Drift-Platteville Aquifer Northern Area Supplemental Remedial Investigation for the Reilly Tar & Chemical Corporation N.P.L. Site, St. Louis Park, Minnesota

Submitted July 15, 1991

Revised October 21, 1991

DRIFT-PLATTEVILLE AQUIFER NORTHERN AREA SUPPLEMENTAL REMEDIAL INVESTIGATION FOR THE REILLY TAR & CHEMICAL CORPORATION N.P.L. SITE, ST. LOUIS PARK, MINNESOTA

SUBMITTED TO THE

REGIONAL ADMINISTRATOR
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION V

EXECUTIVE DIRECTOR
MINNESOTA POLLUTION CONTROL AGENCY

BY

THE CITY OF ST. LOUIS PARK, MINNESOTA

PURSUANT TO
CONSENT DECREE - REMEDIAL ACTION PLAN
SECTION 9.3

UNITED STATES OF AMERICA, ET AL.

vs.

REILLY TAR & CHEMICAL CORPORATION, ET AL.

UNITED STATES DISTRICT COURT
DISTRICT OF MINNESOTA
CIVIL NO. 4-80-469

SUBMITTED JULY 15, 1991

REVISED OCTOBER 21, 1991

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(Cont'd)

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1.0 INTRODUCTION

This report summarizes the results of the Drift-Platteville Aquifer Northern Area Supplemental Remedial Investigation (SRI) conducted pursuant to Section 9.3 of the Consent Decree - Remedial Action Plan (CD-RAP) in the case of the United States of America, *et. al.*, vs. Reilly Tar & Chemical Corporation, *et al.* The Drift-Platteville Aquifer Northern Area SRI was conducted in accordance with the Work Plan submitted on July 23, 1990, as amended in correspondence dated August 27, 1990, and April 12, 1991. On September 19, 1990, bid documents for the construction of seven piezometers and three monitoring wells were submitted. On October 12, 1990, approval of the Drift-Platteville Aquifer Northern Area SRI plan was received pursuant to modifications. On April 29, 1991, approval of the revised schedule for the Drift-Platteville Aquifer Northern Area SRI was received. That schedule includes the separate submittal of the Drift-Platteville Aquifer Northern Area Feasibility Study (FS) concurrent with this SRI Report.

1.1 Purpose of the Report

This report presents the results of the SRI which is focused on a hydrogeologic investigation of the Drift-Platteville Aquifer Northern Area. In addition to the wells and piezometers that were constructed, the SRI included:

- Ground water quality monitoring;
- Aquifer pump testing of a new Platteville Aquifer well; and
- Assessing the hydraulic influence of an increased pumping rate in the Drift-Platteville Aquifer Gradient Control Well (W422) through a ground water level monitoring program.

1.2 Site Background

The CD-RAP, the 1991 Sampling Plan, the correspondence referenced above, and other documents in the project files contain much information regarding the history and background of the former Reilly Tar & Chemical Corporation (Reilly) site and contamination by polynuclear aromatic hydrocarbons (PAHs) and phenolics in area ground waters that are attributable to Reilly's activities at the site. The CD-RAP defined "contamination" as PAH and phenolics resulting from activities of Reilly at the site when found in the ground water or the soil. The use of the word "contamination" in this SRI report is consistent with this definition.

1.2.1 Site Description

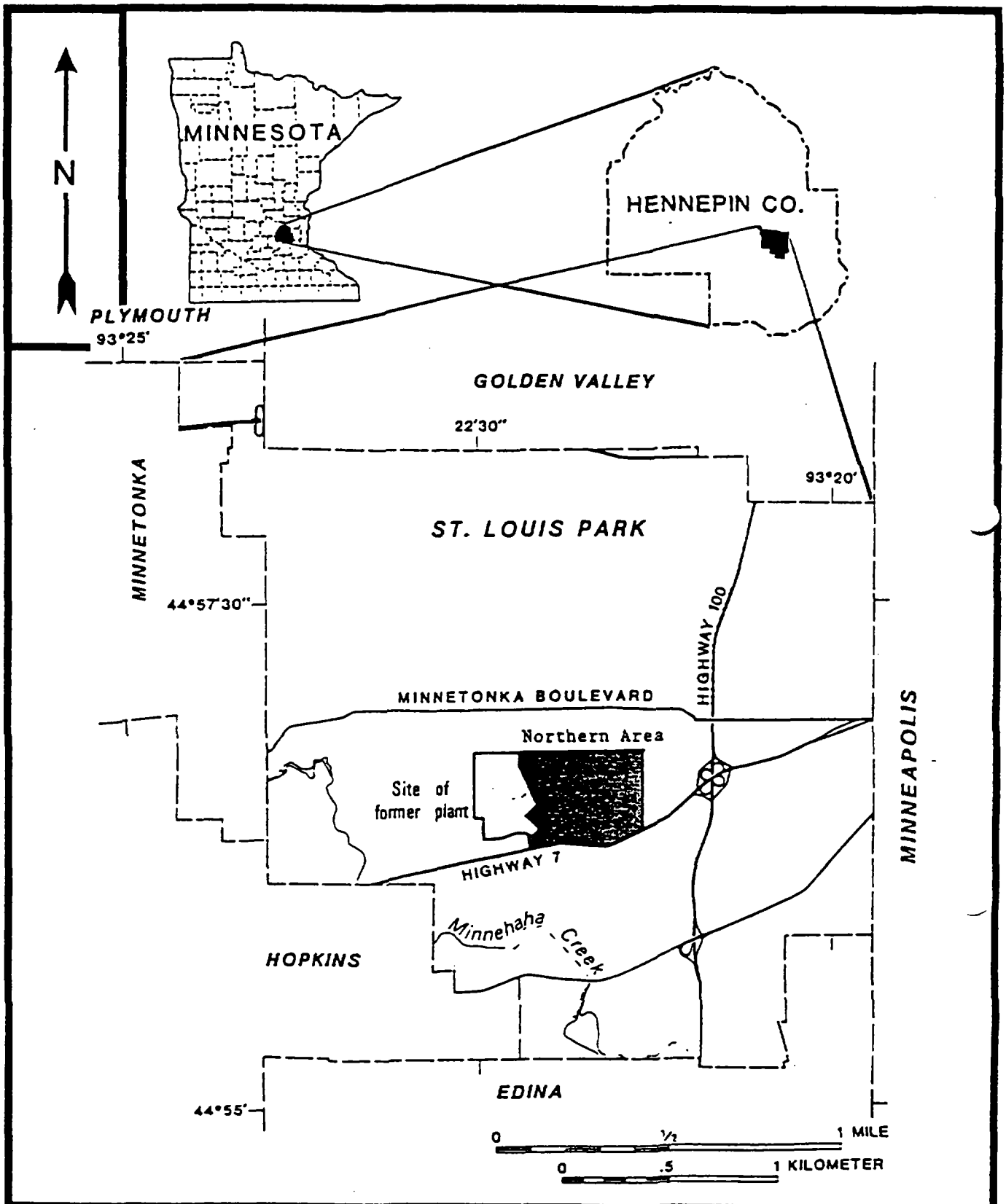
The site is defined in Part C.1 of the Consent Decree and in Section 1.21 of the Remedial Action Plan as the 80-acre property where Reilly operated a coal tar refinery and wood preserving plant from 1917 to 1972 (Figure 1-1). The Northern Area of the Drift-Platteville Aquifer is bounded by West 32nd Street to the north, Alabama Avenue to the east, Highway 7 to the south, and Louisiana Avenue to the west (Figure 1-1). The Northern Area is generally downgradient from the Reilly site and, therefore, dissolved concentrations of PAH and phenolics have reached the Northern Area through the natural ground water flow patterns. Surface drainage patterns were from the Northern Area to the Reilly site, so contaminants did not migrate to the Northern Area via surface water runoff. The Drift-Platteville Aquifer is the uppermost aquifer and is therefore susceptible to potential sources of PAH and phenolics, such as urban runoff, that do not originate from the Reilly site.

The focus of this report is on the hydrogeology and contamination migration of the Northern Area of the Drift-Platteville Aquifer. The relationship between the Drift-Platteville Aquifer and the other bedrock units in the area is shown in Figure 1-2 and 1-3. At the former Reilly plant site, approximately 65 feet of Drift and 30 feet of Platteville Limestone and Glenwood Shale overlie the St. Peter Aquifer. About ½-mile southeast of the former Reilly site, within the City of St. Louis Park, the Platteville and Glenwood bedrock units have been removed by erosion, and the Drift directly overlies the St. Peter Aquifer, as shown in Figure 1-4 (Hult and Schoenberg, 1983). No such buried valleys exist in the Northern Area. A detailed description of the geology of the area based on historical information and on the new information obtained during this investigation is presented in Section 3.1.

1.2.2 Site History

The site was an 80-acre property where Reilly operated a coal tar and wood preserving plant from 1917 to 1972. In 1972 the site was sold and converted to residential and recreational uses. Also, a divided four-lane avenue (Louisiana Avenue) and storm sewer improvements were constructed on the site. Soil and surficial ground water contamination by a variety of coal tar related chemicals have been observed in the immediate vicinity of the former plant site. In addition, polynuclear aromatic hydrocarbons (PAH), which are constituents of creosote and coal tar, have been measured in areas of the bedrock aquifers in the St. Louis Park area.

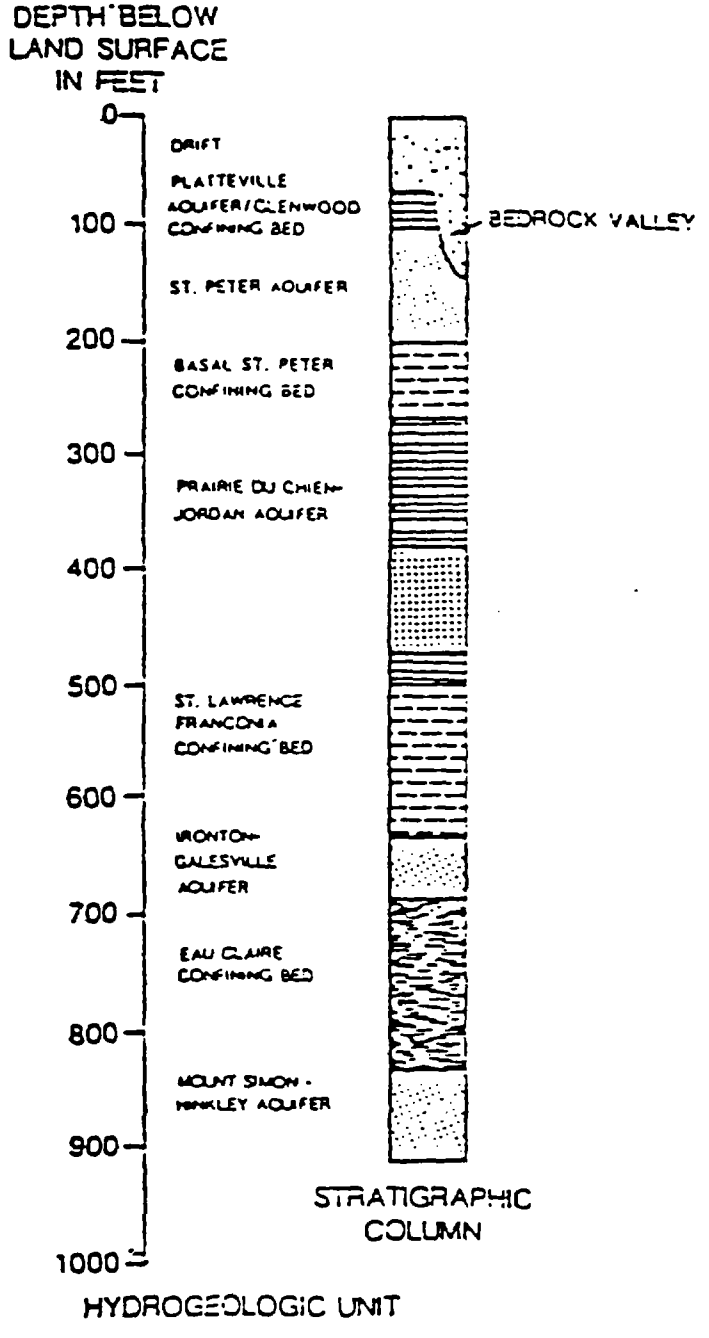
Contamination in the Northern Area of the Drift-Platteville Aquifer exists in the form of dissolved concentrations of PAH and phenolics in ground water. Historically, monitoring wells W59 and W27 have shown high concentrations of PAH and phenolics (see RI Plan for a summary of PAH and phenolics analyses for Drift-Platteville Aquifer wells). Monitoring well W59 was located at the



Source: USGS, 1967. Hopkins and Minneapolis South, MN Quadrangle Maps. Photorevised 1972.

Figure 1-1
Site Location
St. Louis Park, MN

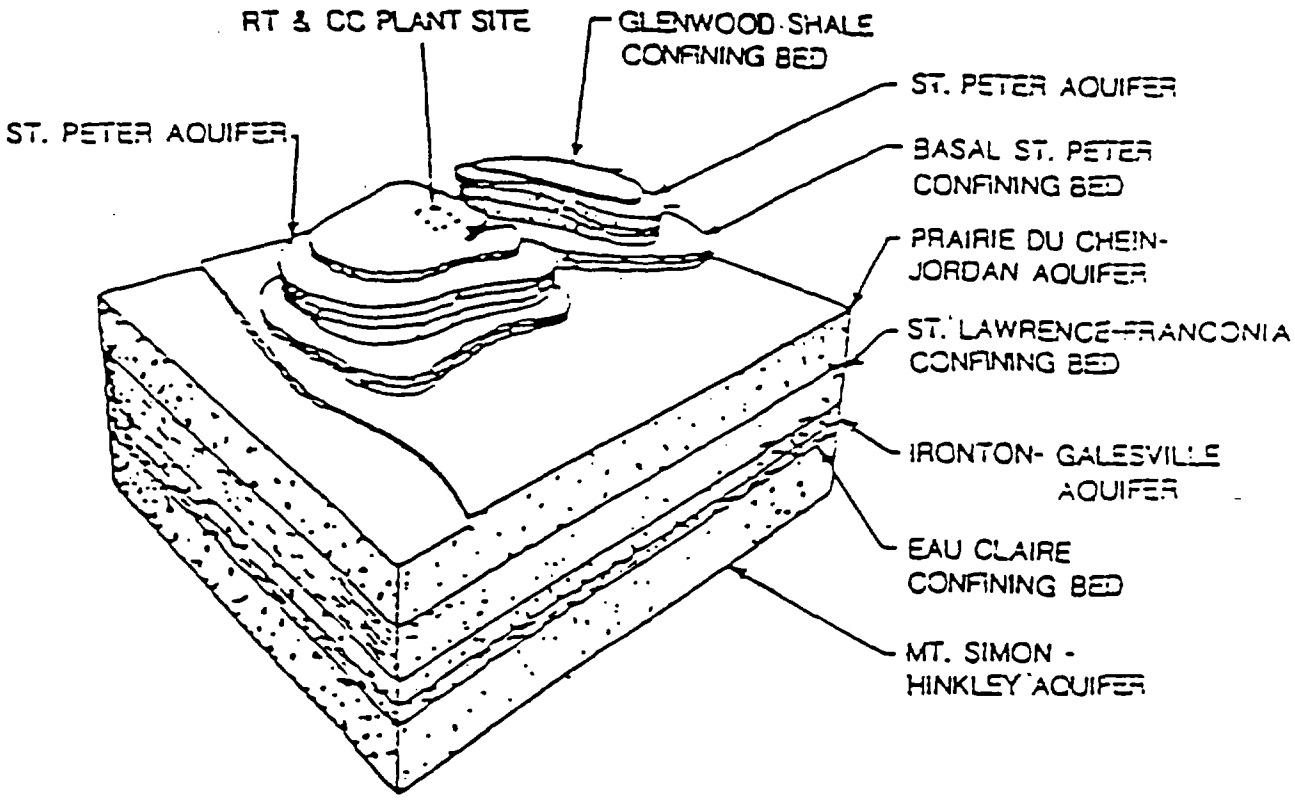
DRAWN: RBG	DATE: 6-24-91	PRJ. NO.: 1620-007



Source: Record of Decision, May 25, 1984.

Figure 1-2
Stratigraphic Profile
St. Louis Park, MN

DRAWN: DWJ	DATE: 6-24-91	PRJ. NO.: 1620-007



Source: Record of Decision, May 25, 1984.

Figure 1-3
Geology Beneath Drift-Platteville Aquifer
St. Louis Park, MN

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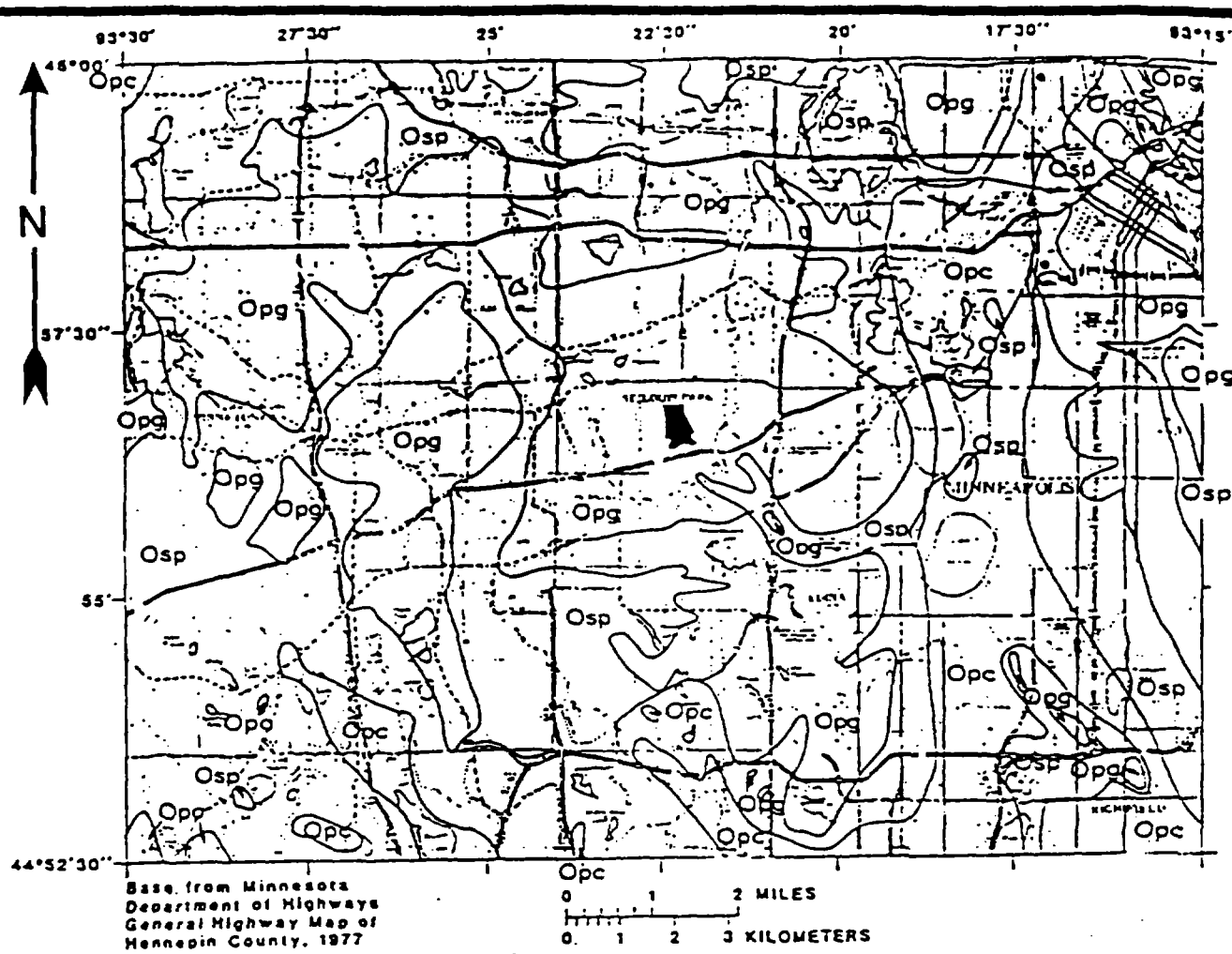

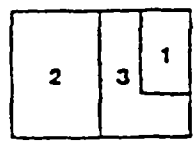

1. Modified from Norvitch, R. F., and Walton, M. S., 1979, U. S. Geological Survey Miscellaneous Investigations Map I-1157
2. Modified from Minnesota Geological Survey, Unpublished Map
3. This study

INDEX TO GEOLOGIC MAPPING

EXPLANATION

CORRELATION OF MAP UNITS

ORDOVICIAN

- Opg — Platteville and Glenwood Formations, undivided
- Osp — St. Peter Sandstone
- Opc — Prairie du Chien Group

Approximate geologic contact

Site of former plant

Source: Hult and Schoenberg, 1984.

Figure 1-4
Historical Buried Bedrock Valley
St. Louis Park, MN

DRAWN: DWJ	DATE: 6-24-91	PRJ. NO.: 1620-007

Park Tavern property on the eastern edge of the former Reilly facility, but was abandoned in 1980. Monitoring well W27 was formerly a Platteville-St. Peter multi-aquifer well that was recompleted in 1979 as a Platteville Aquifer monitoring well (Hult and Schoenberg, 1984). An old gasoline spill has apparently affected the water quality in monitoring well W27, and an adjacent Drift Aquifer piezometer P69, based on observations made during sampling and water level measurements at these locations. The locations of W27 and the other Drift-Platteville monitoring wells are shown in Figure 1-5. Based on the historical data, the Minnesota Pollution Control Agency's (MPCA) inferred area of contamination in the Drift-Platteville Aquifer includes the southern portion of the Northern Area (Figure 1-6). Figure 1-7 shows the extent of contamination as depicted in the Drift-Platteville Aquifer Northern Area Remedial Investigation (City of St. Louis Park, 1989a).

Migration of PAH and phenolics through ground water has created the current plume of dissolved contaminants in the Northern Area. Based on these conditions, the primary potential effect of contamination is on the natural resource value of uncontaminated portions of the aquifer. No drinking water is obtained from the aquifer. The use of private domestic wells for watering lawns and gardens is unknown, but is not a significant concern (ERT, 1983 Appendix H). No contamination of soils, surface materials, biota, or the atmosphere is included in this RI because of the nature of the contamination. However, the discharge of water from a potential ground water gradient control well in the Drift-Platteville Aquifer may require an evaluation of surface water.

Remedial actions being conducted pursuant to Section 9.1 and 9.2 of the CD-RAP are controlling and containing at least a portion of the contaminated ground water in the Drift-Platteville Aquifer that might otherwise migrate to the Northern Area through natural flow patterns. In addition, all known multi-aquifer wells in the area were properly abandoned or reconstructed by the Minnesota Department of Health (MDH) prior to the effective date of the CD-RAP. The only continuing source of contamination to the Drift-Platteville Aquifer is the body of contaminated ground water and aquifer materials associated with the former Reilly plant site.

The CD-RAP provides the criteria shown in Table 1-1 for assessing water quality with respect to public health, welfare, and/or the environment.

1.2.3 Previous Investigations

Due to the distribution of contaminants in the vicinity of the former Reilly site, much of the focus of previous investigations during the time period from plant closure (1972) to the effective date of the CD-RAP (September 4, 1986) was on contaminated portions of the former Reilly site, the bog area south of the former Reilly site, and affected areas of the Drift-Platteville Aquifer

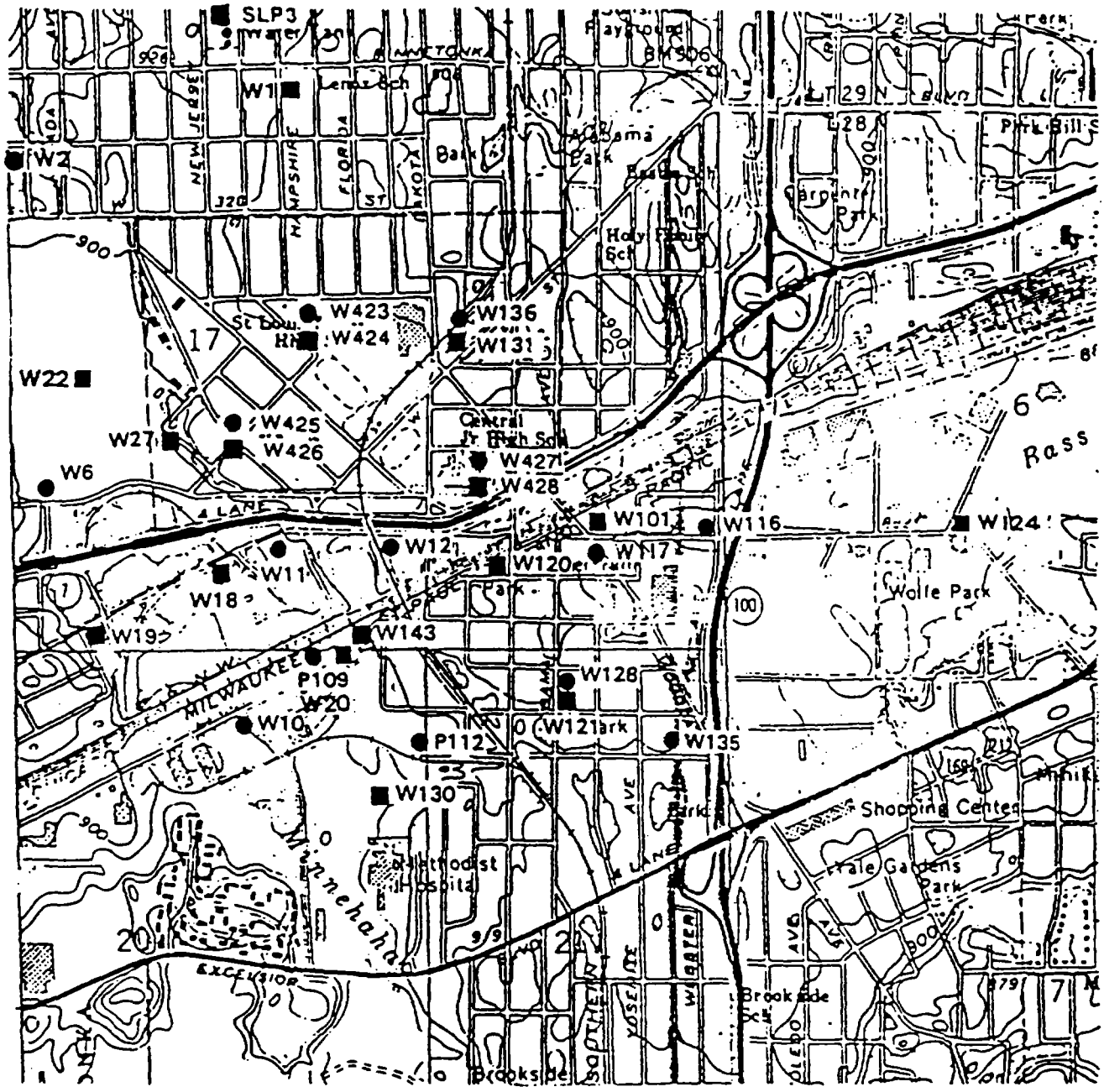

Figure 1-5
Location of Municipal Well SLP3
St. Louis Park, MN

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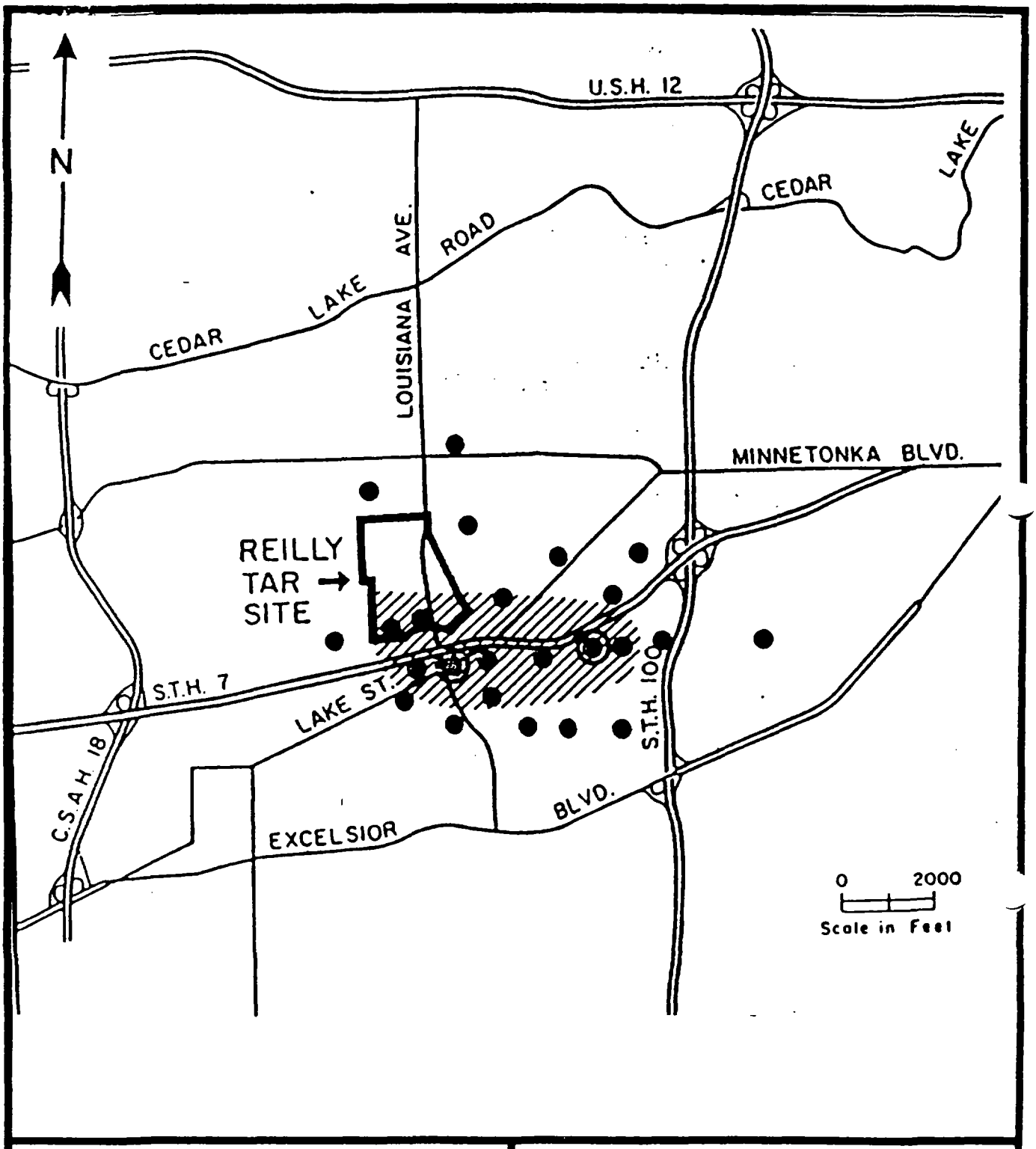

AREA OF CONTAMINATION

MONITORING WELL

SOURCE OR GRADIENT CONTROL WELL

ENSR™
Consulting and Engineering

Figure 1-6
Inferred Area of Contamination
St. Louis Park, MN

DRAWN: DWJ	DATE: 6-24-91	PRJ. NO.: 1620-007

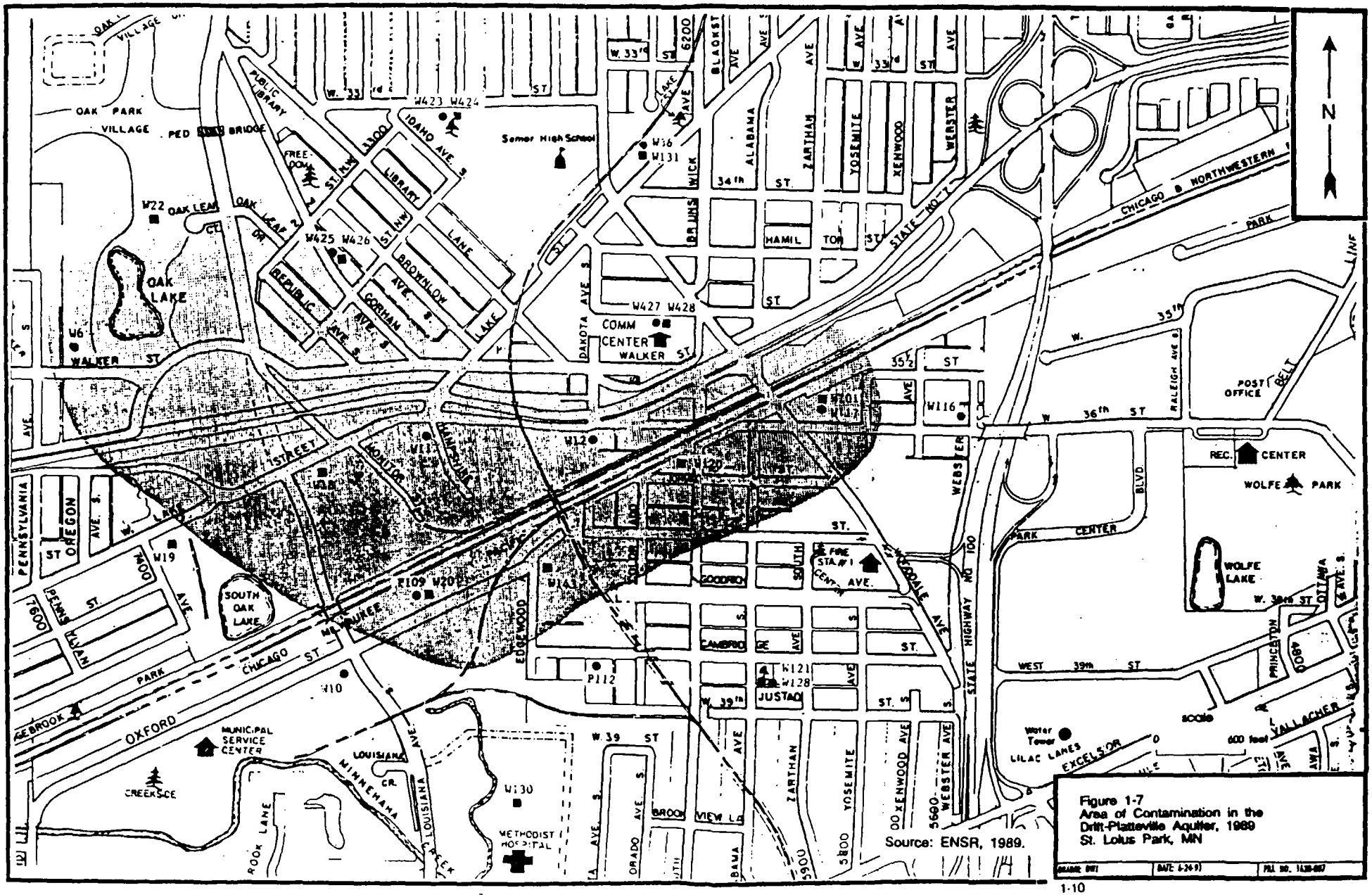

Figure 1-7
Area of Contamination in the Drift-Platteville Aquifer, 1989
St. Lolus Park, MN

TABLE 1-1

Water Quality Criteria

Drinking Water Criteria and Advisory Levels

Parameter	Advisory Level	Drinking Water Criteria
Sum of benzo(a)pyrene and dibenz(a,h)anthracene	3.0 ng/l*	5.6 ng/l
Carcinogenic PAH	15 ng/l	28 ng/l
Other PAH	175 ng/l	280 ng/l

Surface Water Discharge Criteria

Parameter	Daily Maximum Concentration	30-Day Average Concentration
Carcinogenic PAH	-	311 ng/l
Other PAH	34 ug/l	.17 ug/l
Phenanthrene	2 ug/l	1 ug/l
Phenolics	-	10 ug/l

Cessation Criterion for Wells W23 and W105

Parameter	Cessation Criterion
Total PAH	10 ug/l

* or the lowest concenetration that can be quantitifed, whichever is greater

downgradient (east and south) from the bog area. Relatively few wells/piezometers had been installed in the Northern Area. Therefore, the CD-RAP contains provisions for determining the extent of contamination in the Northern Area, and limiting the further spread of contamination, through the RI/FS process. The CD-RAP establishes the use of pumping wells to accomplish this remedial objective.

The revised Drift-Platteville Aquifer Northern Area Remedial Investigation (RI) report was submitted on June 19, 1989, and was approved on September 13, 1989. That RI included the installation of six new monitoring wells in the Northern Area in accordance with the provisions of Section 9.3.1 of the CD-RAP, and ground water monitoring for 30 Drift-Platteville aquifer wells/piezometers in and around the Northern Area in accordance with Section 9.3.3 of the CD-RAP and the 1988 Sampling Plan. Based on the results of the RI, the southwestern portion of the Northern Area was found to contain ground water contamination (wells W27, W425, and W426) while the remainder of the Northern Area was unaffected. The relative levels of PAH and phenolics were higher in the Platteville Limestone than in the Drift. The RI report concluded that an evaluation of the extent to which the existing Drift-Platteville Aquifer source control wells (wells W420 and W421) were capable of controlling the further spread of contamination in the Northern Area was required.

A limited Feasibility Study was conducted in accordance with plans and correspondence dated June 30, 1989, and October 16, 1989, pursuant to Section 9.4 of the CD-RAP. The limited FS included increasing the pumping rates in the Drift-Platteville source control wells to the limit of the existing equipment (approximately 48 gallons per minute in each well) for a period of three months, and water level measurements to evaluate the hydraulic effect of the pumping. The limited FS concluded that wells W420 and W421 were not capable of capturing contamination in the Northern Area pumping at the rate of 48 gallons per minute each. However, all or most of the Drift Aquifer plume in the Northern Area appeared to be contained by the Drift Aquifer gradient control well (well 422). The limited FS suggested options for the Platteville Aquifer of pumping at a higher rate in well W421, or providing a new pumping well in the Platteville Aquifer to limit the further spread of contaminants in the Northern Area.

On April 5, 1990, the agencies expressed concern that the actions proposed in the FS would not adequately control migration of contamination in the Northern Area. Specifically, the ability of well W422 to limit the further spread of contaminants in the Northern Area was questioned, based on a lack of water monitoring data (due to no wells) in a key portion of the Northern Area. Based on those comments and on technical conversations with the agencies, the work plan for this Supplemental Remedial Investigation (SRI) was developed.

1.3 Report Organization

The remainder of this report describes the details of the field investigation and summarizes and interprets the physical and chemical data generated during the SRI. The format is consistent with "Guidance for Conducting Remedial Investigation and Feasibility Studies Under CERCLA" (U.S. EPA, 1988).

Section 2.0 of this report describes the investigation of the site. Characterization of the site begins in Section 3.0 with a description of the physical characteristics of the site and continues in Section 4.0 with a description of the nature and extent of the contamination. Section 5.0 presents the interpretations of the data and conclusions of the SRI. References are given in Section 6.0.

The material appended to this report represents a compilation of all data and information collected during this SRI regarding ground water in the Northern Area of the Drift-Platteville Aquifer. For example, all of the new well/piezometer logs and chemical analytical data are appended. The contents of the appendices are indicated in the Table of Contents.

2.0 SITE INVESTIGATION ACTIVITIES

This section describes the work that was conducted for the SRI. The work included installation of seven Drift Aquifer piezometers, four Platteville Aquifer wells, the Platteville Aquifer pumping test, increasing the pumping rate in well W422, and Drift-Platteville Aquifer ground water monitoring.

2.1 Drift-Platteville Aquifer Piezometer and Well Installation

The piezometers and wells were installed at the locations shown in Figure 2-1. These are the locations prescribed in the SRI Work Plan.

2.1.1 Drift Aquifer Piezometer Installation

Seven (7) Drift Aquifer piezometers were drilled during November and December of 1990. Four of the piezometers were installed using mud rotary drilling methods. The remaining three piezometers were installed using cable tool drilling methods. The piezometers were constructed with 2-inch diameter black steel riser and 10-foot stainless steel screens. Table 2-1 details dates drilled, well size, depth screened and development method. The logs for these piezometers are presented in Appendix A.

2.1.2 Platteville Aquifer Well Installation

A total of four Platteville Aquifer wells were drilled, although only three wells were called for in the work plan. Three of these wells were drilled during October and November 1990 and the fourth was drilled in April 1991. The fourth well (W434) was drilled in April 1991 to replace the 6-inch diameter planned pumping well (W433) due to problems encountered during drilling and aquifer testing at well W433. Sand and gravel encountered in W433 after the surface casing was set necessitated the use of a screen to complete the well. Technical difficulties cut short two attempts at test pumping well W433, although the preliminary data suggested that observation wells were not located near enough to well W433 to register drawdown during test pumping. Therefore, in accordance with the April 12, 1991, modification to the SRI Work Plan, well W434 was drilled at the location shown in Figure 2-1. This location was chosen in part because of its proximity to existing well W120 for use in observing water levels during test pumping.

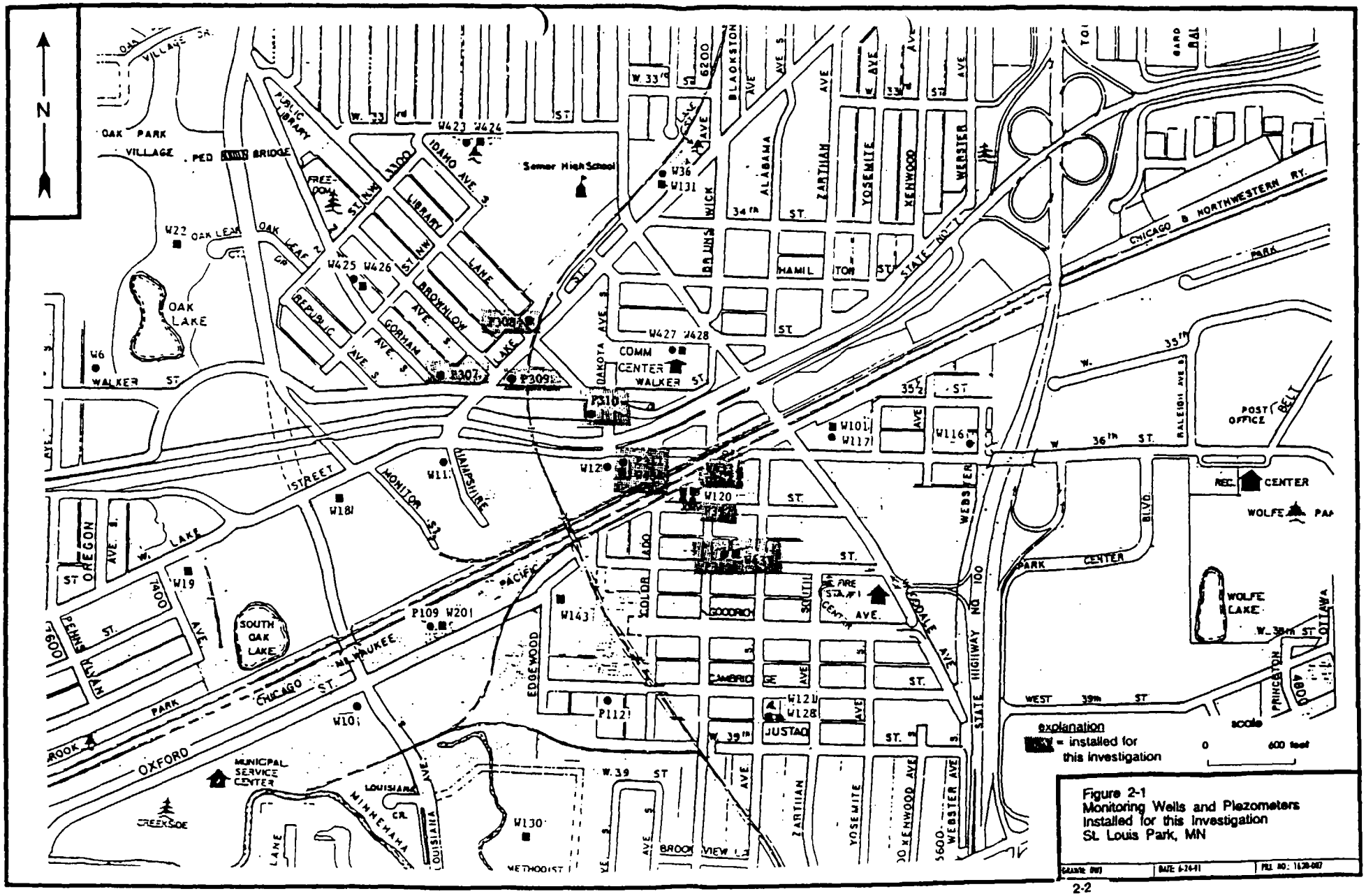

Figure 2-1
Monitoring Wells and Piezometers Installed for this Investigation
St. Louis Park, MN

TABLE 2-1
Well Construction Summary
Drift Aquifer Piezometer Installations

Well Number	Drilling Method	Completion Date	Borehole Diameter	Casing Diameter	Screened Interval[a]	Well Development Method
P307	Mud Rotary	11/29/90	6"	2"	63.7 - 73.7	Air Lift
P308	Mud Rotary	12/4/90	6"	2"	58.7 - 68.7	Air Lift
P309	Mud Rotary	11/27/90	6"	2"	63.0 - 73.0	Air Lift
M310	Cable Tool	11/21/90	6"	2"	59.5 - 69.5	Air Lift
M311	Cable Tool	11/9/90	6"	2"	67.0 - 77.0	Air Lift
P312	Cable Tool	11/16/90	6"	2"	75.0 - 85.0	Air Lift
P313	Mud Rotary	11/21/90	6"	2"	61.0 - 71.0	Air Lift

Platteville Aquifer Well Installations

Well Number	Drilling Method	Completion Date	Borehole Diameter	Casing Diameter	Screened Interval[a]	Well Development Method
W431	Cable tool	11/12/90	none	4"	106 - 114	Submersible Pump
W432	Cable tool	10/31/90	none	4"	98 - 109[b]	Socris Pump
W433	Mud rotary	12/14/90	12"	6"	94 - 109	Submersible Pump
W434	Mud rotary	4/24/91	12"	6"	97 - 112	Submersible Pump

a. Depth, in feet, below ground surface
b. Open-hole construction

The wells were installed using mud rotary or cable tool drilling methods. Completion dates, well diameter, and screened interval and development methods are presented in Table 2-1. The SRI Work Plan indicated that the wells would be open-hole construction with black steel riser pipe grouted from the top of the Platteville Formation to the ground surface. One well (W432) was installed in this manner. However, the remaining three wells (W431, W433, W434) were installed in areas of incompetent bedrock which would not remain open. Drilling in these areas indicated that the Platteville Formation is deeply weathered and contains considerable sand and gravel from the overlying Drift. These wells were constructed with stainless steel screens placed into the Platteville Formation. Well construction diagrams for each of these wells are provided in Appendix A.

2.2 Platteville Aquifer Pump Test

As mentioned in the previous section, a pump test of well W433 was attempted twice. On December 20, 1990, the well was pumped for 10 hours at approximately 25 gallons per minute and no drawdown was measured in any of the observation wells. On January 17, 1991, well W433 was pumped for 13 hours at approximately 40 gallons per minute, and no drawdown was observed in any of the observation wells.

Due to the lack of success in conducting a pump test at well W433, a new well, W434, was drilled at the east end of Jorvig Park. The aquifer pump test for well W434 was performed from May 3 to May 10, 1991. Pre-pump background data was collected from May 3 to May 6. The well was pumped at 30 gallons per minute from 1:00 p.m., May 6 to 1:00 p.m., May 7. Recovery data was collected from 1:00 p.m., May 7 to 1:00 p.m., on May 10. Further details of the aquifer pump test and its interpretation are presented in Section 3.0.

2.3 Drift Aquifer Gradient Control Well Pumping Rate Increase

On May 2, 1991, the pumping rate in well W422, the Drift Aquifer Gradient Control well, was increased from 55 gallons per minute to approximately 70 gallons per minute. A pumping rate of 72 gallons per minute draws down the water level in the well to the approximate level of the pump intake. Therefore, this pumping rate utilizes all of the available drawdown in well W422, given the existing equipment in the well.

Following the pumping rate increase, water level measurements were made in all available Drift-Platteville Aquifer piezometers and wells, in accordance with the Work Plan. The water level data and a discussion of the results of increased pumping at well W422 are discussed in Section 3.0.

2.4 Drift and Platteville Aquifers Ground Water Sampling

On April 11, 1991, the newly installed Drift Aquifer piezometers (P307, P308, P309, P310, P311, P312, P313) and Platteville Aquifer observations wells (W431 and W432) were sampled. The ground water samples were analyzed for PAH and total phenols. Well W434 was sampled on May 7, 1991, for PAH analysis. Samples from the piezometers and wells were collected and analyzed in accordance with procedures identified in the 1991 Sampling Plan. The ground water analytical results are discussed in Section 4.0.

3.0 PHYSICAL CHARACTERISTICS OF STUDY AREA

This section details the geology and hydrogeology of the Drift-Platteville Aquifer Northern Area and the areas surrounding the newly installed Platteville Aquifer wells. The new geologic information gained from the drilling program for the SRI is summarized in Section 3.1. Section 3.2 describes the hydrogeology based on the results of the aquifer pump test and on the study of water level changes in the Drift-Platteville Aquifer following the pumping rate increase in well W422.

3.1 Geology

3.1.1 Drift Geology

The SRI drilling program encountered clay, silt, sand, and gravel strata that are typical of the glacial outwash and till deposits comprising the Drift Aquifer. The geologic information obtained during the drilling program is presented on the well logs contained in Appendix A. No new conclusions, or geologic interpretations of the Drift Aquifer geology, are drawn based on the data from the SRI drilling program.

3.1.2 Bedrock Geology

The uppermost bedrock area in the Northern Area is the Platteville Limestone. The SRI drilling program did not include drilling bedrock in the Northern Area, however, the four Platteville Aquifer wells that were drilled south of the Northern Area (wells W431, W432, W433, and W434) provide some new information regarding bedrock geology.

Hult and Schoenberg (1984) identified a buried bedrock valley that trends southward in the general vicinity of 36th Street and Wooddale Avenue. That feature is shown on Figure 1-4 of this report (reproduced from Hult and Schoenberg, 1984). The buried bedrock valley consists of glacial deposits directly overlying the St. Peter Sandstone due to the removal of the Platteville and Glenwood Formations by subglacial erosion. As described in previous investigations (e.g., Hult and Schoenberg, 1984), the Platteville Formation contains an upper weathered surface. Based on the conditions encountered during the drilling for wells W431, W433, and W434, the extent of weathering increases nearer to the buried bedrock valley throughout the approximate 15-foot thickness of the Platteville Formation at those locations. All three wells required the use of well screens rather than the open-hole construction contemplated in the SRI Work Plan.

The presence of approximately 14 feet of weathered Platteville Limestone encountered in well W431 refines the interpretation of the location of the buried bedrock valley in this area. The buried bedrock valley depicted on Figure 1-4 is based, in part, on the log for well W111 indicating approximately 190 feet of glacial deposits overlying the St. Peter Sandstone. Well W111 is approximately 300 feet west of well W431, and the main channel of the buried bedrock valley is east of W431. Figure 3-1 provides an interpretation of the configuration of the buried bedrock valley based on an "island" of Platteville Limestone that remains in the middle of the buried bedrock valley. Figure 1-4 depicts a larger "island" feature in this same bedrock valley in the area south of Excelsior Boulevard along the path of Highway 100. The possibility exists that a more complicated pattern of bedrock erosion exists in this area (e.g., the Platteville Formation at well W431 represents a divide between two erosional streams); however, the existing data are ambiguous in this regard.

The western arm of the buried bedrock valley depicted in Figure 3-1 (also see Hult and Schoenberg, 1984, Figure 4, page 20) may have different boundaries than those shown, or may be an area where the Platteville Limestone has been thinned by erosion, but is still present (hence, the dashed lines). According to USGS Water Supply Paper 2211, "No well or test boring clearly indicates the presence of a deep bedrock valley in this area; therefore the valley may be absent or much shallower than shown. In-situ weathering or subglacial erosion, rather than steam erosion, may have caused the relief on the bedrock surface."

The eastern arm of the buried bedrock valley is based on an interpretation of borings in that area (Barr, 1991).

The buried bedrock valley is significant because the natural ground water flow patterns in the Drift-Platteville Aquifer are uninhibited by the Glenwood Shale confining layer, thus, a migration pathway to the St. Peter Aquifer exists.

3.2 Hydrogeology

This section describes the results of the Platteville Aquifer pumping test and the results of increased pumping at well W422.

3.2.1 Platteville Aquifer Pumping Test

As described in Section 2.2, the Platteville Aquifer pumping test was implemented in three parts:

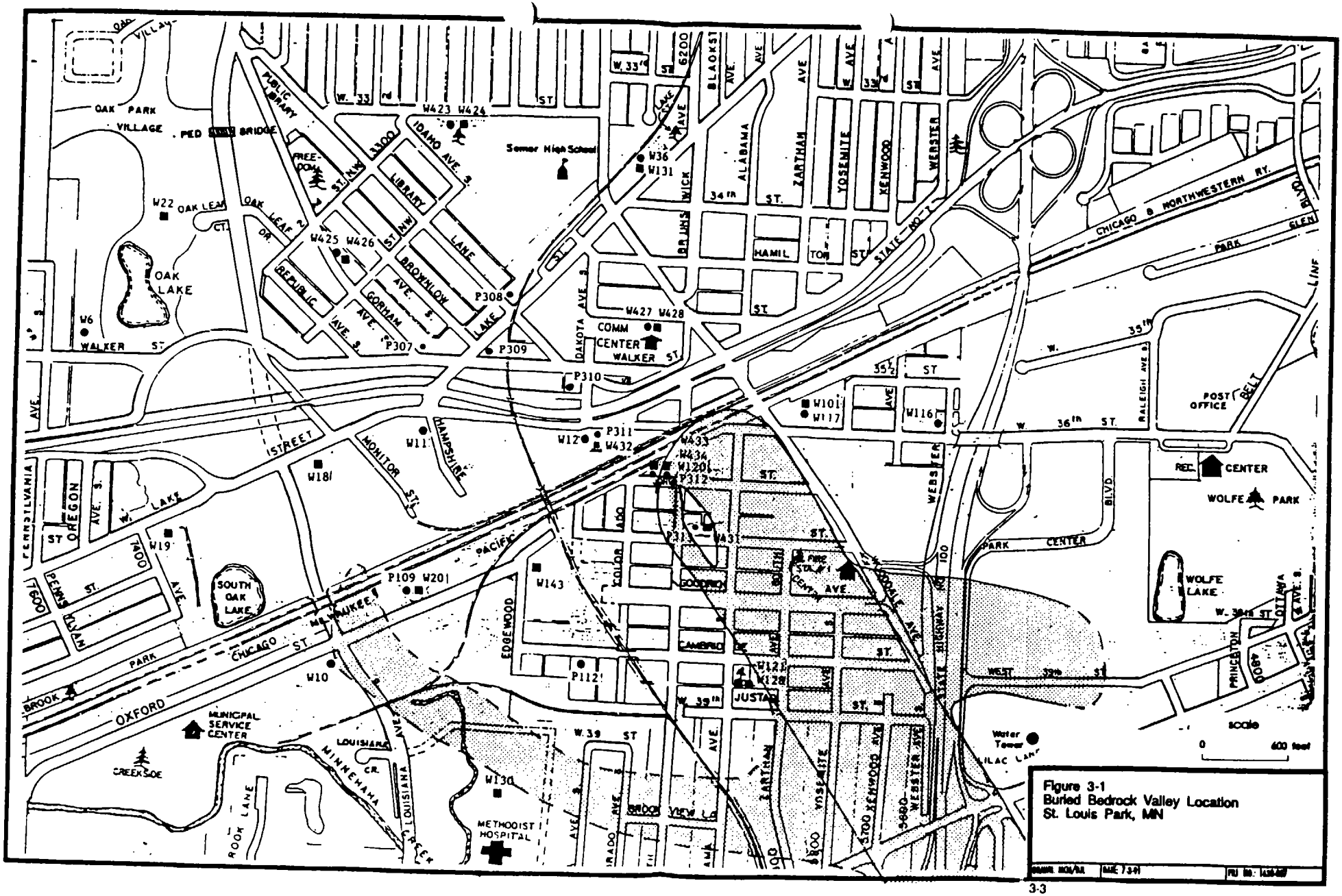

Figure 3-1
Buried Bedrock Valley Location
St. Louis Park, MN

- Pre-test Monitoring (3,600 minutes);
- Constant Discharge Test (1,440 minutes); and
- Recovery Test (2,900 minutes).

The test was performed using W434 as the pumping well and a series of observation wells. Wells W431, W432, W433, and W120 were equipped with automatic water level recorders, and a set of additional wells including W100 (for background) and several Drift Aquifer wells were monitored manually with an electric water level tape to record any water level changes. Three key wells that provided the data to interpret this aquifer pump test are identified in Table 3-1. Well locations are shown in Figure 2-1. Unadjusted field data for all phases of the test are in Appendix B. The lack of significant water level changes in wells W431, W432, and W433 may be due to: 1) distance from the pumping well (e.g., aquifer hydrologic properties); 2) discontinuous aquifer geometry (e.g., well W431 separated by a bedrock valley); or 3) improper automatic water level recorder function.

3.2.1.1 Pre-Test Monitoring

The well array was monitored for 4 days prior to the test. The purpose of the pre-test monitoring was to determine any influence of antecedent water level trends. Figures 3-2 and 3-3 show the prepumping water level trends in W120 and W434. The graphs indicate a rise in the water level at each well. Water levels rose at constant rate between 0.05 feet/day (W434) to 0.07 feet/day (W120). The increase is thought to be a result of seasonal recharge from precipitation.

The prepumping data also reveal small cyclic fluctuations (Figure 3-3) in response to barometric changes or earth tide influences. The presence of these cyclical trends is consistent with a confined or semi-confined aquifer model. Regardless of their source, the magnitude of the cyclic trends are small enough to have no important effect on data analysis. The seasonal trend, however, is significant and was removed from the constant discharge test data.

To correct the constant discharge test data, the seasonal trend was removed. To do this, a linear regression was conducted for each prepumping data set. The regression equations were calculated using the Grapher® software by Golden Software. Grapher® is a graphing program which can calculate linear regressions of curves using a least squared distance calculation. The data from the prepumping phase of the pump test was used to determine the linear regression. The equation obtained from Grapher® as well as the plotted data is presented in Figures 3-2 and 3-3.

TABLE 3-1

Aquifer Test Well Data

Well Number	Function	Distance From Pumping Well (ft)	Stratum
W434	Pumping	0	Platteville
W120	Observation	33	Platteville
P312	Observation	45	Middle Drift

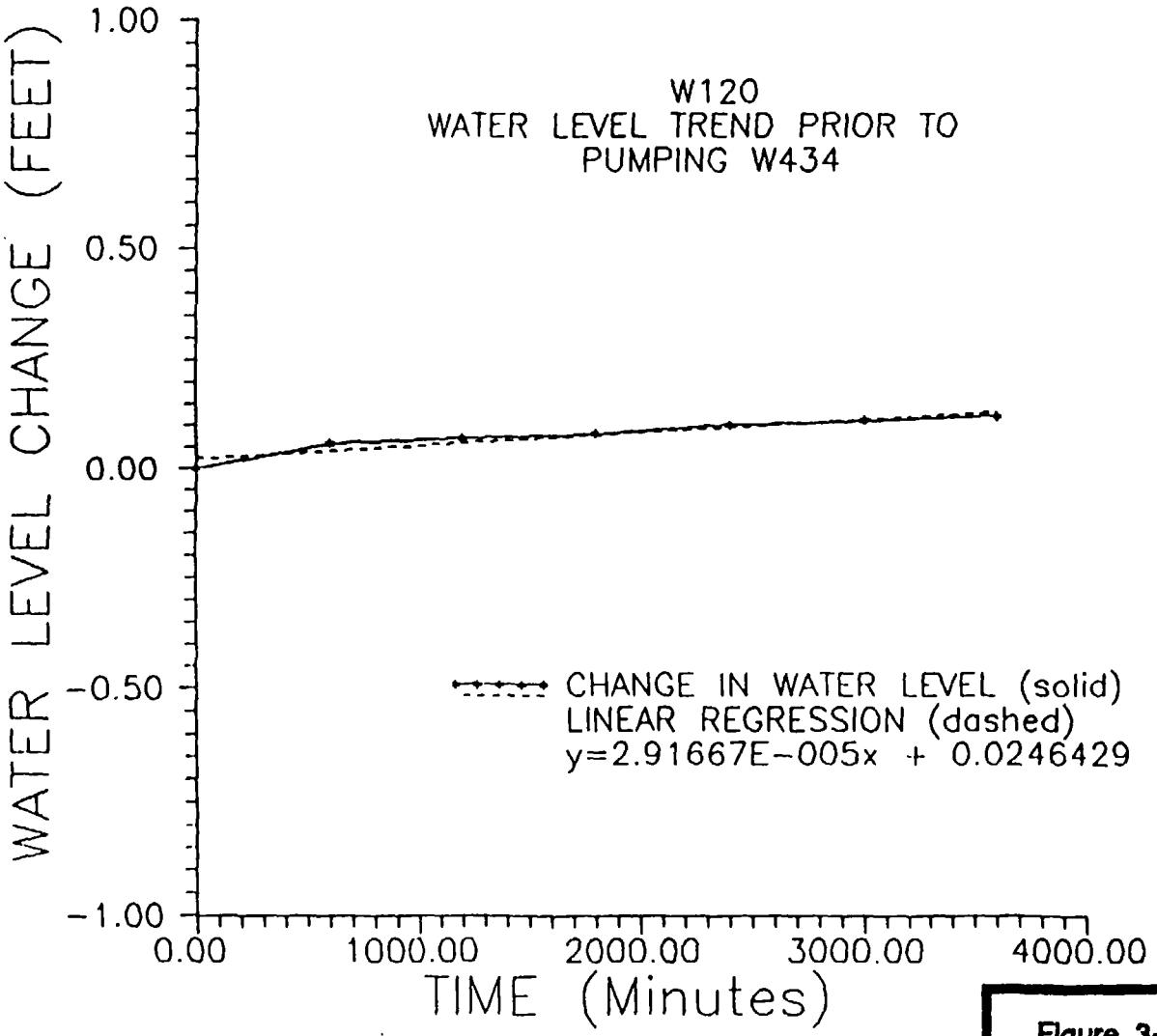

Figure 3-2
W120 Water Level Trend Prior to Pumping W434
St. Louis Park, MN

DRAWN: MCM | DATE: 6-26-91 | PRJ. NO.: 1620-067

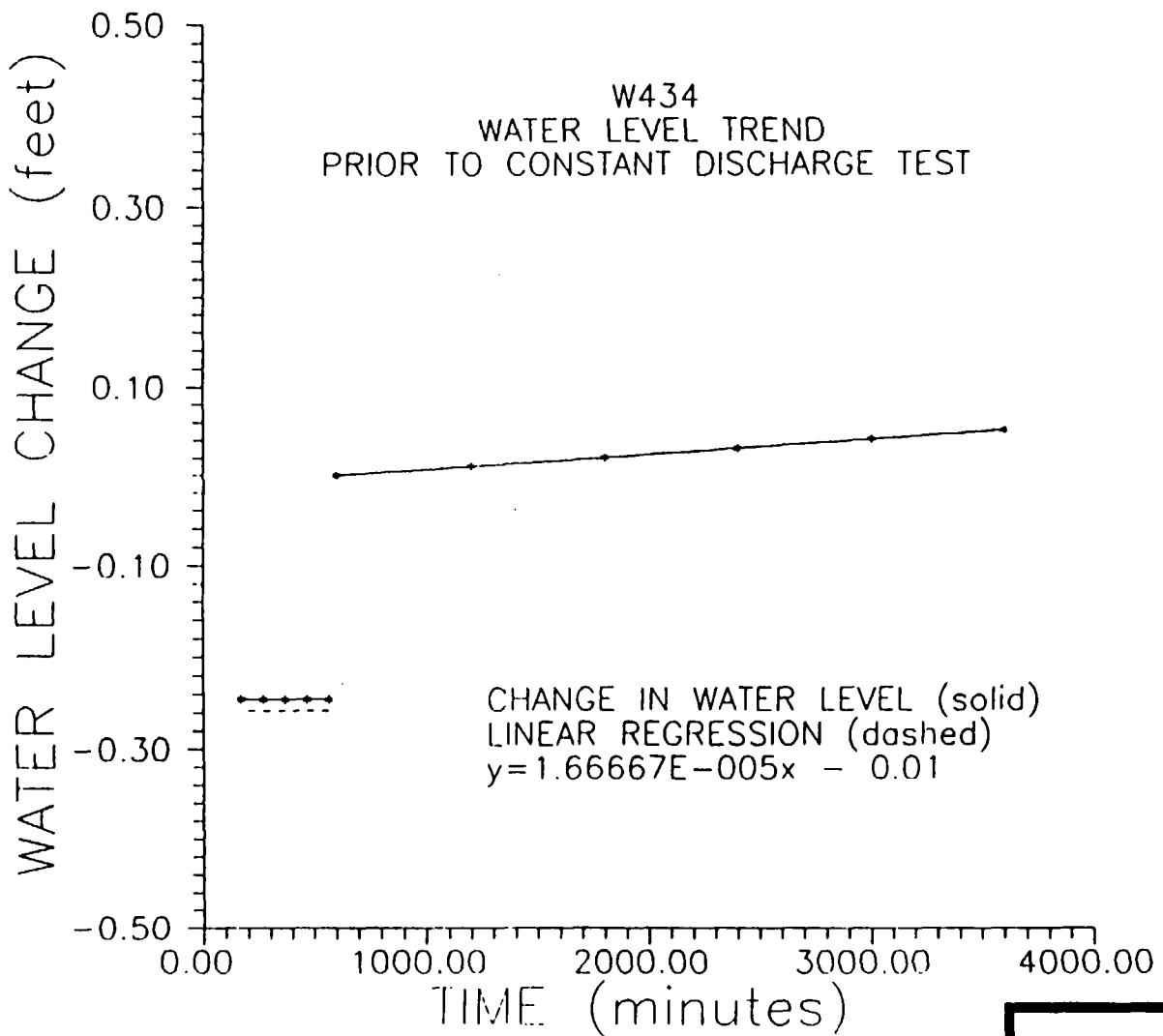

Figure 3-3
W434 Water level Trend
Prior to Pump Test

DRAWN: MCM	DATE: 6-26-91	PRJ. NO.: 1620-007

The linear regression equations were then used to arithmetically adjust the constant discharge test data to remove the seasonal trend as indicated by the linear regression. The adjusted constant discharge test data allows for a more accurate representation of the physical parameters of the aquifer. Recovery test data were not adjusted for the seasonal trend because the background rate of water level rise was small compared to the length of time over which recovery occurred.

3.2.1.2 Constant Discharge Test

Discharge at well W434 was maintained at a near constant rate of 30 GPM. Figure 3-4 presents a log-log plot of observed drawdown in well W434. A break in the data after approximately one minute of pumpage apparently reflects a change in flow rate, although periodic checks indicate a constant discharge of 30 gallons per minute was maintained throughout the test. Well W434 experienced approximately 39 feet of drawdown (82 feet below ground level) which is approximately 15 feet above the top surface of the Platteville Aquifer.

Figure 3-4 clearly demonstrates recharge (leakage) from the overlying Drift Aquifer source bed, which is consistent with the leaky-confined aquifer model for the Platteville Aquifer. After one minute, near steady-state conditions (no additional drawdown) were established at the pumping well as leakage from the source bed equalled pumpage. After about 100 minutes of pumping, however, the water level in well W434 again began to decline indicating a declining head in the Drift Aquifer source bed. No changes in discharge rate occurred at this time.

The observed water level response in the overlying Drift Aquifer (drawdown at piezometer P312) is shown in Figure 3-5. Piezometer P312 is located approximately 45 feet from the pumping well and is installed in the Drift Aquifer. Figure 3-5 shows that after about 100 minutes of pumpage at well W434, the water level in piezometer P312 declined 0.03 feet after its initial decline shortly after pumping began. This suggests a falling head in the source bed which was probably more significant nearer the pumping well though there are no shallow aquifer observation points nearer well W434 than piezometer P312.

Figure 3-6 is a log-log time-drawdown plot of the adjusted water level measurements at well W120. Drawdown ceased after 3 minutes of pumpage indicating steady state conditions had been achieved. The data were analyzed using the method of Hantush and Jacob (1955) for fully penetrating wells in a leaky confined aquifer. The Hantush-Jacob solution assumes that:

1. The pumping well discharges at a constant rate, has an infinitesimal diameter with no significant storage, and fully penetrates the aquifer;

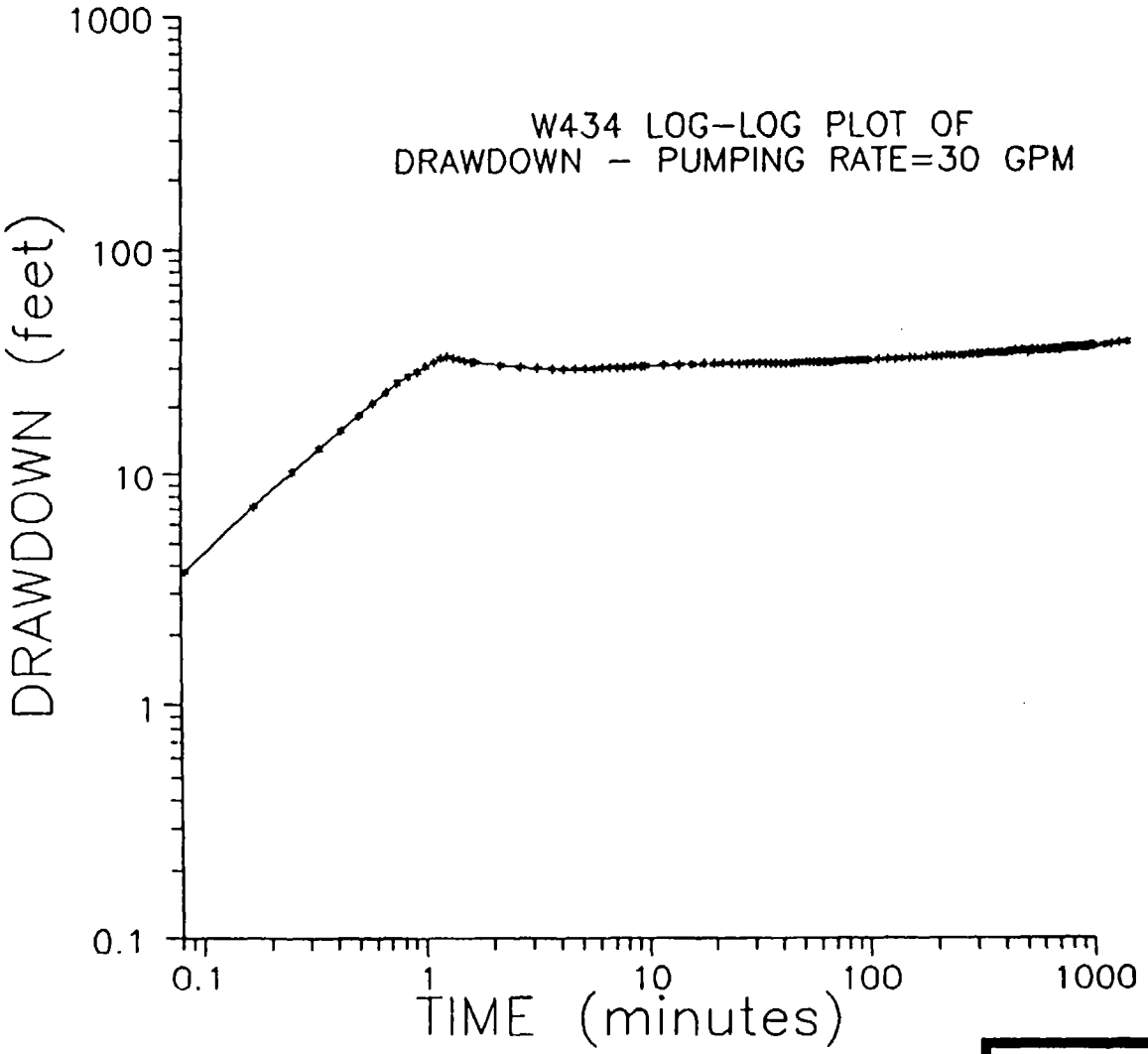

Figure 3-4
Plot of the Drawdown in W434 During the Pumping Phase of the Pump Test

DRAWN: MCM | DATE: 6-26-91 | PRJ. NO.: 1670-007

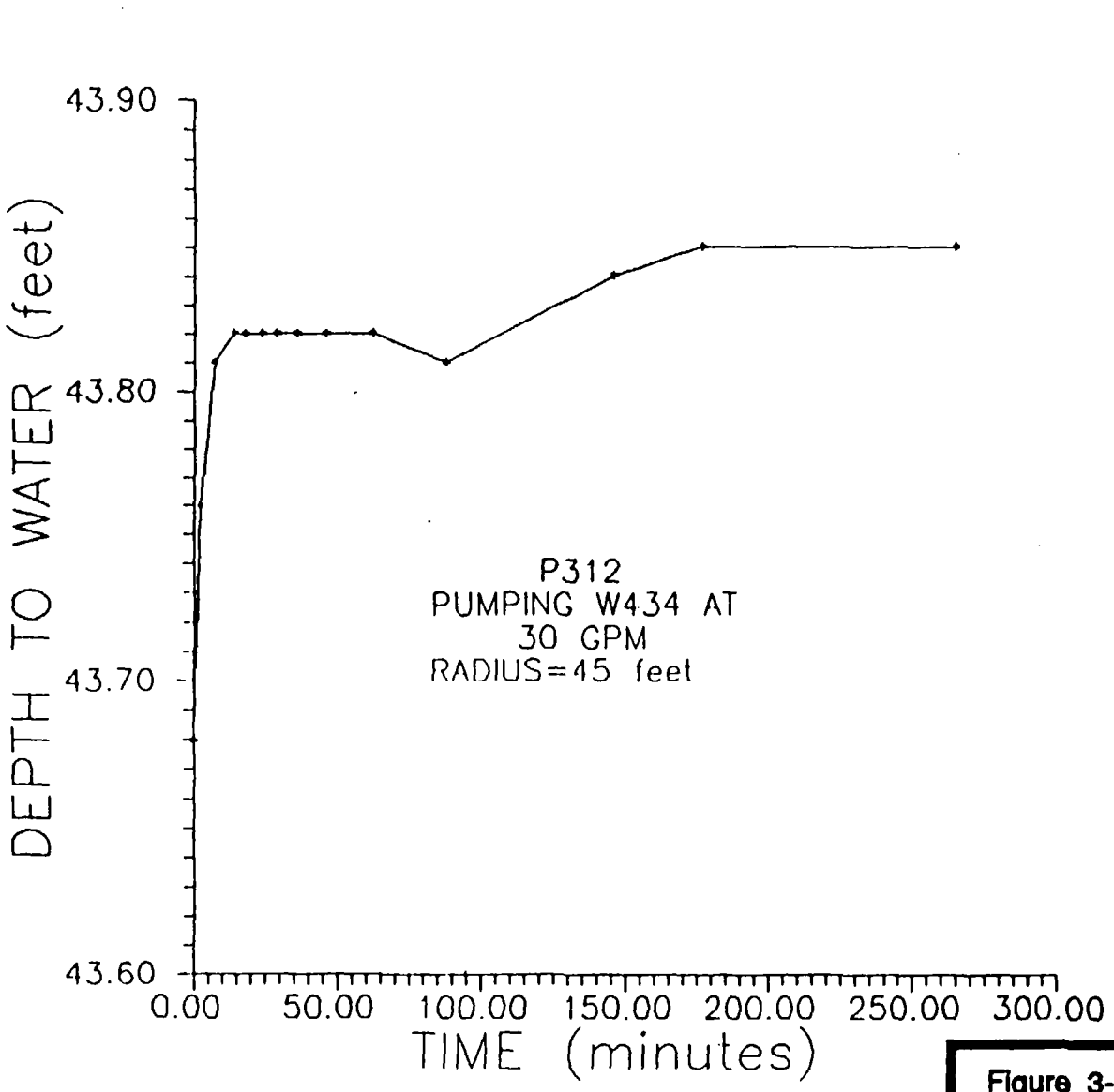

Figure 3-5
Plot of the Drawdown in P312 During the Pumping Phase of the Pump Test

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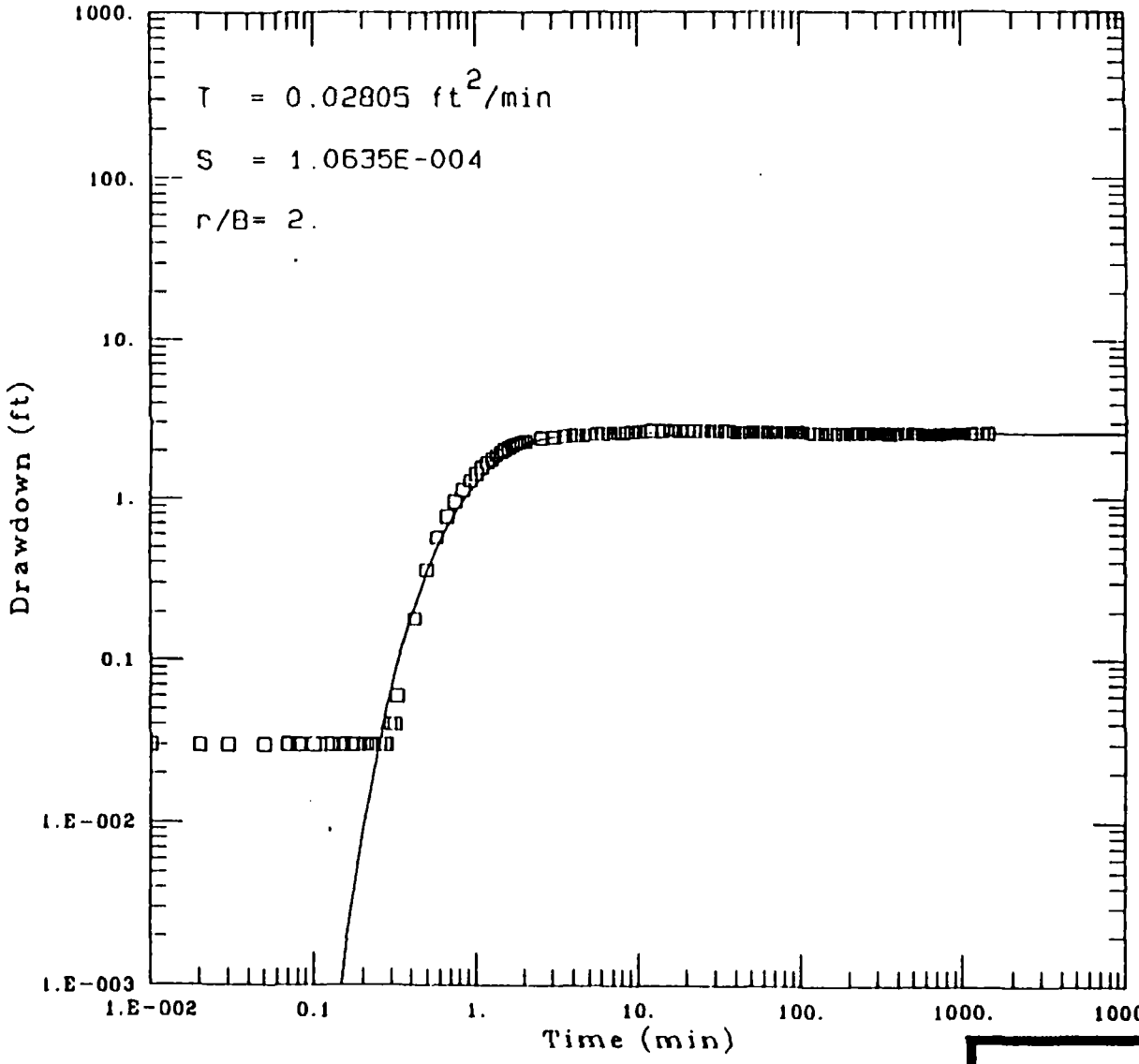


Figure 3-6
Plot of the Adjusted Water level Drawdown in W120 During the Pumping Phase of the Pump Test

DRAWN: MCM	DATE: 6-26-91	PRJ. NO.: 1620-087

2. The aquifer has infinite areal extent; is isotopic, homogeneous, and has constant thickness; is overlain and underlain by a continuous confining layer; and flow is radial in the aquifer and vertical in the overlying confining layer; and

3. The confining layers are incompressible and have uniform thickness and vertical hydraulic conductivity.

The equations used for this method are as follows:

$$T = (Q)\ W(u,r/B)/4\pi s$$

$$S = 4Ttu/r^2$$

$$K = T/b$$

$$K' = Tb'/B^2$$

where

T = Transmissivity

Q = Discharge rate [L^3/T];

S = Storativity [Dimensionless]

W(u,r/B) = Leaky Well Function, determined graphically;

$u = r^2S/4Tt$

s = Drawdown [L], determined graphically;

t = time [T], determined graphically;

r = Distance from pumped well to observation well [L];

K = Hydraulic conductivity [L/T];

b = Aquifer thickness [L];

b' = Thickness of the leaky confining layer [L];

K' = Vertical hydraulic conductivity of the confining layer [L/T]; and

$B = [(T)(b')/(K')]^{1/2}$ [L].

Matching field data to an appropriate type curve was done with the software AQTESOLV (Version 1.0). The computed values of T and S at W120 are shown in Figure 3-6 and are compared with other estimates for Platteville Aquifer parameters in Table 3-2. Table 3-2 shows that the transmissivity computed using drawdown data for W120 is lower than those reported for the Platteville Aquifer in the literature. A previous estimate of transmissivity at well W120 (Hult, 1980) is an order of magnitude higher than the estimate calculated from this test. Hult's slug test results for many of the Platteville Aquifer monitoring wells are depicted in Figure 3-7. Hult's general interpretation of the distribution of transmissivity values in the Platteville Aquifer place Jorvig Park in an area of low transmissivity. As shown in Figure 3-7, wells W124, W131, and W132 produce estimates of transmissivity that are comparable to the calculated value for well W120 for this test.

The value for storativity computed from this test, 1.06E-004, is about an order of magnitude less than the value calculated for the pump test at well W421 (ERT, 1987), but is in the range expected for a leaky confined system.

3.2.1.3 Recovery Test

After the constant discharge phase, recovery of the water levels in wells W434, W120, and P312 was observed. Aquifer characteristics determined with recovery data provide a check for these parameters determined for the pumping phase.

Figure 3-8 is a semi-log recovery curve for well W434. Values of t/t' greater than 360 (approximately 4 minutes of recovery following the 1440 minute constant discharge test) were evaluated using the Theis recovery method (Theis, 1935). AQTESOLV (Version 1.0) was used for the computation. The computed values for T and S' are shown in the figure. The value for T is presented in Table 3-2. The value shown for transmissivity is similar to that computed for well W120 from the constant discharge test. S' is a dimensionless number which is the ratio of storativity during pumping to the storativity during recovery. A value of 0.75 to 1.5 indicates that the storativities obtained during pumping and recovery are comparable.

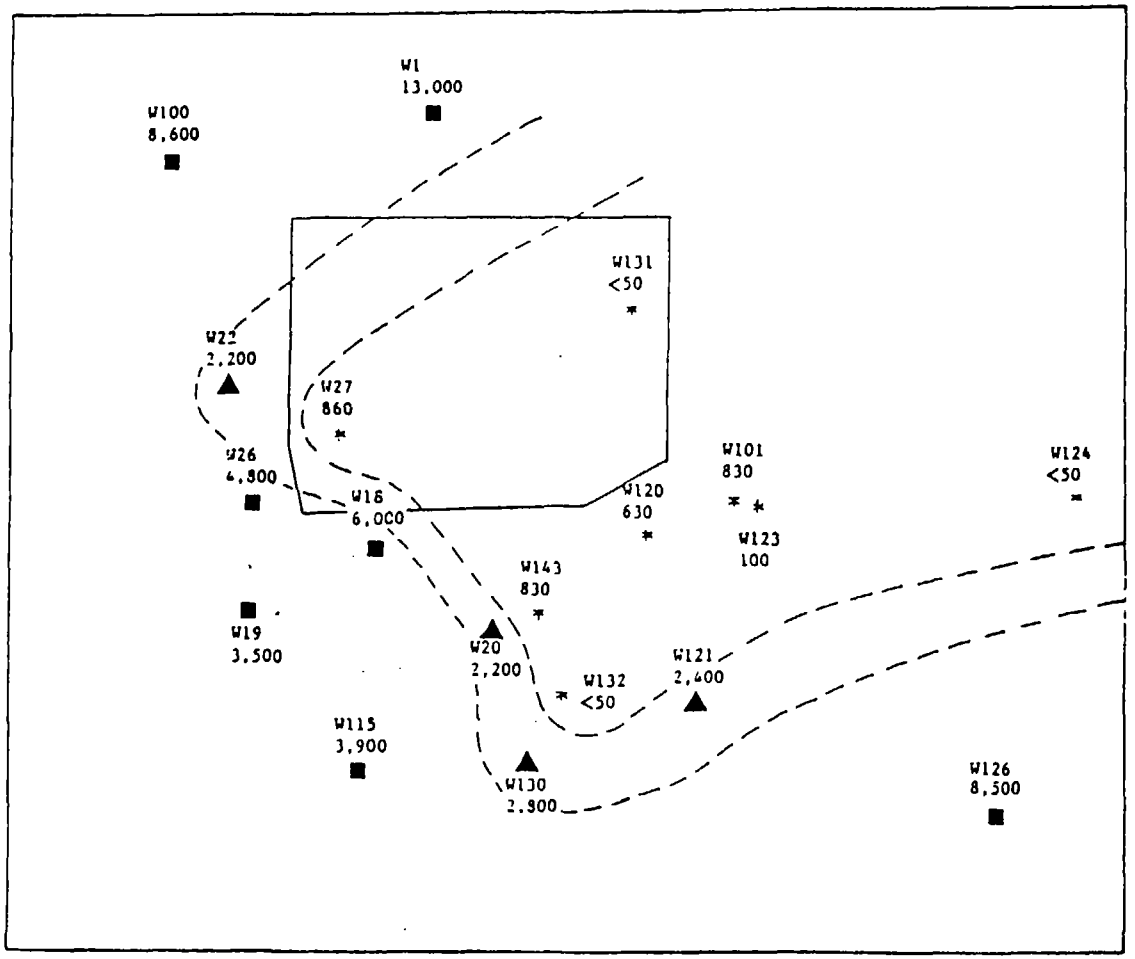
Figures 3-9 and 3-10 show linear plots of the recovery from well W120 and piezometer P312. No attempt was made to compute aquifer parameters based on these data. Well W120

TABLE 3-2

Aquifer Parameters

Source	T[a]	S[b]
W120[c]	40 ft^2/day	1.06×10^{-4}
W434[d]	58 ft^2/day	9.69×10^{-5}
W421[e]	2.8 x gpd/ft (3700 ft^2/day	7.05×10^{-5}
W120[f]	630 ft^2/day	-
Stark & Hult[g]	9000 ft^2/day	-
Hult[h]	3100 ft^2/day	-

a. Transmissivity
b. Storativity
c. Calculated on drawdown data obtained during pump test of W434
d. Calculated from recovery data
e. Pump test, ERT, Inc., 1987
f. Slug test, Hult, 1980
g. Stark & Hult, 1984, average value used for model input
h. Hult, 1981, average value used for model input



Source: Hult, 1980.

Figure 3-7
Transmissivity of the Platteville Aquifer

DRAWN: MCM	DATE: 6-26-91	PRJ. NO.: 1620-007

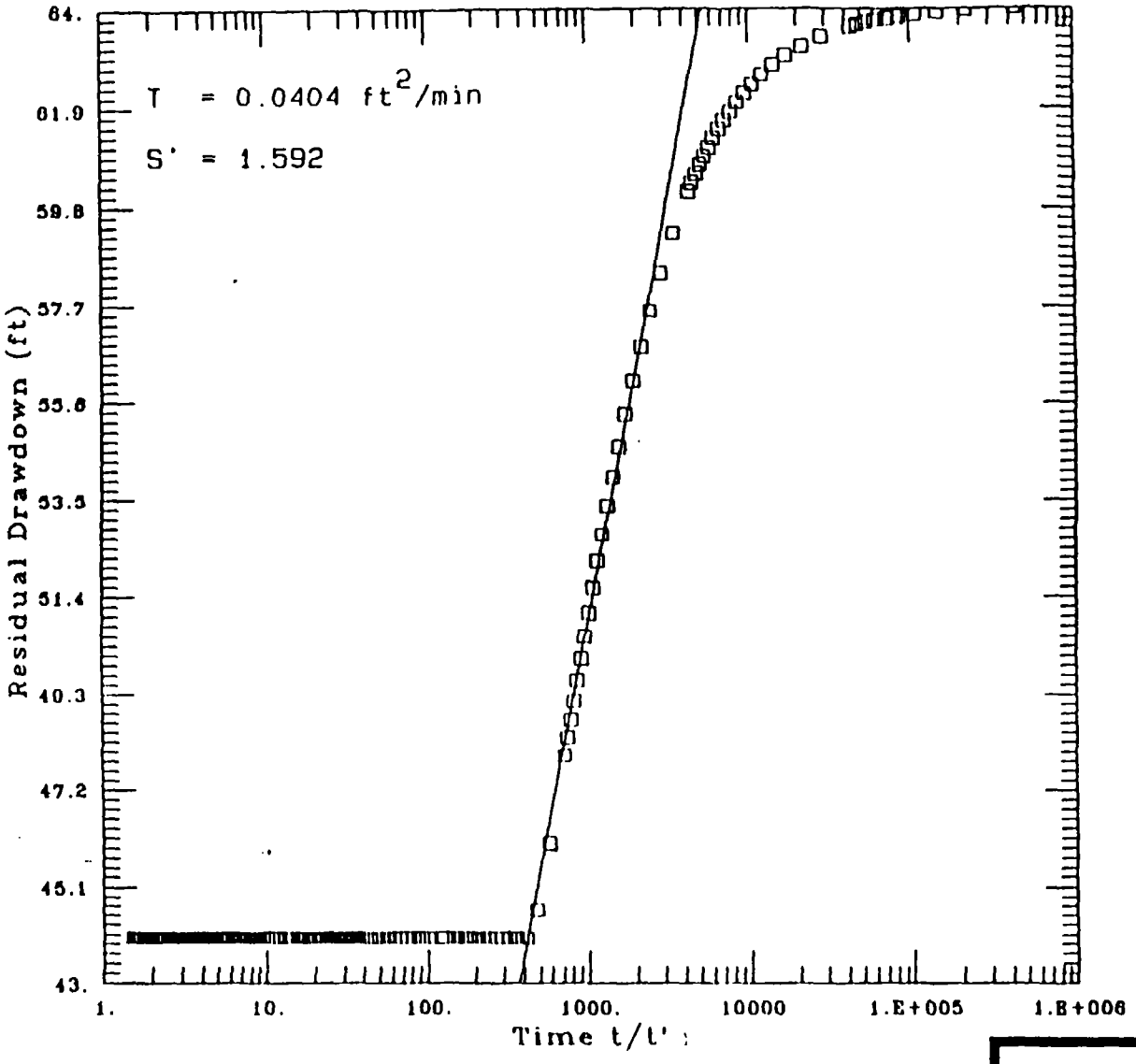


Figure 3-8
Water Level Recovery
Curve for W434

DRAWN: MCM	DATE: 6-26-91	PRJ. NO.: 1670-007

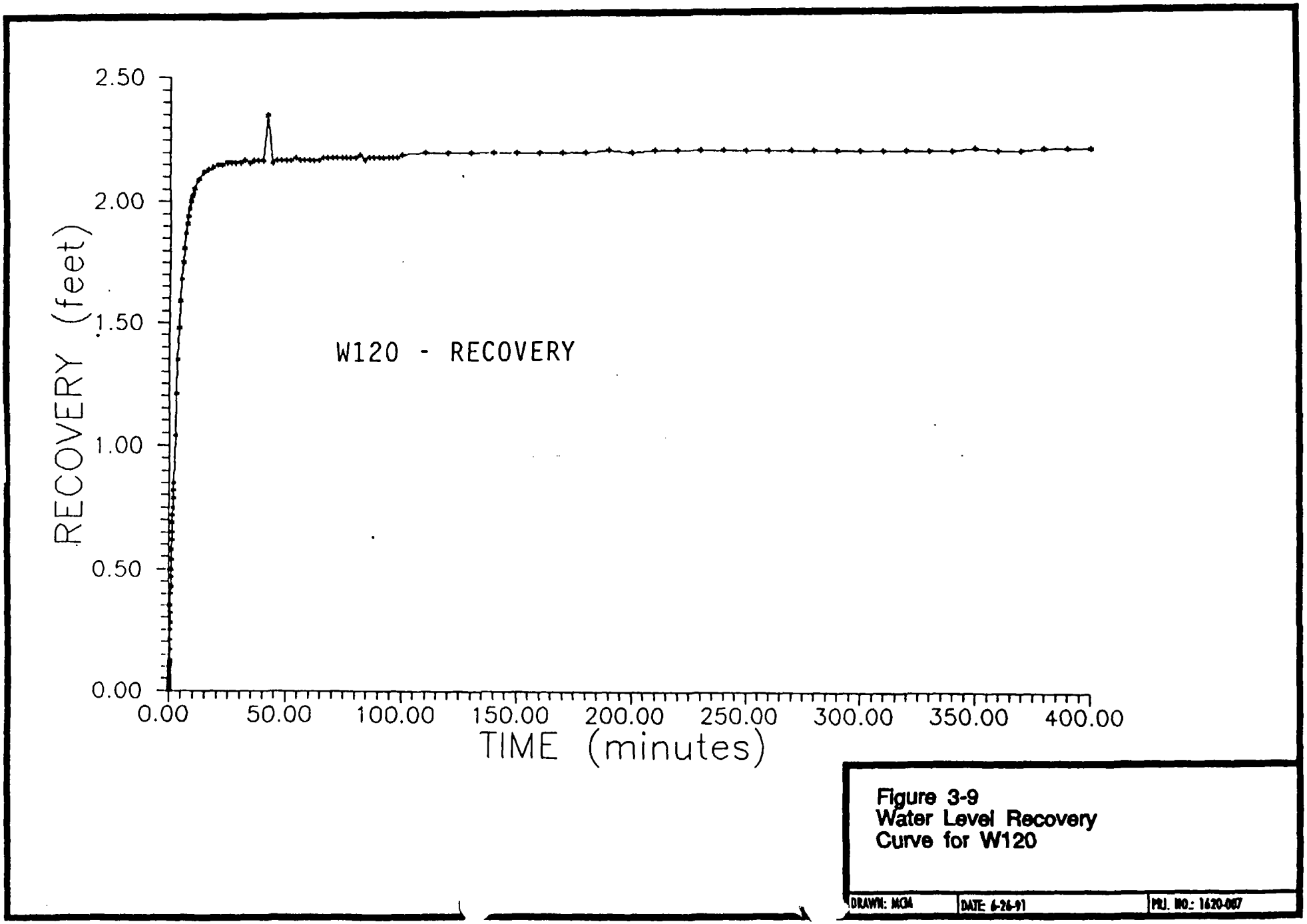


Figure 3-9
Water Level Recovery Curve for W120

DRAWN: MCM | DATE: 6-26-91 | PRJ. NO.: 1620-007

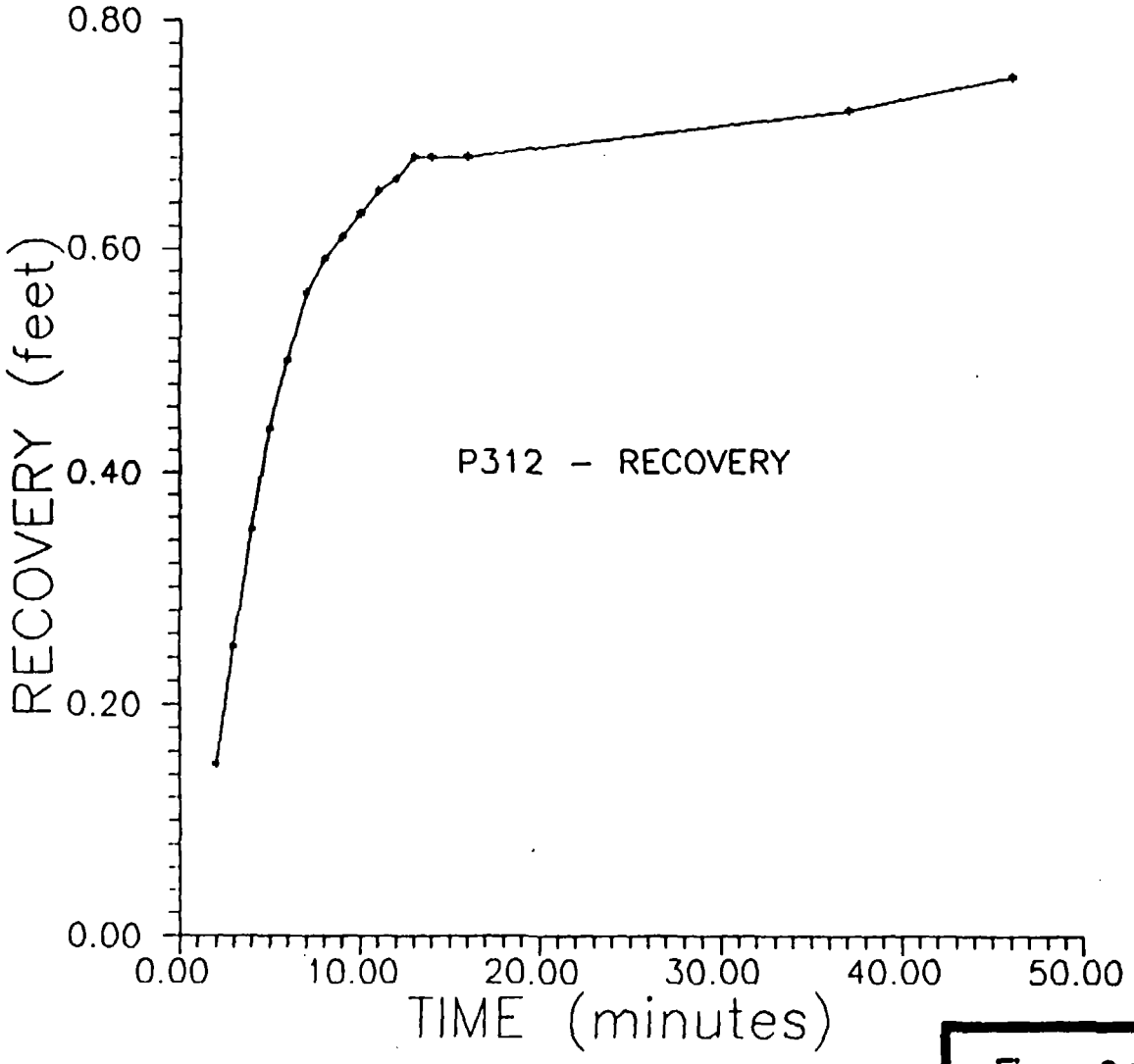


Figure 3-10
Water Level Recovery Curve for P312

DRAWN: MCM	DATE: 6-26-91	PRJ. NO.: 1620-007

recovered to within 90 percent of its pretest level after about 7 minutes. Piezometer P312 recovered at a similar rate.

3.2.1.4 Aquifer Test Conclusions

The following conclusions are made from the results of the Platteville Aquifer test.

- Based on the magnitude of the response observed in piezometer P312, a significant component of the ground water derived from test-pumping well W434 originated in the Drift Aquifer. In a continuous pumping scenario, the relative contribution of ground water from the Drift Aquifer is expected to decrease as the gradient across the basal drift layer decreases. A corresponding expansion in the cone-of-depression (capture area) in the Platteville Aquifer around well W434 will result.

- The computed value for T in the vicinity of well W120 (40 ft^2/day) is lower than values reported in the literature. Although this result is more than an order of magnitude less than Hult's 1980 slug test result for well W120, it confirms the overall interpretation that there is a significant portion of the Platteville Aquifer, including most of the Northern Area, that is much less transmissive than normally considered for the regional Platteville Aquifer.

- A permanent pumping well at the location of well W434, and in the other low transmissivity areas of the Platteville Aquifer, can not be expected to control the hydraulic gradient in a large portion of the aquifer. Drawdown cones tend to be steep and of limited areal extent in such areas. Therefore, the evaluation of the use of well W434 for long-term pumping should consider the impacts in the immediate vicinity of the well (e.g., intercepting contaminated ground water that may be migrating to the St. Peter Aquifer via the buried bedrock valley) more so than the well's potential ability to limit the further spread of contaminants in the Northern Area.

3.2.2 Well W422 Pumping Rate Increase

The pumping rate in the Drift-Platteville Aquifer Gradient Control Well (W422) was increased from approximately 55 gallons per minute to 70 gallons per minute on May 2, 1991. The water level measurements that were conducted for this study are presented in Table 3-3. As noted in the discussion for the Platteville Aquifer test, water levels in the Drift-Platteville Aquifer rose during the study period due to precipitation. However, no adjustments to the water level data were made. Instead, a series of maps were prepared to depict the configuration of the surface of the water table both before and during the pumping rate increase.

TABLE 3-3

Summary of the Water Levels for the Northern Area of the Drift-Platteville Aquifer April 16 - June 27, 1991[a]

Well Number	April 16	May 3	May 10	May 22	May 29	June 12	June 27
Drift Wells							
P117	871.06	871.29	871.98	871.98	872.18	872.38	872.11
P16	876.61	876.78	876.9	877.17	877.29	877.63	877.92
P66	874.17	874.36	874.46	874.67	874.82	875.11	875.36
W117	875.44	875.6	875.71	875.87	876.04	876.34	876.57
W134	876	876.16	876.28	876.47	876.6	876.88	877.12
P102	NA[b]	876.17	876.26	876.47	876.59	876.86	877.11
P312	876.52	876.67	876.77	876.98	877.09	877.32	877.55
P313	875.1	875.28	875.35	875.53	875.64	875.81	874.54
W135	870.13	869.98	870.4	870.58	870.72	870.87	871.09
P45	Dry						
W128	Vandalized				873.16	873.23	873.41
P112	880	880.27	880.47	880.68	880.85	881.23	881.26
W422	866.61	865.34	865.89	865.77	865.29	865.77	865.77
P109	881.61	881.81	882.25	882.22	882.55	882.61	882.51
W16	881.8	882	882.4	882.39	882.67	882.7	882.60
W10	883.66	883.78	884.15	883.97	884.43	884.09	883.94
P20	885.1	885.21	885.28	885.01	885.81	884.92	884.89
P64	885.5	885.46	885.76	885.06	886	885.03	884.66
P42	887.04	887.16	887.58	886.44	887.4	886.59	886.37
W420	878.09	878.27	878.64	878.73	878.99	879.16	878.86
W9	883.04	883.26	883.69	883.72	884.01	884.17	883.91
P304	880.91	882.53	882.98	884.01	883.33	883.41	883.21
P306	882.81	883	883.53	883.62	883.97	884.11	883.68
W8	882.77	882.99	883.51	883.59	883.8	884.05	883.89
NLMW2	881.04	881.19	881.63	881.69	881.97	882.12	881.99
NLMW1	880.9	881.08	881.48	881.56	881.78	882	881.84
W11	880.71	880.9	881.28	881.35	881.57	881.78	880.43
P2	877.88	878.08	878.16	878.43	878.45	878.71	878.85

TABLE 3-3

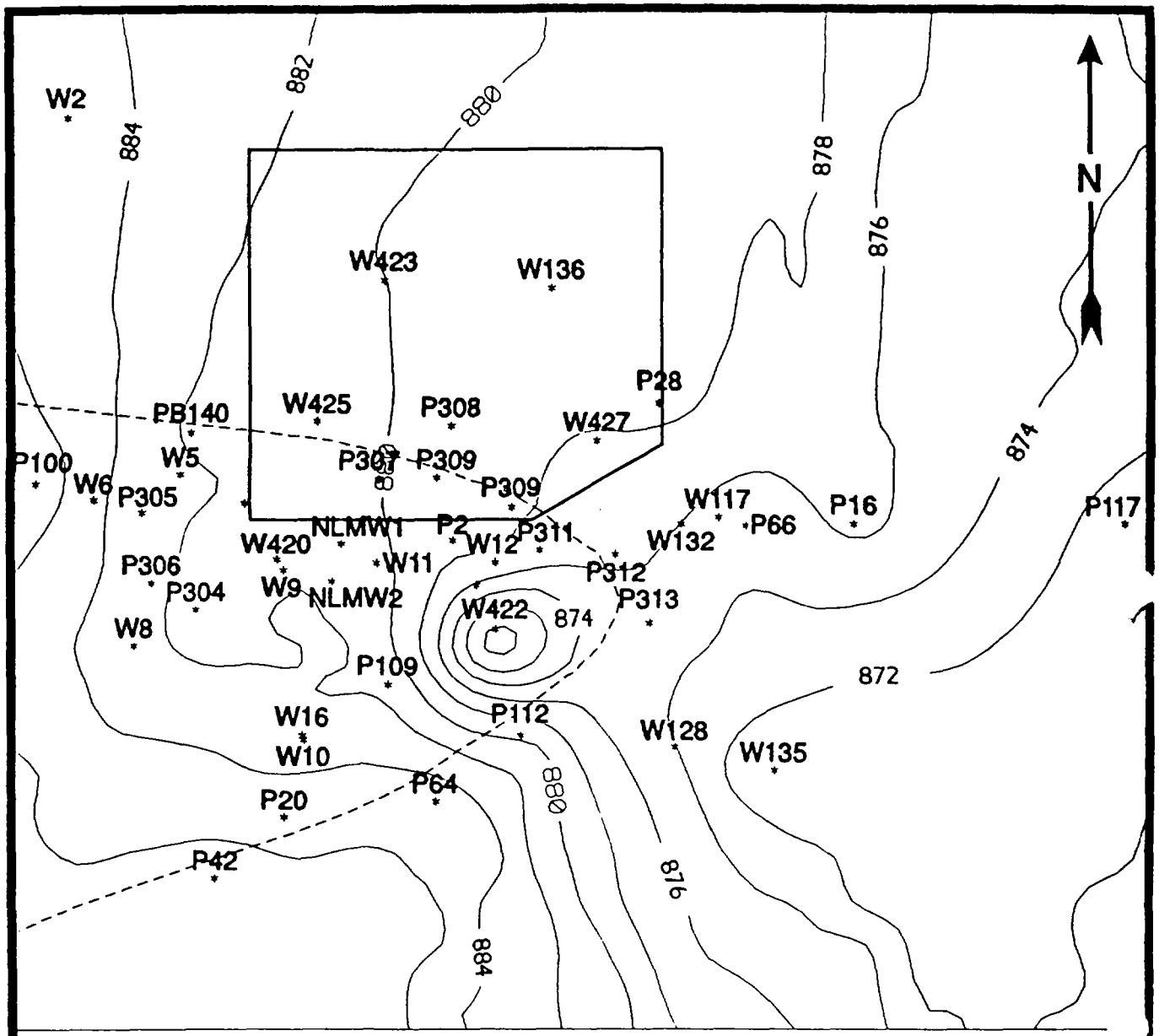
Summary of the Water Levels for the Northern Area of the Drift-Platteville Aquifer April 16 - June 27, 1991[a]

Well Number	April 16	May 3	May 10	May 22	May 29	June 12	June 27
W12	877.77	877.97	878.08	878.3	878.38	878.69	878.79
P311	877.31	877.51	877.63	877.81	877.01	878.16	878.35
PB140	881.54	881.88	882.04	882.19	882.34	882.67	882.51
P300	881.84	NA	NA	882.32	Abandoned		
P25	888.27	Obstructed					
W5	882.58	882.74	883.39	883.4	885.79	883.96	883.37
P305	882.74	882.91	883.54	883.57	883.86	884.12	883.56
P100	887.42	887.6	887.71	887.95	888.1	888.38	888.57
P34	Dry						
W2	884.99	885.16	885.46	885.61	885.75	886.07	886.12
P21	Dry					878.89	880.28
P27	Obstructed						
P28	878.63	878.61	878.55	879.21	879.27	879.77	877.21
W427	877.79	877.94	878.06	878.3	879.42	878.69	878.93
P310	NA	878.26	878.4	878.62	878.71	879.01	879.18
W136	878.13	878.2	878.35	878.63	878.73	879.12	879.39
P308	879.29	879.45	879.59	880.79	879.91	880.23	880.44
P309	879.22	879.43	879.56	884.66	879.89	880.21	880.36
P307	880	880.18	880.4	880.58	880.71	881.04	881.07
W423	880.05	880.19	880.27	880.51	880.52	880.96	881.33
W425	880.92	881.08	881.18	881.45	881.55	880.9	882.10
P69	Dry						
W6	884.39	884.59	885.21	882.22	885.54	885.92	885.50

[a] Water levels in feet mean sea level (MSL)
[b] NA - well not accessible

Table 3-3 indicates that the water levels in some individual wells rose by as much as two to three feet (e.g., wells W5 and P304). Figures 3-11, 3-12, and 3-13 show the configuration of the water table before the pumping rate increase took place (April 16, 1991), four weeks after the pumping rate increase (May 29, 1991), and eight weeks after the pumping rate increase (June 27, 1991), respectively. This information is utilized in Section 5 of this report in conjunction with the ground water quality data to assess the effectiveness of the new pumping rate in well W422. The dashed lines showing the capture zones in Figures 3-11, 3-12, and 3-13 were determined graphically by manually drawing ground water flow lines perpendicular to the water level contours and identifying the flow line that separates water that flows into well W422 from water that flows around the well. The base figures were generated by Golden Software's Surfer® program. The original Surfer® plots for all of the water level measurement rounds conducted for this study are provided in Appendix C.

Appendix C also contains water level data and Surfer® plots for the Platteville Aquifer in the vicinity of well W422. An analysis of these data confirms that the Platteville Aquifer was largely unaffected by the pumping rate increase at well W422.



EXPLANATION

870 — Drift Aquifer Water Level Elevation Contours, April 16, 1991

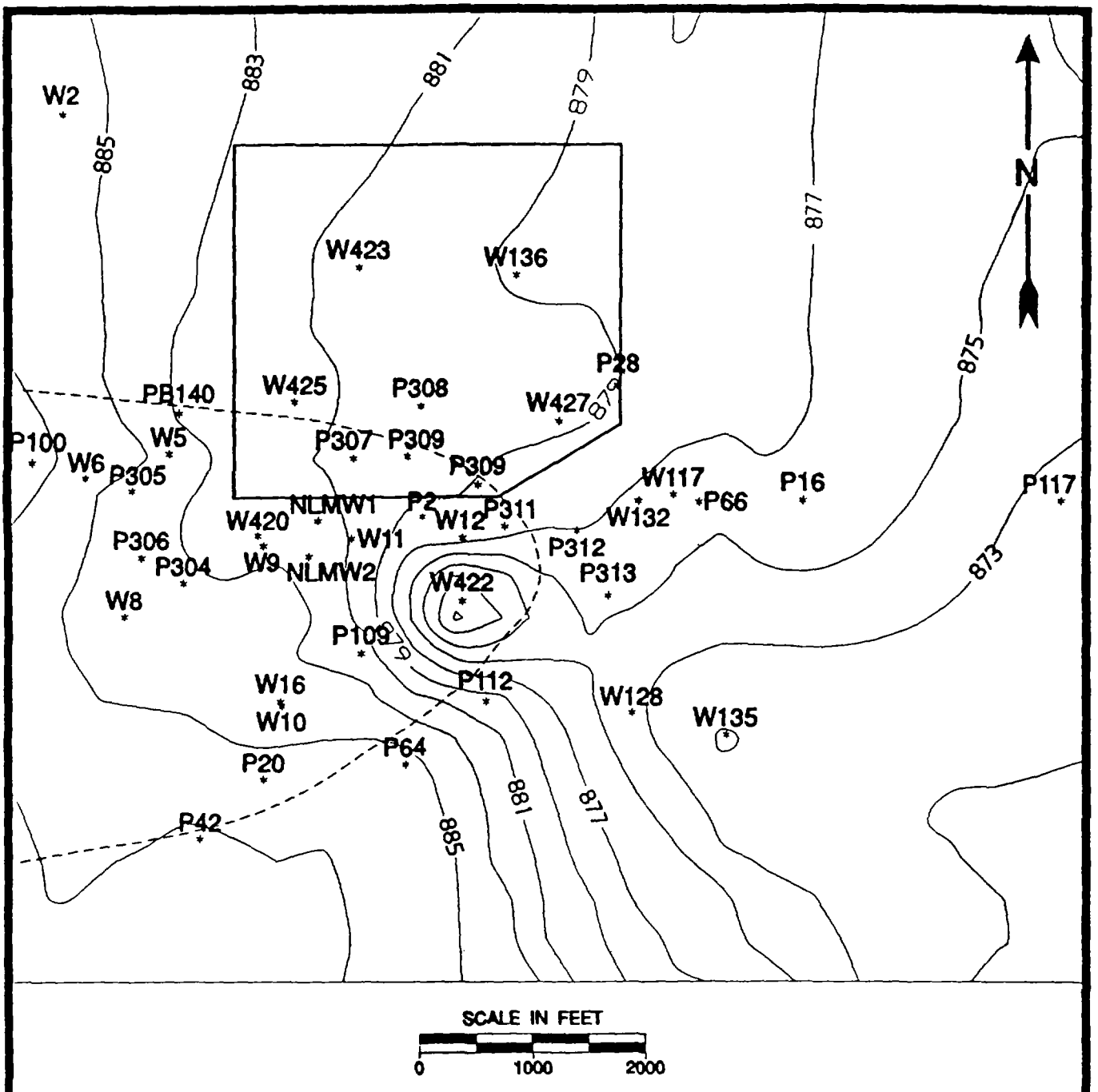
Northern Area Boundary

Well W422 Capture Area

Contours drawn ulng the SURFER contouring program

Figure 3-11
Well W422 Capture Zone, April 16, 1991
St. Louis Park, MN

DRAWN: MCM/DJL	DATE: 7-3-91	PRJ. NO.: 1620-007



EXPLANATION

870 — Drift Aquifer Water Level Elevation Contours, May 29, 1991

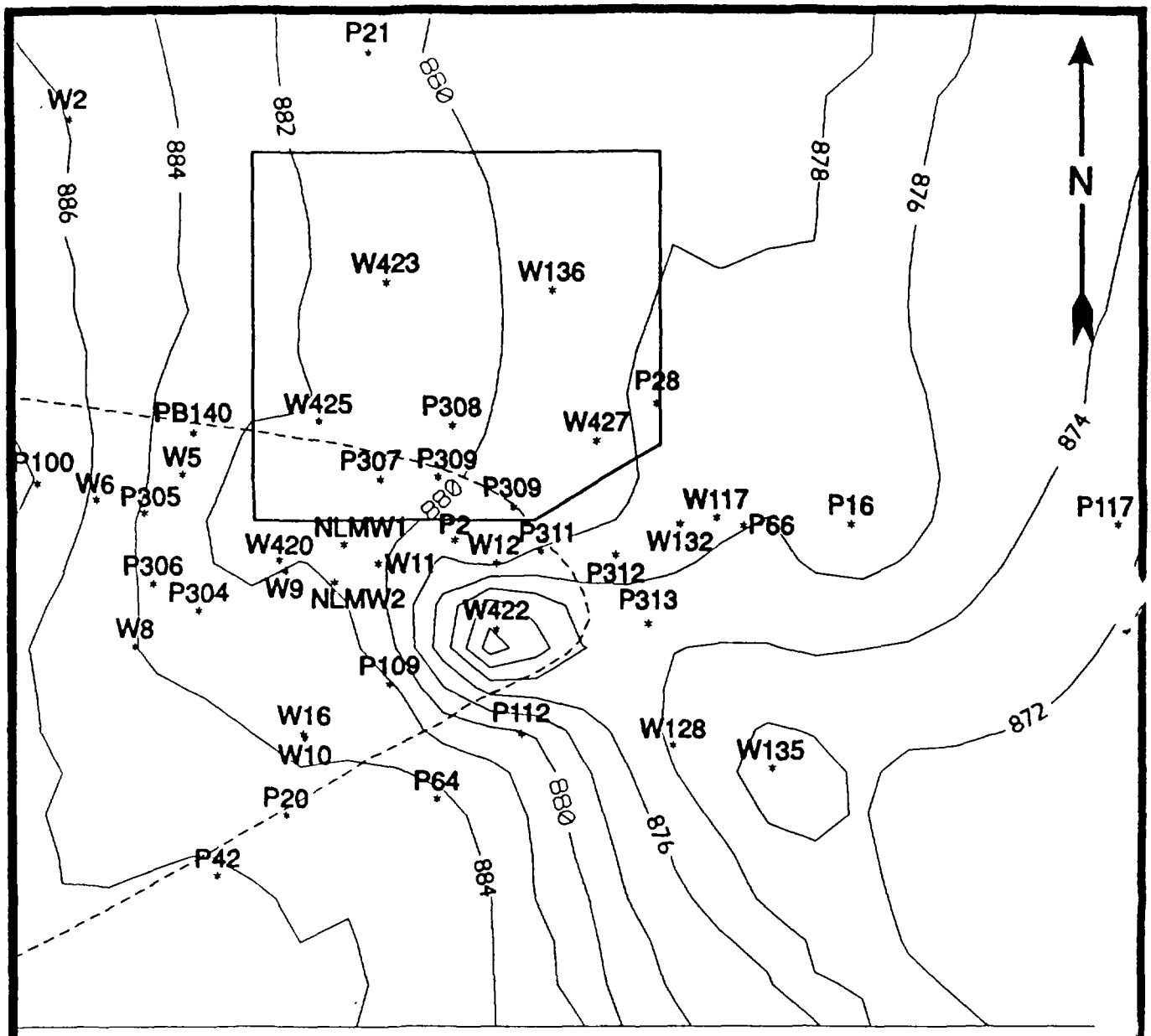
Northern Area Boundary

Well W422 Capture Area

Contours drawn using SURFER, a contouring program

Figure 3-12
Well W422 Capture Zone, May 29, 1991
St. Louis Park, MN

DRAWN: MCM/DJL | DATE: 7-3-91 | PRJ. NO.: 1620-007



EXPLANATION

870 — Drift Aquifer Water Level Elevation Contours, June 27, 1991

Northern Area Boundary

Well W422 Capture Area

Contours drawn using SURFER, a contouring program

Figure 3-13
Well W422 Capture Zone, June 27, 1991
St. Louis Park, MN

DRAWN: MCM/DJL | DATE: 7-9-91 | PRJ. NO.: 1620-087

4.0 NATURE AND EXTENT OF CONTAMINATION

This section presents the results of the ground water analyses performed for the SRI and compares those results with historical ground water monitoring results to update the interpretation of the extent of the plume of contamination in the Drift-Platteville Aquifer.

4.1 Nature of Contamination

Table 4-1 summarizes the results of the ground water analyses performed for the SRI. Totals are given for carcinogenic and other PAH. Appendix D contains the laboratory case narrative and summary data package that provide compound specific information.

The SRI analytical results are consistent with historical results for the Drift-Platteville Aquifer with respect to the nature of contamination. No carcinogenic PAH were detected, and in general, total PAH concentrations decrease in a downgradient direction from the Reilly site. Naphthalene and 2,3-dihydroindene are the predominant PAH typically present in the ground water (Appendix D). The distribution of PAH in the ground water is a function of the relative mobility of the individual PAH compounds.

4.2 Extent of Contamination

The locations of the wells and piezometers installed for the SRI were selected primarily to provide critical water level data for the evaluation of pumping influences in the Drift-Platteville Aquifer. However, the ground water analytical results for samples from the new wells and piezometers provide a refined interpretation of the extent of contamination.

This interpretation is further refined by evaluating the Drift Aquifer separately from the Platteville Aquifer. The extent of contamination in these aquifers appears to be different based primarily on the different hydrogeological properties of the Drift and Platteville strata.

Figure 4-1 depicts the inferred extent of contamination in the Drift Aquifer, and Figure 4-2 shows the Platteville Aquifer plume, based on the SRI analytical results and historical water quality data. The Drift Aquifer plume encompasses all of the new piezometers installed for the SRI with the exception of P313 to the southeast (downgradient direction). Figure 4-1 shows that the northern extent of the Drift Aquifer plume is north of P308, but south of W427. Otherwise, this plume is similar to prior maps of Drift-Platteville Aquifer contamination (e.g., Figure 1-7 in this report).

TABLE 4-1

Summary of Ground Water Analytical Results, ppb[a]

Well Number	Total Carcinogenic PAH	Total Other PAH[b]	Total PAH[b]	Total Phenols
P307	ND[c]	225.5	225.5	18.5
P308	ND	97.5	97.5	10.5
P309	ND	317.6	317.6	22.5
P310	ND	32.7	32.7	7.8
P311	ND	46	46	10.5
P312	ND	14	14	12.5
P313	ND	ND	ND	ND
W431	ND	6	6	6.1
W432	ND	ND	ND	ND
W434	ND	23.5[d]	23.5[d]	NA[e]
W422	ND	57.1	57.1	10.88
W422 Duplicate	ND	58.7	58.7	6.5

a. All samples were analyzed in accordance with the 1991 Sampling Plan using the non-criteria (part per billion) method, except for well W434 which was analyzed using the low-level (part per trillion) method.
b. Totals represent the sum of all compounds that were detected including those that were present in an amount less than the sample quantitation limit but greater than zero (J-flag compounds).
c. Not detected.
d. Totals are calculated for the diluted sample (D-flag compounds), originally reported in nanograms per liter.
e. Not analyzed.

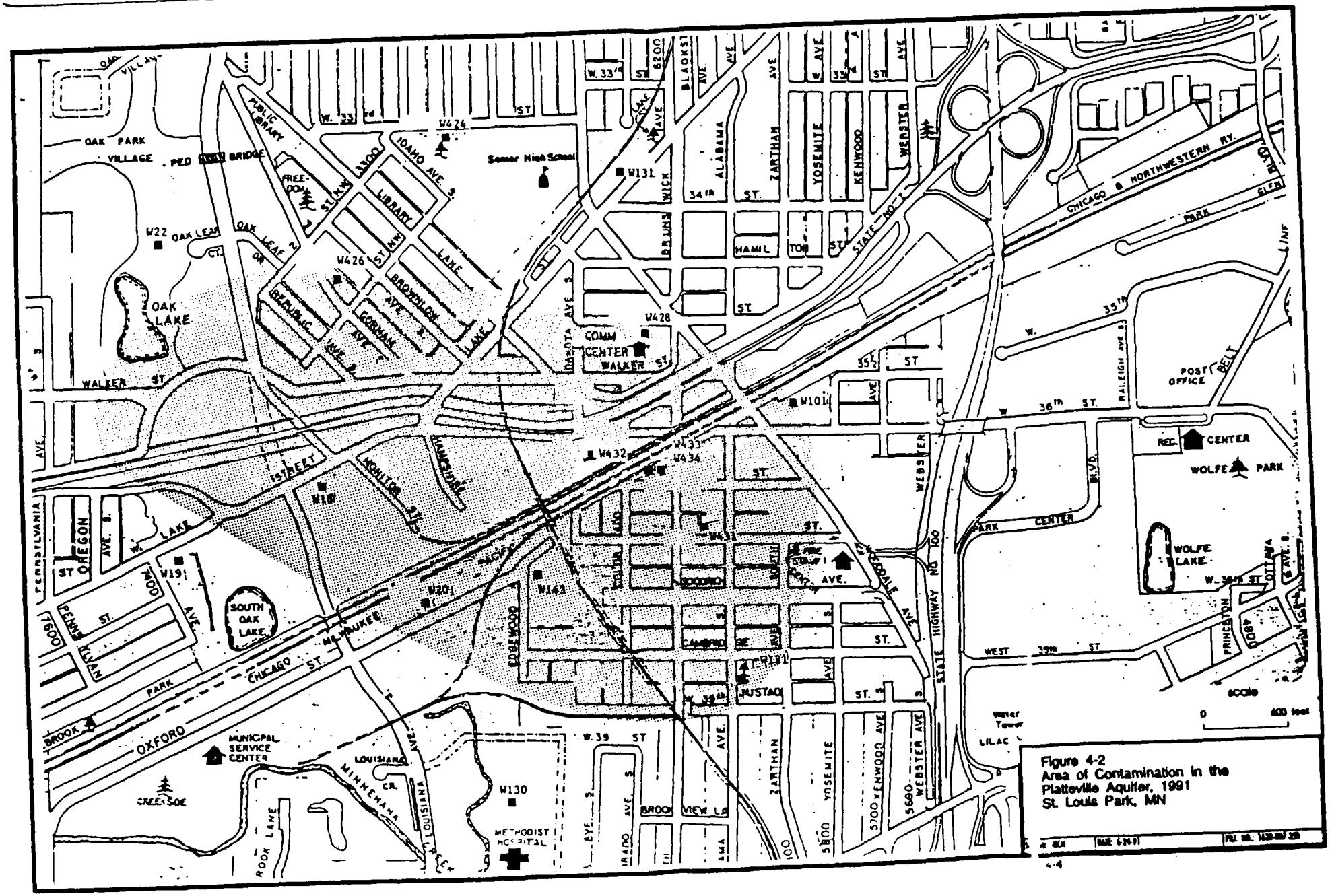


Figure 4-2
Area of Contamination in the Platteville Aquifer, 1991
St. Louis Park, MN

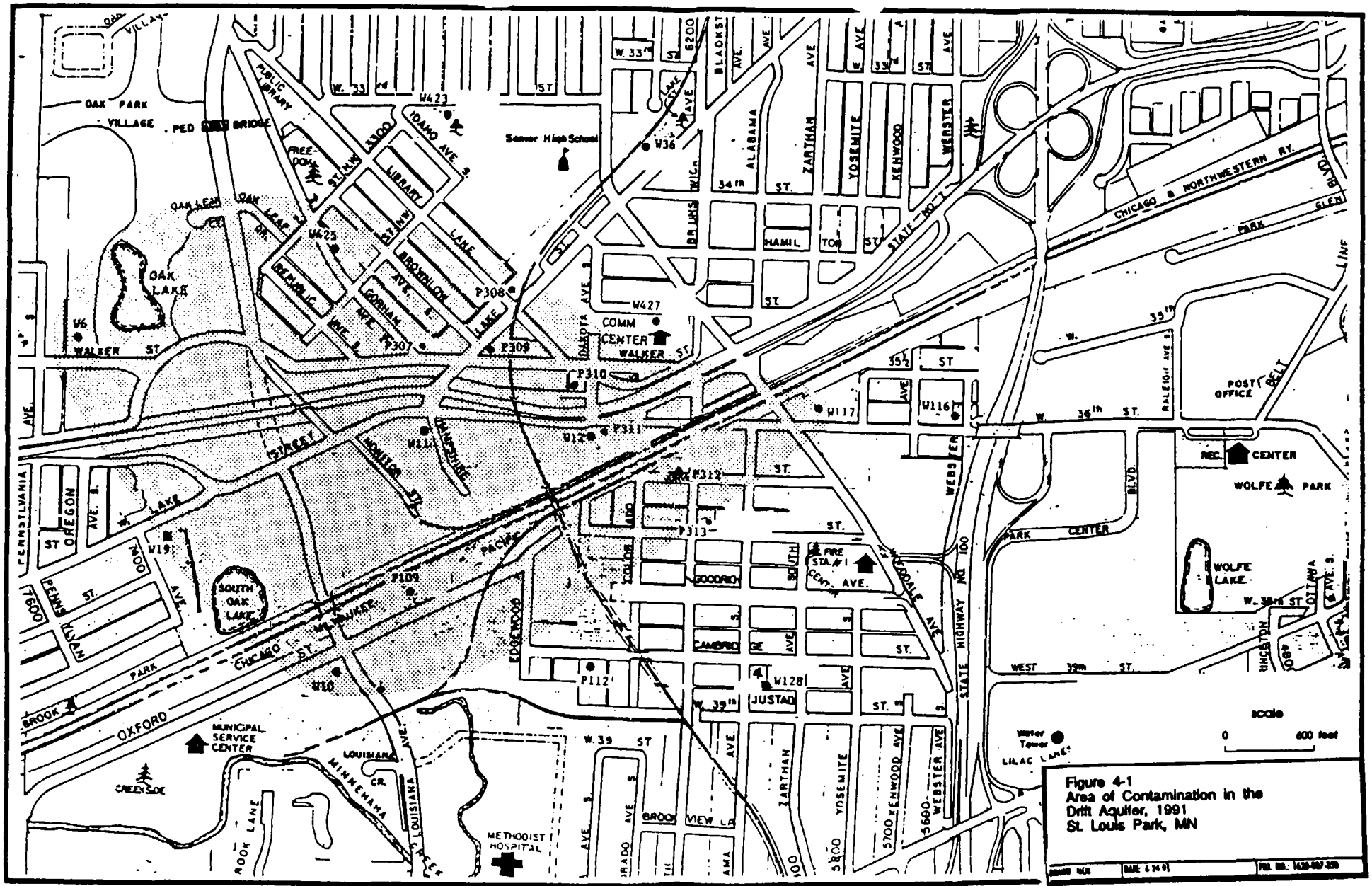


Figure 4-1
Area of Contamination in the Drift Aquifer, 1991
St. Louis Park, MN

A comparison of Figures 4-1 and 4-2 shows that contamination in the Platteville Aquifer is inferred to extend over a larger area than in the Drift Aquifer. The southeast downgradient extent in the Platteville Aquifer includes well W131, and the southern and northern limits include wells W132 and W428, respectively.

The analytical result (ND total PAH) for the sample from the Platteville Aquifer monitoring well W432 is unexpected given the well's location, and the presence of PAH in the Drift piezometer at this location (46 micrograms per liter total PAH in P311). At this time, the extent of contamination in the Platteville Aquifer is interpreted to be continuous in this area, as depicted in Figure 4-2.

5.0 SUPPLEMENTAL REMEDIAL INVESTIGATION SUMMARY AND CONCLUSIONS

This section presents a summary of the SRI and also presents the objectives for any actions that may be taken to remediate the contamination migration through the Northern Area.

5.1 Nature and Extent of Contamination

The contamination in the Northern Area of the Drift-Platteville aquifer is dissolved PAH in ground water. PAH concentrations in the wells sampled range from non-detect to 317.6 ug/l total PAH. The extent of contamination has been refined with the collection of ground water samples from the newly installed wells and piezometers. The contamination plume extends farther north than was previously thought, and it does not extend as far south as was previously thought.

5.2 Contaminant Migration

The contamination plume in the ground water of the Northern Area has been relatively stable in size since at least 1988 when the initial sampling round was conducted (City of St. Louis Park, 1989b). The latest round of water quality sampling assisted in better determining the boundaries of the plume.

Dissolved contaminants do not move as quickly through the aquifer as does the ground water due to the physical and chemical characteristics of both the contaminants and the aquifer materials. PAH migration in the environment is largely controlled by their low vapor pressure, low aqueous solubility and high sorption tendencies. These properties are a strong function of molecular weight, with higher molecular weight PAH being much less mobile in the ground water. The low transmissivity in the Platteville Limestone (Hult, 1980) restricts ground water flow and thus limits the rate of contaminant migration.

The regional ground water flow is generally to the southeast. The configuration of the plume is the result of the ground water flow downgradient from the sources at the Reilly site which are affecting the Drift-Platteville Aquifer. Wells W101 and W117 at the eastern boundary of the plume have historically had higher PAH and phenol concentrations than wells closer to the site. This indicates there may be a potential source of PAH and phenol in the region of Wooddale Avenue and West 36th Street.

The buried bedrock valley into the St. Peter Sandstone near the southeastern boundary of the plume presents a potential contaminant pathway into the St. Peter Aquifer.

5.3 Remedial Action Objectives

The objective of any remedial action within the Northern Area, as stated in the CD-RAP will be to prevent the further spread of contamination within the Northern Area of the Drift-Platteville Aquifer. Utilizing pumping wells to provide ground water controls for remediation, is subject to the water transmitting properties of the individual aquifers. The experience to date in the Northern Area shows that the water transmitting properties are much different between the Drift and the Platteville Aquifers. Therefore, for the purposes of remediation in the Northern Area, the two units should be considered separately. Also, the extent of contamination may be different between the Drift and Platteville Aquifers.

This study is inconclusive relative to the effectiveness of pumping well W422 (at either 50 or 70 gallons per minute) for controlling the flow of ground water and preventing the further spread of contamination within the Northern Area of the Drift Aquifer. Figure 5-1 shows the capture zone of well W422 in the Drift Aquifer based on June 27, 1991, water level data, and the extent of contamination in the Northern Area. The increased pumping rate in well W422 did not produce a measurably larger capture zone, as would be expected, due to the abnormally high precipitation during the measurement period and the corresponding general rise in the water table elevation. The two-month period of time for water level measurements during this study was not representative of steady-state conditions in the Drift Aquifer, as evidenced by the apparent lack of influence the increased pumping had on water levels. Therefore, it is premature to judge whether or not well W422 can adequately limit the further spread of contamination located within the Northern Area. A longer water level monitoring period, conducted over a no-recharge period (i.e. winter) would be necessary to evaluate the increased pumping rate in well W422.

The Platteville Aquifer is largely unaffected by pumping at well W422.

Well W434 is ideally located to intercept ground water from the Drift-Platteville Aquifer before the water moves into the St. Peter Aquifer via the buried bedrock valley. This well may be expected to provide 20 to 25 gallons per minute, pumping on a long-term basis. However, due to the relatively low transmissivity of the Platteville Aquifer, and because well W434 is located downgradient from the Northern Area, well W434 will not control the hydraulic gradient within the Northern Area. Based on its value for protecting the St. Peter Aquifer, well W434 should be completed as a pumping well.

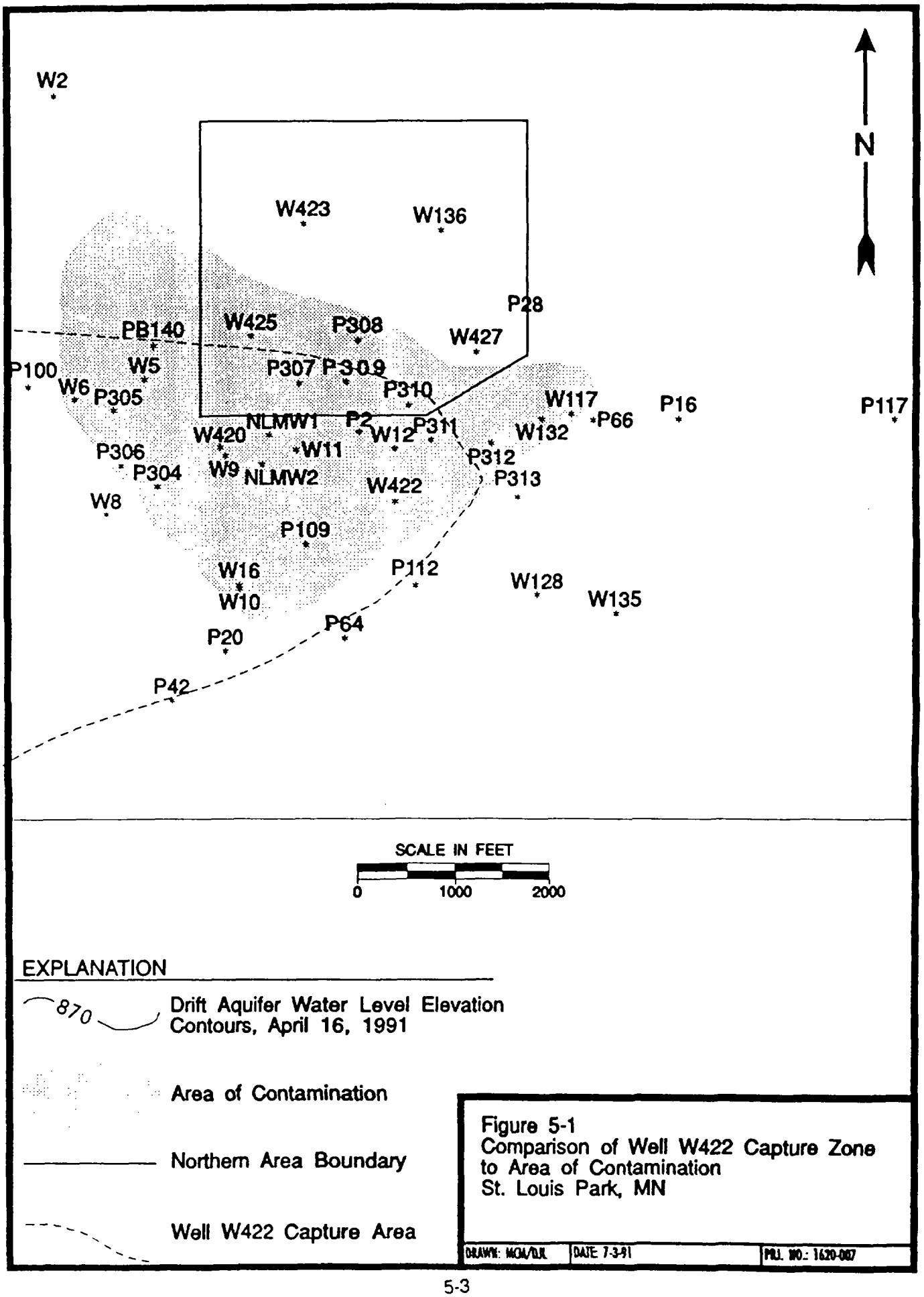


Figure 5-1
Comparison of Well W422 Capture Zone to Area of Contamination
St. Louis Park, MN

DRAWN: MCM/DLR | DATE: 7-3-91 | PRJ. NO.: 1620-007

The extent of contamination in the Drift-Platteville Aquifer, both within and outside the Northern Area, has been redefined based on the SRI ground water analytical results. However, to satisfy the intent of the CD-RAP, the new wells should be resampled to confirm the first round analytical results. Wells that contained less than 20 micrograms per liter of total PAH should be analyzed using the low-level method, per the 1991 Sampling Plan. Also, an increased level of ground water monitoring is needed to adequately evaluate remedial actions in the Drift-Platteville Aquifer. Currently, the CD-RAP requires that 20 wells are sampled and analyzed every other year. An expanded ground water monitoring program should be considered once the confirmation round of monitoring is completed for the new wells.

6.0 REFERENCES

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APPENDIX A

Drillers Logs

Well Completion Diagrams

Well Development Records

Well Location Coordinates

E. H. Renner & Sons

WELL DRILLING FOR FOUR GENERATIONS
15688 Jarvis Street N.W., Elk River, MN 55330
(612) 427-6100 Fax: (612) 427-0533

Equal Opportunity Employer

WELL LOG

MAPCODE D-255

Date Started 11/28 19 90 Date Completed 11/29/ 19 90

Owner or Contractor City of St.Louis Park/ENSR Address 5005 Mtka Blvd. St.Louis Park,Mn. 55416

Job Location Gorham Ave. & Walker

City St.Louis Park County Hennepin State of Minnesota

Well: 307 (Cable Tool) Speedy Rotary Driller: Rob Schaffer

Cased with: 2 inch ____ PE X T&C 64' Ft. Total Depth of Well 72 Ft. from grade
____ inch ____ PE ____ T&C ____ Ft. + 2' stickup
____ inch ____ PE ____ T&C ____ Ft.

Feet of Open Hole ____ Finished in Sand & Gravel Static Water Level 14 Ft.

Tested at 0 gallons per min. Drawn down of ____ feet.
Tested at ____ gallons per min. Drawn down of ____ feet.

Screen:
Size 2 dia. 10 ft. Make Johnson Slot 10

Leader:
Size ____ dia. ____ ft. ____ Material ____ Fittings

Pump:
Make ____ Model ____ HP. ____ Volts ____ Phase Type ____ Tank ____

Motor Serial No. ____ Pump Serial No. ____ Drop Pipe ____ feet

Size ____ Capacity of Pump ____ G.P.M. AT ____ T.D.H Date Installed ____

Inside ____ ft. Outside ____ ft.

Pitless Adapter: Make ____ Offset Material ____ Size ____ inch

Kind of Formation	Color of Formation	Started Depth	Ended Depth	Total Thickness of Formation	Remarks
Gravel & Rocks	Brown	0	21	21	Rocks (took Water)
Sand & Gravel	Brown	21	36	15	
Gravel & Clay	Gray	36	60	24	
Sand & Gravel	Gray	60	81	21	Took Water

County Name: **Hennepin**

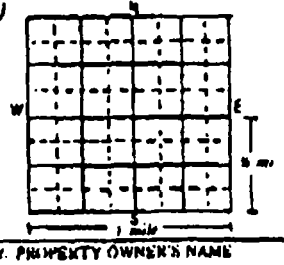
WATER WELL RECORD — Minnesota Statutes 156A.01 to 08 — for Water Supply

462926

Township Name	Township Number	Range Number	Section No.	Fraction
St. Louis Park	117 N/S	21 E/W	17	NE NW SE SW

Numerical Street Address and City of Well Location or Distance from Road Intersection:
Gorham Ave. & Walker Street (P307)

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



Addition Name
Block Number
Lot Number

1. PROPERTY OWNER'S NAME: **City of St.Louis Park/ ENSR**

Mailing Address if different than property address indicated above: **5005 Htka. Blvd. St.Louis Park,MN. 55416**

3. FORMATION LOG	COLOR	HARDNESS OF FORMATION	FROM	TO
Gravel & Rocks	Brown		0	21
Sand & Gravel	Brown		21	36
Gravel & Clay	Gray		36	60
Sand & Gravel	Gray		60	81

Use a second sheet, if needed

4. WELL DEPTH (completed): 72 ft. — Date of Completion: 11/29/90

5. DRILLING METHOD: [X] Cable tool [ ] Reverse [ ] Driven [ ] Dug [ ] Hollow rod [ ] Air [ ] Bored [ ] ____ [X] Rotary [ ] Jetted [ ] Power Auger

6. DRILLING FLUID: Water

7. USE: [ ] Domestic [X] Monitoring [ ] Heat Pump [ ] Irrigation [ ] Public [ ] Industry [ ] Test Well [ ] Municipal [ ] Commercial [ ] Air Conditioning [ ] ____

8. CASING: [ ] Black [ ] Threaded [ ] Galv. [ ] Welded [ ] Plastic [ ]
HEIGHT: Above/Below Surface 2' stickup. Drive Shoe? Yes ___ No ___
HOLE DIAM.
2 in. to 64' ft. Weight ___ lbs./ft. ___ in. to ___ ft.
___ in. to ___ ft. Weight ___ lbs./ft. ___ in. to ___ ft.
___ in. to ___ ft. Weight ___ lbs./ft. ___ in. to ___ ft.

9. SCREEN: Or open hole from 62 ft. to 72 ft.
Make: Johnson
Type: Stainless Steel Diam. ___
Slot/Gauge: 10 Length: FITTINGS
Set between ___ ft. and ___ ft.

10. STATIC WATER LEVEL: 14 ft. [ ] Below [X] Above land surface. Date Measured ___/___/___

11. PUMPING LEVEL (Below land surface)
___ ft. after ___ hrs. pumping ___ g.p.m.
___ ft. after ___ hrs. pumping ___ g.p.m.

12. HEAD WELL COMPLETION
[ ] Pitless adapter manufacturer ___ Model ___
[ ] Basement offset [X] At least 12" above ground
[ ] Plastic casing protector

13. WELL GROUTED? [ ] Yes [ ] No
[ ] Neat Cement [ ] Bentonite [ ] ____
Grout material ___ from ___ ft. to ___ ft. cu. yds ___

14. NEAREST SOURCES OF POSSIBLE CONTAMINATION
___ feet ___ direction ___
Well disinfected upon completion? [ ] Yes [ ] No

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

16. ABANDONED WELLS
Unused well on property? [ ] Yes [ ] No
Sealed [ ] Permanent [ ] Temporary [ ] Not sealed

17. REMARKS, ELEVATION, SOURCE OF DATA, etc.
Rocks(took Water) Map Code D-255

18. WATER WELL CONTRACTOR CERTIFICATION
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

E.H. Renner & Sons, Inc. 71015
Licensee Business Name — License No.

Address: 15688 Jarvis St.N.W. Elk River MN. 5533

Signed ___ Date ___
Authorized Representative

Robert Schaffer Dec 11/29/90
Name of Driller

WATER WELL CONTRACTOR'S COPY — 462926

JUN-25-1991 11:07 FROM ENSR P.04 TO

E. H. Renner & Sons

WELL DRILLING FOR FOUR GENERATIONS
15688 Jarvis Street N.W., Elk River, MN 55330
(612) 427-6100 Fax: (612) 427-0533

Equal Opportunity Employer

WELL LOG

MAPCODE D-256

Date Started 12/4/90 19 90 Date Completed 12/5/90 19 90

Owner or Contractor City of St.Louis Park/ENSR Address 5005 Mtka.Blvd. St.Louis Park,Mn. 55416

Job Location Library Lane at West Lake Street

City St.Louis Park County Hennepin State of Minnesota

Well: 308 Cable Tool Speedy Rotary Driller: Robert Schaffer

Cased with: 2 inch ____ PE X T&C 61 Ft. Total Depth of Well 67 Ft. from grade
____ inch ____ PE ____ T&C ____ Ft. - INCLAS 2 YRS. J
____ inch ____ PE ____ T&C ____ Ft.

Feet of Open Hole ____ Finished in Sand-Gravel Static Water Level 40 Ft.

Tested at 3 gallons per min. Drawn down of ____ feet.
Tested at ____ gallons per min. Drawn down of ____ feet.

Screen:
Size 2 dia. 10 ft. Make Johnson Slot 10

Leader:
Size ____ dia. ____ ft. ____ Material ____ Fittings

Pump:
Make ____ Model ____ HP. ____ Volts ____ Phase Type ____ Tank ____

Motor Serial No. ____ Pump Serial No. ____ Drop Pipe ____ feet

Size ____ Capacity of Pump ____ G.P.M. AT ____ T.D.H Date Installed ____

Inside ____ ft. Outside ____ ft.

Pitless Adapter: Make ____ Offset Material ____ Size ____ inch

Kind of Formation	Color of Formation	Started Depth	Ended Depth	Total Thickness of Formation	Remarks
Sandy Clay	Brown	0	20	20	
Sand & Rocks	Brown	20	41	21	
Sand & Gravel	Gray	41	80	41	Took alot of Water

WATER WELL RECORD

Minnesota Statutes 1969, 103I.205

MINNESOTA UNIQUE WELL NO. For Water Supply: **462927**

County Name: **Hennepin**

Township Name	Township Number	Range Number	Section No.	Fraction
St.Louis Park	117 N	21 W	17	NW ¼ SE ¼ ¼

Numerical Street Address and City of Well Location or Distance from Road Intersection: **Library Lane at W.Lake Street** P.308

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

Addition Name:

Block Number:

Lot Number:

2. PROPERTY OWNER'S NAME: **City of St.Louis Park**

Mailing Address if different than property address indicated above: **5005 Mtka.Blvd. St.Louis Park,Mn. 55416**

3. FORMATION LOG	COLOR	HARDNESS OF FORMATION	FROM	TO
Sandy Clay	Brown		0	20
Sand & Rocks	Brown		20	41
Sand & Gravel	Gray		41	80

Use a separate sheet, if needed

4. WELL DEPTH (completed): **71** ft. Date of Completion: **12/5/90**

5. DRILLING METHOD: ☒ Cable Tool ☐ Reverse ☐ Driven ☐ Dug ☐ Hollow Rod ☐ Air ☐ Bored ☐ ____ ☒ Rotary ☐ Jetted ☐ Power Auger

6. DRILLING FLUID: **Water**

7. USE: ☐ Domestic ☒ Monitoring ☐ Horse Pump ☐ Irrigation ☐ Public ☐ Industry ☐ Test Well ☐ Municipal ☐ Commercial ☐ Air Conditioning ☐ ____

8. CASING: ☐ Black ☐ Threaded ☐ Galv ☐ Welded ☐ Plastic ☐

HEIGHT: Above/Below Surface ____ ft. Drive Shoe? Yes ____ No ____

2 in. to 61 ft. Weight 3.653 lbs./ft.

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

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

HOLE DIAM. ____ in. to ____ ft. ____ in. to ____ ft. ____ in. to ____ ft.

9. SCREEN: Make: **Johnson** Or open hole from 61 ft. to 71 ft.

Type ____ Diam. ____

Slot/Gauge 10 Length ____

Set between ____ ft. and ____ ft. FITTINGS:

10. STATIC WATER LEVEL: 40 ft. ☐ below ☐ above land surface. Date Measured: 12/5/90

11. PUMPING LEVEL (below land surface)

____ ft. after ____ hrs. pumping ____ g.p.m.

____ ft. after ____ hrs. pumping ____ g.p.m.

12. HEAD WELL COMPLETION

☐ Pitless adapter manufacturer ____ Model ____

☐ Basement installation ☒ At least 12" above grade

☐ Plastic casing protection ____

13. WELL GROUTED? ☒ Yes ☐ No

☐ Neat Cement ☐ Bentonite ☐ ____

Grout material ____ from ____ to ____ ft. cu. yds. ____

14. NEAREST SOURCES OF POSSIBLE CONTAMINATION

____ feet ____ direction ____ type

Well disinfected upon completion? ☐ Yes ☐ No

15. PUMP

Date installed ____ ☐ Not installed

Manufacturer's name ____

Model number ____ HP ____ Volts ____

Length of drop pipe ____ ft. Capacity ____ g.p.m.

Material of drop pipe ____

Type: ☐ Submersible ☐ L.S. Turbine ☐ Reciprocating ☐ Jet ☐ Centrifugal ☐ ____

16. ABANDONED WELLS

Unused well on property? ☐ Yes ☐ No

Sealed ☐ Permanent ☐ Temporary ☐ Not sealed

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

Took alot of Water

Map Code B-256

18. WATER WELL CONTRACTOR CERTIFICATION

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

E.H. Renner & Sons,Inc. 71013
License Business Name — License No.

Address 15688 Jarvis St.N.W.Elk River,Mn. 55330

Signed ____ Date ____
Authorized Representative

Robert Schaffer Date 12/5/90
Name of Driller

WATER WELL CONTRACTOR COPY

462927

6/74 30M
7/76 30M
7/78 30M

E. H. Renner & Sons

WELL DRILLING FOR FOUR GENERATIONS
15688 Jarvis Street N.W., Elk River, MN 55330
(612) 427-6100 Fax: (612) 427-0533

Equal Opportunity Employer

WELL LOG

MAP CODE D-257

Date Started 11/26/90 19 90 Date Completed 11/27/90 19 90

Owner or Contractor St.Louis Park/ENSR Address 5005 Mtka.Blvd. St.Louis Park,Mn. 55416

Job Location West Lake Street at Walker Street

City St.Louis Park County Hennepin State of Minnesota

Well: 309 Cable Tool Speedstar Rotary Driller: Robert Schaffer

Cased with: 2 inch ____ PE X T&C 67 Ft. Total Depth of Well 75 Ft. from grade
____ inch ____ PE ____ T&C ____ Ft. Includes sump
____ inch ____ PE ____ T&C ____ Ft.

Feet of Open Hole ____ Finished in Sand-Gravel Static Water Level 41 Ft.

Tested at ____ gallons per min. Drawn down of ____ feet.
Tested at ____ gallons per min. Drawn down of ____ feet.

Screen:
Size 2 dia. 10 ft. Make Johnson Slot 10

Leader:
Size ____ dia. ____ ft. ____ Material ____ Fittings

Pump:
Make ____ Model ____ HP. ____ Volts ____ Phase Type ____ Tank ____

Motor Serial No. ____ Pump Serial No. ____ Drop Pipe ____ feet

Size ____ Capacity of Pump ____ G.P.M. AT ____ T.D.H Date Installed ____

Inside ____ ft. Outside ____ ft.

Pitless Adapter: Make ____ Offset Material ____ Size ____ inch

Kind of Formation	Color of Formation	Started Depth	Ended Depth	Total Thickness of Formation	Remarks
Gravel	Brown	0	21	21	Rocks(took Water)
Sand & Gravel	Brown	21	34	13	
Clay Traces Sand & Gravel	Brown	34	61	27	Rocky
Sand & Gravel	Gray	61	81	20	Took Water

WATER WELL RECORD

Minnesota Statutes 156A.01-.08

MINNESOTA UNIQUE WELL NO. for Water Sample: **462928**

County Name: **Hennepin**

Township Name	Township Number	Range Number	Section No.	Fraction
St.Louis Park	117 N	21 W	17	NE ¼ SE ¼ ¼

Numerical Street Address and City of Well Location or Distance from Road Intersection: **West Lake Street at Walker Street 4P309**

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

Addition Name:

Block Number:

Lot Number:

1 PROPERTY OWNER'S NAME: **City of St.Louis Park RMSR**

Mailing Address if different than property address indicated above: **5005 Mtka.Blvd. St.Louis Park,MN. 55416**

3 FORMATION LOG	COLOR	HARDNESS OR FORMATION	FROM	TO
Gravel	Brown		0	21
Sand-Gravelk	Brown		21	34
Sand-Gravel	Gray		34	61
Sand-Gravel	Gray		61	81

Use a second sheet, if needed

4 WELL DEPTH (completed): 75 ft. Date of Completion: 11/27/90

5 DRILLING METHOD: [X] Cable Tool [ ] Reverse [ ] Driven [ ] Dug [ ] Hollow Rod [ ] Air [ ] Bored [ ] _____ [X] Rotary [ ] Jetted [ ] Power Auger

6 DRILLING FLUID: Water

7 USE: [ ] Domestic [X] Monitoring [ ] Heat Pump [ ] Irrigation [ ] Public [ ] Industry [ ] Test Well [ ] Municipal [ ] Commercial [ ] Air Conditioning [ ] _____

8 CASING: [ ] Black [X] Threaded [ ] Galv. [ ] Welded [ ] Plastic [ ] _____ HEIGHT: Above/Below Surface _____ ft. Drive Shoe? Yes ___ No ___

2 in. to 67 ft. Weight 3.653 lbs./ft. HOLE DIAM. 1¼ in. to ___ ft.

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

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

9 SCREEN: Make Johnson Type Stainless Steel Slot/Gauge 10 Length _____ Set between _____ ft. and _____ ft. Or open hole from 65 ft. to 75 ft. FITTINGS

10 STATIC WATER LEVEL: 41 ft. [ ] Above [X] Below land surface. Date Measured 11/27/90

11 PUMPING LEVEL (below land surface): _____ ft. after _____ hrs. pumping _____ gpm; _____ ft. after _____ hrs. pumping _____ gpm

12 HEAD WELL COMPLETION: [ ] Pitless adapter manufacturer _____ Model _____ [ ] Pitless casing protection _____ [X] At least 12" above ground

13 WELL GROUTED? [ ] Yes [ ] No: [ ] Neat Cement [ ] Bentonite [ ] _____ Grout material _____ From _____ To _____ ft. cu. yds.

14 NEAREST SOURCES OF POSSIBLE CONTAMINATION: _____ feet _____ direction _____ type. Well disinfected upon completion? [ ] Yes [ ] No

15 PUMP: Date installed _____ [ ] Not installed. Manufacturer's name _____ Model number _____ HP _____ Volts _____ Length of drop pipe _____ ft. Capacity _____ gpm. Material of drop pipe _____ Type: [ ] Submersible [ ] L.S. Turbine [ ] Reciprocating [ ] Jet [ ] Centrifugal [ ] _____

16 ABANDONED WELLS: Unused well on property? [ ] Yes [ ] No. Sealed [ ] Permanent [ ] Temporarily [ ] Not sealed

17 REMARKS, ELEVATION, SOURCE OF DATA, etc.: **Map Code D-257**

Rocks(took Water)
Rocky

18 WATER WELL CONTRACTOR CERTIFICATION

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

E.H. Renner & Sons,Inc. 71015
License Business Name — License No.

Address: 15668 Jarvis St,N.W. Elk River,Mn. 55330

Signed _____ Date _____
Authorized Representative

Robert Schaffer Date 11/27/90
Name of Driller

WATER WELL CONTRACTOR COPY

462928

5/74 3081
7/78 Wat

E. H. Renner & Sons

WELL DRILLING FOR FOUR GENERATIONS
15688 Jarvis Street N.W., Elk River, MN 55330
(612) 427-6100 Fax: (612) 427-0533

Equal Opportunity Employer

WELL LOG

MAPCODE D-258

Date Started 11/15/90 19 90 Date Completed 11/21/90 19 90

Owner or Contractor City of St.Louis Park/ENSR Address 5005 Mtka.Blvd. St.Louis Park,Mn. 55416

Job Location North Frontage Road of Hwy # 7,West of Walker St.

City St.Louis Park County Hennepin State of Minnesota

Well: 310 (Cable Tool) 22-W Rotary Driller: Erwin Klavu

Cased with: 2 inch ____ PE X T&C 62'6" Ft. Total Depth of Well 70 Ft. from grade
____ inch ____ PE ____ T&C ____ Ft. 2ft.6in. stickup
____ inch ____ PE ____ T&C ____ Ft.

Set of Open Hole ____ Finished in Sand-Gravel Static Water Level 47 Ft.

Tested at ____ gallons per min. Drawn down of ____ feet.
Tested at ____ gallons per min. Drawn down of ____ feet.

Screen:
Size 2in. dia. 10 ft. Make Howard Smith S.S. Slot 10

Leader: N/A
Size ____ dia. ____ ft. ____ Material ____ Fittings

Pump: NONE
Make ____ Model ____ HP. ____ Volts ____ Phase Type ____ Tank ____

Motor Serial No. ____ Pump Serial No. ____ Drop Pipe ____ feet

Size ____ Capacity of Pump ____ G.P.M. AT ____ T.D.H Date Installed ____

side ____ ft. Outside ____ ft.

Pitless Adapter: Make ____ Offset Material ____ Size ____ inch

Kind of Formation	Color of Formation	Started Depth	Ended Depth	Total Thickness of Formation	Remarks
Course Gravel	Brown	0	28	28	
Course Sand-Gravel	Brown	28	51	23	
Clay-Sand	Gray	51	60	9	
Course-Sand-Gravel	Gray	60	70	10	Drill Well 6 in.
					Set 2in.10ft. Screen
					62'6" 2in. Pull all
					6in. Casing Out

WATER WELL RECORD — Minnesota Statutes 156A.01-.08

MINNESOTA UNIQUE WELL NO. for Water Supply: **462929**

County Name: **Hennepin**

Township Name	Township Number	Range Number	Section No.	Fraction
St.Louis Park	117 N	21 W	17	SW ¼ SE ¼ ¼

Numerical Street Address and City of Well Location or Distance from Road Intersection: **North Frontage Road of Hwy # 7, W.of Walker St.**

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

Addition Name:

Block Number:

Lot Number:

7310

1. WELL DEPTH (completed): **70** ft. — Date of Completion: **11/21/90**

5. DRILLING METHOD: ☒ Cable Tool ☐ Reverse ☐ Driven ☐ Dug ☐ Hollow Rod ☐ Air ☐ Bored ☐ ____ ☐ Rotary ☐ Jetted ☐ Power Auger

6. DRILLING FLUID: **Water**

7. USE: ☐ Domestic ☒ Monitoring ☐ Heat Pump ☐ Irrigation ☐ Public ☐ Industry ☐ Test Well ☐ Municipal ☐ Commercial ☐ Air Conditioning ☐ ____

8. CASING: ☐ Black ☐ Threaded ☐ Galv. ☐ Welded ☐ Plastic ☐ — HEIGHT Above/Below Surface: **2'6" stickup** — Drive Shoe? Yes ___ No ___

2 in. to **60'** ft. — Weight **3.653** lbs./ft. — HOLE DIAM. ___ in. to ___ ft.

___ in. to ___ ft. — Weight ___ lbs./ft. — ___ in. to ___ ft.

___ in. to ___ ft. — Weight ___ lbs./ft. — ___ in. to ___ ft.

9. SCREEN: Make **Howard Smith** — Or open hole from **60** ft. to **70** ft.

Type **Stainless Steel** — Diam. ___

Slot/Gauge **10** — Length ___ — FITTINGS:

Set between ___ ft. and ___ ft.

10. STATIC WATER LEVEL: **67** ft. ☐ Below ☐ Above land surface — Date Measured **11/21/90**

11. PUMPING LEVEL (below land surface)

___ ft. after ___ hrs. pumping ___ gpm.

___ ft. after ___ hrs. pumping ___ gpm.

12. HEAD WELL COMPLETION: ☐ Pitless adapter manufacturer ___ Model ___ ☐ Basement slab ☒ At least 12" above ground ☐ Plastic casing protection ___

13. WELL GROUTED? ☐ Yes ☐ No

☐ Neat Cement ☐ Bentonite ☐ ____

Grout material ___ from ___ ft. to ___ ft. cu. yds. ___

14. NEAREST SOURCES OF POSSIBLE CONTAMINATION

___ feet ___ direction ___

Well disinfected upon completion? ☐ Yes ☐ No

15. PUMP

Date installed ___ ☐ Not installed

Manufacturer's name ___

Model number ___ HP ___ Volts ___

Length of drop pipe ___ ft. Capacity ___ g.p.m.

Material of drop pipe ___

Type: ☐ Submersible ☐ L.S. Turbine ☐ Reciprocating ☐ Jet ☐ Centrifugal ☐ ____

16. ABANDONED WELLS

Unused well on property? ☐ Yes ☐ No

Sealed ☐ Permanent ☐ Temporary ☐ Not sealed

3. FORMATION LOG	COLOR	HARDNESS OR FORMATION	FROM	TO
Course Gravel	Brown		0	28
Course SandpGravel	Brown		28	51
Clay-Sand	Gray		51	60
Course-Sand-Gravel	Gray		60	70

Use a second sheet, if needed

2. PROPERTY OWNER'S NAME: **City of St.Louis Park**

Mailing Address if different than property address indicated above: **5005 Mcka.Blvd. St.Louis Park,Mn. 55426**

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

Map Code D-258

Drill Well 6 in
Set 2in. 10ft. Screen
62'6" 2 in. Pull All
6in. Casing Out

18. WATER WELL CONTRACTOR CERTIFICATION

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

R.H. Renner & Sons Inc. 71015
Licensee Business Name — License No.

Address 15688 Jarvis St. Elk River,Mn. 55330

Signed ___ Date ___
Authorized Representative

Erwin Klavs — Date 11/21/90
Name of Driller

WATER WELL CONTRACTOR COPY

462929

8/74 30M
7/78 30M

E. H. Renner & Sons

WELL DRILLING FOR FOUR GENERATIONS
15688 Jarvis Street N.W., Elk River, MN 55330
(612) 427-6100 Fax: (612) 427-0533

Equal Opportunity Employer

WELL LOG

MAPCODE D-261

Date Started 11/5/90 19 90 Date Completed 11/12/90 19 90

Owner or Contractor St.Louis Park/ENSR Address 5005 Mtka.Blvd. St.Louis Park,mn. 55416

Job Location Oxford Street between Alabama & Brunswick

City St.Louis Park County Hennepin State of Minnesota

Well: 311 (Cable Tool) Rotary Driller: Randy Klavu

Cased with: 2 inch PE X T&C 69' Ft. Total Depth of Well 77' Ft. from grade
inch PE T&C Ft.
inch PE T&C Ft.

Feet of Open Hole — Finished in SAND & GRAVEL Static Water Level 37' Ft.

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

Screen:
Size 2" dia. 10' ft. Make Howard Smith Slot 10

Leader:
Size 2" dia. 69' ft. Black Material Fittings

Pump:
Make Model HP. Volts Phase Type Tank

Motor Serial No. Pump Serial No. Drop Pipe feet

Size Capacity of Pump G.P.M. AT T.D.H Date Installed

Inside ft. Outside ft.

Pitless Adapter: Make Offset Material Size inch

Kind of Formation	Color of Formation	Started Depth	Ended Depth	Total Thickness of Formation	Remarks
Gravel	Brown	0	12	12	
Boulder	Brown	12	14	2	
Gravel	Brown	14	27	13	
Sand-Gravel	Brown	27	47	20	
Clay-Gravel	Brownish Gray	47	57	10	
Sand-Gravel	Brown	57	64	7	
Clay-Sand-Gravel	Gray	64	67	3	
Sand-Gravel	Gray	67	77	10	

WATER WELL RECORD

Minnesota Statutes 156A.01 thg

MINNESOTA UNIQUE WELL NO. for Water Sample: **462931**

1. LOCATION OF WELL

County Name: **Hennepin**

Township Name	Township Number	Range Number	Section No.	Fraction
St.Louis Park	117 N	21 W	16	SW ¼ SW ¼ ¼

Numerical Street Address and City of Well Location or Distance from Road Intersection: **6120 W. 36th St.**

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

Addition Name:

Block Number:

Lot Number:

2. PROPERTY OWNER'S NAME: **City of St.Louis Park**

Mailing Address if different than property address indicated above: **5005 Mtka. Blvd. St.Louis Park,Mn. 55416**

3. FORMATION LOG	COLOR	HARDNESS OF FORMATION	FROM	TO
Sand & Gravel	Brown		0	10
Gravel	Brown		10	40
Gravel-Clay Layers	Gray		40	68
Sand-Gravel	Gray		68	80

Use a second sheet, if needed

4. WELL DEPTH (completed): 71 ft. Date of Completion: 11/20/90

5. DRILLING METHOD: ☒ Cabled ☐ Reverse ☐ Driven ☐ Dug ☐ Hollow Rod ☐ Air ☐ Bored ☐ _____ ☐ Rotary ☐ Jetted ☐ Power Auger

6. DRILLING FLUID: Water

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

8. CASING: ☐ Black ☐ Threaded ☐ Galv ☐ Welded ☐ Plastic ☐ HEIGHT: Above/Below Surface 1' stickup. Drive Shoe? Yes ___ No ___

HOLE DIAM.

2 in. to 61 ft. Weight 3.653 lbs./ft. ___ in. to ___ ft.

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

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

9. SCREEN: Or open hole from 61 ft. to 71 ft.

Make: NONE

Type ___ Diam. ___

Slot/Gauge ___ Length ___ FITTINGS

Set between ___ ft. and ___ ft.

10. STATIC WATER LEVEL: 40 ft. ☐ Below ☒ Above Land surface. Date Measured 11/20/90

11. PUMPING LEVEL (below land surface)

___ ft. after ___ hrs. pumping ___ g.p.m.

___ ft. after ___ hrs. pumping ___ g.p.m.

12. HEAD WELL COMPLETION

☐ Pitless adapter manufacturer ___ Model ___

☐ Basement offset ☒ At least 12" above ground

☐ Plastic casing protection ___

13. WELL GROUTED? ☐ Yes ☐ No

☐ Neat Cement ☐ Bentonite ☐ ___

Grout material ___ From ___ ft. to ___ ft. cu. yds. ___

14. NEAREST SOURCES OF POSSIBLE CONTAMINATION

___ feet ___ direction ___ type

Well disinfected upon completion? ☐ Yes ☐ No

15. PUMP

Date installed ___ ☐ Not installed

Manufacturer's name ___

Model number ___ HP ___ Volts ___

Length of drop pipe ___ ft. Capacity ___ g.p.m.

Material of drop pipe ___

Type: ☐ Submersible ☐ L.S. Turbine ☐ Reciprocating ☐ Jet ☐ Centrifugal ☐ ___

16. ABANDONED WELLS

Unused well on property? ☐ Yes ☐ No

Sealed ☐ Permanent ☐ Temporary ☐ Not sealed

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

Map Code D0259

Boulder 6'-8'
Real Rocky-Took alot of Water
Boulder 14'-16'
Rocky-Clay Layers 40'-534

18. WATER WELL CONTRACTOR CERTIFICATION

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

E.H.Renner & Sons,Inc. 71015
Licensee Business Name License No.

Address 15688 Jarvis St. N.W. Elk River,Mn. 553

Signed ___ Date ___
Authorized Representative

Robert Schaffer Date 11/20/90
Name of Driller

WATER WELL 462931

E. H. Renner & Sons

WELL DRILLING FOR FOUR GENERATIONS
15688 Jarvis Street N.W., Elk River, MN 55330
(612) 427-6100 Fax: (612) 427-0533

Equal Opportunity Employer

WELL LOG

MAPCODE D-260

Date Started 11/13/90 19 90 Date Completed 11/16/90 19 90

Owner or Contractor St.Louis Park/ENSR Address 5005 Mtka.Blvd. St.Louis Park,Mn. 55416

Job Location Jorvig Park

City St.Louis Park County Hennepin State of Minnesota

Well: 312 (Cable Tool) Rotary Driller: Randy Klavu

Cased with: 2" inch PE X T&C 77' Ft. Total Depth of Well 85' Ft. from grade
inch PE T&C Ft. 2' stickup
inch PE T&C Ft.

Feet of Open Hole Finished in Static Water Level 38' Ft.

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

Screen:
Size 2" dia. 10 ft. Make Howard Smith Slot 10

Leader:
Size dia. ft. Material Fittings

Pump:
Make Model HP. Volts Phase Type Tank

Motor Serial No. Pump Serial No. Drop Pipe feet

Size Capacity of Pump G.P.M. AT T.D.H Date Installed

Inside ft. Outside ft.

Pitless Adapter: Make Offset Material Size inch

Kind of Formation	Color of Formation	Started Depth	Ended Depth	Total Thickness of Formation	Remarks
Clay-Gravel	Blk/Brn	0	8	8	
Gravel	Brown	8	17	9	
Boulder	Brown	17	19	2	
Gravel & Sand	Brown	19	53	34	
Gravel & Sand	Brn/Gray	53	60	7	
Sand-Gravel-Clay	Brn/Gray	60	65	5	
Silty Clay	Gray	65	79	14	
Sand- Gravel Little Clay	Gray	79	85	6	Hit Creosote at 79' Smelled when we bailed 79' to 8

Hennepin

462932

Township Name	Township Number	Range Number	Section No.	Fraction
St. Louis Park	117 N/S	21 E/W	16	SW ¼ SW ¼

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

Jorvig Park 0512

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

Sketch map of well location.

Addition Name

Block Number

Lot Number

1 mile

½ mile

1. WELL DEPTH (completed) 85 ft. Date of Completion 11/16/90

5. DRILLING METHOD: ☒ Cable Tool ☐ Reverse ☐ Driven ☐ Dug ☐ Hollow Rod ☐ Air ☐ Bored ☐ ____ ☐ Rotary ☐ Jetted ☐ Power Auger

6. DRILLING FLUID: Water

7. USE: ☐ Domestic ☐ Irrigation ☐ Test Well ☒ Monitoring ☐ Public ☐ Municipal ☐ Air Conditioning ☐ Heat Pump ☐ Industry ☐ Commercial ☐ ____

8. CASING: ☐ Black ☐ Galv. ☐ Plastic ☐ Threaded ☐ Welded ☐ ____ HEIGHT: Above/Below Surface 2" stickup. Drive Shoe? Yes ___ No ___

2 in. to 75 ft. Weight 3.653 lbs./ft. HOLE DIAM. 4 in. to ___ ft.

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

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

2. PROPERTY OWNER'S NAME: St. Louis Park/EMSR

Mailing Address if different than property address indicated above: 5005 Mtka. Blvd. St. Louis Park, Mn. 55416

3. FORMATION LOG	COLOR	HARDNESS OF FORMATION	FROM	TO
Clay-Gravel	Blk/Brn		0	8
Gravel	Brown		8	17
Boulder	Brown		17	19
Gravel & Sand	Brown		19	53
Gravel & Sand	Brn/Gray		53	60
Silty-Gravel-Clay	Brn/Gray		60	65
Silty Clay	Gray		65	79
Sand-Gravel (little clay)	Gray		79	85

Use a second sheet, if needed

9. SCREEN: Make Howard Smith. Or open hole from 75 ft. to 85 ft. Type ___ Diam. ___ Slot/Gauge 10 Length ___ FITTINGS: ___ Set between ___ ft. and ___ ft.

10. STATIC WATER LEVEL 38 ft. ☐ Below ☒ Above land surface. Date Measured 11/16/90

11. PUMPING LEVEL (below land surface): ___ ft. after ___ hrs. pumping ___ gpm; ___ ft. after ___ hrs. pumping ___ gpm

12. WELL COMPLETION: ☐ Pitless adapter manufacturer ___ Model ___ ☐ Basement offset ☒ At least 12" above ground ☐ Plastic casing protection ___

13. WELL GROUTED? ☐ Yes ☐ No. ☐ Neat Cement ☐ Bentonite ☐ ____. Grout material ___ From ___ ft. to ___ ft. No. yds. ___

14. NEAREST SOURCES OF POSSIBLE CONTAMINATION: ___ feet ___ direction ___ type. Well disinfected upon completion? ☐ Yes ☐ No

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

16. ABANDONED WELLS: Unused well on property? ☐ Yes ☐ No. Sealed ☐ Permanent ☐ Temporary ☐ Not sealed

17. REMARKS, ELEVATION, SOURCE OF DATA, etc. Map Code D-260

Hit Creasote at 79'

Smelled when we bailed 79' to 85'

18. WATER WELL CONTRACTOR CERTIFICATION

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

E.H. Renner & Sons, Inc. 71015
Licensee Business Name — License No.

Address 15688 Jarvis St. N.W. Elk River, Mn. 553

Signed ___ Date ___
Authorized Representative

Randy Klavu Date 11/16/90
Name of Driller

WATER WELL CONTRACTOR COPY

462932

JUN-25-1991 11:10 FROM TO ENSR P.09

E. H. Renner & Sons

WELL DRILLING FOR FOUR GENERATIONS
15688 Jarvis Street N.W., Elk River, MN 55330
(612) 427-6100 Fax: (612) 427-0533

Equal Opportunity Employer

WELL LOG

MAPCODE D-259

Date Started 11/19/90 19 90 Date Completed 11/20/90 19 90

Owner or Contractor City of St.Louis Park/ENSR Address 5005 Mtka. Blvd. St.Louis Park,Mn. 55416

Job Location 6120 W. 36th St.

City St.Louis Park County Hennepin State of Minnesota

Well: 313 Cable Tool Speedstar Rotary Driller: Rob Schaffer

Cased with: 2 inch ____ PE X T&C 62 Ft. Total Depth of Well 71 Ft. from grade
____ inch ____ PE ____ T&C ____ Ft.
____ inch ____ PE ____ T&C ____ Ft. 1' stickup

Feet of Open Hole ____ Finished in Sand & Gravel Static Water Level 40 Ft.

Tested at ____ gallons per min. Drawn down of ____ feet.
Tested at ____ gallons per min. Drawn down of ____ feet.

Screen:
Size 2 dia. 10 ft. Make Johnson Slot 10

Leader:
Size ____ dia. ____ ft. ____ Material ____ Fittings

Pump:
Make ____ Model ____ HP. ____ Volts ____ Phase Type ____ Tank ____

Motor Serial No. ____ Pump Serial No. ____ Drop Pipe ____ feet

____ Capacity of Pump ____ G.P.M. AT ____ T.D.H Date Installed ____

Inside ____ ft. Outside ____ ft.

Pitless Adapter: Make ____ Offset Material ____ Size ____ inch

Kind of Formation	Color of Formation	Started Depth	Ended Depth	Total Thickness of Formation	Remarks
Sand & Gravel	Brown	0	10	10	Boulder 6'-8' Real Rocky-took alot of Water
Gravel	Gray	10	40	30	Boulder 14-16 Boulder 37-39
Gravel-Clay-Layers	Gray	40	68	28	Rocky-Clay Layers 40'-55'
Sand-Gravel	Gray	68	80	12	Took Water(Rocks)

WATER WELL RECORD

Minnesota Statutes 1986 Ch 103I

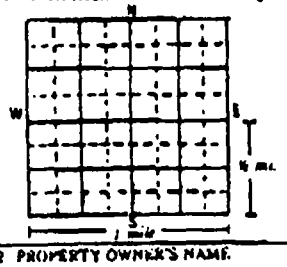
MINNESOTA UNIQUE WELL NO. for Water Supply: **462934**

County Name: **Hennepin**

Township Name: **St.Louis Park** | Township Number: **117** N | Range Number: **21** W | Section No.: **16** | Fraction: **SW** ¼ **SW** ¼ ¼

Numerical Street Address and City of Well Location or Distance from Road Intersection: **Oxford Street between Alabama & Brunswick** P313

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



Addition Name:

Block Number:

Lot Number:

4. WELL DEPTH (completed): **77'** ft. | Date of Completion: **11/12/90**

5. DRILLING METHOD: [X] Cable Tool [ ] Reverse [ ] Driven [ ] Dug [ ] Hollow Rod [ ] Air [ ] Bored [ ] _____ [ ] Rotary [ ] Jetted [ ] Power Auger

6. DRILLING FLUID: **Water**

7. USE: [ ] Domestic [X] Monitoring [ ] Heat Pump [ ] Irrigation [ ] Public [ ] Industry [ ] Test Well [ ] Municipal [ ] Commercial [ ] Air Conditioning [ ] _____

8. CASING: [ ] Black [ ] Threaded [ ] Galv. [ ] Welded [ ] Plastic [ ]

HEIGHT: Above/Below Surface **2" stickup**. Drive Shoe? Yes ___ No ___

2 in. to **67** ft. Weight **3.653** lbs/ft.

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

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

HOLE DIAM. 1 in. to ___ ft. ___ in. to ___ ft. ___ in. to ___ ft.

9. SCREEN: Make **Howard Smith** Or open hole from **65** ft. to **77** ft.

Type ___ Diam. ___

Slot/Gauge **10** Length ___ FITTINGS

Set between ___ ft. and ___ ft.

10. STATIC WATER LEVEL: **77'** ft. [ ] Below [ ] Above land surface. Date Measured **11/12/90**

11. PUMPING LEVEL (below land surface)

___ ft. after ___ hrs. pumping ___ g.p.m.

___ ft. after ___ hrs. pumping ___ g.p.m.

12. HEAD WELL COMPLETION

[ ] Pitless adapter manufacturer ___ Model ___

[ ] Basement offset [X] At least 12" above ground

[ ] Plastic casing protector ___

13. WELL GROUTED? [ ] Yes [ ] No

[ ] Neat Cement [ ] Bentonite [ ] _____

Grout material ___ from ___ ft. to ___ ft. cu. yds. ___

14. NEAREST SOURCES OF POSSIBLE CONTAMINATION

___ feet ___ direction ___

Well disinfected upon completion? [ ] Yes [ ] No

15. PUMP

Date installed ___ [ ] Not installed

Manufacturer's name ___

Model number ___ HP ___ Volts ___

Length of drop pipe ___ ft. Capacity ___ g.p.m.

Material of drop pipe ___

Type [ ] Submersible [ ] L.S. Turbine [ ] Reciprocating [ ] Jet [ ] Centrifugal [ ] _____

16. ABANDONED WELLS

Unused well on property? [ ] Yes [ ] No

Sealed [ ] Permanent [ ] Temporary [ ] Not sealed

2. PROPERTY OWNER'S NAME: **City of St.Louis Park RMSR**

Mailing Address if different than property address indicated above: **5005 Mcka.Blvd. St.Louis Park,MN. 55416**

3. FORMATION LOG	COLOR	HARDNESS OF FORMATION	FROM	TO
Gravel	Brown		0	12
Boulder	Brown		12	14
Gravel	Brown		14	22
Sand-Gravel	Brown		27	47
Clay-Gravel	Brownish Gray		47	57
Sand-Gravel	Brown		57	64
Clay-Band-Gravel	Gray		64	67
Sand-Gravel	Gray		67	77

Use a second sheet, if needed

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

Map Code D-261

18. WATER WELL CONTRACTOR CERTIFICATION

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

E.H. Renner & Sons, Inc. Licensee Business Name: **71015** License No.

Address: **15688 Jarvis St. N.W. Elk River, Mn. 553**

Signed ___ Date ___ Authorized Representative

Randy Klavs Name of Driller Date: **11/12/90**

WATER WELL CONTRACTOR COPY

462934

9/74 30M
7/76 30M

E. H. Renner & Sons

WELL DRILLING FOR FOUR GENERATIONS
15688 Jarvis Street N.W., Elk River, MN 55330
(612) 427-6100 Fax: (612) 427-0533

Equal Opportunity Employer

WELL LOG

MAPCODE D- 261

Date Started 10/29/90 19 90 Date Completed 11/13/90 19 90

Owner or Contractor City of St.Louis Park Address 5005 Mtka.Blvd. St.Louis Park,Mn. 55416

Job Location Oxford St. between Alabama & Brunswick

City St.Louis Park County Hennepin State of Minnesota

Well: 431 Cable Tool 22-W Rotary Driller: Erwin Klavu

Cased with: 4 inch ____ PE X T&C 107 Ft. Total Depth of Well 114 Ft. from grade
____ inch ____ PE ____ T&C ____ Ft. 2'6" stickup
____ inch ____ PE ____ T&C ____ Ft.

Feet of Open Hole 0 Finished in Broken Platteville Static Water Level 47 Ft.

Tested at 5 gallons per min. Drawn down of 33 feet.
Tested at ____ gallons per min. Drawn down of ____ feet.

Screen:
Size 2in. dia. 8 ft. Make Johnson Slot 6 slot

Leader:
Size 2in. dia. 3 ft. Black Pipe Material 1-Coupling-Lead Packers 1-2X3 Bushing Fittings

Pump:
Make ____ Model ____ HP. ____ Volts ____ Phase Type ____ Tank ____

Motor Serial No. ____ Pump Serial No. ____ Drop Pipe ____ feet

Size ____ Capacity of Pump ____ G.P.M. AT ____ T.D.H Date Installed ____

.side ____ ft. Outside ____ ft.

Pitless Adapter: Make ____ Offset Material ____ Size ____ inch

Kind of Formation	Color of Formation	Started Depth	Ended Depth	Total Thickness of Formation	Remarks
Soil	Black	0	3	3	
Gravel	"	3	15	12	
Gravel & Coblers	Brown	15	20	5	Very Hard
Course-Sand-Gravel	"	20	32	12	
Course-Sand	"	32	55	23	
Sand & Clay	"	55	66	11	
Sand Course	"	66	71	6	
Course-Sand-Clay	"	71	88	17	Hole would not stay open
Course Sand	Brown	88	97	9	Weathered Limestone Grey

462935

WATER WELL RECORD
Minnesota Statutes 156A.01-.08

County Name: Hennepin

Township Name	Township Number	Range Number	Section No.	Fraction
St.Louis Park	117 N	21 W	16	SW SW

Numerical Street Address and City of Well Location or Distance from Road Intersection: 4931 Oxford St. Between Alabama &

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

Addition Name / Block Number / Lot Number

2. PROPERTY OWNER'S NAME: City of St.Louis Park

Mailing Address if different than property address indicated above: 5005 Mtka. Blvd. St.Louis Park, Mn. 55416

3. FORMATION LOG	COLOR	HARDNESS OF FORMATION	FROM	TO
Soil	Black		0	3
Gravel	Black		3	15
Gravel & Coblers	Brown		15	20
Course Sand Gravel	Brown		20	32
Course Sand	Brown		32	55
Sand & Clay	Brown		55	66
Sand Course	Brown		66	71
Course Sand Clay	Brown		71	88
Course Sand	Brown		88	97
Sand Med	Grey		97	100

(Use a second sheet, if needed)

4. WELL DEPTH (completed): 114 ft. Date of Completion: 11/13/90

5. DRILLING METHOD: ☒ Cable Tool ☐ Reverse ☐ Driven ☐ Dug ☐ Hollow Rod ☐ Air ☐ Bored ☐ ☐ Rotary ☐ Jetted ☐ Power Auger

6. DRILLING FLUID: Water

7. USE: ☐ Domestic ☐ Irrigation ☐ Test Well ☒ Monitoring ☐ Public ☐ Municipal ☐ Air Conditioning ☐ Heat Pump ☐ Industry ☐ Commercial ☐

8. CASING: ☐ Black ☐ Galv ☐ Plastic ☐ Threaded ☐ Welded ☐
HEIGHT: Above/Below Surface 2' 0" ft. Drive Shoe? Yes ___ No ___
6 in. to 107 ft. Weight 10.79 lbs./ft.
HOLE DIAM.

9. SCREEN: Make None Type ___ Diam. ___ Slot/Gauze ___ Length ___ Set between ___ ft. and ___ ft. FITTINGS
Or open hole from 106 ft. to 114 ft.

10. STATIC WATER LEVEL: 47 ft. ☐ below ☐ above land surface. Date Measured 11/13/90

11. PUMPING LEVEL (below land surface): ___ ft. after ___ hrs. pumping ___ g.p.m.

12. HEAD WELL COMPLETION: ☐ Pitless adapter manufacturer ___ Model ___ ☐ Basement offset ☐ At least 12" above ground ☐ Plastic casing protection

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

14. NEAREST SOURCES OF POSSIBLE CONTAMINATION: ___ feet ___ direction ___
Well disinfected upon completion? ☐ Yes ☐ No

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

16. ABANDONED WELLS: Unused well on property? ☐ Yes ☐ No
Sealed ☐ Permanent ☐ Temporary ☐ Not sealed

17. REMARKS, ELEVATION, SOURCE OF DATA, etc.
MaHapoCoda-26261
Waryd Hard
Hole would not stay open
Weathered Limestone-Grey
100 to 114

18. WATER WELL CONTRACTOR CERTIFICATION
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
E.H. Renner & Sons, Inc. 71015
License Business Name / License No.
Address 15688 Jarvis St. N.W. Elk River, Mn. 55330
Signed ___ Authorized Representative Date ___
Kevin Jayu
Name of Driller Date ___

WATER WELL CONTRACTOR COPY 462935

JUN-25-1991 11:06 FROM TO ENSR P.03

E. H. Renner & Sons

WELL DRILLING FOR FOUR GENERATIONS
15688 Jarvis Street N.W., Elk River, MN 55330
(612) 427-6100 Fax: (612) 427-0533

Equal Opportunity Employer

WELL LOG

MAPCODE D-259

DateStarted 10/26/90 19 90 Date Completed 11/01/90 19 90

Owner or Contractor City of St. Louis Park Address 5005 Mtka Blvd. St.Louis Park,Mn. 55416

Job Location Suburan Plumbing-- 6120 W. 36th St. and 6325 State Hwy #7

City St. Louis Park County Hennepin State of Minnesota

Well: 432 (Cable Tool) 22-W Rotary Driller: Randy Klavu

Cased with: 4 inch X (PE) T&C 99 Ft. Total Depth of Well 109 Ft. from grade
_____ inch _____ PE _____ T&C _____ Ft. includes 2'6" stickup
_____ inch _____ PE _____ T&C _____ Ft.

Feet of Open Hole ~~13~~ 12 5 Finished in Limestone Static Water Level 41'7" Ft.

Tested at _____ gallons per min. Drawn down of _____ feet.
Tested at _____ gallons per min. Drawn down of _____ feet.

Screen:
Size _____ dia. _____ ft. Make _____ Slot _____

Leader:
Size _____ dia. _____ ft. _____ Material _____ Fittings

Pump:
Make _____ Model _____ HP. _____ Volts _____ Phase Type _____ Tank _____

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

Size _____ Capacity of Pump _____ G.P.M. AT _____ T.D.H Date Installed _____

nside _____ ft. Outside _____ ft.

Pitless Adapter: Make _____ Offset Material _____ Size _____ inch

Kind of Formation	Color of Formation	Started Depth	Ended Depth	Total Thickness of Formation	Remarks
Gravel	Brown	0	14	14	
Course Sand	Brown	14	31	17	
Sand-Gravel	Brown	31	40	9	
Gravel	Brown	40	43	3	
Boulder	Brown	43	45	2	
Gravel	Brown	45	49	4	
Sand-Gravel	Brown	49	59	10	
Sand-Gravel-Clay	Grey	59	82	23	
Gravel-Clay	Grey	82	96	14	

WATER WELL RECORD

Minnesota Statutes 156A.01 to .08

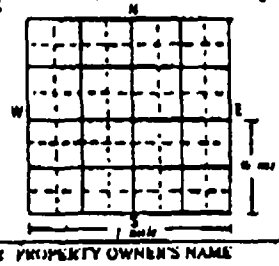
MINNESOTA UNIQUE WELL NO. for Water Supply: **462930**

County Name: **Hennepin**

Township Name	Township Number	Range Number	Section No.	Fraction
St.Louis Park	117 N	21 W	16	SW SW

Numerical Street Address and City of Well Location or Distance from Road Intersection: **Suburban Plumbing-6120 W. 36th St.** 3432

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



Addition Name:

Block Number:

Lot Number:

2 PROPERTY OWNER'S NAME: **City of St.Louis Park**

Mailing Address if different than property address indicated above: **5005 Mtka. Blvd. St.Louis Park,Mn. 55416**

3. FORMATION LOG	COLOR	HARDNESS OF FORMATION	FROM	TO
Gravel	Brown		0	14
Course Sand	Brown		14	31
Sand-Gravel	Brown		31	40
Gravel	Brown		40	43
Boulder	Brown		43	45
Gravel	Brown		45	49
Sand-Gravel	Brown		49	59
Sand-Gravel-Clay	Grey		59	82
Gravel-Clay	Grey		82	96
Limestone	Grey		96	109

Use a second sheet, if needed

4 WELL DEPTH (completed): **109** ft. Date of Completion: **11/01/90**

5 DRILLING METHOD: [X] Cable Tool [ ] Reverse [ ] Driven [ ] Dug [ ] Hollow Rod [ ] Air [ ] Bored [ ] _____ [ ] Rotary [ ] Jetted [ ] Power Auger

6 DRILLING FLUID: **Water**

7 USE: [ ] Domestic [ ] Irrigation [ ] Test Well [X] Monitoring [ ] Public [ ] Municipal [ ] Air Conditioning [ ] Heat Pump [ ] Industry [ ] Commercial [ ] _____

8 CASING: [ ] Black [ ] Threaded [ ] Calv [ ] Welded [ ] Plastic [ ]

HEIGHT: Above/Below Surface 2'6" ft. Drive Shoe? Yes ___ No ___

HOLE DIAM

4 in. to 96 ft. Weight 10.79 lbs./ft. ___ in. to ___ ft.

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

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

9 SCREEN: Or open hole from 96 ft. to 109 ft.

Make NONE

Type ___ Diam. ___

Slot Gauge ___ Length ___ FITTINGS

Set between ___ ft. and ___ ft.

10 STATIC WATER LEVEL: 41.88 ft. [ ] Below [ ] Above land surface. Date Measured 11/01/90

11 PUMPING LEVEL (below land surface)

___ ft. after ___ hrs. pumping ___ g.p.m.

___ ft. after ___ hrs. pumping ___ g.p.m.

12 HEAD WELL COMPLETION

[ ] Pitless adapter manufacturer ___ Model ___

[ ] Basement inlet [X] At least 12" above ground

[ ] Plastic casing protection ___

13 WELL GROUTED? [ ] Yes [X] No

[ ] Neat Cement [ ] Bentonite [ ] ___

Grout material ___ from ___ to ___ ft. cu. yds ___

14 NEAREST SOURCES OF POSSIBLE CONTAMINATION

___ feet ___ direction ___ type

Well disinfected upon completion? [ ] Yes [X] No

15 PUMP

Date installed ___ [ ] Not installed

Manufacturer's name ___

Model number ___ HP ___ Volts ___

Length of drop pipe ___ ft. Capacity ___ g.p.m.

Material of drop pipe ___

Type: [ ] Submersible [ ] L.S. Turbine [ ] Reciprocating [ ] Jet [ ] Centrifugal [ ] ___

16 ABANDONED WELLS

Unused well on property? [ ] Yes [X] No

Sealed [ ] Permanent [ ] Temporary [ ] Not sealed

17 REMARKS, ELEVATION, SOURCE OF DATA, etc.

Hard

18 WATER WELL CONTRACTOR CERTIFICATION

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

E.H. Renner & Sons, Inc. 71015
Licensed Business Name — License No.

Address 15688 Jarvis St.N.W. Elk River,Mn. 5533

Signed ___ Date 12/16/90
Authorized Representative

Randy Klave ___ Date 11/01/90
Name of Driller

WATER WELL CONTRACTOR'S COPY — 462930

5/76 3084
7/78 3084

E. H. Renner & Sons

WELL DRILLING FOR FOUR GENERATIONS
15588 Jarvis Street N.W., Elk River, MN 55330
(612) 427-6100 Fax: (612) 427-0533

Equal Opportunity Employer

WELL LOG

MAPCODE D-260

Date Started 10/25/90 19 90 Date Completed 11/06/90 19 90

Owner or Contractor City of St.Louis Park/ENSR Address 5005 Mtka.Blvd. St.Louis Park,Mn. 55416

Job Location Jorvig Park

City St.Louis Park County Hennepin State of Minnesota

Well: 433 Cable Tool Portadrill Rotary Driller: Dean Davidson

Cased with: 6 inch ____ PE X T&C 99 Ft. Total Depth of Well 112 Ft. from grade
____ inch ____ PE ____ T&C ____ Ft. includes 2'6" stickup
____ inch ____ PE ____ T&C ____ Ft.

Feet of Open Hole ____ Finished in Plateville Static Water Level 46'2" Ft.

Tested at ____ gallons per min. Drawn down of ____ feet.
Tested at ____ gallons per min. Drawn down of ____ feet.

Screen:
Size ____ dia. ____ ft. Make ____ Slot ____

Leader:
Size ____ dia. ____ ft. ____ Material ____ Fittings

Pump:
Make ____ Model ____ HP. ____ Volts ____ Phase Type ____ Tank ____

Motor Serial No. ____ Pump Serial No. ____ Drop Pipe ____ feet

____ Capacity of Pump ____ G.P.M. AT ____ T.D.H Date Installed ____

Inside ____ ft. Outside ____ ft.

Pitless Adapter: Make ____ Offset Material ____ Size ____ inch

Kind of Formation	Color of Formation	Started Depth	Ended Depth	Total Thickness of Formation	Remarks
Topsoil	Black	0	2	2	
Gravel & Rocks	Brown	0	20	18	
Gravel Finer	"	20	30	10	
Gravel & Rocks	Blk/Red	30	50	20	
Clay & Gravel Mix	Blk/Red Grey	50	75	25	Stoney
Clay & Gravel Mix mostly clay	Blk/Red Grey	75	85	10	
Clay & Gravel Mix	"	85	96	11	
Platteville	Greenish	96	112	16	

80'a 7e10t

WATER WELL RECORD

Minnesota Statutes 1969, 81-08

MINNESOTA UNIQUE WELL NO. for Water Supply: **462933**

County Name: **Hennepin**

Township Name	Township Number	Range Number	Section No.	Fraction
St. Louis Park	117 N	21 W	16	SW ¼ SW ¼ ¼

Numerical Street Address and City of Well Location or Distance from Road Intersection: **Jorvig Park**

1. WELL DEPTH (completed): **112** ft. — Date of Completion: **11/06/90**

5. DRILLING METHOD: **Portadrill** — ☐ Cable Tool ☐ Reverse ☐ Driven ☐ Dug ☐ Hollow Rod ☐ Air ☐ Bored ☐ ____ ☐ Rotary ☐ Jetted ☐ Power Auger

6. DRILLING FLUID: /

7. USE: ☐ Domestic ☒ Monitoring ☐ Heat Pump ☐ Irrigation ☐ Public ☐ Industry ☐ Test Well ☐ Municipal ☐ Commercial ☐ Air Conditioning ☐ ____

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

Addition Name: ____ Block Number: ____ Lot Number: ____

2. PROPERTY OWNER'S NAME: **City of St. Louis Park**

Mailing Address if different than property address indicated above: **5005 Mcka.Blvd. St.Louis Park,Mn. 55416**

8. CASING: ☐ Black ☐ Threaded ☐ Galv. ☐ Welded ☐ Plastic ☐ — HEIGHT: Above/Below Surface ____ ft. Drive Shoe? Yes ☐ No ☐

6 in. to **99** ft. Weight **18.97** lbs./ft. HOLE DIAM. ____ in. to ____ ft.

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

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

9. SCREEN: Make **MONEL** Or open hole from **96** ft. to **112** ft.

Type ____ Dia. ____ Slot/Gauge ____ Length ____ FITTINGS: ____ Set between ____ ft. and ____ ft.

10. STATIC WATER LEVEL: **46.2**[00] ft. ☐ below ☐ above land surface — Date Measured **11/06/90**

11. PUMPING LEVEL (below land surface): ____ ft. after ____ hrs. pumping ____ g.p.m. ____ ft. after ____ hrs. pumping ____ g.p.m.

12. HEAD WELL COMPLETION: ☐ Pitless adapter manufacturer ____ Model ____ ☐ Basement inlet ☒ At least 12" above ground ☐ Plastic casing protection ____

13. WELL GROUTED? ☐ Yes ☐ No: ☐ Neat Cement ☐ Bentonite ☐ ____ Grout material ____ from ____ to ____ ft. Cu. yds. ____

14. NEAREST SOURCES OF POSSIBLE CONTAMINATION: ____ feet ____ direction ____ type. Well disinfected upon completion? ☐ Yes ☐ No

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

16. ABANDONED WELLS: (Unused well on property) ☐ Yes ☐ No. Sealed ☐ Permanent ☐ Temporary ☐ Not sealed

3. FORMATION LOG	COLOR	HARDNESS OR FORMATION	FROM	TO
Topsoil	Black		0	2
Gravel & Rocks	Brown		2	20
Gravel Finer	Brown		200	30
Gravel & Rocks	Blk/Red		30	50
Clay & Gravel Mix	Blk/Red Gray		50	75
Clay & Gravel Mix	"		75	85
Clay & GravelMix	"		85	96
Platteville	Greenish		96	112

Use a second sheet, if needed

17. REMARKS, ELEVATION, SOURCE OF DATA, etc.: **Map Code D-260** **Stoney**

18. WATER WELL CONTRACTOR CERTIFICATION: This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

~~E.H. Renner & Sons, Inc.~~ 71015
License Business Name — License No.

Address: 15688 Jarvis St.N.W. Elk River,Mn. 5533

Signed: ____ Date: / /
Authorized Representative

Dean Davidson Date: **11/06/90**
Name of Driller

WATER WELL CONTRACTOR COPY — 462933

5/74 3M
7/74 3M

E. H. Renner & Sons

WELL DRILLING FOR FOUR GENERATIONS
15688 Jarvis Street N.W., Elk River, MN. 55330, (612)427-6100

WELL LOG

MAPCODE _____

Date Started APRIL 19 91 Date Completed APRIL 29 19 91

Owner or Contractor CITY OF ST.LOUIS PARK Address 5005 MINNETONKA BLVD.

Job Location JORVIG PARK

City ST.LOUIS PARK County HENNEPIN State of Minnesota

Well: 434 Cable Tool _____ Rotary Driller: VICTOR PRAUGHT

Cased with: 6 Inch _____ PE _____ T&C 99.36 Ft. Total Depth of Well 114 Ft. from grade
_____ inch _____ PE _____ T&C _____ Ft.
_____ inch _____ PE _____ T&C _____ Ft.

Feet of Open Hole _____ Finished in _____ Static Water Level _____ Ft.

Tested at _____ gallons per min. Drawn down of _____ feet.
Tested at _____ gallons per min. Drawn down of _____ feet.

Screen:
Size 5P2S dia. 15.25 ft. Make JOHNSON VEE Slot 15

Leader:
Size _____ dia. _____ ft. _____ Material _____ Fittings

Pump:
Make NONE Model _____ HP. _____ Volts _____ Phase Type _____ Tank _____

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

Size _____ Capacity of Pump _____ G.P.M. AT _____ T.D.H Date Installed _____

Inside _____ ft. Outside _____ ft.

Suction Adapter: Make _____ Offset Material _____ Size _____ inch

Kind of Formation	Color of Formation	Started Depth	Ended Depth	Total Thickness of Formation	Remarks
TOP SOIL	BLACK	0	5	5	
CLAY	BROWN	5	15	10	
GRAVEL	BROWN	15	38	23	
SILT	GRAY	38	40	2	
CLAY ROCKS	GRAY	40	45	5	
CLAY	BROWN	45	48	3	
MED. SAND	GRAY	48	65	17	
SILT	GRAY	65	80	15	
CLAY, FINE SAND	GRAY	80	95	15	
RUBBLE	GRAY, TAN	95	108	13	
SHALE, LIMESTONE	GRAY	108	112	4	
SHALE	LT.GREEN	112	114	2	

STATE OF MINNESOTA DEPARTMENT OF HEALTH

WATER WELL RECORD

Minnesota Statutes 156A.01 08

MINNESOTA UNIQUE WELL NO. for Water Samples: 463012

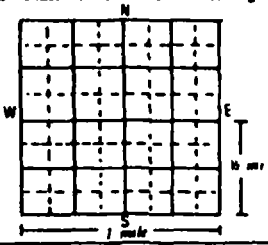
1 LOCATION OF WELL

County Name: HENNEPIN

Township Name: ST. LOUIS PK | Township Number: 117 (N/S) | Range Number: 21 (E/W) | Section No: 16 | Fraction: SW ¼ SW ¼ ¼

Numerical Street Address and City of Well Location or Distance from Road Intersection: JORVIG PARK

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



Addition Name:

Block Number:

Lot Number:

2 PROPERTY OWNER'S NAME: CITY OF ST. LOUIS PARK

Mailing Address if different than property address indicated above: 5005 MINNETONKA BLVD.

3. FORMATION LOG	COLOR	HARDNESS OF FORMATION	FROM	TO
TOP SOIL	BLACK		0	5
CLAY	BROWN		5	15
GRAVEL	BROWN		15	38
SILT	GRAY		38	40
CLAY ROCKS	GRAY		40	45
CLAY	BROWN		45	48
MED. SAND	GRAY		48	65
SILT	GRAY		65	80
CLAY, FINE SAND	GRAY		80	95
RUBBLE	GRAY, TAN		95	108
SHALE, LIMESTONE	GRAY		108	112
SHALE	LT. GREEN		112	--

Use a second sheet, if needed

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

W434

IMPORTANT: 463012

4 WELL DEPTH (completed): 114 ft | Date of Completion: APRIL 29, 1991

5 DRILLING METHOD: ☐ Cable Tool ☐ Reverse ☐ Driven ☐ Dug ☐ Hollow Rod ☐ Air ☐ Bored ☐ ____ ☐ Rotary ☐ Jetted ☐ Power Auger

6 DRILLING FLUID: BENTONITE DRILLING FLUID

7 USE: ☐ Domestic ☑ Monitoring ☐ Heat Pump ☐ Irrigation ☐ Public ☐ Industry ☐ Test Well ☐ Municipal ☐ Commercial ☐ Air Conditioning ☐ ____

8 CASING: ☑ Black ☐ Threaded ☐ Galv ☑ Welded ☐ Plastic ☐

HEIGHT: Above/Below Surface 2'9" ft. Drive Shoe? Yes ☒ No ☐

6 in. to 99.36 ft. Weight 10.79 lbs./ft.

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

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

HOLE DIAM. 12 in. to 112 ft. ____ in. to ____ ft. ____ in. to ____ ft.

9. SCREEN: Make JOHNSON VEE | Or open hole from ____ ft. to ____ ft.

Type S.S. | Diam. 6"P.B

Slot/Gauze 15 slot WR X PB | Length 15.25 FITTINGS.

Set between 97 ft. and 112 ft.

10. STATIC WATER LEVEL: ____ ft. ☑ below ☐ above land surface | Date Measured ____

11. PUMPING LEVEL (below land surface)

____ ft. after ____ hrs pumping ____ g.p.m.

____ ft. after ____ hrs pumping ____ g.p.m.

12. HEAD WELL COMPLETION

☐ Pitless adapter manufacturer ____ Model ____

☐ Basement offset ☑ At least 12" above ground

☐ Plastic casing protection ____

13. WELL GROUTED? ☑ Yes ☐ No

☑ Neat Cement ☐ Bentonite ☐ ____

Grout material Neat | from 0 to 109 ft | cu yds 24

14 NEAREST SOURCES OF POSSIBLE CONTAMINATION

____ feet ____ direction ____ type

Well disinfected upon completion? ☐ Yes ☒ No

15. PUMP

Date installed NONE ☒ Not installed

Manufacturer's name ____

Model number ____ HP ____ Volts ____

Length of drop pipe ____ ft. Capacity ____ g.p.m.

Material of drop pipe ____

Type: ☐ Submersible ☐ L.S. Turbine ☐ Reciprocating ☐ Jet ☐ Centrifugal ☐ ____

16. ABANDONED WELLS

Unused well on property? ☐ Yes ☒ No

Sealed ☐ Permanent ☐ Temporary ☐ Not sealed

18. WATER WELL CONTRACTOR CERTIFICATION

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

E.H. RENNER & SONS, INC. (License Business Name) 71015 (License No.)

Address 15688 JARVIS ST NW, ELK RIVER

Signed Roger E. Renner (Authorized Representative) Date 5-29-91

VICTOR PRAUGHT (Name of Driller) Date 5-29-91

5/74 30M

Project No: 1620-007 Client: SLP Site: St.Louis Park

WELL No: P307

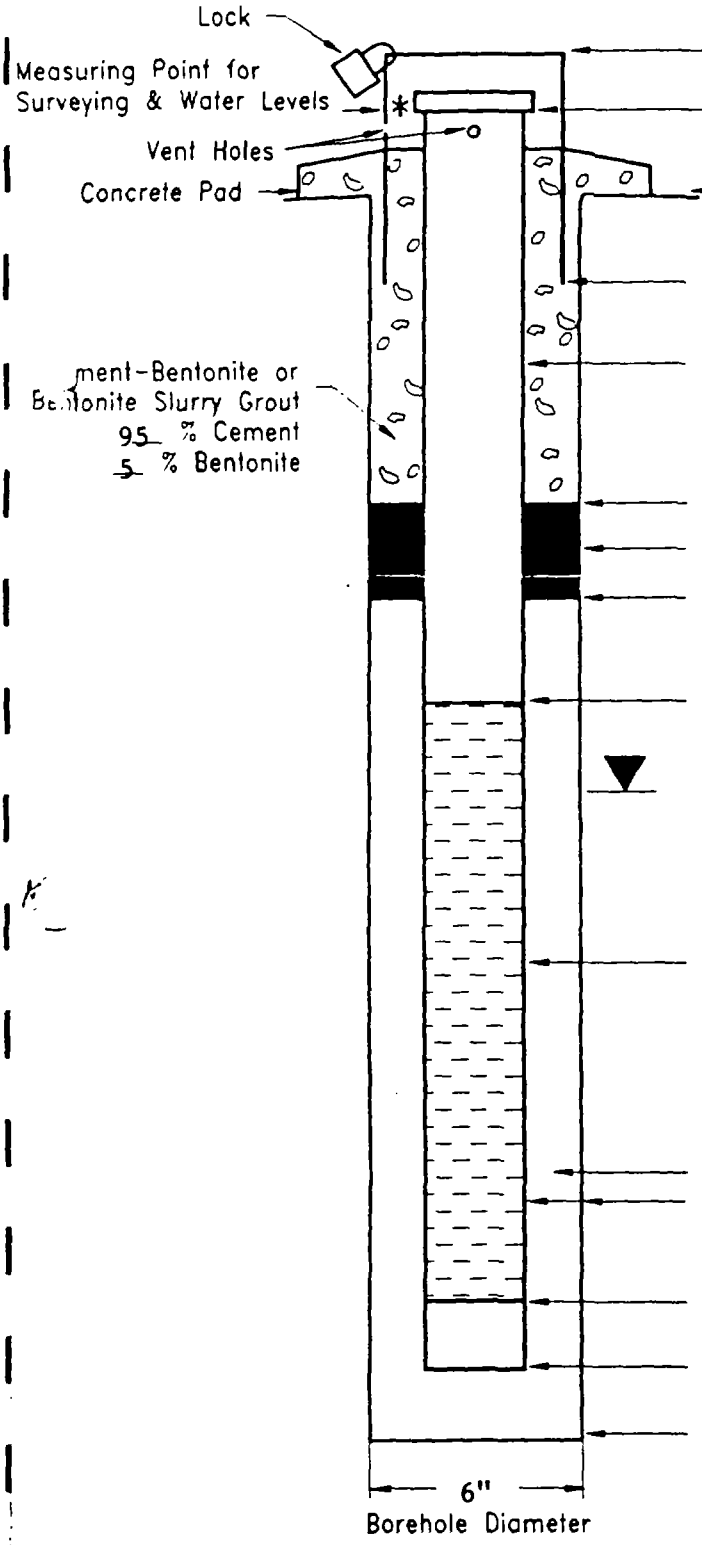
Well Location: Corner of Gorham and Hampshire

Date Installed: 11/29/90

Contractor: E.H. Renner & Sons Method: Mud Rotary

Inspector: R. Grigg

MONITORING WELL CONSTRUCTION DETAIL



		Depth from G.S. (feet)	Elevation (NGVD)
Top of Steel Guard Pipe		2.0	
Top of Riser Pipe		1.5	
Ground Surface (G.S.)		0.00	
Bottom of Steel Guard Pipe		3.0	
Riser Pipe:			
Length	65.2		
Inside Diameter (ID)	2"		
Type of Material	schedule 40 black steel		
Top of Bentonite Seal		60.2	
Bentonite Seal Thickness	1.5		
Top of Sand		61.7	
Top of Screen		63.7	
Stabilized Water Level		41.5	
Screen:			
Length	10'		
Inside Diameter (ID)	2"		
Slot Size	.001		
Type of Material	stainless steel		
Type/Size of Sand	red filter sand 45-55		
Sand Pack Thickness	2"		
Bottom of Screen		73.7	
Bottom of Tail Pipe:		N/A	
Length	N/A		
Bottom of Borehole		74.0	

Approved:

* Describe Measuring Point:

*notch in the top of the riser pipe

Signature Date

ENSR

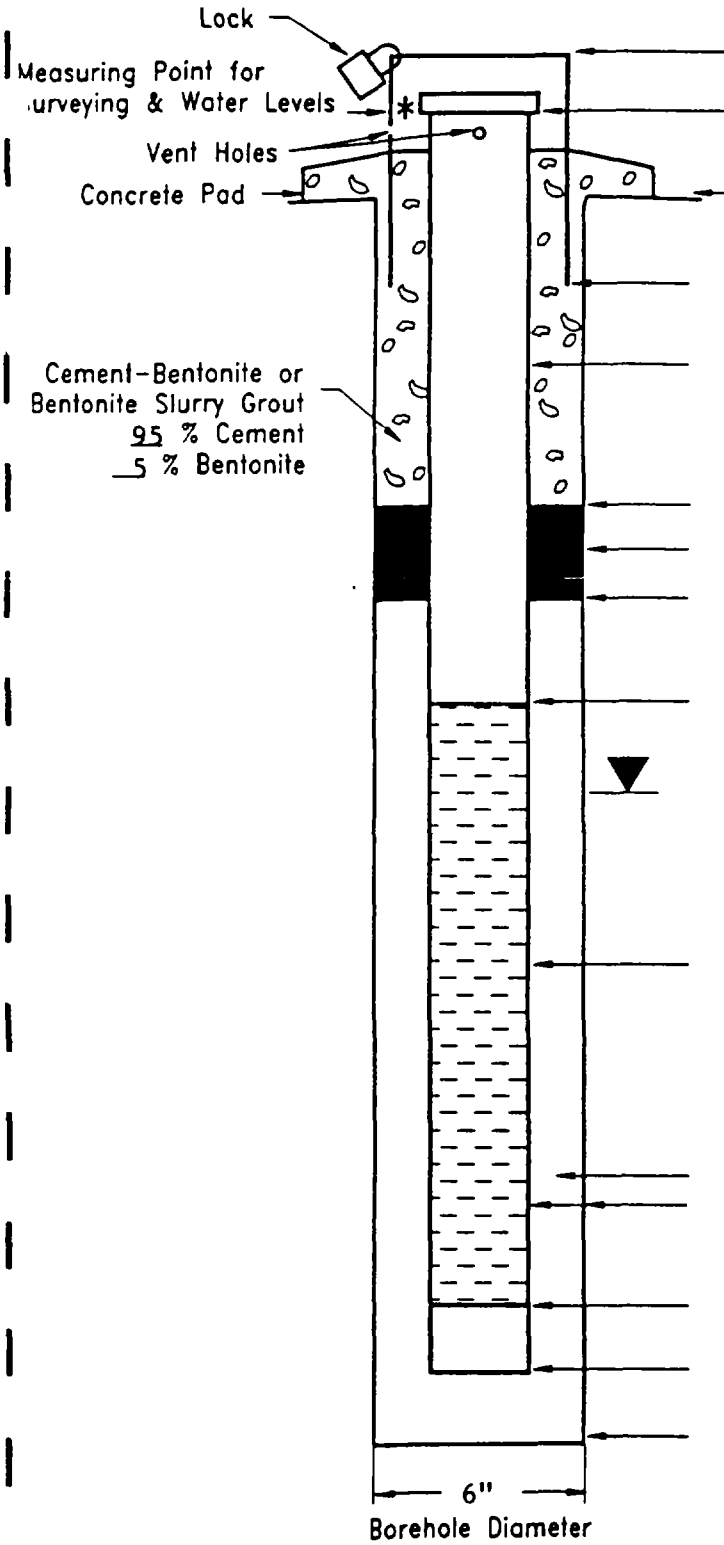
Project No: 1620-007 Client: SLP Site: St.Louis Park

WELL No: P308

Well Location: corner of Lake and Library Date Installed: 12/6/90

Contractor: E.H. Renner & Sons Method: Mud Rotary Inspector: R. Grigg

MONITORING WELL CONSTRUCTION DETAIL



		Depth from G.S. (feet)	Elevation (NGVD)
Top of Steel Guard Pipe		2.0	
Top of Riser Pipe		1.7	
Ground Surface (G.S.)		0.00	
Bottom of Steel Guard Pipe		3.0	
Riser Pipe:			
Length	60.7		
Inside Diameter (ID)	2"		
Type of Material	schedule 40 black steel		
Top of Bentonite Seal		54.5	
Bentonite Seal Thickness	1.5		
Top of Sand		56.5	
Top of Screen		58.7	
Stabilized Water Level		41.65	
Screen:			
Length	10'		
Inside Diameter (ID)	2"		
Slot Size	.001		
Type of Material	stainless steel		
Type/Size of Sand	red filter sand 45-55		
Sand Pack Thickness	2"		
Bottom of Screen		68.7	
Bottom of Tail Pipe:		N/A	
Length	N/A		
Bottom of Borehole		69.0	

Approved:

* Describe Measuring Point:

*notch in the top of the riser pipe

Signature Date

ENSR

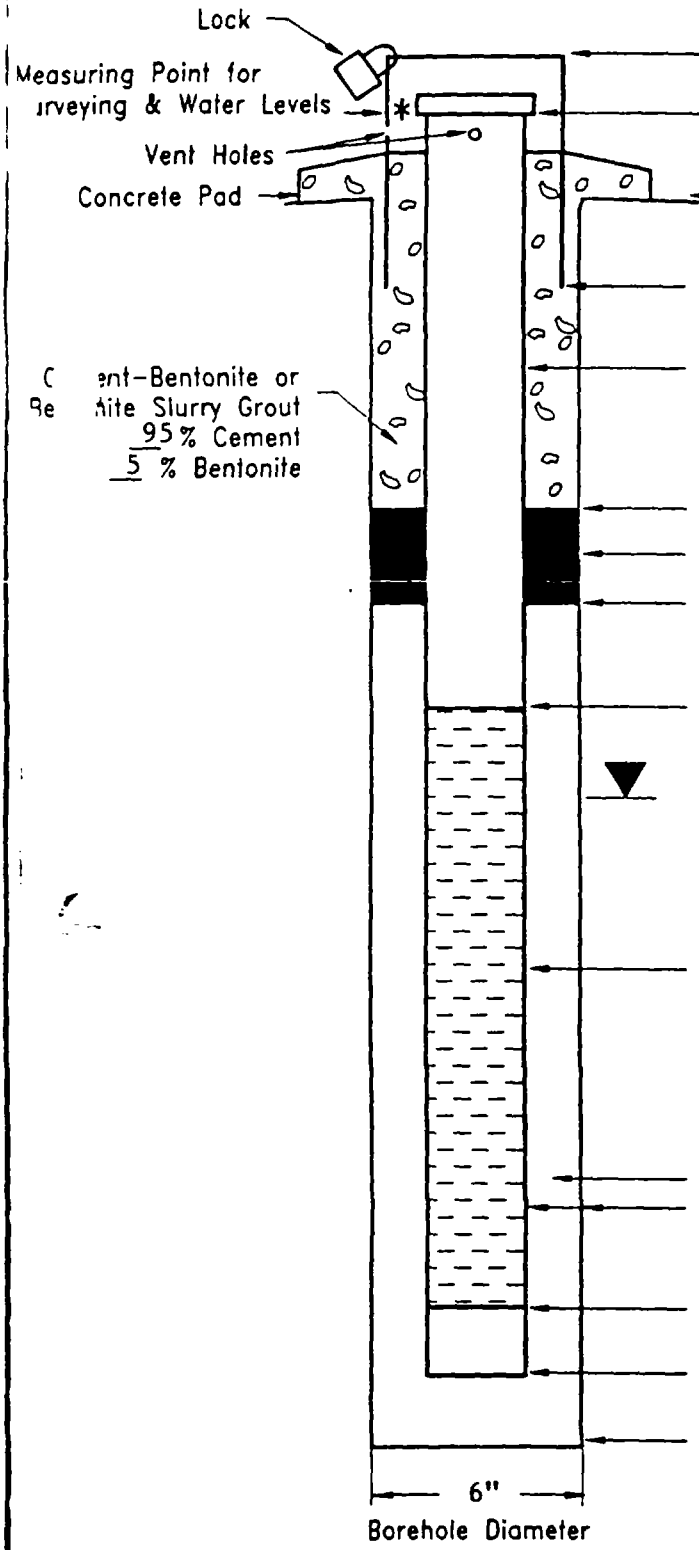
Project No: 1620-007 Client: SLP Site: St.Louis Park

WELL No: P309

Well Location: parking lot at the corner of Lake & Brownlow Date Installed: 11/27/90

Contractor: E.H. Renner & Sons Method: mud rotary Inspector: R. Grigg

MONITORING WELL CONSTRUCTION DETAIL



		Depth from G.S. (feet)	Elevation (NGVD)
Top of Steel Guard Pipe		1.64	
Top of Riser Pipe		1.55	
Ground Surface (G.S.)		0.00	
Bottom of Steel Guard Pipe		3.0	
Riser Pipe:			
Length	64.55		
Inside Diameter (ID)	2"		
Type of Material	schedule 40 black steel		
Top of Bentonite Seal		59.40	
Bentonite Seal Thickness	1.5		
Top of Sand		61.00	
Top of Screen		63.00	
Stabilized Water Level		42.80	
Screen:			
Length	10'		
Inside Diameter (ID)	2"		
Slot Size	.001		
Type of Material	stailess steel		
Type/Size of Sand	red filter sand 45-55		
Sand Pack Thickness	2"		
Bottom of Screen		73.00	
Bottom of Tail Pipe:		N/A	
Length	N/A		
Bottom of Borehole		73.39	

Approved:

* Describe Measuring Point:

*notch in the top of the riser pipe

Signature Date

ENSR

Project No: 1620-007 Client: SLP Site: St.Louis Park

WELL No: P310

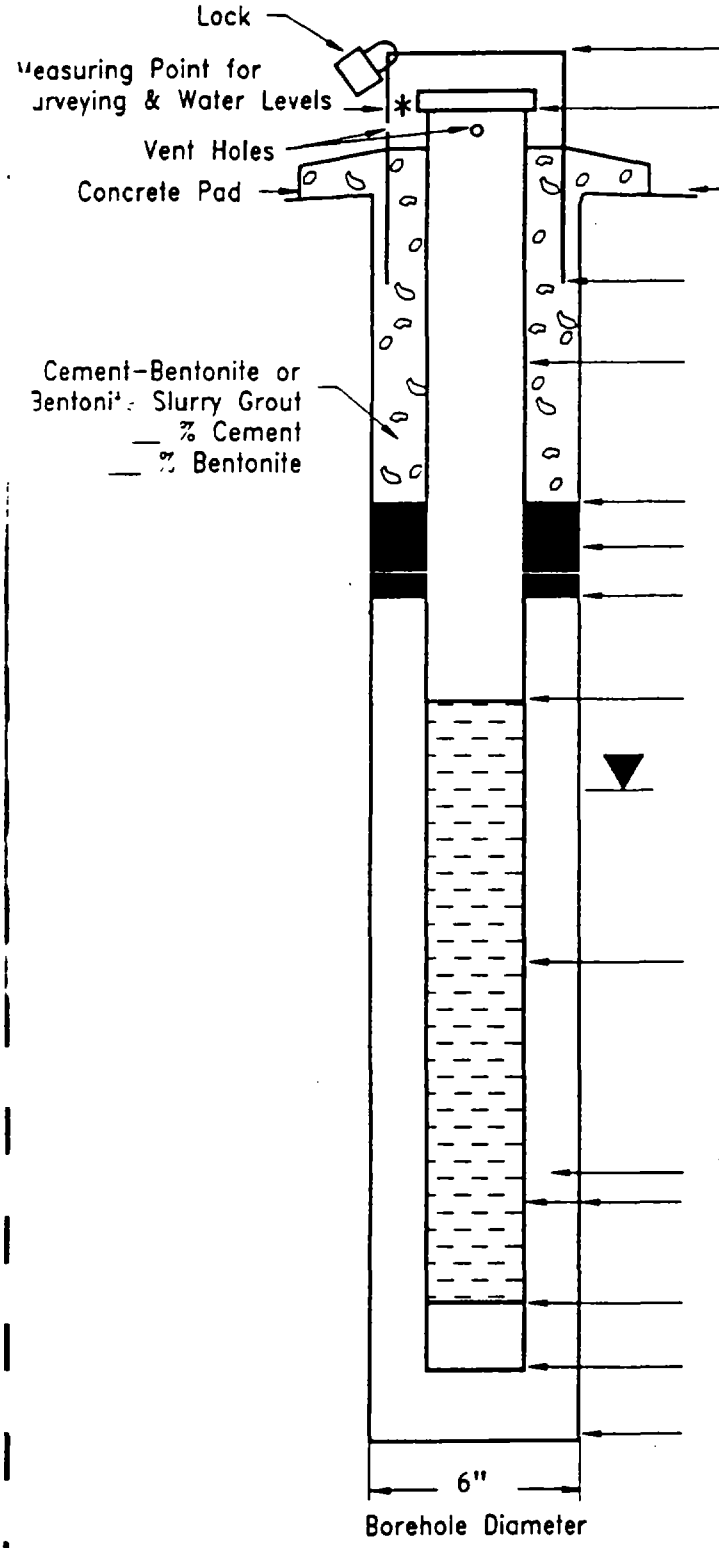
Well Location: just South-West of the SLP Community Center

Date Installed: 11/21/90

Contractor: E.H. Renner & Sons Method: cable tool

Inspector: R. Grigg

MONITORING WELL CONSTRUCTION DETAIL



		Depth from G.S. (feet)	Elevation (NGVD)
Top of Steel Guard Pipe		2.2	
Top of Riser Pipe		2.0	
Ground Surface (G.S.)		0.00	
Bottom of Steel Guard Pipe		3.0	
Riser Pipe:			
Length	61.5		
Inside Diameter (ID)	2"		
Type of Material	schedule 40 black steel		
Top of Bentonite Seal		63.5	
Bentonite Seal Thickness	1.5'		
Top of Sand		62.0	
Top of Screen		59.50	
Stabilized Water Level		43.75	
Screen:			
Length	10'		
Inside Diameter (ID)	2"		
Slot Size	.001		
Type of Material	stainless steel		
Type/Size of Sand	red filter sand 45-55		
Sand Pack Thickness	2"		
Bottom of Screen		69.50	
Bottom of Tail Pipe:		N/A	
Length	N/A		
Bottom of Borehole		69.50	

Approved:

* Describe Measuring Point:

*notch in the top of the riser pipe

Signature Date

ENSR

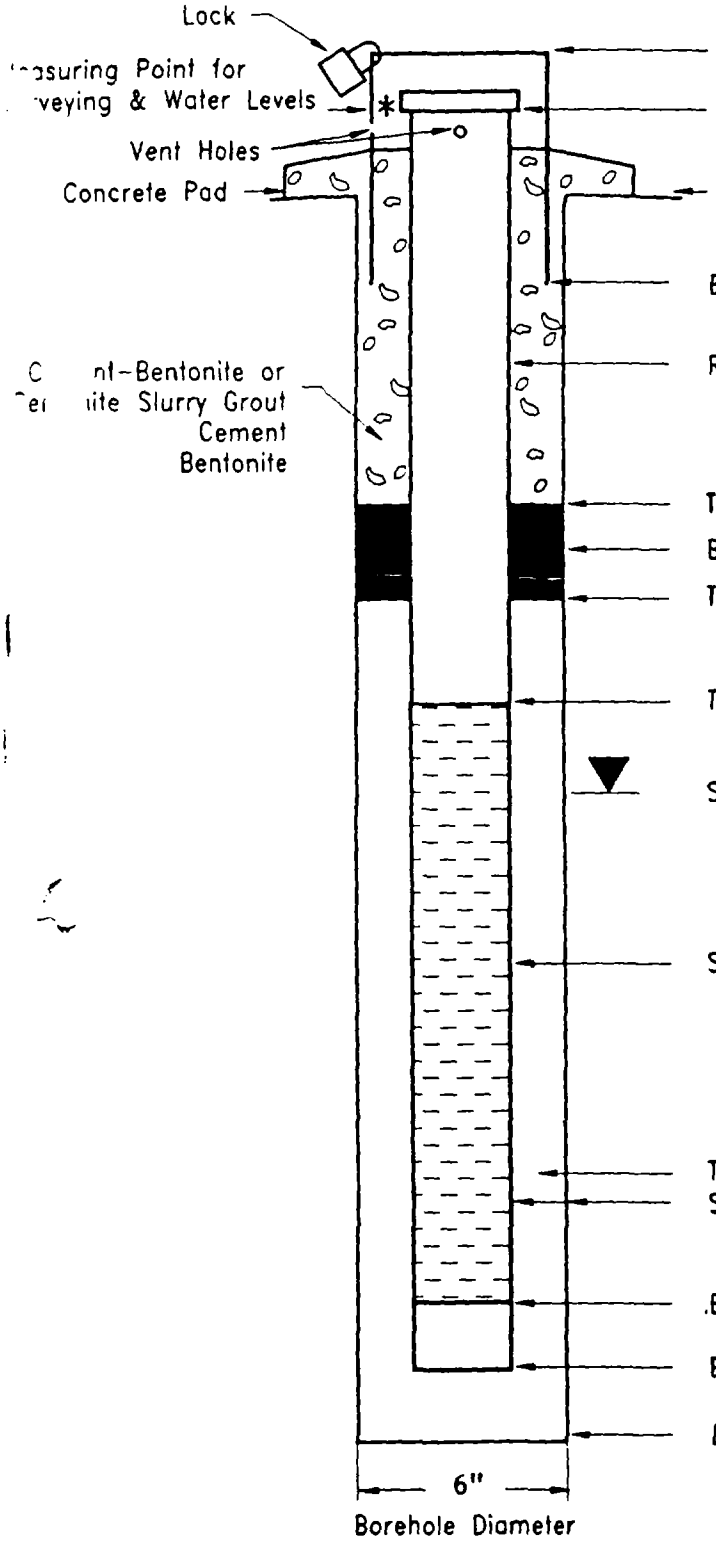
Project No: 1620-007 Client: SLP Site: St. Louis Park

WELL No: P311

Well Location: SPS Plumbing Supply Warehouse Property Date Installed: 11/9/90

Contractor: E.H. Renner & Sons Method: Cable Tool Inspector: M. MacDonald

MONITORING WELL CONSTRUCTION DETAIL



		Depth from G.S. (feet)	Elevation (NGVD)
Top of Steel Guard Pipe		3	
Top of Riser Pipe		2	
Ground Surface (G.S.)		0.00	
Bottom of Steel Guard Pipe		3	
Riser Pipe:			
Length	69 feet		
Inside Diameter (ID)	2 inch		
Type of Material	Schedule 40 Black Steel		
Top of Bentonite Seal		60.5	
Bentonite Seal Thickness	2.5 feet		
Top of Sand		63	
Top of Screen		67	
Stabilized Water Level		36	
Screen:			
Length	10 feet		
Inside Diameter (ID)	2 inch		
Slot Size	0.01 inch		
Type of Material	stainless steel		
Type/Size of Sand	Red Flint Filter Sand 45-55		
Sand Pack Thickness	2"		
Bottom of Screen		77	
Bottom of Tail Pipe:		NA	
Length	--		
Bottom of Borehole		77	

Approved:

* Describe Measuring Point:
notch in top of riser pipe

Signature Date

ENSR

Project No: 1620-007 Client: SLP Site: St. Louis Park

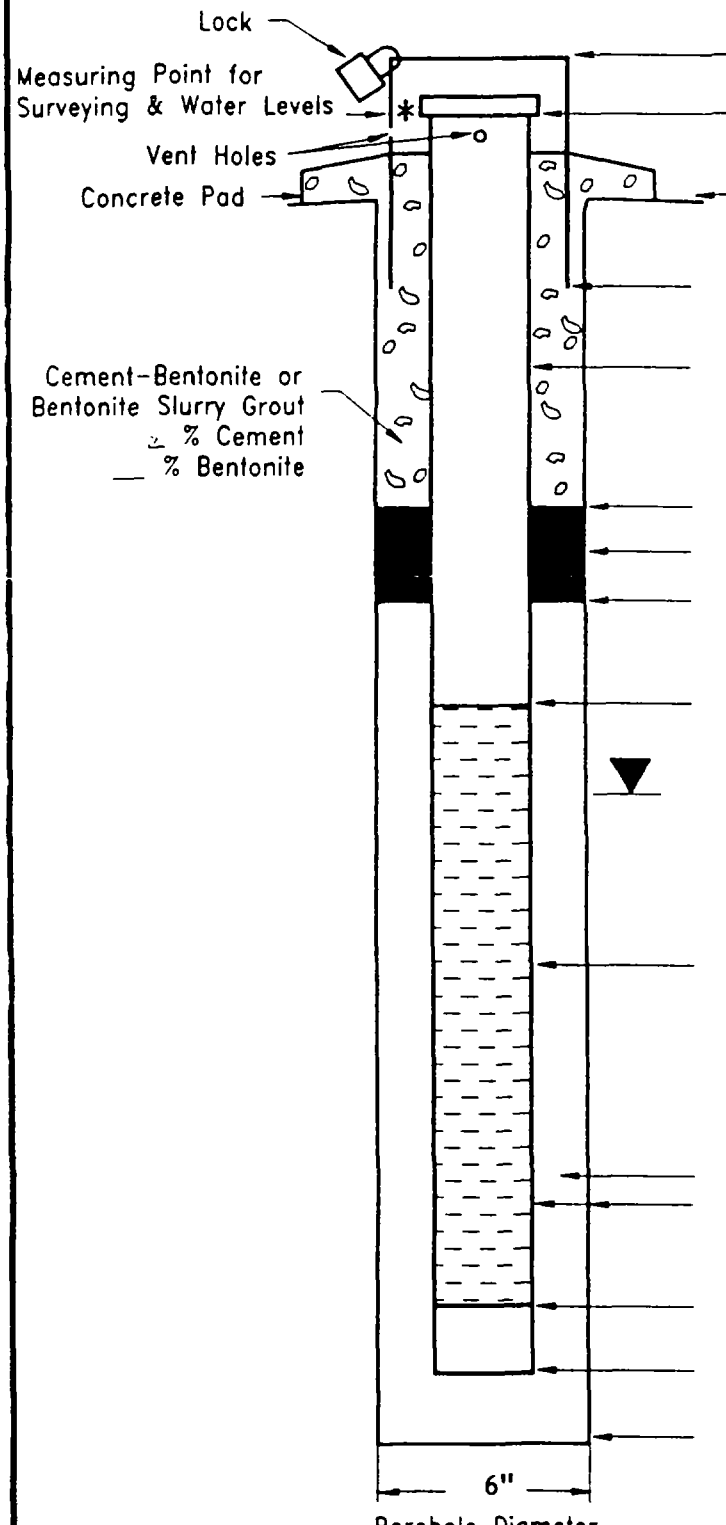
WELL No: P312

Well Location: Jorvig Park

Date Installed: 11/16/90

Contractor: Renner & Sons, Inc. Method: Cable Tool Inspector: R. Grigg

MONITORING WELL CONSTRUCTION DETAIL



		Depth from G.S. (feet)	Elevation (NGVD)
Top of Steel Guard Pipe		2.0	
Top of Riser Pipe		2.2 a.g.	
Ground Surface (G.S.)		0.00	
Bottom of Steel Guard Pipe		3.0'	
Riser Pipe:			
Length	75.0'		
Inside Diameter (ID)	2"		
Type of Material	Schedule 40 Black Steel		
Top of Bentonite Seal		70.5'	
Bentonite Seal Thickness	1.5'		
Top of Sand		72.0'	
Top of Screen		75.0'	
Stabilized Water Level		37.77	
Screen:			
Length	10'		
Inside Diameter (ID)	2"		
Slot Size	.001"		
Type of Material	stainless steel		
Type/Size of Sand	Red flint filter sand 45-55		
Sand Pack Thickness	2"		
Bottom of Screen		85.0'	
Bottom of Tail Pipe:		NA	
Length	--		
Bottom of Borehole		85.4'	

Approved:

* Describe Measuring Point:
notch on top of the riser pipe

Signature Date

ENSR

Project No: 1620-007 Client: SLP Site: St.Louis Park

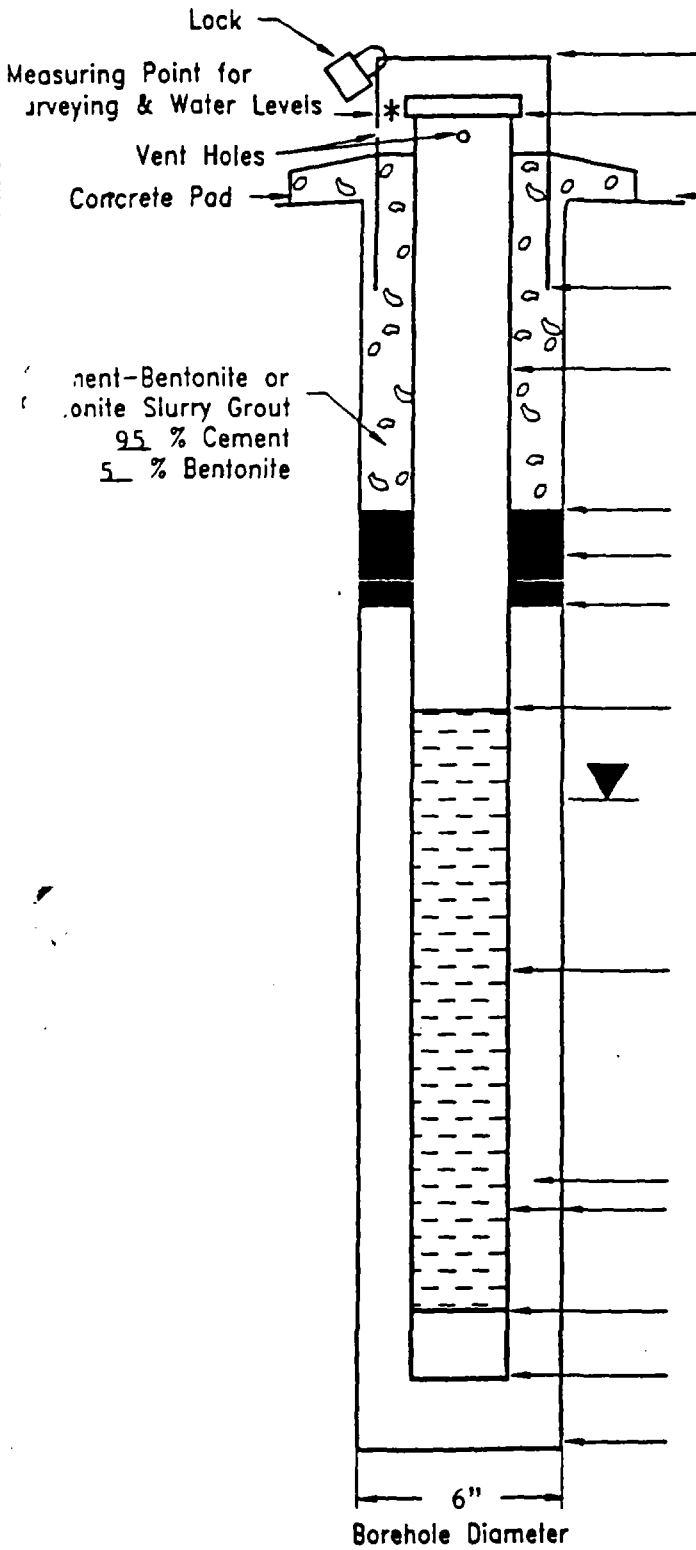
WELL No: P313

Well Location: Union Church

Date Installed: 11/21/90

Contractor: E.H. Renner & Sons Method: mud rotary Inspector: R. Grigg

MONITORING WELL CONSTRUCTION DETAIL



		Depth from G.S. (feet)	Elevation (NGVD)
Top of Steel Guard Pipe		2.2	
Top of Riser Pipe		1.9	
Ground Surface (G.S.)		0.00	
Bottom of Steel Guard Pipe		3.0	
Riser Pipe:			
Length	63.0		
Inside Diameter (ID)	2"		
Type of Material	schedule 40 black steel		
Top of Bentonite Seal		64.5	
Bentonite Seal Thickness	1.5		
Top of Sand		63.0	
Top of Screen		61.0	
Stabilized Water Level		48.1	
Screen:			
Length	10'		
Inside Diameter (ID)	2"		
Slot Size	.001		
Type of Material	stainless steel		
Type/Size of Sand	red flint filter sand 45-55		
Sand Pack Thickness	2"		
Bottom of Screen		71.0	
Bottom of Tail Pipe:		N/A	
Length	N/A		
Bottom of Borehole		71.1	

Approved:

* Describe Measuring Point:

*notch in the top of the riser pipe

Signature Date

ENSR

Project No: 1620-007 Client: SLP Site: St. Louis Park

WELL No: W431

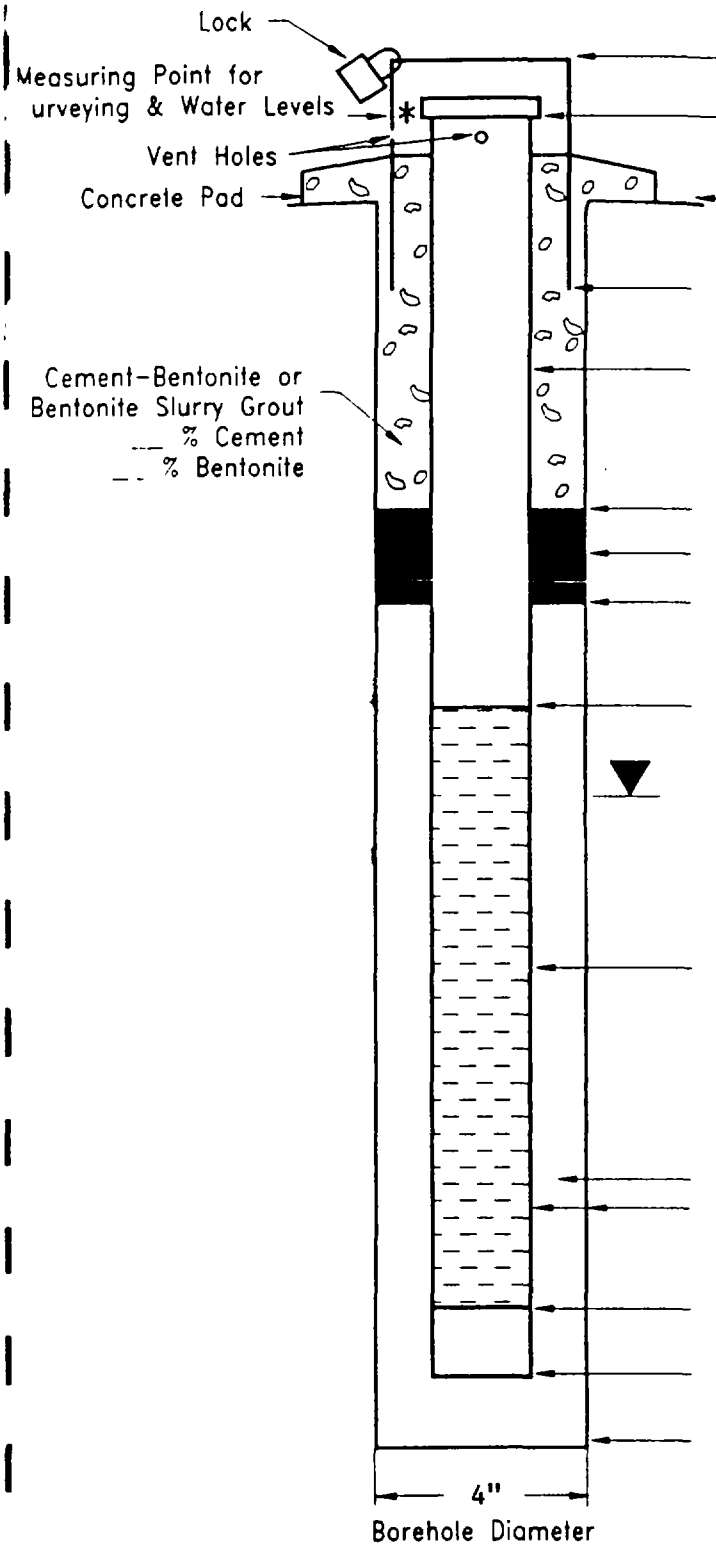
Well Location: Union Church

Date Installed: 11/12/90

Contractor: Renner & Sons, Inc. Method: Cable Tool

Inspector: R. Grigg

MONITORING WELL CONSTRUCTION DETAIL



		Depth from G.S. (feet)	Elevation (NGVD)
Top of Steel Guard Pipe		NA	
Top of Riser Pipe		2.6 a.g.	
Ground Surface (G.S.)		0.00	
Bottom of Steel Guard Pipe		NA	
Riser Pipe:			
Length	108.75		
Inside Diameter (ID)	4"		
Type of Material	schedule 40 black steel		
Top of Bentonite Seal		NA	
Bentonite Seal Thickness	NA		
Top of Sand		NA	
2' pipe extension on top of screen (lead packer)			
Top of Screen		106.15	
Stabilized Water Level		46.78 b.g.	
Screen:			
Length	8		
Inside Diameter (ID)	2"		
Slot Size	.006"		
Type of Material	stainless steel		
Type/Size of Sand	NA		
Sand Pack Thickness	NA		
Bottom of Screen		114.15	
Bottom of Tail Pipe:		NA	
Length	NA		
Bottom of Borehole		114.55	

Approved:

* Describe Measuring Point:

notch on top of the riser pipe

Signature Date

ENSR

Project No: 1620-007 Client: SLP Site: St. Louis Park

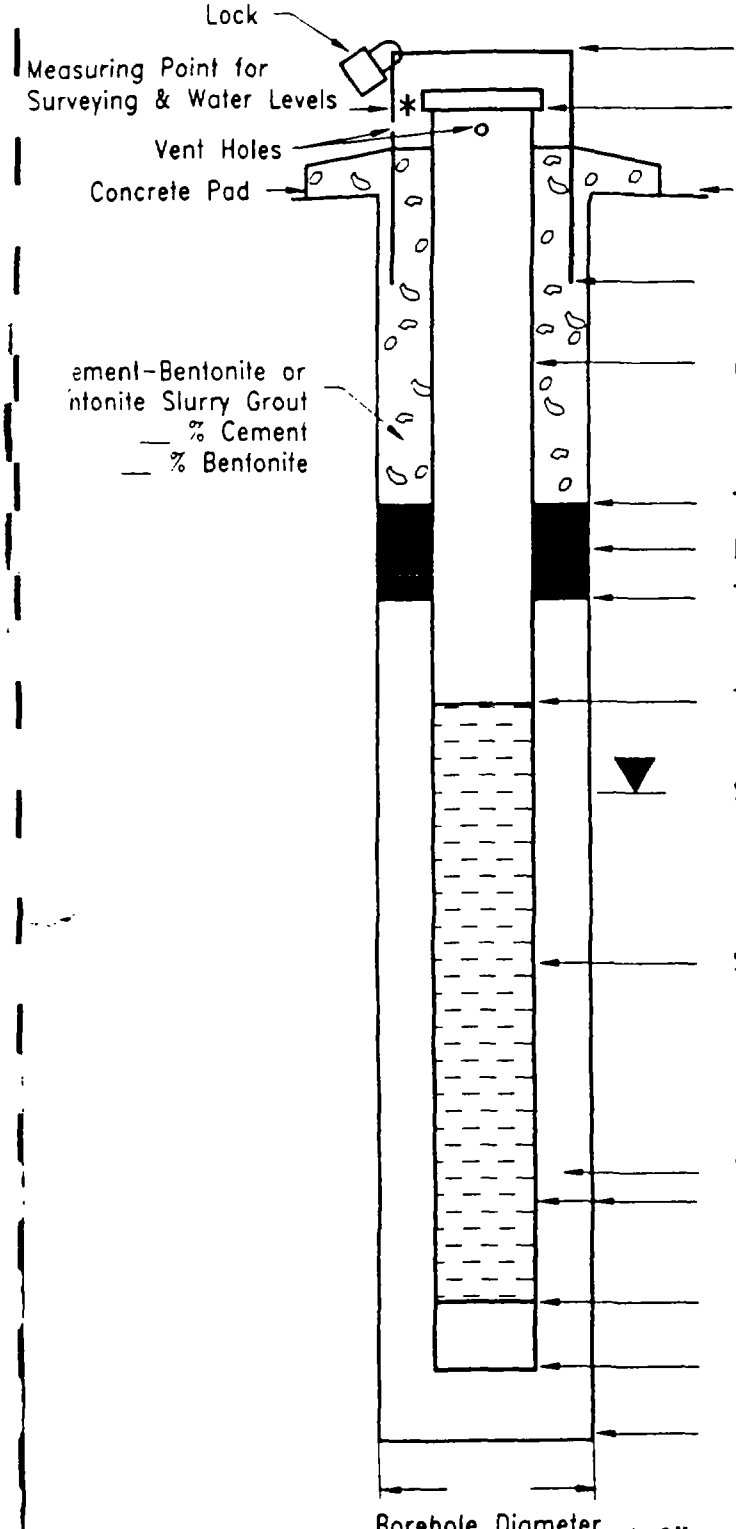
WELL No: W 432

Well Location: SPS Plumbing Supply Warehouse Property

Date Installed: 10/31/90

Contractor: Renner & Sons, Inc. Method: cable tool Inspector: R. Grigg

MONITORING WELL CONSTRUCTION DETAIL



		Depth from G.S. (feet)	Elevation (NGVD)
Top of Steel Guard Pipe		n/a	
Top of Riser Pipe		2.6' a.g.	
Ground Surface (G.S.)		0.00	
Bottom of Steel Guard Pipe		n/a	
Riser Pipe:			
Length	99.0'		
Inside Diameter (ID)	4.0 "		
Type of Material	schedule 40 black steel		
Top of Bentonite Seal		n/a	
Bentonite Seal Thickness			
Top of Sand		n/a	
top of Platteville formation		96.0'	
~~Top of Screen~~			
Stabilized Water Level		41.71'	
Screen:			
Length	n/a		
Inside Diameter (ID)	n/a		
Slot Size	n/a		
Type of Material	n/a		
Type/Size of Sand	n/a		
Sand Pack Thickness	n/a		
Bottom of Screen		n/a	
Bottom of ~~Tail~~ riser Pipe:		n/a	
Length	96.5'		
Bottom of Borehole		109.0'	

Approved:

* Describe Measuring Point:
notch in top of riser

Signature Date

ENSR

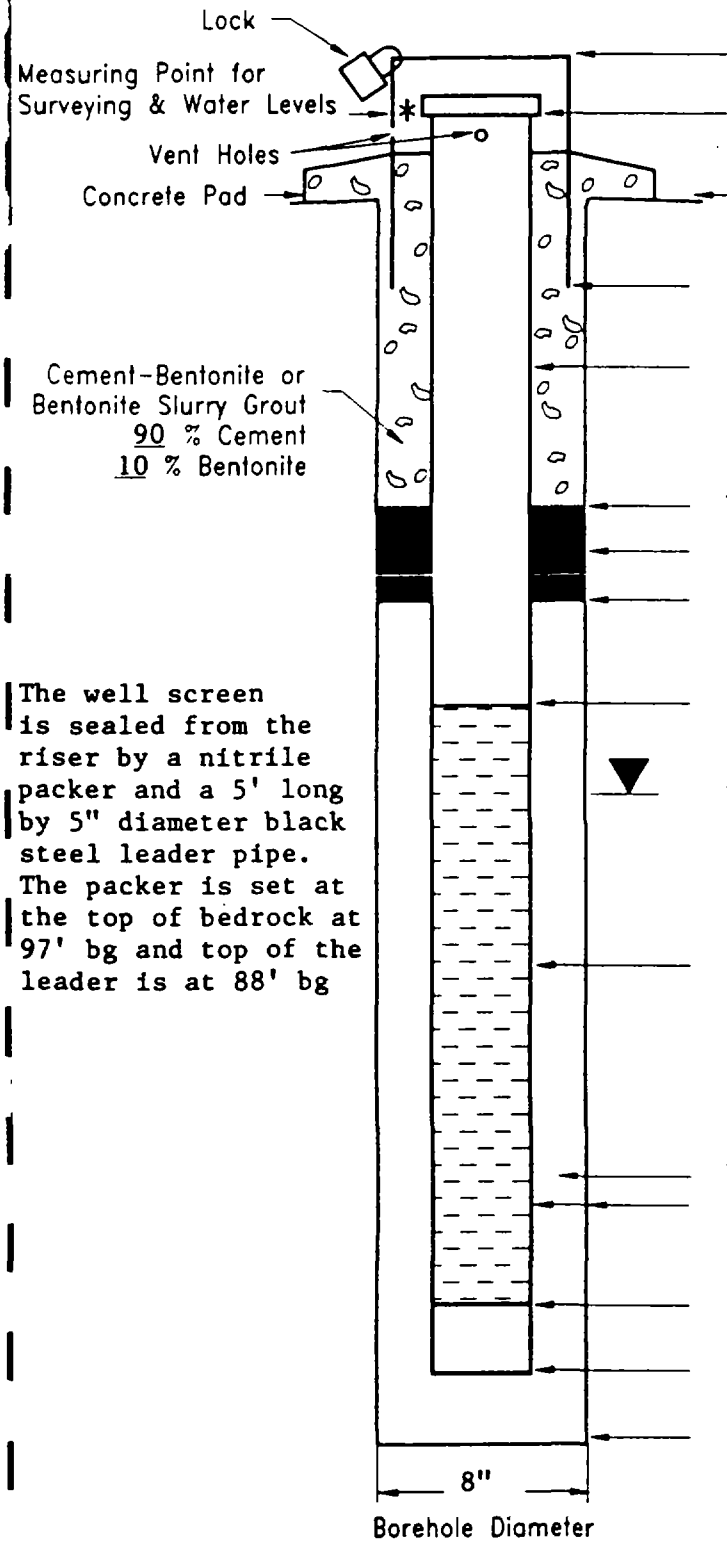
Project No: 1620-007 Client: SLP Site: St. Louis Park

WELL No: W433

Well Location: West end of Jorvig Park Date Installed: 11/5/90

Contractor: E.H. Renner & Sons Method: Mud rotary Inspector: B. Grigg

MONITORING WELL CONSTRUCTION DETAIL



		Depth from G.S. (feet)	Elevation (NGVD)
Top of Steel Guard Pipe		NA	
Top of Riser Pipe		3	
Ground Surface (G.S.)		0.00	
Bottom of Steel Guard Pipe		NA	
Riser Pipe:			
Length	100		
Inside Diameter (ID)	6"		
Type of Material	schedule 40 black steel		
Top of Bentonite Seal		NA	
Bentonite Seal Thickness	NA		
Top of Sand		NA	
Top of Screen		97	
Stabilized Water Level		49.30	
Screen:			
Length	12'		
Inside Diameter (ID)	5"		
Slot Size	8 slot		
Type of Material	stainless steel		
Type/Size of Sand	NA		
Sand Pack Thickness	NA		
Bottom of Screen		112	
Bottom of Tail Pipe:			
Length	NA		
Bottom of Borehole		112.5	

The well screen is sealed from the riser by a nitrile packer and a 5' long by 5" diameter black steel leader pipe. The packer is set at the top of bedrock at 97' bg and top of the leader is at 88' bg

Approved:

* Describe Measuring Point:

notch in top of riser pipe

Signature Date

ENSR

Project No: 1620-007 Client: SLP Site: St. Louis Park

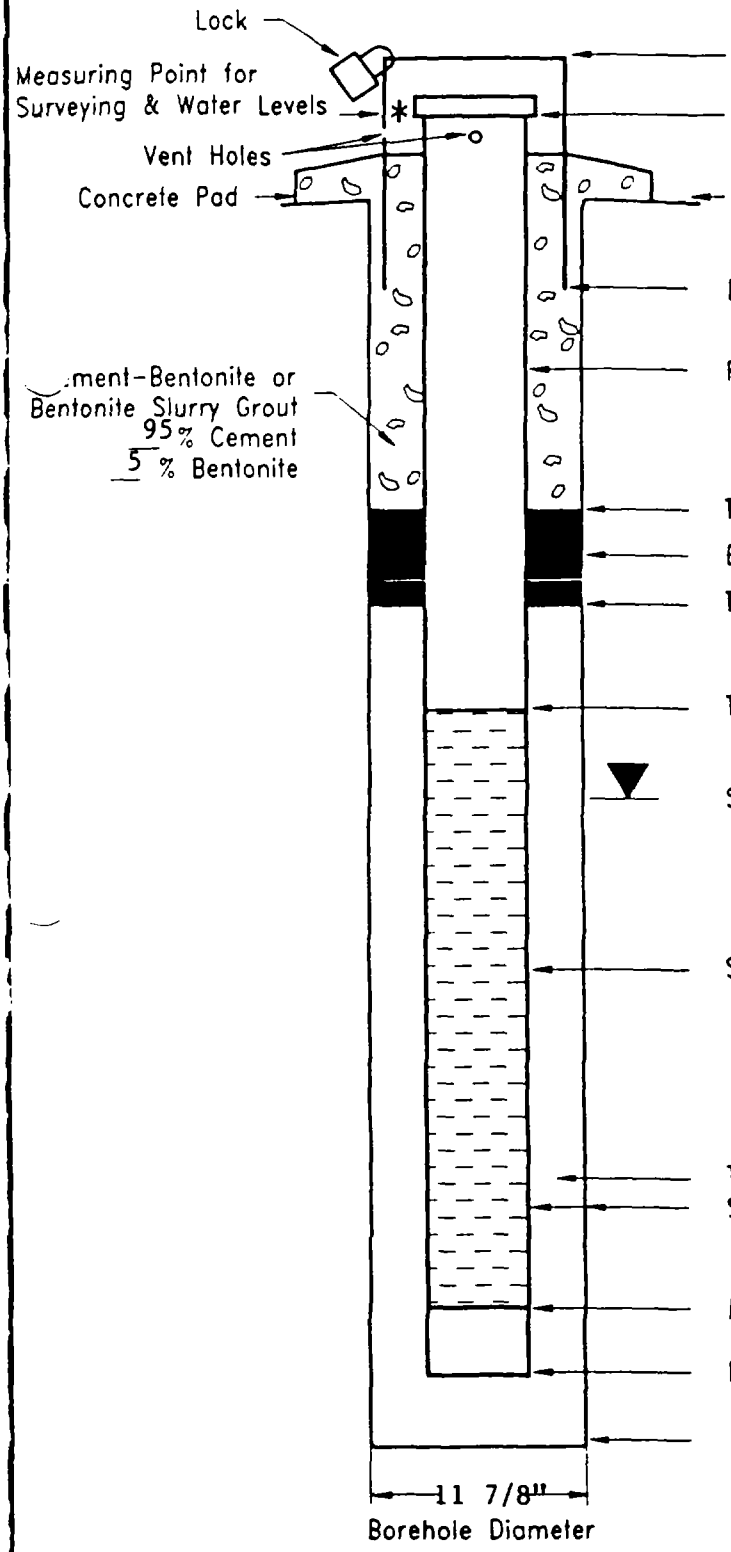
WELL No: W434

Well Location: East end of Jorvig Park

Date Installed: 4/23/91

Contractor: E.H. Renner & Sons Method: Mud Rotary Inspector: R. Grigg

MONITORING WELL CONSTRUCTION DETAIL



		Depth from G.S. (feet)	Elevation (NGVD)
Top of Steel Guard Pipe		+2	
Top of Riser Pipe		+1.5	
Ground Surface (G.S.)		0.00	
Bottom of Steel Guard Pipe		2	
Riser Pipe:			
Length	99'		
Inside Diameter (ID)	6"		
Type of Material	schedule 40 black steel		
Top of Bentonite Seal		88	
Bentonite Seal Thickness	4'		
Top of Sand		92	
Top of Screen		97	
Stabilized Water Level		43.98	
Screen:			
Length	15'		
Inside Diameter (ID)	6"		
Slot Size	.015 inch		
Type of Material	stainless steel		
Type/Size of Sand	red flint sand		
Sand Pack Thickness	5 7/8"		
Bottom of Screen		112	
Bottom of Tail Pipe:			
Length	NA		
Bottom of Borehole		112	

Approved:

* Describe Measuring Point:

top of riser pipe

Signature Date

ENSR

ENSR

MONITORING WELL DEVELOPMENT RECORD

DATE: 12/7/90 WELL I.D.: P307

PROJECT NAME: St. Louis Park LOCATION: corner of Gorham & Hampshire

PROJECT NUMBER: 1600-007 DEVELOPER: Renner and Sons inc.

[X] ORIGINAL DEVELOPMENT [ ] REDEVELOPMENT ORIGINAL DEVELOPMENT DATE: 12/7/90

WELL DATA

Well Diameter	2"
Total Well Depth	74'
Depth to Top of Screen	63.7'
Depth to Bottom of Screen	73.7'
Depth to Static Water Level	41.5'

Geology at Screened Interval	Drift Aquifer
Likely Contaminants	Phenolic compounds PAH Naphthalene
Purge Water and Sediment Disposal Method	sanitary sewer

DEVELOPMENT METHOD	PURGING METHOD	PERMEABILITY TEST RESULTS
Air Lift		

ACCEPTANCE CRITERIA

water volumn in casing: 5.3gal.

min. purge volumn: 53.3gal.

total purge volumn: 65.0gal.

*clear, sediment free water

Signature _____ Date _____

M890322

ENSR

MONITORING WELL DEVELOPMENT RECORD

DATE: 12/6/90 WELL I.D.: P308

PROJECT NAME: St. Louis Park LOCATION: corner of Lake and Library

PROJECT NUMBER: 1600-007 DEVELOPER: Renner and Sons inc.

[x] ORIGINAL DEVELOPMENT [ ] REDEVELOPMENT ORIGINAL DEVELOPMENT DATE: 12/6/90

WELL DATA

Well Diameter	2"
Total Well Depth	68.7'
Depth to Top of Screen	58.7'
Depth to Bottom of Screen	68.7'
Depth to Static Water Level	41.65'

Geology at Screened Interval	Drift Aquifer
Likely Contaminants	Phenolic compounds PAH Naphthalene
Purge Water and Sediment Disposal Method	sanitary sewer

DEVELOPMENT METHOD	PURGING METHOD	PERMEABILITY TEST RESULTS
Air Lift		

ACCEPTANCE CRITERIA

water volumn in casing:	6.78gal.
min. purge volumn:	67.8gal.
total purge volumn:	165gal.
*clear, sediment free water	

Signature _____ Date _____

M890322

ENSR

MONITORING WELL DEVELOPMENT RECORD

DATE: 12/7/90 WELL I.D.: P309

PROJECT NAME: St. Louis Park LOCATION: Parking lot corner of Lake & Brownlow

PROJECT NUMBER: 1600-007 DEVELOPER: Renner and Sons inc.

[X] ORIGINAL DEVELOPMENT [ ] REDEVELOPMENT ORIGINAL DEVELOPMENT DATE: 12/7/90

WELL DATA

Well Diameter	2"
Total Well Depth	73.39'
Depth to Top of Screen	63.00'
Depth to Bottom of Screen	73.00
Depth to Static Water Level	42.8

Geology at Screened Interval	Drift Aquifer
Likely Contaminants	Phenolic compounds PAH Naphthalene
Purge Water and Sediment Disposal Method	sanitary sewer

DEVELOPMENT METHOD	PURGING METHOD	PERMEABILITY TEST RESULTS
Air Lift		

ACCEPTANCE CRITERIA

water volumn in casing:	5.0
min. purge volumn:	50gal.
total purge volumn:	55gal.
*clear, sediment free water	

Signature _____ Date _____

M890322

ENSR

MONITORING WELL DEVELOPMENT RECORD

DATE: 12/7/90 WELL I.D.: P310

PROJECT NAME: St. Louis Park LOCATION: just SW of Community Center

PROJECT NUMBER: 1600-007 DEVELOPER: Renner and Sons inc.

[X] ORIGINAL DEVELOPMENT [ ] REDEVELOPMENT ORIGINAL DEVELOPMENT DATE: 12/7/90

WELL DATA

Well Diameter	2"
Total Well Depth	69.50'
Depth to Top of Screen	59.50
Depth to Bottom of Screen	69.50'
Depth to Static Water Level	42.75

Geology at Screened Interval	Drift Aquifer
Likely Contaminants	Phenolic compounds PAH Naphthalene
Purge Water and Sediment Disposal Method	sanitary sewer

DEVELOPMENT METHOD	PURGING METHOD	PERMEABILITY TEST RESULTS
Air Lift		

ACCEPTANCE CRITERIA

water volumn in casing:	4.4gal.
min. purge volumn:	44gal.
total purge volumn:	55gal.
*clear, sediment free water	

Signature _____ Date _____

M890322

ENSR

MONITORING WELL DEVELOPMENT RECORD

DATE: 12/7/90 WELL I.D.: P311

PROJECT NAME: St. Louis Park LOCATION: SPS Plumbing Supply Warehouse Propert

PROJECT NUMBER: 1600-007 DEVELOPER: Renner and Sons inc.

[X] ORIGINAL DEVELOPMENT [ ] REDEVELOPMENT ORIGINAL DEVELOPMENT DATE: 12/7/90

WELL DATA

Well Diameter	2"
Total Well Depth	77'
Depth to Top of Screen	67'
Depth to Bottom of Screen	77'
Depth to Static Water Level	36'

Geology at Screened Interval	Drift Aquifer
Likely Contaminants	Phenolic compounds PAH Naphthalene
Purge Water and Sediment Disposal Method	sanitary sewer

DEVELOPMENT METHOD	PURGING METHOD	PERMEABILITY TEST RESULTS
Air Lift		

ACCEPTANCE CRITERIA

water volumn in casing:	6.6gal.
min. purge volumn:	66gal.
total purge volumn:	70gal.
*clear, sediment free water	

Signature _____ Date _____

M890322

ENSR

MONITORING WELL DEVELOPMENT RECORD

DATE: 12/6/90 WELL I.D.: P312

PROJECT NAME: St. Louis Park LOCATION: Jorvig Park

PROJECT NUMBER: 1600-007 DEVELOPER: Renner and Sons inc.

[X] ORIGINAL DEVELOPMENT [ ] REDEVELOPMENT ORIGINAL DEVELOPMENT DATE: 12/6/90

WELL DATA

Well Diameter	2"
Total Well Depth	85.4'
Depth to Top of Screen	75.0'
Depth to Bottom of Screen	85.0'
Depth to Static Water Level	37.77'

Geology at Screened Interval	Drift Aquifer
Likely Contaminants	Phenolic compounds PAH Naphthalene
Purge Water and Sediment Disposal Method	sanitary sewer

DEVELOPMENT METHOD	PURGING METHOD	PERMEABILITY TEST RESULTS
Air Lift		

ACCEPTANCE CRITERIA

water volumn in casing:	7.7gal.
min. purge volumn:	77gal.
total purge volumn:	80gal.
*clear, sediment free water	

Signature _____ Date _____

M890322

ENSR

MONITORING WELL DEVELOPMENT RECORD

DATE: 12/6/90 WELL I.D.: P313

PROJECT NAME: St. Louis Park LOCATION: Union Church

PROJECT NUMBER: 1600-007 DEVELOPER: Renner and Sons inc.

[X] ORIGINAL DEVELOPMENT [ ] REDEVELOPMENT ORIGINAL DEVELOPMENT DATE: 12/6/90

WELL DATA

Well Diameter	2"	Geology at Screened Interval	Drift Aquifer
Total Well Depth	71.1'		
Depth to Top of Screen	61.0'	Likely Contaminants	Phenolic compounds PAH Naphthalene
Depth to Bottom of Screen	71.0'		
Depth to Static Water Level	42.77'	Purge Water and Sediment Disposal Method	sanitary sewer

DEVELOPMENT METHOD	PURGING METHOD	PERMEABILITY TEST RESULTS
Air Lift		

ACCEPTANCE CRITERIA

water volumn in casing:	4.6gal.
min. purge volumn:	46gal.
total purge volumn:	55gal.
*clear, sediment free water	

Signature _____ Date _____

M890322

ENSR

MONITORING WELL DEVELOPMENT RECORD

DATE: 11/13/90 WELL I.D.: W431

PROJECT NAME: St. Louis Park LOCATION: Union Church

PROJECT NUMBER: 1620-007 DEVELOPER: Renner and Sons inc.

[X] ORIGINAL DEVELOPMENT [ ] REDEVELOPMENT ORIGINAL DEVELOPMENT DATE: 11/13/90

WELL DATA

Well Diameter	4"	Geology at Screened Interval	
			Platteville aquifer
Total Well Depth	114.55'		
Depth to Top Screen	106.15'	Likely Contaminants	Phenolic compounds
			PAH
Depth to Bottom of Screen	114.15'		Naphthalene
Depth to Static Water Level	46.78'	Purge Water and Sediment Disposal Method	
			sanitaty sewer

DEVELOPMENT METHOD	PURGING METHOD	PERMEABILITY TEST RESULTS
Submersible Pump		

ACCEPTANCE CRITERIA

water volumn in casing:	43.9gal.
min. purge volumn:	439.9gal.
total purge volumn:	500gal.
*clear, sediment free water	

Signature _____ Date _____

M890322

ENSR

MONITORING WELL DEVELOPMENT RECORD

DATE: 11/1/90 WELL I.D.: W432

PROJECT NAME: St. Louis Park LOCATION: SPS Plumbing supply warehouse proper

PROJECT NUMBER: 1620-007 DEVELOPER: Renner and Sons inc.

[X] ORIGINAL DEVELOPMENT [ ] REDEVELOPMENT ORIGINAL DEVELOPMENT DATE: 11/1/90

WELL DATA

Well Diameter	4"
Total Well Depth	109'
Depth to Top of Screen	NA
Depth to Bottom of Screen	NA
Depth to Static Water Level	41.71'

Geology at Screened Interval	Platteville aquifer
Likely Contaminants	Phenolic compounds PAH Naphthalene
Purge Water and Sediment Disposal Method	sanitaty sewer

DEVELOPMENT METHOD	PURGING METHOD	PERMEABILITY TEST RESULTS
Socris Surge Pump		

ACCEPTANCE CRITERIA

water volumn in casing:	67gal.
min. purge volumn:	670gal.
total purge volumn:	700gal.
*clear, sediment free water	

Signature _____ Date _____

M890322

ENSR

MONITORING WELL DEVELOPMENT RECORD

DATE: December 17, 1990 WELL I.D.: W433

PROJECT NAME: City of St. Louis Park LOCATION: Jorveg Park

PROJECT NUMBER: 1620-007 DEVELOPER: E.H. Renner & Sons

[X] ORIGINAL DEVELOPMENT [ ] REDEVELOPMENT ORIGINAL DEVELOPMENT DATE: 12/17/90

WELL DATA

Well Diameter	6 inch
Total Well Depth	112 Feet
Depth to Top Screen	94 Feet
Depth to Bottom of Screen	109 Feet
Depth to Static Water Level	46.6 Feet

Geology at Screened Interval	Platteville Formation
Likely Contaminants	Phenolic Compounds PAH Napthalene
Purge Water and Sediment Disposal Method	Discharge to sanitary sewer

DEVELOPMENT METHOD	PURGING METHOD	PERMEABILITY TEST RESULTS
Submersible Pump		

ACCEPTANCE CRITERIA

Pumped 2140 gallons or 23.5 well volumes of water from well. Had a clear discharge at the end of pumping.

Signature [signature] Date 12/17/90

M890322

Coordinates and measuring points for wells and piezometers installed for the SRI in SLP Oct. 1990–April 1991

Well Number	X Coordinate	Y Coordinate	Measuring Point Elevation
P307	2164545	707591	913.1
P308	2165153	708043	923.29
P309	2165031	707607	925.16
P310	2165656	707357	921.48
P311	2165902	706994	917.91
P312	2166535	706956	919.47
P313	2166824	706384	923.98
W431	2166855	706384	922.77
W432	2166125	706982	919.02
W433	2166258	706807	925.84
W434	2166502	706938	920.59

APPENDIX B

Pump Test Water Levels (Hermit Measurements)

Pump Test Water Levels (Hand Measurements)

W12C Pre Pump Test

SE1000B
Environmental Logger
05/09 16:38

Unit# 00894 Test# 0

INPUT 1: Level (F) TOC

Reference	43.26
Scale factor	10.10
Offset	- 0.03

Step# 0 05/03 14:00

Elapsed Time	Value
0.0000	43.26
600.000	43.20
1200.00	43.19
1800.00	43.18
2400.00	43.16
3000.00	43.15
3600.00	43.14

SE1000B
Environmental Logger
05/09 16:38

Unit# 00894 Test# 1

INPUT 1: Level (F) TOC

Reference	43.26
Scale factor	10.10
Offset	- 0.03

Step# 0 05/06 13:00

Elapsed Time	Value
0.0000	43.14
0.0033	43.15
0.0066	43.15
.0099	43.15
0.0133	43.16
0.0166	43.16
0.0200	43.16
0.0233	43.16
0.0266	43.16
0.0300	43.16
0.0333	43.16
0.0500	43.16
0.0666	43.16
0.0833	43.16
0.1000	43.16
0.1166	43.16
0.1333	43.16
0.1500	43.16
0.1666	43.16
0.1833	43.16
0.2000	43.16
0.2166	43.16
0.2333	43.16
0.2500	43.16
0.2666	43.16
0.2833	43.16
0.3000	43.17
0.3166	43.17
0.3333	43.19
0.4167	43.31
0.5000	43.49
0.5833	43.70
0.6667	43.90
0.7500	44.09
0.8333	44.26
0.9167	44.42
1.0000	44.56
1.0833	44.69
1.1667	44.80
1.2500	44.90
1.3333	44.99
1.4166	45.08
1.5000	45.16

1.5833	45.23
1.6667	45.29
1.7500	45.33
1.8333	45.37
1.9167	45.40
2.0000	45.43
2.5000	45.52
3.0000	45.57
3.5000	45.61
4.0000	45.63
4.5000	45.65
5.0000	45.66
5.5000	45.67
6.0000	45.69
6.5000	45.70
7.0000	45.71
7.5000	45.72
8.0000	45.73
8.5000	45.74
9.0000	45.75
9.5000	45.76
10.0000	45.77
12.0000	45.79
14.0000	45.80
16.0000	45.81
18.0000	45.80
20.0000	45.81
22.0000	45.80
24.0000	45.80
26.0000	45.80
28.0000	45.80
30.0000	45.80
32.0000	45.79
34.0000	45.79
36.0000	45.78
38.0000	45.77
40.0000	45.76
42.0000	45.75
44.0000	45.75
46.0000	45.75
48.0000	45.75
50.0000	45.75
52.0000	45.74
54.0000	45.74
56.0000	45.75
58.0000	45.75
60.0000	45.75
62.0000	45.75
64.0000	45.74
66.0000	45.75
68.0000	45.75
70.0000	45.74
72.0000	45.74
74.0000	45.74
76.0000	45.74
78.0000	45.74
80.0000	45.74
82.0000	45.74
84.0000	45.74
86.0000	45.74

88.0000	45.74
90.0000	45.74
92.0000	45.74
94.0000	45.74
96.0000	45.73
98.0000	45.74
100.000	45.74
110.000	45.73
120.000	45.72
130.000	45.72
140.000	45.71
150.000	45.72
160.000	45.71
170.000	45.71
180.000	45.71
190.000	45.71
200.000	45.70
210.000	45.70
220.000	45.70
230.000	45.70
240.000	45.70
250.000	45.70
260.000	45.70
270.000	45.70
280.000	45.70
290.000	45.70
300.000	45.71
310.000	45.70
320.000	45.69
330.000	45.69
340.000	45.69
350.000	45.68
360.000	45.69
370.000	45.69
380.000	45.69
390.000	45.68
400.000	45.69
410.000	45.69
420.000	45.70
430.000	45.71
440.000	45.71
450.000	45.71
460.000	45.71
470.000	45.71
480.000	45.70
490.000	45.70
500.000	45.68
510.000	45.68
520.000	45.69
530.000	45.68
540.000	45.68
550.000	45.68
560.000	45.68
570.000	45.68
580.000	45.67
590.000	45.68
600.000	45.68
610.000	45.67
620.000	45.65
630.000	45.68

640.000	45.68
650.000	45.68
660.000	45.68
670.000	45.67
680.000	45.67
690.000	45.67
700.000	45.67
710.000	45.67
720.000	45.68
730.000	45.68
740.000	45.68
750.000	45.68
760.000	45.67
770.000	45.67
780.000	45.67
790.000	45.67
800.000	45.67
810.000	45.67
820.000	45.67
830.000	45.67
840.000	45.67
850.000	45.67
860.000	45.68
870.000	45.68
880.000	45.68
890.000	45.68
900.000	45.68
910.000	45.67
920.000	45.67
930.000	45.67
940.000	45.67
950.000	45.67
960.000	45.67
970.000	45.67
980.000	45.67
990.000	45.67
1000.00	45.67
1100.00	45.67
1200.00	45.66
1300.00	45.66
1400.00	45.66

SE1000B
Environmental Logger
05/09 16:41

Unit# 00894 Test# 2

INPUT 1: Level (F) TOC

Reference 43.26
Scale factor 10.10
Offset - 0.03

Step# 0 05/07 13:00

Elapsed Time	Value
0.0000	45.34
0.0033	45.35
0.0066	45.35
.0099	45.35
.0133	45.35
0.0166	45.35
0.0200	45.35
0.0233	45.35
0.0266	45.35
0.0300	45.35
0.0333	45.35
0.0500	45.34
0.0666	45.33
0.0833	45.33
0.1000	45.32
0.1166	45.32
0.1333	45.31
0.1500	45.30
0.1666	45.29
0.1833	45.28
.2000	45.28
0.2166	45.27
0.2333	45.26
0.2500	45.25
0.2666	45.25
0.2833	45.24
0.3000	45.24
0.3166	45.23
0.3333	45.22
0.4167	45.18
0.5000	45.14
0.5833	45.10
0.6667	45.07
0.7500	45.03
0.8333	45.00
0.9167	44.95
1.0000	44.92
1.0833	44.88
1.1667	44.85
1.2500	44.81
1.3333	44.77
1.4166	44.73
1.5000	44.70

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1.5833	44.66
1.6667	44.63
1.7500	44.60
1.8333	44.56
1.9167	44.53
2.0000	44.50
2.5000	44.31
3.0000	44.14
3.5000	44.00
4.0000	43.87
4.5000	43.76
5.0000	43.67
5.5000	43.60
6.0000	43.54
6.5000	43.48
7.0000	43.44
7.5000	43.41
8.0000	43.38
8.5000	43.35
9.0000	43.33
9.5000	43.32
10.0000	43.30
12.0000	43.26
14.0000	43.23
16.0000	43.22
18.0000	43.21
20.0000	43.20
22.0000	43.20
24.0000	43.19
26.0000	43.19
28.0000	43.19
30.0000	43.19
32.0000	43.18
34.0000	43.19
36.0000	43.18
38.0000	43.18
40.0000	43.18
42.0000	43.00
44.0000	43.19
46.0000	43.18
48.0000	43.18
50.0000	43.18
52.0000	43.18
54.0000	43.17
56.0000	43.18
58.0000	43.18
60.0000	43.18
62.0000	43.18
64.0000	43.18
66.0000	43.17
68.0000	43.17
70.0000	43.17
72.0000	43.17
74.0000	43.17
76.0000	43.17
78.0000	43.17
80.0000	43.17
82.0000	43.16
84.0000	43.18
86.0000	43.17

88.0000	43.17
90.0000	43.17
92.0000	43.17
94.0000	43.17
96.0000	43.17
98.0000	43.17
100.000	43.16
110.000	43.15
120.000	43.15
130.000	43.15
140.000	43.15
150.000	43.15
160.000	43.15
170.000	43.15
180.000	43.15
190.000	43.14
200.000	43.15
210.000	43.14
220.000	43.14
230.000	43.14
0.000	43.14
250.000	43.14
260.000	43.14
270.000	43.14
280.000	43.14
290.000	43.14
300.000	43.14
310.000	43.14
320.000	43.14
330.000	43.14
340.000	43.14
350.000	43.13
360.000	43.14
370.000	43.14
380.000	43.13
390.000	43.13
400.000	43.13
410.000	43.13
420.000	43.13
430.000	43.13
440.000	43.13
450.000	43.13
460.000	43.13
470.000	43.13
480.000	43.13
490.000	43.13
500.000	43.13
510.000	43.13
520.000	43.13
530.000	43.13
540.000	43.13
550.000	43.13
560.000	43.12
570.000	43.12
580.000	43.13
590.000	43.13
600.000	43.13
610.000	43.12
620.000	43.12
630.000	43.12

640.000	43.12
650.000	43.12
660.000	43.12
670.000	43.12
680.000	43.12
690.000	43.12
700.000	43.12
710.000	43.12
720.000	43.12
730.000	43.12
740.000	43.12
750.000	43.12
760.000	43.12
770.000	43.12
780.000	43.12
790.000	43.12
800.000	43.12
810.000	43.12
820.000	43.11
830.000	43.11
840.000	43.11
850.000	43.11
860.000	43.11
870.000	43.11
880.000	43.11
890.000	43.11
900.000	43.11
910.000	43.11
920.000	43.11
930.000	43.11
940.000	43.11
950.000	43.11
960.000	43.11
970.000	43.11
980.000	43.11
990.000	43.11
1000.00	43.11
1100.00	43.11
1200.00	43.10
1300.00	43.10
1400.00	43.10
1500.00	43.10
1600.00	43.09
1700.00	43.09
1800.00	43.09
1900.00	43.08
2000.00	43.08
2100.00	43.08
2200.00	43.08
2300.00	43.07
2400.00	43.07
2500.00	43.07
2600.00	43.07
2700.00	43.07
2800.00	43.06
2900.00	43.06

SE1000B
Environmental Logger
05/09 16:25

Unit# 00615 Test# 0

INPUT 1: Level (F) TOC

Reference	49.74
Scale factor	10.01
Offset	0.02

Step# 0 05/03 14:00

Elapsed Time	Value
0.0000	23.81
600.000	23.81
1200.00	23.81
`00.00	23.81
~400.00	23.81
3000.00	23.81
3600.00	23.81
4200.00	23.81

SE1000B
Environmental Logger
05/09 16:26

Unit# 00615 Test# 1

INPUT 1: Level (F) TOC

Reference	49.74
Scale factor	10.01
Offset	0.02

Step# 0 05/06 13:00

Elapsed Time	Value
0.0000	23.81
0.0033	23.81
0.0066	23.81
0.0099	23.81
0.0133	23.81
0.0166	23.81
0.0200	23.81
0.0233	23.81
0.0266	23.81
0.0300	23.81
0.0333	23.81
0.0500	23.81
0.0666	23.81
0.0833	23.81
0.1000	23.81
0.1166	23.81
0.1333	23.81
0.1500	23.81
0.1666	23.81
0.1833	23.81
0.2000	23.81
0.2166	23.81
0.2333	23.81
0.2500	23.81
0.2666	23.81
0.2833	23.81
0.3000	23.81
0.3166	23.81
0.3333	23.81
0.4167	23.81
0.5000	23.81
0.5833	23.81
0.6667	23.81
0.7500	23.81
0.8333	23.81
0.9167	23.81
1.0000	23.81
1.0833	23.81
1.1667	23.81
1.2500	23.81
1.3333	23.81
1.4166	23.81
1.5000	23.81

1.5833	23.81
1.6667	23.81
1.7500	23.81
1.8333	23.81
1.9167	23.81
2.0000	23.81
2.5000	23.81
3.0000	23.81
3.5000	23.81
4.0000	23.81
4.5000	23.81
5.0000	23.81
5.5000	23.81
6.0000	23.81
6.5000	23.81
7.0000	23.81
7.5000	23.81
8.0000	23.81
8.5000	23.81
9.0000	23.81
.5000	23.81
10.0000	23.81
12.0000	23.81
14.0000	23.81
16.0000	23.81
18.0000	23.81
20.0000	23.81
22.0000	23.81
24.0000	23.81
26.0000	23.81
28.0000	23.81
30.0000	23.81
32.0000	23.81
34.0000	23.81
36.0000	23.81
38.0000	23.81
40.0000	23.81
42.0000	23.81
44.0000	23.81
46.0000	23.81
48.0000	23.81
50.0000	23.81
52.0000	23.81
54.0000	23.81
56.0000	23.81
58.0000	23.81
60.0000	23.81
62.0000	23.81
64.0000	23.81
66.0000	23.81
68.0000	23.81
70.0000	23.81
72.0000	23.81
74.0000	23.81
76.0000	23.81
78.0000	23.81
80.0000	23.81
82.0000	23.81
84.0000	23.81
86.0000	23.81

88.0000	23.81
90.0000	23.81
92.0000	23.81
94.0000	23.81
96.0000	23.81
98.0000	23.81
100.000	23.81
110.000	23.81
120.000	23.81
130.000	23.81
140.000	23.81
150.000	23.81
160.000	23.81
170.000	23.81
180.000	23.81
190.000	23.81
200.000	23.81
210.000	23.81
220.000	23.81
230.000	23.81
240.000	23.81
250.000	23.81
260.000	23.81
270.000	23.81
280.000	23.81
290.000	23.81
300.000	23.81
310.000	23.81
320.000	23.81
330.000	23.81
340.000	23.81
350.000	23.81
360.000	23.81
370.000	23.81
380.000	23.81
390.000	23.81
400.000	23.81
410.000	23.81
420.000	23.81
430.000	23.81
440.000	23.81
450.000	23.81
460.000	23.81
470.000	23.81
480.000	23.81
490.000	23.81
500.000	23.81
510.000	23.81
520.000	23.81
530.000	23.81
540.000	23.81
550.000	23.81
560.000	23.81
570.000	23.81
580.000	23.81
590.000	23.81
600.000	23.81
610.000	23.81
620.000	23.81
630.000	23.81

640.000	23.81
650.000	23.81
660.000	23.81
670.000	23.81
680.000	23.81
690.000	23.81
700.000	23.81
710.000	23.81
720.000	23.81
730.000	23.81
740.000	23.81
750.000	23.81
760.000	23.81
770.000	23.81
780.000	23.81
790.000	23.81
800.000	23.81
810.000	23.81
820.000	23.81
830.000	23.81
0.000	23.81
50.000	23.81
860.000	23.81
870.000	23.81
880.000	23.81
890.000	23.81
900.000	23.81
910.000	23.81
920.000	23.81
930.000	23.81
940.000	23.81
950.000	23.81
960.000	23.81
970.000	23.81
980.000	23.81
990.000	23.81
000.00	23.81
100.00	23.81
1200.00	23.81
1300.00	23.81
1400.00	23.81

SE1000B
Environmental Logger
05/09 16:28

Unit# 00615 Test# 2

INPUT 1: Level (F) TOC

Reference 49.74
Scale factor 10.01
Offset 0.02

Step# 0 05/07 13:00

Elapsed Time	Value
0.0000	23.81
0.0033	23.81
0.0066	23.81
0.0099	23.81
0.0133	23.81
0.0166	23.81
0.0200	23.81
0.0233	23.81
0.0266	23.81
0.0300	23.81
0.0333	23.81
0.0500	23.81
0.0666	23.81
0.0833	23.81
0.1000	23.81
0.1166	23.81
0.1333	23.81
0.1500	23.81
0.1666	23.81
0.1833	23.81
0.2000	23.81
0.2166	23.81
0.2333	23.81
0.2500	23.81
0.2666	23.81
0.2833	23.81
0.3000	23.81
0.3166	23.81
0.3333	23.81
0.4167	23.81
0.5000	23.81
0.5833	23.81
0.6667	23.81
0.7500	23.81
0.8333	23.81
0.9167	23.81
1.0000	23.81
1.0833	23.81
1.1667	23.81
1.2500	23.81
1.3333	23.81
1.4166	23.81
1.5000	23.81

1.5833	23.81
1.6667	23.81
1.7500	23.81
1.8333	23.81
1.9167	23.81
2.0000	23.81
2.5000	23.81
3.0000	23.81
3.5000	23.81
4.0000	23.81
4.5000	23.81
5.0000	23.81
5.5000	23.81
6.0000	23.81
6.5000	23.81
7.0000	23.81
7.5000	23.81
8.0000	23.81
8.5000	23.81
9.0000	23.81
).5000	23.81
10.0000	23.81
12.0000	23.81
14.0000	23.81
16.0000	23.81
18.0000	23.81
20.0000	23.81
22.0000	23.81
24.0000	23.81
26.0000	23.81
28.0000	23.81
30.0000	23.81
32.0000	23.81
34.0000	23.81
36.0000	23.81
38.0000	23.81
'0.0000	23.81
2.0000	23.81
44.0000	23.81
46.0000	23.81
48.0000	23.81
50.0000	23.81
52.0000	23.81
54.0000	23.81
56.0000	23.81
58.0000	23.81
60.0000	23.81
62.0000	23.81
64.0000	23.81
66.0000	23.81
68.0000	23.81
70.0000	23.81
72.0000	23.81
74.0000	23.81
76.0000	23.81
78.0000	23.81
80.0000	23.81
82.0000	23.81
84.0000	23.81
86.0000	23.81

88.0000	23.81
90.0000	23.81
92.0000	23.81
94.0000	23.81
96.0000	23.81
98.0000	23.81
100.000	23.81
110.000	23.81
120.000	23.81
130.000	23.81
140.000	23.81
150.000	23.81
160.000	23.81
170.000	23.81
180.000	23.81
190.000	23.81
200.000	23.81
210.000	23.81
220.000	23.81
230.000	23.81
240.000	23.81
250.000	23.81
260.000	23.81
270.000	23.81
280.000	23.81
290.000	23.81
300.000	23.81
310.000	23.81
320.000	23.81
330.000	23.81
340.000	23.81
350.000	23.81
360.000	23.81
370.000	23.81
380.000	23.81
390.000	23.81
400.000	23.81
410.000	23.81
420.000	23.81
430.000	23.81
440.000	23.81
450.000	23.81
460.000	23.81
470.000	23.81
480.000	23.81
490.000	23.81
500.000	23.81
510.000	23.81
520.000	23.81
530.000	23.81
540.000	23.81
550.000	23.81
560.000	23.81
570.000	23.81
580.000	23.81
590.000	23.81
600.000	23.81
610.000	23.81
620.000	23.81
630.000	23.81

640.000	23.81
650.000	23.81
660.000	23.81
670.000	23.81
680.000	23.81
690.000	23.81
700.000	23.81
710.000	23.81
720.000	23.81
730.000	23.81
740.000	23.81
750.000	23.81
760.000	23.81
770.000	23.81
780.000	23.81
790.000	23.81
800.000	23.81
810.000	23.81
820.000	23.81
830.000	23.81
40.000	23.81
50.000	23.81
860.000	23.81
870.000	23.81
880.000	23.81
890.000	23.81
900.000	23.81
910.000	23.81
920.000	23.81
930.000	23.81
940.000	23.81
950.000	23.81
960.000	23.81
970.000	23.81
980.000	23.81
990.000	23.81
1000.00	23.81
100.00	23.81
1200.00	23.81
1300.00	23.81
1400.00	23.81
1500.00	23.81
1600.00	23.81
1700.00	23.81
1800.00	23.81
1900.00	23.81
2000.00	23.81
2100.00	23.81
2200.00	23.81
2300.00	23.81
2400.00	23.81
2500.00	23.81
2600.00	23.81
2700.00	23.81
2800.00	23.81
2900.00	23.81

SE1000B
Environmental Logger
05/09 16:14

Unit# 01004 Test# 0

INPUT 1: Level (F) TOC

Reference	42.26
Scale factor	49.85
Offset	- 0.11

Step# 0 05/03 14:00

Elapsed Time	Value
0.0000	-7.36
600.000	-7.38
1200.00	-7.38
1800.00	-7.39
2400.00	-7.41
3000.00	-7.42
3600.00	-7.44
4200.00	-7.45

SE1000B
Environmental Logger
05/09 16:15

Unit# 01004 Test# 1

INPUT 1: Level (F) TOC

Reference 42.26
Scale factor 49.85
Offset - 0.11

Step# 0 05/06 13:00

Elapsed Time	Value
0.0000	-7.42
0.0033	-7.42
0.0066	-7.42
0.0099	-7.42
0.0133	-7.42
0.0166	-7.42
0.0200	-7.42
0.0233	-7.42
0.0266	-7.42
0.0300	-7.42
0.0333	-7.42
0.0500	-7.42
0.0666	-7.42
0.0833	-7.42
0.1000	-7.42
0.1166	-7.42
0.1333	-7.42
0.1500	-7.42
0.1666	-7.42
0.1833	-7.42
0.2000	-7.42
0.2166	-7.42
0.2333	-7.42
0.2500	-7.42
0.2666	-7.42
0.2833	-7.42
0.3000	-7.42
0.3166	-7.42
0.3333	-7.42
0.4167	-7.42
0.5000	-7.42
0.5833	-7.42
0.6667	-7.42
0.7500	-7.42
0.8333	-7.42
0.9167	-7.42
1.0000	-7.42
1.0833	-7.42
1.1667	-7.42
1.2500	-7.42
1.3333	-7.42
1.4166	-7.42
1.5000	-7.42

1.5833	-7.42
1.6667	-7.42
1.7500	-7.42
1.8333	-7.42
1.9167	-7.42
2.0000	-7.41
2.5000	-7.42
3.0000	-7.41
3.5000	-7.41
4.0000	-7.41
4.5000	-7.41
5.0000	-7.41
5.5000	-7.41
6.0000	-7.41
6.5000	-7.41
7.0000	-7.41
7.5000	-7.41
8.0000	-7.41
8.5000	-7.41
9.0000	-7.41
9.5000	-7.41
10.0000	-7.41
12.0000	-7.41
14.0000	-7.41
16.0000	-7.39
18.0000	-7.41
20.0000	-7.41
22.0000	-7.41
24.0000	-7.41
26.0000	-7.41
28.0000	-7.39
30.0000	-7.39
32.0000	-7.41
34.0000	-7.41
36.0000	-7.41
38.0000	-7.39
40.0000	-7.39
42.0000	-7.41
44.0000	-7.41
46.0000	-7.39
48.0000	-7.39
50.0000	-7.39
52.0000	-7.39
54.0000	-7.39
56.0000	-7.39
58.0000	-7.41
60.0000	-7.39
62.0000	-7.39
64.0000	-7.39
66.0000	-7.39
68.0000	-7.39
70.0000	-7.39
72.0000	-7.39
74.0000	-7.39
76.0000	-7.39
78.0000	-7.39
80.0000	-7.39
82.0000	-7.39
84.0000	-7.39
86.0000	-7.39

88.0000	-7.39
90.0000	-7.39
92.0000	-7.39
94.0000	-7.39
96.0000	-7.39
98.0000	-7.39
100.000	-7.39
110.000	-7.39
120.000	-7.39
130.000	-7.39
140.000	-7.39
150.000	-7.39
160.000	-7.39
170.000	-7.39
180.000	-7.39
190.000	-7.39
200.000	-7.39
210.000	-7.39
220.000	-7.39
230.000	-7.39
240.000	-7.39
250.000	-7.39
260.000	-7.39
270.000	-7.39
280.000	-7.39
290.000	-7.39
300.000	-7.38
310.000	-7.39
320.000	-7.39
330.000	-7.39
340.000	-7.39
350.000	-7.39
360.000	-7.38
370.000	-7.38
380.000	-7.39
390.000	-7.38
400.000	-7.38
410.000	-7.38
420.000	-7.39
430.000	-7.38
440.000	-7.38
450.000	-7.38
460.000	-7.38
470.000	-7.38
480.000	-7.38
490.000	-7.38
500.000	-7.38
510.000	-7.38
520.000	-7.38
530.000	-7.38
540.000	-7.38
550.000	-7.38
560.000	-7.38
570.000	-7.38
580.000	-7.38
590.000	-7.38
600.000	-7.38
610.000	-7.38
620.000	-7.38
630.000	-7.38

640.000	-7.38
650.000	-7.38
660.000	-7.38
670.000	-7.38
680.000	-7.38
690.000	-7.38
700.000	-7.38
710.000	-7.38
720.000	-7.38
730.000	-7.38
740.000	-7.38
750.000	-7.38
760.000	-7.38
770.000	-7.38
780.000	-7.38
790.000	-7.38
800.000	-7.38
810.000	-7.38
820.000	-7.38
830.000	-7.38
840.000	-7.38
850.000	-7.36
860.000	-7.38
870.000	-7.38
880.000	-7.38
890.000	-7.38
900.000	-7.38
910.000	-7.38
920.000	-7.38
930.000	-7.38
940.000	-7.38
950.000	-7.38
960.000	-7.38
970.000	-7.38
980.000	-7.38
990.000	-7.38
1000.00	-7.38
1100.00	-7.38
1200.00	-7.38
1300.00	-7.38

SE1000B
Environmental Logger
05/09 16:17

Unit# 01004 Test# 2

INPUT 1: Level (F) TOC

Reference 42.26
Scale factor 49.85
Offset - 0.11

Step# 0 05/07 13:00

Elapsed Time	Value
0.0000	-7.38
0.0033	-7.38
0.0066	-7.38
0.0099	-7.38
.0133	-7.38
0.0166	-7.38
0.0200	-7.38
0.0233	-7.38
0.0266	-7.38
0.0300	-7.38
0.0333	-7.38
0.0500	-7.38
0.0666	-7.38
0.0833	-7.38
0.1000	-7.38
0.1166	-7.38
0.1333	-7.38
0.1500	-7.38
0.1666	-7.38
0.1833	-7.38
.2000	-7.38
0.2166	-7.38
0.2333	-7.38
0.2500	-7.38
0.2666	-7.38
0.2833	-7.38
0.3000	-7.38
0.3166	-7.38
0.3333	-7.38
0.4167	-7.38
0.5000	-7.38
0.5833	-7.38
0.6667	-7.38
0.7500	-7.38
0.8333	-7.38
0.9167	-7.38
1.0000	-7.38
1.0833	-7.38
1.1667	-7.38
1.2500	-7.39
1.3333	-7.38
1.4166	-7.39
1.5000	-7.39

5833	-7.38
6667	-7.39
.7500	-7.39
.8333	-7.39
.9167	-7.39
1.0000	-7.39
2.5000	-7.39
3.0000	-7.39
3.5000	-7.39
4.0000	-7.39
4.5000	-7.39
5.0000	-7.41
5.5000	-7.41
6.0000	-7.41
6.5000	-7.41
7.0000	-7.41
7.5000	-7.41
8.0000	-7.41
8.5000	-7.41
9.0000	-7.41
9.5000	-7.41
10.0000	-7.41
12.0000	-7.42
14.0000	-7.42
16.0000	-7.42
18.0000	-7.42
20.0000	-7.42
22.0000	-7.42
24.0000	-7.42
26.0000	-7.42
28.0000	-7.42
30.0000	-7.44
32.0000	-7.42
34.0000	-7.42
36.0000	-7.44
38.0000	-7.44
40.0000	-7.44
42.0000	-7.52
44.0000	-7.42
46.0000	-7.44
48.0000	-7.44
50.0000	-7.44
52.0000	-7.44
54.0000	-7.44
56.0000	-7.42
58.0000	-7.42
60.0000	-7.44
62.0000	-7.44
64.0000	-7.44
66.0000	-7.44
68.0000	-7.44
70.0000	-7.44
72.0000	-7.44
74.0000	-7.44
76.0000	-7.44
78.0000	-7.44
80.0000	-7.44
.0000	-7.45
	-7.42

88.0000	-7.44
90.0000	-7.44
92.0000	-7.44
94.0000	-7.44
96.0000	-7.44
98.0000	-7.44
100.000	-7.44
110.000	-7.44
120.000	-7.44
130.000	-7.44
140.000	-7.45
150.000	-7.44
160.000	-7.44
170.000	-7.45
180.000	-7.45
190.000	-7.45
200.000	-7.45
210.000	-7.45
220.000	-7.45
230.000	-7.45
240.000	-7.45
250.000	-7.45
260.000	-7.45
270.000	-7.45
280.000	-7.45
290.000	-7.45
300.000	-7.45
310.000	-7.45
320.000	-7.45
330.000	-7.47
340.000	-7.47
350.000	-7.47
360.000	-7.45
370.000	-7.47
380.000	-7.47
390.000	-7.47
400.000	-7.47
0.000	-7.47
420.000	-7.47
430.000	-7.47
440.000	-7.47
450.000	-7.47
460.000	-7.47
470.000	-7.47
480.000	-7.47
490.000	-7.47
500.000	-7.47
510.000	-7.47
520.000	-7.47
530.000	-7.47
540.000	-7.47
550.000	-7.47
560.000	-7.47
570.000	-7.47
580.000	-7.47
590.000	-7.47
600.000	-7.47
610.000	-7.47
620.000	-7.47
630.000	-7.47

640.000	-7.47
650.000	-7.47
660.000	-7.47
670.000	-7.47
680.000	-7.47
690.000	-7.47
700.000	-7.47
710.000	-7.47
720.000	-7.47
730.000	-7.47
740.000	-7.47
750.000	-7.49
760.000	-7.47
770.000	-7.47
780.000	-7.47
790.000	-7.47
800.000	-7.47
810.000	-7.47
820.000	-7.49
830.000	-7.47
840.000	-7.47
850.000	-7.49
860.000	-7.49
870.000	-7.49
880.000	-7.49
890.000	-7.49
900.000	-7.49
910.000	-7.49
920.000	-7.49
930.000	-7.49
940.000	-7.49
950.000	-7.49
960.000	-7.49
970.000	-7.49
980.000	-7.49
990.000	-7.49
1000.00	-7.49
1100.00	-7.49
1200.00	-7.49
1300.00	-7.49
1400.00	-7.50
1500.00	-7.50
1600.00	-7.50
1700.00	-7.50
1800.00	-7.52
1900.00	-7.52
2000.00	-7.52
2100.00	-7.52
2200.00	-7.53
2300.00	-7.53
2400.00	-7.53
2500.00	-7.53
2600.00	-7.53
2700.00	-7.53
2800.00	-7.53
2900.00	-7.53

SE1000B
Environmental Logger
05/09 16:32

Unit# 32582 Test# 0

INPUT 1: Level (F) TOC

Reference	49.30
Scale factor	10.01
Offset	- 0.03

Step# 0 05/03 14:00

Elapsed Time	Value
0.0000	23.44
600.000	23.44
1200.00	23.44
1800.00	23.44
2400.00	23.44
3000.00	23.44
3600.00	23.44
4200.00	23.44

SE1000B
Environmental Logger
05/09 16:32

Unit# 32582 Test# 1

INPUT 1: Level (F) TOC

Reference 49.30
Scale factor 10.01
Offset - 0.03

Step# 0 05/06 13:00

Elapsed Time	Value
0.0000	23.44
0.0033	23.44
0.0066	23.44
0.0099	23.44
0.0133	23.44
0.0166	23.44
0.0200	23.44
0.0233	23.44
0.0266	23.44
0.0300	23.44
0.0333	23.44
0.0500	23.44
0.0666	23.44
0.0833	23.44
0.1000	23.44
0.1166	23.44
0.1333	23.44
0.1500	23.44
0.1666	23.44
0.1833	23.44
0.2000	23.44
0.2166	23.44
0.2333	23.44
0.2500	23.44
0.2666	23.44
0.2833	23.44
0.3000	23.44
0.3166	23.44
0.3333	23.44
0.4167	23.44
0.5000	23.44
0.5833	23.44
0.6667	23.44
0.7500	23.44
0.8333	23.44
0.9167	23.44
1.0000	23.44
1.0833	23.44
1.1667	23.44
1.2500	23.44
1.3333	23.44
1.4166	23.44
1.5000	23.44

1.5833	23.44
1.6667	23.44
1.7500	23.44
1.8333	23.44
1.9167	23.44
2.0000	23.44
2.5000	23.44
3.0000	23.44
3.5000	23.44
4.0000	23.44
4.5000	23.44
5.0000	23.44
5.5000	23.44
6.0000	23.44
6.5000	23.44
7.0000	23.44
7.5000	23.44
8.0000	23.44
8.5000	23.44
9.0000	23.44
9.5000	23.44
.0000	23.44
12.0000	23.44
14.0000	23.44
16.0000	23.44
18.0000	23.44
20.0000	23.44
22.0000	23.44
24.0000	23.44
26.0000	23.44
28.0000	23.44
30.0000	23.44
32.0000	23.44
34.0000	23.44
36.0000	23.44
38.0000	23.44
40.0000	23.44
.0000	23.44
44.0000	23.44
46.0000	23.44
48.0000	23.44
50.0000	23.44
52.0000	23.44
54.0000	23.44
56.0000	23.44
58.0000	23.44
60.0000	23.44
62.0000	23.44
64.0000	23.44
66.0000	23.44
68.0000	23.44
70.0000	23.44
72.0000	23.44
74.0000	23.44
76.0000	23.44
78.0000	23.44
80.0000	23.44
82.0000	23.44
84.0000	23.44
86.0000	23.44

88.0000	23.44
90.0000	23.44
92.0000	23.44
94.0000	23.44
96.0000	23.44
98.0000	23.44
100.000	23.44
110.000	23.44
120.000	23.44
130.000	23.44
140.000	23.44
150.000	23.44
160.000	23.44
170.000	23.44
180.000	23.44
190.000	23.44
200.000	23.44
210.000	23.44
220.000	23.44
230.000	23.44
240.000	23.44
250.000	23.44
260.000	23.44
270.000	23.44
280.000	23.44
290.000	23.44
300.000	23.44
310.000	23.44
320.000	23.44
330.000	23.44
340.000	23.44
350.000	23.44
360.000	23.44
370.000	23.44
380.000	23.44
390.000	23.44
400.000	23.44
410.000	23.44
420.000	23.44
430.000	23.44
440.000	23.44
450.000	23.44
460.000	23.44
470.000	23.44
480.000	23.44
490.000	23.44
500.000	23.44
510.000	23.44
520.000	23.44
530.000	23.44
540.000	23.44
550.000	23.44
560.000	23.44
570.000	23.44
580.000	23.44
590.000	23.44
600.000	23.44
610.000	23.44
620.000	23.44
630.000	23.44

640.000	23.44
650.000	23.44
660.000	23.44
670.000	23.44
680.000	23.44
690.000	23.44
700.000	23.44
710.000	23.44
720.000	23.44
730.000	23.44
740.000	23.44
750.000	23.44
760.000	23.44
770.000	23.44
780.000	23.44
790.000	23.44
800.000	23.44
810.000	23.44
820.000	23.44
830.000	23.44
840.000	23.44
850.000	23.44
860.000	23.44
870.000	23.44
880.000	23.44
890.000	23.44
900.000	23.44
910.000	23.44
920.000	23.44
930.000	23.44
940.000	23.44
950.000	23.44
960.000	23.44
970.000	23.44
980.000	23.44
990.000	23.44
1000.00	23.44
1100.00	23.44
1200.00	23.44
1300.00	23.44

SE1000B
Environmental Logger
05/09 16:35

Unit# 32582 Test# 2

INPUT 1: Level (F) TOC

Reference 49.30
Scale factor 10.01
Offset - 0.03

Step# 0 05/07 13:00

Elapsed Time	Value
0.0000	23.44
0.0033	23.44
0.0066	23.44
0.0099	23.44
0.0133	23.44
0.0166	23.44
0.0200	23.44
0.0233	23.44
0.0266	23.44
0.0300	23.44
0.0333	23.44
0.0500	23.44
0.0666	23.44
0.0833	23.44
0.1000	23.44
0.1166	23.44
0.1333	23.44
0.1500	23.44
0.1666	23.44
0.1833	23.44
0.2000	23.44
0.2166	23.44
0.2333	23.44
0.2500	23.44
0.2666	23.44
0.2833	23.44
0.3000	23.44
0.3166	23.44
0.3333	23.44
0.4167	23.44
0.5000	23.44
0.5833	23.44
0.6667	23.44
0.7500	23.44
0.8333	23.44
0.9167	23.44
1.0000	23.44
1.0833	23.44
1.1667	23.44
1.2500	23.44
1.3333	23.44
1.4166	23.44
1.5000	23.44

1.5833	23.44
1.6667	23.44
1.7500	23.44
1.8333	23.44
1.9167	23.44
2.0000	23.44
2.5000	23.44
3.0000	23.44
3.5000	23.44
4.0000	23.44
4.5000	23.44
5.0000	23.44
5.5000	23.44
6.0000	23.44
6.5000	23.44
7.0000	23.44
7.5000	23.44
8.0000	23.44
8.5000	23.44
9.0000	23.44
[illegible].5000	23.44
[illegible].0000	23.44
12.0000	23.44
14.0000	23.44
16.0000	23.44
18.0000	23.44
20.0000	23.44
22.0000	23.44
24.0000	23.44
26.0000	23.44
28.0000	23.44
30.0000	23.44
32.0000	23.44
34.0000	23.44
36.0000	23.44
38.0000	23.44
40.0000	23.44
[illegible].0000	23.44
44.0000	23.44
46.0000	23.44
48.0000	23.44
50.0000	23.44
52.0000	23.44
54.0000	23.44
56.0000	23.44
58.0000	23.44
60.0000	23.44
62.0000	23.44
64.0000	23.44
66.0000	23.44
68.0000	23.44
70.0000	23.44
72.0000	23.44
74.0000	23.44
76.0000	23.44
78.0000	23.44
80.0000	23.44
82.0000	23.44
84.0000	23.44
86.0000	23.44

88.0000	23.44
90.0000	23.44
92.0000	23.44
94.0000	23.44
96.0000	23.44
98.0000	23.44
100.000	23.44
110.000	23.44
120.000	23.44
130.000	23.44
140.000	23.44
150.000	23.44
160.000	23.44
170.000	23.44
180.000	23.44
190.000	23.44
200.000	23.44
210.000	23.44
220.000	23.44
230.000	23.44
240.000	23.44
250.000	23.44
260.000	23.44
270.000	23.44
280.000	23.44
290.000	23.44
300.000	23.44
310.000	23.44
320.000	23.44
330.000	23.44
340.000	23.44
350.000	23.44
360.000	23.44
370.000	23.44
380.000	23.44
390.000	23.44
400.000	23.44
410.000	23.44
420.000	23.44
430.000	23.44
440.000	23.44
450.000	23.44
460.000	23.44
470.000	23.44
480.000	23.44
490.000	23.44
500.000	23.44
510.000	23.44
520.000	23.44
530.000	23.44
540.000	23.44
550.000	23.44
560.000	23.44
570.000	23.44
580.000	23.44
590.000	23.44
600.000	23.44
610.000	23.44
620.000	23.44
630.000	23.44

640.000	23.44
650.000	23.44
660.000	23.44
670.000	23.44
680.000	23.44
690.000	23.44
700.000	23.44
710.000	23.44
720.000	23.44
730.000	23.44
740.000	23.44
750.000	23.44
760.000	23.44
770.000	23.44
780.000	23.44
790.000	23.44
800.000	23.44
810.000	23.44
820.000	23.44
830.000	23.44
0.000	23.44
860.000	23.44
860.000	23.44
870.000	23.44
880.000	23.44
890.000	23.44
900.000	23.44
910.000	23.44
920.000	23.44
930.000	23.44
940.000	23.44
950.000	23.44
960.000	23.44
970.000	23.44
980.000	23.44
990.000	23.44
1000.00	23.44
1100.00	23.44
1200.00	23.44
1300.00	23.44
1400.00	23.44
1500.00	23.44
1600.00	23.44
1700.00	23.44
1800.00	23.44
1900.00	23.44
2000.00	23.44
2100.00	23.44
2200.00	23.44
2300.00	23.44
2400.00	23.44
2500.00	23.44
2600.00	23.44
2700.00	23.44
2800.00	23.44
2900.00	23.44

SE1000B
Environmental Logger
05/09 16:44

Unit# 00894 Test# 0

INPUT 2: Level (F) TOC

Reference	43.98
Scale factor	20.11
Offset	0.04

Step# 0 05/03 14:00

Elapsed Time	Value
0.0000	96.07
600.000	75.92
1200.00	75.91
1800.00	75.90
2400.00	75.89
3000.00	75.88
3600.00	75.87

SE1000B
Environmental Logger
05/09 16:46

Unit# 00894 Test# 1

INPUT 2: Level (F) TOC

Reference	43.98
Scale factor	20.11
Offset	0.04

Step# 0 05/06 13:00

Elapsed Time	Value
0.0000	43.98
0.0033	43.98
0.0066	43.98
0.0099	43.98
0.0133	43.98
0.0166	43.98
0.0200	43.98
0.0233	43.98
0.0266	43.98
0.0300	43.98
0.0333	43.98
0.0500	43.98
0.0666	43.98
0.0833	43.98
0.1000	43.98
0.1166	43.98
0.1333	43.98
0.1500	43.98
0.1666	43.98
0.1833	43.98
0.2000	43.98
0.2166	43.98
0.2333	43.98
0.2500	43.98
0.2666	43.98
0.2833	43.98
0.3000	43.98
0.3166	43.98
0.3333	43.98
0.4167	47.72
0.5000	51.15
0.5833	54.18
0.6667	57.00
0.7500	59.68
0.8333	62.24
0.9167	64.73
1.0000	67.22
1.0833	69.53
1.1667	71.30
1.2500	72.63
1.3333	74.26
1.4166	75.58
1.5000	76.71

1.5833	77.17
1.6667	76.88
1.7500	76.36
1.8333	76.12
1.9167	75.74
2.0000	75.47
2.5000	74.55
3.0000	73.93
3.5000	73.57
4.0000	73.32
4.5000	73.19
5.0000	73.18
5.5000	73.29
6.0000	73.36
6.5000	73.60
7.0000	73.65
7.5000	73.78
8.0000	73.71
8.5000	73.87
9.0000	74.07
9.5000	74.13
10.0000	74.17
12.0000	74.35
14.0000	74.49
16.0000	74.61
18.0000	74.70
20.0000	74.70
22.0000	74.81
24.0000	74.89
26.0000	74.92
28.0000	74.97
30.0000	74.94
32.0000	74.96
34.0000	74.93
36.0000	74.82
38.0000	74.79
40.0000	74.81
42.0000	74.77
44.0000	74.90
46.0000	74.90
48.0000	75.00
50.0000	75.02
52.0000	75.05
54.0000	75.10
56.0000	75.25
58.0000	75.23
60.0000	75.30
62.0000	75.36
64.0000	75.27
66.0000	75.33
68.0000	75.35
70.0000	75.44
72.0000	75.39
74.0000	75.42
76.0000	75.39
78.0000	75.52
80.0000	75.40
82.0000	75.49
84.0000	75.59
86.0000	75.63

88.0000	75.61
90.0000	75.67
92.0000	75.74
94.0000	75.73
96.0000	75.79
98.0000	75.86
100.000	75.74
110.000	75.94
120.000	76.07
130.000	76.13
140.000	76.26
150.000	76.36
160.000	76.47
170.000	76.56
180.000	76.78
190.000	76.78
200.000	76.85
210.000	76.94
220.000	77.17
230.000	77.19
[illegible]0.000	77.36
[illegible]0.000	77.38
260.000	77.47
270.000	77.52
280.000	77.75
290.000	77.73
300.000	77.70
310.000	77.79
320.000	77.74
330.000	77.92
340.000	77.99
350.000	77.93
360.000	78.08
370.000	78.09
380.000	78.16
390.000	78.29
400.000	78.29
0.000	78.34
420.000	78.78
430.000	78.76
440.000	78.87
450.000	78.88
460.000	78.83
470.000	78.99
480.000	78.97
490.000	79.08
500.000	78.29
510.000	78.90
520.000	79.00
530.000	79.01
540.000	79.08
550.000	79.07
560.000	79.20
570.000	79.05
580.000	79.21
590.000	79.27
600.000	79.28
610.000	79.27
620.000	78.93
630.000	79.39

640.000	79.51
650.000	79.62
660.000	79.58
670.000	79.63
680.000	79.72
690.000	79.65
700.000	79.51
710.000	79.75
720.000	79.78
730.000	79.78
740.000	79.77
750.000	79.89
760.000	79.80
770.000	79.86
780.000	79.93
790.000	79.97
800.000	80.00
810.000	80.11
820.000	80.02
830.000	80.08
840.000	80.17
850.000	80.31
860.000	80.19
870.000	80.39
880.000	80.45
890.000	80.42
900.000	80.48
910.000	80.57
920.000	80.47
930.000	80.53
940.000	80.58
950.000	80.62
960.000	80.74
970.000	80.74
980.000	80.80
990.000	80.79
1000.00	80.76
1100.00	81.09
1200.00	81.49
1300.00	81.76
1400.00	82.04

SE1000B
Environmental Logger
05/09 16:49

Unit# 00894 Test# 2

INPUT 2: Level (F) TOC

Reference	43.98
Scale factor	20.11
Offset	0.04

Step# 0 05/07 13:00

Elapsed Time	Value
0.0000	64.04
0.0033	64.00
0.0066	63.96
0.0099	63.91
0.0133	63.87
0.0166	63.83
0.0200	63.78
0.0233	63.74
0.0266	63.70
0.0300	63.66
0.0333	63.61
0.0500	63.41
0.0666	63.20
0.0833	63.00
0.1000	62.80
0.1166	62.60
0.1333	62.40
0.1500	62.21
0.1666	62.01
0.1833	61.82
0.2000	61.63
0.2166	61.44
0.2333	61.25
0.2500	61.05
0.2666	60.87
0.2833	60.69
0.3000	60.50
0.3166	60.32
0.3333	60.14
0.4167	59.26
0.5000	58.41
0.5833	57.60
0.6667	56.82
0.7500	56.07
0.8333	55.35
0.9167	54.65
1.0000	53.99
1.0833	53.35
1.1667	52.74
1.2500	52.16
1.3333	51.59
1.4166	51.05
1.5000	50.54

1.5833	50.06
1.6667	49.59
1.7500	49.15
1.8333	48.73
1.9167	48.33
2.0000	47.95
2.5000	46.02
3.0000	44.59
3.5000	43.98
4.0000	43.98
4.5000	43.98
5.0000	43.98
5.5000	43.98
6.0000	43.98
6.5000	43.98
7.0000	43.98
7.5000	43.98
8.0000	43.98
8.5000	43.98
9.0000	43.98
9.5000	43.98
10.0000	43.98
12.0000	43.98
14.0000	43.98
16.0000	43.98
18.0000	43.98
20.0000	43.98
22.0000	43.98
24.0000	43.98
26.0000	43.98
28.0000	43.98
30.0000	43.98
32.0000	43.98
34.0000	43.98
36.0000	43.98
38.0000	43.98
40.0000	43.98
42.0000	43.98
44.0000	43.98
46.0000	43.98
48.0000	43.98
50.0000	43.98
52.0000	43.98
54.0000	43.98
56.0000	43.98
58.0000	43.98
60.0000	43.98
62.0000	43.98
64.0000	43.98
66.0000	43.98
68.0000	43.98
70.0000	43.98
72.0000	43.98
74.0000	43.98
76.0000	43.98
78.0000	43.98
80.0000	43.98
82.0000	43.98
84.0000	43.98
86.0000	43.98

88.0000	43.98
90.0000	43.98
92.0000	43.98
94.0000	43.98
96.0000	43.98
98.0000	43.98
100.000	43.98
110.000	43.98
120.000	43.98
130.000	43.98
140.000	43.98
150.000	43.98
160.000	43.98
170.000	43.98
180.000	43.98
190.000	43.98
200.000	43.98
210.000	43.98
220.000	43.98
230.000	43.98
240.000	43.98
250.000	43.98
260.000	43.98
270.000	43.98
280.000	43.98
290.000	43.98
300.000	43.98
310.000	43.98
320.000	43.98
330.000	43.98
340.000	43.98
350.000	43.98
360.000	43.98
370.000	43.98
380.000	43.98
390.000	43.98
400.000	43.98
410.000	43.98
420.000	43.98
430.000	43.98
440.000	43.98
450.000	43.98
460.000	43.98
470.000	43.98
480.000	43.98
490.000	43.98
500.000	43.98
510.000	43.98
520.000	43.98
530.000	43.98
540.000	43.98
550.000	43.98
560.000	43.98
570.000	43.98
580.000	43.98
590.000	43.98
600.000	43.98
610.000	43.98
620.000	43.98
630.000	43.98

640.000	43.98
650.000	43.98
660.000	43.98
670.000	43.98
680.000	43.98
690.000	43.98
700.000	43.98
710.000	43.98
720.000	43.98
730.000	43.98
740.000	43.98
750.000	43.98
760.000	43.98
770.000	43.98
780.000	43.98
790.000	43.98
800.000	43.98
810.000	43.98
820.000	43.98
830.000	43.98
840.000	43.98
850.000	43.98
860.000	43.98
870.000	43.98
880.000	43.98
890.000	43.98
900.000	43.98
910.000	43.98
920.000	43.98
930.000	43.98
940.000	43.98
950.000	43.98
960.000	43.98
970.000	43.98
980.000	43.98
990.000	43.98
1000.00	43.98
1100.00	43.98
1200.00	43.98
1300.00	43.98
1400.00	43.98
1500.00	43.98
1600.00	43.98
1700.00	43.98
1800.00	43.98
1900.00	43.98
2000.00	43.98
2100.00	43.98
2200.00	43.98
2300.00	43.98
2400.00	43.98
2500.00	43.98
2600.00	43.98
2700.00	43.98
2800.00	43.98
2900.00	43.98

Hand measured water levels for Platteville Aquifer pump test May 6&7, 1991

W427 May 6, 1991		W428 May 6, 1991		P310 May 6, 1991		P311 May 6, 1991	
Pumping Phase							
Water Level	Time	Water Level	Time	Water Level	Time	Water Level	Time
41.45	1310	41.58	1310	43.21	1314	40.42	1318
41.45	1335	41.60	1340	43.20	1344	40.41	1348
41.46	1412	41.60	1412	43.20	1415	40.40	1417
41.45	1445	41.61	1445	43.20	1447	40.42	1450
41.62	1512	41.46	1512	43.21	1512	40.41	1521
41.61	1544	41.45	1544	43.20	1547	40.39	1552
41.45	1615	41.60	1615	43.20	1618	40.39	1623
41.48	1720	41.58	1720	43.20	1717	NA	
May 7, 1991		May 7, 1991		May 7, 1991		May 7, 1991	
41.50	719	41.61	719	43.20	723	40.40	727
41.49	1135	41.60	1135	43.20	1138	40.40	1143
Recovery Phase							
41.45	1322	41.59	1322	43.19	1325	40.40	1330
41.41	1634	41.56	1634	43.17	1636	40.41	1637

Hand measured water levels for Platteville Aquifer pump test May 6&7, 1991

W123 May 6, 1991		W101 May 6, 1991		P102 May 6, 1991		W132 May 6, 1991	
Pumping Phase							
Water Level	Time	Water Level	Time	Water Level	Time	Water Level	Time
35.07	1321	43.19	1323	43.45	1328	33.15	1330
35.05	1351	43.19	1353	43.45	1358	33.76	1359
35.07	1421	43.20	1424	43.46	1426	33.78	1432
35.05	1454	43.20	1456	43.45	1458	33.76	1504
35.06	1525	43.19	1527	43.45	1530	33.76	1536
35.05	1555	43.20	1558	43.46	1601	33.77	1607
35.06	1626	43.45	1626	43.45	1629	33.76	1635
35.05	1725	43.20	1717	43.45	1730	33.76	1738
35.09	731	43.22	733	43.47	740	33.77	752
35.07	1148	43.20	1150	43.47	1152	33.80	1204
Recovery Phase							
35.06	1333	43.19	1335	43.45	1338	33.80	1345
35.05	1641	43.17	1643	43.44	1646	33.80	1653

Hand measured water levels for Platteville Aquifer pump test May 6&7, 1991

P313		W143	
May 6, 1991		May 6, 1991	
Pumping Phase			
Water Level	Time	Water Level	Time
48.74	1333	29.57	1334
48.74	1402	29.59	1400
48.75	1430	29.06	1434
48.75	1502	29.58	1506
48.75	1533	29.57	1537
48.75	1605	29.58	1609
48.75	1633	29.57	1637
48.75	1735	29.58	1740
48.77	749	29.56	754
48.77	1202	29.56	1206
Recovery Phase			
48.73	1342	29.54	1346
43.72	1651	29.55	1655

Hand measured water levels for Platteville Aquifer pump test May 6&7, 1991

P312
May 6, 1991

Pumping Phase

Water Level	Time
43.68	1306
43.76	1308
43.78	1310
43.81	1315
43.82	1320
43.82	1324
43.82	1330
43.82	1335
43.82	1342
43.82	1352
43.82	1408
43.84	1428
43.81	1434
43.85	1500
43.84	1532
43.85	1603
43.85	1631
43.85	1731

Hand measured water levels for Platteville Aquifer pump test May 6&7, 1991

May 7, 1991

43.87	745
43.87	1155

Recovery Phase

43.55	1302
43.40	1304
43.30	1305
43.20	1306
43.11	1307
43.05	1308
42.99	1309
42.96	1310
42.94	1311
42.92	1312
42.90	1313
42.89	1314
42.87	1315
42.87	1316
42.87	1317
42.87	1318
42.83	1339
42.80	1648

APPENDIX C

Site Wide Water Level Measurements

Surfer Ground Water Contouring Plots

TABLE C-1

Summary of the Water Levels for the Northern Area of the Drift-Platteville Aquifer April 16 - June 27, 1991[a]

Well Number	April 16	May 3	May 10	May 22	May 29	June 12	June 27
Drift Wells							
P117	871.06	871.29	871.98	871.98	872.18	872.38	872.11
P16	876.61	876.78	876.9	877.17	877.29	877.63	877.92
P66	874.17	874.36	874.46	874.67	874.82	875.11	875.36
W117	875.44	875.6	875.71	875.87	876.04	876.34	876.57
W134	876	876.16	876.28	876.47	876.6	876.88	877.12
P102	NA[b]	876.17	876.26	876.47	876.59	876.86	877.11
P312	876.52	876.67	876.77	876.98	877.09	877.32	877.55
P313	875.1	875.28	875.35	875.53	875.64	875.81	874.54
W135	870.13	869.98	870.4	870.58	870.72	870.87	871.09
P45	Dry						
W128	Vandalized				873.16	873.23	873.41
P112	880	880.27	880.47	880.68	880.85	881.23	881.26
W422	866.61	865.34	865.89	865.77	865.29	865.77	865.77
P109	881.61	881.81	882.25	882.22	882.55	882.61	882.51
W16	881.8	882	882.4	882.39	882.67	882.7	882.60
W10	883.66	883.78	884.15	883.97	884.43	884.09	883.94
P20	885.1	885.21	885.28	885.01	885.81	884.92	884.89
P64	885.5	885.46	885.76	885.06	886	885.03	884.66
P42	887.04	887.16	887.58	886.44	887.4	886.59	886.37
W420	878.09	878.27	878.64	878.73	878.99	879.16	878.86
W9	883.04	883.26	883.69	883.72	884.01	884.17	883.91
P304	880.91	882.53	882.98	884.01	883.33	883.41	883.21
P306	882.81	883	883.53	883.62	883.97	884.11	883.68
W8	882.77	882.99	883.51	883.59	883.8	884.05	883.89
NLMW2	881.04	881.19	881.63	881.69	881.97	882.12	881.99
NLMW1	880.9	881.08	881.48	881.56	881.78	882	881.84
W11	880.71	880.9	881.28	881.35	881.57	881.78	880.43
P2	877.88	878.08	878.16	878.43	878.45	878.71	878.85

TABLE C-1

Summary of the Water Levels for the Northern Area of the Drift-Platteville Aquifer April 16 - June 27, 1991[a]

Well Number	April 16	May 3	May 10	May 22	May 29	June 12	June 27
W12	877.77	877.97	878.08	878.3	878.38	878.69	878.79
P311	877.31	877.51	877.63	877.81	877.01	878.16	878.35
PB140	881.54	881.88	882.04	882.19	882.34	882.67	882.51
P300	881.84	NA	NA	882.32	Abandoned		
P25	888.27	Obstructed					
W5	882.58	882.74	883.39	883.4	885.79	883.96	883.37
P305	882.74	882.91	883.54	883.57	883.86	884.12	883.56
P100	887.42	887.6	887.71	887.95	888.1	888.38	888.57
P34	Dry						
W2	884.99	885.16	885.46	885.61	885.75	886.07	886.12
P21	Dry					878.89	880.28
P27	Obstructed						
P28	878.63	878.61	878.55	879.21	879.27	879.77	877.21
W427	877.79	877.94	878.06	878.3	879.42	878.69	878.93
P310	NA	878.26	878.4	878.62	878.71	879.01	879.18
W136	878.13	878.2	878.35	878.63	878.73	879.12	879.39
P308	879.29	879.45	879.59	880.79	879.91	880.23	880.44
P309	879.22	879.43	879.56	884.66	879.89	880.21	880.36
P307	880	880.18	880.4	880.58	880.71	881.04	881.07
W423	880.05	880.19	880.27	880.51	880.62	880.96	881.33
W425	880.92	881.08	881.18	881.45	881.55	880.9	882.10
P69	Dry						
W6	884.39	884.59	885.21	882.22	885.54	885.92	885.50

TABLE C-1

Summary of the Water Levels for the Northern Area of the Drift-Platteville Aquifer April 16 - June 27, 1991[a]

Well Number	April 16	May 3	May 10	May 22	May 29	June 12	June 27
Platteville Wells							
W124	869.54	874.28	874.4	874.61	874.75	871.63	870.33
W116	872.51	874.83	874.95	875.15	875.28	873.57	873.75
W123	874.11	875.93	876.03	914.78	876.38	875.03	876.27
W101	874.67	876.64	876.72	876.93	877.05	875.59	875.83
W37	875.73	869.98	869.9	870.58	870.72	876.66	876.88
W120	876.55	876.64	876.72	876.93	877.05	877.27	871.44
W433	NA	876.54	NA	882.15	876.97	877.17	883.44
W434	NA	NA	NA	NA	NA	NA	887.44
W432	872.87	NA	873.16	873.25	873.4	873.26	874.95
W135	870.13	871.01	871.08	871.05	871.22	870.87	NA
W121	NA	NA	875.81	875.96	NA	NA	NA
W132	870.78	878	878.3	878.28	878.52	870.44	870.43
W143	875.66	880.74	881.17	881.19	881.46	877.12	876.19
W20	877.83	873.03	873.16	873.11	873.34	878.28	878.15
W115	880.64	879.22	879.4	879.5	879.72	881.44	881.32
W130	872.88	880.22	880.56	880.62	880.88	872.61	872.53
W421	878.88	879.22	879.4	879.5	879.72	879.91	879.72
W18	880.02	881.11	881.5	881.56	881.81	881.02	880.89
W137	Abandoned						
W429	882.26	881.24	881.62	881.69	881.94	881.91	881.75
W430	881.33	882.12	882.46	882.78	882.88	883.24	883.34
W19	881.04	881.24	881.62	881.69	881.94	882.05	881.89
P118	882.27	Dry	Dry	881.41	884.8	881.43	881.40
W432	876.63	NA	876.9	877.08	877.21	877.42	877.62
W26	881.86	882.04	882.38	882.52	882.7	882.96	872.80
P101	882.61	882.81	883.1	883.24	883.42	883.7	883.57

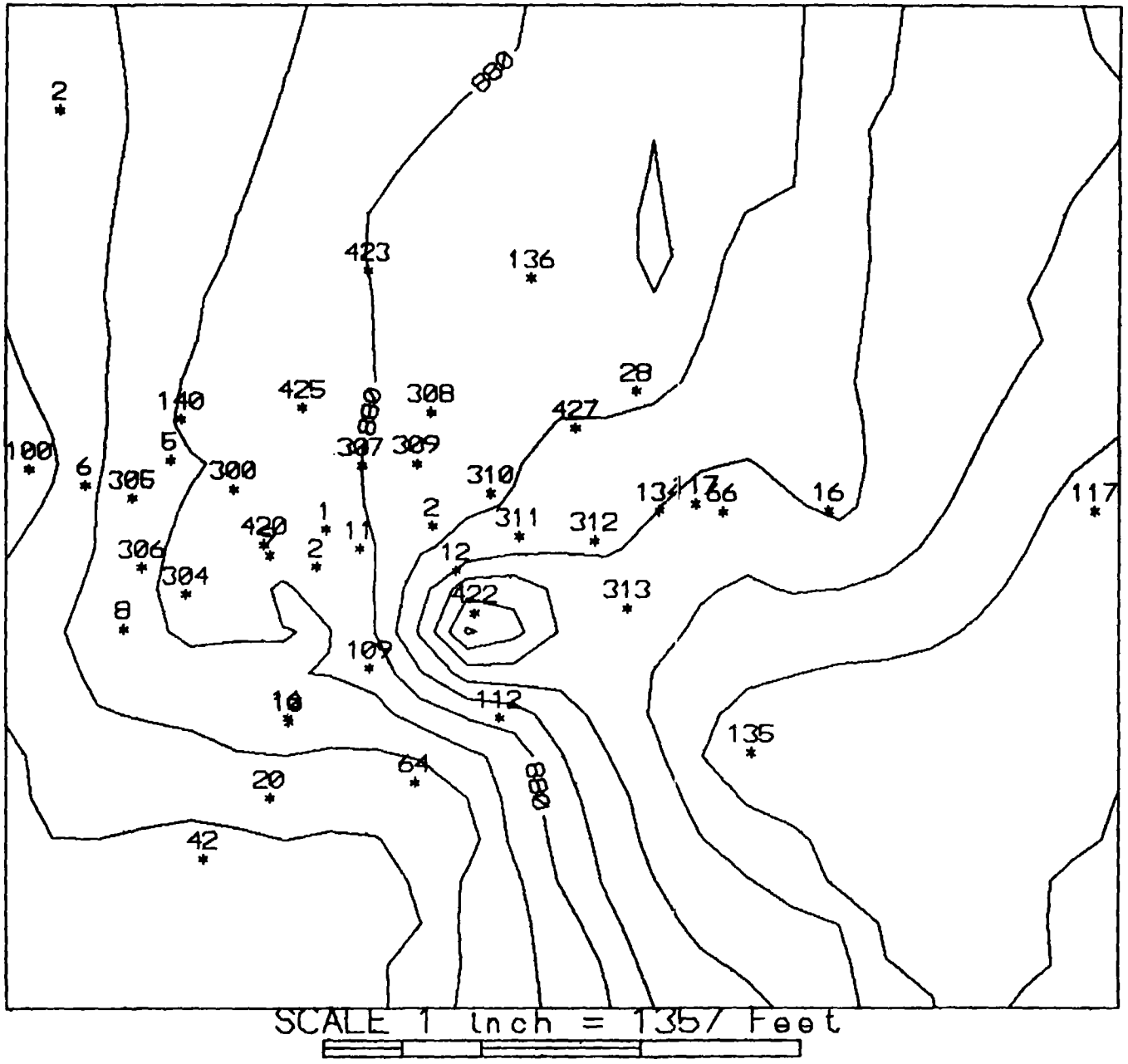
TABLE C-1

Summary of the Water Levels for the Northern Area of the Drift-Platteville Aquifer April 16 - June 27, 1991[a]

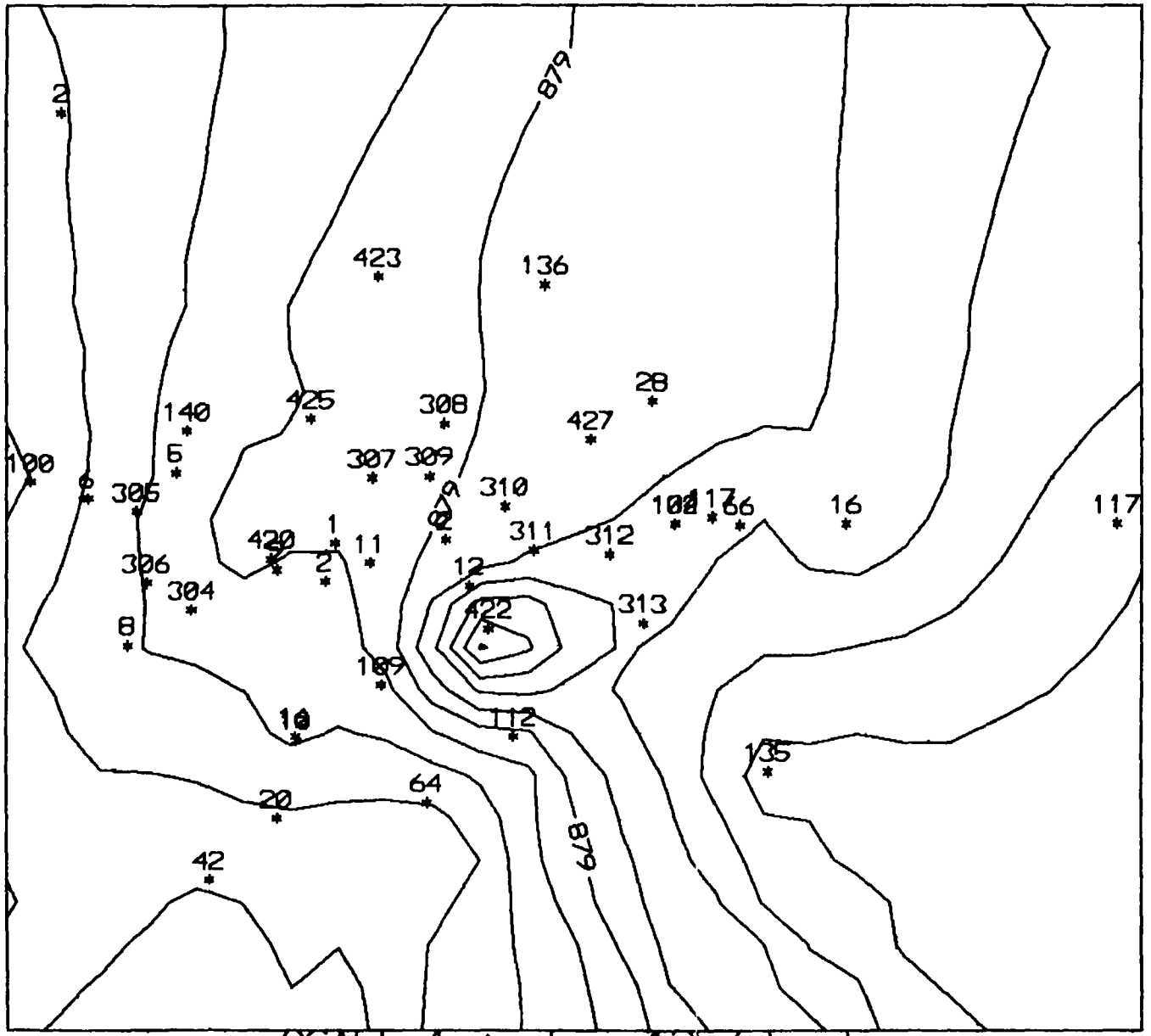
Well Number	April 16	May 3	May 10	May 22	May 29	June 12	June 27
W100	885.08	885.25	885.51	885.76	885.91	886.33	886.50
W1	876.21	876.42	876.72	877.03	877.23	877.73	877.97
W428	877.65	877.8	877.93	878.17	878.25	878.55	878.78
W131	877.76	877.87	877.99	878.19	878.28	878.61	878.89
W426	880.7	880.88	881.14	881.29	881.45	881.75	881.71
W27	880.92	881.08	881.36	881.51	882.67	881.99	881.87
W22	882.8	NA	883.23	883.88	883.52	883.85	883.86
W424	880.42	880.61	880.85	880.99	881.17	881.44	881.33
NL-1	NA	876.08	877.23	NA	877.52	877.73	

[a] Water levels in feet mean sea level (MSL)
[b] NA - well not accessible

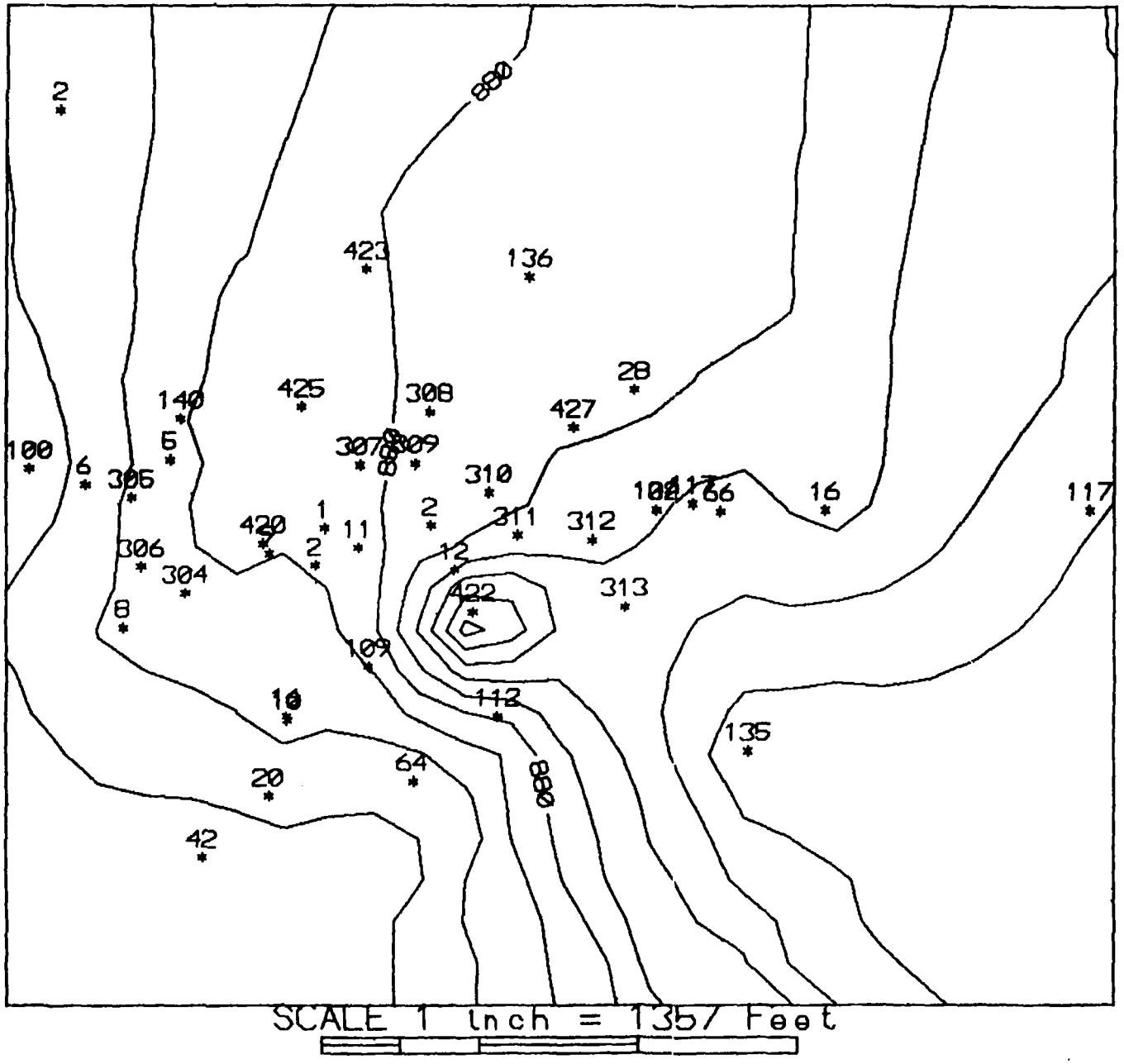
Northern Area Drift Aquifer April 16, 1991



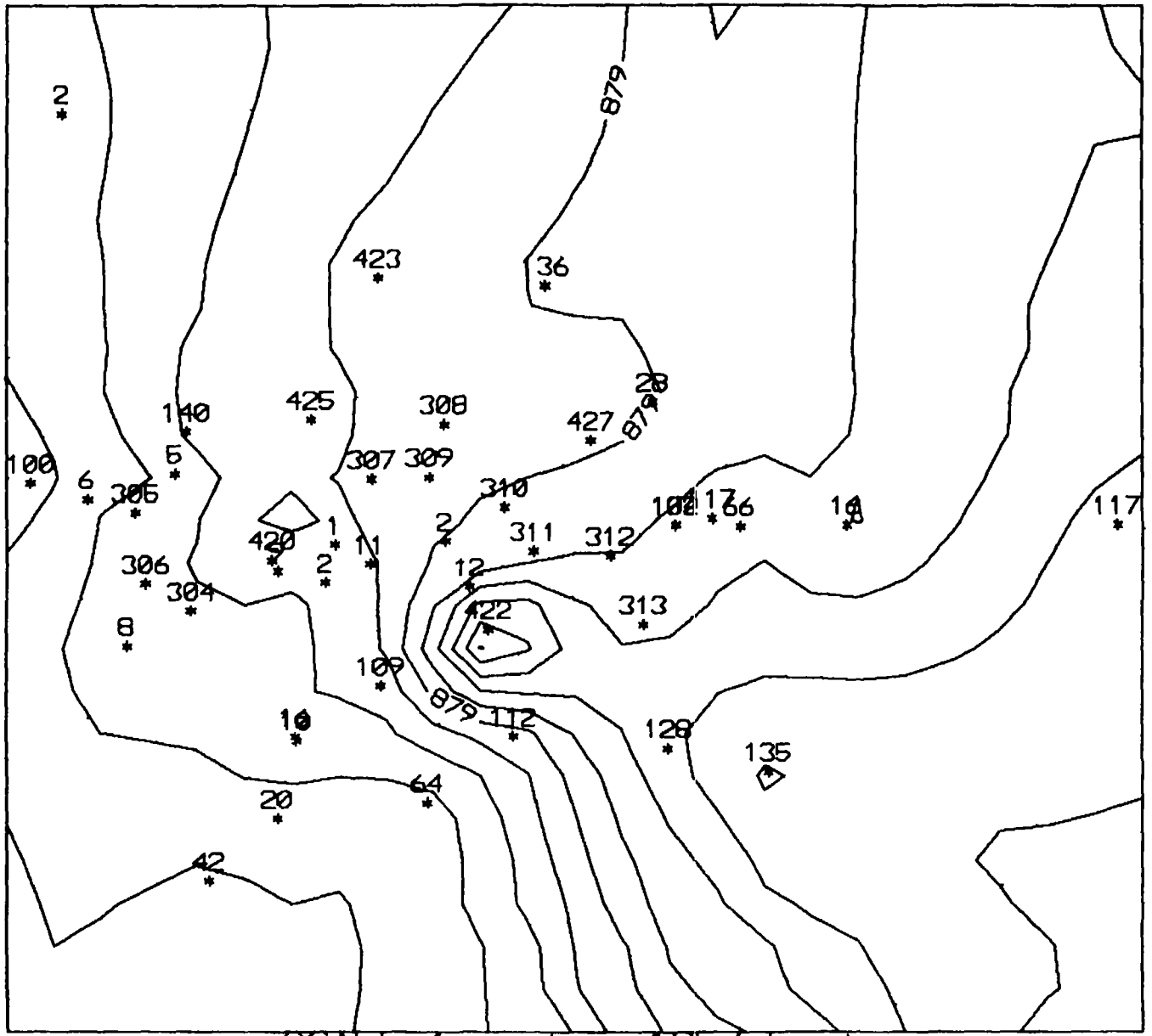
Northern Area Drift Aquifer May 3, 1991



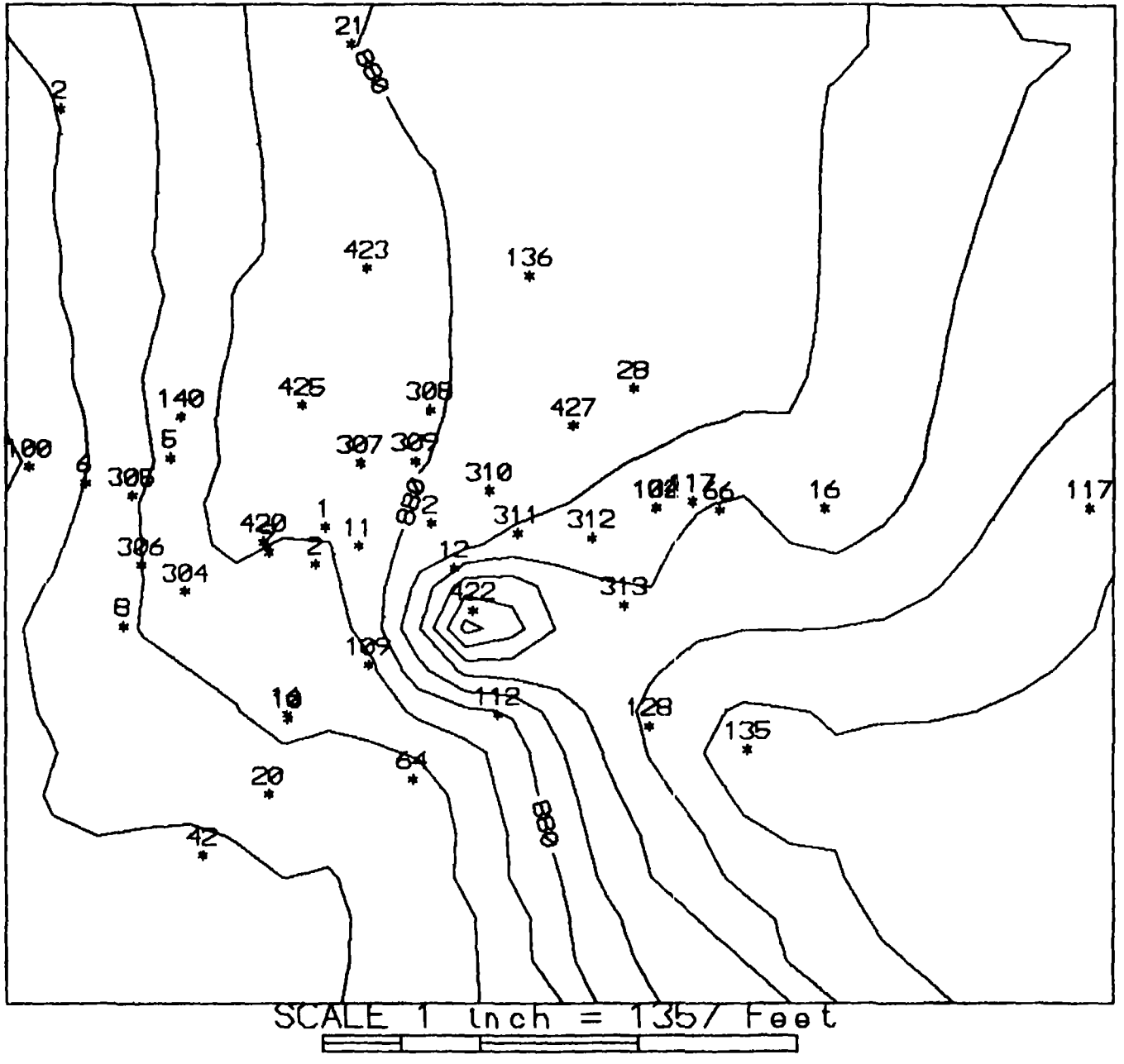
Northern Area Drift Aquifer May 10, 1991



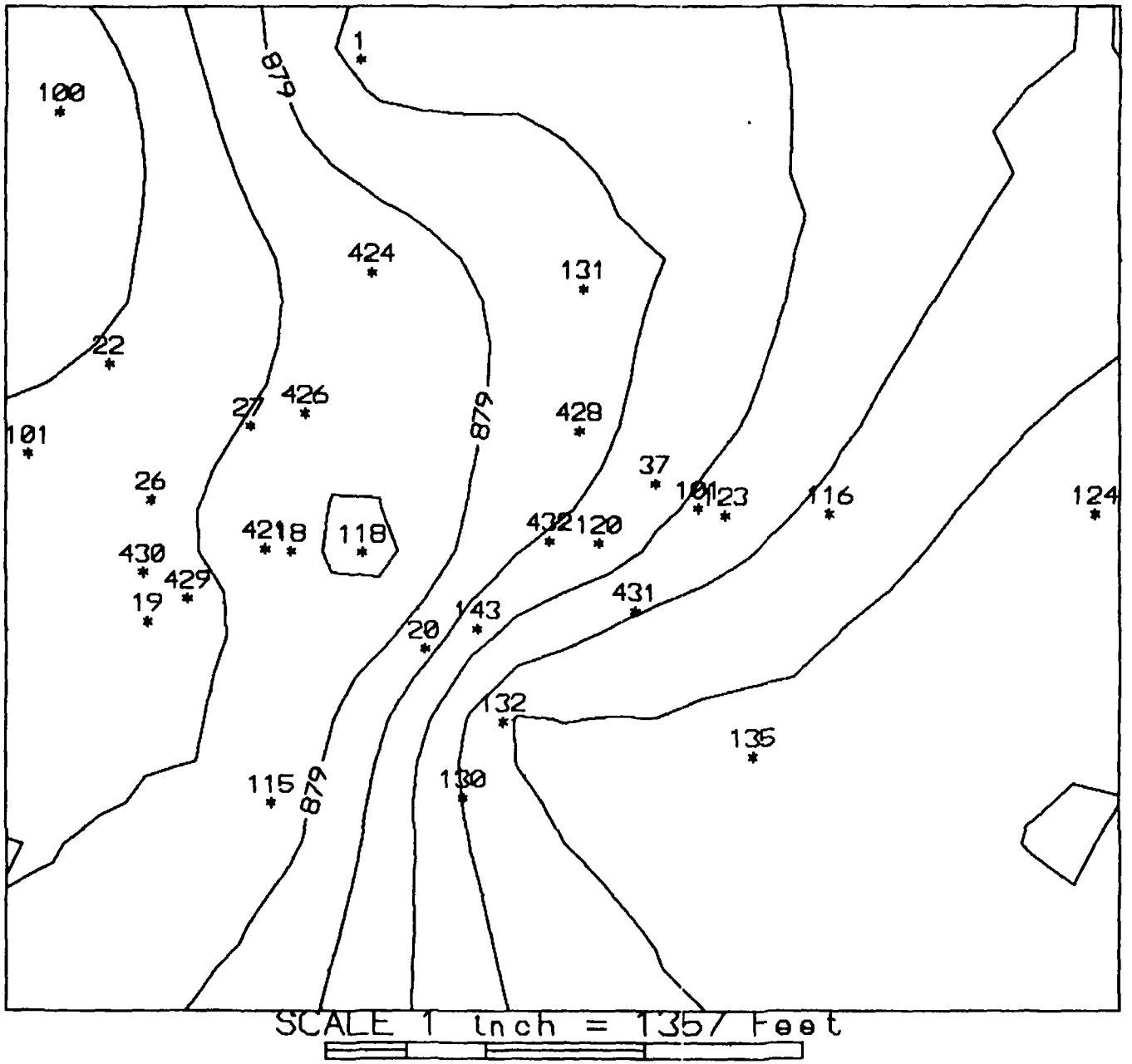
Northern Area Drift Aquifer May 22, 1991



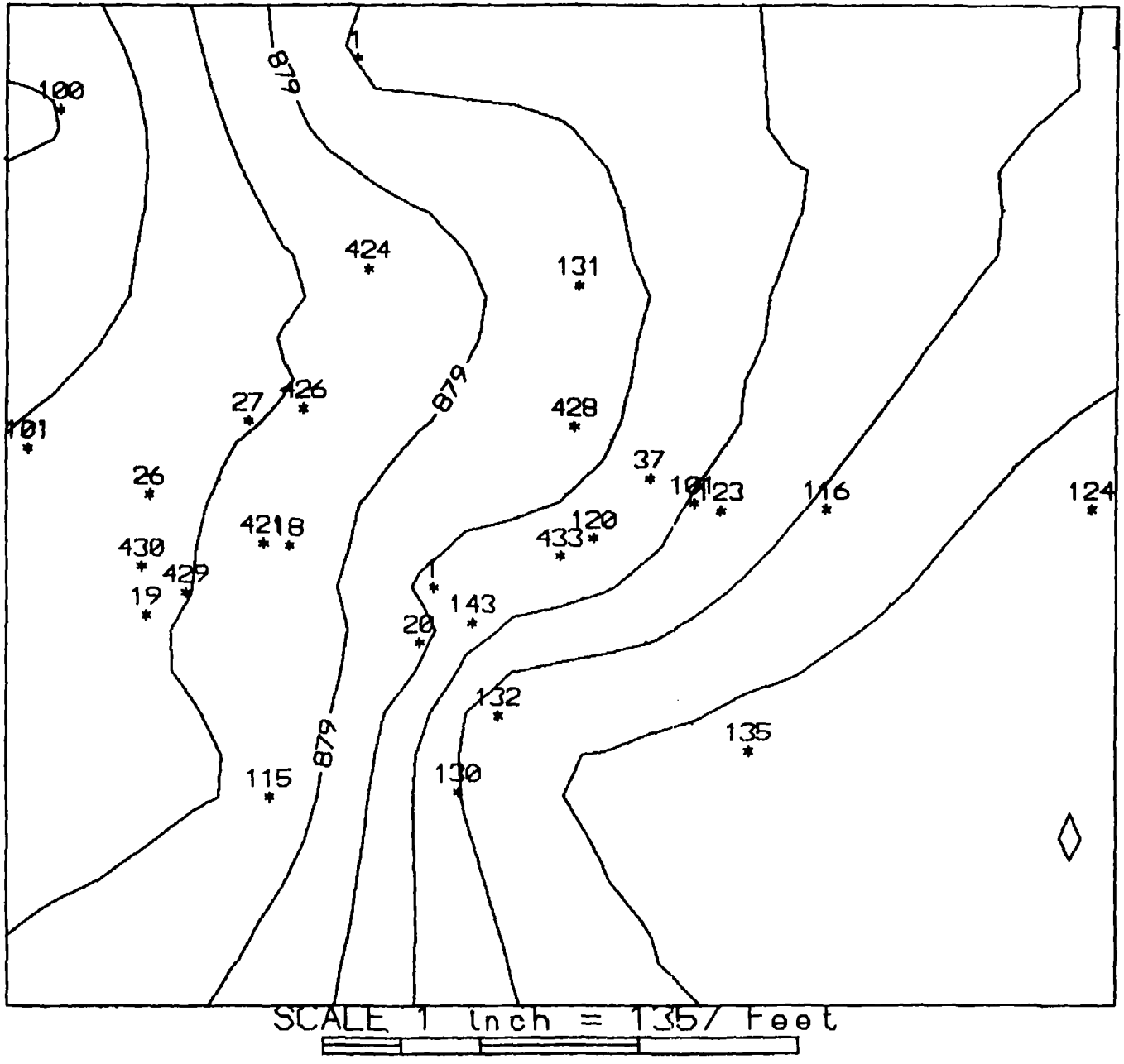
Northern Area Drift Aquifer June 12, 1991



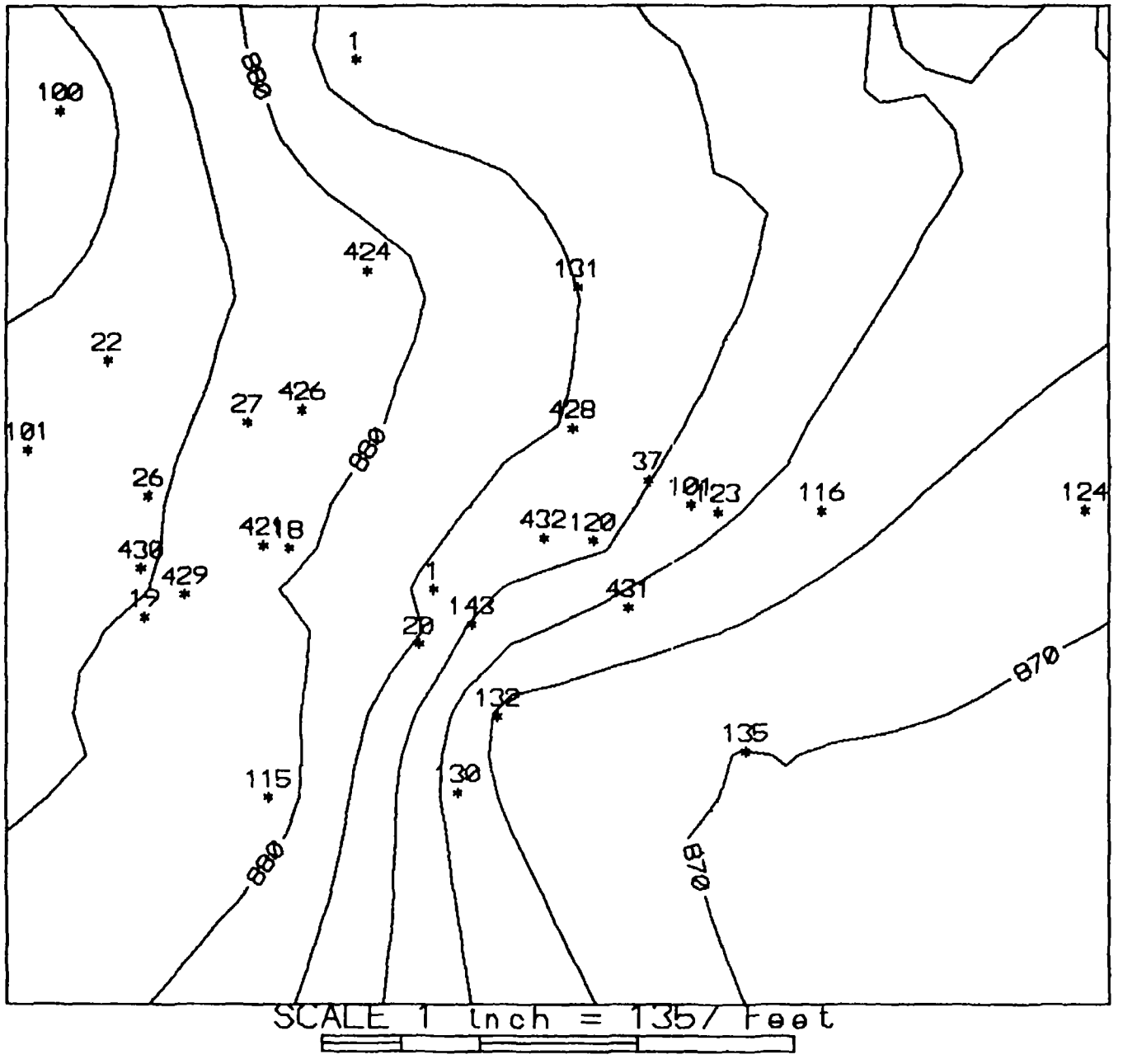
Northern Area Plattevlle Aqulfer Aprll 16,1991



Northern Area Platteville Aquifer May 3, 1991



Northern Area Platteville Aquifer May 10, 1991



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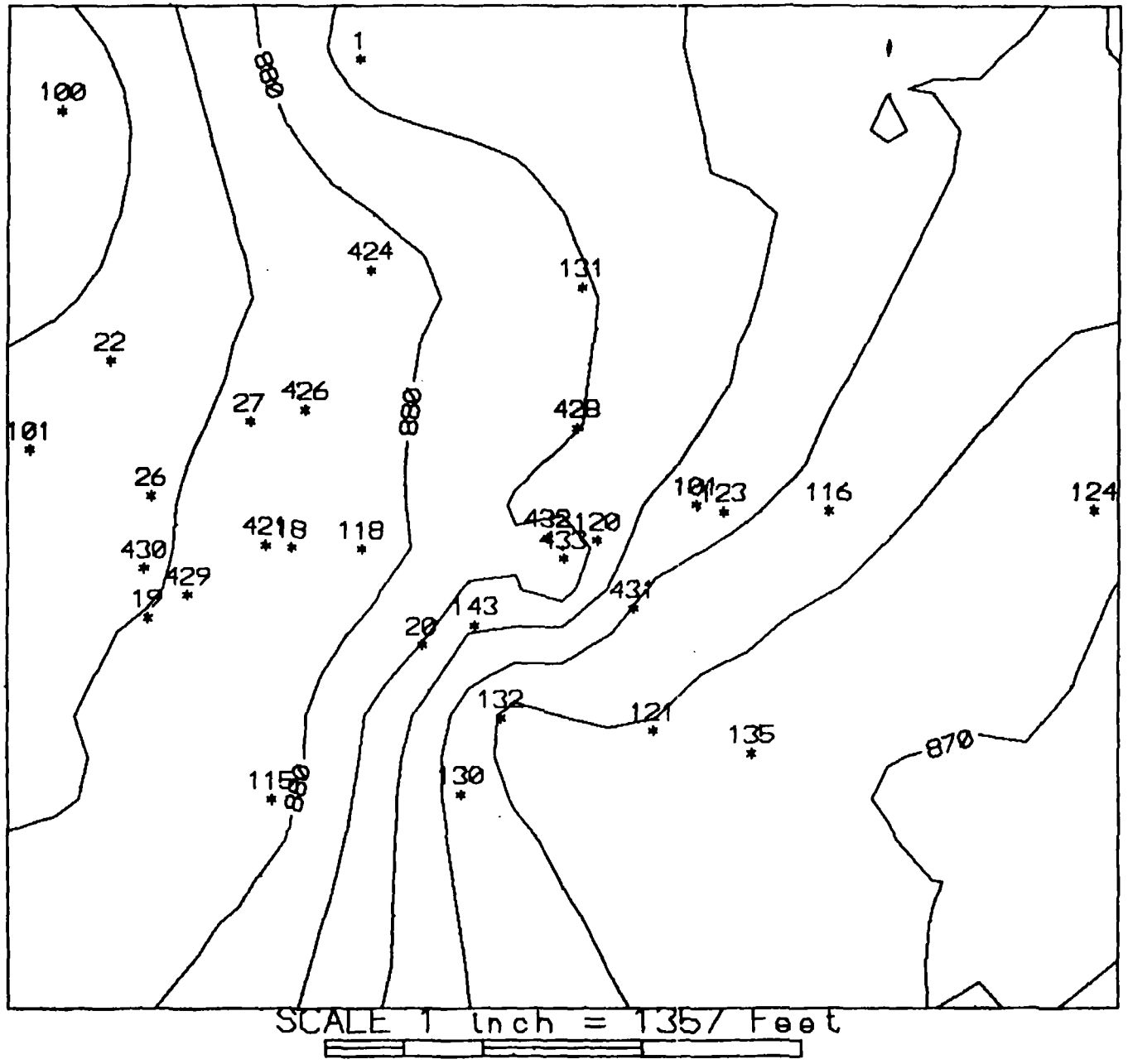
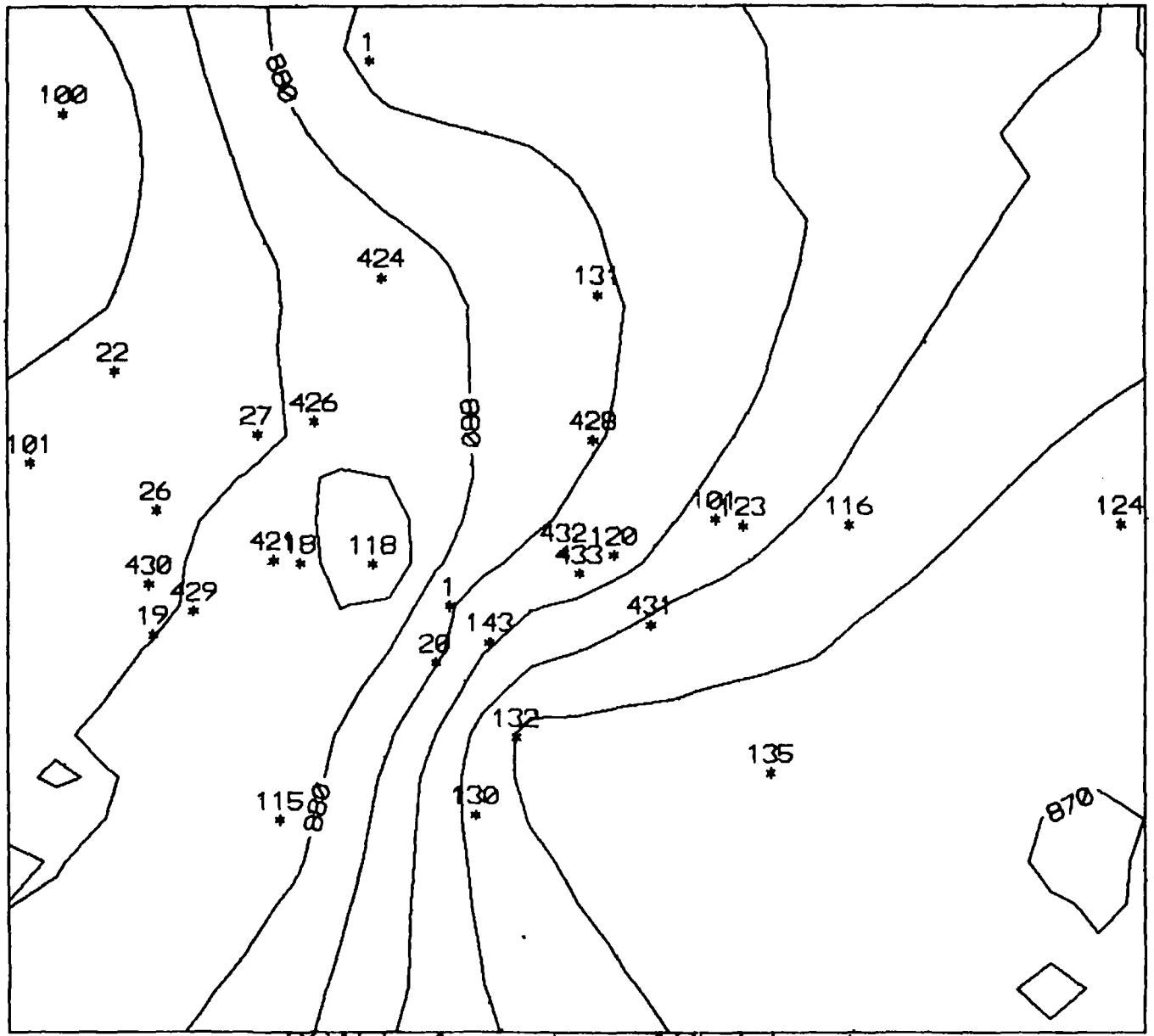
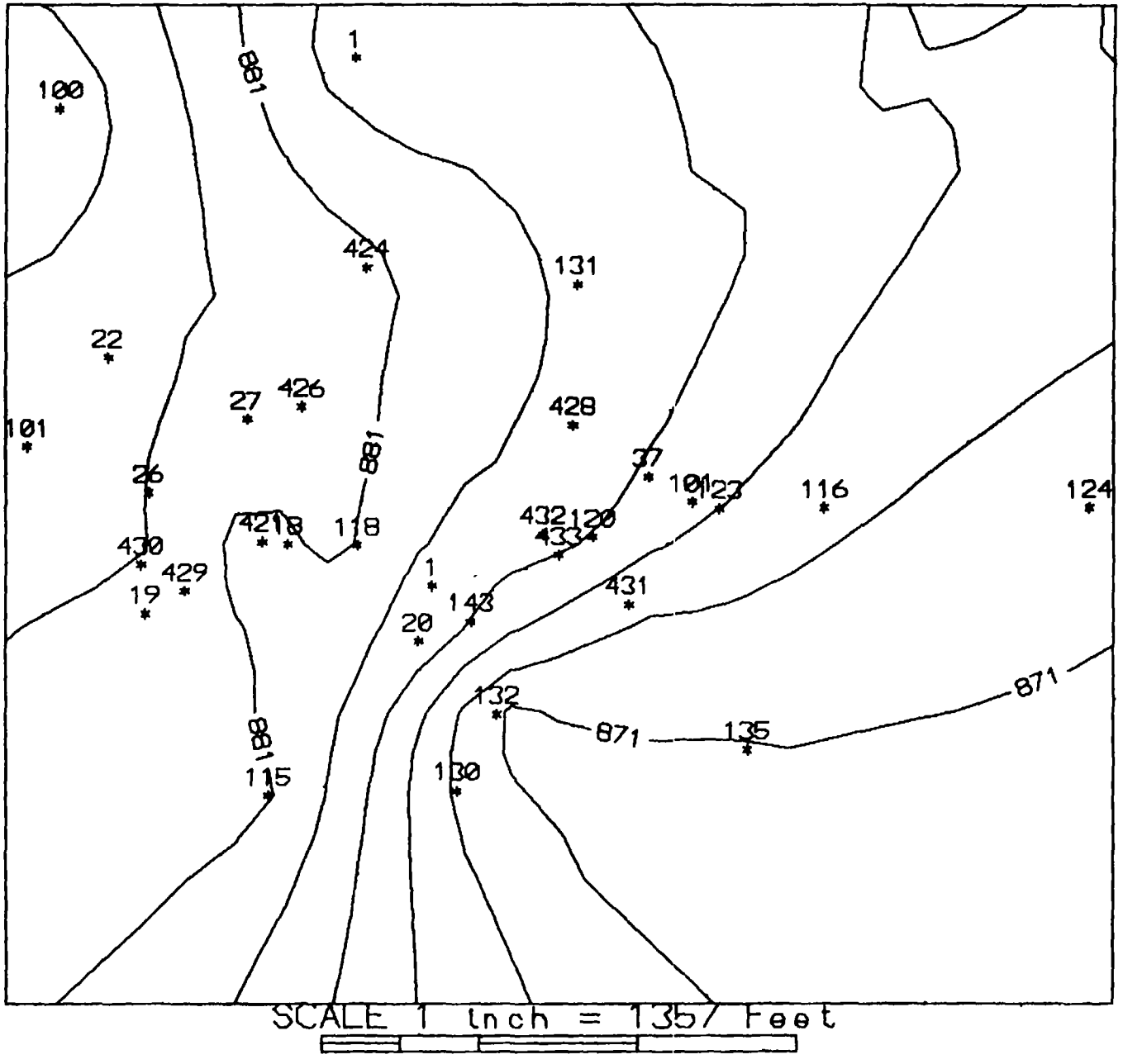


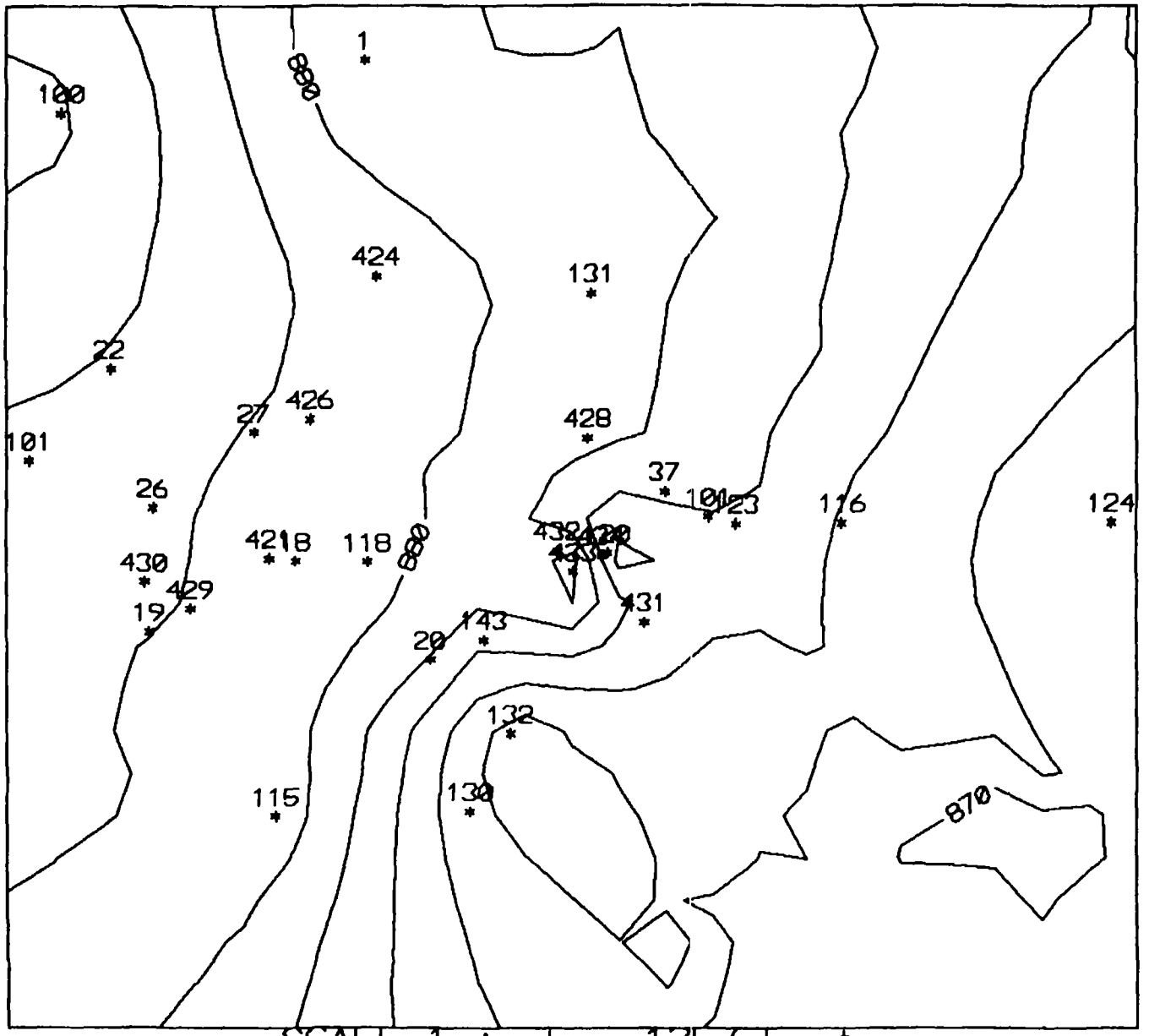
Northern Area Platteville Aquifer May 29, 1991



Northern Area Platteville Aquifer June 12, 1991



Northern Area Platteville Aquifer June 27, 1991



APPENDIX D

Well Stabilization Records

Water Quality Laboratory Data

STABILIZATION TEST

Site St Louis Park Date 4-1-91 Well No. P307

Pumping Rate (gallons/minute) N/A

Type of Pump Bailed

Water Level Before Pumping (nearest 0.01 ft. below top of casing) 32.9

Approximate Well Location Gorham & Walker

Calculated Volume of Water in Casing 6.6

Weather Conditions cloudy cool 45° F

Time	pH (units)	Temperature-Corrected Conductance (umhos/cm)	Temperature (°C)	Water Level (nearest 0.01 ft.)	Cumulative Volume of Water Removed From Well (measured in gallons)
					0
1755	7.15	710	10.8		21
	7.20	720	11.2		21.2
	7.26	710	10.8		21.4

Comments: 2" well

TD = 73.8 ft
- H_2O level = 32.9 ft
= 40.9 ft
× .163
= 6.6 gal

73.8

Sample at 17:55

Well diameter	Gallons per foot of casing
1 1/4"	0.0625
2"	0.163
4"	0.653
6"	1.47
8"	2.61
12"	5.87

Signature 4/1/91 Date

M800450

STABILIZATION TEST

Site St Louis Park Date 4-11-91 Well No. P3C8

Pumping Rate (gallons/minute) N/A

Type of Pump Dal

Water Level Before Pumping (nearest 0.01 ft. below top of casing) 43.7

Approximate Well Location Lake St & Library Lane

Calculated Volume of Water in Casing 4.3

Weather Conditions

Time	pH (units)	Temperature-Corrected Conductance (umhos/cm)	Temperature (°C)	Water Level (nearest 0.01 ft.)	Cumulative Volume of Water Removed From Well (measured in gallons)
	7.28	6.50	11		4.3
	7.40	6.50	10		8.6
	7.33	6.50	11		12.9
		Sampled 1735			

Comments:

2" well

TD =

- H_2O level =

= 26.2 ft

x .163

= 4.3 gal

TD - 69.9

Well diameter	Gallons per foot of casing
1 1/4"	0.0625
2"	0.163
4"	0.653
6"	1.47
8"	2.61
12"	5.87

Signature

4/11/91
Date

M890450

STABILIZATION TEST

Site St Louis Park Date 4-11-91 Well No. P309

Pumping Rate (gallons/minute) NA

Type of Pump Bail

Water Level Before Pumping (nearest 0.01 ft. below top of casing) 45.6

Approximate Well Location Lake St & Walker St

Calculated Volume of Water in Casing 4.8

Weather Conditions cloudy cool 40°

Time	pH (units)	Temperature-Corrected Conductance (umhos/cm)	Temperature (°C)	Water Level (nearest 0.01 ft.)	Cumulative Volume of Water Removed From Well (measured in gallons)
1512					0
7	7.20	7.10	11		5
	7.30	7.50	11		10
	7.46	7.10	10.9		15
		Scan			

Comments: 2" well

TD = 75.5 ft

- H2O level = 45.6 ft

29.9 ft

X .163

4.8 gal

Sample at 15:55

TD 75.5

Well diameter	Gallons per foot of casing
1 1/4"	0.0625
2"	0.163
4"	0.653
6"	1.47
8"	2.61
12"	5.87

Signature Date 4/11/91

M990450

STABILIZATION TEST

Site St Louis Park Date 4-11-91 Well No. P310

Pumping Rate (gallons/minute) NA

Type of Pump Baled

Water Level Before Pumping (nearest 0.01 ft. below top of casing) 42.8

Approximate Well Location Oakota & Walker

Calculated Volume of Water in Casing 4.5

Weather Conditions cool cloudy 42° windy

Time	pH (units)	Temperature-Corrected Conductance (umhos/cm)	Temperature (°C)	Water Level (nearest 0.01 ft.)	Cumulative Volume of Water Removed From Well (measured in gallons)
					0
	7.27	6.90	11.2		15
	7.36	6.50	12		15.5
1605	7.40	6.50	10		16
		Sampled	1605		

Comments: 2" well sample at 1605

TD = 71 ft

H2O level 42.8 ft

28.2 ft

X .163

4.5 gal

Well diameter	Gallons per foot of casing
1 1/4"	0.0625
2"	0.163
4"	0.653
6"	1.47
8"	2.61
12"	5.87

Signature 4/11/91 Date

M860450

STABILIZATION TEST

Site St Louis Park Date 4-11-91 Well No. P311

Pumping Rate (gallons/minute) NA

Type of Pump

Water Level Before Pumping (nearest 0.01 ft. below top of casing) 40.20

Approximate Well Location ~~Jorving Park, N end of Colorado~~ SPS

Calculated Volume of Water in Casing 6.4 gal

Weather Conditions Cool 40° cloudy wind dy

Time	pH (units)	Temperature-Corrected Conductance (umhos/cm)	Temperature (°C)	Water Level (nearest 0.01 ft.)	Cumulative Volume of Water Removed From Well (measured in gallons)
					0
	6.65	7.90	11		6.5
	7.25	~~6800~~	11		13
	7.20	8.00	11		20.5
				Sampled	13:30

Comments: 2" well

TD = 79.5 ft
- H2O level = 40.2 ft
= 39.3 ft

X .163
6.4 gal

Well diameter	Gallons per foot of casing
1 1/4"	0.0625
2"	0.163
4"	0.653
6"	1.47
8"	2.61
12"	5.87

Signature 4/11/91
Date

M890450

STABILIZATION TEST

Site St Louis Park Date 4-11-91 Well No. P312

Pumping Rate (gallons/minute) N/A

Type of Pump bail by hand

Water Level Before Pumping (nearest 0.01 ft. below top of casing) 42.5

Approximate Well Location Jorvig Park Brunswick & 37th

Calculated Volume of Water in Casing 6.7

Weather Conditions cloudy cool 40° windy

Time	pH (units)	Temperature-Corrected Conductance (umhos/cm)	Temperature (°C)	Water Level (nearest 0.01 ft.)	Cumulative Volume of Water Removed From Well (measured in gallons)
13.45		540			0
1405	7.07	~~10.6~~ 540	10.6		7
1430	7.70	660	10.6		14
1450	7.61	700	10.5		21
		Sampled			

Comments:

Sample at 1450

TD = 83.10 (2") ft

- H2O level = 42.50 ft

= 40.6 ft

x .163

= 6.7 gal

Well diameter	Gallons per foot of casing
1 1/4"	0.0625
2"	0.163
4"	0.653
6"	1.47
8"	2.61
12"	5.87

Signature

4/11/91
Date

M890450

STABILIZATION TEST

Site St Louis Park Date 4-11-91 Well No. P 313

Pumping Rate (gallons/minute) NA

Type of Pump Waterra w 5/8" tube

Water Level Before Pumping (nearest 0.01 ft. below top of casing) 48.86

Approximate Well Location

Calculated Volume of Water in Casing 4.2 gal

Weather Conditions Cloudy, calm, 40°F

Time	pH (units)	Temperature-Corrected Conductance (umhos/cm)	Temperature (°C)	Water Level (nearest 0.01 ft.)	Cumulative Volume of Water Removed From Well (measured in gallons)
0925	6.57	1000	11		7
945	~~6.90~~ 7.15	600	6.9		8.5
1000	7.20	1000	10.7		12.5
~~1020~~ 1020	7.24	1000	9.4		16.5
1015	7.22	1000	10.0		21.0

Comments:

TD = 74.4 ft
− H2O level = 48.86 ft
= 25.54 ft
× .163
= 4.2 gal

55.00
− 6.14
48.86

Sample at 11:10

Well diameter	Gallons per foot of casing
1 1/4"	0.0625
2"	0.163
4"	0.653
6"	1.47
8"	2.61
12"	5.87

Signature 4/11/91 Date

M890450

STABILIZATION TEST

Site St Louis Park Date 4-1-91 Well No. W432 ~~W431~~

Pumping Rate (gallons/minute) 7 gpm

Type of Pump 2" Dedi

Water Level Before Pumping (nearest 0.01 ft. below top of casing) 41.6'

Approximate Well Location Oxford & Woodale

Calculated Volume of Water in Casing 56 gal

Weather Conditions cloudy, cool, 50° rain

Time	pH (units)	Temperature-Corrected Conductance (umhos/cm)	Temperature (°C)	Water Level (nearest 0.01 ft.)	Cumulative Volume of Water Removed From Well (measured in gallons)
1025					0
1031	7.25	590	10.0		42
1036	7.22	720	10.0		77
1041	7.80	727	11		145
		Sampled			

Comments: 4 inch well (Plattville) Sampled at 11:10 W432

TD = 105.7

4 zone level = 99.6'

56.1 ~~gallons feet~~

× .653 gal/ft

= 36.6 gal

Well diameter	Gallons per foot of casing
1 1/4"	0.0625
2"	0.163
4"	0.653
6"	1.47
8"	2.61
12"	5.87

Signature 4/11/91 Date

M890450

STABILIZATION TEST

w 432

Site St Louis Park Date 4-11-91 Well No. ~~0432~~ out

Pumping Rate (gallons/minute) 8 gpm

Type of Pump 4" Delta

Water Level Before Pumping (nearest 0.01 ft. below top of casing) 41.75

Approximate Well Location ~~Jerry Park, N of RR track~~ SPS

Calculated Volume of Water in Casing 43gal

Weather Conditions Cloudy, slight breeze, 45°F

Time	pH (units)	Temperature-Corrected Conductance (umhos/cm)	Temperature (°C)	Water Level (nearest 0.01 ft.)	Cumulative Volume of Water Removed From Well (measured in gallons)
11.52	~~out~~	800	~~10.8~~		0
11.57	~~6.87~~ 7.20	800	10.8		~~45~~ 40
12.03	7.28	820	10.8		88
12.09	7.25	820	10.8		136

Comments:

Sample at 12:15

TD = 107.7
- H_2O level = 41.75
= 65.95 ft
x .653
= 43 gals

Well diameter	Gallons per foot of casing
1 1/4"	0.0625
2"	0.163
4"	0.653
6"	1.47
8"	2.61
12"	5.87

Signature

4/11/91
Date

M890450

Enseco
A CORNING Company

CASE NARRATIVE

FOR

City of St. Louis Park

May 30, 1991

Enseco - RMAL Project Number 014472

Introduction

Fifteen aqueous samples (including MS and MSD) were received at Enseco - Rocky Mountain Analytical Laboratory on April 12, 1991. The samples were logged in under RMAL project number 014472. Sample DPV-W422FBD-041191 (RMAL# 014472-04) was extracted and held as per the QAPP. A cross reference associating the RMAL sample numbers to the actual field sample numbers is included. The samples were analyzed for part-per-billion (PPB) polynuclear aromatic hydrocarbons (PAH).

Data Quality Assessment

The results contained in this report were reviewed relative to data acceptance criteria as specified in the 1990 QAPP for completeness, precision, accuracy, representativeness and defensibility of the data. Unless otherwise stated below, no quality control problems or technical difficulties were encountered which would impact the interpretation or use of data in this report.

PPB PAH

In the original analysis of sample 014472-07, target compounds were present in excess of the calibration range. Therefore, the sample was reanalyzed at a dilution and results from both analyses are reported.

Enseco Incorporated
4955 Yarrow Street
Arvada, Colorado 80002
303/421-6611 Fax: 303/431-7171

Sample 014472-08 was originally extracted within holding times; however, due to surrogate recoveries below the quality control limits, the sample required reextraction. The reanalysis was reported as it showed the surrogate recoveries to be higher, though the recovery of D12-Chrysene was now below the quality control limits. The reextraction took place outside of holding times. There was not enough sample available for an additional reextraction.

Sample 014472-12 was also originally extracted within holding times; however, due to surrogate recoveries below the quality control limits, the sample required reextraction. The reanalysis showed surrogate recoveries well within the limits and these results are reported. The reextraction took place outside of holding times.

This data package is in compliance with the terms and conditions of the 1990 QAPP, both technically and for completeness, for other than the conditions detailed above.

Reported by: Tracy Conroy — **Date:** 05/30/91
Tracy Conroy
Data Control Supervisor

Approved by: Joel G. Holtz — **Date:** 5/30/91
Joel Holtz
Program Administrator

Enseco
A Corning Company

SAMPLE DESCRIPTION INFORMATION
for
City of St. Louis Park

Lab ID	Client ID	Matrix	Sampled Date	Sampled Time	Received Date
014472-0001-SA	DPV-W422-041191	AQUEOUS	11 APR 91		12 APR 91
014472-0002-SA	DPV-W422D-041191	AQUEOUS	11 APR 91		12 APR 91
014472-0002-MS	DPV-W422MS-041191	AQUEOUS	11 APR 91		12 APR 91
014472-0002-SD	DPV-W422MSD-041191	AQUEOUS	11 APR 91		12 APR 91
014472-0003-SA	DPV-W422FB-041191	AQUEOUS	11 APR 91		12 APR 91
014472-0004-SA	DPV-W422FBD-041191	AQUEOUS	11 APR 91		12 APR 91
014472-0005-SA	DPV-P307-041191	AQUEOUS	11 APR 91	17:55	12 APR 91
014472-0006-SA	DPV-P308-041191	AQUEOUS	11 APR 91	17:35	12 APR 91
014472-0007-SA	DPV-P309-041191	AQUEOUS	11 APR 91	15:55	12 APR 91
014472-0008-SA	DPV-P310-241191	AQUEOUS	11 APR 91	16:05	12 APR 91
014472-0009-SA	DPV-P311-241191	AQUEOUS	11 APR 91	13:30	12 APR 91
014472-0010-SA	DPV-P312-041191	AQUEOUS	11 APR 91	14:50	12 APR 91
014472-0011-SA	DPV-P313-041191	AQUEOUS	11 APR 91	10:15	12 APR 91
014472-0012-SA	DPV-W431-041191	AQUEOUS	11 APR 91	12:09	12 APR 91
014472-0013-SA	DPV-W432-041191	AQUEOUS	11 APR 91	11:10	12 APR 91

TABLE OF CONTENTS

FOR

CITY OF ST. LOUIS PARK

RMAL PROJECT# 014472

PPT PAH

Enseco
A Corning Company

Rocky Mountain Analytical Laboratory
4955 Yarrow Street
Arvada, CO 80002
303/421-6611 FAX: 303/431-7171

CHAIN OF CUSTODY

ENSECO CLIENT
PROJECT: City of ST Louis PARK
SAMPLING COMPANY: SAME
SAMPLING SITE: SAME
TEAM LEADER: MJB

SAMPLE SAFE™ CONDITIONS

PACKED BY: MJB
SEAL NUMBER:
SEAL INTACT UPON RECEIPT BY SAMPLING COMPANY:
CONDITION OF CONTENTS:
SEALED FOR SHIPPING BY: MJB
INITIAL CONTENTS TEMP: °C
SEAL NUMBER:
SAMPLING STATUS: ☐ Done ☐ Continuing Until
SEAL INTACT UPON RECEIPT BY LAB: ☐ Yes ☐ No
CONTENTS TEMPERATURE UPON RECEIPT BY LAB: °C

DATE	TIME	SAMPLE ID/DESCRIPTION		SAMPLE TYPE	# CONTAINERS	ANALYSIS PARAMETERS	REMARKS
4-11-91		DPV-W422-041191	01	1XL AMBER	2	PCB PAH	
		DPV-W422D-041191	02				
		DPV-W422MS-041191	02MS				
		DPV-W422MSD-041191	02MSD				
		DPV-W422FB-041191	03				
4-11-91		DPV-W422FBD-041191	04	1XL AMBER	2	PPB PAH	

CUSTODY TRANSFERS PRIOR TO SHIPPING

RELINQUISHED BY (SIGNED)	RECEIVED BY (SIGNED)	DATE	TIME

SHIPPING DETAILS

DELIVERED TO SHIPPER BY: MJB
METHOD OF SHIPMENT: FED EXP.
AIRBILL NUMBER: 2850762266
RECEIVED FOR LAB: R.M.A.L.
SIGNED: Justin Chappell
DATE/TIME: 4/12/91 0800
ENSECO PROJECT NUMBER: 14422

ENS-1133

White - CLIENT Pink - LAB

ENSR LABORATORIES ©

CONSULTING AND ENGINEERING
2925 RICHMOND AVENUE HOUSTON, TX 77098 (713) 520-1495

Analysis Request and Chain of Custody Record

Project no.	Client/Project Name	Project Location
	City of St. Louis Park	St. Louis Park MN

Lab ID No	Field Sample No./ Identification	Date and Time	Grab	Comp	Sample Container (Size/Mat'l)	Sample Type (Liquid Sludge, Etc.)	Preservative	ANALYSIS REQUESTED	LABORATORY REMARKS
5	DPV P307-041191	4/11/91 1755			1L amber	water	4°C	PTB PAH	2 bottles
6	DPV P308 041191	1735						PTB Phenolics PAH	
7	DPV P309 041191	1555							
8	DPV P310 041191	1605							
9	DPV P311 041191	1330							
10	DPV P312 041191	1450							
1	DPV P313 041191	1615							
2	DPV W431 041191	1209							
3	DPV W432 041191	1110							

Samplers: (Signature)	Relinquished by: (Signature)	Date: 4/11/91 Time: 1900	Received by: (Signature)	Date: Time:	COC Seal No.
Affiliation	Relinquished by: (Signature)	Date: Time:	Received by: (Signature)	Date: Time:	#1
	Relinquished by: (Signature)	Date: Time:	Received by Laboratory: (Signature) Justin Chappell	Date: 4/12/91 Time: 0800	Intact: YES
REMARKS:			Data Results To: 1. 2.		Laboratory No. 14472

Enseco
A CORNING Company

Qualifier Codes and their Usage

U = Indicates compound was analyzed for but not detected. The sample quantitation limit is corrected for dilution and for percent moisture. For soil samples subjected to GPC clean-up procedures, the CRQL (contract required quantitation limit) is multiplied by two to account for the fact that only half of the extract is recovered.

J = Indicates an estimated value. This flag is used when the mass spectral data indicates the presence of a compound that meets the identification criteria but the result is less than the sample quantitation limit but greater than zero.

B = This flag is used when the analyte is found in the associated blank as well as in the sample. B codes do not necessarily invalidate the data but are dependent upon the judgement of the reviewer in applying the validation guidelines. This flag is used for a TIC as well as for a positively identified target compound list (TCL) compound.

E = This flag identifies compounds whose concentrations exceed the calibration range of the GC/MS instrument for that specific analysis.

D = This flag identifies all compounds identified during a re-analysis of a diluted sample.

A = This flag indicates that a TIC is a suspected aldol-condensation product.

Enseco Incorporated
4955 Yarrow Street
Arvada, Colorado 80002
303/421-6611 Fax: 303/431-7171

SUMMARY

DATA

PACKAGE

FOR

City

of

St. Louis Park

RMAL # 14472

1B

EPA SAMPLE NO.

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

14472-01

Lab Name: ENSECO-RMAL Contract No.:

Lab Code: ENSECO Case No.: 14472 SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: 14472-01

Sample wt/vol: 1050 (g/mL) ML Lab File ID: R5588

Level: (low/med) LOW Date Received: 04/12/91

% Moisture: not dec. dec. Date Extracted: 04/15/91

Extraction: (SepF/Cont/Sonc) CONT Date Analyzed: 05/05/91

GPC Cleanup: (Y/N) N pH: 7.0 Dilution Factor: 0.952

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
271-89-6	2,3-Benzofuran	9.5	U
496-11-7	2,3-Dihydroindene	46	
95-13-6	1H-Indene	9.5	U
91-20-3	Naphthalene	2.5	J
4565-32-6	Benzo(B)Thiophene	9.5	U
91-22-5	Quinoline	9.5	U
120-72-9	1H-Indole	9.5	U
91-57-6	2-Methylnaphthalene	9.5	U
90-12-0	1-Methylnaphthalene	9.5	U
92-52-4	Biphenyl	9.5	U
208-96-8	Acenaphthylene	9.5	U
83-32-9	Acenaphthene	6.7	J
132-64-9	Dibenzofuran	9.5	U
86-73-7	Fluorene	9.5	U
132-65-0	Dibenzothiophene	9.5	U
85-01-8	Phenanthrene	9.5	U
120-12-7	Anthracene	9.5	U
260-94-6	Acridine	9.5	U
86-74-8	Carbazole	1.9	J
206-44-0	Fluoranthene	9.5	U
129-00-0	Pyrene	9.5	U
56-55-3	Benzo(A)Anthracene	9.5	U
218-01-9	Chrysene	9.5	U
205-99-2	Benzo(B)Fluoranthene	9.5	U
207-08-9	Benzo(K)Fluoranthene	9.5	U
192-97-2	Benzo(E)Pyrene	9.5	U
50-32-8	Benzo(A)Pyrene	9.5	U
198-55-0	Perylene	9.5	U
193-39-5	Indeno(1,2,3-CD)Pyrene	9.5	U
53-70-3	Dibenz(A,H)Anthracene	9.5	U
191-24-2	Benzo(G,H,I)Perylene	9.5	U

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SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

14472-02

Lab Name: ENSECO-RMAL Contract No.:

Lab Code: ENSECO Case No.: 14472 SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: 14472-02

Sample wt/vol: 1050 (g/mL) ML Lab File ID: R5589

Level: (low/med) LOW Date Received: 04/12/91

% Moisture: not dec. dec. Date Extracted: 04/15/91

Extraction: (SepF/Cont/Sonc) CONT Date Analyzed: 05/05/91

GPC Cleanup: (Y/N) N pH: 7.0 Dilution Factor: 0.952

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
271-89-6	2,3-Benzofuran	9.5	U
496-11-7	2,3-Dihydroindene	46	
95-13-6	1H-Indene	9.5	U
91-20-3	Naphthalene	2.9	J
4565-32-6	Benzo(B)Thiophene	9.5	U
91-22-5	Quinoline	9.5	U
120-72-9	1H-Indole	9.5	U
91-57-6	2-Methylnaphthalene	9.5	U
90-12-0	1-Methylnaphthalene	9.5	U
92-52-4	Biphenyl	9.5	U
208-96-8	Acenaphthylene	9.5	U
83-32-9	Acenaphthene	7.4	J
132-64-9	Dibenzofuran	9.5	U
86-73-7	Fluorene	9.5	U
132-65-0	Dibenzothiophene	9.5	U
85-01-8	Phenanthrene	9.5	U
120-12-7	Anthracene	9.5	U
260-94-6	Acridine	9.5	U
86-74-8	Carbazole	2.4	J
206-44-0	Fluoranthene	9.5	U
129-00-0	Pyrene	9.5	U
56-55-3	Benzo(A)Anthracene	9.5	U
218-01-9	Chrysene	9.5	U
205-99-2	Benzo(B)Fluoranthene	9.5	U
207-08-9	Benzo(K)Fluoranthene	9.5	U
192-97-2	Benzo(E)Pyrene	9.5	U
50-32-8	Benzo(A)Pyrene	9.5	U
198-55-0	Perylene	9.5	U
193-39-5	Indeno(1,2,3-CD)Pyrene	9.5	U
53-70-3	Dibenz(A,H)Anthracene	9.5	U
191-24-2	Benzo(G,H,I)Perylene	9.5	U

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SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

14472-03

Lab Name: ENSECO-RMAL Contract No.:

Lab Code: ENSECO Case No.: 14472 SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: 14472-03

Sample wt/vol: 1050 (g/mL) ML Lab File ID: R5592

Level: (low/med) LOW Date Received: 04/12/91

% Moisture: not dec. dec. Date Extracted: 04/15/91

Extraction: (SepF/Cont/Sonc) CONT Date Analyzed: 05/05/91

GPC Cleanup: (Y/N) N pH: 7.0 Dilution Factor: 0.952

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
271-89-6	2,3-Benzofuran	9.5	U
496-11-7	2,3-Dihydroindene	9.5	U
95-13-6	1H-Indene	9.5	U
91-20-3	Naphthalene	9.5	U
4565-32-6	Benzo(B)Thiophene	9.5	U
91-22-5	Quinoline	9.5	U
120-72-9	1H-Indole	9.5	U
91-57-6	2-Methylnaphthalene	9.5	U
90-12-0	1-Methylnaphthalene	9.5	U
92-52-4	Biphenyl	9.5	U
208-96-8	Acenaphthylene	9.5	U
83-32-9	Acenaphthene	9.5	U
132-64-9	Dibenzofuran	9.5	U
86-73-7	Fluorene	9.5	U
132-65-0	Dibenzothiophene	9.5	U
85-01-8	Phenanthrene	9.5	U
120-12-7	Anthracene	9.5	U
260-94-6	Acridine	9.5	U
86-74-8	Carbazole	9.5	U
206-44-0	Fluoranthene	9.5	U
129-00-0	Pyrene	9.5	U
56-55-3	Benzo(A)Anthracene	9.5	U
218-01-9	Chrysene	9.5	U
205-99-2	Benzo(B)Fluoranthene	9.5	U
207-08-9	Benzo(K)Fluoranthene	9.5	U
192-97-2	Benzo(E)Pyrene	9.5	U
50-32-8	Benzo(A)Pyrene	9.5	U
198-55-0	Perylene	9.5	U
193-39-5	Indeno(1,2,3-CD)Pyrene	9.5	U
53-70-3	Dibenz(A,H)Anthracene	9.5	U
191-24-2	Benzo(G,H,I)Perylene	9.5	U

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EPA SAMPLE NO.

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

14472-05

Lab Name: ENSECO-RMAL Contract No.:

Lab Code: ENSECO Case No.: 14472 SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: 14472-05

Sample wt/vol: 1050 (g/mL) ML Lab File ID: R5594

Level: (low/med) LOW Date Received: 04/12/91

% Moisture: not dec. dec. Date Extracted: 04/15/91

Extraction: (SepF/Cont/Sonc) CONT Date Analyzed: 05/05/91

GPC Cleanup: (Y/N) N pH: 7.0 Dilution Factor: 0.952

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
271-89-6	2,3-Benzofuran	9.5	U
496-11-7	2,3-Dihydroindene	66	
95-13-6	1H-Indene	12	
91-20-3	Naphthalene	68	
4565-32-6	Benzo(B)Thiophene	14	
91-22-5	Quinoline	9.5	U
120-72-9	1H-Indole	9.5	U
91-57-6	2-Methylnaphthalene	9.5	U
90-12-0	1-Methylnaphthalene	12	
92-52-4	Biphenyl	9.5	U
208-96-8	Acenaphthylene	9.5	U
83-32-9	Acenaphthene	32	
132-64-9	Dibenzofuran	9.5	U
86-73-7	Fluorene	4.4	J
132-65-0	Dibenzothiophene	9.5	U
85-01-8	Phenanthrene	9.5	U
120-12-7	Anthracene	9.5	U
260-94-6	Acridine	9.5	U
86-74-8	Carbazole	17	
206-44-0	Fluoranthene	9.5	U
129-00-0	Pyrene	9.5	U
56-55-3	Benzo(A)Anthracene	9.5	U
218-01-9	Chrysene	9.5	U
205-99-2	Benzo(B)Fluoranthene	9.5	U
207-08-9	Benzo(K)Fluoranthene	9.5	U
192-97-2	Benzo(E)Pyrene	9.5	U
50-32-8	Benzo(A)Pyrene	9.5	U
198-55-0	Perylene	9.5	U
193-39-5	Indeno(1,2,3-CD)Pyrene	9.5	U
53-70-3	Dibenz(A,H)Anthracene	9.5	U
191-24-2	Benzo(G,H,I)Perylene	9.5	U

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SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

14472-06

Lab Name: ENSECO-RMAL Contract No.:

Lab Code: ENSECO Case No.: 14472 SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: 14472-06

Sample wt/vol: 1050 (g/mL) ML Lab File ID: R5597

Level: (low/med) LOW Date Received: 04/12/91

% Moisture: not dec. dec. Date Extracted: 04/15/91

Extraction: (SepF/Cont/Sonc) CONT Date Analyzed: 05/06/91

GPC Cleanup: (Y/N) N pH: 7.0 Dilution Factor: 0.952

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
271-89-6	2,3-Benzofuran	9.5	U
496-11-7	2,3-Dihydroindene	43	
95-13-6	1H-Indene	9.5	U
91-20-3	Naphthalene	1.5	J
4565-32-6	Benzo(B)Thiophene	7.7	J
91-22-5	Quinoline	9.5	U
120-72-9	1H-Indole	9.5	U
91-57-6	2-Methylnaphthalene	9.5	U
90-12-0	1-Methylnaphthalene	23	
92-52-4	Biphenyl	1.6	J
208-96-8	Acenaphthylene	9.5	U
83-32-9	Acenaphthene	15	
132-64-9	Dibenzofuran	2.6	J
86-73-7	Fluorene	1.0	J
132-65-0	Dibenzothiophene	9.5	U
85-01-8	Phenanthrene	9.5	U
120-12-7	Anthracene	9.5	U
260-94-6	Acridine	9.5	U
86-74-8	Carbazole	2.1	J
206-44-0	Fluoranthene	9.5	U
129-00-0	Pyrene	9.5	U
56-55-3	Benzo(A)Anthracene	9.5	U
218-01-9	Chrysene	9.5	U
205-99-2	Benzo(B)Fluoranthene	9.5	U
207-08-9	Benzo(K)Fluoranthene	9.5	U
192-97-2	Benzo(E)Pyrene	9.5	U
50-32-8	Benzo(A)Pyrene	9.5	U
198-55-0	Perylene	9.5	U
193-39-5	Indeno(1,2,3-CD)Pyrene	9.5	U
53-70-3	Dibenz(A,H)Anthracene	9.5	U
191-24-2	Benzo(G,H,I)Perylene	9.5	U

17.

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SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

14472-07

Lab Name: ENSECO-RMAL Contract No.:

Lab Code: ENSECO Case No.: 14472 SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: 14472-07

Sample wt/vol: 950 (g/mL) ML Lab File ID: R5598

Level: (low/med) LOW Date Received: 04/12/91

% Moisture: not dec. dec. Date Extracted: 04/15/91

Extraction: (SepF/Cont/Sonc) CONT Date Analyzed: 05/06/91

GPC Cleanup: (Y/N) N pH: 7.0 Dilution Factor: 1.05

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
271-89-6	2,3-Benzofuran	10	U
496-11-7	2,3-Dihydroindene	190	E
95-13-6	1H-Indene	2.1	J
91-20-3	Naphthalene	4.5	J
4565-32-6	Benzo(B)Thiophene	22	
91-22-5	Quinoline	10	U
120-72-9	1H-Indole	10	U
91-57-6	2-Methylnaphthalene	10	U
90-12-0	1-Methylnaphthalene	9.8	J
92-52-4	Biphenyl	10	U
208-96-8	Acenaphthylene	10	U
83-32-9	Acenaphthene	55	
132-64-9	Dibenzofuran	2.0	J
86-73-7	Fluorene	5.2	J
132-65-0	Dibenzothiophene	10	U
85-01-8	Phenanthrene	10	U
120-12-7	Anthracene	10	U
260-94-6	Acridine	10	U
86-74-8	Carbazole	27	
206-44-0	Fluoranthene	10	U
129-00-0	Pyrene	10	U
56-55-3	Benzo(A)Anthracene	10	U
218-01-9	Chrysene	10	U
205-99-2	Benzo(B)Fluoranthene	10	U
207-08-9	Benzo(K)Fluoranthene	10	U
192-97-2	Benzo(E)Pyrene	10	U
50-32-8	Benzo(A)Pyrene	10	U
198-55-0	Perylene	10	U
193-39-5	Indeno(1,2,3-CD)Pyrene	10	U
53-70-3	Dibenz(A,H)Anthracene	10	U
191-24-2	Benzo(G,H,I)Perylene	10	U

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SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

14472-07DL

Lab Name: ENSECO-RMAL Contract No.:

Lab Code: ENSECO Case No.: 14472 SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: 14472-07DL

Sample wt/vol: 950 (g/mL) ML Lab File ID: R5608

Level: (low/med) LOW Date Received: 04/12/91

% Moisture: not dec. dec. Date Extracted: 04/15/91

Extraction: (SepF/Cont/Sonc) CONT Date Analyzed: 05/07/91

GPC Cleanup: (Y/N) N pH: 7.0 Dilution Factor: 2.11

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
271-89-6	2,3-Benzofuran	21	U
496-11-7	2,3-Dihydroindene	170	D
95-13-6	1H-Indene	2.4	JD
91-20-3	Naphthalene	4.7	JD
4565-32-6	Benzo(B)Thiophene	21	D
91-22-5	Quinoline	21	U
120-72-9	1H-Indole	21	U
91-57-6	2-Methylnaphthalene	21	U
90-12-0	1-Methylnaphthalene	9.8	JD
92-52-4	Biphenyl	21	U
208-96-8	Acenaphthylene	21	U
83-32-9	Acenaphthene	56	D
132-64-9	Dibenzofuran	21	U
86-73-7	Fluorene	4.7	JD
132-65-0	Dibenzothiophene	21	U
85-01-8	Phenanthrene	21	U
120-12-7	Anthracene	21	U
260-94-6	Acridine	21	U
86-74-8	Carbazole	27	D
206-44-0	Fluoranthene	21	U
129-00-0	Pyrene	21	U
56-55-3	Benzo(A)Anthracene	21	U
218-01-9	Chrysene	21	U
205-99-2	Benzo(B)Fluoranthene	21	U
207-08-9	Benzo(K)Fluoranthene	21	U
192-97-2	Benzo(E)Pyrene	21	U
50-32-8	Benzo(A)Pyrene	21	U
198-55-0	Perylene	21	U
193-39-5	Indeno(1,2,3-CD)Pyrene	21	U
53-70-3	Dibenz(A,H)Anthracene	21	U
191-24-2	Benzo(G,H,I)Perylene	21	U

1B

EPA SAMPLE NO.

14472-08

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

Lab Name: ENSECO-RMAL Contract No.:

Lab Code: ENSECO Case No.: 14472 SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: 14472-08

Sample wt/vol: 1050 (g/mL) ML Lab File ID: R5794

Level: (low/med) LOW Date Received: 04/12/91

% Moisture: not dec. dec. Date Extracted: 05/08/91

Extraction: (SepF/Cont/Sonc) CONT Date Analyzed: 05/21/91

GPC Cleanup: (Y/N) N pH: 7.0 Dilution Factor: 0.952

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
271-89-6	2,3-Benzofuran	9.5	U
496-11-7	2,3-Dihydroindene	11	
95-13-6	1H-Indene	2.8	J
91-20-3	Naphthalene	9.5	U
4565-32-6	Benzo(B)Thiophene	5.1	J
91-22-5	Quinoline	9.5	U
120-72-9	1H-Indole	9.5	U
91-57-6	2-Methylnaphthalene	9.5	U
90-12-0	1-Methylnaphthalene	9.5	U
92-52-4	Biphenyl	9.5	U
208-96-8	Acenaphthylene	9.5	U
83-32-9	Acenaphthene	6.3	J
132-64-9	Dibenzofuran	9.5	U
86-73-7	Fluorene	9.5	U
132-65-0	Dibenzothiophene	9.5	U
85-01-8	Phenanthrene	9.5	U
120-12-7	Anthracene	9.5	U
260-94-6	Acridine	9.5	U
86-74-8	Carbazole	7.5	J
206-44-0	Fluoranthene	9.5	U
129-00-0	Pyrene	9.5	U
56-55-3	Benzo(A)Anthracene	9.5	U
218-01-9	Chrysene	9.5	U
205-99-2	Benzo(B)Fluoranthene	9.5	U
207-08-9	Benzo(K)Fluoranthene	9.5	U
192-97-2	Benzo(E)Pyrene	9.5	U
50-32-8	Benzo(A)Pyrene	9.5	U
198-55-0	Perylene	9.5	U
193-39-5	Indeno(1,2,3-CD)Pyrene	9.5	U
53-70-3	Dibenz(A,H)Anthracene	9.5	U
191-24-2	Benzo(G,H,I)Perylene	9.5	U

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SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

14472-09

Lab Name: ENSECO-RMAL Contract No.:

Lab Code: ENSECO Case No.: 14472 SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: 14472-09

Sample wt/vol: 1050 (g/mL) ML Lab File ID: R5600

Level: (low/med) LOW Date Received: 04/12/91

% Moisture: not dec. dec. Date Extracted: 04/15/91

Extraction: (SepF/Cont/Sonc) CONT Date Analyzed: 05/06/91

GPC Cleanup: (Y/N) N pH: 7.0 Dilution Factor: 0.952

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
271-89-6	2,3-Benzofuran	9.5	U
496-11-7	2,3-Dihydroindene	9.5	U
95-13-6	1H-Indene	9.5	U
91-20-3	Naphthalene	9.5	U
4565-32-6	Benzo(B)Thiophene	11	
91-22-5	Quinoline	9.5	U
120-72-9	1H-Indole	9.5	U
91-57-6	2-Methylnaphthalene	9.5	U
90-12-0	1-Methylnaphthalene	9.5	U
92-52-4	Biphenyl	9.5	U
208-96-8	Acenaphthylene	9.5	U
83-32-9	Acenaphthene	23	
132-64-9	Dibenzofuran	9.5	U
86-73-7	Fluorene	9.5	U
132-65-0	Dibenzothiophene	9.5	U
85-01-8	Phenanthrene	9.5	U
120-12-7	Anthracene	9.5	U
260-94-6	Acridine	9.5	U
86-74-8	Carbazole	12	
206-44-0	Fluoranthene	9.5	U
129-00-0	Pyrene	9.5	U
56-55-3	Benzo(A)Anthracene	9.5	U
218-01-9	Chrysene	9.5	U
205-99-2	Benzo(B)Fluoranthene	9.5	U
207-08-9	Benzo(K)Fluoranthene	9.5	U
192-97-2	Benzo(E)Pyrene	9.5	U
50-32-8	Benzo(A)Pyrene	9.5	U
198-55-0	Perylene	9.5	U
193-39-5	Indeno(1,2,3-CD)Pyrene	9.5	U
53-70-3	Dibenz(A,H)Anthracene	9.5	U
191-24-2	Benzo(G,H,I)Perylene	9.5	U

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SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

14472-10

Lab Name: ENSECO-RMAL Contract No.:

Lab Code: ENSECO Case No.: 14472 SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: 14472-10

Sample wt/vol: 1050 (g/mL) ML Lab File ID: R5601

Level: (low/med) LOW Date Received: 04/12/91

% Moisture: not dec. dec. Date Extracted: 04/15/91

Extraction: (SepF/Cont/Sonc) CONT Date Analyzed: 05/06/91

GPC Cleanup: (Y/N) N pH: 7.0 Dilution Factor: 0.952

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
271-89-6	2,3-Benzofuran	9.5	U
496-11-7	2,3-Dihydroindene	14	
95-13-6	1H-Indene	9.5	U
91-20-3	Naphthalene	9.5	U
4565-32-6	Benzo(B)Thiophene	9.5	U
91-22-5	Quinoline	9.5	U
120-72-9	1H-Indole	9.5	U
91-57-6	2-Methylnaphthalene	9.5	U
90-12-0	1-Methylnaphthalene	9.5	U
92-52-4	Biphenyl	9.5	U
208-96-8	Acenaphthylene	9.5	U
83-32-9	Acenaphthene	9.5	U
132-64-9	Dibenzofuran	9.5	U
86-73-7	Fluorene	9.5	U
132-65-0	Dibenzothiophene	9.5	U
85-01-8	Phenanthrene	9.5	U
120-12-7	Anthracene	9.5	U
260-94-6	Acridine	9.5	U
86-74-8	Carbazole	9.5	U
206-44-0	Fluoranthene	9.5	U
129-00-0	Pyrene	9.5	U
56-55-3	Benzo(A)Anthracene	9.5	U
218-01-9	Chrysene	9.5	U
205-99-2	Benzo(B)Fluoranthene	9.5	U
207-08-9	Benzo(K)Fluoranthene	9.5	U
192-97-2	Benzo(E)Pyrene	9.5	U
50-32-8	Benzo(A)Pyrene	9.5	U
198-55-0	Perylene	9.5	U
193-39-5	Indeno(1,2,3-CD)Pyrene	9.5	U
53-70-3	Dibenz(A,H)Anthracene	9.5	U
191-24-2	Benzo(G,H,I)Perylene	9.5	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

14472-11

Lab Name: ENSECO-RMAL Contract No.:

Lab Code: ENSECO Case No.: 14472 SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: 14472-11

Sample wt/vol: 1000 (g/mL) ML Lab File ID: R5602

Level: (low/med) LOW Date Received: 04/12/91

% Moisture: not dec. dec. Date Extracted: 04/15/91

Extraction: (SepF/Cont/Sonc) CONT Date Analyzed: 05/06/91

GPC Cleanup: (Y/N) N pH: 7.0 Dilution Factor: 1.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
271-89-6	2,3-Benzofuran	10	U
496-11-7	2,3-Dihydroindene	10	U
95-13-6	1H-Indene	10	U
91-20-3	Naphthalene	10	U
4565-32-6	Benzo(B)Thiophene	10	U
91-22-5	Quinoline	10	U
120-72-9	1H-Indole	10	U
91-57-6	2-Methylnaphthalene	10	U
90-12-0	1-Methylnaphthalene	10	U
92-52-4	Biphenyl	10	U
208-96-8	Acenaphthylene	10	U
83-32-9	Acenaphthene	10	U
132-64-9	Dibenzofuran	10	U
86-73-7	Fluorene	10	U
132-65-0	Dibenzothiophene	10	U
85-01-8	Phenanthrene	10	U
120-12-7	Anthracene	10	U
260-94-6	Acridine	10	U
86-74-8	Carbazole	10	U
206-44-0	Fluoranthene	10	U
129-00-0	Pyrene	10	U
56-55-3	Benzo(A)Anthracene	10	U
218-01-9	Chrysene	10	U
205-99-2	Benzo(B)Fluoranthene	10	U
207-08-9	Benzo(K)Fluoranthene	10	U
192-97-2	Benzo(E)Pyrene	10	U
50-32-8	Benzo(A)Pyrene	10	U
198-55-0	Perylene	10	U
193-39-5	Indeno(1,2,3-CD)Pyrene	10	U
53-70-3	Dibenz(A,H)Anthracene	10	U
191-24-2	Benzo(G,H,I)Perylene	10	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

14472-12

Lab Name: ENSECO-RMAL Contract No.:

Lab Code: ENSECO Case No.: 14472 SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: 14472-12

Sample wt/vol: 880 (g/mL) ML Lab File ID: R5795

Level: (low/med) LOW Date Received: 04/12/91

% Moisture: not dec. dec. Date Extracted: 05/17/91

Extraction: (SepF/Cont/Sonc) CONT Date Analyzed: 05/21/91

GPC Cleanup: (Y/N) N pH: 7.0 Dilution Factor: 1.14

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
271-89-6	2,3-Benzofuran	11	U
496-11-7	2,3-Dihydroindene	3.3	J
95-13-6	1H-Indene	2.7	J
91-20-3	Naphthalene	11	U
4565-32-6	Benzo(B)Thiophene	11	U
91-22-5	Quinoline	11	U
120-72-9	1H-Indole	11	U
91-57-6	2-Methylnaphthalene	11	U
90-12-0	1-Methylnaphthalene	11	U
92-52-4	Biphenyl	11	U
208-96-8	Acenaphthylene	11	U
83-32-9	Acenaphthene	11	U
132-64-9	Dibenzofuran	11	U
86-73-7	Fluorene	11	U
132-65-0	Dibenzothiophene	11	U
85-01-8	Phenanthrene	11	U
120-12-7	Anthracene	11	U
260-94-6	Acridine	11	U
86-74-8	Carbazole	11	U
206-44-0	Fluoranthene	11	U
129-00-0	Pyrene	11	U
56-55-3	Benzo(A)Anthracene	11	U
218-01-9	Chrysene	11	U
205-99-2	Benzo(B)Fluoranthene	11	U
207-08-9	Benzo(K)Fluoranthene	11	U
192-97-2	Benzo(E)Pyrene	11	U
50-32-8	Benzo(A)Pyrene	11	U
198-55-0	Perylene	11	U
193-39-5	Indeno(1,2,3-CD)Pyrene	11	U
53-70-3	Dibenz(A,H)Anthracene	11	U
191-24-2	Benzo(G,H,I)Perylene	11	U

6

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

14472-13

Lab Name: ENSECO-RMAL Contract No.:

Lab Code: ENSECO Case No.: 14472 SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: 14472-13

Sample wt/vol: 1050 (g/mL) ML Lab File ID: R5604

Level: (low/med) LOW Date Received: 04/12/91

% Moisture: not dec. dec. Date Extracted: 04/15/91

Extraction: (SepF/Cont/Sonc) CONT Date Analyzed: 05/07/91

GPC Cleanup: (Y/N) N pH: 7.0 Dilution Factor: 0.952

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
271-89-6	2,3-Benzofuran	9.5	U
496-11-7	2,3-Dihydroindene	9.5	U
95-13-6	1H-Indene	9.5	U
91-20-3	Naphthalene	9.5	U
4565-32-6	Benzo(B)Thiophene	9.5	U
91-22-5	Quinoline	9.5	U
120-72-9	1H-Indole	9.5	U
91-57-6	2-Methylnaphthalene	9.5	U
90-12-0	1-Methylnaphthalene	9.5	U
92-52-4	Biphenyl	9.5	U
208-96-8	Acenaphthylene	9.5	U
83-32-9	Acenaphthene	9.5	U
132-64-9	Dibenzofuran	9.5	U
86-73-7	Fluorene	9.5	U
132-65-0	Dibenzothiophene	9.5	U
85-01-8	Phenanthrene	9.5	U
120-12-7	Anthracene	9.5	U
260-94-6	Acridine	9.5	U
86-74-8	Carbazole	9.5	U
206-44-0	Fluoranthene	9.5	U
129-00-0	Pyrene	9.5	U
56-55-3	Benzo(A)Anthracene	9.5	U
218-01-9	Chrysene	9.5	U
205-99-2	Benzo(B)Fluoranthene	9.5	U
207-08-9	Benzo(K)Fluoranthene	9.5	U
192-97-2	Benzo(E)Pyrene	9.5	U
50-32-8	Benzo(A)Pyrene	9.5	U
198-55-0	Perylene	9.5	U
193-39-5	Indeno(1,2,3-CD)Pyrene	9.5	U
53-70-3	Dibenz(A,H)Anthracene	9.5	U
191-24-2	Benzo(G,H,I)Perylene	9.5	U

1B

EPA SAMPLE NO.

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

14472-02MS

Lab Name: ENSECO-RMAL Contract No.:

Lab Code: ENSECO Case No.: 14472 SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: 14472-02MS

Sample wt/vol: 1050 (g/mL) ML Lab File ID: R5590

Level: (low/med) LOW Date Received: 04/12/91

% Moisture: not dec. dec. Date Extracted: 04/15/91

Extraction: (SepF/Cont/Sonc) CONT Date Analyzed: 05/05/91

GPC Cleanup: (Y/N) N pH: 7.0 Dilution Factor: 0.952

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
271-89-6	2,3-Benzofuran	9.5	U
496-11-7	2,3-Dihydroindene	49	
95-13-6	1H-Indene	36	SP
91-20-3	Naphthalene	29	SP
4565-32-6	Benzo(B)Thiophene	9.5	U
91-22-5	Quinoline	34	SP
120-72-9	1H-Indole	9.5	U
91-57-6	2-Methylnaphthalene	36	SP
90-12-0	1-Methylnaphthalene	9.5	U
92-52-4	Biphenyl	9.5	U
208-96-8	Acenaphthylene	9.5	U
83-32-9	Acenaphthene	6.9	J
132-64-9	Dibenzofuran	9.5	U
86-73-7	Fluorene	40	SP
132-65-0	Dibenzothiophene	9.5	U
85-01-8	Phenanthrene	9.5	U
120-12-7	Anthracene	9.5	U
260-94-6	Acridine	9.5	U
86-74-8	Carbazole	2.1	J
206-44-0	Fluoranthene	9.5	U
129-00-0	Pyrene	9.5	U
56-55-3	Benzo(A)Anthracene	9.5	U
218-01-9	Chrysene	39	SP
205-99-2	Benzo(B)Fluoranthene	9.5	U
207-08-9	Benzo(K)Fluoranthene	9.5	U
192-97-2	Benzo(E)Pyrene	36	SP
50-32-8	Benzo(A)Pyrene	9.5	U
198-55-0	Perylene	9.5	U
193-39-5	Indeno(1,2,3-CD)Pyrene	9.5	U
53-70-3	Dibenz(A,H)Anthracene	9.5	U
191-24-2	Benzo(G,H,I)Perylene	9.5	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.: 14472-02MSD

Lab Name: ENSECO-RMAL Contract No.:

Lab Code: ENSECO Case No.: 14472 SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: 14472-02MSD

Sample wt/vol: 1050 (g/mL) ML Lab File ID: R5591

Level: (low/med) LOW Date Received: 04/12/91

% Moisture: not dec. dec. Date Extracted: 04/15/91

Extraction: (SepF/Cont/Sonc) CONT Date Analyzed: 05/05/91

GPC Cleanup: (Y/N) N pH: 7.0 Dilution Factor: 0.952

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q	
271-89-6	2,3-Benzofuran	9.5	U	
496-11-7	2,3-Dihydroindene	42		
95-13-6	1H-Indene	30		SP
91-20-3	Naphthalene	25		SP
4565-32-6	Benzo(B)Thiophene	9.5	U	
91-22-5	Quinoline	31		SP
120-72-9	1H-Indole	9.5	U	
91-57-6	2-Methylnaphthalene	31		SP
90-12-0	1-Methylnaphthalene	9.5	U	
92-52-4	Biphenyl	9.5	U	
208-96-8	Acenaphthylene	9.5	U	
83-32-9	Acenaphthene	6.2	J	
132-64-9	Dibenzofuran	9.5	U	
86-73-7	Fluorene	35		SP
132-65-0	Dibenzothiophene	9.5	U	
85-01-8	Phenanthrene	9.5	U	
120-12-7	Anthracene	9.5	U	
260-94-6	Acridine	9.5	U	
86-74-8	Carbazole	1.9	J	
206-44-0	Fluoranthene	9.5	U	
129-00-0	Pyrene	9.5	U	
56-55-3	Benzo(A)Anthracene	9.5	U	
218-01-9	Chrysene	17		SP
205-99-2	Benzo(B)Fluoranthene	9.5	U	
207-08-9	Benzo(K)Fluoranthene	9.5	U	
192-97-2	Benzo(E)Pyrene	18		SP
50-32-8	Benzo(A)Pyrene	9.5	U	
198-55-0	Perylene	9.5	U	
193-39-5	Indeno(1,2,3-CD)Pyrene	9.5	U	
53-70-3	Dibenz(A,H)Anthracene	9.5	U	
191-24-2	Benzo(G,H,I)Perylene	9.5	U	

2C

WATER SEMIVOLATILE SURROGATE RECOVERY

Lab Name: RMAL Contract:

Lab Code: ENSECO Case No.: 14472 SAS No.: SDG No.:

Level: LOW

	EPA SAMPLE NO.	S1 (NAP) #	S2 (FLU) #	S3 (CHR) #	
1	14472-01	70	83	60	
2	14472-02	76	98	104	
3	14472-03	70	88	94	
4	14472-05	66	87	76	
5	14472-06	74	80	64	
6	14472-07	57	64	32	
7	14472-07DL	52	64	33	
8	14472-08	47	52	8	*
9	14472-09	74	78	26	
10	14472-10	64	82	50	
11	14472-11	58	74	36	
12	14472-12	85	92	70	
13	14472-13	59	78	71	
14	14472-02MS	76	94	97	
15	11074-02MSD	66	81	33	
16	BLK01	50	70	92	
17	BLK02	81	46	78	
18	BLK03	69	72	78	

	QC LIMITS
S1 (NAP) = D8-NAPHTHALENE	(25-175)
S2 (FLU) = D10-FLUORENE	(25-175)
S3 (CHR) = D12-CHRYSENE	(25-175)

Column to be used to flag recovery values

* Values outside of contract required QC limits

D Surrogates diluted out

3C

WATER SEMIVOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: RMAL Contract:

Lab Code: ENSECO Case No.: 14472 SAS No.: SDG No.:

Matrix Spike - EPA Sample No.: 14472-02 LEVEL: LOW

Compound	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC
1H-Indene	47.6	0	35.8	75
Naphthalene	47.6	2.87	29.5	56
Quinoline	47.6	0	34.5	72
2-Methylnaphthalene	47.6	0	36.1	76
Fluorene	47.6	0	39.6	83
Chrysene	47.6	0	39.0	82
Benzo(E)Pyrene	47.6	0	36.3	76

Compound	SPIKE ADDED (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC	% RPD
1H-Indene	47.6	30.2	63	17
Naphthalene	47.6	25.4	47	17
Quinoline	47.6	30.5	64	12
2-Methylnaphthalene	47.6	30.5	64	17
Fluorene	47.6	35.3	74	11
Chrysene	47.6	17.0	36	78
Benzo(E)Pyrene	47.6	17.9	38	67

4B

SEMIVOLATILE METHOD BLANK SUMMARY

Lab Name: RMAL Contract:

Lab Code: ENSECO Case No.: 14472 SAS No.: SDG No.:

Lab File ID: R5587 Lab Sample ID: BLK01

Date Extracted: 04/15/91 Extraction: (SepF/Cont/Sonc) CONT

Date Analyzed: 05/05/91 Time Analyzed: 1715

Matrix: (soil/water) WATER Level: (low/med) LOW

Instrument ID: 4500-R

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED
1	14472-01	14472-01	R5588	05/05/91
2	14472-02	14472-02	R5589	05/05/91
3	14472-03	14472-03	R5592	05/05/91
4	14472-05	14472-05	R5594	05/05/91
5	14472-06	14472-06	R5597	05/06/91
6	14472-07	14472-07	R5598	05/06/91
7	14472-07DL	14472-07DL	R5608	05/07/91
8	14472-09	14472-09	R5600	05/06/91
9	14472-10	14472-10	R5601	05/06/91
10	14472-11	14472-11	R5602	05/06/91
11	14472-13	14472-13	R5604	05/07/91
12	14472-02MS	14472-02MS	R5590	05/05/91
13	14472-02MSD	14472-02MSD	R5591	05/05/91

COMMENTS:

1B

EPA SAMPLE NO.

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

BLK01

Lab Name: ENSECO-RMAL Contract No.:

Lab Code: ENSECO Case No.: 14472 SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: BLK01

Sample wt/vol: 1000 (g/mL) ML Lab File ID: R5587

Level: (low/med) LOW Date Received:

% Moisture: not dec. dec. Date Extracted: 04/15/91

Extraction: (SepF/Cont/Sonc) CONT Date Analyzed: 05/05/91

GPC Cleanup: (Y/N) N pH: 7.0 Dilution Factor: 1.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
271-89-6	2,3-Benzofuran	10	U
496-11-7	2,3-Dihydroindene	10	U
95-13-6	1H-Indene	10	U
91-20-3	Naphthalene	10	U
4565-32-6	Benzo(B)Thiophene	10	U
91-22-5	Quinoline	10	U
120-72-9	1H-Indole	10	U
91-57-6	2-Methylnaphthalene	10	U
90-12-0	1-Methylnaphthalene	10	U
92-52-4	Biphenyl	10	U
208-96-8	Acenaphthylene	10	U
83-32-9	Acenaphthene	10	U
132-64-9	Dibenzofuran	10	U
86-73-7	Fluorene	10	U
132-65-0	Dibenzothiophene	10	U
85-01-8	Phenanthrene	10	U
120-12-7	Anthracene	10	U
260-94-6	Acridine	10	U
86-74-8	Carbazole	10	U
206-44-0	Fluoranthene	10	U
129-00-0	Pyrene	10	U
56-55-3	Benzo(A)Anthracene	10	U
218-01-9	Chrysene	10	U
205-99-2	Benzo(B)Fluoranthene	10	U
207-08-9	Benzo(K)Fluoranthene	10	U
192-97-2	Benzo(E)Pyrene	10	U
50-32-8	Benzo(A)Pyrene	10	U
198-55-0	Perylene	10	U
193-39-5	Indeno(1,2,3-CD)Pyrene	10	U
53-70-3	Dibenz(A,H)Anthracene	10	U
191-24-2	Benzo(G,H,I)Perylene	10	U

4B

SEMIVOLATILE METHOD BLANK SUMMARY

Lab Name: RMAL Contract:

Lab Code: ENSECO Case No.: 14472 SAS No.: SDG No.:

Lab File ID: R5792 Lab Sample ID: BLK02

Date Extracted: 05/08/91 Extraction: (SepF/Cont/Sonc) CONT

Date Analyzed: 05/21/91 Time Analyzed: 1746

Matrix: (soil/water) WATER Level: (low/med) LOW

Instrument ID: 4500-R

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED
1	14472-08	14472-08	R5794	05/21/91

COMMENTS:

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BLK02

Lab Name: ENSECO-RMAL Contract No.:

Lab Code: ENSECO Case No.: 14472 SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: BLK02

Sample wt/vol: 1000 (g/mL) ML Lab File ID: R5792

Level: (low/med) LOW Date Received:

% Moisture: not dec. dec. Date Extracted: 05/08/91

Extraction: (SepF/Cont/Sonc) CONT Date Analyzed: 05/21/91

GPC Cleanup: (Y/N) N pH: 7.0 Dilution Factor: 1.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
271-89-6	2,3-Benzofuran	10	U
496-11-7	2,3-Dihydroindene	10	U
95-13-6	1H-Indene	10	U
91-20-3	Naphthalene	10	U
4565-32-6	Benzo(B)Thiophene	10	U
91-22-5	Quinoline	10	U
120-72-9	1H-Indole	10	U
91-57-6	2-Methylnaphthalene	10	U
90-12-0	1-Methylnaphthalene	10	U
92-52-4	Biphenyl	10	U
208-96-8	Acenaphthylene	10	U
83-32-9	Acenaphthene	10	U
132-64-9	Dibenzofuran	10	U
86-73-7	Fluorene	10	U
132-65-0	Dibenzothiophene	10	U
85-01-8	Phenanthrene	10	U
120-12-7	Anthracene	10	U
260-94-6	Acridine	10	U
86-74-8	Carbazole	10	U
206-44-0	Fluoranthene	10	U
129-00-0	Pyrene	10	U
56-55-3	Benzo(A)Anthracene	10	U
218-01-9	Chrysene	10	U
205-99-2	Benzo(B)Fluoranthene	10	U
207-08-9	Benzo(K)Fluoranthene	10	U
192-97-2	Benzo(E)Pyrene	10	U
50-32-8	Benzo(A)Pyrene	10	U
198-55-0	Perylene	10	U
193-39-5	Indeno(1,2,3-CD)Pyrene	10	U
53-70-3	Dibenz(A,H)Anthracene	10	U
191-24-2	Benzo(G,H,I)Perylene	10	U

4B

SEMIVOLATILE METHOD BLANK SUMMARY

Lab Name: RMAL Contract:

Lab Code: ENSECO Case No.: 14472 SAS No.: SDG No.:

Lab File ID: R5792 Lab Sample ID: BLK03

Date Extracted: 05/17/91 Extraction: (SepF/Cont/Sonc) CONT

Date Analyzed: 05/21/91 Time Analyzed: 1838

Matrix: (soil/water) WATER Level: (low/med) LOW

Instrument ID: 4500-R

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED
1	14472-12	14472-12	R5795	05/21/91

COMMENTS:

1B

EPA SAMPLE NO.

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

BLK03

Lab Name: ENSECO-RMAL Contract No.:

Lab Code: ENSECO Case No.: 14472 SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: BLK03

Sample wt/vol: 1000 (g/mL) ML Lab File ID: R5793

Level: (low/med) LOW Date Received:

% Moisture: not dec. dec. Date Extracted: 05/17/91

Extraction: (SepF/Cont/Sonc) CONT Date Analyzed: 05/21/91

GPC Cleanup: (Y/N) N pH: 7.0 Dilution Factor: 1.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
271-89-6	2,3-Benzofuran	10	U
496-11-7	2,3-Dihydroindene	10	U
95-13-6	1H-Indene	10	U
91-20-3	Naphthalene	10	U
4565-32-6	Benzo(B)Thiophene	10	U
91-22-5	Quinoline	10	U
120-72-9	1H-Indole	10	U
91-57-6	2-Methylnaphthalene	10	U
90-12-0	1-Methylnaphthalene	10	U
92-52-4	Biphenyl	10	U
208-96-8	Acenaphthylene	10	U
83-32-9	Acenaphthene	10	U
132-64-9	Dibenzofuran	10	U
86-73-7	Fluorene	10	U
132-65-0	Dibenzothiophene	10	U
85-01-8	Phenanthrene	10	U
120-12-7	Anthracene	10	U
260-94-6	Acridine	10	U
86-74-8	Carbazole	10	U
206-44-0	Fluoranthene	10	U
129-00-0	Pyrene	10	U
56-55-3	Benzo(A)Anthracene	10	U
218-01-9	Chrysene	10	U
205-99-2	Benzo(B)Fluoranthene	10	U
207-08-9	Benzo(K)Fluoranthene	10	U
192-97-2	Benzo(E)Pyrene	10	U
50-32-8	Benzo(A)Pyrene	10	U
198-55-0	Perylene	10	U
193-39-5	Indeno(1,2,3-CD)Pyrene	10	U
53-70-3	Dibenz(A,H)Anthracene	10	U
191-24-2	Benzo(G,H,I)Perylene	10	U

5B

SEMIVOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Lab Name: RMAL Contract:

Lab Code: ENSECO Case No.: 14472 SAS No.: SDG No.:

Lab File ID: R5570 DFTPP Injection Date: 05/03/91

Instrument ID: 4500-R DFTPP Injection Time: 1050

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 60.0% of mass 198	35.5
68	Less than 2.0% of mass 69	0.7 (1.8)1
69	Mass 69 relative abundance	37.7
70	Less than 2.0% of mass 69	0.0 (0.0)1
127	40.0 - 60.0% of mass 198	41.5
197	Less than 1.0% of mass 198	0.0
198	Base peak, 100% relative abundance	100.0
199	5.0 - 9.0% of mass 198	6.8
275	10.0 - 30.0% of mass 198	21.4
365	Greater than 1.00% of mass 198	2.14
441	Present, but less than mass 443	7.6
442	Greater than 40.0% of mass 198	59.7
443	17.0 - 23.0% of mass 442	10.2 (17.2)2

1-Value is % mass 69 2-Value is % mass 442

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	SSTD050	50_PPM_PAH_STD	R5571	05/03/91	1112
02	SSTD160	160_PPM_PAH_STD	R5572	05/03/91	1220
03	SSTD120	120_PPM_PAH_STD	R5573	05/03/91	1320
04	SSTD080	80_PPM_PAH_STD	R5574	05/03/91	1422
05	SSTD020	20_PPM_PAH_STD	R5575	05/03/91	1531

SEMIVOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Lab Name: RMAL Contract:

Lab Code: ENSECO Case No.: 14472 SAS No.: SDG No.:

Lab File ID: R5581 DFTPP Injection Date: 05/05/91

Instrument ID: 4500-R DFTPP Injection Time: 1219

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 60.0% of mass 198	35.2
68	Less than 2.0% of mass 69	0.7 (1.8)1
69	Mass 69 relative abundance	36.8
70	Less than 2.0% of mass 69	0.0 (0.0)1
127	40.0 - 60.0% of mass 198	41.8
197	Less than 1.0% of mass 198	0.0
198	Base peak, 100% relative abundance	100.0
199	5.0 - 9.0% of mass 198	6.5
275	10.0 - 30.0% of mass 198	21.8
365	Greater than 1.00% of mass 198	2.01
441	Present, but less than mass 443	7.7
442	Greater than 40.0% of mass 198	60.9
443	17.0 - 23.0% of mass 442	10.6 (17.4)2

1-Value is % mass 69 2-Value is % mass 442

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	SSTD050	50_PPM_PAH_STD	R5582	05/05/91	1234
02	BLK01	BLK01	R5587	05/05/91	1715
03	14472-01	14472-01	R5588	05/05/91	1808
04	14472-02	14472-02	R5589	05/05/91	1900
05	14472-02MS	14472-02MS	R5590	05/05/91	1952
06	14472-02MSD	14472-02MSD	R5591	05/05/91	2045
07	14472-03	14472-03	R5592	05/05/91	2137
08	14472-05	14472-05	R5594	05/05/91	2322

5B

SEMIVOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Lab Name: RMAL Contract:

Lab Code: ENSECO Case No.: 14472 SAS No.: SDG No.:

Lab File ID: R5595 DFTPP Injection Date: 05/06/91

Instrument ID: 4500-R DFTPP Injection Time: 1726

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 60.0% of mass 198	39.5
68	Less than 2.0% of mass 69	0.0 (0.0)1
69	Mass 69 relative abundance	42.2
70	Less than 2.0% of mass 69	0.0 (0.0)1
127	40.0 - 60.0% of mass 198	44.2
197	Less than 1.0% of mass 198	0.0
198	Base peak, 100% relative abundance	100.0
199	5.0 - 9.0% of mass 198	6.1
275	10.0 - 30.0% of mass 198	20.9
365	Greater than 1.00% of mass 198	2.37
441	Present, but less than mass 443	6.6
442	Greater than 40.0% of mass 198	50.5
443	17.0 - 23.0% of mass 442	8.9 (17.6)2

1-Value is % mass 69 2-Value is % mass 442

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	SSTD050	50_PPM_PAH_STD	R5596	05/06/91	1749
02	14472-06	14472-06	R5597	05/06/91	1900
03	14472-07	14472-07	R5598	05/06/91	1952
04	14472-09	14472-09	R5600	05/06/91	2137
05	14472-10	14472-10	R5601	05/06/91	2229
06	14472-11	14472-11	R5602	05/06/91	2321
07	14472-13	14472-13	R5604	05/07/91	0104

5B

SEMIVOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Lab Name: RMAL Contract:

Lab Code: ENSECO Case No.: 14472 SAS No.: SDG No.:

Lab File ID: R5605 DFTPP Injection Date: 05/07/91

Instrument ID: 4500-R DFTPP Injection Time: 1346

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 60.0% of mass 198	37.7
68	Less than 2.0% of mass 69	0.0 (0.0)1
69	Mass 69 relative abundance	40.2
70	Less than 2.0% of mass 69	0.0 (0.0)1
127	40.0 - 60.0% of mass 198	43.0
197	Less than 1.0% of mass 198	0.0
198	Base peak, 100% relative abundance	100.0
199	5.0 - 9.0% of mass 198	6.9
275	10.0 - 30.0% of mass 198	21.7
365	Greater than 1.00% of mass 198	2.22
441	Present, but less than mass 443	6.6
442	Greater than 40.0% of mass 198	54.0
443	17.0 - 23.0% of mass 442	9.8 (18.1)2

1-Value is % mass 69 2-Value is % mass 442

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	SSTD050	50_PPM_PAH_STD	R5606	05/07/91	1409
02	14472-07DL	14472-07DL	R5608	05/07/91	1649

5B

SEMIVOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Lab Name: RMAL Contract:

Lab Code: ENSECO Case No.: 14472 SAS No.: SDG No.:

Lab File ID: R5790 DFTPP Injection Date: 05/21/91

Instrument ID: 4500-R DFTPP Injection Time: 1243

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 60.0% of mass 198	57.2
68	Less than 2.0% of mass 69	1.0 (1.9)1
69	Mass 69 relative abundance	54.5
70	Less than 2.0% of mass 69	0.0 (0.0)1
127	40.0 - 60.0% of mass 198	50.7
197	Less than 1.0% of mass 198	0.0
198	Base peak, 100% relative abundance	100.0
199	5.0 - 9.0% of mass 198	6.8
275	10.0 - 30.0% of mass 198	20.6
365	Greater than 1.00% of mass 198	2.37
441	Present, but less than mass 443	5.9
442	Greater than 40.0% of mass 198	43.6
443	17.0 - 23.0% of mass 442	8.1 (18.6)2

1-Value is % mass 69 2-Value is % mass 442

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	SSTD050	50_PPM_PAH_STD	R5791	05/21/91	1258
02	BLK02	BLK02	R5792	05/21/91	1746
03	BLK03	BLK03	R5793	05/21/91	1838
04	14472-08	14472-08	R5794	05/21/91	1930
05	14472-12	14472-12	R5795	05/21/91	2022

INITIAL CALIBRATION DATA
PAH COMPOUNDS

Lab Name: RMAL Lab Code: ENSECO Case No: 14472

Instrument ID: 4500-R Calibration Date(s): 05/03/91
05/03/91

Maximum % RSD =30%

Lab File ID: RRF 20 = R5575 RRF 50 = R5571
RRF 80 = R5574 RRF 120 = R5573 RRF 160 = R5572

COMPOUND	20 RRF	50 RRF	80 RRF	120 RRF	160 RRF	AVE RRF	% RSD
2,3-Benzofuran	0.795	0.861	0.899	0.928	0.929	0.882	6.4
2,3-Dihydroindene	0.754	0.808	0.766	0.840	0.823	0.798	4.6
1H-Indene	0.707	0.759	0.727	0.814	0.773	0.756	5.5
Naphthalene	1.760	2.166	2.092	1.785	1.696	1.900	11.2
Benzo(B)Thiophene	1.264	1.342	1.519	1.396	1.348	1.374	6.8
Quinoline	1.050	1.134	1.189	1.195	1.178	1.149	5.3
IH-Indole	1.073	1.157	1.205	1.269	1.193	1.179	6.1
2-Methylnaphthalene	1.045	1.099	1.121	1.187	1.125	1.115	4.6
1-Methylnaphthalene	1.068	1.141	1.069	1.217	1.164	1.132	5.7
Biphenyl	1.340	1.363	1.423	1.435	1.410	1.394	2.9
Acenaphthylene	1.929	2.191	2.210	1.874	1.842	2.009	8.8
Acenaphthene	1.168	1.212	1.216	1.148	1.149	1.179	2.8
Dibenzofuran	1.626	1.875	1.872	1.644	1.562	1.716	8.6
Fluorene	1.325	1.416	1.491	1.414	1.365	1.402	4.4
Dibenzothiophene	0.912	1.140	1.048	0.977	0.903	0.996	10.0
Phenanthrene	0.918	1.166	1.061	1.037	0.907	1.018	10.6
Anthracene	0.995	1.255	1.160	1.085	0.976	1.094	10.6
Acridine	0.688	0.766	0.848	0.766	0.862	0.786	9.0
Carbazole	0.779	0.856	1.000	0.860	0.844	0.868	9.3
Fluoranthene	1.108	1.339	1.265	1.068	0.981	1.152	12.7
Pyrene	1.080	1.310	1.247	1.048	1.019	1.141	11.3
Benzo(A)Anthracene	1.287	1.286	1.357	1.359	1.263	1.310	3.4
Chrysene	1.226	1.200	1.387	1.097	1.040	1.190	11.2
Benzo(B)Fluoranthene	1.116	1.196	1.252	1.337	1.256	1.231	6.6
Benzo(K)Fluoranthene	1.100	1.030	1.164	0.948	0.957	1.040	8.9
Benzo(E)Pyrene	0.990	0.987	0.953	1.054	1.038	1.004	4.1
Benzo(A)Pyrene	0.991	0.987	1.022	1.070	1.022	1.018	3.3
Perylene	0.799	0.827	0.797	0.865	0.872	0.832	4.3
Indeno(1,2,3-CD)Pyrene	0.924	0.984	0.935	0.955	0.948	0.949	2.4
Dibenz(A,H)Anthracene	0.791	0.844	0.801	0.746	0.716	0.780	6.4
Benzo(G,H,I)Perylene	0.761	0.823	0.808	0.778	0.765	0.787	3.5
D8-Naphthalene	1.567	1.650	1.931	1.677	1.567	1.678	8.9
D10-Fluorene	1.098	1.152	1.057	1.124	1.057	1.098	3.8
D12-Chrysene	1.072	1.009	0.979	0.913	0.881	0.971	7.8

CONTINUING CALIBRATION DATA
PAH COMPOUNDS

Lab Name: RMAL Lab Code: ENSECO Case No: 14472

Instrument ID: 4500-R Calibration Date(s): 05/05/91 Time: 1234

Lab ID: R5582 Initial Calibration Date(s): 05/03/91 05/03/91

Maximum %D = 30%

COMPOUND	RRF	50 PPM RRF	%D
2,3-Benzofuran	0.882	0.906	-2.7
2,3-Dihydroindene	0.798	0.853	-6.9
1H-Indene	0.756	0.799	-5.7
Naphthalene	1.900	2.090	-10.0
Benzo(B)Thiophene	1.374	1.417	-3.1
Quinoline	1.149	1.174	-2.2
1H-Indole	1.179	1.195	-1.4
2-Methylnaphthalene	1.115	1.140	-2.2
1-Methylnaphthalene	1.132	1.172	-3.5
Biphenyl	1.394	1.413	-1.4
Acenaphthylene	2.009	2.072	-3.1
Acenaphthene	1.179	1.250	-6.0
Dibenzofuran	1.716	1.687	1.7
Fluorene	1.402	1.416	-1.0
Dibenzothiophene	0.996	0.979	1.7
Phenanthrene	1.018	1.037	-1.9
Anthracene	1.094	1.182	-8.0
Acridine	0.786	0.742	5.6
Carbazole	0.868	0.815	6.1
Fluoranthene	1.152	1.108	3.8
Pyrene	1.141	1.076	5.7
Benzo(A)Anthracene	1.310	1.210	7.6
Chrysene	1.190	1.176	1.2
Benzo(B)Fluoranthene	1.231	1.232	-0.1
Benzo(K)Fluoranthene	1.040	0.989	4.9
Benzo(E)Pyrene	1.004	0.990	1.4
Benzo(A)Pyrene	1.018	1.004	1.4
Perylene	0.832	0.818	1.7
Indeno(1,2,3-CD)Pyrene	0.949	0.981	-3.4
Dibenz(A,H)Anthracene	0.780	0.854	-9.5
Benzo(G,H,I)Perylene	0.787	0.790	-0.4
D8-Naphthalene	1.678	1.729	-3.0
D10-Fluorene	1.098	1.147	-4.5
D12-Chrysene	0.971	0.992	-2.2

CONTINUING CALIBRATION DATA
PAH COMPOUNDS

Lab Name: RMAL Lab Code: ENSECO Case No: 14472

Instrument ID: 4500-R Calibration Date(s): 05/06/91 Time: 1749

Lab ID: R5596 Initial Calibration Date(s): 05/03/91 05/03/91

Maximum %D = 30%

COMPOUND	$\overline{RRF}$	50 PPM RRF	%D
2,3-Benzofuran	0.882	0.917	-4.0
2,3-Dihydroindene	0.798	0.856	-7.3
1H-Indene	0.756	0.793	-4.9
Naphthalene	1.900	1.983	-4.4
Benzo(B)Thiophene	1.374	1.374	0.0
Quinoline	1.149	1.161	-1.0
1H-Indole	1.179	1.195	-1.4
2-Methylnaphthalene	1.115	1.127	-1.1
1-Methylnaphthalene	1.132	1.168	-3.2
Biphenyl	1.394	1.406	-0.9
Acenaphthylene	2.009	2.044	-1.7
Acenaphthene	1.179	1.218	-3.3
Dibenzofuran	1.716	1.677	2.3
Fluorene	1.402	1.407	-0.4
Dibenzothiophene	0.996	0.972	2.4
Phenanthrene	1.018	0.966	5.1
Anthracene	1.094	1.062	2.9
Acridine	0.786	0.757	3.7
Carbazole	0.868	0.871	-0.3
Fluoranthene	1.152	1.307	-13.5
Pyrene	1.141	1.215	-6.5
Benzo(A)Anthracene	1.310	1.172	10.5
Chrysene	1.190	1.151	3.3
Benzo(B)Fluoranthene	1.231	1.214	1.4
Benzo(K)Fluoranthene	1.040	0.944	9.2
Benzo(E)Pyrene	1.004	0.974	3.0
Benzo(A)Pyrene	1.018	0.973	4.4
Perylene	0.832	0.804	3.4
Indeno(1,2,3-CD)Pyrene	0.949	0.968	-2.0
Dibenz(A,H)Anthracene	0.780	0.844	-8.2
Benzo(G,H,I)Perylene	0.787	0.785	0.3
D8-Naphthalene	1.678	1.709	-1.8
D10-Fluorene	1.098	1.149	-4.6
D12-Chrysene	0.971	0.964	0.7

CONTINUING CALIBRATION DATA
PAH COMPOUNDS

Lab Name: RMAL Lab Code: ENSECO Case No: 14472

Instrument ID: 4500-R Calibration Date(s): 05/07/91 Time: 1409

Lab ID: R5606 Initial Calibration Date(s): 05/03/91 05/03/91

Maximum %D = 30%

COMPOUND	RRF	50 PPM RRF	%D
2,3-Benzofuran	0.882	0.888	-0.7
2,3-Dihydroindene	0.798	0.403	-5.3
1H-Indene	0.756	0.795	-5.2
Naphthalene	1.900	1.907	-0.4
Benzo(B)Thiophene	1.374	1.372	0.1
Quinoline	1.149	1.149	0.0
1H-Indole	1.179	1.192	-1.1
2-Methylnaphthalene	1.115	1.130	-1.3
1-Methylnaphthalene	1.132	1.154	-1.9
Biphenyl	1.394	1.389	0.4
Acenaphthylene	2.009	2.037	-1.4
Acenaphthene	1.179	1.235	-4.7
Dibenzofuran	1.716	1.677	2.3
Fluorene	1.402	1.400	0.1
Dibenzothiophene	0.996	0.975	2.1
Phenanthrene	1.018	0.972	4.5
Anthracene	1.094	1.070	2.2
Acridine	0.786	0.747	5.0
Carbazole	0.868	0.838	3.5
Fluoranthene	1.152	1.170	-1.6
Pyrene	1.141	1.118	2.0
Benzo(A)Anthracene	1.310	1.203	8.2
Chrysene	1.190	1.213	-1.9
Benzo(B)Fluoranthene	1.231	1.253	-1.8
Benzo(K)Fluoranthene	1.040	0.968	6.9
Benzo(E)Pyrene	1.004	0.959	4.5
Benzo(A)Pyrene	1.018	0.982	3.5
Perylene	0.832	0.811	2.5
Indeno(1,2,3-CD)Pyrene	0.949	0.934	1.6
Dibenz(A,H)Anthracene	0.780	0.829	-6.3
Benzo(G,H,I)Perylene	0.787	0.731	7.1
D8-Naphthalene	1.678	1.685	-0.4
D10-Fluorene	1.098	1.149	-4.6
D12-Chrysene	0.971	0.990	-2.0

CONTINUING CALIBRATION DATA
PAH COMPOUNDS

Lab Name: RMAL Lab Code: ENSECO Case No: 14472

Instrument ID: 4500-R Calibration Date(s): 05/21/91 Time: 1258

Lab ID: R5791 Initial Calibration Date(s): 05/03/91 05/03/91

Maximum %D = 30%

COMPOUND	$\overline{RRF}$	50 PPM RRF	%D
2,3-Benzofuran	0.882	1.098	-24.5
2,3-Dihydroindene	0.798	1.015	-27.2
1H-Indene	0.756	0.963	-27.4
Naphthalene	1.900	2.212	-11.6
Benzo(B)Thiophene	1.374	1.490	-8.4
Quinoline	1.149	1.207	-5.0
1H-Indole	1.179	1.241	-5.3
2-Methylnaphthalene	1.115	1.234	-10.7
1-Methylnaphthalene	1.132	1.275	-12.6
Biphenyl	1.394	1.414	-1.4
Acenaphthylene	2.009	2.068	-2.9
Acenaphthene	1.179	1.237	-4.9
Dibenzofuran	1.716	1.609	6.2
Fluorene	1.402	1.369	2.4
Dibenzothiophene	0.996	0.953	4.3
Phenanthrene	1.018	1.001	1.7
Anthracene	1.094	1.071	2.1
Acridine	0.786	0.664	15.5
Carbazole	0.868	0.772	11.1
Fluoranthene	1.152	1.075	6.7
Pyrene	1.141	1.098	3.8
Benzo(A)Anthracene	1.310	1.387	-5.9
Chrysene	1.190	1.388	-16.6
Benzo(B)Fluoranthene	1.231	1.251	-1.6
Benzo(K)Fluoranthene	1.040	1.143	-9.9
Benzo(E)Pyrene	1.004	0.971	3.3
Benzo(A)Pyrene	1.018	1.027	-0.9
Perylene	0.832	0.820	1.4
Indeno(1,2,3-CD)Pyrene	0.949	1.057	-11.4
Dibenz(A,H)Anthracene	0.780	0.930	-19.2
Benzo(G,H,I)Perylene	0.787	0.916	-16.4
D8-Naphthalene	1.678	1.870	-11.4
D10-Fluorene	1.098	1.097	-0.1
D12-Chrysene	0.971	1.200	-23.6

8C

SEMIVOLATILE INTERNAL STANDARD AREA SUMMARY

Lab Name: RMAL Contract:

Lab Code: ENSECO Case No: 14472 SAS No.: SDG No:

Lab File ID (Standard): R5582 Date Analyzed: 05/05/91

Instrument ID: 4500-R Time Analyzed: 1234

	IS#1 (ACN) AREA #	IS#2 (PHN) AREA #	IS#3 (BAP) AREA #
12 HOUR STD	31100	60500	39100
UPPER LIMIT	62200	121000	78200
LOWER LIMIT	15600	30200	19600
SAMPLE NO.			
14472-01	34300	66900	36800
14472-02	33900	65800	38300
14472-03	34300	66000	35100
14472-05	36600	71400	42000
14472-02MS	34300	66900	39400
14472-02MSD	32300	63000	41200
BLK01	34300	62500	34200

IS#1 (ACN) = D10-ACENAPHTHENE
IS#2 (PHN) = D10-PHENANTHRENE
IS#3 (BAP) = D12-BENZO(A)PYRENE

UPPER LIMIT = + 100% of internal standard area
LOWER LIMIT = - 50% of internal standard area

Column used to flag internal standard area values with an asterisk

1/87 Rev.

FORM VIII SV-2

8C

SEMIVOLATILE INTERNAL STANDARD AREA SUMMARY

Lab Name: RMAL Contract:

Lab Code: ENSECO Case No: 14472 SAS No.: SDG No:

Lab File ID (Standard): R5596 Date Analyzed: 05/06/91

Instrument ID: 4500-R Time Analyzed: 1749

	IS#1 (ACN) AREA	#	IS#2 (PHN) AREA	#	IS#3 (BAP) AREA	#
12 HOUR STD	29000		55400		39800	
UPPER LIMIT	58000		111000		79600	
LOWER LIMIT	14500		27700		19900	
SAMPLE NO.						
14472-06	31100		60500		38000	
14472-07	31400		61800		38800	
14472-09	32200		62800		41900	
14472-10	32100		63100		45200	
14472-11	31100		61600		45500	
14472-13	31000		60200		43300	

IS#1 (ACN) = D10-ACENAPHTHENE
IS#2 (PHN) = D10-PHENANTHRENE
IS#3 (BAP) = D12-BENZO(A)PYRENE

UPPER LIMIT = + 100% of internal standard area
LOWER LIMIT = - 50% of internal standard area

Column used to flag internal standard area values with an asterisk

1/87 Rev.

FORM VIII SV-2

8C

SEMIVOLATILE INTERNAL STANDARD AREA SUMMARY

Lab Name: RMAL Contract:

Lab Code: ENSECO Case No: 14472 SAS No.: SDG No:

Lab File ID (Standard): R5606 Date Analyzed: 05/07/91

Instrument ID: 4500-R Time Analyzed: 1409

	IS#1 (ACN) AREA #	IS#2 (PHN) AREA #	IS#3 (BAP) AREA #
12 HOUR STD	29200	55900	33600
UPPER LIMIT	58400	112000	67200
LOWER LIMIT	14600	28000	16800
SAMPLE NO.			
14472-07DL	31100	60500	38000

IS#1 (ACN) = D10-ACENAPHTHENE
IS#2 (PHN) = D10-PHENANTHRENE
IS#3 (BAP) = D12-BENZO(A)PYRENE

UPPER LIMIT = + 100% of internal standard area
LOWER LIMIT = - 50% of internal standard area

Column used to flag internal standard area values with an asterisk

1/87 Rev.

FORM VIII SV-2

8C

SEMIVOLATILE INTERNAL STANDARD AREA SUMMARY

Lab Name: RMAL Contract:

Lab Code: ENSECO Case No: 14472 SAS No.: SDG No:

Lab File ID (Standard): R5790 Date Analyzed: 05/21/91

Instrument ID: 4500-R Time Analyzed: 1258

	IS#1 (ACN) AREA #	IS#2 (PHN) AREA #	IS#3 (BAP) AREA #
12 HOUR STD	19600	34800	19400
UPPER LIMIT	39200	69600	38800
LOWER LIMIT	9800	17400	9700
SAMPLE NO.			
14472-08	20100	34700	16400
14472-12	20500	35000	17000
BLK02	18500	29400	15000
BLK03	19700	28700	14100

IS#1 (ACN) = D10-ACENAPHTHENE
IS#2 (PHN) = D10-PHENANTHRENE
IS#3 (BAP) = D12-BENZO(A)PYRENE

UPPER LIMIT = + 100% of internal standard area
LOWER LIMIT = - 50% of internal standard area

Column used to flag internal standard area values with an asterisk

1/87 Rev.

Enseco
A CORNING Company

CASE NARRATIVE

FOR

City of St. Louis Park

June 21, 1991

Enseco - RMAL Project Number 014812

Introduction

Eleven aqueous samples (includes QC) were received at Enseco Rocky Mountain Analytical Laboratory on May 08, 1991. The samples were logged in under RMAL project number 014781. Sample PCJ-SLP16FBD-050791 (RMA # 014812-04) was extracted and held as per the QAPP. A cross reference associating the RMAL sample numbers to the actual field sample numbers is included. The samples were analyzed for part-per-trillion (ppt) polynuclear aromatic hydrocarbons (PAH).

Data Quality Assessment

The results contained in this report were reviewed relative to data acceptance criteria as specified in the April 1990 QAPP for completeness, precision, accuracy, representativeness and defensibility of the data. Unless otherwise stated below, no quality control problems or technical difficulties were encountered which would impact the interpretation or use of data in this report.

PPT PAH

Due to concentrations of target compounds present in excess of calibration range, sample 014812-08 required reanalysis at a dilution. Results from both the original and reanalysis are reported. Surrogates could not be measured in the sample due to the dilution performed.

All samples show target compounds that do not meet secondary ion confirmation. In some instances a compound that does not meet secondary ion confirmation criteria may still be determined to be present in the sample after close inspection of the data by the analyst. Supportive data includes mass chromatograms maxima at the same scan for primary and secondary ions, as well as discernible quantitation interference with the secondary ion. These compounds are flagged with asterisk (*) on the data sheets (Form I) as per the 1990 QAPP.

Enseco Incorporated
4955 Yarrow Street
Arvada, Colorado 80002
303/421-6611 Fax: 303/431-7171

This data package is in compliance with the terms and conditions of the 1990 QAPP, both technically and for completeness, for other than the conditions detailed above.

Reported by: Tracy Conroy Date: 06-12-91
Tracy Conroy
Data Control Supervisor

Approved by: Joel S. Holtz Date: 6-21-91
Joel Holtz
Program Administrator

Enseco
A Corning Company

SAMPLE DESCRIPTION INFORMATION
for
City of St. Louis Park

Lab ID	Client ID	Matrix	Sampled Date	Sampled Time	Received Date
014812-0001-SA	PCJ-SLP16-050791	AQUEOUS	07 MAY 91		08 MAY 91
014812-0001-MS	PCJ-SLP16MS-050791	AQUEOUS	07 MAY 91		08 MAY 91
014812-0001-SD	PCJ-SLP16MSD-050791	AQUEOUS	07 MAY 91		08 MAY 91
014812-0002-SA	PCJ-SLP16D-050791	AQUEOUS	07 MAY 91		08 MAY 91
014812-0003-SA	PCJ-SLP16FB-050791	AQUEOUS	07 MAY 91		08 MAY 91
014812-0004-SA	PCJ-SLP16FBD-050791	AQUEOUS	07 MAY 91		08 MAY 91
014812-0005-SA	PCJ-SLP5-050791	AQUEOUS	07 MAY 91		08 MAY 91
014812-0006-SA	PCJ-W401-050791	AQUEOUS	07 MAY 91	10:01	08 MAY 91
014812-0007-SA	PCJ-H605-050791	AQUEOUS	07 MAY 91	10:35	08 MAY 91
014812-0008-SA	DPV-W434-050791	AQUEOUS	07 MAY 91	12:12	08 MAY 91
014812-0009-SA	PCJ-E2-050791	AQUEOUS	07 MAY 91	08:35	08 MAY 91
014812-0010-SA	PCJ-E13-050791	AQUEOUS	07 MAY 91	09:30	08 MAY 91
014812-0011-SA	PCJ-E15-050791	AQUEOUS	07 MAY 91	09:05	08 MAY 91

TABLE OF CONTENTS

FOR

CITY OF ST. LOUIS PARK

RMAL PROJECT# 014812

PPT PAH

Rocky Mountain
Analytical Laboratory

Enseco
A CORNING Company

Qualifier Codes and their Usage

U = Indicates compound was analyzed for but not detected. The sample quantitation limit is corrected for dilution and for percent moisture. For soil samples subjected to GPC clean-up procedures, the CRQL (contract required quantitation limit) is multiplied by two to account for the fact that only half of the extract is recovered.

J = Indicates an estimated value. This flag is used when the mass spectral data indicates the presence of a compound that meets the identification criteria but the result is less than the sample quantitation limit but greater than zero.

B = This flag is used when the analyte is found in the associated blank as well as in the sample. B codes do not necessarily invalidate the data but are dependent upon the judgement of the reviewer in applying the validation guidelines. This flag is used for a TIC as well as for a positively identified target compound list (TCL) compound.

E = This flag identifies compounds whose concentrations exceed the calibration range of the GC/MS instrument for that specific analysis.

D = This flag identifies all compounds identified during a re-analysis of a diluted sample.

A = This flag indicates that a TIC is a suspected aldol-condensation product.

Enseco Incorporated
4955 Yarrow Street
Arvada, Colorado 80002
303/421-6611 Fax: 303/431-7171

Enseco
A Corning Company

Rocky Mountain Analytical Laboratory
4955 Yarrow Street
Arvada, CO 80002
303/421-6611 FAX: 303/431-7171

CHAIN OF CUSTODY

ENSECO CLIENT: City of St Louis Park
PROJECT:
SAMPLING COMPANY: ENSR
SAMPLING SITE: SLP
TEAM LEADER:

SAMPLE SAFE™ CONDITIONS

PACKED BY: M Z W.
SEAL INTACT UPON RECEIPT BY SAMPLING COMPANY:
SEALED FOR SHIPPING BY: M Z W
SEAL NUMBER:
SAMPLING STATUS: ☒ Done ☐ Continuing Until
SEAL INTACT UPON RECEIPT BY LAB: ☐ Yes ☐ No
SEAL NUMBER:
CONDITION OF CONTENTS:
INITIAL CONTENTS TEMP: °C
CONTENTS TEMPERATURE UPON RECEIPT BY LAB: °C

DATE	TIME	SAMPLE ID/DESCRIPTION	SAMPLE TYPE	# CONTAINERS	ANALYSIS PARAMETERS	REMARKS
5/7/91	1001	PCJ1W401C50791	Water	6	PAH - PPT	-06
"	1035	PCJ1H6C50791	↓	↓	↓	-07
"	1212	PE OPV 1W434 050791	↓	↓	↓	-08

RWA

CUSTODY TRANSFERS PRIOR TO SHIPPING

RELINQUISHED BY (SIGNED)	RECEIVED BY (SIGNED)	DATE	TIME
[signature]	Mike Higgins	5-7-91	2:00PM

SHIPPING DETAILS

DELIVERED TO SHIPPER BY: Mike Higgins
METHOD OF SHIPMENT: FED EXP
AIRBILL NUMBER: 2865076303
RECEIVED FOR LAB: RWA
SIGNED: [signature]
DATE/TIME: 5/8/91 0800
ENSECO PROJECT NUMBER: 14812

ENS-1133

White - CLIENT Pink - LAB

Enseco
A Corning Company

Rocky Mountain Analytical Laboratory
4955 Yarrow Street
Arvada, CO 80002
303/421-6611 FAX: 303/431-7171

CHAIN OF CUSTODY

ENSECO CLIENT: City of ST LOUIS PARK
PROJECT:
SAMPLING COMPANY: SAME
SAMPLING SITE: SAME
TEAM LEADER: MJR

SAMPLE SAFE™ CONDITIONS

PACKED BY: MJR
SEAL NUMBER:
SEAL INTACT UPON RECEIPT BY SAMPLING COMPANY:
CONDITION OF CONTENTS:
SEALED FOR SHIPPING BY: MJR
INITIAL CONTENTS TEMP: °C
SEAL NUMBER:
SAMPLING STATUS: ☐ Done ☐ Continuing Until
SEAL INTACT UPON RECEIPT BY LAB: ☐ Yes ☐ No
CONTENTS TEMPERATURE UPON RECEIPT BY LAB: °C

RMA #

DATE	TIME	SAMPLE ID/DESCRIPTION	SAMPLE TYPE	# CONTAINERS	ANALYSIS PARAMETERS	REMARKS
5-7-91		PCU-SLPIG-050791	IXL AMBER	6	PPL PAH	-01
5-7-91		PCU-SLPIGD-050791	IXL AMBER	6	PPL PAH	-02

CUSTODY TRANSFERS PRIOR TO SHIPPING

RELINQUISHED BY (SIGNED)	RECEIVED BY (SIGNED)	DATE	TIME

SHIPPING DETAILS

DELIVERED TO SHIPPER BY: MJR
METHOD OF SHIPMENT: FED EXP
AIRBILL NUMBER: 286076303
RECEIVED FOR LAB: RMAC
SIGNED: Jul E. Kelly
DATE/TIME: 5/8/91 0600
ENSECO PROJECT NUMBER: 14812

EMB—1133

White - CLIENT Pink - LAB

Enseco
A Corning Company

Rocky Mountain Analytical Laboratory
4955 Yarrow Street
Arvada, CO 80002
303/421-6611 FAX: 303/431-7171

CHAIN OF CUSTODY

ENSECO CLIENT: CITY OF ST LOUIS PARK
PROJECT:
SAMPLING COMPANY: SAME
SAMPLING SITE: SAME
TEAM LEADER: M2H

SAMPLE SAFE™ CONDITIONS

PACKED BY: M2H
SEAL NUMBER:
SEAL INTACT UPON RECEIPT BY SAMPLING COMPANY:
CONDITION OF CONTENTS:
SEALED FOR SHIPPING BY: M2H
INITIAL CONTENTS TEMP. °C
SEAL NUMBER:
SAMPLING STATUS: ☐ Done ☐ Continuing Until
SEAL INTACT UPON RECEIPT BY LAB: ☐ Yes ☐ No
CONTENTS TEMPERATURE UPON RECEIPT BY LAB °C

DATE	TIME	SAMPLE ID/DESCRIPTION	SAMPLE TYPE	# CONTAINERS	ANALYSIS PARAMETERS	REMARKS
5-7-91		PCU-SLP16175-050791	IXL AUGER	6	PPL PAH	-01MS
5-7 91		PCU-SLP16175D-050791	IXL AUGER	6	PPL PAH	-01MSD
5~~7~~-91		~~EB~~				

CUSTODY TRANSFERS PRIOR TO SHIPPING

RELINQUISHED BY (SIGNED)	RECEIVED BY (SIGNED)	DATE	TIME

SHIPPING DETAILS

DELIVERED TO SHIPPER BY: M2H
METHOD OF SHIPMENT: FED EXP.
AIRBILL NUMBER: 286576303
RECEIVED FOR LAB: RMA
SIGNED: Jul G. Holtz
DATE/TIME: 5/8/91 0800
ENSECO PROJECT NUMBER: 14812

ENS-1133

White - CLIENT Pink - LAB

Enseco
A Corning Company

Rocky Mountain Analytical Laboratory
4955 Yarrow Street
Arvada, CO 80002
303/421-6611 FAX: 303/431-7171

CHAIN OF CUSTODY

ENSECO CLIENT: City of St Louis Park
PROJECT: H2O
SAMPLING COMPANY: ENSR
SAMPLING SITE: SLP
TEAM LEADER:

SAMPLE SAFE™ CONDITIONS

PACKED BY: Mike Duffy
SEAL NUMBER:
SEAL INTACT UPON RECEIPT BY SAMPLING COMPANY:
CONDITION OF CONTENTS:
SEALED FOR SHIPPING BY: Mike Duffy
INITIAL CONTENTS TEMP: °C
SEAL NUMBER:
SAMPLING STATUS: ☐ Done ☐ Continuing Until
SEAL INTACT UPON RECEIPT BY LAB: ☐ Yes ☐ No
CONTENTS TEMPERATURE UPON RECEIPT BY LAB: °C

RMA #

DATE	TIME	SAMPLE ID/DESCRIPTION	SAMPLE TYPE	# CONTAINERS	ANALYSIS PARAMETERS	REMARKS
5/7/91	635	PCJ E1050791	water	6	PAH PBT	-09
↓	930	PCJ E1305079 1	↓		↓	-10
↓	~~905~~ 805	PCJ E1505079 1	↓		↓	-11

CUSTODY TRANSFERS PRIOR TO SHIPPING

RELINQUISHED BY (SIGNED)	RECEIVED BY (SIGNED)	DATE	TIME
Mike Duffy	Mike Riggin	5-7-91	2:00PM

SHIPPING DETAILS

DELIVERED TO SHIPPER BY: Mike Riggin
METHOD OF SHIPMENT: FED Exp
AIRBILL NUMBER: 2865076303
RECEIVED FOR LAB: RMAe
SIGNED: Jul E. Hulbert
DATE/TIME: 5/8/91 0800
ENSECO PROJECT NUMBER: 14812

ENS—1133

White – CLIENT Pink – LAB

1B

EPA SAMPLE NO.

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

14812-08

Lab Name: ENSECO-RMAL Contract No.:

Lab Code: ENSECO Case No.: 14812 SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: 14812-08

Sample wt/vol: 4000 (g/ml) ML Lab File ID: X3113

Level: (low/med) LOW Date Received: 05/08/91

% Moisture: not dec. dec. Date Extracted: 05/11/91

Extraction: (SepF/Cont/Sonc) CONT Date Analyzed: 06/07/91

GPC Cleanup: (Y/N) N pH: 7.0 Dilution Factor: 0.125

CONCENTRATION UNITS: NG/L

CAS NO.	COMPOUND		Q	
271-89-6	2,3-Benzofuran	6.3		
496-11-7	2,3-Dihydroindene	1500	E	*
95-13-6	1H-Indene	1500	E	
91-20-3	Naphthalene	930	E	*
4565-32-6	Benzo(B)Thiophene	870	E	*
91-22-5	Quinoline	2.1		*
120-72-9	1H-Indole	7.1		
91-57-6	2-Methylnaphthalene	2.3		*
90-12-0	1-Methylnaphthalene	29		*
92-52-4	Biphenyl	1.1	J	
208-96-8	Acenaphthylene	2.3		*
83-32-9	Acenaphthene	3.2		
132-64-9	Dibenzofuran	1.0	U	
86-73-7	Fluorene	4.3		
132-65-0	Dibenzothiophene	2.7		*
85-01-8	Phenanthrene	4.1		*
120-12-7	Anthracene	3.4		*
260-94-6	Acridine	120		
86-74-8	Carbazole	4.7		*
206-44-0	Fluoranthene	3.1		
129-00-0	Pyrene	1.4		*
56-55-3	Benzo(A)Anthracene	2.5	U	
218-01-9	Chrysene	2.8	U	
205-99-2	Benzo(B)Fluoranthene	2.5	U	
207-08-9	Benzo(K)Fluoranthene	2.3	U	
192-97-2	Benzo(E)Pyrene	1.9	U	
50-32-8	Benzo(A)Pyrene	2.3	U	
198-55-0	Perylene	2.5	U	
193-39-5	Indeno(1,2,3-CD)Pyrene	2.1	U	
53-70-3	Dibenz(A,H)Anthracene	1.6	U	
191-24-2	Benzo(G,H,I)Perylene	2.8	U	

1B

EPA SAMPLE NO.

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

14812-08DL

Lab Name: ENSECO-RMAL Contract No.:

Lab Code: ENSECO Case No.: 14812 SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: 14812-08DL

Sample wt/vol: 4000 (g/ml) ML Lab File ID: X3132

Level: (low/med) LOW Date Received: 05/08/91

% Moisture: not dec. dec. Date Extracted: 05/11/91

Extraction: (SepF/Cont/Sonc) CONT Date Analyzed: 06/11/91

GPC Cleanup: (Y/N) N pH: 7.0 Dilution Factor: 2.50

CONCENTRATION UNITS: NG/L

CAS NO.	COMPOUND		Q
271-89-6	2,3-Benzofuran	102	U
496-11-7	2,3-Dihydroindene	4900	D
95-13-6	1H-Indene	6200	D
91-20-3	Naphthalene	9800	D
4565-32-6	Benzo(B)Thiophene	2400	D
91-22-5	Quinoline	28	U
120-72-9	1H-Indole	53	D *
91-57-6	2-Methylnaphthalene	18	U
90-12-0	1-Methylnaphthalene	31	JD*
92-52-4	Biphenyl	86	U
208-96-8	Acenaphthylene	28	U
83-32-9	Acenaphthene	26	U
132-64-9	Dibenzofuran	20	U
86-73-7	Fluorene	20	U
132-65-0	Dibenzothiophene	22	U
85-01-8	Phenanthrene	26	U
120-12-7	Anthracene	22	U
260-94-6	Acridine	160	D
86-74-8	Carbazole	38	U
206-44-0	Fluoranthene	28	U
129-00-0	Pyrene	28	U
56-55-3	Benzo(A)Anthracene	50	U
218-01-9	Chrysene	56	U
205-99-2	Benzo(B)Fluoranthene	50	U
207-08-9	Benzo(K)Fluoranthene	46	U
192-97-2	Benzo(E)Pyrene	38	U
50-32-8	Benzo(A)Pyrene	46	U
198-55-0	Perylene	50	U
193-39-5	Indeno(1,2,3-CD)Pyrene	42	U
53-70-3	Dibenz(A,H)Anthracene	32	U
191-24-2	Benzo(G,H,I)Perylene	56	U

2C

WATER SEMIVOLATILE SURROGATE RECOVERY

Lab Name: RMAL Contract:

Lab Code: ENSECO Case No.: 14812 SAS No.: SDG No.:

Level: (low/med) LOW

	EPA SAMPLE NO.	S1 (NAP) #	S2 (FLU) #	S3 (CHR) #
1	14812-01	74	85	42
2	14812-01MS	68	84	46
3	14812-01MSD	80	92	40
4	14812-02	68	74	44
5	14812-03	85	91	93
6	14812-05	86	90	38
7	14812-06	75	77	32
8	14812-07	79	84	41
9	14812-08	53	111	35
10	14881-08DL	D	D	D
11	14812-09	65	73	40
12	14812-10	80	88	46
13	14812-11	68	74	35
14	BLK01	70	68	65

	QC LIMITS
S1 (NAP) = D8-NAPHTHALENE	(14-108)
S2 (FLU) = D10-FLUORENE	(41-162)
S3 (CHR) = D12-CHRYSENE	(10-118)

Column to be used to flag recovery values

* Values outside of contract required QC limits

D Surrogates diluted out

COVER PAGE - INORGANIC ANALYSES DATA PACKAGE 000001

Lab Name: ROCKY MOUNTAIN ANALYTICAL Project No. _____

Sample Numbers

RMA SAMPLE NO	CLIENT SAMPLE ID
1449101	DPV-W422TP-041191
1449101D	DPV-W422MSD-041191
1449101S	DPV-W422MS-041191
1449102	DPV-W422TPD-041191
1449103	DPV-W422FB-041191
1449104	DPV-W422FBD-041191
1449105	DPVP307-041191
1449106	DPVP308TP-041191
1449107	DPVP309TP-041191
1449108	DPVP310TP-041191
1449109	DPVP311TP-041191
1449110	DPVP312TP-041191
1449111	DPVP313TP-041191
1449112	DPVW431TP-041191
1449113	DPVW432TP-041191

PARAMETERS	METHOD NO.	DETECTION LIMIT	SOURCE
Phenol	420.1	5 ug/L	1

Comments:

THIRTEEN WATER SAMPLES FOR PHENOL ANALYSIS.
RMA QC# 14491

SOURCE:
1="Methods for Chemical Analysis of Water and Wastes", USEPA-EMSL, Cincinnati.

Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature.

Lab Manager: Kathy K Ohyl

Date: 7-03-91

RESULT QUALIFIERS

C - Concentration Qualifier:

Enter a "B" if the reported value is less than the Contract Required Detection Limit (CRDL) but greater than the Instrument Detection Limit (IDL). If the analyte was analyzed for but not detected, a "U" must be entered.

Q - Quality Control Qualifiers:

E - The reported value is estimated because of the presence of interference. An explanatory note must be included under Comments on the cover Page (if the problem applies to all samples) or on the specific FORM I-IN (if it is an isolated problem).

M - Duplicate injection precision not met.

N - Spiked sample recovery not within control limits.

S - The reported value was determined by the Method of Standard Additions (MSA).

W - Post-digestion spike for Furnace AA analysis is out of control limits (85-115%), while sample absorbance is less than 50% of spike absorbance.

* - Duplicate analysis not within control limits.

\+ - Correlation coefficient for the MSA is less than 0.995.

Entering "S", "W", or "+" is mutually exclusive. No combination of these qualifiers can appear in the same field for an analyte.

M - Method Qualifier:

"P"	for ICP
"A"	for Flame AA
"f"	for Furnace AA
"CV"	for Manual Cold Vapor AA
"AV"	for Automated Cold Vapor AA
"AS"	for Semi-Automated Spectrophotometric
"C"	for Manual Spectrophotometric
"T"	for Titrimetric
"NR"	if the analyte is not required to be analyzed

RMA SAMPLE NO
1449101

CLIENT ID NO
DPV-W422TP-041191

INORGANIC ANALYSIS DATA SHEET

Lab Name: ROCKY MOUNTAIN ANALYTICAL

Project No: _____

Matrix (soil/water): WATER

Level (low/med): LOW

% Solids: 0.0

Date Received: 04/12/91

Analyte	Concentration	C	Q	Concentration Units
Phenol	10.8			ug/L

Color Before: COLORLESS Clarity Before: CLEAR Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

COMMENTS:

RMA SAMPLE NO
1449102

CLIENT ID NO
DPV-W422TPD-
041191

INORGANIC ANALYSIS DATA SHEET

Lab Name: ROCKY MOUNTAIN ANALYTICAL

Project No: _____

Matrix (soil/water): WATER

Level (low/med): LOW

% Solids: 0.0

Date Received: 04/12/91

Analyte	Concentration	C	Q	Concentration Units
Phenol	6.5			ug/L

Color Before: COLORLESS Clarity Before: CLEAR Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

COMMENTS:

_____

_____

_____

INORGANIC ANALYSIS DATA SHEET

RMA SAMPLE NO 1449103

CLIENT ID NO DPV-W422FB-041191

Lab Name: ROCKY MOUNTAIN ANALYTICAL

Project No: _____

Matrix (soil/water): WATER

Level (low/med): LOW

% Solids: 0.0

Date Received: 04/12/91

Analyte	Concentration	C	Q	Concentration Units
Phenol	5	U		ug/L

Color Before: COLORLESS Clarity Before: CLEAR Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

COMMENTS:

_____

_____

_____

RMA SAMPLE NO
1449104

CLIENT ID NO
DPV-W422FBD-
041191

INORGANIC ANALYSIS DATA SHEET

Lab Name: ROCKY MOUNTAIN ANALYTICAL

Project No: _____

Matrix (soil/water): WATER

Level (low/med): LOW

% Solids: 0.0

Date Received: 04/12/91

Analyte	Concentration	C	Q	Concentration Units
Phenol	5	U		ug/L

Color Before: COLORLESS Clarity Before: CLEAR Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

COMMENTS:

_____

_____

_____

INORGANIC ANALYSIS DATA SHEET

RMA SAMPLE NO
1449105

CLIENT ID NO
DPVP307-
041191

Lab Name: ROCKY MOUNTAIN ANALYTICAL

Project No: _____

Matrix (soil/water): WATER

Level (low/med): LOW

% Solids: 0.0

Date Received: 04/12/91

Analyte	Concentration	C	Q	Concentration Units
Phenol	18.5			ug/L

Color Before: YELLOW Clarity Before: CLOUDY Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

COMMENTS:

_____

_____

_____

RMA SAMPLE NO
1449106

CLIENT ID NO
DPVP308TP-
041191

INORGANIC ANALYSIS DATA SHEET

Lab Name: ROCKY MOUNTAIN ANALYTICAL

Project No: _____

Matrix (soil/water): WATER

Level (low/med): LOW

% Solids: 0.0

Date Received: 04/12/91

Analyte	Concentration	C	Q	Concentration Units
Phenol	10.5			ug/L

Color Before: YELLOW Clarity Before: CLOUDY Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

COMMENTS:

_____

_____

_____

RMA SAMPLE NO
1449107

CLIENT ID NO
DPVP309TP-
041191

INORGANIC ANALYSIS DATA SHEET

Lab Name: ROCKY MOUNTAIN ANALYTICAL

Project No: _____

Matrix (soil/water): WATER

Level (low/med): LOW

% Solids: 0.0

Date Received: 04/12/91

Analyte	Concentration	C	Q	Concentration Units
Phenol	22.5			ug/L

Color Before: YELLOW Clarity Before: CLOUDY Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

COMMENTS:

RMA SAMPLE NO
1449108

CLIENT ID NO
DPVP310TP-
041191

INORGANIC ANALYSIS DATA SHEET

Lab Name: ROCKY MOUNTAIN ANALYTICAL

Project No: _____

Matrix (soil/water): WATER

Level (low/med): LOW

% Solids: 0.0

Date Received: 04/12/91

Analyte	Concentration	C	Q	Concentration Units
Phenol	7.8			ug/L

Color Before: YELLOW Clarity Before: CLOUDY Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

COMMENTS:

_____

_____

_____

RMA SAMPLE NO
1449109

CLIENT ID NO
DPVP311TP-
041191

INORGANIC ANALYSIS DATA SHEET

Lab Name: ROCKY MOUNTAIN ANALYTICAL

Project No: _____

Matrix (soil/water): WATER

Level (low/med): LOW

% Solids: 0.0

Date Received: 04/12/91

Analyte	Concentration	C	Q	Concentration Units
Phenol	10.5			ug/L

Color Before: COLORLESS Clarity Before: CLOUDY Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

COMMENTS:

0000016

RMA SAMPLE NO
1449110

CLIENT ID NO
DPVP312TP-
041191

INORGANIC ANALYSIS DATA SHEET

Lab Name: ROCKY MOUNTAIN ANALYTICAL

Project No: _____

Matrix (soil/water): WATER

Level (low/med): LOW

% Solids: 0.0

Date Received: 04/12/91

Analyte	Concentration	C	Q	Concentration Units
Phenol	12.5			ug/L

Color Before: COLORLESS Clarity Before: CLOUDY Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

COMMENTS:

RMA SAMPLE NO
1449111

CLIENT ID NO
DPVP313TP-
041191

INORGANIC ANALYSIS DATA SHEET

Lab Name: ROCKY MOUNTAIN ANALYTICAL

Project No: _____

Matrix (soil/water): WATER

Level (low/med): LOW

% Solids: 0.0

Date Received: 04/12/91

Analyte	Concentration	C	Q	Concentration Units
Phenol	5	U		ug/L

Color Before: YELLOW Clarity Before: CLOUDY Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

COMMENTS:

RMA SAMPLE NO
1449112

CLIENT ID NO
DPVW431TP-
041191

INORGANIC ANALYSIS DATA SHEET

Lab Name: ROCKY MOUNTAIN ANALYTICAL

Project No: _____

Matrix (soil/water): WATER

Level (low/med): LOW

% Solids: 0.0

Date Received: 04/12/91

Analyte	Concentration	C	Q	Concentration Units
Phenol	6.1			ug/L

Color Before: COLORLESS Clarity Before: CLOUDY Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

COMMENTS:

_____

_____

_____

RMA SAMPLE NO
1449113

CLIENT ID NO
DPVW432TP-
041191

INORGANIC ANALYSIS DATA SHEET

Lab Name: ROCKY MOUNTAIN ANALYTICAL

Project No: _____

Matrix (soil/water): WATER

Level (low/med): LOW

% Solids: 0.0

Date Received: 04/12/91

Analyte	Concentration	C	Q	Concentration Units
Phenol	5	U		ug/L

Color Before: YELLOW Clarity Before: CLOUDY Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

COMMENTS:

_____

_____

_____

CALIBRATION AND BLANKS

Lab Name: ROCKY MOUNTAIN ANALYTICAL Project No.: _____

Initial Calibration Source: BAKER #4409 = 50

Continuing Calibration Source: MALLINCKRODT #4408

Concentration Units: ug/L

Analyte	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(1)	Found	%R(1)
Phenol	50.0	49.8	99.6	50.0	51.7	103.4	52.1	104.2
Phenol	50.0	49.1	98.2					

BLANKS

Blank Matrix (soil/water): WATER

Blank Concentration Units: ug/L

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank 1	C	2	C	3	C	Prepa-ration Blank	C
Phenol	5	U	5	U	5	U			5	U

5A
SPIKE SAMPLE RECOVERY

0000017

Lab Name: ROCKY MOUNTAIN ANALYTICAL

RMA SAMPLE NO 1449101S

CLIENT ID NO DPV-W422MS-041191

Matrix (soil/water): WATER

Level (low/med): LOW

Concentration Units: ug/L

Analyte	Control Limit %R	Spike Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q
Phenol	75-125	56.4		10.8		50	91.2	

COMMENTS:

FORM V (PART 1) - IN

DUPLICATES

0000018

Lab Name: ROCKY MOUNTAIN ANALYTICAL

RMA SAMPLE NO
1449101D
CLIENT ID NO
DPV-W422MSD-

Matrix (soil/water): WATER

Level (Low/Med): LOW

% Solids for Sample: 0.0

% Solids for Duplicate: 0.0

Concentration Units: ug/L

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q
Phenol		10.8		10.8		0.0	

0000019

COLORIMETRIC ANALYSIS

DCS 4409 Baker

PARAMETER ppb Phenol CONTROL 50 ppb DATE 4/18/91

ANALYST O'Sullivan SPIKE 50 ppb UNITS ug/L

Spectrophotometer

	Concentration	Absorbance - Blk	
Blank	0	0.062	0.000
STD 1	5	0.076	0.014
STD 2	10	0.091	0.029
STD 3	20	0.109	0.047
STD 4	50	0.209	0.147
STD 5	100	0.360	0.298

Corr. Coef. = 0.999110178

Slope = 332.867

Intercept = 1.15272

4408 recalculated (CCV)

SAMPLE ID	BOTL. TYPE	pH	INTER CHECK	ABSORBANCE SAMPLE	ABSORBANCE COLOR B	CURVE CONC.	DILUTIONS PREP	DILUTIONS ANALYT	REPORTED CONC.	% REC.
BLANK					- Blk					
ICV/DCS				0.208	0.142	49.75	1x	1x	49.8	99.6%
ICV/DCS				0.206	0.144	49.08			49.1	98.2%
~~ICV/DCS~~ ICB				0.050	—	—			5u	
1 PB				0.056	—	—			5u	
14491-01				0.091	0.029	10.80			10.8	
-01D				0.091	0.029	10.80			10.8	RPD 0
-01S				0.228	0.166	56.40			56.4	91.2%
-02				0.078	0.016	6.47			6.5	
-03				0.062	—	—			5u	
-04				0.049	—	—			5u	
-05				0.114	0.052	18.46			18.5	
-06				0.090	0.028	10.47			10.5	
-07				0.126	~~22.456~~ 0.064 ~~0.134~~ 22.456				22.5	
CCV (50)				0.214	0.152	51.74			51.7	103%
CCB				0.063	0.001	—			5u	
-08				0.082	0.020	7.81			7.8	
-09				0.090	0.028	10.47			10.5	
-10				0.096	0.034	12.47			12.5	
-11				0.059	—	—			5u	
-12				0.077	0.015	6.145			6.1	
-13				0.056	—	—			5u	
14236-06				0.070	0.008	3.81			5u	
CCV (50)				0.215	0.153	52.08			52.1	104%
CCB				0.063	0.001	—	↓	↓	5u	

* 5/18/91

INORGANIC NONMETALS SAMPLE PREPARATION

PARAMETER ppb Phenols ANALYST J. Sullivan/brk DATE 4/17/91

SAMPLE ID	pH	BOTTLE TYPE	INTERFERENCE CHECKS SAMPLE PRETREATMENT	INITIAL WT OR VOL	FINAL WT OR VOL	DIL'N FACTOR
ICV ~~BLANK~~	<2		4/17/91 JS	200ml	200ml	
ICV ~~LCS 1~~			1 ml of 10ppm (4408) (4409) TV= 50ppb			
ICB ~~LCS 2~~	↓		↓			
14491-01	<2					
-01D						
-01S			1 ml of 10ppm (4409) TV= 50ppb			
-02						
-03						
-04						
-05						
-06						
-07						
-08						
-09						
-10						
-11						
-12						
-13						
14236-06	↓			↓	↓	

Samples Properly Preserved	Y	N	NA
Interferences Documented	Y		NA
Special Instructions Followed. Copy Attached:	Y	N	NA
Anomalies Observed and Documented:	Y		NA
Deviations From Method Documented:	Y		NA
Prep Documentation Complete and Reviewed:	Y	N	NA
Data Entered:	Y	N	NA

0000021

CLP SAMPLE DESCRIPTION SHEET

City of St.

RMA # 14491 CLIENT # Lois Park MATRIX: WATER

CLP SAMPLE #	COLOR	CLARITY/TEXTURE	% LIQUID
14491 -01	8	1	
-010	8	1	
-015	8	1	
-02	8	1	
-03	8	1	
-04	8	1	
-05	3	2	
-06	1	2	
-07	3	2	
-08	3	2	
-09	8	2	
-10	8	3	
-11	3	2	
-12	8	2	
-13	3	2	

KEY:

COLOR

1	RED	7	WHITE
2	BLUE	8	COLORLESS
3	YELLOW	9	BROWN
4	GREEN	10	GREY
5	ORANGE	11	BLACK
6	VIOLET	12	OTHER (SPECIFY)

CLARITY

1	CLEAR
2	CLOUDY
3	OPAQUE
4	OTHER (SPECIFY)

TEXTURE

1	FINE (POWDERY)
2	MEDIUM (SAND)
3	COARSE (LARGE CRYSTALS OR ROCKS
4	CLAY
5	OTHER (SPECIFY)

COMMENTS:

CLP SAMPLE LOG-IN/PREPARATION SHEET

RMA QC#: 14491 CLIENT #: City of St. Lwis Park MATRIX: LOW___ WATER X MED___ SOIL___

CLP #	DATE RECEIVED	PARAMETERS
14491-01	4-12-91	PPB Phenolics
010		
015		
02		
03		
04		
05		
06		
07		
08		
09		
10		
11		
12		
13	↓	↓

SPECIAL INSTRUCTIONS OR CAUTIONS:
Sample 1:5 QC.
13 waters for PPB Phenolics
28 DAY TAT.

Enseco
A Corning Company

Rocky Mountain Analytical Laboratory
4955 Yarrow Street
Arvada, CO 80002
303/421-6611 FAX: 303/431-7171

CHAIN OF CUSTODY

ENSECO CLIENT: CITY OF ST LOUIS PARK
PROJECT:
SAMPLING COMPANY: SAME
SAMPLING SITE: SAME
TEAM LEADER: MZR

SAMPLE SAFE™ CONDITIONS

PACKED BY: MZR
SEAL INTACT UPON RECEIPT BY SAMPLING COMPANY:
SEALED FOR SHIPPING BY: MZR
SEAL NUMBER:
SEAL NUMBER:
CONDITION OF CONTENTS:
INITIAL CONTENTS TEMP. °C
SAMPLING STATUS: ☐ Done ☐ Continuing Until
SEAL INTACT UPON RECEIPT BY LAB: ☐ Yes ☐ No
CONTENTS TEMPERATURE UPON RECEIPT BY LAB °C

DATE	TIME	SAMPLE ID/DESCRIPTION	SAMPLE TYPE	# CONTAINERS	ANALYSIS PARAMETERS	REMARKS
4-11-91		DPV-W422TP-041191	16oz CLEAR	1	PPB Phenolics	
-02		DPV-W422TPD-041191		1		
-01MS		DPV-W422MS-041191		1		
-01MSD		DPV-W422MSD-041191		1		
-03 4-11-91		DPV-W422FB-041191	16oz CLEAR	1	PPB Phenolics	
-04 4-11-91		DPV-W422FBD-041191	16oz CLEAR	1	PPB Phenolics	

0000023

CUSTODY TRANSFERS PRIOR TO SHIPPING

RELINQUISHED BY (SIGNED)	RECEIVED BY (SIGNED)	DATE	TIME

SHIPPING DETAILS

DELIVERED TO SHIPPER BY: MZR
METHOD OF SHIPMENT: FED EXP
AIRBILL NUMBER: 2865076266
RECEIVED FOR LAB: R.M.A.C
SIGNED: Justin Chappell
DATE/TIME: 4/12/91 0800
ENSECO PROJECT NUMBER:

FORM-1133 - CLIENT PINK LAB

ENSR LABORATORIES ©

CONSULTING AND ENGINEERING
2925 RICHMOND AVENUE HOUSTON, TX 77098 (713) 520-1495

Analysis Request and Chain of Custody Record

Project no.

Client/Project Name: City of St. Louis Park

Project Location: St. Louis Park

Lab ID No	Field Sample No./ Identification	Date and Time	Grab	Comp	Sample Container (Size/Mat'l)	Sample Type (Liquid Sludge, Etc.)	Preservative	ANALYSIS REQUESTED	LABORATORY REMARKS
05	DPVP307 4/11/91	4/11/91 1155			40 ml clear	water	H_2SO_4	PTB Phenolics	
06	DPV P308TP 04/11/91	1735					4°C		
07	DPV P309TP 04/11/91	1555							
08	DPV310 TP 04/11/91	1605							
09	DPVP311TP 04/11/91	1330							
10	DPVP312TP 04/11/91	1450							
11	DPVP313 TP 04/11/91	1015							
12	DPVP431TP 04/11/91	1209							
13	DPV W432 TP 04/11/91	1110							

Samplers) (Signature)	Relinquished by: (Signature)	Date: 4/11/91 Time: 1900	Received by: (Signature)	Date: Time:	COC Seal No.
Affiliation	Relinquished by: (Signature)	Date: Time:	Received by: (Signature)	Date: Time:	
	Relinquished by: (Signature)	Date: Time:	Received by Laboratory: (Signature)	Date: Time:	Intact:

REMARKS:

Data Results To:

Laboratory No.

00002