OPERATION & MAINTENANCE MANUAL

FOR

Flambeau Mining Company
001 Outfall
Rusk County, Wisconsin

Volume I - Manual

February 1993

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PURPOSE AND USE OF THIS MANUAL

Operation and Maintenance (O&M) Manuals are written to provide the wastewater treatment plant (WTP) operator and his assistants with a comprehensive source of information and instruction on the various equipment items and treatment processes involved in operating and maintaining a WTP. In order for the WTP to be operated as designed, and maintained for its design life, the O&M manual, along with accumulated operating experience, should be utilized extensively for guidance in day to day operation.

This O&M manual is divided into 11 chapters and appendices found in three volumes. Each chapter contains major sections and is preceded by a tab indicating the title of the chapter (refer to Table of Contents). Additionally, major reference items located in the Appendix are preceded by an indicating tab. Volume I contains Chapters 1 through 11 and Appendices A through F. Volume 2 contains Appendix G (Maintenance) and Volume 3 contains Appendix H (spare parts).

Although each chapter contains valuable information which is necessary for the efficient, orderly and safe operation of the WTP, Chapters II and III should be considered the most important in normal day to day operation. These two chapters contain the detailed instructions for operating each major item of equipment and process in conformance with the design of the WTP. Therefore, WTP operators must become familiar with these chapters in order to satisfactorily operate the equipment and to achieve maximum treatment efficiency.

Other chapters in the manual contain information regarding permits and standards, personnel requirements, laboratory tests and control, record keeping, emergency procedures, safety procedures, utilities, electrical system functions, maintenance and the Appendices. Each of these chapters must also be read and thoroughly understood by the WTP operator. The information and instructions contained in these chapters should be integrated into the daily routine of wastewater collection and treatment system.

Chapter I. - General

A. Description of the Project and System

1. Background

Flambeau Mining Company, Flambeau, a wholly-owned subsidiary of Kennecott Corporation proposes to remove approximately 2 million tons of copper ore from a 32 acre open pit mine over an 8 year period. The ore deposit which lies close to the surface is readily accessible by open pit mining technology. The ore contains a high concentration of copper, with smaller amounts of gold and silver. All materials covering the ore will be stripped and stored on the site until the site reclamation period at the end of the project. The ore will be crushed and loaded onto railroad cars for transportation and processing at a location out of the state. The sources of the water discharge consist of precipitation runoff from the site and groundwater from the pit.

The non-contact site drainage water will be routed to two settling ponds, where the suspended solids will be settled prior to discharge from the property.

The contact site water comes from four principle sources on the mine property. These sources are the Mine seepage, the lined Type II Storage Pad Drainage, the lined crusher/loadout Areas and the pond underdrains of the Surge and Runoff Ponds. The Type II Storage Pad contains waste rock that has sulfur content of more than 1 percent. The contact water will be treated by two step precipitation using lime and sulfide, together with polymer-enhanced settling and filtration followed by pH adjustment prior to discharge through Outfall 001.

The Flambeau River will receive the non-contact site runoff water at Outfall 002 and treated water from the wastewater treatment plant, WTP, discharge at Outfall 001. (The non-contact water discharge from Outfall 002 is covered in a separate operating procedures manual.)

The WTP consists of the following unit processes:

- Suspended Solids Settling
- Lime Treatment and Neutralization
- Clarification and Sludge Disposal
- Acidification and Sulfide Treatment
- Filtration
- pH Neutralization
- Plant Discharge and Sampling

A summary of the effluent limitations and monitoring requirements for the discharges from WTP discharge (Outfall 001) are shown in Flambeau's WPDES permit contained in Appendix A.

2. Facility Flow Diagram

Flow diagrams, FB&D drawings 250-P-001 and 250-P-002 for the WTP are in Appendix C. The diagrams show the processes involved in the two stage treatment of the contact water flows, which have been collected in the Surge Pond.

The preliminary treatment occurs after the majority of the suspended solids have been settled in the Surge Pond and the water is pumped into the WTP. The contact water enters the WTP and is fed into the agitated, 12,000 gallon Neutralization and Mixing Tank, where a pH controlled addition of a 15 percent lime slurry is added to raise the pH to 8.5 to 9.0. If optimization for treatment falls outside of this range, the control set points will need to be changed. This should be done with trained personnel familiar with the programmable logic controller. This lime addition will react and precipitate most of the soluble contaminants from the water to acceptable discharge limits, except for some of the metal ions.

The reacted slurry in the Neutralization and Mixing Tank is also mixed with recycled sludge from the clarifier underflow and sand filter backwash. The slurry then flows by gravity to the clarifier De-Aerator Tank, where the flocculent is added to enhance the settling of the solids in the slurry prior to flowing into the clarifier centerwell.

The clarifier underflow is recycled to the Neutralization and Mixing Tank as previously stated and a bleed discharge of slurry is pumped to the Slurry Holding Tank. The underflow slurry is controlled to a preset density by the recycle system to reach the maximum percent solids in the clarifier underflow.

The clear solution in the clarifier overflows to the Clarifier Overflow Tank and is pumped to the Sulfide Treatment circuit.

Dilute sulfuric acid is pumped into the line feeding the first Sulfide Mix Tank. Immediately after the acid addition, an in-line mixer insures complete reaction prior to a pH sensor. The acid addition is controlled by the pH probe to a pH between 5.0 and 6.0. If optimization for treatment falls outside of this range, the control set points will need to be changed. This should be done with trained personnel familiar with the programmable logic controller. The acidified clarifier overflow enters into the first of two 4,000 gallon, agitated Sulfide Mixing Tanks. A stream of 10 percent sodium sulfide solution is added to this tank. The amount of Sodium Sulfide solution is proportioned to the water flow rate into the plant. A flocculent polymer addition based on a ratio of the plant feed rate is added to the first Sulfide Mix tank to aid in coagulation of the fine, suspended metal sulfide particles.

The effluent from the first Sulfide Mix Tank overflows by gravity to the second Sulfide Mix Tank, which in-turn overflows to the Sand Filter Feed Tank. The flow rate of the Sand Filter Feed Pump is controlled by a tank level controller to maintain a consistent flow rate to the Sand Filters.

The sand filter feed is pumped into the Sand Filter Feed Box, which distributes the flow into the three filter beds in the Sand Filter. The filtrate from the sand filter is then pumped to the pH Neutralization Tank for pH adjustment to between 7.0 and 8.0 with clarified Milk of Lime, MOL, slurry prior to sampling and discharging of the treated plant effluent to the 001 Outfall. Caution should be taken when purchasing lime. If the lime contains significant amounts of metal impurities, it could present a problem for the discharge meeting effluent limits. The final discharge is continuously monitored for pH and turbidity. If either reading are not within the permitted limits, the WTP discharge will be returned to the process for pretreatment.

When the slurry in the clarifier underflow reaches a predetermined percent solids, the clarifier underflow slurry is pumped into the Clarifier Underflow Storage Tank. The slurry is pumped from the Clarifier Underflow Holding Tank into a slurry tank truck, which will haul the slurry to the top of the Type II stockpile for disposal. The alkalinity of this slurry will aid in stabilizing the Type II Stockpile.

3. Design Criteria

a. Influent Water Flows and Analysis

The WTP is designed to treat a continuous flow of 296 to 800 gpm.

1. The maximum wastewater Flow feeding the WTP, is not anticipated to exceed 570 gpm. Table 1-1 details the anticipated flow conditions.

   The WTP capacity was designed to process 800 gpm. The extra capacity provides operating flexibility in the event of abnormal weather conditions, scheduled plant shutdowns or situations requiring effluent recycle.

   Table 1-1 contains projections of the water flow rates to the WTP under three conditions:

   1. Average annual flow.

   2. Average flow during the typically rainy months of the year (April through October).

   3. Average flow during the month of typical Maximum precipitation (June).

   Flow rates are shown for each area or site feature contributing water to the WTP. Included in the table is the projection of the inflow of groundwater into the open pit for two conditions as determined in the Kennecott Model Report. The first condition represents the maximum pit inflow rate, while the second represents the predicted highest year average annual inflow. The values shown are those determined to be at the high end (high recharge and permeability) of the sensitivity analysis completed as part of the modeling work. The table shows that flows are projected to range from 296 gpm on an annual basis to 570 gpm during the maximum month.

Table 1-1

Projected WTP Flow Rates

	Average Flow in GPM		
	Wet Annual[1]	Max Seasonal[2]	Month
Precipitation and Runoff			
Open Pit	50	73	101
Type II Storage Pile	49	69	95
Plant/Crusher	19	28	37
Ore Haul Road	5	7	9
Subtotal	121	177	242
Maximum Pit Inflow[3]	328	328	328
Average Pit Inflow[4]	175	175	172
Total WTP Flow Rates			
Maximum Pit Inflow	449	505	570[5]
Average Pit Inflow	296[6]	352	417

1 April through October

2 June

3 Maximum inflow of groundwater into the pit that would require treatment at the WTP. Taken from Figure 14 of the "Groundwater Model for the Kennecott Flambeau Project" by Prickett, et al., July 1989. Value represents flow at approximately 1,460th day after excavation commences for high recharge and permeability conditions. Flow occurring at day 30 was not used since dewatering of overburden will not result in removed water being sent to the WWTP. Value represents peak flow which will occur for only a short time during the year of record.

4 Average annual inflow of groundwater into the pit that required treatment at the WTP. Taken from Figure 9 of the Groundwater Model for the Kennecott Flambeau Project by Prickett, et al., July 1989. Value represents highest average annual inflow (year five) based on high recharge and permeability conditions.

5 Assumes peak inflow occurs during maximum month.

6 Minimum Plant flow rate.

During or shortly after storm events the generation of wastewater will occur at rates higher than the average discussed above. The mine pumping system has been designed to pump approximately 1,200 gpm during high water flow situations. Since a uniform flow of water to the WTP is desirable for optimum plant performance, provisions have been made in the design of the WTP for additional flow capacity as well as temporary water storage in the lined surge pond and in the lined runoff catchment pond. A maximum flow rate of 800 gpm was used for WTP sizing and the capacity of the Surge and Runoff Ponds is 1,800,000 and 643,000 gallons, respectively. The storage system has the capacity to store water for sufficient time to do major maintenance work on the WTP, should it be necessary. Each pond will have overflow piping to return water to the mine if the pond becomes full. In addition, the mine pit will be used for emergency water storage in the event of a major storm.

FB&D Drawing No. 250-P-001 is a flow sheet showing the origin of the wastewaters that make up Stream One and how the water will be directed to the WTP. A project plot plan showing the locations of the major water-handling installations is presented in FB&D Drawing No. 210-C-001.

2. The WTP influent analysis was based upon the following program. In early 1988 Flambeau requested that the WDNR develop proposed effluent limits for the project based on baseline data collected for the Flambeau River in late 1987. This information, based on proposed rules, was provided to Flambeau in a memorandum dated April 7, 1988. Although it was recognized that these were "estimated" effluent limits, a treatment process was selected which was felt capable of treating the projected wastewater such that the limits as estimated in the April 7th letter could be met. This process consisted of lime treatment for acid neutralization and metals removal followed by sulfide precipitation and multi-media filtration.

   After the treatment process was selected, a bench test program was developed to verify that the selected system could meet the estimated effluent limits. The results of the study are summarized in Table 1-2. A comparison of the bench test results to Flambeau's WPDES limits is also presented in Table 1-2.

Table 1-2

Projected Treatment Plant Performance (Based on Bench Scale Testing)

Parameter	Influent Water[1] (mg/l)	Lime Treatment Effluent (mg/l)	Sulfide Precipitation Effluent (mg/l)	WPDES Daily Maximum Limits (mg/l)
Arsenic	0.09-0.2	<0.003	<0.0003	0.730
Cadmium	0.094-1.46	0.0007-0.0012	<0.0003	0.0798
Chromium Total	0.003-0.014	<0.002	<0.002	5.400
Chromium (+6)	0.003-0.014	<0.002	<0.002	0.028
Copper	94-910	0.20-0.35	<0.010	0.050
Lead	0.047-0.280	<0.002	<0.002	0.590
Mercury	<0.0005-0.00073	<0.0005	<0.0005	0.000002[2]
Nickel	0.082-1.9	<0.03	<0.03	0.445
Selenium	0.006-0.016	0.004-0.007	0.003	0.120
Silver	0.0024-0.017	<0.0004-0.0005	<0.0004	0.0066
Zinc	24-240	0.07-0.12	<0.03	0.300
pH				6.0-9.0

1 Based on Type II rock samples. Actual loading is anticipated to be lower.

2 Mercury limit is a monthly average.

NOTE: Influent water and lime treatment results represent the range of test results obtained during the bench test program. Sulfide precipitation data represents the results from the final test conducted as part of the bench test.

The bench test, using worst case test conditions, showed that the lime treatment process did an efficient job of removing metals in the wastewater and with the exception of copper and zinc would produce an effluent that would meet the WPDES limits in Table 1-3. The sulfide precipitation process was shown to be capable of lowering the copper and zinc concentration in the lime treatment effluent to levels below the WPDES limits set forth in Table 1-3.

The wastewater used for the bench study was generated from Type II rock obtained during drilling at the Flambeau site. The measured components of this wastewater are contained in Table 1-2. The bench study showed that the ability of the treatment process to meet the estimated effluent limits was not a function of the strength of the influent stream.

Table 1-3

WPDES Effluent Limits[1]

Parameter	Weekly Average (mg/l)	Daily Maximum (mg/l)	Monthly Average (mg/l)	Weekly Average Mass Limit (lb/day)
Total Suspended Solids	--	30	20	
Aluminum	--	1.500	--	
Arsenic	--	0.730	--	
Beryllium	--	--	0.67[2]	
Cadmium	0.0071	0.0798	0.05	0.046
Chromium, Total	0.980	5.40	--	6.4
Chromium (+6)	--	0.0280	--	
Copper	--	0.0500	--	
Lead	0.140	0.590	--	0.89
Mercury	--	--	0.000002	
Nickel	0.156	0.445	--	1.0
Selenium	--	0.120	--	
Silver	--	0.0066	--	
Zinc	--	0.300	--	
pH			(6.0-9.0)	

1 All values in mg/l (part per million) except where noted.
Values taken from requirement C.2 of the WPDES Permit.

2 Pounds per Day.

B. Staffing

1. General

To operate and maintain the WTP properly for the life of the Flambeau Mine, adequate and qualified staffing is a must. The WTP is designed to require a minimum of operation and maintenance manpower. Flambeau Mining has made a commitment to properly staff the facility so that it is operated correctly and adequately maintained.

General staffing recommendations have been based upon the US EPA publication, "Estimating Staffing for Municipal Wastewater Treatment Facilities". The operations staffing of an industrial WTP can vary from that of a municipal treatment plant. Areas

such as maintenance, clerical, supervisory, and yard work can be handled by other departments within an industry's organization. Therefore, it is necessary to make adjustments reflecting industrial operations when using the above document. Staffing estimates are provided in the Flambeau Project Engineering Report dated December 1989 and indicate that 2.4 people are required to operate the WTP and the settling ponds.

2. Manpower Requirements

The Chief Operator is responsible for overall supervision of operations and maintenance of the WTP. This individual must exercise direct authority over all wastewater functions and personnel according to approved policies and procedures. The Chief Operator must regularly conduct inspections of the WTP and must be capable of analyzing and evaluating operation and maintenance functions.

The Chief Operator is also responsible for the day to day WTP operation and maintenance. The Chief Operator operational duties include the following:

- Schedules work to be done concerning operations.
- Maintains inventory of parts and supplies for operations.
- Directs operation of the WTP to provide best effluent to the Flambeau River.
- Directs in-plant testing for process control.
- Compiles/prepares daily, weekly, monthly, and annual reports.
- Trains employees engaged in WTP activities.
- Must have a thorough understanding of WDNR requirements and services.
- Brings to the Manager Operations attention areas within the WTP that must be upgraded to continue optimum treatment.
- Reports to the Manager Operations.

The Assistant Operators are responsible for the operation and maintenance of the WTP. These activities may be conducted simultaneously with the Chief Operator or in the absence of the Chief Operator. The Assistant Operators operational duties include the following:

- Operates the WTP at the direction of the chief operator or in the absence of the chief operator.
- Assists in maintenance as required.
- Conducts in-plant testing for process control.
- Keeps records as required.
- Monitors the operating efficiency of the WTP.

3. Personnel Certification

The State of Wisconsin has made a strong commitment to proper operation and control of all the State's WTPs that operate under a WPDES Discharge Permit. To obtain and retain optimum operation, the State requires that all WTPs employ a certified operator who is responsible for facilities operation. Each facility is only required to have one certified operator, but it is strongly recommended that all operators become State certified if more than one operator is employed.

At Flambeau Mining's WTP, the chief operator is required to have a Grade 3 operators certification in the subgrades of a) Primary Settling and k) Special. Chapter NR 114 of the Wisconsin Administration Code contains the rules for the certification of WTP operators. Ch. NR 114 Wis. Admin. Code can be found in Appendix B.

C. Discussion of Applicable Wisconsin Administrative Code Chapters and Permits

1. Discharge Permit Effluent Limits

The effluent limits as shown in the WPDES permit provided in **Appendix A** will be applicable for the Flambeau Mining WTP.

2. Applicable Wisconsin Administrative Code

The Flambeau Mining contact-water collection and treatment fall under the regulatory control of the Wisconsin Department of Natural Resources. The WDNR was involved with this project from the beginning and will continue to be involved as the regulatory agency responsible for maintaining the quality of surface waters within the State.

Following is a partial listing and brief description of the Administrative Code Chapters related to WTP systems and how they affect the operator.

NR 102 "Water Quality Standards for Wisconsin Surface Waters" -- Establishes water quality standards for surface waters.

NR 105 " Surface Water Quality Criteria for Toxic Substances" -- Establishes water quality criteria and methods for developing criteria for toxic substances. Used for deriving WPDES effluent limits.

NR 106 "Procedures for Calculating Water Quality Based Effluent Limitations for Toxic and Organoleptic Substances Discharged to Surface Waters" -- Specifies methodology for calculating water quality based effluent limitations for toxic and organoleptic substances and whole effluent toxicity.

NR 114 "Certification Requirements for Waterworks and Sewage Treatment Plant Operators" -- Operator qualifications, treatment plant classification.

NR 158 "Contingency Plan for Emergency Actions in Response to the Discharge of Hazardous Substances" -- Establishes a state contingency plan to provide for efficient, coordinated and effective procedures to minimize damage to the air, land and waters of Wisconsin.

NR 200 "Application for Discharge Permits - Wisconsin Pollution Discharge Elimination System (WPDES)" -- Discharge permit requirements.

NR 201 "Fact Sheet for Proposed Permits (WPDES)" -- Discharge of over 500,000 gal/day.

NR 205 "General Provisions WPDES" -- Establish implementation procedures for antidegration policies.

NR 207 "Water Quality Antidegradation" -- Established implementation procedures for the antidegradation policy NR 102.

NR 218 "Method and Manner of Sampling" -- Sampling requirements.

NR 219 "Analytical Test Methods" -- Testing requirements.

Refer to Wisconsin Administrative Code for details.

The receiving stream for the Outfall 001 is the Flambeau River. It is classified as "Full Fish and Aquatic Life" by the WDNR and the WPDES Discharge effluent limits are set accordingly.

Reprints of Wisconsin Administrative Code Chapters NR 102, NR 105, NR 106, NR 114, NR 158, NR 205, NR 207 and NR 218 can be found in Appendix B.

Chapter II. - Wastewater Treatment

A. General

1. Operational Goals

The WTP operator's goal is to maintain optimum wastewater treatment. Optimum wastewater treatment is defined as the degree of treatment required to produce a WTP effluent that meets all of the 001 Outfall Permit limits.

The Wastewater Treatment Plant, WTP, is designed to provide optimum treatment over a wide range of flow conditions. Optimum treatment is achieved by using laboratory analysis, carefully controlling each treatment process and keeping accurate records for evaluation of the optimum operating conditions.

2. Process Description (refer to FB&D Drawings 250-P-001 & 250-P-002)

a. General

The proposed WTP is designed to process flows ranging from 296 TO 800 GPM and to neutralize acids and remove metals in the wastewater. The WTP has a three stage treatment process: (1) lime treatment and clarification; (2) sulfide precipitation of metals; (3) filtration, final neutralization and sampling. Some of the treated water will be recycled for WTP operations, make-up water, wash down water, firewater and dust control. The balance will be discharged to the Flambeau River.

The WTP was constructed concurrently with the other support facilities during construction phase and will be operational by the time placement of Type II rock begins. The WTP will begin operations in the preproduction period and throughout the reclamation period until contact pit water is no longer produced.

A WTP operator will be certified by the Department of Natural Resources and operate the WTP. The WTP, except for the water clarifier, is housed in a heated metal building. Reagents such as lime, sodium sulfide, polymers and sulfuric acid will be unloaded from delivery trucks to storage bins and tanks located within or adjacent to the WTP.

Slurries produced from the WTP are about 25% solids by weight and are stored temporarily in an agitated 8,000 gallon tank. The slurry will be periodically pumped into a 4,000 gallon tank truck for transport to the disposal site on the Type II stockpile. Based on the design criteria for the WTP, the maximum expected slurry production would be approximately 124 tons per day. FB&D Drawing No. 250-P-002 contains a flow sheet for the WTP.

b. Stage 1 - Lime Treatment and Clarification

Lime treatment is commonly used for acid neutralization and metal precipitation. Acid in the wastewater is neutralized in the WTP to produce a sparingly soluble salt as illustrated below:

$$2H^+ + Ca(OH)_2 \rightarrow Ca^{+2} + 2H_2O$$

$$Ca^{+2} + SO_4^{-2} \rightarrow CaSO_4$$

With lime treatment, metals are precipitated with varying effectiveness as hydroxides and calcium salts, depending upon the pH of the system. Generally, a pH in the range of 8.5 to 9.0 provides an optimum range for effective metal precipitation. A higher pH often results in dissolution of some metal hydroxides as complexes and decreases the effectiveness of the lime treatment. Lime Treatment provides an effective step to remove the majority of dissolved metals and improve the effectiveness of the polishing treatments which follow. Typical metal precipitation reactions which occur with lime treatment are:

$$Fe+_3 + Ca(OH)_2 \rightarrow FeO(OH) + Ca^{+2} + H^+$$

$$Cu^{+2} + Ca(OH)_2 \rightarrow Cu(OH)_2 + Ca_{+2}$$

$$Zn^{+2} + Ca(OH)_2 \rightarrow Zn(OH)_2 + Ca^{+2}$$

$$Pb^{+2} + Ca(OH)_2 \rightarrow Pb(OH)_2 + Ca^{+2}$$

$$2AsO_4^{-3} + 3Ca(OH)_2 \rightarrow Ca_3(AsO_4)_2 + 6OH^-$$

$$Cd^{+2} + Ca(OH)_2 \rightarrow Cd(OH)_2 + Ca^{+2}$$

The lime treatment system consists of a lime storage and slaking facility that produces a 15 percent lime slurry, a neutralization and mixing tank for lime treatment of the wastewater and internal WTP recycle streams, a flocculent polymer system, and a clarifier for the sedimentation and removal of precipitated solids.

c. Stage 2 - Sulfide Precipitation

Sulfide precipitation has been incorporated into the WTP process design to promote the removal of copper and zinc from the lime treatment effluent. Typical metal precipitation reactions of the sulfide precipitation process are:

$$Cu^{+2} + Na_2S \rightarrow CuS + 2Na^+$$

$$Zn^{+2} + Na_2S \rightarrow ZnS + 2Na^+$$

$$Fe^{+2} + Na_2S \rightarrow FeS + 2Na^+$$

$$2Fe^{+3} + 3Na_2S \rightarrow 2FeS + 6Na^+ + S$$

$$H_20 + 1/2O_2 + Na_2S \rightarrow S + 2NaOH$$

The very low solubility of the metal sulfides is the key to the effectiveness of the method. Precipitation of residual metals requires that the pH be slightly acid (~~4.5 to~~ 5.0 to 6.0) for best results. This requires re-acidification of the lime precipitation effluent prior to the addition of sodium sulfide to the wastewater.

The sulfuric acid dilution and addition system, a sodium sulfide dilution and addition system and a sand filter feed tank. The dilute acid is added ahead of an in-line mixer and followed by two agitated sulfide mixing tanks and the sand filter feed tank, all in series and each providing approximately five minutes retention time (reaction times are fast and the reagents are readily soluble).

d. Stage 3 - Filtration, Neutralization and Sampling

The sulfide precipitation circuit effluent is pumped to a sand filter circuit, consisting of three compartment multi-media filter, which will remove the suspended solids from the water.

The filters operate automatically and periodically each compartment will back-flush the retained solids out of the filters. This solids-containing slurry is pumped to the Lime Treatment circuit and the solids will ultimately be discharged with the clarifier underflow slurry.

Following the filtration of the treated water, the water flows to the pH Neutralization tank, where a clarified lime solution is added to adjust the water to a pH between 7.0 and 8.0 prior to its sampling and discharge to the Flambeau River.

In the event the WTP discharge does not meet the permitted limits for pH and/or clarity, the effluent will be diverted back to the Runoff Pond for pretreatment.

3. WTP Layout (Refer to FB&D Drawings 250-M-001 & 002)

The WTP was designed in an efficient and readily accessible manner.

4. Hydraulic Profile (Refer to FB&D Drawing 250-P-016)

The Hydraulic Profile reveals that the WTP in-flow is pumped from the Surge Pond and enters the Neutralizing and Mixing Tank. The water then flows by gravity into the De-Aerator Tank and the Clarifier. The Clarifier overflow flows by gravity into the Clarifier Overflow Tank. From there, the effluent stream is pumped to the first Sulfide Mix Tank, which overflows by gravity to the second Sulfide Mix Tank and the Sand Filter Feed Tank. The effluent is then pumped to the Sand Filter and then to the pH Neutralization Tank, which overflows by gravity to the 001 Outfall and the Flambeau River.

5. General Start-Up Precautions

During the start-up of electrically driven equipment, the following general procedures are suggested:

a. Check for required lubrication, adjustments, and installation of all equipment including safety guards.

b. Make a final check for debris and obstructions in tanks, pumps, equipment and piping.

c. Check for clearances around all equipment.

d. Rotate equipment by hand to assure free movements.

e. Check for correct motor rotation.

f. Check for seal water operation on pumps, where applicable.

g. Check manufacturer's equipment and O&M manuals for recommended operational procedures and recommendations.

6. Power Source

a. Electric power for the Flambeau Mining Company, (Flambeau), facility south of Ladysmith, WI is distributed by:

Northern States Power Company
711 West 9th North Street
Ladysmith, WI 54848
(715)-532-6226

b. Electrical service from the Northern States Power Company is received from the feeder station. Primary voltage of 13.8 KV from this feeder is reduced by the Flambeau's main substation adjacent to the WTP. The electrical service is then run underground to the Motor Control Center in the WTP.

c. The reduced voltage entering the WTP is 480/240 volt, 3 phase, 60 Hertz. Dry transformers within the WTP further reduce some of the power to 120 volt, single phase for distribution within the WTP.

d. There is no emergency/standby power provided at this facility. Sufficient contact water storage and WTP processing capacity is available on site to allow the WTP to be shut down in excess of a day, by which time the power outage should be rectified.

For a more detailed description of the WTP electrical system, refer to Chapter XI, Electrical System.

Chapter III. - Slurry Handling Operation

A. General

End products of the Wastewater Treatment Plant, (WTP), are an effluent (of desired quality) and a slurry. The previous chapter described the WTP. This chapter addresses the solids handling.

Slurry refers to the solids accumulated and subsequently separated from the wastewater stream during the various phases of treatment.

1. Operational Goals

The goal of solids handling is to process and concentrate the solids and dispose of the resultant slurry on the Type II Stockpile.

2. Slurry-Handling Process Description

Slurry is withdrawn form the Clarifier by the Clarifier Underflow Pumps & pumped to the Clarifier Underflow Slurry Storage Tank. From the agitated, 8,000 gallon tank, the slurry is periodically pumped from the slurry storage tank to a 3,500-gallon tank truck. The truck will deliver the precipitate slurry to the Type II stockpile.

3. Slurry Flow Schemes

A brief description of the normal slurry flow scheme is presented here. A more detailed description of all flow options are discussed in appropriate sections of the previous chapter.

Slurry is withdrawn from the clarifier underflow and is recycled by one of two underflow pumps back to the neutralization and mixing tank until the underflow slurry is maintained at about 25 percent solids. When the underflow density is at 25 percent solids the slurry is pumped to the 8000 gal Clarifier Underflow Storage Tank. The Clarifier Underflow Storage Tank is equipped with a level sensor. When the tank is approaching capacity, an alarm will sound in the WTP Control Room. The operator will then pump the slurry into a 3,500 gallon tank truck & the slurry will be delivered to the Type II Stockpile. At the maximum design flow rate of 800 gpm feed to the WTP approximately 6 truck loads per day of 25 percent solids slurry will be trucked to the Type II Stockpile Area.

4. General Start-Up Procedures

The following provides general suggestions for start-up of the slurry handling system. Detailed start-up procedures are given in the corresponding equipment sections of this chapter and also in Chapter II.

(a) Close all valves, slide gates and install all stop gates in the system. Put all equipment electrical controls in the "Off" position. Check that all tanks, channels and piping are free of debris.

(b) Open valves for "normal" flow patterns as described in the equipment start-up procedures.

(c) Energize all appropriate components and panels.
During the start-up of electrically driven equipment, several general procedures are suggested:

(1) Check for required lubrication, adjustments and installation of all equipment including safety guards.

(2) Make a final check for debris and obstructions in tanks, channels and piping.

(3) Check for clearances around all equipment.

(4) Rotate equipment by hand to assure free movement.

(5) Check for correct motor rotation.

(6) Check for seal water operation on pumps (where applicable).

(7) Refer to the manufacturer's equipment and O&M manuals for recommended operating procedures and recommendations.

(8) Energize all components and panels.

B. Process Control and Operating Procedures

1. Slurry Pumping

Unlike plant wastewater flow streams, where much of the flow between treatment components is by gravity, most slurry transfer operations require pumping. For that reason, there are a total of three slurry pumps in the slurry handling system including the following:

- Two Clarifier Underflow Pumps located inside the WTP along the North wall.
- One Clarifier Underflow Storage Pump in the southwest corner of the WTP.

In addition to the three slurry pumps, there are two flow meters, a density meter and a tank level sensor to control the slurry flow rates.

The two Clarifier Underflow Pumps are piped and valved such that one pump can be taken out of service for short-periods of time for maintenance and/or repair procedures and the other pump can be utilized as a back-up.

The Clarifier Underflow Storage Pump is used intermittently (approximately 6 hours/day) and allows maintenance to be performed at anytime during the day.

a. Clarifier Underflow Pumps (Refer to FB&D Drawing 250-I-005)

(1) Description

The two Clarifier Underflow Pumps (250-NPP-08 & 09) are Galigher Model 3VRA 1000-520 centrifugal slurry pumps with 20 horsepower motors. The pumps are rated for a maximum flow rate of 400 GPM and 80 TDH at 30 percent solids content.

The Clarifier Underflow slurry discharge from one of the pumps flows through one of two slurry recycle lines both of which flow through flow meters and flow control valves. One of the lines maintains the continuous recycle flow to the Neutralizing and Mixing Tank (250-MDA-04). The second flow contains a density meter in addition to a flow meter. The density sensor monitors the underflow slurry density and when the underflow slurry density is less than the maximum density setting, the flow is also recycled back to the Neutralizing and Mixing Tank (250-MDA-04). When the slurry density is at the desired density, the slurry is pumped to the Clarifier Underflow Storage Tank (250-MDA-17).

(2) Purpose

The Clarifier Underflow Pumps recycle the underflow slurry to the Neutralizing and Mixing Tank or delivers the slurry of the proper density to the Clarifier Underflow Storage.

(3) Start-Up

a) Observe start-up precaution for electrically driven equipment. Refer to Chapter III.A.4

b) Refer to the manufacturer manuals in Volume II for recommended equipment start-up and operational procedures.

c) Open Knife Gate valve V-112 and V-114 or V-113 and V-115 to allow the slurry to flow to the Clarifier Underflow Pump 250-NPP-08 or 09, respectively.

d) Energize the flowmeter loops 165 and 166.

e) Turn the appropriate local "Hand-Off-Auto" selector switch to "Hand" and start the pump. After the pump is operating satisfactorily, turn the "HOA" switch to Auto and operate the pumps from the PLC.

(4) Normal Operation

The Clarifier Underflow Slurry is normally pumped at a rate of 396 gpm at a slurry density of about 1.2 and 25 percent solids, when the plant operations have been stabilized. (Based upon the 800 GPM maximum plant feed rate.)

Based upon the 800 GPM maximum plant feed rate, the recycle flow to the Neutralizing and Mixing Tank will average 375 GPM while the slurry flow rate to the Underflow Storage Tank will be 21.3 GPM.

The proportioning of the Clarifier underflow between the recycle and the storage tank is automatically controlled by the density sensing loop 165 at the preset density in the PLC. When the density is below the preset valve of approximately 25 percent the slurry will be recycled to the Neutralizing and Mixing Tank. When the density is at or above the preset value the slurry is pumped to the Underflow Storage Tank. If the Clarifier Underflow Storage Tank is full the WTP operator will be notified by the PLC alarm and the slurry will be recycled to the Neutralizing and Mixing Tank until the Clarifier Underflow Storage Tank high level has been rectified by transferring the slurry to the slurry tank truck for disposal on the Type II Stockpile.

(5) Electrical Controls

a) The Clarifier Underflow Pumps panel contains the Hand-Off-Auto selector switches and Start/Stop push button stations.

b) In the "Hand" position the local push button station will be activated.

c) In the "Auto" position the control will be from the PLC.

d) In the "Off" position, the pumps will not run.

(6) Alternate/Emergency Operation

a) There is no alternative power available during a power outage. If the outage is anticipated to be longer than a half an hour, the pump discharge lines should be drained to prevent line plugging.

b) Only one Clarifier Underflow Pump is required to handle the plant maximum capacity, the second pump is provided as a back-up for emergency conditions or when the first pump is down for maintenance or repair.

c) Refer to Chapter VIII for maintenance instruction for the Clarifier Underflow Pumps.

b. Clarifier Underflow Storage Pump (Refer to FB&D Drawing 250-I-005)

(1) Description

The Clarifier Underflow Storage Pump (250-NPP-32) is a Galigher Model 3VRA 1000-520 centrifugal slurry pump with a 480 volt, 7.5 horsepower motor. The pump is capable of pumping 400 GPM at 30 TDH of a 25 percent solids, 1.2 density slurry.

(2) Purpose

The purpose of the Clarifier Underflow Storage Pump is to pump the final slurry from the WTP into the slurry tanker truck. The slurry tank truck will then transport the slurry to the Type II Stockpile Area for disposal.

At the maximum plant design feed rate of 800 GPM, there will be approximately 124 tons of 25 percent slurry or 63,000 pounds produced per day.

(3) Start-Up and Normal Operation

This equipment is a batch, manual controlled operation, therefore the start-up and normal operations are identical.

a) Observe start-up precaution for electrically driven equipment. Refer to Chapter III.A.4

b) Refer to the Manufacturer manuals in Volume II for recommended equipment start-up and operational procedures.

c) To transfer the slurry from the Clarifier Underflow Storage Tank to the slurry tank truck, open valve V-136 and start pump NPP-32.

d) Place the flexible hose into the slurry tank truck hatch, secure the hose and open the discharge valve V-137.

e) Monitor the tank truck filling and when the tank is within one foot of the top, close the discharge valve V-137. Remove the flexible hose from the tank truck and turn off the Clarifier Underflow Storage Pump (250-NPP-32).

(4) Electric Controls

a) The Clarifier Underflow Storage Pump control panel contains a "Hand-Off-Auto" selector switch and an "Start-Stop" push button station at the pump location.

(5) Alternative/Emergency Operation

a) During a power outage, the Clarifier Underflow Storage Pump does not require to be operating because this is a batch, manually operated system.

b) Refer to Chapter VIII for maintenance instruction for the Clarifier Underflow Storage Pump (250-NPP-32).

c. Clarifier Underflow Storage Tank Agitator

(1) Description

The Clarifier Underflow Storage Tank Agitator (250-NAG-10) is a Lightnin Series 10, Model 15Q3 with a 7 1/2 horsepower, 480 volt motor.

(2) Purpose

The purpose of the agitator NAG-10 is to maintain the slurry in the tank in a uniform mixture and to prevent the solids from settling out and plugging the tank discharge.

(3) Start-Up and Normal Operation

This equipment is a batch, manual controlled operation, therefore the start-up and normal operations are identical.

a) Observe start-up precaution for electrically driven equipment. Refer to Chapter III.A.4

b) Refer to the Manufacturer manuals in Volume II for recommended equipment start-up and operational procedures.

c) Turn the agitator (250-NAG-10) "Hand-Off-Auto" switch to "Auto". The "HOA" switch is located at the Clarifier Underflow Storage Tank (250-MDA-17) base.

d) The Agitator (250-NAG-10) will then be controlled at the PLC in the control room.

7. Administration Office and Laboratory Building

a. Houses

(1) Offices for the facility staff

(2) Laboratory equipments to prepare mine rock samples and site water samples for analysis

(3) Analytical equipment to analyze the prepared solid and water samples from the facility operations.

b. Structure

(1) Cast-in-place reinforced concrete footings, and floor slabs.

(2) Pre-engineered, metal sided building with fiberglass-batt insulation. The MCC/control room portion is concrete block with poured concrete floors and ceilings.

C. Heating and Ventilating

1. WTP Building

a. Heat is provided by

Tag No.	Location	Type
250-NHE-1	NW	Modine Model PAE-400-AF0108
250-NHE-2	NE	Modine Model PAE-400-AF0108
250-NHE-3	SW	Modine Model PAE-400-Af0108

b. Ventilation is accomplished by

Tag No.	Location	Type
250-NHV-01	South Side WTP	Lennox Model CHA 16-823

2. Firewater System

a. Heat is provided 3KW electrical Space Heater

b. Ventilation is Thermal Controlled Sidewall Louvers and Fan

Chapter V. - Solids Management

A. Introduction

The Flambeau wastewater treatment plant (WTP) will accumulate solids as a result of the treatment process. The sources of the solids are the clarifier precipitate, grit from lime slaking, and sludge from cleaning the runoff, surge, and settling ponds. This chapter identifies methods for the management of these solids.

B. Sources of Solids

1. Clarifier Precipitate

The clarifier precipitate is a slurry which will be maintained at about 25 percent solids. The slurry percent solids, clarifier slurry blanket, clarifier rake arm torque, and slurry volume will be documented daily. This documentation will allow the operator develop trends for WTP operation and maintenance.

Chapter III should be referenced for detailed slurry handling operations. A 3500 gallon tank truck will be used to deposit the slurry in the Type II stockpile. Condition 13 of Part 2 of the Mining Permit states that the "treatment plant precipitate...shall not be placed in the Type II stockpile except in areas where a minimum of 10 feet of material capable of retaining fines or a total thickness of 20 feet of heterogenous waste material is in place between the drainage blanket and the precipitate." Note the area within the Type II stockpile in which slurry is placed. This will provide documentation to show compliance with this permit requirement.

2. Grit from Lime Slaking

Grit will be hauled to the Type II stockpile where its placement must also meet the requirements of Condition 13 of Part 2 of the mining Permit. Note the area of placement within the Type II stockpile to provide documentation of meeting this permit requirement. The volume of grit hauled will be documented daily.

3. Sludge from Runoff, Surge, and Settling Ponds

The cleaning of the Runoff, Surge, and Settling Ponds will be done on an as needed basis. The frequency will be determined by the rate of deposition of solids in each pond. The sludge depth of each pond will be monitored routinely. When the sludge has accumulated to a depth of one foot, the pond will be cleaned.

The sludge cleaned from the Runoff and Surge Ponds will be placed in the Type II stockpile meeting the requirements of Condition 13 of Part 2 of the Mining Permit. The sludge cleaned from the Settling Ponds may be placed in either the Type I or Type II stockpile. Settling Pond sludge placed in the Type II stockpile must meet the requirements of Condition 13 of Part 2 of the Mining Permit. The volume of sludge and the storage area within either of the two stockpiles will be noted to provide documentation that the permit requirement was met.

C. Solids Disposal Records

As with other operational activities at the WTP, it is important that accurate records are maintained for the solids management program. This data will aid the operator in ensuring that the WTP is operating within the intended parameters. Records also provide documentation of compliance with permit requirements.

Chapter VI. - Records

A. Importance and Use of Records

Good records are never more useful than when they are needed to provide insight into operational problem or to respond to an emergency. But they also play a role in the successful day-to-day operation of the wastewater treatment plant (WTP). Records are needed for the following reasons:

1. Operating records can indicate the overall efficiency of the WTP and can point out any tendencies of certain treatment units to cause problems.

   Procedures for controlling the treatment process and guidelines for trouble-shooting must come from the WTP itself through actual operating experience. Most data is obtained during the first year of treatment, with designers assisting the WTP operators in obtaining optimum treatment.

2. Records show the type and frequency of required maintenance conducted on operating units and help to evaluate its effectiveness.

3. Records provide data for making recommendations to modify WTP operation.

4. Records of past performance and of operational procedures help the engineer and operators to evaluate present performance.

5. Records are used to support budget requests for personnel, additional facilities and equipment.

6. Records are helpful in establishing safe working conditions.

7. Records provide the actual data for the preparation of weekly, monthly or annual reports to administrative officials and regulatory agencies.

For records to serve their function, they must be kept and handled properly. Good records must be:

- regular
- permanent
- complete
- accurate
- neat
- well-documented
- categorized as active or inactive

Updating records regularly helps to keep them accurate, neat and organized and its less time-consuming than trying to update them all at once. Disorganized records are more frustrating than useful, and false or misleading records can do harm. A misfiled record is a lost record, and a lost record is worthless.

Accurate records are necessary if trouble-shooting measures based on their data are going to work. Accuracy also allows the operator to determine cause-and-effect relationships between control changes in processing and the degree of treatment efficiency achieved.

B. General Instruction for Good Record-keeping

1. Write entries on data sheets in ink or with an indelible pencil. A lead pencil should never be used because notations can become smudged or can be altered or erased. This destroys their legal chronology.

2. Follow specific instructions for keeping each form explained in the next section, Section C, Types of Records and Operating Logs.

3. Fill in records at the recommended time periods that apply to the form, whether daily or less frequent.

4. Prepare a separate file for recording emergency bypass situations and permit noncompliance events, as recommended by the Wisconsin Department of Natural Resources (WDNR). This file contains information on the cause and duration of each occurrence and a description of the corrective actions taken. Such a file can help to prevent or minimize future bypass or permit violations.

5. Keep essential records, maps and inventories readily available for maintenance crews and service vehicles to use during an emergency. These items should be protected so that they can be reproduced or used immediately. Essential records can be preserved one of two ways:

    a. Keep essential records in a file cabinet not subject to flooding in the Chief Operator's office.

    b. Keep copies of all essential records in the Flambeau's Administration building in addition to keeping the originals at the WTP. This alternative requires more work, but offers two advantages: Records are more accessible, and it is unlikely that an emergency situation will affect both locations simultaneously.

6. Periodically, records no longer useful on day-to-day basis should be placed in storage. The WPDES Permit requires that records of all monitoring information, including all calibration and maintenance records and all original PLC printouts for continuous monitoring instrumentation be kept a minimum of three years.

C. Types of Records and Operating Logs

Flambeau's WTP will require the following types of records. A brief description of each follows:

- Daily Operating Log
- Discharge Monitoring Report
- Record Drawings
- Maintenance Scheduling/Records System

- Inventory Records
- Safety Records (Refer to Chapter IX)
- Lab Worksheets (Refer to Chapter VII)

1. The purpose of the Daily Operating Log is to give the WTP operator a comprehensive checklist of items to check daily. It also provides a convenient format to list visual observations, lab testing results, etc. Any work done or notable events occurring that day should be listed. This becomes a recorded source for future reference.

   The Daily Operating Log format should be continuously updated as operating experience and changing requirements dictate.

2. The monthly Discharge Monitoring Report (DMR)is filled out and submitted to the Wisconsin Department of Natural Resources (WDNR). It lists all the monitoring information required by the WPDES Discharge Permit. One copy is for Flambeau's records.

3. A complete set of Record Drawings of the WTP and collection system should be readily available for use by the WTP operators. The operators will record on these plans all changes made in WTP piping, equipment, and electrical circuitry. The original drawings should be updated regularly according to the changes.

4. The best way for maintenance personnel to maintain the preventive maintenance program is through good record-keeping. The Maintenance Scheduling/Record System will be kept up-to-date daily and the maintenance procedures listed will be reviewed and modified as operating experience dictates.

   The initial preventive maintenance scheduling/record system will be a three-card system. The three maintenance cards are:

   a. An Equipment Data Card will be completed for each item that requires scheduled maintenance. The card lists the name of unit or component, operating data and capacities, identifying numbers, manufacturer/supplier, contractor, special tools required, lubricants, recommended spare parts and other pertinent data.

   b. A corresponding Maintenance Scheduling Card will be completed for each Equipment Data Card. This scheduling card lists the work to be done and the frequency.

   c. The Maintenance Work Record is filled out showing date, work done and by whom (signed). Nonscheduled maintenance (other than that listed on the Maintenance Scheduling Card) is also listed on this form. In this way, the maintenance personnel has a permanent record of all maintenance and repair work done and dates accomplished.

      The maintenance scheduling/record system will be reviewed and revised periodically as experience and/or equipment manufacturer's recommendations dictate. The maintenance technician should confirm the completeness of the information listed on

the maintenance cards. All modifications or additions to equipment should be recorded and maintenance data revised accordingly.

5. An Inventory Records Systems will be used to maintain a sufficient quantity of essential supplies and repair parts. The list of items to be stocked should be updated as operating experience dictates. Some items may be deleted or quantities reduced while others may have to be added or quantities increased.

6. Official Safety Records seek to document causes for illness or injury. These records may be utilized in many ways:

   a. As justification for modifying safety rules or work procedures.

   b. As legal documents in case of dispute or litigation.

   c. As documentation for insurance and other compensation requirements.

   An "Supervisor's Report of Injury" should be filled out and filed anytime an accident occurs.

   In addition, many safety-related incidents do not result in injury or disease but should be noted (Daily Operating Log) and corrective measure taken. It is personnel's responsibility to maintain a safe WTP.

7. Results from on-site WPDES required lab tests (Dissolved Oxygen and pH) will be listed on Lab Worksheets provided at the end of Chapter VII. Use these lab sheets and maintain a file on each whenever laboratory analyses are done. To protect yourself and Flambeau, be sure to initial or sign these sheets where required. These sheets can be used as evidence in case of a WDNR investigation or legal action.

Chapter VII. - Laboratory Testing

A. General

Required laboratory testing will be handled by a certified or registered laboratory as defined under the Wisconsin Administrative Code chapter NR 149.

Those parameters which require immediate analyses will be performed on-site by Flambeau personnel. These include dissolved oxygen (DO) and pH.

B. Effluent Sampling Specifics

The Flambeau Mining Co. (Flambeau) is responsible for effluent and receiving water sampling, sample handling and transportation of the sample to a certified commercial laboratory for testing. The actual sampling and sample handling will be provided either by Flambeau personnel or their designated representative. Field operation will generally consist of flow measurement, sample procurement, sample preservation, sample documentation and record-keeping, as well as shipment to the laboratory for analysis.

1. Sample Type

The DO, sulfide and hexavalent chromium will be collected as a grab samples. The other samples from Outfall 001 will be collected by a flow-proportional composite sampler over the period of the discharge. pH will be monitored continuously in the WTP.

2. Sample Location

Samples from the 001 Outfall will be taken in three locations. Sulfide and dissolved oxygen (DO) will be taken at the bottom of the riprap before the effluent enters the Flambeau River. Hexavalent chromium will be sampled following the wastewater treatment process but before contact with the rip-rapped outfall channel to the Flambeau River. All other samples will be collected by a stationary refrigerated composite sampler located in the wastewater treatment plant (WTP). All samples are drawn from the effluent after pH neutralization which is the final treatment process.

3. Sample Timing

The samples will require an analysis of hexavalent chromium. This procedure has a sample holding time requirement of 24 hours. Because of this, the grab sample should be collected as late in the day as possible. This will allow for the overnight shipment of samples to the laboratory. The laboratory must receive the sample at or before 10:30 a.m. This will allow the analysis to be initiated prior to the expiration of the 24-hour holding time. The sampling personnel must also notify the laboratory prior to shipment. This will allow the laboratory to schedule the analysis for compliance with all the sample holding time restrictions.

4. Sample Containers and Shipping Coolers

Sample containers and shipping coolers will be provided by the commercial laboratory to Flambeau. Flambeau will notify the laboratory in advance of the anticipated testing in order that the containers and coolers can be received by Flambeau when required.

5. Sample Labeling

Each sample collected will contain a label with the following minimum information:

- Client identification
- Individual collecting the sample
- Sample identification
- Date and time of sampling
- Sample type (grab or composite)

Care must be taken when labeling samples such that the label cannot be washed off or smeared when ice is added to the cooler.

6. Sample Preservation

The samples must be refrigerated during the 24 hours they are being composited. The temperature of the refrigerators must be maintained at 4°C. A thermometer must be placed in each unit to ensure that the 4°C temperature is maintained.

Upon completion of the 24 hour sample collection period, the samples will be transferred from the polyethylene sample container inside the refrigerator to the labeled sample containers provided by the laboratory. These samples will be placed inside the coolers for shipment. The coolers will then be filled with a sufficient amount of wet ice to maintain the temperature of the samples at, or less than, 10°C until receipt by the laboratory the following day.

When bioassays are being completed, grab samples from the river will be required.

7. Chain-of-Custody Record and Custody Seal

A chain-of-custody record will be completed for all samples to be shipped to the laboratory. At a minimum, the chain-of-custody record will include the following information:

- Client identification
- Samplers' signature
- Sample identification
- Number of containers
- Sample type (grab or composite)
- Date and time of sampling
- Initial temperature and pH of sample (if known)
- Carrier identification (UPS, Federal Express, etc.)
- Shippers signature, date and time

The shipper will keep a copy of the completed chain-of-custody record for Flambeau files in order to demonstrate sample custody. The shipper will place the completed chain-of-custody record inside a sealed plastic bag and place the sealed bag inside the cooler with the samples. The cooler will then be securely fastened for shipment to the laboratory. A custody seal will be placed around the cooler to ensure that no tampering of the samples takes place.

8. Sample Transportation

Flambeau will select a common carrier, which will guarantee deliver to the laboratory by 10:30 a.m. the next day. The samples will be collected, shipped and delivered according to the laboratory overnight delivery schedule. Flambeau will retain a copy of the shipping documents for their files to demonstrate sample custody. Flambeau will also notify the laboratory in advance of the shipment. In return, the laboratory should be requested to notify Flambeau upon receipt of the samples.

As an alternate, Flambeau may also choose to hand deliver the samples to the laboratory by 10:30 a.m. on the day following the date of sample collection. In this case, the samples will be collected and delivered according to the laboratory hand delivery schedule. Upon delivery of the samples, Flambeau will receive a signed copy of the chain-of-custody record from sample receiving personnel at the laboratory.

C. Individual Tests

1. Dissolved Oxygen (DO)

The DO test measures the amount of oxygen dissolved in an aqueous solution. Natural unpolluted surface waters usually contain close to the maximum amount of oxygen that can be dissolved in such waters. This saturated DO value is a function of the temperature of the stream and the atmospheric pressure. For example, cold water subjected to high atmospheric pressures will hold more DO than warmer waters at lower atmospheric pressures. The concentration typically varies from 7 to 14 mg/l. Lower values of DO are an indication of pollution due to the presence of oxygen-consuming materials. The DO content of a stream is of particular significance because the survival of fish and other aquatic organisms depends on the maintenance of a high DO level.

Effluent with low DO levels can lower the oxygen of a receiving stream. In general, a DO value in the order of 5.0 mg/l or greater is necessary to support game fish and the higher forms of aquatic life.

DO will be determined with the use of a membrane electrode DO meter. Special precautions must be observed in the collection of samples for the DO test in order to exclude the entrance of extraneous air into the sample. A single grab sample is sufficient for the DO determination.

The WPDES permit requirement for Outfall 001 is a minimum DO of 5.0 mg/l.

a. Oxygen Meter

The method being used extensively for DO determination is the membrane electrode method. The membrane electrode method is a simple, quick and convenient method, as long as care is taken to properly calibrate and maintain the instrument.

The DO meter is supplied with an electrode system which can be used in the field to determine the DO in water bodies and treatment systems. The meter must be recalibrated each time the electrode (probe membrane) is changed and/or recalibrated each time the probe is used.

Before starting to use the DO meter and the supplied electrodes, study the manufacturer's recommendations for initial use and calibration of the meter and probes. Be sure to follow recommended maintenance schedules.

b. Oxygen Meter Calibration

Before each day's use, the meter and probes must be calibrated. Follcwing is the calibration procedure for the Checkmate DO Set:

(1) Remove wetting cap from tip of sensor. Switch on meter.

(2) For first calibration point, place sensor in zero oxygen (sodium sulphite) solution. Allow sufficient time for sensor to stabilize.

Move the sensor in a gentle circular motion.

Make sure sensor is immersed to a depth of 40mm to cover the temperature sensing element.

Press CAL button. **CAL 1** is displayed on meter and after endpointing, the display automatically updates to zero.

(3) For second calibration point, hold sensor in air. Press CAL button. **CAL 2** is displayed. After endpointing, the display automatically updates to 100 percent O_2.

(4) To adjust oxygen calibration for salinity and barometric pressure, press the MODE button. In mg/L O_2 mode, press the CAL button and **100** is displayed. Use the arrows buttons on the keypad to adjust the display according to the salinity and barometric pressure tables contained on the operating instruction leaflet.

c. Measuring Samples

(1) The sample is measured in the same way as the calibration procedure.

(2) Place the probe in the sample and allow the temperature to stabilize. Press the READ button. Stir for 30 to 60 seconds and take the meter reading when the display is stable.

Depending on probe condition, temperature and oxygen level, the response time for oxygen measurement may vary from 30 seconds to 2 minutes.

2. pH Determination

The pH of a water solution is an expression of how acidic or alkaline it is. Pure water (H_20) disassociates into a small number of hydrogen ions (H^+)and hydroxyl ions (OH^-). Although their concentration is usually expressed by brackets, no brackets will be used herein, thus H^+ is the concentration in gram equivalents per liter of the hydrogen ions in the solution. A gram equivalent is the weight in grams that equals the atomic weight of the ion. As hydrogen's atomic weight is 1, a gram equivalent of hydrogen weighs 1 gram. The product of the hydrogen ion and hydroxyl ion concentrations remains constant regardless of what else is added to the solution. That product is 10^{-14} or $1/10^{14}$. Thus, $H^+ \times OH^- = 10^{-14}$. If the concentration of the hydrogen ion changes, the hydroxyl ion concentration has to change so that their product remains 10^{-14}.

Technically, pH is the negative logarithm (10 base) of the hydrogen ion concentration denoted H^+. Thus, a hydrogen ion concentration of 10^{-6} means a pH of 6.0. A pH value of 7.0 ($H^+ = 10^{-7}$) is a neutral pH. At that point, the hydrogen ion and hydroxyl ion concentration are both 10^{-7} as their product must be 10^{-14}. A pH below 7.0 is acidic and a pH above 7.0 is alkaline.

The pH of a water solution can be measured calorimetrically or electrically. The calorimetric method is based on the property of chemical "indicators" to change colors with changes in pH. Different indicators are used over different pH ranges as no single indicator can cover the entire pH range of interest in wastewater treatment. The calorimetric method is no longer approved by the U.S. Environmental Protection Agency (EPA). To determine the pH of the effluent, the EPA now requires the use of an electrometric pH meter.

a. pH Meters

The wastewater treatment plant (WTP) process has six separate pH probes which are controlled by the PLC. These probes must be calibrated a minimum of once each year or more frequently as necessary. The calibration must be performed by WTP personnel who are familiar with the instrumentation associated with the pH probes and the PLC. The WTP operators must always be aware that the pH probes must be monitored to verify accurate output. A portable pH probe will be used to check the pH of the process water against the in-line pH probe output.

Meters for pH measurement can be supplied with two separate electrodes, a reference electrode and a calomel pH electrode, or with one combination electrode that contains both systems. The first type of system with two separate electrodes is most useful if the pH meter has a millivolt scale in addition to the pH scale and, therefore, can be used to measure the concentration of other chemicals such fluoride,

chloride, and ammonia. There are special electrodes that can be purchased to measure these other chemicals. If the pH meter is used only for a pH measurement, a combination electrode is the most convenient to use and maintain.

The electrodes should always be filled to a level close to the filling hole with the filling solution recommended by and purchased from the manufacturer. To prevent evaporation, keep the filling hole plugged when not using the meter. When the electrodes are not in use, always immerse them up to about half an inch in pH 7 buffer solution to prevent them from drying out. If an electrode dries up, it will not work. It can be reconditioned but not always successfully.

Initially, prepare the new electrode and pH meter according to the manufacturer's recommendations. Study the manual that is supplied with the meter before attempting to set it up. The meter must be calibrated every 2 hours it is used. If the meter is battery operated, it should be turned off after use and recalibrated before each use. The pH meter should be calibrated using two buffers, one of which is pH 7. The other buffer depends on the sample to be tested, such that the sample pH is bracketed when calibrating. Typically, buffer solutions with pH 4 and pH 7 or pH 7 and pH 10 are used. Buffers are supplied by the manufacturer either as a solution or in packets ready to be dissolved. When using the latter, make the dilutions accurately in an appropriate (usually one liter) volumetric flask. The buffer selected should be close to the pH you expect to measure. Use of indicator papers covering a wide range (pH 1-12) could be used to get a rough idea of the pH to be measured.

Note: The values obtained from the papers cannot be used on the WPDES reporting forms as they do not have sufficient accuracy to meet regulatory requirements.

Before calibration of pH measurement, rinse the electrode tips with distilled water and blot lightly with a clean paper. For calibration, follow the manufacturer's recommendation.

On a battery operated pH meter, also check the condition of the batteries. Wash the electrode tips with distilled water between each use and blot them lightly.

Be careful with the electrodes. They are delicate and break easily. A cracked electrode is useless. Do not knock them with beakers or stirring rods. Store the tips in pH 7 buffer. Watch the level of the filling solution in the electrode. Always use the filling solution recommended by the manufacturer. All pH electrodes do not use the same solution. If you use special electrodes, they might require other filling solutions. Also, you cannot use the same filling solution for the pH electrodes as for the dissolved oxygen probe.

b. General Steps for Measuring pH

(Should be modified as necessary by manufacturer's instructions.)

(1) Let the instrument warm up (turn it "on" or "stand-by").

(2) Check the condition of the batteries (charge or replace them if necessary).

(3) Rinse the electrode(s) with distilled water and blot.

(4) Immerse the electrode(s) in pH 7 buffer.

(5) Check the temperature of the buffer.

(6) Set the temperature dial on the pH meter to the temperature of the buffer.

(7) Turn the meter to "pH reading" and adjust the calibrate knob to the exact pH of the buffer. (It is important that the calibrate knob be adjusted first.)

(8) Repeat Steps 3) through 7) using a pH 10 or pH 4 buffer and adjust with the slope knob. The meter is now ready to use. Turn it to "stand-by" or "on".

(9) Rinse the electrode(s) with distilled water and blot.

(10) Immerse the electrode(s) in the sample.

(11) Check the temperature of the sample.

(12) Stir sample while testing. (Swirl field electrode.)

(13) Set the temperature dial to the temperature of the sample.

(14) Set the pH meter on "pH reading" and read the pH of the sample.

(15) Turn the meter to "stand-by".

(16) Rinse and blot the electrode(s).

(17) Immerse the electrode(s) for storage in pH 7 buffer (see manufacturer's instructions).

(18) Turn the pH meter to "stand-by" or "on" if it will be used again soon. Turn it off if it will not be used again the same day (especially important if the meter is battery run). Before using the meter again, calibrate it with buffer solutions.

D. Sampling Procedures

Sampling procedures will be followed as established in this chapter and in Flambeau's WPDES permit which can be found in Appendix A. Wis. Adm. Code, Chapter NR 218 (Appendix B) must also be referenced to ensure proper sampling procedures are being followed.

pH METER:

MANUFACTURER:

Date	pH of Standard			Temp of Standard	Action Taken Calibration Kinds Used	Remarks	Initials
	4	7	9				

pH DETERMINATION LAB SHEET

Date Sample Taken	Time Sample Taken	Sample Location	Temperature (°C)	pH	Comments	Initials

DISSOLV OXYGEN METER AND PROBE:

MANUFACTURER:

Date	Temp.	Barometric Pressure	Air Saturation Value	Winkler Result	Meter Setting	Anode/ Cathode Cleaned	Membrane/ KCI Changed	Initials

DISSOLVED OXYGEN LAB SHEET

Date Sample Taken	Sample Location	Testing Method Used (DO Meter or Azide Modification)	ml Thiosulfate Used for Test (If Done by Azide Modification	Dissolved Oxygen mg/l	Special Treatment or Comments	Initials

APPENDIX A

WPDES Permit

WISCONSIN
DEPT. OF NATURAL RESOURCES
Carroll D. Besadny
Secretary

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

101 South Webster Street
Box 7921
Madison, Wisconsin 53707
TELEPHONE 608-266-2621
TELEFAX 608-267-3579
TDD 608-267-6897

cc J.E. Murphy
G.D. Schultz
R. Sinclair
J.D. Tygesen
J.R. Huckstorf
P. Kent
J.B. Wood
Permit Manual
11.8.71.4

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

IN REPLY REFER TO: 3430

LAWRENCE E MERCANDO
VICE PRESIDENT
FLAMBEAU MINING CO
105 WEST LAKE AVENUE
LADYSMITH WI 54848

SUBJECT: Modification of WPDES Permit No. WI-0047376-1

Dear Mr. Mercando:

The request for modification of Wisconsin Pollutant Discharge Elimination System (WPDES) Permit No. WI-0047376-1, initiated by the Department of Natural Resources on August 5, 1992, has been processed. This modification will incorporate revised water quality based effluent limits by the Bureau of Water Resources Management based on the April 15, 1992, Supplemental Environmental Impact Statement. The modifications include reduction in limits for nickel and cadmium, application of mass limits for nickel, cadmium, chromium (total or +3), and lead as weekly averages, and increased frequency of whole effluent toxicity testing.

The permit, which is attached, replaces the original permit issued on January 14, 1991. Please replace the original permit with the attached modified permit. All discharges from this facility and actions or reports relating thereto shall be in accordance with the terms and conditions of the original permit, as modified.

The conditions of this modification were determined using the permit application, information from your WPDES permit file, comments received during the public notice period, and Wis. Adm. Codes NR 200, NR 203, NR 205, NR 207, NR 102, NR 105, and NR 106.

In accordance with this permit, discharge monitoring report forms are required to be submitted by you to the Department on a periodic basis. Blank copies of these reports and forms and instructions for completing them will be mailed to you under separate cover within sixty days.

The attached permit contains water quality based effluent limitations which are necessary to ensure that the water quality standards for the Flambeau River are met. You may apply for a variance from the water quality standard used to derive the limitations pursuant to s. 147.05, Wis. Stats., by submitting an application to: C. D. Besadny, Secretary, Department of Natural Resources, P.O. Box 7921, Madison, Wisconsin, 53707 within 30 days after the

date of modification of this permit. Within 30 days of receipt of your application, the Department will notify you of the specific information you must provide to complete your application. Once your application is complete, the Department will issue a public notice of receipt of your application, which will include a 30 day comment period. A tentative decision on your application will be issued within 120 days after receipt of the complete application. A final decision on your application will be issued within 90 days of the expiration of the 30 day comment period provided in the notice of the tentative decision.

The final decision of the Department may be to approve your request for a variance, in whole or in part, or to deny the request. In order to obtain a variance, you must demonstrate by the greater weight of the credible evidence, at least one of the following:

1. Naturally occurring pollutant concentrations prevent the attainment of the standard.

2. Natural, ephemeral, intermittent or low flow conditions or water levels prevent the attainment of the standard, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating water conservation requirements.

3. Human caused conditions or sources of pollution prevent the attainment of the standard and cannot be remedied or would cause more environmental damage to correct than to leave in place.

4. Dams, diversions, or other types of hydrologic modifications preclude the attainment of the standard, and it is not feasible to restore the water body to its original condition or to operate such modification in a way that would result in the attainment of the standard.

5. Physical conditions related to the natural features of the water body, such as the lack of proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to water quality, precludes attainment of aquatic life protection uses.

6. The standard, as applied to the permittee, will cause substantial and widespread adverse social and economic impacts in the area where the permittee is located.

The WPDES permit program has been approved by the Administrator of the U.S. Environmental Protection Agency pursuant to Section 402(b) of the Federal Water Pollution Control Act Amendments of 1972 (33 U.S.C. Section 1342 (b)). The terms and conditions of this permit are accordingly subject to enforcement under Sections 147.21 and 147.29, Wis. Stats., and Section 309 of the Federal Act (33 U.S.C. Section 1319).

The Department has the authority under Chapters 147 and 160, Wis. Stats., to establish effluent limitations, monitoring requirements, and other permit conditions for discharges to groundwaters and surface waters of the State. The Department also has the authority to issue, reissue, modify, suspend or revoke WPDES permits under Chapter 147, Wis. Stats. Wis. Adm. Code Chapters

NR 200, NR 203, NR 205, NR 207, NR 102, NR 105, and NR 106 have been adopted by the Department pursuant to this statutory authority.

To challenge the reasonableness of or necessity for any term or condition of the attached permit, Section 147.20, Wis. Stats., and Chapter NR 203, Wis. Adm. Code require that you file a verified petition for review with the Secretary of the Department of Natural Resources within 60 days of the date of this letter. This notice is provided pursuant to Section 227.48, Wis. Stats., as renumbered by 1985 Wisconsin Act 182.

Sincerely,

Mary Jo Kopecky

Mary Jo Kopecky, Director
Bureau of Wastewater Management

Dated DEC 22 1992

MJK:tsb

Enclosures

cc: Northwest District - Bob Gothblad
Northwest District (Park Falls) - Jim Hansen
EA/6 - Robert Ramharter
SW/3 - Larry Lynch
Jim Hutchison, P.E
Foth & Van Dyke
2737 S. Ridge Road
P.O. Box 19012
Green Bay, WI 54307-9012

Permit No. WI-0047376-1

PERMIT TO DISCHARGE UNDER THE
WISCONSIN POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of Chapter 147, Wisconsin Statutes,

FLAMBEAU MINING COMPANY, SUBSIDIARY OF

KENNECOTT MINERALS COMPANY Kennecott Corporation

is permitted to discharge from a facility located in the Town of Grant, south of

LADYSMITH, WISCONSIN 54848

to THE FLAMBEAU RIVER IN RUSK COUNTY

in accordance with the effluent limitations, monitoring requirements and other conditions set forth in this permit.

This permit shall become effective on the date of signature.

This permit to discharge shall expire at midnight, September 30, 1995.

The permittee shall not discharge after the date of expiration. If the permittee wishes to continue to discharge after this expiration date an application shall be filed for reissuance of this permit in accordance with the requirements of Chapter NR 200, Wis. Adm. Code, at least 180 days prior to this expiration date.

State of Wisconsin Department of Natural Resources
For the Secretary

By Mary Jo Kopecky
Mary Jo Kopecky, Director
Bureau of Wastewater Management

Modified: DEC 22 1992

SPECIAL CONDITIONS

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS FOR OUTFALL 002

(1) During the period beginning on the date of signature and lasting until September 30, 1995, the permittee is authorized to discharge treated wastewaters from the following sources: 1) water from the open pit mine before the exposure of Type II waste rock, 2) runoff from the Type I waste rock storage area (low sulfur), and 3) runoff from other areas that has not contacted either the high sulfur waste rock or the ore, through Outfall 002 (settling pond effluent).

(2) This discharge shall be limited and monitored by the permittee as specified below.

(a) There shall be no discharge of floating solids or visible foam in other than trace amounts.

(b) Samples taken in compliance with the monitoring requirements specified below shall be taken at the following location: Outfall 002 (settling pond effluent), prior to discharge to the Flambeau River.

	EFFLUENT LIMITATIONS				MONITORING REQUIREMENTS	
EFFLUENT CHARACTERISTIC	Daily Maximum	Monthly Average	Weekly Average(3)	Weekly Average Mass Limit	Sample Frequency	Sample Type
Flow - (MGD)	-	-	-	---	Daily	Continuous
Total Suspended Solids	30 mg/L	20 mg/L	-	-	Daily	Composite (4)
Aluminum[5]	1500 ug/L	-	-	-	(6)	Composite (4)
Arsenic[5]	730 ug/L	-	-	-	(6)	Composite (4)
Beryllium	-	0.67 lb/day[7]	-	-	(6)	Composite (4)
Cadmium[5,8]	79.8 ug/L	50 ug/L	7.1 ug/L	0.046 lb/day[7]	(9)	Composite (4)
Chromium, Total (or +3)[5,8]	5400 ug/L	-	980 ug/L	6.4 lb/day[7]	(6)(9)	Composite (4)
Chromium (+6)[5]	28 ug/L	-	-	-	(6)	Grab (4)
Copper[5,8]	50 ug/L	-	-	-	(9)	Composite (4)
Lead[5,8]	590 ug/L	-	140 ug/L	0.89 lb/day[7]	(9)	Composite (4)
Mercury[10]	-	0.002 ug/L	-	-	(9)	Composite (4)
Nickel[5,8]	445 ug/L	-	156 ug/L	1.0 lb/day[7]	(6)(9)	Composite (4)
Selenium[5]	120 ug/L	-	-	-	(6)	Composite (4)
Silver[5,8]	6.6 ug/L	-	-	-	(6)	Composite (4)
Zinc[5,8]	300 ug/L	-	-	-	(6)	Composite (4)
pH (standard units)	(11)	-	-	-	Daily	Grab
Hardness, mg/L as $CaCO_3$	-	-	-	-	Quarterly	Composite (4)
Effluent Toxicity	-	-	-	-	(12)	(12)
Water Treatment Additives (lbs or gallons)	-	-	-	-	Monthly	Record of Addition (13)

(3) If the monitoring frequency is insufficient to allow calculation of a weekly average, this limitation shall be considered a daily maximum. If the permittee monitors this or any pollutant more frequently than required by this permit, the results shall be recorded and reported in accordance with Part II, 15 of this permit.

SPECIAL CONDITIONS

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS - OUTFALL 002 (con't)

(4) A representative composite sample shall be collected during the hours of discharge. If the sample is not collected throughout the entire time of discharge, the sample type and the hours of discharge shall be recorded on the Discharge Monitoring Report (DMR).

(5) Measurement in the "total recoverable" form is acceptable where such a test is available.

(6) In the permit application, the effluent was not analyzed for the substances listed below. Under this permit, the first twelve analyses shall be collected on no less than a monthly basis over a minimum of nine months. The results will be used to determine the need for continuing monitoring and effluent limitations at this outfall. If the substance is consistently not detected using the analytical method specified below, or is consistently detected at a concentration at or below the level of concern listed below, no additional monitoring for the substance will be required under Part I, A. In addition, the effluent limitation for that substance contained in Part I, A, listed above will not be in effect. If the substance is consistently detected at a concentration exceeding the level of concern, the effluent limitation shown above will become effective. Monitoring shall continue on no less than a monthly frequency. If the parameter is subject to mass limits, additional sampling may be required as described in (7) below.

Substance*	Level of Concern**	Analytical Method***
Aluminum	300 ug/L	202.2
Arsenic	146 ug/L	206.2, 206.3
Beryllium	20 ug/L	210.2
Chromium, Total (or +3)	196 ug/L	218.1, 218.2, or 200.7
Chromium (+6)	7 ug/L	218.4
Nickel	31.2 ug/L	249.1, 249.2
Selenium	23 ug/L	70.2, 270.3
Silver	1.3 ug/L	72.2
Zinc	60 ug/L	289.1, 289.2

* Measurement in the "total recoverable" form is acceptable where such a test is available.
** As listed in the table or "None detected", if the value in the table is exceeded by the limit of detection of the analytical method.
*** Suggested EPA test method.

SPECIAL CONDITIONS

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS - OUTFALL 002 (con't)

(7) The permittee shall report both the concentration and the mass of this substance at this outfall for this parameter calculated by the following formula:

Mass loading (lb/day) = concentration (ug/L) X flow (MGD) X .008345 (lb-L/ug-MG)

The mass limits shall be applied to the sum of the loadings to the Flambeau River through Outfalls 001 and 002. This mass limitation is based on the weekly average concentration limit for this metal, except for beryllium, which is based on the monthly average concentration, at the design flow of the wastewater treatment plant of 780,000 gallons per day, or 0.78 MGD. Once discharge begins at Outfall 001, if a discharge occurs concurrently at both outfalls during the same 24 hour period, a sample shall be collected at both outfalls to determine the total mass for this metal in the combined discharge.

(8) The limitation is based on a proposed effluent hardness of 152 ppm (as $CaCO_3$). If the measured hardness is substantially different, the permit may be modified to reflect the changes in the effluent limitation for this metal.

(9) The sample frequency for this parameter shall be no less than monthly until the effluent sample is collected at Outfall 001 for completion of the 2C NPDES Application, after which the frequency shall be no less than twice a month and subject to sampling whenever both outfalls discharge during the same 24 hour period, as described in condition (7) above.

(10) Additional instructions for the determination of compliance with the limitations for this substance are contained in Part I, D.

(11) The range for pH shall be 6.0 to 9.0 standard units.

(12) Sample collection, effluent toxicity testing, and evaluation shall be conducted according to the requirements contained in Part I, E.

(13) The permittee shall report the total amount of each water treatment additive used for the month and furnish a record of daily addition.

(14) Additional treatment shall be provided for the effluent at this outfall if the limitations listed in Part I, A, cannot be met.

(15) If an analysis of effluent data indicates a trend of increasing effluent concentrations for copper, cadmium, lead, or chromium, the permittee shall conduct tests of the solubility of solids or other tests determined to be appropriate following discussions with the permittee and the Department.

SPECIAL CONDITIONS

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS - OUTFALL 002 (con't)

(16) Runoff from the lined Type II (high sulfur) waste rock storage area shall not be discharged at Outfall 002.

(17) The permittee shall notify the Department when the storage of Type II waste rock begins and when ore shipping begins.

SPECIAL CONDITIONS

B. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS FOR OUTFALL 003

(1) During the period beginning on the date of signature and lasting until September 30, 1995, the permittee is authorized to discharge treated wastewaters from the following sources: 1) water from the open pit mine before the exposure of Type II waste rock, 2) runoff from the Type I waste rock storage area (low sulfur), and 3) runoff from other areas that has not contacted either the high sulfur waste rock or the ore, through Outfall 003 to wetlands for the purpose of flow augmentation.

(2) This discharge shall be limited and monitored by the permittee as specified below.

(a) There shall be no discharge of floating solids or visible foam in other than trace amounts.

(b) Samples taken in compliance with the monitoring requirements specified below shall be taken at the following location: Outfall 003 prior to discharge to the wetlands and following the settling ponds.

	EFFLUENT LIMITATIONS			MONITORING REQUIREMENTS		
EFFLUENT CHARACTERISTIC	Daily Minimum	Daily Maximum	Monthly Average	Weekly Average(3)	Sample Frequency	Sample Type
Flow - (MGD)	-	-	-	-	Daily	Estimated (8)
pH (standard units)	6.0 s.u.	9.0 s.u.	-	-	Daily	Grab
Total Suspended Solids	-	30 mg/L	20 mg/L	-	Daily	Composite (4)
Aluminum[5]	-	1500 ug/L	-	-	Monthly	Composite (4)
Arsenic[5]	-	730 ug/L	-	-	Monthly	Composite (4)
Beryllium	-	-	100 ug/L	-	Monthly	Composite (4)
Cadmium[5,6]	-	79.8 ug/L	50 ug/L	7.1 ug/L	Monthly	Composite (4)
Chromium, Total (or +3)[5,6]	-	5400 ug/L	-	980 ug/L	Monthly	Composite (4)
Chromium (+6)[5]	-	28 ug/L	-	-	Monthly	Grab (4)
Copper[5,6]	-	50 ug/L	-	-	Monthly	Composite (4)
Lead[5,6]	-	590 ug/L	-	140 ug/L	Monthly	Composite (4)
Mercury[7]	-	-	0.002 ug/L	-	Monthly	Composite (4)
Nickel[5,6]	-	445 ug/L	-	156 ug/L	Monthly	Composite (4)
Selenium[5]	-	120 ug/L	-	-	Monthly	Composite (4)
Silver[5,6]	-	6.6 ug/L	-	-	Monthly	Composite (4)
Zinc[5,6]	-	300 ug/L	-	-	Monthly	Composite (4)
Hardness, mg/L as $CaCO_3$	-	-	-	-	Quarterly	Composite (4)

(3) If the monitoring frequency is insufficient to allow calculation of a weekly average, this limitation shall be considered a daily maximum. If the permittee monitors this or any pollutant more frequently than required by this permit, the results shall be recorded and reported in accordance with Part II, 15 of this permit.

(4) The same sample may be reported as for Outfall 002.

SPECIAL CONDITIONS

B. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS FOR OUTFALL 003 (con't)

(5) Measurement in the "total recoverable" form is acceptable where such a test is available.

(6) The limitation is based on a proposed effluent hardness of 152 ppm (as $CaCO_3$). If the measured hardness is substantially different, the permit may be modified to reflect the changes in the effluent limitation for this metal.

(7) Additional instructions for the determination of compliance with the limitations for this substance are contained in Part I, D.

(8) According to NR 218 Method and Manner of Sampling, "estimated" sample flow measurement means "a reasonable approximation of the average daily flow based on water balance, an uncalibrated weir", or any of the more complex methods described in s. NR 218.05 (1) and (3) (a) and (b).

(9) This discharge may be discontinued if the Department finds that the wetlands are being significantly deteriorated by the application of this discharge.

SPECIAL CONDITIONS

C. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS FOR OUTFALL 001

(1) During the period beginning on the date of signature and lasting until September 30, 1995, the permittee is authorized to discharge the following treated wastewaters: groundwater seepage from underneath surge and run-off pond liners, runoff from the ore crushing area, the Type II waste rock area, and the ore hauling roads; and water from the open pit that has contacted high sulfur waste rock through outfall serial number 001 (wastewater treatment plant effluent).

(2) This discharge shall be limited and monitored by the permittee as specified below.

(a) There shall be no discharge of floating solids or visible foam in other than trace amounts.

(b) Samples taken in compliance with the monitoring requirements specified below shall be taken at the following locations: (1) Outfall 001, following the wastewater treatment process but before entrance into the Flambeau River for sulfide and dissolved oxygen, (2) Outfall 001, following the wastewater treatment process but before contact with the rip-rapped outfall channel to the Flambeau River for all other parameters

	EFFLUENT LIMITATIONS			MONITORING REQUIREMENTS		
EFFLUENT CHARACTERISTIC	Weekly Average(4)	Daily Maximum	Monthly Average	Weekly Average Mass Limit	Sample Frequency	Sample Type
Flow - (MGD)	-	-	-	-	Daily	Continuous
Total Suspended Solids	-	30 mg/L	20 mg/L	-	Daily	24-hr composite
Aluminum[5]	-	1500 ug/L	-	-	(7)	24-hr composite
Arsenic[5]	-	730 ug/L	-	-	(7)	24-hr composite
Beryllium	-	-	0.67 lb/day[8]	-	(7)	24-hr composite
Cadmium[5,6]	7.1 ug/L	79.8 ug/L	50 ug/L	0.046 lb/day[8]	3X Weekly	24-hr composite
Chromium, Total(or +3)[5,6]	980 ug/L	5400 ug/L	-	6.4 lb/day[8]	(7)	24-hr composite
Chromium (+6)[5]	-	28 ug/L	-	-	(7)	Grab
Copper[5,6]	-	50 ug/L	-	-	3X Weekly	24-hr composite
Lead[5,6]	140 ug/L	590 ug/L	-	0.89 lb/day[8]	Weekly	24-hr composite
Mercury[9]	-	-	0.002 ug/L	-	Weekly	24-hr composite
Nickel[5,6]	156 ug/L	445 ug/L	-	1.0 lb/day[8]	(7)	24-hr composite
Selenium[5]	-	120 ug/L	-	-	(7)	24-hr composite
Silver[5,6]	-	6.6 ug/L	-	-	(7)	24-hr composite
Zinc[5,6]	-	300 ug/L	-	-	(7)	24-hr composite
pH (standard units)[11]	-	9.0 s.u.	-	-	Daily	Continuous
Total Dissolved Solids (mg/L)	-	-	-	-	Monthly	24-hr composite
Dissolved Oxygen[10]	-	5 mg/l(min.)	-	-	Daily	Grab
Hardness, mg/L as $CaCO_3$	-	-	-	-	Quarterly	24-hr composite
Effluent Toxicity	-	-	-	-	(12)	(12)
Water Treatment Additives	-	-	-	-	(13)	(13)
Sulfide[14]	-	-	-	-	3X Weekly	Grab

(3) In the permit application, the effluent was not analyzed for the substances listed in Application Form 2C. The permittee shall analyze the first representative discharge of treated wastewater at

SPECIAL CONDITIONS

C. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS FOR OUTFALL 001 (con't)

this outfall for all of the parameters that are required in EPA Form 2C for ore mining industries. This data will be used to determine the need for modification of the permit to include revisions to the monitoring requirements and effluent limitations listed above.

(4) If the monitoring frequency is insufficient to allow calculation of a weekly average, this limitation shall be considered a daily maximum. If the permittee monitors this or any pollutant more frequently than required by this permit, the results shall be recorded and reported in accordance with Part II, 15 of this permit.

(5) Measurement in the "total recoverable" form is acceptable where such a test is available.

(6) The limitations are based on a proposed effluent hardness of 152 ppm (as $CaCO_3$). If the measured hardness is substantially different, the permit may be modified to reflect the changes in the effluent limitation for this metal.

(7) In the first twelve analyses of the treated effluent conducted on a weekly frequency, if this substance is not consistently detected using the analytical method specified below, or is consistently detected at a concentration at or below the level of concern, no additional monitoring for the substance will be required unless indicated by a demonstration of effluent toxicity. In addition, the effluent limitation for that substance contained in Part I, B, listed above, will not be effective. If the first twelve reported concentrations of the substance do not consistently meet the concentration criteria described above, the effluent limitation shown above shall be effective. Monitoring shall continue on no less than a monthly basis.

Substance*	Level of Concern**	Analytical Method***
Aluminum	300 ug/L	202.2
Arsenic	146 ug/L	206.2, 206.3
Beryllium	20 ug/L	210.2
Chromium, Total (or +3)	196 ug/L	218.1, 218.2, or 200.7
Chromium (+6)	7 ug/L	218.4
Nickel	31.2 ug/L	249.1, 249.2
Selenium	23 ug/L	270.2, 270.3
Silver	1.3 ug/L	272.2
Zinc	60 ug/L	289.1, 289.2

* Measurement in the "total recoverable" form is acceptable where such a test is available.
** As listed in the table or "None detected", if the value in the table is exceeded by the limit of detection of the analytical method.
*** Suggested EPA test method.

SPECIAL CONDITIONS

C. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS FOR OUTFALL 001 (con't)

(8) The mass limit for this metal applies to the sum of the discharges at Outfalls 001 and 002 during the same twenty-four period. If a discharge occurs at both outfalls, samples shall be collected at both outfalls. To determine compliance, the concentration, flow, and mass loading at each outfall shall be calculated using the following formula:

Mass loading (lb/day) = concentration (ug/L) X flow (MGD) X .008345 (lb-L/ug-MG)

The mass limits shall be applied to the sum of the loadings to the Flambeau River through Outfalls 001 and 002. This mass limitation is based on the weekly average concentration limit for this metal, except for beryllium, which is based on the monthly average concentration, at the design flow of the wastewater treatment plant of 780,000 gallons per day, or 0.78 MGD. Once discharge begins at Outfall 001, if a discharge occurs concurrently at both outfalls during the same 24 hour period, a sample shall be collected at both outfalls to determine the total mass for this metal in the combined discharge.

(9) Additional instructions for the determination of compliance with the limitations for this substance are contained in Part I, D.

(10) The daily minimum of the effluent at the point that it enters the receiving water shall be 5 mg/L of dissolved oxygen.

(11) Pursuant to ss. NR 205.06 and 102.03(4)(h), Wis. Adm. Code, the permittee shall maintain the pH of this wastewater at or within the limits of 6.0 to 9.0 standard units, except excursions from the limits are permitted subject to the following conditions:

(a) The total time during which the pH values are outside the required range shall not exceed 446 minutes in any calendar month.

(b) No individual excursion from the range shall exceed 60 minutes.

(c) No individual excursions shall be outside the range of 4.0 to 11.0 standard units (s.u.), inclusive.

(d) On a daily basis, the permittee is required to report the total time the pH limits are exceeded and the number of times any individual excursion exceeds 60 minutes in duration or is outside the range of 4.0 to 11.0 s.u., inclusive.

(12) Sample collection, effluent toxicity testing, and evaluation shall be conducted according to the requirements contained in Part I, E.

(13) Records of treatment additives shall be kept and made available for inspection by Department staff upon request.

SPECIAL CONDITIONS

C. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS FOR OUTFALL 001 (con't)

(14) Detection of sulfide in the effluent or hydrogen sulfide gas from the wastewater treatment plant, using EPA test method 376.1, 376.2, or an alternative test method or sample type that has received written approval from the Department, shall be reported to the DNR.

SPECIAL CONDITIONS

D. DETERMINING COMPLIANCE WITH WATER QUALITY BASED EFFLUENT LIMITATIONS FOR TOXIC OR ORGANOLEPTIC SUBSTANCES

(1) When a water quality based effluent limitation for a toxic or organoleptic substance is imposed as an average concentration, compliance with the limitation shall be determined as follows:

(a) For the purposes of calculating an average or a mass discharge value, the permittee may substitute a 0 (zero) for any effluent concentration that is less than the limit of detection, as defined in par. (2)(b). Be advised, however, that after considering the number of monitoring results that are greater than the limit of detection and applying appropriate statistical techniques pursuant to NR 106.07 (5), the Department may substitute a value other than 0 when determining compliance. Discharges resulting from a storm event greater than a 10 year, 24-hour storm event are exempt from the application of the statistical technique. All effluent concentrations equal to or greater than the limit of detection shall be used as measured; and

(b) The average effluent concentration is compared directly to the average concentration limitation to determine compliance.

(2) Within 9 months of the date of permit issuance, the permittee shall determine and report to the Department the limits of detection and limits of quantitation as specified below. The Department may require the determination of the limits of detection and quantitation be repeated or improved if the reported values fall outside of the range of values normally reported by laboratories certified under ch. NR 149, Wis. Adm. Code, for wastewaters with similar characteristics.

Limits of detection and limits of quantitation determined as described below, unless required by the Department to be repeated or improved, will be considered by the Department to represent acceptable performance of the analytical technique by the permittee for the purpose of self-monitoring data when such self-monitoring data are used to assess compliance with limitations as specified in subsection (1) above. The foregoing in no way restricts the ability of any party, including the permittee, to achieve lower limits of detection and quantitation through proper application of analytical techniques identified below or approved by the Department and to assess compliance with limitations as specified in subsection (1) above.

(a) Limits of detection and quantitation shall be determined for the following substances using the specified analytical test methods or any other test method which provides a method detection limit equal to or less than that specified below and is approved by the Department prior to use.

SPECIAL CONDITIONS

D. DETERMINING COMPLIANCE WITH WATER QUALITY BASED EFFLUENT LIMITATIONS FOR TOXIC OR ORGANOLEPTIC SUBSTANCES (con't)

Mercury using U.S. EPA Method 245.1 or 245.2 (MDL of 0.2 ug/L)

(b) Limits of detection and limits of quantitation shall be determined as follows:

1. The limit of detection shall be derived by the procedure specified for method detection limits in the Code of Federal Regulation, Title 40, Part 136, Appendix B, and the limit of quantitation shall be set equal to 3.33 times the limit of detection. Other methods may be used if first approved by the Department.

2. The sample matrix used shall consist of samples of effluent collected at Outfall 001, in accordance with Part I, C, and at Outfall 002, in accordance with Part I, A.

(c) When reporting the limits of detection and quantitation to the Department, the permittee shall indicate which analytical test method was used, provide the results of the replicate analyses, and include pertinent calculations.

(d) Following the initial determination of the limits of detection and quantitation under this section, the permittee shall report to the Department any consistent deviation from the values initially reported.

(e) At least 90 days prior to changing analytical test methods or certified laboratories for any substance for which a limit of detection has been derived under this section, the permittee shall repeat the determination of the limits of detection and quantitation for that substance using the newer method or laboratory and report the results of the determination to the Department. Within 60 days of receipt of such a report the Department may require the determination of the limits of detection and quantitation be repeated or improved if the reported values fall outside of the range of values normally reported by laboratories certified under ch. NR 149, Wis. Adm. Code, for wastewaters with similar characteristics. If such a request is made by the Department, the permittee must receive written approval from the Department before making the change.

(3) When monitoring is required for a toxic or organoleptic substance, the following information shall be reported on the Discharge Monitoring form (Form 3200-28);

(a) Effluent concentrations less than the limit of detection shall be reported as < (less than) the value of the limit of

SPECIAL CONDITIONS

D. DETERMINING COMPLIANCE WITH WATER QUALITY BASED EFFLUENT LIMITATIONS FOR TOXIC OR ORGANOLEPTIC SUBSTANCES (con't)

detection. For example, if a substance is not detected at a concentration of 0.1 µg/L, report the value as <0.1 µg/L.

(b) Effluent concentrations equal to or greater than the limit of detection shall be reported as measured. In addition, the limit of quantitation shall be reported with all effluent concentrations equal to or greater than the limit of detection, but less than the limit of quantitation.

(c) The permittee shall note on the Discharge Monitoring Report when compliance with a limitation is demonstrated in accordance with par. (1)(b).

(d) When calculating an average effluent concentration or a mass discharge value the permittee shall also report the observed effluent concentrations.

SPECIAL CONDITIONS

E. EFFLUENT TOXICITY TESTING REQUIREMENTS, PROCEDURES, SCHEDULES, AND LIMITATIONS

(1) Effluent Toxicity Testing Requirements: The permittee is required to perform effluent toxicity tests to determine the potential impact of the effluent discharge on aquatic organisms.

(a) Within 7 days of commencement of a discharge of treated wastewater effluent from outfall 001 to the Flambeau River, the permittee shall initiate an acute toxicity test battery using the procedure specified in subsection (2). Thereafter, the permittee shall conduct acute toxicity test batteries using the procedure specified in subsection (2) once each two months for thirty-six months. After the first thirty-six months, the permittee shall conduct acute toxicity test batteries using the procedure specified in subsection (2) once each four months for the remaining term of the permit.

(b) Pursuant to the effluent collection requirements specified for outfall 002 in subparagraph (2)(c)(2), the permittee shall initiate an acute toxicity test battery using the procedure specified in subsection (2). Thereafter, the permittee shall conduct acute toxicity test batteries using the procedure specified in subsection (2) once each subsequent two calendar month interval for thirty-six months. The requirement to conduct an acute toxicity test battery shall be waived for any two calendar month interval in which a discharge does not occur. After the first thirty-six months, the permittee shall conduct acute toxicity test batteries using the procedure specified in subsection (2) once each four months for the remaining term of the permit. The requirement to conduct an acute toxicity test battery shall be waived for any four calendar month interval in which a discharge does not occur.

(c) Should the permittee initiate any two acute toxicity test batteries for outfall 001 or 002 within a twelve month period that are determined to be positive pursuant to paragraph (5)(a), the permittee shall comply with the requirements of subsection (8) to meet an acute toxicity limitation. Upon completion of the schedule of compliance specified in subsection (8), the permittee shall conduct acute toxicity test batteries once each calendar month for the remaining term of the permit using the procedure specified in subsection (2) to determine compliance with the limitation. The requirement to conduct an acute toxicity test battery for compliance determination shall be waived for any calendar month in which a discharge does not occur.

(d) Within 7 days of commencement of a discharge of treated wastewater effluent from outfall 001 to the Flambeau River, the

SPECIAL CONDITIONS

E. EFFLUENT TOXICITY TESTING REQUIREMENTS, PROCEDURES, SCHEDULES, AND LIMITATIONS (con't)

permittee shall initiate a chronic toxicity test battery using the procedure specified in subsection (3). Thereafter, the permittee shall conduct chronic toxicity test batteries using the procedure specified in subsection (3) once each calendar year for the term of the permit between the months of June and September, except as required for any retesting required under subsection (6).

(e) Should the permittee initiate any two chronic test batteries within a twelve month period that are determined to be positive pursuant to paragraph (5)(b), the permittee shall comply with the requirements of subsection (9) to meet a chronic toxicity limitation. Upon completion of the schedule of compliance specified in subsection (9), the permittee shall conduct chronic toxicity test batteries once each calendar month for the remaining term of the permit using the procedure specified in subsection (3) to determine compliance with the limitation. The requirement to conduct a chronic toxicity test battery for compliance determination shall be waived for any calendar month in which a discharge does not occur.

(2) Acute Toxicity Test Battery Procedure: Each acute toxicity test battery shall be performed following the procedures given in Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms (Fourth Edition) (EPA/600/4-90-027) with the following exceptions, clarifications, and additions:

(a) Control Water: all acute toxicity test batteries shall be performed with the following control water treatments which have been collected within 72 hours of test initiation.

1. Primary control water shall be a receiving water grab sample collected at a point that is upstream from the permittee's outfall in the Flambeau River, yet not in contact with any portion of the mixing zone of the permittee's or any other permittees' discharge.

2. Secondary control water shall be uncontaminated surface water or standard dilution water having approximately the same characteristics (pH, hardness and alkalinity) as the receiving water.

3. If, at any time, test organism population mortality exceeds 50% in undiluted effluent and both the primary and secondary controls exhibit mortality exceeding 10% to a test species required by paragraph (2)(f), the toxicity test shall be repeated for that test species.

SPECIAL CONDITIONS

E. EFFLUENT TOXICITY TESTING REQUIREMENTS, PROCEDURES, SCHEDULES, AND LIMITATIONS (con't)

(b) Dilution Water: effluent treatments requiring dilution shall be prepared using the primary control water unless the use of secondary control water is approved by the Department prior to use.

(c) Effluent Collection: effluent samples shall be collected and used under the following conditions:

1. Outfall 001: Two composite samples of treated final effluent shall be collected during two separate, normal 24-hour operating periods as specified in Ch. NR 218.04(11) (Wis. Adm. Code).

2. Outfall 002: A grab sample of treated final effluent shall be collected as specified in Ch. NR 218.04(10) (Wis. Adm. Code) during any discharge event which exceeds a duration of 1 hour during any calendar day unless the scheduled testing requirements of paragraphs (1)(b) or (1)(c) have previously been met for a specific period of time.

3. Revisions to the requirements of subparagraphs (2)(c)1. or (2)(c)2. may be approved in writing by the Department, provided the permittee demonstrates to the Department, that an alternative sample collection protocol proposed by the permittee is equivalent based upon the results from at least three consecutive test batteries.

4. Seventy-two (72) hours after completion of the sample collection shall be the maximum holding time prior to initial use of any effluent sample.

(d) Effluent Treatments: all acute toxicity test batteries shall be performed with the following treatments:

1. Primary and secondary control water as specified in paragraph (2)(a).

2. Treatments equal to 50% and 100% (v:v) effluent.

3. If positive toxicity is demonstrated, as determined in paragraph (5(a), for any acute toxicity test battery conducted pursuant to this WPDES permit, all subsequent acute toxicity test batteries shall be performed with effluent treatments equal to 50% and 100% (v:v) effluent as specified in subparagraph (2)(d)2. and additional treatments equal to 6.25%, 12.5%, and 25% (v:v).

SPECIAL CONDITIONS

E. EFFLUENT TOXICITY TESTING REQUIREMENTS, PROCEDURES, SCHEDULES, AND LIMITATIONS (con't)

4. Any additional treatments selected by the permittee of which all results shall be reported in accordance with subsection (7).

(e) Test Duration and Renewal Frequency (Outfall 001): For effluent discharged from outfall 001, an acute toxicity test battery shall be performed for 48 and 96 hours for invertebrate and vertebrate test species, respectively, and all test vessel solutions shall be renewed daily as specified below:

1. Invertebrate Test Organisms: a renewal shall be made after 24 hours of exposure with the first of the two effluent samples collected as specified in paragraph (2)(c)1.

2. Vertebrate Test Organisms: a renewal shall be made after 24 hours of exposure with the first of the two effluent samples collected as specified in paragraph (2)(c)1. Two additional renewals shall be made after 48 and 72 hours with the second of the two effluent samples collected as specified in paragraph (2)(c)1.

(f) Test Duration and Renewal Frequency (Outfall 002): For effluent discharged from outfall 002, an acute toxicity test battery shall be performed for 48 and 96 hours for invertebrate and vertebrate test species, respectively, and all test vessel solutions shall be renewed daily as specified below:

1. Invertebrate Test Organisms: a renewal shall be made after 24 hours of exposure with the first of two effluent samples collected on consecutive calendar days as specified in paragraph (2)(c)2.

2. Vertebrate Test Organisms: a renewal shall be made after 24 hours of exposure with the first of the two effluent samples collected on consecutive calendar days as specified in paragraph (2)(c)2. Two additional renewals shall be made after 48 and 72 hours with the second of the two effluent samples collected on consecutive calendar days as specified in paragraph (2)(c)2. If consecutive daily samples cannot be collected, the fathead minnow toxicity test may be terminated after 48 hours of continuous exposure and the monitoring requirement specified in paragraph (1)(b) shall be met for that test period.

(g) Test Species: all acute toxicity test batteries shall be performed with the following three freshwater species:

SPECIAL CONDITIONS

E. EFFLUENT TOXICITY TESTING REQUIREMENTS, PROCEDURES, SCHEDULES, AND LIMITATIONS (con't)

1. *Ceriodaphnia dubia* and *Daphnia magna* which are less than 24 hours old.

2. Fathead minnows (*Pimephales promelas*) between 20 and 60 days old, post-hatch (all organisms shall have hatched within 6 days of each other).

(h) Miscellaneous: other needs or circumstances may justify modification of or substitution to the toxicity test battery procedures. Deviation from standard procedures, if necessary for the successful completion of the test battery, may be allowed if first approved by the Department.

(3) Chronic Toxicity Test Battery Procedure: Each chronic toxicity test battery shall be performed following the procedures given in Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms (Second Edition) (EPA/600/4-89/001) with the following exceptions, clarifications, and additions:

(a) Control Water: all chronic toxicity test batteries shall be performed with the following control water treatments which have been collected within 72 hours of test initiation.

1. Primary control water shall be a receiving water grab sample collected from the Flambeau River at a point that is upstream from the permittee's outfall; yet not in contact with any portion of the mixing zone of the permittee's or any other permittees' discharge.

2. Secondary control water shall be uncontaminated surface water or standard dilution water having approximately the same characteristics (pH, hardness and alkalinity) as the receiving water.

3. If, at any time, both the primary and secondary controls exhibit mortality exceeding 20% to a test species required by paragraph (3)(f), the toxicity test shall be repeated for that species.

(b) Dilution Water: effluent treatments requiring dilution shall be prepared using the primary control water unless the use of secondary control water is approved by the Department prior to use.

(c) Effluent Collection: effluent samples shall be collected and used under the following conditions:

1. Three composite samples of treated final effluent shall be collected during three separate, normal 24-hour

SPECIAL CONDITIONS

E. EFFLUENT TOXICITY TESTING REQUIREMENTS, PROCEDURES, SCHEDULES, AND LIMITATIONS (con't)

operating periods as specified in Ch. NR 218.04(11) (Wis. Adm. Code).

2. Revisions to the requirements of subparagraph (3)(c)1. may be approved in writing by the Department, provided the permittee demonstrates to the Department, that an alternative sample collection protocol proposed by the permittee is equivalent based upon the results from at least three consecutive test batteries.

3. Seventy-two (72) hours after completion of the sample collection shall be the maximum holding time prior to initial use of any effluent sample.

(d) Effluent Treatments: all chronic toxicity test batteries shall be performed with the following effluent treatments:

1. Primary and secondary control water as specified in paragraph (3)(a).

2. Effluent treatments equal to the Instream Waste Concentration (IWC) = 1% and additional effluent treatments of 10%, 30%, 60%, and 100% (v:v) effluent.

3. Any additional treatments selected by the permittee of which all results shall be reported in accordance with subsection (7).

(e) Renewal Frequency: all test vessel solutions shall be renewed daily with samples collected as specified in paragraph (3)(c). Test organisms shall be exposed to each of the effluent samples for a minimum of 48 consecutive hours.

(f) Test Species: all chronic toxicity test batteries shall be performed with the following freshwater species:

1. Fathead minnows (*Pimephales promelas*) less than 24 hours old.

2. *Ceriodaphnia dubia* less than 24 hours old (all neonates used shall be released within the same 8 hour period).

(g) Miscellaneous: other needs or circumstances may justify modification of or substitution to the toxicity test procedures. Deviation from standard procedures, if necessary for the successful completion of the test battery, may be allowed if first approved by the Department.

E. EFFLUENT TOXICITY TESTING REQUIREMENTS, PROCEDURES, SCHEDULES, AND LIMITATIONS (con't)

(4) Quality Assurance/Quality Control Plan Submittal: the permittee shall submit a quality assurance/quality control plan to the Department according to the following schedule:

(a) No less than 45 days prior to conducting the first toxicity test required under subsection (1), the permittee shall submit a quality assurance/quality control plan for Department approval. This plan shall include standard operating procedures for all laboratory toxicity testing and detailed descriptions of the quality assurance practices that shall be followed for all aspects of wastewater toxicity testing, including wastewater sampling, handling, and transportation.

(b) The quality assurance/quality control plan submitted under paragraph (4)(a) shall be approved by the Department within 30 days of its receipt unless, within 30 days of its receipt, the Department finds that the plan is inadequate and specifies the basis for the inadequacy in writing.

(c) If the Department finds the plan is inadequate, the permittee shall, within 15 days of receiving written notification of the plan's inadequacy, submit to the Department a plan that has been revised to correct the inadequacies.

(d) All toxicity tests required by this permit shall be conducted according to the quality assurance/quality control plan approved by the Department.

(5) Determination of Positive Test Results: if a toxicity test conducted pursuant to subsection (2) or (3) meets all conditions of the quality assurance/quality control plan approved in subsection (4), it shall be considered positive under any of the following circumstances:

(a) Acute Toxicity Test: the results of an acute toxicity test performed as required by subsection (2) shall be considered positive if:

1. Invertebrate test organism population mortality exceeds 50% after 48 hours of exposure to 100% (v:v) effluent; or

2. Outfall 001: Vertebrate test organism population mortality exceeds 50% after 96 hours of exposure to 100% (v:v) effluent.

3. Outfall 002: Vertebrate test organism population mortality exceeds 50% in the 100% effluent treatment at the time of test termination as provided in subparagraph (2)(f)2.

SPECIAL CONDITIONS

E. EFFLUENT TOXICITY TESTING REQUIREMENTS, PROCEDURES, SCHEDULES, AND LIMITATIONS (con't)

(b) Chronic Toxicity Test: the results of a chronic toxicity test performed as required by subsection (3) shall be considered positive if the 25% Inhibition Concentration (IC_{25}) is determined to be less than the instream waste concentration (IWC) of 1% final effluent. The IC_{25} shall be determined in the following manner:

1. The data set used for the analysis shall contain observations for the treatments specified in subsections (3)(d).

2. Endpoints for each test treatment shall be calculated as follows:

a. *Ceriodaphnia dubia*: The total number of live neonates produced in all replicates excluding neonates produced in replicates subsequently lost to transfer or handling problems or replicates containing male organisms.

b. Fathead minnows: The total dry weight of surviving larvae in a replicate divided by the number of larvae used to initiate that replicate (excluding larvae lost due to transfer or handling problems).

3. The IC_p analysis shall be conducted in accordance with the guidance provided in American Petroleum Institute Publication No. 4468 and U.S. EPA National Effluent Toxicity Assessment Center Technical Report No. 05-88. The "p" value shall be set equal to 25.

4. The IC_{25} value, used to determine positive toxicity, shall be the linear interpolation estimate.

(c) If, in the judgement of the Department, the methods used to determine positive test results are not deemed appropriate for a specific data set, empirical interpretation methods may be used.

(d) Notification of a Positive Result: if a test result is positive as defined by paragraph (5)(a) or (b), the permittee shall notify the Department in writing within 7 days of completing the test which resulted in the positive toxicity result.

(6) Additional Testing Subsequent to a Positive Result:

SPECIAL CONDITIONS

E. EFFLUENT TOXICITY TESTING REQUIREMENTS, PROCEDURES, SCHEDULES, AND LIMITATIONS (con't)

(a) No later than 30 days after the date of termination of the test that yielded the positive result, the permittee shall conduct and submit the results of at least 2 additional test batteries that are conducted in accordance with the subsection that gave a positive test result and any other information the permittee believes relevant. The first of these two additional batteries shall be initiated within 14 days from the date of termination of the test that yielded the positive result.

(b) If an effluent discharge does not occur during the 30-day period specified in paragraph (6)(a), the 2 additional test batteries shall be conducted with effluent samples collected as specified in paragraphs (2)(c) or (3)(c) from subsequent, yet separate, discharge events.

(c) These additional test battery results shall include the information required under subsection (7).

(7) Reporting of Toxicity Test Battery Results: Within 45 days of the conclusion of each toxicity test battery conducted under subsections (2) or (3), the permittee shall submit a copy of the report to both the Department of Natural Resources, Bureau of Wastewater Management, 101 S. Webster Street, P.O. Box 7921, Madison, WI 53707 and the Northwest District Headquarters, WPDES Permits Section, P.O. Box 309, Spooner, WI 54801. The report shall document the following information:

(a) Effluent Samples: sampling point, collection dates and times, sample collection methods, and all pertinent biological, chemical, and physical data.

(b) Dilution Water: source, collection dates and times, sample collection methods, pretreatment information (if any), and all pertinent biological, chemical, and physical data.

(c) Test Methods: all specific conditions not described in the quality assurance/quality control plan approved under subsection (4).

(d) Results: all raw biological, chemical, and physical data (i.e., copies of bench sheets of affected organisms in each effluent treatment and control), and summary tables of biological, chemical, and physical data generated in paragraphs (7)(a), (7)(b), and (7)(c).

(e) Reference toxicant data: submit control charts with each test as detailed in the approved quality assurance/quality control plan.

SPECIAL CONDITIONS

E. EFFLUENT TOXICITY TESTING REQUIREMENTS, PROCEDURES, SCHEDULES, AND LIMITATIONS (con't)

(f) Output from statistical analyses used to determine positive toxicity.

(g) Process or Treatment Modifications: information concerning any changes in the processes or operating procedures at the production facilities or the treatment facilities that may have affected the test results.

(8) Schedule of Compliance for Acute Toxicity Limitation: pursuant to subsection (1)(c), the permittee shall:

(a) Within 1 month, submit a plan describing the procedures to be used to determine the source(s) of the identified toxicity. This plan shall specify the analytical and toxicity testing procedures to be used to identify the processes, flow streams, or chemicals responsible for the effluent toxicity.

(b) Within 3 months, investigate and evaluate wastewater treatment facilities, make a reasonable attempt to identify the source(s) of the toxicity, determine what actions can be taken to reduce or eliminate the toxicity, and submit a report to the Department presenting the results of the evaluation and any conclusions regarding all actions which could be implemented to control the toxicity. As part of this report, if the permittee demonstrates to the satisfaction of the Department that its discharge is no longer toxic, the permittee may request a modification of this permit to revise or to waive all or part of paragraphs (8)(c), (8)(d), and (8)(e). Notwithstanding the submittal of such a request, the permittee shall comply with paragraphs (8)(c),(8)(d), and (8)(e) by the dates established therein unless said paragraphs are revised through modification of this permit.

(c) Within 6 months, submit a toxicity reduction implementation plan including all specific actions identified in paragraph (8)(b) and the dates by which those actions will be implemented.

(d) Within 9 months, submit a progress report identifying the actions taken to reduce the identified toxicity and any results available to date.

(e) Within 13 months, complete all actions contained in the toxicity reduction implementation plan submitted under paragraph (8)(e) and achieve compliance with the following effluent toxicity limitation: It is a violation of this permit to discharge wastewater which exhibits positive acute toxicity as identified by paragraph (5)(a).

SPECIAL CONDITIONS

E. EFFLUENT TOXICITY TESTING REQUIREMENTS, PROCEDURES, SCHEDULES, AND LIMITATIONS (con't)

(9) Schedule of Compliance for Chronic Toxicity Limitation: pursuant to subsection (1)(d), the permittee shall:

(a) Within 1 month, submit a plan describing the procedures to be used to determine the source(s) of the identified toxicity. This plan shall specify the analytical and toxicity testing procedures to be used to identify the processes, flow streams, or chemicals responsible for the effluent toxicity.

(b) Within 3 months, investigate and evaluate wastewater treatment facilities, make a reasonable attempt to identify the source(s) of the toxicity, determine what actions can be taken to reduce or eliminate the toxicity, and submit a report to the Department presenting the results of the evaluation and any conclusions regarding all actions which could be implemented to control the toxicity. As part of this report, if the permittee demonstrates to the satisfaction of the Department that its discharge is no longer toxic, the permittee may request a modification of this permit to revise or to waive all or part of paragraphs (9)(c), (9)(d), or (9)(e). Notwithstanding the submittal of such a request, the permittee shall comply with paragraphs (9)(c), (9)(d), and (9)(e) by the dates established therein unless said paragraphs are revised through modification of this permit.

(c) Within 6 months, submit a toxicity reduction implementation plan including all specific actions identified in paragraph (9)(b) and the dates by which those actions will be implemented.

(d) Within 9 months, submit a progress report identifying the actions taken to reduce the identified toxicity and any results available to date.

(e) Within 13 months, complete all actions contained in the toxicity reduction implementation plan submitted under paragraph (9)(c) and achieve compliance with the following effluent toxicity limitation: It is a violation of this permit to discharge wastewater which exhibits positive chronic toxicity as identified by paragraph (5)(b).

SPECIAL CONDITIONS

F. OTHER SPECIAL CONDITIONS

(1) Reporting

(a) Monitoring reports and reports required by Sections 8, 17, 20, 21 and 23 of Part II of this permit shall be signed;

1. for a corporation by a principal executive officer of at least the level of Vice President or his duly authorized representative having overall responsibility for the operation of the facility for which this permit is issued,

2. for a partnership by a general partner, and

3. for a sole proprietorship by the proprietor, except that

4. in the case of reports required by Sections 17, 21 and 23, the individual required to sign in accordance with this subsection may authorize another individual to sign such reports in his absence.

(b) Monitoring results obtained during the previous month shall be summarized and reported on Discharge Monitoring Report Forms postmarked no later than the 15th day of the month following the completed reporting period. Duplicate signed copies of these reports and of all other reports required herein shall be submitted to the:

Wisconsin Department of Natural Resources
Division for Environmental Quality (Permits)
Northwest District Headquarters
P.O. Box 309
Spooner, WI 54801

GENERAL CONDITIONS

1. Duty to comply. The permittee shall comply with all conditions of the permit. Any permit noncompliance is a violation of the permit and is grounds for enforcement action, permit revocation or modification, or denial of a permit reissuance application.

2. Permit actions. As provided in s. 147.03, Stats., after notice and opportunity for a hearing the permit may be modified or revoked and reissued for cause. If the permittee files a request for a permit modification, revocation or reissuance, or a notification of planned changes or anticipated noncompliance, this action by itself does not relieve the permittee of any permit condition.

3. Property rights. The permit does not convey any property rights of any sort, or any exclusive privilege. The permit does not authorize any injury or damage to private property or any invasion of personal rights, or any infringement of federal, state or local laws or regulations.

4. Inspection and entry. The permittee shall allow an authorized representative of the Department, upon the presentation of credentials, to:

a. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records are required under the conditions of the permit;

b. Have access to and copy, at reasonable times, any records that are required under the conditions of the permit;

c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices or operations regulated or required under the permit; and

d. Sample or monitor at reasonable times, for the purposes of assuring permit compliance, any substances or parameters at any location.

5. Recording of results. For each effluent measurement or sample taken, the permittee shall record the following information.

a. The date, exact place, method and time of sampling or measurements;
b. The individual who performed the sampling or measurements;
c. The date the analysis was performed;
d. The individual who performed the analysis;
e. The analytical techniques or methods used; and
f. The results of the analysis.

6. Records retention. The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by the permit, and records of all data used to complete the application for the permit for a period of at least 3 years from the date of the sample, measurement, report or application. The Department may request that this period be extended by issuing a public notice to modify the permit to extend this period.

7. Signatory requirement. All applications, reports or information submitted to the Department shall be signed for a corporation by a responsible corporate officer including a president, secretary, treasurer, vice president or manager;

GENERAL CONDITIONS

and for a municipality by a ranking elected official; or other person authorized by one of the above and who has responsibility for the overall operation of the facility or activity regulated by the permit. The representative shall certify that the information was gathered and prepared under his or her supervision and based on inquiry of the people directly under his or her supervision that, to the best of his or her knowledge, the information is true, accurate and complete.

8. Compliance schedules. Reports of compliance or noncompliance with interim and final requirements contained in any compliance schedule of the permit shall be submitted in writing within 14 days after the schedule date, except that progress reports shall be submitted in writing on or before each schedule date for each report. Any report of noncompliance shall include the cause of noncompliance, a description of remedial actions taken and an estimate of the effect of the noncompliance on the permittee's ability to meet the remaining schedule dates.

9. Transfers. A permit is not transferable to any person except after notice to the Department. In the event of a transfer of control of a permitted facility, the prospective owner or operator shall file a new permit application and shall file a stipulation of permit acceptance with the Department's WPDES permit section. The Department may require modification or revocation and reissuance of the permit to change the name of the permittee and to reflect the requirements of ch. 147, Stats.

10. Proper operation and maintenance. The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control which are installed or used by the permittee to achieve compliance with the conditions of the permit. The wastewater treatment facility shall be under the direct supervision of a state certified operator as required in s. NR 108.06(2). Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training as required in ch. NR 114 and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of the permit.

11. Duty to mitigate. The permittee shall take all reasonable steps to minimize or prevent any adverse impact on the waters of the state resulting from noncompliance with the permit.

12. Duty to provide information. The permittee shall furnish the Department, within a reasonable time, any information which the Department may request to determine whether cause exists for modifying, revoking or reissuing the permit or to determine compliance with the permit. The permittee shall also furnish the Department, upon request, copies of records required to be kept by the permittee.

13. Sampling procedures. Samples and measurements taken for the purpose of monitoring shall be representative of the volume and nature of the monitored discharge and shall be taken at points specified in the permit using sample types specified in the permit and the following procedures:

a. For effluent flow measurement and sample collection - ch. NR 218.

b. For groundwater sample collection and analysis - ch. NR 214.

GENERAL CONDITIONS

14. Test procedures. Monitoring shall be conducted according to test procedures listed in ch. NR 219, or any other test procedures specified in the permit.

15. Additional monitoring. If a permittee monitors any pollutant more frequently than required by the permit, using test procedures specified in ch. NR 219, the results of that monitoring shall be recorded and reported in accordance with this chapter. Results of this additional monitoring shall be included in the calculation and reporting of the data submitted in the DMR.

16. Monitoring reports. The monitoring results shall be reported at the intervals specified in the permit. Monitoring results shall be summarized on forms designated by the Department.

17. Noncompliance notification.

a. The permittee shall report the following types of noncompliance by a telephone call to the Department's district office within 24 hours after becoming aware of the noncompliance.

(1)
Any noncompliance which may endanger health or the environment.
(2)
Any violation of an effluent limitation resulting from an unanticipated bypass.
(3)
Any violation of an effluent limitation resulting from an upset.
(4)
Any violation of a maximum daily discharge limitation for those pollutants specifically designated in the permit to be reported within 24 hours.

b. A written report describing the noncompliance reported in condition 17, part a. shall be submitted to the Department's district office within 5 days after the permittee becoming aware of the noncompliance. The Department may waive the written report on a case-by-case basis based on the oral report received within 24 hours. The written report shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times; the steps taken or planned to reduce, eliminate and prevent reoccurrence of the noncompliance; and if the noncompliance has not been corrected, the length of time it is expected to continue.

c. Reports of all noncompliance not required to be reported under condition 8 or condition 17, parts a. and b. shall be submitted with the monitoring reports required under condition 16. The reports shall contain all the information listed in condition 17, part b.

18. Removed substances. Solids, sludges, filter backwash or other pollutants removed from or resulting from treatment or control of wastewaters or intake waters shall be stored and disposed of in a manner to prevent any pollutant from the materials from entering the waters of the state. Land disposal of treatment plant solids and sludges shall be at a site or operation licensed by the Department under the provisions of the mining permit.

GENERAL CONDITIONS

19. Spill reporting. The permittee shall notify the Department in accordance with ch. NR 158, in the event that a spill or accidental release of any material or substance results in the discharge of pollutants to the waters of the state at a rate or concentration greater than the effluent limitations established in the permit, or the spill or accidental release of the material is unregulated in the permit, unless the spill or release of pollutants has been reported to the Department under condition 17.

20. Planned changes. In accordance with ss. 147.02(4)(b) and 147.14(1), Stats., the permittee shall report to the Department any facility expansion, production increase or process modifications which will result in new, different or increased discharges of pollutants. The report shall either be a new permit application, or if the new discharge will not violate the effluent limitations of the permit, a written notice of the new, different or increased discharge. The notice shall contain a description of the new activities, an estimate of the new, different or increased discharge of pollutants and a description of the effect of the new or increased discharge on existing waste treatment facilities. Following receipt of this report, the Department may modify the permit to specify and limit any pollutants not previously regulated in the permit.

21. Increased discharge of toxic pollutants.

a. 'Routine or frequent increase'. The permittee shall notify the Department in writing as soon as it knows or has reason to believe that any activity has occurred or will occur which would result, on a routine or frequent basis, in the discharge of any toxic pollutant which is not limited in the permit, if that discharge exceeds the highest of the following levels.

(1) One hundred micrograms per liter (100 µg/L);

(2) Two hundred microgram per liter (200 µg/L) for acrolein and acrylonitrile; five hundred micrograms per liter (500 µg/L) for 2,4-dinitrophenol and for 2-methyl-4,6-dinitrophenol; and one milligram per liter (1 mg/L) for antimony;

(3) Five times the maximum concentration value reported for that pollutant in the permit application; or

(4) A notification level greater than the level in sections (1), (2), or (3) above, which the Department has included as a special condition to the permit.

b. 'Nonroutine or infrequent increase'. The permittee shall notify the Department in writing as soon as it knows or has reason to believe that any activity has occurred or will occur which would result, on a nonroutine or infrequent basis, in any discharge of a toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following levels.

(1) Five hundred micrograms per liter (500 µg/L);

(2) One milligram per liter (1 mg/L) for antimony;

GENERAL CONDITIONS

(3) Ten times the maximum concentration value reported for that pollutant in the permit application; or

(4) A notification level greater than the level in sections (1), (2), or (3) above, which the Department has included as a special condition to the permit.

22. Duty to halt or reduce activity. Upon failure or impairment of treatment facility operation, the permittee shall, to the extent necessary to maintain compliance with its permit, curtail production or wastewater discharges or both until the treatment facility operations are restored or an alternative method of treatment is provided.

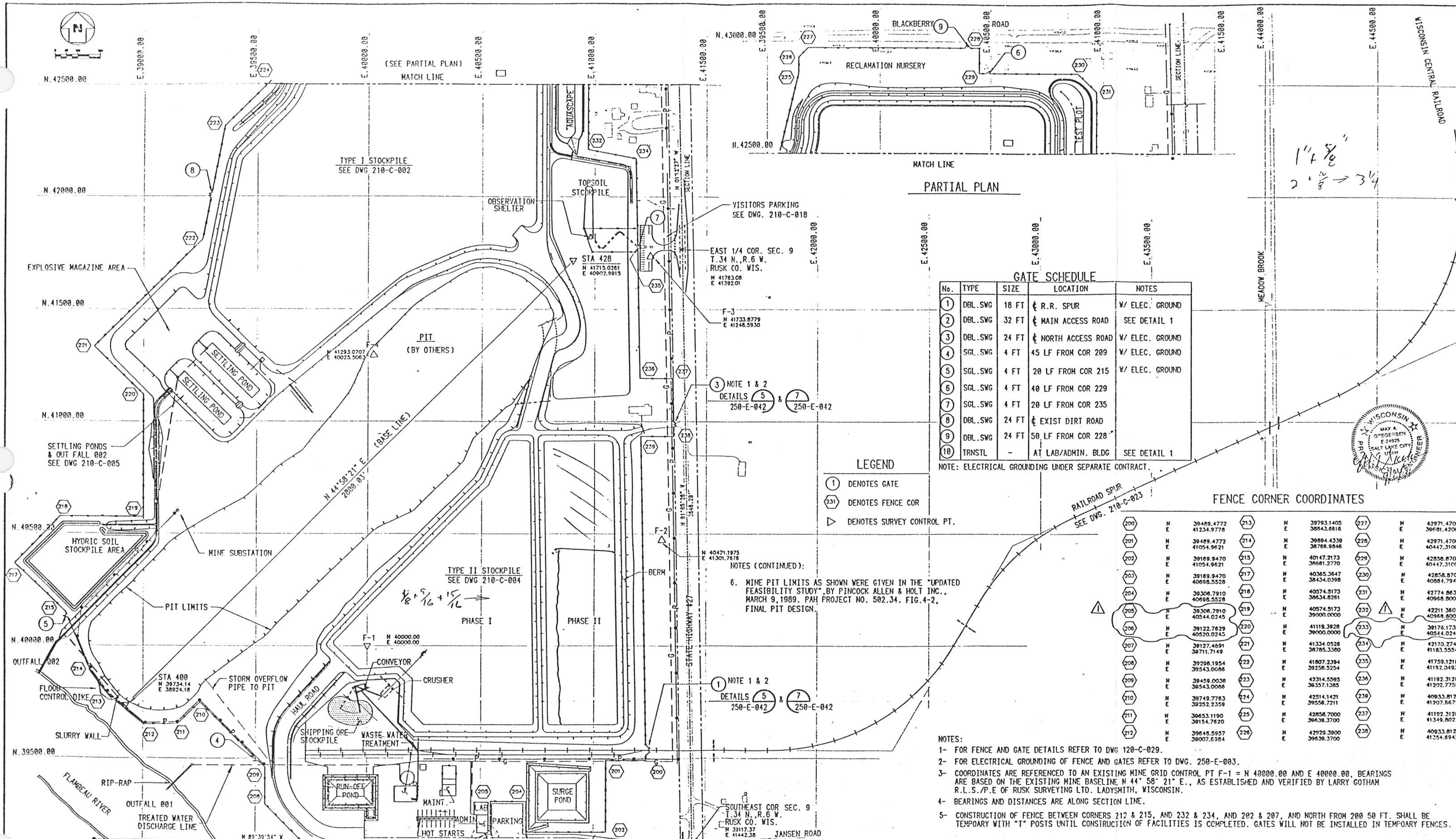
23. Bypass. The permittee may bypass waste treatment facilities if this is necessary for the essential maintenance of the facilities and if the bypass does not exceed permit effluent limitations. The permittee may also bypass if the bypass is due to runoff in excess of the 10 year, 24 hour rainfall event and the bypass is designated as a specific discharge point in the WPDES permit. All other bypasses of waste treatment facilities, including diversion of wastewater from land disposal systems to surface waters, are prohibited unless the following conditions are met:

a. The bypass is necessary to prevent loss of life, personal injury or severe property damage;

b. There are no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes or maintenance during normal periods of equipment downtime; and

c. The permittee submitted written notice 10 days before the date of the bypass and the Department's district office wastewater supervisor had approved the bypass in writing prior to its occurrence; or

d. In the event of an unanticipated bypass, the permittee notified the Department verbally within 24 hours and in writing within 5 days of each unanticipated bypass.



GATE SCHEDULE

No.	TYPE	SIZE	LOCATION	NOTES
1	DBL.SWG	18 FT	℄ R.R. SPUR	W/ ELEC. GROUND
2	DBL.SWG	32 FT	℄ MAIN ACCESS ROAD	SEE DETAIL 1
3	DBL.SWG	24 FT	℄ NORTH ACCESS ROAD	W/ ELEC. GROUND
4	SGL.SWG	4 FT	45 LF FROM COR 209	W/ ELEC. GROUND
5	SGL.SWG	4 FT	20 LF FROM COR 215	W/ ELEC. GROUND
6	SGL.SWG	4 FT	40 LF FROM COR 229	
7	SGL.SWG	4 FT	20 LF FROM COR 235	
8	DBL.SWG	24 FT	℄ EXIST DIRT ROAD	
9	DBL.SWG	24 FT	50 LF FROM COR 228	
10	TRNSTL	-	AT LAB/ADMIN. BLDG	SEE DETAIL 1

NOTE: ELECTRICAL GROUNDING UNDER SEPARATE CONTRACT.

LEGEND

- (1) DENOTES GATE
- (231) DENOTES FENCE COR
- ▷ DENOTES SURVEY CONTROL PT.

NOTES (CONTINUED):

6. MINE PIT LIMITS AS SHOWN WERE GIVEN IN THE "UPDATED FEASIBILITY STUDY", BY PINCOCK ALLEN & HOLT INC., MARCH 9, 1989. PAH PROJECT NO. 502.34. FIG. 4-2, FINAL PIT DESIGN.

FENCE CORNER COORDINATES

COR			COR			COR		
200	N E	39489.4772 41234.9778	213	N E	39793.1405 38843.6616	227	N E	42971.4700 39681.4200
201	N E	39489.4772 41054.9621	214	N E	39894.4339 38766.9846	228	N E	42971.4700 40447.3100
202	N E	39169.9470 41054.9621	215	N E	40147.2173 38661.2770	229	N E	42858.8700 40447.3100
203	N E	39169.9470 40698.5528	217	N E	40365.3647 38434.0398	230	N E	42858.8700 40884.7943
204	N E	39306.7910 40698.5528	218	N E	40574.5173 38634.8261	231	N E	42774.8638 40968.8005
205	N E	39306.7910 40544.0245	219	N E	40574.5173 39000.0000	232	N E	42211.3607 40968.8005
206	N E	39122.7629 40520.0245	220	N E	41119.3928 39000.0000	233	N E	39178.1738 40544.0245
207	N E	39127.4891 39711.7149	221	N E	41334.0526 38785.3380	234	N E	42170.2741 41183.5554
208	N E	39298.1954 39543.0086	222	N E	41807.2394 39258.5254	235	N E	41759.1218 41192.0493
209	N E	39459.0038 39543.0086	223	N E	42314.5595 39357.1385	236	N E	41192.3128 41202.7759
210	N E	39749.7763 39252.2359	224	N E	42514.1421 39556.7211	239	N E	40933.8128 41207.6679
211	N E	39653.1190 39154.7620	225	N E	42858.7000 39639.3700	237	N E	41192.3128 41349.8022
212	N E	39648.5957 39007.6984	226	N E	42929.3900 39639.3700	238	N E	40933.8128 41354.6942

NOTES:

1- FOR FENCE AND GATE DETAILS REFER TO DWG 120-C-029.

2- FOR ELECTRICAL GROUNDING OF FENCE AND GATES REFER TO DWG. 250-E-003.

3- COORDINATES ARE REFERENCED TO AN EXISTING MINE GRID CONTROL PT F-1 = N 40000.00 AND E 40000.00, BEARINGS ARE BASED ON THE EXISTING MINE BASELINE N 44° 58' 21" E., AS ESTABLISHED AND VERIFIED BY LARRY GOTHAM R.L.S./P.E OF RUSK SURVEYING LTD. LADYSMITH, WISCONSIN.

4- BEARINGS AND DISTANCES ARE ALONG SECTION LINE.

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REFERENCES DWG. NO	DESCRIPTION
120-C-129	FENCE STD. DETAILS
250-E-042	ELEC. GROUNDING DETAILS
210-C-017	ACCESS ROAD SECTIONS AND DETAILS

NO	DATE	REVISIONS	BY	CHK'D	ENG'R	ENG'R MGR
B	5-8-91	FOR QUOTE-FENCING	JP	GLT	KJ	
D	6-21-91	FOR PERMIT-LINER	GLT			
0	7-10-91	FOR CONSTRUCTION	GLT	GB	DB	EE
1	8-27-91	FENCE REVISION & GENERAL REVISIONS	JP	GLT	GB	EE

Ford, Bacon & Davis Utah, Inc.
ENGINEERS - CONSTRUCTORS
375 CHIPETA WAY SALT LAKE CITY, UTAH

	BY	DATE		BY	DATE
PROJ. ENG'R	GB	5-8-91	DESIGN	JP	4-19-91
MGR PROCESS ENG'R	DB	7-10-91	DRAWN	JP	4-19-91
ENG'R MGR	DJK	5-8-91	CHK'D	GLT	5-1-91
			DES. ENG'R	KJ	5-8-91
			SECT ENG'R	MAG	5-8-91

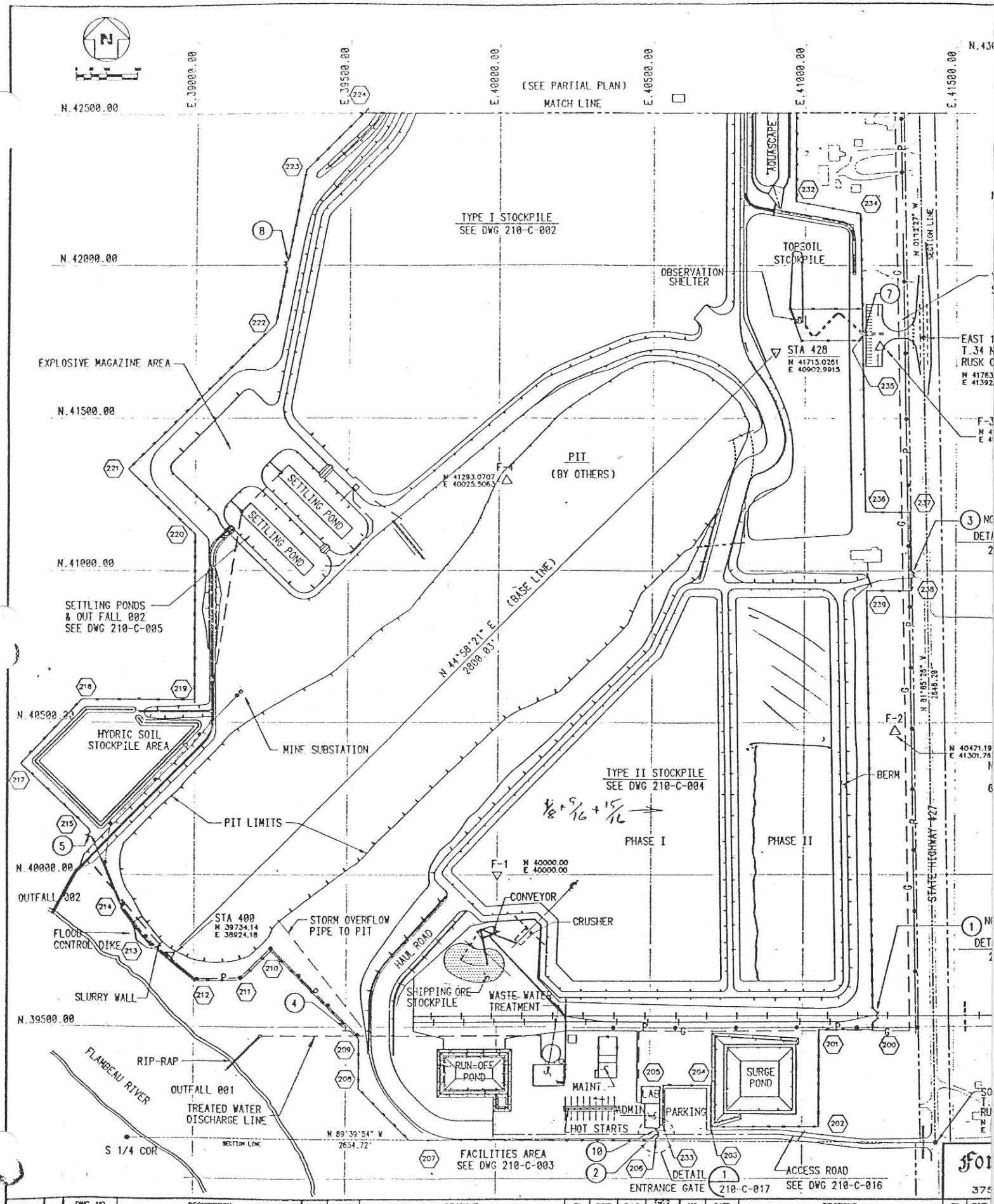
CURRENT DRAWING STATUS	BY	DATE
PRELIMINARY OR PLANNING		
APPROVED FOR FINAL DESIGN		
IN FINAL DESIGN		
APPROVED FOR QUOTE/PURCH	EE	6.6.91
APPROVED FOR CONSTRUCTION	EE	7-10-91

FLAMBEAU PROJECT
LADYSMITH, WISCONSIN

FLAMBEAU MINING COMPANY
LADYSMITH, WISCONSIN 54848

FLAMBEAU MINE
FENCE/PLOT PLAN

MICROFILM: -
JOB: 10102
DRAWING NO.: 210-C-001
REV.: 1
DIVISION DRAWING NO.: 1
SCALE: 1"=200'



DWG. NO	DESCRIPTION
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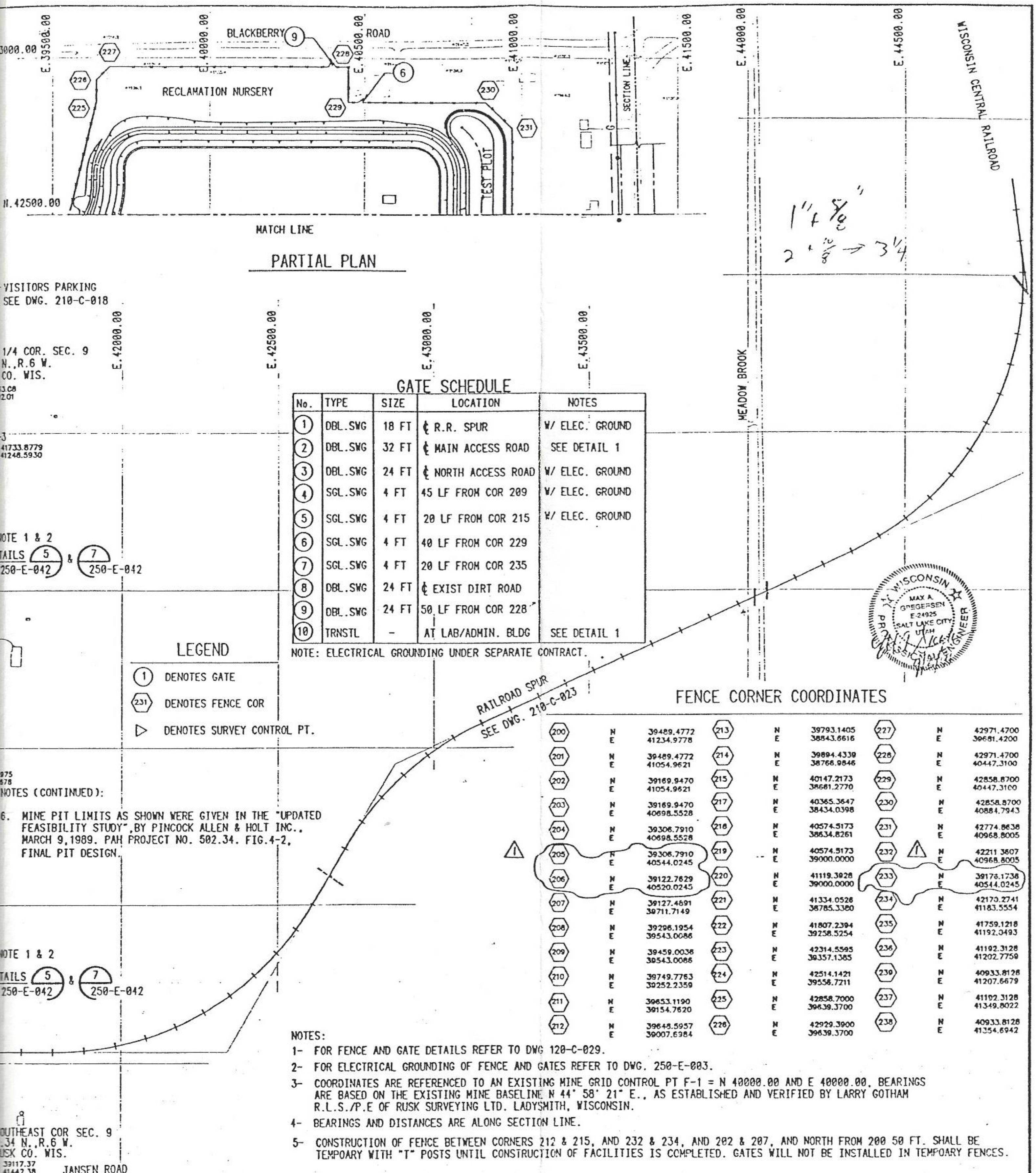
NO	DATE	REVISIONS	BY	CHK'D



GATE SCHEDULE

No.	TYPE	SIZE	LOCATION	NOTES
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2	DBL.SWG	32 FT	℄ MAIN ACCESS ROAD	SEE DETAIL 1
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- (1) DENOTES GATE
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NOTES (CONTINUED):

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FENCE CORNER COORDINATES

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207	39127.4891	39711.7149	221	41334.0528	38785.3380	234	42170.2741	41183.5554
208	39296.1954	39543.0086	222	41807.2394	39258.5254	235	41759.1218	41192.0493
209	39459.0036	39543.0086	223	42314.5595	39357.1385	236	41192.3128	41202.7759
210	39749.7763	39252.2359	224	42514.1421	39556.7211	239	40933.8128	41207.6679
211	39653.1190	39154.7620	225	42858.7000	39639.3700	237	41192.3128	41349.8022
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rd, Bacon & Davis Utah, Inc.
ENGINEERS — CONSTRUCTORS
5 CHIPETA WAY SALT LAKE CITY, UTAH

	BY	DATE		BY	DATE
PROJ. ENGR	GB	5-8-91	DESIGN	JP	4-19-91
MGR PROCESS ENGR	DB	7-10-91	DRAWN	JP	4-19-91
ENGR MGR	DJK	5-8-91	CHK'D	GLT	5-1-91
			DES. ENGR	KJ	5-8-91
			SECT ENGR	MAG	5-8-91

CURRENT DRAWING STATUS	BY	DATE
PRELIMINARY OR PLANNING		
APPROVED FOR FINAL DESIGN		
IN FINAL DESIGN		
APPROVED FOR QUOTE/PURCH	ER	6-6-91
APPROVED FOR CONSTRUCTION	ER	7-10-91

FLAMBEAU PROJECT
LADYSMITH, WISCONSIN
0102C00F

FLAMBEAU MINING COMPANY
LADYSMITH, WISCONSIN
54848

FLAMBEAU MINE
FENCE/PLOT PLAN

MICROFILM	JOB
-	10102

DRAWING NO.	REV.
210-C-001	1

DIVISION DRAWING NO. /

SCALE 1"=200'

A. Miscellaneous Useful Data

1. Formulas

a. $\underline{\text{Pounds}}$ = Flow (MGD) x Concentration (ppm or mg/l) x 8.34 day

b. BOD_5 mg/l = (Initial DO - DO_5) $\frac{\text{Bottle Volume}}{\text{Sample Volume}}$

c. Suspended Solids, mg/l = Sample Wt. (mg) x $\frac{1000}{\text{Sample Volume}}$

Sample Wt. (mg) = (Wt_2 (g) - Wt_1 (g)) x 1000

d. % Removal Efficiency = $\frac{\text{In-Out}}{\text{In}}$ x 100

e. Sludge Volume Index = $\frac{\text{settleable solids (ml)}}{\text{suspended solids (mg/l)}}$ x 1000

f. Sludge Density Index = $\frac{\text{mg/l of Suspended Solids}}{\text{ml. of Settled Solids x 10}}$

g. Detention Time = $\frac{\text{Tank Volume (cu. ft.) x 7.5 gal.cu.ft. x 24 hour day}}{\text{Flow gal/day}}$

h. Velocity = $\frac{\text{distance}}{\text{time}}$

i. Sludge Age = $\frac{\text{lbs. of solids in aeration system}}{\text{solids wastes (lbs/day) + solids in effluent (lbs/day)}}$

j. Ammonia N, mg/l = $\frac{\text{280 (ml of titrant for sample)-ml of titran for blank}}{\text{ml of sample}}$

k. Kjeldahl N, mg/l = mls. titrant

$\frac{\text{(Sample) - (Blank) x 280}}{\text{mls. sample}}$

l. Nitrate N, mg/l = $\frac{\text{net mg } NO_3N}{\text{ml of sample}}$

NO_3 mg/l = mg/l. Nitrate N x 4.43

m. Alkalinity, mg/l. $CaCO_3$ = $\frac{\text{mls. acid x Normality x 50,000}}{\text{mls. sample}}$

n. Oxygen consumption rate, mg/g./hr. =

$$\frac{\text{Uptake rate mg./l./min. x 60 min./hr.}}{\text{Volatile Suspended Solids}}$$

o. Rectangle: Area = (1)(w)
Volume = (1)(w)(h)

p. Area of a Circle = $(pi)r^2$
Volume of Cylinder = $(pi)r^2h$

q. Chlorine Demand = Dose - Residual

r. Chlorinated Lime = $\frac{\text{Chlorine required}}{\%\ \text{CL, in hypochlorite}}$

2. Areas and Volumes

Rectangle	=	Area = lw Perimeter = 2(1+w)
Triangle	=	Area = 1/2 bh
Circle	=	Area = $(pi)r^2 = 3.14(r^2) = 0.785d^2$ Perimeter or circumference = 2(pi)r = 6.28r = 3.14d
Regular Rectangular Solid	=	Volume = lwh Area = 2(1w + wh +1h)
Pyramid	=	Volume = 1/3 h (area of base)
Cylinder	=	Area of curved surface = 2(pi)rh = 6.28rh = 3.14 dh Area = 2(pi)r(h + r) = 6.28r(h + r) Volume = $(pi)r^2h = 3.14r^2h$ or $0.785d^2h$
Cone	=	Area of curved surface = (pi)r $(r^2 + h^2)1/2$ Area = $(pi)r(r^2 + h^2)1/2 + (pi)r^2$ Volume = $1/3(pi)r^2h = 1.047r^2h$
Sphere	=	Area = $4(pi)r^2 = (pi)d^2 = 12.75r^2$ Volume = $4/3(pi)r^3 = 1/6(pi)d^3 = 4.189r^3$

Abbreviations:

b = base	r = radius
h = height	d = diameter
l = length	pi = 3.14 or 22/7
w = width	

The diameter is equal to twice the radius. Where the superscript 2 is used above d or r, it means the diameter or radius is multiplied by itself. The 1/2 power is the square root.

3. Table of Common Equivalent Weights and Measures:

1 U.S. Gallon	= 3.785 liters or 3,785 milliliters
1 U.S. Gallon	= 231 cubic inches
1 U.S. Gallon	= 0.1337 cubic foot
1 cubic foot	= 1,728 cubic inches
1 cubic foot	= 7.48 gallons
1 cubic foot (water)	= 62.4 pounds
1 gallon (water)	= 8.34 pounds
1 cubic yard	= 27 cubic feet
1 second foot	= 1 cubic foot per second
	= 7.48 gallons per second
	= 448.8 gallons per minute
	= 646,000 GPD
	= .646 MGD
1 MGD	= 1.547 cubic feet per second
1 acre	= 43,560 square feet
1 acre - foot	= 325,850 gallons
1 gram	= 0.002205 pound
1 pound (avoirdupois)	= 453.6 grams
1 meter	= 39.3700 inches
1 milliliter	= 1.00 cubic centimeters
1 grain per gal. (water)	= 17.1 ppm or 17.1 mg/l
1 kilogram	= 2.205 pounds

4. Conversion Factors

1 MGD equals 695 GPM (700 GPM is acceptable)
1 gallon of water weighs 8.34#
1 cubic foot of water weighs 62.4#

1 cubic foot of water contains 7.48 gallons (7.5 is acceptable)
1 pound of any chemical in 1,000,000 gallons of water has a concentration of 0.12 ppm (parts per million)
1 foot of water exerts a pressure of 0.43 psi (pounds per square inch)
1 psi is exerted by a column of water 2.31 ft. in height
The area of a circle equals 3.14 x radius x radius (r^2)
Length x width = area
Length x width x height = volume

5. Suggested References, Journals, and Periodicals

"Manual of Instruction for Sewage Treatment Plant Operators", Health Education Service, P.O. Box 7283, Albany, New York 12224.

"Water & Wastes Digest, Environmental Pollution Control", Water & Wastes Digest, Inc., 434 S. Wabash Avenue, Chicago, Illinois 60605.

"Water & Wastes Engineering", Dun-Donnelley Publishing Corp., 666 Fifth Avenue, New York, New York 10019.