REMEDIAL INVESTIGATION
FIGURES & APPENDIX
ENECO TECH
OCTOBER 28,1991

EnecoTech Midwest, Inc
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Bloomington, Minnesota 55425
(612) 854-5513 • Fax (612) 854-5745

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ENVIRONMENTAL CONSULTANTS

October 28, 1991

CERTIFIED MAIL

711-015

Ms. Barbara Jablonski
Minnesota Pollution Control Agency
520 Lafayette Road
Saint Paul, Minnesota 55155

Subject: LEAK#00002433
Sinclair Station, 9456 Medicine Lake Road, New Hope, Minnesota

Dear Ms. Jablonski:

We have enclosed the table, figure and appendix portions of our remedial investigation report for the above referenced site for your review. We are submitting this information prior to arranging a conference call for the purpose of discussing a site corrective action design. It is our understanding that this conference call will include the EnecoTech project engineer and hydrogeologist and the MPCA project manager and hydrogeologist.

Please review this information as soon as possible and call Jim Berg at 854-5513 for scheduling the conference call.

Respectfully,

ENECOTECH MIDWEST, INC.

James A. Berg
Sr. Project Hydrogeologist

JAB:djd

Enclosures

jb/711-15a.ltr

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F	Chain of Custody
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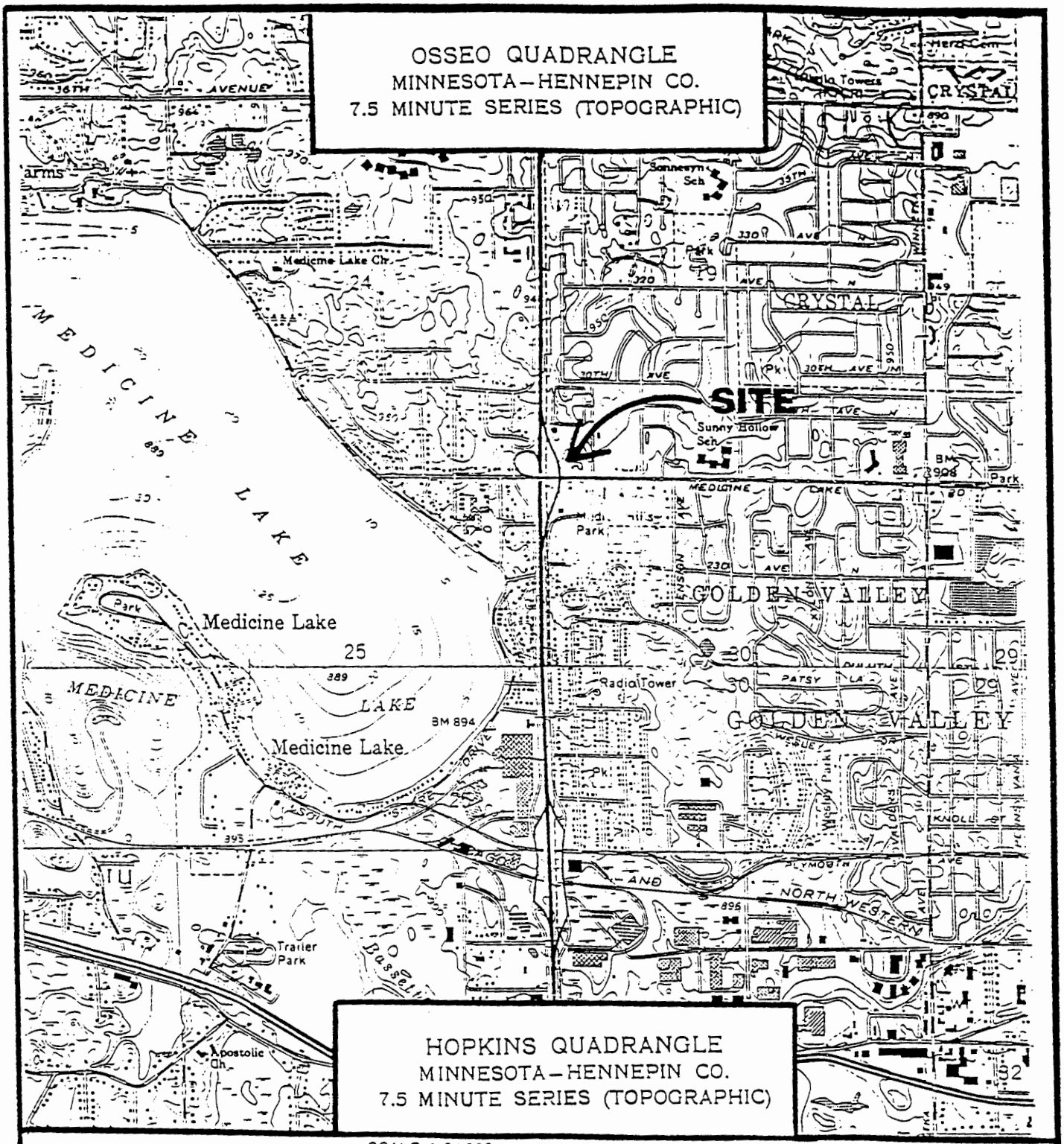
H	Laboratory Data Sheets
I	Remedial Site Assessment, Mobil Oil Corporation Site #4 0560D County Road 18 and Medicine Lake Road, Golden Valley, Minnesota
J	Hydrogeologic Setting and Ground Water Contamination Characterization

FIGURES



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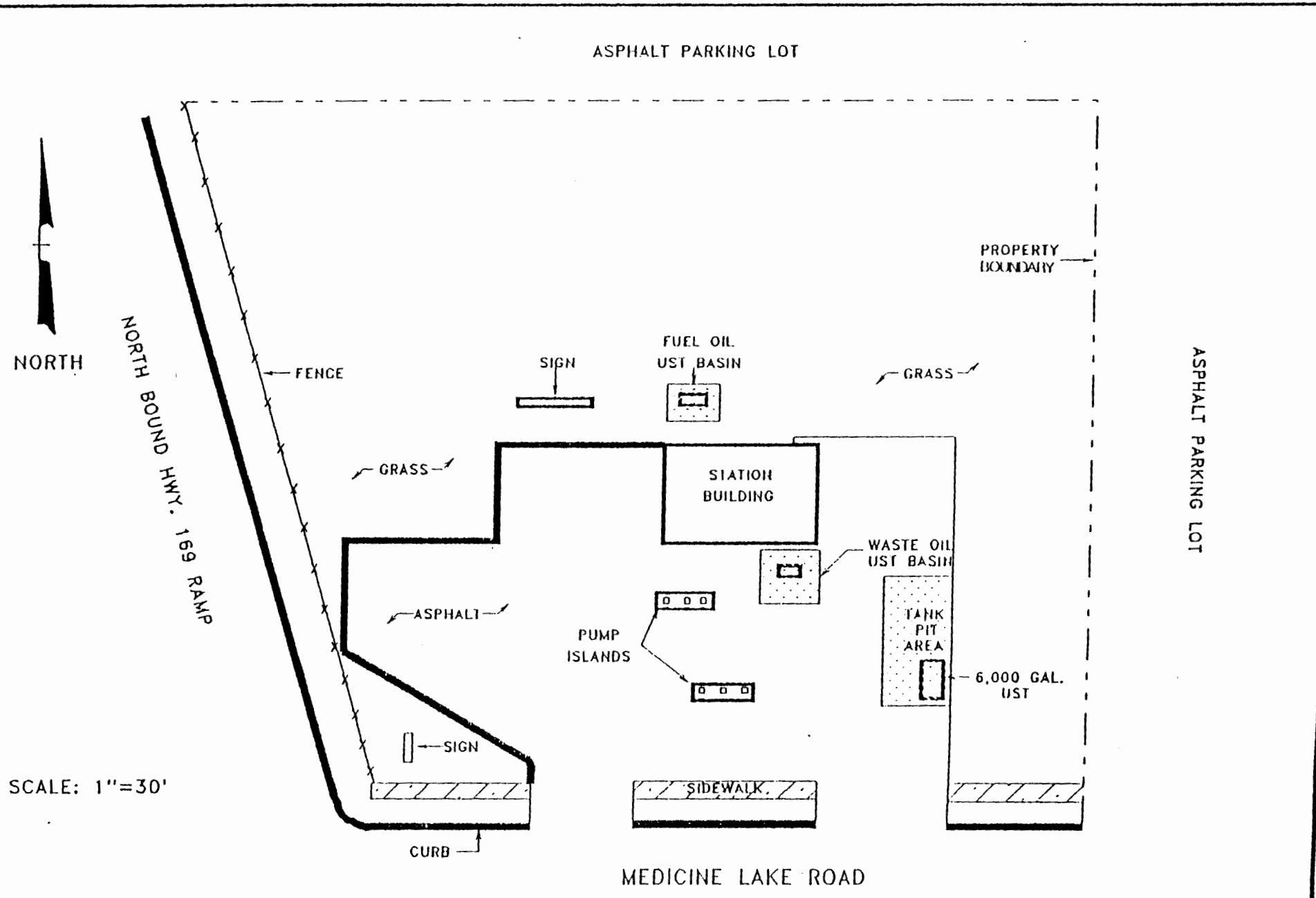
BLOOMINGTON, MINNESOTA

PROJECT SINCLAIR SERVICE STATION
9456 MEDICINE LK. RD., NEW HOPE, MINNESOTA

FIGURE 1
SITE LOCATION MAP

FILE NO.: 711-015 DATE: MAY, 1990 FIGURE NO.: 1



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PROJECT SINCLAIR SERVICE STATION
9456 MEDICINE LAKE RD., NEW HOPE, MN

SITE MAP

FILE NO.: 711-015 DATE: MAY, 1990 FIGURE NO.: 2

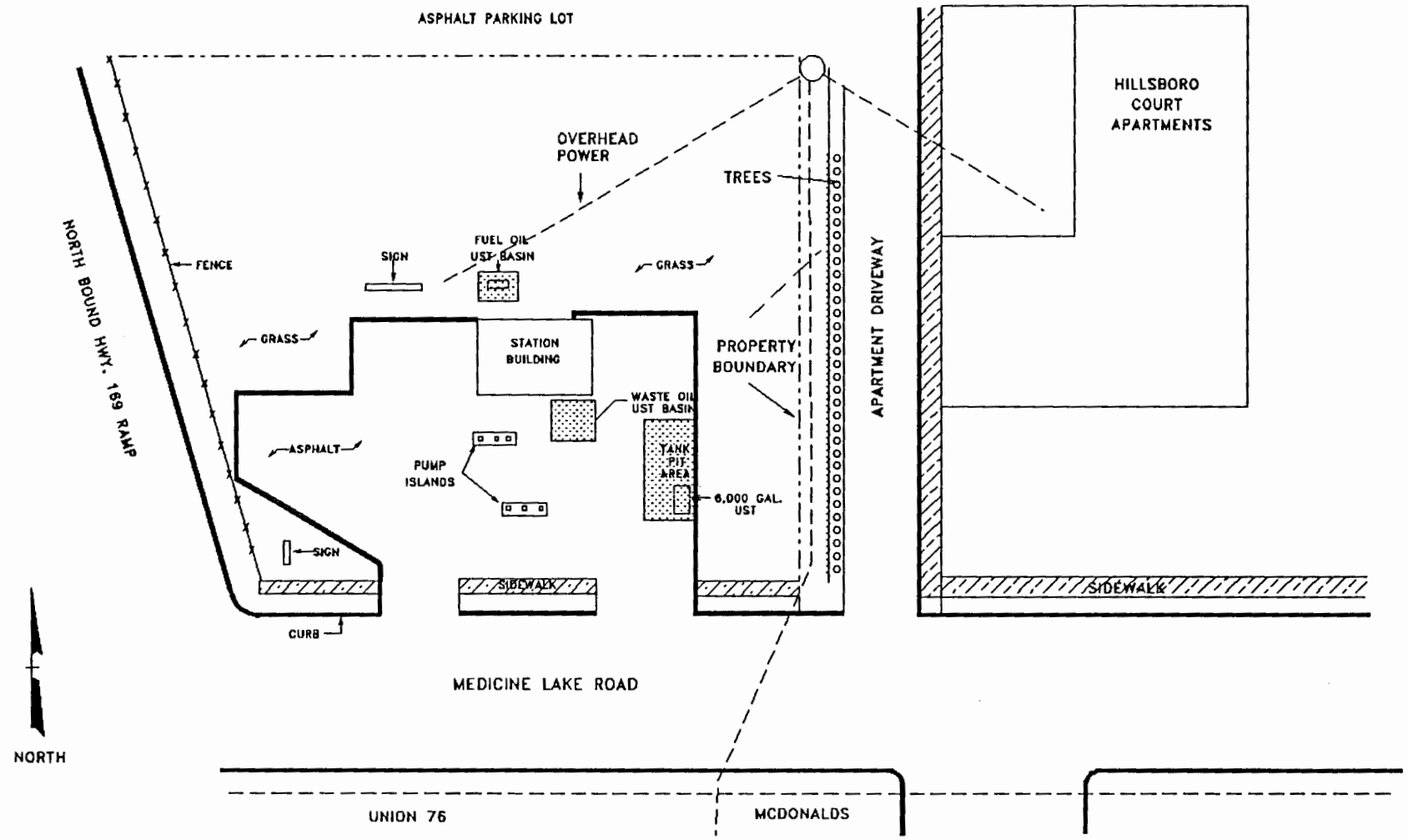

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FIGURE 3
AREA LAND USAGE
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE RD, NEW HOPE, MINNESOTA

PROJECT NO.	DATE	SCALE	PREPARED BY	REVIEWED BY	DATE	REVISION	
711-015	9/91	1" = 50'	EFW			ORIGINAL	SA

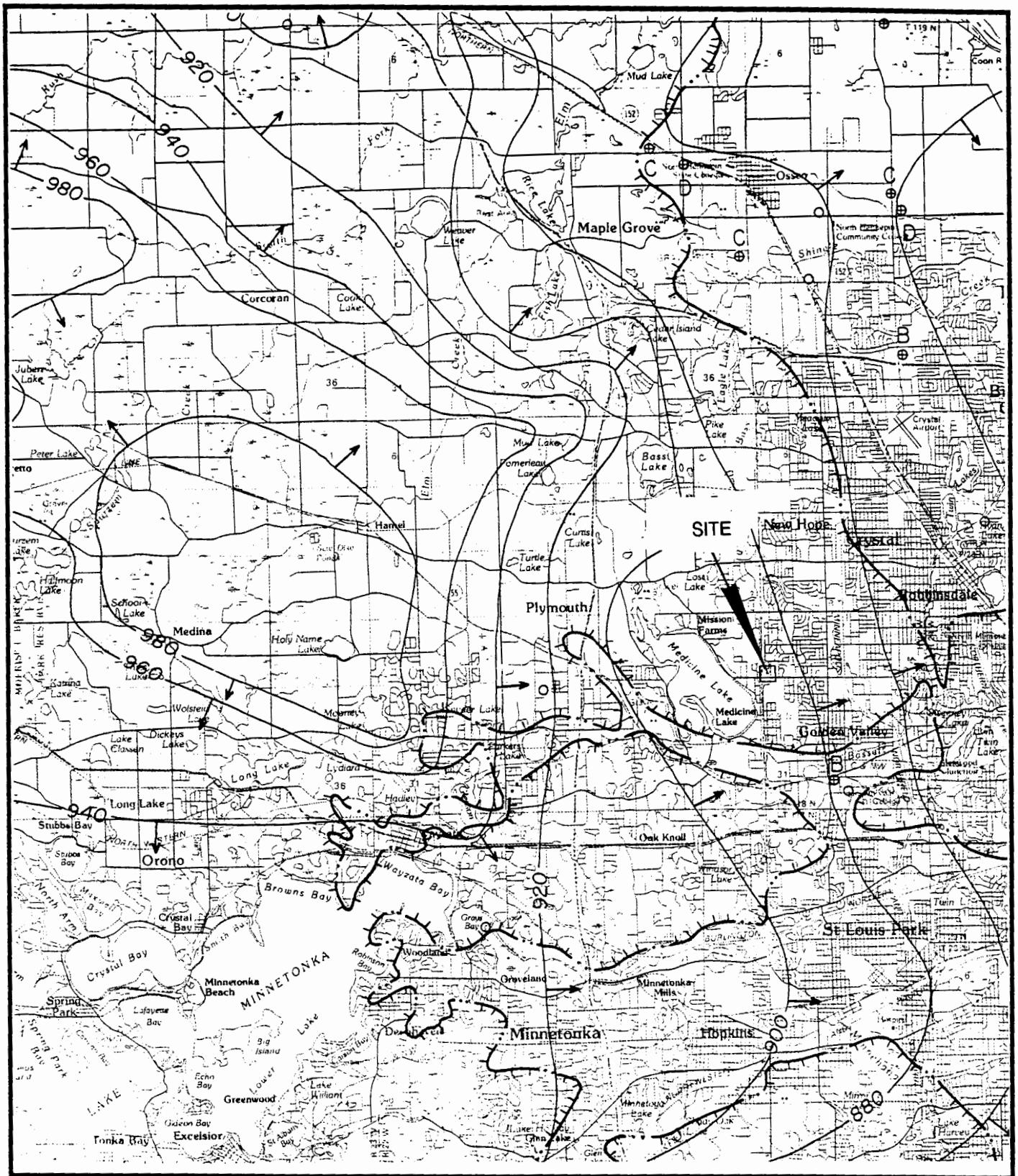

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FIGURE 4
BURIED GLACIAL AQUIFER WATER TABLE
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD
NEW HOPE, MINNESOTA

PROJECT NO.	DATE	SCALE	PREPARED BY	REVIEWED BY	DATE	REVISION	
711-015	9/91	1:100,000	EFW			ORIGINAL	—

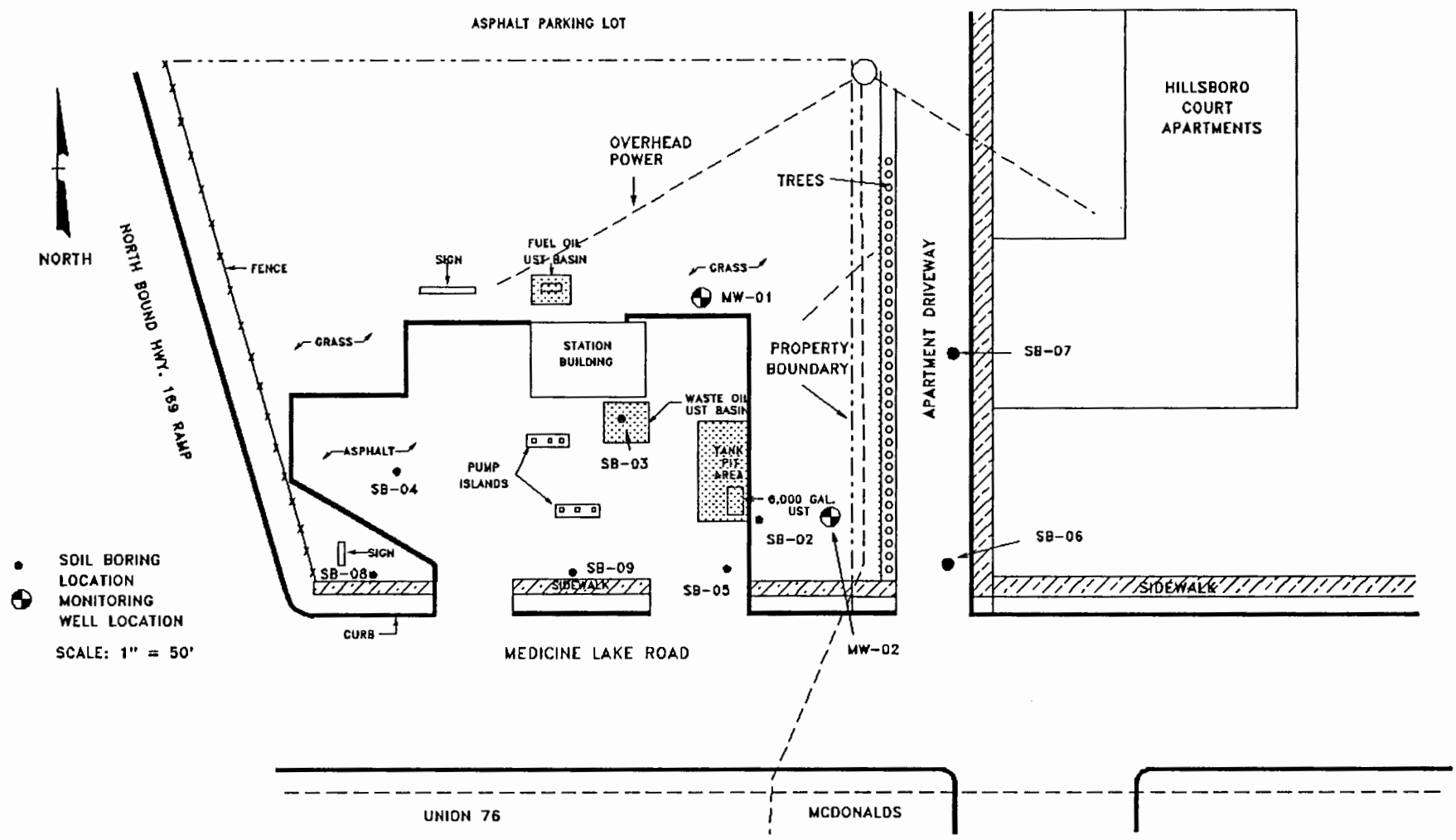

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FIGURE 5
SOIL BORING/MONITORING WELL LOCATIONS
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE RD, NEW HOPE, MINNESOTA

PROJECT NO.	DATE	SCALE	PREPARED BY	REVIEWED BY	DATE	REVISION	
711-015	9/91	1" = 50'	EFW			ORIGINAL	M1

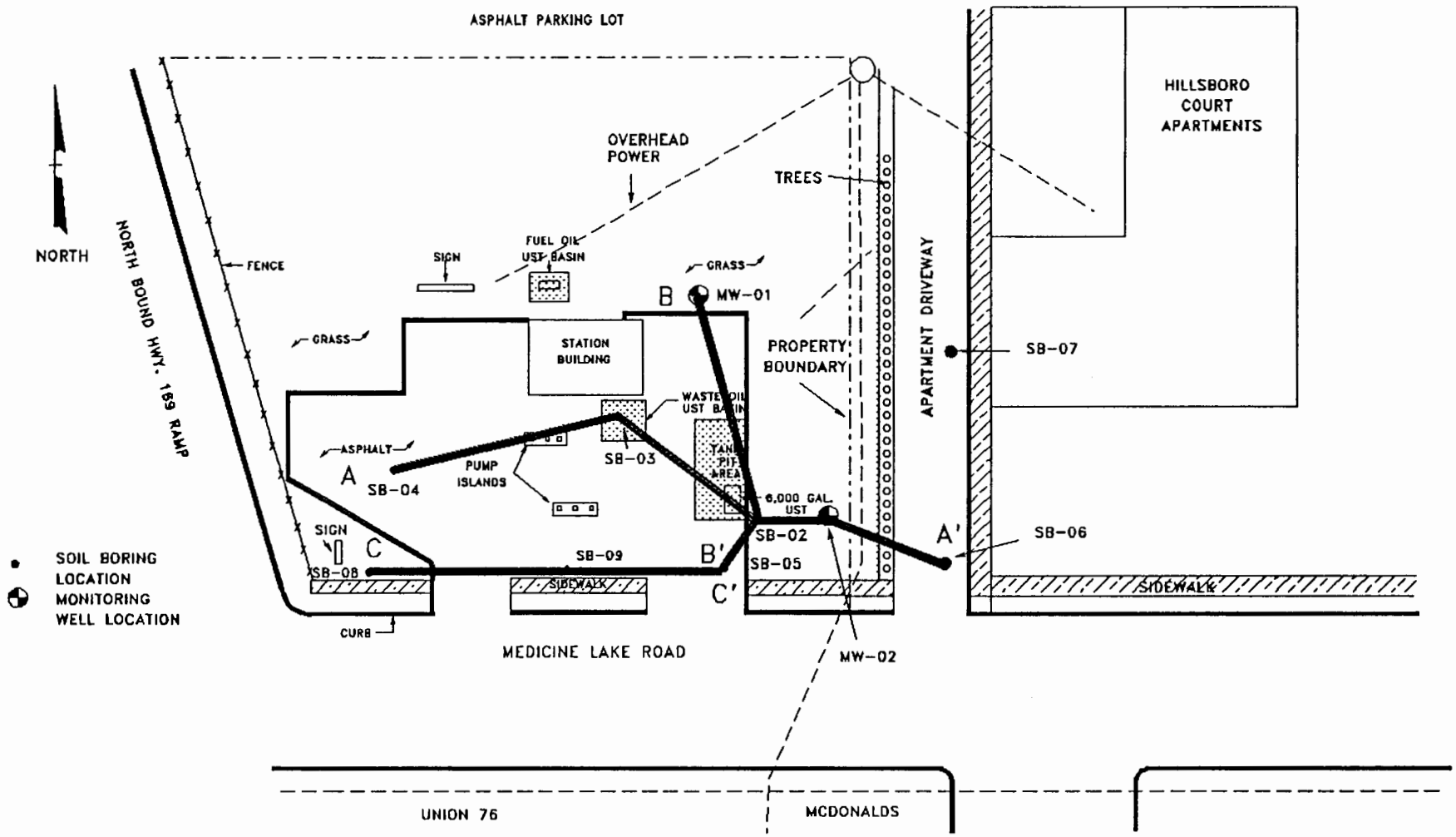

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FIGURE 6
CROSS SECTION LOCATIONS A-A', B-B', C-C'
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD, NEW HOPE, MN

PROJECT NO.	DATE	SCALE	PREPARED BY	REVIEWED BY	DATE	REVISION	
711-015	9/91	1" = 50'	EFW			1	CS

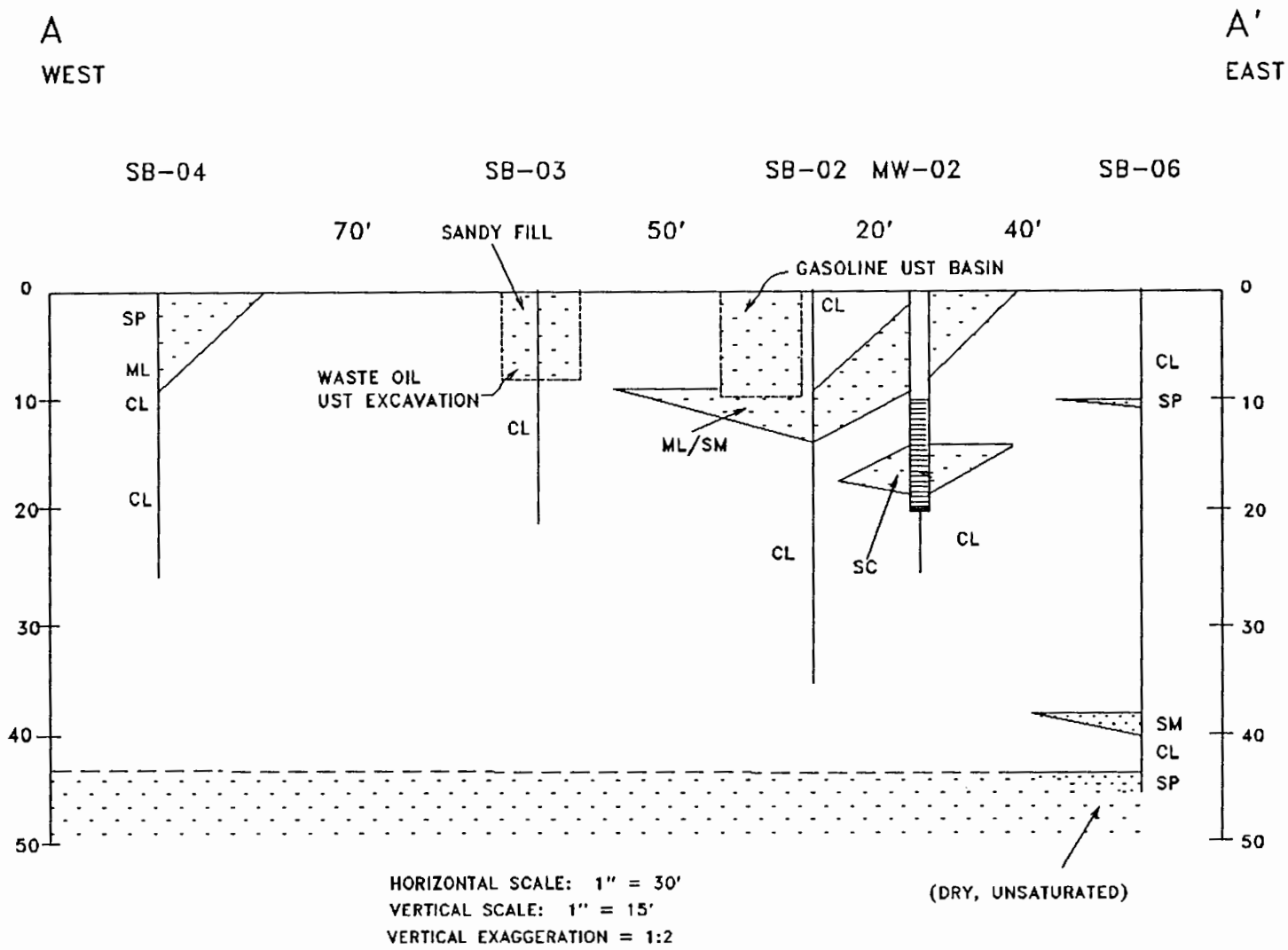

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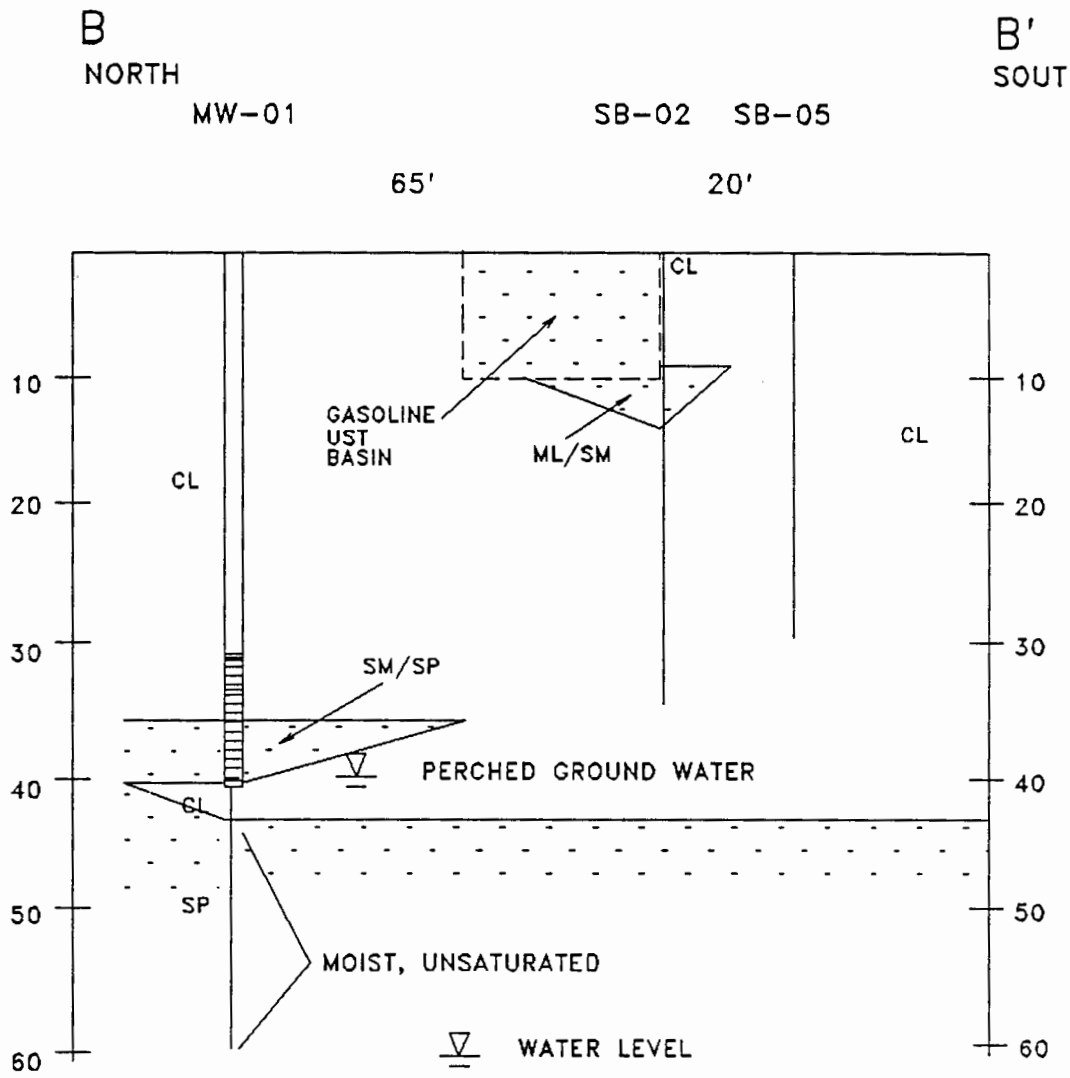
FIGURE 7
GEOLOGIC CROSS-SECTION A-A'
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD
NEW HOPE, MINNESOTA

PROJECT NO.	DATE	SCALE	PREPARED BY	REVIEWED BY	DATE	REVISION	
711-015	9/91	SEE DRAWING	EFW/SHW			1 (EFW)	C3



HORIZONTAL SCALE: 1" = 30'
VERTICAL SCALE: 1" = 15'
VERTICAL EXAGGERATION = 1:2

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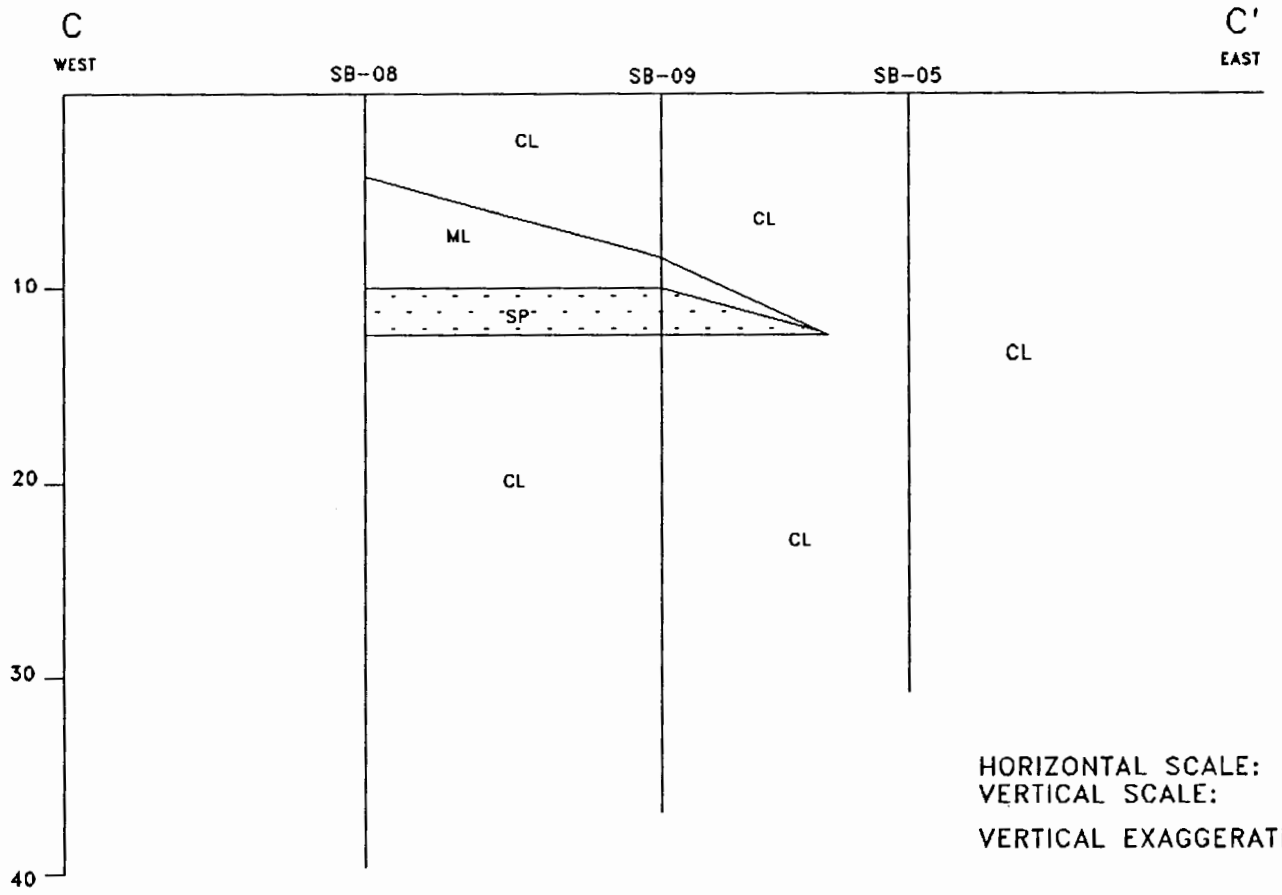
FIGURE 8
GEOLOGIC CROSS-SECTION B-B'
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD
NEW HOPE, MINNESOTA

PROJECT NO.	DATE	SCALE	PREPARED BY	REVIEWED BY	DATE	REVISION	
711-015	9/91	SEE DRAWING	EFW/SHW			1 (EFW)	C4



HORIZONTAL SCALE: 1" = 40'
VERTICAL SCALE: 1" = 10'
VERTICAL EXAGGERATION = 1:4

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FIGURE 9
GEOLOGIC CROSS SECTION C-C'
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD, NEW HOPE, MN

PROJECT NO.	DATE	SCALE	PREPARED BY	REVIEWED BY	DATE	REVISION	
711-015	9/91	SEE DRAWING	EFW			ORIGINAL	C5

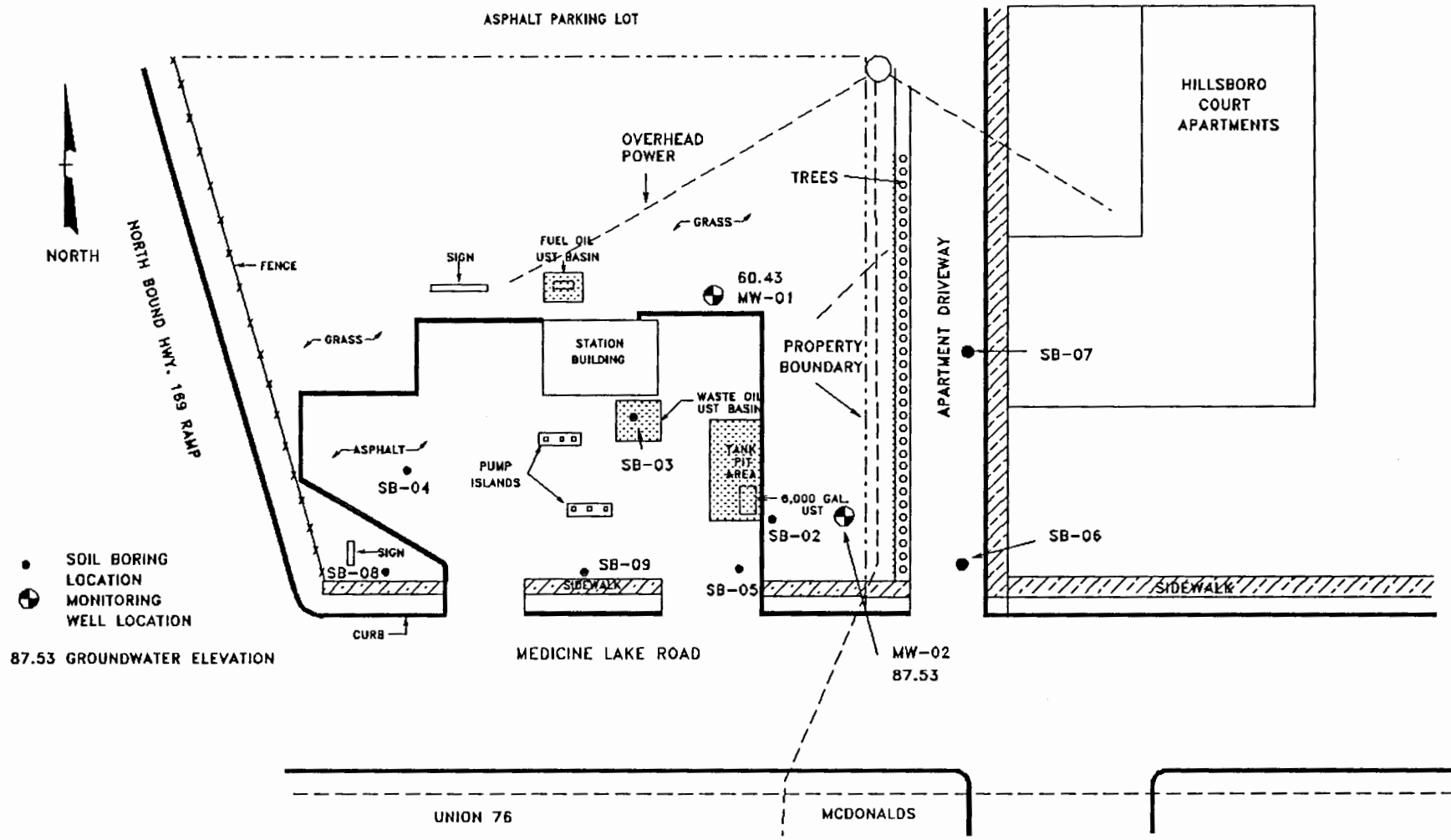

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FIGURE 10
GROUNDWATER ELEVATIONS, 11/12/90
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD, NEW HOPE, MN

PROJECT NO.	DATE	SCALE	PREPARED BY	REVIEWED BY	DATE	REVISION	
711-015	9/91	1" = 50'	EFW			ORIGINAL	D2

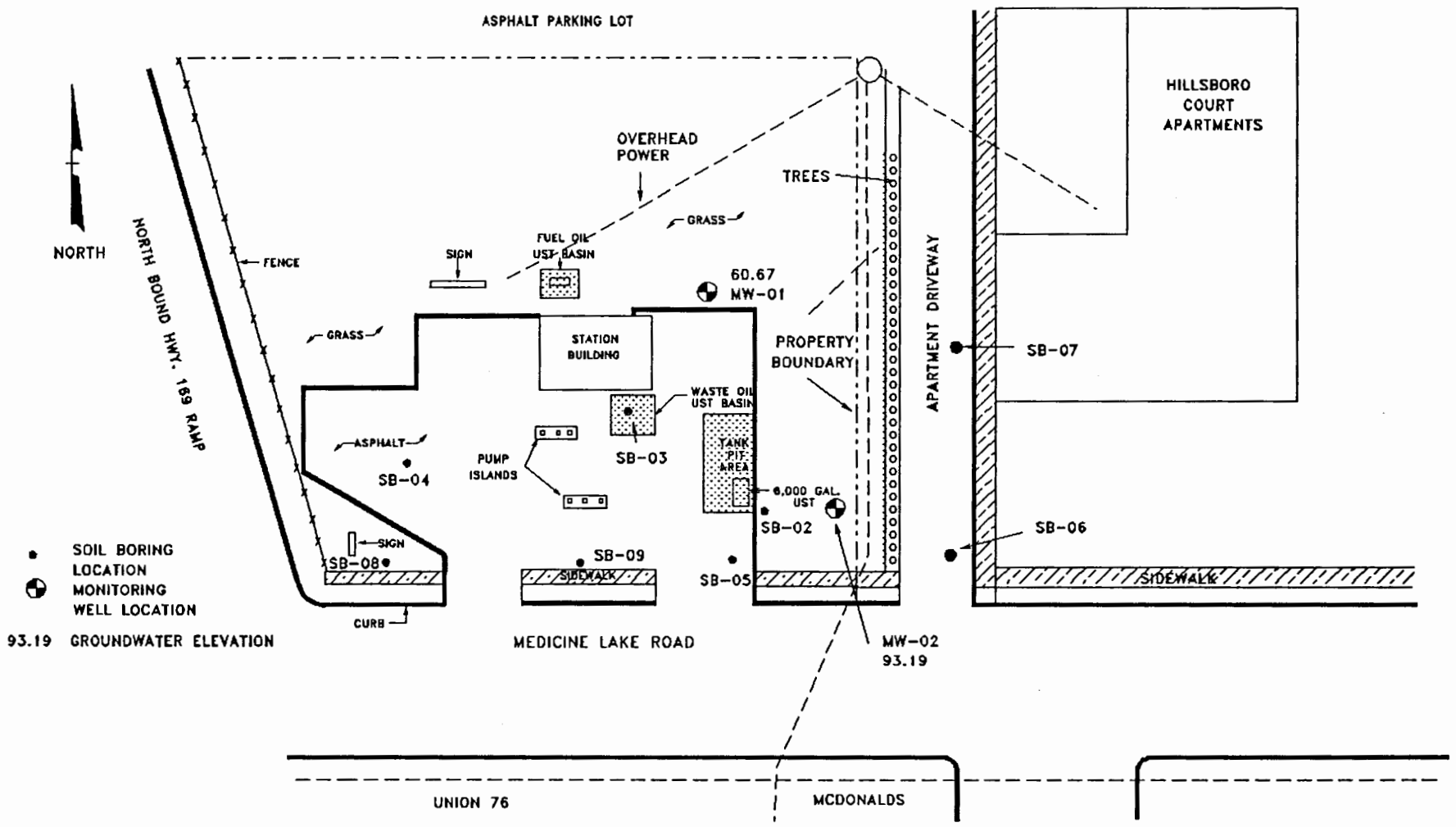

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FIGURE 11
GROUNDWATER ELEVATIONS 5/30/91
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD, NEW HOPE, MN

PROJECT NO.	DATE	SCALE	PREPARED BY	REVIEWED BY	DATE	REVISION	
711-015	9/91	1" = 50'	EFW			ORIGINAL	D1

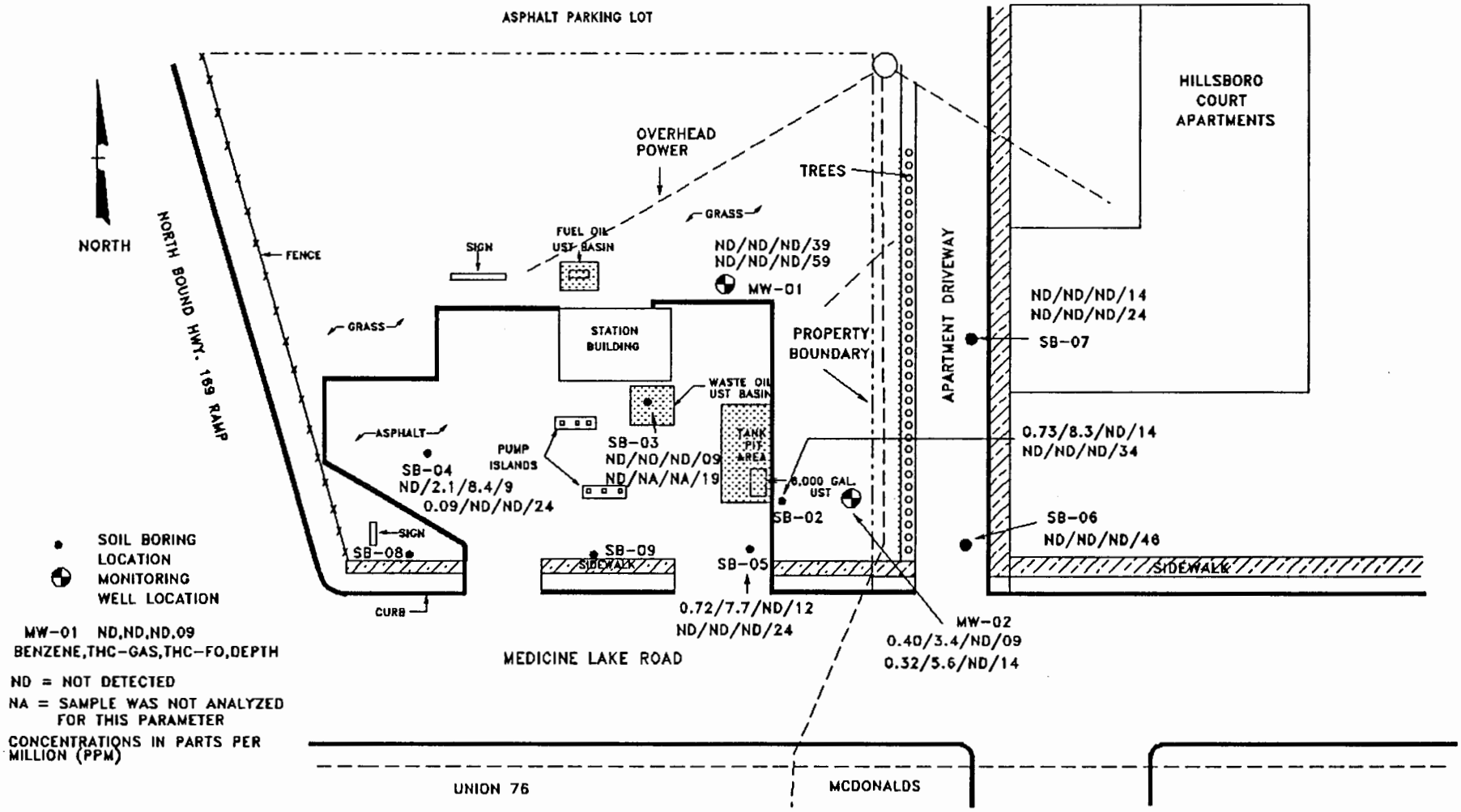

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FIGURE 12
SOIL ANALYTICAL DATA
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD, NEW HOPE, MN

PROJECT NO.	DATE	SCALE	PREPARED BY	REVIEWED BY	DATE	REVISION	
711-015	9/91	1" = 50'	EFW			1	J2

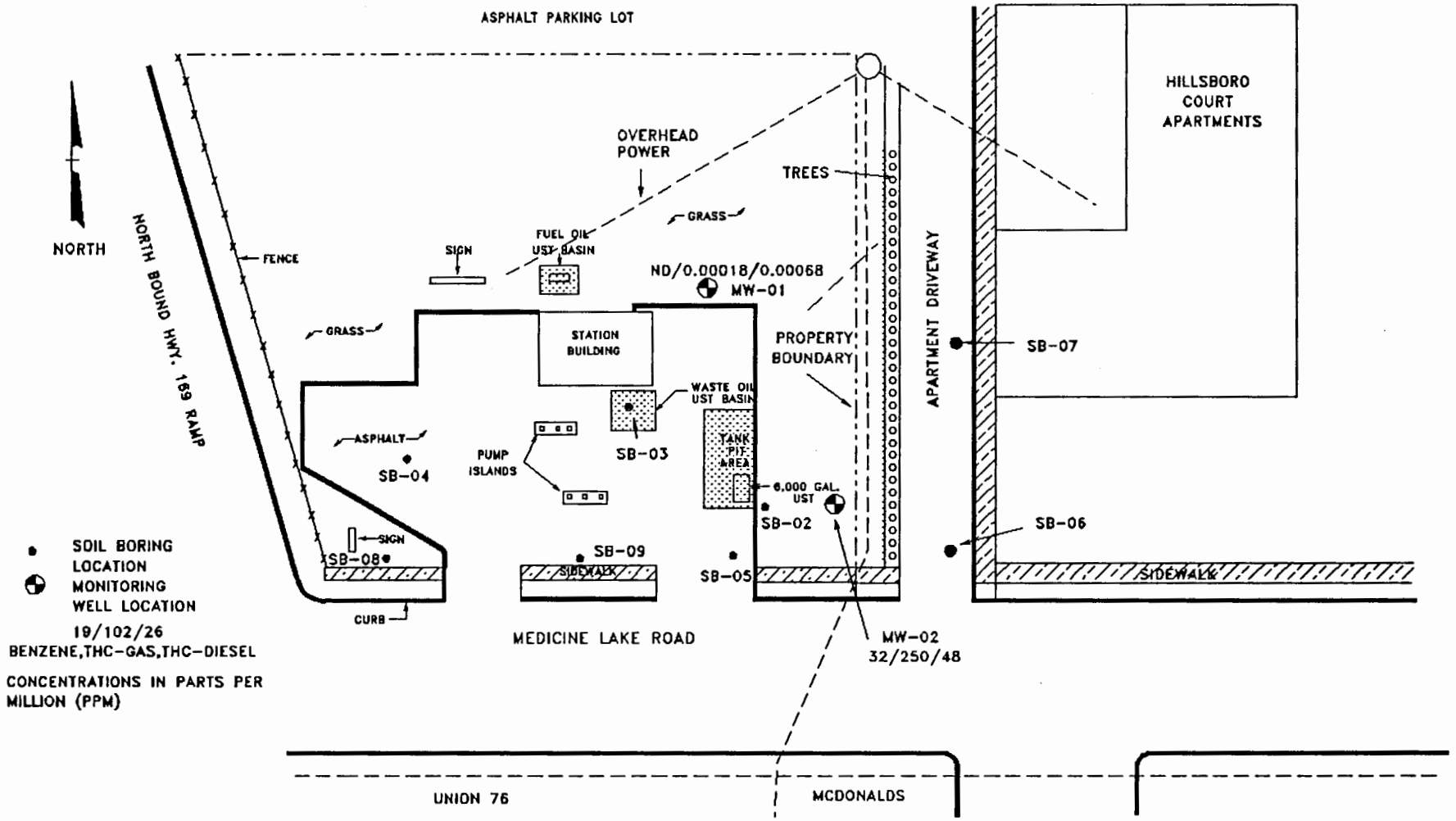

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FIGURE 13
GROUNDWATER ANALYTICAL DATA, 11/12/90
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD, NEW HOPE, MN

PROJECT NO.	DATE	SCALE	PREPARED BY	REVIEWED BY	DATE	REVISION	
711-015	9/91	1" = 50'	EFW			ORIGINAL	J4

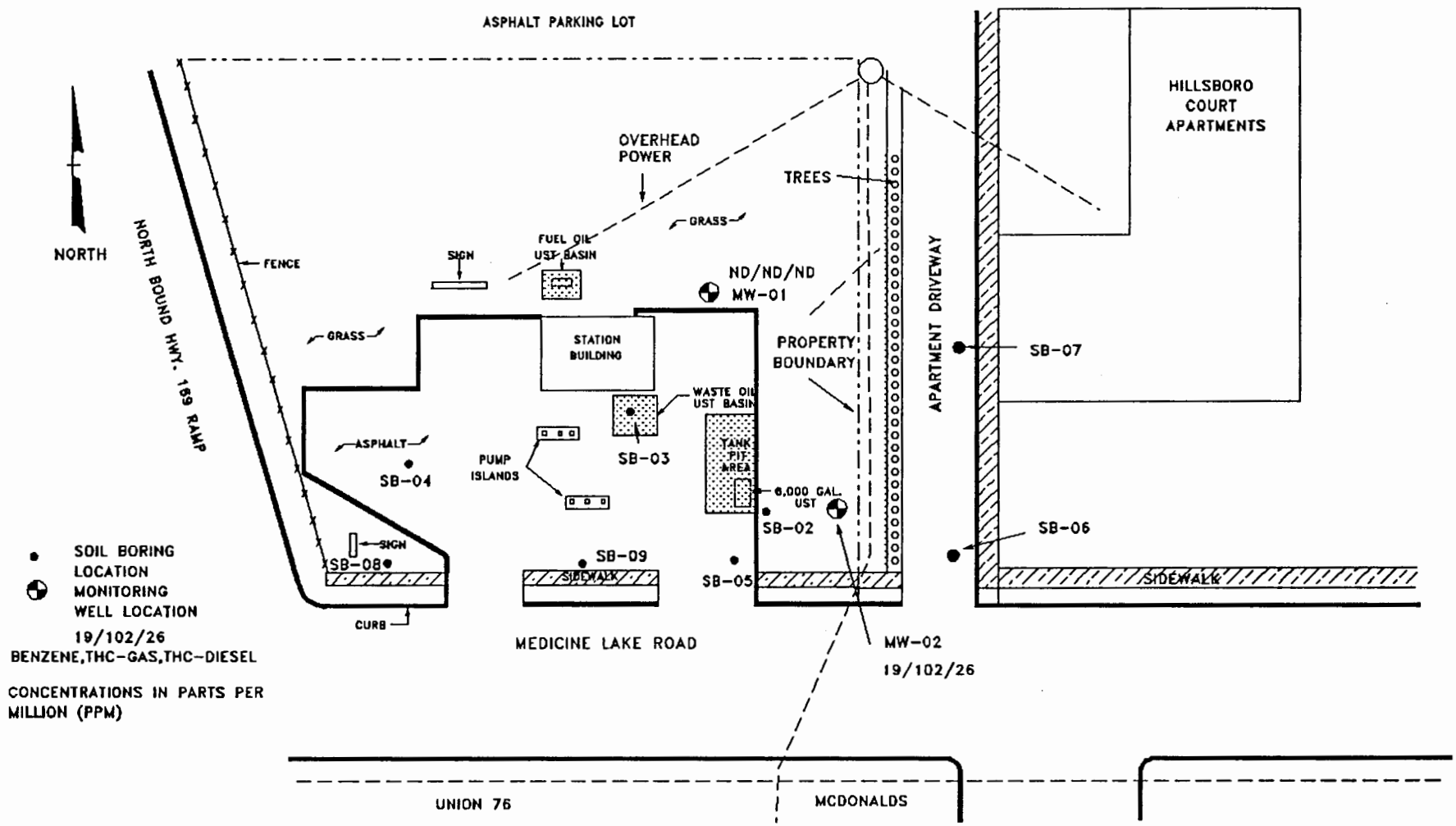

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FIGURE 14
GROUNDWATER ANALYTICAL DATA, 5/30/91 & 7/10/91
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD, NEW HOPE, MN

PROJECT NO.	DATE	SCALE	PREPARED BY	REVIEWED BY	DATE	REVISION	
711-015	9/91	1" = 50'	EFW			ORIGINAL	J3

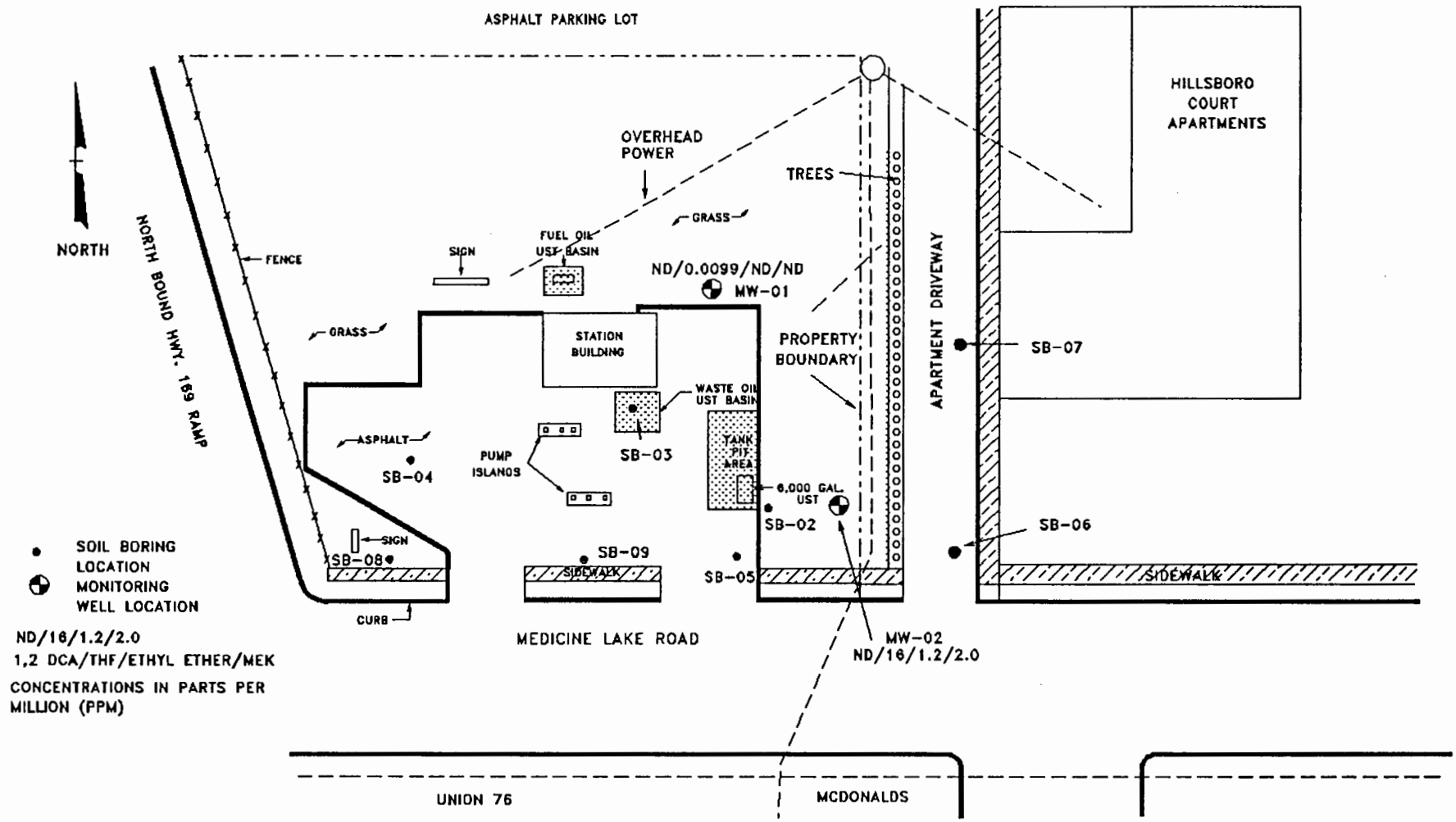

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FIGURE 15
SOLVENT CONSTITUENTS, 5/30/91 AND 7/10/91
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD, NEW HOPE, MN

PROJECT NO.	DATE	SCALE	PREPARED BY	REVIEWED BY	DATE	REVISION	
711-015	9/91	1" = 50'	EFW			ORIGINAL	J5

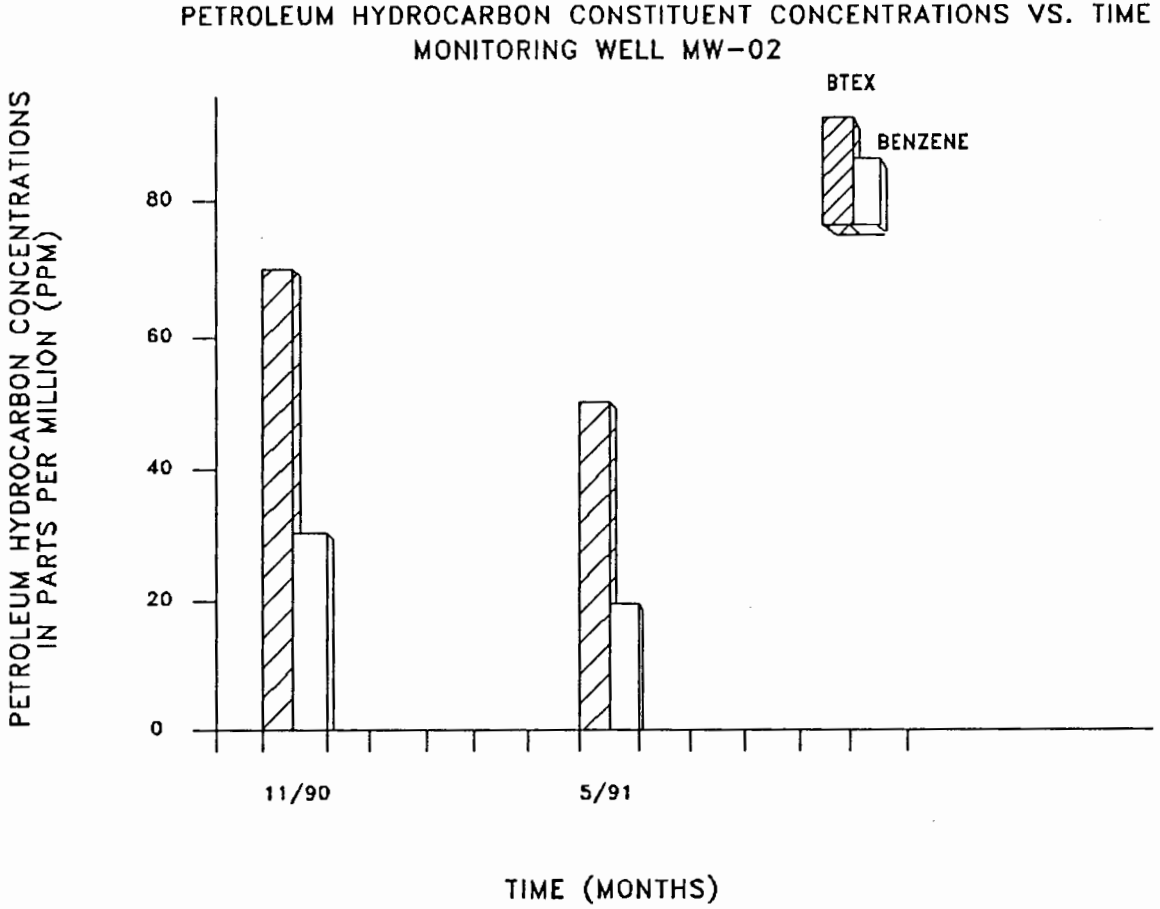

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FIGURE 16
GROUNDWATER PETROLEUM HYDROCARBON CONSTITUENT CONCENTRATIONS VS. TIME
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD, NEW HOPE, MINNESOTA

PROJECT NO.	DATE	SCALE	PREPARED BY	REVIEWED BY	DATE	REVISION	
711-015	9/91	NA	EFW			ORIGINAL	G1

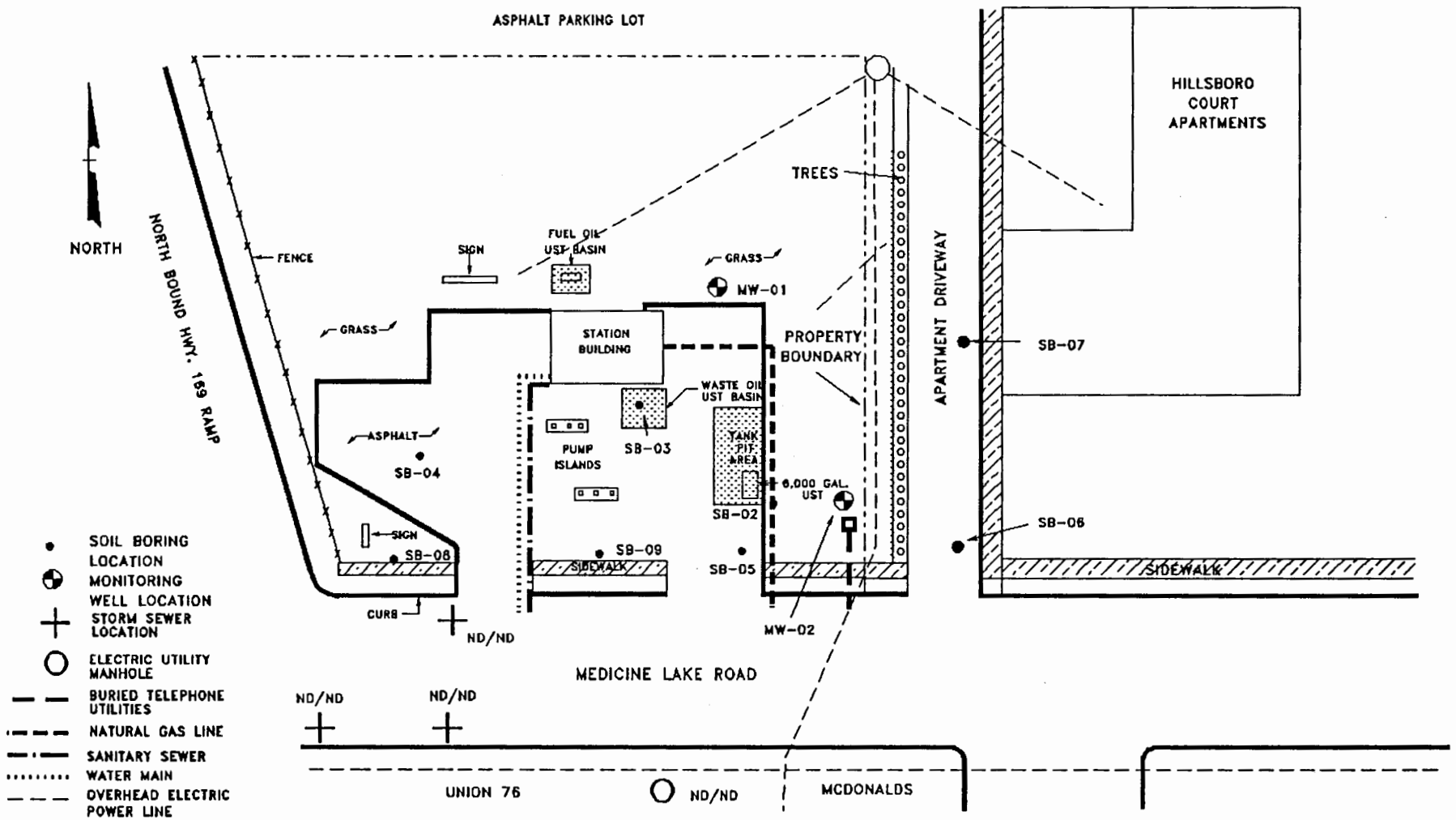

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FIGURE 17
SITE UTILITIES/VAPOR SURVEY RESULTS, 9/2/91
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE RD, NEW HOPE, MINNESOTA

PROJECT NO.	DATE	SCALE	PREPARED BY	REVIEWED BY	DATE	REVISION	
711-015	9/91	1" = 50'	EFW			ORIGINAL	SU

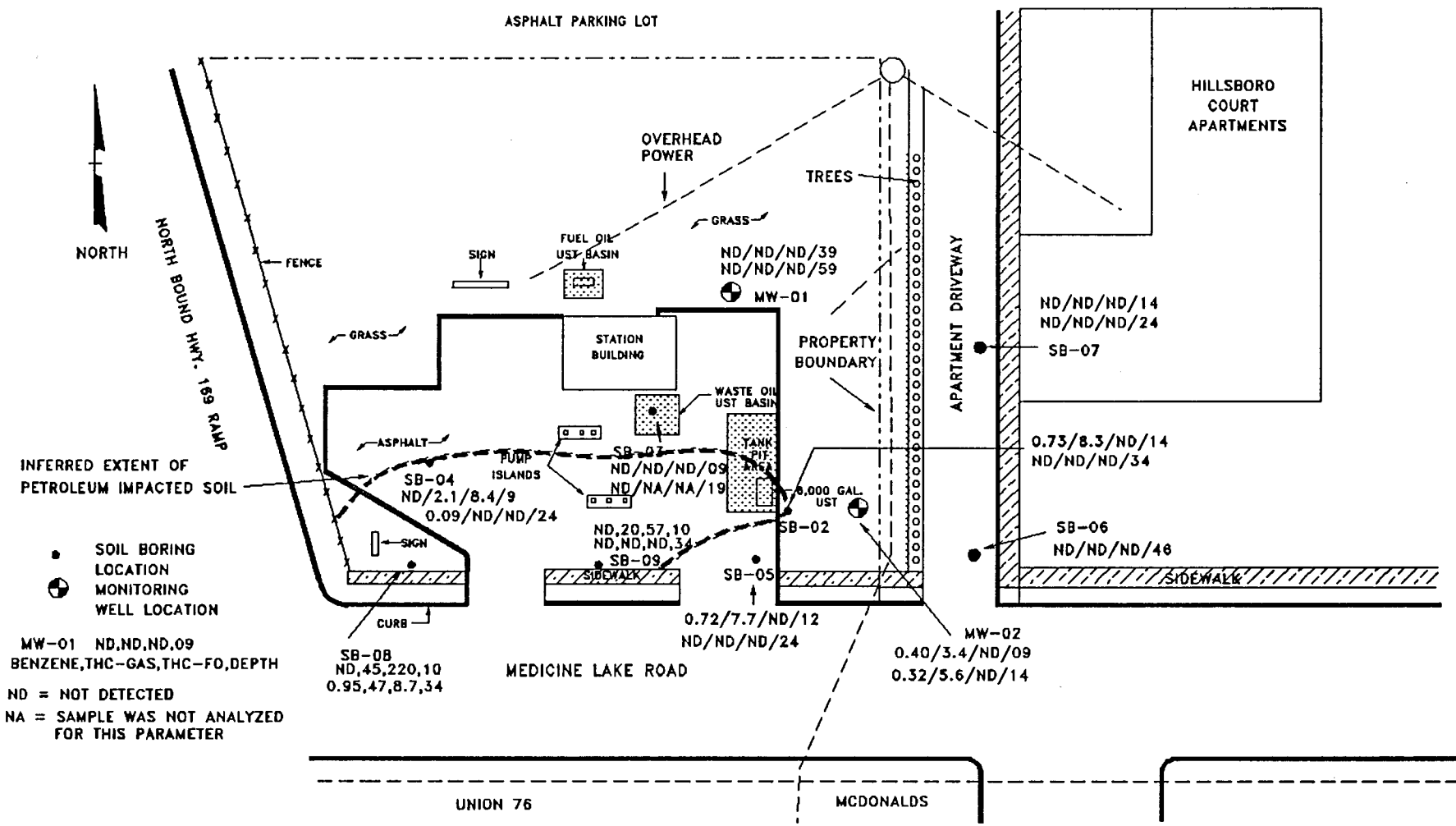

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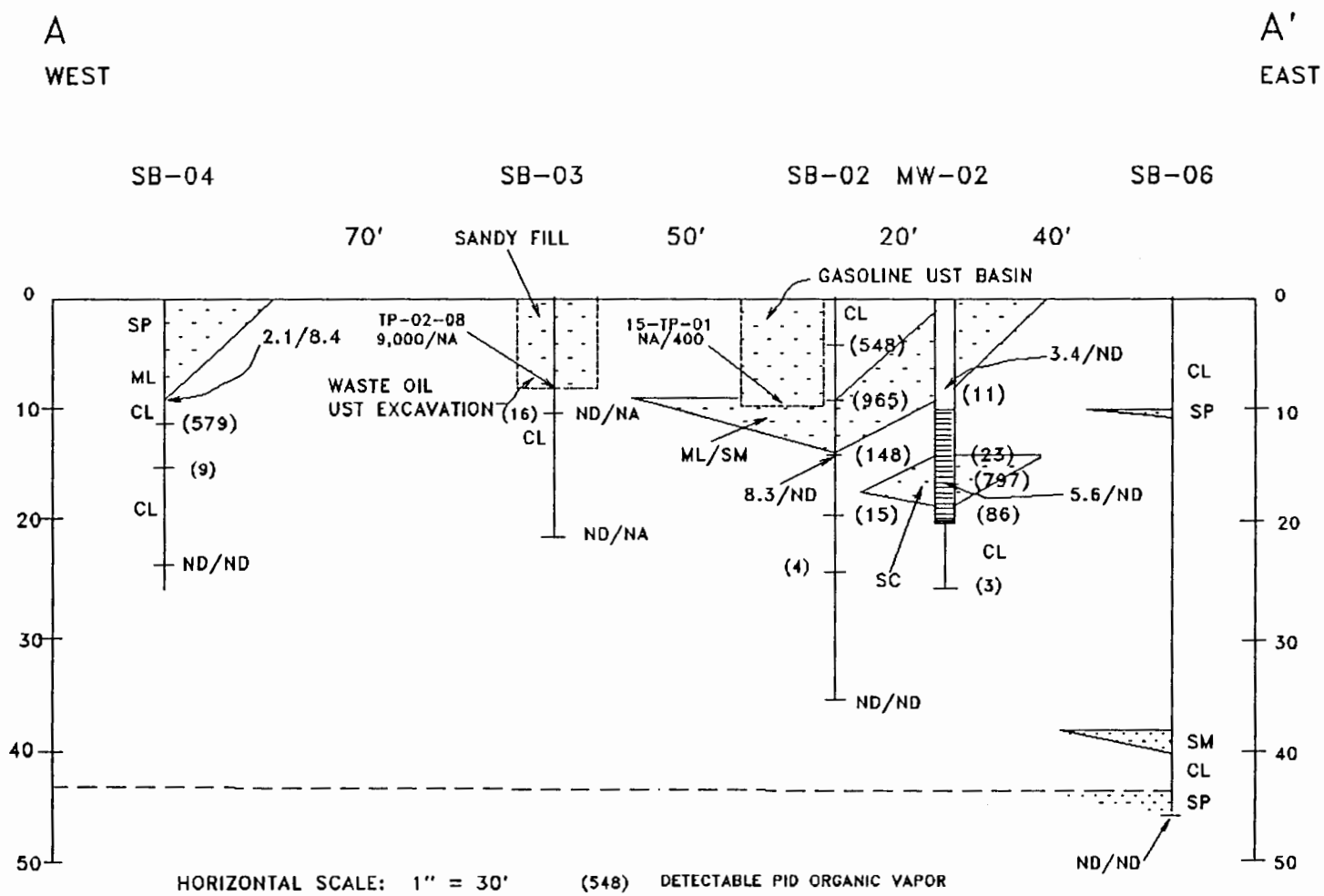
FIGURE 18
INFERRED EXTENT OF PETROLEUM IMPACTED SOIL
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD, NEW HOPE, MN

PROJECT NO.	DATE	SCALE	PREPARED BY	REVIEWED BY	DATE	REVISION	
711-015	9/91	1" = 50'	EFW			ORIGINAL	SS



HORIZONTAL SCALE: 1" = 30'
VERTICAL SCALE: 1" = 15'
VERTICAL EXAGGERATION: 2:1

(548) DETECTABLE PID ORGANIC VAPOR CONCENTRATIONS FROM SPLIT-SPOONS
ND/ND TOTAL HYDROCARBON-FUEL OIL/THC-GASOLINE
NA TEST NOT PERFORMED

CONCENTRATIONS IN PARTS PER MILLION (PPM)

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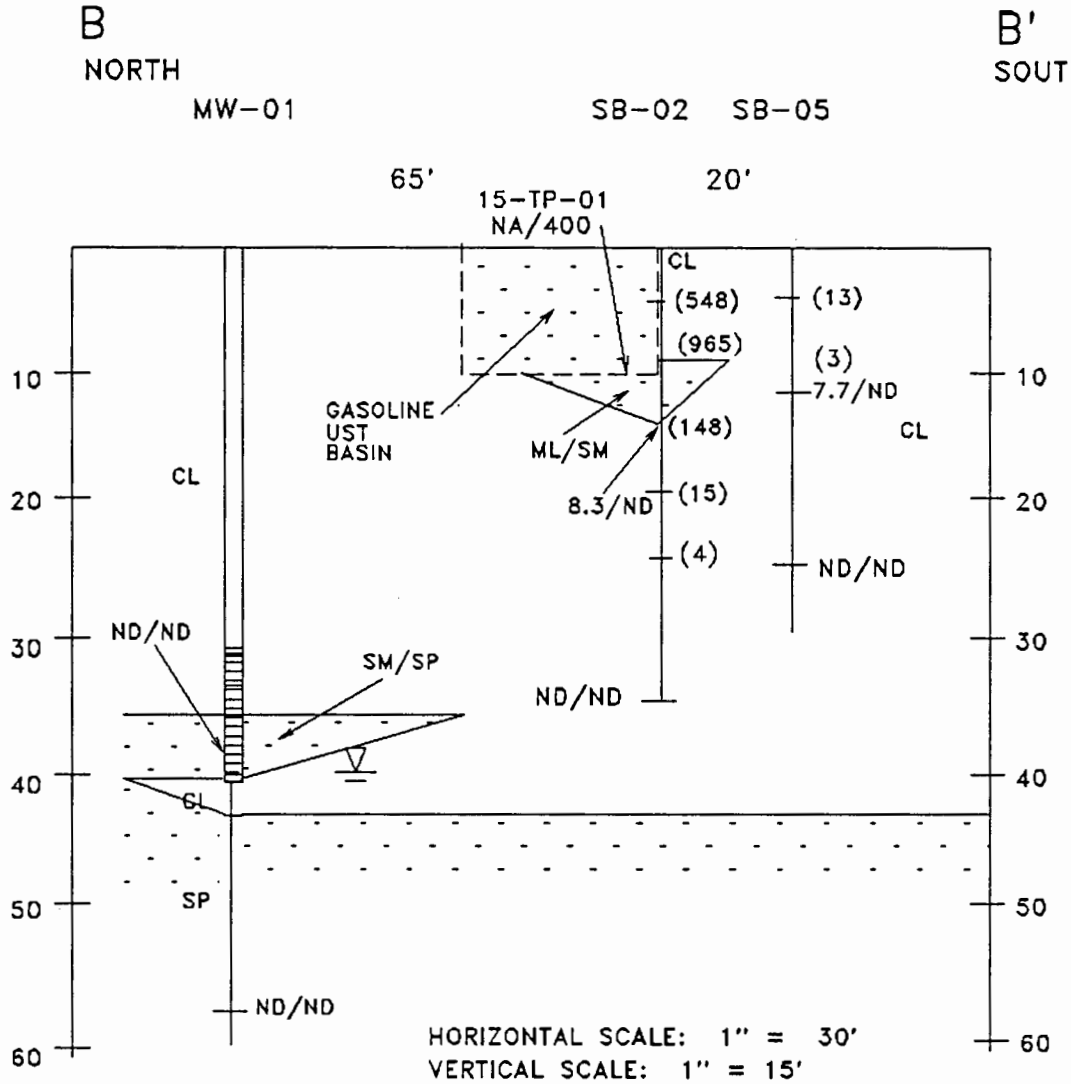
FIGURE 19
GEOLOGIC CROSS SECTION A-A' & SOIL ANALYTICAL DATA
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD
NEW HOPE, MINNESOTA

PROJECT NO.	DATE	SCALE	PREPARED BY	REVIEWED BY	DATE	REVISION	
711-015	10/91	SEE DRAWING	SHW			1	C2



HORIZONTAL SCALE: 1" = 30'
VERTICAL SCALE: 1" = 15'
VERTICAL EXAGGERATION = 1:2

(548) DETECTABLE PID ORGANIC VAPOR CONCENTRATIONS FROM SPLIT-SPOONS

ND/ND TOTAL HYDROCARBON-FUEL OIL/THC-GASOLINE CONCENTRATIONS IN PARTS PER MILLION (PPM)

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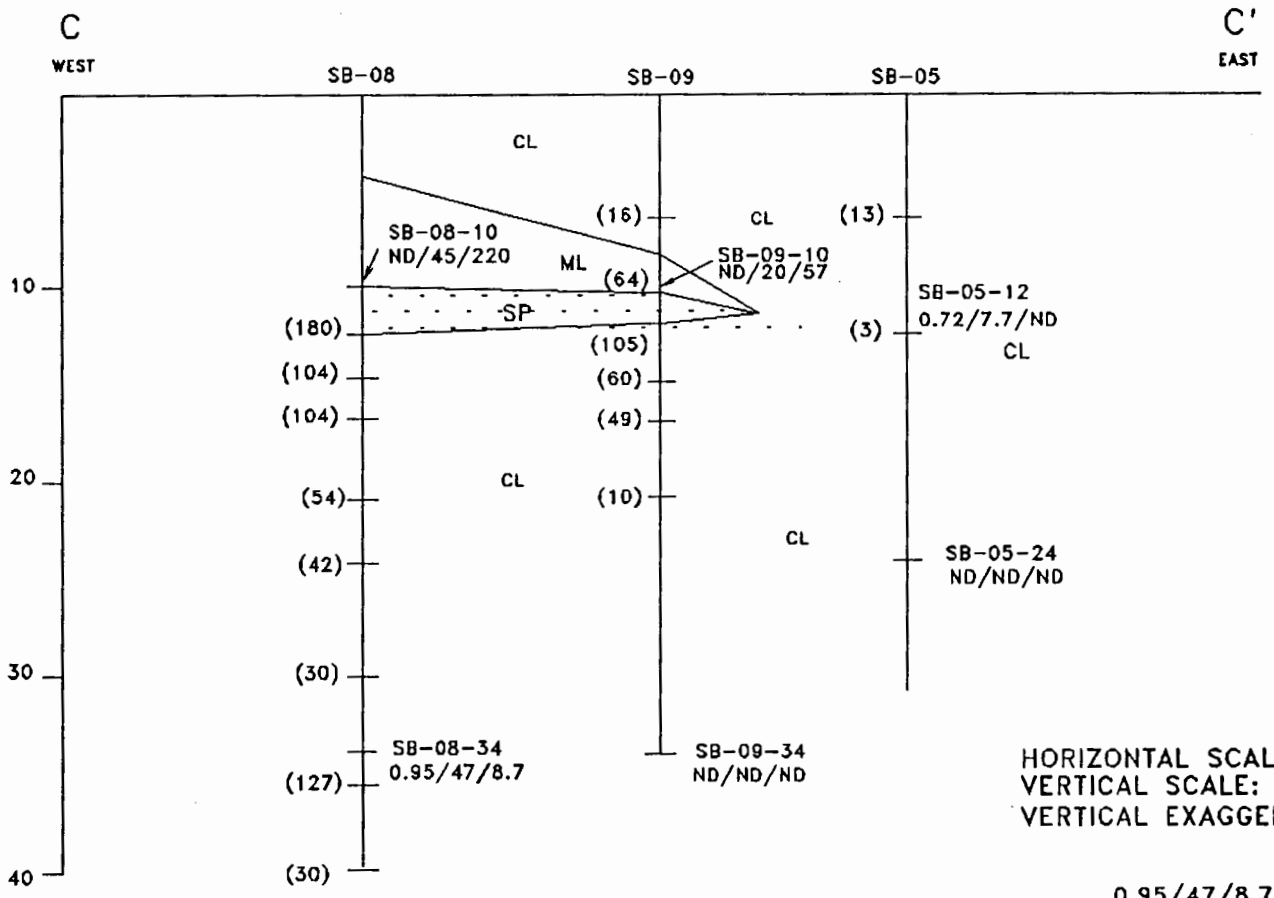
FIGURE 20
GEOLOGIC CROSS SECTION B-B' &
SOIL ANALYTICAL DATA
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD
NEW HOPE, MINNESOTA

PROJECT NO.	DATE	SCALE	PREPARED BY	REVIEWED BY	DATE	REVISION	
711-015	9/91	SEE DRAWING	SW			1 (EFW)	C1



HORIZONTAL SCALE: 1" = 40'
VERTICAL SCALE: 1" = 10'
VERTICAL EXAGGERATION = 1:4

0.95/47/8.7
BENZENE/THC-GAS/THC-F.O.
CONCENTRATIONS IN PARTS PER MILLION (PPM)
(60) – PID VAPORS FROM SPLIT-SPOONS

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FIGURE 21
GEOLOGIC CROSS SECTION C–C' & SOIL ANALYTICAL RESULTS
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD, NEW HOPE, MINNESOTA

PROJECT NO.	DATE	SCALE	PREPARED BY	REVIEWED BY	DATE	REVISION	
711-015	9/91	SEE DRAWING	EFW			ORIGINAL	C6

TABLES

TABLE 1
SOIL ANALYTICAL DATA - REQUESTED ANALYSES
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE RD, NEW HOPE, MN

HOLE SAMP#/ DEPTH (FT)	BTEX	MDH465C	MTBE	LEAD	THC AS GASOLINE	THC AS FUEL OIL	PCB
MW-01-39	X				X	X	
MW-01-59	X				X	X	
MW-02-09	X				X	X	
MW-02-14	X				X	X	
SB-02-14	X				X	X	
SB-02-34	X				X	X	
SB-03-09		X					X
SB-03-19		X					X
SB-04-09	X				X	X	
SB-04-24	X				X	X	
SB-05-12	X				X	X	
SB-05-24	X				X	X	
SB-06-46	X		X		X	X	
SB-07-14	X		X		X	X	
SB-07-24	X		X		X	X	
SB-08-10	X		X	X	X	X	
SB-08-34	X		X	X	X	X	
SB-09-10	X		X	X	X	X	
SB-09-34	X		X	X	X	X	

BTEX = BENZENE, TOLUENE, ETHYLBENZENE, XYLENE, EPA METHOD SW-846, 8020.
MDH465C = MINNESOTA DEPARTMENT OF HEALTH METHOD 465C FOR VOLATILE CONSTITUENTS.
MTBE = METHYL TERTIARY BUTYL ETHER EPA METHOD SW-846, 8020.
LEAD = EPA METHOD SW-846, 6010.
THC AS GASOLINE = TOTAL HYDROCARBONS AS GASOLINE EPA METHOD SW-846, 8015.
THC AS FUEL OIL = TOTAL HYDROCARBONS AS FUEL OIL EPA METHOD SW-846, 3510/8015.
PCB = POLYCHLORINATED BIPHENYL EPA METHOD SW-846, 8080.

TABLE 2
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE RD, NEW HOPE, MN
GROUNDWATER ELEVATION DATA

WELL #	LEVEL DATE	TOC ELEV	WATER LEVEL	PROD. THICK	GW ELEV
MW-01	11/12/90	103.98	43.55	0.00	60.43
MW-01	5/30/91	103.98	43.31	0.00	60.67
MW-02	11/12/90	103.59	16.06	0.00	87.53
MW-02	5/30/91	103.59	10.40	0.00	93.19

TOC = TOP OF RISER PIPE CASING
PROD. = PRODUCT
GW = GROUNDWATER
0.00 = PRODUCT LAYER NOT DETECTABLE
NOTE -- ALL MEASUREMENTS ARE REPRESENTED IN FEET.

TABLE 3
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD, NEW HOPE, MINNESOTA

SOIL ORGANIC VAPOR DATA

HOLE #	0-4	4-6	9-11	14-16	19-21	24-26	29-31	34-36	39-41	44-46	49-51	54-56	59-61
MW-01	0	0	0	0	0	0	0	0	0	0	0	0	0
MW-02	0	0	11	797	86	3	---	---	---	---	---	---	---
SB-02	0	548	965	148	15.6	4.3	0	0	---	---	---	---	---
SB-03	0	3.7	16.3	0	0	---	---	---	---	---	---	---	---
SB-04	0	0	579	9	0	0	0	---	---	---	---	---	---
SB-05	0	13	3	0	0	0	0	---	---	---	---	---	---
SB-06	0	0	0	0	0	0	0	0	0	0	---	---	---
SB-07	0	0	0	9	0	0	0	---	---	---	---	---	---
SB-08	0	0	0	104	54	42	30	127	30	---	---	---	---
SB-09	45	16	64	49	10	1	0	0	---	---	---	---	---

ALL DATA REPRESENTED IN PARTS PER MILLION (PPM).
--- BOREHOLE NOT DRILLED TO THIS DEPTH.

TABLE 4
SOIL ANALYTICAL DATA
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD, NEW HOPE, MN

HOLE SAMP#/ DEPTH (FT)	SAMPLE DATE	BENZENE	TOLUENE	ETHYL-BENZENE	XYLENE	THC AS GASOLINE	THC AS FUEL OIL
MW-01-39	10/17/90	<0.06	<0.11	<0.05	<0.28	<1.2	<1.7
MW-01-59	10/17/90	<0.06	<0.11	<0.05	<0.28	<1.2	<1.7
MW-02-09	10/17/90	0.40	<0.11	<0.05	<0.28	3.4	<1.7
MW-02-14	10/17/90	0.32	0.77	0.12	0.51	5.6	<1.7
SB-02-14	10/17/90	0.73	0.95	0.12	0.65	8.3	<1.7
SB-02-34	10/17/90	<0.06	<0.11	<0.05	<0.28	<1.2	<1.7
SB-03-09	10/17/90	<0.06	<0.11	<0.05	<0.28	*	*
SB-03-19	10/17/90	<0.06	<0.11	<0.05	<0.28	*	*
SB-04-09	10/17/90	<0.06	<0.11	<0.05	<0.28	2.1	8.4
SB-04-24	10/17/90	0.09	<0.11	<0.05	<0.28	<1.2	<1.7
SB-05-12	10/17/90	0.72	0.69	0.12	0.52	7.7	<1.7
SB-05-24	10/17/90	<0.06	<0.11	<0.05	<0.28	<1.2	<1.7
SB-06-46	4/05/91	<0.06	<0.11	<0.05	<0.28	<1.2	<1.4
SB-07-14	4/05/91	<0.06	<0.11	<0.05	<0.28	<1.2	<1.4
SB-07-24	4/05/91	<0.06	<0.11	<0.05	<0.28	<1.2	<1.4
SB-08-10	7/10/91	<0.30	0.76	0.96	4.7	45	220
SB-08-34	7/10/91	0.95	1.1	1.5	8.1	47	8.7
SB-09-10	7/10/91	<0.30	<0.32	<0.20	2.6	20	57
SB-09-34	7/10/91	<0.059	<0.063	<0.041	<0.18	<1.6	<1.4

* SAMPLE NOT ANALYZED FOR THIS PARAMETER
LABORATORY REPORT SHOWS SPECIFIC DETECTION LIMITS USED IN EACH ANALYSIS. ALL VALUES ARE REPRESENTED IN PARTS PER MILLION (PPM).
SAMPLE DEPTHS ARE IN FEET BELOW GROUND SURFACE (BGS). THC = TOTAL HYDROCARBONS.

TABLE 5
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD, NEW HOPE, MN

GROUNDWATER ANALYTICAL DATA - HYDROCARBON CONSTITUENTS

WELL SAMPLE #	SAMPLE DATE	BENZENE	TOLUENE	ETHYL-BENZENE	XYLENE	THC AS GASOLINE	THC AS FUEL OIL
MW-01	11/12/90	<.00047	<.00092	<.00042	<.0022	.00018	.00068
MW-01	7/10/91	<.00047	<.00092	<.00042	<.0022	<.013	<.043
MW-02	11/12/90	32	25	1.8	10	250	48
MW-02	5/30/91	19	19	1	9.3	102	26

ND = NOT DETECTABLE BY LABORATORY TEST METHODS
SEE LABORATORY REPORT FOR DETECTION LIMITS.
ALL CONCENTRATION REPRESENT IN PARTS PER MILLION (PPM).

TABLE 6
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE RD, NEW HOPE, MN

GROUNDWATER ANALYTICAL DATA - SOLVENT CONSTITUENTS

SAMPLE #	DATE	1,2 DCA	THF	ETHYL ETHER	MEK
MW-01	11/12/90	<0.00047	<0.0087	<0.0011	<0.0039
MW-01	7/10/91	<0.00047	0.0099	<0.0011	<0.0039
MW-02	11/12/90	0.032	<0.087	<0.011	<0.039
MW-02	5/30/91	<0.240	16.0	1.2	2.0
MDH-RALs		0.004	0.100	1.0	0.300

RESULTS REPRESENTED IN PARTS PER MILLION (PPM).

APPENDIX A
EXCAVATION REPORT FOR PETROLEUM RELEASE SITES

EnecoTech®
ENVIRONMENTAL CONSULTANTS

UNDERGROUND STORAGE TANK EXCAVATION REPORT SINCLAIR SERVICE STATION 9456 MEDICINE LAKE ROAD NEW HOPE, MINNESOTA

Prepared For:

SINCLAIR MARKETING
3401 Fairbanks Avenue
P.O. Box 6247
Kansas City, Kansas 66106

Prepared By:

ENECOTECH MIDWEST, INC.
3050 Metro Drive, Suite 115
Bloomington, Minnesota 55425

August 10, 1990

PROJECT NUMBER: 711-015

ENECOTECH

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1.0 INTRODUCTION

The purpose of this report is to describe the underground storage tank (UST) excavation and soil sampling activities that occurred at 9456 Medicine Lake Road, New Hope, Minnesota on April 11 through April 13, 1990. Sinclair Marketing (Sinclair) requested that EnecoTech Midwest, Inc. (EnecoTech) supervise the excavation of one 6,000 gallon unleaded gasoline UST, one 560 gallon waste oil UST, and one 1,000 gallon fuel oil UST. Excavation activities were performed by Westside Equipment of Minneapolis, Minnesota. The UST's were excavated because they were no longer in use.

2.0 SITE DESCRIPTION

The site is located at the intersection of Highway 169 and Medicine Lake Road (Figure 1). The property is operated as a gasoline service station. At the time of excavation, onsite surface structures included the station building located near the central portion of the site and two pump islands located in the south central portion of the site (Figure 2). The 6,000 gallon UST was located near the southeast corner of the site. The 560 gallon waste oil and 1,000 gallon fuel oil UST's were located near the station building at the southeast and northwest corners, respectively.

Figure 2 illustrates the approximate locations of the subject tanks prior to removal. Three additional active UST's are located adjacent to the former location of the 6,000 gallon UST. These USTs include two 6,000 gallon unleaded gasoline USTs and one unleaded gasoline UST. All of the removed and existing USTs were installed in 1964. All of the USTs were constructed of uncoated steel.

Properties adjacent to the Sinclair station include: An apartment complex parking lot to the north and east, Medicine Lake Road and a retail gasoline station to the south, and the Medicine Lake Road/Highway 169 northbound entrance ramp to the west.

3.0 FIELD METHODS

The specific tasks performed by EnecoTech included the following:

- The soil encountered in the excavation was classified.
- Excavated soils were screened with an Organic Vapor Meter (OVM) to determine if the soils had been impacted by hydrocarbons.
- Excavated soils that contained elevated levels of organic vapors as determined by OVM measurements were stockpiled on site.

- Upon removal from the subsurface, the UST's were visually inspected.

- Soil samples from the bottom and side walls of each tank pit were measured with the OVM for organic vapors, utilizing Minnesota Pollution Control Agency (MPCA) jar headspace analyses procedures.

- Soil samples were collected from the bottom of each tank pit per MPCA guidelines. The samples were collected from beneath the former locations of each UST (Figure 3). A total of three tank pit bottom samples were collected.

- One representative sample was collected from stockpiled soil.

- The soil samples from the tank pit bottom and soil stockpile were placed into sample containers, sealed, stored on ice and were submitted to Interpoll Laboratories for analysis of the appropriate parameters as required by the MPCA. The soil sample collected from beneath the 6,000 gallon UST was analyzed for benzene, toluene, ethyl benzene, and xylenes (BTEX), MTBE and total hydrocarbons as gasoline. The soil sample collected from beneath the 560 gallon waste oil UST was analyzed for the Minnesota Department of Health (MDH) 465C Suite, total hydrocarbons as fuel oil, PCB's, and metals. The soil sample collected from beneath the 1,000 gallon fuel oil UST was analyzed for BTEX and total hydrocarbons as fuel oil.

4.0 RESULTS

4.1 6,000 Gallon Unleaded Gasoline UST

The soil in the excavation consisted of coarse grained sand backfill, underlain and surrounded by brown to gray silty clay. No free product was encountered in the unleaded gasoline UST pit.

Upon removal from the subsurface, the 6,000 gallon UST was inspected for signs of corrosion and pitting. The bottom one-third of the subject tank was moderately corroded and exhibited several one inch diameter corrosion indentations that did not breach the tank wall.

Upon removal of the UST, the soil in the excavation was evaluated for hydrocarbon impacts. The soil on the sidewalls and the base of the excavation was screened for volatile organic compounds (VOC's) using the OVM. The OVM measurements in the gasoline UST excavation pit ranged from 154.2 to 382 parts per million (ppm) (Table 1). The highest OVM measurements were observed from soil sample HS-05 collected at 9 feet bgs from the excavation wall near the southeast corner of the pit (Figure 3). Excavation of hydrocarbon impacted soils beyond the amount required to remove the 6,000 gallon UST was not attempted due to the proximity of adjacent UST's and subsurface utilities.

Tank bottom sample 15–TP–01, collected from 10 feet bgs beneath the fill pipe location of the 6,000 gallon UST, contained benzene concentrations levels below detection limits, toluene at 15 ppm, ethyl benzene at 13 ppm, and total xylenes at 77 ppm. Total hydrocarbons as gasoline were detected in sample 15–TP–01 at 400 parts per million (Table 2).

Approximately 100 cubic yards of impacted soil was stockpiled onsite from the 6,000 gallon UST excavation.

4.2 560 Gallon Waste Oil UST

The soil in the excavation consisted of coarse grained sand backfill, underlain and surrounded by brown to gray silty clay. No free product or ground water was encountered in the UST pit. The waste oil tank was not corroded or pitted.

The OVM measurements collected during the removal of the 560 gallon waste oil tank ranged from 32.1 ppm to 142.1 ppm (Table 1). The highest OVM measurement at this location was noted in soil sample HS–03 at the base in the southeast corner of the excavation at approximately 8 feet bgs (Figure 3). After the initial vapor screening of the tank basin soils, some additional excavation to the south and east was conducted. However, complete excavation of impacted soil in this area was not possible due to the proximity of the station building, the pump islands and the gasoline UST pit.

Tank bottom sample TP–02–08, collected from beneath the 560 gallon waste oil UST at 8 feet bgs, contained compounds listed in the Minnesota Department of Health (MDH) Method 465–C analysis. The compounds above detection limits included: 1,2 – dichloroethane at 0.51 ppm, ethyl ether at 0.34 ppm, benzene at 0.39 ppm, toluene at 1.2 ppm, ethyl benzene at 0.46 ppm, and total xylenes at 4.3 ppm. Sample TP–02–08 contained 9,000 ppm total hydrocarbons as fuel oil and total PCB's concentrations of 0.050 ppm. Sample TP–02–08 also contained chromium (5 ppm), lead (16 ppm), and mercury (0.06 ppm). All of the above metals analytical data fall within the normal background range for soil (Conner and Shacklette, 1975).

Approximately 50 cubic yards of impacted soil was stockpiled onsite from the excavation of the 560 gallon UST.

4.3 1,000 Gallon Fuel Oil UST

After removal from the subsurface, a 1/8 inch diameter hole was observed at the bottom of the 1,000 gallon UST. The lithology of the tank basin soil was consistent with that as described in the 6,000 and 560 gallon UST excavations. OVM measurements collected during the removal of the 1,000 gallon UST did not reveal the presence of VOC's.

Soil sample TP–03–05, collected from the base of the 1,000 gallon fuel oil UST excavation, did not contain hydrocarbon constituents above target detection limits (Table 2).

Based on the absence of detectable OVM readings in the tank basin, the soil excavated during the removal of the 1,000 gallon UST was backfilled into the excavation basin.

5.0 SUMMARY

The following is a summary of findings for the UST closure at the subject Sinclair Station.

- One (1) 6,000 gallon unleaded gasoline UST, one (1) 560 gallon waste oil UST, and one (1) 1,000 gallon fuel oil UST were excavated at the Sinclair Station located at 9456 Medicine Lake Road, New Hope, Minnesota on April 11, 1990 through April 13, 1990.

- Several one inch diameter corrosion indentations were observed on the base of the 6,000 gallon unleaded gasoline UST. The indentations did not breach the tank wall. One 1/8 inch diameter hole was observed at the base of the 1,000 gallon fuel oil UST. The 560 gallon waste oil UST did not exhibit signs of corrosion.

- Soils in the excavations consisted of coarse grained sand backfill surrounded and underlain by brown to gray silty clay.

- A one inch thick layer of water was observed in the base of the 6,000 gallon unleaded gasoline UST excavation pit.

- OVM readings collected from the 6,000 gallon unleaded gasoline UST excavation ranged from 154.2 to 382 ppm. OVM readings collected from the 560 gallon waste oil UST excavation ranged from 32.1 to 142.1 ppm. The presence of surface and subsurface structures near the 6,000 gallon unleaded gasoline UST and the 560 gallon waste oil UST prohibited the total excavation of all impacted soil. OVM readings above background levels were not observed in the 1,000 gallon UST excavation.

- The 6,000 gallon unleaded gasoline UST pit soil sample contained no detectable levels of benzene, 15 ppm toluene, 13 ppm ethyl benzene, 77 ppm total xylenes, and 400 ppm total hydrocarbons as gasoline.

- The 560 gallon UST pit soil sample contained 0.51 ppm 1,2 dichloroethane, 0.34 ppm ethyl ether, 0.39 ppm benzene, 1.2 ppm toluene, 0.46 ppm ethyl benzene, 4.3 ppm total xylenes, and 9,000 ppm total hydrocarbons as fuel oil. The soil sample also contained 0.050 ppm PCB, 5 ppm chromium, 16 ppm lead, and 0.06 ppm mercury.

- The 1,000 gallon fuel oil UST pit soil sample did not contain benzene, toluene, ethyl benzene, xylenes or fuel oil.

- A total of approximately 150 cubic yards of impacted soil was stockpiled onsite.

6.0 CONCLUSIONS

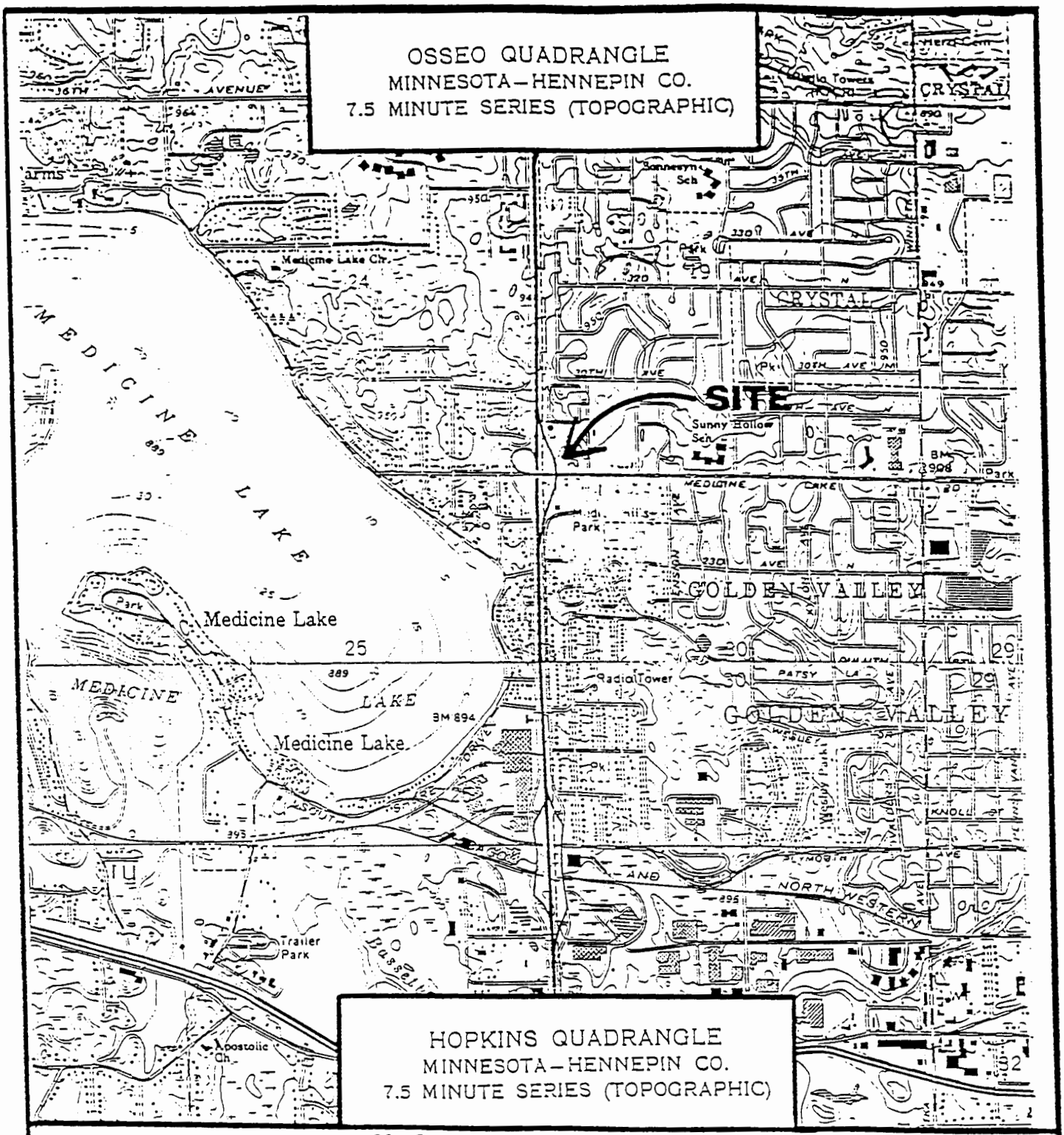
Elevated concentrations of adsorbed hydrocarbons were detected in the 6,000 gallon unleaded gasoline UST and 560 gallon waste oil UST excavation pits. The data collected from the 1,000 gallon fuel oil UST did not indicate the presence of petroleum hydrocarbon impacts. Based on the data collected during the unleaded gasoline and waste oil USTs removal, it appears that soil impacts may extend beyond the boundaries of these UST basins. Soil samples collected from the unleaded gasoline tank pit contained concentration levels of THC (g) which significantly exceeded the MPCA action level of 50 ppm. Since the scope of the investigation was limited to soil within the UST basins, it is undetermined whether ground water beneath the facility has been impacted.

7.0 RECOMMENDATIONS

Based on the potential for hydrocarbon constituents to have impacted soils beyond the 6,000 gallon unleaded gasoline and 560 gallon waste oil UST basins, EnecoTech recommends that additional investigatory work be conducted to define the magnitude and extent of hydrocarbon impacts beneath the facility. EnecoTech recommends the completion of soil borings and monitoring wells to accomplish this task.

FIGURES

SITE LOCATON MAP
SITE MAP
SOIL SAMPLING LOCATIONS



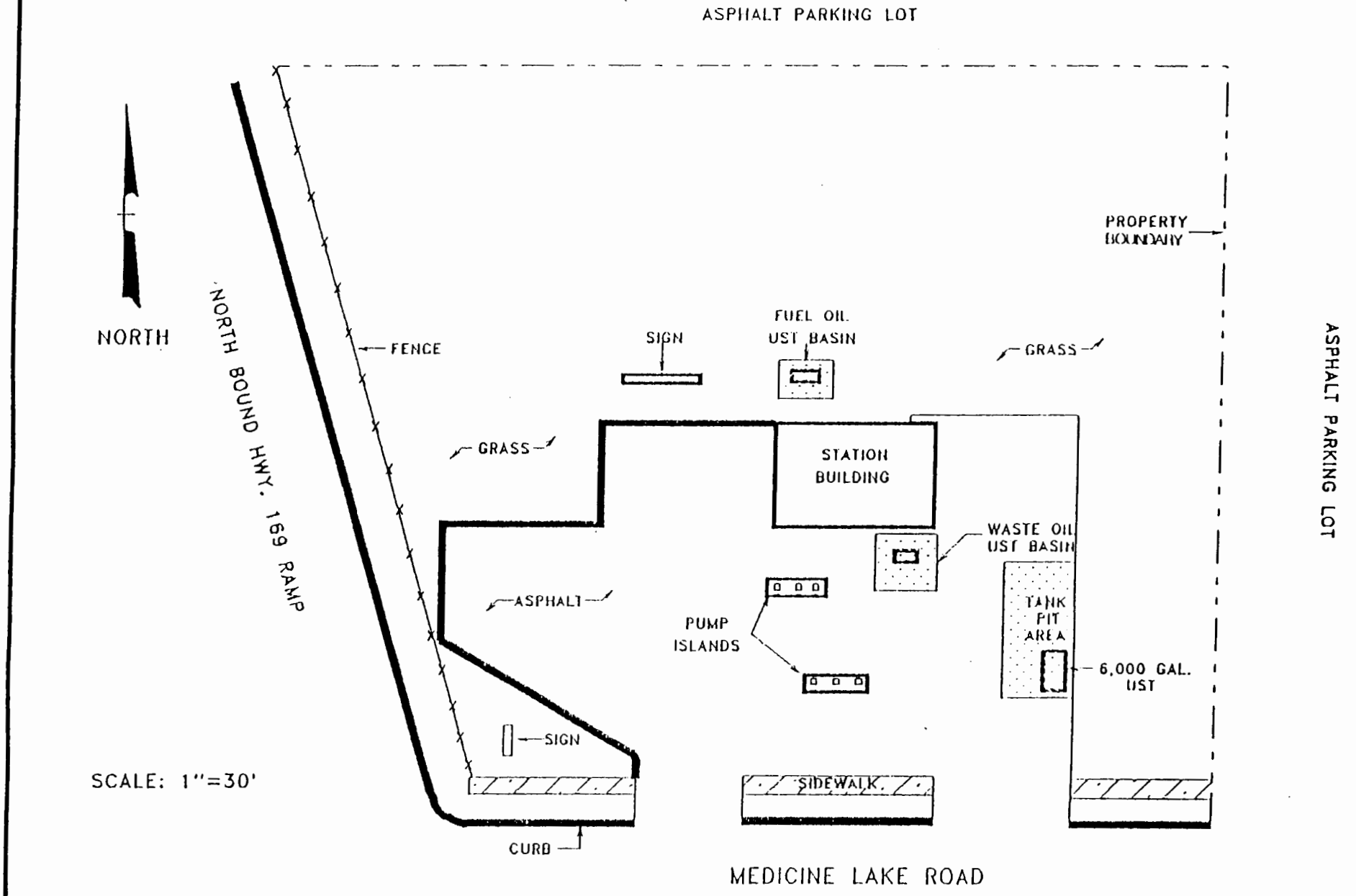
ENECOTECH

BLOOMINGTON, MINNESOTA

PROJECT: SINCLAIR SERVICE STATION
9456 MEDICINE LK. RD., NEW HOPE, MINNESOTA

SITE LOCATION MAP

FILE NO.: 711-015 DATE: MAY, 1990 FIGURE NO.: 1

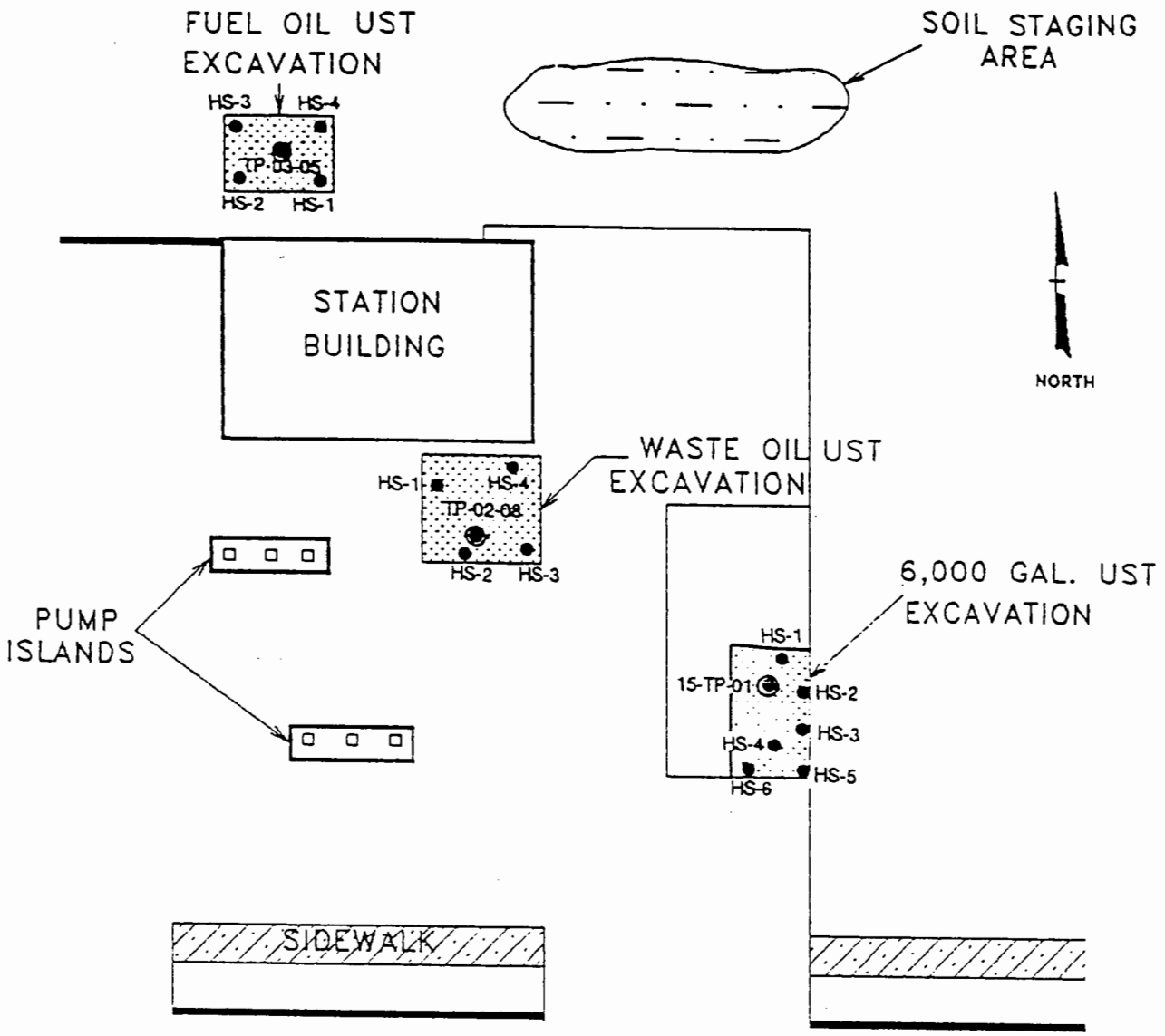


ENECOTECH
BLOOMINGTON, MINNESOTA

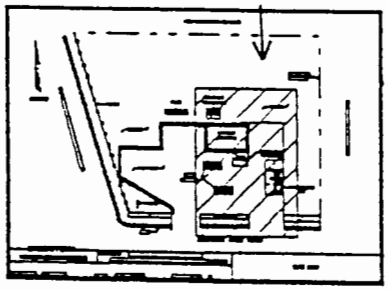
PROJECT SINCLAIR SERVICE STATION
9456 MEDICINE LAKE RD., NEW HOPE, MN

SITE MAP

FILE NO.: 711-015 DATE: MAY, 1990 FIGURE NO.: 2



MAP LOCATION



LEGEND

- ● SOIL HEADSPACE SAMPLING LOCATION
- ● SOIL ANALYTICAL SAMPLING LOCATION

SCALE: 1" = 20'

ENECOTECH

BLOOMINGTON, MINNESOTA

PROJECT SINCLAIR SERVICE STATION
9456 MEDICINE LAKE RD. NEW HOPE, MN

SOIL SAMPLING LOCATIONS

FILE NO.: 711-015

DATE: MAY, 1990

FIGURE NO.: 3

TABLES

PID MEASUREMENTS
SOIL LABORATORY ANALYTICAL RESULTS

TABLE 1
UST CLOSURE - PID MEASUREMENTS
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD
NEW HOPE, MINNESOTA

SAMPLE NUMBER	6,000 GALLON UNLEADED UST SAMPLE COLLECTION LOCATION	LITHOLOGY	DEPTH BELOW GRADE (FT)	OVM READING (PPM)
HS-01	N. TANK BASE	SAND	10	294
HS-02	E. WALL, N. END	CLAY	9	328
HS-03	E. WALL, CENTER	CLAY	9	355
HS-04	S. TANK BASE	SAND	10	154.2
HS-05	E. WALL, S. END	CLAY	9	382
HS-06	S. WALL	CLAY	8	344
	560 GALLON WASTE OIL UST			
HS-01	W. BASE	CLAY	8	20.5
HS-02	S. BASE	CLAY	8	133.4
HS-03	S. BASE	CLAY	8	142.1
HS-04	N. BASE	CLAY	8	32.1
	1000 GALLON FUEL OIL UST			
HS-01	S.E. BASE	CLAY	5	0.0
HS-02	S.W. BASE	CLAY	7	0.0
HS-03	N.W. BASE	CLAY	7	0.0
HS-04	N.E. BASE	CLAY	5	0.0

TABLE 2
SOIL LABORATORY ANALYTICAL RESULTS
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD
NEW HOPE, MINNESOTA

SAMPLE NUMBER	DATE	CADMIUM	CHROMIUM	LEAD	MTBE	BENZENE	TOLUENE	ETHYL BENZENE	XYLENE	T.H.C. AS GASOLINE	T.H.C. AS FUEL OIL
15-TP-01	4/11/90	"	"	"	<0.26	<0.24	15	13	77	400	"
15-TP-C	4/11/90	"	"	4	"	<0.21	7.9	3.7	53	420	"
# TP-02-08	4/13/90	<0.5	5	16	"	0.39	1.2	0.46	4.3	"	9000
TP-03-05	4/13/90	"	"	"	"	<0.06	<0.11	<0.05	<0.28	"	<1.4

= SEE LABORATORY REPORT FOR ADDITIONAL RESULTS ON THIS SAMPLE
" = TEST NOT PERFORMED
ALL RESULTS ARE IN MG/KG (PPM)
SEE LABORATORY REPORT FOR SPECIFIC DETECTION LIMITS USED IN EACH ANALYSIS

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APPENDIX A
LABORATORY ANALYTICAL DATA

interpoll

INTERPOLL LABORATORIES, INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL: 612/786-6020
FAX: 612/786-7854

May 3, 1990

EnecoTech
3050 Metro Drive, Suite 115
Bloomington, MN 55425

Attention: Jim Berg

LABORATORY REPORT: #9334
ENECOTECH PROJECT: #711-015

SAMPLES COLLECTED: April 11, 1990
SAMPLES RECEIVED: April 12, 1990

Sample Identification:			15-TP-C	15-TP-01
Sample Type:			Soil	Soil
Laboratory Log Number:			9334-01	9334-02
Parameter	Units	Target Detection Limit		
EPA Method SW-846, 8020:				
MTBE	mg/Kg	0.06		< 0.26
Benzene	mg/Kg	0.06	< 0.21	< 0.24
Toluene	mg/Kg	0.11	7.9	15
Ethylbenzene	mg/Kg	0.05	3.7	13
Xylenes	mg/Kg	0.28	53	77
EPA Method SW-846, 8015:				
Total hydrocarbons, as gasoline	mg/Kg	1.2	420	400
Dilution factor			4[1]	4[1]

Respectfully submitted,

Wayne A. Olson
Senior Scientist
Organic Chemistry Department

WAO/cg
Invoice Enclosed
< = less than

[1]The achieved detection limit is higher than the targeted detection limit because a smaller sample aliquot was used.

All analyses were performed using EPA or other recognized methodologies.
All units are on an "as received" basis unless otherwise indicated.

interpoll

INTERPOLL LABORATORIES, INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL: 612/786-6020
FAX: 612/786-7854

May 3, 1990

EnecoTech
3050 Metro Drive, Suite 115
Bloomington, MN 55425

Attention: Jim Berg

LABORATORY REPORT: #9334-01
ENECOTECH PROJECT: #711-015

SAMPLES COLLECTED: April 11, 1990
SAMPLES RECEIVED: April 12, 1990

Results of Sieve Analysis on Soil[1] Sample #15-TP-C

Mesh Size	Diameter	Relative Cumulative Frequency Percent by Mass Greater Than
18	1000 um	46.2
100	150 um	90.4
200	75 um	92.7

Sieve determination using sieves meeting ASTM E-11 specifications.

Respectfully submitted,

Gregg W. Holman,
Senior Scientist
Inorganic Chemistry Department

GWH/cg

[1]Soil sample was oven dried at 105°C.

interpoll

INTERPOLL LABORATORIES, INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL: 612/786-6020
FAX: 612/786-7854

May 3, 1990

EnecoTech
3050 Metro Drive, Suite 115
Bloomington, MN 55425

Attention: Jim Berg

LABORATORY REPORT: #9348
ENECOTECH PROJECT: #711-015

SAMPLES COLLECTED: April 13, 1990
SAMPLES RECEIVED: April 16, 1990

Sample Identification:	15-TP-C
Sample Type:	Soil
Laboratory Log Number:	9348-01

Parameter	Units	EPA Method	Target Detection Limit	
Lead	mg/Kg	SW-846, 6010	1.3	4

Sample Identification:	TP-02-08
Sample Type:	Soil
Laboratory Log Number:	9348-02

Parameter	Units	EPA Method	Target Detection Limit	
Arsenic	mg/Kg	SW-846, 6010	2.5	< 2.5
Cadmium	mg/Kg	SW-846, 6010	0.5	< 0.5
Chromium	mg/Kg	SW-846, 6010	0.5	5
Lead	mg/Kg	SW-846, 6010	1.3	16
Mercury	mg/Kg	SW-846, 7470	0.06	0.06

Sample Identification:			TP-02-08
Sample Type:			Soil
Laboratory Log Number:			9348-02
Parameter	Units	Target Detection Limit	
Modified SW-846 Method 3820:			
Total hydrocarbons, as fuel oil	mg/Kg	1.4	9000[1]
Dilution factor			100[2]
EPA Method SW-846, 3550/8080:			
Total PCB	mg/Kg	0.0033	0.050
Method MDH 465-C:			
Chloromethane	mg/Kg	0.17	< 0.17
Bromomethane	mg/Kg	0.03	< 0.03
Vinyl chloride	mg/Kg	0.04	< 0.04
Dichlorodifluoromethane	mg/Kg	0.11	< 0.11
Chloroethane	mg/Kg	0.03	< 0.03
Methylene chloride	mg/Kg	0.38	< 0.38
Trichlorofluoromethane	mg/Kg	0.11	< 0.11
1,1-Dichloroethene	mg/Kg	0.08	< 0.08
Allyl chloride	mg/Kg	0.04	< 0.04
1,1-Dichloroethane	mg/Kg	0.02	< 0.02
cis-1,2-Dichloroethene	mg/Kg	0.03	< 0.03
trans-1,2-Dichloroethene	mg/Kg	0.04	< 0.04
Chloroform	mg/Kg	0.04	< 0.04
1,1,2-Trichlorotrifluoroethane	mg/Kg	0.11	< 0.11
Dibromomethane	mg/Kg	0.06	< 0.06
1,2-Dichloroethane	mg/Kg	0.06	0.51
1,1,1-Trichloroethane	mg/Kg	0.18	< 0.18
Carbon tetrachloride	mg/Kg	0.05	< 0.05
Bromodichloromethane	mg/Kg	0.07	< 0.07
2,3-Dichloro-1-propene	mg/Kg	0.04	< 0.04
1,2-Dichloropropane	mg/Kg	0.04	< 0.04

Sample Identification:			TP-02-08
Sample Type:			Soil
Laboratory Log Number:			9348-02
Parameter	Units	Target Detection Limit	
Method MDH 465-C (continued):			
1,1-Dichloro-1-propene	mg/Kg	0.02	< 0.02
trans-1,3-Dichloropropene	mg/Kg	0.01	< 0.01
Trichloroethene	mg/Kg	0.07	< 0.07
1,3-Dichloropropane	mg/Kg	0.05	< 0.05
1,1,2-Trichloroethane	mg/Kg	0.13	< 0.13
Dibromochloromethane	mg/Kg	0.14	< 0.14
cis-1,3-Dichloropropene	mg/Kg	0.03	< 0.03
1,2-Dibromoethane	mg/Kg	0.03	< 0.03
2-Chloroethylvinyl ether	mg/Kg	0.09	< 0.09
Bromoform	mg/Kg	0.05	< 0.05
1,1,1,2-Tetrachloroethane	mg/Kg	0.04	< 0.04
1,2,3-Trichloropropane	mg/Kg	0.07	< 0.07
1,1,2,2-Tetrachloroethane	mg/Kg	0.27	< 0.27
Tetrachloroethene	mg/Kg	0.06	< 0.06
Pentachloroethane	mg/Kg	0.21	< 0.21
Chlorobenzene	mg/Kg	0.03	< 0.03
1,3-Dichlorobenzene	mg/Kg	0.06	< 0.06
1,2-Dichlorobenzene	mg/Kg	0.06	< 0.06
1,4-Dichlorobenzene	mg/Kg	0.09	< 0.09
Acetone	mg/Kg	2.8	< 2.8
Tetrahydrofuran	mg/Kg	1.1	< 1.1
Ethyl ether	mg/Kg	0.14	0.34
Methyl ethyl ketone	mg/Kg	0.49	< 0.49
Benzene	mg/Kg	0.06	0.39
Methyl isobutyl ketone	mg/Kg	0.20	< 0.20
Toluene	mg/Kg	0.11	1.2
Ethylbenzene	mg/Kg	0.05	0.46
Cumene	mg/Kg	0.22	< 0.22
Total xylenes	mg/Kg	0.28	4.3

Sample Identification:	TP-03-05
Sample Type:	Soil
Laboratory Log Number:	9348-03

Parameter	Units	Target Detection Limit	
EPA Method SW-846, 8020:			
Benzene	mg/Kg	0.06	< 0.06
Toluene	mg/Kg	0.11	< 0.11
Ethylbenzene	mg/Kg	0.05	< 0.05
Xylenes	mg/Kg	0.28	< 0.28
Modified SW-846 Method 3820:			
Total hydrocarbons, as fuel oil	mg/Kg	1.4	< 1.4

Respectfully submitted,

Gregg W. Holman,
Senior Scientist
Inorganic Chemistry Department

Wayne A. Olson,
Senior Scientist
Organic Chemistry Department

GWH/WAO/cg
Invoice Enclosed
< = less than

[1]Although quantified as fuel oil as requested, the chromatographic pattern did not match that of fuel oil.

[2]Sample extract was diluted as indicated to accommodate the concentration of the analyte. Reported values represent the concentration in the original undiluted sample, i.e., instrumental results were multiplied by the dilution factor prior to reporting. Target detection limits are given. The detection limit applicable to the sample may be obtained by multiplying the detection limit by the dilution factor.

All analyses were performed using EPA or other recognized methodologies.
All units are on an "as received" basis unless otherwise indicated.

APPENDIX B
CHAIN-OF CUSTODY

EnecoTech

3050 METRO DRIVE, SUITE 115
BLOOMINGTON, MN 55425 (612) 854-5513

CHAIN OF CUSTODY RECORD

NO. 00144

LOCATION: New Hope, MN
PROJECT NUMBER: 711-015
PROJECT MANAGER: JAB
LABORATORY: Interpoll
TURNAROUND TIME: Standard

ITEM NO.	SAMPLE NUMBER	NUMBER OF CONTAINERS AND TYPE	MATRIX	COLLECTION DATE	COLLECTION TIME	ANALYSIS REQUIRED
1	15-TP-C	1 Mason Jar	Soil	4/11/90	13:15	Sieve Analysis (< 200 mesh)
2	15-TP-C	1 250 mL & 3 40 ml	Soil	4/11/90	15:00	BTEX & TPH - Gasoline
3	15-TP-01	1 250 mL & 3 40 ml	Soil	4/11/90	14:20	BTEX, MTBE, TPH - Gasoline
4						
5						
6						
7						
8						
9						
10						

SAMPLER'S SIGNATURE	DATE
Jodi L. Pill	4/12/90

NOTES: Standard turnaround on all items

TRANSFER NO.	ITEM NO.	RELINQUISHED BY	ACCEPTED BY	DATE SUBMITTED
1	1-3	Jodi L. Pill	Bob Barry	4/12/90
2				
3				
4				

CHAIN OF CUSTODY RECORD

NO. 00122

ENECOTECH
3050 METRO DRIVE, SUITE 115
BLOOMINGTON, MN 55425 (612) 854-5513

LOCATION: Medicine Lake Rd
PROJECT NUMBER: 711-015
PROJECT MANAGER: JAB
LABORATORY: Interpoll
TURNAROUND TIME: Normal

ITEM NO.	SAMPLE NUMBER	NUMBER OF CONTAINERS AND TYPE	MATRIX	COLLECTION DATE	COLLECTION TIME	ANALYSIS REQUIRED
1	15-TP-C	1-250ml	Soil	4/13/90		Pb
2	TP-02-08	3-40ml, 1-250ml				MDH 465C, PCB EPA 600
3	TP-02-08	3-250ml				Pb, Cr, Cd, Hg, Arsenic, THC Fuel Oil
4	TP-03-05	3-40ml, 1-250ml				BETX, THC Fuel Oil
5						
6						
7						
8						
9						
10						

SAMPLER'S SIGNATURE	DATE
Wayne Jackson	4/13/90

NOTES:
Via: Sue Lee: use Method 608
4/16/90 dmw.

TRANSFER NO.	ITEM NO.	RELINQUISHED BY	ACCEPTED BY	DATE SUBMITTED
1	items 1-4	Wayne Jackson	Courier	4/16/90
2			Linda Wynne	4/16/90
3				
4				

APPENDIX B
SOIL INCINERATION RECORDS

711-015
Correspondence

MINNESOTA POLLUTION CONTROL AGENCY
APPLICATION TO TREAT PETROLEUM CONTAMINATED SOIL

I. Source of Soil:

Facility Name: Sinclair Service Station
Address: 9456 Medicine Lake Road
City, State, Zip: New Hope, Minnesota
Site ID#: LEAK 2433

Contact Name: Denny Lorenz
Telephone: (913) 321-4300

II. Contamination Details:

Volume Soil (yd^3): 150 yds^3

Type Petroleum Contamination: (gasoline) fuel, #2 fuel oil (circle one)

Contaminant Concentration (ppm)

Benzene	<0.21	____	____
Toluene	7.9	____	____
Total Xylenes	53	____	____
Total Hydrocarbons as Gasoline or Fuel Oil	420	____	____
Lead	4	____	____

Percent Soil less than 200 mesh or 74 microns 7.3 %

Soil Type (sand, silt, clay, etc.) Sand with minor amounts of clay

III. Proposed Asphalt Plant/Low Temperature Thermal Unit

Name: C.S. McCrossan
Address: 7865 Jefferson Hwy
(if portable, where will plant be located)

City, State, Zip: Maple Grove, MN 55369

Plant Number or Model: Standard Plant Model 1064

Contact: Bob Dougoske Title: Equipment Manager
Telephone: (612) 425-4167 Site Telephone: (612) 425-1255
Air Quality Permit Numoer: 785-A-86-OT-1

Separation Distance in feet from Nearest Resident: 658 ft
Separation Distance in feet from Nearest Business: 517 ft
Burner Temperature during Soil Treatment: 225 Degrees F
Soil Residence Time in Burner during Treatment: 5 minutes

IV. Include signed statement from asphalt concrete plant owner that the plant has been properly maintained and/or repaired prior to treatment of petroleum contaminated soils and is capable of operating in compliance with MPCA permit conditions and rules.

V. Date treatment will be completed: when delivered (If stockpiled before being treated, all petroleum contaminated soil must be tarped and run-off protection provided.)

VI. Final Disposition of Treated Soil: (hov used, location)
(If soils will not be incorporated into asphalt or road base, post burn testing is required. Soils will need to be sampled for the same parameters listed in item II. Two composite soil samples are to be taken for every 300 yard^3 of soil.) asphalt or road base

VII. Consultant Submitting Request:

Company Name: EnecoTech Midwest, Inc.
Address: 3050 Metro Drive, Suite 115
City, State, Zip: Bloomington, MN 55425

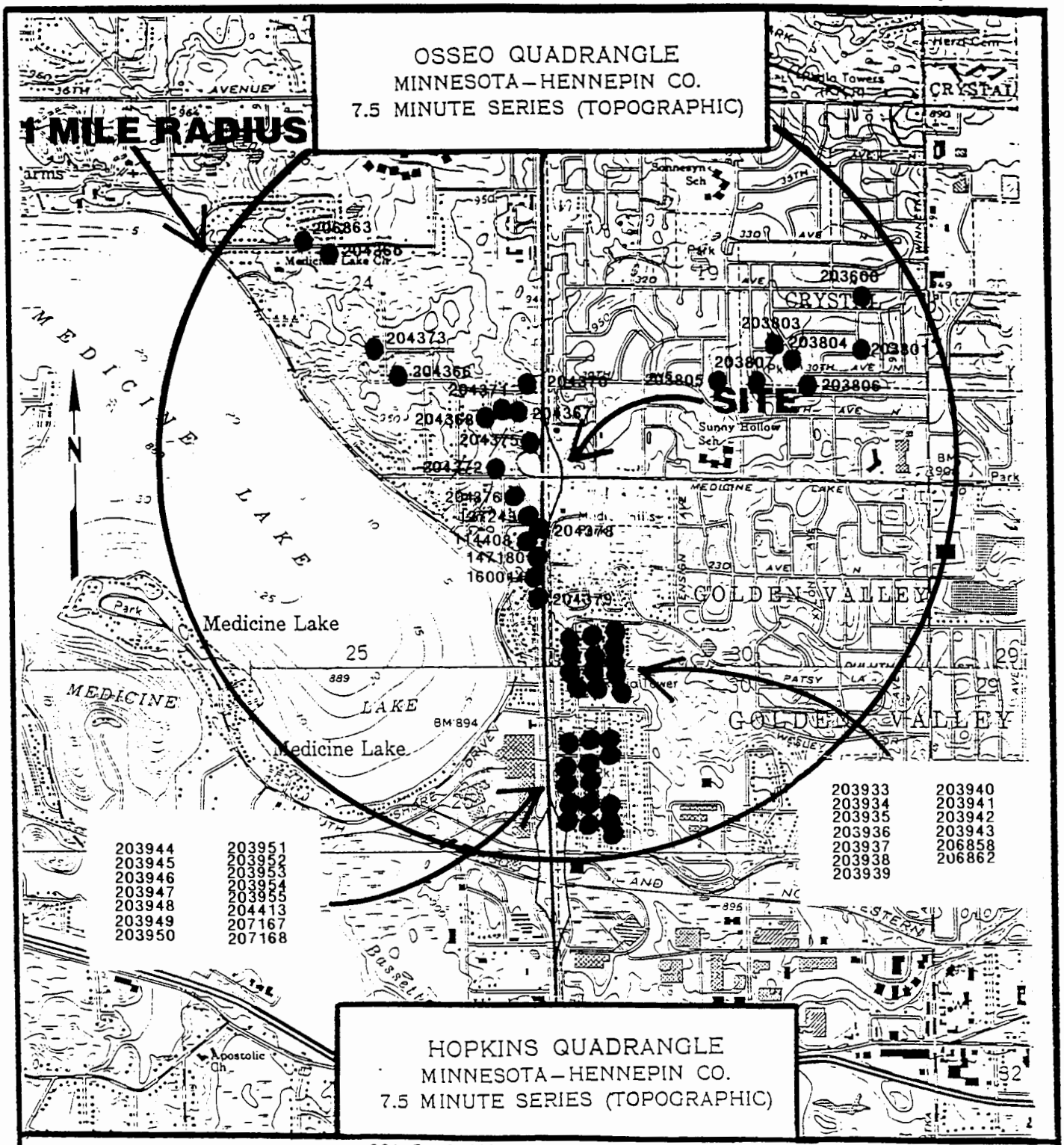
Contact Name: Jim Berg
Telephone: (612) 854-5513

Signature: Jim Berg

Date: 5/19/90

APPENDIX C
SURVEY OF POTENTIAL GROUND WATER RECEPTORS

EnecoTech®
ENVIRONMENTAL CONSULTANTS



ENECOTECH

BLOOMINGTON, MINNESOTA

PROJECT: SINCLAIR SERVICE STATION
9456 MEDICINE LK. RD., NEW HOPE, MINNESOTA

WATER WELL LOCATION MAP

FILE NO.: 711-015 DATE: MAY, 1991 FIGURE NO.: 1 EFW/SHW

TABLE
WATER SUPPLY SUMMARY
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD, NEW HOPE, MINNESOTA

MN UNIQUE WELL NO.	GROUND ELEVATION	WELL BASE ELEVATION	CASING BASE ELEVATION	GROUNDWATER ELEVATION	AQUIFER
114408	910	665	710	830	OSTP-OSTP
127243	915	756	N/A	845	QBAA-QBAA
147180	906	688	732	881	OSTP-OSTP
160014	909	679	714	855	OSTP-OSTP
203600	965	N/A	N/A	875	QUUU-QUUU
203801	965	783	787	865	QBAA-QBAA
203803	950	800	805	805	QBAA-QBAA
203804	945	777	783	867	QBAA-QBAA
203805	950	788	791	860	QBUA-QBUA
203806	955	849	852	875	QBUA-QBUA
203807	945	779	787	870	OSTP-OSTP
203933	935	850	N/A	885	QUUU-QUUU
203934	960	851	N/A	885	QUUU-QUUU
203935	955	855	N/A	873	QUUU-QUUU
203936	925	837	N/A	866	QUUU-QUUU
203937	955	854	N/A	892	QUUU-QUUU
203938	940	851	N/A	895	QUUU-QUUU
203939	950	858	N/A	882	QBUA-QBUA
203940	935	758	N/A	870	QUUU-QUUU
203941	945	851	N/A	872	QUUU-QUUU
203942	940	843	N/A	866	QUUU-QUUU
203943	935	846	N/A	880	QUUU-QUUU
203944	945	N/A	N/A	875	PLTS-PLTS
203945	940	587	N/A	N/A	N/L
203946	940	832	N/A	870	QUUU-QUUU
203947	930	840	909	870	QUUU-QUUU
203948	925	N/A	N/A	870	QUUU-QUUU
203949	915	825	N/A	860	QUUU-QUUU
203950	920	822	N/A	N/A	QBAA-QBAA
203951	920	823	N/A	875	QBAA-QBAA
203952	910	810	N/A	880	OSTP-OSTP
203953	915	821	N/A	875	QUUU-QUUU
203954	915	831	N/A	885	QUUU-QUUU
203955	895	836	840	875	QBAA-QBAA
204365	964	774	N/A	879	QBAA-QBAA
204366	955	770	774	885	QBAA-QBAA
204367	957	N/A	N/A	897	QUUU-QUUU
204368	955	774	N/A	N/A	QBAA-QBAA
204370	938	737	N/A	878	QBUA-QBUA
204371	950	780	N/A	870	QBAA-QBAA
204372	N/A	N/A	N/A	N/A	N/A
204373	N/A	N/A	N/A	N/A	N/A
204375	925	N/A	N/A	875	QBAA-QBAA
204376	925	764	N/A	875	N/A
204378	905	790	N/A	880	QUUU-QUUU
204379	905	766	770	883	QBAA-QBAA
204413	895	842	N/A	882	QBAA-QBAA
206858	N/A	N/A	N/A	N/A	N/A
206862	N/A	N/A	N/A	N/A	N/A
206863	945	794	798	870	QBAA-OSTP
207167	920	835	836	878	OPVL-OPVL

QBAA - BURIED ARTESIAN
QBUA - QUARTERNARY
QUUU - PLEISTOCENE UNDIFF.
OSTP - ST. PETER
PLTS - PLEISTOCENE
OPVL - PLATTEVILLE

TABLE
WATER SUPPLY SUMMARY
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD, NEW HOPE, MINNESOTA

MN UNIQUE WELL NO.	GROUND ELEVATION	WELL BASE ELEVATION	CASING BASE ELEVATION	GROUNDWATER ELEVATION	AQUIFER
207168	915	713	723	865	OSTP-OSTP

QBAA - BURIED ARTESIAN
QBUA - QUARTERNARY
QUUU - PLEISTOCENE UNDIFF.
OSTP - ST. PETER

PLTS - PLEISTOCENE
OPVL - PLATTEVILLE

STATE OF MINNESOTA
DEPARTMENT OF HEALTH

WATER WELL RECORD

Minnesota Statutes 156A.01-.08

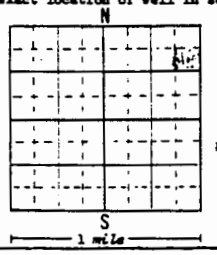
MINNESOTA UNIQUE WELL NO. for Water Sample: 114408

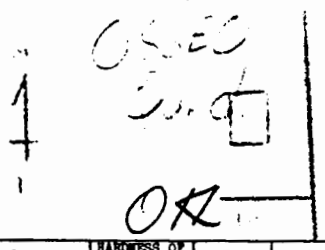
1. LOCATION OF WELL

County Name	Fraction	Section Number	Township Number	Range Number
HENNEPIN	se ¼ ne ¼ ne ¼	25	N. or S.	E. or W.

Distance and Direction from Road Intersections or Street Address and City of Well Location: 9540 24th Ave N Plymouth, MN

Show exact location of well in section grid with "X." Sketch map of well location.





3. PROPERTY OWNER'S NAME

Address: Ken Berscheid, 9540 24th Ave N, Plymouth, MN

4. WELL DEPTH (completed): 245 ft. Date of Completion: 18SEP76

5. 1 ☐ Cable tool 2 ☐ Hollow rod 3 ☒ Rotary 4 ☐ Reverse 5 ☐ Air 6 ☐ Jetted 7 ☐ Driven 8 ☐ Bored 9 ☐ Power Auger 10 ☐ Dug 11 ☐ _____

6. USE: 1 ☒ Domestic 2 ☐ Irrigation 3 ☐ Test Well 4 ☐ Public Supply 5 ☐ Air Conditioning 6 ☐ _____ 7 ☐ Industry 8 ☐ Commercial

7. CASING DIAM.: Threaded ☒ 1 Welded ☐ 3; Black ☒ 2 Galv. ☐ 4; 4 in. to 200 ft. depth; _____ in. to _____ ft. depth; _____ in. to _____ ft. depth

HEIGHT: Above/Below — Surface one ft. Weight 10.79 lbs./ft. Drive Shoe? Yes ☒ No ☐

8. SCREEN: Make _____ Type _____ Dia. _____ Slot/Gauge _____ Length _____ Set between _____ ft. and _____ ft.; _____ ft. and _____ ft.; _____ ft. and _____ ft.

Or open hole from 200 ft. to 245 ft.

FITTINGS:

9. STATIC WATER LEVEL: 80 ft. ☒ below ☐ above land surface Date Measured 18SEP76

10. PUMPING LEVEL (below land surface): _____ ft. after 3 hrs. pumping air 80 g.p.m.; _____ ft. after _____ hrs. pumping _____ g.p.m.

11. WELL HEAD COMPLETION: 1 ☒ Pitless adapter 2 ☐ Basement offset 3 ☐ At least 12" above grade

12. Well grouted? ☐ Yes ☒ No Cu. Yds. _____

1 ☐ Neat cement 2 ☐ Bentonite 3 ☐ _____

Depth: from _____ ft. to _____ ft.; from _____ ft. to _____ ft.

13. Nearest source of possible contamination: _____ feet _____ direction _____ type

Well disinfected upon completion? Yes ☒ No ☐

14. PUMP

Date installed 9SEP76 ☐ Not installed

Manufacturer's Name: Red Jacket

Model Number: BVC TSX 10 HP 1½ Volts 230

Length of drop pipe 105 ft. capacity 14 g.p.m.

Material of drop pipe: 1" galv

Type: 1 ☒ Submersible 2 ☐ Jet 3 ☐ L.S. Turbine 4 ☐ Centrifugal 5 ☐ Reciprocating 6 ☐ _____

16. WATER WELL CONTRACTOR'S CERTIFICATION

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

E. H. REHNER & SONS INC 27015
Licensee Business Name — License No.

Address: 6300 Industry Ave NW ANOKA 55303

Signed _____ Date _____
Authorized Representative

Name of Driller

2. FORMATION LOG

FORMATION LOG	COLOR	HARDNESS OF FORMATION	FROM	TO
CLAY CLAY	BROWN	QTUB	0	35
CLAY & GRAVEL CLAY, GRVL	BROWN	QUB	35	65
GRAVEL GRVL	BROWN	QTUB	65	72
CLAY & STONES CLAY, PEBB	BROWN	QTUB	72	93
CLAY CLAY	GRAY	QTUB	93	115
CLAY & STONES CLAY, PEBB	GRAY	QTUG	115	134
SANDSTONE SNDS	WHITE		134	194
SHALE SHLE	WHITE		194	199
SHALE SHLE	RED	sticky	199	205
ST PETER SS SNDS	RED	hard	205	245

118-22-25
AADACC
120-C
E Lev. 910 ± 5'
1-4
776
Aquifer OSTP-OSTP

CODED

Use a second sheet, if needed.

15. REMARKS, ELEVATION, SOURCE OF DATA, etc.

MINN. GEOLOGICAL SURVEY COPY

STATE OF MINNESOTA
DEPARTMENT OF HEALTH

WATER WELL RECORD

Minnesota Statutes 156A.01-.08

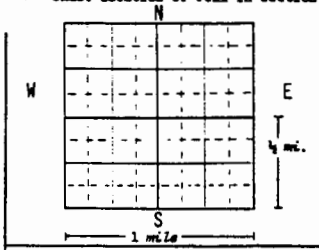
MINNESOTA UNIQUE WELL NO. for Water Sample: 127243

1. LOCATION OF WELL

County Name	Fraction	Section Number	Township Number	Range Number
[illegible]	¼ ¼ ¼		N. or S.	E. or W.

Distance and Direction from Road Intersections or Street Address and City of Well Location: Ossea Oil

Exact location of well in section grid with "X." Sketch map of well location.



3. PROPERTY OWNER'S NAME

Address: [illegible] 12 Dc

4. WELL DEPTH (completed) 145 ft. — **Date of Completion** Nov 77

5. 1 ☐ Cable tool 4 ☐ Reverse 7 ☐ Driven 10 ☐ Dug
2 ☐ Hollow rod 5 ☐ Air 8 ☒ Bored 11 ☐ _____
3 ☐ Rotary 6 ☐ Jetted 9 ☐ Power Auger

6. USE

1 ☐ Domestic 4 ☐ Public Supply 7 ☐ Industry
2 ☐ Irrigation 5 ☐ Air Conditioning 8 ☐ Commercial
3 ☐ Test Well 6 ☐ _____

7. CASING DIAM.

Threaded ☒ 1 Welded ☐ 3
Black ☒ 2 Galv. ☐ 4
_____ in. to _____ ft. depth
_____ in. to _____ ft. depth
_____ in. to _____ ft. depth

HEIGHT: Above/Below
Surface _____ ft.
Weight _____ lbs./ft.
Drive Shoe? Yes ___ No ___

8. SCREEN — Or open hole from _____ ft. to _____ ft.

Make _____
Type _____ Dia. _____
Slot/Gauze _____ Length _____
FITTINGS:
Set between _____ ft. and _____ ft.
_____ ft. and _____ ft.
_____ ft. and _____ ft.

9. STATIC WATER LEVEL

[illegible] ft. ☐ below land surface ☐ above — Date Measured _____

10. PUMPING LEVEL (below land surface)

[illegible] ft. after _____ hrs. pumping _____ g.p.m.
_____ ft. after _____ hrs. pumping _____ g.p.m.

11. WELL HEAD COMPLETION

1 ☒ Pitless adapter 2 ☐ Basement offset 3 ☐ At least 12" above grade

12. Well grouted? ☐ Yes ☐ No Cu. Yds. _____

1 ☐ Neat cement 2 ☐ Bentonite 3 ☐ _____
Depth: from _____ ft. to _____ ft.
From _____ ft. to _____ ft.

13. Nearest source of possible contamination

_____ feet _____ direction _____ type
Well disinfected upon completion? Yes ☒ No ☐

14. PUMP

Date installed 11/77 ☐ Not installed
Manufacturer's Name _____
Model Number _____ HP _____ Volts _____
Length of drop pipe _____ ft. capacity _____ g.p.m.
Material of drop pipe _____
Type: 1 ☒ Submersible 3 ☐ L.S. Turbine 5 ☐ Reciprocating
2 ☐ Jet 4 ☐ Centrifugal 6 ☐ _____

2. FORMATION LOG	COLOR	HARDNESS OF FORMATION	FROM	TO
Clay QTUB-CLAY	yellow		0	30
Gravel QTUB SAND & GRVL	Brown		30	60
Clay QTUR-CLAY	Red		60	145
Rocks & Sand QPUB-COBBLES & SAND	Brown		145	156
Water - Sand. → QFUB-SAND	Brown		156	164
118-22-25 AAADBC				
Elev. 915± 5				
Aquifer: QTSAA-QBAA				

COPY

LOCATED BY
1 - ☒ Address Verification
2 - ☐ Name on Mailbox
3 - ☐ Lot-Block
4 - ☐ Plat Book
5 - ☐ Info. From Owner
6 - ☐ Info. From Neighbor
7 - ☐ Other _____
☐ Can't Locate State Why

Use a second sheet, if needed.

REMARKS, ELEVATION, SOURCE OF DATA, etc.

16. WATER WELL CONTRACTOR'S CERTIFICATION

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

[illegible] 1056
License Business Name — License No.

Address _____

Signed _____ Date 11/77
Authorized Representative

_____
Name of Driller

7/74 30M

MINN. GEOLOGICAL SURVEY COPY

STATE OF MINNESOTA DEPARTMENT OF HEALTH

WATER WELL RECORD

Minnesota Statutes 156A.01-.08

MINNESOTA UNIQUE WELL NO. for Water Sample: 147

1. LOCATION OF WELL

County Name: Hennepin

Township Name	Township Number	Range Number	Section No.	Fraction
Plymouth	118 N/S	22 E/W	25	NE SE NE

Distance and Direction from Road Intersections or Street Address and City of Well Location: 9620 – 25th Ave. No. Plymouth

Show exact location of well in section grid with "X." Sketch map of well location.

N / W / E / S; 1 mile; ½ mi.

Addition Name:

Block Number:

Lot Number:

3. PROPERTY OWNER'S NAME: Sherman Goodmanson

Address: 9620 – 25th Ave. No. Plymouth, Minn.

4. WELL DEPTH (completed): 218 ft. Date of Completion: July 26, 1978

5. ☐ 1 Cable tool ☐ 4 Reverse ☐ 7 Driven ☐ 9 Dug ☐ 2 Hollow rod ☐ 5 Air ☐ 8 Bored ☐ 11 ☒ Rotary ☐ 6 Jetted ☐ 9 Power Auger

6. USE: ☒ 1 Domestic ☐ 4 Public Supply ☐ 7 ☐ 2 Irrigation ☐ 5 Municipal ☐ 8 ☐ 3 Test Well ☐ 6 Air Conditioning ☐ 9

7. CASING: ☐ 1 Black ☒ ☐ 4 Threaded ☒ HEIGHT: Above/Below Surface ft. ☐ 2 Galv. ☐ 5 Welded ☐ 3 ☐ 6 Drive Shoe? Yes ☒ No ☐

in. to ft.	Weight lbs./ft.		in. to ft.	Weight lbs./ft.
in. to ft.	Weight lbs./ft.		in. to ft.	Weight lbs./ft.
in. to ft.	Weight lbs./ft.		in. to ft.	Weight lbs./ft.

8. SCREEN: Make NONE Or open hole from 174 ft. to 218 ft.

Type 906 Dia. 6" Slot/Gauze 147 Length ft. FITTINGS

Set between ft. and ft.

9. STATIC WATER LEVEL: 25 ft. ☐ below land surface ☐ above Date Measured

10. PUMPING LEVEL (below land surface): 100 ft. after 3 hrs. pumping 40 gpm

ft. after hrs. pumping gpm

11. WELL HEAD COMPLETION: ☐ 1 Pitless adapter ☐ 2 Basement offset ☐ 3

12. Well grouted? ☒ Yes ☐ No Cu. Yds.

☐ 1 Neat Cement ☒ 2 Bentonite ☐ 3

Depth: from ft. to ft.

from ft. to ft.

13. Nearest sources of possible contamination: feet direction

Well disinfected upon completion? ☒ Yes ☐ No

14. PUMP: Date Installed ☐ Not Installed

Manufacturer's Name: Red Jacket

Model Number HP 10 Volts

Length of drop pipe 60 ft. capacity

Material of drop pipe steel

Type: ☒ 1 Submersible ☐ 3 L. S. Turbine ☐ 5 Reciprocating ☐ 2 Jet ☐ 4 Centrifugal ☐ 6

2. FORMATION LOG

FORMATION	COLOR	HARDNESS OF FORMATION	FROM	TO
Clay QTUG-CLAY	Gray	hd	1	27
Gravel QFU-GRVL		Soft	27	42
Clay QTUB-CLAY	Brown	hd	42	81
Clay QTUG-CLAY	Gray	"	81	107
Clay QTUR-CLAY	Red	"	107	122
Shale OSTP-SHLE	Blue	"	142	168
Sandrock OSTP-SNDS	White	"	168	184
Sandrock " "	Red - fine	"	184	199
Sandrock " "	White	"	199	218
Rock very hard			184 – 199	
Very little cuttings				
118-22-25 AAACDDD				
Elev. 906 ± 5				
218				
Aquifer: Basal Cambrian				

CODED

LOCATED BY

1 - ☒ Address Verification
2 - ☐ Name on Mailbox
3 - ☐ Lot-Block
4 - ☐ Plat Book
5 - ☐ Info. From Owner
6 - ☐ Info. From Neighbor
7 - ☐ Other
☐ Can't Locate State Why

REMARKS, ELEVATION, SOURCE OF DATA, etc. Use a second sheet if needed.

16. WATER WELL CONTRACTOR'S CERTIFICATION

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

WORK WELL COMPANY 02133

Licensee Business Name

Address 7303 – 185th Ave. NW

Signed Authorized Representative Date

WATER WELL RECORD

Minnesota Statutes 156A.01-.08 — for Water Sample

County Name: HENNEPIN

Township Name	Township Number	Range Number	Section No.	Fraction
PLYMOUTH	118 N/S	22 E/W	25	se ¼ ne ¼ ne ¼

Distance and Direction from Road Intersections or Street Address and City of Well Location

9610 25th Ave N Plymouth

Correct location of well in section grid with "X."

Addition Name / Block Number / Lot Number

Sketch map of well location.

3. PROPERTY OWNER'S NAME

RON GRIDLEY

Address: 4903 S Cedar Lake Rd
MPLS, MN 55416

12DC

4. WELL DEPTH (completed)

230 ft.

Date of Completion: 26FEB79

5.

1 ☐ Cable tool 4 ☐ Reverse 7 ☐ Driven 10 ☐ Dug
2 ☐ Hollow rod 5 ☐ Air 8 ☐ Bored 11 ☐ _____
3 ☒ Rotary 6 ☐ Jetted 9 ☐ Power Auger

6. USE

1 ☒ Domestic 4 ☐ Public Supply 7 ☐ Industry
2 ☐ Irrigation 5 ☐ Municipal 8 ☐ Commercial
3 ☐ Test Well 6 ☐ Air Conditioning 9 ☐

7. CASING

1 ☒ Black 4 ☒ Threaded
2 ☐ Galv. 5 ☐ Welded
3 ☐ Plastic 6 ☐

HEIGHT (Above/Below) Surface: one ft.

Drive Shoe? Yes ☒ No ☐

4 in. to 195 ft. Weight 10.79 lbs./ft.
_____ in. to _____ ft. Weight _____ lbs./ft.
_____ in. to _____ ft. Weight _____ lbs./ft.

HOLE DIAM: _____ in. to _____ ft.; _____ in. to _____ ft.; _____ in. to _____ ft.

8. SCREEN

Make _____

Or open hole from 195 ft. to 230 ft.

Type _____ Dia. _____
Slot/Gauze _____ Length _____
FITTINGS:
Set between _____ ft. and _____ ft.
_____ ft. and _____ ft.
_____ ft. and _____ ft.

9. STATIC WATER LEVEL

54 ft. ☒ below land surface ☐ above — Date Measured 26FEB79

10. PUMPING LEVEL (below land surface)

_____ ft. after 3 hrs. pumping air 80 g.p.m.
_____ ft. after _____ hrs. pumping _____ g.p.m.

11. WELL HEAD COMPLETION

1 ☒ Pitless adapter 2 ☐ Basement offset 3 ☐ At least 12" above grade

12. Well grouted?

☒ Yes ☐ No Cu. Yds. _____

1 ☐ Neat Cement 2 ☒ Bentonite 3 ☐ _____

Depth: from _____ ft. to _____ ft.
from _____ ft. to _____ ft.

13. Nearest source of possible contamination

_____ ft. _____ direction _____ type

Well disinfected upon completion? Yes ☒ No ☐

14. PUMP

Date installed 8MAR79 ☐ Not installed

Manufacturer's Name: RAN JARKEY Jacuzzi
Model Number: 5S419-S1 HP ½ Volts 115
Length of drop pipe: 84 ft. capacity 8 g.p.m.
Material of drop pipe: 1" galv
Type: 1 ☒ Submersible 3 ☐ L. S. Turbine 5 ☐ Reciprocating
2 ☐ Jet 4 ☐ Centrifugal 6 ☐ _____

2. FORMATION LOG

FORMATION LOG	COLOR	HARDNESS OF FORMATION	FROM	TO
CLAY QTUB-CLAY	YELLOW		0	13
QTUB-CLAY, GRVL				
CLAY & ROCKS	DRK YELLOW		13	16
CLAY QTUR-CLAY	RED		16	24
GRAVEL QFUU-GRVL	DARK		24	46
CLAY QTUR-CLAY	RED		46	95
GRAVEL QFUU-GRVL	DARK		95	101
CLAY QTUB-CLAY	YELLOW		101	104
CLAY QTUG-CLAY	GRAY		104	119
GRAVEL QFUU-GRVL	DARK		119	124
QTUG-CLAY, GRVL				
CLAY & GRAVEL	GRAY		124	136
GRAVEL QFUU-GRVL	DARK		136	142
QTUG-CLAY, GRVL				
CLAY & GRAVEL	GRAY		142	167
SHALE OSTP-SHLE	WHITE		167	176
SHALE OSTP-SHLE	BLUE		176	185
SHALE OSTP-SHLE	RED		185	192
OSTP-SHLE, SNDS				
SHALE & SANDSTONE	WHITE		192	230
Asg: OSTP-OSTP				

COD

118-22-25
MADCC
Elev 909.15
TD 230
909
16 7/2
7 4

LOCATED BY
1 - ☑ Address Verification
2 - ☐ Name on Mailbox
3 - ☐ Lot Book
4 - ☐ Plat Book
5 - ☐ Info. From Owner
6 - ☐ Info. From Neighbor
7 - ☐ Other _____
☐ Can't Locate State Why

15. WATER WELL CONTRACTOR'S CERTIFICATION

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

E. H. RENNER & SONS INC 02015
Licensee Business Name — License No.

Address 6300 Industry Ave NW ANOKA, MN 55303

Signed _____ Date 12MAR79
Authorized Representative

_____ Date 12MAR79
Name of Driller

16. REMARKS, ELEVATION, SOURCE OF DATA, etc.

Use a second sheet, if needed.

MINN. GEOLOGICAL SURVEY COPY

100014

5/74 30M
7/76 30M
7/78 30M

2D-17

Crystal 203600 J.

120'c

EMPLOYER John Redenfors 8133-32 ave nlt

WEEK ENDING Aug 29 1942 WEEK No.

DAY OF WEEK	BEFORE NOON IN HR.	BEFORE NOON IN MIN.	BEFORE NOON OUT HR.	BEFORE NOON OUT MIN.	AFTERNOON IN HR.	AFTERNOON IN MIN.	AFTERNOON OUT HR.	AFTERNOON OUT MIN.	EVENING IN HR.	EVENING IN MIN.	EVENING OUT HR.	EVENING OUT MIN.	TOTAL TIME EACH DAY REGULAR	TOTAL TIME EACH DAY O'TIME
SUNDAY	1	30												
MONDAY	20	x	54	x	52	screen								
TUESDAY	74	"	Sander											
WEDNESDAY	90	Ave to Level												
THURSDAY	20	open												
FRIDAY														
SATURDAY														
OTHER INFORMATION												TOTAL FOR WEEK		

I hereby certify that the above is a true report of hours of my employment during said week, to comply with the Wage and Hour Division of the Fair Labor Standards Act of 1938.

Date Reported Aug 31 1942 Signature A Nelson

118-21-19 drib Apb

Elev. 965±5

A 955E.

Qal. R18

DRFT Drift

Q-130

R/835

Aquifer Quat Qtv

203801

120c

122

Osec A

WELL LOG

Aamot Well Drilling Co., Inc.

Well Owner: Hirsch, Richard

Location: 202 31st ave. No. Brooklyn Park

Date Completed: 9/20/61 Driller: Alfred Adams

Depth			Description of Formation	
0	to 21	CLAY	Yellow Clay	QTUB
21	to 92	GRVL, COBL	Coarse gravel + rocks	QFUV
92	to 52	SAND	Fine grey sand	QFUO
52	to 101	GRVL	Coarse gravel	QFUV
101	to 140	HDPN	Hardpan	QTUV
140	to 177	SAND	Fine w.d. sand	QFUR
177	to 182	SAND	Grey coarse sand B/703	QFUG
	to		118-21-19 dab cdb	
	to		Elev. 965±5'	
	to		182 / 183	

PLTB

Aquifer QBAA-QBAA

SIZES AND MATERIALS USED

Top Casing Line: Inside Diameter 3 in. Wt. per ft. ____ lbs.

Depth 178 ft. ____ in.

Any Reduced Casing Sizes ____

Total Depth to bottom of Casing 178 ft. ____ in.

Total Depth to bottom of Well 182 ft. ____ in.

Depth measured from: Gr. level Water level: 100'

Screened Well: Size of Screen: Diam. 1¼ in. Length 5 ft. Slot 40 gauge

Make of Screen Clayton Mark Metal ____

Fittings ____

COPIED

Rock Well: Open Borehole ____ inches diam. ____ ft. deep below casing

Test data: 20 (gpm) (cph) ____ ft. drawdown. Pumped for 3¼ hrs.

Test Pump: ____

Tot. Len. of Setting: ____

NOTES: ____

203903

120C

A 104

Sec.

Stat Log sent in 11-9-61

WELL LOG

Aamot Well Drilling Co., Inc.

Well Owner: [illegible]

Location: 3031 [illegible] New Hope

Date Completed: 10-4-61 Driller [illegible]

Depth			Description of Formation	
0'	to 75	clay		QTUU
75	to 85	SAND		QFUU
85	to 115	SAND		QFUU
115	to 125	HDPN SILT		QTUU
125	to 126	clay		QTUR
126	to 131	HDPN SILT		QTUU
131	to 145	SAND, clay		QUUR QFUU
145	to 150	SAND		QFUU B/600
____	to ____		118-21-19 dbc AAd	
____	to ____		Elev. 950±5'	

F. 3

SIZES AND MATERIALS USED

Top Casing Line: Inside Diameter 3 in. Wt. per ft. ____ lbs.

Depth 145 ft. ____ in.

Any Reduced Casing Sizes ____

Total Depth to bottom of Casing 145 ft. ____ in.

Total Depth to bottom of Well 150 ft. ____ in.

Depth measured from [illegible] Water level: [illegible]

Screened Well: Size of Screen: Diam. 3 in. Length 6 ft. Slot [illegible]

Make of Screen [illegible] Metal [illegible]

Fittings [illegible]

COPY

Rock Well: Open Borehole ____ inches diam. ____ ft. deep below casing

Test data: 10-4-61 (gpm) (gph) 10 ft. drawdown. Pumped for 4 hrs.

Test Pump: 3 in Aermotor Submersible

Tot. Len. of Setting: 115 ft

NOTES: ____

Aquifer QBAA-QBAA

203804

Need address

120C

10

A055

WELL LOG

Aamot Well Drilling Co., Inc.

Well Owner: Richard Henderson

Location: 3025 Kuskokwim YUKON New Hope

Date Completed: 11-18-71 Driller: Jack Aram

Depth			Description of Formation	
0'	to 75'	clay, cobble	Clay and Rock	QTUU
75	to 115'	gravel, cobble	Gravel and Rock	QFUU
115	to 144'	clay, gravel	Clay and Gravel	QUUU
144	to 151'	sand	Sand	QFUU
151	to 168'	sand	Coarse Sand	QFUU
	to			
	to		118-21-19 dbcAda	
	to		Elev 945±5'	
	to		168	
	to		777	

SIZES AND MATERIALS USED

Top Casing Liner Inside Diameter 3 in. Wt. per ft. ____ lbs.

Depth 142 ft. ____ in.

Any Reduced Casing Sizes ____

Total Depth to bottom of Casing 142 ft. ____ in.

Total Depth to bottom of Well 161 ft. ____ in.

Depth measured from Ground Lvl. Water level: 78

Screened Well: Size of Screen: Diam. 1 1/4 in. Length 4 ft. Slot 10

Make of Screen Johnson Metal galv.

Fittings 4' Stnd. 2" th. end point

Rock Well: Open Borehole ____ inches diam. ____ ft. deep below casing

Test data: ____ (gpm) ____ ft. drawdown. Pumped for ____ hrs.
(gph)

Test Pump: ____

Tot. Len. of Setting: ____

NOTES: ____

GEOS

202605 A(69) 120c

WELL LOG

0550 ✓

Aamot Well Drilling Co., Inc.

Well Owner: Dick Hrisch

Location: 3013 Aquila Ave NO Grand Hope

Date Completed: _____ Driller: Floyd Larson

Depth			Description of Formation	
0'	to 58'	CLAY	Clay	QTUU
58	to 147'	SAND	Sand	QFUR
147	to 154'	SAND, GRVL	Sand & Gravel	QFUU
154	to 162'	SAND, GRVL, COBL	Soft Sand Clay Gravel	QFUU
___	to ___'			
___	to ___'		118-21-19 dbc cbb	
___	to ___'		Elev. 950±5'	
___	to ___'		154	
___	to ___'		796	
___	to ___'			

PL

SIZES AND MATERIALS USED

Top Casing Line: Inside Diameter 3 in. Wt. per ft. _____ lbs.

Depth _____ ft. _____ in.

Any Reduced Casing Sizes _____

Aquifer QBUA-QB

Total Depth to bottom of Casing 159 ft. _____ in.

Total Depth to bottom of Well 162 ft. _____ in.

Depth measured from: ground Water level: 90'

Screened Well: Size of Screen: Diam. _____ in. Length _____ ft. Slot _____

Make of Screen _____ Metal _____

Fittings _____

Rock Well: Open Borehole _____ inches diam. _____ ft. deep below casing

Test data: _____ (gpm) _____ ft. drawdown. Pumped for _____ hrs.
(gph)

Test Pump: _____

Tot. Len. of Setting: _____

NOTES: _____

COPIED

120c

203806

117

FHA Log Sheet 055.C0

Sent 2-16-62

WELL LOG

Aamot Well Drilling Co., Inc.

Well Owner: Richard Grieb

Location: S3[illegible]-T3[illegible] [illegible] Mc.

Date Completed: [illegible] Driller: [illegible]

Depth			Description of Formation	
0'	to	[illegible]'	CLAY [illegible]	QTUU
[illegible]	to	[illegible]'	CLAY [illegible]	QTUU
[illegible]	to	[illegible]'	SAND [illegible]	QFUU
[illegible]	to	[illegible]'	SAND GRVL [illegible] B/849	QFUU
	to			
	to		118-21-19 dbd cdd	
	to		Elev. 955±5'	
	to			
	to			
	to			

Aquifer QBUA-QBUA

COPIED

SIZES AND MATERIALS USED

Top Casing Line: Inside Diameter [illegible] in. Wt. per ft. [illegible] lbs.

Depth [illegible] ft. [illegible] in.

Any Reduced Casing Sizes [illegible]

Total Depth to bottom of Casing 103 ft. [illegible] in.

Total Depth to bottom of Well 106 ft. [illegible] in.

Depth measured from: [illegible] Water level: [illegible]

Screened Well: Size of Screen: Diam. [illegible] in. Length [illegible] ft. Slot [illegible]

Make of Screen [illegible] Metal [illegible]

Fittings [illegible]

Rock Well: Open Borehole [illegible] inches diam. [illegible] ft. deep below casing

Test data: [illegible] (gpm) [illegible] ft. drawdown. Pumped for [illegible] hrs.

~~(gph)~~

Test Pump: [illegible]

Tot. Len. of Setting: [illegible]

NOTES: [illegible]

120-C

203807 A (68) Osso

WELL LOG

Aamot Well Drilling Co., Inc.

Well Owner: Richard Hirsch

Location: 2745 Aquila Fallbrook

Date Completed: 11/14/61 Driller: Floyd Iverson

Depth			Description of Formation	
0'	to 20	CLAY	Clay	QTUU ALI
20	to 60	CLAY, GRVL	Clay & gravel	QUUU
60	to 80	CLAY	Clay	QTUU
80	to 110	CLAY, COBBL	Clay & Rocks	QTUU
110	to 147	CLAY SAND	Red Clay & Sand	QUUR
147	to 158	SAND	Red Sand	T/187 QFUR
158	to 166	SNDS	Sand Rock. OSP	
	to		18-21-19 deb bab	
	to		Elev. 945±5'	
	to			

OSTP

Aquifer OSTP-OSTP

230-260

SIZES AND MATERIALS USED

Top Casing Line: Inside Diameter 3 in. Wt. per ft. _____ lbs.

Depth _____ ft. _____ in.

Any Reduced Casing Sizes _____

Total Depth to bottom of Casing 158 ft. _____ in.

Total Depth to bottom of Well 166 ft. _____ in.

Depth measured from: ground Water level: 70

Screened Well: Size of Screen: Diam. _____ in. Length _____ ft. Slot _____

Make of Screen _____ Metal _____

Fittings _____

Rock Well: Open Borehole 3 inches diam. 8 ft. deep below casing

Test data: 20 (gpm) _____ ft. drawdown. Pumped for _____ hrs.
1200 (gph)

Test Pump: _____

Tot. Len. of Setting: _____

NOTES: _____

4/23/74 Pickup Wash. Ave Mines Buildin Church St. Dr. Robert Leggett

1A-25 Golden Va 20323- 120 -

MILLER-DAVIS CO., MINNEAPOLIS 8578-C 2016 Liberty

EMPLOYEE Brandt & Anderson Q (204)

WEEK ENDING 9-22 19 41 WEEK No.

DAY OF WEEK	BEFORE NOON IN HR.	BEFORE NOON IN MIN.	BEFORE NOON OUT HR.	BEFORE NOON OUT MIN.	AFTERNOON IN HR.	AFTERNOON IN MIN.	AFTERNOON OUT HR.	AFTERNOON OUT MIN.	EVENING IN HR.	EVENING IN MIN.	EVENING OUT HR.	EVENING OUT MIN.	TOTAL TIME EACH DAY REGULAR	TOTAL TIME EACH DAY O'TIME
SUNDAY	8	5												
MONDAY	7	45	6	9									0-85	
TUESDAY														
WEDNESDAY														
THURSDAY														
FRIDAY														
SATURDAY														
OTHER INFORMATION												TOTAL FOR WEEK		

PRFT Drift

b/855

Apply QUUU QUUU

I hereby certify that the above is a true report of hours of my employment during said week, to comply with the Wage and Hour Division of the Fair Labor Standards Act of 1938.

Date Reported 9-22 1941 Signature H Haberman

118-21-30 bedbb

Elev. 935±5'

1A-25

Golden Valley 203934

Ck Q #44

EMPLOYEE Gordy Burandt Feb. 28, 63

WEEK ENDING 1913 Independence 19 WEEK No.

DAY OF WEEK	BEFORE NOON IN HR.	BEFORE NOON IN MIN.	BEFORE NOON OUT HR.	BEFORE NOON OUT MIN.	AFTERNOON IN HR.	AFTERNOON IN MIN.	AFTERNOON OUT HR.	AFTERNOON OUT MIN.	EVENING IN HR.	EVENING IN MIN.	EVENING OUT HR.	EVENING OUT MIN.	TOTAL TIME EACH DAY REGULAR	TOTAL TIME EACH DAY O'TIME
SUNDAY	109' Perm												Quan	0-109
MONDAY	25' To water													
TUESDAY	1¼-105 FT Johnson Screen													
WEDNESDAY	2" Aerdek Rope Seal, 6½' Outfall													
THURSDAY	20 SFX													
FRIDAY	Sand Formation													
SATURDAY														
OTHER INFORMATION													TOTAL	

CODED

I hereby certify that the above is a true report of the hours of my employment during said week, to comply with the Wage and Hour Division of the Fair Labor Standards Act of 1938.

Date Reported Feb 28 19 Signature

DRFT Drift

D/C51

Aquifer Quuu-Quuu

118-21-30 bcc cAb

Elev. 960±5'

14-25 RG GTS

Golden Valley 2031 E

118-21-30 bcc cbd

Elev. 955

MILLER-DAVIS CO., MINNEAPOLIS 667B-C

EMPLOYEE Brandt + [illegible] 13[illegible] [illegible] Johns Ave [illegible]

WEEK ENDING [illegible] WEEK No. [illegible]

DAY OF WEEK	BEFORE NOON IN HR.	BEFORE NOON IN MIN.	BEFORE NOON OUT HR.	BEFORE NOON OUT MIN.	AFTERNOON IN HR.	AFTERNOON IN MIN.	AFTERNOON OUT HR.	AFTERNOON OUT MIN.	EVENING IN HR.	EVENING IN MIN.	EVENING OUT HR.	EVENING OUT MIN.	TOTAL TIME EACH DAY REGULAR	TOTAL TIME EACH DAY O'RTIME
SUNDAY	10													
MONDAY											QUUU		0-100	
TUESDAY														
WEDNESDAY	82													
THURSDAY	20													
FRIDAY	[illegible]													
SATURDAY														
OTHER INFORMATION											TOTAL FOR WEEK			

Draft DR B/855

Apply QUUU QUUU

I hereby certify that the above is a true report of hours of my employment during said week, to comply with the Wage and Hour Division of the Fair Labor Standards Act of 1938.

Date Reported 7-23 1961 Signature [illegible]

4-25 Golden Valley 2018 12°C

MILLER-DAVIS CO., MINNEAPOLIS 8575-C

EMPLOYEE Brandt + Anderson 2018 Tullgaboy

WEEK ENDING Oct 18 1962 WEEK No.

DAY OF WEEK	BEFORE NOON IN HR.	BEFORE NOON IN MIN.	BEFORE NOON OUT HR.	BEFORE NOON OUT MIN.	AFTERNOON IN HR.	AFTERNOON IN MIN.	AFTERNOON OUT HR.	AFTERNOON OUT MIN.	EVENING IN HR.	EVENING IN MIN.	EVENING OUT HR.	EVENING OUT MIN.	TOTAL TIME EACH DAY REGULAR	TOTAL TIME EACH DAY O'TIME
SUNDAY	88		41											
MONDAY	20 X		48 X		60						QUUU		C-88 Draft	
TUESDAY	14"		Ended											
WEDNESDAY	20		Ton											
THURSDAY	Sand and gravel													
FRIDAY	59 1.		Fab											
SATURDAY														
OTHER INFORMATION													TOTAL	

CODED

I hereby certify that the above is a true report of hours of my employment during said week, to comply with the Wage and Hour Division of the Fair Labor Standards Act of 1938.

Date Reported Oct 26 1962 Signature Anderson

B/837

Another QUUU+5 QUUU

118-21-30 bcd bAb

Elev. 925±5'

TA-23

Golden Valley

MILLER-DAVIS CO., MINNEAPOLIS 667B-C

EMPLOYEE Burandt-Anderson 2016 Independence Ave No.

WEEK ENDING Aug. 18 1961 WEEK No.

DAY OF WEEK	BEFORE NOON IN HR.	BEFORE NOON IN MIN.	BEFORE NOON OUT HR.	BEFORE NOON OUT MIN.	AFTERNOON IN HR.	AFTERNOON IN MIN.	AFTERNOON OUT HR.	AFTERNOON OUT MIN.	EVENING IN HR.	EVENING IN MIN.	EVENING OUT HR.	EVENING OUT MIN.	TOTAL TIME EACH DAY REGULAR	TOTAL TIME EACH DAY O'TIME
SUNDAY	3 inch				101 feet deep									
MONDAY	Water level				63						QUIT		0-181 Draft	
TUESDAY	Pumped at				70									
WEDNESDAY	@ 9 AM 15+													
THURSDAY	Screen 50 gauge				2 X 48									
FRIDAY	Leader + Casing				8"									
SATURDAY														

OTHER INFORMATION

I hereby certify that the above is a true report of hours of employment during said week to comply with the Wage and Hour Division of the Fair Labor Standards Act of 1938.

Date Reported Aug 18 1961 Signature

COPY

118-21-30 bcc Abb
Elev. 955 ± 5'

11-25

Golden Trolley/Aus Q

MILLER-DAVIS CO., MINNEAPOLIS 647B-C

EMPLOYEE Brandt + anderson

WEEK ENDING 9-17-61 19__ WEEK No. _____

DAY OF WEEK	BEFORE NOON IN HR.	BEFORE NOON IN MIN.	BEFORE NOON OUT HR.	BEFORE NOON OUT MIN.	AFTERNOON IN HR.	AFTERNOON IN MIN.	AFTERNOON OUT HR.	AFTERNOON OUT MIN.	EVENING IN HR.	EVENING IN MIN.	EVENING OUT HR.	EVENING OUT MIN.	TOTAL TIME EACH DAY REGULAR	TOTAL TIME EACH DAY O'TIME
SUNDAY	89													
MONDAY	90	X	5	XX	60									
TUESDAY	18"	Golden												
WEDNESDAY														
THURSDAY														
FRIDAY														
SATURDAY														
OTHER INFORMATION												TOTAL FOR WEEK		

CODED

I hereby certify that the above is a true report of hours of my employment during said week, to comply with the Wage and Hour Division of the Fair Labor Standards Act of 1938.

Date Reported 9-22 1961 Signature _____

118-11-30 bed bbc

Elev. 940±5'

(Osed)

E. H. RENNER & SONS WELL COMPANY

7700 HIGHWAY No. 7 ST. LOUIS PARK, MINNESOTA

20934

WELL LOG

Date Started Dec. 28 1954 Date Completed Dec. 29 1954

OWNER HILLMAN PLUMBING COMPANY

ADDRESS 4129 Broadway Ave. N. ~~Elev 960±5'~~

JOB LOCATION: 1916 Hillsboro Rd. J-6 15-23

Description of Property on which Drilling was done

The ____ of Sec. ____ Twp. ____ Elv. ?

Lot ____ Block ____ in the City of Golden Valley B-262

County of Hennepin State of Minn.

Cased with 3" API Seamless Blk. Pipe (TYPE AND SIZE), ____ feet of Casing used.

Total Depth of Well 92 Feet of Open Hole Screen

Finished in Sand Water Level 68

Tested at 5 gallons per ____ min. Draw Down of 2.5 Feet

Screen Used 2 C.M. (SIZE) Check Valve 60 (MAKE) (SLOT) (NUMBER) 2016

Pump: Make Demro H.P. 3/4 Type Jet

Drop Pipe 70 feet Size 1½ Capacity of Pump 5 G.P.M.

KIND OF FORMATION	COLOR OF FORMATION	STARTED DEPTH	ENDED DEPTH	TOTAL THICKNESS OF FORMATION	REMARKS
Clay	Brown	0	45	CLAY	QTUB 118-21-30
Pack Gravel	Dark	45	64	GRVL	QFW BCDBDC
Clay, Sand and Stone (layered)	Brown	64	92	CLAY, SAND, CONG	QDUB Elev. 960±5
					Aquifer QBUA-QBUA

1A-25

Golden Valley

20 5/16" 140 120C

EMPLOYER Brandt & anderson 1969 - Kellyshing 2nd

WEEK ENDING Sept 14 19 62 WEEK No.

DAY OF WEEK	BEFORE NOON IN HR.	BEFORE NOON IN MIN.	BEFORE NOON OUT HR.	BEFORE NOON OUT MIN.	AFTERNOON IN HR.	AFTERNOON IN MIN.	AFTERNOON OUT HR.	AFTERNOON OUT MIN.	EVENING IN HR.	EVENING IN MIN.	EVENING OUT HR.	EVENING OUT MIN.	TOTAL TIME EACH DAY REGULAR	TOTAL TIME EACH DAY O'TIME
SUNDAY	12	2	4											
MONDAY	9	X	5	X	6	0							QUUU	0-17
TUESDAY	14"		leads											
WEDNESDAY	15'		water											
THURSDAY	20		yards											
FRIDAY	Sand and gravel													
SATURDAY														
OTHER INFORMATION												TOTAL FOR WEEK		

I hereby certify that the above is a true report of hours of my employment during said week, to comply with the Wage and Hour Division of the Fair Labor Standards Act of 1938.

Date Sept 22 1962 Signature [illegible]

CODED

18-21-30 bcdcAd

Elev 935±5'

935

Drift

DRIFT

S/T 56

Area

QUUU-

QUUC

1A-25

A Golden Valley

Hoedy Burandt

120 C

MILLER-DAVIS CO., MINNEAPOLIS 6678-C

EMPLOYEE 1904 Hillsboro Ave No

WEEK ENDING _____ 19 ____ WEEK No. _____

DAY OF WEEK	BEFORE NOON IN HR.	BEFORE NOON IN MIN.	BEFORE NOON OUT HR.	BEFORE NOON OUT MIN.	AFTERNOON IN HR.	AFTERNOON IN MIN.	AFTERNOON OUT HR.	AFTERNOON OUT MIN.	EVENING IN HR.	EVENING IN MIN.	EVENING OUT HR.	EVENING OUT MIN.	TOTAL TIME EACH DAY REGULAR	TOTAL TIME EACH DAY O'TIME
SUNDAY	94	Dec												
MONDAY	3(	Mell											Quit	0-94
TUESDAY		23'												
WEDNESDAY		1200 P.M.												
THURSDAY		2												
FRIDAY		2'												
SATURDAY														
OTHER INFORMATION											TOTAL FOR WEEK			

I hereby certify that the above is a true report of hours of my employment during said week, to comply with the Wage and Hour Division of the Fair Labor Standards Act of 1938.

Date Reported June 24 1967 Signature [illegible]

46 [illegible] 30-bc-d-e-b-c

Elev. 945±5'

DRFT Drift

Apple Quit Quit

1A-25

(45) & B

20340

EMPLOYER Gordy Burandt, 1908 Hillsboro Ave No Golden Valley

WEEK ENDING _____ 19___ WEEK No. _____

DAY OF WEEK	MORNING IN HR.	MORNING IN MIN.	MORNING OUT HR.	MORNING OUT MIN.	AFTERNOON IN HR.	AFTERNOON IN MIN.	AFTERNOON OUT HR.	AFTERNOON OUT MIN.	EVENING IN HR.	EVENING IN MIN.	EVENING OUT HR.	EVENING OUT MIN.	TOTAL TIME EACH DAY REGULAR	TOTAL TIME EACH DAY O'TIME
SUNDAY	3'		Well											
MONDAY	93'		Deep										QUUU	0-97 DSF-Drift
TUESDAY	74'		To	Water										
WEDNESDAY	1200		G.P.h.											Aquifer
THURSDAY	2"	- 50	SA.	Screen					2"	Leader				QUUU-QUUU
FRIDAY			6"	Overall -	10'		Seal							
SATURDAY														
OTHER INFORMATION													TOTAL FOR WEEK	

I hereby certify that the above is a true report of hours of my employment during said week, to comply with the Wage and Hour Division of the Fair Labor Standards Act of 1938.

19___ Signature Dale Juul

CUTTED

118-31-30bcdccb

Elev. 940±5'

IA-25 OSSCO #G

Golden Valley

OK

120C

MILLER-DAVIS CO., MINNEAPOLIS 647B-C

EMPLOYEE Brandt + Anderson 9200 Earle ct

WEEK ENDING Oct 16 1962 WEEK No.

DAY OF WEEK	BEFORE NOON IN HR.	BEFORE NOON IN MIN.	BEFORE NOON OUT HR.	BEFORE NOON OUT MIN.	AFTERNOON IN HR.	AFTERNOON IN MIN.	AFTERNOON OUT HR.	AFTERNOON OUT MIN.	EVENING IN HR.	EVENING IN MIN.	EVENING OUT HR.	EVENING OUT MIN.	TOTAL TIME EACH DAY REGULAR	TOTAL TIME EACH DAY O'TIME
SUNDAY	8	9												
MONDAY	20	x	54	x	60						QUUU		0-89	Draft
TUESDAY	14	"	leader											
WEDNESDAY	20	gpm												
THURSDAY	[illegible]													
FRIDAY														
SATURDAY														
OTHER INFORMATION											TOTAL FOR WEEK			

CODED

I hereby certify that the above is a true report of hours of my employment during said week, to comply with the Wage and Hour Division of the Fair Labor Standards Act of 1938.

Date Reported Oct 19 1962 Signature H. Hakonson

DRFT

Aquifer

QUUU

QUUU

18-21-30

BCDDCC

Elev. 935±5

79

846

1A-25 Golden Valley 203744

104B

HQ (643)

MILLER-DAVIS CO., MINNEAPOLIS 6178-C

EMPLOYEE Brandt and Anderson 1-27 19 41 WEEK No.

WEEK ENDING

DAY OF WEEK	BEFORE NOON IN HR.	IN MIN.	OUT HR.	OUT MIN.	AFTERNOON IN HR.	IN MIN.	OUT HR.	OUT MIN.	EVENING IN HR.	IN MIN.	OUT HR.	OUT MIN.	TOTAL TIME EACH DAY REGULAR	O'TIME
SUNDAY	90										PLTS		0-90 Drift	
MONDAY	90	X	54	X	52									
TUESDAY	90	"	"		"									
WEDNESDAY														
THURSDAY														
FRIDAY														
SATURDAY														
OTHER													TOTAL FOR WEEK	

CODED

RFT B/845

Aquifer PLTS-PLTS

I hereby certify that the above is a true report of hours of my employment during said week, to comply with the Wage and Hour Division of the Fair Labor Standards Act of 1938.

Date Reported June 30 19 41 Signature Y Halvorson

118-21-30 c666 dA

Elev. 945±5'

M. 616

K 41-97
(Rev. 2-59)

203945

MINNESOTA CONSERVATION DEPARTMENT
DIVISION OF WATERS

WELL LOG STATEMENT

104B Hops

File No. 422

Well No. 118-21-30cbb

MAIL REPORT PROMPTLY TO DIRECTOR, DIVISION OF WATERS, STATE OFFICE BLDG., ST. PAUL 1, MINN.

Location of Well Hennepin County Radio Station,

Hennepin County — Naper Road (County 18 & Medicine Lake) City or Town

Describe Further by Lot, Block, Nearest Highway, Street and Number

Locate Well on Plat of Section

Hopkins Quad

Sec. L

Twp.

Range

Drilled for: Hennepin County Radio Station

Address (see above)

Driller Max Renner Well Co.

Address 118-21-30 cbb ddb

Elev. 940±5'

Date of Completion 1-49

Site — Upland, Valley, Hillside, Etc.

Type of Well — Dug, Driven, Bored, Drilled

Drill Rig Used — Solid Tool, Jet, Rotary

Diameter: Top 6" Bottom

Depth of Well 353'

Ground Elevation 940 — Sea Level Datum or Give Distance Above or Below R[illegible] Highway, Lake, Etc.

Height of Casing Above Ground

Quality of Water — Hard or Soft, Fresh or Salty, Etc.

Temperature of Water

Was Laboratory Analysis Made?

For What Purpose Will Water Be Used?

Is Well Pumped? Pump Capacity GPM

Was Well Sealed on Completion?

Does Well Overflow Without Pumping? — Yes or No

Natural Flow GPM

What Pressure, or Head, at Ground Level?

Principal Aquifer Penetrated

REPORT OF FINAL PUMPING TEST

Date of Test

Duration of Test Hrs. Min.

Rate of Pumping GPM

Static Water Level – Ft.

Water Level While Pumping Ft.

Drawdown Ft.

Time Required for Recovery

Expected Average Yield Gal. per day

If Other Tests [illegible]ere Made, Give Details on Another [illegible]e

[illegible]ere [illegible]asu[illegible]ents Made of Effect on Other Nearby Wel[illegible] Dur[illegible] Test? Give Details.

CODED

ABANDONED

1B-25

118-21-30 cb d ACC

Elev. 940±5'

Golden Valley

203946

EMPLOYER Burandt Const 1636 Gettysburg Ave No.

WEEK ENDING Dec. 12 '63 WEEK 9

DAY OF WEEK	BEFORE NOON IN HR.	BEFORE NOON IN MIN.	BEFORE NOON OUT HR.	BEFORE NOON OUT MIN.	AFTERNOON IN HR.	AFTERNOON IN MIN.	AFTERNOON OUT HR.	AFTERNOON OUT MIN.	EVENING IN HR.	EVENING IN MIN.	EVENING OUT HR.	EVENING OUT MIN.	TOTAL TIME EACH DAY REGULAR	TOTAL TIME EACH DAY O'TIME
SUNDAY														
MONDAY														
TUESDAY														
WEDNESDAY														
THURSDAY														
FRIDAY														
SATURDAY														

TOTAL WEEK

SPECIAL INFORMATION

I hereby certify that the above is a true report of hours of my employment during said week, to comply with the Wage and Hour Division of the Fair Labor Standards Act of 1938.

Signature

Date Signed Dec 17 '63

COPIED

DRF Drift

Aquifer Quaternary

1B-25

118-21-30 cb d ACC

Elev. 930±5'

Golden Valley

203947

EMPLOYER Burandt & Anderson

WEEK ENDING 1616 Gettysburg Ave N. Minneapolis Week 12-17-63

DAY OF WEEK	BEFORE NOON IN HR.	BEFORE NOON IN MIN.	BEFORE NOON OUT HR.	BEFORE NOON OUT MIN.	AFTERNOON IN HR.	AFTERNOON IN MIN.	AFTERNOON OUT HR.	AFTERNOON OUT MIN.	EVENING IN HR.	EVENING IN MIN.	EVENING OUT HR.	EVENING OUT MIN.	TOTAL TIME EACH DAY REGULAR	TOTAL TIME EACH DAY O'TIME
SUNDAY														
MONDAY														
TUESDAY														
WEDNESDAY														
THURSDAY														
FRIDAY														
SATURDAY														

TOTAL WEEK

SPECIAL INFORMATION

I hereby certify that the above is a true report of hours of my employment during said week, to comply with the Wage and Hour Division of the Fair Labor Standards Act of 1938.

Signature Frank Clark

COPIED

DRF Drift

Aquifer Quaternary

1B-25 Golden Valley A.

203948

EMPLOYER Brandt & Anderson 16 [illegible]

WEEK ENDING July 22 19 6 WEEK No.

DAY OF WEEK	BEFORE NOON IN HR.	BEFORE NOON IN MIN.	BEFORE NOON OUT HR.	BEFORE NOON OUT MIN.	AFTERNOON IN HR.	AFTERNOON IN MIN.	AFTERNOON OUT HR.	AFTERNOON OUT MIN.	EVENING IN HR.	EVENING IN MIN.	EVENING OUT HR.	EVENING OUT MIN.	TOTAL TIME EACH DAY REGULAR	TOTAL TIME EACH DAY O'TIME
SUNDAY	14	5												
MONDAY	20	X	5	4	5	0	screen							
TUESDAY	14	"	Sander										Quad O-105	
WEDNESDAY	5	5	5	5	mats									
THURSDAY	20	5	pm											
FRIDAY	Sandpoint													
SATURDAY														
OTHER INFORMATION													TOTAL FOR WEEK	

CODED

I hereby [illegible] that [illegible] during said week, to comply with the Wage and Hour Division of the Fair Labor Standards Act of 1938.

Date [illegible] Signature [illegible]

118-21-30 cbd bdc

Elev. 925±5'

104B

640 H.Q

DRFT Drift B/820

Aquifer Quad - Quad

1B-25 Golden Valley A

203949

EMPLOYER Gordy Brandt

WEEK ENDING 15 & 16 Oct 19 40 WEEK No. 63

DAY OF WEEK	BEFORE NOON IN HR.	BEFORE NOON IN MIN.	BEFORE NOON OUT HR.	BEFORE NOON OUT MIN.	AFTERNOON IN HR.	AFTERNOON IN MIN.	AFTERNOON OUT HR.	AFTERNOON OUT MIN.	EVENING IN HR.	EVENING IN MIN.	EVENING OUT HR.	EVENING OUT MIN.	TOTAL TIME EACH DAY REGULAR	TOTAL TIME EACH DAY O'TIME
SUNDAY	3	"	well		9	0	2	7					Quad O-90	
MONDAY														
TUESDAY	2	0	4	8	Screen	gang	screen							
WEDNESDAY														
THURSDAY	2	0	4	8	P.M.									
FRIDAY	5	5	2	7	to	water								
SATURDAY														
OTHER INFORMATION													TOTAL FOR WEEK	

I hereby certify that the above is a true report of hours of my employment during said week, to comply with the Wage and Hour Division of the Fair Labor Standards Act of 1938.

Date Received 19 Signature

CODED

118-21-30 ccA dbc

104B

HQ 639

DRFT Drift

Aquifer Quad - Quad

ADM 11-97
Rev. 2-59

MINNESOTA CONSERVATION DEPARTMENT
DIVISION OF WATERS

RECEIVED
APR 8 1960

WELL LOG STATEMENT

MAIL REPORT PROMPTLY TO DIRECTOR, DIVISION OF WATERS, STATE OFFICE BLDG., ST. PAUL 1, MINN.

File No. H-25
Well No. Hopkins 4-24

Location of Well DIVS 1316 25 W Independence Avenue
Hennepin, Minneapolis, Minnesota
County City or Town
Describe Further by Lot, Block, Nearest Highway, Street and Number

Locate Well on Plat of Section

Sec. 203950
Twp. 118
Range 21

Drilled for: Ralph Olson
Address 1316 Independence Avenue
Minneapolis, 16, Minnesota

Driller 118-21-30 ccc Acd
Address Elev. 920±5'

Date of Completion September 1958

Site
Upland, Valley, Hillside, Etc.

Type of Well Drilled
Dug, Driven, Bored, Drilled

Drill Rig Used Solid tool
Solid Tool, Jet, Rotary

Diameter: Top 3" Bottom 3"

Depth of Well 98'

Ground Elevation
Sea Level Datum or Give Distance Above or Below R. R., Highway, Lake, Etc.

Height of Casing Above Ground well pit

Quality of Water
(Hard or Soft, Fresh or Salty, Etc.)

Temperature of Water

Was Laboratory Analysis Made?

For What Purpose Will Water Be Used? home

Is Well Pumped? yes Pump Capacity 30 GPM

Was Well Sealed on Comple[illegible]?

Does Well Overflow Without [illegible]

Natural Flow GPM

What Pressure, or Head, at Ground Level?

Principal Aquifer Penetrated

REPORT OF FINAL PUMPING TEST

Date of Test September 1958

Duration of Test 2 Hrs. 45 Min.

Rate of Pumping 30 GPM

Static Water Level Ft.

Water Level While Pumping Ft.

Drawdown Ft.

Time Required for Recovery

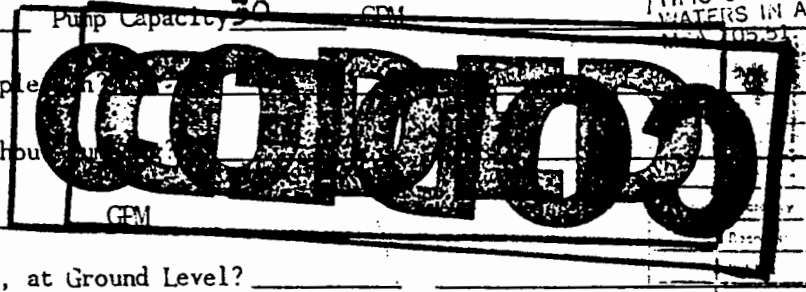
Expected Average Yield Gal. per day

If Other Tests were Made, Give Details on Another Sheet.

Were Measurements Made of Effect on Other Nearby Wells During Test? Give Details.

THE DATA CONTAINED HEREIN IS CONFIDENTIAL AND IS TO BE USED FOR SCIENTIFIC STUDY ONLY BY DIV. OF WATERS IN ACCORDANCE WITH M.S. 105.51

1615



W 41-97
(Rev. 2-59)

MINNESOTA CONSERVATION DEPARTMENT
DIVISION OF WATERS

WELL LOG STATEMENT

Hopkins

118/21-30 CCC 2

RECEIVED
MAR 2 1960
DIVISION OF WATERS

File No.

Well No. SAME AS 424

MAIL REPORT PROMPTLY TO DIRECTOR, DIVISION OF WATERS, STATE OFFICE BLDG., ST. PAUL 1, MINN.

Location of Well 1312 Independence Avenue

Hennepin (County) Minneapolis, Minnesota (City or Town)

Describe Further by Lot, Block, Nearest Highway, Street and Number

Locate Well on Plat of Section

Sec. 30 ccb

Twp. 118

Range 21

251-B

Drilled for: John Garrison

Address 4431 Garrison Lane

Minneapolis, Minnesota

Date of Completion October 1958

Site _____ (Upland, Valley, Hillside, Etc.)

Type of Well _____ (Dug, Driven, Bored, Drilled)

Drill Rig Used _____ (Spudding Tool, Rotary)

Diameter: Top 3" Bottom 3"

Depth of Well 97'

Ground Elevation _____ (Sea Level Datum or Give Distance Above or Below R. R., Highway, Lake, Etc.)

Height of Casing Above Ground Well pit

Quality of Water _____ (Hard or Soft, Fresh or Salty, Etc.)

Temperature of Water _____

Was Laboratory Analysis Made? _____

For What Purpose Will Water Be Used? DOMO

Is Well Pumped? yes Pump Capacity _____

Was Well Sealed on Completion? _____

Does Well Overflow Without Pumping? _____ (Yes or No)

Natural Flow _____ GPM

What Pressure, or Head, at Ground Level? _____

Principal Aquifer Penetrated _____

Driller Joseph Eckes

Address Wayzata, Minnesota

REPORT OF FINAL PUMPING TEST

Date of Test October 1958

Duration of Test 1 Hrs. 15 Min.

Rate of Pumping 20 GPM

Static Water Level 45 Ft.

Water Level While Pumping _____ Ft.

Drawdown _____ Ft.

Time Required for Recovery _____

Expected Average Yield _____ Gal. per day

If Other Tests were Made, Give Details on Another Sheet.

Were Measurements Made of Effect on Other Nearby Wells During Test? Give Details.

118-21-30 ccc Adc
Elev. 920 ± 5'

CODED

THE DATA CONTAINED HEREIN IS CONFIDENTIAL AND IS TO BE USED FOR SCIENTIFIC STUDY ONLY BY DIV. OF WATERS IN ACCORDANCE WITH MSA 105.51.

Hennepin Co well logs

1559

1B-25

118-21-30 ccc Add

Elev. 910±5'

Golden Valley

EMPLOYER G. BURANDT 1325 Hillsboro A203452

WEEK ENDING _____ 19___ WEEK No. _____

DAY OF WEEK	BEFORE NOON IN HR.	BEFORE NOON IN MIN.	BEFORE NOON OUT HR.	BEFORE NOON OUT MIN.	AFTERNOON IN HR.	AFTERNOON IN MIN.	AFTERNOON OUT HR.	AFTERNOON OUT MIN.	EVENING IN HR.	EVENING IN MIN.	EVENING OUT HR.	EVENING OUT MIN.	TOTAL TIME EACH DAY REGULAR	TOTAL TIME EACH DAY O'TIME
SUNDAY	3	well												
MONDAY														
TUESDAY														
WEDNESDAY														
THURSDAY														
FRIDAY														
SATURDAY														
TOTAL														

CODED

DRFT Drift

910
94
816

Date Reported Oct 20, 64

1B-25

Golden Valley

104B

EMPLOYER Gordy Burandt 203454

WEEK ENDING 1321 Hillsboro 19___ WEEK No. _____

DAY OF WEEK	BEFORE NOON IN HR.	BEFORE NOON IN MIN.	BEFORE NOON OUT HR.	BEFORE NOON OUT MIN.	AFTERNOON IN HR.	AFTERNOON IN MIN.	AFTERNOON OUT HR.	AFTERNOON OUT MIN.	EVENING IN HR.	EVENING IN MIN.	EVENING OUT HR.	EVENING OUT MIN.	TOTAL TIME EACH DAY REGULAR	TOTAL TIME EACH DAY O'TIME
SUNDAY	3	well	3	4	ft	deep								
MONDAY														
TUESDAY														
WEDNESDAY														
THURSDAY														
FRIDAY														
SATURDAY														
TOTAL														

CODED

DRFT Drift

Date Reported Oct 5 1964

118-21-30 ccc dAA

Elev. 915±5'

1B-25 (634 HQ) 118-21-30 CCC dAd Elev. 915±5' Golden Valley A 203953

1313 Hillsboro Ave. No

EMPLOYEE— Gordy Burandt

WEEK ENDING June 17 63. —19— WEEK No.—

DAY OF WEEK	MORNING IN HR.	MORNING IN MIN.	MORNING OUT HR.	MORNING OUT MIN.	AFTERNOON IN HR.	AFTERNOON IN MIN.	AFTERNOON OUT HR.	AFTERNOON OUT MIN.	EVENING IN HR.	EVENING IN MIN.	EVENING OUT HR.	EVENING OUT MIN.	TOTAL TIME EACH DAY REGULAR	TOTAL TIME EACH DAY O'TIME
SUNDAY														
MONDAY														
TUESDAY														
WEDNESDAY														
THURSDAY														
FRIDAY														
SATURDAY														
GENERAL INFORMATION												TOTAL FOR WEEK		

3" well
9" pipe
6" [illegible]
Mark Greenall

COPIED

I hereby certify that the above is a true report of hours of my employment during said week, to comply with the Wage and Hour Division of the Fair Labor Standards Act of 1938.

Date Reported _____ 19___ Signature Gordy Burandt

DRFT Drift

Aquifer QUUU-QUUU

No. 13629

E. H. RENNER & SONS WELL COMPANY

7700 HIGHWAY NO. 7 ST. LOUIS PARK, MINNESOTA

203955 B139 1 of 2

WELL LOG

#10 118-21-30 ccd AGG 895#5

Date Started Nov. 5 195 5 Date Completed Nov. 7 195 5

OWNER J. A. KIMPTON

ADDRESS 1412 Gettysburg - Golden Valley No. R J-6 B-139

Description of Property on which Drilling was done

The _____ of Sec. _____ Twp. _____ Elv. _____

Lot _____ Block _____ in the City of Golden Valley

County of Hennepin State of Minn.

Cased with 3" T - C (TYPE AND SIZE), 54' 6" feet of Casing used.

Total Depth of Well 59 Feet of Open Hole _____

Finished in Sand Water Level 20'

Tested at 20 gallons per min. Draw Down of 0 Feet

Screen Used 6' (SIZE) 1¼ (MAKE) 60 (SLOT) (NUMBER)

Pump: Make Wards Shallow H.P. _____ Type _____

Drop Pipe _____ feet Size _____ Capacity of Pump _____ GPM

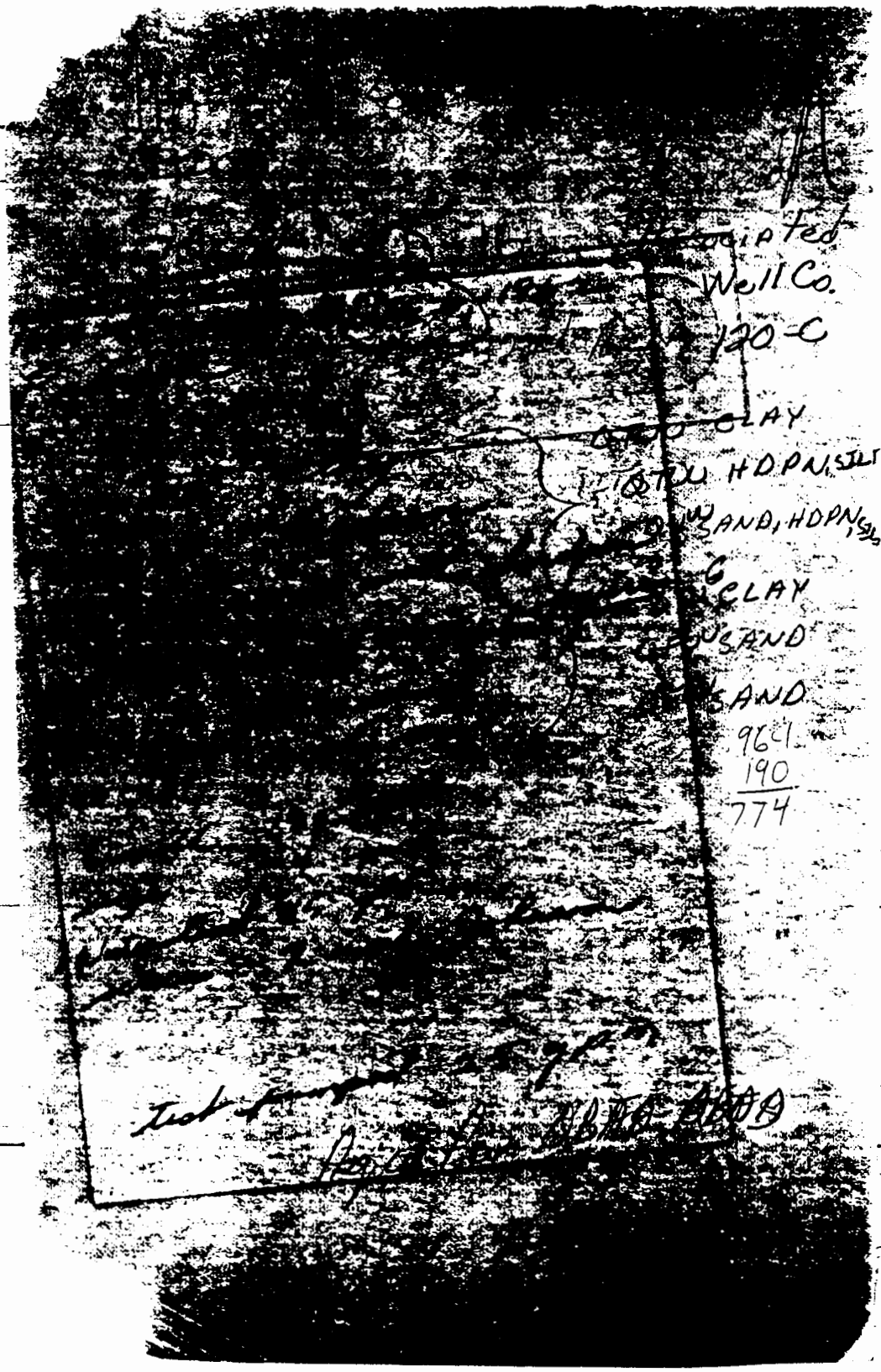
KIND OF FORMATION	COLOR OF FORMATION	STARTED DEPTH	ENDED DEPTH	TOTAL THICKNESS OF FORMATION	REMARKS
Clay CLAY	Yellow	0	40		QTUB
Hard Pan HDPN SLT	Brown	40	45		QTUB
Sand SAND	Brown	45	6[illegible]		QFUB

CODED

Aquifer

QBAA-QBAA

204365?



118-22-24 DBCACD Elev 955± 20436

No. _____

E. H. RENNER & SONS WELL COMPANY
5465 Co. Rd. 18 North Minneapolis 55

INVOICES:
(Well) No. 59
(Pump) No. 05803

Recheck

#39 WELL LOG

OK

Date Started July 20 19 71 Date Completed 8/3/ 19 71

Owner or Contractor Charles Peterson Address 10135 29th Avenue North

Job Location Same

A-104

Lot _____ Block _____ Twp or city Plymouth County Hennepin State of Minnesota

Well:

Cased with 4" W & T Type and Size Ft. 181 Total Depth of Well 185 from grade

Feet of Open Hole 0 Finished in ground Water Level 70

Tested at 20 gallons per min. Drawn down of 5 feet.

CODED

Screen:

Size 4" Make Johnson Slot or Guage 18 Number _____

Pump:

Make Red Jacket H.P. 3/4 Type sub Tank Size 42

Motor Serial No. _____ Pump Serial No. _____ Drop Pipe 105' feet

Size 1" Capacity of pump _____ G.P.M. Date Installed _____

Baker Pitless

120-C

KIND OF FORMATION	COLOR OF FORMATION	STARTED DEPTH	ENDED DEPTH	TOTAL THICKNESS OF FORMATION	REMARKS
Clay, sand, & gravel	brown	0	47	CLAY, SAND, GRVL	21-3 QUUB 9-9
Sand cemented	brown	47	65	SAND	41-0 QFUB 10-00
Pack gravel dry	brown	65	71	GRVL	10-2 QFUB 9-10
Sand dry	brown	71	78	PLUS SAND	10-2 QFUB 10-1
Pack sand ground dry	brown	78	110	SAND	10-7 QFUB 10-10
Sand gravel	red	110	136	SAND, GRVL	9 QFUB 11-0
Clay sandy gravel	green	136	150	CLAY, GRVL	9-10 QUUU 10-7-1/2
Sand	gray	150	179	SAND	9-5 QFUG 8-2-1/2
Gravel	gray	179	185	GRVL	9-3 QFUG B/768
					953 185
				Aquifer	QBAA, QBAB 8

50-16

118-22-24

BBCBAB

120-C

Elev 957±5

Henry Gess OK 204367

Well Co.

EARL (W40TT

MILLER-DAVIS CO., MINNEAPOLIS 667B-C

EMPLOYEE 2935 Custer Ln, Plymouth

WEEK ENDING _____ 19____ WEEK No. _____

DAY OF WEEK	BEFORE NOON IN HR.	IN MIN.	OUT HR.	OUT MIN.	AFTERNOON IN HR.	IN MIN.	OUT HR.	OUT MIN.	EVENING IN HR.	IN MIN.	OUT HR.	OUT MIN.	TOTAL TIME EACH DAY REGULAR	O'TIME
SUNDAY	3"	Well												
MONDAY	78'	Open											10-78 Drift 5 QUOO	
TUESDAY	60	To Surface												
WEDNESDAY	120	Bot.												
THURSDAY	2"-	Bot. Clayton Mbr												
FRIDAY	2"	Lower Pearson, 6½'					Overall							
SATURDAY														
OTHER INFORMATION												TOTAL FOR WEEK		

I hereby certify that the above is a true report of hours of my employment during said week, to comply with the Wage and Hour Division of the Fair Labor Standards Act of 1938.

Date Reported _____ 19____ Signature _____

Aquifer QUOO-QUOS

DRE

118-22-24 BBCBAB

Elev 935±5

204367

Earl Well Co.

Henry Gess

Rachel 3 Wells

2735 - Plymouth

Ic-17, 18-25 PLYMOUTH

Aquifer QBAS-QRAS

PITT

0-74 - QAA

74-30 PP - QTUU CLAY

30-130 - QTUU CLAY SAND

130-145 - QTUU HOPKINS

145-160 - QUU SAND, CLAY

160-170 - QUU SAND, CLAY

170 - QPEU SAND

ALL

121

151

Mark Well Co

Osseo

118-22-24

120-ft

ID-17 298

A

DDABAB

Elev. 961±5

938

204370

Allison Russ

Erickson Roger June 5 June 16-69

1961 - 2 Bbl Oil No.

201 ft 6" well

60 ft 6" Water level

948 - 5" Stainless Steel Screen 18 slot. 6' 6" OL

Installed June 26-69

1 - 3/4 HP Deep Well Sub.

42 Gal. Tank (Capacity)

84 ft 1" Galv. Pipe

90 ft. # 12-3 Cable

1.5 ft 4" Outlet

34 ft 1" Galv. Pipe

30 ft. # 12-2 Cable

Howard

35 gpm

80 ft.	150 ft.	105 ft.	94 ft.	79 ft.	56 ft.	30 ft.

8 - 15 ft. clay

13 ft. rocks - clay

30 ft. rocks - clay

56 ft. hard gravel

72 ft. muddy gravel

94 ft. hard gravel

104 ft. gravel muddy

105 ft. Rock ledge

150 ft. muddy gravel

154 ft. Rocks - gravel

185 ft. muddy - gravel

201 ft. gravel - water

BTW CLAY

BTW ROCK, CLAY

BTW ROCK, CLAY

BTW HARD PAN

BTW SAND, GRAVEL

BTW HARD PAN

BTW GRVL

FEW BOULDERS

FEW GRVL

FEW GRVL

FEW GRVL

FEW GRVL

Aquifer, QBUP ABUP

961/201/761

938/201/737

Mork
Well Co

118-22-24
DDBBCC
Elev. 950±5

120-OK

(299)

Osseo

ID-17
204371

A

Owner Willard Ostrander
2740 Nathan Lane

170 ft. 4" well
80 ft. water level
#948 Stainless Steel Screen 6" OL
4 x 2" lead seal
Installed & flow 24-71
1-½ hp. Sub. Air motor
4 x 2 gal tank w/ float
80 ft. 1" galv. pipe
12-3 cable
4" Pitless 12 ft 1" galv. Keeper
12-3 wire.
25 g.p.m.

SAND, GRVL, CLAY

0 - 1 clay
1 - 80 sand
80 - 170 sand, grvl, clay

QUUB 0 - 45 - Sand grave
Brown clay.
QTUB 45-96 - Brown clay
QUUR 96-151 - Reddish clay w/ sand mixed
QTUL 151-170 - Gravel + sand GRVL
Water bearing
8/780

Dug in by ABAN-ABBO

CODED

450
170
280

1A 5441-3048

~~33~~-25 9530-37 AHP

Allen Eugene Carlson

27th ave. No. of Hwy 41 8

0 to 8 put PIT PIT CLAY

8 to 40 Clay QTLu QTu OSAND

40 to 65 Sand PLTS QTu 20437 5 HORN, SIO

65 to 86 Hardpan QTu 832 SAND

86 to 93 Water-Sand QTu

Water-Sand 50 ft

2" 18 Slot Johnson

Screen

Set pump at 25 GPM.

4" Well

11S 22E 24 ddd A66

CODED

Elev. 925±5'

93

120 C

Associated

Well Co.

Aquifer QBAA-QBAB

Don STODOLA Well Co

Osseo

CARL HUTTEN
2520 Lancaster Lane mpls. Plymouth 50' to water
5-20-67
4" well 161' @ 4.00 644.00
Permit 15.00
Johnson SS screen 100.00
Pitless 100.00
3/4 HP sub & 42 gal tank 375.00
1234.00

204376

Paid in full
6/12/67

118-22-25 AAA b cd
Elev. 925±5'
120-C

4/9

STUB CLAY
2 GRAVEL
SCREEN
3 T/190 ± SOSTP SNDS

Aquifer: No Casing Record

925
161
764

CODED

50' to water
0-40 brown clay
40-135 red clay gravel
135-161 white sandstone

1-1A Plymouth 20[illegible]

Envy Gess Well Co

(204) 05 Q

MILLBOURNE CO., MINNEAPOLIS 8378-C

EMPLOYEE Pirna 96 5 25 [illegible] 970

WEEK ENDING _____ 19___ WEEK No. _____

DAY OF WEEK	BEFORE NOON IN HR.	BEFORE NOON IN MIN.	BEFORE NOON OUT HR.	BEFORE NOON OUT MIN.	AFTERNOON IN HR.	AFTERNOON IN MIN.	AFTERNOON OUT HR.	AFTERNOON OUT MIN.	EVENING IN HR.	EVENING IN MIN.	EVENING OUT HR.	EVENING OUT MIN.	TOTAL TIME EACH DAY REGULAR	TOTAL TIME EACH DAY O'TIME
SUNDAY	3	11	Well		115	Ft.								
MONDAY													0-115	Drift
TUESDAY	2	0.9	P.M.											6/79 ↓
WEDNESDAY														3 DUP DRFT
THURSDAY	2	5	Ft	to water									20	
FRIDAY														Aquifer Quan Qual
SATURDAY	6	Ft.	8"	2048	Sean									
OTHER INFORMATION												TOTAL FOR WEEK		

I hereby certify that the above is a true report of hours of my employment during said week, to comply with the Wage and Hour Division of the Fair Labor Standards Act of 1938.

Date Reported Left 17 1964 Signature Henry Gess

CODE 118-22-25 AAACCA

Elev. 905 ± 5'

115/190 120-C

No. MAP 67

Budd

E. H. RENNER & SONS WELL COMPANY

5465 Co. Rd. 18 North Minneapolis 28

INVOICES: 118-22-25 AAdcAd

(Well) No.

(Pump) No. A5550 (5E)

ADP 1968

WELL LOG

Date Started March 2 19 67 Date Completed March 10 19 67

Owner or Contractor Ronald C. Johnson Address 9605 A 24th. Ave. N. Mpls. 55427

Job Location Same 118-22-25 AAdcAd

Elev. 905±5'

Lot ____ Block ____ Twp or city Plymouth County Hennepin State of Minnesota

Well: A-52

Cased with 4" Black Seamless (Type and Size) Ft. 135 Total Depth of Well 139' from grade

Feet of Open Hole None Finished in Sandrock and gravel Static Water Level 22

Tested at 20 gallons per min. Drawn down of None feet.

Screen:

Size 3" x 5' Make Johnson Stainless Steel Slot or Guage 10 Number 746

Pump:

Make Aermotor H.P. ½ Type Sub. Tank Size 42

Motor Serial No. ____ Pump Serial No. S50LXPE 110 Drop Pipe 42 feet

Size 1" Capacity of pump 11 @ 50# G.P.M. Date Installed March 10, 1967

Well pit Original discharge 120-C

CODED

KIND OF FORMATION	COLOR OF FORMATION	STARTED DEPTH	ENDED DEPTH	TOTAL THICKNESS OF FORMATION	REMARKS
Clay	Yellow	0	29	29	QTUB CLAY
Fine sand	Brown	29	51	22	QFUB SAND
Gravel	Brown	51	56	5	QFUB GRVL
Sandy clay	Red	56	74	18	QTUR CLAY
Clay	Blue	74	96	22	QTUG CLAY
Muddy sand	Yellow	96	130	34	QFUB SAND MUD.
Sandrock and gravel	Yellow	130	139	9	QFUB SAND, GRVL
			Aquifer		QBAA-QBAA

Mor K
Well Co.

204413

Topeka

5/5/1 May 16-66

A

894

1A-35

6" x 3" Well

Screen #2854-60 gauge -5'10"

17 ft. watertight

Pulmet 118-22-25 dad. ABA

Elev. 895 ± 5'

104-B

Installed May 16-17-1966

1-3/4 hp. Meinhold pump

42 gal Aquastat tank

31 ft 1¼" galv. pipe

1-3"-4 ft. Sump filter

Rotor 9 ft 1¼" galv. pipe 35 G.P.M.

X

- 32 - clay
2-11 Loess
1-53 sandy

QTCW CLAY
QOTCW SILT
QPCW SAND, GRVL

Aquifer QBAA-QBAA

CODED

206863

118-22-24 BCADCD

120-C

Elev. 945±5'

A

CODED 500-32 OK

DESCO PLYMOUTH

SD p 16

Well Address: Northeast Plumbing Co. 10610A 32nd Avenue North		WELL RECORD 591
Driller's Signature: Vernon Lohse	Date: July 17, 1962	Permit Number
Drilling Company: **Dependable Well Co.**	Address: **9743 Humboldt Ave. So.**	Telephone: **TU. 8-4303**

SIZE OF WELL	3 INCHES	WATER LEVEL	75 FEET
WELL DEPTH	151 FEET	DRAW DOWN	5 FEET
CASING DEPTH	147 FEET	CAPACITY GALLONS	1000 PER/HR.

DEPTH OF IMPERVIOUS FORMATION 6 FEET	CASED WITH
SAND POINT 3 FEET ... INCHES/BY 1¼ INCHES	WELDED JOINT ( )
MAKE AND TYPE MATERIAL: Johnson 10 slot steel	SCREWED JOINT (X)

Remarks:

104B

H05 36

Perkins Park

WELL ADDRESS 1504 Independence (Hopkins G Mo.		BLOOMINGTON WELL RECORD
DRILLER'S SIGNATURE Dick Junck	DATE Mar 6 60	PERMIT NUMBER 104B
DRILLING COMPANY Dependable	ADDRESS 943 Hillcrest	TELEPHONE TU8-4303
SIZE OF WELL 3 INCHES	WATER LEVEL 42 FEET	
WELL DEPTH 85 FEET	DRAW DOWN 0 FEET	
CASING DEPTH 84 FEET	CAPACITY GALLONS 18 00 PER/HR.	
DEPTH OF IMPERVIOUS FORMATION 31 FEET		CASED WITH
SAND POINT FEET INCHES/BY INCHES		WELDED JOINT ☐
MAKE AND TYPE MATERIAL Iron Age		SCREWED JOINT ☒
REMARKS: Project) Broken Jamnock (Correct Blank		

CODED

WPC 205-1

Hops 35

Hopkins

T3S R2E

A 2071168

1046

WELL ADDRESS 1513 Independence Ave No (Golden Valley) Hopkins

WELL RECORD

DRILLER'S SIGNATURE Dick Tenud

DATE Mar 15, 60

PERMIT NUMBER 104-6

DRILLING COMPANY Dependable

ADDRESS 9743 Humboldt

TELEPHONE 748-4303

SIZE OF WELL	5 INCHES	WATER LEVEL	50 FEET
WELL DEPTH	202 FEET	DRAW DOWN	0 FEET
CASING DEPTH	192 FEET	CAPACITY GALLONS	2000 PER/HR.

DEPTH OF IMPERVIOUS FORMATION 0 FEET

SAND POINT FEET INCHES BY INCHES

MAKE AND TYPE MATERIAL 16" Dependable Gunlobe

CASED WITH

WELDED JOINT ☐

SCREWED JOINT ☒

REMARKS (Repaired)

COPIED

BD203-

Orig

APPENDIX D
PROPERTY ACCESS PERMISSION

EnecoTech Midwest, Inc.
3050 Metro Drive • Suite 115
Bloomington, Minnesota 55425
(612) 854-5513 • Fax (612) 854-5745

EnecoTech
ENVIRONMENTAL CONSULTANTS

RECEIVED
MAR 18 1991

March 7, 1991

711-015

Mr. Mike Semsch
Executive Vice President
Real Estate Equities
325 Cedar Street, Suite 400
St. Paul, Minnesota 55101

Dear Mr. Semsch:

The purpose of this letter is to request your permission to access the Hillsboro Court Apartment property for the purpose of collecting near-surface soil and groundwater samples. Your cooperation will be greatly appreciated.

Allow me to describe: 1) some of the services that our company provides, 2) our client and their involvement in this project, 3) a brief history of the soil and groundwater investigations that we have performed near your property, 4) the purpose of the soil and groundwater samples that we wish to collect, and 5) a description of the activities that will be performed on your property if you agree to grant access.

EnecoTech is an environmental consulting firm that provides a diversified range of services for government and private industry. In general, we work toward helping our clients resolve their environmental issues by minimizing the effects of environmental problems to public health and safety and by helping our clients comply with federal and state regulations.

Since April, 1990, EnecoTech has been performing soil and ground water investigations on the gasoline station at 9456 Medicine Lake Road, New Hope, Minnesota for Sinclair Marketing (Sinclair). Soil samples have been collected from 6 inch diameter boreholes from depths of 2 to 61 feet below the ground surface. Groundwater samples have been collected from 2 inch diameter monitoring wells. All of these samples were analyzed for gasoline and diesel fuel constituents.

The results of this investigation will be submitted to the Minnesota Pollution Control Agency (MPCA). To complete our investigations per MPCA regulations, soil and groundwater quality data will have to be collected beyond the gasoline station property boundaries. Therefore, we are requesting your permission to perform field activities on your property. The enclosed map shows the location of the proposed soil boring.

Before starting the investigations on your property, the underground utilities will be located through Gopher One–Call (natural gas, electricity, water, sewer, and telephone). Drilling locations will be chosen that will not interfere with the underground utilities. Futhermore, drilling locations will be chosen that will cause a minimum of inconvenience to you.

A small truck mounted auger rig will perform the drilling operations. Two 6 inch diameter boreholes will be advanced to a depth of approximately 35 feet. After the drilling has been completed, the holes will be filled with cement grout and the alley road surface will be patched. Any excess soil at the surface that is the result of drilling will be removed from the site.

EnecoTech and its subcontractors are fully insured for property damage and personal injury.

We anticipate that these investigations will be made in March or April of this year. You will be notified in advance if you agree to grant access. The field operations should not take any longer than one working day.

We have enclosed a property access permission form that we request you sign and return to the letterhead address. If you would like to receive a copy of the data generated from the field activities on your property, a copy will be provided to you upon completion of the laboratory work and report preparation. Please indicate on the enclosed form if you wish to receive this material.

We thank you again for your time and cooperation in this matter. Please feel free to call Kelly Kading or myself at 854–5513 if you have any questions.

Sincerely,

ENECOTECH MIDWEST, INC.

James A. Berg
Sr. Project Hydrogeologist

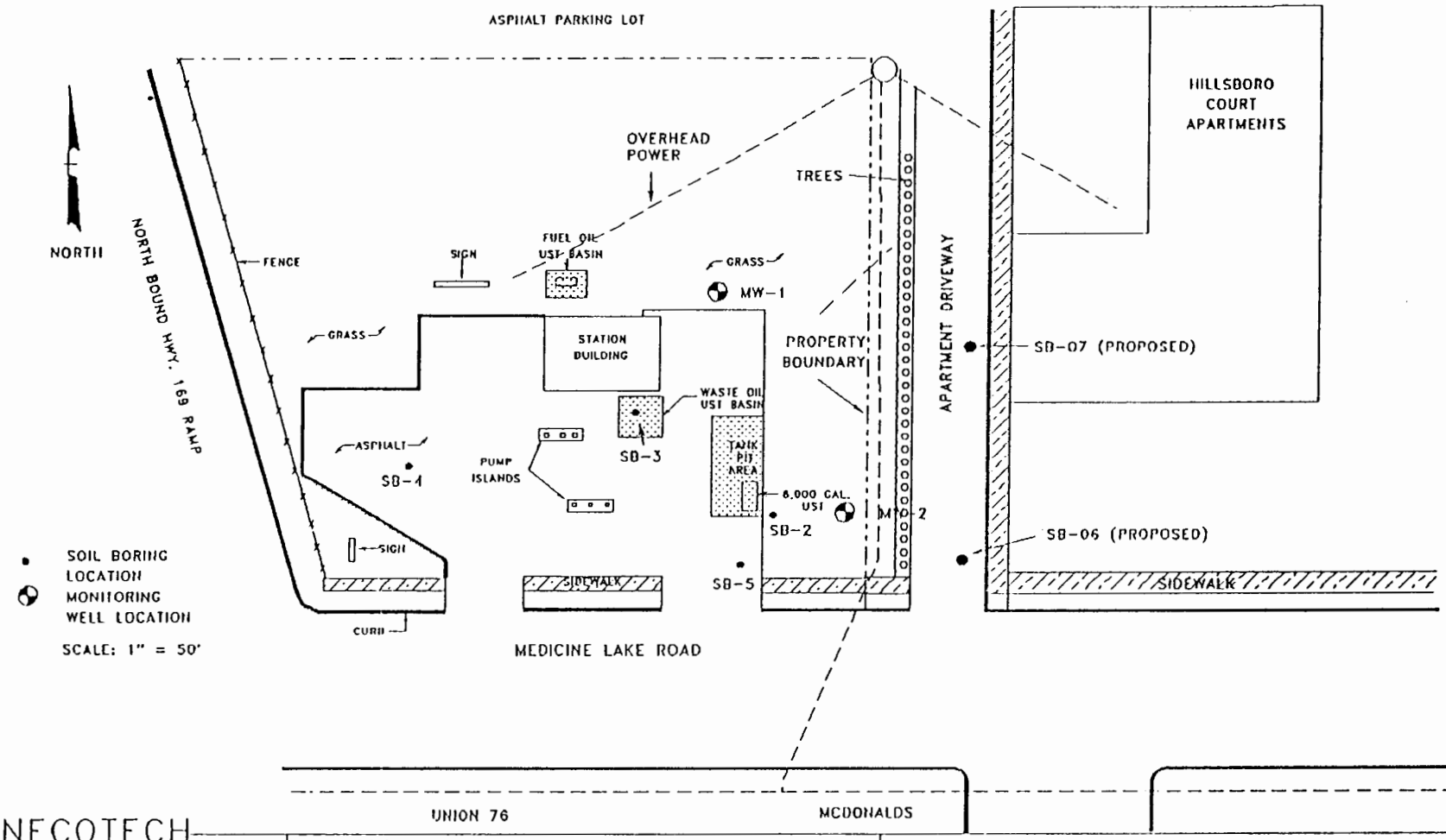
Kelly W. Kading
Project Hydrogeologist

JAB/KWK:djd

cc: Mr. Denny Lorenz, Sinclair Marketing, Kansas City, Kansas

jb/711–15b.ltr

EnecoTech
ENVIRONMENTAL CONSULTANTS



ENECOTECH

BLOOMINGTON, MINNESOTA

PROJECT SINCLAIR SERVICE STATION

PROPOSED SOIL BORING/MONITORING WELL LOCATIONS
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE RD., NEW HOPE, MN

FILE NO.: 711-015 DATE: FEBRUARY, 1991 FIGURE NO.: 5

PROPERTY ACCESS PERMISSION FORM

PROJECT NUMBER: 711-015
PROJECT MANAGER: _____

I, DANIEL J. GEORGE (name), the property owner or authorized representative of the property owner HILLSBORO COURT APTS LTD PARTNERSHIP agree to allow EnecoTech Inc. employees and contractors to enter upon the above described property and to perform investigations of the nature and extent of petroleum products possibly contained in the groundwater and soils. EnecoTech agrees to comply with the conditions described in the attached letter. In addition, a copy of the data generated from the above described property will be submitted to the owner/owner representative.

EnecoTech employees and contractors will enter upon my property only for such purposes as to conduct monitoring surveys, testing and other information gathering to identify the existence and extent of said petroleum product.

Name HILLSBORO COURT APTS

Street Address 2231 HILLSBORO AVE NO.

City NEW HOPE

State MN

3-10-91
Date

Signature – Property Owner

3/7/91
Date

Signature – EnecoTech Representative

APPENDIX E
SOIL BORING LOGS

EnecoTech®
ENVIRONMENTAL CONSULTANTS

SOIL BORING LOG | ENECOTECH, INC. | SHEET NO. 1 OF 2

PROJECT NAME - MEDICINE LAKE RD.
PROJECT NUMBER - 711-015
CLIENT - SINCLAIR
LOCATION - 9456 MEDICINE LAKE RD. NEW HOPE, MN

DRILLING CONTRACTOR - ETI
DRILLER - TOM MOORE
SURFACE ELEVATION -
DRILLING METHOD - HSA 6.75"

HOLE DESIGNATION - MW-01
DATE STARTED - 10/12/90
DATE COMPLETED - 10/12/90
ENECOTECH SUPERVISOR - S.J.B. & T.R.B.

DEPTH FROM	DEPTH TO	SAMPLE NUMBER	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	PERCENT RECOVERY	OVM VALUE	ODOR STRENGTH	ASTM SYMBOL	SAMPLE DESCRIPTION (COMPONENTS, COLOR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)
0	4		AC	--	--	--	--	--	0	NONE	CL	SILTY CLAY W/TR GRAVEL, BLK-BRN-GRAY, MOTTLED, MOIST	
4	6		SS	6	7	10	10	90	0	NONE	CL	SANDY CLAY W/TRACE SILT & GRAVEL,	
										NONE		BROWN-GRAY-RUST BROWN, MOTTLED, MOIST, VERY STIFF	
6	9		AC	--	--	--	--	--	0	NONE	CL	SAME AS ABOVE	
9	11		SS	12	9	12	14	90	0	NONE	CL	SANDY CLAY W/SOME GRAVEL, DK GRAY, MOIST, VERY STIFF	
11	14		AC	--	--	--	--	--	0	NONE	CL	SAME AS ABOVE	
14	16		SS	3	6	9	10	100	0	NONE	CL	SAME AS ABOVE	
16	19		AC	--	--	--	--	--	0	NONE	CL	SAME AS ABOVE	
19	21		SS	7	10	13	15	70	0	NONE	CL	SAME AS ABOVE	
21	24		AC	--	--	--	--	--	0	NONE	CL	SAME AS ABOVE	
24	26		SS	15	12	18	18	90	0	NONE	CL	SAME AS ABOVE, DARK BROWN-GRAY	
26	29		AC	--	--	--	--	--	0	NONE	CL	SAME AS ABOVE	HARD DRILLING
29	31		SS	12	22	31	50	75	0	NONE	CL	SAME AS ABOVE, DARK BROWN-GRAY	CLAYEY SILT LAYER 3" @ 30.5'

SOIL BORING LOG | ENECOTECH, INC. | SHEET NO. 2 OF 2

PROJECT NAME - MEDICINE LAKE RD.
PROJECT NUMBER - 711-015
CLIENT - SINCLAIR
LOCATION - 9456 MEDICINE LAKE RD. NEW HOPE, MN

DRILLING CONTRACTOR - ETI
DRILLER - TOM MOORE
SURFACE ELEVATION -
DRILLING METHOD - HSA 6.75"

HOLE DESIGNATION - MW-01
DATE STARTED - 10/12/90
DATE COMPLETED - 10/15/90
ENECOTECH SUPERVISOR - S.J.B. & T.R.B.

DEPTH FROM	DEPTH TO	SAMPLE NUMBER	SAMPLE METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	PERCENT RECOVERY	DVM VALUE	ODOR STRENGTH	ASTM SYMBOL	SAMPLE DESCRIPTION (COMPONENTS, COLOR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)
31	34		AC	--	--	--	--	--	0	NONE	CL	SAME AS ABOVE	
34	36		SS	14	33	53	55	100	0	NONE	CL	SILTY CLAY W/SOME GRAVEL & SAND, GRAY, MOIST-WET	SILT LAYER 11' / MOIST-WET
										NONE	SM	SILTY SAND, FINE-MED, W/TR CLAY & SOME GRAVEL, RED BRN	35.5
36	39		AC	--	--	--	--	--	0	NONE	SM	SAME AS ABOVE	
39	41	MW-1-39	SS	36	29	23	--	60	0	NONE	SP	SAND W/SOME GRAVEL & TRACE SILT, MED, BRN, SATURATED	39-41
41	44		AC	--	--	--	--	--	0	NONE	CL	SILTY CLAY W/SOME GRAVEL, BROWN, MOIST	41-44
44	46		SS	16	23	27	27	75	0	NONE	SP	SAND W/TRACE GRAVEL, FINE-MEDIUM, LIGHT BROWN, MOIST	
46	49		AC	--	--	--	--	--	0	NONE	SP	SAME AS ABOVE	
49	51		SS	9	19	20	24	60	0	NONE	SP	SAND W/TRACE GRAVEL, VERY FINE-MED, BRN-LT BRN, MOIST	
51	54		AC	--	--	--	--	--	0	NONE	SP	SAME AS ABOVE	
54	56		SS	19	21	38	50	75	0	NONE	SP	SAND, VERY FINE-FINE, LT BRN, MOIST, EXTREMELY DENSE	
56	59		AC	--	--	--	--	--	0	NONE	SP	SAME AS ABOVE	
59	61	MW-01-59	SS	30	46	70	--	60	0	NONE	SP	SAND, VERY FINE, LIGHT BROWN, MOIST, EXTREMELY DENSE	

SOIL BORING LOG

ENECOTECH, INC.

SHEET NO. 1 OF 1

PROJECT NAME - MEDICINE LAKE RD.
PROJECT NUMBER - 711-015
CLIENT - SINCLAIR
LOCATION - 9456 MEDICINE LAKE RD. NEW HOPE, MN

DRILLING CONTRACTOR - ETI
DRILLER - TOM MOORE
SURFACE ELEVATION -
DRILLING METHOD - HSA 6.75"

HOLE DESIGNATION - MW-02
DATE STARTED - 10/16/90
DATE COMPLETED - 10/16/90
ENECOTECH SUPERVISOR - S.J.B.

DEPTH FROM	DEPTH TO	SAMPLE NUMBER	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	PERCENT RECOVERY	OVM VALUE	ODOR STRENGTH	ASTM SYMBOL	SAMPLE DESCRIPTION (COMPONENTS, COLOR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)
0	4		AC	--	--	--	--	--	0	NONE	SM	SILTY SAND W/SOME GRAVEL, DARK BROWN-BROWN, MOIST	COBBLE AT 3'
4	6		SS	5	4	6	13	100	0	NONE	ML	CLAYEY SILT, LIGHT BROWN-GRAY, MOIST, VERY STIFF	
6	9		AC	--	--	--	--	--	0	NONE	ML	SAME AS ABOVE	
9	11	MW-2-9	SS	1	2	3	5	80	11	SLIGHT	CL	SILTY CLAY, LIGHT BROWN-GRAY, MOTTLED, WET-SATURATED	
11	14		AC	--	--	--	--	--	23	MOD	CL	SAME AS ABOVE	
14	16	MW-2-14	SS	6	7	10	15	100	797	STRONG	SC	CLAYEY SAND W/TRACE GRAVEL, FINE-MEDIUM,	5" SATURATED FINE SAND LAYER
										NONE		BROWN-DARK BROWN, MOIST-WET, VERY STIFF	14.5'-15'
16	19		AC	--	--	--	--	--	0	NONE	SC	SAME AS ABOVE	
19	21		SS	5	8	11	15	80	86	MOD	CL	SANDY CLAY W/SOME GRAVEL, DARK GRAY, MOIST	
21	24		AC	--	--	--	--	--	0	NONE	CL	SAME AS ABOVE	
24	26		SS	6	9	11	13		3	NONE	CL	SAME AS ABOVE	

SOIL BORING LOG

ENECOTECH, INC.

PROJECT NAME - MEDICINE LAKE RD.
PROJECT NUMBER - 711-015
CLIENT - SINCLAIR
LOCATION - 9456 MEDICINE LAKE RD. NEW HOPE, MN

DRILLING CONTRACTOR - ETI
DRILLER - TOM MOORE
SURFACE ELEVATION -
DRILLING METHOD - HSA 6.75"

HOLE DESIGNATION - SB-02
DATE STARTED - 10/15/90
DATE COMPLETED - 10/15/90
ENECOTECH SUPERVISOR - T.R.B.

DEPTH FROM	DEPTH TO	SAMPLE NUMBER	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	PERCENT RECOVERY	OVM VALUE	ODOR STRENGTH	AST SYMBOL	SAMPLE DESCRIPTION (COMPONENTS, COLOR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)
0	4		AF							NONE	CL	SILTY CLAY, TRACE GRAVEL, BROWN, MOIST	
4	6		SS	3	7	14	12	100	648	STRONG	CL	SANDY CLAY, TR GRAV & SILT, BRN, GRAY MOTTLING, MOIST	
6	9		AF							STRONG	CL	SAME AS ABOVE	
9	11		SS	3	3	6	6	75	965	STRONG	ML	CLAYEY SILT, BROWN-GRAY MOTTLED, MOIST	9'-12'
11	14		AF							STRONG	SM	SANDY SILT, TRACE CLAY, BLUE GRAY, MOIST	12'-14'
14	16	SB-02-14	SS	10	9	13	15	100	148	SLIGHT	CL	SILTY CLAY, 10% GRAVEL, 2" SAND LENS @ 16',	
												MOIST, DARK BROWN	
16	19		AF								CL	SAME AS ABOVE	
19	21		SS	5	7	11	13	100	15.6	NONE	CL	SILTY CLAY, TRACE GRAVEL, MOIST, GRAY	
21	24		AF								CL	SAME AS ABOVE	
24	26		SS	5	8	11	13	100	4.3	NONE	CL	SANDY CLAY, TRACE GRAVEL, BROWN TO DARK GRAY, MOIST	
26	29		AF								CL	SAME AS ABOVE	
29	31		SS	9	14	19	24	100	0.0	NONE	CL	SAME AS ABOVE, BROWN TO RED BROWN, DRY	

SOIL BORING LOG | ENECOTECH, INC. | SHEET NO. 2 OF 2

PROJECT NAME - MEDICINE LAKE RD.
PROJECT NUMBER - 711-015
CLIENT - SINCLAIR
LOCATION - 9456 MEDICINE LAKE RD. NEW HOPE, MN

DRILLING CONTRACTOR - ETI
DRILLER - TOM MOORE
SURFACE ELEVATION -
DRILLING METHOD - HSA 6.75"

HOLE DESIGNATION - SB-02
DATE STARTED - 10/15/90
DATE COMPLETED - 10/15/90
ENECOTECH SUPERVISOR - T.R.B.

DEPTH FROM	DEPTH TO	SAMPLE NUMBER	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	PERCENT RECOVERY	OVM VALUE	ODOR STRENGTH	ASTM SYMBOL	SAMPLE DESCRIPTION (COMPONENTS, COLOR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)
31	34		AF								CL	SAME AS ABOVE	
34	36	SB-02-34	SS	28	40	50	39	100	0	NONE	CL	SAME AS ABOVE, TRACE SILT, BROWN, DRY	
												3" SAND LENS, MEDIUM TO COARSE, @ 35', DRY	

SOIL BORING LOG

ENECOTECH, INC.

SHEET NO. 1 OF 1

PROJECT NAME - MEDICINE LAKE RD.
PROJECT NUMBER - 711-015
CLIENT - SINCLAIR
LOCATION - 9456 MEDICINE LAKE RD. NEW HOPE, MN

DRILLING CONTRACTOR - ETI
DRILLER - TOM MOORE
SURFACE ELEVATION -
DRILLING METHOD - HSA 6.75"

HOLE DESIGNATION - SB-03
DATE STARTED - 10/16/90
DATE COMPLETED - 10/16/90
ENECOTECH SUPERVISOR - T.R.B. & S.J.B.

DEPTH FROM	DEPTH TO	SAMPLE NUMBER	SAMPLE METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	PERCENT RECOVERY	OVM VALUE	ODOR STRENGTH	ASTM SYMBOL	SAMPLE DESCRIPTION (COMPONENTS, COLOR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)
0	4		AF						0	NONE	CL	CONCRETE (0-1'), GRAVEL FILL (1'-3'), SILTY, SANDY,	
												CLAY (3'-4'), BROWN, MOIST	
4	6		SS	2	2	2	2	10	3.7	NONE	SC	CLAYEY SAND, TRACE GRAVEL, BROWN, MOIST	
6	9		AF								SC	CLAYEY SAND, BROWN, WET	WATER PERCHED IN BOTTOM OF TANK BASI
9	11	SB-03-9	SS	3	4	7	10	100	16.3	NONE	CL	SANDY CLAY, TRACE GRAVEL, DARK BROWN, MOIST	FROM TANK EXCAVATION
11	14		AF								CL	SAME AS ABOVE	
14	16		SS	4	6	12	11	100	0.0	NONE	CL	SILTY CLAY, TR GRAVEL & SAND, GRAY, BRN MOTTLING, DR	
16	19		AF								CL	SAME AS ABOVE	
19	21	SB-03-19	SS	3	5	11	12	100	0.0	NONE	CL	SAME AS ABOVE	

SOIL BORING LOG

ENECOTECH, INC.

SHEET NO. 1 OF 1

PROJECT NAME - MEDICINE LAKE RD.
PROJECT NUMBER - 711-015
CLIENT - SINCLAIR
LOCATION - 9456 MEDICINE LAKE RD. NEW HOPE, MN

DRILLING CONTRACTOR - ETI
DRILLER - TOM MOORE
SURFACE ELEVATION -
DRILLING METHOD - HSA 6.75"

HOLE DESIGNATION - SB-04
DATE STARTED - 10/16/90
DATE COMPLETED - 10/16/90
ENECOTECH SUPERVISOR - S.J.B.

DEPTH FROM	DEPTH TO	SAMPLE NUMBER	SAMPLE METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	PERCENT RECOVERY	OVM VALUE	ODOR STRENGTH	AST SYMBOL	SAMPLE DESCRIPTION (COMPONENTS, COLOR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)
0	4		AC	--	--	--	--	--	0	---	SP	SAND W/ GRAVEL, MEDIUM, BROWN	4" OF ASPHALT
											CL	SILTY CLAY W/TRACE GRAVEL, LIGHT BROWN, MOIST	
4	6		SS	4	8	8	12	80	0	---	ML	CLAYEY SILT W/SOME SAND & TR GRAVEL, LT BRN, MOIST	
6	9	SB-04-09	AC	--	--	--	--	--	0	---	ML	SAME AS ABOVE	
9	11		SS	2	8	12	12	80	579	STRONG	CL	SILTY CLAY, LIGHT BROWN, MOIST, VERY STIFF	
											SM	SILTY SAND W/TRACE GRAVEL, FINE, GRAY, WET	9.5-10 STRONG ODOR
											CL	SANDY CLAY W/TRACE GRAVEL, BROWN, MOIST	
11	14		AC	--	--	--	--	--			CL	SAME AS ABOVE	
14	16		SS	8	13	25	23	75	9	SLIGHT	CL	SANDY CLAY W/SOME GRAVEL, DARK BROWN-GRAY, MOIST	
16	19		AC	--	--	--	--	--	--	---	CL	SAME AS ABOVE	HARD DRILLING
19	21		SS	4	5	7	16	75	0	---	CL	SANDY CLAY W/SOME GRAVEL, DARK GRAY, MOIST	
21	24	SB-04-24	AC	--	--	--	--	--	0	---	CL	SAME AS ABOVE	
24	26		SS	9	13	19	25	100	0	---	CL	SAME AS ABOVE	

SOIL BORING LOG

ENECOTECH, INC.

SHEET NO. 1 OF 1

PROJECT NAME - MEDICINE LAKE RD.
PROJECT NUMBER - 711-015
CLIENT - SINCLAIR
LOCATION - 9456 MEDICINE LAKE RD. NEW HOPE, MN

DRILLING CONTRACTOR - ETI
DRILLER - TOM MOORE
SURFACE ELEVATION -
DRILLING METHOD - HSA 6"

HOLE DESIGNATION - SB-05 (S. OF GAS UST)
DATE STARTED - 10/17/90
DATE COMPLETED - 10/17/90
ENECOTECH SUPERVISOR - J.B.

DEPTH FROM	DEPTH TO	SAMPLE NUMBER	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	PERCENT RECOVERY	DVM VALUE	ODOR STRENGTH	ASTM SYMBOL	SAMPLE DESCRIPTION (COMPONENTS, COLOR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)
0	4		AS	--	--	--	--	--	0	SLIGHT			
4	6		SS	4	5	5	8	100	13	SLIGHT	CL	SANDY CLAY, BROWN, MOIST	
6	10		AS	--	--	--	--	--	5	SLIGHT	CL	SAME AS ABOVE	
10	12	SB-5-12	SS	2	2	5	5	100	3	SLIGHT	CL	SILTY CLAY, GRAY, MOIST	
12	16		AS	--	--	--	--	--	3	SLIGHT	CL	SAME AS ABOVE	
16	18		SS	4	4	6	8	0	0	NONE	CL	SAME AS ABOVE	
18	22		AS	--	--	--	--	--	0	NONE	CL	SAME AS ABOVE	
22	24	SB-5-24	SS	8	8	8	14	100	0	NONE	CL	SANDY CLAY, GRAY, MOIST	
24	28		AS	--	--	--	--	--	0	NONE	CL	SAME AS ABOVE	
28	30		AS	12	10	10	14	100	0	NONE	CL	SAME AS ABOVE	

FILING CODE - 11015S6A

SOIL BORING LOG

ENECOTECH, INC.

PROJECT NAME - SINCLAIR-NEW HOPE
PROJECT NUMBER - 711-015
CLIENT - SINCLAIR
LOCATION - MEDICINE LAKE ROAD

DRILLING CONTRACTOR - THEIN
DRILLER - NATHAN
SURFACE ELEVATION -
DRILLING METHOD - HSA

HOLE DESIGNATION - SB-06
DATE STARTED - 4/4/91
DATE COMPLETED - 4/4/91
ENECOTECH SUPERVISOR - SPY

DEPTH FROM	DEPTH TO	SAMPLE NUMBER	SAMPLE METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	PERCENT RECOVERY	DVM VALUE	ODOR STRENGTH	ASTM SYMBOL	SAMPLE DESCRIPTION (COMPONENTS, COLOR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)
0	4		AF							NONE	CL	SILTY, SANDY CLAY, LIGHT BROWN, MOIST	
4	6		SS	7	6			90	0	NONE	CL	S.A.A., DRY	
6	9		AF							NONE	CL	S.A.A.	
9	11		SS	15	18			80	0	NONE	CL	9-10.5' S.A.A.	
											SP	10.5-11.0' MEDIUM SAND, LIGHT BROWN, DRY	
11	14		AF							NONE	CL	SILTY-SANDY CLAY, LIGHT BROWN, DRY	
14	16	SB-06(16)	SS	8	8			100	0	NONE	CL	SILTY-SANDY CLAY, GRAY, DRY	
16	19		AF							NONE	CL	S.A.A.	
19	21		SS	7	6			10	0	NONE	CL	S.A.A., MIXED WITH GRAVEL	
21	24		AF							NONE	CL	S.A.A., DRY	
24	26		SS	8	8			90	0	NONE	CL	S.A.A., DRY	
26	29		AF							NONE	CL	S.A.A., DRY	
29	31		SS	16	21				0	NONE	CL	S.A.A., DRY	

FILING CODE - 11015S6B

SOIL BORING LOG

ENECOTECH, INC.

PROJECT NAME - SINCLAIR-NEW HOPE
PROJECT NUMBER - 711-015
CLIENT - SINCLAIR
LOCATION - MEDICINE LAKE ROAD

DRILLING CONTRACTOR - THEIN
DRILLER - NATHAN
SURFACE ELEVATION -
DRILLING METHOD - HSA

HOLE DESIGNATION - SB-06
DATE STARTED - 4/4/91
DATE COMPLETED - 4/4/91
ENECOTECH SUPERVISOR - SPY

DEPTH FROM	DEPTH TO	SAMPLE NUMBER	SAMPLE METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	PERCENT RECOVERY	DVM VALUE	ODOR STRENGTH	ASTM SYMBOL	SAMPLE DESCRIPTION (COMPONENTS, COLOR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)
31	34		AF							NONE	CL	S.A.A., DRY	
34	36		SS	-------30---------				50	0	NONE	CL	S.A.A., DRY	
36	39		AF							NONE	CL	SILTY-SANDY CLAY, GRAY, DRY	
39	41		SS	-------33---------				50	0	NONE	SM	SILTY SAND, LIGHT BROWN, MOIST	
41	44		AF							NONE	CL	SANDY-SILTY CLAY, GRAY, DRY	
44	46		SS	-------31---------				50	0	NONE	SP	MEDIUM SAND, LIGHT BROWN, DRY	
												*TERMINATED BORING AT 46' BGS, GROUTED TO SURFACE	

FILING CODE - 11015S7A

SOIL BORING LOG

ENECOTECH, INC.

PROJECT NAME - SINCLAIR-NEW HOPE
PROJECT NUMBER - 711-015
CLIENT - SINCLAIR
LOCATION - MEDICINE LAKE ROAD

DRILLING CONTRACTOR - THEIN
DRILLER - NATHAN
SURFACE ELEVATION -
DRILLING METHOD - HSA

HOLE DESIGNATION - SB-07
DATE STARTED - 4/5/91
DATE COMPLETED - 4/5/91
ENECOTECH SUPERVISOR - GVA

DEPTH FROM	DEPTH TO	SAMPLE NUMBER	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	PERCENT RECOVERY	DVM VALUE	ODOR STRENGTH	AST SYMBOL	SAMPLE DESCRIPTION (COMPONENTS, COLOR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)
0	4		AF						0		CL	0-6" ASPHALT, SANDY CLAY, BROWN	
4	6		SS	27				60	0	NONE	CL	SANDY-SILTY CLAY W/PEBS & SHALE, RED-BRWN, DENSE,	
												MEDIUM PLASTICITY	
5	9		AF							NONE	CL	S.A.A.	
9	11		SS	21				90	0	NONE	CL	SAND-SILT CLAY, OX. IRON MOTTLING, LOW PLAST, MOIST	
10	14		AF							NONE	CL	SILTY CLAY, ORANGE-BROWN, MOIST	
14	16	SB-07-14	SS	17				70	9	NONE	SP	MED. TO COARSE-GRAINED SAND, WET	
15	19		AF							NONE	ML	SANDY SILT, MOIST	
19	21		SS	21				90	0	NONE	CH	SAND-SILT CLAY, UNOX. W/SMALL PEBS, V.DENSE, HIGH	
												PLASTICITY, BLUE-GRAY	
20	24		AF							NONE	CH	S.A.A.	
24	26	SB-07-24	SS	25				60	0	NONE	CH	S.A.A.	
25	29		AF							NONE	CH	S.A.A.	

FILING CODE - 11015S7B

SOIL BORING LOG

ENECOTECH, INC.

PROJECT NAME - SINCLAIR-NEW HOPE
PROJECT NUMBER - 711-015
CLIENT - SINCLAIR
LOCATION - MEDICINE LAKE ROAD

DRILLING CONTRACTOR - THEIN
DRILLER - NATHAN
SURFACE ELEVATION -
DRILLING METHOD - HSA

HOLE DESIGNATION - SB-07
DATE STARTED - 4/5/91
DATE COMPLETED - 4/5/91
ENECOTECH SUPERVISOR - GVA

DEPTH FROM	DEPTH TO	SAMPLE NUMBER	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	PERCENT RECOVERY	DVM VALUE	ODOR STRENGTH	ASTM SYMBOL	SAMPLE DESCRIPTION (COMPONENTS, COLOR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)
29	31		SS	-------28---------				50	0	NONE	CH	S.A.A., MOIST	HIT ROCK, SPOON WAS ONLY HALF FULL.
													TERMINATED BORING AT THIS POINT.
													AUGERS COULD NOT GET PAST ROCK-AUGER
													REFUSAL.

FILING CODE - 11015S8A

SOIL BORING LOG

ENECOTECH, INC.

PROJECT NAME - SINCLAIR-NEW HOPE
PROJECT NUMBER - 711-015
CLIENT - SINCLAIR
LOCATION - MEDICINE LAKE ROAD

DRILLING CONTRACTOR - THEIN
DRILLER - MIKE
SURFACE ELEVATION -
DRILLING METHOD - HSA

HOLE DESIGNATION - SB-08
DATE STARTED - 7/10/91
DATE COMPLETED - 7/10/91
ENECOTECH SUPERVISOR - GVA

DEPTH FROM	DEPTH TO	SAMPLE NUMBER	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	PERCENT RECOVERY	DVM VALUE	ODOR STRENGTH	ASTM SYMBOL	SAMPLE DESCRIPTION (COMPONENTS, COLOR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)
0	4		AF							NONE	CL	0-3" = ASPHALT	
												3"-4' = SANDY SILTY CLAY, BROWN, MOIST	
4	6		SS	17				98	0.5	NONE	ML	SILT W/SOME CLAY, 2" SAND LENS AT 5.5', BROWN WITH	
												IRON STAINING, MOIST	
6	8		SS	33				98	0	NONE	ML	SILT W/SOME CLAY, 2" SAND LENS AT 6', BROWN, MOIST	
8	10		SS	30				98	0	NONE	ML	S.A.A., 2" SAND LENS AT 8'	
10	12	SB-08-10	SS	45				75	180	STRONG	SP	SAND, MED TO COARSE, W/GRAVEL AND BLACK PIECES OF	SHEEN ON SPOON
												WEATHERED PETROLEUM, SATURATED	
12	14		SS	40				75	104	STRONG	CL	VERY SANDY SILTY CLAY, VERY DENSE, SATURATED	
14	16		SS	40				100	104	MOD	CL	SANDY SILTY CLAY, VERY DENSE, SAND LENS 15-15.5 '	LENS CONTAINED WEATHERED PETROLEUM
15	19		AF								CL	SANDY SILTY CLAY, VERY DENSE, DRY	
19	21		SS	32				100	54	SLIGHT	CL	S.A.A., VERY DENSE, GRAY, DRY	
20	24		AF								CL	S.A.A., DRY	

FILING CODE - 11015S8B

SOIL BORING LOG

ENECOTECH, INC.

PROJECT NAME - SINCLAIR-NEW HOPE
PROJECT NUMBER - 711-015
CLIENT - SINCLAIR
LOCATION - MEDICINE LAKE ROAD

DRILLING CONTRACTOR - THEIN
DRILLER - MIKE
SURFACE ELEVATION -
DRILLING METHOD - HSA

HOLE DESIGNATION - SB-08
DATE STARTED - 7/10/91
DATE COMPLETED - 7/10/91
ENECOTECH SUPERVISOR - GVA

DEPTH FROM	DEPTH TO	SAMPLE NUMBER	SAMPLE METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	PERCENT RECOVERY	DVM VALUE	ODOR STRENGTH	ASTM SYMBOL	SAMPLE DESCRIPTION (COMPONENTS, COLOR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)
24	26		SS	-------40---------				100	42	SLIGHT	CL	S.A.A., DRY	
25	29		AF								CL	S.A.A., DRY	
29	31		SS	-------56---------				60	30	SLIGHT	CL	S.A.A., DRY	
30	34		AF								CL	S.A.A.	
34	36	SB-08-34	SS	-------60---------				60	127	SLIGHT	CL	S.A.A., SAND LENS 34-34.5', SATURATED	
35	39		AF								CL	S.A.A.	
39									30		CL	S.A.A.	SAMPLE TAKEN FROM END OF AUGER

FILING CODE - 11015S9A

SOIL BORING LOG

ENECOTECH, INC.

PROJECT NAME - SINCLAIR-NEW HOPE
PROJECT NUMBER - 711-015
CLIENT - SINCLAIR
LOCATION - MEDICINE LAKE ROAD

DRILLING CONTRACTOR - THEIN
DRILLER - MIKE
SURFACE ELEVATION -
DRILLING METHOD - HSA

HOLE DESIGNATION - SB-09
DATE STARTED - 7/10/91
DATE COMPLETED - 7/10/91
ENECOTECH SUPERVISOR - GVA

DEPTH FROM	DEPTH TO	SAMPLE NUMBER	SAMPLE METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	PERCENT RECOVERY	OVM VALUE	ODOR STRENGTH	ASTM SYMBOL	SAMPLE DESCRIPTION (COMPONENTS, COLOR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)
0	4		AF						45	SLIGHT	CL	0-6" = CEMENT, SANDY SILTY CLAY, BROWN, MOIST	
4	6		SS	--------26---------				85	16	SLIGHT	CL	S.A.A.	
6	8		SS	--------28---------				0				NOTHING IN SPOON	
8	10		SS	--------20---------				100	64	MOD	ML	SILT WITH SOME CLAY, BROWN-GRAY, MOIST	
10	12	SB-09-10	SS	--------30---------				90	105	STRONG	SP	10-11' = SAND LENS, SATURATED	
											CL	11-12' = SANDY SILTY CLAY, DENSE, SATURATED	
12	14		SS	--------33---------				97	60	STRONG	CL	S.A.A., DRY	
14	16		SS	--------25---------					49	NONE	CL	S.A.A., DRY	
15	19		AF								CL	S.A.A., DRY	
19	21		SS	--------60---------				20	10	NONE	CL	SANDY SILTY CLAY, VERY DENSE, GRAY, DRY	
20	24		AF								CL	S.A.A.	
24	26		SS	--------50---------					1	NONE	CL	S.A.A.	
25	29		AF								CL	S.A.A.	

FILING CODE - 11015S9B

SOIL BORING LOG

ENECOTECH, INC.

PROJECT NAME - SINCLAIR-NEW HOPE
PROJECT NUMBER - 711-015
CLIENT - SINCLAIR
LOCATION - MEDICINE LAKE ROAD

DRILLING CONTRACTOR - THEIN
DRILLER - MIKE
SURFACE ELEVATION -
DRILLING METHOD - HSA

HOLE DESIGNATION - SB-09
DATE STARTED - 7/10/91
DATE COMPLETED - 7/10/91
ENECOTECH SUPERVISOR - GVA

DEPTH FROM	DEPTH TO	SAMPLE NUMBER	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	PERCENT RECOVERY	DVM VALUE	ODOR STRENGTH	ASTM SYMBOL	SAMPLE DESCRIPTION (COMPONENTS, COLOR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)
29	31		SS	--------50---------					0	NONE	CL	S.A.A.	
30	34		AF								CL	S.A.A.	
34	36	SB-09-34	SS	--------50---------				95	0	NONE	CL	S.A.A.	

APPENDIX F
CHAIN OF CUSTODY

CHAIN OF CUSTODY RECORD

NO. 00225

ENECOTECH
3050 METRO DRIVE, SUITE 115
BLOOMINGTON, MN 55425 (612) 854-5513

LOCATION: Sinclair - New Hope
PROJECT NUMBER: 711-015
PROJECT MANAGER: J. Berg
LABORATORY: Interpoll
TURNAROUND TIME: STANDARD

ITEM NO.	SAMPLE NUMBER	NUMBER OF CONTAINERS AND TYPE	MATRIX	COLLECTION DATE	COLLECTION TIME	ANALYSIS REQUIRED
1	MW-02	3-40 ml VOA's, 1-250ml, 1-1000 ml	H2O	5-30-91	11:00	MTBE, MOI 1465-C, THC-gas, Lead, THC-fuel oil
2						
3						
4						
5						
6						
7						
8						
9						
10						

SAMPLER'S SIGNATURE	DATE
Scott H. Weston	5-30-91
NOTES:	

TRANSFER NO.	ITEM NO.	RELINQUISHED BY	ACCEPTED BY	DATE SUBMITTED
1	1	Scott H. Weston		
2				
3				
4				

CHAIN OF CUSTODY RECORD

ENECOTECH
3050 METRO DRIVE, SUITE 115
BLOOMINGTON, MN 55425 (612) 854-5513

NO. 00466

LOCATION: Sinclair - Medicine Lake Rd
PROJECT NUMBER: 111-015
PROJECT MANAGER: Jim Borg
LABORATORY: Interpet
TURNAROUND TIME: Standard

ITEM NO.	SAMPLE NUMBER	NUMBER OF CONTAINERS AND TYPE	MATRIX	COLLECTION DATE	COLLECTION TIME	ANALYSIS REQUIRED
1	SB-06-16	2-250 mL	SOIL	4/4/91	17:30	THC - Fuel Oil THC - Gas MTBE, BTEX
2	SB-07-14	↓	↓	4/5/91	9:30	
3	SB-07-24			4/5/91	9:30	
4						
5						
6						
7						
8						
9						
10						

SAMPLER'S SIGNATURE	DATE
Georgia Vondra-Amos	4/5/91
NOTES:	

TRANSFER NO.	ITEM NO.	RELINQUISHED BY	ACCEPTED BY	DATE SUBMITTED
1	1-3	GVA		4/5/91
2				
3				
4				

CHAIN OF CUSTODY RECORD

EnecoTech
3050 METRO DRIVE, SUITE 115
BLOOMINGTON, MN 55425 (612) 854-5513

NO. 00363

LOCATION: Sinclair - Mad. Lk. Rd
PROJECT NUMBER: 711-015
PROJECT MANAGER: Jim Berg
LABORATORY: Enterpoll
TURNAROUND TIME: Normal

ITEM NO.	SAMPLE NUMBER	NUMBER OF CONTAINERS AND TYPE	MATRIX	COLLECTION DATE	COLLECTION TIME	ANALYSIS REQUIRED
1	MW-01	6-40ml VOA's, 1-250ml Jar	Water	11/12/90	1545	MOD Method 418.1 TPHC-gasoline, TPHC-Fuel Oil
2	MW-02	6-40ml VOA's, 1-Liter Jar	Water	11/12/90	1545	↓
3						
4						
5						
6						
7						
8						
9						
10						

SAMPLER'S SIGNATURE	DATE
Thomas R. Bakal	11/13/90
NOTES:	

TRANSFER NO.	ITEM NO.	RELINQUISHED BY	ACCEPTED BY	DATE SUBMITTED
1	1-2	Thomas R. Bakal	Courier	11/13/90
2				
3				
4				

CHAIN OF CUSTODY RECORD

NO. 00344

ENECOTECH
3050 METRO DRIVE, SUITE 115
BLOOMINGTON, MN 55425 (612) 854-5513

LOCATION: Medicine Lake Rd. Newhope PROJECT MANAGER: J. Berg TURNAROUND TIME: Standard
PROJECT NUMBER: 711-015 LABORATORY: Interpoll

ITEM NO.	SAMPLE NUMBER	NUMBER OF CONTAINERS AND TYPE	MATRIX	COLLECTION DATE	COLLECTION TIME	ANALYSIS REQUIRED
1	SB-3-4	3 VOA's / 8oz Jar	Soil	10-16-90	0900	~~BTEX~~ MDH 465C, PCB's
2	SB-3-14	3 /	/	10-16-90	0900	/
3						
4						
5						
6						
7						
8						
9						
10						

SAMPLER'S SIGNATURE	DATE
[signature]	10-17-90
NOTES:	

TRANSFER NO.	ITEM NO.	RELINQUISHED BY	ACCEPTED BY	DATE SUBMITTED
1	1-2	[signature]	[signature]	1630 10/17/90
2				
3				
4				

CHAIN OF CUSTODY RECORD

NO. 00341

EnecoTech
3050 METRO DRIVE, SUITE 115
BLOOMINGTON, MN 55425 (612) 854-5513

LOCATION: Medicine Lake Rd. New Hope PROJECT MANAGER: J. Berg TURNAROUND TIME: Standard
PROJECT NUMBER: 21-015 LABORATORY: Interpoll

ITEM NO.	SAMPLE NUMBER	NUMBER OF CONTAINERS AND TYPE	MATRIX	COLLECTION DATE	COLLECTION TIME	ANALYSIS REQUIRED
1	MW-1-39	3 VOA's 2 (8oz Jars)	Soil	10-12-90	1500	BTEX, THC-Fuels/Gas
2	MW-1-59	3 VOA's 2 (8oz Jars	↓	10-12-90	700	↓
3	SB-5-12	3 VOA's (1) 8oz Jar	↓	10-17-90	1000	BTEX : THC-Fuels/Gas
4	SB-5-24	↓	↓	10-17-90	1000	↓
5	MW-2-9	3 VOA's (2) 8oz Jars	↓	10-16-90	~~1150~~	↓
6	MW-2-14	↓	↓	10-16-90	1130	↓
7	SB-4-9	↓	↓	10-16-90	1430	↓
8	SB-4-24	↓	↓	10-16-90	1500	↓
9	SB-2-14	↓	↓	10-15-90	1430	↓
10	SB-2-34	↓	↓	10-15-90	1600	↓

SAMPLER'S SIGNATURE	DATE
[signature]	10-17-90

NOTES:

TRANSFER NO.	ITEM NO.	RELINQUISHED BY	ACCEPTED BY	DATE SUBMITTED
1	1-10	[signature]	[signature]	1630 10/17/90
2				
3				
4				

CHAIN OF CUSTODY RECORD

NO. 00122

EnecoTech
3050 METRO DRIVE, SUITE 115
BLOOMINGTON, MN 55425 (612) 854-5513

LOCATION: Medicine Lake Rd
PROJECT NUMBER: 711-015
PROJECT MANAGER: JAB
LABORATORY: Interpoll
TURNAROUND TIME: Normal

ITEM NO.	SAMPLE NUMBER	NUMBER OF CONTAINERS AND TYPE	MATRIX	COLLECTION DATE	COLLECTION TIME	ANALYSIS REQUIRED
1	15-TP-C	1-250ml	Soil	4/13/90		Pb
2	TP-02-08	3-40ml, 1-250ml	↓	↓		MDH 465C, PCB EPA 600
3	TP-02-08	3-250ml				Pb, Cr, Cd, Hg, Arsenic, THC Fuel Oil
4	TP-03-05	3-40ml, 1-250ml				BETX, THC Fuel Oil
5						
6						
7						
8						
9						
10						

SAMPLER'S SIGNATURE	DATE
Wayne Johnson	4/13/90

NOTES:
Via: Sue Lee: use Method 608
4/16/90 dmw.

TRANSFER NO.	ITEM NO.	RELINQUISHED BY	ACCEPTED BY	DATE SUBMITTED
1	items 1-4	Wayne Johnson	Courier	4/16/90
2			Linda Wynne	4/16/90
3				
4				

CHAIN OF CUSTODY RECORD

NO. 00144

ENECOTECH
3050 METRO DRIVE, SUITE 115
BLOOMINGTON, MN 55425 (612) 854-5513

LOCATION: New Hope, MN
PROJECT NUMBER: 711-015
PROJECT MANAGER: JAB
LABORATORY: Interpoll
TURNAROUND TIME: Standard

ITEM NO.	SAMPLE NUMBER	NUMBER OF CONTAINERS AND TYPE	MATRIX	COLLECTION DATE	COLLECTION TIME	ANALYSIS REQUIRED
1	15-TP-C	1 Mason Jar	Soil	4/11/90	13:15	Sieve Analysis (< 200 mesh)
2	15-TP-C	1250 mL & 3 40 ml	Soil	4/11/90	15:00	BTEX & TPH - Gasoline
3	15-TP-01	1 250 mL & 3 40 ml	Soil	4/11/90	14:20	BTEX, MTBE, TPH - Gasoline
4						
5						
6						
7						
8						
9						
10						

SAMPLER'S SIGNATURE	DATE
Jack L. Pill	4/12/90

NOTES: Standard TURNaround ON all items

TRANSFER NO.	ITEM NO.	RELINQUISHED BY	ACCEPTED BY	DATE SUBMITTED
1	1-3	Jack L. Pill	Bob Barry	4/12/90
2				
3				
4				

APPENDIX G
MONITORING WELL CONSTRUCTION DIAGRAMS

EnecoTech®
ENVIRONMENTAL CONSULTANTS

REGION: _____ COMPLETION DATE: 10/15/90

PROJECT NO.: Med. Lake Rd in New Hope GRADE ELEVATION: _____

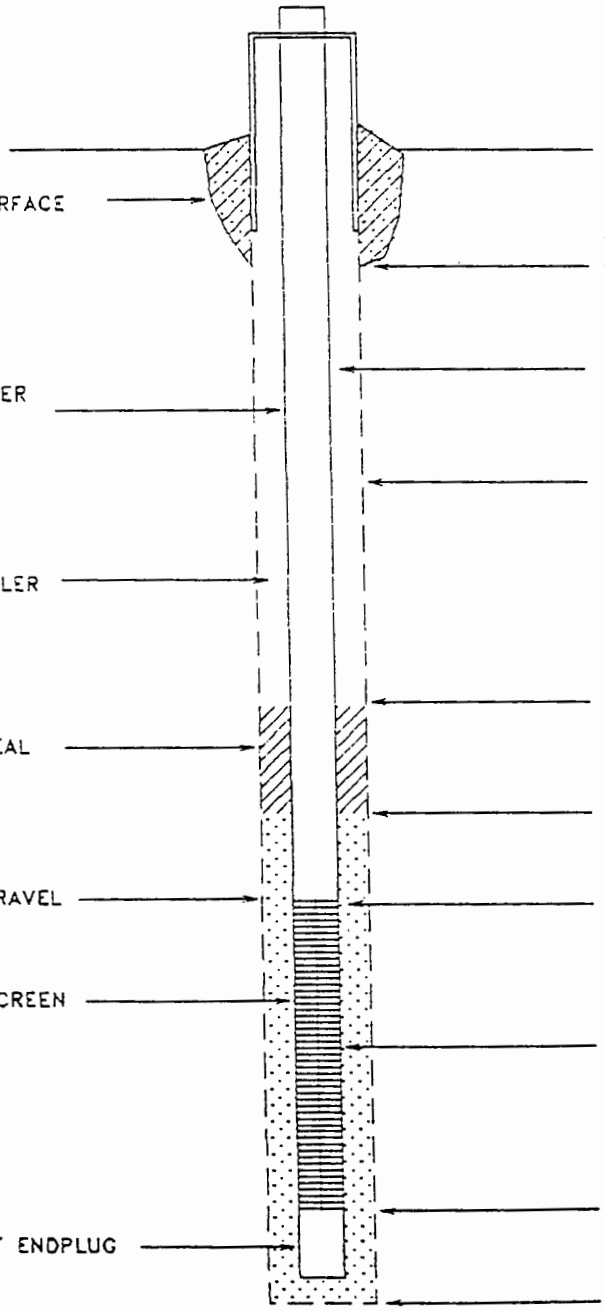
SITE NO.: Sinclair T.O.C. ELEVATION: _____

WELL NO.: MW-01 (NE Corner) STATIC WATER ELEVATION: _____

OWNER: _____ U.S.G.S. QUADRANGLE: _____

DRILLING CONTRACTOR: ETI TOWNSHIP, RANGE, SECTION: _____

DONE BY: _____ _____



Concrete — TYPE OF SURFACE SEAL

DEPTH OF SURFACE SEAL: 2'

Steel — TYPE OF RISER PIPE

O.D. OF RISER PIPE: 2"

DIAMETER OF BOREHOLE: 6 3/4"

Neat Cement — TYPE OF FILLER

Bentonite — TYPE OF SEAL

DEPTH TO TOP OF SEAL: 27'

DEPTH TO TOP OF GRAVEL PACK: 30'

Sand — TYPE OF GRAVEL PACK

DEPTH TO TOP OF SCREEN: 31'

#10 — TYPE OF SCREEN

O.D. OF SCREEN: 2"

SLOT SIZE

DEPTH TO BOTTOM OF SCREEN: 41'

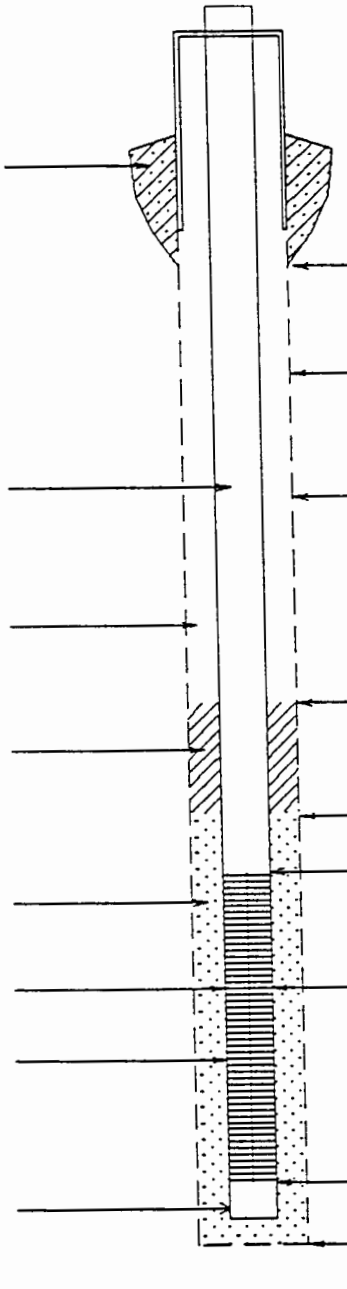
1" — LENGTH OF ENDPLUG

DEPTH TO BOTTOM OF BOREHOLE: _____

MONITORING WELL CONSTRUCTION DIAGRAM
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD
NEW HOPE, MINNESOTA

REGION: MN
PROJECT NUMBER: 711-015
SITE NUMBER: 01
WELL NUMBER: MW-02
MN UNIQ WELL #:
OWNER: SINCLAIR
DRILLER: ETI
DONE BY: SJB

COMPLETION DATE: 10/16/90
GRADE ELEVATION:
T.O.C. ELEVATION:
STATIC WATER LEVEL:
U.S.G.S. QUADRANGLE: OSSEO
TOWNSHIP, RANGE, SECTION:



CONCRETE — TYPE OF SURFACE SEAL

STEEL — TYPE OF RISER PIPE

NEAT CEMENT — TYPE OF FILLER

BENTONITE — TYPE OF SEAL

SILICA SAND — TYPE OF GRAVEL PACK

STAINLESS STEEL — TYPE OF SCREEN

#10 — SLOT SIZE

\- — LENGTH OF ENDPLUG

DEPTH OF SURFACE SEAL	2′
O.D. OF RISER PIPE	2"
DIAMETER OF BOREHOLE	6.75"
DEPTH TO TOP OF SEAL	6′
DEPTH TO TOP OF GRAVEL PACK	8′
DEPTH TO TOP OF SCREEN	10′
O.D. OF SCREEN	2"
DEPTH TO BOTTOM OF SCREEN	20′
DEPTH TO BOTTOM OF BOREHOLE	26′

APPENDIX H
LABORATORY DATA SHEETS

EnecoTech®
ENVIRONMENTAL CONSULTANTS

interpoll

INTERPOLL LABORATORIES, INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL: 612/786-6020
FAX: 612/786-7854

November 6, 1990

EnecoTech
3050 Metro Drive, Suite 115
Bloomington, MN 55425

Attention: Jim Berg

LABORATORY REPORT: #1587
ENECOTECH PROJECT: #711-015

SAMPLES COLLECTED: October 12 - 17, 1990
SAMPLES RECEIVED: October 17, 1990

Sample Identification:			MW-1-39	MW-1-59
Sample Type:			Soil	Soil
Laboratory Log Number:			1587-01	1587-02
Parameter	Units	Target Detection Limit		
EPA Method SW-846, 8020:				
Benzene	mg/Kg	0.06	< 0.06	< 0.06
Toluene	mg/Kg	0.11	< 0.11	< 0.11
Ethylbenzene	mg/Kg	0.05	< 0.05	< 0.05
Xylenes	mg/Kg	0.28	< 0.28	< 0.28
EPA Method SW-846, 8015:				
Total hydrocarbons, as gasoline	mg/Kg	1.2	< 1.2	< 1.2
Modified SW-846 Method 3820:				
Total hydrocarbons, as fuel oil	mg/Kg	1.7	< 1.7	< 1.7

RECEIVED
NOV 15 1990

Sample Identification:			SB-5-12	SB-5-24
Sample Type:			Soil	Soil
Laboratory Log Number:			1587-03	1587-04
Parameter	Units	Target Detection Limit		
EPA Method SW-846, 8020:				
Benzene	mg/Kg	0.06	0.72	< 0.06
Toluene	mg/Kg	0.11	0.69	< 0.11
Ethylbenzene	mg/Kg	0.05	0.12	< 0.05
Xylenes	mg/Kg	0.28	0.52	< 0.28
EPA Method SW-846, 8015:				
Total hydrocarbons, as gasoline	mg/Kg	1.2	7.7	< 1.2
Modified SW-846 Method 3820:				
Total hydrocarbons, as fuel oil	mg/Kg	1.7	< 1.7	< 1.7

Sample Identification:			MW-2-9	MW-2-14
Sample Type:			Soil	Soil
Laboratory Log Number:			1587-05	1587-06
Parameter	Units	Target Detection Limit		
EPA Method SW-846, 8020:				
Benzene	mg/Kg	0.06	0.40	0.32
Toluene	mg/Kg	0.11	< 0.11	0.77
Ethylbenzene	mg/Kg	0.05	< 0.05	0.12
Xylenes	mg/Kg	0.28	< 0.28	0.51
EPA Method SW-846, 8015:				
Total hydrocarbons, as gasoline	mg/Kg	1.2	3.4	5.6
Modified SW-846 Method 3820:				
Total hydrocarbons, as fuel oil	mg/Kg	1.7	< 1.7	< 1.7

Sample Identification:			SB-4-9	SB-4-24
Sample Type:			Soil	Soil
Laboratory Log Number:			1587-07	1587-08
Parameter	Units	Target Detection Limit		
EPA Method SW-846, 8020:				
Benzene	mg/Kg	0.06	< 0.06	0.09
Toluene	mg/Kg	0.11	< 0.11	< 0.11
Ethylbenzene	mg/Kg	0.05	< 0.05	< 0.05
Xylenes	mg/Kg	0.28	< 0.28	< 0.28
EPA Method SW-846, 8015:				
Total hydrocarbons, as gasoline	mg/Kg	1.2	2.1	< 1.2
Modified SW-846 Method 3820:				
Total hydrocarbons, as fuel oil	mg/Kg	1.7	8.4	< 1.7

Sample Identification:			SB-2-14	SB-2-34
Sample Type:			Soil	Soil
Laboratory Log Number:			1587-09	1587-10
Parameter	Units	Target Detection Limit		
EPA Method SW-846, 8020:				
Benzene	mg/Kg	0.06	0.73	< 0.06
Toluene	mg/Kg	0.11	0.95	< 0.11
Ethylbenzene	mg/Kg	0.05	0.12	< 0.05
Xylenes	mg/Kg	0.28	0.65	< 0.28
EPA Method SW-846, 8015:				
Total hydrocarbons, as gasoline	mg/Kg	1.2	8.3	< 1.2
Modified SW-846 Method 3820:				
Total hydrocarbons, as fuel oil	mg/Kg	1.7	< 1.7	< 1.7

Sample Identification:			SB-3-9	SB-3-19
Sample Type:			Soil	Soil
Laboratory Log Number:			1587-11	1587-12
Parameter	Units	Target Detection Limit		
Method MDH 465-C:				
Chloromethane	mg/Kg	0.17	< 0.17	< 0.17
Bromomethane	mg/Kg	0.03	< 0.03	< 0.03
Vinyl chloride	mg/Kg	0.04	< 0.04	< 0.04
Dichlorodifluoromethane	mg/Kg	0.11	< 0.11	< 0.11
Chloroethane	mg/Kg	0.03	< 0.03	< 0.03
Methylene chloride	mg/Kg	0.38	< 0.38	< 0.38
Trichlorofluoromethane	mg/Kg	0.11	< 0.11	< 0.11
1,1-Dichloroethene	mg/Kg	0.08	< 0.08	< 0.08
Allyl chloride	mg/Kg	0.04	< 0.04	< 0.04
1,1-Dichloroethane	mg/Kg	0.02	< 0.02	< 0.02
cis-1,2-Dichloroethene	mg/Kg	0.03	< 0.03	< 0.03
trans-1,2-Dichloroethene	mg/Kg	0.04	< 0.04	< 0.04
Chloroform	mg/Kg	0.04	< 0.04	< 0.04
1,1,2-Trichlorotrifluoroethane	mg/Kg	0.11	< 0.11	< 0.11
Dibromomethane	mg/Kg	0.06	< 0.06	< 0.06
1,2-Dichloroethane	mg/Kg	0.06	< 0.06	< 0.06
1,1,1-Trichloroethane	mg/Kg	0.18	< 0.18	< 0.18
Carbon tetrachloride	mg/Kg	0.05	< 0.05	< 0.05
Bromodichloromethane	mg/Kg	0.07	< 0.07	< 0.07
2,3-Dichloro-1-propene	mg/Kg	0.04	< 0.04	< 0.04
1,2-Dichloropropane	mg/Kg	0.04	< 0.04	< 0.04
1,1-Dichloro-1-propene	mg/Kg	0.02	< 0.02	< 0.02
trans-1,3-Dichloropropene	mg/Kg	0.01	< 0.01	< 0.01
Trichloroethene	mg/Kg	0.07	< 0.07	< 0.07
1,3-Dichloropropane	mg/Kg	0.05	< 0.05	< 0.05
1,1,2-Trichloroethane	mg/Kg	0.13	< 0.13	< 0.13
Dibromochloromethane	mg/Kg	0.14	< 0.14	< 0.14
cis-1,3-Dichloropropene	mg/Kg	0.03	< 0.03	< 0.03
1,2-Dibromoethane	mg/Kg	0.03	< 0.03	< 0.03
2-Chloroethylvinyl ether	mg/Kg	0.09	< 0.09	< 0.09
Bromoform	mg/Kg	0.05	< 0.05	< 0.05
1,1,1,2-Tetrachloroethane	mg/Kg	0.04	< 0.04	< 0.04
1,2,3-Trichloropropane	mg/Kg	0.07	< 0.07	< 0.07
1,1,2,2-Tetrachloroethane	mg/Kg	0.27	< 0.27	< 0.27
Tetrachloroethene	mg/Kg	0.06	< 0.06	< 0.06
Pentachloroethane	mg/Kg	0.21	< 0.21	< 0.21
Chlorobenzene	mg/Kg	0.03	< 0.03	< 0.03
1,3-Dichlorobenzene	mg/Kg	0.06	< 0.06	< 0.06
1,2-Dichlorobenzene	mg/Kg	0.06	< 0.06	< 0.06
1,4-Dichlorobenzene	mg/Kg	0.09	< 0.09	< 0.09
Acetone	mg/Kg	2.8	< 2.8	< 2.8
Tetrahydrofuran	mg/Kg	1.1	< 1.1	< 1.1

Sample Identification:			SB-3-9	SB-3-19
Sample Type:			Soil	Soil
Laboratory Log Number:			1587-11	1587-12
Parameter	Units	Target Detection Limit		
Method MDH 465-C (continued):				
Ethyl ether	mg/Kg	0.14	< 0.14	< 0.14
Methyl ethyl ketone	mg/Kg	0.49	< 0.49	< 0.49
Benzene	mg/Kg	0.06	< 0.06	< 0.06
Methyl isobutyl ketone	mg/Kg	0.20	< 0.20	< 0.20
Toluene	mg/Kg	0.11	< 0.11	< 0.11
Ethylbenzene	mg/Kg	0.05	< 0.05	< 0.05
Cumene	mg/Kg	0.22	< 0.22	< 0.22
Total xylenes	mg/Kg	0.28	< 0.28	< 0.28
EPA Method SW-846, 8080:				
Total PCB	mg/Kg	0.0033	<0.0033	<0.0033

Respectfully submitted,

Wayne A. Olson,
Senior Scientist
Organic Chemistry Department

WAO/cg
Invoice Enclosed
< = less than

All analyses were performed using EPA or other recognized methodologies.
All units are on an "as received" basis unless otherwise indicated.

interpoll

INTERPOLL LABORATORIES, INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL: 612/786-6020
FAX: 612/786-7854

December 5, 1990

EnecoTech
3050 Metro Drive, Suite 115
Bloomington, MN 55425

Attention: Jim Berg

LABORATORY REPORT: #1764
ENECOTECH PROJECT: #711-015

SAMPLES COLLECTED: November 12, 1990
SAMPLES RECEIVED: November 13, 1990

Sample Identification:			MW-01	MW-02
Sample Type:			Water	Water
Laboratory Log Number:			1764-01	1764-02
Parameter	Units	Target Detection Limit		
EPA Method SW-846, 8015:				
Total hydrocarbons, as gasoline	ug/L	10	18	250000
Dilution factor			1	50[a]
Modified SW-846 Method 3820:				
Total hydrocarbons, as fuel oil	ug/L	69	680[b]	48000[c]
Dilution factor			1	50[d]

RECEIVED
DEC 7 - 1990

Sample Identification:			MW-01	MW-02
Sample Type:			Water	Water
Laboratory Log Number:			1764-01	1764-02
Parameter	Units	Target Detection Limit		
Method MDH 465-C:				
Chloromethane	ug/L	1.4	< 1.4	< 14
Bromomethane	ug/L	0.23	< 0.23	< 2.3
Vinyl chloride	ug/L	0.30	< 0.30	< 3.0
Dichlorodifluoromethane	ug/L	0.91	< 0.91	< 9.1
Chloroethane	ug/L	0.26	< 0.26	< 2.6
Methylene chloride	ug/L	3.0	< 3.0	< 30
Trichlorofluoromethane	ug/L	0.87	< 0.87	< 8.7
1,1-Dichloroethene	ug/L	0.66	< 0.66	< 6.6
Allyl chloride	ug/L	0.35	< 0.35	< 3.5
1,1-Dichloroethane	ug/L	0.16	< 0.16	< 1.6
cis-1,2-Dichloroethene	ug/L	0.28	< 0.28	< 2.8
trans-1,2-Dichloroethene	ug/L	0.28	< 0.28	< 2.8
Chloroform	ug/L	0.33	< 0.33	< 3.3
1,1,2-Trichlorotrifluoroethane	ug/L	0.90	< 0.90	< 9.0
Dibromomethane	ug/L	0.50	< 0.50	< 5.0
1,2-Dichloroethane	ug/L	0.47	< 0.47	32
1,1,1-Trichloroethane	ug/L	1.4	< 1.4	< 14
Carbon tetrachloride	ug/L	0.44	< 0.44	< 4.4
Bromodichloromethane	ug/L	0.56	< 0.56	< 5.6
2,3-Dichloro-1-propene	ug/L	0.35	< 0.35	< 3.5
1,2-Dichloropropane	ug/L	0.35	< 0.35	< 3.5
1,1-Dichloro-1-propene	ug/L	0.18	< 0.18	< 1.8
trans-1,3-Dichloropropene	ug/L	0.09	< 0.09	< 0.9
Trichloroethene	ug/L	0.58	< 0.58	< 5.8
1,3-Dichloropropane	ug/L	0.38	< 0.38	< 3.8
1,1,2-Trichloroethane	ug/L	1.0	< 1.0	< 10
Dibromochloromethane	ug/L	1.1	< 1.1	< 11
cis-1,3-Dichloropropene	ug/L	0.27	< 0.27	< 2.7
1,2-Dibromoethane	ug/L	0.26	< 0.26	< 2.6
2-Chloroethylvinyl ether	ug/L	0.70	< 0.70	< 7.0
Bromoform	ug/L	0.39	< 0.39	< 3.9
1,1,1,2-Tetrachloroethane	ug/L	0.30	< 0.30	< 3.0
1,2,3-Trichloropropane	ug/L	0.58	< 0.58	< 5.8
1,1,2,2-Tetrachloroethane	ug/L	2.1	< 2.1	< 21
Tetrachloroethene	ug/L	0.45	< 0.45	< 4.5
Pentachloroethane	ug/L	1.7	< 1.7	< 17

Sample Identification:			MW-01	MW-02
Sample Type:			Water	Water
Laboratory Log Number:			1764-01	1764-02
Parameter	Units	Target Detection Limit		
Method MDH 465-C (continued):				
Chlorobenzene	ug/L	0.23	< 0.23	< 2.3
1,3-Dichlorobenzene	ug/L	0.46	< 0.46	< 4.6
1,2-Dichlorobenzene	ug/L	0.49	< 0.49	< 4.9
1,4-Dichlorobenzene	ug/L	0.69	< 0.69	< 6.9
Acetone	ug/L	22	< 22	< 220
Tetrahydrofuran	ug/L	8.7	< 8.7	< 87
Ethyl ether	ug/L	1.1	< 1.1	< 11
Methyl ethyl ketone	ug/L	3.9	< 3.9	< 39
Benzene	ug/L	0.47	< 0.47	32000[e]
Methyl isobutyl ketone	ug/L	1.6	< 1.6	< 16
Toluene	ug/L	0.92	< 0.92	25000[e]
Ethylbenzene	ug/L	0.42	< 0.42	1800[e]
Cumene	ug/L	1.8	< 1.8	20
Total xylenes	ug/L	2.2	< 2.2	10000[e]
Dilution factor			1	10[f]

Footnotes:

[a]Sample was diluted as indicated to accommodate the analyte concentration. Reported value represents the concentration in the original undiluted sample, i.e., instrumental result was multiplied by the dilution factor prior to reporting. Target detection limit is given. The detection limit applicable to the sample may be obtained by multiplying the detection limit by the dilution factor.

[b]The target detection limit is based on a one liter volume of sample being extracted and analyzed. The achieved detection limit for this sample is 3.8 times higher than the target detection limit because less than one liter was submitted for analysis.

[c]Although quantified as fuel oil as requested, the chromatographic pattern did not match that of fuel oil, but a lighter grade.

[d]Sample extract was diluted as indicated to accommodate the analyte concentration. Reported value represents the concentration in the original undiluted sample, i.e., instrumental result was multiplied by the dilution factor prior to reporting. Target detection limit is given. The detection limit applicable to the sample may be obtained by multiplying the detection limit by the dilution factor.

[e]Sample was diluted by a factor of 1000 to accommodate the analyte concentration. Reported value represents the concentration in the original undiluted sample, i.e., instrumental result was multiplied by the dilution factor prior to reporting. Target detection limit is given. The detection limit applicable to the sample may be obtained by multiplying the detection limit by the dilution factor.

[f]Sample was diluted as indicated due to matrix interferences. Reported values represent the concentration in the original undiluted sample, i.e., instrumental results were multiplied by the dilution factor prior to reporting. Target detection limits are given. The detection limit applicable to the sample may be obtained by multiplying the detection limit by the dilution factor.

Respectfully submitted,

Wayne A. Olson,
Senior Scientist
Organic Chemistry Department

WAO/cg
Invoice Enclosed
< = less than

All analyses were performed using EPA or other recognized methodologies.
All units are on an "as received" basis unless otherwise indicated.

interpoll

INTERPOLL LABORATORIES, INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL: 612/786-6020
FAX: 612/786-7854

RECEIVED
APR 2 1 1991

April 22, 1991

EnecoTech
3050 Metro Drive, Suite 115
Bloomington, MN 55425

Attention: Jim Berg

LABORATORY REPORT: #2672
ENECOTECH PROJECT: #711-015

SAMPLES COLLECTED: April 4-5, 1991
SAMPLES RECEIVED: April 5, 1991

Sample Identification:			SB-06-46	SB-07-14
Sample Type:			Soil	Soil
Laboratory Log Number:			2672-01	2672-02
Parameter	Units	Target Detection Limit		
EPA Method SW-846, 8020:				
MTBE	mg/Kg	0.06	< 0.06	< 0.06
Benzene	mg/Kg	0.06	< 0.06	< 0.06
Toluene	mg/Kg	0.11	< 0.11	< 0.11
Ethylbenzene	mg/Kg	0.05	< 0.05	< 0.05
Xylenes	mg/Kg	0.28	< 0.28	< 0.28
EPA Method SW-846, 8015: Total hydrocarbons, as gasoline	mg/Kg	1.2	< 1.2	< 1.2
EPA Method SW-846, 8015: Total hydrocarbons, as fuel oil	mg/Kg	1.4	< 1.4	< 1.4

Sample Identification:	SB-07-24
Sample Type:	Soil
Laboratory Log Number:	2672-03

Parameter	Units	Method		
EPA Method SW-846, 8020:				
MTBE	mg/Kg	0.06	<	0.06
Benzene	mg/Kg	0.06	<	0.06
Toluene	mg/Kg	0.11	<	0.11
Ethylbenzene	mg/Kg	0.05	<	0.05
Xylenes	mg/Kg	0.28	<	0.28
EPA Method SW-846, 8015: Total hydrocarbons, as gasoline	mg/Kg	1.2	<	1.2
EPA Method SW-846, 8015: Total hydrocarbons, as fuel oil	mg/Kg	1.4	<	1.4

Respectfully submitted,

Wayne A. Olson
Senior Scientist
Organic Chemistry Department

WAO/sk
Invoice Enclosed
< = less than

All analyses were performed using EPA or other recognized methodologies.
All units are on an "as received" basis unless otherwise indicated.

711-015

interpoll

INTERPOLL LABORATORIES, INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL: 612/786-6020
FAX: 612/786-7854

RECEIVED
JUL - 3 1991

June 24, 1991

EnecoTech
3050 Metro Drive, Suite 115
Bloomington, MN 55425

Attention: Jim Berg

LABORATORY REPORT: #3170
ENECOTECH PROJECT: #711-015

SAMPLES COLLECTED: May 30, 1991
SAMPLES RECEIVED: May 31, 1991

Sample Identification:	MW-02
Sample Type:	Water
Laboratory Log Number:	3170-01

Parameter	Units	Target Detection Limit	
EPA Method SW-846, 7421:			
Lead	ug/L	1	74
EPA Method SW-846, 8020:			
MTBE	ug/L	0.68	1700
Dilution factor			50[a]
EPA Method SW-846, 8015:			
Total hydrocarbons, as gasoline	ug/L	12	102000
Dilution factor			50[a]
EPA Method SW-846, 3550/8015:			
Total hydrocarbons, as fuel oil	ug/L	46	26000
Dilution factor			10[b,c]

Sample Identification:	MW-02
Sample Type:	Water
Laboratory Log Number:	3170-01

Parameter	Units	Target Detection Limit	
Method MDH 465-C (continued):			
Chlorobenzene	ug/L	0.23	< 120
1,3-Dichlorobenzene	ug/L	0.46	< 230
1,2-Dichlorobenzene	ug/L	0.49	< 240
1,4-Dichlorobenzene	ug/L	0.69	< 340
Acetone	ug/L	22	< 11000
Tetrahydrofuran	ug/L	8.7	16000
Ethyl ether	ug/L	1.1	1200
Methyl ethyl ketone	ug/L	3.9	2000
Benzene	ug/L	0.47	19000
Methyl isobutyl ketone	ug/L	1.6	< 800
Toluene	ug/L	0.92	19000
Ethylbenzene	ug/L	0.42	1000
Cumene	ug/L	1.8	< 900
Total xylenes	ug/L	2.2	9300
Dilution factor			500[d]

Sample Identification: MW-02
Sample Type: Water
Laboratory Log Number: 3170-01

Parameter	Units	Target Detection Limit		
Method MDH 465-C:				
Chloromethane	ug/L	1.4	<	700
Bromomethane	ug/L	0.23	<	120
Vinyl chloride	ug/L	0.30	<	150
Dichlorodifluoromethane	ug/L	0.91	<	460
Chloroethane	ug/L	0.26	<	130
Methylene chloride	ug/L	3.0	<	1500
Trichlorofluoromethane	ug/L	0.87	<	440
1,1-Dichloroethene	ug/L	0.66	<	330
Allyl chloride	ug/L	0.35	<	180
1,1-Dichloroethane	ug/L	0.16	<	80
cis-1,2-Dichloroethene	ug/L	0.28	<	140
trans-1,2-Dichloroethene	ug/L	0.28	<	140
Chloroform	ug/L	0.33	<	170
1,1,2-Trichlorotrifluoroethane	ug/L	0.90	<	450
Dibromomethane	ug/L	0.50	<	250
1,2-Dichloroethane	ug/L	0.47	<	240
1,1,1-Trichloroethane	ug/L	1.4	<	700
Carbon tetrachloride	ug/L	0.44	<	220
Bromodichloromethane	ug/L	0.56	<	110
2,3-Dichloro-1-propene	ug/L	0.35	<	180
1,2-Dichloropropane	ug/L	0.35	<	180
1,1-Dichloro-1-propene	ug/L	0.18	<	90
trans-1,3-Dichloropropene	ug/L	0.09	<	90
Trichloroethene	ug/L	0.58	<	290
1,3-Dichloropropane	ug/L	0.38	<	190
1,1,2-Trichloroethane	ug/L	1.0	<	500
Dibromochloromethane	ug/L	1.1	<	550
cis-1,3-Dichloropropene	ug/L	0.27	<	95
1,2-Dibromoethane	ug/L	0.26	<	130
2-Chloroethylvinyl ether	ug/L	0.70	<	350
Bromoform	ug/L	0.39	<	200
1,1,1,2-Tetrachloroethane	ug/L	0.30	<	150
1,2,3-Trichloropropane	ug/L	0.58	<	290
1,1,2,2-Tetrachloroethane	ug/L	2.1	<	1000
Tetrachloroethene	ug/L	0.45	<	200
Pentachloroethane	ug/L	1.7	<	850

Footnotes:

[a]Sample was diluted as indicated to accommodate the analyte concentration. Reported value represents the concentration in the original undiluted sample, i.e., instrumental result was multiplied by the dilution factor prior to reporting. Target detection limit is given. The detection limit applicable to the sample may be obtained by multiplying the detection limit by the dilution factor.

[b]Sample extract was diluted as indicated to accommodate the analyte concentration. Reported value represents the concentration in the original undiluted sample, i.e., instrumental result was multiplied by the dilution factor prior to reporting. Target detection limit is given. The detection limit applicable to the sample may be obtained by multiplying the detection limit by the dilution factor.

[c]Although quantified as fuel oil as requested, the chromatographic pattern more closely resembles that of gasoline.

[d]Sample was diluted as indicated to accommodate the analyte with the highest concentration. Reported values represent the concentration in the original undiluted sample, i.e., instrumental results were multiplied by the dilution factor prior to reporting. Target detection limits are given. The detection limit applicable to the sample may be obtained by multiplying the detection limit by the dilution factor.

Respectfully submitted,

Gregg W. Holman,
Senior Scientist
Inorganic Chemistry Department

Wayne A. Olson,
Senior Scientist
Organic Chemistry Department

GWH/WAO/sk
Invoice Enclosed
< = less than

All analyses were performed using EPA or other recognized methodologies.
All units are on an "as received" basis unless otherwise indicated.

CHAIN OF CUSTODY RECORD

ENECOTECH
3050 METRO DRIVE, SUITE 115
BLOOMINGTON, MN 55425 (612) 854-5513

NO. 39225

LOCATION: Sinclair - New Hope
PROJECT NUMBER: 711-015
PROJECT MANAGER: J. Berg
LABORATORY: Interpell
TURNAROUND TIME: STANDARD

ITEM NO.	SAMPLE NUMBER	NUMBER OF CONTAINERS AND TYPE	MATRIX	COLLECTION DATE	COLLECTION TIME	ANALYSIS REQUIRED
3170-01 1	MW-02	3-40 ml VOA's, 1-250ml, 1-1000 ml	H_2O	5-30-91	11:00	MTBE, MDH465-C, THC-gas, Lead, THC-fuel oil (GASOLINE SMELL)
2						
3						
4						
5						
6						
7						
8						
9						
10						

SAMPLER'S SIGNATURE	DATE
Scott H. Weiston	5-30-91
NOTES:	

TRANSFER NO.	ITEM NO.	RELINQUISHED BY	ACCEPTED BY	DATE SUBMITTED
1	1	Scott H. Weiston	BCB	1100 5/31/91
2				
3				
4				

interpoll

INTERPOLL LABORATORIES, INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL: 612/786-6020
FAX: 612/786-7854

August 14, 1991

EnecoTech
3050 Metro Drive, Suite 115
Bloomington, MN 55425

Attention: Jim Berg

LABORATORY REPORT: #3593
ENECOTECH PROJECT: #711-015

SAMPLES COLLECTED: July 10, 1991
SAMPLES RECEIVED: July 12, 1991

Sample Identification:			SB-08-10	SB-08-34
Sample Type:			Soil	Soil
Laboratory Log Number:			3593-01	3593-02
Parameter	Units	Target Detection Limit		
EPA Method SW-846, 6010:				
Lead	mg/Kg	5	6	< 5
EPA Method SW-846, 8020:				
MTBE	mg/Kg	0.085	< 0.43	< 0.17
Benzene	mg/Kg	0.059	< 0.30	0.95
Toluene	mg/Kg	0.063	0.76	1.1
Ethylbenzene	mg/Kg	0.041	0.96	1.5
Xylenes	mg/Kg	0.18	4.7	8.1
Dilution factor			5[a]	2[a]
EPA Method SW-846, 8015:				
Total hydrocarbons, as gasoline	mg/kg	1.6	45	47
Dilution factor			5[b]	2[b]
EPA Method SW-846, 3510/8015:				
Total hydrocarbons, as fuel oil	mg/Kg	1.4	220[c]	8.7[c]
Dilution factor			5[b]	1

Interpoll Laboratories, Inc.
Laboratory Report #3593
EnecoTech

Sample Identification:			SB-09-10	SB-09-34
Sample Type:			Soil	Soil
Laboratory Log Number:			3593-03	3593-04
Parameter	Units	Target Detection Limit		
EPA Method SW-846, 6010:				
Lead	mg/Kg	5	< 5	6
EPA Method SW-846, 8020:				
MTBE	mg/Kg	0.085	< 0.43	< 0.085
Benzene	mg/Kg	0.059	< 0.30	< 0.059
Toluene	mg/Kg	0.063	< 0.32	< 0.063
Ethylbenzene	mg/Kg	0.041	< 0.20	< 0.041
Xylenes	mg/Kg	0.18	2.6	< 0.18
Dilution factor			5[a]	1
EPA Method SW-846, 8015:				
Total hydrocarbons, as gasoline	mg/kg	1.6	20	< 1.6
Dilution factor			5[b]	1
EPA Method SW-846, 3510/8015:				
Total hydrocarbons, as fuel oil	mg/Kg	1.4	57[c]	< 1.4

Interpoll Laboratories, Inc.
Laboratory Report #3593
EnecoTech

August 14, 1991

Sample Identification:	MW-01
Sample Type:	Water
Laboratory Log Number:	3593-05

Parameter	Units	Target Detection Limit		
EPA Method SW-846, 6010:				
Lead	ug/L	30		60
EPA Method SW-846, 8020:				
MTBE	ug/L	0.68	<	0.68
EPA Method SW-846, 8015:				
Total hydrocarbons, as gasoline	ug/L	13	<	13
EPA Method SW-846, 3510/8015:				
Total hydrocarbons, as fuel oil	ug/L	43	<	43

Interpoll Laboratories, Inc.
Laboratory Report #3593
EnecoTech

August 14, 1991

Sample Identification: MW-01
Sample Type: Water
Laboratory Log Number: 3593-05

Parameter	Units	Target Detection Limit		
Method MDH 465-C:				
Chloromethane	ug/L	1.4	<	1.4
Bromomethane	ug/L	0.23	<	0.23
Vinyl chloride	ug/L	0.30	<	0.30
Dichlorodifluoromethane	ug/L	0.91	<	0.91
Chloroethane	ug/L	0.26	<	0.26
Methylene chloride	ug/L	3.0	<	3.0
Trichlorofluoromethane	ug/L	0.87	<	0.87
1,1-Dichloroethene	ug/L	0.66	<	0.66
Allyl chloride	ug/L	0.35	<	0.35
1,1-Dichloroethane	ug/L	0.16	<	0.16
cis-1,2-Dichloroethene	ug/L	0.28	<	0.28
trans-1,2-Dichloroethene	ug/L	0.28	<	0.28
Chloroform	ug/L	0.33	<	0.33
1,1,2-Trichlorotrifluoroethane	ug/L	0.90	<	0.90
Dibromomethane	ug/L	0.50	<	0.50
1,2-Dichloroethane	ug/L	0.47	<	0.47
1,1,1-Trichloroethane	ug/L	1.4	<	1.4
Carbon tetrachloride	ug/L	0.44	<	0.44
Bromodichloromethane	ug/L	0.56	<	0.56
2,3-Dichloro-1-propene	ug/L	0.35	<	0.35
1,2-Dichloropropane	ug/L	0.35	<	0.35
1,1-Dichloro-1-propene	ug/L	0.18	<	0.18
trans-1,3-Dichloropropene	ug/L	0.09	<	0.09
Trichloroethene	ug/L	0.58	<	0.58
1,3-Dichloropropane	ug/L	0.38	<	0.38
1,1,2-Trichloroethane	ug/L	1.0	<	1.0
Dibromochloromethane	ug/L	1.1	<	1.1
cis-1,3-Dichloropropene	ug/L	0.27	<	0.27
1,2-Dibromoethane	ug/L	0.26	<	0.26
2-Chloroethylvinyl ether	ug/L	0.70	<	0.70
Bromoform	ug/L	0.39	<	0.39
1,1,1,2-Tetrachloroethane	ug/L	0.30	<	0.30
1,2,3-Trichloropropane	ug/L	0.58	<	0.58
1,1,2,2-Tetrachloroethane	ug/L	2.1	<	2.1
Tetrachloroethene	ug/L	0.45	<	0.45
Pentachloroethane	ug/L	1.7	<	1.7
Chlorobenzene	ug/L	0.23	<	0.23
1,3-Dichlorobenzene	ug/L	0.46	<	0.46
1,2-Dichlorobenzene	ug/L	0.49	<	0.49
1,4-Dichlorobenzene	ug/L	0.69	<	0.69

Interpoll Laboratories, Inc.
Laboratory Report #3593
EnecoTech

August 14, 1991
Page 5 of 6

Sample Identification: MW-01
Sample Type: Water
Laboratory Log Number: 3593-05

Parameter	Units	Target Detection Limit		
Method MDH 465-C (continued):				
Acetone	ug/L	22	<	22
Tetrahydrofuran	ug/L	8.7		9.9
Ethyl ether	ug/L	1.1	<	1.1
Methyl ethyl ketone	ug/L	3.9	<	3.9
Benzene	ug/L	0.47	<	0.47
Methyl isobutyl ketone	ug/L	1.6	<	1.6
Toluene	ug/L	0.92	<	0.92
Ethylbenzene	ug/L	0.42	<	0.42
Cumene	ug/L	1.8	<	1.8
Total xylenes	ug/L	2.2	<	2.2

Footnotes:

[a]Sample extract was diluted as indicated to accommodate the analyte with the highest concentration. Reported values represent the concentration in the original undiluted sample, i.e., instrumental results were multiplied by the dilution factor prior to reporting. Target detection limits are given. The detection limit applicable to the sample may be obtained by multiplying the detection limit by the dilution factor.

[b]Sample extract was diluted as indicated to accommodate the analyte concentration. Reported value represents the concentration in the original undiluted sample, i.e., instrumental result was multiplied by the dilution factor prior to reporting. Target detection limit is given. The detection limit applicable to the sample may be obtained by multiplying the detection limit by the dilution factor.

[c]Although quantified as fuel oil as requested, the chromatographic pattern did not match that of fuel oil, but a lighter grade.

Respectfully submitted,

Gregg W. Holman,
Senior Scientist
Inorganic Chemistry Department

Wayne A. Olson,
Senior Scientist
Organic Chemistry Department

GWH/WAO/sk
Invoice Enclosed
< = less than

All analyses were performed using EPA or other recognized methodologies.
All units are on an "as received" basis unless otherwise indicated.

APPENDIX I
TWIN CITY TESTING REPORTS
REMEDIAL SITE ASSESSMENT
MOBIL OIL CORPORATION SITE #4 0560D
COUNTY ROAD 18 AND MEDICINE LAKE ROAD
GOLDEN VALLEY, MINNESOTA

January 27, 1987, May 28, 1987, August 2, 1989

EnecoTech®
ENVIRONMENTAL CONSULTANTS

January 27, 1987

Mobil Oil Corporation
600 Woodfield Drive
Schaumburg, Illinois 60196

Attn: Mr. Rick Larson

Subj: Tank Excavation
Mobil Station
9405 Medicine Lake Road
Golden Valley, Minnesota
#4231 87-503

Dear Mr. Larson:

1.0 Introduction

This report presents the results of work completed at a Mobil station in Golden Valley, Minnesota. All work was verbally authorized by M.C. Holland and yourself of Mobil Oil Corporation on January 14, 1987. Site activities consisted of the following:

1. Observation of the removal of the existing 1000 gallon tank.

2. Screening of the soils excavated to insure adequate removal of contaminated material.

2.0 Background

The 1000 gallon diesel oil tank was installed by Pump & Meter Service Company of Minneapolis in 1981. In the spring of 1986, moisture was noted in the product dispensed from the tank. The tank was pumped dry and refilled. Water was again observed in the dispensed product so the tank was pumped out, leaving only a few gallons.

3.0 Project Results

3.1 Tank Removal

The 1000 gallon tank was removed on January 19, 1987 by Pump & Meter Service. A representative of Twin City Testing Corporation (TCT) was present for the removal. The bottom 3/4 of the tank was coated with a black film of oil and a small quality of water diluted oil was noted in the bottom

of the excavation. An inspection of the tank did not reveal any holes in the tank, although several pitted areas were observed. Oil was seen dripping off the end of the tank as it was swung out of the excavation.

3.2 Soil Screening

The TCT technician screened the excavated soil with a Century Systems Model OVA-128 portable organic vapor analyzer. Readings of 98 parts per million (ppm) and 108 ppm total organic vapors were noted. The excavated soils had a strong oil-like odor and staining was apparent.

Pump & Meter Service continued excavation of contaminated soils on January 22, 1987. Approximately 50 cubic yards of contaminated soils were removed. Additional excavation was not warranted, as visual and olfactory evidence indicated no contaminated soil remained in the subsurface environment. A sample of the clay from the excavation floor was returned to the TCT office and screened with a TIP Photovac photoionization meter and a total organic vapor concentration of 13 ppm was indicated.

As indicated in our report dated December 18, 1986, the natural soil in this area is a glacial till of sandy lean clay. The excavation also consisted of clean sand backfill from the original tank installation.

4.0 Discussion

The fuel oil in the ground had saturated the sand fill but apparently had not penetrated the natural clay.

The visual and olfactory evidence indicates that the contaminated soils were removed from the subsurface environment. This observation is supported by the values obtained from photoionization screening of soils at the base of the excavation.

5.0 Recommendations

It is our opinion that further subsurface environmental investigations are not necessary at this site at this time.

6.0 Remarks

The recommendations contained in this report represent our professional opinions. These opinions were arrived at in accordance with currently accepted engineering practices at this time and location. Other than this, no warranty is implied or intended.

Very truly yours,

Twin City Testing Corporation

Terrance P. Brennan

Terrance P. Brennan
Geologist

Tom Gapinske

Tom Gapinske
Hydrogeologist/Senior Project Manager

TPB/TG/sjo

LEAK # 183

REMEDIAL SITE ASSESSMENT

MOBIL OIL CORPORATION SITE #4 05GOD

COUNTY ROAD 18 AND

MEDICINE LAKE ROAD

GOLDEN VALLEY, MINNESOTA

MAY 28, 1987

#4231 87-663

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REMEDIAL SITE ASSESSMENT

MOBIL OIL CORPORATION SITE #4 05GOD

COUNTY ROAD 18 AND

MEDICINE LAKE ROAD

GOLDEN VALLEY, MINNESOTA

#4231 87-663

1.0 INTRODUCTION

The purpose of this assessment was to determine the extent of subsurface contamination, with subsequent recommendations for further action. This assessment was conducted at the Mobil Oil Corporation service station at the intersection of County Road 18 and Medicine Lake Road in Golden Valley, Minnesota (Site #4 05GOD).

Specifically, the work effort consisted of the following:

1. advancing five standard penetration soil borings,
2. completing three soil borings as monitoring wells,
3. evaluating soil samples using visual appearance and odor as criteria,
4. collecting water level measurements and determining the ground water flow regime,
5. collecting and analyzing ground water samples for benzene, toluene, xylenes and total hydrocarbons as gasoline, and

6. preparing a report which summarizes and evaluates the data, with recommendations for further action.

2.0 PROJECT RESULTS

2.1 Subsurface Conditions

The site is underlain by glacial tills and alluvium. The glacial tills consist mainly of silty sand (SM), clayey sand (SC), and sandy lean clay (CL) with varying amounts of gravel. Sand (SP), and sand with silt and gravel (SP-SM) comprise the coarse alluvium. A layer of fine alluvium which consists of lean clay with sand (CL) was encountered at the bottom of the boring for MW-8. Lenses of silt, silty sand, and sand were encountered at varying depths. Soil borings B-5 and B-10 and monitoring well MW-8 terminate in alluvium; whereas, monitoring wells MW-7 and MW-9 terminate in glacial till. The soil boring depths vary between 33' and 56 1/2' below the ground surface; however, the surface elevations also vary considerably at the site.

2.2 Monitoring Wells

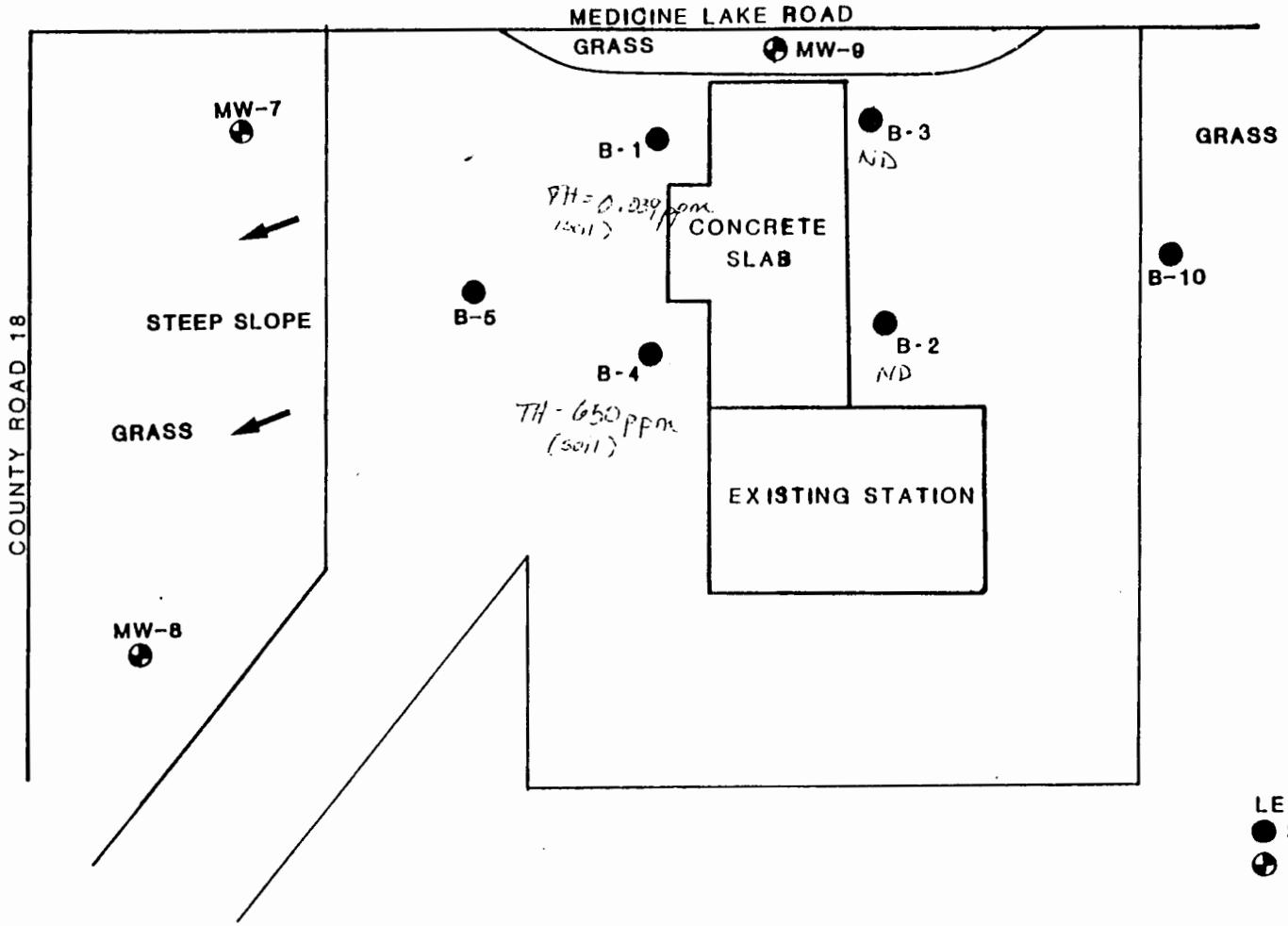
Monitoring wells MW-7, MW-8 and MW-9; soil borings B-5 and B-10; and the previously advanced soil borings B-1, B-2, B-3 and B-4 were placed at the locations indicated on Figure 1. Boring logs and the "Installation of

FIGURE 1

SITE #4 SKETCH

(COUNTY ROAD 18 & MEDICINE LAKE ROAD)

MOBIL OIL
SUBSURFACE CONTAMINATION ASSESSMENT
4231 87-663



LEGEND:
- SOIL BORING LOCATION
- MONITORING WELL

NOT TO SCALE

twin city testing corporation

je 3-#4231 87-663

Monitoring Well" data sheets are presented in Appendix B. The monitoring wells were completed at depths ranging between 33' and 37 3/4' below the ground surface. Soil borings B-5 and B-10 were advanced to depths of 56 1/2' and 46', respectively, without encountering ground water. Therefore, the borings were not completed as monitoring wells.

2.3 Ground Water Levels and Flow Regime

Ground water levels were measured at the three monitoring wells on April 30, 1987. Generally, ground water was encountered between 19' and 30' below the ground surface; however, ground water was not encountered at soil borings B-5 and B-10. The depth to the phreatic surface varies considerably and may be due to waterbearing sand and silt laminations which are encountered at varying depths. Generally, ground water flow appears to be to the southwest, towards Medicine Lake.

2.4 Chemistry

On April 30, 1987, water samples were collected from the three monitoring wells and analyzed for total hydrocarbons as gasoline, benzene, toluene and xylene concentrations.

The laboratory analyses did not detect total hydrocarbons as gasoline, benzene, toluene and xylene in concentrations which exceed the lower detection level. The laboratory results are listed in Table 1 and the laboratory report is included in Appendix A.

Previously, soil samples were collected from soil borings B-1, B-2, B-3 and B-4 and analyzed for total hydrocarbons as gasoline, benzene, toluene and xylenes. The analyses detected high concentrations of dissolved hydrocarbons in a soil sample from boring B-4 at a sampling interval of 19.5' to 21', and low concentrations in samples from B-1 and B-4 at a sampling interval of 9.5' to 11'. The laboratory results are listed in Table 2 and the laboratory report is included in Appendix A.

3.0 DISCUSSION AND CONCLUSIONS

Ground water samples collected and analyzed from monitoring wells MW-7, MW-8 and MW-9 did not contain total hydrocarbons as gasoline, benzene, toluene and xylene concentrations in excess of the lower detection level.

Through visual and olfactory criteria, slight to moderate petroleum odors were noted from soil samples above the 22 1/2' depth at soil boring B-5. This is consistent with the analytical data from B-1 and B-4, which detected dissolved hydrocarbons in soil samples above the 21' depth.

TABLE 1

GROUND WATER ANALYTICAL RESULTS
MOBIL OIL CORPORATION SITE #4 05GOD
GOLDEN VALLEY, MINNESOTA
#4231 87-663

Parameter	MW-7	MW-8	MW-9	LDL
Total hydrocarbons as gasoline	ND*	ND*	ND*	1
Benzene	ND	ND	ND	1
Toluene	ND	ND	ND	1
Xylenes	ND	ND	ND	1

All values are in ug/L. ug/L is equivalent to parts per billion.
ND = Not Detected
LDL = Lower Detectable Limit
* = Unidentified peak at 12 min. non-typical of gasoline

TABLE 2

SOIL SAMPLE ANALYTICAL RESULTS
MOBIL OIL CORPORATION SITE #4 05GOD
GOLDEN VALLEY, MINNESOTA
#4231 87-663

Boring #	Sampling Interval	Total Hydrocarbons	Benzene	Toluene	Xylene
B-1	9.5' - 11'	39	ND	1	8
B-1	19.5' - 21'	ND	ND	ND	ND
B-1	29.5' - 31'	ND	ND	ND	ND
B-2	9.5' - 11'	ND	ND	ND	ND
B-2	19.5' - 21'	ND	ND	ND	ND
B-2	29.5' - 31'	ND	ND	ND	ND
B-3	9.5' - 11'	ND	ND	ND	ND
B-3	19.5' - 21'	ND	ND	ND	ND
B-3	29.5' - 31'	ND	ND	ND	ND
B-4	9.5' - 11'	23	ND	4	20
B-4	19.5' - 21'	650,000	22,000	45,000	115,000
B-4	29.5' - 31'	ND	ND	ND	ND

ND = Not Detected
Lower Detection Limit is 1 ug/kg
All results expressed as ug/kg

The contamination appears to be limited to the soil profile and is localized around B-1, B-4, and B-5. Soil borings B-1, B-4, and B-5 are located adjacent to the pump islands and the buried petroleum tanks. Surface spillage, leaking lines and/or leaking tanks are all potential sources for the detected contamination. Layers of less permeable soil may be acting as barriers to vertical migration to the water table.

Since the contamination does not appear to be widespread, no further action is warranted at this time.

4.0 STANDARD OF CARE

The recommendations contained in this report represent our professional opinions. These opinions were arrived at in accordance with currently accepted hydrogeologic, engineering and analytical practices at this time and location. Other than this, no warranty is implied or intended.

This report was prepared by: William J. Breitzman

William J. Breitzman
Hydrogeologist/Project Manager

Date: May 28, 1987

This report was reviewed by: Tom Gapinske

Tom Gapinske
Hydrogeologist/Senior Project Manager

Date: May 28, 1987

Proofread by: P. Wright

APPENDIX A

CHEMISTRY LABORATORY RESULTS

TABLE 1

VOLATILE ANALYSIS

Parameter	MW-7	MW-9	MW-8	LDL
Total hydrocarbons as gasoline	ND*	ND*	ND*	1
Benzene	ND	ND	ND	1
Toluene	ND	ND	ND	1
Xylenes	ND	ND	ND	1

All values are in ug/L. ug/L is equivalent to parts per billion.

ND - Not detected

LDL - Lower detectable limit

* - Unidentified peak at 12 min. non-typical of gasoline.

Laboratory No 4410 87-3802

TABLE 1

ANALYTICAL RESULTS
MOBIL SITE #05G0D
SITE #4

Boring #	Sampling Interval	Total Hydrocarbons	Benzene	Toluene	Xylene
B-1	9.5'-11'	39	ND	1	8
B-1	19.5'-21'	ND	ND	ND	ND
B-1	29.5'-31'	ND	ND	ND	ND
B-2	9.5'-11'	ND	ND	ND	ND
B-2	19.5'-21'	ND	ND	ND	ND
B-2	29.5'-31'	ND	ND	ND	ND
B-3	9.5'-11'	ND	ND	ND	ND
B-3	19.5'-21'	ND	ND	ND	ND
B-3	29.5'-31'	ND	ND	ND	ND
B-4	9.5'-11'	23	ND	4	20
B-4	19.5'-21'	650,000	22,000	45,000	115,000
B-4	29.5'-31'	ND	ND	ND	ND

ND = Not Detected
Lower Detection Limit is 1 ug/kg
All results expressed as ug/kg

twin city testing
corporation
662 CROMWELL AVENUE
ST. PAUL, MN 55114
PHONE 612/645-3601

REPORT OF CHEMICAL ANALYSIS

PROJECT: MOBIL

REPORTED TO: Twin City Testing
Attn: Tom Gapanski
662 Cromwell Ave
St Paul, MN 55114

DATE: Dec 18, 1986

LABORATORY No. 4400 87-1207

INTRODUCTION:

This report presents the results of our analysis of samples received by this laboratory on Nov 25, 1986 from representatives of Twin City Testing Corporation. The scope of our work was limited to analyzing the samples for the presence of total hydrocarbons as gasoline, benzene, toluene and xylenes using gas chromatographic techniques.

SAMPLE IDENTIFICATION:

Site 4 12 soil samples

METHODOLOGY:

Gasoline concentration was determined using a Tekmar LSC-2 liquid sample concentrator on an HP-5890 gas chromatograph equipped with flame ionization detectors. Compounds were identified by column retention time and quantified by peak area comparisons to those of know standards using a VG Laboratory data system.

RESULTS:

The results are listed in Table #1.

REMARKS:

The samples were consumed in the analysis.

TWIN CITY TESTING CORPORATION

Chris Bremer
Asst Laboratory Supervisor

Harold D Fisher
Chromatography Group Leader

twin city testing
corporation
662 CROMWELL AVENUE
ST. PAUL, MN 55114
PHONE 612/645-3601

REPORT OF: CHEMICAL ANALYSIS

PROJECT: Mobile-Hwy 18 & Medicine Lake Rd - 4231 87-663

DATE: May 5, 1987

REPORTED TO: Twin City Testing Corporation
Attn: Bill Breitzman
662 Cromwell Avenue
St Paul, MN 55114

LABORATORY No. 4410 87-3802

INTRODUCTION

This report presents the results of our analysis of water samples received by this laboratory on May 1, 1987 from Bill Breitzman of Twin City Testing Corporation. The scope of our work was limited to analyzing the samples for the presence of total hydrocarbons as gasoline, benzene, toluene and xylenes using gas chromatographic techniques.

SAMPLE IDENTIFICATION

TCT #870014053 - MW-7
TCT #870014054 - MW-9
TCT #870014055 - MW-8

METHODOLOGY

Gasoline concentration was determined using a Tekmar LSC-2 liquid sample concentrator on a HP-5890 gas chromatograph equipped with flame ionization detectors. Compounds were 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 Table 1.

REMARKS

The samples were analyzed on May 3, 1987. The samples were consumed in the analysis.

TWIN CITY TESTING CORPORATION

Chris Bremer
Asst Laboratory Supervisor

Harold D Fisher
Chromatography Group Leader

CB/HDF/jm

Proofread by

APPENDIX B

BORING LOGS AND MONITORING WELL CONSTRUCTION SHEETS

LOG OF TEST BORING

JOB NO. 4231 87-663 VERTICAL SCALE 1" = 5' BORING NO. B-5

PROJECT Monitoring Well Installation; Medicine Lake Rd & Cty Rd 18 Site #4 05G0D, Mobil Oil

DEPTH IN FEET	DESCRIPTION OF MATERIAL — SURFACE ELEVATION	GEOLOGIC ORIGIN	N	WL	SAMPLE NO	SAMPLE TYPE	PETROLEUM PRODUCT OBSERVATIONS
9"	BLACKTOP						
	FILL, MIXTURE OF SILTY SAND AND CLAYEY SAND W/A LITTLE GRAVEL, brown and gray, dry	FILL			1	HSA	
5							
	FILL, MOSTLY CLAYEY SAND W/A LITTLE GRAVEL, brown,		8		2	SB	
8							
	FILL, MOSTLY SANDY LEAN CLAY W/A LITTLE GRAVEL, brown, medium						
11			8		3	SB	
12	FILL, MOSTLY SANDY (See #1)						
	CLAYEY SAND W/A LITTLE GRAVEL, brown mottled to brownish gray mottled, rather stiff to stiff (SC) to medium	TILL	12		5	SB	
			8		6	SB	Note: Samples above 22½' have slight to moderate petroleum products odor
	(SC)		20		7	SB	
27							
	CLAYEY SAND W/A LITTLE GRAVEL, a few cobbles, reddish brown, stiff (SC)						
30							

(CONTINUED ON NEXT PAGE)

#1 - CLAY W/A LITTLE GRAVEL, gray brown and a trace of black

LOG OF TEST BORING

JOB NO. 4231 87-663 VERTICAL SCALE 1" = 5' BORING NO. B-5 (Cont)

PROJECT Site #4 05GOD (Cont)

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION ____)	GEOLOGIC ORIGIN	N	WL	SAMPLE NO.	SAMPLE TYPE	PETROLEUM PRODUCT OBSERVATIONS
30	CLAYEY SAND W/A LITTLE GRAVEL (Cont)	TILL (Cont)	21		8	SB	
33	SILTY SAND W/A LITTLE GRAVEL, with lenses of dry sand, grayish brown, very dense, a few lenses of sand below about 37½' (SM)		48		9	SB	
			77		10	SB	
42	LEAN CLAYEY SAND W/A LITTLE GRAVEL, grayish brown stiff (SC)	COARSE ALLUVIUM	20		11	SB	
47½	SAND W/A LITTLE GRAVEL, medium grained, light brown, moist, very dense (SP)		37		12	SB	
53	SAND, fine grained, light brown, moist, dense (SP)		28		13	SB	
56½	End of Boring						

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
					to	
4-15	9:15	56½'	52½'	52½'	to	None
					to	
					to	

START 4-14-87 COMPLETE 4-14-87

METHOD HSA 0'-54½' @ 3:00

CREW CHIEF Mishler

LOG OF TEST BORING

JOB NO. 4231 87-663 VERTICAL SCALE 1" = 5' BORING NO B-10

PROJECT Monitoring Well Installation; Medicine Lake Rd & Cty Rd 18; Site #4 05GOD;

Mobil Oil Corp.

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION)	GEOLOGIC ORIGIN	N	WL	SAMPLE NO.	SAMPLE TYPE	PETROLEUM PRODUCT OBSERVATIONS
	FILL, MIXTURE OF SILTY SAND AND CLAYEY SAND W/A LITTLE GRAVEL, black and brown	FILL	4		1	SB	
			17		2	SB	
4	CLAYEY SAND W/A LITTLE GRAVEL, brown, stiff (may be fill) (SC)	FILL OR TILL					
7	CLAYEY SAND W/A LITTLE GRAVEL, brown, rather stiff (may be fill) (SC)		11		3	SB	
13	CLAYEY SAND W/A LITTLE GRAVEL, gray and brown mottled, rather stiff (SC)	TILL	13		4	SB	
16½	SANDY LEAN CLAY W/A LITTLE GRAVEL, brown, rather stiff (CL)		12		5	SB	
19	CLAYEY SAND W/A LITTLE GRAVEL, brown, rather stiff, a lens of silt at about 18' (SC)		11		6	SB	
			14		7	SB	
24							
25	CLAYEY SAND W/A (See #1) (SC)						

(CONTINUED ON NEXT PAGE)

#1 - LITTLE GRAVEL, brownish gray, rather stiff (SC)

LOG OF TEST BORING

JOB NO. 4231 87-663 VERTICAL SCALE 1" = 5' BORING NO. B-10 (Cont)

PROJECT Monitoring Well Installation; Site #4 05GOD

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION ____)	GEOLOGIC ORIGIN	N	WL	SAMPLE NO.	SAMPLE TYPE	PETROLEUM PRODUCT OBSERVATIONS
25	CLAYEY SAND W/A LITTLE GRAVEL, (Cont)	TILL (Cont)	11		8	SB	
26½	CLAYEY SAND W/A LITTLE GRAVEL, a few cobbles, gray to grayish brown, rather stiff to stiff (sc)		10		9	SB	
			13		10	SB	
			11		11	SB	
			44		12	SB	
36½	SILTY SAND W/A LITTLE GRAVEL, brown, moist, dense (SM)		23		13	SB	
39	CLAYEY SAND W/A LITTLE GRAVEL, grayish brown, rather stiff to stiff, a lens of silty sand at about 43' (SC-SM)		12		14	SB	
43½			24		15	SB	
44	SAND, fine grained, (See #1) (SP)	COARSE ALLUVIUM			16	SB	
	SAND W/A LITTLE GRAVEL, medium grained, light brown moist, very dense (SP)		44		17	SB	
46	End of Boring #1 - light brown, moist, dense (SP)						

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
4-20	9:10	41½'	39½'	41.4'	to	None
4-20	9:40	46'	44½'	46.3	to	None
					to	
					to	

START 4-17-87 COMPLETE 4-17-87

METHOD HSA 0'-44½' @ 9:40

CREW CHIEF Mishler

LOG OF TEST BORING

JOB NO. 4231 87-663 VERTICAL SCALE 1" = 5' BORING NO. MW-7

PROJECT Monitoring Well Installation; Medicine Lake Rd & Cty Rd 18; Site #4 05G0D, Mobil Oil

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION ____)	GEOLOGIC ORIGIN	N	WL	SAMPLE NO.	SAMPLE TYPE	PETROLEUM PRODUCT OBSERVATIONS
	FILL, MIXTURE OF SILTY SAND, SANDY LEAN CLAY W/A LITTLE GRAVEL, dark brown and brown,	FILL	5'		1	SB	
4							
	LEAN CLAY, brown mottled, medium (CL)	FINE ALLUVIUM	8		2	SB	
7							
	CLAYEY SAND W/A LITTLE GRAVEL, brown and gray mottled, rather stiff, a lense of silt at about 13½', a lamination of sand at about 16', rather stiff (SC)	TILL	13		3	SB	
			11		4	SB	
15							
	CLAYEY SAND W/A LITTLE GRAVEL, brown and grayish brown mottled, stiff to rather stiff (SC-CL)		19		5	SB	
			14		6	SB	
			14		7	SB	
22							
	CLAYEY SAND W/A LITTLE GRAVEL, grayish brown, stiff to very stiff (SC)		25		8	SB	
			25	▼	9	SB	
28½			32		10	SB	
					11	SB	
	SILTY SAND W/A LITTLE GRAVEL, reddish brown, moist, dense, a lense of waterbearing sand at about 28½' (SM) (No samples taken below 29')						
	End of Boring						
	Note: Monitoring Well installed in boring. See attached "Installation of Monitoring Well" sheet.						

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
4-15	2:35	29'	27'		to	28.2'
4-15	2:40	29'	27'		to	27.9'
4-15	3:00	29'	27'		to	27.5'
4-16	8:50		33'		to	26.3'

START 4-15-87 COMPLETE 4-15-87

METHOD HSA 0'-33' @ 2:30

CREW CHIEF Mishler

SE-V-22(84-A)-5

twin city testing corporation

LOG OF TEST BORING

JOB NO. 4231 87-663 VERTICAL SCALE 1" = 5' BORING NO. MW-8

PROJECT Monitoring Well Installation; Medicine Lake Road & Cty Rd 18-Site #4 05G0D; Mobil Oil

DEPTH IN FEET	DESCRIPTION OF MATERIAL — SURFACE ELEVATION	GEOLOGIC ORIGIN	N	WL	SAMPLE NO	SAMPLE TYPE	PETROLEUM PRODUCT OBSERVATIONS
	FILL, MOSTLY CLAYEY SAND W/A LITTLE GRAVEL, dark brown and gray	FILL	2		1	SB	
9½	CLAYEY SAND W/A LITTLE GRAVEL, brown mottled, medium to rather stiff (SC)	TILL	6		2	SB	
			10		3	SB	
14	CLAYEY SAND W/A LITTLE GRAVEL, brown, moist, rather stiff (SC)		13		4	SB	
18	SANDY LEAN CLAY W/A LITTLE GRAVEL, grayish brown, stiff (CL/SC)		15		5	SB	
					6	SB	
			20		7	SB	
22	(CONTINUED ON NEXT PAGE)						

LOG OF TEST BORING

JOB NO. 4231 87-663 VERTICAL SCALE 1" = 5' BORING NO. MW-8 (cont)

PROJECT Site #4 05GOD (cont)

DEPTH IN FEET	DESCRIPTION OF MATERIAL SURFACE ELEVATION	GEOLOGIC ORIGIN	N	WL	SAMPLE NO.	SAMPLE TYPE	PETROLEUM PRODUCT OBSERVATIONS
22	LEAN CLAYEY SAND W/A LITTLE GRAVEL, brown and gray mottled, stiff (SC)	TILL (cont)	22		8	SB	
			20		9	SB	
25½	CLAYEY SAND W/A LITTLE (see #1)				10	SB	
26½	SILTY SAND W/A LITTLE GRAVEL, grayish brown to reddish brown, moist, with a lamination of sand at about 27½', very dense to dense (SM)		31		11	SB	
			29	▼	12	SB	
			41		13	SB	
34½	SAND W/SILT AND GRAVEL (see #2)	COARSE*			14	SB	
35	LEAN CLAY W/SAND, grayish brown, rather stiff (CL)	FINE ALLUVIUM	18		15	SB	
37.8	End of Boring						
	#1 - GRAVEL, brown, stiff (SC)	*ALLUVIUM					
	#2 - fine to medium grained, brown, waterbearing, medium dense, a lense of silt at about 35' (SP-SM)						

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
4-16	2:40	29'	27'	29'	to	None
4-16	3:15	36½'	34½'	NR	to	33½'
4-16	3:25	36½'	34½'	NR	to	32½'
4-17	8:50	36½'	34½'	NR	to	30½'

START 4-16-87 COMPLETE 4-16-87

METHOD HSA 0' - 37.8' @ 3:15

Note: Monitoring Well Installed- See attached sheet.

CREW CHIEF Mishler

LOG OF TEST BORING

JOB NO. 4231 87-663 VERTICAL SCALE 1" = 5' BORING NO. MW-9

PROJECT Monitoring Well Installation; Medicine Lake Rd and Cty rd 18; Site #4 05GOD, Mobil Oil Corp

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION ____)	GEOLOGIC ORIGIN	N	WL	SAMPLE NO.	SAMPLE TYPE	PETROLEUM PRODUCT OBSERVATIONS
	FILL, MIXTURE OF SILTY SAND AND SAND W/A LITTLE GRAVEL, dark brown and brown	FILL	3		1	SB	
5							
	CLAYEY SAND W/A LITTLE GRAVEL, brown, very stiff (SC) (may be fill)	FILL OR TILL	32		2	SB	
8							
	CLAYEY SAND W/A LITTLE GRAVEL, brown mottled, medium to stiff (SC)	TILL	7		3	SB	
			11		4	SB	
			7		5	SB	
			17		6	SB	
22½							
	CLAYEY SAND W/A LITTLE GRAVEL, reddish brown, very stiff, a few lenses of silty sand (SC)		39		7	SB	
25							
	CLAYEY SAND W/A LITTLE GRAVEL, brownish gray, stiff (SC)		17		8	SB	
			17	▼	9	SB	
30½					10	SB	
	SANDY LEAN CLAY W/A LITTLE GRAVEL, reddish brown, stiff ~~(SC)~~ CL		21		11	SB	
34							
	SILTY SAND W/A LITTLE GRAVEL, grayish brown, moist, very dense, a few lenses of waterbearing sand (SM)		58		12	SB	
36							
	End of Boring						

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
4-20	3:25	31½'	29½'	31.4'	to	None
4-21	9:15	31½'	29½'	30½'	to	27.7'
					to	
					to	

START 4-20-87 COMPLETE 4-21-87

METHOD HSA 0'-34½' @ 9:50

CREW CHIEF Mishler

SE-V-22(84-A)-5

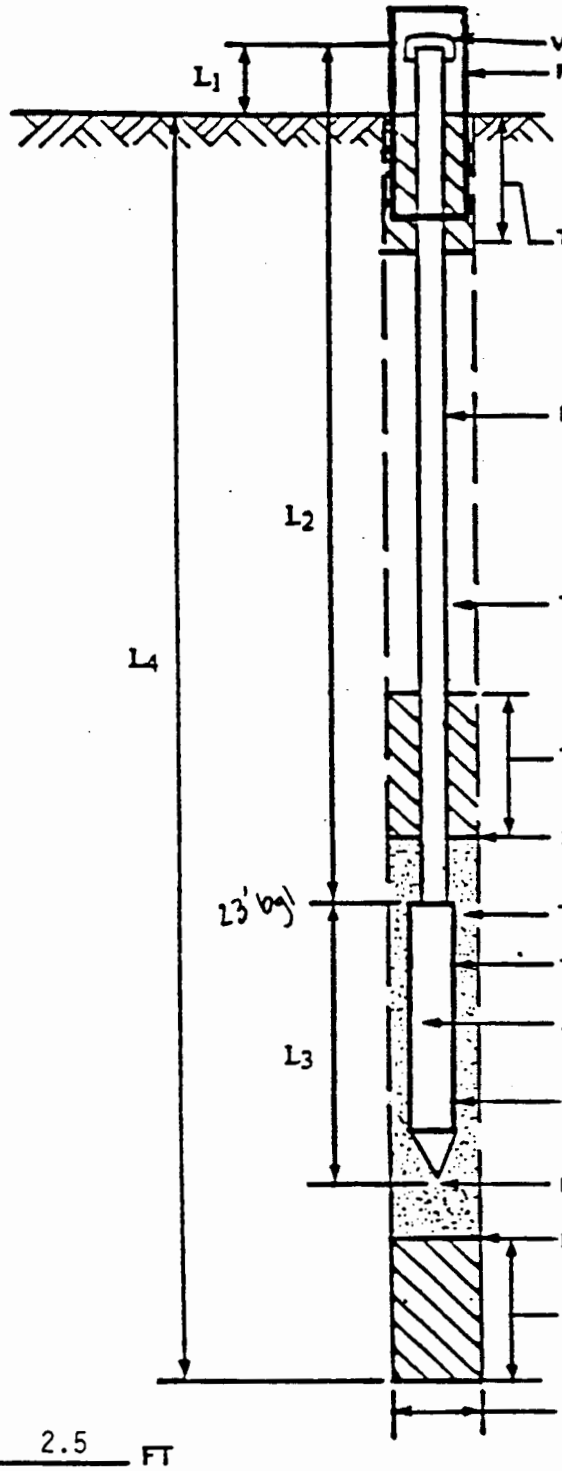
twin city testing corporation

TALLATION OF MONITORING WELL —

JOB NO. 4231 87-663 MONITORING WELL NO. MW-7

Medicine Lake Road & County Road 18; Site #4 05G0D; Mobil Oil Corporation

GROUND SURFACE ELEVATION _____ TOP OF RISER PIPE ELEVATION (with cap removed) 96.41



VENTED CAP	yes
PROTECTIVE CASING	
Diameter and Type	4" steel
Total Length	5'
Length Above Ground	2.6'
THICKNESS AND TYPE OF SEAL	Surface to 17' grout
DIAMETER AND TYPE OF RISER PIPE	2" PVC well casing
TYPE OF BACKFILL AROUND RISER	Grout 0' - 17'
THICKNESS AND TYPE OF SEAL	17'-19' bentonite
DEPTH TO TOP OF FILTER SAND	19'
TYPE OF FILTER AROUND SCREEN	Density sand to 30 30'-33' natural sand
TYPE OF MONITORING WELL	PVC
SCREEN GAUGE OR SIZE OF OPENINGS (SLOT NO.)	.010
DIAMETER AND LENGTH OF SCREEN	2" x 10'
DEPTH TO BOTTOM OF MONITORING WELL	33'
DEPTH TO BOTTOM OF FILTER SAND	30'
THICKNESS AND TYPE OF SEAL	None
DIAMETER OF BOREHOLE	6"

L_1= 2.5 FT

L_2= 25.5 FT

L_3= 10 FT

L_4= 33 FT

INSTALLATION COMPLETED:
Date 4-16-87 Time 11:00

MONITORING WELL WATER LEVEL MEASUREMENTS

DATE	TIME	BAILED DEPTHS	WATER LEVEL*

* DEPTH BELOW TOP OF RISER PIPE

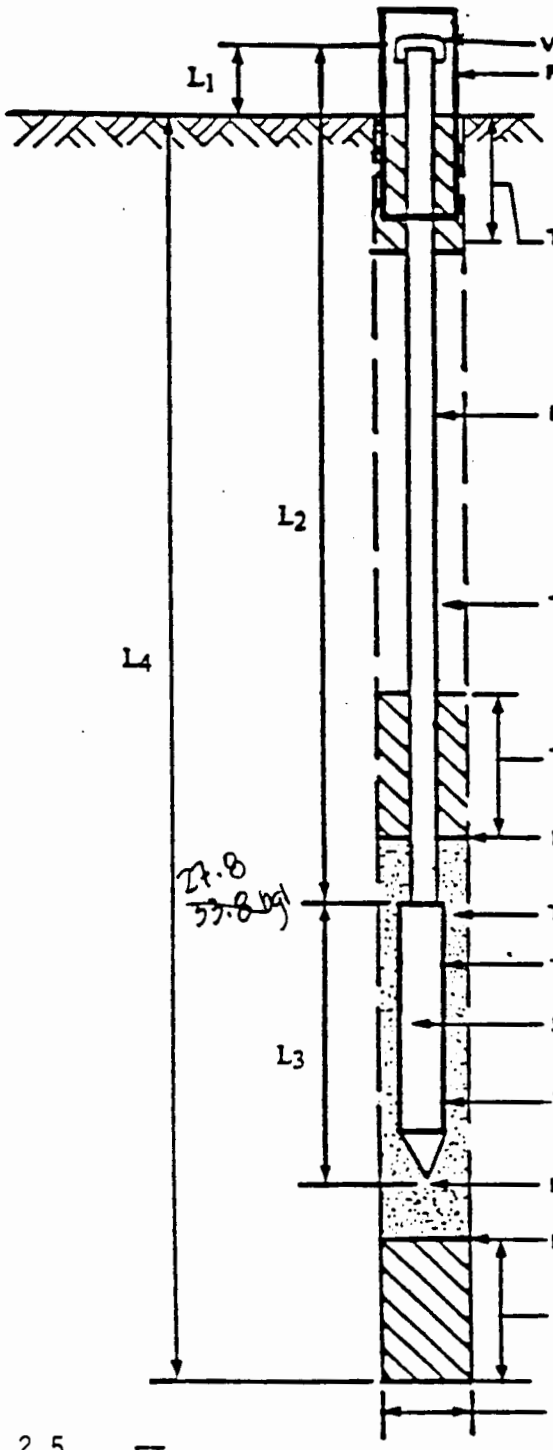
twin city testing corporation

TALLATION OF MONITORING WELL

JOB NO. 4231 87-663 MONITORING WELL NO. MW-8

Medicine Lake Road & County Road 18; Site #4 05G0D; Mobil Oil Corporation

GROUND SURFACE ELEVATION _____ TOP OF RISER PIPE ELEVATION (with cap removed) 89.27



Diameter and Type	4" steel
Total Length	5'
Length Above Ground	2.6'
THICKNESS AND TYPE OF SEAL	0' - 22.5' grout
DIAMETER AND TYPE OF RISER PIPE	2" PVC well casing
TYPE OF BACKFILL AROUND RISER	Grout to 22.5' 22.5' - 25' bentonite, density sand 25' - 27.8'
THICKNESS AND TYPE OF SEAL	See above
DEPTH TO TOP OF FILTER SAND	25'
TYPE OF FILTER AROUND SCREEN	Density sand
TYPE OF MONITORING WELL	PVC
SCREEN GAUGE OR SIZE OF OPENINGS (SLOT NO.)	.010
DIAMETER AND LENGTH OF SCREEN	2" x 10'
DEPTH TO BOTTOM OF MONITORING WELL	37.8'
DEPTH TO BOTTOM OF FILTER SAND	37.3'
THICKNESS AND TYPE OF SEAL	37.3'-37.8' natura sand, none
DIAMETER OF BOREHOLE	6"

L_1= 2.5 FT

L_2= 30.3 FT

L_3= 10 FT

L_4= 37.8 FT

INSTALLATION COMPLETED:
Date 4-17-87 Time 11:00

MONITORING WELL WATER LEVEL MEASUREMENTS			
DATE	TIME	BAILED DEPTHS	WATER LEVEL*

* DEPTH BELOW TOP OF RISER PIPE

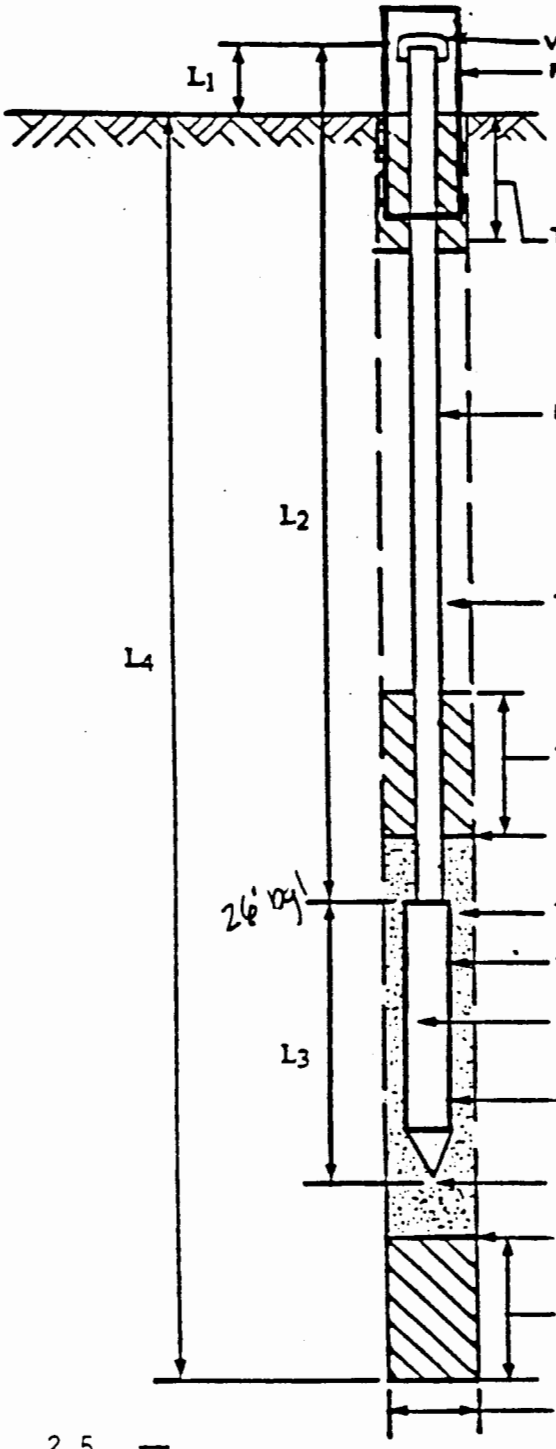
twin city testing corporation

INSTALLATION OF MONITORING WELL

JOB NO. 4231 87-663 MONITORING WELL NO. MW-9

Medicine Lake Road & County Road 18; Site #4 05GOD; Mobil Oil Corporation

GROUND SURFACE ELEVATION _____ TOP OF RISER PIPE ELEVATION (with cap removed) 101.77



VENTED CAP	
PROTECTIVE CASING	
Diameter and Type	4" steel
Total Length	5'
Length Above Ground	2.6'
THICKNESS AND TYPE OF SEAL	0' - 17.5' grout
DIAMETER AND TYPE OF RISER PIPE	2" PVC well casing
TYPE OF BACKFILL AROUND RISER	Grout 0' - 17.5' 17.5'-19.5' bentonite 19.5'-24.5' density sand
THICKNESS AND TYPE OF SEAL	See above
DEPTH TO TOP OF FILTER SAND	19.5'
TYPE OF FILTER AROUND SCREEN	Density sand
TYPE OF MONITORING WELL	PVC
SCREEN GAUGE OR SIZE OF OPENINGS (SLOT NO.)	.010
DIAMETER AND LENGTH OF SCREEN	2" x 10'
DEPTH TO BOTTOM OF MONITORING WELL	34.5'
DEPTH TO BOTTOM OF FILTER SAND	36'
THICKNESS AND TYPE OF SEAL	None
DIAMETER OF BOREHOLE	6"

L_1= 2.5 FT

L_2= 87 28.5 FT

L_3= 10 FT

L_4= 36 FT

INSTALLATION COMPLETED:
Date 4-21-87 Time 11:30

MONITORING WELL WATER LEVEL MEASUREMENTS

DATE	TIME	BAILED DEPTHS	WATER LEVEL*

* DEPTH BELOW TOP OF RISER PIPE

twin city testing corporation

APPENDIX C

METHODS

APPENDIX C

METHODS

Contamination Reduction

The drill rig and sampling tools were cleaned prior to mobilization and between each boring. The split barrel sampler was washed with a trisodium phosphate solution and rinsed in potable water prior to collecting each sample. Wash and rinse water were disposed on-site through infiltration.

Soil Sampling

Soil sampling was done in accordance with ASTM: D 1586-84. Using this procedure, a 2" O.D. split barrel sampler is driven into the soil by a 140 lb weight falling 30". After an initial set of 6", the number of blows required to drive the sampler an additional 12" is known as the penetration resistance of N value. The N value is an index of the relative density of cohesionless soils and the consistency of cohesive soils.

Soil samples were collected in the field immediately upon opening the split barrel sampler. The samples were collected by completely filling 40 ml glass bottles with soil and sealing the bottles with a Teflon lined, septum sealed cap to prevent volatilization of organics from the soil sample.

APPENDIX C

METHODS (cont)

The monitoring wells were developed using a Teflon bailer until temperature, pH and conductivity stabilized and sediment-free water was produced, using a bottom-loading Teflon bailer.

Water Level Measurement

All ground water level measurements were obtained by using an electronic measuring device which indicates when a probe is in contact with the ground water in the well. Measurements were obtained by lowering the device into the well until it was indicated that the water surface had been encountered and by measuring the distance from the top of the riser to the probe. All measurements were reported to the nearest 0.01'; however, the manufacturer's reported accuracy for the instrument is 0.04'.

Water Quality Sampling and Chain of Custody

Upon collecting a sample, a chain of custody log was initiated. The chain of custody record included the following information: project, work order number, shipped by, shipped to, sampling point, location, field ID number, date and time taken, sample type, number of containers, analysis required, sampler(s) signature(s), etc.

APPENDIX C

METHODS (cont)

was measured. Product thickness measured in the monitoring well does not reflect the actual product thickness on the water table. The measured thickness is normally greater than that actually existing on the water table.

APPENDIX C

METHODS (cont)

The completed borings were backfilled with either cement grout or soil cuttings.

Soil Classification

As the samples were obtained in the field, they were visually and manually classified by the crew chief in accordance with ASTM: D 2487-84 and ASTM: D 2488. Representative portions of the samples were then returned to the laboratory for further examination and for verification of the field classification. Logs of the borings indicating the depth and identification of the various strata, the N value, water level information and pertinent information regarding the method of maintaining and advancing the drill holes are attached. Charts illustrating the soil classification procedure, the descriptive terminology and symbols used on the boring logs are also attached.

Monitoring Well Installation and Development

Monitoring well construction and installation details are provided on the "Installation of Monitoring Well" data sheets, presented in Appendix B.

APPENDIX C

METHODS (cont)

The chain of custody records were delivered with the samples to the laboratory. Upon arrival at the laboratory, the samples were checked in and signed over to the appropriate laboratory personnel. A copy of the chain of custody was turned over to the Project Manager. Upon completion of the laboratory analysis, the completed chain of custody record was returned to the Project Manager.

Analytical Procedures

The water samples were analyzed by using a Tekmar LSC-2 liquid sample concentrator linked to an HP-5890 Gas Chromatograph with flame ionization detector. Benzene, toluene and xylene concentrations were identified by retention time and quantified by comparison with known standards. Gasoline concentration was determined by the ratio of total peak area to a gasoline standard total peak area.

Product Measurement

Product thickness was measured by lowering a 2' or 3' Teflon bailer into the monitoring well to a depth of approximately 1' to 1 1/2' below the water table. The bailer was removed and the product thickness within the bailer

LEAK # 183

QUARTERLY MONITORING REPORT

MOBIL STATION #05-GOD

COUNTY ROAD 18 & MEDICINE LAKE ROAD

GOLDEN VALLEY, MINNESOTA

August 2, 1989

#4231 88-521

QUARTERLY MONITORING REPORT

GOLDEN VALLEY MOBIL #05-GOD

GOLDEN VALLEY, MINNESOTA

#4231 88-521

1.0 INTRODUCTION

1.1 Purpose

The purpose of this report is to present the results of the quarterly groundwater monitoring program conducted by Twin City Testing Corporation (TCT) at the above referenced site (Figure 1). The one-year groundwater monitoring program was implemented in October 1988 in response to a Minnesota Pollution Control Agency (MPCA) directive dated September 16, 1988. The MPCA objective was to determine if hydrocarbon contamination present in the soils around soil boring B-4 had migrated into the groundwater beneath the site. Mr Chris Lawson of Mobil Oil Corporation verbally authorized this work in September 1988.

1.2 Scope of Services

The scope of services provided by TCT included the following:

- acquiring four sets of groundwater elevation measurements,
- collecting representative groundwater samples on a quarterly basis for analysis to quantify benzene, ethyl benzene, toluene, xylenes and total hydrocarbons as gasoline concentrations, and
- preparing a report presenting our field and analytical data.

1.3 Background

Previous work has been conducted at this site by TCT since 1986. Additional details of these activities are presented in the following reports:

Preliminary Contamination Assessment	#4231 87-503	December 18,1986
Tank Excavation, Mobil Station	#4231 87-503	January 27, 1987
Remedial Site Assessment	#4231 87-663	May 28, 1987

In December 1986, TCT advanced four soil borings at the site to determine if the subsurface had been impacted by hydrocarbon contamination. Hydrocarbon contamination was quantified at depth in soil boring B-4.

A 1,000 gallon diesel fuel UST was excavated and removed from the site in January 1987. Fifty (50) cubic yards of contaminated soils were removed from the site. Using visual and olfactory evidence as criteria, TCT felt that all contaminated soils were removed by excavating.

A remedial site assessment was carried out in May 1987 to determine the extent of subsurface contamination. No hydrocarbon concentrations were detected above the method detection limit from groundwater samples collected from three monitoring wells installed at the site.

2.0 PROJECT RESULTS

2.1 Soil Conditions

The site is underlain by glacial tills and alluvium. The glacial tills consist mainly of silty sand (SM), clayey sand (SC) and sandy lean clay (CL) with varying amounts of gravel. Sand (SP) and sand with silt and gravel (SP-SM) comprise the coarse alluvium. A layer of fine alluvium which consists of lean clay with sand (CL) was encountered at the bottom of the boring for MW-8. Lenses of silt, silty sand and sand were encountered at varying depths. Soil borings B-5 and B-10 and monitoring well MW-8 terminate in alluvium; whereas, monitoring wells MW-7 and MW-9 terminate in glacial till. The soil boring depths vary between 33 and 56.5 feet below the ground surface; however, the surface elevations also vary considerably at the site. The locations of the soil borings and monitoring wells are presented in Figure 2.

2.2 Groundwater Elevations

Depth to groundwater measurements were obtained from all monitoring wells at the site on October 3, 1988, January 9, April 3, July 5 and July 11, 1989. During the sampling interval the groundwater table exhibited seasonal fluctuations of approximately 1.58, 0.55 and 4.38 feet at monitoring well MW-7, MW-8 and MW-9 respectively. Water table elevations, in general, declined from October 1988 until April 1989. Subsequent water table

elevation measurements indicated a rise in the water table. The water table information is summarized in Table 1. The inferred groundwater flow direction trends southwest towards Medicine Lake (Figure 3).

NOT NECESSARILY

2.3 Chemistry Results

Groundwater quality samples were collected from monitoring wells MW-7, MW-8 and MW-9 on a quarterly basis beginning October 1988. These samples were returned to TCT's chemistry laboratory for analysis to quantify benzene, ethyl benzene, toluene, xylenes and total hydrocarbons as gasoline concentrations. The chemical results are presented as Table 2. No free product was documented in the monitoring wells on site during this sampling phase.

TABLE 1

Water Table Elevation Data
Quarterly Monitoring Report
Golden Valley Mobil #05-GOD
Golden Valley, Minnesota
#4231 88-521

Well	Top of Riser	Water Table Elevation (10-05-88)	Water Table Elevation (1-9-89)	Water Table Elevation (4-3-89)	Water Table Elevation (7-5-89)
MW-7	96.41	71.42	69.72	70.06	64.10
MW-8	89.27	55.70	55.65	55.64	56.07
MW-9	101.77	81.20	79.54	74.32	84.22

NOT SAME UNIT

Note: All elevations measured in feet and referenced to a local datum arbitrarily set at 100.00.

TABLE 2

Water Quality Data
Quarterly Monitoring Report
Golden Valley Mobil #05-GOD
Golden Valley, Minnesota
#4231 88-521

Location	Date	Total Hydrocarbons As Gasoline	Benzene	Benzene	Toluene	Xylenes	MDL
MW-7	10-05-88	ND	ND	ND	ND	ND	1
	1-09-89	15	2	ND	ND	ND	1
	4-03-89	ND	ND	ND	ND	ND	1
	7-05-89	ND	ND	ND	ND	ND	1
MW-8	10-05-88	ND	ND	ND	ND	ND	1
	1-09-89	ND	ND	ND	ND	ND	1
	4-03-89	ND	ND	ND	ND	ND	1
	7-05-89	ND	ND	ND	ND	ND	1
MW-9	10-05-88	ND	ND	ND	ND	ND	1
	1-09-89	ND	ND	ND	ND	ND	1
	4-03-89	ND	ND	ND	ND	ND	1
	7-05-89	ND	ND	ND	ND	ND	1

All values reported as ug/L which are equivalent to parts per billion (ppb).

MDL - Method Detection Limit
ND - Not Detected

The chemistry test parameters were not detected in any monitoring well during the first, third and fourth quarters' sampling events. The sample from MW-7 exhibited concentrations of total hydrocarbons as gasoline and benzene during the second quarter sampling event. TCT suspects that a water level indicator probe may have introduced trace amounts of hydrocarbon contamination to the well prior to sampling.

Previously, soil samples were collected from soil borings B-1, B-2, B-3 and B-4 and analyzed to quantify total hydrocarbons as gasoline, benzene, toluene and xylenes concentrations. The analyses detected high concentrations of dissolved hydrocarbons in a soil sample from boring B-4 at a sampling interval of 19.5 to 21 feet, and low concentrations in samples from B-1 and B-4 at a sampling interval of 9.5 to 11 feet. The laboratory results are listed in Table 3.

3.0 DISCUSSION

A review of the boring logs for the site area indicate, in general, that the sand and silty sand alluvium at depth is overlain by a till layer of variable thickness - approximately 15 to 20 feet. This till layer is in turn overlain by fill material.

The till layer is composed of sandy lean clay with intermittent clay layers. The soil characteristics of this type of till generally preclude the mobility of contaminants both laterally and vertically.

TABLE 3

Soil Sample Analytical Results (12-16-86)
Mobil Oil Corporation Site #05-GOD
Golden Valley, Minnesota
#4231 88-521

Boring	Interval (ft)	Total Hydrocarbons As Gasoline	Benzene	Toluene	Xylenes	MDL
B-1	9.5 - 11	39	ND	1	8	1
	19.5 - 21	ND	ND	ND	ND	1
	29.5 - 31	ND	ND	ND	ND	1
B-2	9.5 - 11	ND	ND	ND	ND	1
	19.5 - 21	ND	ND	ND	ND	1
	29.5 - 31	ND	ND	ND	ND	1
B-3	9.5 - 11	ND	ND	ND	ND	1
	19.5 - 21	ND	ND	ND	ND	1
	29.5 - 31	ND	ND	ND	ND	1
B-4	9.5 - 11	23	ND	4	20	1
	19.5 - 21	650,000	22,000	45,000	115,000	1
	29.5 - 31	ND	ND	ND	ND	1

All results expressed as ug/kg which is equivalent to parts per billion (ppb).

ND - Not Detected

Significant hydrocarbon concentrations were detected at a depth of 19.5 to 21 feet in soil boring B-4 in 1986.

TCT observed the excavation of a 1000 gallon diesel fuel tank at the site in January 1987. The approximate location of the tank is shown in Figure 2. The excavated soils were screened with an OVA-128 portable organic vapor detector. OVA readings of 98 parts per million (ppm) and 108 ppm total organic vapors were documented. Strong petroleum-like odors and staining were present in the soils.

The excavation was terminated when visual and olfactory evidence indicated that no contaminated soil remained in the subsurface. Approximately 50 cubic yards of soil was excavated and removed from the site. Sandy lean clay and clean fill from the original tank installation comprised the bulk of the excavated soils. TCT's report dated January 27, 1987 is included as Appendix A.

No groundwater contamination at or above the method detection limit was detected in the groundwater samples from monitoring wells MW-8 and MW-9. Trace concentrations of petroleum hydrocarbons were quantified in MW-7 during the second sampling event in January 1989. Subsequent chemical analysis performed in April and July 1989 on MW-7 indicated non-detected concentrations for all test parameters. As stated previously, TCT suspects that the water level indicator probe may be responsible for the trace concentrations detected in the water sample.

Based upon the results of the quarterly monitoring program it is TCT's opinion that no impact to the groundwater has occurred from the hydrocarbon-impacted soils remaining at the site. We would expect that the hydrocarbons remaining in the soil will disperse through biodegradation and other natural processes.

4.0 RECOMMENDATIONS

Based upon the results of the one year quarterly monitoring program and the prior remedial action consisting of contaminated soil excavation and removal, TCT feels that groundwater restoration at this site is not warranted. Having successfully met the directive guidelines required by MPCA, TCT recommends that no further site monitoring take place and the site be approved for project closure by the MPCA.

5.0 STANDARD OF CARE

The recommendations contained in this report represent our professional opinions. These opinions were arrived at in accordance with currently accepted hydrogeologic and engineering practices at this time and location. Other than this, no warranty is implied or intended.

This report was written by: Damon M. Powers

Damon M Powers
Geological Engineer/Project Manager

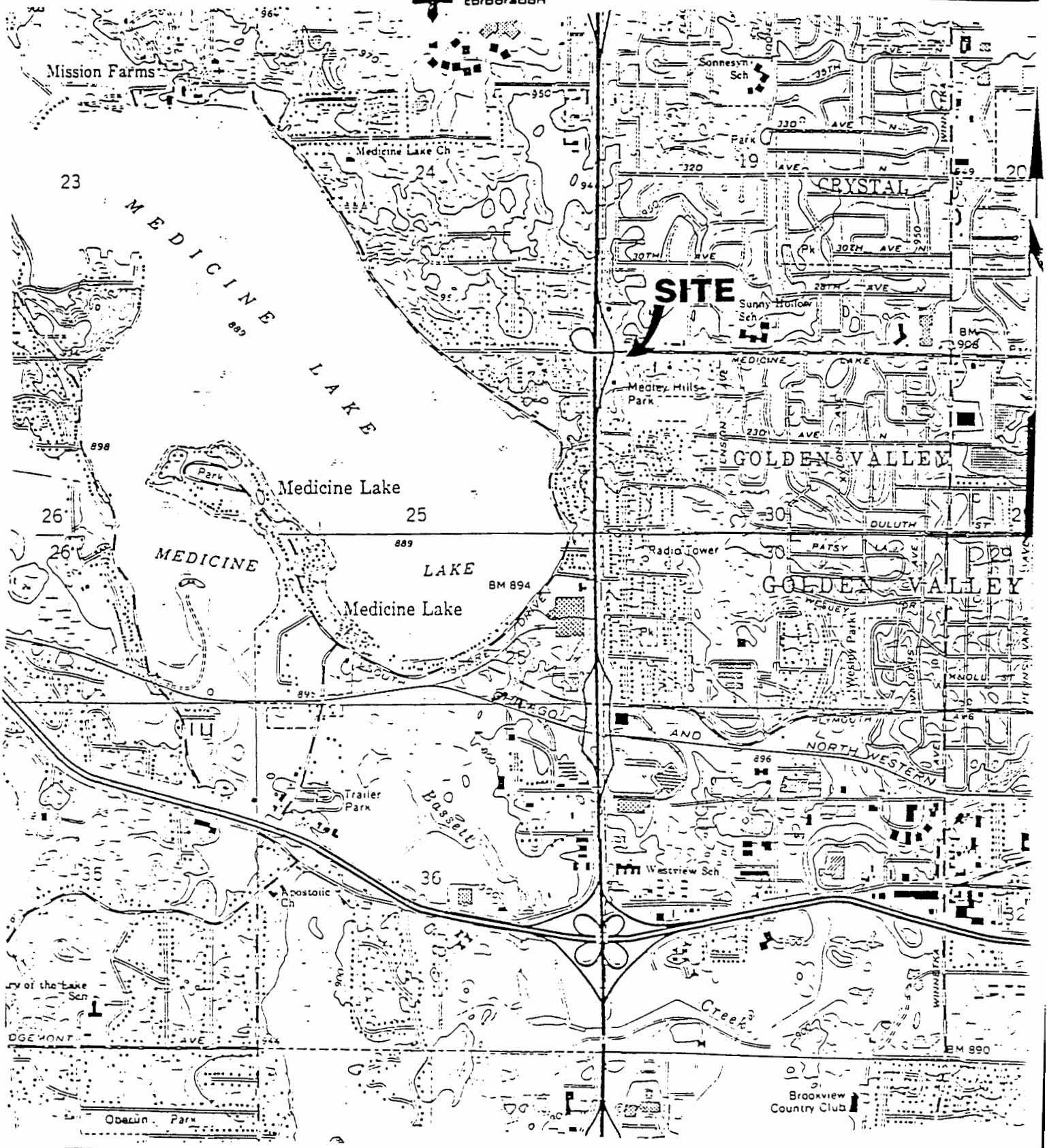
Date: August 2, 1989

This report was reviewed by: Robert A. Wojciak

Robert A Wojciak
Manager/UST Program

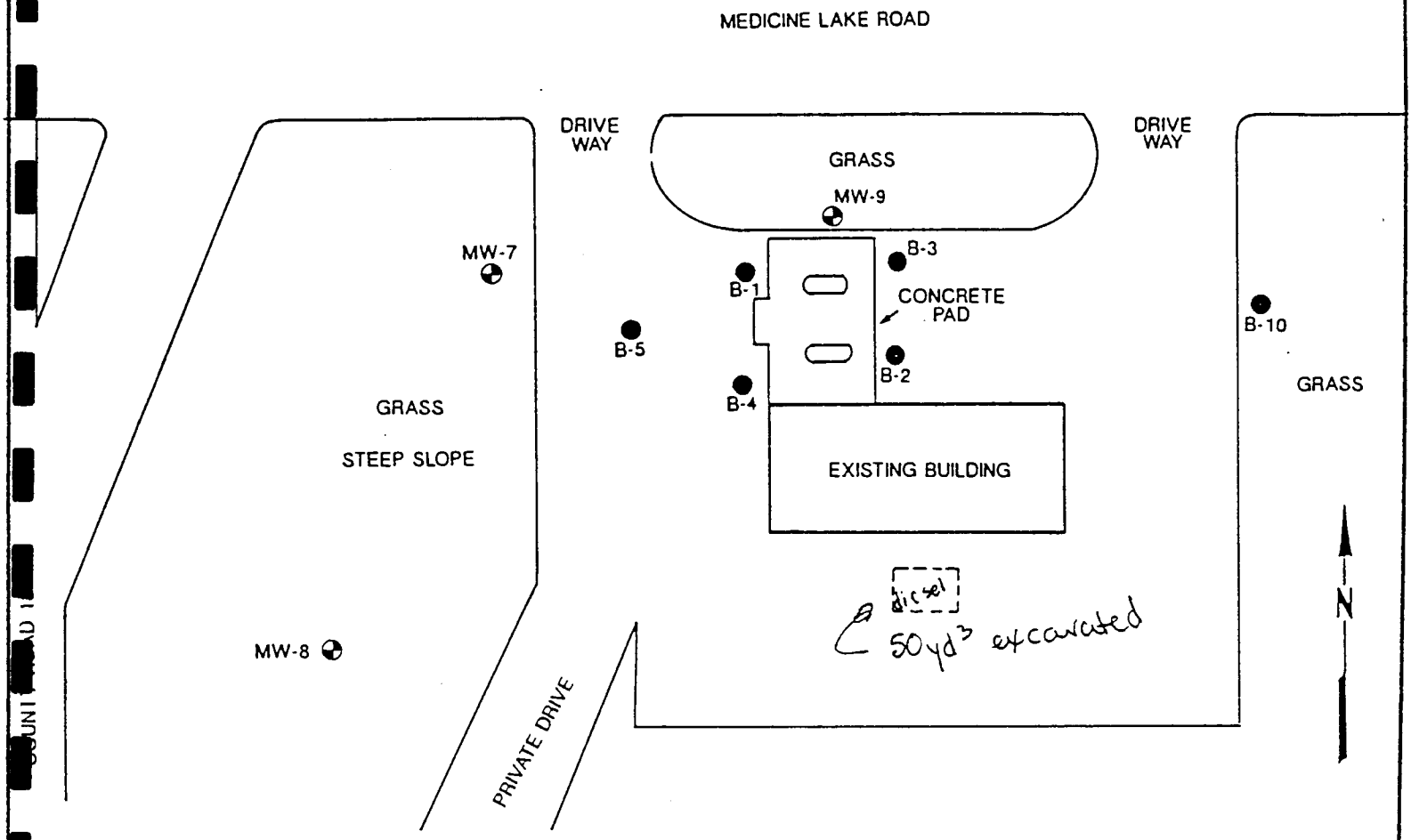
Date: August 2, 1989

Proofread by: DP



SITE LOCATION MAP
MOBIL STATION #05-GOD
COUNTY ROAD 18 & MEDICINE LAKE ROAD
GOLDEN VALLEY, MINNESOTA

DATE 7/20/89	FIGURE 1
PROJECT # 4231 88-521	
REVIEWED BY:	
DRAWN BY: E.J.V.	
SCALE 1"=2000'	

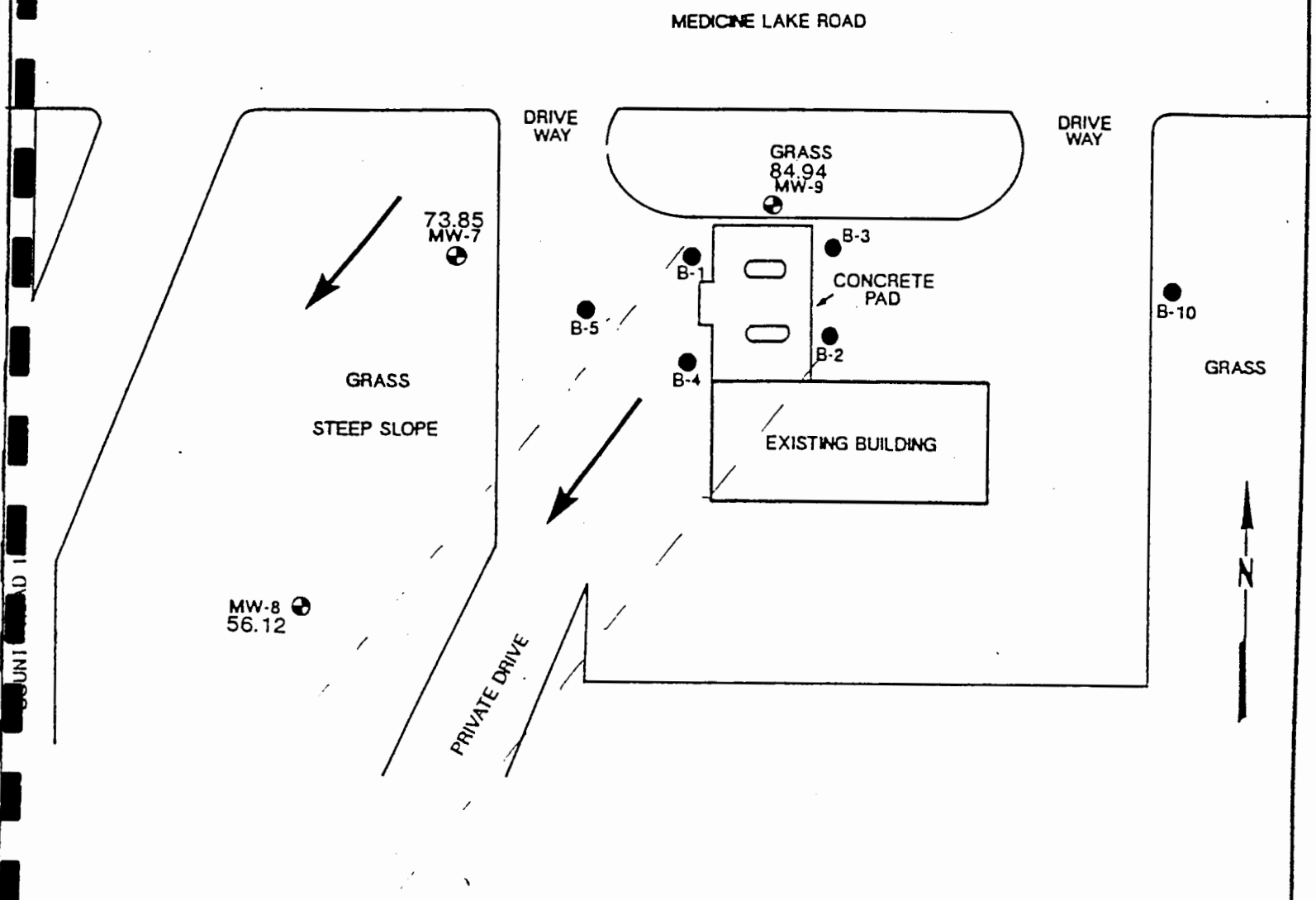


LEGEND:

- ● SOIL BORING LOCATION
- ◒ MONITORING WELL LOCATION
- ▭ PUMP ISLAND
- ⬚ U.S.T REMOVED IN 1987

SITE MAP
MOBIL STATION #05-GOD
COUNTY ROAD 18 & MEDICINE LAKE ROAD
GOLDEN VALLEY, MINNESOTA

DATE 7/21/89	FIGURE 2
PROJECT # 4231 88-521	
REVIEWED BY:	
DRAWN BY: E.J.V.	
SCALE ~~APPROXIMATELY~~ 1"=40	



LEGEND:

- ● SOIL BORING LOCATION
- ⊕ MONITORING WELL LOCATION
- ▭ PUMP ISLAND
- 84.94 WATER TABLE ELEVATION
- ← FLOW DIRECTION

INFERRED WATER TABLE FLOW DIRECTION 7-11-89
MOBIL STATION #05-GOD
COUNTY ROAD 18 & MEDICINE LAKE ROAD
GOLDEN VALLEY, MINNESOTA

DATE 7/21/89	FIGURE 3
PROJECT # 4231 88-521	
REVIEWED BY:	
DRAWN BY: E.J.V.	
SCALE APPROXIMATELY 1"=40	

APPENDIX J
HYDROGEOLOGIC SETTING AND GROUND WATER CONTAMINATION CHARACTERIZATION

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HYDROGEOLOGIC SETTING AND GROUND WATER CONTAMINATION CHARACTERIZATION
PETROLEUM RELEASE SITES

Minnesota Pollution Control Agency
Tanks and Spills Section
May 1991

This worksheet should be completed for all sites which have ground water contamination. It has several purposes. It summarizes remedial investigation (RI) results and conclusions for use by Minnesota Pollution Control Agency (MPCA) staff when reviewing the site to determine whether corrective action will be required to remediate ground water contamination. It also provides supplementary information on investigation, design and reporting requirements (presented in bold type) for sites which have ground water contamination. This worksheet and all other relevant MPCA documents should be reviewed when developing RI work plans to ensure that all RI requirements and objectives will be met during the investigation.

Answers to the following questions should be based on the results of the ground water receptor survey, RI activities, and published geologic literature. The questions should be answered in the space provided. Attach additional sheets if necessary.

1. Identify and describe the geologic units in which ground water has been impacted by the petroleum release. What is the thickness (or estimated thickness) and estimated lateral extent of the impacted unit?
   Des Moines Lobe Glacial Till (Meyer, 1985) interbedded perched layers of sand and sandy clay. One to two feet thick. Lateral extent approximately 10-20 feet.

At all sites with ground water monitoring wells, the RI must include an estimate of hydraulic conductivity, and provide estimates of the ground water velocity in the impacted unit. Documentation of how you arrived at these estimates must be provided.

2. What is the hydraulic conductivity, effective porosity, hydraulic gradient, estimated ground water velocity and flow direction in the impacted unit?
   Since ground water is contained in thin laterally limited porous sediments, these parameters were not calculated.

3. What is the maximum concentration of benzene and total hydrocarbons detected on the site? (parts per billion [ppb] units)

   Benzene 32,000 (Well No. 02, Date 11/12/90)
   Total Hydrocarbons 250,000 (Well No. 02, Date 11/12/90)

4. What is the maximum concentration of benzene and total hydrocarbons detected at or beyond the property boundary? (ppb units)
   Same as above.
   Benzene _____ (Well No. ____, Date _____)
   Total Hydrocarbons _____ (Well No. ____, Date _____)

5. Do contaminant concentrations for any compound exceed the Recommended Allowable Limits (RALs), at, or beyond the site boundaries? (Yes/No) ..... | YES |

   Compound Benzene (Well No. 02, Date 11/12/90)

6. Do sources of contamination (including contaminated soil) remain at the site? (Yes/No).....| YES |
If Yes, briefly describe.
Petroleum impacted soil around the gasoline UST basin

7. Is municipal water supply available at the site and within one mile downgradient of the site? (Yes/No).....| YES |

8. Are there presently any water wells which use the impacted aquifer located within one half mile downgradient of the site, or one mile downgradient of the site if the aquifer material is fractured? (Yes/No).....| NO |

9. Are there any plans for ground water development in the impacted aquifer within one half mile downgradient of the site, or one mile downgradient of the site if the aquifer material is fractured? (Yes/No).....| NO |

If you answered No to questions 8 and 9, please skip to question 10 and continue.

If you answered yes to question 8 or 9, and yes to question 5, corrective action will likely be required to remediate ground water contamination at the site. The RI report should include a proposed Corrective Action Design to meet the following cleanup goal and compliance point.

Cleanup goal: The RALs for VOCs and 1 part per million total hydrocarbons.

Compliance point: At and beyond the site boundaries.

At some LUST sites corrective actions may not be technically capable of achieving remediation to RALs. For a discussion of the options which should be considered when designing corrective actions for sites of this type please see the attached MPCA "Corrective Action Design for Ground Water Remediation to RALs" (May 1991) document.

Stop here if you answered Yes to question 8 or 9.

10. Are there nonpotable water supply wells which use the impacted unit downgradient of the site? (Yes/No).....| NO |

11. Does the plume currently discharge to surface water? (Yes/No).....| NO |
If yes, what is the estimated width of the plume at the shore of the surface water body, and what are the estimated concentrations of the following contaminants at the shore of the surface water body: (The estimation method should be described in the text of the RI report.).

Benzene _____, Ethyl Benzene _____, Toluene _____, Xylenes _____,
Total Hydrocarbons _____

If the answer to question number 11 is yes, the use category of the surface water body should also be determined, in accordance with Minn. Rules ch. 7050, and reported.

12. Does the plume have a projected point of entry to surface water? (Yes/No).....| NO |
If yes, what is the distance from the downgradient edge of the plume to the surface water body?

If you answered yes to question 12, the RI report should characterize the hydrogeologic conditions and land use between the site and the surface water body, and should assess the potential for the plume to discharge to surface water and the likelihood of future ground water use in the vicinity of the plume.

13. Is the impacted unit a bedrock aquifer? (Yes/No).....| NO |

14. Has contamination from the site impacted a quaternary surficial or buried aquifer that is presently used as a drinking water aquifer anywhere within a two mile radius of the site? (Yes/No).....| NO |

Stop here if you answered yes to question 13 or 14. If you answered no to both questions 13 and 14, please continue.

15. Identify and describe the uppermost drinking water aquifer in the site vicinity. What is the depth to the top of the uppermost drinking water aquifer? What is the water level in the uppermost drinking aquifer? Nearest well (204375) approximately 40 feet lower than the site. Therefore the depth and water level of uppermost drinking water aquifer is approximately 90 feet bgs.

16. Is there a confining unit between the impacted unit and the uppermost drinking water aquifer? What is its thickness and extent?
Approximately 30 feet of clay separates the impacted perched sand layer from the top of drinking water sand unit.

17. Is the uppermost drinking water aquifer a karst unit or a sole source aquifer?

No

18. Are there any existing or abandoned wells within approximately 1,000 feet downgradient of the site?

Yes

19. Are there any other site specific conditions which increase the risk of cross contamination from the impacted unit to a drinking water aquifer?

No

20. **Based on the answers to questions 14 through 18 and any other site specific information available, summarize and assess the risk of cross contamination from the impacted unit to the uppermost drinking water aquifer.**
The contaminated ground water is limited to thin areally limited shallow sand layers that are separated from the drinking water aquifer by approximately 30 feet of clay; therefore, the risk is low.

REMEDIAL INVESTIGATION/ CORRECTIVE ACTION DESIGN REPORT SINCLAIR STATION 9456 MEDICINE LAKE ROAD NEW HOPE, MINNESOTA

Prepared For:

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February 5, 1992

PROJECT NO: 711-015

kk/711-015.rpt

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1.0 INTRODUCTION

1.1 Purpose

EnecoTech Midwest, Inc. (EnecoTech) was retained by Sinclair Marketing, Inc. (Sinclair) on October 12, 1990 to perform a site investigation at the Sinclair Station at 9456 Medicine Lake Road, New Hope, Minnesota. The investigation was in response to data collected during underground storage tank (UST) removal activities conducted on April 11 through April 13, 1990 by EnecoTech. The data indicated that site soils had been impacted by a petroleum hydrocarbon release. The purpose of the investigation was to:

- Determine the nature, extent and magnitude of hydrocarbon release(s) to site soils; and
- Provide options and recommendations for remediation of hydrocarbon impacts, if necessary.

1.2 Scope-of-Work

An investigation scope-of-work for the site was developed and implemented by EnecoTech with the approval of Sinclair. The scope-of-work involved the characterization of site geology, hydrogeology, soil quality, ground water quality, and potential hydrocarbon sources. Characterization of these items was accomplished by:

- Drilling eight (8) soil borings,
- Installing two (2) ground water monitoring wells,
- Logging geologic materials encountered in the borings,
- Monitoring soil gas vapors with an OVM Systems photo-ionizer (PID),
- Collecting soil and ground water samples for laboratory analyses,
- Performing ground water level measurements,
- Conducting a ground water receptor survey,
- Conducting a vapor survey.

Field activities were initiated on October 12, 1990 and completed on July 10, 1991.

1.3 Previous Work and Reports Summary

An "Underground Storage Tank Excavation Report" for the subject location (Appendix A) summarized tank excavation activities performed at the site on April 11 through 13, 1990. This report was completed before the MPCA Excavation Report For Petroleum Release Sites format was available. Therefore this report was not rewritten in the MPCA format. A summary of the UST excavations is provided below:

- One 6,000 gallon unleaded gasoline UST, one (1) 1,000 gallon consumptive use fuel oil UST, and one (1) 560 gallon waste oil UST were excavated at the subject location on April 11 through 13, 1990.

- The bottom one-third of the 6,000 gallon unleaded gasoline UST was moderately corroded and exhibited several one inch diameter corrosion indentations that did not appear to breach the tank wall. One 1/8 inch diameter hole was observed at the base of the 1,000 gallon fuel oil UST. The 560 gallon waste oil UST did not exhibit any signs of corrosion.

- Soils in the excavations consisted of coarse grained sand backfill surrounded and underlain by brown to gray silty clay.

- A one inch thick layer of water was observed in the base of the 6,000 gallon unleaded gasoline UST excavation basin.

- OVM readings collected from the 6,000 gallon unleaded gasoline UST excavation ranged from 154 to 382 parts per million (ppm). OVM readings collected from the 560 gallon waste oil UST excavation ranged from 32 to 142 ppm. The presence of surface and subsurface structures near the 6,000 gallon unleaded gasoline UST and the 560 gallon waste oil UST prohibited a complete excavation of all the impacted soil. OVM readings above background levels were not detected in the 1,000 gallon fuel oil UST excavation.

- The 6,000 gallon unleaded gasoline UST basin soil sample (15-TP-01) contained no detectable levels of benzene, 15 ppm toluene, 13 ppm ethylbenzene, 77 ppm total xylenes, and 400 ppm total petroleum hydrocarbons as gasoline (TPH-gasoline).

- The 560 gallon waste oil UST basin soil sample (TP-02-08) contained 0.51 ppm 1,2 dichloroethane, 0.34 ppm ethyl ether, 0.39 ppm benzene, 1.2 ppm toluene, 0.46 ppm ethylbenzene, 4.3 ppm total xylenes, and 9,000 ppm total petroleum hydrocarbons as fuel oil (TPH fuel oil). This sample also contained 0.050 ppm PCB, 5 ppm chromium, 16 ppm lead and 0.06 ppm mercury.

- The 1,000 gallon fuel oil UST basin soil sample (TP-03-05) did not contain any benzene, toluene, ethylene, xylenes (BTEX), or TPH fuel oil.

- A total of approximately 150 cubic yards of impacted soil was removed from the site and incinerated at C.S. McCrossan Asphalt Plant, Maple Grove, MN (Appendix B).

2.0 BACKGROUND INFORMATION

2.1 Site Location, Description and Area Land Use

The site is located at 9456 Medicine Lake Road, New Hope, Minnesota (Figure 1). At the time of the investigation, above ground structures included the station building and two pump islands located in the south central portion of the site (Figure 2). The below ground structures included two 6,000 gallon unleaded gasoline steel USTs and one 6,000 regular gasoline steel UST. These three USTs were located in the southeastern portion of the property. Land usage around the site includes the following: the Highway 169 entrance ramp to the west, an asphalt parking lot to the north, the Hillsboro Court Apartments to the east, and Medicine Lake Road to the south. A McDonalds Restaurant is located south of Medicine Lake Road. Southwest of the site a Union 76 gasoline station is also located south of Medicine Lake Road (Figure 3).

2.2 Site History

Sinclair could not provide information concerning the history of the site prior to its ownership. Sinclair purchased the existing station from Texaco in the early 1970s, and tank records indicate that the tanks were installed in 1964. A 6,000 gallon UST was removed in April, 1990 and had been emptied and removed from service in July 1988. No information was available regarding the reasons for removing this UST from service.

EnecoTech reviewed aerial photographs of the site in an attempt to determine previous use of the property. Aerial photographs taken in the following years were reviewed: 1937, 1945, 1957, 1960, 1964, and 1971. All photographs older than the 1971 photograph indicated that the property was part of a farm and was not commercially developed. The exact parcel was located in the front lawn of the original farmhouse in photographs as recent as 1960. The 1964 photograph, taken on October 14, 1964, indicates that the farmhouse had been removed and the site was in a state of construction. This corresponds with the tank records which indicate that the tanks were installed in 1964. Copies of the aerial photographs have been included as Appendix C.

2.3 Tank and Line Tightness Test Results

The most recent tank and line test results were provided to EnecoTech by Sinclair at the request of the MPCA. These tank and line tightness tests were conducted in July 1991. The results of These tests indicate that all tanks and lines currently in use at the site passed inspection with no evidence of leaks. Results of these tests have been included as Appendix D.

Previous tank and line tightness tests were performed in January 1987 and November 1989. On both occasions the tank and line systems passed inspection with no evidence of leaks.

2.4 Regional Geology

The geology of the region has been characterized from published Minnesota Geological Survey (MGS) information. Available information indicates that the region is underlain by Pleistocene age Des Moines Lobe clay till deposits consisting of gray and brown clay loam and loam with minor inclusions of sandy clay loam and sandy loam. The glacial deposits in this area range in thickness from approximately 100 to 200 feet (Bloomgren, 1979).

2.5 Regional Hydrogeology

The near surface regional aquifer in this area is an unconfined buried glacial aquifer. The ground water flow direction for this aquifer is east (Figure 4). Glacial deposits that underlie this area yield moderate amounts of water to wells.

The major bedrock aquifers in the region are the St. Peter, Prairie du Chien - Jordan and Mt. Simon-Hinckley (Appendix E). These aquifers are approximately 100 to 800 feet below ground surface. The St. Peter sandstone yields 9 to 100 gallons per minute (gpm) and is primarily used for private domestic wells. The Prairie du Chien-Jordan and Mt. Simon Hinkley aquifer supply the majority of ground water to the region. Yields range from 85 to 2,765 gpm (Norvitch, et.al., 1973.)

3.0 INVESTIGATION PROCEDURES

3.1 Soil Boring and Monitoring Well Placement

The locations of soil borings and monitoring wells were based on data from the UST basin excavations in an attempt to delineate the stratigraphic and areal extent of soil and ground water impacts. The soil boring locations were chosen to investigate the soil quality adjacent to and beneath the base of the waste oil and gasoline tank basins. The fuel oil UST basin was not impacted and therefore did not require investigation (Figure 5). Written permission was obtained from the east adjacent property owner prior to drilling offsite soil borings (Appendix F).

3.2 Soil Boring Advancement

Soil boring activities were initiated on October 12, 1990 and completed on July 10, 1991. Exploration Technology, Inc. (ETI) of Eden Prairie, Minnesota and Thein Well Company of Shakopee, Minnesota performed drilling activities under EnecoTech supervision. Drilling equipment was cleaned by field personnel prior to the drilling of the first soil boring and after each soil boring completion. Cleaning was performed with a high pressure washer and potable water. An EnecoTech geologist monitored cleaning activities and inspected the augers to ensure decontamination had been achieved.

A total of 10 boreholes (8 soil borings, 2 monitoring wells) were completed to depths ranging from 21 to 61 feet bgs. The soil borings and 2 inch diameter monitoring wells were drilled using a 6 3/4 inch O.D. hollow stem auger. The EnecoTech geologist logged each borehole by describing the geologic materials encountered in the subsurface (Appendix G).

3.3 Soil Sample Collection and Logging

Soil samples were collected with a split spoon sampler. Split spoons were decontaminated prior to sampling, using a detergent-distilled water-methanol-distilled water rinse cycle. In general, samples were collected at 5 foot intervals to the final bottom hole depths. Soil samples were screened with a Thermo Environmental Organic Vapor Meter (OVM) photoionization detector calibrated to 100 ppm isobutylene. OVM readings of soil samples were taken using the MPCA jar headspace analysis technique. The soil sample from each borehole or horizon that contained the highest concentration of organic vapors was placed in laboratory prepared containers. All samples were labeled, stored on ice, and shipped with a chain of custody form to Interpoll Laboratories (Interpoll), in Circle Pines, MN (Appendix H).

The soil samples were analyzed for the chemical constituents shown in Table 1.

3.4 Monitoring Well Installation

Two monitoring wells, MW-01 and MW-02, were installed within the site property boundaries (Figure 5). The two monitoring wells were installed and completed in the same manner. A ten (10) ft section of 2 inch diameter stainless steel #10 slot screen was installed with black iron riser pipe extending up to approximately 2.5 ft above ground surface. Number 30 flint sand was added to a level approximately 2 ft above the top of the well screen.

A layer of granular bentonite 2 to 3 ft thick was used to seal the top of the sand pack. A bentonite-cement slurry was placed from the bentonite seal to within 1 ft bgs. Cement mortar was used as the top seal to ground level elevation. Protective steel casings with locking caps were installed and bumper posts were placed as required by MDH regulations. Well construction diagrams for each monitoring well are provided in Appendix I.

Monitoring wells were developed by bailing until clear water was obtained, or pH conditions stabilized. A disposable plastic bailer attached to a new nylon rope was used to evacuate water from each well.

EnecoTech surveyed the monitoring well locations and elevations using a local benchmark with an assumed elevation of 100 ft. Top of casing elevation, surface elevation, and well location measurements were completed to facilitate hydrogeologic interpretations.

3.5 Monitoring Well Sample Collection

Ground water samples were collected from the monitoring wells on November 12, 1990, May 30, 1991, and July 10, 1991. The procedure used to collect water samples from the wells consisted of the following steps.

- Three well volumes were evacuated from each well using disposable plastic bailers;
- After removal of three well volumes, a ground water sample was transferred directly from the bailer into laboratory prepared glass containers;
- Samples were immediately placed on ice and stored thereafter at 4°C;
- Sample numbers and bottle numbers were entered directly into a field log book; and
- A chain of custody form was completed and submitted with the samples.

Ground water samples collected November 12, 1990 were analyzed by Interpoll for MDH 465C volatile parameters including BTEX, TPH-gas and TPH-fuel oil. In addition to these constituents, the ground water samples collected on May 30, 1991 and July 10, 1991 were analyzed for MTBE and lead. Interpoll utilized MDH 465C and EPA Methods SW-846, 8020; SW-846, 8015; SW-846, 3510/8015; and SW-846, 6010.

3.6 Fluid Level Measurements

Water level measurements were performed by EnecoTech on November 12, 1990, May 30, 1991, and July 26, 1991. Measurements were taken with an oil/water interface probe. The use of this instrument allows for the detection of free product floating on top of the water table as well as depth to ground water measurements. Measurements were taken to within 0.01 ft from a specific datum point at the top of the casing. The probe was decontaminated with a detergent-distilled water-methanol distilled water rinse sequence between measurements to preclude cross-contamination of monitoring wells.

3.7 Vapor Survey

A vapor risk assessment and survey was completed in accordance with guidelines presented in the MPCA guidance document "Petroleum Vapor Risk Assessment and Survey - May 8, 1990". The main purpose of this survey was to determine the potential for petroleum vapor impacts to subsurface utility corridors or basements. Ambient air within manholes near the site was measured for petroleum vapors using an OVM.

3.8 Survey of Potential Ground Water Receptors

A ground water receptor survey was completed in accordance with guidelines presented in the MPCA guidance document "Ground Water Receptor Survey - May 1991". The main purpose of this survey was to determine if the potentially impacted aquifer was used for a water supply within a one-mile radius of the site (Appendix E). Well logs of registered wells were obtained within this area. In addition, adjacent property owners were surveyed regarding unregistered wells.

4.0 RESULTS

4.1 Site Geology

The soil beneath the site has been characterized to a depth of 61 ft below ground surface (bgs) by logging soil samples obtained from soil borings (Figures 6, 7, 8, and 9; Appendix G). The site is underlain by a brown and gray silty sandy clay to a depth of approximately 44 ft. This clay layer contains 2 to 5 ft thick discontinuous layers of silty and clayey fine to medium grained sand. A locally continuous 0.5 to 2 ft thick sand layer was encountered at a depth of approximately 10 ft bgs. This lens was encountered in soil borings SB-02, SB-04, SB-08, and SB-09. The clay layer was underlain by a fine to medium grained sand unit that is at least 17 ft thick.

4.2 Site Hydrogeology

Perched layers of water were encountered in soil borings SB-04, SB-07, SB-08, and SB-09; and monitoring wells MW-01 and MW-02. The layers were encountered at various depths from 9 to 41 ft bgs. Commonly, the perched water was found in silt or sand layers within the main surficial clay unit at depths from approximately 9-15 ft bgs. None of the saturated layers were thicker than 2 to 3 ft or deeper than 41 ft bgs. Water levels in MW-01 were approximately 42 ft bgs, whereas water levels in MW-02 ranged from approximately 8 to 14 ft bgs (Figures 10 and 11; Table 2).

4.3 Soil Data

4.3.1 Soil Sample Organic Vapor Data

Organic vapors were detected at levels from 3 to 965 ppm at depths from 4 to 41 ft bgs. The highest value (965 ppm) was recorded from the 9 to 11 ft sample in soil boring SB-02. Significant concentrations of organic vapors (greater than 10 ppm) were detected in soil samples from MW-02, SB-02, SB-03, SB-04, SB-05, SB-08 and SB-09. Significant thicknesses of impacted soil (greater than 5 ft) were detected in SB-02, SB-08, SB-09 and MW-02. No organic vapors were detected in soil boring samples from MW-01 or SB-06 (Table 3).

4.3.2 Soil Sample Laboratory Analytical Data

Soil samples were collected from depths of 9 to 59 ft bgs for laboratory analysis (Table 4, Figure 12, Appendix J). Benzene was detected at concentrations of 0.09 ppm (SB-04-24) to 0.95 ppm (SB-08-34). TPH-gas was detected at concentrations of 2.1 ppm (SB-04-24) to 47 ppm (SB-08-34). TPH-fuel oil was encountered at concentrations of 8.4 ppm (SB-04-09) to 220 ppm (SB-08-10). However, all of the samples with petroleum fractions identified as fuel oil were described as having chromatographic patterns that did not match fuel oil, but a lighter grade petroleum (see lab data footnotes, Appendix J).

4.4 Ground Water Data

The ground water samples collected from MW-01 did not contain BTEX or other MDH 465C analytes (Table 5, Figures 13 and 14). However, the November 1990 sample contained TPH-gas and TPH-fuel oil at concentrations of 0.018 ppm and 0.680 ppm, respectively. The November 1990 MW-02 ground water sample contained 32 ppm benzene, 250 ppm TPH-gas, and 48 ppm TPH-fuel oil. In addition, 1,2 dichloroethane was detected at a concentration of 0.032 ppm (Table 6, Figure 15).

The concentrations of the petroleum constituents detected in MW-02 during November 1990 decreased by May 1991 to 19 ppm benzene, 102 ppm TPH-gas, and 26 ppm TPH-fuel oil (Figure 16). However, an increase in solvent constituents was detected in the May/July 1991 samples (Table 6). Tetrahydrofuran (THF) was detected at concentrations from 0.0011 ppm in MW-01 to 16 ppm in MW-02. Ethyl ether (1.2 ppm) and methyl ethyl ketone (MEK) (2.0 ppm) were also detected in MW-02. These compounds are commonly misidentified in laboratory reports due to the similarity of their chromatographic patterns to those of other hydrocarbon constituents. This issue has been recognized by the MPCA, and an explanatory letter from Interpoll has been provided at the beginning of the lab reports in Appendix J.

4.5 Petroleum Vapor Assessment Survey

Figure 17 shows the results of a utility corridor vapor survey that was performed on September 3, 1991. No basements existed in the buildings occupied by McDonalds or Union 76. Since soil impacts did not extend beyond the Sinclair property to the east, the Hillsboro Court apartment basement was not surveyed for petroleum vapors because the vapor risk was considered low. The vapor readings with the PID and explosimeter were non-detectable.

4.6 Survey of Potential Ground Water Receptors

MPCA guidelines require that potential ground water receptors be identified. The following text addresses Items 1, 3 and 4 of the MPCA Ground Water Receptor Survey document (May 1991). Documentation for Items 2, 5, 7, and 8 are included in Appendix E. Since a municipal water supply is readily available in the area, no research was performed for Item 6. None of the registered wells produced water from the shallow perched saturated zone, within the remedial investigation area.

1) The subject property is located in an urban area and, therefore, a municipal water supply is available in the site vicinity.

2) The City of New Hope (City) was contacted regarding possible unregistered water wells in the area. City personnel indicated that the city does not keep private well records.

3) No abandoned or existing water wells were present on the adjoining properties according to the property owners (Appendix E).

Only one deep soil sample contained elevated concentrations of TPH-gas. Sample SB-08-34 contained 47 ppm TPH-gas. Furthermore, elevated soil vapors from split spoon samples were encountered in this borehole from 12 to 39 ft bgs.

5.2 Nature and Extent of Ground Water Impacts

Ground water occurrences within the investigation area were encountered in thin (3-5 ft thick), discontinuous interbedded sand layers. No laterally continuous aquifers were encountered during the investigation. Even though sample MW-02 contained elevated concentrations of gasoline and solvent constituents, the saturated sand lens that is penetrated by this well is limited to the area immediately adjacent to the UST basin. Therefore, the distribution of this impacted ground water is similarly limited.

The concentrations of petroleum constituents detected during November 1990 decreased by May 1991. Benzene decreased from 32 ppm to 19 ppm; and TPH-gas decreased from 250 ppm to 102 ppm.

5.0 DISCUSSION

5.1 Nature and Extent of Soil Impacts

The following discussion of the petroleum hydrocarbon distribution in soil incorporates the data that was collected during the UST excavations as well as data collected during the soil boring investigation. For the purposes of this discussion, significant impacts are based on the MPCA action guideline of TPH-gas or TPH-fuel oil concentrations greater than 50 ppm.

5.5.1 Horizontal Distribution

The horizontal extent of petroleum hydrocarbon impacted soil encountered during this investigation is shown in Figure 18. The gasoline UST basin impacted area is defined by MW-01, SB-02, SB-03, SB-04, and SB-05. These boreholes define the perimeter of the impacted area (Figures 19, 20, and 21). The lateral extent of this impact was apparently limited by the low permeability of the native clay. The locally continuous sand lens that was described in Section 4.1 (Figure 21) was impacted by petroleum releases from the Sinclair gasoline UST basin and possibly by releases from Union 76 Station (MPCA LEAK#0000183) south of Medicine Lake Road.

EnecoTech obtained the Twin City Testing (TCT) remedial investigation report for the Union 76 Station site (Appendix K). This station was formerly owned by Mobil Oil Corporation. The remedial investigation of this site was initiated in April 1987. Soil boring soil sample analytical data is presented in this report from B-1, B-2, B-3, and B-4. Soil samples from the interval 9.5 to 11.0 ft bgs in soil borings B-1 and B-4 contained elevated concentrations of total hydrocarbons (39 ppm and 23 ppm, respectively). This interval is approximately the same depth from which petroleum impacts were detected on the Sinclair property. The TCT report suggested that perched ground water flow from the former Mobil site was southwest away from the Sinclair station. However, the report also stated that the depth to the phreatic surface varies considerably and may be due to waterbearing sand and silt layers which are encountered at varying depths. With these widely variable ground water depths it is doubtful that any reliable flow direction information can be derived from this data.

Soil boring SB-03 was primarily drilled to investigate the impacted soil that was encountered during excavation of the waste oil UST. The soil vapor and laboratory analytical data indicate that the elevated concentrations encountered in the UST basin (9,000 ppm TPH-fuel oil) were limited to a thin (1-2 ft) localized portion of the UST basin.

5.5.2 Vertical Distribution

The vertical distribution of the petroleum impacted soil is limited to the 2 ft thick lens that has been described in previous sections (Figures 11 and 13). The downward movement of gasoline in this area was apparently limited by the low hydraulic conductivity of the native clay.

6.0 REMEDIAL INVESTIGATION SUMMARY

- One 6,000 gallon unleaded gasoline UST, one (1) 1,000 gallon consumptive use fuel oil UST, and one (1) 560 gallon waste oil UST were excavated at the subject location on April 11 through 13, 1990.

- OVM readings collected from the 6,000 gallon unleaded gasoline UST excavation ranged from 154 to 382 ppm. OVM readings collected from the 560 gallon waste oil UST excavation ranged from 32 to 142 ppm. The presence of surface and subsurface structures near the 6,000 gallon unleaded gasoline UST and the 560 gallon waste oil UST prohibited a complete excavation of all the impacted soil. OVM readings above background levels were not detected in the 1,000 gallon UST excavation.

- The 6,000 gallon unleaded gasoline UST basin soil sample (15-TP-01) contained no detectable levels of benzene, 15 ppm toluene, 13 ppm ethylbenzene, 77 ppm total xylenes, and 400 ppm total hydrocarbons as gasoline (TPH-gas).

- The 560 gallon waste oil UST basin soil sample (TP-02-08) contained 0.51 ppm 1,2 dichloroethane, 0.34 ppm ethyl ether, 0.39 ppm benzene, 1.2 ppm toluene, 0.46 ppm ethylbenzene, 4.3 ppm total xylenes, and 9,000 ppm total hydrocarbons as fuel oil (TPH-fuel oil). This sample also contained 0.050 ppm PCB, 5 ppm chromium, 16 ppm lead and 0.06 ppm mercury.

- The 1,000 gallon fuel oil UST basin soil sample (TP-03-05) did not contain any BTEX constituents or TPH-fuel oil.

- A total of approximately 150 cubic yards of impacted soil were removed from the site and incinerated at C.S. McCrossan Asphalt Plant.

- The soil underlying the site has been characterized to a depth of 61 ft bgs by logging soil samples obtained from soil borings. The site is underlain by a brown and gray silty sandy clay, to a depth of approximately 44 ft. This clay layer contains 2 to 5 ft thick discontinuous layers of silty and clayey fine to medium grained sand. The clay layer is underlain by a fine to medium grained sand unit that is a least 17 ft thick.

- Perched layers of water were encountered in most of the soil borings and monitoring wells with the exception of SB-05 and SB-09. The layers were encountered at various depths from 9 to 41 ft bgs. Commonly, the perched water was found in silt or sand layers within the main surficial clay unit. None of the saturated layers were thicker than 2 to 3 ft or deeper than 41 ft bgs.

- Significant concentrations of organic vapors (greater than 10 ppm) were detected in soil samples from MW-02, SB-02, SB-03, SB-04, SB-05, SB-08, and SB-09. However, significant thicknesses of impacted soil (2 ft or greater) that exceeded the MPCA guideline of 50 ppm for TPH were only detected in soil borings SB-08 and SB-09. This area is probably hydraulically connected to the UST systems on the Sinclair and/or Union 76 properties by a 2 ft thick sand lens at approximately 10 ft bgs.

- The ground water samples collected from MW-01 did not contain BTEX or other MDH 465c constituents. The November, 1990 sample contained TPH-gas and TPH-fuel oil at concentrations of 0.018 ppm and 0.680 ppm, respectively.

  The concentrations of the petroleum constituents detected in MW-02 decreased by May 1991 to 19 ppm benzene, 102 ppm TPH-gas, and 26 ppm TPH-fuel oil. An increase in solvent constituents was detected in the May 1991 samples. Tetrahydrofuran (THF) was detected at concentrations from 0.0011 ppm in MW-01 to 16 ppm in MW-02. Ethyl ether (1.2 ppm) and methyl ethyl ketone (MEK) (2.0 ppm) were also detected in MW-02. The presence of these compounds is questionable, however, due to the limitations of the analytical equipment method employed and the lack of a clear source.

8.0 RECOMMENDATIONS/CORRECTIVE ACTION DESIGN

EnecoTech recommends no further action at the subject site. This recommendation is based upon several factors, including; limited vertical and areal extent of soil hydrocarbon impacts; limited concentrations of soil hydrocarbon impacts; reducing concentrations of soil hydrocarbon impacts; limited presence of ground water impacts in discontinuous perched ground water layers; and a lack of potential receptors in the area.

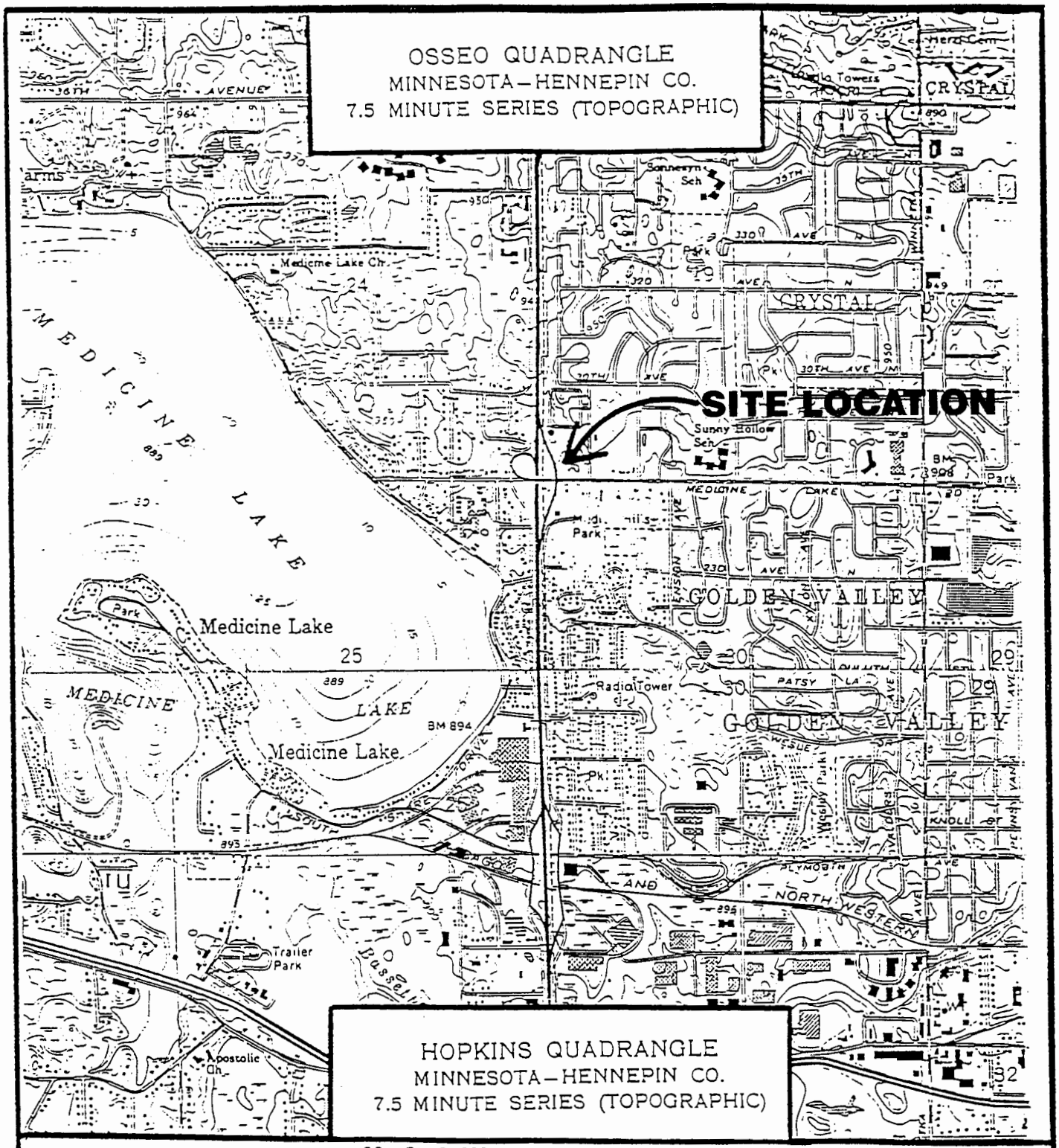
9.0 REFERENCES

Balabon, N.H., 1989; Geologic Atlas, Hennepin County, Minnesota; County Atlas Series, Atlas C-4; Minnesota Geological Survey.

Bloomgren, B.A., Poppe, J.R., 1979 Geologic and Hydrologic Aspects of Tunneling in the Twin Cities Area, Minnesota: Minnesota Geological Survey.

Norvitch, R.F., Ross, T.G., and Brietkriotz, Alex, 1973 Water Resources Outlook for the Minneapolis-St. Paul Metropolitan Area, Minnesota: USGS

Minnesota Pollution Control Agency Guidelines, 1986. "Procedures for Ground Water Monitoring" MPCA Solid and Hazardous Waste Division Program Development Section.



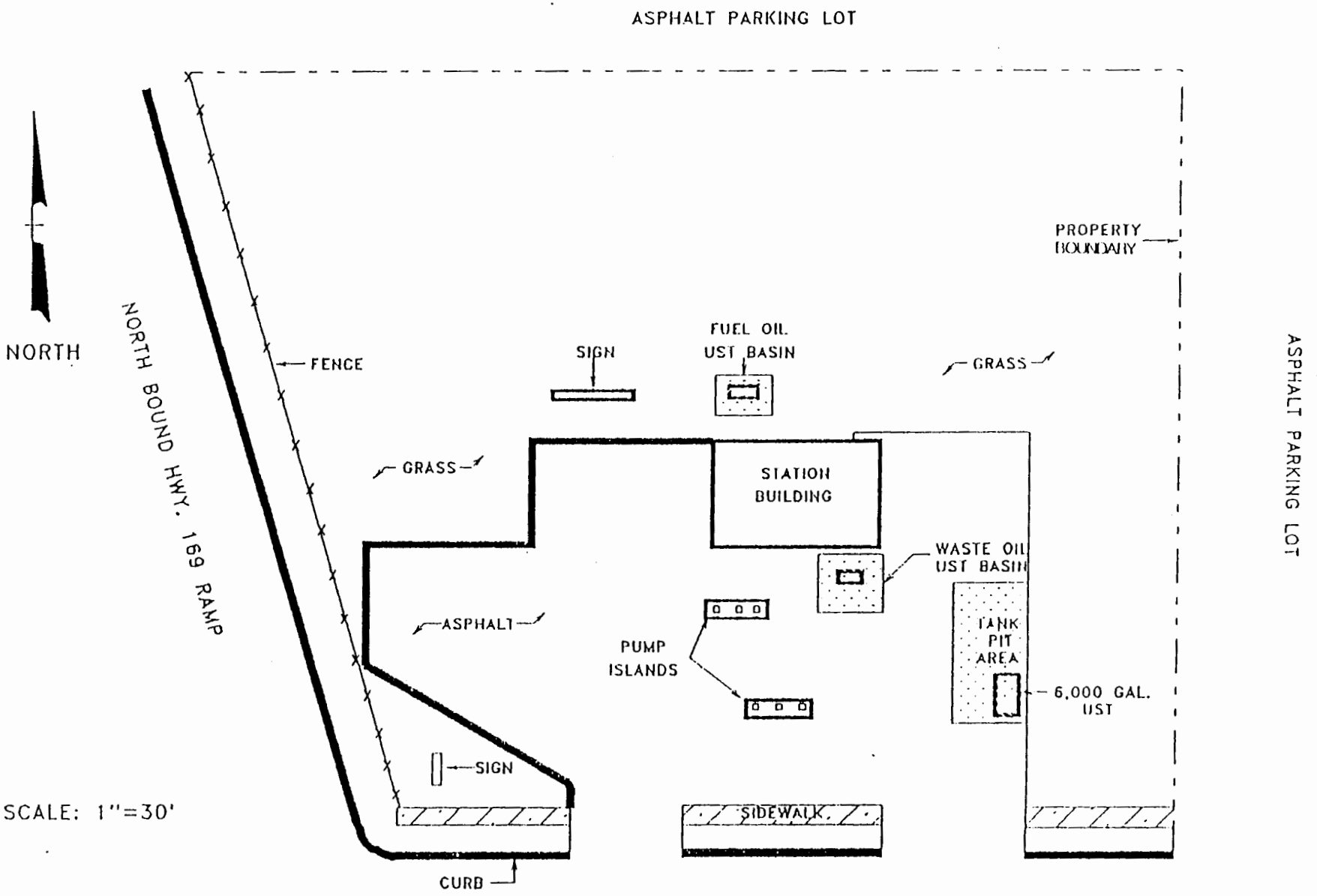
ENECOTECH

BLOOMINGTON, MINNESOTA

PROJECT SINCLAIR SERVICE STATION
9456 MEDICINE LK. RD., NEW HOPE, MINNESOTA

FIGURE 1
SITE LOCATION MAP

FILE NO.: 711-015 DATE: MAY, 1990 FIGURE NO.: 1



ENECOTECH
BLOOMINGTON, MINNESOTA

PROJECT SINCLAIR SERVICE STATION
9456 MEDICINE LAKE RD., NEW HOPE, MN

SITE MAP

FILE NO.: 711-015 DATE: MAY, 1990 FIGURE NO.: 2

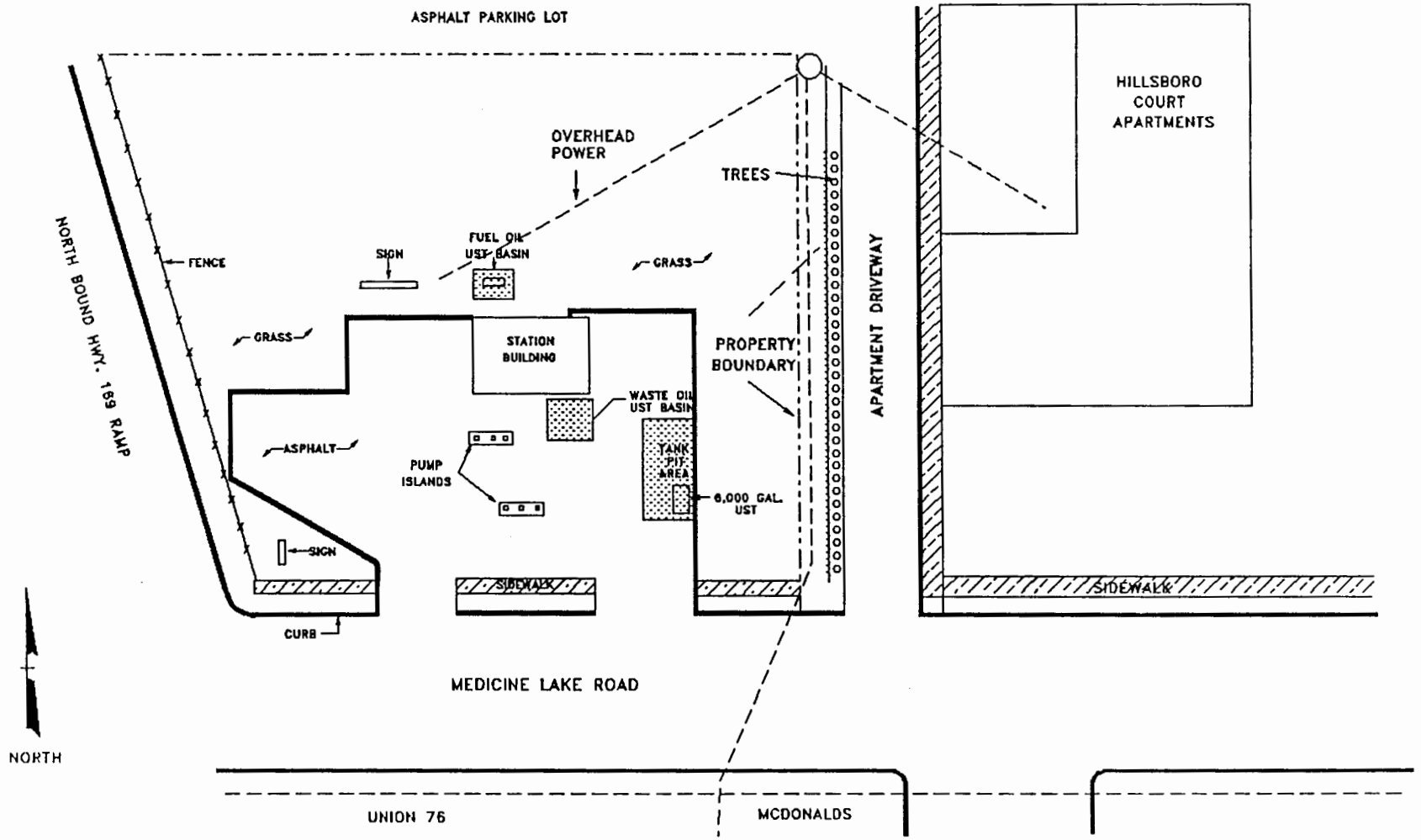


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FIGURE 3
AREA LAND USE MAP
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE RD, NEW HOPE, MINNESOTA

PROJECT NO.	DATE	SCALE	PREPARED BY	REVIEWED BY	DATE	REVISION	
711-015	9/91	1" = 50'	EFW	KWK	1/92	ORIGINAL	SA

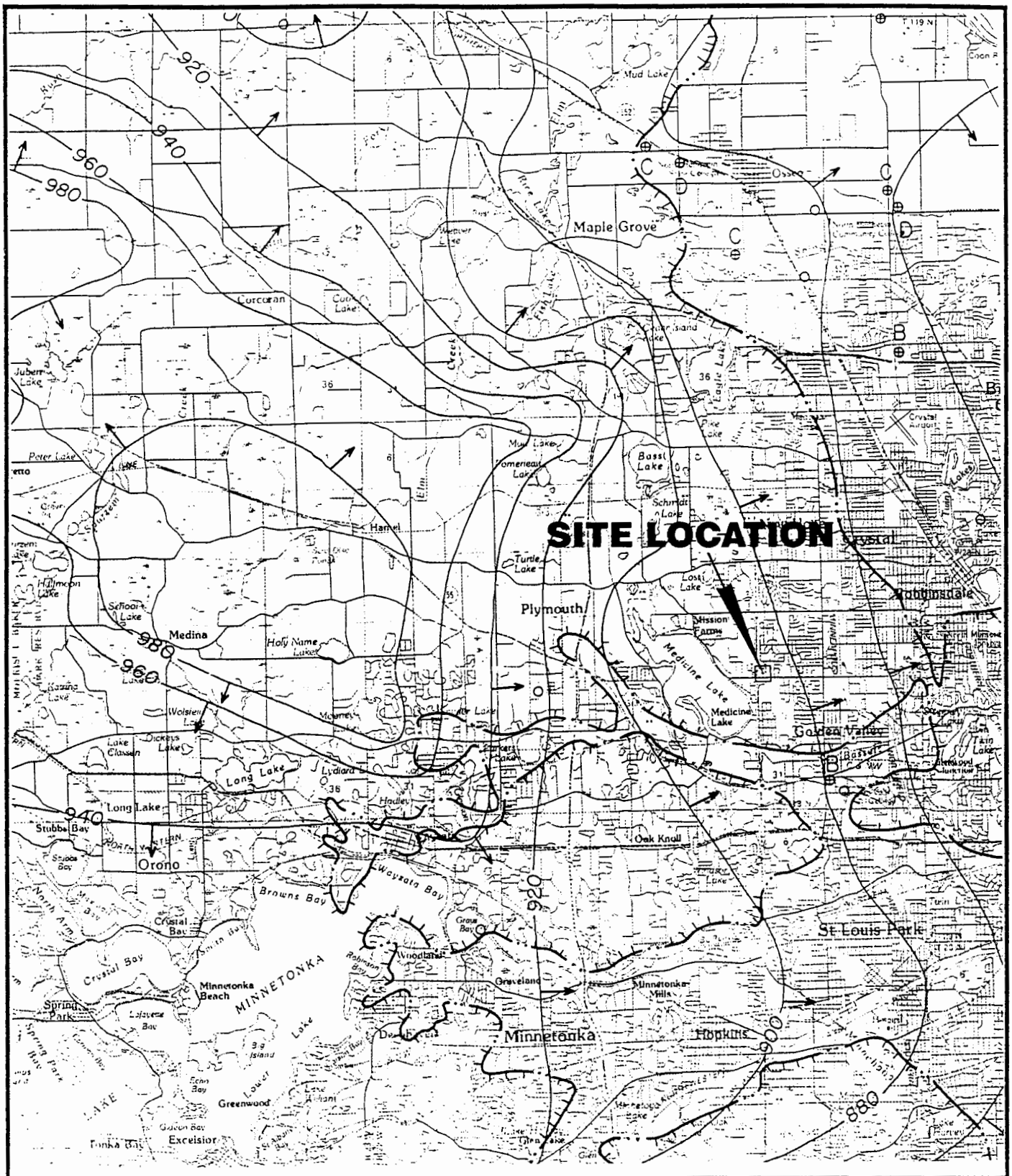

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FIGURE 4
BURIED GLACIAL AQUIFER WATER TABLE
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD
NEW HOPE, MINNESOTA

PROJECT NO.	DATE	SCALE	PREPARED BY	REVIEWED BY	DATE	REVISION	
711-015	9/91	1:100,000	EFW	KWK	1/92	ORIGINAL	---

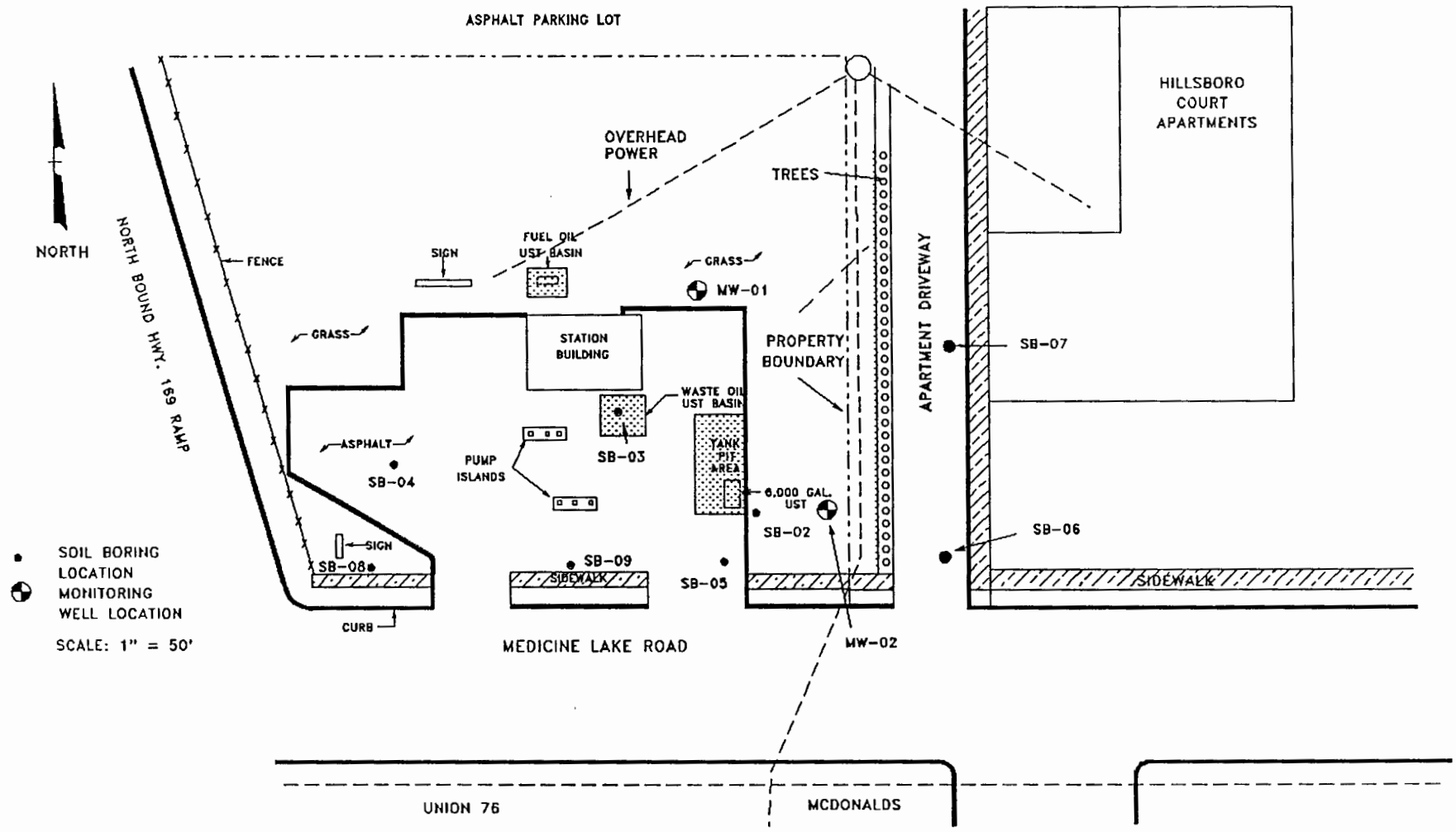

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FIGURE 5
SOIL BORING/MONITORING WELL LOCATIONS
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE RD, NEW HOPE, MINNESOTA

PROJECT NO.	DATE	SCALE	PREPARED BY	REVIEWED BY	DATE	REVISION	
711-015	9/91	1" = 50'	EFW	KWK	1/92	ORIGINAL	M1

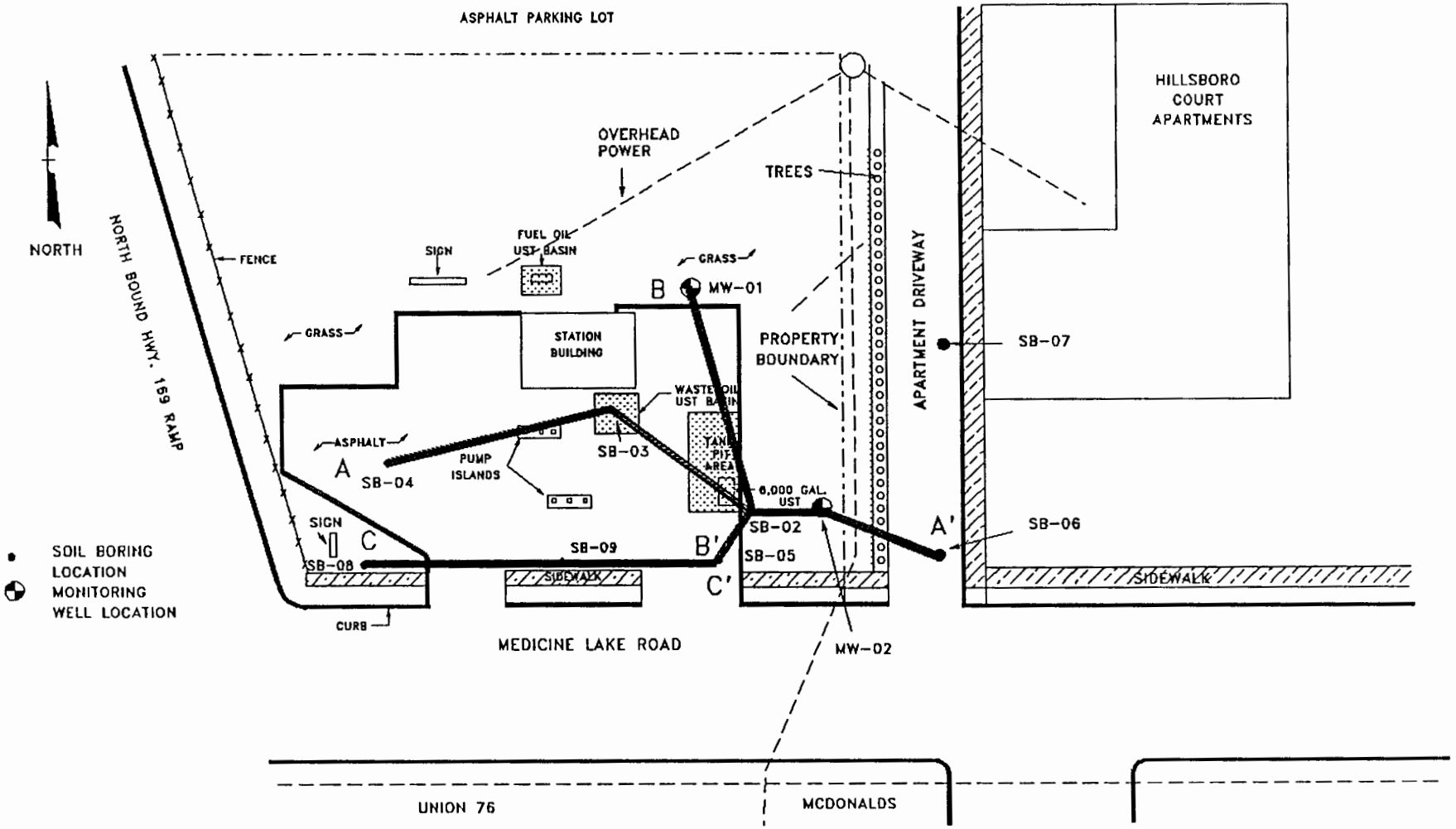

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FIGURE 6
CROSS SECTION LOCATIONS A-A', B-B', C-C'
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD, NEW HOPE, MN

PROJECT NO.	DATE	SCALE	PREPARED BY	REVIEWED BY	DATE	REVISION	
711-015	9/91	1" = 50'	EFW	KWK	1/92	1	CS

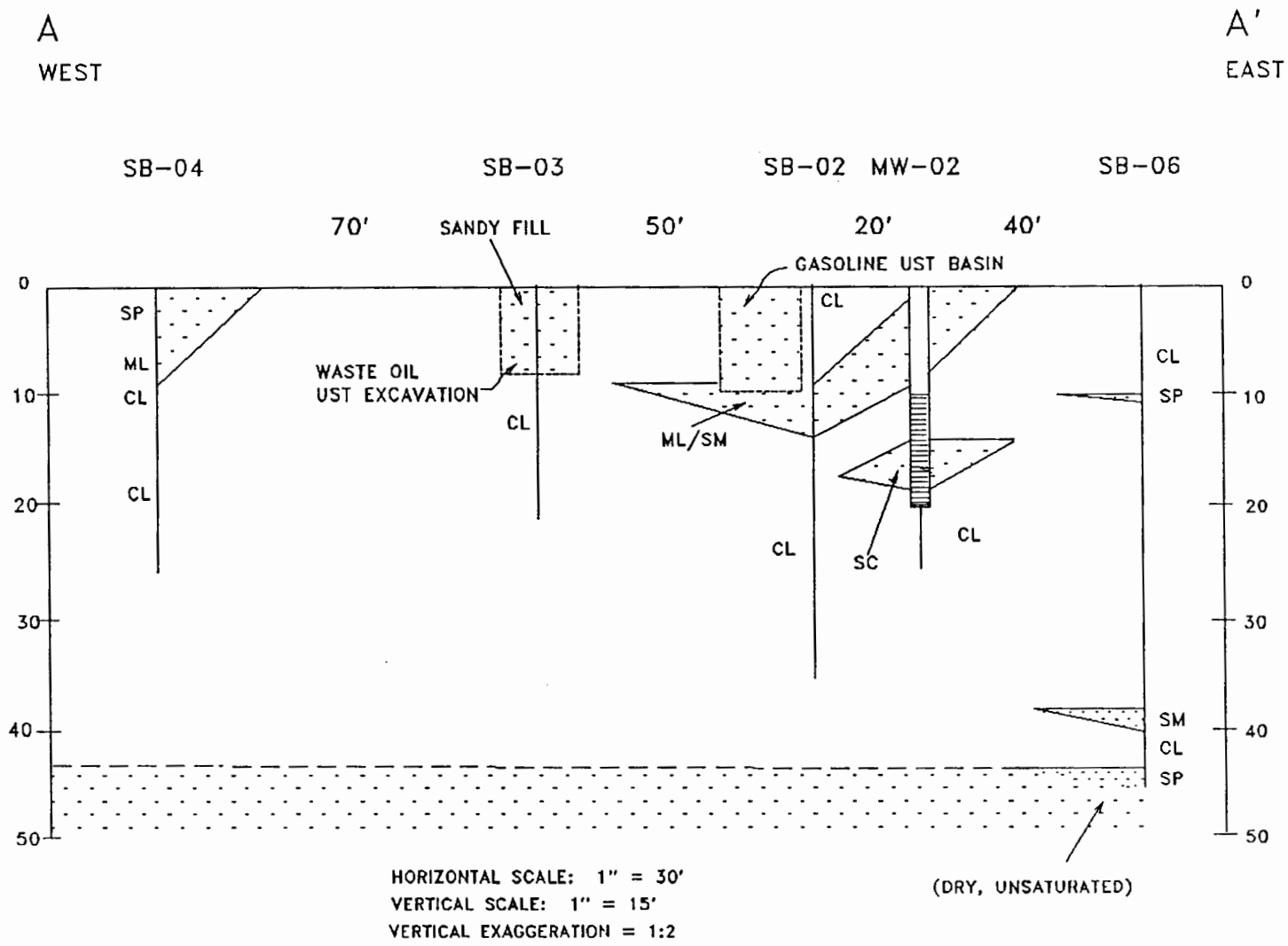

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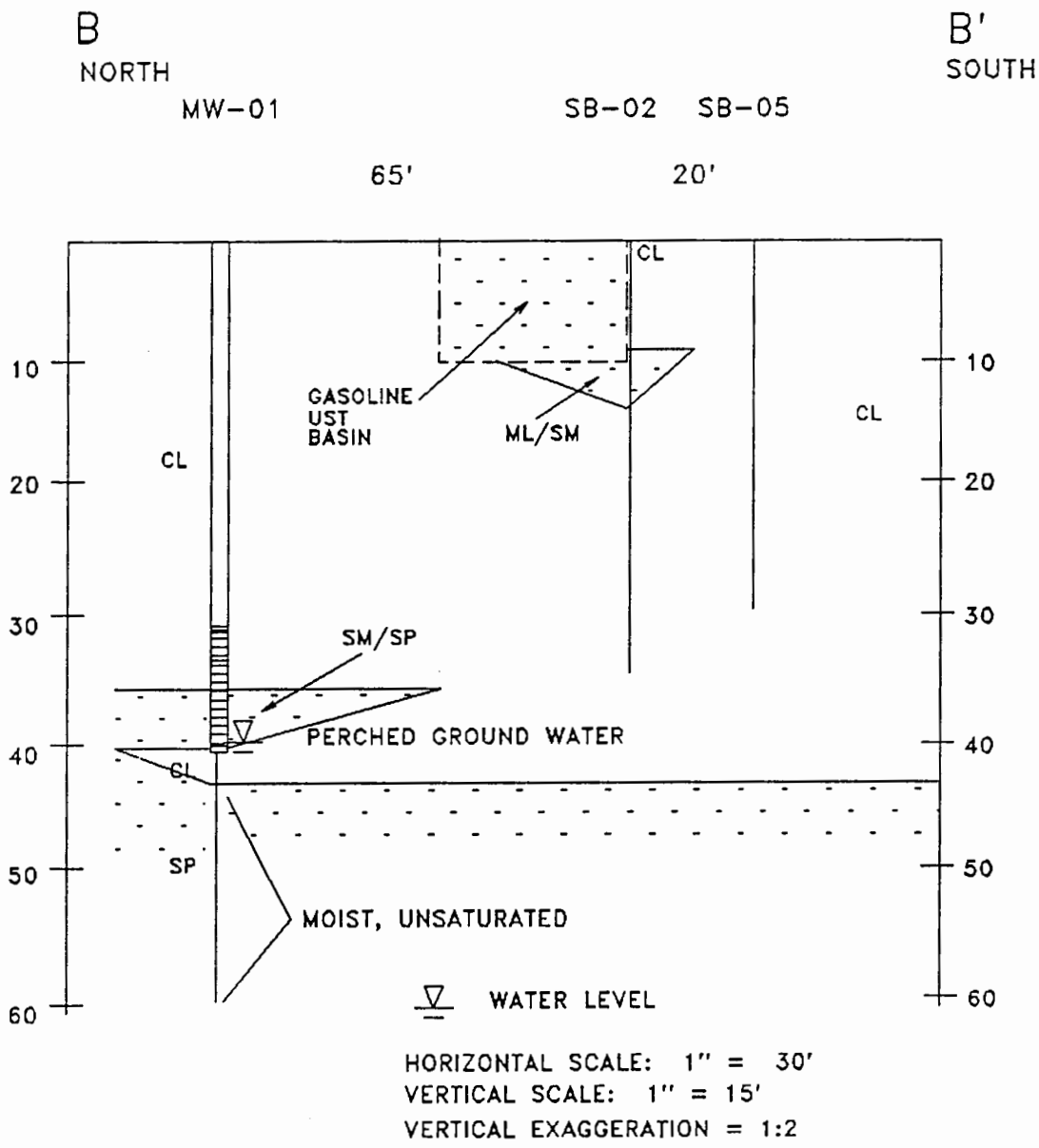
FIGURE 7
GEOLOGIC CROSS-SECTION A-A'
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD
NEW HOPE, MINNESOTA

PROJECT NO.	DATE	SCALE	PREPARED BY	REVIEWED BY	DATE	REVISION	
711-015	9/91	SEE DRAWING	EFW/SHW	KWK	1/12	1 (EFW)	C3



HORIZONTAL SCALE: 1" = 30'
VERTICAL SCALE: 1" = 15'
VERTICAL EXAGGERATION = 1:2

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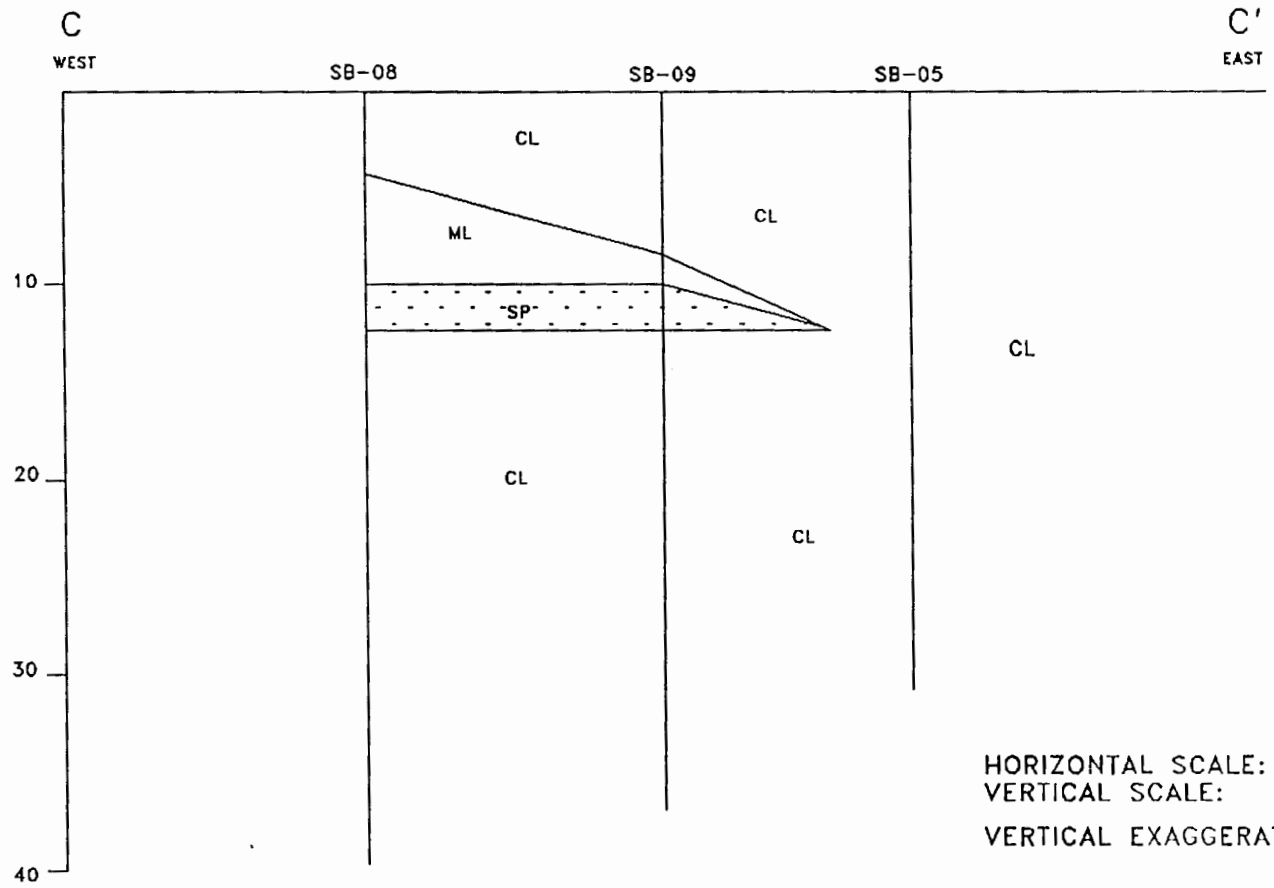
FIGURE 8
GEOLOGIC CROSS-SECTION B-B'
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD
NEW HOPE, MINNESOTA

PROJECT NO.	DATE	SCALE	PREPARED BY	REVIEWED BY	DATE	REVISION	
711-015	9/91	SEE DRAWING	EFW/SHW	KWK	1/92	1 (EFW)	C4



HORIZONTAL SCALE: 1" = 40'
VERTICAL SCALE: 1" = 10'
VERTICAL EXAGGERATION = 1:4

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FIGURE 9
GEOLOGIC CROSS SECTION C-C'
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD, NEW HOPE, MN

PROJECT NO.	DATE	SCALE	PREPARED BY	REVIEWED BY	DATE	REVISION	
711-015	9/91	SEE DRAWING	EFW	KwK	1/92	ORIGINAL	C5

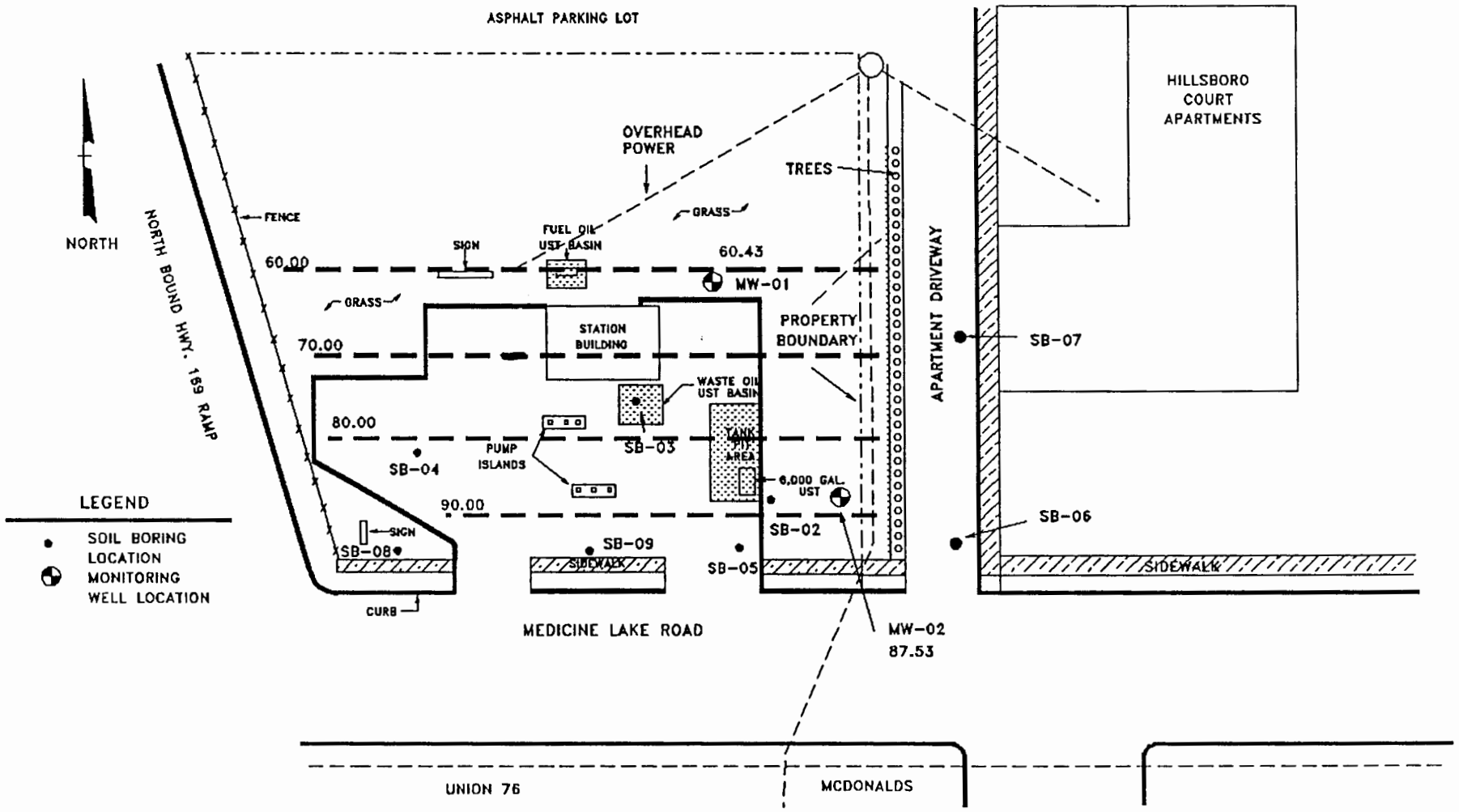

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FIGURE 10
GROUND WATER ELEVATION CONTOURS, NOVEMBER 12, 1990
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD, NEW HOPE, MN

PROJECT NO.	DATE	SCALE	PREPARED BY	REVIEWED BY	DATE	REVISION	
711-015	9/91	1" = 50'	EFW	KwK	1/92	ORIGINAL	D2

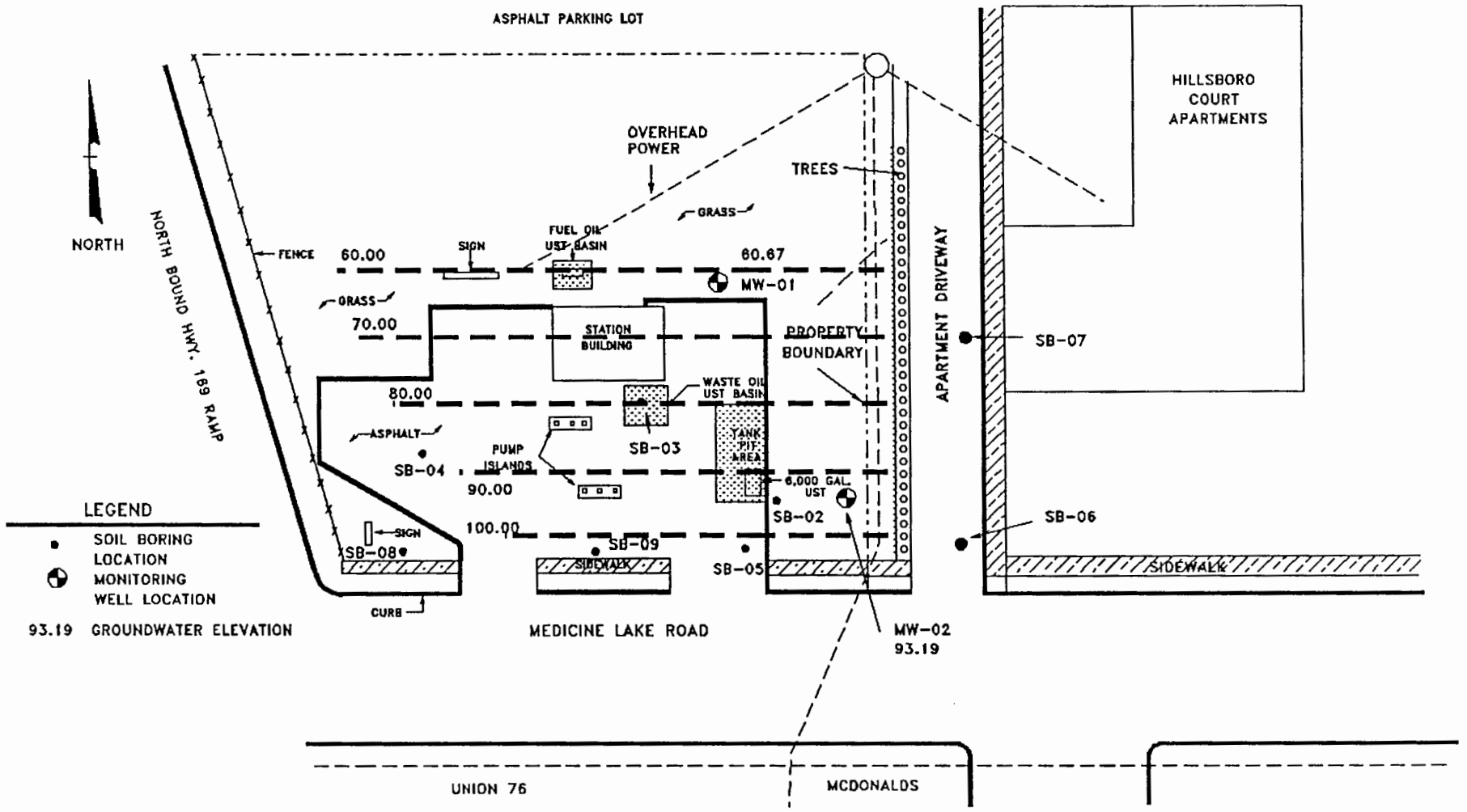

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FIGURE 11
GROUND WATER ELEVATION CONTOURS, MAY 30, 1991
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD, NEW HOPE, MN

PROJECT NO.	DATE	SCALE	PREPARED BY	REVIEWED BY	DATE	REVISION	
711-015	9/91	1" = 50'	EFW	KWK	1/92	ORIGINAL	D1

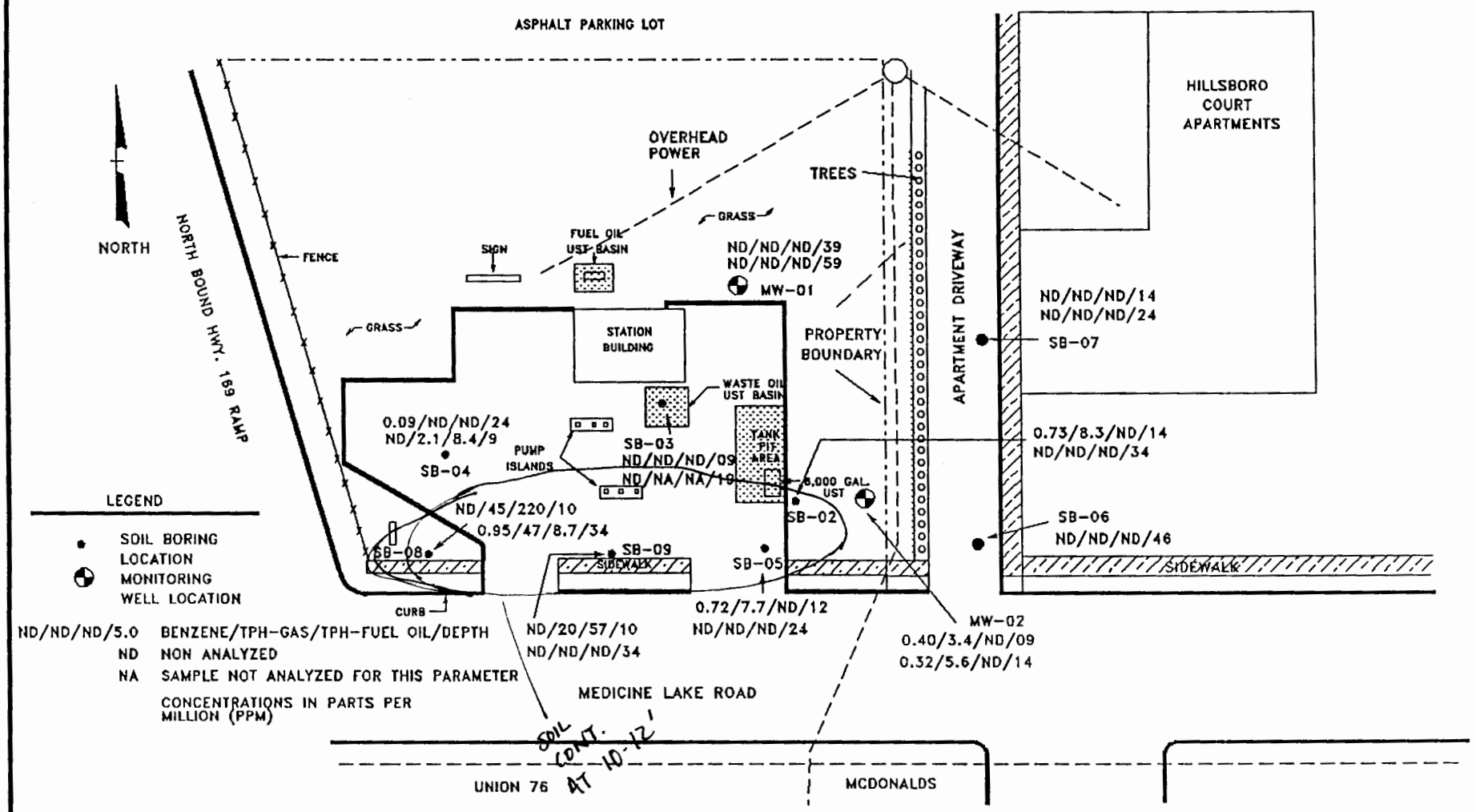

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FIGURE 12
SOIL ANALYTICAL DATA
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD, NEW HOPE, MN

PROJECT NO.	DATE	SCALE	PREPARED BY	REVIEWED BY	DATE	REVISION	
711-015	9/91	1" = 50'	EFW	KwK	2/92	1	J2

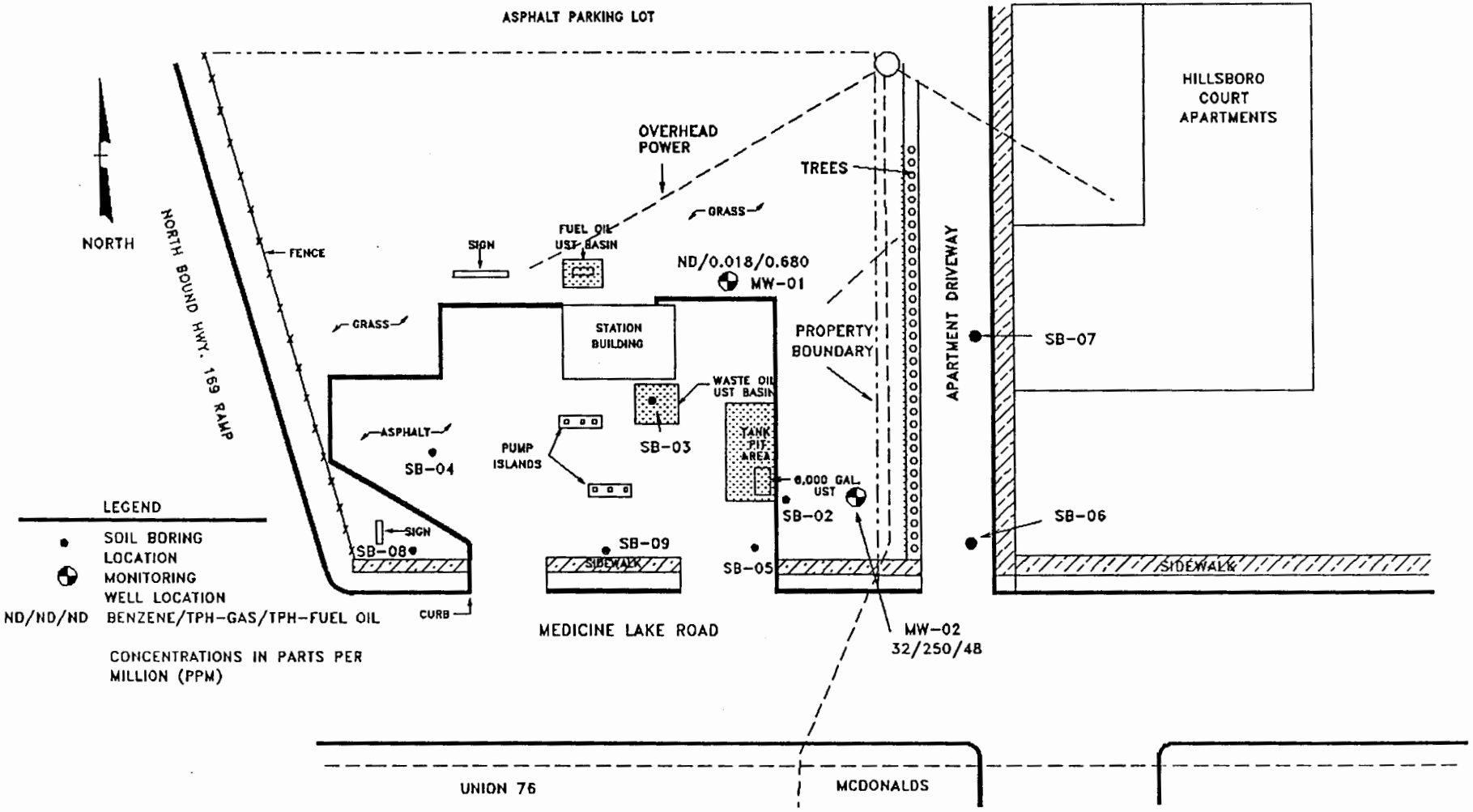

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FIGURE 13
GROUND WATER ANALYTICAL DATA MAP, NOVEMBER 12, 1990
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD, NEW HOPE, MN

PROJECT NO.	DATE	SCALE	PREPARED BY	REVIEWED BY	DATE	REVISION	
711-015	9/91	1" = 50'	EFW	KWK	2/92	ORIGINAL	J4

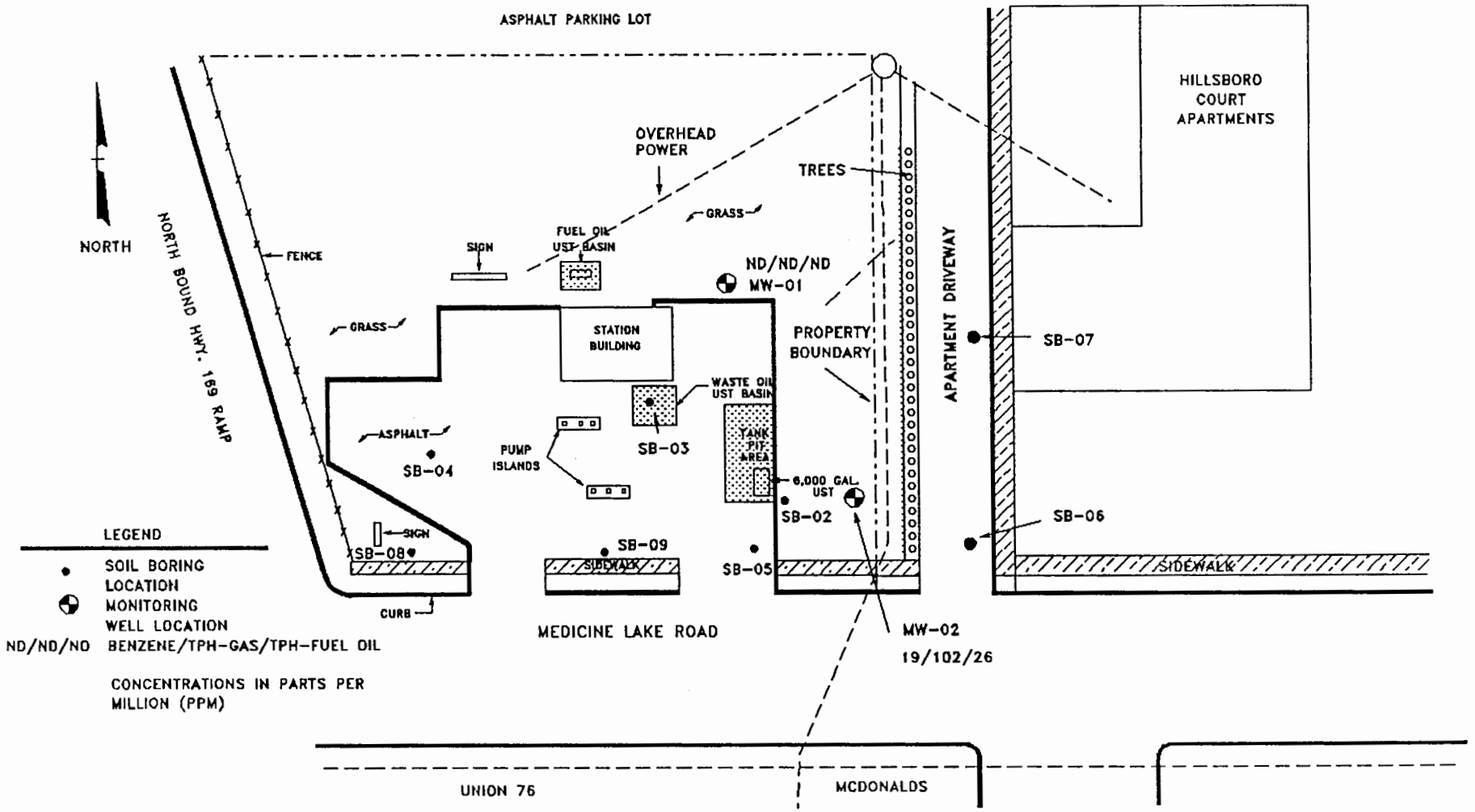

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FIGURE 14
GROUND WATER ANALYTICAL DATA MAP, MAY 30, 1991 AND JULY 10, 1991
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD, NEW HOPE, MN

PROJECT NO.	DATE	SCALE	PREPARED BY	REVIEWED BY	DATE	REVISION	
711-015	9/91	1" = 50'	EFW	KWK	1/92	ORIGINAL	J3

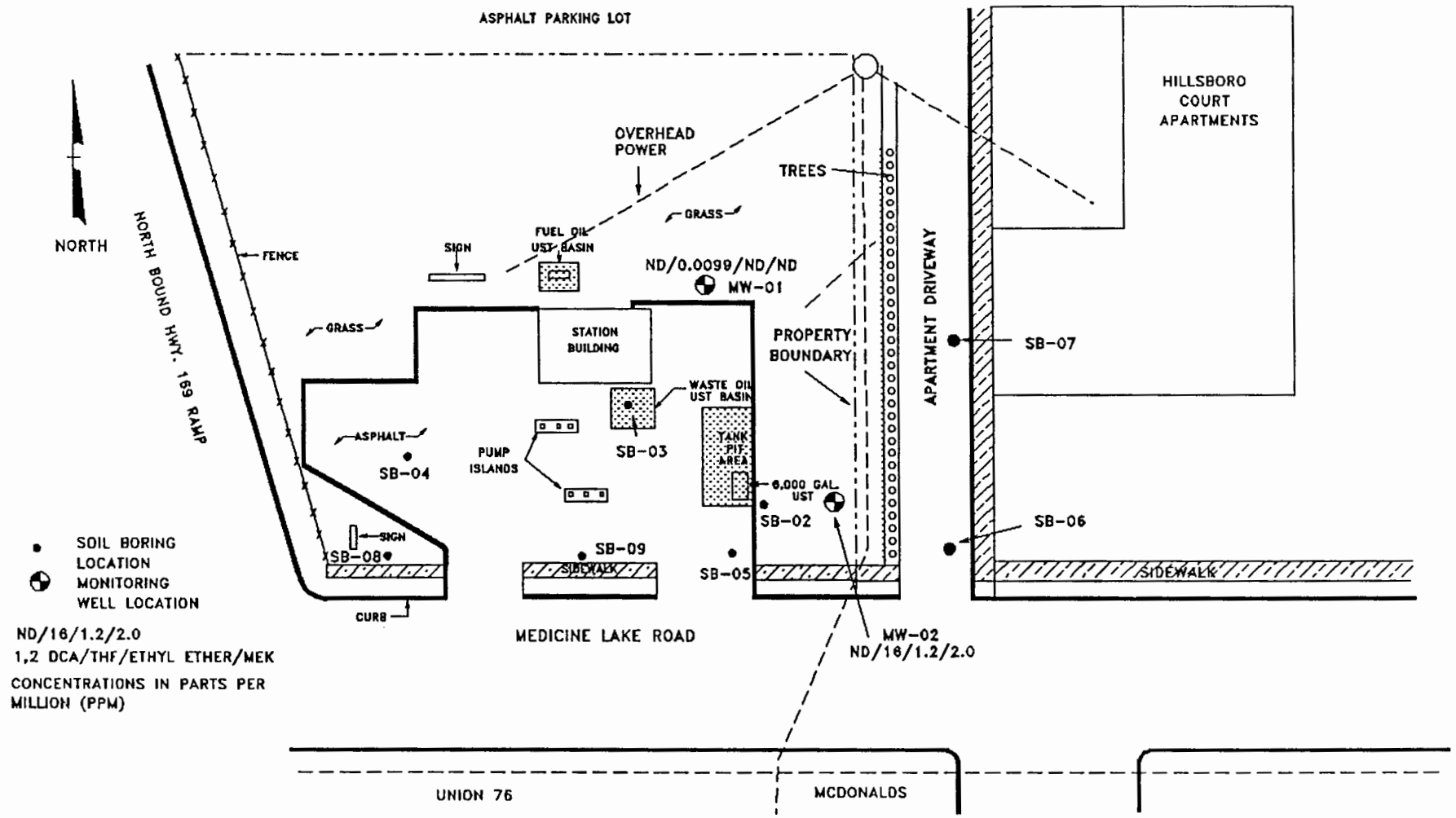

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FIGURE 15
SOLVENT CONSTITUENTS MAP, MAY 30, 1991 AND JULY 10, 1991
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD, NEW HOPE, MN

PROJECT NO.	DATE	SCALE	PREPARED BY	REVIEWED BY	DATE	REVISION	
711-015	9/91	1" = 50'	EFW	KWK	1/92	ORIGINAL	J5

PETROLEUM HYDROCARBON CONSTITUENT CONCENTRATIONS VS. TIME
MONITORING WELL MW-02

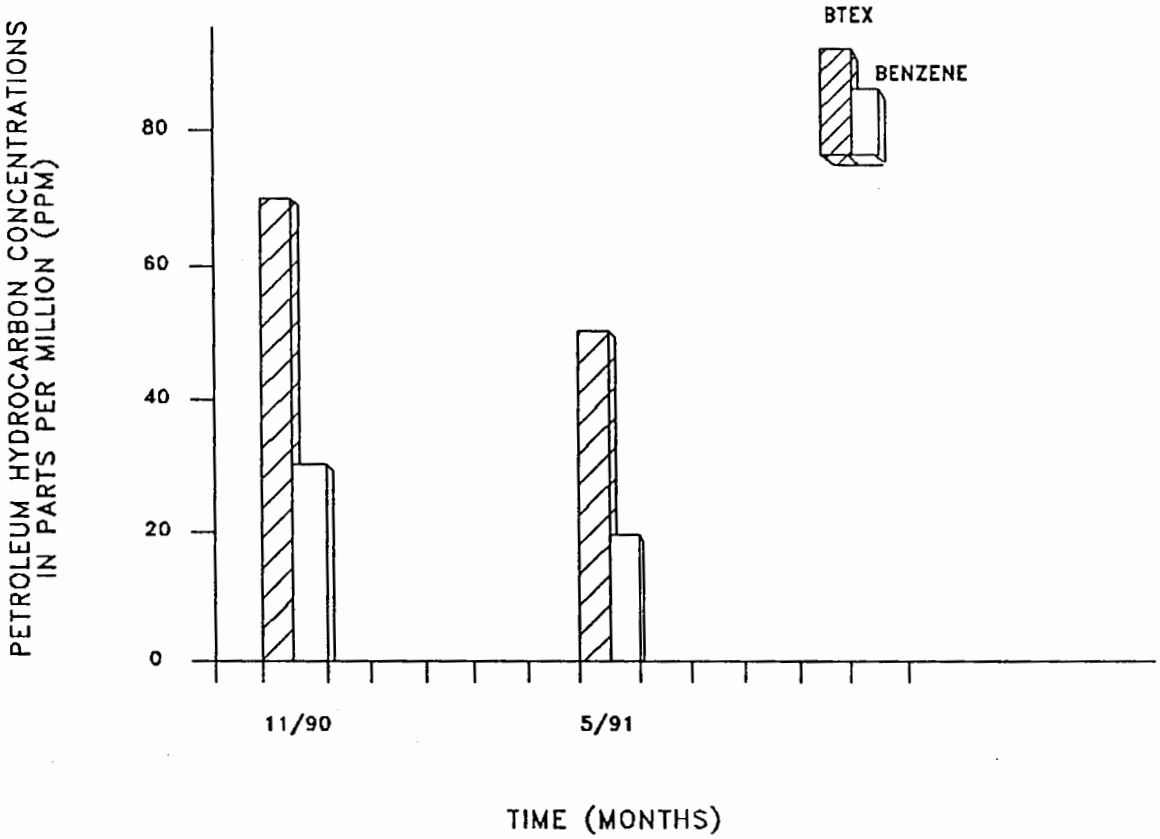

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FIGURE 16
GROUND WATER PETROLEUM HYDROCARBON CONSTITUENT CONCENTRATIONS VS. TIME
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD, NEW HOPE, MINNESOTA

PROJECT NO.	DATE	SCALE	PREPARED BY	REVIEWED BY	DATE	REVISION	
711-015	9/91	NA	EFW	KwK	1/92	ORIGINAL	G1

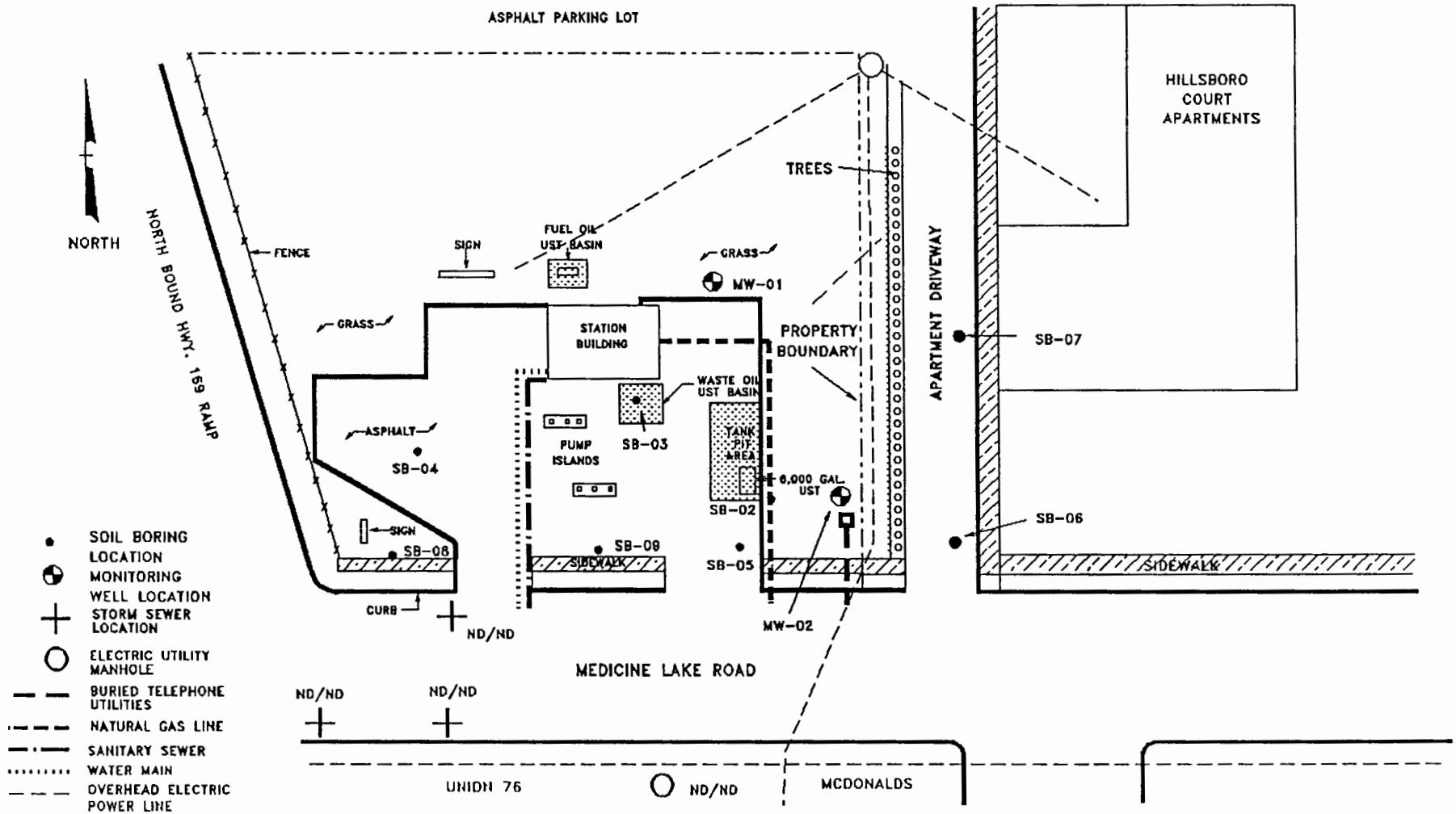

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FIGURE 17
SITE UTILITIES/VAPOR SURVEY RESULTS, SEPTEMBER 2, 1991
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE RD, NEW HOPE, MINNESOTA

PROJECT NO.	DATE	SCALE	PREPARED BY	REVIEWED BY	DATE	REVISION	
711-015	9/91	1" = 50'	EFW	KWK	1/92	ORIGINAL	SU

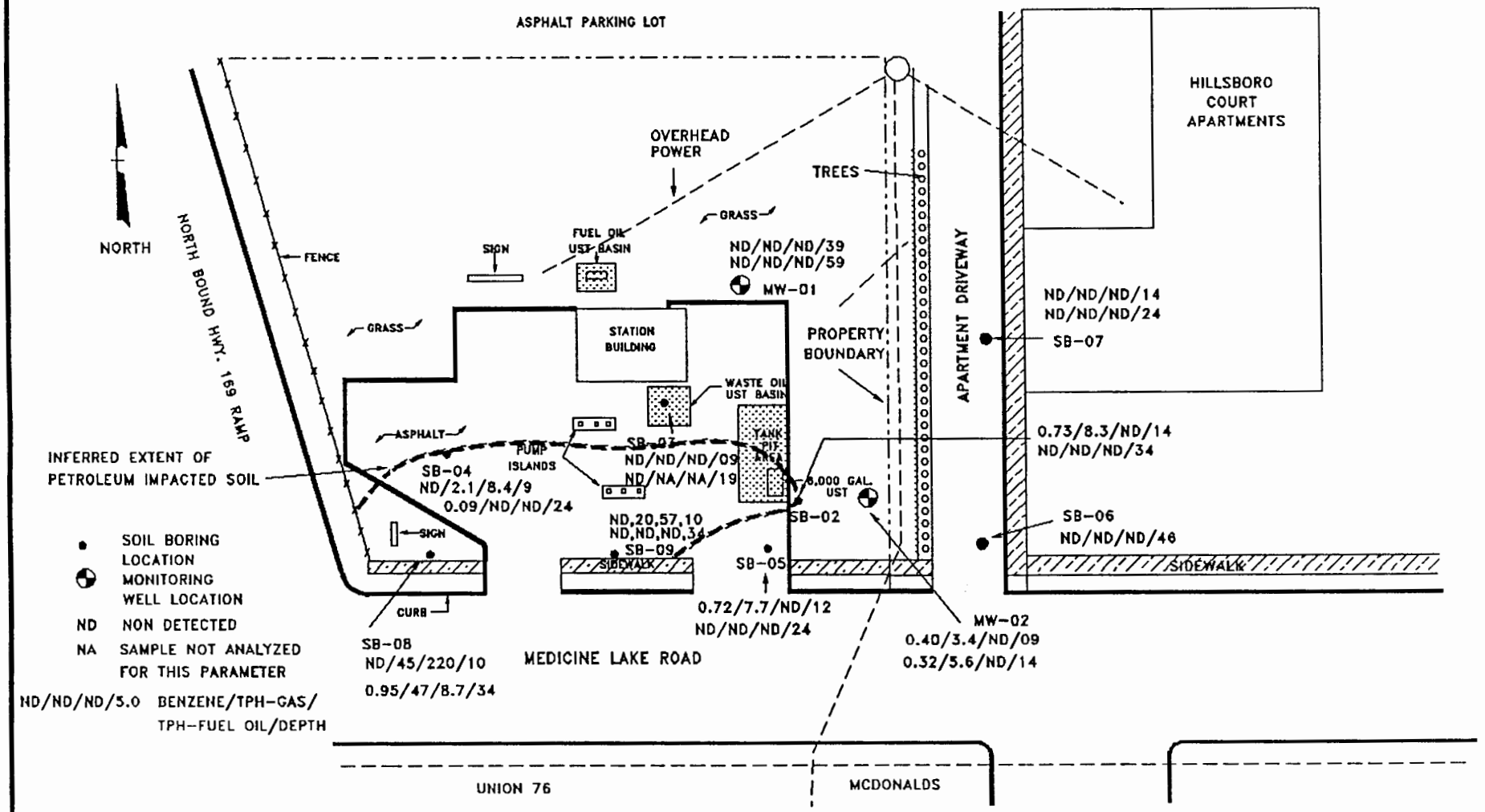

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FIGURE 18
INFERRED EXTENT OF PETROLEUM IMPACTED SOIL
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD, NEW HOPE, MN

PROJECT NO.	DATE	SCALE	PREPARED BY	REVIEWED BY	DATE	REVISION	
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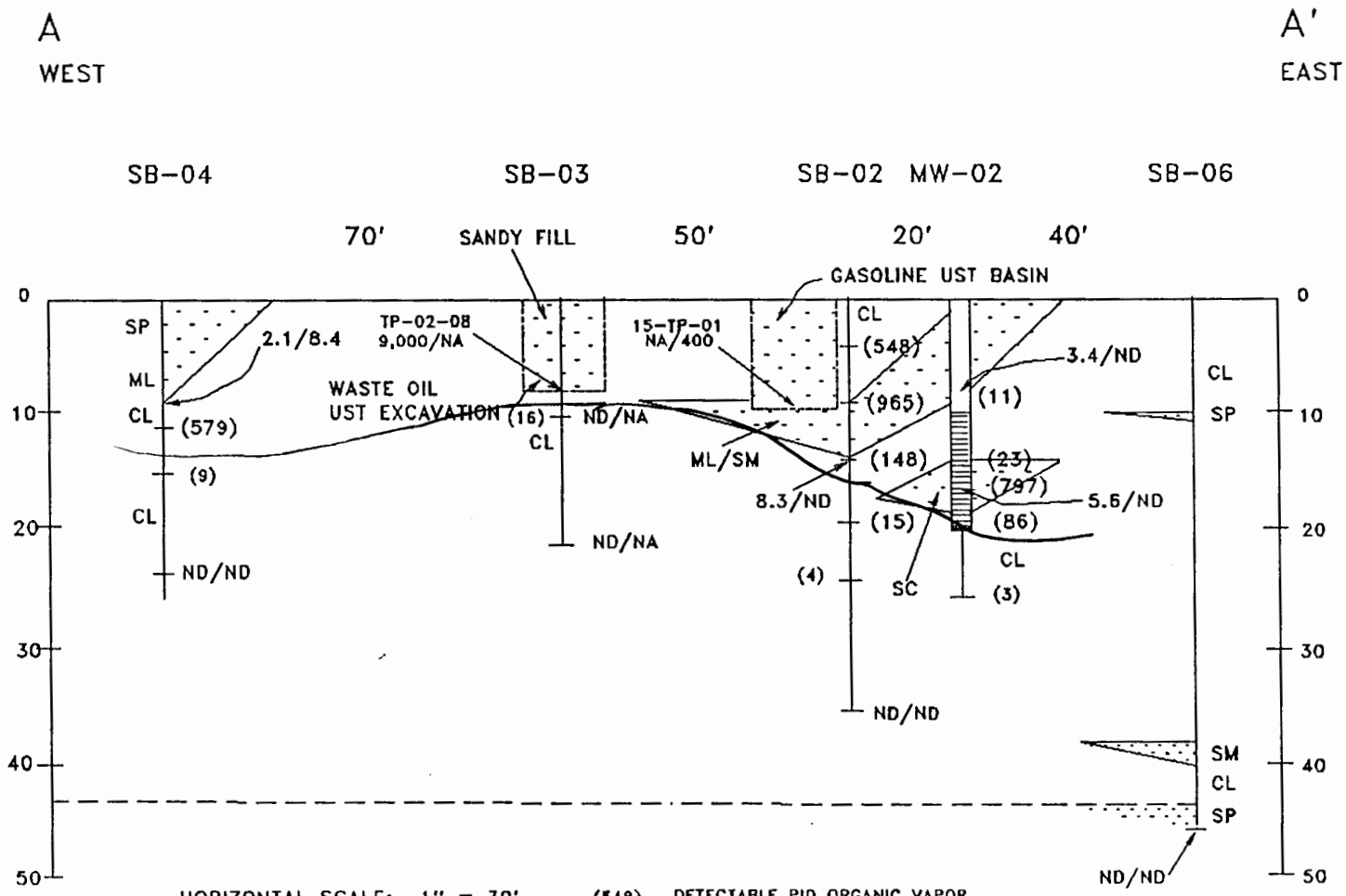

HORIZONTAL SCALE: 1" = 30'
VERTICAL SCALE: 1" = 15'
VERTICAL EXAGGERATION: 2:1

(548) DETECTABLE PID ORGANIC VAPOR CONCENTRATIONS FROM SPLIT-SPOONS
ND/ND TPH-FUEL OIL/TPH-GAS
NA TEST NOT PERFORMED

CONCENTRATIONS IN PARTS PER MILLION (PPM)

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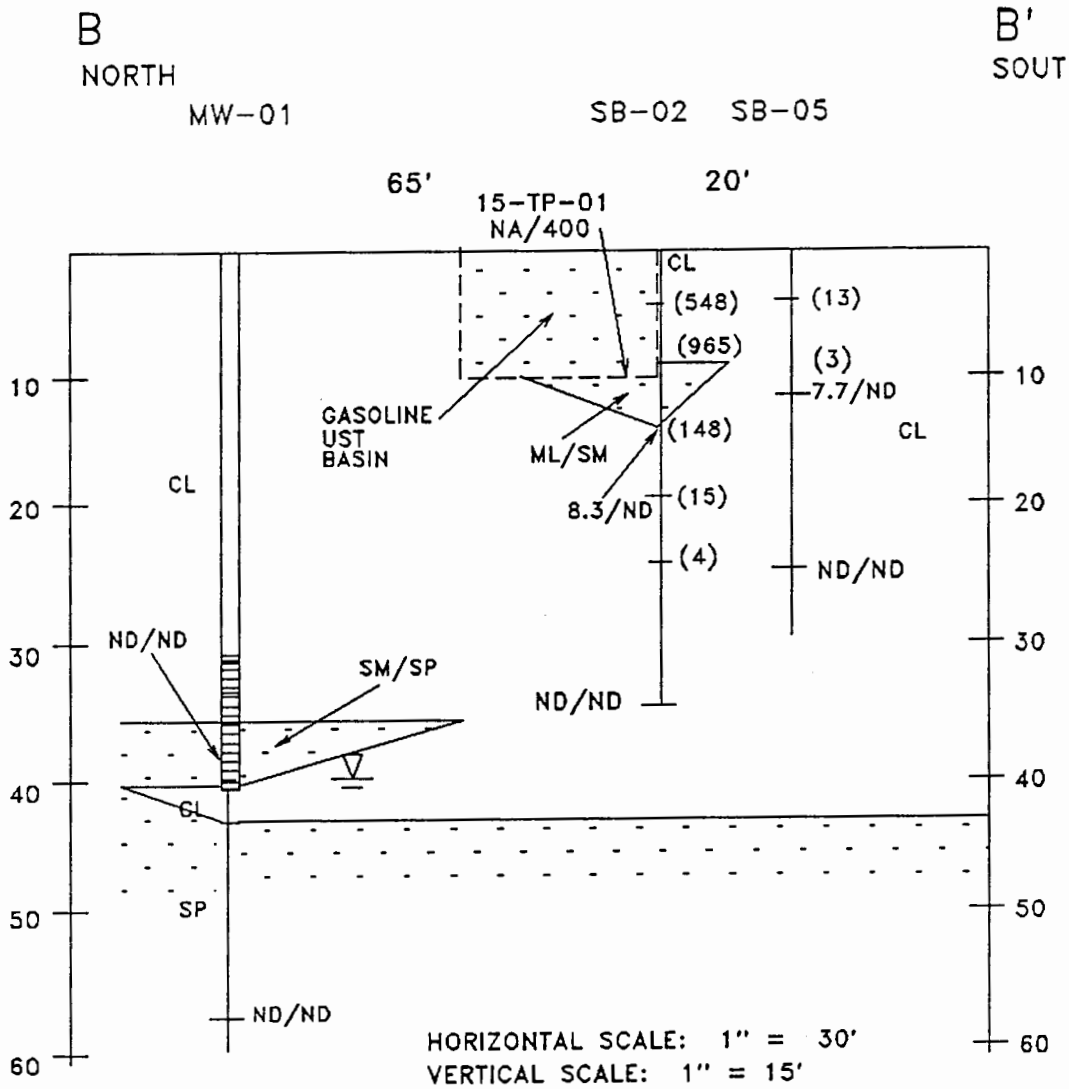
FIGURE 19
GEOLOGIC CROSS SECTION A-A' & SOIL ANALYTICAL DATA
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD
NEW HOPE, MINNESOTA

PROJECT NO.	DATE	SCALE	PREPARED BY	REVIEWED BY	DATE	REVISION	
711-015	10/91	SEE DRAWING	SHW	KWK	1/92	1	C2



HORIZONTAL SCALE: 1" = 30'
VERTICAL SCALE: 1" = 15'
VERTICAL EXAGGERATION = 1:2

(548) DETECTABLE PID ORGANIC VAPOR CONCENTRATIONS FROM SPLIT-SPOONS

ND/ND TPH-FUEL OIL/TPH-GAS

CONCENTRATIONS IN PARTS PER MILLION (PPM)

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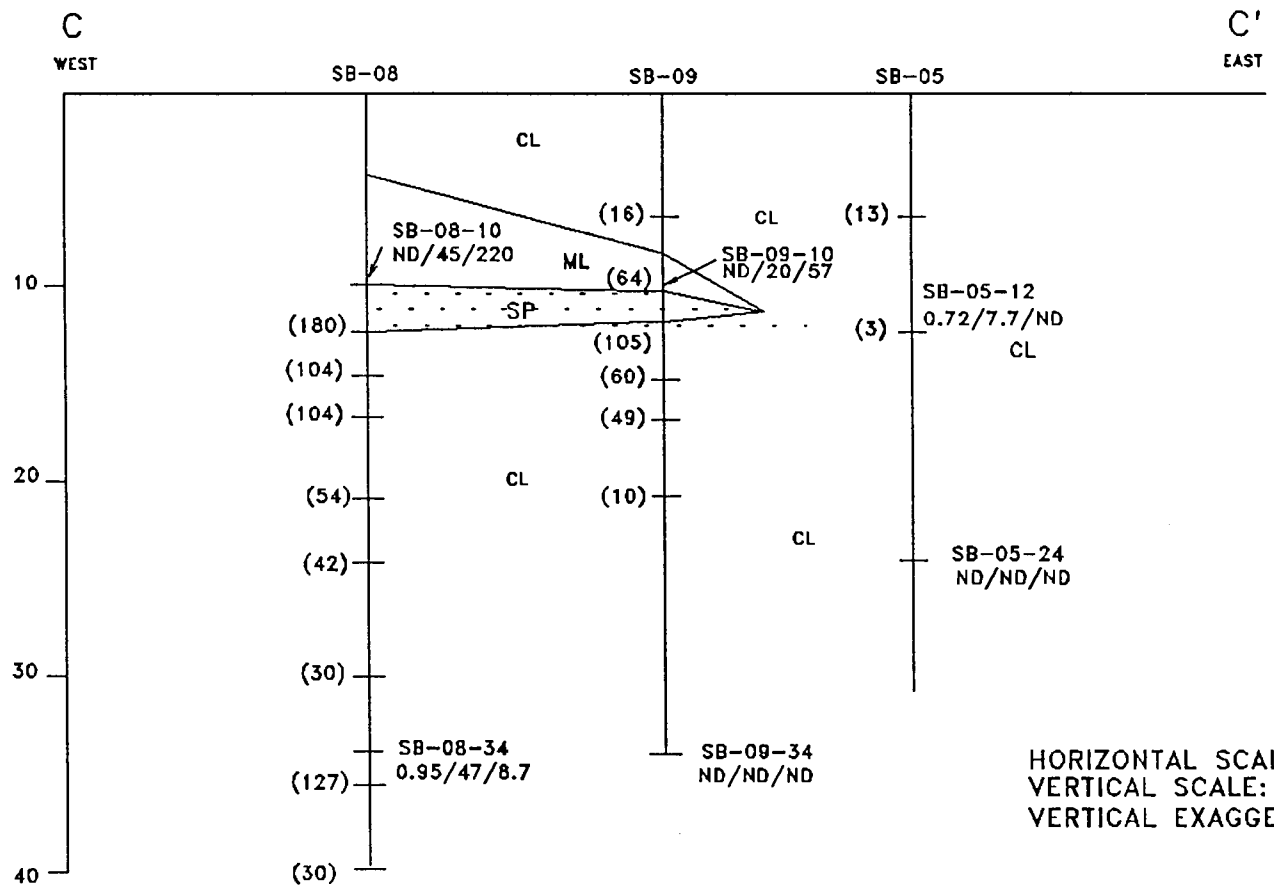
BLOOMINGTON, MINNESOTA

FIGURE 20
GEOLOGIC CROSS SECTION B-B' &
SOIL ANALYTICAL DATA
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD
NEW HOPE, MINNESOTA

PROJECT NO.	DATE	SCALE	PREPARED BY	REVIEWED BY	DATE	REVISION	
711-015	9/91	SEE DRAWING	SW	KWK	1/92	1 (EFW)	C1



HORIZONTAL SCALE: 1" = 40'
VERTICAL SCALE: 1" = 10'
VERTICAL EXAGGERATION = 1:4

ND/ND/ND BENZENE/TPH-GAS/TPH-FUEL OIL

CONCENTRATIONS IN PARTS PER MILLION (PPM)
(60) – PID VAPORS FROM SPLIT-SPOONS

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BLOOMINGTON, MINNESOTA

FIGURE 21
GEOLOGIC CROSS SECTION C–C' & SOIL ANALYTICAL RESULTS
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD, NEW HOPE, MINNESOTA

PROJECT NO.	DATE	SCALE	PREPARED BY	REVIEWED BY	DATE	REVISION	
711-015	9/91	SEE DRAWING	EFW	KWC	1/6/12	ORIGINAL	C6

TABLES

TABLE 1
SOIL ANALYTICAL DATA - REQUESTED ANALYSES
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE RD, NEW HOPE, MN

HOLE SAMP#/ DEPTH (FT)	BTEX	MDH465C	MTBE	LEAD	TPH-GAS	TPH-FUEL OIL	PCB
MW-01-39	X				X	X	
MW-01-59	X				X	X	
MW-02-09	X				X	X	
MW-02-14	X				X	X	
SB-02-14	X				X	X	
SB-02-34	X				X	X	
SB-03-09		X					X
SB-03-19		X					X
SB-04-09	X				X	X	
SB-04-24	X				X	X	
SB-05-12	X				X	X	
SB-05-24	X				X	X	
SB-06-46	X		X		X	X	
SB-07-14	X		X		X	X	
SB-07-24	X		X		X	X	
SB-08-10	X		X	X	X	X	
SB-08-34	X		X	X	X	X	
SB-09-10	X		X	X	X	X	
SB-09-34	X		X	X	X	X	

BTEX = BENZENE, TOLUENE, ETHYLBENZENE, XYLENE, EPA METHOD SW-846, 8020.
MDH465C = MINNESOTA DEPARTMENT OF HEALTH METHOD 465C FOR VOLATILE CONSTITUENTS.
MTBE = METHYL TERTIARY BUTYL ETHER EPA METHOD SW-846, 8020.
LEAD = EPA METHOD SW-846, 6010.
TPH-GAS = TOTAL HYDROCARBONS AS GASOLINE EPA METHOD SW-846, 8015.
TPH-FUEL OIL = TOTAL HYDROCARBONS AS FUEL OIL EPA METHOD SW-846, 3510/8015.
PCB = POLYCHLORINATED BIPHENYL EPA METHOD SW-846, 8080.

TABLE 2
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE RD, NEW HOPE, MN
GROUND WATER ELEVATION DATA

WELL #	LEVEL DATE	TOC ELEV	WATER LEVEL	PROD. THICK	GW ELEV
MW-01	11/12/90	103.98	43.55	0.00	60.43
MW-01	5/30/91	103.98	43.31	0.00	60.67
MW-02	11/12/90	103.59	16.06	0.00	87.53
MW-02	5/30/91	103.59	10.40	0.00	93.19

TOC = TOP OF RISER PIPE CASING
PROD. = PRODUCT
GW = GROUND WATER
0.00 = PRODUCT LAYER NOT DETECTABLE
NOTE -- ALL MEASUREMENTS ARE REPRESENTED IN FEET.

TABLE 3
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD, NEW HOPE, MINNESOTA

SOIL ORGANIC VAPOR DATA

BORING/ WELL #	0-4	4-6	9-11	14-16	19-21	24-26	29-31	34-36	39-41	44-46	49-51	54-56	59-61
MW-01	0	0	0	0	0	0	0	0	0	0	0	0	0
MW-02	0	0	11	797	86	3	---	---	---	---	---	---	---
SB-02	0	548	965	148	15.6	4.3	0	0	---	---	---	---	---
SB-03	0	3.7	16.3	0	0	---	---	---	---	---	---	---	---
SB-04	0	0	579	9	0	0	0	---	---	---	---	---	---
SB-05	0	13	3	0	0	0	0	---	---	---	---	---	---
SB-06	0	0	0	0	0	0	0	0	0	0	---	---	---
SB-07	0	0	0	9	0	0	0	---	---	---	---	---	---
SB-08	0	0	0	104	54	42	30	127	30	---	---	---	---
SB-09	45	16	64	49	10	1	0	0	---	---	---	---	---

ALL DATA REPRESENTED IN PARTS PER MILLION (PPM).
--- BOREHOLE NOT DRILLED TO THIS DEPTH, OR SAMPLE NOT COLLECTED.

TABLE 4
SOIL ANALYTICAL DATA
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD, NEW HOPE, MN

HOLE SAMP#/ DEPTH (FT)	SAMPLE DATE	BENZENE	TOLUENE	ETHYL-BENZENE	XYLENE	TPH-GAS	TPH-FUEL OIL
MW-01-39	10/17/90	<0.06	<0.11	<0.05	<0.28	<1.2	<1.7
MW-01-59	10/17/90	<0.06	<0.11	<0.05	<0.28	<1.2	<1.7
MW-02-09	10/17/90	0.40	<0.11	<0.05	<0.28	3.4	<1.7
MW-02-14	10/17/90	0.32	0.77	0.12	0.51	5.6	<1.7
SB-02-14	10/17/90	0.73	0.95	0.12	0.65	8.3	<1.7
SB-02-34	10/17/90	<0.06	<0.11	<0.05	<0.28	<1.2	<1.7
SB-03-09	10/17/90	<0.06	<0.11	<0.05	<0.28	*	*
SB-03-19	10/17/90	<0.06	<0.11	<0.05	<0.28	*	*
SB-04-09	10/17/90	<0.06	<0.11	<0.05	<0.28	2.1	8.4
SB-04-24	10/17/90	0.09	<0.11	<0.05	<0.28	<1.2	<1.7
SB-05-12	10/17/90	0.72	0.69	0.12	0.52	7.7	<1.7
SB-05-24	10/17/90	<0.06	<0.11	<0.05	<0.28	<1.2	<1.7
SB-06-46	4/05/91	<0.06	<0.11	<0.05	<0.28	<1.2	<1.4
SB-07-14	4/05/91	<0.06	<0.11	<0.05	<0.28	<1.2	<1.4
SB-07-24	4/05/91	<0.06	<0.11	<0.05	<0.28	<1.2	<1.4
SB-08-10	7/10/91	<0.30	0.76	0.96	4.7	45	220
SB-08-34	7/10/91	0.95	1.1	1.5	8.1	47	8.7
SB-09-10	7/10/91	<0.30	<0.32	<0.20	2.6	20	57
SB-09-34	7/10/91	<0.059	<0.063	<0.041	<0.18	<1.6	<1.4

* = SAMPLE NOT ANALYZED FOR THIS PARAMETER.
TPH = TOTAL PETROLEUM HYDROCARBONS.
LABORATORY REPORT SHOWS SPECIFIC DETECTION LIMITS USED IN EACH ANALYSIS. ALL VALUES ARE REPRESENTED IN PARTS PER MILLION (PPM).
SAMPLE DEPTHS ARE IN FEET BELOW GROUND SURFACE (BGS).

TABLE 5
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD, NEW HOPE, MN

GROUND WATER ANALYTICAL DATA - HYDROCARBON CONSTITUENTS

WELL SAMPLE #	SAMPLE DATE	BENZENE	TOLUENE	ETHYL-BENZENE	XYLENE	TPH-GAS	TPH-FUEL OIL
MW-01	11/12/90	<.00047	<.00092	<.00042	<.0022	.018	.680
MW-01	7/10/91	<.00047	<.00092	<.00042	<.0022	<.013	<.043
MW-02	11/12/90	32	25	1.8	10	250	48
MW-02	5/30/91	19	19	1	9.3	102	26

ND = NOT DETECTABLE BY LABORATORY TEST METHODS
SEE LABORATORY REPORT FOR DETECTION LIMITS.
ALL CONCENTRATIONS REPRESENTED IN PARTS PER MILLION (PPM).

TABLE 6
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE RD, NEW HOPE, MN

GROUND WATER ANALYTICAL DATA - SOLVENT CONSTITUENTS

SAMPLE #	DATE	1,2 DCA	THF	ETHYL ETHER	MEK
MW-01	11/12/90	<0.00047	<0.0087	<0.0011	<0.0039
MW-01	7/10/91	<0.00047	0.0099	<0.0011	<0.0039
MW-02	11/12/90	0.032	<0.087	<0.011	<0.039
MW-02	5/30/91	<0.240	16.0	1.2	2.0
MDH-RALs		0.004	0.100	1.0	0.300

RESULTS REPRESENTED IN PARTS PER MILLION (PPM).

UNDERGROUND STORAGE TANK EXCAVATION REPORT SINCLAIR SERVICE STATION 9456 MEDICINE LAKE ROAD NEW HOPE, MINNESOTA

Prepared For:

SINCLAIR MARKETING
3401 Fairbanks Avenue
P.O. Box 6247
Kansas City, Kansas 66106

Prepared By:

ENECOTECH MIDWEST, INC.
3050 Metro Drive, Suite 115
Bloomington, Minnesota 55425

August 10, 1990

PROJECT NUMBER: 711-015

EnecoTech

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1.0 INTRODUCTION

The purpose of this report is to describe the underground storage tank (UST) excavation and soil sampling activities that occurred at 9456 Medicine Lake Road, New Hope, Minnesota on April 11 through April 13, 1990. Sinclair Marketing (Sinclair) requested that EnecoTech Midwest, Inc. (EnecoTech) supervise the excavation of one 6,000 gallon unleaded gasoline UST, one 560 gallon waste oil UST, and one 1,000 gallon fuel oil UST. Excavation activities were performed by Westside Equipment of Minneapolis, Minnesota. The UST's were excavated because they were no longer in use.

2.0 SITE DESCRIPTION

The site is located at the intersection of Highway 169 and Medicine Lake Road (Figure 1). The property is operated as a gasoline service station. At the time of excavation, onsite surface structures included the station building located near the central portion of the site and two pump islands located in the south central portion of the site (Figure 2). The 6,000 gallon UST was located near the southeast corner of the site. The 560 gallon waste oil and 1,000 gallon fuel oil UST's were located near the station building at the southeast and northwest corners, respectively.

Figure 2 illustrates the approximate locations of the subject tanks prior to removal. Three additional active UST's are located adjacent to the former location of the 6,000 gallon UST. These USTs include two 6,000 gallon unleaded gasoline USTs and one unleaded gasoline UST. All of the removed and existing USTs were installed in 1964. All of the USTs were constructed of uncoated steel.

Properties adjacent to the Sinclair station include: An apartment complex parking lot to the north and east, Medicine Lake Road and a retail gasoline station to the south, and the Medicine Lake Road/Highway 169 northbound entrance ramp to the west.

3.0 FIELD METHODS

The specific tasks performed by EnecoTech included the following:

- The soil encountered in the excavation was classified.
- Excavated soils were screened with an Organic Vapor Meter (OVM) to determine if the soils had been impacted by hydrocarbons.
- Excavated soils that contained elevated levels of organic vapors as determined by OVM measurements were stockpiled on site.

- o Upon removal from the subsurface, the UST's were visually inspected.

- o Soil samples from the bottom and side walls of each tank pit were measured with the OVM for organic vapors, utilizing Minnesota Pollution Control Agency (MPCA) jar headspace analyses procedures.

- o Soil samples were collected from the bottom of each tank pit per MPCA guidelines. The samples were collected from beneath the former locations of each UST (Figure 3). A total of three tank pit bottom samples were collected.

- o One representative sample was collected from stockpiled soil.

- o The soil samples from the tank pit bottom and soil stockpile were placed into sample containers, sealed, stored on ice and were submitted to Interpoll Laboratories for analysis of the appropriate parameters as required by the MPCA. The soil sample collected from beneath the 6,000 gallon UST was analyzed for benzene, toluene, ethyl benzene, and xylenes (BTEX), MTBE and total hydrocarbons as gasoline. The soil sample collected from beneath the 560 gallon waste oil UST was analyzed for the Minnesota Department of Health (MDH) 465C Suite, total hydrocarbons as fuel oil, PCB's, and metals. The soil sample collected from beneath the 1,000 gallon fuel oil UST was analyzed for BTEX and total hydrocarbons as fuel oil.

4.0 RESULTS

4.1 6,000 Gallon Unleaded Gasoline UST

The soil in the excavation consisted of coarse grained sand backfill, underlain and surrounded by brown to gray silty clay. No free product was encountered in the unleaded gasoline UST pit.

Upon removal from the subsurface, the 6,000 gallon UST was inspected for signs of corrosion and pitting. The bottom one-third of the subject tank was moderately corroded and exhibited several one inch diameter corrosion indentations that did not breach the tank wall.

Upon removal of the UST, the soil in the excavation was evaluated for hydrocarbon impacts. The soil on the sidewalls and the base of the excavation was screened for volatile organic compounds (VOC's) using the OVM. The OVM measurements in the gasoline UST excavation pit ranged from 154.2 to 382 parts per million (ppm) (Table 1). The highest OVM measurements were observed from soil sample HS-05 collected at 9 feet bgs from the excavation wall near the southeast corner of the pit (Figure 3). Excavation of hydrocarbon impacted soils beyond the amount required to remove the 6,000 gallon UST was not attempted due to the proximity of adjacent UST's and subsurface utilities.

Tank bottom sample 15–TP–01, collected from 10 feet bgs beneath the fill pipe location of the 6,000 gallon UST, contained benzene concentrations levels below detection limits, toluene at 15 ppm, ethyl benzene at 13 ppm, and total xylenes at 77 ppm. Total hydrocarbons as gasoline were detected in sample 15–TP–01 at 400 parts per million (Table 2).

Approximately 100 cubic yards of impacted soil was stockpiled onsite from the 6,000 gallon UST excavation.

4.2 560 Gallon Waste Oil UST

The soil in the excavation consisted of coarse grained sand backfill, underlain and surrounded by brown to gray silty clay. No free product or ground water was encountered in the UST pit. The waste oil tank was not corroded or pitted.

The OVM measurements collected during the removal of the 560 gallon waste oil tank ranged from 32.1 ppm to 142.1 ppm (Table 1). The highest OVM measurement at this location was noted in soil sample HS–03 at the base in the southeast corner of the excavation at approximately 8 feet bgs (Figure 3). After the initial vapor screening of the tank basin soils, some additional excavation to the south and east was conducted. However, complete excavation of impacted soil in this area was not possible due to the proximity of the station building, the pump islands and the gasoline UST pit.

Tank bottom sample TP–02–08, collected from beneath the 560 gallon waste oil UST at 8 feet bgs, contained compounds listed in the Minnesota Department of Health (MDH) Method 465–C analysis. The compounds above detection limits included: 1,2 – dichloroethane at 0.51 ppm, ethyl ether at 0.34 ppm, benzene at 0.39 ppm, toluene at 1.2 ppm, ethyl benzene at 0.46 ppm, and total xylenes at 4.3 ppm. Sample TP–02–08 contained 9,000 ppm total hydrocarbons as fuel oil and total PCB's concentrations of 0.050 ppm. Sample TP–02–08 also contained chromium (5 ppm), lead (16 ppm), and mercury (0.06 ppm). All of the above metals analytical data fall within the normal background range for soil (Conner and Shacklette, 1975).

Approximately 50 cubic yards of impacted soil was stockpiled onsite from the excavation of the 560 gallon UST.

4.3 1,000 Gallon Fuel Oil UST

After removal from the subsurface, a 1/8 inch diameter hole was observed at the bottom of the 1,000 gallon UST. The lithology of the tank basin soil was consistent with that as described in the 6,000 and 560 gallon UST excavations. OVM measurements collected during the removal of the 1,000 gallon UST did not reveal the presence of VOC's.

Soil sample TP–03–05, collected from the base of the 1,000 gallon fuel oil UST excavation, did not contain hydrocarbon constituents above target detection limits (Table 2).

Based on the absence of detectable OVM readings in the tank basin, the soil excavated during the removal of the 1,000 gallon UST was backfilled into the excavation basin.

5.0 SUMMARY

The following is a summary of findings for the UST closure at the subject Sinclair Station.

- One (1) 6,000 gallon unleaded gasoline UST, one (1) 560 gallon waste oil UST, and one (1) 1,000 gallon fuel oil UST were excavated at the Sinclair Station located at 9456 Medicine Lake Road, New Hope, Minnesota on April 11, 1990 through April 13, 1990.

- Several one inch diameter corrosion indentations were observed on the base of the 6,000 gallon unleaded gasoline UST. The indentations did not breach the tank wall. One 1/8 inch diameter hole was observed at the base of the 1,000 gallon fuel oil UST. The 560 gallon waste oil UST did not exhibit signs of corrosion.

- Soils in the excavations consisted of coarse grained sand backfill surrounded and underlain by brown to gray silty clay.

- A one inch thick layer of water was observed in the base of the 6,000 gallon unleaded gasoline UST excavation pit.

- OVM readings collected from the 6,000 gallon unleaded gasoline UST excavation ranged from 154.2 to 382 ppm. OVM readings collected from the 560 gallon waste oil UST excavation ranged from 32.1 to 142.1 ppm. The presence of surface and subsurface structures near the 6,000 gallon unleaded gasoline UST and the 560 gallon waste oil UST prohibited the total excavation of all impacted soil. OVM readings above background levels were not observed in the 1,000 gallon UST excavation.

- The 6,000 gallon unleaded gasoline UST pit soil sample contained no detectable levels of benzene, 15 ppm toluene, 13 ppm ethyl benzene, 77 ppm total xylenes, and 400 ppm total hydrocarbons as gasoline.

- The 560 gallon UST pit soil sample contained 0.51 ppm 1,2 dichloroethane, 0.34 ppm ethyl ether, 0.39 ppm benzene, 1.2 ppm toluene, 0.46 ppm ethyl benzene, 4.3 ppm total xylenes, and 9,000 ppm total hydrocarbons as fuel oil. The soil sample also contained 0.050 ppm PCB, 5 ppm chromium, 16 ppm lead, and 0.06 ppm mercury.

- The 1,000 gallon fuel oil UST pit soil sample did not contain benzene, toluene, ethyl benzene, xylenes or fuel oil.

- o A total of approximately 150 cubic yards of impacted soil was stockpiled onsite.

6.0 CONCLUSIONS

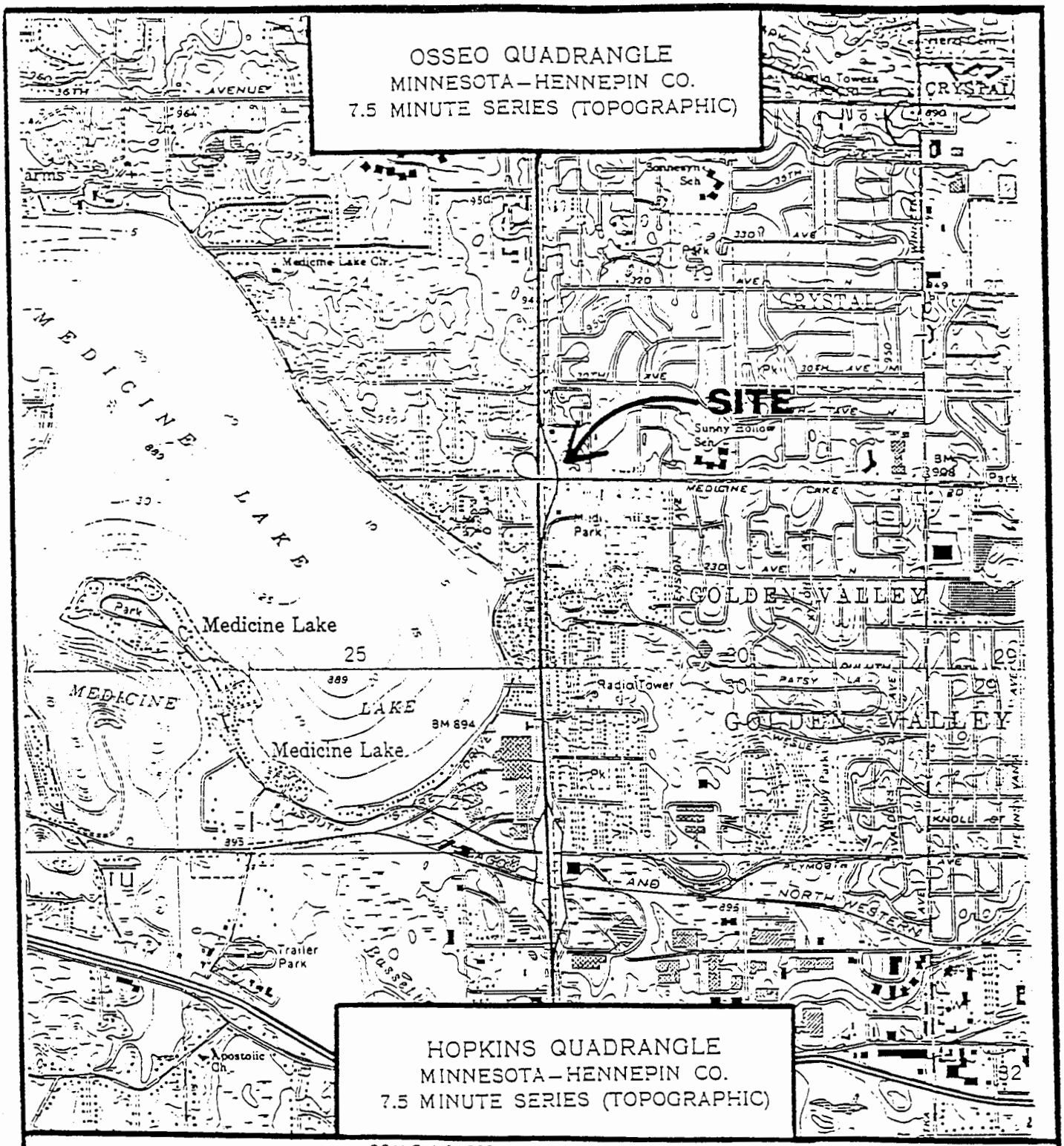
Elevated concentrations of adsorbed hydrocarbons were detected in the 6,000 gallon unleaded gasoline UST and 560 gallon waste oil UST excavation pits. The data collected from the 1,000 gallon fuel oil UST did not indicate the presence of petroleum hydrocarbon impacts. Based on the data collected during the unleaded gasoline and waste oil USTs removal, it appears that soil impacts may extend beyond the boundaries of these UST basins. Soil samples collected from the unleaded gasoline tank pit contained concentration levels of THC (g) which significantly exceeded the MPCA action level of 50 ppm. Since the scope of the investigation was limited to soil within the UST basins, it is undetermined whether ground water beneath the facility has been impacted.

7.0 RECOMMENDATIONS

Based on the potential for hydrocarbon constituents to have impacted soils beyond the 6,000 gallon unleaded gasoline and 560 gallon waste oil UST basins, EnecoTech recommends that additional investigatory work be conducted to define the magnitude and extent of hydrocarbon impacts beneath the facility. EnecoTech recommends the completion of soil borings and monitoring wells to accomplish this task.

FIGURES

SITE LOCATON MAP
SITE MAP
SOIL SAMPLING LOCATIONS



SCALE 1:24000

1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 5 0 1 KILOMETER

CONTOUR INTERVAL 10 FEET

QUADRANGLE LOCATION

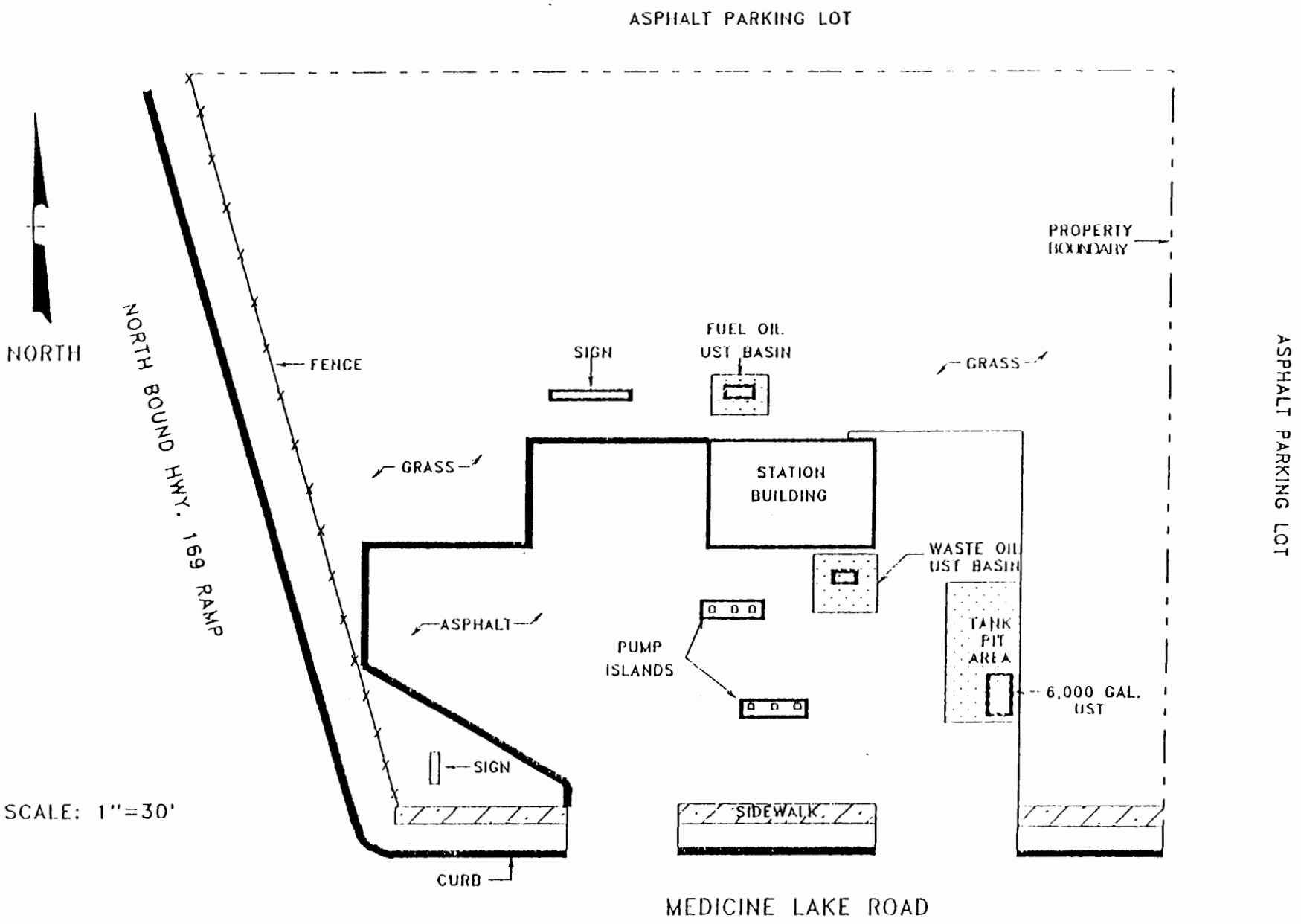
ENECOTECH

BLOOMINGTON, MINNESOTA

PROJECT SINCLAIR SERVICE STATION
9456 MEDICINE LK. RD., NEW HOPE, MINNESOTA

SITE LOCATION MAP

FILE NO.: 711-015 DATE: MAY, 1990 FIGURE NO.: 1

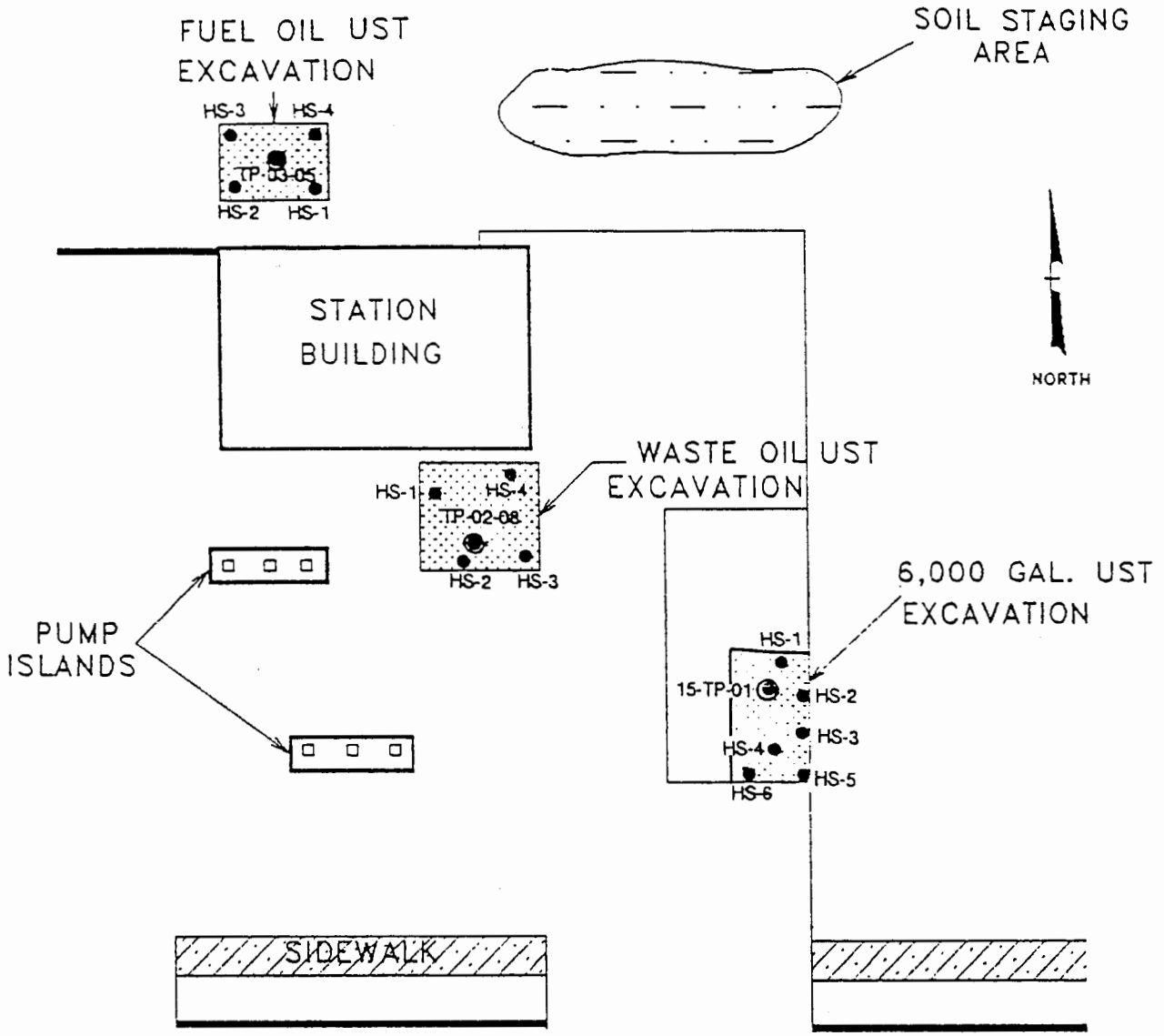


ENECOTECH
BLOOMINGTON, MINNESOTA

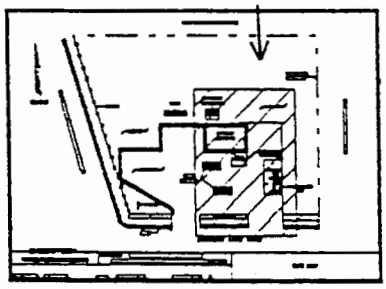
PROJECT SINCLAIR SERVICE STATION
9456 MEDICINE LAKE RD., NEW HOPE, MN

SITE MAP

FILE NO.: 711-015 DATE: MAY, 1990 FIGURE NO.: 2



MAP LOCATION



LEGEND

- ● SOIL HEADSPACE SAMPLING LOCATION
- ● SOIL ANALYTICAL SAMPLING LOCATION

SCALE: 1" = 20'

ENECOTECH

BLOOMINGTON, MINNESOTA

PROJECT SINCLAIR SERVICE STATION
9456 MEDICINE LAKE RD. NEW HOPE, MN

SOIL SAMPLING LOCATIONS

FILE NO.: 711-015 DATE: MAY, 1990 FIGURE NO.: 3

TABLES

PID MEASUREMENTS
SOIL LABORATORY ANALYTICAL RESULTS

TABLE 1
UST CLOSURE - PID MEASUREMENTS
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD
NEW HOPE, MINNESOTA

SAMPLE NUMBER	SAMPLE COLLECTION LOCATION	LITHOLOGY	DEPTH BELOW GRADE (FT)	OVM READING (PPM)
	6,000 GALLON UNLEADED UST			
HS-01	N. TANK BASE	SAND	10	294
HS-02	E. WALL, N. END	CLAY	9	328
HS-03	E. WALL, CENTER	CLAY	9	355
HS-04	S. TANK BASE	SAND	10	154.2
HS-05	E. WALL, S. END	CLAY	9	382
HS-06	S. WALL	CLAY	8	344
	560 GALLON WASTE OIL UST			
HS-01	W. BASE	CLAY	8	20.5
HS-02	S. BASE	CLAY	8	133.4
HS-03	S. BASE	CLAY	8	142.1
HS-04	N. BASE	CLAY	8	32.1
	1000 GALLON FUEL OIL UST			
HS-01	S.E. BASE	CLAY	5	0.0
HS-02	S.W. BASE	CLAY	7	0.0
HS-03	N.W. BASE	CLAY	7	0.0
HS-04	N.E. BASE	CLAY	5	0.0

TABLE 2
SOIL LABORATORY ANALYTICAL RESULTS
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD
NEW HOPE, MINNESOTA

SAMPLE NUMBER	DATE	CADMIUM	CHROMIUM	LEAD	MTBE	BENZENE	TOLUENE	ETHYL BENZENE	XYLENE	T.H.C. AS GASOLINE	T.H.C. AS FUEL OIL
15-TP-01	4/11/90	*	*	*	<0.26	<0.24	15	13	77	400	*
15-TP-C	4/11/90	*	*	4	*	<0.21	7.9	3.7	53	420	*
# TP-02-08	4/13/90	<0.5	5	16	*	0.39	1.2	0.46	4.3	*	9000
TP-03-05	4/13/90	*	*	*	*	<0.06	<0.11	<0.05	<0.28	*	<1.4

= SEE LABORATORY REPORT FOR ADDITIONAL RESULTS ON THIS SAMPLE
* = TEST NOT PERFORMED
ALL RESULTS ARE IN MG/KG (PPM)
SEE LABORATORY REPORT FOR SPECIFIC DETECTION LIMITS USED IN EACH ANALYSIS

APPENDIX A
LABORATORY ANALYTICAL DATA

interpoll

INTERPOLL LABORATORIES, INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL: 612 786-6020
FAX: 612 786-7854

May 3, 1990

EnecoTech
3050 Metro Drive, Suite 115
Bloomington, MN 55425

Attention: Jim Berg

LABORATORY REPORT: #9334
ENECOTECH PROJECT: #711-015

SAMPLES COLLECTED: April 11, 1990
SAMPLES RECEIVED: April 12, 1990

Sample Identification:			15-TP-C	15-TP-01
Sample Type:			Soil	Soil
Laboratory Log Number:			9334-01	9334-02
Parameter	Units	Target Detection Limit		
EPA Method SW-846, 8020:				
MTBE	mg/Kg	0.06		< 0.26
Benzene	mg/Kg	0.06	< 0.21	< 0.24
Toluene	mg/Kg	0.11	7.9	15
Ethylbenzene	mg/Kg	0.05	3.7	13
Xylenes	mg/Kg	0.28	53	77
EPA Method SW-846, 8015:				
Total hydrocarbons, as gasoline	mg/Kg	1.2	420	400
Dilution factor			4[1]	4[1]

Respectfully submitted,

Wayne A. Olson
Senior Scientist
Organic Chemistry Department

WAO/cg
Invoice Enclosed
< = less than

[1]The achieved detection limit is higher than the targeted detection limit because a smaller sample aliquot was used.

All analyses were performed using EPA or other recognized methodologies.
All units are on an "as received" basis unless otherwise indicated.

interpoll

INTERPOLL LABORATORIES, INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL: 612 786-6020
FAX: 612 786-7854

May 3, 1990

EnecoTech
3050 Metro Drive, Suite 115
Bloomington, MN 55425

Attention: Jim Berg

LABORATORY REPORT: #9334-01
ENECOTECH PROJECT: #711-015

SAMPLES COLLECTED: April 11, 1990
SAMPLES RECEIVED: April 12, 1990

Results of Sieve Analysis on Soil[1] Sample #15-TP-C

Mesh Size	Diameter	Relative Cumulative Frequency Percent by Mass Greater Than
18	1000 um	46.2
100	150 um	90.4
200	75 um	92.7

Sieve determination using sieves meeting ASTM E-11 specifications.

Respectfully submitted,

Gregg W. Holman,
Senior Scientist
Inorganic Chemistry Department

GWH/cg

[1]Soil sample was oven dried at 105°C.

interpoll

INTERPOLL LABORATORIES, INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL: 612 786-6020
FAX: 612 786-7854

May 3, 1990

EnecoTech
3050 Metro Drive, Suite 115
Bloomington, MN 55425

Attention: Jim Berg

LABORATORY REPORT: #9348
ENECOTECH PROJECT: #711-015

SAMPLES COLLECTED: April 13, 1990
SAMPLES RECEIVED: April 16, 1990

Sample Identification: 15-TP-C
Sample Type: Soil
Laboratory Log Number: 9348-01

Parameter	Units	EPA Method	Target Detection Limit	
Lead	mg/Kg	SW-846, 6010	1.3	4

Sample Identification: TP-02-08
Sample Type: Soil
Laboratory Log Number: 9348-02

Parameter	Units	EPA Method	Target Detection Limit	
Arsenic	mg/Kg	SW-846, 6010	2.5	< 2.5
Cadmium	mg/Kg	SW-846, 6010	0.5	< 0.5
Chromium	mg/Kg	SW-846, 6010	0.5	5
Lead	mg/Kg	SW-846, 6010	1.3	16
Mercury	mg/Kg	SW-846, 7470	0.06	0.06

Sample Identification:			TP-02-08
Sample Type:			Soil
Laboratory Log Number:			9348-02
Parameter	Units	Target Detection Limit	
Modified SW-846 Method 3820:			
Total hydrocarbons, as fuel oil	mg/Kg	1.4	9000[1]
Dilution factor			100[2]
EPA Method SW-846, 3550/8080:			
Total PCB	mg/Kg	0.0033	0.050
Method MDH 465-C:			
Chloromethane	mg/Kg	0.17	< 0.17
Bromomethane	mg/Kg	0.03	< 0.03
Vinyl chloride	mg/Kg	0.04	< 0.04
Dichlorodifluoromethane	mg/Kg	0.11	< 0.11
Chloroethane	mg/Kg	0.03	< 0.03
Methylene chloride	mg/Kg	0.38	< 0.38
Trichlorofluoromethane	mg/Kg	0.11	< 0.11
1,1-Dichloroethene	mg/Kg	0.08	< 0.08
Allyl chloride	mg/Kg	0.04	< 0.04
1,1-Dichloroethane	mg/Kg	0.02	< 0.02
cis-1,2-Dichloroethene	mg/Kg	0.03	< 0.03
trans-1,2-Dichloroethene	mg/Kg	0.04	< 0.04
Chloroform	mg/Kg	0.04	< 0.04
1,1,2-Trichlorotrifluoroethane	mg/Kg	0.11	< 0.11
Dibromomethane	mg/Kg	0.06	< 0.06
1,2-Dichloroethane	mg/Kg	0.06	0.51
1,1,1-Trichloroethane	mg/Kg	0.18	< 0.18
Carbon tetrachloride	mg/Kg	0.05	< 0.05
Bromodichloromethane	mg/Kg	0.07	< 0.07
2,3-Dichloro-1-propene	mg/Kg	0.04	< 0.04
1,2-Dichloropropane	mg/Kg	0.04	< 0.04

Sample Identification:	TP-02-08
Sample Type:	Soil
Laboratory Log Number:	9348-02

Parameter	Units	Target Detection Limit	
Method MDH 465-C (continued):			
1,1-Dichloro-1-propene	mg/Kg	0.02	< 0.02
trans-1,3-Dichloropropene	mg/Kg	0.01	< 0.01
Trichloroethene	mg/Kg	0.07	< 0.07
1,3-Dichloropropane	mg/Kg	0.05	< 0.05
1,1,2-Trichloroethane	mg/Kg	0.13	< 0.13
Dibromochloromethane	mg/Kg	0.14	< 0.14
cis-1,3-Dichloropropene	mg/Kg	0.03	< 0.03
1,2-Dibromoethane	mg/Kg	0.03	< 0.03
2-Chloroethylvinyl ether	mg/Kg	0.09	< 0.09
Bromoform	mg/Kg	0.05	< 0.05
1,1,1,2-Tetrachloroethane	mg/Kg	0.04	< 0.04
1,2,3-Trichloropropane	mg/Kg	0.07	< 0.07
1,1,2,2-Tetrachloroethane	mg/Kg	0.27	< 0.27
Tetrachloroethene	mg/Kg	0.06	< 0.06
Pentachloroethane	mg/Kg	0.21	< 0.21
Chlorobenzene	mg/Kg	0.03	< 0.03
1,3-Dichlorobenzene	mg/Kg	0.06	< 0.06
1,2-Dichlorobenzene	mg/Kg	0.06	< 0.06
1,4-Dichlorobenzene	mg/Kg	0.09	< 0.09
Acetone	mg/Kg	2.8	< 2.8
Tetrahydrofuran	mg/Kg	1.1	< 1.1
Ethyl ether	mg/Kg	0.14	0.34
Methyl ethyl ketone	mg/Kg	0.49	< 0.49
Benzene	mg/Kg	0.06	0.39
Methyl isobutyl ketone	mg/Kg	0.20	< 0.20
Toluene	mg/Kg	0.11	1.2
Ethylbenzene	mg/Kg	0.05	0.46
Cumene	mg/Kg	0.22	< 0.22
Total xylenes	mg/Kg	0.28	4.3

Sample Identification:	TP-03-05
Sample Type:	Soil
Laboratory Log Number:	9348-03

Parameter	Units	Target Detection Limit	
EPA Method SW-846, 8020:			
Benzene	mg/Kg	0.06	< 0.06
Toluene	mg/Kg	0.11	< 0.11
Ethylbenzene	mg/Kg	0.05	< 0.05
Xylenes	mg/Kg	0.28	< 0.28
Modified SW-846 Method 3820:			
Total hydrocarbons, as fuel oil	mg/Kg	1.4	< 1.4

Respectfully submitted,

Gregg W. Holman,
Senior Scientist
Inorganic Chemistry Department

Wayne A. Olson,
Senior Scientist
Organic Chemistry Department

GWH/WAO/cg
Invoice Enclosed
< = less than

[1]Although quantified as fuel oil as requested, the chromatographic pattern did not match that of fuel oil.

[2]Sample extract was diluted as indicated to accommodate the concentration of the analyte. Reported values represent the concentration in the original undiluted sample, i.e., instrumental results were multiplied by the dilution factor prior to reporting. Target detection limits are given. The detection limit applicable to the sample may be obtained by multiplying the detection limit by the dilution factor.

All analyses were performed using EPA or other recognized methodologies.
All units are on an "as received" basis unless otherwise indicated.

APPENDIX B
CHAIN-OF CUSTODY

CHAIN OF CUSTODY RECORD

NO. 00144

ENECOTECH
3050 METRO DRIVE, SUITE 115
BLOOMINGTON, MN 55425 (612) 854-5513

LOCATION: New Hope, MN
PROJECT NUMBER: 711-015
PROJECT MANAGER: JAB
LABORATORY: Interpoll
TURNAROUND TIME: Standard

ITEM NO.	SAMPLE NUMBER	NUMBER OF CONTAINERS AND TYPE	MATRIX	COLLECTION DATE	COLLECTION TIME	ANALYSIS REQUIRED
1	15-TP-C	1 Mason Jar	Soil	4/11/90	13:15	Sieve Analysis (< 200 mesh)
2	15-TP-C	1 250 mL & 3 40 ml	Soil	4/11/90	15:00	BTEX & TPH - Gasoline
3	15-TP-01	1 250 mL & 3 40 ml	Soil	4/11/90	14:20	BTEX, MTBE, TPH - Gasoline
4						
5						
6						
7						
8						
9						
10						

SAMPLER'S SIGNATURE	DATE
Jodi L. Pill	4/12/90

NOTES: Standard turnaround on all items

TRANSFER NO.	ITEM NO.	RELINQUISHED BY	ACCEPTED BY	DATE SUBMITTED
1	1-3	Jodi L. Pill	Bob Barry	4/12/90
2				
3				
4				

CHAIN OF CUSTODY RECORD

ENECOTECH
3050 METRO DRIVE, SUITE 115
BLOOMINGTON, MN 55425 (612) 854-5513

NO. 00122

LOCATION: Medicine Lake Rd
PROJECT NUMBER: 711-015
PROJECT MANAGER: JAB
LABORATORY: Interpoll
TURNAROUND TIME: Normal

ITEM NO.	SAMPLE NUMBER	NUMBER OF CONTAINERS AND TYPE	MATRIX	COLLECTION DATE	COLLECTION TIME	ANALYSIS REQUIRED
1	15-TP-C	1-250ml	Soil	4/13/90		Pb
2	TP-02-08	3-40ml, 1-250ml				MDH 465C, PCB EPA 600
3	TP-02-08	3-250ml				Pb, Cr, Cd, Hg, Arsenic, THC Fuel Oil
4	TP-03-05	3-40ml, 1-250ml				BETX, THC Fuel Oil
5						
6						
7						
8						
9						
10						

SAMPLER'S SIGNATURE	DATE
Wayne Jackson	4/13/90

NOTES:
Vial: Suc Lec: use Method 608
4/16/90 dmw.

TRANSFER NO.	ITEM NO.	RELINQUISHED BY	ACCEPTED BY	DATE SUBMITTED
1	items 1-4	Wayne Jackson	Courier	4/16/90
2			Linda Wynne	4/16/90
3				
4				

711-015
Correspondence

MINNESOTA POLLUTION CONTROL AGENCY
APPLICATION TO TREAT PETROLEUM CONTAMINATED SOIL

I. Source of Soil:

Facility Name: Sinclair Service Station
Address: 9456 Medicine Lake Road
City, State, Zip: New Hope, Minnesota
Site ID#: LEAK 2433

Contact Name: Denny Lorenz
Telephone: (913) 321-4300

II. Contamination Details:

Volume Soil (yd^3): 150 yds^3

Type Petroleum Contamination: (gasoline) fuel, #2 fuel oil (circle one)

Contaminant Concentration (ppm)

Benzene	<0.21	____	____
Toluene	7.9	____	____
Total Xylenes	53	____	____
Total Hydrocarbons as Gasoline or Fuel Oil	420	____	____
Lead	4	____	____

Percent Soil less than 200 mesh or 74 microns 7.3 %

Soil Type (sand, silt, clay, etc.) Sand with minor amounts of clay

III. Proposed Asphalt Plant/Lov Temperature Thermal Unit

Name: C.S. McCrossan
Address: 7865 Jefferson Hwy
(if portable, where will plant be located)

City, State, Zip: Maple Grove, MN 55369

Plant Number or Model: Standard Plant Model 1064

Contact: Bob Dongoske Title: Equipment Manager
Telephone: (612) 425-4167 Site Telephone: (612) 425-1255
Air Quality Permit Numoer: 7§5-A-§6-OT-1

Separation Distance in feet from Nearest Resident: 658 ft
Separation Distance in feet from Nearest Business: 517 ft
Burner Temperature during Soil Treatment: 225 Degrees F
Soil Residence Time in Burner during Treatment: 5 minutes

IV. Include signed statement from asphalt concrete plant owner that the plant has been properly maintained and/or repaired prior to treatment of petroleum contaminated soils and is capable of operating in compliance with MPCA permit conditions and rules.

V. Date treatment will be completed: when delivered (If stockpiled before being treated, all petroleum contaminated soil must be tarped and run-off protection provided.)

VI. Final Disposition of Treated Soil: (hov used, location)
(If soils will not be incorporated into asphalt or road base, post burn testing is required. Soils will need to be sampled for the same parameters listed in item II. Two composite soil samples are to be taken for every 300 yard^3 of soil.) asphalt or road base

VII. Consultant Submitting Request:

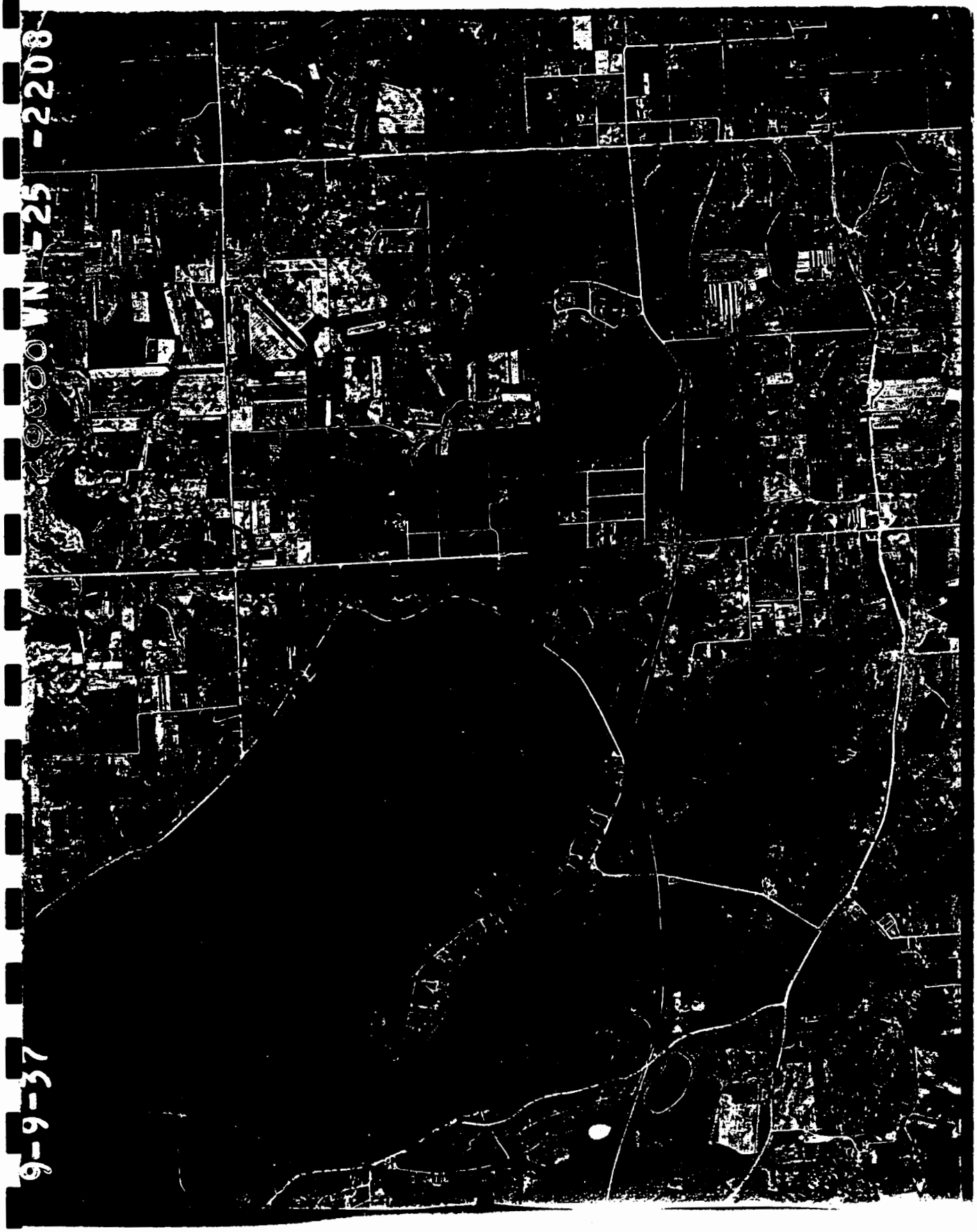
Company Name: EnecoTech Midwest, Inc.
Address: 3050 Metro Drive, Suite 115
City, State, Zip: Bloomington, MN 55425

Contact Name: Jim Berg
Telephone: (612) 854-5513

Signature: Jim Berg

Date: 5/14/90

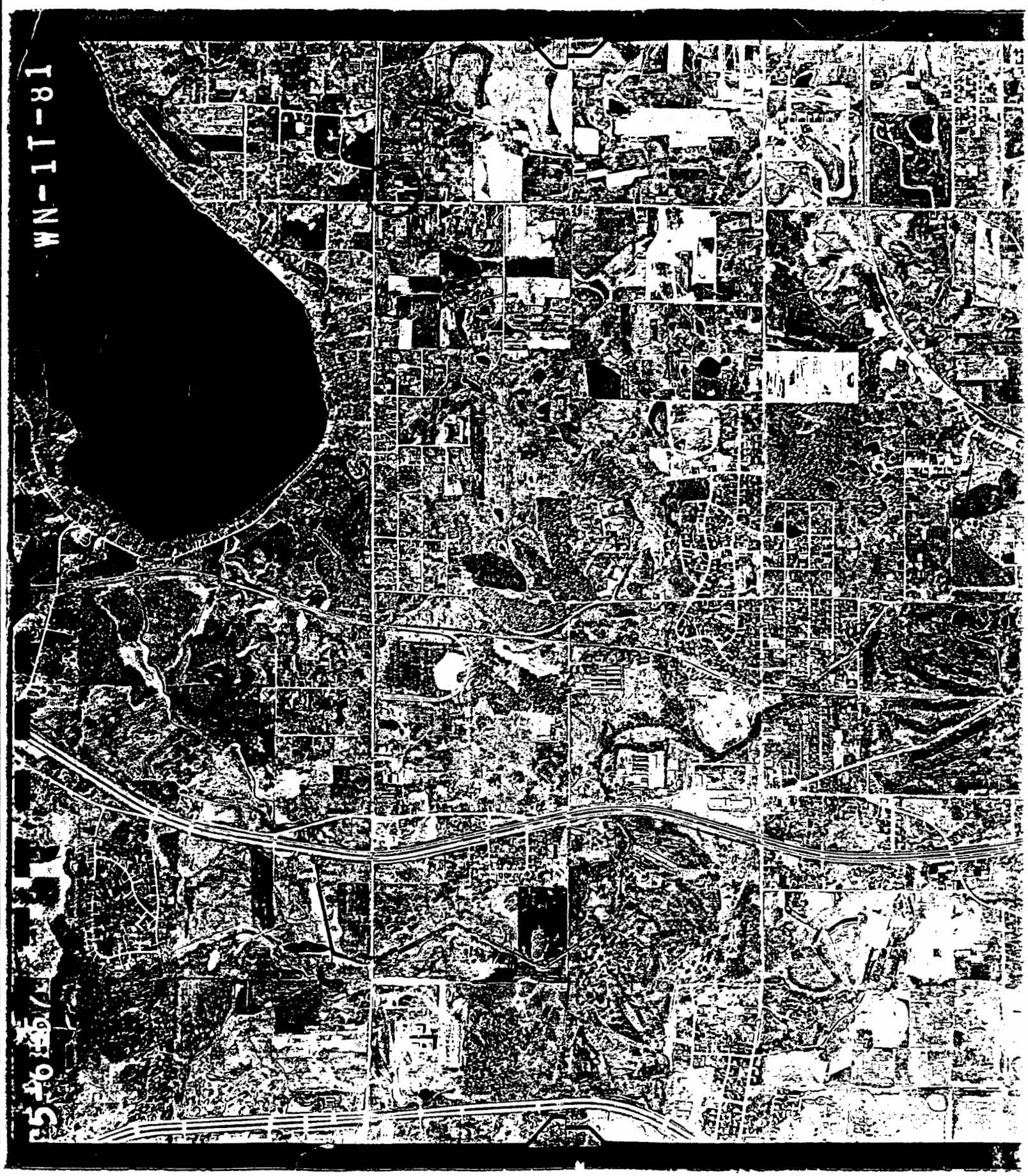
1937



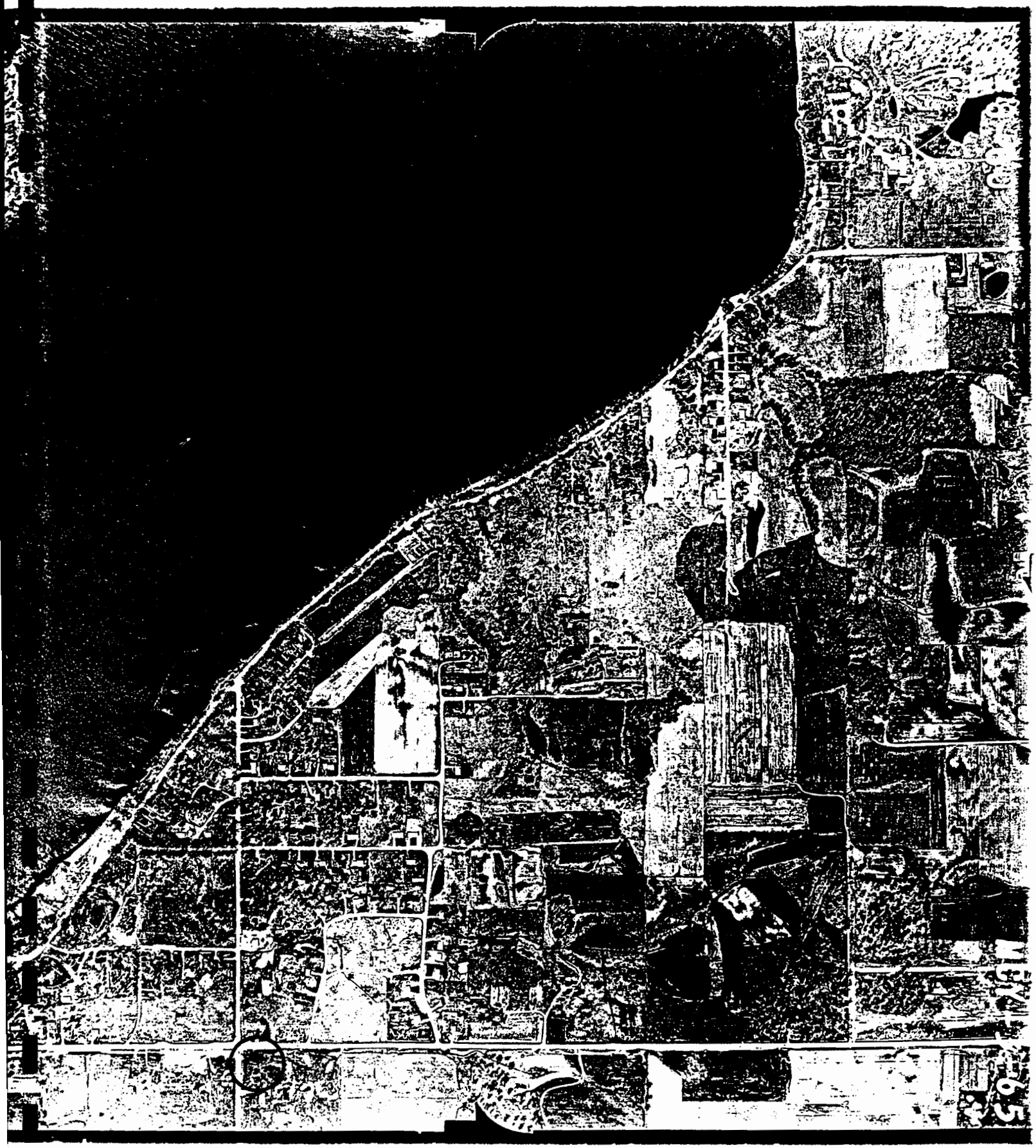
1945

N

1957

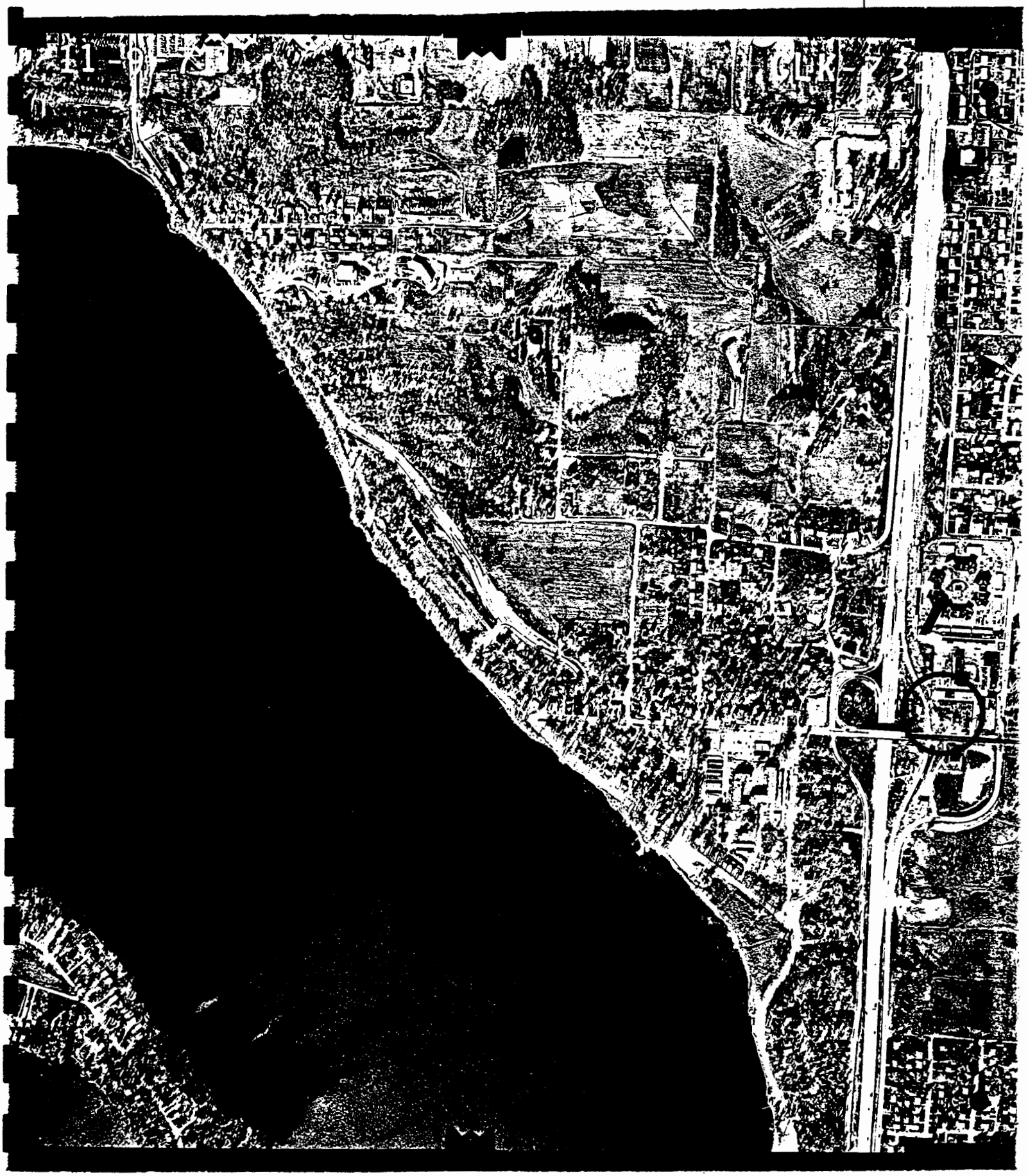


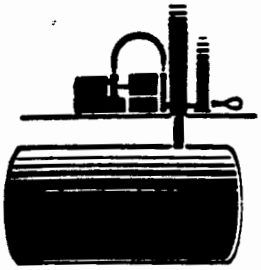
1960



1964

1971





Petro Tech, Inc.

Precision tank and line testing

11170 Sandy Gulch Rd. • Sandy, Utah 84094 • 801-572-9303

Test No.: 910701
Test Date: July 1, 1991
Test Operator: John Labrum
Location: 9456 Medicine Lake Road
New Hope, Minnesota

Product	Tank Type	Capacity (Gal)	Sub/Suc	Manifolds	Installed
Premiun UL	Steel	6016	Sub	0	1964
Regular UL	Steel	6016	Sub	0	1964
Regular UL #3	Steel	6016	Sub	0	1964

TANK TEST RESULT

Product	Water In Tank (Inches)	High Level Leak Rate (GPH)	Low Level Leak Rate (GPH)	Full System Including Vent Line	Tank Only
Premium UL	0	Less than .050	N/A	Pass	Pass
Regular UL	0	Less than .050	N/A	Pass	Pass
Regular UL #3	0	Less than .050	N/A	Pass	Pass

WATER LEVEL CONSIDERATION

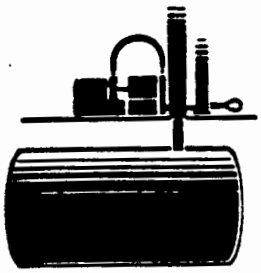
The test of the above tank systems is considered sufficient for certification purposes since the water level in the backfill area is below the point of hydrostatic equilibrium on any portion of the tank or piping.

SPECIAL CONSIDERATION

None

PRODUCT LINE TEST RESULTS

Product	Pump Type	Pounds Held	Isolation Mechanism	Duration	Conclusion
Premium UL	Red Jacket	50 PSI	Silver Bullet	30 min.	Pass
Regular UL	Red Jacket	50 PSI	Silver Bullet	30 min.	Pass
Regular UL #3	Red Jacket	50 PSI	Silver Bullet	30 min.	Pass



Petro Tech, Inc.

Precision tank and line testing

11170 Sandy Gulch Rd. • Sandy, Utah 84094 • 801-572-9303

PRESSURIZED PRODUCT LINE TEST DATA

Location: 9456 Medicine Lake Road, New Hope, Minnesota Operator: John Labrum

Test #910701	Product	Product	Product	Product
Product	Regular Unleaded #3	Regular Unleaded	Premium Unleaded	
Product Pump Type	Red Jacket	Red Jacket	Red Jacket	
Isolation Mechanism	Silver Bullet	Silver Bullet	Check Valve	
Initial Level	.090	.090	.090	
Initial Pressure Level	.081	.079	.078	
Final Pressure Level	.081	.077	.074	
Leak Rate (GPH)	.000	.002	.004	
Bleed-Back Level	.089	.089	.086	
Bleed-Back	.008	.012	.012	
Test Pressure	50 PSI	50 PSI	50 PSI	
Time Started	8:05 a.m.	9:05 a.m.	10:30 a.m.	
Time Complete	8:35 a.m.	9:35 a.m.	11:00 a.m.	
Test Interval (Min.)	30	30	30	
Conclusion (Pass or Fail)	Pass	Pass	Pass	

Comments:

7/1/91
Date of Test

John Labrum
Signature of Tester

Quick Look Report Leak Computer® — Quick Look Report
E 1) (Pass 2)

210/0122.910 Test Number: 210/0122.910

Leak Rate - GAL/HR

One Division = 0.10 gal/hr.

-0.30 0 0.30

UL - Tank 9:10

LAKE RD., NEW HOPE, MN.

T
I
M
E

op 10:10

75 Tank Temp: 72.5

10:11

han 91,655 gal/hr

234 deg F/R

1 gal/hr

Passed Limit

-0.3 -0.15 0 0.15

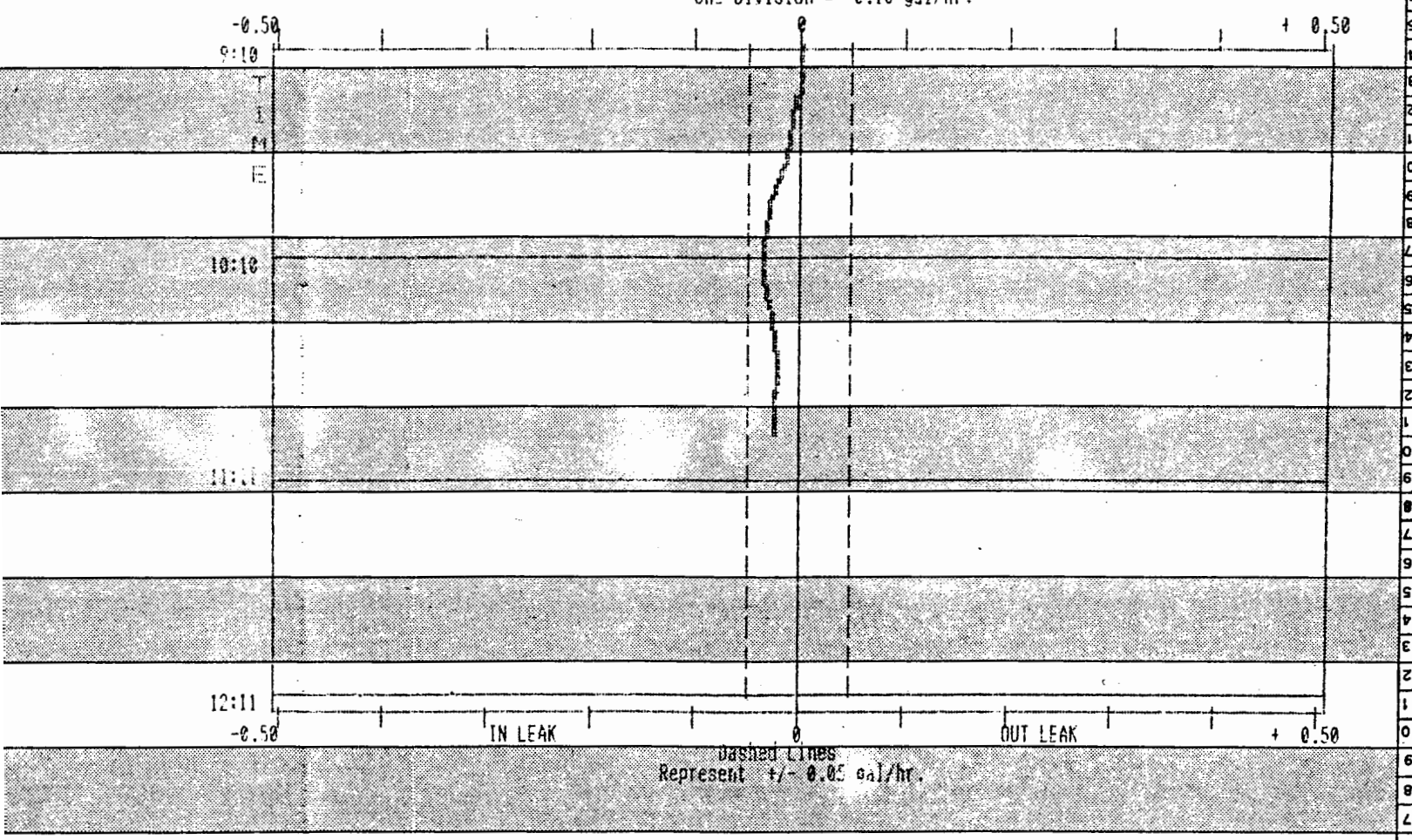
Represents +/- 0.05 gal/hr.

BRUM

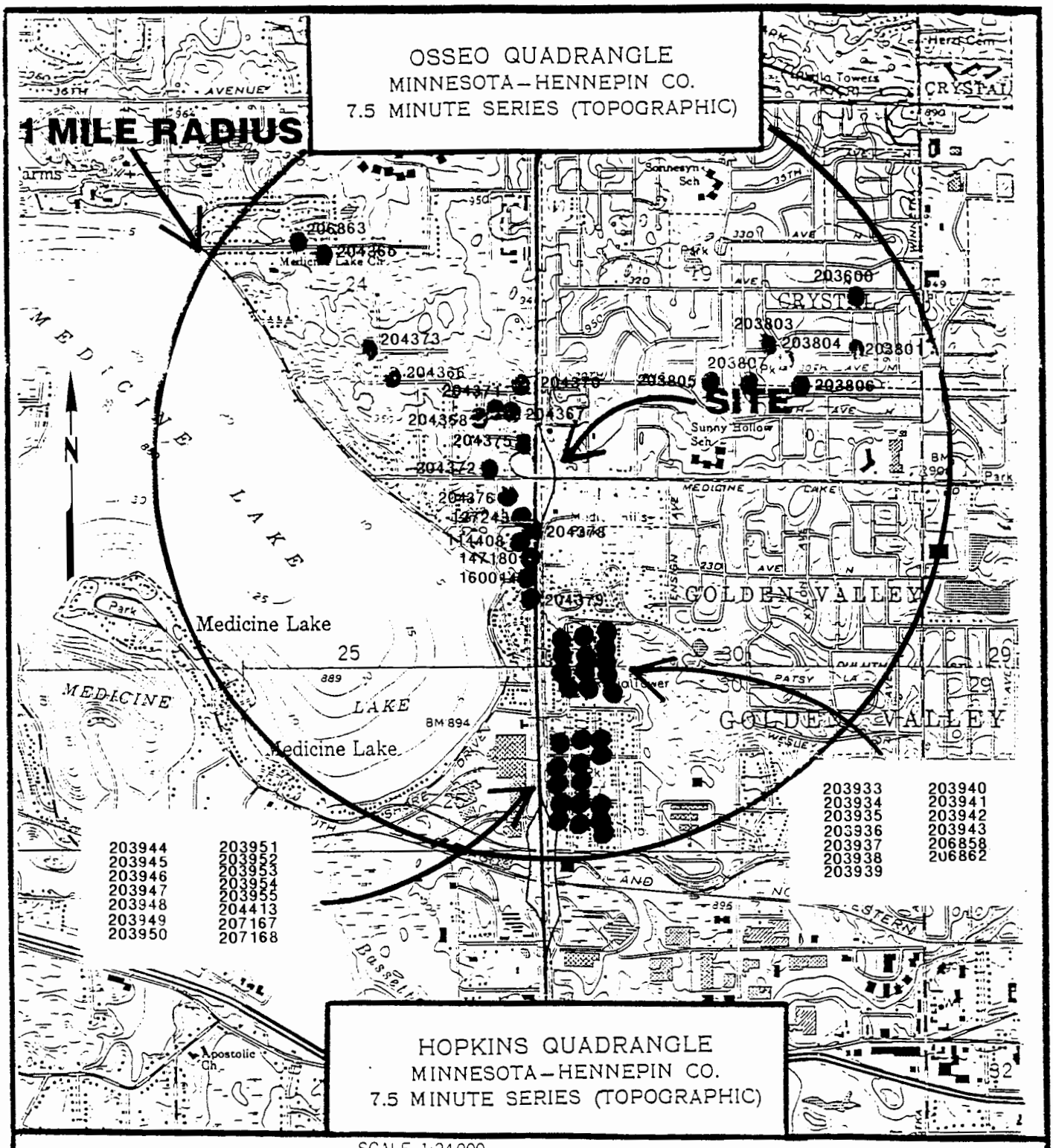
14112 G.B.

Report Leak Computer® — Quick Look Report (PAGE 2)

Test Number: 910701211.A14



14112 G.B.



ENECOTECH

BLOOMINGTON, MINNESOTA

PROJECT: SINCLAIR SERVICE STATION
9456 MEDICINE LK. RD., NEW HOPE, MINNESOTA

WATER WELL LOCATION MAP

FILE NO.: 711-015 DATE: MAY, 1991 FIGURE NO.: 1 EFW/SHW

TABLE
WATER SUPPLY SUMMARY
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD, NEW HOPE, MINNESOTA

MN UNIQUE WELL NO.	GROUND ELEVATION	WELL BASE ELEVATION	CASING BASE ELEVATION	GROUNDWATER ELEVATION	AQUIFER
114408	910	665	710	830	OSTP-OSTP
127243	915	756	N/A	845	QBAA-QBAA
147180	906	688	732	881	OSTP-OSTP
160014	909	679	714	855	OSTP-OSTP
203600	965	N/A	N/A	875	QUUU-QUUU
203801	965	783	787	865	QBAA-QBAA
203803	950	800	805	805	QBAA-QBAA
203804	945	777	783	867	QBAA-QBAA
203805	950	788	791	860	QBUA-QBUA
203806	955	849	852	875	QBUA-QBUA
203807	945	779	787	870	OSTP-OSTP
203933	935	850	N/A	885	QUUU-QUUU
203934	960	851	N/A	885	QUUU-QUUU
203935	955	855	N/A	873	QUUU-QUUU
203936	925	837	N/A	866	QUUU-QUUU
203937	955	854	N/A	892	QUUU-QUUU
203938	940	851	N/A	895	QUUU-QUUU
203939	950	858	N/A	882	QBUA-QBUA
203940	935	758	N/A	870	QUUU-QUUU
203941	945	851	N/A	872	QUUU-QUUU
203942	940	843	N/A	866	QUUU-QUUU
203943	935	846	N/A	880	QUUU-QUUU
203944	945	N/A	N/A	875	PLTS-PLTS
203945	940	587	N/A	N/A	N/L
203946	940	832	N/A	870	QUUU-QUUU
203947	930	840	909	870	QUUU-QUUU
203948	925	N/A	N/A	870	QUUU-QUUU
203949	915	825	N/A	860	QUUU-QUUU
203950	920	822	N/A	N/A	QBAA-QBAA
203951	920	823	N/A	875	QBAA-QBAA
203952	910	810	N/A	880	OSTP-OSTP
203953	915	821	N/A	875	QUUU-QUUU
203954	915	831	N/A	885	QUUU-QUUU
203955	895	836	840	875	QBAA-QBAA
204365	964	774	N/A	879	QBAA-QBAA
204366	955	770	774	885	QBAA-QBAA
204367	957	N/A	N/A	897	QUUU-QUUU
204368	955	774	N/A	N/A	QBAA-QBAA
204370	938	737	N/A	878	QBUA-QBUA
204371	950	780	N/A	870	QBAA-QBAA
204372	N/A	N/A	N/A	N/A	N/A
204373	N/A	N/A	N/A	N/A	N/A
204375	925	N/A	N/A	875	QBAA-QBAA
204376	925	764	N/A	875	N/A
204378	905	790	N/A	880	QUUU-QUUU
204379	905	766	770	883	QBAA-QBAA
204413	895	842	N/A	882	QBAA-QBAA
206858	N/A	N/A	N/A	N/A	N/A
206862	N/A	N/A	N/A	N/A	N/A
206863	945	794	798	870	QBAA-OSTP
207167	920	835	836	878	OPVL-OPVL

QBAA - BURIED ARTESIAN
QBUA - QUARTERNARY
QUUU - PLEISTOCENE UNDIFF.
OSTP - ST. PETER
PLTS - PLEISTOCENE
OPVL - PLATTEVILLE

TABLE
WATER SUPPLY SUMMARY
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD, NEW HOPE, MINNESOTA

MN UNIQUE WELL NO.	GROUND ELEVATION	WELL BASE ELEVATION	CASING BASE ELEVATION	GROUNDWATER ELEVATION	AQUIFER
207168	915	713	723	865	OSTP-OSTP

QBAA - BURIED ARTESIAN
QBUA - QUARTERNARY
QUUU - PLEISTOCENE UNDIFF.
OSTP - ST. PETER
PLTS - PLEISTOCENE
OPVL - PLATTEVILLE

STATE OF MINNESOTA
DEPARTMENT OF HEALTH

WATER WELL RECORD

Minnesota Statutes 156A.01-.08

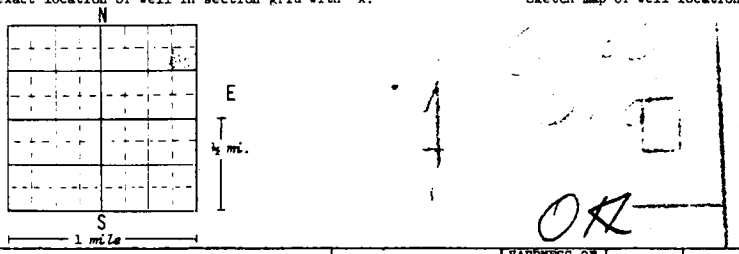
MINNESOTA UNIQUE WELL NO. for Water Sample: 114408

1. LOCATION OF WELL

County Name	Fraction	Section Number	Township Number	Range Number
HENNEPIN	se ¼ ne ¼ ne ¼	25	N. or S.	E. or W.

Distance and Direction from Road Intersections or Street Address and City of Well Location: 9540 24th Ave N Plymouth, MN

Show exact location of well in section grid with "X." Sketch map of well location.



3. PROPERTY OWNER'S NAME
Address: Ken Berscheid, 9540 24th Ave N, Plymouth, MN

4. WELL DEPTH (completed): 245 ft. Date of Completion: 1SEPT76

5. 1 ☐ Cable tool 4 ☐ Reverse 7 ☐ Driven 10 ☐ Dug
2 ☐ Hollow rod 5 ☐ Air 8 ☐ Bored 11 ☐ ____
3 ☒ Rotary 6 ☐ Jetted 9 ☐ Power Auger

6. USE
1 ☒ Domestic 4 ☐ Public Supply 7 ☐ Industry
2 ☐ Irrigation 5 ☐ Air Conditioning 8 ☐ Commercial
3 ☐ Test Well 6 ☐ ____

7. CASING DIAM. Threaded ☒ 1 Welded ☐ 3
Black ☒ 2 Galv. ☐ 4
4 in. to 200 ft. depth
____ in. to ____ ft. depth
____ in. to ____ ft. depth
HEIGHT: Above/Below
Surface one ft.
Weight 10.79 lbs./ft.
Drive Shoe? Yes ☒ No ☐

8. SCREEN Or open hole from 200 ft. to 245 ft.
Make ____
Type ____ Dia. ____
Slot/Gauze ____ Length ____
Set between ____ ft. and ____ ft.
____ ft. and ____ ft.
____ ft. and ____ ft.
FITTINGS:

9. STATIC WATER LEVEL
80 ft. ☒ below land surface ☐ above Date Measured 1SEP76

10. PUMPING LEVEL (below land surface)
____ ft. after 3 hrs. pumping air 80 g.p.m.
____ ft. after ____ hrs. pumping ____ g.p.m.

11. WELL HEAD COMPLETION
1 ☒ Pitless adapter 2 ☐ Basement offset 3 ☐ At least 12" above grade

12. Well grouted? ☐ Yes ☒ No Cu. Yds. ____
1 ☐ Neat cement 2 ☐ Bentonite 3 ☐ ____
Depth: from ____ ft. to ____ ft.
from ____ ft. to ____ ft.

13. Nearest source of possible contamination
____ feet ____ direction ____ type
Well disinfected upon completion? Yes ☒ No ☐

14. PUMP
Date installed 9SEPT76 ☐ Not installed
Manufacturer's Name Red Jacket
Model Number BVC XXX 10 HP XXX1 Volts 230
Length of drop pipe 105 ft. capacity 14 g.p.m.
Material of drop pipe 1" galv
Type: 1 ☒ Submersible 3 ☐ L.S. Turbine 5 ☐ Reciprocating
2 ☐ Jet 4 ☐ Centrifugal 6 ☐ ____

2. FORMATION LOG

FORMATION LOG	COLOR	HARDNESS OF FORMATION	FROM	TO
CLAY CLAY	BROWN	GTUB	0	35
CLAY & GRAVEL CLAY, GRVL	BROWN	QUAT	35	60
GRAVEL GRVL	BROWN	QUAT	60	72
CLAY & STONES CLAY, PEBS	BROWN	QTUB	72	93
CLAY CLAY	GRAY	QTUB	93	115
CLAY & STONES CLAY, PEBS	GRAY	QTUB	115	134
SANDSTONE SNDS	WHITE		134	194
SHALE SHLE	WHITE		194	199
SHALE SHLE	RED	sticky	199	205
ST PETER SS SNDS	RED	hard	205	245

118-22-25
AADACC
120-C
E Lev. 910 ± 5'
1=4
776
Aquifer OSTP-OSTP

Use a second sheet, if needed.

5. REMARKS, ELEVATION, SOURCE OF DATA, etc.

16. WATER WELL CONTRACTOR'S CERTIFICATION

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

E. H. REMNER & SONS INC 27015
License Business Name License No.

Address 6300 Industry Ave NW ANOKA 55303

Signed ____ Date ____
Authorized Representative

Name of Driller

MINN. GEOLOGICAL SURVEY COPY

STATE OF MINNESOTA
DEPARTMENT OF HEALTH

WATER WELL RECORD

Minnesota Statutes 156A.01-.08

MINNESOTA UNIQUE WELL NO. *for Water Supply*

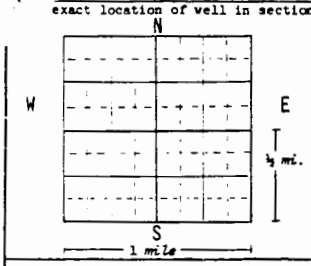
127243

1. LOCATION OF WELL

County Name	Fraction	Section Number	Township Number	Range Number
	¼ ¼ ¼		N. or S.	E. or W.

Distance and Direction from Road Intersections or Street Address and City of Well Location

exact location of well in section grid with "X." Sketch map of well location.



2. FORMATION LOG	COLOR	HARDNESS OF FORMATION	FROM	TO
Clay QTUB-CLAY	yellow		0	30
Gravel QTUB-GRVL	Brown		30	60
Clay QTUR-CLAY	Red		60	145
Rocks & Sand QPB-COBBLES SAND	Brown		145	156
Water-Sand: QFUB-SAND	Brown		156	164
118-22-25 AAADBC				
Elev. 915± 5				
Aquifer: QTSAA-QBAA				

GOOD

LOCATED BY
1 - ☑ Address Verification
2 - ☐ Name on Mailbox
3 - ☐ Lot-Block
4 - ☐ P.I.D. Book
5 - ☐ Info. From Owner
6 - ☐ Info. From Neighbor
7 - ☐ Other
☐ Can't Locate State Why

Use a second sheet, if needed.

REMARKS, ELEVATION, SOURCE OF DATA, etc.

3. PROPERTY OWNER'S NAME

Address 12 AC

4. WELL DEPTH (completed) ft. Date of Completion

5. 1☐ Cable tool 2☐ Hollow rod 3☐ Rotary 4☐ Reverse 5☐ Air 6☐ Jetted 7☐ Driven 8☐ Bored 9☐ Power Auger 10☐ Dug 11☐ ____

6. USE
1☐ Domestic 2☐ Irrigation 3☐ Test Well 4☐ Public Supply 5☐ Air Conditioning 6☐ ____ 7☐ Industry 8☐ Commercial

7. CASING DIAM.
Threaded ☒ 1 Welded ☐ 3
Black ☒ 2 Galv. ☐ 4
____ in. to ____ ft. depth
____ in. to ____ ft. depth
____ in. to ____ ft. depth

HEIGHT: Above/Below
Surface ____ ft.
Weight ____ lbs./ft.
Drive Shoe? Yes ____ No ____

8. SCREEN
Make ____
Type ____ Dia. ____
Slot/Gauze ____ Length ____
Set between ____ ft. and ____ ft.
____ ft. and ____ ft.
____ ft. and ____ ft.

Or open hole from ____ ft. to ____ ft.

FITTINGS:

9. STATIC WATER LEVEL
____ ft. ☐ below ☐ above land surface Date Measured ____

10. PUMPING LEVEL (below land surface)
____ ft. after ____ hrs. pumping ____ g.p.m.
____ ft. after ____ hrs. pumping ____ g.p.m.

11. WELL HEAD COMPLETION
1☐ Pitless adapter 2☐ Basement offset 3☐ At least 12" above grade

12. Well grouted? ☐ Yes ☐ No Cu. Yds. ____
1☐ Neat cement 2☐ Bentonite 3☐ ____
Depths: from ____ ft. to ____ ft.
from ____ ft. to ____ ft.

13. Nearest source of possible contamination
____ feet ____ direction ____ type
Well disinfected upon completion? Yes ☐ No ☐

14. PUMP
Date installed 1977
☐ Not installed
Manufacturer's Name ____
Model Number ____ HP ____ Volts ____
Length of drop pipe ____ ft. capacity ____ g.p.m.
Material of drop pipe ____
Type: 1☒ Submersible 2☐ Jet 3☐ L.S. Turbine 4☐ Centrifugal 5☐ Reciprocating 6☐ ____

16. WATER WELL CONTRACTOR'S CERTIFICATION

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

License Business Name ____ License No. 6

Address ____

Signed ____ Date ____
Authorized Representative

Name of Driller

MINN. GEOLOGICAL SURVEY COPY

7/74 30M

STATE OF MINNESOTA DEPARTMENT OF HEALTH

WATER WELL RECORD

Minnesota Statutes 156A.01-.08

MINNESOTA UNIQUE WELL NO. for Water Sample: 147

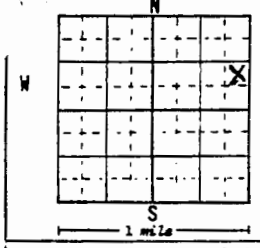
1. LOCATION OF WELL

County Name: Hennepin

Township Name	Township Number	N or S	Range Number	E or W	Section No.	Fraction	¼	¼	¼
Plymouth	118	N	22	W	25	NE SE NE			

Distance and Direction from Road Intersections or Street Address and City of Well Location: 9620 – 25th Ave. No. Plymouth

Show exact location of well in section grid with "X." Sketch map of well location.



Addition Name:

Block Number:

Lot Number:

3. PROPERTY OWNER'S NAME

Address: Sherman Goodmanson, 9620 – 25th Ave. No., Plymouth, Minn. 120

4. WELL DEPTH (completed): 218 ft. Date of Completion: July 28, 1978

5. 1☐ Cable tool 4☐ Reverse 7☐ Driven 10☐ Dug
2☐ Hollow rod 5☐ Air 8☐ Bored 11☐
3☒ Rotary 6☐ Jetted 9☐ Power Auger

6. USE
1☒ Domestic 4☐ Public Supply 7☐
2☐ Irrigation 5☐ Municipal 8☐
3☐ Test Well 6☐ Air Conditioning 9☐

7. CASING
1☐ Black 4☒ Threaded
2☐ Galv. 5☐ Welded
3☐ 6☐
Height: Above/Below Surface ____ ft.
Drive Shoe? Yes ☒
____ in. to ____ ft. Weight 11 lbs./ft.
____ in. to ____ ft. Weight ____ lbs./ft.
____ in. to ____ ft. Weight ____ lbs./ft.

8. SCREEN
Make: none
Type: 906 Dia. 6
Slot/Gauge: 148 Length: 4
Set between ____ ft. and 6 ft.
____ ft. and ____ ft.
____ ft. and ____ ft.
Or open hole from 174 ft. to 218

9. STATIC WATER LEVEL
25 ft. ☐ below land surface ☐ above Date Measured ____

10. PUMPING LEVEL (below land surface)
100 ft. after 3 hrs. pumping 40
____ ft. after ____ hrs. pumping ____

11. WELL HEAD COMPLETION
1☒ Pitless adapter 2☐ Basement offset

12. Well grouted? ☒ Yes ☐ No
1☐ Neat Cement 2☒ Bentonite 3☐ Cu. Yds. ____
Depth: from ____ ft. to ____ ft.
from ____ ft. to ____ ft.

13. Nearest sources of possible contamination
____ feet ____ direction
Well disinfected upon completion? Yes ☐ No ☐

14. PUMP
Date Installed ____
☐ Not installed
Manufacturer's Name: Red Jacket
Model Number ____ HP 1½ Volts 230
Length of drop pipe 60 ft. capacity 10
Material of drop pipe steel
Type: 1☒ Submersible 3☐ L. S. Turbine 5☐ Reciprocating
2☐ Jet 4☐ Centrifugal 6☐

2. FORMATION LOG	COLOR	HARDNESS OF FORMATION	FROM	TO
Clay QTUG-CLAY	Gray	hd	1	27
Gravel QFW-GRVL		Soft	27	42
Clay QTUB-CLAY	Brown	hd	42	81
Clay QTUG-CLAY	Gray	"	81	107
Clay QTUR-CLAY	Red	"	107	122
Shale OSTP-SHLE	Blue	"	142	168
Sandrock OSTP-SNDS	White	"	168	184
Sandrock " "	Red - blue	"	184	199
Sandrock " "	White	"	199	218
Rock very hard			184 – 199	
very little cuttings				
118-22-25 AAACDDD				
Elev. 906 ± 5				
218				
Aquifer: Basal Sand				

CODED

LOCATED BY
1 - ☐ Interpolation
2 - ☐ Name on Mailbox
3 - ☐ Location Book
4 - ☐ Info. From Owner
5 - ☐ Info. From Neighbor
7 - ☐ Other ____
☐ Can't Locate State Why

Use a second sheet, if needed.

REMARKS, ELEVATION, SOURCE OF DATA, etc.

16. WATER WELL CONTRACTOR'S CERTIFICATION

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

MORK WELL COMPANY 02133
Licensee Business Name License No.

Address: 7303 – 185th Ave. NW Elk River

Signed ____ Date ____
Authorized Representative

WATER WELL RECORD

Minnesota Statutes 156A.01 to 08

for Water Sample

County Name: HENNEPIN

Township Name: PLYMOUTH | Township Number: 118 N/S | Range Number: 22 E/W | Section No.: 25 | Fraction: se ¼ ne ¼ ne ¼

Distance and Direction from Road Intersections or Street Address and City of Well Location

9610 25th Ave N Plymouth

Exact location of well in section grid with "X"

N / W / E / S; 1 mile; ½ mi.

Addition Name:

Block Number:

Lot Number:

Sketch map of well location.

3. PROPERTY OWNER'S NAME: RON GRIDLEY

Address: 4903 S Cedar Lake Rd MPLS, MN 55416

12 DC

4. WELL DEPTH (completed): 230 1 ft. | Date of Completion: 26FEB79

5. [1] Cable tool [2] Hollow rod [3] Rotary [4] Reverse [5] Air [6] Jetted [7] Driven [8] Bored [9] Power Auger [10] Dug [11] _____

6. USE: [1] Domestic [2] Irrigation [3] Test Well [4] Public Supply [5] Municipal [6] Air Conditioning [7] Industry [8] Commercial [9] _____

7. CASING: [1] Black [3] Threaded [2] Galv. [5] Welded [3] Plastic [6] _____ | HEIGHT: Above/Below | Surface: one ft. | Drive Shoe? Yes X No

4 in. to 195 ft. Weight 10.79 lbs./ft.

_____ in. to _____ ft. Weight _____ lbs./ft.

_____ in. to _____ ft. Weight _____ lbs./ft.

HOLE DIAM: _____ in. to _____ ft.; _____ in. to _____ ft.; _____ in. to _____ ft.

8. SCREEN: Make _____ | Or open hole from 195 ft. to 230 ft.

Type _____ Dia. _____

Slot/Gauze _____ Length _____

Set between _____ ft. and _____ ft.

_____ ft. and _____ ft.

_____ ft. and _____ ft.

FITTINGS:

9. STATIC WATER LEVEL: 54 ft. [1] below land surface [2] above | Date Measured 26FEB79

10. PUMPING LEVEL (below land surface)

_____ ft. after 3 hrs. pumping air 80 g.p.m.

_____ ft. after _____ hrs. pumping _____ g.p.m.

11. WELL HEAD COMPLETION: [1] Pitless adapter [2] Basement offset [3] At least 12" above grade

12. Well grouted? [1] Yes [2] No | Cu. Yds. _____

[1] Neat Cement [2] Bentonite [3] _____

Depth: from _____ ft. to _____ ft.

from _____ ft. to _____ ft.

13. Nearest source of possible contamination: _____ feet _____ direction _____ type

Well disinfected upon completion? Yes No

14. PUMP: Date installed 8MAR79 [ ] Not installed

Manufacturer's Name: RED JACKET Jacuzzi

Model Number: 5S4J9-S1 HP ½ Volts 115

Length of drop pipe: 84 ft. capacity 8 g.p.m.

Material of drop pipe: 1" galv

Type: [1] Submersible [2] Jet [3] L. S. Turbine [4] Centrifugal [5] Reciprocating [6] _____

2. FORMATION LOG	COLOR	HARDNESS OF FORMATION	FROM	TO
CLAY QTUR-CLAY	YELLOW		0	13
CLAY & ROCKS QTUB-CLAY, COBL	DRK YELLOW		13	16
CLAY QTUR-CLAY	RED		16	24
GRAVEL QBUU-GRVL	DARK		24	46
CLAY QTUR-CLAY	RED		46	95
GRAVEL QBUU-GRVL	DARK		95	101
CLAY QTUB-CLAY	YELLOW		101	104
CLAY QTUG-CLAY	GRAY		104	119
GRAVEL QBUU-GRVL	DARK		119	124
CLAY & GRAVEL QTUG-CLAY, GRVL	GRAY		124	136
GRAVEL QBUU-GRVL	DARK		136	142
CLAY & GRAVEL QTUG-CLAY, GRVL	GRAY		142	167
SHALE OSTP-SHLE	WHITE		167	176
SHALE OSTP-SHLE	BLUE		176	185
SHALE OSTP-SHLE	RED		185	192
SHALE & SANDSTONE OSTP-SHLE, SNDS	WHITE		192	230

Add: OSTP-OSTP

118-22-25

WADLEC

Elev 909 ±

T.D. 230

ELEV. 909

16/7/8/4/1

ARKS. ELEVATION, SOURCE OF DATA, etc. (Use a second sheet, if needed)

LOCATED BY

1 - ✓ Address Verification

2 - ☐ Name on Mailbox

3 - ☐ Tax Book

4 - ☐ Plat Book

5 - ☐ Info From Owner

6 - ☐ Info From Neighbor

7 - ☐ Other _____

☐ Can't Locate State Why

15. WATER WELL CONTRACTOR'S CERTIFICATION

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

E. H. RENNER & SONS INC 02015

Licensee Business Name / License No.

Address 5300 Industry Ave NW ANOKA, MN 55303

Signed _____ Date 12MAR79

Authorized Representative

_____ Date 12MAR79

Name of Driller

MINN. GEOLOGICAL SURVEY COPY

5/74 30M
7/76 30M
7/78 30M

2D-17

Crystal 20360 5"

120'c

EMPLOYER John Hedrofors 8133-32 ave nth

WEEK ENDING Aug 29 1942 WEEK No.

DAY OF WEEK	BEFORE NOON IN HR.	BEFORE NOON IN MIN.	BEFORE NOON OUT HR.	BEFORE NOON OUT MIN.	AFTERNOON IN HR.	AFTERNOON IN MIN.	AFTERNOON OUT HR.	AFTERNOON OUT MIN.	EVENING IN HR.	EVENING IN MIN.	EVENING OUT HR.	EVENING OUT MIN.	TOTAL TIME EACH DAY REGULAR	TOTAL TIME EACH DAY O'TIME
SUNDAY	1	30												
MONDAY	2	8	5	4	5	58	screen							
TUESDAY	7	8	Landscape										QUOTE	D-130
WEDNESDAY	9	0	Grade Level											
THURSDAY	2	0	open											
FRIDAY														
SATURDAY														
OTHER INFORMATION												TOTAL FOR WEEK		

I hereby certify that the above is a true report of hours of my employment during said week, to comply with the Wage and Hour Division of the Fair Labor Standards Act of 1938.

Date Reported Aug 31 1942 Signature A Hakonson

118-21-19 dr b Apb

Elev. 965±5

DRFT Diff

P3/835

Aqufr

QUOTE

QUOTE

203801

120c

122

Osec A

WELL LOG

Aamot Well Drilling Co., Inc.

Well Owner: Hirsch, Richard

Location: 202 31st ave. No. Brooklyn Park

Date Completed: 9/20/61 Driller: Alfred Adams

Depth			Description of Formation	
0'	to 21	CLAY	Yellow Clay	QTUB
21	to 92	GRVL, COBL	Coarse gravel & rocks	QFUU
92	to 52	SAND	Fine grey sand	QFUB
52	to 101	GRVL	Coarse gravel	QFUU
101	to 140	HDPN	Hardpan	QTUU
140	to 177	SAND	Fine red sand	QFUR
177	to 182	SAND	Grey coarse sand B/783	QFUG
	to		118-21-19 dab cdb	
	to		Elev. 965±5'	
	to		182 / 783	

PLTB

Aquifer QBAA-QBAA

SIZES AND MATERIALS USED

Top Casing Line: Inside Diameter 3 in. Wt. per ft. ____ lbs.

Depth 178 ft. ____ in.

Any Reduced Casing Sizes ____

Total Depth to bottom of Casing 178 ft. ____ in.

Total Depth to bottom of Well 182 ft. ____ in.

Depth measured from: Ground Water level: 100'

Screened Well: Size of Screen: Diam. 1¼ in. Length 5 ft. Slot 40 gauge

Make of Screen Clayton Mark Metal ____

Fittings ____

CODED

Rock Well: Open Borehole ____ inches diam. ____ ft. deep below casing

Test data: 20 (gpm) (gph) ____ ft. drawdown. Pumped for 3¼ hrs.

Test Pump: ____

Tot. Len. of Setting: ____

NOTES: ____

203905

1000

A 104

(D) 560

Has Log
sent in 11-9-61

WELL LOG

Aamot Well Drilling Co., Inc.

Well Owner: [illegible]

Location: 3031 [illegible] New Hope

Date Completed: 10-4-61 Driller [illegible]

Depth			Description of Formation	
0'	to 75	clay	[illegible]	QTUU
75	to 85	SAND	[illegible]	QFUU
85	to 115	SAND	[illegible]	QFUU
115	to 125	HDPN SILT	[illegible]	QTUU
125	to 126	clay	[illegible]	QTUR
126	to 131	HDPN ~~SILT~~	[illegible]	QTUU
131	to 145	SAND, clay	[illegible]	QUUR QFUU B/600
145	to 150	SAND	[illegible]	QFUU
___	to ___		118-21-19 dbc AAd	
___	to ___		Elev. 950±5'	

F. 3

SIZES AND MATERIALS USED

Top Casing Line: Inside Diameter 3 in. Wt. per ft. ___ lbs.

Depth 145 ft. ___ in.

Any Reduced Casing Sizes ___

Total Depth to bottom of Casing 145 ft. ___ in.

Total Depth to bottom of Well 150 ft. ___ in.

Depth measured from: [illegible] Water level: [illegible]

Screened Well: Size of Screen: Diam. [illegible] in. Length 6 ft. Slot [illegible]

Make of Screen [illegible] Metal [illegible]

Fittings [illegible]

COPIED

Rock Well: Open Borehole ___ inches diam. ___ ft. deep below casing

Test data: 10-11-61 (gpm) [illegible] (gph) ft. drawdown. Pumped for 4 hrs.

Test Pump: 3 hp Aermotor [illegible]

Tot. Len. of Setting: 115 ft

NOTES: ___

Aquifer
QBAA-QBAA

203804

need address

120C

10 S

A055

WELL LOG

Aamot Well Drilling Co., Inc.

Well Owner: Richard Henderson

Location: 3025 Kuskokwim YUKON Nr. New Hope

Date Completed: 4-28-61 Driller: Jack Wren

Depth			Description of Formation	
0'	to 75'	CLAY, GOBL	Clay and Rock	QTUU
75'	to 115'	GRVL, GOBL	Ground Rock	QFUU
115'	to 144'	CLAY GRVL	Clay and Gravel	QUUU
144'	to 151'	SAND	Sand	QFUU
151'	to 168'	SAND	Coarse sand	QFUU
	to			
	to		11S-21-19 dbcAda	
	to		Elev: 945±5'	
	to		168	
	to		777	

SIZES AND MATERIALS USED

Top Casing Liner Inside Diameter 3 in. Wt. per ft. ____ lbs.

Depth 162 ft. ____ in.

Any Reduced Casing Sizes ____

Total Depth to bottom of Casing 162 ft. ____ in.

Total Depth to bottom of Well 168 ft. ____ in.

Depth measured from Ground Pit Water level: 78

Screened Well: Size of Screen: Diam. 1 1/4 in. Length 4 ft. Slot 10

Make of Screen Johnson Metal galv

Fittings 4' coupling with end point

Rock Well: Open Borehole ____ inches diam. ____ ft. deep, below casing

Test data: ____ (gpm) ____ ft. drawdown. Pumped for ____ hrs.
(gph)

Test Pump: ____

Tot. Len. of Setting: ____

NOTES: ____

202805 A(69) 120C

WELL LOG

Aamot Well Drilling Co., Inc.

Well Owner: Dick Hirsch

Location: 3013 Aquila Ave No. Big Hop

Date Completed: _____ Driller: Floyd Tuttle

Depth			Description of Formation	
0'	to 58'	CLAY	Clay	QTUU
58	to 147	SAND	Sand	QFUR
147	to 154	SAND, GRVL	Sand & Gravel	QFUU
154	to 162	SAND, GRVL, COBL	Soft and Hard Gravel	QFUU
____	to ____			
____	to ____			
____	to ____			
____	to ____			
____	to ____			
____	to ____			

FL

118-21-19 dbc cbb

Elev. 9501 5'

154

796

Aquifer QBUA-QB

SIZES AND MATERIALS USED

Top Casing Line: Inside Diameter 3 in. Wt. per ft. _____ lbs.

Depth _____ ft. _____ in.

Any Reduced Casing Sizes _____

Total Depth to bottom of Casing 159 ft. _____ in.

Total Depth to bottom of Well 162 ft. _____ in.

Depth measured from: ground Water level: 90'

Screened Well: Size of Screen: Diam. _____ in. Length _____ ft. Slot _____

Make of Screen _____ Metal _____

Fittings _____

Rock Well: Open Borehole _____ inches diam. _____ ft. deep below casing

Test data: _____ (gpm) _____ ft. drawdown. Pumped for _____ hrs.
(gph)

Test Pump: _____

Tot. Len. of Setting: _____

NOTES: _____

CODED

120C

203806

117

FHA Log Shelled 0550 Sent 2-16-62

WELL LOG

Aamot Well Drilling Co., Inc.

Well Owner: Richard Quick

Location: [illegible]

Date Completed: [illegible] Driller: [illegible]

Depth		Description of Formation		
0'	to [illegible]	CLAY	Clay	QTUU
42	to [illegible]	CLAY	Clay	QTUU
[illegible]	to 95	SAND	[illegible]	QFUU
98	to 106	SAND GRVL	[illegible] B/849	QFUU
____	to ____			
____	to ____		118-21-19 dbd cdd	
____	to ____		Elev. 955±5'	
____	to ____			
____	to ____			
____	to ____			

Aquifer QBUA-QBUA

CODED

SIZES AND MATERIALS USED

Top Casing Line: Inside Diameter 3 in. Wt. per ft. ____ lbs.

Depth ____ ft. ____ in.

Any Reduced Casing Sizes ____

Total Depth to bottom of Casing 103 ft. ____ in.

Total Depth to bottom of Well 106 ft. ____ in.

Depth measured from: ground Water level: [illegible]

Screened Well: Size of Screen: Diam. 1½ in. Length 3 ft. Slot 15

Make of Screen Johnson Metal ____

Fittings ____

Rock Well: Open Borehole ____ inches diam. ____ ft. deep below casing

Test data: [illegible] (gpm) 15 ____ ft. drawdown. Pumped for 1½ hrs.
~~(gph)~~

Test Pump: ____

Tot. Len. of Setting: ____

NOTES: ____

1A-25

MILLER-DAVIS CO., MINNEAPOLIS 8478-C

EMPLOYER Bradt & Anderson

WEEK ENDING 9-22 19 61 WEEK No.

DAY OF WEEK	BEFORE NOON IN HR.	BEFORE NOON IN MIN.	BEFORE NOON OUT HR.	BEFORE NOON OUT MIN.	AFTERNOON IN HR.	AFTERNOON IN MIN.	AFTERNOON OUT HR.	AFTERNOON OUT MIN.	EVENING IN HR.	EVENING IN MIN.	EVENING OUT HR.	EVENING OUT MIN.	TOTAL TIME EACH DAY REGULAR	TOTAL TIME EACH DAY O'RTIME
SUNDAY														
MONDAY														
TUESDAY														
WEDNESDAY														
THURSDAY														
FRIDAY														
SATURDAY														
OTHER INFORMATION												TOTAL FOR WEEK		

I hereby certify that the above is a true report of hours of my employment during said week, to comply with the Wage and Hour Division of the Fair Labor Standards Act of 1938.

Date Reported 9-22 19 61 Signature H Halverson

118-21-30 bcdbb

Elev. 935±5'

A-25 Golden Valley 2034

Q
#4
C44

MILLER-DAVIS CO., MINNEAPOLIS 6678-C

EMPLOYEE Gordy Burandt Feb. 28, 63

WEEK ENDING 1913 Independence 19 WEEK No.

DAY OF WEEK	BEFORE NOON IN HR.	BEFORE NOON IN MIN.	BEFORE NOON OUT HR.	BEFORE NOON OUT MIN.	AFTERNOON IN HR.	AFTERNOON IN MIN.	AFTERNOON OUT HR.	AFTERNOON OUT MIN.	EVENING IN HR.	EVENING IN MIN.	EVENING OUT HR.	EVENING OUT MIN.	TOTAL TIME EACH DAY REGULAR	TOTAL TIME EACH DAY O'RTIME
SUNDAY	109' Pera													
MONDAY	75' To water												QUUU	O-109
TUESDAY	1¼-10 set Johnson Screen													
WEDNESDAY	2" Leader Rope Seal, 6½' Overall													
THURSDAY	20 GPM													
FRIDAY	Find Formation													
SATURDAY														
OTHER INFORMATION													TOTAL FOR WEEK	

DRFT Drift
D/C51
After QUUU-QUUU

CODED

I hereby certify that the above is a true report of hours of my employment during said week, to comply with the Wage and Hour Division of the Fair Labor Standards Act of 1938.

Date Reported [illegible] 19 Signature

118-21-30 bcc cAb

Elev. 960±5'

14-25 Q5 Golden Valley

118-21-30 bcc cbd

Elev. 955

MILLER-DAVIS CO., MINNEAPOLIS 667B-C

EMPLOYEE [illegible]

WEEK ENDING [illegible] WEEK No. [illegible]

DAY OF WEEK	BEFORE NOON IN HR.	BEFORE NOON IN MIN.	BEFORE NOON OUT HR.	BEFORE NOON OUT MIN.	AFTERNOON IN HR.	AFTERNOON IN MIN.	AFTERNOON OUT HR.	AFTERNOON OUT MIN.	EVENING IN HR.	EVENING IN MIN.	EVENING OUT HR.	EVENING OUT MIN.	TOTAL TIME EACH DAY REGULAR	TOTAL TIME EACH DAY O'TIME
SUNDAY	10	[illegible]												
MONDAY	[illegible]										QUIT		8-100	Drift D
TUESDAY	[illegible]													B/855
WEDNESDAY	8	[illegible]												
THURSDAY	40	[illegible]												
FRIDAY	[illegible]													
SATURDAY														
OTHER INFORMATION											TOTAL FOR WEEK			

Apply- QUIT QUIT

I hereby certify that the above is a true report of hours of my employment during said week, to comply with the Wage and Hour Division of the Fair Labor Standards Act of 1938.

Date Reported 3-23 1961 Signature [illegible]

MILLER-DAVIS CO., MINNEAPOLIS 6575-C

EMPLOYEE Brandt Anderson 2013 Tallyho

WEEK ENDING Oct 18 19 62 WEEK No.

DAY OF WEEK	BEFORE NOON IN HR.	BEFORE NOON IN MIN.	BEFORE NOON OUT HR.	BEFORE NOON OUT MIN.	AFTERNOON IN HR.	AFTERNOON IN MIN.	AFTERNOON OUT HR.	AFTERNOON OUT MIN.	EVENING IN HR.	EVENING IN MIN.	EVENING OUT HR.	EVENING OUT MIN.	TOTAL TIME EACH DAY REGULAR	TOTAL TIME EACH DAY O'RTIME
SUNDAY	88		ft											
MONDAY	20 x 48 x 60										QUUU		C-58 Draft	
TUESDAY	14"		Ladder											B/737
WEDNESDAY	20		Sand											
THURSDAY	Sand and gravel													
FRIDAY	59 ft. Fdn													
SATURDAY														
OTHER INFORMATION													TOTAL	

CODED

I hereby certify that the above is a true report of hours of my employment during said week, to comply with the Wage and Hour Division of the Fair Labor Standards Act of 1938.

Date Reported Oct 22 19 62 Signature

Apt 6 QUUU

QUUU

118-21-30 bcd bAb

Elev. 925 ±5'

MILLER-DAVIS CO., MINNEAPOLIS 667B-C

EMPLOYEE Burandt-Anderson 2016 Independence Ave.

WEEK ENDING Aug. 18 1961 WEEK No.

DAY OF WEEK	BEFORE NOON IN HR.	BEFORE NOON IN MIN.	BEFORE NOON OUT HR.	BEFORE NOON OUT MIN.	AFTERNOON IN HR.	AFTERNOON IN MIN.	AFTERNOON OUT HR.	AFTERNOON OUT MIN.	EVENING IN HR.	EVENING IN MIN.	EVENING OUT HR.	EVENING OUT MIN.	TOTAL TIME EACH DAY REGULAR	TOTAL TIME EACH DAY O'TIME
SUNDAY	3 inch				101 feet deep									
MONDAY	Water level				63						QUUU		0-181 Draft	
TUESDAY	Pumped at				70									
WEDNESDAY	GPM 15+													
THURSDAY	Screen 50 ft				2 x 48									
FRIDAY	Leader + packer				8"									
SATURDAY														

OTHER INFORMATION

I hereby certify that the above is a true report of hours of employment during said week, to comply with the Wage and Hour Division of the Fair Labor Standards Act of 1938.

Date Reported Aug 18 1961 Signature

118-21-30 bcc Abb
Elev. 955 ± 5'

MILLER-DAVIS CO., MINNEAPOLIS 667B-C

EMPLOYEE Brandt + anderson

WEEK ENDING 9-17-61 19__ WEEK No. _____

DAY OF WEEK	BEFORE NOON IN HR.	BEFORE NOON IN MIN.	BEFORE NOON OUT HR.	BEFORE NOON OUT MIN.	AFTERNOON IN HR.	AFTERNOON IN MIN.	AFTERNOON OUT HR.	AFTERNOON OUT MIN.	EVENING IN HR.	EVENING IN MIN.	EVENING OUT HR.	EVENING OUT MIN.	TOTAL TIME EACH DAY REGULAR	TOTAL TIME EACH DAY O'TIME
SUNDAY	8	9												
MONDAY	9	0	5	00	6	00					Quit		10-8	
TUESDAY	12		Gaden											
WEDNESDAY														
THURSDAY														
FRIDAY														
SATURDAY														
OTHER INFORMATION												TOTAL FOR WEEK		

COPIED

I hereby certify that the above is a true report of hours of employment during said week, to comply with the Wage and Hour Division of the Fair Labor Standards Act of 1938.

Date Reported 9-22 1961 Signature _____

118-F1-30 bcd bbc

Elev. 940±5'

(Osseo) 120

E. H. RENNER & SONS WELL COMPANY

7700 HIGHWAY No. 7 ST. LOUIS PARK, MINNESOTA

WELL LOG

Date Started Dec. 28 1954 Date Completed Dec. 29 1954

OWNER HILLMAN PLUMBING COMPANY

ADDRESS 4129 Broadway Ave. N.

JOB LOCATION: 1916 Hillsboro Rd. J-6

Description of Property on which Drilling was done

The ____ of Sec. ____ Twp. ____ Elv. ____

Lot ____ Block ____ in the City of Golden Valley

County of Hennepin State of Minn.

Cased with 3" API Seamless Blk. Pipe, ____ feet of Casing used.
TYPE AND SIZE

Total Depth of Well 92 Feet of Open Hole Screen

Finished in Sand Water Level 68

Tested at 5 gallons per ____ min. Draw Down of L.D.'s Feet

Screen Used 2 C.M. Check Valve 60 2016
SIZE MAKE SLOT NUMBER

Pump: Make Demming H.P. 3/4 Type Jet

Drop Pipe 70 feet Size 1½ Capacity of Pump 5 G.P.M.

KIND OF FORMATION	COLOR OF FORMATION	STARTED DEPTH	ENDED DEPTH	TOTAL THICKNESS OF FORMATION	REMARKS
Clay	Brown	0	45	CLAY	QTUB 118-21-30
Pack Gravel	Dark	45	64	GRVL	QFW BCDBDC
Clay, Sand and Stone (layered)	Brown	64	92	CLAY, SAND & STONE	QBUB Elev. 950±5
					Aquifer QBUA-QBUA

1-25

Golden Valley

A 2053/40

120 C

EMPLOYER Brandt + Sandman 1909 - Gettysburg 2th

WEEK ENDING Sept 14 1962 WEEK No.

DAY OF WEEK	BEFORE NOON IN HR.	BEFORE NOON IN MIN.	BEFORE NOON OUT HR.	BEFORE NOON OUT MIN.	AFTERNOON IN HR.	AFTERNOON IN MIN.	AFTERNOON OUT HR.	AFTERNOON OUT MIN.	EVENING IN HR.	EVENING IN MIN.	EVENING OUT HR.	EVENING OUT MIN.	TOTAL TIME EACH DAY REGULAR	TOTAL TIME EACH DAY O'TIME
SUNDAY	17	7	47											
MONDAY	20	X	54	X	60	sum							QUUU	0-17
TUESDAY	14"	leads												
WEDNESDAY	15'	water												
THURSDAY	20	gyp												
FRIDAY	Sand and gravel													
SATURDAY														
OTHER INFORMATION												TOTAL FOR WEEK		

I hereby certify that the above is a true report of hours of my employment during said week, to comply with the Ware and Hour Division of the Fair Labor Standards Act of 1938.

Date Sept 19 1962 Signature

COPIED

Draft

Andu QUUU-QUUC

21-30 bcd cAd

Elev 935±5'

1A-25

MILLER-DAVIS CO., MINNEAPOLIS 647B-C

EMPLOYEE Hoedy Burandt 1904 Hillsboro Ave No

WEEK ENDING _____ 19____ WEEK No. _____

DAY OF WEEK	BEFORE NOON IN HR.	BEFORE NOON IN MIN.	BEFORE NOON OUT HR.	BEFORE NOON OUT MIN.	AFTERNOON IN HR.	AFTERNOON IN MIN.	AFTERNOON OUT HR.	AFTERNOON OUT MIN.	EVENING IN HR.	EVENING IN MIN.	EVENING OUT HR.	EVENING OUT MIN.	TOTAL TIME EACH DAY REGULAR	TOTAL TIME EACH DAY O'TIME
SUNDAY	94	Deer												
MONDAY	3[illegible]	Well												
TUESDAY		23' To water												
WEDNESDAY		1200 P.S.												
THURSDAY		2 [illegible] Screen												
FRIDAY		2' [illegible] Lake Sec												
SATURDAY														
OTHER INFORMATION												TOTAL FOR WEEK		

I hereby certify that the above is a true report of hours of my employment during said week, to comply with the Wage and Hour Division of the Fair Labor Standards Act of 1938.

Date Reported June 24 1964 Signature [illegible]

~~46 24~~ 94 30-bc-d-e-bc

Elev. 945.35'

DRFT Drift

Aquifer Quat Qua

14-25

Golden Valley

EMPLOYER Gordy Burandt, 1908 Hillsboro Ave No

WEEK ENDING _____ 19___ WEEK No. _____

DAY OF WEEK	MORNING IN HR.	MORNING IN MIN.	MORNING OUT HR.	MORNING OUT MIN.	AFTERNOON IN HR.	AFTERNOON IN MIN.	AFTERNOON OUT HR.	AFTERNOON OUT MIN.	EVENING IN HR.	EVENING IN MIN.	EVENING OUT HR.	EVENING OUT MIN.	TOTAL TIME EACH DAY REGULAR	TOTAL TIME EACH DAY O'TIME
SUNDAY	3'	Well												
MONDAY	97'	Deep											8 UUU	0-97
TUESDAY	74'	to	water											
WEDNESDAY	Roo	G.P.M.												
THURSDAY	2"-	50	GA.	screen					2"	leader				8 UUU-
FRIDAY			6"	Jet	2"-	50	ft	seal						8 UU
SATURDAY														
OTHER EXPLANATION												TOTAL FOR WEEK		

I hereby certify that the above is a true report of hours of my employment during said week, to comply with the Wage and Hour Division of the Fair Labor Standards Act of 1938.

19___ Signature Dale Juul

DFF-
Drift

COPIED

118-21-30bcdccb

Elev: 940±5'

MILLER-DAVIS CO., MINNEAPOLIS 667B-C

EMPLOYEE Brandt + anduran 9200 Earl st

WEEK ENDING Oct 16 1962 WEEK No.

DAY OF WEEK	BEFORE NOON IN HR.	BEFORE NOON IN MIN.	BEFORE NOON OUT HR.	BEFORE NOON OUT MIN.	AFTERNOON IN HR.	AFTERNOON IN MIN.	AFTERNOON OUT HR.	AFTERNOON OUT MIN.	EVENING IN HR.	EVENING IN MIN.	EVENING OUT HR.	EVENING OUT MIN.	TOTAL TIME EACH DAY REGULAR	TOTAL TIME EACH DAY O'RTIME
SUNDAY	8	9												
MONDAY	20	x	54	x	60						QUUU		0-89	Draft
TUESDAY	14	11	leadn											
WEDNESDAY	20	gpm												
THURSDAY	[illegible]													
FRIDAY														
SATURDAY														
OTHER INFORMATION											TOTAL FOR WEEK			

CODED

I hereby certify that the above is a true report of hours of my employment during said week, to comply with the Wage and Hour Division of the Fair Labor Standards Act of 1938.

Date Reported Oct 19 1962 Signature H. Hahnen

M. 616

W. 11-97
(Rev. 2-59)

203945 104B H05

MINNESOTA CONSERVATION DEPARTMENT
DIVISION OF WATERS

WELL LOG STATEMENT

File No. 422

Well No. 118-21-30cbb

MAIL REPORT PROMPTLY TO DIRECTOR, DIVISION OF WATERS, STATE OFFICE BLDG., ST. PAUL 1, MINN.

Location of Well Hennepin ~~County~~ Radio Station.

Hennepin County — Naper Road (County 18 & Medicine Lake) City or Town

Describe Further by Lot, Block, Nearest Highway, Street and Number

Locate Well on Plat of Section — Hopkins Quad

Sec. 6

Twp. ____

Range ____

Drilled for: Hennepin County Radio Station

Address (see above)

Driller Max Renner Well Co.

Address 118-21-30 cbb ddb
Elev. 940±5'

Date of Completion 1-49

Site ____ Upland, Valley, Hillside, Etc.

Type of Well ____ Dug, Driven, Bored, Drilled

Drill Rig Used ____ Solid Tool, Jet, Rotary

Diameter: Top 6" Bottom ____

Depth of Well 353'

Ground Elevation 940 Sea Level Datum or Given Distance Above or Below Road, Highway, Lake, Etc.

Height of Casing Above Ground

Quality of Water ____ (Hard or Soft, Fresh or Salty, Etc.)

Temperature of Water ____

Was Laboratory Analysis Made? ____

For What Purpose Will Water Be Used? ____

Is Well Pumped? ____ Pump Capacity ____ GPM

Was Well Sealed on Completion? ____

Does Well Overflow Without Pumping? ____ Yes or No

Natural Flow ____ GPM

What Pressure, or Head, at Ground Level? ____

Principal Aquifer Penetrated ____

REPORT OF FINAL PUMPING TEST

Date of Test ____

Duration of Test ____ Hrs. ____ Min.

Rate of Pumping ____ GPM

Static Water Level - ____ Ft.

Water Level While Pumping ____ Ft.

Drawdown ____ Ft.

Time Required for Recovery ____

Expected Average Yield ____ Gal. per day

If Other Tests Were Made, Give Details on Another Side

Were Measurements Made of Effect on Other Nearby Wells During Test? Give Details.

CODED

ABANDONED

1B-25

118-21-30 Cbd A66

Elev. 940±5'

Golden Valley

635

1048

203946

EMPLOYER Burandt Const. 1636 Gettysburg Ave No.

WEEK ENDING Dec. 12 1963 WEEK No.

DAY OF WEEK	BEFORE NOON IN HR.	BEFORE NOON IN MIN.	BEFORE NOON OUT HR.	BEFORE NOON OUT MIN.	AFTERNOON IN HR.	AFTERNOON IN MIN.	AFTERNOON OUT HR.	AFTERNOON OUT MIN.	EVENING IN HR.	EVENING IN MIN.	EVENING OUT HR.	EVENING OUT MIN.	TOTAL TIME EACH DAY REGULAR	TOTAL TIME EACH DAY O'TIME
SUNDAY														
MONDAY														
TUESDAY														
WEDNESDAY														
THURSDAY														
FRIDAY														
SATURDAY														
OTHER INFORMATION													TOTAL WEEK	

I hereby certify that the above is a true report of hours of my employment during said week, to comply with the Wage and Hour Division of the Fair Labor Standards Act of 1938.

Date Signed Dec. 17 1963 Signature [illegible]

DRF

Aquifer Recovery

1B-25

118-21-30 Cbd ACC

Elev. 930±5'

Golden Valley

203947

642

DRFT

Drift

Aquifer QUUU QUUC

HELLER-GUNN CO., MINNEAPOLIS 0175-C

EMPLOYER Burandt & Anderson

WEEK ENDING 1616 Gettysburg Ave N 19 63 WEEK No. 8-17-62

DAY OF WEEK	BEFORE NOON IN HR.	BEFORE NOON IN MIN.	BEFORE NOON OUT HR.	BEFORE NOON OUT MIN.	AFTERNOON IN HR.	AFTERNOON IN MIN.	AFTERNOON OUT HR.	AFTERNOON OUT MIN.	EVENING IN HR.	EVENING IN MIN.	EVENING OUT HR.	EVENING OUT MIN.	TOTAL TIME EACH DAY REGULAR	TOTAL TIME EACH DAY O'TIME
SUNDAY														
MONDAY														
TUESDAY														
WEDNESDAY														
THURSDAY														
FRIDAY														
SATURDAY														
OTHER INFORMATION													TOTAL WEEK	

I hereby certify that the above is a true report of hours of my employment during said week, to comply with the Wage and Hour Division of the Fair Labor Standards Act of 1938.

Signature Frank Clark

1B-25 Golden Valley Co. 203948 104B

SELLER-DAVIS CO., MINNEAPOLIS 6170-C

EMPLOYER Brandt & Anderson 16 [illegible] Gettysburg Ave. North

WEEK ENDING July 22 19 6 WEEK No.

DAY OF WEEK	BEFORE NOON IN HR.	IN MIN.	OUT HR.	OUT MIN.	AFTERNOON IN HR.	IN MIN.	OUT HR.	OUT MIN.	EVENING IN HR.	IN MIN.	OUT HR.	OUT MIN.	TOTAL TIME EACH DAY REGULAR	O'TIME
SUNDAY	14	5												
MONDAY	20	X	5	4	50	seven								
TUESDAY	14	"	Leader											
WEDNESDAY	5	5	pt	mstr										
THURSDAY	20	Gpm												
FRIDAY	Sand and Gravel													
SATURDAY														
OTHER INFORMATION													TOTAL FOR WEEK	

CODED

I hereby certify that the above is a true report of hours of my employment during said week, to comply with the Wage and Hour Division of the Fair Labor Standards Act of 1938.

Date Reported July 22 19 6 Signature [illegible]

640 H.Q

DRFT Quvu 0-105 Drift B/820

Aquifer Quvu-Quvu

118-21-30 cbd bdc

Elev. 925±5'

1B-25 Golden Valley 104B

SELLER-DAVIS CO., MINNEAPOLIS 6170-C

EMPLOYER Gordy Brandt 203949 (A)

WEEK ENDING 15th Gettysburg 19 Oct 16 WEEK No. 63

DAY OF WEEK	BEFORE NOON IN HR.	IN MIN.	OUT HR.	OUT MIN.	AFTERNOON IN HR.	IN MIN.	OUT HR.	OUT MIN.	EVENING IN HR.	IN MIN.	OUT HR.	OUT MIN.	TOTAL TIME EACH DAY REGULAR	O'TIME
SUNDAY	3"	well	9	0	2	T							Quvu	0-90
MONDAY														
TUESDAY	2	0	4	8	Leader		gauge							
WEDNESDAY														
THURSDAY	2	C.A.P.M.												
FRIDAY	5	5	2	T	to	water								
SATURDAY														
OTHER INFORMATION													TOTAL FOR WEEK	

I hereby certify that the above is a true report of hours of my employment during said week, to comply with the Wage and Hour Division of the Fair Labor Standards Act of 1938.

Date Reported 19 Signature

HQ 639

DRFT Drift

Aquifer Quvu-Quvu

CODED

11S-21-30 ccA dbc

W 41-97
(Rev. 2-59)

MINNESOTA CONSERVATION DEPARTMENT
DIVISION OF ~~WATERS~~

WELL LOG STATEMENT

Hopkins

118-21-35 ccc 8

RECEIVED
MAR 2 4 1959
DIVISION OF WATERS

File No.

Well No.

MAIL REPORT PROMPTLY TO DIRECTOR, DIVISION OF WATERS, STATE OFFICE BLDG., ST. PAUL 1, MINN.

Location of Well 1312 Independence Avenue

Hennepin (County) Minneapolis, Minnesota (City or Town)

Describe Further by Lot, Block, Nearest Highway, Street and Number

Locate Well on Plat of Section

SAME AS 424

Sec. 30 ccb

Twp. 118

Range 21

25 1-B

Drilled for: John Garrison

Address 4431 Garrison Lane

Minneapolis, Minnesota

Driller Joseph Eckes

Address Wayzata, Minnesota

Date of Completion October 1958

Site _____ (Upland, Valley, Hillside, Etc.)

Type of Well Drilled (Dug, Bored, Drilled)

Drill Rig Used Solid Tool (Solid Tool, Rotary)

Diameter: Top 3" Bottom 3"

Depth of Well 97'

Ground Elevation _____ (Sea Level Datum or Give Distance Above or Below R. R., Highway, Lake, Etc.)

Height of Casing Above Ground Well pit

Quality of Water _____ (Hard or Soft, Fresh or Salty, Etc.)

Temperature of Water _____

Was Laboratory Analysis Made? _____

For What Purpose Will Water Be Used? home

Is Well Pumped? yes Pump Capacity 20

Was Well Sealed on Completion? _____

Does Well Overflow Without Pumping? _____ (Yes or No)

Natural Flow _____ GPM

What Pressure, or Head, at Ground Level? _____

Principal Aquifer Penetrated _____

REPORT OF FINAL PUMPING TEST

Date of Test October 1958

Duration of Test 1 Hrs. 15 Min.

Rate of Pumping 20 GPM

Static Water Level 45 Ft.

Water Level While Pumping _____ Ft.

Drawdown _____ Ft.

Time Required for Recovery _____

Expected Average Yield _____ Gal. per day

If Other Tests were Made, Give Details on Another Sheet.

Were Measurements Made of Effect on Other Nearby Wells During Test? Give Details.

118-21-30 ccc Add.

Elev. 920 ± 5'

Hennepin Co well logs

CODED

THE DATA CONTAINED HEREIN IS CONFIDENTIAL AND IS TO BE USED FOR SCIENTIFIC STUDY ONLY BY DIV. OF WATERS IN ACCORDANCE WITH MSA 105.51.

1559

1B-25

118-21-30 ccc Add 104B

Elev. 910±5'

Golden Valley

A 203952

EMPLOYER G. BURANDT 1325 Hillsboro

WEEK ENDING _____ 19___ WEEK No. _____

DAY OF WEEK	BEFORE NOON IN HR.	BEFORE NOON IN MIN.	BEFORE NOON OUT HR.	BEFORE NOON OUT MIN.	AFTERNOON IN HR.	AFTERNOON IN MIN.	AFTERNOON OUT HR.	AFTERNOON OUT MIN.	EVENING IN HR.	EVENING IN MIN.	EVENING OUT HR.	EVENING OUT MIN.	TOTAL TIME EACH DAY REGULAR	TOTAL TIME EACH DAY O'TIME
SUNDAY	3	well												
MONDAY														
TUESDAY														
WEDNESDAY														
THURSDAY														
FRIDAY														
SATURDAY														
OTHER INFORMATION														

COPIED

DRFT Drift

OVER 0-93½

OSTP 93½-100 SST; OSP

910
94
816

Aquifer OSTP

I hereby certify that the above is a true report of hours of my employment during said week, to comply with the Wage and Hour Division of the Fair Labor Standards Act, 1938.

Date Reported Oct 20, 64 Signature _____

1B-25

104B

Golden Valley

A

EMPLOYER Gordy Burandt 203954

WEEK ENDING 1321 Hillsboro 19___ WEEK No. _____

DAY OF WEEK	BEFORE NOON IN HR.	BEFORE NOON IN MIN.	BEFORE NOON OUT HR.	BEFORE NOON OUT MIN.	AFTERNOON IN HR.	AFTERNOON IN MIN.	AFTERNOON OUT HR.	AFTERNOON OUT MIN.	EVENING IN HR.	EVENING IN MIN.	EVENING OUT HR.	EVENING OUT MIN.	TOTAL TIME EACH DAY REGULAR	TOTAL TIME EACH DAY O'TIME
SUNDAY	3	well	8	4pt	Ideal									
MONDAY														
TUESDAY	[illegible]	20	8	[illegible]	[illegible]	6½	[illegible]							
WEDNESDAY													OVER 0-84	
THURSDAY														
FRIDAY														
SATURDAY														
OTHER INFORMATION														

COPIED

DRFT Drift

Aquifer QUUU-QUUU

I hereby certify that the above is a true report of hours of my employment during said week, to comply with the Wage and Hour Division of the Fair Labor Standards Act, 1938.

Date Reported Oct 8 1964 Signature Duane Burandt

118-21-30 ccc dAA

Elev. 915±5'

No. 13629

203455
B 139

E. H. RENNER & SONS WELL COMPANY

7700 HIGHWAY NO. 7 ST. LOUIS PARK, MINNESOTA

WELL LOG

118-21-30 ccd A66

Date Started Nov. 5 195 5 Date Completed Nov. 7 195 5

OWNER J. A. KIMPTON

ADDRESS 1412 Gettysburg - Golden Valley No. 2 J-6 B-139

Description of Property on which Drilling was done

The _____ of Sec. _____ Twp. _____ Elv. _____

Lot _____ Block _____ in the City of Golden Valley

County of Hennepin State of Minn.

Cased with 3" T - C (TYPE AND SIZE), 54' 6" feet of Casing used.

Total Depth of Well 59 Feet of Open Hole _____

Finished in Sand Water Level 20'

Tested at 20 gallons per min. Draw Down of 0 Feet

Screen Used 6' (SIZE) 1¼ (MAKE) 60 (SLOT NUMBER)

Pump: Make Wards Shallow H.P. _____ Type _____

Drop Pipe _____ feet Size _____ Capacity of Pump _____ G.P.M.

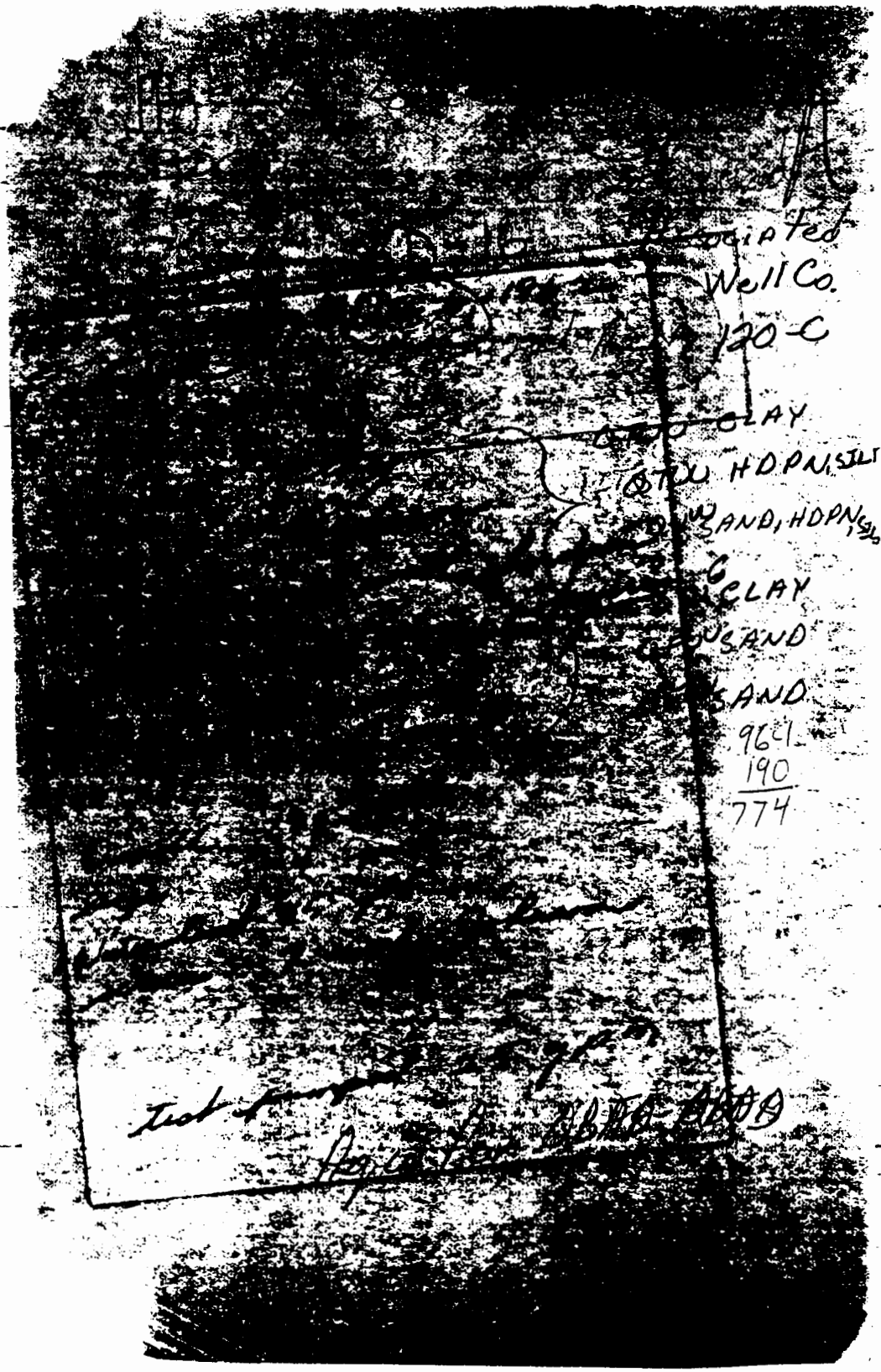
KIND OF FORMATION	COLOR OF FORMATION	STARTED DEPTH	ENDED DEPTH	TOTAL THICKNESS OF FORMATION	REMARKS
Clay CLAY	Yellow	0	40		QTUB
Hard Pan HDPN SILT	Brown	40	45		QTUB
Sand SAND	Brown	45	6[illegible]		QFUB

CODED

Aquifer

QBAA-QBAD

264365 ?


Well Co.
120-C
CLAY
HDPN, SILT
SAND, HDPN, SLT
CLAY,
SAND
SAND
961
190
774

118-22-24 DBCACD Elev 955± 20436

No. _____

E. H. RENNER & SONS WELL COMPANY
5465 Co. Rd. 18 North Minneapolis 55

INVOICES: 59
(Well) No. 59
(Pump) No. 058C3

Recheck

#39 WELL LOG

OK

Date Started July 20 19 71 Date Completed 8/3/ 19 71

Owner or Contractor Charles Peterson Address 10135 29th Avenue North

Job Location same

A-104

Lot _____ Block _____ Twp or city Plymouth County Hennepin State of Minnesota

Well:

Cased with 4" W & T Type and Size Ft. 181 Total Depth of Well 185 from grade

Feet of Open Hole 0 Finished in ground Water Level 70

Tested at 20 gallons per min. Drawn down of 5 feet.

Screen:

Size 4" Make Johnson Slot or Guage 18 Number _____

Pump:

Make Red Jacket H.P. 3/4 Type sub Tank Size 42

Motor Serial No. _____ Pump Serial No. _____ Drop Pipe 105' feet

Size 1" Capacity of pump _____ G.P.M. Date Installed _____

Baker Pitless

120-C

KIND OF FORMATION	COLOR OF FORMATION	STARTED DEPTH	ENDED DEPTH	TOTAL THICKNESS OF FORMATION	REMARKS
Clay, sand, & gravel	brown	0	47	CLAY, SAND, GRVL	QUUB 21-3 9-9
Sand cemented	brown	47	65	SAND	41-0 10-00 QFUB
Pack gravel dry	brown	65	71	GRVL	10-2 9-10 QFUB
Sand dry	brown	71	78	PLUS SAND	10-2 10-1 QFUB
Pack sand ground dry	brown	78	110	SAND	10-7 10-10 QFUB 112-7
Sand gravel	red	110	136	SAND, GRVL	11-0 QFUB 122-7 133-7
Clay sandy gravel	green	136	150	CLAY, GRVL	9-10 10-7-1/2 QUUU
Sand	gray	150	179	SAND	9-5 8-2-1/2 QFUB
Gravel	gray	179	185	GRVL	9-3 QFUB B/168
					953 185
				Aquifer	QBAA-QBAB

5D-16

118-22-24

DBCBAB

150-C

EARL WYATT

Elev. 957±5

Henry Goss Well Co. 204267

MILLER-DAVIS CO., MINNEAPOLIS 667B-C

EMPLOYEE 2935 Custer Lane, Plymouth

WEEK ENDING _____ 19____ WEEK No. _____

DAY OF WEEK	BEFORE NOON IN HR.	BEFORE NOON IN MIN.	BEFORE NOON OUT HR.	BEFORE NOON OUT MIN.	AFTERNOON IN HR.	AFTERNOON IN MIN.	AFTERNOON OUT HR.	AFTERNOON OUT MIN.	EVENING IN HR.	EVENING IN MIN.	EVENING OUT HR.	EVENING OUT MIN.	TOTAL TIME EACH DAY REGULAR	TOTAL TIME EACH DAY O'RTIME
SUNDAY	3"	Well												
MONDAY	78'	Dear											10-78	
TUESDAY	60	To Office												
WEDNESDAY	1200	Lbs.												
THURSDAY	2"-	Platform Mark												
FRIDAY	2"	Jerked Rear Seal, 6½' overall												
SATURDAY														
OTHER INFORMATION												TOTAL FOR WEEK		

Drift & Quvo DRF

I hereby certify that the above is a true report of hours of my employment during said week, to comply with the Wage and Hour Division of the Fair Labor Standards Act of 1938.

Date Reported _____ 19____ Signature _____

Aquifer QUUU-QUUS

Elev. 935±5 Depth 1961

Plymouth Well Co. 204267

1C-17, 18-25

Plymouth Well Co.

Well 3, Wisconsin

2235 - Plymouth

PITT

0-74 - QA

74-130 - QTUU CLAY

130-145 - QTUU CLAY SAND

145-160 - QTUU HORNSTO

160-170 - QUU SAND, CLAY

170-195 - QPU SAND

Aquifer QBAA-QRAS

Mark Well Co

Osseo

A

118-22-24
DDABAB
Elev. 961 ± 5
938

130 ft

ID-17 (298)

204370

Ellison Russ
Erickson Roger
1961 - 2 ft Casing

June 5 June 16, 69

901 ft well
60 ft water level
948 - Skinner Steel Screen 18 dia. 6' 6" OL
Installed June 26, 69
1-3/4 HP Deep Well Sub
42 Gal. Tank (Equate)
84 ft 1" galv. pipe
90 ft. # 12-3 Cable
1.5 HP 4" Pitless
84 ft 1" 2 wire Copper
30 ft. # 12-2 Cable

Howard

35 h.p.m

13 - 8 -

30 - 56 ft.	7 - 94 ft.	9 - 103 ft.	10 - 105 ft.	5 - 150 ft.	8 - 154 ft.

18 ft. clay RTW CLAY
13 ft. rocks - clay RTW ROCK, CLAY
30 ft. Rocks - clay RTW ROCK, CLAY
56 ft. hard gravel RTW HDPK
7 ft. muddy sand, gravel A FEW SAND, GRVL
9 ft. hard gravel RTW HDPK
10 ft. Gravel muddy A FEW GRVL
105 ft. Rock ledge A FEW BOULDERS
150 ft. muddy gravel A FEW GRVL
154 ft. Rocks - gravel A FEW BOULDERS GRVL
189 ft. muddy - gravel - water A FEW GRVL
201 ft. gravel - water A FEW GRVL

Aquifer, Q BUGA ABUG

938
201
737

961
201
761

Mork
Well Co

118-22-24
DDBBCC
Elev. 950±5

120-C OK

(299)

Osseo A

ID-17
204371

Omar Willard Artisian Well #1
2740 Nathan Lane

150 ft. 4" well
80 ft. water level
#948 Stainless Steel Screen 6" OL
4 x 2" lead seal
Installed & flow 24-71
1-½ hp. Sub. Air motor
4 x 2 gal tank w/ float
100 ft. 1" galv. pipe
100 ft. 12-3 cable
1 - 4" Pitless 12 ft 1" galv. K copper
12-3 wire.
25 g.p.m.

SAND, GRVL, CLAY
CLAY & SAND
GRVL, SAND & CLAY

QUUB 0 - 45 - Sand & gravel
Brown clay.
QTUB 45-96 - Brown clay
QUUR 96-151 - Reddish clay w/ sand mixed
QFUL 151-170 - Gravel & sand w/ water bearing

B/780

Ag utility DBBA-DBBB

CODED

450
170
280

DON STODOLA Well #3

Osseo

CARL HUTTEN
2520 Lancaster Lane mgls. Plymouth 50' to water
5-20-67
4" well 161' @ 4.00 644.00
Permit 15.00
Johnson SS screen 100.00
Pitless 100.00
3/4 HP sub & 42 gal tank 375.00
1234.00

204376

Paid in full
4/27/67

118-22-25 AAAbcd
Elev. 925±5'
170-C

4/4

2' Subsoil Clay
3' Gravel
5' T/190 #30STP SNDS

Aquifer: No Casing Record

CODED

925
161
764

50' to water
0-40 brown clay
40-135 red clay gravel
135-161 white sandstone

No. Budd

E. H. RENNER & SONS WELL COMPANY

5465 Co. Rd. 18 North Minneapolis 28

INVOICES:

(Well) No.

(Pump) No. A5660

WELL LOG

Date Started March 2 19 67 Date Completed March 10 19 67

Owner or Contractor Ronald C. Johnson Address 9605 A 24th. Ave. N. Mpls. 55427

Job Location Same 118-22-25 AAdaA

Elev. 905±5'

Lot ____ Block ____ Twp or city Plymouth County Hennepin State of Minnesota

A-52

Well:

Cased with 4" Black Seamless Type and Size Ft. 135 Total Depth of Well 139' from grade

Feet of Open Hole None Finished in Sandrock and gravel Static Water Level 22

Tested at 20 gallons per min. Drawn down of None feet.

CODED

Screen:

Size 3" x 5' Make Johnson Stainless Steel Slot or Guage 10 Number 746

Pump:

Make Aermotor H.P. ½ Type Sub. Tank Size 42

Motor Serial No. ____ Pump Serial No. S50LXPE 110 Drop Pipe 42 feet

Size 1" Capacity of pump 11 @ 50# G.P.M. Date Installed March 10, 1967

Well pit Original discharge 120-C

KIND OF FORMATION	COLOR OF FORMATION	STARTED DEPTH	ENDED DEPTH	TOTAL THICKNESS OF FORMATION	REMARKS
Clay	Yellow	0	29	29	QTUB CLAY
Fine sand	Brown	29	51	22	QFUB SAND
Gravel	Brown	51	56	5	QFUB GRVL
Sandy clay	Red	56	74	18	QTUR CLAY
Clay	Blue	74	96	22	QTUG CLAY
Muddy sand	Yellow	96	130	34	QFUB SAND MUD.
Sandrock and gravel	Yellow	130	139	9	OSP QFUB SAND, GRVL
			Hq Lifter		DBAARBAA

Mor K
Well Co.

204413

Hopkins

A

894

5/5/ May 16-66

9S-3E-17 2nd Ave. So.

1A-15

53 ft. 3" Well

2" S Screen #2854-60 gauge - 5'10"

17 ft. water level

118-22-25 dad. BBA

Elev. 895 ± 5'

104-B

Installed May 16-17-1966

1-3/4 hp. McDonald pump

42 gal Squatty Tank

31 ft 1¼" galv. pipe

1-3"-4 ft. Sand Filter

Roper. 9 ft 1¼" galv pipe 35 G.P.M.

X

- 32 - Clay
2-41 Sandy Clay
1-53 sandy gravel

TOPSOIL CLAY
ROCK SILT
GRAVEL SAND, GRVL

Aquifer ABBA-QBBA

CODED

206863

118-22-24 BCADCD

120-C

Elev. 945±5'

A

CODED 500 32 OK

OESCO PLYMOUTH

SD p 16

Well Address Northeast Plumbing Co. 10610A 32nd Avenue North	WELL RECORD 591
Driller's Signature: Vernon Lohse	Date: July 17, 1962 — Permit Number
Drilling Company: **Dependable Well Co.**	Address: **9743 Humboldt Ave. So.** — Telephone: **TU. 8-4303**

SIZE OF WELL	3 INCHES	WATER LEVEL	75 FEET
WELL DEPTH	151 FEET	DRAW DOWN	5 FEET
CASING DEPTH	147 FEET	CAPACITY GALLONS	1000 PER/HR.

DEPTH OF IMPERVIOUS FORMATION 6 FEET

SAND POINT 3 FEET ... INCHES/BY 1½ INCHES

MAKE AND TYPE MATERIAL: Johnson 10 slot steel

CASED WITH
WELDED JOINT ( )
SCREWED JOINT (X)

Remarks:

EnecoTech

RECEIVED

MAR 18 1991

March 7, 1991

711-015

Mr. Mike Semsch
Executive Vice President
Real Estate Equities
325 Cedar Street, Suite 400
St. Paul, Minnesota 55101

Dear Mr. Semsch:

The purpose of this letter is to request your permission to access the Hillsboro Court Apartment property for the purpose of collecting near-surface soil and groundwater samples. Your cooperation will be greatly appreciated.

Allow me to describe: 1) some of the services that our company provides, 2) our client and their involvement in this project, 3) a brief history of the soil and groundwater investigations that we have performed near your property, 4) the purpose of the soil and groundwater samples that we wish to collect, and 5) a description of the activities that will be performed on your property if you agree to grant access.

EnecoTech is an environmental consulting firm that provides a diversified range of services for government and private industry. In general, we work toward helping our clients resolve their environmental issues by minimizing the effects of environmental problems to public health and safety and by helping our clients comply with federal and state regulations.

Since April, 1990, EnecoTech has been performing soil and ground water investigations on the gasoline station at 9456 Medicine Lake Road, New Hope, Minnesota for Sinclair Marketing (Sinclair). Soil samples have been collected from 6 inch diameter boreholes from depths of 2 to 61 feet below the ground surface. Groundwater samples have been collected from 2 inch diameter monitoring wells. All of these samples were analyzed for gasoline and diesel fuel constituents.

The results of this investigation will be submitted to the Minnesota Pollution Control Agency (MPCA). To complete our investigations per MPCA regulations, soil and groundwater quality data will have to be collected beyond the gasoline station property boundaries. Therefore, we are requesting your permission to perform field activities on your property. The enclosed map shows the location of the proposed soil boring.

Before starting the investigations on your property, the underground utilities will be located through Gopher One-Call (natural gas, electricity, water, sewer, and telephone). Drilling locations will be chosen that will not interfere with the underground utilities. Futhermore, drilling locations will be chosen that will cause a minimum of inconvenience to you.

A small truck mounted auger rig will perform the drilling operations. Two 6 inch diameter boreholes will be advanced to a depth of approximately 35 feet. After the drilling has been completed, the holes will be filled with cement grout and the alley road surface will be patched. Any excess soil at the surface that is the result of drilling will be removed from the site.

EnecoTech and its subcontractors are fully insured for property damage and personal injury.

We anticipate that these investigations will be made in March or April of this year. You will be notified in advance if you agree to grant access. The field operations should not take any longer than one working day.

We have enclosed a property access permission form that we request you sign and return to the letterhead address. If you would like to receive a copy of the data generated from the field activities on your property, a copy will be provided to you upon completion of the laboratory work and report preparation. Please indicate on the enclosed form if you wish to receive this material.

We thank you again for your time and cooperation in this matter. Please feel free to call Kelly Kading or myself at 854-5513 if you have any questions.

Sincerely,

ENECOTECH MIDWEST, INC.

James A. Berg
Sr. Project Hydrogeologist

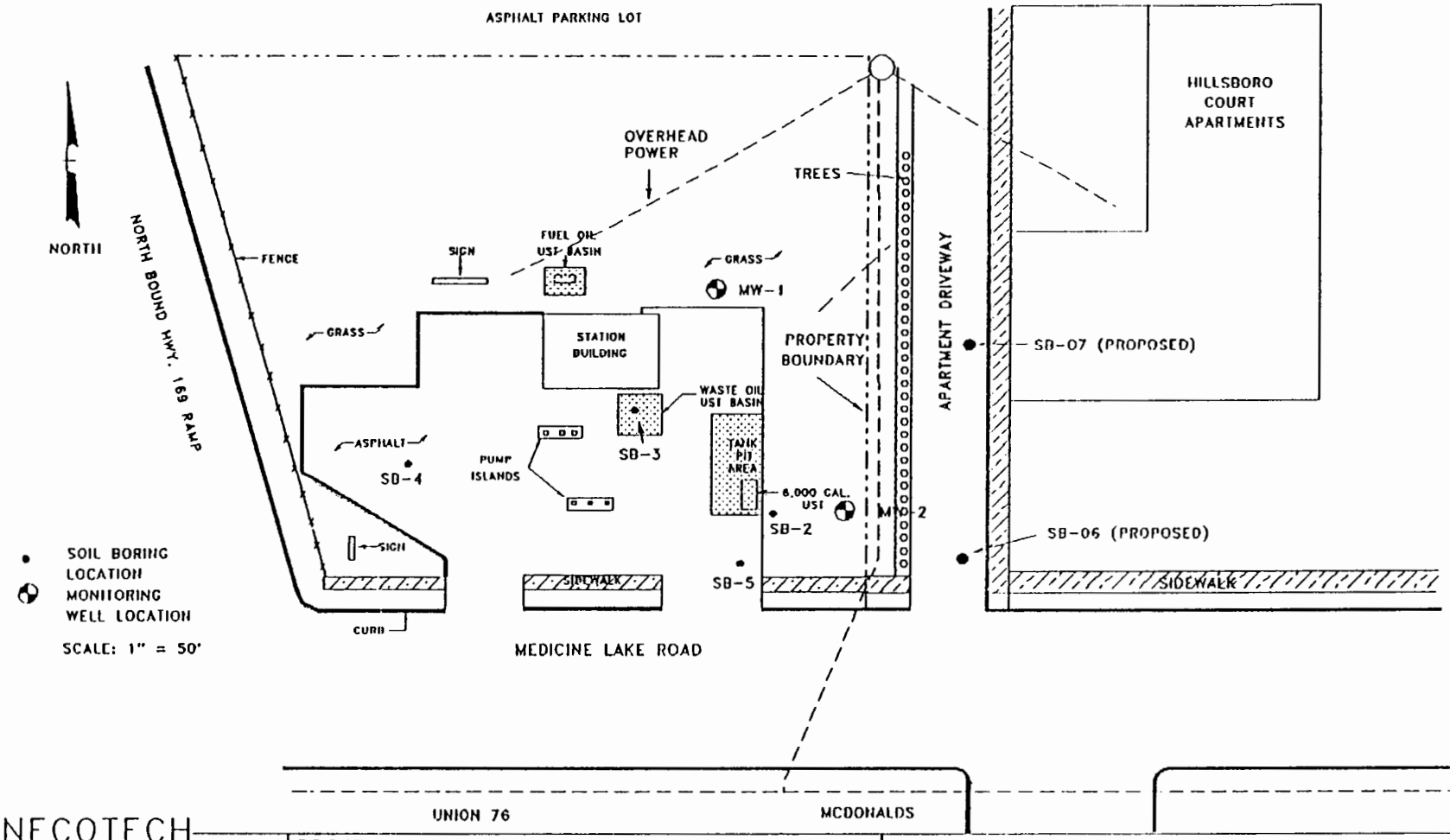
Kelly W. Kading
Project Hydrogeologist

JAB/KWK:djd

cc: Mr. Denny Lorenz, Sinclair Marketing, Kansas City, Kansas

jb/711-15b.ltr

EnecoTech



ENECOTECH

BLOOMINGTON, MINNESOTA

PROJECT: SINCLAIR SERVICE STATION

FILE NO.: 711-015 DATE: FEBRUARY, 1991 FIGURE NO.: 5

PROPOSED SOIL BORING/MONITORING WELL LOCATIONS
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE RD., NEW HOPE, MN

PROPERTY ACCESS PERMISSION FORM

PROJECT NUMBER: 711-015
PROJECT MANAGER: _____

I, [illegible] (name), the property owner or authorized representative of the property owner [illegible] agree to allow EnecoTech Inc. employees and contractors to enter upon the above described property and to perform investigations of the nature and extent of petroleum products possibly contained in the groundwater and soils. EnecoTech agrees to comply with the conditions described in the attached letter. In addition, a copy of the data generated from the above described property will be submitted to the owner/owner representative.

EnecoTech employees and contractors will enter upon my property only for such purposes as to conduct monitoring surveys, testing and other information gathering to identify the existence and extent of said petroleum product.

Name [illegible]

Street Address [illegible]

City [illegible]

State [illegible]

3-10-91
Date

[signature]
Signature – Property Owner

3/7/91
Date

[signature]
Signature – EnecoTech Representative

SOIL BORING LOG | ENECOTECH, INC. | SHEET NO. 1 OF 2

PROJECT NAME - MEDICINE LAKE RD.
PROJECT NUMBER - 711-015
CLIENT - SINCLAIR
LOCATION - 9456 MEDICINE LAKE RD. NEW HOPE, MN

DRILLING CONTRACTOR - ETI
DRILLER - TOM MOORE
SURFACE ELEVATION -
DRILLING METHOD - HSA 6.75"

HOLE DESIGNATION - MW-01
DATE STARTED - 10/12/90
DATE COMPLETED - 10/12/90
ENECOTECH SUPERVISOR - S.J.B. & T.R.B.

DEPTH FROM	DEPTH TO	SAMPLE NUMBER	SAMPLE METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	PERCENT RECOVERY	OVM VALUE	ODOR STRENGTH	ASTM SYMBOL	SAMPLE DESCRIPTION (COMPONENTS, COLOR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)
0	4		AC	--	--	--	--	--	0	NONE	CL	SILTY CLAY W/TR GRAVEL, BLK-BRN-GRAY, MOTTLED, MOIST	
4	6		SS	6	7	10	10	90	0	NONE	CL	SANDY CLAY W/TRACE SILT & GRAVEL,	
										NONE		BROWN-GRAY-RUST BROWN, MOTTLED, MOIST, VERY STIFF	
6	9		AC	--	--	--	--	--	0	NONE	CL	SAME AS ABOVE	
9	11		SS	12	9	12	14	90	0	NONE	CL	SANDY CLAY W/SOME GRAVEL, DK GRAY, MOIST, VERY STIFF	
11	14		AC	--	--	--	--	--	0	NONE	CL	SAME AS ABOVE	
14	16		SS	3	6	9	10	100	0	NONE	CL	SAME AS ABOVE	
16	19		AC	--	--	--	--	--	0	NONE	CL	SAME AS ABOVE	
19	21		SS	7	10	13	15	70	0	NONE	CL	SAME AS ABOVE	
21	24		AC	--	--	--	--	--	0	NONE	CL	SAME AS ABOVE	
24	26		SS	15	12	18	18	90	0	NONE	CL	SAME AS ABOVE, DARK BROWN-GRAY	
26	29		AC	--	--	--	--	--	0	NONE	CL	SAME AS ABOVE	HARD DRILLING
29	31		SS	12	22	31	50	75	0	NONE	CL	SAME AS ABOVE, DARK BROWN-GRAY	CLAYEY SILT LAYER 3" @ 30.5'

SOIL BORING LOG | ENECOTECH, INC. | SHEET NO. 2 OF 2

PROJECT NAME - MEDICINE LAKE RD.
PROJECT NUMBER - 711-015
CLIENT - SINCLAIR
LOCATION - 9456 MEDICINE LAKE RD. NEW HOPE, MN

DRILLING CONTRACTOR - ETI
DRILLER - TOM MOORE
SURFACE ELEVATION -
DRILLING METHOD - HSA 6.75"

HOLE DESIGNATION - MW-01
DATE STARTED - 10/12/90
DATE COMPLETED - 10/15/90
ENECOTECH SUPERVISOR - S.J.B. & T.R.B.

DEPTH FROM	DEPTH TO	SAMPLE NUMBER	SAMPLE METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	PERCENT RECOVERY	OVM VALUE	ODOR STRENGTH	ASTM SYMBOL	SAMPLE DESCRIPTION (COMPONENTS, COLOR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)
31	34		AC	--	--	--	--	--	0	NONE	CL	SAME AS ABOVE	
34	36		SS	14	33	53	55	100	0	NONE	CL	SILTY CLAY W/SOME GRAVEL & SAND, GRAY, MOIST-WET	SILT LAYER 11' / MOIST-WET
										NONE	SM	SILTY SAND,FINE-MED,W/TR CLAY & SOME GRAVEL,RED BRN	35.5
36	39		AC	--	--	--	--	--	0	NONE	SM	SAME AS ABOVE	
39	41	MW-1-39	SS	36	29	23	--	60	0	NONE	SP	SAND W/SOME GRAVEL & TRACE SILT, MED, BRN, SATURATED	39-41
41	44		AC	--	--	--	--	--	0	NONE	CL	SILTY CLAY W/SOME GRAVEL, BROWN, MOIST	41-44
44	46		SS	16	23	27	27	75	0	NONE	SP	SAND W/TRACE GRAVEL, FINE-MEDIUM, LIGHT BROWN, MOIST	
46	49		AC	--	--	--	--	--	0	NONE	SP	SAME AS ABOVE	
49	51		SS	9	19	20	24	60	0	NONE	SP	SAND W/TRACE GRAVEL, VERY FINE-MED, BRN-LT BRN,MOIST	
51	54		AC	--	--	--	--	--	0	NONE	SP	SAME AS ABOVE	
54	56		SS	19	21	38	50	75	0	NONE	SP	SAND, VERY FINE-FINE, LT BRN, MOIST, EXTREMELY DENSE	
56	59		AC	--	--	--	--	--	0	NONE	SP	SAME AS ABOVE	
59	61	MW-01-59	SS	30	46	70	--	60	0	NONE	SP	SAND, VERY FINE, LIGHT BROWN, MOIST, EXTREMELY DENSE	

SOIL BORING LOG

ENECOTECH, INC.

PROJECT NAME - MEDICINE LAKE RD.
PROJECT NUMBER - 711-015
CLIENT - SINCLAIR
LOCATION - 9456 MEDICINE LAKE RD. NEW HOPE, MN

DRILLING CONTRACTOR - ETI
DRILLER - TOM MOORE
SURFACE ELEVATION -
DRILLING METHOD - HSA 6.75"

HOLE DESIGNATION - MW-02
DATE STARTED - 10/16/90
DATE COMPLETED - 10/16/90
ENECOTECH SUPERVISOR - S.J.B.

DEPTH FROM	DEPTH TO	SAMPLE NUMBER	SAMPLE METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	PERCENT RECOVERY	DVM VALUE	ODOR STRENGTH	ASTM SYMBOL	SAMPLE DESCRIPTION (COMPONENTS, COLOR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)
0	4		AC	--	--	--	--	--	0	NONE	SM	SILTY SAND W/SOME GRAVEL, DARK BROWN-BROWN, MOIST	COBBLE AT 3'
4	6		SS	5	4	6	13	100	0	NONE	ML	CLAYEY SILT, LIGHT BROWN-GRAY, MOIST, VERY STIFF	
6	9		AC	--	--	--	--	--	0	NONE	ML	SAME AS ABOVE	
9	11	MW-2-9	SS	1	2	3	5	80	11	SLIGHT	CL	SILTY CLAY, LIGHT BROWN-GRAY, MOTTLED, WET-SATURATED	
11	14		AC	--	--	--	--	--	23	MOD	CL	SAME AS ABOVE	
14	16	MW-2-14	SS	6	7	10	15	100	797	STRONG	SC	CLAYEY SAND W/TRACE GRAVEL, FINE-MEDIUM,	5" SATURATED FINE SAND LAYER
										NONE		BROWN-DARK BROWN, MOIST-WET, VERY STIFF	14.5'-15'
16	19		AC	--	--	--	--	--	0	NONE	SC	SAME AS ABOVE	
19	21		SS	5	8	11	15	80	86	MOD	CL	SANDY CLAY W/SOME GRAVEL, DARK GRAY, MOIST	
21	24		AC	--	--	--	--	--	0	NONE	CL	SAME AS ABOVE	
24	26		SS	6	9	11	13		3	NONE	CL	SAME AS ABOVE	

SOIL BORING LOG | ENECOTECH, INC. | SHEET NO. 1 OF 2

PROJECT NAME - MEDICINE LAKE RD.
PROJECT NUMBER - 711-015
CLIENT - SINCLAIR
LOCATION - 9456 MEDICINE LAKE RD. NEW HOPE, MN

DRILLING CONTRACTOR - ETI
DRILLER - TOM MOORE
SURFACE ELEVATION -
DRILLING METHOD - HSA 6.75"

HOLE DESIGNATION - SB-02
DATE STARTED - 10/15/90
DATE COMPLETED - 10/15/90
ENECOTECH SUPERVISOR - T.R.B.

DEPTH FROM	DEPTH TO	SAMPLE NUMBER	SAMPLE METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	PERCENT RECOVERY	DVM VALUE	ODOR STRENGTH	ASTM SYMBOL	SAMPLE DESCRIPTION (COMPONENTS, COLOR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)
0	4		AF							NONE	CL	SILTY CLAY, TRACE GRAVEL, BROWN, MOIST	
4	6		SS	3	7	14	12	100	648	STRONG	CL	SANDY CLAY, TR GRAV & SILT, BRN, GRAY MOTTLING, MOIST	
6	9		AF							STRONG	CL	SAME AS ABOVE	
9	11		SS	3	3	6	6	75	965	STRONG	ML	CLAYEY SILT, BROWN-GRAY MOTTLED, MOIST	9'-12'
11	14		AF							STRONG	SM	SANDY SILT, TRACE CLAY, BLUE GRAY, MOIST	12'-14'
14	16	SB-02-14	SS	10	9	13	15	100	148	SLIGHT	CL	SILTY CLAY, 10% GRAVEL, 2" SAND LENS @ 16',	
												MOIST, DARK BROWN	
16	19		AF								CL	SAME AS ABOVE	
19	21		SS	5	7	11	13	100	15.6	NONE	CL	SILTY CLAY, TRACE GRAVEL, MOIST, GRAY	
21	24		AF								CL	SAME AS ABOVE	
24	26		SS	5	8	11	13	100	4.3	NONE	CL	SANDY CLAY, TRACE GRAVEL, BROWN TO DARK GRAY, MOIST	
26	29		AF								CL	SAME AS ABOVE	
29	31		SS	9	14	19	24	100	0.0	NONE	CL	SAME AS ABOVE, BROWN TO RED BROWN, DRY	

SOIL BORING LOG

ENECOTECH, INC.

PROJECT NAME - MEDICINE LAKE RD.
PROJECT NUMBER - 711-015
CLIENT - SINCLAIR
LOCATION - 9456 MEDICINE LAKE RD. NEW HOPE, MN

DRILLING CONTRACTOR - ETI
DRILLER - TOM MOORE
SURFACE ELEVATION -
DRILLING METHOD - HSA 6.75"

HOLE DESIGNATION - SB-02
DATE STARTED - 10/15/90
DATE COMPLETED - 10/15/90
ENECOTECH SUPERVISOR - T.R.B.

DEPTH FROM	DEPTH TO	SAMPLE NUMBER	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	PERCENT RECOVERY	OVM VALUE	ODOR STRENGTH	ASTM SYMBOL	SAMPLE DESCRIPTION (COMPONENTS, COLOR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)
31	34		AF								CL	SAME AS ABOVE	
34	36	SB-02-34	SS	28	40	50	39	100	0	NONE	CL	SAME AS ABOVE, TRACE SILT, BROWN, DRY	
												3" SAND LENS, MEDIUM TO COARSE, @ 35', DRY	

SOIL BORING LOG

ENECOTECH, INC.

SHEET NO. 1 OF 1

PROJECT NAME - MEDICINE LAKE RD.
PROJECT NUMBER - 711-015
CLIENT - SINCLAIR
LOCATION - 9456 MEDICINE LAKE RD. NEW HOPE, MN

DRILLING CONTRACTOR - ETI
DRILLER - TOM MOORE
SURFACE ELEVATION -
DRILLING METHOD - HSA 6.75"

HOLE DESIGNATION - SB-03
DATE STARTED - 10/16/90
DATE COMPLETED - 10/16/90
ENECOTECH SUPERVISOR - T.R.B. & S.J.B.

DEPTH FROM	DEPTH TO	SAMPLE NUMBER	SAMPLE METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	PERCENT RECOVERY	DVM VALUE	ODOR STRENGTH	ASTM SYMBOL	SAMPLE DESCRIPTION (COMPONENTS, COLOR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)
0	4		AF						0	NONE	CL	CONCRETE (0-1'), GRAVEL FILL (1'-3'), SILTY, SANDY,	
												CLAY (3'-4'), BROWN, MOIST	
4	6		SS	2	2	2	2	10	3.7	NONE	SC	CLAYEY SAND, TRACE GRAVEL, BROWN, MOIST	
6	9		AF								SC	CLAYEY SAND, BROWN, WET	WATER PERCHED IN BOTTOM OF TANK BASI
9	11	SB-03-9	SS	3	4	7	10	100	16.3	NONE	CL	SANDY CLAY, TRACE GRAVEL, DARK BROWN, MOIST	FROM TANK EXCAVATION
11	14		AF								CL	SAME AS ABOVE	
14	16		SS	4	6	12	11	100	0.0	NONE	CL	SILTY CLAY, TR GRAVEL & SAND, GRAY, BRN MOTTLING,DR	
16	19		AF								CL	SAME AS ABOVE	
19	21	SB-03-19	SS	3	5	11	12	100	0.0	NONE	CL	SAME AS ABOVE	

SOIL BORING LOG

ENECOTECH, INC.

SHEET NO. 1 OF 1

PROJECT NAME - MEDICINE LAKE RD.
PROJECT NUMBER - 711-015
CLIENT - SINCLAIR
LOCATION - 9456 MEDICINE LAKE RD. NEW HOPE, MN

DRILLING CONTRACTOR - ETI
DRILLER - TOM MOORE
SURFACE ELEVATION -
DRILLING METHOD - HSA 6.75"

HOLE DESIGNATION - SB-04
DATE STARTED - 10/16/90
DATE COMPLETED - 10/16/90
ENECOTECH SUPERVISOR - S.J.B.

DEPTH FROM	DEPTH TO	SAMPLE NUMBER	SAMPLE METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	PERCENT RECOVERY	DVM VALUE	ODOR STRENGTH	ASTM SYMBOL	SAMPLE DESCRIPTION (COMPONENTS, COLOR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)
0	4		AC	--	--	--	--	--	0	---	SP	SAND W/ GRAVEL, MEDIUM, BROWN	4" OF ASPHALT
											CL	SILTY CLAY W/TRACE GRAVEL, LIGHT BROWN, MOIST	
4	6		SS	4	8	8	12	80	0	---	ML	CLAYEY SILT W/SOME SAND & TR GRAVEL, LT BRN, MOIST	
6	9	SB-04-09	AC	--	--	--	--	--	0	---	ML	SAME AS ABOVE	
9	11		SS	2	8	12	12	80	579	STRONG	CL	SILTY CLAY, LIGHT BROWN, MOIST, VERY STIFF	
											SM	SILTY SAND W/TRACE GRAVEL, FINE, GRAY, WET	9.5-10 STRONG ODOR
											CL	SANDY CLAY W/TRACE GRAVEL, BROWN, MOIST	
11	14		AC	--	--	--	--	--			CL	SAME AS ABOVE	
14	16		SS	8	13	25	23	75	9	SLIGHT	CL	SANDY CLAY W/SOME GRAVEL, DARK BROWN-GRAY, MOIST	
16	19		AC	--	--	--	--	--	--	---	CL	SAME AS ABOVE	HARD DRILLING
19	21		SS	4	5	7	16	75	0	---	CL	SANDY CLAY W/SOME GRAVEL, DARK GRAY, MOIST	
21	24	SB-04-24	AC	--	--	--	--	--	0	---	CL	SAME AS ABOVE	
24	26		SS	9	13	19	25	100	0	---	CL	SAME AS ABOVE	

SOIL BORING LOG

ENECOTECH, INC.

SHEET NO. 1 OF 1

PROJECT NAME - MEDICINE LAKE RD.
PROJECT NUMBER - 711-015
CLIENT - SINCLAIR
LOCATION - 9456 MEDICINE LAKE RD. NEW HOPE, MN

DRILLING CONTRACTOR - ETI
DRILLER - TOM MOORE
SURFACE ELEVATION -
DRILLING METHOD - HSA 6"

HOLE DESIGNATION - SB-05 (S. OF GAS UST)
DATE STARTED - 10/17/90
DATE COMPLETED - 10/17/90
ENECOTECH SUPERVISOR - J.B.

DEPTH FROM	DEPTH TO	SAMPLE NUMBER	SAMPLE METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	PERCENT RECOVERY	OVM VALUE	ODOR STRENGTH	ASTM SYMBOL	SAMPLE DESCRIPTION (COMPONENTS, COLOR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)
0	4		AS	--	--	--	--	--	0	SLIGHT			
4	6		SS	4	5	5	8	100	13	SLIGHT	CL	SANDY CLAY, BROWN, MOIST	
6	10		AS	--	--	--	--	--	5	SLIGHT	CL	SAME AS ABOVE	
10	12	SB-5-12	SS	2	2	5	5	100	3	SLIGHT	CL	SILTY CLAY, GRAY, MOIST	
12	16		AS	--	--	--	--	--	3	SLIGHT	CL	SAME AS ABOVE	
16	18		SS	4	4	6	8	0	0	NONE	CL	SAME AS ABOVE	
18	22		AS	--	--	--	--	--	0	NONE	CL	SAME AS ABOVE	
22	24	SB-5-24	SS	8	8	8	14	100	0	NONE	CL	SANDY CLAY, GRAY, MOIST	
24	28		AS	--	--	--	--	--	0	NONE	CL	SAME AS ABOVE	
28	30		AS	12	10	10	14	100	0	NONE	CL	SAME AS ABOVE	

FILING CODE - 11015S6A

SOIL BORING LOG

ENECOTECH, INC.

PROJECT NAME - SINCLAIR-NEW HOPE
PROJECT NUMBER - 711-015
CLIENT - SINCLAIR
LOCATION - MEDICINE LAKE ROAD

DRILLING CONTRACTOR - THEIN
DRILLER - NATHAN
SURFACE ELEVATION -
DRILLING METHOD - HSA

HOLE DESIGNATION - SB-06
DATE STARTED - 4/4/91
DATE COMPLETED - 4/4/91
ENECOTECH SUPERVISOR - SPY

DEPTH FROM	DEPTH TO	SAMPLE NUMBER	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	PERCENT RECOVERY	OVM VALUE	ODOR STRENGTH	ASTM SYMBOL	SAMPLE DESCRIPTION (COMPONENTS, COLOR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)
0	4		AF							NONE	CL	SILTY, SANDY CLAY, LIGHT BROWN, MOIST	
4	6		SS	7	6	7	6	90	0	NONE	CL	S.A.A., DRY	
6	9		AF							NONE	CL	S.A.A.	
9	11		SS	15	18	15	18	80	0	NONE	CL	9-10.5' S.A.A.	
											SP	10.5-11.0' MEDIUM SAND, LIGHT BROWN, DRY	
11	14		AF							NONE	CL	SILTY-SANDY CLAY, LIGHT BROWN, DRY	
14	16	SB-06(16)	SS	8	8	8	8	100	0	NONE	CL	SILTY-SANDY CLAY, GRAY, DRY	
16	19		AF							NONE	CL	S.A.A.	
19	21		SS	7	6	7	6	10	0	NONE	CL	S.A.A., MIXED WITH GRAVEL	
21	24		AF							NONE	CL	S.A.A., DRY	
24	26		SS	8	8	8	8	90	0	NONE	CL	S.A.A., DRY	
26	29		AF							NONE	CL	S.A.A., DRY	
29	31		SS	17	20	17	20		0	NONE	CL	S.A.A., DRY	

FILING CODE - 11015S6B

SOIL BORING LOG

ENECOTECH, INC.

PROJECT NAME - SINCLAIR-NEW HOPE
PROJECT NUMBER - 711-015
CLIENT - SINCLAIR
LOCATION - MEDICINE LAKE ROAD

DRILLING CONTRACTOR - THEIN
DRILLER - NATHAN
SURFACE ELEVATION -
DRILLING METHOD - HSA

HOLE DESIGNATION - SB-06
DATE STARTED - 4/4/91
DATE COMPLETED - 4/4/91
ENECOTECH SUPERVISOR - SPY

DEPTH FROM	DEPTH TO	SAMPLE NUMBER	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	PERCENT RECOVERY	DVM VALUE	ODOR STRENGTH	ASTM SYMBOL	SAMPLE DESCRIPTION (COMPONENTS, COLOR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)
31	34		AF							NONE	CL	S.A.A., DRY	
34	36		SS	-------30----------				50	0	NONE	CL	S.A.A., DRY	
36	39		AF							NONE	CL	SILTY-SANDY CLAY, GRAY, DRY	
39	41		SS	-------33----------				50	0	NONE	SM	SILTY SAND, LIGHT BROWN, MOIST	
41	44		AF							NONE	CL	SANDY-SILTY CLAY, GRAY, DRY	
44	46		SS	-------31----------				50	0	NONE	SP	MEDIUM SAND, LIGHT BROWN, DRY	
												*TERMINATED BORING AT 46' BGS, GROUTED TO SURFACE	

FILING CODE - 11015S7A

SOIL BORING LOG

ENECOTECH, INC.

PROJECT NAME - SINCLAIR-NEW HOPE
PROJECT NUMBER - 711-015
CLIENT - SINCLAIR
LOCATION - MEDICINE LAKE ROAD

DRILLING CONTRACTOR - THEIN
DRILLER - NATHAN
SURFACE ELEVATION -
DRILLING METHOD - HSA

HOLE DESIGNATION - SB-07
DATE STARTED - 4/5/91
DATE COMPLETED - 4/5/91
ENECOTECH SUPERVISOR - GVA

DEPTH FROM	DEPTH TO	SAMPLE NUMBER	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	PERCENT RECOVERY	DVM VALUE	ODOR STRENGTH	ASTM SYMBOL	SAMPLE DESCRIPTION (COMPONENTS, COLOR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)
0	4		AF						0		CL	0-6" ASPHALT, SANDY CLAY, BROWN	
4	6		SS	--------27----------				60	0	NONE	CL	SANDY-SILTY CLAY W/PEBS & SHALE, RED-BRWN, DENSE,	
												MEDIUM PLASTICITY	
5	9		AF							NONE	CL	S.A.A.	
9	11		SS	--------21----------				90	0	NONE	CL	SAND-SILT CLAY, OX. IRON MOTTLING, LOW PLAST, MOIST	
10	14		AF							NONE	CL	SILTY CLAY, ORANGE-BROWN, MOIST	
14	16	SB-07-14	SS	--------17----------				70	9	NONE	SP	MED. TO COARSE-GRAINED SAND, WET	
15	19		AF							NONE	ML	SANDY SILT, MOIST	
19	21		SS	--------21----------				90	0	NONE	CH	SAND-SILT CLAY, UNOX. W/SMALL PEBS, V.DENSE, HIGH	
												PLASTICITY, BLUE-GRAY	
20	24		AF							NONE	CH	S.A.A.	
24	26	SB-07-24	SS	--------25----------				60	0	NONE	CH	S.A.A.	
25	29		AF							NONE	CH	S.A.A.	

FILING CODE - 11015S7B

SOIL BORING LOG

ENECOTECH, INC.

PROJECT NAME - SINCLAIR-NEW HOPE
PROJECT NUMBER - 711-015
CLIENT - SINCLAIR
LOCATION - MEDICINE LAKE ROAD

DRILLING CONTRACTOR - THEIN
DRILLER - NATHAN
SURFACE ELEVATION -
DRILLING METHOD - HSA

HOLE DESIGNATION - SB-07
DATE STARTED - 4/5/91
DATE COMPLETED - 4/5/91
ENECOTECH SUPERVISOR - GVA

DEPTH FROM	DEPTH TO	SAMPLE NUMBER	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	PERCENT RECOVERY	DVM VALUE	ODOR STRENGTH	ASTM SYMBOL	SAMPLE DESCRIPTION (COMPONENTS, COLOR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)
29	31		SS	-------28---------				50	0	NONE	CH	S.A.A., MOIST	HIT ROCK, SPOON WAS ONLY HALF FULL.
													TERMINATED BORING AT THIS POINT.
													AUGERS COULD NOT GET PAST ROCK-AUGER
													REFUSAL.

FILING CODE - 11015S8A

SOIL BORING LOG

ENECOTECH, INC.

PROJECT NAME - SINCLAIR-NEW HOPE
PROJECT NUMBER - 711-015
CLIENT - SINCLAIR
LOCATION - MEDICINE LAKE ROAD

DRILLING CONTRACTOR - THEIN
DRILLER - MIKE
SURFACE ELEVATION -
DRILLING METHOD - HSA

HOLE DESIGNATION - SB-08
DATE STARTED - 7/10/91
DATE COMPLETED - 7/10/91
ENECOTECH SUPERVISOR - GVA

DEPTH FROM	DEPTH TO	SAMPLE NUMBER	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	PERCENT RECOVERY	DVM VALUE	ODOR STRENGTH	ASTM SYMBOL	SAMPLE DESCRIPTION (COMPONENTS, COLOR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)
0	4		AF							NONE	CL	0-3" = ASPHALT	
												3"-4' = SANDY SILTY CLAY, BROWN, MOIST	
4	6		SS			17		98	0.5	NONE	ML	SILT W/SOME CLAY, 2" SAND LENS AT 5.5', BROWN WITH	
												IRON STAINING, MOIST	
6	8		SS			33		98	0	NONE	ML	SILT W/SOME CLAY, 2" SAND LENS AT 6', BROWN, MOIST	
8	10		SS			30		98	0	NONE	ML	S.A.A., 2" SAND LENS AT 8'	
10	12	SB-08-10	SS			45		75	180	STRONG	SP	SAND, MED TO COARSE, W/GRAVEL AND BLACK PIECES OF	SHEEN ON SPOON
												WEATHERED PETROLEUM, SATURATED	
12	14		SS			40		75	104	STRONG	CL	VERY SANDY SILTY CLAY, VERY DENSE, SATURATED	
14	16		SS			40		100	104	MOD	CL	SANDY SILTY CLAY, VERY DENSE, SAND LENS 15-15.5 '	LENS CONTAINED WEATHERED PETROLEUM
15	19		AF								CL	SANDY SILTY CLAY, VERY DENSE, DRY	
19	21		SS			32		100	54	SLIGHT	CL	S.A.A., VERY DENSE, GRAY, DRY	
20	24		AF								CL	S.A.A., DRY	

FILING CODE - 11015S8B

SOIL BORING LOG

ENECOTECH, INC.

PROJECT NAME - SINCLAIR-NEW HOPE
PROJECT NUMBER - 711-015
CLIENT - SINCLAIR
LOCATION - MEDICINE LAKE ROAD

DRILLING CONTRACTOR - THEIN
DRILLER - MIKE
SURFACE ELEVATION -
DRILLING METHOD - HSA

HOLE DESIGNATION - SB-08
DATE STARTED - 7/10/91
DATE COMPLETED - 7/10/91
ENECOTECH SUPERVISOR - GVA

DEPTH FROM	DEPTH TO	SAMPLE NUMBER	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	PERCENT RECOVERY	DVM VALUE	ODOR STRENGTH	USTM SYMBOL	SAMPLE DESCRIPTION (COMPONENTS, COLOR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)
24	26		SS	--------40---------				100	42	SLIGHT	CL	S.A.A., DRY	
25	29		AF								CL	S.A.A., DRY	
29	31		SS	--------56---------				60	30	SLIGHT	CL	S.A.A., DRY	
30	34		AF								CL	S.A.A.	
34	36	SB-08-34	SS	--------60---------				60	127	SLIGHT	CL	S.A.A., SAND LENS 34-34.5', SATURATED	
35	39		AF								CL	S.A.A.	
39									30		CL	S.A.A.	SAMPLE TAKEN FROM END OF AUGER

FILING CODE - 11015S9A

SOIL BORING LOG

ENECOTECH, INC.

PROJECT NAME - SINCLAIR-NEW HOPE
PROJECT NUMBER - 711-015
CLIENT - SINCLAIR
LOCATION - MEDICINE LAKE ROAD

DRILLING CONTRACTOR - THEIN
DRILLER - MIKE
SURFACE ELEVATION -
DRILLING METHOD - HSA

HOLE DESIGNATION - SB-09
DATE STARTED - 7/10/91
DATE COMPLETED - 7/10/91
ENECOTECH SUPERVISOR - GVA

DEPTH FROM	DEPTH TO	SAMPLE NUMBER	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6" 6" 6" 6"	PERCENT RECOVERY	OVM VALUE	ODOR STRENGTH	ASTM SYMBOL	SAMPLE DESCRIPTION (COMPONENTS, COLOR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)
0	4		AF			45	SLIGHT	CL	0-6" = CEMENT, SANDY SILTY CLAY, BROWN, MOIST	
4	6		SS	--------26---------	85	16	SLIGHT	CL	S.A.A.	
6	8		SS	--------28---------	0				NOTHING IN SPOON	
8	10		SS	--------20---------	100	64	MOD	ML	SILT WITH SOME CLAY, BROWN-GRAY, MOIST	
10	12	SB-09-10	SS	--------30---------	90	105	STRONG	SP	10-11' = SAND LENS, SATURATED	
								CL	11-12' = SANDY SILTY CLAY, DENSE, SATURATED	
12	14		SS	--------33---------	97	60	STRONG	CL	S.A.A., DRY	
14	16		SS	--------25---------		49	NONE	CL	S.A.A., DRY	
15	19		AF					CL	S.A.A., DRY	
19	21		SS	--------60---------	20	10	NONE	CL	SANDY SILTY CLAY, VERY DENSE, GRAY, DRY	
20	24		AF					CL	S.A.A.	
24	26		SS	--------50---------		1	NONE	CL	S.A.A.	
25	29		AF					CL	S.A.A.	

FILING CODE - 11015S9B

SOIL BORING LOG

ENECOTECH, INC.

PROJECT NAME - SINCLAIR-NEW HOPE
PROJECT NUMBER - 711-015
CLIENT - SINCLAIR
LOCATION - MEDICINE LAKE ROAD

DRILLING CONTRACTOR - THEIN
DRILLER - MIKE
SURFACE ELEVATION -
DRILLING METHOD - HSA

HOLE DESIGNATION - SB-09
DATE STARTED - 7/10/91
DATE COMPLETED - 7/10/91
ENECOTECH SUPERVISOR - GVA

DEPTH FROM	DEPTH TO	SAMPLE NUMBER	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	PERCENT RECOVERY	DVM VALUE	ODOR STRENGTH	ASTM SYMBOL	SAMPLE DESCRIPTION (COMPONENTS, COLOR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)
29	31		SS	--------50----------					0	NONE	CL	S.A.A.	
30	34		AF								CL	S.A.A.	
34	36	SB-09-34	SS	--------50----------				95	0	NONE	CL	S.A.A.	

CHAIN OF CUSTODY RECORD

NO. 00225

EnecoTech
3050 METRO DRIVE, SUITE 115
BLOOMINGTON, MN 55425 (612) 854-5513

LOCATION: Sinclair - New Hope
PROJECT NUMBER: 711 - 015
PROJECT MANAGER: T. Berg
LABORATORY: Interpoll
TURNAROUND TIME: STANDARD

ITEM NO.	SAMPLE NUMBER	NUMBER OF CONTAINERS AND TYPE	MATRIX	COLLECTION DATE	COLLECTION TIME	ANALYSIS REQUIRED
1	MW-02	3-40 ml VOA's, 1-250ml, 1-1000 ml	H20	5-30-91	11:00	MTBE, MOHGS-C, THC-gas, Lead, THC-fuel oil
2						
3						
4						
5						
6						
7						
8						
9						
10						

SAMPLER'S SIGNATURE	DATE
Scott H. Weston	5-30-91
NOTES:	

TRANSFER NO.	ITEM NO.	RELINQUISHED BY	ACCEPTED BY	DATE SUBMITTED
1	1	Scott H. Weston		
2				
3				
4				

CHAIN OF CUSTODY RECORD

ENECOTECH
3050 METRO DRIVE, SUITE 115
BLOOMINGTON, MN 55425 (612) 854-5513

NO. 00466

LOCATION: Sinclair - Medicine Lake Rd
PROJECT NUMBER: 111-015
PROJECT MANAGER: Jill Berg
LABORATORY: Interpet
TURNAROUND TIME: Standard

ITEM NO.	SAMPLE NUMBER	NUMBER OF CONTAINERS AND TYPE	MATRIX	COLLECTION DATE	COLLECTION TIME	ANALYSIS REQUIRED
1	SB-06-16	2-250 ml	SOIL	4/4/91	17:30	THC - Fuel Oil THC - Gas MTBE, BTEX
2	SB-07-14	↓	↓	4/5/91	9:30	
3	SB-07-24			4/5/91	9:30	
4						
5						
6						
7						
8						
9						
10						

SAMPLER'S SIGNATURE	DATE
Georgia Vondra-Amos	4/5/91
NOTES:	

TRANSFER NO.	ITEM NO.	RELINQUISHED BY	ACCEPTED BY	DATE SUBMITTED
1	1-3	GVA		4/5/91
2				
3				
4				

ENECOTECH

CHAIN OF CUSTODY RECORD

NO. 00363

3050 METRO DRIVE, SUITE 115
BLOOMINGTON, MN 55425 (612) 854-5513

LOCATION: Sinclair - Mad. Lk. Rd
PROJECT NUMBER: 711-015
PROJECT MANAGER: Tim Berg
LABORATORY: Enterpoll
TURNAROUND TIME: Normal

ITEM NO.	SAMPLE NUMBER	NUMBER OF CONTAINERS AND TYPE	MATRIX	COLLECTION DATE	COLLECTION TIME	ANALYSIS REQUIRED
1	MW-01	6-40ml VOA's, 1-250ml Jar	Water	11/12/90	1545	MDH Method 465C. TPHC-gasoline, TPHC-Fuel Oil
2	MW-02	6-40ml VOA's, 1-Liter Jar	Water	11/12/90	1545	↓
3						
4						
5						
6						
7						
8						
9						
10						

SAMPLER'S SIGNATURE	DATE
Thomas R. Below	11/13/90
NOTES:	

TRANSFER NO.	ITEM NO.	RELINQUISHED BY	ACCEPTED BY	DATE SUBMITTED
1	1-2	Thomas R. Below	Courier	11/13/90
2				
3				
4				

CHAIN OF CUSTODY RECORD

NO. 00344

ENECOTECH
3050 METRO DRIVE, SUITE 115
BLOOMINGTON, MN 55425 (612) 854-5513

LOCATION: Hidden Lake Rd. Newhope PROJECT MANAGER: J. Berg TURNAROUND TIME: Standard
PROJECT NUMBER: 711-015 LABORATORY: Interpoll

ITEM NO.	SAMPLE NUMBER	NUMBER OF CONTAINERS AND TYPE	MATRIX	COLLECTION DATE	COLLECTION TIME	ANALYSIS REQUIRED
1	SB-3-4	3 voa's 1 8oz Jar	Soil	10-16-90	0900	~~BTEX~~ MDH 465C, PCB's
2	SB-3-14	3 ↓	↓	10-16-90	0900	↓
3						
4						
5						
6						
7						
8						
9						
10						

SAMPLER'S SIGNATURE	DATE
[signature]	10-17-90
NOTES:	

TRANSFER NO.	ITEM NO.	RELINQUISHED BY	ACCEPTED BY	DATE SUBMITTED
1	1-2	[signature]	[signature]	1630 10/17/90
2				
3				
4				

CHAIN OF CUSTODY RECORD

NO. 00341

EnecoTech
3050 METRO DRIVE, SUITE 115
BLOOMINGTON, MN 55425 (612) 854-5513

LOCATION: Yechiine Lake Rd. Newhope PROJECT MANAGER: J. Berg TURNAROUND TIME: Standard
PROJECT NUMBER: 21-015 LABORATORY: Interpoll

ITEM NO.	SAMPLE NUMBER	NUMBER OF CONTAINERS AND TYPE	MATRIX	COLLECTION DATE	COLLECTION TIME	ANALYSIS REQUIRED
1	TW-1-39	3 VOA's 2 (8oz Jars)	Soil	10-12-90	1500	BTEX, THC-Fuel in Gas
2	MW-1-59	3 VOA's 2 (8oz Jars		10-12-90	700	↓
3	SB-5-12	3 VOA's (1) 8oz Jar		10-17-90	1000	BTEX : THC-Fuel in Gas
4	SB-5-24	↓		10-17-90	1000	↓
5	MW-2-9	3 VOA's (2) 8oz Jars		10-16-90	~~1130~~	
6	MW-2-14	↓		10-16-90	1130	
7	SB-4-9			10-16-90	1430	
8	SB-4-24			10-16-90	1500	
9	SB-2-14			10-15-90	1430	
10	SB-2-34			10-15-90	1600	

SAMPLER'S SIGNATURE	DATE
K. J. Pa	10-17-90
NOTES:	

TRANSFER NO.	ITEM NO.	RELINQUISHED BY	ACCEPTED BY	DATE SUBMITTED
1	1-10			1630 10/17/90
2				
3				
4				

CHAIN OF CUSTODY RECORD

NO. 00122

ENECOTECH
3050 METRO DRIVE, SUITE 115
BLOOMINGTON, MN 55425 (612) 854-5513

LOCATION: Medicine Lake Rd
PROJECT NUMBER: 711-015
PROJECT MANAGER: JAB
LABORATORY: ~~Interpoll~~
TURNAROUND TIME: Normal

ITEM NO.	SAMPLE NUMBER	NUMBER OF CONTAINERS AND TYPE	MATRIX	COLLECTION DATE	COLLECTION TIME	ANALYSIS REQUIRED
1	15-TP-C	1-250ml	Soil	4/13/90		Pb
2	TP-02-08	3-40ml, 1-250ml	↓	↓		MDH 465C, PCB EPA 600
3	TP-02-08	3-250ml				Pb, Cr, Cd, Hg, Arsenic, THC Fuel Oil
4	TP-03-05	3-40ml, 1-250ml	↓	↓		BETX, THC Fuel Oil
5						
6						
7						
8						
9						
10						

SAMPLER'S SIGNATURE	DATE
Wayne Jacobson	4/13/90

NOTES:
Via: Sue Lee: use Method 608
4/16/90 dmw.

TRANSFER NO.	ITEM NO.	RELINQUISHED BY	ACCEPTED BY	DATE SUBMITTED
1	items 1-4	Wayne Jacobson	Courier	4/16/90
2			Linda Wynne	4/16/90
3				
4				

CHAIN OF CUSTODY RECORD

NO. 00144

EnecoTech
3050 METRO DRIVE, SUITE 115
BLOOMINGTON, MN 55425 (612) 854-5513

LOCATION: New Hope, MN
PROJECT NUMBER: 711-015
PROJECT MANAGER: JAB
LABORATORY: Interpoll
TURNAROUND TIME: Standard

ITEM NO.	SAMPLE NUMBER	NUMBER OF CONTAINERS AND TYPE	MATRIX	COLLECTION DATE	COLLECTION TIME	ANALYSIS REQUIRED
1	15-TP-C	1 Mason Jar	Soil	4/11/90	13:15	Sieve Analysis (< 200 mesh)
2	15-TP-C	1 250 mL & 3 40 ml	Soil	4/11/90	15:00	BTEX & TPH - Gasoline
3	15-TP-01	1 250 mL & 3 40 ml	Soil	4/11/90	14:20	BTEX, MTBE, TPH - Gasoline
4						
5						
6						
7						
8						
9						
10						

SAMPLER'S SIGNATURE	DATE
Jodi L. Pill	4/12/90

NOTES: Standard turnaround on all items

TRANSFER NO.	ITEM NO.	RELINQUISHED BY	ACCEPTED BY	DATE SUBMITTED
1	1-3	Jodi L. Pill	Bob Barry	4/12/90
2				
3				
4				

REGION: _____ COMPLETION DATE: 10/15/90

PROJECT NO.: Med. Lake Rd in New Hope GRADE ELEVATION: _____

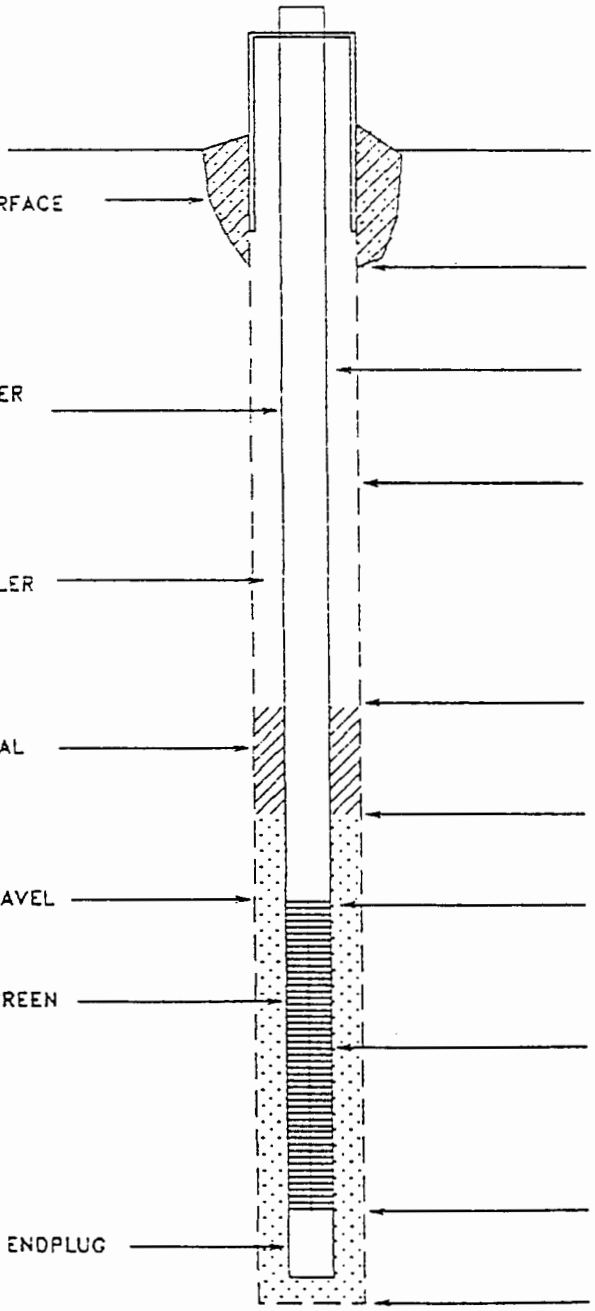
SITE NO.: Sinclair T.O.C. ELEVATION: _____

WELL NO.: MW-01 (NE Corner) STATIC WATER ELEVATION: _____

OWNER: _____ U.S.G.S. QUADRANGLE: _____

DRILLING CONTRACTOR: ETI TOWNSHIP, RANGE, SECTION: _____

DONE BY: _____ _____



Concrete — TYPE OF SURFACE SEAL

DEPTH OF SURFACE SEAL: 2'

Steel — TYPE OF RISER PIPE

O.D. OF RISER PIPE: 2"

DIAMETER OF BOREHOLE: 6 3/4"

Neat Cement — TYPE OF FILLER

Bentonite — TYPE OF SEAL

DEPTH TO TOP OF SEAL: 27'

DEPTH TO TOP OF GRAVEL PACK: 30'

Sand — TYPE OF GRAVEL PACK

DEPTH TO TOP OF SCREEN: 31'

#10 — TYPE OF SCREEN

O.D. OF SCREEN: 2"

SLOT SIZE

DEPTH TO BOTTOM OF SCREEN: 41'

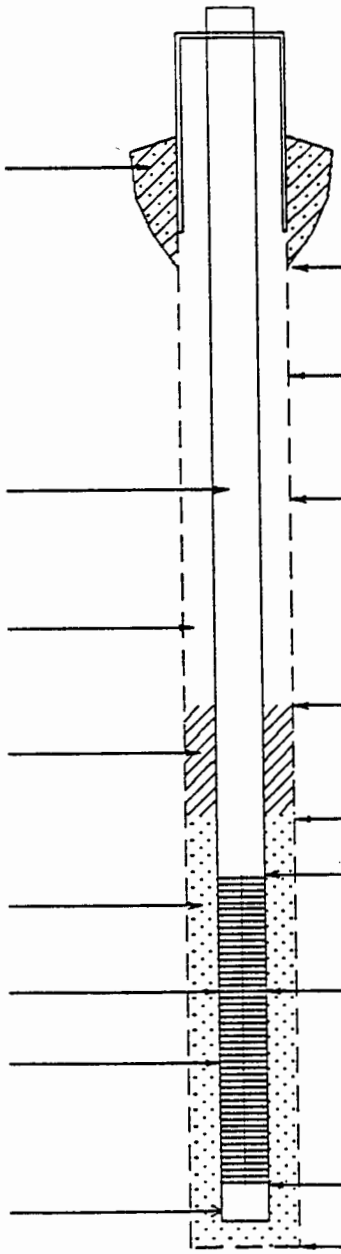
1" — LENGTH OF ENDPLUG

DEPTH TO BOTTOM OF BOREHOLE: _____

MONITORING WELL CONSTRUCTION DIAGRAM
SINCLAIR SERVICE STATION
9456 MEDICINE LAKE ROAD
NEW HOPE, MINNESOTA

REGION: MN
PROJECT NUMBER: 711-015
SITE NUMBER: 01
WELL NUMBER: MW-02
MN UNIQ WELL #:
OWNER: SINCLAIR
DRILLER: ETI
DONE BY: SJB

COMPLETION DATE: 10/16/90
GRADE ELEVATION:
T.O.C. ELEVATION:
STATIC WATER LEVEL:
U.S.G.S. QUADRANGLE: OSSEO
TOWNSHIP, RANGE, SECTION:



CONCRETE — TYPE OF SURFACE SEAL

STEEL — TYPE OF RISER PIPE

NEAT CEMENT — TYPE OF FILLER

BENTONITE — TYPE OF SEAL

SILICA SAND — TYPE OF GRAVEL PACK

STAINLESS STEEL — TYPE OF SCREEN

#10 — SLOT SIZE

\- — LENGTH OF ENDPLUG

DEPTH OF SURFACE SEAL	2′
O.D. OF RISER PIPE	2"
DIAMETER OF BOREHOLE	6.75"
DEPTH TO TOP OF SEAL	6′
DEPTH TO TOP OF GRAVEL PACK	8′
DEPTH TO TOP OF SCREEN	10′
O.D. OF SCREEN	2"
DEPTH TO BOTTOM OF SCREEN	20′
DEPTH TO BOTTOM OF BOREHOLE	26′

interpoll

INTERPOLL LABORATORIES, INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL: 612/786-6020
FAX: 612/786-7854

December 9, 1991

Mr. Kelly Kading
EnecoTech
3050 Metro Drive, Suite 115
Bloomington, MN 55425

Re: Laboratory Report #3865 & #1507

Dear Mr. Kading:

Regarding the concerns you expressed about the data contained in Interpoll Laboratories Report #3865, dated September 12, 1991 as compared to that contained in Laboratory Report #1507 dated October 29, 1990.

The Minnesota Pollution Control Agency has indicated that when a sample is analyzed for volatile organic compounds by Minnesota Department of Health analytical method 465-C (D) certain hydrocarbon components of gasoline have the same gas chromatographic retention times as the ethers and ketones on the 465-C (D) parameter list. As a result, these gasoline components may be misidentified as diethyl ether, tetrahydrofuran, acetone, methyl ethyl ketone (2-butanone) or methyl isobutyl ketone (4-methyl-2-pentanone).

The mis-identification could result in false positives being reported for the ethers and ketones or in the over-estimation of their true concentrations in a sample. Because the 465-C (D) method cannot distinguish between the interfering hydrocarbons and either the ethers or ketones, a confirmatory analysis such as GC/MS is required to positively identify the ethers and ketones and to accurately determine their concentrations is a sample.

Sincerely,

INTERPOLL LABORATORIES, INC.

Wayne A. Olson
Organic Chemistry Department

WAO/sk

interpoll

INTERPOLL LABORATORIES, INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL: 612-786-6020
FAX: 612-786-7854

November 6, 1990

EnecoTech
3050 Metro Drive, Suite 115
Bloomington, MN 55425

Attention: Jim Berg

LABORATORY REPORT: #1587
ENECOTECH PROJECT: #711-015

SAMPLES COLLECTED: October 12 - 17, 1990
SAMPLES RECEIVED: October 17, 1990

Sample Identification:			MW-1-39	MW-1-59
Sample Type:			Soil	Soil
Laboratory Log Number:			1587-01	1587-02
Parameter	Units	Target Detection Limit		
EPA Method SW-846, 8020:				
Benzene	mg/Kg	0.06	< 0.06	< 0.06
Toluene	mg/Kg	0.11	< 0.11	< 0.11
Ethylbenzene	mg/Kg	0.05	< 0.05	< 0.05
Xylenes	mg/Kg	0.28	< 0.28	< 0.28
EPA Method SW-846, 8015:				
Total hydrocarbons, as gasoline	mg/Kg	1.2	< 1.2	< 1.2
Modified SW-846 Method 3820:				
Total hydrocarbons, as fuel oil	mg/Kg	1.7	< 1.7	< 1.7

Sample Identification:			SB-5-12	SB-5-24
Sample Type:			Soil	Soil
Laboratory Log Number:			1587-03	1587-04
Parameter	Units	Target Detection Limit		
EPA Method SW-846, 8020:				
Benzene	mg/Kg	0.06	0.72	< 0.06
Toluene	mg/Kg	0.11	0.69	< 0.11
Ethylbenzene	mg/Kg	0.05	0.12	< 0.05
Xylenes	mg/Kg	0.28	0.52	< 0.28
EPA Method SW-846, 8015:				
Total hydrocarbons, as gasoline	mg/Kg	1.2	7.7	< 1.2
Modified SW-846 Method 3820:				
Total hydrocarbons, as fuel oil	mg/Kg	1.7	< 1.7	< 1.7

Sample Identification:			MW-2-9	MW-2-14
Sample Type:			Soil	Soil
Laboratory Log Number:			1587-05	1587-06
Parameter	Units	Target Detection Limit		
EPA Method SW-846, 8020:				
Benzene	mg/Kg	0.06	0.40	0.32
Toluene	mg/Kg	0.11	< 0.11	0.77
Ethylbenzene	mg/Kg	0.05	< 0.05	0.12
Xylenes	mg/Kg	0.28	< 0.28	0.51
EPA Method SW-846, 8015:				
Total hydrocarbons, as gasoline	mg/Kg	1.2	3.4	5.6
Modified SW-846 Method 3820:				
Total hydrocarbons, as fuel oil	mg/Kg	1.7	< 1.7	< 1.7

Sample Identification:			SB-4-9	SB-4-24
Sample Type:			Soil	Soil
Laboratory Log Number:			1587-07	1587-08
Parameter	Units	Target Detection Limit		
EPA Method SW-846, 8020:				
Benzene	mg/Kg	0.06	< 0.06	0.09
Toluene	mg/Kg	0.11	< 0.11	< 0.11
Ethylbenzene	mg/Kg	0.05	< 0.05	< 0.05
Xylenes	mg/Kg	0.28	< 0.28	< 0.28
EPA Method SW-846, 8015:				
Total hydrocarbons, as gasoline	mg/Kg	1.2	2.1	< 1.2
Modified SW-846 Method 3820:				
Total hydrocarbons, as fuel oil	mg/Kg	1.7	8.4	< 1.7

Sample Identification:			SB-2-14	SB-2-34
Sample Type:			Soil	Soil
Laboratory Log Number:			1587-09	1587-10
Parameter	Units	Target Detection Limit		
EPA Method SW-846, 8020:				
Benzene	mg/Kg	0.06	0.73	< 0.06
Toluene	mg/Kg	0.11	0.95	< 0.11
Ethylbenzene	mg/Kg	0.05	0.12	< 0.05
Xylenes	mg/Kg	0.28	0.65	< 0.28
EPA Method SW-846, 8015:				
Total hydrocarbons, as gasoline	mg/Kg	1.2	8.3	< 1.2
Modified SW-846 Method 3820:				
Total hydrocarbons, as fuel oil	mg/Kg	1.7	< 1.7	< 1.7

Sample Identification:			SB-3-9	SB-3-19
Sample Type:			Soil	Soil
Laboratory Log Number:			1587-11	1587-12
Parameter	Units	Target Detection Limit		
Method MDH 465-C:				
Chloromethane	mg/Kg	0.17	< 0.17	< 0.17
Bromomethane	mg/Kg	0.03	< 0.03	< 0.03
Vinyl chloride	mg/Kg	0.04	< 0.04	< 0.04
Dichlorodifluoromethane	mg/Kg	0.11	< 0.11	< 0.11
Chloroethane	mg/Kg	0.03	< 0.03	< 0.03
Methylene chloride	mg/Kg	0.38	< 0.38	< 0.38
Trichlorofluoromethane	mg/Kg	0.11	< 0.11	< 0.11
1,1-Dichloroethene	mg/Kg	0.08	< 0.08	< 0.08
Allyl chloride	mg/Kg	0.04	< 0.04	< 0.04
1,1-Dichloroethane	mg/Kg	0.02	< 0.02	< 0.02
cis-1,2-Dichloroethene	mg/Kg	0.03	< 0.03	< 0.03
trans-1,2-Dichloroethene	mg/Kg	0.04	< 0.04	< 0.04
Chloroform	mg/Kg	0.04	< 0.04	< 0.04
1,1,2-Trichlorotrifluoroethane	mg/Kg	0.11	< 0.11	< 0.11
Dibromomethane	mg/Kg	0.06	< 0.06	< 0.06
1,2-Dichloroethane	mg/Kg	0.06	< 0.06	< 0.06
1,1,1-Trichloroethane	mg/Kg	0.18	< 0.18	< 0.18
Carbon tetrachloride	mg/Kg	0.05	< 0.05	< 0.05
Bromodichloromethane	mg/Kg	0.07	< 0.07	< 0.07
2,3-Dichloro-1-propene	mg/Kg	0.04	< 0.04	< 0.04
1,2-Dichloropropane	mg/Kg	0.04	< 0.04	< 0.04
1,1-Dichloro-1-propene	mg/Kg	0.02	< 0.02	< 0.02
trans-1,3-Dichloropropene	mg/Kg	0.01	< 0.01	< 0.01
Trichloroethene	mg/Kg	0.07	< 0.07	< 0.07
1,3-Dichloropropane	mg/Kg	0.05	< 0.05	< 0.05
1,1,2-Trichloroethane	mg/Kg	0.13	< 0.13	< 0.13
Dibromochloromethane	mg/Kg	0.14	< 0.14	< 0.14
cis-1,3-Dichloropropene	mg/Kg	0.03	< 0.03	< 0.03
1,2-Dibromoethane	mg/Kg	0.03	< 0.03	< 0.03
2-Chloroethylvinyl ether	mg/Kg	0.09	< 0.09	< 0.09
Bromoform	mg/Kg	0.05	< 0.05	< 0.05
1,1,1,2-Tetrachloroethane	mg/Kg	0.04	< 0.04	< 0.04
1,2,3-Trichloropropane	mg/Kg	0.07	< 0.07	< 0.07
1,1,2,2-Tetrachloroethane	mg/Kg	0.27	< 0.27	< 0.27
Tetrachloroethene	mg/Kg	0.06	< 0.06	< 0.06
Pentachloroethane	mg/Kg	0.21	< 0.21	< 0.21
Chlorobenzene	mg/Kg	0.03	< 0.03	< 0.03
1,3-Dichlorobenzene	mg/Kg	0.06	< 0.06	< 0.06
1,2-Dichlorobenzene	mg/Kg	0.06	< 0.06	< 0.06
1,4-Dichlorobenzene	mg/Kg	0.09	< 0.09	< 0.09
Acetone	mg/Kg	2.8	< 2.8	< 2.8
Tetrahydrofuran	mg/Kg	1.1	< 1.1	< 1.1

Sample Identification:			SB-3-9	SB-3-19
Sample Type:			Soil	Soil
Laboratory Log Number:			1587-11	1587-12
Parameter	Units	Target Detection Limit		
Method MDH 465-C (continued):				
Ethyl ether	mg/Kg	0.14	< 0.14	< 0.14
Methyl ethyl ketone	mg/Kg	0.49	< 0.49	< 0.49
Benzene	mg/Kg	0.06	< 0.06	< 0.06
Methyl isobutyl ketone	mg/Kg	0.20	< 0.20	< 0.20
Toluene	mg/Kg	0.11	< 0.11	< 0.11
Ethylbenzene	mg/Kg	0.05	< 0.05	< 0.05
Cumene	mg/Kg	0.22	< 0.22	< 0.22
Total xylenes	mg/Kg	0.28	< 0.28	< 0.28
EPA Method SW-846, 8080:				
Total PCB	mg/Kg	0.0033	<0.0033	<0.0033

Respectfully submitted,

Wayne A. Olson,
Senior Scientist
Organic Chemistry Department

WAO/cg
Invoice Enclosed
< = less than

All analyses were performed using EPA or other recognized methodologies.
All units are on an "as received" basis unless otherwise indicated.

interpoll

INTERPOLL LABORATORIES, INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL: 612/786-6020
FAX: 612/786-7854

December 5, 1990

EnecoTech
3050 Metro Drive, Suite 115
Bloomington, MN 55425

Attention: Jim Berg

LABORATORY REPORT: #1764
ENECOTECH PROJECT: #711-015

SAMPLES COLLECTED: November 12, 1990
SAMPLES RECEIVED: November 13, 1990

Sample Identification:			MW-01	MW-02
Sample Type:			Water	Water
Laboratory Log Number:			1764-01	1764-02
Parameter	Units	Target Detection Limit		
EPA Method SW-846, 8015:				
Total hydrocarbons, as gasoline	ug/L	10	18	250000
Dilution factor			1	50[a]
Modified SW-846 Method 3820:				
Total hydrocarbons, as fuel oil	ug/L	69	680[b]	48000[c]
Dilution factor			1	50[d]

RECEIVED
DEC 7 - 1990

Sample Identification:			MW-01	MW-02
Sample Type:			Water	Water
Laboratory Log Number:			1764-01	1764-02
Parameter	Units	Target Detection Limit		
Method MDH 465-C:				
Chloromethane	ug/L	1.4	< 1.4	< 14
Bromomethane	ug/L	0.23	< 0.23	< 2.3
Vinyl chloride	ug/L	0.30	< 0.30	< 3.0
Dichlorodifluoromethane	ug/L	0.91	< 0.91	< 9.1
Chloroethane	ug/L	0.26	< 0.26	< 2.6
Methylene chloride	ug/L	3.0	< 3.0	< 30
Trichlorofluoromethane	ug/L	0.87	< 0.87	< 8.7
1,1-Dichloroethene	ug/L	0.66	< 0.66	< 6.6
Allyl chloride	ug/L	0.35	< 0.35	< 3.5
1,1-Dichloroethane	ug/L	0.16	< 0.16	< 1.6
cis-1,2-Dichloroethene	ug/L	0.28	< 0.28	< 2.8
trans-1,2-Dichloroethene	ug/L	0.28	< 0.28	< 2.8
Chloroform	ug/L	0.33	< 0.33	< 3.3
1,1,2-Trichlorotrifluoroethane	ug/L	0.90	< 0.90	< 9.0
Dibromomethane	ug/L	0.50	< 0.50	< 5.0
1,2-Dichloroethane	ug/L	0.47	< 0.47	32
1,1,1-Trichloroethane	ug/L	1.4	< 1.4	< 14
Carbon tetrachloride	ug/L	0.44	< 0.44	< 4.4
Bromodichloromethane	ug/L	0.56	< 0.56	< 5.6
2,3-Dichloro-1-propene	ug/L	0.35	< 0.35	< 3.5
1,2-Dichloropropane	ug/L	0.35	< 0.35	< 3.5
1,1-Dichloro-1-propene	ug/L	0.18	< 0.18	< 1.8
trans-1,3-Dichloropropene	ug/L	0.09	< 0.09	< 0.9
Trichloroethene	ug/L	0.58	< 0.58	< 5.8
1,3-Dichloropropane	ug/L	0.38	< 0.38	< 3.8
1,1,2-Trichloroethane	ug/L	1.0	< 1.0	< 10
Dibromochloromethane	ug/L	1.1	< 1.1	< 11
cis-1,3-Dichloropropene	ug/L	0.27	< 0.27	< 2.7
1,2-Dibromoethane	ug/L	0.26	< 0.26	< 2.6
2-Chloroethylvinyl ether	ug/L	0.70	< 0.70	< 7.0
Bromoform	ug/L	0.39	< 0.39	< 3.9
1,1,1,2-Tetrachloroethane	ug/L	0.30	< 0.30	< 3.0
1,2,3-Trichloropropane	ug/L	0.58	< 0.58	< 5.8
1,1,2,2-Tetrachloroethane	ug/L	2.1	< 2.1	< 21
Tetrachloroethene	ug/L	0.45	< 0.45	< 4.5
Pentachloroethane	ug/L	1.7	< 1.7	< 17

Sample Identification:			MW-01	MW-02
Sample Type:			Water	Water
Laboratory Log Number:			1764-01	1764-02
Parameter	Units	Target Detection Limit		
Method MDH 465-C (continued):				
Chlorobenzene	ug/L	0.23	< 0.23	< 2.3
1,3-Dichlorobenzene	ug/L	0.46	< 0.46	< 4.6
1,2-Dichlorobenzene	ug/L	0.49	< 0.49	< 4.9
1,4-Dichlorobenzene	ug/L	0.69	< 0.69	< 6.9
Acetone	ug/L	22	< 22	< 220
Tetrahydrofuran	ug/L	8.7	< 8.7	< 87
Ethyl ether	ug/L	1.1	< 1.1	< 11
Methyl ethyl ketone	ug/L	3.9	< 3.9	< 39
Benzene	ug/L	0.47	< 0.47	32000[e]
Methyl isobutyl ketone	ug/L	1.6	< 1.6	< 16
Toluene	ug/L	0.92	< 0.92	25000[e]
Ethylbenzene	ug/L	0.42	< 0.42	1800[e]
Cumene	ug/L	1.8	< 1.8	20
Total xylenes	ug/L	2.2	< 2.2	10000[e]
Dilution factor			1	10[f]

Footnotes:

[a]Sample was diluted as indicated to accommodate the analyte concentration. Reported value represents the concentration in the original undiluted sample, i.e., instrumental result was multiplied by the dilution factor prior to reporting. Target detection limit is given. The detection limit applicable to the sample may be obtained by multiplying the detection limit by the dilution factor.

[b]The target detection limit is based on a one liter volume of sample being extracted and analyzed. The achieved detection limit for this sample is 3.8 times higher than the target detection limit because less than one liter was submitted for analysis.

[c]Although quantified as fuel oil as requested, the chromatographic pattern did not match that of fuel oil, but a lighter grade.

[d]Sample extract was diluted as indicated to accommodate the analyte concentration. Reported value represents the concentration in the original undiluted sample, i.e., instrumental result was multiplied by the dilution factor prior to reporting. Target detection limit is given. The detection limit applicable to the sample may be obtained by multiplying the detection limit by the dilution factor.

[e]Sample was diluted by a factor of 1000 to accommodate the analyte concentration. Reported value represents the concentration in the original undiluted sample, i.e., instrumental result was multiplied by the dilution factor prior to reporting. Target detection limit is given. The detection limit applicable to the sample may be obtained by multiplying the detection limit by the dilution factor.

[f]Sample was diluted as indicated due to matrix interferences. Reported values represent the concentration in the original undiluted sample, i.e., instrumental results were multiplied by the dilution factor prior to reporting. Target detection limits are given. The detection limit applicable to the sample may be obtained by multiplying the detection limit by the dilution factor.

Respectfully submitted,

Wayne A. Olson,
Senior Scientist
Organic Chemistry Department

WAO/cg
Invoice Enclosed
< = less than

All analyses were performed using EPA or other recognized methodologies.
All units are on an "as received" basis unless otherwise indicated.

interpoll

INTERPOLL LABORATORIES, INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL: 612/786-6020
FAX: 612/786-7854

April 22, 1991

EnecoTech
3050 Metro Drive, Suite 115
Bloomington, MN 55425

Attention: Jim Berg

LABORATORY REPORT: #2672
ENECOTECH PROJECT: #711-015

SAMPLES COLLECTED: April 4-5, 1991
SAMPLES RECEIVED: April 5, 1991

Sample Identification:			SB-06-46	SB-07-14
Sample Type:			Soil	Soil
Laboratory Log Number:			2672-01	2672-02
Parameter	Units	Target Detection Limit		
EPA Method SW-846, 8020:				
MTBE	mg/Kg	0.06	< 0.06	< 0.06
Benzene	mg/Kg	0.06	< 0.06	< 0.06
Toluene	mg/Kg	0.11	< 0.11	< 0.11
Ethylbenzene	mg/Kg	0.05	< 0.05	< 0.05
Xylenes	mg/Kg	0.28	< 0.28	< 0.28
EPA Method SW-846, 8015: Total hydrocarbons, as gasoline	mg/Kg	1.2	< 1.2	< 1.2
EPA Method SW-846, 8015: Total hydrocarbons, as fuel oil	mg/Kg	1.4	< 1.4	< 1.4

Sample Identification:	SB-07-24
Sample Type:	Soil
Laboratory Log Number:	2672-03

Parameter	Units	Method		
EPA Method SW-846, 8020:				
MTBE	mg/Kg	0.06	<	0.06
Benzene	mg/Kg	0.06	<	0.06
Toluene	mg/Kg	0.11	<	0.11
Ethylbenzene	mg/Kg	0.05	<	0.05
Xylenes	mg/Kg	0.28	<	0.28
EPA Method SW-846, 8015: Total hydrocarbons, as gasoline	mg/Kg	1.2	<	1.2
EPA Method SW-846, 8015: Total hydrocarbons, as fuel oil	mg/Kg	1.4	<	1.4

Respectfully submitted,

Wayne A. Olson
Senior Scientist
Organic Chemistry Department

WAO/sk
Invoice Enclosed
< = less than

All analyses were performed using EPA or other recognized methodologies.
All units are on an "as received" basis unless otherwise indicated.

interpoll

INTERPOLL LABORATORIES, INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL: 612/786-6020
FAX: 612/786-7854

RECEIVED
JUL - 3 1991

June 24, 1991

EnecoTech
3050 Metro Drive, Suite 115
Bloomington, MN 55425

Attention: Jim Berg

LABORATORY REPORT: #3170
ENECOTECH PROJECT: #711-015

SAMPLES COLLECTED: May 30, 1991
SAMPLES RECEIVED: May 31, 1991

Sample Identification:			MW-02
Sample Type:			Water
Laboratory Log Number:			3170-01
Parameter	Units	Target Detection Limit	
EPA Method SW-846, 7421:			
Lead	ug/L	1	74
EPA Method SW-846, 8020:			
MTBE	ug/L	0.68	1700
Dilution factor			50[a]
EPA Method SW-846, 8015:			
Total hydrocarbons, as gasoline	ug/L	12	102000
Dilution factor			50[a]
EPA Method SW-846, 3550/8015:			
Total hydrocarbons, as fuel oil	ug/L	46	26000
Dilution factor			10[b,c]

Sample Identification: MW-02
Sample Type: Water
Laboratory Log Number: 3170-01

Parameter	Units	Target Detection Limit	
Method MDH 465-C (continued):			
Chlorobenzene	ug/L	0.23	< 120
1,3-Dichlorobenzene	ug/L	0.46	< 230
1,2-Dichlorobenzene	ug/L	0.49	< 240
1,4-Dichlorobenzene	ug/L	0.69	< 340
Acetone	ug/L	22	< 11000
Tetrahydrofuran	ug/L	8.7	16000
Ethyl ether	ug/L	1.1	1200
Methyl ethyl ketone	ug/L	3.9	2000
Benzene	ug/L	0.47	19000
Methyl isobutyl ketone	ug/L	1.6	< 800
Toluene	ug/L	0.92	19000
Ethylbenzene	ug/L	0.42	1000
Cumene	ug/L	1.8	< 900
Total xylenes	ug/L	2.2	9300
Dilution factor			500[d]

Sample Identification: MW-02
Sample Type: Water
Laboratory Log Number: 3170-01

Parameter	Units	Target Detection Limit		
Method MDH 465-C:				
Chloromethane	ug/L	1.4	<	700
Bromomethane	ug/L	0.23	<	120
Vinyl chloride	ug/L	0.30	<	150
Dichlorodifluoromethane	ug/L	0.91	<	460
Chloroethane	ug/L	0.26	<	130
Methylene chloride	ug/L	3.0	<	1500
Trichlorofluoromethane	ug/L	0.87	<	440
1,1-Dichloroethene	ug/L	0.66	<	330
Allyl chloride	ug/L	0.35	<	180
1,1-Dichloroethane	ug/L	0.16	<	80
cis-1,2-Dichloroethene	ug/L	0.28	<	140
trans-1,2-Dichloroethene	ug/L	0.28	<	140
Chloroform	ug/L	0.33	<	170
1,1,2-Trichlorotrifluoroethane	ug/L	0.90	<	450
Dibromomethane	ug/L	0.50	<	250
1,2-Dichloroethane	ug/L	0.47	<	240
1,1,1-Trichloroethane	ug/L	1.4	<	700
Carbon tetrachloride	ug/L	0.44	<	220
Bromodichloromethane	ug/L	0.56	<	110
2,3-Dichloro-1-propene	ug/L	0.35	<	180
1,2-Dichloropropane	ug/L	0.35	<	180
1,1-Dichloro-1-propene	ug/L	0.18	<	90
trans-1,3-Dichloropropene	ug/L	0.09	<	90
Trichloroethene	ug/L	0.58	<	290
1,3-Dichloropropane	ug/L	0.38	<	190
1,1,2-Trichloroethane	ug/L	1.0	<	500
Dibromochloromethane	ug/L	1.1	<	550
cis-1,3-Dichloropropene	ug/L	0.27	<	95
1,2-Dibromoethane	ug/L	0.26	<	130
2-Chloroethylvinyl ether	ug/L	0.70	<	350
Bromoform	ug/L	0.39	<	200
1,1,1,2-Tetrachloroethane	ug/L	0.30	<	150
1,2,3-Trichloropropane	ug/L	0.58	<	290
1,1,2,2-Tetrachloroethane	ug/L	2.1	<	1000
Tetrachloroethene	ug/L	0.45	<	200
Pentachloroethane	ug/L	1.7	<	850

Footnotes:

[a]Sample was diluted as indicated to accommodate the analyte concentration. Reported value represents the concentration in the original undiluted sample, i.e., instrumental result was multiplied by the dilution factor prior to reporting. Target detection limit is given. The detection limit applicable to the sample may be obtained by multiplying the detection limit by the dilution factor.

[b]Sample extract was diluted as indicated to accommodate the analyte concentration. Reported value represents the concentration in the original undiluted sample, i.e., instrumental result was multiplied by the dilution factor prior to reporting. Target detection limit is given. The detection limit applicable to the sample may be obtained by multiplying the detection limit by the dilution factor.

[c]Although quantified as fuel oil as requested, the chromatographic pattern more closely resembles that of gasoline.

[d]Sample was diluted as indicated to accommodate the analyte with the highest concentration. Reported values represent the concentration in the original undiluted sample, i.e., instrumental results were multiplied by the dilution factor prior to reporting. Target detection limits are given. The detection limit applicable to the sample may be obtained by multiplying the detection limit by the dilution factor.

Respectfully submitted,

Gregg W. Holman,
Senior Scientist
Inorganic Chemistry Department

Wayne A. Olson,
Senior Scientist
Organic Chemistry Department

GWH/WAO/sk
Invoice Enclosed
< = less than

All analyses were performed using EPA or other recognized methodologies.
All units are on an "as received" basis unless otherwise indicated.

CHAIN OF CUSTODY RECORD

ENECOTECH
3050 METRO DRIVE, SUITE 115
BLOOMINGTON, MN 55425 (612) 854-5513

NO. [illegible]

LOCATION: Sinclair - New Hope
PROJECT NUMBER: TH-015
PROJECT MANAGER: J. Berg
LABORATORY: Interpoll
TURNAROUND TIME: STANDARD

ITEM NO.	SAMPLE NUMBER	NUMBER OF CONTAINERS AND TYPE	MATRIX	COLLECTION DATE	COLLECTION TIME	ANALYSIS REQUIRED
3170-01 1	MW-02	3-40ml VOA's, 1-250ml, 1-1000ml	H2O	5-30-91	11:00	MTBE, MDH465-C, THC-gas, Lead, THC-fuel oil (GASOLINE SMELL)
2						
3						
4						
5						
6						
7						
8						
9						
10						

SAMPLER'S SIGNATURE	DATE
Scott H. Weston	5-30-91
NOTES:	

TRANSFER NO.	ITEM NO.	RELINQUISHED BY	ACCEPTED BY	DATE SUBMITTED
1	1	Scott H. Weston	BC Berg	1100 5/31/91
2				
3				
4				

interpoll

INTERPOLL LABORATORIES, INC
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL 612/786-6020
FAX 612/786-7804

August 14, 1991

EnecoTech
3050 Metro Drive, Suite 115
Bloomington, MN 55425

Attention: Jim Berg

LABORATORY REPORT: #3593
ENECOTECH PROJECT: #711-015

SAMPLES COLLECTED: July 10, 1991
SAMPLES RECEIVED: July 12, 1991

Sample Identification:			SB-08-10	SB-08-34
Sample Type:			Soil	Soil
Laboratory Log Number:			3593-01	3593-02
Parameter	Units	Target Detection Limit		
EPA Method SW-846, 6010:				
Lead	mg/Kg	5	6	< 5
EPA Method SW-846, 8020:				
MTBE	mg/Kg	0.085	< 0.43	< 0.17
Benzene	mg/Kg	0.059	< 0.30	0.95
Toluene	mg/Kg	0.063	0.76	1.1
Ethylbenzene	mg/Kg	0.041	0.96	1.5
Xylenes	mg/Kg	0.18	4.7	8.1
Dilution factor			5[a]	2[a]
EPA Method SW-846, 8015:				
Total hydrocarbons, as gasoline	mg/kg	1.6	45	47
Dilution factor			5[b]	2[b]
EPA Method SW-846, 3510/8015:				
Total hydrocarbons, as fuel oil	mg/Kg	1.4	220[c]	8.7[c]
Dilution factor			5[b]	1

Interpoll Laboratories, Inc.
Laboratory Report #3593
EnecoTech

August 14, 1991

Sample Identification:			SB-09-10	SB-09-34
Sample Type:			Soil	Soil
Laboratory Log Number:			3593-03	3593-04
Parameter	Units	Target Detection Limit		
EPA Method SW-846, 6010:				
Lead	mg/Kg	5	< 5	6
EPA Method SW-846, 8020:				
MTBE	mg/Kg	0.085	< 0.43	< 0.085
Benzene	mg/Kg	0.059	< 0.30	< 0.059
Toluene	mg/Kg	0.063	< 0.32	< 0.063
Ethylbenzene	mg/Kg	0.041	< 0.20	< 0.041
Xylenes	mg/Kg	0.18	2.6	< 0.18
Dilution factor			5[a]	1
EPA Method SW-846, 8015:				
Total hydrocarbons, as gasoline	mg/kg	1.6	20	< 1.6
Dilution factor			5[b]	1
EPA Method SW-846, 3510/8015:				
Total hydrocarbons, as fuel oil	mg/Kg	1.4	57[c]	< 1.4

Interpoll Laboratories, Inc.
Laboratory Report #3593
EnecoTech

August 14, 1991

Sample Identification:	MW-01
Sample Type:	Water
Laboratory Log Number:	3593-05

Parameter	Units	Target Detection Limit		
EPA Method SW-846, 6010:				
Lead	ug/L	30		60
EPA Method SW-846, 8020:				
MTBE	ug/L	0.68	<	0.68
EPA Method SW-846, 8015:				
Total hydrocarbons, as gasoline	ug/L	13	<	13
EPA Method SW-846, 3510/8015:				
Total hydrocarbons, as fuel oil	ug/L	43	<	43

Interpoll Laboratories, Inc.
Laboratory Report #3593
EnecoTech

August 14, 1991

Sample Identification: MW-01
Sample Type: Water
Laboratory Log Number: 3593-05

Parameter	Units	Target Detection Limit		
Method MDH 465-C:				
Chloromethane	ug/L	1.4	<	1.4
Bromomethane	ug/L	0.23	<	0.23
Vinyl chloride	ug/L	0.30	<	0.30
Dichlorodifluoromethane	ug/L	0.91	<	0.91
Chloroethane	ug/L	0.26	<	0.26
Methylene chloride	ug/L	3.0	<	3.0
Trichlorofluoromethane	ug/L	0.87	<	0.87
1,1-Dichloroethene	ug/L	0.66	<	0.66
Allyl chloride	ug/L	0.35	<	0.35
1,1-Dichloroethane	ug/L	0.16	<	0.16
cis-1,2-Dichloroethene	ug/L	0.28	<	0.28
trans-1,2-Dichloroethene	ug/L	0.28	<	0.28
Chloroform	ug/L	0.33	<	0.33
1,1,2-Trichlorotrifluoroethane	ug/L	0.90	<	0.90
Dibromomethane	ug/L	0.50	<	0.50
1,2-Dichloroethane	ug/L	0.47	<	0.47
1,1,1-Trichloroethane	ug/L	1.4	<	1.4
Carbon tetrachloride	ug/L	0.44	<	0.44
Bromodichloromethane	ug/L	0.56	<	0.56
2,3-Dichloro-1-propene	ug/L	0.35	<	0.35
1,2-Dichloropropane	ug/L	0.35	<	0.35
1,1-Dichloro-1-propene	ug/L	0.18	<	0.18
trans-1,3-Dichloropropene	ug/L	0.09	<	0.09
Trichloroethene	ug/L	0.58	<	0.58
1,3-Dichloropropane	ug/L	0.38	<	0.38
1,1,2-Trichloroethane	ug/L	1.0	<	1.0
Dibromochloromethane	ug/L	1.1	<	1.1
cis-1,3-Dichloropropene	ug/L	0.27	<	0.27
1,2-Dibromoethane	ug/L	0.26	<	0.26
2-Chloroethylvinyl ether	ug/L	0.70	<	0.70
Bromoform	ug/L	0.39	<	0.39
1,1,1,2-Tetrachloroethane	ug/L	0.30	<	0.30
1,2,3-Trichloropropane	ug/L	0.58	<	0.58
1,1,2,2-Tetrachloroethane	ug/L	2.1	<	2.1
Tetrachloroethene	ug/L	0.45	<	0.45
Pentachloroethane	ug/L	1.7	<	1.7
Chlorobenzene	ug/L	0.23	<	0.23
1,3-Dichlorobenzene	ug/L	0.46	<	0.46
1,2-Dichlorobenzene	ug/L	0.49	<	0.49
1,4-Dichlorobenzene	ug/L	0.69	<	0.69

Interpoll Laboratories, Inc.
Laboratory Report #3593
EnecoTech

August 14, 1991

Sample Identification:	MW-01
Sample Type:	Water
Laboratory Log Number:	3593-05

Parameter	Units	Target Detection Limit		
Method MDH 465-C (continued):				
Acetone	ug/L	22	<	22
Tetrahydrofuran	ug/L	8.7		9.9
Ethyl ether	ug/L	1.1	<	1.1
Methyl ethyl ketone	ug/L	3.9	<	3.9
Benzene	ug/L	0.47	<	0.47
Methyl isobutyl ketone	ug/L	1.6	<	1.6
Toluene	ug/L	0.92	<	0.92
Ethylbenzene	ug/L	0.42	<	0.42
Cumene	ug/L	1.8	<	1.8
Total xylenes	ug/L	2.2	<	2.2

Footnotes:

[a]Sample extract was diluted as indicated to accommodate the analyte with the highest concentration. Reported values represent the concentration in the original undiluted sample, i.e., instrumental results were multiplied by the dilution factor prior to reporting. Target detection limits are given. The detection limit applicable to the sample may be obtained by multiplying the detection limit by the dilution factor.

[b]Sample extract was diluted as indicated to accommodate the analyte concentration. Reported value represents the concentration in the original undiluted sample, i.e., instrumental result was multiplied by the dilution factor prior to reporting. Target detection limit is given. The detection limit applicable to the sample may be obtained by multiplying the detection limit by the dilution factor.

[c]Although quantified as fuel oil as requested, the chromatographic pattern did not match that of fuel oil, but a lighter grade.

Respectfully submitted,

Gregg W. Holman,
Senior Scientist
Inorganic Chemistry Department

Wayne A. Olson,
Senior Scientist
Organic Chemistry Department

GWH/WAO/sk
Invoice Enclosed
< = less than

All analyses were performed using EPA or other recognized methodologies.
All units are on an "as received" basis unless otherwise indicated.

January 27, 1987

Mobil Oil Corporation
600 Woodfield Drive
Schaumburg, Illinois 60196

Attn: Mr. Rick Larson

Subj: Tank Excavation
Mobil Station
9405 Medicine Lake Road
Golden Valley, Minnesota
#4231 87-503

Dear Mr. Larson:

1.0 Introduction

This report presents the results of work completed at a Mobil station in Golden Valley, Minnesota. All work was verbally authorized by M.C. Holland and yourself of Mobil Oil Corporation on January 14, 1987. Site activities consisted of the following:

1. Observation of the removal of the existing 1000 gallon tank.

2. Screening of the soils excavated to insure adequate removal of contaminated material.

2.0 Background

The 1000 gallon diesel oil tank was installed by Pump & Meter Service Company of Minneapolis in 1981. In the spring of 1986, moisture was noted in the product dispensed from the tank. The tank was pumped dry and refilled. Water was again observed in the dispensed product so the tank was pumped out, leaving only a few gallons.

3.0 Project Results

3.1 Tank Removal

The 1000 gallon tank was removed on January 19, 1987 by Pump & Meter Service. A representative of Twin City Testing Corporation (TCT) was present for the removal. The bottom 3/4 of the tank was coated with a black film of oil and a small quality of water diluted oil was noted in the bottom

of the excavation. An inspection of the tank did not reveal any holes in the tank, although several pitted areas were observed. Oil was seen dripping off the end of the tank as it was swung out of the excavation.

3.2 Soil Screening

The TCT technician screened the excavated soil with a Century Systems Model OVA-128 portable organic vapor analyzer. Readings of 98 parts per million (ppm) and 108 ppm total organic vapors were noted. The excavated soils had a strong oil-like odor and staining was apparent.

Pump & Meter Service continued excavation of contaminated soils on January 22, 1987. Approximately 50 cubic yards of contaminated soils were removed. Additional excavation was not warranted, as visual and olfactory evidence indicated no contaminated soil remained in the subsurface environment. A sample of the clay from the excavation floor was returned to the TCT office and screened with a TIP Photovac photoionization meter and a total organic vapor concentration of 13 ppm was indicated.

As indicated in our report dated December 18, 1986, the natural soil in this area is a glacial till of sandy lean clay. The excavation also consisted of clean sand backfill from the original tank installation.

4.0 Discussion

The fuel oil in the ground had saturated the sand fill but apparently had not penetrated the natural clay.

The visual and olfactory evidence indicates that the contaminated soils were removed from the subsurface environment. This observation is supported by the values obtained from photoionization screening of soils at the base of the excavation.

5.0 Recommendations

It is our opinion that further subsurface environmental investigations are not necessary at this site at this time.

6.0 Remarks

The recommendations contained in this report represent our professional opinions. These opinions were arrived at in accordance with currently accepted engineering practices at this time and location. Other than this, no warranty is implied or intended.

Very truly yours,

Twin City Testing Corporation

Terrance P. Brennan

Terrance P. Brennan
Geologist

Tom Gapinske

Tom Gapinske
Hydrogeologist/Senior Project Manager

TPB/TG/sjo

LEAK # 183

REMEDIAL SITE ASSESSMENT

MOBIL OIL CORPORATION SITE #4 05GOD

COUNTY ROAD 18 AND

MEDICINE LAKE ROAD

GOLDEN VALLEY, MINNESOTA

MAY 28, 1987

#4231 87-663

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REMEDIAL SITE ASSESSMENT

MOBIL OIL CORPORATION SITE #4 05GOD

COUNTY ROAD 18 AND

MEDICINE LAKE ROAD

GOLDEN VALLEY, MINNESOTA

#4231 87-663

1.0 INTRODUCTION

The purpose of this assessment was to determine the extent of subsurface contamination, with subsequent recommendations for further action. This assessment was conducted at the Mobil Oil Corporation service station at the intersection of County Road 18 and Medicine Lake Road in Golden Valley, Minnesota (Site #4 05GOD).

Specifically, the work effort consisted of the following:

1. advancing five standard penetration soil borings,
2. completing three soil borings as monitoring wells,
3. evaluating soil samples using visual appearance and odor as criteria,
4. collecting water level measurements and determining the ground water flow regime,
5. collecting and analyzing ground water samples for benzene, toluene, xylenes and total hydrocarbons as gasoline, and

6. preparing a report which summarizes and evaluates the data, with recommendations for further action.

2.0 PROJECT RESULTS

2.1 Subsurface Conditions

The site is underlain by glacial tills and alluvium. The glacial tills consist mainly of silty sand (SM), clayey sand (SC), and sandy lean clay (CL) with varying amounts of gravel. Sand (SP), and sand with silt and gravel (SP-SM) comprise the coarse alluvium. A layer of fine alluvium which consists of lean clay with sand (CL) was encountered at the bottom of the boring for MW-8. Lenses of silt, silty sand, and sand were encountered at varying depths. Soil borings B-5 and B-10 and monitoring well MW-8 terminate in alluvium; whereas, monitoring wells MW-7 and MW-9 terminate in glacial till. The soil boring depths vary between 33' and 56 1/2' below the ground surface; however, the surface elevations also vary considerably at the site.

2.2 Monitoring Wells

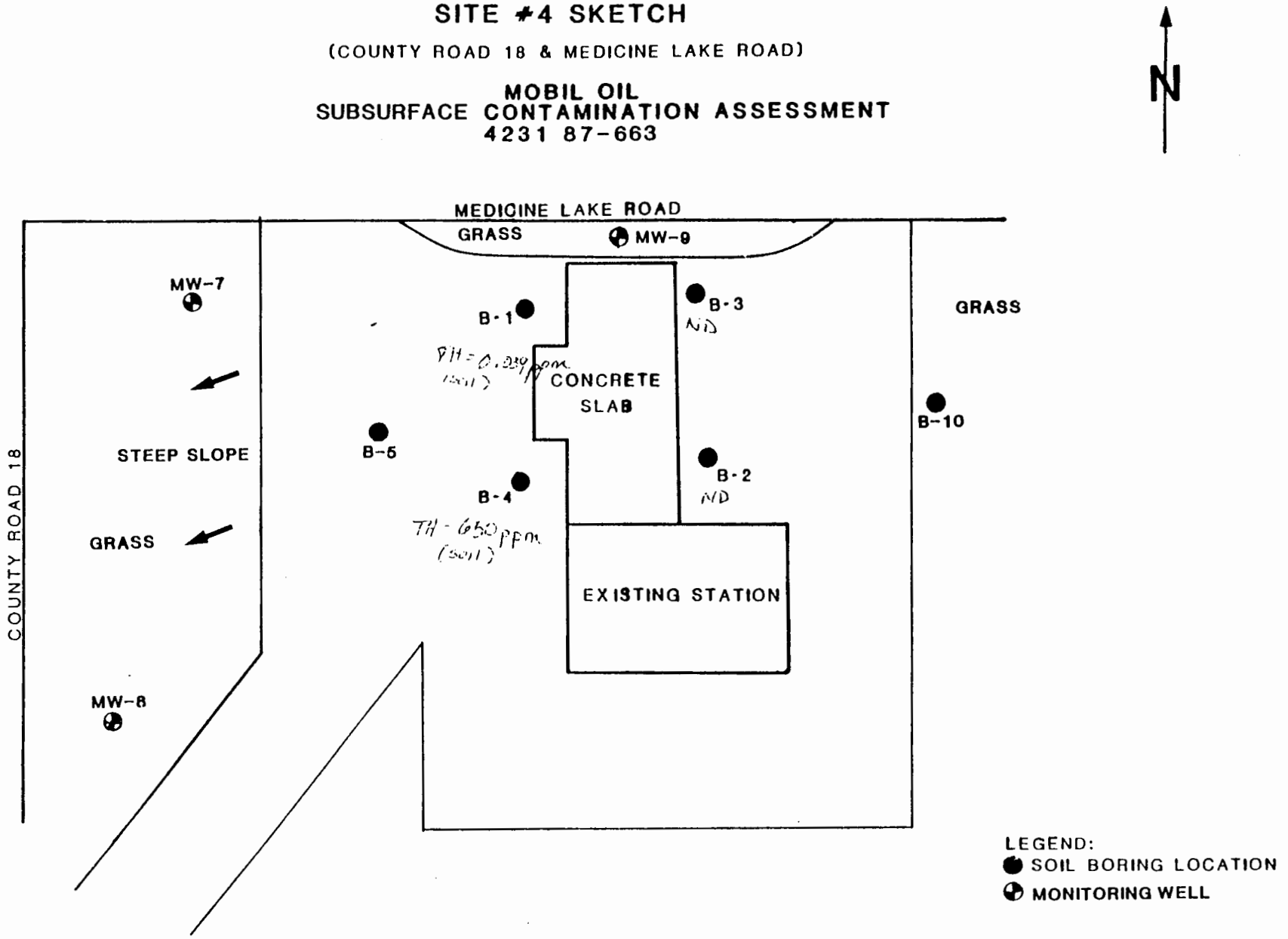
Monitoring wells MW-7, MW-8 and MW-9; soil borings B-5 and B-10; and the previously advanced soil borings B-1, B-2, B-3 and B-4 were placed at the locations indicated on Figure 1. Boring logs and the "Installation of

FIGURE 1

SITE #4 SKETCH

(COUNTY ROAD 18 & MEDICINE LAKE ROAD)

MOBIL OIL
SUBSURFACE CONTAMINATION ASSESSMENT
4231 87-663



twin city testing corporation

Je 3-#4231 87-663

Monitoring Well" data sheets are presented in Appendix B. The monitoring wells were completed at depths ranging between 33' and 37 3/4' below the ground surface. Soil borings B-5 and B-10 were advanced to depths of 56 1/2' and 46', respectively, without encountering ground water. Therefore, the borings were not completed as monitoring wells.

2.3 Ground Water Levels and Flow Regime

Ground water levels were measured at the three monitoring wells on April 30, 1987. Generally, ground water was encountered between 19' and 30' below the ground surface; however, ground water was not encountered at soil borings B-5 and B-10. The depth to the phreatic surface varies considerably and may be due to waterbearing sand and silt laminations which are encountered at varying depths. Generally, ground water flow appears to be to the southwest, towards Medicine Lake.

2.4 Chemistry

On April 30, 1987, water samples were collected from the three monitoring wells and analyzed for total hydrocarbons as gasoline, benzene, toluene and xylene concentrations.

The laboratory analyses did not detect total hydrocarbons as gasoline, benzene, toluene and xylene in concentrations which exceed the lower detection level. The laboratory results are listed in Table 1 and the laboratory report is included in Appendix A.

Previously, soil samples were collected from soil borings B-1, B-2, B-3 and B-4 and analyzed for total hydrocarbons as gasoline, benzene, toluene and xylenes. The analyses detected high concentrations of dissolved hydrocarbons in a soil sample from boring B-4 at a sampling interval of 19.5' to 21', and low concentrations in samples from B-1 and B-4 at a sampling interval of 9.5' to 11'. The laboratory results are listed in Table 2 and the laboratory report is included in Appendix A.

3.0 DISCUSSION AND CONCLUSIONS

Ground water samples collected and analyzed from monitoring wells MW-7, MW-8 and MW-9 did not contain total hydrocarbons as gasoline, benzene, toluene and xylene concentrations in excess of the lower detection level.

Through visual and olfactory criteria, slight to moderate petroleum odors were noted from soil samples above the 22 1/2' depth at soil boring B-5. This is consistent with the analytical data from B-1 and B-4, which detected dissolved hydrocarbons in soil samples above the 21' depth.

TABLE 1

GROUND WATER ANALYTICAL RESULTS
MOBIL OIL CORPORATION SITE #4 05GOD
GOLDEN VALLEY, MINNESOTA
#4231 87-663

Parameter	MW-7	MW-8	MW-9	LDL
Total hydrocarbons as gasoline	ND*	ND*	ND*	1
Benzene	ND	ND	ND	1
Toluene	ND	ND	ND	1
Xylenes	ND	ND	ND	1

All values are in ug/L. ug/L is equivalent to parts per billion.
ND = Not Detected
LDL = Lower Detectable Limit
* = Unidentified peak at 12 min. non-typical of gasoline

TABLE 2

SOIL SAMPLE ANALYTICAL RESULTS
MOBIL OIL CORPORATION SITE #4 05GOD
GOLDEN VALLEY, MINNESOTA
#4231 87-663

Boring #	Sampling Interval	Total Hydrocarbons	Benzene	Toluene	Xylene
B-1	9.5' - 11'	39	ND	1	8
B-1	19.5' - 21'	ND	ND	ND	ND
B-1	29.5' - 31'	ND	ND	ND	ND
B-2	9.5' - 11'	ND	ND	ND	ND
B-2	19.5' - 21'	ND	ND	ND	ND
B-2	29.5' - 31'	ND	ND	ND	ND
B-3	9.5' - 11'	ND	ND	ND	ND
B-3	19.5' - 21'	ND	ND	ND	ND
B-3	29.5' - 31'	ND	ND	ND	ND
B-4	9.5' - 11'	23	ND	4	20
B-4	19.5' - 21'	650,000	22,000	45,000	115,000
B-4	29.5' - 31'	ND	ND	ND	ND

ND = Not Detected
Lower Detection Limit is 1 ug/kg
All results expressed as ug/kg

The contamination appears to be limited to the soil profile and is localized around B-1, B-4, and B-5. Soil borings B-1, B-4, and B-5 are located adjacent to the pump islands and the buried petroleum tanks. Surface spillage, leaking lines and/or leaking tanks are all potential sources for the detected contamination. Layers of less permeable soil may be acting as barriers to vertical migration to the water table.

Since the contamination does not appear to be widespread, no further action is warranted at this time.

4.0 STANDARD OF CARE

The recommendations contained in this report represent our professional opinions. These opinions were arrived at in accordance with currently accepted hydrogeologic, engineering and analytical practices at this time and location. Other than this, no warranty is implied or intended.

This report was prepared by: William J. Breitzman

William J. Breitzman
Hydrogeologist/Project Manager

Date: May 28, 1987

This report was reviewed by: Tom Gapinske

Tom Gapinske
Hydrogeologist/Senior Project Manager

Date: May 28, 1987

Proofread by: J. Wright

APPENDIX A

CHEMISTRY LABORATORY RESULTS

TABLE 1

VOLATILE ANALYSIS

Parameter	MW-7	MW-9	MW-8	LDL
Total hydrocarbons as gasoline	ND*	ND*	ND*	1
Benzene	ND	ND	ND	1
Toluene	ND	ND	ND	1
Xylenes	ND	ND	ND	1

All values are in ug/L. ug/L is equivalent to parts per billion.

ND - Not detected

LDL - Lower detectable limit

* - Unidentified peak at 12 min. non-typical of gasoline.

Laboratory No 4410 87-3802

TABLE 1

ANALYTICAL RESULTS
MOBIL SITE #05G0D
SITE #4

Boring #	Sampling Interval	Total Hydrocarbons	Benzene	Toluene	Xylene
B-1	9.5'-11'	39	ND	1	8
B-1	19.5'-21'	ND	ND	ND	ND
B-1	29.5'-31'	ND	ND	ND	ND
B-2	9.5'-11'	ND	ND	ND	ND
B-2	19.5'-21'	ND	ND	ND	ND
B-2	29.5'-31'	ND	ND	ND	ND
B-3	9.5'-11'	ND	ND	ND	ND
B-3	19.5'-21'	ND	ND	ND	ND
B-3	29.5'-31'	ND	ND	ND	ND
B-4	9.5'-11'	23	ND	4	20
B-4	19.5'-21'	650,000	22,000	45,000	115,000
B-4	29.5'-31'	ND	ND	ND	ND

ND = Not Detected
Lower Detection Limit is 1 ug/kg
All results expressed as ug/kg

twin city testing
corporation
662 CROMWELL AVENUE
ST PAUL, MN 55114
PHONE 612/645-3601

REPORT OF CHEMICAL ANALYSIS

PROJECT: MOBIL

REPORTED TO: Twin City Testing
Attn: Tom Gapanski
662 Cromwell Ave
St Paul, MN 55114

DATE: Dec 18, 1986

LABORATORY No. 4400 87-1207

INTRODUCTION:

This report presents the results of our analysis of samples received by this laboratory on Nov 25, 1986 from representatives of Twin City Testing Corporation. The scope of our work was limited to analyzing the samples for the presence of total hydrocarbons as gasoline, benzene, toluene and xylenes using gas chromatographic techniques.

SAMPLE IDENTIFICATION:

Site 4 12 soil samples

METHODOLOGY:

Gasoline concentration was determined using a Tekmar LSC-2 liquid sample concentrator on an HP-5890 gas chromatograph equipped with flame ionization detectors. Compounds were identified by column retention time and quantified by peak area comparisons to those of know standards using a VG Laboratory data system.

RESULTS:

The results are listed in Table #1.

REMARKS:

The samples were consumed in the analysis.

TWIN CITY TESTING CORPORATION

Chris Bremer
Asst Laboratory Supervisor

Harold D Fisher
Chromatography Group Leader

twin city testing corporation
662 CROMWELL AVENUE
ST. PAUL, MN 55114
PHONE 612/645-3601

REPORT OF: CHEMICAL ANALYSIS

PROJECT: Mobile-Hwy 18 & Medicine Lake Rd - 4231 87-663

DATE: May 5, 1987

REPORTED TO: Twin City Testing Corporation
Attn: Bill Breitzman
662 Cromwell Avenue
St Paul, MN 55114

LABORATORY No. 4410 87-3802

INTRODUCTION

This report presents the results of our analysis of water samples received by this laboratory on May 1, 1987 from Bill Breitzman of Twin City Testing Corporation. The scope of our work was limited to analyzing the samples for the presence of total hydrocarbons as gasoline, benzene, toluene and xylenes using gas chromatographic techniques.

SAMPLE IDENTIFICATION

TCT #870014053 - MW-7
TCT #870014054 - MW-9
TCT #870014055 - MW-8

METHODOLOGY

Gasoline concentration was determined using a Tekmar LSC-2 liquid sample concentrator on a HP-5890 gas chromatograph equipped with flame ionization detectors. Compounds were 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 Table 1.

REMARKS

The samples were analyzed on May 3, 1987. The samples were consumed in the analysis.

TWIN CITY TESTING CORPORATION

Chris Bremer
Asst Laboratory Supervisor

Harold D Fisher
Chromatography Group Leader

CB/HDF/jm

Proofread by

APPENDIX B

BORING LOGS AND MONITORING WELL CONSTRUCTION SHEETS

LOG OF TEST BORING

JOB NO 4231 87-663 VERTICAL SCALE 1" = 5' BORING NO B-5

PROJECT Monitoring Well Installation; Medicine Lake Rd & Cty Rd 18 Site #4 05G0D, Mobil Oil

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION)	GEOLOGIC ORIGIN	N	WL	SAMPLE NO	SAMPLE TYPE	PETROLEUM PRODUCT OBSERVATIONS
9"	BLACKTOP						
	FILL, MIXTURE OF SILTY SAND AND CLAYEY SAND W/A LITTLE GRAVEL, brown and gray, dry	FILL			1	HSA	
5							
	FILL, MOSTLY CLAYEY SAND W/A LITTLE GRAVEL, brown,		8		2	SB	
8							
	FILL, MOSTLY SANDY LEAN CLAY W/A LITTLE GRAVEL, brown, medium		8		3	SB	
11							
12	FILL, MOSTLY SANDY (See #1)						
	CLAYEY SAND W/A LITTLE GRAVEL, brown mottled to brownish gray mottled, rather stiff to stiff (SC) to medium	TILL	12		5	SB	
			8		6	SB	Note: Samples above 22½' have slight to moderate petroleum products odor
	(SC)		20		7	SB	
27							
	CLAYEY SAND W/A LITTLE GRAVEL, a few cobbles, reddish brown, stiff (SC)						
30							

(CONTINUED ON NEXT PAGE)

#1 - CLAY W/A LITTLE GRAVEL, gray brown and a trace of black

LOG OF TEST BORING

JOB NO 4231 87-663 VERTICAL SCALE 1" = 5' BORING NO. B-5 (Cont)

PROJECT Site #4 05GOD (Cont)

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION)	GEOLOGIC ORIGIN	N	WL	SAMPLE NO.	SAMPLE TYPE	PETROLEUM PRODUCT OBSERVATIONS
30	CLAYEY SAND W/A LITTLE GRAVEL (Cont)	TILL (Cont)	21		8	SB	
33	SILTY SAND W/A LITTLE GRAVEL, with lenses of dry sand, grayish brown, very dense, a few lenses of sand below about 37½' (SM)		48		9	SB	
			77		10	SB	
42	LEAN CLAYEY SAND W/A LITTLE GRAVEL, grayish brown stiff (SC)	COARSE ALLUVIUM	20		11	SB	
47½	SAND W/A LITTLE GRAVEL, medium grained, light brown, moist, very dense (SP)		37		12	SB	
53	SAND, fine grained, light brown, moist, dense (SP)		28		13	SB	
56½	End of Boring						

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
					to	
4-15	9:15	56½'	52½'	52½'	to	None
					to	
					to	

START 4-14-87 COMPLETE 4-14-87

METHOD HSA 0'-54½' @ 3:00

CREW CHIEF Mishler

LOG OF TEST BORING

JOB NO 4231 87-663 VERTICAL SCALE 1" = 5' BORING NO B-10

PROJECT Monitoring Well Installation; Medicine Lake Rd & Cty Rd 18; Site #4 05GOD;

Mobil Oil Corp.

SURFACE ELEVATION

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GEOLOGIC ORIGIN	N	WL	SAMPLE NO	SAMPLE TYPE	PETROLEUM PRODUCT OBSERVATIONS
	FILL, MIXTURE OF SILTY SAND AND CLAYEY SAND W/A LITTLE GRAVEL, black and brown	FILL	4		1	SB	
			17		2	SB	
4	CLAYEY SAND W/A LITTLE GRAVEL, brown, stiff (may be fill) (SC)	FILL OR TILL					
7	CLAYEY SAND W/A LITTLE GRAVEL, brown, rather stiff (may be fill) (SC)		11		3	SB	
13	CLAYEY SAND W/A LITTLE GRAVEL, gray and brown mottled, rather stiff (SC)	TILL	13		4	SB	
16½	SANDY LEAN CLAY W/A LITTLE GRAVEL, brown, rather stiff (CL)		12		5	SB	
19	CLAYEY SAND W/A LITTLE GRAVEL, brown, rather stiff, a lens of silt at about 18' (SC)		11		6	SB	
			14		7	SB	
24							
25	CLAYEY SAND W/A (See #1) (SC)						

(CONTINUED ON NEXT PAGE)

#1 - LITTLE GRAVEL, brownish gray, rather stiff (SC)

LOG OF TEST BORING

JOB NO. 4231 87-663 VERTICAL SCALE 1" = 5' BORING NO. B-10 (Cont)

PROJECT Monitoring Well Installation; Site #4 05GOD

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION ____)	GEOLOGIC ORIGIN	N	WL	SAMPLE NO.	SAMPLE TYPE	PETROLEUM PRODUCT OBSERVATIONS
25	CLAYEY SAND W/A LITTLE GRAVEL, (Cont)	TILL (Cont)	11		8	SB	
26½	CLAYEY SAND W/A LITTLE GRAVEL, a few cobbles, gray to grayish brown, rather stiff to stiff (sc)		10		9	SB	
			13		10	SB	
			11		11	SB	
			44		12	SB	
36½	SILTY SAND W/A LITTLE GRAVEL, brown, moist, dense (SM)		23		13	SB	
39	CLAYEY SAND W/A LITTLE GRAVEL, grayish brown, rather stiff to stiff, a lens of silty sand at about 43' (SC-SM)		12		14	SB	
43½			24		15	SB	
44	SAND, fine grained, (See #1) (SP)	COARSE ALLUVIUM			16	SB	
46	SAND W/A LITTLE GRAVEL, medium grained, light brown moist, very dense (SP)		44		17	SB	
	End of Boring						
	#1 - light brown, moist, dense (SP)						

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
4-20	9:10	41½'	39½'	41.4'	to	None
4-20	9:40	46'	44½'	46.3	to	None
					to	
					to	

START 4-17-87 COMPLETE 4-17-87

METHOD HSA 0'-44½' @ 9:40

CREW CHIEF Mishler

LOG OF TEST BORING

JOB NO. 4231 87-663 VERTICAL SCALE 1" = 5' BORING NO. MW-7

PROJECT Monitoring Well Installation; Medicine Lake Rd & Cty Rd 18; Site #4 05G0D, Mobil Oil

DEPTH IN FEET	DESCRIPTION OF MATERIAL (▼ SURFACE ELEVATION ____)	GEOLOGIC ORIGIN	N	WL	SAMPLE NO	SAMPLE TYPE	PETROLEUM PRODUCT OBSERVATIONS
	FILL, MIXTURE OF SILTY SAND, SANDY LEAN CLAY W/A LITTLE GRAVEL, dark brown and brown,	FILL	5'		1	SB	
4							
	LEAN CLAY, brown mottled, medium (CL)	FINE ALLUVIUM	8		2	SB	
7							
	CLAYEY SAND W/A LITTLE GRAVEL, brown and gray mottled, rather stiff, a lense of silt at about 13½', a lamination of sand at about 16', rather stiff (SC)	TILL	13		3	SB	
			11		4	SB	
15							
	CLAYEY SAND W/A LITTLE GRAVEL, brown and grayish brown mottled, stiff to rather stiff (SC-CL)		19		5	SB	
			14		6	SB	
			14		7	SB	
22							
	CLAYEY SAND W/A LITTLE GRAVEL, grayish brown, stiff to very stiff (SC)		25		8	SB	
			25	▼	9	SB	
28½			32		10	SB	
					11	SB	
	SILTY SAND W/A LITTLE GRAVEL, reddish brown, moist, dense, a lense of waterbearing sand at about 28½' (SM) (No samples taken below 29')						
	End of Boring						
	Note: Monitoring Well installed in boring. See attached "Installation of Monitoring Well" sheet.						

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
4-15	2:35	29'	27'		to	28.2'
4-15	2:40	29'	27'		to	27.9'
4-15	3:00	29'	27'		to	27.5'
4-16	8:50		33'		to	26.3'

START 4-15-87 COMPLETE 4-15-87

METHOD HSA 0'-33' @ 2:30

CREW CHIEF Mishler

LOG OF TEST BORING

JOB NO 4231 87-663 VERTICAL SCALE 1" = 5' BORING NO MW-8

PROJECT Monitoring Well Installation; Medicine Lake Road & Cty Rd 18-Site #4 05G0D; Mobil Oil

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION ____)	GEOLOGIC ORIGIN	N	WL	SAMPLE NO	SAMPLE TYPE	PETROLEUM PRODUCT OBSERVATIONS
	FILL, MOSTLY CLAYEY SAND W/A LITTLE GRAVEL, dark brown and gray	FILL	2		1	SB	
9½	CLAYEY SAND W/A LITTLE GRAVEL, brown mottled, medium to rather stiff (SC)	TILL	6		2	SB	
			10		3	SB	
14	CLAYEY SAND W/A LITTLE GRAVEL, brown, moist, rather stiff (SC)		13		4	SB	
					5	SB	
18	SANDY LEAN CLAY W/A LITTLE GRAVEL, grayish brown, stiff (CL/SC)		15		6	SB	
			20		7	SB	
22							

(CONTINUED ON NEXT PAGE)

LOG OF TEST BORING

JOB NO. 4231 87-663 VERTICAL SCALE 1" = 5' BORING NO. MW-8 (cont)

PROJECT Site #4 05GOD (cont)

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION ____)	GEOLOGIC ORIGIN	N	WL	SAMPLE NO.	SAMPLE TYPE	PETROLEUM PRODUCT OBSERVATIONS
22	LEAN CLAYEY SAND W/A LITTLE GRAVEL, brown and gray mottled, stiff (SC)	TILL (cont)	22		8	SB	
			20		9	SB	
25½	CLAYEY SAND W/A LITTLE (see #1)				10	SB	
26½	SILTY SAND W/A LITTLE GRAVEL, grayish brown to reddish brown, moist, with a lamination of sand at about 27½', very dense to dense (SM)		31		11	SB	
			29	▼	12	SB	
			41		13	SB	
34½							
35	SAND W/SILT AND GRAVEL (see #2)	COARSE*			14	SB	
	LEAN CLAY W/SAND, grayish brown, rather stiff (CL)	FINE ALLUVIUM	18		15	SB	
37.8	End of Boring						
	#1 - GRAVEL, brown, stiff (SC)	*ALLUVIUM					
	#2 - fine to medium grained, brown, waterbearing, medium dense, a lense of silt at about 35' (SP-SM)						

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
4-16	2:40	29'	27'	29'	to	None
4-16	3:15	36½'	34½'	NR	to	33½'
4-16	3:25	36½'	34½'	NR	to	32½'
4-17	8:50	36½'	34½'	NR	to	30½'

START 4-16-87 COMPLETE 4-16-87

METHOD HSA 0' - 37.8' @ 3:15

Note: Monitoring Well Installed- See attached sheet.

CREW CHIEF Mishler

LOG OF TEST BORING

JOB NO 4231 87-663 VERTICAL SCALE 1" = 5' BORING NO. MW-9

PROJECT Monitoring Well Installation; Medicine Lake Rd and Cty rd 18; Site #4 05G0D, Mobil Oil Corp

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION ____)	GEOLOGIC ORIGIN	N	WL	SAMPLE NO.	SAMPLE TYPE	PETROLEUM PRODUCT OBSERVATIONS
	FILL, MIXTURE OF SILTY SAND AND SAND W/A LITTLE GRAVEL, dark brown and brown	FILL	3		1	SB	
5							
	CLAYEY SAND W/A LITTLE GRAVEL, brown, very stiff (SC) (may be fill)	FILL OR TILL	32		2	SB	
8							
	CLAYEY SAND W/A LITTLE GRAVEL, brown mottled, medium to stiff (SC)	TILL	7		3	SB	
			11		4	SB	
			7		5	SB	
			17		6	SB	
22½							
	CLAYEY SAND W/A LITTLE GRAVEL, reddish brown, very stiff, a few		39		7	SB	
25	lenses of silty sand (SC)						
	CLAYEY SAND W/A LITTLE GRAVEL, brownish gray, stiff (SC)		17	▼	8	SB	
			17		9	SB	
30½					10	SB	
	SANDY LEAN CLAY W/A LITTLE GRAVEL, reddish brown, stiff ~~(SC)~~ CL		21		11	SB	
34							
	SILTY SAND W/A LITTLE GRAVEL, grayish brown, moist, very dense, a						
36	few lenses of waterbearing sand (SM)		58		12	SB	
	End of Boring						

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
4-20	3:25	31½'	29½'	31.4'	to	None
4-21	9:15	31½'	29½'	30½'	to	27.7'
					to	
					to	

START 4-20-87 COMPLETE 4-21-87

METHOD HSA 0'-34½' @ 9:50

CREW CHIEF Mishler

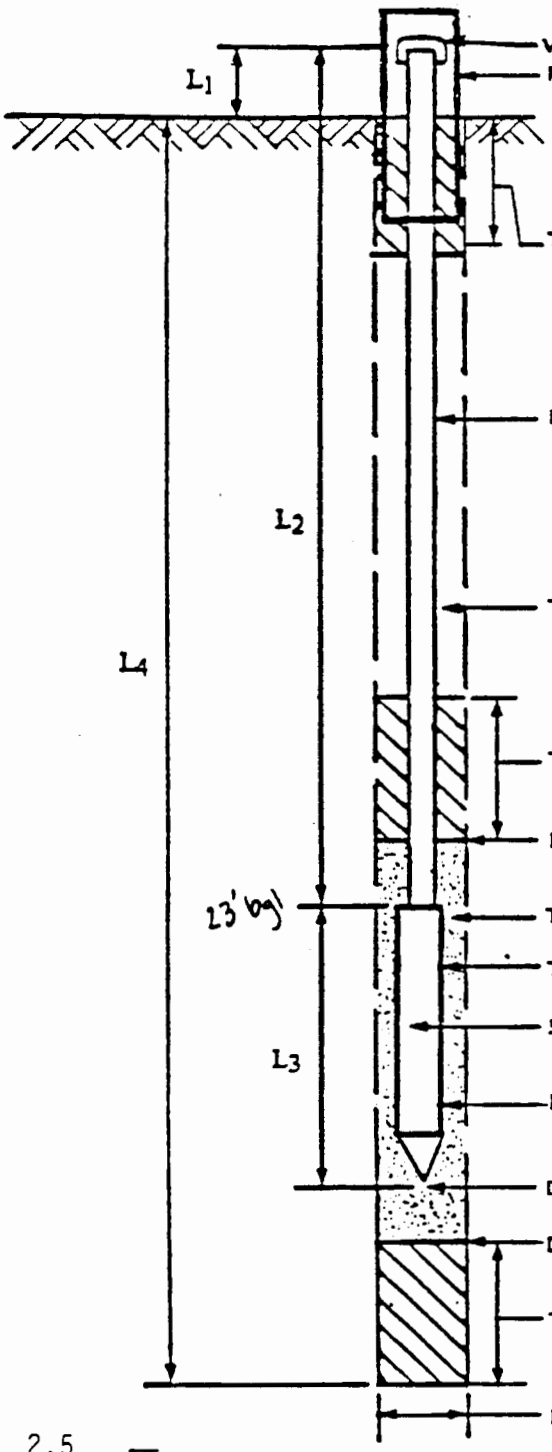
Twin City Testing

TALLATION OF MONITORING WELL —

JOB NO. 4231 87-663 MONITORING WELL NO. MW-7

Medicine Lake Road & County Road 18; Site #4 05G0D; Mobil Oil Corporation

GROUND SURFACE ELEVATION _____ TOP OF RISER PIPE ELEVATION (with cap removed) 96.41



VENTED CAP	yes
PROTECTIVE CASING	
Diameter and Type	4" steel
Total Length	5'
Length Above Ground	2.6'
THICKNESS AND TYPE OF SEAL	Surface to 17' grout
DIAMETER AND TYPE OF RISER PIPE	2" PVC well casing
TYPE OF BACKFILL AROUND RISER	Grout 0' - 17'
THICKNESS AND TYPE OF SEAL	17'-19' bentonite
DEPTH TO TOP OF FILTER SAND	19'
TYPE OF FILTER AROUND SCREEN	Density sand to 30 30'-33' natural sand
TYPE OF MONITORING WELL	PVC
SCREEN GAUGE OR SIZE OF OPENINGS (SLOT NO.)	.010
DIAMETER AND LENGTH OF SCREEN	2" x 10'
DEPTH TO BOTTOM OF MONITORING WELL	33'
DEPTH TO BOTTOM OF FILTER SAND	30'
THICKNESS AND TYPE OF SEAL	None
DIAMETER OF BOREHOLE	6"

L_1= 2.5 FT

L_2= 25.5 FT

L_3= 10 FT

L_4= 33 FT

INSTALLATION COMPLETED:
Date 4-16-87 Time 11:00

MONITORING WELL WATER LEVEL MEASUREMENTS

DATE	TIME	BAILED DEPTHS	WATER LEVEL*

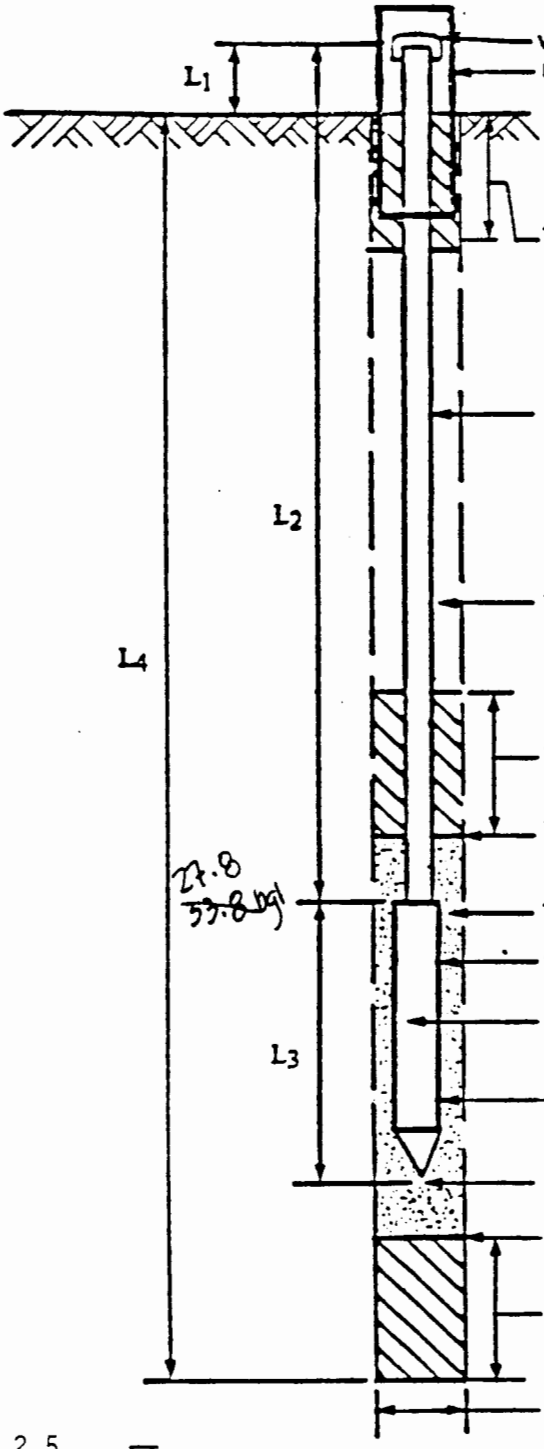
* DEPTH BELOW TOP OF RISER PIPE

TALLATION OF MONITORING WELL

JOB NO. 4231 87-663 MONITORING WELL NO. MW-8

Medicine Lake Road & County Road 18; Site #4 05G0D; Mobil Oil Corporation

GROUND SURFACE ELEVATION _____ TOP OF RISER PIPE ELEVATION (with cap removed) 89.27



VENTED CAP	
PROTECTIVE CASING	
Diameter and Type	4" steel
Total Length	5'
Length Above Ground	2.6'
THICKNESS AND TYPE OF SEAL	0' - 22.5' grout
DIAMETER AND TYPE OF RISER PIPE	2" PVC well casing
TYPE OF BACKFILL AROUND RISER	Grout to 22.5' 22.5' - 25' bentonite, density sand 25' - 27.8'
THICKNESS AND TYPE OF SEAL	See above
DEPTH TO TOP OF FILTER SAND	25'
TYPE OF FILTER AROUND SCREEN	Density sand
TYPE OF MONITORING WELL	PVC
SCREEN GAUGE OR SIZE OF OPENINGS (SLOT NO.)	.010
DIAMETER AND LENGTH OF SCREEN	2" x 10'
DEPTH TO BOTTOM OF MONITORING WELL	37.8'
DEPTH TO BOTTOM OF FILTER SAND	37.3'
THICKNESS AND TYPE OF SEAL	37.3'-37.8' natural sand, none
DIAMETER OF BOREHOLE	6"

L_1= 2.5 FT

L_2= 30.3 FT

L_3= 10 FT

L_4= 37.8 FT

INSTALLATION COMPLETED:
Date 4-17-87 Time 11:00

MONITORING WELL WATER LEVEL MEASUREMENTS

DATE	TIME	BAILED DEPTHS	WATER LEVEL*

* DEPTH BELOW TOP OF RISER PIPE

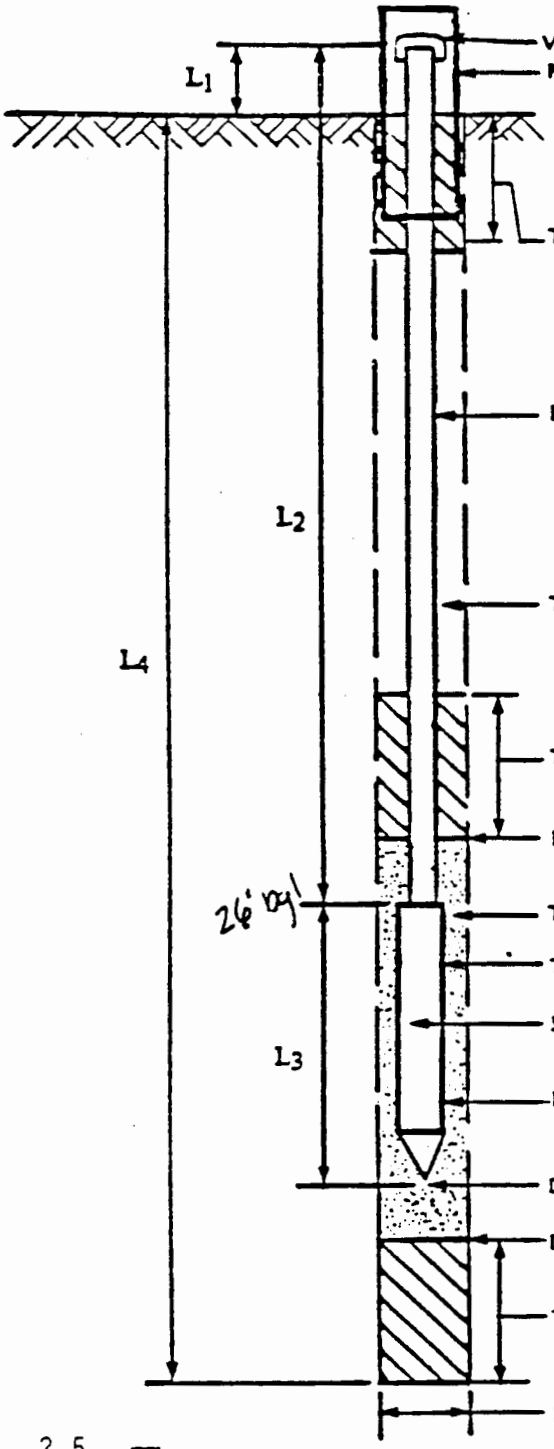
twin city testing

INSTALLATION OF MONITORING WELL

JOB NO. 4231 87-663 MONITORING WELL NO. MW-9

Medicine Lake Road & County Road 18; Site #4 05G0D; Mobil Oil Corporation

GROUND SURFACE ELEVATION _____ TOP OF RISER PIPE ELEVATION (with cap removed) 101.77



Protective casing: Diameter and Type	4" steel
Protective casing: Total Length	5'
Protective casing: Length Above Ground	2.6'
Thickness and type of seal	0' - 17.5' grout
Diameter and type of riser pipe	2" PVC well casing
Type of backfill around riser	Grout 0' - 17.5' 17.5'-19.5' bentonite 19.5'-24.5' density sand
Thickness and type of seal	See above
Depth to top of filter sand	19.5'
Type of filter around screen	Density sand
Type of monitoring well	PVC
Screen gauge or size of openings (slot no.)	.010
Diameter and length of screen	2" x 10'
Depth to bottom of monitoring well	34.5'
Depth to bottom of filter sand	36'
Thickness and type of seal	None
Diameter of borehole	6"

L_1= 2.5 FT

L_2= 87 28.5 FT

L_3= 10 FT

L_4= 36 FT

INSTALLATION COMPLETED:
Date 4-21-87 Time 11:30

MONITORING WELL WATER LEVEL MEASUREMENTS

DATE	TIME	BAILED DEPTHS	WATER LEVEL*
		-	

* DEPTH BELOW TOP OF RISER PIPE

APPENDIX C

METHODS

APPENDIX C

METHODS

Contamination Reduction

The drill rig and sampling tools were cleaned prior to mobilization and between each boring. The split barrel sampler was washed with a trisodium phosphate solution and rinsed in potable water prior to collecting each sample. Wash and rinse water were disposed on-site through infiltration.

Soil Sampling

Soil sampling was done in accordance with ASTM: D 1586-84. Using this procedure, a 2" O.D. split barrel sampler is driven into the soil by a 140 lb weight falling 30". After an initial set of 6", the number of blows required to drive the sampler an additional 12" is known as the penetration resistance of N value. The N value is an index of the relative density of cohesionless soils and the consistency of cohesive soils.

Soil samples were collected in the field immediately upon opening the split barrel sampler. The samples were collected by completely filling 40 ml glass bottles with soil and sealing the bottles with a Teflon lined, septum sealed cap to prevent volatilization of organics from the soil sample.

APPENDIX C

METHODS (cont)

The monitoring wells were developed using a Teflon bailer until temperature, pH and conductivity stabilized and sediment-free water was produced, using a bottom-loading Teflon bailer.

Water Level Measurement

All ground water level measurements were obtained by using an electronic measuring device which indicates when a probe is in contact with the ground water in the well. Measurements were obtained by lowering the device into the well until it was indicated that the water surface had been encountered and by measuring the distance from the top of the riser to the probe. All measurements were reported to the nearest 0.01'; however, the manufacturer's reported accuracy for the instrument is 0.04'.

Water Quality Sampling and Chain of Custody

Upon collecting a sample, a chain of custody log was initiated. The chain of custody record included the following information: project, work order number, shipped by, shipped to, sampling point, location, field ID number, date and time taken, sample type, number of containers, analysis required, sampler(s) signature(s), etc.

APPENDIX C

METHODS (cont)

was measured. Product thickness measured in the monitoring well does not reflect the actual product thickness on the water table. The measured thickness is normally greater than that actually existing on the water table.

APPENDIX C

METHODS (cont)

The completed borings were backfilled with either cement grout or soil cuttings.

Soil Classification

As the samples were obtained in the field, they were visually and manually classified by the crew chief in accordance with ASTM: D 2487-84 and ASTM: D 2488. Representative portions of the samples were then returned to the laboratory for further examination and for verification of the field classification. Logs of the borings indicating the depth and identification of the various strata, the N value, water level information and pertinent information regarding the method of maintaining and advancing the drill holes are attached. Charts illustrating the soil classification procedure, the descriptive terminology and symbols used on the boring logs are also attached.

Monitoring Well Installation and Development

Monitoring well construction and installation details are provided on the "Installation of Monitoring Well" data sheets, presented in Appendix B.

APPENDIX C

METHODS (cont)

The chain of custody records were delivered with the samples to the laboratory. Upon arrival at the laboratory, the samples were checked in and signed over to the appropriate laboratory personnel. A copy of the chain of custody was turned over to the Project Manager. Upon completion of the laboratory analysis, the completed chain of custody record was returned to the Project Manager.

Analytical Procedures

The water samples were analyzed by using a Tekmar LSC-2 liquid sample concentrator linked to an HP-5890 Gas Chromatograph with flame ionization detector. Benzene, toluene and xylene concentrations were identified by retention time and quantified by comparison with known standards. Gasoline concentration was determined by the ratio of total peak area to a gasoline standard total peak area.

Product Measurement

Product thickness was measured by lowering a 2' or 3' Teflon bailer into the monitoring well to a depth of approximately 1' to 1 1/2' below the water table. The bailer was removed and the product thickness within the bailer

LEAK # 183

QUARTERLY MONITORING REPORT

MOBIL STATION #05-GOD

COUNTY ROAD 18 & MEDICINE LAKE ROAD

GOLDEN VALLEY, MINNESOTA

August 2, 1989

#4231 88-521

QUARTERLY MONITORING REPORT

GOLDEN VALLEY MOBIL #05-GOD

GOLDEN VALLEY, MINNESOTA

#4231 88-521

1.0 INTRODUCTION

1.1 Purpose

The purpose of this report is to present the results of the quarterly groundwater monitoring program conducted by Twin City Testing Corporation (TCT) at the above referenced site (Figure 1). The one-year groundwater monitoring program was implemented in October 1988 in response to a Minnesota Pollution Control Agency (MPCA) directive dated September 16, 1988. The MPCA objective was to determine if hydrocarbon contamination present in the soils around soil boring B-4 had migrated into the groundwater beneath the site. Mr Chris Lawson of Mobil Oil Corporation verbally authorized this work in September 1988.

1.2 Scope of Services

The scope of services provided by TCT included the following:

- acquiring four sets of groundwater elevation measurements,
- collecting representative groundwater samples on a quarterly basis for analysis to quantify benzene, ethyl benzene, toluene, xylenes and total hydrocarbons as gasoline concentrations, and
- preparing a report presenting our field and analytical data.

1.3 Background

Previous work has been conducted at this site by TCT since 1986. Additional details of these activities are presented in the following reports:

Preliminary Contamination Assessment	#4231 87-503	December 18,1986
Tank Excavation, Mobil Station	#4231 87-503	January 27, 1987
Remedial Site Assessment	#4231 87-663	May 28, 1987

In December 1986, TCT advanced four soil borings at the site to determine if the subsurface had been impacted by hydrocarbon contamination. Hydrocarbon contamination was quantified at depth in soil boring B-4.

A 1,000 gallon diesel fuel UST was excavated and removed from the site in January 1987. Fifty (50) cubic yards of contaminated soils were removed from the site. Using visual and olfactory evidence as criteria, TCT felt that all contaminated soils were removed by excavating.

A remedial site assessment was carried out in May 1987 to determine the extent of subsurface contamination. No hydrocarbon concentrations were detected above the method detection limit from groundwater samples collected from three monitoring wells installed at the site.

2.0 PROJECT RESULTS

2.1 Soil Conditions

The site is underlain by glacial tills and alluvium. The glacial tills consist mainly of silty sand (SM), clayey sand (SC) and sandy lean clay (CL) with varying amounts of gravel. Sand (SP) and sand with silt and gravel (SP-SM) comprise the coarse alluvium. A layer of fine alluvium which consists of lean clay with sand (CL) was encountered at the bottom of the boring for MW-8. Lenses of silt, silty sand and sand were encountered at varying depths. Soil borings B-5 and B-10 and monitoring well MW-8 terminate in alluvium; whereas, monitoring wells MW-7 and MW-9 terminate in glacial till. The soil boring depths vary between 33 and 56.5 feet below the ground surface; however, the surface elevations also vary considerably at the site. The locations of the soil borings and monitoring wells are presented in Figure 2.

2.2 Groundwater Elevations

Depth to groundwater measurements were obtained from all monitoring wells at the site on October 3, 1988, January 9, April 3, July 5 and July 11, 1989. During the sampling interval the groundwater table exhibited seasonal fluctuations of approximately 1.58, 0.55 and 4.38 feet at monitoring well MW-7, MW-8 and MW-9 respectively. Water table elevations, in general, declined from October 1988 until April 1989. Subsequent water table

elevation measurements indicated a rise in the water table. The water table information is summarized in Table 1. The inferred groundwater flow direction trends southwest towards Medicine Lake (Figure 3).

NOT NECESSARILY

2.3 Chemistry Results

Groundwater quality samples were collected from monitoring wells MW-7, MW-8 and MW-9 on a quarterly basis beginning October 1988. These samples were returned to TCT's chemistry laboratory for analysis to quantify benzene, ethyl benzene, toluene, xylenes and total hydrocarbons as gasoline concentrations. The chemical results are presented as Table 2. No free product was documented in the monitoring wells on site during this sampling phase.

TABLE 1

Water Table Elevation Data
Quarterly Monitoring Report
Golden Valley Mobil #05-GOD
Golden Valley, Minnesota
#4231 88-521

Well	Top of Riser	Water Table Elevation (10-05-88)	Water Table Elevation (1-9-89)	Water Table Elevation (4-3-89)	Water Table Elevation (7-5-89)
MW-7	96.41	71.42	69.72	70.06	64.10
MW-8	89.27	55.70	55.65	55.64	56.07
MW-9	101.77	81.20	79.54	74.32	84.22

NOT SAME UNIT

Note: All elevations measured in feet and referenced to a local datum arbitrarily set at 100.00.

TABLE 2

Water Quality Data
Quarterly Monitoring Report
Golden Valley Mobil #05-GOD
Golden Valley, Minnesota
#4231 88-521

Location	Date	Total Hydrocarbons As Gasoline	Benzene	Benzene	Toluene	Xylenes	MDL
MW-7	10-05-88	ND	ND	ND	ND	ND	1
	1-09-89	15	2	ND	ND	ND	1
	4-03-89	ND	ND	ND	ND	ND	1
	7-05-89	ND	ND	ND	ND	ND	1
MW-8	10-05-88	ND	ND	ND	ND	ND	1
	1-09-89	ND	ND	ND	ND	ND	1
	4-03-89	ND	ND	ND	ND	ND	1
	7-05-89	ND	ND	ND	ND	ND	1
MW-9	10-05-88	ND	ND	ND	ND	ND	1
	1-09-89	ND	ND	ND	ND	ND	1
	4-03-89	ND	ND	ND	ND	ND	1
	7-05-89	ND	ND	ND	ND	ND	1

All values reported as ug/L which are equivalent to parts per billion (ppb).

MDL - Method Detection Limit
ND - Not Detected

The chemistry test parameters were not detected in any monitoring well during the first, third and fourth quarters' sampling events. The sample from MW-7 exhibited concentrations of total hydrocarbons as gasoline and benzene during the second quarter sampling event. TCT suspects that a water level indicator probe may have introduced trace amounts of hydrocarbon contamination to the well prior to sampling.

Previously, soil samples were collected from soil borings B-1, B-2, B-3 and B-4 and analyzed to quantify total hydrocarbons as gasoline, benzene, toluene and xylenes concentrations. The analyses detected high concentrations of dissolved hydrocarbons in a soil sample from boring B-4 at a sampling interval of 19.5 to 21 feet, and low concentrations in samples from B-1 and B-4 at a sampling interval of 9.5 to 11 feet. The laboratory results are listed in Table 3.

3.0 DISCUSSION

A review of the boring logs for the site area indicate, in general, that the sand and silty sand alluvium at depth is overlain by a till layer of variable thickness - approximately 15 to 20 feet. This till layer is in turn overlain by fill material.

The till layer is composed of sandy lean clay with intermittent clay layers. The soil characteristics of this type of till generally preclude the mobility of contaminants both laterally and vertically.

TABLE 3

Soil Sample Analytical Results (12-16-86)
Mobil Oil Corporation Site #05-GOD
Golden Valley, Minnesota
#4231 88-521

Boring	Interval (ft)	Total Hydrocarbons As Gasoline	Benzene	Toluene	Xylenes	MDL
B-1	9.5 - 11	39	ND	1	8	1
	19.5 - 21	ND	ND	ND	ND	1
	29.5 - 31	ND	ND	ND	ND	1
B-2	9.5 - 11	ND	ND	ND	ND	1
	19.5 - 21	ND	ND	ND	ND	1
	29.5 - 31	ND	ND	ND	ND	1
B-3	9.5 - 11	ND	ND	ND	ND	1
	19.5 - 21	ND	ND	ND	ND	1
	29.5 - 31	ND	ND	ND	ND	1
B-4	9.5 - 11	23	ND	4	20	1
	19.5 - 21	650,000	22,000	45,000	115,000	1
	29.5 - 31	ND	ND	ND	ND	1

All results expressed as ug/kg which is equivalent to parts per billion (ppb).

ND - Not Detected

Significant hydrocarbon concentrations were detected at a depth of 19.5 to 21 feet in soil boring B-4 in 1986.

TCT observed the excavation of a 1000 gallon diesel fuel tank at the site in January 1987. The approximate location of the tank is shown in Figure 2. The excavated soils were screened with an OVA-128 portable organic vapor detector. OVA readings of 98 parts per million (ppm) and 108 ppm total organic vapors were documented. Strong petroleum-like odors and staining were present in the soils.

The excavation was terminated when visual and olfactory evidence indicated that no contaminated soil remained in the subsurface. Approximately 50 cubic yards of soil was excavated and removed from the site. Sandy lean clay and clean fill from the original tank installation comprised the bulk of the excavated soils. TCT's report dated January 27, 1987 is included as Appendix A.

No groundwater contamination at or above the method detection limit was detected in the groundwater samples from monitoring wells MW-8 and MW-9. Trace concentrations of petroleum hydrocarbons were quantified in MW-7 during the second sampling event in January 1989. Subsequent chemical analysis performed in April and July 1989 on MW-7 indicated non-detected concentrations for all test parameters. As stated previously, TCT suspects that the water level indicator probe may be responsible for the trace concentrations detected in the water sample.

This report was written by: Damon M. Powers

Damon M Powers
Geological Engineer/Project Manager

Date: August 2, 1989

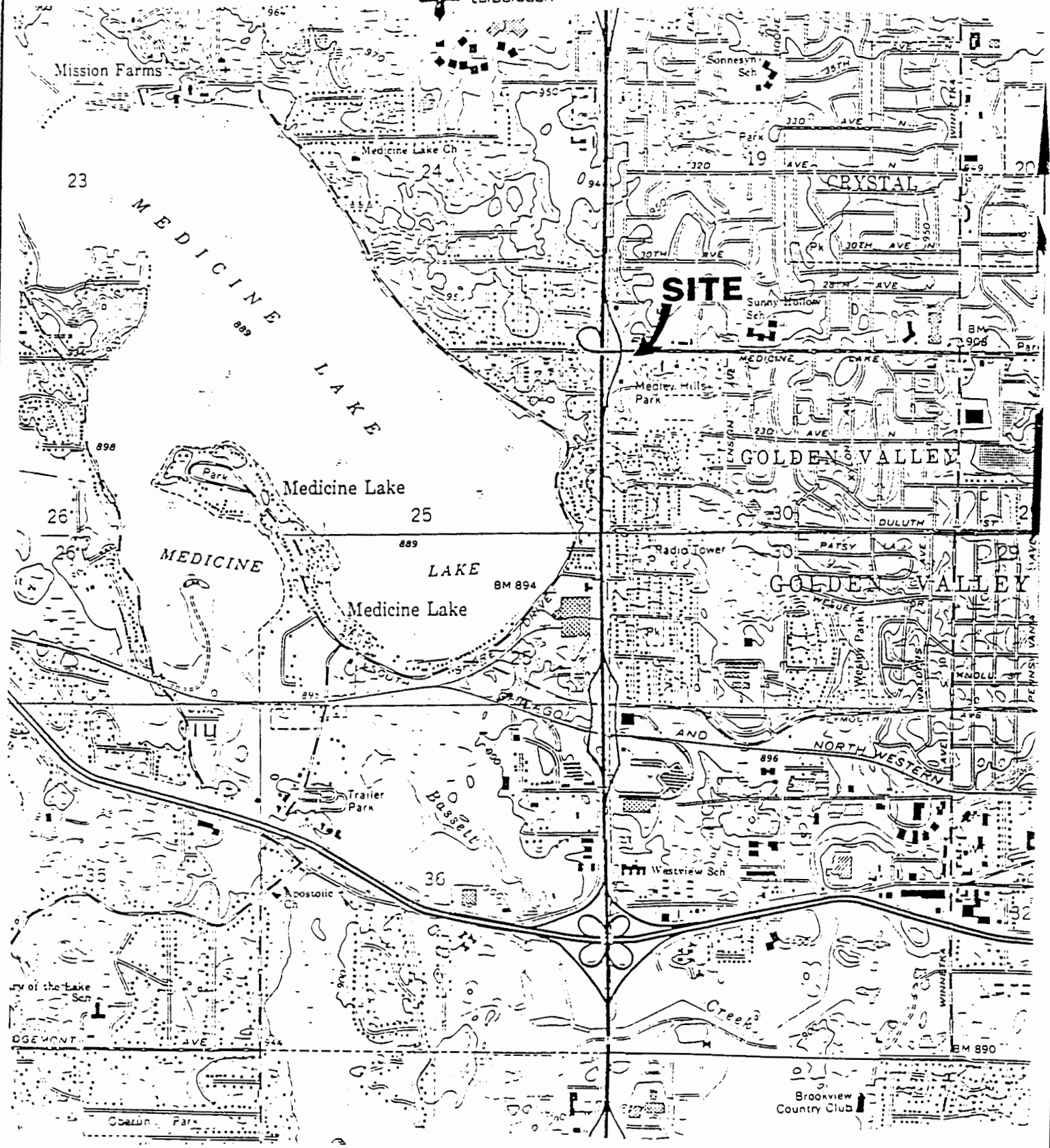
This report was reviewed by: Robert A. Wojciak

Robert A Wojciak
Manager/UST Program

Date: August 2, 1989

Proofread by: JD

twin city testing corporation



SITE LOCATION MAP
MOBIL STATION #05-GOD
COUNTY ROAD 18 & MEDICINE LAKE ROAD
GOLDEN VALLEY, MINNESOTA

DATE 7/20/89	FIGURE 1
PROJECT #	4231 88-521
REVIEWED BY:	
DRAWN BY:	E.J.V.
SCALE	1"=2000'

Based upon the results of the quarterly monitoring program it is TCT's opinion that no impact to the groundwater has occurred from the hydrocarbon-impacted soils remaining at the site. We would expect that the hydrocarbons remaining in the soil will disperse through biodegradation and other natural processes.

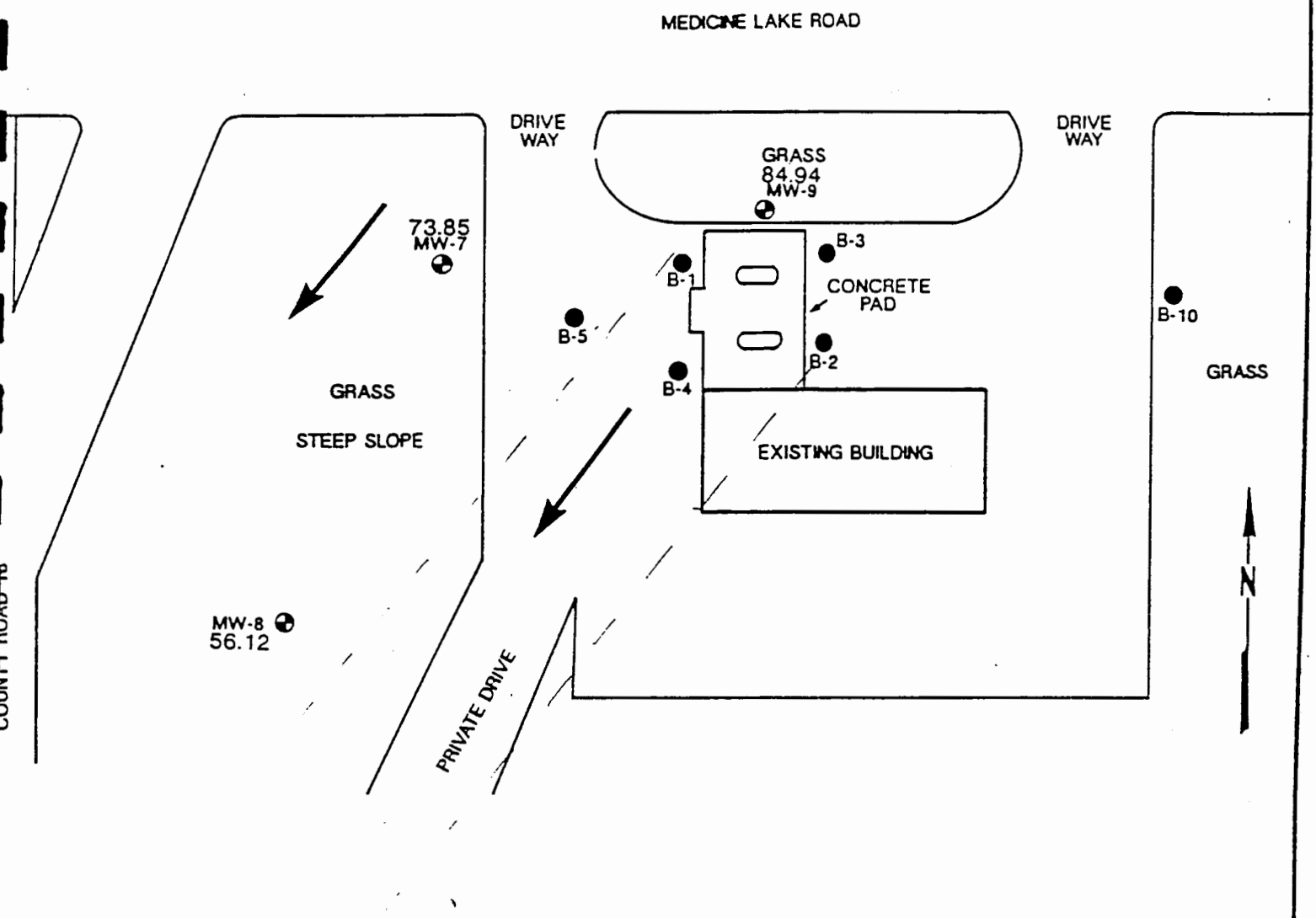
4.0 RECOMMENDATIONS

Based upon the results of the one year quarterly monitoring program and the prior remedial action consisting of contaminated soil excavation and removal, TCT feels that groundwater restoration at this site is not warranted. Having successfully met the directive guidelines required by MPCA, TCT recommends that no further site monitoring take place and the site be approved for project closure by the MPCA.

5.0 STANDARD OF CARE

The recommendations contained in this report represent our professional opinions. These opinions were arrived at in accordance with currently accepted hydrogeologic and engineering practices at this time and location. Other than this, no warranty is implied or intended.

twin city testing corporation

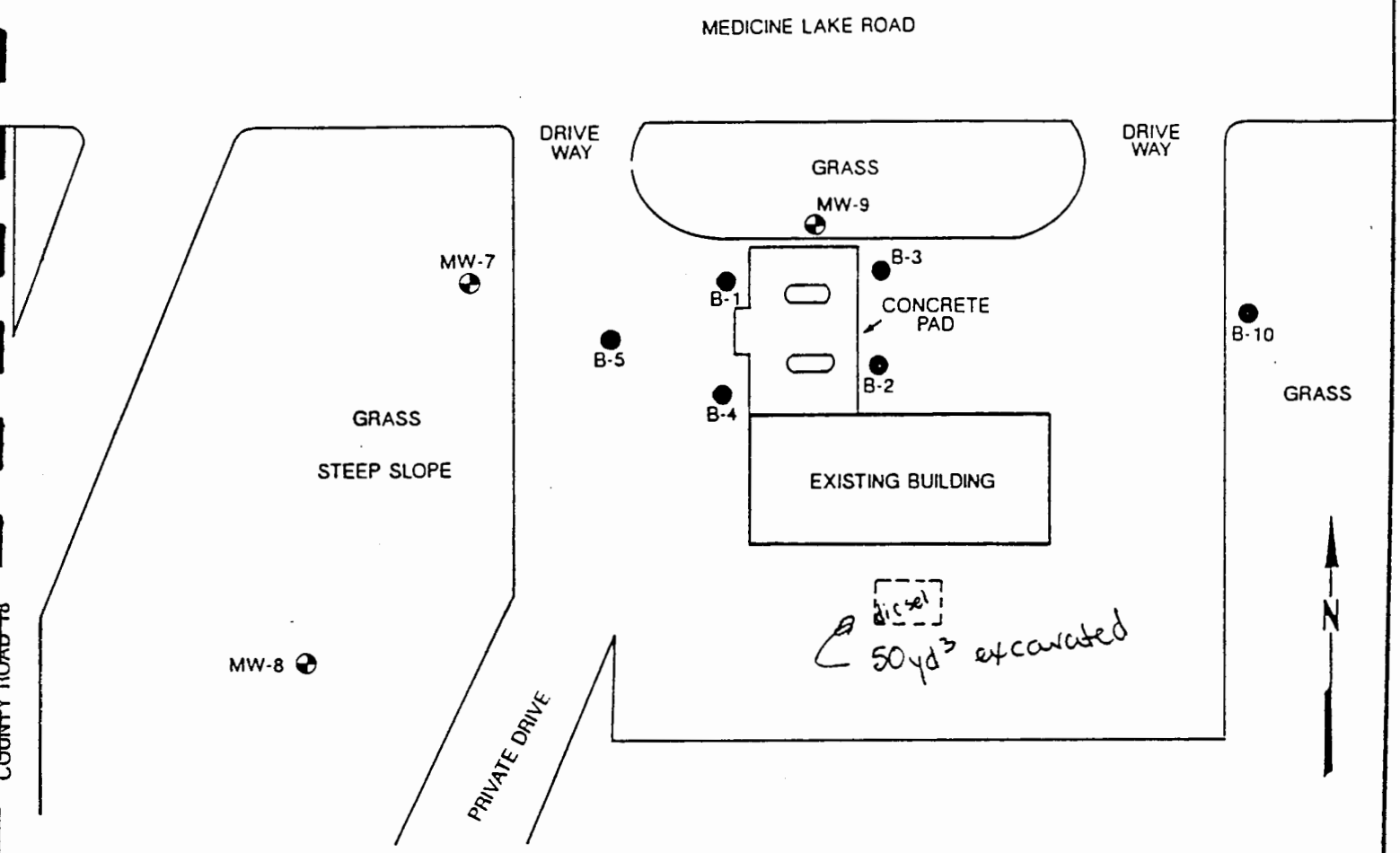


LEGEND:

- ● SOIL BORING LOCATION
- ⊕ MONITORING WELL LOCATION
- ⬭ PUMP ISLAND
- 84.94 WATER TABLE ELEVATION
- ← FLOW DIRECTION

INFERRED WATER TABLE FLOW DIRECTION 7-11-89
MOBIL STATION #05-GOD
COUNTY ROAD 18 & MEDICINE LAKE ROAD
GOLDEN VALLEY, MINNESOTA

DATE 7/21/89	FIGURE 3
PROJECT # 4231 88-521	
REVIEWED BY:	
DRAWN BY: E.J.V.	
SCALE APPROXIMATELY 1"=40	



LEGEND:

- SOIL BORING LOCATION
- MONITORING WELL LOCATION
- PUMP ISLAND
- U.S.T REMOVED IN 1987

SITE MAP
MOBIL STATION #05-GOD
COUNTY ROAD 18 & MEDICINE LAKE ROAD
GOLDEN VALLEY, MINNESOTA

DATE 7/21/89	FIGURE 2
PROJECT # 4231 88-521	
REVIEWED BY:	
DRAWN BY: E.J.V.	
SCALE ~~APPROXIMATELY~~ 1"=40	

HYDROGEOLOGIC SETTING AND GROUND WATER CONTAMINATION CHARACTERIZATION
PETROLEUM RELEASE SITES

Minnesota Pollution Control Agency
Tanks and Spills Section
May 1991

This worksheet should be completed for all sites which have ground water contamination. It has several purposes. It summarizes remedial investigation (RI) results and conclusions for use by Minnesota Pollution Control Agency (MPCA) staff when revieving the site to determine whether corrective action will be required to remediate ground water contamination. It also provides supplementary information on investigation, design and reporting requirements (presented in bold type) for sites which have ground water contamination. This worksheet and all other relevant MPCA documents should be reviewed when developing RI work plans to ensure that all RI requirements and objectives will be met during the investigation.

Answers to the following questions should be based on the results of the ground water receptor survey, RI activities, and published geologic literature. The questions should be answered in the space provided. Attach additional sheets if necessary.

1. Identify and describe the geologic units in which ground water has been impacted by the petroleum release. What is the thickness (or estimated thickness) and estimated lateral extent of the impacted unit?
   Des Moines Lobe Glacial Till (Meyer, 1985) interbedded perched layers of sand and sandy clay. One to two feet thick. Lateral extent approximately 10-20 feet.

At all sites with ground water monitoring wells, the RI must include an estimate of hydraulic conductivity, and provide estimates of the ground water velocity in the impacted unit. Documentation of how you arrived at these estimates must be provided.

2. What is the hydraulic conductivity, effective porosity, hydraulic gradient, estimated ground water velocity and flow direction in the impacted unit?
   Since ground water is contained in thin laterally limited porous sediments, these parameters were not calculated.

3. What is the maximum concentration of benzene and total hydrocarbons detected on the site? (parts per billion [ppb] units)

   Benzene 32,000 (Well No. 02, Date 11/12/90)
   Total Hydrocarbons 250,000 (Well No. 02, Date 11/12/90)

4. What is the maximum concentration of benzene and total hydrocarbons detected at or beyond the property boundary? (ppb units)
   Same as above.
   Benzene _____ (Well No. ____, Date _____)
   Total Hydrocarbons _____ (Well No. ____, Date _____)

5. Do contaminant concentrations for any compound exceed the Recommended Allowable Limits (RALs), at, or beyond the site boundaries? (Yes/No) .....| YES |

   Compound Benzene (Well No. 02, Date 11/12/90)

HYDROGEOLOGIC SETTING AND GROUND WATER CONTAMINATION CHARACTERIZATION
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At all sites with ground water monitoring wells, the RI must include an estimate of hydraulic conductivity, and provide estimates of the ground water velocity in the impacted unit. Documentation of how you arrived at these estimates must be provided.

2. What is the hydraulic conductivity, effective porosity, hydraulic gradient, estimated ground water velocity and flow direction in the impacted unit?

   Since ground water is contained in thin laterally limited porous sediments, these parameters were not calculated.

3. What is the maximum concentration of benzene and total hydrocarbons detected on the site? (parts per billion [ppb] units)

   Benzene 32,000 (Well No. 02, Date 11/12/90)
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   Same as above.
   Benzene _____ (Well No. ____, Date _____)
   Total Hydrocarbons _____ (Well No. ____, Date _____)

5. Do contaminant concentrations for any compound exceed the Recommended Allowable Limits (RALs), at, or beyond the site boundaries? (Yes/No) ..... YES

   Compound Benzene (Well No. 02, Date 11/12/90)

6. Do sources of contamination (including contaminated soil) remain at the site? (Yes/No).....| YES |
If Yes, briefly describe.
Petroleum impacted soil around the gasoline UST basin

7. Is municipal water supply available at the site and within one mile downgradient of the site? (Yes/No).....| YES |

8. Are there presently any water wells which use the impacted aquifer located within one half mile downgradient of the site, or one mile downgradient of the site if the aquifer material is fractured? (Yes/No).....| NO |

9. Are there any plans for ground water development in the impacted aquifer within one half mile downgradient of the site, or one mile downgradient of the site if the aquifer material is fractured? (Yes/No).....| NO |

If you answered No to questions 8 and 9, please skip to question 10 and continue.

If you answered yes to question 8 or 9, and yes to question 5, corrective action will likely be required to remediate ground water contamination at the site. The RI report should include a proposed Corrective Action Design to meet the following cleanup goal and compliance point.

Cleanup goal: The RALs for VOCs and 1 part per million total hydrocarbons.

Compliance point: At and beyond the site boundaries.

At some LUST sites corrective actions may not be technically capable of achieving remediation to RALs. For a discussion of the options which should be considered when designing corrective actions for sites of this type please see the attached MPCA "Corrective Action Design for Ground Water Remediation to RALs" (May 1991) document.

Stop here if you answered Yes to question 8 or 9.

10. Are there nonpotable water supply wells which use the impacted unit downgradient of the site? (Yes/No).....| NO |

11. Does the plume currently discharge to surface water? (Yes/No).....| NO |
If yes, what is the estimated width of the plume at the shore of the surface water body, and what are the estimated concentrations of the following contaminants at the shore of the surface water body: (The estimation method should be described in the text of the RI report.).

Benzene _____, Ethyl Benzene _____, Toluene _____, Xylenes _____,
Total Hydrocarbons _____

If the answer to question number 11 is yes, the use category of the surface water body should also be determined, in accordance with Minn. Rules ch. 7050, and reported.

12. Does the plume have a projected point of entry to surface water? (Yes/No).....| NO |
If yes, what is the distance from the downgradient edge of the plume to the surface water body?

If you answered yes to question 12, the RI report should characterize the hydrogeologic conditions and land use between the site and the surface water body, and should assess the potential for the plume to discharge to surface water and the likelihood of future ground water use in the vicinity of the plume.

13. Is the impacted unit a bedrock aquifer? (Yes/No).....| NO |

14. Has contamination from the site impacted a quaternary surficial or buried aquifer that is presently used as a drinking water aquifer anywhere within a two mile radius of the site? (Yes/No).....| NO |

Stop here if you answered yes to question 13 or 14. If you answered no to both questions 13 and 14, please continue.

15. Identify and describe the uppermost drinking water aquifer in the site vicinity. What is the depth to the top of the uppermost drinking water aquifer? What is the water level in the uppermost drinking aquifer? Nearest well (204375) approximately 40 feet lower than the site. Therefore the depth and water level of uppermost drinking water aquifer is approximately 90 feet bgs.

16. Is there a confining unit between the impacted unit and the uppermost drinking water aquifer? What is its thickness and extent?
Approximately 30 feet of clay separates the impacted perched sand layer from the top of drinking water sand unit.

17. Is the uppermost drinking water aquifer a karst unit or a sole source aquifer?

No

18. Are there any existing or abandoned wells within approximately 1,000 feet downgradient of the site?

Yes

19. Are there any other site specific conditions which increase the risk of cross contamination from the impacted unit to a drinking water aquifer?

No

20. Based on the answers to questions 14 through 18 and any other site specific information available, summarize and assess the risk of cross contamination from the impacted unit to the uppermost drinking water aquifer.
The contaminated ground water is limited to thin areally limited shallow sand layers that are separated from the drinking water aquifer by approximately 30 feet of clay; therefore, the risk is low.