Preliminary Engineering Report

Wastewater Treatment Facility Effluent Discharge Feasibility Study

City of Detroit Lakes, Minnesota

UEI Project No. 504.71

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the state of Minnesota.

Signature

THOMAS J. WELLE
Typed or Printed Name

Date October 4TH, 2004

Reg. No. 40009

Larson-Peterson / Ulteig Engineers, Inc.
Fargo Bismarck Detroit Lakes Minneapolis Sioux Falls

October 2004

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PRELIMINARY ENGINEERING REPORT
WASTEWATER TREATMENT FACILITY
EFFLUENT DISCHARGE FEASIBILTY STUDY
DETROIT LAKES, MINNESOTA

I. EXECUTIVE SUMMARY

A. Introduction

This Preliminary Engineering Report (PER) has been prepared to provide the City of Detroit Lakes with alternatives for final discharge of the City's effluent from the Wastewater Treatment Facility (WWTF), as requested by the Minnesota Pollution Control Agency (MPCA), and due to the anticipated loss of approximately thirty-four (34) acres of existing Spray Irrigation facilities. The loss of the spray irrigation lands is expected to occur when the Detroit Lakes - Becker County Airport expansion takes place. The earliest anticipated start date for the airport project would be the 2006 construction season.

B. Existing Facilities

Currently the Detroit Lakes WWTF consists of three major components—a mechanical trickling filter plant on West Willow Street, a 25-acre stabilization pond and chemical precipitation plant, and various rapid infiltration basins and spray irrigation facilities for discharge of the City's effluent.

All of the aforementioned facilities are in good to adequate working condition and continue to provide very high levels of treatment for BOD, TSS and Phosphorus. The current hydraulic and organic loads were analyzed as part of this report and it is apparent that all are well within the original design parameters.

Furthermore, each facility continues to function at a high level of service and is meeting the parameters as set forth in the City's National Pollutant Discharge Elimination System (NPDES) permit.

C. Need For Project

The City of Detroit Lakes faces two immediate issues that will impact future operations at the City's WWTF—expansion of the Becker County Airport and growth of the City.

Loss of approximately 34-acres of spray irrigation lands adjacent to the airport will have a dramatic impact on how the City discharges effluent from its WWTF.

Also, the City of Detroit Lakes continues to grow. As the City grows the capacity of the WWTF is reduced. Based on current dry weather and wet weather influent flows it is projected that there is additional capacity at the existing WWTF for 3,400 to 4,400 residents, assuming no additional large commercial or industrial users.

In addition to the aforementioned need for the project, it must be noted that a condition of the City's NPDES/SDS permit renewal in the year 2007 is for the City to present a Final Progress and Recommendation Report for spray irrigation. The report is intended to present conclusions of a spray irrigation evaluation so that any needed modifications or upgrades (such as the acquisition of additional acreage) can be included with the application for reissuance of the permit.

D. Alternatives Considered

Four alternatives were considered. They were as follows:

1. Do Nothing – Extend Operation of Chemical Precipitation Plant
2. Additional Spray Irrigation Facilities
3. Convert Spray Irrigation Areas to Rapid Infiltration Basins
4. Construct Additional Rapid Infiltration Basins

A detailed discussion of each alternative is found within the report.

E. Recommended Alternative

It is recommended that, at this time, the City do nothing and extend operations at their Chemical Precipitation Plant when the loss of spray irrigation facilities occurs.

Based on average wastewater flows, the Chemical Precipitation Plant will need to treat an additional 25 million gallons annually. This will result in approximately $19,000 per year in additional operations and maintenance costs.

II. INTRODUCTION

A. Purpose and Scope

The City of Detroit Lakes, Minnesota has contracted with Larson-Peterson/Ulteig Engineers for the development of a Preliminary Engineering Report (PER) which evaluates alternatives for final discharge of effluent from the City's Wastewater Treatment Facility. This report is intended to:

- Meet the requirements of the Land Application Option Evaluation Report, requested by the Minnesota Pollution Control Agency (MPCA).

- And account for the anticipated loss of approximately thirty-four (34) acres of existing Spray Irrigation (SI) facilities in and around the Detroit Lakes – Becker County Airport.

The loss of SI lands is expected to occur when the airport expansion takes place. The earliest anticipated start date for the airport project would be the 2006 construction season.

In addition to the aforementioned items, this report will present:

- A description of the existing and future areas to be served by the City of Detroit Lakes,
- A description of the City's existing WWTF,
- A condition assessment of the existing trickling filter plant, chemical precipitation plant and effluent discharge facilities,
- Performance data from the existing facilities
- An assessment of hydraulic and organic capacities at the WWTF,
- The need for the project,
- An evaluation of alternatives considered,
- A comparison of capital, operation and maintenance costs for each proposed alternative.

The alternatives discussed in this report were chosen because they represent the most feasible alternatives for meeting the requirements of the City of Detroit Lakes, the Minnesota Pollution Control Agency (MPCA) and the US Environmental Protection Agency (EPA). The intent of this report is to provide the City with information relating to the feasibilities and costs of the alternatives for facility and economic planning purposes.

B. Planning Area

The planning area for this report was developed in collaboration with the City's WWTF Superintendent, Jarrod Christen. It represents the existing service area of the City's WWTF and those areas which could reasonably be considered for annexation by the City in the near future. This planning area is shown in Figure II.1. This area is a slight variation on the 30-year planning area that was outlined in the 1990 Preliminary Engineering Report on Future Wastewater Treatment Facilities.

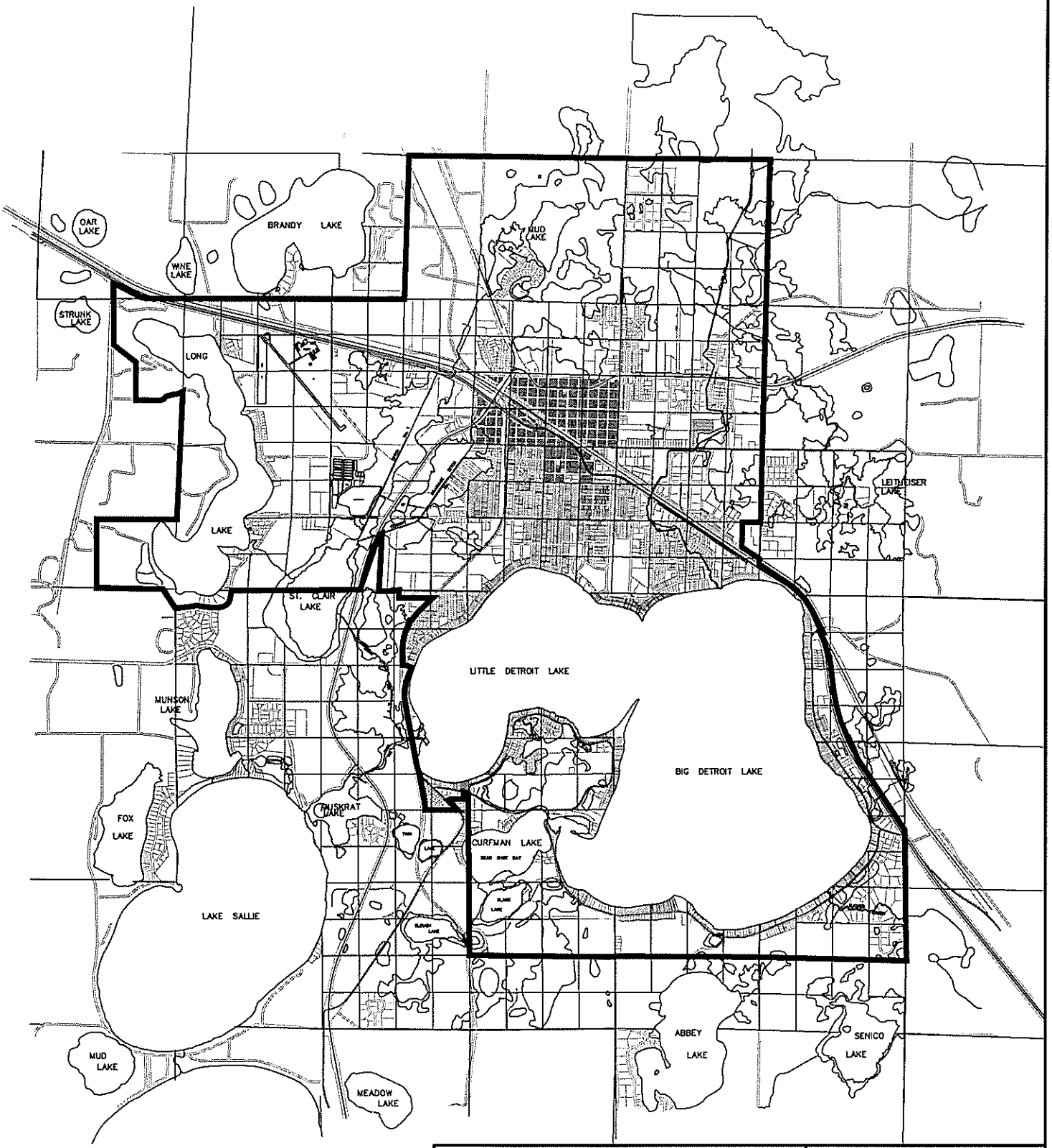
III. EXISTING FACILITIES

A. Location

The existing wastewater treatment facilities are located at various sites on the west side of the City as shown in Figure III.1.

B. History

The original wastewater treatment process for the City consisted of an Imhoff (settling) tank constructed in 1929 which provided primary treatment. In 1942, as part of a Works Progress Administration (WPA) project, the original plant was converted to a trickling filter facility to provide secondary treatment. Major modifications to the trickling filter plant were made in 1962, including construction of the aerated pond and stabilization pond. The chemical precipitation plant and land application facilities were constructed in 1975 and 1976. Primary clarification and sludge digestion improvements were made in the mid 1990's. A summary of the treatment units, construction dates and basic functions are listed in Table III.1:



PLANNING AREA

PRELIMINARY ENGINEERING REPORT
FIGURE II.1-WWTF PLANNING AREA
DETROIT LAKES, MINNESOTA

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Approved By:	TJP	Date of Revision:	NA
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PRELIMINARY ENGINEERING REPORT
FIGURE III.1-WWTF EXISTING FACILITIES
DETROIT LAKES, MINNESOTA

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Table III-1

Summary of Existing Facilities		
Unit Process	***Date Constructed***	***Function***
Preliminary Treatment	1962	Influent flow measurement, solids screening, grit removal, lift pumps.
Primary Clarification	1962	Settlable solids removal.
Trickling Filters (2)	1942, 1962	Secondary biological treatment.
Secondary (Final) Clarification	1962	Settling of treated trickling filter effluent.
Sludge Treatment & Storage	1929, 1962	Treatment and storage of solids.
Effluent Pumping to Filter	1962	Pump trickling filter plant effluent to aerated pond.
Aerated Pond	1962	BOD reduction.
Stabilization Pond	1962	Additional BOD reduction & storage.
Chemical Precipitation Plant	1976	Tertiary treatment (phosphorus removal) prior to surface discharge (November – April).
Rapid Infiltration Basins	1976	Effluent Discharge (May – October).
Spray Irrigation Facilities	1976	Effluent Discharge (May – September).
Primary Clarification Improvements	1995	Settlable solids removal.
Sludge Digestion Improvements	1995	Treatment and storage of solids.

C. Facilities Description

1. Mechanical Trickling Filter Plant

The existing trickling filter plant located on West Willow Street in Detroit Lakes consists of an influent pumping station, a mechanical bar screen, an aerated grit removal system, two (2) primary clarifiers, two (2) trickling filters, a secondary settling tank, a chlorine contact tank and a three (3)-acre aerated pond with floating aerators (note: the aeration system is no longer used). A primary anaerobic digester and secondary biosolids holding tank are utilized for solids treatment and storage.

2. Stabilization Pond and Chemical Precipitation Plant

Flow from the three acre aerated pond at the Trickling Filter Plant is discharged to the existing twenty five (25)-acre stabilization pond located adjacent to the Chemical Precipitation Plant. From there effluent can be pumped to the Precipitation Plant, Rapid Infiltration Basins (RIBs) or Spray Irrigation Facilities. The chemical precipitation plant, which is located southeast of the Becker County Airport, is used for chemical phosphorus removal. The plant consists of two (2) solids contact clarifiers, two (2) dual media gravity filters and a chlorination unit for disinfection of the plant effluent.

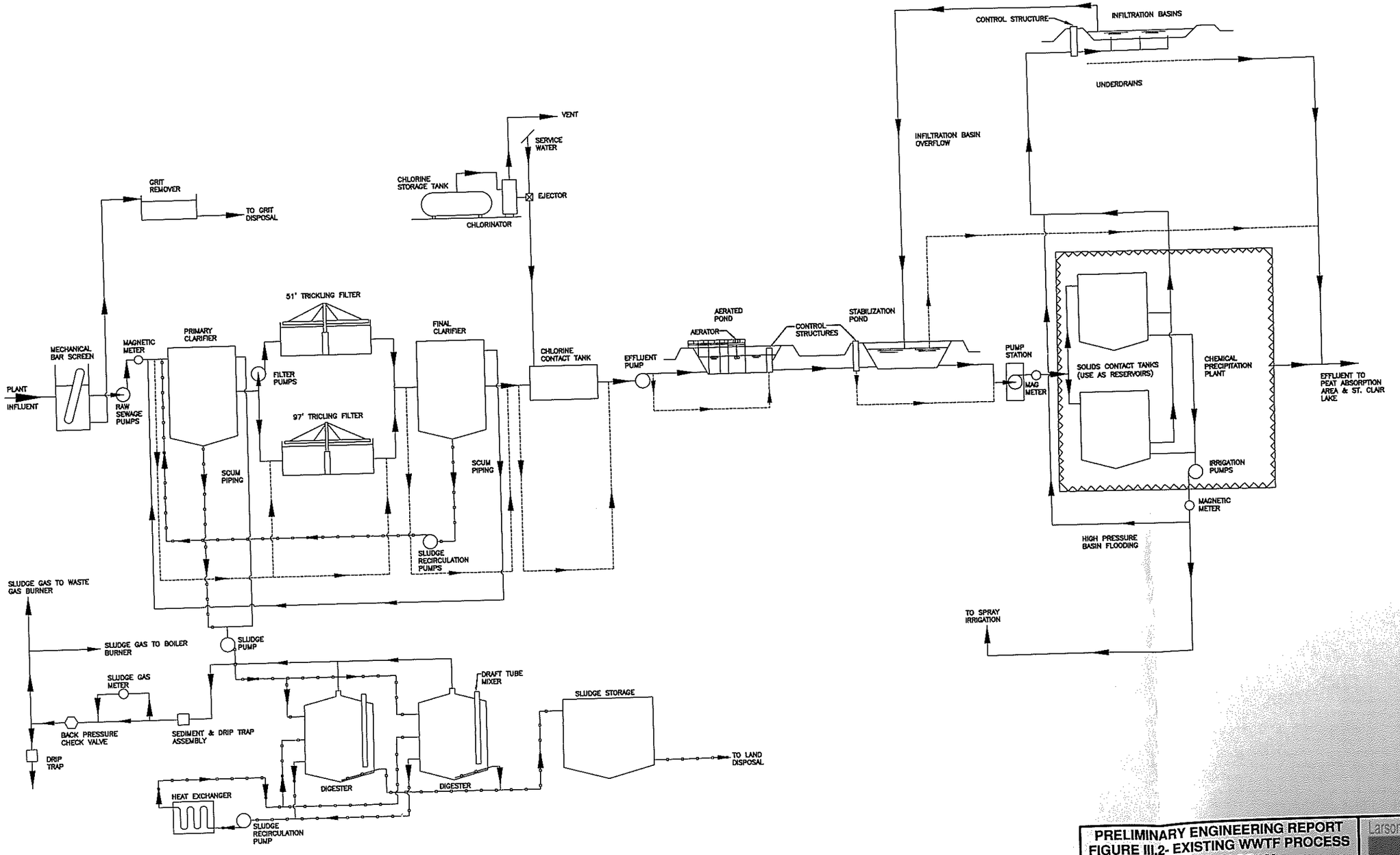
The Chemical Precipitation Plant has a capacity of 1.44 mgd and is operated primarily in the winter months. The effluent from the plant is discharged directly into a effluent dispersion ditch (SD 002) and then into a twenty (20)-acre peat bog.

3. Effluent Discharge Facilities

In the summer months, as an alternative to the Chemical Precipitation Plant, the City utilizes eighteen (18) rapid infiltration basins and several spray irrigation sites for discharge of the City's effluent. The irrigation sites, totaling 54-acres, consist of two (2) irrigation pumps and four (4) on-land spray irrigation areas equipped with fixed nozzles.

The application rate to the spray irrigation facilities is based on a flow limit of 130 million gallons total annual application. The City averages approximately 100 million gallons annually to the spray irrigation facilities. This application volume is valid until the permit expires. As stated in the City's permit, the rapid infiltration basins are operated by filling the basins up to three inches and then resting them until dried. Application rates to the basins average 0.75 million gallons per day (mgd).Based on extensive dialog with City Personnel; it is our understanding that there are some operational limitations at the Chemical Precipitation Plant, which limit the flexibility of combined facility operations. It is not possible to run the chemical precipitation plant when operating either the spray irrigation facilities or the rapid infiltration basins. This is primarily due to the fact that the fill lines for the basins and the irrigation pumps both pull wastewater from the solids contact clarifiers. Thus, running both facilities simultaneously is not possible.

A schematic flow diagram for all of the existing facilities is shown on the following page in Figure III.2.



PRELIMINARY ENGINEERING REPORT
FIGURE III.2- EXISTING WWTF PROCESS PIPING DIAGRAM
DETROIT LAKES, MINNESOTA

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4. Condition of Existing Facilities

All of the facilities listed in the aforementioned paragraphs were toured with City Personnel and a general assessment on the condition of each unit process was made. The assessment included a review of the structural and mechanical features of each unit by visual inspection. City personnel were interviewed regarding the operations of each unit process. The general condition of the various components is as follows:

a. The trickling filter plant underwent an extensive renovation and upgrade in the mid to late 1990's. All components appear to be in good working condition.

b. The aeration and stabilization ponds are in satisfactory condition. The City has not been aerating the aeration pond for some time now. It is expected that the aeration pond will be eliminated when the airport expansion occurs.

c. The chemical precipitation plant is in good condition. City Personnel have made some operational modifications in recent years to make the plant more cost-effective. Lime additives for precipitation of phosphorus have been replaced by ferric sulfate which is a much more cost effective coagulant.

d. The infiltration basins and spray irrigation facilities all appear to be in good working condition.

5. NPDES Permit Requirements and Discharge Standards

The effluent from the City's WWTF is regulated by National Pollution Discharge Elimination System / State Disposal System (NPDES/SDS) Permit No. MN 0020192 issued by the Minnesota Pollution Control Agency (MPCA). The current NPDES/SDS permit was issued on September 24, 2001 and expires on July 31, 2006.

The facility discharges from the Chemical Precipitation Plant to an effluent dispersion ditch and then into a 20-acre peat bog located on the northeast end of St. Clair Lake. See Figure III.1of this report.

The City's current NPDES permit states that treated effluent from the WWTF can be applied to the existing infiltration basins from approximately April 15th until December 31st each year. The infiltration basins are operated by filling the basins up to three inches deep. The basins are then rested until they are dried. Excessive ground water is collected in the under drains and discharged to the dispersion ditch. The under drains beneath the infiltration basins are typically left open; however, the under drains must be plugged if

the total phosphorus levels exceed the 1.0 mg/L. In recent years, the under drains have been plugged at all times.

The City's current NPDES permit also states that treated effluent from the WWTF can be applied to the exiting spray irrigation sites from approximately May 15 to October 31. The spray irrigation sites are operated by simply pumping water from the Chemical Precipitation Plant to the spray irrigation areas. It should be noted that the permit does allow concurrent operation of the infiltration basins and irrigation system.

The existing WWTF is listed as a Class A facility and it includes 15 ground water monitoring wells around the site. Test results from the wells can be found in the appendix section of this report.

The City's discharge standards, as listed in the current NPDES permit are shown below in Table III-2.

Table III-2

NPDES Discharge Permit Standards for Existing Facilities	
Parameter	***Maximum Value or Range***
Daily Flow	1.64 Million Gallons per Day (MGD)
5-Day Biochemical Oxygen Demand (BOD)	20 mg/L
Total Suspended Solids (TSS)	20 mg/L
pH	6.0 – 9.0
Fecal Coliform Organisms	200 MPN / 100 ml (March 1 – October 31)
Oil	Essentially free of visible floating oil.
Unspecified Toxic or Corrosive Substances	None at levels acutely toxic to humans or other animal or plant life, or directly damaging to real property.
Total Phosphorus	1 mg/L

The treatment facilities continue to meet all NPDES/SDS performance standards. In addition, the ground water monitoring wells have not seen a rise in total phosphorus or nitrate levels.

6. Performance of Existing Facilities

Table III-3 is a summary of the 2003 and 2004 operational data for influent and effluent BOD, TSS and phosphorus concentrations at the City's Trickling Filter and Chemical Precipitation Plants. Performance of the existing facilities is classified as good. Overall removal efficiencies for BOD, TSS and phosphorus are 96%, 96% and 92% respectively. Furthermore, effluent concentrations for BOD, TSS and phosphorus are well below the maximum values listed in the City's NPDES discharge permit.

7. Hydraulic and Organic Capacity of the Existing Facilities

a. Hydraulic Capacity

According to the City's NPDES permit, the existing Trickling Filter Plant was designed to treat an average influent flow of 1,640,000 gallons per day (gpd). In addition, the design average wet weather flow for this facility, according to the permit, has been calculated to be 3,000,000 gpd.

The maximum 2003/2004 monthly influent flow to the City's Trickling Filter Plant, listed in Table III-3 of this report is 1,312,258 gpd, which is approximately 330,000 gpd below the average influent design flow. The 2003/2004 influent flow data would indicate that the hydraulic capacity of the existing Trickling Filter Plant is adequate at this time.

b. Organic Capacity

According to the City's NPDES permit, the existing Trickling Filter Plant is designed to treat an average influent flow of 1,640,000 gallons per day (gpd) with a five-day biochemical oxygen demand (BOD_5) strength of 320 milligrams per liter (mg/L). This amounts to a design BOD loading of 4,380 lbs/day; however, the City is limited to 3,400 lbs/day on a monthly average according to the permit.

The 2003/2004 monthly average for influent BOD loading is 1,730 lbs/day as shown in Table III-3. This figure is well below the influent BOD design load (3,400 lbs/day) for the Trickling Filter Plant. At this time the Trickling Filter Plant is at 45 % of its intended organic design load. The facility has plenty of capacity to treat additional organic loads well into the future.

Table III-3

Month/Yr	Trickling Filter Plant								Chemical Precipitation Plant								Overall BOD Removal	Overall TSS Removal	Phosphorus % Removal	Influent BOD Load	Influent TSS Load	% of Organic Design Load
	Influent Flow	Influent BOD	Effluent BOD	BOD % Removal	Influent TSS	Effluent TSS	TSS % Removal	Influent Phosphorus	Effluent Phosphorus	Influent Flow	Influent BOD	Effluent BOD	BOD % Removal	Influent TSS	Effluent TSS	TSS % Removal	Effluent Phosphorus						
2003	(gpd)	(mg/L)	(mg/L)	(%)	(mg/L)	(mg/L)	(%)	(mg/L)	(mg/L)	(gallons)	(mg/L)	(mg/L)	(%)	(mg/L)	(mg/L)	(%)	(mg/L)	(%)	(%)	(%)	(lbs/day)	(lbs/day)	(%)
January	962,774	240	36	85%	185	22	88%	-	4.64	856,065	28	10	64%	24	7	71%	0.30	96%	96%	94%	1,928	1,486	49%
February	972,395	213	40	81%	169	28	83%	7.08	4.28	1,030,360	43	14	67%	29	8	72%	0.35	93%	95%	92%	1,728	1,371	44%
March	1,008,330	204	36	82%	206	29	86%	6.23	4.25	982,667	42	13	69%	51	7	86%	0.30	94%	97%	93%	1,717	1,733	44%
April	1,030,730	195	29	85%	186	21	89%	-	4.02												1,677	1,600	43%
May	1,114,451	172	23	87%	144	18	88%	-	4.93												1,600	1,339	41%
June	1,198,233	169	20	88%	152	46	70%	-	3.97												1,690	1,520	43%
July	1,312,258	174	11	94%	170	18	89%	3.49	2.94												1,905	1,862	49%
August	1,202,548	187	11	94%	185	18	90%	5.76	4.38												1,877	1,857	48%
September	1,050,000	189	10	95%	181	15	92%	5.30	4.18												1,656	1,586	42%
October																					1,565	1,316	40%
November	961,733	195	11	94%	164	11	93%	-	5.41												1,565	1,316	40%
December	961,733	195	11	94%	164	11	93%	5.90	5.41	812,285	7	3	57%	4	4	0%	0.42	98%	98%	92%			
Avg	**1,070,471**	**194**	**22**	**89%**	**173**	**22**	**87%**	**5.63**	**4.40**	**920,344**	**30**	**10**	**64%**	**27**	**7**	**57%**	**0.34**	**95%**	**96%**	**93%**	**1,719**	**1,544**	**44%**
Max	1,312,258	240	40	95%	206	46	93%	7.08	5.41	1,030,360	43	14	69%	51	8	86%	0.42	98%	98%	94%	1,928	1,862	49%
Min	961,733	169	10	81%	144	11	70%	3.49	2.94	812,285	7	3	57%	4	4	0%	0.30	93%	95%	92%	1,565	1,316	40%

Month/Yr	Trickling Filter Plant								Chemical Precipitation Plant								Overall BOD Removal	Overall TSS Removal	Phosphorus % Removal	Influent BOD Load	Influent TSS Load	% of Organic Design Load
	Influent Flow	Influent BOD	Effluent BOD	BOD % Removal	Influent TSS	Effluent TSS	TSS % Removal	Influent Phosphorus	Effluent Phosphorus	Influent Flow	Influent BOD	Effluent BOD	BOD % Removal	Influent TSS	Effluent TSS	TSS % Removal	Effluent Phosphorus						
2004	(gpd)	(mg/L)	(mg/L)	(%)	(mg/L)	(mg/L)	(%)	(mg/L)	(mg/L)	(gallons)	(mg/L)	(mg/L)	(%)	(mg/L)	(mg/L)	(%)	(mg/L)	(%)	(%)	(%)	(lbs/day)	(lbs/day)	(%)
January	974,100	211	25	88%	255	21	92%	-	3.35	803,225	9	8	11%	13	5	62%	0.37	96%	98%	89%	1,715	2,073	44%
February	1,018,300	225	26	88%	298	18	94%	-	3.23	817,172	27	10	63%	26	5	81%	0.29	96%	98%	91%	1,912	2,532	49%
March	1,098,390	204	25	88%	214	19	91%	-	3.61	854,258	19	9	53%	18	7	61%	0.36	96%	97%	90%	1,870	1,962	48%
April	1,110,770	180	23	87%	198	22	89%	-	2.81	1,058,533	24	10	58%	36	8	78%	0.26	94%	96%	91%	1,668	1,835	43%
May	1,212,355	159	17	89%	172	28	84%	-	3.96	689,581	21	6	71%	60	12	80%	0.24	96%	93%	94%	1,609	1,740	41%
June	1,303,600	155	19	88%	151	34	77%	4.54	3.34	721,545	25	6	76%	44	6	86%	0.19	96%	96%	94%	1,686	1,643	43%
Avg	**1,119,586**	**189**	**23**	**88%**	**215**	**24**	**88%**	**4.54**	**3.38**	**824,052**	**21**	**8**	**55%**	**33**	**7**	**75%**	**0.28**	**96%**	**96%**	**92%**	**1,743**	**1,964**	**45%**
Max	1,303,600	225	26	89%	298	34	94%	4.54	3.96	1,058,533	27	10	76%	60	12	86%	0.37	96%	98%	94%	1,912	2,532	49%
Min	974,100	155	17	87%	151	18	77%	4.54	2.81	689,581	9	6	11%	13	5	61%	0.19	94%	93%	89%	1,609	1,643	41%

- *Shut Down of Chemical Precipitation Plant*

IV. NEED FOR PROJECT

A. Health, Sanitation & Security

The City of Detroit Lakes is required to operate their WWTF in accordance with their NPDES/SDS permit. This ensures the health and safety of not only the citizens of Detroit Lakes, but also the surrounding environment. With the anticipated loss of thirty-four (34) acres of spray irrigation facilities, the City must develop alternatives to treat and release the additional effluent, currently being handled by the facilities, in a manner that will continue to comply with their permit and ensure the health and safety of the citizens and environment.

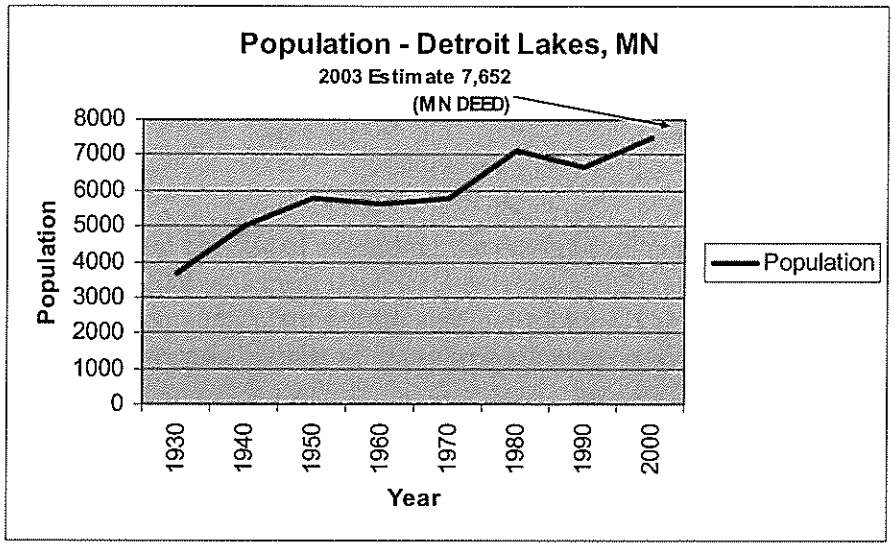
B. System O&M

System operations and maintenance is a critical component to ensure safe, efficient and reliable performance of the WWTF. The O&M costs associated with each processes used to treat trickling filter plant effluent must be analyzed in determining the most cost-effective alternative to deal with the loss of the thirty-four (34) acres of spray irrigation facilities.

Operations and maintenance costs for the WWTF consist of three general components; chemicals, power/electricity and labor. For the purposes of this study, only costs associated with processes after the trickling filter plant will be considered (i.e. chemical precipitation plant, spray irrigation facilities and rapid infiltration basins). According to City personnel, the amount of labor required for final treatment of the trickling filter effluent when operating any process or combination of processes is approximately the same. Therefore, the labor component will be ignored and only power/electricity and chemical costs will be considered.

C. Historical Population

The population of the City of Detroit Lakes has shown a steady increase over the past fifty years. The Minnesota Department of Employment and Economic Development estimates the City's 2003 population to be 7,562. The chart on the following page shows how the population has changed over the years.



D. Future Waste Loads and Population Projections

The City's average daily flow at the wastewater treatment facility in the year 2003 was approximately 1.0 million gallons per day (MGD) with a maximum monthly average flow of approximately 1.3 MGD in July.

To calculate the per capita daily sanitary sewer discharge from all residential users in the City of Detroit Lakes we obtained water production records and billed water useage records from City Personnel. After excluding the City's large water users, the per capita daily discharge is estimated to be 100 gpcd.

During wet weather months of the year, the City's wastewater treatment facilities can handle flow from an additional 3,400 residents, based on the trickling filter plant's design flow of 1.64 MGD and assuming no other significant industrial or commercial users are included.

During the winter months, the City is limited to a design flow of 1.44 MGD, which is the design flow of the chemical precipitation plant. Assuming a winter flow of approximately 1 MGD, the City's wastewater treatment facilities can handle an additional 4,400 residents, assuming no additional significant industrial or commercial users.

V. ALTERNATIVES CONSIDERED

A. Do Nothing – Extend Operation of Chemical Precipitation Plant

1. Description

This alternative would consist of extending the operational period of the chemical precipitation plant. Effluent from the City's existing stabilization pond would be treated for phosphorus at the chem. plant during summer months. Currently, discharge operations from the stabilization pond consist of spray irrigation or use of the rapid infiltration basins.

2. Design Criteria

The existing infiltration basins and the remaining 20-acres of spray irrigation facilities will continue to operate as they have been. Historically, the infiltration basins have been averaging approximately 0.75 mgd during their months of operation. It is assumed that this will continue. The existing fifty-four (54) acres of spray irrigation facilities are permitted to apply 130 million gallons annually. This amounts to an application rate of approximately 7.3 feet per acre per year. Assuming an application rate of 6 feet per acre per year on the remaining 20 acres, the City would be able to apply approximately 0.25 mgd. Therefore, under average influent flow conditions, the chemical precipitation plant will need to treat approximately 25 million gallons between the months of May and October.

3. Maps & Schematics

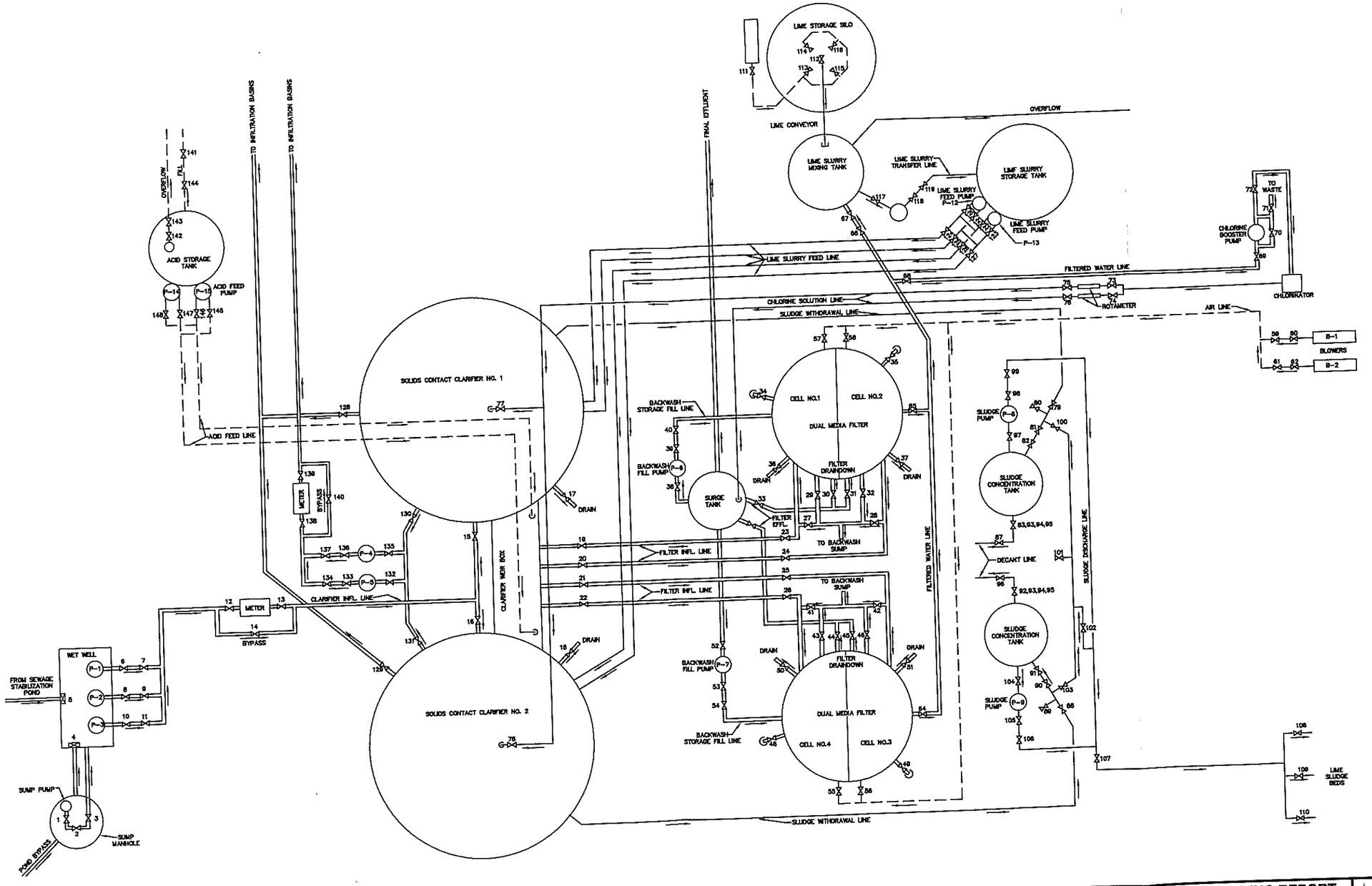
No additional facilities will be required as a result of implementing this alternative. Figure V.1, on the following page, is a process schematic of the existing chemical precipitation plant. Note that the City currently feeds ferric sulfate instead of lime. Refer to Figure III.1 for a layout of all existing facilities.

4. Environmental Impacts

There will be no adverse environmental impacts as a result of the implementation of this alternative.

5. Land Requirements

No additional lands will be required under this alternative.



PRELIMINARY ENGINEERING REPORT
FIGURE V.1-EXISTING CHEM. PLANT
PROCESS DIAGRAM
DETROIT LAKES, MINNESOTA

Drawn By: JDH
Checked By: TJP
Approved By: TJP

Project Number: 504.71
Date of Original: Sept. 30, 2004
Date of Revision: NA
Sheet: 1 of 1

Larson-Peterson
Ulteig engineers

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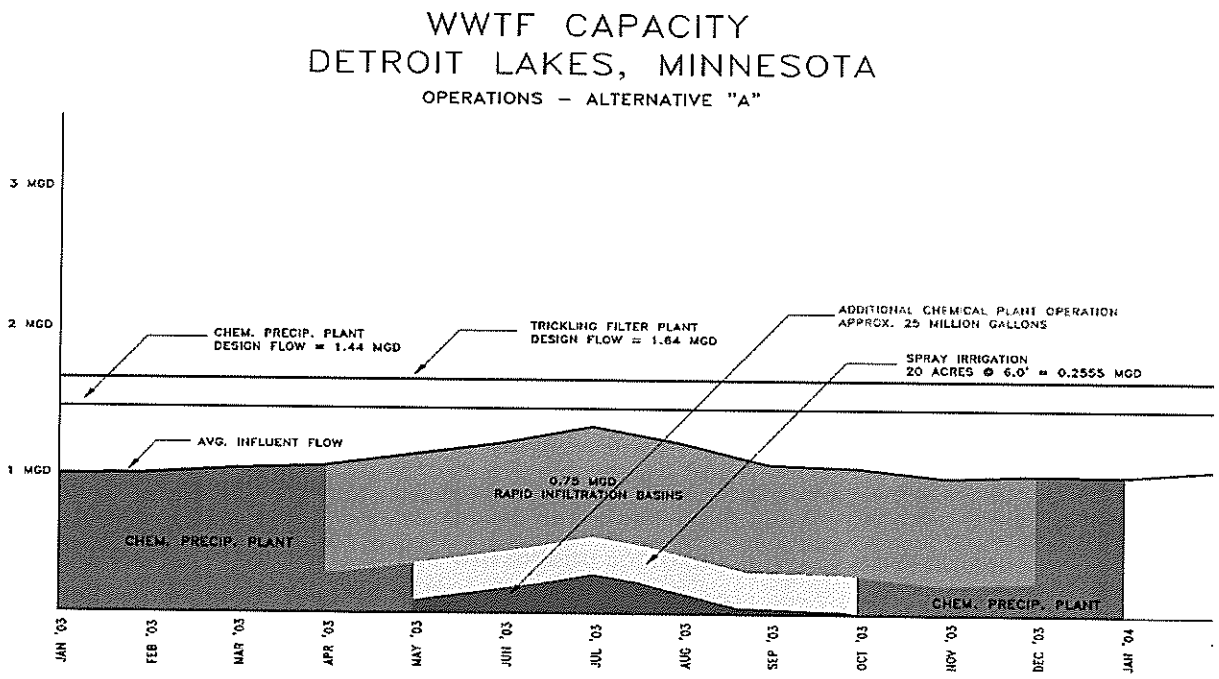
6. Costs

a. Capital Costs

No up-front capital costs will be required to implement this alternative.

b. O&M Costs

This alternative will require running the chemical precipitation plant during the summer months to treat trickling filter plant effluent that cannot be handled by the remaining spray irrigation facilities and rapid infiltration basins. Based on average historical effluent flows, this amounts to treating approximately 25 millions gallons between the months of May and October. The following chart shows the additional volume needed in red. It shows a maximum day of approximately 0.28 MGD, a minimum day of approximately 0.013 MGD and an average day of approximately 0.15 MGD. Based on figures obtained from City personnel, in order to treat this additional flow of 25 million gallons, an estimated additional annual cost of $3,808 will be needed for chemicals and an estimated additional annual cost of $15,000 will be need for power/electricity.



B. Additional Spray Irrigation Facilities

1. Description

This alternative consists of purchasing additional lands for spray irrigation facilities and installing additional pumping facilities, a forcemain and irrigation facilities.

2. Design Criteria

It is anticipated that any new spray irrigation facilities will be subject to a lower application rate than the existing facilities are. For this conceptual design, that application rate is assumed to be 30 inches per acre per year.

Several sites were considered for possible new irrigation facilities. Figure V.2, on the following page, shows the most probable location chosen for additional facilities. It is located west of the City, just southwest of Long Lake.

New facilities would include pumping facilities, approximately 18,000 lineal feet of 16" forcemain and a 1,160 foot radius center pivot irrigation system. Based on the new assumed application rate, this new facility will be able to apply approximately 80 million gallons annually or an average of 0.43 mgd during its operating months. It is also, assumed that several monitoring wells would also need to be installed.

3. Maps & Schematics

As previously stated, Figure V.2 shows the proposed location for the new spray irrigation facilities.

4. Environmental Impacts

An in-depth environmental review is beyond the scope of this study. However, before implementation of this, or any, alternative, a detailed environmental assessment will need to be conducted to ensure that all possible impacts are identified and all interested agencies have an opportunity to comment.

5. Land Requirements

The new spray irrigation facilities will require approximately 125 acres of land.

PRELIMINARY ENGINEERING REPORT

FIGURE V.2-ALTERNATIVE "B"

DETROIT LAKES, MINNESOTA

Drawn By:	JDH	Project Number:	504.71
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		Sheet:	1 of 1

Larson-Peterson Ulteig engineers

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6. Costs

a. Capital Costs

Based on the conceptual design for this alternative, an Engineer's Preliminary Opinion of Capital Cost was prepared. This is included in the Appendix. The estimated capital cost for this alternative is $2,185,595.

b. O&M Costs

The operations and maintenance costs for this alternative include an increase in electricity needed due to the increased pumping distance. It is estimated that an additional annual cost of $3,000 will be needed for electricity.

It is also common practice for the City to charge the depreciation of fixed assets as an O&M expense. It is estimated that an additional annual cost of $7,000 will be need for depreciation of equipment.

C. Convert Spray Irrigation Areas to Rapid Infiltration Basins

1. Description

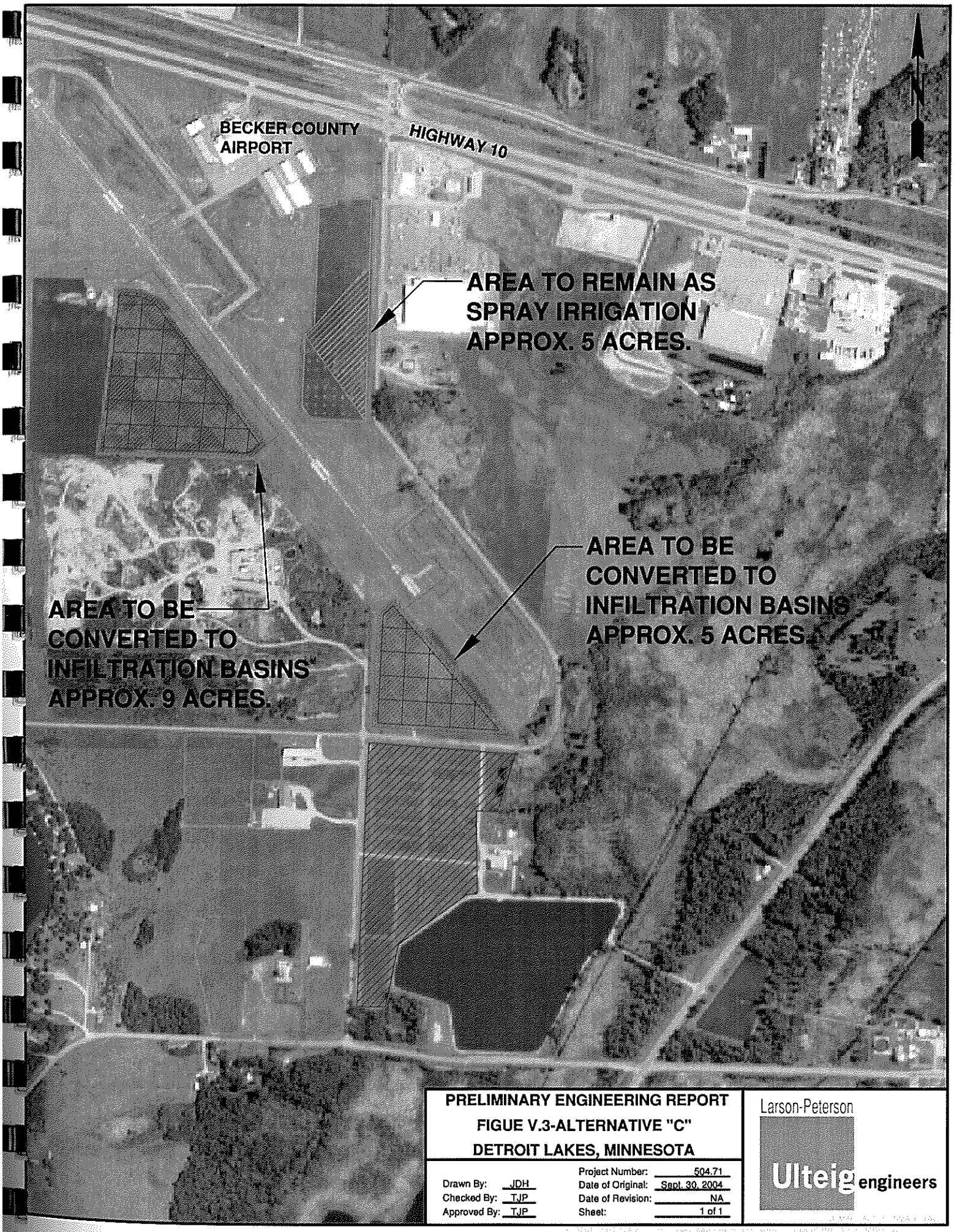
This alternative would consist of converting a portion of the remaining spray irrigation areas to rapid infiltration basins.

2. Design Criteria

It is anticipated that the City will have approximately 20 acres of spray irrigation area remaining after the expansion of the Becker County Airport. Figure V.3, on the following page, shows converting the remaining areas to the south and west of the airport to rapid infiltration basins, while the area to the north of the airport remains as spray irrigation.

The new infiltration basins would have a floor area of approximately 14 acres and the spray irrigation would be approximately 5 acres. Operating as currently permitted, the irrigation facilities would be able to apply approximately 10 million gallons annually or an average of 0.053 mgd. The new infiltration basins, operated at 5 acres at a time, would be able to apply 112 million gallons annually or an average of 0.40 mgd.

A detailed hydrogeological investigation will need to be performed, as a part of this alternative, before a final design can be developed.



PRELIMINARY ENGINEERING REPORT

FIGUE V.3-ALTERNATIVE "C"

DETROIT LAKES, MINNESOTA

Drawn By:	JDH	Project Number:	504.71
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Approved By:	TJP	Date of Revision:	NA
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Larson-Peterson Ulteig engineers

In addition, final approval of this alternative would be required by the Federal Aviation Administration. The new RIB's would have to meet the requirements of the FAA's document on hazardous wildlife attractants on or near airports.

3. Maps & Schematics

As stated previously, Figure V.3 shows the areas to be converted to infiltration basins under this alternative.

4. Environmental Impacts

An in-depth environmental review is beyond the scope of this study. However, before implementation of this, or any, alternative, a detailed environmental assessment will need to be conducted to ensure that all possible impacts are identified and all interested agencies have an opportunity to comment.

5. Land Requirements

No additional lands will be required under this alternative. Some permanent and/or construction easements may be required for basin influent piping.

6. Costs

a. Capital Costs

Based on the conceptual design for this alternative, an Engineer's Preliminary Opinion of Capital Cost was prepared. This is included in the Appendix. The Cost Opinion shows a total project cost of $1,486,500 for this alternative.

b. O&M Costs

No additional operations and maintenance cost will be necessary under this alternative.

D. Construct Additional Rapid Infiltration Basins

1. Description

This alternative would keep the remaining spray irrigation facilities in service and construction additional rapid infiltration basins.

2. Design Criteria

The City owns a parcel of land located directly north of the existing chemical precipitation plant and existing rapid infiltration basins. Figure V.4, on the following page, shows a conceptual design of how a portion of this land would be converted to approximately 6 acres of additional rapid infiltration basins under this alternative. Operated 2 acres at a time, the new infiltration basins would be able to apply approximately 44 million gallons annually or 0.17 mgd.

A detailed hydrogeological investigation will need to be performed, as a part of this alternative, before a final design can be developed.

In addition, an extensive soils investigation would be required to confirm that existing soils are appropriate for these facilities. Preliminary investigations revealed that the area being considered under this alternative is the area most likely to be suitable for rapid infiltration basins.

3. Maps and Schematics

As previously stated, Figure V.4 shows a conceptual design for the new rapid infiltration basins under this alternative.

4. Environmental Impacts

An in-depth environmental review is beyond the scope of this study. However, before implementation of this, or any, alternative, a detailed environmental assessment will need to be conducted to ensure that all possible impacts are identified and all interested agencies have an opportunity to comment.

5. Land Requirements

No additional lands will need to be purchased by the City under this alternative. The proposed land to be used is currently owned by the City and is used to land apply their biosolids from the trickling filter plant.

PRELIMINARY ENGINEERING REPORT
FIGURE V.4-ALTERNATIVE "D"
DETROIT LAKES, MINNESOTA

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		Sheet:	1 of 1

Larson-Peterson Ulteig engineers

6. Costs

a. Capital Costs

Based on the conceptual design for this alternative, an Engineer's Preliminary Opinion of Capital Cost was prepared. This is included in the Appendix. The Cost Opinion shows a total project cost of $680,000 for this alternative.

b. O&M Costs

The operations and maintenance costs for this alternative include an increase in electricity needed due to the increased pumping. It is estimate that an additional annual cost of $3,600 will be need for electricity.

It is also common practice for the City to charge the depreciation of fixed assets as an O&M expense. It is estimated that an additional annual cost of $2,500 will be need for depreciation of equipment.

VI. COMPARISON OF ALTERNATIVES

A. Project Design

All alternatives were conceptually designed as per the requirements of the Minnesota Pollution Control Agency and "The Recommended Standards for Wastewater Treatment Facilities (1997 Addition)".

B. Total Annual Costs

Total annual costs for each alternative include costs for debt service, reserve funds (if any) and operations and maintenance costs. Debt service requirements assumed a 20-year loan at an interest rate of 3% through the Water Pollution Control Revolving Loan Fund administered through the Minnesota Public Facilities Authority. The following table outlines the total annual costs associated with each alternative:

Alternative	Debt Service	Reserve Fund	O&M Expenses	Total Annual Cost
A	$0	$0	$19,000	$19,000
B	$147,000	$0	$10,000	$157,000
C	$100,000	$0	$0	$100,000
D	$46,000	$0	$6,100	$52,100

VII. RECOMMENDED ALTERNATIVE

A. Project Design

It is recommended that, at this time, the City do nothing and extend the operation of the chemical precipitation plant when the airport expansion occurs and they loose a portion of their spray irrigation facilities. This alternative will require no up-front capital costs and will require a minor increase in annual operations and maintenance costs.

B. Annual Operating Budget

1. Debt Service

No debt service will be required under this alternative.

2. Reserves

Although no reserve fund is required, the City may wish to consider establishing a reserve fund for future expansion of their wastewater treatment facilities.

3. O&M

This alternative will require additional chemical feed and additional electricity during additional hours of operation. It is estimated that this expense will be approximately $19,000 per year (2004 dollars).

C. User Costs

According to City personnel, there are approximately 3,320 wastewater customers. Dividing the additional annual costs of this alternative equally over all customers results in an annual expense of $5.73 per customer, or $0.48 per month.

D. Other Recommendations

As previously stated, there are some operational limitations when attempting to utilize the chemical precipitation plant in combination with either the spray irrigation facilities or the rapid infiltration basins. We recommend that the City pursue a study to evaluate alternatives to alleviate these operational limitations in order to allow increased flexibility when operating these facilities.

Also, we recommend that a portion, of the City owned parcel north of the chemical precipitation plant be retained for construction of future rapid infiltration basins or spray irrigation facilities.

APPENDICES

National Pollution Discharge Elimination System / State Disposal System (NPDES/SDS) Permit

New Revised Sept 01

Minnesota Pollution Control Agency

September 24, 2001

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

The Honorable Larry Buboltz
Mayor, City of Detroit Lakes
City Hall, P.O. Box 647
Detroit Lakes, MN 56502-0647

RE: Minor Modification NPDES/SDS Permit No. MN 0020192
Detroit Lakes Wastewater Treatment Facility
Detroit Lakes, Minnesota

Dear Honorable Buboltz:

Enclosed is a copy of the reissued final modified National Pollutant Discharge Elimination System (NPDES)/State Disposal System (SDS) permit for the Detroit Lakes wastewater treatment facility. This permit supersedes an earlier NPDES permit that was issued on August 20, 2001.
It is the responsibility of the Permittee to maintain compliance with all of the terms and conditions of this permit. Please carefully review the entire permit.

We would like to draw your attention to the following:

Mercury Monitoring

P. 11 – Mercury monitoring for SD 003. Mercury monitoring shall take place during the months of June, September and December.

P. 19 – SD 002 – Monitoring for Mercury shall take place, during any quarter that discharge occurs from the chemical precipitation plant, to the peat absorption area.

P. 19 – SD 003 – Monitoring for Mercury shall take place, during any quarter that discharge occurs from the rapid infiltration basins, to the peat absorption area, and during the allowed discharge period.

If you have any questions regarding any of the terms and conditions of the permit, please contact Michael Swan of my staff at (218) 846-0786.

Sincerely,

Douglas A. Hall
Supervisor
North/South Major Facilities

DAH/MS:kva

Enclosures: Minor Modification Permit

cc: Jarrod Christen, Detroit Lakes Wastewater Treatment Facility Operator (w/enclosure)
Jeff Lewis, MPCA Regional Office, Detroit Lakes (w/enclosure)
Mike Swan, MPCA Regional Office, Detroit Lakes (w/enclosure)

STATE OF MINNESOTA

Minnesota Pollution Control Agency

North District

National Pollutant Discharge Elimination System (NPDES) and State Disposal System (SDS) Permit MN 0020192

PERMITTEE: The City of Detroit Lakes

FACILITY NAME: Detroit Lakes Municipal Wastewater Treatment Facility

RECEIVING WATER: A wetland (Class 2D water) and thence to St. Clair Lake

CITY OR TOWNSHIP: Detroit Township **COUNTY:** Becker County

REISSUANCE DATE: September 24, 2001 **EXPIRATION DATE:** July 31, 2006

The state of Minnesota, on behalf of its citizens through the Minnesota Pollution Control Agency (MPCA), authorizes the Permittee to operate a disposal system at the facility named above, and to discharge from this facility, to the receiving water named above, in accordance with the requirements of this permit.

The goal of this permit is to protect water quality in accordance with Minnesota and U.S. statutes and rules, including Minn. Stat. chs. 115 and 116, Minn. R. chs. 7001, 7050, and the U.S. Clean Water Act.

This permit is a modification of an existing permit which was issued on August 20, 2001. This modified permit is effective on the issuance date identified above and supersedes the previous permit issued for this facility.

This permit and the authorization to discharge shall expire approximately five years from the date of final issuance. The Permittee is not authorized to discharge after the above date of expiration. In order to receive authorization to discharge beyond the above date of expiration, the Permittee shall submit such information and forms as are required by the MPCA no later than 180 days prior to the above date of expiration pursuant to Minn. R. 7001.0040.

Signature: Ann Foss

Ann Foss
Manager
North/South Major Facilities

for

Karen A. Studders
Commissioner
Minnesota Pollution Control Agency

If you have questions on this permit, including the specific permit requirements, permit reporting or permit compliance status, please contact:

Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155-4194
Telephone: (651) 296-6300
Fax: (651) 297-8683
Telephone Device for Deaf (TTY): (651) 282-5332

TABLE OF CONTENTS

REPORT SUBMITTAL SUMMARY

Discharge Monitoring Report (DMR) monthly by 21 days after each calendar month.

Develop and submit a Rapid Infiltration Basin Management Plan 90 days after final reissuance of this permit.

Toxicity Test Submittals:

Submit the results of each year test batteries within 30 days of test completion.

Submit the results of the final test battery with the application for permit reissuance.

Organic Priority Pollutant Submittal:

Submit the results of the first priority pollutant sampling event by November 21, 2002.

Submit the results of the second priority pollutant sampling event by November 21, 2003.

Submit the results of the third or final sampling event with the application for permit reissuance.

Ground Water Monitoring Report due on the May, August, and November DMRs.

Annual Report for the Land Application of Biosolids due by December 31 following the end of each cropping year.

Submit an Option Evaluation Report by December 31, 2003 that includes options considered, selected option, and schedule of implementation.

Submit a progress report by October 31, 2004 stating the goals, decision and direction the city is taking before expiration of this permit.

Land Application Management Plan for the spray irrigation sites, Plans and Specifications for any constructions must be submitted before expiration of permit.

TREATMENT FACILITY DESCRIPTION AND LOCATION

The application and plans indicate that the original treatment system consists of a pumping station, bar screen, comminutor, aerated grit removal, primary settling tank, two trickling filters, secondary settling tank, chlorine contact tank, three-acre aerated pond with floating aerators (4.75-day detention time), 25-acre stabilization pond (18-day detention time), effluent pumping station, chemical precipitation unit, chlorination unit, two dual media filters, 18 infiltration basins with underdrains and one infiltration basin without underdrains totaling 21.75 floor acres, a 450 foot long effluent dispersion ditch, two irrigation pumps, four on-land spray irrigation areas totaling 54 acres equipped with fixed nozzles, two lime sludge concentration tanks, and three lime sludge lagoons. The mechanical facility includes two old sludge digesters and a sludge storage tank, which have been retained for future storage capacity.

The facility was remodeled in 1995-1996 and completed in 1997. Remodeling included a new pumping station, bar screen, aerated grit removal, two primary clarifiers - 40 foot in diameter with proposed maximum month design of 3,900 lb./day, one primary digester, one secondary digester, and standby power generation. The original units were replaced except the comminutor, which was eliminated from the system.

The facility includes 15 ground water monitoring wells as shown on the map on page 6 of this permit. This is a Class A facility.

The facility is designed to treat an average annual influent flow of 1,640,000 gallons per day, with a five-day biochemical oxygen demand (BOD_5) strength of 320 milligrams per liter (mg/L). The January 1, 1988, design average wet weather flow for this facility has been calculated to be 3,000,000 gallons per day. This flow is used to set a baseline for nondegradation review. Any expansion that increases the discharge by more than 200,000 gpd above the baseline design flow shall be subject to nondegradation review pursuant to Minn. R. 7050.0185, subp. 1.

The facility discharges from the Chemical Precipitation plant to the effluent dispersion ditch (SD 002 (Discharge 010)) and then into a 20-acre peat bog area (wetland, 2D water) located in the northeast end of St. Clair Lake.

From approximately April 15 to December 31, the treated effluent may be applied to the infiltration basins. The infiltration basins are operated by filling the basins up to three inches. The basins are then rested until they are dried. Excessive ground water is collected in the underdrains and discharged to the dispersion ditch (SD 003). The underdrains beneath the infiltration basins are typically left open; however, the underdrains must be plugged if the total phosphorus levels exceed the 1.0 mg/l limit applies to discharges that affect the lake.

From approximately May 15 to October 31, the treated effluent is applied to the spray irrigation areas. The infiltration basins may be used concurrently with the spray irrigation system.

The facilities are further described in plans and specifications on file with the MPCA (WPC 3673 dated December 29, 1961, and Permit #8524 dated July 15, 1974) and in engineering reports prepared by Winston C. Larson and Associates, Detroit Lakes, Minnesota. The facility was expanded and upgraded in 1995. Plans and specifications for the upgraded facilities were prepared by Larson-Peterson & Associates and are on file with the MPCA.

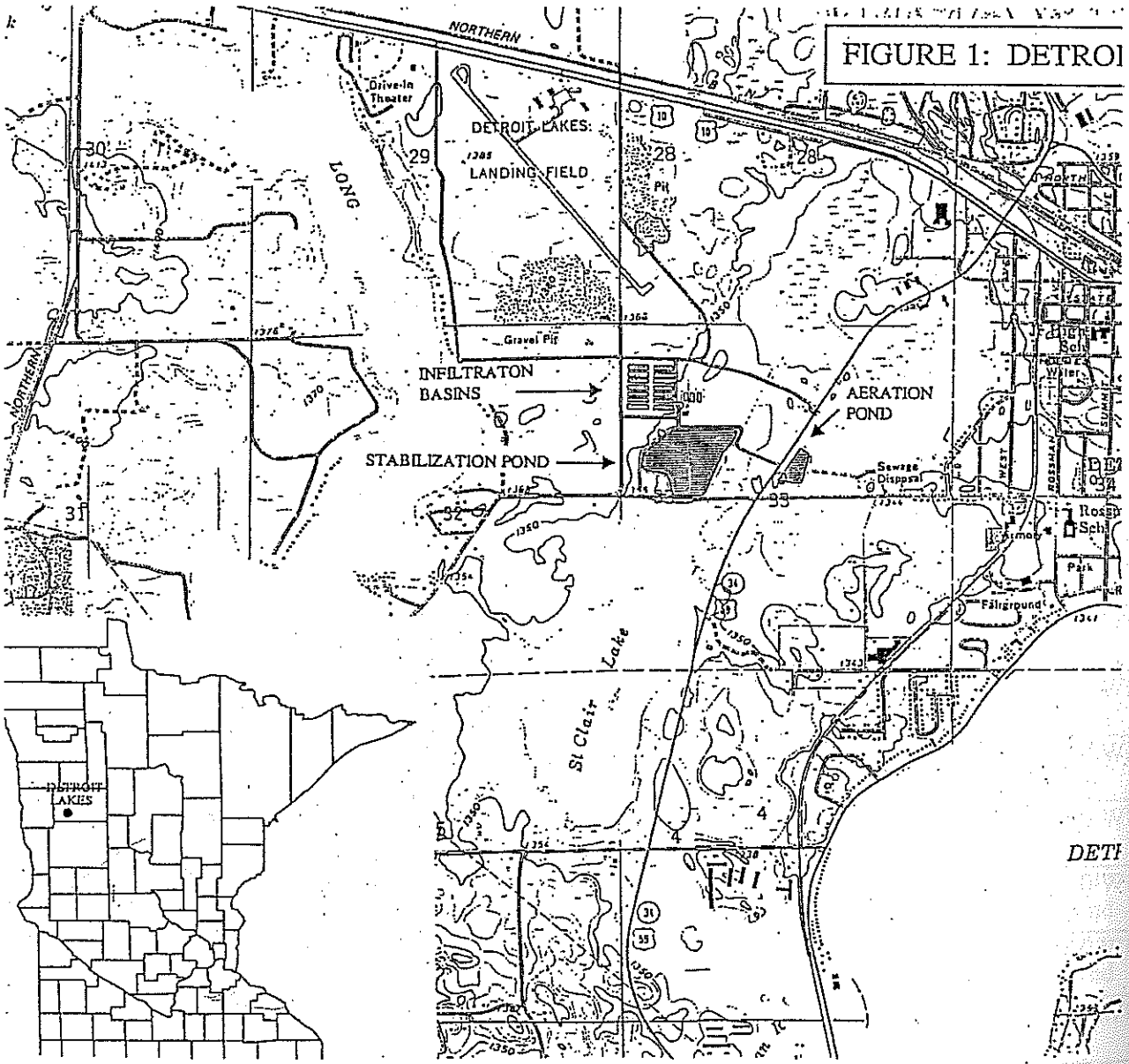
There are no bypass points known to exist in the disposal system.

DESIGNATED MONITORING SITES

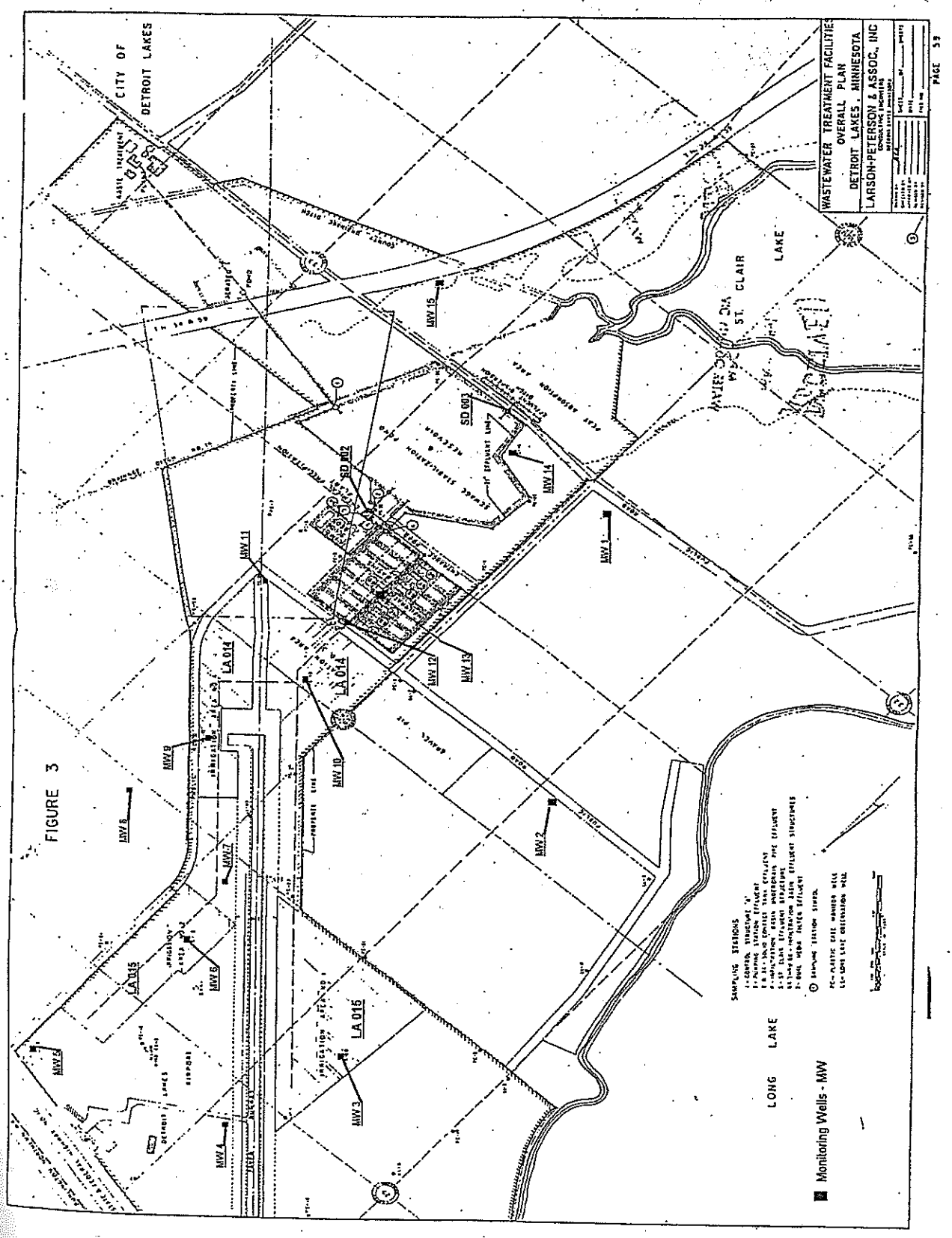
Site Number	Type of Site Monitored	Township/ Range Location	Latitude/Longitude
SD 002	Discharge from Chem. Plant	SW¼, NW¼, Section 33, T 139 N, R41 W	47° 47' 40"N; 95° 52' 30"W
SD 003	Discharge from RIBs	SW¼, NW¼, Section 33, T 139 N, R41 W	
WS 002	Internal Waste Stream		
WS 003	Stabilization Ponds to Spray Irrigation Site		
WS 004	Stabilization Ponds to Rapid Infiltration Basins	NW¼, Section 33, T 139 N, R41 W	
WS 008	Intermediate Bio-Solids to Land Application		
LA 014	Spray Irrigation Sites Field 1 & 2	E1/2, Section 29 T 139 N, R41 W	
LA 015	Spray Irrigation Sites Field 3 & 4	SW¼, SW¼, Section 28; NW¼, NW¼, Section 33; T 139 N, R41 W	
GW 001	Monitoring Well # 1 Unique Well # 495626	SE¼,SE¼,NE¼, Section 32, T 139 N, R 41 W	
GW 002	Monitoring Well # 2 Unique Well # 495624	NE¼,NW¼,NE¼, Section 32, T 139 N, R 41 W	
GW 003	Monitoring Well # 3 Unique Well # 495634	SE¼,NW¼,SE¼, Section 29, T 139 N, R 41 W	
GW 004	Monitoring Well # 4 Unique Well # 495622	SE¼,SW¼,NE¼, Section 29, T 139 N, R 41 W	
GW 005	Monitoring Well # 5 Unique Well # 495633	NE¼,SE¼,NE¼, Section 29, T 139 N, R 41 W	
GW 006	Monitoring Well # 6 Unique Well # 495632	NE¼,NE¼,SE¼, Section 29, T 139 N, R 41 W	
GW 007	Monitoring Well #7 Unique Well # 495623	SE¼,NE¼,SE¼, Section 29, T 139 N, R 41 W	
GW 008	Monitoring Well #8 Unique Well # 495625	SE¼,NW¼,SW¼, Section 28, T 139 N, R 41 W	
GW 009	Monitoring Well #9 Unique Well # 243503	NW¼,SW¼,SW¼, Section 28, T 139 N, R 41 W	
GW 010	Monitoring Well #10 Unique Well # 495631	NW¼,NW¼,NW¼, Section 33, T 139 N, R 41 W	
GW 011	Monitoring Well #11 Unique Well # 495635	NE¼,NW¼,NW¼, Section 33, T 139 N, R 41 W	
GW 012	Monitoring Well #12 Unique Well # 243493	NW¼,NW¼,NW¼, Section 33, T 139 N, R 41 W	
GW 013	Monitoring Well #13 Unique Well # 243495	SW¼,NW¼,NW¼, Section 33, T 139 N, R 41 W	

GW 014	Monitoring Well #14 Unique Well # 243508	SW¼,SW¼,NW¼, Section 33, T 139 N, R 41 W	
GW 015	Monitoring Well #15 Unique Well # 495627	NW¼,NE¼,SW¼, Section 33, T 139 N, R 41 W	

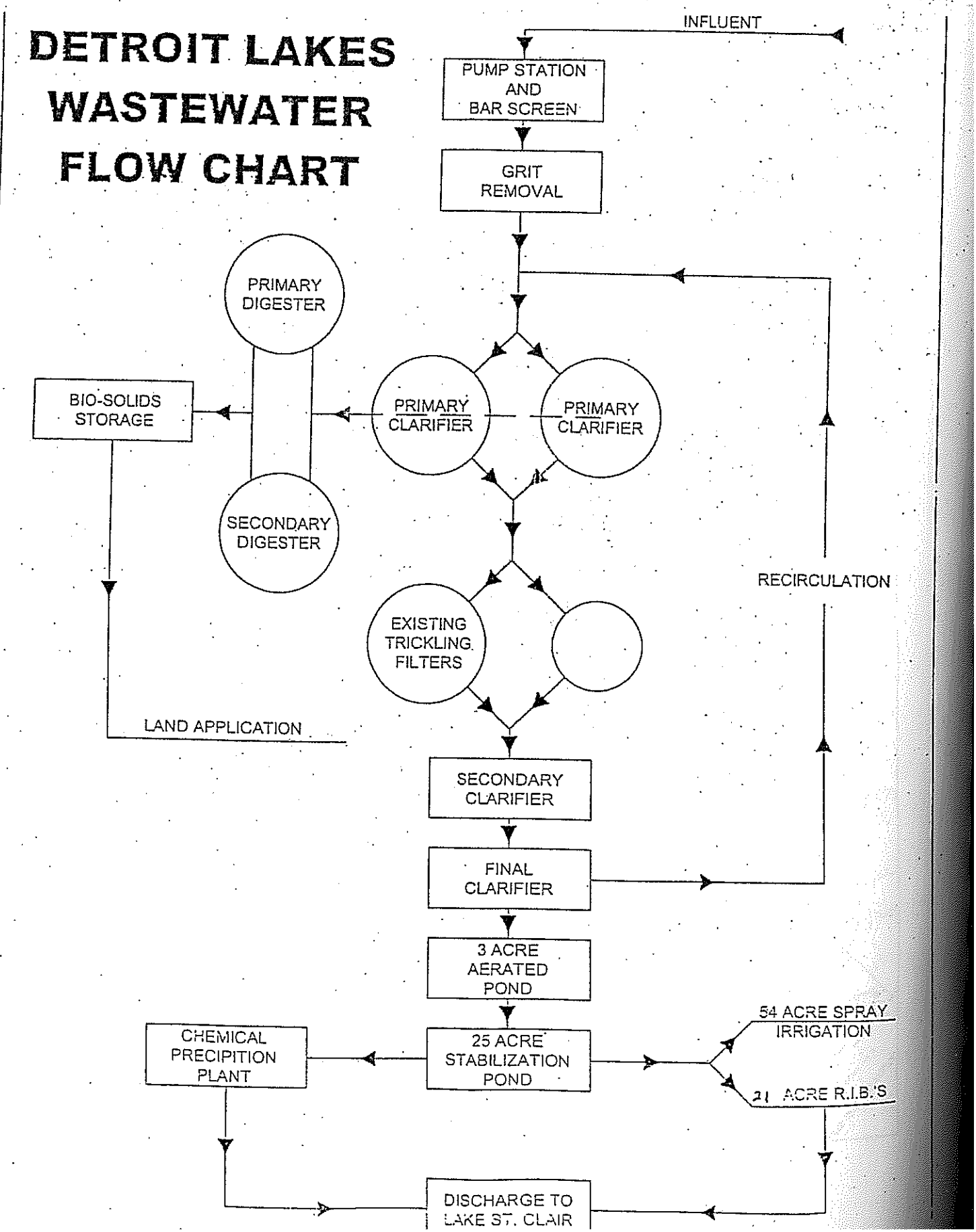
Facility Location



Facility Description



Flow Diagram



Summary of Stations

ound Water Stations

Station	Type of Station	Local Name
GW001	Well, Downgradient	MW-1
GW002	Well, Upgradient	MW-2
GW003	Well, Downgradient	MW-3
GW004	Well, Upgradient	MW-4
GW005	Well, Upgradient	MW-5
GW006	Well, Downgradient	MW-6
GW007	Well, Downgradient	MW-7
GW008	Well, Downgradient	MW-8
GW009	Well, Downgradient	MW-9
GW010	Well, Downgradient	MW-10
GW011	Well, Downgradient	MW-11
GW012	Well, Downgradient	MW-12
GW013	Well, Downgradient	MW-13
GW014	Well, Downgradient	MW-14
GW015	Well, Downgradient	MW-15

d Application Stations

Station	Type of Station	Local Name
A014	Spray Irrigation Site, Domestic	
A015	Spray Irrigation Site, Domestic	

face Discharge Stations

Station	Type of Station	Local Name
SD002	Effluent To Surface Water	Chem PPT Plant to Unnamed Wetland
D003	Effluent To Surface Water	Underdrains to Unnamed Wetland

Waste Stream Stations

Station	Type of Station	Local Name
WS002	Influent Waste	Influent Waste Stream
WS003	Intermediate: WW to Land	Stabilization Pond to Spray Irrig. Sites
WS004	Intermediate: WW to Land	Stabilization Ponds to RIBs
WS008	Intermediate: Biosolids to Land	Biosolids Production Site #1

Limits and Monitoring Requirements

The Permittee shall comply with the limits and monitoring requirements as specified below.

GW 001, GW 003, GW 006, GW 007, GW 008, GW 009, GW 010, GW 011

Parameter	Limit	Units	Limit Type	Effective Period	Sample Type	Frequency	Notes
Chloride, Total	250	mg/L	Instantaneous Maximum Intervention	Apr, Jul, Oct	Grab	1 x Month	
Elevation of GW Relative to Mean Sea Level	Monitor Only	feet	Single Value	Apr, Jul, Oct	Measurement, Instantaneous	1 x Month	
Nitrogen, Ammonia, Total (as N)	Monitor Only	mg/L	Single Value	Apr, Jul, Oct	Grab	1 x Month	
Nitrogen, Kjeldahl, Total	Monitor Only	mg/L	Single Value	Apr, Jul, Oct	Grab	1 x Month	
Nitrogen, Nitrate, Total (as N)	10	mg/L	Instantaneous Maximum Intervention	Apr, Jul, Oct	Grab	1 x Month	
pH, Field	Monitor Only	SU	Single Value	Apr, Jul, Oct	Grab	1 x Month	
Specific Conductance, Field	Monitor Only	umh/cm	Single Value	Apr, Jul, Oct	Grab	1 x Month	
Temperature, Water	Monitor Only	Deg C	Single Value	Apr, Jul, Oct	Grab	1 x Month	

GW 002, GW 004, GW 005

Parameter	Limit	Units	Limit Type	Effective Period	Sample Type	Frequency	Notes
Chloride, Total	Monitor Only	mg/L	Single Value	Apr, Jul, Oct	Grab	1 x Month	
Elevation of GW Relative to Mean Sea Level	Monitor Only	feet	Single Value	Apr, Jul, Oct	Measurement, Instantaneous	1 x Month	
Nitrogen, Ammonia, Total (as N)	Monitor Only	mg/L	Single Value	Apr, Jul, Oct	Grab	1 x Month	
Nitrogen, Kjeldahl, Total	Monitor Only	mg/L	Single Value	Apr, Jul, Oct	Grab	1 x Month	
Nitrogen, Nitrate, Total (as N)	Monitor Only	mg/L	Single Value	Apr, Jul, Oct	Grab	1 x Month	
pH, Field	Monitor Only	SU	Single Value	Apr, Jul, Oct	Grab	1 x Month	
Specific Conductance, Field	Monitor Only	umh/cm	Single Value	Apr, Jul, Oct	Grab	1 x Month	
Temperature, Water	Monitor Only	Deg C	Single Value	Apr, Jul, Oct	Grab	1 x Month	

GW 012, GW 013, GW 014, GW 015

Parameter	Limit	Units	Limit Type	Effective Period	Sample Type	Frequency	Notes
Chloride, Total	250	mg/L	Instantaneous Maximum Intervention	Apr, Jul, Oct	Grab	1 x Month	
Elevation of GW Relative to Mean Sea Level	Monitor Only	feet	Single Value	Apr, Jul, Oct	Measurement, Instantaneous	1 x Month	
Nitrogen, Ammonia, Total (as N)	Monitor Only	mg/L	Single Value	Apr, Jul, Oct	Grab	1 x Month	
Nitrogen, Kjeldahl, Total	Monitor Only	mg/L	Single Value	Apr, Jul, Oct	Grab	1 x Month	
Nitrogen, Nitrate, Total (as N)	10	mg/L	Instantaneous Maximum Intervention	Apr, Jul, Oct	Grab	1 x Month	
pH, Field	Monitor Only	SU	Single Value	Apr, Jul, Oct	Grab	1 x Month	
Phosphorus, Total (as P)	Monitor Only	mg/L	Single Value	Apr, Jul, Oct	Grab	1 x Month	15
Specific Conductance, Field	Monitor Only	umh/cm	Single Value	Apr, Jul, Oct	Grab	1 x Month	
Temperature, Water	Monitor Only	Deg C	Single Value	Apr, Jul, Oct	Grab	1 x Month	

Limits and Monitoring Requirements

The Permittee shall comply with the limits and monitoring requirements as specified below.

A 014 Spray Irr.

Parameter	Limit	Units	Limit Type	Effective Period	Sample Type	Frequency	Notes
a Of Disposal, Used	31.13	acres	Instantaneous Maximum	May-Oct	Estimate	1 x Month	13
rganic Matter, Total In Soil	Monitor Only	%	Single Value	Sep-Aug	Composite	.1 x Year	9
1 To 1 Soil To Water	Monitor Only	SU	Single Value	Sep-Aug	Composite	1 x Year	9
sphorus, BRAY PI Ext In Soil	Monitor Only	lb/acr	Single Value	Sep-Aug	Composite	1 x Year	9
assium, NH4AC, Ext In Soil	Monitor Only	lb/acr	Single Value	Sep-Aug	Composite	1 x Year	9
ific Conductance	Monitor Only	mmh/cm	Instantaneous Maximum	Sep-Aug	Composite	1 x Year	9

015 Spray Irr.

Parameter	Limit	Units	Limit Type	Effective Period	Sample Type	Frequency	Notes
rea Of Disposal, Used	22.84	acres	Instantaneous Maximum	May-Oct	Estimate	1 x Month	13
nic Matter, Total In Soil	Monitor Only	%	Single Value	Sep-Aug	Composite	1 x Year	9
H, 1 To 1 Soil To Water	Monitor Only	SU	Single Value	Sep-Aug	Composite	1 x Year	9
phorus, BRAY PI Ext In Soil	Monitor Only	lb/acr	Single Value	Sep-Aug	Composite	1 x Year	9
otassium, NH4AC, Ext In Soil	Monitor Only	lb/acr	Single Value	Sep-Aug	Composite	1 x Year	9
ific Conductance	Monitor Only	mmh/cm	Single Value	Sep-Aug	Composite	1 x Year	9

002 @Hem P. Discharge

Parameter	Limit	Units	Limit Type	Effective Period	Sample Type	Frequency	Notes
OD, Carbonaceous 05 Day (20 C)	227	kg/day	Calendar Month Average	Jan-Dec	Grab	3 x Week	
, Carbonaceous 05 Day (20 eg C)	20.0	mg/L	Calendar Month Average	Jan-Dec	Grab	3 x Week	
, Carbonaceous 05 Day (20 C)	340	kg/day	Maximum Calendar Week Average	Jan-Dec	Grab	3 x Week	
OD, Carbonaceous 05 Day (20 eg C)	30.0	mg/L	Maximum Calendar Week Average	Jan-Dec	Grab	3 x Week	
, Carbonaceous 05 Day (20 C) Percent Removal	85	%	Minimum Calendar Month Average	Jan-Dec	Calculation	3 x Week	
hlorine, Total Residual	Monitor Only	mg/L	Daily Maximum	Apr-Oct	Grab	1 x Day	2
Coliform, MPN or brane Filter 44.5C	200	#100ml	Calendar Month Geometric Mean	Apr-Oct	Grab	3 x Week	
low	Monitor Only	mgd	Calendar Month Average	Jan-Dec	Measurement, Continuous	1 x Day	
	Monitor Only	MG	Calendar Month Total	Jan-Dec	Measurement, Continuous	1 x Day	
ercury, Total (as Hg)	Monitor Only	ng/L	Single Value	Mar, Jun, Sep, Dec	Grab	1 x Month	14
gen, Ammonia, Total (as N)	Monitor Only	mg/L	Single Value	Jan-Dec	24-Hour Flow Composite	1 x Month	
xygen, Dissolved	Monitor Only	mg/L	Calendar Month Minimum	Jan-Dec	Grab	3 x Week	3
	9.0	SU	Calendar Month Maximum	Jan-Dec	Grab	3 x Week	1
	6.0	SU	Calendar Month Minimum	Jan-Dec	Grab	3 x Week	1

Limits and Monitoring Requirements

The Permittee shall comply with the limits and monitoring requirements as specified below.

SD 002 Chem P. Londo

Parameter	Limit	Units	Limit Type	Effective Period	Sample Type	Frequency	Notes
hosphorus, Total (as P)	6.2	kg/day	Calendar Month Average	Jan-Dec	Grab	3 x Week	
hosphorus, Total (as P)	1	mg/L	Calendar Month Average	Jan-Dec	Grab	3 x Week	
olids, Total Suspended (TSS)	227	kg/day	Calendar Month Average	Jan-Dec	Grab	3 x Week	
olids, Total Suspended (TSS)	20.0	mg/L	Calendar Month Average	Jan-Dec	Grab	3 x Week	
olids, Total Suspended (TSS)	340	kg/day	Maximum Calendar Week Average	Jan-Dec	Grab	3 x Week	
olids, Total Suspended (TSS)	30.0	mg/L	Maximum Calendar Week Average	Jan-Dec	Grab	3 x Week	
olids, Total Suspended (TSS) ercent Removal	85	%	Minimum Calendar Month Average	Oct-Apr	Calculation	3 x Week	

SD 003 RIB Discharge

Parameter	Limit	Units	Limit Type	Effective Period	Sample Type	Frequency	Notes
BOD, Carbonaceous 05 Day (20 Deg C)	227	kg/day	Calendar Month Average	Apr-Dec	Grab	3 x Week	10
BOD, Carbonaceous 05 Day (20 Deg C)	20	mg/L	Calendar Month Average	Apr-Dec	Grab	3 x Week	10
BOD, Carbonaceous 05 Day (20 Deg C)	340	kg/day	Maximum Calendar Week Average	Apr-Dec	Grab	3 x Week	10
BOD, Carbonaceous 05 Day (20 Deg C)	30	mg/L	Maximum Calendar Week Average	Apr-Dec	Grab	3 x Week	10
Chlorine, Total Residual	Monitor Only	mg/L	Daily Maximum	Apr-Oct	Grab	1 x Day	10
Fecal Coliform, MPN or Membrane Filter 44.5C	200	#100ml	Calendar Month Geometric Mean	Apr-Oct	Grab	3 x Week	10
Mercury, Total (as Hg)	Monitor Only	ng/L	Single Value	Mar, Jun, Sep, Dec	Grab	1 x Month	14
Oxygen, Dissolved	Monitor Only	mg/L	Calendar Month Minimum	Apr-Dec	Grab	3 x Week	11
pH	9.0	SU	Calendar Month Maximum	Apr-Dec	Grab	3 x Week	11
pH	6.0	SU	Calendar Month Minimum	Apr-Dec	Grab	3 x Week	11
Phosphorus, Total (as P)	11.0	kg/day	Calendar Month Average	Apr-Dec	Grab	3 x Week	10
Phosphorus, Total (as P)	1.0	mg/L	Calendar Month Average	Apr-Dec	Grab	3 x Week	10
Solids, Total Suspended (TSS)	227	kg/day	Calendar Month Average	Apr-Dec	Grab	3 x Week	10
Solids, Total Suspended (TSS)	20	mg/L	Calendar Month Average	Apr-Dec	Grab	3 x Week	10
Solids, Total Suspended (TSS)	340	kg/day	Maximum Calendar Week Average	Apr-Dec	Grab	3 x Week	10
Solids, Total Suspended (TSS)	30	mg/L	Maximum Calendar Week Average	Apr-Dec	Grab	3 x Week	10

WS 002 Ins,

Parameter	Limit	Units	Limit Type	Effective Period	Sample Type	Frequency	Notes
BOD, Carbonaceous 05 Day (20 Deg C)	Monitor Only	mg/L	Calendar Month Average	Jan-Dec	24-Hour Flow Composite	3 x Week	
BOD, Carbonaceous 05 Day (20 Deg C)	Monitor Only	mg/L	Calendar Month Maximum	Jan-Dec	24-Hour Flow Composite	3 x Week	
Flow	Monitor Only	mgd	Calendar Month Average	Jan-Dec	Measurement, Continuous	1 x Day	

Limits and Monitoring Requirements

The Permittee shall comply with the limits and monitoring requirements as specified below.

VS 002

Parameter	Limit	Units	Limit Type	Effective Period	Sample Type	Frequency	Notes
	Monitor Only	mgd	Calendar Month Minimum	Jan-Dec	Measurement, Continuous	1 x Day	
low	Monitor Only	mgd	Calendar Month Total	Jan-Dec	Measurement, Continuous	1 x Day	
H	Monitor Only	SU	Calendar Month Maximum	Jan-Dec	Grab	3 x Week	1
	Monitor Only	SU	Calendar Month Minimum	Jan-Dec	Grab	3 x Week	1
hosphorus, Total (as P)	Monitor Only	mg/L	Calendar Month Average	Jan-Dec	24-Hour Flow Composite	1 x Week	
ipitation	Monitor Only	in	Calendar Month Total	Jan-Dec	Measurement	1 x Day	
olids, Total Suspended (TSS)	Monitor Only	mg/L	Calendar Month Average	Jan-Dec	24-Hour Flow Composite	3 x Week	
s, Total Suspended (TSS)	Monitor Only	mg/L	Calendar Month Maximum	Jan-Dec	24-Hour Flow Composite	3 x Week	

J03 Spond to Spray Irr.

Parameter	Limit	Units	Limit Type	Effective Period	Sample Type	Frequency	Notes
hlorine, Total Residual	Monitor Only	mg/L	Daily Maximum	May-Oct	Grab	1 x Day	7
Coliform, MPN or embrane Filter 44.5C	Monitor Only	#100ml	Single Value	May-Oct	Grab	1 x Month	7
low	Monitor Only	mgd	Calendar Month Average	May-Oct	Measurement, Continuous	1 x Day	6
	Monitor Only	mgd	Calendar Month Maximum	May-Oct	Measurement, Continuous	1 x Day	6
low	Monitor Only	MG	Calendar Month Total	May-Oct	Measurement, Continuous	1 x Day	6
	130	MG	Calendar Year To Date Total	Oct	Measurement, Continuous	1 x Day	5
e Plus Nitrate, Total (as N)	Monitor Only	mg/L	Single Value	May-Oct	Grab	1 x Month	7
itrogen, Ammonia, Total (as N)	Monitor Only	mg/L	Single Value	May-Oct	Grab	1 x Month	7
gen, Kjeldahl, Total	Monitor Only	mg/L	Single Value	May-Oct	Grab	1 x Month	7
hosphorus, Total (as P)	Monitor Only	mg/L	Single Value	May-Oct	Grab	1 x Month	7

VS 004 Spond to RIB's

Parameter	Limit	Units	Limit Type	Effective Period	Sample Type	Frequency	Notes
	Monitor Only	mgd	Calendar Month Average	Apr-Dec	Measurement, Continuous	1 x Day	8
low	Monitor Only	mgd	Calendar Month Maximum	Apr-Dec	Measurement, Continuous	1 x Day	8
	Monitor Only	MG	Calendar Month Total	Apr-Dec	Measurement, Continuous	1 x Day	8
low	Monitor Only	MG	Calendar Year To Date Total	Dec	Measurement, Continuous	1 x Day	4
e Plus Nitrate, Total (as N)	Monitor Only	mg/L	Single Value	Apr-Dec	Grab	1 x Month	8
itrogen, Ammonia, Total (as N)	Monitor Only	mg/L	Single Value	Apr-Dec	Grab	1 x Month	8
gen, Kjeldahl, Total	Monitor Only	mg/L	Single Value	Apr-Dec	Grab	1 x Month	8

Limits and Monitoring Requirements

The Permittee shall comply with the limits and monitoring requirements as specified below.

WS 008

Parameter	Limit	Units	Limit Type	Effective Period	Sample Type	Frequency	Notes
Arsenic, Total, Dry Weight	75	mg/kg	Crop Year Maximum	Sep-Aug	Composite	1 x Year	12
Cadmium, Total, Dry Weight, (as Cd)	85	mg/kg	Crop Year Maximum	Sep-Aug	Composite	1 x Year	12
Copper, Total, Dry Weight, (as Cu)	4300	mg/kg	Crop Year Maximum	Sep-Aug	Composite	1 x Year	12
Lead, Total, Dry Weight (as Pb)	840	mg/kg	Crop Year Maximum	Sep-Aug	Composite	1 x Year	12
Mercury, Total, Dry Weight, (as Hg)	57	mg/kg	Crop Year Maximum	Sep-Aug	Composite	1 x Year	12
Molybdenum, Total, Dry Weight (as Mo)	75	mg/kg	Crop Year Maximum	Sep-Aug	Composite	1 x Year	12
Nickel, Total, Dry Weight, (as Ni)	420	mg/kg	Crop Year Maximum	Sep-Aug	Composite	1 x Year	12
Nitrogen, Ammonia, Dry Weight	Monitor Only	%	Single Value	Sep-Aug	Composite	1 x Year	
Nitrogen, Kjeldahl, Total, Solid Fraction, Dry Weight	Monitor Only	%	Single Value	Sep-Aug	Composite	1 x Year	
pH, Sludge	Monitor Only	SU	Single Value	Sep-Aug	Composite	1 x Year	
Phosphorus, Total, Dry Weight (as P)	Monitor Only	%	Single Value	Sep-Aug	Composite	1 x Year	
Potassium, Total, Dry Weight (as K)	Monitor Only	%	Single Value	Sep-Aug	Composite	1 x Year	
Selenium, Total, Dry Weight (as Se)	100	mg/kg	Crop Year Maximum	Sep-Aug	Composite	1 x Year	12
Solids, Total	Monitor Only	%	Single Value	Sep-Aug	Composite	1 x Year	
Solids, Total Volatile, Percent of Total	Monitor Only	%	Single Value	Sep-Aug	Composite	1 x Year	
Zinc, Total, Dry Weight, (as Zn)	7500	mg/kg	Crop Year Maximum	Sep-Aug	Composite	1 x Year	12

Limits and Monitoring Requirements

The Permittee shall comply with the limits and monitoring requirements as specified below.

lotes:
-- Analyze immediately.
Analyze immediately. Applicable whenever chlorine is added.
Analze immediately.
-- Report on the December DMR.
-- Report total flow on the October DMR.
Required only during periods of discharge to the irrigation site. "No Discharge" should be noted otherwise.
Required only during periods of discharge to the irrigation site. "No Discharge" should be noted otherwise. Sample should be representative of otal flow to the irrigation site.
-- Required only during periods of discharge. "No discharge" should be noted on the DMR during other times.
Sample before irrigation or application of commercial or other supplement fertilizer. The composite shall consist of a mixture of 15-20 subsamples n from 0 to 8-inches core. At least one composite sample shall be collected for each 40 acres.
0 -- Sample must be collected in manhole
1 -- Sample must be collected in manhole and analyze immediately
See Tables 3 and 4 in the Monitoring Requirements Section of the Domestic Biosolids, SDS chapter of this permit of further instructions about ar pling frequencies.
3 -- The Permittee is authorized to discharge to the spray irrigation sites from May 15 to October 31 of each year.
The Permittee is required to use EPA Method 1631, Revision B, with Clean techniques Method 1669. Should another mercury analytical method proved by the U.S. Environmental Protection Agency that has a reportable quantitation level that allows for low-level effluent characterization, ermittee is authorized to use that method. Minimum quarterly for the life of the permit.
5 -- The Permittee shall monitor for total phosphorus only in ground water monitoring wells numbers 12, 13, 14, and 15.

Chapter 1. Ground Water Station Requirements - General

1. Lysimeters

1.1 "Lysimeters" shall be evacuated once, one to two days before sampling.

2. Monitoring Wells

2.1 The Permittee shall install, maintain and abandon ground water monitoring wells according to the Minnesota Water Well Construction Code, Minnesota Rules, ch. 4725. Damaged or improperly constructed monitoring wells shall be repaired or properly abandoned and replaced. Information on licensed water well contractors is available from the Minnesota Department of Health.

2.2 The Permittee shall submit a detailed monitoring well log for each monitoring well at the facility and a detailed US Geological Survey topographical map identifying the location of each well.

2.3 Each monitoring well shall be clearly numbered on the outside of the well with either indelible paint or an inscribed number.

2.4 The monitoring wells shall be sampled in accordance with "Minnesota Pollution Control Agency, Water Quality Division: Sampling Protocol for Ground Water Monitoring Wells, July 1997," Triplett, et. al. Copies of this publication are available on the internet at http://www.pca.state.mn.us/water/groundwater/wqsampling.html or may be obtained from the MPCA by calling (651)296-7162.

Chapter 2. Land Application Station Requirements - General

1. Compliance Schedule

1.1 Submit a report by December 31, 2003. Submit an Option Evaluation Report should include, but not limited to: an assessment of options to reduce loading rates at the current spray irrigation site, including the acquisition of more spray irrigation acreage.

1.2 Submit a progress report by October 31, 2004. The goal of the Final Progress and Recommendation Report is to present the conclusion of the spray irrigation evaluation so that plans and specifications for any modifications or upgrades (such as the acquisition of additional acreage), if needed, can be included with the application for reissuance of the permit required by Chapter 8.17, and can be revieved and approved, as needed, for incorporation into the next reissuance of this permit.

2. Sampling Location

2.1 Soil samples for Station LA014 and LA015 shall be taken at the spray irrigation sites.

3. Soil Samples

3.1 Soil samples shall be taken in the spring before the first irrigation and before the first application of commercial or other supplemental fertilizer for that year.

Chapter 2. Land Application Station Requirements - General

3. Soil Samples

3.2 Soil samples shall be a composite of a mixture of 15 to 20 equally proportioned subsamples taken from a 0- to 8-inch core. At least one composite sample shall be collected for each 40 acres on the permitted land application site.

4. Application Rates

4.1 Application rates to the land application sites (LA 14 and LA 15) is based on flow limit of WS 003 (130 MG) total until expiration of permit.

4.2 Nitrogen land application applies to the sum of all sources of nitrogen applied to a permitted application site.

4.3 If nitrogen is applied to a permitted land application site from other sources including commercial fertilizer, manure, silage, sewage or wastewater treatment solids and sludges, then these other nitrogen sources shall be included in the sum of nitrogen or sodium applied to determine compliance with application rate limits at that site.

4.4 The nitrogen application rate shall be calculated as the sum of the total annual mass Kjeldahl nitrogen and nitrate-plus-nitrite nitrogen applied to the site, divided by the acreage of the site.

Chapter 3. Surface Discharge Station Requirements - General

1. Sampling Location

1.1 Samples for Station SD002 shall be taken at chemical precipitation plant.

1.2 Samples for Station SD 003 shall be taken at the manhole structure located on the northside of Long Lake Road.

2. Surface Discharges

2.1 Floating solids or visible foam shall not be discharged in other than trace amounts.

2.2 Oil or other substances shall not be discharged in amounts that create a visible color film.

2.3 The Permittee shall install and maintain outlet protection measures at the discharge stations to prevent erosion.

3. Discharge Monitoring Reports

3.1 The Permittee shall submit monitoring results for discharges in accordance with the limits and monitoring requirements for these stations. If no discharge occurred during the reporting period, the Permittee shall check the "No Discharge" box on the Discharge Monitoring Report (DMR).

Chapter 3. Surface Discharge Station Requirements - General

4. Priority Pollutants - Monitoring Requirements

4.1 The Permittee shall monitor the effluent for the following specified priority pollutants. Monitoring shall be for the organic priority pollutants identified under the acid, base/neutral and pesticide fractions using EPA methods 625 and 608 (40 CFR Part 136, October 25, 1984) as listed in Table II of 40 CFR Part 122, Appendix D.

The following priority pollutant total metals shall also be monitored using either EPA method 200.7 or EPA method 200.8 or their corresponding graphite furnace methods found in Table IB of 40 CFR 136: cadmium, chromium, copper, lead, nickel and zinc.

4.2 Submit the results of the first priority pollutant sampling event by November 21, 2002.

4.3 Submit the results of the second priority pollutant sampling event by November 21, 2003.

4.4 Submit the results of the third or final sampling event with the application for permit reissuance 180 days prior to the expiration date of the permit.

5. Chronic Toxicity Testing

5.1 The Permittee shall conduct a series of five (5) chronic toxicity test batteries at Station SD002 within the five-year term of the permit. Sampling for individual test batteries shall not be less than one (1) year apart and shall be performed each full year following permit issuance.

5.2 The results of the final test battery shall be submitted with the application for permit reissuance 180 days prior to the expiration date of the permit.

6. Chronic Toxicity Testing - Species and Procedural Requirements

6.1 Tests shall be conducted in accordance with procedures outlined in EPA-600/4-91-002 "Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms" (Chronic Manual), any revisions to the Manual, and "MPCA Toxicity Test Procedures and Test Conditions for NPDES Permits."

6.2 Test organisms for each test battery shall include the fathead minnow (Pimephales promelas) and Ceriodaphnia dubia.

6.3 Static renewal chronic serial dilution tests of the effluent shall consist of a control, 6, 12, 25, 50 and 100% effluent. At a zero 7Q10 the Receiving Water Concentration (RWC) is 100% effluent.

6.4 All samples collected of the effluent shall be flow proportioned, 24-hour composites with test solutions renewed daily from fresh composite. Testing of the effluent shall begin within 36 hours of sample collection. Receiving water collected outside of the influence of discharge shall be used for dilution and controls.

Chapter 3. Surface Discharge Station Requirements - General

6. Chronic Toxicity Testing - Species and Procedural Requirements

6.5 Any other circumstances not covered in Chapter 2, part 6 and listed exceptions, or that require deviation from which is specified in Chapter 2, part 6 and listed exceptions shall first be approved by the MPCA.

7. Chronic Toxicity Testing - Quality Control and Report Submittals

7.1 Any test that does not meet quality control measures, or results which the Permittee believes reflect an artifact of testing shall be repeated within two (2) weeks. Individual test battery results shall be submitted within 30 days of test completion. These reports shall contain information consistent with the report preparation section of the Chronic Manual. The MPCA shall make the final determination regarding test validity.

Chapter 4. Waste Stream Station Requirements - General

1. Sampling Location

1.1 Grab samples shall be collected at a point representative of total flow to the system.

1.2 Samples for Station WS 002 shall be taken at a point representative of the influent waste flow that enters the wastewater treatment system.

1.3 Samples for Station WS 003 shall be taken at a point representative of the effluent flow from the stabilization ponds to the spray irrigation sites.

1.4 Samples for Station WS 004 shall be taken at a point representative of the effluent flow from the stabilization ponds tot he rapid infiltration basins.

1.5 Samples for Station WS 008 shall be taken at a point representative of the intermediate Biosolids waste.

2. Sampling Frequency

2.1 Sampling is required only during periods of discharge to the irrigation sites. If there is no discharge during the reporting period, the Permittee shall check the "No Discharge" box on the Discharge Monitoring Report (DMR).

2.2 Sampling is required only during periods of discharge to the Rapid Infiltration Basins. If there is no discharge during the reporting period, the Permittee shall check the "No Discharge" box on the Discharge Monitoring Report (DMR).

Chapter 5. Station Requirements - Specific

1. Ground Water Stations

1.1 GW 001, GW 002, GW 003, GW 004, GW 005, GW 006, GW 007, GW 008, GW 009, GW 010, GW 011, GW 012, GW 013, GW 014, GW 015: Submit a monthly DMR monthly by 21 days after the end of each calendar month following permit issuance. Monitoring and report is only due in the months of April, July and October.

2. Land Application Stations

2.1 LA 014, LA 015: Submit a monthly DMR monthly by 21 days after end of each calendar month following permit issuance.

3. Surface Discharge Stations

3.1 SD 002: Monitoring for Mercury shall take place, during any quarter that discharge occurs from the chemical precipitation plant, to the peat absoprtion area.

3.2 SD 002: Quarterly monitoring for Mercury shall begin at the first full calendar quarter following permit reissuances.

3.3 SD 002, SD 003: Submit a monthly DMR monthly by 21 days after the end of each calendar month following permit issuance.

3.4 SD 003: Monitoring for Mercury shall take place, during any quarter that discharge occurs from the RIBs, to the peat absorption area, and during the allowed discharged period.

3.5 SD 003: Quarterly monitoring for Mercury shall begin at the first full calendar quarter following permit reissuances.

4. Waste Stream Stations

4.1 WS 002, WS 003, WS 004: Submit a monthly DMR monthly by 21 days after the end of each calendar month following permit issuance.

Chapter 6. Domestic Wastewater, POTW, NPDES/SDS

1. Authorization

1.1 This permit authorizes the Permittee to treat and dispose of domestic wastewater in accordance with the provisions in this chapter.

1.2 25-acre stabilization pond is an intermediate treatment pond and does not have direct discharge. Discharge is monitored at either Stations WS 003, WS 004, SD 002 or SD 003.

Chapter 6. Domestic Wastewater, POTW, NPDES/SDS

2. Ponds - Observations

2.1 The Permittee shall inspect the pond system weekly, and shall take measurements of pond water depth, estimate the coverage of aquatic plants, floating mats and ice cover on the surface of the ponds, and note odors, the condition of the dikes and the presence of muskrats. The Permittee shall maintain records of these weekly inspections for the last three (3) years, and submit the results on the Discharge Monitoring Report (DMR) supplemental form.

2.2 The Permittee shall maintain daily precipitation records.

3. Permit Violations

3.1 The following shall be considered violations of the terms of this permit:

a. Exceedances of the effluent limitations at Station SD002.

b. Exceedances of the effluent limitations at Station SD003.

c. Discharge to an ice covered receiving water.

d. Discharge to a receiving water outside of the acceptable discharge periods where adequate dilution ratios are not met.

4. Sanitary Sewer Extension Permit

4.1 The Permittee is required to obtain a Sanitary Sewer Extension Permit from the MPCA prior to the start of construction of any addition, extension or replacement to the sanitary sewer.

5. Operator Certification

5.1 The Permittee shall provide a Class A state certified operator who is in direct responsible charge of the operation, maintenance and testing functions required to ensure compliance with the terms and conditions of this permit. (Minnesota Statutes, section 115.72)

5.2 The Permittee shall provide the appropriate number of operators with a Type IV certification to be responsible for the land application of biosolids or semisolids from commercial or industrial operations. (Minnesota Rules, pt. 7048.0500)

5.3 If the Permittee chooses to meet operator certification requirements through a contractual agreement, the Permittee shall provide a copy of the contract to the MPCA. The contract shall include the certified operator's name, certificate number, company name if appropriate, and evidence that the operation is being adequately supervised by a properly certified operator.

5.4 The Permittee shall notify the MPCA within 30 days of a change in operator certification or contract status.

Chapter 6. Domestic Wastewater, POTW, NPDES/SDS

6. Pretreatment - Definitions

6.1 An "Individual Control Mechanism" is a document, such as an agreement or permit, that imposes limitations or requirements on an individual industrial user of the POTW.

6.2 "Significant Industrial User" (SIU) means any industrial user that:

a. discharges 25,000 gallons per day or more of process wastewater;

b. contributes a load of five (5) % or more of the capacity of the POTW; or

c. is designated as significant by the Permittee or the MPCA on the basis that the SIU has a reasonable potential to adversely impact the POTW, or the quality of its effluent or residuals.

7. Pretreatment - Permittee Responsibility to Control Users

7.1 It is the Permittee's responsibility to regulate the discharge from users of its wastewater treatment facility. The Permittee shall prevent any pass through of pollutants or any inhibition or disruption of the Permittee's facility, its treatment processes, or its sludge processes or disposal that contribute to the violation of the conditions of this permit or any federal, state, or local law or regulation.

7.2 The Permittee shall prohibit the discharge of the following to its wastewater treatment facility:

a. pollutants which create a fire or explosion hazard, including any discharge with a flash point less than 60 degrees C (140 degrees F);

b. pollutants which would cause corrosive structural damage, including any waste stream with a pH of less than 5.0;

c. solid or viscous pollutants which would obstruct flow;

d. heat that would inhibit biological activity, including any discharge that would cause the temperature of the waste stream at the POTW to exceed 40 degrees C (104 degrees F);

e. pollutants which produce toxic gases, vapors, or fumes that may endanger the health or safety of workers; or

f. new sources of non-contact cooling waters, unless there are no cost-effective alternatives.

7.3 The Permittee shall prohibit new discharges of non-contact cooling waters unless there is no cost effective alternative. Existing discharges of non-contact cooling water to the Permittee's wastewater treatment facility shall be eliminated, where elimination is cost-effective, or where an infiltration/inflow analysis and sewer system evaluation survey indicates the need for such removal.

Chapter 6. Domestic Wastewater, POTW, NPDES/SDS

7. Pretreatment - Permittee Responsibility to Control Users

7.4 If the Permittee accepts trucked-in wastes, the Permittee shall evaluate the trucked in wastes prior to acceptance in the same manner as it monitors sewered wastes. The Permittee shall accept trucked-in wastes only at specifically designated points.

8. Control of Significant Industrial Users

8.1 The Permittee shall impose pretreatment requirements on SIUs which will ensure compliance with all applicable effluent limitations and other requirements set forth in this permit, or any applicable federal, state, or local law or regulation. These requirements shall be applied to SIUs by means of an individual control mechanism.

8.2 The Permittee shall make no agreement with any user that would allow the user to contribute an amount or strength of wastewater that would cause violation of any limitation or requirement in the permit, or any applicable federal, state or local law or regulation..

9. Monitoring of Significant Industrial Users

9.1 The Permittee shall obtain from SIUs specific information on the quality and quantity of the SIU's discharges to the Permittee's POTW. Except where specifically requested by the Permittee and approved by the MPCA, this information shall be obtained by means of representative monitoring conducted by the Permittee or by the SIU under requirements imposed by the Permittee in the SIU's individual control mechanism. Monitoring performed to comply with this requirement shall include all pollutants for which the SIU is significant and shall be done at a frequency commensurate with the significance of the SIU.

Chapter 6. Domestic Wastewater, POTW, NPDES/SDS

10. Reporting and Notification

10.1 If a SIU discharges to the POTW during a given calendar year, the Permittee shall submit a Pretreatment Annual Report for that calendar year, due by January 31 of the following year. The Pretreatment Annual Report shall include:

a. the name, address, and telephone number of the Permittee's primary pretreatment contact, and the names and phone numbers of any other individuals who should be contacted regarding aspects of the pretreatment program;

b. a description of changes or proposed changes in the Permittee's pretreatment program, including changes to its legal authority (sewer use ordinance), Industrial User Individual Control Mechanisms, or pretreatment program procedures;

c. an updated listing of the Permittee's SIUs with additions and deletions noted and reasons given for deletions;

d. a summary of monitoring data for SIUs, including all industrial self monitoring and all monitoring of industrial users by the Permittee;

e. a summary of all inspections of industrial users performed by the Permittee, violations by industrial users of any requirements imposed by the Permittee, and enforcement actions taken against industrial users by the Permittee; and

f. a description of any interferences, upsets or operational problems at the facility, and any increased or unusual levels of pollutants discharged or contained in sludge. The description shall include an evaluation of possible causes and an assessment of the effectiveness of the pretreatment program in preventing interference, pass-through of pollutants, and contamination of sludge.

10.2 The Permittee shall notify the MPCA in writing of any:

a. SIU of the Permittee's POTW which has not been previously disclosed to the MPCA;

b. anticipated or actual changes in the volume or quality of discharge by an industrial user that could result in the industrial user becoming an SIU as defined in this chapter; or

c. anticipated or actual changes in the volume or quality of discharges by a SIU that would require changes to the SIU's individual control mechanism.

This notification shall be submitted as soon as possible and, where changes are proposed, must be submitted prior to changes being made.

apter 6. Domestic Wastewater, POTW, NPDES/SDS

. Reporting and Notification

10.3 Upon notifying the MPCA of a SIU or change in a SIU discharge as required above, the Permittee shall submit the following for approval:

a. the control mechanism that will be used to control the SIU;

b. a characterization of the SIU's discharge;

c. a load balance for all pollutants for which the SIU is significant, showing the derivation of the limits to be applied to the SIU and the loading to the treatment works by the SIU and other users of the treatment works; and

d. a plan for monitoring the SIU which is consistent with monitoring requirements in this chapter.

10.4 In addition, the Permittee shall, upon request, submit the following to the MPCA for approval:

a. the Permittee's legal authority to be used for regulating the SIU; and

b. the Permittee's procedures for enforcing the requirements imposed on the SIU.

10.5 This permit may be modified in accordance with Minnesota Rules, ch. 7001 to require development of a pretreatment program approvable under the Federal General Pretreatment Regulation (40 CFR 403).

Chapter 7. Domestic Biosolids, SDS

1. Authorization

1.1 This permit authorizes the Permittee to store and land apply domestic wastewater treatment biosolids in accordance with the provisions in this chapter and Minnesota Rules, ch. 7041.

1.2 Permittees who prepare bulk biosolids must obtain approval of the sites on which bulk biosolids are applied before they are applied unless they are exceptional quality biosolids. Site application procedures are set forth in Minnesota Rules, pt. 7041.0800.

2. Notification

2.1 The Permittee shall provide information needed to comply with the biosolids requirements of Minnesota Rules, ch. 7041 to others who prepare or use the biosolids.

Chapter 7. Domestic Biosolids, SDS

3. Pollutant Limits

3.1 Biosolids which are applied to the land must not exceed the ceiling concentrations in Table 1 and must not be applied so that the cumulative amounts of pollutant in Table 2 are exceeded.

Table 1 Ceiling Concentrations

Arsenic - 75 mg/kg
Cadmium - 85 mg/kg
Copper - 4300 mg/kg
Lead - 840 mg/kg
Mercury - 57 mg/kg
Molybdenum - 75 mg/kg
Nickel - 420 mg/kg
Selenium - 100 mg/kg
Zinc - 7500 mg/kg

Table 2 Cumulative Limits

Arsenic - 37 lbs/acre
Cadmium - 35 lbs/acre
Copper - 1339 lbs/acre
Lead - 268 lbs/acre
Mercury - 15 lbs/acre
Molybdenum - not established*
Nickel - 375 lbs/acre
Selenium - 89 lbs/acre
Zinc - 2500 lbs/acre

*The cumulative limit for molybdenum has not been established at the time of permit issuance

4. Pathogen and Vector Attraction Reduction

4.1 Biosolids shall be processed, treated, or be incorporated or injected into the soil to meet one of the vector attraction reduction requirements in Minnesota Rules, pt. 7041.1400.

4.2 Biosolids shall be processed or treated by one of the alternatives in Minnesota Rules, pt. 7041.1300 to meet the Class B standards for the reduction of pathogens. When Class B biosolids are applied to the land, the site restrictions in Minnesota Rules, pt. 7041.1300 must also be met.

Chapter 7. Domestic Biosolids, SDS

4. Pathogen and Vector Attraction Reduction

4.3 The minimum duration between application and harvest, grazing or public access to areas where Class B biosolids have been applied to the land is as follows:

a. 14 months for food crops whose harvested parts may touch the soil/biosolids mixture (such as melons, squash, tomatoes, etc.), when biosolids are surface applied, incorporated or injected.

b. 20 months or 38 months depending on the application method for food crops whose harvested parts grow in the soil (such as potatoes, carrots, onions, etc.). The 20 month time period is required when biosolids are surface applied or surface applied and incorporated after they have been on the soil surface for at least four (4) months. The 38 month time period is required when the biosolids are injected or surface applied and incorporated within four (4) months of application.

c. 30 days for feed crops, other food crops (such as field corn, sweet corn, etc.), hay or fiber crops when biosolids are surface applied, incorporated or injected.

d. 30 days for grazing of animals when biosolids are surface applied, incorporated or injected.

e. One year where there is a high potential for public contact with the site, (such as a reclamation site located in populated areas, a construction site located in a city, turf farms, plant nurseries, etc.) and 30 days where there is low potential for public contact (such as agricultural land, forest, a reclamation site located in an unpopulated area, etc.) when biosolids are surface applied, incorporated, or injected.

5. Management Practices

5.1 The management practices for the land application of biosolids are described in detail in Minnesota Rules, pt. 7041.1200 and must be followed unless specified otherwise in a site approval letter or a permit issued by the MPCA.

5.2 Overall management requirements:

a. Biosolids must not be applied to the land if it is likely to adversely affect a threatened or endangered species listed under Section 4 of the Endangered Species Act or its designated critical habitat.

b. Biosolids must not be applied to flooded, frozen or snow covered ground so that the biosolids enter wetlands or other waters of the state.

c. Biosolids must be applied at an agronomic rate unless specified otherwise by the MPCA in a permit.

d. Biosolids shall not be applied within 33 feet of a wetland or waters of the state unless specified otherwise by the MPCA in a permit.

Chapter 7. Domestic Biosolids, SDS

6. Monitoring Requirements

6.1 Representative samples of biosolids applied to the land must be analyzed for the following parameters: arsenic, cadmium, copper, lead, mercury, molybdenum, nickel, selenium, zinc, Kjeldahl nitrogen, ammonia nitrogen, total solids, volatile solids, phosphorus, potassium and pH.

6.2 At a minimum, biosolids must be monitored at the frequencies specified in Table 3 for the parameters listed above, and any pathogen or vector attraction reduction requirements in Minnesota Rules, pts. 7041.1300 and 7041.1400 if used to determine compliance with those parts.

Table 3 Minimum Sampling Frequencies

Biosolids Applied* (metric tons/365-day period)	Biosolids Applied* (tons/365-day period)	Frequency (times/365-day period)
>0 but <290	>0 but <320	1
>=290 but <1,500	>=320 but <1,650	4
>=1,500 but <15,000	>=1,650 but <16,500	6
>=15,000	>=16,500	12

* Either the amount of bulk biosolids applied to the land or the amount of biosolids received by a person who prepares biosolids that are sold or given away in a bag or other container for application to the land (dry weight basis).

6.3 Increased sampling frequencies are specified for the parameters listed in Table 4. Sampling at a frequency at least twice the minimum frequencies listed in Table 3 is required if concentrations listed in Table 4 are exceeded (based on the average of all analyses made during the previous cropping year).

Table 4 Increased Frequency of Sampling

Arsenic - 38 mg/kg of dry weight
Cadmium - 43 mg/kg of dry weight
Copper - 2150 mg/kg of dry weight
Lead - 420 mg/kg of dry weight
Mercury - 28 mg/kg of dry weight
Molybdenum - 38 mg/kg of dry weight
Nickel - 210 mg/kg of dry weight
Selenium - 50 mg/kg of dry weight
Zinc - 3750 mg/kg of dry weight

7. Records

7.1 The Permittee shall keep records of the information necessary to show compliance with pollutant concentrations and loadings, pathogen reduction requirements, vector attraction reduction requirements and management practices as specified in Minnesota Rules, pt. 7041.1600, subp. 3.

Chapter 7. Domestic Biosolids, SDS

8. Reporting Requirements

8.1 By December 31 following the end of each cropping year, submit a Biosolids Annual Report for the land application of biosolids on a form provided by or approved by the MPCA. The report shall include the requirements in Minnesota Rules, part 7041.1700. Submit the report to:

Biosolids Coordinator
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, Minnesota 55155-4194

8.2 If, during any cropping year, biosolids were transferred, or not land applied, the Permittee shall submit a report by December 31 following the end of the cropping year. The report shall state that biosolids were not land applied, how much was generated, and where they were transferred to, if applicable. Submit the report to:

Biosolids Coordinator
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, Minnesota 55155-4194

8.3 The Permittee must notify the MPCA in writing when 90 percent or more of any of the cumulative pollutant loading rates listed for any Land Application Sites has been reached for a site.

Chapter 8. Total Facility Requirements

1. Definitions

1.1 "Agronomic Rate" means the sewage sludge application rate (dry weight basis) designed to:

a. provide the amount of nitrogen which can be utilized by the food crop, feed crop, fiber crop, cover crop, or vegetation grown on the land; and

b. minimize the amount of nitrogen in the sewage sludge that passes below the root zone of the crop or vegetation grown on the land to the ground water.

1.2 "Biosolids" - see "Sewage Sludge."

1.3 "Calendar Month Average" is calculated by adding all daily values measured during a calendar month and dividing by the number of daily values measured during that month. The "Calendar Month Average" limit is an upper limit.

1.4 "Calendar Month Geometric Mean" is calculated by multiplying the value of all samples taken during the month by each other, where the number of samples = n, and calculating the nth root of the product. The "Calendar Month Geometric Mean" is an upper limit.

Chapter 8. Total Facility Requirements

1. Definitions

1.5 "Calendar Month Maximum" is the highest value of single samples taken throughout the month. The "Calendar Month Maximum" is an upper limit.

1.6 "Calendar Month Minimum" is the lowest value of single samples taken throughout the month. The "Calendar Month Minimum" is a lower limit.

1.7 "Calendar Month Total" is calculated by adding all daily values measured during a calendar month. It is usually expressed in mass or volume units. The "Calendar Month Total" is an upper limit.

1.8 "Calendar Year Average" is calculated by adding all sample values measured during a calendar year and dividing by the number of samples measured during that year. The "Calendar Year Average" limit is an upper limit.

1.9 "Calendar Year Maximum" is the highest value of single samples taken throughout the calendar year. The "Calendar Year Maximum" is an upper limit.

1.10 "Calendar Year Total" is calculated by adding all values measured during a calendar year. It is usually expressed in mass or volume units. The "Calendar Year Total" is an upper limit.

1.11 "Chronic Toxicity Test" is a static renewal test conducted on an exponentially diluted series of effluent. The purpose is to calculate appropriate effect/no effect biological endpoints, specified in the referenced chronic manual (Chapter 2, part 6). A statistical effect level less than or equal to the Receiving Water Concentration (RWC) constitutes a positve test for chronic toxicity. The RWC equals the 100% effluent concentration.

1.12 "Crop Year Maximum" is the highest value of single samples taken throughout the cropping year (September 1 - August 31). The "Crop Year Maximum" is an upper limit.

1.13 "Crop Year Total" is the calculated total quantity of a given measurement for a cropping year (September 1 - August 31). Example: Total quantity of biosolids land applied during the cropping year. The "Crop Year Total" limit is an upper limit.

1.14 "Grab" sample type is an individual sample collected from one location at one point in time.

1.15 "Instantaneous Maximum" is the highest value recorded when continuous monitoring is used or when the reporting frequency is not specifically defined. The "Instantaneous Maximum" limit is an upper limit. The highest value recorded is reported.

1.16 "Instantaneous Maximum Intervention Limit" is the maximum value that, if exceeded by a single sample, the Permittee must perform specified response actions.

Chapter 8. Total Facility Requirements

1. Definitions

1.17 "Maximum Calendar Week Average" is calculated by adding the value of all samples for a specific parameter taken within a single week, and dividing by the number of samples taken during the week. The highest of all of the weekly averages calculated in a calendar month shall be reported. The "Maximum Calendar Week Average" is an upper limit.

1.18 "Pathogens" means organisms that are capable of producing an infection or disease in a susceptible host.

1.19 "Sewage Sludge" means solid, semisolid, or liquid residue generated during the treatment of domestic sewage in a treatment works. Sewage sludge includes but is not limited to, scum or solids removed in primary, secondary, or advanced wastewater treatment processes, and a material derived from sewage sludge. Sewage sludge does not include ash generated during the firing of sewage sludge in a sewage sludge incinerator or grit and screenings generated during preliminary treatment of domestic sewage in a treatment works. Sewage sludge that is acceptable and beneficial for recycling on land as a soil conditioner and nutrient source is also known as biosolids.

1.20 "Single Value" is a reported value from a single sample or measurement for which there is no limit.

1.21 "Storm Water" means storm water runoff, snow melt runoff, and surface runoff and drainage.

1.22 "Vector Attraction" means the characteristic of sewage sludge that attracts rodents, flies, mosquitoes, or other organisms capable of transporting infectious agents.

2. Sampling and Analyses

2.1 Samples and measurements required by this permit shall be representative of the monitored activity and shall be analyzed by a laboratory certified by the Minnesota Department of Health for the applicable permitted parameters. Analyses of dissolved oxygen, pH, temperature and total residual chlorine do not need to be completed by a certified laboratory.

2.2 Sample preservation and test procedures for the analysis of pollutants shall conform to 40 CFR Part 136 and Minnesota Rules, part 7041.3200.

2.3 All monitoring and analytical instruments used to monitor as required by this permit shall be calibrated and maintained at a frequency necessary to ensure accuracy. The Permittee shall measure flows to ensure accuracy within plus or minus ten percent of the true flow values. The Permittee shall maintain written records of all calibrations and maintenance.

2.4 The "sample type", "sampling frequency" and "effective period" identified in the Limits and Monitoring section of this permit together designate the minimum required monitoring frequency. (Minnesota Rules, pt. 7001.1090, subp. 1.E)

Chapter 8. Total Facility Requirements

2. Sampling and Analyses

2.5 For bypasses, upsets, spills or any other discharge that may cause pollution of the waters of the state, the Permittee shall take at least one (1) grab sample for permitted effluent parameters two (2) times per week. If the Permittee believes that measuring these parameters is inappropriate due to known information about the discharge, the monitoring may be modified in consultation with the MPCA. Where there is reason to believe a pollutant other than those limited in the permit is present, the Permittee shall sample for that pollutant. Appropriate sampling shall be determined in consultation with the MPCA.

3. Reporting

3.1 The Permittee shall report monitoring results for the completed reporting period in the units specified by this permit on a Discharge Monitoring Report (DMR) form or other report form provided by the MPCA.

3.2 The Permittee shall report ground water monitoring results on a Ground Water Monitoring Report form provided by the MPCA.

3.3 The Permittee shall report values less than the level of detection as "<" the value of the level of detection. For example, if a parameter is not detected at a detection level of 0.1 mg/L, the concentration shall be reported as "<0.1 mg/L." "Non-detected", "undetected", "below detection limit" and "zero" are unacceptable reporting results, and are permit reporting violations.

3.4 A Discharge Monitoring Report (DMR) shall be submitted for each station even if no discharge occurred during the reporting period. The Permittee shall report 'No Discharge', 'No Flow' or 'No Materials Generated' on a DMR or other monitoring report form only if no discharge, flow or materials are generated during the entire reporting period. The schedule for reporting can be found on the Submittals Summary section of this permit.

3.5 Individual values for each sample and measurement must be reported on the Supplemental Report Form provided by the MPCA and submitted with the Discharge Monitoring Report (DMR).

3.6 The Permittee shall report the following information on the Discharge Monitoring Report (DMR):

a. any substantial changes in operational procedures;

b. activities which alter the nature or frequency of the discharge; and

c. material factors affecting compliance with the conditions of this permit.

3.7 The Permittee shall report monitoring results of bypass events on its Discharge Monitoring Report (DMR). If no bypass events occurred, check the "No Discharge" box on the DMR.

Chapter 8. Total Facility Requirements

3. Reporting

3.8 The Permittee shall submit a written description of any bypass, spill, upset or permit violation during the reporting period to the MPCA with its Discharge Monitoring Report (DMR). If no DMR is required within 30 days, the Permittee shall submit a written report within 30 days of the discovery of the noncompliance. This description shall include the following information:

a. a description of the event including volume, duration, monitoring results and receiving waters;

b. the cause of the event;

c. the steps taken to reduce, eliminate and prevent reoccurrence of the event;

d. the exact dates and times of the event; and

e. steps taken to reduce any adverse impact resulting from the event. (Minnesota Rules, pt. 7001.0150, subp. 3.K)

3.9 The Permittee or the duly authorized representative of the Permittee shall sign the reports and documents submitted to the MPCA by the Permittee. Discharge Monitoring Reports (DMRs) shall be signed by both a certified operator and the Permittee's authorized representative. (Minnesota Rules, pt. 7001.0150, subp. 2.D)

3.10 A person who falsifies, tampers with, or knowingly renders inaccurate a monitoring device or method required to be maintained under this permit is subject to penalties provided by federal and state law. (Minnesota Rules, pt. 7001.1090, subp. 1.G, K)

4. Intervention Limits

4.1 If an intervention limit is exceeded, the Permittee shall:

a. sample the monitoring station again within two (2) days of receiving sample results if the previous samples at the facility did not exceed the intervention limit;

b. evaluate the significance and the cause of the intervention limit having been exceeded;

c. evaluate the need for immediate corrective action to prevent pollutant levels from exceeding the intervention limits again; and

d. evaluate the need for changes in monitoring, including but not limited to, increasing sampling frequencies, changing the characteristics monitored, installing additional monitoring stations, and reducing pollutant loadings.

4.2 The Permittee shall submit a Discharge Evaluation Report 30 days after obtaining sample results.

Chapter 8. Total Facility Requirements

4. Intervention Limits

4.3 This report shall describe the evaluations and conclusions, and the schedule of actions taken or planned to prevent the intervention limits from being exceeded.

5. Records

5.1 The Permittee shall maintain records for each sample and measurement. The records shall include the following information:

a. the exact place, date and time of the sample or measurement;

b. the date of analysis;

c. the name of the person who performed the sample collection, measurement, analysis, or calculation;

d. the analytical techniques, procedures and methods used; and

e. the results of the analysis.

5.2 The Permittee shall keep the records required by this permit for at least three (3) years, including any calculations, original recordings from automatic monitoring instruments, and laboratory sheets. The Permittee shall extend these record retention periods upon request of the MPCA and/or during the course of an unresolved enforcement action. (Minnesota Rules, pt. 7001.0150, subp. 2.C.)

5.3 Except for data determined to be confidential according to Minnesota Statutes, ch. 116.075, subd. 2, all reports required by this permit shall be available for public inspection at the MPCA St. Paul office. Effluent data shall not be considered confidential. Confidential material shall be submitted according to Minnesota Rules, pt. 7000.1300.

5.4 The Permittee shall, when requested by the commissioner, submit within a reasonable time the information and reports that are relevant to the control of pollution regarding the construction, modification, or operation of the facility covered by the permit or regarding the conduct of the activity covered by the permit. (Minnesota Rules, pt. 7001.0150, subp. 3.H.)

6. Compliance Responsibility

6.1 The Permittee shall perform the actions or conduct the activity authorized by the permit in accordance with the plans and specifications approved by the agency and in compliance with the conditions of the permit. (Minnesota Rules, pt. 7001.0150, subp. 3.E.)

Chapter 8. Total Facility Requirements

7. Noncompliance

7.1 Noncompliance with the requirements of this permit subjects the Permittee to penalties provided by federal and state law including monetary penalties, imprisonment, or both. (Minnesota Rules, pt. 7001.1090, subp. 1.B.; U.S.C. title 33, sect. 1319; Minn. Stat. sect. 115.071)

7.2 If the Permittee discovers that noncompliance with a condition of the permit has occurred, the Permittee shall:

a. take all reasonable steps to minimize the adverse impacts to human health, public drinking water supplies, or the environment resulting from a permit violation.

b. notify the Minnesota Department of Public Safety Duty Officer at 1(800)422-0798 or (651)649-5451 within 24 hours of becoming aware of a permit violation that may endanger human health, public drinking water supplies or the environment. The Permittee shall submit a written description of the exceedance to the MPCA within five (5) days of discovery of the exceedance.

Nothing in this requirement relieves the Permittee from immediately notifying the MPCA of any release to surface waters of the state. (Minnesota Rules, pt. 7001.0150, subp. 3. J, K)

8. Upset Defense

8.1 In the event of temporary noncompliance by the Permittee with an applicable effluent limitation resulting from an upset at the Permittee's facility due to factors beyond the control of the Permittee, the Permittee has an affirmative defense to an enforcement action brought by the agency as a result of the noncompliance if the Permittee demonstrates by a preponderance of competent evidence:

a. the specific cause of the upset;

b. that the upset was unintentional;

c. that the upset resulted from factors beyond the control of the Permittee and did not result from operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or increases in production which are beyond the design capability of the treatment facilities;

d. that at the time of the upset the facility was being properly operated;

e. that the Permittee properly notified the commissioner of the upset in accordance with Minnesota Rules, part 7001.0150, subpart 3, item I; and

f. that the Permittee implemented the remedial measures required by Minnesota Rules, part 7001.0150, subpart 3, item J. (Minnesota Rules, pt. 7001.1090, subp. 1.L)

Chapter 8. Total Facility Requirements

9. Duty to Notify and Avoid Water Pollution

9.1 The Permittee shall notify the Minnesota Department of Public Safety Duty Officer at (800)422-0798 or (651)649-5451 immediately of the discharge, accidental or otherwise, of any substance or material under its control which, if not recovered, may cause pollution of waters of the state. Notification is not required for a discharge of five (5) gallons or less of petroleum. (Minnesota Statutes, section 115.061)

9.2 The Permittee shall report to the Duty Officer all pertinent information regarding the discharge. Refer to the MPCA "Emergency Notification Guidance for Wastewater Treatment Systems" for further information.

9.3 The Permittee shall take all reasonable steps to minimize the adverse impacts to human health, public drinking water supplies or to the environment resulting from the discharge. This may include restricting or preventing untreated or partially treated wastewater, plant chemicals or feedlot materials from entering waterways, containing spilled materials, recycling by-passed wastewater through the plant, or using auxiliary treatment methods. (Minnesota Rules, pt. 7001.0150, subp. 3.J; Minnesota Statutes, section 115.061)

9.4 The Permittee shall maintain a plan designed to adequately notify the public of potential health threats due to discharges of untreated or partially treated wastewater. The Permittee shall notify the public in accordance with the plan.

10. Anticipated Bypasses

10.1 The Permittee may allow a bypass to occur if the bypass will not cause the exceedance of an effluent limitation but only if the bypass is necessary for essential maintenance to assure efficient operation of the facility. The permittee shall submit notice of the need for the bypass at least ten days before the date of the bypass. (Minnesota Rules, pt. 7001.1090, subp. 1.J)

10.2 The notice of the need for a bypass shall include the following information:

a. The proposed date and estimated duration of the bypass.

b. The alternatives to bypassing.

c. The proposed measures to mitigate environmental harm caused by the bypass.

d. A proposal for bypass monitoring.

Chapter 8. Total Facility Requirements

10. Anticipated Bypasses

10.3 The Permittee shall not allow an anticipated bypass to occur that will cause an exceedance of an applicable effluent limitation unless the following conditions are met:

a. The bypass is unavoidable to prevent loss of life, personal injury, or severe property damage. For the purposes of this paragraph, "severe property damage" means substantial damage to property of the Permittee or of others; damage to the wastewater treatment facilities that may cause them to become inoperable; or substantial and permanent loss of natural resources that can be reasonably expected to occur in the absence of a bypass. "Severe property damage" does not mean economic loss as a result of a delay in production.

b. There is no feasible alternative to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or performance of maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate backup equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventative maintenance.

c. The Permittee has notified the commissioner of the anticipated bypass and the commissioner has approved the bypass. The commissioner shall approve the bypass if the commissioner finds that the conditions set forth in Minnesota Statutes, part 7001.0190, subpart 1, items A and B are met. (Minnesota Rules, pt. 7001.1090, subp. 1.K)

11. Facilities Operation

11.1 The Permittee shall properly operate and maintain the systems used to achieve permit compliance. Proper operation and maintenance includes effective performance, adequate funding, adequate staffing and training, and adequate process and laboratory controls, including appropriate quality assurance procedures. (Minnesota Rules, pt. 7001.0150, subp. 3.F)

11.2 The Permittee is responsible for insuring system reliability and shall install adequate backup or support systems to achieve permit compliance and prevent the discharge of untreated or inadequately treated waste. These systems may include alternative power sources, auxiliary treatment works and sufficient storage volume for untreated wastes. (Minnesota Rules, pt. 7001.0150, subp. 3.F)

11.3 The Permittee shall store, transport and dispose of biosolids, sediments, residual solids, filter backwash, screenings, oil, grease and other substances so that pollutants do not enter surface waters or ground waters of the state.

11.4 The Permittee's discharge shall not cause any nuisance conditions, acutely toxic conditions to aquatic life or other adverse impact on the receiving water.

11.5 The Permittee shall comply with all applicable water quality, air quality, solid waste and hazardous waste statutes and rules in the operation and maintenance of the facility.

Chapter 8. Total Facility Requirements

11. Facilities Operation

11.6 The Permittee shall schedule maintenance of the treatment works during non-critical water quality periods to prevent degradation of water quality.

11.7 In-plant control tests shall be conducted at a frequency adequate to ensure continuous efficient operation of the treatment facility.

12. Chemical Additives

12.1 The Permittee shall receive prior written approval from the MPCA before increasing the use of a chemical additive authorized by this permit, or using a chemical additive not authorized by this permit. "Chemical additive" includes processing reagents, water treatment products, cooling water additives, freeze conditioning agents, chemical dust suppressants, detergents and solvent cleaners used for equipment and maintenance cleaning, among other materials.

12.2 The Permittee shall request approval for an increased or new use of a chemical additive 60 days before the proposed increased or new use.

12.3 This written request shall include the following information for the proposed additive:

a. Material Safety Data Sheet.

b. A complete product use and instruction label.

c. The commercial and chemical names of all ingredients.

d. Aquatic toxicity and human health or mammalian toxicity data including a carcinogenic, mutagenic or teratogenic concern or rating.

e. Environmental fate information including, but not limited to, persistence, half-life, intermediate breakdown products, and bioaccumulation data.

f. The proposed method, concentration, and average and maximum rates of use.

g. If applicable, the number of cycles before wastewater bleedoff.

h. If applicable, the ratio of makeup flow to discharge flow.

12.4 This permit may be modified to restrict the use or discharge of a chemical additive.

Chapter 8. Total Facility Requirements

13. Inspection And Entry

13.1 The Permittee shall allow a representative of the MPCA, in accordance with Section 308 of the Act and Minnesota Statutes, section 115.04, (1992), and upon presentation of proper credentials, to:

a. enter the premises where the facility is located or activity conducted;

b. review and copy the records required by this permit;

c. inspect the facilities, systems, equipment, practices or operations regulated or required by this permit;

d. sample or monitor to determine compliance; and

e. bring equipment upon the Permittee's premises necessary to conduct surveys and investigations. (Minnesota Rules, pt. 7001.0150, subp. 3.I)

14. Permit Modifications

14.1 Changes to the facility or operation of the facility may require a permit modification. The Permittee shall submit an application describing the changes to the facility or operation to the MPCA and receive a permit modification prior to implementing the changes. The Permittee must submit the permit modification application fee in accordance with Minnesota Rules, part 7002.0250 with the application.

14.2 The following changes may require a permit modification:

a. Increased use or new use of a chemical additive.

b. Changes in the characteristics, concentrations or frequency of the wastewater flow, which may include new significant industrial discharges to a sanitary sewage treatment system, significant changes in existing industrial discharges to a sanitary system, significant rerouting of wastewater for reuse or for land disposal or significant changes in the levels of indicator characteristics.

c. Changes in biosolids or residual solids use and disposal practices.

14.3 The procedures as set forth in Minnesota Rules, pt. 7001.0100 through 7001.0130, including public notice, apply to applications for permit modifications, with the following exceptions:

a. Modifications solely as to ownership or control as described in Minnesota Rules, pt. 7001.0190, subp. 2.

b. Minor modifications as described in Minnesota Rules, pt. 7001.0190, subp. 3.

Chapter 8. Total Facility Requirements

14. Permit Modifications

14.4 No permit may be assigned or transferred by the holder without the approval of the MPCA. A person to whom the permit has been transferred shall comply with the conditions of the permit. (Minnesota Rules, pt. 7001.0150, subp. 3.N)

15. Construction

15.1 Construction related to facility modifications, additions or expansions that is not expressly authorized by this permit requires a permit modification. If the construction project requires an Environmental Assessment Worksheet under Minnesota Rules, ch. 4410, no construction shall begin until a negative declaration has been issued and all approvals have been received or implemented. (Minnesota Rules, pt. 7001.0030)

15.2 No construction shall begin until the Permittee has received written approval of reports, plans and specifications for the construction from the MPCA.

16. Permit Modification, Suspension or Revocation

16.1 This permit may be modified, suspended, or revoked for the following reasons:

a. A violation of permit requirements.

b. Misrepresentation or failure to disclose fully all relevant information to obtain the permit.

c. A change in a condition that alters the discharge.

d. The establishment of a new or amended pollution standard, limitation or effluent guideline that is applicable to the permitted facility or activity.

e. Failure to pay permit fees.

f. Other reasons listed in Minnesota Rules, pt. 7001.0170.

17. Permit Reissuance

17.1 The Permittee shall submit an application for reissuance at least 180 days before permit expiration. (Minnesota Rules, pt. 7001.0040, subp. 3)

Chapter 8. Total Facility Requirements

17. Permit Reissuance

17.2 If the Permittee has submitted a timely application for permit reissuance, the Permittee may continue to conduct the activities authorized by this permit, in compliance with the requirements of this permit, until the MPCA takes final action on the application, unless the MPCA determines one of the following:

a. The Permittee is not in substantial compliance with the requirements of this permit, or with a stipulation agreement or compliance schedule designed to bring the Permittee into compliance with this permit.

b. The MPCA, as a result of an action or failure to act by the Permittee, has been unable to take final action on the application on or before the expiration date of the permit.

c. The Permittee has submitted an application with major deficiencies or has failed to properly supplement the application in a timely manner after being informed of deficiencies. (Minnesota Rules, pt. 7001.0160)

17.3 If the Permittee does not intend to continue the activities authorized by this permit after the expiration date of this permit, the Permittee shall notify the MPCA. The MPCA may require the Permittee to apply for reissuance or a major modification of this permit to authorize facility closure.

18. Facility Closure

18.1 Facility closure that could result in a potential long-term water quality concern, such as the ongoing discharge of wastewater to surface or ground water, may require a permit modification. An application for permit modification shall be submitted to the MPCA for approval before the proposed change is implemented.

18.2 The Permittee is responsible for closure and postclosure care of the facility. The Permittee shall notify the MPCA of a significant reduction or cessation of operations described in this permit.

18.3 The MPCA may require the Permittee to establish financial assurance for closure, postclosure care and remedial action at the facility.

19. Property Rights

19.1 The permit does not convey a property right or an exclusive privilege. (Minnesota Rules, pt. 7001.0150, subp. 3.C)

Chapter 8. Total Facility Requirements

20. Liability Exemption

20.1 In issuing this permit, the state and the MPCA assume no responsibility for damage to persons, property, or the environment caused by the activities of the Permittee in the conduct of actions, including those activities authorized, directed, or undertaken to achieve compliance with this permit. To the extent the state and MPCA may be liable for the activities of its employees, that liability is explicitly limited to that provided in the Tort Claims Act, Minnesota Statutes, section 3.736. (Minnesota Rules, pt. 7001.0150, subp. 3.O)

20.2 The MPCA's issuance of this permit does not obligate the MPCA to enforce local laws, rules or plans beyond what is authorized by Minnesota Statutes. (Minnesota Rules, pt. 7001.0150, subp. 3.D)

21. Liabilities

21.1 The MPCA's issuance of this permit does not release the Permittee from any liability, penalty or duty imposed by Minnesota or federal statutes or rules or local ordinances, except the obligation to obtain the permit. (Minnesota Rules, pt. 7001.0150, subp. 3.A)

21.2 The issuance of a permit does not prevent the future adoption by the MPCA of pollution control rules, standards or orders more stringent than those now in existence and does not prevent the enforcement of these rules, standards or orders against the Permittee. (Minnesota Rules, pt. 7001.0150, subp. 3.B)

22. Severability

22.1 The provisions of this permit are severable, and if any provisions of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances and the remainder of this permit shall not be affected thereby.

23. Incorporation By Reference

23.1 The Permittee shall comply with the provisions of 40 CFR Parts 122.41 and 122.42, Minnesota Rules, pt. 7001.0150, subp. 3, and pt. 7001.1090, which are incorporated into this permit by reference, and are enforceable parts of this permit.

-Time Submittals

ıe Date / Requirement

et Due Date. Submit the results of the first priority pollutant sampling event by November 21, 2002.

Set Due Date. Submit the results of the second priority pollutant sampling event by November 21, 2003.

et Due Date. Submit the results of the third or final sampling event with the application for permit reissuance 180 days prior to the ation date of the permit.

/31/2003. Submit a report by December 31, 2003. Submit an Option Evaluation Report should include, but not limited to: an assessment tions to reduce loading rates at the current spray irrigation site, including the acquisition of more spray irrigation acreage.

/2004. Submit a progress report by October 31, 2004. The goal of the Final Progress and Recommendation Report is to present the nclusion of the spray irrigation evaluation so that plans and specifications for any modifications or upgrades (such as the acquisition of ditional acreage), if needed, can be included with the application for reissuance of the permit required by Chapter 8.17, and can be revieved pproved, as needed, for incorporation into the next reissuance of this permit.

eriodic Submittals

ıency / Requirement

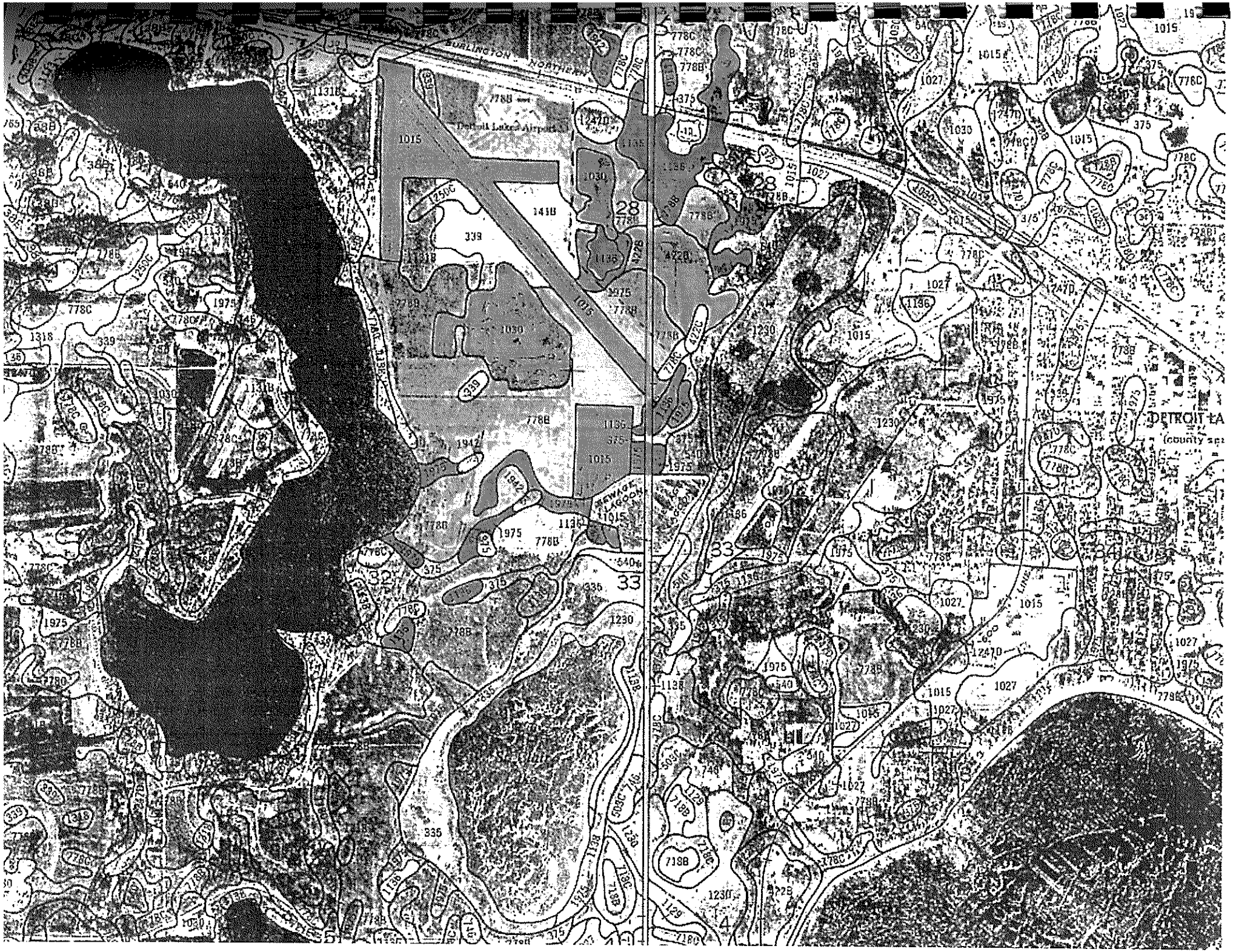
onthly. Submit a monthly DMR monthly by 21 days after the end of each calendar month following permit issuance. Monitoring and port is only due in the months of April, July and October. (GW 001, GW 002, GW 003, GW 004, GW 005, GW 006, GW 007, GW 008, 09, GW 010, GW 011, GW 012, GW 013, GW 014, GW 015)

nly. Submit a monthly DMR monthly by 21 days after end of each calendar month following permit issuance. (LA 014, LA 015)

onthly. Submit a monthly DMR monthly by 21 days after the end of each calendar month following permit issuance. (SD 002, SD 003)

nly. Submit a monthly DMR monthly by 21 days after the end of each calendar month following permit issuance. (WS 002, WS 003, /S 004)

Becker County, Minnesota Soils Map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ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
141B:												
Egeland	0-9	Fine sandy loam	SM, SC-SM	A-2, A-4	0	0	100	95-100	75-100	30-50	15-25	NP-7
	9-16	Sandy loam, fine sandy loam.	SM, SC-SM	A-2, A-4	0	0	95-100	85-100	70-100	15-50	15-25	NP-7
	16-60	Stratified fine sand to silt loam.	SM, ML, SC-SM	A-2, A-4	0	0	95-100	85-100	65-90	30-80	15-25	NP-5
141C:												
Egeland	0-13	Fine sandy loam	SM, SC-SM	A-2, A-4	0	0	100	95-100	75-100	30-50	15-25	NP-7
	13-22	Sandy loam, fine sandy loam.	SM, SC-SM	A-2, A-4	0	0	95-100	85-100	70-100	15-50	15-25	NP-7
	22-60	Stratified fine sand to silt loam.	SM, ML, SC-SM	A-2, A-4	0	0	95-100	85-100	65-90	30-80	15-25	NP-5
168B:												
Forman	0-8	Clay loam	CL	A-6, A-7	0	0-5	95-100	90-100	85-100	70-80	30-45	10-25
	8-15	Clay loam	CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	80-95	60-80	25-45	5-20
	15-60	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	80-95	60-80	25-45	5-20
168C2:												
Forman	0-7	Clay loam	CL	A-6, A-7	0	0-5	95-100	90-100	85-100	70-80	30-45	10-25
	7-16	Clay loam	CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	80-95	60-80	25-45	5-20
	16-60	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	80-95	60-80	25-45	5-20
168D2:												
Forman	0-8	Clay loam	CL	A-6, A-7	0	0-5	95-100	90-100	85-100	70-80	30-45	10-25
	8-15	Clay loam	CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	80-95	60-80	25-45	5-20
	15-60	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	80-95	60-80	25-45	5-20
168E:												
Forman	0-7	Clay loam	CL	A-6, A-7	0	0-5	95-100	90-100	85-100	70-80	30-45	10-25
	7-15	Clay loam	CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	80-95	60-80	25-45	5-20
	15-60	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	80-95	60-80	25-45	5-20

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
315A:												
Bootlake--------	0-6	Sandy loam-----	SM	A-2-4	0	0	95-100	90-100	55-70	25-35	0-20	NP-4
	6-13	Coarse sand, loamy coarse sand, loamy sand.	SM, SP-SM	A-2-4, A-1-b	0	0	95-100	90-100	40-70	10-25	0-14	NP
	13-28	Sandy loam, coarse sandy loam.	SM	A-2-4	0	0	95-100	90-100	50-65	25-35	0-20	NP-4
	28-60	Sand, coarse sand.	SP, SP-SM	A-3, A-2-4	0	0	95-100	75-100	50-80	2-10	0-14	NP
315B:												
Bootlake--------	0-3	Sandy loam-----	SM	A-2-4	0	0	95-100	90-100	55-70	25-35	0-20	NP-4
	3-9	Coarse sand, loamy coarse sand, loamy sand.	SM, SP-SM	A-2-4, A-1-b	0	0	95-100	90-100	40-70	10-25	0-14	NP
	9-21	Sandy loam, coarse sandy loam.	SM	A-2-4	0	0	95-100	90-100	50-65	25-35	0-20	NP-4
	21-60	Sand, coarse sand.	SP, SP-SM	A-3, A-2-4	0	0	95-100	75-100	50-80	2-10	0-14	NP
332B:												
Sugarbush-------	0-4	Sandy loam-----	SM	A-2-4	0	0	95-100	80-100	55-70	25-35	15-20	NP-4
	4-13	Loamy sand, loamy coarse sand, sand.	SM, SP-SM	A-1-b, A-2-4	0	0	95-100	80-100	40-70	10-25	---	NP
	13-18	Sandy loam, coarse sandy loam.	SM	A-2-4	0	0	95-100	80-100	50-70	25-35	15-20	NP-4
	18-60	Gravelly coarse sand, gravelly sand, coarse sand.	SP, SP-SM	A-1-b, A-3, A-2-4	0-5	0-5	55-85	50-85	30-55	2-10	---	NP
335:												
Urness----------	0-7	Mucky silt loam	OL, CL, CL-ML	A-4, A-6, A-7	0	0	100	100	90-100	70-95	20-50	3-20
	7-60	Mucky silt loam, mucky silty clay loam, silty clay loam.	ML, CL, CL-ML, OL	A-4, A-6, A-7	0	0	95-100	90-100	85-100	70-95	20-50	3-30
339:												
Pordville-------	0-10	Loam-----------	ML, CL	A-4, A-6, A-7	0	0	100	100	70-85	55-75	30-45	5-20
	10-17	Loam, silt loam, clay loam.	CL, ML	A-4, A-6, A-7	0	0	100	95-100	70-95	55-80	30-45	5-20
	17-28	Loam, clay loam, fine sandy loam.	CL, ML, SM, SC	A-4, A-6	0	0	95-100	90-100	65-90	40-55	25-40	3-15
	28-60	Gravelly loamy sand, gravelly sand, very gravelly sand.	SW, SM, SW-SM	A-1	0	0	55-85	50-75	30-55	2-10	15-25	NP-5

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
344: Quam----------	0-10	Silty clay loam	CL, ML, OL	A-7	0	0	100	100	90-100	85-95	40-50	15-25
	10-42	Silty clay loam, silt loam, loam.	CL, ML	A-7, A-6, A-4	0	0	100	100	80-100	70-95	30-50	5-25
	42-60	Clay loam, silty clay loam, silt loam.	CL, ML, CL-ML	A-4, A-6, A-7	0	0	100	90-100	85-95	70-90	20-50	5-20
1: Alvin----------	0-12	Silty clay loam	CL	A-6, A-7	0	0	100	100	90-100	80-95	35-50	15-30
	12-45	Silt loam, silty clay loam.	CL	A-6, A-7	0	0	100	100	90-100	80-95	25-50	10-30
	45-60	Loam, silt loam, silty clay loam.	CL	A-6, A-7	0	0	100	100	90-100	70-95	25-50	10-25
Fo Forada----------	0-14	Loam----------	ML	A-4	0	0	95-100	85-100	70-90	50-70	25-35	5-20
	14-22	Sandy loam, loam, fine sandy loam.	ML, SM	A-4, A-2	0	0	95-100	85-100	55-85	30-60	15-30	NP-10
	22-60	Sand, gravelly coarse sand, loamy sand.	SP, SM, SP-SM, GP-GM	A-1, A-2, A-3	0	0	50-100	50-100	40-70	5-30	---	NP
Wi Winger----------	0-13	Silty clay loam	CL	A-6	0	0	100	100	90-100	70-90	30-40	10-15
	13-37	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0	0	100	100	90-100	70-90	20-40	2-15
	37-60	Loam, clay loam	ML, CL, CL-ML	A-4, A-6, A-7	0	0-10	90-100	85-100	75-95	50-75	20-45	3-25
Sh Shiro----------	0-9	Sandy loam-----	SM, SC-SM	A-4, A-2	0	0	90-100	85-100	50-70	25-50	0-25	NP-5
	9-21	Loam, sandy loam, coarse sandy loam.	SC-SM, SC, CL-ML, CL	A-4, A-6	0	0	90-100	85-100	50-90	35-75	15-30	4-14
	21-60	Gravelly coarse sand, gravelly sand.	SP, GP, SP-SM, GP-GM	A-1	0	0-5	50-90	35-75	15-40	0-10	0-20	NP

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
406B: Dorset----------	0-10	Sandy loam-----	SM, SC-SM	A-4, A-2	0	0	90-100	85-100	50-70	25-50	0-25	NP-5
	10-17	Loam, sandy loam, coarse sandy loam.	SC-SM, SC, CL-ML, CL	A-4, A-6	0	0	90-100	85-100	50-90	35-75	15-30	4-14
	17-29	Gravelly loamy sand, gravelly loamy coarse sand, gravelly coarse sand.	SP-SM, SM, SC-SM, GM	A-1, A-2	0	0-5	50-90	35-75	20-50	10-25	0-20	NP-7
	29-60	Gravelly coarse sand, gravelly sand.	SP, SP-SM, GP, GP-GM	A-1	0	0-5	50-90	35-75	15-40	0-10	0-20	NP
413: Osakis----------	0-8	Sandy loam-----	SM, SC-SM	A-4, A-2	0	0	95-100	85-100	50-70	25-40	15-25	NP-7
	8-18	Loam, sandy loam.	SM, ML, CL-ML, SC-SM	A-4, A-2	0	0	95-100	85-100	55-90	25-70	20-35	1-8
	18-60	Coarse sand, gravelly coarse sand.	SP, GP, SP-SM, GP-GM	A-1	0	0-5	55-85	50-75	30-55	2-10	15-20	NP
428: Lamoure----------	0-39	Silty clay loam	CL, CH, MH, ML	A-7	0	0	100	100	95-100	85-100	40-70	15-35
	39-60	Stratified sandy loam to silty clay loam.	CL, SC	A-6, A-7	0	0	95-100	95-100	70-95	35-90	30-70	10-35
528: Wygland----------	0-8	Silty clay loam	CL, ML	A-7, A-6	0	0	100	100	95-100	95-100	35-50	15-25
	8-22	Silty clay, clay, silty clay loam.	CH, CL, MH	A-7	0	0	100	100	95-100	85-100	45-70	20-45
	22-38	Silty clay loam, silt loam, silty clay.	CL, CH	A-6, A-7	0	0	100	100	90-100	80-95	25-50	10-30
	38-60	Stratified silty clay loam to silt loam.	CL, CH	A-6, A-7	0	0	100	100	90-100	80-95	25-50	10-30

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
422C: Bygland---------	0-8	Silty clay loam	CL, ML	A-7, A-6	0	0	100	100	95-100	95-100	35-50	15-25
	8-16	Silty clay, clay, silty clay loam.	CH, CL, MH	A-7	0	0	100	100	95-100	85-100	45-70	20-45
	16-25	Silty clay loam, silt loam, silty clay.	CL, CH	A-6, A-7	0	0	100	100	90-100	80-95	25-50	10-30
	25-60	Stratified silty clay loam to silt loam.	CL, CH	A-6, A-7	0	0	100	100	90-100	80-95	25-50	10-30
3B: lmlake---------	0-3	Fine sandy loam	SM, SC, SC-SM	A-2, A-4	0	0	100	95-100	60-85	30-50	15-25	2-10
	3-20	Very fine sand, loamy fine sand, fine sandy loam.	SM	A-2, A-4	0	0	100	95-100	60-85	25-50	15-25	NP-4
	20-28	Fine sandy loam, sandy loam, loam.	SM, CL, SC, ML	A-4	0	0	100	95-100	60-90	35-65	20-30	2-10
	28-60	Stratified fine sand to silt loam.	SM, ML, SC-SM, CL-ML	A-2, A-4	0	0	100	95-100	65-90	30-80	15-25	NP-5
3C: Balmlake---------	0-2	Fine sandy loam	SM, SC, SC-SM	A-2, A-4	0	0	100	95-100	60-85	30-50	15-25	2-10
	2-17	Very fine sand, loamy fine sand, fine sandy loam.	SM	A-2, A-4	0	0	100	95-100	60-85	25-50	15-25	NP-4
	17-29	Fine sandy loam, sandy loam, loam.	SM, CL, SC, ML	A-4	0	0	100	95-100	60-90	35-65	20-30	2-10
	29-60	Stratified fine sand to silt loam.	SM, ML, SC-SM, CL-ML	A-2, A-4	0	0	100	95-100	65-90	30-80	15-25	NP-5
503B: Balmlake---------	0-2	Fine sandy loam	SM, SC, SC-SM	A-2, A-4	0	0	100	95-100	60-85	30-50	15-25	2-10
	2-15	Very fine sand, loamy fine sand, fine sandy loam.	SM	A-2, A-4	0	0	100	95-100	60-85	25-50	15-25	NP-4
	15-28	Fine sandy loam, sandy loam, loam.	SM, CL, SC, ML	A-4	0	0	100	95-100	60-90	35-65	20-30	2-10
	28-60	Stratified fine sand to silt loam.	SM, ML, SC-SM, CL-ML	A-2, A-4	0	0	100	95-100	65-90	30-80	15-25	NP-5

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
508: Wyndmere	0-14	Fine sandy loam	SM, ML, SC, SC-SM	A-2, A-4	0	0	100	100	60-80	30-55	10-30	NP-10
	14-24	Sandy loam, fine sandy loam.	SM, ML, SC, SC-SM	A-2, A-4	0	0	100	100	60-90	30-55	10-30	NP-10
	24-60	Fine sand, loamy fine sand, fine sandy loam.	SM, ML	A-2, A-4	0	0	100	100	60-100	20-55	---	NP
540: Seelyeville	0-24	Muck	PT	A-8	0	0	0	0	0	0	---	NP
	24-60	Muck, mucky peat.	PT	A-8	0	0	0	0	0	0	---	NP
541: Rifle	0-14	Mucky peat	PT	A-8	0	0	0	0	0	0	---	NP
	14-60	Mucky peat	PT	A-8	0	0	0	0	0	0	---	NP
544: Cathro	0-8	Muck	PT	A-8	0	0	0	0	0	0	---	NP
	8-22	Sapric material	PT	A-8	0	0	0	0	0	0	---	NP
	22-60	Sandy loam, loam, clay loam.	CL-ML, SC-SM, SC, CL	A-4, A-6	0	0-5	85-100	75-100	60-100	35-90	20-40	5-20
564: Friendship	0-3	Loamy sand	SM, SP-SM	A-1, A-2	0	0	75-100	75-100	40-75	12-30	0-14	NP
	3-31	Sand, coarse sand.	SP-SM, SM, SP	A-1, A-3, A-2	0	0	75-100	75-100	40-70	3-15	0-14	NP
	31-60	Sand, coarse sand.	SP-SM, SM, SP	A-1, A-3, A-2	0	0	75-100	75-100	40-70	3-15	0-14	NP
567A: Verndale	0-8	Sandy loam	SM, SC-SM	A-4, A-2-4	0	0	100	85-100	60-85	25-45	15-20	3-6
	8-15	Sandy loam, fine sandy loam, loam.	SC, SC-SM	A-4, A-2-4	0	0	98-100	85-100	60-85	25-45	20-26	5-10
	15-33	Sand, coarse sand, loamy coarse sand.	SM, SP-SM	A-3, A-2-4	0	0	98-100	85-100	50-65	5-20	---	NP-2
	33-60	Sand, coarse sand.	SP, SP-SM	A-3, A-1-b, A-2-4	0	0	96-100	75-100	45-60	3-10	---	NP
567B: Verndale	0-7	Sandy loam	SM, SC-SM	A-4, A-2-4	0	0	100	85-100	60-85	25-45	15-20	3-6
	7-13	Sandy loam, fine sandy loam, loam.	SC, SC-SM	A-4, A-2-4	0	0	98-100	85-100	60-85	25-45	20-26	5-10
	13-31	Sand, coarse sand, loamy coarse sand.	SM, SP-SM	A-3, A-2-4	0	0	98-100	85-100	50-65	5-20	---	NP-2
	31-60	Sand, coarse sand.	SP, SP-SM	A-3, A-1-b, A-2-4	0	0	96-100	75-100	45-60	3-10	---	NP

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
718C: Naytahwaush-----	0-4	Loam----------	CL, ML	A-6	0	0-5	95-100	90-100	75-90	60-90	30-40	10-15
	4-6	Loam, silt loam, fine sandy loam.	CL, ML	A-4, A-6	0	0-5	95-100	90-100	65-90	50-80	25-40	5-20
	6-23	Clay, silty clay, clay loam.	CL, CH	A-7	0	0-5	95-100	90-100	75-95	70-90	45-65	25-40
	23-60	Clay loam, silty clay loam, loam.	CL	A-6, A-7	0	0-5	95-100	90-100	75-95	60-90	35-50	15-25
718E: Naytahwaush-----	0-3	Loam----------	CL, ML	A-6	0	0-5	95-100	90-100	75-90	60-90	30-40	10-15
	3-7	Loam, silt loam, fine sandy loam.	CL, ML	A-4, A-6	0	0-5	95-100	90-100	65-90	50-80	25-40	5-20
	7-23	Clay, silty clay, clay loam.	CL, CH	A-7	0	0-5	95-100	90-100	75-95	70-90	45-65	25-40
	23-60	Clay loam, silty clay loam, loam.	CL	A-6, A-7	0	0-5	95-100	90-100	75-95	60-90	35-50	15-25
721E: Orliss----------	0-7	Loamy sand-----	SM, SP-SM	A-1-b, A-2-4	0	0-5	85-100	80-100	40-70	10-25	15-21	NP-4
	7-60	Coarse sand, sand, gravelly coarse sand.	SP, SP-SM	A-1-b, A-3	0	0-5	60-95	50-85	30-65	2-10	---	NP
[illegible] Maslie----------	0-8	Muck----------	PT	A-8	0	0	0	0	0	0	---	NP
	8-43	Sapric material, muck.	PT	A-8	0	0	0	0	0	0	---	NP
	43-60	Coprogenous earth, mucky silt loam.	OL	A-5	0	0	100	95-100	85-100	75-96	41-50	2-10
727B: Audubon----------	0-9	Silty clay loam	CL, CH	A-7	0-1	0-2	95-100	94-99	90-99	70-94	43-66	21-39
	9-29	Silty clay loam, silty clay, clay loam.	CL, CH	A-7	0-1	0-2	95-100	94-99	90-99	70-94	43-66	21-39
	29-60	Silty clay loam, silty clay, clay loam.	CL, CH	A-7	0-1	0-2	95-100	94-99	90-99	70-94	43-66	21-39
733D: Sheylake--------	0-8	Loamy sand-----	SM, SP-SM	A-2-4	0	0	100	85-100	55-70	10-25	---	NP-4
	8-24	Sand, coarse sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	0	100	85-100	55-75	2-15	---	NP-4
	24-60	Sand, coarse sand.	SP, SP-SM	A-3, A-1	0	0	100	85-100	40-75	2-10	---	NP

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
778B:												
Dorset----------	0-10	Sandy loam-----	SM, SC-SM	A-4, A-2	0	0	90-100	85-100	50-70	25-50	0-25	NP-5
	10-20	Loam, sandy loam, coarse sandy loam.	SC-SM, SC, CL-ML, CL	A-4, A-6	0	0	90-100	85-100	50-90	35-75	15-30	4-14
	20-24	Gravelly loamy sand, gravelly loamy coarse sand, gravelly coarse sand.	SP-SM, SM, SC-SM, GM	A-1, A-2	0	0-5	50-90	35-75	20-50	10-25	0-20	NP-7
	24-60	Gravelly coarse sand, gravelly sand.	SP, GP, SP-SM, GP-GM	A-1	0	0-5	50-90	35-75	15-40	0-10	0-20	NP
Carliss----------	0-5	Loamy coarse sand.	SM, SP-SM	A-1-b, A-2-4	0	0-5	85-100	80-100	40-70	10-25	15-21	NP-4
	5-13	Loamy sand, gravelly sand, coarse sand.	SP-SM, SM, SP	A-1-b, A-3, A-2-4	0	0-5	75-95	50-85	35-70	2-25	15-21	NP-4
	13-60	Coarse sand, sand, gravelly coarse sand.	SP, SP-SM	A-1-b, A-3	0	0-5	60-95	50-85	30-65	2-10	---	NP
778C:												
Dorset----------	0-9	Sandy loam-----	SM, SC-SM	A-4, A-2	0	0	90-100	85-100	50-70	25-50	0-25	NP-5
	9-15	Loam, sandy loam, coarse sandy loam.	SC-SM, SC, CL-ML, CL	A-4, A-6	0	0	90-100	85-100	50-90	35-75	15-30	4-14
	15-18	Gravelly loamy sand, gravelly loamy coarse sand, gravelly coarse sand.	SP-SM, SM, SC-SM, GM	A-1, A-2	0	0-5	50-90	35-75	20-50	10-25	0-20	NP-7
	18-60	Gravelly coarse sand, gravelly sand.	SP, GP, SP-SM, GP-GM	A-1	0	0-5	50-90	35-75	15-40	0-10	0-20	NP
Carliss----------	0-5	Loamy coarse sand.	SM, SP-SM	A-1-b, A-2-4	0	0-5	85-100	80-100	40-70	10-25	15-21	NP-4
	5-60	Coarse sand, sand, gravelly coarse sand.	SP, SP-SM	A-1-b, A-3	0	0-5	60-95	50-85	30-65	2-10	---	NP
1008:												
Hubbon----------	0-9	Silty clay loam	CL, CH	A-7	0-1	0-2	95-100	94-99	90-99	70-94	43-66	21-39
	9-27	Silty clay loam, silty clay, clay loam.	CL, CH	A-7	0-1	0-2	95-100	94-99	90-99	70-94	43-66	21-39
	27-60	Silty clay loam, silty clay, clay loam.	CL, CH	A-7	0-1	0-2	95-100	94-99	90-99	70-94	43-66	21-39

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
51C:												
Nebish----------	0-3	Loam----------	ML, CL-ML	A-4	0	0-3	95-100	85-100	85-95	50-70	20-40	1-10
	3-11	Clay loam, loam	SM, SC-SM	A-4, A-2-4	0	0-3	95-100	85-100	50-85	30-50	15-25	NP-6
	11-26	Loam, clay loam, sandy clay loam.	CL, ML	A-6, A-7	0	0-3	95-100	85-100	70-95	55-80	30-50	10-20
	26-60	Loam, clay loam, sandy clay loam.	CL, ML, CL-ML	A-4, A-6	0	0-3	95-100	85-100	70-95	50-80	20-40	5-20
Sugarbush-------	0-3	Sandy loam-----	SM	A-2-4	0	0	95-100	80-100	55-70	25-35	15-20	NP-4
	3-9	Loamy sand, loamy coarse sand, sand.	SM, SP-SM	A-1-b, A-2-4	0	0	95-100	80-100	40-70	10-25	---	NP
	9-15	Sandy loam, coarse sandy loam.	SM	A-2-4	0	0	95-100	80-100	50-70	25-35	15-20	NP-4
	15-60	Gravelly coarse sand, gravelly sand, coarse sand.	SP, SP-SM	A-1-b, A-3, A-2-4	0-5	0-5	55-85	50-85	30-55	2-10	---	NP
51E:												
Nebish----------	0-3	Loam----------	ML, CL-ML	A-4	0	0-3	95-100	85-100	85-95	50-70	20-40	1-10
	3-11	Clay loam, loam	SM, SC-SM	A-4, A-2-4	0	0-3	95-100	85-100	50-85	30-50	15-25	NP-6
	11-27	Loam, clay loam, sandy clay loam.	CL, ML	A-6, A-7	0	0-3	95-100	85-100	70-95	55-80	30-50	10-20
	27-60	Loam, clay loam, sandy clay loam.	CL, ML, CL-ML	A-4, A-6	0	0-3	95-100	85-100	70-95	50-80	20-40	5-20
Sugarbush-------	0-2	Sandy loam-----	SM	A-2-4	0	0	95-100	80-100	55-70	25-35	15-20	NP-4
	2-8	Loamy sand, loamy coarse sand, sand.	SM, SP-SM	A-1-b, A-2-4	0	0	95-100	80-100	40-70	10-25	---	NP
	8-16	Sandy loam, coarse sandy loam.	SM	A-2-4	0	0	95-100	80-100	50-70	25-35	15-20	NP-4
	16-60	Gravelly coarse sand, gravelly sand, coarse sand.	SP, SP-SM	A-1-b, A-3, A-2-4	0-5	0-5	55-85	50-85	30-55	2-10	---	NP
1S:												
Dipsamments-----	0-14	Sand----------	SM, SP-SM	A-2	0	0	95-100	85-100	75-90	10-35	---	NP
	14-60	Sand, fine sand	SP-SM, SP	A-2, A-3	0	0	95-100	85-100	50-75	5-25	---	NP
	60-80	Coarse sand, gravelly coarse sand.	SP, SP-SM, GP-GM	A-1, A-2	0	0	75-100	65-85	40-65	1-10	---	NP
1S:												
Udorthents------	0-60	Variable-------	---	---	---	---	---	---	---	---	---	---
	60-80	Variable-------	---	---	0	0	0	0	0	0	---	NP

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
1027: Udorthents.												
1030 Pits												
Udipsamments-----	0-14	Sand----------	SM, SP-SM	A-2	0	0	95-100	85-100	75-90	10-35	---	NP
	14-60	Sand, fine sand	SP-SM, SP	A-2, A-3	0	0	95-100	85-100	50-75	5-25	---	NP
	60-80	Coarse sand, gravelly coarse sand.	SP, SP-SM, GP-GM	A-1, A-2	0	0	75-100	65-85	40-65	1-10	---	NP
1004B: Waukon----------	0-9	Loam----------	ML, CL, CL-ML	A-6, A-4	0-1	0-3	95-100	90-100	80-95	60-90	20-40	5-20
	9-17	Clay loam, loam	CL, ML	A-6, A-7	0-1	0-3	95-100	90-100	75-95	50-85	30-45	10-20
	17-60	Loam, clay loam	ML, CL	A-6	0-1	0-3	95-100	90-100	70-95	50-80	30-40	10-20
Dorset----------	0-8	Sandy loam-----	SM, SC-SM	A-4, A-2	0	0	90-100	85-100	50-70	25-50	0-25	NP-5
	8-14	Loam, sandy loam, coarse sandy loam.	SC-SM, SC, CL-ML, CL	A-4, A-6	0	0	90-100	85-100	50-90	35-75	15-30	4-14
	14-60	Gravelly coarse sand, gravelly sand.	SP, GP, SP-SM, GP-GM	A-1	0	0-5	50-90	35-75	15-40	0-10	0-20	NP
1004C: Waukon----------	0-8	Loam----------	ML, CL, CL-ML	A-6, A-4	0-1	0-3	95-100	90-100	80-95	60-90	20-40	5-20
	8-21	Clay loam, loam	CL, ML	A-6, A-7	0-1	0-3	95-100	90-100	75-95	50-85	30-45	10-20
	21-60	Loam, clay loam	ML, CL	A-6	0-1	0-3	95-100	90-100	70-95	50-80	30-40	10-20
Dorset----------	0-7	Sandy loam-----	SM, SC-SM	A-4, A-2	0	0	90-100	85-100	50-70	25-50	0-25	NP-5
	7-16	Loam, sandy loam, coarse sandy loam.	SC-SM, SC, CL-ML, CL	A-4, A-6	0	0	90-100	85-100	50-90	35-75	15-30	4-14
	16-60	Gravelly coarse sand, gravelly sand.	SP, GP, SP-SM, GP-GM	A-1	0	0-5	50-90	35-75	15-40	0-10	0-20	NP
1111: Aldaros----------	0-24	Muck----------	PT	A-8	0	0	0	0	0	0	---	NP
	24-38	Sandy clay loam, sandy loam, loam.	SC, CL, CL-ML, SC-SM	A-6, A-2-6, A-4	0	0	95-100	85-100	50-95	30-75	21-40	NP-20
	38-60	Coarse sand, loamy sand, gravelly sand.	SP, SM, SP-SM, SW	A-1-b, A-3, A-2-4	0	0	60-100	50-100	30-70	3-30	---	NP
1113: Halla----------	0-20	Muck----------	PT	A-8	0	0	0	0	0	0	---	NP
	20-60	Coprogenous earth, mucky silty clay.	OL	A-5	0	0	100	95-100	85-100	75-96	41-50	2-10

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
1130: Wolverton-------	0-8	Fine sandy loam	CL-ML, SC-SM, CL	A-4, A-6	0	0	100	100	90-100	40-90	15-30	4-11
	8-12	Loamy very fine sand, loamy fine sand, loamy sand.	SM, SC-SM	A-2-4, A-4	0	0	100	100	85-100	30-50	15-25	NP-7
	12-41	Loamy very fine sand, loamy fine sand, fine sand.	SM, SC-SM, SP-SM	A-2-4, A-4	0	0-3	100	90-100	75-90	10-50	15-21	NP-4
	41-60	Clay loam, silty clay loam, loam.	CL	A-4, A-6, A-7	0	1-10	95-100	90-100	50-90	50-80	28-43	9-21
1131B: Verndale---------	0-12	Sandy loam-----	SM, SC-SM	A-4, A-2-4	0	0	100	85-100	60-85	25-45	15-20	3-6
	12-16	Sandy loam, fine sandy loam, loam.	SC, SC-SM	A-4, A-2-4	0	0	98-100	85-100	60-85	25-45	20-26	5-10
	16-35	Sand, coarse sand, loamy coarse sand.	SM, SP-SM	A-3, A-2-4	0	0	98-100	85-100	50-65	5-20	---	NP-2
	35-60	Sand, coarse sand.	SP, SP-SM	A-3, A-1-b, A-2-4	0	0	96-100	75-100	45-60	3-10	---	NP
Abbeylake-------	0-7	Loamy sand-----	SM, SP-SM	A-2-4	0	0	100	85-100	55-70	10-25	---	NP-4
	7-22	Sand, coarse sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	0	100	85-100	55-75	2-15	---	NP-4
	22-60	Sand, coarse sand.	SP, SP-SM	A-3, A-1	0	0	100	85-100	40-75	2-10	---	NP
1132B: Englevieu-------	0-9	Loamy sand-----	SP-SM, SM	A-2, A-1	0	0	100	85-100	60-80	10-25	---	NP
	9-28	Loamy sand, loamy coarse sand, sand.	SP-SM, SM, SP	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	28-48	Sand, coarse sand, loamy sand.	SP, SM, SP-SM	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	48-60	Sand, coarse sand.	SP, SP-SM	A-3, A-2, A-1	0	0	100	85-100	40-75	2-10	---	NP

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
1132E: Balmlake---------	0-3	Fine sandy loam	SM, SC, SC-SM	A-2, A-4	0	0	100	95-100	60-85	30-50	15-25	2-10
	3-17	Very fine sand, loamy fine sand, fine sandy loam.	SM	A-2, A-4	0	0	100	95-100	60-85	25-50	15-25	NP-4
	17-27	Fine sandy loam, sandy loam, loam.	SM, CL, CL, SC, ML	A-4	0	0	100	95-100	60-90	35-65	20-30	2-10
	27-60	Stratified fine sand to silt loam.	SM, ML, SC-SM, CL-ML	A-2, A-4	0	0	100	95-100	65-90	30-80	15-25	NP-5
1135: [illegible]xlake---------	0-19	Silty clay loam	CL, MH	A-7	0-1	0-2	95-100	95-99	85-95	70-90	43-66	21-39
	19-38	Silty clay loam, silty clay, clay loam.	CL, MH	A-7	0-1	0-2	95-100	95-99	85-95	70-90	43-66	21-39
	38-49	Silty clay loam, silty clay, clay loam.	CL, MH	A-7	0-1	0-2	95-100	95-99	85-95	70-90	43-66	21-39
	49-60	Silty clay loam, silty clay, clay loam.	CL, MH	A-7	0-1	0-2	95-100	95-99	85-95	70-90	43-66	21-39
[illegible] [illegible]daros---------	0-31	Muck----------	PT	A-8	0	0	0	0	0	0	---	NP
	31-49	Sandy clay loam, sandy loam, loam.	SC, CL, CL-ML, SC-SM	A-6, A-2-6, A-4	0	0	95-100	85-100	50-95	30-75	21-40	NP-20
	49-60	Coarse sand, loamy sand, gravelly sand.	SP, SM, SP-SM, SW	A-1-b, A-3, A-2-4	0	0	60-100	50-100	30-70	3-30	---	NP
1178: [illegible]rchlake-------	0-8	Silty clay loam	CL, MH	A-7	0-1	0-2	96-100	94-99	85-95	70-90	39-48	18-25
	8-27	Clay, silty clay, silty clay loam.	CL, CH	A-7	0-1	0-2	96-100	94-99	85-95	75-90	43-66	21-39
	27-60	Silty clay loam, clay loam.	CL, CH	A-7, A-6	0-1	0-2	96-100	94-99	85-95	70-90	35-57	18-32
	40-80	Silty clay loam, clay loam.	CL, CH	A-7, A-6	0-1	0-2	96-100	94-99	85-95	70-90	35-57	18-32
1178: [illegible]rchlake-------	0-8	Silty clay loam	CL, MH	A-7	0-1	0-2	96-100	94-99	85-95	70-90	39-48	18-25
	8-17	Clay, silty clay, silty clay loam.	CL, CH	A-7	0-1	0-2	96-100	94-99	85-95	75-90	43-66	21-39
	17-60	Silty clay loam, clay loam.	CL, CH	A-7, A-6	0-1	0-2	96-100	94-99	85-95	70-90	35-57	18-32
	40-80	Silty clay loam, clay loam.	CL, CH	A-7, A-6	0-1	0-2	96-100	94-99	85-95	70-90	35-57	18-32

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
1137D: Birchlake--------	0-7	Silty clay loam	CL, MH	A-7	0-1	0-2	96-100	94-99	85-95	70-90	39-48	18-25
	7-15	Clay, silty clay, silty clay loam.	CL, CH	A-7	0-1	0-2	96-100	94-99	85-95	75-90	43-66	21-39
	15-60	Silty clay loam, clay loam.	CL, CH	A-7, A-6	0-1	0-2	96-100	94-99	85-95	70-90	35-57	18-32
	40-80	Silty clay loam, clay loam.	CL, CH	A-7, A-6	0-1	0-2	96-100	94-99	85-95	70-90	35-57	18-32
1137E: Birchlake--------	0-7	Silty clay loam	CL, MH	A-7	0-1	0-2	96-100	94-99	85-95	70-90	39-48	18-25
	7-16	Clay, silty clay, silty clay loam.	CL, CH	A-7	0-1	0-2	96-100	94-99	85-95	75-90	43-66	21-39
	16-60	Silty clay loam, clay loam.	CL, CH	A-7, A-6	0-1	0-2	96-100	94-99	85-95	70-90	35-57	18-32
	40-80	Silty clay loam, clay loam.	CL, CH	A-7, A-6	0-1	0-2	96-100	94-99	85-95	70-90	35-57	18-32
1148: Rushlake--------	0-7	Loamy sand-----	SM, SP-SM	A-1-b, A-2-4	0	0	95-100	75-100	15-60	10-35	---	NP
	7-60	Gravelly sand, gravelly loamy sand, sand.	SP, SP-SM	A-1-b, A-3	0	0-3	55-95	50-90	15-60	2-10	---	NP
Rangaard--------	0-13	Sandy loam-----	SM	A-2, A-4	0	0-3	95-100	80-100	50-75	20-45	---	NP
	13-60	Gravelly coarse sand, gravelly sand, coarse sand.	SP-SM, SP	A-3, A-1, A-2	0	2-5	70-95	55-90	30-60	0-10	---	NP
1140B: Eagleview--------	0-9	Loamy sand-----	SP-SM, SM	A-2, A-1	0	0	100	85-100	60-80	10-25	---	NP
	9-22	Loamy sand, loamy coarse sand, sand.	SP-SM, SM, SP	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	22-40	Sand, coarse sand, loamy sand.	SP, SM, SP-SM	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	40-60	Sand, coarse sand.	SP, SP-SM	A-3, A-2, A-1	0	0	100	85-100	40-75	2-10	---	NP

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
44E: Sugarbush--------	0-3	Sandy loam-----	SM	A-2-4	0	0	95-100	80-100	55-70	25-35	15-20	NP-4
	3-17	Loamy sand, loamy coarse sand, sand.	SM, SP-SM	A-1-b, A-2-4	0	0	95-100	80-100	40-70	10-25	---	NP
	17-47	Sandy loam, coarse sandy loam.	SM	A-2-4	0	0	95-100	80-100	50-70	25-35	15-20	NP-4
	47-60	Gravelly coarse sand, gravelly sand, coarse sand.	SP, SP-SM	A-1-b, A-3, A-2-4	0-5	0-5	55-85	50-85	30-55	2-10	---	NP
446: Ginger----------	0-15	Silty clay loam	CL	A-6	0	0	100	100	90-100	70-90	30-40	10-15
	15-37	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0	0	100	100	90-100	80-90	20-40	2-15
	37-60	Loam, clay loam	ML, CL, CL-ML	A-4, A-6, A-7	0	0-10	90-100	85-97	75-95	50-75	20-45	3-25
[illegible]D: Corliss--------	0-9	Loamy coarse sand.	SM, SP-SM	A-1-b, A-2-4	0	0-5	85-100	80-100	40-70	10-25	15-21	NP-4
	9-16	Loamy sand, gravelly sand, coarse sand.	SP-SM, SM, SP	A-1-b, A-3, A-2-4	0	0-5	75-95	50-85	35-70	2-25	15-21	NP-4
	16-60	Coarse sand, sand, gravelly coarse sand.	SP, SP-SM	A-1-b, A-3	0	0-5	60-95	50-85	30-65	2-10	---	NP
[illegible]orset----------	0-9	Sandy loam-----	SM, SC-SM	A-4, A-2	0	0	90-100	85-100	50-70	25-50	0-25	NP-5
	9-17	Loam, sandy loam, coarse sandy loam.	SC-SM, SC, CL-ML, CL	A-4, A-6	0	0	90-100	85-100	50-90	35-75	15-30	4-14
	17-25	Gravelly loamy sand, gravelly loamy coarse sand, gravelly coarse sand.	SP-SM, SM, SC-SM, GM	A-1, A-2	0	0-5	50-90	35-75	20-50	10-25	0-20	NP-7
	25-60	Gravelly coarse sand, gravelly sand.	SP, GP, SP-SM, GP-GM	A-1	0	0-5	50-90	35-75	15-40	0-10	0-20	NP
[illegible]C: [illegible]more----------	0-7	Loamy sand-----	SM, SP-SM	A-2, A-3	0	0	95-100	90-100	50-75	5-30	15-20	NP
	7-55	Sand, coarse sand, loamy coarse sand.	SM, SP, SP-SM	A-1, A-2, A-3	0	0	95-100	85-100	45-75	2-15	15-20	NP
	55-60	Sand, coarse sand.	SP, SM, SP-SM	A-1, A-3, A-2	0	0	95-100	85-100	45-75	2-15	15-20	NP

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
48C: Verndale--------	0-6	Coarse sandy loam.	SM, SC-SM	A-4, A-2-4	0	0	100	85-100	60-85	25-45	15-20	3-6
	6-27	Sandy loam, fine sandy loam, loam.	SC, SC-SM	A-4, A-2-4	0	0	98-100	85-100	60-85	25-45	20-26	5-10
	27-48	Sand, coarse sand, loamy coarse sand.	SM, SP-SM	A-3, A-2-4	0	0	98-100	85-100	50-65	5-20	---	NP-2
	48-60	Sand, coarse sand.	SP, SP-SM	A-1-b, A-3, A-2-4	0	0	96-100	75-100	45-60	3-10	---	NP
249C: Graycalm--------	0-8	Loamy sand-----	SP-SM, SM	A-2, A-1	0	0-5	95-100	75-100	35-75	10-30	---	NP
	8-18	Sand, loamy sand.	SP-SM, SM, SP	A-3, A-2, A-1	0	0-5	95-100	75-100	30-75	0-30	---	NP
	18-37	Sand, loamy sand, loamy coarse sand.	SM, SP, SP-SM	A-2, A-1, A-3	0	0-5	95-100	75-100	30-75	0-30	---	NP
	37-60	Sand, coarse sand.	SP, SM, SP-SM	A-2, A-1, A-3	0	0-5	95-100	75-100	35-55	0-15	---	NP
Bootlake--------	0-8	Sandy loam-----	SM	A-2-4	0	0	95-100	90-100	55-70	25-35	0-20	NP-4
	8-17	Coarse sand, loamy coarse sand, loamy sand.	SM, SP-SM	A-2-4, A-1-b	0	0	95-100	90-100	40-70	10-25	0-14	NP
	17-27	Sandy loam, coarse sandy loam.	SM	A-2-4	0	0	95-100	90-100	50-65	25-35	0-20	NP-4
	27-60	Sand, coarse sand.	SP, SP-SM	A-3, A-2-4	0	0	95-100	75-100	50-80	2-10	0-14	NP
250C: Abbeylake-------	0-9	Loamy coarse sand.	SM, SP-SM	A-2-4	0	0	100	85-100	55-70	10-25	---	NP-4
	9-16	Sand, coarse sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	0	100	85-100	55-75	2-15	---	NP-4
	16-60	Sand, coarse sand.	SP, SP-SM	A-3, A-1	0	0	100	85-100	40-75	2-10	---	NP
Verndale--------	0-8	Coarse sandy loam.	SM, SC-SM	A-4, A-2-4	0	0	100	85-100	60-85	25-45	15-20	3-6
	8-14	Sandy loam, fine sandy loam, loam.	SC, SC-SM	A-4, A-2-4	0	0	98-100	85-100	60-85	25-45	20-26	5-10
	14-28	Sand, coarse sand, loamy coarse sand.	SM, SP-SM	A-3, A-2-4	0	0	98-100	85-100	50-65	5-20	---	NP-2
	28-60	Sand, coarse sand.	SP, SP-SM	A-1-b, A-3, A-2-4	0	0	96-100	75-100	45-60	3-10	---	NP

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
825B: Seelyeville-----	0-60	Muck-----------	PT	A-8	0	0	0	0	0	0	---	NP
878: Hamre-----------	0-14	Muck-----------	PT	A-8	0	0	0	0	0	0	---	NP
	14-19	Loam, clay loam, silt loam.	CL, CL-ML	A-4, A-6, A-7	0-1	0-3	90-100	80-100	70-100	50-90	25-45	6-20
	19-60	Loam, clay loam, silt loam.	CL, CL-ML	A-4, A-6, A-7	0-1	0-3	80-100	75-100	65-95	50-85	25-45	6-20
938: Lakepark--------	0-8	Clay loam------	CL	A-6	0	0	100	92-100	90-100	65-90	30-40	10-15
	8-28	Clay loam, silty clay loam, silt loam.	ML, CL	A-4, A-6	0	0	100	92-100	90-100	65-90	30-40	2-12
	28-34	Silty clay loam, clay loam, loam.	CL	A-6, A-7	0	0-5	95-100	90-98	85-100	65-90	30-45	15-30
	34-60	Clay loam, loam	CL	A-6	0	0-5	95-100	90-98	75-85	55-75	30-40	10-20
942: Porada----------	0-10	Mucky loam-----	ML	A-4	0	0	95-100	85-100	70-90	50-70	25-35	NP-10
	10-21	Sandy loam, loam, fine sandy loam.	ML, SM	A-4, A-2	0	0	95-100	85-100	55-85	30-60	20-40	NP-10
	21-60	Sand, coarse sand, gravelly coarse sand.	SP, SM, SP-SM, GP-GM	A-1, A-2, A-3	0	0	50-90	50-80	40-70	2-30	0-14	NP
967: Wanorly---------	0-9	Clay loam------	CL	A-6, A-7	0	0-5	95-100	90-100	80-95	75-95	30-45	10-25
	9-20	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	80-95	60-75	20-45	5-25
	20-60	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	75-95	55-75	20-45	5-25
Wallers---------	0-15	Silty clay loam	OL, CL, ML	A-6, A-7	0	0	95-100	95-100	95-100	85-95	30-50	11-20
	15-25	Clay loam, silty clay loam, sandy clay loam.	CL	A-6	0	0	95-100	90-100	80-95	50-80	30-40	11-20
	25-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0	0	95-100	90-100	85-95	60-85	20-40	5-20
[illegible] Zilan----------	0-13	Sandy loam-----	SM, SC-SM	A-2-4, A-4	0	0	100	85-100	60-85	25-45	15-20	3-6
	13-22	Loam, sandy loam.	SC, CL, SC-SM, CL-ML	A-4	0	0	100	85-100	60-85	35-60	20-30	5-10
	22-52	Loamy sand, sand, coarse sand.	SM, SP-SM	A-3, A-2-4	0	0	98-100	85-100	50-65	5-20	---	NP
	52-60	Sand, coarse sand, gravelly sand.	SP, SP-SM	A-1-b, A-3, A-2-4	0	0	90-100	60-100	35-55	3-10	---	NP

Monitoring Well Reports

MONTHLY REPORT OF AREA WELLS (WATER CHARACTERISTICS)

DETROIT LAKES, MINNESOTA

0020192 (PERMIT NUMBER) 010 (DIS. NO.) MONTH December 97

Send to: MINNESOTA POLLUTION CONTROL AGENCY
1935 WEST COUNTY ROAD B 2
ROSEVILLE, MINNESOTA 55113
ATTN: COMPLIANCE & ENFORCEMENT SECTION

FIGURE 20

DATE	INFORMATION	WELL NO. 1	WELL NO. 2	WELL NO. 3	WELL NO. 4	WELL NO. 5	WELL NO. 6	WELL NO. 7	WELL NO. 8	WELL NO. 9	WELL NO. 10	WELL NO. 11	WELL NO. 12	WELL NO. 13	WELL NO. 14	WELL NO. 15	WELL NO. 16	WELL NO. 17
	DEPTH OF SAMPLE (M)																	
	TEMPERATURE (CENT)												10.7	8.4	18.8			
	pH												6.9	7.03	7.35			
	PO_4 TOTAL																	
	SULFATE												26	26	<15			
	NH_3 – N																	
	FECAL COLIFORM																	
	NO_3 – N												1.94	1.95	405			
	CONDUCTIVITY																	
	CHLORIDES																	
	TKN												181	177	211			
	$CBOD_5$												0.44	0.18	9.0			
	ELEV. (Top of casing)																	
	ELEV. (Bottom of well)																	
	ELEV. (Water level)						9'4"						9'4"	12'3"	9'5"			
		WELL NO. 18	WELL NO. 19	WELL NO. 20	WELL NO. 21	WELL NO. 22	WELL NO. 23	WELL NO. 24	WELL NO. 25	WELL NO. 26	WELL NO. 27	WELL NO. 28	WELL NO. 29	WELL NO. 30	WELL NO. 31	WELL NO. 32	WELL NO. 33	
	DEPTH OF SAMPLE (M)																	
	TEMPERATURE (CENT)																	
	pH																	
	PO_4 TOTAL																	
	SULFATE																	
	NH_3 – N																	
	FECAL COLIFORM																	
	NO_3 – N																	
	CONDUCTIVITY																	
	CHLORIDES																	
	TKN																	
	$CBOD_5$																	
	ELEV. (Top of casing)																	
	ELEV. (Bottom of well)																	
	ELEV. (Water level)																	

NOTES:

1. ALTERNATE TESTS BETWEEN EVEN AND ODD NUMBERED WELLS.
2. GRAB SAMPLES TO BE TAKEN MONTHLY DURING SPRAY SEASON; QUARTERLY DURING NON-SPRAY SEASON.
3. AT LEAST ONCE A YEAR EACH TEST MUST BE BASED ON A 24 HOUR COMPOSITE SAMPLE.

MONTHLY REPORT OF AREA WELLS (WATER CHARACTERISTICS)

DETROIT LAKES, MINNESOTA

0020192 PERMIT NUMBER — 010 DIS. NO. — MONTH April 98

Send to: MINNESOTA POLLUTION CONTROL AGENCY
1935 WEST COUNTY ROAD B 2
ROSEVILLE, MINNESOTA 55113
ATTN: COMPLIANCE & ENFORCEMENT SECTION

FIGURE 20

DATE	INFORMATION	WELL NO. 1	WELL NO. 2	WELL NO. 3	WELL NO. 4	WELL NO. 5	WELL NO. 6	WELL NO. 7	WELL NO. 8	WELL NO. 9	WELL NO. 10	WELL NO. 11	WELL NO. 12	WELL NO. 13	WELL NO. 14	WELL NO. 15	WELL NO. 16	WELL NO. 17
	DEPTH OF SAMPLE (M)																	
4/30	TEMPERATURE (CENT)	8.6	8.4	12.2	11.7	9.7	4.9	8.9	7.5	8.9	9.6	9.0	9.6	6.7	8.4	6.3		
4/30	pH	7.53	7.69	7.33	7.51	7.65	7.25	7.48	7.20	7.42	7.49	7.62	7.42	7.44	7.63	7.59		
	PO_4 TOTAL																	
	SULFATE												<15	<15	<15	<15		
	NH_3-N																	
	FECAL COLIFORM																	
	NO_3-N	3.4	1.5	2.6	71	40	<.5	1.8	<.5	2.6	<.5	2.0	0.9	5.8	<.5	<.5		
4/30	CONDUCTIVITY	442	363	486	555	422	450	610	753	833	700	583	597	835	1170	949		
	CHLORIDES	20.4	44.1	55.5	15.7	25.4	230	38.7	111	109	104	81	63.5	94	233	215		
	TKN	0.16	0.09	0.18	0.14	0.16	0.31	0.13	0.20	0.18	0.31	0.20	0.16	0.50	9.0	4.3		
	$CBOD_5$																	
	ELEV. (Top of casing)																	
	ELEV. (Bottom of well)																	
	ELEV. (Water level)																	

DATE	INFORMATION	WELL NO. 18	WELL NO. 19	WELL NO. 20	WELL NO. 21	WELL NO. 22	WELL NO. 23	WELL NO. 24	WELL NO. 25	WELL NO. 26	WELL NO. 27	WELL NO. 28	WELL NO. 29	WELL NO. 30	WELL NO. 31	WELL NO. 32	WELL NO. 33
	DEPTH OF SAMPLE (M)																
	TEMPERATURE (CENT)																
	pH																
	PO_4 TOTAL																
	SULFATE																
	NH_3-N																
	FECAL COLIFORM																
	NO_3-N																
	CONDUCTIVITY																
	CHLORIDES																
	TKN																
	$CBOD_5$																
	ELEV. (Top of casing)																
	ELEV. (Bottom of well)																
	ELEV. (Water level)																

NOTES:

1. ALTERNATE TESTS BETWEEN EVEN AND ODD NUMBERED WELLS.
2. GRAB SAMPLES TO BE TAKEN MONTHLY DURING SPRAY SEASON QUARTERLY DURING NON-SPRAY SEASON.
3. AT LEAST ONCE A YEAR EACH TEST MUST BE BASED ON A 24 HOUR COMPOSITE SAMPLE.

MONTHLY REPORT OF AREA WELLS (WATER CHARACTERISTICS)

DETROIT LAKES, MINNESOTA

010 — DIS. NO.

MONTH May 98

00220192 — PERMIT NUMBER

Send to: MINNESOTA POLLUTION CONTROL AGENCY
1935 WEST COUNTY ROAD B 2
ROSEVILLE, MINNESOTA 55113
ATTN: COMPLIANCE & ENFORCEMENT SECTION

FIGURE 20

DATE	INFORMATION	WELL NO. 1	WELL NO. 2	WELL NO. 3	WELL NO. 4	WELL NO. 5	WELL NO. 6	WELL NO 7	WELL NO. 8	WELL NO. 9	WELL NO. 10	WELL NO. 11	WELL NO. 12	WELL NO. 13	WELL NO. 14	WELL NO. 15	WELL NO. 16	WELL NO. 17
	DEPTH OF SAMPLE (M)																	
	TEMPERATURE (CENT)		9.9	13.4	12.8	11.3	11.7	8.2	6.6	9.8	13.1	11.2						
	ph		7.65	7.21	7.18	7.69	7.32	7.37	7.2	7.24	7.27	7.41						
	PO_4 TOTAL																	
	SULFATE																	
	NH_3 -N																	
	FECAL COLIFORM																	
	NO_3 -N		1.44	5.4	2.6	4.1	.4	3.8	.09	2.6	.76	2.0						
	CONDUCTIVITY		511	1060	523	469	1130	729	919	962	655	799						
	CHLORIDES		43.4	207	27	28.2	226	56.4	109	151	96	88.5						
	TKN		18	2.2	.46	.89	0.17	.09	0.30	1.1	1.2	0.14						
	$CBOD_5$																	
	ELEV. (Top of casing)																	
	ELEV. (Bottom of well)																	
	ELEV. (Water level)		167.5	166	356.5	326	25'10"	13'4"	10'7½	10'6"	15'6"	7'9"						

		WELL NO.18	WELL NO. 19	WELL NO.20	WELL NO. 21	WELL NO.22	WELL NO.23	WELL NO.24	WELL NO.25	WELL NO.26	WELL NO.27	WELL NO.28	WELL NO.29	WELL NO. 30	WELL NO.31	WELL NO.32	WELL NO.33
	DEPTH OF SAMPLE (M)																
	TEMPERATURE (CENT)																
	ph																
	PO_4 TOTAL																
	SULFATE																
	NH_3 -N																
	FECAL COLIFORM																
	NO_3 -N																
	CONDUCTIVITY																
	CHLORIDES																
	TKN																
	$CBOD_5$																
	ELEV. (Top of casing)																
	ELEV. (Bottom of well)																
	ELEV. (Water level)																

NOTES:

1. ALTERNATE TESTS BETWEEN EVEN AND ODD NUMBERED WELLS.
2. GRAB SAMPLES TO BE TAKEN MONTHLY DURING SPRAY SEASON QUARTERLY DURING NON-SPRAY SEASON.
3. AT LEAST ONCE A YEAR EACH TEST MUST BE BASED ON A 24 HOUR COMPOSITE SAMPLE.

MONTHLY REPORT OF AREA WELLS (WATER CHARACTERISTICS)

DETROIT LAKES, MINNESOTA

0020192 PERMIT NUMBER *010* DIS. NO. MONTH *June 98*

Send to: MINNESOTA POLLUTION CONTROL AGENCY
1935 WEST COUNTY ROAD B 2
ROSEVILLE, MINNESOTA 55113
ATTN: COMPLIANCE & ENFORCEMENT SECTION

FIGURE 20

DATE	INFORMATION	WELL NO. 1	WELL NO. 2	WELL NO. 3	WELL NO. 4	WELL NO. 5	WELL NO. 6	WELL NO. 7	WELL NO. 8	WELL NO. 9	WELL NO. 10	WELL NO. 11	WELL NO. 12	WELL NO. 13	WELL NO. 14	WELL NO. 15	WELL NO. 16	WELL NO. 17
	DEPTH OF SAMPLE (M)																	
	TEMPERATURE (CENT)		9.3	14.0	10.0	10.5	10.1	9.3	8.9	10.0	10.9	11.6						
	pH		7.63	7.25	7.38	7.69	7.36	7.46	7.09	7.24	7.41	7.37						
	PO_4 TOTAL																	
	SULFATE																	
	NH_3-N																	
	FECAL COLIFORM																	
	NO_3-N		1.1	4.14	3.0	3.44	0.46	3.6	0.21	3.10	2.79	.4						
	CONDUCTIVITY		298	836	348	345	723	433	689	697	640	430						
	CHLORIDES		40.1	21.8	10.0	35.9	222	33.5	113	138	155	76.5						
	TKN		0.16	0.33	0.51	.09	.09	.09	.09	.10	0.28	.09						
	$CBOD_5$																	
	ELEV. (Top of casing)																	
	ELEV. (Bottom of well)																	
	ELEV. (Water level)		16'4"	14'7"	35'6½"	28'7"	11'10"	11'10"	10'3"	10'	14'7"	8'2"						
		WELL NO. 18	WELL NO. 19	WELL NO. 20	WELL NO. 21	WELL NO. 22	WELL NO. 23	WELL NO. 24	WELL NO. 25	WELL NO. 26	WELL NO. 27	WELL NO. 28	WELL NO. 29	WELL NO. 30	WELL NO. 31	WELL NO. 32	WELL NO. 33	
	DEPTH OF SAMPLE (M)																	
	TEMPERATURE (CENT)																	
	pH																	
	PO_4 TOTAL																	
	SULFATE																	
	NH_3-N																	
	FECAL COLIFORM																	
	NO_3-N																	
	CONDUCTIVITY																	
	CHLORIDES																	
	TKN																	
	$CBOD_5$																	
	ELEV. (Top of casing)																	
	ELEV. (Bottom of well)																	
	ELEV. (Water level)																	

NOTES:

1. ALTERNATE TESTS BETWEEN EVEN AND ODD NUMBERED WELLS.
2. GRAB SAMPLES TO BE TAKEN MONTHLY DURING SPRAY SEASON QUARTERLY DURING NON-SPRAY SEASON.
3. AT LEAST ONCE A YEAR EACH TEST MUST BE BASED ON A 24 HOUR COMPOSITE SAMPLE.

MONTHLY REPORT OF AREA WELLS (WATER CHARACTERISTICS)

DETROIT LAKES, MINNESOTA MONTH July

PERMIT NUMBER DIS. NO.

Send to: MINNESOTA POLLUTION CONTROL AGENCY
1935 WEST COUNTY ROAD B 2
ROSEVILLE, MINNESOTA 55113
ATTN: COMPLIANCE & ENFORCEMENT SECTION

FIGURE 20

DATE	INFORMATION	WELL NO. 1	WELL NO. 2	WELL NO. 3	WELL NO. 4	WELL NO. 5	WELL NO. 6	WELL NO. 7	WELL NO. 8	WELL NO. 9	WELL NO. 10	WELL NO. 11	WELL NO. 12	WELL NO. 13	WELL NO. 14	WELL NO. 15	WELL NO. 16	WELL NO. 17
	DEPTH OF SAMPLE (M)															(CBOD)		
	TEMPERATURE (CENT)	11.9	10.7	22.0	11.6	10.7	10.7	16.1	10.5	12.1	12.7	13.6	12.8	16.9	14.1	13.2		
	ph	7.20	7.69	7.20	7.33	7.74	7.28	7.39	7.44	7.43	7.43	7.50	7.20	7.27	7.64	7.47		
	PO_4 TOTAL	.007													1.313	.447		
	SULFATE	<15											16	21	<15 (CBOD)	<15		
	NH_3 -N																	
	FECAL COLIFORM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	NO_3 -N	1.36	.935	1.64	10.45	2.503	1.351	.730	.003	1.179	.873	.760	1.382	.549	.003	.003		
	CONDUCTIVITY	609	480	760	828	492	1330	978	926	934	1100 1063	795	1050	1180	1350	1410		
	CHLORIDES	9.5	23.1	92.5	15.7	17.3	21.7	104	109	124	186	88.6	153	161	222	211		
	TKN	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.0	5.6		
	$CBOD_5$	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	ELEV. (Top of casing)															(CBOD)		
	ELEV. (Bottom of well)																	
	ELEV. (Water level)	1354	1359	1316	1366	1348	1350	1347	1340	1340	1317	1340	1349	1312	1373	1346		

	WELL NO.18	WELL NO. 19	WELL NO.20	WELL NO. 21	WELL NO.22	WELL NO.23	WELL NO.24	WELL NO.25	WELL NO.26	WELL NO.27	WELL NO.28	WELL NO.29	WELL NO. 30	WELL NO.31	WELL NO.32	WELL NO.33
DEPTH OF SAMPLE (M)																
TEMPERATURE (CENT)																
ph																
PO_4 TOTAL																
SULFATE																
NH_3 -N																
FECAL COLIFORM																
NO_3 -N																
CONDUCTIVITY																
CHLORIDES																
TKN																
$CBOD_5$																
ELEV. (Top of casing)																
ELEV. (Bottom of well)																
ELEV. (Water level)																

NOTES:

1. ALTERNATE TESTS BETWEEN EVEN AND ODD NUMBERED WELLS.
2. GRAB SAMPLES TO BE TAKEN MONTHLY DURING SPRAY SEASON QUARTERLY DURING NON-SPRAY SEASON.
3. AT LEAST ONCE A YEAR EACH TEST MUST BE BASED ON A 24 HOUR COMPOSITE SAMPLE.

MONTHLY REPORT OF AREA WELLS (WATER CHARACTERISTICS)

DETROIT LAKES, MINNESOTA

0020192 PERMIT NUMBER — 010 DIS. NO. — MONTH August 98

Send to: MINNESOTA POLLUTION CONTROL AGENCY
1935 WEST COUNTY ROAD B 2
ROSEVILLE, MINNESOTA 55113
ATTN: COMPLIANCE & ENFORCEMENT SECTION

FIGURE 20

DATE	INFORMATION	WELL NO. 1	WELL NO. 2	WELL NO. 3	WELL NO. 4	WELL NO. 5	WELL NO. 6	WELL NO. 7	WELL NO. 8	WELL NO. 9	WELL NO. 10	WELL NO. 11	WELL NO. 12	WELL NO. 13	WELL NO. 14	WELL NO. 15	WELL NO. 16	WELL NO. 17
	DEPTH OF SAMPLE (M)																	
	TEMPERATURE (CENT)		10.7	16.8	10.8	11.0	11.6	13.5	11.3	11.3	14.4	13.1						
	pH		7.71	7.30	7.2	7.8	7.4	7.4	7.1	7.31	7.3	7.5						
	PO_4 TOTAL																	
	SULFATE																	
	NH_3 -N																	
	FECAL COLIFORM																	
	NO_3 -N		.917	1.425	6.89	1.39	2.24	.839	.074	1.05	1.539	.790	[illegible]					
	CONDUCTIVITY		394	807	695	406	1210	725	557	856	1070	634						
	CHLORIDES		25.8	111	15.4	11	218	74.1	102	132	186	98						
	TKN		<.09	0.22	0.21	0.14	0.45	0.20	0.31	0.24	0.42	0.13						
	$CBOD_5$																	
	ELEV. (Top of casing)																	
	ELEV. (Bottom of well)																	
	ELEV. (Water level)		19'6"	14'10"	33'2"	24'1½	21'4½	17'1"	10'4"	10'	17'8½	7'3"						

DATE	INFORMATION	WELL NO. 18	WELL NO. 19	WELL NO. 20	WELL NO. 21	WELL NO. 22	WELL NO. 23	WELL NO. 24	WELL NO. 25	WELL NO. 26	WELL NO. 27	WELL NO. 28	WELL NO. 29	WELL NO. 30	WELL NO. 31	WELL NO. 32	WELL NO. 33
	DEPTH OF SAMPLE (M)																
	TEMPERATURE (CENT)																
	pH																
	PO_4 TOTAL																
	SULFATE																
	NH_3 -N																
	FECAL COLIFORM																
	NO_3 -N																
	CONDUCTIVITY																
	CHLORIDES																
	TKN																
	$CBOD_5$																
	ELEV. (Top of casing)																
	ELEV. (Bottom of well)																
	ELEV. (Water level)																

NOTES:

1. ALTERNATE TESTS BETWEEN EVEN AND ODD NUMBERED WELLS.
2. GRAB SAMPLES TO BE TAKEN MONTHLY DURING SPRAY SEASON QUARTERLY DURING NON-SPRAY SEASON.
3. AT LEAST ONCE A YEAR EACH TEST MUST BE BASED ON A 24 HOUR COMPOSITE SAMPLE.

MONTHLY REPORT OF AREA WELLS (WATER CHARACTERISTICS)

DETROIT LAKES, MINNESOTA MONTH September 78

0026192 PERMIT NUMBER 010 DIS. NO.

Send to: MINNESOTA POLLUTION CONTROL AGENCY
1935 WEST COUNTY ROAD B-2
ROSEVILLE, MINNESOTA 55113
ATTN: COMPLIANCE & ENFORCEMENT SECTION

DATE	INFORMATION	WELL NO. 1		WELL NO. 2		WELL NO. 3		WELL NO. 4		WELL NO. 5		WELL NO. 6		WELL NO. 7		WELL NO. 8		WELL NO. 9		WELL NO. 10		WELL NO. 11		WELL NO. 12		WELL NO. 13		WELL NO. 14		WELL NO 15		WELL NO. 16		WELL NO. 17	
	DEPTH OF SAMPLE (M)																																		
	TEMPERATURE (CENT)			16.9		14.0		12.8		11.4		12.3		13.3		13.9		12.4		16.8		14.0													
	ph			7.47		7.09		6.78		7.77		7.36		7.63		7.15		7.40		7.23		7.40													
	PO_4 TOTAL																																		
	SULFATE																																		
	NH_3 -N																																		
	FECAL COLIFORM																																		
	NO_3 -N			1.86		2.14		5.06		1.33		2.23		1.37		.33		1.44		1.75		1.57													
	CONDUCTIVITY			451		1060		660		379		1160		748		935		974		1190		1010													
	CHLORIDES			31		189		65		6.5		212		106		123		134		231		152													
	TKN			<.09		0.30		<.09		<.09		0.23		<.09		0.20		0.14		0.34		0.18													
	$CBOD_5$																																		
	ELEV. (Top of casing)																																		
	ELEV. (Bottom of well)																																		
	ELEV. (Water level)			17'		15'3½"		33'7"		9'4½"		2'6"		15'6"		13'7½"		10'2½"		14'6"		7'11"													

		WELL NO. 18		WELL NO. 19		WELL NO. 20		WELL NO. 21		WELL NO. 22		WELL NO. 23		WELL NO. 24		WELL NO. 25		WELL NO. 26		WELL NO. 27		WELL NO. 28		WELL NO. 29		WELL NO. 30		WELL NO. 31		WELL NO. 32		WELL NO. 33			
	DEPTH OF SAMPLE (M)																																		
	TEMPERATURE (CENT)																																		
	ph																																		
	PO_4 TOTAL																																		
	SULFATE																																		
	NH_3 -N																																		
	FECAL COLIFORM																																		
	NO_3 -N																																		
	CONDUCTIVITY																																		
	CHLORIDES																																		
	TKN																																		
	$CBOD_5$																																		
	ELEV. (Top of casing)																																		
	ELEV. (Bottom of well)																																		
	ELEV. (Water level)																																		

FIGURE 20

NOTES:

1. ALTERNATE TESTS BETWEEN EVEN AND ODD NUMBERED WELLS.
2. GRAB SAMPLES TO BE TAKEN MONTHLY DURING SPRAY SEASON QUARTERLY DURING NON-SPRAY SEASON.
3. AT LEAST ONCE A YEAR EACH TEST MUST BE BASED ON A 24 HOUR COMPOSITE SAMPLE.

Samples for Nitrate were accidentally discarded for 7, 8, 9, 10, 11.
Nitrate on Wells 12, 13, 14, 15. Will be reported on next months report.

MONTHLY REPORT OF AREA WELLS (WATER CHARACTERISTICS)

DETROIT LAKES, MINNESOTA

MONTH October 98

0220192 PERMIT NUMBER

010 DIS. NO.

Send to: MINNESOTA POLLUTION CONTROL AGENCY
1935 WEST COUNTY ROAD B 2
ROSEVILLE, MINNESOTA 55113
ATTN: COMPLIANCE & ENFORCEMENT SECTION

FIGURE 20

DATE	INFORMATION	WELL NO. 1		WELL NO. 2		WELL NO. 3		WELL NO. 4		WELL NO. 5		WELL NO. 6		WELL NO. 7		WELL NO. 8		WELL NO. 9		WELL NO. 10		WELL NO 11		WELL NO 12		WELL NO. 13		WELL NO. 14		WELL NO. 15		WELL NO. 16		WELL NO. 17	
	DEPTH OF SAMPLE (M)																																		
	TEMPERATURE (CENT)		11.7		10.4		13.0		9.5		10.1		10.3		12.5		11.6		11.5		14.4		11.4		13.6		15.6		14.9		13.4					
	ph		7.16		7.38		7.53		7.18		7.26		7.29		7.26		7.44		7.57		7.14		7.49		7.30		7.26		7.45		7.73					
	PO_4 TOTAL																																		
	SULFATE																							<15		27		<15		<15					
	NH_3 -N																																		
	FECAL COLIFORM																																		
	NO_3 -N		0.53		2.08		1.9		7.2		1.49		2.92																						
	CONDUCTIVITY		537		561		1180		752		454		1230		1060		543		1060		1340		970		1170		1110		1100		981					
	CHLORIDES		64		33.8		228		37.8		26.4		200		133		116		138		228		146		201		262		187		148					
	TKN		0.37		<0.09		0.34		0.09		<0.09		0.30		0.14		0.14		0.14		0.24		0.17		0.30		0.40		5.1		2.7					
	$CBOD_5$																																		
	ELEV. (Top of casing)																																		
	ELEV. (Bottom of well)																																		
	ELEV. (Water level)		15'9"		16'2"		15'5"		33'10		24'4"		21'1"		12'		10'4"		9'10"		13'10"		7'2"		8'11"		12'		7'11"		5'					
		WELL NO. 18		WELL NO. 19		WELL NO. 20		WELL NO. 21		WELL NO. 22		WELL NO. 23		WELL NO. 24		WELL NO. 25		WELL NO. 26		WELL NO. 27		WELL NO. 28		WELL NO. 29		WELL NO. 30		WELL NO. 31		WELL NO. 32		WELL NO. 33			
	DEPTH OF SAMPLE (M)																																		
	TEMPERATURE (CENT)																																		
	ph																																		
	PO_4 TOTAL																																		
	SULFATE																																		
	NH_3 -N																																		
	FECAL COLIFORN																																		
	NO_3 -N																																		
	CONDUCTIVITY																																		
	CHLORIDES																																		
	TKN																																		
	$CBOD_5$																																		
	ELEV. (Top of casing)																																		
	ELEV. (Bottom of well)																																		
	ELEV. (Water level)																																		

NOTES:

1. ALTERNATE TESTS BETWEEN EVEN AND ODD NUMBERED WELLS.
2. GRAB SAMPLES TO BE TAKEN MONTHLY DURING SPRAY SEASON QUARTERLY DURING NON-SPRAY SEASON.
3. AT LEAST ONCE A YEAR EACH TEST MUST BE BASED ON A 24 HOUR COMPOSITE SAMPLE.

MONTHLY REPORT OF AREA WELLS (WATER CHARACTERISTICS)

DETROIT LAKES, MINNESOTA

0220/92 PERMIT NUMBER 0/0 DIS. NO. MONTH November

Send to: MINNESOTA POLLUTION CONTROL AGENCY
1935 WEST COUNTY ROAD B 2
ROSEVILLE, MINNESOTA 55113
ATTN: COMPLIANCE & ENFORCEMENT SECTION

FIGURE 20

DATE	INFORMATION	WELL NO. 1		WELL NO. 2		WELL NO 3		WELL NO. 4		WELL NO. 5		WELL NO. 6		WELL NO. 7		WELL NO. 8		WELL NO. 9		WELL NO 10		WELL NO 11		WELL NO.12		WELL NO 13		WELL NO. 14		WELL NO 15		WELL NO.16		WELL NO 17	
	DEPTH OF SAMPLE (M)																																		
	TEMPERATURE (CENT)			10.9		12.5		9.1		10.2		10.7		11.8		10.0		11.6		13.8		9.7													
	ph			7.93		7.36		7.32		8.82		7.14		7.25		6.09		7.32		7.80		7.44													
	PO_4 TOTAL																																		
	SULFATE																																		
	NH_3 -N																																		
	FECAL COLIFORM																																		
	NO_3 -N			2.24		1.09		10.09		0.99		1.25		.81		.12		1.49		2.67		1.86													
	CONDUCTIVITY			668		1120		712		1070		385		865		762		930		1040		894													
	CHLORIDES			24.4		215		~~582~~ 200		~~LL~~ 155		195		153		96		147		222		323													
	TKN			1.8		.18		~~1.09~~ .90		~~.18~~		.12		.26		.15		.20		.32		17													
	$CBOD_5$																																		
	ELEV. (Top of casing)																																		
	ELEV. (Bottom of well)																																		
	ELEV. (Water level)			16'3"		15'4"		33'6"		24'		21'6"		12'		10'1"		16'1"		15'3"		8'													

DATE	INFORMATION	WELL NO. 18		WELL NO. 19		WELL NO.20		WELL NO. 21		WELL NO.22		WELL NO.23		WELL NO.24		WELL NO.25		WELL NO.26		WELL NO.27		WELL NO.28		WELL NO.29		WELL NO.30		WELL NO.31		WELL NO.32		WELL NO.33			
	DEPTH OF SAMPLE (M)																																		
	TEMPERATURE (CENT)																																		
	ph																																		
	PO_4 TOTAL																																		
	SULFATE																																		
	NH_3 -N																																		
	FECAL COLIFORM																																		
	NO_3 -N																																		
	CONDUCTIVITY																																		
	CHLORIDES																																		
	TKN																																		
	$CBOD_5$																																		
	ELEV. (Top of casing)																																		
	ELEV. (Bottom of well)																																		
	ELEV. (Water level)																																		

NOTES:

1. ALTERNATE TESTS BETWEEN EVEN AND ODD NUMBERED WELLS.
2. GRAB SAMPLES TO BE TAKEN MONTHLY DURING SPRAY SEASON QUARTERLY DURING NON-SPRAY SEASON.
3. AT LEAST ONCE A YEAR EACH TEST MUST BE BASED ON A 24 HOUR COMPOSITE SAMPLE.

MONTHLY REPORT OF AREA WELLS (WATER CHARACTERISTICS)

DETROIT LAKES, MINNESOTA

MONTH December 88

PERMIT NUMBER 0020192 DIS. NO. 010

Send to: MINNESOTA POLLUTION CONTROL AGENCY
1935 WEST COUNTY ROAD B-2
ROSEVILLE, MINNESOTA 55113
ATTN: COMPLIANCE & ENFORCEMENT SECTION

FIGURE 20

DATE	INFORMATION	WELL NO. 1		WELL NO. 2		WELL NO. 3		WELL NO. 4		WELL NO. 5		WELL NO. 6		WELL NO. 7		WELL NO. 8		WELL NO. 9		WELL NO. 10		WELL NO. 11		WELL NO. 12		WELL NO. 13		WELL NO. 14		WELL NO. 15		WELL NO. 16		WELL NO. 17	
	DEPTH OF SAMPLE (M)																																		
12/1	TEMPERATURE (CENT)		12.3																					13.0		13.7		13.8		14.1					
12/1	ph		7.38																					7.38		7.31		7.50		7.44					
	PO_4 TOTAL																																		
	SULFATE		<15																					<15		<15		<15		<15					
	NH_3 -N																																		
	FECAL COLIFORM																																		
	NO_3 -N		1.6																					1.8		1.4		.02		.02					
12/1	CONDUCTIVITY		504																					1130		1010		1120		1100					
	CHLORIDES		6																					238		190		196		187					
	TKN		<.09																					0.15		0.10		8.0		.50					
	$CBOD_5$																																		
	ELEV. (Top of casing)																																		
	ELEV. (Bottom of well)																																		
12/1	ELEV. (Water level)		20'8"																					17'7"		25'7"		19'1"		19'1½					

DATE	INFORMATION	WELL NO. 18		WELL NO. 19		WELL NO. 20		WELL NO. 21		WELL NO. 22		WELL NO. 23		WELL NO. 24		WELL NO. 25		WELL NO. 26		WELL NO. 27		WELL NO. 28		WELL NO. 29		WELL NO. 30		WELL NO. 31		WELL NO. 32		WELL NO. 33			
	DEPTH OF SAMPLE (M)																																		
	TEMPERATURE (CENT)																																		
	ph																																		
	PO_4 TOTAL																																		
	SULFATE																																		
	NH_3 -N																																		
	FECAL COLIFORM																																		
	NO_3 -N																																		
	CONDUCTIVITY																																		
	CHLORIDES																																		
	TKN																																		
	$CBOD_5$																																		
	ELEV. (Top of casing)																																		
	ELEV. (Bottom of well)																																		
	ELEV. (Water level)																																		

NOTES:

1. ALTERNATE TESTS BETWEEN EVEN AND ODD NUMBERED WELLS.
2. GRAB SAMPLES TO BE TAKEN MONTHLY DURING SPRAY SEASON QUARTERLY DURING NON-SPRAY SEASON.
3. AT LEAST ONCE A YEAR EACH TEST MUST BE BASED ON A 24 HOUR COMPOSITE SAMPLE.

MONTHLY REPORT OF AREA WELLS (WATER CHARACTERISTICS)

DETROIT LAKES, MINNESOTA

0020192 PERMIT NUMBER 010 DIS. NO. MONTH January

Send to: MINNESOTA POLLUTION CONTROL AGENCY
1935 WEST COUNTY ROAD B 2
ROSEVILLE, MINNESOTA 55113
ATTN: COMPLIANCE & ENFORCEMENT SECTION

FIGURE 20

DATE	INFORMATION	WELL NO. 1	WELL NO. 2	WELL NO. 3	WELL NO. 4	WELL NO. 5	WELL NO. 6	WELL NO. 7	WELL NO. 8	WELL NO. 9	WELL NO. 10	WELL NO. 11	WELL NO. 12	WELL NO. 13	WELL NO. 14	WELL NO. 15	WELL NO. 16	WELL NO. 17
	DEPTH OF SAMPLE (M)																	
	TEMPERATURE (CENT)	9.7											9.9	4.5	10.0	5.9		
	pH	7.47											7.44	7.38	7.83	7.76		
	PO_4 TOTAL												12	14	62	45		
	SULFATE	11																
	NH_3 - N																	
	FECAL COLIFORM																	
	NO_3 - N	2.00											1.09	0.37	0.0	8.0		
	CONDUCTIVITY	484											353	905	970	1210		
	CHLORIDES	225											51.5	95.5	208	247		
	TKN	.12											2.4	.26	8.7	4.7		
	$CBOD_5$																	
	ELEV. (Top of casing)																	
	ELEV. (Bottom of well)																	
	ELEV. (Water level)	22.24											17.0	25.2	13.2	19.25		

	WELL NO. 18	WELL NO. 19	WELL NO. 20	WELL NO. 21	WELL NO. 22	WELL NO. 23	WELL NO. 24	WELL NO. 25	WELL NO. 26	WELL NO. 27	WELL NO. 28	WELL NO. 29	WELL NO. 30	WELL NO. 31	WELL NO. 32	WELL NO. 33
DEPTH OF SAMPLE (M)																
TEMPERATURE (CENT)																
pH																
PO_4 TOTAL																
SULFATE																
NH_3 - N																
FECAL COLIFORM																
NO_3 - N																
CONDUCTIVITY																
CHLORIDES																
TKN																
$CBOD_5$																
ELEV. (Top of casing)																
ELEV. (Bottom of well)																
ELEV. (Water level)																

NOTES:

1. ALTERNATE TESTS BETWEEN EVEN AND ODD NUMBERED WELLS.
2. GRAB SAMPLES TO BE TAKEN MONTHLY DURING SPRAY SEASON QUARTERLY DURING NON-SPRAY SEASON.
3. AT LEAST ONCE A YEAR EACH TEST MUST BE BASED ON A 24 HOUR COMPOSITE SAMPLE.

MONTHLY REPORT OF AREA WELLS (WATER CHARACTERISTICS)

DETROIT LAKES, MINNESOTA

0020192 PERMIT NUMBER — 010 DIS NO — MONTH April 99

Send to: MINNESOTA POLLUTION CONTROL AGENCY
1935 WEST COUNTY ROAD B 2
ROSEVILLE, MINNESOTA 55113
ATTN: COMPLIANCE & ENFORCEMENT SECTION

FIGURE 20

DATE	INFORMATION	WELL NO. 1	WELL NO. 2	WELL NO. 3	WELL NO. 4	WELL NO. 5	WELL NO. 6	WELL NO. 7	WELL NO. 8	WELL NO. 9	WELL NO. 10	WELL NO. 11	WELL NO. 12	WELL NO. 13	WELL NO. 14	WELL NO. 15	WELL NO. 16	WELL NO. 17
	DEPTH OF SAMPLE (M)																	
	TEMPERATURE (CENT)	9.5	9.2	13.1	13.1	15.1	14.3	8.9	6.7	8.4	10	8.0	8.6	9.0	8.7	6.5		
	pH	7.29	7.57	6.24	7.27	7.61	7.61	7.12	8.1	7.44	7.16	6.41	7.35	7.28	7.34	2.46		
	PO_4 TOTAL																	
	SULFATE	6.9											<50	12	11	10		
	NH_3 -N																	
	FECAL COLIFORM																	
	NO_3 -N	2.19	2.75	.17	5.60	[illegible]	2.71	1.01	.05	2.92	.64	2.0	.70	.70 / .38	<.02	<.02		
	CONDUCTIVITY	505	444	531	457	354	932	546	706	725	537	970	1020	980	1000	1400		
	CHLORIDES	11.4	31.2	76.1	6.1	7.5	20.1	40.2	132.7	150.2	16.2	98.7	28.1	66.2	284	144		
	TKN	<0.02	<.01	.19	.12	<.01	[illegible]	<.01	.26	<.04	<.07	.15	<.09	.29	6.7	4.1		
	$CBOD_5$																	
	ELEV (Top of casing)																	
	ELEV (Bottom of well)																	
	ELEV (Water level)	57.15	41.5	22.15	41.21	22.6	29.3	15.4	17.3	30	12.8	16.6	17.6	25.6	42.1	42.0		

DATE	INFORMATION	WELL NO 18	WELL NO. 19	WELL NO. 20	WELL NO. 21	WELL NO. 22	WELL NO. 23	WELL NO. 24	WELL NO. 25	WELL NO. 26	WELL NO. 27	WELL NO. 28	WELL NO. 29	WELL NO. 30	WELL NO. 31	WELL NO. 32	WELL NO. 33	
	DEPTH OF SAMPLE (M)																	
	TEMPERATURE (CENT)																	
	pH																	
	PO_4 TOTAL																	
	SULFATE																	
	NH_3 -N																	
	FECAL COLIFORM																	
	NO_3 -N																	
	CONDUCTIVITY																	
	CHLORIDES																	
	TKN																	
	$CBOD_5$																	
	ELEV (Top of casing)																	
	ELEV (Bottom of well)																	
	ELEV (Water level)																	

NOTES:

1. ALTERNATE TESTS BETWEEN EVEN AND ODD NUMBERED WELLS.
2. GRAB SAMPLES TO BE TAKEN MONTHLY DURING SPRAY SEASON QUARTERLY DURING NON-SPRAY SEASON.
3. AT LEAST ONCE A YEAR EACH TEST MUST BE BASED ON A 24 HOUR COMPOSITE SAMPLE.

MONTHLY REPORT OF AREA WELLS (WATER CHARACTERISTICS)

DETROIT LAKES, MINNESOTA MONTH May 99

0026192 PERMIT NUMBER 010 DIS. NO.

Send to: MINNESOTA POLLUTION CONTROL AGENCY
1935 WEST COUNTY ROAD B 2
ROSEVILLE, MINNESOTA 55113
ATTN: COMPLIANCE & ENFORCEMENT SECTION

DATE	INFORMATION	WELL NO. 1	WELL NO. 2	WELL NO. 3	WELL NO. 4	WELL NO. 5	WELL NO. 6	WELL NO. 7	WELL NO. 8	WELL NO. 9	WELL NO. 10	WELL NO. 11	WELL NO. 12	WELL NO. 13	WELL NO. 14	WELL NO. 15	WELL NO. 16	WELL NO. 17
5/4	DEPTH OF SAMPLE (M)																	
5/4	TEMPERATURE (CENT)		9.5	11.(	11.7	11.3	11.8	9.2	7.8	10.4	11.2	11.4						
5/4	ph		7.24	7.26	7.05	7.63	7.32	7.10	7.07	7.64	7.64	7.5						
	PO_4 TOTAL																	
	SULFATE																	
	NH_3 -N																	
	FECAL COLIFORM																	
	NO_3 -N		2.6	1.9	6.1	6.8	2.7	1.5	<.02	2.2	2.0	.84						
	CONDUCTIVITY		554	563	578	514	1100	586	884	882	785	705						
	CHLORIDES		26.5	32.5	10.2	36.9	212	132	37.5	115	125	77.5						
	TKN		<.09	<.09	<.09	<.09	.22	<.09	.15	<.09	<.16	<.09						
	$CBOD_5$																	
	ELEV. (Top of casing)																	
	ELEV. (Bottom of well)																	
	ELEV. (Water level)		24.6	22.4	41.3	33.1	29.3	19.4	17.3	30	19.8	16.6						

		WELL NO.18	WELL NO. 19	WELL NO.20	WELL NO. 21	WELL NO.22	WELL NO.23	WELL NO.24	WELL NO.25	WELL NO.26	WELL NO.27	WELL NO.28	WELL NO.29	WELL NO.30	WELL NO.31	WELL NO.32	WELL NO.33
	DEPTH OF SAMPLE (M)																
	TEMPERATURE (CENT)																
	ph																
	PO_4 TOTAL																
	SULFATE																
	NH_3 -N																
	FECAL COLIFORM																
	NO_3 -N																
	CONDUCTIVITY																
	CHLORIDES																
	TKN																
	$CBOD_5$																
	ELEV. (Top of casing)																
	ELEV. (Bottom of well)																
	ELEV. (Water level)																

FIGURE 20

NOTES:

1. ALTERNATE TESTS BETWEEN EVEN AND ODD NUMBERED WELLS.
2. GRAB SAMPLES TO BE TAKEN MONTHLY DURING SPRAY SEASON QUARTERLY DURING NON-SPRAY SEASON.
3. AT LEAST ONCE A YEAR EACH TEST MUST BE BASED ON A 24 HOUR COMPOSITE SAMPLE.

MONTHLY REPORT OF AREA WELLS (WATER CHARACTERISTICS)

DETROIT LAKES, MINNESOTA

0020192 PERMIT NUMBER — 010 DIS. NO. — MONTH June

Send to: MINNESOTA POLLUTION CONTROL AGENCY
1935 WEST COUNTY ROAD B 2
ROSEVILLE, MINNESOTA 55113
ATTN: COMPLIANCE & ENFORCEMENT SECTION

FIGURE 20

DATE	INFORMATION	WELL NO. 1	WELL NO. 2	WELL NO. 3	WELL NO. 4	WELL NO. 5	WELL NO. 6	WELL NO. 7	WELL NO. 8	WELL NO. 9	WELL NO. 10	WELL NO. 11	WELL NO. 12	WELL NO. 13	WELL NO. 14	WELL NO. 15	WELL NO. 16	WELL NO. 17
	DEPTH OF SAMPLE (M)																	
6/22	TEMPERATURE (CENT)	[illegible]	10.6	12.4	13.3	12.1	13.4	11.4	11.2	11.5	13.4	13.2						
6/22	ph	[illegible]	7.41	7.28	7.16	7.68	7.30	7.61	7.21	7.38	7.44	7.58						
	PO_4 TOTAL																	
	SULFATE																	
	NH_3 -N																	
	FECAL COLIFORM																	
	NO_3 -N		2.9	1.9	5.5	2.9	3.6	0.95	<.02	1.6	3.3	.77						
6/22	CONDUCTIVITY	[illegible]	639	1150	644	456	1250	738	1030	976	997	828						
	CHLORIDES		29.2	175	87.5	12	155	55	107	77.5	152	84.9						
	TKN		<.09	<.09	<.09	<.09	.52	<.09	.18	<.09	<.09	<.09						
	$CBOD_5$																	
	ELEV. (Top of casing)																	
	ELEV. (Bottom of well)																	
6/22	ELEV. (Water level)	[illegible]	24.6	22.4	41.3	33.1	29.3	19.4	17.3	29.9	19.8	16.6						

DATE	INFORMATION	WELL NO. 18	WELL NO. 19	WELL NO. 20	WELL NO. 21	WELL NO. 22	WELL NO. 23	WELL NO. 24	WELL NO. 25	WELL NO. 26	WELL NO. 27	WELL NO. 28	WELL NO. 29	WELL NO. 30	WELL NO. 31	WELL NO. 32	WELL NO. 33
	DEPTH OF SAMPLE (M)																
	TEMPERATURE (CENT)																
	ph																
	PO_4 TOTAL																
	SULFATE																
	NH_3 -N																
	FECAL COLIFORM																
	NO_3 -N																
	CONDUCTIVITY																
	CHLORIDES																
	TKN																
	$CBOD_5$																
	ELEV. (Top of casing)																
	ELEV. (Bottom of well)																
	ELEV. (Water level)																

NOTES:

1. ALTERNATE TESTS BETWEEN EVEN AND ODD NUMBERED WELLS.
2. GRAB SAMPLES TO BE TAKEN MONTHLY DURING SPRAY SEASON QUARTERLY DURING NON-SPRAY SEASON.
3. AT LEAST ONCE A YEAR EACH TEST MUST BE BASED ON. A 24 HOUR COMPOSITE SAMPLE.

MONTHLY REPORT OF AREA WELLS (WATER CHARACTERISTICS)

DETROIT LAKES, MINNESOTA

MONTH July 92

0020192 PERMIT NUMBER | 010 DIS. NO.

Send to: MINNESOTA POLLUTION CONTROL AGENCY
1935 WEST COUNTY ROAD B 2
ROSEVILLE, MINNESOTA 55113
ATTN: COMPLIANCE & ENFORCEMENT SECTION

FIGURE 20

DATE	INFORMATION	WELL NO. 1	WELL NO. 2	WELL NO. 3	WELL NO 4	WELL NO 5	WELL NO. 6	WELL NO. 7	WELL NO. 8	WELL NO. 9	WELL NO. 10	WELL NO. 11	WELL NO. 12	WELL NO 13	WELL NO. 14	WELL NO. 15	WELL NO. 16	WELL NO. 17
7/22	DEPTH OF SAMPLE (M)																	
7/22	TEMPERATURE (CENT)	13	9.3	12.2	11.7	10.6	11.4	10.9	10.4	11.0	14.0	14.6	13.8	14.6	13.3	13.7		
7/22	ph	7.02	7.21	7.07	7.07	7.46	7.12	7.07	6.90	7.48	7.13	7.32	7.29	7.19	7.4	7.32		
	PO_4 TOTAL	.029	.026	.16	.10	.018	.044	.036	.037	.106	.169	.216	.03	.398	3.505	1.24		
	SULFATE	5.0											20	16	<5	5.1		
	NH_3 -N																	
	FECAL COLIFORM	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0		
	NO_3 -N	3.32	3.11	4.0	5.09	4.10	3.28	1.28	~~2.05~~ 2.58	.252	1.48	.793	2.0	2.63	<.02	<.02		
	CONDUCTIVITY	663	694	1513	658	506	1370	1083	~~1405~~ 1364	978	1369	867	1357	1124	1526	1437		
	CHLORIDES	12.3	27.2	229	1.75	19.5	206	140	~~197~~ 206	18.5	210	24	70	140	235	245		
	TKN	<.09	.10	.32	<.09	<.09	.14	<.09	~~.13~~ .25	<.09	.35	<.09	.53	.30	8.7	5.5		
	$CBOD_5$	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2		
	ELEV. (Top of casing)																	
	ELEV. (Bottom of well)																	
7/22	ELEV. ft. (Water level)	15.75'	16.83'	14.3'	33.9'	25'	31.4'	42.3'	10.2'	10'	13'	7.8'	8.8'	12'	8.2'	5'		

	WELL NO.18	WELL NO. 19	WELL NO.20	WELL NO.21	WELL NO.22	WELL NO.23	WELL NO.24	WELL NO.25	WELL NO.26	WELL NO.27	WELL NO.28	WELL NO.29	WELL NO. 30	WELL NO.31	WELL NO. 32	WELL NO. 33
DEPTH OF SAMPLE (M)																
TEMPERATURE (CENT)																
ph																
PO_4 TOTAL																
SULFATE																
NH_3 -N																
FECAL COLIFORM																
NO_3 -N																
CONDUCTIVITY																
CHLORIDES																
TKN																
$CBOD_5$																
ELEV. (Top of casing)																
ELEV. (Bottom of well)																
ELEV. (Water level)																

NOTES:

1. ALTERNATE TESTS BETWEEN EVEN AND ODD NUMBERED WELLS.
2. GRAB SAMPLES TO BE TAKEN MONTHLY DURING SPRAY SEASON QUARTERLY DURING NON-SPRAY SEASON.
3. AT LEAST ONCE A YEAR EACH TEST MUST BE BASED ON A 24 HOUR COMPOSITE SAMPLE.

MONTHLY REPORT OF AREA WELLS (WATER CHARACTERISTICS)

DETROIT LAKES, MINNESOTA

0020192 PERMIT NUMBER 010 DIS. NO. MONTH August 89

Send to: MINNESOTA POLLUTION CONTROL AGENCY
1935 WEST COUNTY ROAD B 2
ROSEVILLE, MINNESOTA 55113
ATTN: COMPLIANCE & ENFORCEMENT SECTION

FIGURE 20

DATE	INFORMATION	WELL NO. 1	WELL NO. 2	WELL NO. 3	WELL NO. 4	WELL NO. 5	WELL NO. 6	WELL NO. 7	WELL NO. 8	WELL NO. 9	WELL NO. 10	WELL NO. 11	WELL NO. 12	WELL NO. 13	WELL NO. 14	WELL NO. 15	WELL NO. 16	WELL NO. 17
	DEPTH OF SAMPLE (M)																	
	TEMPERATURE (CENT)		18.4	21.9	12	12	11.6	12.1	12.2	11.5	17.4	14.3						
	ph		7.34	6.98	7.08	7.51	7.17	7.27	7.01	7.22	7.68	7.29						
	PO_4 TOTAL																	
	SULFATE																	
	NH_3-N		[illegible]															
	FECAL COLIFORM																	
	NO_3-N		2.5	2.0	6.6	2.5	2.8	1.4	<0.02	1.4	4.6	.85						
	CONDUCTIVITY		551	1390	618	428	1020	972	968	799	1138	701						
	CHLORIDES		24.7	142	11	34.2	145	136	83	94.9	237	73						
	TKN		<0.09	.40	<0.09	<0.09	<0.09	.19	4.09	<0.09	.20	<0.09						
	$CBOD_5$																	
	ELEV. (Top of casing)																	
	ELEV. (Bottom of well)																	
	ELEV. (Water level)		16.5	13.3	33.6	24.3	24.49	11.4	10	24.5	13.5	7.58						
		WELL NO.18	WELL NO. 19	WELL NO.20	WELL NO. 21	WELL NO.22	WELL NO.23	WELL NO.24	WELL NO.25	WELL NO.26	WELL NO.27	WELL NO.28	WELL NO.29	WELL NO.30	WELL NO.31	WELL NO.32	WELL NO.33	
	DEPTH OF SAMPLE (M)																	
	TEMPERATURE (CENT)																	
	ph																	
	PO_4 TOTAL																	
	SULFATE																	
	NH_3-N																	
	FECAL COLIFORM																	
	NO_3-N																	
	CONDUCTIVITY																	
	CHLORIDES																	
	TKN																	
	$CBOD_5$																	
	ELEV. (Top of casing)																	
	ELEV. (Bottom of well)																	
	ELEV. (Water level)																	

NOTES:

1. ALTERNATE TESTS BETWEEN EVEN AND ODD NUMBERED WELLS.
2. GRAB SAMPLES TO BE TAKEN MONTHLY DURING SPRAY SEASON QUARTERLY DURING NON-SPRAY SEASON.
3. AT LEAST ONCE A YEAR EACH TEST MUST BE BASED ON A 24 HOUR COMPOSITE SAMPLE.

MONTHLY REPORT OF AREA WELLS (WATER CHARACTERISTICS)

DETROIT LAKES, MINNESOTA

0020612 PERMIT NUMBER

010 DIS. NO.

MONTH: September 99

Send to: MINNESOTA POLLUTION CONTROL AGENCY
1935 WEST COUNTY ROAD B 2
ROSEVILLE, MINNESOTA 55113
ATTN: COMPLIANCE & ENFORCEMENT SECTION

FIGURE 20

DATE	INFORMATION	WELL NO. 1		WELL NO. 2		WELL NO. 3		WELL NO 4		WELL NO 5		WELL NO. 6		WELL NO 7		WELL NO. 8		WELL NO 9		WELL NO. 10		WELL NO 11		WELL NO 12		WELL NO 13		WELL NO 14		WELL NO 15		WELL NO. 16		WELL NO. 17	
	DEPTH OF SAMPLE (M)																																		
	TEMPERATURE (CENT)		45		11.1		16.6		12.5		11.0		11.2		13.5		13.5		12.8		18.7		13.9													
	ph		735		7.75		7.12		7.19		7.09		7.36		7.35		7.06		7.31		7.15		7.23													
	PO_4 TOTAL																																		
	SULFATE																																		
	NH_3 -N																																		
	FECAL COLIFORM																																		
	NO_3 -N				2.2		3.1		5.4		1.3		2.7		1.0		.02		2.0		3.3		4.2													
	CONDUCTIVITY				560		1330		797		433		1140		817		338		1120		1630		851													
	CHLORIDES				15.9		204		11		1.5		155		35		64.9		99.9		185		126													
	TKN				<.09		.18		<.09		.09		.12		<.09		<.09		<.09		.15		<.09													
	$CBOD_5$																																		
	ELEV. (Top of casing)																																		
	ELEV. (Bottom of well)																																		
	ELEV. (Water level)				K.2'		15.0'		33'		24.3		30.8		11.7		10.0		9.7		14.2		7.7													
		WELL NO.18		WELL NO. 19		WELL NO.20		WELL NO. 21		WELL NO.22		WELL NO.23		WELL NO.24		WELL NO.25		WELL NO.26		WELL NO.27		WELL NO.28		WELL NO.29		WELL NO. 30		WELL NO.31		WELL NO.32		WELL NO.33			
	DEPTH OF SAMPLE (M)																																		
	TEMPERATURE (CENT)																																		
	ph																																		
	PO_4 TOTAL																																		
	SULFATE																																		
	NH_3 -N																																		
	FECAL COLIFORM																																		
	NO_3 -N																																		
	CONDUCTIVITY																																		
	CHLORIDES																																		
	TKN																																		
	$CBOD_5$																																		
	ELEV. (Top of casing)																																		
	ELEV. (Bottom of well)																																		
	ELEV. (Water level)																																		

NOTES:

1. ALTERNATE TESTS BETWEEN EVEN AND ODD NUMBERED WELLS.
2. GRAB SAMPLES TO BE TAKEN MONTHLY DURING SPRAY SEASON QUARTERLY DURING NON-SPRAY SEASON.
3. AT LEAST ONCE A YEAR EACH TEST MUST BE BASED ON A 24 HOUR COMPOSITE SAMPLE.

MONTHLY REPORT OF AREA WELLS (WATER CHARACTERISTICS)

DETROIT LAKES, MINNESOTA — MONTH October-99

0020192 — PERMIT NUMBER — 010 — DIS. NO.

Send to: MINNESOTA POLLUTION CONTROL AGENCY
1935 WEST COUNTY ROAD B 2
ROSEVILLE, MINNESOTA 55113
ATTN: COMPLIANCE & ENFORCEMENT SECTION

FIGURE 20

DATE	INFORMATION	WELL NO. 1		WELL NO. 2		WELL NO. 3		WELL NO. 4		WELL NO. 5		WELL NO. 6		WELL NO. 7		WELL NO. 8		WELL NO. 9		WELL NO. 10		WELL NO. 11		WELL NO. 12		WELL NO. 13		WELL NO. 14		WELL NO. 15		WELL NO. 16		WELL NO. 17	
	DEPTH OF SAMPLE (M)																																		
	TEMPERATURE (CENT)		13		11.1		14.3		9.8		10.7		10.7		12.7		12.5		12.4		K.9		12.1		15.4		13.7		14.9		13.3					
	ph		7.17		7.53		7.06		7.16		7.72		7.32		7.18		7.04		2.22		7.15		7.25		7.2		7.2		7.39		7.37					
	PO_4 TOTAL																																		
	SULFATE		525		16		7.8		56		5.7		12		5.7		5.3		5.5		6.4		8.5		6.1		10		9.7		8.1					
	NH_3 -N																																		
	FECAL COLIFORM																																		
	NO_3 -N		29		1.9		7.5		6.9		1.2		2.7		1.6		<.02		1.5		3.4		3.3		2.1		2.7		5.02		0.29					
	CONDUCTIVITY		633		530		1410		618		340		964		900		721		955		1060		843		1220		1060		1200		1110					
	CHLORIDES		98		200		205		145		5		190		43.2		83.5		170		210		145		215		180		215		205					
	TKN		<.09		<.09		.18		<.09		<.09		<.09		<.09		<.09		<.09		.17		<.09		.11		.10		4.2		1.9					
	$CBOD_5$																																		
	ELEV. (Top of casing)																																		
	ELEV. (Bottom of well)																																		
	ELEV. Ft (Water level)		15.7		K.9		22.4		33.7		24		21		12		10		10.3		15.4		8		9.3		12.2		7.8		5					
		WELL NO.18		WELL NO. 19		WELL NO.20		WELL NO. 21		WELL NO.22		WELL NO.23		WELL NO.24		WELL NO.25		WELL NO.26		WELL NO.27		WELL NO.28		WELL NO.29		WELL NO. 30		WELL NO.31		WELL NO. 32		WELL NO. 33					
	DEPTH OF SAMPLE (M)																																		
	TEMPERATURE (CENT)																																		
	ph																																		
	PO_4 TOTAL																																		
	SULFATE																																		
	NH_3 -N																																		
	FECAL COLIFORM																																		
	NO_3 -N																																		
	CONDUCTIVITY																																		
	CHLORIDES																																		
	TKN																																		
	$CBOD_5$																																		
	ELEV. (Top of casing)																																		
	ELEV. (Bottom of well)																																		
	ELEV. (Water level)																																		

NOTES:

1. ALTERNATE TESTS BETWEEN EVEN AND ODD NUMBERED WELLS.
2. GRAB SAMPLES TO BE TAKEN MONTHLY DURING SPRAY SEASON QUARTERLY DURING NON-SPRAY SEASON.
3. AT LEAST ONCE A YEAR EACH TEST MUST BE BASED ON A 24 HOUR COMPOSITE SAMPLE.

MONTHLY REPORT OF AREA WELLS (WATER CHARACTERISTICS)

DETROIT LAKES, MINNESOTA

0020192 (PERMIT NUMBER) 010 (DIS. NO.) MONTH November 99

Send to: MINNESOTA POLLUTION CONTROL AGENCY
1935 WEST COUNTY ROAD B 2
ROSEVILLE, MINNESOTA 55113
ATTN: COMPLIANCE & ENFORCEMENT SECTION

FIGURE 20

DATE	INFORMATION	WELL NO. 1		WELL NO. 2		WELL NO. 3		WELL NO. 4		WELL NO. 5		WELL NO. 6		WELL NO. 7		WELL NO. 8		WELL NO. 9		WELL NO. 10		WELL NO. 11		WELL NO. 12		WELL NO. 13		WELL NO. 14		WELL NO. 15		WELL NO. 16		WELL NO. 17	
	DEPTH OF SAMPLE (M)																																		
	TEMPERATURE (CENT)		12.1		10.4		12.6		10.6		11.0		12.4		12.8		10.6		12.9		14.5		10.7		13.5		13.3		13.4		10.8					
	ph		7.23		7.44		7.22		7.19		7.68		7.20		7.19		7.06		7.26		7.31		7.2		7.27		7.30		7.49		7.39					
	PO_4 TOTAL																																		
	SULFATE																								20		21		<5.0		<5.0				
	NH_3 -N																																		
	FECAL COLIFORM																																		
	NO_3 -N		1.9		2.1		4.4		7.3		0.97		1.9		1.8		2.4 (2.0)		.10		2.2		1.4		1.9		1.0		<.02		<.02					
	CONDUCTIVITY		419		408		907		578		275		775		882		602		742		756		748		1110		890		1120		1180					
	CHLORIDES		9.0		23.5		220		22		2.0		175		19		285 (180)		160		145		80		150		135		190		200					
	TKN		.14		<.09		.36		<.09		<.09		.15		<.09		<.09 (<.09)		<.09		<.09		11		<.09		<.09		9.8		5.7					
	$CBOD_5$																																		
	ELEV. (Top of casing)																																		
	ELEV. (Bottom of well)																																		
	ELEV. (Water level)		15.9'		17.1		16.0		34		25		22.3		13.9		14.6		10.6		16.9		8.3		9.1		12.2		8.1		5.0					
		WELL NO. 18		WELL NO. 19		WELL NO. 20		WELL NO. 21		WELL NO. 22		WELL NO. 23		WELL NO. 24		WELL NO. 25		WELL NO. 26		WELL NO. 27		WELL NO. 28		WELL NO. 29		WELL NO. 30		WELL NO. 31		WELL NO. 32		WELL NO. 33					
	DEPTH OF SAMPLE (M)																																		
	TEMPERATURE (CENT)																																		
	ph																																		
	PO_4 TOTAL																																		
	SULFATE																																		
	NH_3 -N																																		
	FECAL COLIFORM																																		
	NO_3 -N																																		
	CONDUCTIVITY																																		
	CHLORIDES																																		
	TKN																																		
	$CBOD_5$																																		
	ELEV. (Top of casing)																																		
	ELEV. (Bottom of well)																																		
	ELEV. (Water level)																																		

NOTES:

1. ALTERNATE TESTS BETWEEN EVEN AND ODD NUMBERED WELLS.
2. GRAB SAMPLES TO BE TAKEN MONTHLY DURING SPRAY SEASON QUARTERLY DURING NON-SPRAY SEASON.
3. AT LEAST ONCE A YEAR EACH TEST MUST BE BASED ON A 24 HOUR COMPOSITE SAMPLE.

MONTHLY REPORT OF AREA WELLS (WATER CHARACTERISTICS)

DETROIT LAKES, MINNESOTA MONTH January 2000

0020192 PERMIT NUMBER 010 DIS. NO.

Send to: MINNESOTA POLLUTION CONTROL AGENCY
1935 WEST COUNTY ROAD B 2
ROSEVILLE, MINNESOTA 55113
ATTN: COMPLIANCE & ENFORCEMENT SECTION

DATE	INFORMATION	WELL NO. 1	WELL NO. 2	WELL NO. 3	WELL NO. 4	WELL NO. 5	WELL NO. 6	WELL NO. 7	WELL NO. 8	WELL NO. 9	WELL NO. 10	WELL NO. 11	WELL NO. 12	WELL NO. 13	WELL NO. 14	WELL NO. 15
1/18	DEPTH OF SAMPLE (M)	[illegible]														
1/18	TEMPERATURE (CENT)	9.9											10.1	10.2	10.2	6.0
1/18	ph	7.58											7.38	7.34	7.55	7.61
	PO_4 TOTAL															
	SULFATE	<5											9.9	22	<5.0	<5.0
	NH_3 -N															
	FECAL COLIFORM															
	NO_3 -N	.50											1.5	.87	<.02	<.02
	CONDUCTIVITY	455											561	887	1200	1130
	CHLORIDES	85											25	120	250	225
	TKN	<.09											<.09	<.09	8.1	5.0
	$CBOD_5$															
	ELEV. (Top of casing)															
	ELEV. (Bottom of well)															
1/10	ELEV. (Water level)	1241'											16'	12.6'	8.3	5.0

	WELL NO. 18	WELL NO. 19	WELL NO. 20	WELL NO. 21	WELL NO. 22	WELL NO. 23	WELL NO. 24	WELL NO. 25	WELL NO. 26	WELL NO. 27	WELL NO. 28	WELL NO. 29	WELL NO. 30	WELL NO. 31	WELL NO. 32
DEPTH OF SAMPLE (M)															
TEMPERATURE (CENT)															
ph															
PO_4 TOTAL															
SULFATE															
NH_3 -N															
FECAL COLIFORM															
NO_3 -N															
CONDUCTIVITY															
CHLORIDES															
TKN															
$CBOD_5$															
ELEV. (Top of casing)															
ELEV. (Bottom of well)															
ELEV. (Water level)															

FIGURE 20

NOTES:

1. ALTERNATE TESTS BETWEEN EVEN AND ODD NUMBERED WELLS.
2. GRAB SAMPLES TO BE TAKEN MONTHLY DURING SPRAY SEASON QUARTERLY DURING NON-SPRAY SEASON.
3. AT LEAST ONCE A YEAR EACH TEST MUST BE BASED ON A 24 HOUR COMPOSITE SAMPLE.

MONTHLY REPORT OF AREA WELLS (WATER CHARACTERISTICS)

DETROIT LAKES, MINNESOTA

0020192 — PERMIT NUMBER   010 — DIS. NO.   MONTH January 2000

Send to: MINNESOTA POLLUTION CONTROL AGENCY
1935 WEST COUNTY ROAD B 2
ROSEVILLE, MINNESOTA 55113
ATTN: COMPLIANCE & ENFORCEMENT SECTION

FIGURE 20

DATE	INFORMATION	WELL NO. 1	WELL NO. 2	WELL NO. 3	WELL NO. 4	WELL NO. 5	WELL NO. 6	WELL NO. 7	WELL NO. 8	WELL NO. 9	WELL NO. 10	WELL NO. 11	WELL NO. 12	WELL NO. 13	WELL NO. 14	WELL NO. 15
1/18	DEPTH OF SAMPLE (M)	[illegible]														
1/18	TEMPERATURE (CENT)	9.9											10.1	10.2	10.2	6.0
1/18	ph	7.58											7.38	7.34	7.55	7.61
	PO_4 TOTAL															
	SULFATE	<5											9.9	22	<5.0	<5.0
	NH_3 -N															
	FECAL COLIFORM															
	NO_3 -N	.50											1.5	.87	<.02	<.02
	CONDUCTIVITY	455											561	887	1200	1130
	CHLORIDES	8.5											25	120	230	225
	TKN	<.09											<.09	<.09	8.1	5.0
	$CBOD_5$															
	ELEV. (Top of casing)															
	ELEV. (Bottom of well)															
1/10	ELEV. (Water level)	6.41'											10'	12.6'	8.3	5.0

		WELL NO. 18	WELL NO. 19	WELL NO. 20	WELL NO. 21	WELL NO. 22	WELL NO. 23	WELL NO. 24	WELL NO. 25	WELL NO. 26	WELL NO. 27	WELL NO. 28	WELL NO. 29	WELL NO. 30	WELL NO. 31	WELL NO. 32
	DEPTH OF SAMPLE (M)															
	TEMPERATURE (CENT)															
	ph															
	PO_4 TOTAL															
	SULFATE															
	NH_3 -N															
	FECAL COLIFORM															
	NO_3 -N															
	CONDUCTIVITY															
	CHLORIDES															
	TKN															
	$CBOD_5$															
	ELEV. (Top of casing)															
	ELEV. (Bottom of well)															
	ELEV. (Water level)															

NOTES:

1. ALTERNATE TESTS BETWEEN EVEN AND ODD NUMBERED WELLS.
2. GRAB SAMPLES TO BE TAKEN MONTHLY DURING SPRAY SEASON QUARTERLY DURING NON-SPRAY SEASON.
3. AT LEAST ONCE A YEAR EACH TEST MUST BE BASED ON A 24 HOUR COMPOSITE SAMPLE.

MONTHLY REPORT OF AREA WELLS (WATER CHARACTERISTICS)

DETROIT LAKES, MINNESOTA

PERMIT NUMBER 0020192 DIS. NO. 010 MONTH March

Send to: MINNESOTA POLLUTION CONTROL AGENCY
1935 WEST COUNTY ROAD B 2
ROSEVILLE, MINNESOTA 55113
ATTN: COMPLIANCE & ENFORCEMENT SECTION

FIGURE 20

DATE	INFORMATION	WELL NO. 1	WELL NO. 2	WELL NO. 3	WELL NO. 4	WELL NO. 5	WELL NO. 6	WELL NO. 7	WELL NO. 8	WELL NO. 9	WELL NO. 10	WELL NO. 11	WELL NO. 12	WELL NO. 13	WELL NO. 14	WELL NO. 15	WELL NO. 16	WELL NO. 17
	DEPTH OF SAMPLE (M)																	
	TEMPERATURE (CENT)	9.2	5.4	10.7	9.9	10.1	15.9	15.2	16.0	8.7	9.9	8.1	8.5	7.5	8.3	2.9		
	ph	7.86	7.78	7.57	7.49	7.98	7.37	7.61	7.30	7.56	7.41	7.48	7.76	7.47	7.84	7.86		
	PO_4 TOTAL	.04	.032	.087	.081	.034	.087	.032	.032	.101	.142	.077	.101	.152	.235	.221		
	SULFATE																	
	NH_3 -N																	
	FECAL COLIFORM																	
	NO_3 -N	.46	.34	2.4	4.0	1.9	2.0	1.2	<.02	1.5	.33	1.3	.86	.68	7.0	<.02		
	CONDUCTIVITY	351	497	583	453	273	946	489	672	733	545	628	394	717	875	911		
	CHLORIDES	7.99	65.5	327	62	4.24	212	42.5	87.5	115	75	107	32.5	230	247	137		
	TKN	<.09	.37	.51	.33	<.09	.24	.36	.29	.09	.62	1.1	1.2	.61	7.0	6.6		
	$CBOD_5$																	
	ELEV. (Top of casing)																	
	ELEV. (Bottom of well)																	
	ELEV. (Water level)	1608	17.25	17.25	35.7	27.1	24.4	19.2	11.7	11.7	16.8	8.6	10	12.4	7.8	4.8		

	INFORMATION	WELL NO. 18	WELL NO. 19	WELL NO. 20	WELL NO. 21	WELL NO. 22	WELL NO. 23	WELL NO. 24	WELL NO. 25	WELL NO. 26	WELL NO. 27	WELL NO. 28	WELL NO. 29	WELL NO. 30	WELL NO. 31	WELL NO. 32	WELL NO. 33
	DEPTH OF SAMPLE (M)																
	TEMPERATURE (CENT)																
	ph																
	PO_4 TOTAL																
	SULFATE																
	NH_3 -N																
	FECAL COLIFORM																
	NO_3 -N																
	CONDUCTIVITY																
	CHLORIDES																
	TKN																
	$CBOD_5$																
	ELEV. (Top of casing)																
	ELEV. (Bottom of well)																
	ELEV. (Water level)																

NOTES:

1. ALTERNATE TESTS BETWEEN EVEN AND ODD NUMBERED WELLS.
2. GRAB SAMPLES TO BE TAKEN MONTHLY DURING SPRAY SEASON QUARTERLY DURING NON-SPRAY SEASON.
3. AT LEAST ONCE A YEAR EACH TEST MUST BE BASED ON A 24 HOUR COMPOSITE SAMPLE.

MONTHLY REPORT OF AREA WELLS (WATER CHARACTERISTICS)

DETROIT LAKES, MINNESOTA

MONTH March 2002

MN0022942 (PERMIT NUMBER) 010 (DIS. NO.)

Send to: MINNESOTA POLLUTION CONTROL AGENCY
1935 WEST COUNTY ROAD B 2
ROSEVILLE, MINNESOTA 55113
ATTN: COMPLIANCE & ENFORCEMENT SECTION

FIGURE 20

There are the sulfate results for March

DATE	INFORMATION	WELL NO. 1		WELL NO. 2		WELL NO. 3		WELL NO. 4		WELL NO. 5		WELL NO. 6		WELL NO. 7		WELL NO. 8		WELL NO. 9		WELL NO. 10		WELL NO. 11		WELL NO. 12		WELL NO. 13		WELL NO. 14		WELL NO. 15		WELL NO. 16		WELL NO. 17	
	DEPTH OF SAMPLE (M)																																		
	TEMPERATURE (CENT)																																		
	ph																																		
	PO_4 TOTAL																																		
	SULFATE		5.8																					9.0		21		<5		10					
	NH_3 -N																																		
	FECAL COLIFORM																																		
	NO_3 -N																																		
	CONDUCTIVITY																																		
	CHLORIDES																																		
	TKN																																		
	$CBOD_5$																																		
	ELEV. (Top of casing)																																		
	ELEV. (Bottom of well)																																		
	ELEV. (Water level)																																		
		WELL NO. 18		WELL NO. 19		WELL NO. 20		WELL NO. 21		WELL NO. 22		WELL NO. 23		WELL NO. 24		WELL NO. 25		WELL NO. 26		WELL NO. 27		WELL NO. 28		WELL NO. 29		WELL NO. 30		WELL NO. 31		WELL NO. 32		WELL NO. 33			
	DEPTH OF SAMPLE (M)																																		
	TEMPERATURE (CENT)																																		
	ph																																		
	PO_4 TOTAL																																		
	SULFATE																																		
	NH_3 -N																																		
	FECAL COLIFORM																																		
	NO_3 -N																																		
	CONDUCTIVITY																																		
	CHLORIDES																																		
	TKN																																		
	$CBOD_5$																																		
	ELEV (Top of casing)																																		
	ELEV (Bottom of well)																																		
	ELEV. (Water level)																																		

NOTES.

1. ALTERNATE TESTS BETWEEN EVEN AND ODD NUMBERED WELLS.
2. GRAB SAMPLES TO BE TAKEN MONTHLY DURING SPRAY SEASON QUARTERLY DURING NON-SPRAY SEASON
3. AT LEAST ONCE A YEAR EACH TEST MUST BE BASED ON A 24 HOUR COMPOSITE SAMPLE.

MONTHLY REPORT OF AREA WELLS (WATER CHARACTERISTICS)

DETROIT LAKES, MINNESOTA

MN0020192 — PERMIT NUMBER

0/0 — DIS. NO.

MONTH April 2000

Send to: MINNESOTA POLLUTION CONTROL AGENCY
1935 WEST COUNTY ROAD B 2
ROSEVILLE, MINNESOTA 55113
ATTN: COMPLIANCE & ENFORCEMENT SECTION

FIGURE 20

DATE	INFORMATION	WELL NO 1	WELL NO 2	WELL NO 3	WELL NO 4	WELL NO 5	WELL NO 6	WELL NO 7	WELL NO. 8	WELL NO 9	WELL NO 10	WELL NO 11	WELL NO 12	WELL NO 13	WELL NO 14	WELL NO 15	WELL NO 16	WELL NO 17
	DEPTH OF SAMPLE (M)																	
	TEMPERATURE (CENT)	9.1	9.2	12.2	11.0	11.0	11.7	8.8	7.3	8.5	10.7	9.8	10.2	9.5	9.0	15.9		
	ph	7.58	7.57	7.58	7.51	7.72	7.33	7.71	7.39	7.84	7.53	7.50	7.67	7.94	7.68	7.64		
	PO_4 TOTAL	.05	.029	.105	.109	.051	.032	.055	.082	.111	.079	.045	.097	.13	.114	.134		
	SULFATE	6.2											7.9	14	6.5	6.3		
	NH_3 -N																	
	FECAL COLIFORM																	
	NO_3 -N	1.6	.226	2.5	4.5	5.5	2.1	1.5	<.02	1.3	0.69	0.80	.93	1.4	<.02	<.02		
	CONDUCTIVITY	556	762	777	739	564	875	525	690	787	560	725	421	790	815	905		
	CHLORIDES	7.49	58.9	42.5	22.2	22.2	227	40	120	110	67.5	97.5	7.49	25	247	200		
	TKN	<.09	<.09	<.09	<.09	<.09	<.09	<.09	<.09	<.09	<.09	<.09	<.09	<.09	8.0	5.1		
	$CBOD_5$																	
	ELEV. (Top of casing)																	
	ELEV. (Bottom of well)																	
	ELEV (Water level)	15.8'	17'	17.4'	36'	27.3'	24.4'	13.8'	11.3'	11.1'	16.5'	18.5'	9.7	12.3'	7.8	5.0		

	WELL NO.18	WELL NO. 19	WELL NO.20	WELL NO. 21	WELL NO.22	WELL NO.23	WELL NO.24	WELL NO.25	WELL NO.26	WELL NO.27	WELL NO.28	WELL NO.29	WELL NO.30	WELL NO.31	WELL NO.32	WELL NO.33
DEPTH OF SAMPLE (M)																
TEMPERATURE (CENT)																
ph																
PO_4 TOTAL																
SULFATE																
NH_3 -N																
FECAL COLIFORM																
NO_3 -N																
CONDUCTIVITY																
CHLORIDES																
TKN																
$CBOD_5$																
ELEV (Top of casing)																
ELEV. (Bottom of well)																
ELEV (Water level)																

NOTES:

1. ALTERNATE TESTS BETWEEN EVEN AND ODD NUMBERED WELLS.
2. GRAB SAMPLES TO BE TAKEN MONTHLY DURING SPRAY SEASON QUARTERLY DURING NON-SPRAY SEASON.
3. AT LEAST ONCE A YEAR EACH TEST MUST BE BASED ON A 24 HOUR COMPOSITE SAMPLE.

MONTHLY REPORT OF AREA WELLS (WATER CHARACTERISTICS)

DETROIT LAKES, MINNESOTA

MN0022192 / PERMIT NUMBER — PCO / DIS. NO. — MONTH May 2000

Send to: MINNESOTA POLLUTION CONTROL AGENCY
1935 WEST COUNTY ROAD B 2
ROSEVILLE, MINNESOTA 55113
ATTN: COMPLIANCE & ENFORCEMENT SECTION

FIGURE 20

DATE	INFORMATION	WELL NO 1		WELL NO 2		WELL NO 3		WELL NO 4		WELL NO 5		WELL NO 6		WELL NO 7		WELL NO 8		WELL NO 9		WELL NO. 10		WELL NO. 11		WELL NO.12		WELL NO 13		WELL NO 14		WELL NO 15		WELL NO 16		WELL NO 17	
	DEPTH OF SAMPLE (M)																																
	TEMPERATURE (CENT)			8.4		10.4		10.7		10.5		11.3		9.0		7.8		9.2		10.5		10.9													
	ph			7.48		7.39		7.31		7.59		7.3		7.42		7.35		7.39		7.50		7.47													
	PO_4 TOTAL			.043		.065		.008		.010		.018		.010		.013		.089		.105		.032													
	SULFATE																																
	NH_3 —N																																
	FECAL COLIFORM																																
	NO_3 —N			.29		2.4		4.7		8.0		2.1		1.9		<.02		1.6		1.0		.81													
	CONDUCTIVITY			634		620		66		564		210		468		868		789		658		791													
	CHLORIDES			60		26.2		24.5		10.2		232		35		147		102		70		97.5													
	TKN			<.09		<.09		<.09		<.09		<.09		<.09		.12		.12		.09		<.09													
	$CBOD_5$																																
	ELEV. (Top of casing)																																
	ELEV. (Bottom of well)																																
	ELEV. (Water level)			17.2		17.6		36.0		27.5		24.5		13.9		11.5		11.1		16.3		8.1													

		WELL NO.18		WELL NO. 19		WELL NO.20		WELL NO. 21		WELL NO.22		WELL NO.23		WELL NO.24		WELL NO.25		WELL NO.26		WELL NO.27		WELL NO.28		WELL NO.29		WELL NO. 30		WELL NO.31		WELL NO.32		WELL NO.33			
	DEPTH OF SAMPLE (M)																																
	TEMPERATURE (CENT)																																
	ph																																
	PO_4 TOTAL																																
	SULFATE																																
	NH_3 —N																																
	FECAL COLIFORM																																
	NO_3 —N																																
	CONDUCTIVITY																																
	CHLORIDES																																
	TKN																																
	$CBOD_5$																																
	ELEV. (Top of casing)																																
	ELEV. (Bottom of well)																																
	ELEV. (Water level)																																

NOTES:

1. ALTERNATE TESTS BETWEEN EVEN AND ODD NUMBERED WELLS.
2. GRAB SAMPLES TO BE TAKEN MONTHLY DURING SPRAY SEASON QUARTERLY DURING NON-SPRAY SEASON.
3. AT LEAST ONCE A YEAR EACH TEST MUST BE BASED ON A 24 HOUR COMPOSITE SAMPLE.

MONTHLY REPORT OF AREA WELLS (WATER CHARACTERISTICS)

DETROIT LAKES, MINNESOTA

MONTH July 2000

0020192 — PERMIT NUMBER

010 — DIS. NO.

Send to: MINNESOTA POLLUTION CONTROL AGENCY
1935 WEST COUNTY ROAD B 2
ROSEVILLE, MINNESOTA 55113
ATTN: COMPLIANCE & ENFORCEMENT SECTION

FIGURE 20

250 mg/l limit

DATE	INFORMATION	WELL NO. 1		WELL NO. 2		WELL NO. 3		WELL NO. 4		WELL NO. 5		WELL NO. 6		WELL NO. 7		WELL NO. 8		WELL NO. 9		WELL NO. 10		WELL NO. 11		WELL NO 12		WELL NO. 13		WELL NO 14		WELL NO. 15		WELL NO. 16		WELL NO. 17	
	DEPTH OF SAMPLE (M)																																
7/11	TEMPERATURE (CENT)		10.8		9.7		11.7		11.3		11		11		10.3		9.8		9.5		12.2		12.5		12.4		15.2		11.9		12				
7/11	ph		7.25		7.5		7.28		7.22		7.58		7.24		7.37		7.12		7.36		7.41		7.38		7.4		7.20		7.62		7.48				
	PO_4 TOTAL																																	
	SULFATE																								15		16		<5		<5				
	NH_3 -N																																	
	FECAL COLIFORM		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0				
	NO_3 -N		4.0		.33		2.7		5.5		11		2.6		2.4		<.02		1.6		4.0				1.8		1.1		<.02		<.02				
	CONDUCTIVITY		653		660		1260		706		630		1330		731		856		892		1110		896		989		1160		1410		1320				
	CHLORIDES		9.49		49.4		21.7		28.5		38.5		235		67.4		120		9.49		200				147		150		252		207				
	TKN		.20		<.09		.22		<.09		<.09		.11		<.09		.57		.24		.23				.17		.74		10		6				
	$CBOD_5$		2.13		0		0		.08		.11		.30		.38		.20		.11		0		.22		.39		.85		1.3		.81				
	ELEV. (Top of casing)																																	
	ELEV. (Bottom of well)																																	
	ELEV. (Water level)		15.3'		K0.3'		15.3'		34.5'		26'		22.6'		12.3'		10.4'		10.'		13.6'		7.7'		8.8'		12'		7.3'		5'				
		WELL NO. 18		WELL NO. 19		WELL NO.20		WELL NO.21		WELL NO.22		WELL NO.23		WELL NO.24		WELL NO.25		WELL NO.26		WELL NO.27		WELL NO.28		WELL NO.29		WELL NO.30		WELL NO.31		WELL NO.32		WELL NO.33			
	DEPTH OF SAMPLE (M)																																	
	TEMPERATURE (CENT)																																	
	ph																																	
	PO_4 TOTAL																																	
	SULFATE																																	
	NH_3 -N																																	
	FECAL COLIFORM																																	
	NO_3 -N																																	
	CONDUCTIVITY																																	
	CHLORIDES																																	
	TKN																																	
	$CBOD_5$																																	
	ELEV. (Top of casing)																																	
	ELEV. (Bottom of well)																																	
	ELEV. (Water level)																																	

NOTES:

RECEIVED

OCT 30 2000

Larson-Peterson & Assoc.,Inc.

MONTHLY REPORT OF AREA WELLS (WATER CHARACTERISTICS)

DETROIT LAKES, MINNESOTA

MN0020192 PERMIT NUMBER — 010 DIS. NO. — MONTH Sept 2000

Send to: MINNESOTA POLLUTION CONTROL AGENCY
1935 WEST COUNTY ROAD B 2
ROSEVILLE, MINNESOTA 55113
ATTN: COMPLIANCE & ENFORCEMENT SECTION

FIGURE 20

DATE	INFORMATION	WELL NO. 1	WELL NO. 2	WELL NO. 3	WELL NO. 4	WELL NO. 5	WELL NO. 6	WELL NO. 7	WELL NO. 8	WELL NO. 9	WELL NO. 10	WELL NO. 11	WELL NO. 12	WELL NO. 13	WELL NO. 14	WELL NO. 15	WELL NO. 16	WELL NO. 17
9/11	DEPTH OF SAMPLE (M)																	
9/11	TEMPERATURE (CENT)		10.3	12.3	10.7	11.0	11.6	13.0	14.7	11.7	15.5	13.0						
9/11	pH		7.53	7.24	7.27	7.66	7.24	7.27	7.13	8.44	7.23	7.40						
	PO_4 TOTAL																	
	SULFATE																	
	NH_3-N																	
	FECAL COLIFORM																	
	NO_3-N		0.37	2.3	4.9	4.0	2.8	2.4	<.02	1.2	2.3	.86						
	CONDUCTIVITY		542	1150	577	391	880	1080	900	926	1170	770						
	CHLORIDES		53.7	204	18	11.2	230	177	140	123	245	92.5						
	TKN		<.09	.38	<.09	<.09	0.19	0.21	0.40	<.09	<.09	.09						
	$CBOD_5$																	
	ELEV. (Top of casing)																	
	ELEV. (Bottom of well)																	
	ELEV. (Water level)		17.3	16	34.6	25.7	21.8	12.5	10.6	10.2	14.1	7.2						

DATE	INFORMATION	WELL NO. 18	WELL NO. 19	WELL NO. 20	WELL NO. 21	WELL NO. 22	WELL NO. 23	WELL NO. 24	WELL NO. 25	WELL NO. 26	WELL NO. 27	WELL NO. 28	WELL NO. 29	WELL NO. 30	WELL NO. 31	WELL NO. 32	WELL NO. 33
	DEPTH OF SAMPLE (M)																
	TEMPERATURE (CENT)																
	pH																
	PO_4 TOTAL																
	SULFATE																
	NH_3-N																
	FECAL COLIFORM																
	NO_3-N																
	CONDUCTIVITY																
	CHLORIDES																
	TKN																
	$CBOD_5$																
	ELEV. (Top of casing)																
	ELEV. (Bottom of well)																
	ELEV. (Water level)																

NOTES.

1. ALTERNATE TESTS BETWEEN EVEN AND ODD NUMBERED WELLS.
2. GRAB SAMPLES TO BE TAKEN MONTHLY DURING SPRAY SEASON QUARTERLY DURING NON-SPRAY SEASON.
3. AT LEAST ONCE A YEAR EACH TEST MUST BE BASED ON A 24 HOUR COMPOSITE SAMPLE.

MONTHLY REPORT OF AREA WELLS (WATER CHARACTERISTICS)

DETROIT LAKES, MINNESOTA

MN0020192 / PERMIT NUMBER — 010 / DIS. NO. — MONTH October 2000

Send to: MINNESOTA POLLUTION CONTROL AGENCY
1935 WEST COUNTY ROAD B 2
ROSEVILLE, MINNESOTA 55113
ATTN: COMPLIANCE & ENFORCEMENT SECTION

DATE	INFORMATION	WELL NO. 1		WELL NO. 2		WELL NO. 3		WELL NO. 4		WELL NO. 5		WELL NO. 6		WELL NO. 7		WELL NO. 8		WELL NO. 9		WELL NO. 10		WELL NO. 11		WELL NO. 12		WELL NO. 13		WELL NO. 14		WELL NO. 15		WELL NO. 16		WELL NO. 17	
	DEPTH OF SAMPLE (M)																																		
	TEMPERATURE (CENT)		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		11.6		13.7		12.5		12.5		10.2		12.4		14.6		14.7		14.4		13.2					
	ph		7.47		7.5		7.15		7.3		7.7		7.23		7.92		7.18		7.8		7.24		7.43		7.25		7.66		7.5		7.40					
	PO_4 TOTAL		.012		.022		.065		<.010		.045		.018		.02		.02		.145		.117		.028		.036		.497		.795		.459					
	SULFATE		<50																						<5.0		5.8		<5.0		<50					
	NH_3 -N																																			
	FECAL COLIFORM																																			
	NO_3 -N		2.5		2.42		16		4.5		8.1		2.6		1.7		<.02		1.0		2.1		1.5		1.5		2.9		<.02		<.02					
	CONDUCTIVITY		477		603		1170		579		431		950		1100		823		773		1170		793		1290		1170		1310		1290					
	CHLORIDES		10.5		159.5		364		365		24.2		224		295		182		142		312		350		322		367		375		270					
	TKN		<.09		<.09		.26		.23		.29		.40		.38		.54		.25		.45		.16		.36		.46		11		6.7					
	$CBOD_5$																																			
	ELEV. (Top of casing)																																			
	ELEV. (Bottom of well)																																			
	ELEV. (Water level)		16.2'		17.2		16.5'		35.0'		25.4'		21'		12'		19.9'		18.5'		14.7'		7.9'		9.1'		11.7'		8'		5'					

DATE	INFORMATION	WELL NO. 18		WELL NO. 19		WELL NO. 20		WELL NO. 21		WELL NO. 22		WELL NO. 23		WELL NO. 24		WELL NO. 25		WELL NO. 26		WELL NO. 27		WELL NO. 28		WELL NO. 29		WELL NO. 30		WELL NO. 31		WELL NO. 32		WELL NO. 33			
	DEPTH OF SAMPLE (M)																																		
	TEMPERATURE (CENT)																																		
	ph																																		
	PO_4 TOTAL																																		
	SULFATE																																		
	NH_3 -N																																		
	FECAL COLIFORM																																		
	NO_3 -N																																		
	CONDUCTIVITY																																		
	CHLORIDES																																		
	TKN																																		
	$CBOD_5$																																		
	ELEV. (Top of casing)																																		
	ELEV. (Bottom of well)																																		
	ELEV. (Water level)																																		

NOTES:

1. ALTERNATE TESTS BETWEEN EVEN AND ODD NUMBERED WELLS.
2. GRAB SAMPLES TO BE TAKEN MONTHLY DURING SPRAY SEASON QUARTERLY DURING NON-SPRAY SEASON.
3. AT LEAST ONCE A YEAR EACH TEST MUST BE BASED ON A 24 HOUR COMPOSITE SAMPLE.

FIGURE 20

MONTHLY REPORT OF AREA WELLS (WATER CHARACTERISTICS)

DETROIT LAKES, MINNESOTA

MN0020192 PERMIT NUMBER 010 DIS. NO. MONTH August 2001

Send to: MINNESOTA POLLUTION CONTROL AGENCY
1935 WEST COUNTY ROAD B 2
ROSEVILLE, MINNESOTA 55113
ATTN: COMPLIANCE & ENFORCEMENT SECTION

FIGURE 20

DATE	INFORMATION	WELL NO. 1	WELL NO. 2	WELL NO. 3	WELL NO. 4	WELL NO. 5	WELL NO. 6	WELL NO. 7	WELL NO. 8	WELL NO. 9	WELL NO. 10	WELL NO 11	WELL NO 12	WELL NO 13	WELL NO 14	WELL NO 15	WELL NO 16	WELL NO.17
	DEPTH OF SAMPLE (M)							16'										
	TEMPERATURE (CENT)																	
	ph		2.95	7.15	7.1	7.32	7.16	7.17	7.2	7.25	7.04	7.98						
	PO_4 TOTAL																	
	SULFATE																	
	NH_3 - N																	
	FECAL COLIFORM																	
	NO_3 - N	.34		1.30	4.03	16.2	2.13	1.14	<.02	1.85	.252	.84						
	CONDUCTIVITY	664		1220	529	1.52	1290	1040	885	915	1880	708						
	CHLORIDES	74		190	22.2	76	226	176	102	422	247	805						
	TKN	<.33		<.89	<.33	.35	<.33	<.33	.40	<.33	.56	.33						
	$CBOD_5$																	
	ELEV (Top of casing)																	
	ELEV. (Bottom of well)																	
	ELEV. (Water level)																	
		WELL NO.18	WELL NO. 19	WELL NO.20	WELL NO. 21	WELL NO.22	WELL NO.23	WELL NO.24	WELL NO.25	WELL NO.26	WELL NO.27	WELL NO.28	WELL NO.29	WELL NO.30	WELL NO.31	WELL NO.32	WELL NO.33	
	DEPTH OF SAMPLE (M)																	
	TEMPERATURE (CENT)																	
	ph																	
	PO_4 TOTAL																	
	SULFATE																	
	NH_3 - N																	
	FECAL COLIFORM																	
	NO_3 - N																	
	CONDUCTIVITY																	
	CHLORIDES																	
	TKN																	
	$CBOD_5$																	
	ELEV. (Top of casing)																	
	ELEV. (Bottom of well)																	
	ELEV. (Water level)																	

NOTES:

1. ALTERNATE TESTS BETWEEN EVEN AND ODD NUMBERED WELLS.
2. GRAB SAMPLES TO BE TAKEN MONTHLY DURING SPRAY SEASON QUARTERLY DURING NON-SPRAY SEASON.
3. AT LEAST ONCE A YEAR EACH TEST MUST BE BASED ON A 24 HOUR COMPOSITE SAMPLE.

MONTHLY REPORT OF AREA WELLS (WATER CHARACTERISTICS)

DETROIT LAKES, MINNESOTA

MN0020192 PERMIT NUMBER 010 DIS. NO. MONTH April 2002

Send to: MINNESOTA POLLUTION CONTROL AGENCY
1935 WEST COUNTY ROAD B 2
ROSEVILLE, MINNESOTA 55113
ATTN: COMPLIANCE & ENFORCEMENT SECTION

FIGURE 20

DATE	INFORMATION	WELL NO. 1	WELL NO. 2	WELL NO. 3	WELL NO. 4	WELL NO. 5	WELL NO. 6	WELL NO. 7	WELL NO. 8	WELL NO. 9	WELL NO. 10	WELL NO. 11	WELL NO. 12	WELL NO. 13	WELL NO. 14	WELL NO. 15	WELL NO. 16	WELL NO. 17
	DEPTH OF SAMPLE (M)																	
	TEMPERATURE (CENT)	8.3	7.3	9.6	9.5	9.0	10.3	6.7	3.5	7.8	9.9	8.5	6.5	4.2	6.7	3.4		
	ph	7.7	7.52	7.38	7.32	7.71	7.34	7.45	7.24	7.42	7.53	7.33	7.55	7.46	7.64	7.68		
	PO_4 TOTAL												.018	.738	.537	.919		
	SULFATE																	
	NH_3 -N	.22	.09	.05	.04	<.04	<.04	<.04	<.04	<.04	<.04	<.04	<.04	.67	8.24	5.86		
	FECAL COLIFORM																	
	NO_3 -N	1.84	.26	3.39	5.65	3.66	1.85	1.26	<.02	.98	.94	2.53	1.82	1.76	.04	<.02		
	CONDUCTIVITY	572	902	1340	865	678	1750	1060	1400	1450	1130	1480	1010	1890	1910	2210		
	CHLORIDES	10.74	73.97	89.72	17.74	67.23	232	54.89	108	64.98	74.97	182	57.48	230	225	226		
	TKN	>.21<	<.18	<.18	<.18	<.18	<.18	<.18	>.20<	<.18	>.23<	>.24<	<.18	.99	8.3	5.9		
	$CBOD_5$																	
	ELEV. (Top of casing)																	
	ELEV. (Bottom of well)																	
	ELEV. (Water level)	16.2'	17.6'	17.8'	36.3'	27.8'	25'	19.5'	12'	11.6'	10.8'	8'	8.91'	11.2'	7.83'	9.46'		

	INFORMATION	WELL NO. 18	WELL NO. 19	WELL NO. 20	WELL NO. 21	WELL NO. 22	WELL NO. 23	WELL NO. 24	WELL NO. 25	WELL NO. 26	WELL NO. 27	WELL NO. 28	WELL NO. 29	WELL NO. 30	WELL NO. 31	WELL NO. 32	WELL NO. 33
	DEPTH OF SAMPLE (M)																
	TEMPERATURE (CENT)																
	ph																
	PO_4 TOTAL																
	SULFATE																
	NH_3 -N																
	FECAL COLIFORM	-															
	NO_3 -N																
	CONDUCTIVITY																
	CHLORIDES																
	TKN																
	$CBOD_5$																
	ELEV. (Top of casing)																
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NOTES:

1. ALTERNATE TESTS BETWEEN EVEN AND ODD NUMBERED WELLS.
2. GRAB SAMPLES TO BE TAKEN MONTHLY DURING SPRAY SEASON QUARTERLY DURING NON-SPRAY SEASON.
3. AT LEAST ONCE A YEAR EACH TEST MUST BE BASED ON A 24 HOUR COMPOSITE SAMPLE.

MONITORING WELLS, CITY OF DETROIT LAKES						
Well #	Chlorides	Elevation of GW	Ammonia Nitrogen	Kjeldahl Nitrogen	Nitrate Nitrogen	pH
1	6.7	16.33	<0.02	<0.1	1.34	7.56
2	78.8	17.66	<0.02	<0.1	0.21	7.38
3	51.9	18.08	<0.02	0.3	2.52	7.36
4	18	36.83	<0.02	1	5.47	7.07
5	11.8	28.5	<0.02	<0.1	2.13	7.54
6	270	25.08	<0.02	0.4	3.41	7.19
7	68.8	14.5	<0.02	0.1	1.24	7.31
8	140	12.08	<0.02	0.1	<0.2	7.08
9	129	11.75	<0.02	0.1	1.06	7.27
10	49.9	16.83	<0.02	<0.1	1.24	7.45
11	207	8.5	<0.02	0.4	2.16	7.35
12	20.3	9.66	<0.02	<0.1	1.67	7.58
13	298	12.25	0.26	0.4	<0.2	7.4
14	282	7.83	5.65	6.1	<0.2	7.59
15	214	5	4.81	5.5	<0.2	7.78
Well #	Conductance	Temperature	Phosphorus			
1	1070	7.6				
2	1450	6.7				
3	1370	8.5				
4	1430	8.9				
5	972	8.4				
6	2680	10.6				
7	1450	6.6				
8	1950	3.6				
9	1780	7.4				
10	1240	10.3				
11	2050	9.3				
12	1210	9.66	0.042			
13	2790	4.5	0.798			
14	2730	6.6	1.556			
15	2370	2.9	0.457			

MONITORING WELLS, CITY OF DETROIT LAKES						
Well #	Chlorides	Elevation of GW	Nitrate Nitrogen	Ammonia Nitrogen	Kjeldahl Nitrogen	pH
1	10.6	15.06	1.86	<0.02	1	7.34
2	77	16.83	0.49	<0.02	0.7	7.36
3	142	17.05	3.15	<0.02	0.7	7.63
4	30.4	37	4.33	<0.02	0.9	7.23
5	56.3	28.5	5	<0.02	0.9	7.51
6	284	25	4.39	<0.02	0.9	6.72
7	90.7	13.58	1.65	<0.02	<0.1	6.73
8	208	11.25	<0.2	<0.02	<0.1	6.77
9	151	10.83	1.19	<0.02	<0.1	6.74
10	35.6	16.08	1.82	<0.02	<0.1	6.74
11	272	7.91	3.73	<0.02	<0.1	6.74
12	22.2	9.91	1.98	<0.02	<0.1	7.64
13	275	11.04	<0.2	0.5	0.7	7.37
14	267	7.05	<0.2	4.41	5.2	7.24
15	273	5	<0.2	5.4	5.8	7.65

Well #	Conductance	Temperature	Phosphorus
1	939	7.6	
2	1560	7.1	
3	1850	8.8	
4	1560	10.3	
5	1400	9.5	
6	2100	10	
7	1290	6.8	
8	1720	4.2	
9	1470	6.4	
10	929	10.3	
11	2080	10.5	
12	1060	6.5	0.093
13	2850	4.8	0.746
14	2890	6.7	1.754
15	2610	4.1	0.367

Engineer's Opinion of Estimate Capital Costs

Wastewater Treatment Facility
Detroit Lakes, Minnesota

Engineer's Opinion of Estimated Cost
Alternative "B" - Additional Spray Irrigation Facilities

Item	Unit	Quantity	Unit Price	Extended Price
Mobilization	LS	1	$40,000.00	$40,000.00
Salvage & Reinstall Culvert	EACH	27	$250.00	$6,750.00
Clear & Grub Trees	ACRE	3	$2,000.00	$6,000.00
Remove Bituminous Pavement	SY	1,000	$5.00	$5,000.00
Class 5 Restoration	TON	425	$10.00	$4,250.00
Air Release Manhole	EACH	10	$3,750.00	$37,500.00
Drain Manhole	EACH	5	$3,750.00	$18,750.00
Valve Manhole	EACH	2	$4,000.00	$8,000.00
Manhole Casting	EACH	17	$300.00	$5,100.00
Machine Time	HOURS	12	$400.00	$4,800.00
Bituminous Wear Course	TON	110	$47.00	$5,170.00
Bituminous Base Course	TON	110	$47.00	$5,170.00
Tack Coat	GAL	50	$3.00	$150.00
16" PVC Forcemain	LF	18,000	$50.00	$900,000.00
Steel Casing	LF	80	$200.00	$16,000.00
Traffic Control	LS	1	$8,000.00	$8,000.00
Center Pivot Irrigation (1,160' rad.)	LS	1	$45,500.00	$45,500.00
Seeding	ACRE	16	$150.00	$2,400.00
Seed	LBS	1,600	$3.00	$4,800.00
Fertilizer	TON	1.6	$800.00	$1,280.00
Mulch	TON	32	$150.00	$4,800.00
Disk Anchoring	ACRE	16	$150.00	$2,400.00
Erosion Control	LS	1	$5,000.00	$5,000.00
Pivot Blocks	EACH	4	$2,000.00	$8,000.00
Pumping Station	LS	1	$300,000.00	$300,000.00

Total Construction Cost	$1,444,820.00
Admin. & Legal	$20,000.00
Engineering Design	$115,000.00
Engineering Construction	$100,000.00
Hydrologist & Monitoring Wells	$88,250.00
Land Acquisition	$250,000.00
Electrical	$20,000.00
Soil Boring / Testing	$3,000.00
Capitalized Interest	$30,000.00
Contingencies	$114,525.00
Total Project Cost	$2,185,595.00

Wastewater Treatment Facility
Detroit Lakes, Minnesota

Engineer's Opinion of Estimated Cost
Alternative "C" - Convert Spray Irrigation to Rapid Infiltration Basins

Item	Unit	Quantity	Unit Price	Extended Price
Remove/Abandon Spray Irrigation	LS	1	$30,000.00	$30,000.00
Construct RIB's	LS	1	$660,000.00	$660,000.00
12" PVC Piping	LF	5,000	$35.00	$175,000.00
Pumping Facilities	LS	1	$150,000.00	$150,000.00
12" PVC Forcemain	LF	3,500	$35.00	$122,500.00
Turf Establishment	ACRE	22	$2,000.00	$44,000.00
		Total Construction Cost		$1,181,500.00
		Admin. & Legal		$20,000.00
		Engineering		$145,000.00
		Soil Boring / Testing		$10,000.00
		Capitalized Interest		$30,000.00
		Contingencies		$100,000.00
		Total Project Cost		$1,486,500.00

Wastewater Treatment Facility
Detroit Lakes, Minnesota

Engineer's Opinion of Estimated Cost
Alternative "D" - Construct New Rapid Infiltration Basins

Item	Unit	Quantity	Unit Price	Extended Price
Clear & Grub	ACRE	10	$1,000.00	$10,000.00
Construct RIB's	LS	1	$305,000.00	$305,000.00
12" PVC Piping	LF	1,000	$35.00	$35,000.00
Pumping Facilities	LS	1	$100,000.00	$100,000.00
12" PVC Forcemain	LF	1,000	$35.00	$35,000.00
Turf Establishment	ACRE	10	$2,000.00	$20,000.00
		Total Construction Cost		$505,000.00
		Admin. & Legal		$10,000.00
		Engineering		$76,000.00
		Soil Boring / Testing		$14,000.00
		Capitalized Interest		$20,000.00
		Contingencies		$55,000.00
		Total Project Cost		$680,000.00