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NSA MID SOUTH
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FINAL ENVIRONMENTAL ASSESSMENT REPORT BUILDING S 50 UNDERGROUND
STORAGE TANK SITE MILLINGTON SUPPACT TN
10/1/1993
ENSAFE ALLEN AND HOSHALL

**COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION
NAVAL AIR STATION MEMPHIS
MILLINGTON, TENNESSEE**



**FINAL ENVIRONMENTAL ASSESSMENT REPORT
BUILDING S-50 UST SITE**

Prepared for:

**DEPARTMENT OF THE NAVY
SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
NORTH CHARLESTON, SC**

**SOUTHDIV CONTRACT NUMBER:
N62467-89-D-0318**



Prepared by:

**ENSAFE/ALLEN & HOSHALL
5720 SUMMER TREES DRIVE, SUITE 8
MEMPHIS, TENNESSEE 38134
(901) 383-9115**

OCTOBER 1993

**Release of this document requires the prior notification of the Commanding Officer of the
Naval Air Station Memphis**



EnSafe / Allen & Hoshall

a joint venture for professional services

5720 Summer Trees Dr. Suite 8 Memphis, TN 38134
(901) 383-9115 Fax (901) 383-1743

August 23, 1994

Greg Parker
Memphis/Shelby County Health Department
Pollution Control-Water Quality
814 Jefferson Avenue
Memphis, Tennessee 38105

RE: Closure of Five Monitoring Wells at Building S-50, NAS Memphis.

Dear Mr. Parker,

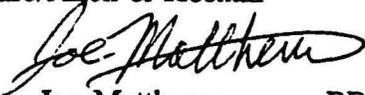
On behalf of the Navy, EnSafe/Allen & Hoshall (E/A&H) is notifying your office of monitoring well closures at NAS Memphis, Millington, Tennessee. Five shallow monitoring wells were closed at Building S-50. The closure procedure met requirements outlined in *Shelby County Well Construction Codes*, June 1994 including:

- Sanitizing each well with a chlorine tablet.
- Pressure grouting from the bottom of the well to the surface with Portland cement.
- Removing each wellhead and filling the last few feet with concrete.

Ms. Sherry Wheeler from your office was onsite during well sanitation and grouting. Joe Matthews of E/A&H, a State of Tennessee Registered Professional Geologist, was the onscene coordinator. Tristate Testing Services, Inc. completed the work under subcontract to E/A&H.

Enclosed please find logs for each monitoring well, a site map with well locations, and the completed well permit for the closure action. Please do not hesitate to call if you have any questions or require additional information.

Sincerely,
EnSafe/Allen & Hoshall

By:  Joe Matthews, RPG TN1112

enclosures

cc: Tonya Barker, NAS Memphis
John Karlyk, SOUTH DIV
Glenn Birdwell, TDEC
TDEC-Nashville

WELL CONSTRUCTION LOG.

S50-MW-2

WELL LOCATION BUILDING S-50, NAS MEMPHIS

DATE INSTALLED 06/15/93

TYPE OF WELL 2 INCH O.D. SCHEDULE 40 PVC MONITORING WELL

<ol style="list-style-type: none"> 1. HEIGHT OF CASING ABOVE GROUND <u>FLUSH MOUNT</u> 2. WATER SURFACE ELEV. <u>259.02 (06/28/93)</u> a) DEPTH TO SATURATED ZONE <u>N/A</u> 3. TOP OF CASING ELEV. <u>265.82</u> 4. PROTECTIVE CASING <u>YES</u> <input checked="" type="radio"/> <u>NO</u> a) CASING LENGTH <u>N/A</u> 5. LENGTH OF SCREEN <u>15.0'</u> 6. SIZE\TYPE OF SCREEN <u>.010" SLOT PVC</u> 7. LENGTH OF SUMP <u>0</u> 8. TOTAL DEPTH OF BORING <u>21.3</u> HOLE DIAMETER _____ 9. SCREENED INTERVAL <u>16.3' - 21.3'</u> 10. TYPE OF SCREEN FILTER PACK <u>10/20 FILTER SAND</u> QUANTITY USED <u>375lb.</u> SIZE _____ U/C _____ 11. DEPTH TO TOP OF FILTER <u>5.0'</u> 12. TYPE OF SEAL <u>1/4" BENTONITE PELLETS</u> QUANTITY USED <u>2.5 GALLONS</u> 13. DEPTH TO TOP OF SEAL <u>3.0'</u> 14. TYPE OF GROUT <u>PORTLAND TYPE I / BENTONITE</u> GROUT MIXTURE <u>93/7</u> METHOD OF PLACEMENT <u>PRESSURE GROUT</u> 15. COMMENTS <u>COMPLETED WITH LOCKING EXPANSION -</u> <u>TYPE CAP</u> 	<p style="text-align: center;">INSTALLATION DESCRIPTION</p> <table border="1" style="width: 100%;"> <thead> <tr> <th style="width: 70%;">DESCRIPTION</th> <th style="width: 30%;">DEPTH(FT.)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center; vertical-align: middle;">  </td> <td style="text-align: center; vertical-align: middle;"> <p>0'</p> <p>21.3'</p> </td> </tr> </tbody> </table>	DESCRIPTION	DEPTH(FT.)		<p>0'</p> <p>21.3'</p>
DESCRIPTION	DEPTH(FT.)				
	<p>0'</p> <p>21.3'</p>				



ENVIRONMENTAL ASSESSMENT
REPORT
NAS MEMPHIS

S50-MW-2
WELL CONSTRUCTION LOG

DWG DATE: 08/26/93 | DWG NAME: 68MWLOG2

WELL CONSTRUCTION LOG. S50-MW-3

WELL LOCATION BUILDING S-50, NAS MEMPHIS

DATE INSTALLED 06/16/93

TYPE OF WELL 2 INCH O.D. SCHEDULE 40 PVC MONITORING WELL

<ol style="list-style-type: none"> 1. HEIGHT OF CASING ABOVE GROUND <u>FLUSH MOUNT</u> 2. WATER SURFACE ELEV. <u>261.23 (06/28/93)</u> a) DEPTH TO SATURATED ZONE <u>N/A</u> 3. TOP OF CASING ELEV. <u>266.58</u> 4. PROTECTIVE CASING <u>YES</u> <input checked="" type="radio"/> <u>NO</u> a) CASING LENGTH <u>N/A</u> 5. LENGTH OF SCREEN <u>15.0'</u> 6. SIZE\TYPE OF SCREEN <u>.010" SLOT PVC</u> 7. LENGTH OF SUMP <u>0</u> 8. TOTAL DEPTH OF BORING <u>21.4</u> HOLE DIAMETER _____ 9. SCREENED INTERVAL <u>6.4' - 21.4'</u> 10. TYPE OF SCREEN FILTER PACK <u>10/20 FILTER SAND</u> QUANTITY USED <u>375lb.</u> SIZE _____ U/C _____ 11. DEPTH TO TOP OF FILTER <u>5.0'</u> 12. TYPE OF SEAL <u>1/4" BENTONITE PELLETS</u> QUANTITY USED <u>2.5 GALLONS</u> 13. DEPTH TO TOP OF SEAL <u>3.0'</u> 14. TYPE OF GROUT <u>PORTLAND TYPE I / BENTONITE</u> GROUT MIXTURE <u>93/7</u> METHOD OF PLACEMENT <u>PRESSURE GROUT</u> 15. COMMENTS <u>COMPLETED WITH LOCKING EXPANSION -</u> <u>TYPE CAP</u> 	<div style="text-align: center; border-bottom: 1px solid black; padding-bottom: 5px;"> <h2 style="margin: 0;">INSTALLATION DESCRIPTION</h2> </div> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 70%; border-bottom: 1px solid black;">DESCRIPTION</th> <th style="width: 30%; border-bottom: 1px solid black;">DEPTH(FT.)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center; vertical-align: middle;"> </td> <td style="text-align: center; vertical-align: middle;"> <p>0'</p> <p style="text-align: right;">21.4'</p> </td> </tr> </tbody> </table>	DESCRIPTION	DEPTH(FT.)		<p>0'</p> <p style="text-align: right;">21.4'</p>
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	<p>0'</p> <p style="text-align: right;">21.4'</p>				



ENVIRONMENTAL ASSESSMENT
REPORT
NAS MEMPHIS

S50-MW-3
WELL CONSTRUCTION LOG

DWG DATE: 08/26/93 | DWG NAME: 68NMLOG

WELL CONSTRUCTION LOG.

S50-MW-4

WELL LOCATION BUILDING S-50, NAS MEMPHIS

DATE INSTALLED 06/17/93

TYPE OF WELL 2 INCH O.D. SCHEDULE 40 PVC MONITORING WELL

<ol style="list-style-type: none"> 1. HEIGHT OF CASING ABOVE GROUND <u>FLUSH MOUNT</u> 2. WATER SURFACE ELEV. <u>260.95 (06/28/93)</u> a) DEPTH TO SATURATED ZONE <u>N/A</u> 3. TOP OF CASING ELEV. <u>266.24</u> 4. PROTECTIVE CASING <u>YES</u> <input checked="" type="radio"/> <u>NO</u> a) CASING LENGTH <u>N/A</u> 5. LENGTH OF SCREEN <u>15.0'</u> 6. SIZE\TYPE OF SCREEN <u>.010" SLOT PVC</u> 7. LENGTH OF SUMP <u>0</u> 8. TOTAL DEPTH OF BORING <u>21.1</u> HOLE DIAMETER _____ SCREENED INTERVAL <u>6.1' - 21.1'</u> 10. TYPE OF SCREEN FILTER PACK <u>10/20 FILTER SAND</u> QUANTITY USED <u>375lb.</u> SIZE _____ U/C _____ 11. DEPTH TO TOP OF FILTER <u>5.0'</u> 12. TYPE OF SEAL <u>1/4" BENTONITE PELLETS</u> QUANTITY USED <u>2.5 GALLONS</u> 13. DEPTH TO TOP OF SEAL <u>3.0'</u> 14. TYPE OF GROUT <u>PORTLAND TYPE I / BENTONITE</u> GROUT MIXTURE <u>93/7</u> METHOD OF PLACEMENT <u>PRESSURE GROUT</u> 15. COMMENTS <u>COMPLETED WITH LOCKING EXPANSION -</u> <u>TYPE CAP</u> 	<p style="text-align: center; font-weight: bold;">INSTALLATION DESCRIPTION</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 70%;">DESCRIPTION</th> <th style="width: 30%;">DEPTH(FT.)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center; vertical-align: middle;">  </td> <td style="text-align: center; vertical-align: middle;"> <p>0'</p> <p>21.1'</p> </td> </tr> </tbody> </table>	DESCRIPTION	DEPTH(FT.)		<p>0'</p> <p>21.1'</p>
DESCRIPTION	DEPTH(FT.)				
	<p>0'</p> <p>21.1'</p>				



ENVIRONMENTAL ASSESSMENT
REPORT
NAS MEMPHIS

S50-MW-4
WELL CONSTRUCTION LOG

DWG DATE: 08/26/93 | DWG NAME: 68NML04

WELL CONSTRUCTION LOG. S50-MW-5

WELL LOCATION BUILDING S-50, NAS MEMPHIS

DATE INSTALLED 06/18/93

TYPE OF WELL 2 INCH O.D. SCHEDULE 40 PVC MONITORING WELL

<ol style="list-style-type: none"> 1. HEIGHT OF CASING ABOVE GROUND <u>FLUSH MOUNT</u> 2. WATER SURFACE ELEV. <u>258.91 (06/28/93)</u> a) DEPTH TO SATURATED ZONE <u>N/A</u> 3. TOP OF CASING ELEV. <u>266.55</u> 4. PROTECTIVE CASING <u>YES</u> <input checked="" type="radio"/> <u>NO</u> a) CASING LENGTH <u>N/A</u> 5. LENGTH OF SCREEN <u>15.0'</u> 6. SIZE\TYPE OF SCREEN <u>.010" SLOT PVC</u> 7. LENGTH OF SUMP <u>0</u> 8. TOTAL DEPTH OF BORING <u>21.1</u> HOLE DIAMETER _____ SCREENED INTERVAL <u>6.1' - 21.1'</u> 10. TYPE OF SCREEN FILTER PACK <u>10/20 FILTER SAND</u> QUANTITY USED <u>375lb.</u> SIZE _____ U/C _____ 11. DEPTH TO TOP OF FILTER <u>5.0'</u> 12. TYPE OF SEAL <u>1/4" BENTONITE PELLETS</u> QUANTITY USED <u>2.5 GALLONS</u> 13. DEPTH TO TOP OF SEAL <u>3.0'</u> 14. TYPE OF GROUT <u>PORTLAND TYPE I / BENTONITE</u> GROUT MIXTURE <u>93/7</u> METHOD OF PLACEMENT <u>PRESSURE GROUT</u> 15. COMMENTS <u>COMPLETED WITH LOCKING EXPANSION -</u> <u>TYPE CAP</u> 	<div style="text-align: center; border-bottom: 1px solid black; padding-bottom: 5px;"> <h2 style="margin: 0;">INSTALLATION DESCRIPTION</h2> </div> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 70%;">DESCRIPTION</th> <th style="width: 30%;">DEPTH(FT.)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center; vertical-align: middle;"> </td> <td></td> </tr> </tbody> </table>	DESCRIPTION	DEPTH(FT.)		
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ENVIRONMENTAL ASSESSMENT
REPORT
NAS MEMPHIS

S50-MW-5
WELL CONSTRUCTION LOG

94-223-1100 GP

COPY

MEMPHIS AND SHELBY COUNTY HEALTH DEPARTMENT
POLLUTION CONTROL SECTION
WATER QUALITY ROOM 438-L
814 JEFFERSON AVENUE
MEMPHIS, TENNESSEE 38105
901-576-7741

WELL APPLICATION FORM

SECTIONS I, II, III, AND IX MUST BE COMPLETELY FILLED OUT BY THE WELL OWNER.
SECTIONS IV THRU VIII MUST BE COMPLETELY FILLED OUT BY THE WELL DRILLER.
APPLICANT AND DRILLER MUST SIGN APPLICATION.

I. WELL OWNER

NAME OR NAME OF ESTABLISHMENT Naval Air Station
CONTACT NAME: Joe Matthews TITLE: Professional Geologist
MAILING ADDRESS: 5720 Summer Trees Drive, Suite 8
CITY: Memphis, STATE: TN ZIP: 38134
PHONE: BUSINESS (901) 383-9115 HOME N/A

II. WELL LOCATION

ADDRESS: Building S-50 (Off Navy Road)
WELL IS APPROX. _____ FEET N S E W OF _____ RD. OR ST.
WELL IDENTIFICATION # _____ LAND SIZE IN ACRES _____

III. TYPE WELL TO BE DRILLED

____ WATER PRODUCTION _____ MONITORING
____ DEWATERING _____ a. Ground water quality
____ RECOVERY _____ b. Methane gas
____ SOIL BORING _____ c. Water level
____ OTHER _____ d. Leachate
SPECIFY _____ e. Gas movement
____ f. Chemical movement
____ g. Other: _____

IV. WELL DRILLER

DRILLING COMPANY: TRI-STATE TESTING SERVICES, INC.
TENNESSEE WELL DRILLER LICENSE #: N/A
REPRESENTATIVE: DAVID D. McCRAY PHONE: (901) 385-1199
MAILING ADDRESS: 6756 BUCKLES COVE
CITY: MEMPHIS, STATE: TN ZIP: 38133

V. TYPE OF WORK

____ NEW WELL _____ REPLACEMENT
____ REWORK _____ REPAIR
X ____ FILL AND ABANDON _____ OTHER
____ SPECIFY _____

WELL APPLICATION FORM (PAGE 2)

VI. WELL CONSTRUCTION INFORMATION

EXPECTED DEPTH OF WELL _____ FT. CONSTRUCTION WATER SOURCE _____
WELL CASING: TYPE MATERIAL _____ DIAMETER _____ WALL THICKNESS _____
TYPE OF WATER PUMPING EQUIP.: SUBMERSIBLE _____ JET _____ TURBINE _____

VII. WELL INFORMATION

- 1. NUMBER OF WELLS NEEDED: Five PROPOSED DEPTH OF WELL (S): 21.0'
- 2. SUBSTANCES TO BE MONITORED FOR: _____
- 3. SAMPLING METHOD TO BE USED: BAILER _____ PUMP _____
- 4. HOW OFTEN IS WELL TO BE SAMPLED? _____

VIII. WATER WELL USAGE

RESIDENTIAL _____ COMMERCIAL _____ INDUSTRIAL _____ FARM _____
HEAT PUMP _____ SPRINKER SYSTEM _____ IRRIGATION _____
RETAIN LAKE LEVEL _____ OTHER (SPECIFY) _____

IX. ADDITIONAL INFORMATION REQUIRED

- 1. HOW MANY EXISTING WELLS ARE ON PROPERTY?
_____ ACTIVE _____ INACTIVE OR ABANDONED _____ NONE
- 2. THE FOLLOWING MUST ACCOMPANY APPLICATION WHEN SUBMITTED:
A. PLOT PLAN SHOWING ALL NEEDED INFORMATION AS STATED IN REGULATIONS.
B. \$25.00 PROCESSING FEE (DOES NOT APPLY TO FILLING AN ABANDONED WELL)
C. ALL WELL APPLICATIONS REQUIRE AN ADDITIONAL \$100.00 INSPECTION FEE
(WITH THE EXCEPTION OF WATER PRODUCTION WELL APPLICATIONS).
D. A SKETCH OF ANY PROPOSED WELL MUST BE ENCLOSED.

APPLICANT AND WELL DRILLER HEREBY AGREE TO COMPLY WITH ALL RULES AND REGULATIONS ADOPTED BY THE M.S.C.H.D. TO REGULATE WATER QUALITY CONTROL WITHIN SHELBY COUNTY. FURTHERMORE, THE DUTIES WHICH ARE LISTED IN THE REGULATIONS HAVE BEEN READ BY THE APPLICANT AND BY THE WELL DRILLER, AND ARE FULLY UNDERSTOOD AND AGREED UPON.

SIGNATURE OF WELL OWNER Donald H. Kellon DATE 8/23/94
SIGNATURE OF WELL DRILLER David D. McCray DATE 24 Aug. '94

REMARKS: THE HEALTH DEPARTMENT RESERVES THE RIGHT TO SUPPLEMENT THE GENERAL REQUIREMENTS BY AN ADDENDUM AS MAY BE REQUIRED. IF THE APPLICATION IS APPROVED BY THE HEALTH DEPARTMENT, A CONSTRUCTION PERMIT WILL BE ISSUED IN WRITING TO THE WELL DRILLER WITH A COPY BEING SENT TO THE APPLICANT. NO CONSTRUCTION IS TO BEGIN UNTIL SAID PERMIT HAS BEEN RECEIVED, AND SHALL BE KEPT AT THE CONSTRUCTION SITE UNTIL WELL HAS BEEN COMPLETED.

FOR DEPARTMENT USE ONLY

DATE APPLICATION RECEIVED _____ LOG NUMBER _____
PERMIT REJECTED _____ GRANTED _____ CONDITIONS _____
APPROVAL/DENIAL DATE _____ PERMIT NUMBER _____
DEPARTMENT SIGNATURE _____

**COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION
NAVAL AIR STATION MEMPHIS
MILLINGTON, TENNESSEE**



**FINAL ENVIRONMENTAL ASSESSMENT REPORT
BUILDING S-50 UST SITE**

Prepared for:

**DEPARTMENT OF THE NAVY
SOUTHERN DIVISION
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Prepared by:

**ENSAFE/ALLEN & HOSHALL
5720 SUMMER TREES DRIVE, SUITE 8
MEMPHIS, TENNESSEE 38134
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OCTOBER 1993

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ACRONYMS AND ABBREVIATIONS

The following list contains many of the acronyms, abbreviations, and units of measure used in this report.

<u>TITLE</u>	<u>DEFINITION</u>
ACGIH	American Council of Governmental and Industrial Hygienists
ADI	Average Daily Intake
ARAR	Applicable or Relevant and Appropriate Requirements
ASTM	American Society of Testing and Materials
BTX	Sum of the Concentrations of Benzene, Toluene, and Total Xylenes in a Sample (UST soil cleanup parameters)
BW	Body Weight
CAG	Carcinogenic Assessment Group
CAP	Corrective Action Plan
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CGI	Combustible Gas Indicator (Explosimeter)
CLEAN	Comprehensive Long-Term Environmental Action Navy
CLP	USEPA Contract Laboratory Program
CNS	Central Nervous System
COC	Chain of Custody
CPC	Chemical-Protective Clothing
CPR	Cardiopulmonary Resuscitation
CSEP	Confined Space Entry Permit
CV	Coefficient of Variation
DOD	U.S. Department of Defense
DOT	U.S. Department of Transportation
DP	Duplicate (sample)
DQO	Data Quality Objective
E/A&H	EnSafe/Allen & Hoshall
EAP	Environmental Assessment Plan

EAR	Environmental Assessment Report
EFD	Engineering Field Division
EIC	Engineer-in-Charge
EP	Extraction Procedure/Exposure Period
EPA	United States Environmental Protection Agency
FB	Field Blank
FID	Flame Ionization Detector
GC	Gas Chromatography
GW	Groundwater (sample)
HASP	Health and Safety Plan
HCl	Hydrochloric Acid
HSWA	Hazardous and Solid Waste Amendments of 1984
I.D.	Internal Diameter
IDLH	Immediately Dangerous to Life and Health
IR	Average Soil Ingestion Rate
LEL	Lower Explosive Limit
LQAC	Laboratory Quality Assurance Coordinator
M³	Cubic Meter of Air
mg/kg	Milligrams/Kilogram
mg/L	Milligrams/Liter
MS	Matrix Spike
MSD	Matrix Spike Duplicate
MSA	Mine Safety Administration
MSDS	Material Safety Data Sheet
MSL	Mean Sea Level
MW	Monitoring Well
NAD	North American Datum
NAS	Naval Air Station
NAVFACENGCOM	Naval Facilities Engineering Command
NCP	National Oil and Hazardous Substances Contingency Plan
NCR	NEESA Contract Representative
NEESA	Naval Energy and Environmental Support Activity

NFA	No Further Action
NIOSH	National Institute of Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
OVA	Organic Vapor Analyzer
PEL	Permissible Exposure Limit
pH	Negative log of the Hydrogen Ion Concentration
PID	Photoionization Detector
ppb	Parts per Billion
PPE	Personal Protective Equipment
ppm	Parts per Million
PVC	Poly Vinyl Chloride
QA	Quality Assurance
QAO	Quality Assurance Officer
QAP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
QC	Quality Control
R	Acceptable Incremental Lifetime Cancer Risk
RB	Rinsate Blank
RCRA	Resource Conservation and Recovery Act
RRF	Relative Response Factor
RSD	Relative Standard Deviation
SB	Soil Boring
SCBA	Self Contained Breathing Apparatus
SG	Soil Gas
SOP	Standard Operating Procedure
SOP/QAM	Standard Operating Procedures and Quality Assurance Manual (USEPA Region IV Environmental Compliance Branch)
SOUTHDIV	Southern Division, Naval Facilities Engineering Command
SOW	Statement of Work
STEL	Short-Term Exposure Limit
SVOC	Semivolatile Organic Compounds
TB	Trip Blank

TCLP	Toxicity Characteristic Leaching Procedure
TDEC	Tennessee Department of Environment and Conservation
TDS	Total Dissolved Solids
TLV	Threshold Limit Value
TN	Tennessee
TPH	Total Petroleum Hydrocarbons
TWA	Time Weighted Average
UEL	Upper Explosive Limit
ug/L	Micrograms/liter
UST	Underground Storage Tank
VOA	Volatile Organic Analysis
VOC	Volatile Organic Compounds
WGBT	Wet Globe Bulb Temperature Index

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EXECUTIVE SUMMARY

The Department of the Navy's engineering field division, Southern Division Naval Facilities Engineering Command is providing engineering support and contract services to the Naval Air Station (NAS) Memphis, Millington, Tennessee in support of their compliance with the Tennessee Department of Environment and Conservation (TDEC) Underground Storage Tank (UST) Division regulations.

This Environmental Assessment Report (EAR) presents the findings of the assessment of petroleum hydrocarbon contamination associated with the unregulated underground storage tank located adjacent to Building S-50, NAS Memphis. The following conclusions and recommendations are based on information obtained during the assessment activities.

Conclusions:

- Diesel Range Organics (DRO) concentrations in the soil do not exceed TDEC cleanup levels for a non-drinking water aquifer.
- DRO concentrations in groundwater do not exceed the TDEC cleanup levels for a non-drinking water aquifer.
- The apparent groundwater flow direction beneath the site is centered toward the source area (S50-MW-5) with an average hydraulic gradient of 0.030 ft./ft.
- Depth to the static water table beneath the site ranges between 5.3 feet and 7.6 feet below grade.
- Free product was not detected in any monitoring wells.

- Permeabilities of soil samples collected in native soils outside the tank pit exhibited average vertical hydraulic conductivities ranging from 1.3×10^{-5} cm/sec to 3.8×10^{-8} cm/sec, which are typical permeabilities of clay.
- The aquifer can be classified as non-drinking water based on a water use survey in the vicinity of the site and on water samples collected near the site which did not meet several primary and secondary drinking water standards.

Recommendations:

In lieu of a Corrective Action Plan, EnSafe/Allen & Hoshall recommends no further action be taken at this location because no petroleum contamination above TDEC action levels was found at the Building S-50 UST site. Upon receipt of approval from TDEC for no further action, monitoring wells installed during this Environmental Assessment should be properly abandoned in accordance with the TDEC UST Guidelines.

1.0 INTRODUCTION

EnSafe/Allen & Hoshall (E/A&H) was tasked by the Department of the Navy to conduct an Environmental Assessment of a former underground storage tank (UST) location at the Naval Air Station (NAS) Memphis in Millington, Tennessee. The tank was reportedly used to store diesel fuel as a supply for the building's emergency backup power system. The tank was regulated under 40 CFR 280. However, a Facility Identification Number has not been assigned by the Tennessee Department of Environment and Conservation. The former tank location is in an open area between two wings of Building S-50. The site is located in a relatively flat, paved area at the corner of 6th Avenue and "F" Street. All surface drainage appears to flow into a nearby storm drain. The subject site's location is provided in Figures 1-1 through 1-3.

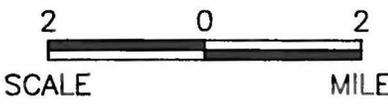
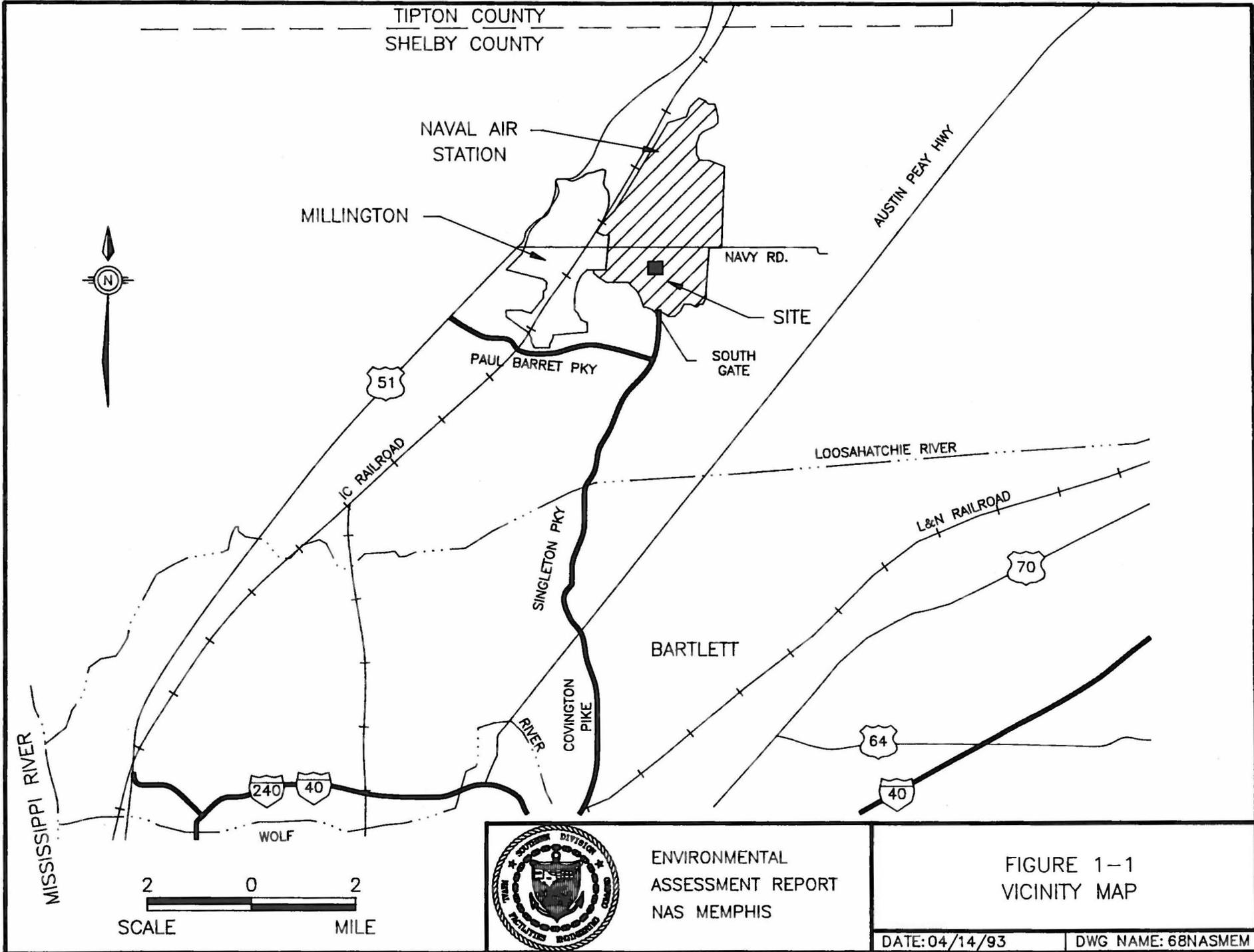
The purpose of this investigation was to assess the vertical and lateral extent of any contamination in the shallow zone and water table resulting from the Building S-50 UST system. This investigation has been completed in accordance with the Tennessee Department of Environment and Conservation Environmental Assessment Guidance (January 1992).

1.1 Objectives and Scope

The objectives of the Environmental Assessment were in accordance with the Tennessee Department of Environment and Conservation's (TDEC) UST Division guidance.

Objectives:

- Determine whether soil and/or groundwater were contaminated.
- Determine the horizontal and vertical extent of contamination, if any.
- Determine the extent and thickness of free phase product, if any.
- Describe the geology and hydrogeology beneath the site and the relationship to the contamination.



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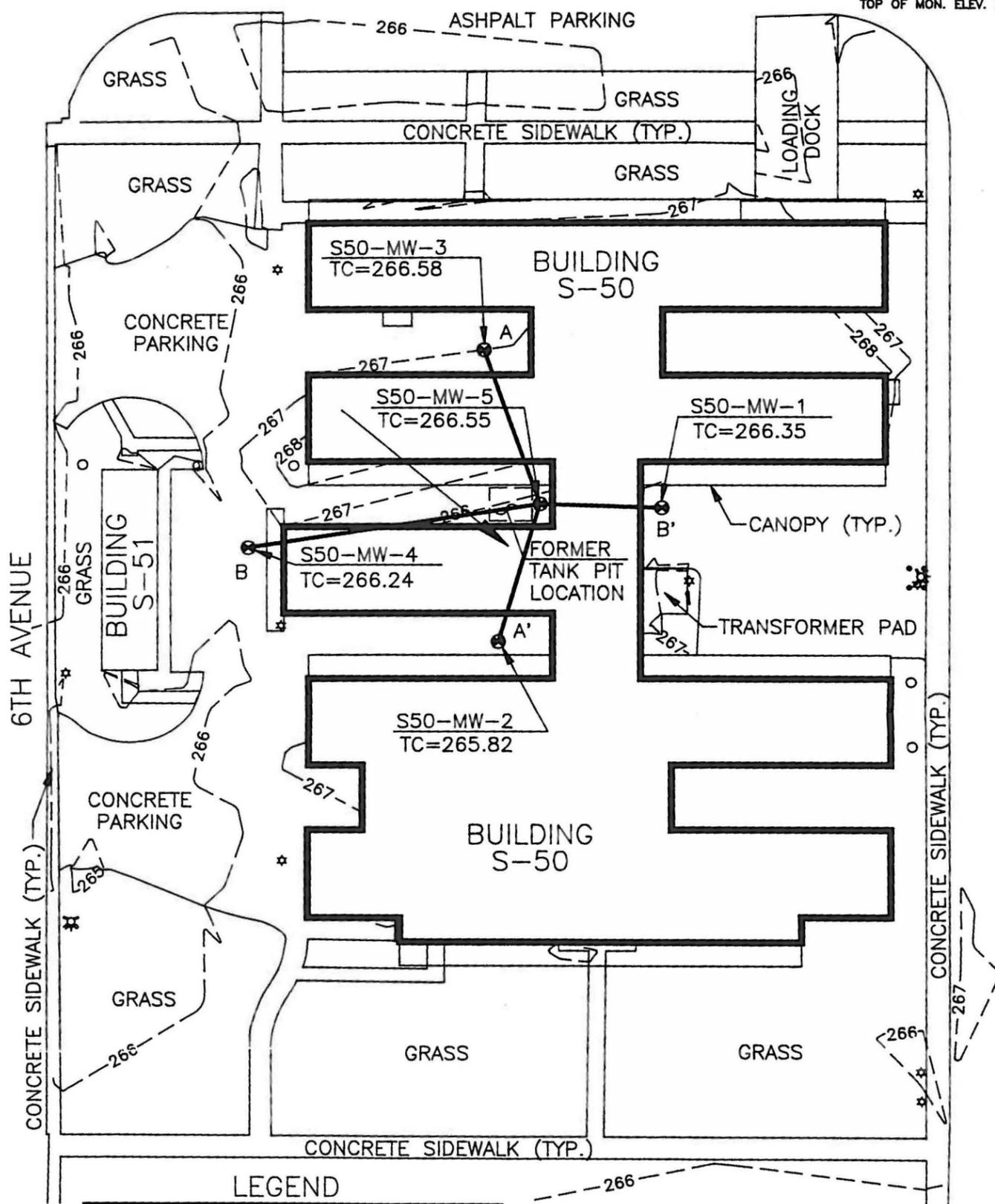
FIGURE 1-1
VICINITY MAP

DATE: 04/14/93

DWG NAME: 68NASMEM

"F" STREET

BENCHMARK
MONUMENT 33, GRID COORINATES N 3-1+73,
W 85+27, LOCATED SOUTH OF "F" STREET
APPROX. 110' EAST OF 5TH AVE.
TOP OF MON. ELEV. 263.77



LEGEND

- * POWER POLE
- ⊠ FIRE HYDRANT
- MONITOR WELL
- GUARD POST (BOLLARD)
- STEAM PIPE POST
- - - 266 - - - EXIST. GROUND CONTOUR
- S50-MW-3 MONITOR WELL I.D.
- TC=266.58 TOP OF CASING ELEVATION

50 0 50
SCALE FEET

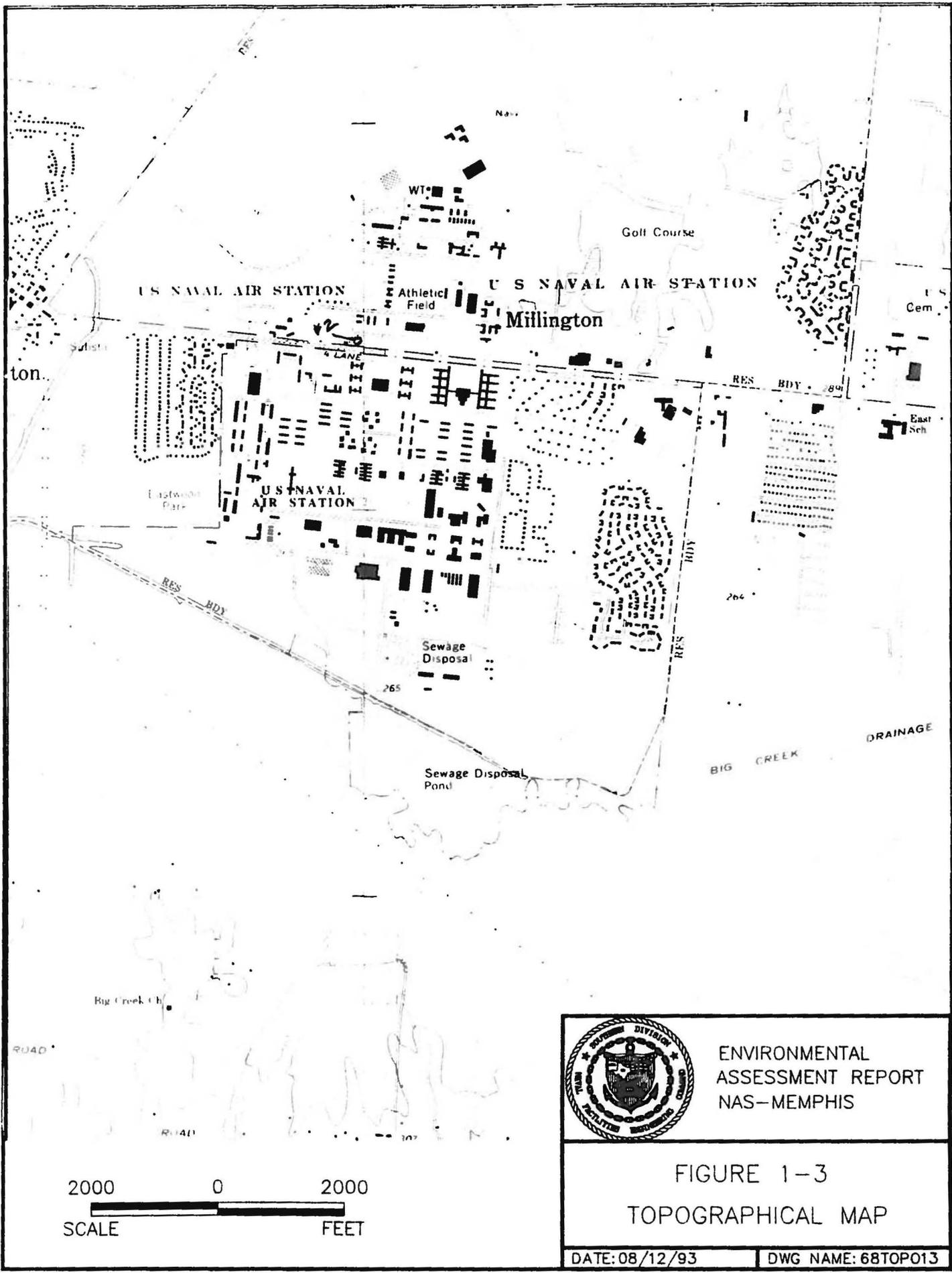


ENVIRONMENTAL
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FIGURE 2-1
A-A' AND B-B'
LOCATION MAP
BLDG. S-50 UST SITE

DATE: 09/30/93

DWG NAME: 68ABL21S



2000 0 2000
 SCALE FEET



ENVIRONMENTAL
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FIGURE 1-3
 TOPOGRAPHICAL MAP

DATE: 08/12/93

DWG NAME: 68TOP013

- Perform laboratory analysis of select soil and water samples for various parameters to aid in the design of remedial alternatives, if needed. These are included as Appendix G.

The scope of work in this investigation included the following:

- A series of five soil borings at the site, all converted to monitoring wells.
- Soil samples collected from all borings and groundwater samples collected from all monitoring wells.
- Laboratory analysis of 11 soil samples, six groundwater samples, and four QA/QC samples for DRO.

1.2 Background Information/Previous Work

Background information concerning the UST located adjacent to Building S-50 is very limited. Initial abatement actions taken included the removal of the tank and the associated piping. Due to the absence of inventory records for the UST, the estimated quantity of release is unknown. In April 1992, National Salvage and Services Corporation was contracted to remove and provide proper closure documentation for the UST. After excavation and removal of the tank, soil samples were taken from the bottom of the pit at each corner of each tank and analyzed for both DRO and Gasoline Range Organics (GRO). The results of this analysis indicated elevated levels of DRO, only. Table 1-1 lists the sample locations and analytical results.

Table 1-1 Previous Analytical Results Building S-50 UST Site (mg/kg)		
Sample Location	TPH, Diesel Range Organics (Hi Boil Hydrocarbons)	TPH, Gasoline Range Organics (Lo Boil Hydrocarbons)
UST NE Corner	1,150	< 5.0
UST NW Corner	< 5.0	< 5.0
UST SE Corner	< 5.0	< 5.0
UST SW Corner	< 5.0	< 5.0

Note: TPH = Total Petroleum Hydrocarbons

2.0 SOIL INVESTIGATION

2.1 Regional and Site-Specific Geology

The site is located within the central Mississippi Embayment geologic province consisting of a 200-mile wide trough or syncline that plunges southward along an axis which approximates the Mississippi River. The Embayment is filled with several thousand feet of sediment dating from the Quaternary to Cretaceous Periods (0 to 140 million years ago). The geology and hydrogeology consist of a thick sequence of unconsolidated Quaternary and Tertiary sediments. This sequence comprises, in ascending order, the Wilcox Group, the Claiborne Group, Terrace Deposits and the surficial loess deposits. Two major aquifer systems are included in this sequence, the Fort Pillow Formation (Wilcox Group) and the Memphis Sand Formation (Lower Claiborne Group.) These aquifers provide approximately 95 percent of the municipal and industrial water supplies for the Memphis and Shelby County areas. These aquifers are overlain by the Jackson-Upper Claiborne confining unit (Jackson Clay, Cockfield, and Cook Mountain Formations). This significant confining unit retards the downward migration of shallow groundwater to the potable subordinate aquifers.

The Terrace deposits and the surficial loess deposits are stratigraphically above the Jackson Clay. The Terrace deposits consist of Pleistocene and Pliocene age sand, gravel, some clay with thin layers of a ferruginous sandstone, and conglomerates at the base. This unit ranges in thickness from 0 feet to 100 feet and has limited uses as a groundwater source for agricultural applications.

The surficial loess deposits are windblown sediments comprised of silt, silty clay, clay, and minor amounts of sand. Loess is typically 0 feet to 65 feet in the Memphis area. Water-bearing zones are present in this unit; however, yield is low and water quality is poor.

Soil types encountered during boring activities consist of clayey silts and silty clays from the surface to the terminating depth of the boring. A layer of soft gray clay was encountered in boring S50-SB-2 at a depth of 11.0 feet below grade. The maximum depth penetrated was 21 feet below grade in borings S50-SB-2 through S50-SB-5, all of which terminated in a medium brown, soft silty clay. Lithologic cross sections generated from boring log data can be found in Figures 2-1, 2-2, and 2-3. Boring logs are included in Appendix A.

Shelby tube samples collected from boring S50-SB-5 at depth intervals of 7 feet to 8.5 feet and 11 feet to 13 feet indicate average permeabilities of 3.8×10^{-8} cm/sec and 1.3×10^{-5} cm/sec, respectively. Shelby tube samples were analyzed through a flexi-wall permeameter per ASTM Method 5084. The samples were collected from the zones suspected of having the highest permeabilities and from the soil-water interface. Results of the permeability analysis are presented in Appendix B.

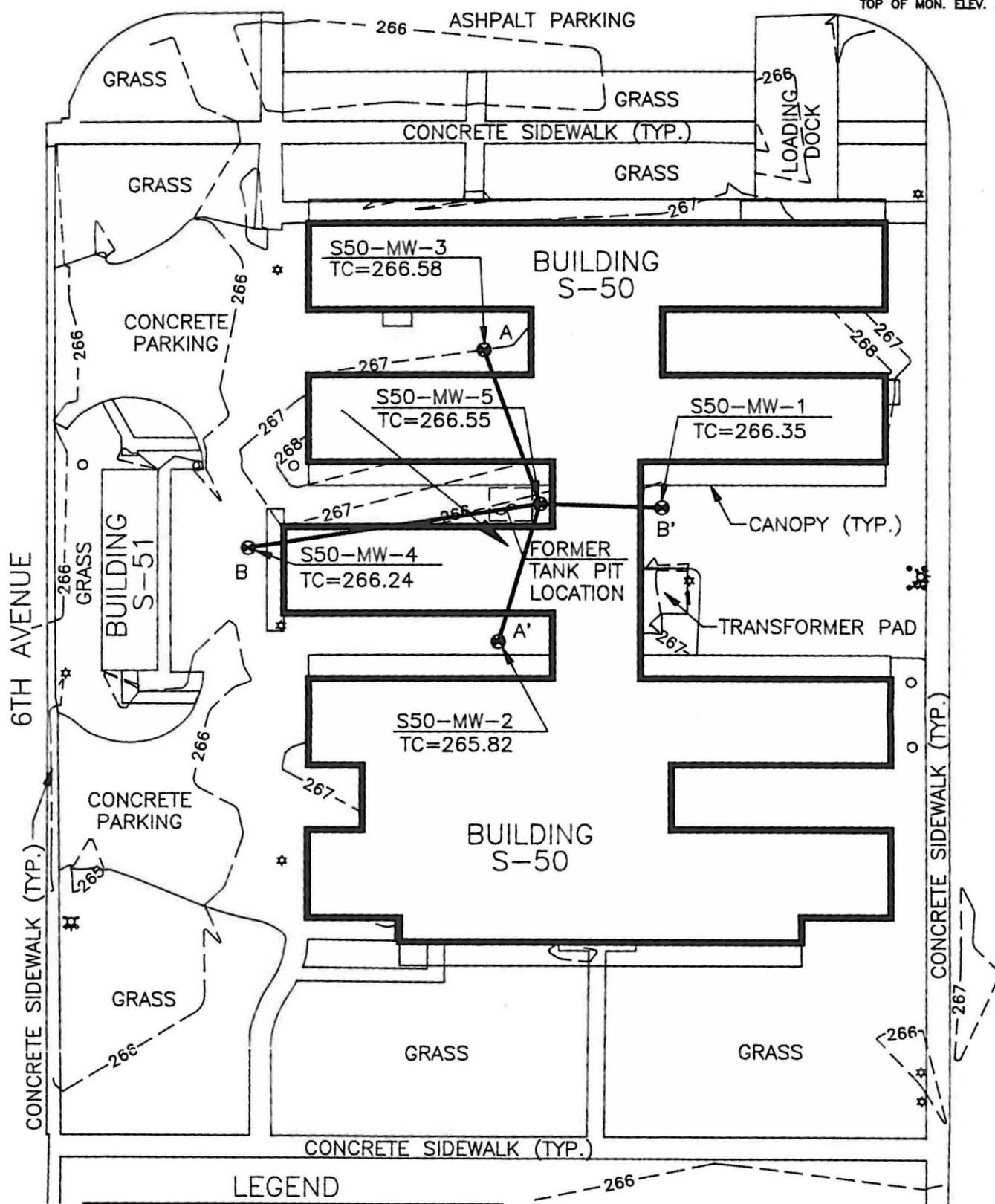
Due to the confining nature of the Jackson-Upper Claiborne and the shallow extent of the fuel release at the facility, impact to the potable aquifer systems is not likely at the Building S-50 UST site.

2.2 Soil Borings

Five soil borings were drilled to define the extent of soil contamination and to characterize the geology/surficial sediments beneath the site (Figure 2-4). Soil borings were drilled in conjunction with monitoring well installations. Soil samples were collected continuously using a 5-foot long, 2-inch inner diameter (ID) split barrel sampler through the hollow-stem augers to the terminating depth of the boring. Soil retrieved from the sampler was analyzed in place using a HNu Model GP101 Photoionization Detector (PID) to determine the interval exhibiting the highest concentration of Volatile Organic Compounds (VOCs). The interval exhibiting the highest PID readings was sampled in accordance with the Environmental Assessment Plan

"F" STREET

BENCHMARK
MONUMENT 33, GRID COORINATES N 3-1+73,
W 85+27, LOCATED SOUTH OF "F" STREET
APPROX. 110' EAST OF 5TH AVE.
TOP OF MON. ELEV. 263.77



LEGEND

- * POWER POLE
- ⊠ FIRE HYDRANT
- MONITOR WELL
- GUARD POST (BOLLARD)
- STEAM PIPE POST
- - - 266 - - - EXIST. GROUND CONTOUR
- S50-MW-3 MONITOR WELL I.D.
- TC=266.58 TOP OF CASING ELEVATION

50 0 50
SCALE FEET

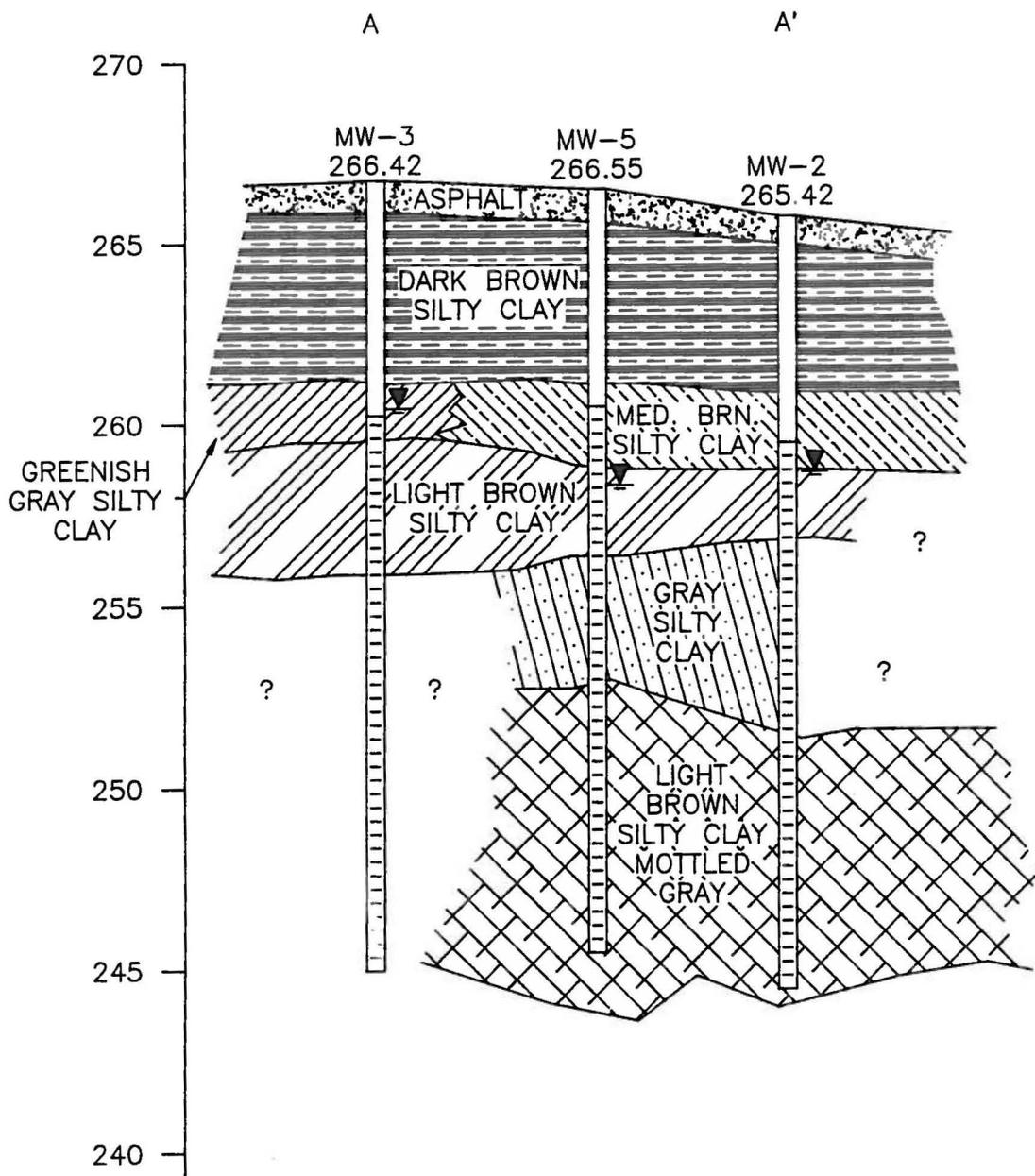


ENVIRONMENTAL
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FIGURE 2-1
A-A' AND B-B'
LOCATION MAP
BLDG. S-50 UST SITE

DATE: 09/30/93

DWG NAME: 68ABL21S



LEGEND

▼ - WATER LEVEL

SCALE: VERTICAL 1" = 5'
 HORIZONTAL 1" = 50'

NOTE: WATER LEVEL DATA
 COLLECTED 06/28/93

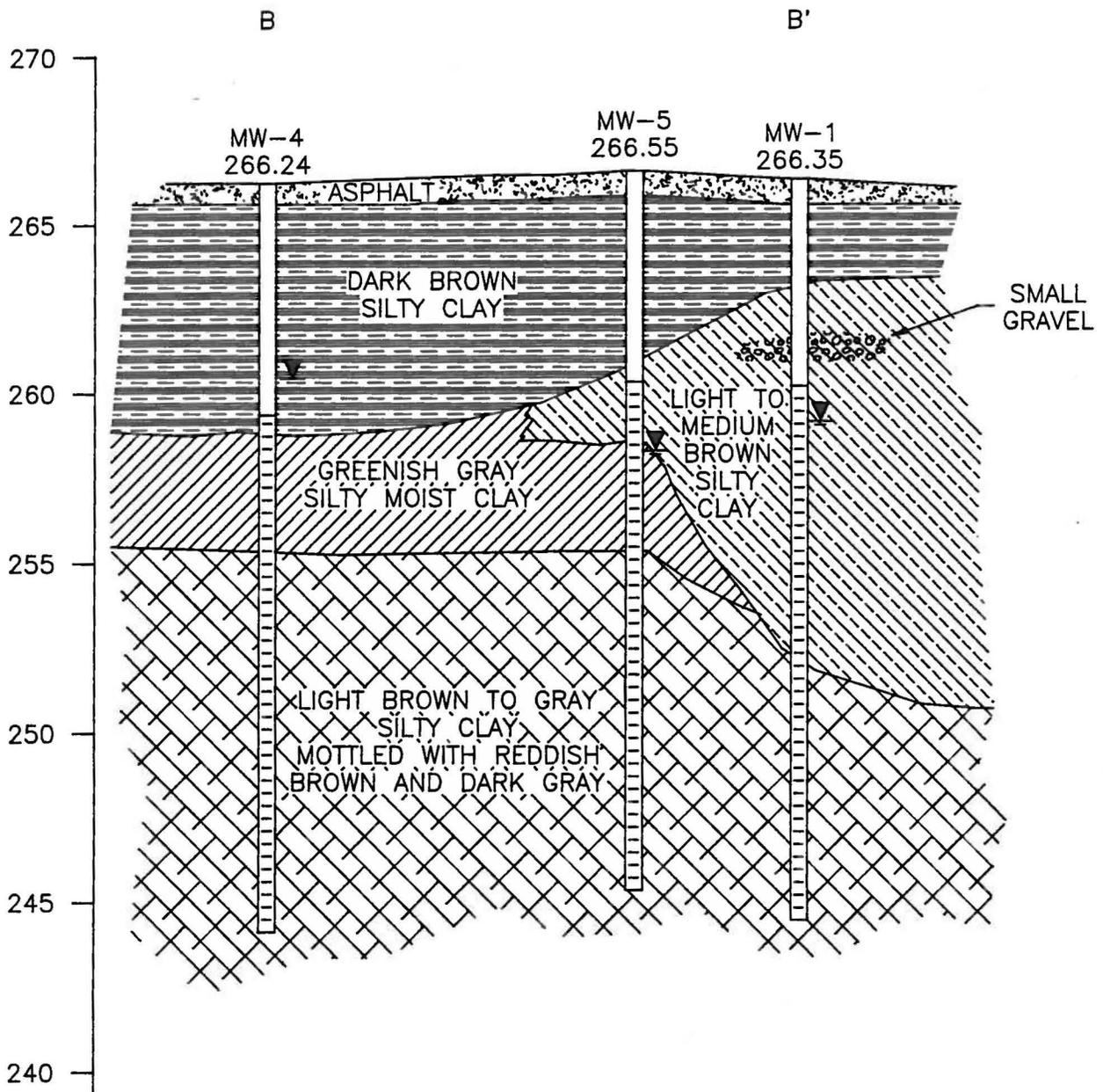


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FIGURE 2-2
 BUILDING S-50 UST SITE
 GEOLOGIC CROSS-SECTION
 A-A'

DWG DATE: 08/27/93

DWG NAME: 068CRS1



LEGEND

▼ - WATER LEVEL

SCALE: VERTICAL 1" = 5'
 HORIZONTAL 1" = 50'

NOTE: WATER LEVEL DATA.
 COLLECTED 06/28/93



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FIGURE 2-3
 BUILDING S-50 UST SITE
 GEOLOGIC CROSS-SECTION
 B-B'

Table 3-1 Water Table Elevations Building S-50 Monitoring Wells					
Monitoring Well	Measuring Point Elevation (Mean Sea Level)	Date of Measurements			
		June 28, 1993		July 6, 1993	
		Depth to Water (ft btoc)^a	Water Level Elevations (ft)^b	Depth to Water (ft btoc)	Water Level Elevations (ft)
S50-MW-1	266.35	6.76	259.59	6.81	259.54
S50-MW-2	265.82	6.80	259.02	6.91	258.91
S50-MW-3	266.58	5.35	261.23	5.37	261.21
S50-MW-4	266.24	5.29	260.95	5.31	260.93
S50-MW-5	266.55	7.64	258.91	7.66	258.89

Notes:

- ^a - ft. btoc = feet below top of casing
- ^b - ft. mean sea level

Groundwater Gradient

The greatest and the lowest horizontal hydraulic gradients were calculated using the piezometric surface diagrams. The calculated hydraulic gradient for all wells is presented in Table 3-2. The lowest gradient was calculated from Figure 3-2 (6/28/93) by using the following relationship:

$$\text{Lowest gradient} = 0.68 \text{ ft. head change} / 44 \text{ ft. distance} = 0.015 \text{ ft./ft.}$$

The highest gradient was calculated from Figure 3-3 (7/6/93) with the following relationship:

$$\text{Highest gradient} = 2.32 \text{ ft. head change} / 60 \text{ ft. distance} = 0.039 \text{ ft./ft.}$$

Table 3-2 Hydraulic Gradients Building S-60 UST Site	
06/28/93	07/06/93
∇ (MW1, MW2) = $\frac{259.59 \text{ ft} - 259.02 \text{ ft}}{78.0 \text{ ft}} = 7.3 \times 10^{-3} \text{ ft/ft}$	∇ (MW1, MW2) = $\frac{259.54 \text{ ft} - 258.91 \text{ ft}}{78.0 \text{ ft}} = 8.1 \times 10^{-3} \text{ ft/ft}$
∇ (MW1, MW3) = $\frac{259.59 \text{ ft} - 261.23 \text{ ft}}{87.0 \text{ ft}} = -1.9 \times 10^{-2} \text{ ft/ft}$	∇ (MW1, MW3) = $\frac{259.54 \text{ ft} - 261.21 \text{ ft}}{87.0 \text{ ft}} = -1.9 \times 10^{-2} \text{ ft/ft}$
∇ (MW1, MW4) = $\frac{259.59 \text{ ft} - 260.95 \text{ ft}}{151.0 \text{ ft}} = -9.0 \times 10^{-3} \text{ ft/ft}$	∇ (MW1, MW4) = $\frac{259.54 \text{ ft} - 260.93 \text{ ft}}{151.0 \text{ ft}} = -9.2 \times 10^{-3} \text{ ft/ft}$
∇ (MW1, MW5) = $\frac{259.59 \text{ ft} - 258.91 \text{ ft}}{38.0 \text{ ft}} = 1.8 \times 10^{-2} \text{ ft/ft}$	∇ (MW1, MW5) = $\frac{259.54 \text{ ft} - 258.89 \text{ ft}}{38.0 \text{ ft}} = 1.7 \times 10^{-2} \text{ ft/ft}$
∇ (MW2, MW3) = $\frac{259.02 \text{ ft} - 261.23 \text{ ft}}{108.0 \text{ ft}} = -2.0 \times 10^{-2} \text{ ft/ft}$	∇ (MW2, MW3) = $\frac{258.91 \text{ ft} - 261.21 \text{ ft}}{108.0 \text{ ft}} = -2.1 \times 10^{-2} \text{ ft/ft}$
∇ (MW2, MW4) = $\frac{259.02 \text{ ft} - 260.95 \text{ ft}}{97.0 \text{ ft}} = -2.0 \times 10^{-2} \text{ ft/ft}$	∇ (MW2, MW4) = $\frac{258.91 \text{ ft} - 260.93 \text{ ft}}{97.0 \text{ ft}} = -2.1 \times 10^{-2} \text{ ft/ft}$
∇ (MW2, MW5) = $\frac{259.02 \text{ ft} - 258.91 \text{ ft}}{58.0 \text{ ft}} = 1.9 \times 10^{-3} \text{ ft/ft}$	∇ (MW2, MW5) = $\frac{258.91 \text{ ft} - 258.89 \text{ ft}}{58.0 \text{ ft}} = 3.4 \times 10^{-4} \text{ ft/ft}$
∇ (MW3, MW4) = $\frac{261.23 \text{ ft} - 260.95 \text{ ft}}{112.0 \text{ ft}} = 2.5 \times 10^{-3} \text{ ft/ft}$	∇ (MW3, MW4) = $\frac{261.21 \text{ ft} - 260.93 \text{ ft}}{112.0 \text{ ft}} = 2.5 \times 10^{-3} \text{ ft/ft}$
∇ (MW3, MW5) = $\frac{261.23 \text{ ft} - 258.91 \text{ ft}}{61.0 \text{ ft}} = 3.8 \times 10^{-2} \text{ ft/ft}$	∇ (MW3, MW5) = $\frac{261.21 \text{ ft} - 258.89 \text{ ft}}{61.0 \text{ ft}} = 3.8 \times 10^{-2} \text{ ft/ft}$
∇ (MW4, MW5) = $\frac{260.95 \text{ ft} - 258.91 \text{ ft}}{108.0 \text{ ft}} = 1.9 \times 10^{-2} \text{ ft/ft}$	∇ (MW4, MW5) = $\frac{260.93 \text{ ft} - 258.89 \text{ ft}}{108.0 \text{ ft}} = 1.9 \times 10^{-2} \text{ ft/ft}$

Groundwater gradients were calculated by the following equation:

$$\nabla = \frac{A - B}{C}$$

∇ = Gradient (ft/ft)

A = Elevation of 1st well (ft MSL)

B = Elevation of 2nd well (ft MSL)

C = Distance AB (ft)

3.2 Monitoring Well Construction

Monitoring wells were drilled with a CME 45 rotary drill rig using 4.25-inch inner diameter (8.25-inch outer diameter) hollow-stem augers. Monitoring wells S50-MW-1 and S50-MW-2 were installed on June 15, 1993. Monitoring wells S50-MW-3, S50-MW-4, and S50-MW-5

were installed on June 16, 17, and 18 respectively. All auger, drilling rod, and sampling equipment was steam cleaned before drilling activities began. Clean augers were used for each monitoring well to prevent cross contamination. Monitoring wells were constructed of 2-inch diameter, Schedule 40 PVC. A 15-foot 0.010-inch slot, PVC screen was positioned 3 feet above and 12 feet below the soil/water interface to ensure adequate screening of "floater" contaminants, while allowing for temporal fluctuations in the water table.

The annular space surrounding each monitoring well was filled with a 10/20 silica sand pack from the bottom of the borehole to 1 foot above the screened interval. Sand was poured from the surface through the annular space of the hollow-stem augers. A 2-foot bentonite seal was placed over the sand pack and the remaining annular space was filled to near land surface with a 97/3 percent mixture of Portland Type I cement and bentonite grout. A water-tight locking expansion cap was placed on each well casing. A man-hole type, flush-mount protective vault was installed to maintain well integrity and security.

Monitoring well completion data are provided in Table 3-3 and calculated versus actual well construction materials used in Table 3-4. Monitoring well construction details are provided in Appendix D.

Table 3-3 Well Completion Data Building S-50 UST Site					
Monitoring Well Identification	Installation Date	Total Depth (ft. btoc) ^a	Well Diameter (inches)	Screened Interval (ft. bls)	Top of Casing Elevation ^b
S50-MW-1	15 June 93	21.80	2	6.8 - 21.8	266.35
S50-MW-2	15 June 93	21.30	2	6.3 - 21.3	265.82
S50-MW-3	16 June 93	21.40	2	6.4 - 21.4	266.58
S50-MW-4	17 June 93	21.10	2	6.1 - 21.1	266.24
S50-MW-5	18 June 93	21.10	2	6.1 - 21.1	266.55

Notes:
 a - below top of casing
 b - mean sea level

Table 3-4 Well Construction Materials Building S-50 UST Site								
Monitoring Well Identification	Calculated Material Volumes Used				Actual Material Volumes Used			
	Sand^a 100 lb. bag	Bentonite^b 5 gal. bucket	Grout^c 94 lb. bag	Cement^d 80 lb. bag	Sand 100 lb. bag	Bentonite 5 gal. bucket	Grout 96 lb. bag	Cement 80 lb. bag
S50-MW-1	3.75	½	1	8	3.75	½	1	8
S50-MW-2	3.75	½	1	8	3.75	½	1	8
S50-MW-3	3.75	½	1	8	3.75	½	1	8
S50-MW-4	3.75	½	1	8	3.75	½	1	8
S50-MW-5	3.75	½	1	8	3.75	½	1	8

Notes:

- ^a Sand = 10/20 sieve size
- ^b Bentonite = ¼-inch pellets
- ^c Grout = Portland Type I/Bentonite (93/7%) mixture
- ^d Cement = Sakrete used in pad construction

3.3 Monitoring Well Development

Development of the monitoring wells was carried out by the drilling subcontractor using a combination of a decontaminated PVC hand-pump and a 2-inch submersible pump. Between six and eight well volumes were removed from each well and development continued until visual consistency was achieved. All monitoring wells remained high in fine suspended solids. Well development and purge water was containerized in DOT approved 55-gallon drums, labeled, numbered, and left onsite. During monitoring well development and later sampling activities, no free product was discovered in any of the monitoring wells.

3.4 Monitoring Well Sampling

Groundwater samples were collected from monitoring wells S50-MW-1 through S50-MW-5 on June 28, 1993. Groundwater samples from S50-MW-1 through S50-MW-5 were collected with disposable 3-foot PVC single-check valve bailers.

Static water level measurements were recorded for each well and a minimum of three casing volumes were purged from each well before groundwater sampling. Purging was performed to remove stagnant water from the well casing and to assure that groundwater samples were representative of the surrounding aquifer. Select water quality measurements were collected during purging including pH, temperature, and conductivity (see Table 3-5). Measured water quality parameters were stabilized to within the following specifications before sampling:

pH	= ± 0.5 units
Temperature	= ± 1° C
Conductivity	= ± 10%

Groundwater samples were transferred directly from the bailer into laboratory-prepared containers preserved with hydrochloric acid, immediately packed on ice and delivered via overnight courier to International Technologies Services Analytical Laboratory in Knoxville, Tennessee. Samples were analyzed for DRO using Modified EPA Method 8015/TN DRO. Field and equipment blanks were collected and analyzed for the same parameters. Matrix Spikes and Matrix Spike Duplicates (MS/MSD) were collected to validate laboratory precision and accuracy as discussed in the Data Validation portion of Section 4.0 of this EAR.

3.5 Groundwater Analytical Results

Free product was not observed in groundwater from any monitoring wells at the facility. Analytical results indicated DRO above detection limits in sample S50-MW-3 at a concentration of 0.15 ppm.

Table 3-5 Well Purging Data Building S-50 UST Site							
Well #	Total Depth (ft. btoc)	Depth to Water (ft. btoc)	Well Volume (gallons)	Purge Volume (gallons)	pH	Conductivity (mhos)	Temperature (°C)
S50-MW-1	21.06	6.76	2.33	6.99	6.43	.545	26.9
					6.57	.511	27.7
					6.61	.516	26.8
S50-MW-2	21.08	6.80	2.33	6.98	6.48	.534	26.2
					6.37	.526	25.8
					6.30	.536	25.7
S50-MW-3	21.0	5.35	2.55	7.55	6.45	.428	24.2
					6.45	.432	23.8
					6.46	.432	24.1
S50-MW-4	21.08	5.29	2.57	7.72	6.51	.456	24.0
					6.42	.448	23.8
					6.41	.457	23.5
S50-MW-5	21.10	7.64	2.19	5.59	6.64	.455	23.7
					6.57	.455	23.6
					6.55	.454	23.5

of 0.150 ppm. This sample was from S50-MW-3 and is below TDEC's cleanup level of 1.0 ppm for non-drinking water aquifers. A summary of the groundwater analytical results is

presented in Table 3-6. The laboratory results for the groundwater analysis are presented in Appendix E.

Table 3-6 Groundwater Analytical Results Building S-50 UST Site	
Well #	DRO Concentrations (ppm)
S50-MW-1	BDL*
S50-MW-2	BDL
S50-MW-2DUP	BDL
S50-MW-3	0.15
S50-MW-4	BDL
S50-MW-5	BDL

Note:

* — Below Method Detection Limit

3.6 Groundwater Classification

A water use survey was conducted in the vicinity to determine whether any domestic or agricultural wells are accessing the surficial aquifer. A water well survey completed by the Memphis and Shelby County Health Department (Appendix F) found the closest well to be located approximately one mile west of the site. Furthermore, there are no reported records of wells local to the site.

A groundwater sample was collected from monitoring well S50-MW-5 on June 28 and analyzed for Primary and Secondary Drinking Water Standards in accordance with the TDEC's Technical Guidance Document 002 (Table 3-7). Analytical results indicate iron and manganese in excess of the respective suggested levels for drinking water.

Table 3-7 Drinking Water Quality Building S-50 UST Site		
Parameters	Result (ppm)	Standard (ppm)
Iron	46.3	0.3
Manganese	2.77	0.05

Because the shallow aquifer is not being utilized as a water source (drinking or otherwise) local to the site, and because the elevated iron and manganese content fails to meet the drinking water standards, the aquifer can be characterized as a "non-drinking water" aquifer. Based upon this classification, the TDEC cleanup levels are 1.0 ppm DRO for groundwater and 1,000 ppm for soil.

4.0 DATA VALIDATION

Data validation has been performed on all analytical data collected for the environmental assessment at Building S-50, NAS Memphis, Millington, Tennessee. The analytical work was conducted by International Technology Analytical Services (IT), Knoxville, TN.

A total of 11 soil samples, 6 groundwater samples and 4 field/rinsate blanks were collected as part of this investigation. Sample collection at NAS Memphis, Building S-50 was performed and reported under three separate sample delivery groups (SDGs): ENFA 54340, ENFA 54350, and ENFA 54420. The SDGs were all received by the laboratory in good condition, with the proper custody documents and seals intact. The laboratory reported that the first cooler of groundwater samples (SDG 54420) was at a temperature of 9° C upon arrival. The samples were processed as received.

Ten soil and six water samples were analyzed for total high-boiling petroleum hydrocarbons, also known as diesel-range organics (DRO), by the DRO-TPH 8015/TN DRO Method. The technical holding times from the time of sample collection until the time of sample extraction and/or analysis, were found to be within method requirements. All surrogate spike recoveries, MS/MSD, and blank spike analysis results were within QC criteria. Method blanks were analyzed in compliance with QC requirements, and no contamination was detected in either method or field blanks.

Data Assessment

The analytical data produced in support of the environmental assessment at Building S-50 have been reviewed and validated in accordance with applicable EPA guidelines as found in *Quality Assurance/Quality Control Guidance for Removal Activities: Sampling QA/QC Plan and Data Validation Procedures, EPA/540/G-90/004*, as well as applicable NEESA guidelines. No

significant QC problems were encountered during the data review. The data quality is considered to be good and the data are usable.

The analytical data are presented in summary form, outlining the positively detected compounds and qualified data critical to the reader.

Data Qualifier Definitions

The following is a brief explanation of the data qualifiers used in the validation process.

- U** — The compound was analyzed for, but not detected above the reported sample quantitation limit.
- J** — The compound was positively detected but the reported concentration is considered to approximate the concentration within the sample.
- UJ** — The compound was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the compound in the sample.
- R** — The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. The presence or absence of the compound cannot be verified.

5.0 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are based on the information gathered during assessment activities.

Conclusions:

- DRO concentrations in the soil do not exceed TDEC cleanup levels for a non-drinking water aquifer.
- DRO concentrations in groundwater do not exceed TDEC cleanup levels for a non-drinking water aquifer. Therefore, no contaminant plume exists at this site.
- The apparent groundwater flow direction beneath the site is centered toward the source area (S50-MW-5) with an average hydraulic gradient of 0.030 ft./ft.
- Depth to the static water table beneath the site ranges between 5.3 feet and 7.6 feet below grade.
- Free product was not detected in any monitoring wells.
- Permeabilities of soil samples collected in native soils outside the tank pit exhibited average vertical hydraulic conductivities ranging from 1.3×10^{-5} cm/sec to 3.8×10^{-8} cm/sec, which are typical permeabilities of clay.
- The aquifer can be classified as non-drinking water based on a water use survey in the site vicinity and on water samples collected near the site which did not meet several primary and secondary drinking water standards.

Recommendations:

In lieu of a Corrective Action Plan, EnSafe/Allen & Hoshall recommends no further action be taken at this location because no petroleum contamination above TDEC action levels was found at the Building S-50 UST site. Upon receipt of approval from TDEC for no further action, monitoring wells installed during this Environmental Assessment should be properly abandoned in accordance with the TDEC UST Guidelines.

6.0 SIGNATURE PAGE

I, the undersigned, do hereby affirm that the information contained in this report is accurate and correct to the best of my knowledge and belief.

Name: Paul V. Stoddard
State: Tennessee
Registration No. TN0249
Date: October 8, 1993

A handwritten signature in cursive script, followed by the registration number "TN 0249" written in a similar style. The signature and number are written over a horizontal line.

Signature/Date

APPENDIX A
BORING LOGS

DESCRIPTION OF SUBSURFACE MATERIALS

DEPTH (FEET)	SAMPLE TYPE	% RECOVERY	TIME	DESCRIPTION
				ASPHALT TO 0.8' 0.8'-1.0' DARK BROWN STIFF SILTY CLAY
				SAME AS ABOVE
	SS 75	0925		3.0'-5.0' LIGHT BROWN SILTY STIFF CLAY MOTTLED WITH GRAY
5	SS 100	0930		5.0'-5.5' BROWN SILTY CLAY WITH SOME GRAVEL 5.5'-7.0' LIGHT BROWN SILTY STIFF CLAY
	SS 100	0935		
				LIGHT BROWN SILTY SOFT CLAY MOTTLED WITH GRAY MOIST WET @ 9.0'
	SS 100	0940		LIGHT BROWN SILTY SOFT CLAY MOTTLED WITH GRAY MOIST
10				
	SS 100	0945		
				SAME AS ABOVE GRAY SOFT SILTY CLAY MOTTLED WITH LIGHT BROWN AT 12.7' MOIST
	SS 100	0948		
15				▼ GRAY FINE SANDY CLAY WATER AT 14.5'
	SS 100	0950		
				LIGHT BROWN SILTY SOFT CLAY MOTTLED WITH GRAY WET
	SS 100	0955		
				SAME AS ABOVE VERY WET
	SS 100	1000		
20				
				SAME AS ABOVE BLUISH GRAY SILTY SOFT CLAY AT 20.5'
	SS 100	1005		
	TD			TOTAL DEPTH 21.8'
25				



ENVIRONMENTAL ASSESSMENT
REPORT
NAS MEMPHIS

S50-SB-1
BUILDING S-50 UST SITE
NAS MEMPHIS

DATE: 09/30/93

DWG NAME: 068SB-1

DESCRIPTION OF SUBSURFACE MATERIALS

DEPTH (FEET)	SAMPLE TYPE	% RECOVERY	TIME	DESCRIPTION
				ASPHALT TO 0.8'
				DARK BROWN SILTY STIFF CLAY MOTTLED WITH REDDISH BROWN FERROUS DEPOSITS
	SS 75	1335		
				SAME AS ABOVE
5	SS 100	1338		
				5.0'-5.4' MEDIUM BROWN SILTY CLAY SOME SMALL ANG. CHERT GRAVEL (MOIST)
	SS 100	1342		5.4-7.0 DARK BROWN SILTY STIFF CLAY
				DARK BROWN SILTY SOFT CLAY MOTTLED WITH GRAY
	SS 100	1345		8.6-9.0 MEDIUM BROWN SILTY CLAY WET SAME AS ABOVE BUT DRYER AND STIFF
10				9.5-11.0 GRAY SILTY MOIST CLAY MOTTLED WITH BROWN
	SS 100	1350		
				DARK GRAY SILTY SOFT CLAY MOTTLED WITH LIGHT BROWN
	SS 100	1355		▼ WATER AT 12.5'
				SAME AS ABOVE WET
				14.2'-15.0' LIGHT BROWN SILTY WET CLAY MOTTLED WITH GRAY
15	SS 100	1358		
				SAME AS ABOVE TO 16.1
				16.1-17.0' LIGHT GRAY SILTY WET SAND MOTTLED WITH LIGHT BROWN
	SS 100	1405		
				SAME AS ABOVE TO 18.0'
	SS 100	1410		118.0-19.0' LIGHT BROWN SILTY WET CLAY MOTTLED WITH GRAY AND FERROUS DEPOSITS
20				
				SAME AS ABOVE WET
	SS 100	1415		
	TD			TOTAL DEPTH 21.3'
25				



ENVIRONMENTAL ASSESSMENT
REPORT
NAS MEMPHIS

S50-SB-2
BUILDING S-50 UST SITE
NAS MEMPHIS

DATE: 09/30/93

DWG NAME: 068SB-2

DESCRIPTION OF SUBSURFACE MATERIALS

DEPTH (FEET)	SAMPLE TYPE	% RECOVERY	TIME	DESCRIPTION
				ASPHALT TO 0.8'
				DARK BROWN SILTY STIFF CLAY
	SS 75	0833		
				SAME AS ABOVE MOTTLED WITH REDDISH BROWN FERROUS DEPOSITS
5	SS 100	0835		5.3 TO 6.2' GREENISH GRAY SILTY CLAY SOFT AND MOIST 6.2' TO 7.0' GREEN GRAY CLAY MOTTLED WITH LIGHT BROWN
	SS 100	0840		LIGHT BROWN SOFT SILTY CLAY MOTTLED WITH GRAY AND SOME FERROUS DEPOSITS VERY MOIST FROM 8.9'-9.0'
	SS 100	0845		
10				SAME AS ABOVE
	SS 100	0850		GRAY SILTY SOFT CLAY MOTTLED WITH LIGHT BROWN SAND FERROUS DEPOSITS
	SS 100	0855		▼ WATER AT 12.5'
				SAME AS ABOVE VERY WET
15	SS 100	0900		
				SAME AS ABOVE
	SS 100	0910		
				SAME AS ABOVE
	SS 100	0915		
20				SAME AS ABOVE TO 20.5'
	SS 100	0920		20.5' TO 21.0' DARK GRAY SOFT SILTY CLAY MOTTLED WITH FERROUS DEPOSITS
	TD			TOTAL DEPTH 21.4'
25				



ENVIRONMENTAL ASSESSMENT
REPORT
NAS MEMPHIS

S50-SB-3
BUILDING S-50 UST SITE
NAS MEMPHIS

DATE: 09/30/93

DWG NAME: 068SB-3

DESCRIPTION OF SUBSURFACE MATERIALS

DEPTH (FEET)	SAMPLE TYPE	% RECOVERY	TIME	DESCRIPTION
				ASPHALT TO 0.8'
	SS	75	1042	MEDIUM BROWN SILTY SOFT CLAY MOTTLED WITH REDDISH BROWN
				SAME AS ABOVE
5	SS	100	1045	
				5.2-7.0 DARK BROWN SILTY STIFF CLAY MOTTLED WITH GRAY
	SS	100	1047	7.3-9.0 GREENISH GRAY SILTY MOIST CLAY MOTTLED WITH SOME DARK BROWN
	SS	100	1053	9.0-10.8 GREEN GRAY SILTY SOFT CLAY MOTTLED WITH LIGHT YELLOW BROWN
10	SS	100	1055	10.8-11.0 MEDIUM BROWN SILTY SOFT CLAY
	SS	100	1100	GRAY SILTY SOFT CLAY MOTTLED WITH REDDISH BROWN ▼ SAND DARK GRAY-WATER AT 12.5'
				SAME AS ABOVE
15	SS	100	1105	
				SAME AS ABOVE
	SS	100	1110	
				SAME AS ABOVE
	SS	100	1115	
20	SS	100	1125	GRAY SILTY WET CLAY MOTTLED WITH REDDISH BROWN AND DARK GRAY
	TD			TOTAL DEPTH 21.1'
25				



ENVIRONMENTAL ASSESSMENT
 REPORT
 NAS MEMPHIS

S50-SB-4
 BUILDING S-50 UST SITE
 NAS MEMPHIS

DATE: 09/30/93

DWG NAME: 068SB-4

DEPTH (FEET)	SAMPLE TYPE	% RECOVERY	TIME	DESCRIPTION OF SUBSURFACE MATERIALS
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				<p>ASPHALT AT 0.8'</p>
5	SS 100	100	0900	<p>DARK BROWN SILTY SOFT CLAY MOTTLED WITH GRAY</p>
	SS 100	100	0910	<p>DARK BROWN SILTY SOFT CLAY MOTTLED WITH GRAY AND FERROUS DEPOSITS</p>
	SS 100	100	0915	<p>5.2-6.0 MEDIUM BROWN SILTY SOFT CLAY MOTTLED WITH REDDISH BROWN 6.0-7.0 DARK BROWN SILTY SOFT CLAY MOIST MOTTLED WITH GRAY AND FERROUS DEPOSITS</p>
	SS 100	100	0955	<p>GREENISH GRAY "STAINED" CLAY AT 8.0' STRONG PETROLEUM ODOR</p>
10	SS 100	100	1010	<p>GREENISH GRAY "STAINED" SOFT SILTY CLAY MOTTLED WITH LIGHT BROWN, STRONG PETROLEUM ODOR</p>
	SS 100	100	1020	<p>▼ WATER BETWEEN 11.0-13.0' GRAY SILTY WET CLAY MOTTLED WITH LIGHT BROWN CLAY LIGHT BROWN CLAY WET MOTTLED WITH GRAY</p>
15	SS 100	100	1020	
	SS 100	100	1030	<p>LIGHT BROWN SILTY WET CLAY MOTTLED WITH GRAY WET</p>
	SS 100	100	1040	<p>SOS WITH FERROUS DEPOSITS WET</p>
20	SS 100	100	1045	<p>SOS WITH FERROUS DEPOSITS, WET</p>
	TD			<p>TOTAL DEPTH 21.0'</p>
25				

APPENDIX B
PERMEABILITY RESULTS



Professional Service Industries, Inc.

October 8, 1993

Mr. Chuck Mason
EnSafe
5724 Summer Trees Drive
Memphis, Tennessee 38134

Re: Permeability Test Results
Building S50
Naval Air Station
Millington, Tennessee

Dear Chuck,

Following are the results of the permeability tests performed on undisturbed Shelby tube samples. The tests were performed under ASTM Method D 5084

Boring No.	Depth, feet	K cm/s
SB-1	7 - 8.5	3.79×10^{-8}
SB-5	11 - 13	1.32×10^{-5}

We appreciate the opportunity to have provided you with our geotechnical services. If you have any questions, please contact our office.

Respectfully submitted,

PROFESSIONAL SERVICE INDUSTRIES, INC.


Raj Krishnasamy
Department Manager

RK/mt

APPENDIX C
SOIL ANALYTICAL RESULTS

HIGH BOILING PETROLEUM HYDROCARBONS ANALYSIS

Laboratory Name:	ITAS-KNOXVILLE	SDG Number:	NA
Contract Name:	ENSAFE NAS MEMPHIS	Job Number:	ENFA 54340
Client Sample ID:	S50-SB1-15	Collection Date:	06/15/93
Lab Sample ID:	XX6101	Extraction Date:	06/21/93
Sample Matrix:	SOIL	Analysis Date:	06/26/93
Concentration Units:	mg/kg	Dryness Factor:	0.7681

Compound	Results	Qualifiers	Detection Limits
total high boiling petroleum hydrocarbons, as diesel range organics	10	U	10

Surrogate Recovery	C ₃₂	C ₃₂
Acceptance Limits: SOIL	(41-149%)	(59-179%)
Lab Sample I.D.: XX6101	97	103

HIGH BOILING PETROLEUM HYDROCARBONS ANALYSIS

Laboratory Name:	ITAS-KNOXVILLE	SDG Number:	NA
Contract Name:	ENSAFE NAS MEMPHIS	Job Number:	ENFA 54340
Client Sample ID:	S50-SB2-13	Collection Date:	06/15/93
Lab Sample ID:	XX6102	Extraction Date:	06/21/93
Sample Matrix:	SOIL	Analysis Date:	06/26/93
Concentration Units:	mg/kg	Dryness Factor:	0.7267

Compound	Results	Qualifiers	Detection Limits
total high boiling petroleum hydrocarbons, as diesel range organics	10	U	10

Surrogate Recovery	C ₃₂	C ₃₇
Acceptance Limits: SOIL	(41-149%)	(59-179%)
Lab Sample I.D.: XX6102	93	99

HIGH BOILING PETROLEUM HYDROCARBONS ANALYSIS

Laboratory Name:	ITAS-KNOXVILLE	SDG Number:	NA
Contract Name:	ENSAFE NAS MEMPHIS	Job Number:	ENFA 54340
Client Sample ID:	S50-SB2-13 DUP	Collection Date:	06/15/93
Lab Sample ID:	XX6103	Extraction Date:	06/21/93
Sample Matrix:	SOIL	Analysis Date:	06/26/93
Concentration Units:	mg/kg	Dryness Factor:	0.7625

Compound	Results	Qualifiers	Detection Limits
total high boiling petroleum hydrocarbons, as diesel range organics	10	U	10

Surrogate Recovery	C ₃₂	C ₃₂
Acceptance Limits: SOIL	(41-149%)	(59-179%)
Lab Sample I.D.: XX6103	91	99

Laboratory Name:	ITAS-KNOXVILLE	SDG Number:	NA
Contract Name:	ENSAFE NAS MEMPHIS	Job Number:	ENFA 54340
Client Sample ID:	S50-SB2-21	Collection Date:	06/15/93
Lab Sample ID:	XX6104	Extraction Date:	06/21/93
Sample Matrix:	SOIL	Analysis Date:	06/26/93
Concentration Units:	mg/kg	Dryness Factor:	0.7914

Compound	Results	Qualifiers	Detection Limits
total high boiling petroleum hydrocarbons, as diesel range organics	10	U	10

Surrogate Recovery	C ₃₂	C ₃₂
Acceptance Limits: SOIL	(41-149%)	(59-179%)
Lab Sample I.D.: XX6104	93	101

Laboratory Name:	ITAS-KNOXVILLE	SDG Number:	NA
Contract Name:	ENSAFE NAS MEMPHIS	Job Number:	ENFA 54340
Client Sample ID:	S50-SB3-17	Collection Date:	06/16/93
Lab Sample ID:	XX6105	Extraction Date:	06/21/93
Sample Matrix:	SOIL	Analysis Date:	06/26/93
Concentration Units:	mg/kg	Dryness Factor:	0.7806

Compound	Results	Qualifiers	Detection Limits
total high boiling petroleum hydrocarbons, as diesel range organics	10	U	10

Surrogate Recovery	C_{32}	C_{32}
Acceptance Limits: SOIL	(41-149%)	(59-179%)
Lab Sample I.D.: XX6105	93	101

HIGH BOILING PETROLEUM HYDROCARBONS ANALYSIS

Laboratory Name:	ITAS-KNOXVILLE	SDG Number:	NA
Contract Name:	ENSAFE NAS MEMPHIS	Job Number:	ENFA 54340
Client Sample ID:	S50-SB3-21	Collection Date:	06/16/93
Lab Sample ID:	XX6106	Extraction Date:	06/21/93
Sample Matrix:	SOIL	Analysis Date:	06/26/93
Concentration Units:	mg/kg	Dryness Factor:	0.7846

Compound	Results	Qualifiers	Detection Limits
total high boiling petroleum hydrocarbons, as diesel range organics	10	U	10

Surrogate Recovery	C ₃₂	C ₃₂
Acceptance Limits: SOIL	(41-149%)	(59-179%)
Lab Sample I.D.: XX6106	89	96

HIGH BOILING PETROLEUM HYDROCARBONS ANALYSIS

Laboratory Name:	ITAS-KNOXVILLE	SDG Number:	NA
Contract Name:	ENSAFE NAS MEMPHIS	Job Number:	ENFA 54340
Client Sample ID:	S50-SB4-5	Collection Date:	06/17/93
Lab Sample ID:	XX6107	Extraction Date:	06/21/93
Sample Matrix:	SOIL	Analysis Date:	06/26/93
Concentration Units:	mg/kg	Dryness Factor:	NA

Compound	Results	Qualifiers	Detection Limits
total high boiling petroleum hydrocarbons, as diesel range organics	10	U	10

Surrogate Recovery	C ₃₂	C ₃₂
Acceptance Limits: SOIL	(41-149%)	(59-179%)
Lab Sample I.D.: XX6107	98	104

HIGH BOILING PETROLEUM HYDROCARBONS ANALYSIS

Laboratory Name:	ITAS-KNOXVILLE	SDG Number:	NA
Contract Name:	ENSAFE NAS MEMPHIS	Job Number:	ENFA 54340
Client Sample ID:	S50-SB4-13	Collection Date:	06/17/93
Lab Sample ID:	XX6108	Extraction Date:	06/21/93
Sample Matrix:	SOIL	Analysis Date:	06/26/93
Concentration Units:	mg/kg	Dryness Factor:	0.7814

Compound	Results	Qualifiers	Detection Limits
total high boiling petroleum hydrocarbons, as diesel range organics	10	U	10

Surrogate Recovery	C ₃₂	C ₃₂
Acceptance Limits: SOIL	(41-149%)	(59-179%)
Lab Sample I.D.: XX6108	96	102

Laboratory Name:	ITAS-KNOXVILLE	SDG Number:	NA
Contract Name:	ENSAFE NAS MEMPHIS	Job Number:	ENFA 54350
Client Sample ID:	S50-SB5-11	Collection Date:	06/18/93
Lab Sample ID:	XX6175	Extraction Date:	06/22/93
Sample Matrix:	SOIL	Analysis Date:	06/25/93
Concentration Units:	mg/kg	Dryness Factor:	NA

Compound	Results	Qualifiers	Detection Limits
total high boiling petroleum hydrocarbons, as diesel range organics	10		10

Surrogate Recovery	C ₃₂	C ₃₂
Acceptance Limits: SOIL	(41-149%)	(59-179)
Lab Sample I.D.: XX6175	88	94

HIGH BOILING PETROLEUM HYDROCARBONS ANALYSIS

Laboratory Name:	ITAS-KNOXVILLE	SDG Number:	NA
Contract Name:	ENSAFE NAS MEMPHIS	Job Number:	ENFA 54350
Client Sample ID:	S50-SB5-15	Collection Date:	06/18/93
Lab Sample ID:	XX6176	Extraction Date:	06/22/93
Sample Matrix:	SOIL	Analysis Date:	06/25/93
Concentration Units:	mg/kg	Dryness Factor:	NA

Compound	Results	Qualifiers	Detection Limits
total high boiling petroleum hydrocarbons, as diesel range organics	10	U	10

Surrogate Recovery	C ₃₂	C ₃₂
Acceptance Limits: SOIL	(41-149%)	(59-179)
Lab Sample I.D.: XX6176	83	76

APPENDIX D

MONITORING WELL CONSTRUCTION DIAGRAMS

WELL CONSTRUCTION LOG.

S50-MW-1

WELL LOCATION BUILDING S-50, NAS MEMPHIS

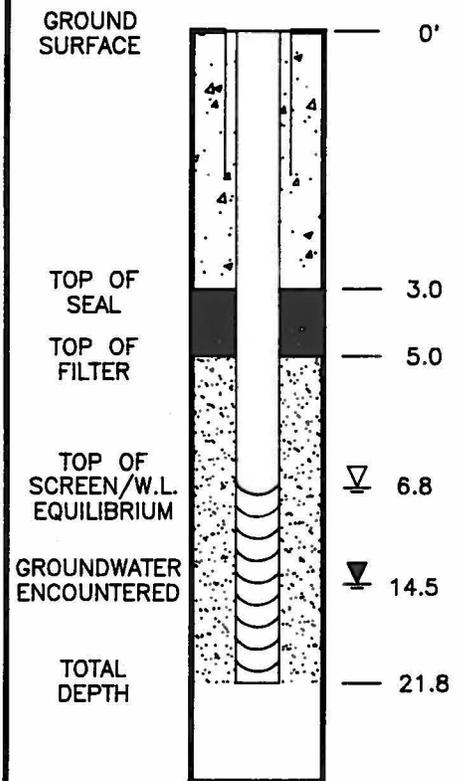
DATE INSTALLED 06/15/93

TYPE OF WELL 2 INCH O.D. SCHEDULE 40 PVC MONITORING WELL

1. HEIGHT OF CASING ABOVE GROUND FLUSH MOUNT
2. WATER SURFACE ELEV. 259.59 (06/28/93)
 - a) DEPTH TO SATURATED ZONE N/A
3. TOP OF CASING ELEV. 266.35
4. PROTECTIVE CASING YES NO
 - a) CASING LENGTH N/A
5. LENGTH OF SCREEN 15.0'
6. SIZE\TYPE OF SCREEN .010" SLOT PVC
7. LENGTH OF SUMP 0
8. TOTAL DEPTH OF BORING 21.8 HOLE DIAMETER _____
9. SCREENED INTERVAL 6.8' - 21.8'
10. TYPE OF SCREEN FILTER PACK 10/20 FILTER SAND
QUANTITY USED 375lb. SIZE _____ U/C _____
11. DEPTH TO TOP OF FILTER 5.0'
12. TYPE OF SEAL 1/4" BENTONITE PELLETS
QUANTITY USED 2.5 GALLONS
13. DEPTH TO TOP OF SEAL 3.0'
14. TYPE OF GROUT PORTLAND TYPE I / BENTONITE
GROUT MIXTURE 93/7
METHOD OF PLACEMENT PRESSURE GROUT
15. COMMENTS COMPLETED WITH LOCKING EXPANSION -
TYPE CAP

INSTALLATION DESCRIPTION

DESCRIPTION	DEPTH (FT.)
GROUND SURFACE	0'
TOP OF SEAL	3.0
TOP OF FILTER	5.0
TOP OF SCREEN/W.L. EQUILIBRIUM	6.8
GROUNDWATER ENCOUNTERED	14.5
TOTAL DEPTH	21.8



ENVIRONMENTAL ASSESSMENT
REPORT
NAS MEMPHIS

S50-MW-1
WELL CONSTRUCTION LOG

DWG DATE: 09/30/93

DWG NAME: 68MW.0G1

WELL CONSTRUCTION LOG.

S50-MW-2

WELL LOCATION BUILDING S-50, NAS MEMPHIS

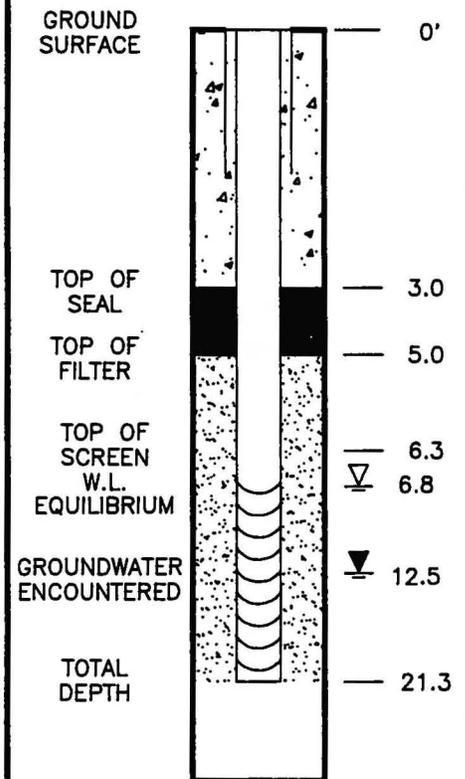
DATE INSTALLED 06/15/93

TYPE OF WELL 2 INCH O.D. SCHEDULE 40 PVC MONITORING WELL

1. HEIGHT OF CASING ABOVE GROUND FLUSH MOUNT
2. WATER SURFACE ELEV. 259.02 (06/28/93)
- a) DEPTH TO SATURATED ZONE N/A
3. TOP OF CASING ELEV. 265.82
4. PROTECTIVE CASING YES NO
- a) CASING LENGTH N/A
5. LENGTH OF SCREEN 15.0'
6. SIZE\TYPE OF SCREEN .010" SLOT PVC
7. LENGTH OF SUMP 0
8. TOTAL DEPTH OF BORING 21.3 HOLE DIAMETER _____
9. SCREENED INTERVAL 6.3' - 21.3'
10. TYPE OF SCREEN FILTER PACK 10/20 FILTER SAND
QUANTITY USED 375lb. SIZE _____ U/C _____
11. DEPTH TO TOP OF FILTER 5.0'
12. TYPE OF SEAL 1/4" BENTONITE PELLETS
QUANTITY USED 2.5 GALLONS
13. DEPTH TO TOP OF SEAL 3.0'
14. TYPE OF GROUT PORTLAND TYPE I / BENTONITE
GROUT MIXTURE 93/7
METHOD OF PLACEMENT PRESSURE GROUT
15. COMMENTS COMPLETED WITH LOCKING EXPANSION -
TYPE CAP

INSTALLATION DESCRIPTION

DESCRIPTION DEPTH(FT.)



ENVIRONMENTAL ASSESSMENT
REPORT
NAS MEMPHIS

S50-MW-2
WELL CONSTRUCTION LOG

DWG DATE: 09/30/93

DWG NAME: 68MWLOG2

WELL CONSTRUCTION LOG.

S50-MW-3

WELL LOCATION BUILDING S-50, NAS MEMPHIS

DATE INSTALLED 06/16/93

TYPE OF WELL 2 INCH. O.D. SCHEDULE 40 PVC MONITORING WELL

1. HEIGHT OF CASING ABOVE GROUND FLUSH MOUNT
2. WATER SURFACE ELEV. 261.23 (06/28/93)
 - a) DEPTH TO SATURATED ZONE N/A
3. TOP OF CASING ELEV. 266.58
4. PROTECTIVE CASING YES NO
 - a) CASING LENGTH N/A
5. LENGTH OF SCREEN 15.0'
6. SIZE\TYPE OF SCREEN .010" SLOT PVC
7. LENGTH OF SUMP 0
8. TOTAL DEPTH OF BORING 21.4 HOLE DIAMETER _____
9. SCREENED INTERVAL 6.4' - 21.4'
10. TYPE OF SCREEN FILTER PACK 10/20 FILTER SAND
QUANTITY USED 375lb. SIZE _____ U/C _____
11. DEPTH TO TOP OF FILTER 5.0'
12. TYPE OF SEAL 1/4" BENTONITE PELLETS
QUANTITY USED 2.5 GALLONS
13. DEPTH TO TOP OF SEAL 3.0'
14. TYPE OF GROUT PORTLAND TYPE I / BENTONITE
GROUT MIXTURE 93/7
METHOD OF PLACEMENT PRESSURE GROUT
15. COMMENTS COMPLETED WITH LOCKING EXPANSION -
TYPE CAP

INSTALLATION DESCRIPTION

DESCRIPTION	DEPTH (FT.)
GROUND SURFACE	0'
TOP OF SEAL	3.0
TOP OF FILTER	5.0
W.L. EQUILIBRIUM	5.3
TOP OF SCREEN	6.4
GROUNDWATER ENCOUNTERED	12.5
TOTAL DEPTH	21.4

GROUND SURFACE

0'

TOP OF SEAL

3.0

TOP OF FILTER

5.0

W.L. EQUILIBRIUM
TOP OF SCREEN

5.3

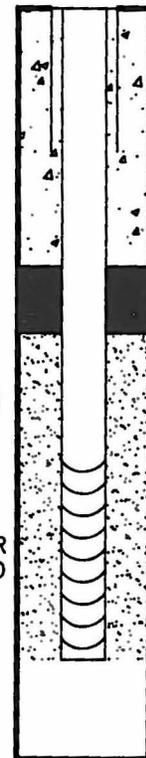
6.4

GROUNDWATER ENCOUNTERED

12.5

TOTAL DEPTH

21.4



ENVIRONMENTAL ASSESSMENT
REPORT
NAS MEMPHIS

S50-MW-3
WELL CONSTRUCTION LOG

DWG DATE: 09/30/93

DWG NAME: 68NML0G3

WELL CONSTRUCTION LOG.

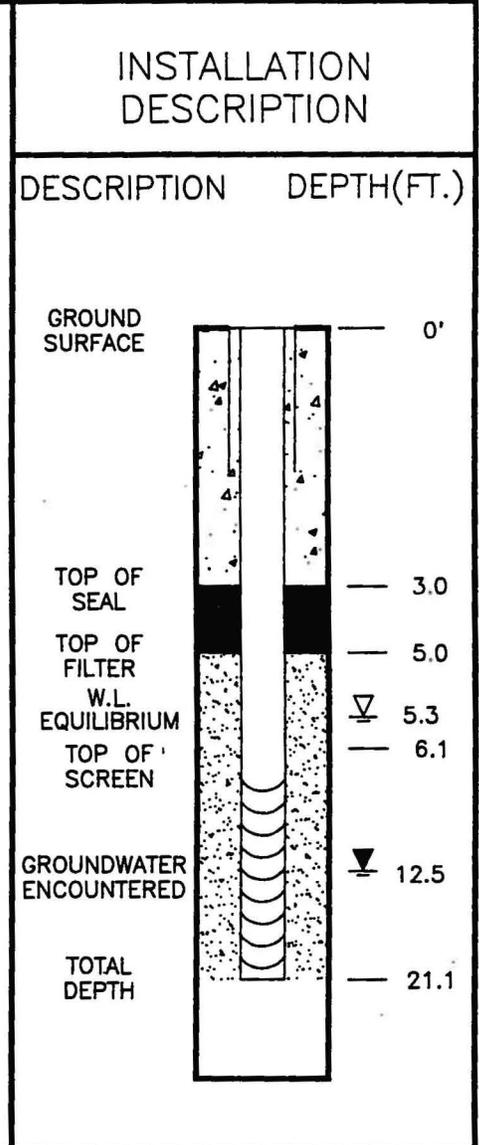
S50-MW-4

WELL LOCATION BUILDING S-50, NAS MEMPHIS

DATE INSTALLED 06/17/93

TYPE OF WELL 2 INCH O.D. SCHEDULE 40 PVC MONITORING WELL

1. HEIGHT OF CASING ABOVE GROUND FLUSH MOUNT
2. WATER SURFACE ELEV. 260.95 (06/28/93)
 - a) DEPTH TO SATURATED ZONE N/A
3. TOP OF CASING ELEV. 266.24
4. PROTECTIVE CASING YES NO
 - a) CASING LENGTH N/A
5. LENGTH OF SCREEN 15.0'
6. SIZE\TYPE OF SCREEN .010" SLOT PVC
7. LENGTH OF SUMP 0
8. TOTAL DEPTH OF BORING 21.1 HOLE DIAMETER _____
9. SCREENED INTERVAL 6.1' - 21.1'
10. TYPE OF SCREEN FILTER PACK 10/20 FILTER SAND
 QUANTITY USED 375lb. SIZE _____ U/C _____
11. DEPTH TO TOP OF FILTER 5.0'
12. TYPE OF SEAL 1/4" BENTONITE PELLETS
 QUANTITY USED 2.5 GALLONS
13. DEPTH TO TOP OF SEAL 3.0'
14. TYPE OF GROUT PORTLAND TYPE I / BENTONITE
 GROUT MIXTURE 93/7
 METHOD OF PLACEMENT PRESSURE GROUT
15. COMMENTS COMPLETED WITH LOCKING EXPANSION -
TYPE CAP



ENVIRONMENTAL ASSESSMENT
 REPORT
 NAS MEMPHIS

S50-MW-4
 WELL CONSTRUCTION LOG

WELL CONSTRUCTION LOG.

S50-MW-5

WELL LOCATION BUILDING S-50, NAS MEMPHIS

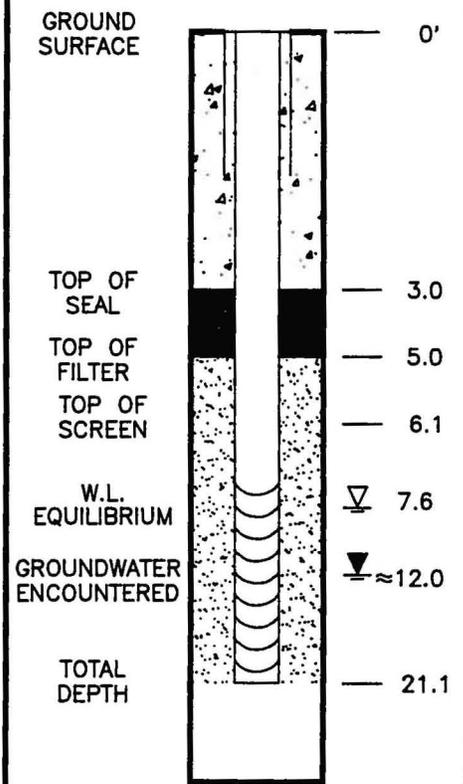
DATE INSTALLED 06/18/93

TYPE OF WELL 2 INCH O.D. SCHEDULE 40 PVC MONITORING WELL

1. HEIGHT OF CASING ABOVE GROUND FLUSH MOUNT
2. WATER SURFACE ELEV. 258.91 (06/28/93)
 - a) DEPTH TO SATURATED ZONE N/A
3. TOP OF CASING ELEV. 266.55
4. PROTECTIVE CASING YES NO
 - a) CASING LENGTH N/A
5. LENGTH OF SCREEN 15.0'
6. SIZE\TYPE OF SCREEN .010" SLOT PVC
7. LENGTH OF SUMP 0
8. TOTAL DEPTH OF BORING 21.1 HOLE DIAMETER _____
9. SCREENED INTERVAL 6.1' - 21.1'
10. TYPE OF SCREEN FILTER PACK 10/20 FILTER SAND
 QUANTITY USED 375lb. SIZE _____ U/C _____
11. DEPTH TO TOP OF FILTER 5.0'
12. TYPE OF SEAL 1/4" BENTONITE PELLETS
 QUANTITY USED 2.5 GALLONS
13. DEPTH TO TOP OF SEAL 3.0'
14. TYPE OF GROUT PORTLAND TYPE I / BENTONITE
 GROUT MIXTURE 93/7
 METHOD OF PLACEMENT PRESSURE GROUT
15. COMMENTS COMPLETED WITH LOCKING EXPANSION -
TYPE CAP

INSTALLATION DESCRIPTION

DESCRIPTION DEPTH(FT.)



ENVIRONMENTAL ASSESSMENT
 REPORT
 NAS MEMPHIS

S50-MW-5
 WELL CONSTRUCTION LOG

DWG DATE: 09/30/93

DWG NAME: 68NML0G5

APPENDIX E
GROUNDWATER ANALYTICAL RESULTS

HIGH BOILING PETROLEUM HYDROCARBONS ANALYSIS

Laboratory Name:	ITAS-KNOXVILLE	SDG Number:	NA
Contract Name:	NAS MEMPHIS	Job Number:	ENFA 54420
Client Sample ID:	S50-MW-1	Collection Date:	06/28/93
Lab Sample ID:	XX6835	Extraction Date:	07/01/93
Sample Matrix:	WATER	Analysis Date:	07/05/93
Concentration Units:	μg/liter	Dryness Factor:	NA

Compound	Results	Qualifiers	Detection Limits
total high boiling petroleum hydrocarbons, as diesel range organics	100	U	100

Surrogate Recovery	C ₂₃	C ₃₂
Acceptance Limits: WATER	(23-132%)	(31-155%)
Lab Sample ID: XX6835	87	96

HIGH BOILING PETROLEUM HYDROCARBONS ANALYSIS

Laboratory Name:	ITAS-KNOXVILLE	SDG Number:	NA
Contract Name:	NAS MEMPHIS	Job Number:	ENFA 54420
Client Sample ID:	S50-MW-2	Collection Date:	06/28/93
Lab Sample ID:	XX6836	Extraction Date:	07/01/93
Sample Matrix:	WATER	Analysis Date:	07/05/93
Concentration Units:	µg/liter	Dryness Factor:	NA

Compound	Results	Qualifiers	Detection Limits
total high boiling petroleum hydrocarbons, as diesel range organics	100	U	100

Surrogate Recovery	C ₂₃	C ₃₂
Acceptance Limits: WATER	(23-132%)	(31-155%)
Lab Sample ID: XX6836	98	106

HIGH BOILING PETROLEUM HYDROCARBONS ANALYSIS

Laboratory Name:	ITAS-KNOXVILLE	SDG Number:	NA
Contract Name:	NAS MEMPHIS	Job Number:	ENFA 54420
Client Sample ID:	S50-MW-2 DUP	Collection Date:	06/28/93
Lab Sample ID:	XX6837	Extraction Date:	07/01/93
Sample Matrix:	WATER	Analysis Date:	07/05/93
Concentration Units:	µg/liter	Dryness Factor:	NA

Compound	Results	Qualifiers	Detection Limits
total high boiling petroleum hydrocarbons, as diesel range organics	100	U	100

Surrogate Recovery	C ₂₃	C ₃₂
Acceptance Limits: WATER	(23-132%)	(31-155%)
Lab Sample ID: XX6837	104	114

HIGH BOILING PETROLEUM HYDROCARBONS ANALYSIS

Laboratory Name:	ITAS-KNOXVILLE	SDG Number:	NA
Contract Name:	NAS MEMPHIS	Job Number:	ENFA 54420
Client Sample ID:	S50-MW-3	Collection Date:	06/28/93
Lab Sample ID:	XX6838	Extraction Date:	07/01/93
Sample Matrix:	WATER	Analysis Date:	07/05/93
Concentration Units:	µg/liter	Dryness Factor:	NA

Compound	Results	Qualifiers	Detection Limits
total high boiling petroleum hydrocarbons, as diesel range organics	150		100

Surrogate Recovery	C ₂₃	C ₃₂
Acceptance Limits: WATER	(23-132%)	(31-155%)
Lab Sample ID: XX6838	96	104

HIGH BOILING PETROLEUM HYDROCARBONS ANALYSIS

Laboratory Name:	ITAS-KNOXVILLE	SDG Number:	NA
Contract Name:	NAS MEMPHIS	Job Number:	ENFA 54420
Client Sample ID:	S50-MW-3 MS	Collection Date:	06/28/93
Lab Sample ID:	XX6839	Extraction Date:	07/01/93
Sample Matrix:	WATER	Analysis Date:	07/05/93
Concentration Units:	µg/liter	Dryness Factor:	NA

Compound	Results	Qualifiers	Detection Limits
total high boiling petroleum hydrocarbons, as diesel range organics	1,000		100

Surrogate Recovery	C₂₃	C₃₂
Acceptance Limits: WATER	(23-132%)	(31-155%)
Lab Sample ID: XX6839	81	81

HIGH BOILING PETROLEUM HYDROCARBONS ANALYSIS

Laboratory Name:	ITAS-KNOXVILLE	SDG Number:	NA
Contract Name:	NAS MEMPHIS	Job Number:	ENFA 54420
Client Sample ID:	S50-MW-3 MSD	Collection Date:	06/28/93
Lab Sample ID:	XX6840	Extraction Date:	07/01/93
Sample Matrix:	WATER	Analysis Date:	07/05/93
Concentration Units:	$\mu\text{g/liter}$	Dryness Factor:	NA

Compound	Results	Qualifiers	Detection Limits
total high boiling petroleum hydrocarbons, as diesel range organics	1,300		100

Surrogate Recovery	C ₂₃	C ₃₂
Acceptance Limits: WATER	(23-132%)	(31-155%)
Lab Sample ID: XX6840	87	87

HIGH BOILING PETROLEUM HYDROCARBONS ANALYSIS

Laboratory Name:	ITAS-KNOXVILLE	SDG Number:	NA
Contract Name:	NAS MEMPHIS	Job Number:	ENFA 54420
Client Sample ID:	S50-MW-4	Collection Date:	06/28/93
Lab Sample ID:	XX6841	Extraction Date:	07/01/93
Sample Matrix:	WATER	Analysis Date:	07/05/93
Concentration Units:	µg/liter	Dryness Factor:	NA

Compound	Results	Qualifiers	Detection Limits
total high boiling petroleum hydrocarbons, as diesel range organics	100	U	100

Surrogate Recovery	C ₂₃	C ₃₂
Acceptance Limits: WATER	(23-132%)	(31-155%)
Lab Sample ID: XX6841	104	111

HIGH BOILING PETROLEUM HYDROCARBONS ANALYSIS

Laboratory Name:	ITAS-KNOXVILLE	SDG Number:	NA
Contract Name:	NAS MEMPHIS	Job Number:	ENFA 54420
Client Sample ID:	S50-MW-5	Collection Date:	06/28/93
Lab Sample ID:	XX6842	Extraction Date:	07/01/93
Sample Matrix:	WATER	Analysis Date:	07/05/93
Concentration Units:	µg/liter	Dryness Factor:	NA

Compound	Results	Qualifiers	Detection Limits
total high boiling petroleum hydrocarbons, as diesel range organics	100	U	100

Surrogate Recovery	C ₂₃	C ₃₂
Acceptance Limits: WATER	(23-132%)	(31-155%)
Lab Sample ID: XX6842	95	99

APPENDIX F
SHELBY COUNTY WATER WELL SURVEY



MEMPHIS AND SHELBY COUNTY
HEALTH DEPARTMENT

RICHARD SWIGGART, M.P.A.
Director

SHERMAN KAHN, M.D.
Health Officer



DR. W. W. HERENTON
Mayor of Memphis

WILLIAM N. MORRIS, JR.
Mayor of Shelby County

August 6, 1992

EnSafe / Allen & Hoshall
5720 Summer Trees Drive, Suite 8
Memphis, Tennessee 38134

Attn: Lawson M. Anderson

RE: Environmental Site Assessment
Water Well Search
Millington Naval Air Station-Willis Gate
Intersection Of Navy Road And Third Avenue
Millington, Tennessee

Dear Mr. Anderson:

Please find enclosed a list of quasi-public, commercial, and residential wells located within an approximate two (2) mile radius of the above location that are contained in our files. This list does not contain the location of any public water supply wells that are operated by the Public Utility Division, nor does it contain wells used for groundwater monitoring. Public water well information may be obtained from Memphis Light, Gas, and Water Division, 245 South Main St., Memphis, Tennessee (901)528-4011. Information regarding monitoring wells associated with leaking petroleum storage tanks may be obtained from the Tennessee Department of Environment and Conservation, Division of Water Management, 2500 Mt. Moriah Road, (901)543-6695.

Our records indicate five (5) wells on the Naval Air Station property, however, information regarding the exact location, use, and depth of these wells is not included in our files. You may contact Lt. Ron Gruzesky, NAS Memphis, 873-5230 for additional information about these wells.

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I hope this clarifies the facts for which we have records on file in our office. If Pollution Control can be of further assistance, feel free to contact me at 576-7775.

Sincerely,



S. L. Sherrill, Jr., Asst. Manager
POLLUTION CONTROL

ENCLOSURE

wp-00751/116
WAS/SLS
HK-199

WATER WELL LIST

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Water Well Number: 1
Owner of Well: James E. Krosp
Location of Well: 7378 Krosp Road
Mailing Address: James E. Krosp
7378 Krosp Road
Millington, TN 38053
Number of wells at this location: 1
Well Depth: 150 Feet
Well Classification: Residential

Water Well Number: 2
Owner of Well: Clifford O. Longmire
Location of Well: 7431 Krosp Road
Mailing Address: Clifford O. Longmire
7431 Krosp Road
Millington, TN 38053
Number of wells at this location: 1
Well Depth: 120 Feet
Well Classification: Residential

Water Well Number: 3
Owner of Well: Terry Longmire
Location of Well: 7473 Krosp Road
Mailing Address: Terry Longmire
7473 Krosp Road
Millington, TN 38053
Number of wells at this location: 1
Well Depth: 130 Feet
Well Classification: Residential

Water Well Number: 4
Owner of Well: Phoenix Zinc
Location of Well: 4525/4599 Big Creek Church Road
Mailing Address: 4525/4599 Big Creek Church Road
Millington, TN 38053
Number of wells at this location: 1
Well Depth: Not Listed
Well Classification: Commercial

Water Well Number: 5
Owner of Well: Shelby County Conservation Board
Location of Well: Edmond Orgill Park
Mailing Address: Shelby County Conservation Board
2599 Avery
Memphis, TN 38053
Attn: Ed Price
Number of wells at this location: 1
Well Depth: Depth Not Listed
Well Classification: Irrigation And To Maintain Lake Level

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WATER WELL LIST (Continued)

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Water Well Number: 6
Owner of Well: Harold Bradley
Location of Well: 5230 Bateman Road
Mailing Address: Harold Bradley
5230 Batman Road
Millington, TN 38053
Number of wells at this location: 1
Well Depth: 150 Feet
Well Classification: Residential

APPENDIX G
REMEDIAL DESIGN PARAMETERS

Table G-1 Remedial Design Parameters (Soil) Building S-50 UST Site		
Parameter	Results	
Microbial Plate Count*	Total Heterotrophs	Contaminant Degraders
	1.9 x 10 ⁶	5.7 x 10 ⁶
	1.7 x 10 ⁵	5.3 x 10 ⁴

* - CFU/gm, Colony Forming Units per gram of dry soil

Table G-2 Remedial Design Parameters (Groundwater) Building S-50 UST Site	
Parameter	Results
Total Organic Carbon (mg/l)	16.0
Total Phosphorus (mg p/l)	6.9
Nitrate-Nitrite-N (mg/l)	0.87
Total Suspended Solids (mg/l)	5,320.0
Iron (µg/l)	46,300.0
Manganese (µg/l)	2,770.0