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SYSTEM PERFORMANCE REPORT
VACUUM ENHANCED LNAPL AND
GROUND-WATER RECOVERY AND TREATMENT SYSTEM
JANUARY 2000 THROUGH DECEMBER 2000
SITE 10; NAVY FUEL FARM
NAVAL AIR STATION JOINT RESERVE BASE
WILLOW GROVE, HORSHAM TOWNSHIP, PENNSYLVANIA

Contract No. N62472-9219-1296
CTO No. 0074

Prepared for

Department of the Navy
Engineering Field Activity, Northeast
Naval Facilities Engineering Command
10 Industrial Highway
Mail Stop No. 82
Lester, Pennsylvania 19113-2090

Prepared by

EA Engineering, Science, and Technology
92 Read's Way, Suite 109
New Castle, Delaware 19720
(302) 325-3560

June 2001

Project No. 29600.74.7200

EA Engineering, Science, and Technology, Inc.
92 Read's Way Suite 109
New Castle, DE 19720
TEL: (302) 325-3560

Letter of Transmittal

TO: Engineering Field Activity Northeast	DATE: 29 June 2001 / JOB NO.: 29600.74.7200
Naval Facilities Engineering Command (Code 1812/JLC)	ATTENTION: Mr. Jim Colter
10 Industrial Highway, Mail Stop #82	RE: Contract No. N62472-92-D-1296
Lester, PA 19113-2090	CTO No. 0074
Attn.: Mr. James L. Colter	

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2	25 June 2001	2	Cover Letter

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ENGINEERING FIELD ACTIVITY, NORTHEAST
NAVAL FACILITIES ENGINEERING COMMAND
10 INDUSTRIAL HIGHWAY
MAIL STOP, #82
LESTER, PA 19113-2090

IN REPLY REFER TO

5090
Code 1821/JLC

25 JUN 2001

Ms. Pam Reigh
Pennsylvania Department of Environmental Protection
555 North Lane
Conshohocken, PA 19428

Dear Pam:

Subj: FINAL REPORT ON PERFORMANCE OF VACUUM-ENHANCED LNAPL RECOVERY SYSTEM FOR CALENDAR YEAR 2000 AT NAVY FUEL FARM; NASJRB WILLOW GROVE, PA

The Navy is enclosing a Final Report regarding System Performance of the LNAPL Recovery System that was installed at the Navy's Fuel Farm (IR Site 10). Installation of the full-scale LNAPL Recovery System was completed in January 1998 and, to date, the system has continued to be operational. This report summarizes and describes the system's performance for the year of operation covering the period from January 2000 until December 2000.

The report will conclude that, although the LNAPL Recovery System continues to yield free product, the effectiveness of the system has been significantly reduced. Therefore, the Navy is recommending that the vacuum enhanced portion of the treatment system be discontinued for a period of time. During that time, recovery of free product will continue using more passive techniques such as bailing or absorbent pillows, and then compare the rates of recovery.

In addition, the groundwater extraction portion of the system has continued to extract and treat groundwater contaminated with low levels of BTEX compounds. Graphs that have been incorporated into this report will show that the influent concentrations of these BTEX compounds have gradually reduced over time. Therefore, the Navy would also like to explore the possibility of closing this site out under the ACT 2 requirements of PADEP's Land Recycling Program and would appreciate any comments that you may have regarding this issue.

If you have any questions or would like to discuss the enclosed document further, please call me at (610) 595-0567, extension 163.

Sincerely,

JAMES L. COLTER
Remedial Project Manager
By direction of the
Commanding Officer

Enclosure: (1) LNAPL System Performance Report for Calendar Year 2000

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GROUND-WATER RECOVERY AND TREATMENT SYSTEM
JANUARY 2000 THROUGH DECEMBER 2000
SITE 10; NAVY FUEL FARM
NAVAL AIR STATION JOINT RESERVE BASE
WILLOW GROVE, HORSHAM TOWNSHIP, PENNSYLVANIA

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Department of the Navy
Engineering Field Activity, Northeast
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10 Industrial Highway
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Prepared by

EA Engineering, Science, and Technology
92 Read's Way, Suite 109
New Castle, Delaware 19720
(302) 325-3560

June 2001

Project No. 29600.74.7200

29600.74.7200

System Performance Report
Vacuum Enhanced LNAPL and Ground-Water Recovery and Treatment System
January 2000 through December 2000
Site 10; Navy Fuel Farm
Naval Air Station Joint Reserve Base
Willow Grove, Horsham Township, Pennsylvania

Contract No. N62472-9219-1296
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EA Engineering, Science, and Technology
92 Read's Way, Suite 109
New Castle, Delaware
(302) 325-3560

Carl Reitenbach, P.E.
CTO Manager

6/27/01
Date

June 2001

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LIST OF ACCRONYMS

AST – Aboveground Storage Tank

GAC – Granulated Activated Carbon

LNAPL – Light Non-Aqueous Phase Liquid

NAS – Naval Air Station

NASJRB – Naval Air Station Joint Reserve Base

NFFW – Navy Fuel Farm Well

PID – Photoionization Detector

PLC – Programmable logic controller

VER – Vapor Enhanced Recovery

UST – Underground Storage Tank

1. INTRODUCTION

1.1 OBJECTIVE

Under contract number N62472-9219-1296, CTO No. 0074, a Vacuum Enhanced Light Non-Aqueous Phase Liquid (LNAPL) and Ground-Water Recovery and Treatment System has been operating at the Navy Fuel Farm, Naval Air Station Joint Reserve Base (NASJRB) Willow Grove. Figure 1-1 is a site location map and Figure 1-2 is a site map of the Navy Fuel Farm.

The objective of the report is to evaluate the remediation systems effectiveness at achieving the Remedial Action Objective for the site. The Remedial Action Objective is the removal of recoverable LNAPL from the subsurface. The comparison of the gauging data and ground-water analytical data collected during the last year of operation with historical site data is used to evaluate system effectiveness. Records of LNAPL recovery will be used to assess the continuing effectiveness of the remediation system. Historical data from the site has been collected from the following documents:

> EA Engineering, Science, and Technology, Inc. 1991 *Interim Report On Investigations At The Navy Fuel Farm, NAS Willow Grove, November 1990 - July 1991*. Contract Number N62472-86-C-1037. November.
>
> EA Engineering, Science, and Technology, Inc. 1993 *Interim Report On Investigations, Navy Fuel Farm, Willow Grove NAS*. Contract Number N62472-91-D-1449. September.
>
> EA Engineering, Science, and Technology, Inc. 1996 *Final Pilot Study Report, Product Recovery Pilot System, Navy Fuel Farm Facility, Naval Air Station Willow Grove, Horsham Township, Pennsylvania*. Contract Number N62472-92-D-1296. Contract Task Order Number 0009. November.
>
> EA Engineering, Science, and Technology, Inc. 1997 *Sampling And Analysis Plan For Remedial Action At The Naval Air Station Joint Reserve Base, Willow Grove, Horsham Township, Pennsylvania*. Contract Number N62472-92-D-1296. Contract Task Order Number 0074. 20 August.

EA Engineering, Science, and Technology, Inc. 1997 *Remedial Action Engineering Work Plan For Installation Of Remedial Action System At Naval Air Station Joint Reserve Base, Willow Grove, Horsham Township, Pennsylvania.* Contract Number N62472-92-D-1296. Contract Task Order Number 0074. 3 July.

EA Engineering, Science, and Technology, Inc. 1998 *Sampling and Analysis Report For Remedial Action At The Navy Fuel Farm, Naval Air Station Joint Reserve Base, Willow Grove, Horsham Township, Pennsylvania.* Contract Number N62472-92-D-1296. Contract Task Order Number 0074. 11 June.

EA Engineering, Science, and Technology, Inc. 1999 *Final Report on System Performance of the Vacuum Enhanced LNAPL and Ground-Water Recovery and Treatment System At The Navy Fuel Farm, Naval Air Station Joint Reserve Base, Willow Grove, Horsham Township, Pennsylvania.* Contract Number N62472-92-D-1296. Contract Task Order Number 0074. 14 June.

EA Engineering, Science, and Technology, Inc. 2000 *Final Report on System Performance of the Vacuum Enhanced LNAPL and Ground-Water Recovery and Treatment System January 1999 to December 1999 Site 10; Navy Fuel Farm, Naval Air Station Joint Reserve Base, Willow Grove, Horsham Township, Pennsylvania.* Contract Number N62472-92-D-1296. Contract Task Order Number 0074. 14 June.

1.2 SCOPE OF WORK

This report presents the system monitoring and ground-water gauging results collected during the third year of operation of the Vacuum Enhanced LNAPL and Ground-Water Recovery and Treatment System at the Navy Fuel Farm, NASJRB Willow Grove (January 2000 through December 2000). Recommendations for improving the remediation system are also included along with predicted yearly operation and maintenance costs for the existing remediation system.

1.3 ORGANIZATION OF THE REPORT

This Report on System Performance is comprised of the text, tables and figures in Chapters 1 through 4, and Appendices A through C. The four chapters in this report include:

Chapter 1: Introduction - Objective, scope and organization of this report.

Chapter 2: Ground-Water Gauging Data - Compares historical ground-water gauging and LNAPL occurrence data to data collected in 2000.

Chapter 3: System Operations - Evaluates system operation for the third year and recommends changes to the remedial system. Anticipated annual operation costs are also evaluated.

Chapter 4: Conclusions and Recommendations - Summarizes the conclusions drawn about system effectiveness, system improvements, and annual operation costs.

1.4 SITE HISTORY

From 1950 to 1991, two partially buried 210,000-gal JP-4/JP-5 aviation fuel tanks (Tank Nos. 115 and 116) were located at the Navy Fuel Farm. A 500-gal underground waste oil tank and an underground diesel fuel tank were also located at the southwestern corner of the site.

In 1986, a release occurred when Tank No. 115 was overfilled and fuel flowed from the vent pipe onto the ground. The event was attributed to faulty gauges that registered less fuel than was actually present. During this same year, a utility trench was excavated along the western boundary of the site and LNAPL was observed floating on the water within the trench. The area where the LNAPL was discovered is immediately adjacent to a former drywell. The drywell accepted water that was periodically siphoned from the bottom of the fuel tanks.

In March 1989, JP-5 jet fuel was detected emanating from two patches of dead grass to the west of Tank No. 115. As a result, it was decided to empty and remove these tanks. Removal occurred in 1991. During this time the waste oil and diesel fuel USTs were also removed. Inspection of the waste oil tank during removal revealed the tank was not intact as holes up to 1 in. in diameter were reported.

Following the completion of removal activities, a new AST system was installed to the east of the former tank field location. The new tank system at the Navy Fuel Farm consists of aboveground steel tanks set in a concrete berm. The Navy currently stores potassium acetate in the new 40,000-gal AST. One of the 210,000-gal ASTs is connected to the boiler house,

Building 6, with an underground pipeline and holds #2 fuel oil. The second 210,000-gal AST remains empty.

The Navy performed a pilot study (March 1994 to October 1996) of remedial alternatives to address the recovery of LNAPL petroleum products at the Navy Fuel Farm (EA 1996). Based on results of the pilot study, the Navy proceeded with the expansion of the Vacuum-Enhanced LNAPL and Ground Water Recovery and Treatment System to include recovery from three wells (NFFW-2R, NFFW-14, and NFFW-16). The expansion was completed in January 1998 and operation of the remedial action commenced. The system has been operating for three years and this Report on System Performance assesses system operation for the third year (January 2000 to December 2000).

1.5 PREVIOUS INVESTIGATIONS

Several investigations have been conducted at the Navy Fuel Farm. The Vacuum Enhanced LNAPL and Ground-Water Recovery and Treatment System was installed as a result of the following reports and regulations:

- Draft Appendix B, Soil Vapor Contaminant Assessment at NAS Willow Grove. (EA December, 1988b).
- Interim Report, Electromagnetic Survey, Soil Vapor Contaminant Assessment, and Revised Field Sampling Plan for Site Inspection Studies at NAS Willow Grove. (EA March, 1989a).
- Final Report, Environmental Test Boring Investigation at the Navy Fuel Farm, NAS Willow Grove, Horsham Township, Pennsylvania. (EA June, 1989a)
- Final Report, Site Inspection Studies at NAS Willow Grove, Horsham Township, Pennsylvania. Volumes I and II. (EA May, 1990)
- Final Interim Report on Investigations at the Navy Fuel Farm, NAS Willow Grove, November 1990 - July 1991. (EA November, 1991).
- Commonwealth of Pennsylvania Department of Environmental Resources, Ground Water Quality Protection Strategy. (PADER February, 1992).

- Title 25 - Pennsylvania Code Chapter 245 Subchapter D, Storage Tanks; Corrective Action. August. Commonwealth of Pennsylvania, Environmental Quality Board (EQB 1993).

- Final Report of Interim Site Investigations, Navy Fuel Farm - Willow Grove NAS. (EA September, 1993b).

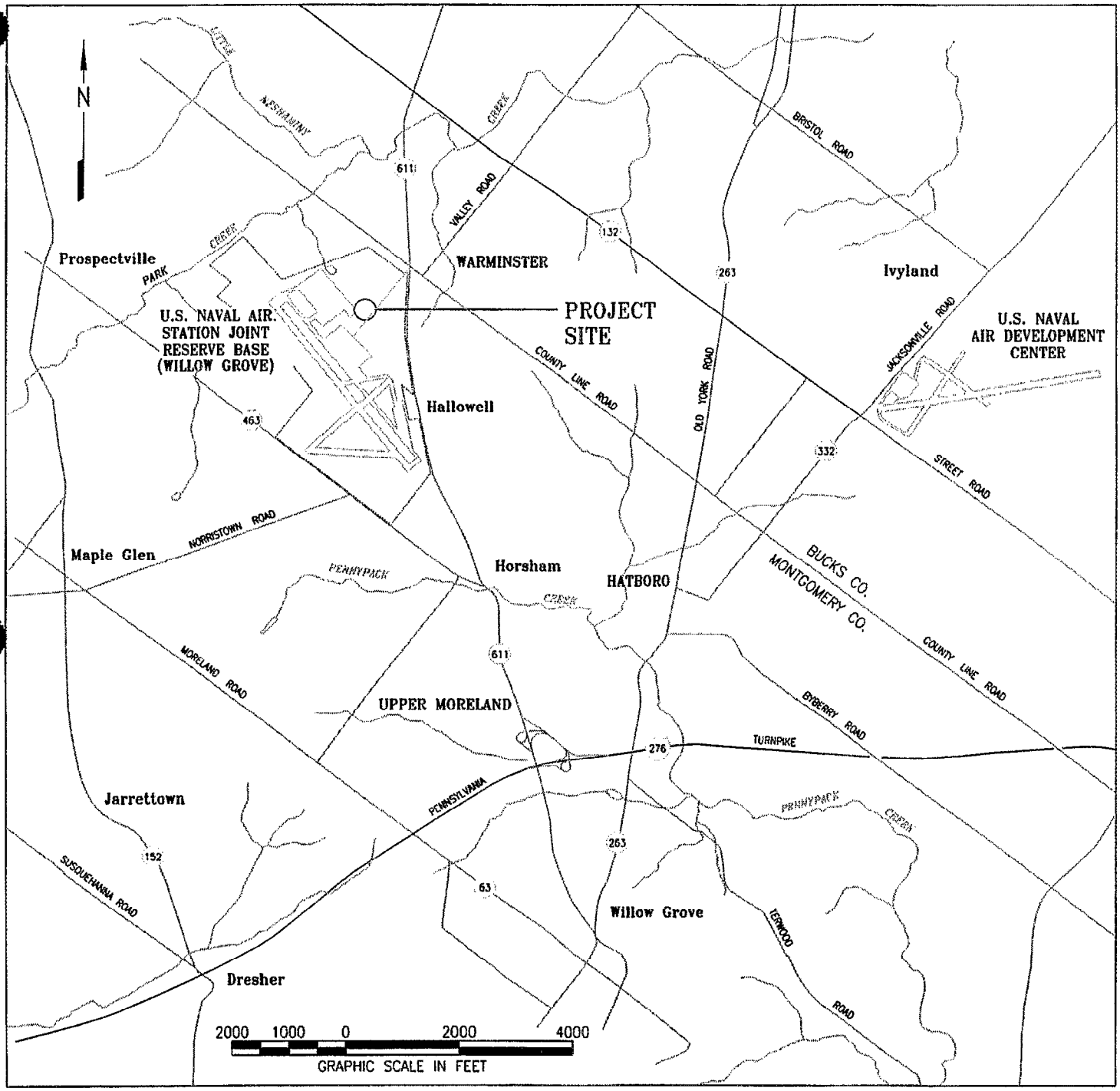
- Final Pilot Study Report, Product Recovery Pilot System at the Navy Fuel Farm, Naval Air Station Willow Grove, Horsham Township Pennsylvania. (EA, November 1996).

- Remedial Action Engineering Work Plan for Installation of Remedial Action System at Naval Air Station Joint Reserve Base, Willow Grove, Horsham Township, Pennsylvania. (EA, 3 July 1997)

- Sampling and Analysis Plan for Remedial Action at the Navy Fuel Farm, Naval Air Station Joint Reserve Base Willow Grove, Horsham Township, Pennsylvania. (EA, 20 August 1997)

- Sampling and Analysis Report for Remedial Action at the Navy Fuel Farm, Naval Air Station Joint Reserve Base Willow Grove, Horsham Township, Pennsylvania. (EA, 11 June 1998)

- Operation and Maintenance Manual for the Vacuum Enhanced LNAPL and Ground-Water Recovery System at Navy Fuel Farm, Naval Air Station Joint Reserve Base Willow Grove, Horsham Township, Pennsylvania. (EA, October 1998)



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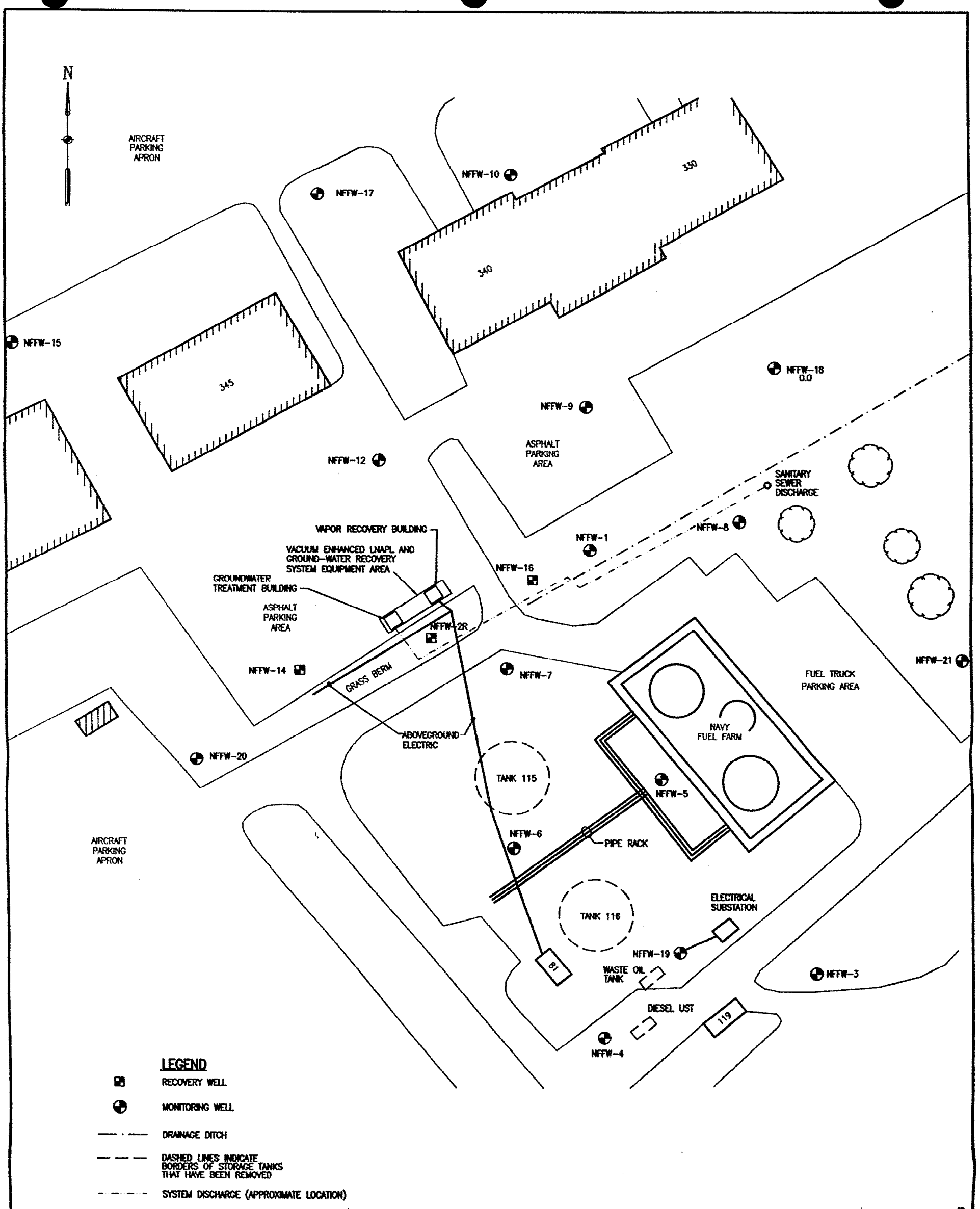
EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC.

NAVY FUEL FARM
NAVAL AIR STATION JOINT RESERVE BASE
WILLOW GROVE, PENNSYLVANIA

SITE LOCATION MAP

PROJECT MGR	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	DATE	PROJECT NO	FIGURE
HGP	SHD	CJV/PMH	CR	AS SHOWN	2-23-99	29600.74	1-1



NOTE:

BASE MAP DEVELOPED FROM EA FIELD MEASUREMENTS AND SITE PLAN DEVELOPED BY EA (1993). NO AS-BUILT DRAWINGS OF NEW FUEL FARM FACILITY WERE AVAILABLE FROM NAVY PERSONNEL PRIOR TO DEVELOPMENT OF BASE MAP. BASE MAP IS INTENDED AS A REFERENCE ONLY. ANY DECISIONS MADE BASED ON THE CONTENT OF THIS MAP ARE THE SOLE RESPONSIBILITY OF THE USER.

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EA ENGINEERING, SCIENCE, AND TECHNOLOGY

NAVY FUEL FARM
NAVAL AIR STATION JOINT RESERVE BASE
WILLOW GROVE, PENNSYLVANIA

SITE PLAN

PROJECT MGR.	DESIGNED BY	DRAWN BY	CHECKED BY	DATE	SCALE	PROJECT NO.	FILE NAME	DRAWING NO.	FIGURE
HGP	MK	FDV	CGR	4-20-99	AS SHOWN	29600.74	SITE	-	1-2

2. GROUND-WATER AND LNAPL GAUGING DATA

This chapter presents and evaluates the remediation system's effectiveness at achieving the Remedial Action Objective based on the analysis of ground-water and LNAPL gauging at the Navy Fuel Farm. Section 2.1 presents historical gauging data and Section 2.2 presents the gauging data collected during the third year of the remediation systems operation.

2.1 HISTORICAL GROUND-WATER AND LNAPL GAUGING DATA

Ground-water level and LNAPL occurrence gauging data has been collected from the site monitoring wells since March 1994 and is presented in Appendix A. Regional ground-water flow direction has consistently been toward the north-northeast as illustrated in the following figures:

- Figure 2-1 shows potentiometric surface, or water table elevation, on 4 April 1994 prior to the operation of the pilot system.

- Figure 2-2 shows potentiometric surface on 8 December 1995 during the operation of the pilot system. This figure indicates that the pilot system intercepts ground water and LNAPL flow from the area of the release (Tanks 115 and 116).

- Figure 2-3 shows potentiometric surface on 21 May 1998 during the operation of the current remedial system. This figure indicates that the size of the cone of depression has increased and flow from the area of the release (Tanks 115 and 116) is toward the recovery wells.

The gauging data also indicates a relationship between water table elevation and LNAPL occurrence. During periods of high water table elevation, LNAPL is present in only a few monitoring wells. During periods of low water table elevation, the occurrence of LNAPL

increases, both in extent and in thickness of the LNAPL layer observed in the monitoring wells. The following figures illustrate this relationship:

- Figure 2-4 is an isopach, or LNAPL thickness, map from 4 April 1994 during a period of high water table elevation. LNAPL was present in only one well (NFFW-6).

- Figure 2-5 shows LNAPL thickness on 21 December 1994 during a period of low water table elevation. This figure indicates that LNAPL is present in several monitoring wells. It also indicates that the operation of the pilot system in NFFW-2R has caused LNAPL to collect around the recovery well.

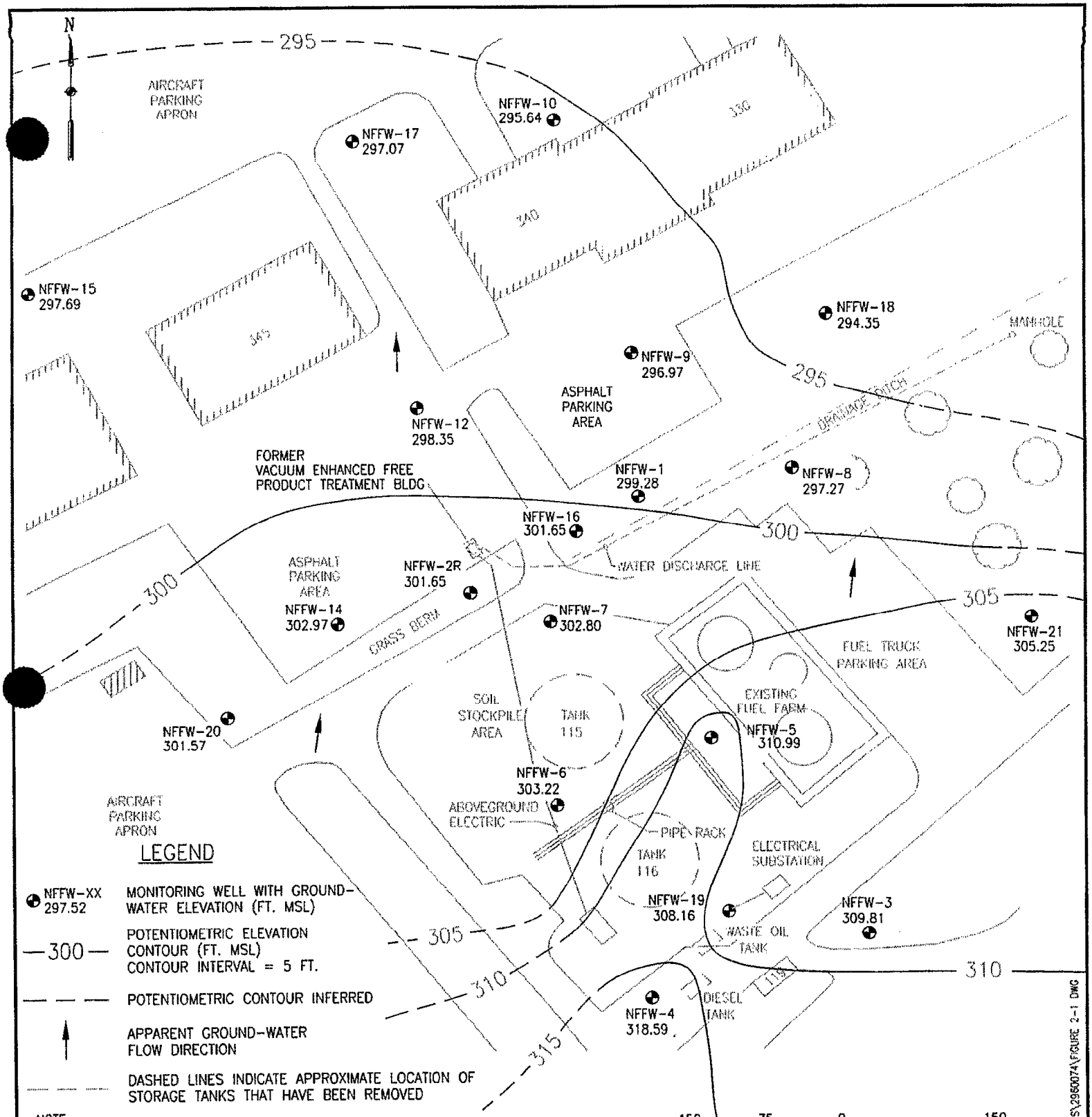
- Figure 2-6 shows the LNAPL thickness on 21 May 1998 during a high water table elevation period. This figure indicates that LNAPL is present only in the recovery wells where the water table is being depressed by the remediation system.

2.2 CURRENT GROUND-WATER AND LNAPL GAUGING DATA

Three rounds of ground-water level and LNAPL gauging were conducted on the 19 monitoring wells at the Navy Fuel Farm in 2000. The gauging data are presented in Appendix A. Figures 2-7 and 2-8 show the potentiometric surface maps of the ground water at the Navy Fuel Farm on 11 February 2000 and 26 October 2000, which are considered representative of periods of high and low water table elevations, respectively. Ground-water flow remains northeasterly with a cone of depression apparent around NFFW-2R, NFFW-14 and NFFW-16. The cone of depression created by the recovery wells is directly down gradient from the release area (former tanks 115 and 116) and aids in drawing LNAPL into the recovery wells. The potentiometric surface maps are consistent with historical data.

Figure 2-9 is an isopach map showing the occurrence and thickness of LNAPL in the monitoring wells on 11 February 2000. No LNAPL was gauged in any of the site wells during the gauging event of 26 October 2000, and an isopach map for this date was not prepared. The 11 February

2000 gauging event was conducted during a period of high water table elevation and only small amounts of product were present in the recovery wells. The LNAPL gauging data collected in 2000 is consistent with historical data.



NOTE:

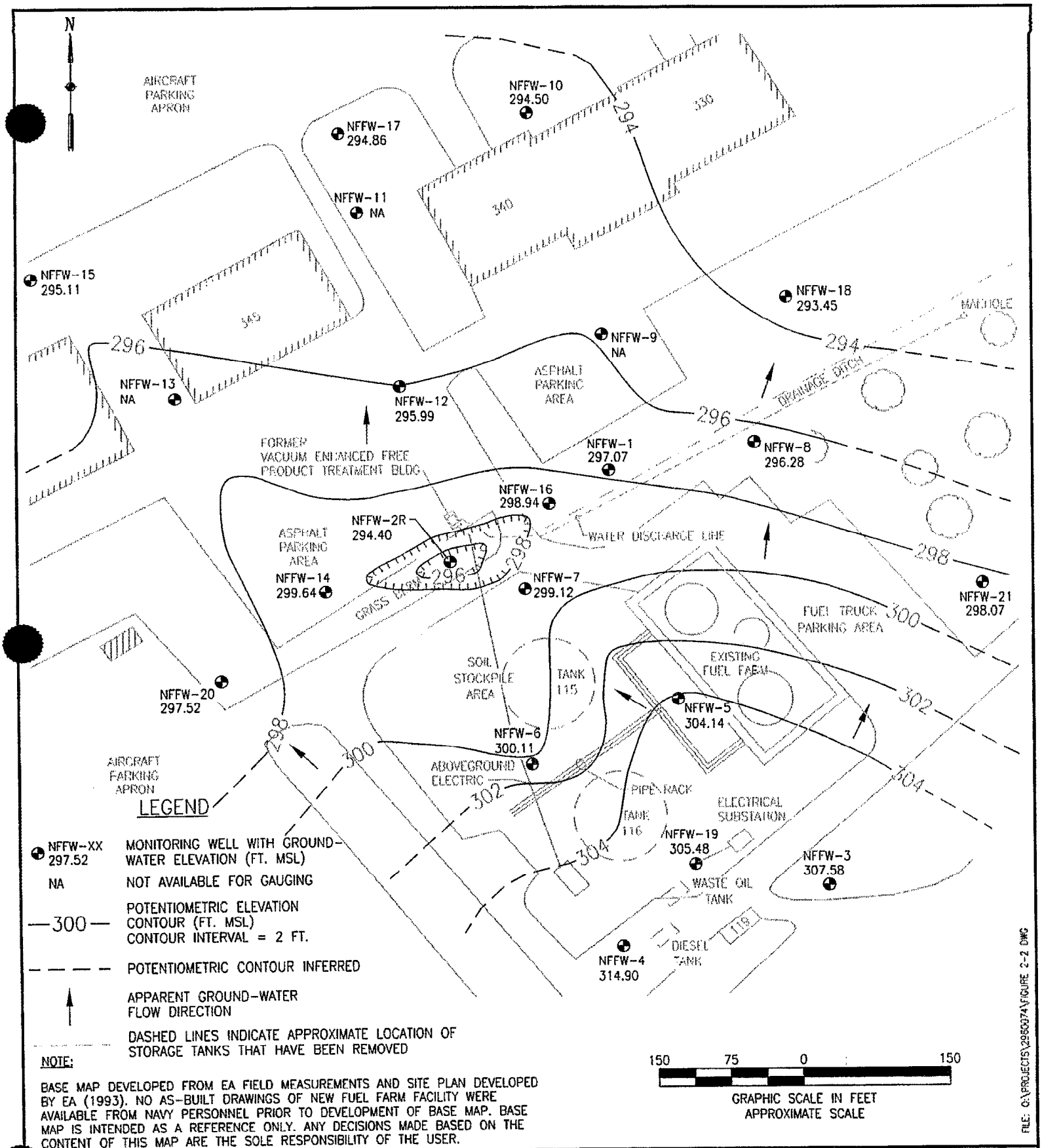
BASE MAP DEVELOPED FROM EA FIELD MEASUREMENTS AND SITE PLAN DEVELOPED BY EA (1993). NO AS-BUILT DRAWINGS OF NEW FUEL FARM FACILITY WERE AVAILABLE FROM NAVY PERSONNEL PRIOR TO DEVELOPMENT OF BASE MAP. BASE MAP IS INTENDED AS A REFERENCE ONLY. ANY DECISIONS MADE BASED ON THE CONTENT OF THIS MAP ARE THE SOLE RESPONSIBILITY OF THE USER.

EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC.

NAVY FUEL FARM
NAVAL AIR STATION JOINT RESERVE BASE
WILLOW GROVE, PENNSYLVANIA

POTENTIOMETRIC SURFACE
4 APRIL 1994

PROJECT MGR	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	DATE	PROJECT NO	FIGURE
CR	BS	DWM	CR	1"=150'	2-18-00	29600.74	2-1



NOTE:

BASE MAP DEVELOPED FROM EA FIELD MEASUREMENTS AND SITE PLAN DEVELOPED BY EA (1993). NO AS-BUILT DRAWINGS OF NEW FUEL FARM FACILITY WERE AVAILABLE FROM NAVY PERSONNEL PRIOR TO DEVELOPMENT OF BASE MAP. BASE MAP IS INTENDED AS A REFERENCE ONLY. ANY DECISIONS MADE BASED ON THE CONTENT OF THIS MAP ARE THE SOLE RESPONSIBILITY OF THE USER.

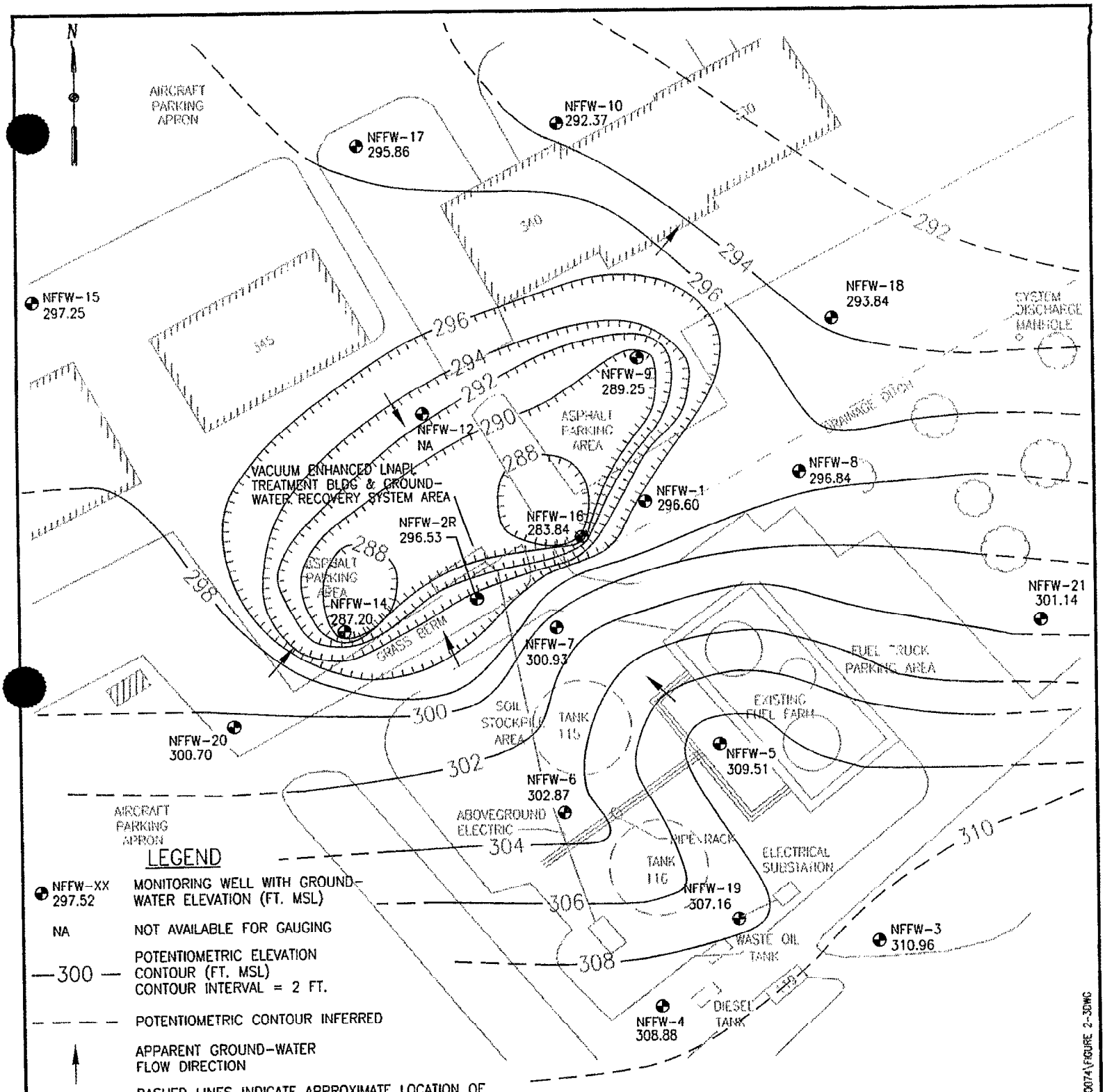
FILE: Q:\PROJECTS\2960074\FIGURE 2-2.DWG

EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC.

NAVY FUEL FARM
NAVAL AIR STATION JOINT RESERVE BASE
WILLOW GROVE, PENNSYLVANIA

POTENTIOMETRIC SURFACE
8 DECEMBER 1995

PROJECT MGR	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	DATE	PROJECT NO	FIGURE
CR	BS	DWM	CR	1"=150'	2-18-00	29600.74	2-2



NOTE:

BASE MAP DEVELOPED FROM EA FIELD MEASUREMENTS AND SITE PLAN DEVELOPED BY EA (1993). NO AS-BUILT DRAWINGS OF NEW FUEL FARM FACILITY WERE AVAILABLE FROM NAVY PERSONNEL PRIOR TO DEVELOPMENT OF BASE MAP. BASE MAP IS INTENDED AS A REFERENCE ONLY. ANY DECISIONS MADE BASED ON THE CONTENT OF THIS MAP ARE THE SOLE RESPONSIBILITY OF THE USER.

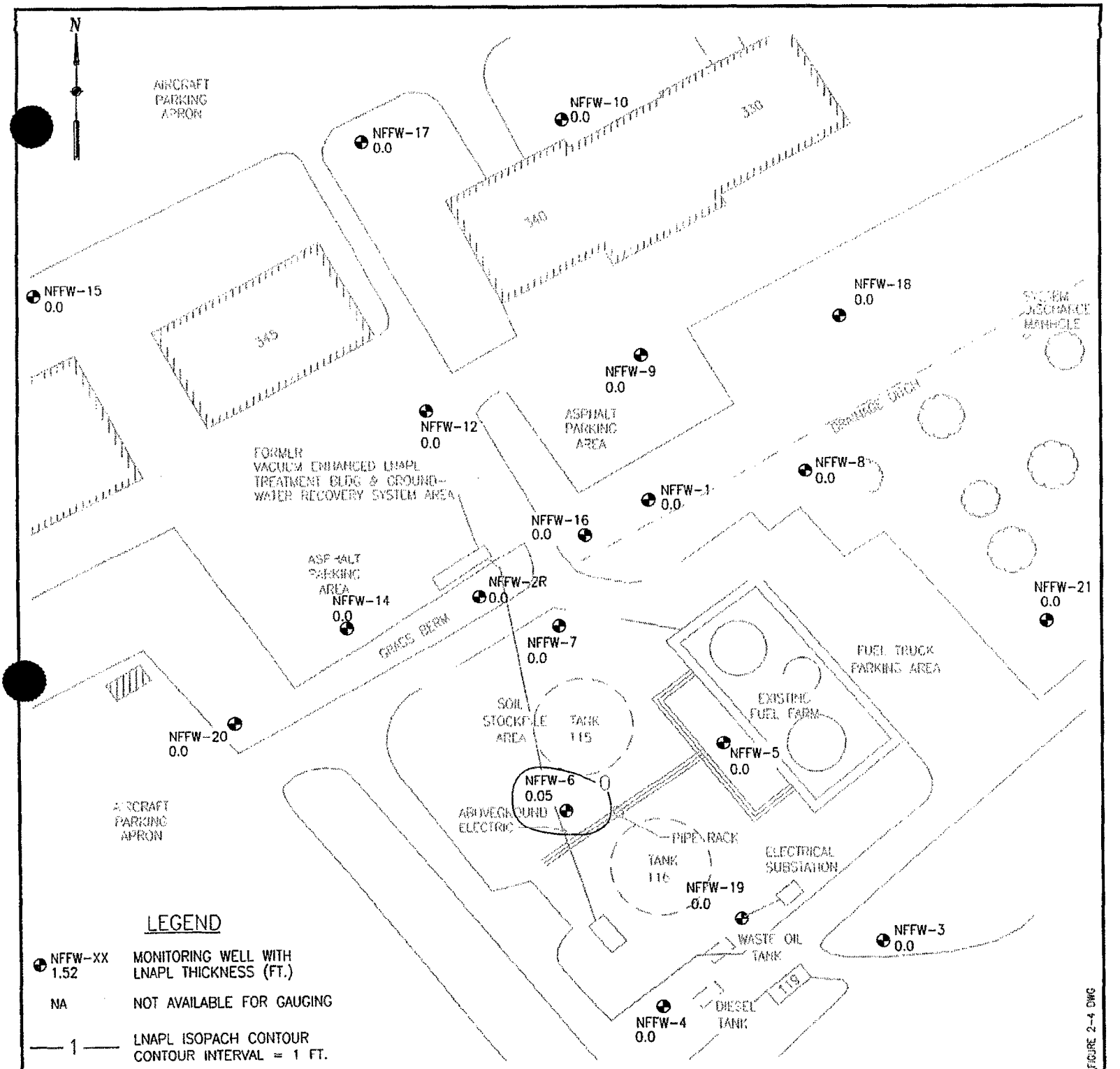
FILE: Q:\PROJECTS\29600.74\FIGURE 2-3.DWG

EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC.

NAVY FUEL FARM
NAVAL AIR STATION JOINT RESERVE BASE
WILLOW GROVE, PENNSYLVANIA

POTENTIOMETRIC SURFACE
21 MAY 1998

PROJECT MGR	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	DATE	PROJECT NO	FIGURE
CR	MK	DWM	CR	1"=150'	2-18-00	29600.74	2-3



LEGEND

NFFW-XX 1.52	MONITORING WELL WITH LNAPL THICKNESS (FT.)
NA	NOT AVAILABLE FOR GAUGING
—— 1 ——	LNAPL ISOPACH CONTOUR CONTOUR INTERVAL = 1 FT.
- - - - -	DASHED LINES INDICATE APPROXIMATE LOCATION OF STORAGE TANKS THAT HAVE BEEN REMOVED

NOTE:

BASE MAP DEVELOPED FROM EA FIELD MEASUREMENTS AND SITE PLAN DEVELOPED BY EA (1993). NO AS-BUILT DRAWINGS OF NEW FUEL FARM FACILITY WERE AVAILABLE FROM NAVY PERSONNEL PRIOR TO DEVELOPMENT OF BASE MAP. BASE MAP IS INTENDED AS A REFERENCE ONLY. ANY DECISIONS MADE BASED ON THE CONTENT OF THIS MAP ARE THE SOLE RESPONSIBILITY OF THE USER.

150 75 0 150

GRAPHIC SCALE IN FEET
APPROXIMATE SCALE

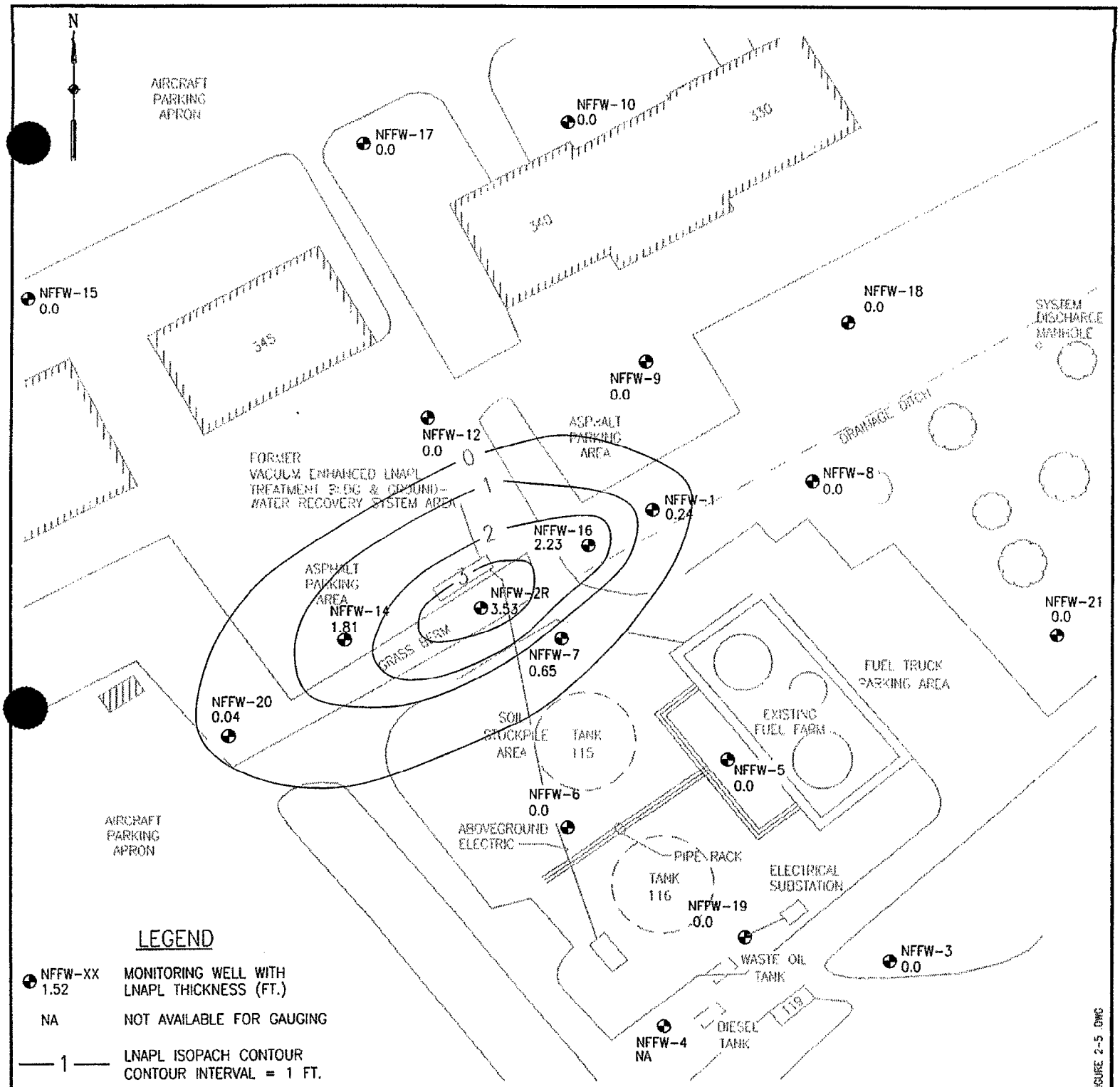
FILE: C:\PROJECTS\29600.74\FIGURE 2-4.DWG

EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC.

NAVY FUEL FARM
NAVAL AIR STATION JOINT RESERVE BASE
WILLOW GROVE, PENNSYLVANIA

ISOPACH MAP OF THE LNAPL MEASURED IN MONITORING WELLS
4 APRIL 1994

PROJECT MGR	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	DATE	PROJECT NO	FIGURE
CR	MK	DWM	CR	1"=150'	2-18-00	29600.74	2-4



LEGEND

NFFW-XX 1.52	MONITORING WELL WITH LNAPL THICKNESS (FT.)
NA	NOT AVAILABLE FOR GAUGING
—— 1 ——	LNAPL ISOPACH CONTOUR CONTOUR INTERVAL = 1 FT.
- - - - - -	DASHED LINES INDICATE APPROXIMATE LOCATION OF STORAGE TANKS THAT HAVE BEEN REMOVED

NOTE:

BASE MAP DEVELOPED FROM EA FIELD MEASUREMENTS AND SITE PLAN DEVELOPED BY EA (1993). NO AS-BUILT DRAWINGS OF NEW FUEL FARM FACILITY WERE AVAILABLE FROM NAVY PERSONNEL PRIOR TO DEVELOPMENT OF BASE MAP. BASE MAP IS INTENDED AS A REFERENCE ONLY. ANY DECISIONS MADE BASED ON THE CONTENT OF THIS MAP ARE THE SOLE RESPONSIBILITY OF THE USER.

150 75 0 150

GRAPHIC SCALE IN FEET
APPROXIMATE SCALE

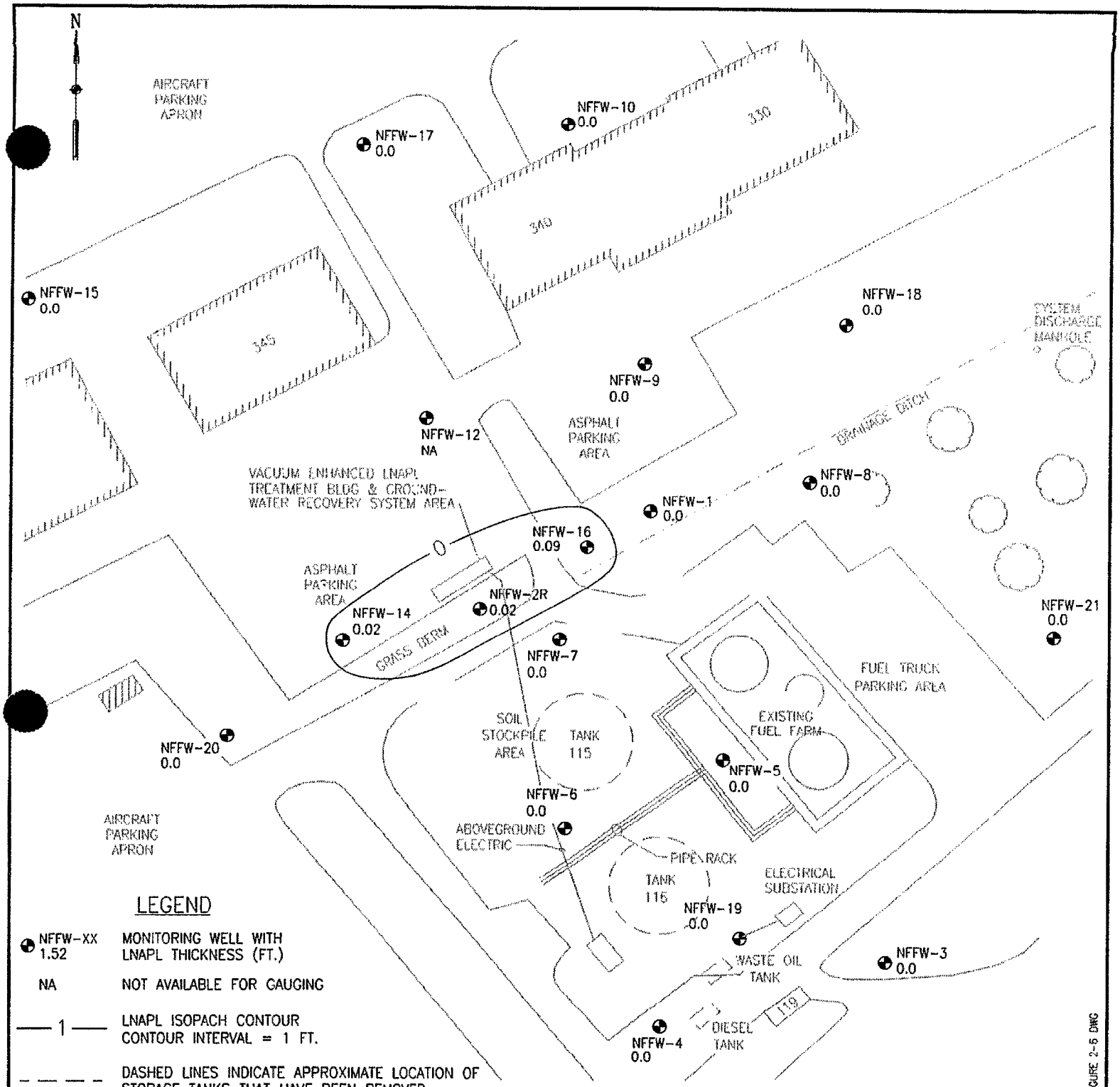
FILE: Q:\PROJECTS\29600.74\FIGURE 2-5.DWG

EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC.

NAVY FUEL FARM
NAVAL AIR STATION JOINT RESERVE BASE
WILLOW GROVE, PENNSYLVANIA

ISOPACH MAP OF THE LNAPL MEASURED IN MONITORING WELLS 21 DECEMBER 1994

PROJECT MGR	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	DATE	PROJECT NO	FIGURE
CR	MK	DWM	CR	1"=150'	2-18-00	29600.74	2-5



LEGEND

NFFW-XX 1.52	MONITORING WELL WITH LNAPL THICKNESS (FT.)
NA	NOT AVAILABLE FOR GAUGING
—— 1 ——	LNAPL ISOPACH CONTOUR CONTOUR INTERVAL = 1 FT.
- - - -	DASHED LINES INDICATE APPROXIMATE LOCATION OF STORAGE TANKS THAT HAVE BEEN REMOVED

NOTE:

BASE MAP DEVELOPED FROM EA FIELD MEASUREMENTS AND SITE PLAN DEVELOPED BY EA (1993). NO AS-BUILT DRAWINGS OF NEW FUEL FARM FACILITY WERE AVAILABLE FROM NAVY PERSONNEL PRIOR TO DEVELOPMENT OF BASE MAP. BASE MAP IS INTENDED AS A REFERENCE ONLY. ANY DECISIONS MADE BASED ON THE CONTENT OF THIS MAP ARE THE SOLE RESPONSIBILITY OF THE USER.

150 75 0 150

GRAPHIC SCALE IN FEET
APPROXIMATE SCALE

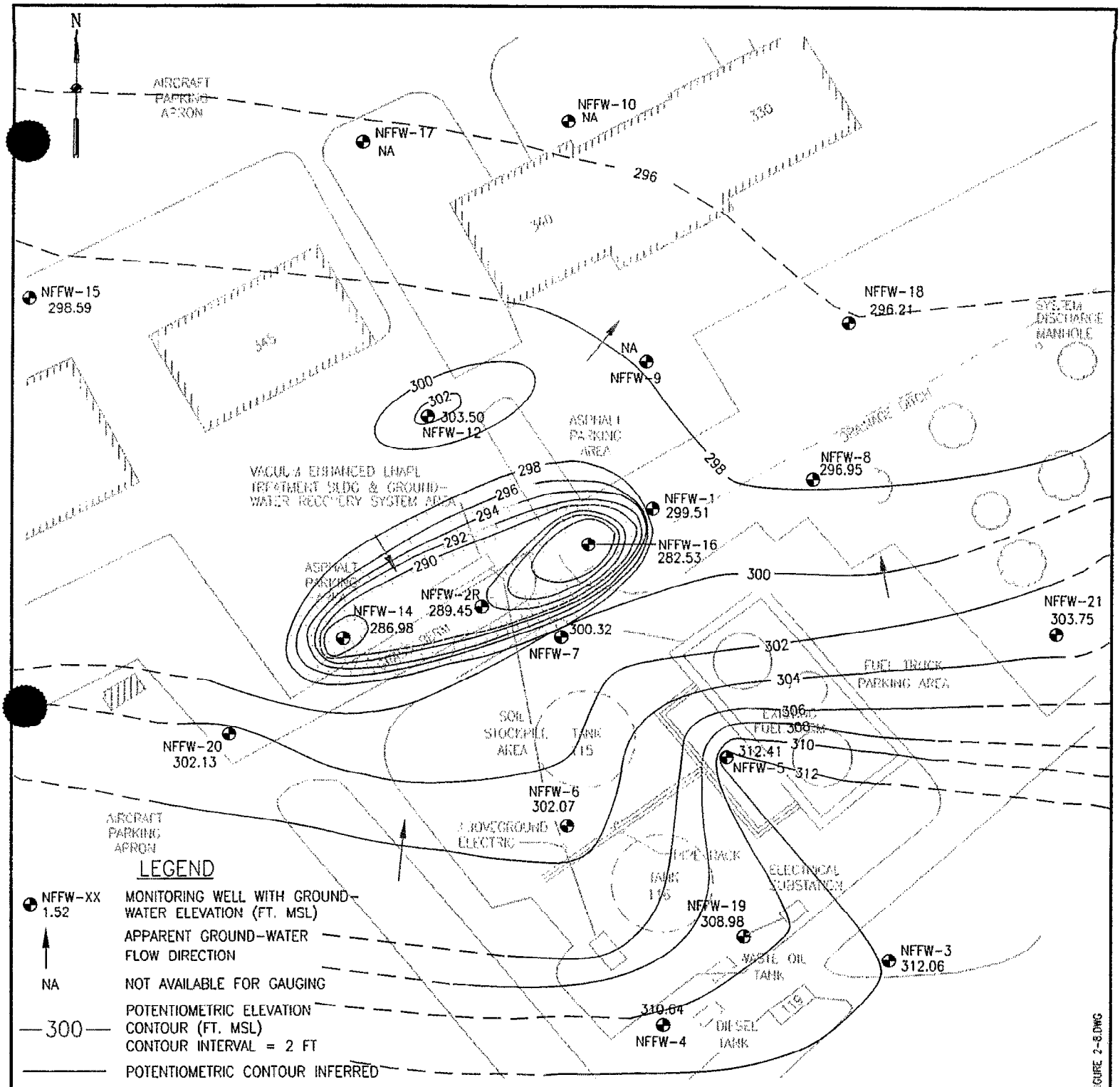
FILE: Q:\PROJECTS\2960074\FIGURE 2-6.DWG

EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC.

NAVY FUEL FARM
NAVAL AIR STATION JOINT RESERVE BASE
WILLOW GROVE, PENNSYLVANIA

ISOPACH MAP OF THE LNAPL MEASURED IN MONITORING WELLS
21 MAY 1998

PROJECT MGR	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	DATE	PROJECT NO	FIGURE
CR	MK	DWM	CR	1"=150'	2-18-00	29600.74	2-6



NOTE:

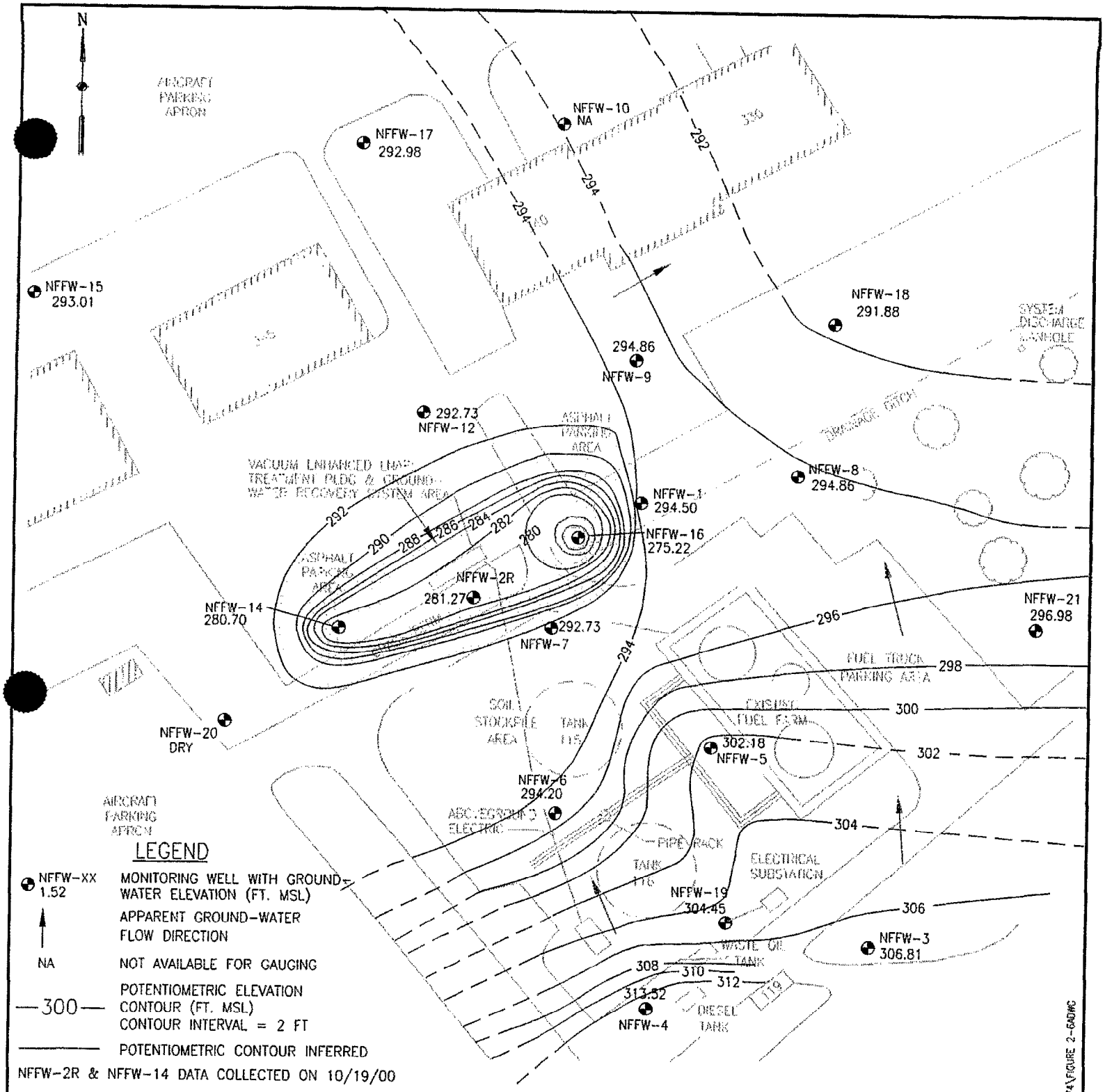
BASE MAP DEVELOPED FROM EA FIELD MEASUREMENTS AND SITE PLAN DEVELOPED BY EA (1993). NO AS-BUILT DRAWINGS OF NEW FUEL FARM FACILITY WERE AVAILABLE FROM NAVY PERSONNEL PRIOR TO DEVELOPMENT OF BASE MAP. BASE MAP IS INTENDED AS A REFERENCE ONLY. ANY DECISIONS MADE BASED ON THE CONTENT OF THIS MAP ARE THE SOLE RESPONSIBILITY OF THE USER.

EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC.

NAVY FUEL FARM
NAVAL AIR STATION JOINT RESERVE BASE
WILLOW GROVE, PENNSYLVANIA

POTENTIOMETRIC SURFACE
11 FEBRUARY 2000

PROJECT MGR	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	DATE	PROJECT NO	FIGURE
CR	MK	DWM	CR	1"=150'	2-22-01	29600.74	2-7



NOTE:

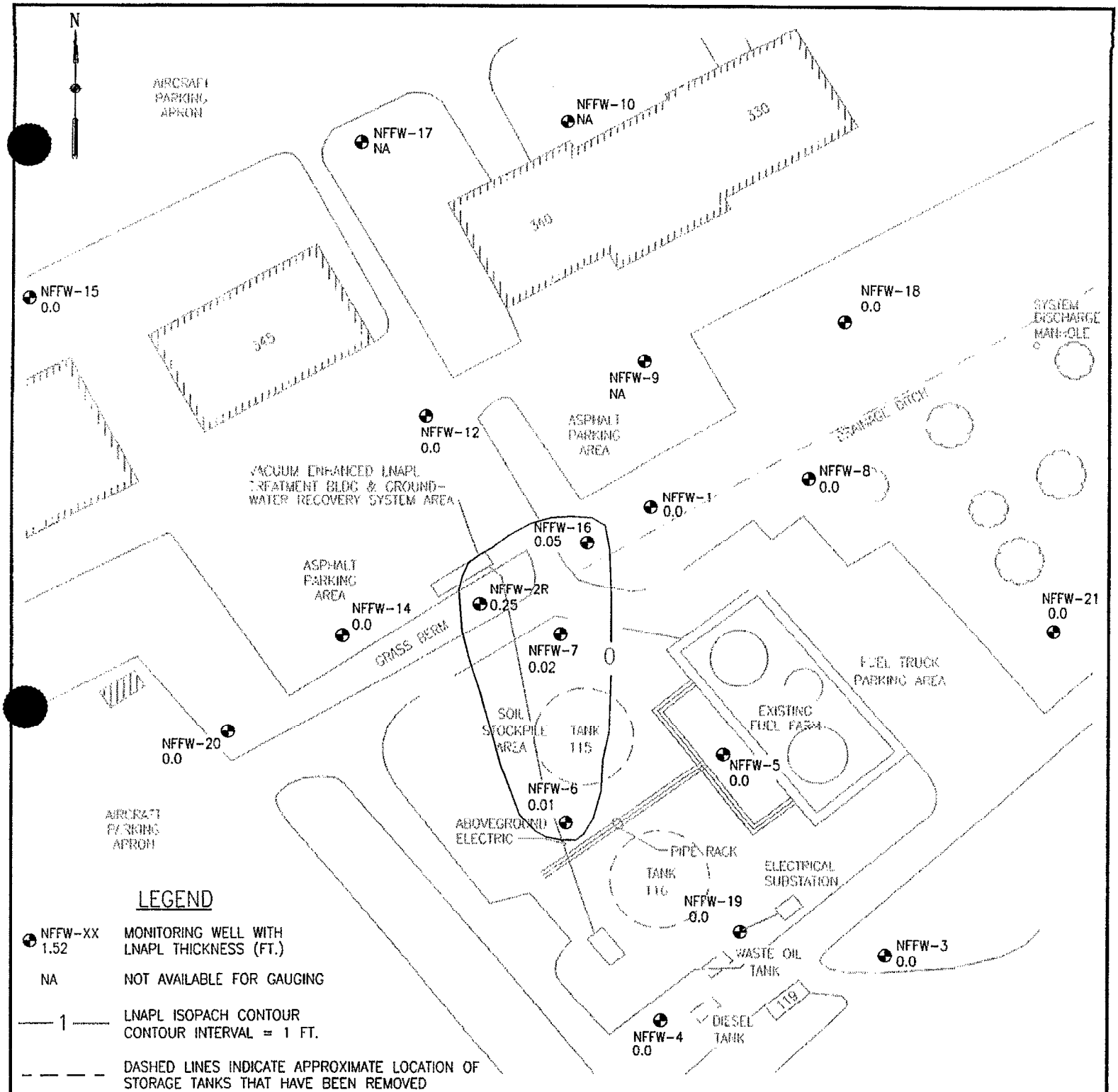
BASE MAP DEVELOPED FROM EA FIELD MEASUREMENTS AND SITE PLAN DEVELOPED BY EA (1993). NO AS-BUILT DRAWINGS OF NEW FUEL FARM FACILITY WERE AVAILABLE FROM NAVY PERSONNEL PRIOR TO DEVELOPMENT OF BASE MAP. BASE MAP IS INTENDED AS A REFERENCE ONLY. ANY DECISIONS MADE BASED ON THE CONTENT OF THIS MAP ARE THE SOLE RESPONSIBILITY OF THE USER.

EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC.

NAVY FUEL FARM
NAVAL AIR STATION JOINT RESERVE BASE
WILLOW GROVE, PENNSYLVANIA

POTENTIOMETRIC SURFACE
26 OCTOBER 2000

PROJECT MGR	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	DATE	PROJECT NO	FIGURE
CR	MK	DWM	CR	1"=150'	2-22-01	29600.74	2-8



LEGEND

NFFW-XX 1.52	MONITORING WELL WITH LNAPL THICKNESS (FT.)
NA	NOT AVAILABLE FOR GAUGING
—— 1 ——	LNAPL ISOPACH CONTOUR CONTOUR INTERVAL = 1 FT.
— — — —	DASHED LINES INDICATE APPROXIMATE LOCATION OF STORAGE TANKS THAT HAVE BEEN REMOVED

NOTE:

BASE MAP DEVELOPED FROM EA FIELD MEASUREMENTS AND SITE PLAN DEVELOPED BY EA (1993). NO AS-BUILT DRAWINGS OF NEW FUEL FARM FACILITY WERE AVAILABLE FROM NAVY PERSONNEL PRIOR TO DEVELOPMENT OF BASE MAP. BASE MAP IS INTENDED AS A REFERENCE ONLY. ANY DECISIONS MADE BASED ON THE CONTENT OF THIS MAP ARE THE SOLE RESPONSIBILITY OF THE USER.

150 75 0 150

GRAPHIC SCALE IN FEET
APPROXIMATE SCALE

EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC.

NAVY FUEL FARM
NAVAL AIR STATION JOINT RESERVE BASE
WILLOW GROVE, PENNSYLVANIA

ISOPACH MAP OF THE LNAPL MEASURED IN MONITORING WELLS
11 FEBRUARY 2000

PROJECT MGR	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	DATE	PROJECT NO	FIGURE
CR	MK	DWM	CR	1"=150'	2-18-00	29600.74	2-9

3. SYSTEM OPERATIONS

The Vacuum Enhanced LNAPL and Ground-Water Recovery and Treatment System has been operating since 9 January 1998. As construction of different components of the system was completed the components were activated. The ground-water recovery/treatment, LNAPL recovery, and vapor extraction systems were operating by 9 February 1998. The Genesis SCADA system was not completely operational until 17 April 1998. System data recorded in 2000 is presented in Table 3-1 and Appendix B. Appendix B also includes the operational data from the start-up of the system in 1998 through 2000.

This chapter reviews the third year of the remediation systems operation. The Vacuum Enhanced LNAPL and Ground-Water Recovery and Treatment System review is divided into the three components of the system which operate independently of each other. These components: the ground-water recovery and treatment system, the LNAPL recovery system, and the vapor recovery and treatment system are reviewed in Sections 3.1, 3.2, and 3.3 respectively. Each section includes a review of system operations and recommendations associated with the continuing operation of the component. Section 3.4 is the projected annual operating costs for the Vacuum Enhanced LNAPL and Ground-Water Recovery and Treatment System.

3.1 GROUND-WATER RECOVERY AND TREATMENT SYSTEM

3.1.1 System Operation

Between 30 December 1999 and 18 December 2000, the ground-water recovery and treatment system has recovered and treated approximately 1,437,490 gallons of ground water from wells NFFW-2R, NFFW-14, and NFFW-16. Between 13-26 July 2000, the system was not operable due to a malfunctioning module on the programmable logic controller (PLC), most likely as the result of a lightning strike. During the rest of the year the ground-water recovery system operated continuously except for short periods during power outages or shutdowns for routine O&M.

Dissolved phase hydrocarbons recovered with the ground water from 30 December 1999 to 18 December 2000 was the equivalent of 0.8 gallons of LNAPL (Table 3-1). The treated ground water is discharged to the base wastewater treatment system.

Ground-water level gauging data (January 2000 through December 2000), Section 2-2, indicates that the ground-water table is being depressed in the vicinity of the recovery wells. The depression of the ground-water table induces flow of LNAPL towards the recovery points and retards migration of dissolved phase petroleum products past the recovery points, north of the site.

3.1.2 System Sampling

A total of 35 ground-water samples were collected from before (influent), between, and after (effluent) the granular activated carbon (GAC) in the water treatment system from 20 January 2000 through 18 December 2000. The objective was to monitor breakthrough of the GACs and document pre-treatment of the water prior to discharge to the sanitary service. Table 3-2 summarizes the analytical results and the excerpts from the laboratory report are included in Appendix C. The influent samples indicate that benzene concentrations ranged from below the laboratory detection limit (ND) to 350 μg/L; total BTEX concentration ranged from 11 μg/L to 2,760 μg/L and naphthalene concentration ranged from ND to an estimated 2,100 μg/L. The between samples show that benzene was detected during the 23 October, 20 November, and 18 December 2000 sampling events at 1 μg/L, 4 μg/L, and 2.9 μg/L, respectively. Based on the results, it appeared that breakthrough had occurred in the lead carbon and the lead carbon was replaced in January 2001.

In addition to evaluating treatment of the extracted ground water, the influent sample results can be used to assess the ground-water quality in the area influenced by the remedial system. The influent results indicate that throughout 2000, benzene and naphthalene consistently exceeded the Statewide Human Health Standard Medium Specific Concentration (MSC) for used aquifers with less than 2,500 mg/L of total dissolved solids (TDS); the most stringent of the Pennsylvania

screening criteria. The MSC for benzene and naphthalene are 5 µg/L and 20 µg/L respectively. The MSC was for both benzene and naphthalene was exceeded in 11 of the 12 influent samples. Furthermore, one of 12 samples exceeded the MSC for toluene (MSC=1,000 µg/L). However, as illustrated in Figure 3-1, the influent benzene concentration has shown a decreasing trend since 1998.

3.1.3 Recommendations

The ground water recovery system is operating as designed and has induced the flow of LNAPL toward the recovery wells. However, as discussed in Section 3.2, the LNAPL recovery rate has decreased and vacuum-enhanced recovery may no longer be effective. Therefore, alternative LNAPL recovery methods should be considered and as a result the continued depression of the water table should also be reevaluated.

Influent sample results indicate a decreasing trend in concentrations of petroleum hydrocarbons, however, the last site-wide ground-water-sampling event was conducted in 1997. At that time benzene and naphthalene were reported in samples collected from 2 wells at concentrations exceeding the Statewide Human Health Standard in accordance with Pennsylvania's Land Recycling Program (25 Pa Code Chapter 250), commonly referred to as Act 2 (EA 1998). To document current conditions and evaluate the effectiveness of continuing water table depression, current ground water conditions should be evaluated. This could be accomplished by conducting another ground-water sampling and analysis event on the monitoring wells at the Navy Fuel Farm. The ground-water samples should be analyzed for volatile organic compounds (VOC).

3.2 LNAPL RECOVERY SYSTEM

3.2.1 System Operation

During 2000 (12/30/99 through 12/18/00), approximately 41.4 gallons of LNAPL was recovered at the Navy Fuel Farm. This is a 32 percent decrease from the 60.5 gallons recovered in 1999 (12/21/98 through 12/30/99) and an 85 percent decrease in the 282.17 gallons recovered in 1998

(1/02/98 through 12/21/98). Ninety-seven percent of the LNAPL (40.3-gal) was recovered from well NFFW-2R. The remaining LNAPL (1.1-gal) was recovered from NFFW-14, and no LNAPL was recovered from NFFW-16. LNAPL recovery from the individual recovery wells is detailed on Table 3-1. As shown in Figure 3-2, LNAPL recovery in 2000 was highest in the fourth quarter with approximately 16 gallons of LNAPL recovered. LNAPL recovery the rest of the year fluctuated from approximately 3 to 12 gallons of LNAPL per quarter. Figure 3-3 shows quarterly LNAPL recovery per well for 2000 and Figure 3-4 shows the total LNAPL recovery per well since 1998. An examination of Table 3-1 indicates that the 68 percent of the LNAPL were recovered in 4 time periods as follows:

Dates	LNAPL Recovered
2/29/00 to 3/7/00	3.3-gal
3/21/00 to 3/30/00	6.3-gal
6/12/00 to 6/30/00	5.9-gal
11/8/00 to 11/13/00	12.8-gal

Operator observations indicated that these slugs of product were recovered during periods of low water table elevations

LNAPL recovery was conducted throughout 2000 in well NFFW-2R except between 13-26 July 2000, when the system was not operable due to a malfunctioning PLC module. In addition to this time period, the LNAPL recovery pumps in wells NFFW-14 and NFFW-16 were not operable in March and early April when these pumps were being repaired by the manufacturer.

3.2.2 Recommendations

As stated above, the annual LNAPL recovery rate has decreased significantly since system start-up in 1998. Comparisons of vacuum enhanced LNAPL recovery systems and conventional, or non-vacuum enhanced systems, indicate that initially vacuum enhanced systems recover more LNAPL than conventional systems. However, over time the recovery rate of a vacuum enhanced system will decrease and approach the LNAPL recovery rate of the conventional system. Based on the 85 percent decrease in the annual recovery rate since 1998, it appears that continued vacuum enhanced recovery may not be significantly more effective than conventional recovery.

As a result, it is recommended that the vacuum enhanced and vapor recovery component of the system be shut down. Furthermore, since most of the LNAPL is recovered in slugs during periods of low water table elevation it is recommended that the LNAPL be hand bailed from the recovery wells. Hand bailing would recover the LNAPL that accumulates in the recovery wells and would eliminate the high cost of product pump maintenance. LNAPL could be bailed quarterly with several additional bailing events conducted throughout the year during periods of low water table elevation and/or low rainfall.

3.3 VAPOR RECOVERY AND TREATMENT SYSTEM

3.3.1 System Operation

The vapor recovery system recovered the equivalent of 158 gallons of vapor phase LNAPL in 2000, the third year of remedial system operation. However, this estimate is based on measurements of extracted soil vapor using a photoionization detector (PID) in the field. This method of measurement is intended for qualitative and not quantitative purposes. Therefore, this data and the estimate of vapor phase LNAPL recovery must be used appropriately. The amount of LNAPL recovered from the vapor phase has increased slightly from the first two years of operation (133-gal recovered in 1998, 137-gal recovered in 1999, and 158-gallons recovered in 2000).

The vapor recovery system complied with the requirements of the air discharge permit the entire operating period. The discharge permit requires a minimum chamber temperature of 1410° F and a maximum effluent concentration of 300 ppm. Results of the monitoring of these system parameters are included in Table 3-1.

3.3.2 Recommendations

As discussed in Section 3.2.2, vacuum enhanced recovery may no longer be more effective than conventional or non-vacuum enhanced LNAPL recovery. Therefore, it is recommended that the vapor recovery system be shut down as discussed in Section 3.2.2.

3.4 PROJECTED ANNUAL OPERATION COSTS

The projected annual operating costs for the remediation system are based on the actual operation and maintenance costs for 1999 and 2000. The activities covered under the projected operating costs include:

- Biweekly O&M site visits.
- Monthly Before, Between, and Effluent samples from the ground-water treatment system (36 samples per year) analyzed for BTEX and Naphthalene.
- Quarterly gauging of all site wells.
- Four unscheduled site visits.
- Monthly system operation reports.
- A yearly System Performance Report.
- Disposal of 500 gallons of LNAPL a year.
- Two change-outs of the carbon vessels.
- Propane supply for a year.

The cost for these tasks is estimated at $90,000. However, shutting down the vapor recovery and treatment system and operating the LNAPL recovery system under conventional or non-vacuum enhanced conditions could save 20-30 percent. These cost savings would result from eliminating the cost associated with providing propane as an auxiliary fuel source for the thermal oxidizer.

FIGURE 3-1. INFLUENT BENZENE CONCENTRATIONS vs TIME 1998 TO 2000 NASJRB WILLOW GROVE NAVY FUEL FARM

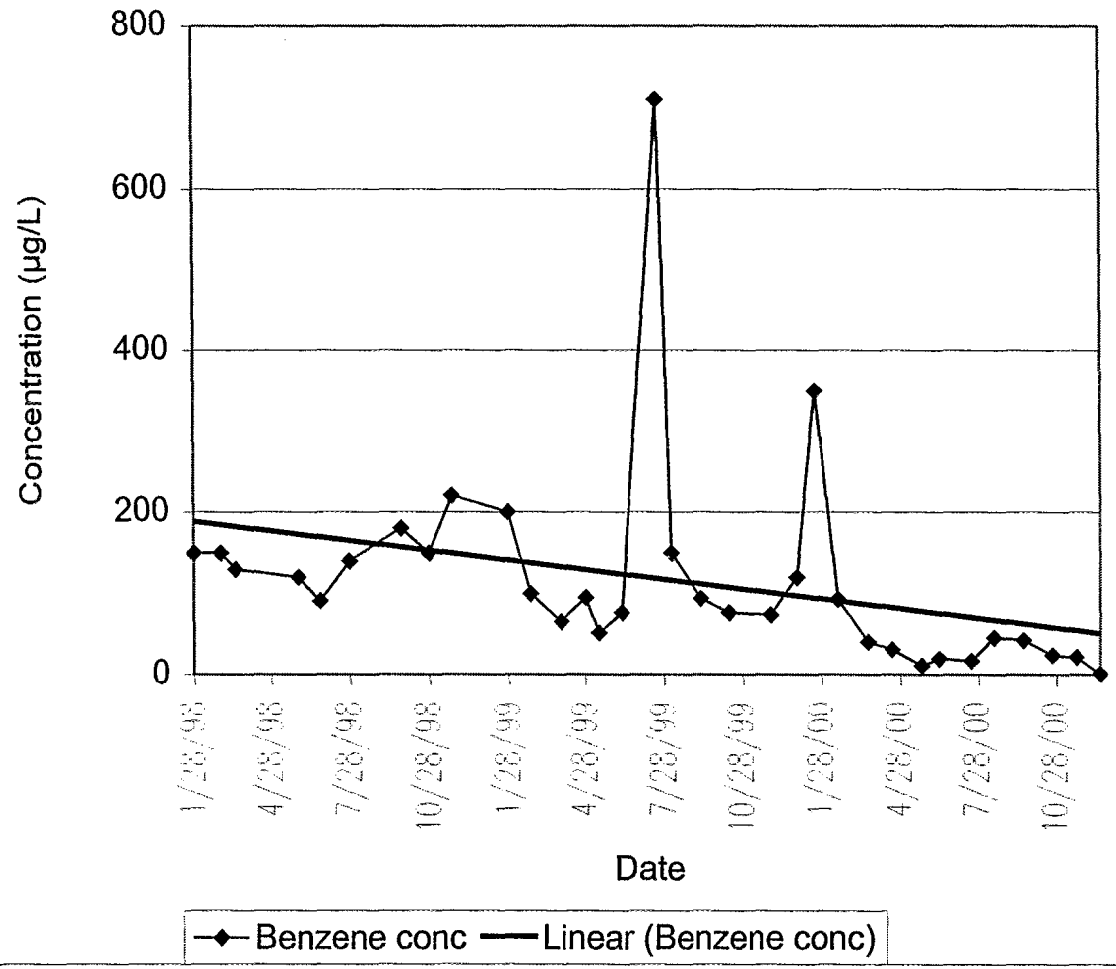


FIGURE 3-2 TOTAL QUARTERLY LNAPL RECOVERY FOR 2000 VACUUM ENHANCED LNAPL AND GROUND-WATER RECOVERY AND TREATMENT SYSTEM NAVY FUEL FARM, NAVAL AIR STATION JOINT RESERVE BASE WILLOW GROVE, HORSHAM TOWNSHIP, PENNSYLVANIA

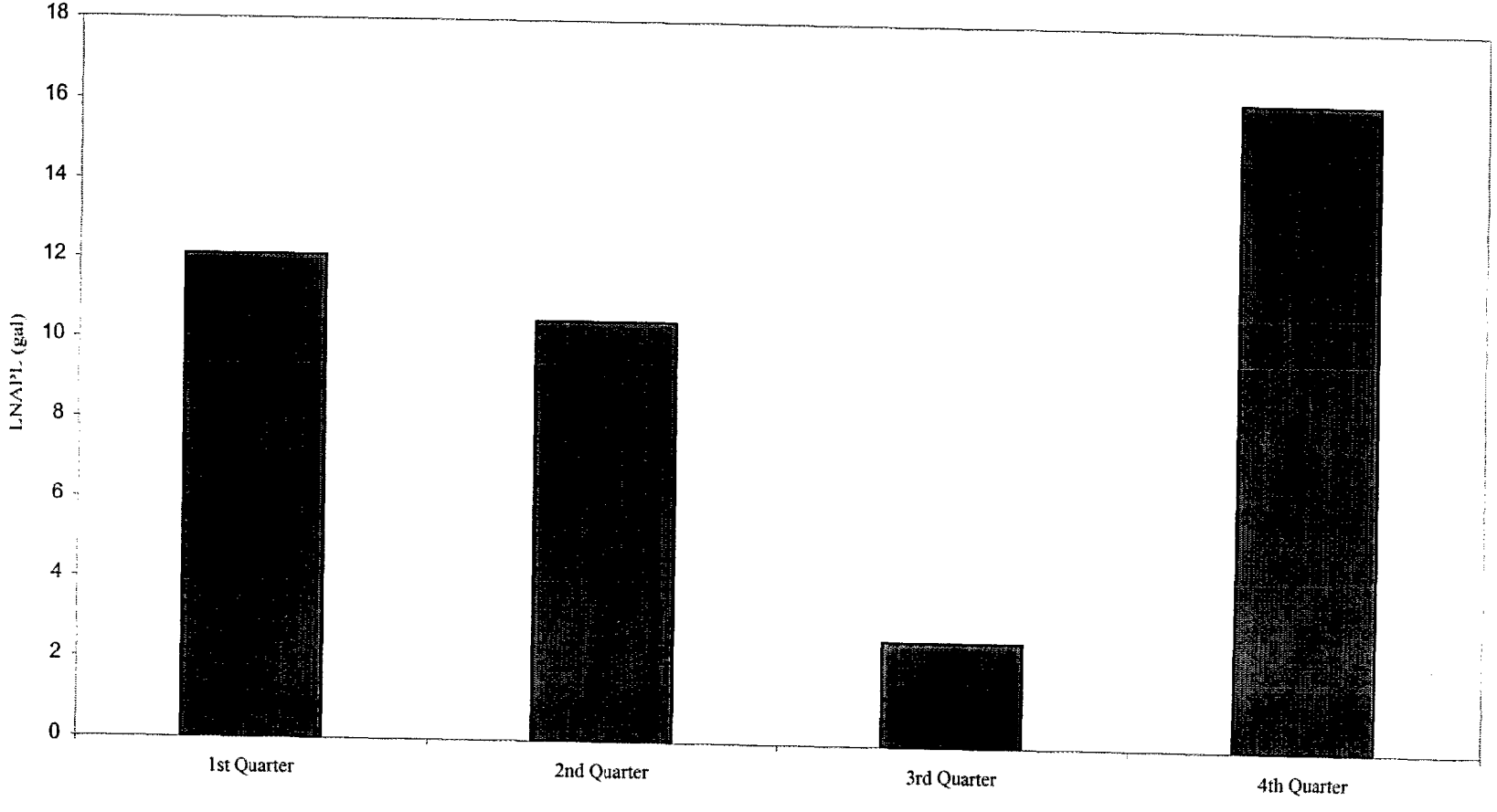


FIGURE 3-3 QUARTERLY LNAPL RECOVERY FROM INDIVIDUAL WELLS FOR 2000
VACUUM ENHANCED LNAPL AND GROUND-WATER RECOVERY AND TREATMENT SYSTEM NAVY
FUEL FARM, NAVAL AIR STATION JOINT RESERVE BASE
WILLOW GROVE, HORSHAM TOWNSHIP, PENNSYLVANIA

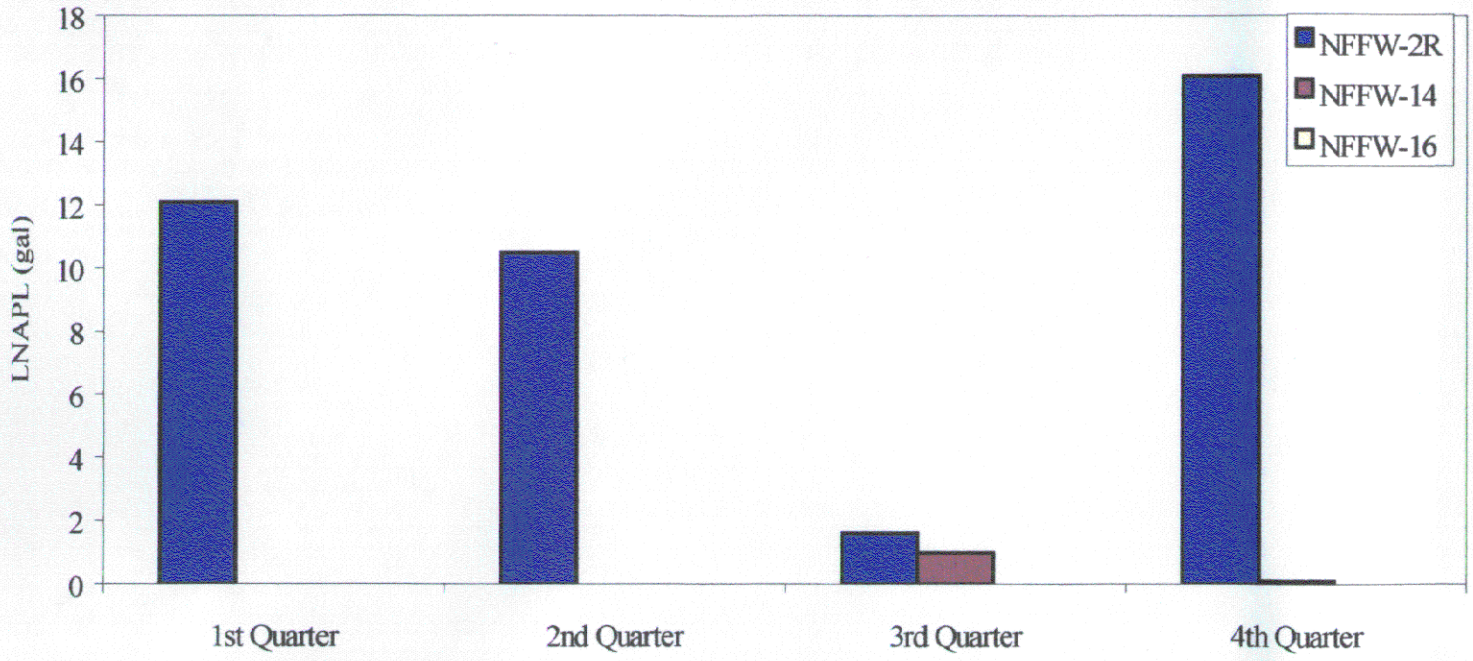


FIGURE 3-4 LNAPL RECOVERY FROM
VACUUM ENHANCED LNAPL AND GROUND-WATER RECOVERY AND TREATMENT SYSTEM
NAVY FUEL FARM, NAVAL AIR STATION JOINT RESERVE BASE
WILLOW GROVE, HORSHAM TOWNSHIP, PENNSYLVANIA

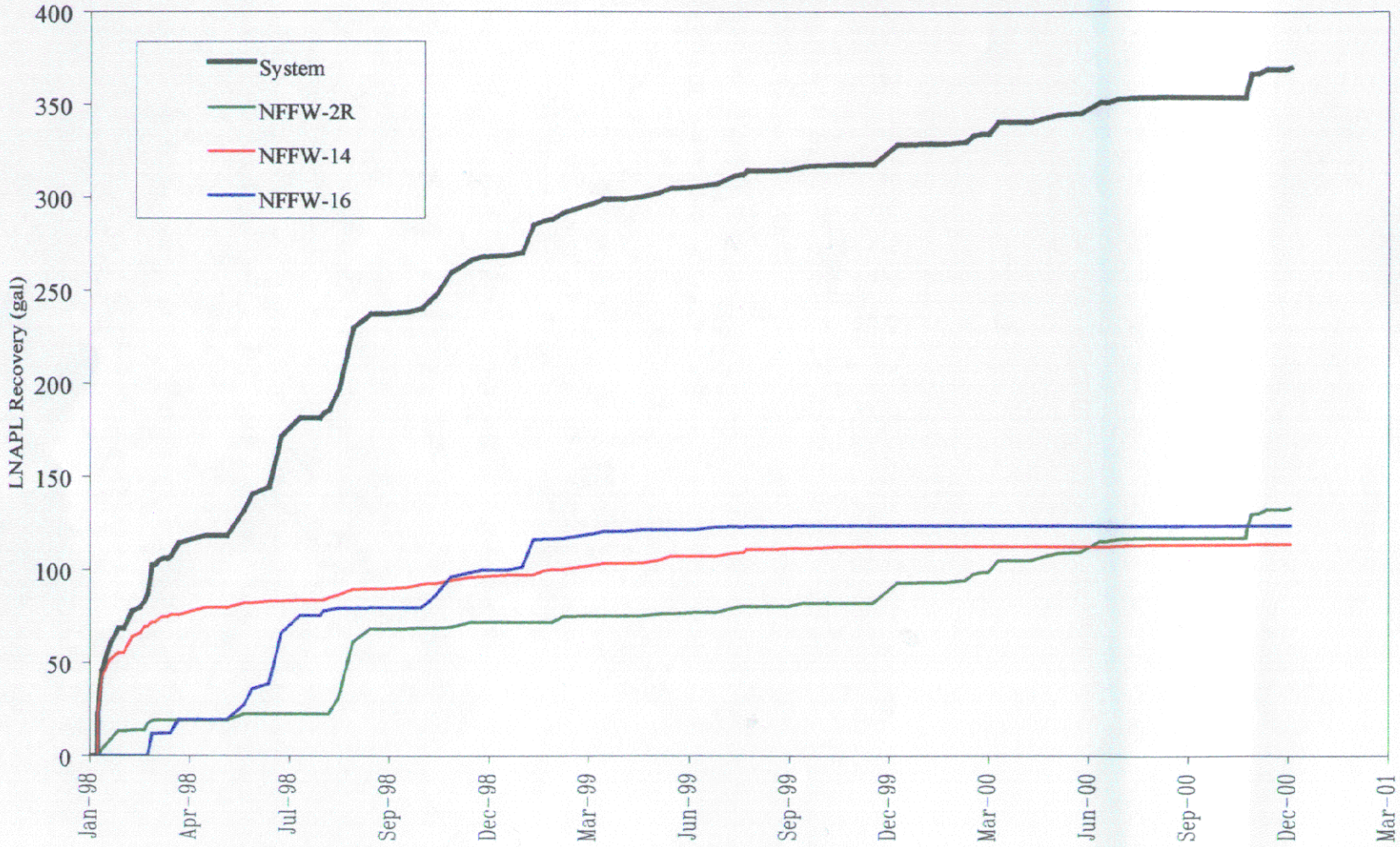


TABLE 3-1 SYSTEM REPORT ON VACUUM ENHANCED LNAPL AND GROUND WATER RECOVERY AND TREATMENT SYSTEM
NAVY FUEL FARM, NAVAL AIR STATION JOINT RESERVE BASE
WILLOW GROVE, HORSHAM TOWNSHIP, PENNSYLVANIA

	NFFW-2R					NFFW-14					NFFW-16						Thermal -Oxidizer		Product Recovery			
	Ground-Water System			VER System		Ground-Water System			VER System		Ground-Water System			VER System		System						
Date	Product Recovered Total (gal)	Product Recovered gpd (avg.)	Ground-Water Recovered Gpm	Vacuum (psia)	Flow (SCFM)	Product Recovered Total (gal)	Product Recovered gpd (avg.)	Ground-Water Recovered gpm	Vacuum (psia)	Flow (SCFM)	Product Recovered Total (gal)	Product Recovered gpd (avg.)	Ground-Water Recovered gpm	Vacuum (psia)	Flow (SCFM)		Chamber Temperature (F)	Effluent Concentration (ppmv)	LNAPL All Wells (gal)	Vapor Phase All Wells (gal)	Dissolved Phase All Wells (gal)	Total All Wells (gal)
12/30/99	92.75	0.49	1.6	14.70	0.0	112.34	0.00	1.2	14.70	0.0	123.38	0.00	1.00	14.70	0.0	4226940	0	-	328.47	270.09	1.57	600.12
01/06/00	92.75	0.00	1.4	8.80	7.4	112.34	0.00	4.4	14.70	0.0	123.38	0.00	1.10	14.70	0.0	4267780	1410	-	328.47	270.09	1.60	600.15
01/13/00	92.75	0.00	-	-	-	112.34	0.00	-	-	-	123.38	0.00	-	-	-	4267780	0	-	328.47	270.09	1.60	600.15
01/20/00	92.95	0.03	1.5	10.77	12.9	112.34	0.00	2.0	14.70	0.0	123.38	0.00	1.00	10.77	9.9	4347383	1410	3.2	328.67	278.40	1.91	608.98
02/11/00	92.95	0.00	1.5	11.26	12.7	112.34	0.00	1.6	14.70	0.0	123.38	0.00	1.00	11.26	9.0	4423720	1410	2.9	328.67	285.30	1.96	615.93
02/29/00	94.15	0.07	4.5	7.50	9.6	112.34	0.00	0.0	12.24	11.2	123.38	0.00	1.90	14.70	0.0	4496840	1410	-	329.87	294.69	2.01	626.56
03/07/00	97.45	0.47	2.8	11.01	16.5	112.34	0.00	2.8	14.70	0.0	123.38	0.00	1.80	14.70	0.0	4566820	1410	-	333.17	298.53	2.05	633.75
03/15/00	98.55	0.14	9.1	10.77	11.5	112.34	0.00	0.0	14.70	0.0	123.38	0.00	1.40	14.70	0.0	4577580	1410	-	334.27	299.44	2.06	635.77
03/21/00	98.55	0.00	-	-	-	112.34	0.00	-	-	-	123.38	0.00	-	-	-	4577580	0	-	334.27	299.44	2.06	635.77
03/30/00	104.85	0.70	3.4	11.26	14.4	112.34	0.00	1.3	14.70	0.0	123.38	0.00	0.90	14.70	0.0	4725080	1411	5.4	340.57	308.45	2.11	651.13
04/18/00	104.85	0.00	3.8	9.29	17.5	112.34	0.00	3.1	14.70	0.0	123.38	0.00	2.20	14.70	0.0	4881320	1410	2.7	340.57	314.47	2.16	657.20
04/28/00	104.95	0.01	2.1	9.78	18.5	112.34	0.00	0.9	14.70	0.0	123.38	0.00	1.70	14.70	0.0	4962210	1410	9.6	340.67	318.88	2.18	661.72
05/10/00	106.95	0.17	-	10.28	10.3	112.34	0.00	0.1	14.70	0.0	123.38	0.00	0.60	14.70	0.0	4962490	1410	4.3	342.67	327.13	2.18	671.97
05/23/00	108.85	0.15	-	-	-	112.34	0.00	0.9	14.70	0.0	123.38	0.00	1.70	14.70	0.0	4988200	0	-	344.57	329.40	2.19	676.16
06/12/00	109.45	0.03	2.4	9.78	14.9	112.34	0.00	0.0	14.70	0.0	123.38	0.00	0.10	14.70	0.0	5018210	1410	-	345.17	329.40	2.20	676.77
06/30/00	115.35	0.33	0.0	10.77	11.5	112.34	0.00	0.0	14.70	0.0	123.38	0.00	0.00	14.70	0.0	5034050	1410	3.3	351.07	334.22	2.20	687.49
07/06/00	115.35	0.00	0.0	10.52	-	112.34	0.00	0.0	14.70	0.0	123.38	0.00	0.00	14.70	0.0	5034090	1410	6.7	351.07	335.90	2.20	689.17
07/16/00	116.55	0.12	25.0	14.70	-	112.84	0.05	0.1	14.70	0.0	123.38	0.00	0.40	14.70	0.0	5050240	0	-	352.77	335.90	2.20	690.87
07/26/00	116.75	0.02	0.9	14.20	10.8	112.94	0.01	0.5	14.70	0.0	123.38	0.00	1.50	14.70	0.0	5064150	1410	8.6	353.07	337.67	2.21	692.95
07/28/00	116.75	0.00	-	14.70	0.0	113.04	0.05	0.1	11.75	24.1	123.38	0.00	0.80	14.70	0.0	5073310	1410	-	353.17	340.69	2.21	696.06
08/04/00	116.85	0.01	2.4	14.70	0.0	113.14	0.01	2.9	10.77	20.0	123.38	0.00	1.60	14.70	0.0	5099330	1410	-	353.37	345.92	2.21	701.49
08/08/00	116.85	0.00	3.4	14.70	0.0	113.14	0.00	0.1	11.99	23.3	123.38	0.00	0.90	14.70	0.0	5137070	1410	-	353.37	347.87	2.21	703.45
08/15/00	116.95	0.01	3.8	12.49	20.3	113.24	0.01	0.1	14.70	0.0	123.38	0.00	0.40	14.70	0.0	5180990	1410	3.3	353.57	348.37	2.23	704.17
08/22/00	116.95	0.00	2.0	12.49	19.0	113.34	0.01	2.3	14.70	0.0	123.38	0.00	1.20	14.70	0.0	5224920	1410	-	353.67	353.82	2.25	709.73
08/28/00	116.95	0.00	2.3	12.49	-	113.34	0.00	2.8	14.70	0.0	123.38	0.00	0.40	14.70	0.0	5267440	1410	-	353.67	359.59	2.26	715.51
09/08/00	116.95	0.00	0.8	13.22	13.8	113.34	0.00	0.1	14.70	0.0	123.38	0.00	0.40	14.70	0.0	5320040	1410	11.6	353.67	365.57	2.28	721.52
09/19/00	116.95	0.00	0.5	12.98	14.6	113.34	0.00	0.1	14.70	0.0	123.38	0.00	0.10	14.70	0.0	5360440	1410	4.6	353.67	372.80	2.29	728.76
09/25/00	116.95	0.00	2.0	14.70	0.0	113.34	0.00	0.1	12.24	18.1	123.38	0.00	0.10	14.70	0.0	5390520	1410	6.4	353.67	375.94	2.29	731.90
10/06/00	116.95	0.00	1.9	14.70	0.0	113.34	0.00	0.2	12.24	16.6	123.38	0.00	0.20	14.70	0.0	5390520	1410	-	353.67	378.06	2.29	734.02
10/11/00	116.95	0.00	2.7	14.70	0.0	113.34	0.00	0.2	-	-	123.38	0.00	1.70	14.70	0.0	5415350	0	-	353.67	378.06	2.30	734.02
10/12/00	116.95	0.00	2.6	14.70	0.0	113.34	0.00	0.5	11.01	19.6	123.38	0.00	1.10	14.70	0.0	5423160	1410	-	353.67	378.12	2.30	734.08
10/19/00	116.95	0.00	2.3	14.70	0.0	113.34	0.00	2.0	10.77	17.6	123.38	0.00	1.40	14.70	0.0	5476160	1410	-	353.67	382.66	2.31	738.63
10/26/00	116.95	0.00	-	-	-	113.34	0.00	-	-	-	123.38	0.00	-	-	-	5476160	0	-	353.67	382.66	2.31	738.63
11/03/00	116.95	0.00	1.6	14.70	0.0	113.34	0.00	0.8	11.26	-	123.38	0.00	2.90	14.70	0.0	5544870	1410	-	353.67	392.82	2.32	748.81
11/08/00	116.95	0.00	1.5	14.70	0.0	113.34	0.00	0.5	11.26	19.3	123.38	0.00	2.40	14.70	0.0	5559820	1410	-	353.67	395.62	2.32	751.61
11/09/00	121.45	4.50	1.5	12.24	20.7	113.34	0.00	0.8	14.70	0.0	123.38	0.00	2.10	14.70	0.0	5562520	1410	-	358.17	396.39	2.32	756.88
11/13/00	129.65	2.05	1.8	12.73	14.5	113.44	0.02	0.8	14.70	0.0	123.38	0.00	1.50	14.70	0.0	5574000	1410	-	366.47	398.94	2.32	767.73
11/20/00	130.05	0.06	2.3	12.98	17.1	113.44	0.00	2.3	14.70	0.0	123.38	0.00	1.70	14.70	0.0	5593530	1410	-	366.87	403.63	2.33	772.82
11/27/00	132.15	0.30	1.4	12.73	20.5	113.44	0.00	0.7	14.70	0.0	123.38	0.00	1.80	14.70	0.0	5610080	1410	6.8	368.97	409.50	2.33	780.80
12/04/00	132.15	0.00	1.7	13.22	19.5	113.44	0.00	1.0	14.70	0.0	123.38	0.00	1.40	14.70	0.0	5628150	1410	11.2	368.97	417.97	2.34	789.27
12/15/00	132.25	0.01	3.1	12.73	16.2	113.44	0.00	1.9	14.70	0.0	123.38	0.00	2.70	14.70	0.0	5656230	1410	7.7	369.07	428.07	2.35	799.48
12/18/00	133.05	0.27	2.0	12.73	17.0	113.44	0.00	1.2	14.70	0.0	123.38	0.00	1.10	14.70	0.0	5664430	1410	-	369.87	428.07	2.37	800.31

Notes: VER - Vapor Enhanced Product Recovery.
- Indicates data is not available.

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TABLE 3-2 SUMMARY OF ANALYTICAL RESULTS FOR GROUND-WATER SAMPLES COLLECTED AT NAVY FUEL FARM, NAVAL AIR STATION JOINT RESERVE BASE WILLOW GROVE, HORSHAM TOWNSHIP, PENNSYLVANIA JANUARY 2000 - DECEMBER 2000

Location	Date	Benzene (µg/l)	Toluene (µg/l)	Ethylbenzene (µg/l)	Total Xylenes (µg/l)	Total BTEX (µg/l)	Naphthalene (µg/l)
	PADEP MSC	5	1000	700	10000	-	20
Influent	01/20/00	**350 D**	**1200 D**	620 D	590 D	2760	**650 D**
	02/16/00	**93 D**	ND	230 D	38 D	361	**210 D**
	03/21/00	**41 D**	ND	100 D	23 D	164	**150 D**
	04/18/00	**31**	ND	100	13	144	110
	05/23/00	**11**	ND	ND	ND	11	ND
	06/12/00	**20 D**	ND	68 D	18 D	106	**150 D**
	07/20/00	**17**	ND	2	4	23	**42**
	08/15/00	**46**	2	140	22	210	**130**
	09/19/00	**43**	ND	ND	ND	43	**100**
	10/23/00	**24 D**	ND	17 D	5 D	46	**89 D**
	11/20/00	**22**	2	69	6	99	**150**
	12/18/00	ND	ND	460 *I	14 *I	600 *I	**2100 *I**
Between	01/20/00	NS	NS	NS	NS	NS	NS
	02/16/00	ND	ND	ND	ND	ND	ND
	03/21/00	ND	ND	ND	ND	ND	ND
	04/18/00	ND	ND	ND	ND	ND	ND
	05/23/00	ND	ND	ND	ND	ND	ND
	06/12/00	ND	ND	ND	ND	ND	ND
	07/20/00	ND	ND	ND	ND	ND	ND
	08/15/00	ND	ND	ND	ND	ND	ND
	09/19/00	ND	ND	ND	ND	ND	ND
	10/23/00	1	ND	ND	ND	1	ND
	11/20/00	4	ND	ND	ND	4	ND
	12/18/00	2.9	ND	ND	ND	2.9	ND
Effluent	01/20/00	ND	3	ND	2	5	ND
	02/16/00	ND	ND	ND	ND	ND	ND
	03/21/00	ND	ND	ND	ND	ND	ND
	04/18/00	ND	ND	ND	ND	ND	ND
	05/23/00	ND	ND	ND	ND	ND	ND
	06/12/00	ND	ND	ND	ND	ND	ND
	07/20/00	ND	ND	ND	ND	ND	ND
	08/15/00	ND	ND	ND	ND	ND	ND
	09/19/00	ND	ND	ND	ND	ND	ND
	10/23/00	ND	ND	ND	ND	ND	ND
	11/20/00	ND	ND	ND	ND	ND	ND
	12/18/00	ND	ND	ND	ND	ND	ND

Note: ND = Analyte not detected *I = Estimated value due to hydrocarbon interference
NS = Analyte not sampled D = Sampled was diluted before analyses
PADEP MSC = Pennsylvania medium specific concentration for ground water; statewide health standard.

4. CONCLUSIONS

The remedial action objective for the Navy Fuel Farm is LNAPL recovery. Operational data was reviewed to assess the effectiveness of the Vacuum Enhanced LNAPL Recovery and Ground-Water Recovery and Treatment System. The following conclusions have been made through an examination of the performance of the remediation system:

- System operation has developed a cone of depression around the recovery wells and the system has captured and recovered LNAPL.
- Approximately 41-gal of LNAPL was recovered in 2000.
- LNAPL recovery has decreased significantly (85 percent) since 1998.
- In 2000, most of the LNAPL (68 percent) was recovered during periods of low water table elevation and/or low rainfall.
- Recoverable amounts of LNAPL remain in the subsurface.
- Vacuum enhanced LNAPL recovery may no longer be cost effective at this site.

Based on the conclusions listed above, continued LNAPL recovery is appropriate. However, after 3 years of operation it is likely that the advantages of vacuum enhanced recovery are no longer being realized. Furthermore, future remedial efforts at this site should be conducted in accordance with Pennsylvania's Land Recycling Program (25 Pa Code 250), more commonly known as Act 2. Therefore, based on operational data and regulatory requirements, the following actions are recommended:

- Suspend operation of vacuum-enhanced recovery by shutting down the vapor recovery and treatment system.

- Collect ground-water samples from site monitoring wells and analyze for VOC to document current conditions.

- Continue LNAPL recovery via water table depression and hand bailing on a quarterly basis with several additional bailing events conducted during periods of low water table elevation and/or rainfall.

- Pursue site remediation/closure under Act 2 with PADEP.

These recommendations will minimize expenditures while the requirements for additional remedial actions under Act 2 are assessed.

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APPENDIX A

GAUGING DATA

Notes:

- indicates that data is not available.

* indicates that the product meters ran backwards due to the vacuum on the well. No product recovery information is available for this period.

Well ID: **NFFW-1**
TOC: **311.18** ft amsl
Ground: **309.78** ft amsl
Depth of Well: **28.88** ft bgs
Depth to Screen **8.88** ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)	Total LNAPL Recovered (gal)	Comments
03/30/94	-	11.60	0.00	299.58	-	-	Lock 2C22 is rusty
04/04/94	-	11.90	0.00	299.28	-	-	
04/06/94	-	12.12	0.00	299.06	-	-	
04/07/94	-	12.30	0.00	298.88	-	-	
04/12/94	-	12.83	0.00	298.35	-	-	
04/20/94	-	13.04	0.00	298.14	-	-	
04/27/94	-	13.31	0.00	297.87	-	-	
05/04/94	-	14.17	0.00	297.01	-	-	
05/12/94	-	14.20	0.00	296.98	-	-	
05/13/94	-	14.27	0.00	296.91	-	-	
05/16/94	-	14.54	0.00	296.64	-	-	
05/24/94	-	15.35	0.00	295.83	-	-	
05/27/94	-	15.60	0.00	295.58	-	-	
06/03/94	-	16.35	0.00	294.83	-	-	
06/15/94	17.20	17.21	0.00	293.98	-	-	
06/16/94	17.29	17.30	0.01	293.89	-	-	
07/01/94	19.11	19.16	0.05	292.06	-	-	
07/13/94	20.92	21.10	0.18	290.24	0.25	0.25	Bailed 0.25 gal
08/05/94	-	17.42	0.00	293.76	-	0.25	
08/17/94	-	17.68	0.00	293.50	-	0.25	
08/30/94	-	16.20	0.00	294.98	-	0.25	
09/08/94	-	16.46	0.00	294.72	-	0.25	
09/14/94	-	17.07	0.00	294.11	-	0.25	
09/19/94	-	17.53	0.00	293.65	-	0.25	
09/30/94	-	17.88	0.00	293.30	-	0.25	Odor
10/17/94	20.27	20.33	0.06	290.90	-	0.25	
10/25/94	21.42	21.56	0.14	289.74	-	0.25	
11/11/94	23.20	23.55	0.35	287.93	-	0.25	
11/22/94	23.22	23.56	0.34	287.92	-	0.25	
12/07/94	21.19	21.46	0.27	289.95	-	0.25	
12/21/94	19.46	19.70	0.24	291.69	-	0.25	
01/04/95	19.32	19.48	0.16	291.84	-	0.25	
01/16/95	17.79	17.88	0.09	293.38	-	0.25	
01/23/95	-	16.87	0.00	294.31	-	0.25	
02/16/95	-	16.94	0.00	294.24	-	0.25	
02/28/95	-	15.96	0.00	295.22	-	0.25	
03/10/95	-	14.80	0.00	296.38	-	0.25	
03/29/95	-	14.84	0.00	296.34	-	0.25	
04/04/95	-	15.24	0.00	295.94	-	0.25	
04/27/95	-	16.49	0.00	294.69	-	0.25	
05/11/95	-	16.50	0.00	294.68	-	0.25	
05/24/95	-	16.85	0.00	294.33	-	0.25	
06/15/95	-	17.35	0.00	293.83	-	0.25	
06/29/95	-	18.11	0.00	293.07	-	0.25	Sheen
07/06/95	-	18.90	0.00	292.28	-	0.25	
07/25/95	20.01	20.02	0.01	291.17	-	0.25	
08/01/95	20.34	20.43	0.09	290.83	-	0.25	
08/21/95	23.10	23.42	0.32	288.04	-	0.25	
09/14/95	24.08	24.18	0.10	287.09	-	0.25	
09/28/95	22.55	22.65	0.10	288.62	-	0.25	
10/06/95	21.08	21.14	0.06	290.09	-	0.25	
10/25/95	-	16.17	0.00	295.01	-	0.25	
11/21/95	-	12.87	0.00	298.31	-	0.25	
12/08/95	-	14.11	0.00	297.07	-	0.25	

Well ID: **NFFW-1**
TOC: **311.18** ft amsl
Ground: **309.78** ft amsl
Depth of Well: **28.88** ft bgs
Depth to Screen **8.88** ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)	Total LNAPL Recovered (gal)	Comments
12/21/95	-	14.15	0.00	297.03	-	0.25	
01/23/96	-	12.98	0.00	298.20	-	0.25	
02/09/96	-	12.02	0.00	299.16	-	0.25	
02/19/96	-	13.25	0.00	297.93	-	0.25	
01/09/98	-	14.79	0.00	296.39	-	0.25	New System Started
01/13/98	-	14.76	0.00	296.42	-	0.25	
02/20/98	-	13.57	0.00	297.61	-	0.25	
02/27/98	-	12.87	0.00	298.31	-	0.25	
03/16/98	-	13.03	0.00	298.15	-	0.25	
05/21/98	-	14.58	0.00	296.60	-	0.25	
08/14/98	-	19.24	0.00	291.94	-	0.25	
10/14/98	-	19.63	0.00	291.55	-	0.25	
12/21/98	23.85	23.97	0.12	287.11	-	0.25	
01/13/99	21.29	21.30	0.01	289.87	-	0.25	
05/28/99	-	18.77	0.00	292.41	-	0.25	
10/07/99	-	15.00	0.00	296.18	-	0.25	
02/11/00	-	11.67	0.00	299.51	-	0.25	
08/15/00	13.01	13.02	0.01	298.15	-	0.25	
10/26/00	-	16.68	0.00	294.50	-	0.25	

Well ID:	**NFFW-2R**	(Recovery Well)
TOC:	**313.97**	ft amsl
Ground:	**312.53**	ft amsl
Depth of Well:	**35.50**	ft bgs
Depth to Screen	**5.50**	ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Pressure Transducer	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)		Total LNAPL Recovered (gal)	Ground-water Flow Rate (gpm)	Ground-water Recovered (gal)	Vacuum at Vault (psia)	Flow Rate (SCFM)	Concentration (ppmv)	Comments
03/30/94	-	12.58	0.00		302.57	-		-		-				START WELL @ 1600
03/31/94	-	13.50	0.00		301.65	-		0.00	1.25	0				1400 HOURS, PUMP AT 13.5 FT
04/04/94	-	13.50	0.00		301.65	-		0.00	-	-				NEED TO RESURVEY WELL
04/04/94	24.40	24.70	0.30		290.71	-		0.00	5.00	7122				1400 HOURS, PUMP RESET AT 17.5 FT
07/04/94	-	17.50	0.00		297.65	-		0.00		-				1100 HOURS
07/04/94	-	19.50	0.00		295.65	-		0.00	4.50	12212				
04/12/94	-	20.08	0.00		295.07	0.57		0.57	6.00	42122				Lowered pump to approx 21.72 ft
04/20/94	-	16.73	0.00		298.42	-		0.57	0.00	87452				Pump not running
04/27/94	-	15.25	0.00		299.90	0.28		0.85	6.00	89052				Lowered pump 1.5 ft
05/04/94	-	16.75	0.00		298.40	-		0.85	4.00	94562				lowered pump about 1 ft to 18.2 ft
05/12/94	16.00	16.02	0.02		299.15	-		0.85	0.00	97329				SYSTEM ALARM LIGHT ON, PUMPS OFF
05/13/94	16.23	16.25	0.02		298.92	-		0.85	0.00	-				1130 HRS, PUMPS TURNED BACK ON
05/13/94	23.50	23.52	0.02		291.65	-		0.85	-	97402				1300 HRS
05/16/94	24.21	24.23	0.02		290.94	42.48		43.33	2.50	108562				1205 HRS
05/24/94	24.19	27.08	2.89		290.58	34.68		78.01		18937				
05/27/94	27.41	27.42	0.01		287.74	92.98		170.99	1.00	131602				1200 hours
06/03/94	-	26.75	0.00		288.40	44.76		215.75	1.17	143542				1300 hrs, Product pump turned on, vacuum enhanced tested for 2 hours
06/07/94	-	-	-		-	-		215.75	1.71	148159				1650 hrs; 7.5" Hg vacuum
06/07/94	-	-	-		-	-		215.75	-	148162				1710 hrs; Decreased vacuum to 2.5" Hg
06/07/94	-	-	-		-	-		215.75	-	148162				1710 hrs
06/07/94	-	-	-		-	-		215.75	-	148182				1735 hrs
06/07/94	-	-	-		-	-		215.75	0.60	148188				1745 hrs
06/07/94	-	-	-		-	-		215.75	1.36	148222				1810 hrs
06/07/94	-	-	-		-	19.21		234.96	1.00	148232				1820 hrs
06/07/94	-	-	-		-	10.53		245.49	0.67	148242				1835 hrs
06/07/94	-	-	-		-	-		245.49	1.17	148277				1905 hrs
06/08/94	26.93	26.94	0.01		288.22	14.28		259.77	0.90	148961				0745 hrs
06/08/94	-	-	-		-	-		259.77	0.90	149185				1200 hrs
06/15/94	23.53	23.72	0.19		291.60	2.60		262.37	-	150232				1210 hrs; Turn on vacuum enhanced system
06/15/94	-	-	-		-	-		262.37	2.10	150247				1217 hrs; approx 4" Hg vacumm
06/15/94	-	-	-		-	-		262.37	3.50	150254				1219 hrs
06/15/94	-	-	-		-	-		262.37	0.75	150257				1223 hrs
06/15/94	-	-	-		-	-		262.37	2.30	150264				1226 hrs
06/15/94	-	-	-		-	-		262.37	2.06	150303				1245 hrs
06/15/94	-	-	-		-	-		262.37	1.39	150407				1400 hrs; shut off vacuum system at 1510
06/16/94	-	26.60	0.00		288.55	5.55		267.92	0.52	151026				0948 hrs; Started vacuum at 4" Hg
06/16/94	-	-	-		-	-		267.92	0.42	151031				1000 hrs
06/16/94	-	-	-		-	-		267.92	1.17	151038				1006 hrs
06/16/94	-	-	-		-	-		267.92	3.10	151044				1015 hours
06/16/94	-	-	-		-	-		267.92	1.20	151062				1030 hours
06/16/94	-	-	-		-	-		267.92	0.73	151073				1045 hours
06/20/94	-	-	-		-	12.52		280.44	0.28	152666				1030 hrs
06/21/94	-	-	-		-	4.92		285.36	0.17	152910				1040 hrs; Reconfigure system to place moisture trap before carbon
06/21/94	-	-	-		-	-		285.36	0.11	152941				1515 hrs; Start up vacuum enhanced system at 3" Hg; New air carbons
06/21/94	-	-	-		-	-		285.36	0.27	152956				1610 hrs; 99.5% treatment after 1st carbon-100% after 2nd carbon

Well ID.	**NFFW-2R**	(Recovery Well)
TOC:	**313.97**	ft amsl
Ground:	**312.53**	ft amsl
Depth of Well:	**35.50**	ft bgs
Depth to Screen	**5.50**	ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Pressure Transducer	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)		Total LNAPL Recovered (gal)	Ground-water Flow Rate (gpm)	Ground-water Recovered (gal)	Vacuum at Vault (psig)	Flow Rate (SCFM)	Concentration (ppmv)	Comments
06/21/94	-	-	-		-	-		285.36	0.23	153006				1340 hrs, 87% removal after 1st carbon; 99.5% after 2nd carbon
06/22/94	-	-	-		-	-		285.36	-	153062				0800 hrs; System shut down - water over ride; restart at 3" Hg
06/22/94	25.60	28.25	2.75		289.29	9.81		295.17	-	153086				0930 hrs; Water over ride restart at 2.5" Hg; 8% removal after 1st carbon, 48% after 2nd
06/22/94	-	-	-		-	-		295.17	0.40	153100				1005 hrs; 17% removal after 1st carbon, 46% after 2nd
06/22/94	-	26.40	0.00		288.75	6.52		301.69	-	153109				1320 hrs
06/24/94	-	-	-		-	-		301.69	0.18	153502				0040 hrs; 4% removal after 1st carbon, 12.5% after 2nd
06/24/94	-	27.10	0.00		288.05	9.74		311.43	0.01	153568				0845 hours; turn vacuum enhaced system off continue recovery under normal conditions
07/01/94	27.19	28.65	1.46		287.77	-		311.43		153558				
07/13/94	32.05	33.28	1.23		282.94	-		311.43		153558				
07/13/94	32.05	33.28	1.23		282.94	8.45		319.88		153558				After bailing monitoring wells
08/05/94	22.95	23.63	0.68		292.11	-		319.88		153558				
08/05/94	22.95	23.63	0.68		292.11	-		319.88		153558				After bailing monitoring wells
08/17/94	22.98	24.47	1.49		291.98	1.16		321.04		153558				
08/17/94	22.98	24.47	1.49		291.98	-		321.04		153558				After bailing monitoring wells
08/30/94	20.08	20.35	0.27		295.03	-		321.04		153558				
09/08/94	19.64	19.73	0.19		295.59	-		321.04		153558				
09/14/94	21.15	21.63	0.48		293.94	-		321.04		153558				
09/19/94	21.07	22.00	0.93		293.96	-		321.04		153558				
09/30/94	22.63	24.00	1.37		292.34	-		321.04		153572				
10/17/94	27.11	33.27	6.16		287.24	-		321.04		153572				
10/25/94	29.95	36.47	6.52		284.35	-		321.04		153572				
11/11/94	33.35	35.30	1.95		281.65	-		321.04		153572				Installed winch lowered pump
11/22/94	-	-	0.00		NG	-		321.04		153572				IFP BROKE DURING GAUGING, NO INFORMATION AVAILABLE
12/07/94	30.08	34.15	4.07		284.54	318.04		639.07		153572				Tank gauged after bailing
12/21/94	25.73	29.26	3.53		288.96	110.74		749.82		153579				Tank Full
12/31/94	-	-	-		NG	45.00		794.82		153579				55 Gal Drum Full
01/04/95	25.12	28.98	3.86		289.53	-		794.82		153582				Tank & Drum Pumped out
01/16/95	24.11	29.11	5.00		290.39	10.95		805.76		153724				
01/23/95	25.12	28.98	3.86		289.53	0.95		806.71		153772				
02/16/95	21.28	23.18	1.90		293.62	0.24		806.95		154047				Replaced carbons
02/28/95	-	23.15	0.00		292.00	6.36		813.30		154167				Pump on overide on arival
03/10/95	-	24.45	0.00		290.70	160.89		974.20		180222				
03/29/95	-	16.24	Sheen		298.91	33.24		1007.44		216109				Pump on overide on arival
04/04/95	-	22.30	0.00		292.85	2.51		1009.95		236537				
04/27/95	-	26.15	0.00		289.00	134.25		1144.20		280732				
05/11/95	26.25	26.28	0.03		288.90	21.35		1165.55		296342				Pump Submurged on arrival
05/24/95	-	26.65	0.00		289.10	38.09		1203.64		318793				
06/15/95	-	27.70	0.00		287.45	61.20		1264.84		344582				Sampled Carbons
06/29/95	23.86	24.76	0.90		291.17	5.98		1270.83		347172				Tank Full
07/06/95	25.35	25.54	0.19		289.78	-		1270.83		347252				Tank Pumped out
07/25/95	25.61	26.45	0.84		289.43	20.31		1291.13		348509				System down
08/01/95	25.82	27.29	1.47		289.14	-		1291.13		348509				System down

Well ID: **NFFW-2R** (Recovery Well)
TOC: **313.97** ft amsl
Ground: **312.53** ft amsl
Depth of Well: **35.50** ft bgs
Depth to Screen **5.50** ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Pressure Transducer	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)		Total LNAPL Recovered (gal)	Ground-water Flow Rate (gpm)	Ground-water Recovered (gal)	Vacuum at Vault (psia)	Flow Rate (SCFM)	Concentration (ppmv)	Comments
08/21/95	-	-	0.00		NG	-		1291.13		348509				Vacuum recovery system running, COULD NOT OPEN
09/14/95	-	Dry	0.00		Dry	-		1291.13		348509				Vacuum recovery system running
09/28/95	29.73	32.59	2.86		285.05	-		1291.13		348509				Vacuum recovery system running
10/06/95	26.55	27.95	1.40		288.42	1.23		1292.37		348509				Vacuum recovery system running
10/18/95	25.75	27.46	1.71		289.18	16.08		1308.44		358462				Vacuum recovery system running
10/25/95	26.62	26.72	0.10		288.52	4.30		1312.75		359305				Vacuum recovery system running
11/21/95	17.60	17.60	Sheen		297.55	-		1312.75		433812				Vac system off
12/08/95	20.71	21.05	0.34		294.40	-		1312.75		515782				
12/21/95	16.23	16.32	0.09		298.91	-		1312.75		534802				
01/23/96	-	14.35	0.00		300.80	-		1312.75		534851				Line Frozen
02/09/96	17.60	17.80	0.20		297.52	-		1312.75		535362				
02/19/96	-	17.00	0.00		298.15	-		1312.75		592952				
01/02/98	-	-	0.00	-	NG	-	999983.70	1312.75	-	-	-	-	-	New System Started
01/09/98	-	15.38	0.00	48.6	298.59	-	999983.70	1312.75	-	-	-	-	-	
01/09/98	26.18	26.30	0.12	36.5	287.57	-	999983.70	1312.75	6.00	-	-	-	-	
01/13/98	-	26.90	0.00	36.0	287.07	3.40	999987.10	1316.15	3.00	-	-	-	-	
01/20/98	-	-	0.00	36.0	NG	4.70	999991.80	1320.85	2.00	-	-	-	-	
01/28/98	-	-	0.00	36.0	NG	5.20	999997.00	1326.05	-	-	-	-	-	
02/02/98	-	-	0.00	-	NG	-	999997.00	1326.05	-	-	-	-	-	
02/09/98	27.36	27.41	0.05	36.0	286.52	0.50	999997.50	1326.55	-	-	-	-	-	
02/16/98	-	-	0.00	36.0	NG	-	999997.50	1326.55	3.30	-	12.4	-	185	
02/20/98	22.80	26.35	3.55	35.9	284.53	-	999997.50	1326.55	3.00	-	12.7	-	535	
02/23/98	-	-	0.00	35.9	NG	3.60	1.10	1330.15	2.80	-	12.5	-	725	
02/27/98	24.98	25.07	0.09	38.3	288.82	1.50	2.60	1331.65	-	-	12.6	-	-	
03/02/98	23.75	23.79	0.04	-	290.15	0.27	2.87	1331.92	-	-	13.0	19.0	-	
03/05/98	22.06	22.16	0.10	42.6	291.72	-	2.87	1331.92	3.70	137	12.2	15.9	486	
03/09/98	23.09	23.45	0.36	40.1	290.21	-	2.87	1331.92	3.80	27305	-	-	-	
03/13/98	17.42	17.45	0.03	47.6	296.49	-	2.87	1331.92	3.70	27809	11.5	12.9	-	
03/16/98	-	18.34	0.00	46.2	295.63	*	994093.00	1331.92	2.10	29999	13.0	11.6	230	Product meter went backwards due to Vacuum at vault/Groundwater pump off
03/23/98	-	-	0.00	-	NG	*	992869.00	1331.92	-	-	12.5	11.3	-	Product meter went backwards due to Vacuum at vault
04/02/98	-	10.74	0.00	53.4	303.23	-	992869.00	1331.92	-	-	12.0	11.1	-	
04/13/98	-	11.02	0.00	52.7	302.95	-	992869.00	1331.92	-	-	13.0	14.6	105	
04/17/98	-	-	0.00	48.8	NG	-	992869.00	1331.92	2.00	29999	13.0	13.7	286	Cleaned screen on product pump/ installed flow meter
04/22/98	-	-	0.00	-	NG	-	992869.00	1331.92	-	-	13.2	12.2	-	
05/05/98	23.97	25.00	1.03	-	288.07	*	992864.80	1331.92	-	-	13.7	14.6	940	
05/21/98	17.40	17.42	0.02	-	296.53	3.30	992868.10	1335.22	-	-	11.5	6.9	190	
05/28/98	-	-	0.00	48.5	NG	0.08	992868.18	1335.30	-	123026	13.2	9.0	-	RW-2R not operating (variable frequency drive)
06/12/98	13.55	13.60	0.05	50.6	300.33	-	992868.18	1335.30	-	123151	13.2	7.4	-	RW-2R not operating (variable frequency drive)
06/23/98	-	14.70	0.00	-	299.27	-	992868.18	1335.30	-	123912	-	-	-	Pulled pump, motor siezed up, still under warranty
07/10/98	15.20	15.21	0.01	48.7	298.75	*	992868.10	1335.30	0.60	123912	14.0	5.4	396	
07/28/98	-	-	0.00	-	NG	-	992868.10	1335.30	-	-	-	-	-	
07/31/98	-	-	0.00	-	NG	-	992868.10	1335.30	-	128313	-	-	-	
08/05/98	-	-	0.00	-	NG	-	992868.10	1335.30	-	-	-	-	-	
08/14/98	20.84	21.91	1.07	-	291.13	8.40	992876.50	1343.70	-	-	14.0	7.6	-	
08/27/98	27.03	27.05	0.02	-	286.90	30.00	992906.50	1373.70	-	-	13.7	9.2	880	

Well ID:	**NFFW-2R**	(Recovery Well)
TOC:	**313.97**	ft amsl
Ground:	**312.63**	ft amsl
Depth of Well:	**35.50**	ft bgs
Depth to Screen	**5.50**	ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Pressure Transducer	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)		Total LNAPL Recovered (gal)	Ground-water Flow Rate (gpm)	Ground-water Recovered (gal)	Vacuum at Vault (psia)	Flow Rate (SCFM)	Concentration (ppmv)	Comments
09/11/98	15.80	15.82	0.02	-	298.13	7.30	992913.80	1381.00	-	-	-	-	-	
09/16/98	-	-	0.00	44.3	NG	-	992913.80	1381.00	0.00	129999	14.0	11.4	-	
09/25/98	-	-	0.00	57.8	NG	-	992913.80	1381.00	3.50	129999	-	-	196	
10/14/98	23.30	24.00	0.70	57.3	289.36	-	992913.80	1381.00	0.00	-	-	-	-	
10/27/98	24.97	25.12	0.15	57.5	288.72	0.40	992914.20	1381.40	0.00	-	-	-	-	
11/03/98	29.55	29.63	0.08	-	284.27	-	992914.20	1381.40	-	-	-	-	-	
11/10/98	-	-	0.00	-	NG	-	992914.20	1381.40	-	-	-	-	-	
11/23/98	28.05	29.22	1.17	57.0	283.73	0.50	992914.70	1381.90	0.00	129999	-	-	-	
12/11/98	31.80	31.82	0.02	57.7	282.13	2.70	992917.40	1384.60	-	129999	-	-	-	
12/21/98	-	Dry	0.00	-	Dry	-	992917.40	1384.60	-	129999	-	-	-	
01/13/99	-	Dry	0.00	57.7	Dry	-	992917.40	1384.60	-	-	-	-	-	
01/26/99	-	Dry	0.00	57.7	Dry	-	992917.40	1384.60	-	-	-	-	-	
02/05/99	31.44	31.45	0.01	57.7	282.51	-	992917.40	1384.60	-	-	-	-	-	
02/15/99	29.30	29.35	0.05	57.7	284.58	-	992917.40	1384.60	0.60	129999	-	-	-	
02/22/99	29.15	29.23	0.08	-	284.67	-	992917.40	1384.60	-	-	12.7	10.2	410	
03/04/99	27.34	29.41	2.07	57.7	282.76	3.00	992920.40	1387.60	0.00	129999	11.5	7.7	-	
03/30/99	28.48	28.40	-0.08	57.7	285.64	0.40	992920.80	1388.00	0.60	129999	10.8	9.4	-	
04/09/99	27.65	27.85	0.20	57.7	285.95	-	992920.80	1388.00	0.20	152073	-	-	-	
04/28/99	-	-	0.00	57.7	NG	-	992920.80	1388.00	0.30	153884	-	-	-	
05/13/99	27.88	27.90	0.02	57.7	286.05	-	992920.80	1388.00	0.20	159999	-	-	-	
05/28/99	19.11	19.33	0.22	-	294.45	0.90	992921.70	1388.90	0.40	159999	-	-	-	
06/09/99	28.17	28.19	0.02	57.7	285.76	0.20	992921.90	1389.10	-	159999	-	-	-	
06/21/99	21.40	22.16	0.76	57.7	291.15	0.30	992922.20	1389.40	0.70	159999	-	-	-	
07/01/99	29.64	29.71	0.07	38.1	284.20	0.40	992922.60	1389.80	0.20	159999	-	-	-	
07/20/99	30.10	30.15	0.05	37.2	283.78	-	992922.60	1389.80	0.10	159999	13.0	-	550	
08/05/99	31.60	31.66	0.06	31.9	282.26	2.50	992925.10	1392.30	0.00	159999	-	-	-	
08/13/99	28.99	29.04	0.05	33.1	284.89	0.70	992925.80	1393.00	0.00	159999	-	-	-	
08/16/99	-	-	0.00	34.8	NG	-	992925.80	1393.00	0.00	159999	-	-	-	
09/09/99	28.34	28.65	0.31	35.9	285.05	-	992925.80	1393.00	0.50	159999	-	-	-	
09/22/99	28.01	28.05	0.04	39.2	285.89	-	992925.80	1393.00	0.70	171993	-	-	-	
10/07/99	27.68	27.73	0.05	39.9	286.20	1.70	992927.50	1394.70	0.50	179999	-	-	-	
10/12/99	14.68	15.17	0.49	45.9	298.37	0.10	992927.60	1394.80	0.50	179999	14.7	0.0	-	
11/03/99	-	-	0.00	38.2	NG	-	992927.60	1394.80	0.80	20733	14.7	0.0	-	
11/09/99	-	-	0.00	40.4	NG	-	992927.60	1394.80	1.50	204730	14.7	0.0	-	
11/28/99	29.10	30.02	0.92	50.8	283.15	-	992927.60	1394.80	0.20	209999	14.7	0.0	-	
12/08/99	31.16	31.25	0.09	39.4	282.64	-	992927.60	1394.80	1.90	209999	14.7	0.0	-	
12/30/99	29.20	29.27	0.07	38.7	284.64	10.70	992938.30	1405.50	1.60	256115	14.7	0.0	-	
01/06/00	29.50	29.54	0.04	39.5	284.40	-	992938.30	1405.50	1.40	259999	8.8	7.4	-	
01/13/00	-	-	0.00	-	NG	-	992938.30	1405.50	-	0	-	-	-	
01/20/00	25.13	25.17	0.04	38.1	288.77	0.20	992938.50	1405.70	1.50	25370	10.8	12.9	719	
02/11/00	24.05	24.30	0.25	38.5	289.45	-	992938.50	1405.70	1.60	82730	11.3	12.7	687	
02/29/00	22.05	22.13	0.08	43.0	291.77	1.20	992939.70	1406.90	4.50	290390	7.5	9.6	-	
03/07/00	16.45	17.85	1.40	42.7	294.90	3.30	3.30	1410.20	2.80	350190	11.0	16.5	-	
03/15/00	14.30	14.32	0.02	44.7	299.63	1.10	4.40	1411.30	9.10	375650	10.8	11.5	-	
03/21/00	-	-	0.00	-	NG	-	4.40	1411.30	-	-	-	-	-	
03/30/00	26.34	26.37	0.03	44.2	287.57	6.30	10.70	1417.60	3.40	183360	11.3	14.4	407	
04/18/00	29.16	29.17	0.01	41.9	284.79	-	10.70	1417.60	3.80	1145210	9.3	17.5	385	
04/28/00	29.49	29.50	0.01	41.7	284.46	0.10	10.80	1417.70	2.10	13640	9.8	18.5	360	
05/10/00	27.16	27.18	0.02	44.8	286.77	2.00	12.80	1419.70	-	131680	10.3	10.3	366	

Well ID: **NFFW-2R** (Recovery Well)
TOC: **313.97** ft amsl
Ground: **312.53** ft amsl
Depth of Well: **35.50** ft bgs
Depth to Screen **5.50** ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Pressure Transducer	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)		Total LNAPL Recovered (gal)	Ground-water Flow Rate (gpm)	Ground-water Recovered (gal)	Vacuum at Vault (psia)	Flow Rate (SCFM)	Concentration (ppmv)	Comments
05/23/00	-	-	0.00	46.1	NG	1.90	14.70	1421.60	-	176387	-	-	-	
06/12/00	-	-	0.00	41.8	NG	0.60	15.30	1422.20	2.40	1877290	9.8	14.9	-	
06/30/00	-	15.16	0.00	45.0	298.81	5.90	21.20	1428.10	0.00	193160	10.8	11.5	266	
07/06/00	-	-	0.00	-	NG	-	21.20	1428.10	0.00	-	10.5	-	262	
07/16/00	30.01	30.02	0.01	35.6	283.94	1.20	22.40	1429.30	25.00	2335600	14.7	-	0	
07/26/00	-	-	0.00	36.6	NG	0.20	22.60	1429.50	0.90	2783960	14.2	10.8	384	
07/28/00	-	-	0.00	38.7	NG	-	22.60	1429.50	-	2792450	14.7	0.0	-	
08/04/00	-	-	0.00	40.2	NG	0.10	22.70	1429.60	2.40	2878600	14.7	0.0	-	
08/08/00	-	-	0.00	37.6	NG	-	22.70	1429.60	3.40	307920	14.7	0.0	305	
08/15/00	30.60	30.80	0.20	38.1	283.00	0.10	22.80	1429.70	3.80	3098900	12.5	20.3	412	
08/22/00	30.36	30.37	0.01	39.9	283.59	-	22.80	1429.70	2.00	3189200	12.5	19.0	-	
08/28/00	31.17	31.19	0.02	36.9	282.76	-	22.80	1429.70	2.30	3266200	12.5	-	-	
09/08/00	30.07	30.08	0.01	36.9	283.88	-	22.80	1429.70	0.80	3339600	13.2	13.8	265	
09/19/00	30.15	30.16	0.01	37.0	283.80	-	22.80	1429.70	0.50	3377020	13.0	14.6	288	
09/25/00	31.01	31.02	0.01	36.9	282.94	-	22.80	1429.70	2.00	3421900	14.7	0.0	-	
10/06/00	30.00	30.01	0.01	38.3	283.95	-	22.80	1429.70	1.90	3457760	14.7	0.0	-	
10/11/00	28.16	28.18	0.02	46.3	285.77	-	22.80	1429.70	2.70	3469980	14.7	0.0	-	
10/12/00	29.60	29.62	0.02	44.7	284.33	-	22.80	1429.70	2.60	3484640	14.7	0.0	-	
10/19/00	-	29.91	0.00	38.6	284.06	-	22.80	1429.70	2.30	3584080	14.7	0.0	-	
10/26/00	-	-	0.00	-	NG	-	22.80	1429.70	-	-	-	-	-	
11/03/00	30.12	30.13	0.01	37.9	283.83	-	22.80	1429.70	1.60	3697140	14.7	0.0	-	
11/08/00	29.30	29.41	0.11	37.0	284.46	-	22.80	1429.70	1.50	3732630	14.7	0.0	-	
11/09/00	27.16	27.26	0.10	35.2	286.62	4.50	27.30	1434.20	1.50	3739600	12.2	20.7	-	
11/13/00	28.96	28.99	0.03	34.6	284.95	8.20	35.50	1442.40	1.80	3769540	12.7	14.5	-	
11/20/00	27.03	27.09	0.06	35.6	286.83	0.40	35.90	1442.80	2.30	3821130	13.0	17.1	-	
11/27/00	28.11	28.14	0.03	33.9	285.80	2.10	38.00	1444.90	1.40	3878920	12.7	20.5	440	
12/04/00	28.22	28.27	0.05	33.9	285.66	-	38.00	1444.90	1.70	3926460	13.2	19.5	511	
12/15/00	29.02	29.06	0.04	34.0	284.88	0.10	38.10	1445.00	3.10	403560	12.7	16.2	510	
12/16/00	28.88	29.04	0.16	34.0	284.79	0.80	38.90	1445.80	2.00	4044490	12.7	17.0	-	

Well ID: **NFFW-3**
TOC: **324.08** ft amsl
Ground: **321.92** ft amsl
Depth of Well: **26** ft bgs
Depth to Screen **6** ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)	Total LNAPL Recovered (gal)	Comments
03/30/94	-	12.18	0.00	310.40			NO LOCK
04/04/94	-	12.77	0.00	309.81			
04/12/94	-	9.84	0.00	312.74			
04/20/94	-	14.25	0.00	308.33			
05/12/94	-	17.03	0.00	305.55			
05/24/94	-	19.35	0.00	303.23			
06/03/94	-	23.40	0.00	299.18			
07/01/94	-	28.25	0.00	294.33			
07/13/94	-	Dry	0.00	Dry			
08/05/94	-	23.26	0.00	299.32			
08/17/94	-	25.90	0.00	296.68			
08/30/94	-	19.72	0.00	302.86			
09/08/94	-	22.39	0.00	300.19			
09/19/94	-	27.90	0.00	294.68			
09/30/94	-	28.18	0.00	294.40			
10/17/94	-	28.20	0.00	294.38			
10/25/94	-	28.19	0.00	294.39			
11/11/94	-	28.21	0.00	294.37			
11/22/94	-	28.21	0.00	294.37			
12/07/94	-	28.17	0.00	294.41			
12/21/94	-	28.19	0.00	294.39			
01/04/95	-	28.18	0.00	294.40			
01/23/95	-	25.76	0.00	296.82			
02/16/95	-	24.77	0.00	297.81			
02/28/95	-	21.06	0.00	301.52			
03/10/95	-	16.64	0.00	305.94			
03/29/95	-	16.48	0.00	306.10			
04/04/95	-	17.40	0.00	305.18			
04/27/95	-	21.42	0.00	301.16			
05/11/95	-	21.83	0.00	300.75			
05/24/95	-	23.29	0.00	299.29			
06/15/95	-	27.12	0.00	295.46			
06/29/95	-	28.22	0.00	294.36			
07/06/95	-	28.14	0.00	294.44			
07/25/95	-	28.15	0.00	294.43			
08/01/95	-	28.20	0.00	294.38			
08/21/95	-	Dry	0.00	Dry			
09/14/95	-	Dry	0.00	Dry			
09/28/95	-	Dry	0.00	Dry			
10/06/95	-	23.79	0.00	298.79			
10/25/95	-	15.80	0.00	306.78			
11/21/95	-	13.21	0.00	309.37			
12/08/95	-	15.00	0.00	307.58			
12/21/95	-	15.01	0.00	307.57			

Well ID: **NFFW-3**
TOC: **324.08** ft amsl
Ground: **321.92** ft amsl
Depth of Well. **26** ft bgs
Depth to Screen **6** ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)	Total LNAPL Recovered (gal)	Comments
01/23/96	-	12.26	0.00	310.32			
02/09/96	-	12.88	0.00	309.70			
02/19/96	-	13.94	0.00	308.64			
01/09/98	-	17.33	0.00	306.75	-	0.00	New System Started
02/20/98	-	13.39	0.00	310.69	-	0.00	
05/21/98	-	13.12	0.00	310.96	-	0.00	
12/21/98	-	Dry	0.00	Dry	-	0.00	
01/13/99	-	Dry	0.00	Dry	-	0.00	
05/28/99	-	Dry	0.00	Dry	-	0.00	
10/07/99	-	13.97	0.00	310.11	-	0.00	
02/11/00	-	12.02	0.00	312.06	-	0.00	
08/15/00	-	18.04	0.00	306.04	-	0.00	
10/26/00	-	15.77	0.00	308.31	-	0.00	

Well ID: **NFFW-4**
TOC: **320.61** ft amsl
Ground: **320.98** ft amsl
Depth of Well: **26** ft bgs
Depth to Screen **6** ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)	Total LNAPL Recovered (gal)	Comments
03/30/94	-	8.39	0.00	318.47			NO LOCK
04/04/94	-	8.27	0.00	318.59			
04/12/94	-	9.93	0.00	316.93			
04/20/94	-	14.27	0.00	312.59			
05/12/94	-	15.02	0.00	311.84			
05/24/94	-	17.85	0.00	309.01			
06/03/94	-	22.15	0.00	304.71			
07/01/94	-	Dry	0.00	Dry			
07/13/94	-	Dry	0.00	Dry			
08/05/94	-	24.35	0.00	302.51			
08/17/94	-	Dry	0.00	Dry			
08/30/94	-	21.58	0.00	305.28			
09/08/94	-	23.07	0.00	303.79			
09/19/94	-	24.36	0.00	302.50			
09/30/94	-	Dry	0.00	Dry			
10/17/94	-	Dry	0.00	Dry			
10/25/94	-	Dry	0.00	Dry			
11/11/94	-	Dry	0.00	Dry			
11/22/94	-	Dry	0.00	Dry			
12/07/94	-	Dry	0.00	Dry			
12/21/94	-	Dry	0.00	Dry			
01/04/95	-	Dry	0.00	Dry			
01/23/95	-	23.89	0.00	302.97			
02/16/95	-	23.81	0.00	303.05			
02/28/95	-	21.66	0.00	305.20			
03/10/95	-	16.02	0.00	310.84			
03/29/95	-	14.47	0.00	312.39			
04/04/95	-	15.43	0.00	311.43			
04/27/95	-	19.81	0.00	307.05			
05/11/95	-	20.62	0.00	306.24			
05/24/95	-	21.87	0.00	304.99			
06/15/95	-	Dry	0.00	Dry			
06/29/95	-	Dry	0.00	Dry			
07/06/95	-	Dry	0.00	Dry			
07/25/95	-	Dry	0.00	Dry			
08/01/95	-	Dry	0.00	Dry			
08/21/95	-	Dry	0.00	Dry			
09/14/95	-	Dry	0.00	Dry			
09/28/95	-	Dry	0.00	Dry			
10/06/95	-	23.93	0.00	302.93			
10/25/95	-	16.73	0.00	310.13			
11/21/95	-	10.49	0.00	316.37			
12/08/95	-	11.96	0.00	314.90			
12/21/95	-	12.03	0.00	314.83			
01/23/96	-	9.17	0.00	317.69			

Well ID: **NFFW-4**
TOC: **320.61** ft amsl
Ground: **320.98** ft amsl
Depth of Well: **26** ft bgs
Depth to Screen **6** ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)	Total LNAPL Recovered (gal)	Comments
02/09/96	-	8.81	0.00	318.05			
02/19/96	-	10.32	0.00	316.54			
01/09/98	-	14.40	0.00	306.21	-	0.00	New System Started
01/13/98	-	13.89	0.00	306.72	-	0.00	
02/27/98	-	8.64	0.00	311.97	-	0.00	
03/16/98	-	8.64	0.00	311.97	-	0.00	
05/21/98	-	11.73	0.00	308.88	-	0.00	
10/14/98	-	Dry	0.00	Dry	-	0.00	
12/21/98	-	Dry	0.00	Dry	-	0.00	
01/13/99	-	Dry	0.00	Dry	-	0.00	
05/28/99	-	Dry	0.00	Dry	-	0.00	
10/07/99	-	10.49	0.00	310.12	-	0.00	
02/11/00	-	9.97	0.00	310.64	-	0.00	
08/15/00	-	15.68	0.00	304.93	-	0.00	
10/26/00	-	13.34	0.00	307.27	-	0.00	

Well ID:	**NFFW-5**	
TOC:	**316.54**	ft amsl
Ground:	**314.94**	ft amsl
Depth of Well:	**26**	ft bgs
Depth to Screen	**6**	ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)	Total LNAPL Recovered (gal)	Comments
03/30/94	-	3.40	0.00	313.48	-	-	NO CAP OR LOCK
04/04/94	-	5.89	0.00	310.99	-	-	
04/12/94	-	4.13	0.00	312.75	-	-	
04/20/94	-	11.50	0.00	305.38	-	-	
05/12/94	-	12.12	0.00	304.76	-	-	
05/24/94	-	13.85	0.00	303.03	-	-	
06/03/94	-	15.48	0.00	301.40	-	-	
07/01/94	-	12.64	0.00	304.24	-	-	
07/13/94	-	20.95	0.00	295.93	-	-	
08/05/94	-	13.28	0.00	303.60	-	-	
08/17/94	-	14.23	0.00	302.65	-	-	
08/30/94	-	13.55	0.00	303.33	-	-	
09/08/94	-	16.38	0.00	300.50	-	-	
09/19/94	-	12.53	0.00	304.35	-	-	
09/30/94	-	12.94	0.00	303.94	-	-	
10/17/94	-	18.35	0.00	298.53	-	-	
10/25/94	-	12.34	0.00	304.54	-	-	
11/11/94	-	12.10	0.00	304.78	-	-	
11/22/94	-	4.57	0.00	312.31	-	-	
12/07/94	-	4.97	0.00	311.91	-	-	
12/21/94	-	15.04	0.00	301.84	-	-	
01/04/95	-	6.58	0.00	310.30	-	-	
01/23/95	-	5.69	0.00	311.19	-	-	
02/16/95	-	4.32	0.00	312.56	-	-	
02/28/95	-	2.85	0.00	314.03	-	-	
03/10/95	-	4.60	0.00	312.28	-	-	
03/29/95	-	13.06	0.00	303.82	-	-	
04/27/95	-	15.79	0.00	301.09	-	-	
05/11/95	-	5.91	0.00	310.97	-	-	
05/24/95	-	15.41	0.00	301.47	-	-	
06/15/95	-	16.96	0.00	299.92	-	-	
06/29/95	-	19.10	0.00	297.78	-	-	
07/06/95	-	19.96	0.00	296.92	-	-	
07/25/95	-	14.46	0.00	302.42	-	-	
08/01/95	-	18.88	0.00	298.00	-	-	
08/21/95	-	22.89	0.00	293.99	-	-	
09/14/95	-	8.49	0.00	308.39	-	-	
09/28/95	-	6.67	0.00	310.21	-	-	
10/06/95	-	4.17	0.00	312.71	-	-	
10/25/95	-	10.19	0.00	306.69	-	-	
11/21/95	-	6.09	0.00	310.79	-	-	
12/08/95	-	12.74	0.00	304.14	-	-	
12/21/95	-	5.70	0.00	311.18	-	-	

Well ID:	**NFFW-5**	
TOC:	**316.54**	ft amsl
Ground:	**314.94**	ft amsl
Depth of Well:	**26**	ft bgs
Depth to Screen	**6**	ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)	Total LNAPL Recovered (gal)	Comments
01/23/96	-	5.15	0.00	311.70	-	-	
02/09/96	-	2.85	0.00	314.03	-	-	
02/19/96	-	11.92	0.00	304.96	-	-	
01/05/98	-	3.86	0.00	312.68	-	-	New System Started
01/13/98	-	9.93	0.00	306.61	-	-	
02/20/98	-	3.94	0.00	312.60	-	-	
02/27/98	-	5.14	0.00	311.40	-	-	
03/16/98	-	5.42	0.00	311.12	-	-	
05/21/98	-	7.03	0.00	309.51	-	-	
08/14/98	-	17.44	0.00	299.10	-	-	
10/14/98	-	9.11	0.00	307.43	-	-	
12/21/98	-	23.00	0.00	293.54	-	-	
01/13/99	-	4.78	0.00	311.76	-	-	
05/28/99	-	4.04	0.00	312.50	-	-	
10/07/99	-	6.38	0.00	310.16	-	-	
02/11/00	-	4.13	0.00	312.41	-	-	
08/15/00	-	6.79	0.00	309.75	-	-	
10/26/00	-	14.70	0.00	301.84	-	-	

Well ID:	**NFFW-6**	
TOC:	**319.85**	ft amsl
Ground:	**319.05**	ft amsl
Depth of Well:	**26**	ft bgs
Depth to Screen	**6**	ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)	Total LNAPL Recovered (gal)	Comments
03/30/94	15.73	15.92	0.19	303.87	-	0.00	1000 HOURS
03/30/94	15.66	15.86	0.20	303.93	-	0.00	1400 HOURS
04/04/94	16.41	16.46	0.05	303.20	1.24	1.24	1000 HOURS
04/06/94	16.40	16.43	0.03	303.22	0.21	1.45	1200 HOURS
04/07/94	-	16.58	0.00	303.04	-	1.45	1100 HOURS
04/12/94	17.86	18.00	0.14	301.74	-	1.45	Lowered pump to approx 18 ft
04/20/94	-	18.09	0.00	301.53	0.41	1.86	1230 hours
04/27/94	18.17	18.19	0.02	301.45	-	1.86	1105 hours
05/04/94	19.22	19.29	0.07	300.39	-	1.86	0800 hours, lowered pump approx 1 ft
05/12/94	19.34	19.45	0.11	300.27	-	1.86	LOWERED PUMP ABOUT 1 FT
05/13/94	19.49	19.50	0.01	300.13	-	1.86	
05/16/94	-	20.04	0.00	299.58	-	1.86	
05/24/94	20.76	20.77	0.01	298.86	-	1.86	
05/27/94	21.04	21.05	0.01	298.58	-	1.86	
06/03/94	21.64	21.66	0.02	297.98	-	1.86	
06/15/94	23.20	23.24	0.04	296.41	-	1.86	
06/16/94	23.40	23.46	0.05	296.21	-	1.86	
06/21/94	24.40	24.50	0.10	295.21	-	1.86	Well TD 27.90
07/01/94	26.44	26.62	0.18	293.16	-	1.86	Pump set 4" from bottom of well, water and oil intakes above water
07/13/94	27.30	27.31	0.01	292.32	-	1.86	
08/05/94	21.38	21.40	0.02	298.24	-	1.86	
08/17/94	22.92	22.94	0.02	296.70	-	1.86	
08/30/94	20.62	20.65	0.03	299.00	-	1.86	
09/08/94	21.57	21.65	0.08	298.04	-	1.86	
09/14/94	22.93	23.01	0.08	296.68	-	1.86	
09/19/94	24.05	24.11	0.06	295.56	-	1.86	
09/30/94	-	24.05	0.00	295.57	-	1.86	
10/17/94	26.90	27.17	0.27	292.68	-	1.86	
10/25/94	-	27.89	0.00	291.73	-	1.86	
11/11/94	-	Dry	0.00	Dry	-	1.86	
11/22/94	-	Dry	0.00	Dry	-	1.86	
12/07/94	-	27.85	0.00	291.77	-	1.86	
12/21/94	-	24.82	0.00	294.80	-	1.86	
01/04/95	-	25.54	0.00	294.08	-	1.86	
01/16/95	-	23.09	0.00	296.53	-	1.86	
01/23/95	-	21.03	0.00	298.59	-	1.86	
02/16/95	-	22.20	0.00	297.42	-	1.86	
02/28/95	-	20.77	0.00	298.85	-	1.86	No Power To Pump
03/10/95	-	19.32	0.00	300.30	-	1.86	No Power To Pump
03/29/95	-	19.66	0.00	299.96	-	1.86	No Power To Pump
04/27/95	-	21.82	0.00	297.80	-	1.86	No Power To Pump
05/11/95	-	21.82	0.00	297.80	-	1.86	No Power To Pump
05/24/95	-	22.40	0.00	297.22	-	1.86	No Power To Pump
06/15/95	-	22.97	0.00	296.65	-	1.86	No Power To Pump
06/29/95	-	24.86	0.00	294.76	-	1.86	No Power To Pump
07/06/95	-	25.74	0.00	293.88	-	1.86	No Power To Pump
07/25/95	-	25.98	0.00	293.64	-	1.86	No Power To Pump
08/01/95	-	25.48	0.00	294.14	-	1.86	No Power To Pump
08/21/95	-	Dry	0.00	Dry	-	1.86	Panel removed for repair
09/14/95	-	Dry	0.00	Dry	-	1.86	
09/28/95	-	27.71	0.00	291.91	-	1.86	
10/06/95	-	25.10	0.00	294.52	-	1.86	
10/25/95	-	20.15	0.00	299.47	-	1.86	
11/21/95	-	17.30	0.00	302.32	-	1.86	
12/08/95	-	19.51	0.00	300.11	-	1.86	
12/21/95	-	19.37	0.00	300.25	-	1.86	
01/23/96	-	17.10	0.00	302.52	-	1.86	
02/09/96	-	16.00	0.00	303.62	-	1.86	

Well ID: **NFFW-6**
TOC: **319.85** ft amsl
Ground: **319.85** ft amsl
Depth of Well: **26** ft bgs
Depth to Screen **6** ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)	Total LNAPL Recovered (gal)	Comments
02/19/96	-	18.40	0.00	301.22	-	1.86	
01/09/98	-	18.84	0.00	301.01	-	1.86	New System Started
01/13/98	-	19.31	0.00	300.54	-	1.86	
02/20/98	-	18.03	0.00	301.82	-	1.86	
02/27/98	-	17.39	0.00	302.46	-	1.86	
03/16/98	-	17.07	0.00	302.78	-	1.86	
05/21/98	-	16.98	0.00	302.87	-	1.86	
08/14/98	-	22.64	0.00	297.21	-	1.86	
10/14/98	25.19	25.21	0.02	294.62	-	1.86	
12/21/98	-	Dry	0.00	Dry	-	1.86	
01/13/99	27.29	27.39	0.10	292.37	-	1.86	
05/28/99	22.10	22.13	0.03	297.69	-	1.86	
10/07/99	-	19.68	0.00	300.17	-	1.86	
02/11/00	17.76	17.77	0.01	302.07	-	1.86	
08/15/00	-	19.89	0.00	299.96	-	1.86	
10/26/00	-	20.42	0.00	299.43	-	1.86	

Well ID: **NFFW-7**
TOC: **314.46** ft amsl
Ground: **312.57** ft amsl
Depth of Well: **26** ft bgs
Depth to Screen **6** ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)	Total LNAPL Recovered (gal)	Comments
03/30/94	-	11.50	0.00	302.58	-	-	1030 HOURS, NO LOCK
03/30/94	-	11.42	0.00	302.66	-	-	1400 HOURS
04/04/94	-	11.28	0.00	302.80	-	-	1000 HOURS
04/06/94	-	11.99	0.00	302.09	-	-	1200 HOURS
04/07/94	-	12.16	0.00	301.92	-	-	1100 HOURS
04/12/94	-	13.57	0.00	300.51	-	-	1200 HOURS
04/20/94	-	14.08	0.00	300.00	-	-	
04/27/94	-	13.50	0.00	300.58	-	-	
05/04/94	-	14.64	0.00	299.44	-	-	
05/12/94	-	14.89	0.00	299.19	-	-	
05/13/94	-	14.93	0.00	299.15	-	-	
05/16/94	15.92	15.93	0.01	298.16	-	-	
05/24/94	16.92	16.96	0.04	297.15	-	-	
05/27/94	17.69	17.78	0.09	296.38	-	-	
06/03/94	18.52	18.60	0.08	295.55	-	-	
06/15/94	20.06	20.26	0.20	293.99	-	-	
06/16/94	20.38	20.56	0.18	293.68	-	-	
07/01/94	24.12	24.41	0.29	289.92	-	-	
07/13/94	26.57	26.95	0.38	287.46	0.50	0.50	BAILED 0.5 GAL
08/05/94	-	19.38	0.00	294.70	-	0.50	
08/17/94	20.24	20.25	0.01	293.84	-	0.50	
08/30/94	-	17.33	0.00	296.75	-	0.50	
09/08/94	18.41	18.42	0.01	295.67	-	0.50	SHEEN
09/14/94	19.96	19.97	0.01	294.12	-	0.50	
09/19/94	21.25	21.27	0.02	292.83	-	0.50	
09/30/94	21.10	21.10	Sheen	292.98	-	0.50	
10/17/94	24.76	24.90	0.14	289.30	-	0.50	
10/25/94	27.14	27.48	0.34	286.90	-	0.50	
11/11/94	-	Dry	0.00	Dry	-	0.50	28.08 Bottom
11/22/94	-	Dry	0.00	Dry	-	0.50	
12/07/94	27.88	28.08	0.20	286.17	-	0.50	
12/21/94	22.92	23.57	0.65	291.08	-	0.50	
01/04/95	23.17	23.91	0.74	290.81	1.00	1.50	Bailed Product
01/16/95	21.09	21.29	0.20	292.96	-	1.50	
01/23/95	19.05	19.12	0.07	295.02	-	1.50	
02/16/95	18.80	18.93	0.13	295.26	-	1.50	
02/28/95	17.17	17.22	0.05	296.90	-	1.50	
03/10/95	16.42	16.45	0.03	297.66	-	1.50	
03/29/95	14.98	14.98	0.01	299.10	-	1.50	product .005
04/04/95	16.46	16.51	0.05	297.61	-	1.50	
04/27/95	18.46	18.49	0.03	295.62	-	1.50	
05/11/95	17.90	17.96	0.06	296.17	-	1.50	
05/24/95	19.08	19.25	0.17	294.98	-	1.50	
06/15/95	-	-	0.00	NG	-	1.50	Well Knocked Over During Soil Removal Operations
06/29/95	22.02	22.25	0.23	292.03	-	1.50	Well is bent over
07/06/95	23.05	23.30	0.25	291.00	0.25	1.75	Bailed Product
07/25/95	23.35	23.50	0.15	290.71	-	1.75	Well is bent over
08/01/95	23.42	23.65	0.23	290.63	0.25	2.00	
08/21/95	-	Dry	0.00	Dry	-	2.00	
09/14/95	-	Dry	0.00	Dry	-	2.00	
09/28/95	-	Dry	0.00	Dry	-	2.00	
10/06/95	23.97	24.08	0.11	290.10	-	2.00	

Well ID:	**NFFW-7**	
TOC:	**314.46**	ft amsl
Ground:	**312.57**	ft amsl
Depth of Well:	**26**	ft bgs
Depth to Screen	**6**	ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)	Total LNAPL Recovered (gal)	Comments
10/25/95	-	16.86	0.00	297.22	-	2.00	
11/21/95	-	12.70	0.00	301.38	-	2.00	
12/08/95	-	14.96	0.00	299.12	-	2.00	
12/21/95	-	15.18	0.00	298.90	-	2.00	
01/23/96	-	12.63	0.00	301.25	-	2.00	
02/09/96	-	11.46	0.00	302.62	-	2.00	
02/19/96	-	14.12	0.00	299.96	-	2.00	
01/09/98	-	14.86	0.00	299.60	-	2.00	New System Started
01/13/98	-	15.71	0.00	298.75	-	2.00	
02/20/98	-	15.41	0.00	299.05	-	2.00	
02/27/98	-	14.34	0.00	300.12	-	2.00	
03/16/98	-	13.40	0.00	301.06	-	2.00	
05/21/98	-	13.53	0.00	300.93	-	2.00	
08/14/98	22.50	22.63	0.13	291.72	-	2.00	
10/14/98	22.80	24.13	1.33	289.17	-	2.00	
10/27/98	-	-	0.00	NG	1.00	3.00	Passive Bailer
11/03/98	-	-	0.00	NG	0.50	3.50	Passive Bailer
11/10/98	-	-	0.00	NG	0.50	4.00	Passive Bailer
11/23/98	-	-	0.00	NG	0.50	4.50	Passive Bailer
12/21/98	-	Dry	0.00	Dry	-	4.50	
01/13/99	-	Dry	0.00	Dry	-	4.50	
05/28/99	15.22	15.27	0.05	299.15	-	4.50	
10/07/99	17.25	17.27	0.02	297.17	-	4.50	
02/11/00	14.10	14.12	0.02	300.32	-	4.50	
08/15/00	-	15.40	0.00	299.06	-	4.50	
10/26/00	-	19.10	0.00	295.36	-	4.50	

Well ID: **NFFW-8**
TOC: **309.61** ft amsl
Ground: **308.49** ft amsl
Depth of Well: **27.5** ft bgs
Depth to Screen **7.5** ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)	Total LNAPL Recovered (gal)	Comments
03/30/94	-	12.25	0.00	297.82			1030 HOURS, NO LOCK
04/04/94	-	12.80	0.00	297.27			1000 HOURS
04/12/94	-	13.26	0.00	296.81			1200 HOURS
04/20/94	-	13.63	0.00	296.44			
05/12/94	-	14.80	0.00	295.27			
05/24/94	-	15.82	0.00	294.25			
06/03/94	-	16.94	0.00	293.13			
07/01/94	-	19.83	0.00	290.24			
07/13/94	21.78	21.79	0.01	288.29			
08/05/94	-	18.03	0.00	292.04			
08/17/94	-	18.83	0.00	291.24			
08/30/94	-	16.77	0.00	293.30			
09/08/94	-	17.51	0.00	292.56			
09/19/94	-	18.55	0.00	291.52			
09/30/94	-	18.69	0.00	291.38			
10/17/94	-	21.28	0.00	288.79			
10/25/94	-	21.97	0.00	288.10			
11/11/94	24.42	24.45	0.03	285.65			
11/22/94	24.71	24.76	0.05	285.35			
12/07/94	-	20.89	0.00	289.18			
12/21/94	-	20.20	0.00	289.87			
01/04/95	-	20.00	0.00	290.07			
01/23/95	-	16.48	0.00	293.59			
02/16/95	-	17.32	0.00	292.75			
02/28/95	-	15.38	0.00	294.69			
03/10/95	-	13.99	0.00	296.08			
03/29/95	-	14.88	0.00	295.19			
04/04/95	-	15.29	0.00	294.78			
04/27/95	-	16.51	0.00	293.56			
05/11/95	-	16.25	0.00	293.82			
05/24/95	-	17.01	0.00	293.06			
06/15/95	-	17.51	0.00	292.56			
06/29/95	-	18.02	0.00	292.05			
07/06/95	-	19.20	0.00	290.87			
07/25/95	-	19.02	0.00	291.05			
08/01/95	-	20.36	0.00	289.71			
08/21/95	23.37	23.37	Sheen	286.70			
09/14/95	26.21	26.32	0.11	283.85			
09/28/95	-	19.90	0.00	290.17			
10/06/95	-	17.48	0.00	292.59			
10/25/95	-	15.38	0.00	294.69			
11/21/95	-	12.59	0.00	297.48			
12/08/95	-	13.79	0.00	296.28			
12/21/95	-	13.78	0.00	296.29			
01/23/96	-	12.69	0.00	297.38			
02/09/96	-	12.12	0.00	297.95			
02/19/96	-	12.19	0.00	297.88			
01/09/98	-	14.63	0.00	294.98	-	0.00	New System Started
01/13/98	-	14.82	0.00	294.79	-	0.00	
02/20/98	-	13.05	0.00	296.56	-	0.00	
02/27/98	-	12.34	0.00	297.27	-	0.00	

Well ID: **NFFW-8**
TOC: **309.61** ft amsl
Ground: **308.49** ft amsl
Depth of Well: **27.5** ft bgs
Depth to Screen **7.5** ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)	Total LNAPL Recovered (gal)	Comments
03/16/98	-	12.12	0.00	297.49	-	0.00	
05/21/98	-	12.77	0.00	296.84	-	0.00	
08/14/98	-	17.02	0.00	292.59	-	0.00	
10/14/98	-	19.06	0.00	290.55	-	0.00	
12/21/98	23.70	23.89	0.19	285.55	-	0.00	
01/13/99	-	19.49	0.00	290.12	-	0.00	
05/28/99	-	16.33	0.00	293.28	-	0.00	
10/07/99	-	13.52	0.00	296.09	-	0.00	
02/11/00	-	12.66	0.00	296.95	-	0.00	
10/26/00	-	15.21	0.00	294.40	-	0.00	

Well ID: **NFFW-9**
TOC: **300.29** ft amsl
Ground: **300.45** ft amsl
Depth of Well: **26** ft bgs
Depth to Screen **6** ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)	Total LNAPL Recovered (gal)	Comments
03/30/94	-	2.92	0.00	297.69			1030 HOURS
04/04/94	-	3.64	0.00	296.97			1000 HOURS
04/12/94	-	3.91	0.00	296.70			1200 HOURS
04/20/94	-	4.25	0.00	296.36			
05/12/94	-	5.18	0.00	295.43			
05/24/94	-	6.19	0.00	294.42			
06/03/94	-	7.44	0.00	293.17			
07/01/94	-	9.91	0.00	290.70			
07/13/94	-	12.65	0.00	287.96			
08/05/94	-	8.62	0.00	291.99			
08/17/94	-	9.40	0.00	291.21			
08/30/94	-	7.33	0.00	293.28			
09/08/94	8.18	8.18	Sheen	292.43			
09/19/94	-	8.91	0.00	291.70			
09/30/94	-	9.14	0.00	291.47			
10/17/94	-	11.93	0.00	288.68			
10/25/94	-	11.50	0.00	289.11			
11/11/94	-	13.53	0.00	287.08			
11/22/94	-	13.15	0.00	287.46			
12/07/94	-	10.36	0.00	290.25			
12/21/94	-	10.64	0.00	289.97			
01/04/95	-	10.14	0.00	290.47			
01/23/95	-	-	0.00	NG			CAR PARKED ON WELL
02/16/95	-	7.54	0.00	293.07			
02/28/95	-	-	0.00	NG			CAR PARKED ON WELL
03/10/95	-	4.39	0.00	296.22			
03/29/95	-	5.54	0.00	295.07			
04/04/95	-	6.95	0.00	293.66			
04/27/95	-	7.10	0.00	293.51			
05/11/95	-	6.63	0.00	293.98			
05/24/95	-	7.58	0.00	293.03			
06/15/95	-	8.52	0.00	292.09			
06/29/95	-	7.95	0.00	292.66			
07/06/95	-	9.68	0.00	290.93			
07/25/95	-	9.45	0.00	291.16			
08/01/95	-	10.95	0.00	289.66			
08/21/95	-	14.49	0.00	286.12			
09/14/95	-	17.64	0.00	282.97			
09/28/95	-	9.85	0.00	290.76			
10/06/95	-	7.35	0.00	293.26			
10/25/95	-	6.04	0.00	294.57			
11/21/95	-	4.10	0.00	296.51			
12/08/95	-	-	0.00	NG			Car Over Well
12/21/95	-	-	0.00	NG			Well Under Snow
01/23/96	-	3.94	0.00	296.67			
02/09/96	-	3.60	0.00	297.01			
02/19/96	-	4.26	0.00	296.35			
01/09/98	-	5.13	0.00	295.16	-	0.00	New System Started
01/13/98	-	5.42	0.00	294.87	-	0.00	
02/20/98	-	3.87	0.00	296.42	-	0.00	
02/27/98	-	3.76	0.00	296.53	-	0.00	

Well ID: **NFFW-9**
TOC: **300.29** ft amsl
Ground: **300.45** ft amsl
Depth of Well: **26** ft bgs
Depth to Screen **6** ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)	Total LNAPL Recovered (gal)	Comments
03/16/98	-	9.54	0.00	290.75	-	0.00	
05/21/98	-	11.04	0.00	289.25	-	0.00	
08/14/98	-	8.46	0.00	291.83	-	0.00	
10/14/98	-	18.02	0.00	282.27	-	0.00	
12/21/98	-	16.15	0.00	284.14	-	0.00	
01/13/99	-	9.98	0.00	290.31	-	0.00	
05/28/99	-	7.71	0.00	292.58	-	0.00	
10/07/99	-	5.05	0.00	295.24	-	0.00	
08/15/00	-	6.44	0.00	293.85	-	0.00	
10/26/00	-	5.74	0.00	294.55	-	0.00	

Well ID: **NFFW-10**
TOC: **300.51** ft amsl
Ground: **300.85** ft amsl
Depth of Well: **37** ft bgs
Depth to Screen **7** ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)	Total LNAPL Recovered (gal)	Comments
03/30/94	-	5.33	0.00	295.77			NEEDS NEW LOCK
04/04/94	-	5.46	0.00	295.64			1000 HOURS
04/12/94	-	6.60	0.00	294.50			1200 HOURS
04/20/94	-	6.96	0.00	294.14			
05/12/94	-	3.65	0.00	297.45			
07/01/94	-	12.45	0.00	288.65			
07/13/94	-	15.78	0.00	285.32			
08/05/94	-	11.05	0.00	290.05			
08/17/94	-	11.31	0.00	289.79			
08/30/94	-	8.88	0.00	292.22			
09/08/94	-	9.56	0.00	291.54			
09/19/94	-	11.32	0.00	289.78			
09/30/94	-	11.23	0.00	289.87			
10/17/94	-	14.27	0.00	286.83			
10/25/94	-	15.66	0.00	285.44			
11/11/94	-	19.18	0.00	281.92			
11/22/94	-	19.77	0.00	281.33			
12/07/94	-	15.75	0.00	285.35			
12/21/94	-	13.83	0.00	287.27			
01/04/95	-	13.66	0.00	287.44			
01/23/95	-	10.27	0.00	290.83			
02/16/95	-	-	0.00	NG			BURIED UNDER SNOW
02/28/95	-	8.76	0.00	292.34			
03/10/95	-	7.72	0.00	293.38			
03/29/95	-	-	0.00	NG			CAR PARKED ON WELL
04/04/95	-	7.73	0.00	293.37			
04/27/95	-	8.91	0.00	292.19			
05/11/95	-	8.91	0.00	292.19			
05/24/95	-	9.53	0.00	291.57			
06/15/95	-	10.57	0.00	290.53			
06/29/95	-	-	0.00	NG			TRUCK PARKED ON WELL
07/06/95	-	-	0.00	NG			TRUCK PARKED ON WELL
07/25/95	-	12.86	0.00	288.24			
08/01/95	-	13.79	0.00	287.31			
08/21/95	-	17.75	0.00	283.35			
09/14/95	-	22.39	0.00	278.71			
09/28/95	-	15.00	0.00	286.10			
10/06/95	-	12.09	0.00	289.01			
10/25/95	-	8.24	0.00	292.86			
11/21/95	-	-	0.00	NG			Equipment over well
12/08/95	-	6.60	0.00	294.50			
12/21/95	-	-	0.00	NG			Manhole Filled With Ice
01/23/96	-	-	0.00	NG			Manhole Filled With Ice
01/09/98	-	7.74	0.00	292.77	-	0.00	New System Started
02/20/98	-	6.28	0.00	294.23	-	0.00	
05/21/98	-	8.14	0.00	292.37	-	0.00	
12/21/98	-	19.06	0.00	281.45	-	0.00	
01/13/99	-	14.92	0.00	285.59	-	0.00	
05/28/99	-	11.46	0.00	289.05	-	0.00	

Well ID: **NFFW-12**
TOC: **309.02** ft amsl
Ground: **309.13** ft amsl
Depth of Well: **26.5** ft bgs
Depth to Screen **6.5** ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)	Total LNAPL Recovered (gal)	Comments
03/30/94	-	8.73	0.00	298.63			1030 HOURS, NO LOCK
04/04/94	-	9.01	0.00	298.35			1000 HOURS
04/06/94	-	9.22	0.00	298.14			1200 HOUR
04/07/94	-	9.28	0.00	298.08			1100 HOURS
04/12/94	-	10.04	0.00	297.32			1200 HOURS
04/20/94	-	10.43	0.00	296.93			
04/27/94	-	10.74	0.00	296.62			
05/04/94	-	11.72	0.00	295.64			
05/12/94	-	11.95	0.00	295.41			
05/13/94	-	11.98	0.00	295.38			
05/16/94	-	12.35	0.00	295.01			
05/24/94	-	13.23	0.00	294.13			
05/27/94	-	13.65	0.00	293.71			
06/03/94	-	14.44	0.00	292.92			
06/15/94	15.74	15.75	0.02	291.62			
06/16/94	15.91	15.92	0.02	291.45			
07/01/94	18.03	18.11	0.08	289.32			
07/13/94	20.08	20.20	0.12	287.26	0.25	0.25	BAILED 0.25 GAL
08/05/94	16.92	16.94	0.02	290.44	-	0.25	
08/17/94	16.35	16.37	0.02	291.01	-	0.25	
08/30/94	-	14.17	0.00	293.19	-	0.25	
09/08/94	-	14.31	0.00	293.05	-	0.25	
09/14/94	-	14.17	0.00	293.19	-	0.25	
09/19/94	-	15.99	0.00	291.37	-	0.25	
09/30/94	-	16.77	0.00	290.59	-	0.25	
10/17/94	18.95	19.05	0.10	288.40	-	0.25	
10/25/94	-	20.80	0.00	286.56	-	0.25	
11/11/94	23.89	23.97	0.08	283.46	-	0.25	
11/22/94	-	-	0.00	NG	-	0.25	IFP Broke during gauging, no information available
12/07/94	22.52	22.52	Sheen	284.84	-	0.25	
12/21/94	-	19.30	0.00	288.06	-	0.25	
01/04/95	-	19.10	0.00	288.26	-	0.25	
01/16/95	-	17.54	0.00	289.82	-	0.25	
01/23/95	-	15.95	0.00	291.41	-	0.25	
02/16/95	-	15.33	0.00	292.03	-	0.25	
02/28/95	-	14.14	0.00	293.22	-	0.25	
03/10/95	-	12.96	0.00	294.40	-	0.25	
03/29/95	-	12.32	0.00	295.04	-	0.25	
04/04/95	-	13.02	0.00	294.34	-	0.25	
04/27/95	-	14.64	0.00	292.72	-	0.25	
05/11/95	-	14.57	0.00	292.79	-	0.25	
05/24/95	-	15.19	0.00	292.17	-	0.25	
06/15/95	-	16.14	0.00	291.22	-	0.25	
06/29/95	-	17.14	0.00	290.22	-	0.25	
07/06/95	-	17.84	0.00	289.52	-	0.25	
07/25/95	-	18.88	0.00	288.48	-	0.25	
08/01/95	-	19.05	0.00	288.31	-	0.25	
08/21/95	22.37	22.38	0.01	284.99	-	0.25	
09/14/95	25.38	25.65	0.27	281.94	-	0.25	
09/28/95	21.56	21.64	0.08	285.79	-	0.25	
10/06/95	-	19.26	0.00	288.10	-	0.25	

Well ID: **NFFW-12**
TOC: **309.02** ft amsl
Ground: **309.13** ft amsl
Depth of Well: **26.5** ft bgs
Depth to Screen **6.5** ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)	Total LNAPL Recovered (gal)	Comments
10/25/95	-	13.78	0.00	293.58	-	0.25	
11/21/95	-	9.70	0.00	297.66	-	0.25	
12/06/95	-	11.37	0.00	295.99	-	0.25	
12/21/95	-	11.80	0.00	295.56	-	0.25	
01/23/96	-	10.37	0.00	296.99	-	0.25	
02/09/96	-	9.45	0.00	297.91	-	0.25	
02/19/96	-	10.60	0.00	296.76	-	0.25	
01/09/98	-	12.46	0.00	296.56	-	0.25	New System Started
01/13/98	-	12.42	0.00	296.60	-	0.25	
02/20/98	-	10.32	0.00	298.70	-	0.25	
02/27/98	-	9.58	0.00	299.44	-	0.25	
03/16/98	-	3.63	0.00	305.39	-	0.25	
08/14/98	-	15.63	0.00	293.39	-	0.25	
10/14/98	-	10.07	0.00	298.95	-	0.25	
12/21/98	-	23.89	0.00	285.13	-	0.25	
01/13/99	-	20.73	0.00	288.29	-	0.25	
05/28/99	15.50	15.52	0.02	293.48	-	0.25	
10/07/99	-	11.56	0.00	297.46	-	0.25	
02/11/00	-	5.52	0.00	303.50	-	0.25	
08/15/00	-	12.98	0.00	296.04	-	0.25	
10/26/00	-	12.63	0.00	296.39	-	0.25	

Well ID:	**NFFW-14**	(Recovery Well)
TOC:	**314.40**	ft amsl
Ground:	**313.13**	ft amsl
Depth of Well:	**37.5**	ft bgs
Depth to Screen	**7.5**	ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Pressure Transducer	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)	Total LNAPL Recovered (gal)	Ground-water Flow Rate (gpm)	Ground-water Recovered (gal)	Vacuum at Vault (psia)	Flow Rate (SCFM)	Concentration (ppmv)	Comments
03/30/94	-	10.28	0.00		302.88	-	0.00						1030 HOURS, NEEDS NEW LOCK
04/04/94	-	10.19	0.00		302.97	-	0.00						1000 HOURS
04/06/94	-	10.88	0.00		302.28	-	0.00						1200 HOUR
04/07/94	-	11.09	0.00		302.07	-	0.00						1100 HOURS
04/12/94	12.57	12.58	0.01		300.59	-	0.00						1200 HOURS
04/20/94	12.57	12.96	0.39		300.54	-	0.00						
04/27/94	12.65	12.67	0.02		300.51	-	0.00						bailed 12 oz product
05/04/94	13.85	13.89	0.04		299.30	-	0.00						bailed 32 oz of product
05/12/94	14.23	14.29	0.06		298.92	-	0.00						
05/13/94	14.17	14.18	0.01		298.99	-	0.00						BAILED PRODUCT
05/16/94	15.30	15.38	0.08		297.85	-	0.00						BAILED PRODUCT
05/24/94	16.44	16.50	0.06		296.71	-	0.00						BAILED PRODUCT
05/27/94	17.04	17.08	0.05		296.12	-	0.00						BAILED PRODUCT
06/03/94	17.93	17.98	0.05		295.22	-	0.00						BAILED PRODUCT
06/15/94	19.54	19.58	0.04		293.61	-	0.00						BAILED PRODUCT
06/16/94	19.72	19.83	0.11		293.43	-	0.00						BAILED PRODUCT
07/01/94	23.03	23.38	0.35		290.08	-	0.00						
07/13/94	26.70	31.74	5.04		285.80	10.00	10.00						BAILED APPROX 10 GAL
08/05/94	17.53	21.55	4.02		295.11	5.00	15.00						BAILED APPROX 5 GAL
08/17/94	17.70	21.78	4.08		294.93	7.00	22.00						BAILED APPROX 7 GAL
08/30/94	18.28	18.31	0.03		297.21	-	22.00						INSTALLED FAP ADDED 28" OF 4" CASING
09/08/94	19.15	19.42	0.27		296.30	-	22.00						
09/14/94	20.77	20.80	0.03		294.72	-	22.00						FIXED TANK-FULL PROBE
09/19/94	21.90	21.92	0.02		293.59	-	22.00						
09/30/94	22.35	22.36	0.01		293.14	-	22.00						
10/17/94	25.36	25.46	0.10		290.12	-	22.00						
10/25/94	27.86	33.50	5.64		286.90	-	22.00						Passive Bailer Installed After Gauging
11/11/94	31.31	36.54	5.23		283.50	1.10	23.10						Passive Bailer Installed
11/22/94	-	-	0.00		NG	5.00	28.10						0.2' OF WATER, 4' PRODUCT (APPROX) BAILED PROD, IFP BROKE DURING GAUGING
12/07/94	27.86	33.90	6.04		286.84	11.00	39.10						BAILED PRODUCT
12/21/94	23.47	25.28	1.81		291.78	3.00	42.10						BAILED PRODUCT
01/04/95	24.00	24.48	0.48		291.43	1.00	43.10						BAILED PRODUCT
01/16/95	22.35	22.56	0.21		293.11	-	43.10						
01/23/95	-	20.64	0.00		294.85	0.37	43.47						PRODUCT FROM PASSIVE BAILER
02/16/95	20.36	20.37	0.01		295.13	-	43.47						
02/28/95	-	18.93	0.00		296.56	-	43.47						
03/10/95	-	17.73	0.00		297.76	-	43.47						
03/29/95	16.60	16.76	0.16		298.87	-	43.47						MOVED PASSIVE SKIMMER TO WELL
04/04/95	18.29	18.54	0.25		297.17	-	43.47						
04/27/95	20.22	20.67	0.45		295.21	-	43.47						LOWERED SKIMMER
05/11/95	20.11	20.35	0.24		295.35	0.37	43.84						
05/24/95	21.07	21.22	0.15		294.40	0.37	44.21						
06/15/95	21.86	22.12	0.26		293.60	-	44.21						
06/29/95	23.79	23.89	0.10		291.69	0.37	44.58						
07/06/95	24.52	24.58	0.06		290.96	-	44.58						
07/25/95	24.52	24.86	0.34		290.93	0.55	45.13						

Well ID: **NFFW-14** (Recovery Well)
TOC: **314.49** ft amsl
Ground: **313.13** ft amsl
Depth of Well: **37.5** ft bgs
Depth to Screen **7.5** ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Pressure Transducer	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)	Total LNAPL Recovered (gal)	Ground-water Flow Rate (gpm)	Ground-water Recovered (gal)	Vacuum at Vault (psia)	Flow Rate (SCFM)	Concentration (ppmv)	Comments
08/01/95	25.44	25.64	0.20		290.92	0.37	45.50						
08/21/95	31.66	35.21	3.55		283.37	0.37	45.87						
09/14/95	33.93	34.45	0.52		279.16	0.37	46.24						
09/28/95	24.80	28.18	3.38		287.92	6.50	52.74						Bailed Product
10/06/95	22.12	22.77	0.65		290.96	-	52.74						
10/25/95	15.78	16.02	0.24		297.35	0.37	53.11						
11/21/95	11.29	12.03	0.74		301.77	-	53.11						
12/08/95	13.39	14.36	0.97		299.64	2.00	55.11						
12/21/95	-	-	0.00		NG	-	55.11						Covered Under Plowed Snow
01/23/96	-	-	0.00		NG	-	55.11						Covered Under Plowed Snow
01/02/98	-	-	0.00	-	NG	-	55.11	-	-	-	-	-	New System Started
01/09/98	-	15.44	0.00	52.00	298.96	-	55.11	-	-	-	-	-	
01/09/98	29.28	29.41	0.13	35.00	284.88	22.40	77.51	2.5	-	-	-	-	
01/13/98	-	29.71	0.00	35.00	284.69	20.00	97.51	1.0	-	-	-	-	
01/20/98	-	-	0.00	35.00	NG	9.10	106.61	1.0	-	-	-	-	
01/28/98	-	-	0.00	35.00	NG	3.80	110.41	-	-	-	-	-	
02/02/98	-	-	0.00	-	NG	-	110.41	-	-	-	-	-	
02/09/98	29.89	29.94	0.05	35.00	284.42	8.72	119.13	-	-	-	-	-	
02/16/98	-	-	0.00	34.70	NG	1.92	121.05	-	-	12.4	-	236	
02/20/98	-	-	0.00	34.90	NG	3.46	124.51	-	-	12.5	-	610	
02/23/98	-	-	0.00	34.70	NG	0.10	124.61	-	-	12.5	-	232	
02/27/98	29.42	29.55	0.13	34.60	284.74	2.40	127.01	-	-	12.2	-	-	
03/02/98	-	29.49	0.00	-	284.91	-	127.01	-	-	12.7	9.9	-	
03/05/98	29.80	29.84	0.04	34.70	284.53	1.60	128.61	0.0	9999	12.0	22.2	78	
03/09/98	28.97	29.03	0.06	35.80	285.32	1.20	129.81	0.0	337	-	-	-	
03/13/98	30.25	30.30	0.05	35.60	284.06	-	129.81	0.0	367	11.7	8.5	-	
03/16/98	28.88	28.90	0.02	35.20	285.48	1.00	130.81	0.1	491	-	-	85	
03/23/98	-	-	0.00	35.60	NG	-	130.81	-	-	12.5	13.4	-	
04/02/98	29.40	29.41	0.01	35.80	284.98	1.80	132.61	-	-	12.2	10.0	-	
04/13/98	29.75	29.76	0.01	35.50	284.63	1.70	134.31	-	-	13.5	12.9	30	
04/17/98	-	-	0.00	35.90	NG	0.50	134.81	0.3	531	13.2	33.0	243	Cleaned screen on product pump/ installed flow meter
04/22/98	-	-	0.00	-	NG	-	134.81	-	-	13.5	-	-	
05/05/98	28.00	28.94	0.94	-	284.64	-	134.81	-	-	13.7	6.5	320	
05/21/98	27.16	27.18	0.02	-	287.20	2.40	137.21	-	-	11.7	7.8	88	
05/28/98	-	-	0.00	44.70	NG	*	137.21	-	22595	13.7	17.6	-	
06/12/98	24.25	24.26	0.01	39.30	290.13	0.94	138.15	0.4	25740	13.0	6.2	-	
06/23/98	-	25.26	0.00	39.90	289.14	0.15	138.30	0.2	29999	13.2	7.4	-	
07/10/98	17.16	17.18	0.02	49.50	297.20	0.45	138.75	0.1	29999	13.5	3.7	365	
07/25/98	-	-	0.00	-	NG	-	138.75	-	-	-	-	-	
07/31/98	-	-	0.00	37.10	NG	0.04	138.79	0.7	51559	12.2	10.0	-	
08/05/98	-	-	0.00	-	NG	1.16	139.95	-	-	14.0	6.6	615	
08/14/98	27.07	27.13	0.06	-	287.22	1.60	141.55	-	-	14.2	5.4	-	
08/27/98	27.10	27.14	0.04	-	287.23	2.90	144.45	-	-	-	-	-	
09/11/98	17.74	17.77	0.03	-	296.60	0.30	144.75	-	-	-	-	-	
09/16/98	27.47	27.51	0.04	39.70	286.86	-	144.75	0.0	59999	14.7	0.0	-	
09/25/98	-	-	0.00	43.80	NG	-	144.75	0.6	59999	-	-	333	

Well ID: **NFFW-14** (Recovery Well)
TOC: **314.40** ft amsl
Ground: **313.13** ft amsl
Depth of Well: **37.5** ft bgs
Depth to Screen **7.5** ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Pressure Transducer	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)	Total LNAPL Recovered (gal)	Ground-water Flow Rate (gpm)	Ground-water Recovered (gal)	Vacuum at Vault (psia)	Flow Rate (SCFM)	Concentration (ppmv)	Comments
10/14/98	-	23.25	0.00	39.40	291.15	0.80	145.55	0.0	-	14.7	0.0	-	
10/27/98	23.85	23.87	0.02	36.20	290.51	1.50	147.05	3.1	-	-	-	-	
11/03/98	23.70	23.74	0.04	-	290.63	0.70	147.75	-	-	-	-	-	
11/10/98	-	-	0.00	-	NG	-	147.75	-	-	-	-	-	
11/23/98	24.17	24.19	0.02	36.70	290.19	1.60	149.35	0.0	15999	-	-	-	
12/11/98	34.90	34.90	0.00	34.90	279.50	1.60	150.95	-	179999	-	-	-	
12/21/98	31.77	31.90	0.13	35.00	282.39	0.40	151.35	-	179999	-	-	-	
01/13/99	29.90	29.92	0.02	36.80	284.46	0.80	152.15	-	-	-	-	-	
01/26/99	28.90	28.93	0.03	43.60	285.44	-	152.15	0.2	179999	-	-	-	
02/05/99	28.06	28.07	0.01	37.60	286.32	0.20	152.35	0.1	179999	-	-	-	
02/15/99	28.89	28.90	0.01	37.50	285.49	2.10	154.45	0.1	179999	-	-	-	
02/22/99	28.72	28.74	0.02	37.30	285.64	0.80	155.25	0.1	179999	-	-	-	
03/04/99	27.02	29.04	2.02	36.70	283.60	-	155.25	0.1	179999	14.7	0.0	-	
03/30/99	27.54	27.60	0.06	39.60	286.75	2.10	157.35	0.3	209999	14.7	0.0	-	
04/09/99	15.83	15.85	0.02	49.10	298.53	1.00	158.35	0.1	209999	-	-	-	
04/28/99	-	-	0.00	49.80	NG	0.10	158.45	0.2	209999	-	-	-	
05/13/99	22.40	22.46	0.06	46.10	291.89	0.30	158.75	0.5	209999	-	-	-	
05/28/99	30.53	30.50	-0.03	34.10	283.93	1.20	159.95	2.5	209999	-	-	-	
06/09/99	29.12	29.15	0.03	38.80	285.22	2.40	162.35	0.0	220402	-	-	-	
06/21/99	-	21.33	0.00	44.20	293.07	-	162.35	0.1	222487	-	-	-	
07/01/99	28.02	28.05	0.03	40.40	286.32	-	162.35	0.5	222789	-	-	-	
07/20/99	29.19	29.20	0.01	38.20	285.19	-	162.35	3.0	222824	10.8	-	1700	
08/05/99	30.73	30.77	0.04	31.90	283.60	1.70	164.05	0.0	224730	11.0	-	-	
08/13/99	29.88	29.90	0.02	29.80	284.48	0.30	164.35	0.0	225623	10.3	-	-	
08/16/99	-	-	0.00	35.50	NG	1.60	165.95	0.0	225623	10.0	-	-	
09/09/99	-	30.45	0.00	33.00	283.95	-	165.95	0.0	225628	-	-	-	
09/22/99	24.26	24.91	0.65	33.00	288.92	0.40	166.35	0.1	229999	-	-	-	
10/07/99	25.88	26.04	0.16	36.90	288.22	-	166.35	4.6	229999	-	-	-	
10/12/99	15.36	15.64	0.28	45.70	298.52	0.20	166.55	3.2	229999	14.7	0.0	-	
11/03/99	-	-	0.00	37.70	NG	0.60	167.15	0.1	259999	14.7	0.0	-	
11/09/99	-	-	0.00	40.20	NG	-	167.15	3.6	259999	12.5	8.8	-	
11/28/99	30.09	30.11	0.02	37.20	284.27	0.30	167.45	0.7	259999	14.7	0.0	-	
12/08/99	29.54	29.56	0.02	37.40	284.82	-	167.45	0.5	276540	14.7	0.0	-	
12/30/99	30.31	30.33	0.02	37.90	284.05	-	167.45	1.2	279999	14.7	0.0	-	
01/06/00	-	28.41	0.00	40.80	285.99	-	167.45	4.4	302709	14.7	0.0	-	
01/13/00	-	-	0.00	-	NG	-	167.45	-	0	-	-	-	
01/20/00	-	29.36	0.00	37.40	285.04	-	167.45	2.0	29100	14.7	0.0	-	
02/11/00	-	27.42	0.00	37.70	286.98	-	167.45	1.6	122460	14.7	0.0	-	
02/29/00	32.26	32.29	0.03	35.00	282.08	-	167.45	0.0	158350	12.2	11.2	-	
03/07/00	17.30	17.38	0.08	43.30	296.95	-	167.45	2.8	173680	14.7	0.0	-	
03/15/00	27.12	27.15	0.03	36.20	287.22	-	167.45	0.0	174700	14.7	0.0	-	
03/21/00	-	-	0.00	-	NG	-	167.45	-	-	-	-	-	
03/30/00	28.88	28.99	0.11	38.10	285.31	-	167.45	1.3	78970	14.7	0.0	-	
04/18/00	30.04	30.06	0.02	37.40	284.32	-	167.45	3.1	235900	14.7	0.0	-	
04/28/00	30.45	30.48	0.03	36.30	283.89	-	167.45	0.9	241070	14.7	0.0	-	
05/10/00	29.28	29.30	0.02	45.20	285.08	-	167.45	0.1	241200	14.7	0.0	-	
05/23/00	-	-	0.00	41.30	NG	-	167.45	0.9	24332	14.7	0.0	-	

Well ID: **NFFW-14** (Recovery Well)
TOC: **314.40** ft amsl
Ground: **313.13** ft amsl
Depth of Well: **37.5** ft bgs
Depth to Screen **7.5** ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Pressure Transducer	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)	Total LNAPL Recovered (gal)	Ground-water Flow Rate (gpm)	Ground-water Recovered (gal)	Vacuum at Vault (psia)	Flow Rate (SCFM)	Concentration (ppmv)	Comments
06/12/00	-	-	0.00	46.60	NG	-	167.45	0.0	243910	14.7	0.0	-	
06/30/00	29.20	29.21	0.01	45.10	294.18	-	167.45	0.0	244310	14.7	0.0	-	
07/06/00	-	-	0.00	-	NG	-	167.45	0.0	-	14.7	0.0	-	
07/18/00	29.02	29.54	0.52	36.90	284.41	0.50	167.96	0.1	246960	14.7	0.0	-	
07/26/00	-	-	0.00	34.50	NG	0.10	168.05	0.5	249630	14.7	0.0	-	
07/28/00	-	-	0.00	31.00	NG	0.10	168.15	0.1	251530	11.7	24.1	-	
08/04/00	-	-	0.00	41.90	NG	0.10	168.25	2.9	258600	10.8	20.0	-	
08/08/00	-	-	0.00	35.90	NG	-	168.25	0.1	269590	12.0	23.3	305	
08/15/00	-	30.66	0.00	35.50	283.74	0.10	168.35	0.1	284810	14.7	0.0	-	
08/22/00	-	31.03	0.00	36.80	283.37	0.10	168.45	2.3	290440	14.7	0.0	-	
08/28/00	-	31.12	0.00	35.30	283.28	-	168.45	2.8	294730	14.7	0.0	-	
09/06/00	-	29.31	0.00	35.30	285.09	-	168.45	0.1	3320	14.7	0.0	-	
09/19/00	-	29.86	0.00	34.80	284.54	-	168.45	0.1	35740	14.7	0.0	-	
09/25/00	-	29.66	0.00	36.90	284.74	-	168.45	0.1	38400	12.2	18.1	296	
10/06/00	29.71	29.72	0.01	36.60	284.67	-	168.45	0.2	3108690	12.2	16.6	-	
10/11/00	28.07	28.10	0.03	36.50	286.27	-	168.45	0.2	312920	-	-	-	
10/12/00	29.19	29.21	0.02	34.60	286.17	-	168.45	0.5	315470	11.0	19.6	385	
10/19/00	-	29.80	0.00	35.00	284.60	-	168.45	2.0	332250	10.8	17.6	-	
10/26/00	-	-	0.00	-	NG	-	168.45	-	-	-	-	-	
11/03/00	-	29.97	0.00	35.00	284.43	-	168.45	0.8	375880	11.3	-	-	
11/08/00	29.10	29.14	0.04	34.90	285.23	-	168.45	0.5	393050	11.3	19.3	-	
11/09/00	-	29.55	0.00	34.90	284.85	-	168.45	0.8	396280	14.7	0.0	-	
11/13/00	28.85	28.91	0.06	34.60	285.44	0.10	168.55	0.8	48940	14.7	0.0	-	
11/20/00	29.61	29.62	0.01	35.60	284.77	-	168.55	2.3	426810	14.7	0.0	-	
11/27/00	-	29.33	0.00	35.30	285.07	-	168.55	0.7	446330	14.7	0.0	-	
12/04/00	29.01	29.02	0.01	35.80	285.37	-	168.55	1.0	468500	14.7	0.0	-	
12/15/00	28.40	28.42	0.02	35.30	285.96	-	168.55	1.9	54860	14.7	0.0	-	
12/18/00	29.09	29.10	0.01	36.00	285.29	-	168.55	1.2	532290	14.7	0.0	-	

Well ID: **NFFW-15**
TOC: **308.42** ft amsl
Ground: **305.97** ft amsl
Depth of Well: **32.5** ft bgs
Depth to Screen **7.5** ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)	Total LNAPL Recovered (gal)	Comments
03/30/94	-	8.94	0.00	297.93			1030 HOURS, NO LOCK
04/04/94	-	9.18	0.00	297.69			1000 HOURS
04/12/94	-	10.46	0.00	296.41			1200 HOURS
04/20/94	-	10.39	0.00	296.48			
05/12/94	-	13.35	0.00	293.52			
05/24/94	-	14.61	0.00	292.26			
06/03/94	-	16.15	0.00	290.72			
07/01/94	-	21.48	0.00	285.39			
07/13/94	-	24.28	0.00	282.59			
08/05/94	-	17.29	0.00	289.58			
08/17/94	-	17.36	0.00	289.51			
08/30/94	-	13.95	0.00	292.92			
09/08/94	-	14.93	0.00	291.94			
09/19/94	-	17.32	0.00	289.55			
09/30/94	-	18.21	0.00	288.66			
10/17/94	-	21.37	0.00	285.50			
10/25/94	-	23.82	0.00	283.05			
11/11/94	-	27.50	0.00	279.37			
11/22/94	-	28.30	0.00	278.57			
12/07/94	-	23.33	0.00	283.54			
12/21/94	-	19.95	0.00	286.92			
01/04/95	-	20.56	0.00	286.31			
01/23/95	-	17.01	0.00	289.86			
02/16/95	-	17.17	0.00	289.70			
02/28/95	-	15.72	0.00	291.15			
03/10/95	-	13.42	0.00	293.45			
03/29/95	-	13.27	0.00	293.60			
04/04/95	-	14.01	0.00	292.86			
04/27/95	-	16.22	0.00	290.65			
05/11/95	-	16.70	0.00	290.17			
05/24/95	-	17.31	0.00	289.56			
06/15/95	-	18.50	0.00	288.37			
06/29/95	-	20.48	0.00	286.39			
07/06/95	-	21.55	0.00	285.32			
07/25/95	-	21.72	0.00	285.15			
08/01/95	-	22.04	0.00	284.83			
08/21/95	-	26.98	0.00	279.89			
09/14/95	-	31.88	0.00	274.99			
09/28/95	-	23.00	0.00	283.87			
10/06/95	-	18.91	0.00	287.96			
10/25/95	-	13.42	0.00	293.45			
11/21/95	-	9.48	0.00	297.39			
12/08/95	-	11.76	0.00	295.11			
12/21/95	-	12.46	0.00	294.41			
01/23/96	-	-	0.00	-			Covered With Plowed Snow
02/09/96	-	9.69	0.00	297.18			
02/19/96	-	10.92	0.00	295.95			
01/09/98	-	12.86	0.00	295.56	-	0.00	New System Started
02/20/98	-	9.92	0.00	298.50	-	0.00	
05/21/98	-	11.17	0.00	297.25	-	0.00	
12/21/98	-	27.29	0.00	281.13	-	0.00	

Well ID: **NFFW-15**
TOC: **308.42** ft amsl
Ground: **305.97** ft amsl
Depth of Well: **32.5** ft bgs
Depth to Screen **7.5** ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)	Total LNAPL Recovered (gal)	Comments
01/13/99	-	22.90	0.00	285.52	-	0.00	
05/28/99	-	16.85	0.00	291.57	-	0.00	
10/07/99	-	11.13	0.00	297.29	-	0.00	
02/11/00	-	9.83	0.00	298.59	-	0.00	
08/15/00	-	13.42	0.00	295.00	-	0.00	
10/26/00	-	13.86	0.00	294.56	-	0.00	

Well ID: **NFFW-16** (Recovery Well)
TOC: **312.08** ft amsl
Ground: **310.67** ft amsl
Depth of Well: **32.5** ft bgs
Depth to Screen **7.5** ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Pressure Transducer	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)		Total LNAPL Recovered (gal)	Ground-water Flow Rate (gpm)	Ground-water Recovered (gal)	Vacuum at Vault (psia)	Flow Rate (SCFM)	Concentration (ppmv)	Comments
03/30/94	-	11.40	0.00		301.54	-		0.00						1030 HOURS
04/04/94	-	11.29	0.00		301.65	-		0.00						1000 HOURS
04/06/94	-	11.83	0.00		301.11	-		0.00						1200 HOUR
04/07/94	-	12.11	0.00		300.83	-		0.00						1100 HOURS
04/12/94	-	13.08	0.00		299.86	-		0.00						1200 HOURS
04/20/94	-	13.44	0.00		299.50	-		0.00						
04/27/94	-	3.30	0.00		309.64	-		0.00						Invalid data?
05/04/94	-	14.15	0.00		298.79	-		0.00						
05/12/94	-	14.32	0.00		298.62	-		0.00						
05/13/94	-	14.39	0.00		298.55	-		0.00						
05/16/94	-	14.88	0.00		298.06	-		0.00						
05/24/94	-	15.71	0.00		297.23	-		0.00						
05/27/94	16.18	16.18	0.00		296.76	-		0.00						
06/03/94	16.04	16.07	0.03		296.90	-		0.00						
06/15/94	18.27	18.34	0.07		294.66	-		0.00						
06/16/94	18.49	18.56	0.07		294.45	-		0.00						
07/01/94	21.62	21.77	0.15		291.30	-		0.00						
07/13/94	24.18	24.68	0.50		288.70	0.25		0.25						BAILED 0.25 GAL
08/05/94	17.43	18.66	1.23		295.35	1.00		1.25						BAILED 1 GAL
08/17/94	18.52	19.26	0.74		294.32	0.50		1.75						BAILED 0.5 GAL
08/30/94	16.45	16.58	0.13		296.47	0.25		2.00						BAILED 0.25 GAL INSTALLED P SKIMMER
09/08/94	17.11	17.17	0.06		295.82	-		2.00						
09/14/94	20.77	20.80	0.03		292.17	-		2.00						
09/19/94	19.28	19.29	0.01		293.66	0.07		2.07						BAILED 250 ML
09/30/94	19.36	19.36	0.00		293.58	-		2.07						SHEEN
10/17/94	22.52	22.61	0.09		290.41	-		2.07						
10/25/94	24.86	26.20	1.34		287.91	-		2.07						
11/11/94	29.80	32.36	2.56		282.81	-		2.07						
11/22/94	31.22	34.19	2.97		281.33	-		2.07						
12/07/94	25.45	28.90	3.45		287.04	-		2.07						
12/21/94	20.88	23.11	2.23		291.77	4.00		6.07						Bailed Product
01/04/95	21.27	22.03	0.76		291.57	1.00		7.07						Bailed Product
01/16/95	19.33	19.64	0.31		293.57	1.00		8.07						Bailed Product
01/23/95	17.72	17.97	0.25		295.19	-		8.07						
02/16/95	17.58	17.73	0.15		295.34	-		8.07						Installed Bailer
02/28/95	-	16.41	0.00		296.53	-		8.07						
03/10/95	-	15.84	0.00		297.10	-		8.07						
03/29/95	-	14.90	0.00		298.04	0.25		8.32						Removed Bailer
04/04/95	-	15.47	0.00		297.47	-		8.32						
04/27/95	16.98	16.99	0.00		295.96	-		8.32						Product .005 thick
05/11/95	-	16.85	0.00		296.09	-		8.32						
05/24/95	17.59	17.60	0.01		295.35	-		8.32						
06/15/95	18.46	18.47	0.01		294.48	-		8.32						
06/29/95	19.78	19.86	0.08		293.15	-		8.32						
07/06/95	-	21.08	0.00		291.86	-		8.32						
07/25/95	21.75	21.83	0.08		291.18	-		8.32						
08/01/95	21.90	21.99	0.09		291.03	-		8.32						

Well ID: **NFFW-16** (Recovery Well)
TOC: **312.08** ft amsl
Ground: **310.67** ft amsl
Depth of Well: **32.5** ft bgs
Depth to Screen: **7.5** ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Pressure Transducer	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)		Total LNAPL Recovered (gal)	Ground-water Flow Rate (gpm)	Ground-water Recovered (gal)	Vacuum at Vault (psia)	Flow Rate (SCFM)	Concentration (ppmv)	Comments
08/21/95	27.72	29.10	1.38		285.04	-		8.32						
09/14/95	33.59	36.60	3.01		278.96	6.00		14.32						Bailed Product
09/28/95	27.05	27.81	0.76		285.79	-		14.32						
10/06/95	22.20	22.38	0.18		290.72	-		14.32						
10/25/95	-	15.92	0.00		297.02	-		14.32						
11/21/95	-	12.17	0.00		300.77	-		14.32						
12/08/95	-	14.00	0.00		298.94	-		14.32						
12/21/95	-	14.15	0.00		298.79	-		14.32						
01/23/96	-	12.55	0.00		300.39	-		14.32						
02/09/96	-	11.24	0.00		301.70	-		14.32						
02/19/96	-	13.28	0.00		299.68	-		14.32						
01/02/98	-	-	0.00	-	NG	-		14.32	-	-	-	-	-	New System Started
01/09/98	-	13.91	0.00	48.60	298.17	-	999977.60	14.32	-	-	-	-	-	
01/09/98	-	-	0.00	-	NG	-	999977.60	14.32	-	-	-	-	-	
01/13/98	-	14.16	0.00	52.10	297.92	-	999977.60	14.32	-	-	-	-	-	
01/20/98	-	-	0.00	-	NG	-	999977.60	14.32	-	-	-	-	-	
01/28/98	-	-	0.00	52.80	NG	-	999977.60	14.32	-	-	-	-	-	
02/02/98	-	13.18	0.00	53.40	298.90	-	999977.60	14.32	-	-	-	-	-	
02/09/98	28.13	30.79	2.66	38.00	278.98	11.82	999989.42	26.14	-	-	-	-	-	
02/16/98	-	-	0.00	42.50	NG	*	999989.84	26.14	-	-	12.6	-	452	
02/20/98	-	-	0.00	42.70	NG	0.26	999989.10	26.40	-	-	12.6	-	620	
02/23/98	-	-	0.00	42.50	NG	-	999989.10	26.40	-	-	12.6	-	426	
02/27/98	16.48	31.70	15.22	45.90	267.14	0.10	999989.20	26.50	-	-	12.4	-	-	
03/02/98	14.62	30.85	16.23	-	267.11	-	999989.20	26.50	-	-	13.0	6.9	-	GW system off b/c product system not recovering product
03/06/98	12.63	12.77	0.14	32.90	299.19	7.20	999996.40	33.70	-	877	-	-	-	6.7 gal of product was hand bailed
03/09/98	12.33	12.62	0.29	-	299.21	-	999996.40	33.70	-	-	-	-	-	
03/13/98	11.03	11.14	0.11	37.60	300.84	-	999996.40	33.70	-	5024	-	-	-	
03/16/98	20.48	24.20	3.72	40.60	284.64	-	999996.40	33.70	0.3	109999	-	-	-	
03/23/98	-	-	0.00	44.20	NG	-	999996.40	33.70	-	-	11.7	8.0	-	
04/02/98	28.45	28.64	0.19	49.70	283.27	-	999996.40	33.70	-	-	12.2	10.5	-	
04/13/98	29.42	29.49	0.07	46.30	282.53	8.20	1000004.60	41.90	-	-	13.2	9.8	173	
04/17/98	-	-	0.00	43.80	NG	8.30	2.90	50.20	4.8	1059999	13.0	6.9	420	installed flow sensor (water)
04/22/98	-	-	0.00	-	NG	2.71	5.61	52.91	-	-	13.5	6.1	-	
05/05/98	31.08	31.15	0.07	-	280.87	27.39	33.00	80.30	-	-	13.5	7.0	793	
05/21/98	28.02	28.11	0.09	-	283.89	9.30	42.30	89.60	-	-	10.8	9.9	209	
05/28/98	-	-	0.00	45.00	NG	0.02	42.32	89.62	-	1659999	13.2	6.9	-	
06/12/98	31.70	31.83	0.13	31.70	280.14	2.48	44.80	92.10	0.4	1829999	12.0	6.6	-	
06/23/98	30.98	31.11	0.13	36.50	280.86	0.56	45.36	92.66	1.7	2352729	13.2	8.5	-	
07/10/98	16.04	16.12	0.08	53.60	295.89	0.94	46.30	93.60	2.1	2490841	13.0	6.9	716	
07/25/98	-	-	0.00	-	NG	-	46.30	93.60	-	-	-	-	-	
07/31/98	-	-	0.00	42.10	NG	0.04	46.34	93.64	1.3	3445104	-	-	-	
08/05/98	-	-	0.00	-	NG	0.06	46.40	93.70	-	-	-	-	-	
08/14/98	30.48	30.56	0.08	-	281.45	0.10	46.50	93.80	-	-	-	-	-	
08/27/98	30.70	32.30	1.60	-	278.39	-	46.50	93.80	-	-	-	-	-	
09/11/98	19.12	20.44	1.32	-	290.49	-	46.50	93.80	-	-	-	-	-	
09/16/98	27.55	29.10	1.55	42.80	281.63	3.20	49.70	97.00	0.2	5249999	14.7	0.0	-	

Well ID: **NFFW-16** (Recovery Well)
TOC: **312.08** ft amsl
Ground: **310.67** ft amsl
Depth of Well: **32.5** ft bgs
Depth to Screen **7.5** ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Pressure Transducer	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)		Total LNAPL Recovered (gal)	Ground-water Flow Rate (gpm)	Ground-water Recovered (gal)	Vacuum at Vault (psia)	Flow Rate (SCFM)	Concentration (ppmv)	Comments
09/25/98	-	-	0.00	56.60	NG	3.90	53.60	100.90	2.1	5349999	13.9	8.7	-	
10/14/98	-	20.74	0.00	40.40	291.34	9.50	63.10	110.40	4.5	-	12.5	9.5	-	
10/27/98	24.12	24.17	0.05	35.70	287.87	2.50	65.60	112.90	0.2	-	13.7	9.3	640	
11/03/98	24.00	24.03	0.03	-	288.02	1.30	66.90	114.20	-	-	13.7	10.0	595	
11/10/98	-	-	0.00	-	NG	-	66.90	114.20	-	-	-	-	-	
11/23/98	23.87	23.88	0.01	37.30	288.19	1.50	68.40	115.70	0.2	733544	12.0	12.3	638	
12/11/98	29.98	29.99	0.01	36.80	282.08	11.30	79.70	127.00	0.9	8119999	12.7	14.4	-	
12/21/98	30.01	30.12	0.11	36.80	281.86	1.40	81.10	128.40	1.0	8589999	12.5	17.2	444	
01/13/99	31.25	31.28	0.03	37.90	280.77	2.10	83.20	130.50	0.1	9317282	12.5	9.5	-	
01/26/99	30.88	30.90	0.02	36.80	281.16	-	83.20	130.50	0.6	9834366	12.5	11.7	388	
02/05/99	30.12	30.14	0.02	37.30	281.92	-	83.20	130.50	0.2	10304872	12.5	13.5	435	
02/15/99	30.53	30.55	0.02	37.10	281.51	0.10	83.30	130.60	0.1	10789772	-	-	-	
02/22/99	30.38	30.40	0.02	36.60	281.66	0.20	83.50	130.80	0.1	11184873	13.2	10.9	385	
03/04/99	30.70	30.73	0.03	36.90	281.32	0.30	83.80	131.10	0.5	11589999	11.3	20.2	-	
03/30/99	29.77	29.76	-0.01	38.00	282.33	2.30	86.10	133.40	0.8	12808153	10.5	-	-	
04/09/99	31.85	31.90	0.05	35.70	280.14	1.50	87.60	134.90	2.1	13273303	-	-	-	
04/28/99	-	-	0.00	54.90	NG	-	87.60	134.90	0.8	13409999	-	-	-	
05/13/99	26.66	26.69	0.03	44.60	285.36	0.80	88.40	135.70	1.8	14109999	-	-	-	
05/28/99	30.40	30.36	-0.04	36.10	281.75	0.00	87.60	135.70	1.2	14679991	-	-	-	
06/09/99	30.22	30.27	0.05	36.60	281.77	-	87.60	135.70	0.0	15229999	-	-	-	
06/21/99	20.10	20.21	0.11	47.90	291.77	-	87.60	135.70	0.2	15796495	-	-	-	
07/01/99	29.56	29.59	0.03	37.40	282.46	0.10	87.70	135.80	0.1	16275459	-	-	-	
07/20/99	29.44	29.46	0.02	37.10	282.60	1.50	89.20	137.30	0.1	16549999	13.2	10.9	1800	
08/05/99	29.89	29.92	0.03	36.40	282.13	0.10	89.30	137.40	0.1	17549999	-	-	-	
08/13/99	28.06	28.20	0.14	36.80	283.76	-0.10	89.20	137.30	0.1	17919999	-	-	-	
08/16/99	-	-	0.00	36.70	NG	0.30	89.50	137.60	0.0	17960828	-	-	-	
09/09/99	28.17	28.22	0.05	36.90	283.82	-	89.50	137.60	0.1	18599999	12.7	-	450	
09/22/99	22.14	22.17	0.03	36.60	289.88	-	89.50	137.60	1.2	19189999	11.7	-	NA	
10/07/99	24.60	24.62	0.02	39.60	287.44	0.10	89.60	137.70	1.6	19910374	-	-	-	
10/12/99	11.19	11.20	0.01	48.60	300.87	-	89.60	137.70	1.7	19989266	-	-	-	
11/03/99	-	-	0.00	37.20	NG	-	89.60	137.70	0.1	21039999	14.7	0.0	-	
11/09/99	-	-	0.00	44.20	NG	-	89.60	137.70	0.1	21311185	12.2	5.8	-	
11/28/99	31.16	31.20	0.04	36.60	280.85	-	89.60	137.70	1.0	22289999	12.7	18.6	-	
12/08/99	30.80	30.81	0.01	37.10	281.26	-	89.60	137.70	1.0	22659999	11.5	10.7	-	
12/30/99	27.46	27.49	0.03	41.30	284.56	-	89.60	137.70	1.0	23657275	14.7	0.0	-	
01/06/00	27.40	27.42	0.02	43.70	284.64	-	89.60	137.70	1.1	23979999	14.7	0.0	-	
01/13/00	-	-	0.00	-	NG	-	89.60	137.70	-	0	-	-	-	
01/20/00	30.32	30.38	0.06	35.30	281.65	-	89.60	137.70	1.0	715990	10.8	9.9	388	
02/11/00	29.46	29.51	0.05	35.30	282.53	-	89.60	137.70	1.0	3179940	11.3	9.0	412	
02/29/00	-	34.12	0.00	35.20	277.96	-	89.60	137.70	1.9	4843250	14.7	0.0	-	
03/07/00	14.12	14.14	0.02	47.40	297.92	-	89.60	137.70	1.8	5046240	14.7	0.0	-	
03/15/00	-	28.66	0.00	35.40	283.42	-	89.60	137.70	1.4	6243660	14.7	0.0	-	
03/21/00	-	-	0.00	-	NG	-	89.60	137.70	-	-	-	-	-	
03/30/00	27.11	27.14	0.03	38.10	284.91	-	89.60	137.70	0.9	9189560	14.7	0.0	-	
04/18/00	-	28.88	0.00	38.10	283.20	-	89.60	137.70	2.2	12556410	14.7	0.0	-	
04/28/00	-	29.36	0.00	37.40	282.72	-	89.60	137.70	1.7	14412010	14.7	0.0	-	
05/10/00	-	27.82	0.00	37.00	284.26	-	89.60	137.70	0.6	14421100	14.7	0.0	-	

Well ID: **NFFW-16** (Recovery Well)
TOC: **312.06** ft amsl
Ground: **310.67** ft amsl
Depth of Well: **32.5** ft bgs
Depth to Screen: **7.5** ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Pressure Transducer	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)		Total LNAPL Recovered (gal)	Ground-water Flow Rate (gpm)	Ground-water Recovered (gal)	Vacuum at Vault (psia)	Flow Rate (SCFM)	Concentration (ppmv)	Comments
05/23/00	-	-	0.00	51.00	NG	-	89.60	137.70	1.7	1505370	14.7	0.0	-	
06/12/00	-	-	0.00	40.80	NG	-	89.60	137.70	0.1	17271220	14.7	0.0	-	
06/30/00	-	14.68	0.00	51.80	297.50	-	89.60	137.70	0.0	18221460	14.7	0.0	-	
07/06/00	-	-	0.00	-	NG	-	89.60	137.70	0.0	-	14.7	0.0	-	
07/16/00	31.04	31.06	0.02	36.50	281.00	-	89.60	137.70	0.4	1923510	14.7	0.0	-	
07/26/00	-	-	0.00	36.20	NG	-	89.60	137.70	1.5	20317750	14.7	0.0	-	
07/28/00	-	-	0.00	32.70	NG	-	89.60	137.70	0.8	21047460	14.7	0.0	-	
08/04/00	-	-	0.00	43.70	NG	-	89.60	137.70	1.6	22324720	14.7	0.0	-	
08/08/00	-	-	0.00	32.70	NG	-	89.60	137.70	0.9	2328670	14.7	0.0	-	
08/15/00	-	29.46	0.00	33.00	282.62	-	89.60	137.70	0.4	24329860	14.7	0.0	-	
08/22/00	-	28.16	0.00	44.80	283.92	-	89.60	137.70	1.2	25459720	14.7	0.0	-	
08/28/00	-	30.64	0.00	44.80	281.44	-	89.60	137.70	0.4	26643240	14.7	0.0	-	
09/08/00	-	31.16	0.00	33.00	280.92	-	89.60	137.70	0.4	28690630	14.7	0.0	-	
09/19/00	-	31.22	0.00	32.80	280.86	-	89.60	137.70	0.1	30778180	14.7	0.0	-	
09/25/00	-	30.55	0.00	32.90	281.53	-	89.60	137.70	0.1	3197240	14.7	0.0	-	
10/06/00	-	29.88	0.00	33.20	282.20	-	89.60	137.70	0.2	32287140	14.7	0.0	-	
10/11/00	-	27.44	0.00	46.50	284.64	-	89.60	137.70	1.7	32654510	14.7	0.0	-	
10/12/00	-	29.09	0.00	42.10	282.99	-	89.60	137.70	1.1	32840250	14.7	0.0	-	
10/19/00	-	30.16	0.00	39.00	281.92	-	89.60	137.70	1.4	34151810	14.7	0.0	-	
10/25/00	-	34.23	0.00	-	277.85	-	89.60	137.70	-	-	-	-	-	
11/03/00	33.17	33.21	0.04	35.40	278.84	-	89.60	137.70	2.9	36944320	14.7	0.0	-	
11/08/00	-	30.98	0.00	32.90	281.10	-	89.60	137.70	2.4	37864610	14.7	0.0	-	
11/09/00	-	27.16	0.00	42.50	284.92	-	89.60	137.70	2.1	38046050	14.7	0.0	-	
11/13/00	-	30.04	0.00	36.30	282.04	-	89.60	137.70	1.5	38748130	14.7	0.0	-	
11/20/00	-	30.41	0.00	35.00	281.67	-	89.60	137.70	1.7	40063970	14.7	0.0	-	
11/27/00	-	33.10	0.00	32.70	278.98	-	89.60	137.70	1.8	41379040	14.7	0.0	-	
12/04/00	-	31.38	0.00	33.30	280.70	-	89.60	137.70	1.4	42682950	14.7	0.0	-	
12/15/00	-	30.88	0.00	33.40	281.20	-	89.60	137.70	2.7	44742160	14.7	0.0	-	
12/18/00	-	30.97	0.00	33.00	281.11	-	89.60	137.70	1.1	45299930	14.7	0.0	-	

Well ID: **NFFW-17**
TOC: **301.08** ft amsl
Ground: **301.76** ft amsl
Depth of Well: **24** ft bgs
Depth to Screen **4** ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)	Total LNAPL Recovered (gal)	Comments
03/30/94	-	2.38	0.00	297.14			1030 HOURS
04/04/94	-	2.45	0.00	297.07			1000 HOURS
04/12/94	-	3.58	0.00	295.94			1200 HOURS
04/20/94	-	3.67	0.00	295.85			
05/12/94	-	5.97	0.00	293.55			
05/24/94	-	7.13	0.00	292.39			
06/03/94	-	8.26	0.00	291.26			
07/01/94	-	11.70	0.00	287.82			
07/13/94	-	14.15	0.00	285.37			
08/05/94	-	10.67	0.00	288.85			
08/17/94	-	9.78	0.00	289.74			
08/30/94	-	7.15	0.00	292.37			
09/08/94	-	7.62	0.00	291.90			
09/19/94	-	10.85	0.00	288.67			
09/30/94	-	9.98	0.00	289.54			
10/17/94	-	12.35	0.00	287.17			
10/25/94	-	14.15	0.00	285.37			
11/11/94	17.91	17.91	Sheen	281.61			
11/22/94	-	18.37	0.00	281.15			
12/07/94	-	15.44	0.00	284.08			
12/21/94	-	12.82	0.00	286.70			
01/04/95	-	12.62	0.00	286.90			
01/23/95	-	9.62	0.00	289.90			
02/16/95	-	-	0.00	NG			Well Buried in Snow
02/28/95	-	7.72	0.00	291.80			
03/10/95	-	6.35	0.00	293.17			
03/29/95	-	6.01	0.00	293.51			
04/04/95	-	6.49	0.00	293.03			
04/27/95	-	8.25	0.00	291.27			
05/11/95	-	8.45	0.00	291.07			
05/24/95	-	8.94	0.00	290.58			
06/15/95	-	9.77	0.00	289.75			
06/29/95	-	10.81	0.00	288.71			
07/06/95	-	11.78	0.00	287.74			
07/25/95	-	12.82	0.00	286.70			
08/01/95	-	13.17	0.00	286.35			
08/21/95	-	17.03	0.00	282.49			
09/14/95	-	21.62	0.00	277.90			
09/28/95	-	15.25	0.00	284.27			
10/06/95	-	11.22	0.00	288.30			
10/25/95	-	6.80	0.00	292.72			
11/21/95	-	2.62	0.00	296.90			
12/08/95	-	4.66	0.00	294.86			
12/21/95	-	-	0.00	NG			Covered With Snow
01/23/96	-	3.51	0.00	296.01			
02/09/96	-	2.78	0.00	296.74			
02/19/96	-	-	0.00	NG			
01/09/98	-	5.86	0.00	295.22	-	0.00	New System Started
02/20/98	-	3.46	0.00	297.62	-	0.00	
05/21/98	-	5.22	0.00	295.86	-	0.00	
12/21/98	-	18.33	0.00	282.75	-	0.00	

Well ID: **NFFW-17**
TOC: **301.08** ft amsl
Ground: **301.76** ft amsl
Depth of Well: **24** ft bgs
Depth to Screen **4** ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)	Total LNAPL Recovered (gal)	Comments
01/13/99	-	15.07	0.00	286.01	-	0.00	
05/28/99	-	9.12	0.00	291.96	-	0.00	
10/07/99	-	4.13	0.00	296.95	-	0.00	
08/15/00	-	7.37	0.00	293.71	-	0.00	
10/26/00	-	6.54	0.00	294.54	-	0.00	

Well ID: **NFFW-18**
TOC: **308.47** ft amsl
Ground: **305.49** ft amsl
Depth of Well: **25** ft bgs
Depth to Screen **5** ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)	Total LNAPL Recovered (gal)	Comments
03/30/94	-	11.95	0.00	294.99			1030 HOURS, N0 LOCK
04/04/94	-	12.59	0.00	294.35			1000 HOURS
04/12/94	-	12.84	0.00	294.10			1200 HOURS
04/20/94	-	13.09	0.00	293.85			
05/12/94	-	13.95	0.00	292.99			
05/24/94	-	14.93	0.00	292.01			
06/03/94	-	16.12	0.00	290.82			
07/01/94	-	19.30	0.00	287.64			
07/13/94	-	22.05	0.00	284.89			
08/05/94	-	17.15	0.00	289.79			
08/17/94	-	18.17	0.00	288.77			
08/30/94	-	15.78	0.00	291.16			
09/08/94	-	16.74	0.00	290.20			
09/19/94	-	17.80	0.00	289.14			
09/30/94	-	17.91	0.00	289.03			
10/17/94	-	21.15	0.00	285.79			
10/25/94	-	21.48	0.00	285.46			
11/11/94	-	24.55	0.00	282.39			
11/22/94	-	24.83	0.00	282.11			
12/07/94	-	19.49	0.00	287.45			
12/21/94	-	19.27	0.00	287.67			
01/04/95	-	19.23	0.00	287.71			
01/23/95	-	15.23	0.00	291.71			
02/16/95	-	16.30	0.00	290.64			
02/28/95	-	14.12	0.00	292.82			
03/10/95	-	12.91	0.00	294.03			
03/29/95	-	14.07	0.00	292.87			
04/04/95	-	14.42	0.00	292.52			
04/27/95	-	15.59	0.00	291.35			
05/11/95	-	15.26	0.00	291.68			
05/24/95	-	16.11	0.00	290.83			
06/15/95	-	16.41	0.00	290.53			
06/29/95	-	17.12	0.00	289.82			
07/06/95	-	18.41	0.00	288.53			
07/25/95	-	18.25	0.00	288.69			
08/01/95	-	19.87	0.00	287.07			
08/21/95	-	23.80	0.00	283.14			
09/14/95	-	27.81	0.00	279.13			
09/28/95	-	18.70	0.00	288.24			
10/06/95	-	15.85	0.00	291.09			
10/25/95	-	14.39	0.00	292.55			
11/21/95	-	12.66	0.00	294.28			
12/08/95	-	13.49	0.00	293.45			
12/21/95	-	13.33	0.00	293.61			
01/23/96	-	12.64	0.00	294.30			
02/09/96	-	12.36	0.00	294.58			
02/19/96	-	12.91	0.00	294.03			
01/09/98	-	13.67	0.00	294.80	-	0.00	New System Started
02/20/98	-	12.50	0.00	295.97	-	0.00	
05/21/98	-	14.63	0.00	293.84	-	0.00	
12/21/98	-	25.96	0.00	282.51	-	0.00	

Well ID: **NFFW-18**
TOC: **308.47** ft amsl
Ground: **305.49** ft amsl
Depth of Well: **25** ft bgs
Depth to Screen **5** ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)	Total LNAPL Recovered (gal)	Comments
01/13/99	-	19.70	0.00	288.77	-	0.00	
05/28/99	-	16.94	0.00	291.53	-	0.00	
10/07/99	-	13.40	0.00	295.07	-	0.00	
02/11/00	-	12.26	0.00	296.21	-	0.00	
08/15/00	-	12.36	0.00	296.11	-	0.00	
09/25/00	-	-	0.00	NG	-	0.00	
10/06/00	-	-	0.00	NG	-	0.00	
10/11/00	-	-	0.00	NG	-	0.00	
10/12/00	-	-	0.00	NG	-	0.00	
10/19/00	-	-	0.00	NG	-	0.00	
10/26/00	-	15.06	0.00	293.41	-	0.00	
11/03/00	-	-	0.00	NG	-	0.00	
11/08/00	-	-	0.00	NG	-	0.00	
11/09/00	-	-	0.00	NG	-	0.00	
11/13/00	-	-	0.00	NG	-	0.00	
11/20/00	-	-	0.00	NG	-	0.00	
11/27/00	-	-	0.00	NG	-	0.00	
12/04/00	-	-	0.00	NG	-	0.00	
12/15/00	-	-	0.00	NG	-	0.00	
12/18/00	-	-	0.00	NG	-	0.00	

Well ID: **NFFW-19**
TOC: **323.00** ft amsl
Ground: **319.73** ft amsl
Depth of Well: **31** ft bgs
Depth to Screen **6** ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)	Total LNAPL Recovered (gal)	Comments
03/30/94	-	12.93	0.00	308.51	-	0.00	1030 HOURS
04/04/94	-	13.28	0.00	308.16	-	0.00	1000 HOURS
04/06/94	-	13.59	0.00	307.85	-	0.00	1200 HOUR
04/07/94	-	13.97	0.00	307.47	-	0.00	1100 HOURS
04/12/94	-	15.24	0.00	306.20	-	0.00	1200 HOURS
04/20/94	-	15.22	0.00	306.22	-	0.00	
04/27/94	-	15.31	0.00	306.13	-	0.00	
05/04/94	-	15.27	0.00	306.17	-	0.00	
05/12/94	-	18.50	0.00	302.94	-	0.00	
05/16/94	-	19.35	0.00	302.09	-	0.00	
05/24/94	-	14.35	0.00	307.09	-	0.00	
05/27/94	-	22.33	0.00	299.11	-	0.00	
06/03/94	-	25.46	0.00	295.98	-	0.00	
06/15/94	31.66	31.74	0.07	289.77	-	0.00	
06/16/94	32.23	32.30	0.07	289.20	-	0.00	
06/21/94	33.32	33.42	0.10	288.11	-	0.00	
07/01/94	33.33	33.43	0.10	288.10	-	0.00	
07/13/94	-	29.30	0.00	292.14	-	0.00	
08/05/94	-	28.13	0.00	293.31	-	0.00	
08/17/94	-	29.78	0.00	291.66	-	0.00	
08/30/94	-	24.02	0.00	297.42	-	0.00	
09/08/94	-	25.97	0.00	295.47	-	0.00	
09/14/94	-	29.87	0.00	291.57	-	0.00	
09/19/94	-	21.18	0.00	300.26	-	0.00	
10/17/94	-	33.37	0.00	288.07	-	0.00	ODOR
10/25/94	-	33.35	0.00	288.09	-	0.00	
11/11/94	-	33.34	0.00	288.10	-	0.00	
11/22/94	-	33.31	0.00	288.13	-	0.00	
12/07/94	33.26	33.26	Sheen	288.18	-	0.00	
12/21/94	-	33.29	0.00	288.15	-	0.00	
01/04/95	-	33.27	0.00	288.17	-	0.00	
01/16/95	-	32.11	0.00	289.33	-	0.00	
01/23/95	-	26.21	0.00	295.23	-	0.00	
02/16/95	-	26.73	0.00	294.71	-	0.00	
02/28/95	-	23.80	0.00	297.64	-	0.00	
03/10/95	-	18.67	0.00	302.77	-	0.00	
03/29/95	-	17.87	0.00	303.57	-	0.00	
04/04/95	-	18.81	0.00	302.63	-	0.00	
04/27/95	-	22.71	0.00	298.73	-	0.00	
05/11/95	-	23.23	0.00	298.21	-	0.00	
05/24/95	-	24.76	0.00	296.68	-	0.00	
06/15/95	-	28.10	0.00	293.34	-	0.00	
06/29/95	-	32.55	0.00	288.89	-	0.00	
07/06/95	-	23.28	0.00	298.16	-	0.00	
07/25/95	-	32.45	0.00	288.99	-	0.00	
08/01/95	-	33.26	0.00	288.18	-	0.00	
08/21/95	-	33.26	0.00	288.18	-	0.00	
09/14/95	-	-	0.00	NG	-	0.00	Did Not Have Key For Well
09/28/95	-	32.53	0.00	288.91	-	0.00	
10/06/95	-	26.15	0.00	295.29	-	0.00	
10/25/95	-	18.92	0.00	302.52	-	0.00	
11/21/95	-	14.58	0.00	306.86	-	0.00	
12/08/95	-	15.96	0.00	305.48	-	0.00	
12/21/95	-	16.01	0.00	305.43	-	0.00	
01/23/96	-	13.14	0.00	308.30	-	0.00	

Well ID: **NFFW-19**
TOC: **323.00** ft amsl
Ground: **319.73** ft amsl
Depth of Well: **31** ft bgs
Depth to Screen **6** ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)	Total LNAPL Recovered (gal)	Comments
02/09/96	-	13.12	0.00	308.32	-	0.00	
02/19/96	-	14.46	0.00	306.98	-	0.00	
01/09/98	-	17.65	0.00	305.35	-	0.00	New System Started
01/13/98	-	17.33	0.00	305.67	-	0.00	
02/20/98	-	13.69	0.00	309.31	-	0.00	
02/27/98	-	12.94	0.00	310.06	-	0.00	
03/16/98	-	13.69	0.00	309.91	-	0.00	
05/21/98	-	15.84	0.00	307.16	-	0.00	
08/14/98	-	23.15	0.00	299.85	-	0.00	
10/14/98	-	28.79	0.00	294.21	-	0.00	
12/21/98	-	Dry	0.00	Dry	-	0.00	
01/13/99	-	32.08	0.00	290.92	-	0.00	
05/28/99	-	17.63	0.00	305.37	-	0.00	
10/07/99	-	15.13	0.00	307.87	-	0.00	
02/11/00	-	14.02	0.00	308.98	-	0.00	
08/15/00	-	18.86	0.00	304.14	-	0.00	
10/26/00	-	16.99	0.00	306.01	-	0.00	

Well ID: **NFFW-20**
TOC: **326.11** ft amsl
Ground: **323.36** ft amsl
Depth of Well: **34** ft bgs
Depth to Screen **14** ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)	Total LNAPL Recovered (gal)	Comments
03/30/94	-	23.16	0.00	301.39	-	-	1030 HOURS
04/04/94	-	22.98	0.00	301.57	-	-	1000 HOURS
04/12/94	-	25.41	0.00	299.14	-	-	1200 HOURS
04/20/94	-	25.90	0.00	298.65	-	-	
05/12/94	-	27.88	0.00	296.67	-	-	
05/24/94	-	29.45	0.00	295.10	-	-	
06/03/94	30.94	30.94	0.00	293.61	-	-	
07/01/94	34.29	34.84	0.55	290.19	-	-	
07/13/94	35.29	35.31	0.02	289.26	0.10	0.10	BAILED 0.10 GAL
08/05/94	-	32.04	0.00	292.51	-	0.10	
08/17/94	-	31.52	0.00	293.03	-	0.10	
08/30/94	-	29.45	0.00	295.10	-	0.10	
09/08/94	-	30.25	0.00	294.30	-	0.10	
09/19/94	-	31.60	0.00	292.95	-	0.10	
09/30/94	-	31.99	0.00	292.56	-	0.10	ODOR
10/17/94	33.30	33.55	0.25	291.22	-	0.10	Installed Pasive Bailer
10/25/94	35.09	35.13	0.04	289.45	0.25	0.35	Removed Bailer
11/11/94	35.57	35.77	0.20	288.95	-	0.35	
11/22/94	35.90	36.15	0.25	288.62	-	0.35	
12/07/94	36.00	36.29	0.29	288.51	-	0.35	
12/21/94	34.60	34.64	0.04	289.94	-	0.35	
01/04/95	-	33.31	0.00	291.24	-	0.35	
01/23/95	-	31.18	0.00	293.37	-	0.35	
02/16/95	-	31.10	0.00	293.45	-	0.35	
02/28/95	-	30.08	0.00	294.47	-	0.35	
03/10/95	-	28.41	0.00	296.14	-	0.35	
03/29/95	-	27.65	0.00	296.90	-	0.35	
04/04/95	-	28.80	0.00	295.75	-	0.35	
04/27/95	30.73	30.74	0.01	293.82	-	0.35	Product .005 thick
05/11/95	-	30.27	0.00	294.28	-	0.35	
05/24/95	-	30.27	0.00	294.28	-	0.35	
06/15/95	-	31.67	0.00	292.88	-	0.35	
06/29/95	32.55	33.54	0.99	291.87	-	0.35	
07/06/95	33.09	33.54	0.45	291.40	-	0.35	
07/25/95	35.05	35.29	0.24	289.47	-	0.35	
08/01/95	34.81	34.97	0.16	289.72	-	0.35	
08/21/95	35.08	35.39	0.31	289.43	-	0.35	
09/14/95	36.00	36.37	0.37	288.50	-	0.35	
09/28/95	36.13	36.50	0.37	288.37	-	0.35	
10/06/95	36.00	36.27	0.27	288.51	-	0.35	
10/25/95	-	28.77	0.00	295.78	-	0.35	
11/21/95	-	24.37	0.00	300.18	-	0.35	
12/08/95	-	27.03	0.00	297.52	-	0.35	
12/21/95	-	27.31	0.00	297.24	-	0.35	
01/23/96	-	24.72	0.00	299.83	-	0.35	
02/09/96	-	23.25	0.00	301.30	-	0.35	
02/19/96	-	26.08	0.00	298.47	-	0.35	
01/09/98	-	26.91	0.00	299.20	-	0.35	New System Started
01/13/98	-	27.25	0.00	298.86	-	0.35	
02/20/98	-	25.81	0.00	300.30	-	0.35	

Well ID: **NFFW-20**
TOC: **326.11** ft amsl
Ground: **323.36** ft amsl
Depth of Well: **34** ft bgs
Depth to Screen **14** ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)	Total LNAPL Recovered (gal)	Comments
02/27/98	-	25.17	0.00	300.94	-	0.35	
03/16/98	-	24.57	0.00	301.54	-	0.35	
05/21/98	-	25.41	0.00	300.70	-	0.35	
08/14/98	-	31.45	0.00	294.66	-	0.35	
10/14/98	33.96	33.99	0.03	292.09	-	0.35	
12/21/98	35.61	35.80	0.19	290.14	-	0.35	
01/13/99	36.07	36.32	0.25	289.57	0.25	0.60	
05/28/99	29.49	29.51	0.02	296.58	-	0.60	
10/07/99	-	dry	0.00	dry	-	0.60	
02/11/00	-	23.98	0.00	302.13	-	0.60	
08/15/00	-	dry	0.00	dry	-	0.60	
10/26/00	-	dry	0.00	dry	-	0.60	

Well ID: **NFFW-21**
TOC: **318.91** ft amsl
Ground: **315.96** ft amsl
Depth of Well: **34** ft bgs
Depth to Screen **9** ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)	Total LNAPL Recovered (gal)	Comments
03/30/94	-	12.11	0.00	305.25			1030 HOURS, NO LOCK
04/04/94	-	12.11	0.00	305.25			1000 HOURS
04/12/94	-	13.32	0.00	304.04			1200 HOURS
04/20/94	-	18.94	0.00	298.42			
05/12/94	-	22.96	0.00	294.40			
05/24/94	-	25.55	0.00	291.81			
06/03/94	-	28.56	0.00	288.80			
07/01/94	-	36.47	0.00	280.89			
07/13/94	-	36.51	0.00	280.85			WELL DRY?
08/05/94	-	32.54	0.00	284.82			
08/17/94	-	32.78	0.00	284.58			
08/30/94	-	30.15	0.00	287.21			
09/08/94	29.27	29.28	0.01	288.09			SHEEN
09/19/94	-	32.95	0.00	284.41			
09/30/94	-	33.39	0.00	283.97			
10/17/94	-	36.47	0.00	280.89			
10/25/94	-	36.50	0.00	280.86			
11/11/94	-	36.51	0.00	280.85			
11/22/94	-	36.51	0.00	280.85			
12/07/94	36.48	36.48	Sheen	280.88			
12/21/94	-	36.48	0.00	280.88			
01/04/95	-	36.48	0.00	280.88			
01/23/95	-	29.31	0.00	288.05			
02/16/95	-	28.49	0.00	288.87			
02/28/95	-	25.38	0.00	291.98			
03/10/95	-	21.55	0.00	295.81			
03/29/95	-	21.07	0.00	296.29			
04/04/95	-	22.07	0.00	295.29			
04/27/95	-	25.12	0.00	292.24			
05/11/95	-	25.47	0.00	291.89			
05/24/95	-	26.82	0.00	290.54			
06/15/95	-	29.08	0.00	288.28			
06/29/95	-	32.33	0.00	285.03			
07/06/95	-	33.03	0.00	284.33			
07/25/95	-	34.18	0.00	283.18			
08/01/95	-	34.70	0.00	282.66			
08/21/95	-	36.45	0.00	280.91			
09/14/95	-	36.48	0.00	280.88			
09/28/95	-	36.49	0.00	280.87			
10/06/95	-	32.65	0.00	284.71			
10/25/95	-	22.82	0.00	294.54			
11/21/95	-	16.64	0.00	300.72			
12/08/95	-	19.29	0.00	298.07			
12/21/95	-	19.70	0.00	297.66			
01/23/96	-	14.89	0.00	302.47			
02/09/96	-	15.58	0.00	301.78			
02/19/96	-	17.61	0.00	299.75			
01/09/98	-	21.71	0.00	297.20	-	0.00	New System Started
02/20/98	-	16.34	0.00	302.57	-	0.00	
05/21/98	-	17.77	0.00	301.14	-	0.00	

Well ID: **NFFW-21**
TOC: **318.91** ft amsl
Ground: **315.96** ft amsl
Depth of Well: **34** ft bgs
Depth to Screen **9** ft bgs

Gauge Date	Depth To LNAPL (ft)	Depth To Water (ft)	LNAPL Thickness (ft)	Corrected GW Elevation (ft amsl)	LNAPL Recovered (gal)	Total LNAPL Recovered (gal)	Comments
12/21/98	-	36.50	0.00	282.41	-	0.00	
01/13/99	-	34.63	0.00	284.28	-	0.00	
05/28/99	-	28.08	0.00	290.83	-	0.00	
10/07/99	-	17.58	0.00	301.33	-	0.00	
02/11/00	-	15.16	0.00	303.75	-	0.00	
08/15/00	-	16.71	0.00	302.20	-	0.00	
10/26/00	-	20.38	0.00	298.53	-	0.00	

APPENDIX B

LNAPL AND GROUND WATER RECOVERY AND TREATMENT SYSTEM OPERATIONAL DATA 1998 TO 2000

APPENDIX B SYSTEM REPORT ON VACUUM ENHANCED LNAPL AND GROUND WATER RECOVERY AND TREATMENT SYSTEM NAVY FUEL FARM, NAVAL AIR STATION JOINT RESERVE BASE WILLOW GROVE, HORSHAM TOWNSHIP, PENNSYLVANIA

	NFFW-2R					NFFW-14					NFFW-16						Thermal -Oxidizer		Product Recovery			
	Ground-Water System			VER System		Ground-Water System			VER System		Ground-Water System			VER System								
Date	Product Recovered Total (gal)	Product Recovered Gpd (avg.)	Ground-Water Recovered Gpm	Vacuum (psia)	Flow (SCFM)	Product Recovered Total (gal)	Product Recovered gpd (avg.)	Ground-Water Recovered gpm	Vacuum (psia)	Flow (SCFM)	Product Recovered Total (gal)	Product Recovered gpd (avg.)	Ground-Water Recovered gpm	Vacuum (psia)	Flow (SCFM)	System Effluent Totalizer (gal)	Chamber Temperature (F)	Effluent Concentration (ppmv)	LNAPL All Wells (gal)	Vapor Phase All Wells (gal)	Dissolved Phase All Wells (gal)	Total All Wells (gal)
01/02/98	0.00		(1)	(2)	(2)	0.00		(1)	(2)	(2)	0.00		(1)	(2)	(2)		(2)	(2)	(4)	(2)	(5)	
01/09/98	0.00	0.00	(1)	(2)	(2)	0.00	0.00	(1)	(2)	(2)	0.00	0.00	(1)	(2)	(2)	1628750	(2)	(2)	(4)	(2)	(5)	
01/09/98	0.00	0.00	6.0	(2)	(2)	22.40	22.40	2.5	(2)	(2)	0.00	0.00	(1)	(2)	(2)	1628750	(2)	(2)	22.40	(2)	(5)	22.40
01/13/98	3.40	0.85	3.0	(2)	(2)	42.40	5.00	1.0	(2)	(2)	0.00	0.00	(1)	(2)	(2)	1653960	(2)	(2)	45.80	(2)	0.02	45.82
01/20/98	8.10	0.67	2.0	(2)	(2)	51.50	1.30	1.0	(2)	(2)	0.00	0.00	(1)	(2)	(2)	1689130	(2)	(2)	59.60	(2)	0.06	59.65
01/28/98	13.30	0.65	-	(2)	(2)	55.30	0.48	-	(2)	(2)	0.00	0.00	(1)	(2)	(2)	1742210	(2)	(2)	68.60	(2)	0.11	68.70
02/02/98	13.30	0.00	-	(2)	(2)	55.30	0.00	-	(2)	(2)	0.00	0.00	(1)	(2)	(2)	1742210	(2)	(2)	68.60	(2)	0.11	68.70
02/09/98	13.80	0.07	-	(2)	(2)	64.02	1.25	-	(2)	(2)	0.00	0.00	(1)	(2)	(2)	1857420	(2)	(2)	77.82	(2)	0.21	78.02
02/16/98	13.80	0.00	3.3	12.44	(3)	65.94	0.27	-	12.39	(3)	0.00	0.00	(1)	12.61	(3)	1924760	1413	14.0	79.74	0.00	0.26	80.00
02/20/98	13.80	0.00	3.0	12.73	(3)	69.40	0.86	-	12.49	(3)	0.00	0.00	(1)	12.61	(3)	1964660	1410	25.0	83.20	22.43	0.30	105.93
02/23/98	17.40	1.20	2.8	12.49	(3)	69.50	0.03	-	12.49	(3)	0.00	0.00	(1)	12.61	(3)	2001060	1410	3.8	86.90	29.95	0.33	117.18
02/27/98	18.90	0.38	-	12.61	(3)	71.90	0.60	-	12.24	(3)	11.82	2.96	(1)	12.36	(3)	2041600	1410	-	102.62	33.05	0.37	136.03
03/02/98	19.17	0.09	-	12.98	19.0	71.90	0.00	-	12.73	9.9	11.82	0.00	(1)	12.98	6.9	2078240	1410	-	102.89	39.17	0.39	142.45
03/05/98	19.17	0.00	3.7	12.24	15.9	73.50	0.53	0.0	11.99	22.2	12.08	0.09	(1)	-	-	2110370	1410	1.9	104.75	43.40	0.41	148.56
03/09/98	19.17	0.00	3.8	-	-	74.70	0.30	0.0	-	-	12.08	0.00	(1)	-	-	2149390	-	-	105.95	43.40	0.44	149.79
03/13/98	19.17	0.00	3.7	11.50	12.9	74.70	0.00	0.0	11.75	8.5	12.18	0.02	(1)	-	-	2150320	1410	2.0	106.05	43.40	0.44	149.89
03/16/98	(6)	(6)	2.1	12.98	11.6	75.70	0.33	0.1	-	-	12.18	0.00	0.30	-	-	2191350	1410	2.4	107.05	44.26	0.47	151.79
03/23/98	(6)	(6)	-	12.49	11.3	75.70	0.00	-	12.49	13.4	19.38	1.03	-	11.75	8.0	2193290	1410	-	114.25	45.27	0.47	159.99
04/02/98	19.17	0.00	-	11.99	11.1	77.50	0.18	-	12.24	10.0	19.38	0.00	-	12.24	10.5	2238360	1410	-	116.05	47.46	0.50	164.01
04/13/98	19.17	0.00	-	12.98	14.6	79.20	0.15	-	13.47	12.9	19.38	0.00	-	13.22	9.8	2318420	1410	1.7	117.75	52.68	0.56	170.99
04/17/98	19.17	0.00	2.0	12.98	13.7	79.70	0.13	0.3	13.22	33.0	19.38	0.00	4.80	12.98	6.9	2346880	1410	1.8	118.25	57.31	0.58	176.13
04/22/98	19.17	0.00	-	13.22	12.2	79.70	0.00	-	13.47	-	19.38	0.00	-	13.47	6.1	2406460	1410	-	118.25	62.83	0.61	181.69
05/05/98	(6)	(6)	-	13.71	14.6	79.70	0.00	-	13.71	6.5	19.38	0.00	-	13.47	7.0	2550430	1410	2.0	92.08	85.04	0.69	177.81
05/21/98	22.47	1.84	-	11.50	6.9	82.10	0.15	-	11.75	7.8	27.58	0.51	-	10.77	9.9	2703620	1410	2.1	132.15	89.30	0.78	222.23
05/28/98	22.55	0.01	-	13.22	9.0	82.10	(6)	-	13.71	17.6	35.88	1.19	-	13.22	6.9	2755810	1412	-	140.53	90.74	0.81	232.07
06/12/98	22.55	(7)	(7)	13.22	7.4	83.04	0.06	0.4	12.98	5.2	38.59	0.18	0.40	11.99	6.6	2777010	1410	-	144.18	94.09	0.81	239.08
06/23/98	22.55	(7)	(7)	(7)	(7)	83.19	0.01	0.2	13.22	7.4	65.98	2.49	1.70	13.22	8.5	2830750	1410	-	171.72	99.55	0.83	272.10
07/10/98	22.55	(7)	(7)	(7)	(7)	83.64	0.03	0.1	13.47	3.7	75.28	0.55	2.10	12.98	6.9	2844880	1410	1.7	181.47	102.13	0.83	284.42
07/28/98	22.55	0.00	-	-	-	83.64	0.00	-	-	-	75.30	0.00		-	-	-	-	-	181.49	102.13	0.83	284.44
07/31/98	22.55	0.00	-	-	-	83.68	0.01	0.7	12.24	10.0	77.78	0.83	1.30	-	-	2923400	1410	-	184.01	106.01	0.87	290.88
08/05/98	22.55	0.00	-	-	-	84.84	0.23	-	13.96	6.6	78.34	0.11	-	-	-	2931480	1410	0.9	185.73	108.02	0.87	294.62
08/14/98	30.95	0.93	-	13.96	7.6	86.44	0.18	-	14.20	5.4	79.28	0.10	-	-	-	2941320	1410	-	196.67	112.80	0.88	310.34
08/27/98	60.95	2.31	-	13.71	9.2	89.34	0.22	-	-	-	79.28	0.00	-	-	-	2960150	1410	2.9	229.57	125.03	0.89	355.48
09/11/98	68.25	0.49	-	-	-	89.64	0.02	-	-	-	79.32	0.00	-	-	-	2970340	-	-	237.21	125.03	0.90	363.13
09/16/98	68.25	0.00	0.0	13.96	11.4	89.64	0.00	0.0	14.70	0.0	79.38	0.01	0.20	14.70	0.0	2970620	1410	-	237.27	125.03	0.90	363.19
09/25/98	68.25	0.00	3.5	-	-	89.64	0.00	0.6	-	-	79.48	0.01	2.10	13.94	8.7	2973240	1410	3.4	237.37	125.05	0.90	363.32
10/14/98	68.25	0.00	0.0	-	-	90.44	0.04	0.0	14.70	0.0	79.48	0.00	4.50	12.49	9.5	2973240	1410	-	238.17	133.08	0.90	372.15
10/27/98	68.65	0.03	0.0	-	-	91.94	0.12	3.1	-	-	79.48	0.00	0.20	13.71	9.3	2978160	1410	1.9	240.07	133.18	0.91	374.16
11/03/98	68.65	0.00	-	-	-	92.64	0.10	-	-	-	82.68	0.46	-	13.71	10.0	2978160	1410	2.9	243.97	133.18	0.91	378.06
11/10/98	68.65	0.00	-	-	-	92.64	0.00	-	-	-	86.58	0.56	-	-	-	2978160	-	-	247.87	133.18	0.91	381.96
11/23/98	69.15	0.04	0.0	-	-	94.24	0.12	0.0	-	-	96.08	0.73	0.20	11.99	12.3	2978230	1410	3.3	259.47	133.18	0.91	393.56
12/11/98	71.85	0.15	-	-	-	95.84	0.09	-	-	-	98.58	0.14	0.90	12.73	14.4	2978250	1410	-	266.27	133.18	0.91	400.36
12/21/98	71.85	0.00	-	-	-	96.24	0.04	-	-	-	99.88	0.13	1.00	12.49	17.2	2978250	1410	1.2	267.97	133.18	0.91	402.06

Notes: VER - Vapor Enhanced Product Recovery.
- Indicates data is not available.
(1) PLC was not yet programmed to convert 4 to 20 mA signals to gpm.
(2) VER System was not turned on yet.
(3) Magnahelic gauges were not yet connected to the flow sensors.
(4) Product recovery pumps were not operating properly.
(5) System effluent totalizer was not installed yet.
(6) Product meter ran backwards due to vacuum on well.
(7) RW-2R off because groundwater pump motor is being replaced

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APPENDIX B SYSTEM REPORT ON VACUUM ENHANCED LNAPL AND GROUND WATER RECOVERY AND TREATMENT SYSTEM NAVY FUEL FARM, NAVAL AIR STATION JOINT RESERVE BASE WILLOW GROVE, HORSHAM TOWNSHIP, PENNSYLVANIA

	NFFW-2R					NFFW-14					NFFW-16						Thermal -Oxidizer		Product Recovery			
	Ground-Water System			VER System		Ground-Water System			VER System		Ground-Water System			VER System		System Effluent Totalizer (gal)	Chamber Temperature (F)	Effluent Concentration (ppmv)	LNAPL All Wells (gal)	Vapor Phase All Wells (gal)	Dissolved Phase All Wells (gal)	Total All Wells (gal)
Date	Product Recovered Total (gal)	Product Recovered gpd (avg.)	Ground-Water Recovered Total (gal) Gpm	Vacuum (psia)	Flow (SCFM)	Product Recovered Total (gal)	Product Recovered gpd (avg.)	Ground-Water Recovered gpm	Vacuum (psia)	Flow (SCFM)	Product Recovered Total (gal)	Product Recovered gpd (avg.)	Ground-Water Recovered gpm	Vacuum (psia)	Flow (SCFM)							
01/13/99	71.85	0.00	-	-	-	97.04	0.03	-	-	-	99.88	0.00	0.10	12.49	9.5	2978290	1410	-	268.77	133.18	0.91	402.86
01/26/99	71.85	0.00	-	-	-	97.04	0.00	0.2	-	-	101.38	0.12	0.60	12.49	11.7	2984210	1410	3.6	270.27	141.68	0.91	412.85
01/13/99	71.85	0.00	-	-	-	97.04	0.03	-	-	-	116.18	0.09	0.10	12.49	9.5	2978290	1410	-	285.07	133.18	0.91	419.16
01/26/99	71.85	0.00	-	-	-	97.04	0.00	0.2	-	-	116.18	0.00	0.60	12.49	11.7	2984210	1410	3.6	285.07	141.68	0.91	427.65
02/05/99	71.85	0.00	-	-	-	97.24	0.02	0.1	-	-	116.18	0.00	0.20	12.49	13.5	3016630	1410	3.6	285.27	149.45	0.93	435.64
02/15/99	71.85	0.00	0.6	-	-	99.34	0.21	0.1	-	-	116.28	0.01	0.10	-	-	3054730	0	-	287.47	149.45	0.95	437.87
02/22/99	71.85	0.00	-	12.73	10.2	100.14	0.11	0.1	-	-	116.48	0.03	0.10	13.22	10.9	3085220	1410	1.3	288.47	149.45	0.97	438.89
03/04/99	74.85	0.30	0.0	11.50	7.7	100.14	0.00	0.1	14.70	0.0	116.78	0.03	0.50	11.26	20.2	3112780	1410	-	291.77	159.55	0.99	452.30
03/30/99	75.25	0.02	0.6	10.77	9.4	102.24	0.08	0.3	14.70	0.0	119.08	0.09	0.80	10.52	-	3215400	1410	-	296.57	184.09	1.03	481.68
04/09/99	75.25	0.00	0.2	-	-	103.24	0.10	0.1	-	-	120.58	0.15	2.10	-	-	3316980	0	-	299.07	184.09	1.07	484.22
04/28/99	75.25	0.00	0.3	-	-	103.34	0.01	0.2	-	-	120.58	0.00	0.80	-	-	3337650	0	-	299.17	184.09	1.08	484.34
05/13/99	75.25	0.00	0.2	-	-	103.64	0.02	0.5	-	-	121.38	0.05	1.80	-	-	3438800	0	-	300.27	184.09	1.11	485.47
05/28/99	76.15	0.06	0.4	-	-	104.84	0.08	2.5	-	-	121.38	0.00	1.20	-	-	3485180	0	-	302.37	184.09	1.13	487.58
06/09/99	76.35	0.02	-	-	-	107.24	0.20	0.0	-	-	121.38	0.00	0.01	-	-	3526360	0	-	304.97	184.09	1.15	490.20
06/21/99	76.65	0.02	0.7	-	-	107.24	0.00	0.1	-	-	121.38	0.00	0.20	-	-	3550850	0	-	305.27	184.09	1.16	490.52
07/01/99	77.05	0.04	0.2	-	-	107.24	0.00	0.5	-	-	121.48	0.01	0.10	-	-	3560530	0	-	305.77	184.09	1.17	491.02
07/20/99	77.05	0.00	0.1	12.98	-	107.24	0.00	3.0	10.77	-	122.98	0.08	0.10	13.22	10.9	3563200	1410	-	307.27	194.47	1.17	502.91
08/05/99	79.55	0.16	0.0	-	-	108.94	0.11	0.0	11.01	-	123.08	0.01	0.10	-	-	3564040	1410	-	311.57	222.69	1.17	535.43
08/13/99	80.25	0.09	0.0	-	-	109.24	0.04	0.0	10.28	-	122.98	-0.01	0.10	-	-	3564040	1410	-	312.47	229.73	1.17	543.36
08/16/99	80.25	0.00	0.0	-	-	110.84	0.53	0.0	10.03	-	123.28	0.10	0.00	-	-	3564040	1410	-	314.37	230.95	1.17	546.49
09/09/99	80.25	0.00	0.5	-	-	110.84	0.00	0.0	-	-	123.28	0.00	0.10	12.73	-	3570910	1410	3.2	314.37	242.26	1.18	557.80
09/22/99	80.25	0.00	0.7	-	-	111.24	0.03	0.1	-	-	123.28	0.00	1.20	11.75	-	3621020	1410	-	314.77	249.95	1.20	565.91
10/07/99	81.95	0.11	0.5	-	-	111.24	0.00	4.6	-	-	123.38	0.01	1.60	-	-	3748650	0	-	316.57	249.95	1.27	567.78
10/12/99	82.05	0.02	0.5	14.70	0.0	111.44	0.04	3.2	14.70	0.0	123.38	0.00	1.70	-	-	3762520	1410	-	316.87	249.98	1.28	568.12
11/03/99	82.05	0.00	0.8	14.70	0.0	112.04	0.03	0.1	14.70	0.0	123.38	0.00	0.10	14.70	0.0	3932900	1410	-	317.47	257.45	1.37	576.28
11/09/99	82.05	0.00	1.5	14.70	0.0	112.04	0.00	3.6	12.49	8.8	123.38	0.00	0.10	12.24	5.8	3964320	1410	-	317.47	257.48	1.38	576.33
11/28/99	82.05	0.00	0.2	14.70	0.0	112.34	0.02	0.7	14.70	0.0	123.38	0.00	1.00	12.73	18.6	4046550	1410	-	317.77	264.34	1.42	583.52
12/08/99	82.05	0.00	1.9	14.70	0.0	112.34	0.00	0.5	14.70	0.0	123.38	0.00	1.00	11.50	10.7	4076440	1408	-	317.77	270.09	1.43	589.28
12/30/99	92.75	0.49	1.6	14.70	0.0	112.34	0.00	1.2	14.70	0.0	123.38	0.00	1.00	14.70	0.0	4226940	0	-	328.47	270.09	1.57	600.12

Notes: VER - Vapor Enhanced Product Recovery.
- Indicates data is not available.
(1) PLC was not yet programmed to convert 4 to 20 mA signals to gpm.
(2) VER System was not turned on yet.
(3) Magnahelic gauges were not yet connected to the flow sensors.
(4) Product recovery pumps were not operating properly.
(5) System effluent totalizer was not installed yet.
(6) Product meter ran backwards due to vacuum on well.
(7) RW-2R off because groundwater pump motor is being replaced

APPENDIX B SYSTEM REPORT ON VACUUM ENHANCED LNAPL AND GROUND WATER RECOVERY AND TREATMENT SYSTEM
NAVY FUEL FARM, NAVAL AIR STATION JOINT RESERVE BASE
WILLOW GROVE, HORSHAM TOWNSHIP, PENNSYLVANIA

	NFFW-2R					NFFW-14					NFFW-16						Thermal -Oxidizer		Product Recovery			
	Ground-Water System			VER System		Ground-Water System			VER System		Ground-Water System			VER System		System Effluent Totalizer						
Date	Product Recovered Total (gal)	Product Recovered gpd (avg.)	Ground-Water Recovered Gpm	Vacuum (psia)	Flow (SCFM)	Product Recovered Total (gal)	Product Recovered gpd (avg.)	Ground-Water Recovered gpm	Vacuum (psia)	Flow (SCFM)	Product Recovered Total (gal)	Product Recovered gpd (avg.)	Ground-Water Recovered gpm	Vacuum (psia)	Flow (SCFM)	(gal)	Chamber Temperature (F)	Effluent Concentration (ppmv)	LNAPL All Wells (gal)	Vapor Phase All Wells (gal)	Dissolved Phase All Wells (gal)	Total All Wells (gal)
01/06/00	92.75	0.00	1.4	8.80	7.4	112.34	0.00	4.4	14.70	0.0	123.38	0.00	1.10	14.70	0.0	4267780	1410	-	328.47	270.09	1.60	600.15
01/13/00	92.75	0.00	-	-	-	112.34	0.00	-	-	-	123.38	0.00	-	-	-	4267780	0	-	328.47	270.09	1.60	600.15
01/20/00	92.95	0.03	1.5	10.77	12.9	112.34	0.00	2.0	14.70	0.0	123.38	0.00	1.00	10.77	9.9	4347383	1410	3.2	328.67	278.40	1.91	608.98
02/11/00	92.95	0.00	1.5	11.26	12.7	112.34	0.00	1.6	14.70	0.0	123.38	0.00	1.00	11.26	9.0	4423720	1410	2.9	328.67	285.30	1.96	615.93
02/29/00	94.15	0.07	4.5	7.50	9.6	112.34	0.00	0.0	12.24	11.2	123.38	0.00	1.90	14.70	0.0	4496840	1410	-	329.87	294.69	2.01	626.56
03/07/00	97.45	0.47	2.8	11.01	16.5	112.34	0.00	2.8	14.70	0.0	123.38	0.00	1.80	14.70	0.0	4566820	1410	-	333.17	298.53	2.05	633.75
03/15/00	98.55	0.14	9.1	10.77	11.5	112.34	0.00	0.0	14.70	0.0	123.38	0.00	1.40	14.70	0.0	4577580	1410	-	334.27	299.44	2.06	635.77
03/21/00	98.55	0.00	-	-	-	112.34	0.00	-	-	-	123.38	0.00	-	-	-	4577580	0	-	334.27	299.44	2.06	635.77
03/30/00	104.85	0.70	3.4	11.26	14.4	112.34	0.00	1.3	14.70	0.0	123.38	0.00	0.90	14.70	0.0	4725080	1411	5.4	340.57	308.45	2.11	651.13
04/18/00	104.85	0.00	3.8	9.29	17.5	112.34	0.00	3.1	14.70	0.0	123.38	0.00	2.20	14.70	0.0	4881320	1410	2.7	340.57	314.47	2.16	657.20
04/28/00	104.95	0.01	2.1	9.78	18.5	112.34	0.00	0.9	14.70	0.0	123.38	0.00	1.70	14.70	0.0	4962210	1410	9.6	340.67	318.88	2.18	661.72
05/10/00	106.95	0.17	-	10.28	10.3	112.34	0.00	0.1	14.70	0.0	123.38	0.00	0.60	14.70	0.0	4962490	1410	4.3	342.67	327.13	2.18	671.97
05/23/00	108.85	0.15	-	-	-	112.34	0.00	0.9	14.70	0.0	123.38	0.00	1.70	14.70	0.0	4988200	0	-	344.57	329.40	2.19	676.16
06/12/00	109.45	0.03	2.4	9.78	14.9	112.34	0.00	0.0	14.70	0.0	123.38	0.00	0.10	14.70	0.0	5018210	1410	-	345.17	329.40	2.20	676.77
06/30/00	115.35	0.33	0.0	10.77	11.5	112.34	0.00	0.0	14.70	0.0	123.38	0.00	0.00	14.70	0.0	5034050	1410	3.3	351.07	334.22	2.20	687.49
07/06/00	115.35	0.00	0.0	10.52	-	112.34	0.00	0.0	14.70	0.0	123.38	0.00	0.00	14.70	0.0	5034090	1410	6.7	351.07	335.90	2.20	689.17
07/16/00	116.55	0.12	25.0	14.70	-	112.84	0.05	0.1	14.70	0.0	123.38	0.00	0.40	14.70	0.0	5050240	0	-	352.77	335.90	2.20	690.87
07/26/00	116.75	0.02	0.9	14.20	10.8	112.94	0.01	0.5	14.70	0.0	123.38	0.00	1.50	14.70	0.0	5064150	1410	8.6	353.07	337.67	2.21	692.95
07/28/00	116.75	0.00	-	14.70	0.0	113.04	0.05	0.1	11.75	24.1	123.38	0.00	0.80	14.70	0.0	5073310	1410	-	353.17	340.69	2.21	696.06
08/04/00	116.85	0.01	2.4	14.70	0.0	113.14	0.01	2.9	10.77	20.0	123.38	0.00	1.60	14.70	0.0	5099330	1410	-	353.37	345.92	2.21	701.49
08/08/00	116.85	0.00	3.4	14.70	0.0	113.14	0.00	0.1	11.99	23.3	123.38	0.00	0.90	14.70	0.0	5137070	1410	-	353.37	347.87	2.21	703.45
08/15/00	116.95	0.01	3.8	12.49	20.3	113.24	0.01	0.1	14.70	0.0	123.38	0.00	0.40	14.70	0.0	5180990	1410	3.3	353.57	348.37	2.23	704.17
08/22/00	116.95	0.00	2.0	12.49	19.0	113.34	0.01	2.3	14.70	0.0	123.38	0.00	1.20	14.70	0.0	5224920	1410	-	353.67	353.82	2.25	709.73
08/28/00	116.95	0.00	2.3	12.49	-	113.34	0.00	2.8	14.70	0.0	123.38	0.00	0.40	14.70	0.0	5267440	1410	-	353.67	359.59	2.26	715.51
09/08/00	116.95	0.00	0.8	13.22	13.8	113.34	0.00	0.1	14.70	0.0	123.38	0.00	0.40	14.70	0.0	5320040	1410	11.6	353.67	365.57	2.28	721.52
09/19/00	116.95	0.00	0.5	12.98	14.6	113.34	0.00	0.1	14.70	0.0	123.38	0.00	0.10	14.70	0.0	5360440	1410	4.6	353.67	372.80	2.29	728.76
09/25/00	116.95	0.00	2.0	14.70	0.0	113.34	0.00	0.1	12.24	18.1	123.38	0.00	0.10	14.70	0.0	5390520	1410	6.4	353.67	375.94	2.29	731.90
10/06/00	116.95	0.00	1.9	14.70	0.0	113.34	0.00	0.2	12.24	16.6	123.38	0.00	0.20	14.70	0.0	5390520	1410	-	353.67	378.06	2.29	734.02
10/11/00	116.95	0.00	2.7	14.70	0.0	113.34	0.00	0.2	-	-	123.38	0.00	1.70	14.70	0.0	5415350	0	-	353.67	378.06	2.30	734.02
10/12/00	116.95	0.00	2.6	14.70	0.0	113.34	0.00	0.5	11.01	19.6	123.38	0.00	1.10	14.70	0.0	5423160	1410	-	353.67	378.12	2.30	734.08
10/19/00	116.95	0.00	2.3	14.70	0.0	113.34	0.00	2.0	10.77	17.6	123.38	0.00	1.40	14.70	0.0	5476160	1410	-	353.67	382.66	2.31	738.63
10/26/00	116.95	0.00	-	-	-	113.34	0.00	-	-	-	123.38	0.00	-	-	-	5476160	0	-	353.67	382.66	2.31	738.63
11/03/00	116.95	0.00	1.6	14.70	0.0	113.34	0.00	0.8	11.26	-	123.38	0.00	2.90	14.70	0.0	5544870	1410	-	353.67	392.82	2.32	748.81
11/08/00	116.95	0.00	1.5	14.70	0.0	113.34	0.00	0.5	11.26	19.3	123.38	0.00	2.40	14.70	0.0	5559820	1410	-	353.67	395.62	2.32	751.61
11/09/00	121.45	4.50	1.5	12.24	20.7	113.34	0.00	0.8	14.70	0.0	123.38	0.00	2.10	14.70	0.0	5562520	1410	-	358.17	396.39	2.32	756.88
11/13/00	129.65	2.05	1.8	12.73	14.5	113.44	0.02	0.8	14.70	0.0	123.38	0.00	1.50	14.70	0.0	5574000	1410	-	366.47	398.94	2.32	767.73
11/20/00	130.05	0.06	2.3	12.98	17.1	113.44	0.00	2.3	14.70	0.0	123.38	0.00	1.70	14.70	0.0	5593530	1410	-	366.87	403.63	2.33	772.82
11/27/00	132.15	0.30	1.4	12.73	20.5	113.44	0.00	0.7	14.70	0.0	123.38	0.00	1.80	14.70	0.0	5610080	1410	6.8	368.97	409.50	2.33	780.80
12/04/00	132.15	0.00	1.7	13.22	19.5	113.44	0.00	1.0	14.70	0.0	123.38	0.00	1.40	14.70	0.0	5628150	1410	11.2	368.97	417.97	2.34	789.27
12/15/00	132.25	0.01	3.1	12.73	16.2	113.44	0.00	1.9	14.70	0.0	123.38	0.00	2.70	14.70	0.0	5656230	1410	7.7	369.07	428.07	2.35	799.48
12/18/00	133.05	0.27	2.0	12.73	17.0	113.44	0.00	1.2	14.70	0.0	123.38	0.00	1.10	14.70	0.0	5664430	1410	-	369.87	428.07	2.37	800.31

Notes: VER - Vapor Enhanced Product Recovery.
- Indicates data is not available.
(1) PLC was not yet programmed to convert 4 to 20 mA signals to gpm.
(2) VER System was not turned on yet.
(3) Magnahelic gauges were not yet connected to the flow sensors.
(4) Product recovery pumps were not operating properly.
(5) System effluent totalizer was not installed yet.
(6) Product meter ran backwards due to vacuum on well.
(7) RW-2R off because groundwater pump motor is being replaced

SUMMARY OF ANALYTICAL RESULTS FOR GROUND-WATER
SAMPLES COLLECTED AT NAVY FUEL FARM, NAVAL AIR STATIONS
JOINT RESERVE BASE WILLOW GROVE,
HORSHAM TOWNSHIP, PENNSYLVANIA
JANUARY 1998 - DECEMBER 1998

Location	Date	Benzene (µg/l)	Toluene (µg/l)	Ethylbenzene (µg/l)	Total Xylenes (µg/l)	Total BTEX (µg/l)	Naphthalene (µg/l)
Influent	01/28/98	150	3	260	147	280	280
	02/27/98	150	44	190	187	571	190
	03/16/98	130	19	190	138	477	150
	05/28/98	120	11	130	131	392	100
	06/23/98	91	8	3	31	133	75
	07/27/98	140	10	160	76	386	150
	09/25/98	180	22	200	154	556	160
	10/27/98	150	25	220	136	531	160
	11/23/98	220	31	270	174	695	240
Between	01/28/98	ND	ND	ND	ND	ND	ND
	02/27/98	ND	ND	ND	ND	ND	ND
	03/16/98	ND	ND	ND	ND	ND	5
	05/28/98	ND	ND	ND	ND	ND	ND
	06/23/98	ND	ND	ND	ND	ND	ND
	07/27/98	ND	ND	ND	ND	ND	ND
	09/25/98	3	ND	2	3	8	ND
	10/27/98	ND	ND	ND	ND	ND	ND
	11/23/98	2	7	3	10	22	ND
Effluent	01/28/98	ND	ND	ND	ND	ND	ND
	02/27/98	ND	ND	ND	ND	ND	ND
	03/16/98	ND	ND	ND	ND	ND	ND
	05/28/98	ND	ND	ND	ND	ND	ND
	06/23/98	ND	ND	ND	ND	ND	ND
	07/27/98	ND	ND	ND	ND	ND	ND
	09/25/98	ND	ND	ND	ND	ND	ND
	10/27/98	ND	ND	ND	ND	ND	ND
	11/23/98	ND	ND	ND	ND	ND	ND

SUMMARY OF ANALYTICAL RESULTS FOR GROUND-WATER SAMPLES COLLECTED AT NAVY FUEL FARM, NAVAL AIR STATION JOINT RESERVE BASE WILLOW GROVE, HORSHAM TOWNSHIP, PENNSYLVANIA JANUARY 1999 - DECEMBER 1999

Location	Date	Benzene (µg/l)	Toluene (µg/l)	Ethylbenzene (µg/l)	Total Xylenes (µg/l)	Total BTEX (µg/l)	Naphthalene (µg/l)
Influent	01/27/99	200	21	25	129	375	150
	02/22/99	100	8	190	90	388	120
	03/30/99	66	20	62	91	239	110
	04/28/99	95	21	220	127	463	180
	05/13/99	52	9	2	82	239	120
	06/09/99	77	4	160	82	323	170
	07/20/99	710	98	270	175	713	320
	08/05/99	150	14	190	57	411	180
	09/09/99	94	8	190	41	333	140
	10/12/99	77	15	170	57	319	140
	11/30/99	74	2	140	28	244	130
	12/30/99	120	83	290	76	590	220
Between	01/27/99	ND	ND	ND	ND	ND	ND
	02/22/99	ND	ND	ND	ND	ND	ND
	03/30/99	ND	ND	ND	2	2	ND
	04/28/99	ND	ND	ND	ND	ND	ND
	05/13/99	ND	ND	ND	ND	ND	ND
	06/09/99	ND	ND	ND	ND	ND	ND
	07/20/99	ND	ND	ND	ND	ND	ND
	08/05/99	ND	ND	ND	ND	ND	ND
	09/09/99	ND	ND	ND	ND	ND	ND
	10/12/99	9	1	ND	ND	10	ND
	11/30/99	41	ND	ND	ND	41	ND
	12/30/99	ND	ND	ND	ND	ND	ND
Effluent	01/27/99	ND	ND	ND	ND	ND	ND
	02/22/99	ND	ND	ND	ND	ND	ND
	03/30/99	ND	ND	ND	ND	ND	ND
	04/28/99	ND	ND	ND	ND	ND	ND
	05/13/99	ND	ND	ND	ND	ND	ND
	06/09/99	ND	ND	ND	ND	ND	ND
	07/20/99	ND	ND	ND	ND	ND	ND
	08/05/99	ND	ND	ND	ND	ND	ND
	09/09/99	ND	ND	ND	ND	ND	ND
	10/12/99	ND	ND	ND	ND	ND	ND
	11/30/99	ND	ND	ND	ND	ND	ND
	12/30/99	2	4	ND	ND	6	13

Note: = Analyte not detected

SUMMARY OF ANALYTICAL RESULTS FOR GROUND-WATER SAMPLES COLLECTED AT NAVY FUEL FARM, NAVAL AIR STATION JOINT RESERVE BASE WILLOW GROVE, HORSHAM TOWNSHIP, PENNSYLVANIA JANUARY 2000 - DECEMBER 2000

Location	Date	Benzene (µg/l)	Toluene (µg/l)	Ethylbenzene (µg/l)	Total Xylenes (µg/l)	Total BTEX (µg/l)	Naphthalene (µg/l)
	PADEP MSC	5	1000	700	10000	-	20
Influent	01/20/00	**350 D**	**1200 D**	620 D	590 D	2760	**650 D**
	02/16/00	**93 D**	ND	230 D	38 D	361	**210 D**
	03/21/00	**41 D**	ND	100 D	23 D	164	**150 D**
	04/18/00	**31**	ND	100	13	144	110
	05/23/00	**11**	ND	ND	ND	11	ND
	06/12/00	**20 D**	ND	68 D	18 D	106	**150 D**
	07/20/00	**17**	ND	2	4	23	**42**
	08/15/00	**46**	2	140	22	210	**130**
	09/19/00	**43**	ND	ND	ND	43	**100**
	10/23/00	**24 D**	ND	17 D	5 D	46	**89 D**
	11/20/00	**22**	2	69	6	99	**150**
	12/18/00	ND	ND	460 *I	14 *I	600 *I	**2100 *I**
Between	01/20/00	NS	NS	NS	NS	NS	NS
	02/16/00	ND	ND	ND	ND	ND	ND
	03/21/00	ND	ND	ND	ND	ND	ND
	04/18/00	ND	ND	ND	ND	ND	ND
	05/23/00	ND	ND	ND	ND	ND	ND
	06/12/00	ND	ND	ND	ND	ND	ND
	07/20/00	ND	ND	ND	ND	ND	ND
	08/15/00	ND	ND	ND	ND	ND	ND
	09/19/00	ND	ND	ND	ND	ND	ND
	10/23/00	1	ND	ND	ND	1	ND
	11/20/00	4	ND	ND	ND	4	ND
	12/18/00	2.9	ND	ND	ND	2.9	ND
Effluent	01/20/00	ND	3	ND	2	5	ND
	02/16/00	ND	ND	ND	ND	ND	ND
	03/21/00	ND	ND	ND	ND	ND	ND
	04/18/00	ND	ND	ND	ND	ND	ND
	05/23/00	ND	ND	ND	ND	ND	ND
	06/12/00	ND	ND	ND	ND	ND	ND
	07/20/00	ND	ND	ND	ND	ND	ND
	08/15/00	ND	ND	ND	ND	ND	ND
	09/19/00	ND	ND	ND	ND	ND	ND
	10/23/00	ND	ND	ND	ND	ND	ND
	11/20/00	ND	ND	ND	ND	ND	ND
	12/18/00	ND	ND	ND	ND	ND	ND

Note: ND = Analyte not detected *I = Estimated value due to hydrocarbon interference
NS = Analyte not sampled D = Sampled was diluted before analyses
PADEP MSC = Pennsylvania medium specific concentration for ground water; statewide health standard.

APPENDIX C

LABORATORY ANALYTICAL RESULTS

Committed To *Your* Success

Severn Trent Laboratories
19 Loveton Circle
Sparks, MD 21152

Tel: (410) 771-4920
Fax: (410) 771-4407
www.stl-inc.com

February 7, 2000

Carl Reitenbach
EA Engineering, Science, and Technology, Inc.
New Castle Corporate Commons
92 Read's Way, Suite 109
New Castle, DE 19720

Re:Willow Grove NAS (29600.74)

Dear Mr. Reitenbach:

Enclosed is our report on the analysis of two water samples collected for the Willow Grove NAS project on 20 January 2000. The invoice is included.

Please contact me if you have any questions or require further information and refer to report 000075. Unless other arrangements are made, we reserve the right to dispose of your samples sixty (60) days from the date of this letter. We will retain the raw data for seven years from this date.

Sincerely,

Mary E. Asper
Laboratory Project Manager

MEA/gsp
enclosure

Committed To *Your* Success

LABORATORY DATA REPORT

Prepared for:
EA Engineering, Science, and Technology, Inc.
New Castle Corporate Commons
92 Read's Way, Suite 109
New Castle, DE 19720

Prepared by:

Severn Trent Laboratories - Baltimore
19 Loveton Circle
Sparks, MD 21152

Report 000075

February 2000

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1. NARRATIVE

Severn Trent Laboratories - Baltimore
ANALYTICAL NARRATIVE

Client: **EA Eng., Sci., & Tech., Inc.**
Site: **Willow Grove NAS**
Project number:**29600.74**

STL Baltimore Report: **000075**
Laboratory Project Manager: **Mary E. Asper**
Report Date: **7 February 2000**

This report contains the results of the analysis of two water samples collected on 20 January 2000 in support of the referenced project.

SAMPLE RECEIPT

The samples and one trip blank arrived intact by Federal Express at Severn Trent Laboratories - Baltimore on 24 January 2000. Upon receipt, the samples and trip blank were inspected and compared with the chain-of-custody record. The samples and trip blank were then logged into the laboratory computer system with assigned laboratory accession numbers and released for analysis.

Client Sample Designation	ST Lab Number
INFLUENT	0000464
EFFLUENT	0000465

Following this narrative section are a glossary of data qualifiers (Table 1), codes associated with manual integration of chromatographic peaks (Table 2), and the original chain-of-custody record. Analytical results and quality control information are summarized in the appended data package which has been formatted to be consistent with the deliverable requirements of this project.

QUALITY CONTROL

The following sections are ordered as the data appears in this report. They contain observations made during sample analysis, summarize the results of quality control measurements, and address the impact on data usability based upon project Data Quality Objectives. For each fractional analysis the narrative includes:

- Sample chronology: This section summarizes the sample history by fraction including the sample preparation method and date, analytical method, and analysis date. Anything unusual about the samples, digestates, or extracts is identified. Holding time compliance is evaluated in this section.

- Laboratory method performance: All quality control criteria for method performance must be met for all target analytes for data to be reported. These criteria generally apply to instrument tune, calibration, method blanks, and Laboratory Control Samples (LCS). In some instances where method criteria fail, useable data can be obtained and are reported with client approval. The narrative will then include a thorough discussion of the impact on data quality.

- Sample performance: Quality control field samples are analyzed to determine any measurement bias due to the sample matrix based on evaluation of matrix spikes (MS), matrix spike duplicates

(MSD), and laboratory duplicates (D). If acceptance criteria are not met, matrix interferences are confirmed either by reanalysis or by inspection of the LCS results to verify that laboratory method performance is in control. Data are reported with appropriate qualifiers or discussion.

AROMATIC VOLATILES by GC - WATER (STL0000464, STL0000465)

Sample Chronology: Two samples and associated quality control were analyzed on 01 and 03 February 2000 for the client specified list of analytes by USEPA SW-846, Methods 5030B/8021B. All holding times were met.

The batch MS/MSD, analyzed on 03 February 2000, was performed on another client's sample. All data associated with these QC analyses have been included in this report to fulfill reporting requirements. However, recoveries were not evaluated because they do not apply to the samples associated with this report.

Sample INFLUENT was analyzed at a 5X dilution in order to bring the concentrations of target analytes within instrument calibration range and to reduce instrument contamination from high levels of petroleum interferences.

Laboratory Method Performance: All laboratory method performance criteria were met for the reported samples with the following exceptions:

Sample Performance: All quality control criteria were met for the reported samples with the following exceptions:

a batch MS/MSD and/or LCSD could not performed on 01 February due to instrument contamination from the high levels of petroleum interferences in sample INFLUENT.

sample INFLUENT had the surrogate recovery of bromofluorobenzene (390%) above the upper QC limit of 126%. This high recovery appears to be the result of coeluting interferences. The sample was not reanalyzed due to the high levels of petroleum interferences present in the sample.

CERTIFICATION OF RESULTS

The Laboratory certifies that this report meets the project requirements for analytical data as stated in the Analytical Task Order (ATO) and the chain-of-custody. In addition, the Laboratory certifies that the data as reported meet the Data Quality Objectives for precision, accuracy, and completeness specified for this project or as stated in Severn Trent Laboratories - Baltimore Quality Assurance program for other than the conditions detailed above. It is recommended by the Laboratory that this analytical report should only be reproduced in its entirety. Severn Trent Laboratories - Baltimore is

Severn Trent Laboratories - Baltimore
ANALYTICAL NARRATIVE

Client: **EA Eng., Sci., & Tech., Inc.**	STL Baltimore Report: **000075**
Site: **Willow Grove NAS**	Laboratory Project Manager: **Mary E. Asper**
Project number:**29600.74**	Report Date: **7 February 2000**

not responsible for any assumptions of data quality if partial packages are used to interpret data Release of the data contained in this report has been authorized by the appropriate Laboratory Manager as verified by the following signature.

Mary E. Asper February 7, 2000
Mary E. Asper, Laboraotry Project Manager

TABLE 1. LABORATORY ORGANIC ANALYSIS DATA QUALIFIERS [1]

Qualifiers other than those listed below may be required to properly define the results. If used, they are given an alphabetic designation not already specified in this table or in a project/program document such as a Quality Assurance Project Plan or a contract Statement of Work. Each additional qualifier is fully described in the Analytical Narrative section of the laboratory report.

U Indicates a target compound was analyzed for but not detected. The sample Reporting Limit (RL) is corrected for dilution and, if a soil sample, for percent moisture, if reported on a dry weight basis.

J Indicates an estimated value. This qualifier is used under the following circumstances:

1) when estimating a concentration for tentatively identified compounds (TICs) in GC/MS analyses, where a 1:1 response is assumed,
2) when the mass spectral and retention time data indicate the presence of a compound that meets the volatile and semivolatile GC/MS identification criteria, and the result is less than the RL but greater than the method detection limit (MDL).

B This qualifier is used when the analyte is found in the associated method blank as well as in the sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action. For GC/MS analyses, this qualifier is used for a TIC, as well as, for a positively identified target compound.

E This qualifier identifies compounds whose concentrations exceed the calibration range of the instrument for that specific analysis.

D When applied, this qualifier identifies all compound concentrations reported from a secondary dilution analysis.

A This qualifier indicates that a TIC is a suspected aldol-condensation product.

N Indicates presumptive evidence of a compound. This qualifier is only used for GC/MS TICs, where the identification is based on a mass spectral library search. For generic characterization of a TIC, such as chlorinated hydrocarbon, the N qualifier is not used.

P When applied, this qualifier indicates a reported value from a GC analysis when there is greater than 25% difference for detected concentrations between the two GC columns.

---

(1) These Data Qualifiers are added by the laboratory to provide additional information for the reported results. ***They should not be confused with the qualifiers applied to the reported data as a result of a data validation process performed independently of the laboratory reporting procedure.***

TABLE 2. CODES ASSOCIATED WITH MANUAL INTEGRATION OF CHROMATOGRAPHIC PEAKS

M1 .... Software failed to integrate peak or integrated peak improperly

M2 .... Multiple peaks within window, analyst's discretion used in peak identification.

M3 .... Close eluting or near-coelution of interferences.

M4 .... Adding or removing area due to peak tailing - subject to consistency within the sequence.

M5 .... Adding/removing area due to positive baseline deflection matrix effect.

M6 .... Adding/removing area due to negative baseline deflection matrix effect.

M7 .... Retention time shifts.

M8 .... Skimming vs. dropped baseline.

M9 .... Adding area due to peak splitting .

M10 ... Secondary ions or qualifier ions.

Note: Appropriate Qualifiers are used and specified in the data package; either on the individual quantitation reports or in the Technical Review Checklists.

F:\GROUP\FINALRPT\MASTER\MANINT.MAS

2. CHAIN-OF-CUSTODY

Chain of Custody Record

EA Laboratories
19 Loveton Circle
Sparks, MD 21152
Telephone: (410) 771-4920
Fax: (410) 771-4407

Company Name: EA DELAWARE

Project Manager or Contact: CARL REITENBACH
Phone: 302-325-3560

Project No. 29600.74

Project Name: WILLOW GROVE N.A.S.

Dept.: 2132 Task: 7200

Sample Storage Location: VOA 1

ATO Number: —

Page 1 of

Report #: 000075

Report Deliverables: 1 2 3 4 D E

EDD: Yes/No

DUE TO CLIENT: 2-14-00

Parameter Method Numbers for Analysis

Date	Time	Water	Soil	Sample Identification 19 Characters	No. of Containers	624	8270	MLLA	1-24-00	EA Labs Accession Number	Remarks
1/20/00	1620	X		INFLUENT	3	✓				0000464	LPM: MEA
1/20/00	1600	X		EFFLUENT	3	✓				0000465	STL-FS-0090
											L-17453
											6 VOAs
											COC0006578

Samples by: (Signature)	Date/Time	Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time
[signature]	1/20/00 1630				

Relinquished by: (Signature)	Date/Time	Received by Laboratory: (Signature)	Date/Time	Airbill Number:	Sample Shipped by: (Circle)
[signature]	1/21/00 1300	[signature]	1/24/00 8:30	8161848 74320	Fed Ex Puro. UPS Hand Carried Other:

Cooler Temp. 5 C pH: ☐ Yes ☐ No Comments: Custody Seals Intact ☐ Yes ☐ No

NOTE: Please indicate method number for analyses requested. This will help clarify any questions with laboratory techniques.

WHITE—EA Laboratories YELLOW—EA Laboratories PINK—Project Manager *Shaded Areas for Lab Use Only*

T00020

Committed to Your Success

19 Loveton Circle
Sparks, Maryland 21152
(410) 771-4920

COOLER RECEIPT CHECKLIST

Report: 000075

Project: EA Delaware Willow Grove NAS
Received: 24-JAN-00 8:30
COC: COC0006578
Samples: 0000464-0000465

A. COOLER INSPECTION:

Date cooler was opened: 1/24/00 [signature]
Date — Custodian Signature

1. Did cooler come with a shipping slip, air bill, etc? YES NO N/A NCR# _____
1a. Circle courier: Federal Express UPS *Air bill Number from Chain-of-Custody* 816182437432C
1b. Circle, if applicable: Handcarried Other

2. Custody seals were present on outside of cooler? YES NO N/A NCR# _____
3. Custody seals were unbroken at the time of arrival? YES NO N/A NCR# _____
4. Chain-of-Custody (COC)records were present and legible? YES NO N/A NCR# _____
5. Were the COC records completed? YES NO N/A NCR# _____
6. Was cooler temperature 4C ± 2C? YES NO N/A NCR# _____
50

B. SAMPLE INSPECTION

9. All bottles arrived unbroken? YES NO N/A NCR# _____
10. All bottles labels were legible and complete? YES NO N/A NCR# _____
11. Containers were correct for the analysis listed on the COC? YES NO N/A NCR# _____
12. Were preservatives checked (except VOA vials)? YES NO N/A NCR# _____
13. Were bubbles absent in Volatiles samples? YES NO N/A NCR# _____

Special Notes:

Sample Management Officer — Date

September 29, 1999/mmu

3. BTEX DATA

A. QC Summary

LCS Recovery Report

Lab Name : STL Baltimore File ID : VB2A9377.D Instrument: VB2

Sample : VL002032 Date Analyzed: 3 Feb 200

Matrix : WATER Method : AB200131.M

Client : 000075 Project : WILLOW GROVE

Spike Compound	Spike Added	Spike Res	Spike %Rec	QC Limits % Rec
Benzene	50	43.3	87	87-121
Toluene	50	43.1	86	81-125
Ethylbenzene	50	43.4	87	50-150

MS 2/7/00

* - Indicates values outside of QC limits

4A

VOLATILE METHOD BLANK SUMMARY

EPA SAMPLE NO.

VBLK01

Lab Name: STL BALTIMORE Contract: 000075

Lab Code: ST LABS Case No.: WILLOW SAS No.: _____ SDG No.: _____

Lab File ID: VB2A9333.D Lab Sample ID: VB002014

Date Analyzed: 2/1/00 Time Analyzed: 12:27

GC Column: DB-VRX ID: 0.45 (mm) Heated Purge: (Y/N) N

Instrument ID: VB2

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	TIME ANALYZED
01	VLCS01	VL002014	VB2A9331.D	11:28
02	EFFLUENT	0000465	VB2A9334.D	12:57

COMMENTS

B. Sample Results

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

INFLUENT

Lab Name: STL BALTIMORE Contract: 000075

Lab Code: ST LABS Case No.: WILLOW SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 0000464

Sample wt/vol: 5.0 (g/ml) ML Lab File ID: VB2A9381.D

Level: (low/med) LOW Date Received: 1/24/00

% Moisture: not dec. _____ Date Analyzed: 2/3/00

GC Column: DB-VRX ID: 0.45 (mm) Dilution Factor: 5.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
71-43-2	Benzene	350	D
108-88-3	Toluene	1200	D
100-41-4	Ethylbenzene	620	D
	m&p-Xylenes	590	D
	Naphthalene	650	D
95-47-6	o-Xylene	5	U
3114-55-4	Chlorobenzene	5	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

EFFLUENT

Lab Name: STL BALTIMORE Contract: 000075

Lab Code: ST LABS Case No.: WILLOW SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 0000465

Sample wt/vol: 5.0 (g/ml) ML Lab File ID: VB2A9334.D

Level: (low/med) LOW Date Received: 1/24/00

% Moisture: not dec. _____ Date Analyzed: 2/1/00

GC Column: DB-VRX ID: 0.45 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
71-43-2	Benzene	1	U
108-88-3	Toluene	3	
100-41-4	Ethylbenzene	1	U
	m&p-Xylenes	2	
	Naphthalene	5	U
95-47-6	o-Xylene	1	U
3114-55-4	Chlorobenzene	1	U

FORM I VOA

Committed To *Your* Success

Severn Trent Laboratories
19 Loveton Circle
Sparks, MD 21152

Tel: (410) 771-4920
Fax: (410) 771-4407
www.stl-inc.com

March 3, 2000

Carl Reitenbach
EA Engineering, Science, and Technology, Inc.
92 Reads Way STE 109
New Castle, DE 19720

Re:Willow Grove NAS (29600.74)

Dear Mr. Reitenbach:

Enclosed is our report on the analysis of three water samples collected for the Willow Grove NAS project on 16 February 2000. The electronic data deliverables (EDD) will follow. The invoice is included.

Please contact me if you have any questions or require further information and refer to report 000131. Unless other arrangements are made, we reserve the right to dispose of your samples sixty (60) days from the date of this letter. We will retain the raw data for seven years from this date.

Sincerely,

Mary E. Asper
Laboratory Project Manager

MEA/gsp
enclosure

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LABORATORY DATA REPORT

Prepared for:

EA Engineering, Science, and Technology, Inc.
92 Reads Way STE 109
New Castle, DE 19720

Prepared by:

Severn Trent Laboratories - Baltimore
19 Loveton Circle
Sparks, MD 21152

Report 000131

March 2000

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1. NARRATIVE

Severn Trent Laboratories - Baltimore
ANALYTICAL NARRATIVE

Client: **EA Eng., Sci., & Tech., Inc.**
Site: **Willow Grove NAS**
Project number:**29600.74**

STL Baltimore Report: **000131**
Laboratory Project Manager: **Mary E. Asper**
Report Date: **3 March 2000**

This report contains the results of the analysis of three water samples collected on 16 February 2000 in support of the referenced project.

SAMPLE RECEIPT

The samples arrived intact by hand at Severn Trent Laboratories - Baltimore on 16 February 2000. Upon receipt, the samples were inspected and compared with the chain-of-custody record. The samples were then logged into the laboratory computer system with assigned laboratory accession numbers and released for analysis.

Client Sample Designation	ST Lab Number
EFFLUENT	0001026
BETWEEN	0001027
INFLUENT	0001028

Following this narrative section are a glossary of data qualifiers (Table 1), codes associated with manual integration of chromatographic peaks (Table 2), and the original chain-of-custody record. Analytical results and quality control information are summarized in the appended data package which has been formatted to be consistent with the deliverable requirements of this project.

QUALITY CONTROL

The following sections are ordered as the data appears in this report. They contain observations made during sample analysis, summarize the results of quality control measurements, and address the impact on data usability based upon project Data Quality Objectives. For each fractional analysis the narrative includes:

- Sample chronology: This section summarizes the sample history by fraction including the sample preparation method and date, analytical method, and analysis date. Anything unusual about the samples, digestates, or extracts is identified. Holding time compliance is evaluated in this section.

- Laboratory method performance: All quality control criteria for method performance must be met for all target analytes for data to be reported. These criteria generally apply to instrument tune, calibration, method blanks, and Laboratory Control Samples (LCS). In some instances where method criteria fail, useable data can be obtained and are reported with client approval. The narrative will then include a thorough discussion of the impact on data quality.

- Sample performance: Quality control field samples are analyzed to determine any measurement bias due to the sample matrix based on evaluation of matrix spikes (MS), matrix spike duplicates (MSD), and laboratory duplicates (D). If acceptance criteria are not met, matrix interferences are

confirmed either by reanalysis or by inspection of the LCS results to verify that laboratory method performance is in control. Data are reported with appropriate qualifiers or discussion.

AROMATIC VOLATILES by GC - WATER (STL0001026 - STL0001028)

Sample Chronology: Three samples and associated quality control were analyzed on 22 February 2000 for the client specified list of analytes by USEPA SW-846, Methods 5030B/8021B. All holding times were met.

Sample INFLUENT was analyzed at a 2X dilution in order to bring the target analytes within instrument calibration range.

Laboratory Method Performance: All laboratory method performance criteria were met for the reported samples.

Sample Performance: All quality control criteria were met for the reported samples.

CERTIFICATION OF RESULTS

The Laboratory certifies that this report meets the project requirements for analytical data as stated in the Analytical Task Order (ATO) and the chain-of-custody. In addition, the Laboratory certifies that the data as reported meet the Data Quality Objectives for precision, accuracy, and completeness specified for this project or as stated in Severn Trent Laboratories - Baltimore Quality Assurance program for other than the conditions detailed above. It is recommended by the Laboratory that this analytical report should only be reproduced in its entirety. Severn Trent Laboratories - Baltimore is not responsible for any assumptions of data quality if partial packages are used to interpret data Release of the data contained in this report has been authorized by the appropriate Laboratory Project Manager as verified by the following signature.

Mary Ele March 3, 2000
Mary E. Asper, Laboraotry Project Manager

TABLE 1. LABORATORY ORGANIC ANALYSIS DATA QUALIFIERS [1]

Qualifiers other than those listed below may be required to properly define the results. If used, they are given an alphabetic designation not already specified in this table or in a project/program document such as a Quality Assurance Project Plan or a contract Statement of Work. Each additional qualifier is fully described in the Analytical Narrative section of the laboratory report.

U Indicates a target compound was analyzed for but not detected. The sample Reporting Limit (RL) is corrected for dilution and, if a soil sample, for percent moisture, if reported on a dry weight basis.

J Indicates an estimated value. This qualifier is used under the following circumstances:

1) when estimating a concentration for tentatively identified compounds (TICs) in GC/MS analyses, where a 1:1 response is assumed,
2) when the mass spectral and retention time data indicate the presence of a compound that meets the volatile and semivolatile GC/MS identification criteria, and the result is less than the RL but greater than the method detection limit (MDL).

B This qualifier is used when the analyte is found in the associated method blank as well as in the sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action. For GC/MS analyses, this qualifier is used for a TIC, as well as, for a positively identified target compound.

E This qualifier identifies compounds whose concentrations exceed the calibration range of the instrument for that specific analysis.

D When applied, this qualifier identifies all compound concentrations reported from a secondary dilution analysis.

A This qualifier indicates that a TIC is a suspected aldol-condensation product.

N Indicates presumptive evidence of a compound. This qualifier is only used for GC/MS TICs, where the identification is based on a mass spectral library search. For generic characterization of a TIC, such as chlorinated hydrocarbon, the N qualifier is not used.

P When applied, this qualifier indicates a reported value from a GC analysis when there is greater than 25% difference for detected concentrations between the two GC columns.

---

(1) These Data Qualifiers are added by the laboratory to provide additional information for the reported results. ***They should not be confused with the qualifiers applied to the reported data as a result of a data validation process performed independently of the laboratory reporting procedure.***

TABLE 2. CODES ASSOCIATED WITH MANUAL INTEGRATION OF CHROMATOGRAPHIC PEAKS

M1 .... Software failed to integrate peak or integrated peak improperly

M2 .... Multiple peaks within window, analyst's discretion used in peak identification.

M3 .... Close eluting or near-coelution of interferences.

M4 .... Adding or removing area due to peak tailing - subject to consistency within the sequence.

M5 .... Adding/removing area due to positive baseline deflection matrix effect.

M6 .... Adding/removing area due to negative baseline deflection matrix effect.

M7 .... Retention time shifts.

M8 .... Skimming vs. dropped baseline.

M9 .... Adding area due to peak splitting .

M10 ... Secondary ions or qualifier ions.

Note: Appropriate Qualifiers are used and specified in the data package; either on the individual quantitation reports or in the Technical Review Checklists.

F:\GROUP\FINALRPT\MASTER\MANINT.MAS

2. CHAIN-OF-CUSTODY

Company Name	Project Manager or Contact:
EA DELAWARE	CARL REITENBACH
Project No. 29600.74	Phone: (302) 325-3560
Dept.: 2132 Task: 7200	Project Name: WILLOW GROVE NAS.
Sample Storage Location: V0017	ATO Number: —
Page 1 of 1	Report #: 000131

Parameters/Method Numbers for Analysis

Chain of Custody Rec

EA Laboratories
19 Loveton Circle
Sparks, MD 21152
Telephone: (410) 771-4920
Fax: (410) 771-4407

Report Deliverables: 1 2 3 4 D E

EDD: Yes/No

DUE TO CLIENT: 3/1/00

Date	Time	Water	Soil	Sample Identification 19 Characters	No. of Containers	BTEX/NAPTHALENE by 8260	MEA Spiked	EA Labs Accession Number	Remarks
2/16/00	1300	X		EFFLUENT	3	✓		0001026	LPM: MKA
	1310	X		BETWEEN	3	✓		0001027	SR-B-090
↓	1315	X		INFLUENT	3	✓		0001028	
									~~L17515~~
									L17511
									9 VOA
									COC000 6641

Sampled by: (Signature)	Date/Time	Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time
[signature]	2/16/00 1330				

Relinquished by: (Signature)	Date/Time	Received by Laboratory: (Signature)	Date/Time	Airbill Number:	Sample Shipped by: (Circle)
[signature]	2/16/00 1900	[signature]	2/16/00 10:00	8161848747 21	Fed Ex. Puro. UPS Hand Carried Other:

Cooler Temp. 4 C pH: ☐ Yes ☐ No Comments: Custody Seals Intact ☐ Yes ☐ No

NOTE: Please indicate method number for analyses requested. This will help clarify any questions with laboratory techniques.

WHITE—EA Laboratories YELLOW—EA Laboratories PINK—Project Manager *Shaded Areas for Lab Use Only*

000001

STL Baltimore

19 Loveton Circle
Sparks, Maryland 21152
(410) 771-4920

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COOLER RECEIPT CHECKLIST

Report: 000131

Project: Willow Grove Nas
Received: 16-FEB-00 10:00
COC: COC0006641
Samples: 0001026-0001028

A. COOLER INSPECTION:

Date cooler was opened: 2/16/00 (Date) [signature] (Custodian Signature)

1. Did cooler come ~~with a shipping~~ slip, air bill, etc? (YES) NO N/A NCR# _____
1a. Circle courier: Federal Express UPS ***Air bill Number from Chain-of-Custody*** 8/6/8487 4721
1b. Circle, if applicable: ~~Handcarried~~ Other

2. Custody seals were present on outside of cooler? YES (NO) N/A NCR# _____
3. Custody seals were unbroken at the time of arrival? YES NO (N/A) NCR# _____
4. Chain-of-Custody (COC)records were present and legible? (YES) NO N/A NCR# _____
5. Were the COC records completed? (YES) NO N/A NCR# _____
6. Was cooler temperature 4C ± 2C? (YES) NO N/A NCR# _____ 4°

B. SAMPLE INSPECTION

9. All bottles arrived unbroken? (YES) NO N/A NCR# _____
10. All bottles labels were legible and complete? (YES) NO N/A NCR# _____
11. Containers were correct for the analysis listed on the COC? (YES) NO N/A NCR# _____
12. Were preservatives checked (except VOA vials)? YES NO (N/A) NCR# _____
13. Were bubbles absent in Volatiles samples? (YES) NO N/A NCR# _____

Special Notes:

[signature] 2/14/00
Sample Management Officer Date

September 29, 1999/mmu

020002

3. BTEX DATA

A. QC Summary

LCS Recovery Report

Lab Name : STL Baltimore File ID : VB2A9536.D Instrument: VB2

Sample : VL002221 Date Analyzed: 22 Feb 200

Matrix : WATER Method : AB200215.M

Client : Project :

Spike Compound	Spike Added	Spike Res	Spike %Rec	QC Limits % Rec
Benzene	50	60.2	120	87-121
Toluene	50	57.7	115	81-125
Ethylbenzene	50	58.0	116	50-150

* - Indicates values outside of QC limits

4A

VOLATILE METHOD BLANK SUMMARY

EPA SAMPLE NO.

VBLK01

Lab Name: STL BALTIMORE Contract: 000131

Lab Code: ST LABS Case No.: WILLOW SAS No.: _____ SDG No.: _____

Lab File ID: VB2A9538.D Lab Sample ID: VB002221

Date Analyzed: 2/22/00 Time Analyzed: 11:20

GC Column: DB-VRX ID: 0.45 (mm) Heated Purge: (Y/N) Y

Instrument ID: VB2

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	TIME ANALYZED
01	VLCS01	VL002221	VB2A9536.D	10:21
02	BETWEEN	0001027	VB2A9541.D	12:47
03	EFFLUENT	0001026	VB2A9545.D	14:44
04	BETWEENMS	0001027MS	VB2A9547.D	15:43
05	BETWEENMSD	0001027MSD	VB2A9548.D	16:12
06	INFLUENT	0001028	VB2A9549.D	16:41

COMMENTS

B. Sample Results

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

EFFLUENT

Lab Name: STL BALTIMORE Contract: 000131

Lab Code: ST LABS Case No.: WILLOW SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 0001026

Sample wt/vol: 5.0 (g/ml) ML Lab File ID: VB2A9545.D

Level: (low/med) LOW Date Received: 2/16/00

% Moisture: not dec. _____ Date Analyzed: 2/22/00

GC Column: DB-VRX ID: 0.45 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND (ug/L or ug/Kg) UG/L		Q
71-43-2	Benzene	1	U
108-88-3	Toluene	1	U
100-41-4	Ethylbenzene	1	U
91-20-3	Naphthalene	5	U
	m&p-Xylenes	1	U
95-47-6	o-Xylene	1	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BETWEEN

Lab Name: STL BALTIMORE Contract: 000131

Lab Code: ST LABS Case No.: WILLOW SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 0001027

Sample wt/vol: 5.0 (g/ml) ML Lab File ID: VB2A9541.D

Level: (low/med) LOW Date Received: 2/16/00

% Moisture: not dec. _____ Date Analyzed: 2/22/00

GC Column: DB-VRX ID: 0.45 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
71-43-2	Benzene	1	U
108-88-3	Toluene	1	U
100-41-4	Ethylbenzene	1	U
91-20-3	Naphthalene	5	U
	m&p-Xylenes	1	U
95-47-6	o-Xylene	1	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

INFLUENT

Lab Name: STL BALTIMORE Contract: 000131

Lab Code: ST LABS Case No.: WILLOW SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 0001028

Sample wt/vol: 5.0 (g/ml) ML Lab File ID: VB2A9549.D

Level: (low/med) LOW Date Received: 2/16/00

% Moisture: not dec. _____ Date Analyzed: 2/22/00

GC Column: DB-VRX ID: 0.45 (mm) Dilution Factor: 2.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
71-43-2	Benzene	93	D
108-88-3	Toluene	2	U
100-41-4	Ethylbenzene	230	D
91-20-3	Naphthalene	210	D
	m&p-Xylenes	34	D
95-47-6	o-Xylene	4	D

FORM I VOA

Committed To *Your* Success

Severn Trent Laboratories
19 Loveton Circle
Sparks, MD 21152

Tel: (410) 771-4920
Fax: (410) 771-4407
www.stl-inc.com

April 5, 2000

Carl Reitenbach
EA Engineering, Science, and Technology, Inc.
92 Reads Way STE 109
New Castle, DE 19720

Re:Willow Grove NAS (29600.74)

Dear Mr. Reitenbach:

Enclosed is our report on the analysis of three water samples collected for the Willow Grove NAS project on 21 March 2000. The electronic data deliverables (EDD) will follow. The invoice is included.

Please contact me if you have any questions or require further information and refer to report 000320. Unless other arrangements are made, we reserve the right to dispose of your samples sixty (60) days from the date of this letter. We will retain the raw data for seven years from this date.

Sincerely,

Mary E. Asper
Laboratory Project Manager

MEA/gsp
enclosure

Committed To *Your* Success

LABORATORY DATA REPORT

Prepared for:

EA Engineering, Science, and Technology, Inc.
92 Reads Way STE 109
New Castle, DE 19720

Prepared by:

Severn Trent Laboratories - Baltimore
19 Loveton Circle
Sparks, MD 21152

Report 000320

April 2000

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1. NARRATIVE

Severn Trent Laboratories - Baltimore
ANALYTICAL NARRATIVE

Client: **EA Eng., Sci., & Tech., Inc.**
Site: **Willow Grove NAS**
Project number:**29600.74**

STL Baltimore Report: **000320**
Laboratory Project Manager: **Mary E. Asper**
Report Date: **5 April 2000**

This report contains the results of the analysis of three water samples collected on 21 March 2000 in support of the referenced project.

SAMPLE RECEIPT

The samples arrived with custody seals absent by Federal Express at Severn Trent Laboratories - Baltimore on 21 March 2000. Upon receipt, the samples were inspected and compared with the chain-of-custody record. The samples were then logged into the laboratory computer system with assigned laboratory accession numbers and released for analysis.

Client Sample Designation	ST Lab Number
EFFLUENT	0002662
BETWEEN	0002663
INFLUENT	0002664

Following this narrative section are a glossary of data qualifiers (Table 1), codes associated with manual integration of chromatographic peaks (Table 2), and the original chain-of-custody record. Analytical results and quality control information are summarized in the appended data package which has been formatted to be consistent with the deliverable requirements of this project.

ANALYTICAL METHODS

The analytical methods used by the laboratory are referenced by the STL Baltimore Method SOP which is formatted as STL-M-XXXXX-Y, where XXXXX is the reference method and Y is the SOP revision number. For example, analyses performed using EPA SW846 Method 8260B are identified as STL-M-8260B-3 where 3 is the laboratory SOP revision number. General Chemistry methods which are a consolidation of several reference methods, e.g. STL-M-CN for cyanide determinations, also include the identification of the specific reference method used for the analyses.

QUALITY CONTROL

The following sections are ordered as the data appears in this report. They contain observations made during sample analysis, summarize the results of quality control measurements, and address the impact on data usability based upon project Data Quality Objectives. For each fractional analysis the narrative includes:

- Sample chronology: This section summarizes the sample history by fraction including the sample preparation method and date, analytical method, and analysis date. Anything unusual about the samples, digestates, or extracts is identified. Holding time compliance is evaluated in this section.

- Laboratory method performance: All quality control criteria for method performance must be met for all target analytes for data to be reported. These criteria generally apply to instrument tune, calibration, method blanks, and Laboratory Control Samples (LCS). In some instances where method criteria fail, useable data can be obtained and are reported with client approval. The narrative will then include a thorough discussion of the impact on data quality.

- Sample performance: Quality control field samples are analyzed to determine any measurement bias due to the sample matrix based on evaluation of matrix spikes (MS), matrix spike duplicates (MSD), and laboratory duplicates (D). If acceptance criteria are not met, matrix interferences are confirmed either by reanalysis or by inspection of the LCS results to verify that laboratory method performance is in control. Data are reported with appropriate qualifiers or discussion.

AROMATIC VOLATILES by GC - WATER (ST0002662-ST0002664)

Sample Chronology: Three samples and associated quality control were analyzed on 25 March 2000 for the client specified list of analytes by STL-M-5030B-0/STL-M-8021B-2. All holding times were met.

Sample INFLUENT was analyzed at a 2X dilution in order to bring the concentrations of target analytes within instrument calibration range.

The batch MS/MSD was performed on another client's sample. All data associated with these QC analyses have been included in this report to fulfill reporting requirements. However, recoveries were not evaluated because they do not apply to the samples associated with this report.

Laboratory Method Performance: All laboratory method performance criteria were met for the reported samples.

Sample Performance: All quality control criteria were met for the reported samples.

CERTIFICATION OF RESULTS

The Laboratory certifies that the reported results relate only to those samples tested and that this report meets the project requirements for analytical data as stated in the Analytical Task Order (ATO) and the chain-of-custody. In addition, the Laboratory certifies that the data as reported meet the Data Quality Objectives for precision, accuracy, and completeness specified for this project or as stated in STL Baltimore's Quality Assurance program for other than the conditions detailed above.

Severn Trent Laboratories - Baltimore
ANALYTICAL NARRATIVE

Client: **EA Eng., Sci., & Tech., Inc.**
Site: **Willow Grove NAS**
Project number:**29600.74**

STL Baltimore Report: **000320**
Laboratory Project Manager: **Mary E. Asper**
Report Date: **5 April 2000**

Release of the data contained in this report has been authorized by the Laboratory Project Manager as verified by the following signature.

Mary E. Asper April 5, 2000
Mary E. Asper, Laboratory Project Manager

010003

TABLE 1. LABORATORY ORGANIC ANALYSIS DATA QUALIFIERS [1]

Qualifiers other than those listed below may be required to properly define the results. If used, they are given an alphabetic designation not already specified in this table or in a project/program document. such as a Quality Assurance Project Plan or a contract Statement of Work. Each additional qualifier is fully described in the Analytical Narrative section of the laboratory report.

U Indicates a target compound was analyzed for but not detected. The sample Reporting Limit (RL) is corrected for dilution and, if a soil sample, for percent moisture, if reported on a dry weight basis.

J Indicates an estimated value. This qualifier is used under the following circumstances:

1) when estimating a concentration for tentatively identified compounds (TICs) in GC/MS analyses, where a 1:1 response is assumed,
2) when the mass spectral and retention time data indicate the presence of a compound that meets the volatile and semivolatile GC/MS identification criteria, and the result is less than the RL but greater than the method detection limit (MDL).

B This qualifier is used when the analyte is found in the associated method blank as well as in the sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action. For GC/MS analyses, this qualifier is used for a TIC, as well as, for a positively identified target compound.

E This qualifier identifies compounds whose concentrations exceed the calibration range of the instrument for that specific analysis.

D When applied, this qualifier identifies all compound concentrations reported from a secondary dilution analysis.

A This qualifier indicates that a TIC is a suspected aldol-condensation product.

N Indicates presumptive evidence of a compound. This qualifier is only used for GC/MS TICs, where the identification is based on a mass spectral library search. For generic characterization of a TIC, such as chlorinated hydrocarbon, the N qualifier is not used.

P When applied, this qualifier indicates a reported value from a GC analysis when there is greater than 25% difference for detected concentrations between the two GC columns.

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(1) These Data Qualifiers are added by the laboratory to provide additional information for the reported results. ***They should not be confused with the qualifiers applied to the reported data as a result of a data validation process performed independently of the laboratory reporting procedure.***

TABLE 2. CODES ASSOCIATED WITH MANUAL INTEGRATION OF CHROMATOGRAPHIC PEAKS

M1 .... Software failed to integrate peak or integrated peak improperly

M2 .... Multiple peaks within window, analyst's discretion used in peak identification.

M3 ... Close eluting or near-coelution of interferences.

M4 .... Adding or removing area due to peak tailing - subject to consistency within the sequence.

M5 .... Adding/removing area due to positive baseline deflection matrix effect.

M6 .... Adding/removing area due to negative baseline deflection matrix effect.

M7 .... Retention time shifts.

M8 .... Skimming vs. dropped baseline.

M9 .... Adding area due to peak splitting .

M10 ... Secondary ions or qualifier ions.

Note: Appropriate Qualifiers are used and specified in the data package; either on the individual quantitation reports or in the Technical Review Checklists.

F:\GROUP\FINALRPT\MASTER\MANINT.MAS

2. CHAIN-OF-CUSTODY

Company Name:	Project Manager or Contact:
EA DELAWARE	CARL REITENBACH
Project No. 29600.74	Phone: 302-325-3560
Dept.: 2132 Task: 7200	Project Name: WILLOWGROVE N.A.S
Sample Storage Location: VOA12	ATO Number:
Page 1 of 1	Report #: 000320

Parameter/Method Numbers for Analysis

Chain of Custody Record

EA Laboratories
19 Loveton Circle
Sparks, MD 21152
Telephone: (410) 771-4920
Fax: (410) 771-4407

Report Deliverables: 1 2 3 4 D E

EDD: Yes/No

DUE TO CLIENT: 4/14/00

Date	Time	Water	Soil	Sample Identification 19 Characters	No. of Containers	BTEX/NAPHTHALENE (8021)	PCB (8082)	MTBE (8260)	EA Labs Accession Number	Remarks
3/21	1330	X		INFLUENT	3	✓			0002662	LPM: MEA
↓	1320	X		BETWEEN	3	✓			0002663	SR-PS-0910
	1310	X		EFFLUENT	3	✓			0002664	
										L17688
										9 VOA
										COC00068S2

Sampled by: (Signature)	Date/Time	Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time
[signature]	3/21/00 1400				

Relinquished by: (Signature)	Date/Time	Received by Laboratory: (Signature)	Date/Time	Airbill Number:	Sample Shipped by: (Circle)
[signature]	3/22/00 0800	Jennifer E Jessen	3/22/00 11:00	8161848739 42	Fed Ex Puro. UPS Hand Carried Other:

Cooler Temp. 4 C pH: ☐ Yes ☐ No Comments: Custody Seals Intact ☐ Yes ☒ No

NOTE: Please indicate method number for analyses requested. This will help clarify any questions with laboratory techniques.

WHITE—EA Laboratories YELLOW—EA Laboratories PINK—Project Manager *Shaded Areas for Lab Use Only*

000001

STL Baltimore

19 Loveton Circle
Sparks, Maryland 21152
(410) 771-4920

Committed to *Your* Success

COOLER RECEIPT CHECKLIST

Report: 000320

Project: EA Delaware
Received: 25-MAR-00 12:50
COC: COC0006852
Samples: 0002662-0002664

A. COOLER INSPECTION:

Date cooler was opened: 3/25/00 (Date) Jennifer E. Jessen (Custodian Signature)

1. Did cooler come with a shipping slip, air bill, etc? YES NO N/A NCR# _____
1a. Circle courier: Federal Express UPS ***Air bill Number from Chain-of-Custody*** 8168487394 2
1b. Circle, if applicable: Handcarried Other

2. Custody seals were present on outside of cooler? YES NO N/A NCR# _____
3. Custody seals were unbroken at the time of arrival? YES NO N/A NCR# _____
4. Chain-of-Custody (COC)records were present and legible? YES NO N/A NCR# _____
5. Were the COC records completed? YES NO N/A NCR# _____
6. Was cooler temperature 4C ± 2C? 4° YES NO N/A NCR# _____

B. SAMPLE INSPECTION

9. All bottles arrived unbroken? YES NO N/A NCR# _____
10. All bottles labels were legible and complete? YES NO N/A NCR# _____
11. Containers were correct for the analysis listed on the COC? YES NO N/A NCR# _____
12. Were preservatives checked (except VOA vials)? YES NO N/A NCR# _____
13. Were bubbles absent in Volatiles samples? YES NO N/A NCR# 4-1933

Special Notes:

Jennifer E Jessen — Sample Management Officer

3/25/00 — Date

September 29, 1999/mmu

020002

3. BTEX DATA

A. QC Summary

LCS Recovery Report

Lab Name : STL Baltimore File ID : VB2A9798.D Instrument: VB2

Sample : VL004011 Date Analyzed: 1 Apr 2000

Matrix : WATER Method : AB200323.M

Client : Project :

Spike Compound	Spike Added	Spike Res	Spike %Rec	QC Limits % Rec
Benzene	50	41.4	83	72-133
Toluene	50	44.0	88	81-122
Ethylbenzene	50	43.9	88	81-124

* - Indicates values outside of QC limits

4A

VOLATILE METHOD BLANK SUMMARY

EPA SAMPLE NO.

VBLK01

Lab Name: STL BALTIMORE Contract: 000320

Lab Code: ST LABS Case No.: WILLOW SAS No.: _____ SDG No.: _____

Lab File ID: VB2A9800.D Lab Sample ID: VB004011

Date Analyzed: 4/1/00 Time Analyzed: 13:21

GC Column: DB-VRX ID: 0.45 (mm) Heated Purge: (Y/N) N

Instrument ID: VB2

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	TIME ANALYZED
01	VLCS01	VL004011	VB2A9798.D	12:23
02	REFERENCE	0002363	VB2A9804.D	15:17
03	REFERENCEMS	0002363MS	VB2A9805.D	15:46
04	REFERENCEMSD	0002363MSD	VB2A9806.D	16:15
05	EFFLUENT	0002664	VB2A9811.D	18:40
06	BETWEEN	0002663	VB2A9812.D	19:08
07	INFLUENT	0002662	VB2A9813.D	19:37

COMMENTS

B. Sample Results

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

INFLUENT

Lab Name: STL BALTIMORE Contract: 000320

Lab Code: ST LABS Case No.: WILLOW SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 0002662

Sample wt/vol: 5.0 (g/ml) ML Lab File ID: VB2A9813.D

Level: (low/med) LOW Date Received: 3/25/00

% Moisture: not dec. _____ Date Analyzed: 4/1/00

GC Column: DB-VRX ID: 0.45 (mm) Dilution Factor: 2.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND (ug/L or ug/Kg) UG/L		Q
71-43-2	Benzene	41	D
108-88-3	Toluene	2	U
100-41-4	Ethylbenzene	100	D
91-20-3	Naphthalene	150	D
108-38-3/106-42-	m&p-Xylenes	23	D
95-47-6	o-Xylene	2	U

030007

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BETWEEN

Lab Name: STL BALTIMORE Contract: 000320

Lab Code: ST LABS Case No.: WILLOW SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 0002663

Sample wt/vol: 5.0 (g/ml) ML Lab File ID: VB2A9812.D

Level: (low/med) LOW Date Received: 3/25/00

% Moisture: not dec. _____ Date Analyzed: 4/1/00

GC Column: DB-VRX ID: 0.45 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND (ug/L or ug/Kg) UG/L		Q
71-43-2	Benzene	1	U
108-88-3	Toluene	1	U
100-41-4	Ethylbenzene	1	U
91-20-3	Naphthalene	5	U
108-38-3/106-42-	m&p-Xylenes	1	U
95-47-6	o-Xylene	1	U

Committed To *Your* Success

Severn Trent Laboratories
19 Loveton Circle
Sparks, MD 21152

Tel: (410) 771-4920
Fax: (410) 771-4407
www.stl-inc.com

May 2, 2000

Mr. Carl Reitenbach
EA Engineering, Science, & Technology, Inc.
92 Reads Way
Suite 109
New Castle, DE 19720

Re: Willow Grove, N.A.S. (29600.74)

Dear Mr. Reitenbach:

Enclosed is our report on the analysis of three water samples collected for the Willow Grove, N.A.S. project on 18 April 2000. The invoice is included.

Please contact me if you have any questions or require further information and refer to report 000451. Unless other arrangements are made, we reserve the right to dispose of your sample sixty (60) days from the date of this letter. We will retain the raw data for seven years from this date.

Sincerely,

Mary E. Aspet
Laboratory Project Manager

MEA/gsp
enclosure

Committed To *Your* Success

LABORATORY DATA REPORT

Prepared for:

EA Engineering, Science, & Technology, Inc.
92 Reads Way
Suite 109
New Castle, DE 19720

Prepared by:

Severn Trent Laboratories
19 Loveton Circle
Sparks, Maryland 21152

May 2000

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Willow Grove, N.A.S.
Severn Trent Laboratories - Baltimore Report# 000451

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1. NARRATIVE

010000

SEVERN TRENT LABORATORIES - BALTIMORE
ANALYTICAL NARRATIVE

Client: **EA Eng., Sci., and Tech.,Inc.**
Site: **Willow Grove, N.A.S.**
Project number: **12751.01**

STL - Baltimore Report: **000451**
Laboratory Project Manager: **Mary E. Asper**
Report Date: **2 May 2000**

This report contains the results of the analysis of three water samples collected on 18 April 2000 in support of the referenced project.

SAMPLE RECEIPT

The samples arrived with custody seals absent by Federal Express at Severn Trent Laboratories - Baltimore on 20 April 2000. Upon receipt, the samples and were inspected and compared with the chain-of-custody record. The samples and were then logged into the laboratory computer system with an assigned laboratory accession number and released for analysis.

Client Sample Designation	ST Lab Number
INFLUENT	0004251
BETWEEN	0004252
EFFLUENT	0004253

Following this narrative section is a glossary of data qualifiers (Table 1), codes associated with manual integration of chromatographic peaks (Table 2), and the original chain-of-custody record. Analytical results and quality control information are summarized in the appended data package which has been formatted to be consistent with the deliverable requirements of this project.

ANALYTICAL METHODS

The analytical methods used by the laboratory are referenced by the STL Baltimore Method SOP which is formatted as STL-M-XXXXX-Y, where XXXXX is the reference method and Y is the SOP revision number. For example, analyses performed using EPA SW846 Method 8260B are identified as STL-M-8260B-3 where 3 is the laboratory SOP revision number. General Chemistry methods which are a consolidation of several reference methods, e.g. STL-M-CN for cyanide determinations, also include the identification of the specific reference method used for the analyses.

QUALITY CONTROL

The following sections are ordered as the data appears in this report. They contain observations made during sample analysis, summarize the results of quality control measurements, and address the impact on data usability based upon project Data Quality Objectives. For each fractional analysis the narrative includes:

SEVERN TRENT LABORATORIES - BALTIMORE
ANALYTICAL NARRATIVE

Client: **EA Eng., Sci., and Tech.,Inc.**
Site: **Willow Grove, N.A.S.**
Project number: **12751.01**

STL - Baltimore Report: **000451**
Laboratory Project Manager: **Mary E. Asper**
Report Date: **2 May 2000**

- Sample chronology: This section summarizes the sample history by fraction including the sample preparation method and date, analytical method, and analysis date. Anything unusual about the samples, digestates, or extracts is identified. Holding time compliance is evaluated in this section.

- Laboratory method performance: All quality control criteria for method performance must be met for all target analytes for data to be reported. These criteria generally apply to instrument tune, calibration, method blanks, and Laboratory Control Samples (LCS). In some instances where method criteria fail, useable data can be obtained and are reported with client approval. The narrative will then include a thorough discussion of the impact on data quality.

- Sample performance: Quality control field samples are analyzed to determine any measurement bias due to the sample matrix based on evaluation of matrix spikes (MS), matrix spike duplicates (MSD), and laboratory duplicates (D). If acceptance criteria are not met, matrix interferences are confirmed either by reanalysis or by inspection of the LCS results to verify that laboratory method performance is in control. Data are reported with appropriate qualifiers or discussion.

AROMATIC VOLATILES by GC - WATER (ST0004251 - ST0004253)

Sample Chronology: Three samples and associated quality control were analyzed on 27 April 2000 for the client specified list of analytes by Methods STL-5030B-1/STL-8021B-2. All holding times were met.

Sample INFLUENT was analyzed at a 2X dilution in order to bring the concentrations of target analytes within instrument calibration range.

Laboratory Method Performance: All laboratory method performance criteria were met for the reported samples.

Sample Performance: All quality control criteria were met for the reported samples with the following exceptions;

- sample BETWEEN, had the surrogate recovery of bromofluorobenzene (81%) below the lower laboratory QC limit of 85%.

- the batch MS/MSD, performed on sample EFFLUENT, had the surrogate recoveries of

bromofluorobenzene (82%/84%) below the lower laboratory QC limit of 85%.

CERTIFICATION OF RESULTS

The Laboratory certifies that the reported results relate only to those samples tested and that this report meets the project requirements for analytical data as stated in the Analytical Task Order (ATO) and the chain-of-custody. In addition, the Laboratory certifies that the data as reported meet the Data Quality Objectives for precision, accuracy, and completeness specified for this project or as stated in STL Baltimore's Quality Assurance program for other than the conditions detailed above. Release of the data contained in this report has been authorized by the Laboratory Project Manager as verified by the following signature.

Mary E. Asper 2 May 2000
Mary E. Asper, Laboratory Project Manager

TABLE 1. LABORATORY ORGANIC ANALYSIS DATA QUALIFIERS [1]

Qualifiers other than those listed below may be required to properly define the results. If used, they are given an alphabetic designation not already specified in this table or in a project/program document. such as a Quality Assurance Project Plan or a contract Statement of Work. Each additional qualifier is fully described in the Analytical Narrative section of the laboratory report.

U Indicates a target compound was analyzed for but not detected. The sample Reporting Limit (RL) is corrected for dilution and, if a soil sample, for percent moisture, if reported on a dry weight basis.

J Indicates an estimated value. This qualifier is used under the following circumstances:

1) when estimating a concentration for tentatively identified compounds (TICs) in GC/MS analyses, where a 1:1 response is assumed,
2) when the mass spectral and retention time data indicate the presence of a compound that meets the volatile and semivolatile GC/MS identification criteria, and the result is less than the RL but greater than the method detection limit (MDL).

B This qualifier is used when the analyte is found in the associated method blank as well as in the sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action. For GC/MS analyses, this qualifier is used for a TIC, as well as, for a positively identified target compound.

E This qualifier identifies compounds whose concentrations exceed the calibration range of the instrument for that specific analysis.

D When applied, this qualifier identifies all compound concentrations reported from a secondary dilution analysis.

A This qualifier indicates that a TIC is a suspected aldol-condensation product.

N Indicates presumptive evidence of a compound. This qualifier is only used for GC/MS TICs, where the identification is based on a mass spectral library search. For generic characterization of a TIC, such as chlorinated hydrocarbon, the N qualifier is not used.

P When applied, this qualifier indicates a reported value from a GC analysis when there is greater than 25% difference for detected concentrations between the two GC columns.

---

(1) These Data Qualifiers are added by the laboratory to provide additional information for the reported results. ***They should not be confused with the qualifiers applied to the reported data as a result of a data validation process performed independently of the laboratory reporting procedure.***

TABLE 2. CODES ASSOCIATED WITH MANUAL INTEGRATION OF CHROMATOGRAPHIC PEAKS

M1 .... Software failed to integrate peak or integrated peak improperly

M2 .... Multiple peaks within window, analyst's discretion used in peak identification.

M3 ... Close eluting or near-coelution of interferences.

M4 .... Adding or removing area due to peak tailing - subject to consistency within the sequence.

M5 .... Adding/removing area due to positive baseline deflection matrix effect.

M6 .... Adding/removing area due to negative baseline deflection matrix effect.

M7 .... Retention time shifts.

M8 .... Skimming vs. dropped baseline.

M9 .... Adding area due to peak splitting .

M10 ... Secondary ions or qualifier ions.

Note: Appropriate Qualifiers are used and specified in the data package; either on the individual quantitation reports or in the Technical Review Checklists.

F:\GROUP\FINALRPT\MASTER\MANINT.MAS

2. CHAIN-OF-CUSTODY

Company Name:	Project Manager or Contact:
EA DELAWARE	CARL REITENBACH Phone: 302-325-3560
Project No. 29600.74 Dept.: 2132 Task: 7200	Project Name: WILLOW GROVE NAS
Sample Storage Location: VOA 4	ATO Number:
Page 1 of 1	Report #: 000451

Parameter Method Numbers for Analysis

Chain of Custody Record

EA Laboratories
19 Loveton Circle
Sparks, MD 21152
Telephone: (410) 771-4920
Fax: (410) 771-4407

Report Deliverables: 1 2 3 4 D E

EDD: Yes/No MA 4-2000

DUE TO CLIENT: 5/12/00

Date	Time	Water	Soil	Sample Identification 19 Characters	No. of Containers	BTEX/NAPTHALENE by 8020	EA Labs Accession Number	Remarks
4/18	1320	X		INFLUENT	3	✓	0004251	LPM: MEA
↓	1310	X		BETWEEN	3	✓	0004252	STL-PS-090
	1300	X		EFFLUENT	3	✓	0004253	
								L17829
								COC0007002
								9 VOA

Samples by: (Signature)	Date/Time	Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time
[signature]	4/18/00 1320				

Relinquished by: (Signature)	Date/Time	Received by Laboratory: (Signature)	Date/Time	Airbill Number:	Sample Shipped by: (Circle)
[signature]	4/19/00 1450	[signature]	4/20/00 10:00	8168487371 4	Fed Ex. Puro. UPS Hand Carried Other:

Cooler Temp. 5° C pH: ☐ Yes ☐ No Comments: Custody Seals Intact ☐ Yes ☐ No

NOTE: Please indicate method number for analyses requested. This will help clarify any questions with laboratory techniques.

WHITE—EA Laboratories YELLOW—EA Laboratories PINK—Project Manager *Shaded Areas for Lab Use Only*

STL Baltimore

19 Loveton Circle
Sparks, Maryland 21152
(410) 771-4920

Committed to *Your* Success

COOLER RECEIPT CHECKLIST

Report: 000451

Project: EA Delaware Willow Grove
Received: 20-APR-00 10:00
COC: COC0007002
Samples: 0004251-0004253

A. COOLER INSPECTION:

Date cooler was opened: 4/20/00 (Date) Phyllis Easter (Custodian Signature)

1. Did cooler come with ~~a shipping~~ slip, air bill, etc? YES NO N/A NCR# _____
1a. Circle courier: Federal Express UPS *Air bill Number from Chain-of-Custody* 816184873714
1b. Circle, if applicable: ~~Handcarried~~ Other

2. Custody seals were present on outside of cooler? YES NO N/A NCR# _____
3. Custody seals were unbroken at the time of arrival? YES NO N/A NCR# _____
4. Chain-of-Custody (COC)records were present and legible? YES NO N/A NCR# _____
5. Were the COC records completed? YES NO N/A NCR# _____
6. Was cooler temperature 4C ± 2C? YES NO N/A NCR# _____
5°

B. SAMPLE INSPECTION

9. All bottles arrived unbroken? YES NO N/A NCR# _____
10. All bottles labels were legible and complete? YES NO N/A NCR# _____
11. Containers were correct for the analysis listed on the COC? YES NO N/A NCR# _____
12. Were preservatives checked (except VOA vials)? YES NO N/A NCR# _____
13. Were bubbles absent in Volatiles samples? YES NO N/A NCR# _____

Special Notes:

Jennifer E. Jessen
Sample Management Officer

4/20/00
Date

September 29, 1999/mmu

020002

3. AROMATIC VOLATILES DATA

A. QC Summary

LCS Recovery Report

Lab Name : STL Baltimore File ID : VB2B0054.D Instrument: VB2

Sample : VL004274 Date Analyzed: 27 Apr 2000

Matrix : WATER Method : AB200323.M

Client : 000451 Project : WILLOW GROVE

Spike Compound	Spike Added	Spike Res	Spike %Rec	QC Limits % Rec
Benzene	50	46.9	94	72-133
Toluene	50	46.1	92	81-122
Ethylbenzene	50	46.0	92	81-124

* - Indicates values outside of QC limits

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

VBLK01

Lab Name: STL BALTIMORE Contract: 000451

Lab Code: ST LABS Case No.: WILLOW SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: VB004274

Sample wt/vol: 5.0 (g/ml) ML Lab File ID: VB2B0056.D

Level: (low/med) LOW Date Received: 4/20/00

% Moisture: not dec. _____ Date Analyzed: 4/27/00

GC Column: DB-VRX ID: 0.45 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND (ug/L or ug/Kg) UG/L		Q
71-43-2	Benzene	1	U
108-88-3	Toluene	1	U
100-41-4	Ethylbenzene	1	U
91-20-3	Naphthalene	5	U
108-38-3/106-42-	m&p-Xylenes	1	U
95-47-6	o-Xylene	1	U

FORM I VOA

030003

B. Sample Results

1A

EPA SAMPLE NO.

VOLATILE ORGANICS ANALYSIS DATA SHEET

INFLUENT

Lab Name: STL BALTIMORE Contract: 000451

Lab Code: ST LABS Case No.: WILLOW SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 0004251

Sample wt/vol: 5.0 (g/ml) ML Lab File ID: VB2B0059.D

Level: (low/med) LOW Date Received: 4/20/00

% Moisture: not dec. _____ Date Analyzed: 4/27/00

GC Column: DB-VRX ID: 0.45 (mm) Dilution Factor: 2.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND (ug/L or ug/Kg) UG/L		Q
71-43-2	Benzene	31	D
108-88-3	Toluene	2	U
100-41-4	Ethylbenzene	100	D
91-20-3	Naphthalene	110	D
108-38-3/106-42-	m&p-Xylenes	13	D
95-47-6	o-Xylene	2	U

FORM I VOA

030005

1A

EPA SAMPLE NO.

VOLATILE ORGANICS ANALYSIS DATA SHEET

BETWEEN

Lab Name: STL BALTIMORE Contract: 000451

Lab Code: ST LABS Case No.: WILLOW SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: 0004252

Sample wt/vol: 5.0 (g/ml) ML Lab File ID: VB2B0058.D

Level: (low/med) LOW Date Received: 4/20/00

% Moisture: not dec. Date Analyzed: 4/27/00

GC Column: DB-VRX ID: 0.45 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
71-43-2	Benzene	1	U
108-88-3	Toluene	1	U
100-41-4	Ethylbenzene	1	U
91-20-3	Naphthalene	5	U
108-38-3/106-42-	m&p-Xylenes	1	U
95-47-6	o-Xylene	1	U

030006

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

EFFLUENT

Lab Name: STL BALTIMORE Contract: 000451

Lab Code: ST LABS Case No.: WILLOW SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 0004253

Sample wt/vol: 5.0 (g/ml) ML Lab File ID: VB2B0057.D

Level: (low/med) LOW Date Received: 4/20/00

% Moisture: not dec. _____ Date Analyzed: 4/27/00

GC Column: DB-VRX ID: 0.45 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND (ug/L or ug/Kg) UG/L	Q
71-43-2	Benzene 1	U
108-88-3	Toluene 1	U
100-41-4	Ethylbenzene 1	U
91-20-3	Naphthalene 5	U
108-38-3/106-42-	m&p-Xylenes 1	U
95-47-6	o-Xylene 1	U

FORM I VOA

030007

Committed To *Your* Success

Severn Trent Laboratories
19 Loveton Circle
Sparks, MD 21152

Tel: (410) 771-4920
Fax: (410) 771-4407
www.stl-inc.com

June 19, 2000

Carl Reitenbach
EA Engineering, Science, and Technology, Inc.
92 Reads Way STE 109
New Castle, DE 19720

Re:Willow Grove NAS (29600.74)

Dear Mr. Reitenbach:

Enclosed is our report on the analysis of three water samples collected for the Willow Grove NAS project on 23 May 2000. The electronic data deliverables (EDD) will follow. The invoice is included.

Please contact me if you have any questions or require further information and refer to report 000641. Unless other arrangements are made, we reserve the right to dispose of your samples sixty (60) days from the date of this letter. We will retain the raw data for seven years from this date.

Sincerely,

Mary E. Asper
Laboratory Project Manager

MEA/gsp
enclosure

Committed To *Your* Success

LABORATORY DATA REPORT

Prepared for:

EA Engineering, Science, and Technology, Inc.
92 Reads Way STE 109
New Castle, DE 19720

Prepared by:

Severn Trent Laboratories - Baltimore
19 Loveton Circle
Sparks, MD 21152

Report 000641

June 2000

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Severn Trent Laboratories - Baltimore Report 000641

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1. NARRATIVE

Severn Trent Laboratories - Baltimore
ANALYTICAL NARRATIVE

Client: **EA Eng., Sci., & Tech., Inc.**
Site: **Willow Grove NAS**
Project number:**29600.74**

STL Baltimore Report: **000641**
Laboratory Project Manager: **Mary E. Asper**
Report Date: **19 June 2000**

This report contains the results of the analysis of three water samples collected on 23 May 2000 in support of the referenced project.

SAMPLE RECEIPT

The samples and trip blank arrived with custody seals absent by Federal Express at Severn Trent Laboratories - Baltimore on 26 May 2000. Upon receipt, the samples and trip blank were inspected and compared with the chain-of-custody record. The trip blanks had bubbles in all bottles received. The cooler temperature was greater then 15°C. The samples and trip blank were then logged into the laboratory computer system with assigned laboratory accession numbers and released for analysis.

Client Sample Designation	ST Lab Number
INFLUENT	0006127
BETWEEN	0006128
EFFLUENT	0006129
TRIP BLANK	0006130

Following this narrative section are a glossary of data qualifiers (Table 1), codes associated with manual integration of chromatographic peaks (Table 2), and the original chain-of-custody record. Analytical results and quality control information are summarized in the appended data package which has been formatted to be consistent with the deliverable requirements of this project.

ANALYTICAL METHODS

The analytical methods used by the laboratory are referenced by the STL Baltimore Method SOP which is formatted as STL-M-XXXXX-Y, where XXXXX is the reference method and Y is the SOP revision number. For example, analyses performed using EPA SW846 Method 8260B are identified as STL-M-8260B-3 where 3 is the laboratory SOP revision number. General Chemistry methods which are a consolidation of several reference methods, e.g. STL-M-CN for cyanide determinations, also include the identification of the specific reference method used for the analyses.

QUALITY CONTROL

The following sections are ordered as the data appears in this report. They contain observations made during sample analysis, summarize the results of quality control measurements, and address the impact on data usability based upon project Data Quality Objectives. For each fractional analysis the narrative includes:

- Sample chronology: This section summarizes the sample history by fraction including the sample

preparation method and date, analytical method, and analysis date. Anything unusual about the samples, digestates, or extracts is identified. Holding time compliance is evaluated in this section.

- Laboratory method performance: All quality control criteria for method performance must be met for all target analytes for data to be reported. These criteria generally apply to instrument tune, calibration, method blanks, and Laboratory Control Samples (LCS). In some instances where method criteria fail, useable data can be obtained and are reported with client approval. The narrative will then include a thorough discussion of the impact on data quality.

- Sample performance: Quality control field samples are analyzed to determine any measurement bias due to the sample matrix based on evaluation of matrix spikes (MS), matrix spike duplicates (MSD), and laboratory duplicates (D). If acceptance criteria are not met, matrix interferences are confirmed either by reanalysis or by inspection of the LCS results to verify that laboratory method performance is in control. Data are reported with appropriate qualifiers or discussion.

AROMATIC VOLATILES by GC - WATER (ST0006127 - STL0006130)

Sample Chronology: Four samples and associated quality control were analyzed on 01 May 2000 for the client specified list of analytes by USEPA SW-846, Methods 5030B/8021B. All holding times were met.

Laboratory Method Performance: All laboratory method performance criteria were met for the reported samples.

Sample Performance: All quality control criteria were met for the reported samples.

CERTIFICATION OF RESULTS

The Laboratory certifies that the reported results relate only to those samples tested and that this report meets the project requirements for analytical data as stated in the Analytical Task Order (ATO) and the chain-of-custody. In addition, the Laboratory certifies that the data as reported meet the Data Quality Objectives for precision, accuracy, and completeness specified for this project or as stated in STL Baltimore's Quality Assurance program for other than the conditions detailed above. Release of the data contained in this report has been authorized by the Laboratory Project Manager as verified by the following signature.

Mary E. Asper June 19, 2000
Mary E. Asper, Laboraotry Project Manager

TABLE 1. LABORATORY ORGANIC ANALYSIS DATA QUALIFIERS [1]

Qualifiers other than those listed below may be required to properly define the results. If used, they are given an alphabetic designation not already specified in this table or in a project/program document. such as a Quality Assurance Project Plan or a contract Statement of Work. Each additional qualifier is fully described in the Analytical Narrative section of the laboratory report.

U Indicates a target compound was analyzed for but not detected. The sample Reporting Limit (RL) is corrected for dilution and, if a soil sample, for percent moisture, if reported on a dry weight basis.

J Indicates an estimated value. This qualifier is used under the following circumstances:

1) when estimating a concentration for tentatively identified compounds (TICs) in GC/MS analyses, where a 1:1 response is assumed,
2) when the mass spectral and retention time data indicate the presence of a compound that meets the volatile and semivolatile GC/MS identification criteria, and the result is less than the RL but greater than the method detection limit (MDL).

B This qualifier is used when the analyte is found in the associated method blank as well as in the sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action. For GC/MS analyses, this qualifier is used for a TIC, as well as, for a positively identified target compound.

E This qualifier identifies compounds whose concentrations exceed the calibration range of the instrument for that specific analysis.

D When applied, this qualifier identifies all compound concentrations reported from a secondary dilution analysis.

A This qualifier indicates that a TIC is a suspected aldol-condensation product.

N Indicates presumptive evidence of a compound. This qualifier is only used for GC/MS TICs, where the identification is based on a mass spectral library search. For generic characterization of a TIC, such as chlorinated hydrocarbon, the N qualifier is not used.

P When applied, this qualifier indicates a reported value from a GC analysis when there is greater than 25% difference for detected concentrations between the two GC columns.

---

(1) These Data Qualifiers are added by the laboratory to provide additional information for the reported results. ***They should not be confused with the qualifiers applied to the reported data as a result of a data validation process performed independently of the laboratory reporting procedure.***

TABLE 2. CODES ASSOCIATED WITH MANUAL INTEGRATION OF CHROMATOGRAPHIC PEAKS

M1 . . . . Software failed to integrate peak or integrated peak improperly

M2 . . . . Multiple peaks within window, analyst's discretion used in peak identification.

M3 . . . Close eluting or near-coelution of interferences.

M4 . . . . Adding or removing area due to peak tailing - subject to consistency within the sequence.

M5 . . . . Adding/removing area due to positive baseline deflection matrix effect.

M6 . . . . Adding/removing area due to negative baseline deflection matrix effect.

M7 . . . . Retention time shifts.

M8 . . . . Skimming vs. dropped baseline.

M9 . . . . Adding area due to peak splitting .

M10 . . . Secondary ions or qualifier ions.

Note: Appropriate Qualifiers are used and specified in the data package; either on the individual quantitation reports or in the Technical Review Checklists.

F:\GROUP\FINALRPT\MASTER\MANINT.MAS

2. CHAIN-OF-CUSTODY

Company Name	Project Manager or Contact:
EA Delaware	Carl Reitenbach Phone: 302-325-3320
Project No. 29600.74-7200	Project Name: Willow Grove
Sample Storage Location: VOA6	ATO Number:
Page 1 of 1	Job ID: 000641

Chain of Custody Record

EA Laboratories
19 Loveton Circle
Sparks, MD 21152
(410) 771-4920
Fax (410) 771-4407

Report/Deliverables: ~~5~~ 4 0 + EDD's
5/26/00

Due 6/16/00

Parameter/Method Numbers for Analysis*: BTEX/MTBE 8021

Date	Time	Water	Soil	Sample Identification 19 Characters	No. of Containers	BTEX/MTBE 8021	EA Labs Accession Number	Remarks
5/23/00	1500	X		INFLUENT	3	✓	000612 7	LPM: MEA
↓	1450	X		BETWEEN	3	✓	000612 8	PS-090
	1440	X		EFFLUENT	3	✓	000612 9	
				Trip Blank	3	5/26/00	000613 0	
								L15030
								Method changed per instructions from Client on 5/26/00 MEA
								COC0007204
								12 voa

Sampled by: (Signature)	Date/Time	Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time
[signature]	5/23/00 1700				

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Airbill Number:	Sample Shipped by: (Circle)
[signature]	5/25/00 0900	[signature]	5/26/00 10:30	816184873276	Fed Ex. Puro. UPS Hand Carried Other.

Cooler Temp: ____C pH: ☐ Yes ☑ No Comments: Custody Seals Intact ☐ Yes ☐ No

NOTE: Please indicate method number for analyses requested. This will help clarify any questions with laboratory techniques.

WHITE - EA Laboratories YELLOW - EA Laboratories PINK - Project Manager *Shaded Areas for Lab Use Only*

000220

Committed to *Your* Success

Severn Trent Laboratories
STL Baltimore

19 Loveton Circle
Sparks, Maryland 21152
(410) 771-4920

COOLER RECEIPT CHECKLIST

Report: 000641

Project: Willow Grove
Received: 26-MAY-00 10:30
COC: COC0007204
Samples: 0006127-0006130

A. COOLER INSPECTION:

Date cooler was opened: 5/26/00 (Date) — Julia M. Yost (Custodian Signature)

1. Did cooler come with a shipping slip, air bill, etc? YES NO N/A NCR# _____
1a. Circle courier: Federal Express UPS *Air bill Number from Chain-of-Custody* 8161 8487 3276
1b. Circle, if applicable: Handcarried Other

2. Custody seals were present on outside of cooler? YES NO N/A NCR# _____
3. Custody seals were unbroken at the time of arrival? YES NO N/A NCR# _____
4. Chain-of-Custody (COC)records were present and legible? YES NO N/A NCR# _____
5. Were the COC records completed? YES NO N/A NCR# _____
6. Was cooler temperature 4C ± 2C? YES NO N/A NCR# 2081

B. SAMPLE INSPECTION

9. All bottles arrived unbroken? YES NO N/A NCR# _____
10. All bottles labels were legible and complete? YES NO N/A NCR# _____
11. Containers were correct for the analysis listed on the COC? YES NO N/A NCR# _____
12. Were preservatives checked (except VOA vials)? YES NO N/A NCR# _____
13. Were bubbles absent in Volatiles samples? YES NO N/A NCR# 2081

Special Notes:

bubbles were present in all 3 trip blanks

- cooler was not within the temperature limit - came in with a warm ice pack

Jennifer E. Jessen — 5/26/00
Sample Management Officer — Date

M:\GROUP\QA\FORMS\COOLER.WPD

September 29, 1999/mmu

3. BTEX DATA

A. QC Summary

LCS Recovery Report

Lab Name : STL Baltimore File ID : VB2B0398.D Instrument: VB2

Sample : VD006012 Date Analyzed: 1 Jun 2000

Matrix : SOIL Method : AB200522.M

Client : Project :

Spike Compound	Spike Added	Spike Res	Spike %Rec	QC Limits % Rec
Benzene	50	55.9	112	88-123
Toluene	50	56.7	113	84-119
Ethylbenzene	50	58.5	117	81-124

* - Indicates values outside of QC limits

4A

VOLATILE METHOD BLANK SUMMARY

EPA SAMPLE NO.

VBLK01

Lab Name: STL BALTIMORE Contract: 000641

Lab Code: ST LABS Case No.: EA/WILL SAS No.: _____ SDG No.: _____

Lab File ID: VB2B0397.D Lab Sample ID: VB006012

Date Analyzed: 6/1/00 Time Analyzed: 11:53

GC Column: DB-VRX ID: 0.45 (mm) Heated Purge: (Y/N) N

Instrument ID: VB2

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	TIME ANALYZED
01	VLCS01	VD006012	VB2B0398.D	12:22
02	TRIP BLANK	0006130	VB2B0399.D	12:51
03	EFFLUENT	0006129	VB2B0400.D	13:20
04	BETWEEN	0006128	VB2B0401.D	13:49
05	INFLUENT	0006127	VB2B0402.D	14:18
06	EFFLUENTMS	0006129MS	VB2B0404.D	15:16
07	EFFLUENTMSD	0006129MSD	VB2B0405.D	15:45

COMMENTS

B. Sample Results

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

INFLUENT

Lab Name: STL BALTIMORE Contract: 000641

Lab Code: ST LABS Case No.: EA/WILL SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 0006127

Sample wt/vol: 5.0 (g/ml) ML Lab File ID: VB2B0402.D

Level: (low/med) LOW Date Received: 5/26/00

% Moisture: not dec. _____ Date Analyzed: 6/1/00

GC Column: DB-VRX ID: 0.45 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
71-43-2	Benzene	11	
108-88-3	Toluene	1	U
100-41-4	Ethylbenzene	1	U
91-20-3	Naphthalene	5	U
108-38-3/106-42-	m&p-Xylenes	1	U
95-47-6	o-Xylene	1	U

FORM I VOA

1A

EPA SAMPLE NO.

VOLATILE ORGANICS ANALYSIS DATA SHEET

BETWEEN

Lab Name: STL BALTIMORE Contract: 000641

Lab Code: ST LABS Case No.: EA/WILL SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 0006128

Sample wt/vol: 5.0 (g/ml) ML Lab File ID: VB2B0401.D

Level: (low/med) LOW Date Received: 5/26/00

% Moisture: not dec. _____ Date Analyzed: 6/1/00

GC Column: DB-VRX ID: 0.45 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
71-43-2	Benzene	1	U
108-88-3	Toluene	1	U
100-41-4	Ethylbenzene	1	U
91-20-3	Naphthalene	5	U
108-38-3/106-42-	m&p-Xylenes	1	U
95-47-6	o-Xylene	1	U

FORM I VOA

1A

EPA SAMPLE NO.

VOLATILE ORGANICS ANALYSIS DATA SHEET

EFFLUENT

Lab Name: STL BALTIMORE Contract: 000641

Lab Code: ST LABS Case No.: EA/WILL SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 0006129

Sample wt/vol: 5.0 (g/ml) ML Lab File ID: VB2B0400.D

Level: (low/med) LOW Date Received: 5/26/00

% Moisture: not dec. _____ Date Analyzed: 6/1/00

GC Column: DB-VRX ID: 0.45 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND (ug/L or ug/Kg) UG/L		Q
71-43-2	Benzene	1	U
108-88-3	Toluene	1	U
100-41-4	Ethylbenzene	1	U
91-20-3	Naphthalene	5	U
108-38-3/106-42-	m&p-Xylenes	1	U
95-47-6	o-Xylene	1	U

Committed To *Your* Success

Severn Trent Laboratories
19 Loveton Circle
Sparks, MD 21152

Tel: (410) 771-4920
Fax: (410) 771-4407
www.stl-inc.com

June 27, 2000

Carl Reitenbach
EA Engineering, Science, and Technology, Inc.
92 Reads Way STE 109
New Castle, DE 19720

Re:Willow Grove NAS (29600.74)

Dear Mr. Reitenbach:

Enclosed is our report on the analysis of three water samples collected for the Willow Grove NAS project on 12 June 2000. The electronic data deliverables (EDD) will follow. The invoice is included.

Please contact me if you have any questions or require further information and refer to report 000718. Unless other arrangements are made, we reserve the right to dispose of your samples sixty (60) days from the date of this letter. We will retain the raw data for seven years from this date.

Sincerely,

Mary E. Asper
Laboratory Project Manager

MEA/gsp
enclosure

Committed To *Your* Success

LABORATORY DATA REPORT

Prepared for:

EA Engineering, Science, and Technology, Inc.
92 Reads Way STE 109
New Castle, DE 19720

Prepared by:

Severn Trent Laboratories - Baltimore
19 Loveton Circle
Sparks, MD 21152

Report 000718

June 2000

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1. NARRATIVE

Severn Trent Laboratories - Baltimore
ANALYTICAL NARRATIVE

Client: **EA Eng., Sci., & Tech., Inc.**
Site: **Willow Grove NAS**
Project number:**29600.74**

STL Baltimore Report: **000718**
Laboratory Project Manager: **Mary E. Asper**
Report Date: **27 June 2000**

This report contains the results of the analysis of three water samples collected on 12 June 2000 in support of the referenced project.

SAMPLE RECEIPT

The samples arrived with custody seals absent by Federal Express at Severn Trent Laboratories - Baltimore on 14 June 2000. Upon receipt, the samples were inspected and compared with the chain-of-custody record. The samples were then logged into the laboratory computer system with assigned laboratory accession numbers and released for analysis.

Client Sample Designation	ST Lab Number
INFLUENT	0006738
BETWEEN	0006739
EFFLUENT	0006740

Following this narrative section are a glossary of data qualifiers (Table 1), codes associated with manual integration of chromatographic peaks (Table 2), and the original chain-of-custody record. Analytical results and quality control information are summarized in the appended data package which has been formatted to be consistent with the deliverable requirements of this project.

ANALYTICAL METHODS

The analytical methods used by the laboratory are referenced by the STL Baltimore Method SOP which is formatted as STL-M-XXXXX-Y, where XXXXX is the reference method and Y is the SOP revision number. For example, analyses performed using EPA SW846 Method 8260B are identified as STL-M-8260B-3 where 3 is the laboratory SOP revision number. General Chemistry methods which are a consolidation of several reference methods, e.g. STL-M-CN for cyanide determinations, also include the identification of the specific reference method used for the analyses.

QUALITY CONTROL

The following sections are ordered as the data appears in this report. They contain observations made during sample analysis, summarize the results of quality control measurements, and address the impact on data usability based upon project Data Quality Objectives. For each fractional analysis the narrative includes:

- Sample chronology: This section summarizes the sample history by fraction including the sample preparation method and date, analytical method, and analysis date. Anything unusual about the samples, digestates, or extracts is identified. Holding time compliance is evaluated in this section.

Severn Trent Laboratories - Baltimore
ANALYTICAL NARRATIVE

Client: **EA Eng., Sci., & Tech., Inc.**
Site: **Willow Grove NAS**
Project number:**29600.74**

STL Baltimore Report: **000718**
Laboratory Project Manager: **Mary E. Asper**
Report Date: **27 June 2000**

- Laboratory method performance: All quality control criteria for method performance must be met for all target analytes for data to be reported. These criteria generally apply to instrument tune, calibration, method blanks, and Laboratory Control Samples (LCS). In some instances where method criteria fail, useable data can be obtained and are reported with client approval. The narrative will then include a thorough discussion of the impact on data quality.

- Sample performance: Quality control field samples are analyzed to determine any measurement bias due to the sample matrix based on evaluation of matrix spikes (MS), matrix spike duplicates (MSD), and laboratory duplicates (D). If acceptance criteria are not met, matrix interferences are confirmed either by reanalysis or by inspection of the LCS results to verify that laboratory method performance is in control. Data are reported with appropriate qualifiers or discussion.

AROMATIC VOLATILES by GC - WATER (STL0006738 - STL0006740)

Sample Chronology: Three samples and associated quality control were analyzed on 19 June 2000 for the client specified list of analytes by STL-M-5030B-1/STL-M-8021B-2. All holding times were met.

Sample INFLUENT required a 2X dilution in order to bring the concentrations of target analytes within instrument calibration range.

Laboratory Method Performance: All laboratory method performance criteria were met for the reported samples.

Sample Performance: All quality control criteria were met for the reported samples.

CERTIFICATION OF RESULTS

The Laboratory certifies that the reported results relate only to those samples tested and that this report meets the project requirements for analytical data as stated in the Analytical Task Order (ATO) and the chain-of-custody. In addition, the Laboratory certifies that the data as reported meet the Data Quality Objectives for precision, accuracy, and completeness specified for this project or as stated in STL Baltimore's Quality Assurance program for other than the conditions detailed above. Release of the data contained in this report has been authorized by the Laboratory Project Manager as verified by the following signature.

Mary E Asper June 27, 2000
Mary E. Asper, Laboraotry Project Manager

TABLE 1. LABORATORY ORGANIC ANALYSIS DATA QUALIFIERS [1]

Qualifiers other than those listed below may be required to properly define the results. If used, they are given an alphabetic designation not already specified in this table or in a project/program document. such as a Quality Assurance Project Plan or a contract Statement of Work. Each additional qualifier is fully described in the Analytical Narrative section of the laboratory report.

U Indicates a target compound was analyzed for but not detected. The sample Reporting Limit (RL) is corrected for dilution and, if a soil sample, for percent moisture, if reported on a dry weight basis.

J Indicates an estimated value. This qualifier is used under the following circumstances:

1) when estimating a concentration for tentatively identified compounds (TICs) in GC/MS analyses, where a 1:1 response is assumed,
2) when the mass spectral and retention time data indicate the presence of a compound that meets the volatile and semivolatile GC/MS identification criteria, and the result is less than the RL but greater than the method detection limit (MDL).

B This qualifier is used when the analyte is found in the associated method blank as well as in the sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action. For GC/MS analyses, this qualifier is used for a TIC, as well as, for a positively identified target compound.

E This qualifier identifies compounds whose concentrations exceed the calibration range of the instrument for that specific analysis.

D When applied, this qualifier identifies all compound concentrations reported from a secondary dilution analysis.

A This qualifier indicates that a TIC is a suspected aldol-condensation product.

N Indicates presumptive evidence of a compound. This qualifier is only used for GC/MS TICs, where the identification is based on a mass spectral library search. For generic characterization of a TIC, such as chlorinated hydrocarbon, the N qualifier is not used.

P When applied, this qualifier indicates a reported value from a GC analysis when there is greater than 25% difference for detected concentrations between the two GC columns.

---

(1) These Data Qualifiers are added by the laboratory to provide additional information for the reported results. ***They should not be confused with the qualifiers applied to the reported data as a result of a data validation process performed independently of the laboratory reporting procedure.***

TABLE 2. CODES ASSOCIATED WITH MANUAL INTEGRATION OF CHROMATOGRAPHIC PEAKS

M1 .... Software failed to integrate peak or integrated peak improperly

M2 .... Multiple peaks within window, analyst's discretion used in peak identification.

M3 .... Close eluting or near-coelution of interferences.

M4 .... Adding or removing area due to peak tailing - subject to consistency within the sequence.

M5 .... Adding/removing area due to positive baseline deflection matrix effect.

M6 .... Adding/removing area due to negative baseline deflection matrix effect.

M7 .... Retention time shifts.

M8 .... Skimming vs. dropped baseline.

M9 .... Adding area due to peak splitting .

M10 ... Secondary ions or qualifier ions.

Note: Appropriate Qualifiers are used and specified in the data package; either on the individual quantitation reports or in the Technical Review Checklists.

F:\GROUP\FINALRPT\MASTER\MANINT.MAS

2. CHAIN-OF-CUSTODY

Chain-of-Custody Record

EA Laboratories
19 Loveton Circle
Sparks, MD 21152
(301) 771-4920

Company Name: EA DELAWARE

Project Manager or Contact: CARL REITSNBACH
Phone: 302-325-3560

Project No.: 29600.74-7200

Project Name: WILLOW GROVE NAS.

Sample Storage Location: VOA7

Page 1 of 1

Batch ID: 000718

Reports/Deliverables Only 4D + EDD'S
Due: 7/6/00
STL-PS-090 LPM: MEA

Parameters/Method Numbers for Analysis*: 8021 by GC

Date	Time	Water	Soil	Sample Identification (ID and Matrix) 19 Characters	No. of Containers	BTEX/NAPTHALENE by GC 8021	EA Labs Acession Number	Remarks
6/12/00	1530	X		INFLUENT	3	✓	0006738	STL-PS-090
	1520	X		BETWEEN	3	✓	0006739	
✓	1510	X		EFFLUENT	3	✓	0006740	
								L18104
								9VOA
								COC0007290

Sampled by: (Signature)	Date/Time	Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time
[signature]	6/12/00 1600			816/8487 3130	
Received by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Holding Times for VOAs	Sample Shipped by: (Circle)
[signature]	6/13/00 0900	Cathy Hershey	6/14/00 1010		Fed. Ex. Puro. UPS

Cooler Temp.: 5 C pH: ☐ Yes ☐ No Comments:

Other:

Air Bill Number:

*NOTE: Please indicate method number for analyses requested. This will help clarify any questions with laboratory technicians.

EA 0396 White — EA Laboratories Yellow — EA Laboratories Pink — Project Manager Shaded Area for Lab Use Only

100080

Committed to *Your* Success

Severn Trent Laboratories
STL Baltimore

19 Loveton Circle
Sparks, Maryland 21152
(410) 771-4920

COOLER RECEIPT CHECKLIST

000718

Received: 14-JUN-00 10:10

A. **COOLER INSPECTION:**

Date cooler was opened: 6/14/00 Cathy Hershey
Date Custodian Signature

1. Did cooler come with a shipping slip, air bill, etc? YES NO N/A NCR# _____
1a. Circle courier: Federal Express UPS *Air bill Number from Chain-of-Custody* 8161873130
1b. Circle, if applicable: Handcarried Other

2. Custody seals were present on outside of cooler? YES NO N/A NCR# _____
3. Custody seals were unbroken at the time of arrival? YES NO N/A NCR# _____
4. Chain-of-Custody (COC)records were present and legible? YES NO N/A NCR# _____
5. Were the COC records completed? YES NO N/A NCR# _____
6. Was cooler temperature 4C ± 2C? YES NO N/A NCR# _____
5

B. **SAMPLE INSPECTION**

9. All bottles arrived unbroken? YES NO N/A NCR# _____
10. All bottles labels were legible and complete? YES NO N/A NCR# _____
11. Containers were correct for the analysis listed on the COC? YES NO N/A NCR# _____
12. Were preservatives checked (except VOA vials)? YES NO N/A NCR# _____
13. Were bubbles absent in Volatiles samples? YES NO N/A NCR# _____

Special Notes:

Jennifer E Jessen 6/14/00
Sample Management Officer Date

M:\GROUP\QA\FORMS\COOLER.WPD

September 29, 1999/mmu

020002

3. AROMATIC DATA

A. QC Summary

LCS Recovery Report

Lab Name : STL Baltimore File ID : VB2B0576.D Instrument: VB2

Sample : VD006192 Date Analyzed: 19 Jun 2000

Matrix : WATER Method : AB200607.M

Client : Project :

Spike Compound	Spike Added	Spike Res	Spike %Rec	QC Limits % Rec
Benzene	50	51.6	103	72-133
Toluene	50	50.2	100	81-122
Ethylbenzene	50	51.5	103	81-124

* - Indicates values outside of QC limits

4A

VOLATILE METHOD BLANK SUMMARY

EPA SAMPLE NO.

VBLK01

Lab Name: STL BALTIMORE Contract: 000718

Lab Code: ST LABS Case No.: EA/WILL SAS No.: _____ SDG No.: _____

Lab File ID: VB2B0575.D Lab Sample ID: VB006192

Date Analyzed: 6/19/00 Time Analyzed: 11:42

GC Column: DB-VRX ID: 0.45 (mm) Heated Purge: (Y/N) N

Instrument ID: VB2

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	TIME ANALYZED
01	VLCS01	VD006192	VB2B0576.D	12:11
02	EFFLUENT	0006740	VB2B0577.D	12:53
03	BETWEEN	0006739	VB2B0578.D	13:22
04	INFLUENT	0006738	VB2B0579.D	13:51
05	EFFLUENTMS	0006740MS	VB2B0581.D	14:50
06	EFFLUENTMSD	0006740MSD	VB2B0582.D	15:19

COMMENTS

B. Sample Results

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

INFLUENT

Lab Name: STL BALTIMORE Contract: 000718

Lab Code: ST LABS Case No.: EA/WILL SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 0006738

Sample wt/vol: 5.0 (g/ml) ML Lab File ID: VB2B0579.D

Level: (low/med) LOW Date Received: 6/14/00

% Moisture: not dec. _____ Date Analyzed: 6/19/00

GC Column: DB-VRX ID: 0.45 (mm) Dilution Factor: 2.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
71-43-2	Benzene	20	D
108-88-3	Toluene	2	U
100-41-4	Ethylbenzene	68	D
91-20-3	Naphthalene	150	D
108-38-3/106-42-	m&p-Xylenes	14	D
95-47-6	o-Xylene	4	D

FORM I VOA

1A

EPA SAMPLE NO.

VOLATILE ORGANICS ANALYSIS DATA SHEET

BETWEEN

Lab Name: STL BALTIMORE Contract: 000718

Lab Code: ST LABS Case No.: EA/WILL SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 0006739

Sample wt/vol: 5.0 (g/ml) ML Lab File ID: VB2B0578.D

Level: (low/med) LOW Date Received: 6/14/00

% Moisture: not dec. _____ Date Analyzed: 6/19/00

GC Column: DB-VRX ID: 0.45 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
71-43-2	Benzene	1	U
108-88-3	Toluene	1	U
100-41-4	Ethylbenzene	1	U
91-20-3	Naphthalene	5	U
108-38-3/106-42-	m&p-Xylenes	1	U
95-47-6	o-Xylene	1	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

EFFLUENT

Lab Name: STL BALTIMORE Contract: 000718

Lab Code: ST LABS Case No.: EA/WILL SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 0006740

Sample wt/vol: 5.0 (g/ml) ML Lab File ID: VB2B0577.D

Level: (low/med) LOW Date Received: 6/14/00

% Moisture: not dec. _____ Date Analyzed: 6/19/00

GC Column: DB-VRX ID: 0.45 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
71-43-2	Benzene	1	U
108-88-3	Toluene	1	U
100-41-4	Ethylbenzene	1	U
91-20-3	Naphthalene	5	U
108-38-3/106-42-	m&p-Xylenes	1	U
95-47-6	o-Xylene	1	U

SEVERN
TRENT
SERVICES

STL Baltimore
19 Loveton Circle
Sparks, MD 21152

Tel: 410 771 4920
Fax: 410 771 4407
www.stl-inc.com

August 7, 2000

Carl Reitenbach
EA Engineering, Science, and Technology, Inc.
New Castle Corporate Commons
92 Read's Way, Suite 109
New Castle, DE 19720

Re:Willow Grove NAS (29600.74)

Dear Mr. Reitenbach:

Enclosed is our report on the analysis of three water samples collected for the Willow Grove NAS project on 20 July 2000. The invoice is included.

Please contact me if you have any questions or require further information and refer to report 000930. Unless other arrangements are made, we reserve the right to dispose of your samples sixty (60) days from the date of this letter. We will retain the raw data for seven years from this date.

Sincerely,

Mary E. Asper
Laboratory Project Manager

MEA/gsp
enclosure

SEVERN
TRENT
SERVICES

STL Baltimore

LABORATORY DATA REPORT

Prepared for:

EA Engineering, Science, and Technology, Inc.
New Castle Corporate Commons
92 Read's Way, Suite 109
New Castle, DE 19720

Prepared by:

Severn Trent Laboratories - Baltimore
19 Loveton Circle
Sparks, MD 21152

Report 000930

August 2000

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Severn Trent Laboratories - Baltimore Report 000930

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Willow Grove NAS
Severn Trent Laboratories - Baltimore Report 000930

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1. NARRATIVE

Severn Trent Laboratories - Baltimore
ANALYTICAL NARRATIVE

Client: **EA Eng., Sci., & Tech., Inc.**
Site: **Willow Grove NAS**
Project number:**29600.74**

STL Baltimore Report: **000930**
Laboratory Project Manager: **Mary E. Asper**
Report Date: **5 August 2000**

This report contains the results of the analysis of three water samples collected on 20 July 2000 in support of the referenced project.

SAMPLE RECEIPT

The samples arrived with custody seals absent by hand at Severn Trent Laboratories - Baltimore on 21 July 2000. Upon receipt, the samples were inspected and compared with the chain-of-custody record. The samples were then logged into the laboratory computer system with assigned laboratory accession numbers and released for analysis.

Client Sample Designation	ST Lab Number
INFLUENT	0008404
BETWEEN	0008405
EFFLUENT	0008406

Following this narrative section are a glossary of data qualifiers (Table 1), codes associated with manual integration of chromatographic peaks (Table 2), and the original chain-of-custody record. Analytical results and quality control information are summarized in the appended data package which has been formatted to be consistent with the deliverable requirements of this project.

ANALYTICAL METHODS

The analytical methods used by the laboratory are referenced by the STL Baltimore Method SOP which is formatted as STL-M-XXXXX-Y, where XXXXX is the reference method and Y is the SOP revision number. For example, analyses performed using EPA SW846 Method 8260B are identified as STL-M-8260B-3 where 3 is the laboratory SOP revision number. General Chemistry methods which are a consolidation of several reference methods, e.g. STL-M-CN for cyanide determinations, also include the identification of the specific reference method used for the analyses.

QUALITY CONTROL

The following sections are ordered as the data appears in this report. They contain observations made during sample analysis, summarize the results of quality control measurements, and address the impact on data usability based upon project Data Quality Objectives. For each fractional analysis the narrative includes:

- Sample chronology: This section summarizes the sample history by fraction including the sample

preparation method and date, analytical method, and analysis date. Anything unusual about the samples, digestates, or extracts is identified. Holding time compliance is evaluated in this section.

- Laboratory method performance: All quality control criteria for method performance must be met for all target analytes for data to be reported. These criteria generally apply to instrument tune, calibration, method blanks, and Laboratory Control Samples (LCS). In some instances where method criteria fail, useable data can be obtained and are reported with client approval. The narrative will then include a thorough discussion of the impact on data quality.

- Sample performance: Quality control field samples are analyzed to determine any measurement bias due to the sample matrix based on evaluation of matrix spikes (MS), matrix spike duplicates (MSD), and laboratory duplicates (D). If acceptance criteria are not met, matrix interferences are confirmed either by reanalysis or by inspection of the LCS results to verify that laboratory method performance is in control. Data are reported with appropriate qualifiers or discussion.

AROMATIC VOLATILES by GC - WATER (ST0008404 - ST0008406)

Sample Chronology: Three samples and associated quality control were analyzed on 01 August 2000 for the client specified list of analytes following the procedures specified in STL-M-5030B-1/STL-M-8021B-2. All holding times were met.

Laboratory Method Performance: All laboratory method performance criteria were met for the reported samples.

Sample Performance: All quality control criteria were met for the reported samples.

CERTIFICATION OF RESULTS

The Laboratory certifies that the reported results relate only to those samples tested and that this report meets the project requirements for analytical data as stated in the Analytical Task Order (ATO) and the chain-of-custody. In addition, the Laboratory certifies that the data as reported meet the Data Quality Objectives for precision, accuracy, and completeness specified for this project or as stated in STL Baltimore's Quality Assurance program for other than the conditions detailed above. Release of the data contained in this report has been authorized by the Laboratory Project Manager as verified by the following signature.

Mary E. Asper August 5, 2000
Mary E. Asper, Laboraotry Project Manager

TABLE 1. LABORATORY ORGANIC ANALYSIS DATA QUALIFIERS [1]

Qualifiers other than those listed below may be required to properly define the results. If used, they are given an alphabetic designation not already specified in this table or in a project/program document. such as a Quality Assurance Project Plan or a contract Statement of Work. Each additional qualifier is fully described in the Analytical Narrative section of the laboratory report.

U Indicates a target compound was analyzed for but not detected. The sample Reporting Limit (RL) is corrected for dilution and, if a soil sample, for percent moisture, if reported on a dry weight basis.

J Indicates an estimated value. This qualifier is used under the following circumstances:

1) when estimating a concentration for tentatively identified compounds (TICs) in GC/MS analyses, where a 1:1 response is assumed,
2) when the mass spectral and retention time data indicate the presence of a compound that meets the volatile and semivolatile GC/MS identification criteria, and the result is less than the RL but greater than the method detection limit (MDL).

B This qualifier is used when the analyte is found in the associated method blank as well as in the sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action. For GC/MS analyses, this qualifier is used for a TIC, as well as, for a positively identified target compound.

E This qualifier identifies compounds whose concentrations exceed the calibration range of the instrument for that specific analysis.

D When applied, this qualifier identifies all compound concentrations reported from a secondary dilution analysis.

A This qualifier indicates that a TIC is a suspected aldol-condensation product.

N Indicates presumptive evidence of a compound. This qualifier is only used for GC/MS TICs, where the identification is based on a mass spectral library search. For generic characterization of a TIC, such as chlorinated hydrocarbon, the N qualifier is not used.

P When applied, this qualifier indicates a reported value from a GC analysis when there is greater than 25% difference for detected concentrations between the two GC columns.

---

(1) These Data Qualifiers are added by the laboratory to provide additional information for the reported results. ***They should not be confused with the qualifiers applied to the reported data as a result of a data validation process performed independently of the laboratory reporting procedure.***

TABLE 2. CODES ASSOCIATED WITH MANUAL INTEGRATION OF CHROMATOGRAPHIC PEAKS

M1 . . . . Software failed to integrate peak or integrated peak improperly

M2 . . . . Multiple peaks within window, analyst's discretion used in peak identification.

M3 . . . . Close eluting or near-coelution of interferences.

M4 . . . . Adding or removing area due to peak tailing - subject to consistency within the sequence.

M5 . . . . Adding/removing area due to positive baseline deflection matrix effect.

M6 . . . . Adding/removing area due to negative baseline deflection matrix effect.

M7 . . . . Retention time shifts.

M8 . . . . Skimming vs. dropped baseline.

M9 . . . . Adding area due to peak splitting .

M10 . . . Secondary ions or qualifier ions.

Note: Appropriate Qualifiers are used and specified in the data package; either on the individual quantitation reports or in the Technical Review Checklists.

F:\GROUP\FINALRPT\MASTER\MANINT.MAS

2. CHAIN-OF-CUSTODY

Company Name:	Project Manager or Contact:
EA DELAWARE	CARL REITENBACH
Project No. 29600.74 - [illegible]	Phone: 302-325-3620
Dept.: 2132 Task: 7200	Project Name: WILLOW GROVE NAS
Sample Storage Location: VOA 11	ATO Number:
Page 1 of 1	Report #: 000930

Parameters/Method Numbers for Analysis

Chain of Custody Record

EA Laboratories
19 Loveton Circle
Sparks, MD 21152
Telephone: (410) 771-4920
Fax: (410) 771-4407

Report Deliverables: 1 2 3 4 D E

EDD: Yes/No

DUE TO CLIENT: 8/12/00

Date	Time	Water	Soil	Sample Identification 19 Characters	No. of Containers	8021/8260 BTEX/MTBE/Naphthalene										EA Labs Accession Number	Remarks
7/20	1450	X		INFLUENT	3	✓										0008404	LPM: M Aspee
"	1430	X		BETWEEN	3	✓										0008405	
"	1425	X		EFFLUENT	3	✓										0008406	STL-PS-090
																	L18319
																	9VOA
																	COC0007523

Sampled by: (Signature)	Date/Time	Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time
[signature]	7/20/00 1500				
Relinquished by: (Signature)	**Date/Time**	**Received by Laboratory: (Signature)**	**Date/Time**	**Airbill Number:**	
[signature]	7/21/00 1425	[signature]	7/21/00 1430		

Sample Shipped by: (Circle) Fed Ex. Puro. UPS Hand Carried Other:

Cooler Temp. 5 C pH: Yes No Comments: ✓ (NA) Custody Seals Intact Yes No (Absent)

NOTE: Please indicate method number for analyses requested. This will help clarify any questions with laboratory techniques.

WHITE—EA Laboratories YELLOW—EA Laboratories PINK—Project Manager *Shaded Areas for Lab Use Only*

000001

STL Baltimore

19 Loveton Circle
Sparks, Maryland 21152
(410) 771-4920

Committed to *Your* Success

COOLER RECEIPT CHECKLIST

Report: 000930

Project: Willow Grove NAS
Received: 21-JUL-00 14:30
COC: COC0007523
Samples: 0008404-0008406

A. COOLER INSPECTION:

Date cooler was opened: 7/21/00 Date — Custodian Signature

1. Did cooler come with a shipping slip, air bill, etc? YES NO N/A NCR# _____
1a. Circle courier: Federal Express UPS *Air bill Number from Chain-of-Custody* _____
1b. Circle, if applicable: Handcarried Other

2. Custody seals were present on outside of cooler? YES NO N/A NCR# _____
3. Custody seals were unbroken at the time of arrival? YES NO N/A NCR# _____
4. Chain-of-Custody (COC)records were present and legible? YES NO N/A NCR# _____
5. Were the COC records completed? YES NO N/A NCR# _____
6. Was cooler temperature 4C ± 2C? YES NO N/A NCR# _____

B. SAMPLE INSPECTION

9. All bottles arrived unbroken? YES NO N/A NCR# _____
10. All bottles labels were legible and complete? YES NO N/A NCR# _____
11. Containers were correct for the analysis listed on the COC? YES NO N/A NCR# _____
12. Were preservatives checked (except VOA vials)? YES NO N/A NCR# _____
13. Were bubbles absent in Volatiles samples? YES NO N/A NCR# _____

Special Notes:

Jennifer E. Jessen — 7/21/00
Sample Management Officer — Date

M:\GROUP\QA\FORMS\COOLER.WPD

September 29, 1999/mmu

020002

3. AROMATIC DATA

A. QC Summary

LCS Recovery Report

Lab Name : STL Baltimore File ID : VB2B0832.D Instrument: VB2

Sample : VL008012 Date Analyzed: 1 Aug 2000

Matrix : WATER Method : AB200801.M

Client : 000930 Project : EA/WILLOW GROVE

Spike Compound	Spike Added	Spike Res	Spike %Rec	QC Limits % Rec
Benzene	50	49.0	98	72-133
Toluene	50	48.6	97	81-122
Ethylbenzene	50	48.1	96	81-124

* - Indicates values outside of QC limits

8/5/00

~~030003~~

4A

VOLATILE METHOD BLANK SUMMARY

EPA SAMPLE NO.

VBLK01

Lab Name: STL BALTIMORE Contract: 000930

Lab Code: ST LABS Case No.: EA/WILL SAS No.: _____ SDG No.: _____

Lab File ID: VB2B0834.D Lab Sample ID: VB008012

Date Analyzed: 8/1/00 Time Analyzed: 16:11

GC Column: DB-VRX ID: 0.45 (mm) Heated Purge: (Y/N) N

Instrument ID: VB2

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	TIME ANALYZED
01	VLCS01	VL008012	VB2B0832.D	15:13
02	EFFLUENT	0008406	VB2B0835.D	16:45
03	BETWEEN	0008405	VB2B0838.D	18:12
04	INFLUENT	0008404	VB2B0839.D	18:41
05	EFFLUENTMS	0008406MS	VB2B0844.D	21:07
06	EFFLUENTMSD	0008406MSD	VB2B0845.D	21:36

COMMENTS

B. Sample Results

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

INFLUENT

Lab Name: STL BALTIMORE Contract: 000930

Lab Code: ST LABS Case No.: EA/WILL SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 0008404

Sample wt/vol: 5.0 (g/ml) ML Lab File ID: VB2B0839.D

Level: (low/med) LOW Date Received: 7/21/00

% Moisture: not dec. _____ Date Analyzed: 8/1/00

GC Column: DB-VRX ID: 0.45 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
71-43-2	Benzene	17	
108-88-3	Toluene	1	U
100-41-4	Ethylbenzene	2	
91-20-3	Naphthalene	42	
108-38-3/106-42-	m&p-Xylenes	2	
95-47-6	o-Xylene	2	

FORM I VOA

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BETWEEN

Lab Name: STL BALTIMORE Contract: 000930

Lab Code: ST LABS Case No.: EA/WILL SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 0008405

Sample wt/vol: 5.0 (g/ml) ML Lab File ID: VB2B0838.D

Level: (low/med) LOW Date Received: 7/21/00

% Moisture: not dec. _____ Date Analyzed: 8/1/00

GC Column: DB-VRX ID: 0.45 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
71-43-2	Benzene	1	U
108-88-3	Toluene	1	U
100-41-4	Ethylbenzene	1	U
91-20-3	Naphthalene	5	U
108-38-3/106-42-	m&p-Xylenes	1	U
95-47-6	o-Xylene	1	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

EFFLUENT

Lab Name: STL BALTIMORE Contract: 000930

Lab Code: ST LABS Case No.: EA/WILL SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 0008406

Sample wt/vol: 5.0 (g/ml) ML Lab File ID: VB2B0835.D

Level: (low/med) LOW Date Received: 7/21/00

% Moisture: not dec. _____ Date Analyzed: 8/1/00

GC Column: DB-VRX ID: 0.45 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND (ug/L or ug/Kg) UG/L		Q
71-43-2	Benzene	1	U
108-88-3	Toluene	1	U
100-41-4	Ethylbenzene	1	U
91-20-3	Naphthalene	5	U
108-38-3/106-42-	m&p-Xylenes	1	U
95-47-6	o-Xylene	1	U

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STL Baltimore
19 Loveton Circle
Sparks, MD 21152

Tel: 410 771 4920
Fax: 410 771 4407
www.stl-inc.com

August 24, 2000

Carl Reitenbach
EA Engineering, Science, and Technology, Inc.
New Castle Corporate Commons
92 Read's Way, Suite 109
New Castle, DE 19720

Re:Willow Grove NAS (29600.74)

Dear Mr. Reitenbach:

Enclosed is our report on the analysis of three water samples collected for the Willow Grove NAS project on 15 August 2000. The invoice is included.

Please contact me if you have any questions or require further information and refer to report 001071. Unless other arrangements are made, we reserve the right to dispose of your samples sixty (60) days from the date of this letter. We will retain the raw data for seven years from this date.

Sincerely,

Mary E. Asper
Laboratory Project Manager

MEA/gsp
enclosure

SEVERN TRENT SERVICES

STL Baltimore

LABORATORY DATA REPORT

Prepared for:

EA Engineering, Science, and Technology, Inc.
New Castle Corporate Commons
92 Read's Way, Suite 109
New Castle, DE 19720

Prepared by:

Severn Trent Laboratories - Baltimore
19 Loveton Circle
Sparks, MD 21152

Report 001071

August 2000

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Severn Trent Laboratories - Baltimore Report 001071

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1. NARRATIVE

Severn Trent Laboratories - Baltimore
ANALYTICAL NARRATIVE

Client: **EA Eng., Sci., & Tech., Inc.**
Site: **Willow Grove NAS**
Project number:**29600.74**

STL Baltimore Report: **001071**
Laboratory Project Manager: **Mary E. Asper**
Report Date: **24 August 2000**

This report contains the results of the analysis of three water samples collected on 15 August 2000 in support of the referenced project.

SAMPLE RECEIPT

The samples arrived with custody seals absent by hand at Severn Trent Laboratories - Baltimore on 17 August 2000. Upon receipt, the samples were inspected and compared with the chain-of-custody record. The samples were then logged into the laboratory computer system with assigned laboratory accession numbers and released for analysis.

Client Sample Designation	ST Lab Number
INFLUENT	0009378
BETWEEN	0009379
EFFLUENT	0009380

Following this narrative section are a glossary of data qualifiers (Table 1), codes associated with manual integration of chromatographic peaks (Table 2), and the original chain-of-custody record. Analytical results and quality control information are summarized in the appended data package which has been formatted to be consistent with the deliverable requirements of this project.

ANALYTICAL METHODS

The analytical methods used by the laboratory are referenced by the STL Baltimore Method SOP which is formatted as STL-M-XXXXX-Y, where XXXXX is the reference method and Y is the SOP revision number. For example, analyses performed using EPA SW846 Method 8260B are identified as STL-M-8260B-3 where 3 is the laboratory SOP revision number. General Chemistry methods which are a consolidation of several reference methods, e.g. STL-M-CN for cyanide determinations, also include the identification of the specific reference method used for the analyses.

QUALITY CONTROL

The following sections are ordered as the data appears in this report. They contain observations made during sample analysis, summarize the results of quality control measurements, and address the impact on data usability based upon project Data Quality Objectives. For each fractional analysis the narrative includes:

- Sample chronology: This section summarizes the sample history by fraction including the sample

preparation method and date, analytical method, and analysis date. Anything unusual about the samples, digestates, or extracts is identified. Holding time compliance is evaluated in this section.

- Laboratory method performance: All quality control criteria for method performance must be met for all target analytes for data to be reported. These criteria generally apply to instrument tune, calibration, method blanks, and Laboratory Control Samples (LCS). In some instances where method criteria fail, useable data can be obtained and are reported with client approval. The narrative will then include a thorough discussion of the impact on data quality.

- Sample performance: Quality control field samples are analyzed to determine any measurement bias due to the sample matrix based on evaluation of matrix spikes (MS), matrix spike duplicates (MSD), and laboratory duplicates (D). If acceptance criteria are not met, matrix interferences are confirmed either by reanalysis or by inspection of the LCS results to verify that laboratory method performance is in control. Data are reported with appropriate qualifiers or discussion.

AROMATIC VOLATILES by GC - WATER (ST0009377 - ST0009379)

Sample Chronology: Three samples and associated quality control were analyzed on 18 and 21 August 2000 for the client specified list of analytes following the procedures specified in STL-M-5030B-1/STL-M-8021B-2. All holding times were met.

The batch MS/MSD, analyzed on 21 August, was performed on another client's sample. All data associated with these QC samples have been included in this report to fulfill reporting requirements. However, recoveries were not evaluated since they do not apply to the samples associated with this report.

Laboratory Method Performance: All laboratory method performance criteria were met for the reported samples.

Sample Performance: All quality control criteria were met for the reported samples.

CERTIFICATION OF RESULTS

The Laboratory certifies that the reported results relate only to those samples tested and that this report meets the project requirements for analytical data as stated in the Analytical Task Order (ATO) and the chain-of-custody. In addition, the Laboratory certifies that the data as reported meet the Data Quality Objectives for precision, accuracy, and completeness specified for this project or as stated in STL Baltimore's Quality Assurance program for other than the conditions detailed above. Release

Severn Trent Laboratories - Baltimore
ANALYTICAL NARRATIVE

Client: **EA Eng., Sci., & Tech., Inc.**
Site: **Willow Grove NAS**
Project number:**29600.74**

STL Baltimore Report: **001071**
Laboratory Project Manager: **Mary E. Asper**
Report Date: **24 August 2000**

---

of the data contained in this report has been authorized by the Laboratory Project Manager as verified by the following signature.

Mary E Asper August 24, 2000
Mary E. Asper, Laboraotry Project Manager

TABLE 1. LABORATORY ORGANIC ANALYSIS DATA QUALIFIERS [1]

Qualifiers other than those listed below may be required to properly define the results. If used, they are given an alphabetic designation not already specified in this table or in a project/program document. such as a Quality Assurance Project Plan or a contract Statement of Work. Each additional qualifier is fully described in the Analytical Narrative section of the laboratory report.

U Indicates a target compound was analyzed for but not detected. The sample Reporting Limit (RL) is corrected for dilution and, if a soil sample, for percent moisture, if reported on a dry weight basis.

J Indicates an estimated value. This qualifier is used under the following circumstances:

1) when estimating a concentration for tentatively identified compounds (TICs) in GC/MS analyses, where a 1:1 response is assumed,
2) when the mass spectral and retention time data indicate the presence of a compound that meets the volatile and semivolatile GC/MS identification criteria, and the result is less than the RL but greater than the method detection limit (MDL).

B This qualifier is used when the analyte is found in the associated method blank as well as in the sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action. For GC/MS analyses, this qualifier is used for a TIC, as well as, for a positively identified target compound.

E This qualifier identifies compounds whose concentrations exceed the calibration range of the instrument for that specific analysis.

D When applied, this qualifier identifies all compound concentrations reported from a secondary dilution analysis.

A This qualifier indicates that a TIC is a suspected aldol-condensation product.

N Indicates presumptive evidence of a compound. This qualifier is only used for GC/MS TICs, where the identification is based on a mass spectral library search. For generic characterization of a TIC, such as chlorinated hydrocarbon, the N qualifier is not used.

P When applied, this qualifier indicates a reported value from a GC analysis when there is greater than 25% difference for detected concentrations between the two GC columns.

---

(1) These Data Qualifiers are added by the laboratory to provide additional information for the reported results. ***They should not be confused with the qualifiers applied to the reported data as a result of a data validation process performed independently of the laboratory reporting procedure.***

TABLE 2. CODES ASSOCIATED WITH MANUAL INTEGRATION OF CHROMATOGRAPHIC PEAKS

M1 . . . . Software failed to integrate peak or integrated peak improperly

M2 . . . . Multiple peaks within window, analyst's discretion used in peak identification.

M3 . . . . Close eluting or near-coelution of interferences.

M4 . . . . Adding or removing area due to peak tailing - subject to consistency within the sequence.

M5 . . . . Adding/removing area due to positive baseline deflection matrix effect.

M6 . . . . Adding/removing area due to negative baseline deflection matrix effect.

M7 . . . . Retention time shifts.

M8 . . . . Skimming vs. dropped baseline.

M9 . . . . Adding area due to peak splitting .

M10 . . . Secondary ions or qualifier ions.

Note: Appropriate Qualifiers are used and specified in the data package; either on the individual quantitation reports or in the Technical Review Checklists.

F:\GROUP\FINALRPT\MASTER\MANINT.MAS

2. CHAIN-OF-CUSTODY

Company Name:	Project Manager or Contact:
EA DELAWARE	CARL REITENBACH Phone: 302-325-3500
Project No. 29600.74	Project Name:
Dept.: 2132 Task: 7200	WILLOW GROVE
Sample Storage Location: VOA 12	ATO Number:
Page 1 of 1	Report #: 001071

Parameter/Method Numbers for Analysis: 8021 HALS by 8015 GRO

Chain of Custody Record

EA Laboratories
19 Loveton Circle
Sparks, MD 21152
Telephone: (410) 771-4920
Fax: (410) 771-4407

Report Deliverables: 1 2 3 4 D E

EDD: Yes/No

DUE TO CLIENT: 9/6/00

Date	Time	Water	Soil	Sample Identification 19 Characters	No. of Containers	8021 HALS by 8015 GRO	EA Labs Accession Number	Remarks
8/15/00	1415	X		INFLUENT	3	X	0009377	LPM: M. Aspen
	1405	X		BETWEEN	3	X	0009378	SRL-PS-090
	1400	X		EFFLUENT	3	X	0009379	
								L18450
								9 VOA
								COC0007659

Samples by: (Signature)	Date/Time	Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time
[signature]	8/15/00 1430				
Relinquished by: (Signature)	**Date/Time**	**Received by Laboratory: (Signature)**	**Date/Time**	**Airbill Number:**	
[signature]	8/16/00 1400	[signature]	8/17/00 10:00	8120 7404 5706	

Sample Shipped by: (Circle) Fed Ex. Purc. UPS Hand Carried Other:

Cooler Temp. 5°C pH: Yes No Comments: Custody Seals Intact Yes No

NOTE: Please indicate method number for analyses requested. This will help clarify any questions with laboratory techniques.

WHITE—EA Laboratories YELLOW—EA Laboratories PINK—Project Manager *Shaded Areas for Lab Use Only*

000001

STL Baltimore

19 Loveton Circle
Sparks, Maryland 21152
(410) 771-4920

Committed to *Your* Success

COOLER RECEIPT CHECKLIST

Report: 001071

Project: Willow Grove
Received: 17-AUG-00 10:00
COC: COC0007659
Samples: 0009377-0009379

A. COOLER INSPECTION:

Date cooler was opened: 8/17/00 (Date) — Custodian Signature

1. Did cooler come with a shipping slip, air bill, etc? YES NO N/A NCR#
1a. Circle courier: Federal Express UPS *Air bill Number from Chain-of-Custody* 8120 7404 5706
1b. Circle, if applicable: Handcarried Other

2. Custody seals were present on outside of cooler? YES NO N/A NCR# _____
3. Custody seals were unbroken at the time of arrival? YES NO N/A NCR# _____
4. Chain-of-Custody (COC)records were present and legible? YES NO N/A NCR# _____
5. Were the COC records completed? YES NO N/A NCR# _____
6. Was cooler temperature 4C ± 2C? 5° YES NO N/A NCR# _____

B. SAMPLE INSPECTION

9. All bottles arrived unbroken? YES NO N/A NCR# _____
10. All bottles labels were legible and complete? YES NO N/A NCR# _____
11. Containers were correct for the analysis listed on the COC? YES NO N/A NCR# _____
12. Were preservatives checked (except VOA vials)? YES NO N/A NCR# _____
13. Were bubbles absent in Volatiles samples? YES NO N/A NCR# _____

Special Notes:

Jennifer E. Jensen — 8/17/00
Sample Management Officer — Date

M:\GROUP\QA\FORMS\COOLER.WPD

September 29, 1999/mmu

020002

3. AROMATIC DATA

B. Sample Results

LCS Recovery Report

Lab Name : STL Baltimore File ID : VB2B0898.D Instrument: VB2

Sample : VL008212 Date Analyzed: 21 Aug 2000

Matrix : WATER Method : AB200801.M

Client : 001071 Project :

Spike Compound	Spike Added	Spike Res	Spike %Rec	QC Limits % Rec
Benzene	50	51.4	103	72-133
Toluene	50	52.8	106	81-122
Ethylbenzene	50	51.8	104	81-124

* - Indicates values outside of QC limits

4A

VOLATILE METHOD BLANK SUMMARY

EPA SAMPLE NO.

VBLK01

Lab Name: STL BALTIMORE Contract: 001071

Lab Code: ST LABS Case No.: EA/WILL SAS No.: SDG No.:

Lab File ID: VB2B0881.D Lab Sample ID: VB008183

Date Analyzed: 8/18/00 Time Analyzed: 14:48

GC Column: DB-VRX ID: 0.45 (mm) Heated Purge: (Y/N) N

Instrument ID: VB2

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	TIME ANALYZED
01	VLCS01	VL008183	VB2B0879.D	13:50
02	EFFLUENT	0009379	VB2B0883.D	15:47
03	BETWEEN	0009378	VB2B0884.D	16:16
04	EFFLUENTMS	0009379MS	VB2B0892.D	20:09
05	EFFLUENTMSD	0009379MSD	VB2B0893.D	20:38

COMMENTS

4A

VOLATILE METHOD BLANK SUMMARY

EPA SAMPLE NO.

VBLK02

Lab Name: STL BALTIMORE Contract: 001071

Lab Code: ST LABS Case No.: EA/WILL SAS No.: _____ SDG No.: _____

Lab File ID: VB2B0900.D Lab Sample ID: VB008212

Date Analyzed: 8/21/00 Time Analyzed: 15:02

GC Column: DB-VRX ID: 0.45 (mm) Heated Purge: (Y/N) N

Instrument ID: VB2

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	TIME ANALYZED
01	VLCS02	VL008212	VB2B0898.D	13:06
02	INFLUENT	0009377	VB2B0901.D	15:31
03	REFERENCE	0009045RE	VB2B0902.D	16:00
04	REFERENCEMS	0009045REMS	VB2B0903.D	16:30
05	REFERENCEMSD	0009045REMSD	VB2B0904.D	16:59

COMMENTS

A. QC Summary

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

INFLUENT

Lab Name: STL BALTIMORE Contract: 001071

Lab Code: ST LABS Case No.: EA/WILL SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 0009377

Sample wt/vol: 5.0 (g/ml) ML Lab File ID: VB2B0901.D

Level: (low/med) LOW Date Received: 8/17/00

% Moisture: not dec. _____ Date Analyzed: 8/21/00

GC Column: DB-VRX ID: 0.45 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
71-43-2	Benzene	46	
108-88-3	Toluene	2	
100-41-4	Ethylbenzene	140	
91-20-3	Naphthalene	130	
108-38-3/106-42-	m&p-Xylenes	19	
95-47-6	o-Xylene	3	

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BETWEEN

Lab Name: STL BALTIMORE Contract: 001071

Lab Code: ST LABS Case No.: EA/WILL SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 0009378

Sample wt/vol: 5.0 (g/ml) ML Lab File ID: VB2B0884.D

Level: (low/med) LOW Date Received: 8/17/00

% Moisture: not dec. _____ Date Analyzed: 8/18/00

GC Column: DB-VRX ID: 0.45 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
71-43-2	Benzene	1	U
108-88-3	Toluene	1	U
100-41-4	Ethylbenzene	1	U
91-20-3	Naphthalene	5	U
108-38-3/106-42-	m&p-Xylenes	1	U
95-47-6	o-Xylene	1	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

EFFLUENT

Lab Name: STL BALTIMORE Contract: 001071

Lab Code: ST LABS Case No.: EA/WILL SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 0009379

Sample wt/vol: 5.0 (g/ml) ML Lab File ID: VB2B0883.D

Level: (low/med) LOW Date Received: 8/17/00

% Moisture: not dec. _____ Date Analyzed: 8/18/00

GC Column: DB-VRX ID: 0.45 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
71-43-2	Benzene	1	U
108-88-3	Toluene	1	U
100-41-4	Ethylbenzene	1	U
91-20-3	Naphthalene	5	U
108-38-3/106-42-	m&p-Xylenes	1	U
95-47-6	o-Xylene	1	U

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STL Baltimore
19 Loveton Circle
Sparks, MD 21152

Tel: 410 771 4920
Fax: 410 771 4407
www.stl-inc.com

October 2, 2000

Carl Reitenbach
EA Engineering, Science, and Technology, Inc.
New Castle Corporate Commons
92 Read's Way, Suite 109
New Castle, DE 19720

Re:Willow Grove NAS (29600.74)

Dear Mr. Reitenbach:

Enclosed is our report on the analysis of three water samples collected for the Willow Grove NAS project on 19 September 2000. The invoice is included.

Please contact me if you have any questions or require further information and refer to report 001254. Unless other arrangements are made, we reserve the right to dispose of your samples sixty (60) days from the date of this letter. We will retain the raw data for seven years from this date.

Sincerely,

Jennifer E. Jessen for

Mary E. Asper
Laboratory Project Manager

MEA/gsp
enclosure

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SERVICES

STL Baltimore

LABORATORY DATA REPORT

Prepared for:

EA Engineering, Science, and Technology, Inc.
New Castle Corporate Commons
92 Read's Way, Suite 109
New Castle, DE 19720

Prepared by:

Severn Trent Laboratories - Baltimore
19 Loveton Circle
Sparks, MD 21152

Report 001254

October 2000

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Severn Trent Laboratories - Baltimore Report 001254

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	C.	Standards Data	030015
		1. Initial Calibration	030016
		2. Continuing Calibration	030041
	D.	Raw QC Data	030052
		1. Method Blank (Form I VOA + raw instrument)	030053
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1. NARRATIVE

Severn Trent Laboratories - Baltimore
ANALYTICAL NARRATIVE

Client: **EA Eng., Sci., & Tech., Inc.**
Site: **Willow Grove NAS**
Project number:**29600.74**

STL Baltimore Report: **001254**
Laboratory Project Manager: **Mary E. Asper**
Report Date: **2 October 2000**

This report contains the results of the analysis of three water samples collected on 19 September 2000 in support of the referenced project.

SAMPLE RECEIPT

The samples arrived with custody seals absent by Federal Express at Severn Trent Laboratories - Baltimore on 21 September 2000. Upon receipt, the samples were inspected and compared with the chain-of-custody record. The samples were then logged into the laboratory computer system with assigned laboratory accession numbers and released for analysis.

Client Sample Designation	ST Lab Number
INFLUENT	0010460
BETWEEN	0010461
EFFLUENT	0010462

Following this narrative section are a glossary of data qualifiers (Table 1), codes associated with manual integration of chromatographic peaks (Table 2), and the original chain-of-custody record. Analytical results and quality control information are summarized in the appended data package which has been formatted to be consistent with the deliverable requirements of this project.

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The following sections are ordered as the data appears in this report. They contain observations made during sample analysis, summarize the results of quality control measurements, and address the impact on data usability based upon project Data Quality Objectives. For each fractional analysis the narrative includes:

- Sample chronology: This section summarizes the sample history by fraction including the sample preparation method and date, analytical method, and analysis date. Anything unusual about the samples, digestates, or extracts is identified. Holding time compliance is evaluated in this section.

Severn Trent Laboratories - Baltimore
ANALYTICAL NARRATIVE

Client: **EA Eng., Sci., & Tech., Inc.**
Site: **Willow Grove NAS**
Project number:**29600.74**

STL Baltimore Report: **001254**
Laboratory Project Manager: **Mary E. Asper**
Report Date: **2 October 2000**

- Laboratory method performance: All quality control criteria for method performance must be met for all target analytes for data to be reported. These criteria generally apply to instrument tune, calibration, method blanks, and Laboratory Control Samples (LCS). In some instances where method criteria fail, useable data can be obtained and are reported with client approval. The narrative will then include a thorough discussion of the impact on data quality.

- Sample performance: Quality control field samples are analyzed to determine any measurement bias due to the sample matrix based on evaluation of matrix spikes (MS), matrix spike duplicates (MSD), and laboratory duplicates (D). If acceptance criteria are not met, matrix interferences are confirmed either by reanalysis or by inspection of the LCS results to verify that laboratory method performance is in control. Data are reported with appropriate qualifiers or discussion.

AROMATIC VOLATILES by GC - WATER (ST0010460 - ST0010462)

Sample Chronology: Three samples and associated quality control were analyzed on 27 September 2000 for the client specified list of analytes following the procedures specified in STL-M-5030B-1/STL-M-8021B-2. All holding times were met.

Laboratory Method Performance: All laboratory method performance criteria were met for the reported samples.

Sample Performance: All quality control criteria were met for the reported samples.

CERTIFICATION OF RESULTS

The Laboratory certifies that the reported results relate only to those samples tested and that this report meets the project requirements for analytical data as stated in the Analytical Task Order (ATO) and the chain-of-custody. In addition, the Laboratory certifies that the data as reported meet the Data Quality Objectives for precision, accuracy, and completeness specified for this project or as stated in STL Baltimore's Quality Assurance program for other than the conditions detailed above. Release of the data contained in this report has been authorized by the Laboratory Project Manager as verified by the following signature.

Jennifer E. Jensen for October 2, 2000
Mary E. Asper, Laboratory Project Manager

TABLE 1. LABORATORY ORGANIC ANALYSIS DATA QUALIFIERS [1]

Qualifiers other than those listed below may be required to properly define the results. If used, they are given an alphabetic designation not already specified in this table or in a project/program document. such as a Quality Assurance Project Plan or a contract Statement of Work. Each additional qualifier is fully described in the Analytical Narrative section of the laboratory report.

U Indicates a target compound was analyzed for but not detected. The sample Reporting Limit (RL) is corrected for dilution and, if a soil sample, for percent moisture, if reported on a dry weight basis.

J Indicates an estimated value. This qualifier is used under the following circumstances:

1) when estimating a concentration for tentatively identified compounds (TICs) in GC/MS analyses, where a 1:1 response is assumed,
2) when the mass spectral and retention time data indicate the presence of a compound that meets the volatile and semivolatile GC/MS identification criteria, and the result is less than the RL but greater than the method detection limit (MDL).

B This qualifier is used when the analyte is found in the associated method blank as well as in the sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action. For GC/MS analyses, this qualifier is used for a TIC, as well as, for a positively identified target compound.

E This qualifier identifies compounds whose concentrations exceed the calibration range of the instrument for that specific analysis.

D When applied, this qualifier identifies all compound concentrations reported from a secondary dilution analysis.

A This qualifier indicates that a TIC is a suspected aldol-condensation product.

N Indicates presumptive evidence of a compound. This qualifier is only used for GC/MS TICs, where the identification is based on a mass spectral library search. For generic characterization of a TIC, such as chlorinated hydrocarbon, the N qualifier is not used.

P When applied, this qualifier indicates a reported value from a GC analysis when there is greater than 25% difference for detected concentrations between the two GC columns.

---

(1) These Data Qualifiers are added by the laboratory to provide additional information for the reported results. ***They should not be confused with the qualifiers applied to the reported data as a result of a data validation process performed independently of the laboratory reporting procedure.***

SEVERN TRENT SERVICES

STL Baltimore
19 Loveton Circle
Sparks, Maryland 21152

Tel 410 771 4920
Fax 410 771 4407
www.stl-inc.com

CODES ASSOCIATED WITH MANUAL INTEGRATION OF CHROMATOGRAPHIC PEAKS

M1 . . . . . Software failed to integrate peak or integrated peak improperly

M2 . . . . . Multiple peaks within window, analyst's discretion used in peak identification.

M3 . . . . . Close eluting or near-coelution of interferences.

M4 . . . . . Adding or removing area due to peak tailing - subject to consistency within the sequence.

M5 . . . . . Adding/removing area due to positive baseline deflection matrix effect.

M6 . . . . . Adding/removing area due to negative baseline deflection matrix effect.

M7 . . . . . Retention time shifts.

M8 . . . . . Skimming vs. dropped baseline.

M9 . . . . . Adding area due to peak splitting .

M10 . . . . Secondary ions or qualifier ions.

2. CHAIN-OF-CUSTODY

Chain of Custody Record

EA Laboratories
19 Loveton Circle
Sparks, MD 21152
Telephone: (410) 771-4920
Fax: (410) 771-4407

Company Name: EA DELAWARE

Project Manager or Contact: CARL REITENBACH

Phone: 302-325-3580

Project No. 89600.94

Project Name: WILLOW GROVE NAS.

Dept.: 2132 Task: 7200

Sample Storage Location: 110 A14

ATO Number:

Page 1 of 1 Report #: 001254

Report Deliverables: 1 2 3 4 D E

EDD: Yes/No

DUE TO CLIENT: 10/9/00

Parameter/Method Numbers for Analysis

Date	Time	Water	Soil	Sample Identification 19 Characters	No. of Containers	8021	8260	NA4		EA Labs Accession Number	Remarks
9/9	1500	X		INFLUENT	3	X				00104160	LPM: M. Lopez
	1450	X		BETWEEN	3	X				00104161	SIL-RS (PID)
↓	1445	X		EFFLUENT	3	X				00104162	
											COC0007828
											L18637
											911OA

Sampled by: (Signature)	Date/Time	Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time
[signature]	9/9/00 1500				

Relinquished by: (Signature)	Date/Time	Received by Laboratory: (Signature)	Date/Time	Airbill Number:	Sample Shipped by: (Circle)
[signature]	9/9/00 1500	[signature]	9/11/00 1030	8207401 8139	Fed Ex Puro. UPS Hand Carried Other:

Cooler Temp. ___ C pH: ☑ Yes ☐ No Comments: Custody Seals Intact ☐ Yes ☑ No

NOTE: Please indicate method number for analyses requested. This will help clarify any questions with laboratory techniques.

WHITE—EA Laboratories YELLOW—EA Laboratories PINK—Project Manager *Shaded Areas for Lab Use Only*

100020

STL
Committed to *Your* Success

19 Loveton Circle
Sparks, Maryland 21152
(410) 771-4920

COOLER RECEIPT CHECKLIST

Report: 001254

Project: Willow Grove NAS
Received: 21-SEP-00 10:30
COC: COC0007828
Samples: 0010460-0010462

A. COOLER INSPECTION:

Date cooler was opened: 9/21/00 Date — Cathy Hesky Custodian Signature

1. Did cooler come with a shipping slip, air bill, etc? YES NO N/A NCR# _____
1a. Circle courier: Federal Express UPS *Air bill Number from Chain-of-Custody* 8120 7404 3139
1b. Circle, if applicable: Handcarried Other

2. Custody seals were present on outside of cooler? YES NO N/A NCR# _____
3. Custody seals were unbroken at the time of arrival? YES NO N/A NCR# _____
4. Chain-of-Custody (COC)records were present and legible? YES NO N/A NCR# _____
5. Were the COC records completed? YES NO N/A NCR# _____
6. Was cooler temperature 4C ± 2C? YES NO N/A NCR# _____ 7.0

B. SAMPLE INSPECTION

9. All bottles arrived unbroken? YES NO N/A NCR# _____
10. All bottles labels were legible and complete? YES NO N/A NCR# _____
11. Containers were correct for the analysis listed on the COC? YES NO N/A NCR# _____
12. Were preservatives checked (except VOA vials)? YES NO N/A NCR# _____
13. Were bubbles absent in Volatiles samples? YES NO N/A NCR# _____

Special Notes:

Cathy Hesky — Sample Management Officer

9/21/00 — Date

M:\GROUP\QA\FORMS\COOLER.WPD

September 29, 1999/mmu

3. AROMATIC DATA

A. QC Summary

3A-LCS
WATER VOLATILE LABORATORY CONTROL SAMPLE RECOVERY

Lab Name: STL BALTIMORE Contract: _____

Lab Code: ST LABS Case No.: _____ SAS No.: _____ SDG No.: _____

COMPOUND	SPIKE ADDED (ug/L)	LCS CONCENTRATION (ug/L)	LCS % REC	#		QC LIMITS REC.
Benzene	50	47	94			72-133
Toluene	50	49	98			81-122
Ethylbenzene	50	50	100			81-124

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

Comments: _____

FORM III-LCS VOA-1

030003A

4A

EPA SAMPLE NO.

VOLATILE METHOD BLANK SUMMARY

VBLK01

Lab Name: STL BALTIMORE Contract: 001254

Lab Code: ST LABS Case No.: WILLOW SAS No.: _____ SDG No.: _____

Lab File ID: VB2B0985.D Lab Sample ID: VB009271

Date Analyzed: 9/27/00 Time Analyzed: 11:08

GC Column: DB-VRX ID: 0.45 (mm) Heated Purge: (Y/N) N

Instrument ID: VB2

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	TIME ANALYZED
01	VLCS01	VL009271	VB2B0983.D	10:10
02	EFFLUENT	0010462	VB2B0987.D	12:07
03	EFFLUENTMS	0010462MS	VB2B0988.D	12:36
04	EFFLUENTMSD	0010462MSD	VB2B0989.D	13:05
05	BETWEEN	0010461	VB2B0990.D	13:34
06	INFLUENT	0010460	VB2B0995.D	16:00

COMMENTS

B. Sample Results

1A

EPA SAMPLE NO.

VOLATILE ORGANICS ANALYSIS DATA SHEET

INFLUENT

Lab Name: STL BALTIMORE Contract: 001254

Lab Code: ST LABS Case No.: WILLOW SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 0010460

Sample wt/vol: 5.0 (g/ml) ML Lab File ID: VB2B0995.D

Level: (low/med) LOW Date Received: 9/21/00

% Moisture: not dec. _____ Date Analyzed: 9/27/00

GC Column: DB-VRX ID: 0.45 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
71-43-2	Benzene	43	
108-88-3	Toluene	1	U
100-41-4	Ethylbenzene	1	U
91-20-3	Naphthalene	100	
108-38-3/106-42-	m&p-Xylenes	1	U
95-47-6	o-Xylene	1	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BETWEEN

Lab Name: STL BALTIMORE Contract: 001254

Lab Code: ST LABS Case No.: WILLOW SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 0010461

Sample wt/vol: 5.0 (g/ml) ML Lab File ID: VB2B0990.D

Level: (low/med) LOW Date Received: 9/21/00

% Moisture: not dec. _____ Date Analyzed: 9/27/00

GC Column: DB-VRX ID: 0.45 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND (ug/L or ug/Kg) UG/L		Q
71-43-2	Benzene	1	U
108-88-3	Toluene	1	U
100-41-4	Ethylbenzene	1	U
91-20-3	Naphthalene	5	U
108-38-3/106-42-	m&p-Xylenes	1	U
95-47-6	o-Xylene	1	U

FORM I VOA

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Sparks, MD 21152

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www.stl-inc.com

November 8, 2000

Carl Reitenbach
EA Engineering Science & Tech.
92 Reads Way
New Castle, DE 19720

Re: Willow Grove NAS

Dear Mr. Reitenbach:

Enclosed is our report on the analysis of three water samples collected for the Willow Grove project on 23 October 2000. The electronic data deliverables (EDD) will follow. The invoice is included.

Please contact me if you have any questions or require further information and refer to report 001405. Unless other arrangements are made, we reserve the right to dispose of your samples sixty (60) days from the date of this letter. We will retain the raw data for seven years from this date.

Sincerely,

Mary E. Asper
Laboratory Project Manager

MEA/jml
enclosure

SEVERN
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LABORATORY DATA REPORT

Prepared for:

EA Engineering Science & Tech.
92 Reads Way
New Castle, DE 19720

Prepared by:

Severn Trent Laboratories - Baltimore
19 Loveton Circle
Sparks, MD 21152

Report 001405

November 2000

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Willow Grove

Severn Trent Laboratories - Baltimore Report 001405

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1. NARRATIVE

Severn Trent Laboratories - Baltimore
ANALYTICAL NARRATIVE

Client: **EA Engineering Science & Tech.**
Site: **Willow Grove NAS**
Project number: **29600.74**

STL Baltimore Report: **001405**
Laboratory Project Manager: **Mary E. Asper**
Report Date: **8 November 2000**

This report contains the results of the analysis of three water samples collected on 23 October 2000 in support of the referenced project.

SAMPLE RECEIPT

The samples arrived with custody seals absent by Federal Express at Severn Trent Laboratories - Baltimore on 26 Ocotber 2000. Upon receipt, the samples were inspected and compared with the chain-of-custody records. The samples were then logged into the laboratory computer system with assigned laboratory accession numbers and released for analysis.

Client Sample Designation	ST Lab Number
INFLUENT	0011574
BETWEEN	0011575
EFFLUENT	0011576

Following this narrative section are glossaries of data qualifiers (Table 1), and the original chain-of-custody records. Analytical results and quality control information are summarized in the appended data package which has been formatted to be consistent with the deliverable requirements of this project.

ANALYTICAL METHODS

The analytical methods used by the laboratory are referenced by the STL Baltimore Method SOP which is formatted as STL-M-XXXXX-Y, where XXXXX is the reference method and Y is the SOP revision number. For example, analyses performed using EPA SW846 Method 8260B are identified as STL-M-8260B-3 where 3 is the laboratory SOP revision number. General Chemistry methods which are a consolidation of several reference methods, e.g. STL-M-CN for cyanide determinations, also include the identification of the specific reference method used for the analyses.

QUALITY CONTROL

The following sections are ordered as the data appears in this report. They contain observations made during sample analysis, summarize the results of quality control measurements, and address the impact on data usability based upon project Data Quality Objectives. For each fractional analysis the narrative includes:

- Sample chronology: This section summarizes the sample history by fraction including the sample

preparation method and date, analytical method, and analysis date. Anything unusual about the samples, digestates, or extracts is identified. Holding time compliance is evaluated in this section.

- Laboratory method performance: All quality control criteria for method performance must be met for all target analytes for data to be reported. These criteria generally apply to instrument tune, calibration, method blanks, and Laboratory Control Samples (LCS). In some instances where method criteria fail, useable data can be obtained and are reported with client approval. The narrative will then include a thorough discussion of the impact on data quality.

- Sample performance: Quality control field samples are analyzed to determine any measurement bias due to the sample matrix based on evaluation of matrix spikes (MS), matrix spike duplicates (MSD), and laboratory duplicates (D). If acceptance criteria are not met, matrix interferences are confirmed either by reanalysis or by inspection of the LCS results to verify that laboratory method performance is in control. Data are reported with appropriate qualifiers or discussion.

AROMATIC VOLATILES by GC - WATER (ST0011574 - ST0011576)
Sample Chronology: Three samples and associated quality control were analyzed on 31 October 2000 for the client specified list of analytes following the procedures specified in STL-M-5030B-1/STL-M-8021B-2. All holding times were met.

A batch MS/MSD was not performed with these samples.

Sample INFLUENT was analyzed at a 2X dilution in order to bring the concentrations of target analytes within instrument calibration range.

Laboratory Method Performance: All laboratory method performance criteria were met for the reported samples.

Sample Performance: All quality control criteria were met for the reported samples.

CERTIFICATION OF RESULTS

The Laboratory certifies that the reported results relate only to those samples tested and that this report meets the project requirements for analytical data as stated in the Analytical Task Order (ATO) and the chain-of-custody. In addition, the Laboratory certifies that the data as reported meet the Data Quality Objectives for precision, accuracy, and completeness specified for this project or as stated in STL Baltimore's Quality Assurance program for other than the conditions detailed above. Release

Severn Trent Laboratories - Baltimore
ANALYTICAL NARRATIVE

Client: **EA Engineering Science & Tech.**	STL Baltimore Report: **001405**
Site: **Willow Grove NAS**	Laboratory Project Manager: **Mary E. Asper**
Project number: **29600.74**	Report Date: **8 November 2000**

of the data contained in this report has been authorized by the Laboratory Project Manager as verified by the following signature.

Mary E Asper November 8, 2000
Mary E. Asper, Laboratory Project Manager

TABLE 1. LABORATORY ORGANIC ANALYSIS DATA QUALIFIERS [1]

Qualifiers other than those listed below may be required to properly define the results. If used, they are given an alphabetic designation not already specified in this table or in a project/program document. such as a Quality Assurance Project Plan or a contract Statement of Work. Each additional qualifier is fully described in the Analytical Narrative section of the laboratory report.

U Indicates a target compound was analyzed for but not detected. The sample Reporting Limit (RL) is corrected for dilution and, if a soil sample, for percent moisture, if reported on a dry weight basis.

J Indicates an estimated value. This qualifier is used under the following circumstances:

1) when estimating a concentration for tentatively identified compounds (TICs) in GC/MS analyses, where a 1:1 response is assumed,
2) when the mass spectral and retention time data indicate the presence of a compound that meets the volatile and semivolatile GC/MS identification criteria, and the result is less than the RL but greater than the method detection limit (MDL).

B This qualifier is used when the analyte is found in the associated method blank as well as in the sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action. For GC/MS analyses, this qualifier is used for a TIC, as well as, for a positively identified target compound.

E This qualifier identifies compounds whose concentrations exceed the calibration range of the instrument for that specific analysis.

D When applied, this qualifier identifies all compound concentrations reported from a secondary dilution analysis.

A This qualifier indicates that a TIC is a suspected aldol-condensation product.

N Indicates presumptive evidence of a compound. This qualifier is only used for GC/MS TICs, where the identification is based on a mass spectral library search. For generic characterization of a TIC, such as chlorinated hydrocarbon, the N qualifier is not used.

P When applied, this qualifier indicates a reported value from a GC analysis when there is greater than 25% difference for detected concentrations between the two GC columns.

---

(1) These Data Qualifiers are added by the laboratory to provide additional information for the reported results. ***They should not be confused with the qualifiers applied to the reported data as a result of a data validation process performed independently of the laboratory reporting procedure.***

2. CHAIN-OF-CUSTODY

Chain of Custody Record

EA Laboratories
19 Loveton Circle
Sparks, MD 21152
Telephone: (410) 771-4920
Fax: (410) 771-4407

Company Name: EA DELAWARE

Project Manager or Contact: CARL REITENBACH

Phone: 302.325-3560

Project No. 29600.74

Project Name: WILLOW GROVE, NAS

Dept.: 2132 Task: 7200

Sample Storage Location: VOA 16

ATO Number:

Page 1 of 1

Report #: 001405

Parameter Method Numbers for Analysis: 8021 RW 8260 10/26/00

Report Deliverables: 1 2 3 4 D E

EDD: Yes/No

DUE TO CLIENT: 11/14/00

Date	Time	Water	Soil	Sample Identification 19 Characters	No. of Containers	BTEX / MTBE/Naphthalene	EA Labs Accession Number	Remarks
10/23	1515	x		INFLUENT	3	✓	0011574	LPM: M Roger
	1505	x		BETWEEN	3	✓	0011575	SR-PS-0910
↓	1500	x		EFFLUENT	3	✓	0011576	
								9VOA
								COC007993

Sampled by: (Signature)	Date/Time	Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time
[signature]	10/25 1530				

Relinquished by: (Signature)	Date/Time	Received by Laboratory: (Signature)	Date/Time	Airbill Number:	Sample Shipped by: (Circle)
[signature]	10/25 1200	[signature]	10/26/00 1030	8120 7409 5283	Fed Ex. Puro. UPS

Cooler Temp. 0 C pH: Yes No Comments: Custody Seals Intact Yes No NA

Hand Carried

Other:

NOTE: Please indicate method number for analyses requested. This will help clarify any questions with laboratory techniques.

WHITE—EA Laboratories YELLOW—EA Laboratories PINK—Project Manager *Shaded Areas for Lab Use Only*

C00001

Severn Trent Laboratories
STL Baltimore

19 Loveton Circle
Sparks, Maryland 21152
(410) 771-4920

Committed to *Your* Success

COOLER RECEIPT CHECKLIST

Report: 001405

Project: Willow Grove
Received: 26-OCT-00 10:30
COC: COC0007993
Samples: 0011574-0011576

A. COOLER INSPECTION:

Date cooler was opened: 10/26/00 (Date) Cathy Hersky (Custodian Signature)

1. Did cooler come with a shipping slip, air bill, etc? YES NO N/A NCR# _____
1a. Circle courier: Federal Express UPS *Air bill Number from Chain-of-Custody* 8120 7404 5183
1b. Circle, if applicable: Handcarried Other

2. Custody seals were present on outside of cooler? YES NO N/A NCR# _____
3. Custody seals were unbroken at the time of arrival? YES NO N/A NCR# _____
4. Chain-of-Custody (COC)records were present and legible? YES NO N/A NCR# _____
5. Were the COC records completed? YES NO N/A NCR# _____
6. Was cooler temperature 4C ± 2C? YES NO N/A NCR# _____

B. SAMPLE INSPECTION

9. All bottles arrived unbroken? YES NO N/A NCR# _____
10. All bottles labels were legible and complete? YES NO N/A NCR# _____
11. Containers were correct for the analysis listed on the COC? YES NO N/A NCR# _____
12. Were preservatives checked (except VOA vials)? YES NO N/A NCR# _____
13. Were bubbles absent in Volatiles samples? YES NO N/A NCR# _____

Special Notes:

Jennifer E. Jessen 10/26/00
Sample Management Officer Date

M:\GROUP\QA\FORMS\COOLER.WPD

September 29, 1999/mmu

020003

3. VOLATILES DATA

A. QC Summary

WATER VOLATILE LABORATORY CONTROL SAMPLE RECOVERY

Lab Name: STL BALTIMORE Contract: _____

Lab Code: ST LABS Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix Spike - Sample No.: VLCS01

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	LCS CONCENTRATION (ug/L)	LCS % REC #	QC. LIMITS REC.
Benzene	50	0	53	107	72-133
Ethylbenzene	50	0	55	111	81-124
Toluene	50	0	53	98	81-122

4A

EPA SAMPLE NO.

VOLATILE METHOD BLANK SUMMARY

VBLK01

Lab Name: STL BALTIMORE Contract: 001405

Lab Code: ST LABS Case No.: WILLOW SAS No.: _____ SDG No.: _____

Lab File ID: VB2B1069.D Lab Sample ID: VB010313

Date Analyzed: 10/31/00 Time Analyzed: 16:36

GC Column: DB-VRX ID: 0.45 (mm) Heated Purge: (Y/N) N

Instrument ID: VB2

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	TIME ANALYZED
01	VLCS01	STD#32592	VB2B1066.D	15:09
02	EFFLUENT	0011576	VB2B1070.D	17:06
03	BETWEEN	0011575	VB2B1071.D	17:35
04	INFLUENT	0011574	VB2B1072.D	18:04

COMMENTS:

B. Sample Data

1A

EPA SAMPLE NO.

VOLATILE ORGANICS ANALYSIS DATA SHEET

INFLUENT

Lab Name: STL BALTIMORE Contract: 001405

Lab Code: ST LABS Case No.: WILLOW SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 0011574

Sample wt/vol: 5.0 (g/ml) ML Lab File ID: VB2B1072.D

Level: (low/med) LOW Date Received: 10/26/00

% Moisture: not dec. _____ Date Analyzed: 10/31/00

GC Column: DB-VRX ID: 0.45 (mm) Dilution Factor: 2.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
71-43-2	Benzene	24	D
108-88-3	Toluene	2	U
100-41-4	Ethylbenzene	17	D
91-20-3	Naphthalene	89	D
108-38-3/106-42-	m&p-Xylenes	5	D
95-47-6	o-Xylene	2	U

FORM I VOA

1A

EPA SAMPLE NO.

VOLATILE ORGANICS ANALYSIS DATA SHEET

BETWEEN

Lab Name: STL BALTIMORE Contract: 001405

Lab Code: ST LABS Case No.: WILLOW SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 0011575

Sample wt/vol: 5.0 (g/ml) ML Lab File ID: VB2B1071.D

Level: (low/med) LOW Date Received: 10/26/00

% Moisture: not dec. _____ Date Analyzed: 10/31/00

GC Column: DB-VRX ID: 0.45 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
71-43-2	Benzene	1	
108-88-3	Toluene	1	U
100-41-4	Ethylbenzene	1	U
91-20-3	Naphthalene	5	U
108-38-3/106-42-	m&p-Xylenes	1	U
95-47-6	o-Xylene	1	U

FORM I VOA

1A

EPA SAMPLE NO.

VOLATILE ORGANICS ANALYSIS DATA SHEET

EFFLUENT

Lab Name: STL BALTIMORE Contract: 001405

Lab Code: ST LABS Case No.: WILLOW SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 0011576

Sample wt/vol: 5.0 (g/ml) ML Lab File ID: VB2B1070.D

Level: (low/med) LOW Date Received: 10/26/00

% Moisture: not dec. _____ Date Analyzed: 10/31/00

GC Column: DB-VRX ID: 0.45 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
71-43-2	Benzene	1	U
108-88-3	Toluene	1	U
100-41-4	Ethylbenzene	1	U
91-20-3	Naphthalene	5	U
108-38-3/106-42-	m&p-Xylenes	1	U
95-47-6	o-Xylene	1	U

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Sparks, MD 21152

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Fax: 410 771 4407
www.stl-inc.com

December 11, 2000

Carl Reitenbach
EA Engineering, Science, and Technology, Inc.
92 Reads Way
Suite 109
New Castle, DE 19720

Re: NAS Willow Grove

Dear Mr. Reitenbach:

Enclosed is our report on the analysis of three water samples collected for the NAS Willow Grove project on 20 November 2000. The electronic data deliverables (EDD) will follow. The invoice is included.

Please contact me if you have any questions or require further information and refer to report 200103. Unless other arrangements are made, we reserve the right to dispose of your samples sixty (60) days from the date of this letter. We will retain the raw data for seven years from this date.

Sincerely,

John G. O'Donnell
Laboratory Project Manager

JGO/jml
enclosure

SEVERN
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SERVICES

STL Baltimore

LABORATORY DATA REPORT

Prepared for:

EA Engineering, Science, and Technology, Inc.
92 Reads Way
Suite 109
New Castle, DE 19720

Prepared by:

Severn Trent Laboratories - Baltimore
19 Loveton Circle
Sparks, MD 21152

Report 200103

December 2000

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1. NARRATIVE

Severn Trent Laboratories - Baltimore
ANALYTICAL NARRATIVE

Client: **EA Engineering, Science, and Technology, Inc.** STL Baltimore Report: **200103**
Site: **NAS Willow Grove** Laboratory Project Manager: **John G. O'Donnell**
Project number: **29600.74** Report Date: **11 December 2000**

This report contains the results of the analysis of three water samples collected on 20 November 2000 in support of the referenced project.

SAMPLE RECEIPT

The samples arrived with custody seals absent by hand at Severn Trent Laboratories - Baltimore on 21 November 2000. Upon receipt, the samples were inspected and compared with the chain-of-custody records. The samples were then logged into the laboratory computer system with assigned laboratory accession numbers and released for analysis.

Client Sample Designation	ST Lab Number
EFFLUENT	200103-1
BETWEEN	200103-2
INFLUENT	200103-3

Following this narrative section are glossaries of data qualifiers (Table 1), and the original chain-of-custody records. Analytical results and quality control information are summarized in the appended data package which has been formatted to be consistent with the deliverable requirements of this project.

ANALYTICAL METHODS

The analytical methods used by the laboratory are referenced by the STL Baltimore Method SOP which is formatted as STL-M-XXXXX-Y, where XXXXX is the reference method and Y is the SOP revision number. For example, analyses performed using EPA SW846 Method 8260B are identified as STL-M-8260B-3 where 3 is the laboratory SOP revision number. General Chemistry methods which are a consolidation of several reference methods, e.g. STL-M-CN for cyanide determinations, also include the identification of the specific reference method used for the analyses.

QUALITY CONTROL

The following sections are ordered as the data appears in this report. They contain observations made during sample analysis, summarize the results of quality control measurements, and address the impact on data usability based upon project Data Quality Objectives. For each fractional analysis the narrative includes:

- Sample chronology: This section summarizes the sample history by fraction including the sample preparation method and date, analytical method, and analysis date. Anything unusual about the

samples, digestates, or extracts is identified. Holding time compliance is evaluated in this section.

- Laboratory method performance: All quality control criteria for method performance must be met for all target analytes for data to be reported. These criteria generally apply to instrument tune, calibration, method blanks, and Laboratory Control Samples (LCS). In some instances where method criteria fail, useable data can be obtained and are reported with client approval. The narrative will then include a thorough discussion of the impact on data quality.

- Sample performance: Quality control field samples are analyzed to determine any measurement bias due to the sample matrix based on evaluation of matrix spikes (MS), matrix spike duplicates (MSD), and laboratory duplicates (D). If acceptance criteria are not met, matrix interferences are confirmed either by reanalysis or by inspection of the LCS results to verify that laboratory method performance is in control. Data are reported with appropriate qualifiers or discussion.

AROMATIC VOLATILES by GC - WATER (STL200103-1 to STL200103-3)

Sample Chronology: Three samples and associated quality control were analyzed on 30 November 2000 for the client specified list of analytes following the procedures specified in STL-M-5030B-1/STL-M-8021B-2. All holding times were met.

Laboratory Method Performance: All laboratory method performance criteria were met for the reported samples with the following exceptions;

The confirmation column analyses for these samples had the average percent difference of response factors above the laboratory QC limit of 15%. However, since all results were reported from the primary column (which was compliant) there should be no impact on data usability.

Sample Performance: All quality control criteria were met for the reported samples with the following exceptions;

- Samples BETWEEN and INFLUENT had the surrogate recoveries of bromofluorobenzene (85% and 74%, respectively) below the lower laboratory QC limit of 85%.

CERTIFICATION OF RESULTS

The Laboratory certifies that the reported results relate only to those samples tested and that this report meets the project requirements for analytical data as stated in the Analytical Task Order (ATO) and the chain-of-custody. In addition, the Laboratory certifies that the data as reported

Severn Trent Laboratories - Baltimore
ANALYTICAL NARRATIVE

Client: **EA Engineering, Science, and Technology, Inc.** STL Baltimore Report: **200103**
Site: **NAS Willow Grove** Laboratory Project Manager: **John G. O'Donnell**
Project number: **29600.74** Report Date: **11 December 2000**

---

meet the Data Quality Objectives for precision, accuracy, and completeness specified for this project or as stated in STL Baltimore's Quality Assurance program for other than the conditions detailed above. Release of the data contained in this report has been authorized by the Laboratory Project Manager as verified by the following signature.

_____ December 11, 2000
John G. O'Donnell, Laboratory Project Manager

TABLE 1. LABORATORY ORGANIC ANALYSIS DATA QUALIFIERS [1]

Qualifiers other than those listed below may be required to properly define the results. If used, they are given an alphabetic designation not already specified in this table or in a project/program document. such as a Quality Assurance Project Plan or a contract Statement of Work. Each additional qualifier is fully described in the Analytical Narrative section of the laboratory report.

U Indicates a target compound was analyzed for but not detected. The sample Reporting Limit (RL) is corrected for dilution and, if a soil sample, for percent moisture, if reported on a dry weight basis.

J Indicates an estimated value. This qualifier is used under the following circumstances:

1) when estimating a concentration for tentatively identified compounds (TICs) in GC/MS analyses, where a 1:1 response is assumed,
2) when the mass spectral and retention time data indicate the presence of a compound that meets the volatile and semivolatile GC/MS identification criteria, and the result is less than the RL but greater than the method detection limit (MDL).

B This qualifier is used when the analyte is found in the associated method blank as well as in the sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action. For GC/MS analyses, this qualifier is used for a TIC, as well as, for a positively identified target compound.

E This qualifier identifies compounds whose concentrations exceed the calibration range of the instrument for that specific analysis.

D When applied, this qualifier identifies all compound concentrations reported from a secondary dilution analysis.

A This qualifier indicates that a TIC is a suspected aldol-condensation product.

N Indicates presumptive evidence of a compound. This qualifier is only used for GC/MS TICs, where the identification is based on a mass spectral library search. For generic characterization of a TIC, such as chlorinated hydrocarbon, the N qualifier is not used.

P When applied, this qualifier indicates a reported value from a GC analysis when there is greater than 25% difference for detected concentrations between the two GC columns.

---

(1) These Data Qualifiers are added by the laboratory to provide additional information for the reported results. *They should not be confused with the qualifiers applied to the reported data as a result of a data validation process performed independently of the laboratory reporting procedure.*

2. CHAIN-OF-CUSTODY

Chain of Custody Record

EA Laboratories
19 Loveton Circle
Sparks, MD 21152
Telephone: (410) 771-4920
Fax: (410) 771-4407

Company Name: EA DELAWARE

Project Manager or Contact: CARL REITSNBACH
Phone: (302) 325-3560

Project No. 29600.74

Project Name: WILLOW GROVE

Dept.: 2132 Task: 7200

Sample Storage Location: Voa 20

ATO Number:

Page 1 of 1

Report #: 2000103

Report Deliverables: 1 2 3 4 D E

EDD Yes/No EXCEL SUMMARY

DUE TO CLIENT: 12/12/00

Parameters/Method Numbers for Analysis: BTEX/MTBE/NAPHTHALENE 8020

Date	Time	Water	Soil	Sample Identification 19 Characters	No. of Containers	BTEX/MTBE/NAPHTHALENE 8020	EA Labs Accession Number	Remarks
11/20/00	1300	X		EFFLUENT	3	✓	2000103-1	LPM:
↓	1305	X		BETWEEN	3	✓	-2	
	1315	X		INFLUENT	3	✓	-3	
								9 Voa

Sampled by: (Signature)	Date/Time	Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time
[signature]	11/20/00 1370				

Relinquished by: (Signature)	Date/Time	Received by Laboratory: (Signature)	Date/Time	Airbill Number:	Sample Shipped by: (Circle)
[signature]	11/21/00 1440	[signature]	11/21/00 1445		Fed Ex. Puro. UPS Hand Carried Other:

Cooler Temp. 5 C pH: Yes N/A No Comments: Custody Seals Intact Yes No N/A

NOTE: Please indicate method number for analyses requested. This will help clarify any questions with laboratory techniques.

WHITE—EA Laboratories YELLOW—EA Laboratories PINK—Project Manager

Severn Trent Laboratories
STL Baltimore

19 Loveton Circle
Sparks, Maryland 21152
(410) 771-4920

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COOLER RECEIPT CHECKLIST

Insert LIMS label here

200103

A. COOLER INSPECTION:

Date cooler was opened: 11/21/00 (Date) — Custodian Signature

1. Did cooler come with a shipping slip, air bill, etc? YES NO N/A NCR# _____
1a. Circle courier: Federal Express UPS *Air bill Number from Chain-of-Custody* _____
1b. Circle, if applicable: Handcarried Other

2. Custody seals were present on outside of cooler? YES NO N/A NCR# _____
3. Custody seals were unbroken at the time of arrival? YES NO N/A NCR# _____
4. Chain-of-Custody (COC)records were present and legible? YES NO N/A NCR# _____
5. Were the COC records completed? YES NO N/A NCR# _____
6. Was cooler temperature 4C ± 2C? YES NO N/A NCR# _____
5°

B. SAMPLE INSPECTION

9. All bottles arrived unbroken? YES NO N/A NCR# _____
10. All bottles labels were legible and complete? YES NO N/A NCR# _____
11. Containers were correct for the analysis listed on the COC? YES NO N/A NCR# _____
12. Were preservatives checked (except VOA vials)? YES NO N/A NCR# _____
13. Were bubbles absent in Volatiles samples? YES NO N/A NCR# _____

Special Notes:

_____

_____

Sample Management Officer — Date

M:\GROUP\QA\FORMS\COOLER.WPD

September 29, 1999/mmu

020002

Job Sample Receipt Checklist Report
11/21/2000

Job Number.....: 200103 Location.: 57223 Customer Job ID.....: Job Check List Date.: 11/21/2000
Project Number.: 20000187 Project Description.: NAS Willow Grove Project Manager.....: masp
Customer.....: EA Engineering, Science & Technology Contact.: Carl Reitenbach

Questions ?	(Y/N)	Comments
Chain-of-Custody Present?.....		
...If "yes", completed properly?.....		
Custody seal on shipping container?.....		
...If "yes", custody seal intact?.....		
Custody seals on sample containers?.....		
...If "yes", custody seal intact?.....		
Samples iced?.....		
Temperature of cooler acceptable? (4 deg C +/- 2).		
Samples received intact (good condition)?.....		
Volatile samples acceptable? (no headspace).....		
Correct containers used?.....		
Adequate sample volume provided?.....		
Samples preserved correctly?.....		
Samples received within holding-time?.....		
Agreement between COC and sample labels?.....		
A Non-Conformance Record (NCR) was needed?.....		
Comments.....		
If samples were shipped enter the air bill #.....		
Sample Custodian Signature/Date.....		

3. VOLATILES DATA

A. QC Summary

3A

WATER VOLATILE LABORATORY CONTROL SAMPLE RECOVERY

Lab Name: STL BALTIMORE Contract: _____

Lab Code: ST LABS Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix Spike - Sample No.: VLCS01

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	LCS CONCENTRATION (ug/L)	LCS % REC #	QC. LIMITS REC.
Benzene	50	0	55	109	72-133
Ethylbenzene	50	0	47	95	81-124
Toluene	50	0	49	97	81-122

4A

EPA SAMPLE NO.

VOLATILE METHOD BLANK SUMMARY

VBLK01

Lab Name: STL BALTIMORE Contract: 200103

Lab Code: ST LABS Case No.: WILLOW SAS No.: SDG No.:

Lab File ID: VB2B1199.D Lab Sample ID: VB011301

Date Analyzed: 11/30/00 Time Analyzed: 16:26

GC Column: DB-VRX ID: 0.45 (mm) Heated Purge: (Y/N) N

Instrument ID: VB2

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	TIME ANALYZED
01	EFFLUENT	200103-1	VB2B1203.D	18:23
02	EFFLUENTMS	200103-1MS	VB2B1204.D	18:52
03	EFFLUENTMSD	200103-1MSD	VB2B1205.D	19:22
04	BETWEEN	200103-2	VB2B1206.D	19:51
05	INFLUENT	200103-3	VB2B1207.D	20:20

COMMENTS:

B. Sample Data

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

EFFLUENT

Lab Name: STL BALTIMORE Contract: 200103

Lab Code: ST LABS Case No.: WILLOW SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: 200103-1

Sample wt/vol: 5.0 (g/ml) ML Lab File ID: VB2B1203.D

Level: (low/med) LOW Date Received: 11/21/00

% Moisture: not dec. Date Analyzed: 11/30/00

GC Column: DB-VRX ID: 0.45 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
71-43-2	Benzene	1	U
108-88-3	Toluene	1	U
100-41-4	Ethylbenzene	1	U
91-20-3	Naphthalene	5	U
108-38-3/106-42-	m&p-Xylenes	1	U
95-47-6	o-Xylene	1	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BETWEEN

Lab Name: STL BALTIMORE Contract: 200103

Lab Code: ST LABS Case No.: WILLOW SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: 200103-2

Sample wt/vol: 5.0 (g/ml) ML Lab File ID: VB2B1206.D

Level: (low/med) LOW Date Received: 11/21/00

% Moisture: not dec. Date Analyzed: 11/30/00

GC Column: DB-VRX ID: 0.45 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
71-43-2	Benzene	4	
108-88-3	Toluene	1	U
100-41-4	Ethylbenzene	1	U
91-20-3	Naphthalene	5	U
108-38-3/106-42-	m&p-Xylenes	1	U
95-47-6	o-Xylene	1	U

1A

EPA SAMPLE NO.

VOLATILE ORGANICS ANALYSIS DATA SHEET

INFLUENT

Lab Name: STL BALTIMORE Contract: 200103

Lab Code: ST LABS Case No.: WILLOW SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: 200103-3

Sample wt/vol: 5.0 (g/ml) ML Lab File ID: VB2B1207.D

Level: (low/med) LOW Date Received: 11/21/00

% Moisture: not dec. Date Analyzed: 11/30/00

GC Column: DB-VRX ID: 0.45 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
71-43-2	Benzene	22	
108-88-3	Toluene	2	
100-41-4	Ethylbenzene	69	
91-20-3	Naphthalene	150	
108-38-3/106-42-	m&p-Xylenes	6	
95-47-6	o-Xylene	1	U

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19 Loveton Circle
Sparks, MD 21152

Tel: 410 771 4920
Fax: 410 771 4407
www.stl-inc.com

January 9, 2000

Carl Reitenbach
EA Engineering, Science & Technology
92 Read's Way
Suite 109
New Castle, DE 19720

Re: Willow Grove NAS

Dear Mr. Reitenbach:

Enclosed is our report on the analysis of three water samples collected for the Willow Grove NAS project on 18 December 2000. The analysis was performed at STL North Canton. The electronic data deliverables (EDD) will follow.

Please contact me if you have any questions or require further information and refer to report 200217. Unless other arrangements are made, we reserve the right to dispose of your samples sixty (60) days from the date of this letter. We will retain the raw data for seven years from this date.

Sincerely,

Mary E. Asper
Laboratory Project Manager

MEA/jml
enclosure

VOC Report 20021

SEVERN TRENT SERVICES

STL North Canton
4101 Shuffel Drive NW
North Canton, OH 44720-6961

Tel: 330 497 9396
Fax: 330 497 0772
www.stl-inc.com

ANALYTICAL REPORT

PROJECT NO. 29600.74

WILLOW GROVE N.A.S.

Lot #: A0L260115

Mary Asper

STL Baltimore
19 Loveton Circle
Sparks, MD 21152

SEVERN TRENT LABORATORIES, INC.

Kenneth J. Kuzior
Project Manager

January 4, 2001

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CASE NARRATIVE

CASE NARRATIVE

A0L260115

The following report contains the analytical results for three water samples submitted to STL North Canton by STL Baltimore from the Willow Grove N.A.S. Site, project number 29600.74. The samples were received December 23, 2000, according to documented sample acceptance procedures.

STL utilizes only USEPA approved methods in all analytical work. The samples presented in this report were analyzed for the parameter listed on the analytical methods summary page in accordance with the method indicated.

The results included in this report have been reviewed for compliance with the laboratory QA/QC plan. All data have been found to be compliant with laboratory protocol.

SUPPLEMENTAL QC INFORMATION

GC VOLATILES

***I FLAG** During volatile analyses by gas chromatography, hydrocarbon interferences are sometimes encountered which cause an erratic baseline on the chromatogram, making accurate identification and quantitation of an individual compound difficult.

Under these analytical conditions, the relevant peak will be identified and quantitated per method requirements, and using analytical judgement. The result will then be flagged with " *I ", and identified as being suspect due to hydrocarbon interference. The bias could be high or low, depending upon whether the interfering hydrocarbon peaks more significantly affected the target analyte peaks or the internal standard peak.

CASE NARRATIVE

A0L260115

The following report contains the analytical results for three water samples submitted to STL North Canton by STL Baltimore from the Willow Grove N.A.S. Site, project number 29600.74. The samples were received December 23, 2000, according to documented sample acceptance procedures.

STL utilizes only USEPA approved methods in all analytical work. The samples presented in this report were analyzed for the parameter listed on the analytical methods summary page in accordance with the method indicated.

The results included in this report have been reviewed for compliance with the laboratory QA/QC plan. All data have been found to be compliant with laboratory protocol.

QUALITY CONTROL ELEMENTS OF SW-846 METHODS

STL North Canton conducts a quality assurance/quality control (QA/QC) program designed to provide scientifically valid and legally defensible data. Toward this end, several types of quality control indicators are incorporated into the QA/QC program, which is described in detail in QA Policy, QA-003. These indicators are introduced into the sample testing process to provide a mechanism for the assessment of the analytical data.

QC BATCH

Environmental samples are taken through the testing process in groups called QUALITY CONTROL BATCHES (QC batches). A QC batch contains up to twenty environmental samples of a similar matrix (water, soil) that are processed using the same reagents and standards. STL North Canton requires that each environmental sample be associated with a QC batch.

Several quality control samples are included in each QC batch and are processed identically to the twenty environmental samples. These QC samples include a METHOD BLANK (MB), a LABORATORY CONTROL SAMPLE (LCS) and, where appropriate, a MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD) pair or a MATRIX SPIKE/SAMPLE DUPLICATE (MS/DU) pair. If there is insufficient sample to perform an MS/MSD or an MS/DU, then a LABORATORY CONTROL SAMPLE DUPLICATE (LCSD) is included in the QC batch.

LABORATORY CONTROL SAMPLE

The Laboratory Control Sample is a QC sample that is created by adding known concentrations of a full or partial set of target analytes to a matrix similar to that of the environmental samples in the QC batch. The LCS analyte recovery results are used to monitor the analytical process and provide evidence that the laboratory is performing the method within acceptable guidelines. All control analytes indicated by a bold type in the LCS must meet acceptance criteria. Failure to meet the established recovery guidelines requires the repreparation and reanalysis of all samples in the QC batch. The only exception is that if the LCS recoveries are biased high and the associated sample is ND for the parameter(s) of interest, the batch is acceptable.

At times, a Laboratory Control Sample Duplicate (LCSD) is also included in the QC batch. An LCSD is a QC sample that is created and handled identically to the LCS. Analyte recovery data from the LCSD is assessed in the same way as that of the LCS. The LCSD recoveries, together with the LCS recoveries, are used to determine the reproducibility (precision) of the analytical system. Precision data are expressed as relative percent differences (RPDs). If the RPD fails for an LCS/LCSD and yet the recoveries are within acceptance criteria, the batch is still acceptable.

METHOD BLANK

The Method Blank is a QC sample consisting of all the reagents used in analyzing the environmental samples contained in the QC batch. Method Blank results are used to determine if interference or contamination in the analytical system could lead to the reporting of false positive data or elevated analyte concentrations. All target analytes must be below the reporting limits (RL) or the associated sample(s) must be ND except under the following circumstances:

- Common organic contaminants may be present at concentrations up to 5 times the reporting limits. Common metals contaminants may be present at concentrations up to 2 times the reporting limit, or the reported blank concentration must be twenty fold less than the concentration reported in the associated environmental samples. (See common laboratory contaminants listed below.)

Volatile (GC or GC/MS)	Semivolatile (GC/MS)	Metals
Methylene chloride	Phthalate Esters	Copper
Acetone		Iron
2-Butanone		Zinc
		Lead*

** for analyses run on TJA Trace ICP or GFAA only*

- Organic blanks will be accepted if compounds detected in the blank are present in the associated samples at levels 10 times the blank level. Inorganic blanks will be accepted if elements detected in the blank are present in the associated samples at 20 times the blank level.

- Blanks will be accepted if the compounds/elements detected are not present in any of the associated environmental samples.

Failure to meet these Method Blank criteria requires the repreparation and reanalysis of all samples in the QC batch.

MATRIX SPIKE/MATRIX SPIKE DUPLICATE

A Matrix Spike and a Matrix Spike Duplicate are a pair of environmental samples to which known concentrations of a full or partial set of target analytes are added. The MS/MSD results are determined in the same manner as the results of the environmental sample used to prepare the MS/MSD. The analyte recoveries and the relative percent differences (RPDs) of the recoveries are calculated and used to evaluate the effect of the sample matrix on the analytical results. Due to the potential variability of the matrix of each sample, the MS/MSD results may not have an immediate bearing on any samples except the one spiked; therefore, the associated batch MS/MSD may not reflect the same compounds as the samples contained in the analytical report. When these MS/MSD results fail to meet acceptance criteria, the data is evaluated. If the LCS is within acceptance criteria, the batch is considered acceptable. The acceptance criteria do not apply to samples that are diluted for organics if the native sample amount is 4x the concentration of the spike.

For certain methods, a Matrix Spike/Sample Duplicate (MS/DU) may be included in the QC batch in place of the MS/MSD. For the parameters (i.e. pH, ignitability) where it is not possible to prepare a spiked sample, a Sample Duplicate may be included in the QC batch. However, a Sample Duplicate is less likely to provide usable precision statistics depending on the likelihood of finding concentrations below the standard reporting limit. When the Sample Duplicate result fails to meet acceptance criteria, the data is evaluated.

SURROGATE COMPOUNDS

In addition to these batch-related QC indicators, each organic environmental and QC sample are spiked with surrogate compounds. Surrogates are organic chemicals that behave similarly to the analytes of interest and that are rarely present in the environment. Surrogate recoveries are used to monitor the individual performance of a sample in the analytical system.

If the surrogate recoveries are outside criteria for environmental or MS/MSD samples, the batch is acceptable if the Method Blank, LCS, and LCSD surrogate recoveries are within acceptance criteria. The only exception is if the surrogate recoveries are biased high in the LCS, LCSD, or the Method Blank and the associated sample(s) are ND, the batch is acceptable. If the LCS, LCSD, or Method Blank surrogate(s) fail to meet recovery criteria, the entire sample batch is reprepared and reanalyzed.

For the GC/MS BNA methods, the surrogate criterion is that two of the three surrogates for each fraction must meet acceptance criteria. The third surrogate must have a recovery of ten percent or greater.

For the Pesticide/PCB, PAH, and Herbicide methods, the surrogate criteria is that one of two surrogate compounds meet acceptance criteria.

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METHOD REFERENCE

ANALYTICAL METHODS SUMMARY

A0L260115

PARAMETER	ANALYTICAL METHOD
Volatiles by GC	SW846 8021B

References:

SW846 "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 and its updates.

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SAMPLE SUMMARY

SAMPLE SUMMARY

A0L260115

WO #	SAMPLE#	CLIENT SAMPLE ID	DATE	TIME
DR072	001	INFLUENT	12/18/00	14:10
DR073	002	BETWEEN	12/18/00	14:05
DR075	003	EFFLUENT	12/18/00	14:00

NOTE(S):

- The analytical results of the samples listed above are presented on the following pages.
- All calculations are performed before rounding to avoid round-off errors in calculated results.
- Results noted as "ND" were not detected at or above the stated limit.
- This report must not be reproduced, except in full, without the written approval of the laboratory.
- Results for the following parameters are never reported on a dry weight basis: color, corrosivity, density, flashpoint, ignitability, layers, odor, paint filter test, pH, porosity pressure, reactivity, redox potential, specific gravity, spot tests, solids, solubility, temperature, viscosity, and weight.

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SHIPPING AND RECEIVING DOCUMENTS

Company Name:	Project Manager or Contact:
EA DELAWARE	CARL REITENBACH
	Phone: 302-325-3560
Project No. 29600.74	Project Name:
Dept.: 2132 Task: 7200	WILLOW GROVE N.AS
Sample Storage Location: VOA: METALS: OTHER:	ATO Number:
Page 1 of 1	Report #: 200217

Parameters/Method Numbers for Analysis

Chain of Custody Record

SEVERN TRENT SERVICES

Severn Trent Laboratories
19 Loveton Circle
Sparks, MD 21152
Telephone: (410) 771-4950
Fax: (410) 771-4407

Report Deliverables: 1 2 3 4 0 E
EDD: NO/YES
DUE TO CLIENT: 1-8-2001
LPM: M. Lagan
PS: DAO

Date	Time	Water	Soil	Sample Identification 19 Characters	No. of Containers	BTEX/MTBE 8021	STL Accession Number	Remarks
12/18/00	1410	X		INFLUENT	3	✓	200217-1	COC-
↓	1405	X		BETWEEN	3	✓	2	
↓	1400	X		EFFLUENT	3	✓	3	
								9200AS
								catrex (187)

Samples by: (Signature)	Date/Time	Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time
[signature]	12/18/00 1530				
Relinquished by: (Signature)	Date/Time	Received by Laboratory: (Signature)	Date/Time	Airbill Number:	Sample Shipped by: Circle: Fed Ex. Puro. UPS Hand Carried Other:
[signature]	12/18/00 1530	[signature]	12/20 11:20	8160 140 45 194	

Cooler Temp. 4.0 C pH: Yes N/A Comments: Custody Seals Intact: Yes No: N/A

NOTE: Please indicate method number for analyses requested. This will help clarify any questions with laboratory techniques.

Shaded Areas for Lab Use Only

STL North Canton

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SEVERN TRENT

STL Baltimore
19 Loveton Circle
[illegible]

Report Due: 01/10/2001
QC Protocols: [illegible]
Deliverables: FULL PKG + Excel EDD

Transferred to: STL North Canton
4401 Shuffel Drive NW
North Canton, OH 44720
330-497-9396
ATTN: Ken Kuzior

Intra-Laboratory Custody Transfer Record

	Date	Time	Sample ID / Location No.	voc by 8021	Sample Cost	SDG 200217
1			Influent	X	$45.00	200217-1
2			Effluent	X	$45.00	200217-2
3			Effluent	X	$45.00	200217-3
4				X		
5				X		
6				X		
7				X		
8				X		
9				X		
10				X		
11				X		
12				X		
				X		
				X		
				X		
1						
2						
3						
4						
5						

Total Shipment Value: $135.00

Date of Order: 12/22/00
Delivery Date: 12/23/00
PM Approval: Marys Cox
PM Phone: 410-771-4920

Special Instructions: SEE Attached sheets for analyte list

Relinquished by (signature)	Date	Time	Received by (signature)	Date	Time	Method of Shipment / Airbill Number
Marys Cox	12/22/00		Anne Sanders	12/23/00	1100	Fedex

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STL North Canton

RSR280

Client: 54156

Lot #: A0L260115

Case Number/SDG: 29600.74

Storage Location: GC

Severn Trent Laboratories, Inc.
Sample Control Record

Laboratory Sample I.D.	Transferred By	Date	Entered	Removed	Reason	Date Returned
DR072	EARLES	12/23/00	Yes		Storage	
DR073	EARLES	12/23/00	Yes		Storage	
DR075	EARLES	12/23/00	Yes		Storage	

STL Cooler Receipt Form/Narrative
North Canton Facility

Client: STL BALTIMORE Project: _____ Quote#: _____
Cooler Received on: 12-23-00 Opened on: 12-23-00 by: Anne Sanders (Signature)

Fedx ☒ Client Drop Off ☐ UPS ☐ Airborne ☐
Other: _____

Cooler ☐ Safe ☐ Foam Box ☐ Client Cooler ☒ Other: _____
STL Shipper No#: _____

1. Were custody seals on the outside of the cooler and intact? Yes ☒ No ☐
   If YES, Quantity 1 Location OVER ICE
   Were the custody seals signed and dated? Yes ☒ No ☐ NA ☐
2. Shipper's packing slip attached to this form? Yes ☒ No ☐
3. Were custody papers included inside the cooler and relinquished? Yes ☒ No ☐
4. Did you sign the custody papers in the appropriate place? Yes ☒ No ☐
5. Packing material used:
Peanuts ☐ Bubble Wrap ☐ Vermiculite ☐ Foam ☒ None ☐ Other: _____
6. Cooler temperature upon receipt 4.3 °C (see back of form for multiple coolers/temp)
METHOD: Temperature Vial ☒ Coolant ☐ Against Bottles ☐
COOLANT: Wet Ice ☒ Blue Ice ☐ Dry Ice ☐ Water ☐ None ☐
7. Were all the bottles sealed in separate plastic bags? Yes ☐ No ☒
8. Did all bottles arrive in good condition (Unbroken)? Yes ☒ No ☐
9. Did all bottle labels and tags agree with the custody papers? Yes ☒ No ☐
10. Were samples at the correct pH? Yes ☐ No ☐ NA ☒
11. Were correct bottles used for the tests indicated? Yes ☒ No ☐
12. Were air bubbles >6 mm in any VOA vials? Yes ☒ No ☐ NA ☐
13. Was a sufficient amount of sample sent in each bottle? Yes ☒ No ☐
Contacted PM KTK Date: 12/26/00 by: SE via Voice Mail ☐ Verbal ☒ Other ☐
Concerning: BUBBLES IN VIALS.

√	MACRO	MACRO
1. CHAIN OF CUSTODY		
	SR1A	Samples were received under proper custody procedures and without discrepancies.
	SR1B	The chain of custody and sample bottles did not agree. The following discrepancies occurred _____
2. SAMPLE CONDITION		
	SR2A	Sample(s) _____ were received or requested after the recommended holding time had expired.
	SR2B	Sample(s) _____ were received with insufficient volume
	SR2C	Sample(s) _____ were received in a broken container.
3. SAMPLE PRESERVATION		
	SR3A	Sample(s) _____ were further preserved in sample receiving to meet recommended pH level(s).
√	SR3B	Sample(s) C-BAK were received with bubble > 6 mm in diameter (cc: PM)
4. NCM		
	SR4A	NCM has been generated. Refer to Clouseau for details
5. Other Anomalies (see below or back)		

Revision 13, June 19, 2000
SOP: NC-SC-0003, Sample Receiving
n:\qaqc\narrativ\stl\cooler_stl.doc

STL Cooler Receipt Form/Narrative
North Canton Facility

Client ID	pH	Date	Initials

Cooler	Temp	Method	Comments

Discrepancies Cont.

Macro Name: SR3B 1 vial 200223-1, 1 vial 200223-2, 3 vials 200217-
1 vial 200217-2

Macro Name:

Macro Name:

Macro Name:

Other Anomalies:

Revision 13, June 19, 2000
SOP: NC-SC-0005, Sample Receiving
n:\qaqc\narrativ\stl\cooler_stl.doc

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GC VOLATILE DATA

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QC SUMMARY DATA

SW846 8021B SURROGATE RECOVERY

Lab Name: Severn Trent Laboratories, Inc. Client: STL Baltimore

Lab Code: STLCAN SDG No:

Lot #: A0L260115

	CLIENT ID.	SRG01	TOT OUT
01	INFLUENT	192*	01
02	BETWEEN	104	00
03	EFFLUENT	102	00
04	METHOD BLK. DR15N1AA	101	00
05	LCS DR15N1AC	98	00
06	EFFLUENT D	99	00
07	LCSD DR15N1AD	98	00
08	EFFLUENT S	101	00

SURROGATES		QC LIMITS
SRG01	= Trifluorotoluene	(50-150)

\# Column to be used to flag recovery values
* Values outside of required QC Limits
D System monitoring Compound diluted out

FORM II

SW846 8021B CHECK SAMPLE RECOVERY

Lab Name: Severn Trent Laboratories, Inc. Client: STL Baltimore

Lab Code: STLCAN SDG No:

Lot #: A0L270000 WO #: DR15N1AC
BATCH: 0362293

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENT. (ug/L)	% REC	QC LIMITS REC	QUAL
Toluene	20	20	99	71 - 132	
Benzene	20	19	97	73 - 134	

NOTES(S):

* Values outside of QC limits

Spike Recovery: 0 out of 2 outside limits

COMMENTS:

FORM III

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SAMPLE DATA

Lab Name:Severn Trent Laboratories, Inc. SDG Number:

Matrix: (soil/water) WG
Method: SW846 8021B
Volatile Organics (8021B)

Lab Sample ID:A0L260115 001

Sample WT/Vol: 5 / mL
Work Order: DR0721AA
Dilution factor: 50
Moisture %:

Date Received: 12/23/00
Date Extracted:12/27/00
Date Analyzed: 12/27/00

QC Batch: 0362293

Client Sample Id: INFLUENT

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) ug/L	Q
71-43-2	Benzene	50	U
100-41-4	Ethylbenzene	460	*I
91-20-3	Naphthalene	2100	*I
108-88-3	Toluene	50	U
95-47-6	o-Xylene	74	*I
136777-61-2	m-Xylene & p-Xylene	66	*I

FORM I

Lab Name:Severn Trent Laboratories, Inc. SDG Number:

Matrix: (soil/water) WG
Method: SW846 8021B
Volatile Organics (8021B)

Lab Sample ID:A0L260115 002

Sample WT/Vol: 5 / mL
Work Order: DR0731AA
Dilution factor: 1
Moisture %:

Date Received: 12/23/00
Date Extracted:12/27/00
Date Analyzed: 12/27/00

QC Batch: 0362293

Client Sample Id: BETWEEN

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) ug/L	Q
71-43-2	Benzene	2.9	
100-41-4	Ethylbenzene	1.0	U
91-20-3	Naphthalene	1.0	U
108-88-3	Toluene	1.0	U
95-47-6	o-Xylene	1.0	U
136777-61-2	m-Xylene & p-Xylene	1.0	U

FORM I

Lab Name:Severn Trent Laboratories, Inc. SDG Number:

Matrix: (soil/water) WG
Method: SW846 8021B
Volatile Organics (8021B)

Lab Sample ID:A0L260115 003

Sample WT/Vol: 5 / mL
Work Order: DR0751AA
Dilution factor: 1
Moisture %:

Date Received: 12/23/00
Date Extracted:12/27/00
Date Analyzed: 12/27/00

QC Batch: 0362293

Client Sample Id: EFFLUENT

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) ug/L	Q
71-43-2	Benzene	1.0	U
100-41-4	Ethylbenzene	1.0	U
91-20-3	Naphthalene	1.0	U
108-88-3	Toluene	1.0	U
95-47-6	o-Xylene	1.0	U
136777-61-2	m-Xylene & p-Xylene	1.0	U

FORM I