

Leaksite ID# 3711
CITY OF HECTOR
Site Name

Tank Facility ID
CITY OF HECTOR
Responsible Party

LEAKSITE REMARKS

01/08/91- release report
01/11/91- Std. letter mailed to Doris Richter; Hector city clerk
01/29/91- Phone conv. w/ Ms. Richter: Will be taking bids and will
notify. City Council will be making decision on who...?
04/04/91- Mail consultants list to Doris w/ speed memo
05/28/92- MEK call from Terracon consultant (Charles Williams) on land
app., need correspondence in full completed land
app., notification form and monitoring results;
06/12/92- MEK call to Nancy M. on site visit; sent land app. info;
07/01/92- MEK- land application approval (lta_b) mailed to city of
Hector; await monitoring results, then send standard closure
(as opposed to monitor closure);
07/21/92: RCS-Rec'd pictures of the City of Hector Brush Dump Site
from Ron Linn, Mge. Operations Office. In file.
9/28/92 Rec'd land spread notification form.
07/19/93- MEK- rec'd soil monitoring results; 8.1 ppm
07/23/93- MEK- land application site/file closure letter mailed; file
is closed;
07/26/96- EME- file archived

End of Remarks



Minnesota Pollution Control Agency

July 23, 1993

Mr. Matt Hylan
City of Hector
301 South Main Street, Box 457
Hector, Minnesota 55342

Dear Mr. Hylan:

RE: Completion of Conditional Closure and Land Treatment Soil Monitoring Requirements

Site: City of Hector, 110 Cedar Avenue, Hector
Site ID#: LEAK00003711

On February 25, 1992, the Minnesota Pollution Control Agency (MPCA) staff issued a conditional petroleum tank release site closure letter for the site referenced above. The conditional closure letter specified that additional follow-up soil analysis as outlined in part III.C of the MPCA document "Land Application of Petroleum Contaminated Soil: Single Application Sites" (May 1991) is still required.

The MPCA staff has received and reviewed the monitoring results for soil samples collected at the land-application site on June 17, 1993. The results indicate that the soil has been adequately treated. Therefore, no further follow-up soil monitoring and tillage is required at the land application site. This area may now be used for crop production if desired.

The file regarding this petroleum tank release will be closed. If you have any questions, please contact me at 612/297-8611.

Sincerely,

A handwritten signature in black ink that reads "Mark Koplitz".

Mark Koplitz
Pollution Control Specialist
Tanks and Spills Section
Hazardous Waste Division

MK:vb

cc: Charles Williams, Terracon Environmental, Inc.
Gary Torbert, Hector Township
Doug Knutson, Renville County

SOIL MONITORING RESULTS FOR LAND TREATED PETROLEUM CONTAMINATED SOIL (FORM D)

Minnesota Pollution Control Agency
Tanks and Spills Section
April 1993

This form must be used for reporting the results of follow-up soil sampling where petroleum contaminated soil has been spread at a land treatment site for a specific batch of soil. Refer to Minn. Rules ch. 7037 for specific information on monitoring and reporting.

I. BACKGROUND

A. Generator (and mailing address):

Name: Matt Hylan
Business name: City of Hector
Street/Box: 301 So. Main St. Box 457
City, Zip: Hector, MN 55342
Telephone: (612) 848-2122

B. Site from which contaminated soil was generated:

MPCA Site ID#: LEAK0000 3711
Business name: City of Hector
Street: 301 So. Main St., Box 457
City, Zip: Hector, MN 55342
County: Renville

C. Land Treatment Site Owner (and mailing address):

Name: City of Hector
Street/Box: 301 So. Main St. Box 457
City, Zip: Hector, MN 55342
Telephone: (612) 848-2122

D. Land Treatment Site Operator (and mailing address):

Name: Matt Hylan
Street/Box: 301 So. Main St., Box 457
City, Zip: Hector, MN 55342
Telephone: (612) 848-2122

E. Person(s) who completed this form:

Name: Charles E. Williams
Business name: Terracon Environmental, Inc
Street/Box: 3535 Hoffman Road East
City, Zip: White Bear Lake, MN 55110
Telephone: (612) 770-1500

F. Legal Description of Land Treatment Site:

SE $\frac{1}{4}$ of SW $\frac{1}{4}$ of Section 16, Township 115N Range 32W, County Renville

II. LAND TREATMENT INFORMATION

- A. Actual date soil was spread: 9/22/92
- B. Dates soil was tilled (since spreading or the most recent monitoring report):
6/14/93
- C. If land treatment plot was cropped indicate type of crop and seeding date:

(see reverse side)

RECEIVED

JUL 19 1993

MPCA HAZARDOUS
WASTE DIVISION

Soil Monitoring Results--Form D
Page 2
April 1993

- D. Soil monitoring sampling date: June 17, 1993
- E. List the soil sample analytical results (total petroleum hydrocarbons, TPH) from the land treatment site. If additional petroleum constituents were required to be reported, list results on a separate attached table.

Sample Number	TPH as Gas or Fuel Oil (circle one) ppm	(DRO)	Sample Number	TPH as Gas or Fuel Oil (circle one) ppm
<u>Comp #1</u>	<u>8.1</u>			
<u>Comp #2</u>	<u>less than 2.0</u>			

Note: Copies of laboratory results and chain of custody forms must be attached.

III. LOCAL GOVERNMENT NOTIFICATION INFORMATION

A copy of this form must be sent to the appropriate local government officials before or at the same time that it is submitted to the MPCA. Provide the following for the local government officials to whom copies of this form have been sent:

County	Township, City, or
official: Doug Knutson	Tribal official: Bert Golly
Title: Renville Co. Solid Waste Officer	Title: City of Hector Maintenance
Street/Box: 500 Depue Ave. E.	Street/Box: 301 So. Main St., Box 457
City, Zip: Olivia, MN 56277-1396	City, Zip: Hector, MN 55342
Telephone: 612-523-1172	Telephone: (612) 848-2122

Mail completed form and all attachments to:


Project Manager	-OR-	appropriate MPCA Regional
Minnesota Pollution Control Agency		Office land treatment site
Tanks and Spills Section		approval letter was issued by
520 Lafayette Road		MPCA Regional Office Staff.
St. Paul, Minnesota 55155-4194		

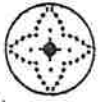
SOIL SAMPLING INFORMATION SHEET

PROJECT NAME City of Hector PROJECT NO. 41905101
 PROJECT LOCATION Hector, Mn.

SAMPLE POINT Landfarm #1 DATE 6/17/93 TIME 0900
 SAMPLE POINT DESCRIPTION east side of landfarm area
 SAMPLE METHOD composite of 28 samples.
 SAMPLE INTERVAL NA
 SAMPLE DESCRIPTION dk. brown with rock & organic mtl.
 SAMPLE APPEARANCE wet
 ORGANIC VAPOR READING 1 ppm
 SAMPLING PROBLEMS None
 CLEANING PERFORMED IN FIELD used clean st. steel spoon & bowl
 COMMENTS and latex gloves

SAMPLE POINT Landfarm #2 DATE 6/17/93 TIME 0930
 SAMPLE POINT DESCRIPTION west side of landfarm area
 SAMPLE METHOD composite of 28 samples
 SAMPLE INTERVAL NA
 SAMPLE DESCRIPTION dk. brown with rock & organic mtl.
 SAMPLE APPEARANCE wet
 ORGANIC VAPOR READING 1 ppm
 SAMPLING PROBLEMS none.
 CLEANING PERFORMED IN FIELD see above
 COMMENTS _____

FORM COMPLETED BY CE Williams DATE 6/17/93




Legend
Technical Services

739 VANDALIA ST.
ST. PAUL, MN 55114
(612) 642-1150
FAX (612) 642-1239

July 8, 1993

Mr. Chuck Williams
Terracon Environmental Consultants
3535 Hoffman Road East
White Bear Lake, MN 55124

SUBJECT: 41905101
LEGEND No. 93-1003

1.0 INTRODUCTION

LEGEND TECHNICAL SERVICES, INC. (LEGEND) received two soil samples from a representative of Terracon Environmental Consultants on June 17, 1993. Our laboratory was requested to analyze the samples for the presence of diesel range organics, benzene, toluene, ethyl benzene, and total xylenes.

2.0 DISCUSSION

The sample analysis indicated the presence of some of the analytes requested.

3.0 SAMPLE IDENTIFICATION

<u>Laboratory No.</u>	<u>Client ID</u>
SN93-12068	Comp #1
SN93-12069	Comp #2

4.0 METHODOLOGY

Diesel Range Organics (DRO)

The samples were analyzed using methods based on the Wisconsin Department of Natural Resources Method, PUBL-SW-141, for Modified DRO.

Petroleum Volatile Organic Analysis

The samples were analyzed using purge and trap techniques with an OI Model 4460A liquid sample concentrator coupled with an HP 5890 Series II gas chromatograph equipped with photoionization and flame ionization detectors in series. Volatile organic compounds were separated using a Restek RTx-5 30 M capillary column, and quantified using a 5-point calibration curve. The total hydrocarbons as gasoline were quantified by peak area summation using the flame ionization detector. The analysis is based on EPA Methods 5030/8020 for volatile aromatic compounds.

5.0 CASE NARRATIVE

The samples were taken on June 17, 1993 and were received on ice in acceptable condition.

The volatiles analysis was performed on June 27, 1993. The DRO samples were prepared on June 18, 1993 and analyzed on June 25, 1993.

The associated method blanks were free of target analytes at detectable levels, and the associated batch quality assurance/quality control criteria were met with satisfaction.

6.0 REMARKS

The samples will be retained by our laboratory for 30 days from the date of this report and then discarded unless other instructions are received by the client.

Submitted by,

LEGEND TECHNICAL SERVICES, INC.


Chris Bremer
Laboratory Manager

CB/JN/ss

Attachment


Jennifer Nelson
Chemist

LEGEND TECHNICAL SERVICES, INC.

TABLE #1

LEGEND No. 93-1003

TERRACON ENVIRONMENTAL CONSULTANTS
DIESEL RANGE ORGANICS

Sample ID	Diesel Range Organics (mg/kg)
Comp #1	8.1
Comp #2	<2.0
Method Blank	<2.0
Method Detection Limit	2.0

<u>Recovery Data</u>	<u>Percent Recovery</u>
Spike #1	95%
Spike #2	113%

< = Less than number shown

mg/kg is equal to parts per million (dry weight basis)

Date Extracted: 6/18/93

Date Analyzed: 6/25/93

LEGEND TECHNICAL SERVICES, INC.

TABLE #2

LEGEND No. 93-01003
TERRACON ENVIRONMENTAL CONSULTANTS
PETROLEUM VOLATILE ORGANIC COMPOUNDS

Compound	Comp #1 (mg/kg)	Comp #2 (mg/kg)	Method	
			Blank (mg/kg)	MDL (mg/kg)
Benzene	<0.001	<0.001	<0.001	0.001
Toluene	<0.001	<0.001	<0.001	0.001
Ethyl Benzene	<0.001	<0.001	<0.001	0.001
Total Xylenes	<0.001	<0.001	<0.001	0.001

SURROGATE RECOVERY
RESULT %

α, α, α -tFL-Tol 62.2%* 64.9%* 75.3%

* The surrogate recovery was low on duplicate analyses. This appears to be matrix related.

MDL - Method detection limit.

$\mu\text{g/kg}$ is equal to parts per billion (dry weight basis).

< = Less than number shown.

Date Analyzed: 6/27/93 6/27/93 6/27/93

LEGEND TECHNICAL SERVICES, INC.

TABLE #3

LEGEND No. 93-1003

TERRACON ENVIRONMENTAL CONSULTANTS
QUALITY ASSURANCE/QUALITY CONTROL SUMMARY

Parameter	Percent Recovery A	Percent Recovery B	Percent Reproducibility	Acceptable Range
Benzene	92.4	95.3	97.1	≥ 80
Toluene	87.6	89.7	97.9	≥ 80
Ethyl Benzene	90.5	94.3	96.2	≥ 80
p,m-Xylene	92.8	96.5	96.4	≥ 80
o-Xylene	91.5	95.1	96.4	≥ 80

≥ = Greater than or equal to.

LEGEND TECHNICAL SERVICES, INC.

739 Vandalia Street
 St. Paul, MN 55114
 (612)642-1150

CHAIN OF CUSTODY RECORD

Client Name: <u>City of Hector</u> Report To: <u>Terracon</u> <u>Chuck Williams</u> Samplers: <u>Chuck Williams</u> Project No.: <u>41905101</u>	Verbal Results To: _____ Copy of Report To: _____ Samples Returned To: _____ Laboratory Project No.: <u>93-1003</u>	Analysis / # Of Containers <table border="1" style="width:100%; height: 100px; border-collapse: collapse;"> <tr> <td style="width:10%;"></td> <td style="width:10%;"></td> <td style="width:10%;"></td> <td style="width:10%;"></td> <td style="width:10%;"></td> <td style="width:10%;"></td> <td style="width:10%;"></td> <td style="width:10%;"></td> </tr> <tr> <td style="text-align: center; vertical-align: middle;">DRO</td> <td style="text-align: center; vertical-align: middle;">BTEX</td> <td style="text-align: center; vertical-align: middle;">Moisture Cont.</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>									DRO	BTEX	Moisture Cont.					
DRO	BTEX	Moisture Cont.																

Item #	Field ID #	Sample Description	Collection		Sample Matrix			Lab ID#						
			Date	Time	Air	Liq.	Sol.							
1	Comp #1	Landfarm Comp. #1	6/17/93	0900			X	93-12068	X	X	X			
2	Comp #2	Landfarm Comp. #2	6/17/93	0930			X	93-12069	X	X	X			
3								93-12070						
4														
5														
6														
7														
8														
9														
10														
11														

Transfer No.	Item Number	Relinquished By	Accepted By	Date	Time	Comments
1	all	Charles Williams	CBearns	6/17/93		rec'd on ice
2						
3						
4						

**NOTIFICATION OF SPREADING PETROLEUM CONTAMINATED SOIL
AT A LAND TREATMENT SITE (FORM C)**

Minnesota Pollution Control Agency
Tanks and Spills Section
May 1992

**MPCA, HAZARDOUS
WASTE DIVISION**

SEP 28 1992

This form should be used to notify the Minnesota Pollution Control Agency (MPCA) that petroleum contaminated soil approved for land treatment has been spread in accordance with the MPCA document "Land Treatment of Petroleum Contaminated Soil: Land Treatment Sites" (Guidance Document 24). **This form must be completed and submitted to the MPCA within 10 days following spreading.** Land treatment of petroleum contaminated soil after receipt of an MPCA letter of approval may allow the responsible person identified under item I.A, below, to apply for partial Petrofund reimbursement under stage 2 (Minn. Stat. § 115C.09, subd. 2(a)(2), (1991)). Stockpiling of soil is not considered as land treatment.

I. BACKGROUND AND SOIL SPREADING INFORMATION

- A. Tank owner/operator (and mailing address)
- Contact: Mary Saeger
Company name: City of Hector
Street/Box: P.O. Box 457
City, Zip: Hector, MN 55342
Telephone: 612-848-2122
- B. Site from which contaminated soil originated:
- MPCA Site ID#: **LEAK000** 3711
Company name: City of Hector
Street: P.O.Box 457
City, Zip: Hector, MN 55342
County: Renville
- C. Land Treatment Site Owner (and mailing address)
- Name: City of Hector
Street/Box: P.O.Box 457
City, Zip: Hector, MN 55342
Telephone: 612-848-2122
- D. Land Treatment Site Operator (and mailing address)
- Name: City of Hector
Street/Box: P.O.Box 457
City, Zip: Hector, MN 55342
Telephone: 612-848-2122
- E. Consultant (or other) preparing this form:
- Name: Charles E. Williams
Company name: Terracon Environmental Inc.
Street/Box: 3535 Hoffman Road E.
City, Zip: White Bear Lake, MN 55110
Telephone: 612-770-1500
- F. Legal Description of Land Treatment Site:
- SE $\frac{1}{4}$ of SW $\frac{1}{4}$ of Section 16,
Township 115N, Range 32W,
Township Name Hector,
County Renville
- G. Date of MPCA Land Treatment/Soil Corrective Action Plan Approval Letter: July 1, 1992
- H. Name of MPCA staff who issued Land Treatment/Soil Corrective Action Plan Approval Letter: Mark Koplitz
- I. Date contaminated soil spread: 09-22-92
- J. Volume of Soil spread (cubic yards): 60
- K. Area of land used (square feet or acres): 4861

(see reverse side)

II. FIGURES AND SUPPORTING INFORMATION--Attach the following:

Site location map (scale should be 1 inch = 50 feet). Indicate the following:

- . borders of land treatment site (indicate dimensions of each side in feet)
- . delineate actual spreading area for soil of this application (label dimensions in feet)
- . delineate all areas previously used for land treatment (label dimensions in feet and indicate with leaksite number)
- . north arrow

III. COUNTY AND LOCAL NOTIFICATION INFORMATION

A copy of this form must be sent to the appropriate county and local officials before or at the same time that it is submitted to the MPCA. Provide the following for the county and local officials to whom copies of this form have been sent:

County official: Jim Tersteeg
Title: Renville County Auditor
Street/Box: Renville County Courthouse
City, Zip: Olivia, MN 56277
Telephone: 612-523-2071

Local Official: Mary Saeger, City Administrator
Title: City of Hector
Street/Box: P.O. Box 457
City, Zip: Hector, MN 55342
Telephone: 612-848-2122

Mail completed form and all attachments to:

Project Manager
Minnesota Pollution Control Agency
Tanks and Spills Section
520 Lafayette Road
St. Paul, Minnesota 55155-4194

-OR-
appropriate MPCA Regional
Office land treatment site
approval letter was issued by
MPCA Regional Office Staff.

APPLICATION TO LAND TREAT PETROLEUM CONTAMINATED SOIL AT AN APPROVED SITE (FORM B)

Minnesota Pollution Control Agency
Tanks and Spills Section
May 1992

This form is to be submitted after specific soil contamination information is known and after a land treatment site has been issued Minnesota Pollution Control Agency (MPCA) approval (however, if a land treatment site has not been pre-selected this form should be submitted at the same time as land treatment FORM A (Guidance Document 25)). Refer to the MPCA document "Land Treatment of Petroleum Contaminated Soil: Land Treatment Sites" (Guidance Document 24) for specific information. Note: This application, if complete, is considered to be an acceptable form of a Petroleum Contaminated Soil Corrective Action Plan. If approved by MPCA staff, an approval letter will be issued.

I. BACKGROUND

- A. Tank owner/operator (and mailing address)
- Contact: Mary Saeger, City Administrator
Company name: City of Hector
Street/Box: P.O.Box 457
City, Zip: Hector, MN 55342
Telephone: 612-848-2122
- B. Site from which contaminated soil originated:
- MPCA Site ID#: LEAK00003711
Company name: City of Hector
Street: P.O.Box 457
City, Zip: Hector, MN 55342
County: Renville
- C. Land Treatment Site Owner (and mailing address)
- D. Land Treatment Site Operator (and mailing address)

Name: City of Hector
Street/Box: P.O.Box 457
City, Zip: Hector, MN 55342
Telephone: 612-848-2122

Name: City of Hector
Street/Box: P.O.Box 457
City, Zip: Hector, MN 55342
Telephone: 612-848-2122

- E. Consultant (or other) preparing this form:

Name: Charles E. Williams
Company name: Terracon Environmental Inc.
Street/Box: 3535 Hoffman Road E.
City, Zip: White Bear Lake, MN 55110
Telephone: 612-770-1500

- F. Legal Description of Land Treatment Site:
- SE 1/4 of SW 1/4 of Section 16,
Township 115N, Range 32W,
County Renville

- G. Volume of Soil to be land applied (cubic yards): 60
H. Area of land to be used (square feet or acres): 4861 sq. feet
I. Proposed spreading thickness (inches): no more than 4 inches
J. Projected date of soil spreading: July, 1992
K. If fertilizers will be applied, provide application rates:

_____ lbs. nitrogen/acre, _____ lbs. P₂O₅/acre, _____ lbs. sulfur/acre

II. PETROLEUM CONTAMINATED SOIL SAMPLING RESULTS

Circle the type(s) of petroleum contamination: unleaded gas, regular gas, diesel fuel, No. 2 fuel oil, used oil, other (please specify _____).

RECEIVED
JUL 07 1992
MPCA, HAZARDOUS
WASTE DIVISION

List the appropriate soil sample analytical results (and averaged concentrations) from the contaminated soil (refer to "Soil and Ground Water Analysis at Petroleum Release Sites" (Guidance Document 11)). Note: Since a single composite sample is used to determine lead, report this value in the blank for "AVERAGE." Also, if the petroleum was not gasoline or fuel oil attach a separate table, listing the appropriate analytical parameters.

Sample Code	TPH as		Ethyl-		Toluene ppm	Xylene ppm	MTBE ppm	Lead ppm
	gas or FO ppm (circle one)	Benzene ppm	benzene ppm					
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
AVERAGE	_____	_____	_____	_____	_____	_____	_____	_____

III. FIGURES AND SUPPORTING INFORMATION--Attach the following:

- A. Site location map (scale should be 1 inch = 50 feet). Indicate the following:
 - . borders of land treatment site (indicate dimensions of each side in feet)
 - . delineate area proposed for land treatment of soil of this application (label dimensions in feet)
 - . delineate all areas previously used for land treatment (label dimensions in feet and indicate with leaksite number)
 - . north arrow

B. Copies of laboratory reports and chain of custody forms for contaminated soil

IV. INFORMATION REGARDING PREVIOUSLY APPROVED CONTAMINATED SOIL

Provide the following for contaminated soil that has been spread or has been approved for spreading at this land treatment site:

Leaksite Number	Actual Soil Volume (cu. yds.)	Spreading Thickness (inches)	Spreading Date
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

There has not been contaminated soil spread at this site in the past.

Application--Form B

Page 3

May 1992

V. COUNTY AND LOCAL NOTIFICATION INFORMATION

A copy of this form must be sent to the appropriate county and local officials before or at the same time that it is submitted to the MPCA. Provide the following for the county and local officials to whom copies of this form have been sent:

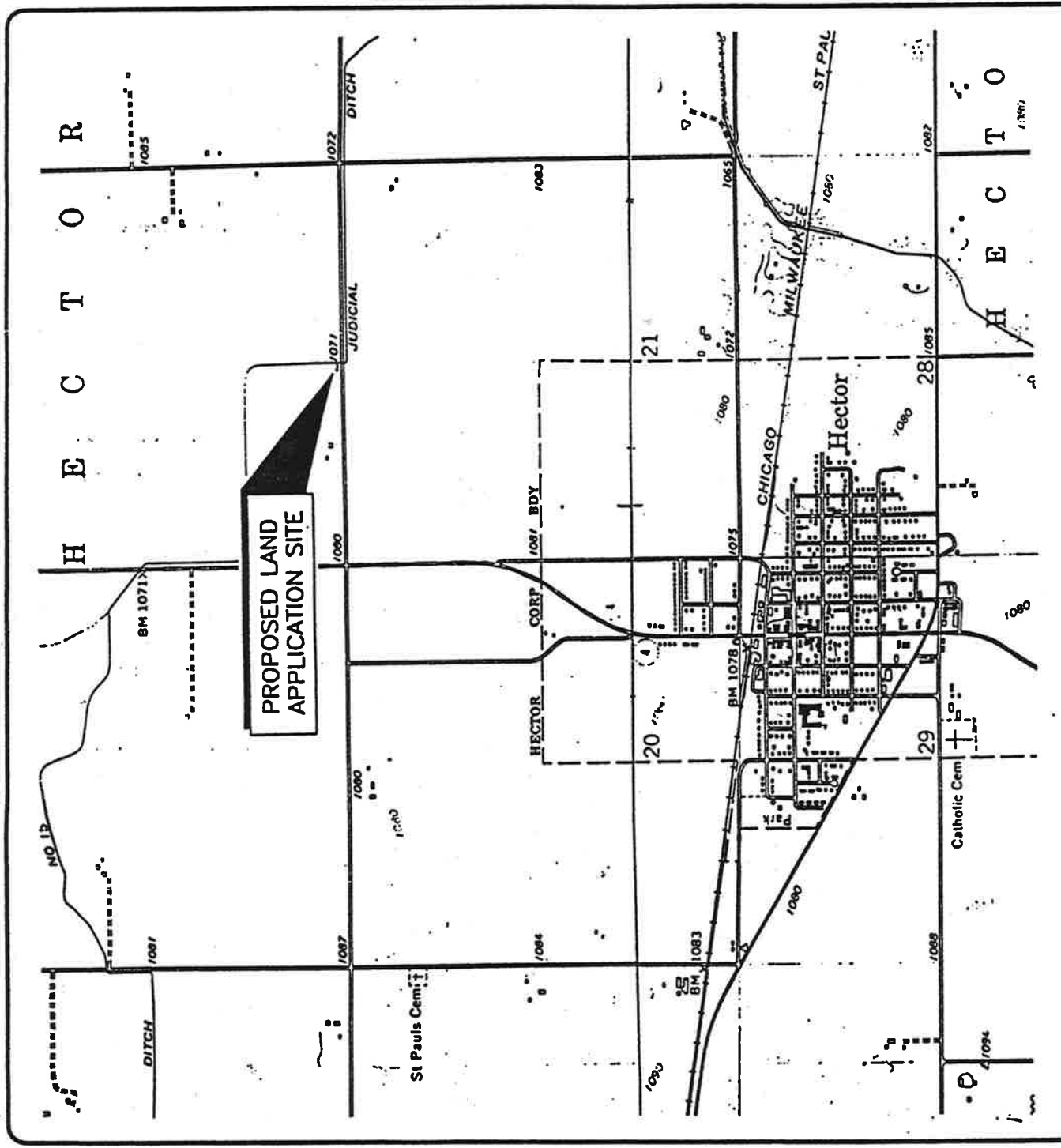
County official: Jim Tersteeg
Title: County Auditor
Street/Box: Renville County Courthouse
City, Zip: Olivia, MN 56277
Telephone: 612-523-2071

Local Official: Mary Sæger
Title: City Administrator, City of Hector
Street/Box: P.O. Box 457
City, Zip: Hector, MN 55342
Telephone: 612-848-2122

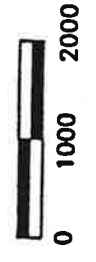
Mail completed application and all attachments to:

Project Manager
Minnesota Pollution Control Agency
Tanks and Spills Section
520 Lafayette Road
St. Paul, Minnesota 55155-4194

appropriate MPCA Regional
Office land treatment site
approval letter was issued by
MPCA Regional Office Staff.



APPROXIMATE SCALE:
1 INCH = 2000 FEET



PROPOSED LAND
APPLICATION SITE
CITY OF HECTOR
HECTOR, MINNESOTA
MPCA SITE ID#: LEAK00003711
TERRACON PROJECT NO. 41905101



UNION CO-OP OIL CO.
LP Gas • Bulk Petroleum • Service Station



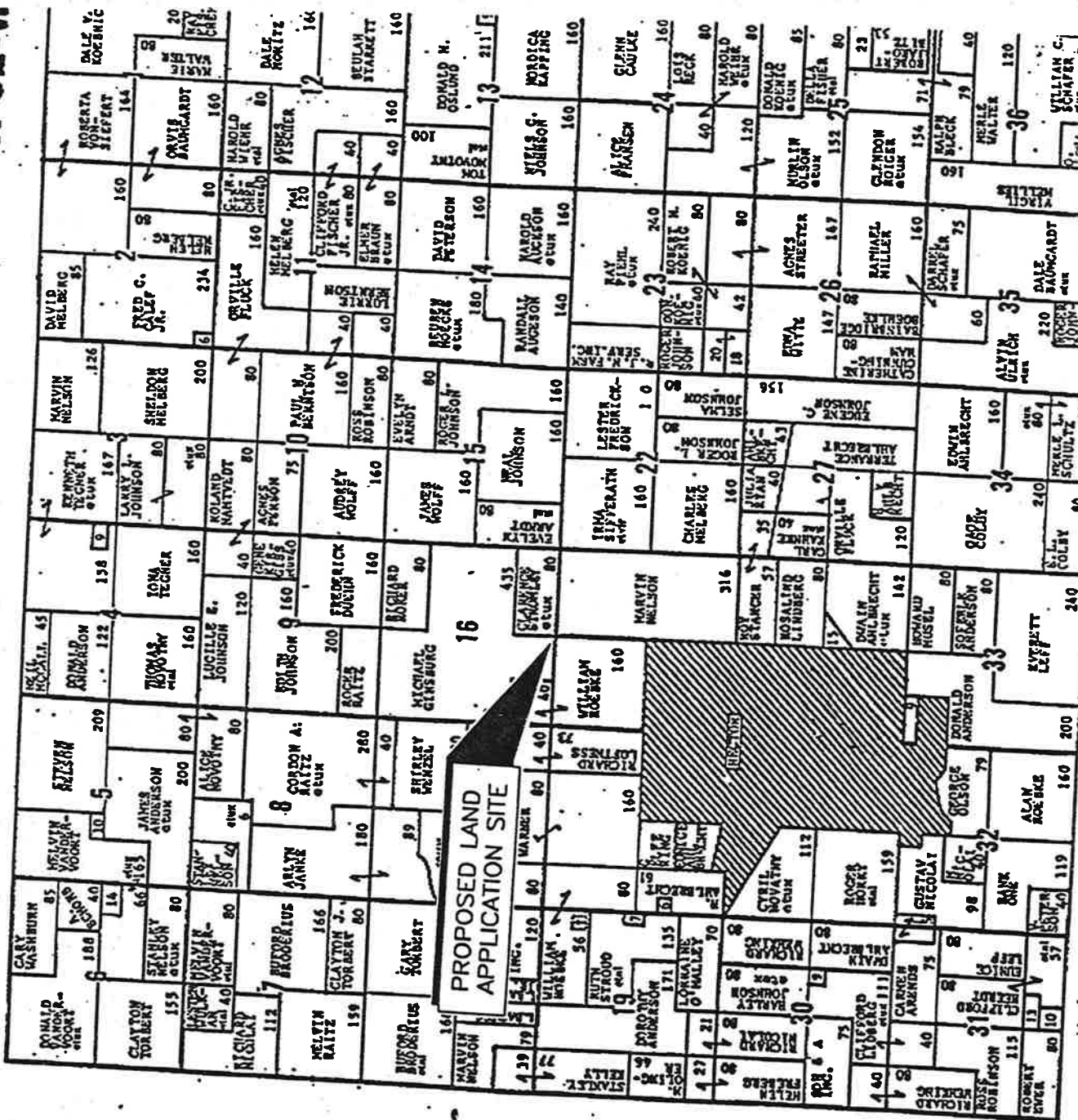
Cosmos Hecor
877-7616 • 848-6288 • Hecor Convenience Store • 848-6100

Buffalo La
848-628

T-115-N

HECTOR PLAT

R-32-W





twin city testing
CORPORATION

662 CROMWELL AVENUE
ST. PAUL, MN 55114
PHONE 612/645-3601

REPORT OF: CHEMICAL ANALYSES

PROJECT: CITY OF HECTOR, 41905101 **DATE:** July 15, 1991

REPORTED TO: Terracon Consultants
Attn: Jeff Solheim
3584 Hoffman Road East
White Bear Lake, MN 55110

LABORATORY NO: 4410 91-3644

INTRODUCTION

This report presents the results of the analyses of seven samples received on June 19, 1991, from a representative of Terracon Consultants. The scope of our services was limited to the parameters listed in the attached tables.

SAMPLE IDENTIFICATION

B-1 - TCT #252119
B-2 - TCT #252120
B-3, 23-25' - TCT #252121
Stockpile - TCT #252122
B-4, 24-26' - TCT #252123
B-5, 19-21' - TCT #252124
Trip Blank - TCT #252125

METHODOLOGY

Volatiles

Gasoline concentrations were determined using methods similar to EPA Method 8020 with a Tekmar Liquid Sample Concentrator and an HP5890A gas chromatograph equipped with a flame ionization detector. Compounds were identified by column retention time and quantified by peak area comparisons to those of known standards using a VG Laboratory data system.

Fuel Oil (#2)

The samples were extracted with methylene chloride. The extracts were dehydrated with anhydrous sodium sulfate and concentrated to less than five milliliters in Kuderna-Danish concentrators on a steam bath. The extracts were then analyzed using an HP 5890A gas chromatograph equipped with a flame ionization detector. Fuel oil (#2) was identified by column retention time and quantified by peak area comparisons to those of known standards using a VG Laboratory data system.

RESULTS

The results are listed in the attached tables.

REPORT OF: CHEMICAL ANALYSES

PROJECT: CITY OF HECTOR, 41905101

DATE: July 15, 1991

LABORATORY NO: 4410 91-3644

PAGE: 2

REMARKS

The samples were collected on June 18, 1991, and were consumed in the analyses.

TWIN CITY TESTING CORPORATION

Stephanie Kidder

Stephanie A. Kidder
Project Manager

SAK/CAL/jim

Catherine A. Laudénbach
Catherine A. Laudénbach
Chemist

TABLE 2

ANALYTICAL RESULTS

<u>Parameter</u>	<u>B-3, 23-25'</u>	<u>B-4, 24-26'</u>	<u>B-5, 19-21'</u>	<u>MDL (ug/kg)</u>
Total hydrocarbons as gasoline	ND	8	ND	5
Benzene	ND	ND	ND	1
Toluene	ND	ND	ND	1
Total xylenes	ND	ND	ND	1
Ethyl benzene	ND	ND	ND	1
Surrogate Recovery:				
α, α, α -Trifluorotoluene	83%	84%	87%	

All values are in ug/kg which is equal to parts-per-billion (ppb).

ND = Not Detected

MDL = Method Detection Limit

Date Analyzed: July 1, 1991

TABLE 1

ANALYTICAL RESULTS

<u>Parameter</u>	<u>B-1</u>	<u>B-2</u>	<u>Trip Blank</u>	<u>Method Blank</u>	<u>MDL (ug/L)</u>
Total hydrocarbons as gasoline	ND	5	ND	ND	5
Benzene	ND	ND	ND	ND	1
Toluene	ND	ND	ND	ND	1
Total xylenes	ND	ND	ND	ND	1
Ethyl benzene	ND	ND	ND	ND	1
Surrogate Recovery:					
α,α,α-Trifluorotoluene	111%	109%	111%	112%	

All values are in ug/L which is equivalent to parts-per-billion (ppb).

ND = Not Detected

MDL = Method Detection Limit

Date Analyzed: June 30, 1991

TABLE 3

ANALYTICAL RESULTS

<u>Parameter</u>	<u>Stockpile</u>	<u>MDL (ug/kg)</u>
Total hydrocarbons as gasoline	*22,000	35
Benzene	1	7
Toluene	1	7
Total xylenes	1	7
Ethyl benzene	ND	7
Surrogate Recovery:		
α, α -Trifluorotoluene	107%	

*Higher boiling hydrocarbon peaks present, non-typical of gasoline.

All values are in ug/kg which is equal to parts-per-billion (ppb).

ND = Not Detected

MDL = Method Detection Limit

Date Analyzed: July 1, 1991

TABLE 4

ANALYTICAL RESULTS

<u>Sample Identification</u>	<u>Total Hydrocarbons as #2 Fuel Oil (mg/L)</u>
B-1	1.9
B-2	ND
Method Detection Limit	0.2

All values are in mg/L which is equivalent to parts-per-million (ppm).

ND - Not Detected

Date Extracted: June 21, 1991

Date Analyzed: June 24, 1991

TABLE 5

ANALYTICAL RESULTS

<u>Sample Identification</u>	<u>Total Hydrocarbons as #2 Fuel Oil (mg/kg)</u>
B-3, 23-25'	ND
Stockpile	1,000
B-4, 24-26'	ND
B-5, 19-21'	ND
Method Detection Limit	2.0

All values are in mg/kg which is equal to parts-per-million (ppm).

ND - Not Detected

Date Extracted: June 24, 1991

Date Analyzed: June 26, 1991



twin city testing
corporation

662 CROMWELL AVENUE
DOCK #4
ST. PAUL, MN 55114
PHONE 612/645-3601

SAMPLE IDENTIFICATION
CHAIN-OF-CUSTODY RECORD

Check delivery method:
 Samples hand carried from site to lab
 Samples shipped from site directly to lab
 Shipment method/carrier: _____
 Custody seal #: _____
 Attn: _____

Project Number		Project Name/Client			No. of Containers	Analyses Required						Remarks	Sample Lab Number
41905101		City of Hector / Terracon				BTEX Tot. HCs as F.O. See "Req for Chem Serv" X - Susp. Hazard. Matl.							
Item No.	Sample Number (Field ID Number)	Date	Time	Sampling Point Description								Sample Type (water, soil, etc)	Sample Container
1	0618911100	6-18-91	1100	B-1	2	X	X					Water	40ml / 50ml Amber
2	0618911310	6-18-91	1310	B-2	2	X	X					↓	↓
3	0618911500	6-18-91	1500	B-3 (23-2)	2	X	X					Soil	40ml / Soil Jar
4	0618911545	6-18-91	1545	Stockpile	2	X	X					↓	Soil Jar
5	0618911720	6-18-91	1720	B-4 (24-26)	2	X	X					↓	40ml / Soil Jar
6	0618911840	6-18-91	1840	B-5 (19-21)	2	X	X					↓	
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													

Packed/Relinquished by (Signature) <i>Jeff Solheim</i>	Date/Time 6-19-91	Item Numbers: 1-6	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Date/Time	Item Numbers:	Received by: (Signature) [Laboratory Personnel]	Date/Time
Disposed of by: (Signature)	Items	Date/Time	Laboratory Receiving Notes: Custody seal intact? Temperature of shipping container: Sample Condition: Laboratory Invoice Number:	
Send Lab Results To: <i>JEFF SOLHEIM</i>				
Comments:				

Chain-of-Custody Record Number
TCT No 28312



Minnesota Pollution Control Agency

Celebrating our 25th anniversary and the 20th anniversary of the Clean Water Act

July 1, 1992

Ms. Mary Saeger
City of Hector
P.O. Box 547
Hector, Minnesota 55342

Dear Ms. Saeger:

RE: Land Treatment of Petroleum Contaminated Soil/Soil Corrective Action Plan Approval

Land Treatment Site: City of Hector Property, consisting of approximately 4,861 square feet in the SE $\frac{1}{4}$ of the SW $\frac{1}{4}$ of Section 16, T115N, R32W, Hector Township, Renville County.

Leaksite: City of Hector, 110 Cedar Avenue
Site ID#: LEAK00003711

The application received June 8, 1992, to land treat approximately 60 cubic yards of petroleum contaminated soil from the above-referenced leaksite at the above-referenced land treatment site is hereby approved by the Minnesota Pollution Control Agency (MPCA). This approval is based upon the MPCA staff's understanding that the appropriate county and local officials have been notified and/or have given approval for the land treatment of this soil and is subject to the following additional conditions:

1. Stockpiled soil shall be protected from run-on and run-off prior to spreading.
2. Soil shall be spread to a thickness of no more than 4 inches and incorporated into the top four to six inches of native soil as outlined in part II.G of the MPCA document "Land Treatment of Petroleum Contaminated Soil: Land Treatment Sites" (May 1992). All other land treatment procedures and limitations described in part II of the land treatment document shall be followed.
3. The MPCA form "Notification of Spreading Petroleum Contaminated Soil at a Land Treatment Site (FORM C)" shall be submitted to the MPCA within ten days following spreading.
4. The land treated soil shall be sampled and reports shall be submitted in accordance with part III.C of the MPCA land treatment document until analyses indicate 10 parts per million total petroleum hydrocarbons or lower. The MPCA form entitled "Soil Monitoring Results for Land Treated Petroleum Contaminated Soil (FORM D)" should be used for reporting.
5. The MPCA's approval of this application does not release you from any duty to comply with county or local ordinances.

Ms. Mary Saeger
Page 2
July 1, 1992

We believe these actions will provide treatment of the excavated petroleum contaminated soil. The MPCA reserves the right to require additional work if this is determined to be necessary to protect public health and the environment. This letter does not release any person from liability for this contamination. In addition, this letter does not address the adequacy of cleanup or investigative work completed or yet to be completed at the leaksite.

This approval provides eligibility under Minn. Stat. § 115C.09, subd. 2(a)(1) (1991) for Petrofund reimbursement of eligible cleanup costs associated with this leaksite that have been incurred up to the date of this letter. Applications for reimbursement must be made directly to the Petro Board by responsible persons and eligible volunteers. The Petro Board makes the final decision on reimbursement. Reimbursement decisions are based on factors such as the adequacy of cleanup, reasonableness of cost, compliance with notification laws and cooperativeness with the MPCA.

Please contact me at 612/297-8611, if you have any questions.

Sincerely,



Mark Koplitz
Pollution Control Specialist
Hazardous Waste Division
Tanks and Spills Section

MEK:mk

cc: Bert Golly, City of Hector Maintenance
Doug Knutson, Renville County Solid Waste Officer
Charles E. Williams, Terracon Environmental



Minnesota Pollution Control Agency

520 Lafayette Road, Saint Paul, Minnesota 55155-3898

Telephone (612) 296-6300

February 25, 1992

Ms. Doris Richter
City of Hector
301 South Main Street Box 457
Hector, Minnesota 55342

Dear Ms. Richter:

RE: Conditional Petroleum Tank Release Site Closure/Off-Site Analysis Required
at Land Application Site
Site: City of Hector, 110 Cedar Avenue, Hector
Site ID#: LEAK00003711

The Minnesota Pollution Control Agency (MPCA) staff has determined that the cleanup performed in response to the petroleum tank release at the site referenced above had adequately addressed the petroleum contamination, and therefore additional remedial investigation or corrective action will not be required. However, follow-up soil analysis as outlined in part III.C of the MPCA document "Land Application of Petroleum Contaminated Soil: Single Application Sites" (May 1991) is still required. The MPCA form "Soil Monitoring Results for Land-Applied Petroleum Contaminated Soil" should be used for reporting results. The file regarding this release will be closed when monitoring results indicate that soil at the land application site has been adequately treated. Failure to fulfill monitoring requirements may result in MPCA staff recommending a reduction in potential Petrofund reimbursement.

On January 8, 1991, a petroleum tank release was reported to the MPCA. Since then the following corrective actions have been taken in response to the release:

1. Two 1000 gallon fuel oil underground storage tanks were removed from the site November 19, 1990.
2. Approximately 60 cubic yards of petroleum contaminated soil was excavated and land applied on property owned by Ms. Doris Richter. The property location is Township 115W, Range 32W, Section 16 in Hector Township, Renville County. *Approved* ^{verbal}
3. Soil samples collected from the bottom and sides of the excavation indicated that most of the petroleum contaminated soil was removed from the excavation. Contaminated soil remaining is below action levels and does not warrant remediation. Ground water was not encountered during the excavation.

Ms. Doris Richter
Page 2

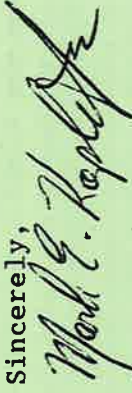
February 25, 1992

Based on the currently available information, we concur that these actions have adequately addressed the petroleum tank release. Therefore, MPCA staff does not intend to require any more investigation or cleanup work in response to this release. However, the MPCA reserves the right to reopen this file and require additional work if in the future more work is determined to be necessary, and this letter does not release any party from liability for this contamination.

Because you performed the requested work, the state may reimburse you for a major portion of your costs. The Petroleum Tank Release Cleanup Act establishes a fund which in certain circumstances provides partial reimbursement for petroleum tank release cleanup costs. This fund is administered by the Petro Board. More specific eligibility rules are available from the Petro Board (612/297-1119 or 612/297-4203).

Thank you for your cooperation with the MPCA in responding to this petroleum tank release to protect the public health and the environment of the state of Minnesota. If you have any questions regarding this correspondence, please call me at 612/297-8614.

Sincerely,



Mark Koplitz
Pollution Control Specialist
Tanks and Spills Section
Hazardous Waste Division

MK:np

cc: Jeff Solheim, Terracon Environmental, Inc., 3535 S. ~~Main St.~~ ~~Box 4577~~,
~~Hector 55942~~ *CUMMINS BEAR COKE*

APPLICATION TO LAND APPLY PETROLEUM CONTAMINATED

Minnesota Pollution Control Agency
Tanks and Spills Section
May 1991

Refer to the Minnesota Pollution Control Agency (MPCA) document for information on
Petroleum Contaminated Soil: Single Application Sites for Specific Information on
acceptable soil and site criteria.

RECEIVED
MPCA
MPCA Site ID# 1-612-848-2122

FEB 12 1992

I. BACKGROUND

MPCA Site ID# 1-612-848-2122
MPCA HAZARDOUS WASTE DIVISION

B. Site from which contaminated soil originated:

A. Tank owner/operator mailing address:

Contact: Ms. Doris Richter
Company name: City of Hector
Street/Box: 301 S. Main Street Box 457
City, Zip: Hector, Minnesota 55342
Telephone: 1-612-848-2122

Company name: City of Hector
Street: 301 S. Main St. Box 457
City, Zip: Hector, Minnesota 55342
County: Renville

C. Address or legal description of land spreading site:

Contact: Ms. Doris Richter
Street:
City, Zip: Hector, MN 55342
Telephone: (612) 848-2122

D. Consultant (or other) preparing this form:

Contact: Jeff Solheim
Company name: Terracon Environmental, Inc.
Street/Box: 3535 Hoffman Road East
Telephone: White Bear Lake, MN 55110 (612) 770-1500

SE ¼ of SW ¼ of Section 16,
Township 115N Range 32W, Township Name Hector

Note: Item 1.C assumes landowner farms/manages landspreading site. If an absentee landowner is involved, provide his/her name-address-telephone on an attached sheet.

- E. Volume of Soil to be land applied (cubic yards): 60
- F. Area of land to be used (square feet or acres): 4861 square feet
- G. Spreading thickness (inches): 4
- H. Projected date of application of soil: 10-30-91
- I. Any past waste disposal activities at the proposed site? No Yes X
(if yes, please explain)
City Tree & Shrub Disposal Site.

II. SITE AND SOIL CHARACTERISTICS

- A. Site slope (percent):
- B. Distance to surface water (feet or miles): 3 miles
- C. Distance to nearest building or residential property lines (feet): 2500 feet
- D. Depth to seasonal high water table (feet): 12
- Depth to field tile lines (feet):
- If bedrock exists at 8 feet or less, indicate depth (feet):

III. SOIL SAMPLING RESULTS

- A. If soil nutrient tests were conducted, list the results below:
Organic Matter, Percent _____ Extractable Phosphorus, ppm _____
If fertilizers will be applied, provide application rates:
nitrogen/acre, _____ lbs. P205/acre, _____ lbs. sulfur/acre

B. Circle the type(s) of petroleum contamination: unleaded gas, regular gas, diesel fuel, No. 2 fuel oil, waste oil, other (please specify _____).

List the appropriate soil sample analytical results from the excavated contaminated soil (refer to the MPCA document "Soil and Ground Water Analysis at Petroleum Release Sites"). If the petroleum was not gasoline or fuel oil attach a separate table. Do not include analyses from remedial investigation soil borings.

Sample Code	THC as gas or FO ppm		Ethyl-benzene ppm		Toluene ppm	Xylene ppm	MTBE ppm	Lead ppm
	(circle one)							
Stockpile	22,000*(gas)	1	ND		1	1		
Stockpile	1,000(f.o.)							

NOTE: COPIES OF LABORATORY REPORTS AND CHAIN OF CUSTODY FORMS MUST BE INCLUDED.

IV. FIGURES - Include the following figures:

- A. Copy of county soil survey map (if the county has been mapped) with copies of the interpretation tables or sheets. CLEARLY MARK location of site on the soil map.
- B. Site location map with exact application location marked (scale should be approximately 1 inch = 50 feet). Also, attach county plat map showing location.
- C. Copy of tiling map if soil at proposed site is tile drained.

Signature and Title of MPCA Staff Inspector (or other authorized inspector): _____

Date Inspected: _____

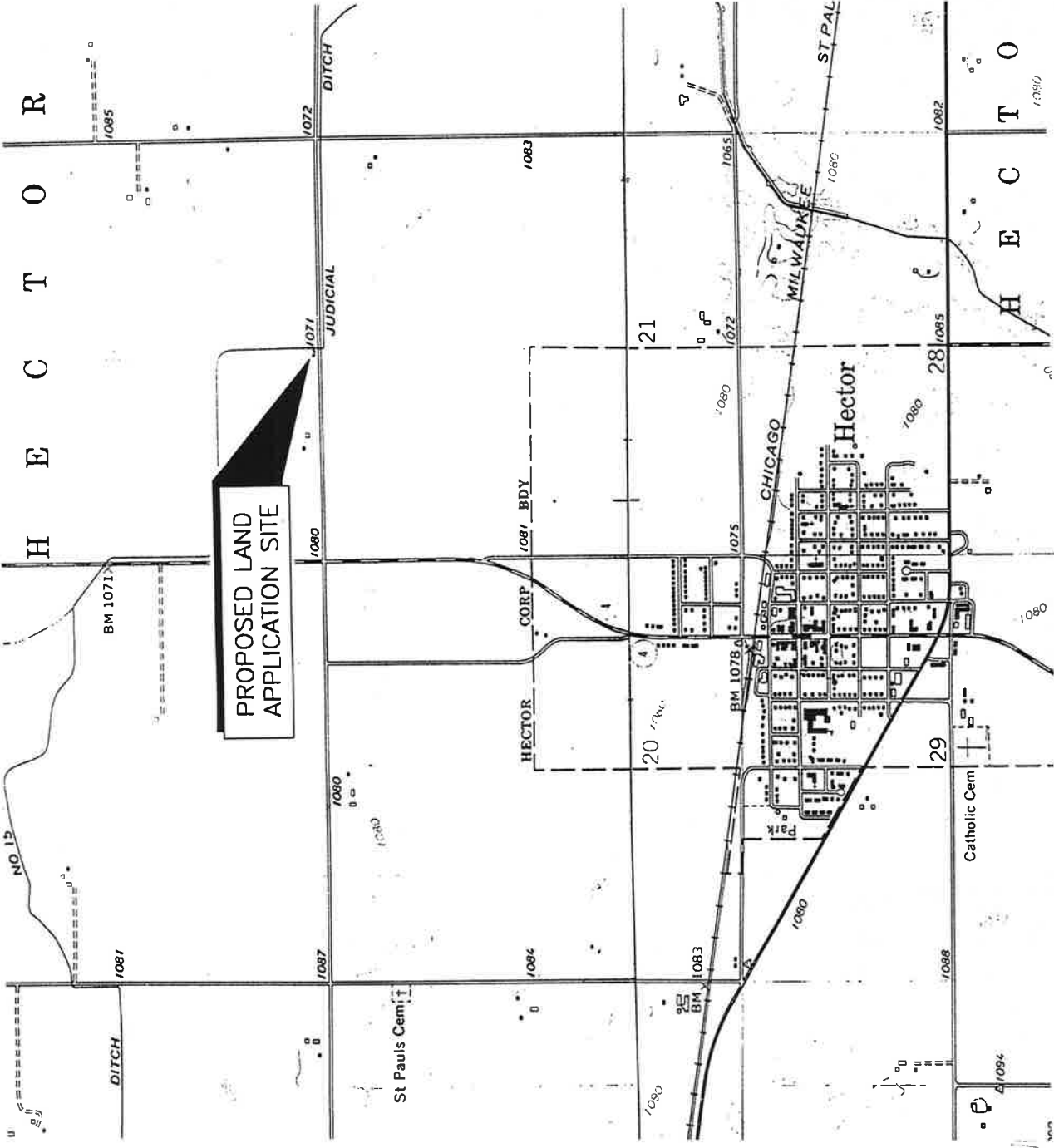
By signing below, County and Township officials acknowledge that they have been notified of this proposed land application site. This notice is intended to provide County and Township officials with the opportunity to inform the applicant of any applicable local ordinances.

Signature and Title of County Official: Mark Kopitz _____

Signature and Title of City/Township Official: _____

 Mail to: Project Manager Mark Kopitz
 Minnesota Pollution Control Agency
 Hazardous Waste Division
 Tanks and Spills Section
 520 Lafayette Road
 St. Paul, Minnesota 55155-3898

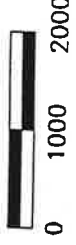
H E C T O R



PROPOSED LAND APPLICATION SITE



APPROXIMATE SCALE:
1 INCH = 2000 FEET



PROPOSED LAND APPLICATION SITE
CITY OF HECTOR
HECTOR, MINNESOTA
MPCA SITE ID#: LEAK00003711
TERRACON PROJECT NO. 41905101

Terracon

Max
Carter

**LAND APPLICATION
SITE VISIT CHECKLIST**

MPCA STAFF: PP
DATE: 6-18-99
TIME: 10:30

LEAKSITE #: 3711

SOIL ORIGINATION SITE NAME: City of Hector
CONTACT NAME: Mark Wagner
PHONE #: (612) 848-2122
PRESENT ON SITE: no

LAND APPLICATION SITE OWNER: City of Hector
PHONE #: 848-2131 (city shed) 848-2122 (club)
PRESENT ON SITE: Brett Hely

CO-OWNERS: none
ADDRESS:
PHONE #:

CONSULTANT NAME AND COMPANY:
PHONE #:
PRESENT ON SITE: no

LEGAL DESCRIPTION OF LAND APPLICATION SITE:
SE 1/4 of SW 1/4 section 16 Hector TWP
Renville County

SOIL VOLUME:

AREA OF LAND TO BE USED:

SPREADING THICKNESS:

HAS EXCAVATION OF CONTAMINATED SOILS ALREADY OCCURRED?

STOCKPILE LOCATION:

SOIL TYPE(S):

SLOPE(S):

SEASONAL HIGHWATER TABLE(S): 6-8 ft.

PERMEABILITY:

SITE ON: _____ Page in the _____ County soil Survey

ERODED:

Brett Hely
848-2131 city shed
848-2122 club

tbl 3

TYPE OF SURFACE WATER AND SEPARATION DISTANCE(S):

(Seasonal or intermittent stream, lake, river drainage ditch, pond, etc...)

DRINKING WATER WELL(S):

SEPARATION DISTANCE:

DEPTH:

OWNER NAME AND PHONE #:

DISTANCE TO NEAREST BUILDING:

(Residence, livestock building, business, storage, etc....)

FIELD TILE LINES:

DEPTH: 3'

HAS TOP SOIL BEEN REMOVED IN THE PAST?

IS THIS A GRAVEL PIT?

LAND APPLICATION SITE PRESENT COVER:

IS FERTILITY QUESTIONED?

IS SITE MEASURED?

DIMENSIONS:

STAKED:

HAS THIS SITE PREVIOUSLY BEEN USED FOR LAND APPLICATION?

SITE NAME(S):

VOLUME OF SOIL:

EXTENUATING OF SPECIAL CIRCUMSTANCES FOR POSITIONING OF LAND APPLICATION SITE:

INFORM LANDOWNER (Person who will be working soil) OF:

APPROVAL PROCEDURE:

- * Stockpiling, notice required
- * Formal letter of approval sent to RP
- * If approved, does not constitute blanket approval for future

SOIL TREATMENT PROCEDURE:

- * Spreading thickness
- * Discing procedure
 - Draw 6" into native soil
 - Disc once per month: no more, no less
 - # of discings required (as per guidance document)
 - Microbiological breakdown vs. volatilization
 - Alteration of native soil
 - No pasturing animals on land application site

APPLICATION FOR A PETROLEUM CONTAMINATED SOIL LAND TREATMENT SITE (FORM

Minnesota Pollution Control Agency
Tanks and Spills Section
May 1992

Refer to the Minnesota Pollution Control Agency (MPCA) document "Land Treatment of Petroleum Contaminated Soil: Land Treatment Sites" (Guidance Document 24) for MPCA Hazardous Waste Division. Refer to the Minnesota Pollution Control Agency (MPCA) document "Land Treatment of Petroleum Contaminated Soil: Land Treatment Sites" (Guidance Document 24) for MPCA Hazardous Waste Division. specific information on acceptable soil and site criteria and the MPCA approval process. The MPCA considers the land treatment site owner to be the "applicant." If the site is approved, correspondence will be sent to this person. Contaminated soil may not be spread until land treatment FORM B (Guidance Document 26) is submitted and approved.

I. BACKGROUND

A. Land Treatment Site Owner
(and mailing address):

Name: City of Hector
Street/Box: P.O. Box 457
City, Zip: Hector, MN 55342
Telephone: 612-848-2122

B. Land Treatment Site Operator
(and mailing address):

Name: City of Hector
Street/Box: P.O. Box 457
City, Zip: Hector, MN 55342
Telephone: 612-848-2122

C. Consultant (or other)
preparing this form:

D. Legal Description of Land
Treatment Site:

Name: Charles E. Williams
Company name: Terracon Environmental Inc.
Street/Box: 3535 Hoffman Road E
City, Zip: White Bear Lake, MN 55110
Telephone: 612-770-1500
SE $\frac{1}{4}$ of SW $\frac{1}{4}$ of Section 16,
Township 115N Range 32W,
Township Name Hector
County Renville

- E. Total area for proposed land treatment (square feet or acres): 4861 sq. feet
F. Potential soil volume capacity--at 4" spreading thickness (cubic yards): 60
G. Any past waste disposal activities at the proposed site? No Yes
(if yes, please explain)
City tree & shrub disposal site

II. SITE AND NATIVE SOIL CHARACTERISTICS

Provide the following information. Items A through I should be given in feet. If the distance for items A through I is greater than the minimum requirement, simply indicate this (e.g. For surface water write "greater than 200 feet").

- A. Distance to ordinary high water mark of surface water: greater than 200 ft.
B. Distance to nearest tile drain inlet: "
C. Distance to nearest known underground cave or sinkhole: "
D. Distance to nearest residential property lines
or inhabited buildings: "
E. Distance to nearest adjacent property: "
F. Distance to nearest private water supply well: "
G. Distance to nearest public water supply well: "
H. Distance to nearest land treatment site: "
I. Depth to seasonal high water table: 12 ft.
Depth to field tile lines: "
Depth to bedrock: "
J. Site slope (percent): "

Follow Form 1990
Tanks and Spills Section

RECEIVED
JUN 08 1992
MPCA HAZARDOUS
WASTE DIVISION

K. Indicate the following information to a depth of four feet for the predominant soils at the land treatment site. This information should be obtained from either Soil Conservation Service (SCS) soil survey reports, other SCS information, or from on-site soil investigations.

Soil series and map symbols	Soil horizon	Depth from surface (inches)	USDA Texture	Permeability (inches/hour)
		soil survey not available for this area		

III. NATIVE SOIL SAMPLING RESULTS

If nutrient tests were conducted on the native soil of the land treatment site, list the results below (fertilizer application will depend on contaminant levels of soil):

Organic Matter (percent): _____ Extractable Phosphorus (ppm): _____

IV. FIGURES AND SUPPORTING INFORMATION

Attach the following. CLEARLY MARK exact location of site on each map.

- A. County soil survey information: (if the county has been mapped)
 - . copy of soil survey map
 - . copies of the interpretation tables or sheets for all soil series within the boundaries of the land treatment site (i.e. tables which include depth to ground water, USDA soil texture, etc.).

- B. Site location map (scale should be 1 inch = 200 feet). Indicate the following:
- . borders of land treatment site
 - . all features in part II.A-H above
 - . indicate general topography with contours and drainage patterns
 - . north arrow
- C. Copy of tiling map if soil at proposed site is tile drained.
- D. Copy of county plat map or comparable map showing road directions to site.

V. COUNTY AND LOCAL NOTIFICATION INFORMATION

By signing below, County and Township officials acknowledge that they have been notified of this proposed land treatment site. This notice is intended to provide County and Township officials with the opportunity to inform the applicant of any applicable local ordinances. (Alternatively, officials may contact MPCA by phone or letter to indicate that they have been notified by the applicant).

Signature and Title of County Official: John Tersteeg, County Auditor
Signature and Title of City/Township Official: Mary Sauger

ACTING CITY ADMINISTRATOR

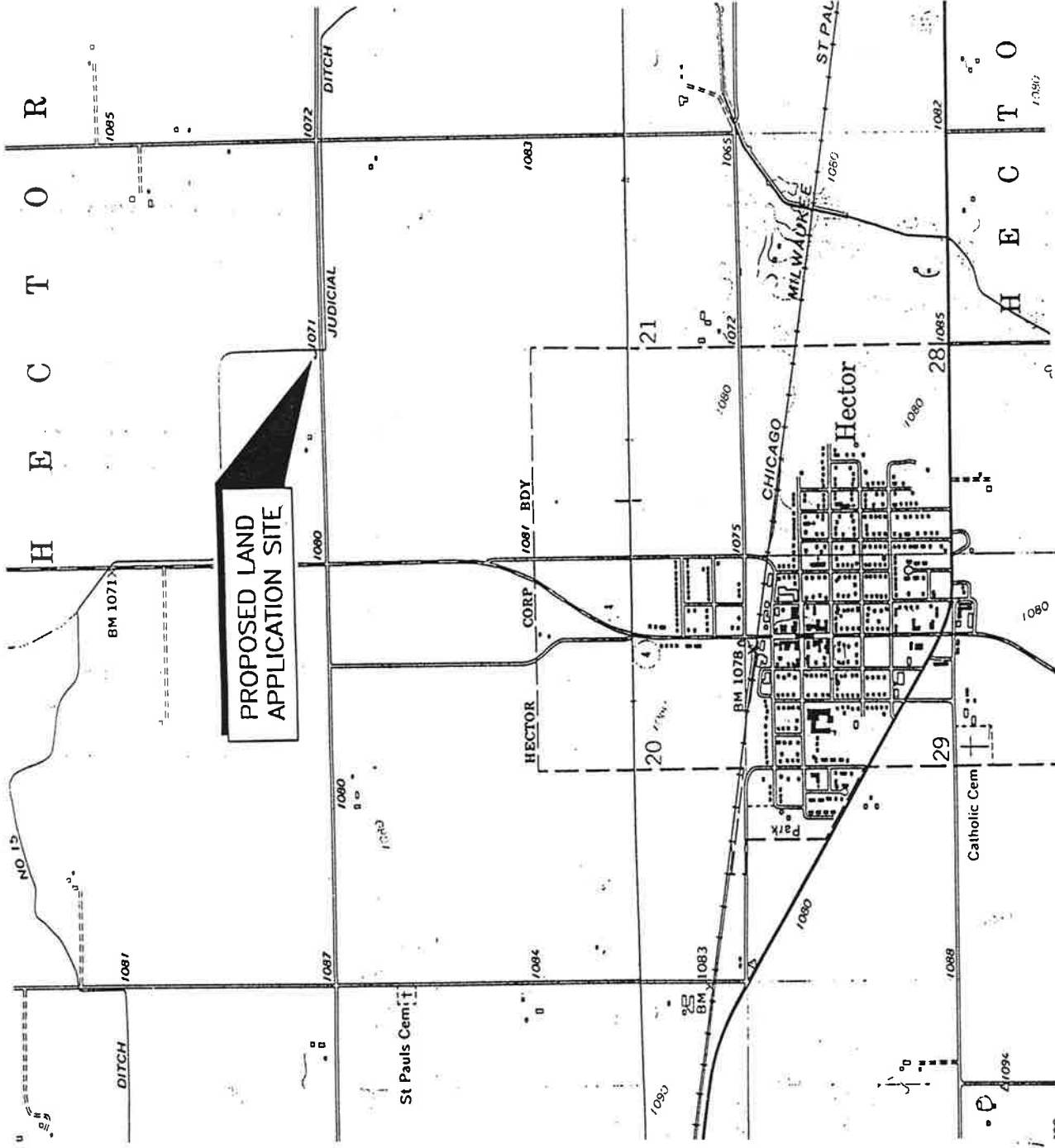
Provide the county and local officials with a copy of this form and indicate their mailing addresses and telephone numbers below:

County official: Jim Tersteeg, County Auditor
Street/Box: Renville County Courthouse
City, Zip: 500 E. DePue Ave.
Telephone: Olivia, MN 56277
612-523-2071

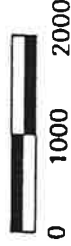
Local Official: City of Hector
Street/Box: P.O. Box 457
City, Zip: Hector, MN 55342
Telephone: 612-848-2122

Mail completed application and all attachments to:

Project Manager -OR- appropriate MPCA Regional Office
Minnesota Pollution Control Agency
Tanks and Spills Section
520 Lafayette Road
St. Paul, Minnesota 55155-4194



APPROXIMATE SCALE:
1 INCH = 2000 FEET



PROPOSED LAND
APPLICATION SITE
CITY OF HECTOR
HECTOR, MINNESOTA
MPCA SITE ID#: LEAK00003711
TERRACON PROJECT NO. 41905101



UNION CO-OP OIL CO.

LP Gas • Bulk Petroleum • Service Station
Groceries • Deli



Cosmos

877-7616

Hector

848-6288

Hector Convenience Store

848-6100

Buffalo L...

848-628

T-115-N

HECTOR PLAT

R-32-W





twin city testing
corporation

662 CROMWELL AVENUE
ST. PAUL, MN 55114
PHONE 612/645-3601

REPORT OF: CHEMICAL ANALYSES

DATE: July 15, 1991

PROJECT: CITY OF HECTOR, 41905101

REPORTED TO: Terracon Consultants
Attn: Jeff Solheim
3584 Hoffman Road East
White Bear Lake, MN 55110

LABORATORY NO: 4410 91-3644

INTRODUCTION

This report presents the results of the analyses of seven samples received on June 19, 1991, from a representative of Terracon Consultants. The scope of our services was limited to the parameters listed in the attached tables.

SAMPLE IDENTIFICATION

B-1 - TCT #252119
B-2 - TCT #252120
B-3, 23-25' - TCT #252121
Stockpile - TCT #252122
B-4, 24-26' - TCT #252123
B-5, 19-21' - TCT #252124
Trip Blank - TCT #252125

METHODOLOGY

Volatiles

Gasoline concentrations were determined using methods similar to EPA Method 8020 with a Tekmar Liquid Sample Concentrator and an HP5890A gas chromatograph equipped with a flame ionization detector. Compounds were identified by column retention time and quantified by peak area comparisons to those of known standards using a VG Laboratory data system.

Fuel Oil (#2)

The samples were extracted with methylene chloride. The extracts were dehydrated with anhydrous sodium sulfate and concentrated to less than five milliliters in Kuderna-Danish concentrators on a steam bath. The extracts were then analyzed using an HP 5890A gas chromatograph equipped with a flame ionization detector. Fuel oil (#2) was identified by column retention time and quantified by peak area comparisons to those of known standards using a VG Laboratory data system.

RESULTS

The results are listed in the attached tables.

REPORT OF: CHEMICAL ANALYSES

PROJECT: CITY OF HECTOR, 41905101

DATE: July 15, 1991

LABORATORY NO: 4410 91-3644

PAGE: 2

REMARKS

The samples were collected on June 18, 1991, and were consumed in the analyses.

TWIN CITY TESTING CORPORATION

Stephanie Kidder

Stephanie A. Kidder
Project Manager

SAK/CAL/jlm

Catherine A. Laudembach

Catherine A. Laudembach
Chemist

TABLE 1

ANALYTICAL RESULTS

<u>Parameter</u>	<u>B-1</u>	<u>B-2</u>	<u>Trip Blank</u>	<u>Method Blank</u>	<u>MDL (ug/L)</u>
Total hydrocarbons as gasoline	ND	5	ND	ND	5
Benzene	ND	ND	ND	ND	1
Toluene	ND	ND	ND	ND	1
Total xylenes	ND	ND	ND	ND	1
Ethyl benzene	ND	ND	ND	ND	1
Surrogate Recovery:					
α, α -Trifluorotoluene	111%	109%	111%	112%	

All values are in ug/L which is equivalent to parts-per-billion (ppb).

ND = Not Detected

MDL = Method Detection Limit

Date Analyzed: June 30, 1991

TABLE 2

ANALYTICAL RESULTS

<u>Parameter</u>	<u>B-3, 23-25'</u>	<u>B-4, 24-26'</u>	<u>B-5, 19-21'</u>	<u>MDL (ug/kg)</u>
Total hydrocarbons as gasoline	ND	8	ND	5
Benzene	ND	ND	ND	1
Toluene	ND	ND	ND	1
Total xylenes	ND	ND	ND	1
Ethyl benzene	ND	ND	ND	1
Surrogate Recovery:				
α, α -Trifluorotoluene	83%	84%	87%	

All values are in ug/kg which is equal to parts-per-billion (ppb).

ND = Not Detected

MDL = Method Detection Limit

Date Analyzed: July 1, 1991

TABLE 3

ANALYTICAL RESULTS

<u>Parameter</u>	<u>Stockpile</u>	<u>MDL (ug/kg)</u>
Total hydrocarbons as gasoline	*22,000	35
Benzene	1	7
Toluene	1	7
Total xylenes	1	7
Ethyl benzene	ND	7
Surrogate Recovery: α, α, α -Trifluorotoluene	107%	

*Higher boiling hydrocarbon peaks present, non-typical of gasoline.
All values are in ug/kg which is equal to parts-per-billion (ppb).

ND = Not Detected

MDL = Method Detection Limit

Date Analyzed: July 1, 1991

TABLE 4

ANALYTICAL RESULTS

<u>Sample Identification</u>	<u>Total Hydrocarbons as #2 Fuel Oil (mg/L)</u>
B-1	1.9
B-2	ND
Method Detection Limit	0.2

All values are in mg/L which is equivalent to parts-per-million (ppm) .

ND - Not Detected

Date Extracted: June 21, 1991

Date Analyzed: June 24, 1991

TABLE 5

ANALYTICAL RESULTS

**Total Hydrocarbons
as #2 Fuel Oil (mg/kg)**

Sample Identification

B-3, 23-25'	ND
Stockpile	1,000
B-4, 24-26'	ND
B-5, 19-21'	ND

Method Detection Limit

2.0

All values are in mg/kg which is equal to parts-per-million (ppm).

ND - Not Detected

Date Extracted: June 24, 1991

Date Analyzed: June 26, 1991

Laboratory No: 4410 91-3644



662 CROMWELL AVENUE
DOCK #4
ST. PAUL, MN 55114
PHONE 612/645-3601

SAMPLE IDENTIFICATION
CHAIN-OF-CUSTODY RECORD

Check delivery method:
 Samples hand carried from site to lab
 Samples shipped from site directly to lab
 Shipment method/carrier: _____
 Custody seal #: _____
 Attn: _____

Project Number		Project Name/Client				No. of Containers	Analyses Required						Remarks	Sample Lab Number
41905101		City of Hector / Terracon					<i>BTEX</i> <i>Tot. HC as F.O.</i> <i>See "Req for Chem Serv"</i> <i>X = Susp. Hazard. Mtrl.</i>							
Item No.	Sample Number (Field ID Number)	Date	Time	Sampling Point Description								Sample Type (water, soil, etc)	Sample Container	
1	0618911100	6-18-91	1100	B-1	2	X	X					Water	40ml / 500ml Amber	
2	0618911310	6-18-91	1310	B-2	2	X	X					↓	↓	
3	0618911500	6-18-91	1500	B-3 (23-28)	2	X	X					Soil	40ml / Soil Jar	
4	0618911545	6-18-91	1545	Stockpile	2	X	X					↓	Soil Jar	
5	0618911720	6-18-91	1720	B-4 (24-26)	2	X	X					↓	40ml / Soil Jar	
6	0618911840	6-18-91	1840	B-5 (19-21)	2	X	X					↓		
7														
8														
9														
10														
11														
12														
13														
14														
15														
16														

Packed/Relinquished by: (Signature) <i>Jeff Solheim</i>		Date/Time 6-19-91	Item Numbers: 1-6	Received by: (Signature)	Date/Time
Relinquished by: (Signature)		Date/Time	Item Numbers:	Received by: (Signature) [Laboratory Personnel]	Date/Time
Disposed of by: (Signature)	Items	Date/Time	Laboratory Receiving Notes:		
Send Lab Results To: <i>JEFF SOLHEIM</i>			Custody seal intact?		
Comments:			Temperature of shipping container:		
			Sample Condition:		
			Laboratory Invoice Number:		

Chain-of-Custody
Record Number
TCT No. 28312

SOIL LEGEND FOR THE SE1/4 OF THE SW1/4 OF SECTION 16, HECTOR
TOWNSHIP, RENVILLE COUNTY

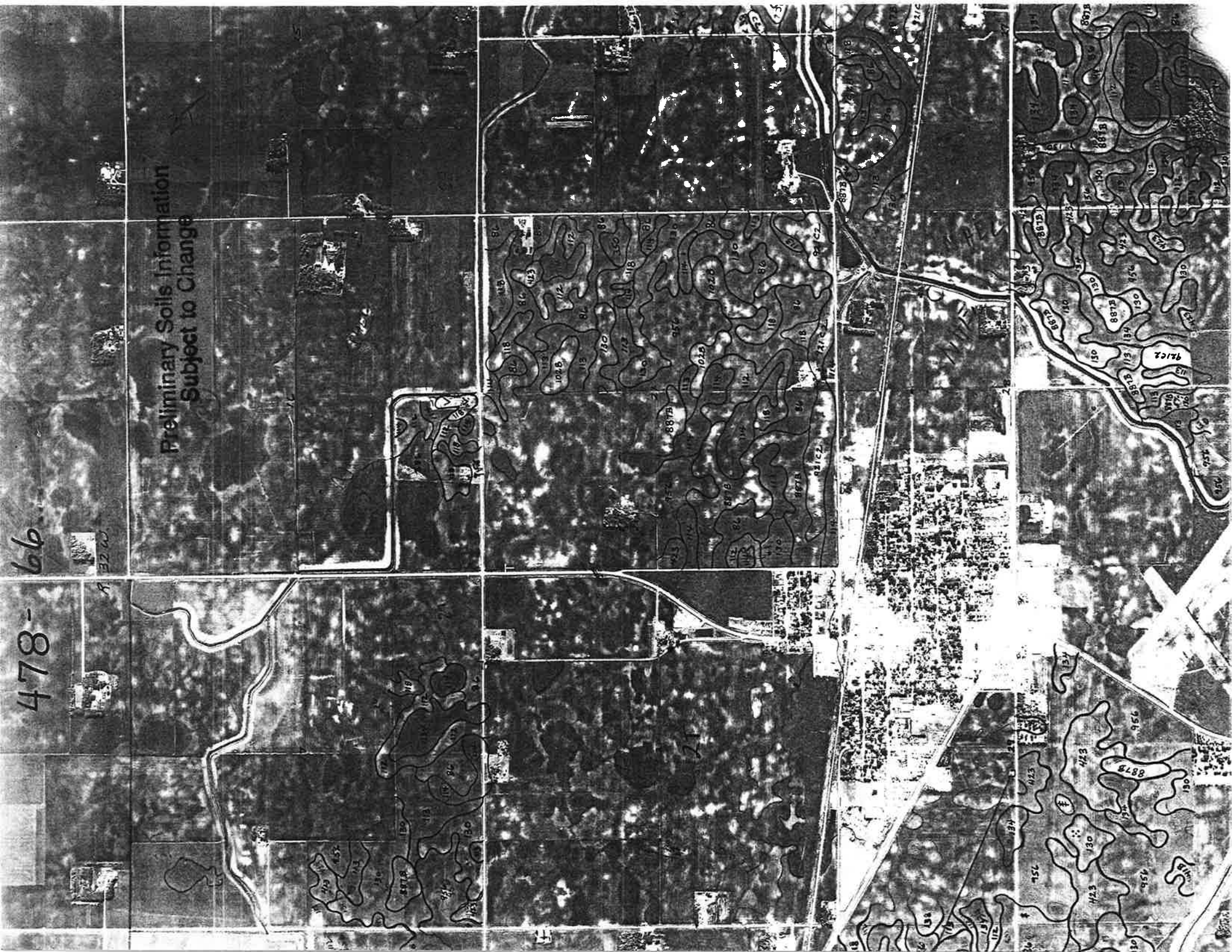
MAP UNIT	OFFICIAL NAME	SLOPE RANGE
112	Harps clay loam	0-2%
114	Glencoe silty clay loam	0-1%
118	Crippin loam	1-3%
386	Okoboji mucky silty clay loam	0-1%
956	Canisteeo-Glencoe complex	0-2%

SPOT SYMBOLS

SYMBOL	DESCRIPTION
Ⓜ	Area of disturbed/reclaimed land

478-66

Preliminary Soils Information
Subject to Change



MLRA(S): 103

REV. JUL, 7-90

AQUIC HAPLICOLS, FINE-LOAMY, MIXED, MESSIC

CRIPPIN

#118

THE CRIPPIN SERIES CONSISTS OF DEEP, SOMEWHAT POORLY DRAINED SOILS FORMED IN CALCAREOUS GLACIAL TILL UNDER PRAIRIE VEGETATION ON UPLANDS. THE SURFACE SOIL IS BLACK LOAM 16 INCHES THICK. THE SUBSOIL IS BLACK, VERY DARK GRAY AND DARK GRAYISH BROWN LOAM 19 INCHES THICK. THE SUBSTRATUM IS DARK GRAYISH BROWN MOTTLED LOAM. SLOPES RANGE FROM 0 TO 3 PERCENT. MOST AREAS ARE USED FOR CROPLAND.

LANDSCAPE AND CLIMATE PROPERTIES

ANNUAL AIR TEMPERATURE	FROST FREE DAYS	ANNUAL PRECIPITATION (IN)	ELEVATION (FT)	DRAINAGE CLASS	SLOPE (PCT)
45-50	145-170	26-32	500-1500	SF	0-3

ESTIMATED SOIL PROPERTIES

DEPTH (IN.)	USDA TEXTURE	UNIFIED	ASHTO	FRACT. FRACT. >10 IN > 3 IN (PCT)	PERCENT OF MATERIAL LESS THAN 3" PASSING SIEVE NO. 4	CLAY
0-16; 16-35; 35-60	LOCL LOCL LOCL	A-6, A-7 A-6, A-7 A-6		0 0 0-5	95-100 95-100 90-100	60-80 60-80 60-80
		A-6		2-5	85-100	55-80

DEPTH (IN.)	LIQUID LIMIT	MOISTURE RATIO	PERMEABILITY	AVAILABLE WATER CAPACITY	SOIL REACTION	SAR	CEC	CATION EXCHANGE CAPACITY (ME/100G)	GYPSUM
0-16; 0-16; 16-35; 35-60	30-45 30-45 30-40 30-40	1.35-1.40 1.35-1.40 1.40-1.55 1.55-1.75	0.6-2.0 0.6-2.0 0.6-2.0 0.6-2.0	0.20-0.22 0.20-0.22 0.17-0.19 0.17-0.19	6.6-8.4 6.6-8.4 7.4-8.4 7.9-8.4	- - - -	20-25 20-25 20-25 20-25	0-25 0-25 5-30 15-30	- - - -

DEPTH (IN.)	ORGANIC MATTER (PCT)	SHRINKAGE POTENTIAL (PCT)	SWELLING POTENTIAL (PCT)	EROSION INDEX	WIND EROSION INDEX	CORROSION
0-16; 0-16; 16-35; 35-60	5-6 5-6 3-4 1-2	LOW LOW LOW LOW	LOW LOW LOW LOW	24 24 23 27	4L 4L 4L 4L	HIGH HIGH LOW LOW

FLOODING	DEPTH (IN.)	QUANTITY	MONTHS	APPARENT	NOV-JUN	BEDROCK	SUSCEPTIBILITY	HYDROTHERMAL
			2-0-4	0	860			

DATE: 1-10-68

SANITARY FACILITIES () STRUCTURE MATERIAL

SEPTIC TANK ABSORPTION FIELDS	SEVERE-WETNESS	POOR-LOW STRENGTH
SEWAGE LAGOON AREAS	SEVERE-WETNESS	IMPROBABLE-EXCESS FINES
SANITARY LANDFILL (TRENCH)	SEVERE-WETNESS	IMPROBABLE-EXCESS FINES
SANITARY LANDFILL (AREA)	SEVERE-WETNESS	FAIR-SMALL STONES
DAILY COVER FOR LANDFILL	FAIR-TOO CLAYEY, WETNESS	WATER MANAGEMENT MODERATE-SEEPAGE
BUILDING SITE DEVELOPMENT		
SHALLOW EXCAVATIONS	SEVERE-WETNESS	MODERATE-PIPING, WETNESS
DWELLINGS WITHOUT BASEMENTS	MODERATE-WETNESS	MODERATE-DEEP TO WATER, SLOW REFILL
DWELLINGS WITH BASEMENTS	SEVERE-WETNESS	FROST ACTION
SMALL COMMERCIAL BUILDINGS	MODERATE-WETNESS	WETNESS, ROOTING DEPTH
LOCAL ROADS AND STREETS	SEVERE-LOW STRENGTH, FROST ACTION	ERODIES EASILY, WETNESS
LAWNS, LANDSCAPING AND GOLF FAIRWAYS	SLIGHT	ERODIES EASILY, ROOTING DEPTH

ROADFILL

SAND

GRAVEL

TOP SOIL

POND RESERVOIR AREA

EMBANKMENTS
DIKES AND
LEVEES

EXCAVATED
PONDS
AQUIFER FED

DRAINAGE

IRRIGATION

TERRACES
AND
DIVERSIONS

GRASSSED
WATERWAYS

RECREATIONAL DEVELOPMENT

MODERATE-WETNESS	0-2%: MODERATE-WETNESS
CAMP AREAS	2-3%: MODERATE-SLOPE,WETNESS PLAYGROUNDS
PTONIC AREAS	SLIGHT PATHS AND TRAILS

REGIONAL INTERRELATIONS

PASTURE AND HAYLAND	GROUP 1, MN
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CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE (HIGH LEVEL MANAGEMENT)

CLASS- DETERMINING PHASE	CORN (BU)	SOYBEANS (BU)	OATS (BU)	BROMEGRASS-ALFALFA HAY (TONS)	BROMEGRASS (ALM)	KENTUCKY BLUEGRASS (ALM)	SMOOTH BROMEGRASS (ALM)	ALFALFA (ALM)
1	150	48	105	6.0	3.7	6.2	10.0	

WOODLAND SUITABILITY

CLASS- DETERMINING PHASE	MANAGEMENT PROBLEMS	POTENTIAL PRODUCTIVITY
1	SYMBIOS N'EDUIF, ISEEL, IWINITHPLANT, IHAZARD, IIMT, IIMORTLY, IHAZARD, ICOMET	COMMON TREES SITE/PROD: INDUCIAS NONE

WINDBREAKS (A)

CLASS-DETERMINING PHASE	SPECIES	IHTI	SPECIES	IHTI	SPECIES	IHTI	SPECIES	IHTI
FALL	EASTERN COTTONWOOD	145	HACKBERRY	124	NORTHERN WHITECEDAR	113	COTONEASTER	110
	GOLDEN WILLOW	132	WHITE SPRUCE	121	GREEN ASH	127	EASTERN REDCEDAR	117
	HONEYLOCUST	130	SIBERIAN PEASHRUB	19	LILAC	110	BUR OAK	122

WILDLIFE HABITAT SUITABILITY

CLASS-	POTENTIAL FOR HABITAT ELEMENTS				POTENTIAL AS HABITAT FOR:			
DETERMINING PHASE	FORN & GRASS & WILD HERB.	THRUSH & CONIFER TREES	SHALLOW WATER PLANTS	WETLAND OPENED PLANTS	WOODLAND	WETLAND	RANGELAND	WILDLIFE
FALL	GOOD	GOOD	GOOD	FAIR	POOR	GOOD	GOOD	POOR

POTENTIAL NATIVE PLANT COMMUNITY (RANGELAND OR FOREST UNDERSTORY VEGETATION)

COMMON PLANT NAME	PERCENTAGE COMPOSITION (CRY WEIGHT BY CLASS DETERMINING PHASE)							
	PLANT							
	SYMBOL (NLSP#)							
POTENTIAL PRODUCTION (LES./AC. DRY WT):								
FAVORABLE YEARS								
NORMAL YEARS								
UNFAVORABLE YEARS								

FOOTNOTES

A WINDBREAK GROUP JK.

MURA(S) : 103, 104, 108, 110, 95B, 102A

REV. KRVALEB, 10-90

956

TYPIC HAPLADOLLS, FINE-LOAMY, MIXED (CALCAREOUS), MESIC

THE CANISTED SERIES CONSISTS OF DEEP POORLY DRAINED SOILS FORMED IN GLACIAL TILL UNDER PRAIRIE VEGETATION ON RINGS OF DEPRESSIONS ON GLACIAL TILL PLAINS. THE SURFACE SOIL IS BLACK AND VERY DARK GRAY CLAY LOAM 20 INCHES THICK. THE SUBSOIL IS DARK GRAY, DARK GRAYISH BROWN AND OLIVE GRAY CLAY LOAM 11 INCHES THICK. THE SUBSTRATUM IS OLIVE GRAY CLAY LOAM. SLOPES ARE 0 TO 2 PERCENT. CROPLAND IS THE MAIN USE.

LANDSCAPE AND CLIMATE PROPERTIES

ANNUAL AIR TEMPERATURE	FROST FREE DAYS	ANNUAL PRECIPITATION	ELEVATION (FT)	DRAINAGE CLASS	SLOPE (PCT)
!	!	!	!	P	0-2

ESTIMATED SOIL PROPERTIES

DEPTH (IN.)	USDA TEXTURE	UNIFIED	AASHTO	FRACT. FRACT. >10 IN	PERCENT OF MATERIAL LESS THAN 3" PASSING SIEVE NO.	CLAY
!	!	!	!	!	!	!
0-13	OL, SCL	!	!	!	!	!
!	!	!	!	!	!	!
0-13	SIL, L	!	!	!	!	!
!	!	!	!	!	!	!
13-24	OL, L, SCL	!	!	!	!	!
!	!	!	!	!	!	!
24-31	OL, L, SL	!	!	!	!	!
!	!	!	!	!	!	!
31-60	OL, L	!	!	!	!	!
!	!	!	!	!	!	!

DEPTH (IN.)	LIQUID LIMIT	PLASTICITY INDEX	MOIST BULK DENSITY (G/CM ³)	PERMEABILITY (CM/HR)	AVAILABLE WATER CAPACITY (IN/IN)	SOIL REACTION (PH)	SALINITY (MMHDS/CM)	SAR	CEC	CAOD3	GYPSUM
!	!	!	!	!	!	!	!	!	!	!	!
0-13	40-50	15-20	1.25-1.35	0.6-2.0	0.18-0.22	7.4-8.4	-	-	-	-	-
!	!	!	!	!	!	!	!	!	!	!	!
0-13	30-50	10-25	1.20-1.30	0.6-2.0	0.20-0.22	7.4-8.4	-	-	-	-	-
!	!	!	!	!	!	!	!	!	!	!	!
13-24	38-50	25-35	1.35-1.50	0.6-2.0	0.15-0.19	7.4-8.4	-	-	-	-	-
!	!	!	!	!	!	!	!	!	!	!	!
24-31	30-40	5-15	1.30-1.50	0.6-2.0	0.12-0.18	7.4-8.4	-	-	-	-	-
!	!	!	!	!	!	!	!	!	!	!	!
31-60	30-40	12-20	1.45-1.60	0.6-2.0	0.14-0.16	7.4-8.4	-	-	-	-	-
!	!	!	!	!	!	!	!	!	!	!	!

DEPTH (IN.)	ORGANIC MATTER	SHRINK SWELL FACTORS	EROSION POTENTIAL (K)	WIND EROSION INDEX (T)	GROUP INDEX	CORROSION	STEEL (CONCRETE)
!	!	!	!	!	!	!	!
0-13	4-8	MODERATE	1.24	5	4L	86	HIGH
!	!	!	!	!	!	!	!
0-13	4-8	MODERATE	1.32	5	4L	86	LOW
!	!	!	!	!	!	!	!
13-24	MODERATE	1.32	!	!	!	!	!
!	!	!	!	!	!	!	!
24-31	LOW	1.32	!	!	!	!	!
!	!	!	!	!	!	!	!
31-60	LOW	1.32	!	!	!	!	!
!	!	!	!	!	!	!	!

DEPTH (IN.)	FLOODING	HIGH WATER TABLE	CEMENTED PAN	BEDROCK	SUBSIDENCE	HYDROTENTIAL
!	!	!	!	!	!	!
0-13	!	!	!	!	!	!

DEPTH (IN.)	KIND	MONTHS	DEPTH (FT)	HARDNESS	INITIAL TOTAL GRF	FROST
!	!	!	!	!	!	!
0-13	!	!	!	!	!	!

DEPTH (IN.)	DURATION	MONTHS	(IN)	(IN)	(IN)	ACTION
!	!	!	!	!	!	!
0-13	!	!	!	!	!	!

DEPTH (IN.)	FREQUENCY	DURATION	MONTHS	(IN)	(IN)	(IN)	ACTION
!	!	!	!	!	!	!	!
0-13	!	!	!	!	!	!	!

DEPTH (IN.)	APPEARANCE	(FT)	(IN)	(IN)	(IN)	(FT)	(FT)
!	!	!	!	!	!	!	!
0-13	!	!	!	!	!	!	!

SANITARY FACILITIES

CONSTRUCTION MATERIAL

+	SEVERE-METNESS		FAIR-LOW STRENGTH+METNESS
!	SEPTIC TANK	!!	
!	ABSORPTION	!!	ROADFILL
!	FIELDS	!!	
!		!!	
+	SEVERE-METNESS		IMPROBABLE-EXCESS FINES
!	SEWAGE	!!	
!	LAGOON	!!	SAND
!	AREAS	!!	
!		!!	
+	SEVERE-METNESS		IMPROBABLE-EXCESS FINES
!	SANITARY	!!	
!	LANDFILL	!!	GRAVEL
!	(TRENCH)	!!	
!		!!	
!		!!	
+	SEVERE-METNESS		FAIR-SMALL STONES
!	SANITARY	!!	
!	LANDFILL	!!	TOPSOIL
!	(AREA)	!!	
!		!!	
!		!!	
+	FOUR-METNESS		WATER MANAGEMENT
!	DAILY	!!	
!		!!	
+	COVER FOR		MODERATE-SEEPAGE
!	LANDFILL	!!	FUND
!		!!	RESERVOIR
!		!!	
!		!!	AREA
!		!!	
+	BUILDING SITE DEVELOPMENT		
!	SEVERE-METNESS		SEVERE-METNESS
!	SHALLOW	!!	EMBANKMENTS
!	EXCAVATIONS	!!	DIKES AND
!		!!	LEVEES
!		!!	
!		!!	
+	SEVERE-METNESS		MODERATE-SLOW REFILL
!	DWELLINGS	!!	EXCAVATED
!	WITHOUT	!!	FOUNDS
!	BASEMENTS	!!	LANDFILL FED
!		!!	
!		!!	
+	SEVERE-METNESS		FROST ACTION
!	DWELLINGS	!!	
!	WITH	!!	DRAINAGE
!	BASEMENTS	!!	
!		!!	
!		!!	
+	SEVERE-METNESS		METNESS
!	SMALL	!!	
!	COMMERCIAL	!!	IRRIGATION
!	BUILDINGS	!!	
!		!!	
!		!!	
+	SEVERE-LOW STRENGTH+FROST ACTION		METNESS
!	LOCAL	!!	TERRACES
!	ROADS AND	!!	AMT
!		!!	

STREETS															
LAWNS	MODERATE-WETNESS													METALSS	
LANDSCAPING															
T AND GOLF													GRASSED		
FAIRWAYS													WATERWAYS		

ICANISTED SERIES MN0069

RECREATIONAL DEVELOPMENT															
SEVERE-WETNESS															SEVERE-WETNESS
CAMP AREAS															PLAYGROUNDS
PTONIC AREAS															MODERATE-WETNESS
															PATHS AND TRAILS

REGIONAL INTERPRETATIONS

PASTURE AND HAYLAND GROUP 3.

CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE (HIGH LEVEL MANAGEMENT)															
CLASS- DETERMINING PHASE															
IRR	IRR	IRR	IRR	IRR	IRR	IRR	IRR	IRR	IRR	IRR	IRR	IRR	IRR	IRR	IRR

CLASS-	YIELD	CORN	SOYBEANS	OATS	KENTUCKY BLUEGRASS	ALFALFA	BROMEGRASS	LUM	LUM
2W	110	36	75	3.5	3.0	5.2			
ALL									

MIDLAND SUITABILITY															
CLASS-	PROD	MANAGEMENT PROBLEMS	POTENTIAL PRODUCTIVITY	COMMON TREES	TREES TO PLANT										
DETERMINING PHASE	SYMPLOS N/EQUIP	SEEDL W/INTOTH	SITE/PROD	TREES	TREES TO PLANT										
	HAZARD/LIMIT	HAZARD/COMPET	INDEX/CLAS												
				NONE											

UNLISTED SERIES

MN0059

WINDBREAKS (A)

CLASS-DETERMINING PHASE	SPECIES	IHT	SPECIES	IHT	SPECIES	IHT	SPECIES	IHT
MAAT<50	EASTERN COTTONWOOD	145	GOLDEN WILLOW	130	HONEYLOCUST	132	SIBERIAN PEASHOB	19
	HACKBERRY	124	COTONEASTER	110	LILAC	110	GREEN ASH	127
	BUR OAK	120	WHITE SPRUCE	121	NORTHERN WHITECEDAR	13	EASTERN REDCEDAR	116
MAAT>50	BLACK WILLOW	131	OSAGEORANGE	124	GREEN ASH	124	EASTERN REDCEDAR	120
	NORTHERN WHITECEDAR	120	WHITE SPRUCE	118	WASHINGTON HAWTHORN	15	MANNBERRY VIBURNUM	112
	COTONEASTER	110						

WILDLIFE HABITAT SUITABILITY

CLASS-	POTENTIAL FOR HABITAT ELEMENTS	POTENTIAL AS HABITAT FOR:
DETERMINING PHASE	GRAIN & GRASS & WILD SEED LEGUME & HERE. TREES & PLANTS	WETLAND & SHALLOW OPEN WOOD WILDLIFE & WILDLIFE & WILDLIFE

FALL

GOOD	GOOD	FAIR	FAIR	FAIR	FAIR	GOOD	GOOD	GOOD	GOOD	GOOD	FAIR	GOOD

POTENTIAL NATIVE PLANT COMMUNITY (RANGELAND OR FOREST UNDERSTORY VEGETATION)

COMMON PLANT NAME	PLANT	PERCENTAGE COMPOSITION (DRY WEIGHT) BY CLASS DETERMINING PHASE
SYMBOL (NLSPN)		

POTENTIAL PRODUCTION (LBS./AC., DRY WT.):

FAVORABLE YEARS	
NORMAL YEARS	
UNFAVORABLE YEARS	

MLRA(S): 103
REV. 060, 12-90

CUMULIC HAPLAQUELLS, FINE, MONTMORILLONITIC, MESC

OK03031

386

THE OKOEDI SERIES CONSISTS OF VERY POORLY DRAINED SOILS FORMED IN LOCAL ALLUVIUM UNDER GRASSES IN DEPRESSIONS ON TILL PLAINS. THE SURFACE SOIL IS BLACK SILTY CLAY LOAM 32 INCHES THICK. THE SUBSOIL IS VERY DARK GRAY, DARK GRAY AND OLIVE GRAY SILTY CLAY LOAM 24 INCHES THICK. THE SUBSTRATUM IS DARK GRAY AND GRAY SILTY CLAY LOAM. SLOPES ARE LESS THAN 1 PERCENT. DRAINED AREAS ARE USED FOR CROPLAND.

LANDSCAPE AND CLIMATE PROPERTIES					
ANNUAL AIR TEMPERATURE (45-50)	FROST FREE DAYS (145-170)	ANNUAL PRECIPITATION (28-32)	ELEVATION (FT) (800-1450)	DRAINAGE CLASS (UP)	SLOPE (ECT) (0-1)

ESTIMATED SOIL PROPERTIES

DEPTH (IN.)	USDA TEXTURE	UNIFIED	AASHTO	ELEVATION (FT)	PERCENT OF MATERIAL LESS THAN 10 IN (3-10 IN) (ECT)	PERCENT OF MATERIAL LESS THAN 3" PASSING SIEVE NO. 40 (ECT)	CEC	CAC03	GYP SUM
0-10: SIC		IC	A-7		0	100	100	90-100	80-95
0-10: SIL		ICL	A-7, A-6		0	100	100	95-100	90-95
0-10: MK-SIL, MK-SIC		IMH	A-7		0	100	100	95-100	90-95
10-32: SIC		IC	A-7		0	100	100	90-100	80-95
32-56: SIC		IC	A-7		0	95-100	95-100	90-100	80-95
56-60: LSRL-SID		ICL, CH	A-7		0	0-5	95-100	90-100	75-90

DEPTH ORGANIC SHRINK-EROSION WIND

(IN.) MATTER : SMELL : REACTORS : HEROD. : WIND : CORROSIVITY

(ECT) : POTENTIAL : K : T : GROUP : INDEX : STEEP : CONCRETE :

DEPTH (IN.)	POTENTIAL (ECT)	K	T	GROUP	INDEX	STEEP	CONCRETE
0-10	7-10	HIGH	1.32	5	4	86	HIGH : LOW
0-10	7-10	HIGH	1.32	5	6	48	
0-10	10-13	MODERATE	1.32	5	6	48	
10-32	7-10	HIGH	1.32				
32-56	3-4	HIGH	1.32				
56-60	1-3	MODERATE	1.32				

FLOODING

FREQUENCY	DURATION	MONTHS	DEPTH (FT)	KIND	MONTHS	DEPTH (IN)	HARDNESS	DEPTH (IN)	TOTAL (IN)	FROST ACTION
NONE			41-1.0	APPARENT	NOV-JUL			260		HIGH

SANITARY FACILITIES (A)
SEVERE-FONDING; PERCS SLOWLY

3. COLLECTION MATERIAL

SEPTIC TANK DESCRIPTION FIELDS	ROADFILL	FOUR-LOW STRENGTH; WETNESS
SEWAGE LAGOON AREAS	SAND	IMPROBABLE-EXCESS FINES
SANITARY LANDFILL (TRENCH)	GRAVEL	IMPROBABLE-EXCESS FINES
SANITARY LANDFILL (AREA)	TOPSOIL	FOUR-TOO CLAYEY; WETNESS
DAILY COVER FOR LANDFILL	FOND RESERVOIR AREA	WATER MANAGEMENT MODERATE-SEEPAGE
BUILDING SITE DEVELOPMENT (A)		
SHALLOW EXCAVATIONS	EMBANKMENTS DIKES AND LEVEES	SEVERE-FONDING
WELLINGS WITHOUT EASEMENTS	EXCAVATED FONDS AQUIFER FED	SEVERE-SLOW REFILL
WELLINGS WITH EASEMENTS	DRAINAGE	FONDING; FROST ACTION
SMALL COMMERCIAL BUILDINGS	IRRIGATION	SIDL; SIL; MK-SIL; MK-SIDL; FONDING SIC: FONDING; SLOW INTAKE
LOCAL ROADS AND STREETS	TERRACES AND DIVERSIONS	FONDING
LAWNS, LANDSCAPING AND GOLF FAIRWAYS	GRASSED WATERWAYS	WETNESS

RECREATIONAL DEVELOPMENT (A)

CLASS-- DETERMINING PHASE	SIC,SIL,MK-SIL,MK-SICL, SIC: SEVERE-PONDING, TOO CLAYEY	SEVERE-PONDING TOO CLAYEY	SIC,SIL,MK-SIL,MK-SICL, SIC: SEVERE-PONDING, TOO CLAYEY,PONDING	SEVERE-PONDING TOO CLAYEY,PONDING
CAMP AREAS		PLAYGROUNDS		
PICNIC AREAS	SIC,SIL,MK-SIL,MK-SICL: SIC: SEVERE-PONDING, TOO CLAYEY	PATHS AND TRAILS	SIC,SIL,MK-SIL,MK-SICL: SIC: SEVERE-PONDING, TOO CLAYEY	SEVERE-PONDING TOO CLAYEY

REGIONAL INTERPRETATIONS

CLASS-- DETERMINING PHASE	PASTURE AND HAYLAND	GROUP 6, MN

CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE (HIGH LEVEL MANAGEMENT)

CLASS-- DETERMINING PHASE	CAPABILITY	CORN	SOYBEANS	OATS	KENTUCKY BLUEGRASS (ALM)	BERMUDAGRASS (ALM)	SMOOTH ALFALFA HAY (TMS)	BERMUDAGRASS (ALM)	ALFALFA (ALM)
	INTER. YIELD	INTER. YIELD	INTER. YIELD	INTER. YIELD	INTER. YIELD	INTER. YIELD	INTER. YIELD	INTER. YIELD	INTER. YIELD
MK-SIL,MK-SICL	3W	119	38	83	2.9	3.6	4.9	6.0	
SIC,SIC,SIL	3W	115	37	81	2.8	3.5	4.7	5.8	

WOODLAND SUITABILITY

CLASS-- DETERMINING PHASE	WOODLAND SUITABILITY	POTENTIAL PRODUCTIVITY	TREES TO PLANT
	MANAGEMENT PROBLEMS	COMMON TREES	SITE PROD.
	SYNTHETIC EQUIP. USE LIMIT	HAZARD LIMIT	INDEX CLASS.
		NONE	

WINDBREAKS (B)						
CLASS-DETERMINING PHASE	SPECIES	IHT	SPECIES	IHT	SPECIES	IHT
ALL	BLACK WILLOW	131	BLACK ASH	122	WHITE WILLOW	123
	GOLDEN WILLOW	133	TALL PURPLE WILLOW	123		

WILDLIFE HABITAT SUITABILITY

CLASS-DETERMINING PHASE	POTENTIAL FOR HABITAT ELEMENTS	POTENTIAL AS HABITAT FOR:
	GRAIN & GRASS & WILD THAROND CONIFERS/SHRUBS	WETLANDS/SHALLOW OPEN/OLD WOODS/WETLAND/RANGELAND
	SEED LEGUME TREES PLANTS	PLANTS WATER WILDLIFE WILDLIFE WILDLIFE WILDLIFE WILDLIFE
ALL	FAIR FAIR FAIR IV. POOR -	GOOD GOOD FAIR FAIR FAIR FAIR GOOD

POTENTIAL NATIVE PLANT COMMUNITY (RANGELAND OR FOREST INTERSTORY VEGETATION)

COMMON PLANT NAME	PLANT SYMBOL	PERCENTAGE COMPOSITION (DRY WEIGHT) BY CLASS DETERMINING PHASE
	(NLSN)	

POTENTIAL PRODUCTION (LBS./AC. DRY WT):
 FAVORABLE YEARS
 NORMAL YEARS
 UNFAVORABLE YEARS

FOOTNOTES

- A THIS SOIL RECEIVES RUNOFF FROM ADJOINING AND IS SUBJECT TO FLOODING
- B FLAT AREAS REQUIRE EXCESSIVE DIKING FOR STORAGE.
- C WINDBREAK GROUP 2M.

MLRA(S): 90, 103, 104
 REV. ARG, RJB 7-91
 CUMULIC HAPLAQUILLS, FINE-LOAMY, MIXED, MESIC #114, 956

THE GLENCOE SERIES CONSISTS OF DEEP, VERY POORLY DRAINED SOILS FORMED IN GLACIAL TILL ON DEPRESSIONS AND SWALES IN THE UPLANDS. THE SURFACE SOIL IS BLACK AND VERY DARK GRAY CLAY LOAM 35 INCHES THICK. THE SUBSOIL IS OLIVE-GRAY MOTTLED LOAM 13 INCHES THICK. THE SUBSTRATUM IS GRAYISH BROWN AND LIGHT OLIVE BROWN LOAM. SLOPES ARE LESS THAN 1 PERCENT. CROPLAND IS THE MAIN USE.

ANNUAL AIR TEMPERATURE		LANDSCAPE AND CLIMATE PROPERTIES	
FROST FREE DAYS		ANNUAL PRECIPITATION	ELEVATION (FT)
DRAINAGE CLASS		SLOPE (PCT)	
VP		0-1	

DEPTH (IN.)	USDA TEXTURE	UNIFIED	ESTIMATED SOIL PROPERTIES										
			PLAS- TILITY INDEX	MOTST BULK DENSITY (G/CM3)	PERMEA- BILITY (IN/HR)	AVAILABLE WATER CAPACITY (IN/IN)	SOIL REACTION (PH)	SALINITY (MMHOS/CM)	SAR	CEC	CAC03	GYPSUM	CLAY (PCT)
0-10	STCL	OL, ML, CL	15-20	1.35-1.45	0.2-2.0	0.18-0.22	6.1-7.8	0	95-100	90-100	75-100	60-90	27-35
0-10	CL	OL, ML, CL	15-20	1.35-1.45	0.2-2.0	0.18-0.22	6.1-7.8	0	95-100	90-100	75-100	60-90	27-35
0-10	CL	OL, ML, CL	10-15	1.35-1.45	0.6-2.0	0.18-0.22	6.1-7.8	0	95-100	90-100	75-100	60-90	25-27
10-35	StCL, CL, L	OL, ML, CL	10-20	1.35-1.45	0.2-2.0	0.18-0.22	6.1-7.8	0	95-100	90-100	75-100	60-90	25-35
35-48	L, CL, StCL	CL, ML	10-20	1.35-1.50	0.2-2.0	0.15-0.19	6.6-7.8	0	95-100	90-100	75-100	60-90	25-35
48-60	L, CL	CL, ML	10-20	1.35-1.50	0.6-2.0	0.15-0.19	7.4-7.8	0	90-100	85-100	60-95	55-75	22-32

DEPTH (IN.)	ORGANIC MATTER (PCT)	SHRINK- SWELL POTENTIAL	EROSION FACTORS		CORROSIIVITY	
			K	KT	STEEL	CONCRETE
0-10	5-10	MODERATE	3	7	HIGH	LOW
0-10	5-10	MODERATE	5	6	HIGH	LOW
10-35	5-10	MODERATE	5	6	HIGH	LOW
35-48	28	MODERATE	5	6	HIGH	LOW
48-60	28	LOW	5	6	HIGH	LOW

FREQUENCY	DURATION	HIGH WATER TABLE		CEMENTED PAN DEPTH (IN)	BEDROCK DEPTH (IN)	SUBSIDENCE INTL. (IN)	HYD POTENTIAL (PCT)
		DEPTH (FT)	KIND				
NONE-RARE	MONTHS	+1-1.0	APPARENT	OCT-JUL	>60	-	B7D

SANITARY FACILITIES		CONSTRUCTION MATERIAL	
SEPTIC TANK ABSORPTION FIELDS	SEVERE-PONDING, PERCS SLOWLY	ROADFILL	POOR-WETNESS
SEWAGE LAGOON AREAS	SEVERE-PONDING	SAND	IMPROBABLE-EXCESS FINES
SANITARY LANDFILL (TRENCH)	SEVERE-PONDING, EXCESS HUMUS	GRAVEL	IMPROBABLE-EXCESS FINES
SANITARY LANDFILL (AREA)	SEVERE-PONDING	TOPSOIL	POOR-WETNESS
DAILY COVER FOR LANDFILL	POOR-HARD TO PACK, PONDING		
WATER MANAGEMENT			
		POND RESERVOIR AREA 1	MODERATE-SEEPAGE
BUILDING SITE DEVELOPMENT			
SHALLOW EXCAVATIONS	SEVERE-EXCESS HUMUS, PONDING	EMBANKMENTS DIKES AND LEVEES	SEVERE-EXCESS HUMUS, PONDING
DWELLINGS WITHOUT BASEMENTS	NONE: SEVERE-PONDING, LOW STRENGTH RARE: SEVERE-FLOODING, PONDING, LOW STRENGTH	EXCAVATED PONDS AQUIFER FED	SEVERE-SLOW REFILL
DWELLINGS WITH BASEMENTS	NONE: SEVERE-PONDING RARE: SEVERE-FLOODING, PONDING	DRAINAGE	PONDING, FROST ACTION
SMALL COMMERCIAL BUILDINGS	NONE: SEVERE-PONDING, LOW STRENGTH RARE: SEVERE-FLOODING, PONDING, LOW STRENGTH	IRRIGATION	PONDING
LOCAL ROADS AND STREETS	SEVERE-LOW STRENGTH, PONDING, FROST ACTION	TERRACES AND DIVERSIONS	PONDING
LAWNS, LANDSCAPING AND GOLF FAIRWAYS	SEVERE-PONDING	GRASSED WATERWAYS	WETNESS

CLASS-DETERMINING PHASE DRAINED	WINDBREAKS (A)				HT 33	SPECIES BLACK ASH TALL PURPLE WILLOW	HT 22	SPECIES GOLDEN WILLOW	HT 55	SPECIES REDOSTER DOGWOOD	HT 8
	SPECIES BLACK WILLOW WHITE WILLOW	SPECIES	SPECIES	SPECIES							
UNDRAINED											
WILDLIFE HABITAT SUITABILITY											
CLASS-DETERMINING PHASE ALL	POTENTIAL FOR HABITAT ELEMENTS			POTENTIAL AS HABITAT FOR:							
	GRASS & SEED GOOD	WILD HERB. FAIR	WILD HERB. FAIR	HARDWOOD TREES FAIR	CONIFER PLANTS FAIR	SHRUBS -	WETLAND PLANTS GOOD	SHALLOW WATER GOOD	OPEN WILDLF GOOD	WOODLAND WILDLF FAIR	WETLAND WILDLF GOOD
POTENTIAL NATIVE PLANT COMMUNITY (RANGELAND OR FOREST UNDERSTORY VEGETATION)											
COMMON PLANT NAME	PLANT SYMBOL (NLSFN)			PERCENTAGE COMPOSITION (DRY WEIGHT) BY CLASS DETERMINING PHASE							
POTENTIAL PRODUCTION (LBS./AC. DRY WT):											
FAVORABLE YEARS											
NORMAL YEARS											
UNFAVORABLE YEARS											

FOOTNOTES

- 1 EXTENSIVE DIKING REQUIRED FOR STORAGE
- A DRAINED: WINDBREAK GROUP 2W; UNRAINED: WINDBREAK GROUP 10

HARPS
#112MLGAS) : 102B, 103
REV. LIL, 7-90

TYPIC CALCARIOLLS, FINE-LOAMY, MESIC

THE HARPS SERIES CONSISTS OF DEEP, POORLY DRAINED SOILS FORMED IN GLACIAL TILL OR ALLUVIUM UNDER PRAIRIE VEGETATION IN AREAS BORDERING DEPRESSIONS. THE SURFACE SOIL IS BLACK AND VERY DARK GRAY CALcareous CLAY LOAM 16 INCHES THICK. THE SUBSOIL IS LIGHT OLIVE GRAY, GRAY AND OLIVE GRAY MOTTLED CALcareous LOAM. THE SUBSTRATUM IS GRAY, DARK GRAY AND DARK YELLOWISH BROWN MOTTLED CALcareous LOAM. SLOPES RANGE FROM 0 TO 3 PERCENT. CROPLAND IS THE MAIN USE.

LANDSCAPE AND CLIMATE PROPERTIES				
ANNUAL AIR TEMPERATURE	FROST FREE DAYS	ANNUAL PRECIPITATION	ELEVATION (FT)	DRAINAGE CLASS
45-52	145-170	26-36	800-1400	P
				0-3

ESTIMATED SOIL PROPERTIES

DEPTH (IN.)	USDA TEXTURE	UNIFIED	MASHTO	FRACT. >10 IN	PERCENT OF MATERIAL LESS THAN 3" PASSING SIEVE NO. 4	10	40	200	CLAY
0-16 IL	CL		A-6, A-7	0	95-100	95-100	80-90	65-80	25-27
0-16 ICL	CL, CH		A-6, A-7	0	95-100	95-100	80-90	65-80	27-35
16-42 IL, CL, SCL	CL, CH		A-6, A-7	0	95-100	95-100	80-90	65-80	18-32
42-60 IL, SCL, CL	CL		A-6	0	95-100	90-100	70-80	50-75	20-30

DEPTH (IN.)	ORGANIC MATTER (PCT)	SHRINK POTENTIAL	SWELL INDEX	EROSION	WIND GROUP	WIND INDEX	MINI	EROD.	EROD. INDEX	CONCRETE	CORROSION
0-16	4-5	MODERATE	1.24	5	4L	86	HIGH	LOW			
0-16	4-5	MODERATE	1.24	5	4L	86					
16-42	2-3	MODERATE	1.32								
42-60	0-1	MODERATE	1.32								

FREQUENCY	DURATION	MONTHS	DEPTH (FT)	KIND	MONTHS	DEPTH (IN)	HARDNESS	DEPTH (IN)	HARDNESS	INITIAL	TOTAL	DEPTH (IN)	FROST ACTION
NONE		1.0-3.0	APPARENT	INDEX								16/01	HIGH

SANITARY FACILITY		CONSTRUCTION MATERIAL
SEPTIC TANK ABSORPTION FIELDS	SEVERE-WETNESS	ROAD FILL FAIR-TO-FRINK-SWELL-LOW STRENGTH-WETNESS
SEWAGE LAGOON AREAS	SEVERE-WETNESS	IMPROBABLE-EXCESS FINES
SANITARY LANDFILL (TRENCH)	SEVERE-WETNESS	GRAVEL IMPROBABLE-EXCESS FINES
SANITARY LANDFILL (AREA)	SEVERE-WETNESS	TOPSOIL FAIR-LARGE STONES
DAILY COVER FOR LANDFILL	POOR-HARD TO PACK-WETNESS	WATER MANAGEMENT MODERATE-SEEPAGE
BUILDING SITE DEVELOPMENT		
SHALLOW EXCAVATIONS	SEVERE-WETNESS	EMBANKMENTS Dikes AND LEVEES SEVERE-WETNESS
DWELLINGS WITHOUT BASEMENTS	SEVERE-WETNESS	EXCAVATED PONDS FACILTY FED MODERATE-LOW REFILL
DWELLINGS WITH BASEMENTS	SEVERE-WETNESS	DRAINAGE FROST ACTION
SMALL COMMERCIAL BUILDINGS	SEVERE-WETNESS	IRRIGATION WETNESS
LOCAL ROADS AND STREETS	SEVERE-LOW STRENGTH-FROST ACTION	TERRACES AND DIVERSIONS WETNESS
LAUNDRY LANDSCAPING AND GOLF FAIRWAYS	MODERATE-WETNESS	GRASSED WATERWAYS WETNESS

RECREATIONAL DEVELOPMENT	
SEVERE-METNESS	SEVERE-METNESS
CAMP AREAS	PLAYGROUNDS
MODERATE-METNESS	MODERATE-METNESS
PICNIC AREAS	PATHS AND TRAILS

REGIONAL INTERCATIONS	
PASTURE AND HAYLAND	GROUP 3, MN

CLASS- DETERMINING PHASE	CAPACITY AND YIELDS PER ACRE OF CROPS AND PASTURE (HIGH LEVEL MANAGEMENT)									
	CORN (BU)	SOYBEANS (BU)	OATS (BU)	BERMUDGRASS (ACRES)	KENTUCKY BLUEGRASS (ACRES)	SMOOTH ALFALFA (ACRES)	BERMUDGRASS (ACRES)	BERMUDGRASS (ACRES)	SMOOTH ALFALFA (ACRES)	SMOOTH ALFALFA (ACRES)
ALL	24	125	40	3.8	3.1	5.1	6.3			

WOODLAND SUITABILITY			
CLASS- DETERMINING PHASE	MANAGEMENT PROBLEMS	POTENTIAL PRODUCTIVITY	SITE INDEX
	SEEDLING LIMIT	COMMON TREES	INDEX CLASS
	NONE	TREES TO PLANT	

CLASS-DETERMINING PHASE		WINDBREAKS			
SPECIES	IHT	SPECIES	IHT	SPECIES	IHT
10: GOLDEN WILLOW	120: LILAC	110: HACKBERRY	124: NORTHERN WHITE CEDAR		
11: HONEYLOCUST	121: WHITE SPRUCE	121: GREEN ASH	127: EASTERN WHITE CEDAR		
12: BUR OAK	120: STERILIAN PEARSHUB	19: EASTERN CUTTOWOOD	45:		

POTENTIAL AS HABITAT FOR:

CLASS--	POTENTIAL FOR HABITAT ELEMENTS	POTENTIAL AS HABITAT FOR:
DETERMINING PHASE	GRAIN & GRASS & WILD HERB. TREES PLANTS	WETLAND: SHALLOW OPENED WETLAND: WILDLIFE: WILDLIFE: WILDLIFE
	SEED LEGUME HERB. TREES PLANTS	WATER: WILDLIFE: WILDLIFE: WILDLIFE: WILDLIFE
ALL	FAIR FAIR FAIR FAIR FAIR	GOOD GOOD FAIR FAIR FAIR

POTENTIAL NATIVE PLANT COMMUNITY (RANGELAND OR FOREST UNDERSTORY VEGETATION)

COMMON PLANT NAME	PLANT	PERCENTAGE COMPOSITION (DRY WEIGHT) BY CLASS DETERMINING PHASE
	SYMBOL (NILSEN)	

POTENTIAL PRODUCTION (LBS./AC. DRY WT):
FAVORABLE YEARS
NORMAL YEARS
UNFAVORABLE YEARS

FOOTNOTES

1. FLAT AREAS THAT REQUIRE EXTENSIVE DRAINAGE FOR STORAGE.
- A. WINDBREAK GROUP 2K.