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

twin city testing
corporation

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

May 28, 1987

Mobil Oil Corporation
600 Woodfield Drive
Suite 400
Schaumburg, Illinois 60172

Attn: Mr. Rick Larsen

Subj: Remedial Site Assessment
Mobil Oil Corporation Site #4 05GOD
County Road 18 and Medicine Lake Road
Golden Valley, Minnesota
#4231 87-663

Dear Mr. Larsen:

Enclosed please fine three copies of the remedial site assessment for the Mobil Oil Corporation service station at the intersection of County Road 18 and Medicine Lake Road in Golden Valley, Minnesota.

The report summarizes and evaluates the site conditions. Briefly, dissolved hydrocarbons were detected in some soil samples, but not in ground water samples collected from the three monitoring wells.

If you have any questions, please call me at (612) 549-5586.

Very truly yours,

Twin City Testing Corporation

William J. Breitzman
Hydrogeologist/Project Manager

WJB/sjo

Encs

cc: 1 - Mobil Oil Corporation
Attn: Mr. Mike Holland

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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

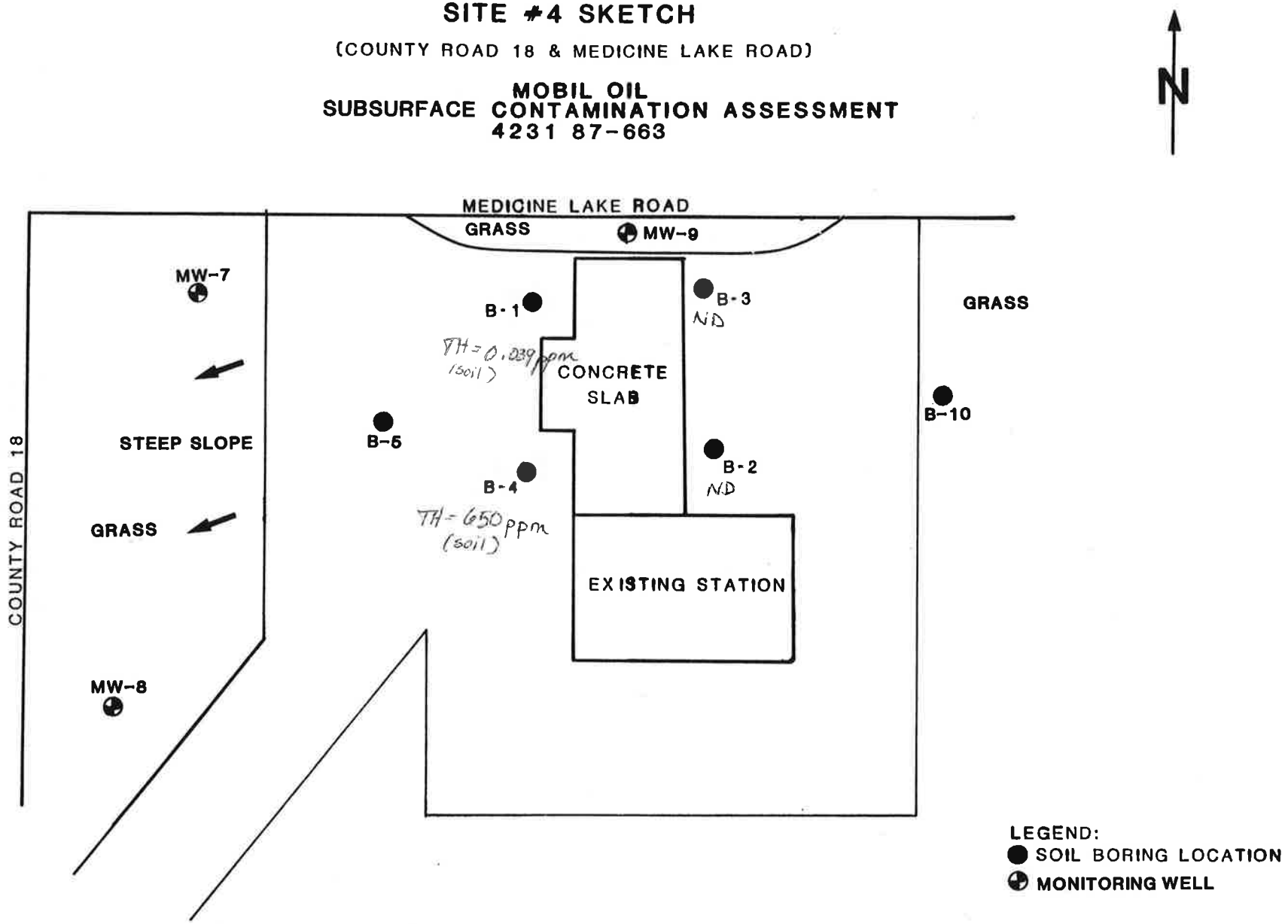
Monitoring wells MW-7, MW-8 and MW-9; soil borings B-5 and B-10; and the previously advanced soil borings B-1, B-2, B-3 and B-4 were placed at the locations indicated on Figure 1. Boring logs and the "Installation of

FIGURE 1

SITE #4 SKETCH

(COUNTY ROAD 18 & MEDICINE LAKE ROAD)

MOBIL OIL
SUBSURFACE CONTAMINATION ASSESSMENT
4231 87-663



twin city testing corporation

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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.

Tank Removal/Excavation Report
UNO-VEN Station No.9280-306
Golden Valley, Minnesota
ĀTEC Project # 55-07-92-00014

Prepared For:

UNO-VEN Company
3850 North Wilke Road
Arlington Heights, IL 60004

Attn: Mr. C. W. Harmon

September 9, 1992

ATEC Environmental Consultants
Division of ATEC Associates, Inc.
1479 Energy Park Drive
St. Paul, Minnesota 55108
(612)645-9520 FAX (612)645-9529

September 9, 1992

Mr. C. W. Harmon
UNO-VEN Company
3850 North Wilke Road
Arlington Heights, IL 60004

Subject: Tank Removal/Excavation Report
UNO-VEN Station No. 9280-306
Golden Valley, Minnesota
MPCA Site ID #183
ĀTEC Project #55-07-92-00014

Dear Mr. Harmon:

The purpose of this letter is to summarize the results of work performed at the above referenced facility per your purchase order contract dated February 28, 1992. This report also includes the Minnesota Pollution Control Agency (MPCA) form; "Excavation Report for Petroleum Release Sites".

There were five (5) underground storage tanks (UST's) and a known petroleum release at the site. Three (3) were gasoline UST's (4,000 gallon, 8,000 gallon and 10,000 gallon). One (1) was a 500 gallon heating oil tank and one (1) was a 550 gallon used oil tank. ĀTEC provided sampling and documentation for the UST removal/closure and contaminated soil excavation/disposal.

BACKGROUND

A review of technical files available at the MPCA was conducted to review prior site history. The leaksite file (#183) revealed that the site was a former Mobil service station (#05-G0D). The following chronology briefly summarizes events at the site, as understood by ĀTEC, prior to performing the work described in this report:

12-4-86 A 550 gallon fuel oil tank failed a tank tightness test. The MPCA was notified of the release.

12-18-86 A Preliminary Contamination Assessment was conducted by Twin City Testing Corporation (TCT). Four soil borings were advanced to 30 feet. Soils adjacent

to the gasoline tank basin were found to contain up to 650 parts per million (ppm) total hydrocarbons as gasoline (THG).

1-1987 The fuel oil tank was removed and approximately 50 cubic yards of contaminated backfill soils were excavated. The base of the completed excavation was screened with an organic vapor analyzer (OVA) which detected only up to 13 ppm organic vapors and the soils appeared clean.

4-1987 Five more soil borings were conducted and three were completed as monitoring wells. The wells were sampled quarterly for one year and THG was detected only once in monitoring well MW-7 at 15 parts per billion (ppb). TCT theorized that the contamination detected in MW-7 may have been introduced by a contaminated water level probe. TCT recommends no further actions should be taken at this site.

10-31-89 The MPCA approves TCT's recommendation for no action but requests more information regarding gasoline contaminated soils and requests that the monitoring wells on site remain until any UST's are removed/replaced.

5-8-92 ĀTEC documents UST removal and overexcavation of petroleum contaminated soil at the site.

EXCAVATION OVERSIGHT

On May 6 through 8, 1992 ĀTEC representatives documented the removal of five (5) UST's, and additional excavation of petroleum contaminated soil at the Medicine Lake 76 Station in Golden valley, Minnesota. Please refer to the site location map (figure 1) and site map (figure 2) included in Appendix A. Mr. Don Egerer, representing UNO-VEN, and Denny Habbish a tank removal contractor were present on site.

ĀTEC screened soils and collected soil samples as required by current MPCA guidelines from under UST's and from the final excavation. Tank backfill material encountered during excavation activities was a medium to fine grained brown/grey sand. The native soils encountered at the bottom and sidewalls of the excavation consisted mostly of brown mottled lean clay to sandy lean clay. The sandy backfill material appeared more permeable than the native clay soils.

ĀTEC observed the following tanks removed:

TANK OBSERVATIONS			
SIZE (gal)	CONTENTS	CONSTRUCTION	CONDITION
10,000	Unleaded	Steel	Good - No Observed Leakage
8,000	Blend	Steel	Good - No Observed Leakage
4,000	Super	Steel	Good - No Observed Leakage
500	Heating Oil	Fiberglass	Good - No Observed Leakage, tank was reinstalled.
550	Used Oil	Steel	Good - No Observed Leakage

Photographs of site construction activities are included in Appendix B. All removed tanks were reportedly transported to Determan Welding and Tank Service for disposal.

Soils screened from the gasoline tank basin and two (2) cubic yards of soil in the heating oil tank basin indicated the presence of petroleum contaminated soils. The site had been previously assigned MPCA site ID #LEAK00000183. Approval to excavate petroleum contaminated soils was obtained from Ms. Beth Schoepke, UNO-VEN on May 6, 1992. An excavation report is presented in Appendix C.

Approximately 791 cubic yards of contaminated soils were removed from the former gasoline tank basin and approximately 2 cubic yards of contaminated soils were removed from the immediate vicinity of the heating oil tank basin (see Figure 2, Appendix A). All soils were immediately transported to Clean Soils, Inc. fixed base facility in South St. Paul for stockpiling. Ms. Beth Schoepke, UNO-VEN, received verbal permission from Mr. Chris Mclain, MPCA to overexcavate over 400 but not more than 1,000 cubic yards of petroleum contaminated soils on May 7, 1992. Three soil samples were collected from the soil stockpile to characterize soils for thermal treatment and disposal.

Groundwater was not encountered during excavation activities.

SOIL CHEMISTRY ANALYSIS

Soil samples collected from beneath the used oil and heating oil tank were analyzed for total hydrocarbons as fuel oil (THFO). None of the parameters tested indicate concentrations above quantitation limits.

At the time of excavation, the soils were screened with a photoionization detector (PID) for total organic vapors. Soils visually stained by petroleum or exceeding the MPCA guidance limit of 40 ppm PID headspace were removed from the gasoline tank basin and soils exceeding the MPCA guidance limit of 10 ppm PID headspace were removed from the heating oil tank basin.

The following table summarizes PID headspace results:

Sample Code	Soil Type	Reading (ppm)	Bottom/Sidewall
S-1 (2')	Sand	300	Excavated Soil
S-2A (16')	Clay	274	Excavated Soil
S-2B (16')	Sand	140	Excavated Soil
S-3 (16')	Clay	42	Bottom of Excavation
S-4 (16')	Clay	158	Excavated Soil
S-5 (10')	Sand	52	East Sidewall
S-6 (12')	Clay	7	South Sidewall
S-7 (12')	Clay	80	West Sidewall
S-8 (12')	Clay)	71	Excavated Soil
S-9 (18')	Clay	2	Bottom of Excavation
S-10 (15')	Clay	48	Excavated Soil
S-11 (6')	Clay	24	West Sidewall
S-12 (4')	Sand	688	West Sidewall
S-13 (4')	Clay	0	East Sidewall
S-14 (8')	Clay	3	East Sidewall
S-15 (15')	Clay	1	Bottom of Excavation
S-16 (6')	Clay	2	North Sidewall
S-17 (6')	Sand	645	NE Corner Sidewall

See figure 3, Appendix A for soil headspace sample locations.

Soil samples collected from the bottom and sidewalls of the final excavation were analyzed for total hydrocarbons as gasoline (THG) and benzene, ethyl benzene, toluene, and xylenes (BETX). Chemistry results of soil samples collected from the bottom of the excavation (S-3, S-9 and S-15) do not indicate concentrations of THG above 3.9 ppm.

Some contaminated soils were not accessible and remained in the sidewalls of the gasoline tank excavation to the west under road easement and northeast along water service utility. Soil sample analytical results are summarized in the following table:

Sample Code	THG (ppm)	Benzene (ppm)	Ethyl-Benzene (ppm)	Toluene (ppm)	Xylenes (ppm)
S-3	3.9	0.120	0.032	0.034	0.130
S-9	<2.0	<0.005	<0.005	<0.005	<0.005
S-12	7,400	4	8	0.76	51
S-15	2.4	<0.005	<0.005	<0.005	<0.005
550 W.O.	<2.0*				
550 F.O.	<2.0*				

* As Fuel Oil

See figure 4, Appendix A for soil sample locations.

Three (3) soil samples were collected from the soil stockpile were analyzed for THG, BETX and lead. The highest chemistry results from these samples indicated 10,000 ppm total hydrocarbons as gasoline. These results were submitted with the application to thermally treat petroleum contaminated soils as required by the MPCA. Stockpile soil sample analytical results are summarized in the following table:

Sample Code	THG (ppm)	Benzene (ppm)	Ethyl-Benzene (ppm)	Toluene (ppm)	Xylene (ppm)	Lead (ppm)
Stock E.	1,200	3.8	0.350	0.430	7.6	<13
Stock W.	10,000	7.6	7.2	16.0	1,100	<13
Stock Center	7,400	14	14	12	91	<13

Complete chemistry reports are submitted in Appendix D.

DISCUSSION

The referenced UST's were removed and excavation of soil at the site has removed approximately 791 cubic yards of petroleum contaminated soils.

The stockpiled soils were thermally treated by Clean Soils, Inc. A final report on soil treatment and notification documenting soil tonnage, date treated by the treatment plant, post-burn results and final disposition of the soils is submitted in Appendix E.

A copy of this report should be forwarded to the MPCA for review and approval to: Mr. Chris McLain, Minnesota Pollution Control Agency, Tanks and Spills Section, Hazardous Waste Division, 520 Lafayette Road, St. Paul, MN 55155-3898.

ĀTEC suspects that the volume of petroleum contaminated soils which could not be excavated (approximately 20 to 50 cubic yards) are not likely to impact groundwater due to low permeable native clay soil surrounding the sandy basin fill material. ĀTEC recommends no further excavation or evaluation at this time.

METHODOLOGY

Soil samples were collected by hand using fresh disposable latex gloves for each sample. Soil samples were screened using a photoionization detector equipped with a 10.0 eV lamp and calibrated for reading in parts-per-million volume/volume of benzene. Soil samples collected for chemical analysis were placed in laboratory cleaned glass jars with Teflon lined lids and transported to the laboratory in an ice filled cooler.

A chain of custody log was completed for the samples before shipment. The chain of custody record is included with the chemistry analysis reports in Appendix D. As few people as possible handle the sample containers.

QUALIFICATIONS

Our professional services have been performed, our findings obtained and our recommendations prepared in accordance with customary principles and practices in the fields of environmental science and engineering. This warranty is in lieu of all other warranties either express or implied. This company is not responsible for the independent conclusions, opinions or recommendations made by others based on the field exploration and laboratory test data presented in this report.

We appreciate the opportunity to provide you with these services. If you should have any questions or comments regarding this report or our recommendations, please feel free to contact me at 612-645-9520 or 1-800-676-ĀTEC (2832) if there are any questions or if we can be of additional service. It has been a pleasure working with you on this project.

Sincerely,

ĀTEC Associates, Inc.

Ward Tongen, P.G.
Senior Project Manager

Mark S. Mason
District Manager

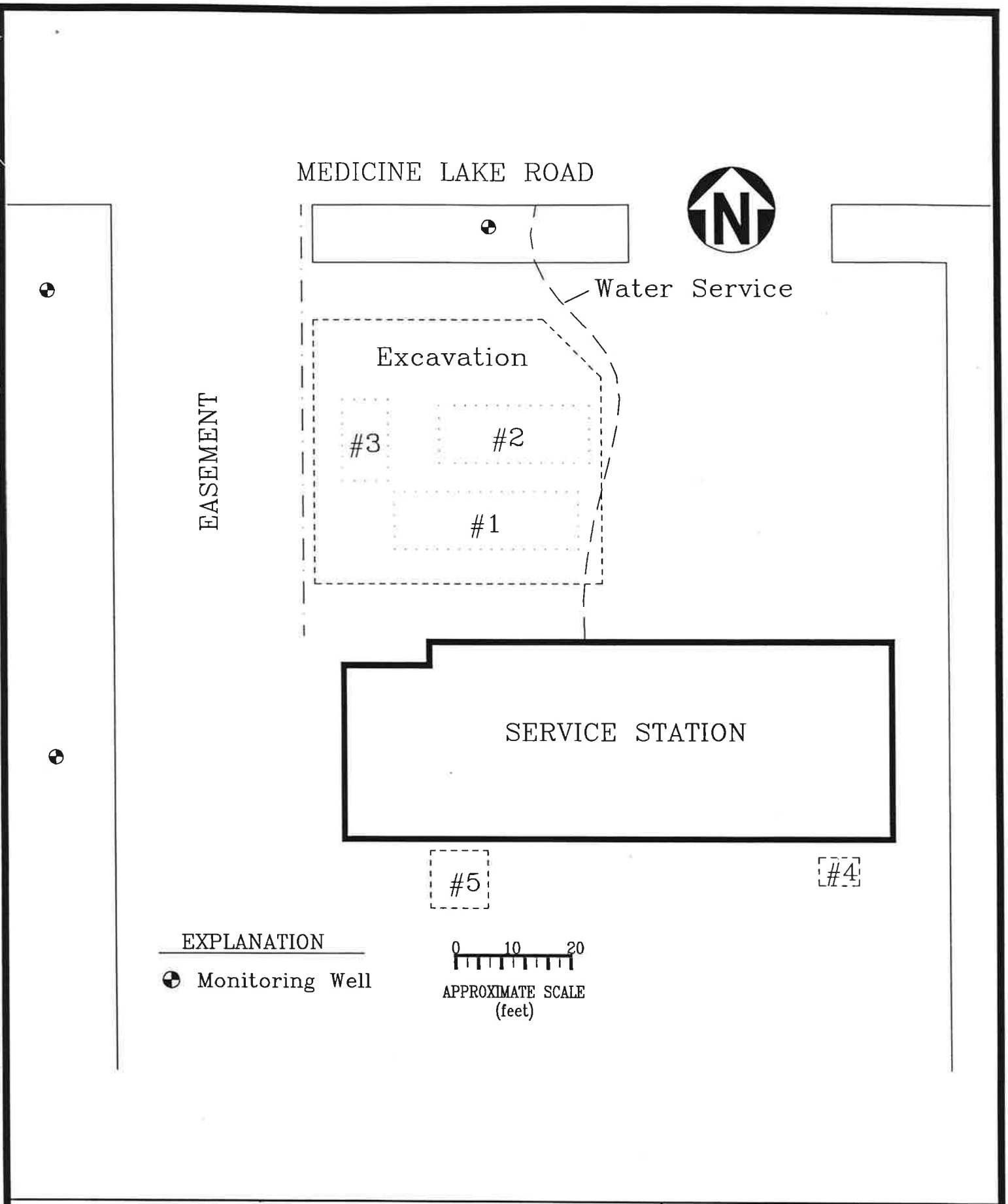
attachments

APPENDIX A

FIGURES

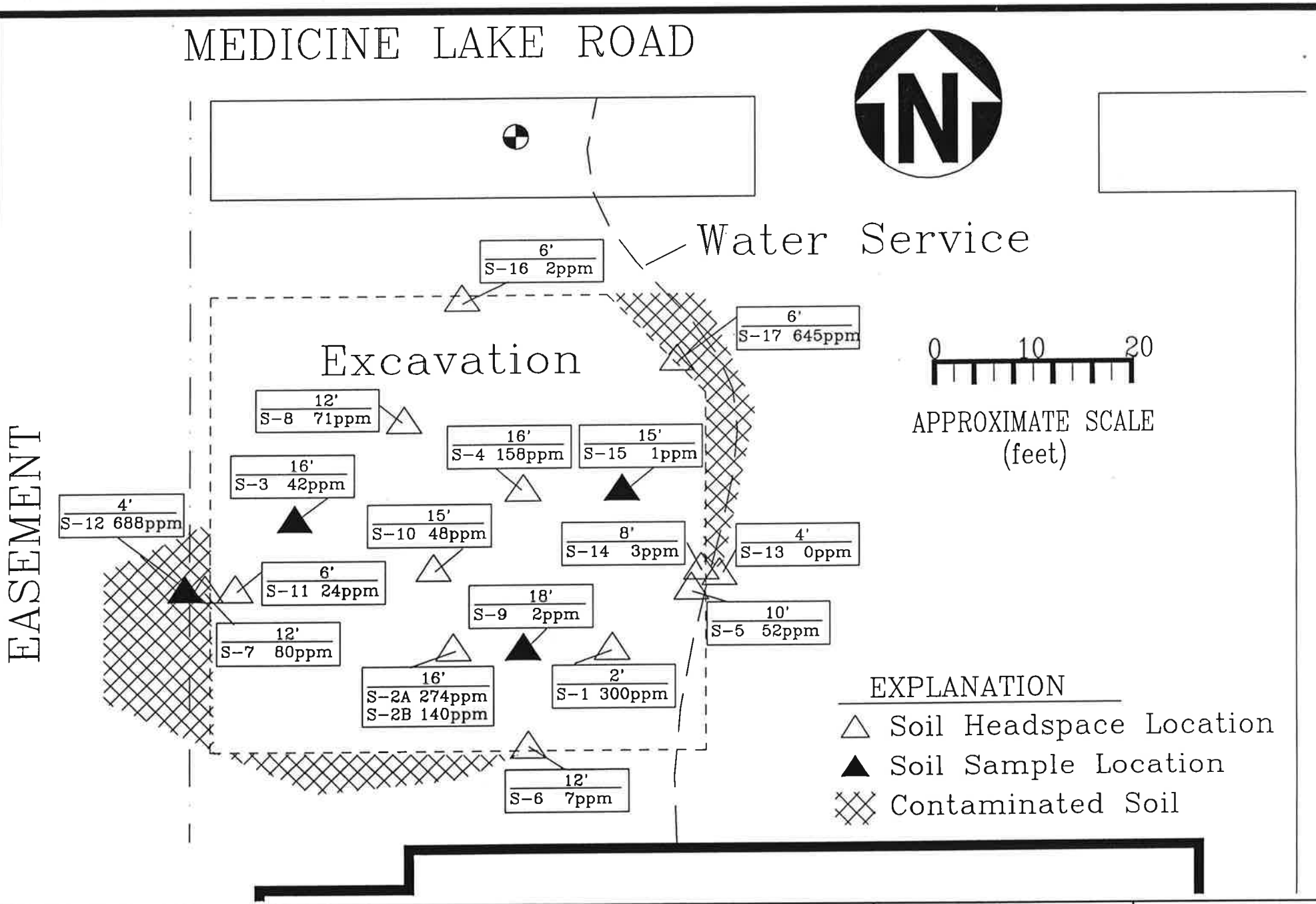
SITE LOCATION MAP
UNO-VEN Station #9280-306
Golden Valley, Minnesota

#55-07-92-00014	
Scale: 1:24,000	ĀTEC
Figure: 1	



SITE MAP
UNO-VEN Station #9280-306
Golden Valley, Minnesota

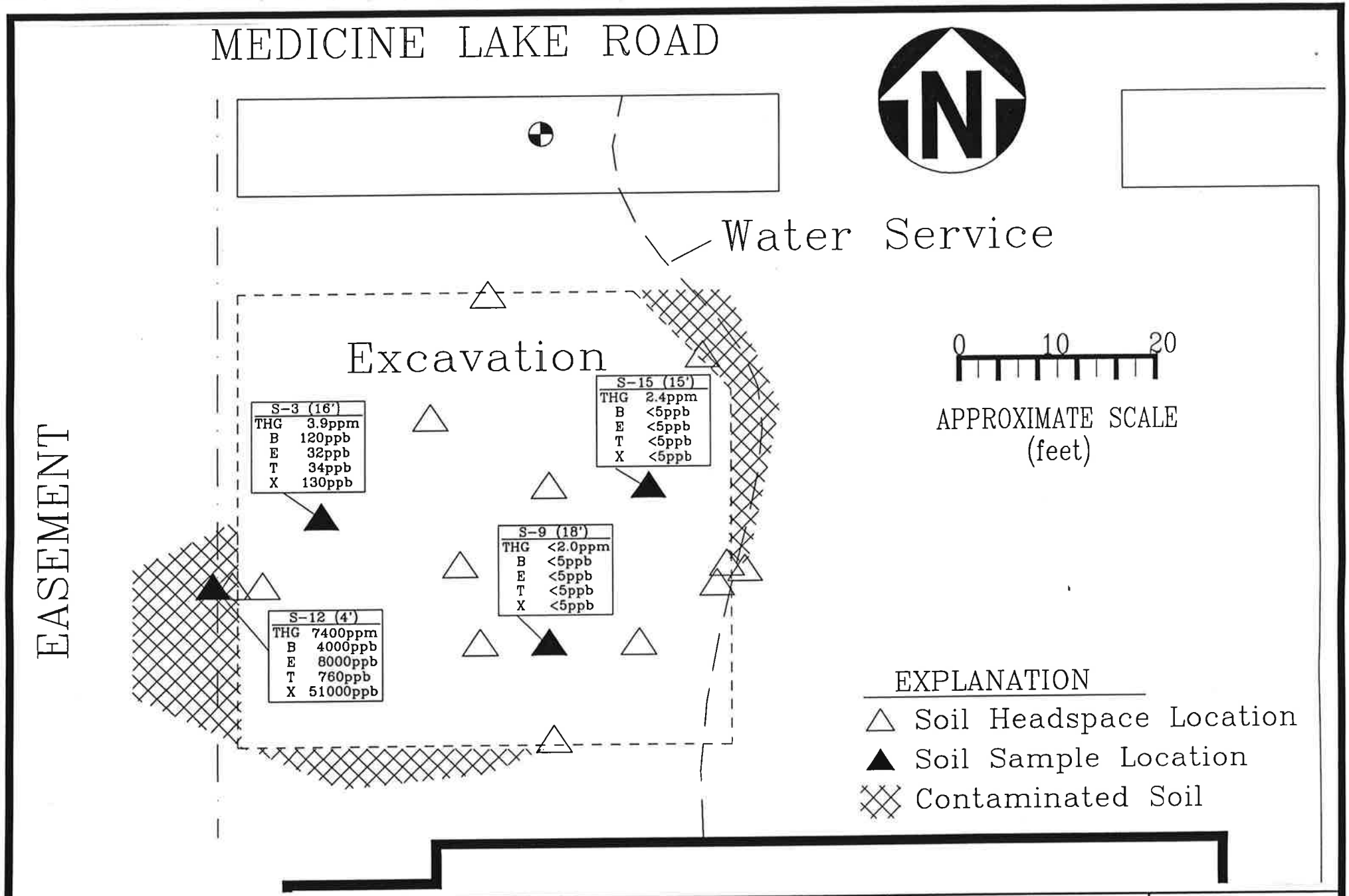
#55-07-92-00014	
Scale: Approximate	ĀTEC
Figure: 2	



SOIL SCREEN/SAMPLE LOCATION MAP
UNO-VEN Station #9280-306
Golden Valley, Minnesota

Project #55-07-92-00014	
Scale: Approximate	
Figure: 3	

ĀTEC



SOIL ANALYTICAL RESULTS MAP
UNO-VEN Station #9280-306
Golden Valley, Minnesota

Project #55-07-92-00014	
Scale: Approximate	
Figure: 4	

ĀTEC

APPENDIX B

PHOTOGRAPHS

PHOTOGRAPH 1
10,000 GALLON UST

PHOTOGRAPH 2
10,000 GALLON UST

SITE PHOTOGRAPHIC LOG
UNO-VEN Service Station #9280-306
Golden Valley, Minnesota

#55-07-92-0014	
Scale: none	
Taken by: Tongen	

ĀTEC

PHOTOGRAPH 3
8,000 GALLON UST

PHOTOGRAPH 4
4,000 GALLON UST

SITE PHOTOGRAPHIC LOG
UNO-VEN Service Station #9280-306
Golden Valley, Minnesota

#55-07-92-0014	
Scale: none	ĀTEC
Taken by: Tongen	

PHOTOGRAPH 5
EAST SIDEWALL OF EXCAVATION, REPAIRING WATER SERVICE

PHOTOGRAPH 6
500 GALLON UST (heating oil)

SITE PHOTOGRAPHIC LOG
UNO-VEN Service Station #9280-306
Golden Valley, Minnesota

#55-07-92-0014	
Scale: none	ĀTEC
Taken by: Tongen	

PHOTOGRAPH 7
WEST SIDE OF EXCAVATION, VIEW UNDER ROAD EASEMENT

SITE PHOTOGRAPHIC LOG **UNO-VEN Service Station #9280-306** **Golden Valley, Minnesota**	#55-07-92-00014 Scale: none Taken by: Tongen	**ĀTEC**

PHOTOGRAPH 8
550 GALLON UST (used oil)

SITE PHOTOGRAPHIC LOG
UNO-VEN Service Station #9280-306
Golden Valley, Minnesota

#55-07-92-00014	
Scale: none	ĀTEC
Taken by: Tongen	

APPENDIX C

EXCAVATION FORM

EXCAVATION REPORT FOR PETROLEUM RELEASE SITES

Minnesota Pollution Control Agency
Tanks and Spills Section
May 1992

Complete the information below and submit to the Minnesota Pollution Control Agency (MPCA) Tanks and Spills Section to document excavation and treatment of petroleum contaminated soil. Excavations must be done in accordance with "Excavation of Petroleum Contaminated Soil" (Guidance Document 6). Please attach any available preliminary site investigation reports to this excavation report.

Additional pages may be attached. Please type or print clearly.

I. BACKGROUND

A. Site: Medicine Lake 76
(UNO-VEN Station 9280-306)

Street: 9405 Medicine Lake Rd.
City, Zip: Golden Valley, MN 55427
County: Hennepin

MPCA Site ID#: LEAK0000 0183

B: Tank Owner/Operator:
The UNO-VEN Company
Mailing Address:
Street/Box: 3850 North Wilke Rd.
City/Zip: Arlington Hgts., IL 60004
Telephone: (708) 818-7254
(Beth Schoepke)

C. Excavating Contractor:
Griffin Service Station Equip. Co.
Contact: Denny Habish
Telephone: 780-6332
Tank Contractor Certification
Number: #0178

D. Consultant:
ĀTEC Associates, Inc.
Contact: Ward Tongen
Street/Box: 1479 Energy Park Dr.
City, Zip: St. Paul, MN 55108
Telephone: (612) 645-9520

E. Other on-site during site work (e.g., fire marshal, local officials, MPCA staff, etc):

Mr. Ed Anderson (Golden Valley Fire Inspector), Mr. Jay Ipsen (Golden Valley Building Inspector), Mr. John Zadarski (UNO-VEN), Mr. Chris McLain (MPCA), Mr. Don Egerer (DLE)

Note: If person other than tank owner and/or operator is conducting the cleanup, provide name, address, and relationship to site on a separate attached sheet.

II. DATES

A. Date release reported to MPCA: 12/4/86

B. Dates site work performed:

Work Performed	Date
Remove 10,000, 8,000, and 4,000 Gallon Tanks	5/6/92
Remove 500 gal. heating oil and 550 gal. used oil tank	5/8/92

III. RELEASE INFORMATION

A. Provide the following information for all removed tanks.

Tank 1: Capacity: 10,000 Type: Steel Age: 25

Condition: Good, No Holes

Product history: Unleaded Gasoline

Approximate quantity of petroleum released, if known: Unknown

Cause of release: Unknown

Tank 2: Capacity: 8,000 Type: Steel Age: 25

Condition: Good, No Holes

Product history: Leaded Gasoline till 4/91 then unleaded

Approximate quantity of petroleum released, if known: Unknown

Cause of release: Unknown

Tank 3: Capacity: 4,000 Type: Steel Age: 25

Condition: Good, No Holes

Product history: Unleaded Gasoline

Approximate quantity of petroleum released, if known: Unknown

Cause of release: Unknown

Tank 4: Capacity: 500 Type: Fiberglass Age: 3

Condition: Very Good, No Holes (reinstalled)

Product history: Heating Fuel (#2 fuel oil)

Approximate quantity of petroleum released, if known: Unknown

Cause of release: Unknown

Tank 5: Capacity: 550 Type: Steel Age: 25

Condition: Good, No Holes

Product history: Used Oil

Approximate quantity of petroleum released, if known: Unknown

Cause of release: Unknown

B. Provide the following information for all existing tanks.

Tank Number	Capacity	Contents	Type	Age
4 (reinstalled)	500 gal.	#2 Fuel Oil	Fiberglass	3

C. If the release was associated with the lines or dispensers, briefly describe the problem:

Encountered gasoline contaminated soils overlying tanks and directly under lines and dispensing islands. No holes in tanks. Release likely associated with leaking product line or dispenser.

D. If the release was a surface spill, briefly describe the problem:

NA

IV. EXCAVATION

A. Dimensions of excavation: 50' x 46' x 17' deep

B. Original tank backfill material (sand, gravel, etc): Sand

C. Native soil type (clay, sand, etc.): Clay

D. Quantity of contaminated soil removed (cubic yards): 774

[NOTE: If more than 400 cubic yards removed, please attach copy of written approval from MPCA]

Work was conducted prior to 6/1/92. Verbal approval given by Chris McLain, MPCA.

E. Was groundwater encountered or was there evidence of a seasonally high groundwater table? At what depth?

No

F. If a soil boring was necessary (as indicated in part VI of "Excavation of Petroleum Contaminated Soil" (Guidance Document 6) for sand and silty sand native soils) describe the soil analytical and soil vapor headspace results. Attach the boring logs and laboratory results to this report.

NA

G. If groundwater was encountered or if a soil boring was conducted, was there evidence of groundwater contamination? Specify e.g., free product (specify thickness), product sheen, groundwater in contact with petroleum contaminated soil, water analytical results, etc.

NA

[NOTE: If free product was observed, contact MPCA staff immediately as outlined in "Petroleum Tank Release Reports" (Guidance Document 2)]

H. Was bedrock encountered in the excavation? At what depth?

No

I. Were other unique conditions associated with this site? If so, explain.

Approximately 2 cubic yards of fill material was removed from tank basin #4 (fuel oil UST) from a 10' x 10' x 7' deep excavation before tank was reinstalled with clean fill. Fill material contaminated by former release, the tank was OK.

V. SAMPLING

A. Briefly describe the field methods (including use of a photoionization detector) used to distinguish contaminated from uncontaminated soil:

Fill material was stained with contamination. Stained soils removed unstained soils verified as uncontaminated using headspace analysis (PID).

B. List soil vapor headspace analysis results. Indicate sampling locations using sample codes (with sampling depths in parentheses), e.g. SV-1 (2 feet), SV-2 (10 feet), etc. Samples collected at different depths at the same location should be labeled SV-1A (2 feet), SV-1B (4 feet), SV-1C (6 feet), etc. These should correspond with the codes on the site map in Part VI. If the sample represents soil from the final extent of the excavation indicate "bottom" or "sidewall" in the bottom/sidewall column.

Sample Code	Soil Type	Reading (ppm)	Bottom/Sidewall
S-1 (2')	Sand	300	Excavated Soil
S-2A (16')	Clay	274	Excavated Soil
S-2B (16')	Sand	140	Excavated Soil
S-3 (16')	Clay	42	Bottom of Excavation
S-4 (16')	Clay	158	Excavated Soil
S-5 (10')	Sand	52	East Sidewall
S-6 (12')	Clay	7	South Sidewall
S-7 (12')	Clay	80	West Sidewall
S-8 (12')	Clay)	71	Excavated Soil
S-9 (18')	Clay	2	Bottom of Excavation
S-10 (15')	Clay	48	Excavated Soil
S-11 (6')	Clay	24	West Sidewall
S-12 (4')	Sand	688	West Sidewall
S-13 (4')	Clay	0	East Sidewall
S-14 (8')	Clay	3	East Sidewall
S-15 (15')	Clay	1	Bottom of Excavation
S-16 (6')	Clay	2	North Sidewall
S-17 (6')	Sand	645	NE Corner Sidewall

C. Briefly describe the soil sampling and handling procedures used:

Soil samples were collected in accordance with MPCA soil sampling guidelines. Laboratory cleaned soil jars were used with disposable vinyl gloves. Soil samples with chain of custody were cooled to 9 degrees celsius and transported to a laboratory.

D. List the appropriate soil sample analytical results from the bottom and sidewalls of the excavation below (refer to "Soil and Groundwater Analysis at Petroleum Release Sites", Guidance Document 11). If the petroleum was not gasoline or fuel oil attach appropriate analytical results. Code the samples (with sampling depths in parentheses) SS-1 (8 feet), SS-2 (4 feet), etc. These should correspond with the codes on the site map in Part VI. Do not include analyses from the stockpiled soils.

Sample Code	THC as Gas or FO (ppm) (circle one)	Benzene (ppm)	Ethyl-Benzene (ppm)	Toluene (ppm)	Xylene (ppm)	MTBE (ppm)	Lead (ppm)
S-3	3.9	0.120	0.032	0.034	0.130		
S-9	<2.0	<0.005	<0.005	<0.005	<0.005		
S-12	7,400	4	8	0.76	51		
S-15	2.4	<0.005	<0.005	<0.005	<0.005		
550 W.O.	<2.0*						
550 F.O.	<2.0 *						

*As Fuel Oil

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

VI. FIGURES

Attach the following figures to this report:

1. Site location map.
2. Site map(s) drawn to scale illustrating the following:

   a. Location (or former location) of all present and former tanks, lines, and dispensers;
   b. location of other structures (buildings, canopies, etc.);
   c. adjacent city, township, or county roadways;
   d. final extent of excavation; and
   e. location of soil vapor analyses (e.g. SV-1), soil samples (e.g., SS-1), and soil borings (e.g. SB-1). Also, attach all boring logs.
   f. north arrow and map legend.

VII. SUMMARY

Briefly summarize evidence indicating whether additional investigation is necessary at the site, as discussed in part VI of "Excavation of Petroleum Contaminated Soil" (Guidance Document 6). If no further action is recommended, the MPCA staff will review this report following notification of soil treatment.

Petroleum contaminated soils with a PID headspace greater than 40 ppm (PID) were removed where possible. Petroleum contamination was primarily limited to fill materials and did not migrate significantly into the native clay soils. An estimated 20-50 cubic yards of contaminated fill soils remain in the Northeast corner of the tank basin (due to utilities) and west of the excavation under a road easement. These soils were not available for removal and further migration or impacts of petroleum hydrocarbons from these soils is considered unlikely. No further excavation on investigation is recommended at this time.

VIII. SOIL TREATMENT INFORMATION

A. Soil treatment method used (thermal, land application, other). If you choose "other" specify treatment method: Thermal

B. Location of treatment site/facility: Clean Soils fixed base facility

C. Date MPCA approved soil treatment (if thermal treatment was used after May 1, 1991, indicate date that the MPCA permitted thermal treatment facility agreed to accept soil): 4/23/92

D. Identify the location of any stockpiled contaminated soil:
Clean Soils fixed base facility, South St. Paul, MN

IX. CONSULTANT (OR OTHER) PREPARING THIS REPORT

Company Name: ĀTEC Associates, Inc.
Street/Box: 1479 Energy Park Drive
City, Zip: St. Paul, MN 55108
Telephone: (612) 645-9520
Contact: Ward Tongen

Signature: _____ Date: 7/15/92

If additional investigation is not required at the site, please mail this form and all necessary attachments to:

Mr. Chris McLain
Minnesota Pollution control Agency
Hazardous Waste Division
Tanks and Spills Section
520 Lafayette Road
St. Paul, Minnesota 55155

If additional investigation is required at the site, include this form as a section in the Remedial Investigation/Corrective Action Design report. Excavation reports indicating a remedial investigation (RI) is necessary will not be reviewed by MPCA staff until the RI has been completed.

APPENDIX D

CHEMISTRY

ATEC Associates, Inc.
2646 Highway Avenue
Highland, Indiana 46322
[219] 972-5252, [312] 375-9092
FAX # [312] 375-8649

May 18, 1992
File 52-08-91-18039
55-07-92-00014

Mr. Ward Tongen
ATEC Associates, Inc.
1479 Energy Park Drive
St. Paul, MN 55108

Re: Three Soil - Samples for TPH, BTEX, and Lead Analysis
24 Hour Turnaround

Dear Mr. Tongen:

Enclosed are the results of the Organic/Chemical analyses for the three soil samples which were submitted to the ATEC Environmental/Analytical Testing Division on May 13, 1992, on behalf of ATEC - St. Paul, MN/UNO-VEN.

The volatile samples were analyzed on a Hewlett Packard 5890 Gas Chromatograph using PID detection via SW 846 Method 8020 for Purgeable Organic Compounds.

The Total Hydrocarbon analyses were performed on a Hewlett Packard 5890 Gas Chromatograph using Photo Ionization Detection via SW 846 Method 8015 revised.

Metals were analyzed on a Leeman PS 1000 ICP according to SW 846 Method 6010.

All associated quality control information will be maintained in the Testing Division files and available to you without charge for thirty days. It has been a pleasure serving you and, as always, if there are any questions concerning these results, please feel free to contact me.

Respectfully submitted,

ATEC Associates, Inc.

Environmental/Analytical
Testing Division

REPORT OF TEST RESULTS

Client: ATEC - St. Paul, MN/UNO-VEN

Sample Matrix:	Soil
Sample Taken By:	DD
Date Sampled:	May 12, 1992
Date Received:	May 13, 1992
Date Analyzed:	May 13, 1992
Analyst:	SLK
ATEC Lab Number:	920276-1/3
ATEC Project Number:	52-08-91-18039/55-07-92-00014

PARAMETER (unit in mg/kg unless noted)	SAMPLE I.D. NUMBER			QUANTI-TATION LIMIT	SW846 METHOD NO.
	STOCK E.	STOCK W.	STOCK CENTER		
Lead	<13	<13	<13	13	6010

Respectfully submitted,
ATEC Associates, Inc.

Sandy Kavagelly
Environmental/Analytical
Testing Division

TOTAL PETROLEUM HYDROCARBONS
ANALYTICAL RESULTS

Client: ATEC - St. Paul, MN/UNO-VEN

Sample Matrix:	Soil
Sample Taken By:	DD
Date Sampled:	May 12, 1992
Date Received:	May 13, 1992
Date Analyzed:	May 13, 1992
Analyst:	JH
ATEC Lab Number:	920276-1/3
ATEC Project Number:	52-08-91-18039/55-07-92-00014

SAMPLE I.D. NO.	LAB I.D. NO.	TOTAL HYDROCARBON, PPM	QUANTITATION LIMIT, PPM
Stock E	920276-1	1,200*	100
Stock W	920276-2	10,000*	2,000
Stock Center	920276-3	7,400*	2,000
	Method Blank	<2.0	2.0

*Sample most closely resembles Unleaded Gasoline.

Analytical Method: SW 846 Method 8015 Revised

Respectfully submitted,
ATEC Associates, Inc.

Environmental/Analytical
Testing Division

PURGEABLE AROMATICS - BTEX
ANALYTICAL RESULTS

Client: ATEC - St. Paul, MN/UNO-VEN

Sample Identification:	Stock E
Sample Matrix:	Soil
Sample Taken By:	DD
Date Sampled:	May 12, 1992
Date Received:	May 13, 1992
Date Analyzed:	May 13, 1992
ATEC Lab Number:	920276-1
ATEC Project Number:	52-08-91-18039/55-07-92-00014

ANALYTE	CAS NUMBER	CONCENTRATION (ug/kg)	QUANTITATION LIMIT (ug/kg)
Benzene	71-43-2	3,800	250
Toluene	108-88-3	430	250
Ethylbenzene	100-41-4	350	350
Total Xylenes	1330-20-7	7,600	250

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8020

Respectfully submitted,
ATEC Associates, Inc.

Environmental/Analytical
Testing Division

PURGEABLE AROMATICS - BTEX
ANALYTICAL RESULTS

Client: ATEC - St. Paul, MN/UNO-VEN

Sample Identification:	Stock W
Sample Matrix:	Soil
Sample Taken By:	DD
Date Sampled:	May 12, 1992
Date Received:	May 13, 1992
Date Analyzed:	May 13, 1992
ATEC Lab Number:	920276-2
ATEC Project Number:	52-08-91-18039/55-07-92-00014

ANALYTE	CAS NUMBER	CONCENTRATION (ug/kg)	QUANTITATION LIMIT (ug/kg)
Benzene	71-43-2	7,600	5,000
Toluene	108-88-3	16,000	5,000
Ethylbenzene	100-41-4	7,200	5,000
Total Xylenes	1330-20-7	1,100,000	5,000

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8020

Respectfully submitted,
ATEC Associates, Inc.

Environmental/Analytical
Testing Division

PURGEABLE AROMATICS - BTEX
ANALYTICAL RESULTS

Client: ATEC - St. Paul, MN/UNO-VEN

Sample Identification:	Stock Center
Sample Matrix:	Soil
Sample Taken By:	DD
Date Sampled:	May 12, 1992
Date Received:	May 13, 1992
Date Analyzed:	May 13, 1992
ATEC Lab Number:	920276-3
ATEC Project Number:	52-08-91-18039/55-07-92-00014

ANALYTE	CAS NUMBER	CONCENTRATION (ug/kg)	QUANTITATION LIMIT (ug/kg)
Benzene	71-43-2	14,000	5,000
Toluene	108-88-3	12,000	5,000
Ethylbenzene	100-41-4	14,000	5,000
Total Xylenes	1330-20-7	91,000	5,000

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8020

Respectfully submitted,
ATEC Associates, Inc.

Environmental/Analytical
Testing Division

PURGEABLE AROMATICS - BTEX
ANALYTICAL RESULTS

Client: ATEC - St. Paul, MN/UNO-VEN

Sample Identification:	Method Blank
Sample Matrix:	Soil
Date Analyzed:	May 13, 1992
ATEC Lab Number:	Method Blank
ATEC Project Number:	52-08-91-18039/55-07-92-00014

ANALYTE	CAS NUMBER	CONCENTRATION (ug/kg)	QUANTITATION LIMIT (ug/kg)
Benzene	71-43-2	<5	5
Toluene	108-88-3	<5	5
Ethylbenzene	100-41-4	<5	5
Total Xylenes	1330-20-7	<5	5

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8020

Respectfully submitted,
ATEC Associates, Inc.

Environmental/Analytical
Testing Division

18039

CHAIN OF CUSTODY RECORD

* 24 HR TURNAROUND PLEASE

PROJ. NO. 55-07-52-0004 | PROJECT NAME / CLIENT: UNO-VEN | LAB PROJ. NO.

SAMPLERS: (Signature)

SAMPLING METHOD

SAMPLE I.D. NO.	DATE	TIME	COMPOSITE	GRAB	WATER	SOIL		FILTERED	ACIDIFIED	ICED		NUMBER OF CONTAINERS	LAB I.D. NUMBER	EPA 601/8010	EPA 602/8020	~~TPH~~ (TPH) GC Method	BTEX	~~METALS~~ LEAD	EPA 610	EPA 624/8240	EPA 625/8270	SAMPLE LOCATION / REMARKS
* STOCK E.	5-12-92	1230		X		X				X		3				X	X	X				0512 1230
* STOCK W.	5-12-92	1235		X		X				X		3				X	X	X				0512 1235
* STOCK CENTER	5-12-92	1240		X		X				X		3				X	X	X				0512 1240

920276-1
-2

ATEC Environmental Consultants
Division of ATEC Associates, Inc.
23 Empire Drive
St. Paul, Minnesota 55103
[612] 427-2670, FAX # [612] 223-8413

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
	5-12-92 1600				
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Project Manager / Phone #:	
		Warren R. Novak	5-13-92 10:10AM	WARD TANGEN 612-645-9520	* 24 HR TURNAROUND PLEASE!!

ATEC Associates, Inc.
2646 Highway Avenue
Highland, Indiana 46322
[219] 972-5252, [312] 375-9092
FAX # [312] 375-8649

June 1, 1992
File 55-07-91-00014/52-08-91-18039

Mr. Ward Tongen
ATEC Associates, Inc.
1479 Energy Park Drive
St. Paul, MN 55108

Re: Six Soil Samples for Analysis

Dear Mr. Tongen:

Enclosed are the results of the Organic analyses for the six soil samples which were submitted to the ATEC Environmental/Analytical Testing Division on May 11, 1992, on behalf of ATEC, St. Paul, MN - UNO-VEN Company.

The volatile samples were analyzed on a Hewlett Packard 5890 Gas Chromatograph using PID detection via SW 846 Method 8020 for Purgeable Organic Compounds.

The Total Hydrocarbon analyses were performed on a Hewlett Packard 5890 Gas Chromatograph using Photo Ionization Detection, and FID detection via SW 846 Method 8015 revised.

All associated quality control information will be maintained in the Testing Division files and available to you without charge for thirty days. It has been a pleasure serving you and, as always, if there are any questions concerning these results, please feel free to contact me.

Respectfully submitted,
ATEC Associates, Inc.

Environmental/Analytical
Testing Division

PURGEABLE AROMATICS - BTEX
ANALYTICAL RESULTS

Client: ATEC, St. Paul, MN - UNO-VEN

Sample Identification:	S-3
Sample Matrix:	Soil
Sample Taken By:	WT
Date Sampled:	May 6, 1992
Date Received:	May 11, 1992
Date Analyzed:	May 21, 1992
ATEC Lab Number:	920265-3
ATEC Project Number:	52-08-91-18039/55-07-91-00014

ANALYTE	CAS NUMBER	CONCENTRATION (ug/kg)	QUANTITATION LIMIT (ug/kg)
Benzene	71-43-2	120	5
Toluene	108-88-3	34	5
Ethylbenzene	100-41-4	32	5
Total Xylenes	1330-20-7	130	5

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8020

Respectfully submitted,
ATEC Associates, Inc.

Environmental/Analytical
Testing Division

PURGEABLE AROMATICS - BTEX
ANALYTICAL RESULTS

Client: ATEC, St. Paul, MN - UNO-VEN

Sample Identification:	S-9
Sample Matrix:	Soil
Sample Taken By:	WT
Date Sampled:	May 7, 1992
Date Received:	May 11, 1992
Date Analyzed:	May 21, 1992
ATEC Lab Number:	920265-4
ATEC Project Number:	52-08-91-18039/55-07-91-00014

ANALYTE	CAS NUMBER	CONCENTRATION (ug/kg)	QUANTITATION LIMIT (ug/kg)
Benzene	71-43-2	<5	5
Toluene	108-88-3	<5	5
Ethylbenzene	100-41-4	<5	5
Total Xylenes	1330-20-7	<5	5

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8020

Respectfully submitted,
ATEC Associates, Inc.

Environmental/Analytical
Testing Division

PURGEABLE AROMATICS - BTEX
ANALYTICAL RESULTS

Client: ATEC, St. Paul, MN - UNO-VEN

Sample Identification:	S-12
Sample Matrix:	Soil
Sample Taken By:	WT
Date Sampled:	May 7, 1992
Date Received:	May 11, 1992
Date Analyzed:	May 22, 1992
ATEC Lab Number:	920265-5
ATEC Project Number:	52-08-91-18039/55-07-91-00014

ANALYTE	CAS NUMBER	CONCENTRATION (ug/kg)	QUANTITATION LIMIT (ug/kg)
Benzene	71-43-2	4,000	500
Toluene	108-88-3	760	500
Ethylbenzene	100-41-4	8,000	5,000
Total Xylenes	1330-20-7	51,000	5,000

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8020

Respectfully submitted,
ATEC Associates, Inc.

Environmental/Analytical
Testing Division

PURGEABLE AROMATICS - BTEX
ANALYTICAL RESULTS

Client: ATEC, St. Paul, MN - UNO-VEN

Sample Identification:	S-15
Sample Matrix:	Soil
Sample Taken By:	WT
Date Sampled:	May 7, 1992
Date Received:	May 11, 1992
Date Analyzed:	May 21, 1992
ATEC Lab Number:	920265-6
ATEC Project Number:	52-08-91-18039/55-07-91-00014

ANALYTE	CAS NUMBER	CONCENTRATION (ug/kg)	QUANTITATION LIMIT (ug/kg)
Benzene	71-43-2	<5	5
Toluene	108-88-3	<5	5
Ethylbenzene	100-41-4	<5	5
Total Xylenes	1330-20-7	<5	5

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8020

Respectfully submitted,
ATEC Associates, Inc.

Nancy L Faulks

Environmental/Analytical
Testing Division

PURGEABLE AROMATICS - BTEX
ANALYTICAL RESULTS

Client: ATEC, St. Paul, MN - UNO-VEN

Sample Identification:	Method Blank
Sample Matrix:	Soil
Date Analyzed:	May 21, 22, 1992
ATEC Lab Number:	Method Blank
ATEC Project Number:	52-08-91-18039/55-07-91-00014

ANALYTE	CAS NUMBER	CONCENTRATION (ug/kg)	QUANTITATION LIMIT (ug/kg)
Benzene	71-43-2	<5	5
Toluene	108-88-3	<5	5
Ethylbenzene	100-41-4	<5	5
Total Xylenes	1330-20-7	<5	5

* Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8020

Respectfully submitted,
ATEC Associates, Inc.

Environmental Analytical
Testing Division

TOTAL PETROLEUM HYDROCARBONS
ANALYTICAL RESULTS

Client: ATEC, St. Paul, MN - UNO-VEN Co.

Sample Matrix:	Soil
Sample Taken By:	WT
Date Sampled:	May 7, 8, 1992
Date Received:	May 11, 1992
Date Extracted:	May 21, 1992
Date Analyzed:	May 26, 1992
Analyst:	JH
ATEC Lab Number:	920265-1/2
ATEC Project Number:	52-08-91-18039/55-07-91-00014

SAMPLE I.D. NO.	LAB I.D. NO.	TOTAL HYDROCARBON, FUEL OIL PPM	QUANTITATION LIMIT, PPM
550 W.O.	920265-1	<2.0	2.0
550 F.O.	920265-2	<2.0	2.0
Method Blank	Method Blank	<2.0	2.0

Analytical Method: SW 846 Method 8015 Revised

Respectfully submitted,
ATEC Associates, Inc.

Environmental/Analytical
Testing Division

TOTAL PETROLEUM HYDROCARBONS
ANALYTICAL RESULTS

Client: ATEC, St. Paul, MN - UNO-VEN Co.

Sample Matrix:	Soil
Sample Taken By:	WT
Date Sampled:	May 6, 7, 1992
Date Received:	May 11, 1992
Date Analyzed:	May 21, 22, 1992
Analyst:	JH
ATEC Lab Number:	920265-3/6
ATEC Project Number:	52-08-91-18039/55-07-91-00014

SAMPLE I.D. NO.	LAB I.D. NO.	TOTAL HYDROCARBON, PPM	QUANTITATION LIMIT, PPM
S-3	920265-3	3.9*	2.0
S-9	920265-4	<2.0	2.0
S-12	920265-5	7,400*	2,000
S-15	920265-6	2.4**	2.0
Method Blank	Method Blank	<2.0	2.0

*Sample most closely resembles Unleaded Gasoline.

**Sample most closely resembles a Weathered Diesel Fuel.

Analytical Method: SW 846 Method 8015 Revised

Respectfully submitted,
ATEC Associates, Inc.

Environmental/Analytical
Testing Division

62-00-91-
18039

CHAIN OF CUSTODY RECORD

*G.C. Method

PROJ. NO. 55-07-91-00014 | PROJECT NAME Medicine Lake 7.6 | CLIENT UNO-VEN Co. | LAB PROJ. NO.

SAMPLERS: (Signature) Ward Tongen

SAMPLING METHOD Grab

LABORATORY ANALYSIS

SAMPLE I.D. NO.	DATE	TIME	COMPOSITE	GRAB	WATER	SOIL		FILTERED	ACIDIFIED	ICED		NUMBER OF CONTAINERS	LAB I.D. NUMBER	EPA 601/8010	~~EPA 602/8020~~ THC*	~~EPA 418.1 (TPH)~~ *THC	BTEX	METALS	EPA 610	EPA 624/8240	EPA 625/8270	SAMPLE LOCATION / REMARKS
550 N.O.	5/7/92	1500		X		X				X		1			X							05071500 9202651
550 F.O.	5/8/92	1200		X		X				X		2			X							05081200-2
S-3	5/6/92	1400		X		X				X		2			X		X					05061400-3
S-9	5/7/92	0830		X		X				X		2			X		X					05070830-4
S-12	5/7/92	1000		X		X				X		2			X		X					05071000-5
S-15	5/7/92	1315		X		X				X		2			X		X					05071315-6
~~S-16~~																						

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Ward Tongen	5/8/92 1720				
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Project Manager / Phone #:	
		Karen R. Novak	5-11-92 3:30	Ward Tongen	1-800-676-2832

ATEC Environmental Consultants
Division of ATEC Associates, Inc.
23 Empire Drive
St. Paul, Minnesota 55103
[612] 227-2670, FAX # [612] 223-8413

APPENDIX E

SOIL TREATMENT

CleanSoils Inc. 84 2nd Avenue S.E., New Brighton, MN 55112 • (612) 639-8811 • FAX (612) 639-8813

June 24, 1992

Mr. Ward Tongen
ATEC Associates
1479 Energy Park Drive
St. Paul, MN 55108

Dear Mr. Tongen:

RE: Final Report on Soil Treatment and Notification of Post-Burn Sampling Results

Site: Medicine Lake 76, Station 9280-306
MPCA Leak ID#: 183
CleanSoils Project #: MN0359

CleanSoils has successfully completed the thermal treatment of petroleum contaminated soil from the above referenced site. The treated soil meets all MPCA requirements. Attached please find a copy of independent post-burn soil analyses for BTEX and TPH. Below is other information regarding the soil treated.

Quantity of Soil: 1,107.81 tons
Completion Date: June 4, 1992
Post-Burn Samples: MN0359-1
Final Disposition of Soil: Qualified Fill Project

If you should have any questions regarding this project, please contact me at (612) 639-8811.

Sincerely,

Bruce Rivers

Bruce Rivers
Account Executive

attachments

pc: File
Bob Dullinger, MPCA

SERCO Laboratories

1931 West County Road C2. St. Paul. Minnesota 55113 Phone (612) 636-7173 FAX (612) 636-7178

LABORATORY ANALYSIS REPORT NO: 21908 PAGE 1
06/19/92

CleanSoils, Inc.
84 2nd Ave. S.E.
New Brighton, MN 55112

Attn: David Kress

DATE COLLECTED: 06/01/92; 06/12/92
DATE RECEIVED: 06/15/92
COLLECTED BY : CLIENT
DELIVERED BY : CLIENT
SAMPLE TYPE : SOIL

SERCO SAMPLE NO:	50952
SAMPLE DESCRIPTION:	MN0359-1
ANALYSIS:	
Benzene, mg/kg	0.11
Ethylbenzene, mg/kg	<0.005
Toluene, mg/kg	0.040
Xylene, mg/kg	0.017
FID Scan, mg/kg, as #2 fuel oil	-
FID Scan, mg/kg, as gasoline	<0.50

SERCO SAMPLE NO:	
SAMPLE DESCRIPTION:	
ANALYSIS:	
Benzene, mg/kg	
Ethylbenzene, mg/kg	
Toluene, mg/kg	
Xylene, mg/kg	
FID Scan, mg/kg, as #2 fuel oil	
FID Scan, mg/kg, as gasoline	

< means "not detected at this level". 1 mg = 1000 ug.

Member

Mobil Oil Corporation

3225 GALLOWS ROAD
FAIRFAX, VIRGINIA 22037-0001

September 5, 1989

Mr. Michael Kanner
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, MN 55155

LEAK 183

MOBIL STATION # 05-GOD
COUNTY RD 18 & MEDICINE
GOLDEN VALLEY, MINNESOTA

Dear Mr. Kanner:

Attached for your information and review is the quarterly monitoring report prepared by Twin City Testing, dated August 2, 1989, for the referenced location.

Subsurface material consists of silty sand, clayey sand and sandy lean clay with varying amounts of gravel. This is underlain by sand and sand with silt and gravel and lean clay with sand. Ground water levels varied from 0.55' to 4.38' below grade level, due to seasonal fluctuations. Ground water flow is to the southwest. No free phased hydrocarbons were detected. Ground water samples taken during four (4) rounds of sampling did not detect any BTX constituents. The exception to this was the January 9, 1989 sampling in which 2 ppb Benzene was detected in one (1) of three (3) monitoring wells. Soil samples indicated high concentrations of dissolved hydrocarbons in one (1) boring, 187,000 ppb from 19.5'-21' below grade level.

A total of 50 cubic yards of contaminated soil has been removed from this site.

It is expected that the remaining hydrocarbons in the soil will disperse through biodegradation and other natural processes. There has been no impact on ground water. Based on the above information Mobil requests closure of this site.

Should you have any questions, please contact the field engineer, P. D. Gates at 312-330-6682.

Sincerely,

Craig M. La Belle
Environmental Advisor

CML/cml

Attachment

cc: C. E. Doumas
P. D. Gates - Woodfield
A. G. Swenson - Westford

LEAK # 183

QUARTERLY MONITORING REPORT

MOBIL STATION #05-GOD

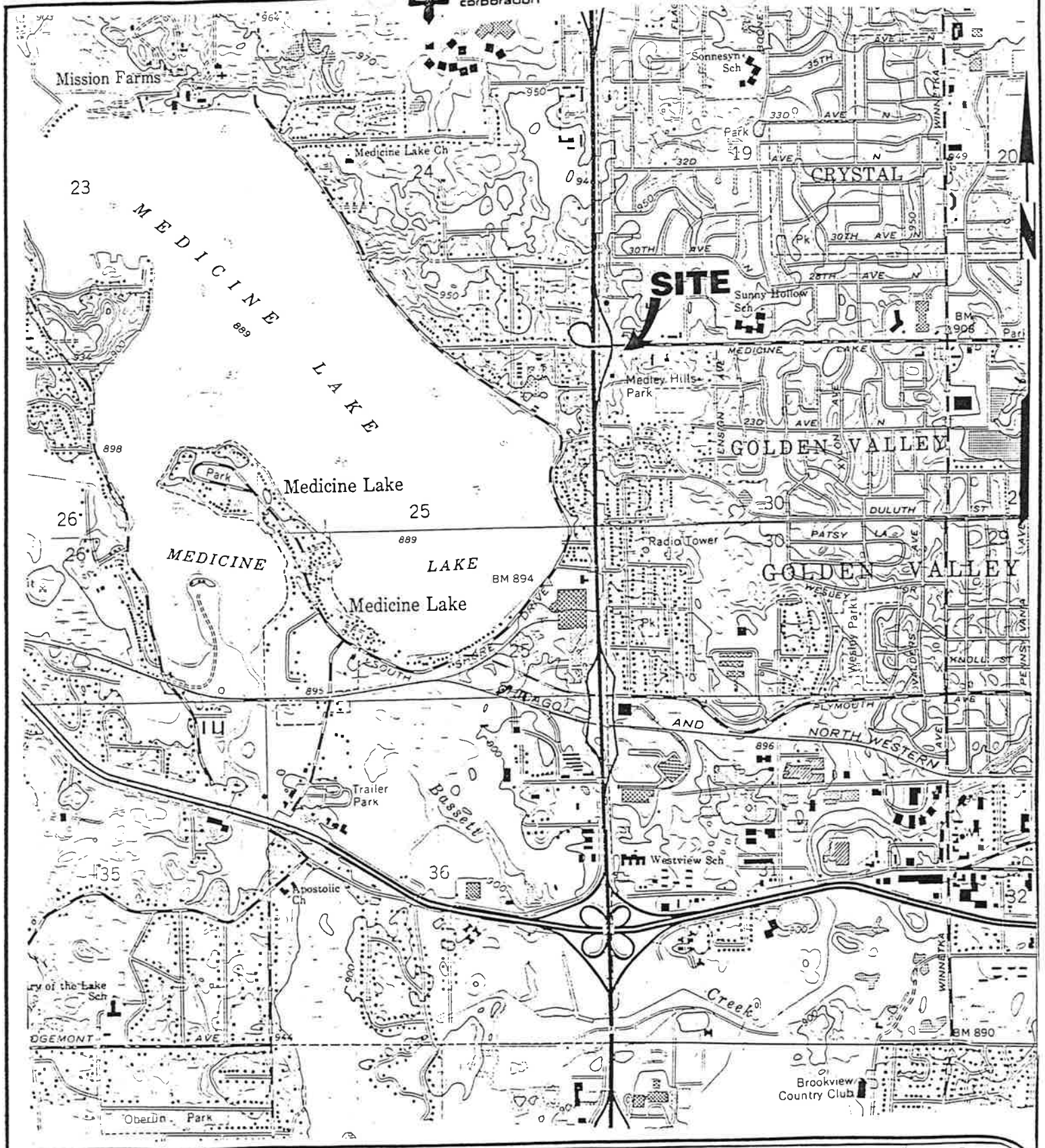
COUNTY ROAD 18 & MEDICINE LAKE ROAD

GOLDEN VALLEY, MINNESOTA

August 2, 1989

#4231 88-521

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'

ENV-200 (11/86)

QUARTERLY MONITORING REPORT

GOLDEN VALLEY MOBIL #05-GOD

GOLDEN VALLEY, MINNESOTA

#4231 88-521

1.0 INTRODUCTION

1.1 Purpose

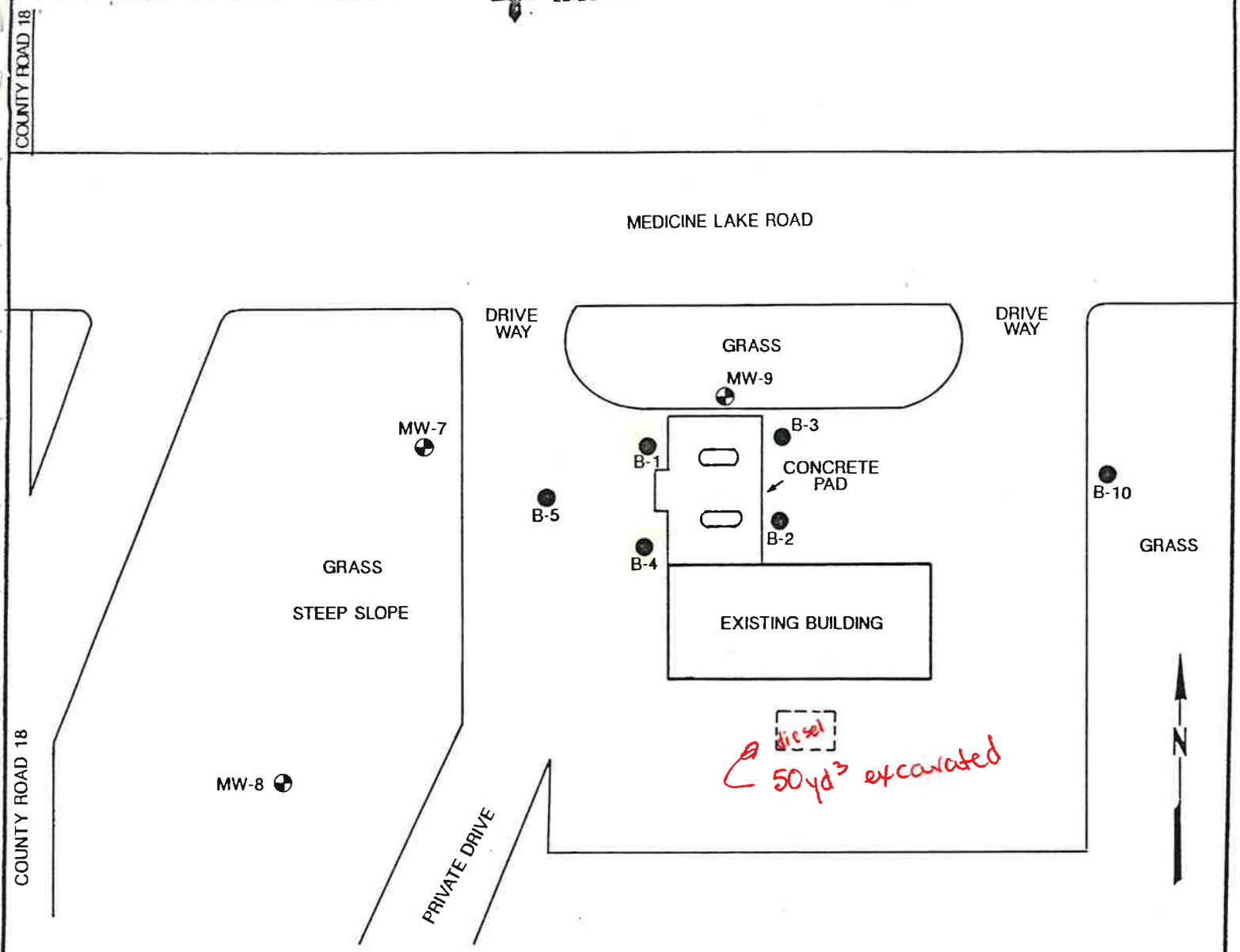
The purpose of this report is to present the results of the quarterly groundwater monitoring program conducted by Twin City Testing Corporation (TCT) at the above referenced site (Figure 1). The one-year groundwater monitoring program was implemented in October 1988 in response to a Minnesota Pollution 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.

twin city testing corporation



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	

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.

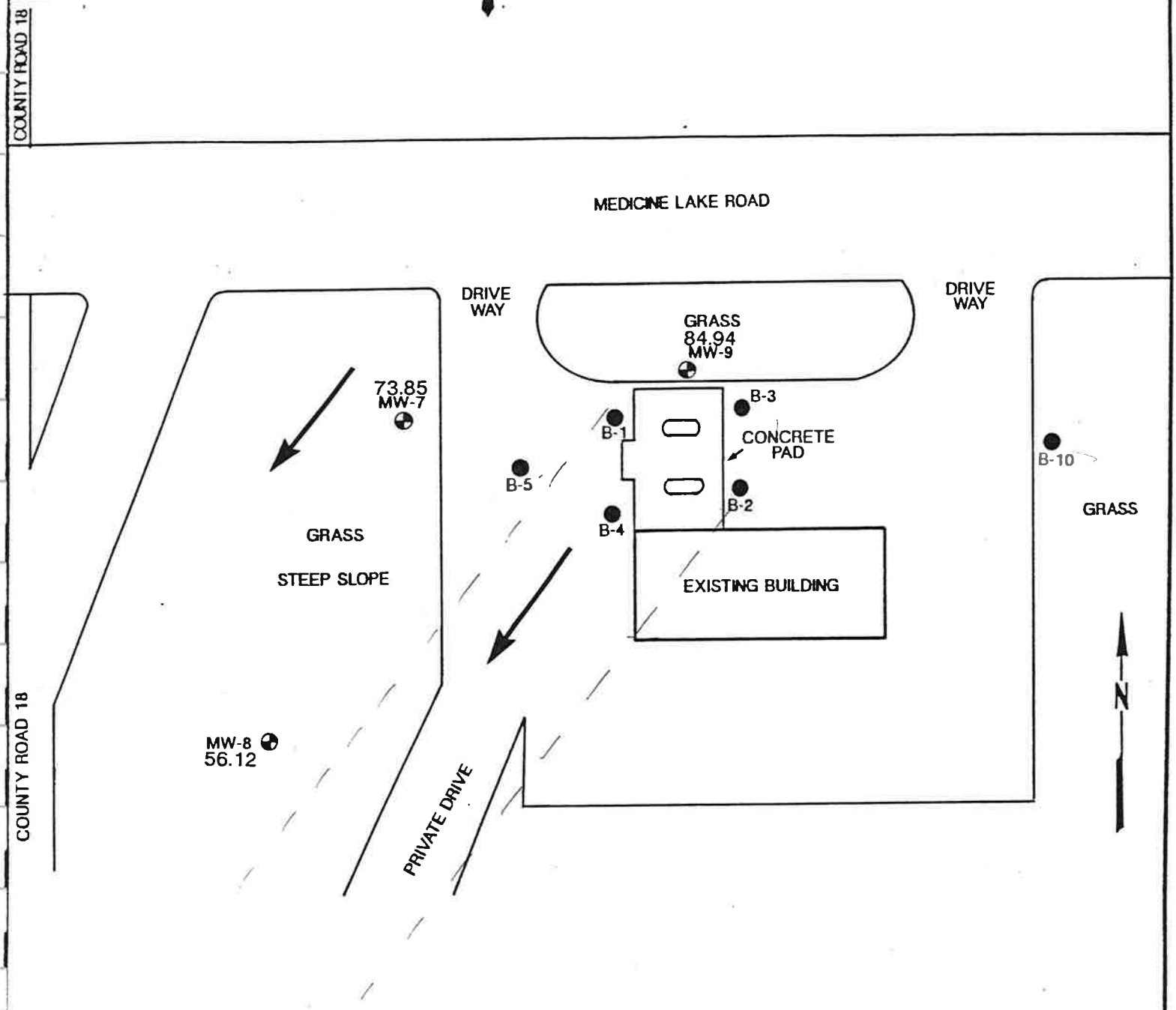
TABLE 2

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



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	

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: JD

APPENDIX A

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

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

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

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

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

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

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 05GOD, 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 to medium (SC)	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. MW-7

PROJECT Monitoring Well Installation; Medicine Lake Rd & Cty Rd 18; Site #4 05GOD, 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	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		39		7	SB	
25	lenses of silty sand (SC)		17		8	SB	
	CLAYEY SAND W/A LITTLE GRAVEL, brownish gray, stiff (SC)		17	▼	9	SB	
30½					10	SB	
	SANDY LEAN CLAY W/A LITTLE GRAVEL, reddish brown, stiff ~~(SC)~~ CL		21		11	SB	
34							
36	SILTY SAND W/A LITTLE GRAVEL, grayish brown, moist, very dense, a 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

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. B-10

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

DEPTH IN FEET	DESCRIPTION OF MATERIAL Mobil Oil Corp. 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	
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

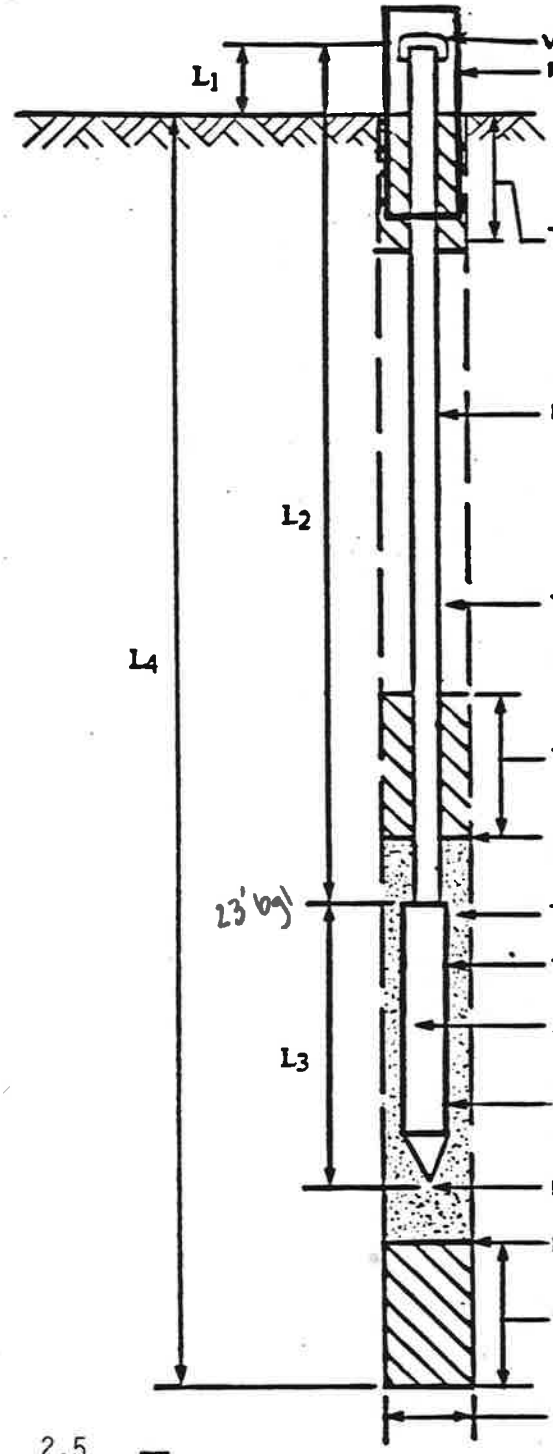
CREW CHIEF Mishler

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

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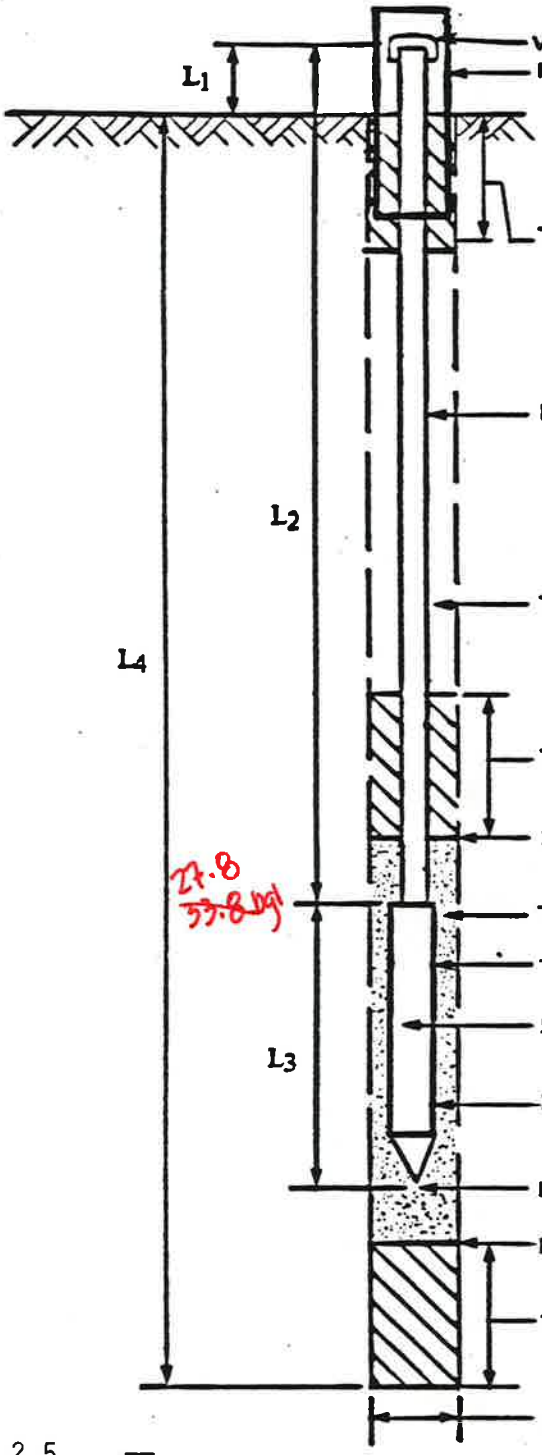
TALLATION OF MONITORING WELL

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

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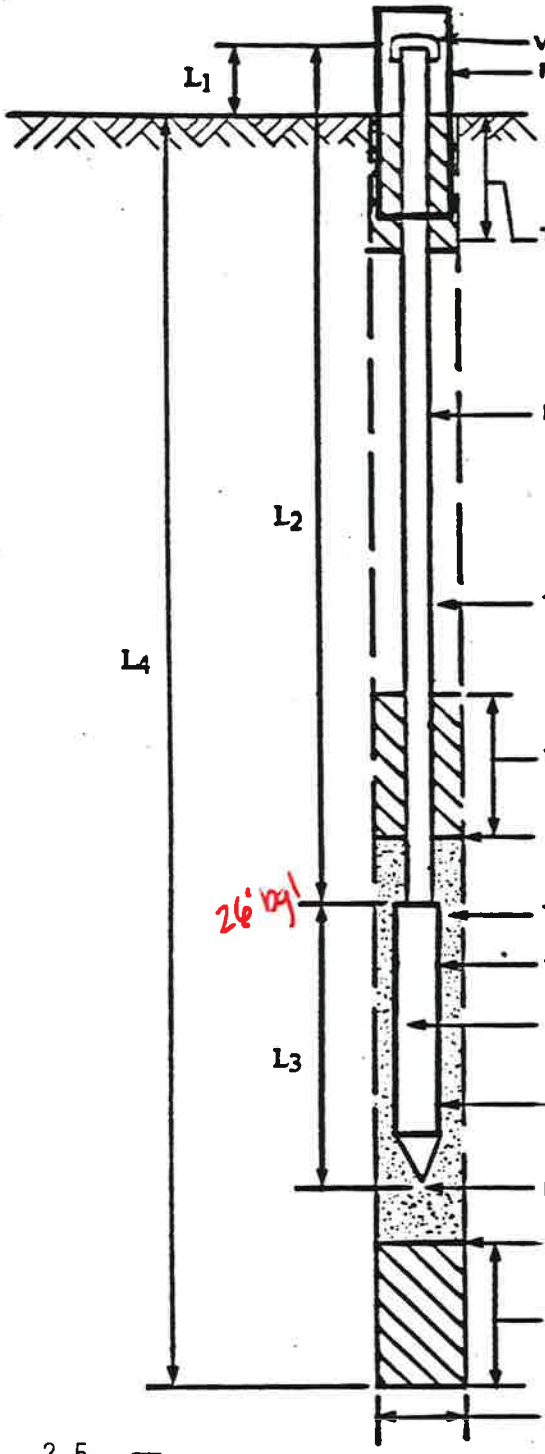
INSTALLATION OF MONITORING WELL

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



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= ~~27~~ 18.5 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 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 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)

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

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.