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April 7, 1995

Ms. Jean Hanson
Minnesota Pollution Control Agency
Hazardous Waste Division
Tanks and Spills Section
520 Lafayette Road North
St. Paul, MN 55155-3898

Subject: Remedial Investigation/Corrective Action Design Report
Holiday Station No. 226
Hinckley, Minnesota
MPCA Leak No. 7487
Delta No. A094-158

Dear Ms. Hanson:

On behalf of Holiday Companies, Inc. (Holiday), Delta Environmental Consultants, Inc. (Delta), is submitting the above reference Remedial Investigation/Corrective Action Design (RI/CAD) report for your review and approval.

The RI/CAD was completed at the Holiday Station No. 226 in response to the Minnesota Pollution Control Agency (MPCA) action letter dated July 8, 1994, which requested Holiday to conduct a voluntary subsurface soil and ground water investigation at the above referenced site.

Based on investigative results, Delta recommends that quarterly ground water sampling and reporting be conducted in April, July, and October 1995. Delta will recommend site closure if hydrocarbons concentrations in monitoring wells do not increase significantly during 1995.

If you have any questions regarding this RI/CAD report, please contact me at (612) 486-5845.

Sincerely,

DELTA ENVIRONMENTAL CONSULTANTS, INC.

Chai Insook
Project Manager

CI/bjc

Enclosures

cc Mr. Keith Yokom - Holiday Company Inc.
Mr. Neil Piazza - Agricultural Excess and Surplus Insurance Company

REMEDIAL INVESTIGATION/
CORRECTIVE ACTION DESIGN REPORT

HOLIDAY STATION NO. 226

HINCKLEY, MINNESOTA

MPCA LEAK NO. 7487

DELTA NO. A094-158-1

Prepared by:

Delta Environmental Consultants, Inc.
3900 Northwoods Drive, Suite 200
St. Paul, MN 55112
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April 7, 1995

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CORRECTIVE ACTION DESIGN REPORT

HOLIDAY STATION NO. 226

HINCKLEY MINNESOTA

MPCA LEAK NO. 7487

DELTA NO. A094-158-1

1.0 INTRODUCTION

1.1 Purpose and Authorization

This report presents the results of a remedial investigation (RI) conducted by Delta Environmental Consultants, Inc. (Delta), on behalf of Holiday Companies (Holiday), at the Holiday Station No. 226 (the Holiday site). The Holiday site is located at on the northeast corner of Interstate Highway 35 (I-35) and County Road 48, in Hinckley, Minnesota (Figure 1). Holiday requested Delta to conduct a subsurface environmental investigation of soil and ground water at the site in response to the Minnesota Pollution Control Agency (MPCA) action letter dated July 8, 1994.

1.2 Scope of Work

The following scope of work was completed at the site:

- Completed a file review at the MPCA of data and reports collected and completed as part of the RI completed by Tobies Service Station, which is an adjacent leak site.
- Drilled five soil borings and installed three ground water monitoring wells.
- Submitted eight (8) soil samples collected from the five soil borings, and two rounds of ground water samples collected from the three monitoring wells for chemical analyses.
- Collected two rounds of ground water elevations data from the three wells on the Holiday site and from available wells on the Tobies site to evaluate the direction of ground water flow.
- Completed a record search of registered water wells located within a 1 mile radius of the site.
- Completed the MPCA Hydrogeologic Setting and Ground Water Contamination Worksheet (Fact Sheet No.24).
- Prepared and submitted this RI/CAD report, which incorporates hydrogeologic data from an RI/CAD report prepared for the Tobies Service Station site.

2.0 BACKGROUND INFORMATION

Holiday has operated a petroleum retail facility (Holiday Station No. 226) on the site property (Figure 2) since 1986. Before 1986, the site property was vacant and prior history of site use is unknown. The Holiday site operates four underground storage tanks (USTs) (two 10,000 gallon tanks and two 12,000 gallon tanks) and dispenses unleaded and diesel fuel; sales of leaded gasoline was discontinued in 1991. USTs and connective product pipe lines at the Holiday site are pressure tested for leaks annually; the previous two tests were conducted in August 1994, and July 1993. The results of pressure testing did not indicate a leak in any of the USTs at the Holiday station. Additionally, product inventory records at the Holiday station do not indicate any significant product loss from the USTs.

The Holiday site is located north of County Road 48. South of County Road 48 is the Tobies site (Figure 3). In October 1990 four USTs were excavated and removed at the Tobies site, and a release of petroleum hydrocarbons was reported to the MPCA (MPCA Leak No. 3367). An RI was then conducted at the Tobies site by EnecoTech (1992) and Huntingdon (HTCT [1993]).

The results of RI completed at the Tobies site indicated that the Holiday site was a potential up-gradient source of hydrocarbons that were detected in ground water at the Tobies site. Subsequently, the MPCA requested that Holiday conduct an RI at the Holiday site to access the possible release of hydrocarbons into subsurface soils and ground water.

3.0 FIELD INVESTIGATION

A remedial investigation of subsurface soils and ground water was conducted at the Holiday site in November 1994. During this phase of work, five (5) soil borings were drilled and three monitoring wells were installed. Underground utilities at the site that may serve as potential receptors of organic vapors were also identified. Field methodologies are presented in Appendix A.

3.1 Drilling and Soil Sampling

Drilling was conducted on November 29 and November 30, 1994, utilizing a Mobile drilling rig, equipped with 4.25 inch inner diameter (I.D.) hollow stem-augers. The auger flights had been steam-cleaned prior to arrival at the site, and they were judged to be clean. Only clean augers were used to drill the soil borings and the wells. Additional steam cleaning of the augers took place off site and was performed by the drillers as needed.

Five soil borings (SB-1, SB-2, SB-3, SB-4, and SB-5 [Figure 2]) were drilled and soil samples were collected utilizing a 2 inch outside diameter split spoon sampler. Split spoon soil samples were collected continuously from approximately 2 feet below ground surface (bgs) to the base of soil boring SB-1. Split spoon soil samples were collected at approximately every 5 foot interval in soil borings SB-2, SB-3, SB-4, and SB-5.

Before sampling a particular interval, the split spoon sample was cleaned in a phosphate free detergent wash, rinsed with potable water, then dried. Samples for chemical analysis were collected into clean sample jars that were prepared by the laboratory. Generally, soil from the bottom 6 inch sample from the split spoon was collected for the laboratory analysis.

Selected soil samples from the split spoons were collected for headspace screening of total organic vapors using a photo ionization detector (PID) equipped with a 10.8 electron volts lamp, and for lithologic logging. The soil samples were described in accordance with the Unified Soil Classification System. Soil vapor headspace measurements and field soil classification methodologies are described in Appendix A. The PID soil headspace readings are recorded on the geologic logs of the soil borings, which are provided in Appendix B.

Soil boring SB-1 was drilled immediately south of the tank basin and south of the gasoline pump island, on the southern property boundary, to a total depth of 26 feet bgs. SB-2 was drilled approximately 20 feet west of the pump island, to the depth of 21 feet bgs. SB-3 was drilled on the southwest corner of the property boundary to the depth of 30 feet bgs. SB-4 was drilled immediately north of the pump island to the total depth of 23 feet bgs, and SB-5 was drilled approximately 20 feet north of the pump island to the total depth of 25 feet bgs. Ground water was encountered in all soil borings at approximately 14 to 16 feet bgs. Additional soil borings could not be drilled south and east of SB-1 (MW-1) because of overhead and underground utilities.

Two soil samples were collected from each of the borings SB-1, SB-2, and SB-4 for chemical analyses of benzene, toluene, ethylbenzene, and total xylenes (BTEX) and gasoline range organics (GRO). A sample from the interval exhibiting the highest headspace reading (generally from the sample near the vadose zone) and a soil sample from near the base of each boring were collected for chemical analyses. In borings that exhibited low field PID readings (SB-3 and SB-5), only one soil sample from each borehole was collected for chemical analysis.

3.2 Monitoring Well Installation

Three monitoring wells (MW-1, MW-2, and MW-3) were installed in the boreholes of soil borings SB-1, SB-3, SB-5, respectively. Each well was constructed of 2 inch I.D., Schedule 40, poly vinyl chloride (PVC) screen with a 0.010 inch manufactured slot size. The well screens extend from 14 to 24 feet bgs in wells MW-1, from 16 to 26 feet bgs in MW-2, and from 15 to 25 feet bgs in MW-3. A 2 inch I.D., polyvinyl chloride (PVC) casing extended from the top of the well screens to the ground surface. A No. 30 silica sand pack was placed from the bottom of the borehole to 2 feet above the well screen, and bentonite grout seal was placed above the sand pack. MW-1 and MW-3 were completed as at-grade monitoring wells, equipped with 8 in I.D., protective manhole covers and locking steel caps. MW-2 was completed as an above-grade monitoring well, equipped with a 6 inch ID protective steel casing. Monitoring wells completion diagrams and soil boring logs are provided in Appendix B.

A specific point on the top of each monitoring well PVC casing was denoted with a notch, and marked with an indelible ink pen. The denoted marks were surveyed by Kemper & Associates, Inc., (Kemper), a licensed surveyor. The elevations were referenced to the nearest National Geodetic Vertical Datum (NGVD) survey benchmark. In order to compare elevations data from the Holiday site to those of the Tobies site, Holiday well MW-2 and Tobies MW-3 were surveyed to a common reference datum by representatives from Delta and HTCT. This information was used to adjust the top of casing (TOC) elevations at the Tobies site to the same reference datum at the Holiday site.

3.3 Well Development and Ground Water Sampling

In order to remove the fine-grained materials from the wells and sand packs, and to improve the hydraulic communication between the wells and the geologic materials, monitoring wells were developed on December 6, 1994, utilizing a bailing method.

Ground water samples were collected after well development on December 6, 1994, and again on January 20, 1995. Ground water samples collected on December 6, 1994 were analyzed for volatile organic compounds (VOCs), GRO, and DRO. Ground water samples collected on January 20, 1995 were analyzed for BTEX, GRO, and DRO.

Before purging and collecting the samples, the depth to ground water in the wells was measured with an electronic water level indicator. The monitoring wells were then purged, and ground water samples were collected utilizing dedicated PVC bailers. Free product was not encountered in any of the wells during well

development, purging, and sampling activities. Water level measurement and ground water sampling protocol are discussed in Appendix A.

3.4 Potential Receptors of Organic Vapors

During the site investigation, underground utilities in the site vicinity were located and mapped (Figure 2). Storm and sanitary sewer lines are positioned above the ground water table, and are located cross-gradient of ground water flow beneath the Holiday site. An organic vapor survey of utilities was deemed unnecessary.

HTCT conducted an organic vapor survey in the sanitary and storm sewers along County Road 48, and in the two buildings on the Tobies site in November 1993. HTCT utilized an explosimeter and PID to screen for organic vapors, and reported that no readings above background levels were observed in the sewers or in the buildings.

4.0 PROJECT RESULTS

4.1 Site Geology

Geologic logs of soil borings indicate that the Holiday site is predominantly underlain by a mixture of poorly sorted sands and gravels, with discontinuous lenses of poorly sorted sands, and silty sands. The sand and gravel layer extends from ground surface to approximately 21 to 28 feet bgs. Approximately 4 to 7 feet of silty sand and gravel fill was encountered above the poorly sorted sand and gravel layer in SB-1 and SB-4 (north and south of the canopy). Fill was not encountered in boreholes SB-2, SB-3, and SB-5.

A silty and sandy clay till unit was encountered beneath the poorly sorted sand and gravel layer in all borings except SB-2, where auger refusal was encountered at 21 feet bgs. Auger refusal may indicate a cobble in the sand and gravel unit, or the contact with the clay till. All borings at the Holiday site (except SB-2) terminated in the clay till.

Geology observed at the Holiday site is consistent with that observed at the Tobies site. Geology at the Tobies site is reported to be predominantly glacial till, which consists of approximately 7 to 20 feet of sands and gravels, intermixed with clay lenses. A sandy clay unit with a minimum thickness of approximately 20 feet underlies the sand and gravel layer. According to HTCT, the Hinckley Sandstone Formation (regional bedrock) is approximately 43 feet bgs at the Tobies site (HTCT B-8).

Geology beneath the Holiday and Tobies sites is depicted in a generalized geologic cross-section (Figure 4), with the line of cross-section shown in Figure 3. In constructing the geologic cross-section, elevations for Tobies site wells and soil borings were adjusted relative to the surveyed elevations for the Holiday site. Figure 4 shows that the sand and gravel layer, and the clay till unit are laterally extensive and exhibits variable thickness beneath the sites.

4.2 Site Hydrogeology

Ground water was encountered in all soil borings at the Holiday site at approximately 14 to 16 feet bgs. Depth to water levels were measured in Holiday wells on December 6, 1994, December 20, 1994, and on January 20, 1995. Depth to water levels were measured in all Tobies site wells on December 20, 1994, and in three Tobies site wells which are closest to the Holiday site on January 20, 1995.

Direction of ground water flow beneath the Holiday site was approximated for the December 6, 1994, ground water elevations data (Figures 5). Ground water elevations contour maps for the Holiday and the Tobies sites were constructed for the December 20, 1994, and January 20, 1995, data (Figure 6, and 7). Figure 5, 6, and 7 show that ground water beneath the Holiday site flows southwest, with a hydraulic gradient that ranges from approximately 0.02 to 0.06 ft/ft.

EnecoTech conducted single well response (slug) tests in monitoring wells MW-1, MW-2 and MW-3, at the Tobies site in September 1992, and reported an average horizontal hydraulic conductivity (K) value of 4.04 feet per day (ft/d). To estimate ground water flow velocities beneath the Holiday site, the average K (4.04 ft/d) value that was estimated at the Tobies site and the highest hydraulic gradient observed at the Holiday site (0.06 ft/ft) were applied in Darcy's equation for ground water flow. According to Darcy's equation, average linear flow velocity can be calculated as follows (Freeze and Cherry, 1979, p.71):

Darcy's Equation: $V_x = -Ki/n$

Where: V_x = horizontal linear flow velocity (ft/d)
K = horizontal hydraulic conductivity (4.04 ft/d at the site)
i = horizontal hydraulic gradient (0.06 ft/ft at the site)
n = effective porosity (estimated at 35 percent for sand)

Using the reported K value of 4.04 ft/d, the highest horizontal hydraulic gradient observed at the Holiday site of 0.06 ft/ft, and an average porosity of 0.35 for sand, the average linear horizontal ground water velocity at the site is approximately 0.7 ft/d (about 256 feet per year). The MPCA Hydrogeologic Setting and Ground Water Contamination Worksheet (Fact Sheet No. 24) is provided in Appendix C.

Figure 6 represents ground water elevations data for all wells at both Holiday and Tobies sites. As shown in Figure 6, a ground water mound, which acts as a ground water flow divide, may exist beneath the Tobies site. The highest ground water elevation observed at the Tobies site is in well MW-2 (1014.83 feet). Ground water north of Tobies MW-2 flows north toward the Holiday site, and ground water south of Tobies MW-2 flows south. Figure 7 represents elevations data for all Holiday wells and elevation data from MW-2, MW-3, and MW-6 at the Tobies site, and shows that ground water beneath the Tobies site flows north in the area north of Tobies well MW-2.

4.3 Soil Chemistry

Field PID headspace screening of total organic vapors in soils collected from split spoon samples showed that organic vapors were detected in all soil borings. PID headspace readings of less than 100 parts per million (ppm) were screened in soils samples collected from borings SB-3 (4 ppm @ 21 to 23 foot interval), SB-4 (39 ppm @ 9 to 11 foot interval), and SB-5 (12 ppm @ 14 to 16 foot interval). PID reading greater than 100 ppm were screened in soil samples collected from borings SB-2 (214 ppm @ 6 to 8 foot interval), and in SB-1 (1119 ppm @ 14 to 16 foot interval). PID readings decreased below the 6 to 8 foot interval in boring SB-2, and suggests that overfills or surface spills may have occurred near the tank basin. PID readings decreased to less than 20 ppm at the base of boring SB-2, decreased to 5 ppm at the base of boring SB-4, and no organic vapors were detected at the base of borings SB-1, SB-3, and SB-5.

Selected soil samples from borings were analyzed for BTEX and GRO. Analytical results of soils are presented in Table 2 and Figure 8. As shown in Table 2 and Figure 8, BTEX and GRO were detected in the sample collected from the 14 to 16 foot interval, and benzene and ethylbenzene were detected in the sample collected at the base of SB-1. Benzene was detected in the sample collected from the 6 to 8 foot interval, and BTEX and GRO were detected in the sample collected from the 14 to 16 foot interval of SB-2. BTEX and GRO were detected in the sample collected from the 14 to 16 foot interval and in the sample collected from the base of SB-4.

Based on low field PID readings, a sample at the vadose zone of SB-3 (west of the UST basin), and from the base of SB-5 (north of the pump island) were not submitted for analyzes. BTEX and GRO were not detected in the base sample of SB-3 or from the 14 to 16 foot sample interval of SB-5.

The highest concentrations of benzene (0.19 milligrams per kilograms [mg/kg]), and GRO (2.5 mg/kg) present at the base of the borings were detected in SB-4. These low concentrations of hydrocarbons detected in soils below the water table indicate that the vertical extent of hydrocarbons in soil is adequately defined. Laboratory report sheets for soil samples, with analytical methods and method detection limits, are provided in Appendix D.

4.4 Ground Water Chemistry

Ground water samples were collected on December 6, 1994, and on January 20, 1995. Samples collected in December 1994 were analyzed for volatile organic compounds (VOCs), GRO and diesel range organics (DRO). Samples collected in January 1995 were analyzed for BTEX, GRO, and DRO. The analytical results of ground water samples are presented in Table 3, Table 4, and Figure 9. The laboratory reports for water samples, showing analytical methods, method detection limits, and results are provided in Appendix E.

As shown in Table 3 and Figure 9, BTEX, GRO, and DRO were detected in ground water sample collected from MW-1 in December 1994 and January 1995, with benzene and ethylbenzene concentrations exceeding the Minnesota Department of Health (MDH) Health Risk Limits (HRLs) in both sampling events. Benzene and GRO were detected in the sample collected from MW-2 in December 1994, but BTEX and GRO were not detected in the sample collected from MW-2 in January 1995. Benzene, xylenes, and GRO were detected in the sample collected from MW-3 in both sampling events. Additionally, DRO was detected in the sample collected from MW-3 in January 1995. BTEX concentrations did not exceed HRLs in samples collected from MW-2 and MW-3.

Table 4 and Appendix E show additional VOCs that were detected in the ground water samples collected from MW-1 and MW-3 on December 6, 1994. All the analytes listed on Table 4 (except for naphthelene [420 ug/l] in MW-1) are either detected at concentrations less than the HRLs, or no state compliance standard are available for them.

4.5 Potential Receptors

Delta conducted a water well inventory using compiled driller's logs from the Minnesota Geological Survey (MGS). EnecoTech conducted a water well inventory for the Tobies site in October 1992. EnecoTech reported that one abandoned well and one inactive well (beneath asphalt) are located within 500 feet south of the site, and that no drinking water wells are known to exist within 1000 feet of the Tobies site. EnecoTech also reported that the underlying clay till, that may be a minimum of 20 feet thick, overlies the local drinking water aquifer (Hinckley Sandstone). According to the well logs, all the identified water wells were completed in the Hinckley Sandstone, with top of screens installed deeper than 60 feet bgs, and all the wells were screened below the regional confining clay till unit. Water well locations are shown in Figure 10, and the MGS well logs are provided in Appendix F.

According to HTCT, the split spoon samples of the clay till in soil boring B-8 were dry from 27 to 43 feet bgs. This indicates that the clay till unit acts as a confining layer between the shallow ground water aquifer observed at the site and the regional bedrock aquifer of the Hinckley Sandstone.

5.0 CONCLUSIONS

5.1 Hydrocarbons in Soils

The highest concentration of GRO in soil was detected in the sample from the 14 to 16 foot interval of SB-1 (170 mg/kg), which is located south of the pump island, may indicate a release on the Holiday property. Annual tightness tests and inventory records do not indicate that a release from tanks and lines has occurred at the Holiday site, and detected hydrocarbons in soils may be related to routine filling and dispensing operations. Low concentrations of hydrocarbons in soils near the UST basin (SB-2) and pump islands (SB-4) may indicate that a release of petroleum hydrocarbons did occur at some time at the site.

5.2 Ground Water Flow

Ground water elevations data collected on three measuring events consistently show that ground water beneath the Holiday site flows southwest (Figures 5, 6, and 7). Figures 6 and 7 show that ground water beneath the Tobies site flows north in the northern part of the site, and Figure 6 also shows that ground water beneath the Tobies site flows south in the southern part of the site.

5.3 Hydrocarbons in Ground Water

BTEX concentrations detected in samples MW-2 and MW-3 did not exceed HRLs. Benzene and ethylbenzene concentrations detected in ground water samples collected from MW-1 exceeded HRLs. The

highest concentrations of benzene (1400 micrograms per liter [ug/l]), GRO (13000 ug/l), and DRO (6000 ug/l) in ground water at the Holiday site were detected in the sample collected from MW-1, in December 1994. BTEX, GRO, and DRO concentrations detected in the December 1994 sample from MW-1 at the Holiday site are lower than the reported concentrations for the same analytes detected in the June 1994 sample of MW-3 at the Tobies site.

Ground water sample collected from Tobies MW-3 showed detections of benzene (2300 ug/l), toluene (8300 ug/l), ethyl benzene (1300 ug/l), xylenes (14000 ug/l), and GRO (40000 ug/l) in June 1994. The highest benzene concentration reported for Tobies MW-3 was 5000 ug/l, in December 1993. The highest benzene concentration detected in ground water at the Tobies site was observed in Tobies MW-1 (11000 ug/l) in January 1991.

Figure 4 shows a north to south geologic cross-section from MW-3 on the Holiday site to MW-7A on the Tobies site, and also shows ground water elevations for December 20, 1994. As shown in Figure 4, ground water flows from Tobies MW-3 towards Holiday MW-1, suggesting that hydrocarbons concentrations observed in Holiday MW-1 may be attributed to the release at the Tobies site. Tobies UST basin is positioned approximately 10 feet south of Tobies MW-3.

5.4 Potential Receptors

Underground utilities are positioned above the ground water table, and are not located down gradient of site ground water flow. No active water wells exist within one mile down-gradient of the site, and the municipal water supply wells are located approximately one half mile west of the site (Figure 10). These facts, coupled with low concentrations of VOCs detected in site soils and ground water, indicate that the hydrocarbons detected at the site should not impact local utilities or area aquifers.

6.0 RECOMMENDATIONS

Based upon the above conclusions, Delta recommends that quarterly ground water samples be collected from the three Holiday site wells in April, July and October 1995, and samples should be analyzed for BTEX and GRO. Delta recommends that the monitoring site visits at the Holiday and the Tobies sites be completed concurrently to aid comparison of hydrogeochemical data. Depth to ground water in monitoring wells at both sites should also be measured quarterly during site visits, to evaluate the direction of ground water flow

beneath both sites. A ground water mound may exist at the Tobies site (between MW-3 and MW-1), and its cause should be identified. If ground water impacts on Holiday's site do not increase significantly during 1995, we will recommend project closure.

7.0 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.**

Chai Insook
Project Manager

Date: 4/7/95

Reviewed by:

Paul Carter
Project Manager

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Steve —
Don't we require
4 rounds of sampling
after CAD approval?
Jean

8.0 REFERENCES

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TABLE 1 GROUND WATER ELEVATIONS

Holiday Station No. 226
Hinckley, Minnesota
DELTA NO. A094-158

Holiday Station Wells and Top of Casing Elevations						
	MW-1	1031.11	MW-2	1034.02	MW-3	1029.71
Date	Water Level	GW Elevation	Water Level	GW Elevation	Water Level	GW Elevation
06-Dec-94	21.26	1009.85	24.91	1009.11	15.56	1014.15
20-Dec-94	21.20	1009.91	24.96	1009.06	15.90	1013.81
20-Jan-95	21.93	1009.18	25.41	1008.61	19.32	1010.39

Tobies Service Station Wells and Top of Casing Elevations (reported by HTCT)												
MW-1	104.66	MW-2	106.78	MW-3	105.13	MW-4	97.65	MW-5	96.63	MW-6	101.13	MW-7A	102.48

Tobies Service Station Wells and Top of Casing Elevations (adjusted to Holiday elevations datum)													
	MW-1	1029.49	MW-2	1031.61	MW-3	1029.96	MW-4	1022.48	MW-5	1021.46	MW-6	1025.96	MW-7A	1027.31
Date	Water Level	GW Elevation	Water Level	GW Elevation	Water Level	GW Elevation	Water Level	GW Elevation	Water Level	GW Elevation	Water Level	GW Elevation	Water Level	GW Elevation
20-Dec-94	15.40	1014.09	16.78	1014.83	16.71	1013.25	12.45	1010.03	7.83	1013.63	12.67	1013.29	17.64	1009.67
20-Jan-95			16.89	1014.72	16.57	1013.39					13.36	1012.60		

NOTE:

Elevations are reported in feet - NGVD (National Geodetic Vertical Datum)
TOC elevations for Holiday station wells are provided by Kemper & Associates, Inc.
TOC elevations for Tobies Service Station wells are normalized to Holiday wells.

Stadia rod readings of Holiday well MW-2 and Tobies well MW-3 (surveyed on 12/20/94)
Holiday MW-2 = 2.96
Tobies MW-3 = 7.02
Tobies well MW-3 is 4.06 feet lower than Holiday well MW-2

TABLE 2 SOIL CHEMISTRY (mg/kg)

Holiday Station No. 226
Hinckley, Minnesota
Delta No. A094-158-1

Sample I.D.	Depth (feet)	Date	Benzene	Toluene	Ethyl-benzene	Total Xylenes	GRO
SB-1 (MW-1)	14-16	29-Nov-94	0.04	0.053	2.7	4.1	170
	24-26	29-Nov-94	0.033	<0.05	0.15	<0.08	<0.5
SB-2	6-8	29-Nov-94	0.025	<0.05	<0.02	<0.08	<0.5
	14-16	29-Nov-94	0.15	0.26	0.026	0.25	0.79
SB-3 (MW-2)	21-23	30-Nov-94	<0.02	<0.05	<0.02	<0.08	<0.5
SB-4	14-16	30-Nov-94	0.051	0.07	0.064	0.16	0.89
	21-23	30-Nov-94	0.19	0.1	0.25	0.73	2.5
SB-5 (MW-3)	14-16	30-Nov-94	<0.02	<0.05	<0.02	<0.08	<0.5

GRO = Gasoline-range organics
mg/kg = milligrams per kilograms, which is equivalent to parts per million (ppm)

TABLE 3 GROUND WATER CHEMISTRY (ug/l)

Holiday Station No. 226
Hinckley, Minnesota
Delta No. A094-158-1

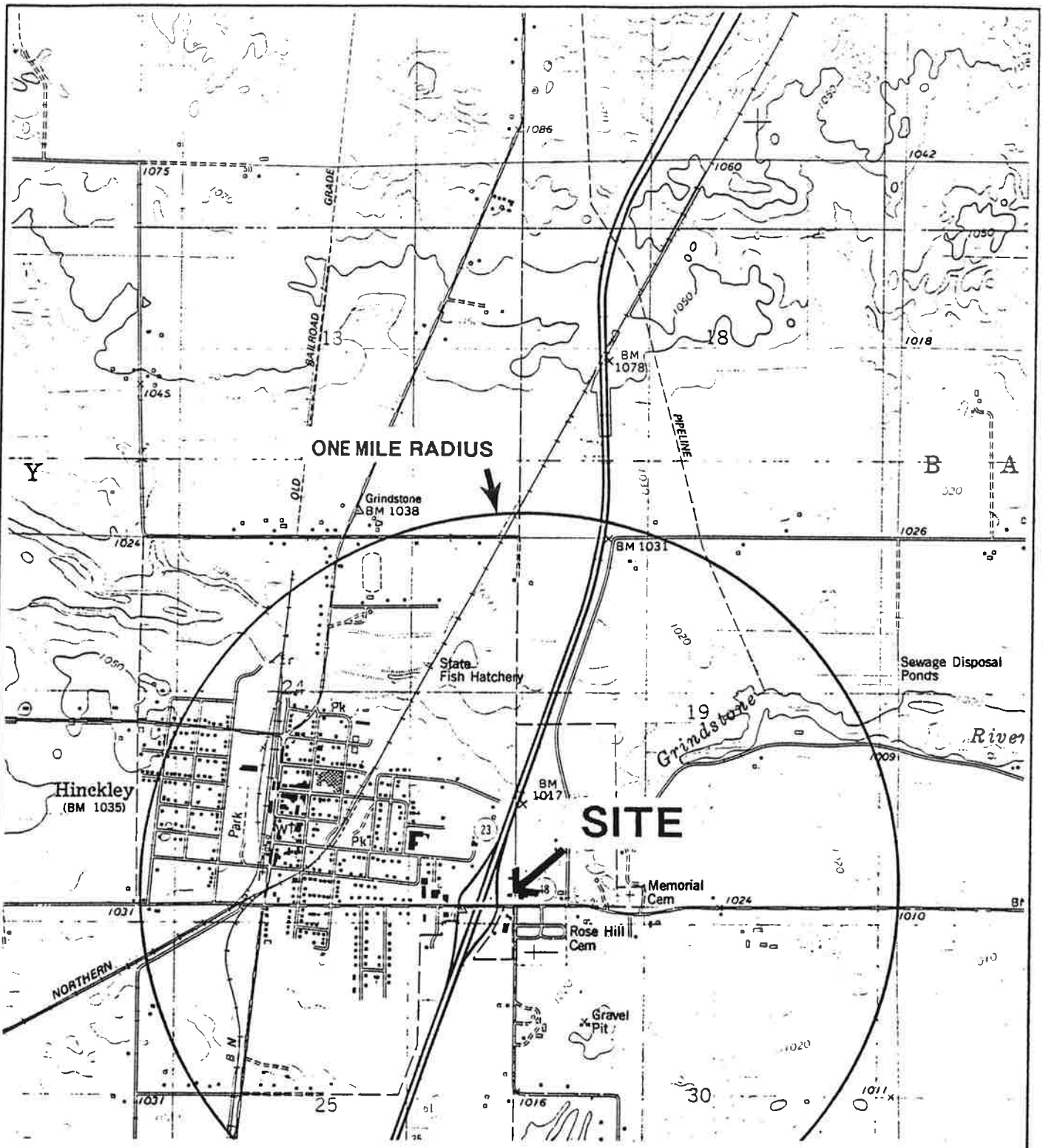
Sample I.D.	Date	Benzene	Toluene	Ethyl-benzene	Total Xylenes	GRO	DRO
MW-1	06-Dec-94	1400	230	1700	3300	13000	6000
	20-Jan-95	1100	360	1600	2900	12000	4300
Mw-2	06-Dec-94	2.7	<0.6	<0.2	<0.5	35	<29
	20-Jan-95	<0.2	<0.5	<0.2	<0.8	<20	<31
Mw-3	06-Dec-94	1.6	<0.6	<0.2	0.39	42	<29
	20-Jan-95	1.3	<0.5	<0.2	0.82	300	40

DRO = Diesel-range organics
GRO = Gasoline-range organics
ug/l = micrograms per liter, which is equivalent to parts per billion (ppb)

TABLE 4 VOLATILE ORGANIC COMPOUNDS IN GROUND WATER (ug/l)

Holiday Station No. 226
Hinckley, Minnesota
Delta No. A094-158-1

Analytes	MW-1	MW-2	MW-3
n-Butylbenzene	52	<0.2	<0.2
Chlorobenzene	<5.0	<0.2	6
1,2-Dichlorobenzene	<10	<0.4	16
1,3-Dichlorobenzene	<7.5	<0.3	0.82
1,4-Dichlorobenzene	<13	<0.5	2.3
Isopropyl benzene	88	<0.2	<0.2
p-Isophopyl toluene	8.4	<0.2	<0.2
Naphtalene	420	<0.2	0.26
1,2,4-Trimethyl benzene	530	<0.3	<0.3



QUADRANGLE LOCATION

HINCKLEY QUADRANGLE
MINNESOTA–PINE CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

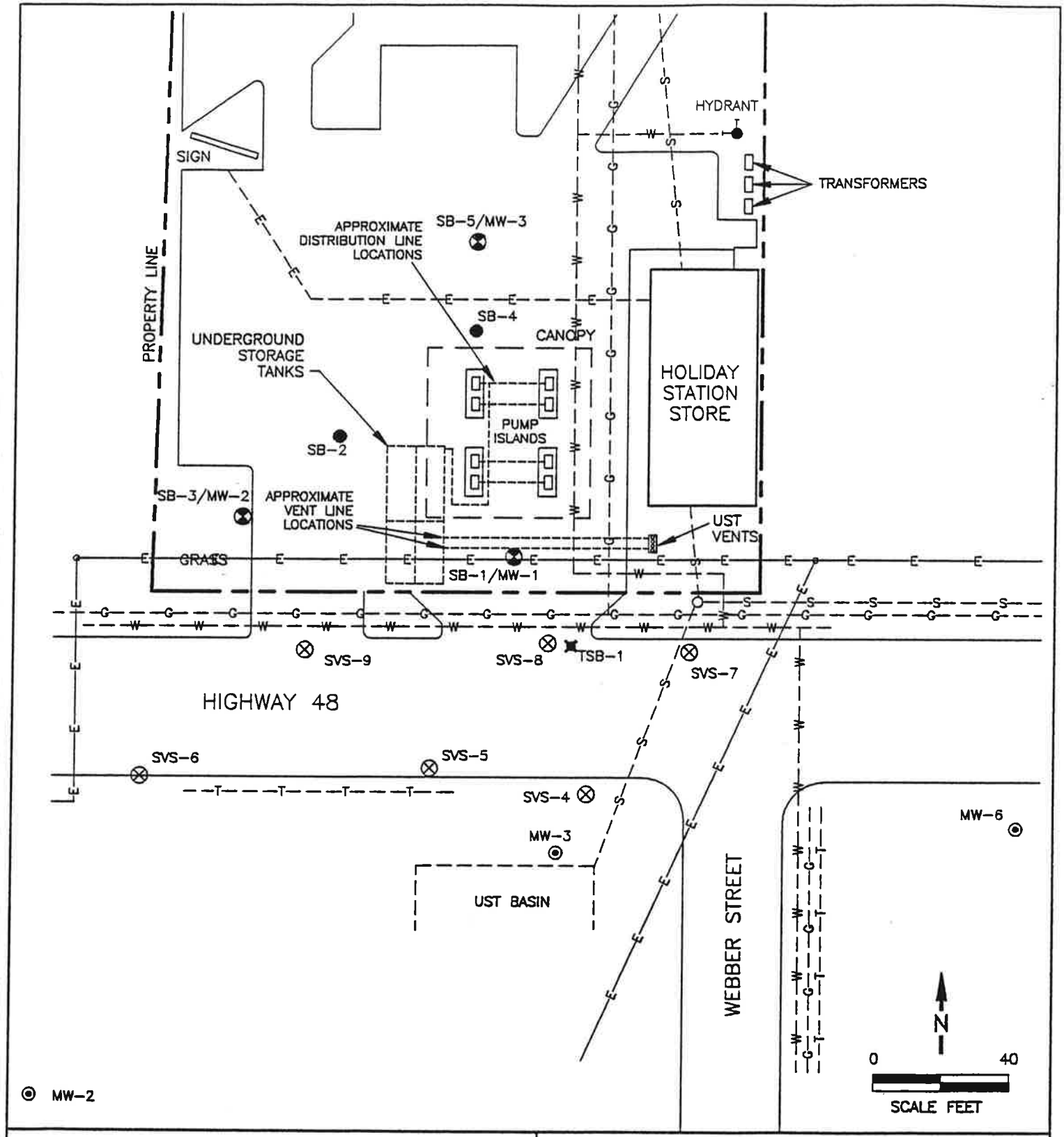
0 NORTH 2000

SCALE IN FEET

FIGURE 1
SITE LOCATION MAP
HOLIDAY STATION NO. 226
HINCKLEY, MINNESOTA

PROJECT NO.	PREPARED BY
A094–158	CI
DATE	REVIEWED BY
3/7/95	

Delta Environmental Consultants, Inc.



LEGEND:

- MONITORING WELL (HOLIDAY)
- SOIL BORING (HOLIDAY)
- MONITORING WELL (TOBIES)
- SOIL VAPOR SURVEY POINT (TOBIES)
- SOIL BORING (TOBIES)
- OVERHEAD POWER LINE
- SEWER LINE
- NATURAL GAS LINE
- TELEPHONE LINE
- WATER LINE

FIGURE 2
DETAILED SITE MAP
HOLIDAY STATION NO. 226
HINCKLEY, MINNESOTA

PROJECT NO.	PREPARED BY	DRAWN BY
A094-158	CI	DD
DATE	REVIEWED BY	FILE NAME
3/16/95		94158-2

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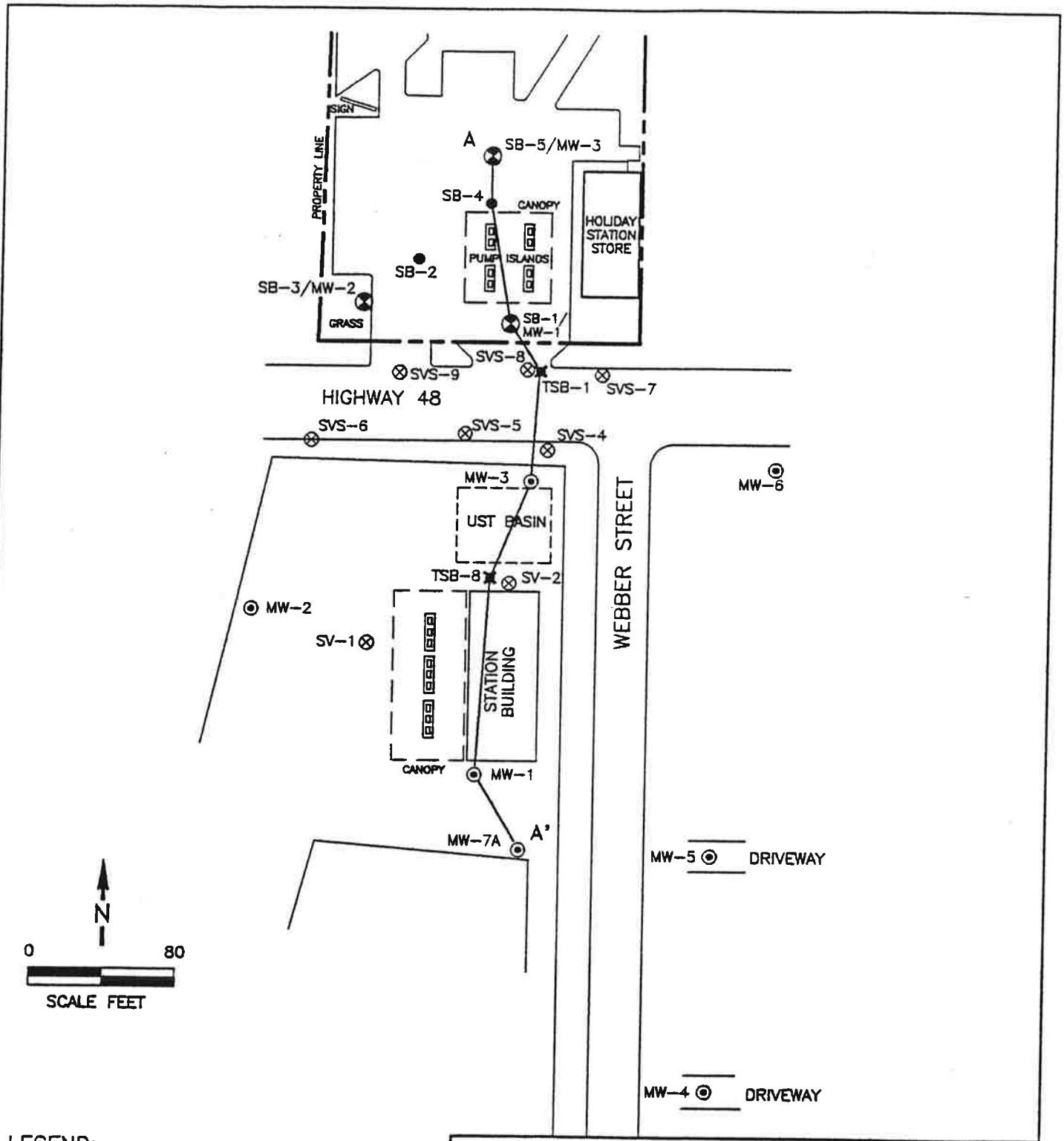

LEGEND:

- MONITORING WELL (HOLIDAY)
- SOIL BORING (HOLIDAY)
- MONITORING WELL (TOBIES)
- SOIL VAPOR SURVEY POINT (TOBIES)
- SOIL BORING (TOBIES)

FIGURE 3
SITE MAP
HOLIDAY STATION NO. 226
AND TOBIES SERVICE STATION
(SHOWING LINE OF GEOLOGIC CROSS SECTION A–A')
HINCKLEY, MINNESOTA

PROJECT NO.	PREPARED BY	DRAWN BY
A094-158	CI	DD
DATE	REVIEWED BY	FILE NAME
3/6/95		94158-3

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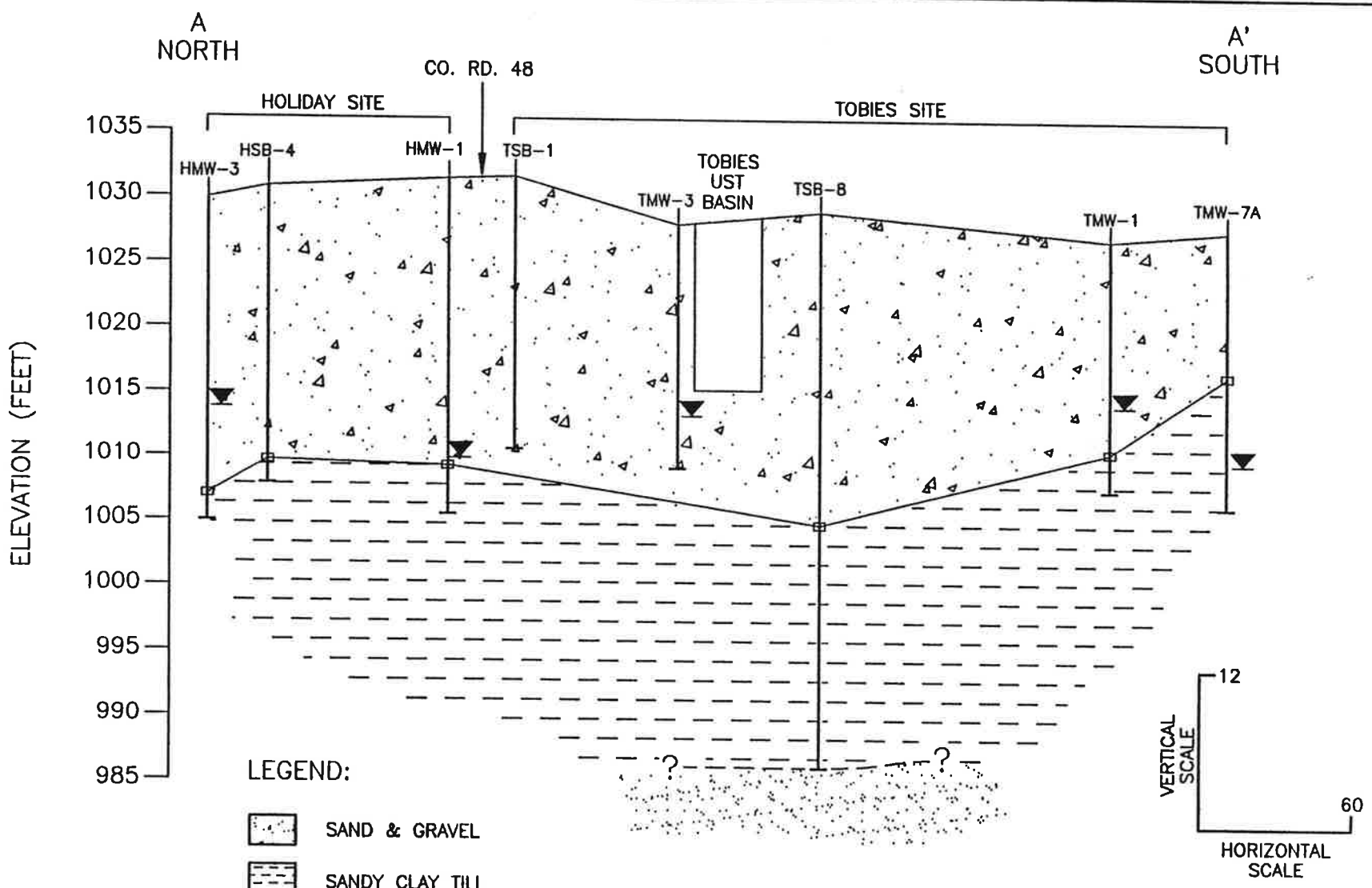

FIGURE 4
GENERALIZED GEOLOGIC CROSS SECTION
HOLIDAY STATION NO. 226
AND TOBIES SERVICE STATION
HINCKLEY, MINNESOTA

PROJECT NO.	PREPARED BY	DRAWN BY
A094-158	CI	DD
DATE	REVIEWED BY	FILE NAME
3/7/95		94158-AA

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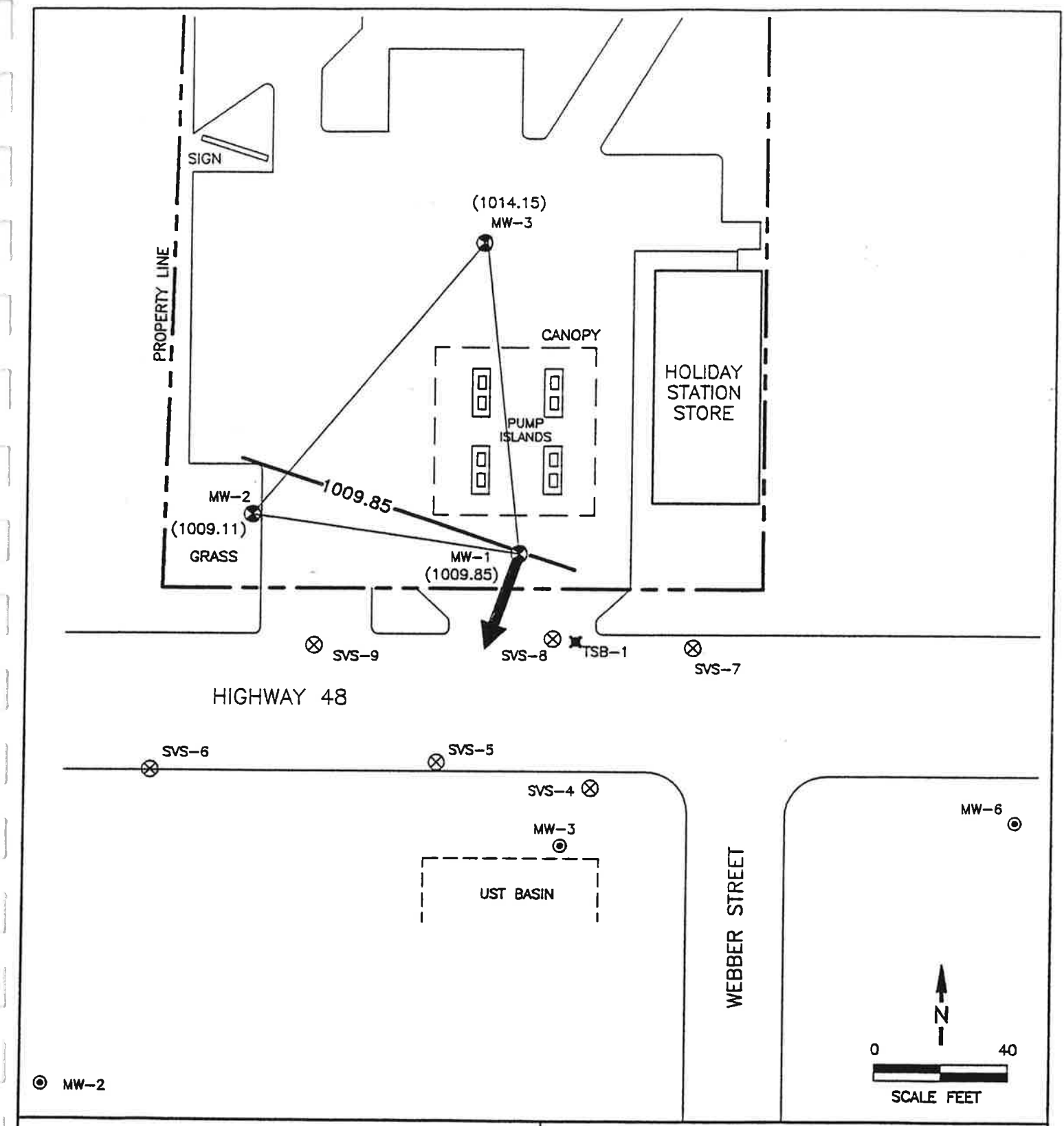

LEGEND:

- MONITORING WELL (HOLIDAY)
- MONITORING WELL (TOBIES)
- SOIL VAPOR SURVEY POINT (TOBIES)
- SOIL BORING (TOBIES)
- (1009.11) GROUND WATER ELEVATION (IN FEET)
- —1009.85— GROUND WATER CONTOUR LINE
- DIRECTION OF GROUND WATER FLOW

FIGURE 5
GROUND WATER FLOW MAP
DECEMBER 6, 1994
HOLIDAY STATION NO. 226
HINCKLEY, MINNESOTA

PROJECT NO.	PREPARED BY	DRAWN BY
A094-158	CI	DD
DATE	REVIEWED BY	FILE NAME
3/16/95		94158-2

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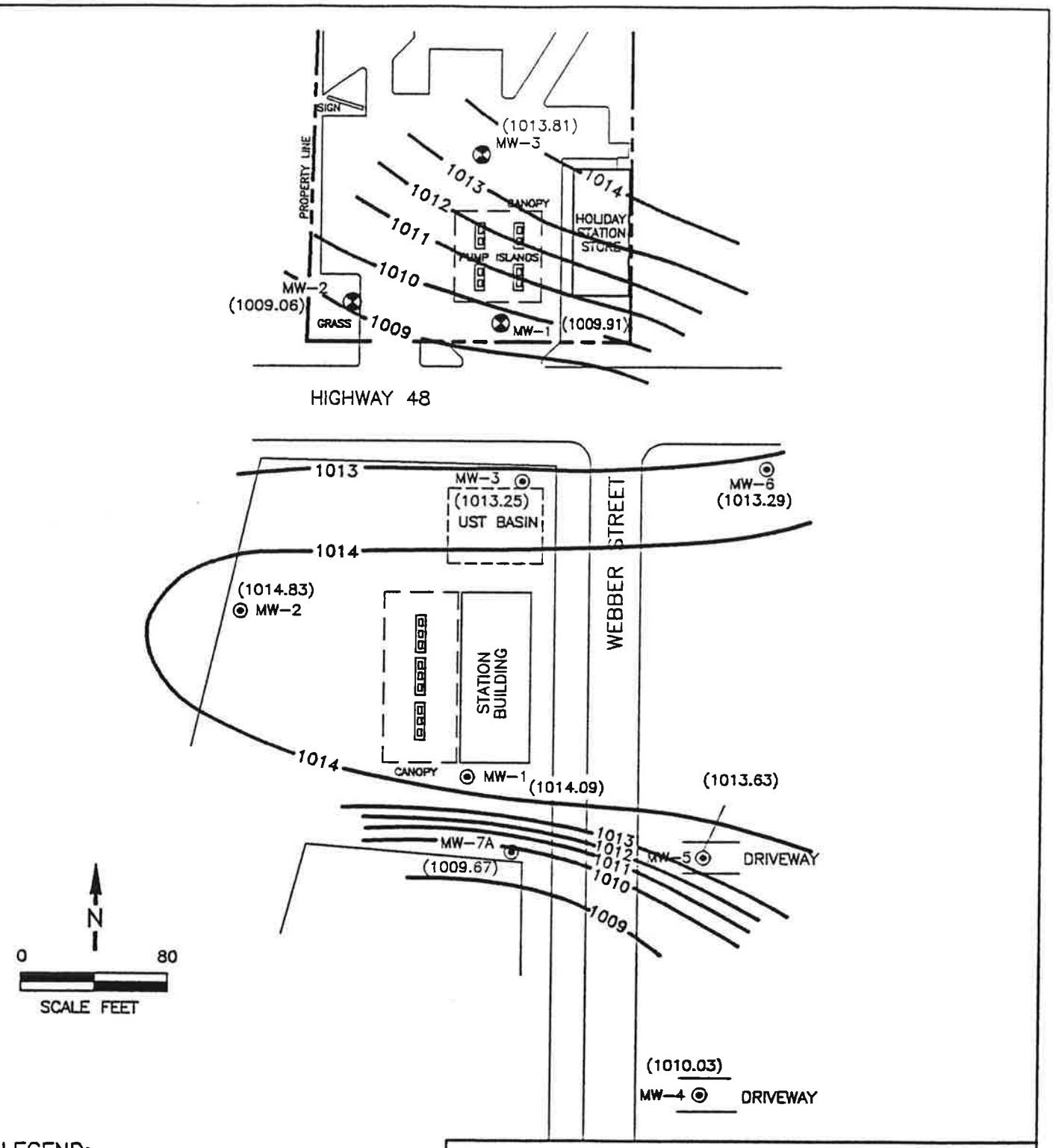

LEGEND:

- ⊗ MONITORING WELL (HOLIDAY)
- ⊙ MONITORING WELL (TOBIES)
- (1014.09) GROUND WATER ELEVATION (IN FEET)
- —1014— GROUND WATER CONTOUR LINE

FIGURE 6
GROUND WATER CONTOUR MAP
DECEMBER 20, 1994
HOLIDAY STATION NO. 226
AND TOBIES SERVICE STATION
HINCKLEY, MINNESOTA

PROJECT NO.	PREPARED BY	DRAWN BY	
A094-158	CI	DD	
DATE	REVIEWED BY	FILE NAME	
3/6/95		94158-3	

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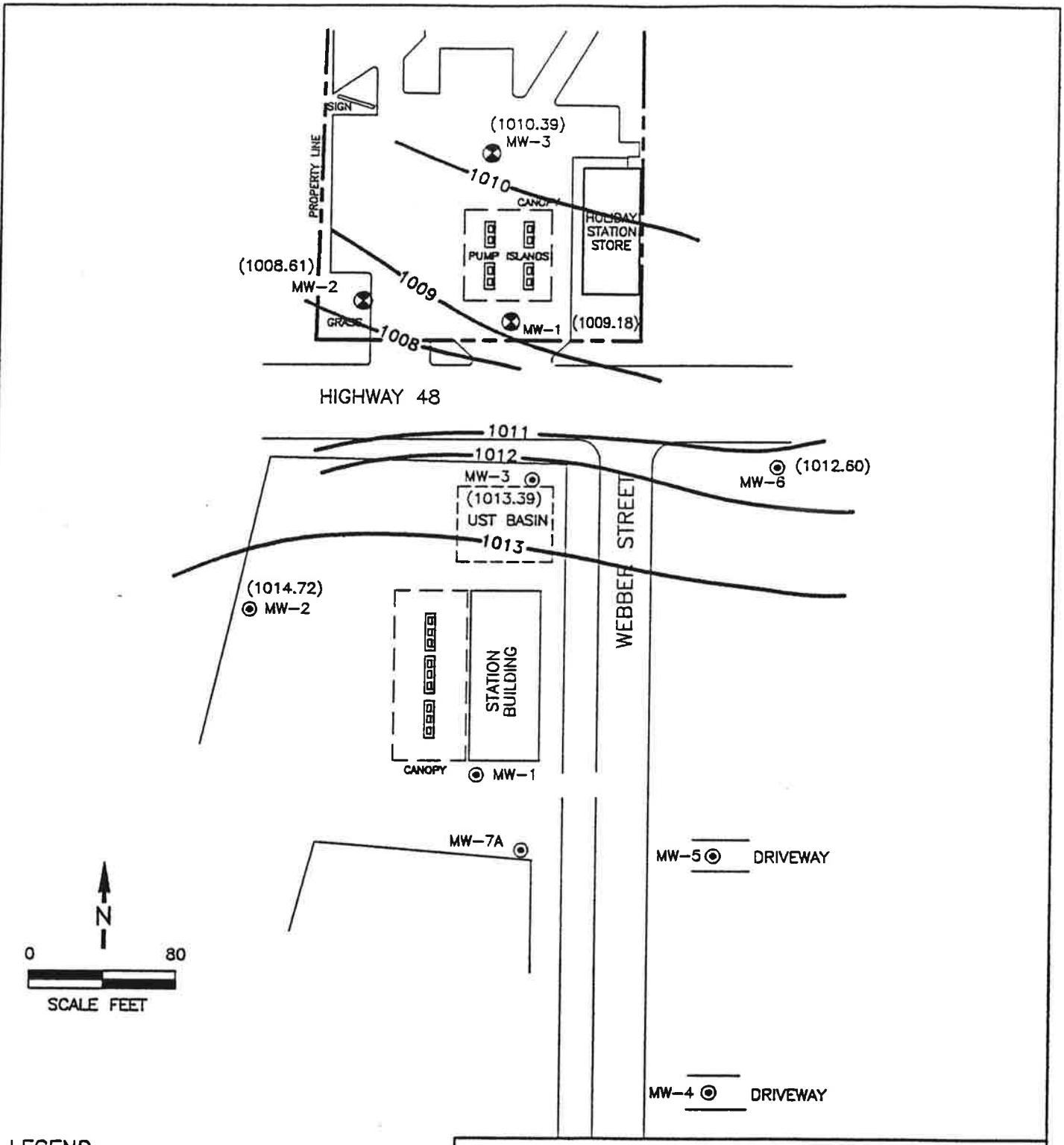

LEGEND:

- ⊗ MONITORING WELL (HOLIDAY)
- ⊙ MONITORING WELL (TOBIES)
- (1014.72) GROUND WATER ELEVATION (IN FEET)
- —1012— GROUND WATER CONTOUR LINE

FIGURE 7
GROUND WATER CONTOUR MAP
JANUARY 20, 1995
HOLIDAY STATION NO. 226
AND TOBIES SERVICE STATION
HINCKLEY, MINNESOTA

PROJECT NO.	PREPARED BY	DRAWN BY
A094-158	CI	DD
DATE	REVIEWED BY	FILE NAME
3/6/95		94158-3

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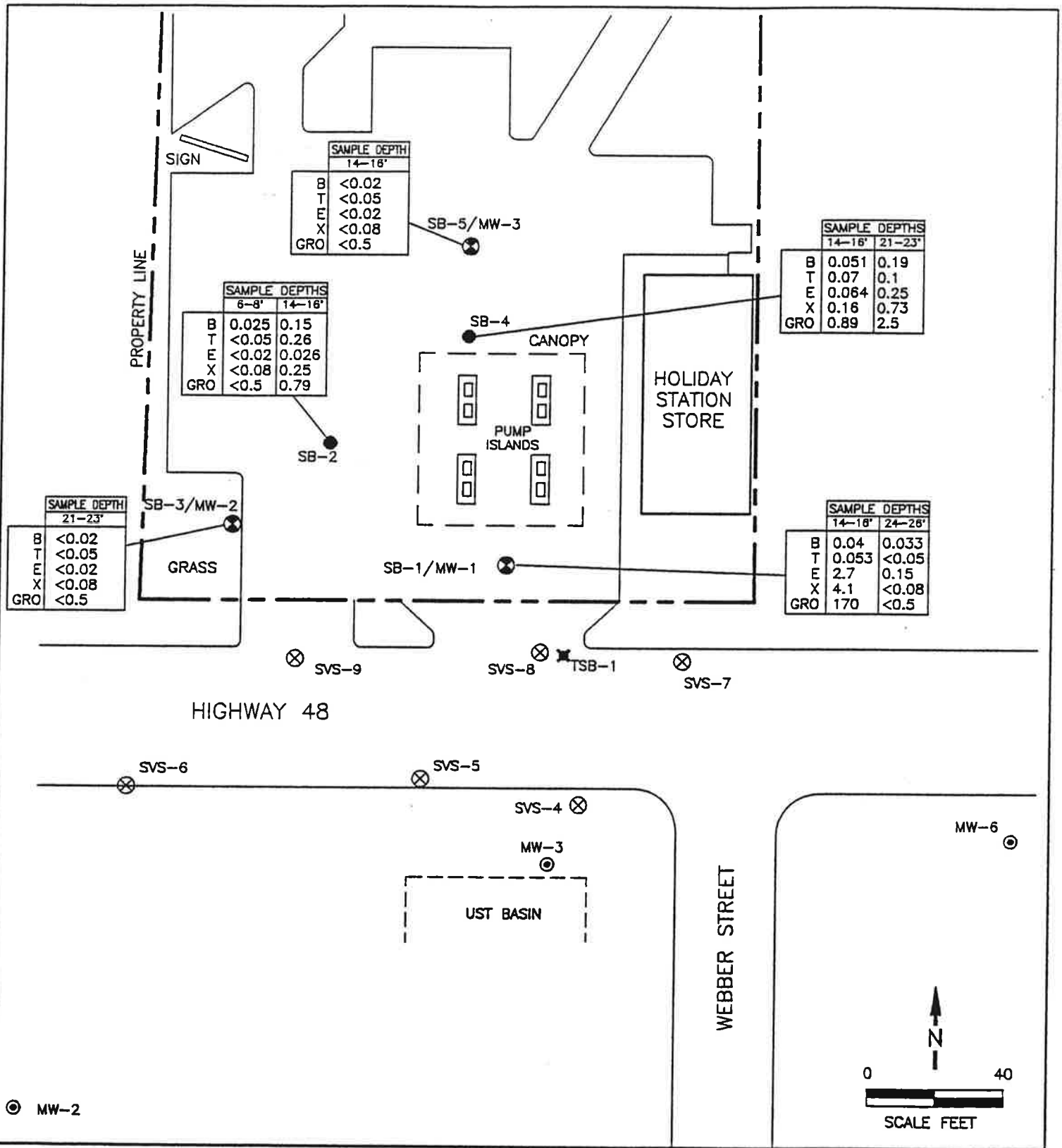


LEGEND:

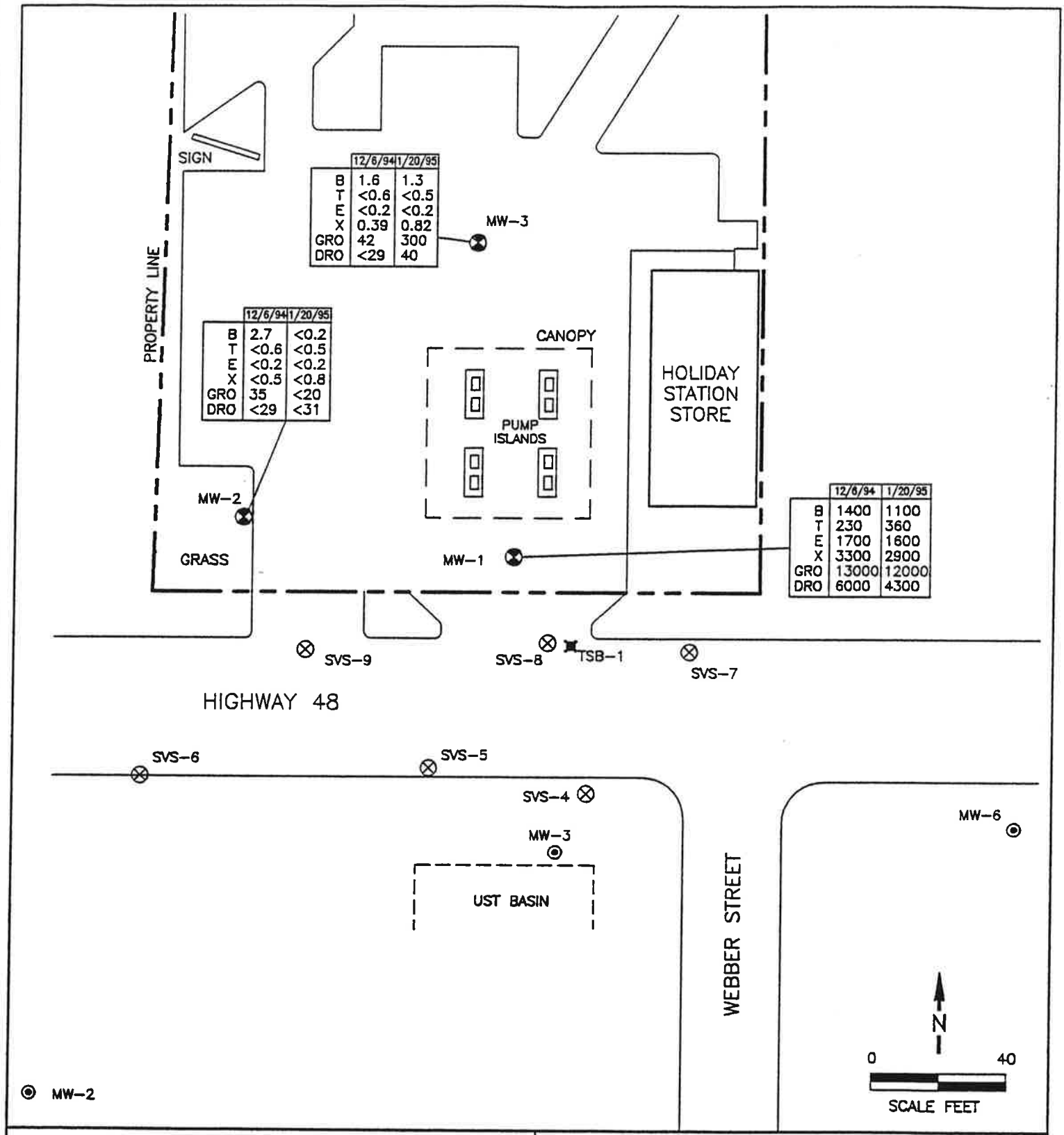
- MONITORING WELL (HOLIDAY)
- SOIL BORING (HOLIDAY)
- MONITORING WELL (TOBIES)
- SOIL VAPOR SURVEY POINT (TOBIES)
- SOIL BORING (TOBIES)

B = BENZENE
T = TOLUENE
E = ETHYLBENZENE
X = XYLENES
GRO = GASOLINE RANGE ORGANICS
DRO = DIESEL RANGE ORGANICS

FIGURE 8
SOIL CHEMISTRY (mg/kg)
HOLIDAY STATION NO. 226
HINCKLEY, MINNESOTA

PROJECT NO.	PREPARED BY	DRAWN BY
A094–158	CI	DD
DATE	REVIEWED BY	FILE NAME
3/16/95		94158–2

Delta Environmental Consultants, Inc.



LEGEND:

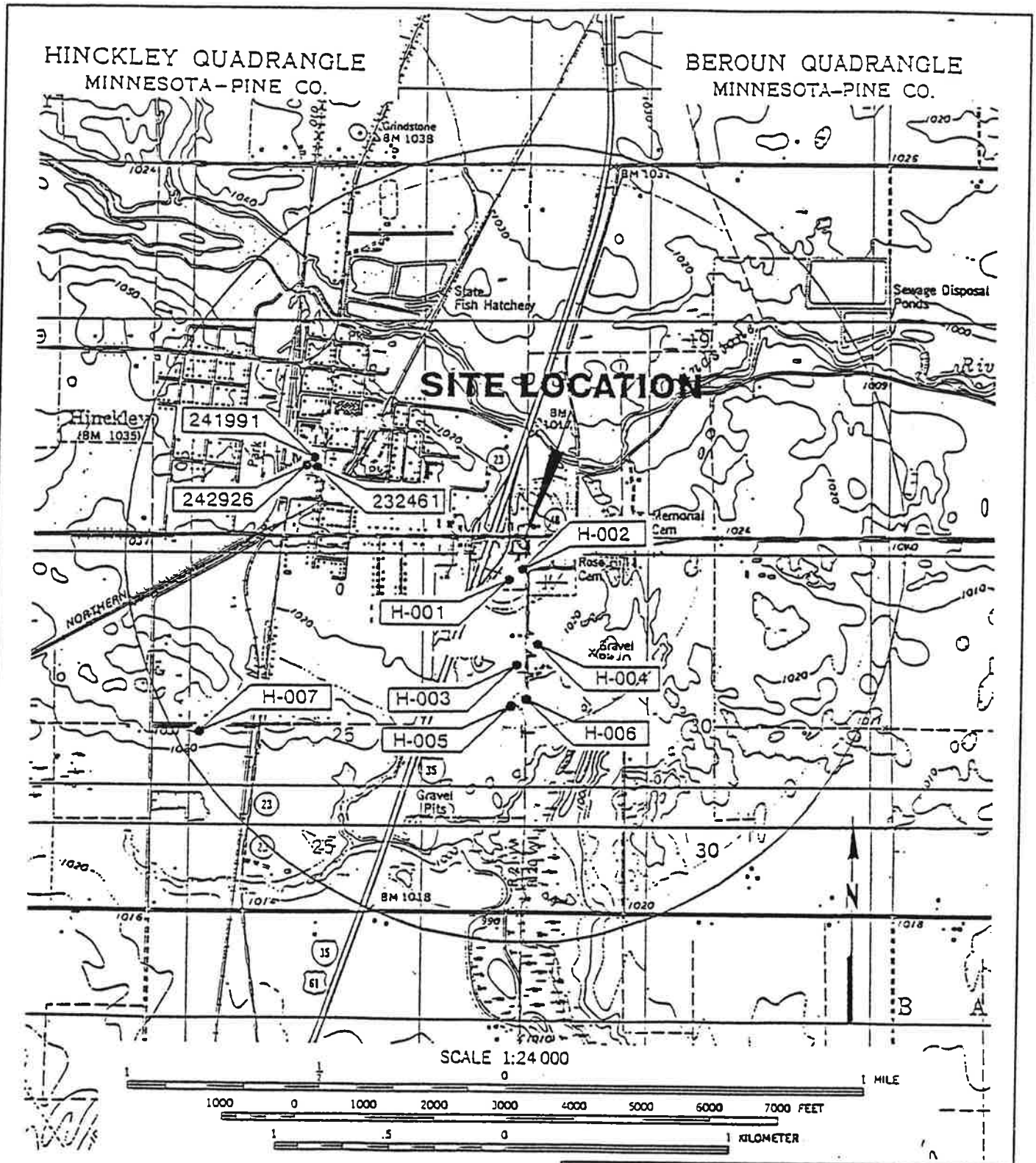
- MONITORING WELL (HOLIDAY)
- MONITORING WELL (TOBIES)
- SOIL VAPOR SURVEY POINT (TOBIES)
- SOIL BORING (TOBIES)

B = BENZENE
T = TOLUENE
E = ETHYLBENZENE
X = XYLENES
GRO = GASOLINE RANGE ORGANICS
DRO = DIESEL RANGE ORGANICS

FIGURE 9
GROUND WATER CHEMISTRY ($\mu g/l$)
HOLIDAY STATION NO. 226
HINCKLEY, MINNESOTA

PROJECT NO.	PREPARED BY	DRAWN BY
A094-158	CI	DD
DATE	REVIEWED BY	FILE NAME
3/16/95		94158-2

Delta Environmental Consultants, Inc.



ADOPTED FROM:

ENECOTECH ENVIRONMENTAL CONSULTANTS
BLOOMINGTON, MINNESOTA

LEGEND:

- ● WATER WELL LOCATIONS

FIGURE 10
WATER WELL LOCATIONS
HOLIDAY & TOBIES SITES
I–35 AND CO. RD. 48
HINCKLEY, MINNESOTA

PROJECT NO.	PREPARED BY
A094–158	
DATE	REVIEWED BY
3/7/95	

Delta Environmental Consultants, Inc.

APPENDIX A

APPENDIX A
FIELD METHODOLOGIES

Soil Sampling

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

Soil samples recovered from the split-spoon samples are screened immediately using a portable photoionization detector to determine the relative contamination of the sample. A portion of the split spoon sample is then collected and stored in a clean, glass jar for soil vapor headspace measurements and lithologic description. The collection of soil vapor headspace measurements involves sealing the jar mouth with aluminum foil and capping the jar. After the boring is completed and the samples have equilibrated to similar temperatures, the cap is removed from the jar and the aluminum foil is punctured with the photoionization detector probe. This allows for the measurement of volatile organic vapors, which may have accumulated in the headspace of the sample jar.

Water Level Measurements

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

Groundwater Sampling

Monitoring wells are sampled from the suspected cleanest to the most contaminated. The following describes the protocol for sampling a monitoring well.

Field Protocol

Step 1: Measure the water level.

Step 2: Develop the monitoring well with a dedicated bailer. A minimum of three to five well bore water volumes are evacuated from the monitoring well prior to sampling.

Step 3: Collect water samples. Water samples are collected using the dedicated stainless-steel bailer.

Step 4: Water samples are stored and transported to the specified laboratory, following all documentation, preservation, and chain of custody procedures.

Step 5: Clean the equipment. Water level measurement equipment is cleaned with denatured alcohol and deionized water rinse.

Upon completion of a soil or ground water sampling, a chain-of-custody is initiated. Chain-of-custody records include the following information: project name and location, project number, shipped by, shipped to, suspected hazard, sampling point and location, field identification number, date and time collected, sample type, number of containers, analysis required, and the sampler's signature. As few people as possible handle the samples.

The chain-of-custody records are shipped with the samples to the laboratory. Upon arrival at the laboratory, the sample is checked in by the appropriate laboratory personnel. Laboratory identification numbers are noted on the chain-of-custody record. A copy of the chain-of-custody is turned over to the laboratory project manager. Upon completion of the laboratory analysis, the completed chain-of-custody record is returned to the Delta project manager.

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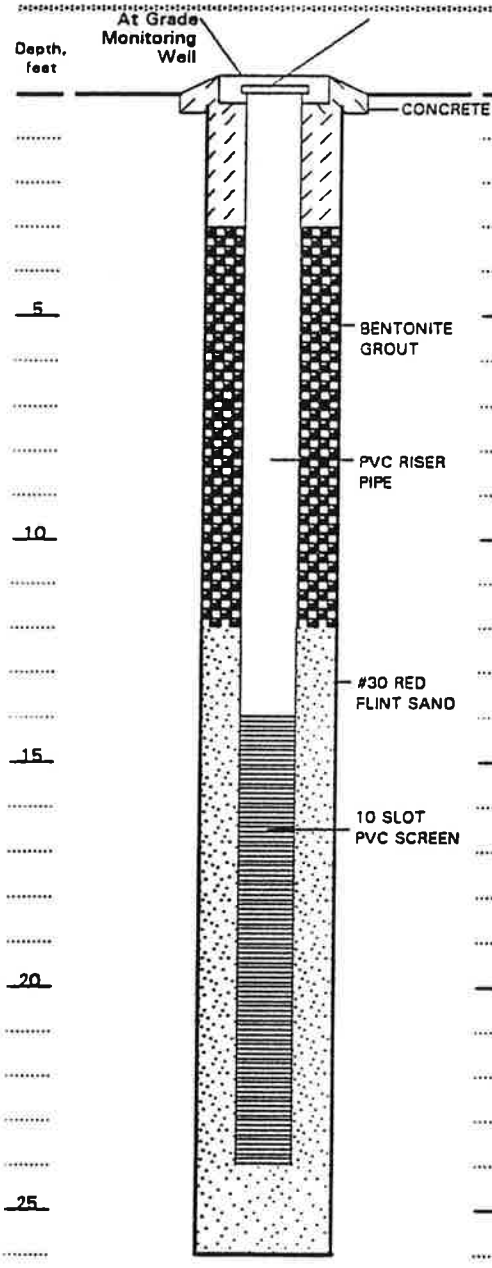
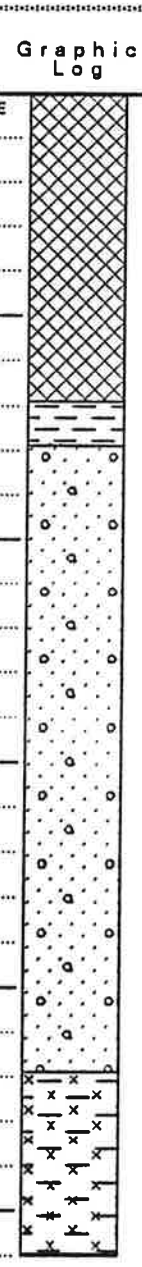
Page 1 of 1

WELL CONSTRUCTION LOG

N

BORING/WELL NO.: MW-1/SB1	
PROJECT NO./NAME: A094-158/HOLIDAY STORE #226	LOCATION: HINCKLEY, MINNESOTA
DRILLING CONTRACTOR/DRILLER: THEIN WELL/NATHAN	
GEOLOGIST/OFFICE: M. TEWINKLE/ST. PAUL	APPROVED BY:
DRILLING EQUIPMENT/METHOD: MOBILE DRILL/HSA	SIZE/TYPE OF BIT: — SAMPLING METHOD: 2" SPLIT BARREL — START/FINISH DATE: 11/29/94-11/29/94
WELL INSTALLED? YES ☒ NO ☐ — CASING MAT./DIA.: PVC 2" — SCREEN: TYPE SLOTTED MAT. PVC LENGTH 10' DIA. 2" SLOT SIZE 10 SLOT	
ELEVATION OF: (FT. ABOVE M.S.L.) — GROUND SURFACE — TOP OF WELL CASING: 1031.11 — TOP & BOTTOM SCREEN: / — GW SURFACE — DATE	





Depth, feet	Visual Description	Sample No. and Interval	Values (ppm) HEADSPAC
	SILTY SAND AND GRAVEL FILL		0
5		5	0
	SILTY CLAY W/ ORGANIC MATTER, Soft, Gray to Black, Wet.		4
	SAND; FINE TO COARSE W/ GRAVEL, Reddish Brown, Moist.		3
10		10	41
	As Above.		72
15	As Above.	15	1119
	SAND; FINE TO MED., Brown, Wet.		119
	SAND; FINE TO COARSE W/ GRAVEL, Brown, Saturated.		57
20	As Above, Fine to Medium.	20	69
	SILTY CLAY, Brown, Wet.		4
25		25	0
	END OF BORING AT 26 FEET.		

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Page 1 of 1

SOIL BORING LOG

N

BORING/WELL NO.: SB-2			
PROJECT NO./NAME: A094-158/HOLIDAY STORE #226	LOCATION: HINCKLEY, MINNESOTA		
DRILLING CONTRACTOR/DRILLER: THEIN WELL/NATHAN			
GEOLOGIST/OFFICE: M. TEWINKLE/ST. PAUL	APPROVED BY:		
DRILLING EQUIPMENT/METHOD: MOBILE DRILL/HSA	SIZE/TYPE OF BIT:	SAMPLING METHOD: 2" SPLIT BARREL	START/FINISH DATE: 11/29/94-11/29/94
			TOTAL DEPTH: 21.0

Depth, feet	Graphic Log	Visual Description	Sample No. and Interval	Penetration Rate (Blows/)	Values (ppm)
					HEADSPAC
		SAND; FINE TO COARSE W/ GRAVEL			0
5		SAND; MED. TO COARSE, W/ GRAVEL, Reddish Brown, Dry.	5		214
10		As above, Moist.	10		184
15		As above, Gray, Wet.	15		121
20		As above.	20		17
		HIT OBSTRUCTION, BORING ABANDONDED AT 21 FEET.			

LITHOLOGY

SAMPLING DATA

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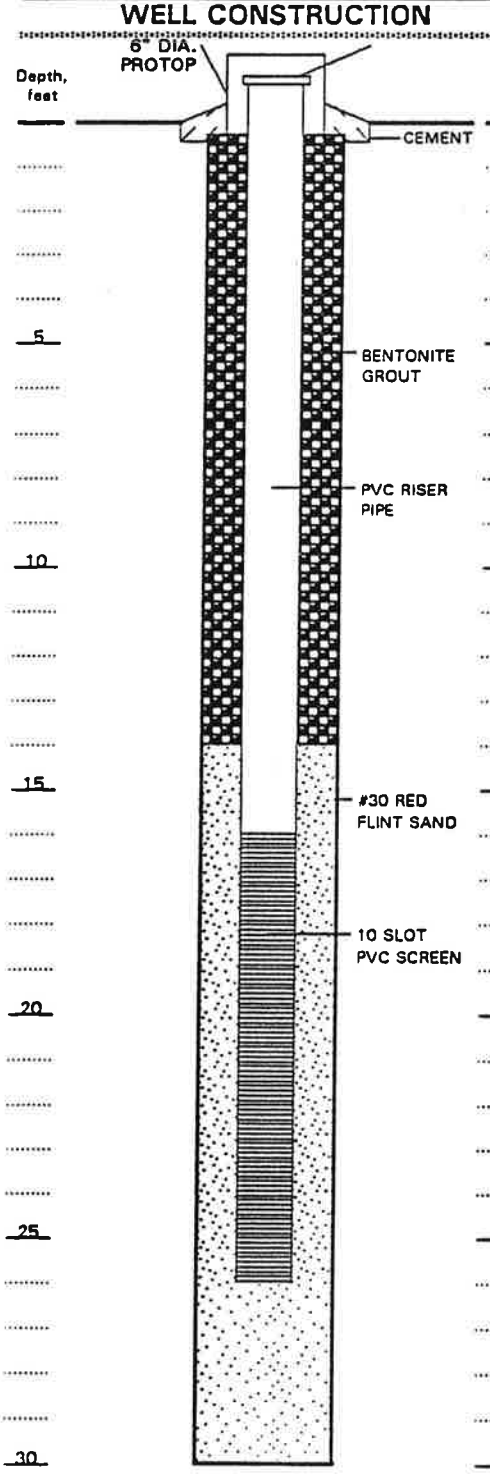
Page 1 of 1

WELL CONSTRUCTION LOG

N

BORING/WELL NO.	MW-2/SB3
PROJECT NO./NAME	A094-158/HOLIDAY STORE #226
LOCATION	HINCKLEY, MINNESOTA
DRILLING CONTRACTOR/DRILLER	THEIN WELL/NATHAN
GEOLOGIST/OFFICE	M. TEWINKLE/ST. PAUL
APPROVED BY	
DRILLING EQUIPMENT/METHOD	MOBILE DRILL/HSA
SIZE/TYPE OF BIT	
SAMPLING METHOD	2" SPLIT BARREL
START/FINISH DATE	11/29/94-11/30/94
WELL INSTALLED? YES [X] NO [ ]	
CASING MAT./DIA.	PVC 2"
SCREEN: TYPE SLOTTED MAT. PVC LENGTH 10' DIA. 2" SLOT SIZE 10 SLOT	
ELEVATION OF: (FT. ABOVE M.S.L.) GROUND SURFACE / TOP OF WELL CASING 1034.02 / TOP & BOTTOM SCREEN / GW SURFACE / DATE	



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Page 1 of 1

SOIL BORING LOG

BORING/WELL NO. SB-4	
PROJECT NO./NAME A094-158/HOLIDAY STORE #226	LOCATION HINCKLEY, MINNESOTA
DRILLING CONTRACTOR/DRILLER THEIN WELL/NATHAN	
GEOLOGIST/OFFICE M. TEWINKLE/ST. PAUL	APPROVED BY
DRILLING EQUIPMENT/METHOD MOBILE DRILL/HSA	SIZE/TYPE OF BIT
SAMPLING METHOD 2" SPLIT BARREL	START/FINISH DATE 11/30/94-11/30/94
	TOTAL DEPTH 23.0

N

LITHOLOGY

Depth, feet	Graphic Log	Visual Description
		SILTY SAND FILL W/ GRAVEL AND COBBLES
		SAND; FINE TO MED. Brown, Dry.
5		
		As above, Black (possible staining).
10		
		As above, Brown, Moist.
15		
		SAND; FINE GRADING INTO SILT W/ SAND, Wet.
20		
		SILTY CLAY, Soft.

SAMPLING DATA

Sample No. and Interval	Penetration Rate (Blows/)	Values (ppm)
		HEADSPAC
		0
		39
		31
		10
		5

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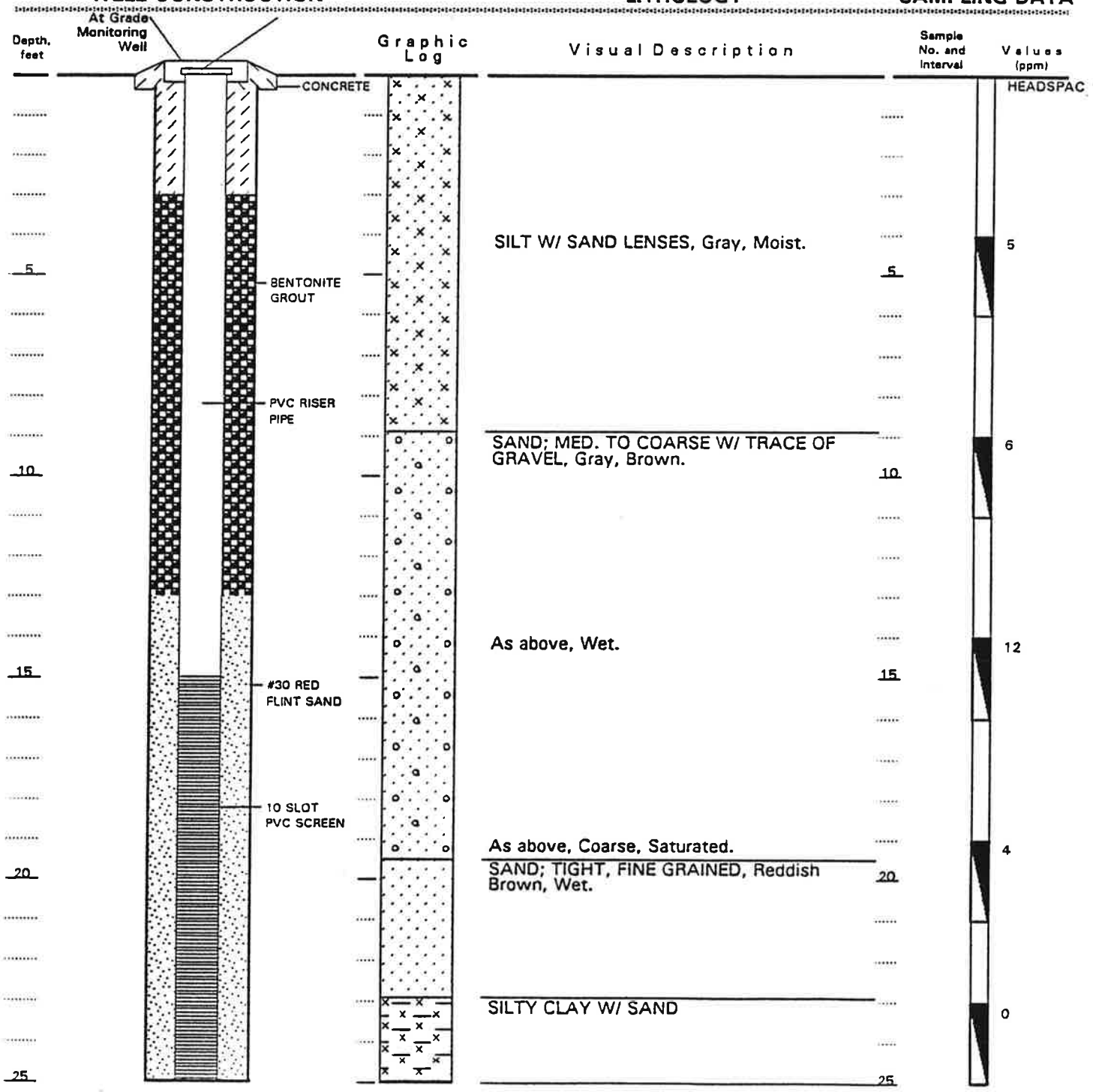
Page 1 of 1

WELL CONSTRUCTION LOG

N

BORING/WELL NO.	MW-3/SB5
PROJECT NO./NAME	A094-158/HOLIDAY STORE #226
LOCATION	HINCKLEY, MINNESOTA
DRILLING CONTRACTOR/DRILLER	THEIN WELL/NATHAN
GEOLOGIST/OFFICE	M. TEWINKLE/ST. PAUL
APPROVED BY	
DRILLING EQUIPMENT/METHOD	MOBILE DRILL/HSA
SIZE/TYPE OF BIT	
SAMPLING METHOD	2" SPLIT BARREL
START/FINISH DATE	11/30/94-11/30/94
WELL INSTALLED?	YES ☒ NO ☐
CASING MAT./DIA.	PVC 2"
SCREEN:	TYPE SLOTTED MAT. PVC LENGTH 10' DIA. 2" SLOT SIZE 10 SLOT
ELEVATION OF: (FT. ABOVE M.S.L.)	GROUND SURFACE / TOP OF WELL CASING 1029.71 / TOP & BOTTOM SCREEN / GW SURFACE / DATE



APPENDIX C

HYDROGEOLOGIC SETTING AND GROUND WATER CONTAMINATION WORKSHEET

Fact Sheet #24
Minnesota Pollution Control Agency
LUST Cleanup Program
April 1993

Complete this worksheet for all sites with ground water contamination. The worksheet has several purposes. It summarizes remedial investigation (RI) results and conclusions for use by Minnesota Pollution Control Agency (MPCA) staff when reviewing the site to determine whether corrective action will be required to remediate ground water contamination. It also provides supplementary information on investigation, design, and reporting requirements (presented in bold type) for sites with ground water contamination. Review this worksheet and all other relevant MPCA documents when developing RI work plans to ensure the investigation meets all RI requirements.

Base answers to the following questions on the results of the ground water receptor survey, RI activities, and published geologic literature. Answer the questions in the space provided and attach additional sheets, if necessary.

Include this worksheet as an appendix to the RI/Corrective Action Design (CAD) report. RI/CAD reports submitted without this worksheet or with an incomplete worksheet will be rejected as inadequate.

LEAK # *7487*
SITE NAME *Holiday Station No. 226*
SITE LOCATION *Hinckley, Minnesota*

1. Geology. Describe the geologic units in which ground water has been impacted by the petroleum release, the thickness, and estimated lateral extent of the impacted unit.

   Geologic description: *Glacial outwash sands and gravels.*

   Thickness of impacted unit: *Approximately 20 feet*

   Estimated lateral extent: *Continuous to approximately 800 south of the site; unknown further south.*

2. Aquifer parameters. At all sites with ground water monitoring wells, include an estimate of hydraulic conductivity, and provide estimates of the ground water velocity in the impacted unit. Explain how you arrived at these estimates. Also provide estimated values for porosity, flow direction, and horizontal and vertical gradients.

   Hydraulic conductivity (K) value is specific to the Tobies site, which is hydrogeologically similar to the Holiday site. Other aquifer parameters are calculated for the Holiday site, using the K value provided for the Tobies site.

K =	*4.04 ft/day*	porosity = *0.35*	dh/dl = *0.02 to 0.06*
v =	*<0.7 ft/day*	flow direction = *SW*	dv/dl = *N/A*

3. Maximum concentrations (on site). Please list the following maximum contaminant concentrations (ppb) for contaminants detected on site:

   Benzene *1,400 ug/l*
   (Well No. *MW-1*, Date *12/6/94*)

   Total Hydrocarbons *13,000 ug/l*
   (Well No. *MW-1* , Date *12/6/94*)

4. Maximum concentrations (off site). Please list the following maximum contaminant concentrations (ppb) for contaminants detected off site: *Highest benzene and total hydrocarbons are reported at the Tobies site:*

   Benzene *11,000 ug/l* (Well No. *MW-1*, Date *1/23/91*)

   Total Hydrocarbons *150,000 ug/l* (Well No. *MW-3*, Date *1/23/91*)

5. Drinking water criteria. Do contaminant concentrations for any compound exceed the Recommended Allowable Limits (RALs) at or beyond the site boundaries? (Yes/No) ..... [Y]

   Compound *Benzene @ 1,400 ug/l* ..... (Well No. *MW-1*, Date *12/6/94*)

6. Source. Do sources of contamination (including contaminated soil) remain at the site? (Yes/No) ..... [N]
   If yes, briefly describe. *No apparent source of hydrocarbons in soil remains beneath the site. Source of hydrocarbons in ground water is unknown.*

7. Municipal water supply available. Is municipal water supply available at the site and within 1 mile downgradient of the site? (Yes/No) ..... [Y]

8. Drinking water wells. Are there presently any drinking water wells which use the impacted aquifer located within ½ mile downgradient of the site, or 1 mile downgradient of the site if the aquifer material is fractured? (Yes/No) ..... [N]

9. Water development. Are there any plans for ground water development in the impacted aquifer within ½ mile downgradient of the site, or 1 mile downgradient of the site if the aquifer material is fractured? (Yes/No) ..... [N]

If you answered No to questions 8 AND 9, please skip to question 10 and continue.

If you answered yes to questions 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 CAD to meet the following clean-up goal and compliance point.

Clean-up goal: The RALs for VOCs and 1 part per million total hydrocarbons. Collect free product where technically feasible.

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 "LUST Program Clean-up Strategy" (Guidance Document #16).

10. Are there nonpotable water supply wells which use the impacted unit within ½ mile downgradient of the site? (Yes/No) ..... [N]

11. Does the plume currently discharge to surface water? (Yes/No) ..... [N]
If yes, what is the estimated width of the plume at the shore of the surface water body; and what are the estimated concentrations of the following contaminants at the shore of the surface water body: (The estimation method should be described in the text of the RI Report).

Benzene ____, Ethylbenzene ____, Toluene ____, Xylenes ____, Total Hydrocarbons ____

If the answer to question number 11 is yes, determine and report the use category of the surface water body, in accordance with Minn. Rules ch. 7050. Call _____ for help.

12. Does the plume have a projected point of entry to surface water? (Yes/No) ... [Y]
If yes, what is the distance from the downgradient edge of the plume to the surface water body?
1500 feet

If you answered yes to question 12, the RI Report should characterize the hydrogeologic conditions and land use between the site and the surface water body, and should assess the potential for the plume to discharge to surface water and the likelihood of future ground water use in the vicinity of the plume.

13. Is the impacted unit a bedrock aquifer? (Yes/No) ..... [N]

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 2-mile radius of the site? (Yes/No) ..... [N]

15. Uppermost drinking water aquifer.

geologic description *Quaternary sand and gravel alluvium*

depth to top *0 - 4'*

water level *15'- 20'*

karst? (yes/no) ..... [N]

sole source? (yes/no) ..... [N]

16. Confining unit. Is there a confining unit between the impacted unit and the uppermost drinking water aquifer? (yes/no) ..... [Y]

If yes: thickness: *Approximately 20 feet*

extent: *laterally extensive (from well drillers logs)*

formation name or material description: *clay till*

17. Are there any abandoned wells within approximately 1,000 feet downgradient of the site? (yes/no) ..... [Y]

If yes, describe: *One abandoned well and one inactive well are reported within 500 feet down gradient of Tobies site (EnecoTech).*

18. List other site specific conditions which increase the risk of cross contamination from the impacted unit to a drinking water aquifer.

None

19. Based on the answers to questions 14 through 17 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.

Hydrocarbons in ground water at the site is not likely to migrate through the confining clay till to the sandstone bedrock.

APPENDIX D

Horizon
Laboratories, Inc.

5155 East River Road, Suite #416 Minneapolis, MN. 55421 Tel. (612) 572-0425 Fax (612) 572-0441

LABORATORY RESULTS

Client: Delta Environmental Consultants, Inc
3900 Northwoods Drive, Suite 200
St. Paul, MN 55112
Attn: Paul Carter

Project: Holiday Store 226
Hinckley, MN

Date Sampled: 11/29/94 - 11/30/94
Date Analyzed: 12/07/94 - 12/08/94
Physical State: Soil

Report Date: 12/08/94
Lab P.N.: 1000-324
Client P.N.: A094-158

Sample I.D.	Benzene mg/kg EPA 8020	Toluene mg/kg EPA 8020	Ethyl-benzene mg/kg EPA 8020	Total, Xylenes mg/kg EPA 8020	GRO mg/kg Wis. DNR	% Moisture
SB-1/MW-1 14-16	0.040	0.053	2.7	4.1	170	6.3
SB-1/MW-1 24-26	0.033	<0.050	0.15	<0.080	<0.50	13
SB-2 6-8	0.025	<0.050	<0.020	<0.080	<0.50	5.7
SB-2 14-16	0.15	0.26	0.026	0.25	0.79	12
SB-3/MW-2 21-23	<0.020	<0.050	<0.020	<0.080	<0.50	15
SB-4 21-23	0.19	0.10	0.25	0.73	2.5	12
SB-4 14-16	0.051	0.070	0.064	0.16	0.89	13
SB-5/MW-3 14-16	<0.020	<0.050	<0.20	<0.080	<0.50	11
MDL, mg/kg	0.020	0.050	0.020	0.080	0.50	

MDL; Method Detection Limit

GRO; Gasoline Range Organics

All results are in mg/kg which is equal to parts-per-million (ppm) and are based on a "dry weight" basis.

The Laboratory Results are only a part of the Laboratory Report.

Horizon
Laboratories, Inc.

5155 East River Road, Suite #416 Minneapolis, MN. 55421 Tel. (612) 572-0425 Fax (612) 572-0441

LABORATORY REPORT

Client:	Delta Environmental Consultants, Inc	Date Sampled:	11/29/94 - 11/30/94
	3900 Northwoods Drive, Suite 200	Date Received:	12/01/94
	St. Paul, MN 55112	Date Analyzed:	12/07/94 - 12/08/94
	Attn: Paul Carter	Physical State:	Soil
Project:	Holiday Store 226	Report Date:	12/08/94
	Hinckley, MN	Lab P.N.:	1000-324
		Client P.N.:	A094-158

Quality Assurance / Quality Control Summary

Parameter (Method)	QC Type	Percent Recovery	Acceptable Range	Percent Reproducibility	Acceptable Range
Benzene (EPA 8020)	M	89	127 - 76	95	127 - 76
Toluene (EPA 8020)	M	92	125 - 76	95	125 - 76
Ethylbenzene (EPA 8020)	M	96	125 - 76	96	125 - 76
m,p-Xylenes (EPA 8020)	M	99	125 - 76	95	125 - 76
o-Xylenes (EPA 8020)	M	96	125 - 76	94	125 - 76
GRO (Wis. DNR)	M	91	117 - 85	89	115 - 84

M = Matrix Spike / Matrix Spike Duplicate

L = Laboratory Control Sample

Reviewed

Approved

Compounds were identified by column retention time and quantified by peak area of known standards using a Hewlett Packard ChemStation Data System. The samples were received by HORIZON LABORATORIES, INC. and accompanied by the Chain-of-Custody record. The Laboratory Report is the sole property of the client to whom it is addressed. The Laboratory Results are only a part of the Laboratory Report.

Delta
Environmental Consultants, Inc.
3900 Northwoods Dr., Suite 200
St. Paul, MN 55112

CHAIN-OF-CUSTODY RECORD

DELTA PROJECT NO. A094-158 | INVOICE CODE | PAGE 1 OF 1

PROJECT MANAGER: Paul Carter

PROJECT NAME: Holiday Store 226

PROJECT LOCATION: Hinckley MN

SAMPLER'S SIGNATURE: Megan Tunkey

TURN AROUND REQUESTED: [X] NORMAL [ ] RUSH _____ [ ] OTHER _____

LAB NAME: Horizon

LAB USE ONLY

LABORATORY PROJECT NO.: 1000-324

SAMPLE ID	SAMPLE LOCATION/DESCRIPTION	DATE/TIME SAMPLED	SAMPLE MATRIX: SOIL(S): AIR(A): BULK(B): AQUEOUS(Q): SLUDGE(L): OTHER(O)	ANALYSIS REQUESTED: BTEX/GRO	NUMBER OF CONTAINERS	ACCEPT (A) REJECT	SAMPLE CONDITION AS RECEIVED: CHILLED YES/NO; SEALED YES/NO; SAMPLE CONDITION/ COMMENTS	LABORATORY SAMPLE NUMBER
SB-1/MW-1 14-16		11/29/91 10:15	S	X	2			12713
SB-1/MW-1 24-26		10:50		X	2			12714
SB-2 6-8		2:15		X	2			12715
SB-2 14-16		2:30		X	2			12716
SB-3/MW-2 21-23		11/30/91 7:45		X	2			12717
SB-4 21-23		1:00		X	2			12718
SB-4 14-16		11:45		X	2			12719
SB-5/MW-3	14-16	3:36		X	2			12720
~~SB-3/MW-2 14-16~~		~~11/29/91 4:00~~			2			

GENERAL COMMENTS: Results to Paul Carter

16 ◀ TOTAL NUMBER OF CONTAINERS

	DATE		DATE		DATE
1 RELINQUISHED BY (SIGNATURE): Megan Tunkey	12/1/91	3 RELINQUISHED BY (SIGNATURE)		5 RELINQUISHED BY (SIGNATURE)	
COMPANY: Delta	TIME: 1:00	COMPANY	TIME	COMPANY	TIME
2 RECEIVED BY (SIGNATURE): Glenn Klein	DATE: 12/1	4 RECEIVED BY (SIGNATURE)	DATE	6 RECEIVED BY (SIGNATURE)	DATE
COMPANY: Horizon	TIME: 16 30	COMPANY	TIME	COMPANY	TIME

Original - Return with Report • Yellow - Lab Copy • Pink - Sampler Copy

Horizon
Laboratories, Inc.

5155 East River Road, Suite #416 Minneapolis, MN. 55421 Tel. (612) 572-0425 Fax (612) 572-0441

LABORATORY RESULTS

Client: Delta Environmental Consultants, Inc
3900 Northwoods Drive, Suite 200
St. Paul, MN 55112
Attn: Megan Tewinkle

Project: Holiday #226
Hinckley, MN

Date Sampled: 12/06/94
Date Analyzed: 12/14/94
Physical State: Aqueous

Report Date: 12/15/94
Lab P.N.: 1000-324.2
Client P.N.: A094-158

MDH 465D

Sample I.D.	MW-1	MW-2	MW-3	MDL
Parameter	µg/l	µg/l	µg/l	µg/l
Acetone	<750	<30	<30	30
Allyl Chloride	<20	<0.8	<0.8	0.8
Benzene	1,400	2.7	1.6	0.2
Bromobenzene	<10	<0.4	<0.4	0.4
Bromochloromethane	<13	<0.5	<0.5	0.5
Bromodichloromethane	<15	<0.6	<0.6	0.6
Bromoform	<5.0	<0.2	<0.2	0.2
Bromomethane	<23	<0.9	<0.9	0.9
n-Butylbenzene	52	<0.2	<0.2	0.2
sec-Butylbenzene	15	<0.2	<0.2	0.2
tert-Butylbenzene	<5.0	<0.2	<0.2	0.2
Carbon Tetrachloride	<13	<0.5	<0.5	0.5
Chlorobenzene	<5.0	<0.2	6.0	0.2
Chloroethane	<250	<10	<10	10
Chloroform	<13	<0.5	<0.5	0.5
Chloromethane	<250	<10	<10	10
2-Chlorotoluene	<7.5	<0.3	<0.3	0.3
4-Chlorotoluene	<18	<0.7	<0.7	0.7
Dibromochloromethane	<10	<0.4	<0.4	0.4
1,2-Dibromo-3-Chloropropane	<7.5	<0.3	<0.3	0.3
1,2-Dibromoethane	<15	<0.6	<0.6	0.6
Dibromomethane	<23	<0.9	<0.9	0.9
1,2-Dichlorobenzene	<10	<0.4	16	0.4
1,3-Dichlorobenzene	<7.5	<0.3	0.82	0.3
1,4-Dichlorobenzene	<13	<0.5	2.3	0.5
Dichlorodifluoromethane	<150	<6.0	<6.0	6.0
1,1-Dichloroethane	<10	<0.4	<0.4	0.4
1,2-Dichloroethane	<28	<1.1	<1.1	1.1
1,1-Dichloroethene	<30	<1.2	<1.2	1.2
cis-1,2-Dichloroethene	<2.5	<0.1	<0.1	0.1
trans-1,2-Dichloroethene	<13	<0.5	<0.5	0.5
Dichlorofluoromethane	<500	<20	<20	20
1,2-Dichloropropane	<13	<0.5	<0.5	0.5
1,3-Dichloropropane	<10	<0.4	<0.4	0.4

MDL; Method Detection Limit
All results are in µg/l which is equal to parts-per-billion (ppb).
The Laboratory Results are only a part of the Laboratory Report.

Horizon
Laboratories, Inc.

5155 East River Road, Suite #416 Minneapolis, MN. 55421 Tel. (612) 572-0425 Fax (612) 572-0441

LABORATORY RESULTS

Client: Delta Environmental Consultants, Inc
3900 Northwoods Drive, Suite 200
St. Paul, MN 55112
Attn: Megan Tewinkle

Project: Holiday #226
Hinckley, MN

Date Sampled: 12/06/94
Date Analyzed: 12/14/94
Physical State: Aqueous

Report Date: 12/15/94
Lab P.N.: 1000-324.2
Client P.N.: A094-158

MDH 465D

Sample I.D.	MW-1	MW-2	MW-3	MDL
Parameter	µg/l	µg/l	µg/l	µg/l
*2,2-Dichloropropane	<18	<0.7	<0.7	0.7
1,1-Dichloropropene	<13	<0.5	<0.5	0.5
cis-1,3-Dichloropropene	<13	<0.5	<0.5	0.5
trans-1,3-Dichloropropene	<7.5	<0.3	<0.3	0.3
Ethyl Benzene	1,700	<0.2	<0.2	0.2
Ethyl Ether	<130	<5.0	<5.0	5.0
Hexachlorobutadiene	<15	<0.6	<0.6	0.6
Isopropyl Benzene	88	<0.2	<0.2	0.2
p-Isopropyltoluene	8.4	<0.2	<0.2	0.2
Methyl Ethyl Ketone	<380	<15	<15	15
Methyl Isobutyl Ketone	<1500	<60	<60	60
Methyl tert-Butyl Ether	<130	<5.0	<5.0	5.0
Methylene Chloride	<10	<0.4	<0.4	0.4
Naphthalene	420	<0.2	0.26	0.2
*n-Propylbenzene	<5.0	<0.2	<0.2	0.2
o-Xylene	1,500	<0.2	0.39	0.2
Styrene	<13	<0.5	<0.5	0.5
1,1,1,2-Tetrachloroethane	<15	<0.6	<0.6	0.6
1,1,2,2-Tetrachloroethane	<10	<0.4	<0.4	0.4
Tetrachloroethene	<13	<0.5	<0.5	0.5
Tetrahydrofuran	<380	<15	<15	15
Toluene	230	<0.6	<0.6	0.6
1,2,3-Trichlorobenzene	<25	<1.0	<1.0	1.0
1,2,4-Trichlorobenzene	<7.5	<0.3	<0.3	0.3
1,1,1-Trichloroethane	<25	<1.0	<1.0	1.0
1,1,2-Trichloroethane	<10	<0.4	<0.4	0.4
Trichloroethene	<15	<0.6	<0.6	0.6
Trichlorofluoromethane	<130	<5.0	<5.0	5.0
1,2,3-Trichloropropane	<10	<0.4	<0.4	0.4
1,1,2-Trichlorotrifluoroethane	<20	<0.8	<0.8	0.8
1,2,4-Trimethylbenzene	530	<0.3	<0.3	0.3
*1,3,5-Trimethylbenzene	150	<0.2	<0.2	0.2
Vinyl Chloride	<130	<5.0	<5.0	5.0
m,p-Xylenes	1,800	<0.5	<0.5	0.5

*; coeluting compounds
MDL; Method Detection Limit
All results are in µg/l which is equal to parts-per-billion (ppb).
The Laboratory Results are only a part of the Laboratory Report.

Horizon
Laboratories, Inc.

5155 East River Road, Suite #416 *Minneapolis, MN. 55421* *Tel. (612) 572-0425* *Fax (612) 572-0441*

LABORATORY RESULTS

Client:	Delta Environmental Consultants, Inc 3900 Northwoods Drive, Suite 200 St. Paul, MN 55112 Attn: Megan Tewinkle	Date Sampled: Date Analyzed: Physical State:	12/06/94 12/09/94 - 12/14/94 Aqueous
Project:	Holiday #226 Hinckley, MN	Report Date: Lab P.N.: Client P.N.:	12/15/94 1000-324.2 A094-158

Sample I.D.	GRO µg/l Wis. DNR	DRO µg/l Wis. DNR
MW-1	13,000	6,000
MW-2	35	<29
MW-3	42	<29
MDL, µg/l	20	29

MDL; Method Detection Limit for undiluted samples.

GRO; Gasoline Range Organics

DRO; Diesel Range Organics

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

The Laboratory Results are only a part of the Laboratory Report.

Horizon
Laboratories, Inc.

5155 East River Road, Suite #416 Minneapolis, MN. 55421 Tel. (612) 572-0425 Fax (612) 572-0441

LABORATORY REPORT

Client:	Delta Environmental Consultants, Inc	Date Sampled:	12/06/94
	3900 Northwoods Drive, Suite 200	Date Received:	12/06/94
	St. Paul, MN 55112	Date Analyzed:	12/09/94 - 12/14/94
	Attn: Megan Tewinkle	Physical State:	Aqueous
Project:	Holiday #226 Hinckley, MN	Report Date:	12/15/94
		Lab P.N.:	1000-324.2
		Client P.N.:	A094-158

Quality Assurance / Quality Control Summary

Parameter: (Method)	QC Type	Percent Recovery	Acceptable Range	Percent Reproducibility	Acceptable Range
MtBE (MDH 465D)	M	98	120 - 80	106	120 - 80
Benzene (MDH 465D)	M	98	120 - 80	101	120 - 80
Toluene (MDH 465D)	M	97	120 - 80	101	120 - 80
Ethylbenzene (MDH 465D)	M	98	120 - 80	100	120 - 80
m,p-Xylenes (MDH 465D)	M	98	120 - 80	100	120 - 80
o-Xylene (MDH 465D)	M	99	120 - 80	99	120 - 80
Dibromomethane (MDH 465D)	M	101	120 - 80	109	120 - 80
Bromomethane (MDH 465D)	M	88	120 - 80	98	120 - 80
GRO (Wis. DNR)	M	105	117 - 85	97	115 - 84
DRO (Wis. DNR)	M	97	130 - 60	101	130 - 60

M = Matrix Spike / Matrix Spike Duplicate L = Laboratory Control Sample

Reviewed

Approved

Compounds were identified by column retention time and quantified by peak area to those of known standards using a Hewlett Packard ChemStation data system. The samples were received by HORIZON LABORATORIES, INC. and accompanied by the Chain-of-Custody Record. The Laboratory Report is the sole property of the client to whom it is addressed. The Laboratory Results are only a part of the Laboratory Report.

CHAIN–OF–CUSTODY RECORD

Delta Environmental Consultants, Inc.
St. Paul, MN

DELTA PROJECT NO. 17094-158 | INVOICE CODE ☐ | PAGE 1 OF 1

PROJECT NAME: HCL-IDAY # 226

PROJECT LOCATION: HINCKLEY, MN

SAMPLER'S SIGNATURE: Kelly L. Anderson

TURN AROUND REQUESTED: ☒ NORMAL ☐ RUSH ☐ OTHER

SAMPLE ID	SAMPLE LOCATION/DESCRIPTION	DATE/TIME SAMPLED	SAMPLE MATRIX: SOIL(S): AIR(A): BULK(B): AQUEOUS(Q): SLUDGE(L): OTHER(O)	ANALYSIS REQUESTED: 8260	ANALYSIS REQUESTED: DRO	NUMBER OF CONTAINERS	ACCEPT (A) REJECT (R)	SAMPLE CONDITION/ COMMENTS	LABORATORY SAMPLE NUMBER
MW-1		12-6 / 10:05	Q	X	X	4			12801
MW-2		12-6 / 09:00	↓	X	X	4			12802
MW-3		12-6 / 09:30		X	X	4			12803

LAB USE ONLY

LABORATORY PROJECT NO. 1000-324.2

SAMPLE CONDITION AS RECEIVED: CHILLED YES/NO SEALED YES/NO

GENERAL COMMENTS: RESULTS TO MEGAN TEWINCKLE

12 ◀ TOTAL NUMBER OF CONTAINERS

1 RELINQUISHED BY (SIGNATURE): Kelly L. Anderson	DATE: 12-6-97	3 RELINQUISHED BY (SIGNATURE)	DATE	5 RELINQUISHED BY (SIGNATURE)	DATE
COMPANY: Delta Environmental	TIME: 13:00	COMPANY	TIME	COMPANY	TIME
2 RECEIVED BY (SIGNATURE)	DATE	4 RECEIVED BY (SIGNATURE): Richard Hamm	DATE: 12/6	6 RECEIVED BY (SIGNATURE)	DATE
COMPANY	TIME	COMPANY: Horizon Labs	TIME: 1400	COMPANY	TIME

Original - Return with Report • Yellow - Lab Copy • Pink - Sampler Copy

Horizon
Laboratories, Inc.

5155 East River Road, Suite #416 Minneapolis, MN. 55421 Tel. (612) 572-0425 Fax (612) 572-0441

LABORATORY RESULTS

Client: Delta Environmental Consultants, Inc
3900 Northwoods Drive, Suite 200
St. Paul, MN 55112
Attn: Paul Carter

Project: Holiday #226
Hinckley, MN

Date Sampled: 01/20/95
Date Analyzed: 01/25/95 - 01/26/95
Physical State: Aqueous

Report Date: 01/26/95
Lab P.N.: 1000-324.3
Client P.N.: A094-158-1.0001

Sample I.D.	Benzene µg/l EPA 8020	Toluene µg/l EPA 8020	Ethyl-benzene µg/l EPA 8020	Total Xylenes µg/l EPA 8020	GRO µg/l Wis. DNR	DRO µg/l Wis. DNR
MW-1	1,100	360	1,600	2,900	12,000	4,300
MW-2	< 0.20	< 0.50	< 0.20	< 0.80	< 20	< 31
MW-3	1.3	< 0.50	< 0.20	0.82	300	40
MDL, µg/l	0.20	0.50	0.20	0.80	20	31

MDL; Method Detection Limit for undiluted samples.
GRO; Gasoline Range Organics
DRO; Diesel Range Organics
All results are in µg/l which is equal to parts-per-billion (ppb).
The Laboratory Results are only a part of the Laboratory Report.

Horizon
Laboratories, Inc.

5155 East River Road, Suite #416 Minneapolis, MN. 55421 Tel. (612) 572-0425 Fax (612) 572-0441

LABORATORY REPORT

Client:	Delta Environmental Consultants, Inc	Date Sampled:	01/20/95
	3900 Northwoods Drive, Suite 200	Date Received:	01/20/95
	St. Paul, MN 55112	Date Analyzed:	01/25/95 - 01/26/95
	Attn: Paul Carter	Physical State:	Aqueous
Project:	Holiday #226	Report Date:	01/26/95
	Hinckley, MN	Lab P.N.:	1000-324.3
		Client P.N.:	A094-158-1.0001

Quality Assurance / Quality Control Summary

Parameter (Method)	QC Type	Percent Recovery	Acceptable Range	Percent Reproducibility	Acceptable Range
Benzene (EPA 8020)	M	101	127 - 76	98	127 - 76
Toluene (EPA 8020)	M	99	125 - 76	98	125 - 76
Ethylbenzene (EPA 8020)	M	100	125 - 76	98	125 - 76
m,p-Xylenes (EPA 8020)	M	103	125 - 76	98	125 - 76
o-Xylenes (EPA 8020)	M	96	125 - 76	98	125 - 76
GRO (Wis. DNR)	M	98	117 - 85	99	115 - 84
DRO (Wis. DNR)	M	79	130 - 60	100	130 - 60

M = Matrix Spike / Matrix Spike Duplicate

L = Laboratory Control Sample

Reviewed

Approved

Compounds were identified by column retention time and quantified by peak area of known standards using a Hewlett Packard ChemStation Data System. The samples were received by HORIZON LABORATORIES, INC. and accompanied by the Chain-of-Custody record. The Laboratory Report is the sole property of the client to whom it is addressed. The Laboratory Results are only a part of the Laboratory Report.

Delta
Environmental
Consultants, Inc.
3900 Northwoods Dr., Suite 200
St. Paul, MN 55112

CHAIN–OF–CUSTODY RECORD

DELTA PROJECT NO. HOLI-153-10001 | INVOICE CODE | PAGE 1 OF 1

PROJECT MANAGER: PAUL CARTER

PROJECT NAME: HOLIDAY #226

PROJECT LOCATION: HINCKLEY, MN

SAMPLER'S SIGNATURE: Robert L. Walker

TURN AROUND REQUESTED:
- [X] NORMAL
- [ ] RUSH
- [ ] OTHER

LAB NAME: HORIZON

LAB USE ONLY

LABORATORY PROJECT NO. 1000-324.3

SAMPLE ID	SAMPLE LOCATION/DESCRIPTION	DATE/TIME SAMPLED	SAMPLE MATRIX: SOIL(S): AIR(A): BULK(B): AQUEOUS(Q): SLUDGE(L): OTHER(O)	ANALYSIS REQUESTED: WATER	GRO	DRO	NUMBER OF CONTAINERS	ACCEPT (A) REJECT (R)	SAMPLE CONDITION AS RECEIVED: CHILLED YES/NO; SEALED YES/NO; SAMPLE CONDITION/ COMMENTS	LABORATORY SAMPLE NUMBER
MW-1		1-20/11:10		X	X	X	3			13634
MW-2		1-20/11:40		X	X	X	3			13635
MW-3		1-20/12:00		X	X	X	3			13636

GENERAL COMMENTS: RESULTS TO PAUL CARTER

9 ◀ TOTAL NUMBER OF CONTAINERS

	DATE		DATE		DATE
1 RELINQUISHED BY (SIGNATURE): Robert L. Walker	1-20-95	3 RELINQUISHED BY (SIGNATURE)		5 RELINQUISHED BY (SIGNATURE)	
COMPANY: Delta Environmental	TIME: 1700	COMPANY	TIME	COMPANY	TIME
2 RECEIVED BY (SIGNATURE)	DATE	4 RECEIVED BY (SIGNATURE): Glenn Hess	DATE 1/20/95	6 RECEIVED BY (SIGNATURE)	DATE
COMPANY	TIME	COMPANY: Horizon Labs	TIME 1725	COMPANY	TIME

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APPENDIX F

GROUND WATER RECEPTOR SURVEY
Holiday Station No. 226
Hinkley, Minnesota
DELTA #A094-158

Unique Well Number	Ground Surface Elevation	Base of Well Elevation	Base of Casing Elevation	Water Level Elevation	Aquifer	Use	Date Drilled
232461	NA	*-452	*-125	*-21	NA	Municipal	1974
241991	NA	*-425	NA	NA	NA	Municipal	1918
242926	1033	759	1001	1016	Hinkley S.Stone-Fon du Lac	Commercial	NA
H-001 (433518)	NA	*-145	*-61	*-15	NA	Commercial	1986
H-002 (433519)	NA	*-132	*-71	*-15	NA	Commercial	1986
H-003 (441194)	NA	*-110	*-89	*-24	NA	Domestic	1988
H-004 (441243)	NA	*-350	*-199	*-24	NA	Commercial	1988
H-005 (111370)	1010	905	919	987	Hinkley S.Stone	Domestic	1976
H-006 (436787)	NA	*-79	*-73	*-17	NA	Domestic	1987
H-007	NA	*-74	*-70	*-37	NA	Domestic	1988

Elevations are in feet
*=base elevation level not available, value could not be calculated

MINNESOTA COUNTY WELL INDEX/WELL LOG.
UN.NO./CO. : 109566/58 NAME : PHILIP FAGERSTROM SR.

WELL CONSTRUCTION.

	DIAM(IN)	FROM(FT)	TO(FT)	[GROUT MATERIAL	AMNT	UNITS]
CASING 1 :	005	0	0053			

SCREEN.
PRESENT?: NO OPEN HOLE FROM: 0053 FT. TO: 061FT.

PUMP.
INSTLLD?: YES DATE : / /
MAKE : GOULD MODEL: 10EJ05412
SIZE : 00.5 H.P. VOLTS: 0230 CAPACITY: GPM
TYPE : SUBMERSIBLE DROP PIPE: 0055 FT. MATERIAL:

PUMPAGE TEST(S).
STATIC WATER LEVEL: 015 FT. DATE: 1975/11/

	LEVEL(FT)	HOURS	GPM	DRAWDOWN(FT)
TEST 1:	75	001	0012	60.0

DRILLER S/GEOLOGIC LOG

DEPTH INTERVAL [EL.TOP]	DRILLER S DESCRIPTION [INTERPRETED LITHOLOGY]	[CODE]	COLOR HARDNESS [STRATIGRAPHIC UNIT(S)]	[AGE]
0000 0047	RED CLAY			
[1030]	[CLAY	[QTUR]	[TILL,RED]	[QUA]
0047 061	SANDROCK			
[983]	[SANDSTONE	[PMHN]	[HINCKLEY SANDSTONE]	[PCM]

MINNESOTA COUNTY WELL INDEX.

UN.NO./CO. : 111370/58 ENTERED: 1988/04/17
NAME : PAUL HOLMES UPDATED: 1991/08/18

COUNTY : PINE USE : DOMESTIC DRILLED: 1976/06/01
T/R/SEC. : 41/21/25ADDDDA DEPTH : 105 FT. DEPTH D: 105 FT.
ELEVATION: 1010 FT.(TOPO) CASED : 0091 FT. GROUT :
DIAM. : 4 IN. DRL/DS : 58069 :ROSGA WELL CO.
LOC.METH.: LOC.BY : MGS COORDS.:
STATUS : ACTIVE WHPA : DNR PA#:

DPTH BDRK: 0086 FT. BEDROCK: HINCKLEY SANDSTONE
OPEN HOLE: HINCKLEY SANDSTONE
AQUIFER : HINCKLEY SANDSTONE

ADDRESS : , , MN
QUAD(7.5): 188 CONTACT:

CWI/WL: YES CWI/WC: NO CORE/CTTNGS/GP.:

DATE	NITRATE	BACTERIA	SOURCE	SWL	ELEV	SOURCE
1976/06/01				023	987	

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MINNESOTA COUNTY WELL INDEX/WELL LOG.
UN.NO./CO. : 219363/58            NAME    : MOBIL OIL COMPANY

----------------------------------------------------------------------
  WELL CONSTRUCTION.
                                                    [GROUT-------------]
                DIAM(IN)   FROM(FT)    TO(FT)     MATERIAL     AMNT  UNITS
                --------   --------   --------    ----------   ----  -----
   CASING 1   :     006          0       0040

  SCREEN.
   PRESENT?: NO         OPEN HOLE FROM: 0040 FT.  TO:  155FT.

  PUMP  : DATA UNAVAILABLE.
----------------------------------------------------------------------
  PUMPAGE TEST(S).
   STATIC WATER LEVEL:     025 FT.        DATE: 1967/05/
              LEVEL(FT)    HOURS    GPM   DRAWDOWN(FT)
             ----------    -----    ----  ------------
   TEST 1:       65          012    0030       40.0
----------------------------------------------------------------------

                        DRILLER S/GEOLOGIC LOG
----------------------------------------------------------------------
 DEPTH
INTERVAL  DRILLER S DESCRIPTION              COLOR    HARDNESS
[EL.TOP ] [INTERPRETED LITHOLOGY     ][CODE][STRATIGRAPHIC UNIT(S)  ] [AGE]
--------- ------------------------------------------------------------ -----
0000 0036 SAND & GRAVEL
[   1020] [SAND, GRAVEL              ][QFUU][SAND                   ] [QUA]
0036  155 PINK SANDROCK
[    984] [SANDSTONE                 ][PMHN][HINCKLEY SANDSTONE     ] [PCM]
----------------------------------------------------------------------
**********************************************************************

   **********************************************************************
   MINNESOTA COUNTY WELL INDEX.

   UN.NO./CO. : 232461/58                              ENTERED: 1992/08/20
   NAME       : HINCKLEY #2                            UPDATED: 1992/08/20

     COUNTY    : PINE              USE    : MUNICIPAL  DRILLED: 1974/04/30
     T/R/SEC.  :  41/21/24         DEPTH  :  452 FT.   DEPTH D:  452 FT.
     ELEVATION:       FT.(      ) CASED  :  125 FT.   GROUT  :
     DIAM.     : 12 IN.            DRL/DS :

     ADDRESS   : , , MN
     QUAD(7.5): HINCKLEY                    CONTACT:
     CWI/WL: NO     CWI/WC: NO     CORE/CTTNGS/GP.:

        DATE      NITRATE  BACTERIA   SOURCE        SWL   ELEV   SOURCE
        ----------  -------  --------  -------       -----  ----  -------
           /  /                                       21
   **********************************************************************
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MINNESOTA COUNTY WELL INDEX.

UN.NO./CO. : 242926/58 ENTERED: 1990/10/09
NAME : OLD CREAMERY WELL HINCKL UPDATED: 1991/08/18

COUNTY	: PINE	USE	: COMMERCIAL	DRILLED:	/ /
T/R/SEC.	: 41/21/24CDABCD	DEPTH	: 274 FT.	DEPTH D:	274 FT.
ELEVATION	: 1033 FT.(TOPO)	CASED	: 32 FT.	GROUT	:
DIAM.	: 8 IN.	DRL/DS	:		
LOC.METH.	:	LOC.BY	: MGS	COORDS.	:
STATUS	: ACTIVE	WHPA	:	DNR PA#	:

DPTH BDRK: 26 FT. BEDROCK: HINCKLEY SANDSTONE
OPEN HOLE: HINCKLEY SANDSTONE-FOND DU LAC FORMATION
AQUIFER : MULTIPLE

ADDRESS : , , MN
QUAD(7.5): HINCKLEY CONTACT:
CWI/WL: YES CWI/WC: NO CORE/CTTNGS/GP.:

DATE	NITRATE	BACTERIA	SOURCE	SWL	ELEV	SOURCE
/ /				17	1016	

COMMENTS: GAMMA LOGGED + TV. 7-13-90.

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MINNESOTA COUNTY WELL INDEX/WELL LOG.
UN.NO./CO. : 242926/58 NAME : OLD CREAMERY WELL HINCKL

WELL CONSTRUCTION.

	DIAM(IN)	FROM(FT)	TO(FT)	[GROUT MATERIAL	AMNT	UNITS]
CASING 1 :	8	0	32			

SCREEN.
PRESENT?: NO OPEN HOLE FROM: 32 FT. TO: 274FT.

PUMP : DATA UNAVAILABLE.

PUMPAGE TEST: DATA UNAVAILABLE.

DRILLER S/GEOLOGIC LOG

DEPTH INTERVAL [EL.TOP]	DRILLER S DESCRIPTION [INTERPRETED LITHOLOGY	][CODE]	COLOR HARDNESS [STRATIGRAPHIC UNIT(S)	] [AGE]
0 26	GLACIAL DRIFT			
[1033]	[DRIFT	][QUUU]	[PLEISTOCENE DEPOSIT	] [QUA]
26 164	HINCKLEY FORMATION			
[1007]	[SANDSTONE	][PMHN]	[HINCKLEY SANDSTONE	] [PCM]
164 274	FOND DU LAC FORMATION			
[869]	[SANDSTONE, SILTSTONE	][PMFL]	[FOND DU LAC FORMATION	] [PCM]

MINNESOTA COUNTY WELL INDEX.

UN.NO./CO. : 401026/58 ENTERED: 1989/02/28
NAME : SCHRADE, JOHN UPDATED: 1993/08/19

COUNTY : PINE USE : DOMESTIC DRILLED: 1984/05/17
T/R/SEC. : 41/20/30BBA DEPTH : 165 FT. DEPTH D: 165 FT.
ELEVATION: FT.( ) CASED : 85 FT. GROUT : NO
DIAM. : 4 IN. DRL/DS : 58069 :ROSGA WELL CO.
STATUS : ACTIVE WHPA : DNR PA#:

ADDRESS : RR 2 , HINCKLEY , MN 55037
POTENTIAL POLLUTION SOURCE: 50 FT. DIR.: E TYPE: OTHER
CWI/WL: NO CWI/WC: NO CORE/CTTNGS/GP.:

DATE	NITRATE	BACTERIA	SOURCE	SWL	ELEV	SOURCE
1984/05/17				18		58069

MINNESOTA COUNTY WELL INDEX.

UN.NO./CO. : 411060/58 ENTERED: 1989/02/28
NAME : WORLICKY, BOB UPDATED: 1993/08/22

COUNTY : PINE USE : DOMESTIC DRILLED: 1985/07/09
T/R/SEC. : 41/21/25 BD DEPTH : 72 FT. DEPTH D: 72 FT.
ELEVATION: FT.( ) CASED : 68 FT. GROUT : YES
DIAM. : 4 IN. DRL/DS : 58069 :ROSGA WELL CO.
STATUS : ACTIVE WHPA : DNR PA#:

ADDRESS : , HINCKLEY , MN 55037
POTENTIAL POLLUTION SOURCE: 50 FT. DIR.: E TYPE: SEPTIC/DFL
CWI/WL: NO CWI/WC: NO CORE/CTTNGS/GP.:

DATE	NITRATE	BACTERIA	SOURCE	SWL	ELEV	SOURCE
1985/07/09				13		58069

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MINNESOTA COUNTY WELL INDEX.

UN.NO./CO. : 423277/58 ENTERED: 1991/02/26
NAME : PIEPER, KEN UPDATED: 1993/09/03

COUNTY : PINE USE : DOMESTIC DRILLED: 1986/09/12
T/R/SEC. : 41/20/25BCB DEPTH : 140 FT. DEPTH D: 140 FT.
ELEVATION: FT.( ) CASED : 95 FT. GROUT : NO
DIAM. : 6 IN. DRL/DS : 82054 :MCCULLOUGH & SONS
STATUS : ACTIVE WHPA : DNR PA#:

ADDRESS : , , MN
CNTCT.ADD: 9219 2ND AV. S , BLOOMINGTON , MN 55420
POTENTIAL POLLUTION SOURCE: 60 FT. DIR.: E TYPE: SEPTIC/DFL
CWI/WL: NO CWI/WC: NO CORE/CTTNGS/GP.:

DATE	NITRATE	BACTERIA	SOURCE	SWL	ELEV	SOURCE
1986/09/12				35		58069

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MINNESOTA COUNTY WELL INDEX.

UN.NO./CO. : 425137/58 ENTERED: 1988/04/17
NAME : MCALLEN, SCOTT UPDATED: 1993/08/22

COUNTY : PINE USE : DOMESTIC DRILLED: 1986/09/09
T/R/SEC. : 41/21/24DAD DEPTH : 80 FT. DEPTH D: 80 FT.
ELEVATION: FT.( ) CASED : 25 FT. GROUT : YES
DIAM. : 4 IN. DRL/DS : 58069 :ROSGA WELL CO.
ABANDONED: / / UNUSED?: NO SEALED?:
STATUS : ACTIVE WHPA : DNR PA#:

ADDRESS : , HINCKLEY , MN 55037
POTENTIAL POLLUTION SOURCE: 50 FT. DIR.: W TYPE: SEPTIC/DFL
CWI/WL: NO CWI/WC: NO CORE/CTTNGS/GP.:

DATE	NITRATE	BACTERIA	SOURCE	SWL	ELEV	SOURCE
1986/09/09				8		58069

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MINNESOTA COUNTY WELL INDEX.

UN.NO./CO. : 433518/58 ENTERED: 1989/02/24
NAME : TOBIES ENTERPRISES UPDATED: 1993/08/22

COUNTY : PINE USE : COMMERCIAL DRILLED: 1986/10/30
T/R/SEC. : 41/21/25 AA DEPTH : 145 FT. DEPTH D: 145 FT.
ELEVATION: FT.( ) CASED : 61 FT. GROUT : YES
DIAM. : 6 IN. DRL/DS : 58069 :ROSGA WELL CO.
ABANDONED: / / UNUSED?: NO SEALED?:
STATUS : ACTIVE WHPA : DNR PA#:

ADDRESS : , HINCKLEY , MN 55037
POTENTIAL POLLUTION SOURCE: 100 FT. DIR.: E TYPE: SEPTIC/DFL
CWI/WL: NO CWI/WC: NO CORE/CTTNGS/GP.:

DATE	NITRATE	BACTERIA	SOURCE	SWL	ELEV	SOURCE
1987/10/30				15		58069

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MINNESOTA COUNTY WELL INDEX.

UN.NO./CO. : 433519/58 ENTERED: 1989/02/24
NAME : TOBIES ENTERPRISES UPDATED: 1993/08/22

COUNTY : PINE USE : COMMERCIAL DRILLED: 1986/11/29
T/R/SEC. : 41/21/25 AA DEPTH : 132 FT. DEPTH D: 132 FT.
ELEVATION: FT.( ) CASED : 71 FT. GROUT : YES
DIAM. : 6 IN. DRL/DS : 58069 :ROSGA WELL CO.
ABANDONED: / / UNUSED?: NO SEALED?:
STATUS : ACTIVE WHPA : DNR PA#:

ADDRESS : , HINCKLEY , MN 55037
POTENTIAL POLLUTION SOURCE: 150 FT. DIR.: NE TYPE: SEPTIC/DFL
CWI/WL: NO CWI/WC: NO CORE/CTTNGS/GP.:

DATE	NITRATE	BACTERIA	SOURCE	SWL	ELEV	SOURCE
1986/11/29				14		58069

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T/R/SEC. : 41/20/25ABA DEPTH : 165 FT. DEPTH D: 165 FT.
ELEVATION: FT.( ) CASED : 42 FT. GROUT : YES
DIAM. : 6 IN. DRL/DS : 58069 :ROSGA WELL CO.
ABANDONED: / / UNUSED?: NO SEALED?:
STATUS : ACTIVE WHPA : DNR PA#:

ADDRESS : RR 1 BOX 23 , HINCKLEY , MN 55037
POTENTIAL POLLUTION SOURCE: 50 FT. DIR.: TYPE: SEPTIC/DFL
CWI/WL: NO CWI/WC: NO CORE/CTTNGS/GP.:

DATE	NITRATE	BACTERIA	SOURCE	SWL	ELEV	SOURCE
1987/08/25				15		58069

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MINNESOTA COUNTY WELL INDEX.

UN.NO./CO. : 436744/58 ENTERED: 1991/03/07
NAME : SEVESTA, BERNARD UPDATED: 1993/09/03

COUNTY : PINE USE : DOMESTIC DRILLED: 1987/10/02
T/R/SEC. : 41/21/24BAA DEPTH : 55 FT. DEPTH D: 55 FT.
ELEVATION: FT.( ) CASED : 32 FT. GROUT : NO
DIAM. : 4 IN. DRL/DS : 58069 :ROSGA WELL CO.
ABANDONED: / / UNUSED?: YES SEALED?: TEM
STATUS : ACTIVE WHPA : DNR PA#:

ADDRESS : , HINCKLEY , MN 55037
POTENTIAL POLLUTION SOURCE: 50 FT. DIR.: W TYPE: SEPTIC/DFL
CWI/WL: NO CWI/WC: NO CORE/CTTNGS/GP.:

DATE	NITRATE	BACTERIA	SOURCE	SWL	ELEV	SOURCE
1987/10/02				16		58069

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MINNESOTA COUNTY WELL INDEX.

UN.NO./CO. : 436770/58 ENTERED: 1991/03/07
NAME : GOEBEL, BERNARD UPDATED: 1993/08/22

COUNTY : PINE USE : DOMESTIC DRILLED: 1987/03/02
T/R/SEC. : 41/21/24 BA DEPTH : 50 FT. DEPTH D: 50 FT.
ELEVATION: FT.( ) CASED : 32 FT. GROUT : YES
DIAM. : 4 IN. DRL/DS : 58069 :ROSGA WELL CO.
ABANDONED: / / UNUSED?: YES SEALED?: TEM
STATUS : ACTIVE WHPA : DNR PA#:

ADDRESS : BOX 448 , HINCKLEY , MN 55037
POTENTIAL POLLUTION SOURCE: 50 FT. DIR.: E TYPE: SEPTIC/DFL
CWI/WL: NO CWI/WC: NO CORE/CTTNGS/GP.:

1. LOCATION OF HUG 06 '92 10:46 ROSGA WELL DRILLING — Minnesota Statutes 156A.01-.08 — for Water Sample — P.7/7

County Name: Pine

Township Name: Barry | Township Number: 41 N | Range Number: 20 W | Section: 10 | Fraction: [illegible]

4. WELL DEPTH (completed): 74 ft. | Date of Completion: 7-15-88

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

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

Addition Name / Block Number / Lot Number

5. DRILLING METHOD
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. DRILLING FLUID: Bentonite

7. USE
1☒ Domestic 4☐ Monitoring 8☐ Heat Pump
2☐ Irrigation 5☐ Public 9☐ Industry
3☐ Test Well 6☐ Municipal 10☐ Commercial
7☐ Air Conditioning 11☐

2. PROPERTY OWNER'S NAME
Lee Klaf
Address: Rt 2
Hinckley, Mn 55037

8. CASING
1☒ Black 4☒ Threaded
2☐ Galv. 5☐ Welded
3☐ Plastic 6☐
4 in. to 70 ft. Weight ___ lbs./ft.
HEIGHT: Above/Below Surface 1 ft.
Drive Shoe? Yes ___ No X
HOLE DIAM. 6¼ in. to 74 ft.

3. FORMATION LOG

FORMATION LOG	COLOR	HARDNESS OF FORMATION	FROM	TO
Clay & Cobbles	Brown	M	0	8
Sand & Gravel	Brown	M	8	25
Clay & Sand	Brown	MH	25	64
Med Sand	Brown	S	64	74

Use a second sheet, if needed

9. SCREEN: Johnson
Make: Stainless Steel — Dia. 2"
Type: 10 — Length 2"
Slot/Gauze: 2x4 — FITTINGS:
Set between 70 ft. and 74 ft. — Lead Packer
Or open hole from ___ ft. to ___ ft.

10. STATIC WATER LEVEL: 17 ft. ☒ below ☐ above land surface — Date Measured 7-15-88

11. PUMPING LEVEL (below land surface)
70 ft. after 1 hrs. pumping 20 g.p.m.
55 ft. after ½ hrs. pumping 15 g.p.m.

12. HEAD WELL COMPLETION
1☐ Pitless adapter, manufacturer ___ model ___
2☐ Basement offset 3☐ At least 12" above ground
4☐ Plastic casing protection

13. WELL GROUTED?
☐ Yes ☐ No
1☐ Neat Cement 2☐ Bentonite 3☐
Grout material ___ from ___ to ___ ft. cu. yds.

14. NEAREST SOURCES OF POSSIBLE CONTAMINATION
50 feet W direction Sewer 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: 1☐ Submersible 3☐ L.S. Turbine 5☐ Reciprocating
2☐ Jet 4☐ Centrifugal 6☐

16. EXISTING WELLS
Unused well on property? ☐ Yes ☒ No
Abandoned ☐ Permanent ☐ Temporary ☐ Not sealed

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

#H-007

Well

Klar's

18. WATER WELL CONTRACTORS CERTIFICATION
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Rosga Well Drilling — Licensee Business Name — 56[illegible] License No.
Address: 410 2nd St. S.E.
Signed ___ Authorized Representative ___ Date ___