

**MINNESOTA POLLUTION CONTROL AGENCY
TANKS AND SPILLS SECTION
PETROLEUM TANK RELEASE REPORT**

Report Taken By: Wise/SJM Date/Time Occurred: _____
 Date/Time Reported: 9/25/92 Date/Time Discovered: 9/24/92
 LEAK# 5708 PROJECT MANAGER: JME USTIS# 13353

CALLER
 Name: Dave Rybak
 Phone: 788 6577
 Relationship to site: Rybak Excavating

SITE
 Name: Falls Superette
 Street: 5000 Hiawatha Ave S
 City: Minneapolis Zip: 55417
 County: Hennepin Region: 3

TANK OPERATOR
 Name: _____
 Street: _____
 City: _____ Zip: _____
 Contact Person: _____
 Phone: _____
volunteer →

Own tanks/product/property?
 Share in profits?
 Control over inventory, maintenance and tank decisions?

TANK OWNER
 Name: City of Mpls / Dept. of Inspections
 Street: 250 South 4th St Suite #300
 City: Minneapolis St.: MN Zip: 55415
 Contact Person: Don Thompson
 Phone: 673-5800

| | | |
|---|--|------------------------------------|
| SITUATION Material Released/Amount: <u>Gas</u> | Source of Release: <u>USTs</u> | Release Discovery: _____ |
|---|--|------------------------------------|

TANK INFORMATION

| Contents | Size | Age | Removed | Condition | Registered |
|--------------------|-------------|-------|------------|-------------|------------|
| <u>Gasoline</u> | <u>8000</u> | _____ | <u>yes</u> | <u>good</u> | <u>yes</u> |
| <u>Gasoline</u> | <u>8000</u> | _____ | <u>I</u> | <u>I</u> | <u>I</u> |
| <u>Gasoline</u> | <u>8000</u> | _____ | <u>I</u> | <u>I</u> | <u>I</u> |
| <u>Heating oil</u> | <u>560</u> | _____ | <u>I</u> | <u>I</u> | <u>I</u> |
| _____ | _____ | _____ | _____ | _____ | _____ |

State or Federal Excavation Contractor: Rybak Excavating Notification prior to removal: _____
 Consultant: _____

SOIL
 Contaminated soil excavated: _____
 Was it a total excavation: _____
 Vapor readings: _____
 Soil samples: _____
 Borings: _____
 Native soil type: Sandy Clay
 Stockpiled properly/disposal arranged: _____
 Other: _____

| | |
|---|--|
| <p>CONCLUSIONS AND OTHER RELATED INFORMATION</p> | |
| <p>CONTACTS Local Fire/Police Local Officials Regional Staff Other</p> | <p>INSTRUCTION GIVEN Hire consultant Submit report Staff will call Contact staff</p> |
| | <p>SITE INFORMATION Description of area: Previous release(s):</p> |
| | <p>VAPORS Sewers/buildings:</p> |
| | <p>WATER Groundwater in excavation: Free product present: Depth to groundwater: City water/wells private/municipal: Surface water:</p> |



TANKS & LEAKS

ATTACHMENT A

HAZARDOUS MATERIALS INCIDENT REPORT

A.D.O. Wise DATE 9/25/92 TIME 0743

Leak
5708
JMB

I. CONTACT INFORMATION

Caller's Name: DAVE RYBAK
Firm/Agency: RYBAK EXCAVATING Address: 3134 CALIFORNIA ST NE
City: MINNEAPOLIS County: HENNEPIN State: MN Zip: 55418
Phone: (Day) 788-6577 (Evening) _____

II. RESPONSIBLE PARTY

Contact Person: DON THOMPSON
Firm/Agency: CITY OF MPLS / DEPT. OF INSPECTIONS Address: 250 SOUTH 4TH ST # 300
City: MPLS County: HENNEPIN State: MN Zip: 55415
Phone: (Day) 678-5800 (Evening) _____

III. INCIDENT SPECIFICS

Date and Time of Incident: 9/24/92 @ 1630
Location of incident (street, city, county): 5000 HIAWATHA
MPLS, MN - HENNEPIN

LIST
13353

Material(s) and quantity ① GASOLINE - 8000 GALLON TANK ② GASOLINE - 8000
③ GASOLINE - 8000 GALLON ④ HEATING OIL - 510 GALLON TANK

Is released material near surface ^{OR GROUND} water? Yes No Specify _____
Has the released material been contained? Yes No Specify _____
Evacuation: No Yes Pending Number of people _____
Material released to: Air Water Soil Asphalt/Concrete
Other (specify) SANDY CLAY

General description of area affected: Urban Rural Residential
Industrial Commercial

For fixed facilities, has the material escaped from the facility or facility property? Yes No Unknown

IV. DESCRIPTION OF INCIDENT

(Circle as appropriate, AND describe below.)

Spill / Equip. Malfunct. / Air Release / Dumping / Sewage Bypass / Complaint

LEAKY UNDERGROUND STORAGE TANKS - THEY APPEAR TO BE IN GOOD CONDITION.

IS THIS A BUSINESS OR GOVERNMENT FACILITY REPORTING IN COMPLIANCE WITH SARA TITLE 111, SECTION 304? Yes No Unknown If YES, complete section V of this form. If NO, go on to section VI.

May 31, 1992
Page CA-1, Part 1

Post-It™ brand fax transmittal memo 7671 # of pages 1

| | | | |
|-------|------------|---------|------|
| To | PCA SPILLS | From | DEM |
| Co. | | Co. | D.O. |
| Depl. | | Phone # | |
| Fax # | | Fax # | |

REMEDIAL INVESTIGATION REPORT

**5000 HIAWATHA AVENUE SITE
CITY OF MINNEAPOLIS
MINNEAPOLIS, MINNESOTA
DELTA NO. 10-92-333**

RECEIVED

JUL 06 1993

MPCA, HAZARDOUS
WASTE DIVISION

Prepared by:

**Delta Environmental Consultants, Inc.
3900 Northwoods Drive, Suite 200
St. Paul, MN 55112
(612) 486-8022**

July 1, 1993

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REMEDIAL INVESTIGATION REPORT

5000 HIAWATHA AVENUE SITE

CITY OF MINNEAPOLIS

MINNEAPOLIS, MINNESOTA

DELTA NO. 10-92-333

1.0 INTRODUCTION

1.1 Purpose and Objective

The purpose of this report is to present the results of a Remedial Investigation (RI) conducted by Delta Environmental Consultants, Inc. (Delta), for the City of Minneapolis at the 5000 Hiawatha Avenue Site (site), in Minneapolis, Hennepin County, Minnesota. The objective of this investigation was to evaluate the extent and magnitude of contaminated soil, bedrock, and ground water at the site, and to identify any threats to public health, welfare, and the environment. Authorization to conduct this investigation was given by Mr. Donald Thompson, City Inspector, Department of Regulatory Services, in October 1992. The Minnesota Pollution Control Agency (MPCA) LEAK number is 00005708.

1.2 Scope of Work

The following activities were conducted by Delta as part of the RI:

- Prepared a Site Health and Safety Plan.
- Observed the removal of four underground storage tanks (UST).
- Observed the removal of 200 cubic yards of petroleum-contaminated soil from the tank basin and pump island areas. The contaminated soil was removed off site for thermal treatment.
- Conducted a site reconnaissance to identify soil boring and monitoring well locations.
- Advanced five soil borings using hollow-stem-auger drilling techniques, and collected soil samples for lithologic description, field screening, and chemical analyses.
- Screened all soil samples for organic vapors using a photoionization detector (PID).
- Submitted selected soil samples for laboratory analysis of volatile organic compounds (VOC); gasoline range organics (GRO); petroleum volatile organic chemicals; methyl tertiary butyl ether (MTBE); and lead.
- Converted the five soil borings into monitoring wells. One monitoring well was installed as a deep well to determine if a vertical downward hydraulic gradient exists at the site.
- Conducted a soil probe survey to evaluate the extent of off-site contamination.

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5000 Hiawatha Avenue Site

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- Collected ground water samples for laboratory analysis of GRO, benzene, toluene, ethylbenzene, xylenes (BTEX), MTBE, and VOCs.
- Performed slug tests on two wells to evaluate aquifer parameters.
- Mapped and surveyed the site.
- Evaluated site geological, hydrogeological, and chemical data and prepared this report.
- Prepared MPCA Fact Sheets 4, 6, 7, and 24. (Appendix A).

2.0 BACKGROUND INFORMATION

2.1 Site Location

The site is located at 5000 Hiawatha Avenue, in Minneapolis, Hennepin County, Minnesota (Figure 1). The site is no longer an active service station and is presently not being used. The sites legal description is the NW ¼, of the NE ¼, of the SE ¼, Section 18, Township 27 North, Range 22 West, St. Paul West Quadrangle, Hennepin County, Minnesota, Latitude 47.51.32 North, Longitude 92.58.05 West.

2.2 Site Topography, Surface Water Features, and Physiography

The site is located at an elevation of 816 feet above mean sea level (MSL). The site topography is flat with the western edge of the site cut into a hillside with a retaining wall. The surrounding topography has been shaped by glacial activity, the Mississippi River, and Minnehaha Creek. Immediately west of the site the land rises to an elevation of 840 feet above MSL then levels out. East of the site the land is flat to the Minnehaha Creek valley, where there is a steep drop-off of about 100 feet, to Minnehaha Creek. Bedrock outcrops are visible at Minnehaha Falls and along the creek valley.

Land use in the area is mixed single and multiple family residential, park property, and commercial. Single family homes and apartment buildings surround the site to the south and west. To the east is Minnehaha Park and to the north is a dry cleaning business.

2.3 Site Description

The site was operated as a gas station from the 1930s to at least 1983. The site is not currently being used and the USTs were removed in October 1992. Appendix B contains the Polk Directory, which lists businesses present at the 5000 Hiawatha Avenue address from 1930 to 1983.

According to our observations four USTs (Figure 2) were located at the site in a tank basin north of the station building. Within the tank basin were three 8,000-gallon USTs used to store leaded and unleaded gasoline and one 860-gallon fuel oil tank. All the tanks were constructed of steel. A pump island was located east of the station. The results of the excavation are presented in the Excavation Report worksheet (Appendix B).

3.0 RESULTS

3.1 Regional Geology

The overlying regional deposits are of glacial origin. The glacial sediments in the area are till deposits, outwash deposits, alluvial deposits, and lacustrine deposits. The unconsolidated glacial deposits range from 0 to 100 feet thick. The bedrock formations are of Cambrian and Ordovician age. Bedrock stratigraphy in the region of the site consists of, in ascending order: Mt. Simon Sandstone, Eau Claire Formation, Ironton Galesville Formations, Franconia Formation, St. Lawrence Formation, Jordan Sandstone, Prairie du Chien group, St. Peter sandstone, Glenwood shale, and Platteville limestone.

3.2 Site Soils and Geology

A total of six soil borings were advanced during the investigation, with all of the borings being completed as monitoring wells. The location of each boring/monitoring well is shown in Figure 2. Soil samples were collected from 3- to 5-foot intervals from every boring using a split-spoon sampler. The soil samples were logged and classified in the field. The boring logs are contained in Appendix C.

Figures 3, 4, and 5 present the geological cross sections of the site. Soils at the site from the surface down consist of 0 to 1 feet of brown organic soil and/or fill, 4 to 7 feet of clayey silt with sand, and 6- to 9-foot thick sand with some silt and gravel. The Platteville limestone bedrock formation was encountered at a depth ranging from 16.5 to 20 feet beneath the site.

Well logs from nearby wells (Appendix D) show the Platteville formation to be approximately 30 feet thick in the area. Underlying the Platteville is the Glenwood shale unit.

3.3 Soil Probe Survey

A soil probe survey was conducted on the site, to the west along 50th Street, and to the east in Minnehaha Park. Seven soil probes (Figure 6) were advanced to collect soil gas, soil samples, or ground water samples. All samples were analyzed on site by a mobile laboratory. The methods for sample collection and analysis are contained in Appendix E. Three soil survey probes were advanced on the east side of Hiawatha Avenue in Minnehaha Park to evaluate if BTEX/total hydrocarbons (THC) contamination was present off site and to locate an appropriate location for a downgradient monitoring well. Two soil probes were placed west of the site to evaluate for the presence of any potential upgradient sources. Two soil probes were placed on the eastern edge of the site to evaluate for the presence of BTEX/THC contamination.

Soil vapor samples were collected from all of the probe locations at depths ranging from 13 to 16 feet below ground surface. BTEX/THC was not detected by the mobile laboratory in any of the soil vapor samples. Soil samples were collected from soil probe locations and depths, SV-1 (14 feet), SV-2 (13 feet), SV-5 (14 feet), SV-5 (16 feet), and SV-7 (16 feet). Soil samples were analyzed for BTEX/THC; no detectable concentration of these parameters was observed by the laboratory. One water sample was collected from SV-3 at a depth of 16 feet. The laboratory did not detect BTEX/THC in the water sample.

3.4 Regional Hydrogeology

The bedrock hydrogeology consists of 14 geologic formations ranging in age from Precambrian to Ordovician. Combined, these formations can be over 1,000 feet in thickness. The 14 geologic units have been grouped into 4 bedrock aquifers and 4 confining units. The four bedrock aquifers consist of sandstone, limestone, and dolomite. The formations, which comprise each aquifer, are as follows (in descending order): St. Peter Formation, Prairie du Chien and Jordan Formations, Ironston and Galesville Formations, and the Mount Simon and Hinckley Formations. The confining units are comprised primarily of fine-grained sandstone, siltstone, and shale. The formations, which make up the four confining units, are as follows (in descending order): Decorah, Platteville, and Glenwood Formations, the lower portion of the St. Peter, St. Lawrence and Franconia Formations, and the Eau Clair Formation. The thickness of the St. Peter aquifer averages 60 feet within the Twin Cities Basin and it is located between 45 and over 150 feet below grade within the Twin Cities Basin (Schoenberg, 1989; and Woodward, 1986). The shallowest aquifer underlying the site is the Platteville Formation. The Platteville Formation consists of 30 feet of limestone

overlying 5 feet of the Glenwood Shale Formation, which is considered a confining unit. The Plattville Formation is not to be used for potable water supply by new wells in areas where less than 50 feet of cover exists within 1 mile. The Plattville is generally used by domestic wells, because it cannot provide large amounts of water. The St. Peter Formation is the next aquifer, which consists of approximately 160 feet of fine- to medium-grained sandstone. The St. Peter aquifer is a source of water for domestic and low-capacity local use. The shallowest continuous regional aquifer underlying the site is the Prairie du Chien/Jordan Aquifer. The regional flow of the Prairie du Chien/Jordan Aquifer in Minneapolis is to the southeast toward the Mississippi River. The regional aquifer has been observed at an approximate elevation of 750 feet above MSL in the area.

3.5 Site Hydrogeology

Three wells (MW-1, MW-2, and MW-3) were installed on the site during the first phase of investigation, and MW-4, MW-5, and MW-6 were installed during the second phase of the investigation. Monitoring wells MW-4 and MW-6 were placed in locations off site. Monitoring well MW-4 was located upgradient of the site on the corner of 50th Street and 43rd Avenue. Monitoring well MW-6 is located east of the site in Minnehaha Park. Monitoring well MW-5 was located close to MW-1 to determine if a downward vertical hydraulic gradient was present at the site.

Monitoring wells MW-1, MW-2, MW-3, MW-4, and MW-6 were advanced to the top of the bedrock and screened across the water table. Monitoring well MW-5 was installed to a depth of approximately 40 feet within the Plattville Formation. The monitoring wells intersect the water table at approximately 14 feet beneath the site. Monitoring well logs are included in Appendix F, well construction diagrams and permits are included in Appendix G.

On February 10, 1992, Delta measured water levels in monitoring wells MW-1, MW-2, and MW-3. As shown on Figure 7, ground water contours indicate that ground water flow was in a northeast direction. Ground water elevation measurements were collected on April 19 and May 11, 1993. Ground water contours indicated a ground water flow to the east-southeast direction (Figures 7 and 8). The ground water elevation in MW-6 is higher than elevations observed at the site, and was not used in contouring water level elevations. The peat observed at the base of MW-6 may be influencing the water levels in the well. The discharge zone for the shallow aquifer is believed to be Minnehaha Creek or the Mississippi River.

As noted on Figures 7, 8, and 9, ground water elevations are relatively flat across the site, with little change in elevation between each well. Ground water elevation from MW-5 indicates a slight downward vertical hydraulic gradient.

On May 11, 1993, single-well response tests (slug tests) were conducted in monitoring wells MW-5 and MW-6. An estimated hydraulic conductivity (K) for the bedrock was derived from the slug test in MW-5; K is estimated at 3.61×10^{-1} feet/day. An estimated hydraulic conductivity for the unconsolidated deposits on the site was derived from the slug test conducted on MW-6; K is estimated at 1.21×10^1 feet/day. Data and calculation for the response tests are located in Appendix F.

Based on the calculated values of hydraulic conductivity from the slug tests, hydraulic gradient, an estimated effective porosity of 30 percent for unconsolidated sand, and limestone bedrock, an average horizontal ground water flow or advective linear flow velocity was computed at 0.0002 to 0.0008 feet/day. Calculations for obtaining the advective linear flow velocity are located in Appendix H. A site well hydrograph is also presented in Appendix H.

3.6 Soil Screening/Soil Chemistry

Soil samples were collected using a hollow-stem-auger drill rig and split-spoon sampler, and screened for organic vapors using a PID equipped with a 10.6 eV lamp calibrated to benzene, to determine the relative degree of contamination. Bedrock cutting were collected using an air-rotary drill rig. Following the initial field screen measurement, a portion of the sample was collected for a jar headspace measurement to further evaluate the presence of VOCs. Soil and bedrock samples were placed in a clean, glass sample jar, sealed with aluminum foil, capped, and agitated. After the samples had thermally equilibrated, the caps were removed from the jars, the foil seal was pierced with the PID probe, and the jar headspace measurements recorded. Both field vapor screening and headspace vapor screening values were recorded for each sample. Petroleum-hydrocarbon impacts to soil above 50 parts per million were detected with PID screening in SB-1/MW-1, SB-2/MW-2, SB-3/MW-3, and SB-5/MW-5 at 12 to 21 feet below ground. No impacts were detected by the PID screening in SB-4/MW-4 or SB-6/MW-6. Table 1 contains the results from the field screening and jar headspace readings.

Confirmation soil samples were obtained at specific depths during the soil boring advancement. The soil samples collected from SB-1/MW-2, SB-2/MW-2, and SB-3/MW-3 were submitted to Horizon Laboratories, Inc. (Horizon), for analysis of petroleum volatile organic compounds, GRO, and lead. The analytical results of these samples indicate that the identified borings contain detectable concentrations of petroleum contaminants. Lead concentrations above the method detection limits (MDL) were not identified. Soil samples collected from SB-4/MW-4 and SB-6/MW-6 were submitted to Horizon for analysis of BTEX and GRO. The analytical results of these samples indicate only a small GRO detect in SB-4/MW-4. Table 2 is a summary of laboratory analytical results for soils. Complete analytical reports, sampling sheets, and chain of custodies are contained in Appendix G.

The soil samples collected during the soil probe investigation were analyzed by the laboratory and no detectable amounts of BTEX/THC were observed. Two samples were collected west of the site, two east of the site, and three on the eastern edge of the site.

3.7 Ground Water Chemistry

Ground water samples collected on November 10, 1992, from MW-1, MW-2, and MW-3 were analyzed for, and reported by, the laboratory as the following parameters: GRO, lead, and VOCs (Minnesota Department of Health (MDH) 465D series). Laboratory results indicated levels of benzene, toluene, and ethylbenzene above the MPCA recommended allowable limits (RAL) for drinking water. The results also indicated levels of naphthalene and tetrahydrofuran above the RALs. High levels of GRO were also present. Monitoring wells MW-1 through MW-6 were sampled on April 19, 1993, and May 14, 1993, for MDH Method 465D, GRO, and diesel range organics (DRO). Results of the analysis indicated levels of benzene, ethylbenzene, naphthalene, and tetrahydrofuran above the RALs. High levels of GRO and DRO were evident in MW-1, MW-3, and MW-5. Results from monitoring well MW-4, the upgradient well, indicated 0.3 parts per billion (ppb) benzene, 0.38 ppb ethylbenzene, 0.23 ppb naphthalene, 0.22 ppb 1,2,4-trimethylbenzene, and 0.14 ppb o-xylene/styrene. Results from monitoring wells MW-4 and MW-5 (the bedrock well) indicate low levels of tetrachloroethene, 1.5 ppb and 1.8 ppb, respectively. Results from monitoring well MW-6, the downgradient well, indicated no detections of the compounds analyzed. Analytical results have been summarized in Table 3. Complete analytical reports, sampling sheets, and chain of custodies are provided in Appendix I.

One ground water sample was collected during the soil probe investigation at a location (SV-3) east of the site. Laboratory analysis of the sample for BTEX/THC did not detect any of these parameters above MDL. Laboratory results are presented in Appendix E.

3.8 Utility Vapor Survey

A vapor risk assessment was conducted by Delta at the site and it was deemed unnecessary, according to MPCA Fact Sheet No. 22, that a vapor survey of accessible utilities be conducted. The utilities are located off site along 50th Street and Hiawatha Avenue. The contamination is currently located within the site property boundaries. The utilities are located above ground water elevation, except for the storm sewer and sanitary sewer shafts and tunnels (Figure 10). The storm sewer and sanitary sewer system in the area includes vertical shafts and tunnels buried 60 feet below Hiawatha Avenue. (No impacts to these utilities are expected, based on results of the worksheet.)

3.9 Water Well Survey

Delta conducted a water well survey within a 1-mile radius of the site by obtaining water well logs from the Minnesota Geological Survey. Figure 11 shows the locations of the known water wells within the 1-mile radius, based on the obtained logs. Eleven wells were evident in the survey and the logs for eight of these wells are presented in Appendix K. The nearest well is Unique Well No. 200606, which is located 1,500 feet northwest of the site. All Minneapolis residents are on a municipal water system.

4.0 DISCUSSION

4.1 Extent of Soil Contamination

The extent of soil and bedrock contamination within the tank basin and pump island areas was evaluated during our investigation. The observed areas of contamination are based on results from the excavation, the soil borings, and the soil probe survey conducted at the site by Delta.

The majority of the contamination was observed in the tank basin and pump island areas. Based on field observations, PID readings, and soil samples collected for analysis during the investigations, petroleum-hydrocarbon impacts exist in these areas, but do not extend off site. Soil boring samples and PID readings indicate that the soil contamination is above the water table in SB-1 near the former tank basin.

PID readings, soil sample and soil vapor analysis collected indicate that, except for the former tank basin and pump island areas, on-site soil contamination is present at the soil/ground water interface. This contamination appears to be the result of elevation fluctuations of the contaminated ground water.

4.2 Extent of Ground Water Contamination

The on-site monitoring wells MW-1, MW-2, MW-3, and MW-5 all had detectable levels of petroleum contamination in them. Low levels of benzene and ethylbenzene were observed in MW-4 upgradient from the site. No petroleum-related compounds were observed in the downgradient well MW-6.

In addition to petroleum-related compounds observed in the monitoring wells, several other compounds were detected by the laboratory: tetrahydrofuran, tetrachloroethene (PCE), naphthalene, methyl ethyl ketone, cis-1,2-dichloroethene, and methyl isobutyl ketone. In general, the highest levels of tetrahydrofuran, naphthalene, methyl ethyl ketone, cis-1,2-dichloroethene and methyl isobutyl ketone were observed in MW-1 and MW-3. The PCE was reported by the laboratory in MW-4, indicating a possible off-site source, and also in MW-5.

The extent of ground water contamination horizontally has been evaluated and it appears to exist within the site boundaries. The extent of contamination into the bedrock has not been defined.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The following is a summary of Delta's conclusions with respect to the RI objectives.

- Four USTs were removed from the site and 200 cubic yards of contaminated soil.
- The geology at the site consists of silty to clayey sand overlying fine to coarse sand. Platteville bedrock limestone was encountered at a depth of approximately 16 feet below ground surface.
- Ground water is encountered approximately 15 feet below ground surface at the site. Ground water flows from west to east across the site toward Hiawatha Creek and the Mississippi River. Ground water in the unconsolidated soil appears to be hydraulically connected to the ground water in the bedrock. The horizontal ground water hydraulic gradient is relatively flat across the site.

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City of Minneapolis

Minneapolis, Minnesota

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- A vertical ground water hydraulic gradient was measured in the deep well installed at the site.
- During the soils investigation, contamination was observed at the soil/ground water interface.
- Free product was not observed in any of the monitoring wells.
- Petroleum contamination was observed in the ground water at the site. Petroleum contamination was observed off site in an upgradient well (MW-4) indicating potential existence of an off-site source.
- There does not appear to be vapor risk since the source has removed and there is no free product.
- VOC contamination was observed in site monitoring wells and in the upgradient well (MW-4). A source for the VOC contamination has not been identified.
- Ground water will most likely discharge into the Minnehaha creek, and there are no downgradient receptors between the site and the creek.

5.2 Recommendations

Based on the results of our investigation, we recommended that the site be monitored on a periodic basis and that Corrective Actions not be conducted at the site for the following reasons:

- The source of the contamination, the USTs, and contaminated soil have been removed.
- Ground water contamination in the unconsolidated material does not appear to have migrated beyond the site boundaries.
- Migration of petroleum contamination in the Platteville aquifer is restricted by a confining formation (Glenwood shale) and the close proximity of Minnehaha Creek.
- The effectiveness of using air sparging as a corrective action for treating contaminated ground water above the bedrock is limited because of the thin saturated thickness of the ground water above the bedrock.
- A pump-and-treatment system would require installation of a bedrock recovery well or wells. It is unknown if a bedrock well would be effective in capturing contaminated ground water from unconsolidated material because of the bedding and fractured condition of the bedrock.

6.0 REMARKS

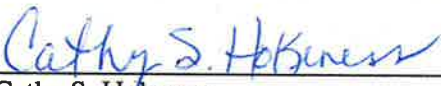
The recommendations contained in this report represent our professional opinions. These opinions are based on currently-available information and are arrived at in accordance with currently-accepted hydrogeologic and engineering practices at this time and location. Other than this, no warranty is implied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

This report was prepared by **DELTA ENVIRONMENTAL CONSULTANTS, INC.**



Gary J. Schroeder
Project Manager


Date: 7-2-93



Cathy S. Hokeness
Hydrogeologist

Date: 7-2-93

Reviewed by:



James P. Prieur
Senior Hydrogeologist

Date: 7-2-93

7.0 REFERENCES

- Wright, H.E., Jr. 1990. Geologic History of Minnesota Rivers. Minnesota Geological Survey. University of Minnesota-Educational Series-7. St. Paul, Minnesota. pp. 1-17.
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TABLE 1

SOIL SAMPLE PID MEASUREMENTS

CITY OF MINNEAPOLIS

5000 HIAWATHA AVENUE

MINNEAPOLIS, MINNESOTA

DELTA NO. 10-92-333

| SOIL BORING | DATE COLLECTED | SAMPLE INTERVAL | FIELD SCREENING | HEAD-SPACE | COMMENTS |
|-------------|----------------|-----------------|-----------------|------------|---------------------------------------|
| SB-1/MW-1 | 11/02/92 | 1-3 | 0 | 0 | Silty sand w/ gravel - fill |
| | | 4-6 | 0 | 3 | Silty sand w/ gravel - fill |
| | | 7-9 | 40 | 10 | Silty sand/Medium grained sand |
| | | 10-12 | 30 | 15 | Medium grained sand |
| | | 13-15 | - | 50 | Fine grained sand |
| | | 16-18 | - | 130 | Coarse grained sand/Limestone-bedrock |
| SB-2/MW-2 | 11/02/92 | 1-3 | - | 0 | Organic soil |
| | | 4-6 | - | 0 | Silty to clayey sand |
| | | 7-9 | - | 0 | Silty sand w/gravel |
| | | 10-12 | - | 0 | Medium to coarse sand |
| | | 13-15 | - | 0 | Medium to coarse sand |
| | | 16-18 | - | 100 | Limestone - bedrock |
| SB3/MW-3 | 11/02/92 | 1-3 | - | 0 | Silty sand |
| | | 4-6 | - | 2 | Silty sand |
| | | 6-8 | - | 7 | Silty to clayey sand |
| | | 9-11 | - | 4 | Silty to clayey sand |
| | | 12-14 | - | 4 | Medium to coarse sand |
| | | 15-17 | - | 450 | Medium to coarse sand |
| | | 18-20 | - | 450 | Limestone - bedrock |

Field and headspace results are in parts per million (ppm).

Field samples were screened with a photoionization detector (PID) equipped with a 10.2 eV lamp calibrated to benzene.

Sample intervals are in feet below surface.

- Data not available.

| SOIL BORING | DATE COLLECTED | SAMPLE INTERVAL | FIELD SCREENING | HEAD-SPACE | COMMENTS |
|-------------|----------------|-----------------|-----------------|------------|---------------------------------|
| SB-4/MW-4 | 04/05/93 | 4-6 | 0 | 0 | Clayey silt w/sand |
| | | 9-11 | 0 | 2 | Sand and gravel |
| | | 14-16 | 0 | 2 | Fine to medium grained sand |
| | | 19-21 | 0 | 0 | Medium to coarse grained sand |
| | | 24-26 | 2 | 2 | coarse sand/Limestone - bedrock |
| SB-5/MW-5 | 04/06/93 | 4-6 | 2 | 6 | Sand and gravel fill |
| | | 9-11 | 0 | 5 | Fine to medium grained sand |
| | | 14-16 | 4 | 364 | Medium to coarse grained sand |
| | | 19-21 | 20 | 583 | Limestone - bedrock |
| | | 22-24 | - | 42 | Limestone - bedrock |
| | | 24-26 | - | 8 | Limestone - bedrock |
| | | 31-33 | - | 17 | Limestone - bedrock |
| | | 37-39 | - | 6 | Limestone - bedrock |
| SB-6/MW-6 | 04/07/93 | 4-6 | 0 | 0 | Silty clay w/sand and gravel |
| | | 8-10 | 0 | 2 | Fine grained sand |
| | | 12-14 | 0 | 2 | Sand/Peat |

Field and headspace results are in parts per million (ppm).

Field samples were screened with a photoionization detector (PID) equipped with a 10.2 eV lamp calibrated to benzene.

Sample intervals are in feet below surface.

- Data not available.

TABLE 2

SUMMARY OF SOIL SAMPLE ANALYTICAL RESULTS

CITY OF MINNEAPOLIS
5000 HIAWATHA AVENUE
MINNEAPOLIS, MINNESOTA
DELTA NO. 10-92-333

| SAMPLE LOCATION AND DEPTH BELOW GROUND | DATE OF COLLECTION | BENZENE | TOLUENE | ETHYL-BENZENE | XYLENES | GRO | THC | MTBE | LEAD | 1,3,5 TRIMETHYL-BENZENE | 1,2,4 TRIMETHYL-BENZENE |
|--|--------------------|---------|---------|---------------|---------|------|--------|---------|------|-------------------------|-------------------------|
| SB-1 @ 13-15 FT | 11/02/92 | <0.0002 | 0.00098 | 0.0028 | 0.019 | 16 | NA | <0.001 | <5.0 | 0.0059 | 0.014 |
| SB-2 @ 13-15 FT | 11/02/92 | <0.0002 | 0.02 | 0.0023 | <0.0008 | <5.0 | NA | <0.001 | <5.0 | <0.0008 | 0.00081 |
| SB-2 @ 16 FT | 11/02/92 | <0.2 | 0.31 | 0.88 | 3.8 | 190 | NA | 54 | <5.0 | 4.5 | 13 |
| SB-3 @ 12-14 FT | 11/02/92 | <0.0002 | <0.0005 | <0.0002 | <0.0008 | <5.0 | NA | <0.001 | <5.0 | <0.0008 | <0.0008 |
| SB-4 @ 22 FT | 04/05/93 | <0.0004 | <0.002 | <0.0002 | <0.002 | 18 | NA | <0.0004 | NA | NA | NA |
| SB-4 @ 24 FT | 04/05/93 | <0.0004 | <0.002 | <0.0002 | <0.002 | <10 | NA | <0.0004 | NA | NA | NA |
| SB-6 @ 13-14 FT | 04/07/93 | <0.0004 | <0.002 | <0.0002 | <0.002 | <10 | NA | <0.0004 | NA | NA | NA |
| SV-1 SOIL @ 14 FT | 02/10/93 | <0.01 | <0.01 | <0.02 | <0.05 | NA | <0.1 | NA | NA | NA | NA |
| SV-1 VAPOR @ 14 FT | 02/10/93 | <0.0001 | <0.0001 | <0.0002 | <0.0005 | NA | <0.001 | NA | NA | NA | NA |
| SV-2 SOIL @ 13 FT | 02/10/93 | <0.01 | <0.01 | <0.02 | <0.05 | NA | <0.1 | NA | NA | NA | NA |
| SV-2 VAPOR @ 13 FT | 02/10/93 | <0.0001 | <0.0001 | <0.0002 | <0.0005 | NA | <0.001 | NA | NA | NA | NA |
| SV-3 VAPOR @ 14 FT | 02/10/93 | <0.0001 | <0.0001 | <0.0002 | <0.0005 | NA | <0.001 | NA | NA | NA | NA |
| SV-3 WATER @ 16 FT | 02/10/93 | <0.001 | <0.001 | <0.002 | <0.005 | NA | <0.01 | NA | NA | NA | NA |
| SV-4 VAPOR @ 14 FT | 02/10/93 | <0.0001 | <0.0001 | <0.0002 | <0.0005 | NA | <0.001 | NA | NA | NA | NA |
| SV-5 SOIL @ 14 FT | 02/10/93 | <0.01 | <0.01 | <0.02 | <0.05 | NA | <0.1 | NA | NA | NA | NA |
| SV-5 SOIL @ 16 FT | 02/10/93 | <0.01 | <0.01 | <0.02 | <0.05 | NA | <0.1 | NA | NA | NA | NA |
| SV-5 VAPOR @ 14 FT | 02/10/93 | <0.0001 | <0.0001 | <0.0002 | <0.0005 | NA | <0.001 | NA | NA | NA | NA |
| SV-6 SOIL @ 14 FT | 02/10/93 | <0.01 | <0.01 | <0.02 | <0.05 | NA | <0.1 | NA | NA | NA | NA |
| SV-6 VAPOR @ 14 FT | 02/10/93 | <0.0001 | <0.0001 | <0.0002 | <0.0005 | NA | <0.001 | NA | NA | NA | NA |
| SV-7 SOIL @ 16 FT | 02/10/93 | <0.01 | <0.01 | <0.02 | <0.05 | NA | <0.1 | NA | NA | NA | NA |
| SV-7 VAPOR @ 16 FT | 02/10/93 | <0.0001 | <0.0001 | <0.0002 | <0.0005 | NA | <0.001 | NA | NA | NA | NA |

CONCENTRATIONS FOR SOIL SAMPLES ARE REPORTED IN MILLIGRAMS PER KILOGRAM (MG/KG)

CONCENTRATIONS FOR GRO, VAPOR AND WATER ARE REPORTED IN MILLIGRAMS PER LITER (MG/L)

GRO - GASOLINE RANGE COMPOUNDS

THC - TOTAL HYDROCARBONS

MDL - METHOD DETECTION LIMIT

TABLE 3

GROUND WATER CHEMISTRY DATA

CITY OF MINNEAPOLIS

5000 HIAWATHA AVENUE

MINNEAPOLIS, MINNESOTA

DELTA NO. 10-92-333

WELL NO.: MW-1

| DATE SAMPLED | BENZENE | TOLUENE | ETHYL- BENZENE | XYLENES | GRO | DRO | LEAD | MTBE |
|-----------------|---------|---------|-------------------|---------|-------|------|------|------|
| 11/10/92 | 2000 | 2100 | 2000 | 6400 | 30000 | NA | <200 | <5.0 |
| 04/19/93 | 1200 | 860 | 1800 | 7900 | 24000 | NA | NA | NA |
| 05/14/93 | 1200 | 120 | 1600 | 5000 | NA | 4200 | NA | <130 |

WELL NO.: MW-2

| DATE SAMPLED | BENZENE | TOLUENE | ETHYL- BENZENE | XYLENES | GRO | DRO | LEAD | MTBE |
|-----------------|---------|---------|-------------------|---------|------|-----|------|------|
| 11/10/92 | 28 | 91 | 72 | 240 | 2400 | NA | <200 | <1.0 |
| 04/19/93 | 0.41 | <0.5 | 1.3 | 1.5 | 46 | NA | NA | NA |
| 05/14/93 | 0.85 | <0.6 | 0.26 | 0.86 | NA | NA | NA | <5.0 |

WELL NO.: MW-3

| DATE SAMPLED | BENZENE | TOLUENE | ETHYL- BENZENE | XYLENES | GRO | DRO | LEAD | MTBE |
|-----------------|---------|---------|-------------------|---------|-------|-------|------|------|
| 11/10/92 | 250 | 69 | 1800 | 5200 | 29000 | NA | <200 | <5.0 |
| 04/19/93 | 39 | 6.5 | 160 | 260 | 10000 | NA | NA | NA |
| 05/14/93 | 83 | 38 | 250 | 330 | NA | 12000 | NA | <63 |

WELL NO.: MW-4

| DATE SAMPLED | BENZENE | TOLUENE | ETHYL- BENZENE | XYLENES | GRO | DRO | LEAD | MTBE |
|-----------------|---------|---------|-------------------|---------|-----|-----|------|------|
| 11/10/92 | NS | NS | NS | NS | NS | NS | NS | NS |
| 04/19/93 | <0.2 | <0.5 | 0.38 | <0.8 | <20 | <10 | NA | <5.0 |
| 05/14/93 | 0.3 | <0.6 | 0.16 | <0.5 | NA | NA | NA | <5.0 |

WELL NO.: MW-1

| DATE SAMPLED | n-PROPYL-BENZENE | TETRAHYDRO-FURAN | 1,2,4-TRIMETHYL-BENZENE | 1,3,5-TRIMETHYL-BENZENE | o-XYLENE STYRENE | TETRA-CHLOROETHENE | CHLORO-BENZENE | cis-1,2-DI CHLOROETHENE |
|--------------|------------------|------------------|-------------------------|-------------------------|------------------|--------------------|----------------|-------------------------|
| 11/10/92 | 190 | 510 | 1600 | 580 | 2600 | <1.0 | <1.0 | <0.8 |
| 04/19/93 | NA | NA | 1300 | 400 | NA | NA | NA | NA |
| 05/14/93 | 140 | <380 | 1300 | 420 | 420 | <13 | 1.3 | 6.9 |

WELL NO.: MW-2

| DATE SAMPLED | n-PROPYL-BENZENE | TETRAHYDRO-FURAN | 1,2,4-TRIMETHYL-BENZENE | 1,3,5-TRIMETHYL-BENZENE | o-XYLENE STYRENE | TETRA-CHLOROETHENE | CHLORO-BENZENE | cis-1,2-DI CHLOROETHENE |
|--------------|------------------|------------------|-------------------------|-------------------------|------------------|--------------------|----------------|-------------------------|
| 11/10/92 | 25 | 63 | 250 | 65 | 73 | <0.2 | <0.2 | <0.16 |
| 04/19/93 | NA | NA | 1.1 | <0.8 | NA | NA | NA | NA |
| 05/14/93 | 0.12 | <15 | 0.54 | 0.31 | 0.58 | <0.5 | <0.05 | <0.06 |

WELL NO.: MW-3

| DATE SAMPLED | n-PROPYL-BENZENE | TETRAHYDRO-FURAN | 1,2,4-TRIMETHYL-BENZENE | 1,3,5-TRIMETHYL-BENZENE | o-XYLENE STYRENE | TETRA-CHLOROETHENE | CHLORO-BENZENE | cis-1,2-DI CHLOROETHENE |
|--------------|------------------|------------------|-------------------------|-------------------------|------------------|--------------------|----------------|-------------------------|
| 11/10/92 | 200 | 2200 | 2800 | 1000 | 1600 | <1.0 | <1.0 | <0.8 |
| 04/19/93 | NA | NA | 960 | 280 | NA | NA | NA | NA |
| 05/14/93 | 380 | <190 | 1400 | 610 | 110 | <6.3 | <0.63 | 4.3 |

WELL NO.: MW-4

| DATE SAMPLED | n-PROPYL-BENZENE | TETRAHYDRO-FURAN | 1,2,4-TRIMETHYL-BENZENE | 1,3,5-TRIMETHYL-BENZENE | o-XYLENE STYRENE | TETRA-CHLOROETHENE | CHLORO-BENZENE | cis-1,2-DI CHLOROETHENE |
|--------------|------------------|------------------|-------------------------|-------------------------|------------------|--------------------|----------------|-------------------------|
| 11/10/92 | NS | NS | NS | NS | NS | NS | NS | NS |
| 04/19/93 | <0.1 | <15 | <0.1 | <0.1 | <0.6 | 1.4 | <0.05 | <0.08 |
| 05/14/93 | <0.1 | <15 | 0.22 | <0.2 | 0.14 | 1.5 | <0.05 | <0.08 |

WELL NO.: MW-1

| DATE SAMPLED | n-BUTYL BENZENE | sec-BUTYL BENZENE | tert-BUTYL BENZENE | ISOPROPY BENZENE | p-ISOPROPYL-TOLUENE | METHYL ETHYL KETONE | METHYL ISOBUTYL KETONE | NAPHTHALENE |
|--------------|-----------------|-------------------|--------------------|------------------|---------------------|---------------------|------------------------|-------------|
| 11/10/92 | 110 | 26 | 650 | 86 | 27 | 250 | 51 | 800 |
| 04/19/93 | NA | NA | NA | NA | NA | NA | NA | NA |
| 05/14/93 | 140 | 12 | <2.5 | 54 | 7.1 | <380 | <250 | 470 |

WELL NO.: MW-2

| DATE SAMPLED | n-BUTYL BENZENE | sec-BUTYL BENZENE | tert-BUTYL BENZENE | ISOPROPY BENZENE | p-ISOPROPYL-TOLUENE | METHYL ETHYL KETONE | METHYL ISOBUTYL KETONE | NAPHTHALENE |
|--------------|-----------------|-------------------|--------------------|------------------|---------------------|---------------------|------------------------|-------------|
| 11/10/92 | 47 | 6.5 | 96 | 7.5 | 8.4 | <4.0 | <2.0 | 8.4 |
| 04/19/93 | NA | NA | NA | NA | NA | NA | NA | NA |
| 05/14/93 | <0.3 | 0.35 | <0.1 | 0.17 | <0.1 | <15 | <10 | 0.57 |

WELL NO.: MW-3

| DATE SAMPLED | n-BUTYL BENZENE | sec-BUTYL BENZENE | tert-BUTYL BENZENE | ISOPROPY BENZENE | p-ISOPROPYL-TOLUENE | METHYL ETHYL KETONE | METHYL ISOBUTYL KETONE | NAPHTHALENE |
|--------------|-----------------|-------------------|--------------------|------------------|---------------------|---------------------|------------------------|-------------|
| 11/10/92 | 470 | 54 | 1100 | 160 | 23 | 26 | 59 | 930 |
| 04/19/93 | NA | NA | NA | NA | NA | NA | NA | NA |
| 05/14/93 | 830 | 370 | <1.3 | 250 | 50 | <190 | <130 | 170 |

WELL NO.: MW-4

| DATE SAMPLED | n-BUTYL BENZENE | sec-BUTYL BENZENE | tert-BUTYL BENZENE | ISOPROPY BENZENE | p-ISOPROPYL-TOLUENE | METHYL ETHYL KETONE | METHYL ISOBUTYL KETONE | NAPHTHALENE |
|--------------|-----------------|-------------------|--------------------|------------------|---------------------|---------------------|------------------------|-------------|
| 11/10/92 | NS | NS | NS | NS | NS | NS | NS | NS |
| 04/19/93 | <0.09 | <0.1 | <0.1 | <0.1 | <0.1 | <15 | <10 | <0.2 |
| 05/14/93 | <0.3 | <0.1 | <0.1 | <0.1 | <0.1 | <15 | <10 | 0.23 |

WELL NO.: MW-5

| DATE SAMPLED | BENZENE | TOLUENE | ETHYL-BENZENE | XYLENES | GRO | DRO | LEAD | MTBE |
|--------------|---------|---------|---------------|---------|-----|------|------|------|
| 11/10/92 | NS | NS | NS | NS | NS | NS | NS | NS |
| 04/19/93 | 0.35 | 0.55 | 0.34 | 1.1 | <20 | 32* | NA | <5.0 |
| 05/14/93 | 0.47 | <0.6 | 0.11 | 1.6 | <20 | 3200 | NA | <5.0 |

WELL NO.: MW-5 DUP

| DATE SAMPLED | BENZENE | TOLUENE | ETHYL-BENZENE | XYLENES | GRO | DRO | LEAD | MTBE |
|--------------|---------|---------|---------------|---------|-----|------|------|------|
| 11/10/92 | NS | NS | NS | NS | NS | NS | NS | NS |
| 04/19/93 | 0.44 | 0.7 | 0.36 | 2.5 | <20 | 270* | NA | <5.0 |
| 05/14/93 | NA | NA | NA | NA | NA | NA | NA | NA |

WELL NO.: MW-8

| DATE SAMPLED | BENZENE | TOLUENE | ETHYL-BENZENE | XYLENES | GRO | DRO | LEAD | MTBE |
|--------------|---------|---------|---------------|---------|-----|-----|------|------|
| 11/10/92 | NS | NS | NS | NS | NS | NS | NS | NS |
| 04/19/93 | <0.2 | <0.5 | <0.2 | <0.8 | <20 | <10 | NA | <5.0 |
| 05/14/93 | <0.2 | <0.5 | <0.2 | <0.8 | <20 | NA | NA | NA |

| RAL's ug/l | BENZENE | TOLUENE | ETHYL-BENZENE | XYLENES | GRO | DRO | LEAD | MTBE |
|---------------|---------|---------|---------------|---------|-----|-----|------|------|
| | 10 | 1000 | 700 | 10000 | - | - | 20 | |

RESULTS ARE PRESENTED IN MICROGRAMS PER LITER (ug/L), WHICH IS EQUIVALENT TO PARTS PER BILLION

NA - NOT ANALYZED FOR THIS PARAMETER

NS - WELL DID NOT EXIST AT THIS DATE

ELL NO.: MW-5

| DATE SAMPLED | n-BUTYL BENZENE | sec-BUTYL BENZENE | tert-BUTYL BENZENE | ISOPROPY BENZENE | p-ISOPROPYL-TOLUENE | METHYL ETHYL KETONE | METHYL ISOBUTYL KETONE | NAPHTHALENE |
|--------------|-----------------|-------------------|--------------------|------------------|---------------------|---------------------|------------------------|-------------|
| 11/10/92 | NS | NS | NS | NS | NS | NS | NS | NS |
| 04/19/93 | <0.09 | <0.1 | <0.1 | <0.1 | <0.1 | <15 | <10 | <0.2 |
| 05/14/93 | 0.85 | 0.15 | <0.1 | <0.1 | <0.1 | <15 | <10 | 1.1 |

WELL NO.: MW-5 DUP

| DATE SAMPLED | n-BUTYL BENZENE | sec-BUTYL BENZENE | tert-BUTYL BENZENE | ISOPROPY BENZENE | p-ISOPROPYL-TOLUENE | METHYL ETHYL KETONE | METHYL ISOBUTYL KETONE | NAPHTHALENE |
|--------------|-----------------|-------------------|--------------------|------------------|---------------------|---------------------|------------------------|-------------|
| 11/10/92 | NS | NS | NS | NS | NS | NS | NS | NS |
| 04/19/93 | <0.09 | <0.1 | <0.1 | <0.1 | <0.1 | <15 | <10 | <0.2 |
| 05/14/93 | NA | NA | NA | NA | NA | NA | NA | NA |

ELL NO.: MW-6

| DATE SAMPLED | n-BUTYL BENZENE | sec-BUTYL BENZENE | tert-BUTYL BENZENE | ISOPROPY BENZENE | p-ISOPROPYL-TOLUENE | METHYL ETHYL KETONE | METHYL ISOBUTYL KETONE | NAPHTHALENE |
|--------------|-----------------|-------------------|--------------------|------------------|---------------------|---------------------|------------------------|-------------|
| 11/10/92 | NS | NS | NS | NS | NS | NS | NS | NS |
| 04/19/93 | <0.09 | <0.1 | <0.1 | <0.1 | <0.1 | <15 | <10 | <0.2 |
| 05/14/93 | NA | NA | NA | NA | NA | NA | NA | NA |

| DATE SAMPLED | n-BUTYL BENZENE | sec-BUTYL BENZENE | tert-BUTYL BENZENE | ISOPROPY BENZENE | p-ISOPROPYL-TOLUENE | METHYL ETHYL KETONE | METHYL ISOBUTYL KETONE | NAPHTHALENE |
|--------------|-----------------|-------------------|--------------------|------------------|---------------------|---------------------|------------------------|-------------|
| 11/10/92 | NS | NS | NS | NS | NS | NS | NS | NS |
| 04/19/93 | <0.09 | <0.1 | <0.1 | <0.1 | <0.1 | <15 | <10 | <0.2 |
| 05/14/93 | NA | NA | NA | NA | NA | NA | NA | NA |

300

300

300

30

WELL NO.: MW-5

| DATE SAMPLED | n-PROPYL-BENZENE | TETRAHYDRO-FURAN | 1,2,4-TRIMETHYL-BENZENE | 1,3,5-TRIMETHYL-BENZENE | o-XYLENE STYRENE | TETRA-CHLOROETHENE | CHLORO-BENZENE | cis-1,2-DI-CHLOROETHENE |
|--------------|------------------|------------------|-------------------------|-------------------------|------------------|--------------------|----------------|-------------------------|
| 11/10/92 | NS | NS | NS | NS | NS | NS | NS | NS |
| 04/19/93 | <0.1 | <15 | 0.54 | <0.1 | <0.6 | <0.5 | <0.05 | <0.06 |
| 05/14/93 | <0.1 | <15 | 2.2 | 0.62 | 1.2 | 1.8 | <0.05 | <0.06 |

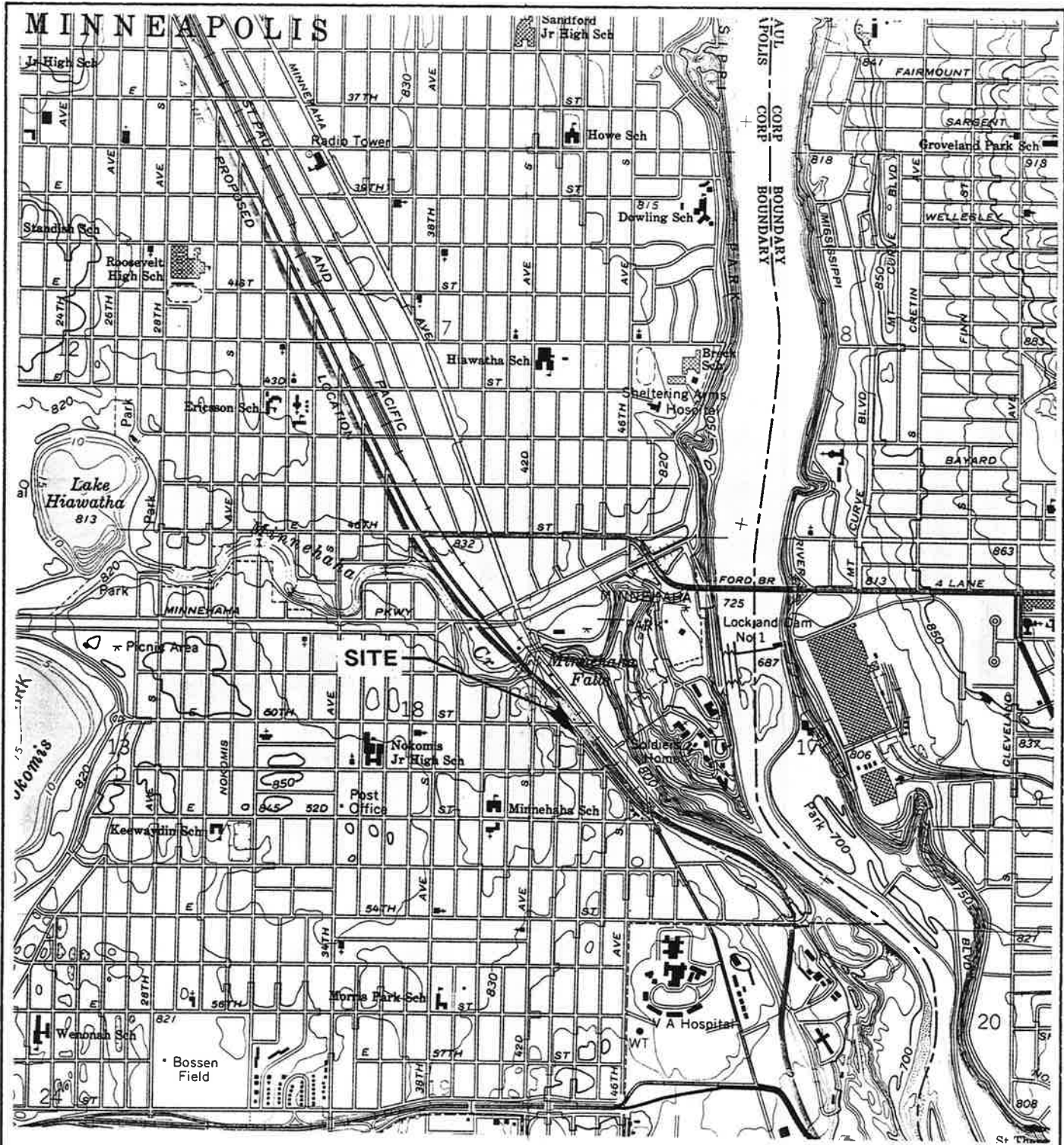
WELL NO.: MW-5 DUP

| DATE SAMPLED | n-PROPYL-BENZENE | TETRAHYDRO-FURAN | 1,2,4-TRIMETHYL-BENZENE | 1,3,5-TRIMETHYL-BENZENE | o-XYLENE STYRENE | TETRA-CHLOROETHENE | CHLORO-BENZENE | cis-1,2-DI-CHLOROETHENE |
|--------------|------------------|------------------|-------------------------|-------------------------|------------------|--------------------|----------------|-------------------------|
| 11/10/92 | NS | NS | NS | NS | NS | NS | NS | NS |
| 04/19/93 | <0.1 | <15 | 1.1 | <0.1 | 0.95 | <0.5 | <0.5 | <0.6 |
| 05/14/93 | NA | NA | NA | NA | NA | NA | NA | NA |

WELL NO.: MW-6

| DATE SAMPLED | n-PROPYL-BENZENE | TETRAHYDRO-FURAN | 1,2,4-TRIMETHYL-BENZENE | 1,3,5-TRIMETHYL-BENZENE | o-XYLENE STYRENE | TETRA-CHLOROETHENE | CHLORO-BENZENE | cis-1,2-DI-CHLOROETHENE |
|--------------|------------------|------------------|-------------------------|-------------------------|------------------|--------------------|----------------|-------------------------|
| 11/10/92 | NS | NS | NS | NS | NS | NS | NS | NS |
| 04/19/93 | <0.1 | <15 | <0.1 | <0.1 | <0.6 | <0.5 | <0.5 | <0.6 |
| 05/14/93 | NA | NA | NA | NA | NA | NA | NA | NA |

| DATE SAMPLED | n-PROPYL-BENZENE | TETRAHYDRO-FURAN | 1,2,4-TRIMETHYL-BENZENE | 1,3,5-TRIMETHYL-BENZENE | o-XYLENE STYRENE | TETRA-CHLOROETHENE | CHLORO-BENZENE | cis-1,2-DI-CHLOROETHENE |
|--------------|------------------|------------------|-------------------------|-------------------------|------------------|--------------------|----------------|-------------------------|
| 04/19/93 | 100 | | | | 10000/10 | 7.0 (?) | 100 | 70 |



ST. PAUL WEST QUADRANGLE
MINNESOTA
7.5 MINUTE SERIES (TOPOGRAPHIC)

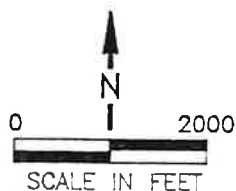


FIGURE 1
SITE LOCATION MAP
5000 HIAWATHA
MINNEAPOLIS, MINNESOTA

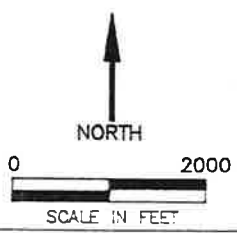
| | |
|--------------------------|-----------------------|
| PROJECT NO. 10-92-333 | PREPARED BY GJS/BG |
| DATE 4-26-93 | REVIEWED BY |



MINNEAPOLIS



**ST. PAUL WEST QUADRANGLE
MINNESOTA
7.5 MINUTE SERIES (TOPOGRAPHIC)**



**FIGURE 11
WELL RECEPTOR SURVEY MAP
5000 HIAWATHA AVENUE
MINNEAPOLIS, MINNESOTA**

| | |
|--------------------------|-----------------------|
| PROJECT NO. 10-92-333 | PREPARED BY GJS/ND |
| DATE 6/18/93 | REVIEWED BY |



EXCAVATION REPORT WORKSHEET FOR PETROLEUM RELEASE SITES

Fact Sheet #4
Minnesota Pollution Control Agency
LUST Cleanup Program
April 1993

Complete the information below and submit to the Minnesota Pollution Control Agency (MPCA) Tanks and Spills Section to document excavation and treatment of petroleum contaminated soil. Conduct excavations in accordance with "Excavation of Petroleum Contaminated Soil" (fact sheet #13). Please attach any available preliminary site investigation reports to this excavation report.

Attach additional pages if necessary. Please type or print clearly.

The excavation reporting deadline is 10 months from the date of receipt of the standard letter. A shorter deadline may be established by MPCA staff for high priority sites.

I. BACKGROUND

- A. Site: *City of Minneapolis*
Street: *5000 Hiawatha Avenue*
City, ZIP: *Minneapolis*
County: *Hennepin*
MPCA Site ID #: *LEAK00005708*
- B. Tank Owner/Operator: *Unknown*
Street/Box:
City, ZIP:
Telephone:
- C. Excavating Contractor:
Rybak Excavating and Contracting, Inc.
Contact: *Dave Rybak*
Telephone: *(612) 788-6577*
Tank Contractor Certification Number:
- D. Consultant:
Delta Environmental Consultants, Inc.
Contact: *Gary Schroeder*
Street/Box: *3900 Northwoods Dr. Ste. 200*
City, ZIP: *St. Paul, 55112*
Telephone: *(612) 486-5800*
- E. Others on site during site work (e.g., fire marshal, local officials, MPCA staff, etc.):

Note: If person other than tank owner and/or operator is conducting the cleanup, provide name, address, and relationship to site on a separate attached sheet. *The site is an abandoned property currently owned by the City of Minneapolis, and has assumed responsibility for clean up. Contact Don Thompson, City Inspector, City of Minneapolis Department of Inspections, Minneapolis, Minnesota (612) 673-5828.*

II. DATES

- A. Date release was reported to MPCA: *September 25, 1992*
- B. Dates site work was performed:

| Work Performed | Date |
|---|---------------------------|
| <i>Excavation of four UST's, collection of soil samples for laboratory analysis.</i> | <i>September 25, 1992</i> |
| <i>Excavation of dispenser pump islands and distribution lines, and collection of soil samples for laboratory analysis.</i> | <i>October 2, 1992</i> |

III. RELEASE INFORMATION

A. Provide the following information for all removed tanks.

Tank 1: Capacity: *8,000 gallon* Type: *Steel* Age: *Unknown*
 Condition: *Rusted, corroded, pitted.*
 Product history: *Premium unleaded*
 Approximate quantity of petroleum released, if known: *Unknown*
 Cause of release: *Unknown*

Tank 2: Capacity: *8,000 gallon* Type: *Steel* Age: *Unknown*
 Condition: *Rusted, corroded, pitted*
 Product history: *Regular leaded gasoline*
 Approximate quantity of petroleum release, if known: *Unknown*
 Cause of release: *Unknown*

Tank 3: Capacity: *560 gallon* Type: *Steel* Age: *Unknown*
 Condition: *Rusted, corroded, pitted*
 Product history: *Regular gasoline*
 Approximate quantity of petroleum released, if known: *Unknown*
 Cause of release: *Unknown*

Tank 4: Capacity: *8,000 gallon* Type: *Steel* Age: *Unknown*
 Condition: *Rusted, corroded, pitted*
 Product history: *Heating oil*
 Approximate quantity of petroleum released, if known: *Unknown*
 Cause of release: *Unknown*

B. Provide the following information for all existing tanks. *There are no known tanks remaining at the site.*

| Tank No. | Capacity | Contents | Type | Age |
|----------|----------|----------|------|-----|
| | | | | |
| | | | | |
| | | | | |

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

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

IV. EXCAVATION

- A. Dimensions of excavation: *21 x 21 x 13 and 10 x 10 x 10*
- B. Original tank backfill material (sand, gravel, etc.): *Sand*
- C. Native soil type (clay, sand, etc.): *Sand*
- D. Quantity of contaminated soil removed (cubic yards): *200*
[Note: If more than 400 cubic yards removed, please attach copy of written approval from MPCA.]
- E. Was ground water encountered or was there evidence of a seasonally high ground water table? At what depth? *Yes, approximately 16*
- F. If a soil boring was required (see fact sheet #13, "Excavation of Petroleum Contaminated Soil," Part VI Additional Investigation) describe the soil screening and analytical results. Attach the boring logs and laboratory results to this report.
- G. If no soil boring was required, explain.
- H. If ground water was encountered or if a soil boring was conducted, was there evidence of ground water contamination? Specify, e.g., free product (specify thickness), product sheen, ground water in contact with petroleum contaminated soil, water analytical results, etc.

[Note: If free product was observed, contact MPCA staff immediately as outlined in "Petroleum Tank Release Reports" (fact sheet #3). Also consult fact sheet #18, "Free Product: Evaluation and Recovery"].

Yes, ground water in contact with contaminated soil and laboratory results of monitoring wells indicate ground water contamination.

- I. Was bedrock encountered in the excavation? At what depth? *No.*
- J. Were other unique conditions associated with this site? If so, explain. *No.*

V. SAMPLING

- A. Briefly describe the field methods used to distinguish contaminated from uncontaminated soil:

Soil samples were screened for the presence of organic vapor contamination using a photoionization detector (PID) equipped with 10.6 eV lamp and calibrated to benzene standard. Screening consisted of placing soil into a clean glass jar, covering the mouth of the jar with aluminum foil, and capping the jar. The aluminum foil was punctured with the PID probe after the samples had equilibrated, and a measurement of the organic vapors accumulated in the headspace of the jar was recorded.

Excavation Report Worksheet for Petroleum Release Sites

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- B. List soil vapor headspace analysis results. Indicate sampling locations using sample codes (with sampling depths in parentheses), e.g. R-1 (2 feet), R-2 (10 feet), etc. "R" stands for removed." Samples collected at different depths at the same location should be labeled R-1A (2 feet), R-1B (4 feet), R-1C (6 feet), etc. If the sample collected from the sidewall or bottom after excavation was complete, label it S-1 (for sidewall) or B-1 (for "bottom"). Be sure the sample codes correspond with the site map required in part VI, below.

| Sample Code | Soil Type | Reading (ppm) |
|-------------|-----------|---------------|
| S-1A(4) | Sand | 0 |
| S-1B(8) | Sand | 0 |
| S-1C(10) | Sand | 0 |
| S-2A(6) | Sand | 0 |
| S-2B(8) | Sand | 0 |
| S-3A(4) | Sand | 0 |
| S-3B(8) | Sand | 0 |
| S-3C(10) | Sand | 0 |
| S-4(10) | Sand | 0 |
| S-5(5) | Sand | 0 |
| S-6(8) | Sand | 0 |
| S-7(10) | Sand | 0 |
| S-8A(3) | Sand | 0 |
| S-8B(9) | Sand | 0 |
| S9A(3) | Sand | 0 |
| S-9B(9) | Sand | 0 |
| B-10(8) | Sand | 0 |
| R-11A(4) | Sand | 0 |
| R-11B(6) | Sand | 0 |
| B-11C(8) | Sand | 0 |
| R-12A(6) | Sand | 0 |
| R-12B(8) | Sand | 0 |
| R-12C(11) | Sand | 0 |
| | | |

| Sample Code | Soil Type | Reading (ppm) |
|-------------|-----------|---------------|
| B-12(13) | Sand | 0 |
| R-13A(6) | Sand | 50 |
| R-13B(8) | Sand | 40 |
| B-13(10) | Sand | 30 |
| R-14A(8) | Sand | 0 |
| R-14B(10) | Sand | 0 |
| B-14(14) | Sand | 0 |
| R-15A(10) | Sand | 0 |
| B-15(13) | Sand | 0 |
| R-16A(10) | Sand | 140 |
| R-16B(13) | Sand | 130 |
| B-16(15) | Sand | 150 |
| R-17A(4) | Sand | 110 |
| R-17B(6) | Sand | 110 |
| R-17C(8) | Sand | 110 |
| B-17(10) | Sand | 110 |
| R-18A(2) | Sand | 150 |
| R-18B(4) | Sand | 150 |
| R-18C(6) | Sand | 110 |
| B-18(8) | Sand | 110 |
| R-19A(4) | Sand | 560 |
| R-19B(6) | Sand | 560 |
| R-19C(8) | Sand | 560 |
| B-19(10) | Sand | 560 |

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

Soil samples were collected during drilling operations supervised by Delta personnel. Soils were collected from the selected sampling interval by placing soils into laboratory-prepared glassware. The glassware was filled to capacity, and placed in a cooler maintained at approximately 4 degrees Celsius for transportation to the analytical laboratory. Sample handling was minimized.

D. List below the soil sample analytical results from bottom and sidewall samples (i.e., soils left in place when excavation is complete). Code the samples with sampling depths in parentheses as follows: sidewall samples S-1 (8 feet), S-2 (4 feet), etc.; bottom samples B-1 (13 feet), B-2 (14 feet), etc. Be sure the sample codes correspond to the site map required in part VI. Do not include analyses from the stockpiled soils.

| Sample Code | GRO/DRO | Benzene ppm | Ethyl-benzene ppm | Toluene ppm | Xylene ppm | MTBE ppm | Lead ppm |
|-------------|---------|-------------|-------------------|-------------|------------|----------|----------|
| B-1(9) | ND/ND | ND | ND | ND | ND | ND | -- |
| B-2(13) | ND/--- | ND | ND | ND | ND | ND | ND |
| B-3(14) | ND/--- | ND | ND | ND | ND | ND | ND |
| B-4(13) | ND/--- | ND | ND | ND | ND | ND | ND |
| B-5(13) | 890/--- | ND | 12 | 1.5 | 41 | ND | 6.8 |
| B-6(13) | ND/--- | ND | ND | ND | ND | ND | ND |
| B-7(8) | 110/--- | 0.8 | 2.8 | 6.1 | 17 | ND | 20 |
| B-8(8) | 83/--- | 0.3 | 1.7 | 0.8 | 7.9 | ND | 5.0 |
| B-9(16) | 8.7/--- | ND | 0.1 | ND | 0.4 | ND | 34 |
| B-10(18) | 520/--- | 1.6 | 25 | 33 | 74 | ND | ND |
| S-1(8) | | | | | | | |
| S-2(10) | | | | | | | |
| S-3(10) | | | | | | | |

Note: ATTACH COPIES OF LABORATORY REPORTS AND CHAIN OF CUSTODY FORMS.

VI. FIGURES

Attach the following figures to this report:

1. Site location map.
2. Site map(s) drawn to scale illustrating the following:
 - a. Location (or former location) of all present and former tanks, lines, and dispensers;
 - b. Location of other structures (buildings, canopies, etc.);
 - c. Adjacent city, township, or county roadways;
 - d. Final extent and depth of excavation;
 - e. Location of soil screening samples (e.g. R-1), soil analytical samples (e.g., S-1 or B-1), and soil borings (e.g. SB-1). Also, attach all boring logs.
 - f. North arrow, bar scale, and map legend.

VII. SUMMARY

Briefly summarize evidence indicating whether additional investigation is necessary at the site, as discussed in part VI of "Excavation of Petroleum Contaminated Soil" (fact sheet #13). If no further action is recommended, the MPCA staff will review this report following notification of soil treatment.

Contaminated soil remains at the site. The ground water at the site has been impacted and the extent has not yet been defined. Delta recommends additional investigation be conducted.

VIII. SOIL TREATMENT INFORMATION

- A. Soil treatment method used (thermal, land application, other). If you choose "other" specify treatment method:
- B. Location of treatment site/facility: *C.S. McCrossan*
- C. Date MPCA approved soil treatment (if thermal treatment was used after May 1, 1991, indicate date that the MPCA permitted thermal treatment facility agreed to accept soil): *October 1992*
- D. Identify the location of any stockpiled contaminated soil: *Soil was stockpiled on site then transported to C.S. McCrossan.*

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IX. CONSULTANT (OR OTHER) PREPARING THIS REPORT

Company Name:

Street/Box:

City, Zip:

Telephone:

Contact:

Signature: _____ Date: _____

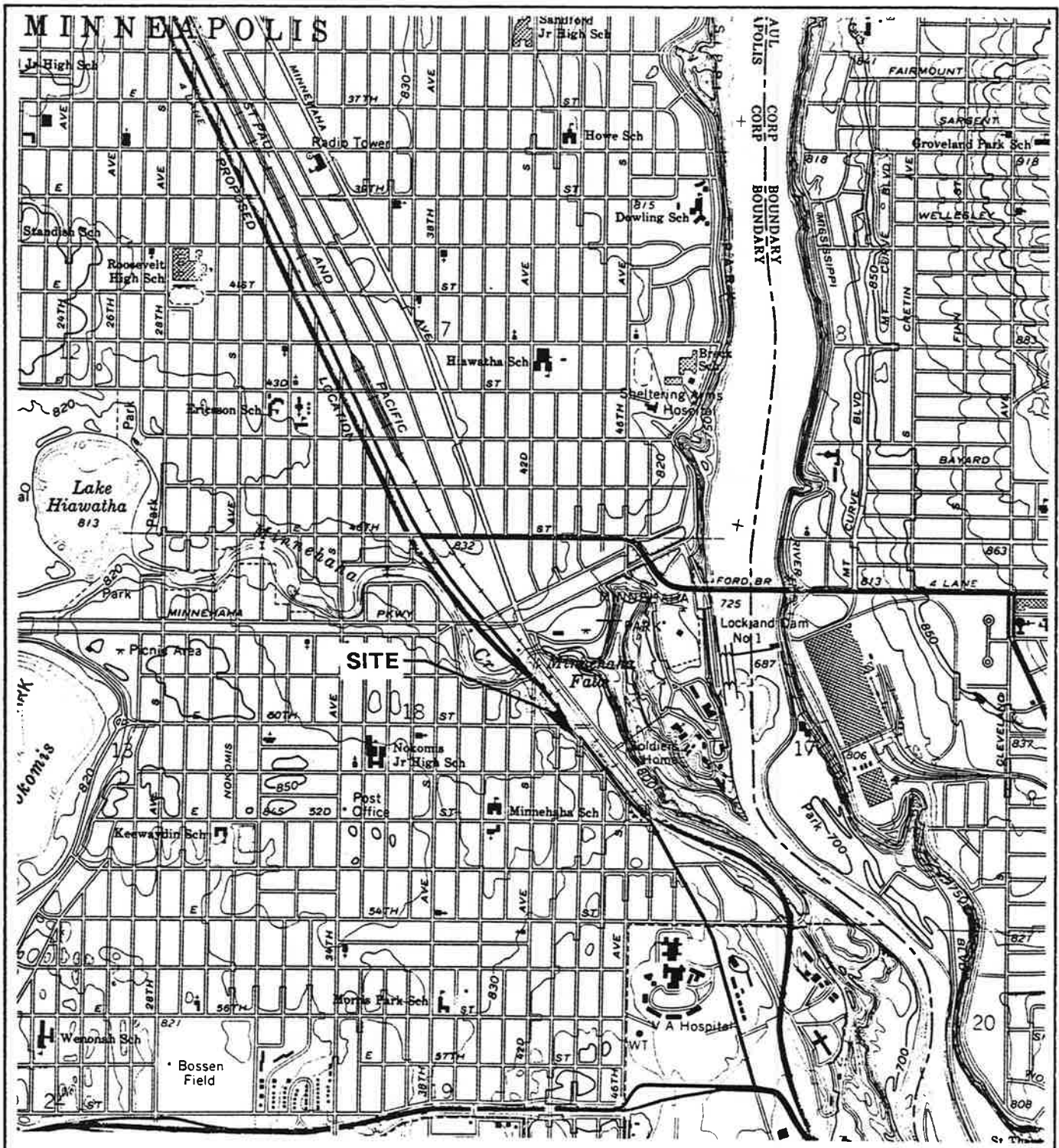
If additional investigation is not required at the site, please mail this form and all necessary attachments to:

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

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

Upon request, this document can be made available in other formats, including braille, large print and audio tape. TDD users, call the Minnesota State Relay Service, 612/297-5353 or Greater Minnesota TDD 1-800-627-3529.

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ST. PAUL WEST QUADRANGLE
MINNESOTA
7.5 MINUTE SERIES (TOPOGRAPHIC)

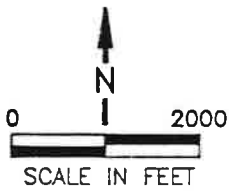
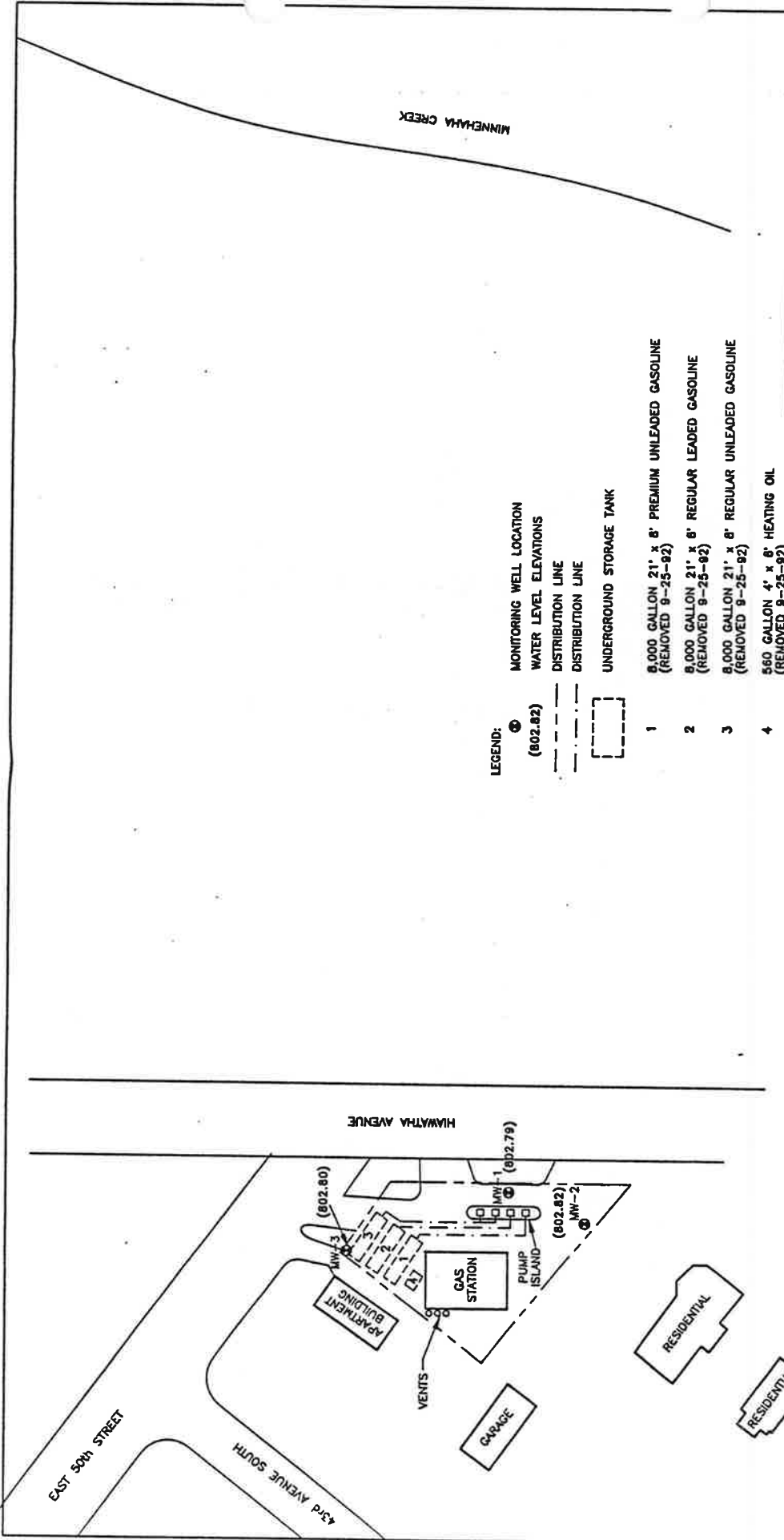


FIGURE 1
SITE LOCATION MAP
5000 HIAWATHA
MINNEAPOLIS, MINNESOTA

| | |
|--------------------------|-----------------------|
| PROJECT NO. 10-92-333 | PREPARED BY GJS/BG |
| DATE 4-26-93 | REVIEWED BY |





- LEGEND:**
- ① MONITORING WELL LOCATION
 - (802.82) WATER LEVEL ELEVATIONS
 - DISTRIBUTION LINE
 - - - DISTRIBUTION LINE
 - UNDERGROUND STORAGE TANK
- 1 8,000 GALLON 21' x 8' PREMIUM UNLEADED GASOLINE (REMOVED 9-25-92)
 - 2 8,000 GALLON 21' x 8' REGULAR LEADED GASOLINE (REMOVED 9-25-92)
 - 3 8,000 GALLON 21' x 8' REGULAR UNLEADED GASOLINE (REMOVED 9-25-92)
 - 4 560 GALLON 4' x 8' HEATING OIL (REMOVED 9-25-92)

NOTE: LOCATION OF DISTRIBUTION LINES ARE INFERRED

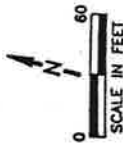


FIGURE 2
SOIL BORING AND MONITORING WELL LOCATIONS
 CITY OF MINNEAPOLIS
 5000 EAST 50th STREET
 MINNEAPOLIS, MINNESOTA

| | | |
|--------------------------|-----------------------|----------------------|
| PROJECT NO. 10-92-333 | PREPARED BY GJS/LS | REVIEWED BY |
| DATE 12-11-92 | REVISION NO. | FILE NAME 92333-2 |

Delta
 Environmental Consultants, Inc.

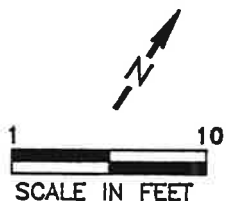
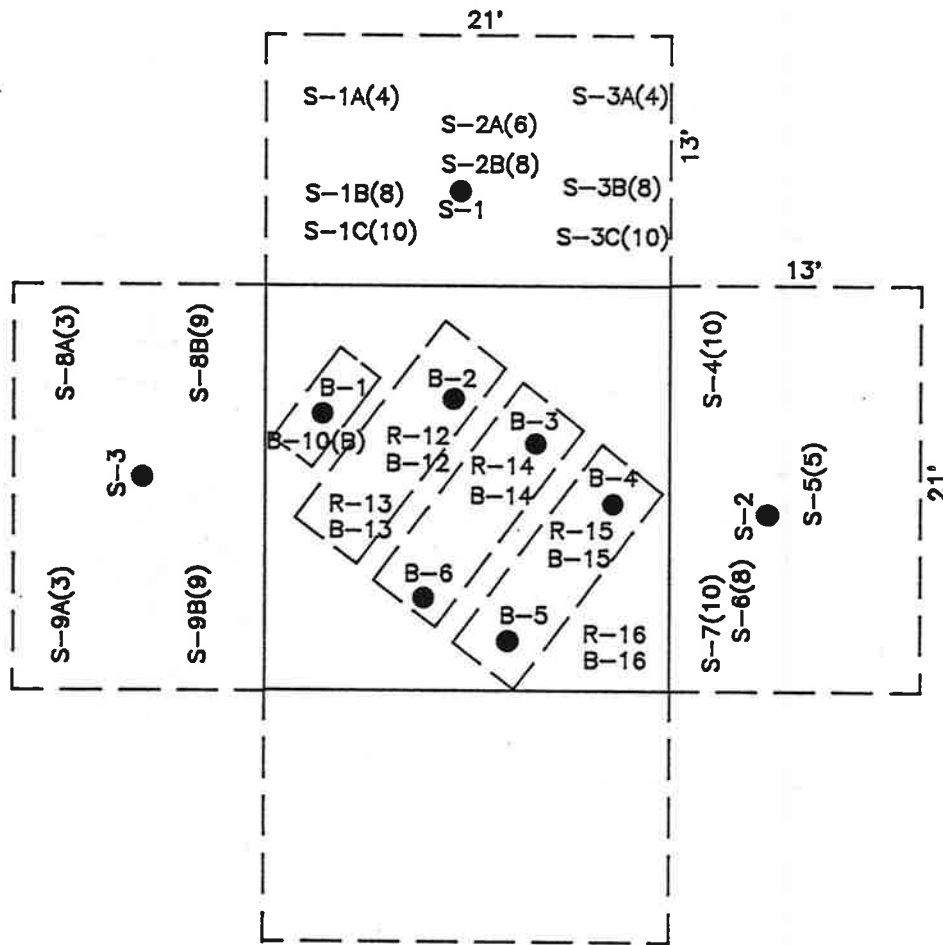



FIGURE 3
TANK BASIN EXCAVATION
& SAMPLE LOCATION
5000 HIAWATHA AVENUE
MINNEAPOLIS, MINNESOTA

| | | | |
|--------------------------|-----------------------|----------------------|---|
| PROJECT NO. 10-92-333 | PREPARED BY GJS/ND | REVIEWED BY |  Delta Environmental Consultants, Inc. |
| DATE 6/18/93 | REVISION NO. | FILE NAME 92333-3 | |

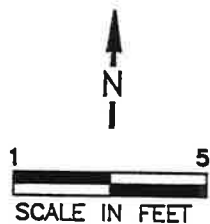
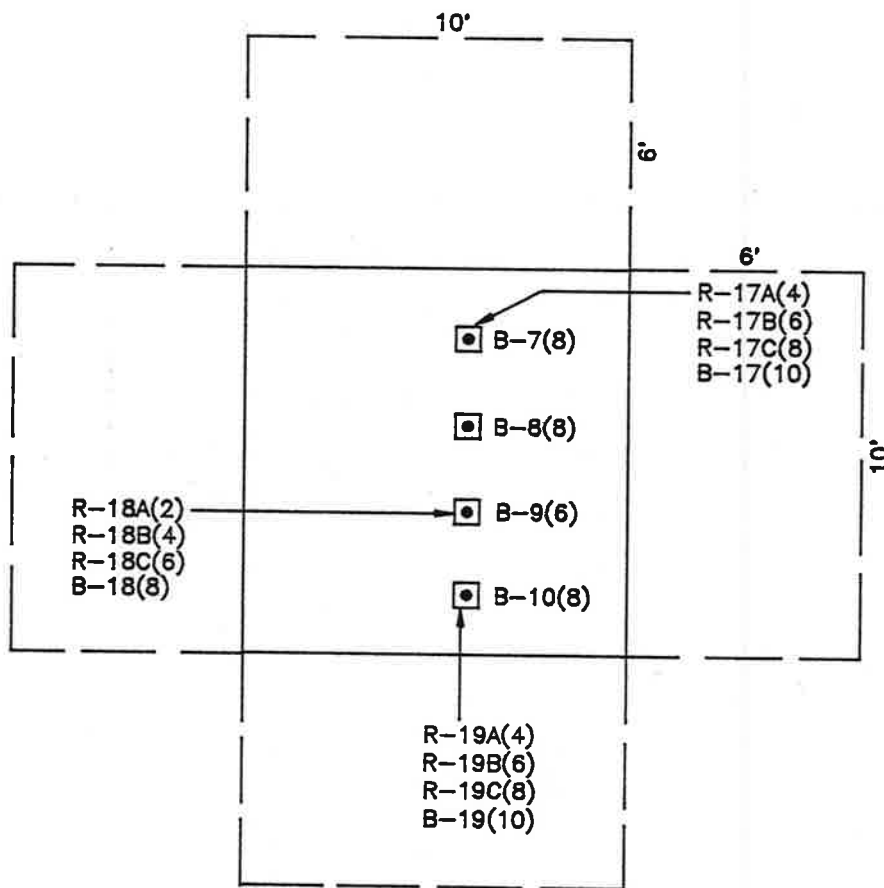


FIGURE 4
 PUMP DISPENSER EXCAVATION
 & SOIL SAMPLE LOCATIONS
 5000 HIAWATHA AVENUE
 MINNEAPOLIS, MINNESOTA

| | | |
|--------------------------|-----------------------|----------------------|
| PROJECT NO. 10-92-333 | PREPARED BY GJS/ND | REVIEWED BY |
| DATE 6/18/93 | REVISION NO. | FILE NAME 92333-4 |



| | | | | |
|---|--|------------------------------|--------------------------------|---------------------|
| PROJECT NAME/LOCATION City of Minneapolis 5000 Hiawatha Avenue Minneapolis, Minnesota | | PROJECT NO. 10-92-333 | BORING NO. SB-1 | SHEET 1 OF 1 |
| | | CONTRACTOR WTD | DRILL METHOD HSA | |
| | | DRILLER | DRILL RIG | |
| | | START 9:50 11/2/92 | COMPLETED 11:10 11/2/92 | |
| LAND OWNER Tom Peterson | | ELEVATION 816.72 | LOGGED BY Andrew Vikman | |

| SAMPLE | | BLOW | SAMPLE | | DEPTH | DESCRIPTIONS OF MATERIALS AND CONDITIONS | OBSERVATIONS | | COMMENTS |
|--------|-----|----------------------|--------------------|--------------------|------------------|--|--------------|-------|---------------------|
| TYPE | NO. | COUNT | INTERVAL (FEET) | RECOVERY (INCH) | SCALE 1" = 4' | | INSTR. | PID | |
| | | | | | | | Field | Head | |
| | | | | | | | screen | space | |
| SS | 1 | 3 4 10 6 | 1-3 | 24 | 1 | Brown-black, silty sand, with mixed gravel. (FL) | 0 | 0 | |
| | | | | | 2 | | | | |
| | | | | | 3 | | | | |
| SS | 2 | 8 8 12 11 | 4-6 | 6 | 4 | Same as above. | 0 | 3 | |
| | | | | | 5 | | | | |
| | | | | | 6 | | | | |
| SS | 3 | 6 7 9 4 | 7-9 | 20 | 7 | Dark brown, silty sand. (SM) | 40 | 10 | |
| | | | | | 8 | Brown, medium grained sand with gravel. (SP) | | | |
| | | | | | 9 | | | | |
| SS | 4 | 11 15 14 16 | 10-12 | 20 | 10 | | 30 | 15 | |
| | | | | | 11 | | | | |
| | | | | | 12 | Rust brown. | | | |
| SS | 5 | 11 11 12 15 | 13-15 | 20 | 13 | Brown, fine grained sand with gravel. (SP) | | 50 | |
| | | | | | 14 | | | | Water at 14.5 feet. |
| | | | | | 15 | | | | |
| SS | 6 | 50 - - - | 16-18 | 18 | 16 | Brown, coarse sand, with gravel, Bedrock-limestone. (SP) | | 130 | |
| | | | | | 17 | End of boring at 17 feet bgs. | | | |
| | | | | | 18 | | | | |
| | | | | | 19 | | | | |
| | | | | | 20 | | | | |
| | | | | | 21 | | | | |
| | | | | | 22 | | | | |
| | | | | | 23 | | | | |
| | | | | | 24 | | | | |
| | | | | | 25 | | | | |

| BOREHOLE WATER LEVEL DATA | | | |
|---------------------------|---------|--|--|
| DATE | 11/2/92 | | |
| TIME | | | |
| GWL | 14.5 | | |
| CASING DEPTH | | | |

| | | | | |
|---|--|------------------------------|--------------------------------|---------------------|
| PROJECT NAME/LOCATION City of Minneapolis 5000 Hiawatha Avenue Minneapolis, Minnesota | | PROJECT NO. 10-92-333 | BORING NO. SB-2 | SHEET 1 OF 1 |
| LAND OWNER Jim Peterson | | CONTRACTOR WTD | DRILL METHOD HSA | |
| | | DRILLER | DRILL RIG | |
| | | START 12:40 11/2/92 | COMPLETED 2:32 11/2/92 | |
| | | ELEVATION 816.95 | LOGGED BY Andrew Vikman | |

| SAMPLE TYPE | SAMPLE NO. | BLOW COUNT | SAMPLE INTERVAL (FEET) | RECOVERY (INCH) | DEPTH SCALE 1" = 4' | DESCRIPTIONS OF MATERIALS AND CONDITIONS | OBSERVATIONS | | |
|-------------|------------|------------|------------------------|-----------------|------------------------|--|--------------|---------|---------------------------------|
| | | | | | | | INSTR. UNITS | PID ppm | COMMENTS |
| SS | 1 | 2 | 1-3 | 10 | 1 | Black, topsoil, silty clay with organics. (OL) | Field | Head | |
| | | screen | | | | | space | | |
| | | - | | | | | 0 | | |
| SS | 2 | 3 | 4-6 | 4 | 4 | Red-brown, silty to clayey sand with gravel. (SM/SC) | - | 0 | |
| | | 12 | | | | | | | |
| | | 18 | | | | | | | |
| SS | 3 | 15 | 7-9 | 12 | 7 | Rusty brown, silty sand with gravel, rough lenses. (SC/SM) | - | 0 | |
| | | 16 | | | | | | | |
| | | 18 | | | | | | | |
| SS | 4 | 15 | 10-12 | 20 | 10 | Rust brown, medium to coarse sand, with intermixed gravel. (SC) | - | 0 | |
| | | 18 | | | | | | | |
| | | 11 | | | | | | | |
| SS | 5 | 14 | 13-15 | 20 | 13 | Red brown, rust brown, medium sand graded into coarse sand. (SC) | - | 0 | No odor. Water at 13.5 feet. |
| | | 11 | | | | | | | |
| | | 16 | | | | | | | |
| SS | 6 | 13 | 16-18 | 6 | 16 | Bedrock-limestone. End of boring at 16.5 feet. | - | 100 | Strong odor, product shean. |
| | | 50 | | | | | | | |
| | | - | | | | | | | |
| | | | | | 17 | | | | |
| | | | | | 18 | | | | |
| | | | | | 19 | | | | |
| | | | | | 20 | | | | |
| | | | | | 21 | | | | |
| | | | | | 22 | | | | |
| | | | | | 23 | | | | |
| | | | | | 24 | | | | |
| | | | | | 25 | | | | |

| BOREHOLE WATER LEVEL DATA | | | |
|---------------------------|---------|--|--|
| DATE | 11/2/92 | | |
| TIME | 13.5 | | |
| GWL | | | |
| CASING DEPTH | | | |

| | | | | |
|---|--|------------------------------|-------------------------------|--------------|
| PROJECT NAME/LOCATION City of Minneapolis 5000 Hiawatha Avenue Minneapolis, Minnesota | | PROJECT NO. 10-92-333 | BORING NO. SB-3 | SHEET 1 OF 1 |
| | | CONTRACTOR WTD | DRILL METHOD HSA | |
| | | DRILLER | DRILL RIG | |
| | | START 8:30 11/3/92 | COMPLETED 9:40 11/3/92 | |
| LAND OWNER Jim Peterson | | ELEVATION 817.89 | LOGGED BY AWW | |

| SAMPLE TYPE | SAMPLE NO. | BLOW COUNT | SAMPLE | | DEPTH SCALE 1" = 4' | DESCRIPTIONS OF MATERIALS AND CONDITIONS | OBSERVATIONS | | COMMENTS | |
|-------------|------------|------------|-----------------|-----------------|------------------------|---|--------------|---------|----------|---------------------|
| | | | INTERVAL (FEET) | RECOVERY (INCH) | | | INSTR. UNITS | PID ppm | | |
| SS | 1 | 2 | 1-3 | 24 | 1 | Brown, silty sand, medium grained. | Field | Head | | |
| | | 1 | | | | | screen | space | | |
| | | 2 | | | | | - | 0 | | |
| | | 3 | | | 2 | | | | | |
| | | | | | 3 | | | | | |
| SS | 2 | 1 | 4-6 | 24 | 4 | (With gravel.) | | | | |
| | | 1 | | | | | - | 2 | | |
| | | 2 | | | | | | | | |
| | | 3 | | | 5 | | | | | |
| | | | | | 6 | | | | | |
| SS | 3 | 0 | 6-8 | 18 | 7 | Dark brown rusty, silty to clayey sand. (FL) | | | | |
| | | 1 | | | | | - | 7 | | |
| | | 1 | | | | | | | | |
| | | 2 | | | 8 | | | | | |
| | | | | | 9 | | | | | |
| SS | 4 | 1 | 9-11 | 18 | 10 | | | | | |
| | | 1 | | | | | - | 4 | | |
| | | 1 | | | | | | | | |
| | | | | | 11 | | | | | |
| | | | | | 12 | | | | | |
| SS | 5 | 18 | 12-14 | 24 | 12 | Rust brown, medium to coarse sand with mixed gravel. (SP) | | | 4 | Strong odor. |
| | | 25 | | | | | - | 4 | | |
| | | 45 | | | | | | | | |
| | | 60 | | | 13 | | | | | |
| | | | | | 14 | | | | | |
| SS | 6 | 10 | 15-17 | 24 | 15 | | | | 10 | Water at 16.5 feet. |
| | | 11 | | | | | - | 10 | | |
| | | 16 | | | | | | | | |
| | | 26 | | | 16 | (Black.) | | 450 | | Petroleum stained |
| | | | | | 17 | | | | | |
| SS | 7 | 50 | 18-20 | 3 | 18 | Bedrock-limestone. | | | 450 | |
| | | - | | | | | - | 450 | | |
| | | - | | | | | | | | |
| | | | | | 19 | End of boring at 18.5 feet. | | | | |
| | | | | | 20 | | | | | |
| | | | | | 21 | | | | | |
| | | | | | 22 | | | | | |
| | | | | | 23 | | | | | |
| | | | | | 24 | | | | | |
| | | | | | 25 | | | | | |

| BOREHOLE WATER LEVEL DATA | |
|---------------------------|-----------|
| DATE | 11/3/92 |
| TIME | |
| GWL | 16.5 feet |
| CASING DEPTH | |

| PROJECT NAME/LOCATION | | | PROJECT NO. | | BORING NO. | | SHEET 1 OF 1 | | | |
|---|----------|---------|-----------------|-----------------|--------------|---|--------------|------------|---------------------------------|--|
| City of Minneapolis 5000 Hiawatha Avenue Minneapolis, Minnesota | | | CONTRACTOR | | DRILL METHOD | | DRILL RIG | | | |
| | | | DRILLER | | COMPLETED | | LOGGED BY | | | |
| | | | START | | ELEVATION | | OVM #1 | | COMMENTS | |
| | | | LAND OWNER | | ELEVATION | | UNITS | | ppm | |
| City of Minneapolis | | | 825.23 | | CSH | | | | | |
| SAMPLE TYPE | BLOW NO. | COUNT | SAMPLE | | DEPTH SCALE | DESCRIPTIONS OF MATERIALS AND CONDITIONS | OBSERVATIONS | | COMMENTS | |
| | | | INTERVAL (FEET) | RECOVERY (INCH) | | | INSTR. | OVM #1 | | |
| | | | | | 1" = 4' | | Field screen | Head space | | |
| SS | 1 | | 4-6 | 12 | | Soil - brown organic. | | | | |
| | | | | | | Clayey silt, with sand, some organic material, brown, moist. | 0 | 0 | | |
| SS | 2 | | 9-11 | 12 | | Sand and gravel fill, tanish orangish, with silt, with rocks - limestone, dry. | 0 | 2 | | |
| SS | 3 | | 14-16 | 12 (ROCK) | | Sand - fine to medium grained, with silt, with cobbles - quartz, limestone, basalt, brown, moist to dry, dense. | 0 | 2 | | |
| SS | 4 | | 19-21 | 18 | | Sand - medium to coarse grained with gravel, with cobbles, moist, brown. | 0 | 0 | | |
| SS | 5 | | 24-26 | 16 | | Sand - coarse grained, rusty brown, wet. | 2 | 2 | SS2 @ 22 feet 2:45 (from auger) | |
| | | | | | | Bedrock - limestone, grey. | | | SS1 @ 24 feet 12:45 | |
| BOREHOLE WATER LEVEL DATA | | | | | | | | | | |
| DATE | 4/5/93 | 4/5/93 | 4/5/93 | | | | | | | |
| TIME | 1:00 | 2:50 | 2:50 | | | | | | | |
| GWL | 22.75 | 22.75 | 24.67 | | | | | | | |
| | surface | surface | top of riser | | | | | | | |

| | | | | |
|---|--|----------------------------------|--|--------------|
| PROJECT NAME/LOCATION City of Minneapolis 5000 Hiawatha Avenue Minneapolis, Minnesota | | PROJECT NO. 10-92-333 | BORING NO. SB-5 | SHEET 1 OF 2 |
| LAND OWNER Tom Peterson | | CONTRACTOR WTD | DRILL METHOD Air Rotary 4.25" HSA | |
| | | DRILLER Dan T. and Ran R. | DRILL RIG Ford Model B-57 #276 | |
| | | START 8:00 4/6/93 | COMPLETED 5:30 4/6/93 | |
| | | ELEVATION 816.88 | LOGGED BY CSH | |

| SAMPLE | | BLOW | SAMPLE | | DEPTH | DESCRIPTIONS OF MATERIALS AND CONDITIONS | OBSERVATIONS | | |
|--------|-----|-------|--------------------|--------------------|------------------|---|--------------|--------|---|
| TYPE | NO. | COUNT | INTERVAL (INCH) | RECOVERY (INCH) | SCALE 1" = 4' | | INSTR. | OVM #1 | COMMENTS |
| | | | | | | | UNITS | ppm | |
| | | | | | 1 | Concrete. | Field | Head | |
| | | | | | 2 | Fill-sand, gravel, brown, dry. | screen | space | |
| | | | | | 3 | | | | |
| SS | 1 | | 4-6 | 12 | 4 | Sand - coarse grained with gravel, rusty brown, moist to dry, soft - Fill. | 2 | 6 | |
| | | | | | 5 | | | | |
| | | | | | 6 | | | | |
| | | | | | 7 | | | | |
| | | | | | 8 | | | | |
| SS | 2 | | 9-11 | 12 | 9 | Sand - fine to medium grained with silt, with gravel, with cobbles, brown to rust brown, moist. | 0 | 5 | |
| | | | | | 10 | | | | |
| | | | | | 11 | | | | |
| | | | | | 12 | | | | |
| | | | | | 13 | | | | |
| SS | 3 | | 14-16 | 1 | 14 | Sand - medium to coarse grained brown, wet - saturated. | 4 | 364 | |
| | | | | | 15 | | | | |
| | | | | | 16 | | | | |
| | | | | | 17 | Bedrock - weathered limestone, buff to grey. | | | HSA to 20 feet. Air rotary 20 to 40 feet. |
| | | | | | 18 | | | | |
| SS | 4 | | 19-21 | 4 | 19 | | | | Probably sluff from contact. Mostly sand with rock pieces. |
| | | | | | 20 | | 20 | 583 | |
| | | | | | 21 | | | | |
| | | | | | 22 | (rock chips - limestone-crystalline, buff to grey) | | | 84 - Cuttings. 42 - Water |
| | | | | | 23 | | | | |
| | | | | | 24 | | | | 5 - Water |
| | | | | | 25 | | | | |

BOREHOLE WATER LEVEL DATA

| | | | |
|---------------------|---------|-----------|--|
| DATE | 4/6/93 | 4/7/93 | |
| TIME | 4:45 | 7:30 | |
| GWL | 21 feet | 14.5 feet | |
| CASING DEPTH | 19 feet | 19 feet | |

| | | | | |
|------------------------------|--|------------------------------|------------------------|---------------------|
| PROJECT NAME/LOCATION | | PROJECT NO. 10-92-333 | BORING NO. SB-5 | SHEET 2 OF 2 |
| | | CONTRACTOR | DRILL METHOD | |
| | | DRILLER | DRILL RIG | |
| | | START | COMPLETED | |
| LAND OWNER | | ELEVATION | LOGGED BY | |

| SAMPLE TYPE | SAMPLE NO. | BLOW COUNT | SAMPLE INTERVAL (INCH) | RECOVERY (INCH) | DEPTH SCALE 1" = 4' | DESCRIPTIONS OF MATERIALS AND CONDITIONS | OBSERVATIONS | | | |
|---|------------|------------|------------------------|-----------------|------------------------|--|--------------|----------------|--|-----------------------------|
| | | | | | | | INSTR. UNITS | Head space ppm | COMMENTS | |
| A I R R O T A R Y | | | | | 25 | Cuttings Limestone - gray and buff, larger peices show weathered surfaces, wet. | Field screen | 8 | Occasional slight odor noticed while drilling. | |
| | | | | | 26 | | | | | |
| | | | | | 27 | | | | | |
| | | | | | 28 | | | | | |
| | | | | | 29 | | | | | |
| | | | | | 30 | | | | | |
| | | | | | 31 | | | | | |
| | | | | | 32 | | | | | |
| | | | | | 33 | | | 17 | | -Water Very slight odor. |
| | | | | | 34 | | | | | |
| | | | | | 35 | | | | | |
| | | | | | 36 | | | | | |
| | | | | | 37 | | | | | |
| | | | | | 38 | | | 6 | -Cuttings | |
| | | | | | 39 | | | | | |
| | | | | | 40 | End of borgn at 40 feet. | | | | |
| | | | | | 41 | | | | | |
| | | | | | 42 | | | | | |
| | | | | | 43 | | | | | |
| | | | | | 44 | | | | | |
| | | | | | 45 | | | | | |
| | | | | | 46 | | | | | |
| | | | | | 47 | | | | | |
| | | | | | 48 | | | | | |
| | | | | | 49 | | | | | |

| BOREHOLE WATER LEVEL DATA | | | | Screen from 30 to 40 feet. |
|---------------------------|--|--|--|----------------------------|
| DATE | | | | Sand to 28 feet. |
| TIME | | | | |
| GWL | | | | |
| CASING DEPTH | | | | |

| | | | | |
|---|--|--------------------------------|-----------------------------------|--------------|
| PROJECT NAME/LOCATION | | PROJECT NO. 10-92-333 | BORING NO. SB-6 | SHEET 1 OF 1 |
| City of Minneapolis 5000 Hiawatha Avenue Minneapolis, Minnesota | | CONTRACTOR WTD | DRILL METHOD 4.25-inch HSA | |
| | | DRILLER Dan T. & Dan R. | DRILL RIG Ford B57 #27653 | |
| | | START 3:30 4/7/93 | COMPLETED 5:00 4/7/93 | |
| LAND OWNER Minnehaha Park | | ELEVATION 814.21 | LOGGED BY CSH | |

| SAMPLE TYPE | BLOW NO. | BLOW COUNT | SAMPLE INTERVAL (INCH) | RECOVERY (INCH) | DEPTH SCALE 1" = 4' | DESCRIPTIONS OF MATERIALS AND CONDITIONS | OBSERVATIONS | | COMMENTS |
|-------------|----------|------------|------------------------|-----------------|------------------------|--|--------------|------------|---------------------------------|
| | | | | | | | INSTR. UNITS | OVN #1 ppm | |
| | | | | | 1 | Soil - brown organic. | Field screen | Head space | |
| | | | | | 2 | | | | |
| | | | | | 3 | | | | |
| SS | 1 | | 4-6 | 14 | 4 | Silty clay - with sand and gravel, tan, dense, dry. | 0 | 0 | |
| | | | | | 5 | | | | |
| | | | | | 6 | | | | |
| | | | | | 7 | | | | |
| SS | 2 | | 8-10 | 22 | 8 | Sand - fine grained with silt, soft, brown, dry. | 0 | 2 | |
| | | | | | 9 | | | | |
| | | | | | 10 | | | | |
| | | | | | 11 | | | | |
| SS | 3 | | 12-14 | 20 | 12 | Moist, soft. | 0 | 2 | SS3 @ 4:30 13 to 14' sand/peat. |
| | | | | | 13 | Peat - organic rich, black, soft moist to wet, with sand & silt. | | | |
| | | | | | 14 | | | | |
| | | | | | 15 | Bedrock at 15 feet. End of boring at 15 feet. | | | |
| | | | | | 16 | | | | |
| | | | | | 17 | | | | |
| | | | | | 18 | | | | |
| | | | | | 19 | | | | |
| | | | | | 20 | | | | |
| | | | | | 21 | | | | |
| | | | | | 22 | | | | |
| | | | | | 23 | | | | |
| | | | | | 24 | | | | |
| | | | | | 25 | | | | |

| BOREHOLE WATER LEVEL DATA | | | |
|---------------------------|-----------|--|--|
| DATE | 4/7/93 | | |
| TIME | 4:45 | | |
| GWL | 12.2 feet | | |
| CASING DEPTH | | | |

PRECISION ENVIRONMENTAL

Field Monitoring and Testing Services

19 FEB 93 12: 20

8251 Main Street N.E.
Minneapolis, Minnesota 55432-1849
(612) 780-9787 • FAX (612) 780-7157

February 17, 1993

Cathy Hokeness
Hydrogeologist
Delta Environmental Consultants, Inc.
3900 Northwoods Drive, Suite 200
St. Paul, Minnesota 55112

Dear Ms. Hokeness;

Enclosed are two copies of Report of Field Monitoring for the monitoring conducted by Precision Environmental at 5000 Hiawatha Avenue - Minneapolis, Minnesota on February 10, 1993.

Please do not hesitate to contact me if you have any questions or comments. It has been a pleasure assisting you with this project.

Sincerely,

Precision Environmental



Dean Myers
Manager, Field Services

DAM/tmg
Enclosures: 2

Report of Field Monitoring

At

5000 Hiawatha Avenue - Minneapolis, Minnesota

February 10, 1993

Prepared for:

**Cathy Hokeness
Delta Environmental Consultants
3900 Northwoods Drive
Suite 200
St. Paul, MN 55112**

Prepared by:

**Precision Environmental
8251 Main Street Northeast
Minneapolis, Minnesota 55432
(612) 780-9787
FAX (612) 780-7157**

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1.00 Introduction

This report is a summary of soil sampling and analysis performed by Precision Environmental as requested by:

Cathy Hokeness
Delta Environmental Consultants
3900 Norhtwoods Drive
Suite 200
St. Paul, MN 55112

Sampling and analytical results and procedures described in this report were performed in conjunction with the following project:

City of Minneapolis
5000 Hiawatha Avenue
Minneapolis, Minnesota

This location will be referred to as the project site for the remainder of the report. Figure 1 shows the project site location. Services provided by Precision Environmental were conducted in accordance with the sampling plan outlined by Ms. Hokeness.

2.00 Summary

Monitoring at the project site was conducted on February 10, 1993. A map of the project location is shown in Figure 1. Ms. Hokeness of Delta was present on-site during sampling and analysis. A total of fourteen samples were collected and analyzed on-site for :

Benzene
Toluene
Ethyl Benzene
Xylenes
Total Hydrocarbons as Gasoline

Sample totals are listed below:

| | |
|--|----|
| Soil Vapor samples collected from 13 feet: | 1 |
| Soil Vapor samples collected from 14 feet: | 5 |
| Soil Vapor samples collected from 16 feet: | 1 |
| Soil samples collected from 13 feet: | 1 |
| Soil samples collected from 14 feet: | 3 |
| Soil samples collected from 16 feet: | 2 |
| <u>Water samples collected from 16 feet:</u> | 1 |
| Total | 14 |

Analytical chromatograms were provided to Ms. Hokeness on-site. Monitoring results are summarized as follows:

| | |
|-------------------------------|-------------|
| Sampling and Analytical Data: | Table 1a-1b |
| Field Data Forms | Appendix A |
| Laboratory Report No. 93-060 | Appendix B |

3.00 Summary of Sampling Procedures

Samples were collected at the locations and depths specified by Ms. Hokeness.

3.10 Soil Vapor Sample Collection

Sampling depth was reached by driving a 3/8" tile probe with a 3/4" tip to depth using a slide hammer. Soil vapor was drawn through the sampling probe using an SKC personnel pump. A "T" fitting equipped with a septum was attached to the sampling probe. The sample was collected by piercing the septum with a gas-tight syringe and drawing the sample. A schematic of the total organic vapor monitoring assembly is shown in Figure 2. Field data is recorded on the Soil Vapor Sampling Data Sheet included in Appendix A. Sampling procedures are detailed below:

1. "T" fittings and septa were decontaminated prior to sampling by the following procedure:
 - a. Interior and exterior surfaces wash of the fittings with a deionized water and Alconox solution.
 - b. Interior and exterior surface rinse of the fittings with deionized water.
 - c. Interior and exterior surface rinse of the fittings with reagent grade methanol.
 - d. Oven heat for a minimum of one-hour at 105 °C.
 - e. Store assembled fittings and septa separately in plastic bags. Disposable gloves must be worn at all times.
2. The pump was calibrated to sample at 200 ml per minute using a bubble tube. A syringe kit containing a syringe and index card for sample identification was obtained from mobile laboratory personnel.
3. The fitting was attached to the sampling probe and tightened securely. The pump was attached to the "T" fitting.
4. The vacuum was run for a minimum of two-minutes prior to sampling. The septum was pierced with the syringe and cycled repeatedly to purge the syringe. The sample was collected by overfilling the syringe. The syringe was withdrawn and capped. Sample identification information was kept with each sample at all times.

5. The sample was delivered immediately to the mobile laboratory personnel for analysis.

3.20 Soil Sample Collection

Sampling depth was reached by driving a 3/8" tile probe with a 3/4" tip to depth using a slide hammer. The tile probe was withdrawn and a 3/8" tile probe with a 7/16" O.D. stainless steel sampling spoon was inserted into the hole. Separate spoons were used to collect each sample. Samples were delivered immediately to the mobile laboratory for analysis. Field data is recorded on the Soil Vapor Sampling Data Sheet included in Appendix A.

Stainless steel sampling spoons are decontaminated prior to sampling by the following procedure:

- a. Interior and exterior surface wash of the sampling spoons with Alconox solution.
- b. Interior and exterior surface rinse of the sampling spoons with deionized water.
- c. 15 minute 10% HCl bath .
- d. Interior and exterior surface rinse of the sampling spoons with deionized water.
- e. Interior and exterior surface rinse of the sampling spoons with reagent grade methanol.
- f. Oven-heat for a minimum of one hour at 105° C.
- g. Wrap while hot in aluminum foil (shiny-side out). Disposable gloves are worn at all times.

3.30 Water Sample Collection

Sampling depth was reached by driving a 3/8" tile probe with a 3/4" tip to depth using a slide hammer. The tile probe was withdrawn and a 1/4" stainless steel sampling probe was inserted into the hole. A peristaltic pump was attached to the sampling probe. The water sample was pumped directly into an I-Chem flint glass septum vial and delivered immediately to the mobile laboratory for analysis. Field data is recorded on the Soil Vapor Sampling Data Sheet included in Appendix A.

4.00 Summary of Mobile Laboratory Analysis

Analytical results are shown in Table 1 and Appendix B. All samples were analyzed on-site by GC-PID and GC-FID (EPA methods 8020 and 8015) for the following parameters:

| <u>Analyte</u> | <u>Detection Limit Air</u> | <u>Detection Limit Soil</u> | <u>Detection Limit Water</u> |
|--------------------|----------------------------|-----------------------------|------------------------------|
| Benzene | 0.1 µg/l | 10 µg/Kg | 1 µg/l |
| Toluene | 0.1 µg/l | 10 µg/Kg | 1 µg/l |
| Ethyl Benzene | 0.2 µg/l | 20 µg/Kg | 2 µg/l |
| Xylenes | 0.5 µg/l | 50 µg/Kg | 5 µg/l |
| Total Hydrocarbons | 1.0 µg/l | 100 µg/Kg | 10 µg/l |

Table 1a
 Sampling and Analytical Data
 5000 Hiawatha Avenue, Minneapolis, MN
 Precision Environmental February 10, 1993

| <u>Location ID</u> | <u>SV-1 Vapor</u> | <u>SV-2 Vapor</u> | <u>SV-3 Vapor</u> | <u>SV-4 Vapor</u> | <u>SV-5 Vapor</u> |
|--------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Sampling Depth, ft. | 14 | 13 | 14 | 14 | 14 |
| Sampling Method | Syringe | Syringe | Syringe | Syringe | Syringe |
| Time Collected | 9:25 | 10:15 | 11:40 | 11:30 | 12:15 |
| Date Collected | 2/10/93 | 2/10/93 | 2/10/93 | 2/10/93 | 2/10/93 |
| Chronology | 1 | 3 | 7 | 6 | 8 |
| PI-101, ppmv | 0 | 16 | 20 | 20 | 20 |
| Benzene,ug/l | ND | ND | ND | ND | ND |
| Toluene,ug/l | ND | ND | ND | ND | ND |
| Ethyl Benzene,ug/l | ND | ND | ND | ND | ND |
| Xylenes,ug/l | ND | ND | ND | ND | ND |
| <u>Total Hydrocarbons,ug/l</u> | <u>ND</u> | <u>ND</u> | <u>ND</u> | <u>ND</u> | <u>ND</u> |
| FID Chromatogram No. | 112 | 114 | 118 | 117 | 120 |
| PID Chromatogram No. | 77 | 79 | 83 | 82 | 85 |

| <u>Location ID</u> | <u>SV-6 Vapor</u> | <u>SV-7 Vapor</u> |
|--------------------------------|-------------------|-------------------|
| Sampling Depth, ft. | 14 | 16 |
| Sampling Method | Syringe | Syringe |
| Time Collected | 14:00 | 16:50 |
| Date Collected | 2/10/93 | 2/10/93 |
| Chronology | 11 | 13 |
| PI-101, ppmv | 130 | - |
| Benzene,ug/l | ND | ND |
| Toluene,ug/l | ND | ND |
| Ethyl Benzene,ug/l | ND | ND |
| Xylenes,ug/l | ND | ND |
| <u>Total Hydrocarbons,ug/l</u> | <u>ND</u> | <u>ND</u> |
| FID Chromatogram No. | 2 | 4 |
| PID Chromatogram No. | 67 | 69 |

*Analysis by GC-PID and GC-FID (EPA methods 8015 and 8020).

Methods

Syringe = Vapor Syringe
 Spoon = Stainless Steel Sampling Spoon
 Pump = Peristaltic Pump

Comments

The PI-101 malfunctioned at bore hole 7, no readings were obtained.

Table 1b
 Sampling and Analytical Data
 5000 Hiawatha Avenue, Minneapolis, MN
 Precision Environmental February 10, 1993

| <u>Location ID</u> | <u>SV-1 Soil</u> | <u>SV-2 Soil</u> | <u>SV-5 Soil</u> | <u>SV -5 Soil</u> | <u>SV-6 Soil</u> | <u>SV -7 Soil</u> |
|---------------------------------|------------------|------------------|------------------|-------------------|------------------|-------------------|
| Sampling Depth, ft. | 14 | 13 | 14 | 16 | 14 | 16 |
| Sampling Method | Spoon | Spoon | Spoon | Spoon | Spoon | Spoon |
| Time Collected | 9:40 | 10:20 | 12:25 | 13:15 | 14:10 | 17:00 |
| Date Collected | 2/10/93 | 2/10/93 | 2/10/93 | 2/10/93 | 2/10/93 | 2/10/93 |
| Chronology | 2 | 4 | 9 | 10 | 12 | 14 |
| Benzene,ug/Kg | ND | ND | ND | ND | ND | ND |
| Toluene,ug/Kg | ND | ND | ND | ND | ND | ND |
| Ethyl Benzene,ug/Kg | ND | ND | ND | ND | ND | ND |
| Xylenes,ug/Kg | ND | ND | ND | ND | ND | ND |
| <u>Total Hydrocarbons,ug/Kg</u> | <u>ND</u> | <u>ND</u> | <u>ND</u> | <u>ND</u> | <u>ND</u> | <u>ND</u> |
| FID Chromatogram No. | 113 | 115 | 121 | 122 | 3 | 5 |
| PID Chromatogram No. | 78 | 80 | 86 | 87 | 68 | 70 |

| <u>Location ID</u> | <u>SV-3 Water</u> |
|--------------------------------|-------------------|
| Sampling Depth, ft. | 16 |
| Sampling Method | Pump |
| Time Collected | 11:00 |
| Date Collected | 2/10/93 |
| Chronology | 5 |
| Benzene,ug/l | ND |
| Toluene,ug/l | ND |
| Ethyl Benzene,ug/l | ND |
| Xylenes,ug/l | ND |
| <u>Total Hydrocarbons,ug/l</u> | <u>ND</u> |
| FID Chromatogram No. | 116 |
| PID Chromatogram No. | 81 |

*Analysis by GC-PID and GC-FID (EPA methods 8015 and 8020).

Methods

Syringe = Vapor Syringe
 Spoon = Stainless Steel Sampling Spoon
 Pump = Peristaltic Pump

Comments

The PI-101 malfunctioned at bore hole 7, no readings were obtained.

N ↑

X proposed locations
⊗ possible locations

