REMEDIAL INVESTIGATION
FORMER MOBIL SERVICE STATION
4201 HIAWATHA AVENUE
MINNEAPOLIS, MINNESOTA
MPCA LEAK NUMBER 1485

MARCH 20, 1992

Prepared for:

Agate Properties
c/o CMI-Cronstroms
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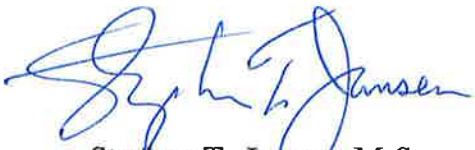

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1.0 INTRODUCTION

1.1 PURPOSE

Peer Environmental & Engineering Resources, Inc. (PEER) was retained by Agate Properties to perform a remedial investigation (RI) of the Former Mobil Service Station (site) at 4201 Hiawatha Avenue, Minneapolis, Minnesota. The services were performed in accordance with PEER's proposal dated November 13, 1991.

The investigation was conducted in response to a previously identified petroleum release from underground storage tanks. The tanks stored gasoline and #2 fuel oil. The purpose of this investigation was to define the horizontal and vertical extent of the release and to assess potential impacts to public health and the environment.

1.2 SCOPE OF SERVICES

The Scope of Services performed by PEER as part of this investigation included:

- Review of existing investigation data.
- Completion of soil borings and installation of monitoring wells.
- Headspace analysis of soil samples from the soil borings and monitoring wells.
- Collection and analytical testing of soil and ground water samples.
- Completion of a vapor risk assessment and ground water receptor survey.
- Completion of MPCA Hydrogeologic Setting and Ground Water Contamination Characterization Worksheet.
- Data evaluation and preparation of a Remedial Investigation report presenting conclusions and recommendations regarding the petroleum release.

The RI activities were performed between December 1991 and March 1992.

2.0 BACKGROUND

2.1 SITE DESCRIPTION

The site is located at the intersection of 42nd Street and Hiawatha Avenue in Minneapolis (Figure 1). The Mississippi River lies one mile east of the site and Lake Hiawatha is located approximately 1/2 mile to the southwest. The site is located in the NE1/4, NE1/4, NW1/4, SW1/4 of Section 7, T28N, R23W (U.S.G.S., St. Paul West, 7-1/2 Minute Quadrangle).

2.2 AVAILABLE INFORMATION

2.2.1 UST Information

Records obtained from the City of Minneapolis indicate that four underground storage tanks (USTs) were installed at the site in June 1962 (Appendix A). Three of these tanks contained gasoline, the other contained drain oil (waste oil). A fifth tank which contained fuel oil also previously existed at the site. The City information indicates the waste oil UST was removed in 1979. However, during excavation activities in October 1991 it was discovered that the waste oil UST (actually 1,000 gallons in capacity) still existed. It was subsequently removed in October 1991.

Available information on all of the former USTs is summarized in the following table.

Tank	Contents	Capacity	Type of Tank	Date Installed	Date Registered	Date Tank & Piping Removed
1	Fuel Oil	560	Steel	Unknown	7/28/89	8/17/89
2	Waste Oil	1000	Steel	6/20/62	10/18/91	10/4/91
3	Gasoline	8000	Unknown	6/20/62	10/18/91	9/24/79, 10/2/91*
4	Gasoline	4000	Unknown	6/20/62	10/18/91	9/24/79, 10/2/91*
5	Gasoline	5000	Unknown	6/20/62	10/18/91	9/24/79, 10/2/91*
NOTE: Vent pipes and piping to two pump islands removed on 10/2/91.						

The locations of the former USTs and the associated pump islands and lines are shown on Figure 2. Copies of the Minnesota Pollution Control Agency (MPCA) Notification for Underground Storage Tanks forms are included in Appendix A.

2.2.2 UST Removals and Reported Release

City information indicates the gasoline USTs were removed on September 24, 1979, which was prior to acquisition of the site by Agate Properties. No documentation on removal activities was available.

The fuel oil UST was removed on August 17, 1989 by Germundsen Companies, Inc. (GCI). Pace Laboratories, Inc. (Pace) conducted soil sampling from the tank excavation. A copy of a report on the results of the sampling dated September 12, 1989 is included in a Appendix A. Based on observations and analytical testing results it was determined that a release of fuel oil and possibly a gasoline release had occurred at the site. A subsurface investigation was recommended to define the extent of petroleum contamination. The release was reported to the MPCA on August 17, 1989. The MPCA Leak Number assigned to the release was 1485.

The waste oil tank was removed on October 4, 1991 by GCI. Monitoring with an H-NU photoionization detector and soil sampling were performed by PEER. One soil sample was collected from the base of the excavation at the south end of the UST. The sample was analyzed for total hydrocarbons as #2 fuel oil, volatile organic compounds (VOCs), polychlorinated biphenyls (PCBs) and total cadmium, chromium, and lead. A copy of the analytical testing results is included in Appendix A. Very low concentrations of several VOCS and low concentrations of metals were detected in the soil sample. Based on field observations, H-NU monitoring data and the analytical results, it was determined that no significant releases occurred from the waste oil UST.

2.3 PREVIOUS INVESTIGATION

Following the identification of the release in August 1989, a subsurface investigation consisting of soil borings, soil sampling and analytical testing was implemented by Pace. The results of the investigation are presented in a report entitled: "Soil Investigation, Former Mobil Gas Station, 4201 Hiawatha Avenue, Minneapolis, Minnesota" dated July 27, 1990. A copy of this report was submitted to the MPCA on February 20, 1992.

The locations of the soil borings performed by Pace are shown on Figure 2. The data from the Pace investigation has been evaluated and is summarized with the results of the remedial investigation completed by PEER.

2.4 EXCAVATION REPORT

The previous subsurface investigation identified petroleum impacted soil in two areas of the site: the former fuel oil UST basin and the pump island area west of the service station building. Excavation of the impacted soil from these areas was conducted between October 1 and 3, 1991. An "Excavation Report For Petroleum Release Sites" dated November 15, 1991 was completed by PEER. A copy of this report was submitted to the MPCA on February 20, 1992.

The locations of the excavations are shown on Figure 2. Approximately 80 cubic yards of fuel oil impacted soil were excavated from the fuel oil UST basin (excavation E-1) and 320 cubic yards of gasoline impacted soil were excavated from the pump island area (excavation E-2). The source of the fuel oil impacts was determined to be a leak from the fuel oil UST. The gasoline impacts were determined to be associated with leaking dispenser lines. The impacted soil was thermally treated at C.S. McCrossan in Maple Grove, Minnesota.

The results of analytical testing of soil samples collected from the excavation in the pump island area indicated the majority of impacted soil was removed and that additional corrective actions or investigation in this area were not warranted. The analytical results from the fuel oil UST basin excavation indicated soil with petroleum hydrocarbon concentrations above the MPCA action level (50 ppm total petroleum hydrocarbons) still remained in place. In addition, previous soil boring data suggested that the fuel oil impacted soil was in contact with ground water. Since the MPCA action level was exceeded and there was a potential for ground water impacts, this remedial investigation was implemented.

3.0 METHODS AND PROCEDURES

3.1 FIELD INVESTIGATION

3.1.1 General

Field investigation activities consisted of completion of soil borings, installation of monitoring wells, and sampling of soil and ground water at the site. Drilling services were provided by Bergerson-Caswell, Inc. of Maple Plain, Minnesota. A detailed description of field investigation methods and procedures is provided in Appendix B. The following is an overview of the activities performed. The locations of the completed soil borings and monitoring wells are shown on Figure 2.

3.1.2 Soil Borings

Two soil borings (P-1 and P-2) were completed on December 17 and 18, 1991, using a truck-mounted drill rig equipped with hollow stem augers. The borings were completed to a depth of 40 feet. Split-barrel soil samples were collected for classification purposes and soil headspace analysis. Selected soil samples were submitted for analytical testing. Boring logs are included in Appendix C. Soil boring logs from the previous borings (B-1 through B-6) are also included in Appendix C.

3.1.3 Monitoring Wells

Three, 2 inch I.D. (inside diameter) monitoring wells were installed between December 17 and 20, 1991. The wells consist of 10 foot, Schedule 40 PVC screens and low carbon riser pipe. The monitoring wells were screened to intersect the water table. Two of the wells were completed above grade and one (MW-2) was finished at-grade. Well construction data is summarized in following table. Monitoring well construction diagrams, geologic logs, and Minnesota Department of Health Well Logs are included in Appendix D.

MONITORING WELL CONSTRUCTION DATA

ITEM	MW-1	MW-2	MW-3
Date Installed	12/20/91	12/20/91	12/20/91
Ground Surface Elevation (feet)	837.40	837.21	837.84
Top of Riser Elevation (feet)	839.79	837.21	840.29
Top of Filter Pack Elevation (feet)	812.10	813.52	811.55
Top of Screen Elevation (feet)	810.10	811.52	809.55
Bottom of Screen Elevation (feet)	800.10	801.52	799.55
Depth of Well from Top of Riser (feet)	39.69	35.69	40.74
MDH Unique Well Number	498841	498842	498843

NOTES:

Elevations are referenced to top nut of fire hydrant at northeast corner of Hiawatha Avenue and 42nd Street.

The monitoring wells were developed on December 24, 1991, using dedicated disposable polyethylene bailers. Each well was developed until a relatively sediment free discharge was obtained. Development data, including the volume of water removed and observations of the discharge, are summarized in the following table.

MONITORING WELL DEVELOPMENT DATA			
ITEM	MW-1*	MW-2	MW-3
Cumulative Bailing Time (minutes)	185	82	131
Total Volume of Water Removed (gallons)	85	45	60
Estimated Volume of Water in Well Casing (gallons)	1.2	1.2	1.3
Approximate Well Unit Volumes Removed	70.8	37.5	46.2
Date Developed	12/24/91	12/24/91	12/24/91
NOTES: Development conducted using disposable polyethylene bailers. *Strong gasoline odor noted during development and sheen observed on discharge water.			

The monitoring wells were purged and ground water samples were collected with disposable polyethylene bailers on December 26, 1991, following MPCA guidelines. Monitoring well sampling data forms are presented in Appendix E.

Water level and free product measurements were obtained at the time of sampling and on one other occasion. Water level measurements were referenced to the top of the riser and were obtained using an electronic water level indicator. Measurements for free product were made using a tape and petroleum product detecting paste. The data obtained is summarized in the following table.

WATER LEVEL MEASUREMENT DATA				
Well	Date	Elevation of TOR	Water Level Below TOR	Water Level Elevation
MW-1	12/26/91	839.79	32.19	807.60
	1/27/92		32.36	807.43
MW-2	12/26/91	837.21	29.50	807.71
	1/27/92		29.62	807.59
MW-3	12/26/91	840.29	32.58	807.71
	1/27/92		32.72	807.57

NOTES:

NO free product detected in any of the monitoring wells.
TOR = Top of Riser.
Elevations referenced to NGVD.

Slug tests were performed on each well on December 26, 1991, to provide data for evaluating aquifer parameters (specifically hydraulic conductivity). The slug test procedure is described in Appendix B. The slug test field data is presented in Appendix F.

An elevation survey of the monitoring wells and soil borings was conducted on December 23, 1991. Elevation data is provided on the respective soil boring logs and monitoring well construction diagrams (Appendices C and D).

3.2 ANALYTICAL TESTING

Soil and ground water samples were submitted to the contract laboratory, Twin City Testing of St. Paul, for analytical testing. Table 1 summarizes information regarding the samples submitted. The samples were analyzed for a combination of the following parameters:

- Benzene, ethyl benzene, toluene and xylene (BETX) (soil samples only).
- Volatile organic compounds (VOCs) using Minnesota Department of Health (MDH) Method 465C (ground water samples only).
- Total hydrocarbons as gasoline.
- Total hydrocarbons as #2 fuel oil.

A trip blank accompanied the ground water samples and was analyzed for VOCs. A method blanks were also analyzed by the laboratory for VOCs.

Analytical testing methods utilized are specified on the respective laboratory reports included in Appendix G.

3.3 VAPOR RISK ASSESSMENT

A vapor risk assessment was performed to determine the potential for vapor impacts to utilities and/or basements. The assessment included review of available plan sheets from City of Minneapolis Public Works to identify the locations of sewers and other utility lines. The potential for vapor impacts was then evaluated based on the site specific conditions, such as the nature and extent of the release, soil types and the identified locations of utilities and basements.

3.4 RECEPTOR SURVEY

An inventory of registered water wells located within a one-mile radius of the site was conducted by reviewing Minnesota Geological Survey files. Copies of available well logs for wells that have been field verified by the MGS were obtained and reviewed for geological and hydrogeological information.

4.0 RESULTS

4.1 HYDROGEOLOGY

4.1.1 Geologic Setting

Available information was reviewed and evaluated to determine the geologic and hydrogeologic setting at the site. Information sources included published references, soil borings logs from the current investigation and from the previous site investigation, and water well logs obtained from the Minnesota Geological Survey.

A listing of published references reviewed is included in Section 8.0. Figure 2 shows the locations of all on-site subsurface investigation activities. Soil boring logs and water well logs are included in the Appendices.

The soil borings encountered sandy clay fill to depths of up to 5 feet. Fill is underlain by silty clay (alluvial or lacustrine origin) to depth of approximately 9 feet. Coarse alluvium consisting of sand gravel was encountered below the clay to the termination depths of the borings (maximum of 40 feet).

Water well logs and published references indicate bedrock occurs at a depth of approximately 60 to 70 feet and consists of limestone and shale of the Platteville and Glenwood Formations. These formations are on the order of 20 to 40 feet thick, are underlain by the St. Peter Sandstone. A thin layer of clayey glacial till (approximately 10 feet) may overlie the Platteville and Glenwood Formations.

Ground water occurs in the unconsolidated deposits at a depth of approximately 30 feet. Published hydrogeologic maps show regional shallow ground water flow to generally be to the east toward the Mississippi River. It is anticipated that the direction of local shallow ground water flow is affected by the proximity of Lake Hiawatha and by excessive seasonal pumping in the Minneapolis area. Ground water flow based on the site data is discussed in the following section.

4.1.2 Ground Water Flow and Gradient

Water level data for January 27, 1992 was evaluated to determine the water table configuration and hydraulic gradient. The water table configuration is presented in Figure 3. Based on this data, ground water flow is west-southwest, in the general direction of Lake Hiawatha. The hydraulic gradient was calculated to be 0.0013. Evaluation of the December 26, 1991 water level data indicates ground water flow to the west-northwest and a similar hydraulic gradient. It is possible that the water levels in the wells had not fully stabilized at the time the December measurements were obtained.

4.1.3 Hydraulic Conductivity

Slug test field data and calculations of hydraulic conductivities for the screened zones of the monitoring wells are presented in Appendix F. The following hydraulic conductivities were determined:

Well	Hydraulic Conductivity
MW-1	1.04×10^{-2} cm/sec (29 ft/day)
MW-2	2.14×10^{-2} cm/sec (61 ft/day)
MW-3	2.60×10^{-2} cm/sec (74 ft/day)

Based on these values, the average hydraulic conductivity of the screened intervals of the wells is 1.93×10^{-2} cm/sec (or 55 ft/day).

4.1.4 Ground Water Flow Velocity

Ground water flow velocity was determined using the equation $v = K(i/n)$. The average hydraulic conductivity (K) for the screened intervals of the wells was calculated to be 1.93×10^{-2} cm/sec (or 55 ft/day). The hydraulic gradient (i) at the site was determined to be 0.0013. Assuming an effective porosity (n) of 0.20 to 0.30 for the screened material, ground water flow velocity (v) is calculated to be 0.24 to 0.36 ft/day or 88 to 131 feet/year.

4.2 VAPOR MONITORING

Soil samples obtained from soil borings were screened for organic vapors which provide an indication of the presence and relative concentration of petroleum products in the soil samples. Vapor monitoring results obtained from this investigation and the previous one are summarized in Tables 2 and 3.

Samples obtained from soil borings completed by PEER were analyzed using an H-NU photoionization detector with a 10.2 eV lamp in accordance with the "MPCA Jar Headspace Method" which is described in Appendix B.

Samples from the previous soil borings with "B" designation were apparently analyzed by placing the PID probe near freshly exposed soil and recording the reading. Apparently, the samples were not placed in jars prior to obtaining vapor readings. These samples were analyzed using H-NU photoionization detector. The lamp rating was not specified but is presumed to be 10.2 eV.

4.3 ANALYTICAL TESTING

4.3.1 Soil Samples

Analytical results for soil samples collected by PEER are summarized in Table 4. The laboratory analytical report is included in Appendix G. Table 5 summarizes the analytical results of soil samples obtained from the previous soil borings. The laboratory analytical report for the previous soil testing is not included.

4.3.2 Ground Water Samples

The analytical results for the ground water samples are summarized in Table 6. Table 6 also includes a summary of applicable Minnesota Department of Health Recommended Allowable Limits (RALs) for Drinking Water Contaminants. The laboratory analytical report is included in Appendix G.

4.4 VAPOR RISK ASSESSMENT

City of Minneapolis utility plans show sewer and water mains are located under the center line of Hiawatha Avenue at depths of 5 to 10 feet. Plans also show a old sewer line which runs under the centerline of Hiawatha Avenue at a depth of approximately 18 feet.

No building structures are located immediately downgradient of the release site.

Based on the results of the vapor risk assessment, the completion of a vapor survey does not appear warranted.

4.5 GROUND WATER RECEPTOR SURVEY

Registered water wells located within a one-mile radius of the site are shown on Figure 4. Copies of the available water well logs, field verified by the MGS, are included in Appendix H. A summary of construction and hydrogeologic information regarding the wells is presented in the following table.

WATER WELL DATA

MN Well Number	Ground Surface Elevation (ft)	Well Base Elevation (ft)	Casing Base Elevation (ft)	Water Level Elevation	Aquifer	Use and/or Diameter (inches)
236024	832	468	579	740	OPDC	12
200605	832	760	760	801	OPVL	5
200601	831	ND	ND	ND	OPVL	ND
235546	835	456	692	ND	CJDN	10
200606	811	80	ND	ND	ND	ND

NOTES:

Listed elevations are relative to NGVD (National Geodetic Vertical Datum).
OPVL = Ordovician Platteville Limestone
OPDC = Ordovician Prairie du Chien.
CJDN = Cambrian Jordan.
ND = No Data.

A copy of the MPCA Hydrogeologic Setting and Ground Water Contamination Characterization Worksheet which summarizes potential risks associated with the release is included in Appendix I.

5.0 DISCUSSION

Investigation activities performed to date have identified petroleum releases from three on-site sources including:

- The former fuel oil UST
- Lines to the pump islands from the former gasoline USTs
- The former gasoline USTs

Corrective actions were implemented in October 1991 to address the areas of petroleum impacted soil identified by the initial soil boring investigation at the site. Approximately 80 cubic yards of impacted soil was excavated from the fuel oil UST basin and 320 cubic yards from the former pump island area west of the service station building.

Analytical testing data from the fuel oil UST basin excavation and soil borings indicate some impacted soil remains in place under the northeast portion of the building. Analytical testing data from the excavation in the former pump island area indicate all impacted soil was removed in this location. The impacted soils were thermally treated at an off-site facility.

Based on the results of this remedial investigation, it appears a release occurred from the former gasoline USTs. Impacted soil and ground water was identified in monitoring well MW-1 which is adjacent to and downgradient of the former location of the gasoline USTs. Ground water flow data suggests impacted ground water extends off-site to the west beneath Hiawatha Avenue.

Analytical testing of ground water identified total hydrocarbons as gasoline and petroleum-related volatile organic compounds (VOCs). VOCs detected included ethyl benzene, toluene, xylene, and cumene (a high octane gasoline additive). Only ethyl benzene and toluene were detected at concentrations above the Minnesota Department of Health RALs (3.5 times and 7 times the RALs, respectively).

Chloroform and methylene chloride were also detected in the ground water samples at very low concentrations. These compounds are widely used by analytical laboratories for cleaning of lab equipment and sample containers. Based on the concentrations detected and the trip and method blank data, it is likely these two compounds were laboratory induced.

No ground water receptors were identified downgradient of the release site. The results of the vapor risk assessment indicate a low potential for any vapor impacts from the release.

6.0 SUMMARY AND CONCLUSIONS

- The on-site geology consists of about 9 feet of alluvial clay over sand alluvium, which was encountered to the termination depths (maximum 40 feet) of all the borings. Ground water occurs at about 30 feet. Ground water flows to the west-southwest (almost opposite of the direction estimated from available hydrogeologic maps).

- A fuel oil UST release occurred near the northeast corner of the former service station building, which contaminated the clay and underlying sand to the depth of ground water.

- Most of the highly impacted soil from the fuel oil UST release was removed, but some impacted soil (above MPCA action levels) remains in place at-depth (17-30 feet) and beneath the building.

- A gasoline tank line leak occurred in the dispenser pump area west of the building, and impacted the clay but not the underlying sand. Essentially all of the impacted soil from this release has been excavated.

- The impacted soil was thermally treated off-site.

- Ground water investigation indicates impacts from gasoline in the northwest quadrant of the site. Fuel oil impacts do not appear to be significant.

- The source of gasoline ground water contamination is estimated (through the process of elimination) to be from former gasoline UST(s) which were located on the north side of the site.

- The "point of release" from the gasoline UST(s) was not encountered in borings or test pits. It is assumed the release was from the bottom of the gasoline UST(s) in the sand beneath the clay; hence is localized.

- Impacted ground water appears to extend to the west, off-site, beneath Hiawatha Avenue.

- There are no remaining USTs on-site.

- The site geology and results of the receptor survey indicates no significant risk of impacts to drinking water aquifers, water wells, or surface water bodies.

- The vapor risk assessment indicates no nearby basements are present, and no utilities are in contact with impacted soil or close to ground water.

7.0 RECOMMENDATIONS

Based on the results of this investigation and the corrective actions performed to date at the site, it is recommended that no further action be conducted with the exception of one year of quarterly ground water monitoring. This recommendation is based on the following factors:

- There are no downgradient ground water receptors or potential receptors of vapors associated with the release.

- No free product was detected on ground water.

- Two petroleum related volatile organic compounds (VOCs), were detected at concentrations in excess of the Minnesota Department of Health (MDH) Recommended Allowable Limits (RAL) for Drinking Water Contaminants. However, the concentrations detected are well below a factor of 100 times the RAL, which the MPCA has applied as a cleanup level at some petroleum release sites.

Following completion of one year of ground water monitoring, it is recommended that site closure be requested from the MPCA. This assumes stable or declining concentration trends of the ground water contaminants are documented.

If future site development plans involve demolition of the existing building, there is some potential that impacted soil may be encountered beneath its northeast corner. If impacted soil must be removed as part of construction, it should be handled and disposed of in accordance with MPCA guidelines.

8.0 REFERENCES

Geologic Atlas, Hennepin County, Minnesota, 1989: N.H. Balaban, Editor, Minnesota Geologic Survey, County Atlas Series, Atlas C-4.

Geologic and Hydrologic Aspects of Tunneling in the Twin Cities Area, Minnesota: Edited by Norvitch, R.F., and Walton, M.S., United States Geological Survey, 1979, Miscellaneous Investigations Series I-1157.

St. Paul West, Minnesota, 7-1/2 Minute Series Topographic Map, 1967 (photorevised in 1972, photoinspected in 1977), United States Geological Survey.

TABLE 1
SUMMARY OF SAMPLES SUBMITTED FOR ANALYTICAL TESTING

GENERAL INFORMATION				PARAMETER			
Sample Number	Location	Matrix	Date Collected - Received*	BETX	THC as Gasoline	THC as Fuel Oil #2	VOCs
P-1/S-7	Boring P-1, 33-35'	Soil	12/17/91 - 12/18/91	X	X	X	
P-1/S-8	Boring P-1, 38-40'	Soil	12/17/91 - 12/18/91	X	X	X	
P-2/S-9	Boring P-2, 33-35'	Soil	12/17/91 - 12/18/91	X	X	X	
MW-1	Monitoring Well MW-1	Water	12/26/91 - 12/26/91		X	X	X
MW-2	Monitoring Well MW-2	Water	12/26/91 - 12/26/91		X	X	X
MW-3	Monitoring Well MW-3	Water	12/26/91 - 12/26/91		X	X	X
Trip Blank	Laboratory Trip Blank	Water	12/26/91 - 12/26/91				X

NOTES:

*Date sample was collected-date sample was received by laboratory.
All samples were analyzed by Twin City Testing, St. Paul, Minnesota.

TABLE 2
SOIL HEADSPACE ANALYSIS DATA
SOIL BORINGS COMPLETED BY PEER

	SOIL BORING NUMBER				
Depth Interval (feet)	P-1	P-2	MW-1	MW-2	MW-3
3 - 5	0	0	0.2	10	0
8 - 10	0.8	0	0.4	0	0
13 - 15	0	0.2	0.2	0	0
18 - 20	2	0.4	0	0	0
23 - 25	0	2.6	.2	0.8	0
28 - 30	2.2	3.2	.2	NS	NS
29 - 31	NS	NS	NS	11.2	NS
33 - 35	7.2**	NS**	220	0	0
38 -40	14**	0.2	180	---	0

NOTES:

All headspace results in parts per million (ppm). Readings taken with an H-NU photoionization detector with a 10.2 eV lamp.
Soil samples were collected from split spoon sampler unless otherwise indicated.
* = Denotes sample collected from auger cuttings.
** = Denotes sample submitted for analytical testing.
NS = No sample collected for headspace analysis.
--- = Indicates interval is below depth of soil boring.

TABLE 3
SOIL VAPOR SCREENING RESULTS
SOIL BORINGS B-1 THROUGH B-6

	SOIL BORING NUMBER					
Depth Interval (feet)	B-1	B-2	B-3	B-4	B-5	B-6
1 - 3	NS	NS	600*	NS	NS	NS
5 - 7	2	610	22	0*	0	0
7 - 9	75	650*	3	0	15	0
9 - 11	30	340	1	0	38	2
11 - 13	800*	310	1	0	100	15
13 - 15	10*	13	0*	1	300*	18*
15 - 17	---	9	---	1*	350	2
17 - 19	---	10*	---	---	220	12
19 - 21	---	---	---	---	270	12*
21 - 23	---	---	---	---	280	---
23 - 25	---	---	---	---	250	---
25 - 27	---	---	---	---	38	---
27 - 29	---	---	---	---	28	---
29 - 31	---	---	---	---	25	---
31 - 33	---	---	---	---	24	---
33 - 35	---	---	---	---	21*	---

NOTES:

All readings in parts per million (ppm). H-NU photoionization detector used, lamp not specified. Readings presumed not to be from headspace analysis.
Soil samples were collected from split spoon sampler.
* = Denotes sample submitted for analytical testing.
NS = No sample collected for soil vapor screening.
--- = Indicates interval is below depth of soil boring.

TABLE 4
ANALYTICAL RESULTS FOR SOIL SAMPLES
SOIL BORINGS COMPLETED BY PEER

Compound/Parameter	P-1/S-7 33-35'	P-1/S-8 38-40'	P-2/S-9 33-35'	Method Blank	PQL	MDL
Benzene	ND[1]	ND[4]	ND	ND	5	---
Ethyl benzene	ND[1]	ND[4]	ND	ND	5	---
Toluene	ND[1]	ND[4]	ND	ND	5	---
Total xylenes	ND[1]	ND[4]	ND	ND	5	---
Total Hydrocarbons as Gasoline	450,000[2][3]	31,000[3][5]	70[6]	ND	30	---
Total Hydrocarbons as Fuel Oil #2 (in mg/kg)	100	2.5	ND	ND	---	2.0

NOTES:

All units in ug/kg, unless otherwise noted.
ND = Compound or parameter not detected above Practical Quantitation Limit (PQL), or Method Detection Limit (MDL).
[1] = PQL was 1,300 ug/kg.
[2] = PQL was 8,100 ug/kg.
[3] = Chromatographic profile is not typical of gasoline. Higher boiling hydrocarbons are detected.
[4] = PQL was 40 ug/kg.
[5] = PQL was 250 ug/kg.
[6] = Chromatographic profile is not typical of gasoline.

TABLE 5
ANALYTICAL RESULTS FOR SOIL SAMPLES
SOIL BORINGS B-1 THROUGH B-6

Compound/Parameter	B-1 11-13'	B-1 13-15'	B-2 7-9'	B-2 17-19'	B-3 1-3'	B-3 13-15'	B-4 5-7'	B-4 13-15'	B-5 13-15'	B-5 33-35'	B-6 13-15'	B-6 19-21'	MDL
METALS													
Lead (in mg/kg)	NA	7.5	17	7.2	80	6.5	16	7.3	9.6	3.0	8.5	9.7	2.5
ORGANICS													
Benzene	ND	ND	3,300	ND	2,700	ND	ND	ND	ND	ND	ND	ND	120
Ethyl benzene	ND	ND	7,500	ND	4,100	ND	ND	ND	220	ND	ND	ND	120
Toluene	ND	ND	14,000	ND	7,200	ND	ND	ND	500	ND	ND	ND	120
Xylene	ND	ND	30,000	ND	22,000	ND	ND	ND	1,600	ND	ND	ND	120
Total Hydrocarbons as Gasoline	NA	ND	340,000	ND	24,000	ND	ND	ND	63,000	2,700	ND	ND	1,000
Gasoline (Hexane Extract in mg/kg)	NA	ND	180	ND	1,700	ND	ND	ND	ND	ND	ND	ND	3.3
Fuel Oil #1 (Hexane Extract in mg/kg)	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.3
Fuel Oil #2 (Hexane Extract in mg/kg)	NA	ND	ND	ND	ND	ND	ND	ND	2,500	260	ND	ND	3.3

NOTES:

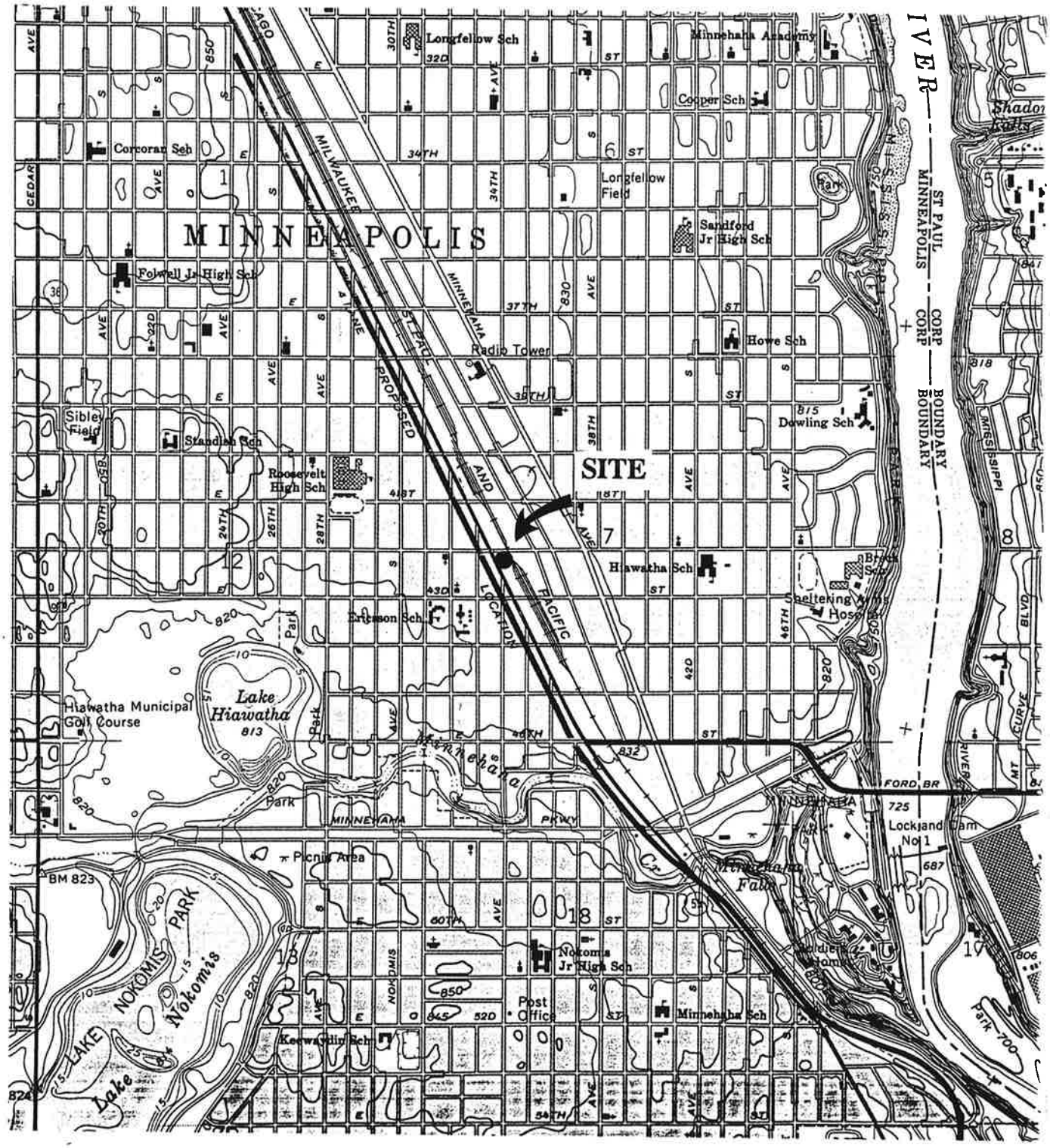
All units in ug/kg, unless otherwise noted.
ND = Compound or parameter not detected above Method Detection Limit (MDL).
NA = Sample not analyzed for this compound or parameter.

TABLE 6
ANALYTICAL RESULTS FOR GROUND WATER SAMPLES

Compound/Parameter	MW-1	MW-2	MW-3	Trip Blank	Method Blank	PQL	MDL	MDH RAL
Chloroform	ND[1]	2	ND	ND	ND	---	1	60
Cumene	97[1]	ND	ND	ND	ND	---	1	N/A
Ethyl benzene	2,400[1]	ND	ND	ND	ND	---	1	700
Methylene Chloride	300[1]	6	4	3	5	---	1	50
Toluene	7,000[1]	ND	ND	ND	ND	---	1	1,000
Total xylenes	7,800[1]	ND	ND	ND	ND	---	1	10,000
Total Hydrocarbons as Gasoline	42,000[2]	ND	ND	NA	ND	30	---	N/A
Total Hydrocarbons as Fuel Oil #2 (in mg/L)	ND[3]	ND	ND	NA	ND	---	0.2	N/A

NOTES:

All units in ug/L, unless otherwise noted.
ND = Compound or parameter not detected above Practical Quantitation Limit (PQL) or Method Detection Limit (MDL).
NA = Sample not analyzed for this compound or parameter.
MDL RAL = Minnesota Department of Health Recommended Allowable Limit for Drinking Water Contaminants.
N/A = Not available.
[1] = MDL was 50 ug/L.
[2] = PQL was 750 ug/L.
[3] = Chromatographic profile is not typical of #2 fuel oil. Lower boiling hydrocarbons are present.

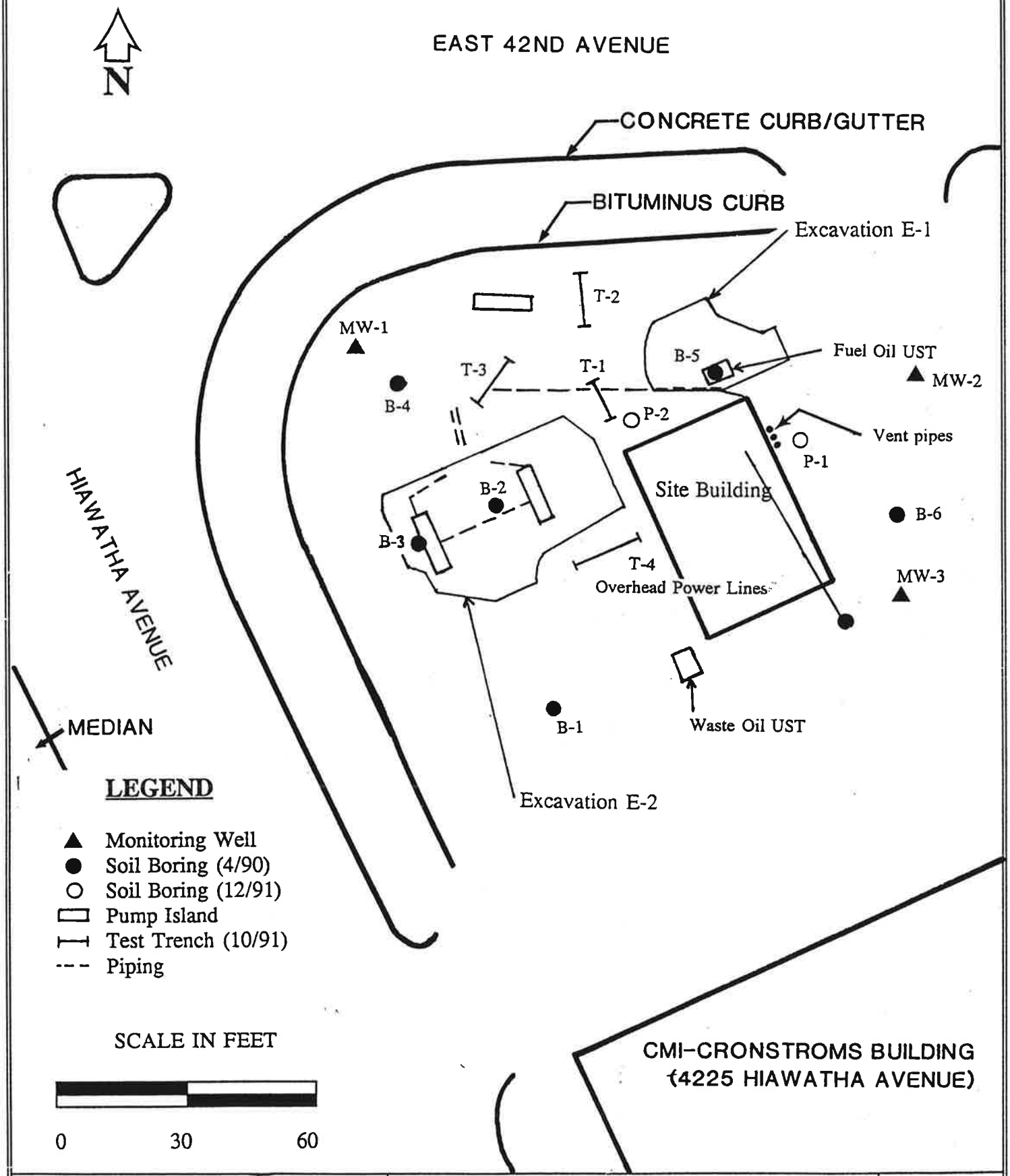


SCALE IN MILES

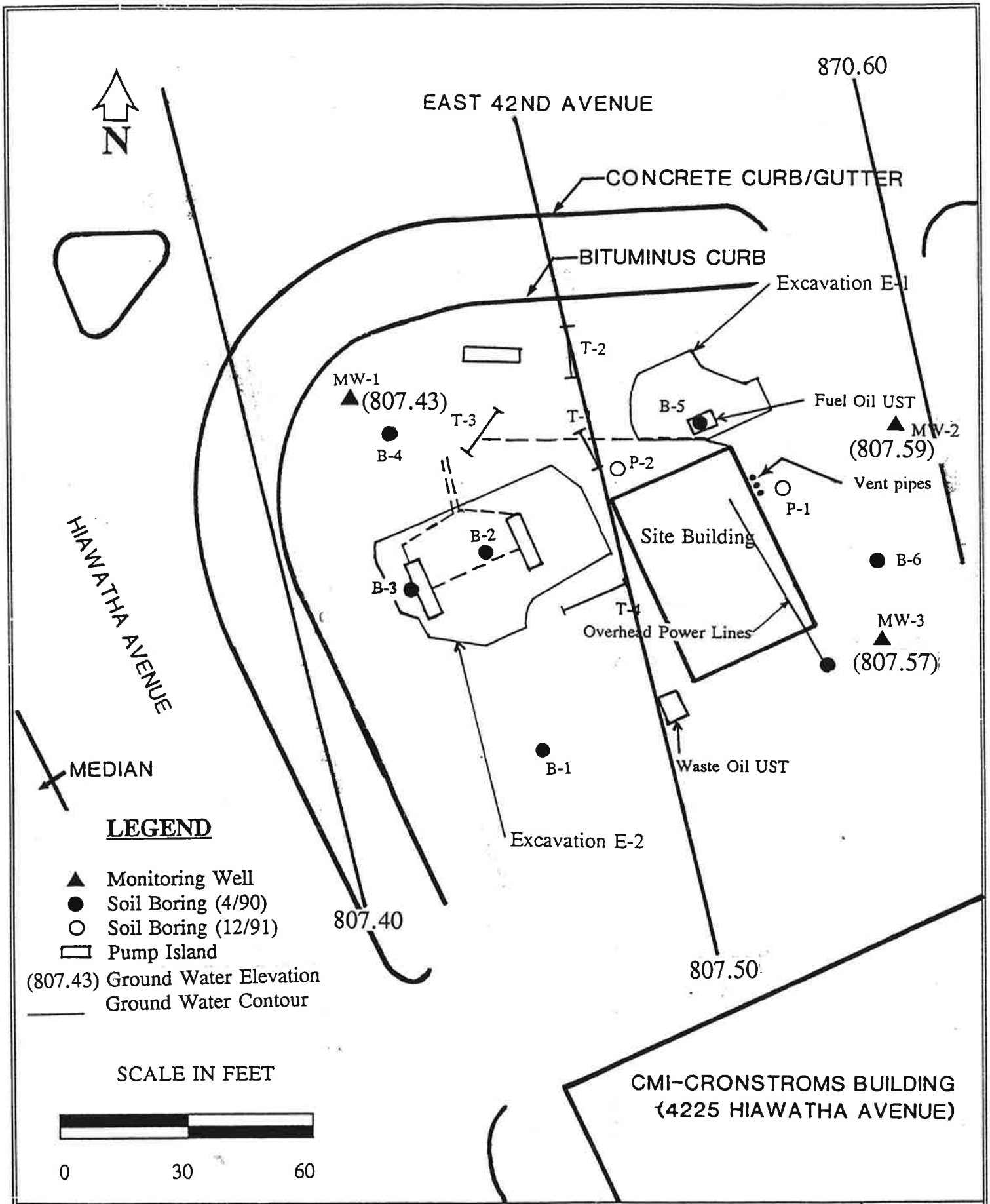
0 .5 1

N

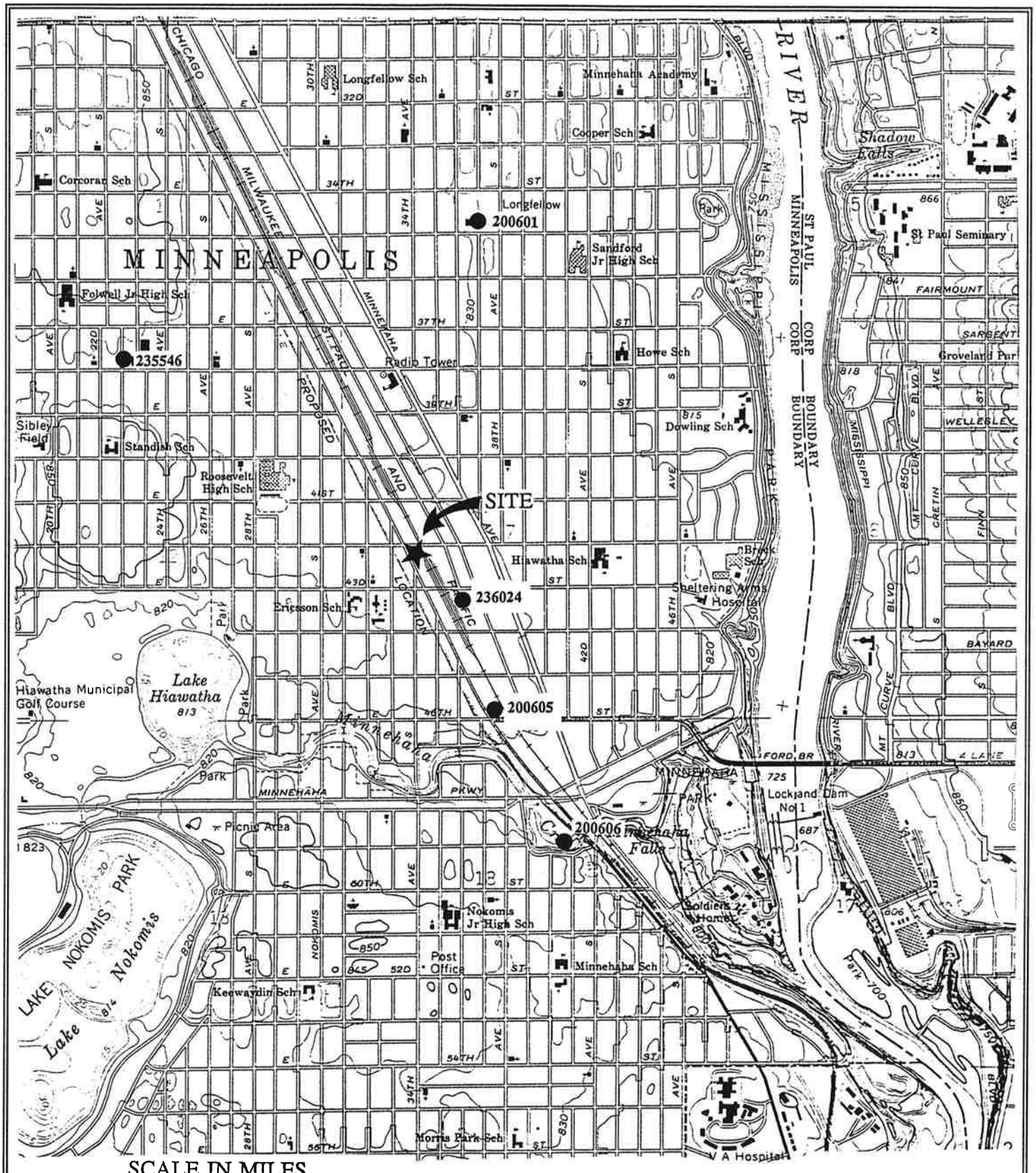
Peer Environmental & Engineering Resources, Inc. Chaska, Minnesota	Site Location Map Former Mobil Service Station 4201 Hiawatha Avenue Minneapolis, Minnesota	Mar. 92 1



Peer Environmental & Engineering Resources, Inc. Chaska, Minnesota	Site Map Former Mobil Service Station 4201 Hiawatha Avenue Minneapolis, Minnesota	Mar. 92 2



Peer Environmental & Engineering Resources, Inc. Chaska, Minnesota	Water Table Configuration (1/27/92) Former Mobil Service Station 4201 Hiawatha Avenue Minneapolis, Minnesota	Mar. 92 3



SCALE IN MILES

0 .5 1

N

Peer Environmental & Engineering Resources, Inc. Chaska, Minnesota	Location of Water Wells One Mile Radius of 4201 Hiawatha Avenue Minneapolis, Minnesota	Mar. 92 4

APPENDIX A

AVAILABLE INFORMATION

DEPARTMENT OF REGULATORY SERVICES
250 South Fourth Street Rm 300
Minneapolis MN 55415-1316

JOHN A. BERGQUIST, DIRECTOR
INSPECTIONS DIVISION
(612) 673-5820

T.F. THORSTENSON, P.E.
DIRECTOR

MERWYN LARSON, P.E.
DEPUTY DIRECTOR

ADMINISTRATION
HOUSING
BUILDING
ZONING
PLAN REVIEW
ENVIRONMENTAL
ELECTRICAL
PLUMBING
HEATING

minneapolis
city of lakes

May 1, 1990

Mary Wentworth
PACE LABORATORIES, INC.
1710 Douglas Drive North
Minneapolis, MN 55422

Dear Ms. Wentworth: RE: 4201 Hiawatha Avenue

After researching Pollution Control records, Building permits and Fire Prevention records, I was able to locate the following information:

1. There are Pollution Control complaints on record regarding leaking underground storage tanks. A 560 gallon underground fuel oil tank was removed on August 17, 1989 and reportedly had pinholes in it. Both PACE Laboratories and Delta Environmental were the consultants for this project.

2. A copy of the Building card is enclosed.

3. Fire Prevention Bureau records show (1) 8000 gallon gasoline, (1) 4000 gallon gasoline, (1) 5000 gallon gasoline and (1) 550 gallon drain oil tank installed on June 20, 1962. See attached Fire Prevention record. These tanks were removed in September 1979.

Since underground storage tanks may have been installed without permits and spills or leaks could have occurred without being reported, soil and/or groundwater investigation may provide further assurance that this site is pollution free. Visual inspection of the area for fill or vent pipes is also recommended.

If you have any questions, please give me a call at 673-5807.

Sincerely,

Janice L. Kline

Janice Kline
Pollution Control Inspector

JK:br

Enclosure

PAID
MAY - 2 1990
50.00

INSPECTOR OF BUILDINGS

LOCATION 4201 Hiawatha Ave. Deans South Park Plot of the distributors

LOT 17 BLOCK 4 ADD. of part of Estate of Annie E. Steele

PERMIT NO.	CONSTRUCTION	DATE	CONTRACTOR	COST	O. K.
F-411012	5 transfs-neon sign	7-12-48	Suburban Elec.Co.	100.	
B 377534	47.3x29.9x12-1sty.Gasoline service station	9-12-62	Socony Mobile Oil Co.	16,000.	S

5R237

Form F.P. 17

ATD

OF BUILDINGS
OF MINNEAPOLIS

Application for Fire Department Permit to STORE, HANDLE OR USE FLAMMABLE LIQUIDS

Permit No. 5975

Application No. G-

Receipt No. _____ Date Issued 6-20, 1967

License No. _____ Date Permit Expires _____, 19

Fee Paid $ _____

Location 42nd & Bloomington Ave

Licensee Mobil Oil Co. Address 606 Vandalia St Phone MI-6-7851

Chief, Bureau of Fire Prevention
Minneapolis Fire Department

The undersigned hereby makes application for a permit to store, handle or use flammable liquids in accordance with the provisions of the Fire Prevention Code, city ordinances of Minneapolis, Minn., and agrees not to violate any of the conditions imposed by the Bureau of Fire Prevention.

Minneapolis, Minnesota _____, 19

Owner of Building Mobil Oil Co. Address 606 Vandalia St.

Construction of Building Cement Block

Name of Original Owner of Tanks and Pumps ~~S. Mem~~ Mobil

Name of Present Owner of Tanks and Pumps _____

Name of Company Installing or Removing Tanks or Pumps Pump & Meter Service Tel.No. FE-8-582

Name of Company Purging Tanks " " " " Tel.No. "

Are Tanks or Pumps Being Removed or Installed? Installed

Number of Tanks 1 Capacity of Each 8000 Contents Gas Class Liquid _____

Number of Tanks 1 Capacity of Each 4000 Contents " Class Liquid _____

Number of Tanks 1 Capacity of Each 5000 Contents " Class Liquid _____

Drain Oil Tanks 1 Capacity of Each 550

Location of Tanks See Plan on file

Location of Pumps _____ No. 6 Dispensing Nozzles _____

Size of Fill Pipe 4" Extended to Little Proof cap

Size of Fill Pipe _____ Extended to _____

Size of Vent Pipe 2" Extended to 18 inches above parapet wall

Type of Pump Submerged How Operated Electric

Are Tanks or Pumps on Private Property or City Property? Private

Kind of Heating Plant Overhead Air Does It Comply with Ordinance? Yes

Number of Fire Extinguishers One Kind 20 lb Dry Chemical

Remarks: Tanks Removed on 9-24-79 Dr. Jorgenson

NOTE: The Bureau of Fire Prevention shall be notified at least 24 hours prior to the installation or removal of any gasoline or flammable liquid storage tanks and before any piping from flammable liquid storage tanks is removed or altered.

Approved Robert T. Palmer (S) _____
Chief, Bureau of Fire Prevention

Installation Inspected By Stanley J. Leight Date O.K. June 24 1968

Approved by Safety Committee _____ Passed by City Council _____

Notification for Underground Storage Tanks

Minnesota Pollution Control Agency
Hazardous Waste Division Tanks and Spills Section
520 Lafayette Road North St. Paul, MN 55155

for office use:
ID#
LK#

PO-00410 03 (8-90)

A. Name of Tank Site: Elder Mobil Service Station

Tank Site Address: 4201 Hiawatha Avenue

Fire Marshal Permit #:

City: Minneapolis

Zip Code: 55406 - 3394

Phone: (N/A) - County: Hennepin

B. Name of Owner: Algal Petroleum c/o OMI

Mailing Address: 4225 Hiawatha Avenue

City: Minneapolis State: MN

Zip Code: 55406 - 3394 Phone: (612) 722 - 6671

Questions? Call (612) 643-3413 or Toll-free 1-800-652-9747 during normal business hours

C. **Tank number** Type or use ink and complete as best as possible. Please photocopy form if site has more than 3 tanks.

1. Assign a 3 digit number to each tank *(eg. 001, 002...)*: 001

2. Installation date: unknown (mo/da/yr)

3. Is tank currently used?

1		2		3	
yes	no	yes	no	yes	no
☐	☒	☐	☐	☐	☐

See Section K - Comments

D. Tank Action 1. Please check applicable box(es).

	1	2	3
Initial notification	☐	☐	☐
Add new tank(s) to site	☐	☐	☐
Change in tank owner	☐	☐	☐
Change tank contents	☐	☐	☐
Repair tank (please explain in Box K)	☐	☐	☐
Remove tank	☐	☐	☐
Close tank in place	☐	☐	☐
Temporary closure	☐	☐	☐
(product in tank, in # of gallons)			

2. Please write date of above action:

E. Tank Information Please check applicable boxes.

1. Type of Pump:

	1	2	3
Submersible	☐	☐	☐
Suction	☒	☐	☐
Other (specify in Box K)	☐	☐	☐

2. Type of Tank:

	1	2	3
STIP3	☐	☐	☐
Fiberglass	☐	☐	☐
Composite	☐	☐	☐
Asphalt coated steel	☐	☐	☐
Painted steel	☐	☐	☐
Bare steel	☒	☐	☐
Concrete	☐	☐	☐
Other (specify in Box K)	☐	☐	☐

3. Capacity: (# of gal) 560

4. Substance Currently or Last Stored:

	1	2	3
Regular gasoline	☐	☐	☐
Unleaded gasoline	☐	☐	☐
Diesel	☐	☐	☐
Used (waste) oil	☐	☐	☐
Fuel (heating) oil	☒	☐	☐
Kerosene	☐	☐	☐
Hazardous substance (specify chemical and tank # in Box K, on back)	☐	☐	☐
Other (specify in Box K)	☐	☐	☐

5. Corrosion Protection: None

	1	2	3
Anodes	☐	☐	☐
Impressed current	☐	☐	☐
Internal	☐	☐	☐
Not needed	☐	☐	☐

(if certified by corrosion expert, write name and PE or certification # in Box K)

turn page over!

6. Secondary Containment:

	1	2	3
Double wall tank	☐	☐	☐
Vault	☐	☐	☐
Liner	☐	☐	☐
Not Applicable	☒	☐	☐

7. Does tank have spill containment?

☐ ☒	☐ ☐	☐ ☐
yes no	yes no	yes no

8. Does tank have overfill prevention?

☐ ☒	☐ ☐	☐ ☐
yes no	yes no	yes no

F. Piping:

1. Construction Material:

Galvanized steel	☐	☐	☐
Wrapped steel	☐	☐	☐
Black iron	☐	☐	☐
Fiberglass	☐	☐	☐
Double walled	☐	☐	☐
Copper	☒	☐	☐
Other (specify in Box K)	☐	☐	☐

2. Corrosion Protection: unknown

Anodes	☐	☐	☐
Impressed current	☐	☐	☐
Wrapped	☐	☐	☐
Not needed (ie. fiberglass)	☐	☐	☐

(if certified by corrosion protection expert, write name and PE or certification # in Box K)

G. Financial Responsibility

(Applies to petroleum marketers with 1-12 tanks after Oct. 26, 1991, those with 13-99 tanks at more than one facility after April 26, 1991, and other tank owners as specified in 40 CFR, part 280.)

Type: N/A

Insurer: _____

Policy #: _____ Expiration date: ___ / ___ / ___

H. Release Detection N/A

To be completed for tanks (except heating oil) installed after Dec. 22, 1988 and older tanks if subject to 40 CFR, part 280, subp. D. Choose all that apply.

1. Tanks:

	1	2	3
Inventory control (daily sticking)	☐	☐	☐
Tank tightness test	☐	☐	☐
Manual tank gauging	☐	☐	☐
Automatic tank gauging	☐	☐	☐
Soil vapor monitoring	☐	☐	☐
Groundwater monitoring	☐	☐	☐
Other (Specify in Box K)	☐	☐	☐

2. Date of last tank tightness test (if applicable):

3. Piping:

	1	2	3
Automatic line leak detector and annual line tightness test	☐	☐	☐
Vapor monitoring	☐	☐	☐
Groundwater monitoring	☐	☐	☐
Interstitial monitoring	☐	☐	☐
Other (Specify in Box K)	☐	☐	☐
Line tightness test every three years (for suction piping only)	☐	☐	☐
Not needed (for suction piping only)	☐	☐	☐

4. Date of last line tightness test (if applicable):

I. Owner's Signature

I certify under penalty of law that the information submitted is accurate and complete to the best of my knowledge, and that all work was performed as per the manufacturers' instructions, industry standards, and applicable state and federal regulations. For installations performed after July 9, 1990, I certify that the installer was in compliance with the certification requirements of Minn. Rules, chap. 7105.

Agate Properties — Sec'y

Print name of owner or authorized representative and title

Signature of owner/authorized representative — 10/18/91 Date

(Unsigned forms will be returned)

J. Tank Contractor's Signature

I certify under penalty of law that all work was performed as specified by the manufacturers' instructions, and according to industry standards, applicable state and federal regulations and is complete to the best of my knowledge. I certify that I am in compliance with Minn. Rules, chap. 7105, if work was completed after July 9, 1990.

N/A

Name of tank contractor company — MPCA Contractor #

Print supervisor name — MPCA Supervisor #

Supervisor signature — Date

Contractor Address: _____

City: _____ State: _____ Zip: _____

Please write tank number(s) that work was performed on:

K. Comments (attach additional sheets if necessary)

Initial notification and tank removal forms submitted on 7/28/89 and 8/29/89 list incorrect tank site address and owner name (MPCA ID #13062). This form is being submitted to amend the previous forms.

Notification for Underground Storage Tanks

Minnesota Pollution Control Agency
Hazardous Waste Division Tanks and Spills Section
520 Lafayette Road North St. Paul, MN 55155

for office use:
ID#
LK#

PO-00410-03 (8/90)

A. Name of Tank Site: Former Mobil Service Station

Tank Site Address: 4201 Hiawatha Avenue

Fire Marshal Permit #:

City: Minneapolis

Zip Code: 55406-3394

Phone: (N/A) -

County: Hennepin

B. Name of Owner: Algatel Properties c/o CMI

Mailing Address: 4225 Hiawatha Avenue

City: Minneapolis State: MN

Zip Code: 55406-3394

Phone: (612) 722-6711

Questions? Call (612) 643-3413 or Toll-free 1-800-652-9747 during normal business hours

C. Tank number — Type or use ink and complete as best as possible. Please photocopy form if site has more than 3 tanks.

	1	2	3
1. Assign a 3 digit number to each tank *(eg. 001, 002...)*	003	004	005
2. Installation date: (mo/da/yr)	6/21/62	6/21/62	6/21/62
3. Is tank currently used?	☐ yes ☒ no	☐ yes ☒ no	☐ yes ☒ no

D. Tank Action — 1. Please check applicable box(es).

	1	2	3
Initial notification *	☒	☒	☒
Add new tank(s) to site	☐	☐	☐
Change in tank owner	☐	☐	☐
Change tank contents	☐	☐	☐
Repair tank (please explain in Box K)	☐	☐	☐
Remove tank	☒	☒	☒
Close tank in place	☐	☐	☐
Temporary closure	☐	☐	☐
(product in tank, in # of gallons)			

*Initial notification as of date of this form.

2. Please write date of above action:

1	2	3
9/24/79	9/24/79	9/24/79

E. Tank Information — Please check applicable boxes.

1. Type of Pump:

	1	2	3
Submersible	☒	☒	☒
Suction	☐	☐	☐
Other (specify in Box K)	☐	☐	☐

2. Type of Tank:

	1	2	3
STIP3	☐	☐	☐
Fiberglass	☐	☐	☐
Composite	☐	☐	☐
Asphalt coated steel	☐	☐	☐
Painted steel	☐	☐	☐
Bare steel	☐	☐	☐
Concrete	☐	☐	☐
Other (specify in Box K) **	☒	☒	☒

** unknown, probably bare steel

3. Capacity: (# of gal) 8000 | 4000 | 5000

4. Substance Currently or Last Stored:

	1	2	3
Regular gasoline ***	☒	☒	☒
Unleaded gasoline	☐	☐	☐
Diesel	☐	☐	☐
Used (waste) oil	☐	☐	☐
Fuel (heating) oil	☐	☐	☐
Kerosene	☐	☐	☐
Hazardous substance (specify chemical and tank # in Box K, on back)	☐	☐	☐
Other (specify in Box K)	☐	☐	☐

***Unleaded gasoline may also have been stored.

5. Corrosion Protection: unknown

	1	2	3
Anodes	☐	☐	☐
Impressed current	☐	☐	☐
Internal	☐	☐	☐
Not needed	☐	☐	☐

(if certified by corrosion expert, write name and PE or certification # in Box K)

turn page over!

Use of this form is required as per Minn. Stat. 116.48 and 40 CFR, part 280.

6. Secondary Containment:

	1	2	3
Double wall tank	☐	☐	☐
Vault	☐	☐	☐
Liner	☐	☐	☐
Not Applicable	☐	☐	☐
Unknown	X	X	X

7. Does tank have spill containment? unknown

1		2		3	
☐ yes	☐ no	☐ yes	☐ no	☐ yes	☐ no

8. Does tank have overfill prevention? unknown

1		2		3	
☐ yes	☐ no	☐ yes	☐ no	☐ yes	☐ no

F. Piping:

1. Construction Material:

	1	2	3
~~Galvanized~~ steel	☒	☒	☒
Wrapped steel	☐	☐	☐
Black iron	☐	☐	☐
Fiberglass	☐	☐	☐
Double walled	☐	☐	☐
Copper	☐	☐	☐
Other (specify in Box K)	☐	☐	☐

2. Corrosion Protection: unknown

	1	2	3
Anodes	☐	☐	☐
Impressed current	☐	☐	☐
Wrapped	☐	☐	☐
Not needed (ie. fiberglass)	☐	☐	☐

(if certified by corrosion protection expert, write name and PE or certification # in Box K)

G. Financial Responsibility

(Applies to petroleum marketers with 1-12 tanks after Oct. 26, 1991, those with 13-99 tanks at more than one facility after April 26, 1991, and other tank owners as specified in 40 CFR, part 280.)

Type: N/A

Insurer: _____

Policy #: _____ Expiration date: ___ / ___ / ___

H. Release Detection

N/A

To be completed for tanks (except heating oil) installed after Dec. 22, 1988 and older tanks if subject to 40 CFR, part 280, subp. D. Choose all that apply.

1. Tanks:

	1	2	3
Inventory control (daily sticking)	☐	☐	☐
Tank tightness test	☐	☐	☐
Manual tank gauging	☐	☐	☐
Automatic tank gauging	☐	☐	☐
Soil vapor monitoring	☐	☐	☐
Groundwater monitoring	☐	☐	☐
Other (Specify in Box K)	☐	☐	☐

2. Date of last tank tightness test (if applicable):

3. Piping:

	1	2	3
Automatic line leak detector and annual line tightness test	☐	☐	☐
Vapor monitoring	☐	☐	☐
Groundwater monitoring	☐	☐	☐
Interstitial monitoring	☐	☐	☐
Other (Specify in Box K)	☐	☐	☐
Line tightness test every three years (for suction piping only)	☐	☐	☐
Not needed (for suction piping only)	☐	☐	☐

4. Date of last line tightness test (if applicable):

I. Owner's Signature

I certify under penalty of law that the information submitted is accurate and complete to the best of my knowledge, and that all work was performed as per the manufacturers' instructions, industry standards, and applicable state and federal regulations. For installations performed after July 9, 1990, I certify that the installer was in compliance with the certification requirements of Minn. Rules, chap. 7105.

Agate Properties — Secy

Print name of owner or authorized representative and title

T C Waitt — 10/18/91

Signature of owner/authorized representative — Date

(Unsigned forms will be returned)

J. Tank Contractor's Signature

I certify under penalty of law that all work was performed as specified by the manufacturers' instructions, and according to industry standards, applicable state and federal regulations and is complete to the best of my knowledge. I certify that I am in compliance with Minn. Rules, chap. 7105, if work was completed after July 9, 1990.

N/A

Name of tank contractor company — MPCA Contractor #

Print supervisor name — MPCA Supervisor #

Supervisor signature — Date

Contractor Address: _____

City: _____ State: _____ Zip: _____

Please write tank number(s) that work was performed on:

K. Comments

(attach additional sheets if necessary)

City of Minneapolis information indicates tanks were installed as of 6/21/62 and removed 9/24/79. Tanks were removed by Mobil Oil prior to aquisiti of property by current owner in 1986. An investigation is in progress to evaluate releases associated with these tanks and a former fuel oil tank (Leak no. 1485). Piping associated with the former gas tanks was removed on 10/2/91 by GCI (Contractor #0021), during excavation of impacted

Notification for Underground Storage Tanks

Minnesota Pollution Control Agency
Hazardous Waste Division Tanks and Spills Section
520 Lafayette Road North St. Paul, MN 55155

for office use:
ID#
LK#

PO-00410-03 (8/90)

A. Name of Tank Site
Farmer Mobil Service Station

Tank Site Address
4201 Hiawatha Avenue

Fire Marshal Permit #

City
Minneapolis

Zip Code
55406 - 3394

Phone
(N/A) -

County
Hennepin

B. Name of Owner
Algaite Properties c/o CMI

Mailing Address
4225 Hiawatha Avenue

City
Minneapolis

State
MN

Zip Code
55406 - 3394

Phone
(612) 721-2 - 6617 11

Questions? Call (612) 643-3413 or Toll-free 1-800-652-9747 during normal business hours

C. **Tank number** Type or use ink and complete as best as possible. Please photocopy form if site has more than 3 tanks.

1. Assign a 3 digit number to each tank *(eg. 001, 002...)*

002		

2. Installation date: 6/2 1/62 (mo/da/yr)

3. Is tank currently used?

1 yes	1 no	2 yes	2 no	3 yes	3 no
☐	☒	☐	☐	☐	☐

D. **Tank Action** 1. Please check applicable box(es).

	1	2	3
Initial notification	☒	☐	☐
Add new tank(s) to site	☐	☐	☐
Change in tank owner	☐	☐	☐
Change tank contents	☐	☐	☐
Repair tank	☐	☐	☐
(please explain in Box K)			
Remove tank	☒	☐	☐
Close tank in place	☐	☐	☐
Temporary closure	☐	☐	☐
(product in tank, in # of gallons)			

2. Please write date of above action: 10/4/91

E. **Tank Information** Please check applicable boxes.

1. Type of Pump:

	None	1	2	3
Submersible		☐	☐	☐
Suction		☐	☐	☐
Other (specify in Box K)		☐	☐	☐

2. Type of Tank:

	1	2	3
STIP3	☐	☐	☐
Fiberglass	☐	☐	☐
Composite	☐	☐	☐
Asphalt coated steel	☐	☐	☐
Painted steel	☐	☐	☐
Bare steel	☒	☐	☐
Concrete	☐	☐	☐
Other (specify in Box K)	☐	☐	☐

3. Capacity: (# of gal) 1000

4. Substance Currently or Last Stored:

	1	2	3
Regular gasoline	☐	☐	☐
Unleaded gasoline	☐	☐	☐
Diesel	☐	☐	☐
Used (waste) oil	☒	☐	☐
Fuel (heating) oil	☐	☐	☐
Kerosene	☐	☐	☐
Hazardous substance	☐	☐	☐
(specify chemical and tank # in Box K, on back)			
Other (specify in Box K)	☐	☐	☐

5. Corrosion Protection:

	None	1	2	3
Anodes		☐	☐	☐
Impressed current		☐	☐	☐
Internal		☐	☐	☐
Not needed		☐	☐	☐

(if certified by corrosion expert, write name and PE or certification # in Box K)

turn page over!

Use of this form is required as per Minn. Stat. 116.48 and 40 CFR. part 280.

6. Secondary Containment:

	1	2	3
Double wall tank	☐	☐	☐
Vault	☐	☐	☐
Liner	☐	☐	☐
Not Applicable	☒	☐	☐

7. Does tank have spill containment?

1		2		3	
☐ yes	☒ no	☐ yes	☐ no	☐ yes	☐ no

8. Does tank have overfill prevention?

1		2		3	
☐ yes	☒ no	☐ yes	☐ no	☐ yes	☐ no

F. Piping:

1. Construction Material:

	1	2	3
~~Galvanized~~ steel	☒	☐	☐
Wrapped steel	☐	☐	☐
Black iron	☐	☐	☐
Fiberglass	☐	☐	☐
Double walled	☐	☐	☐
Copper	☐	☐	☐
Other (specify in Box K)	☐	☐	☐

2. Corrosion Protection:

	1	2	3
Anodes	☐	☐	☐
Impressed current	☐	☐	☐
Wrapped	☐	☐	☐
Not needed (ie. fiberglass)	☐	☐	☐

(if certified by corrosion protection expert, write name and PE or certification # in Box K)

G. Financial Responsibility

(Applies to petroleum marketers with 1-12 tanks after Oct. 26, 1991, those with 13-99 tanks at more than one facility after April 26, 1991, and other tank owners as specified in 40 CFR, part 280.)

Type: N/A

Insurer: _____

Policy #: _____ Expiration date: ___/___/___

H. Release Detection N/A

To be completed for tanks (except heating oil) installed after Dec. 22, 1988 and older tanks if subject to 40 CFR, part 280, subp. D. Choose all that apply.

1. Tanks:

	1	2	3
Inventory control (daily sticking)	☐	☐	☐
Tank tightness test	☐	☐	☐
Manual tank gauging	☐	☐	☐
Automatic tank gauging	☐	☐	☐
Soil vapor monitoring	☐	☐	☐
Groundwater monitoring	☐	☐	☐
Other (Specify in Box K)	☐	☐	☐

2. Date of last tank tightness test (if applicable):

3. Piping:

	1	2	3
Automatic line leak detector and annual line tightness test	☐	☐	☐
Vapor monitoring	☐	☐	☐
Groundwater monitoring	☐	☐	☐
Interstitial monitoring	☐	☐	☐
Other (Specify in Box K)	☐	☐	☐
Line tightness test every three years (for suction piping only)	☐	☐	☐
Not needed (for suction piping only)	☐	☐	☐

4. Date of last line tightness test (if applicable):

I. Owner's Signature

I certify under penalty of law that the information submitted is accurate and complete to the best of my knowledge, and that all work was performed as per the manufacturers' instructions, industry standards, and applicable state and federal regulations. For installations performed after July 9, 1990, I certify that the installer was in compliance with the certification requirements of Minn. Rules, chap. 7105.

Agate Properties — Secy.

Print name of owner or authorized representative and title

Signature of owner/authorized representative — Date: 10/18/91

(Unsigned forms will be returned)

J. Tank Contractor's Signature

I certify under penalty of law that all work was performed as specified by the manufacturers' instructions, and according to industry standards, applicable state and federal regulations and is complete to the best of my knowledge. I certify that I am in compliance with Minn. Rules, chap. 7105, if work was completed after July 9, 1990.

Name of tank contractor company — MPCA Contractor #

Print supervisor name — MPCA Supervisor #

Supervisor signature — Date

Contractor Address: _____

City: _____ State: _____ Zip: _____

Please write tank number(s) that work was performed on:

001 | | |

K. Comments (attach additional sheets if necessary)

City of Minneapolis information indicates a drain (waste) oil tank was installed in 1962 and removed 10/24/79. However, during excavation activities it was discovered the tank (actually 1,000 gallons still existed, and it was subsequently removed on 10/4/91.

pace® laboratories, inc.
PROFESSIONAL ANALYTICAL CHEMISTRY & ENGINEERING

Offices:
Minneapolis, Minnesota
Tampa, Florida
Coralville, Iowa
Novato, California
Leawood, Kansas

1710 Douglas Drive North □ Minneapolis, MN 55422 □ Phone (612) 544-5543 □ FAX (612) 544-3974

September 12, 1989

Mr. R.J. Voith
CMI - Cronstroms
4225 Hiawatha Avenue
Minneapolis, MN 55406

Re: Soil Sampling Results
4225 Hiawatha Avenue
PACE Project No. 890817.201

Dear Mr. Voith:

This letter will report analytical results and recommendations regarding the soil samples taken at 4115 Hiawatha Avenue upon removal of a 560 gallon (fuel oil) underground storage tank (UST).

Sampling

Two soil samples were taken for laboratory analysis from the area storage tank. The soil sample described as "under UST" was sampled directly below the 560 gallon underground storage tank. The soil sample described as "bottom of excavation" was sampled at approximately the 12 feet below grade (6 feet below the UST) to determine the extent of fuel oil contamination at the bottom of the excavation.

Analysis and Test Results

The samples collected for laboratory analysis were analyzed for total hydrocarbons as gasoline, as well as benzene, toluene, ethyl benzene, xylene (BTEX) and lead.

Laboratory results for the sample taken below the UST indicated the presence of toluene, ethyl benzene and xylene above the minimum detection limits. Fuel oil #2 was detected at 2900 mg/kg directly below the UST.

Laboratory analysis of the "bottom of excavation" sample indicated the presence of ethyl benzene above the minimum detection limits. Fuel oil #2 was detected at the 180 mg/kg at the excavation bottom.

Summary and Recommendations

Fuel oil #2 was present at a high concentration below the UST, and continued downward through to approximately 12 foot level. Contaminated soil removed to that depth was placed on the blacktop and covered with a plastic tarp until proper disposal could be arranged. Due to the volume of contaminated soil, and having reached the excavation limits of the machinery present, further removal of contaminated soil was halted.

Based on the data collected to date, additional soil boring investigations should be conducted to determine the extent of soil contamination.

If you have any questions regarding this report, please do not hesitate to contact us.

Sincerely,

Erik S Forgaard

Erik S. Forgaard
Environmental Scientist

Robert A Kaiser

Robert A. Kaiser
Manager, Environmental Services

ESF60/mhp

Enclosure: Laboratory Results

pace laboratories, inc

REPORT OF LABORATORY ANALYSIS

Minneapolis, Minnesota
Tampa, Florida
Coralville, Iowa
Novato, California
Leawood, Kansas

Thorpe Brothers, Inc.
8085 Wayzata Boulevard
Minneapolis, MN 55426

Attn: Mr. Thomas Junnila

September 04, 1989
PACE Project Number: 890817201

Date Sample(s) Collected: 08/17/89
Date Sample(s) Received: 08/17/89

PACE Sample Number:			294490	294500
Parameter	Units	MDL	Under UST	Bottom of Excavation
INORGANIC ANALYSIS				
INDIVIDUAL PARAMETERS				
Lead	mg/kg	2.5	20	16
ORGANIC ANALYSIS				
INDIVIDUAL PARAMETERS				
Moisture content	%	1.0	16.9	25.9
VOLATILE PETROLEUM RELATED CMPDS IN SOIL				
Date Analyzed			08/18/89	08/18/89
Benzene	mg/kg	0.12	ND	ND
Toluene	mg/kg	0.12	0.63	ND
Ethyl benzene	mg/kg	0.12	0.88	0.16
Xylene	mg/kg	0.12	3.5	ND
Total Hydrocarbons as gasoline	mg/kg	1.0	23	1.6
HEXANE EXTRACT PETROLEUM PRODUCTS SOIL				
Date Analyzed			08/29/89	08/29/89
Date Extracted			08/25/89	08/25/89
Gasoline	mg/kg	3.3	ND	ND
Fuel oil #1	mg/kg	3.3	ND	ND
Fuel oil #2	mg/kg	3.3	2900	180

MDL Method Detection Limit
ND Not detected at or above the MDL.

pace laboratories, inc

Offices:
Minneapolis, Minnesota
Tampa, Florida
Coralville, Iowa
Novato, California
Leawood, Kansas

REPORT OF LABORATORY ANALYSIS

September 04, 1989
PACE Project Number: 890817201

The analyses of soil samples were performed 'as received' and do not reflect analyses on a dry weight basis unless indicated.

The data contained in this report were obtained using EPA or other approved methodologies. All analyses were performed by me or under my direct supervision.

Thomas L. Halverson
Inorganic Chemistry Manager

Dennis R. Seeger
Organic Chemistry Manager

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

REPORT OF: CHEMICAL ANALYSES

PROJECT: AGATE PROPERTIES/CMI PROJECT #1041 **DATE:** October 25, 1991

REPORTED TO: Peer Environmental
Attn: Steve Jansen
11 Peavey Road
Chaska, MN 55318

LABORATORY NO: 4410 92-0083

INTRODUCTION

This report presents the results of the analyses of one sample received on October 4, 1991, from a representative of Peer Environmental. The scope of our services was limited to the parameters listed in the attached tables.

SAMPLE IDENTIFICATION

WO-1 S End of Tank - TCT #264317

METHODOLOGY

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

Metals
Metals content was determined based on EPA Test Methods for Evaluating Solid Wastes, SW-846, Method #6010.

Volatile Organic Compounds

Volatile Organic Compounds were determined using methods similar to Minnesota Department of Health Method 465C.

REPORT OF: CHEMICAL ANALYSES

PROJECT: AGATE PROPERTIES/CMI PROJECT #1041 **DATE:** October 25, 1991

LABORATORY NO: 4410 92-0083 **PAGE:** 2

METHODOLOGY (Cont.)

PCB Soil

The samples were prepared and analyzed with methods based on EPA SW846 8080 for soils, or EPA 608 for liquids. The samples were extracted with methylene chloride and dehydrated with anhydrous sodium sulfate, solvent switched to hexane, and concentrated to less than five milliliters in Kuderna-Danish concentrators on a steam bath. The extracts were then analyzed using an HP5890A gas chromatograph equipped with an electron capture detector. Aroclors 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 the attached tables.

REMARKS

The samples were collected on October 3 and October 4, 1991, and were consumed in the analyses.

TWIN CITY TESTING CORPORATION

Stephanie A. Kidder
Project Manager

Catherine A. Laudenbach
Project Manager

SAK\CAL\pph

TABLE 1

ANALYTICAL RESULTS

Sample Identification	Total Hydrocarbons as #2 Fuel Oil (mg/kg)	Pentacosane Recovery (%)
WO-1 S End of Tank	ND	97
Method Detection Limit	2.0	

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

ND = Not Detected

Date Extracted: October 10, 1991

Date Analyzed: October 15, 1991

Laboratory No: 4410 92-0083

TABLE 2

PCB SOIL ANALYSIS

PCB Aroclor	WO-1 S End of Tank	Method Blank	MDL (µg/kg)
1016	ND	ND	20
1221	ND	ND	20
1232	ND	ND	20
1242	ND	ND	20
1248	ND	ND	20
1254	ND	ND	20
1260	ND	38*	20

*PCB aroclor 1260 was present in the method blank, but not in the Peer sample. It was determined that carryover contamination was present on the glassware used for the organic extraction. Because there were no PCB's detected in the samples, there is no need for re-extraction.

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

ND = Not Detected

MDL = Method Detection Limit

Date Extracted: October 17, 1991

Date Analyzed: October 18, 1991

Laboratory No: 4410 92-0083

TABLE 3

ANALYTICAL RESULTS

Compound	WO-1 S End of Tank	MDL (µg/kg)
Acetone	ND	10
Ethyl ether	ND	5
Benzene	ND	1
Toluene	ND	1
Cumene	ND	1
o-Xylene	1	1
m-p-Xylenes[1]	ND	1
Tetrahydrofuran	ND	5
Methyl ethyl ketone	ND	5
Ethyl benzene	ND	1
Methyl isobutyl ketone	ND	1
Chloromethane	NP	P/NP
Vinyl chloride	NP	P/NP
Chloroethane	NP	P/NP
Methylene chloride	4	1
Allyl chloride	ND	1
1,1-Dichloroethane	ND	1
Cis-1,2-dichloroethylene	ND	1
1,2-Dichloroethane	ND	1
1,1,1-Trichloroethane	ND	1
Bromodichloromethane	ND	1
2,3-Dichloro-1-propene	ND	1
1,1-Dichloro-1-propene	ND	1
Trichloroethylene	ND	1
Dibromochloromethane	ND	1
Cis-1,3-dichloro-1-propene	ND	1
2-Chloroethyl vinyl ether	ND	2
1,1,1,2-Tetrachloroethane	ND	1
1,1,2,2-Tetrachloroethane	1	1
Pentachloroethane	ND	2
1,1,2-Trichlorotrifluoroethane	ND	1
Dichlorodifluoromethane	NP	P/NP
Bromomethane	NP	P/NP
Dichlorofluoromethane	NP	P/NP
Trichlorofluoromethane	ND	5

[1]Compounds not separated by this method.

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

P/NP = Present/Not Present
ND = Not Detected
MDL = Method Detection Limit

Laboratory No: 4410 92-0083

TABLE 3 (Cont.)

ANALYTICAL RESULTS

Compound	WO-1 S End of Tank	MDL (µg/kg)
1,1-Dichloroethylene	ND	1
Trans-1,2-Dichloroethylene	ND	1
Chloroform	ND	1
Dibromomethane	ND	5
Carbon tetrachloride	ND	1
Dichloroacetonitrile	ND	2
1,2-Dichloropropane	ND	1
Trans-1,3-dichloro-1-propene	ND	1
1,3-Dichloropropane	ND	1
1,1,2-Trichloroethane	11	1
1,2-Dibromoethane	ND	1
Bromoform	ND	5
1,2,3-Trichloropropane	ND	1
Tetrachloroethylene	1	1
Chlorobenzene	1	1
1,2-Dichlorobenzene	ND	1
1,3-Dichlorobenzene	ND	1
1,4-Dichlorobenzene	ND	1

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

ND = Not Detected
MDL = Method Detection Limit

Date Analyzed: October 16, 1991

Laboratory No: 4410 92-0083

TABLE 4

ANALYTICAL RESULTS

Compound	Method Blank	MDL (µg/L)
Acetone	ND	10
Ethyl ether	ND	5
Benzene	ND	1
Toluene	ND	1
Cumene	ND	1
o-Xylene	ND	1
m-p-Xylenes[1]	ND	1
Tetrahydrofuran	ND	5
Methyl ethyl ketone	ND	5
Ethyl benzene	ND	1
Methyl isobutyl ketone	ND	1
Chloromethane	NP	P/NP
Vinyl chloride	NP	P/NP
Chloroethane	NP	P/NP
Methylene chloride	1	1
Allyl chloride	ND	1
1,1-Dichloroethane	ND	1
Cis-1,2-dichloroethylene	ND	1
1,2-Dichloroethane	ND	1
1,1,1-Trichloroethane	ND	1
Bromodichloromethane	ND	1
2,3-Dichloro-1-propene	ND	1
1,1-Dichloro-1-propene	ND	1
Trichloroethylene	ND	1
Dibromochloromethane	ND	1
Cis-1,3-dichloro-1-propene	ND	1
2-Chloroethyl vinyl ether	ND	2
1,1,1,2-Tetrachloroethane	ND	1
1,1,2,2-Tetrachloroethane	ND	1
Pentachloroethane	ND	2
1,1,2-Trichlorotrifluoroethane	ND	1
Dichlorodifluoromethane	NP	P/NP
Bromomethane	NP	P/NP
Dichlorofluoromethane	NP	P/NP
Trichlorofluoromethane	ND	5

[1]Compounds not separated by this method.

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

P/NP = Present/Not Present
ND = Not Detected
MDL = Method Detection Limit

Laboratory No: 4410 92-0083

TABLE 4 (Cont.)

ANALYTICAL RESULTS

Compound	Method Blank	MDL (µg/L)
1,1-Dichloroethylene	ND	1
Trans-1,2-Dichloroethylene	ND	1
Chloroform	ND	1
Dibromomethane	ND	5
Carbon tetrachloride	ND	1
Dichloroacetonitrile	ND	2
1,2-Dichloropropane	ND	1
Trans-1,3-dichloro-1-propene	ND	1
1,3-Dichloropropane	ND	1
1,1,2-Trichloroethane	ND	1
1,2-Dibromoethane	ND	1
Bromoform	ND	5
1,2,3-Trichloropropane	ND	1
Tetrachloroethylene	ND	1
Chlorobenzene	ND	1
1,2-Dichlorobenzene	ND	1
1,3-Dichlorobenzene	ND	1
1,4-Dichlorobenzene	ND	1

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

ND = Not Detected
MDL = Method Detection Limit

Date Analyzed: October 16, 1991

Laboratory No: 4410 92-0083

TABLE 5

ANALYTICAL RESULTS

Parameter	WO-1 S End of Tank	LDL
Cadmium	3.3	0.50
Chromium	17	0.50
Lead	8.3	2.5

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

LDL = Lower Detectable Limit

Date Analyzed: October 11, 1991

Laboratory No: 4410 92-0083

APPENDIX B

INVESTIGATION METHODS AND PROCEDURES

APPENDIX B
INVESTIGATION METHODS AND PROCEDURES
TABLE OF CONTENTS

I. SOIL BORINGS

Soil borings were completed with a truck-mounted drill rig using 4-1/4 inch inside diameter (I.D.) hollow stem augers. On completion, the borings were abandoned with a mixture of native soil and bentonite (puddling clay).

Split-barrel soil samples were collected from each boring at 5 foot intervals. A 2 inch O.D. (outside diameter) split-barrel sampler was driven into the soil in four, 6 inch increments with a wire-line hammer. The number of blows required to drive the sampler through the second and third 6 inch increments were recorded. This value, known as the penetration resistance or N-value, provides an index of the relative density of cohesionless soils and the consistency of cohesive soils.

The drill rig and associated equipment were steam cleaned prior to arrival on-site. A clean drill bit and clean sections of auger and/or drill rod were used at each soil boring location to reduce the risk of potential cross-contamination. The split barrel sampler was cleaned between samples using an Alconox detergent wash, a clean tap water rinse, and a final deionized water rinse. The wash water was changed regularly to ensure effective decontamination.

II. MONITORING WELLS

A. CONSTRUCTION

The monitoring well borings were completed with a truck-mounted drill rig using 4-1/4 inch inside diameter (I.D.) hollow stem augers. Split-barrel soil samples were collected from each boring at 5 foot intervals.

The drill rig and associated equipment were steam cleaned prior to arrival on-site. A clean drill bit and clean sections of auger and/or drill rod were used at each monitoring well boring location to reduce the risk of potential cross-contamination. The split-barrel sampler was cleaned between samples using an Alconox detergent wash, a clean tap water rinse, and a final deionized water rinse. The wash water was changed regularly to ensure effective decontamination.

The wells consist of 2 inch I.D. by 10 foot, Schedule 40 PVC, 0.010 inch slot screens and 2 inch I.D., low carbon riser. The screen and riser are joined with a threaded coupling. All well materials were steam cleaned prior to arrival on-site.

After the auger was advanced to full depth, the well screen and riser assembly was lowered into the borehole. As the augers were retracted, the annular space between the borehole and well screen was backfilled with a coarse to very coarse sand filter pack, which was extended to approximately two feet above the well screen. A two foot bentonite seal was placed directly above the filter pack. The remainder of the annular space around the well riser, from the top of the seal to approximately two feet below grade, was backfilled with tremie-placed bentonite grout. Two of the wells were completed above grade with a locking steel protective cover and three steel posts which were cemented into place. One well was completed at grade due to its proximity to parking and traffic areas. The surface protection for this well included an 8 inch steel gate box which was cemented into place at the ground surface.

Monitoring wells were constructed in accordance with Minnesota Department of Health (MDH) regulations. MDH permits were obtained by the drilling contractor prior to installation of the wells.

B. DEVELOPMENT

Well development was performed using dedicated disposable polyethylene bailers. The wells were developed for a period of approximately 1.4 to 3 hours to remove water introduced during drilling and/or until a relatively sediment free discharge was obtained. Surging for periods of 2 minutes was intermittently performed during the development process by raising and lowering the bailer within the water column. The volume of water removed and observations of the discharge were recorded during the development of each well.

C. SLUG TEST

Slug tests (slug-in) were conducted on the monitoring wells using the following procedure:

1. Static water level in the respective monitoring well was measured with an electronic water level indicator to the nearest 0.01 feet.

2. A dedicated PVC cylinder (slug) with a volume of 0.05 ft^3 was rapidly submersed in the respective well and the water level was allowed to stabilize while water level measurements were obtained.

III. ELEVATION SURVEY

An elevation survey was performed for the monitoring wells and soil borings. The top of riser elevations of the wells and the ground surface elevations of the borings were surveyed to the nearest 0.01 foot using a surveyor's level. The top nut of the fire hydrant at the northeast corner of Hiawatha Avenue and East 42nd Avenue was used as a benchmark for the survey. The City of Minneapolis Department of Public Works provided an elevation of 838.99 feet National Geodetic Vertical Datum (NGVD) for the benchmark.

IV. SOIL CLASSIFICATION/DOCUMENTATION

Soil samples collected from the soil borings and monitoring well borings were visually and manually classified in the field in general accordance with ASTM Method D2488. Representative portions of the samples were returned to the office for further examination and verification of the field classification.

Field logs were maintained for the soil and monitoring well borings which identified the various soil strata, water level information, field methods, and environmental monitoring data, such as visual and olfactory observations, and soil headspace analysis results.

V. SOIL HEADSPACE ANALYSIS

Soil samples were screened for volatile organic compounds (VOCs) using an H-NU Model 101 photoionization detector equipped with a 10.2 eV lamp. The H-NU was calibrated to a benzene standard for reading in parts per million on a volume/volume basis. For each sample, a clean eight ounce glass jar was half filled with soil and immediately covered with aluminum foil (shiny side up) after which the lid was applied tightly to the jar. The jar was shaken for approximately 15 seconds. The sample was then stored for a minimum of 10 minutes in an atmosphere of at least 32°F. After headspace development, the jar was shaken for another 15 seconds. The lid was removed and the foil seal punctured with the sample probe. The highest meter response with in a time period of two to five seconds after insertion was then recorded for each sample.

In addition to headspace analysis, all soil samples were carefully examined for evidence of contamination using visual and odor criteria.

VI. SOIL AND GROUND WATER SAMPLING PROTOCOLS

A. SOIL SAMPLING

Soil samples obtained from the soil borings were collected directly from the split-barrel sampler for analytical testing. Disposable latex gloves were used during sample handling to reduce the risk of potential cross-contamination.

Soil samples were placed in clean containers with teflon lined lids provided by the contract laboratory. The sample containers were labeled and immediately placed in a field cooler following collection. The samples were then transported to the laboratory with completed chain-of-custody forms.

B. GROUND WATER SAMPLING

Ground water sampling was performed in general accordance with the procedures described in the MPCA document entitled "Ground Water Sample Collection Protocol", dated February 1, 1990. The sampling procedures used are summarized as follows:

- The water level of the respective monitoring well was measured to the nearest 0.01 foot using an electronic water level indicator. The water level indicator was decontaminated with a double rinse of deionized water.

- The monitoring well was purged by removing three well volumes using a disposable polyethylene bailer with new rope.

- Following purging the respective ground water samples were obtained with the dedicated bailer. The bailer was slowly lowered into and retrieved from the well to prevent loss of volatile organic compounds (VOCs) by agitation.

- Samples were placed in clean glass and/or plastic containers provided by the contract laboratory. The respective sample containers were labeled with the following information:

  - Unique sample number
  - Site name
  - Well number
  - Date

- Immediately following collection, samples were placed in a field cooler. Samples were transported to the contract laboratory along with completed chain-of-custody forms after completion of the sampling event.

A trip blank consisting of laboratory grade deionized water was prepared by the contract laboratory prior to sampling. The trip blank accompanied the samples during the sampling event.

APPENDIX C

SOIL BORING LOGS

BORING LOG

PROJECT: CMI 4201 Hiawatha Avenue Minneapolis, Minnesota	DATE: 12/17/91	BORING: P-1
	SURFACE ELEVATION: 838.04	SCALE: 1" = 6'

SAMPLE NO.	DEPTH FEET	ASTM D2487	DESCRIPTION - ASTM D2488 (See Report & Descr. Terminology)	"N"	HNU ppm	NOTES
		CL	Sandy clay with trace gravel. Brown to dark brown, moist, rather stiff. (fill)			H-NU PID readings taken in accordance with MPCA "headspace" method.
1	5			12	0	
		CL	Clay. Green to tan, moist, stiff. (lacustrine)			
2	10			15	0.8	
		SP	Sand fine to coarse grained with trace gravel. Light brown to brown, moist to waterbearing at 33 feet, medium dense. Faint to moderate petroleum odors detected below 28 feet. (alluvium)			
3	15			17	0	
4	20			14	2	
5	25			16	0	
6	30			19	2.2	
7*	35			8	7.2	Gray staining evident in sample from 33 to 35 feet
8*	40			15	14	
			END OF BORING Boring backfilled with mixture of auger cuttings and bentonite.			

PEER ENVIRONMENTAL & ENGINEERING RESOURCES, INC.
11 Peavey Road, Chaska, MN 55318 (612) 448-6775

BORING LOG

PROJECT: CMI 4201 Hiawatha Avenue Minneapolis, Minnesota	DATE: 12/18/91	BORING: P-2
	SURFACE ELEVATION: 838.15	SCALE: 1" = 6'

SAMPLE NO.	DEPTH FEET	ASTM D2487	DESCRIPTION - ASTM D2488 (See Report & Descr. Terminology)	"N"	HNU ppm	NOTES
		CL	Sandy clay with trace gravel. Dark brown, moist, rather stiff. (fill)			H-NU PID readings taken in accordance with MPCA "headspace" method. *Duplicate sample submitted for laboratory analysis. **Auger cutting sample. NS = no sample.
1	5			11	0	
		CL	Silty clay. Green to tan, moist, stiff. (lacustrine)	**	2.4	
3	10			13	0	
		SP	Sand fine to coarse grained with trace gravel. Light brown to gray, moist to waterbearing at 33 feet, medium dense to dense. Faint petroleum odors detected below 23 feet. (alluvium)			
4	15			27	0.2	
6	20			16	0.4	
7	25			19	26	
8	30			21	3.2	
9*	35			28	NS	
10	40			14	0.2	
			END OF BORING Boring backfilled with mixture of auger cuttings and bentonite.			

PEER ENVIRONMENTAL & ENGINEERING RESOURCES, INC.
11 Peavey Road, Chaska, MN 55318 (612) 448-6775

DESCRIPTIVE TERMINOLOGY
CLASSIFICATION (ASTM D2487-2488)

Criteria for Assigning Group Symbols and Group Names			Soil Classification Group Symbol	Group Name
Coarse-Grained Soils	Gravels	Clean gravels less than 5% fines	GW GP	Well-graded gravel Poorly graded gravel
		Gravels with fines more than 12% fines	GM GC	Silty gravel Clayey gravel
	Sands	Clean sands less than 5% fines	SW SP	Well-graded sand Poorly graded sand
		Sands with fines more than 12% fines	SM SC	Silty sand Clayey sand
Fine-Grained Soils	Silts and Clays Liquid limit less than 50	Inorganic	CL ML	Lean clay Silt
		Organic	OL	Organic clay Organic silt
	Silts and Clays Liquid limit 50 or more	Inorganic	CH MH	Fat clay Elastic silt
		Organic	OH	Organic clay Organic silt
Highly organic soils		Primarily organic matter, dark in color, and organic odor	PT	Peat

DEFINITIONS

GRAIN SIZE

Soil Fraction		Particle Size	U.S. Standard Sieve Size
Boulders		Larger than 12"	Larger than 12"
Cobbles		3" to 12"	3" to 12"
Gravel:	Coarse	3/4" to 3"	3/4 to 3"
	Fine	4.78 mm to 3/4"	#4 to 3/4"
Sand:	Coarse	2.00 mm to 4.78 mm	#10 to #4
	Medium	0.42 mm to 2.00 mm	#40 to #10
	Fine	0.074 mm to 0.42 mm	#200 to #40
Silt		0.005 mm to 0.074 mm	Smaller than #200
Clay		Smaller than 0.005 mm	Smaller than #200

Plasticity characteristics differentiate between silt and clay

RELATIVE PROPORTIONS OF SOIL

Proportional Term	Defining Range by Percentage of Weight
Trace	< 5%
Few	5% - 10%
Little	15% - 25%
Some	30% - 45%
Mostly	50% - 100%

RELATIVE DENSITY OF COHESIONLESS SOILS

Very Loose	0-4 BPF
Loose	5-10 BPF
Medium Dense	11-30 BPF
Dense	31-50 BPF
Very Dense	50+ BPF

CONSISTENCY OF COHESIVE SOILS

Very Soft	0-1 BPF
Soft	2-3 BPF
Rather Soft	4-5 BPF
Medium	6-8 BPF
Rather Stiff	9-12 BPF
Stiff	13-16 BPF
Very Stiff	17-30 BPF
Hard	30+ BPF

NOTE: Standard "N" penetration: blows per foot (BPF) of a 140 pound hammer falling 30 inches on a 2 inch OD Split Barrel Sampler

STRATIFICATION

TERM	THICKNESS
Layer	> 1/2'
Lense	1/2" - 1/2'
Lamination	< 1/2'

MOISTURE CONDITION

Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

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LOG OF B-1

Project: PACE90111

Location: 4201 Hiawatha Ave. No., Minneapolis, MN

Client: Pace Laboratories

TELLUS CONSULTANTS
1315 Glenwood Avenue North, Minneapolis, MN 5540
(612) 374-1422

Boring Co. Tellus Consultants | Date: 4/12/90 | Sheet 1 of 1

Foreman JEA | Rig: B-57 | Date started: 4/12/90

Geologist AHS | Weather: Sunny 40° F. | Date completed: 4/12/90

Depth	"N" Blows/ ft.	Sample Number	Type Sample	SAMPLE DESCRIPTION (Surface Elevation ft.)	REMARKS
				0.3 Asphalt	No Fuel Odor
				0.5 Brown, sandy GRAVEL FILL (GP)	
				Black, silty, sandy CLAY FILL (CL)	
				5.0	
5	2-2-3-3	SS-1	SS	Brown, very loose, fine-med. SAND (SP)	Rec. 1.5
	1-2-3-3	SS-2	SS		Rec. 1.5
10	2-2-5-5	SS-3	SS		Rec. 1.5
	5-6-8-9	SS-4	SS		Rec. 1.5
				13.0 Brown, very loose, moist, med.-cse. SAND (SP)	
	2-3-4-6	SS-5	SS		Rec. 1.5
15				15.0 Bottom of Hole	No Fuel Odor

Drawn: Date:

Approved: Date:

Job #

Exact location

Topsoil Thickness	Water Level
Fill Thickness	Water Loss
Cave in Level	Artesian Pressure

LOG OF B-2

Project: PACE90111

Location: 4201 Hiawatha Ave. No., Minneapolis, MN

Client: Pace Laboratories

TELLUS CONSULTANTS
1315 Glenwood Avenue North, Minneapolis, MN 5540
(612) 374-1422

Boring Co. Tellus Consultants | Date: 4/11/90 | Sheet 1 of 1

Foreman JEA | Rig: B-57 | Date started: 4/11/90

Geologist AHS | Weather: Cloudy, Flurries 25° F. | Date completed: 4/11/90

Depth	"N" Blows/ ft.	Sample Number	Type Sample	SAMPLE DESCRIPTION Surface Elevation ft.	REMARKS
				0.5 Concrete	
				1.0 Brown, sandy GRAVEL FILL (GP)	Strong Gasoline Odor Begins at One Foot.
				Black/green, sandy, silty CLAY (CL)	
5				5.0 Green/tan, soft, moist CLAY (CL)	
	2-2-4-6	SS-1	SS		Rec. 1.5
	1-2-5-6	SS-2	SS		Rec. 1.5
10				9.5	
	2-4-7-12	SS-3	SS	Brown, loose, med.-cse. SAND some gravel (SP)	Rec. 1.5
	6-9-11-10	SS-4	SS		Rec. 1.5
	4-4-6-7	SS-5	SS		Rec. 1.5 Diminishing Fuel Odor
15					
	2-2-7-7	SS-6	SS		Rec. 1.5 No Fuel Odor
	4-6-5-5	SS-7	SS		Rec. 1.6 No Fuel Odor
				19.0 Bottom of Hole	
20					

Drawn: Date:

Approved: Date:

Job #

Exact location

Topsoil Thickness	Water Level
Fill Thickness	Water Loss
Cave in Level	Artesian Pressure

LOG OF B-5

Project: PACE90111

Location: 4201 Hiawatha Ave. No., Minneapolis, MN

Client: Pace Laboratories

TE CONSULTANTS
1315 Glenwood Avenue North, Minneapolis, MN 5540
(612) 374-1422

Boring Co. Tellus Consultants | Date: 4/12/90 | Sheet 1 of 1

Foreman JEA | Rig: B-57 | Date started: 4/12/90

Geologist AHS | Weather: Sunny, 40° F. | Date completed: 4/12/90

Depth	"N" Blows/ ft.	Sample Number	Type Samole	SAMPLE DESCRIPTION Surface Elevation ft.	REMARKS
				-0.3 Asphalt Black, silty, sandy CLAY FILL (CL)	Strong Gasoline Odor at 0.3; No Fuel Odor Below 5-7 ft.
	3-4-3-4	SS-1	SS	-2.5	Rec. 1.8
5	2-3-5-4	SS-2	SS	Green, soft CLAY tr. gravel (CL)	Rec. 1.8
	2-2-4-6	SS-3	SS	Green grading to tan soft CLAY (CL)	Rec. 1.8
10	2-4-4-9	SS-4	SS	-9.5 Brown, loose, med. SAND tr. gravel (SP)	Rec. 1.5
	5-6-8-8	SS-5	SS		Rec. 1.5
	1-4-6-6	SS-6	SS		Rec. 1.5
15				-15.0 Bottom of Hole	

Drawn: Date:

Approved: Date:

Job #

Exact location

Topsoil Thickness | Water Level

Fill Thickness | Water Loss

Cave in Level | Artesian Pressure

LOG OF B-4

Project: PACE90111

Location: 4201 Hiawatha Ave. No., Minneapolis, MN

Client: Pace Laboratories

TE CONSULTANTS
1315 Glenwood Avenue North, Minneapolis, MN 5540
(612) 374-1422

Boring Co. Tellus Consultants | Date: 4/11/90 | Sheet 1 of 1

Foreman JEA | Rig: B-57 | Date started: 4/11/90

Geologist AHS | Weather: Sunny, 40° F. | Date completed: 4-11/90

Depth	"N" Blows/ ft.	Sample Number	Type Sample	SAMPLE DESCRIPTION Surface Elevation ft.	REMARKS
				-0.3 Asphalt Black, moist, sandy CLAY FILL (CL)	Some Fuel Odor in Top Three Feet, Auger Cuttings
				-3.0 Grading to gray/brown, soft, moist CLAY (CL)	
5	2-3-6-7	SS-1	SS		Rec. 1.8 No Fuel Odor
	2-3-4-5	SS-2	SS		Rec. 1.8
				-9.5	
10	1-2-6-10	SS-3	SS	Brown, loose, fine-medium SAND (SP)	Rec. 1.5
	4-7-8-9	SS-4	SS		Rec. 1.5
	5-8-8-9	SS-5	SS		Rec. 1.5
15				-15.0 Bottom of Hole	

Drawn: Date:

Approved: Date:

Job #

Exact location

Topsoil Thickness	Water Level
Fill Thickness	Water Loss
Cave In Level	Artesian Pressure

LOG OF B-5

Project: PACE90111

Location: 4201 Hiawatha Ave. No., Minneapolis, MN

Client: Pace Laboratories

TELLUS CONSULTANTS
1315 Glenwood Avenue North, Minneapolis, MN 5540
(612) 374-1422

Boring Co. Tellus Consultants | Date: 4/9/90 | Sheet 1 of 2

Foreman JEA | Rig: B-57 | Date started: 4/9/90

Geologist AHS | Weather: Sunny, 50° F. | Date completed: 4/9/90

Depth	"N" Blows/ ft.	Sample Number	Type Sample	SAMPLE DESCRIPTION Surface Elevation ft.	REMARKS
				1.0 Asphalt	
				Sandy PEA GRAVEL FILL (GW)	
				5.0	
5	1-1-2-1	SS-1	SS	Brown, very loose, moist, silty, medium SAND FILL, tr. clay, gravel (SP)	Rec. 0.9
				7.0	
	2-2-3-6	SS-2	SS	Gray, soft, moist CLAY (CL)	Rec. 1.5 Slight Fuel Odor
10	1-4-8-10	SS-3	SS	10.0	Rec. 1.5 Increasing Fuel Odor
				Gray, loose, fine-med. SAND (SP)	
	3-7-9-14	SS-4	SS		Rec. 1.3
	5-9-9-9	SS-5	SS	Gray/brown, loose, med.-cse. SAND (SP)	Rec. 1.3
15					
	4-8-13-13	SS-6	SS		Rec. 1.5
	9-10-12-15	SS-7	SS		Rec. 1.7
				Brown, firm, fine-med. SAND tr. gravel (SP)	
20	6-29-21-15	SS-8	SS		Rec. 1.3 Gravel 1/2" to 2" Diameter
	5-9-15-20	SS-9	SS		Rec. 1.3
	6-12-15-17	SS-10	SS		Rec. 1.5
25					
	4-6-10-15	SS-11	SS		Rec. 1.2
	4-12-20-25	SS-12	SS		Rec. 1.0
	7-13-18-26	SS-13	SS		Rec. 1.2

Drawn: Date:

Approved: Date:

Job #

Exact location

Topsoil Thickness	Water Level
Fill Thickness	Water Loss
Cave in Level	Artesian Pressure

LOG OF B-5

Project: PACE90111

Location: 4201 Hiawatha Ave. No., Minneapolis, MN

Client: Pace Laboratories

TELLUS CONSULTANTS
1315 Glenwood Avenue North, Minneapolis, MN 5540
(612) 374-1422

Boring Co. Tellus Consultants | Date: 4/9/90 | Sheet 2 of 2

Foreman JEA | Rig: B-57 | Date started: 4/9/90

Geologist AHS | Weather: Sunny, 50° F. | Date completed: 4/9/90

Depth	"N" Blows/ ft.	Sample Number	Type Samole	SAMPLE DESCRIPTION (Surface Elevation ft.)	REMARKS
				Brown, firm, moist fine-med. SAND (SP)	
31	8.15.22.25	SS-14	SS		Rec. 1.2
	4.12.16.18	SS-15	SS		Rec. 1.2
35				35.0 Bottom of Hole	Tip of Spoon at 35 ft. Saturated Fuel Odor from 7-35 ft.

Drawn: Date:

Approved: Date:

Job #

Exact location

Topsoil Thickness

Fill Thickness

Cave in Level

Water Level

Water Loss

Artesian Pressure

LOG OF B-6

Project: PACE90111

Location: 4201 Hiawatha Ave. No., Minneapolis, MN

Client: Pace Laboratories

TELLUS CONSULTANTS
1315 Glenwood Avenue North, Minneapolis, MN 55405
(612) 374-1422

Boring Co. Tellus Consultants | Date: 4/10/90 | Sheet 1 of 1

Foreman JEA | Rig: B-57 | Date started: 4/10/90

Geologist AHS | Weather: Sunny, 45° F. | Date completed: 4/10/90

Depth	"N" Blows/ ft.	Sample Number	Type Sample	SAMPLE DESCRIPTION (Surface Elevation ft.)	REMARKS
				-0.5 Asphalt Brown, gravelly SAND FILL (SP)	Fill has Debris, i.e. Concrete, Bricks, etc.
				-1.5 Black, silty SAND FILL (SP)	
				-5.0 Tan, soft, moist CLAY (CL)	
5	3-3-5-6	SS-1	SS		Rec. 1.8
	3-3-5-8	SS-2	SS		Rec. 2.0
				-9.5	
10	2-6-6-6	SS-3	SS	Brown, loose, fine-med. SAND some coarse sand, tr. gravel (SP)	Rec. 1.5
	2-3-8-12	SS-4	SS		Rec. 1.5
	2-5-7-11	SS-5	SS		Rec. 1.5
15	6-7-8-9	SS-6	SS		Rec. 2.0
	6-6-20-19	SS-7	SS		Rec. 1.5
				Brown, loose, med.-cse. SAND (SP)	
20	6-6-13-11	SS-8	SS		Rec. 1.0 Not Enough Sample fc Pace to Split with Tellus
				-21.0 Bottom of Hole	No Fuel Odor in Boring

Drawn: Date:

Approved: Date:

Job #

Exact location

Topsoil Thickness	Water Level
Fill Thickness	Water Loss
Cave in Level	Artesian Pressure

Table 1

SOIL BORING LOG SHEET

Project: Phase I - Soil Investigation
Client: CMI-Cronstroms
Location: Former Mobil Gas Station
4201 Hiawatha Ave.
Minneapolis, Minnesota

DATE: 4/9-12/90

SAMPLING LOCATION	DEPTH (ft.)	SOIL DESCRIPTION	PETROLEUM ODOR	PID READING (ppm)
B-1	5-7	Brown sand	None	2
	7-9	Brown sand	None	75
	9-11	Fine light brown sand	None	30
*	11-13	Brown sand	None	800
*	13-15	Coarse brown sand	None	10
B-2	5-7	Green clay	Strong	610
*	7-9	Green clay	Strong	650
	9-11	Green clay/Brown sand	Strong	340
	11-13	Green/Brown sand	None	310
	13-15	Brown fine sand	None	13
	15-17	Brown fine sand	None	9
*	17-19	Brown fine sand	None	10
B-3 *	1-3	Black clay and sand	Strong	500
	5-7	Green clay	Strong	22
	7-9	Hard green clay	None	3
	9-11	Green clay and sand	None	1
	11-13	Coarse brown sand	None	1
*	13-15	Coarse brown sand	None	ND
B-4 *	5-7	Green hard clay	None	ND
	7-9	Green hard clay	None	ND
	9-11	Green clay/Brown sand	None	ND
	11-13	Brown sand	None	1
*	13-15	Coarse brown sand	None	1

* - Sample selected for laboratory analysis
ND - Not detected

Table 1 (continued)

SOIL BORING LOG SHEET

Project: Phase I - Soil Investigation
Client: CMI-Cronstroms
Location: Former Mobil Gas Station
4201 Hiawatha Ave.
Minneapolis, Minnesota

DATE: 4/9-12/90

SAMPLING LOCATION	DEPTH (ft.)	SOIL DESCRIPTION	PETROLEUM ODOR	PID READING (ppm)
B-5	5-7	Moist dark brown sand	Strong	ND
	7-9	Moist brown clay	Strong	15
	9-11	Fine gray sand	Strong	38
	11-13	Fine gray sand	Strong	100
*	13-15	Gray sand	Strong	300
	15-17	Gray sand	Strong	350
	17-19	Gray sand	Strong	220
	19-21	Gray sand	Strong	270
	21-23	Gray sand	Strong	280
	23-25	Gray/Brown sand	Strong	250
	25-27	Brown sand	Slight	38
	27-29	Brown sand	Slight	28
	29-31	Brown sand	Slight	25
	31-33	Brown sand	Slight	24
*	33-35	Moist brown/gray sand	Slight	21
B-6	5-7	Green hard clay	None	ND
	7-9	Green hard clay	None	ND
	9-11	Green clay/Brown sand	None	2
	11-13	Fine brown sand	None	15
*	13-15	Fine brown sand	None	18
	15-17	Fine brown sand	None	2
	17-19	Coarse brown sand	None	12
*	19-21	Coarse brown sand	None	12

* - Sample selected for laboratory analysis
ND - Not Detected

APPENDIX D

MONITORING WELL GEOLOGIC LOGS, CONSTRUCTION DIAGRAMS AND MDH LOGS

GEOLOGIC LOG

PROJECT: CMI 4201 Hiawatha Avenue Minneapolis, Minnesota	DATE: 12/20/91	BORING: MW-1
	SURFACE ELEVATION: 837.40	SCALE: 1" = 6'

SAMPLE NO.	DEPTH FEET	ASTM D2487	DESCRIPTION - ASTM D2488 (See Report & Descr. Terminology)	"N"	HNU ppm	NOTES
		CL	Silty clay. Gray to brown, moist, stiff. (fill)			H-NU PID readings taken in accordance with MPCA "headspace" method. *Duplicate sample submitted for laboratory analysis.
1	5			16	0.2	
		CL	Clay. Green to tan, moist, stiff. (lacustrine)			
2	10			16	0.4	
3	15			20	0.2	
4	20			85	0	Layer of gravel noted at 18.5 to 19.5 feet.
		SP	Sand, fine to coarse grained, with trace gravel. Light brown to brown, moist to waterbearing at 30 feet, medium dense to dense. Strong petroleum odors detected below 33 feet. (alluvium)			
5	25			31	0.2	
6	30			35	0.2	
7	35			24	220	
8	40			18	180	
			END OF BORING Monitoring well MW-1 installed upon boring completion.			

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11 Peavey Road, Chaska, MN 55318 (612) 448-6775

GEOLOGIC LOG

PROJECT: CMI 4201 Hiawatha Avenue Minneapolis, Minnesota	DATE: 12/18/91	BORING: MW-2
	SURFACE ELEVATION: 837.21	SCALE: 1" = 6'

SAMPLE NO.	DEPTH FEET	ASTM D2487	DESCRIPTION - ASTM D2488 (See Report & Descr. Terminology)	"N"	HNU ppm	NOTES
		CL	Sandy clay. Dark gray to black, moist, very stiff. (fill)			H-NU PID readings taken in accordance with MPCA "headspace" method. *Duplicate sample submitted for laboratory analysis.
1	5			20	10	
		CL	Clay. Green to tan, moist, stiff. (lacustrine)			
2	10			14	0	
		SP	Sand, fine to medium grained, with trace coarse sand and gravel. Light brown to brown, moist, medium dense to dense. (alluvium)			
3	15			12	0	
4	20			28	0	
		SC	Clayey sand with trace gravel. Dark gray to black, moist.			
5	25	SP	Sand, fine to coarse grained. Light brown to brown, moist to waterbearing at 30 feet. Faint petroleum odor detected in sample from 29 to 31 feet. (alluvium)	55	0.8	Black sandy clay to clayey sand from 29 to 29.5 feet.
6	31			25	11.2	
7	35			22	0	
			END OF BORING Monitoring well MW-2 installed upon boring completion.			No petroleum odors detected in boring.

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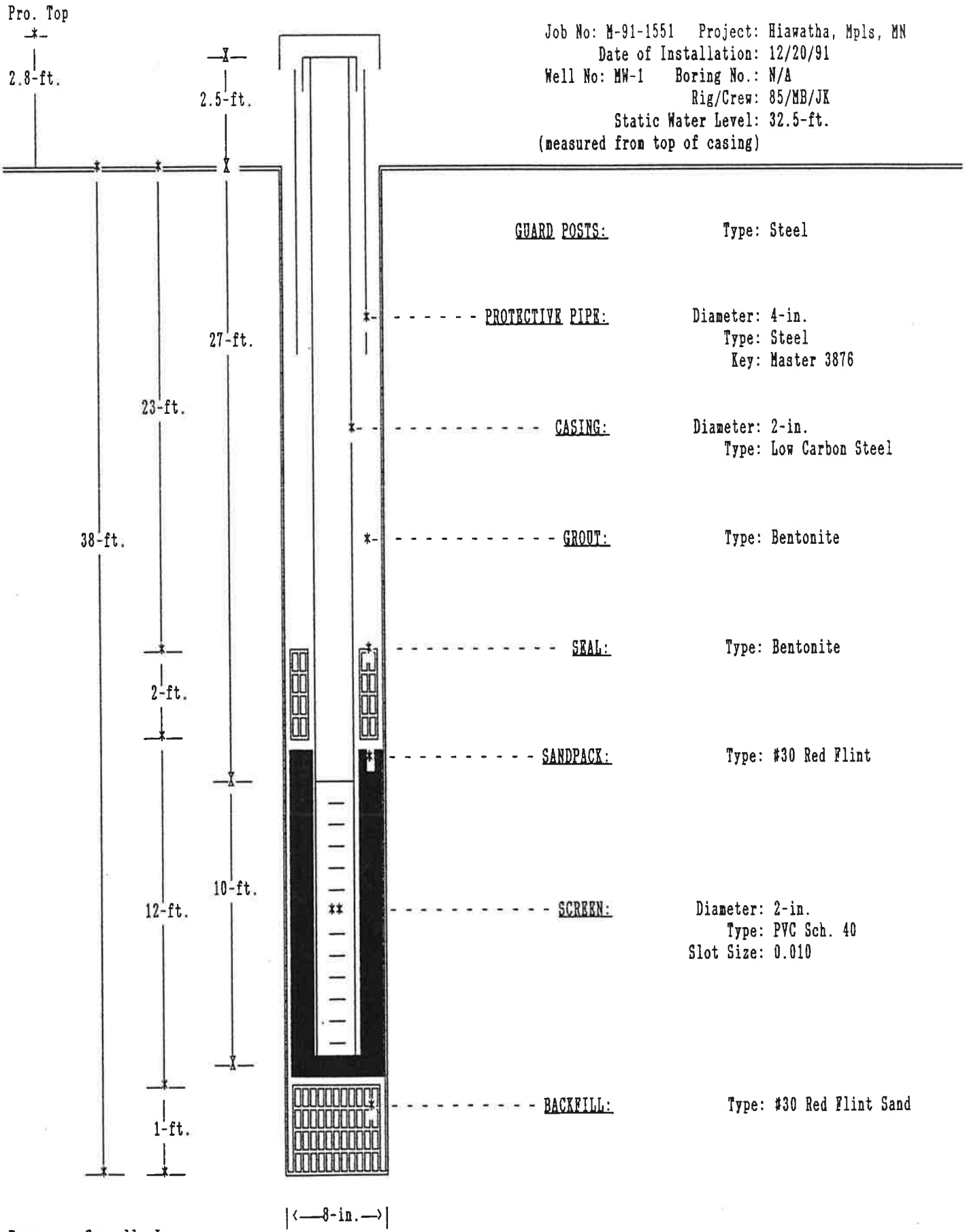
GEOLOGIC LOG

PROJECT: CMI 4201 Hiawatha Avenue Minneapolis, Minnesota	DATE: 12/17/91	BORING: MW-3
	SURFACE ELEVATION: 837.84	SCALE: 1" = 6'

SAMPLE NO.	DEPTH FEET	ASTM D2487	DESCRIPTION - ASTM D2488 (See Report & Descr. Terminology)	"N"	HNU ppm	NOTES
		CL	Silty clay with some sand. Gray to brown, moist, rather stiff. (fill)			H-NU PID readings taken in accordance with MPCA "headspace" method. *Duplicate sample submitted for laboratory analysis. NS = no sample. Trace gravel noted in samples from 18 to 35 feet
1	5			11	0	
		CL	Clay. Green to tan, moist, stiff. (lacustrine)			
2	10			13	0	
		SP	Sand, fine to medium grained, with trace gravel. Light brown to brown, moist to waterbearing at 31 feet, medium dense to dense. (alluvium)			
3	15			15	0	
4	20			20	0	
5	25			21	0	
6	30			48	NS	
7	35			20	0	
8	40			14	0	
			END OF BORING Monitoring well MW-3 installed upon boring completion.			

PEER ENVIRONMENTAL & ENGINEERING RESOURCES, INC.
11 Peavey Road, Chaska, MN 55318 (612) 448-6775

MONITORING WELL DIAGRAM



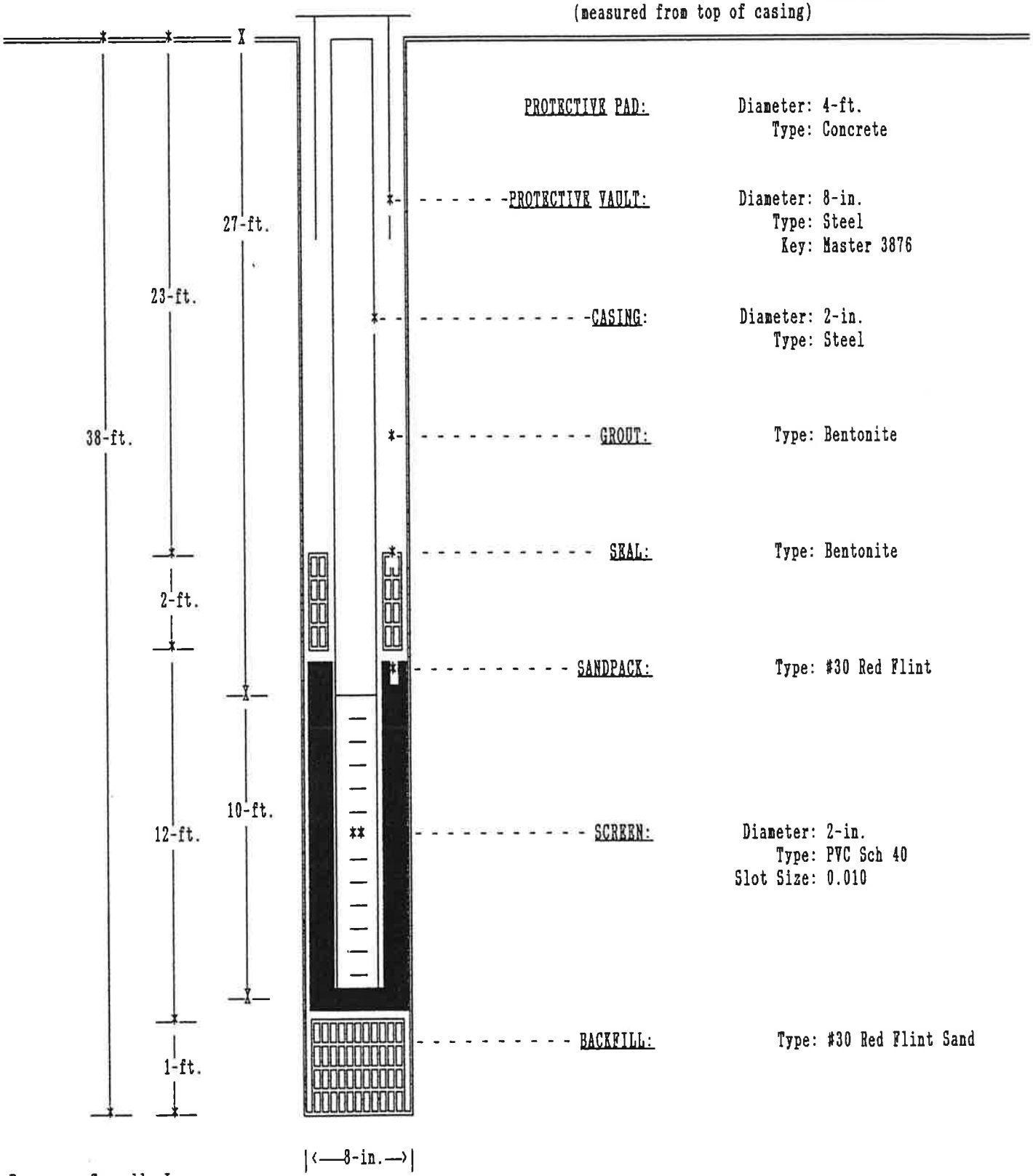
Job No: M-91-1551 Project: Hiawatha, Mpls, MN
Date of Installation: 12/20/91
Well No: MW-1 Boring No.: N/A
Rig/Crew: 85/MB/JK
Static Water Level: 32.5-ft.
(measured from top of casing)

GUARD POSTS:	Type: Steel
PROTECTIVE PIPE:	Diameter: 4-in. Type: Steel Key: Master 3876
CASING:	Diameter: 2-in. Type: Low Carbon Steel
GROUT:	Type: Bentonite
SEAL:	Type: Bentonite
SANDPACK:	Type: #30 Red Flint
SCREEN:	Diameter: 2-in. Type: PVC Sch. 40 Slot Size: 0.010
BACKFILL:	Type: #30 Red Flint Sand

Bergerson-Caswell, Inc.
5115 Industrial Street
Maple Plain, MN 55359
612-479-3121

MONITORING WELL DIAGRAM

Job No: M-91-1551 Project: Hiawatha, Mpls, MN
Date of Installation: 12/18/91
Well No: MW-2 Boring No.: N/A
Rig/Crew: 85/MB/JK
Static Water Level: 30.2-ft.
(measured from top of casing)



PROTECTIVE PAD: Diameter: 4-ft.
Type: Concrete

PROTECTIVE VAULT: Diameter: 8-in.
Type: Steel
Key: Master 3876

CASING: Diameter: 2-in.
Type: Steel

GROUT: Type: Bentonite

SEAL: Type: Bentonite

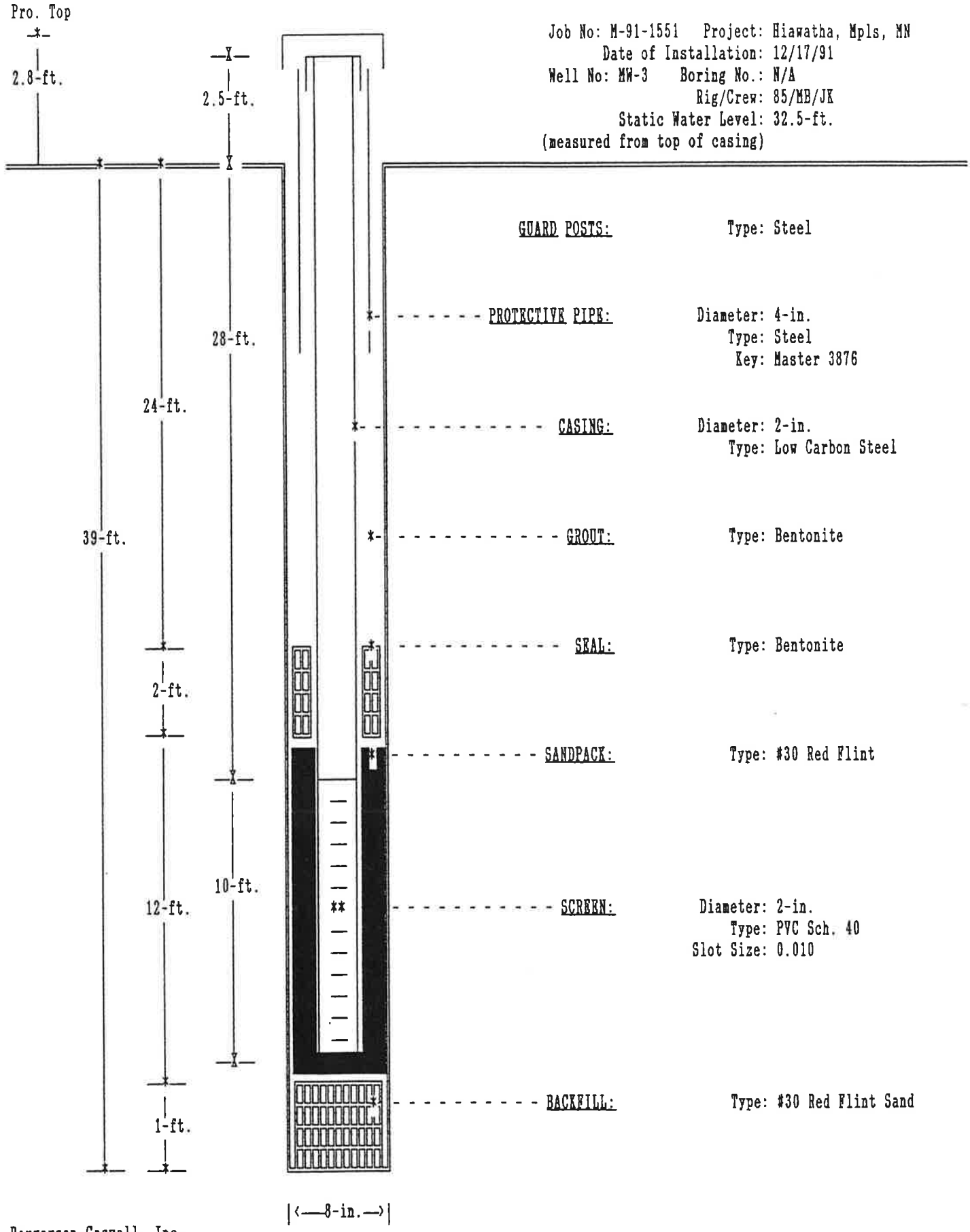
SANDPACK: Type: #30 Red Flint

SCREEN: Diameter: 2-in.
Type: PVC Sch 40
Slot Size: 0.010

BACKFILL: Type: #30 Red Flint Sand

Bergerson-Caswell, Inc.
5115 Industrial Street
Maple Plain, MN 55359
612-479-3121

MONITORING WELL DIAGRAM



Job No: M-91-1551 Project: Hiawatha, Mpls, MN
Date of Installation: 12/17/91
Well No: MW-3 Boring No.: N/A
Rig/Crew: 85/MB/JK
Static Water Level: 32.5-ft.
(measured from top of casing)

GUARD POSTS:	Type: Steel
PROTECTIVE PIPE:	Diameter: 4-in. Type: Steel Key: Master 3876
CASING:	Diameter: 2-in. Type: Low Carbon Steel
GROUT:	Type: Bentonite
SEAL:	Type: Bentonite
SANDPACK:	Type: #30 Red Flint
SCREEN:	Diameter: 2-in. Type: PVC Sch. 40 Slot Size: 0.010
BACKFILL:	Type: #30 Red Flint Sand

Bergerson-Caswell, Inc.
5115 Industrial Street
Maple Plain, MN 55359
612-479-3121

STATE OF MINNESOTA DEPARTMENT OF HEALTH

WATER WELL RECORD

Minnesota Statutes 156A.01-.08

MINNESOTA UNIQUE WELL NO. for Water Sample **498841**

1. LOCATION OF WELL

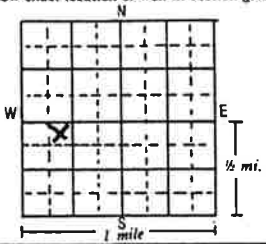
County Name: Hennepin

Township Name	Township Number	Range Number	Section No.	Fraction
Minneapolis	28 N S	23 E W	7	NE ¼ NW ¼ SW ¼

Numerical Street Address and City of Well Location or Distance from Road Intersection.

4201 Hiawatha Ave., Minneaplis, MN

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

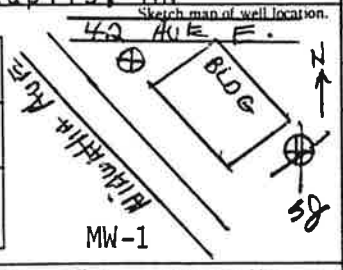


Addition Name

Block Number

Lot Number

Sketch map of well location.



2. PROPERTY OWNER'S NAME

Agate Properties
4225 Hiawatha Ave.
Mpls, MN 55406

Mailing Address if different than property address indicated above. Peer Environmental
11 Peavey Rd
Chaska, MN 55318

3. FORMATION LOG	COLOR	HARDNESS OF FORMATION	FROM	TO
Silty Clay	Green Gray	Med	0	9
Sand (fine-coarse) w/ Gravel	Brown	Med	9	40

Use a second sheet, if needed

4. WELL DEPTH (completed) 37 ft. — **Date of Completion** 12/20/91

5. DRILLING METHOD

☐ Cable Tool ☐ Reverse ☐ Driven ☐ Dug
☐ Hollow Rod ☐ Air ☐ Bored ☐ _____
☐ Rotary ☐ Jetted ☒ Power Auger

6. DRILLING FLUID Water

7. USE

☐ Domestic ☒ Monitoring ☐ Heat Pump
☐ Irrigation ☐ Public ☐ Industry
☐ Test Well ☐ Municipal ☐ Commercial
☐ Air Conditioning ☐ _____

8. CASING

☒ Black ☐ Threaded — HEIGHT: Above/Below Surface 2.5 ft.
☐ Galv. ☐ Welded
☐ Plastic ☐ — Drive Shoe? Yes ___ No X

2 in. to 27 ft. — Weight 3.65 lbs./ft.
___ in. to ___ ft. — Weight ___ lbs./ft.
___ in. to ___ ft. — Weight ___ lbs./ft.

HOLE DIAM.: 8 in. to 40 ft.; ___ in. to ___ ft.; ___ in. to ___ ft.

9. SCREEN

Make Conitinuous
Type PVC Sch 40 — Diam. 2 in.
Slot/Gauze 0.010 — Length 10 ft.
Set between 27 ft. and 37 ft.
Or open hole from ___ ft. to ___ ft.
FITTINGS:

10. STATIC WATER LEVEL 30 ft. ☒ below ☐ above land surface — Date Measured 12/20/91

11. PUMPING LEVEL (below land surface)

N/A ft. after ___ hrs. pumping ___ g.p.m.
___ ft. after ___ hrs. pumping ___ g.p.m.

12. HEAD WELL COMPLETION

☐ Pitless adapter manufacturer ___ Model ___
☐ Basement, offset ☒ At least 12" above ground
☐ Plastic casing protection ___

13. WELL GROUTED? ☒ Yes ☐ No

☐ Neat Cement ☒ Bentonite ☐ _____
Grout material Bentonite from 0 to 23 ft. cu. yds 0.3

14. NEAREST SOURCES OF POSSIBLE CONTAMINATION

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

15. PUMP

Date installed ___ ☒ Not installed
Manufacturer's name ___
Model number ___ HP ___ Volts ___
Length of drop pipe ___ ft. Capacity ___ g.p.m.
Material of drop pipe ___
Type: ☐ Submersible ☐ L.S. Turbine ☐ Reciprocating
☐ Jet ☐ Centrifugal ☐ _____

16. ABANDONED WELLS

Unused well on property? ☐ Yes ☒ No
Sealed ☐ Permanent ☐ Temporary ☐ Not sealed

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

Job # M-91-1551

18. WATER WELL CONTRACTOR CERTIFICATION

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

Bergerson-Caswell (Licensee Business Name) — 27058 (License No.)
Address 5115 Industrial St., Maple Plain
Signed John W. Hennes (Authorized Representative) — Date 1/20/92
Mike Brase (Name of Driller) — Date 1/20/92

IMPORTANT: FILE WITH DEED — WELL OWNER COPY — 498841

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

STATE OF MINNESOTA DEPARTMENT OF HEALTH

WATER WELL RECORD

Minnesota Statutes 156A.01-.08

MINNESOTA UNIQUE WELL NO. for Water Sample **498842**

1. LOCATION OF WELL

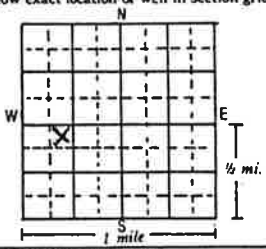
County Name: Hennepin

Township Name	Township Number	Range Number	Section No.	Fraction
Minneapolis	28 N/S	23 E/W	7	NE ¼ NW ¼ SW ¼

Numerical Street Address and City of Well Location or Distance from Road Intersection.

4288 Hiawatha Ave., Mpls, MN 55406

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

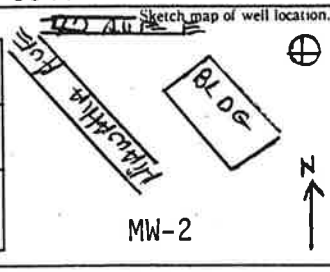


Addition Name

Block Number

Lot Number

Sketch map of well location.



2. PROPERTY OWNER'S NAME

Agate Properties
4225 Hiawatha Ave
Mpls, MN 55406

Mailing Address if different than property address indicated above.

Peer Environment
11 Peavey Rd.
Chaska, MN 55318

3. FORMATION LOG	COLOR	HARDNESS OF FORMATION	FROM	TO
Sandy Clay	Black Brn	Med	0	9
Sand (fine-med)w/Grav	Green Brn	Med	9	28
Clay	Black	Med	28	29
Sand	Brown	Med	29	38

Use a second sheet, if needed

4. WELL DEPTH (completed) 37 ft. — **Date of Completion** 12/18/91

5. DRILLING METHOD

☐ Cable Tool ☐ Reverse ☐ Driven ☐ Dug
☐ Hollow Rod ☐ Air ☐ Bored ☐ _____
☐ Rotary ☐ Jetted ☒ Power Auger

6. DRILLING FLUID Water

7. USE

☐ Domestic ☒ Monitoring ☐ Heat Pump
☐ Irrigation ☐ Public ☐ Industry
☐ Test Well ☐ Municipal ☐ Commercial
☐ Air Conditioning ☐ _____

8. CASING

☒ Black ☐ Threaded
☐ Galv. ☐ Welded
☐ Plastic ☐

HEIGHT: Above/Below Surface at-grd ft.
Drive Shoe? Yes ___ No X

2 in. to 27 ft. Weight 3.65 lbs./ft.
_____ in. to _____ ft. Weight _____ lbs./ft.
_____ in. to _____ ft. Weight _____ lbs./ft.

HOLE DIAM.
8 in. to 38 ft.
___ in. to ___ ft.
___ in. to ___ ft.

9. SCREEN

Make Continuous
Type PVC Sch 40 Diam. 2 in.
Slot/Gauze 0.010 Length 10 ft.
Set between 27 ft. and 37 ft.

Or open hole from _____ ft. to _____ ft.

FITTINGS:

10. STATIC WATER LEVEL 30.2 ft. ☒ below ☐ above land surface — Date Measured 12/18/91

11. PUMPING LEVEL (below land surface)

N/A ft. after _____ hrs. pumping _____ g.p.m.
_____ ft. after _____ hrs. pumping _____ g.p.m.

12. HEAD WELL COMPLETION

☐ Pitless adapter manufacturer _____ Model _____
☐ Basement, offset ☒ At least 12" above ground
☐ Plastic casing protection

13. WELL GROUTED? ☒ Yes ☐ No

☐ Neat Cement ☒ Bentonite ☐ _____
Grout material Bentonite from 0 to 23 ft. cu. yds. 0.3

14. NEAREST SOURCES OF POSSIBLE CONTAMINATION

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

15. PUMP

Date installed _____ ☒ Not installed
Manufacturer's name _____
Model number _____ HP _____ Volts _____
Length of drop pipe _____ ft. Capacity _____ g.p.m.
Material of drop pipe _____
Type: ☐ Submersible ☐ L.S. Turbine ☐ Reciprocating
☐ Jet ☐ Centrifugal ☐ _____

16. ABANDONED WELLS

Unused well on property? ☐ Yes ☒ No
Sealed ☐ Permanent ☐ Temporary ☐ Not sealed

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

Job # M-91-1551

18. WATER WELL CONTRACTOR CERTIFICATION

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

Bergerson-Caswell 27058
Licensee Business Name *License No.*
Address 5115 Industrial St., Maple Plain
Signed John A. Hensch Date 1/18/92
Authorized Representative
Mike Brase Date 1/18/92
Name of Driller

IMPORTANT:
FILE WITH DEED – WELL OWNER COPY

498842

HE-01205-03(Rev. 9/88)

5/74 30M
7/76 30M
7/78 30M
2/82 10M

STATE OF MINNESOTA DEPARTMENT OF HEALTH

WATER WELL RECORD

Minnesota Statutes 156A.01-.08

MINNESOTA UNIQUE WELL NO. for Water Sample **498843**

1. LOCATION OF WELL

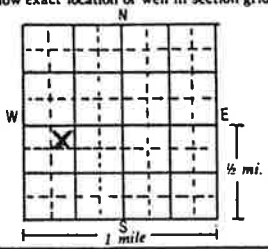
County Name: Hennepin

Township Name	Township Number	Range Number	Section No.	Fraction
Minneapolis	28 (N/S)	23 (E/W)	7	NE ¼ NW ¼ SW ¼

Numerical Street Address and City of Well Location or Distance from Road Intersection.

4201 Hiawatha Ave., Mpls, MN

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

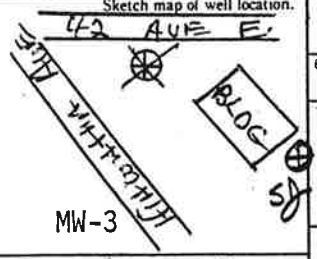


Addition Name:

Block Number:

Lot Number:

Sketch map of well location.



2. PROPERTY OWNER'S NAME

Agate Properties
4225 Hiawatha Ave.
Mpls, MN 55406

Mailing Address if different than property address indicated above. Peer Environmental
11 Peavey Rd.
Cahaska, MN 55318

3. FORMATION LOG	COLOR	HARDNESS OF FORMATION	FROM	TO
Clay w/Sand/Gravel	Gray	Med	0	8
Clay	Lt. Brown	Med	8	10
Sand (fine-coarse)	Brown	Med	10	40

Use a second sheet, if needed

4. WELL DEPTH (completed) 38 ft. — **Date of Completion** 12/17/91

5. DRILLING METHOD

☐ Cable Tool ☐ Reverse ☐ Driven ☐ Dug
☐ Hollow Rod ☐ Air ☐ Bored ☐ _____
☐ Rotary ☐ Jetted ☒ Power Auger

6. DRILLING FLUID Water

7. USE

☐ Domestic ☒ Monitoring ☐ Heat Pump
☐ Irrigation ☐ Public ☐ Industry
☐ Test Well ☐ Municipal ☐ Commercial
☐ Air Conditioning ☐ _____

8. CASING

☒ Black ☐ Threaded
☐ Galv. ☐ Welded
☐ Plastic ☐

HEIGHT: Above / Below
Surface 2.5 ft.
Drive Shoe? Yes ___ No X

2 in. to 28 ft. Weight 3.65 lbs./ft.
___ in. to ___ ft. Weight ___ lbs./ft.
___ in. to ___ ft. Weight ___ lbs./ft.

HOLE DIAM.
8 in. to 40 ft.
___ in. to ___ ft.
___ in. to ___ ft.

9. SCREEN Or open hole from ___ ft. to ___ ft.

Make Continuous
Type PVC SCh 40 Diam. 2 in.
Slot/Gauze 0.01 Length 10 ft.
Set between 28 ft. and 38 ft. FITTINGS:

10. STATIC WATER LEVEL

30 ft. ☒ below ☐ above land surface — Date Measured 12/17/91

11. PUMPING LEVEL (below land surface)

N/A ft. after ___ hrs. pumping ___ g.p.m.
___ ft. after ___ hrs. pumping ___ g.p.m.

12. HEAD WELL COMPLETION

☐ Pitless adapter manufacturer ___ Model ___
☐ Basement, offset ☒ At least 12" above ground
☐ Plastic casing protection ___

13. WELL GROUTED? ☒ Yes ☐ No

☐ Neat Cement ☒ Bentonite ☐ _____
Grout material Bentonite from 0 to 24 ft. cu. yds. 0.3

14. NEAREST SOURCES OF POSSIBLE CONTAMINATION

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

15. PUMP

Date installed ___ ☒ Not installed
Manufacturer's name ___
Model number ___ HP ___ Volts ___
Length of drop pipe ___ ft. Capacity ___ g.p.m.
Material of drop pipe ___
Type: ☐ Submersible ☐ L.S. Turbine ☐ Reciprocating
☐ Jet ☐ Centrifugal ☐ _____

16. ABANDONED WELLS

Unused well on property? ☐ Yes ☒ No
Sealed ☐ Permanent ☐ Temporary ☐ Not sealed

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

Job # M-91-1551

18. WATER WELL CONTRACTOR CERTIFICATION

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

Bergerson-Caswell 27058
Licensee Business Name *License No.*

Address 5115 Industrial St., Maple Plain

Signed John W. Hennick *Authorized Representative* Date 1/17/92

Mike Brase Date 1/17/92
Name of Driller

IMPORTANT:
FILE WITH DEED – WELL OWNER COPY

498843

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

INVOICE

PAID

POLLUTION CONTROL DIVISION
300 PUBLIC HEALTH CENTER
250 SOUTH 4TH STREET
MINNEAPOLIS MN 55415
348-7897 or 348-7827

$ 150 NOV 1 MC BY
DEPT OF INSPECTIONS

BERGERSON - CASWELL
5115 INDUSTRIAL STREET
MAPLE PLAIN, MN 55359

INVOICE NO ER200
EMPLOYEE 5956
DATE 11-25-91
AMOUNT $ 150.00

Please make payment from this invoice, no statement will be sent.

This invoice is not valid unless stamped paid.

DESCRIPTION	AMOUNT
This invoice, when stamped paid, will serve as the registration for installation of three monitoring wells at 4201 Hiawatha Avenue. This Department is charged with the authority for registration of any pollution control or monitoring device and any equipment pertaining, thereto, and if found to meet the requirements to approve the same. If you have any questions, please give us a call at 673-5897.	
KN	$150.00

Make check payable to:
MINNEAPOLIS FINANCE OFFICE

Send to: Mpls Dept of Inspections
300 Public Health Center
250 South 4th Street
Minneapolis, MN 55415

ATTENTION: POLLUTION CONTROL DIVISION

ADDED/REMOVED ON REGISTRATION RECORDS?

BILLING BY added for,

MASTER BY _____ 20 92
initial date

APPENDIX E

MONITORING WELL SAMPLING DATA

MONITORING WELL SAMPLING DATA FORM	Peer Environmental & Engineering Resources, Inc. 11 Peavey Road, Chaska, MN 55318 Phone: (612) 448-6775 Fax: (612) 448-6050
Project/Client Name: CMI	Project Number: 1041.01

Well Number: MW-1	**STABILIZATION TEST**						
Date Sampled: 12/26/91	No	Hours	Gallons	Temp°C	SC,umhos	pH, units	Bailers removed
Time Collected: 9:35 am	1	9:27	1.2	--	--	--	4
Sampling Order: 1/3	2	9:29	2.4	--	--	--	8
GENERAL DATA	3	9:31	3.7	--	--	--	12
Casing Diameter,in: 2	4	9:35	collected sample				
Static Depth,ft: 32.19	5						
Casing Length,ft: 39.69	6						
Well Volume*,gal: 1.22	7						
TOR Elev.,ft: 839.79	Maximum Result						
Water Elev.,ft: 807.60	Minimum Result						
Well Locked? Yes	Difference						

Key Number: 3876

Well Condition: Good

SAMPLE APPEARANCE

Color:Clear light brown

Phases: None

Odor: Petro odor, sheen

EQUIPMENT NOTES

•Disposable 1.6"x3' polyethylene bailer with new rope

•Solinst water level meter
•Kolor Kut product detecting paste

COMMENTS

Stabilization test not performed. Three well volumes purged prior to sample collection instead.

No free product detected with paste or observed in initial bailer volume removed.

Collected ground water sample MW-1:
- 6 - 40 ml vials with HCL
- 1 - 1 liter amber bottle

*Well Volume =
(casing length - static depth) x 0.163

Field Team: STJ/TEM	Form Completed by: STJ	Date Completed:12/26/91

MONITORING WELL SAMPLING DATA FORM	Peer Environmental & Engineering Resources, Inc. 11 Peavey Road, Chaska, MN 55318 Phone: (612) 448-6775 Fax: (612) 448-6050
Project/Client Name: CMI	Project Number: 1041.01

Well Number: MW-2	**STABILIZATION TEST**						
Date Sampled: 12/26/91	No	Hours	Gallons	Temp°C	SC,umhos	pH, units	Bailers removed
Time Collected:10:00 am	1	9:51	1.0	--	--	--	3.5
Sampling Order: 2/3	2	9:53	2.0	--	--	--	7.0
GENERAL DATA	3	9:56	3.0	--	--	--	10.5
Casing Diameter,in: 2	4	10:00	collected sample				
Static Depth,ft: 29.50	5						
Casing Length,ft: 35.69	6						
Well Volume*,gal: 1.0	7						
TOR Elev.,ft: 837.21	Maximum Result						
Water Elev.,ft: 807.71	Minimum Result						
Well Locked? Yes	Difference						

Key Number: 3876	**COMMENTS**
Well Condition: Good	Stabilization test not performed. Three well volumes purged prior to sample collection instead.
SAMPLE APPEARANCE	
Color:Clear-light brown	
Phases: None	
Odor: None	No free product detected with paste or observed in initial bailer volume removed.
EQUIPMENT NOTES	
•Disposable 1.6"x3' polyethylene bailer with new rope •Solinst water level meter •Kolor Kut product detecting paste	Collected ground water sample MW-2: • 6 - 40 ml vials with HCL • 1 - 1 liter amber bottle
	*Well Volume = (casing length - static depth) x 0.163

Field Team: STJ/TEM	Form Completed by: STJ	Date Completed:12/26/91

MONITORING WELL SAMPLING DATA FORM	Peer Environmental & Engineering Resources, Inc. 11 Peavey Road, Chaska, MN 55318 Phone: (612) 448-6775 Fax: (612) 448-6050
Project/Client Name: CMI	Project Number: 1041.01

Well Number: MW-3	**STABILIZATION TEST**						
Date Sampled: 12/26/91	No	Hours	Gallons	Temp°C	SC,umhos	pH, units	Bailers removed
Time Collected:10:30 am	1	10:15	1.3	--	--	--	4.5
Sampling Order: 3/3	2	10:18	2.6	--	--	--	9.0
GENERAL DATA	3	10:20	3.9	--	--	--	13.5
Casing Diameter,in: 2	4	10:30	collected sample				
Static Depth,ft: 32.58	5						
Casing Length,ft: 40.74	6						
Well Volume*,gal: 1.33	7						
TOR Elev.,ft: 840.29	Maximum Result						
Water Elev.,ft: 807.71	Minimum Result						
Well Locked? Yes	Difference						

Key Number: 3876

Well Condition:

SAMPLE APPEARANCE

Color: Light brown

Phases: None

Odor: None

EQUIPMENT NOTES

•Disposable 1.6"x3' polyethylene bailer with new rope

•Solinst water level meter
•Kolor Kut product detecting paste

COMMENTS

Stabilization test not performed. Three well volumes purged prior to sample collection instead.

No free product detected with paste or observed in initial bailer volume removed.

Collected ground water sample MW-3:
- 6 - 40 ml vials with HCL
- 1 - 1 liter amber bottle

*Well Volume =
(casing length - static depth) x 0.163

Field Team: STJ/TEM	Form Completed by: STJ	Date Completed:12/26/91

APPENDIX F

SLUG TEST DATA AND CALCULATIONS

SLUG TESTS

Slug tests were conducted to assist in evaluating aquifer properties, specifically hydraulic conductivity. The procedure used to conduct the slug tests is described in Appendix B. This appendix presents the field data and describes the data analysis performed.

Field data for slug-in tests of the wells are attached to this Appendix. The data were analyzed using the Bouwer and Rice method. This method is described in the following references: Bouwer, H., and Rice, R.C., 1976, "Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Partially Penetrating Wells": Water Resources Research, Volume 12, No. 2, P.423-428; Bouwer, H., 1989, "The Bouwer and Rice Slug Test - An Update": Groundwater, Volume 27, No. 3, p.304-309.

The Bouwer and Rice method is based on the following assumptions:

1. Drawdown of the water table around the well is negligible.

2. Flow above the water table (in the capillary fringe) can be ignored.

3. Head losses as water enters the well (well losses) are negligible.

4. The aquifer is homogeneous and isotropic.

Prior the calculation of hydraulic conductivity, a plot on semilogarithmic paper of water level recovery data (y) versus time (t) was constructed for each well. The plots are included at the end of this Appendix.

Hydraulic conductivity (k) was calculated using the following equation:

$$K = \frac{r_c^2 \ln (R_e/r_w)}{2L_e} \frac{1}{t} \ln \frac{y_o}{y_t}$$

Where:

r_c = Inside radius of well casing if the water level is above the perforated portion of the well.

L_e = Length of screened, perforated, or otherwise open section of well.

y = Vertical distance between water level in well and equilibrium (static) water table in aquifer.

R_e = Effective radius over which y is dissipated.

r_w = Radial distance of undisturbed portion of aquifer from centerline (well radius or radius of casing plus thickness of sand or gravel pack and/or developed zone).

y_o = Initial change in water level, y - intercept from graph.

y_t = Value of y at a specified time interval (t) from graph.

In order to use the previous equation the value of ln R_e/r_w was first determined using the following equation:

$$\ln \frac{R_e}{r_w} = \left[\frac{1.1}{\ln (L_w/r_w)} + \frac{A + B \ln [(H-L_w)/r_w]}{L_e/r_w} \right]^{-1}$$

Where:

L_w = Distance from depth of well to water table.

H = Thickness of aquifer.

A and B = Dimensionless coefficients that are functions of L/r_w and estimated from Figure 3 of Bouwer and Rice (1976).

The variables used in the above described equations and the calculated hydraulic conductivities are presented in Table 1 of this Appendix.

SLUG TEST DATA SHEET

Test Date: 12/26/91	Site: Former Mobil Service Station - Agate/CMI
Well No.: MW-1	Project No.: 1041.01
Initial Static Water Level (ft): 32.20	Field Person: STJ/TEM
Depth of Well (ft): 39.69	Slug Size/Type: 3' x 1.66"/PVC

Slug In Method			Slug Out Method		
Time (seconds)	Water Level Depth (feet)	Change in Water Level (feet)	Time (seconds)	Water Level Depth (feet)	Change in Water Level (feet)
TEST 1					
5	32.17	0.03			
10	32.19	0.01			
20	32.19	0.01			
30	32.20	0			
40	32.20	0			
TEST 2*					
10	32.16	0.04			
20	32.18	0.02			
30	32.19	0.01			
40	32.20	0			
50	32.20	0			
60	32.20	0			

Comments:

* = Data used for slug test calculations.

Peer Environmental & Engineering Resources, Inc.
11 Peavey Road
Chaska, Minnesota 55318
(612) 448-6775

TABLE 1
VARIABLES USED FOR SLUG TEST CALCULATIONS

VALUES USED			
Variable	MW-1	MW-2	MW-3
r_w (feet)	0.33	0.33	0.33
L_w (feet)	7.49	6.18	8.15
H (feet)	35	35	35
L_e/r_w	22.70	18.73	24.70
B	0.30	0.30	0.35
A	2.25	2.20	2.30
L_e (feet)	7.49	6.18	8.15
ln R_e/r_w	1.96	1.77	2.01
r_c (feet)*	0.194	0.194	0.194
t (seconds)	10	10	10
y_o (feet)	0.08	0.14	0.17
y_t (feet)	0.04	0.038	0.027
K (feet/sec)	3.41×10^{-4}	7.03×10^{-4}	8.54×10^{-4}
K (cm/sec)	1.04×10^{-2}	2.14×10^{-2}	2.60×10^{-2}

NOTES:

* = The r_c equivalent value was used in place of r_c to account for the porosity of the gravel pack around the well (see Bouwer and Rice, 1976 p.424).

SLUG TEST DATA SHEET

Test Date: 12/26/91	Site: Former Mobil Service Station - Agate/CMI
Well No.: MW-2	Project No.: 1041.01
Initial Static Water Level (ft): 29.51	Field Person: STJ/TEM
Depth of Well (ft): 35.69	Slug Size/Type: 3' x 1.66"/PVC

Slug In Method			Slug Out Method		
Time (seconds)	Water Level Depth (feet)	Change in Water Level (feet)	Time (seconds)	Water Level Depth (feet)	Change in Water Level (feet)
3	32.42	0.09			
10	32.47	0.04			
15	32.49	0.02			
20	32.50	0.01			
30	32.50	0.01			
35	32.505	0.005			
40	32.51	0			
50	32.51	0			

Comments:

Peer Environmental & Engineering Resources, Inc.
11 Peavey Road
Chaska, Minnesota 55318
(612) 448-6775

SLUG TEST DATA SHEET

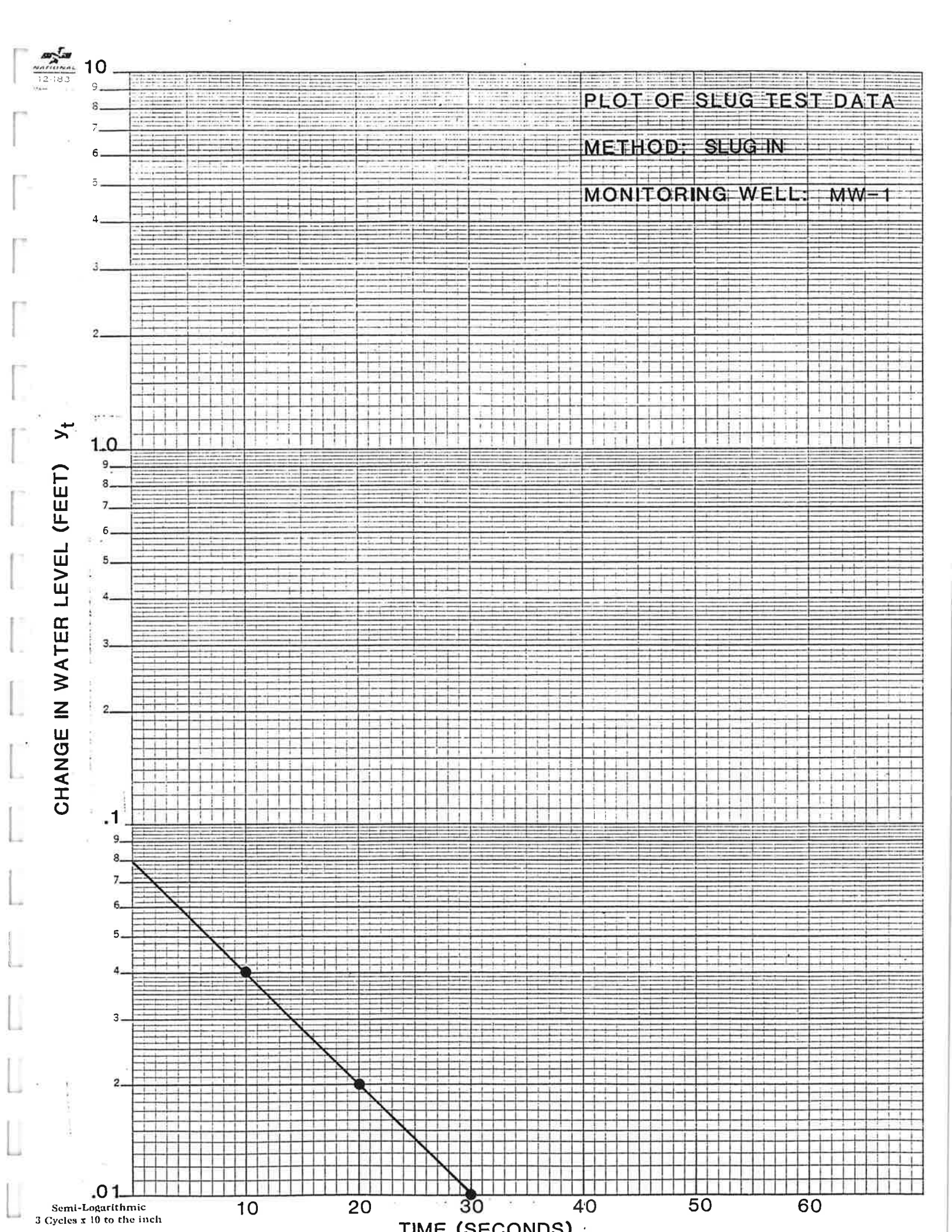
Test Date: 12/26/91	Site: Former Mobil Service Station - Agate/CMI
Well No.: MW-3	Project No.: 1041.01
Initial Static Water Level (ft): 32.59	Field Person: STJ/TEM
Depth of Well (ft): 40.74	Slug Size/Type: 3' x 1.66"/PVC

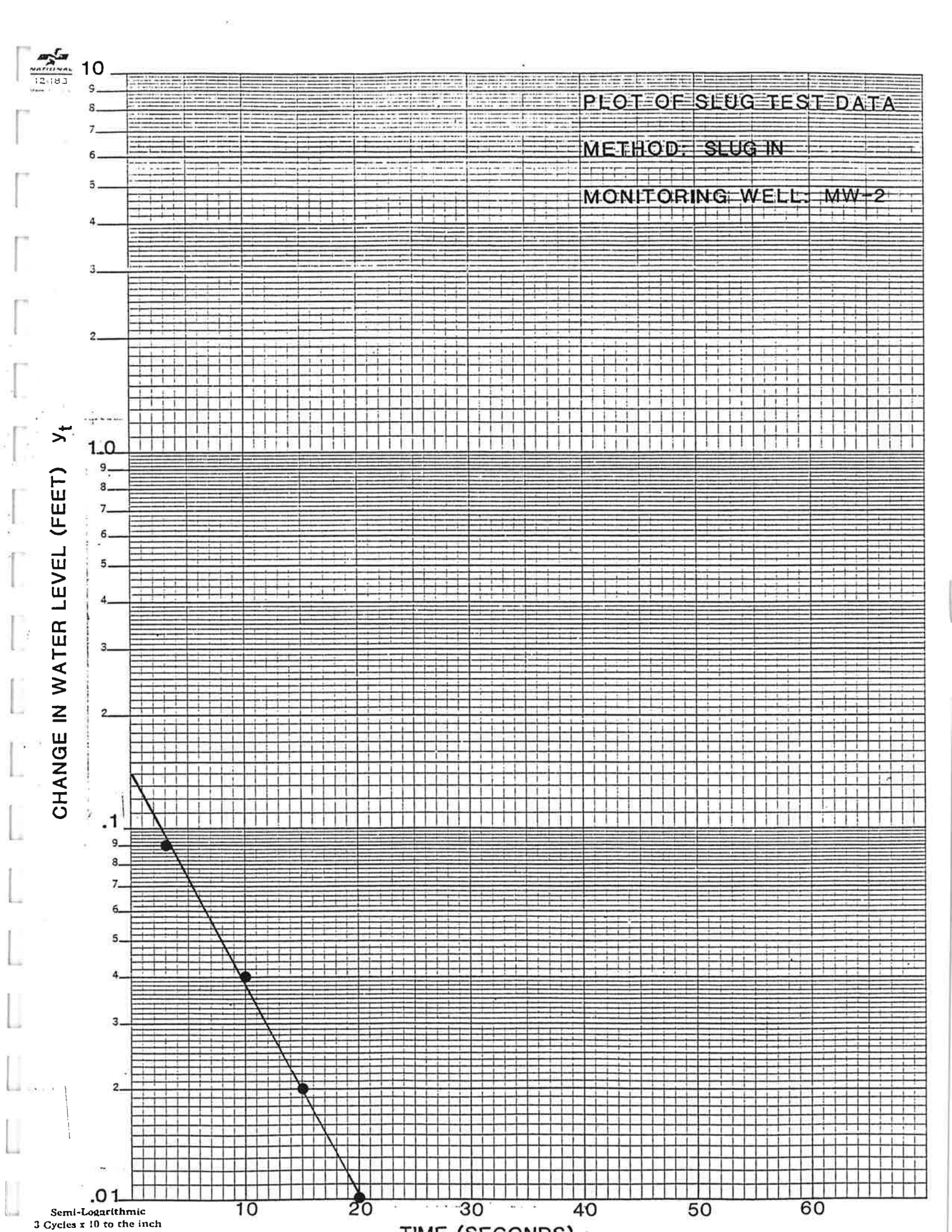
Slug In Method			Slug Out Method		
Time (seconds)	Water Level Depth (feet)	Change in Water Level (feet)	Time (seconds)	Water Level Depth (feet)	Change in Water Level (feet)
TEST 1					
7	32.58	0.01			
10	32.59	0			
20	32.59	0			
30	32.59	0			
40	32.59	0			
50	32.59	0			
60	32.59	0			
TEST 2*					
3	32.50	0.09			
10	32.56	0.03			
15	32.58	0.01			
20	32.59	0			
30	32.59	0			
40	32.59	0			
50	32.59	0			
60	32.59	0			

Comments:

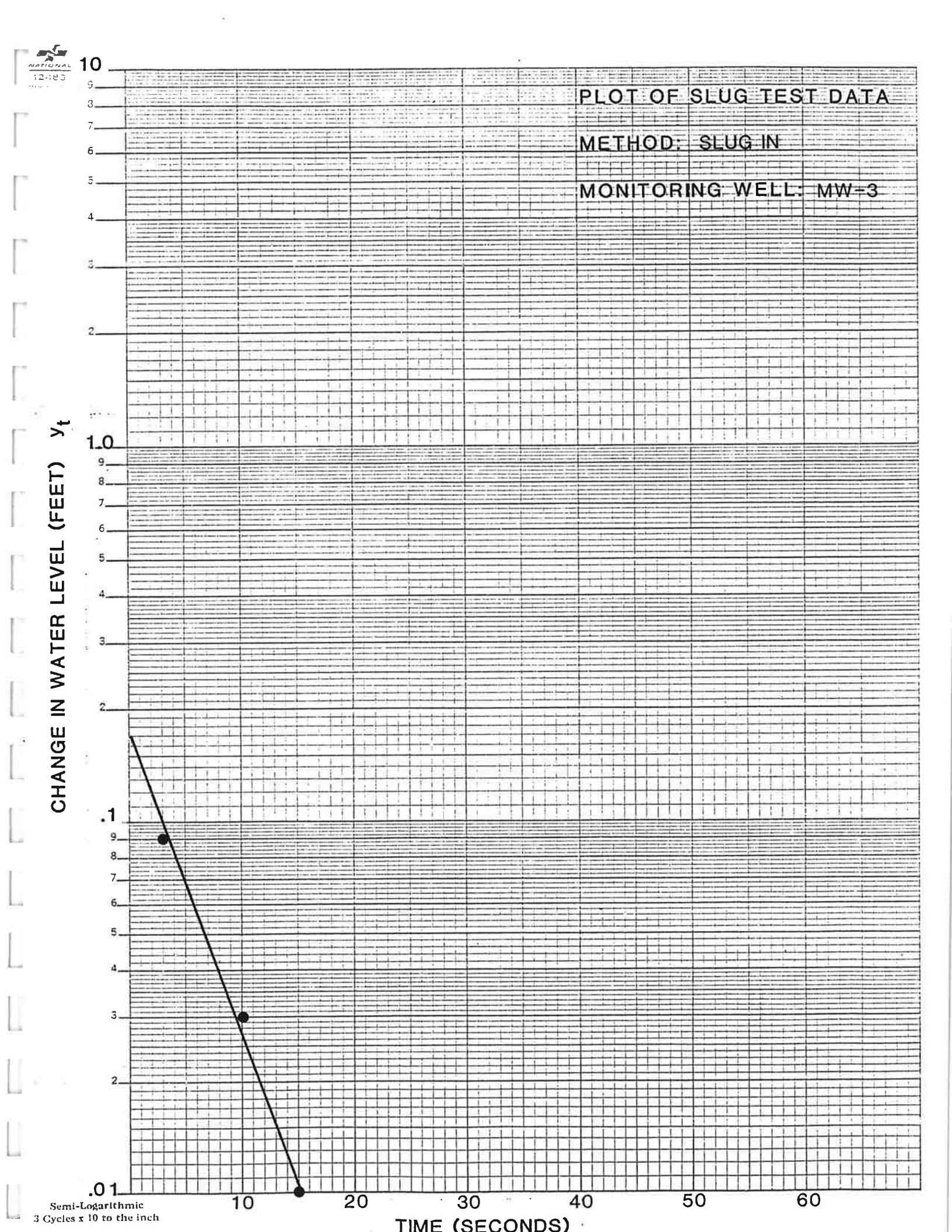
* = Data used for slug test calculations.

Peer Environmental & Engineering Resources, Inc.
11 Peavey Road
Chaska, Minnesota 55318
(612) 448-6775


PLOT OF SLUG TEST DATA
METHOD: SLUG IN
MONITORING WELL: MW-1
CHANGE IN WATER LEVEL (FEET) y_t
10
9
8
7
6
5
4
3
2
1.0
.1
.01
10
20
30
40
50
60
TIME (SECONDS)
Semi-Logarithmic
3 Cycles x 10 to the inch



Semi-Logarithmic
3 Cycles x 10 to the inch



Semi-Logarithmic
3 Cycles x 10 to the inch

APPENDIX G

LABORATORY ANALYTICAL REPORTS

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

REPORT OF: CHEMICAL ANALYSES

PROJECT: CMI - FORMER MOBIL, #1041.01 **DATE:** January 14, 1992

REPORTED TO: Peer Environmental
Attn: Steve Jansen
11 Peavey Road
Chaska, MN 55318

LABORATORY NO: 4410 92-0712

INTRODUCTION

This report presents the results of the analyses of three samples received on December 18, 1991, from a representative of Peer Environmental. The scope of our services was limited to the parameters listed in the attached tables.

METHODOLOGY

Analyses are performed according to Twin City Testing Standard Operating Procedures. The procedures are based on the references stated in the analytical results tables.

RESULTS

The results are listed in the attached tables.

REMARKS

The samples were collected on December 17 through December 18, 1991, and were consumed in the analyses.

TWIN CITY TESTING CORPORATION

Stephanie A. Kidder
Project Manager

Susan D. Max, Director
Laboratory Operations

SAK\SDM\clj

VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/Kg which is equal to parts-per-billion)

Client ID:	**P-1/S-8**	
TCT ID:	272512	
Parameter:		**PQL**
Benzene	ND	40
Toluene	ND	40
Ethyl benzene	ND	40
Total xylenes	ND	40
Surrogate Recovery:		
α,α,α-Trifluorotoluene	104%	
Total hydrocarbons as gasoline	31,000*	250
Surrogate Recovery:		
α,α,α-Trifluorotoluene	105%	
Date Analyzed:	12/20/91	

* Chromatographic profile is not typical of gasoline. Higher boiling hydrocarbons are detected.

PQL = Practical Quantitation Limit

ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, November 1986, 3rd Edition.

LABORATORY NO: 4410 92-0712

VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/Kg which is equal to parts-per-billion)

Client ID:	**P-1/S-7**	
TCT ID:	272513	
Parameter:		**PQL**
Benzene	ND	1,300
Toluene	ND	1,300
Ethyl benzene	ND	1,300
Total xylenes	ND	1,300
Surrogate Recovery:		
α,α,α-Trifluorotoluene	78%	
Total hydrocarbons as gasoline	450,000*	8,100
Surrogate Recovery:		
α,α,α-Trifluorotoluene	95%	
Date Extracted:	12/30/91	
Date Analyzed:	12/30/91	

* Chromatographic profile is not typical of gasoline. Higher boiling hydrocarbons are detected.

PQL = Practical Quantitation Limit

ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, November 1986, 3rd Edition.

LABORATORY NO: 4410 92-0712

VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/Kg which is equal to parts-per-billion)

Client ID:	**P-2/S-9**	
TCT ID:	272514	
Parameter:		**PQL**
Benzene	ND	5
Toluene	ND	5
Ethyl benzene	ND	5
Total xylenes	ND	5
Surrogate Recovery:		
α,α,α-Trifluorotoluene	104%	
Total hydrocarbons as gasoline	70*	30
Surrogate Recovery:		
α,α,α-Trifluorotoluene	110%	
Date Analyzed:	12/20/91	

* Chromatographic profile is not typical of gasoline.

PQL = Practical Quantitation Limit

ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, November 1986, 3rd Edition.

LABORATORY NO: 4410 92-0712

VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

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

Client ID: **Method Blank**

TCT ID:

Parameter:		**PQL**
Benzene	ND	5
Toluene	ND	5
Ethyl benzene	ND	5
Total xylenes	ND	5
Surrogate Recovery:		
α,α,α-Trifluorotoluene	104%	
Total hydrocarbons as gasoline	ND	30
Surrogate Recovery:		
α,α,α-Trifluorotoluene	107%	
Date Analyzed:	12/20/91	

PQL = Practical Quantitation Limit

ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, November 1986, 3rd Edition.

LABORATORY NO: 4410 92-0712

FUEL OIL RESULTS
USGS METHOD 82-1004

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

Sample Identification	TCT ID	Total Hydrocarbons as #2 Fuel Oil	Pentacosane Recovery (%)
P-1/S-8	272512	2.5	93
P-1/S-7	272513	100	97
P-2/S-9	272514	ND	116
Blank		ND	73
Spike		79% Recovery	104
Spike Duplicate		78% Recovery	117
Method Detection Limit		2.0	
Date Extracted:		12/23/91	
Date Analyzed:		12/26/91	

ND = Not Detected

Reference: Methods for the Determination of Organic Substances in Water and Fluvial Sediments, U.S. Geological Survey Techniques of Water-Resources Investigations, Book 5, Laboratory Analysis, Chapter A3.

Leaking Underground Fuel Tank (LUFT) Field Manual, California State Water Resources Control Board, Division of Water Quality, December 17, 1987.

LABORATORY NO: 4410 92-0712

twin city testing corporation

737 PELHAM AVENUE
DOCK 4
ST. PAUL, MN 55114
PHONE 612/659-7555

CHAIN-OF-CUSTODY RECORD

TCT NO. 34579

PEER ENVIRONMENTAL
CLIENT NAME
11 Peavey Rd.
CLIENT ADDRESS (STREET NUMBER, SUITE, ETC.)
Chaska, MN 55413
CLIENT ADDRESS (CITY, STATE, ZIP)

Thomas McMullen Thomas McMull
CLIENT CONTACT/ADDRESS IF DIFFERENT FROM ABOVE — PHONE
SAMPLED BY PRINT NAME/SIGNATURE

POSSIBLE HAZARD: YES X UNKNOWN ____ (COMMENT BELOW)

SAMPLE DISPOSAL: RETURN TO CLIENT ____ DISPOSAL BY LAB X
(ADDITIONAL CHARGES MAY BE ASSESSED)

Stephanie Kidder
TCT CONTACT
CMI – FORMER MOBIL
PROJECT NAME
1041.01
CLIENT P.O. # / PROJECT NO.
PEER ENV.
BILL TO (CO. NAME, ADDRESS)
Steve Jansen
REPORT TO

TCT USE ONLY	
PROJ. MGR.	stephanie
PRIORITY	Normal
INVOICE #	4410 92-0712
JOB NAME	Peer.33
CUSTODY SEAL INTACT/NUMBER Y/N	NA
TEMPERATURE OF CONTAINER	Room temp
SAMPLE CONDITION	O.K.

PREPAY Y/N	NO
CHECK NO.	
CHECK AMOUNT	

ANALYSES REQUEST

FILTERED (YES/NO)
PRESERVED (CODE)
REFRIGERATED (Y/N)

CODE A - NONE
B - HNO_3
C - H_2SO_4
D - NaOH
E - HCl
F - ____

ITEM NO.	CLIENT SAMPLE ID.	MATRIX	DATE SAMPLED	TIME SAMPLED	TH as Gasoline (Y)	TH as Fuel Oil #2 (Y)	BETX (Y)	NO. OF CONTAINERS	CONTAINER TYPE	TCT NO.
1	P-1 /S-8	Soil	12-17-91		X	X	X	3	2-4oz. 1-8oz.	27512
2	P-1 /S-7	↓	12-17-91		X	X	X	3	2-4oz. 1-8oz.	27513
3	P-2 /S-10 9 as per S Johnson 12-20-91	↓	12-18-91		X	X	X	4	4-4oz.	27514
4										
5										
6										
7										
8										
9										
10										

Additional Comments

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
Thomas M. Mull	12-18-91	5:10	[illegible]	12/18	5:10 pm

* SEE REVERSE SIDE FOR INSTRUCTIONS

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

REPORT OF: CHEMICAL ANALYSES

PROJECT: CMI/FORMER MOBIL, #1041.01

DATE: January 17, 1992

REPORTED TO: Peer Environmental
Attn: Steve Jansen
11 Peavey Road
Chaska, MN 55318

LABORATORY NO: 4410 92-0761

INTRODUCTION

This report presents the results of the analyses of four samples received on December 26, 1991, from a representative of Peer Environmental. The scope of our services was limited to the parameters listed in the attached tables.

METHODOLOGY

Analyses are performed according to Twin City Testing Standard Operating Procedures. The procedures are based on the references stated in the analytical results tables.

RESULTS

The results are listed in the attached tables.

REMARKS

The samples were collected on December 26, 1991, and were consumed in the analyses.

TWIN CITY TESTING CORPORATION

Stephanie A. Kidder
Project Manager

Susan D. Max, Director
Laboratory Operations

SAK\SDM\tlv

VOLATILE ORGANIC COMPOUNDS
MNDH METHOD 465C

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

Client ID: **MW-1**

TCT ID: 272951

Compound:		**MDL**
Acetone	ND	500
Ethyl ether	ND	250
Benzene	ND	50
Toluene	7,000	50
Cumene	97	50
o-Xylene	2,600	50
p-m-Xylenes[1]	5,200	50
Tetrahydrofuran	ND	500
Methyl ethyl ketone	ND	250
Ethyl benzene	2,400	50
Methyl isobutyl ketone	ND	250
Chloromethane	ND	100
Vinyl chloride	ND	100
Chloroethane	ND	100
Methylene chloride	300	50
Allyl chloride	ND	500
1,1-Dichloroethane	ND	50
Cis-1,2-dichloroethylene	ND	50
1,2-Dichloroethane	ND	50
1,1,1-Trichloroethane	ND	50
Bromodichloromethane	ND	50
1,1-Dichloro-1-propene	ND	50
Trichloroethylene	ND	50
Dibromochloromethane	ND	50
Cis-1,3-dichloro-1-propene	ND	50
1,1,1,2-Tetrachloroethane	ND	50
1,1,2,2-Tetrachloroethane	ND	50

(continued)

[1]Compounds not separated by this method.

MDL = Method Detection Limit

ND = Not Detected

LABORATORY NO: 4410 92-0761

VOLATILE ORGANIC COMPOUNDS (continued)
MNDH METHOD 465C

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

Client ID: **MW-1**

TCT ID: 272951

Compound:		**MDL**
1,1,2-Trichlorotrifluoroethane	ND	50
Dichlorodifluoromethane	ND	100
Bromomethane	ND	100
Dichlorofluoromethane	ND	100
Trichlorofluoromethane	ND	100
1,1-Dichloroethylene	ND	50
Trans-1,2-Dichloroethylene	ND	50
Chloroform	ND	50
Dibromomethane	ND	250
Carbon tetrachloride	ND	50
1,2-Dichloropropane	ND	50
Trans-1,3-dichloro-1-propene	ND	50
1,3-Dichloropropane	ND	50
1,1,2-Trichloroethane	ND	50
1,2-Dibromoethane	ND	50
Bromoform	ND	250
1,2,3-Trichloropropane	ND	50
Tetrachloroethylene	ND	50
Chlorobenzene	ND	50
1,2-Dichlorobenzene	ND	50
1,3-Dichlorobenzene	ND	50
1,4-Dichlorobenzene	ND	50
Date Analyzed:	1/8/92 1/9/92	

MDL = Method Detection Limit

ND = Not Detected

Reference: Minnesota Department of Health, Method 465C.

LABORATORY NO: 4410 92-0761

VOLATILE ORGANIC COMPOUNDS
MNDH METHOD 465C

(All values are in µg/L which is equal to parts-per-billion)

Client ID:	**MW-2**	**MW-3**	**Trip Blank**	
TCT ID:	272952	272953	272954	
Compound:				**MDL**
Acetone	ND	ND	ND	10
Ethyl ether	ND	ND	ND	5
Benzene	ND	ND	ND	1
Toluene	ND	ND	ND	1
Cumene	ND	ND	ND	1
o-Xylene	ND	ND	ND	1
p-m-Xylenes[1]	ND	ND	ND	1
Tetrahydrofuran	ND	ND	ND	5
Methyl ethyl ketone	ND	ND	ND	5
Ethyl benzene	ND	ND	ND	1
Methyl isobutyl ketone	ND	ND	ND	5
Chloromethane	ND	ND	ND	2
Vinyl chloride	ND	ND	ND	2
Chloroethane	ND	ND	ND	2
Methylene chloride	6	4	3	1
Allyl chloride	ND	ND	ND	10
1,1-Dichloroethane	ND	ND	ND	1
Cis-1,2-dichloroethylene	ND	ND	ND	1
1,2-Dichloroethane	ND	ND	ND	1
1,1,1-Trichloroethane	ND	ND	ND	1
Bromodichloromethane	ND	ND	ND	1
1,1-Dichloro-1-propene	ND	ND	ND	1
Trichloroethylene	ND	ND	ND	1
Dibromochloromethane	ND	ND	ND	1
Cis-1,3-dichloro-1-propene	ND	ND	ND	1
1,1,1,2-Tetrachloroethane	ND	ND	ND	1
1,1,2,2-Tetrachloroethane	ND	ND	ND	1

(continued)

[1]Compounds not separated by this method.

MDL = Method Detection Limit

ND = Not Detected

LABORATORY NO: 4410 92-0761

VOLATILE ORGANIC COMPOUNDS (continued)
MNDH METHOD 465C

(All values are in µg/L which is equal to parts-per-billion)

Client ID:	**MW-2**	**MW-3**	**Trip Blank**	
TCT ID:	272952	272953	272954	
Compound:				**MDL**
1,1,2-Trichlorotrifluoroethane	ND	ND	ND	1
Dichlorodifluoromethane	ND	ND	ND	2
Bromomethane	ND	ND	ND	2
Dichlorofluoromethane	ND	ND	ND	2
Trichlorofluoromethane	ND	ND	ND	5
1,1-Dichloroethylene	ND	ND	ND	1
Trans-1,2-Dichloroethylene	ND	ND	ND	1
Chloroform	2	ND	ND	1
Dibromomethane	ND	ND	ND	5
Carbon tetrachloride	ND	ND	ND	1
1,2-Dichloropropane	ND	ND	ND	1
Trans-1,3-dichloro-1-propene	ND	ND	ND	1
1,3-Dichloropropane	ND	ND	ND	1
1,1,2-Trichloroethane	ND	ND	ND	1
1,2-Dibromoethane	ND	ND	ND	1
Bromoform	ND	ND	ND	5
1,2,3-Trichloropropane	ND	ND	ND	1
Tetrachloroethylene	ND	ND	ND	1
Chlorobenzene	ND	ND	ND	1
1,2-Dichlorobenzene	ND	ND	ND	1
1,3-Dichlorobenzene	ND	ND	ND	1
1,4-Dichlorobenzene	ND	ND	ND	1
Date Analyzed:	1/8/92 1/9/92	1/8/92 1/9/92	1/8/92 1/9/92	

MDL = Method Detection Limit

ND = Not Detected

Reference: Minnesota Department of Health, Method 465C.

LABORATORY NO: 4410 92-0761

VOLATILE ORGANIC COMPOUNDS
MNDH METHOD 465C

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

Client ID: **Method Blank**

TCT ID: _____

Compound:		**MDL**
Acetone	ND	10
Ethyl ether	ND	5
Benzene	ND	1
Toluene	ND	1
Cumene	ND	1
o-Xylene	ND	1
p-m-Xylenes[1]	ND	1
Tetrahydrofuran	ND	10
Methyl ethyl ketone	ND	5
Ethyl benzene	ND	1
Methyl isobutyl ketone	ND	5
Chloromethane	ND	2
Vinyl chloride	ND	2
Chloroethane	ND	2
Methylene chloride	5	1
Allyl chloride	ND	10
1,1-Dichloroethane	ND	1
Cis-1,2-dichloroethylene	ND	1
1,2-Dichloroethane	ND	1
1,1,1-Trichloroethane	ND	1
Bromodichloromethane	ND	1
1,1-Dichloro-1-propene	ND	1
Trichloroethylene	ND	1
Dibromochloromethane	ND	1
Cis-1,3-dichloro-1-propene	ND	1
1,1,1,2-Tetrachloroethane	ND	1
1,1,2,2-Tetrachloroethane	ND	1

(continued)

[1]Compounds not separated by this method.

MDL = Method Detection Limit

ND = Not Detected

VOLATILE ORGANIC COMPOUNDS (continued)
MNDH METHOD 465C

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

Client ID: **Method Blank**

TCT ID: _____

Compound:		**MDL**
1,1,2-Trichlorotrifluoroethane	ND	1
Dichlorodifluoromethane	ND	2
Bromomethane	ND	2
Dichlorofluoromethane	ND	2
Trichlorofluoromethane	ND	2
1,1-Dichloroethylene	ND	1
Trans-1,2-Dichloroethylene	ND	1
Chloroform	ND	1
Dibromomethane	ND	5
Carbon tetrachloride	ND	1
1,2-Dichloropropane	ND	1
Trans-1,3-dichloro-1-propene	ND	1
1,3-Dichloropropane	ND	1
1,1,2-Trichloroethane	ND	1
1,2-Dibromoethane	ND	2
Bromoform	ND	5
1,2,3-Trichloropropane	ND	1
Tetrachloroethylene	ND	1
Chlorobenzene	ND	1
1,2-Dichlorobenzene	ND	1
1,3-Dichlorobenzene	ND	1
1,4-Dichlorobenzene	ND	1
Date Analyzed:	1/8/92	

MDL = Method Detection Limit

ND = Not Detected

Reference: Minnesota Department of Health, Method 465C.

LABORATORY NO: 4410 92-0761

VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

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

Client ID:	**MW-1**	
TCT ID:	272951	
Parameter:		**PQL**
Total hydrocarbons as gasoline	42,000	750
Surrogate Recovery:		
α,α,α-Trifluorotoluene	82%	
Date Analyzed:	1/7/92	

PQL = Practical Quantitation Limit

ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, November 1986, 3rd Edition.

LABORATORY NO: 4410 92-0761

VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

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

Client ID:	**MW-2**	**MW-3**	**Method Blank**	
TCT ID:	272952	272953		
Parameter:				**PQL**
Total hydrocarbons as gasoline	ND	ND	ND	30
Surrogate Recovery:				
α,α,α-Trifluorotoluene	88%	89%	95%	
Date Analyzed:	1/7/92	1/7/92	1/7/92	

PQL = Practical Quantitation Limit

ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, November 1986, 3rd Edition.

LABORATORY NO: 4410 92-0761

FUEL OIL RESULTS
USGS METHOD 82-1004

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

Sample Identification	TCT ID	Total Hydrocarbons as #2 Fuel Oil	Pentacosane Recovery (%)
MW-1	272951	ND*	104
MW-2	272952	ND	107
MW-3	272953	ND	115
Blank		ND	114
Spike		85% Recovery	118
Spike Duplicate		81% Recovery	116
Method Detection Limit		0.2	
Date Extracted:		1/2/92	
Date Analyzed:		1/2/92	

* Chromatographic profile is not typical of #2 fuel oil. Lower boiling hydrocarbons are present.

ND = Not Detected

Reference: Methods for the Determination of Organic Substances in Water and Fluvial Sediments, U.S. Geological Survey Techniques of Water-Resources Investigations, Book 5, Laboratory Analysis, Chapter A3.

Leaking Underground Fuel Tank (LUFT) Field Manual, California State Water Resources Control Board, Division of Water Quality, December 17, 1987.

LABORATORY NO: 4410 92-0761

twin city testing corporation

737 PELHAM AVENUE
DOCK 4
ST. PAUL, MN 55114
PHONE 612/649-5555

CHAIN-OF-CUSTODY RECORD ✓

TCT NO. 32456

STEPHANIE KIDDER
TCT CONTACT

CMI / FORMER MOBIL
PROJECT NAME

1041.01
CLIENT P.O. # / PROJECT NO.

PEER
BILL TO (CO. NAME, ADDRESS)

STEVE JANSEN
REPORT TO

PEER ENVIRONMENTAL
CLIENT NAME

11 PEAVEY ROAD CHASKA 55318
CLIENT ADDRESS

STEVE JANSEN 448-6775
CLIENT CONTACT/ADDRESS IF DIFFERENT FROM ABOVE PHONE

STEVE JANSEN / Steve Jansen
SAMPLED BY PRINT NAME/SIGNATURE

12/26/91
DATE/TIME SAMPLED

POSSIBLE HAZARD: YES X UNKNOWN ____ (COMMENT BELOW)

SAMPLE DISPOSAL: RETURN TO CLIENT ____ DISPOSAL BY LAB X
(ADDITIONAL CHARGES MAY BE ASSESSED)

TCT USE ONLY	
PROJ. MGR.	Stephanie
PRIORITY	Normal
INVOICE #	7410 92-0761
JOB NAME	Peer, 36
CUSTODY SEAL INTACT/NUMBER Y/N	N/A
TEMPERATURE OF CONTAINER	
SAMPLE CONDITION	Good

PREPAY Y/N	NO
CHECK NO.	
CHECK AMOUNT	

ANALYSES REQUEST

CODE A - NONE
B - HNO_3
C - H_2SO_4
D - NaOH
E - HCl
F - ____

ITEM NO.	CLIENT SAMPLE ID.	MATRIX	NO. OF CONTAINERS	CONTAINER TYPE	FILTERED (YES/NO)										REMARKS	TCT NO.
					PRESERVED (CODE)	NO A	NO E	NO E								
					REFRIGERATED (Y/N)	Y	Y	Y								
					TH as #2 Fuel Oil	TH as Gasoline	Volatiles (by 8260)									
1	MW-1	W	7	6-40ml / 1-L	✓	✓	✓									272951
2	MW-2	W	7	"	✓	✓	✓									272952
3	MW-3	W	7	"	✓	✓	✓									272953
4	TRIP BLANK	W	1	1-40ml			✓									272954
5																
6																
7																
8																
9																
10																

Additional Comments

STANDARD TURNAROUND TIME

ITEM NO.	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
1-4	Thomas N. Mill / PEER		12/26/91	12:24
		Cheryl J. Klein	12/26	12:24 PM

APPENDIX H

WATER WELL LOGS

RECEIVED

FEB 25 1985

Division of Waters

~236027

FEB 14 1985

REPORT

P.A. 55-[illegible]

Permit 76-0070

Tack

Well No. 430 Green

Town Apple

Date Started 3/24/76 Machine No. State Minn.

Date Completed 3/31/76 Owner T. & P. Railway Co.

Location 3412 E 442 ST Total Depth of Well 364

DIAMETER OF HOLE	16"	12			
Top of Pipe above / below Surface					
Bottom of Pipe below Surface	57	253'			
No. of Ft. of Pipe in the Hole					
No. of Ft. of Hole Drilled	255'				

TEST	1	2	3	4
Depth of the Hole	364			
Depth to Water at Rest	42			
Depth to Water Pumping	126'			
Depth of Pump Pipe				
Gallons per minute	500			
Will well supply more?	yes			
Was Strainer in Hole?				
Was water clear?	yes			
Was well pumping sand?	Very little			
Hours Pumping				

FORMATION	Thickness	Depth
Fill - Cinders & Gravel PLWF	2	2
Clay - yellow QTUU	5	7
Sand - silty QTUU	16	23
Clay - blue QTUU	5	28
Sand & Gravel QTUU	17	45
Sand, Gravel, Shale & Bldrs LR QFUU	13	58
Plat. LR OPUL	18	76 T/75
St. Peter SR. Shaley OSTP	50	126
St Peter SR. OSTP	62	188
" " Shaly OSTP	7	195
Shale blue OSTP	13	208
St. Peter SR Shaly OSTP	32	240
Shakopee LR OPdc	124	364

STRAINER		
Make		
Type of Metal		
Diameter O. D.		
Diameter I. D.		
Total Length		
Number		
Top of Screen below Surface		
No. of Ft. Exposed		
Bottom of Screen below Surface		
Was Str. swedged		
Did Sand come thru Str.		
Was Str. coarse enough		
Style of Fittings		

All measurements taken from Casing 254' - 294 - 297 - 301 - 310
312 - 324 - 334

1/18/71 - sent appropriation & Water report

2/13/85 - Copy sent to [illegible] Dept. Natural Resources

Well, 1: (Co. Rd. 4 - 554 ac

28-23-7 CACACA

elev. 832 ±5'

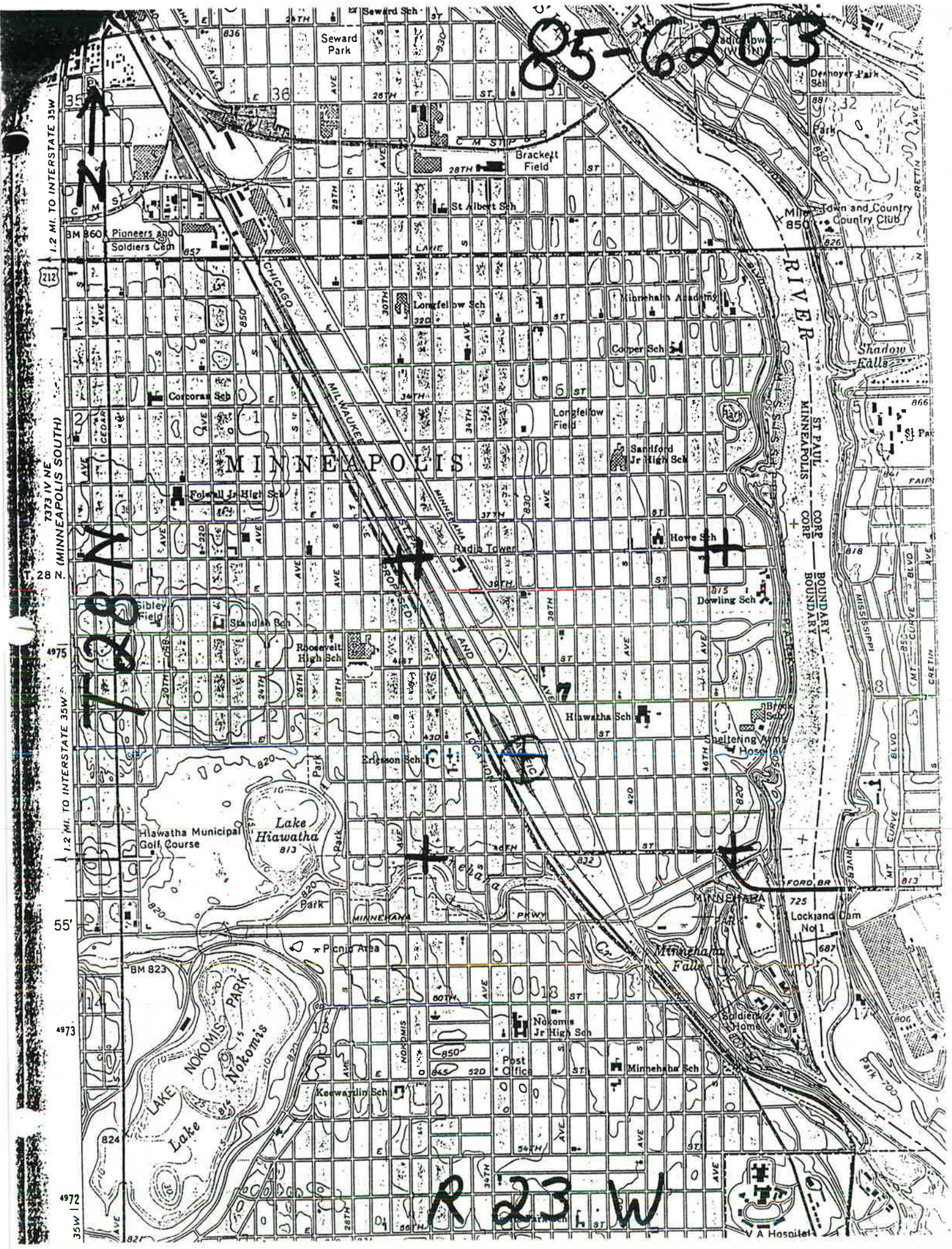
103-B

28.23.7 Ca

832
-76
756

LOCATED BY

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


85-6203
T. 28 N.
R 23 W
MINNEAPOLIS
RIVER
MINNEAPOLIS — ST PAUL CORP BOUNDARY
CHICAGO MILWAUKEE & ST PAUL R.R.
PROPOSED LOCATION
Seward Park
Seward Sch
Bracket Field
St Albert Sch
Pioneers and Soldiers Cem
BM 860
Town and Country Country Club
Minnehaha Academy
Longfellow Sch
Cooper Sch
Corcoran Sch
Longfellow Field
Sanford Jr High Sch
Folwell Jr High Sch
Radio Tower
Howe Sch
Dowling Sch
Sibley Field
Standish Sch
Roosevelt High Sch
Hiawatha Sch
Brook Sch
Sheltering Arms Hospital
Ericsson Sch
Hiawatha Municipal Golf Course
Lake Hiawatha
Minnehaha Park
Minnehaha Falls
Lockland Cem No 1
Picnic Area
BM 823
Nokomis Jr High Sch
Minnehaha Sch
Post Office
Keewaydin Sch
Soldiers Home
V A Hospital
Shadow Falls
1.2 MI. TO INTERSTATE 35W
7373 IV NE (MINNEAPOLIS SOUTH)
1.2 MI. TO INTERSTATE 35W

MINNESOTA CONSERVATION DEPARTMENT
DIVISION OF WATERS

P. 35, 1B

DOT-172

WELL LOG STATEMENT

200605

File No. 88

Well No. 28.23.7 ddd

Henn. Co. 28 (23 ddd)

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

Location of Well 3800 E - 46th St So by Hiawatha Minneapolis

County: Hennepin — City or Town

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

Locate Well on Plat of Section

103-B

Sec. 7

Twp. 28N

Range 22W

Owner Pete Peterson

Address 3800 - E 46th St.

Driller P.A. Desrochers

Address 3431 - Cannon Ave SW

Date of Completion Summer 1955

Site Upland

Upland, Valley, Hillside, Etc.

Type of Well Drilled

Dug, Driven, Bored, Drilled

Drill Rig Used Acme Portable

Solid Tool, Jet, Rotary

Diameter: Top 5" Bottom 5"

Depth of Well 70 ft

Ground Elevation 832

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

Height of Casing Above Ground

Quality of Water Good

(Hard or Soft, Fresh or Salty, Etc.)

Temperature of Water

Was Laboratory Analysis Made? yes USGS 1960 - see other water sheet

For What Purpose Will Water Be Used? Domestic

Is Well Pumped? yes Pump Capacity 10 GPM

Was Well Sealed on Completion? yes

Does Well Overflow Without Pumping? no

Yes or No

Natural Flow GPM

What Pressure, or Head, at Ground Level?

Principal Aquifer Penetrated

REPORT OF FINAL PUMPING TEST

Date of Test Summer 1955

Duration of Test 1 Hrs. Min.

Rate of Pumping 30 GPM

Static Water Level 21 Ft. (701)

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.

RECEIVED
FEB 14 1956
DIVISION OF WATERS

COUNTRY CLUB THERE NW

OK

HENNEPIN CO.
28-23-7
CDDDCB
Elev. 832±5

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

CODED

26

WELL LOG

Geologic Formations Kind, Color, Hard or Soft	Thickness of Formation	Depth in Feet From	Depth in Feet To	Casing Diam.	Water Conditions Found
Recent Gravel	45	0	45	5"	QFUV SAND, GRVL
Pierre Shale	27	45	72	5"	OPVL LMSN
Aquifer unknown					Aq. OPVL-ORVL
No casing record					

Indicate Size, Type, & Location of Any Screens, Gravel Packs, Grouting, or Other Development

State of Minnesota)
) ss.
County of _____)

_____ being first duly sworn, deposes and says, that the above well was constructed by him or under his supervision, and that he is personally familiar with the data presented in this statement, and that he hereby verifies that it is true and correct.

Subscribed and Sworn To Before Me

_____ Day of _____ 19___

Verification Rec'd 2-14-96 DM

Public _____ County, Minn.

(Firm Name) _____

By _____

Title _____

Mpls. Water Dept. data

200606 * (103-B) OT-132

SPW

P. 34, 5C

HENNEPIN CO

~~28-23-18~~

~~[illegible]~~

~~Elev. [illegible]~~

ACACBC OK

Minneapolis:

Longfellow Park Well. 39th & [illegible] 28'

Formation	Code		Thickness	Depth
~~Ground Surface~~ ~~Drift~~ Elevation				811
Platteville Ls.	OPVL	LMSN	36	800
St. Peter SS	OSTP	SNDS	153	764
Shakopee Dol.	OPDC		125	611
Jordan SS	CJDN	SNDS	80	486
St. Lawrence Sh.	CSLF	SH	198	406
~~Dresbach~~ Franconia SS	CTGL	SNDS	70	208
Shale	CECR	SHLE	58	138
				80
			731'	

Mpls. Par. Board. Eng. Dept. Norling.

28-23-18 ACACBC

elev. 811±5'

103-B

Aquifer unknown

No casing record

STATE OF MINNESOTA
DEPARTMENT OF HEALTH

WATER WELL RECORD

Minnesota Statutes 156A.01-.09

MINNESOTA UNIQUE WELL NO.
for Water Supply

a355546

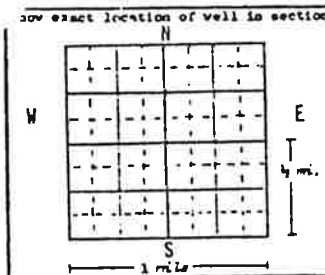
1. LOCATION OF WELL

County Name	Fraction	Section Number	Township Number	Range Number
Hennepin	¼ ¼ ¼	1	28 N. or S.	24 E. or W.

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

3. PROPERTY OWNER'S NAME
Address Nile Theater

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



28-24-1 CDD CCB
elev. 835±5
103-B

4. WELL DEPTH (completed) 379 ft. Date of Completion ?

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 Ind.
2 Irrigation 5 Air Conditioning X Cmrc
3 Test Well 6 _____

2. FORMATION LOG	COLOR	HARDNESS OF FORMATION	FROM	TO
drift			0	40
Platteville			40	60
Glenwood			60	65
ST. Peter			65	225
Prairie du Chien			225	352
Jordan			352	379
log from interpretation of borehole geophysics GAMMA	Logged	6-20-83		

CODED

Use a second sheet, if needed.

7. CASING DIAM. Threaded 1 Welded 2
Black 2 Galv. 2
10 in. to 143 ft. depth
_____ in. to _____ ft. depth
_____ in. to _____ ft. depth
HEIGHT: Above/Below
Surface _____
Weight _____
Drive Shoe? Yes ___

8. SCREEN Or open hole
Make _____ from _____ ft. to _____
Type _____ Dia. _____
Slot/Gauze _____ Length _____
Set between _____ ft. and _____ ft.
_____ ft. and _____ ft.
_____ ft. and _____ ft.
FITTINGS:

9. STATIC WATER LEVEL
_____ ft. below land surface above 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 _____
Depth: from _____ ft. to _____ ft.
from _____ ft. to _____ ft.

13. Nearest source of possible contamination
_____ feet _____ direction _____
Well disinfected upon completion? Yes No

14. PUMP
Date installed _____
Not installed
Manufacturer's Name _____
Model Number _____ HP _____ Volts ___
Length of drop pipe _____ ft. capacity _____
Material of drop pipe _____
Type: 1 Submersible 3 L.S. Turbine 5 Reciprocat
2 Jet 4 Centrifugal 6 _____

15. REMARKS, ELEVATION, SOURCE OF DATA, etc.
gamma log available
well abandoned (sealed)

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
Address
Signed _____ Date _____
(Authorized Representative)

A

200601

d 4pls
Water Dept. data

ST. PAUL WEST QUAD
P. 34, 5A

DOT-129

HENNEPIN CO.
28-23-6
CAA CBB
Elev. 831±5

~~750~~ 200601 *

103-B

Longfellow Field 28-23-6 CAAC CENTER 188
26 Ave S. + 29 St
ELEV 839.5

surf = 130.
709 5
539.5
45.
794.5

24
16
5
45 to Shale

CODED

0-45 DRIFT PLTS DRIFT
45 SHALE OPVL LMSN. SHLE

Softer

TENTATIVE
OK

Aquifer unknown
No casing record

CODED

APPENDIX I

HYDROGEOLOGIC SETTING AND GROUND WATER CONTAMINATION CHARACTERIZATION WORKSHEET

Hydrogeologic Setting and Ground Water Contamination Characterization
Petroleum Release Sites
Former Mobil Service Station
4201 Hiawatha Avenue
Minneapolis, Minnesota
MPCA Leak No. 1485

Minnesota Pollution Control Agency
Tanks and Spills Section
May 1991
(Form re-typed by Peer Environmental & Engineering Resources, Inc.)

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 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?*

   Middle terrace sand deposits. Saturated thickness estimated to be 20-30 feet. Lateral extent defined on the northwest quadrant of the site, undefined to the west beneath Hiawatha Avenue. (see Figures 2 and 3)

At all sites with ground water monitoring wells, the RI must include an estimated 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 (K), effective porosity (n), hydraulic gradient (i), estimated ground water velocity (v) and flow direction in the impacted unit?*

   Hydraulic Conductivity calculated from slug tests in 3 monitoring wells. Range in $K = 1.04 \times 10^{-2}$ cm/sec to 2.60×10^{-2} cm/sec; Average $K = 1.93 \times 10^{-2}$ cm/sec = 55 feet/day. Estimated n = 0.2 - 0.3. Measured i = 0.0013. Calculate $v = K\,i\,(n^{-1})$ = 0.24 - 0.36 feet/day. Flow direction is to the west-southwest.

3. *What is the maximum concentration of benzene and total hydrocarbons detected on the site? (parts per billion [ppb] units)*

Benzene **N.D. (MDL = 50 ug/L)** *Total Hydrocarbons* **42,000 ug/L**

(Well No. **1**, *Date* **12/26/91**) *(Well No.* **1**, *Date* **12/26/91**)

Benzene was N.D. (MDL = 1 ug/L) for MW-2 and MW-3

4. *What is the maximum concentration of benzene and total hydrocarbons detected at or beyond the property boundary? (ppb units)* **MW-1 is near the northwest property corner. No wells installed beyond the property boundary.**

Benzene _____ *Total Hydrocarbons* _____
(Well No. ___, *Date* _____) *(Well No.* ___, *Date* _____)

5. *Do contaminant concentrations for any compound exceed the Recommended Allowable Limits (RALs), at, or beyond the site boundaries?* **Yes**

Compound **Ethyl Benzene, Methylene Chloride, Toluene**
(Well No. **1**, *Date* **12/26/91**)

6. *Do sources of contamination (including contaminated soil) remain at the site? (Yes/No) If Yes, briefly describe.* **Yes. A limited amount of contaminated soil was left in place. (see Excavation Report).**

7. *Is municipal water supply available at the site and within one mile downgradient of the site?* **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?* **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?* **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 one 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?* **No**

11. *Does the plume currently discharge to surface water? 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.)* **No**

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 Minnesota Rules Chapter 7050, and reported.

12. *Does the plume have a projected point of entry to surface water? (Yes/No) If Yes, what is the distance from the downgradient edge of the plume to the surface water body?* **No**

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?* **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?* **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?* **St. Peter Sandstone. Depth to top of the St. Peter Sandstone estimated to be 78-90 feet. An unconfined water table is estimated to occur in the St. Peter Sandstone at a depth of 94 feet (elevation 744).**

16. *Is there a confining unit between the impacted unit and the uppermost drinking water aquifer? What is its thickness and extent?* **Yes, the Platteville Limestone bedrock formation and possibly a till layer over bedrock. The till if present is probably no greater than 10 feet thick. The Platteville limestone is estimated to range from 18-44 feet thick.**

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?* **No**

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.* **Based on the presence of a confining layer, and that removal of the primary source (tanks) and substantial removal of the secondary source (contaminated soil) of contamination has been performed, the risk of cross contamination appears low.**