97 721026
Arrient Strategy Stra	C-187LS-5 Reported: 03/17/97 Result 92 ND ND 10 350 210 40000 0.052 8.4 1200 5.3	mg/L mg/L ug/L ug/L ug/L ug/L mg/L mg/L ug/L s.u.	2.0 0.034 16 1.2 3.0 4.3 54 0.010 3.0 1.8 1.0	2.0 0.12 57 3.8 3.0 15 190 0.035 3.0 6.1	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	03/06/97 721026 03/11/97 721026 03/11/97 721026 03/11/97 721026 03/11/97 721026 03/11/97 721026 03/11/97 721026 03/11/97 721026 03/11/97 721026 03/11/97 721026 03/05/97 721026
lef. Line 6 of COC 25140 Description: FMC Collected: 03/03/97 Received: 03/05/97 arameter	C-187LS-5 Reported: 03/17/97	mg/L mg/L ug/L ug/L ug/L ug/L mg/L mg/L mg/L ug/L	2.0 0.034 16 1.2 3.0 4.3 54 0.010 3.0 1.8	2.0 0.12 57 3.8 3.0 15 190 0.035 3.0	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	03/06/97 721026 03/11/97 721026 03/11/97 721026 03/11/97 721026 03/11/97 721026 03/11/97 721026 03/11/97 721026 03/11/97 721026 03/11/97 721026 03/11/97 721026

LOD = Limit of Detection DWB = Dry Weight Basis LOQ = Limit of Quantitation NA = Not Applicable

i.

ND = Not Detected %DWB = (mg/kg DWB)/10000

Reviewed by:

Authorized by:

i

NORTHERN LAKE SERVICE, 1 analytical Laboratory and Environment 00 North Lake Avenue - Crandon, WI	al Services				WIS. LAB	CERT. NO. 72102	26460	
Fel:(715)478-2777 Fax:(715)478-3060		ANALYTIC	AL REPORT		PAGE: 7	NLS PROJ	ECT# 326	54
Att: 273 PO 1	h & Van Dyke Associ n: Russ Janeshek 7 S. Ridge Road Box 19012 en Bay, WI 54307	ates						
							····	
ef. Line 7 of COC 25140 Descript collected: 03/03/97 Received: 03		7 Result	Units	LOD	LOO	Method	Analyzed	Lab
ef. Line 7 of COC 25140 Descript ollected: 03/03/97 Received: 03 urameter	tion: FMC-192LS-5	Result		LOD	<u>100</u>	Method	Analyzed	
ef. Line 7 of COC 25140 Descript ollected: 03/03/97 Received: 03 trameter :idity, tot. as CaCO3	tion: FMC-192LS-5 3/05/97 Reported: 03/17/97		mg/L	2.0	2.0	EPA 305.1	03/06/97	7210264
of. Line 7 of COC 25140 Descript Delected: 03/03/97 Received: 03 <u>rameter</u> idity, tot. as CaCO3 uminum, dis. as Al by IC senic, dis. as As by ICP	tion: FMC-192LS-5 3/05/97 Reported: 03/17/97	Result ND ND ND	mg/L mg/L			EPA 305.1 EPA 200.7	03/06/97	7210264
of. Line 7 of COC 25140 Descript collected: 03/03/97 Received: 03 <u>rameter</u> idity, tot. as CaCO3 uminum, dis. as Al by IC senic, dis. as As by ICP dmium, dis. as Cd by ICP	tion: FMC-192LS-5 3/05/97 Reported: 03/17/97	Result ND ND ND < 2.8 >	mg/L mg/L ug/L ug/L	2.0 0.034 16 1.2	2.0 0.12 57 3.8	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7	03/06/97 03/11/97 03/11/97 03/11/97	7210264 7210264 7210264 7210264 7210264
of. Line 7 of COC 25140 Descript ollected: 03/03/97 Received: 03 <u>rameter</u> idity, tot. as CaCO3 uminum, dis. as Al by ICP dmium, dis. as Cd by ICP dmium, dis. as Ca by ICP lcium, dis. as Ca by ICP	tion: FMC-192LS-5 3/05/97 Reported: 03/17/97	Result ND ND < 2.8 > 86	mg/L mg/L ug/L ug/L mg/L	2.0 0.034 16 1.2 3.0	2.0 0.12 57 3.8 3.0	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	03/06/97 03/11/97 03/11/97 03/11/97 03/11/97	7210264 7210264 7210264 7210264 7210264 7210264
of. Line 7 of COC 25140 Descript officited: 03/03/97 Received: 03 rameter idity, tot. as CaCO3 uminum, dis. as Al by IC senic, dis. as As by ICP dmium, dis. as Ca by ICP lcium, dis. as Ca by ICP balt, dis. as Co by ICP	tion: FMC-192LS-5 3/05/97 Reported: 03/17/97	Result ND ND < 2.8 > 86 180	mg/L mg/L ug/L ug/L mg/L ug/L	2.0 0.034 16 1.2 3.0 4.3	2.0 0.12 57 3.8 3.0 15	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	03/06/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97	7210264 7210264 7210264 7210264 7210264 7210264 7210264
of. Line 7 of COC 25140 Descript Delected: 03/03/97 Received: 03 rameter didity, tot. as CaCO3 uminum, dis. as Al by IC senic, dis. as As by ICP dmium, dis. as Cd by ICP lcium, dis. as Co by ICP balt, dis. as Co by ICP pper, dis. as Cu by ICP	tion: FMC-192LS-5 3/05/97 Reported: 03/17/97	Result ND ND < 2.8 > 86 180 17000	mg/L mg/L ug/L ug/L ug/L ug/L ug/L	2.0 0.034 16 1.2 3.0 4.3 54	2.0 0.12 57 3.8 3.0 15 190	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	03/06/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97	7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264
ef. Line 7 of COC 25140 Descript ollected: 03/03/97 Received: 03 rameter tidity, tot. as CaCO3 uminum, dis. as Al by IC senic, dis. as As by ICP dmium, dis. as Cd by ICP dmium, dis. as Ca by ICP obalt, dis. as Co by ICP opper, dis. as Fe by ICP	tion: FMC-192LS-5 3/05/97 Reported: 03/17/97	Result ND ND < 2.8 > 86 180 17000 ND	mg/L mg/L ug/L ug/L ug/L ug/L ug/L ug/L	2.0 0.034 16 1.2 3.0 4.3 54 0.010	2.0 0.12 57 3.8 3.0 15 190 0.035	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	03/06/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97	7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264
ef. Line 7 of COC 25140 Descript ollected: 03/03/97 Received: 03 <u>trameter</u> cidity, tot. as CaCO3 cuminum, dis. as Al by ICP admium, dis. as Cd by ICP admium, dis. as Cd by ICP admium, dis. as Co by ICP obalt, dis. as Cu by ICP con, dis. as Fe by ICP agnesium, dis. as Mg by I	tion: FMC-192LS-5 3/05/97 Reported: 03/17/97	Result ND ND 2.8 > 86 180 170000 ND 12	mg/L mg/L ug/L ug/L mg/L ug/L ug/L mg/L mg/L	2.0 0.034 16 1.2 3.0 4.3 54 0.010 3.0	2.0 0.12 57 3.8 3.0 15 190 0.035 3.0	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	03/06/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97	7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264
Ref. Line 7 of COC 25140 Descript Collected: 03/03/97 Received: 03 arameter cidity, tot. as CaCO3 luminum, dis. as As by ICP admium, dis. as Cd by ICP admium, dis. as Cd by ICP alcium, dis. as Co by ICP obalt, dis. as Co by ICP opper, dis. as Cu by ICP ron, dis. as Fe by ICP agnesium, dis. as Mg by I anganese, dis. as Mn by I H, lab	tion: FMC-192LS-5 3/05/97 Reported: 03/17/97	Result ND ND < 2.8 > 86 180 17000 ND	mg/L mg/L ug/L ug/L ug/L ug/L ug/L ug/L	2.0 0.034 16 1.2 3.0 4.3 54 0.010 3.0 1.8	2.0 0.12 57 3.8 3.0 15 190 0.035	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	03/06/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97	7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264
Carameter Acidity, tot. as CaCO3 Aluminum, dis. as Al by IC Arsenic, dis. as As by ICP Cadmium, dis. as Cd by ICP Calcium, dis. as Ca by ICP	tion: FMC-192LS-5 3/05/97 Reported: 03/17/97	Result ND ND < 2.8 > 86 180 17000 ND 12 1500	mg/L mg/L ug/L ug/L ug/L ug/L ug/L mg/L mg/L ug/L	2.0 0.034 16 1.2 3.0 4.3 54 0.010 3.0	2.0 0.12 57 3.8 3.0 15 190 0.035 3.0	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	03/06/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97	7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264

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

Sumas

Authorized by:

Reviewed by:

Analytical Laboratory and Environ 400 North Lake Avenue - Crandon,					WIS. LAB	CERT. NO. 72102	26460
Tel:(715)478-2777 Fax:(715)478-30		ANALYTIC	AL REPORT		PAGE: 8	NLS PROJ	BCT# 32654
	Foth & Van Dyke Associa Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307	ates					
Project Description: Project Title: 96F02							
Sample ID: FMC-190LS		<u> </u>		··· · · · · · · · · · · ·			
Ref. Line 8 of COC 25140 Dea	scription: FMC-190LS-5 d: 03/05/97 Reported: 03/17/97	Result	Units	LOD	FOO	Method	Analyzed Lab

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:

•••									
NORTHERN LAKE SERVICE, INC. nalytical Laboratory and Environmental Services 00 North Lake Avenue - Crandon, WI 54520 el:(715)478-2777 Fax:(715)478-3060		ANALYTICAL REPORT			WIS. LAB C PAGE: 9		CERT. NO. 721026460 NLS PROJECT# 32654		
Client:	Foth & Van Dyke Associat Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307	tes							
Project Description Project Title: 96F(n: Flambeau Mining								
Sample TD. RMC-1721									
	LS-5 NLS#: 129389 Description: FMC-172LS-5 ived: 03/05/97 Reported: 03/17/97								
Ref. Line 9 of COC 25140	LS-5 NLS#: 129389 Description: FMC-172LS-5 ived: 03/05/97 Reported: 03/17/97	Result	Units	FOD	FOD	Method	Analyzed	Lab	

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

Thomas

Authorized by:

Reviewed by:

NORTHERN LAKE SERVICE, INC. Analytical Laboratory and Environmental Services 400 North Lake Avenue - Crandon, WI 54520 Tel:(715)478-2777 Fax:(715)478-3060							
	ANALYTIC	CAL REPORT		PAGE: 10	NLS PRO	JECT# 326	554
Attn: Rus							
Project Description: Flambeau Project Title: 96F022	Mining						
Sample ID: FMC-176LS-5	NLS#: 129390						
Sample ID: FMC-176LS-5 Ref. Line 10 of COC 25140 Description: FM Collected: 03/03/97 Received: 03/05/97	NLS#: 129390 C-176LS-5 Reported: 03/17/97						
Ref. Line 10 of COC 25140 Description: FM	C-176LS-5	Units	LOD	FOÖ	Method	Analyzed	Lab
Ref. Line 10 of COC 25140 Description: FM Collected: 03/03/97 Received: 03/05/97 arameter cidity, tot. as CaCO3	C-176LS-5 Reported: 03/17/97 <u>Result</u> ND	mg/L	2.0	2.0	EPA 305.1	03/06/97	7210264
ef. Line 10 of COC 25140 Description: FM ollected: 03/03/97 Received: 03/05/97 arameter cidity, tot. as CaCO3 luminum, dis. as Al by ICP	C-176LS-5 Reported: 03/17/97 <u>Result</u> ND ND	mg/L mg/L	2.0 0.034	2.0 0.12	EPA 305.1 EPA 200.7	03/06/97 03/11/97	7210264
ef. Line 10 of COC 25140 Description: FM ollected: 03/03/97 Received: 03/05/97 arameter cidity, tot. as CaCO3 luminum, dis. as Al by ICP csenic, dis. as As by ICP	C-176LS-5 Reported: 03/17/97 <u>Result</u> ND ND ND	mg/L mg/L ug/L	2.0 0.034 16	2.0 0.12 57	EPA 305.1 EPA 200.7 EPA 200.7	03/06/97 03/11/97 03/11/97	7210264 7210264 7210264
ef. Line 10 of COC 25140 Description: FM ollected: 03/03/97 Received: 03/05/97 arameter cidity, tot. as CaCO3 Luminum, dis. as Al by ICP csenic, dis. as As by ICP admium, dis. as Cd by ICP	C-176LS-5 Reported: 03/17/97 <u>Result</u> ND ND ND ND 78	mg/L mg/L ug/L ug/L	2.0 0.034 16 1.2	2.0 0.12 57 3.8	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7	03/06/97 03/11/97 03/11/97 03/11/97	7210264 7210264 7210264 7210264
ef. Line 10 of COC 25140 Description: FM collected: 03/03/97 Received: 03/05/97 arameter cidity, tot. as CaCO3 luminum, dis. as Al by ICP csenic, dis. as As by ICP admium, dis. as Cd by ICP alcium, dis. as Ca by ICP	C-176LS-5 Reported: 03/17/97 <u>Result</u> ND ND ND 78 580	mg/L mg/L ug/L ug/L mg/L	2.0 0.034 16 1.2 3.0	2.0 0.12 57 3.8 3.0	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	03/06/97 03/11/97 03/11/97 03/11/97 03/11/97	7210264 7210264 7210264 7210264 7210264 7210264
ef. Line 10 of COC 25140 Description: FM collected: 03/03/97 Received: 03/05/97 arameter cidity, tot. as CaCO3 luminum, dis. as Al by ICP rsenic, dis. as As by ICP admium, dis. as Cd by ICP alcium, dis. as Ca by ICP obalt, dis. as Co by ICP	C-176LS-5 Reported: 03/17/97 <u>Result</u> ND ND ND 78 580 680	mg/L mg/L ug/L ug/L mg/L ug/L	2.0 0.034 16 1.2 3.0 4.3	2.0 0.12 57 3.8 3.0 15	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	03/06/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97	7210264 7210264 7210264 7210264 7210264 7210264 7210264
ef. Line 10 of COC 25140 Description: FM ollected: 03/03/97 Received: 03/05/97 arameter cidity, tot. as CaCO3 luminum, dis. as Al by ICP rsenic, dis. as As by ICP admium, dis. as Cd by ICP alcium, dis. as Ca by ICP obalt, dis. as Co by ICP opper, dis. as Cu by ICP	C-176LS-5 Reported: 03/17/97 <u>Result</u> ND ND 78 580 680 13000	mg/L mg/L ug/L ug/L ug/L ug/L ug/L	2.0 0.034 16 1.2 3.0 4.3 54	2.0 0.12 57 3.8 3.0 15 190	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	03/06/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97	7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264
tef. Line 10 of COC 25140 Description: FM collected: 03/03/97 Received: 03/05/97 arameter cidity, tot. as CaCO3 luminum, dis. as Al by ICP rsenic, dis. as As by ICP admium, dis. as Cd by ICP alcium, dis. as Ca by ICP obalt, dis. as Co by ICP opper, dis. as Cu by ICP ron, dis. as Fe by ICP	C-176LS-5 Reported: 03/17/97	mg/L mg/L ug/L ug/L ug/L ug/L ug/L	2.0 0.034 16 1.2 3.0 4.3 54 0.010	2.0 0.12 57 3.8 3.0 15 190 0.035	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	03/06/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97	7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264
Arrian Straight Strai	C-176LS-5 Reported: 03/17/97 <u>Result</u> ND ND 78 580 680 13000	mg/L mg/L ug/L ug/L ug/L ug/L mg/L mg/L	2.0 0.034 16 1.2 3.0 4.3 54 0.010 3.0	2.0 0.12 57 3.8 3.0 15 190 0.035 3.0	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	03/06/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97	7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264
Arright States and the set of the	C-176LS-5 Reported: 03/17/97 ND ND 78 580 680 13000 ND 31	mg/L mg/L ug/L ug/L ug/L ug/L ug/L	2.0 0.034 16 1.2 3.0 4.3 54 0.010	2.0 0.12 57 3.8 3.0 15 190 0.035	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	03/06/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97	7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264
tef. Line 10 of COC 25140 Description: FMU Collected: 03/03/97 Received: 03/05/97 arameter cidity, tot. as CaCO3 luminum, dis. as Al by ICP rsenic, dis. as As by ICP admium, dis. as Cd by ICP admium, dis. as Cd by ICP alcium, dis. as Cd by ICP obalt, dis. as Co by ICP opper, dis. as Cu by ICP ron, dis. as Fe by ICP agnesium, dis. as Mg by ICP anganese, dis. as Mn by ICP H, lab	C-176LS-5 Reported: 03/17/97 <u>Result</u> ND ND ND 78 580 680 13000 ND 31 9000	mg/L mg/L ug/L ug/L ug/L ug/L ug/L ug/L ug/L u	2.0 0.034 16 1.2 3.0 4.3 54 0.010 3.0 1.8	2.0 0.12 57 3.8 3.0 15 190 0.035 3.0	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	03/06/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/05/97	7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264
Ref. Line 10 of COC 25140 Description: FMU Collected: 03/03/97 Received: 03/05/97 arameter cidity, tot. as CaCO3 luminum, dis. as Al by ICP rsenic, dis. as As by ICP admium, dis. as Cd by ICP alcium, dis. as Ca by ICP obalt, dis. as Co by ICP	C-176LS-5 Reported: 03/17/97 Result ND ND ND 78 580 680 13000 ND 31 9000 5.4	mg/L mg/L ug/L ug/L ug/L ug/L mg/L mg/L ug/L	2.0 0.034 16 1.2 3.0 4.3 54 0.010 3.0 1.8 1.0	2.0 0.12 57 3.8 3.0 15 190 0.035 3.0 6.1	EPA 305.1 EPA 200.7 EPA 150.1	03/06/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97	7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264 7210264

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:

1

							<u> </u>		
NORTHERN LAKE SERVICE, INC. Inalytical Laboratory and Environmental Services 00 North Lake Avenue - Crandon, WI 54520 Yel:(715)478-2777 Fax:(715)478-3060		ANALYTIC	AL REPORT	· ·	WIS. LAB CERT. NO. 721026460 PAGE: 11 NLS PROJECT# 3			32654	
Client:	Foth & Van Dyke Assoc Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307	ciates							
Project Description Project Title: 96F(n: Flambeau Mining)22								
				•					
Sample ID: FMC-15-3 Ref. Line 1 of COC 25141 I Collected: 03/04/97 Recei	L-5 NLS#: 129391 Description: FMC-15-3L-5 ved: 03/05/97 Reported: 03/17			·					
Ref. Line 1 of COC 25141	Description: FMC-15-3L-5		Units	LOD	FOÖ	Method	Analyzed I	Lab	

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

ø

Authorized by:

Reviewed by:

nalytical Laboratory and Environ 00 North Lake Avenue - Crandon	CE, INC. Imental Services . WI 54520				WIS. LAB	CERT. NO. 72102	.6460
'el:(715)478-2777 Fax:(715)478-30		ANALYTIC	AL REPORT		PAGE: 12	NLS PRO	JECT# 32654
	Foth & Van Dyke Associat Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307	68					
Project Description: Project Title: 96F02	Flambeau Mining 2						
Sample ID: FMC-180L-			•				
Ref. Line 2 of COC 25141 De	d: 03/05/97 Reported: 03/17/97	Result	Units	LOD	FOD	Method	Analyzed Lab

LOD = Limit of Detection DWB - Dry Weight Basis LOQ = Limit of Quantitation NA = Not Applicable

ND = Not Detected *DWB = (mg/kg DWB)/10000

Authorized by:

t

R. T. Krueger Laboratory Manager

Reviewed by:

NORTHERN LAKE SE					WIS. LAB (CERT. NO. 72102	26460	
nalytical Laboratory and Environmental Services 10 North Lake Avenue - Crandon, WI 54520 el:(715)478-2777 Fax:(715)478-3060		ANALYTIC	ANALYTICAL REPORT		PAGE: 13		NLS PROJECT# 32654	
Client:	Foth & Van Dyke J Attn: Russ Janes 2737 S. Ridge R PO Box 19012 Green Bay, WI 54	hek oad						
ro]ect Title: 96	5 144							
		9393						
Ref. Line 3 of COC 25141 Collected: 03/04/97 Re			Units	LOD	LOO	Method	Analyzed	Lab
lef. Line 3 of COC 25141 Collected: 03/04/97 Re <u>arameter</u> cidity, tot. as Ca	Description: FMC-181L-5 ceived: 03/05/97 Reported: xCO3	03/17/97 <u>Result</u> 440	mg/L	<u>LOD</u> 2.0	<u>LOQ</u> 2.0	Method EPA 305.1	Analyzed 03/06/97	721026
ef. Line 3 of COC 25141 collected: 03/04/97 Re <u>arameter</u> cidity, tot. as Ca Luminum, dis. as A	Description: FMC-181L-5 ceived: 03/05/97 Reported: ACO3 AL by ICP	03/17/97 <u>Result</u> 440 0.31	mg/L mg/L	2.0 0.034	2.0 0.12	EPA 305.1 EPA 200.7	03/06/97	721026 721026
ef. Line 3 of COC 25141 collected: 03/04/97 Re cidity, tot. as Ca luminum, dis. as A rsenic, dis. as As admium, dis. as Co	Description: FMC-181L-5 ceived: 03/05/97 Reported: aCO3 Al by ICP s by ICP d by ICP	03/17/97 <u>Result</u> 440 0.31 < 31 > 360	mg/L mg/L ug/L ug/L	2.0	2.0	EPA 305.1	03/06/97	721026 721026 721026 721026
ef. Line 3 of COC 25141 collected: 03/04/97 Re <u>arameter</u> cidity, tot. as Ca luminum, dis. as A rsenic, dis. as A admium, dis. as Ca adcium, dis. as Ca	Description: FMC-181L-5 ceived: 03/05/97 Reported: aCO3 AL by ICP 3 by ICP A by ICP A by ICP	03/17/97 <u>Result</u> 440 0.31 < 31 > 360 530	mg/L mg/L ug/L ug/L mg/L	2.0 0.034 16 1.2 3.0	2.0 0.12 57 3.8 3.0	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	03/06/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97	721026 721026 721026 721026 721026 721026
ef. Line 3 of COC 25141 ollected: 03/04/97 Re arameter cidity, tot. as Ca luminum, dis. as A csenic, dis. as A admium, dis. as Ca alcium, dis. as Ca obalt, dis. as Co	Description: FMC-181L-5 ceived: 03/05/97 Reported: aCO3 al by ICP by ICP by ICP by ICP by ICP by ICP	03/17/97 <u>Result</u> 440 0.31 < 31 > 360 530 1700	mg/L mg/L ug/L ug/L mg/L ug/L	2.0 0.034 16 1.2 3.0 4.3	2.0 0.12 57 3.8 3.0 15	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	03/06/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97	721026 721026 721026 721026 721026 721026
ef. Line 3 of COC 25141 ollected: 03/04/97 Re arameter cidity, tot. as Ca luminum, dis. as A csenic, dis. as A admium, dis. as Ca alcium, dis. as Co obalt, dis. as Co opper, dis. as Cu	Description: FMC-181L-5 ceived: 03/05/97 Reported: ACO3 Al by ICP by ICP by ICP by ICP by ICP by ICP by ICP	03/17/97 <u>Result</u> 440 0.31 < 31 > 360 530 1700 370000	mg/L mg/L ug/L ug/L mg/L ug/L ug/L	2.0 0.034 16 1.2 3.0 4.3 54	2.0 0.12 57 3.8 3.0 15 190	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	03/06/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97	721026 721026 721026 721026 721026 721026 721026 721026
ef. Line 3 of COC 25141 collected: 03/04/97 Re <u>arameter</u> cidity, tot. as Ca luminum, dis. as As admium, dis. as Ca admium, dis. as Ca cobalt, dis. as Co obalt, dis. as Cu copper, dis. as Fe by	Description: FMC-181L-5 ceived: 03/05/97 Reported: AL by ICP by ICP by ICP by ICP by ICP by ICP by ICP	03/17/97 <u>Result</u> 440 0.31 < 31 > 360 530 1700 370000 3.4	mg/L mg/L ug/L ug/L mg/L ug/L ug/L mg/L	2.0 0.034 16 1.2 3.0 4.3 54 0.010	2.0 0.12 57 3.8 3.0 15 190 0.035	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	03/06/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97	721026 721026 721026 721026 721026 721026 721026 721026 721026
tef. Line 3 of COC 25141 Collected: 03/04/97 Re arameter cidity, tot. as Ca luminum, dis. as Ca admium, dis. as Ca admium, dis. as Ca alcium, dis. as Ca obalt, dis. as Co opper, dis. as Cu agnesium, dis. as Ca	Description: FMC-181L-5 ceived: 03/05/97 Reported: ACO3 AL by ICP 3 by ICP 4 by ICP by ICP by ICP by ICP 7 ICP Mg by ICP	03/17/97 <u>Result</u> 440 0.31 < 31 > 360 530 1700 370000	mg/L mg/L ug/L ug/L ug/L ug/L ug/L mg/L mg/L	2.0 0.034 16 1.2 3.0 4.3 54 0.010 3.0	2.0 0.12 57 3.8 3.0 15 190 0.035 3.0	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	03/06/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97	721026 721026 721026 721026 721026 721026 721026 721026 721026 721026
Ref. Line 3 of COC 25141 Collected: 03/04/97 Re Acidity, tot. as Ca Auminum, dis. as A Arsenic, dis. as A Cadmium, dis. as Ca Cadmium, dis. as Ca Cobalt, dis. as Co Copper, dis. as Cu Iron, dis. as Fe by Aggnesium, dis. as	Description: FMC-181L-5 ceived: 03/05/97 Reported: ACO3 AL by ICP 3 by ICP 4 by ICP by ICP by ICP by ICP 7 ICP Mg by ICP	03/17/97 <u>Result</u> 440 0.31 < 31 > 360 530 1700 370000 3.4 46 9000 4.4	mg/L mg/L ug/L ug/L mg/L ug/L ug/L mg/L	2.0 0.034 16 1.2 3.0 4.3 54 0.010	2.0 0.12 57 3.8 3.0 15 190 0.035	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	03/06/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97	7210266 7210266 7210266 7210266 7210266 7210266 7210266 7210266 7210266 7210266 7210266 7210260
Parameter Acidity, tot. as Ca Aluminum, dis. as A Arsenic, dis. as As	Description: FMC-181L-5 ceived: 03/05/97 Reported: ACO3 Al by ICP by ICP by ICP by ICP by ICP by ICP y ICP Mg by ICP Mn by ICP Se by furnace	03/17/97 Result 440 0.31 < 31 > 360 530 1700 370000 3.4 46 9000	mg/L mg/L ug/L ug/L ug/L ug/L ug/L mg/L ug/L ug/L	2.0 0.034 16 1.2 3.0 4.3 54 0.010 3.0 1.8	2.0 0.12 57 3.8 3.0 15 190 0.035 3.0	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	03/06/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97	7210266 7210266 7210266 7210266 7210266 7210266 7210266 7210266 7210266 7210266 7210266 7210266 7210266

LOD = Limit of Detection DWB = Dry Weight Basis LOQ = Limit of Quantitation NA = Not Applicable

I.

ND = Not Detected *DWB = (mg/kg DWB)/10000

Authorized by:

Reviewed by:

NORTHERN LAKE SERVICE, INC. Analytical Laboratory and Environmental Services 400 North Lake Avenue - Crandon, WI 54520 Fel:(715)478-2777 Fax:(715)478-3060							
iel:(/15)4/8-2/// F8X;(/15)4/8-30	00	ANALYTIC	AL REPORT		PAGE: 14	NLS PRO	JECT# 32654
1	Foth & Van Dyke Associ Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307	ates					
Project Description: Project Title: 96F022	Flambeau Mining 2						
Sample ID: FMC-4-1L-5 Ref. Line 4 of COC 25141 Des Collected: 03/04/97 Received	5 NLS#: 129394 scription: FMC-4-1L-5 d: 03/05/97 Reported: 03/17/9	7					
Parameter	1. 00/00/07 Reported. 00/17/0	Result	<u>Units</u>	LOD	<u>roð</u>	Method	Analyzed Lab
cidity, tot. as CaCO3		40	mg/L	2.0	2.0	EPA 305.1	
luminum, dis. as Al by	YICP	ND	mg/L mg/L	0.034	0.12	EPA 200.7	03/11/97 72102
luminum, dis. as Al by rsenic, dis. as As by	ICP	ND ND	mg/L ug/L	0.034 16	0.12 57	EPA 200.7 EPA 200.7	03/11/97 72102 03/11/97 72102
luminum, dis. as Al by rsenic, dis. as As by admium, dis. as Cd by	ICP ICP	ND ND 63	mg/L ug/L ug/L	0.034 16 1.2	0.12 57 3.8	EPA 200.7 EPA 200.7 EPA 200.7	03/11/97 72102 03/11/97 72102 03/11/97 72102
luminum, dis. as Al by rsenic, dis. as As by admium, dis. as Cd by alcium, dis. as Ca by	ICP ICP ICP	ND ND 63 570	mg/L ug/L ug/L mg/L	0.034 16 1.2 3.0	0.12 57 3.8 3.0	EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	03/11/97 72102 03/11/97 72102 03/11/97 72102 03/11/97 72102 03/11/97 72102
luminum, dis. as Al by rsenic, dis. as As by admium, dis. as Cd by alcium, dis. as Ca by obalt, dis. as Co by J	ICP ICP ICP ICP	ND ND 63 570 490	mg/L ug/L ug/L mg/L ug/L	0.034 16 1.2 3.0 4.3	0.12 57 3.8 3.0 15	EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	03/11/97 72102 03/11/97 72102 03/11/97 72102 03/11/97 72102 03/11/97 72102 03/11/97 72102
luminum, dis. as Al by rsenic, dis. as As by admium, dis. as Cd by alcium, dis. as Ca by obalt, dis. as Co by J opper, dis. as Cu by J	ICP ICP ICP ICP ICP	ND ND 63 570 490 25000	mg/L ug/L ug/L mg/L ug/L ug/L	0.034 16 1.2 3.0 4.3 54	0.12 57 3.8 3.0 15 190	EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	03/11/97 72102 03/11/97 72102 03/11/97 72102 03/11/97 72102 03/11/97 72102 03/11/97 72102 03/11/97 72102
luminum, dis. as Al by rsenic, dis. as As by admium, dis. as Cd by alcium, dis. as Ca by obalt, dis. as Co by I opper, dis. as Cu by I ron, dis. as Fe by ICE agnesium, dis. as Mg h	ICP ICP ICP ICP ICP P P by ICP	ND ND 63 570 490 25000 ND 35	mg/L ug/L mg/L ug/L ug/L mg/L	0.034 16 1.2 3.0 4.3 54 0.010 3.0	0.12 57 3.8 3.0 15 190 0.035 3.0	EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	03/11/97 72102 03/11/97 72102 03/11/97 72102 03/11/97 72102 03/11/97 72102 03/11/97 72102 03/11/97 72102
luminum, dis. as Al by rsenic, dis. as As by admium, dis. as Cd by alcium, dis. as Ca by obalt, dis. as Co by I opper, dis. as Cu by I ron, dis. as Fe by ICI agnesium, dis. as Mg h anganese, dis. as Mn h	ICP ICP ICP ICP ICP P P by ICP	ND ND 63 570 490 25000 ND 35 4000	mg/L ug/L mg/L ug/L ug/L mg/L mg/L ug/L	0.034 16 1.2 3.0 4.3 54 0.010 3.0 1.8	0.12 57 3.8 3.0 15 190 0.035	EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	03/11/97 72102 03/11/97 72102 03/11/97 72102 03/11/97 72102 03/11/97 72102 03/11/97 72102 03/11/97 72102 03/11/97 72102 03/11/97 72102
luminum, dis. as Al by rsenic, dis. as As by admium, dis. as Cd by alcium, dis. as Ca by obalt, dis. as Co by I opper, dis. as Cu by I ron, dis. as Fe by ICH agnesium, dis. as Mg H anganese, dis. as Mn H H, lab	ICP ICP ICP ICP P by ICP by ICP	ND ND 63 570 490 25000 ND 35 4000 4.8	mg/L ug/L mg/L ug/L ug/L ug/L mg/L ug/L s.u.	0.034 16 1.2 3.0 4.3 54 0.010 3.0 1.8 1.0	0.12 57 3.8 3.0 15 190 0.035 3.0 6.1	EPA 200.7 EPA 150.1	03/11/97 72102 03/11/97 72102 03/11/97 72102 03/11/97 72102 03/11/97 72102 03/11/97 72102 03/11/97 72102 03/11/97 72102 03/11/97 72102 03/11/97 72102
Aluminum, dis. as Al by Arsenic, dis. as As by Cadmium, dis. as Cd by Calcium, dis. as Ca by Cobalt, dis. as Co by J	ICP ICP ICP ICP ICP by ICP by ICP by ICP y furnace	ND ND 63 570 490 25000 ND 35 4000	mg/L ug/L mg/L ug/L ug/L mg/L mg/L ug/L	0.034 16 1.2 3.0 4.3 54 0.010 3.0 1.8	0.12 57 3.8 3.0 15 190 0.035 3.0	EPA 200.7 EPA 200.2	03/11/97 72102 03/11/97 72102 03/11/97 72102 03/11/97 72102 03/11/97 72102 03/11/97 72102 03/11/97 72102 03/11/97 72102 03/11/97 72102

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

ł

NORTHERN LAKE S Analytical Laboratory and 400 North Lake Avenue - C	Environmental Services				WIS. LAB C	ERT. NO. 72102	6460
Tel:(715)478-2777 Fax:(71	5)478-3060	ANALYTICAL	REPORT		PAGE: 15	NLS PRO	JECT# 32654
Client:	Foth & Van Dyke Associate Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307	9 <i>8</i>					
Project Descript Project Title: 9	tion: Flambeau Mining 96F022						
	I-1LS-5 NLS#: 129395 1 Description: FMC-4-1LS-5 Received: 03/05/97 Reported: 03/17/97						
Parameter	<u>F</u>	Result	Units	LOD	LOQ	Method	Analyzed Lab
Manganese, dis. a	s Mn by ICP	3400	ug/L	1.8	6.1	EPA 200.7	03/11/97 721026460

LOD = Limit of Detection DWB = Dry Weight Basis LOQ = Limit of Quantitation NA = Not Applicable

ŗ

ND = Not Detected %DWB = (mg/kg DWB)/10000

Authorized by:

R. T. Krueger Laboratory Manager

Reviewed by:

NORTHERN LAKE SERVIC Analytical Laboratory and Environ 400 North Lake Avenue - Crandon	mental Services				WIS. LAB	CERT. NO. 72102	26460
Tel:(715)478-2777 Fax:(715)478-3	160	ANALYTIC	AL REPORT		PAGE: 16	NLS PRO	JECT# 32654
	Foth & Van Dyke Associ Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307	ates					
Project Description: Project Title: 96F02	Flambeau Mining 2						
Sample ID: FMC-1811.S Ref. Line 6 of COC 25141 De Collected: 03/04/97 Receive		7					
Parameter		Result	Units	LOD	LOQ	Method	Analyzed Lab
Acidity, tot. as CaCO3 Aluminum, dis. as Al b Arsenic, dis. as As by Cadmium, dis. as Cd by Calcium, dis. as Ca by Cobalt, dis. as Co by Copper, dis. as Co by Iron, dis. as Fe by IC Magnesium, dis. as Mg Manganese, dis. as Mn	ICP ICP ICP ICP ICP P P by ICP	290 < 0.061 > ND 310 540 1600 240000 1.1 42 8000 4.5	mg/L mg/L ug/L mg/L ug/L ug/L mg/L mg/L ug/L s.u.	2.0 0.034 16 1.2 3.0 4.3 54 0.010 3.0 1.8 1.0	2.0 0.12 57 3.8 3.0 15 190 0.035 3.0 6.1	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	03/11/97 721026460 03/11/97 721026460 03/11/97 721026460 03/11/97 721026460 03/11/97 721026460 03/11/97 721026460 03/11/97 721026460

.

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

Authorized by:

R. T. Krueger Laboratory Manager

Reviewed by:

VORTHERN LAKE SERVICE, nalytical Laboratory and Environmen 10 North Lake Avenue - Crandon, WI el:(715)478-2777 Fax:(715)478-3060	tal Services	ΑΝΑΙΥΤΙΟ	AL REPORT		WIS. LAB	NT.S. PPO	26460 JECT# 32(554
Att 273 Po	ch & Van Dyke Associa cn: Russ Janeshek 37 S. Ridge Road Box 19012 aen Bay, WI 54307				FRG8. 17		0201# 320	FCG
lef. Line 7 of COC 25141 Descrip Collected: 03/04/97 Received: 0		Regult	Unita	IOD	T-00	Mathod	Analused	T.ah
ef. Line 7 of COC 25141 Descrip ollected: 03/04/97 Received: O arameter cidity, tot. as CaCO3 luminum, dis. as Al by I csenic, dis. as As by IC admium, dis. as Ca by IC admium, dis. as Ca by IC	otion: FMC-180LS-5 3/05/97 Reported: 03/17/97 CP P P P	<u>Result</u> 12 ND ND 79 580	Units mg/L mg/L ug/L ug/L mg/L	LOD 2.0 0.034 16 1.2 3.0	LOQ 2.0 0.12 57 3.8 3.0	Method EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7	<u>Analyzed</u> 03/06/97 03/11/97 03/11/97 03/11/97	721026 721026 721026 721026 721026 721026
arameter cidity, tot. as CaCO3 luminum, dis. as Al by I rsenic, dis. as As by IC admium, dis. as Cd by IC	otion: FMC-180LS-5 3/05/97 Reported: 03/17/97 CP P P P	12 ND ND 79	mg/L mg/L ug/L ug/L	2.0 0.034 16 1.2	2.0 0.12 57 3.8	EPA 305.1 EPA 200.7 EPA 200.7 EPA 200.7	03/06/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97 03/11/97	721026 721026 721026 721026 721026 721026 721026 721026 721026 721026

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

Homes

Authorized by:

Reviewed by:

NORTHERN LAKE SERV Analytical Laboratory and Enviro 400 North Lake Avenue - Crando	nmental Services n, WI 54520			·	WIS. LAB	CERT. NO. 72102	6460
Tel:(715)478-2777 Fax:(715)478-	5000	ANALY	TICAL REPORT		PAGE: 18	NLS PRO	JECT# 32654
Client: Project Description	Foth & Van Dyke Associ Attn: Russ Janeshek 2737 S. Ridge Road PO Box 19012 Green Bay, WI 54307 : Flambeau Mining	ates					
Project Title: 96F0							
	LS-5 NLS#: 129398 escription: FMC-15-3LS-5 red: 03/05/97 Reported: 03/17/9						
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

LOD = Limit of Detection DWB = Dry Weight Basis LOQ = Limit of Quantitation NA = Not Applicable

ND = Not Detected %DWB = (mg/kg DWB)/10000

Authorized by:

R. T. Krueger Laboratory Manager

Reviewed by: