

**FINAL CONTAMINATION ASSESSMENT REPORT  
UNDERGROUND STORAGE TANK  
NAVAL SUPPORT ACTIVITY MEMPHIS  
MILLINGTON, TENNESSEE**

**SOUTHNAVFACENGCOM  
Contract Number: N62467-89-D-0318**

**CTO-136**

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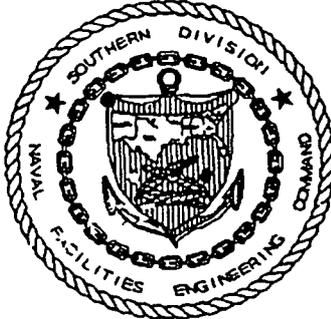


**Prepared for:**

**Department of the Navy  
Southern Division  
Naval Facilities Engineering Command  
North Charleston, South Carolina**

**Prepared by:**

**EnSafe Inc.  
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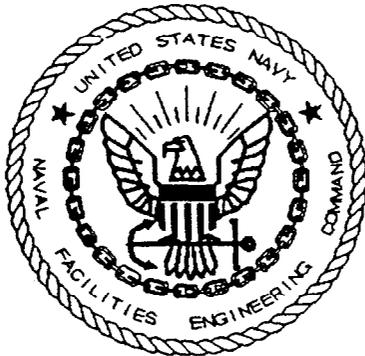


The Contractor, EnSafe Inc., hereby certifies that, to the best of its knowledge and belief, the technical data delivered herewith under Contract No. N62467-89-D-0318 is complete, accurate and complies with all requirements of the contract.

**Date:** July 14, 1998  
**Signature:** Allison Dennen  
**Name:** Allison Dennen  
**Title:** Task Order Manager

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**FINAL CONTAMINATION ASSESSMENT REPORT  
UNDERGROUND STORAGE TANK N-12  
NAVAL SUPPORT ACTIVITY MEMPHIS  
MILLINGTON, TENNESSEE**

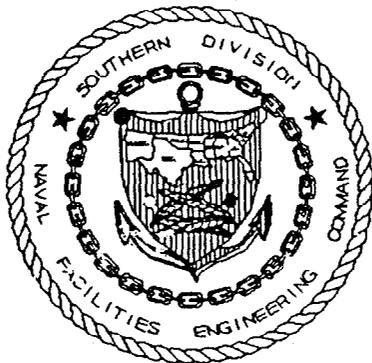


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Appendix B	Analytical Results
Appendix C	Slug Test Graphs and Results
Appendix D	Site Ranking Results

## EXECUTIVE SUMMARY

At the request of the Navy, Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM), EnSafe Inc. (EnSafe) completed the proposed Plan of Action (POA) to determine the nature and extent of contamination at the underground storage tank (UST) N-12 at Naval Support Activity Memphis (NSA Memphis). The tank, a 7.5 gallon (gal) UST which had stored diesel, was removed in September, 1996. Tank N-12 was located east of Building N-12 and had a broken fill pipe. Two soil samples collected at the time of removal indicated the presence of contamination. Overexcavation was limited by underground utilities and adjacent buildings. Conditions encountered at the site are summarized below.

- Groundwater at the site is classified as "non-drinking" water.
- The site soil cleanup level is 500 milligrams per kilogram (mg/kg), and the site groundwater cleanup level is 1 milligram per liter (mg/L) for TPH-DRO and TPH-GRO.
- One or more petroleum releases have occurred at the site impacting both soil and groundwater.
- Soil benzene and TPH-DRO concentrations were below the cleanup levels of 50,000  $\mu\text{g}/\text{kg}$  and 500 mg/kg in all soil samples collected.
- TPH-GRO concentrations in groundwater were below the cleanup level of 1 mg/L in all monitoring wells. TPH-DRO was not detected in groundwater.
- Benzene concentrations in groundwater were above the cleanup level of 70  $\mu\text{g}/\text{L}$  in N12G04LS. Benzene was not detected in the other site monitoring wells. Vinyl chloride was also detected in shallow groundwater above its MCL.

- The site ranking was completed and calculated at 343, which is below the ranking (500) that requires corrective action. A production well is located within 400 feet of the site, but it is completed in the Ft. Pillow not in the loess deposits. Sampling of the Memphis Sand wells during the ongoing RCRA facility investigation (RFI) has found that VOCs are absent in deeper groundwater.
- In the RCRA facility investigations, chlorinated solvents have been detected in the groundwater of the loess and fluvial deposits in the Northside. Tank N-12 is within Area of Concern A (AOC A), which has undergone an RFI. The RFI identified multiple areas with chlorinated solvents in the loess and deeper fluvial deposits groundwater that warrant corrective action. Pending corrective measures associated with AOC A will address the multiple solid waste management units (SWMUs)/sites within it, including the area of N-12. In addition, as a condition of property transfer, Northside groundwater use will be restricted. EnSafe recommends, with BCT concurrence, transfer of the N-12 groundwater to the Northside Loess Groundwater Corrective Measures Study (CMS).

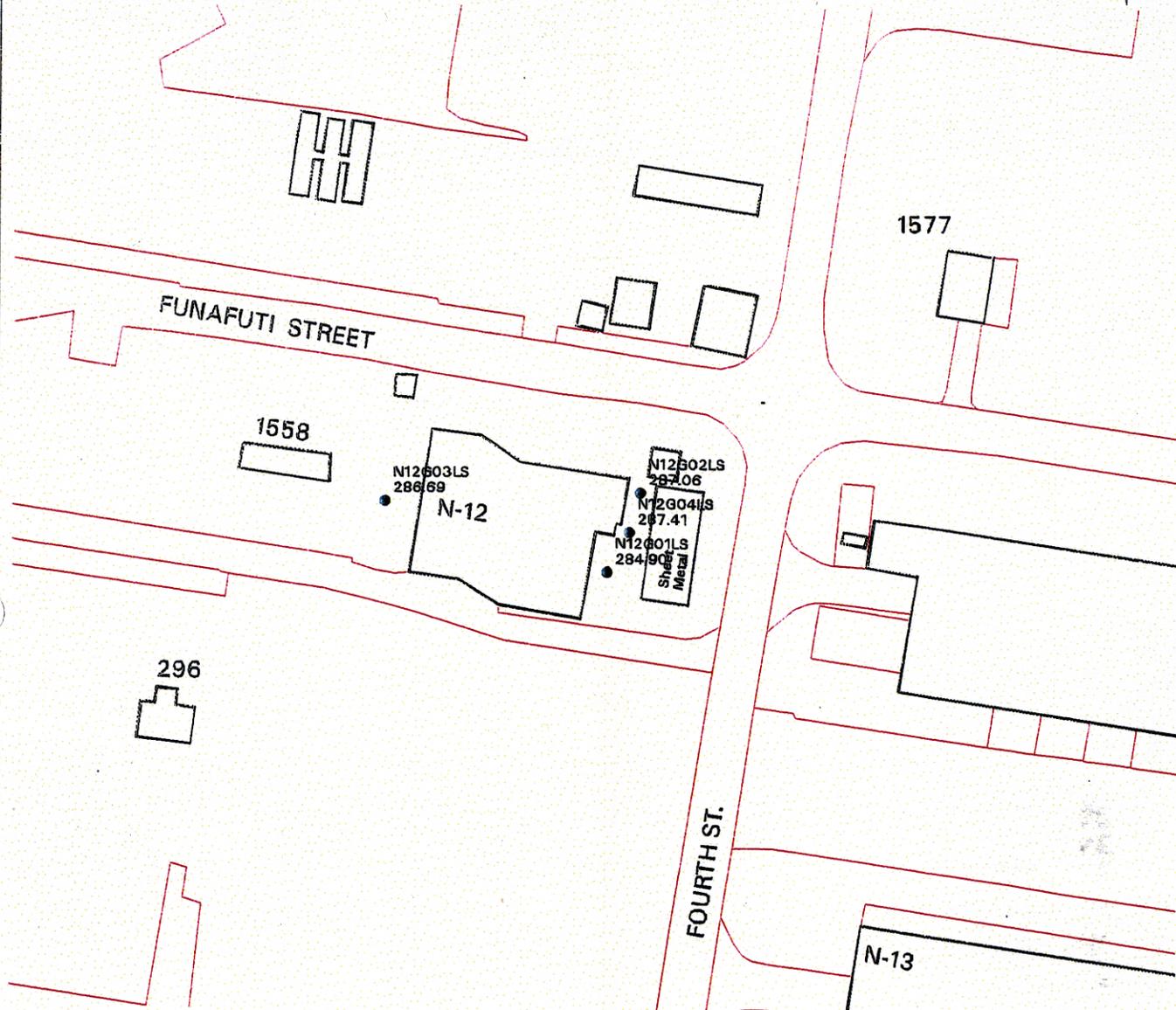
## **1.0 INTRODUCTION**

At the request of the Navy, Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM), EnSafe Inc. (EnSafe) completed the proposed Plan of Action (POA) to determine the nature and extent of contamination at the underground storage tank (UST) N-12 at Naval Support Activity Memphis (NSA Memphis). The tank, a 7.5 gallon (gal) UST which had stored diesel, was removed in September, 1996. Tank N-12 was located east of Building N-12 and had a broken fill pipe. Two soil samples collected at the time of removal indicated the presence of contamination. Overexcavation was limited by underground utilities and adjacent buildings.

## 2.0 SITE LOCATION

Facility N-12, which consists of two abandoned buildings, is located at the corner of Funafuti Street and Fourth Street on the north side of Naval Support Activity, Memphis (NSAMEM) in Millington, Tennessee (Figure 2-1). The former UST N-12 was located between the two buildings. Figure 2-2 shows the location of the buildings at Facility N-12, and the former UST N-12. Figure 2-2 also illustrates the locations of monitoring wells N12G01LS, N12G02LS, N12G03LS, and N12G04LS and DPT borings N12SSB06, N12SSB07, N12SSB08, and N21SSB09 at Facility N-12 during this investigation. Figure 2-3 presents the distances and angles from monitoring well N12G04LS to the top of each well casing. In accordance with the TDEC, Division of Underground Storage Tanks, *Environmental Assessment Guidelines, August, 1996*, vicinity maps, provided by the Navy Public Works Department, show surface culture within the site vicinity and present accurate locations of subsurface structures and utilities, including water lines (Figure 2-4), storm water drains (Figure 2-5), steam lines (Figure 2-6), sanitary sewer lines (Figure 2-7), and electric lines (Figure 2-8) within 0.1 mile of the site. Gas lines are not located within 0.1 mile of the site.

Local topography is flat and consists mostly of paved streets, parking areas, and some grassy portions (Figure 2-9). The Naval airfield is north of the site and extends east to west. Storm water runoff can flow over these paved areas in the vicinity of Facility N-12, and can collect in the nearest storm water drain northwest of the site (see Figure 2-5). Directly west of the site is the former N-94 fuel farm where two 100,000-gallon USTs were located. The tanks have been removed and the tank pits are now backfilled with gravel.

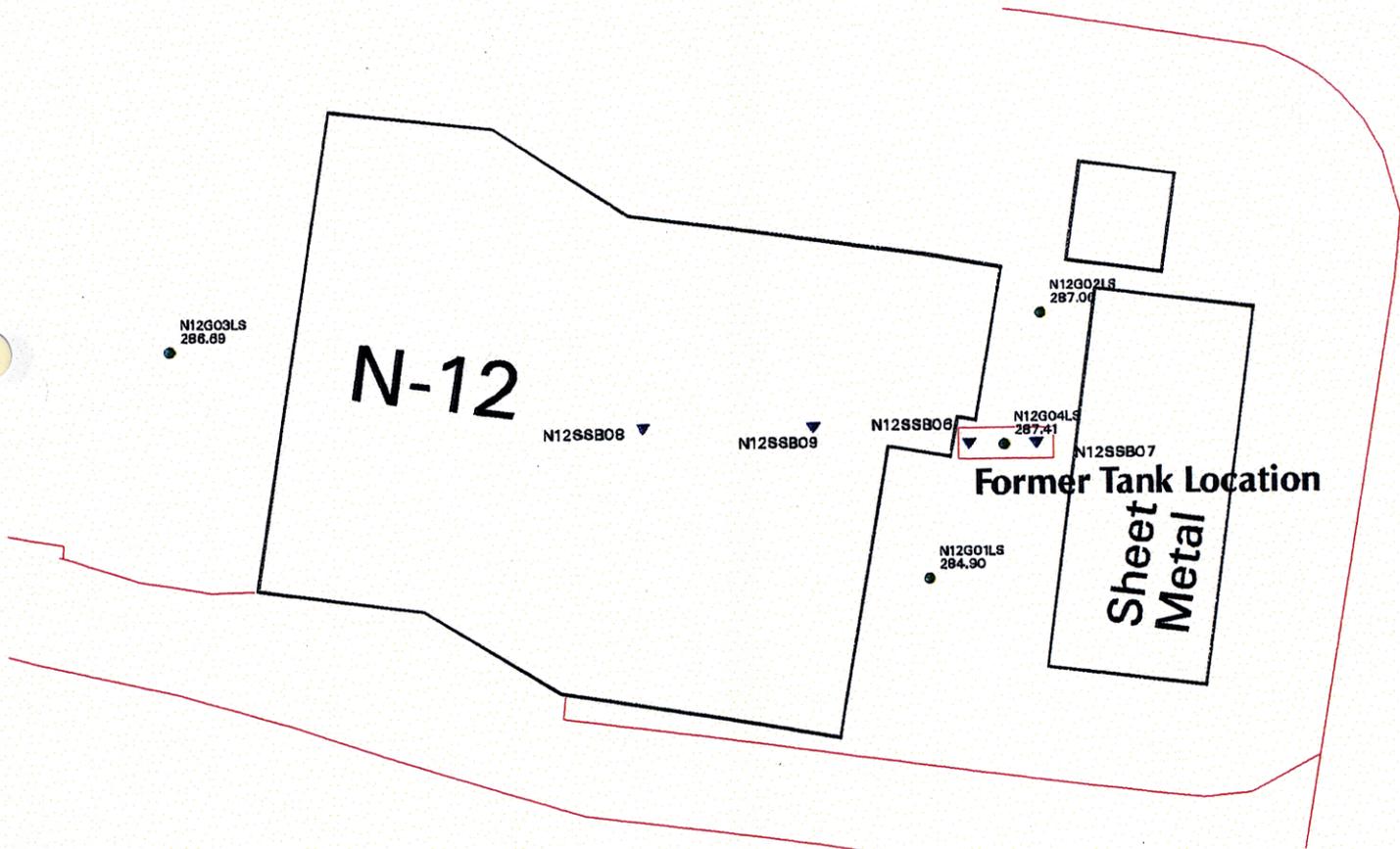


Facility Investigation  
 UST N-12  
 NSA Memphis

**FIGURE 2-1**  
 Vicinity Map

AML: /home4/dep/evd\_gis/mapping\_gis/fig11.mxd

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### LEGEND

-  Monitoring Well
-  DPT

N12G03LS Well ID  
286.89 Groundwater Elevation (feet above MSL)

NOTES: Underground utilities are shown on Figure 2-4 through 2-8.  
Top of casing elevations are shown for monitoring wells.



Facility Investigation  
UST N-12  
NSA Memphis

FIGURE 2-2  
Site Map



TI STREET

1558

N12G03LS  
286.69

N-12

N12G02LS  
287.00

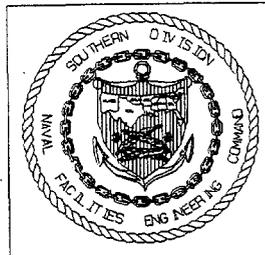
N12G04LS  
287.41

N12G01LS  
284.90

Sheet  
Metal

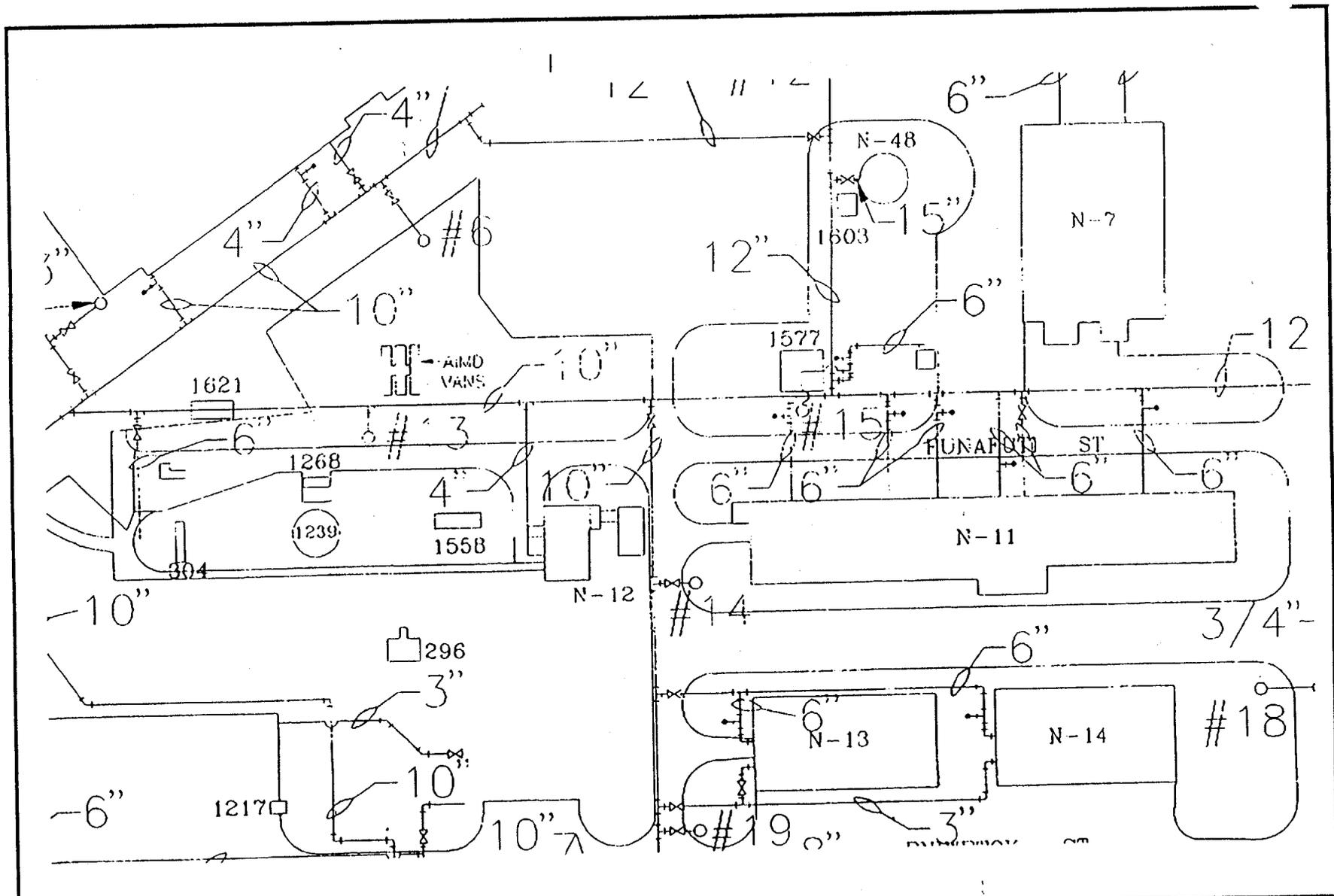
Note: Angles are from magnetic north.

	Distance (feet)	Angle (decimal degrees)
N12G04LS to N12G01LS	19	208.68017
N12G04LS to N12G02LS	16	15.38744
N12G04LS to N12G03LS	102	277.05053



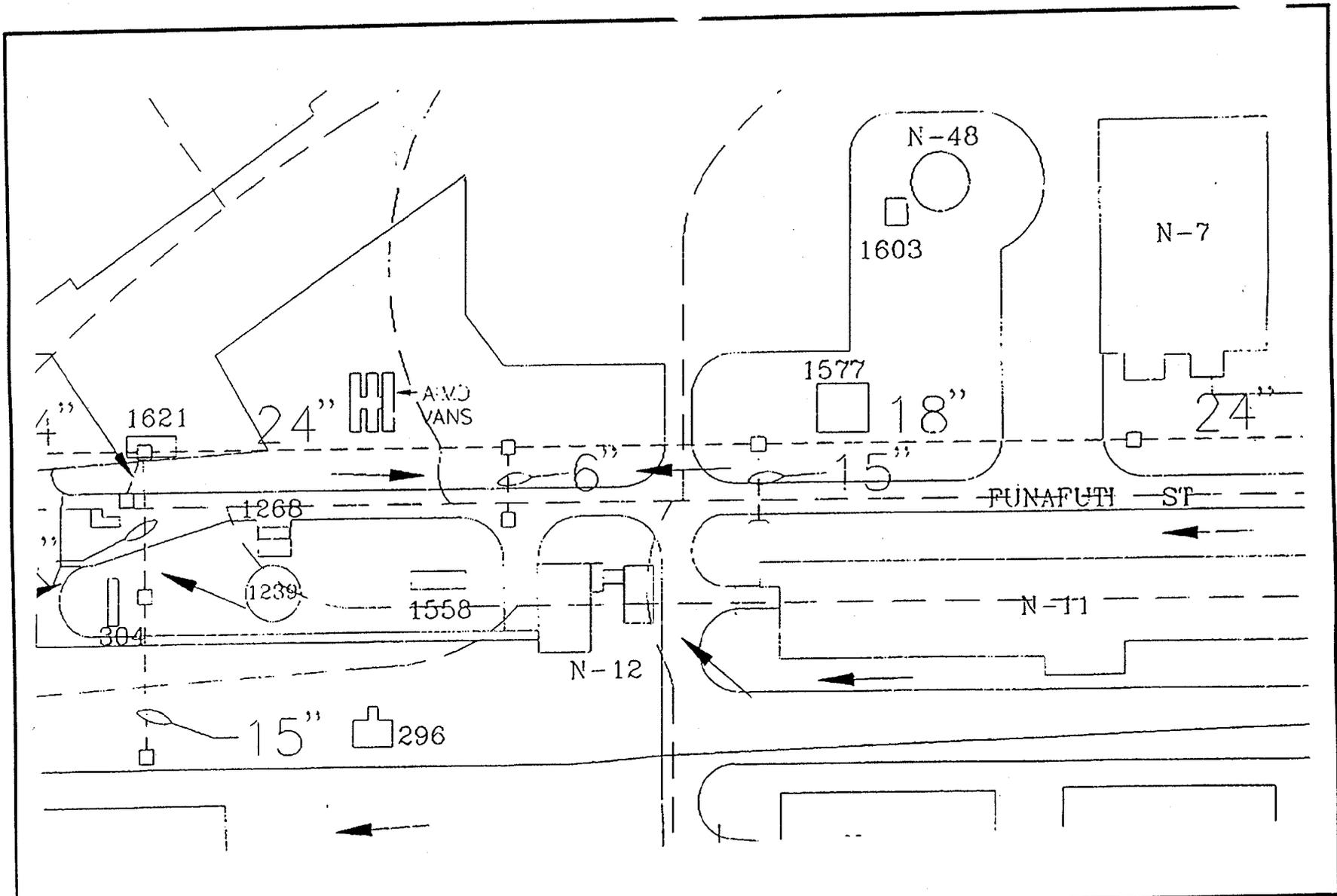
### Facility Investigation UST N-12 NSA Memphis

FIGURE 2-3 - Distances and Angles from N12G04LS to other Wells



FACILITY INVESTIGATION  
 UST N-12  
 NSA MEMPHIS

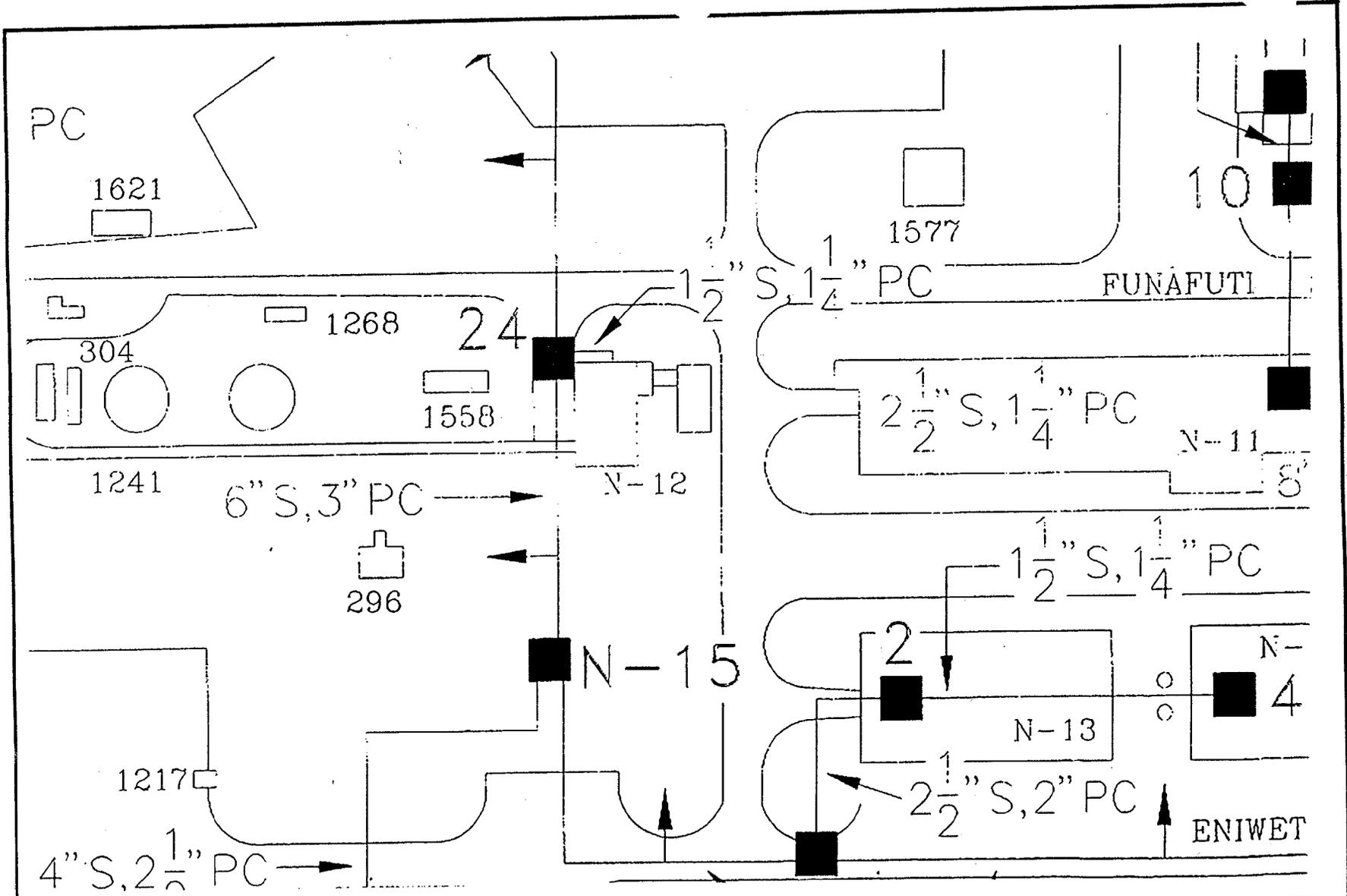
FIGURE 2-4  
 WATER LINES



FACILITY INVESTIGATION  
 UST N-12  
 NSA MEMPHIS

FIGURE 2-5  
 STORM WATER LINES

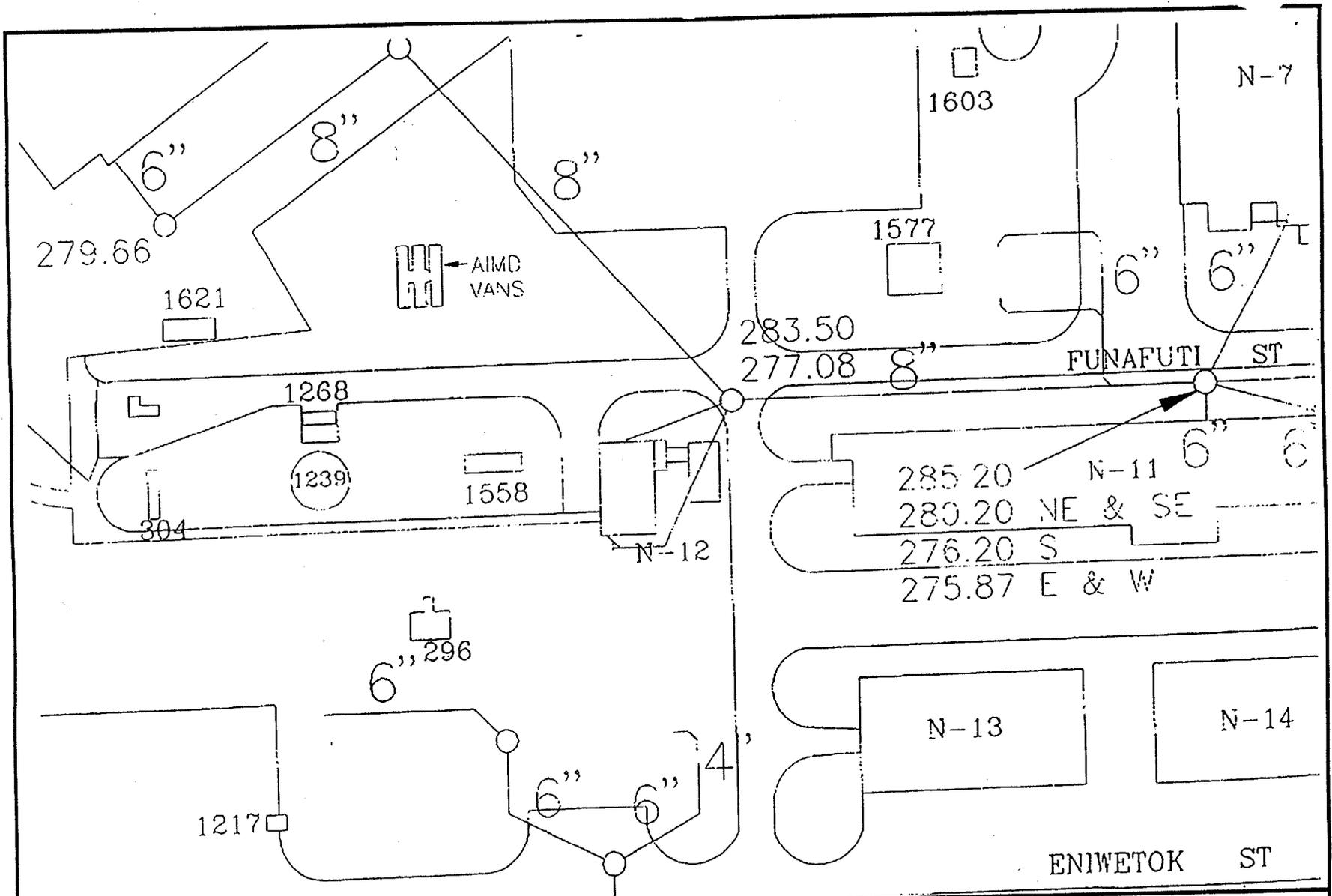
DWG DATE: 02/20/98 | DWG NAME: BORDER



FACILITY INVESTIGATION  
 UST N-12  
 NSA MEMPHIS

FIGURE 2-6  
 STEAM LINES

DWG DATE: 02/20/98 | DWG NAME: BORDER



FACILITY INVESTIGATION  
 UST N-12  
 NSA MEMPHIS

FIGURE 2-7  
 SAMINTARY SEWER LINES

DWG DATE: 02/20/98 | DWG NAME: BORDER



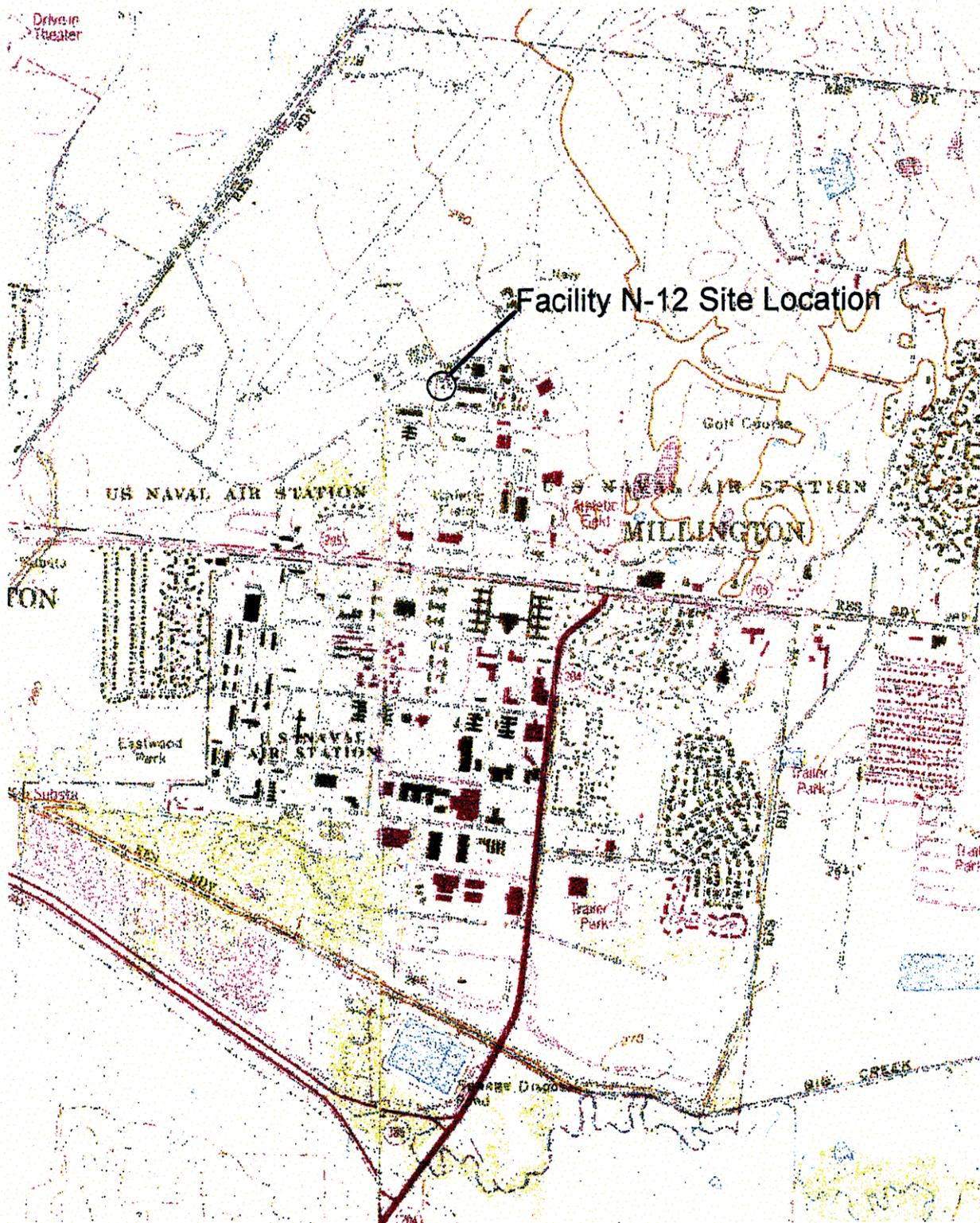


Figure 2-9  
 Topographic Map of NSA Memphis (formerly NAS Memphis) and vicinity.  
 N-12 site location is circled. Scale 1:24,000. Topographic map is taken  
 from both the USGS 7.5 minute Millington and Brunswick Quadrangles,  
 revised 1993.

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### **3.0 SOIL INVESTIGATION**

The N-12 tank site was assessed using hollow-stem auger drilling and split-spoon sampling techniques and direct-push technology (DPT). Before any intrusive activities began, all utilities, lines, and storage tanks were identified. Soil contamination was evaluated using soil borings, continuous soil sampling, field screening, and laboratory analyses of selected samples.

#### **3.1 Geology**

##### **3.1.1 Regional Geologic Setting**

NSA Memphis is within the central Mississippi Embayment, a 200-mile wide syncline that plunges southward along an axis approximating the Mississippi River. The Naval Base is underlain by Pleistocene age loess deposits which in turn are underlain (in descending order) by the Terrace Deposits and the Claiborne and Wilcox Groups.

The surficial loess deposits are unconsolidated windblown sediments consisting of silt, silty clay, clay, clayey silt, and minor amounts of sand. These deposits typically range from 0 to 65 feet thick in the Memphis/Millington area. The underlying Terrace Deposits are unconsolidated alluvial sediments consisting of sand, gravel, and some clay with thin layers of ferruginous sands and conglomerates at the base. This unit ranges from 0 to 100 feet thick in the Memphis/Millington area.

##### **3.1.2 Site-Specific Geologic Setting**

Specifically at the site, soil encountered during the investigation consisted primarily of clayey silts which is part of the surficial loess deposits. Little stratification was observed in the soil, except for slight color changes. Bedrock was not encountered at the site.

## 3.2 Soil Investigation Results

### 3.2.1 Soil Boring Results

Drilling at the site was performed by Tri-State Testing Inc. of Memphis, Tennessee. All soil borings converted to monitoring wells were advanced using 4.25-inch inside diameter (ID) hollow-stem augers. Additional borings were advanced with DPT using a 2-inch diameter, 4-foot long continuous split spoon sampler with a dedicated plastic insert (See Section 3.2.2). Due to the possible existence of underground utilities, a decontaminated post-hole digger or hand auger was used at each location to remove approximately the first 4 to 5 feet of soil.

A total of five borings were advanced in five locations using the hollow-stem augers. Four of the borings were converted to monitoring wells (MW). The first boring (B-1/N12G01LS) was placed sidegradient of the release. The second boring (B-2/N12G02LS) was placed upgradient of the release. The third boring (B-3/N12G03LS) was placed downgradient of the release. The fourth boring (B-4/N12G04LS) was placed as close as possible to the release area, where site-specific data suggested the highest concentration of contamination was present. Soil boring/monitoring well locations are shown in Figure 2-1. In addition to the four soil borings that were converted to monitoring wells, an additional boring was also advanced adjacent to the B-4/N12G04LS location. The purpose of the fifth boring was to collect Shelby tube samples (see Section 3.4) for geotechnical analysis. The location of the additional boring is not shown on Figure 2-1. The soil boring advanced adjacent to B-4/N12G04LS was not converted into a groundwater monitoring well and was abandoned onsite. Abandonment procedures consisted of grouting the borehole with a mixture of Portland cement and 4%-6% powdered bentonite using a grout density of 13.5 to 14.1 pounds (lbs)/gallon (gal). Grouting continued until the grout flowing out of the borehole had a density of at least 13.5 lbs/gal. A tremie pipe was not used to place the grout since the borehole was not more than 30 feet deep. The upper 2 feet of the borehole were filled with high solids bentonite pellets.

Soil samples were collected continuously from each boring using decontaminated 4-inch outside diameter (OD) continuous samplers at least 5 feet long. Each 5-foot sample was split in half lengthwise with a decontaminated stainless-steel knife. A composite portion of one half of the sample was immediately placed in a laboratory-prepared jar in a manner that eliminates head space. The jar was properly labeled and stored at 4°C until it was delivered to the Tennessee Department of Environment and Conservation (TDEC)-approved laboratory. A chain-of-custody form was completed for collected soil samples and was signed by both the field geologist who collected the sample and the laboratory receiving it to maintain sample security during all phases of transport.

The remaining half of the sampler was visually logged and portions placed in clean, airtight, sealable plastic bags to allow some air space for head space screening. After this screening, the sample was properly labeled and allowed to volatilize for at least 15 minutes at a minimum temperature of 68° Fahrenheit. All samples were allowed to volatilize for an approximately equal period of time before screening. After volatilization occurred, the head space was screened for organic vapors using a PID which was calibrated daily. Samples were selected for laboratory analysis based on field screening results and visual and/or olfactory detection. Organic vapor concentrations were recorded on the field boring or well log forms and are provided in Appendix A. In addition, each sampler was described and logged in the field on soil boring/well log forms. These boring/well log descriptions are provided in Appendix A.

Auger cuttings from the borings were containerized in 55-gallon steel drums and segregated by soil boring. Before containment, samples of the cuttings were collected using a decontaminated stainless-steel spoon following the procedures outlined in TDEC technical guidance document (TGD)-005, August 1996.

### **3.2.2 DPT Investigation**

At the request of the Navy (SOUTHNAVFACENGCOM) and NSA Memphis (NSAMEM), additional sampling was performed at the Facility N-12 site to adequately define soil and groundwater contamination. Two soil borings (N12SSB06 and N12SSB07) were advanced in the area of the former UST, one boring at each end of the tank cavity. Boring N12SSB06 was advanced on the western side of the UST cavity and boring N12SSB07 was advanced on the eastern side. Two additional borings (N12SSB08 and N12SSB09) were advanced downgradient of this area, one approximately 10 to 15 feet west of the cavity, and a second approximately 20 to 25 feet west of the cavity. The four DPT borings are shown in Figure 2-2. At the conclusion of the field work, the borings were abandoned via grouting with high solids bentonite and hydration.

#### **Cavity Borings**

Using DPT methods, a 4-foot continuous split spoon sampler was advanced to approximately 7 to 8 feet below ground surface (bgs) at each location. Upon retrieval, the sampler was split lengthwise. The EnSafe geologist used a decontaminated stainless-steel spoon to collect soil from the sampler at each location. The samples (N12SSB06 and N12SSB07) were each placed into pre-preserved glass containers provided by the laboratory and labeled. All samples were kept on ice and maintained under chain-of-custody until delivered the next day to ETC Laboratory in Memphis, Tennessee. Sampling activities and sample IDs were documented in a field logbook during the field event.

#### **Downgradient Borings**

Two DPT borings were advanced downgradient of the former UST. Boring N12SSB09 was advanced at a location approximately 10 to 15 feet west of the cavity area; boring N12SSB08 was advanced approximately 20 to 25 feet west of the cavity. Field screening and sampling procedures previously described were followed for the downgradient borings. Samples were collected at the following intervals: four to eight feet bgs, eight to 12 feet bgs, and 12 to 16 feet bgs.

The boring logs for N12SSB08 and N12SSB09 are provided in Appendix A. Continuous borings were not advanced at locations N12SSB06 and N12SSB07 and thus, boring log descriptions are provided only for the sampled two-foot intervals (7 to 8 feet bgs) at these locations. Analytical results for all four DPT borings are provided in Appendix B.

### 3.3 Analytical Results

#### Tank Closure

During the N-12 tank removal in 1996, two soil samples were collected from the bottom of the tank pit approximately 6 to 7 feet below ground surface (bgs) to determine if any contamination was present. Sample 12S was collected from the south end of the tank pit and Sample 12N was collected from the north end. The samples were analyzed using method SW-846 8020 for benzene and method SW-846 8015 for total petroleum hydrocarbons-gasoline range organics (TPH-GRO) with the following results, reported in parts per million (ppm):

	<b>Benzene</b>	<b>TPH</b>
Sample 12S	0.027	2,700
Sample 12N	1.9	8,900

The closure report is included in Appendix B.

#### Environmental Assessment

Tank N-12 was documented to contain diesel; therefore, soil samples selected for laboratory analyses were tested for benzene, toluene, xylenes, ethylbenzene, methyl-tertiary-butyl-ether (MTBE), and TPH-DRO. Due to inconsistencies in records of the UST contents, soil samples were analyzed for TPH-gasoline range organics (TPH-GRO). In addition, one soil sample from each boring was analyzed for volatile organic compounds (VOCs) at the request of the BRAC Closure Team (BCT).

Soil analytical results are summarized in Table 3-1 and provided in Appendix B. None of the detected benzene or TPH-DRO concentrations exceeded applicable cleanup levels. TPH-GRO was not detected in the soil samples submitted for laboratory analysis. Xylenes, ethylbenzene, and toluene were detected in the sample collected from the 3 to 8 foot depth in boring 0136SMW04. Those parameters do not have cleanup levels for soil.

Acetone, a common laboratory contaminant, was the only VOC detected that was not petroleum-related in soil. It was detected in the 8 to 13 foot sample interval in boring N12SMW04 (6.4  $\mu\text{g}/\text{kg}$ ) below its residential soil risk-based concentration of 7,800,000  $\mu\text{g}/\text{kg}$ .

### **3.4 Soil Properties Samples**

Two Shelby tube samples were collected from a boring adjacent to boring B-4/N12G04LS for geotechnical analyses. Based on the subsurface conditions encountered at boring B-4, one Shelby tube sample (136SB4ST0408) was collected from 6 to 8 feet bgs, across the capillary fringe and water table surface, and at a depth anticipated to represent the zone of highest permeability; the second Shelby tube sample (136SB4ST0413) was collected from 11 to 13 feet bgs, below the water table. Collection of Shelby tube samples was limited because groundwater recovery during drilling activities was slow; during the field investigation, the water table was encountered at approximately 12 to 13 feet bgs. However, the potentiometric surface rose to approximately 7.5 feet bgs.

The Shelby tubes were submitted to Tri-State Testing, Inc. of Memphis Tennessee for analysis of permeability, volumetric air and water content, total soil porosity, and soil bulk density. The analyses were performed in accordance with Method 9100 of Test Methods for evaluating Solid Waste, Third Addition (SW-846) and in general accordance with ASTM D-5084-90. The results are summarized in Table 3-2 and are provided in Appendix B.

**Table 3-1**  
**Soil Analytical Results**  
 UST N-12, NSA Memphis

Location ID	Date Sample Collected	Sample Depth (ft bgs)	Benzene ( $\mu\text{g}/\text{kg}$ )	Toluene ( $\mu\text{g}/\text{kg}$ )	Xylenes ( $\mu\text{g}/\text{kg}$ )	Ethylbenzene ( $\mu\text{g}/\text{kg}$ )	MTBE ( $\mu\text{g}/\text{kg}$ )	TPH-GRO (mg/kg)	TPH-DRO (mg/kg)	Acetone ( $\mu\text{g}/\text{kg}$ )
<b>Tank Closure</b>										
12S	9/19/96	7	27	NA	NA	NA	NA	2,700	NA	NA
12N	9/19/96	7	1,900	NA	NA	NA	NA	8,900	NA	NA
<b>Environmental Assessment</b>										
N12SMW01	1/6/98	03-08	ND	ND	ND	ND	ND	ND	1.4	NA
	1/6/98	08-13	ND	ND	ND	ND	ND	ND	1.9	NA
	1/6/98	13-18	ND	ND	ND	ND	ND	ND	ND	ND
N12SMW02	1/6/98	04-09	ND	ND	ND	ND	ND	ND	2.1	NA
	1/6/98	09-14	ND	ND	ND	ND	ND	ND	ND	NA
	1/6/98	14-19	ND	ND	ND	ND	ND	ND	ND	ND
N12SMW03	1/7/98	03-08	ND	ND	ND	ND	ND	ND	1.1	NA
	1/7/98	08-13	ND	ND	ND	ND	ND	ND	5.1	NA
	1/7/98	13-18	ND	ND	ND	ND	ND	ND	ND	ND

Table 3-1  
 Soil Analytical Results  
 UST N-12, NSA Memphis

Location ID	Date Sample Collected	Sample Depth (ft bgs)	Benzene ( $\mu\text{g}/\text{kg}$ )	Toluene ( $\mu\text{g}/\text{kg}$ )	Xylenes ( $\mu\text{g}/\text{kg}$ )	Ethylbenzene ( $\mu\text{g}/\text{kg}$ )	MTBE ( $\mu\text{g}/\text{kg}$ )	TPH-GRO (mg/kg)	TPH-DRO (mg/kg)	Acetone ( $\mu\text{g}/\text{kg}$ )
N12SMW04	1/8/98	03-08	10	5.9	23	33	ND	ND	1.8	NA
	1/8/98	08-13	ND	ND	ND	ND	ND	ND	ND	NA
	1/8/98	13-18	ND	ND	ND	ND	ND	ND	2.2	ND
<b>Additional DPT Sampling</b>										
N12SSB06	3/10/98	05-07	825	3,490	10,400	2,590	ND	61.6	95.1	ND
N12SSB07	3/10/98	05-07	ND	ND	ND	ND	ND	ND	95.1	ND
N12SSB08	3/10/98	04-08	ND	ND	ND	ND	ND	ND	ND	NA
		08-12	ND	ND	ND	ND	ND	ND	ND	NA
		12-16	ND	ND	ND	ND	ND	ND	ND	ND
N12SSB09	3/10/98	04-08	ND	ND	ND	ND	ND	ND	ND	NA
		08-12	ND	ND	ND	ND	ND	ND	ND	NA
		12-16	ND	ND	ND	ND	ND	ND	ND	ND
<b>Cleanup Level</b>			50,000	NS	NS	NS	NS	500	500	7,800,000 <sup>a</sup>

**Notes:**

- ND = not detected
- NS = no standard established
- NA = not analyzed
- a = USEPA Region III, Risk-based Concentration for Residential Soil Ingestion (USEPA, 1997)

The permeabilities obtained from the laboratory analysis of the Shelby tubes are similar. Permeabilities from the 6 to 8 foot and 11 to 13 foot depths are  $1.4 \times 10^{-6}$  cm/sec and  $3.5 \times 10^{-6}$  cm/sec, respectively. The soil was classified as a clayey silt at both depths.

In accordance with TDEC requirements, a soil sample (136SFOC08) was collected and submitted for fractional organic carbon ( $F_{oc}$ ) analysis from the first soil boring (B-1) at a depth of 3 to 8 feet bgs, which is approximately one foot below the depth of the tank pit. The sample was placed in a plastic bag, in accordance with the POA, properly labeled and submitted to a laboratory to determine the  $F_{oc}$  content. Tri-State Testing Services, Inc. of Memphis, Tennessee performed the  $F_{oc}$  analysis in accordance with ASTM method D2974-87 (Method C). The  $F_{oc}$  content was determined to be 0.008 g-carbon/g-soil.

Based on the permeabilities detected in the Shelby tube samples, the cleanup levels for benzene and TPH in soil are 50,000  $\mu\text{g}/\text{kg}$  and 500 mg/kg respectively.

**Table 3-2**  
**Soil Properties**  
**N-12, NSA Memphis**

Parameter	Unit of Measure	0136ST0408	0136ST0413	0136SFOC08
Permeability	centimeters (cm)/second (sec)	$1.4 \times 10^{-6}$	$3.5 \times 10^{-6}$	NA
Volumetric Air Content	$\text{cm}^3\text{-air}/\text{cm}^3\text{-soil}$	0.019	0.036	NA
Volumetric Water Content	$\text{cm}^3\text{-H}_2\text{O}/\text{cm}^3\text{-soil}$	0.400	0.423	NA
Total Soil Porosity	$\text{cm}^3/\text{cm}^3\text{-soil}$	0.419	0.459	NA
Soil Bulk Density	$\text{g-soil}/\text{cm}^3\text{-soil}$	1.96	1.85	NA
Fractional Organic Carbon	$\text{g-carbon}/\text{g-soil}$	NA	NA	0.008

*Note:*

NA = not analyzed

### **3.5 Soil Contaminant Plume Maps**

Soil contamination at N-12 appears to be limited to a relatively small area. Analytical data indicate that soil contamination is not above the cleanup levels for benzene (50,000  $\mu\text{g}/\text{kg}$ ) or TPH (500  $\text{mg}/\text{kg}$ ). Maximum detected concentrations for benzene and TPH-DRO in soil are presented in Figures 3-1 and 3-2.



TI STREET

1558

N-12

Sheet Metal

N12G03LS  
ND

N12SSB08  
ND

N12SSB09  
ND

M12G02LS  
ND

N12G04LS  
ND

N12SSB08  
825

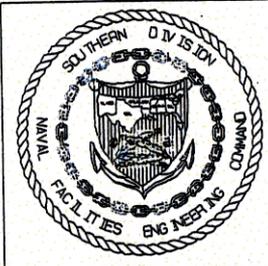
N12SSB07  
ND

N12G01LS  
ND

### LEGEND

-  Monitoring Well
-  DPT
-  Concentration Contour

NOTES: All results are in ppb.  
 Maximum concentrations in soil  
 are shown for each boring  
 Contour Interval - 500  
 Non-detects (ND)  
 are assumed to be zero.



Facility Investigation  
 UST N-12  
 NSA Memphis

FIGURE 3-1 Maximum Benzene  
 Concentrations in Soil

000440 B2Y



TI STREET

1558

N-12

Sheet Metal

N12903LS  
● 1.1

ND  
N1268808

ND  
N1268809

N12902LS  
● 2.1

ND  
N12904LS

N1298806  
● 96.1

N1268807  
● 14.1

N12901LS  
● 1.9

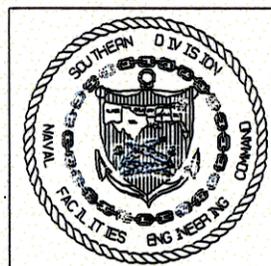
### LEGEND

● Monitoring Well

▼ DPT

~ Concentration Contour

NOTES: All results are in ppm.  
The Maximum result for each boring is shown  
for each boring  
Contour Interval - 50  
Non-detects (ND) are assumed to be zero.



Facility Investigation  
UST N-12  
NSA Memphis

FIGURE 3-2 Maximum TPH-DRO Concentrations in Soil

## **4.0 GROUNDWATER INVESTIGATION PROCEDURES**

### **4.1 Hydrogeology**

#### **4.1.1 Regional and Site Hydrogeology**

Shallow groundwater at the site occurs as a perched zone within the surficial loess deposits. These deposits primarily consist of silt, silty clay, clay, and clayey silt, and exhibit low water yields and poor water quality.

Beneath this surficial water-bearing zone lie two major aquifers, the Memphis Sand (lower Claiborne Group) and the Fort Pillow Formation (Wilcox Group). These aquifers provide 95 percent of the municipal and industrial water supply for the Memphis and Shelby County areas. The surficial aquifer is separated from the Memphis Sand and Fort Pillow aquifers by the Jackson-Upper Claiborne confining unit. The Jackson-Upper Claiborne unit consists of the Cockfield Formation and the Cook Mountain Formation. These confining units act as an aquitard, impeding the downward migration of shallow groundwater to the Memphis Sand and Fort Pillow aquifers below.

#### **4.1.2 Potentiometric Surface**

Water level data were collected on January 15 and 16, 1998, and February 5, 6, and 9, 1998 from the newly installed groundwater monitoring wells (N12G01LS, N12G02LS, N12G03LS, and N12G04LS). Table 4-1 summarizes the groundwater data collected on these dates. Water level measurements fluctuated slightly from the time the wells were installed to the time the last round of water levels was recorded. This fluctuation may be attributed to the following factors: 1) significant rainfall occurred during the installation of the monitoring wells; 2) rainfall occurred during the February collection of water level data; and 3) at the request of the Navy, continuous pumping was performed by the Army Corps of Engineers (at a rate of 85 gallons per minute) on the N-94 fuel farm monitoring wells, which lie directly west and within 150 feet of facility N-12. Pumping continued from February 5, 1998 to February 11, 1998 at N-94 fuel farm to dewater a

Table 4-1  
 Water Level Data  
 January and February, 1998

Monitoring Well	Top of Casing (TOC) Elevation (ft msl)	Depth to Water (ft below TOC)/Potentiometric Surface Elevations (ft msl)			Total Depth of Well (ft below grade)
		January 15 <sup>a</sup> -16, 1998	February 5 <sup>b</sup> -6, 1998	February 9, 1998	
N12G01LS	284.901	4.94/279.961	6.95/277.951	7.45/277.45	18.0
N12G02LS	287.061	6.60/280.461	8.82/278.241	9.32/277.741	19.0
N12G03LS	286.692	9.29/277.402	8.78/277.912	9.40/277.292	18.0
N12G04LS	287.410	6.86/280.550	9.09/278.32	9.57/277.840	18.0

**Notes:**

- a = N12G03LS water level was recorded on January 15, 1998; N12G01LS, N12G02LS, N12G04LS on January 16, 1998.
  - b = N12G03LS water level was recorded on February 5, 1998; N12G01LS, N12G02LS, N12G04LS on February 6, 1998.
- Free product was not encountered.

gravel-filled cavity which had formerly housed a 100,000-gallon UST. Dewatering the cavity was required for a MEME (Mobile Enhanced MultiPhase Extraction) to be performed on February 11, 1998 at N-94 fuel farm. Therefore, interpretation of the water level data collected at the N-12 facility is not straightforward and may be partially biased due to the previously mentioned influences on groundwater levels.

Potentiometric maps have been developed using water level data from monitoring wells N12G01LS through N12G04LS at facility N-12 (Figures 4-1, 4-2, and 4-3). As shown in Figures 4-1 through 4-3, groundwater "highs" exist in N12G04LS whereas groundwater "lows" exist in N12G03LS. Based on these interpretations, groundwater at the site flows due west.

It should be noted that the interpretations herein describing and illustrating the potentiometric surface and the groundwater flow direction at facility N-12 are only a few of several interpretations that could be posed for the data available. The existing limits of contamination at the site generally agree with the groundwater flow interpretation presented. Significant groundwater contamination has not been detected (see Section 4.4).



TI STREET

1558

N-12

Groundwater Flow Direction

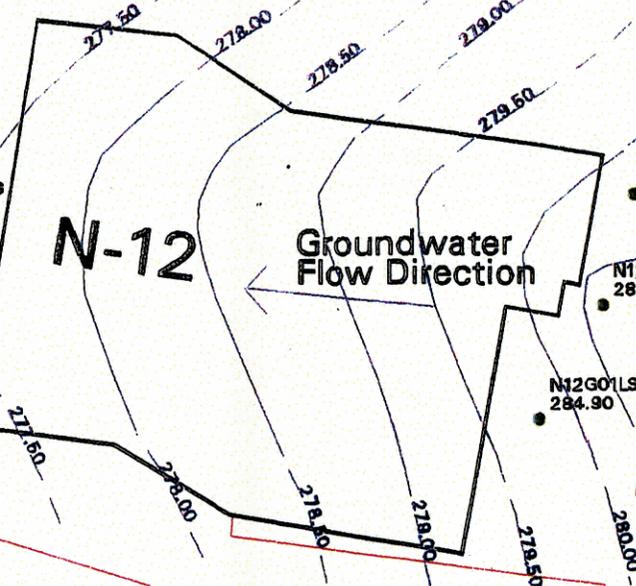
Sheet Metal

N12G03LS  
286.69

N12G02LS  
287.06

N12G04LS  
287.41

N12G01LS  
284.90



NOTE: Before Pumping



Facility Investigation  
 UST N-12  
 NSA Memphis

FIGURE 4-1 - Potentiometric  
 Surface Map - 1-15/1-16 1998

00044CB3Y



TI STREET

1558

N12G03LS  
286.69

N-12

Groundwater  
Flow Direction

N12G04LS  
287.41

N12G01LS  
284.90

N12G02LS  
267.08

Sheet  
Metal

278.00

278.25

NOTE: Begin Pumping



Facility Investigation  
UST N-12  
NSA Memphis

FIGURE 4-2 - Potentiometric  
Surface Map - 2-5/2-6 1998



TI STREET

1558

N-12

Groundwater  
Flow Direction

Sheet  
Metal

N12G03LS  
286.89

N12G02LS  
287.08

N12G04LS  
287.41

N12G01LS  
284.90

NOTE: After Pumping 5 Days



Facility Investigation  
UST N-12  
NSA Memphis

FIGURE 4-3 - Potentiometric  
Surface Map - 2/9/1998

#### 4.1.3 Free Product

No free product was encountered during the installation of monitoring wells N12G01LS through N12G04LS. However, during development of N12G04LS, a strong odor of petroleum and/or gasoline was noted, and a heavy oily sheen was observed on the surface of the groundwater purged. Analytical results indicate TPH-DRO and TPH-GRO concentrations in the groundwater sample collected from N12G04LS. The sample indicates concentrations of contamination that are within regulatory levels but higher than any of the concentrations found in samples collected from N12G01LS, N12G02LS, or N12G03LS.

#### 4.1.4 Hydraulic Gradient

Based on the most reliable potentiometric data available collected January 15 and 16, 1998 (Figure 4-1), the greatest hydraulic gradient occurs between monitoring wells N12G01LS and N12G04LS. Water levels from these wells indicate a drop in head of 0.59 feet across a horizontal distance of approximately 14 feet. Using these data, the hydraulic gradient between monitoring wells N12G01LS and N12G04LS is calculated to be 0.040. The lowest gradient occurs between monitoring wells N12G02LS and N12G04LS. Water levels from these wells indicate a drop in head of 0.09 feet across a horizontal distance of approximately 8.99 feet. Using these data, the gradient between monitoring wells N12G02LS and N12G04LS is calculated to be 0.0099. Gradient calculations between the respective wells are provided below:

$$\begin{aligned} \text{N12G01LS and N12G04LS} \quad dy/dx &= (280.55 \text{ ft} - 279.96 \text{ ft})/14.71 \text{ ft} \\ &= 0.04011 \end{aligned}$$

$$\begin{aligned} \text{N12G02LS and N12G04LS} \quad dy/dx &= (280.55 \text{ ft} - 280.46 \text{ ft})/8.99 \text{ ft} \\ &= 0.0099 \end{aligned}$$

#### 4.1.5 Slug Testing

Both rising and falling head slug tests were performed on three of the four newly installed wells at the N-12 facility to provide additional estimates of aquifer characteristics. Prior to slug testing, the static water levels were measured using an electronic water level indicator (see Figure 4-3). Slug testing was then performed on monitoring wells N12G01LS, N12G02LS, and N12G04LS; N12G01LS and N12G02LS slug tests were performed simultaneously using a two-channel Hermit 1000C data logger. An In-Situ pressure transducer was placed in the water column at the bottom of the well (or wells) and connected to the data logger so water levels in the well could be measured and recorded. After allowing the water column (or columns) to recover and stabilize from insertion of the pressure transducer (or transducers), a 3-foot-long, 1.5-inch diameter Teflon slug was rapidly inserted into the water column. The data logger, programmed to continuously record water levels from the insertion of the slug until termination of the test, began recording water level measurements. To facilitate subsequent graphing of the slug test data, the data logger recorded water level measurements logarithmically. Rising head tests were similarly performed in the monitoring wells, with water level measurements recorded during and subsequent to rapid withdrawal of the slug from the water column.

Data from the slug tests were evaluated using AQTESOLV (Aquifer Test Solver) by Geraghty and Miller Modeling Group (1989). Rising and falling head slug test data were plotted using the unconfined aquifer solution. Elapsed time versus displacement was plotted on semi-logarithmic graphs. Hydraulic conductivity (k) values were computed using an equation developed by Bouwer and Rice (1976) for unconfined aquifers. Table 4-2 summarizes the slug test results for the three newly installed monitoring wells, N12G01LS, N12G02LS, and N12G04LS. The average k value calculated from the four tests is  $3.0 \times 10^{-5}$  ft/min. Slug test results and graphs are provided in Appendix C.

**Table 4-2**  
**Slug Test Results**

Monitoring Well	Rising Head Test	Falling Head Test
N12G01LS	$k = 3.092 \times 10^{-5}$ ft/min	$k = 3.777 \times 10^{-5}$ ft/min
N12G02LS	$k = 2.393 \times 10^{-5}$ ft/min	$k = 2.83 \times 10^{-5}$ ft/min
N12G04LS	$k = 4.782 \times 10^{-5}$ ft/min	$k = 2.703 \times 10^{-5}$ ft/min
Average k for N12G01LS, N12G02LS, N12G04LS		$k = 3.0 \times 10^{-5}$ ft/min

*Note:*

k = hydraulic conductivity

#### 4.1.6 Groundwater Flow Rates

Groundwater flow velocities were estimated using the following expression:

$$V = ki/n_e$$

Where:

V = groundwater velocity

k = horizontal hydraulic conductivity

i = hydraulic gradient

$n_e$  = estimated effective porosity

Groundwater velocity calculations were made using an average hydraulic conductivity (*k*) value of  $3.0 \times 10^{-5}$  ft/min based on an average of the *k* values obtained from slug test results. A range of velocities was determined using the observed high and low hydraulic gradients of 0.04011 and 0.0099, respectively. For this calculation, the effective porosity is assumed to be the average total porosity. The average total porosity value was taken from results of the Shelby tube analyses of soil collected in the boring adjacent to B-4/N12G04LS. This average total porosity is 0.439. The lowest and highest estimated groundwater velocities are calculated as shown below:

$$V_l = [\text{hydraulic conductivity (ft/min)}][\text{gradient}]/[\text{porosity}] = \text{ft/min}$$

$$V_h = [\text{hydraulic conductivity (ft/min)}][\text{gradient}]/[\text{porosity}] = \text{ft/min}$$

Where:

$V_l$  = lowest estimated groundwater velocity

$V_h$  = highest estimated groundwater velocity

Therefore:

$$V_l = (3.0 \times 10^{-5} \text{ ft/min})(0.0099)/(0.439) = 6.765 \times 10^{-7} \text{ ft/min}$$

$$V_h = (3.0 \times 10^{-5} \text{ ft/min})(0.04011)/(0.439) = 2.741 \times 10^{-6} \text{ ft/min}$$

Groundwater at the site is moving at a rate of  $6.765 \times 10^{-7}$  ft/min (or  $9.7 \times 10^{-4}$  ft/day) to  $2.741 \times 10^{-6}$  ft/min (or  $3.95 \times 10^{-3}$  ft/day).

## 4.2 Monitoring Well Construction

Four groundwater monitoring wells were installed during this investigation. Monitoring well N12G02LS was installed as an upgradient well to the former UST cavity and suspected release location; N12G01LS was installed as a sidegradient well; N12G03LS was installed as a downgradient well; and N12G04LS was installed as close to the suspected release location as possible.

Placement of B-2/N12G02LS was modified slightly due to the presence of several overhead power lines in the area. Once health and safety issues were assessed, the boring/monitoring well was placed as close to its originally proposed location as possible.

### 4.2.1 Drilling Methods

The original borings were advanced by hollow-stem auger drilling techniques approximately 10 feet into the saturated zone, or approximately 18 to 19 feet bgs. Bedrock was not encountered

during drilling. The saturated zone was encountered at around 8 feet bgs. Advancing the borings 10 feet into the saturated zone allowed for installation of a 15-foot well screen in accordance with TDEC recommendations.

#### 4.2.2 Number, Type, and Location of Monitoring Wells

TDEC UST regulations require the installation of at least four monitoring wells to assess groundwater conditions. The four required well locations correspond to the locations of the converted soil borings. These locations include one upgradient position (B-2/N12G02LS), one sidegradient position (B-1/N12G01LS), one downgradient position (B-3/N12G03LS), and one position (B-4/N12G04LS) as close as possible to the suspected release point. The monitoring wells were installed in the uppermost water-bearing zone. The groundwater flow direction is to the west. Boring/monitoring well locations are shown on Figure 2-1.

To adequately define the plume, soil samples were collected at four additional soil borings (see Figure 2-2). These soil boring locations (N12SSB06, N12SSB07, N12SSB08, and N12SSB09) were advanced using DPT methods, and were not converted to monitoring wells. The four soil borings advanced as part of the DPT investigation are described in Section 3.2.2.

Monitoring wells are identified by a number unique to each well using the following format and guidelines:

*FORMAT:*    1 2 3 4 5 6 7 8

1 2 3    — The first three digits designate the site (N12).

4        — This digit represents the matrix of the sample. G is used to designate groundwater.

5678 — These four digits are for monitoring well identification. The first two digits represent the well number (i.e., 01, 02) followed by the unit in which the well is screened (LS = loess, UF = upper fluvial, LF = lower fluvial):

#### 4.2.3 Drilling Methods

The original borings were advanced by hollow-stem auger drilling techniques approximately 10 feet into the saturated zone, or approximately 18 to 19 feet bgs. Bedrock was not encountered during drilling. The saturated zone was encountered at around 8 feet bgs. Advancing the borings 10 feet into the saturated zone allowed for installation of a 15-foot well screen in accordance with TDEC recommendations.

Based on previous well installations in the area, groundwater monitoring wells installed at the N-12 facility were constructed using single-cased installations. The following paragraphs detail the steps that were followed. Table 4-3 summarizes the actual and calculated construction materials used for each monitoring well.

Table 4-3  
 Well Construction Materials  
 Calculated and Actual Volumes

	Sand Pack (ft <sup>3</sup> )		Bentonite Seal (ft <sup>3</sup> )		Grout Mixture (ft <sup>3</sup> )		Total (ft <sup>3</sup> )	
	Calc.	Actual	Calc.	Actual	Calc.	Actual	Calc.	Actual
N12G01LS	5.238	5.238	0.327	0.327	0.164	0.164	5.729	5.729
N12G02LS	5.565	5.565	0.327	0.327	0.164	0.164	6.056	6.056
N12G03LS	5.238	5.238	0.327	0.327	0.164	0.164	5.729	5.729
N12G04LS	5.238	5.238	0.327	0.327	0.164	0.164	5.729	5.729

- **Casing and Screen Type** — The casing and screen were constructed of 2-inch ID, precleaned, flush threaded, Schedule 40 PVC. The screen, which had 0.01-inch factory milled slots, was terminated with a threaded end cap. The casing was terminated with a locking, watertight cap.

- **Screen Length and Placement** — The screen was long enough and placed so that it intersected the water table at all times. A 15-foot screen was installed in all monitoring wells in a manner such that 10 feet of screen extends below the water table and 5 feet extends above the water table. A centralizer used in all single-cased monitoring wells, was placed below the screened interval at the bottom of the well. Because the water table elevation at the site is seven (7) to eight (8) feet bgs, there was little room, three (3) feet, to place the top of the sand filter pack, bentonite seal, and grout or cementing material. As with boring/monitoring well placement, field decisions were made regarding well construction based on the site-specific conditions.
- **Minimum Borehole Diameter** — The borehole diameter was at least 4 inches larger than the outside diameter of the well casing. Borings/monitoring wells were drilled using hollow stem augers with 4.25-inch inner diameter (ID).
- **Placement and Type of Filter Pack** — At least 6 inches of the filter pack material was placed under the bottom of the well screen to provide a firm footing. The filter pack extended 1 to 2 feet above the screened section. A weighted tape was used to prevent bridging and to ensure proper placement of the filter pack, which consisted of clean, washed, well sorted silica sand. Approximately 8 bags of sand were used to place the filter packs at each monitoring well location.
- **Placement and Type of Filter Pack Seal** — A 1-foot-thick filter pack seal was placed atop the filter pack. The filter pack seal consisted of high solids pure bentonite pellets. A weighted tape was used to prevent bridging and ensure proper placement of the filter pack seal. Because the seal was placed above the water table, 2 gallons of potable water were used to hydrate the pellets for at least one hour.

- **Placement and Type of Annular Grout** — The annular grout extended from the top of the filter pack seal to within 1 foot of the surface. The grout consisted of Portland cement mixed with 4%-6% powdered bentonite, for a grout density of 13.5 to 14.1 lbs/gal.
- **Surface Completion (Flush Mount)** — The final volume of the annular space was filled with concrete terminating in a flush-mounted manhole with a watertight, bolt-down, loadbearing cover. Manholes were held in place by concrete, sloped away from the manhole to divert surface drainage. A locking watertight cap was used for below-grade installations. A surface completion was used for N12G01LS.
- **Construct Wellhead Pad (Above-grade)** — After the protective casing was installed, concrete was poured into the pad form. The concrete pad was finished so that it slopes away from the wellhead in all directions with a minimum thickness of 6 inches. The protective posts (4-inch diameter, 6-foot long, 1/4-inch thickness, concrete-filled) were set in the concrete pad at a depth of 3 feet. Above-grade completions were used at monitoring wells N12G02LS, N12G03LS, and N12G04LS.

#### 4.3 Well Development

Before sampling newly installed wells N12G01LS, N12G02LS, N12G03LS, and N12G04LS, each well was developed using a combination of surging and bailing. Gallons removed from each well are listed below.

- N12G01LS            85 gallons
- N12G02LS            75 gallons
- N12G03LS            65 gallons
- N12G04LS            85 gallons

Development water was collected and drummed onsite for later disposal.

#### **4.4 Groundwater Sampling**

##### **4.4.1 Monitoring Wells**

A total of four monitoring wells were sampled during this investigation. The monitoring wells were purged until they were dry. The wells were allowed to recharge, then samples were collected using previously decontaminated and dedicated Teflon bailers. Samples were then transferred to clean, pre-preserved bottles. All samples were kept on ice and maintained under chain-of-custody until delivered overnight to Savannah Laboratory in Savannah, Georgia.

##### **4.4.2 DPT locations**

A total of two borings (N12SSB08 and N12SSB09) were advanced from which groundwater samples were collected. Groundwater samples were collected from depths at which PID readings indicated the highest concentrations of VOCs; the highest levels of VOCs were found at approximately 16 feet bgs in both borings. Once each boring reached a total depth of 16 feet bgs, and the soil samples had been collected, DPT rods were advanced to 16 feet bgs; a two-foot stainless-steel screen at the end of the rods was then ejected from its housing by retracting the rods two feet. The stainless-steel screen allowed groundwater to flow into the rods; dedicated tubing inserted into the rods and fastened to a Geoprobe-mounted vacuum pump was used to purge the "temporary well" for sampling.

During the purging process, groundwater was continually monitored for water quality parameters (pH, specific conductance, turbidity, and temperature) using a water quality meter. Though groundwater produced at both locations (N12SSB08 and N12SSB09) by the loess sediments was turbid and only partially decreased, water quality parameters stabilized within approximately 10% of successive readings. Additionally, the shallow loess sediments were purged dry at both locations. Groundwater samples were collected from the dedicated tubing, transferred into clean,

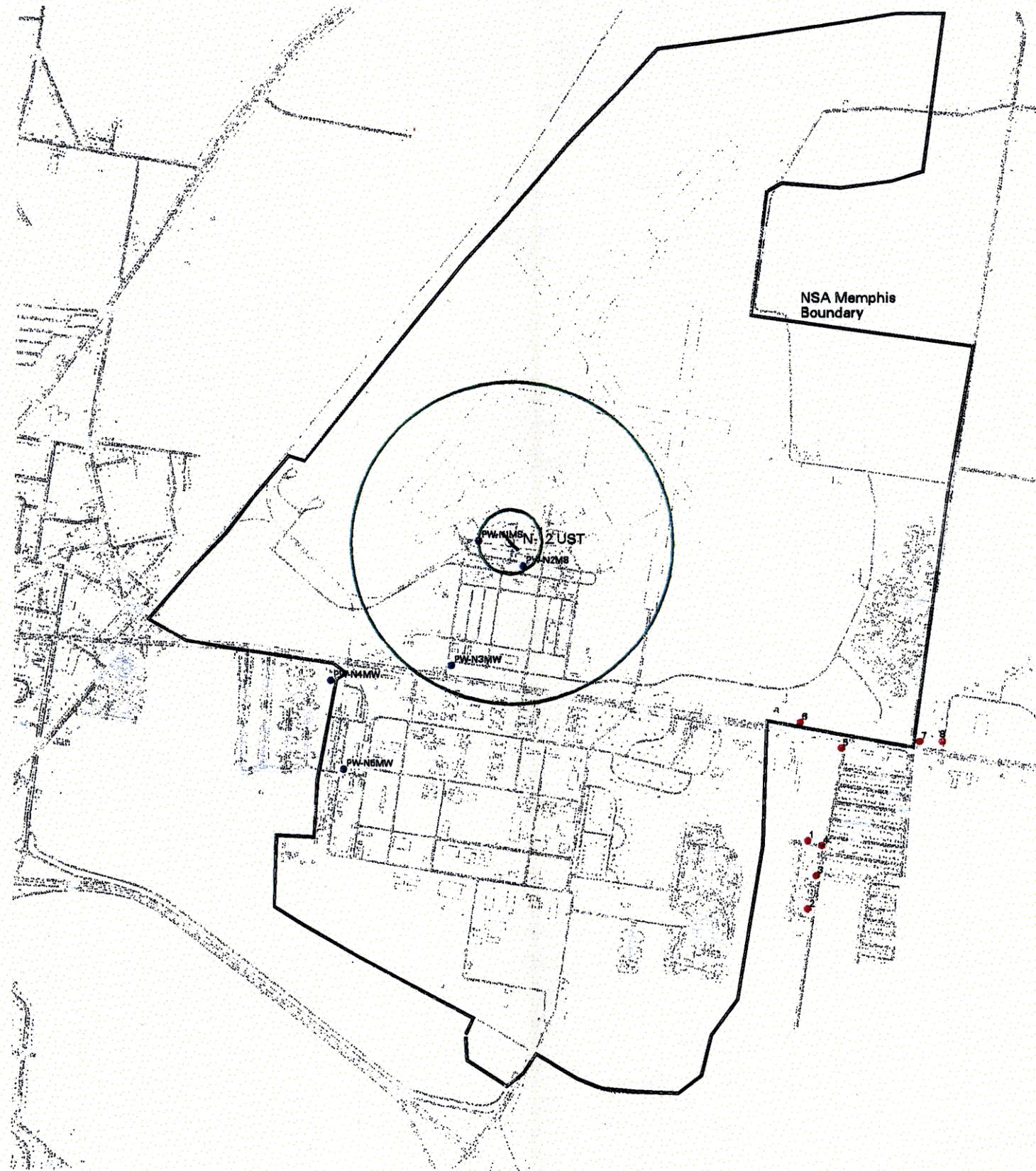
pre-preserved glass containers provided by the laboratory, and labeled in accordance with the POA. All samples were kept on ice and maintained under chain-of-custody until delivered the next day to ETC Laboratory in Memphis, Tennessee. Sampling activities and sample IDs were documented in a field logbook.

#### **4.5 Analytical Results**

Groundwater analytical results are provided in Table 4-4. The benzene concentration (150  $\mu\text{g/L}$ ) in the groundwater sample from N12G04LS exceeded its cleanup level (70  $\mu\text{g/L}$ ). No other parameters exceeded cleanup levels.

#### **4.6 Groundwater Classification**

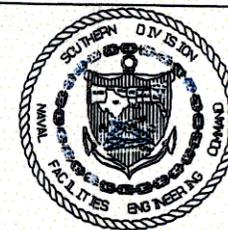
There are three water supply wells within 0.5 miles of N-12 NSA Memphis production well N-1 is approximately 500 feet west of N-12 (Figure 4-4). The total depth of this well is 523 feet, and it is screened in the Memphis Sand. Production well N-1 is currently not in use. Production well N-2 is approximately 400 feet southeast of N-12. The well is upgradient of the site based on the westerly groundwater direction. Production Well N-2 is 466 feet deep and provides potable water to the base. Production well N-3 is 2,250 feet southwest of N-12. The well is 1,450 feet deep and is sidegradient of N-12. It is used to supply potable water to the base. The Jackson-upper Claiborne Formation (a regional confining unit) has been documented by EnSafe near N-12. This formation is between the impacted surficial aquifer and the underlying Fort Pillow and Memphis Sand aquifers. It should act as a barrier to contaminants in the surficial zone, if the production wells are properly cased.



**LEGEND**

- Private wells
- Production Wells
- .5 and .1 mile from UST Location

Scale 1 : 2000



**FIGURE 4-4**  
NSA Memphis  
Drinking Water  
Supply Wells

File: /home/oe2/memphis\_dir/migw\_data/srsawells.amf

0001110021

Table 4-4  
 Groundwater Analytical Results

Monitoring Well	Date Sampled	Benzene (µg/L)	Toluene (µg/L)	Xylenes (µg/L)	Ethylbenzene (µg/L)	MTBE (µg/L)	TPH-GRO (mg/L)	TPH-DRO (mg/L)	Vinyl Chloride (µg/L)
<b>Environmental Assessment</b>									
N12G01LS	1/13/98	ND	ND	ND	ND	ND	ND	ND	ND
N12G02LS	1/13/98	ND	ND	ND	ND	ND	ND	ND	ND
N12G03LS	1/14/98	ND	ND	ND	ND	ND	ND	ND	ND
N12G04LS	1/13/98	<b>150</b>	71	130	46	12	0.72	0.32	ND
<b>Additional DPT Investigation</b>									
N12GSB0816	3/10/98	ND	ND	4.35	ND	ND	ND	ND	<b>3.04</b>
N12GSB0916	3/10/98	ND	ND	ND	ND	ND	ND	0.101	ND
Cleanup Level		70 <sup>a</sup>	1,000 <sup>a</sup>	10,000 <sup>a</sup>	700 <sup>a</sup>	NS	1 <sup>a</sup>	1 <sup>a</sup>	2 <sup>b</sup>

**Notes:**

ND = Not detected

NS = No standard established

Standard exceedances are in **bold**.

a = TDEC Division of Underground Storage Tank Cleanup Level

b = USEPA Maximum Contaminant Level

A groundwater sample was collected from monitoring well N12G01LS to determine if the impacted groundwater meets primary and secondary drinking water standards of Rule 1200-5-1. The analytical results are presented in Table 4-5. The sample was tested for iron and manganese and failed to meet the secondary standards for those metals. The groundwater is not a drinking water source as determined in the water use survey, and is therefore classified as a nondrinking water supply. A pumping test was not performed on the aquifer. The cleanup levels applicable to site groundwater are 70  $\mu\text{g/L}$  for benzene and 1 mg/L for TPH.

Table 4-5  
Groundwater Classification Sample Results

	Iron ( $\mu\text{g/L}$ )	Manganese ( $\mu\text{g/L}$ )
N12G01LS	26,700	1,090
Standard	300	50

#### 4.7 Groundwater Contaminant Plume Maps

Groundwater contamination at N-12 appears to be limited to a relatively small area. Analytical data indicate that groundwater contamination is above the cleanup levels for benzene (70  $\mu\text{g/kg}$ ) only at N12G04LS. Benzene, TPH-GRO, and TPH-DRO concentrations are shown in Figures 4-5, 4-6, and 4-7 respectively.

#### 4.8 Site Ranking

A site ranking was completed as requested in TGD — 014 of the *Environmental Assessment Report Guidelines*, from the TDEC, UST Reference Handbook, July 1996. The calculated site score was 343. A score greater than 500 indicates a corrective action is required. The site ranking form is provided in Appendix D.

The NSA Memphis production well N-1 is screened in the Ft. Pillow. The Jackson-upper Claiborne Formation is a confining unit that inhibits migration of the contaminants to the Ft. Pillow. Therefore, the score for the public water supply source is 0.



TI STREET

1558

N-12

Sheet Metal

N12G03LS  
ND

N12SSB08  
ND

N12SSB09  
ND

N12G02LS  
ND

60

100

160

100

60

0

N12G04LS

N12SSB06

N12SSB07

N12G01LS  
ND

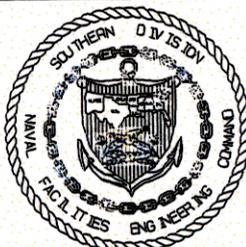
### LEGEND

● Monitoring Well

▼ DPT

N Concentration Contour

NOTES: All results are in ppb.  
50 - Contour Interval  
Non Detects are assumed to be 0.  
Groundwater samples were not collected  
at N12SSB06 and N12SSB07.



Facility Investigation  
UST N-12  
NSA Memphis

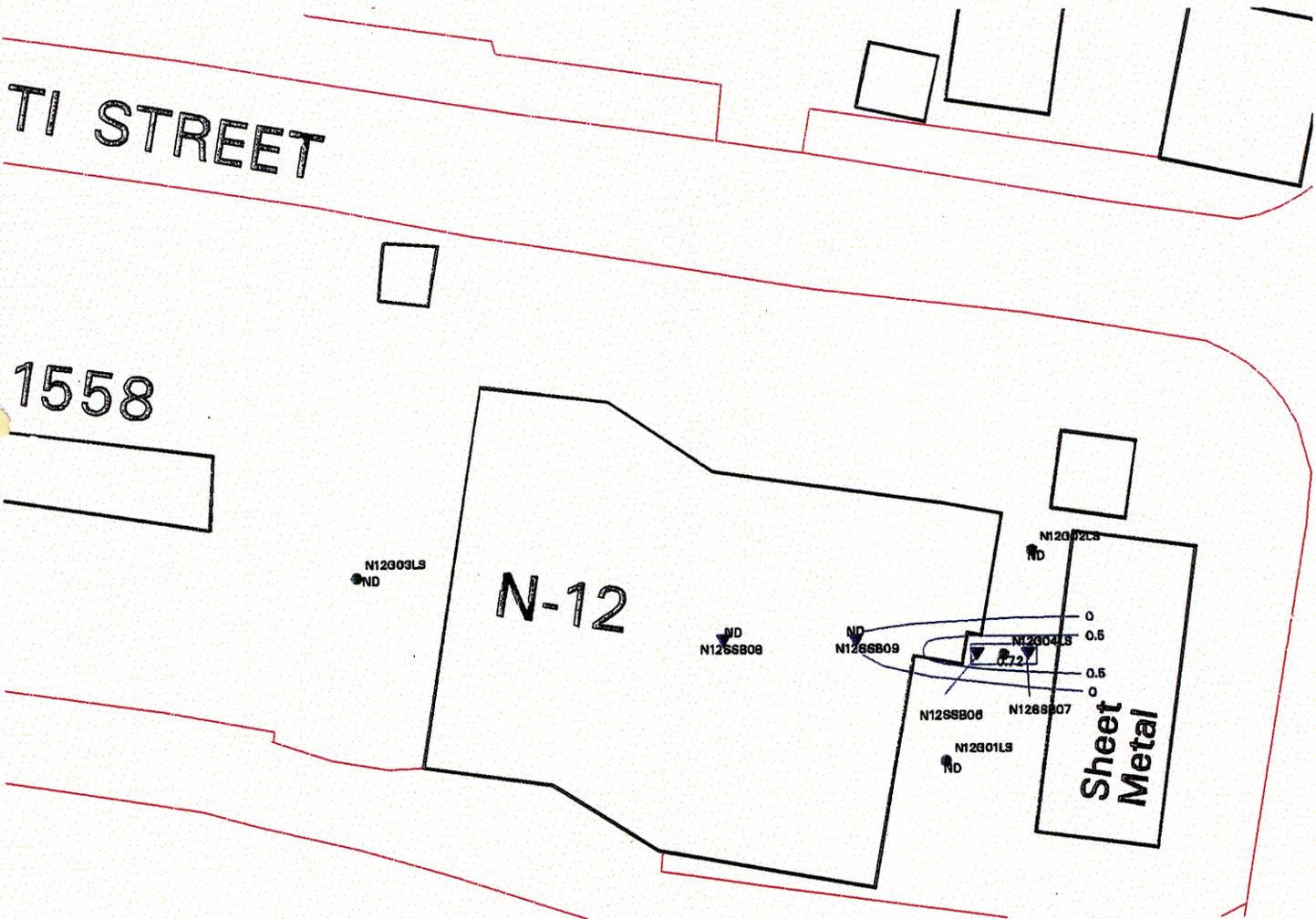
FIGURE 4-5 Benzene  
Concentrations in Groundwater

000440 B4V



TI STREET

1558



### LEGEND

● Monitoring Well

▼ DPT

∩ Concentration Contour

NOTES: All results are in ppm.  
0.5 - Contour Interval  
Non Detects are assumed to be zero.



Facility Investigation  
UST N-12  
NSA Memphis

FIGURE 4-6 TPH-GRO  
Concentrations in Groundwater





TI STREET

1558

N12903LS  
ND

N-12

ND  
N1298808

QJ01  
N1298808

N12982LS  
ND

0

0.1

0.2

0.3

0.2

0.32

N129804LS

N1298808

N1298807

ND

N12801LS

ND

Sheet  
Metal

### LEGEND

● Monitoring Well

▼ DPT

~ Concentration Contour

NOTES: All results are in ppm.  
Contour Interval - 0.1  
Non Detects are assumed to be 0.  
Groundwater samples were not collected  
at N1298808 and N1298807.



Facility Investigation  
UST N-12  
NSA Memphis

FIGURE 4-7 TPH-DRO  
Concentrations in Groundwater

## 5.0 FINDINGS AND RECOMMENDATIONS

The tank, a 7.5 gallon (gal) UST which had stored diesel, was removed in September 1996. Tank N-12 was located east of Building N-12 and had a broken fill pipe. Two soil samples collected at the time of removal indicated the presence of contamination. Overexcavation was limited by underground utilities and adjacent buildings. Conditions encountered at the site are summarized below.

- Groundwater at the site is classified as "non-drinking" water.
- The site soil cleanup level is 500 milligrams per kilogram (mg/kg), and the site groundwater cleanup level is 1 milligram per liter (mg/L) for TPH-DRO and TPH-GRO.
- One or more petroleum releases have occurred at the site impacting both soil and groundwater.
- Soil benzene and TPH-DRO concentrations were below the cleanup levels of 50,000  $\mu\text{g}/\text{kg}$  and 500 mg/kg in all soil samples collected.
- TPH-GRO concentrations in groundwater were below the cleanup level of 1 mg/L in all monitoring wells. TPH-DRO was not detected in groundwater.
- Benzene concentrations in groundwater were above the cleanup level of 70  $\mu\text{g}/\text{L}$  in N12G04LS. Benzene was not detected in the other site monitoring wells. Vinyl chloride was also detected in shallow groundwater above its MCL.
- The site ranking was completed and the score was calculated at 343 which is below the ranking (500) that requires corrective action. A production well is located within 400 feet

of the site, but it is completed in the Ft. Pillow not in the loess deposits. Sampling of the Memphis Sand wells during the ongoing RCRA facility investigation (RFI) has found that VOCs are absent in deeper groundwater.

In the RCRA facility investigations, chlorinated solvents have been detected in the groundwater of the loess and fluvial deposits in the Northside. Tank N-12 is within Area of Concern A (AOC A), which has undergone an RFI. The RFI identified multiple areas with chlorinated solvents in the loess and deeper fluvial deposits groundwater that warrant corrective action. Pending corrective measures associated with AOC A will address the multiple solid waste management units (SWMUs)/sites within it, including the area of N-12. In addition, as a condition of property transfer, Northside groundwater use will be restricted. EnSafe recommends, with BCT concurrence, transfer of the N-12 groundwater to the Northside Loess Groundwater Corrective Measures Study (CMS).

**6.0 SIGNATURE PAGE**

I, the undersigned, certify under penalty of law, including but not limited to penalties for perjury, that the information contained in this report and on any attachments is true, accurate, and complete to the best of our knowledge, information, and belief. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for intentional violations.

Allison Dennen (P.G.)  
P.E. or P.G. (Print)

Allison Dennen July 14, 1998  
Signature Date

TN0788  
Tennessee License/Registration Number

STATE OF Tennessee COUNTY OF Shelby

Sworn to and subscribed before me by Allison Dennen on this date 7-14-98 My  
commission expires MY COMMISSION EXPIRES MAY 14, 2002

Regina A. Smith  
Notary Public (print name)

Regina A. Smith 7-14-98  
Signature Date

**Appendix A**  
**Soil Boring Logs/Monitoring Well Construction Diagrams**



**Environmental & Safety Designs, Inc.**

**Log of Monitoring Well N12G01LS**

Project: <i>NSA Memphis</i>	Location: <i>Millington, TN. N-12 UST Investigation</i>
Project No.: <i>0136-001</i>	Surface Elevation: <i>285.18 feet msl</i>
Started at: <i>1000 on 1-6-98</i>	TOC Elevation: <i>284.90 feet msl</i>
Completed at: <i>1200 on 1-6-98</i>	Depth to Groundwater: <i>7.45 feet</i> Measured:
Drilling Method: <i>4.25" HMS; 5' CSS</i>	Groundwater Elevation: <i>2-9-98 feet msl</i>
Drilling Company: <i>Tri-State Testing</i>	Total Depth: <i>18.0 feet</i>
Geologist: <i>Barb McGavern-Atkinson</i>	Well Screen: <i>3 to 18 feet</i>

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM
0-3								Post hole the first 3 feet (2' of concrete, then 3' of silty clay). Save some soil for IDW characterization.		<p>0.01 slot, PVC screen 2" ID, Sch. 40 PVC Casing 3" PVC end cap bentonite grout bentonite seal 10/20 sand</p>
3-4						CL	(3-4') Silty clay, medium brown.			
4-5						CL	(4-5') Silty clay with gravels.			
5-5.5			1	50	33	CL	(5-5.5') Silty clay, transition to mottled orange brown and light gray with brown iron concretions.			
5.5-8						CL	Took Foc sample at 8'.			
8-9						CL	(8-9') Silty clay, light gray mottled with dark gray. Iron inclusions present.			
9-12			2	83	41	CL	(9-12') Silty clay, grades to mottled orange brown and light gray. Iron inclusions present.	272.2		
13.5-14						ML	Encountered water at ~ 13.5-14'.			
14-18			3	100	53	ML	Clayey silt, mottled light gray and orange brown. Dark red to brown iron concretions, partings throughout.	267.2		
18-18.3							Well set @ 18'; screen 18-3'.			

Project: <i>NSA Memphis</i>	Location: <i>Millington, TN. N-12 UST Investigation</i>
Project No.: <i>0136-001</i>	Surface Elevation: <i>284.83 feet msl</i>
Started at <i>1440 on 1-6-98</i>	TOC Elevation: <i>287.06 feet msl</i>
Completed at <i>1640 on 1-6-98</i>	Depth to Groundwater: <i>9.32 feet</i> Measured:
Drilling Method: <i>4.25" HSA; 5" CSS</i>	Groundwater Elevation: <i>2-9-98 feet msl</i>
Drilling Company: <i>Tri-State Testing</i>	Total Depth: <i>19.0 feet</i>
Geologist: <i>Barb McGavern-Atkinson</i>	Well Screen: <i>4 to 19 feet</i>

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM
							ML	Surface conditions: grassy area; posthole the first ~4', save some soil for IDW characterization.		<p>WELL DIAGRAM</p> <p>0.01 slot, PVC screen            2" ID, Sch. 40 PVC Casing            3" PVC end cap            bentonite grout            bentonite seal            10/20 sand</p>
5			1			NA	CL	Clayey silt; medium brown with rootlets.  (4-8") Silty clay, medium brown with rootlets, quartz pebbles, and hematitic blebs throughout.	280.8	
10			2	50	49		SM	(8-9') Silty clay; mottled brown-orange and light gray; hematitic and (organic?) blebs throughout; some gravel to 4" diameter (long dim.).	275.8	
15			3	100	51			Silty sand, fine; mottled light gray and orange brown with hematitic blebs throughout, concentrated in some areas, increasing towards 14'. Moist		
20			4	100	55			Wet at ~14-14.5' Same as above with hematitic blebs throughout.  Water began rising within a half hour.		
20								Well set @ 19.0'; screen 19-4'.	265.8	



**Environmental & Safety Designs, Inc.**

**Log of Monitoring Well N12G03LS**

Project: <i>NSA Memphis</i>	Location: <i>Millington, TN N-12 UST Investigation</i>
Project No.: <i>0136-001</i>	Surface Elevation: <i>284.59 feet msl</i>
Started at <i>1215 on 1-7-98</i>	TOC Elevation: <i>286.69 feet msl</i>
Completed at <i>1415 on 1-7-98</i>	Depth to Groundwater: <i>9.40 feet</i> Measured:
Drilling Method: <i>4.25" HSA; 5" CSS</i>	Groundwater Elevation: <i>2-9-98 feet msl</i>
Drilling Company: <i>Tri-State Testing</i>	Total Depth: <i>12.0 feet</i>
Geologist: <i>Barb McGavern-Atkinson</i>	Well Screen: <i>3 to 18 feet</i>

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM
0-5			1	100	NA	[Vertical lines]	ML	Surface conditions: grassy area. Post hole the first ~3 feet of soil. Save some soil for IDW characterization.  (3-5') Clayey silt; orange-brown with common gravels and wood chips. Dry.	279.6	<p>0.01 slot, PVC screen 3" PVC end cap 2" ID, Sch. 40 PVC Casing bentonite grout bentonite seal 10/20 sand</p>
5-6			2	100	32	[Diagonal lines]	CL	(5-6') Silty clay; dark gray to green with hematitic blebs.	276.6	
6-8			3	100	34	[Vertical lines]	ML	(6-8') Silty clay; mottled tan/orange and gray; iron precipitation within rootlets, some iron nodules present. Moist.		
8-11			3	100	34	[Vertical lines]	ML	(8-11') Clayey silt; mottled light gray and orange brown, with iron concretions and hematitic blebs. Moist		
11-13			3	100	34	[Vertical lines]	ML	(11-13') Same as above. At 11' there is a dark gray cross-bedded silty clay with iron blebs; mottled with light gray silty clay.		
13-20			4	100	29	[Vertical lines]		(13-20') Clayey silt; mottled light gray and orange brown with black (organics?) and iron blebs throughout.  Water at ~ 13'.  Well set @ ~18'; screen 18-3'.	266.6	
20-40										



**Environmental & Safety Designs, Inc.**

**Log of Monitoring Well N12G04LS**

Project: NSA Memphis	Location: <i>Millington, TN N-12 UST Investigation</i>
Project No.: 0136-001	Surface Elevation: 285.40 feet msl
Started at 1000 on 1-8-98	TOC Elevation: 287.41 feet msl
Completed at 1200 on 1-8-98	Depth to Groundwater: 9.57 feet Measured:
Drilling Method: 4.25" HSA; 5' CSS	Groundwater Elevation: 2-9-98 feet msl
Drilling Company: Tri-State Testing	Total Depth: 18.0 feet
Geologist: Barb McGavern-Atkinson	Well Screen: 3 to 18 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM
0-3								Post hole the first 3 feet (grassy) of soil. Save some soil for IDW characterization.		<p>WELL DIAGRAM</p> <p>0.01 slot, PVC screen</p> <p>3" PVC end cap</p> <p>2" ID, Sch. 40 PVC Casing</p> <p>bentonite grout</p> <p>10/20 sand</p> <p>bentonite seal</p>
3.0-3.5							ML	(3.0-3.5') Clayey silt, medium gray to green gray.		
3.5-4.0			1	66	33		ML	(3.5-4.0') Clayey silt, medium brown mottled with light brown and iron stained silt. Iron precipitation cement within rootlet tubules. Some rootlets are preserved. Dry.		
4.5-5.5			2	100	41		ML	There is visual and olfactory indication of contamination present in the soil matrix. Odor is strong (petroleum/gasoline). (4.5-5.5') Clayey silt, medium brown, with rare gravels. No iron or visual/olfactory indication of contamination in lower part of split spoon. Dry.		
8.0-13.0			3	100	53		ML	(8.0-13.0') Clayey silt, medium gray stained green with contamination. Medium to strong odor present and obvious. Clayey silt is mottled with medium brown clayey silt and iron blebs throughout. Moist.	267.4	
13.0-18.0								(13.0-18.0') Water encountered around 13.0'. Slight odor is apparent in split spoon sample. Soil is clayey silt mottled medium gray and brown, with iron/hematitic blebs throughout but rare.		
								Well set at 18'; screen 18-3'.		



**Environmental & Safety Designs, Inc.**

**Log of Boring N12SSB06**

Project: <i>NSA Memphis</i>	Location: <i>Millington, TN. N-12 UST Investigation</i>
Project No.: <i>0136-001</i>	Geologist: <i>Barb McGavern-Atkinson</i>
Started at <i>1035 on 3-10-98</i>	Surface Elevation: <i>feet msl</i>
Completed at <i>1045 on 3-10-98</i>	Depth to Groundwater: <i>~8.0 feet</i> Measured:
Drilling Method: <i>Geoprobe with 4' split spoon</i>	Groundwater Elevation: <i>feet msl</i>
Drilling Company: <i>Tri-State Testing</i>	Total Depth: <i>8.0 feet</i>

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
0-4'							NS	(0-4') Post hole as precaution for underground utilities. No sample collected.	
4-7'							NS	(4-7') No sample collected.	
7-8'			ss-1	100	NA		ML	(7-8') Clayey silt, mottled moderate brown and orange. Strong gasoline odor present. Moderately moist. Sample collected from approximately 7 to 8 feet bgs.	
<p><i>End of boring at approximately 8.0 feet bgs</i></p> <p>Note: NS=Not Sampled</p>									



**Environmental & Safety Designs, Inc.**

**Log of Boring N12SSB07**

Project: <i>NSA Memphis</i>	Location: <i>Milington, TN N-12 UST Investigation</i>
Project No: <i>0136-001</i>	Geologist: <i>Barb McGavern-Atkinson</i>
Started at <i>1050 on 3-10-98</i>	Surface Elevation: <i>feet msl</i>
Completed at <i>1100 on 3-10-98</i>	Depth to Groundwater: <i>~8.0 feet</i> Measured:
Drilling Method: <i>Geoprobe with 4' split spoon</i>	Groundwater Elevation: <i>feet msl</i>
Drilling Company: <i>Tri-State Testing</i>	Total Depth: <i>8.0 feet</i>

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PTD (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
0-4'							NS	(0-4') Post hole as precaution for underground utilities. No sample collected.	
4-7'								(4-7') No sample collected.	
7-8'			ss-1	100	NA		ML	(7-8') Clayey silt, mottled moderate brown and orange. Moderately moist. Sample collected from approximately 7 to 8 feet bgs.	
8.0'								End of boring at approximately 8.0 feet bgs Note: NS=Not Sampled	



**Environmental & Safety Designs, Inc.**

**Log of Boring N12SSB08LS**

Project: <i>NSA Memphis</i>	Location: <i>Millington, Tennessee</i>
Project No.: <i>0136-001</i>	Geologist: <i>Barbara McGavern-Atkinson</i>
Started at <i>1230 on 3-10-98</i>	Surface Elevation: <i>feet msl</i>
Completed at <i>1330 on 3-10-98</i>	Depth to Groundwater: <i>~6.0 feet</i> Measured: <i>3-10-98</i>
Drilling Method: <i>Geoprobe with 4' split spoon</i>	Groundwater Elevation: <i>feet msl</i>
Drilling Company: <i>Tri-State Testing Services, Inc.</i>	Total Depth: <i>16.0 feet</i>

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
0-7'								Concrete and building foundation.	
7-1'								Gravel fill.	
1-4'								Clay, dark gray, dry.	
4-6'								Clay, dark gray, with hematitic concentrations and rare silt. Wet at ~6.0'.	
6-8'								Silty clay, dark brown.	
8-10'							CL	Silty clay, dark brown, mottled with light brown to orange silt. Concentrations of black material (organics?) present. Wet.	
10-12'								Silty clay, orange to brown, with rare dark brown silty clay. Black material (organics?) present. Moist to wet.	
12-16'								Same as above (10-12').	
16-16'								End of boring at 16 feet bgs	
								Note: Due to existence of possible underground utilities, the first four feet of soil was removed by and augering (HA).	



Environmental & Safety Designs, Inc.

Log of Boring N12SSB09LS

Project: NSA Memphis	Location: Millington, Tennessee
Project No: 0136-001	Geologist: Barbara McGavern-Atkinson
Started at 1500 on 3-10-98	Surface Elevation: feet msl
Completed at 1600 on 3-10-98	Depth to Groundwater: ~6.0 feet Measured: 3-10-98
Drilling Method: Geoprobe with 4' split spoon	Groundwater Elevation: feet msl
Drilling Company: Tri-State Testing Services, Inc.	Total Depth: 16.0 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
0 - 0.7								(0-.7') Concrete and building foundation.	
0.7 - 1								(.7-1') Gravel fill.	
1 - 4			HA	NA	NA		CL	(1-4') Clay, dark gray, dry.	
4 - 8			ss-1	100	100		CL	(4-8') Silty clay, dark grayish brown, mottled with common tan silt. Black material (organics?) present throughout. Wet at ~6.0.	
8 - 16			ss-2	100	115		ML	(8-16') Clayey silt, mottled light gray and orangish brown. Black material (organics?) throughout, with hematitic concentrations. Moist to wet.	
16 - 200			ss-3	100	200			End of boring at 16 feet bgs. Note: Due to possible existence of underground utilities, the first four feet of soil was removed by hand augering (HA).	

**Appendix B**  
**Analytical Results**



**CLOSURE REPORT  
NAVAL SUPPORT ACTIVITY, MEMPHIS  
TANK N-12  
CONTRACT NO. N62467-96-C-0720**

Prepared By

**GEOSCIENCES, INC.  
5021 MERCER UNIVERSITY DRIVE  
SUITE D-2  
MACON, GEORGIA 31210**



5. Method of purging tank atmosphere:  
Carbon dioxide gas \_\_\_ Nitrogen \_\_\_ Eductor-type air movers XX  
Diffused air blower \_\_\_ Dry ice (1.5 lb/100 gal.) \_\_\_  
Other \_\_\_\_\_
6. Product piping was drained into the tank. Yes XX No \_\_\_
7. Product piping was: Capped \_\_\_ Removed XX
8. All liquid/sludge was removed from the UST system. Yes XX No \_\_\_  
Not encountered \_\_\_
9. Method of liquid/sludge storage: Stored in DOT approved Drums, Naval Support Activity, Memphis
10. Method of liquid/sludge disposal: Turned over to Navy for disposal  
Manifests included in Appendix C. Yes \_\_\_ No XX  
Not applicable \_\_\_
11. Tank was labeled in accordance with the UST Regulations Appendix 6(4)(f).  
Yes XX No \_\_\_ Not applicable \_\_\_
12. Method of UST system storage/disposal:  
Cut up for disposal XX Stored on site \_\_\_ Stored off site \_\_\_  
Other \_\_\_\_\_
- UST systems stored on site or off site are subject to Rules 1200-1-15-.07(2)(e), (f) and (g) and Appendix 7.
13. Location of UST system storage/disposal Lazarov Brothers, 1166 N. Seventh Street Memphis, TN  
Certificate of disposal included in Appendix C. Yes XX No \_\_\_  
If no, explain \_\_\_\_\_
14. Amount of material excavated during UST system closure: 1 cubic yards.

15. Total amount of contaminated material overexcavated after removal of the UST system:  
0 cubic yards.

If more than 100 cubic yards of material was overexcavated, Division personnel in the appropriate field office should have been contacted.

Division personnel in the appropriate field office were contacted. Yes \_\_\_ No \_\_\_  
Not applicable XX

If yes:

Person contacted \_\_\_\_\_

Field Office \_\_\_\_\_

Date \_\_\_\_\_

Reported by \_\_\_\_\_

All excavated material remaining on the site of generation or on a site owned by the responsible party or subsidiary of the responsible party shall be placed on and covered with plastic and bermed. Sampling the excavated material in accordance with Technical Guidance Document - 005, must be completed prior to proper disposal.

If petroleum contaminated material is managed in accordance with Technical Guidance Document-009, the appropriate *Application to Treat Petroleum Contaminated Soil* shall be completed and submitted to the local field office for approval. If the contaminated material is to be treated on a site owned by a Third Party, contact the Tennessee Division of Solid Waste Management.

All excavations shall be backfilled with material containing levels at or below 5 ppm benzene and/or 100 ppm TPH.

16. Mark all that apply regarding the management of the excavated material:  
Stockpiled on site \_\_\_ Thermal treatment on site \_\_\_ Thermal treatment off site \_\_\_  
Landfilled \_\_\_ Other Place in drum, turned over to Navy \_\_\_\_\_

Documentation is included in Appendix C. Yes \_\_\_ No \_\_\_ If no, explain why \_\_\_\_\_

17. Explain why the method in #16 was chosen for management of the excavated material \_\_\_\_\_  
Navy Decision.

18. All samples were placed directly into the appropriate containers, immediately after collection. Yes XX No \_\_\_

19. Immediately after collection all samples were placed on ice and maintained at 4°C until delivered to a Division approved laboratory. Yes XX No \_\_\_

20.  Laboratory confirmation of petroleum contamination or discovery of free product was reported to the Division within 72 hours. Yes\_\_\_ No\_\_\_ Not applicable XX

If yes:

Person contacted \_\_\_\_\_

Field office \_\_\_\_\_

Date \_\_\_\_\_

Reported by \_\_\_\_\_

21. Water was encountered in the soil borings during closure-in-place.

Yes\_\_\_ NoXX Not applicable XX

If encountered, was water sampled. Yes\_\_\_ No\_\_\_

Monitoring well information is in Appendix A. Yes\_\_\_ No\_\_\_

Analytical results are in Appendix B. Yes\_\_\_ No\_\_\_

22. Water was encountered during excavation of the UST system. Yes\_\_\_ NoXX

Amount of water removed: \_\_\_\_\_ gals.

Water recharged within 24 hours. Yes\_\_\_ No\_\_\_

Recharge water was sampled. Yes\_\_\_ No\_\_\_

Analytical results are in Appendix B. Yes\_\_\_ No\_\_\_

Method of water disposal: \_\_\_\_\_

Manifests included in Appendix C. Yes\_\_\_ No\_\_\_

23. If more than 500 gallons of water were removed, Division personnel in the appropriate field office should have been contacted.

Division personnel in the appropriate field office were contacted. Yes\_\_\_ No\_\_\_

Not applicable XX

If yes:

Person contacted \_\_\_\_\_

Field Office \_\_\_\_\_

Date \_\_\_\_\_

Reported by \_\_\_\_\_

24. Bedrock was encountered during UST system removal/closure-in-place.

Yes\_\_\_ No XX

All contaminated material above the applicable cleanup level was excavated.

Yes\_\_\_ No XX Not applicable \_\_\_

Soil was sampled from floor of excavation. Yes XX No\_\_\_

Analytical results are in Appendix B. Yes XX No\_\_\_

25. The original Notification Form reporting the closure of the tank system was submitted to the Nashville Central Office. Yes XX No\_\_\_

26. Failure to submit a Notification Form may result in the assessment of additional tank fees.

THIS PERMANENT CLOSURE REPORT WILL NOT BE PROCESSED WITHOUT THE COMPLETION AND SUBMITTAL OF THE APPROPRIATE APPENDICES IN THEIR ENTIRETY.

27. An updated site map shall be provided in this space showing buildings, utilities, areas of overexcavation, borings, and sample points. The map shall also include soil stockpiles, their dimensions in feet, and properly labeled screening and sampling points. A measurement shall be included from one corner of the tank excavation to a permanent structure (i.e. building, power pole, fire hydrant, etc.). The site map shall include a north arrow.

See figures 1 and 2 in Appendix A.

Permanent Closure Report  
Date 12/18/96  
Page 6 of 6

Facility ID Number \_\_\_\_\_  
Tank No. N-12

I certify under penalty of law, including but not limited to penalties for perjury, that the information contained in this form and on any attachments is true, accurate and complete to the best of my knowledge, information and belief. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for intentional violations.

_____ UST System RP or RP's authorized representative (Print name)	_____ Signature	_____ Date
_____ Title (Print)		
<u>Jon A. Spaller, P.G.</u> P.E. or P.G. (Print name)	<u>Jon A Spaller</u> Signature	<u>12/18/96</u> Date
<u>TN0299</u> TN Registration #		

Note: Each of the above signatures shall be notarized separately with the following statement.

STATE OF GEORGIA COUNTY OF BIBB

Sworn to and subscribed before me by Jon A. Spaller on this date  
12/18/96. My commission expires My Commission Expires Oct. 18, 2003

<u>DEBBIE W. SCARBOROUGH</u> Notary Public (Print Name)	<u>Debbie W. Scarborough</u> Signature	<u>12/18/96</u> Date
--	---	-------------------------

Stamp/Seal

Permanent Closure Report  
Date 12-2-96  
Page 6 of 6

Facility ID Number 0-791696

I certify under penalty of law, including but not limited to penalties for perjury, that the information contained in this form and on any attachments is true, accurate and complete to the best of my knowledge, information and belief. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for intentional violations.

Darryl K. Cressy, Public Works Officer  
UST System RP or RP's authorized  
representative (Print name)

D.K.C.  
Signature

14 JAN 97  
Date

\_\_\_\_\_  
Title (Print)

\_\_\_\_\_  
P.E. or P.G. (Print name)

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
TN Registration #

Note: Each of the above signatures shall be notarized separately with the following statement.

STATE OF TENNESSEE COUNTY OF STHELBY

Sworn to and subscribed before me by Darryl K. Cressy on this date

14 JAN 97. My commission expires 08/97.

ERIC M. HURT  
LT. JAGC. USNR  
Notary Public (Print Name)

Eric M. Hurt  
Signature

14 JAN 97  
Date

Stamp/Seal

BUILDING N-12

FACILITY ID NUMBER N/A

TABLE 1  
FIELD SCREENING RESULTS

PID/FID READING	LOCATION	DEPTH
10 TO 100	Side Walls	0 to 3 feet
260 to 570	Side Walls	3 to 6 feet
>2000	Pit Bottom	6 to 7 feet

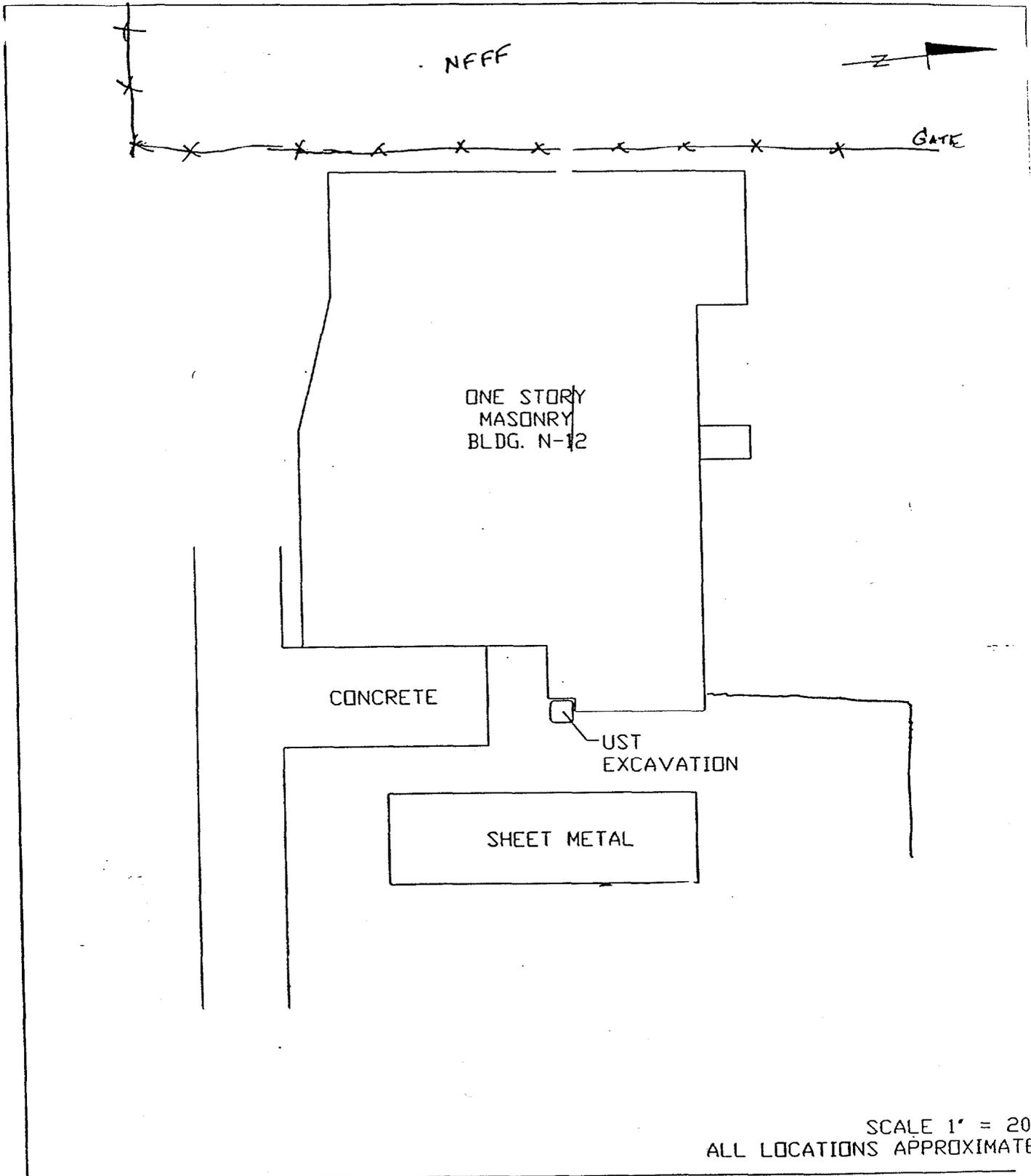
Results in PPM

TABLE 2  
ANALYTICAL RESULTS

SAMPLE ID #	TPH (GRO)
N-12, North (-7 feet)	8900
N-12, South (-7 feet)	2700

Results in PPM  
ND = None Detected

See Appendix B for complete report

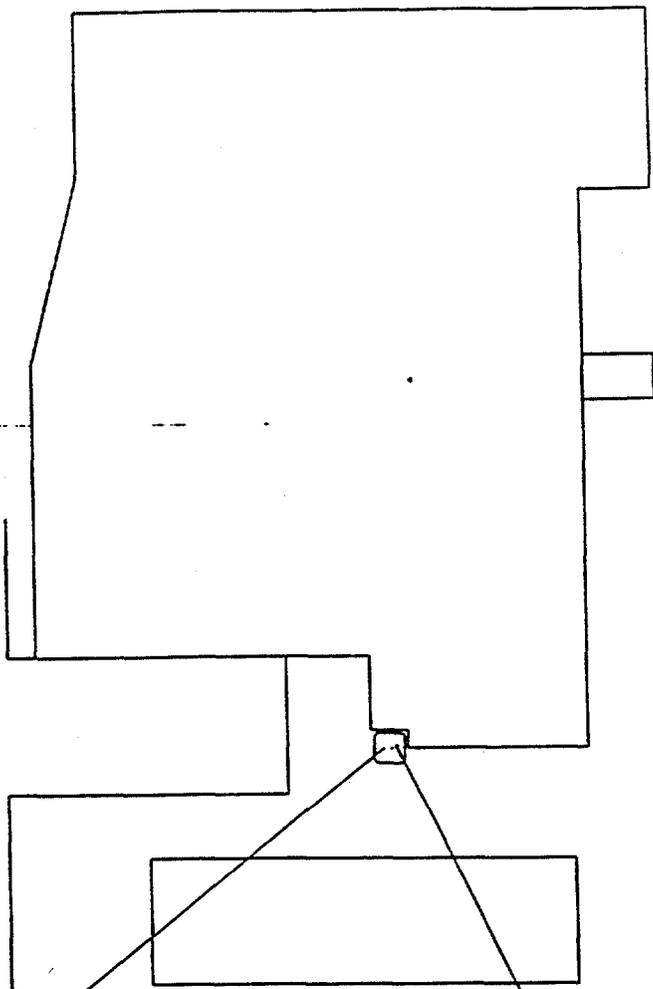


SCALE 1" = 20'  
ALL LOCATIONS APPROXIMATE

FIGURE 1  
SITE MAP, BLDG. N-12  
NAVAL SUPPORT ACTIVITY, MEMPHIS  
MILLINGTON, TENNESSEE  
GEOSCIENCES JOB NO. MCE-96-515A



Geosciences inc.



LAB ID: AB07858  
SAMPLE ID: N-12, SOUTH (-7')  
TPH = 2700 ppm  
BENZENE = 0.027 ppm

LAB ID: AB07857  
SAMPLE ID: N-12, NORTH (-)  
TPH = 8900 ppm  
BENZENE = 1.9 ppm

SCALE 1" =  
ALL LOCATIONS APPROXIMATE

FIGURE 2  
SITE MAP, BLDG. N-12  
NAVAL SUPPORT ACTIVITY, MEMPHIS  
MILLINGTON, TENNESSEE  
GEOSCIENCES JOB NO. MCE-96-515A



Geosciences inc.

# ACCURA ANALYTICAL LABORATORY, INC.

6017 Financial Drive, Norcross, Georgia 30071, Phone (770) 449-8800

FL Certification # E8742

NC Certification # 48

SC Certification # 9877

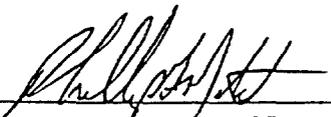
## LABORATORY REPORT

Omega Environmental Services  
Client Contact: DOUG DRIVER  
Client Proj No: N/A  
Client Proj Name: MEMPHIS NAS, TN.

Client Sample ID: N-12,NORTH (-7)  
Lab Sample ID: AB07857  
Lab Project# 11113

Date Sampled: 09/19/96  
Date Received: 09/24/96  
Date Reported: 12/04/96  
Sample Matrix: SOIL

Compound	Date Analyzed:	Analyst:	Method Ref.:	Reported Detection Limits	RESULTS	Units
<b>BENZENE REPORT</b>						
Benzene	10/01/96	LM	SW846-8020	1000	1,900	ug/kg
<b>BENZENE QC REPORT</b>						
1,4-Difluorobenzene (Surrogate)	10/01/96	LM	SW846-8020		178 %	ug/kg
4-Bromofluorobenzene (Surrogate)	10/01/96	LM	SW846-8020		107 %	ug/kg
Gasoline Range Organics	10/01/96	LM	SW846 8015	1000	8,900	mg/kg
<b>TPH (GRO) QC REPORT</b>						
1,4-Difluorobenzene (Surrogate)	10/01/96	LM	SW846 8015		158 %	mg/kg
4-Bromofluorobenzene (Surrogate)	10/01/96	LM	SW846 8015		146 %	mg/kg

  
Accura Analytical Laboratory,

# ACCURA ANALYTICAL LABORATORY, INC.

6017 Financial Drive, Norcross, Georgia 30071, Phone (770) 449-8800

FL Certification # E87429

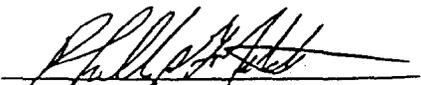
NC Certification # 483

SC Certification # 98011

## LABORATORY REPORT

<b>Omega Environmental Services</b>	<b>Client Sample ID: N-12, SOUTH (-7)</b>	<b>Date Sampled: 09/19/96</b>
<b>Client Contact: DOUG DRIVER</b>	<b>Lab Sample ID: AB07858</b>	<b>Date Received: 09/24/96</b>
<b>Client Proj No: N/A</b>	<b>Lab Project# 11113</b>	<b>Date Reported: 12/04/96</b>
<b>Client Proj Name: MEMPHIS NAS, TN.</b>		<b>Sample Matrix: SOIL</b>

Compound	Date Analyzed:	Analyst:	Method Ref.:	Reported Detection Limits	RESULTS	Units
<b>BENZENE REPORT</b>						
Benzene	10/01/96	LM	SW846-8020	10	27	ug/kg
<b>BENZENE QC REPORT</b>						
1,4-Difluorobenzene (Surrogate)	10/01/96	LM	SW846-8020		652 %	ug/kg
4-Bromofluorobenzene (Surrogate)	10/01/96	LM	SW846-8020		93 %	ug/kg
<b>Gasoline Range Organics</b>	10/01/96	LM	SW846 8015	1000	2,700	mg/kg
<b>TPH (GRO) QC REPORT</b>						
1,4-Difluorobenzene (Surrogate)	10/01/96	LM	SW846 8015		22 %	mg/kg
4-Bromofluorobenzene (Surrogate)	10/01/96	LM	SW846 8015		65 %	mg/kg

  
Accura Analytical Laboratory, I

# ACCURA ANALYTICAL LABORATORY, INC.

6017 Financial Drive, Norcross, Georgia 30071, Phone (770) 449-8800

FL Certification # E87-

NC Certification # 4

SC Certification # 9

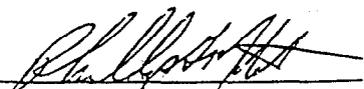
## LABORATORY REPORT

Client: Omega Environmental Services  
Client Contact: DOUG DRIVER  
Client Proj No: N/A  
Client Proj Name: MEMPHIS NAS, TN.

Client Sample ID: METHOD BLANK  
Lab Sample ID: AB07859  
Lab Project# 11113

Date Sampled: 09/19/96  
Date Received: 09/24/96  
Date Reported: 12/04/96  
Sample Matrix: SOIL

Compound	Date Analyzed:	Analyst:	Method Ref.:	Reported Detection Limits	RESULTS	Units
<b>BENZENE REPORT</b>						
Benzene	10/01/96	LM	SW846-8020	5	Not detected	ug/kg
<b>BENZENE QC REPORT</b>						
1,4-Difluorobenzene (Surrogate)	10/01/96	LM	SW846-8020		101 %	ug/kg
4-Bromofluorobenzene (Surrogate)	10/01/96	LM	SW846-8020		75 %	ug/kg
Gasoline Range Organics	10/01/96	LM	SW846 8015	10	Not detected	mg/kg
<b>TPH (GRO) QC REPORT</b>						
1,4-Difluorobenzene (Surrogate)	10/01/96	LM	SW846 8015		104 %	mg/kg
4-Bromofluorobenzene (Surrogate)	10/01/96	LM	SW846 8015		84 %	mg/kg

  
Accura Analytical Laboratory

**ACCURA ANALYTICAL LABORATORY, INC.**  
6017 Financial Drive, Norcross, Georgia 30071, Phone (770) 449-8800

**CASE NARRATIVE**

**Project Number: 11113**

**Client Name: Omega Environmental Services**

The following problems were encountered with this project:

1) The following sample(s) required dilution raising the Reported Detection Limits due to high analyte concentrations:

**GASOLINE RANGE ORGANICS**

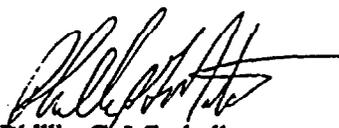
**N-12,NORTH(-7)\*                      N-12,SOUTH(-7)\***

**BENZENE by Method 8020**

**N-12,NORTH(-7)\*                      N-12,SOUTH(-7)\***

\*The recovery for one surrogate for this sample(s) was outside of acceptable limits due to matrix interferences. The remaining surrogate was within limits for this sample(s).

No other problems were encountered with this project.

  
**Phillip G. Mitchell**  
Quality Assurance Manager

**ACCURA ANALYTICAL LABORATORY, INC.**  
6017 Financial Drive, Norcross, Georgia 30071, Phone (770) 449-8800

**CASE NARRATIVE**

**Project Number: 11404**

**Client Name: Omega Environmental Services**

The following problems were encountered with this project:

- 1) The following sample(s) required dilution raising the Reported Detection Limits due to high analyte concentrations:

TCLP BENZENE  
N-12

No other problems were encountered with this project. Note that TCLP analyte concentrations that are found to be above the regulatory limits are marked with asterisks.

  
Phillip G. Mitchell  
Quality Assurance Manager





ACCURA ANALYTICAL LABORATORY, INC.

Environmental Analytical Services

CHAIN OF CUSTODY

6017 Financial Drive, Norcross, GA 30071-2925  
Phone # (770) 449-8800 Fax # (770) 449-5477

Company Name: Omega Environmental SVS  
 Address: 4661 Hammermill Rd. Site B Tucker GA 30084  
 Contact Name: Long Driver  
 Contact Phone # 770 621 9444 Fax # \_\_\_\_\_  
 Project Name: Memphis NAS, TN  
 Client Project # \_\_\_\_\_  
 Client P.O. # Call for P.O. # please

For Laboratory Use Only	
Custody Seal: <u>Y</u> <u>N</u>	Page <u>1</u> of <u>07</u>
QC Level: <u>N</u> <u>1</u> <u>2</u> <u>3</u> <u>4</u>	Init Temp: _____
Entered into LIMS: _____	AAL Project # _____
Sample Condition: _____	

Samplers: (signature) [Signature] Samplers: (printed) Trevi's Shoppard

Station #	Sample Date / Time	Comp	Grab	Matrix Preserved	Station Location:	No. of Containers	ANALYSIS REQUESTED				Remarks	AAL#: AB
							TPH	GRD	Belevone	TPH DRO		
N-12	9-19-96				North (-7)	1	✓	✓			IF not over	
N-12	9-19-96				South (-7)	1	✓	✓			100 ppm on GRD, then call for consideration of DRO.	

Relinquished By: [Signature] Date / Time: 9-23-96  
 Received By: \_\_\_\_\_ Date / Time: \_\_\_\_\_  
 Relinquished By: \_\_\_\_\_ Date / Time: \_\_\_\_\_  
 Received At Laboratory By: \_\_\_\_\_ Date / Time: \_\_\_\_\_  
 Special Requirements Or Remarks: \_\_\_\_\_  
 Turnaround Time Requested: \_\_\_\_\_

# ACCURA ANALYTICAL LABORATORY, INC.

6017 Financial Drive, Norcross, Georgia 30071, Phone (770) 449-8800

FL Certification # E874

NC Certification # 4

SC Certification #

## LABORATORY REPORT

Client: Omega Environmental Services

Client Sample ID: N-12

Date Sampled: 10/30/96

Client Contact: JOHN MOUNT

Lab Sample ID: AB09585

Date Received: 10/31/96

Client Proj No: BLDG#N-12

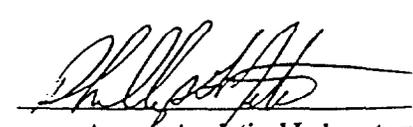
Lab Project# 11404

Date Reported: 11/05/96

Client Proj Name: MEMPHIS NAS CONTRACT# N62467-96-4-0720

Sample Matrix: LIQUID

Compound	Date Analyzed:	Analyst:	Method Ref.:	Reported Detection Limits	RESULTS	Units
Ignitability/Flash Point	11/05/96	JMS	SW846-1010	68	> 140	deg F
TCLP Lead	11/04/96	SCH	EPA 1311/200.7	1.0	Not detected	mg/L
TCLP BENZENE REPORT						
Benzene	11/04/96	LM	SW846-1311/8020	10	16 *	mg/L
TCLP BENZENE QC REPORT						
1,4-Difluorobenzene (Surrogate)	11/04/96	LM	SW846-1311/8020		89 %	mg/L
Bromofluorobenzene (Surrogate)	11/04/96	LM	SW846-1311/8020		99 %	mg/L



Accura Analytical Laboratory

# ACCURA ANALYTICAL LABORATORY, INC.

6017 Financial Drive, Norcross, Georgia 30071, Phone (770) 449-8800

FL Certification # E87  
NC Certification #  
SC Certification

## LABORATORY REPORT

Client: **Omega Environmental Services**      Client Sample ID: **METHOD BLANK**      Date Sampled: **10/30/96**  
Client Contact: **JOHN MOUNT**      Lab Sample ID: **AB09586**      Date Received: **10/31/96**  
Client Proj No: **BLDG#N-12**      Lab Project# **11404**      Date Reported: **11/05/96**  
Client Proj Name: **MEMPHIS NAS CONTRACT# N62467-96-4-0720**      Sample Matrix: **LIQUID**

Compound	Date Analyzed:	Analyst:	Method Ref.:	Reported Detection Limits	RESULTS	Units
TCLP Lead	11/04/96	SCH	EPA 1311/200.7	1.0	Not detected	mg/L
TCLP BENZENE REPORT						
Benzene	11/04/96	LM	SW846-1311/8020	1	Not detected	mg/L
TCLP BENZENE QC REPORT						
1,4-Difluorobenzene (Surrogate)	11/04/96	LM	SW846-1311/8020		117 %	mg/L
Bromofluorobenzene (Surrogate)	11/04/96	LM	SW846-1311/8020		76 %	mg/L

  
Accura Analytical Laboratory

Naval Support Activity, Memphis  
Millington, Tennessee

Subject: Storage Tanks and Solid Waste Management  
Units Removal  
Certification of Destruction  
Contract #N62467-96-R-0720

The undersigned certifies that the UST(s) listed below were removed, transported, cleaned and scrapped in general accordance with the following:

American Petroleum Institute (API)  
API RP 1604  
API PUBL 2015  
Code of Federal Regulation  
29 CFR 1910  
40 CFR 280  
Corps of Engineers (COE)  
COE EM-385-1-1

The UST was received from: NAVAL SUPPORT ACTIVITY, MEMPHIS

For destruction, the UST was delivered to: OMEGA ENVIRONMENTAL SERVICES, INC.

UST ID#: N-12

Place of Origin: BLDG. N-12

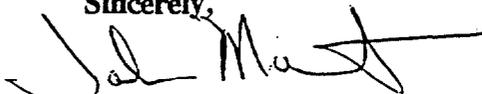
Date: 10-15-96

Buyer: LAZAROV BROTHERS

Seller: OMEGA ENVIRONMENTAL SERVICES, INC.

If there are any questions regarding this Certificate of Destruction, please contact John Mount or John Fleming at Omega Environmental Services, Inc. at (770) 621-9414.

Sincerely,



John A. Mount  
Project Manager

Lazarov Bros.  
North 7th Street  
Memphis Tennessee 38107

To Whom It may Concern:

On October 8, 1996 we received scrap metal from Omega Environmental Services. Cash was given to Bobby Styles of Omega Environmental Services for the amount shown on settlement reports 1753 and 1709.

A handwritten signature in cursive script that reads "Michael Wexler".

Michael Wexler  
Lazarov Brothers

**LAZAROV BROS.**

1167 North 7th St.  
Memphis, TN 38107

**SETTLEMENT REPORT**

**No. 1709**

Used From:

Date \_\_\_\_\_

Settlement Report # \_\_\_\_\_

Customer # \_\_\_\_\_

*Bobby Styles*

11/2/88

23920

#2 Steel Unprepared	19920	12780	0	7140	25.600 / NT	89.25	
							905T
							BOBBY STYLES
							17125 OLD MILL RD
							LITTLE ROCK, AR 72205

7140

89.25

Cash

*Bobby Styles*

TOTAL

LESS FREIGHT \_\_\_\_\_

LESS ADVANCE \_\_\_\_\_

BALANCE DUE \_\_\_\_\_

CUSTOMER

**LAZAROV BROS.**

1167 North 7th St.  
Memphis, TN 38107

**SETTLEMENT REPORT**

**No. 1753**

Used From:

Date \_\_\_\_\_

Settlement Report # \_\_\_\_\_

Customer # \_\_\_\_\_

*Bohly Style*

10/8/96

23964

15 40 Steel Unprepared 20140 12820 0 7320 25.000 7 NT 91.50

BOST  
BOBBY STILES  
17125 OLD MILL RD  
LITTLE ROCK, AR 72205

7320

91.50 CASH

*Bohly Style*

TOTAL

--	--	--	--	--	--

LESS FREIGHT \_\_\_\_\_

LESS ADVANCE \_\_\_\_\_

BALANCE DUE \_\_\_\_\_

CUSTOMER

**Contamination Assessment Analytical Results**

EN SAFE



CHAIN OF CUSTODY RECORD  
NSA MEMPHIS, BUILDING N-12

CTO-Task: 0136-001-08-400

CoC: 010798A

BPA/SO: 996/PO2R24/000

Page: 1 of 1

Address: 5724 Summer Trees Drive  
Memphis, TN 38134

Project Manager: Allison Denn  
Telephone No.: (901) 372-7962  
Fax No.: (901) 372-2454

Database Number 0136-00001

Samplers: (Signature): *L. Thompson*  
*(S) BIIIA*

Field Sample Number	Date	Time	Sample Type	Type/Size Of Container	Preservation		No. of Containers	ANALYSIS REQUIRED										Remarks				
					TEMP.	Chemical		BTEX	MTBE	SW846-VOA	TPH-DRO	TPH-GRO										
N12CMW0318	01/07/98	14:15	Soil	250, 125ML JARS	4ø C	NONE	4	X	X	X	X	X										
N12SMW0308	01/07/98	13:45	Soil	250, 125ML JARS	4ø C	NONE	8	X	X	X	X	X										MS/MSD
N12SMW0313	01/07/98	14:00	Soil	250, 125ML JARS	4ø C	NONE	4	X	X	X	X	X										
N12SMW0318	01/07/98	14:15	Soil	250, 125ML JARS	4ø C	NONE	4	X	X	X	X	X										
N12T010798	01/07/98		Water	40 ML VIAL	4ø C	HCL	3			X												TRIP BLANK
<p><i>per fax of 1/8/98 Do NOT analyze for TEL VOA on N12 SMW0318, N12 CMW0318 and N12 SMW0308 - only analyze for MTBE + BTEX</i></p>																						

RELINQUISHED BY: Signature: <i>L. Thompson</i> Printed: <u>Charlene Thompson</u> Company: <u>E/A&amp;H</u> Reason: <u>Ship to Lab</u>	DATE 01/07/98 TIME 16:56	RECEIVED BY: Signature: <i>[Signature]</i> Printed: <u>ERSICAN</u> Company: <u>SLES</u> Reason: <u>Analysis</u>	DATE 01/07/98 TIME 9:50	RELINQUISHED BY: Signature: _____ Printed: _____ Company: _____ Reason: _____	DATE _____ TIME _____	RECEIVED BY: Signature: <i>[Signature]</i> Printed: _____ Company: _____ Reason: _____	DATE _____ TIME _____
---	-----------------------------------	---	----------------------------------	---	--------------------------------	--	--------------------------------

Method of Shipment: <u>Fed Ex</u>	Shipment No.: _____	Special Instruction: _____	Comments: <u>Level III QC</u>	After Analysis, Samples are to be: <input type="checkbox"/> Disposed of <input type="checkbox"/> Stored (90 days Max) <input type="checkbox"/> Stored Over 90 Days <input type="checkbox"/> Returned to Customer
-----------------------------------	---------------------	----------------------------	-------------------------------	--

**ENSAFE****FAX COVER SHEET**

5724 Summer Trees Drive  
Memphis, Tennessee 38134  
(901) 372-796 Fax (901) 372-2454

Date: January 8, 1998  
To: Linda Wolfe  
From: Charlene Thompson  
Fax: 1-912-352-0165 Pages (Including Cover): 1  
Subject: Cancellation of analyses on samples received today

Linda,

Please cancel the SW846-VOA analysis on samples N12SMW0318, N12CMW0318, and N12SMW0308. Please perform the SW846-VOA analysis on sample N12SMW0313.

Thank you,  
Charlene Thompson

**EN SAFE**



**CHAIN OF CUSTODY RECORD  
NSA MEMPHIS, BUILDING N-12**

CTO-Task: 0136-001-08-40  
CoC: 010798A  
BPA/SO: 996/PO2R24/0C0

Address: 5724 Summer Trees Drive  
Memphis, TN 38134

Project Manager: Allison Denn  
Telephone No.: (901) 372-7962  
Fax No.: (901) 372-2454

Database Number 0136-00001

Samplers: (Signature): \_\_\_\_\_

Page: 1 of 1

JAN-08-1998 08:26 ENSAFE INC. VOL 003 L143 F.04/04

No. of Containers	ANALYSIS REQUIRED										Remarks	
	BTEX	MTBE	SNR66-VDA	TPH-DRO	TPH-GRO							
4	X	X	X	X	X							
8	X	X	X	X	X							MS/MSD
4	X	X	X	X	X							
4	X	X	X	X	X							
3			X									TRIP BLANK

Field Sample Number	Date	Time	Sample Type	Type/Size Of Container	Preservation		No. of Containers	BTEX	MTBE	SNR66-VDA	TPH-DRO	TPH-GRO					Remarks	
					TEMP.	Chemical												
N12CMW0318	01/07/98	14:15	Soil	250, 125ML JARS	40 C	NONE	4	X	X	X	X	X						
N12SMW0308	01/07/98	13:45	Soil	250, 125ML JARS	40 C	NONE	8	X	X	X	X	X						MS/MSD
N12SMW0313	01/07/98	14:00	Soil	250, 125ML JARS	40 C	NONE	4	X	X	X	X	X						
N12SMW0318	01/07/98	14:15	Soil	250, 125ML JARS	40 C	NONE	4	X	X	X	X	X						
N12T010798	01/07/98		Water	40 ML VIAL	40 C	HCL	3			X								TRIP BLANK

RELINQUISHED BY: Signature: _____ Printed: <u>Charlene Thompson</u> Company: <u>E/A&amp;H</u> Reason: <u>Ship to Lab</u>	DATE <u>01/07/98</u> TIME <u>16:56</u>	RECEIVED BY: Signature: _____ Printed: _____ Company: _____ Reason: _____	DATE TIME	RELINQUISHED BY: Signature: _____ Printed: _____ Company: _____ Reason: _____	DATE TIME	RECEIVED BY: Signature: _____ Printed: _____ Company: _____ Reason: _____	DATE TIME
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Method of Shipment: <u>Fed Ex</u> Shipment No.: _____ Special Instruction: _____	Comments: <u>Level III QC</u> _____ _____	After Analysis, Samples are to be: <input type="checkbox"/> Disposed of <input type="checkbox"/> Stored (90 days Max) <input type="checkbox"/> Stored Over 90 Days <input type="checkbox"/> Returned to Customer
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TOTAL P.04



**EN SAFE**



**CHAIN OF CUSTODY RECORD  
NSA MEMPHIS, BUILDING N-12**

CTO-Task: 0136-001-08-400

CoC: 010698B

BPA/SO: 996/PO2R24/000

Page: 1 of 2

Address: 5724 Summer Trees Drive  
Memphis, TN 38134

Project Manager: Allison Denn  
Telephone No.: (901) 372-7962  
Fax No.: (901) 372-2454

Database Number 0136-00001

Samplers: (Signature): *Barbara M. L...*

No. of Containers	ANALYSIS REQUIRED										Remarks	
	BTEX	MTBE	SH846-VDA	TPH-DRO	TPH-GRO	TCLP-BENZE	TCLP-PB					
11	X	X	X	X	X							
11	X	X	X	X	X							
2						X	X					
2						X	X					
2						X	X					
2						X	X					
4	X	X		X	X							
4	X	X		X	X							
4	X	X	X	X	X							

Field Sample Number	Date	Time	Sample Type	Type/Size Of Container	Preservation		No. of Containers	BTEX	MTBE	SH846-VDA	TPH-DRO	TPH-GRO	TCLP-BENZE	TCLP-PB			Remarks
					TEMP.	Chemical											
N12E041200	01/08/98	12:00	Water	40 ML, 1L GLASS	4ø C	SEE BOTTLE	11	X	X	X	X	X					
N12F041230	01/08/98	12:30	Water	40 ML, 1L GLASS	4ø C	SEE BOTTLE	11	X	X	X	X	X					
N12IDWMW01	01/06/98	13:00	Soil	250, 125ML JARS	4ø C	NONE	2						X	X			
N12IDWMW02	01/06/98	17:00	Soil	250, 125ML JARS	4ø C	NONE	2						X	X			
N12IDWMW03	01/07/98	15:00	Soil	250, 125ML JARS	4ø C	NONE	2						X	X			
N12IDWMW04	01/08/98	14:00	Soil	250, 125ML JARS	4ø C	NONE	2						X	X			
N12SMW0108	01/06/98	10:45	Soil	250, 125ML JARS	4ø C	NONE	4	X	X		X	X					
N12SMW0113	01/06/98	10:55	Soil	250, 125ML JARS	4ø C	NONE	4	X	X		X	X					
N12SMW0118	01/06/98	11:10	Soil	250, 125ML JARS	4ø C	NONE	4	X	X	X	X	X					

RELINQUISHED BY: Signature: <u><i>Charlene Thompson</i></u> Printed: <u>Charlene Thompson</u> Company: <u>E/A&amp;H</u> Reason: <u>Ship to Lab</u>	DATE <u>01/09/98</u> TIME <u>15:10</u>	RECEIVED BY: Signature: <u><i>S. Samuel</i></u> Printed: _____ Company: <u>SLGS</u> Reason: <u>SR-80149</u>	DATE <u>1/10/98</u> TIME <u>10:24</u>	RELINQUISHED BY: Signature: _____ Printed: _____ Company: _____ Reason: _____	DATE _____ TIME _____	RECEIVED BY: Signature: _____ Printed: _____ Company: _____ Reason: _____	DATE _____ TIME _____
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Method of Shipment: <u>Fed Ex</u> Shipment No.: _____ Special Instruction: _____	Comments: <u>Level III QC</u> _____ _____	After Analysis, Samples are to be: <input type="checkbox"/> Disposed of <input type="checkbox"/> Stored (90 days Max) <input type="checkbox"/> Stored Over 90 Days <input type="checkbox"/> Returned to Customer
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EN SAFE



CHAIN OF CUSTODY RECORD  
NSA MEMPHIS, BUILDING N-12

CTO-Task: 0136-001-08-400  
CoC: 010698B  
BPA/SO: 996/PO2R24/000

Address: 5724 Summer Trees Drive  
Memphis, TN 38134

Project Manager: Allison Denn  
Telephone No.: (901) 372-7962  
Fax No.: (901) 372-2454

Database Number 0136-00001

Samplers: (Signature): *Bub O. M. [unclear]*

Field Sample Number	Date	Time	Sample Type	Type/Size Of Container	Preservation		No. of Containers	ANALYSIS REQUIRED								Remarks		
					TEMP.	Chemical		BTEX	MTBE	SW846-VOA	TPH-DRD	TPH-GRO	TCLP-BENZE	TCLP-PB				
N12SMW0209	01/06/98	15:15	Soil	250, 125ML JARS	4ø C	NONE	4	X	X		X	X						
N12SMW0214	01/06/98	15:20	Soil	250, 125ML JARS	4ø C	NONE	4	X	X		X	X						
N12SMW0219	01/06/98	15:25	Soil	250, 125ML JARS	4ø C	NONE	4	X	X	X	X	X						
N12SMW0408	01/08/98	10:20	Soil	250, 125ML JARS	4ø C	NONE	3	X	X		X	X						STRONG ODOR
N12SMW0413	01/08/98	10:35	Soil	250, 125ML JARS	4ø C	NONE	4	X	X	X	X	X						STRONG ODOR
N12SMW0418	01/08/98	10:50	Soil	250, 125ML JARS	4ø C	NONE	3	X	X		X	X						STRONG ODOR
N12T010998	01/09/98		Water	40 ML VIALS	4ø C	HCL	3			X								TRIP BLANK

RELINQUISHED BY: Signature: <i>Charlene Thompson</i> Printed: <u>Charlene Thompson</u> Company: <u>E/A&amp;H</u> Reason: <u>Ship to Lab</u>	DATE <u>01/09/98</u> TIME <u>15:10</u>	RECEIVED BY: Signature: <i>S. Samuel</i> Printed: _____ Company: <u>SLCS</u> Reason: <u>SS-80149</u>	DATE <u>1/10/98</u> TIME <u>10:24</u>	RELINQUISHED BY: Signature: _____ Printed: _____ Company: _____ Reason: _____	DATE _____ TIME _____	RECEIVED BY: Signature: _____ Printed: _____ Company: _____ Reason: _____	DATE _____ TIME _____
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Method of Shipment: <u>Fed Ex</u> Shipment No.: _____ Special Instruction: _____	Comments: <u>Level III QC</u> _____ _____	After Analysis, Samples are to be: <input type="checkbox"/> Disposed of <input type="checkbox"/> Stored (90 days Max) <input type="checkbox"/> Stored Over 90 Days <input type="checkbox"/> Returned to Customer
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EN SAFE



CHAIN OF CUSTODY RECORD  
NSA MEMPHIS, BUILDING N-12

CTO-Task: 0136-001-08-400

CoC: 011498E

BPA/SO: 996/PO2R24/000

Page: 1 of 1

Address: 5724 Summer Trees Drive  
Memphis, TN 38134

Project Manager: Allison Denn  
Telephone No.: (901) 372-7962  
Fax No.: (901) 372-2454

Database Number 0136-00001

Samplers: (Signature): *Barbara McGovern*

Field Sample Number	Date	Time	Sample Type	Type/Size Of Container	Preservation		No. of Containers	ANALYSIS REQUIRED								Remarks	
					TEMP.	Chemical		BTEX	FE & MN	IGNIT&FLAS	MTBE	SW846-VOA	TPH-DRO	TPH-GRO	SW846-SVOA		
N12E011498	01/14/98	14:20	Water	VARIOUS	40 C	SEE BOTTLE	11	X	X	X	X	X	X	X			
N12F011498	01/14/98	14:10	Water	VARIOUS	40 C	SEE BOTTLE	11	X	X	X	X	X	X	X			
N12GMW0113	01/13/98	13:00	Water	VARIOUS	40 C	SEE BOTTLE	11	X	X	X	X	X	X	X			
N12GMW0213	01/13/98	13:20	Water	VARIOUS	40 C	SEE BOTTLE	11	X	X	X	X	X	X	X			cancel Fe & Mn
N12GMW0313	01/14/98	13:45	Water	VARIOUS	40 C	SEE BOTTLE	11	X	X	X	X	X	X	X			cancel Mn & Fe
N12GMW0413	01/13/98	14:00	Water	VARIOUS	40 C	SEE BOTTLE	33	X	X	X	X	X	X	X			MS/MSD cancel Fe & Mn
N12HMW0413	01/13/98	14:00	Water	VARIOUS	40 C	SEE BOTTLE	11	X	X	X	X	X	X	X			cancel Fe & Mn
N12T011498	01/14/98		Water	40 ML VIALS	40 C	HCL	3					X		X			TRIP BLANK

*cancel Fe & Mn*  
*cancel Mn & Fe*  
*MS/MSD cancel Fe & Mn*  
*cancel Fe & Mn*  
*cancel SVOA analyze for VOA only*

RELINQUISHED BY: Signature: <i>Barbara McGovern</i> Printed: <u>barbara mcgovern a</u> Company: <u>E/A&amp;H</u> Reason: <u>Ship to Lab</u>	DATE 01/14/98 TIME 15:33	RECEIVED BY: Signature: <i>M. Sincomb</i> Printed: <u>M. Sincomb</u> Company: <u>SLES</u> Reason: <u>SE-80248</u>	DATE 1/15/98 TIME 10:02	RELINQUISHED BY: Signature: _____ Printed: _____ Company: _____ Reason: _____	DATE TIME	RECEIVED BY: Signature: _____ Printed: _____ Company: _____ Reason: _____	DATE TIME
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Method of Shipment: <u>Fed Ex</u>	Shipment No.: _____	Special Instruction: _____	Comments: <u>DQO Level III</u> <u>3 coolers</u> <i>per attached cancel 4 for Fe &amp; Mn on samples &amp; walk 1/15/98</i>	After Analysis, Samples are to be: <input type="checkbox"/> Disposed of <input type="checkbox"/> Stored (90 days Max) <input type="checkbox"/> Stored Over 90 Days <input type="checkbox"/> Returned to Customer
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**ENSAFE****FAX COVER SHEET**

5724 Summer Trees Drive  
Memphis, Tennessee 38134  
(901) 372-796 Fax (901) 372-2454

Date: January 15, 1998  
To: Linda Wolfe, Beth Kessler  
From: Charlene Thompson  
Fax: 1-912-352-0165 Pages (Including Cover): 2  
Subject: Samples received today

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Linda and Beth,

The enclosed COC is the correct COC for release 24. It was decided this morning to cancel four Fe & Mn analyses and the SVOA analysis on the trip blank was a typo.

Please do not hesitate to contact me if you have any questions.

Thank you,  
Charlene Thompson

**EN SAFE**



**CHAIN OF CUSTODY RECORD  
NSA MEMPHIS, BUILDING N-12**

CTO-Task: 0136-0v1-08-401  
CoC: 011498E  
BPA/SO: 996/PO2R24/000

JAN-15-1998 08:48 ENSAFE, INC. TOTAL COC UNIT

Address: 5724 Summer Trees Drive  
Memphis, TN 38134

Project Manager: Allison Denn  
Telephone No.: (901) 372-7962  
Fax No.: (901) 372-2454

Page: 1 of 1

Database Number 0136-00001

Samplers: (Signature): C. Thompson for BMA

Field Sample Number	Date	Time	Sample Type	Type/Size Of Container	Preservation		No. of Containers	ANALYSIS REQUIRED							Remarks	
					TEMP.	Chemical		BTEX	FE & MN	IGNIT&FLAS	MTBE	SUB&S-VOA	TPH-DRO	TPH-GRO		
N12E011498	01/14/98	14:20	Water	VARIOUS	4ø C	SEE BOTTLE	11	X	X	X	X	X	X	X		
N12F011498	01/14/98	14:10	Water	VARIOUS	4ø C	SEE BOTTLE	11	X	X	X	X	X	X			
N12GHW0113	01/13/98	13:00	Water	VARIOUS	4ø C	SEE BOTTLE	11	X	X	X	X	X	X			
N12GHW0213	01/13/98	13:20	Water	VARIOUS	4ø C	SEE BOTTLE	11	X		X	X	X	X			
N12GHW0313	01/14/98	13:45	Water	VARIOUS	4ø C	SEE BOTTLE	11	X		X	X	X	X			
N12GHW0413	01/13/98	14:00	Water	VARIOUS	4ø C	SEE BOTTLE	33	X		X	X	X	X			MS/MSD
N12HKW0413	01/13/98	14:00	Water	VARIOUS	4ø C	SEE BOTTLE	11	X		X	X	X	X			
N12T011498	01/14/98		Water	40 ML VIALS	4ø C	HCL	3					X				TRIP BLANK

RELINQUISHED BY: Signature: <u>CMS for BMA</u> Printed: <u>barbara mcgavern a</u> Company: <u>E/A&amp;H</u> Reason: <u>Ship to Lab</u>	DATE <u>01/14/98</u> TIME <u>15:33</u>	RECEIVED BY: Signature: _____ Printed: _____ Company: _____ Reason: _____	DATE TIME	RELINQUISHED BY: Signature: _____ Printed: _____ Company: _____ Reason: _____	DATE TIME	RECEIVED BY: Signature: _____ Printed: _____ Company: _____ Reason: _____	DATE TIME
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Method of Shipment: <u>Fed Ex</u> Shipment No.: _____ Special Instruction: _____	Comments: <u>DQO Level III</u> _____ _____	After Analysis, Samples are to be: <input type="checkbox"/> Disposed of <input type="checkbox"/> Stored (90 days Max) <input type="checkbox"/> Stored Over 90 Days <input type="checkbox"/> Returned to Customer
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DATALCP2  
03/25/98

NSA MEMPHIS  
NSA MEMPHIS, BUILDING N-12

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Time: 09:36

MEM45 SW846-BTEX		SAMPLE ID ----->	H12-S-MW04-18	N12-S-MW01-08	N12-S-MW01-13	N12-S-MW02-09	N12-S-MW02-14	N12-S-MW03-08
		ORIGINAL ID ----->	N12SMW0418	N12SMW0108	N12SMW0113	N12SMW0209	N12SMW0214	N12SMW0308
		LAB SAMPLE ID ---->	S880149*9	S880149*4	S880149*5	S880149*6	S880149*7	S880101*3
		SAMPLE DATE ----->	01/08/98	01/06/98	01/06/98	01/06/98	01/06/98	01/07/98
		DATE ANALYZED ---->	01/16/98	01/16/98	01/16/98	01/16/98	01/16/98	01/16/98
		MATRIX ----->	Soil	Soil	Soil	Soil	Soil	Soil
		UNITS ----->	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG
CAS #	Parameter							
71-43-2	Benzene		6.3 U	6.6 U	6.9 U	6.5 U	6.4 U	6.2 U
108-88-3	Toluene		6.3 U	6.6 U	6.9 U	6.5 U	6.4 U	6.2 U
100-41-4	Ethylbenzene		6.3 U	6.6 U	6.9 U	6.5 U	6.4 U	6.2 U
1330-20-7	Xylene (Total)		6.3 U	6.6 U	6.9 U	6.5 U	6.4 U	6.2 U

DATALCP2  
03/25/98

NSA MEMPHIS  
NSA MEMPHIS, BUILDING N-12

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Time: 09:36

MEM45 SUB46-BTEX		SAMPLE ID -----> ORIGINAL ID -----> LAB SAMPLE ID ----> SAMPLE DATE -----> DATE ANALYZED ----> MATRIX -----> UNITS ----->	N12-C-MW03-18 N12CMW0318 S880101*2 01/07/98 01/16/98 Soil UG/KG	A	N12-S-MW04-08 N12SMW0408 S880149*8 01/08/98 01/16/98 Soil UG/KG	A	N12-S-LM03-18 N12SWM0318 S880101*4 01/07/98 01/16/98 Soil UG/KG	A			
CAS #	Parameter										
71-43-2	Benzene	6.4	U	10.		6.4	U				
108-88-3	Toluene	6.4	U	5.9	J	6.4	U				
100-41-4	Ethylbenzene	6.4	U	23.		6.4	U				
1330-20-7	Xylene (Total)	6.4	U	33.		6.4	U				

\*\*\* Validation Complete \*\*\*

DATALCP2  
03/25/98

NSA MEMPHIS  
NSA MEMPHIS, BUILDING N-12

Page: 3  
Time: 09:36

MEM45 SWB46-MTBE	SAMPLE ID ----->	N12-S-MW01-08	N12-S-MW01-13	N12-S-MW02-09	N12-S-MW02-14	N12-S-MW03-08	N12-C-MW03-18
	ORIGINAL ID ----->	N12SMW0108	N12SMW0113	N12SMW0209	N12SMW0214	N12SMW0308	N12CMW0318
	LAB SAMPLE ID ---->	S880149*4	S880149*5	S880149*6	S880149*7	S880101*3	S880101*2
	SAMPLE DATE ----->	01/06/98	01/06/98	01/06/98	01/06/98	01/07/98	01/07/98
	DATE ANALYZED ---->	01/16/98	01/16/98	01/16/98	01/16/98	01/16/98	01/16/98
	MATRIX ----->	Soil	Soil	Soil	Soil	Soil	Soil
	UNITS ----->	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG
CAS #	Parameter						
1634-04-4	Methyl tert-butyl ether	66. U	69. U	65. U	64. U	62. U	64. U

NSA MEMPHIS  
NSA MEMPHIS, BUILDING N-12

MEM45 SW846-MTBE	SAMPLE ID -----> ORIGINAL ID -----> LAB SAMPLE ID ----> SAMPLE DATE -----> DATE ANALYZED ----> MATRIX -----> UNITS ----->	N12-S-MW04-08 N12SMW0408 S880149*8 01/08/98 01/16/98 Soil UG/KG	N12-S-MW04-18 N12SMW0418 S880149*9 01/08/98 01/16/98 Soil UG/KG	N12-S-WM03-18 N12SMW0318 S880101*4 01/07/98 01/16/98 Soil UG/KG			
CAS #	Parameter	62. U	63. U	64. U			
1634-04-4	Methyl tert-butyl ether						

DATALCP2  
03/25/98

NSA MEMPHIS  
NSA MEMPHIS, BUILDING N-12

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Time: 09:36

MEM45 SW846-VOA		SAMPLE ID -----> ORIGINAL ID -----> LAB SAMPLE ID ----> SAMPLE DATE -----> DATE ANALYZED ----> MATRIX -----> LIMITS ----->	N12-S-MW01-18 N12SMW0118 S880149*1 01/06/98 01/16/98 Soil UG/KG	N12-S-MW02-19 N12SMW0219 S880149*2 01/06/98 01/16/98 Soil UG/KG	N12-S-MW03-13 N12SMW0313 S880101*1 01/07/98 01/16/98 Soil UG/KG	N12-S-MW04-13 N12SMW0413 S880149*3 01/08/98 01/16/98 Soil UG/KG			
CAS #	Parameter								
74-87-3	Chloromethane	13.	U	13.	U	13.	U	12.	U
74-83-9	Bromomethane	13.	UJ	13.	UJ	13.	UJ	12.	UJ
75-01-4	Vinyl chloride	13.	U	13.	U	13.	U	12.	U
75-00-3	Chloroethane	13.	U	13.	U	13.	U	12.	U
75-35-4	1,1-Dichloroethene	6.4	U	6.4	U	6.3	U	6.2	U
75-09-2	Methylene chloride	6.4	U	6.4	U	6.3	U	6.2	U
75-34-3	1,1-Dichloroethane	6.4	U	6.4	U	6.3	U	6.2	U
67-66-3	Chloroform	6.4	U	6.4	U	6.3	U	6.2	U
71-55-6	1,1,1-Trichloroethane	6.4	U	6.4	U	6.3	U	6.2	U
56-23-5	Carbon tetrachloride	6.4	U	6.4	U	6.3	U	6.2	U
71-43-2	Benzene	6.4	U	6.4	U	6.3	U	6.2	U
107-06-2	1,2-Dichloroethane	6.4	U	6.4	U	6.3	U	6.2	U
79-01-6	Trichloroethene	6.4	U	6.4	U	6.3	U	6.2	U
78-87-5	1,2-Dichloropropane	6.4	U	6.4	U	6.3	U	6.2	U
75-27-4	Bromodichloromethane	6.4	U	6.4	U	6.3	U	6.2	U
108-88-3	Toluene	6.4	U	6.4	U	6.3	U	6.2	U
79-00-5	1,1,2-Trichloroethane	6.4	U	6.4	U	6.3	U	6.2	U
127-18-4	Tetrachloroethene	6.4	U	6.4	U	6.3	U	6.2	U
124-48-1	Dibromochloromethane	6.4	U	6.4	U	6.3	U	6.2	U
108-90-7	Chlorobenzene	6.4	U	6.4	U	6.3	U	6.2	U
100-41-4	Ethylbenzene	6.4	U	6.4	U	6.3	U	6.2	U
100-42-5	Styrene	6.4	U	6.4	U	6.3	U	6.2	U
75-25-2	Bromoform	6.4	U	6.4	U	6.3	U	6.2	U
79-34-5	1,1,2,2-Tetrachloroethane	6.4	U	6.4	U	6.3	U	6.2	U
67-64-1	Acetone	64.	U	64.	U	63.	U	64.	J
75-15-0	Carbon disulfide	6.4	U	6.4	U	6.3	U	6.2	U
78-93-3	2-Butanone (MEK)	32.	U	32.	U	32.	U	31.	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	32.	U	32.	U	32.	U	31.	U
10061-01-5	cis-1,3-Dichloropropene	6.4	U	6.4	U	6.3	U	6.2	U
10061-02-6	trans-1,3-Dichloropropene	6.4	U	6.4	U	6.3	U	6.2	U
591-78-6	2-Hexanone	32.	U	32.	U	32.	U	31.	U
1330-20-7	Xylene (Total)	6.4	U	6.4	U	6.3	U	6.2	U
540-59-0	1,2-Dichloroethene (total)	6.4	U	6.4	U	6.3	U	6.2	U
1634-04-4	Methyl tert-butyl ether	64.	U	64.	U	63.	U	62.	U

\*\*\* Validation Complete \*\*\*

DATALCP2  
03/25/98

NSA MEMPHIS  
NSA MEMPHIS, BUILDING N-12

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CAS #	Parameter	N12-V-DWMW-01	N12-V-DWMW-02	N12-V-DWMW-03	N12-V-DWMW-04		
7439-92-1	Lead (Pb)	0.2 U	0.2 U	0.2 U	0.2 U		

\*\*\* Validation Complete \*\*\*

DATALCP2  
03/25/98

NSA MEMPHIS  
NSA MEMPHIS, BUILDING N-12

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MEM45 TCLP-VDA		SAMPLE ID -----> ORIGINAL ID -----> LAB SAMPLE ID ----> SAMPLE DATE -----> DATE ANALYZED ----> MATRIX -----> UNITS ----->	N12-V-DMMW-01 N121DMMW01 S880149*12 01/06/98 01/16/98 Soil MG/L	N12-V-DMMW-02 N121DMMW02 S880149*13 01/06/98 01/16/98 Soil MG/L	N12-V-DMMW-03 N121DMMW03 S880149*14 01/06/98 01/16/98 Soil MG/L	N12-V-DMMW-04 N121DMMW04 S880149*15 01/08/98 01/21/98 Soil MG/L		
CAS #	Parameter							
71-43-2	Benzene		0.02 U	0.02 U	0.02 U	0.02 U		

DATALCP2  
03/25/98

NSA MEMPHIS  
NSA MEMPHIS, BUILDING N-12

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Time: 09:36

MEM45 TPH-DRO	SAMPLE ID ----->	N12-S-MW01-08	N12-S-MW01-13	N12-S-MW01-18	N12-S-MW02-09	N12-S-MW02-14	N12-S-MW02-19
	ORIGINAL ID ----->	N12SMW0108	N12SMW0113	N12SMW0118	N12SMW0209	N12SMW0214	N12SMW0219
	LAB SAMPLE ID ----->	S880149*4	S880149*5	S880149*1	S880149*6	S880149*7	S880149*2
	SAMPLE DATE ----->	01/06/98	01/06/98	01/06/98	01/06/98	01/06/98	01/06/98
	DATE EXTRACTED -->	01/14/98	01/14/98	01/14/98	01/14/98	01/14/98	01/14/98
	DATE ANALYZED -->	01/17/98	01/17/98	01/17/98	01/17/98	01/17/98	01/17/98
	MATRIX ----->	Soil	Soil	Soil	Soil	Soil	Soil
	UNITS ----->	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG
CAS #	Parameter	A	A	A	A	A	A
9999900-02-6	TPH - Diesel Range Organics	1.4 J	1.9 J	5.1 U	2.1 J	5.1 U	5.1 U

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NSA MEMPHIS  
NSA MEMPHIS, BUILDING N-12

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MEM45 TPH-DRO	SAMPLE ID ----->	N12-S-MW03-08	N12-S-MW03-13	N12-C-MW03-18	N12-S-MW04-08	N12-S-MW04-13	N12-S-MW04-18
	ORIGINAL ID ----->	N12SMW0308	N12SMW0313	N12CMW0318	N12SMW0408	N12SMW0413	N12SMW0418
	LAB SAMPLE ID --->	S880101*3	S880101*1	S880101*2	S880149*8	S880149*3	S880149*9
	SAMPLE DATE ----->	01/07/98	01/07/98	01/07/98	01/08/98	01/08/98	01/08/98
	DATE EXTRACTED -->	01/14/98	01/14/98	01/14/98	01/14/98	01/14/98	01/14/98
	DATE ANALYZED --->	01/17/98	01/17/98	01/17/98	01/17/98	01/17/98	01/17/98
	MATRIX ----->	Soil	Soil	Soil	Soil	Soil	Soil
	UNITS ----->	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG
CAS #	Parameter						
9999900-02-6	TPH - Diesel Range Organics	1.1 J	5.1	5.1 U	1.8 J	5. U	2.2 J

DATALCP2  
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NSA MEMPHIS  
NSA MEMPHIS, BUILDING N-12

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CAS #	Parameter					
MEM45 TPH-DRO	SAMPLE ID -----> ORIGINAL ID -----> LAB SAMPLE ID ----> SAMPLE DATE -----> DATE EXTRACTED --> DATE ANALYZED ----> MATRIX -----> UNITS ----->	N12-S-WM03-18 N12SWM0318 S880101*4 01/07/98 01/14/98 01/17/98 Soil MG/KG	A			
9999900-02-6	TPH - Diesel Range Organics	5.1	U			

\*\*\* Validation Complete \*\*\*

DATALCP2  
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NSA MEMPHIS  
NSA MEMPHIS, BUILDING N-12

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CAS #	Parameter	N12-S-MW01-08 N12SMW0108 S880149*4 01/06/98 01/13/98 Soil NG/KG	N12-S-MW01-13 N12SMW0113 S880149*5 01/06/98 01/13/98 Soil MG/KG	N12-S-MW02-09 N12SMW0209 S880149*6 01/06/98 01/14/98 Soil MG/KG	N12-S-MW02-14 N12SMW0214 S880149*7 01/06/98 01/14/98 Soil MG/KG	N12-S-MW02-19 N12SMW0219 S880149*2 01/06/98 01/13/98 Soil MG/KG	N12-S-MW03-08 N12SMW0308 S880101*3 01/07/98 01/12/98 Soil MG/KG
9999900-02-5	TPH - Gasoline Range Organics	0.24 U	0.25 U	0.23 U	0.23 U	0.23 U	0.22 U

\*\*\* Validation Complete \*\*\*

DATALCP2  
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NSA MEMPHIS  
NSA MEMPHIS, BUILDING N-12

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CAS #	Parameter	N12-S-MW03-13 N12SMW0313 S880101*1 01/07/98 01/12/98 Soil MG/KG	N12-C-MW03-18 N12CMW0318 S880101*2 01/07/98 01/12/98 Soil MG/KG	N12-S-MW04-08 N12SMW0408 S880149*8 01/08/98 01/14/98 Soil MG/KG	N12-S-MW04-13 N12SMW0413 S880149*3 01/08/98 01/13/98 Soil MG/KG	N12-S-MW04-18 N12SMW0418 S880149*9 01/08/98 01/14/98 Soil MG/KG	N12-S-MW03-18 N12SMW0318 S880101*4 01/07/98 01/12/98 Soil MG/KG
9999900-02-5	TPH - Gasoline Range Organics	0.23 U	0.23 U	0.22 U	0.22 U	0.23 U	0.23 U

\*\*\* Validation Complete \*\*\*

DATALCP2  
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NSA MEMPHIS  
NSA MEMPHIS, BUILDING N-12

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MEM46 FE & MN	SAMPLE ID -----> ORIGINAL ID -----> LAB SAMPLE ID ----> SAMPLE DATE -----> DATE EXTRACTED ---> DATE ANALYZED ----> MATRIX -----> UNITS ----->	N12-G-MW01-13 N12GMW0113 S880248*3 01/13/98 01/20/98 01/26/98 Water UG/L	A				
CAS #	Parameter						
7439-89-6	Iron (Fe)	26700.	J				
7439-96-5	Manganese (Mn)	1090.					

DATALCP2  
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NSA MEMPHIS, BUILDING N-12

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CAS #	Parameter	N12-G-MW01-13	N12-G-MW02-13	N12-G-MW03-13	N12-G-MW04-13	N12-H-MW04-13
MEM46 IGNIT	SAMPLE ID -----> ORIGINAL ID -----> LAB SAMPLE ID ----> SAMPLE DATE -----> DATE EXTRACTED --> DATE ANALYZED ----> MATRIX -----> UNITS ----->	N12-G-MW01-13 N12GMW0113 S880248*3 01/13/98 01/16/98 01/16/98 Water DEGRE	N12-G-MW02-13 N12GMW0213 S880248*4 01/13/98 01/16/98 01/16/98 Water DEGRE	N12-G-MW03-13 N12GMW0313 S880248*5 01/14/98 01/16/98 01/16/98 Water DEGRE	N12-G-MW04-13 N12GMW0413 S880248*6 01/13/98 01/16/98 01/16/98 Water DEGRE	N12-H-MW04-13 N12HWM0413 S880248*7 01/13/98 01/16/98 01/16/98 Water DEGRE
9999900-30-5	Ignitability (øF)	140. >	140. >	140. >	140. >	140. >

\*\*\* Validation Complete \*\*\*

MEM46 SUB46-VDA		SAMPLE ID -----> ORIGINAL ID -----> LAB SAMPLE ID -----> SAMPLE DATE -----> DATE ANALYZED -----> MATRIX -----> UNITS ----->	N12-G-MW01-13 N12GMW0113 S880248*3 01/13/98 01/22/98 Water UG/L	N12-G-MW02-13 N12GMW0213 S880248*4 01/13/98 01/22/98 Water UG/L	N12-G-MW03-13 N12GMW0313 S880248*5 01/14/98 01/22/98 Water UG/L	N12-G-MW04-13 N12GMW0413 S880248*6 01/13/98 01/22/98 Water UG/L	N12-H-MW04-13 N12HMW0413 S880248*7 01/13/98 01/22/98 Water UG/L		
CAS #	Parameter								
74-87-3	Chloromethane	10.	UJ	10.	UJ	10.	UJ	10.	UJ
74-83-9	Bromomethane	10.	U	10.	U	10.	U	10.	U
75-01-4	Vinyl chloride	10.	U	10.	U	10.	U	10.	U
75-00-3	Chloroethane	10.	U	10.	U	10.	U	10.	U
75-35-4	1,1-Dichloroethene	5.	U	5.	U	5.	U	5.	U
75-09-2	Methylene chloride	5.	U	5.	U	5.	U	5.	U
75-34-3	1,1-Dichloroethane	5.	U	5.	U	5.	U	5.	U
67-66-3	Chloroform	5.	U	5.	U	5.	U	5.	U
71-55-6	1,1,1-Trichloroethane	5.	U	5.	U	5.	U	5.	U
56-23-5	Carbon tetrachloride	5.	U	5.	U	5.	U	5.	U
71-43-2	Benzene	5.	U	5.	U	5.	U	150.	U
107-06-2	1,2-Dichloroethane	5.	U	5.	U	5.	U	5.	U
79-01-6	Trichloroethene	5.	U	5.	U	5.	U	5.	U
78-87-5	1,2-Dichloropropane	5.	U	5.	U	5.	U	5.	U
75-27-4	Bromodichloromethane	5.	U	5.	U	5.	U	5.	U
108-88-3	Toluene	5.	U	5.	U	5.	U	71.	U
79-00-5	1,1,2-Trichloroethane	5.	U	5.	U	5.	U	5.	U
127-18-4	Tetrachloroethene	5.	U	5.	U	5.	U	5.	U
124-48-1	Dibromochloromethane	5.	U	5.	U	5.	U	5.	U
108-90-7	Chlorobenzene	5.	U	5.	U	5.	U	5.	U
100-41-4	Ethylbenzene	5.	U	5.	U	5.	U	46.	U
100-42-5	Styrene	5.	U	5.	U	5.	U	5.	U
75-25-2	Bromoform	5.	U	5.	U	5.	U	5.	U
79-34-5	1,1,2,2-Tetrachloroethane	5.	U	5.	U	5.	U	5.	U
67-64-1	Acetone	50.	U	50.	U	50.	U	50.	U
75-15-0	Carbon disulfide	5.	U	5.	U	5.	U	5.	U
78-93-3	2-Butanone (MEK)	25.	U	25.	U	25.	U	25.	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	25.	U	25.	U	25.	U	25.	U
10061-01-5	cis-1,3-Dichloropropene	5.	U	5.	U	5.	U	5.	U
10061-02-6	trans-1,3-Dichloropropene	5.	U	5.	U	5.	U	5.	U
591-78-6	2-Hexanone	25.	U	25.	U	25.	U	25.	U
1330-20-7	Xylene (Total)	5.	U	5.	U	5.	U	130.	U
540-59-0	1,2-Dichloroethene (total)	5.	U	5.	U	5.	U	5.	U
1634-04-4	Methyl tert-butyl ether	10.	U	10.	U	10.	U	12.	U

DATALCP2  
03/25/98

NSA MEMPHIS  
NSA MEMPHIS, BUILDING N-12

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MEM46 TPH-DRO	SAMPLE ID -----> ORIGINAL ID -----> LAB SAMPLE ID ----> SAMPLE DATE -----> DATE EXTRACTED --> DATE ANALYZED ----> MATRIX -----> UNITS ----->	N12-G-MW01-13 N12GMW0113 S880248*3 01/13/98 01/19/98 01/21/98 Water MG/L	N12-G-MW02-13 N12GMW0213 S880248*4 01/13/98 01/19/98 01/21/98 Water MG/L	N12-G-MW03-13 N12GMW0313 S880248*5 01/14/98 01/19/98 01/21/98 Water MG/L	N12-G-MW04-13 N12GMW0413 S880248*6 01/13/98 01/19/98 01/21/98 Water MG/L	N12-H-MW04-13 N12HMMW0413 S880248*7 01/13/98 01/19/98 01/21/98 Water MG/L
CAS #	Parameter	0.1 U	0.1 U	0.1 U	0.32 J	0.22 J
9999900-02-6	TPH - Diesel Range Organics					

\*\*\* Validation Complete \*\*\*

DATALCP2  
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NSA MEMPHIS  
NSA MEMPHIS, BUILDING N-12

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		N12-G-MW01-13	N12-G-MW02-13	N12-G-MW03-13	N12-G-MW04-13	N12-H-MW04-13	
MEM46 TPH-GRO	SAMPLE ID ----->	N12GMW0113	N12GMW0213	N12GMW0313	N12GMW0413	N12HMMW0413	
	ORIGINAL ID ----->	S880248*3	S880248*4	S880248*5	S880248*6	S880248*7	
	LAB SAMPLE ID ---->	01/13/98	01/13/98	01/14/98	01/13/98	01/13/98	
	SAMPLE DATE ----->	01/16/98	01/16/98	01/16/98	01/16/98	01/16/98	
	DATE ANALYZED ---->	Water	Water	Water	Water	Water	
MATRIX ----->	MG/L	MG/L	MG/L	MG/L	MG/L		
UNITS ----->	A	A	A	A	A	A	
CAS #	Parameter						
9999900-02-5	TPH - Gasoline Range Organics	0.036 UJ	0.036 UJ	0.36 UJ	0.72	0.72 J	

\*\*\* Validation Complete \*\*\*

**Shelby Tube and FOC Analytical Results**



Report of Fractional Organic Carbon

Client: Ensafe

Purchase Order No. 01268

Date of Report: 01/11/99

Project No.: E-3-889

Project Location: Naval Air Station-Millington  
Memphis, Tennessee

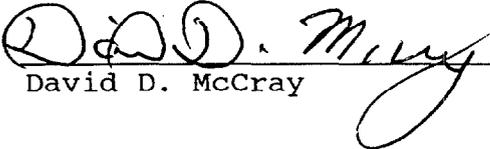
Sample I.D.: 0136SFOC08, Depth: 3 - 8', Sample Date: 01/06/98

Fractional Organic Carbon .008 g-carbon/g-soil

Tested in accordance with ASTM D-2974-87 (Method C).

Lab No. FOC-E3889

Reviewed By:

  
David D. McCray



Measurement of Hydraulic Conductivity

Client: EnSafe

Date of Report: 01/26/98

Project No.: E-3-889

Project Name: NAS - Memphis, TN

Sample I.D.: CTO # 136-001, Sample # 0136ST0413, Depth 11'-13'

Soil Description: Gray & Green Clayey Silt

Test Media: City of Memphis Water

Volumetric Air Content	.036 cm <sup>3</sup> -air/cm <sup>3</sup> -soil
Volumetric Water Content	.423 cm <sup>3</sup> -H <sub>2</sub> O/cm <sup>3</sup> -soil
Total Soil Porosity	.459 cm <sup>3</sup> /cm <sup>3</sup> -soil
Soil Bulk Density (wet)	1.85 g-soil/cm <sup>3</sup> -soil
Moisture Content	29.8 Percent

**Permeability**

Temperature Correction,  $R_t = .986$

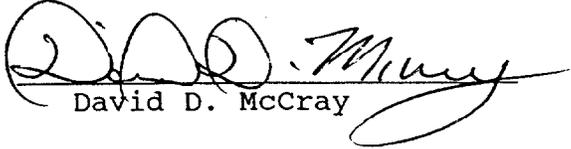
$K_1 = 3.4 \times 10^{-6}$  cm/sec  
 $K_2 = 3.5 \times 10^{-6}$  cm/sec  
 $K_3 = 3.5 \times 10^{-6}$  cm/sec  
 $K_4 = 3.6 \times 10^{-6}$  cm/sec

Coefficient of Permeability,  $K_{20} = 3.5 \times 10^{-6}$  cm/sec

Tested in accordance with Method 9100 of Test Methods for evaluating Solid Waste, Third Addition (SW-846) and in general accordance with ASTM D-5084-90. Fractional Organic Carbon tested in accordance with ASTM D-2974-87 (Method C)

Lab No. P-98-002

Reviewed By:

  
David D. McCray



Measurement of Hydraulic Conductivity

Client: EnSafe

Date of Report: 01/26/98

Project No.: E-3-889

Project Name: NAS - Memphis, TN

Sample I.D.: CTO # 136-001, Sample # 0136ST0408, Depth 6'-8'

Soil Description: Brown & Gray Clayey Silt

Test Media: City of Memphis Water

Volumetric Air Content	.019 cm <sup>3</sup> -air/cm <sup>3</sup> -soil
Volumetric Water Content	.400 cm <sup>3</sup> -H <sub>2</sub> O/cm <sup>3</sup> -soil
Total Soil Porosity	.419 cm <sup>3</sup> /cm <sup>3</sup> -soil
Soil Bulk Density (wet)	1.96 g-soil/cm <sup>3</sup> -soil
Moisture Content	28.1 Percent

**Permeability**

Temperature Correction,  $R_t = .986$

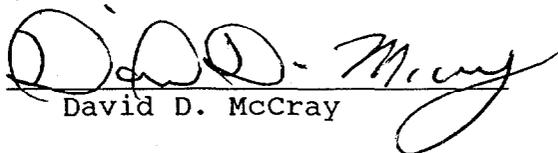
$$\begin{aligned}K_1 &= 2.2 \times 10^{-6} \text{ cm/sec} \\K_2 &= 1.1 \times 10^{-6} \text{ cm/sec} \\K_3 &= 1.1 \times 10^{-6} \text{ cm/sec} \\K_4 &= 1.2 \times 10^{-6} \text{ cm/sec}\end{aligned}$$

Coefficient of Permeability,  $K_{20} = 1.4 \times 10^{-6} \text{ cm/sec}$

Tested in accordance with Method 9100 of Test Methods for evaluating Solid Waste, Third Addition (SW-846) and in general accordance with ASTM D-5084-90. Fractional Organic Carbon tested in accordance with ASTM D-2974-87 (Method C)

Lab No. P-98-001

Reviewed By:

  
David D. McCray

**DPT Investigation Analytical Results**

**Environmental Testing & Consulting, Inc.**  
**Data Qualifiers for Organic Reporting**

Within the attached report, some analytical data may be reported as "Qualified Data" as indicated by a "Data Qualifier" next to the result. This table summarizes the possible "Data Qualifiers" that may be associated with this report.

<b>Q</b>	Surrogate Recovery Outside QC Limits
<b>J</b>	Estimated Value. Presence of the compound was confirmed but less than the reported detection limit.
<b>E</b>	Concentration exceeds the established method calibration range but is within the working range of the instrument.
<b>B</b>	Analyte detected in the associated Method Blank.
<b>U</b>	Reported result was unconfirmed. Refer to Case Narrative.
<b>N</b>	Non-Compliance Report associated with this sample or project.
<b>C</b>	Result reported from GC/MS confirmation analysis.
<b>*</b>	QC Data (percent recovery/RPD for a particular analyte was outside QC Limits)

**Environmental Testing & Consulting, Inc.**

**Login  
Chain-of-Custody**

**000002**



**NAVY CLEAN**  
**ENSAFE/ALLEN&HOSHALL**  
 (901) 383-9115

**CHAIN OF CUSTODY RECORD**

9863-313

PAGE 1 OF 2

CTO-TASK: \_\_\_\_\_  
 COC #: \_\_\_\_\_  
 BPA/SO: M 0065

000003

CLIENT ENSAFE/NAVY  
 ADDRESS 5724 SUMMER TREES DR.  
Memphis, TN 38134  
 PROJECT NAME/NUMBER N-12 0136-001  
 SAMPLERS: (SIGNATURE) Barbara McGovern

PROJECT MANAGER ALLISON DENNEN  
 TELEPHONE NO. (901) 372-7962  
 FAX NO. (901) 372-2454

NO. OF CONTAINERS	ANALYSIS REQUIRED				REMARKS
	TOTAL VOCs	BTEX/MTBE	TPH - GRO	TPH - DRO	

FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION		NO. OF CONTAINERS	TOTAL VOCs	BTEX/MTBE	TPH - GRO	TPH - DRO	REMARKS
					TEMP.	CHEMICAL						
N12GSB0916	3/10/98	4:40	water	40 ml glass	4°C	HCl	6	X	X	X		
N12GSB0816	3/10/98	2:35	water	40 ml glass	4°C	HCl	6	X	X	X		
N12GSB0916	3/10/98	4:40	water	1L Amber	4°C	HCl	1			X		
N12GSB0816	3/10/98	2:35	water	1L Amber	4°C	HCl	1			X		
N12SSB0816	3/10/98	1:30	soil	4oz jar	4°C	---	5	X	X	X	X	
N12SSB0812	3/10/98	1:25	soil	4oz jar	4°C	---	4		X	X	X	
N12SSB0808	3/10/98	1:20	soil	4oz jar	4°C	---	4		X	X	X	
N12SSB0908	3/10/98	3:30	soil	4oz jar	4°C	---	4		X	X	X	
N12SSB0912	3/10/98	3:35	soil	4oz jar	4°C	---	4		X	X	X	
N12SSB0916	3/10/98	3:40	soil	4oz jar	4°C	---	5	X	X	X	X	

RELINQUISHED BY: SIGNATURE <u>Barbara McGovern</u> PRINTED <u>Barbara McGovern</u> COMPANY <u>ENSAFE</u> REASON <u>Analyses</u>	DATE <u>3/11/98</u> TIME <u>0910</u>	RECEIVED BY: SIGNATURE _____ PRINTED _____ COMPANY _____ REASON _____	DATE _____ TIME _____	RELINQUISHED BY: SIGNATURE _____ PRINTED _____ COMPANY _____ REASON _____	DATE _____ TIME _____	RECEIVED BY: SIGNATURE <u>Lucretia B...</u> PRINTED <u>ETC</u> COMPANY _____ REASON <u>Analyses</u>	DATE _____ TIME _____
---	---	---	--------------------------	---	--------------------------	---	--------------------------

METHOD OF SHIPMENT: HAND Deliver COMMENTS: Sample Recover was difficult in some cases. Sample Volumes are as much as could be obtained.

SHIPMENT NO. \_\_\_\_\_

SPECIAL INSTRUCTION: \_\_\_\_\_

AFTER ANALYSIS, SAMPLES ARE TO BE:  
 DISPOSED OF  
 STORED (90 DAYS MAX)  
 STORED OVER 90 DAYS  
 RETURNED TO CUSTOMER

9803-313



**NAVY CLEAN**  
**ENSAFE/ALLEN&HOSHALL**  
 (901) 383-9115

**CHAIN OF CUSTODY RECORD**

PAGE 2 OF 2  
 CTO-TASK: \_\_\_\_\_  
 COC #: \_\_\_\_\_  
 BPA/SO: MDD65

000003A

CLIENT ENSAFE/NAVY PROJECT MANAGER ALLISON DENNEN  
 ADDRESS 5724 Summer Trees TELEPHONE NO. (901) 372-7962  
Memphis, TN 38134  
 PROJECT NAME/NUMBER N-12 0136-001 FAX. NO. (901) 372-2454  
 SAMPLERS: (SIGNATURE) Barbara A McDevan

FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION		ANALYSIS REQUIRED							REMARKS	
					TEMP.	CHEMICAL	NO. OF CONTAINERS	TOTAL VOCs	BTEX/MTBE	TPH-GRO	TPH-DIRO				
N12SSBD798	3/10/98	1100	SOIL	4oz jar	4°C	—	2	X	X	X	X				
N12SSBD698	3/10/98	1045	SOIL	4oz jar	4°C	—	4	X	X	X	X				
N12T031098	3/10/98	1800	Water	40ml glass	4°C	HCl	1	X							TRIP BLANK
<del>N12SSR0898</del>	<del>3/10/98</del>	<del>1100</del>	<del>SOIL</del>	<del>4oz jar</del>	<del>4°C</del>	<del>—</del>	<del>2</del>	<del>X</del>	<del>X</del>	<del>X</del>	<del>X</del>				

RELINQUISHED BY: SIGNATURE <u>Barbara A McDevan</u> PRINTED <u>Barbara A McDevan</u> COMPANY <u>ENSAFE</u> REASON <u>Analyses</u>	DATE <u>3/11/98</u> TIME <u>0910</u>	RECEIVED BY: SIGNATURE _____ PRINTED _____ COMPANY _____ REASON _____	DATE TIME	RELINQUISHED BY: SIGNATURE _____ PRINTED _____ COMPANY _____ REASON _____	DATE TIME	RECEIVED BY: SIGNATURE <u>Keith Busby</u> PRINTED <u>Keith Busby</u> COMPANY <u>ETC</u> REASON <u>Analysis</u>	DATE <u>3/11/98</u> TIME _____
---	---	---	--------------	---	--------------	--	---

METHOD OF SHIPMENT: Hand Deliver COMMENTS: LEVEL II  
 SHIPMENT NO. \_\_\_\_\_  
 SPECIAL INSTRUCTION: \_\_\_\_\_  
RUSH TURNAROUND

AFTER ANALYSIS, SAMPLES ARE TO BE:  
 DISPOSED OF  
 STORED (90 DAYS MAX)  
 STORED OVER 90 DAYS  
 RETURNED TO CUSTOMER

COOLER RECEIPT FORM

Cooler Receipt Form  
9803313.CRF p. 1

LIMS #: 9803-313 Number of Coolers: 1  
Date Received: 03/11/98  
VDTSR: 03/11/98\_09:25  
PROJECT: Navy

USE OTHER SIDE OF THIS FORM TO NOTE DETAILS CONCERNING CHECK-IN PROBLEMS

A. PRELIMINARY EXAMINATION PHASE: Date cooler was opened: 03/11/98  
by (print): Lynette Bugg (sign): Lynette Bugg

- 1. Did cooler come with a shipping slip (airbill, etc.)?..... NO  
If YES, enter carrier name & airbill number: \_\_\_\_\_
- 2a. Were custody seals on outside of cooler?..... NO
- 2b. Were custody seals on sample containers?..... NO
- 3. Were custody seals unbroken and intact at the date and time of arrival?..... NA
- 4. Did you screen samples for radioactivity using a Geiger Counter?..... NO
- 5. Were custody papers sealed in a plastic bag & taped inside to the lid?..... NO
- 6. Were custody papers filled out properly (ink, signed, etc.)?..... YES
- 7. Did you sign custody papers in the appropriate place?..... YES
- 8. Was project identifiable from custody papers? If YES, enter project name at top of this form..... YES
- 9. If required, was enough ice used? cooler temp: <4° c, Type of ice: \_\_\_\_\_ YES
- 10. Have designated person initial here to acknowledge receipt of cooler: \_\_\_\_\_ LB \_\_\_\_\_ date: 03/11/98

B. LOG-IN PHASE: Date samples were logged-in: 03/11/98  
(Print): Margaret Cook (sign): Margaret Cook

- 11. Describe type of packing in cooler: Ice
- 12. Were all bottles sealed in separate plastic bags?..... NO
- 13. Did all bottles arrive unbroken and were labels in good condition?..... YES
- 14. Were all bottle labels complete (ID, date, time, signature, preserved, etc.)?..... YES
- 15. Did all bottle labels agree with custody papers?..... YES
- 16. Were correct containers used for the tests indicated?..... YES
- 17. Were correct preservatives added to samples?..... YES
- 18. Was a sufficient amount of sample sent for tests indicated?..... YES
- 19. Were bubbles absent in VOA samples? If NO, list by sample#: \_\_\_\_\_ YES
- 20. Was the project manager called and status discussed? If YES, give details on the back of this form.... NO
- 21. Who was called? \_\_\_\_\_ By whom? \_\_\_\_\_ (date) \_\_\_\_\_

VDTSR - Validated Date/Time of Sample Receipt (Date sample is logged into LIMS system)

000004

Environmental Testing and Consulting, Inc.  
2924 Walnut Grove Road - Memphis, TN 38111 - (901)327-2750

Cross Reference Table

Project : Navy

Sample ID	Laboratory ID
N12GSB0916	9803-313-01
N12GSB0816	9803-313-02
N12SSB0816	9803-313-03
N12SSB0812	9803-313-04
N12SSB0808	9803-313-05
N12SSB0908	9803-313-06
N12GSB0912	9803-313-07
N12SSB0916	9803-313-08
N12SSB0798	9803-313-09
N12SSB0698	9803-313-10
N12T031098	9803-313-11

000005

**Environmental Testing & Consulting, Inc.**

**Sample Reports**

**000006**

ENVIRONMENTAL TESTING & CONSULTING, INC.  
Memphis, TN  
INORGANIC ANALYSIS DATA SHEET  
PERCENT SOLIDS

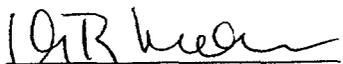
Client Name :Ensafe/Allen & Hoshall  
Project Name :Navy

Matrix :SOIL

Date Sample Received :03/11/98

Contract Laboratory Order Number :9803-313

<u>Contract Lab Sample No</u>	<u>Client Sample ID</u>	<u>Date Sampled</u>	<u>Result Units :(% )</u>	<u>Date Analyzed</u>	<u>Method</u>	<u>By</u>
9803-313-03	N12SSB0816	03/10/98	78.9	03/12/98	160.3	MC
9803-313-04	N12SSB0812	03/10/98	78.7	03/12/98	160.3	MC
9803-313-05	N12SSB0808	03/10/98	78.4	03/16/98	160.3	MC
9803-313-06	N12SSB0908	03/10/98	80.2	03/12/98	160.3	MC
9803-313-07	N12GSB0912	03/10/98	79.2	03/12/98	160.3	MC
9803-313-08	N12SSB0916	03/10/98	78.4	03/12/98	160.3	MC
9803-313-09	N12SSB0798	03/10/98	79.3	03/12/98	160.3	MC
9803-313-10	N12SSB0698	03/10/98	79.6	03/12/98	160.3	MC

  
LABORATORY MANAGER

000007

# ENVIRONMENTAL TESTING & CONSULTING, INC.

2924 Walnut Grove Road - Memphis, TN 38111 - (901)327-2750

## ORGANIC ANALYSIS DATA SHEET

Client Name **Ensafe/Allen & Hoshall**  
**Navy Clean Joint Venture**  
**CLEAN Management Program**  
**5724 Summer Tree Drive**  
**Memphis, TN 38134**

Site ID **Navy**

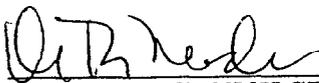
Project # **N-12 0136-001**  
 FID #

Date Arrived **03/11/98**  
 ETC Order Number **9803313**

ETC Lab ID **9803313-01**  
**Sample ID: N12GSB0916**

Matrix **:AQUEOUS**  
 Sample Date **:03/10/98**

TEST	RESULT	UNITS	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED	BY	METHOD
BTEX/TPH GRO							8020/GRO
					03/12/98	JG	
Analysis Batch Method 5030	S103121A	mg/L					
Benzene	ND	mg/L	0.001				
Toluene	ND	mg/L	0.002				
Ethyl Benzene	ND	mg/L	0.001				
Xylenes (Total)	ND	mg/L	0.001				
TPH - Gasoline Range Organics	ND	mg/L	0.100				
MTBE	ND	mg/L	0.005				
<hr/>							
<u>rogate Standard</u>		<u>% Recovery</u>		<u>OC Limits</u>			
- BFB		83	50	150			
S2 - BFB		77	50	150			

  
 LABORATORY MANAGER

ND - Not Detected

000008

**ENVIRONMENTAL TESTING & CONSULTING, INC.**  
 2924 Walnut Grove Road - Memphis, TN 38111 - (901)327-2750  
**ORGANIC ANALYSIS DATA SHEET**

Client Name **Ensafe/Allen & Hoshall**  
**Navy Clean Joint Venture**  
**CLEAN Management Program**  
**5724 Summer Tree Drive**  
**Memphis, TN 38134**

Site ID **Navy**

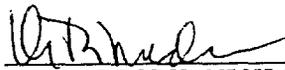
Project # **N-12 0136-001**  
 FID #

Date Arrived **03/11/98**  
 ETC Order Number **9803313**

ETC Lab ID **9803313-01**  
**Sample ID: N12GSB0916**

Matrix : **AQUEOUS**  
 Sample Date : **03/10/98**

TEST	RESULT	UNITS	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED	BY	METHOD
Volatile Organics					03/14/98	LS	8260A
Analysis Batch Method 5030	V3031401A	ug/L					
Acrolein	ND	ug/L	50.0				
Acrylonitrile	ND	ug/L	50.0				
Acetone	ND	ug/L	25.0				
Benzene	ND	ug/L	1.00				
Bromobenzene	ND	ug/L	1.00				
Bromochloromethane	ND	ug/L	1.00				
Dibromodichloromethane	ND	ug/L	1.00				
Dibromomethane	ND	ug/L	1.00				
Dibromomethane	ND	ug/L	1.00				
n-Butylbenzene	ND	ug/L	1.00				
sec-Butylbenzene	ND	ug/L	1.00				
tert-Butylbenzene	ND	ug/L	1.00				
Carbon Disulfide	ND	ug/L	1.00				
Carbon Tetrachloride	ND	ug/L	1.00				
Chlorobenzene	ND	ug/L	1.00				
Chlorodibromomethane	ND	ug/L	1.00				
Chloroethane	ND	ug/L	1.00				
2-Chloroethylvinyl ether	ND	ug/L	5.00				
Chloroform	ND	ug/L	1.00				
Chloromethane	ND	ug/L	1.00				
o-Chlorotoluene	ND	ug/L	1.00				
p-Chlorotoluene	ND	ug/L	1.00				
1,2-Dibromo-3-Chloropropane	ND	ug/L	1.00				
1,2-Dibromoethane (EDB)	ND	ug/L	1.00				
Dibromomethane	ND	ug/L	1.00				
1,2-Dichlorobenzene	ND	ug/L	1.00				
1,3-Dichlorobenzene	ND	ug/L	1.00				
1,4-Dichlorobenzene	ND	ug/L	1.00				
Dichlorodifluoromethane	ND	ug/L	1.00				
1,1-Dichloroethane	ND	ug/L	1.00				
1,2-Dichloroethane	ND	ug/L	1.00				
1,1-Dichloroethylene	ND	ug/L	1.00				
trans-1,4-Dichloro-2-butene	ND	ug/L	1.00				
cis-1,2-Dichloroethylene	ND	ug/L	1.00				
trans-1,2-Dichloroethylene	ND	ug/L	1.00				
1,2-Dichloropropane	ND	ug/L	1.00				
1,3-Dichloropropane	ND	ug/L	1.00				
1,2-Dichloropropane	ND	ug/L	1.00				
1,1-Dichloropropene	ND	ug/L	1.00				
cis-1,3-Dichloropropene	ND	ug/L	1.00				
trans-1,3-Dichloropropene	ND	ug/L	1.00				
Ethylbenzene	ND	ug/L	1.00				

  
 LABORATORY MANAGER

ND - Not Detected

000005

**ENVIRONMENTAL TESTING & CONSULTING, INC.**  
 2924 Walnut Grove Road - Memphis, TN 38111 - (901)327-2750  
**ORGANIC ANALYSIS DATA SHEET**

Client Name **Ensafe/Allen & Hoshall**  
**Navy Clean Joint Venture**  
**CLEAN Management Program**  
**5724 Summer Tree Drive**  
**Memphis, TN 38134**

Site ID **Navy**

Project # **N-12 0136-001**  
 FID #

Date Arrived **03/11/98**  
 ETC Order Number **9803313**

ETC Lab ID **9803313-01**  
**Sample ID: N12GSB0916**

Matrix **:AQUEOUS**  
 Sample Date **:03/10/98**

TEST	RESULT	UNITS	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED	BY	METHOD
Volatile Organics							8260A
					03/14/98	LS	
Fluorotrichloromethane	ND	ug/L	1.00				
Hexachlorobutadiene	ND	ug/L	1.00				
Iodomethane	ND	ug/L	1.00				
Isopropylbenzene	ND	ug/L	1.00				
p-Isopropyltoluene	ND	ug/L	1.00				
Methyl-Butyl-Ketone	ND	ug/L	20.0				
Methyl-Ethyl-Ketone	ND	ug/L	25.0				
Methyl-Isobutyl-Ketone	ND	ug/L	20.0				
Dichloroethylene Chloride	ND	ug/L	20.0				
Phthalene	1.47	ug/L	1.00				
n-Propylbenzene	ND	ug/L	1.00				
Styrene	ND	ug/L	1.00				
1,1,1,2-Tetrachloroethane	ND	ug/L	1.00				
1,1,2,2-Tetrachloroethane	ND	ug/L	1.00				
Tetrachloroethylene	ND	ug/L	1.00				
Toluene	ND	ug/L	5.00				
1,2,3-Trichlorobenzene	ND	ug/L	1.00				
1,2,4-Trichlorobenzene	ND	ug/L	1.00				
1,1,1-Trichloroethane	ND	ug/L	1.00				
1,1,2-Trichloroethane	ND	ug/L	1.00				
Trichloroethylene	ND	ug/L	1.00				
Trichlorofluoromethane	ND	ug/L	1.00				
1,2,3-Trichloropropane	ND	ug/L	1.00				
1,2,4-Trimethylbenzene	ND	ug/L	1.00				
1,3,5-Trimethylbenzene	ND	ug/L	1.00				
Vinyl Acetate	ND	ug/L	1.00				
Vinyl Chloride	ND	ug/L	1.00				
Xylenes (total)	ND	ug/L	1.00				
MTBE	ND	ug/L	5.00				

Surrogate Standard	% Recovery	QC Limits
S1 - Dibromofluoromethane	87	87 107
S2 - Toluene-d8	95	91 108
S3 - 4-Bromofluorobenzene	106	88 107

  
 LABORATORY MANAGER

ND - Not Detected

000010

**ENVIRONMENTAL TESTING & CONSULTING, INC.**  
 2924 Walnut Grove Road - Memphis, TN 38111 - (901)327-2750  
**ORGANIC ANALYSIS DATA SHEET**

Client Name **Ensafe/Allen & Hoshall**  
**Navy Clean Joint Venture**  
**CLEAN Management Program**  
**5724 Summer Tree Drive**  
**Memphis, TN 38134**

Site ID **Navy**

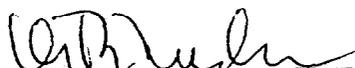
Project # **N-12 0136-001**  
 FID #

Date Arrived **03/11/98**  
 ETC Order Number **9803313**

ETC Lab ID **9803313-01**  
**Sample ID: N12GSB0916**

Matrix **:AQUEOUS**  
 Sample Date **:03/10/98**

TEST	RESULT	UNITS	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED	BY	METHOD
Petroleum Hydrocarbons				03/12/98	03/13/98	JP	TN DRO
Extraction Batch Method 3510	V13DRA44	mg/L					
Diesel Range Organics	0.101	mg/L	0.100				
<u>Surrogate Standard</u>	<u>% Recovery</u>		<u>QC Limits</u>				
S1 - OTP	75		50	150			

  
 LABORATORY MANAGER

ND - Not Detected

000011

# ENVIRONMENTAL TESTING & CONSULTING, INC.

2924 Walnut Grove Road - Memphis, TN 38111 - (901)327-2750

## ORGANIC ANALYSIS DATA SHEET

Client Name **Ensafe/Allen & Hoshall**  
**Navy Clean Joint Venture**  
**CLEAN Management Program**  
**5724 Summer Tree Drive**  
**Memphis, TN 38134**

Project # **N-12 0136-001**  
 FID #

Site ID **Navy**

Date Arrived **03/11/98**  
 ETC Order Number **9803313**

ETC Lab ID **9803313-02**  
**Sample ID: N12GSB0816**

Matrix : **AQUEOUS**  
 Sample Date : **03/10/98**

TEST	RESULT	UNITS	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED	BY	METHOD
BTEX/TPH GRO							8020/GRO
Analysis Batch Method 5030	S103121A	mg/L			03/12/98	JG	
Benzene	ND	mg/L	0.001				
Toluene	ND	mg/L	0.002				
Ethyl Benzene	ND	mg/L	0.001				
Xylenes (Total)	ND	mg/L	0.001				
TPH - Gasoline Range Organics	ND	mg/L	0.100				
MTBE	ND	mg/L	0.005				
<u>rogate Standard</u>		<u>% Recovery</u>		<u>QC Limits</u>			
- BFB		86	50	150			
S2 - BFB		80	50	150			

  
 LABORATORY MANAGER

ND - Not Detected

000012

# ENVIRONMENTAL TESTING & CONSULTING, INC.

2924 Walnut Grove Road - Memphis, TN 38111 - (901)327-2750

## ORGANIC ANALYSIS DATA SHEET

Client Name **Ensafe/Allen & Hoshall**  
**Navy Clean Joint Venture**  
**CLEAN Management Program**  
**5724 Summer Tree Drive**  
**Memphis, TN 38134**

Site ID **Navy**

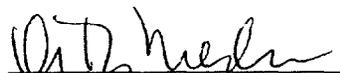
Project # **N-12 0136-001**  
 FID #

Date Arrived **03/11/98**  
 ETC Order Number **9803313**

ETC Lab ID **9803313-02**  
**Sample ID: N12GSB0816**

Matrix : **AQUEOUS**  
 Sample Date : **03/10/98**

TEST	RESULT	UNITS	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED	BY	METHOD
Volatile Organics							8260A
Analysis Batch Method 5030	V3031401A	ug/L			03/14/98	KS	
Acrolein	ND	ug/L	50.0				
Acrylonitrile	ND	ug/L	50.0				
Acetone	ND	ug/L	25.0				
Benzene	ND	ug/L	1.00				
Bromobenzene	ND	ug/L	1.00				
Bromochloromethane	ND	ug/L	1.00				
Bromodichloromethane	ND	ug/L	1.00				
Bromoform	ND	ug/L	1.00				
Bromomethane	ND	ug/L	1.00				
n-Butylbenzene	ND	ug/L	1.00				
sec-Butylbenzene	ND	ug/L	1.00				
tert-Butylbenzene	ND	ug/L	1.00				
Carbon Disulfide	ND	ug/L	1.00				
Carbon Tetrachloride	ND	ug/L	1.00				
Chlorobenzene	ND	ug/L	1.00				
Chlorodibromomethane	ND	ug/L	1.00				
Chloroethane	ND	ug/L	1.00				
2-Chloroethylvinyl ether	ND	ug/L	5.00				
Chloroform	ND	ug/L	1.00				
Chloromethane	ND	ug/L	1.00				
o-Chlorotoluene	ND	ug/L	1.00				
p-Chlorotoluene	ND	ug/L	1.00				
1,2-Dibromo-3-Chloropropane	ND	ug/L	1.00				
1,2-Dibromoethane (EDB)	ND	ug/L	1.00				
Dibromomethane	ND	ug/L	1.00				
1,2-Dichlorobenzene	ND	ug/L	1.00				
1,3-Dichlorobenzene	ND	ug/L	1.00				
1,4-Dichlorobenzene	ND	ug/L	1.00				
Dichlorodifluormethane	ND	ug/L	1.00				
1,1-Dichloroethane	ND	ug/L	1.00				
1,2-Dichloroethane	ND	ug/L	1.00				
1,1-Dichloroethylene	ND	ug/L	1.00				
trans-1,4-Dichloro-2-butene	ND	ug/L	1.00				
cis-1,2-Dichloroethylene	ND	ug/L	1.00				
trans-1,2-Dichloroethylene	ND	ug/L	1.00				
1,2-Dichloropropane	ND	ug/L	1.00				
1,3-Dichloropropane	ND	ug/L	1.00				
1,2-Dichloropropane	ND	ug/L	1.00				
1,1-Dichloropropene	ND	ug/L	1.00				
cis-1,3-Dichloropropene	ND	ug/L	1.00				
trans-1,3-Dichloropropene	ND	ug/L	1.00				
Ethylbenzene	ND	ug/L	1.00				

  
 LABORATORY MANAGER

ND - Not Detected

000013

**ENVIRONMENTAL TESTING & CONSULTING, INC.**  
 2924 Walnut Grove Road - Memphis, TN 38111 - (901)327-2750  
**ORGANIC ANALYSIS DATA SHEET**

Client Name **Ensafe/Allen & Hoshall**  
**Navy Clean Joint Venture**  
**CLEAN Management Program**  
**5724 Summer Tree Drive**  
**Memphis, TN 38134**

Site ID **Navy**

Project # **N-12 0136-001**  
 FID #

Date Arrived **03/11/98**  
 ETC Order Number **9803313**

ETC Lab ID **9803313-02**  
**Sample ID: N12GSB0816**

Matrix : **AQUEOUS**  
 Sample Date : **03/10/98**

TEST	RESULT	UNITS	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED	BY	METHOD
Volatile Organics							8260A
					03/14/98	LS	
Fluorotrichloromethane	ND	ug/L	1.00				
Hexachlorobutadiene	ND	ug/L	1.00				
Iodomethane	ND	ug/L	1.00				
Isopropylbenzene	ND	ug/L	1.00				
p-Isopropyltoluene	ND	ug/L	1.00				
Methyl-Butyl-Ketone	ND	ug/L	20.0				
Methyl-Ethyl-Ketone	ND	ug/L	25.0				
Methyl-Isobutyl-Ketone	ND	ug/L	20.0				
1,1-Dichloroethylene Chloride	ND	ug/L	20.0				
1,2,3-Trichlorobenzene	ND	ug/L	1.00				
1,2,4-Trichlorobenzene	ND	ug/L	1.00				
1,1,1-Trichloroethane	ND	ug/L	1.00				
1,1,2-Trichloroethane	ND	ug/L	1.00				
Trichloroethylene	ND	ug/L	1.00				
Trichlorofluoromethane	ND	ug/L	1.00				
1,2,3-Trichloropropane	ND	ug/L	1.00				
1,2,4-Trimethylbenzene	ND	ug/L	1.00				
1,3,5-Trimethylbenzene	ND	ug/L	1.00				
Vinyl Acetate	ND	ug/L	1.00				
Vinyl Chloride	3.04	ug/L	1.00				
Xylenes (total)	4.35	ug/L	1.00				
MTBE	ND	ug/L	5.00				

Surrogate Standard	% Recovery	QC Limits	
S1 - Dibromofluoromethane	88	87	107
S2 - Toluene-d8	95	91	108
S3 - 4-Bromofluorobenzene	106	88	107

*(Signature)*  
 LABORATORY MANAGER

ND - Not Detected

000014

**ENVIRONMENTAL TESTING & CONSULTING, INC.**  
 2924 Walnut Grove Road - Memphis, TN 38111 - (901)327-2750  
**ORGANIC ANALYSIS DATA SHEET**

Client Name **Ensafe/Allen & Hoshall**  
**Navy Clean Joint Venture**  
**CLEAN Management Program**  
**5724 Summer Tree Drive**  
**Memphis, TN 38134**

Site ID **Navy**

Project # **N-12 0136-001**  
 FID #

Date Arrived **03/11/98**  
 ETC Order Number **9803313**

ETC Lab ID **9803313-02**  
**Sample ID: N12GSB0816**

Matrix : **AQUEOUS**  
 Sample Date : **03/10/98**

TEST	RESULT	UNITS	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED	BY	METHOD
<b>Petroleum Hydrocarbons</b>							<b>TN DRO</b>
Extraction Batch Method 3510	V13DRA44	mg/L		03/12/98	03/13/98	JP	
Diesel Range Organics	ND	mg/L	0.100				
<b>Surrogate Standard</b>	<b>% Recovery</b>		<b>QC Limits</b>				
S1 - OTP	78		50	150			

  
 LABORATORY MANAGER

ND - Not Detected

000015

# ENVIRONMENTAL TESTING & CONSULTING, INC.

2924 Walnut Grove Road - Memphis, TN 38111 - (901)327-2750

## ORGANIC ANALYSIS DATA SHEET

Client Name **Ensafe/Allen & Hoshall**  
Navy Clean Joint Venture  
CLEAN Management Program  
5724 Summer Tree Drive  
Memphis, TN 38134

Project # N-12 0136-001  
FID #

Site ID Navy

Date Arrived 03/11/98  
ETC Order Number 9803313

ETC Lab ID 9803313-03  
**Sample ID: N12SSB0816**

Matrix :SOIL  
Sample Date :03/10/98

TEST	RESULT	UNITS	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED	BY	METHOD
BTEX/TPH GRO				03/12/98	03/13/98	JG	8020/GRO
Analysis Batch Method 5030	V29BXS8S	mg/Kg					
Benzene	ND	mg/Kg	0.100				
Toluene	ND	mg/Kg	0.100				
Ethyl Benzene	ND	mg/Kg	0.100				
Xylenes (Total)	ND	mg/Kg	0.100				
TPH - Gasoline Range Organics	ND	mg/Kg	5.00				
MTBE	ND	mg/Kg	0.500				

Prorogate Standard	% Recovery	QC Limits
- BFB	85	50 150
S2 - BFB	100	50 150

  
LABORATORY MANAGER

ND - Not Detected

000016

# ENVIRONMENTAL TESTING & CONSULTING, INC.

2924 Walnut Grove Road - Memphis, TN 38111 - (901)327-2750

## ORGANIC ANALYSIS DATA SHEET

Client Name **Ensafe/Allen & Hoshall**  
**Navy Clean Joint Venture**  
**CLEAN Management Program**  
**5724 Summer Tree Drive**  
**Memphis, TN 38134**

Site ID **Navy**

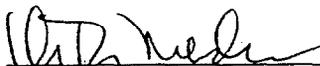
Project # **N-12 0136-001**  
 FID #

Date Arrived **03/11/98**  
 ETC Order Number **9803313**

ETC Lab ID **9803313-03**  
**Sample ID: N12SSB0816**

Matrix : **SOIL**  
 Sample Date : **03/10/98**

TEST	RESULT	UNITS	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED	BY	METHOD
Volatile Organics							8260A
Analysis Batch Method 5030	V3031401S	ug/Kg			03/14/98	LS	
Acrolein	ND	ug/Kg	100				
Acrylonitrile	ND	ug/Kg	100				
Acetone	ND	ug/Kg	50.0				
Benzene	ND	ug/Kg	2.00				
Bromobenzene	ND	ug/Kg	2.00				
Bromochloromethane	ND	ug/Kg	2.00				
Bromodichloromethane	ND	ug/Kg	2.00				
Bromoform	ND	ug/Kg	2.00				
Bromomethane	ND	ug/Kg	2.00				
n-Butylbenzene	ND	ug/Kg	2.00				
sec-Butylbenzene	ND	ug/Kg	2.00				
tert-Butylbenzene	ND	ug/Kg	2.00				
Carbon Disulfide	ND	ug/Kg	2.00				
Carbon Tetrachloride	ND	ug/Kg	2.00				
Chlorobenzene	ND	ug/Kg	2.00				
Chlorodibromomethane	ND	ug/Kg	2.00				
Chloroethane	ND	ug/Kg	2.00				
2-Chloroethylvinyl ether	ND	ug/Kg	10.0				
Chloroform	ND	ug/Kg	2.00				
Chloromethane	ND	ug/Kg	2.00				
o-Chlorotoluene	ND	ug/Kg	2.00				
p-Chlorotoluene	ND	ug/Kg	2.00				
1,2-Dibromo-3-Chloropropane	ND	ug/Kg	2.00				
1,2-Dibromoethane (EDB)	ND	ug/Kg	2.00				
Dibromomethane	ND	ug/Kg	2.00				
1,2-Dichlorobenzene	ND	ug/Kg	2.00				
1,3-Dichlorobenzene	ND	ug/Kg	2.00				
1,4-Dichlorobenzene	ND	ug/Kg	2.00				
Dichlorodifluormethane	ND	ug/Kg	2.00				
1,1-Dichloroethane	ND	ug/Kg	2.00				
1,2-Dichloroethane	ND	ug/Kg	2.00				
1,1-Dichloroethylene	ND	ug/Kg	2.00				
trans-1,4-Dichloro-2-butene	ND	ug/Kg	2.00				
cis-1,2-Dichloroethylene	ND	ug/Kg	2.00				
trans-1,2-Dichloroethylene	ND	ug/Kg	2.00				
1,2-Dichloropropane	ND	ug/Kg	2.00				
1,3-Dichloropropane	ND	ug/Kg	2.00				
1,2-Dichloropropane	ND	ug/Kg	2.00				
1,1-Dichloropropene	ND	ug/Kg	2.00				
trans-1,3-Dichloropropene	ND	ug/Kg	2.00				
cis-1,3-Dichloropropene	ND	ug/Kg	2.00				
Ethylbenzene	ND	ug/Kg	2.00				

  
 LABORATORY MANAGER

ND - Not Detected

000017

**ENVIRONMENTAL TESTING & CONSULTING, INC.**  
 2924 Walnut Grove Road - Memphis, TN 38111 - (901)327-2750  
**ORGANIC ANALYSIS DATA SHEET**

Client Name **Ensafe/Allen & Hoshall**  
**Navy Clean Joint Venture**  
**CLEAN Management Program**  
**5724 Summer Tree Drive**  
**Memphis, TN 38134**

Site ID **Navy**

Project # **N-12 0136-001**  
 FID #

Date Arrived **03/11/98**  
 ETC Order Number **9803313**

ETC Lab ID **9803313-03**  
**Sample ID: N12SSB0816**

Matrix : **SOIL**  
 Sample Date : **03/10/98**

TEST	RESULT	UNITS	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED	BY	METHOD
Volatile Organics							8260A
					03/14/98	LS	
Fluorotrichloromethane	ND	ug/Kg	2.00				
Hexachlorobutadiene	ND	ug/Kg	2.00				
Iodomethane	ND	ug/Kg	2.00				
Isopropylbenzene	ND	ug/Kg	2.00				
p-Isopropyltoluene	ND	ug/Kg	2.00				
Methyl-Butyl-Ketone	ND	ug/Kg	40.0				
Methyl-Ethyl-Ketone	ND	ug/Kg	50.0				
Methyl-Isobutyl-Ketone	ND	ug/Kg	40.0				
ethylene Chloride	ND	ug/Kg	20.0				
phthalene	ND	ug/Kg	2.00				
m-Propylbenzene	ND	ug/Kg	2.00				
Styrene	ND	ug/Kg	2.00				
1,1,1,2-Tetrachloroethane	ND	ug/Kg	2.00				
1,1,2,2-Tetrachloroethane	ND	ug/Kg	2.00				
Tetrachloroethylene	ND	ug/Kg	2.00				
Toluene	ND	ug/Kg	5.00				
1,2,3-Trichlorobenzene	ND	ug/Kg	2.00				
1,2,4-Trichlorobenzene	ND	ug/Kg	2.00				
1,1,1-Trichloroethane	ND	ug/Kg	2.00				
1,1,2-Trichloroethane	ND	ug/Kg	2.00				
Trichloroethylene	ND	ug/Kg	2.00				
Trichlorofluoromethane	ND	ug/Kg	2.00				
1,2,3-Trichloropropane	ND	ug/Kg	2.00				
1,2,4-Trimethylbenzene	ND	ug/Kg	2.00				
1,3,5-Trimethylbenzene	ND	ug/Kg	2.00				
Vinyl Acetate	ND	ug/Kg	2.00				
Vinyl Chloride	ND	ug/Kg	2.00				
Xylenes (total)	ND	ug/Kg	2.00				
MTBE	ND	ug/Kg	10.0				

Surrogate Standard	% Recovery	QC Limits	
S1 - Dibromofluoromethane	91	85	119
S2 - Toluene-d8	96	87	114
S3 - 4-Bromofluorobenzene	105	75	111

*W. T. Mader*  
 LABORATORY MANAGER

ND - Not Detected

000018

# ENVIRONMENTAL TESTING & CONSULTING, INC.

2924 Walnut Grove Road - Memphis, TN 38111 - (901)327-2750

## ORGANIC ANALYSIS DATA SHEET

Client Name **Ensafe/Allen & Hoshall**  
**Navy Clean Joint Venture**  
**CLEAN Management Program**  
**5724 Summer Tree Drive**  
**Memphis, TN 38134**

Site ID **Navy**

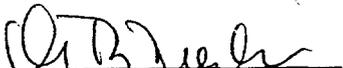
Project # **N-12 0136-001**  
FID #

Date Arrived **03/11/98**  
ETC Order Number **9803313**

ETC Lab ID **9803313-03**  
**Sample ID: N12SSB0816**

Matrix : **SOIL**  
Sample Date : **03/10/98**

TEST	RESULT	UNITS	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED	BY	METHOD
Petroleum Hydrocarbons				03/13/98	03/13/98	JP	TN DRO
Extraction Batch Method 3550	V13DRS44	mg/Kg					
Diesel Range Organics	ND	mg/Kg	10.0				
<u>Surrogate Standard</u>	<u>% Recovery</u>		<u>QC Limits</u>				
S1 - OTP	84		50	150			

  
LABORATORY MANAGER

ND - Not Detected

000019

# ENVIRONMENTAL TESTING & CONSULTING, INC.

2924 Walnut Grove Road - Memphis, TN 38111 - (901)327-2750

## ORGANIC ANALYSIS DATA SHEET

Client Name **Ensafe/Allen & Hoshall**  
**Navy Clean Joint Venture**  
**CLEAN Management Program**  
**5724 Summer Tree Drive**  
**Memphis, TN 38134**

Project # **N-12 0136-001**  
FID #

Site ID **Navy**

Date Arrived **03/11/98**  
ETC Order Number **9803313**

ETC Lab ID **9803313-04**  
**Sample ID: N12SSB0812**

Matrix **:SOIL**  
Sample Date **:03/10/98**

TEST	RESULT	UNITS	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED	BY	METHOD
BTEX/TPH GRO							8020/GRO
				03/12/98	03/13/98	JG	
Analysis Batch Method 5030	V29BXS8S	mg/Kg					
Benzene	ND	mg/Kg	0.100				
Toluene	ND	mg/Kg	0.100				
Ethyl Benzene	ND	mg/Kg	0.100				
Xylenes (Total)	ND	mg/Kg	0.100				
TPH - Gasoline Range Organics	ND	mg/Kg	5.00				
MTBE	ND	mg/Kg	0.500				
<u>rogate Standard</u>	<u>% Recovery</u>		<u>QC Limits</u>				
- BFB	78		50	150			
S2 - BFB	101		50	150			

  
LABORATORY MANAGER

ND - Not Detected

000020

**ENVIRONMENTAL TESTING & CONSULTING, INC.**  
 2924 Walnut Grove Road - Memphis, TN 38111 - (901)327-2750  
**ORGANIC ANALYSIS DATA SHEET**

Client Name **Ensafe/Allen & Hoshall**  
**Navy Clean Joint Venture**  
**CLEAN Management Program**  
**5724 Summer Tree Drive**  
**Memphis, TN 38134**

Site ID **Navy**

Project # **N-12 0136-001**  
 FID #

Date Arrived **03/11/98**  
 ETC Order Number **9803313**

ETC Lab ID **9803313-04**  
**Sample ID: N12SSB0812**

Matrix : **SOIL**  
 Sample Date : **03/10/98**

TEST	RESULT	UNITS	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED	BY	METHOD
<b>Petroleum Hydrocarbons</b>							<b>TN DRO</b>
Extraction Batch Method	3550	V13DRS44	mg/Kg	03/13/98	03/13/98	JP	
Diesel Range Organics		ND	mg/Kg				10.0
<b>Surrogate Standard</b>		<b>% Recovery</b>					<b>QC Limits</b>
S1 - OTP		72					50 150

  
 LABORATORY MANAGER

ND - Not Detected

000021

**ENVIRONMENTAL TESTING & CONSULTING, INC.**

2924 Walnut Grove Road - Memphis, TN 38111 - (901)327-2750

**ORGANIC ANALYSIS DATA SHEET**

Client Name **Ensafe/Allen & Hoshall**  
**Navy Clean Joint Venture**  
**CLEAN Management Program**  
**5724 Summer Tree Drive**  
**Memphis, TN 38134**

Site ID **Navy**

Project # **N-12 0136-001**  
 FID #

Date Arrived **03/11/98**  
 ETC Order Number **9803313**

ETC Lab ID **9803313-05**  
**Sample ID: N12SSB0808**

Matrix : **SOIL**  
 Sample Date : **03/10/98**

TEST	RESULT	UNITS	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED	BY	METHOD
BTEX/TPH GRO				03/12/98	03/13/98	JG	8020/GRO
Analysis Batch Method 5030	V29BXS8S	mg/Kg					
Benzene	ND	mg/Kg	0.100				
Toluene	ND	mg/Kg	0.100				
Ethyl Benzene	ND	mg/Kg	0.100				
Xylenes (Total)	ND	mg/Kg	0.100				
TPH - Gasoline Range Organics	ND	mg/Kg	5.00				
MTBE	ND	mg/Kg	0.500				
<u>rogate Standard</u>	<u>% Recovery</u>		<u>QC Limits</u>				
- BFB	74		50	150			
S2 - BFB	100		50	150			

*[Signature]*  
 LABORATORY MANAGER

ND - Not Detected

000022

# ENVIRONMENTAL TESTING & CONSULTING, INC.

2924 Walnut Grove Road - Memphis, TN 38111 - (901)327-2750

## ORGANIC ANALYSIS DATA SHEET

Client Name **Ensafe/Allen & Hoshall**  
**Navy Clean Joint Venture**  
**CLEAN Management Program**  
**5724 Summer Tree Drive**  
**Memphis, TN 38134**

Project # **N-12 0136-001**  
FID #

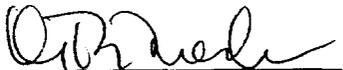
Site ID **Navy**

Date Arrived **03/11/98**  
ETC Order Number **9803313**

ETC Lab ID **9803313-05**  
**Sample ID: N12SSB0808**

Matrix : **SOIL**  
Sample Date : **03/10/98**

TEST	RESULT	UNITS	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED	BY	METHOD
Petroleum Hydrocarbons				03/13/98	03/13/98	JP	TN DRO
Extraction Batch Method 3550	V13DRS44	mg/Kg					
Diesel Range Organics	ND	mg/Kg	10.0				
<u>Surrogate Standard</u>	<u>% Recovery</u>		<u>QC Limits</u>				
S1 - OTP	63		50 150				

  
LABORATORY MANAGER

ND - Not Detected

000023

# ENVIRONMENTAL TESTING & CONSULTING, INC.

2924 Walnut Grove Road - Memphis, TN 38111 - (901)327-2750

## ORGANIC ANALYSIS DATA SHEET

Client Name **Ensafe/Allen & Hoshall**  
**Navy Clean Joint Venture**  
**CLEAN Management Program**  
**5724 Summer Tree Drive**  
**Memphis, TN 38134**

Site ID **Navy**

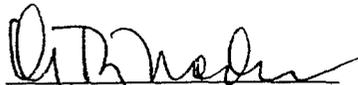
Project # **N-12 0136-001**  
FID #

Date Arrived **03/11/98**  
ETC Order Number **9803313**

ETC Lab ID **9803313-06**  
**Sample ID: N12SSB0908**

Matrix : **SOIL**  
Sample Date : **03/10/98**

TEST	RESULT	UNITS	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED	BY	METHOD
BTEX/TPH GRO				03/12/98	03/13/98	JG	8020/GRO
Analysis Batch Method 5030	V29BXS8S	mg/Kg					
Benzene	ND	mg/Kg	0.100				
Toluene	ND	mg/Kg	0.100				
Ethyl Benzene	ND	mg/Kg	0.100				
Xylenes (Total)	ND	mg/Kg	0.100				
TPH - Gasoline Range Organics	ND	mg/Kg	5.00				
MTBE	ND	mg/Kg	0.500				
<u>rogate Standard</u>		<u>% Recovery</u>					<u>QC Limits</u>
- BFB		75	50	150			
S2 - BFB		99	50	150			

  
LABORATORY MANAGER

ND - Not Detected

000024

# ENVIRONMENTAL TESTING & CONSULTING, INC.

2924 Walnut Grove Road - Memphis, TN 38111 - (901)327-2750

## ORGANIC ANALYSIS DATA SHEET

Client Name **Ensafe/Allen & Hoshall**  
**Navy Clean Joint Venture**  
**CLEAN Management Program**  
**5724 Summer Tree Drive**  
**Memphis, TN 38134**

Site ID **Navy**

Project # **N-12 0136-001**  
FID #

Date Arrived **03/11/98**  
ETC Order Number **9803313**

ETC Lab ID **9803313-06**  
**Sample ID: N12SSB0908**

Matrix : **SOIL**  
Sample Date : **03/10/98**

TEST	RESULT	UNITS	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED	BY	METHOD
Petroleum Hydrocarbons				03/13/98	03/13/98	JP	TN DRO
Extraction Batch Method 3550	V13DRS44	mg/Kg					
Diesel Range Organics	ND	mg/Kg	10.0				
<u>Surrogate Standard</u>	<u>% Recovery</u>		<u>QC Limits</u>				
S1 - OTP	77		50	150			

  
LABORATORY MANAGER

ND - Not Detected

000025

**ENVIRONMENTAL TESTING & CONSULTING, INC.**  
 2924 Walnut Grove Road - Memphis, TN 38111 - (901)327-2750  
**ORGANIC ANALYSIS DATA SHEET**

Client Name **Ensafe/Allen & Hoshall**  
**Navy Clean Joint Venture**  
**CLEAN Management Program**  
**5724 Summer Tree Drive**  
**Memphis, TN 38134**

Site ID **Navy**

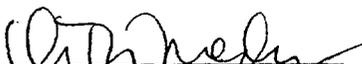
Project # **N-12 0136-001**  
 FID #

Date Arrived **03/11/98**  
 ETC Order Number **9803313**

ETC Lab ID **9803313-07**  
**Sample ID: N12GSB0912**

Matrix : **SOIL**  
 Sample Date : **03/10/98**

TEST	RESULT	UNITS	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED	BY	METHOD
BTEX/TPH GRO				03/12/98	03/13/98	JG	8020/GRO
Analysis Batch Method 5030	V29BXS8S	mg/Kg					
Benzene	ND	mg/Kg	0.100				
Toluene	ND	mg/Kg	0.100				
Ethyl Benzene	ND	mg/Kg	0.100				
Xylenes (Total)	ND	mg/Kg	0.100				
TPH - Gasoline Range Organics	ND	mg/Kg	5.00				
"BE	ND	mg/Kg	0.500				
<u>Proximate Standard</u>		<u>% Recovery</u>					<u>QC Limits</u>
- BFB		76	50	150			
S2 - BFB		100	50	150			

  
 LABORATORY MANAGER

ND - Not Detected

000026

**ENVIRONMENTAL TESTING & CONSULTING, INC.**

2924 Walnut Grove Road - Memphis, TN 38111 - (901)327-2750

**ORGANIC ANALYSIS DATA SHEET**

Client Name **Ensafe/Allen & Hoshall**  
**Navy Clean Joint Venture**  
**CLEAN Management Program**  
**5724 Summer Tree Drive**  
**Memphis, TN 38134**

Project # **N-12 0136-001**  
FID #

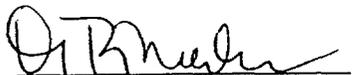
Site ID **Navy**

Date Arrived **03/11/98**  
ETC Order Number **9803313**

ETC Lab ID **9803313-07**  
**Sample ID: N12GSB0912**

Matrix : **SOIL**  
Sample Date : **03/10/98**

TEST	RESULT	UNITS	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED	BY	METHOD
Petroleum Hydrocarbons				03/13/98	03/13/98	JP	TN DRO
Extraction Batch Method 3550	V13DRS44	mg/Kg					
Diesel Range Organics	ND	mg/Kg	10.0				
<u>Surrogate Standard</u>	<u>% Recovery</u>		<u>QC Limits</u>				
S1 - OTP	73		50	150			

  
LABORATORY MANAGER

ND - Not Detected

000027

**ENVIRONMENTAL TESTING & CONSULTING, INC.**

2924 Walnut Grove Road - Memphis, TN 38111 - (901)327-2750

**ORGANIC ANALYSIS DATA SHEET**

Client Name **Ensafe/Allen & Hoshall**  
**Navy Clean Joint Venture**  
**CLEAN Management Program**  
**5724 Summer Tree Drive**  
**Memphis, TN 38134**

Site ID **Navy**

Project # **N-12 0136-001**  
 FID #

Date Arrived **03/11/98**  
 ETC Order Number **9803313**

ETC Lab ID **9803313-08**  
**Sample ID: N12SSB0916**

Matrix : **SOIL**  
 Sample Date : **03/10/98**

TEST	RESULT	UNITS	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED	BY	METHOD
BTEX/TPH GRO				03/12/98	03/13/98	JG	8020/GRO
Analysis Batch Method 5030	V29BXS8S	mg/Kg					
Benzene	ND	mg/Kg	0.100				
Toluene	ND	mg/Kg	0.100				
Ethyl Benzene	ND	mg/Kg	0.100				
Xylenes (Total)	ND	mg/Kg	0.100				
TPH - Gasoline Range Organics	ND	mg/Kg	5.00				
MTBE	ND	mg/Kg	0.500				
<u>rogate Standard</u>	<u>% Recovery</u>		<u>QC Limits</u>				
- BFB	74		50	150			
S2 - BFB	99		50	150			

*OTB*  
 LABORATORY MANAGER

ND - Not Detected

000028

# ENVIRONMENTAL TESTING & CONSULTING, INC.

2924 Walnut Grove Road - Memphis, TN 38111 - (901)327-2750

## ORGANIC ANALYSIS DATA SHEET

Client Name **Ensafe/Allen & Hoshall**  
**Navy Clean Joint Venture**  
**CLEAN Management Program**  
**5724 Summer Tree Drive**  
**Memphis, TN 38134**

Project # **N-12 0136-001**  
 FID #

Site ID **Navy**

Date Arrived **03/11/98**  
 ETC Order Number **9803313**

ETC Lab ID **9803313-08**  
**Sample ID: N12SSB0916**

Matrix : **SOIL**  
 Sample Date : **03/10/98**

TEST	RESULT	UNITS	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED	BY	METHOD
Volatile Organics							8260A
Analysis Batch Method 5030	V3031501S	ug/Kg			03/14/98	LS	
Acrolein	ND	ug/Kg	100				
Acrylonitrile	ND	ug/Kg	100				
Acetone	ND	ug/Kg	50.0				
Benzene	ND	ug/Kg	2.00				
Bromobenzene	ND	ug/Kg	2.00				
Bromochloromethane	ND	ug/Kg	2.00				
Bromodichloromethane	ND	ug/Kg	2.00				
Bromoform	ND	ug/Kg	2.00				
Bromomethane	ND	ug/Kg	2.00				
n-Butylbenzene	ND	ug/Kg	2.00				
sec-Butylbenzene	ND	ug/Kg	2.00				
tert-Butylbenzene	ND	ug/Kg	2.00				
Carbon Disulfide	ND	ug/Kg	2.00				
Carbon Tetrachloride	ND	ug/Kg	2.00				
Chlorobenzene	ND	ug/Kg	2.00				
Chlorodibromomethane	ND	ug/Kg	2.00				
Chloroethane	ND	ug/Kg	2.00				
2-Chloroethylvinyl ether	ND	ug/Kg	10.0				
Chloroform	ND	ug/Kg	2.00				
Chloromethane	ND	ug/Kg	2.00				
o-Chlorotoluene	ND	ug/Kg	2.00				
p-Chlorotoluene	ND	ug/Kg	2.00				
1,2-Dibromo-3-Chloropropane	ND	ug/Kg	2.00				
1,2-Dibromoethane (EDB)	ND	ug/Kg	2.00				
Dibromomethane	ND	ug/Kg	2.00				
1,2-Dichlorobenzene	ND	ug/Kg	2.00				
1,3-Dichlorobenzene	ND	ug/Kg	2.00				
1,4-Dichlorobenzene	ND	ug/Kg	2.00				
Dichlorodifluormethane	ND	ug/Kg	2.00				
1,1-Dichloroethane	ND	ug/Kg	2.00				
1,2-Dichloroethane	ND	ug/Kg	2.00				
1,1-Dichloroethylene	ND	ug/Kg	2.00				
trans-1,4-Dichloro-2-butene	ND	ug/Kg	2.00				
cis-1,2-Dichloroethylene	ND	ug/Kg	2.00				
trans-1,2-Dichloroethylene	ND	ug/Kg	2.00				
1,2-Dichloropropane	ND	ug/Kg	2.00				
1,3-Dichloropropane	ND	ug/Kg	2.00				
1,2-Dichloropropane	ND	ug/Kg	2.00				
1,1-Dichloropropene	ND	ug/Kg	2.00				
cis-1,3-Dichloropropene	ND	ug/Kg	2.00				
trans-1,3-Dichloropropene	ND	ug/Kg	2.00				
Ethylbenzene	ND	ug/Kg	2.00				

  
 LABORATORY MANAGER

ND - Not Detected

000029

# ENVIRONMENTAL TESTING & CONSULTING, INC.

2924 Walnut Grove Road - Memphis, TN 38111 - (901)327-2750

## ORGANIC ANALYSIS DATA SHEET

Client Name **Ensafe/Allen & Hoshall**  
**Navy Clean Joint Venture**  
**CLEAN Management Program**  
**5724 Summer Tree Drive**  
**Memphis, TN 38134**

Site ID **Navy**

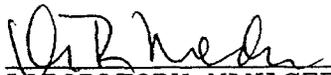
Project # **N-12 0136-001**  
 FID #

Date Arrived **03/11/98**  
 ETC Order Number **9803313**

ETC Lab ID **9803313-08**  
**Sample ID: N12SSB0916**

Matrix : **SOIL**  
 Sample Date : **03/10/98**

TEST	RESULT	UNITS	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED	BY	METHOD
Volatile Organics							8260A
					03/14/98	LS	
Fluorotrichloromethane	ND	ug/Kg	2.00				
Hexachlorobutadiene	ND	ug/Kg	2.00				
Iodomethane	ND	ug/Kg	2.00				
Isopropylbenzene	ND	ug/Kg	2.00				
p-Isopropyltoluene	ND	ug/Kg	2.00				
Methyl-Butyl-Ketone	ND	ug/Kg	40.0				
Methyl-Ethyl-Ketone	ND	ug/Kg	50.0				
ethyl-Isobutyl-Ketone	ND	ug/Kg	40.0				
ethylene Chloride	ND	ug/Kg	20.0				
phthalene	ND	ug/Kg	2.00				
n-Propylbenzene	ND	ug/Kg	2.00				
Styrene	ND	ug/Kg	2.00				
1,1,1,2-Tetrachloroethane	ND	ug/Kg	2.00				
1,1,2,2-Tetrachloroethane	ND	ug/Kg	2.00				
Tetrachloroethylene	ND	ug/Kg	2.00				
Toluene	ND	ug/Kg	5.00				
1,2,3-Trichlorobenzene	ND	ug/Kg	2.00				
1,2,4-Trichlorobenzene	ND	ug/Kg	2.00				
1,1,1-Trichloroethane	ND	ug/Kg	2.00				
1,1,2-Trichloroethane	ND	ug/Kg	2.00				
Trichloroethylene	ND	ug/Kg	2.00				
Trichlorofluoromethane	ND	ug/Kg	2.00				
1,2,3-Trichloropropane	ND	ug/Kg	2.00				
1,2,4-Trimethylbenzene	ND	ug/Kg	2.00				
1,3,5-Trimethylbenzene	ND	ug/Kg	2.00				
Vinyl Acetate	ND	ug/Kg	2.00				
Vinyl Chloride	ND	ug/Kg	2.00				
Xylenes (total)	ND	ug/Kg	2.00				
MTBE	ND	ug/Kg	10.0				
<b>Surrogate Standard</b>		<b>% Recovery</b>		<b>QC Limits</b>			
S1 - Dibromofluoromethane		87		85	119		
S2 - Toluene-d8		93		87	114		
S3 - 4-Bromofluorobenzene		107		75	111		

  
 LABORATORY MANAGER

ND - Not Detected

000030

# ENVIRONMENTAL TESTING & CONSULTING, INC.

2924 Walnut Grove Road - Memphis, TN 38111 - (901)327-2750

## ORGANIC ANALYSIS DATA SHEET

Client Name **Ensafe/Allen & Hoshall**  
**Navy Clean Joint Venture**  
**CLEAN Management Program**  
**5724 Summer Tree Drive**  
**Memphis, TN 38134**

Project # **N-12 0136-001**  
FID #

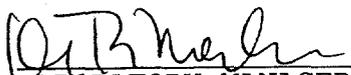
Site ID **Navy**

Date Arrived **03/11/98**  
ETC Order Number **9803313**

ETC Lab ID **9803313-08**  
**Sample ID: N12SSB0916**

Matrix : **SOIL**  
Sample Date : **03/10/98**

TEST	RESULT	UNITS	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED	BY	METHOD
Petroleum Hydrocarbons							TN DRO
Extraction Batch Method	3550	V13DRS44	mg/Kg	03/13/98	03/13/98	JP	
Diesel Range Organics	ND	mg/Kg	10.0				
<u>Surrogate Standard</u>		<u>% Recovery</u>					<u>QC Limits</u>
S1 - OTP		70					50 150

  
LABORATORY MANAGER

ND - Not Detected

000031

# ENVIRONMENTAL TESTING & CONSULTING, INC.

2924 Walnut Grove Road - Memphis, TN 38111 - (901)327-2750

## ORGANIC ANALYSIS DATA SHEET

Client Name **Ensafe/Allen & Hoshall**  
**Navy Clean Joint Venture**  
**CLEAN Management Program**  
**5724 Summer Tree Drive**  
**Memphis, TN 38134**

Site ID **Navy**

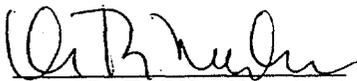
Project # **N-12 0136-001**  
 FID #

Date Arrived **03/11/98**  
 ETC Order Number **9803313**

ETC Lab ID **9803313-09**  
**Sample ID: N12SSB0798**

Matrix **:SOIL**  
 Sample Date **:03/10/98**

TEST	RESULT	UNITS	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED	BY	METHOD
BTEX/TPH GRO				03/12/98	03/13/98	JG	8020/GRO
Analysis Batch Method 5030	V29BXS8S	mg/Kg					
Benzene	ND	mg/Kg	0.100				
Toluene	ND	mg/Kg	0.100				
Ethyl Benzene	ND	mg/Kg	0.100				
Xylenes (Total)	ND	mg/Kg	0.100				
TPH - Gasoline Range Organics	ND	mg/Kg	5.00				
MTBE	ND	mg/Kg	0.500				
<u>rogate Standard</u>		<u>% Recovery</u>					<u>QC Limits</u>
- BFB		81	50	150			
S2 - BFB		100	50	150			

  
 LABORATORY MANAGER

ND - Not Detected

000032

# ENVIRONMENTAL TESTING & CONSULTING, INC.

2924 Walnut Grove Road - Memphis, TN 38111 - (901)327-2750

## ORGANIC ANALYSIS DATA SHEET

Client Name    **Ensafe/Allen & Hoshall**  
**Navy Clean Joint Venture**  
**CLEAN Management Program**  
**5724 Summer Tree Drive**  
**Memphis, TN 38134**

Site ID        **Navy**

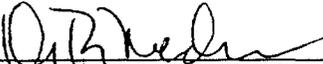
Project #    **N-12 0136-001**  
 FID #

Date Arrived    **03/11/98**  
 ETC Order Number    **9803313**

ETC Lab ID    **9803313-09**  
**Sample ID: N12SSB0798**

Matrix        **:SOIL**  
 Sample Date    **:03/10/98**

TEST	RESULT	UNITS	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED	BY	METHOD
Volatile Organics					03/14/98	LS	8260A
Analysis Batch Method 5030	V3031401S	ug/Kg					
Acrolein	ND	ug/Kg	100				
Acrylonitrile	ND	ug/Kg	100				
Acetone	ND	ug/Kg	50.0				
Benzene	ND	ug/Kg	2.00				
Bromobenzene	ND	ug/Kg	2.00				
Bromochloromethane	ND	ug/Kg	2.00				
bromodichloromethane	ND	ug/Kg	2.00				
bromoform	ND	ug/Kg	2.00				
bromomethane	ND	ug/Kg	2.00				
n-Butylbenzene	ND	ug/Kg	2.00				
sec-Butylbenzene	ND	ug/Kg	2.00				
tert-Butylbenzene	ND	ug/Kg	2.00				
Carbon Disulfide	ND	ug/Kg	2.00				
Carbon Tetrachloride	ND	ug/Kg	2.00				
Chlorobenzene	ND	ug/Kg	2.00				
Chlorodibromomethane	ND	ug/Kg	2.00				
Chloroethane	ND	ug/Kg	2.00				
2-Chloroethylvinyl ether	ND	ug/Kg	10.0				
Chloroform	ND	ug/Kg	2.00				
Chloromethane	ND	ug/Kg	2.00				
o-Chlorotoluene	ND	ug/Kg	2.00				
p-Chlorotoluene	ND	ug/Kg	2.00				
1,2-Dibromo-3-Chloropropane	ND	ug/Kg	2.00				
1,2-Dibromoethane (EDB)	ND	ug/Kg	2.00				
Dibromomethane	ND	ug/Kg	2.00				
1,2-Dichlorobenzene	ND	ug/Kg	2.00				
1,3-Dichlorobenzene	ND	ug/Kg	2.00				
1,4-Dichlorobenzene	ND	ug/Kg	2.00				
Dichlorodifluormethane	ND	ug/Kg	2.00				
1,1-Dichloroethane	ND	ug/Kg	2.00				
1,2-Dichloroethane	ND	ug/Kg	2.00				
1,1-Dichloroethylene	ND	ug/Kg	2.00				
trans-1,4-Dichloro-2-butene	ND	ug/Kg	2.00				
cis-1,2-Dichloroethylene	ND	ug/Kg	2.00				
trans-1,2-Dichloroethylene	ND	ug/Kg	2.00				
1,2-Dichloropropane	ND	ug/Kg	2.00				
1,3-Dichloropropane	ND	ug/Kg	2.00				
2-Dichloropropane	ND	ug/Kg	2.00				
1-Dichloropropene	ND	ug/Kg	2.00				
cis-1,3-Dichloropropene	ND	ug/Kg	2.00				
trans-1,3-Dichloropropene	ND	ug/Kg	2.00				
Ethylbenzene	ND	ug/Kg	2.00				

  
 LABORATORY MANAGER

ND - Not Detected

000033

# ENVIRONMENTAL TESTING & CONSULTING, INC.

2924 Walnut Grove Road - Memphis, TN 38111 - (901)327-2750

## ORGANIC ANALYSIS DATA SHEET

Client Name **Ensafe/Allen & Hoshall**  
**Navy Clean Joint Venture**  
**CLEAN Management Program**  
**5724 Summer Tree Drive**  
**Memphis, TN 38134**

Site ID **Navy**

Project # **N-12 0136-001**  
 FID #

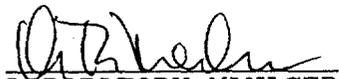
Date Arrived **03/11/98**  
 ETC Order Number **9803313**

ETC Lab ID **9803313-09**  
**Sample ID: N12SSB0798**

Matrix : **SOIL**  
 Sample Date : **03/10/98**

TEST	RESULT	UNITS	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED	BY	METHOD
Volatile Organics							8260A
					03/14/98	LS	
Fluorotrichloromethane	ND	ug/Kg	2.00				
Hexachlorobutadiene	ND	ug/Kg	2.00				
Iodomethane	ND	ug/Kg	2.00				
Isopropylbenzene	ND	ug/Kg	2.00				
p-Isopropyltoluene	ND	ug/Kg	2.00				
Methyl-Butyl-Ketone	ND	ug/Kg	40.0				
Methyl-Ethyl-Ketone	ND	ug/Kg	50.0				
thyl-Isobutyl-Ketone	ND	ug/Kg	40.0				
ethylene Chloride	25.2B	ug/Kg	20.0				
phthalene	ND	ug/Kg	2.00				
n-Propylbenzene	ND	ug/Kg	2.00				
Styrene	ND	ug/Kg	2.00				
1,1,1,2-Tetrachloroethane	ND	ug/Kg	2.00				
1,1,2,2-Tetrachloroethane	ND	ug/Kg	2.00				
Tetrachloroethylene	ND	ug/Kg	2.00				
Toluene	ND	ug/Kg	5.00				
1,2,3-Trichlorobenzene	ND	ug/Kg	2.00				
1,2,4-Trichlorobenzene	ND	ug/Kg	2.00				
1,1,1-Trichloroethane	ND	ug/Kg	2.00				
1,1,2-Trichloroethane	ND	ug/Kg	2.00				
Trichloroethylene	ND	ug/Kg	2.00				
Trichlorofluoromethane	ND	ug/Kg	2.00				
1,2,3-Trichloropropane	ND	ug/Kg	2.00				
1,2,4-Trimethylbenzene	ND	ug/Kg	2.00				
1,3,5-Trimethylbenzene	ND	ug/Kg	2.00				
Vinyl Acetate	ND	ug/Kg	2.00				
Vinyl Chloride	ND	ug/Kg	2.00				
Xylenes (total)	ND	ug/Kg	2.00				
MTBE	ND	ug/Kg	10.0				

Surrogate Standard	% Recovery	QC Limits	
S1 - Dibromofluoromethane	87	85	119
S2 - Toluene-d8	95	87	114
S3 - 4-Bromofluorobenzene	108	75	111

  
 LABORATORY MANAGER

ND - Not Detected

000034

# ENVIRONMENTAL TESTING & CONSULTING, INC.

2924 Walnut Grove Road - Memphis, TN 38111 - (901)327-2750

## ORGANIC ANALYSIS DATA SHEET

Client Name **Ensafe/Allen & Hoshall**  
**Navy Clean Joint Venture**  
**CLEAN Management Program**  
**5724 Summer Tree Drive**  
**Memphis, TN 38134**

Site ID **Navy**

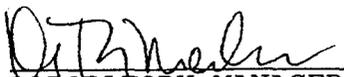
Project # **N-12 0136-001**  
FID #

Date Arrived **03/11/98**  
ETC Order Number **9803313**

ETC Lab ID **9803313-09**  
**Sample ID: N12SSB0798**

Matrix **:SOIL**  
Sample Date **:03/10/98**

TEST	RESULT	UNITS	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED	BY	METHOD
Petroleum Hydrocarbons				03/13/98	03/13/98	JP	TN DRO
Extraction Batch Method 3550	V13DRS44	mg/Kg					
Diesel Range Organics	14.1	mg/Kg	10.0				
<u>Surrogate Standard</u>	<u>% Recovery</u>		<u>QC Limits</u>				
S1 - OTP	70		50	150			

  
LABORATORY MANAGER

ND - Not Detected

000035

# ENVIRONMENTAL TESTING & CONSULTING, INC.

2924 Walnut Grove Road - Memphis, TN 38111 - (901)327-2750

## ORGANIC ANALYSIS DATA SHEET

Client Name **Ensafe/Allen & Hoshall**  
**Navy Clean Joint Venture**  
**CLEAN Management Program**  
**5724 Summer Tree Drive**  
**Memphis, TN 38134**

Site ID **Navy**

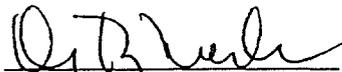
Project # **N-12 0136-001**  
FID #

Date Arrived **03/11/98**  
ETC Order Number **9803313**

ETC Lab ID **9803313-10**  
**Sample ID: N12SSB0698**

Matrix : **SOIL**  
Sample Date : **03/10/98**

TEST	RESULT	UNITS	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED	BY	METHOD
BTEX/TPH GRO							8020/GRO
Analysis Batch Method 5030	V29BXS8S	mg/Kg		03/12/98	03/13/98	JG	
Benzene	0.314	mg/Kg	0.100				
Toluene	1.32	mg/Kg	0.100				
Ethyl Benzene	1.32	mg/Kg	0.100				
Xylenes (Total)	5.64	mg/Kg	0.100				
TPH - Gasoline Range Organics	61.6	mg/Kg	5.00				
MTBE	ND	mg/Kg	0.500				
<u>rogate Standard</u>		<u>% Recovery</u>					<u>QC Limits</u>
- BFB		96		50	150		
S2 - BFB		113		50	150		

  
LABORATORY MANAGER

ND - Not Detected

000036

# ENVIRONMENTAL TESTING & CONSULTING, INC.

2924 Walnut Grove Road - Memphis, TN 38111 - (901)327-2750

## ORGANIC ANALYSIS DATA SHEET

Client Name **Ensafe/Allen & Hoshall**  
**Navy Clean Joint Venture**  
**CLEAN Management Program**  
**5724 Summer Tree Drive**  
**Memphis, TN 38134**

Project # **N-12 0136-001**  
 FID #

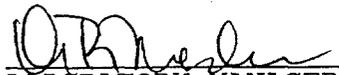
Site ID **Navy**

Date Arrived **03/11/98**  
 ETC Order Number **9803313**

ETC Lab ID **9803313-10**  
**Sample ID: N12SSB0698**

Matrix : **SOIL**  
 Sample Date : **03/10/98**

TEST	RESULT	UNITS	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED	BY	METHOD
Volatile Organics					03/14/98	LS	8260A
Analysis Batch Method 5030	V3031401S	ug/Kg					
Acrolein	ND	ug/Kg	10000				
Acrylonitrile	ND	ug/Kg	10000				
Acetone	ND	ug/Kg	5000				
Benzene	825	ug/Kg	200				
Bromobenzene	ND	ug/Kg	200				
Bromochloromethane	ND	ug/Kg	200				
Dichloromethane	ND	ug/Kg	200				
Form	ND	ug/Kg	200				
Methane	ND	ug/Kg	200				
n-Butylbenzene	ND	ug/Kg	200				
sec-Butylbenzene	ND	ug/Kg	200				
tert-Butylbenzene	ND	ug/Kg	200				
Carbon Disulfide	ND	ug/Kg	200				
Carbon Tetrachloride	ND	ug/Kg	200				
Chlorobenzene	ND	ug/Kg	200				
Chlorodibromomethane	ND	ug/Kg	200				
Chloroethane	ND	ug/Kg	200				
2-Chloroethylvinyl ether	ND	ug/Kg	1000				
Chloroform	ND	ug/Kg	200				
Chloromethane	ND	ug/Kg	200				
o-Chlorotoluene	ND	ug/Kg	200				
p-Chlorotoluene	ND	ug/Kg	200				
1,2-Dibromo-3-Chloropropane	ND	ug/Kg	200				
1,2-Dibromoethane (EDB)	ND	ug/Kg	200				
Dibromomethane	ND	ug/Kg	200				
1,2-Dichlorobenzene	ND	ug/Kg	200				
1,3-Dichlorobenzene	ND	ug/Kg	200				
1,4-Dichlorobenzene	ND	ug/Kg	200				
Dichlorodifluoromethane	ND	ug/Kg	200				
1,1-Dichloroethane	ND	ug/Kg	200				
1,2-Dichloroethane	ND	ug/Kg	200				
1,1-Dichloroethylene	ND	ug/Kg	200				
trans-1,4-Dichloro-2-butene	ND	ug/Kg	200				
cis-1,2-Dichloroethylene	ND	ug/Kg	200				
trans-1,2-Dichloroethylene	ND	ug/Kg	200				
1,2-Dichloropropane	ND	ug/Kg	200				
1,3-Dichloropropane	ND	ug/Kg	200				
1,2-Dichloropropane	ND	ug/Kg	200				
1,1-Dichloropropene	ND	ug/Kg	200				
trans-1,3-Dichloropropene	ND	ug/Kg	200				
trans-1,3-Dichloropropene	ND	ug/Kg	200				
Ethylbenzene	2,590	ug/Kg	200				

  
 LABORATORY MANAGER

ND - Not Detected

000037

**ENVIRONMENTAL TESTING & CONSULTING, INC.**  
 2924 Walnut Grove Road - Memphis, TN 38111 - (901)327-2750  
**ORGANIC ANALYSIS DATA SHEET**

Client Name **Ensafe/Allen & Hoshall**  
**Navy Clean Joint Venture**  
**CLEAN Management Program**  
**5724 Summer Tree Drive**  
**Memphis, TN 38134**

Site ID **Navy**

Project # **N-12 0136-001**  
 FID #

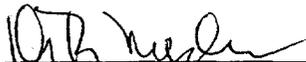
Date Arrived **03/11/98**  
 ETC Order Number **9803313**

ETC Lab ID **9803313-10**  
**Sample ID: N12SSB0698**

Matrix : **SOIL**  
 Sample Date : **03/10/98**

TEST	RESULT	UNITS	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED	BY	METHOD
Volatile Organics							8260A
					03/14/98	LS	
Fluorotrichloromethane	ND	ug/Kg	200				
Hexachlorobutadiene	ND	ug/Kg	200				
Iodomethane	ND	ug/Kg	200				
Isopropylbenzene	235	ug/Kg	200				
p-Isopropyltoluene	ND	ug/Kg	200				
Methyl-Butyl-Ketone	ND	ug/Kg	4000				
Methyl-Ethyl-Ketone	ND	ug/Kg	5000				
ethyl-Isobutyl-Ketone	ND	ug/Kg	4000				
Ethylene Chloride	ND	ug/Kg	2000				
naphthalene	749	ug/Kg	200				
m-Propylbenzene	790	ug/Kg	200				
Styrene	ND	ug/Kg	200				
1,1,1,2-Tetrachloroethane	ND	ug/Kg	200				
1,1,2,2-Tetrachloroethane	ND	ug/Kg	200				
Tetrachloroethylene	ND	ug/Kg	200				
Toluene	3,490	ug/Kg	500				
1,2,3-Trichlorobenzene	ND	ug/Kg	200				
1,2,4-Trichlorobenzene	ND	ug/Kg	200				
1,1,1-Trichloroethane	ND	ug/Kg	200				
1,1,2-Trichloroethane	ND	ug/Kg	200				
Trichloroethylene	ND	ug/Kg	200				
Trichlorofluoromethane	ND	ug/Kg	200				
1,2,3-Trichloropropane	ND	ug/Kg	200				
1,2,4-Trimethylbenzene	5,130	ug/Kg	200				
1,3,5-Trimethylbenzene	1,530	ug/Kg	200				
Vinyl Acetate	ND	ug/Kg	200				
Vinyl Chloride	ND	ug/Kg	200				
Xylenes (total)	10,400	ug/Kg	200				
MTBE	ND	ug/Kg	1000				

Surrogate Standard	% Recovery	QC Limits
S1 - Dibromofluoromethane	89	85 119
S2 - Toluene-d8	96	87 114
S3 - 4-Bromofluorobenzene	112 Q	75 111

  
 LABORATORY MANAGER

ND - Not Detected

000038

# ENVIRONMENTAL TESTING & CONSULTING, INC.

2924 Walnut Grove Road - Memphis, TN 38111 - (901)327-2750

## ORGANIC ANALYSIS DATA SHEET

Client Name **Ensafe/Allen & Hoshall**  
**Navy Clean Joint Venture**  
**CLEAN Management Program**  
**5724 Summer Tree Drive**  
**Memphis, TN 38134**

Project # **N-12 0136-001**  
FID #

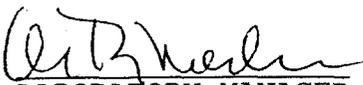
Site ID **Navy**

Date Arrived **03/11/98**  
ETC Order Number **9803313**

ETC Lab ID **9803313-10**  
**Sample ID: N12SSB0698**

Matrix **:SOIL**  
Sample Date **:03/10/98**

TEST	RESULT	UNITS	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED	BY	METHOD
Petroleum Hydrocarbons							TN DRO
Extraction Batch Method 3550	V13DRS44	mg/Kg		03/13/98	03/14/98	JP	
Diesel Range Organics	95.1	mg/Kg	10.0				
<u>Surrogate Standard</u>	<u>% Recovery</u>		<u>QC Limits</u>				
S1 - OTP	87		50		150		

  
LABORATORY MANAGER

ND - Not Detected

00003

# ENVIRONMENTAL TESTING & CONSULTING, INC.

2924 Walnut Grove Road - Memphis, TN 38111 - (901)327-2750

## ORGANIC ANALYSIS DATA SHEET

Client Name **Ensafe/Allen & Hoshall**  
**Navy Clean Joint Venture**  
**CLEAN Management Program**  
**5724 Summer Tree Drive**  
**Memphis, TN 38134**

Project # **N-12 0136-001**  
 FID #

Site ID **Navy**

Date Arrived **03/11/98**  
 ETC Order Number **9803313**

ETC Lab ID **9803313-11**  
**Sample ID: N12T031098**

Matrix **:AQUEOUS**  
 Sample Date **:03/10/98**

TEST	RESULT	UNITS	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED	BY	METHOD
Volatile Organics					03/14/98	LS	8260A
Analysis Batch Method 5030	V3031401A	ug/L					
Acrolein	ND	ug/L	50.0				
Acrylonitrile	ND	ug/L	50.0				
Acetone	ND	ug/L	25.0				
Benzene	ND	ug/L	1.00				
Bromobenzene	ND	ug/L	1.00				
Bromochloromethane	ND	ug/L	1.00				
1,1-Dichloromethane	ND	ug/L	1.00				
1,1-Dichloroethane	ND	ug/L	1.00				
1,2-Dichloroethane	ND	ug/L	1.00				
1,3-Dichloroethane	ND	ug/L	1.00				
1,4-Dichloroethane	ND	ug/L	1.00				
1,1-Dichloroethylene	ND	ug/L	1.00				
trans-1,2-Dichloroethylene	ND	ug/L	1.00				
cis-1,2-Dichloroethylene	ND	ug/L	1.00				
trans-1,3-Dichloropropene	ND	ug/L	1.00				
cis-1,3-Dichloropropene	ND	ug/L	1.00				
trans-1,3-Dichloropropene	ND	ug/L	1.00				
Ethylbenzene	ND	ug/L	1.00				

  
 LABORATORY MANAGER

ND - Not Detected

000040

# ENVIRONMENTAL TESTING & CONSULTING, INC.

2924 Walnut Grove Road - Memphis, TN 38111 - (901)327-2750

## ORGANIC ANALYSIS DATA SHEET

Client Name **Ensafte/Allen & Hoshall**  
**Navy Clean Joint Venture**  
**CLEAN Management Program**  
**5724 Summer Tree Drive**  
**Memphis, TN 38134**

Project # **N-12 0136-001**  
 FID #

Site ID **Navy**

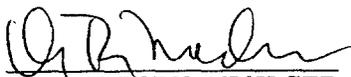
Date Arrived **03/11/98**  
 ETC Order Number **9803313**

ETC Lab ID **9803313-11**  
**Sample ID: N12T031098**

Matrix **:AQUEOUS**  
 Sample Date **:03/10/98**

TEST	RESULT	UNITS	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED	BY	METHOD
Volatile Organics							8260A
					03/14/98	LS	
Fluorotrichloromethane	ND	ug/L	1.00				
Hexachlorobutadiene	ND	ug/L	1.00				
Iodomethane	ND	ug/L	1.00				
Isopropylbenzene	ND	ug/L	1.00				
p-Isopropyltoluene	ND	ug/L	1.00				
Methyl-Butyl-Ketone	ND	ug/L	20.0				
ethyl-Ethyl-Ketone	ND	ug/L	25.0				
ethyl-Isobutyl-Ketone	ND	ug/L	20.0				
ethylene Chloride	ND	ug/L	20.0				
phthalene	ND	ug/L	1.00				
m-Propylbenzene	ND	ug/L	1.00				
Styrene	ND	ug/L	1.00				
1,1,1,2-Tetrachloroethane	ND	ug/L	1.00				
1,1,2,2-Tetrachloroethane	ND	ug/L	1.00				
Tetrachloroethylene	ND	ug/L	1.00				
Toluene	ND	ug/L	5.00				
1,2,3-Trichlorobenzene	ND	ug/L	1.00				
1,2,4-Trichlorobenzene	ND	ug/L	1.00				
1,1,1-Trichloroethane	ND	ug/L	1.00				
1,1,2-Trichloroethane	ND	ug/L	1.00				
Trichloroethylene	ND	ug/L	1.00				
Trichlorofluoromethane	ND	ug/L	1.00				
1,2,3-Trichloropropane	ND	ug/L	1.00				
1,2,4-Trimethylbenzene	ND	ug/L	1.00				
1,3,5-Trimethylbenzene	ND	ug/L	1.00				
Vinyl Acetate	ND	ug/L	1.00				
Vinyl Chloride	ND	ug/L	1.00				
Xylenes (total)	ND	ug/L	1.00				
MTBE	ND	ug/L	5.00				

Surrogate Standard	% Recovery	QC Limits
S1 - Dibromofluoromethane	90	87 107
S2 - Toluene-d8	93	91 108
S3 - 4-Bromofluorobenzene	106	88 107

  
 LABORATORY MANAGER

ND - Not Detected

000041

**Environmental Testing & Consulting, Inc.**

**Quality Control Reports  
Volatiles  
GC Method 8020**

**000042**

ENVIRONMENTAL TESTING AND CONSULTING, INC.  
MEMPHIS, TN  
CASE NARRATIVE  
GC VOLATILE FRACTION - SOIL

Client Name : Ensafe /Allen & Hoshall  
Project Name : Navy  
ETC Order # : 9803-313  
Method (SW-846) : 8020  
5030

**HOLDING TIMES**

Sample Analysis : All samples analyzed within 14 days  
of collection.

**QUALITY CONTROL**

QC Batch Form 4 Summary  
V29BXS8 0312-1BLK

System Monitoring Compounds FORM 2  
Surrogate recoveries within QC limits.

Laboratory Control Sample FORM 3  
0312-1LCS/LCSD

All criteria met.

Matrix Spike / Matrix Spike Dup FORM 3  
9803-314-01

RPD : All analytes within QC limits.\*  
Spike Recovery : All analytes within QC limits.\*

\*

Recoveries and RPDs for multiple analytes in the Matrix Spike  
and Matrix Spike Duplicate associated with this project were flagged  
outside QC Limits.

Refer to Laboratory Control Sample(s) for system verification.

Method Blank FORM 4  
0312-1BLK

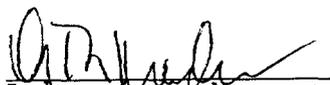
No Target Analytes detected above Practical Quantitation Limit.

**CALIBRATION**

Initial Calibration : All criteria met. FORM 6  
Daily Calibration : All criteria met. FORM 7A

**SAMPLE ANALYSIS**

Instrumentation : HP 5890 Series II GC  
Dilutions Required : No dilutions required.

  
Laboratory Manager

000043



FORM 4  
BTEX-VOC METHOD BLANK SUMMARY

CLIENT SAMPLE NO.

0312-1BLK

Lab Name: ETC, INC.

Contract:

Lab Code:

Case No.:

SAS No.:

SDG No.: 9803-313

Lab File ID: S103121-24R

Lab Sample ID:

Date Analyzed: 03/12/98

Time Analyzed: 2359

GC Column: DB624 ID: 0.32 (mm)

Heated Purge: (Y/N) N

Instrument ID: BTX1

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

	SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	TIME ANALYZED
01	0312-1LCS		S103121-25R	0030
02	0312-1LCSD		S103121-26R	0101
03	9803-314-1		S103121-27R	0131
04	9803-314-1MS		S103121-28R	0202
05	9803-314-1MS		S103121-29R	0233
06	9803-313-3		S103121-36R	0607
07	9803-313-4		S103121-37R	0638
08	9803-313-5		S103121-38R	0709
09	9803-313-6		S103121-39R	0739
10	9803-313-7		S103121-40R	0810
11	9803-313-8		S103121-41R	0841
12	9803-313-9		S103121-42R	0911
13	9803-313-10		S103121-45R	1044
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29				
30				

COMMENTS:

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FORM 3  
SOIL BTEX-VOC MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

ab Name: ETC, INC.

Contract:

Lab Code:

Case No.:

SAS No.:

SDG No.: 9803-313

Matrix Spike - Sample No.: 9803-314-1

Level:(low/med) MED

COMPOUND	SPIKE ADDED (mg/Kg)	SAMPLE CONCENTRATION (mg/Kg)	MS CONCENTRATION (mg/Kg)	MS % REC #	QC. LIMITS REC.
MTBE	4.54	0.000	1.08	24*	46-162
DIPE	4.54	0.000	0.950	21*	46-162
Benzene	4.54	0.000	0.514	11*	46-162
Toluene	4.54	0.000	0.596	13*	47-150
Ethyl Benzene	4.54	0.000	0.932	20*	50-157
m p-Xylene	9.09	0.0642	1.58	17*	48-158
o-Xylene	4.54	0.000	0.879	19*	48-158

COMPOUND	SPIKE ADDED (mg/Kg)	MSD CONCENTRATION (mg/Kg)	MSD % REC #	% RPD #	QC LIMITS RPD	REC.
MTBE	4.81	1.05	22*	9	20	46-162
DIPE	4.81	0.829	17*	21*	20	46-162
Benzene	4.81	0.389	8*	32*	20	46-162
Toluene	4.81	0.446	9*	36*	20	47-150
Ethyl Benzene	4.81	0.683	14*	35*	20	50-157
m p-Xylene	9.62	1.20	12*	34*	20	48-158
o-Xylene	4.81	0.696	14*	30*	20	48-158

# Column to be used to flag recovery and RPD values with an asterisk

\* Values outside of QC limits

RPD: 6 out of 7 outside limits

Spike Recovery: 14 out of 14 outside limits

COMMENTS:

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ENVIRONMENTAL TESTING AND CONSULTING, INC.  
MEMPHIS, TN  
CASE NARRATIVE  
GC VOLATILE FRACTION - SOIL

Client Name : Ensafe /Allen & Hoshall  
Project Name : Navy  
ETC Order # : 9803-313  
Method (SW-846) : TN GRO  
5030

**HOLDING TIMES**

Sample Analysis : All samples analyzed within 14 days  
of collection.

**QUALITY CONTROL**

QC Batch Form 4 Summary  
V29BXS8 0312-1BLK

System Monitoring Compounds FORM 2  
Surrogate recoveries within QC limits.

Laboratory Control Sample FORM 3  
0312-1LCS/LCSD

All criteria met.

Matrix Spike / Matrix Spike Dup FORM 3  
9803-314-01 RPD : All analytes within QC limits.\*  
Spike Recovery : All analytes within QC limits.\*

\*  
RPD was flagged as outside QC Limits due to low recovery in the  
Matrix Spike Duplicate. MS recovery was within QC Limits.

Refer to Laboratory Control Sample(s) for system verification.

Method Blank FORM 4  
0312-1BLK

No Target Analytes detected above Practical Quantitation Limit.

**CALIBRATION**

Initial Calibration : All criteria met. FORM 6  
Daily Calibration : All criteria met. FORM 7A

**SAMPLE ANALYSIS**

Instrumentation : HP 5890 Series II GC  
Dilutions Required : No dilutions required.

  
Laboratory Manager

000049



FORM 4  
GRO-VOC METHOD BLANK SUMMARY

CLIENT SAMPLE NO.

0312-1BLK

Lab Name: ETC, INC. Contract:   
 Lab Code: Case No.: SAS No.: SDG No.: 9803-313   
 Lab File ID: S103121B-24R Lab Sample ID:   
 Date Analyzed: 03/12/98 Time Analyzed: 2359   
 GC Column: DB 624 ID: 0.53 (mm) Heated Purge: (Y/N) N   
 Instrument ID: GRO1

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

	SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	TIME ANALYZED
01	0312-1LCS		S103121B-25R	0030
02	0312-1LCSD		S103121B-26R	0101
03	9803-314-1		S103121B-27R	0131
04	9803-314-1MS		S103121B-28R	0202
05	9803-314-1MS		S103121B-29R	0233
06	9803-313-3		S103121B-36R	0607
07	9803-313-4		S103121B-37R	0638
08	9803-313-5		S103121B-38R	0709
09	9803-313-6		S103121B-39R	0739
10	9803-313-7		S103121B-40R	0810
11	9803-313-8		S103121B-41R	0841
12	9803-313-9		S103121B-42R	0911
13	9803-313-10		S103121B-45R	1044
14				
15				
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COMMENTS:

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FORM 1  
GRO-VOC ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

0312-1BLK
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ab Name: ETC, INC.	Contract:	
Lab Code:	Case No.:	SAS No.:
		SDG No.: 9803-313
Matrix: (soil/water) SOIL		Lab Sample ID:
Sample wt/vol: _____ (g/mL) G		Lab File ID: S103121B-24R
Level: (low/med) MED		Date Received: _____
% Moisture: not dec. _____		Date Analyzed: 03/12/98
GC Column: DB 624 ID: 0.53 (mm)		Dilution Factor: 1.0
Soil Extract Volume: _____ (uL)		Soil Aliquot Volume: _____ (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) MG/KG	Q
-----Total GRO		5.00	U



FORM 3  
SOIL GRO-VOC MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

ab Name: ETC, INC.

Contract:

Lab Code:

Case No.:

SAS No.:

SDG No.: 9803-313

Matrix Spike - Sample No.: 9803-314-1

Level:(low/med) MED

COMPOUND	SPIKE ADDED (mg/Kg)	SAMPLE CONCENTRATION (mg/Kg)	MS CONCENTRATION (mg/Kg)	MS % REC #	QC. LIMITS REC.
Total GRO	45.4	0.000	24.7	54	50-150

COMPOUND	SPIKE ADDED (mg/Kg)	MSD CONCENTRATION (mg/Kg)	MSD % REC #	% RPD #	QC LIMITS RPD	REC.
Total GRO	48.1	15.4	32*	51*	20	50-150

# Column to be used to flag recovery and RPD values with an asterisk

\* Values outside of QC limits

RPD: 1 out of 1 outside limits

Spike Recovery: 1 out of 2 outside limits

COMMENTS:

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ENVIRONMENTAL TESTING AND CONSULTING, INC.  
MEMPHIS, TN  
CASE NARRATIVE  
GC VOLATILE FRACTION - WATER

Client Name : Ensafe /Allen & Hoshall  
Project Name : Navy  
ETC Order # : 9803-313  
Method (SW-846) : 8020  
5030

**HOLDING TIMES**

Sample Analysis : All samples analyzed within 14 days  
of collection.

**QUALITY CONTROL**

QC Batch Form 4 Summary  
S103121A 0311W-BLK

System Monitoring Compounds FORM 2  
Surrogate recoveries within QC limits.

Laboratory Control Sample FORM 3  
0311W-LCS/LCSD

All criteria met.

Matrix Spike / Matrix Spike Dup FORM 3  
9803-316-04 RPD : All analytes within QC limits.\*  
Spike Recovery : All analytes within QC limits.\*

\*  
RPDs for multiple analytes were flagged as outside QC Limits due  
to low recovery in the Matrix Spike. MSD recoveries were within QC  
Limits.

Refer to Laboratory Control Sample(s) for system verification.

Method Blank FORM 4  
0311W-BLK

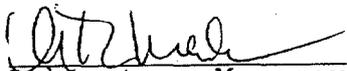
No Target Analytes detected above Practical Quantitation Limit.

**CALIBRATION**

Initial Calibration : All criteria met. FORM 6  
Daily Calibration : All criteria met. FORM 7A

**SAMPLE ANALYSIS**

Instrumentation : HP 5890 Series II GC  
Dilutions Required : No dilutions required.

  
Laboratory Manager

000055

FORM 2  
WATER BTEX-VOC SYSTEM MONITORING COMPOUND RECOVERY

ab Name: ETC, INC.

Contract:

Lab Code:

Case No.:

SAS No.:

SDG No.: 9803-313

	CLIENT SAMPLE NO.	SMC1 #	SMC2 #	SMC3 #	OTHER	TOT OUT
01	0311W-BLK	82				0
02	0311W-LCS	89				0
03	9803-316-4MS	86				0
04	9803-316-4MS	88				0
05	9803-313-1	83				0
06	9803-313-2	86				0
07	0311W-LCSD	89				0
08	9803-316-4	80				0
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QC LIMITS

SMC1 = Bromofluorobenzene-Sur (50-150)

# Column to be used to flag recovery values

\* Values outside of contract required QC limits

D System Monitoring Compound diluted out

FORM 4  
BTEX-VOC METHOD BLANK SUMMARY

CLIENT SAMPLE NO.

0311W-BLK

Lab Name: ETC, INC.

Contract:

Lab Code:

Case No.:

SAS No.:

SDG No.: 9803-313

Lab File ID: S203111BLK-14R

Lab Sample ID:

Date Analyzed: 03/11/98

Time Analyzed: 2213

GC Column: DB624 ID: 0.32 (mm)

Heated Purge: (Y/N) N

Instrument ID: BTX2

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

	SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	TIME ANALYZED
01	0311W-LCS		S203111LCS-1	2245
02	9803-316-4MS		S203111-17R	2348
03	9803-316-4MS		S203111-18R	0020
04	9803-313-1		S203111-19R	0052
05	9803-313-2		S203111-20R	0124
06	0311W-LCSD		S203111LCSD-	0227
07	9803-316-4		S203111-16R	2317
08				
09				
10				
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COMMENTS:

FORM 1  
BTEX-VOC ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

0311W-BLK

Lab Name: ETC, INC. Contract: \_\_\_\_\_  
 Lab Code: \_\_\_\_\_ Case No.: \_\_\_\_\_ SAS No.: \_\_\_\_\_ SDG No.: 9803-313  
 Matrix: (soil/water) WATER Lab Sample ID: \_\_\_\_\_  
 Sample wt/vol: 5.000 (g/mL) ML Lab File ID: S203111BLK-14R  
 Level: (low/med) LOW Date Received: \_\_\_\_\_  
 % Moisture: not dec. \_\_\_\_\_ Date Analyzed: 03/11/98  
 GC Column: DB624 ID: 0.32 (mm) Dilution Factor: 1.0  
 Soil Extract Volume: \_\_\_\_\_ (uL) Soil Aliquot Volume: \_\_\_\_\_ (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) MG/L	Q
1643-04-4	MTBE	0.00500	U
71-43-2	Benzene	0.00100	U
108-88-3	Toluene	0.00200	U
100-41-4	Ethyl Benzene	0.00100	U
1330-20-7	m p-Xylene	0.00100	U
95-47-6	o-Xylene	0.00100	U

FORM I BTEX-VOC

000058



FORM 3  
WATER BTEX-VOC MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: ETC, INC.

Contract:

Lab Code:

Case No.:

SAS No.:

SDG No.: 9803-313

Matrix Spike - Sample No.: 9803-316-4

COMPOUND	SPIKE ADDED (mg/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (mg/L)	MS % REC #	QC. LIMITS REC.
MTBE	0.0500		0.00771	15*	46-162
Benzene	0.100		0.0171	17*	46-162
Toluene	0.100		0.0159	16*	47-150
Ethyl Benzene	0.100		0.0144	14*	50-157
m p-Xylene	0.200		0.0281	14*	48-158
o-Xylene	0.100		0.0136	14*	48-158

COMPOUND	SPIKE ADDED (mg/L)	MSD CONCENTRATION (mg/L)	MSD % REC #	% RPD #	QC LIMITS RPD	REC.
MTBE	0.0500	0.0477	95	145*	20	46-162
Benzene	0.100	0.105	105	144*	20	46-162
Toluene	0.100	0.0944	94	142*	20	47-150
Ethyl Benzene	0.100	0.0914	91	147*	20	50-157
m p-Xylene	0.200	0.180	90	146*	20	48-158
o-Xylene	0.100	0.0929	93	148*	20	48-158

# Column to be used to flag recovery and RPD values with an asterisk

\* Values outside of QC limits

RPD: 6 out of 6 outside limits

Spike Recovery: 6 out of 12 outside limits

COMMENTS:

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ENVIRONMENTAL TESTING AND CONSULTING, INC.  
MEMPHIS, TN  
CASE NARRATIVE  
GC VOLATILE FRACTION - WATER

Client Name : Ensafe /Allen & Hoshall  
Project Name : Navy  
ETC Order # : 9803-313  
Method (SW-846) : TN GRO  
5030

**HOLDING TIMES**

Sample Analysis : All samples analyzed within 14 days  
of collection.

**QUALITY CONTROL**

QC Batch Form 4 Summary  
S103121A 0311W-BLK

System Monitoring Compounds FORM 2  
Surrogate recoveries within QC limits.

Laboratory Control Sample FORM 3  
0311W-LCS/LCSD

All criteria met.

Matrix Spike / Matrix Spike Dup FORM 3  
9803-316-04 RPD : All analytes within QC limits.\*  
Spike Recovery : All analytes within QC limits.\*

\*  
RPD was flagged as outside QC Limits due to low recovery in the  
Matrix Spike. MSD recovery was within QC Limits.

Refer to Laboratory Control Sample(s) for system verification.

Method Blank FORM 4  
0311W-BLK

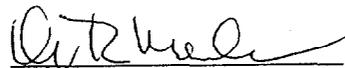
No Target Analytes detected above Practical Quantitation Limit.

**CALIBRATION**

Initial Calibration : All criteria met. FORM 6  
Daily Calibration : All criteria met. FORM 7A

**SAMPLE ANALYSIS**

Instrumentation : HP 5890 Series II GC  
Dilutions Required : No dilutions required.

  
Laboratory Manager

000061

FORM 2  
WATER TPH-VOA SYSTEM MONITORING COMPOUND RECOVERY

ab Name: ETC, INC.

Contract:

Lab Code:

Case No.:

SAS No.:

SDG No.: 9803-313

	CLIENT SAMPLE NO.	SMC1 #	SMC2 #	SMC3 #	OTHER	TOT OUT
01	0311W-BLK	75				0
02	0311W-LCS	83				0
03	9803-316-4	80				0
04	9803-316-4MS	82				0
05	9803-316-4MS	81				0
06	9803-313-1	77				0
07	9803-313-2	80				0
08	0311W-LCSD	81				0
09						
10						
11						
12						
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QC LIMITS

SMC1 = Bromofluorobenzene Sur (50-150)

# Column to be used to flag recovery values

\* Values outside of contract required QC limits

D System Monitoring Compound diluted out

FORM 4  
TPH-VOA METHOD BLANK SUMMARY

CLIENT SAMPLE NO.

0311W-BLK

Lab Name: ETC, INC.

Contract:

Lab Code:

Case No.:

SAS No.:

SDG No.: 9803-313

Lab File ID: S203111BBLK-14R

Lab Sample ID:

Date Analyzed: 03/11/98

Time Analyzed: 2213

GC Column: DB 624 ID: 0.53 (mm)

Heated Purge: (Y/N) N

Instrument ID: GRO2

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

	SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	TIME ANALYZED
01	0311W-LCS		S203111BLCS-	2245
02	9803-316-4		S203111B-16R	2317
03	9803-316-4MS		S203111B-17R	2348
04	9803-316-4MS		S203111B-18R	0020
05	9803-313-1		S203111B-19R	0052
06	9803-313-2		S203111B-20R	0124
07	0311W-LCSD		S203111BLCSD	0227
08				
09				
10				
11				
12				
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COMMENTS:

FORM 1  
 TPH-VOA ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

0311W-BLK
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Lab Name: ETC, INC. Contract: \_\_\_\_\_

Lab Code: \_\_\_\_\_ Case No.: \_\_\_\_\_ SAS No.: \_\_\_\_\_ SDG No.: 9803-313

Matrix: (soil/water) WATER Lab Sample ID: \_\_\_\_\_

Sample wt/vol: \_\_\_\_\_ (g/mL) ML Lab File ID: S203111BBLK-14R

Level: (low/med) LOW Date Received: \_\_\_\_\_

% Moisture: not dec. \_\_\_\_\_ Date Analyzed: 03/11/98

GC Column: DB 624 ID: 0.53 (mm) Dilution Factor: 1.0

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

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) MG/L	Q
	-----Total GRO	0.100	U

FORM 3  
WATER TPH-VOA LAB CONTROL SAMPLE

Lab Name: ETC, INC.

Contract:

Lab Code:

Case No.:

SAS No.:

SDG No.: 9803-313

Matrix Spike - Sample No.: 0311W-LCS

COMPOUND	SPIKE ADDED (mg/L)	SAMPLE CONCENTRATION (ug/L)	LCS CONCENTRATION (mg/L)	LCS % REC #	QC. LIMITS REC.
Total GRO	1.10		1.04	94	50-150

COMPOUND	SPIKE ADDED (mg/L)	LCSD CONCENTRATION (mg/L)	LCSD % REC #	% RPD #	QC LIMITS RPD	REC.
Total GRO	1.10	1.06	96	2	20	50-150

# Column to be used to flag recovery and RPD values with an asterisk

\* Values outside of QC limits

RPD: 0 out of 1 outside limits

Spike Recovery: 0 out of 2 outside limits

COMMENTS:

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FORM 3  
WATER TPH-VOA MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

ab Name: ETC, INC.

Contract:

Lab Code:

Case No.:

SAS No.:

SDG No.: 9803-313

Matrix Spike - Sample No.: 9803-316-4

COMPOUND	SPIKE ADDED (mg/L)	SAMPLE CONCENTRATION (mg/L)	MS CONCENTRATION (mg/L)	MS % REC #	QC. LIMITS REC.
Total GRO	1.10	0.000	0.146	13*	50-150

COMPOUND	SPIKE ADDED (mg/L)	MSD CONCENTRATION (mg/L)	MSD % REC #	% RPD #	QC LIMITS RPD	REC.
Total GRO	1.10	0.996	90	150*	20	50-150

# Column to be used to flag recovery and RPD values with an asterisk

\* Values outside of QC limits

RPD: 1 out of 1 outside limits

Spike Recovery: 1 out of 2 outside limits

COMMENTS: \_\_\_\_\_

**Environmental Testing & Consulting, Inc.**

**Quality Control Reports  
Volatiles  
GC/MS Method 8260A**

000067

ENVIRONMENTAL TESTING AND CONSULTING, INC.  
MEMPHIS, TN  
CASE NARRATIVE  
GC/MS VOLATILE COMPOUNDS - SOIL

Client Name : Ensafe /Allen & Hoshall  
Project Name : Navy  
ETC Order # : 9803-313  
Method (SW-846) : 8260A

**HOLDING TIMES**

Sample Analysis : All samples analyzed within 14 days of collection.

**QUALITY CONTROL**

QC Batch Form 4 Summary  
V3031401S 0314-V3BLK1  
V3031501S 0315-V3BLK1

System Monitoring Compounds FORM 2  
Surrogate recoveries within QC limits.\*

\*  
Surrogate recoveries were flagged as outside QC Limits in samples 9803-313-08(N12SSB0916) and 9803-313-10(N12SSB0698). These samples were re-analyzed for verification with recoveries within QC Limits.

Laboratory Control Sample FORM 3  
0314-V3LCS  
0315-V3LCS

All criteria met.

Matrix Spike / Matrix Spike Dup FORM 3  
9803-313-09 RPD : All analytes within QC limits.  
N12SSSB0798 Spike Recovery : All analytes within QC limits.\*

\*  
Recovery for Benzene was flagged outside QC Limits in the Matrix Spike. MSD recovery was within QC Limits.

Refer to Laboratory Control Sample(s) for system verification.

Matrix Spike / Matrix Spike Dup FORM 3  
9803-313-08 RPD : All analytes within QC limits.  
N12SSSB0916 Spike Recovery : All analytes within QC limits.\*

\*  
Recovery for Benzene was flagged outside QC Limits in the Matrix Spike and Matrix Spike Duplicate.

Recoveries for Trichloroethene and Chlorobenzene were flagged outside QC Limits in the Matrix Spike Duplicate. MS recoveries were within QC Limits.

Refer to Laboratory Control Sample(s) for system verification.

Method Blank FORM 4  
0314-V3BLK1  
0315-V3BLK1

Methylene Chloride identified in 0314-V3BLK1 at 20.9 ug/Kg.  
Methylene Chloride identified in 0315-V3BLK1 at 0.293J ug/Kg.

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ENVIRONMENTAL TESTING AND CONSULTING, INC.  
MEMPHIS, TN  
CASE NARRATIVE  
GC/MS VOLATILE COMPOUNDS - SOIL

Client Name : \_Ensafe /Allen & Hoshall  
Project Name : \_Navy  
ETC Order # : \_9803-313  
Method (SW-846) : \_8260A

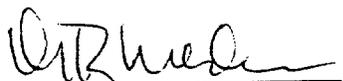
**CALIBRATION**

BFB Daily 12 Hour Tune : All criteria met. FORM 5  
Initial Calibration : All criteria met. FORM 6  
Daily Calibration : All criteria met. FORM 7A

Volatile Internal Standard Area and RT FORM 8  
Daily Check Standard(s) Internal Standard Areas and Retention Times  
within QC limits.

**SAMPLE ANALYSIS**

Instrumentation : HP 5890 Series II GC, 5971MSD  
Dilutions Required : No dilutions required.

  
Laboratory Manager

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FORM 2  
SOIL VOA-GCMS SYSTEM MONITORING COMPOUND RECOVERY

ab Name: ETC, INC. Contract:  
 Lab Code: Case No.: SAS No.: SDG No.: 9803-313  
 Level: (low/med) LOW

	CLIENT SAMPLE NO.	SMC1 (DBF) #	SMC2 (TOL) #	SMC3 (BFB) #	OTHER	TOT OUT
01	0314-V3LCS	91	96	100		0
02	0314-V3BLK1	96	92	105		0
03	9803-313-3	91	96	105		0
04	9803-313-8	87	84*	107		1
05	9803-313-9	87	95	108		0
06	9803-313-10	89	96	112*		1
07	9803-313-10	91	96	107		0
08	9803-313-9MS	94	95	110		0
09	9803-313-9MS	94	94	104		0
10	0315-V3LCS	91	94	102		0
11	0315-V3BLK1	94	95	106		0
12	9803-313-8	87	93	107		0
13	9803-313-8MS	92	93	104		0
14	9803-313-8MS	92	96	102		0
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QC LIMITS

SMC1 (DBF) = Dibromofluoromethane (85-119)  
 SMC2 (TOL) = Toluene-d8 (87-114)  
 SMC3 (BFB) = Bromofluorobenzene (75-111)

# Column to be used to flag recovery values  
 \* Values outside of contract required QC limits  
 D System Monitoring Compound diluted out



FORM 1  
VOA-GCMS ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

0314-V3BLK1

Lab Name: ETC, INC. Contract: \_\_\_\_\_  
 Lab Code: Case No.: SAS No.: SDG No.: 9803-313  
 Matrix: (soil/water) SOIL Lab Sample ID: \_\_\_\_\_  
 Sample wt/vol: 10.0 (g/mL) G Lab File ID: 0501004  
 Level: (low/med) LOW Date Received: \_\_\_\_\_  
 % Moisture: not dec. \_\_\_\_\_ Date Analyzed: 03/14/98  
 GC Column: ID: 2.00 (mm) Dilution Factor: 1.0  
 Soil Extract Volume: \_\_\_\_\_ (uL) Soil Aliquot Volume: \_\_\_\_\_ (uL)

CONCENTRATION UNITS:  
(ug/L or ug/Kg) UG/KG

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
67-64-1	Dichlorodifluoromethane	2.00	U
74-87-3	Chloromethane	2.00	U
75-01-4	Vinyl Chloride	2.00	U
74-83-9	Bromomethane	2.00	U
75-00-3	Chloroethane	2.00	U
75-69-4	Trichlorofluoromethane	2.00	U
110-00-9	Furan	2.00	U
107-02-8	Acrolein	50.0	U
67-64-1	Acetone	50.0	U
76-13-1	1,1,2-trichloro-1,2,2-triflu	2.00	U
75-35-4	1,1-Dichloroethene	2.00	U
75-05-8	Acetonitrile	50.0	U
74-88-4	Iodomethane	2.00	U
75-15-0	Carbon Disulfide	2.00	U
75-09-2	Methylene Chloride	20.9	
107-13-1	Acrylonitrile	50.0	U
1634-04-4	Methyl-tertbutyl-Ether	2.00	U
156-60-5	trans-1,2-Dichloroethene	2.00	U
110-54-3	Hexane	2.00	U
108-05-4	Vinyl Acetate	50.0	U
108-20-3	dipe	2.00	U
75-34-3	1,1-Dichloroethane	2.00	U
78-93-3	Methyl-Ethyl Ketone	50.0	U
109-99-9	Tetrahydrofuran	2.00	U
590-20-7	2,2-Dichloropropane	2.00	U
156-59-4	cis-1,2-Dichloroethene	2.00	U
141-78-6	Ethyl Acetate	50.0	U
67-66-3	Chloroform	2.00	U
74-97-5	Bromochloromethane	2.00	U
71-55-6	1,1,1-Trichloroethane	2.00	U
563-58-6	1,1-Dichloropropene	2.00	U
56-23-5	Carbon Tetrachloride	2.00	U
71-43-2	Benzene	2.00	U

FORM 1  
VOA-GCMS ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

0314-V3BLK1

Lab Name: ETC, INC. Contract: \_\_\_\_\_  
 Lab Code: Case No.: SAS No.: SDG No.: 9803-313  
 Matrix: (soil/water) SOIL Lab Sample ID: \_\_\_\_\_  
 Sample wt/vol: 10.0 (g/mL) G Lab File ID: 0501004  
 Level: (low/med) LOW Date Received: \_\_\_\_\_  
 % Moisture: not dec. \_\_\_\_\_ Date Analyzed: 03/14/98  
 GC Column: ID: 2.00 (mm) Dilution Factor: 1.0  
 Soil Extract Volume: \_\_\_\_\_ (uL) Soil Aliquot Volume: \_\_\_\_\_ (uL)

CONCENTRATION UNITS:  
(ug/L or ug/Kg) UG/KG

CAS NO.	COMPOUND	UG/KG	Q
107-06-2	1,2-Dichloroethane	2.00	U
79-01-6	Trichloroethene	2.00	U
78-87-5	1,2-Dichloropropane	2.00	U
75-27-4	Bromodichloromethane	2.00	U
74-95-3	Dibromomethane	2.00	U
108-10-1	4-Methyl-2-Pentanone	50.0	U
10061-01-5	cis-1,3-Dichloropropene	2.00	U
108-88-3	Toluene	2.00	U
109-60-4	n-Propyl Acetate	2.00	U
10061-02-6	trans-1,3-Dichloropropene	2.00	U
79-00-5	1,1,2-Trichloroethane	2.00	U
591-78-6	2-Hexanone	50.0	U
142-28-9	1,3-Dichloropropane	2.00	U
110-75-0	2-Chloroethylvinyl Ether	2.00	U
127-18-4	Tetrachloroethene	2.00	U
124-48-1	Chlorodibromomethane	2.00	U
106-93-4	1,2-Dibromoethane	2.00	U
108-90-7	Chlorobenzene	2.00	U
630-20-6	1,1,1,2-Tetrachloroethane	2.00	U
1330-20-7	Xylene-mp	2.00	U
100-41-4	Ethylbenzene	2.00	U
95-47-6	Xylene-o	2.00	U
100-42-5	Styrene	2.00	U
75-25-2	Bromoform	2.00	U
98-82-8	Isopropylbenzene	2.00	U
79-34-5	1,1,2,2-Tetrachloroethane	2.00	U
96-18-4	1,2,3-Trichloropropane	2.00	U
108-86-1	Bromobenzene	2.00	U
103-65-1	n-Propylbenzene	2.00	U
110-57-6	trans-1,4-Dichloro-2-butene	2.00	U
95-49-8	2-Chlorotoluene	2.00	U
108-67-8	1,3,5-Trimethylbenzene	2.00	U
106-43-4	4-Chlorotoluene	2.00	U

FORM 1  
VOA-GCMS ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

0314-V3BLK1

Lab Name: ETC, INC. Contract: \_\_\_\_\_  
 Lab Code: Case No.: SAS No.: SDG No.: 9803-313  
 Matrix: (soil/water) SOIL Lab Sample ID: \_\_\_\_\_  
 Sample wt/vol: 10.0 (g/mL) G Lab File ID: 0501004  
 Level: (low/med) LOW Date Received: \_\_\_\_\_  
 % Moisture: not dec. \_\_\_\_\_ Date Analyzed: 03/14/98  
 GC Column: ID: 2.00 (mm) Dilution Factor: 1.0  
 Soil Extract Volume: \_\_\_\_\_ (uL) Soil Aliquot Volume: \_\_\_\_\_ (uL)

CAS NO. COMPOUND CONCENTRATION UNITS:  
(ug/L or ug/Kg) UG/KG Q

95-63-6-----	1,2,4-Trimethylbenzene	2.00	U
135-98-8-----	sec-Butylbenzene	2.00	U
98-06-6-----	tert-Butylbenzene	2.00	U
99-87-6-----	4-Isopropyltoluene	2.00	U
111-44-4-----	dcee	2.00	U
541-73-1-----	1,3-Dichlorobenzene	2.00	U
106-46-7-----	1,4-Dichlorobenzene	2.00	U
104-51-8-----	n-Butylbenzene	2.00	U
95-50-1-----	1,2-Dichlorobenzene	2.00	U
96-12-8-----	1,2-Dibromo-3-chloropropane	2.00	U
120-82-1-----	1,2,4-Trichlorobenzene	2.00	U
87-63-3-----	Hexachlorobutadiene	2.00	U
91-20-3-----	Naphthalene	2.00	U
87-61-6-----	1,2,3-Trichlorobenzene	2.00	U
97-63-2-----	Ethyl methacrylate	2.00	U
80-62-6-----	Methyl methacrylate	50.0	U
78-83-1-----	Isobutyl Alcohol	2.00	U

FORM I VOA-GCMS

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FORM 3  
SOIL VOA-GCMS LAB CONTROL SAMPLE

Lab Name: ETC, INC.

Contract:

Lab Code:

Case No.:

SAS No.:

SDG No.: 9803-313

Matrix Spike - Sample No.: 0314-V3LCS

Level: (low/med) LOW

COMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	LCS CONCENTRATION (ug/Kg)	LCS % REC #	QC. LIMITS REC.
Chloromethane	20.0		12.2	61	0-273
Vinyl Chloride	20.0		15.9	80	0-251
Bromomethane	20.0		24.8	124	0-242
Chloroethane	20.0		20.7	104	14-230
Trichlorofluoromethane	20.0		20.4	102	17-181
1,1-Dichloroethene	20.0		18.7	94	0-234
Methylene Chloride	20.0		30.4	152	0-221
trans-1,2-Dichloroethen	20.0		20.3	102	54-156
1,1-Dichloroethane	20.0		18.6	93	59-155
Chloroform	20.0		19.8	99	51-138
1,1,1-Trichloroethane	20.0		20.7	104	52-162
Carbon Tetrachloride	20.0		21.0	105	70-140
Benzene	20.0		20.2	101	37-151
1,2-Dichloroethane	20.0		19.3	96	49-155
Trichloroethene	20.0		21.9	110	71-157
1,2-Dichloropropane	20.0		19.2	96	0-210
Bromodichloromethane	20.0		19.5	98	35-155
cis-1,3-Dichloropropene	20.0		20.5	102	0-227
Toluene	20.0		20.1	100	47-150
trans-1,3-Dichloroprope	20.0		20.5	102	17-183
1,1,2-Trichloroethane	20.0		18.6	93	52-150
Tetrachloroethene	20.0		19.8	99	64-148
Chlorodibromomethane	20.0		18.2	91	53-149
Chlorobenzene	20.0		21.6	108	37-160
Ethylbenzene	20.0		23.7	118	37-162
Bromoform	20.0		17.9	90	45-169
1,1,2,2-Tetrachloroetha	20.0		20.2	101	46-157
1,3-Dichlorobenzene	20.0		23.3	116	59-156

# Column to be used to flag recovery and RPD values with an asterisk

\* Values outside of QC limits

COMMENTS:

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FORM 1  
VOA-GCMS ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

0315-V3BLK1

Lab Name: ETC, INC. Contract: \_\_\_\_\_  
 Lab Code: Case No.: SAS No.: SDG No.: 9803-313  
 Matrix: (soil/water) SOIL Lab Sample ID: \_\_\_\_\_  
 Sample wt/vol: 10.0 (g/mL) G Lab File ID: 0501004  
 Level: (low/med) LOW Date Received: \_\_\_\_\_  
 % Moisture: not dec. \_\_\_\_\_ Date Analyzed: 03/15/98  
 GC Column: ID: 2.00 (mm) Dilution Factor: 1.0  
 Soil Extract Volume: \_\_\_\_\_ (uL) Soil Aliquot Volume: \_\_\_\_\_ (uL)

CONCENTRATION UNITS:  
(ug/L or ug/Kg) UG/KG

CAS NO. COMPOUND (ug/L or ug/Kg) UG/KG Q

67-64-1	Dichlorodifluoromethane	2.00	U
74-87-3	Chloromethane	2.00	U
75-01-4	Vinyl Chloride	2.00	U
74-83-9	Bromomethane	2.00	U
75-00-3	Chloroethane	2.00	U
75-69-4	Trichlorofluoromethane	2.00	U
110-00-9	Furan	2.00	U
107-02-8	Acrolein	50.0	U
67-64-1	Acetone	50.0	U
76-13-1	1,1,2-trichloro-1,2,2-triflu	2.00	U
75-35-4	1,1-Dichloroethene	2.00	U
75-05-8	Acetonitrile	50.0	U
74-88-4	Iodomethane	2.00	U
75-15-0	Carbon Disulfide	2.00	U
75-09-2	Methylene Chloride	0.293	J
107-13-1	Acrylonitrile	50.0	U
1634-04-4	Methyl-tertbutyl-Ether	2.00	U
156-60-5	trans-1,2-Dichloroethene	2.00	U
110-54-3	Hexane	2.00	U
108-05-4	Vinyl Acetate	50.0	U
108-20-3	dipe	2.00	U
75-34-3	1,1-Dichloroethane	2.00	U
78-93-3	Methyl-Ethyl Ketone	50.0	U
109-99-9	Tetrahydrofuran	2.00	U
590-20-7	2,2-Dichloropropane	2.00	U
156-59-4	cis-1,2-Dichloroethene	2.00	U
141-78-6	Ethyl Acetate	50.0	U
67-66-3	Chloroform	2.00	U
74-97-5	Bromochloromethane	2.00	U
71-55-6	1,1,1-Trichloroethane	2.00	U
563-58-6	1,1-Dichloropropene	2.00	U
56-23-5	Carbon Tetrachloride	2.00	U
71-43-2	Benzene	2.00	U

FORM I VOA-GCMS

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FORM 1  
VOA-GCMS ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

0315-V3BLK1

Lab Name: ETC, INC. Contract: \_\_\_\_\_  
 Lab Code: \_\_\_\_\_ Case No.: \_\_\_\_\_ SAS No.: \_\_\_\_\_ SDG No.: 9803-313  
 Matrix: (soil/water) SOIL Lab Sample ID: \_\_\_\_\_  
 Sample wt/vol: 10.0 (g/mL) G Lab File ID: 0501004  
 Level: (low/med) LOW Date Received: \_\_\_\_\_  
 % Moisture: not dec. \_\_\_\_\_ Date Analyzed: 03/15/98  
 GC Column: ID: 2.00 (mm) Dilution Factor: 1.0  
 Soil Extract Volume: \_\_\_\_\_ (uL) Soil Aliquot Volume: \_\_\_\_\_ (uL)

CONCENTRATION UNITS:  
(ug/L or ug/Kg) UG/KG

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
107-06-2	1,2-Dichloroethane	2.00	U
79-01-6	Trichloroethene	2.00	U
78-87-5	1,2-Dichloropropane	2.00	U
75-27-4	Bromodichloromethane	2.00	U
74-95-3	Dibromomethane	2.00	U
108-10-1	4-Methyl-2-Pentanone	50.0	U
10061-01-5	cis-1,3-Dichloropropene	2.00	U
108-88-3	Toluene	2.00	U
109-60-4	n-Propyl Acetate	2.00	U
10061-02-6	trans-1,3-Dichloropropene	2.00	U
79-00-5	1,1,2-Trichloroethane	2.00	U
591-78-6	2-Hexanone	50.0	U
142-28-9	1,3-Dichloropropane	2.00	U
110-75-0	2-Chloroethyl vinyl Ether	2.00	U
127-18-4	Tetrachloroethene	2.00	U
124-48-1	Chlorodibromomethane	2.00	U
106-93-4	1,2-Dibromoethane	2.00	U
108-90-7	Chlorobenzene	2.00	U
630-20-6	1,1,1,2-Tetrachloroethane	2.00	U
1330-20-7	Xylene-mp	2.00	U
100-41-4	Ethylbenzene	2.00	U
95-47-6	Xylene-o	2.00	U
100-42-5	Styrene	2.00	U
75-25-2	Bromoform	2.00	U
98-82-8	Isopropylbenzene	2.00	U
79-34-5	1,1,2,2-Tetrachloroethane	2.00	U
96-18-4	1,2,3-Trichloropropane	2.00	U
108-86-1	Bromobenzene	2.00	U
103-65-1	n-Propylbenzene	2.00	U
110-57-6	trans-1,4-Dichloro-2-butene	2.00	U
95-49-8	2-Chlorotoluene	2.00	U
108-67-8	1,3,5-Trimethylbenzene	2.00	U
106-43-4	4-Chlorotoluene	2.00	U

FORM 1  
VOA-GCMS ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

0315-V3BLK1

ab Name: ETC, INC. Contract: \_\_\_\_\_  
 Lab Code: \_\_\_\_\_ Case No.: \_\_\_\_\_ SAS No.: \_\_\_\_\_ SDG No.: 9803-313  
 Matrix: (soil/water) SOIL Lab Sample ID: \_\_\_\_\_  
 Sample wt/vol: 10.0 (g/mL) G Lab File ID: 0501004  
 Level: (low/med) LOW Date Received: \_\_\_\_\_  
 % Moisture: not dec. \_\_\_\_\_ Date Analyzed: 03/15/98  
 GC Column: ID: 2.00 (mm) Dilution Factor: 1.0  
 Soil Extract Volume: \_\_\_\_\_ (uL) Soil Aliquot Volume: \_\_\_\_\_ (uL)

CAS NO. COMPOUND CONCENTRATION UNITS:  
(ug/L or ug/Kg) UG/KG Q

95-63-6-----	1,2,4-Trimethylbenzene	2.00	U
135-98-8-----	sec-Butylbenzene	2.00	U
98-06-6-----	tert-Butylbenzene	2.00	U
99-87-6-----	4-Isopropyltoluene	2.00	U
111-44-4-----	dcee	2.00	U
541-73-1-----	1,3-Dichlorobenzene	2.00	U
106-46-7-----	1,4-Dichlorobenzene	2.00	U
104-51-8-----	n-Butylbenzene	2.00	U
95-50-1-----	1,2-Dichlorobenzene	2.00	U
96-12-8-----	1,2-Dibromo-3-chloropropane	2.00	U
120-82-1-----	1,2,4-Trichlorobenzene	2.00	U
87-63-3-----	Hexachlorobutadiene	2.00	U
91-20-3-----	Naphthalene	2.00	U
87-61-6-----	1,2,3-Trichlorobenzene	2.00	U
97-63-2-----	Ethyl methacrylate	2.00	U
80-62-6-----	Methyl methacrylate	50.0	U
78-83-1-----	Isobutyl Alcohol	2.00	U

FORM 3  
SOIL VOA-GCMS LAB CONTROL SAMPLE

Lab Name: ETC, INC.

Contract:

Lab Code:

Case No.:

SAS No.:

SDG No.: 9803-313

Matrix Spike - Sample No.: 0315-V3LCS

Level: (low/med) LOW

COMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	LCS CONCENTRATION (ug/Kg)	LCS % REC #	QC. LIMITS REC.
Chloromethane	20.0		15.4	77	0-273
Vinyl Chloride	20.0		20.2	101	0-251
Bromomethane	20.0		29.0	145	0-242
Chloroethane	20.0		22.5	112	14-230
Trichlorofluoromethane	20.0		24.8	124	17-181
1,1-Dichloroethene	20.0		19.8	99	0-234
Methylene Chloride	20.0		19.8	99	0-221
trans-1,2-Dichloroethene	20.0		20.1	100	54-156
1,1-Dichloroethane	20.0		18.2	91	59-155
Chloroform	20.0		19.1	96	51-138
1,1,1-Trichloroethane	20.0		19.7	98	52-162
Carbon Tetrachloride	20.0		18.0	90	70-140
Benzene	20.0		16.0	80	37-151
1,2-Dichloroethane	20.0		18.6	93	49-155
Trichloroethene	20.0		20.6	103	71-157
1,2-Dichloropropane	20.0		18.0	90	0-210
Bromodichloromethane	20.0		18.6	93	35-155
cis-1,3-Dichloropropene	20.0		18.0	90	0-227
Toluene	20.0		18.2	91	47-150
trans-1,3-Dichloropropene	20.0		18.5	92	17-183
1,1,2-Trichloroethane	20.0		16.5	82	52-150
Tetrachloroethene	20.0		19.1	96	64-148
Chlorodibromomethane	20.0		16.7	84	53-149
Chlorobenzene	20.0		19.8	99	37-160
Ethylbenzene	20.0		22.4	112	37-162
Bromoform	20.0		18.3	92	45-169
1,1,2,2-Tetrachloroethane	20.0		18.1	90	46-157
1,3-Dichlorobenzene	20.0		21.6	108	59-156

# Column to be used to flag recovery and RPD values with an asterisk

\* Values outside of QC limits

COMMENTS:

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FORM 3  
SOIL VOA-GCMS MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

ab Name: ETC, INC.

Contract:

Lab Code:

Case No.:

SAS No.:

SDG No.: 9803-313

Matrix Spike - Sample No.: 9803-313-8

Level: (low/med) LOW

COMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	MS CONCENTRATION (ug/Kg)	MS % REC #	QC. LIMITS REC.
1,1-Dichloroethene	100	0.000	79.6	80	69-118
Benzene	100	0.000	78.0	78*	84-122
Trichloroethene	100	0.000	86.2	86	84-119
Toluene	100	0.000	83.4	83	75-119
Chlorobenzene	100	0.000	97.9	98	90-111

COMPOUND	SPIKE ADDED (ug/Kg)	MSD CONCENTRATION (ug/Kg)	MSD % REC #	% RPD #	QC LIMITS RPD	REC.
1,1-Dichloroethene	100	72.4	72	10	20	69-118
Benzene	100	71.2	71*	9	20	84-122
Trichloroethene	100	79.2	79*	8	20	84-119
Toluene	100	77.2	77	8	20	75-119
Chlorobenzene	100	87.1	87*	12	20	90-111

# Column to be used to flag recovery and RPD values with an asterisk

\* Values outside of QC limits

RPD: 0 out of 5 outside limits

Spike Recovery: 4 out of 10 outside limits

COMMENTS:

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ENVIRONMENTAL TESTING AND CONSULTING, INC.  
MEMPHIS, TN  
CASE NARRATIVE  
GC/MS VOLATILE COMPOUNDS - WATER

Client Name : \_Ensafe /Allen & Hoshall  
Project Name : \_Navy  
ETC Order # : \_9803-313  
Method (SW-846) : \_8260A

**HOLDING TIMES**

Sample Analysis : All samples analyzed within 14 days of collection.

**QUALITY CONTROL**

QC Batch Form 4 Summary  
V3031401A 0314-V3BLK1

System Monitoring Compounds FORM 2  
Surrogate recoveries within QC limits.\*

\*  
Surrogate recoveries for Bromofluorobenzene were flagged as outside QC Limits in samples 9803-313-02MS/MSD(N12GSB0816).

Laboratory Control Sample FORM 3  
0314-V3LCS

All criteria met.

Matrix Spike / Matrix Spike Dup FORM 3  
9803-313-02 RPD : All analytes within QC limits.  
N12GSB0816 Spike Recovery : All analytes within QC limits.\*

\*  
Recovery for Benzene was flagged outside QC Limits in the Matrix Spike Duplicate. MS recovery was within QC Limits.

Recovery for Chlorobenzene was flagged outside QC Limits in the Matrix Spike. MSD recovery was within QC Limits.

Refer to Laboratory Control Sample(s) for system verification.

Method Blank FORM 4  
0314-V3BLK1

Methylene Chloride identified in 0314-V3BLK1 at 12.9 ug/L.

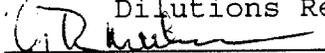
**CALIBRATION**

BFB Daily 12 Hour Tune : All criteria met. FORM 5  
Initial Calibration : All criteria met. FORM 6  
Daily Calibration : All criteria met. FORM 7A

Volatile Internal Standard Area and RT FORM 8  
Daily Check Standard(s) Internal Standard Areas and Retention Times within QC limits.

**SAMPLE ANALYSIS**

Instrumentation : HP 5890 Series II GC, 5971MSD  
Dilutions Required : No dilutions required.

  
Laboratory Manager

000085





FORM 1  
VOA-GCMS ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

0314-V3BLK1

Lab Name: ETC, INC. Contract: \_\_\_\_\_

Lab Code: \_\_\_\_\_ Case No.: \_\_\_\_\_ SAS No.: \_\_\_\_\_ SDG No.: 9803-313

Matrix: (soil/water) WATER Lab Sample ID: \_\_\_\_\_

Sample wt/vol: 10.00 (g/mL) ML Lab File ID: 0401003

Level: (low/med) LOW Date Received: \_\_\_\_\_

% Moisture: not dec. \_\_\_\_\_ Date Analyzed: 03/14/98

GC Column: ID: 2.00 (mm) Dilution Factor: 1.0

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

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
67-64-1	Dichlorodifluoromethane	1.00	U
74-87-3	Chloromethane	1.00	U
75-01-4	Vinyl Chloride	1.00	U
74-83-9	Bromomethane	1.00	U
75-00-3	Chloroethane	1.00	U
75-69-4	Trichlorofluoromethane	1.00	U
110-00-9	Furan	1.00	U
107-02-8	Acrolein	25.0	U
67-64-1	Acetone	25.0	U
76-13-1	1,1,2-trichloro-1,2,2-triflu	1.00	U
75-35-4	1,1-Dichloroethene	1.00	U
75-05-8	Acetonitrile	25.0	U
74-88-4	Iodomethane	1.00	U
75-15-0	Carbon Disulfide	1.00	U
75-09-2	Methylene Chloride	12.9	U
107-13-1	Acrylonitrile	25.0	U
1634-04-4	Methyl-tertbutyl-Ether	1.00	U
156-60-5	trans-1,2-Dichloroethene	1.00	U
110-54-3	Hexane	1.00	U
108-05-4	Vinyl Acetate	25.0	U
108-20-3	dipe	1.00	U
75-34-3	1,1-Dichloroethane	1.00	U
78-93-3	Methyl-Ethyl Ketone	25.0	U
109-99-9	Tetrahydrofuran	1.00	U
590-20-7	2,2-Dichloropropane	1.00	U
156-59-4	cis-1,2-Dichloroethene	1.00	U
141-78-6	Ethyl Acetate	25.0	U
67-66-3	Chloroform	1.00	U
74-97-5	Bromochloromethane	1.00	U
71-55-6	1,1,1-Trichloroethane	1.00	U
563-58-6	1,1-Dichloropropene	1.00	U
56-23-5	Carbon Tetrachloride	1.00	U
71-43-2	Benzene	1.00	U

FORM 1  
VOA-GCMS ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

0314-V3BLK1

ab Name: ETC, INC. Contract: \_\_\_\_\_  
 Lab Code: Case No.: SAS No.: SDG No.: 9803-313  
 Matrix: (soil/water) WATER Lab Sample ID: \_\_\_\_\_  
 Sample wt/vol: 10.00 (g/mL) ML Lab File ID: 0401003  
 Level: (low/med) LOW Date Received: \_\_\_\_\_  
 % Moisture: not dec. \_\_\_\_\_ Date Analyzed: 03/14/98  
 GC Column: ID: 2.00 (mm) Dilution Factor: 1.0  
 Soil Extract Volume: \_\_\_\_\_ (uL) Soil Aliquot Volume: \_\_\_\_\_ (uL)

CONCENTRATION UNITS:  
(ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND	Q
107-06-2	1,2-Dichloroethane	1.00 U
79-01-6	Trichloroethene	1.00 U
78-87-5	1,2-Dichloropropane	1.00 U
75-27-4	Bromodichloromethane	1.00 U
74-95-3	Dibromomethane	1.00 U
108-10-1	4-Methyl-2-Pentanone	25.0 U
10061-01-5	cis-1,3-Dichloropropene	1.00 U
108-88-3	Toluene	1.00 U
109-60-4	n-Propyl Acetate	1.00 U
10061-02-6	trans-1,3-Dichloropropene	1.00 U
79-00-5	1,1,2-Trichloroethane	1.00 U
591-78-6	2-Hexanone	25.0 U
142-28-9	1,3-Dichloropropane	1.00 U
110-75-0	2-Chloroethylvinyl Ether	1.00 U
127-18-4	Tetrachloroethene	1.00 U
124-48-1	Chlorodibromomethane	1.00 U
106-93-4	1,2-Dibromoethane	1.00 U
108-90-7	Chlorobenzene	1.00 U
630-20-6	1,1,1,2-Tetrachloroethane	1.00 U
1330-20-7	Xylene-mp	1.00 U
100-41-4	Ethylbenzene	1.00 U
95-47-6	Xylene-o	1.00 U
100-42-5	Styrene	1.00 U
75-25-2	Bromoform	1.00 U
98-82-8	Isopropylbenzene	1.00 U
79-34-5	1,1,2,2-Tetrachloroethane	1.00 U
96-18-4	1,2,3-Trichloropropane	1.00 U
108-86-1	Bromobenzene	1.00 U
103-65-1	n-Propylbenzene	1.00 U
110-57-6	trans-1,4-Dichloro-2-butene	1.00 U
95-49-8	2-Chlorotoluene	1.00 U
108-67-8	1,3,5-Trimethylbenzene	1.00 U
106-43-4	4-Chlorotoluene	1.00 U

FORM 1  
VOA-GCMS ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

0314-V3BLK1

ab Name: ETC, INC. Contract: \_\_\_\_\_  
 Lab Code: \_\_\_\_\_ Case No.: \_\_\_\_\_ SAS No.: \_\_\_\_\_ SDG No.: 9803-313  
 Matrix: (soil/water) WATER Lab Sample ID: \_\_\_\_\_  
 Sample wt/vol: 10.00 (g/mL) ML Lab File ID: 0401003  
 Level: (low/med) LOW Date Received: \_\_\_\_\_  
 % Moisture: not dec. \_\_\_\_\_ Date Analyzed: 03/14/98  
 GC Column: ID: 2.00 (mm) Dilution Factor: 1.0  
 Soil Extract Volume: \_\_\_\_\_ (uL) Soil Aliquot Volume: \_\_\_\_\_ (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
95-63-6	1,2,4-Trimethylbenzene	1.00	U
135-98-8	sec-Butylbenzene	1.00	U
98-06-6	tert-Butylbenzene	1.00	U
99-87-6	4-Isopropyltoluene	1.00	U
111-44-4	dcee	1.00	U
541-73-1	1,3-Dichlorobenzene	1.00	U
106-46-7	1,4-Dichlorobenzene	1.00	U
104-51-8	n-Butylbenzene	1.00	U
95-50-1	1,2-Dichlorobenzene	1.00	U
96-12-8	1,2-Dibromo-3-chloropropane	1.00	U
120-82-1	1,2,4-Trichlorobenzene	1.00	U
87-63-3	Hexachlorobutadiene	1.00	U
91-20-3	Naphthalene	1.00	U
87-61-6	1,2,3-Trichlorobenzene	1.00	U
97-63-2	Ethyl methacrylate	1.00	U
80-62-6	Methyl methacrylate	25.0	U
78-83-1	Isobutyl Alcohol	1.00	U

FORM 3  
WATER VOA-GCMS LAB CONTROL SAMPLE

Lab Name: ETC, INC. Contract: \_\_\_\_\_  
 Lab Code: Case No.: SAS No.: SDG No.: 9803-313  
 Matrix Spike - Sample No.: 0314-V3LCS

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	LCS CONCENTRATION (ug/L)	LCS % REC #	QC. LIMITS REC.
Chloromethane	20.0		12.2	61	0-273
Vinyl Chloride	20.0		15.9	80	0-251
Bromomethane	20.0		24.8	124	0-242
Chloroethane	20.0		20.7	104	14-230
Trichlorofluoromethane	20.0		20.4	102	17-181
1,1-Dichloroethene	20.0		18.7	94	0-234
Methylene Chloride	20.0		30.4	152	0-221
trans-1,2-Dichloroethen	20.0		20.3	102	54-156
1,1-Dichloroethane	20.0		18.6	93	59-155
Chloroform	20.0		19.8	99	51-138
1,1,1-Trichloroethane	20.0		20.7	104	52-162
Carbon Tetrachloride	20.0		21.0	105	70-140
Benzene	20.0		20.2	101	37-151
1,2-Dichloroethane	20.0		19.3	96	49-155
Trichloroethene	20.0		21.9	110	71-157
1,2-Dichloropropane	20.0		19.2	96	0-210
Bromodichloromethane	20.0		19.5	98	35-155
cis-1,3-Dichloropropene	20.0		20.5	102	0-227
Toluene	20.0		20.1	100	47-150
trans-1,3-Dichloroprope	20.0		20.5	102	17-183
1,1,2-Trichloroethane	20.0		18.6	93	52-150
Tetrachloroethene	20.0		19.8	99	64-148
Chlorodibromomethane	20.0		18.2	91	53-149
Chlorobenzene	20.0		21.6	108	37-160
Ethylbenzene	20.0		23.7	118	37-162
Bromoform	20.0		17.9	90	45-169
1,1,2,2-Tetrachloroetha	20.0		20.2	101	46-157
1,3-Dichlorobenzene	20.0		23.3	116	59-156

# Column to be used to flag recovery and RPD values with an asterisk

\* Values outside of QC limits

COMMENTS: \_\_\_\_\_



FORM 3  
 WATER VOA-GCMS MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

ab Name: ETC, INC.

Contract:

Lab Code:

Case No.:

SAS No.:

SDG No.: 9803-313

Matrix Spike - Sample No.: 9803-313-2

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC #	QC. LIMITS REC.
1,1-Dichloroethene	100	0.000	87.2	87	70-110
Benzene	100	0.000	88.1	88	86-115
Trichloroethene	100	0.000	107	107	86-119
Toluene	100	0.000	102	102	86-116
Chlorobenzene	100	0.000	116	116*	90-110

COMPOUND	SPIKE ADDED (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC #	% RPD #	QC LIMITS RPD	REC.
1,1-Dichloroethene	100	81.1	81	7	20	70-110
Benzene	100	83.0	83*	6	20	86-115
Trichloroethene	100	93.5	94	13	20	86-119
Toluene	100	92.0	92	10	20	86-116
Chlorobenzene	100	106	106	9	20	90-110

# Column to be used to flag recovery and RPD values with an asterisk

\* Values outside of QC limits

RPD: 0 out of 5 outside limits

Spike Recovery: 2 out of 10 outside limits

COMMENTS:

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**Environmental Testing & Consulting, Inc.**

**Quality Control Reports**

**GC Method 8015M - Extractable Fraction**

**000094**



FORM 2  
SOIL TPH-EXT SYSTEM MONITORING COMPOUND RECOVERY

ab Name: ETC, INC.

Contract:

Lab Code:

Case No.:

SAS No.:

SDG No.: 9803-313

Level:(low/med) LOW

	CLIENT SAMPLE NO.	SMC1 #	SMC2 #	SMC3 #	OTHER	TOT OUT
01	0313-1BLK	76				0
02	0313-1LCS	76				0
03	9803-314-1	82				0
04	9803-314-1MS	80				0
05	9803-314-1MS	80				0
06	9803-313-3	84				0
07	9803-313-4	72				0
08	9803-313-5	63				0
09	9803-313-6	77				0
10	9803-313-7	73				0
11	9803-313-8	70				0
12	9803-313-9	70				0
13	9803-313-10	86				0
14						
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30						

SMC1 = OTP Surr QC LIMITS  
(50-150)

# Column to be used to flag recovery values

\* Values outside of contract required QC limits

D System Monitoring Compound diluted out

FORM 4  
TPH-EXT METHOD BLANK SUMMARY

CLIENT SAMPLE NO.

0313-1BLK

ab Name: ETC, INC. Contract:   
 Lab Code: Case No.: SAS No.: SDG No.: 9803-313   
 Lab File ID: 1031301-07R Lab Sample ID:   
 Date Analyzed: 03/13/98 Time Analyzed: 1357   
 GC Column: DB5MS ID: 0.25 (mm) Heated Purge: (Y/N) N   
 Instrument ID: DR01

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

	SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	TIME ANALYZED
01	0313-1LCS		1031301-10R	1557
02	9803-314-1		1031301-12R	1716
03	9803-314-1MS		1031301-13R	1802
04	9803-314-1MS		1031301-14R	1841
05	9803-313-3		1031301-17R	2038
06	9803-313-4		1031301-18R	2117
07	9803-313-5		1031301-19R	2156
08	9803-313-6		1031301-20R	2235
09	9803-313-7		1031301-21R	2314
10	9803-313-8		1031301-22R	2352
11	9803-313-9		1031301-23R	0031
12	9803-313-10		1031301-24R	0110
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COMMENTS:

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FORM 1  
 TPH-EXT ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

0313-1BLK
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ab Name: ETC, INC. Contract: \_\_\_\_\_  
 Lab Code: \_\_\_\_\_ Case No.: \_\_\_\_\_ SAS No.: \_\_\_\_\_ SDG No.: 9803-313  
 Matrix: (soil/water) SOIL Lab Sample ID: \_\_\_\_\_  
 Sample wt/vol: \_\_\_\_\_ (g/mL) G Lab File ID: 1031301-07R  
 Level: (low/med) LOW Date Received: \_\_\_\_\_  
 % Moisture: not dec. \_\_\_\_\_ Date Analyzed: 03/13/98  
 GC Column: DB5MS ID: 0.25 (mm) Dilution Factor: 1.0  
 Soil Extract Volume: \_\_\_\_\_ (uL) Soil Aliquot Volume: \_\_\_\_\_ (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) MG/KG		Q
	-----Total DRO	10.0	U	





ENVIRONMENTAL TESTING AND CONSULTING, INC.  
MEMPHIS, TN  
CASE NARRATIVE  
GC EXTRACTABLE FRACTION - WATER

Client Name : Ensafe /Allen & Hoshall  
Project Name : Navy  
ETC Order # : 9803-313  
Method (SW-846) : TN DRO  
3510

**HOLDING TIMES**

Sample Extraction : All water samples extracted within 7 days.  
Sample Analysis : All samples analyzed within 40 days of  
extraction.

**QUALITY CONTROL**

QC Batch Form 4 Summary  
V13DRA44 0312-1BLK

System Monitoring Compounds FORM 2  
Surrogate recoveries within QC limits.

Laboratory Control Sample FORM 3  
0312-1LCS

All criteria met.

Matrix Spike / Matrix Spike Dup FORM 3  
9803-316-04 RPD : All analytes within QC limits.  
Spike Recovery : All analytes within QC limits.

Refer to Laboratory Control Sample(s) for system verification.

Method Blank FORM 4  
0312-1BLK

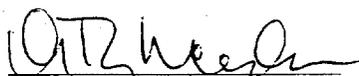
No Target Analytes detected above Practical Quantitation Limit.

**CALIBRATION**

Initial Calibration : All criteria met. FORM 6  
Daily Calibration : All criteria met. FORM 7A

**SAMPLE ANALYSIS**

Instrumentation : HP 5890 Series II GC  
Dilutions Required : No dilutions required.

  
Laboratory Manager

000101

FORM 2  
WATER TPH-EXT SYSTEM MONITORING COMPOUND RECOVERY

Lab Name: ETC, INC.

Contract:

Lab Code:

Case No.:

SAS No.:

SDG No.: 9803-313

	CLIENT SAMPLE NO.	SMC1 #	SMC2 #	SMC3 #	OTHER	TOT OUT
01	0312-1BLK	77				0
02	9803-313-1	75				0
03	9803-313-2	78				0
04	9803-316-4	86				0
05	0312-1LCS	88				0
06	9803-316-4MS	91				0
07	9803-316-4MS	92				0
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29						
30						

SMC1 = OTP Surr QC LIMITS  
(50-150)

# Column to be used to flag recovery values

\* Values outside of contract required QC limits

D System Monitoring Compound diluted out

FORM 4  
TPH-EXT METHOD BLANK SUMMARY

CLIENT SAMPLE NO.

0312-1BLK

Lab Name: ETC, INC. Contract: \_\_\_\_\_  
 Lab Code: \_\_\_\_\_ Case No.: \_\_\_\_\_ SAS No.: \_\_\_\_\_ SDG No.: 9803-313  
 Lab File ID: 1031301-05R Lab Sample ID: \_\_\_\_\_  
 Date Analyzed: 03/13/98 Time Analyzed: 1238  
 GC Column: DB5MS ID: 0.25 (mm) Heated Purge: (Y/N) N  
 Instrument ID: DRO1

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

	SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	TIME ANALYZED
01	9803-313-1		2031301-06R	1959
02	9803-313-2		2031301-07R	2038
03	9803-316-4		2031301-12R	2352
04	0312-1LCS		2031301-22R	0621
05	9803-316-4MS		2031301-24R	0738
06	9803-316-4MS		2031301-25R	0818
07				
08				
09				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				

COMMENTS:

---



---

FORM 1  
 TPH-EXT ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

0312-1BLK
-----------

ab Name: ETC, INC. Contract: \_\_\_\_\_

Lab Code: \_\_\_\_\_ Case No.: \_\_\_\_\_ SAS No.: \_\_\_\_\_ SDG No.: 9803-313

Matrix: (soil/water) WATER Lab Sample ID: \_\_\_\_\_

Sample wt/vol: 1000 (g/mL) ML Lab File ID: 1031301-05R

Level: (low/med) LOW Date Received: \_\_\_\_\_

% Moisture: not dec. \_\_\_\_\_ Date Analyzed: 03/13/98

GC Column: DB5MS ID: 0.25 (mm) Dilution Factor: 1.0

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

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) MG/L		Q
-----	Total DRO	0.100	U	

FORM 3  
WATER TPH-EXT LAB CONTROL SAMPLE

Lab Name: ETC, INC. Contract: \_\_\_\_\_  
 Lab Code: \_\_\_\_\_ Case No.: \_\_\_\_\_ SAS No.: \_\_\_\_\_ SDG No.: 9803-313  
 Matrix Spike - Sample No.: 0312-1LCS

COMPOUND	SPIKE ADDED (mg/L)	SAMPLE CONCENTRATION (ug/L)	LCS CONCENTRATION (mg/L)	LCS % REC #	QC. LIMITS REC.
Total DRO	0.859		0.801	93	50-150

# Column to be used to flag recovery and RPD values with an asterisk

\* Values outside of QC limits

RPD: 0 out of 0 outside limits

Spike Recovery: 0 out of 1 outside limits

COMMENTS: \_\_\_\_\_  
 \_\_\_\_\_

FORM 3  
WATER TPH-EXT MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

ab Name: ETC, INC.

Contract:

Lab Code:

Case No.:

SAS No.:

SDG No.: 9803-313

Matrix Spike - Sample No.: 9803-316-4

COMPOUND	SPIKE ADDED (mg/L)	SAMPLE CONCENTRATION (mg/L)	MS CONCENTRATION (mg/L)	MS % REC #	QC. LIMITS REC.
Total DRO	0.859	0.000	0.821	96	50-150

COMPOUND	SPIKE ADDED (mg/L)	MSD CONCENTRATION (mg/L)	MSD % REC #	% RPD #	QC LIMITS RPD	REC.
Total DRO	0.859	0.824	96	0	20	50-150

# Column to be used to flag recovery and RPD values with an asterisk

\* Values outside of QC limits

RPD: 0 out of 1 outside limits

Spike Recovery: 0 out of 2 outside limits

COMMENTS:

---

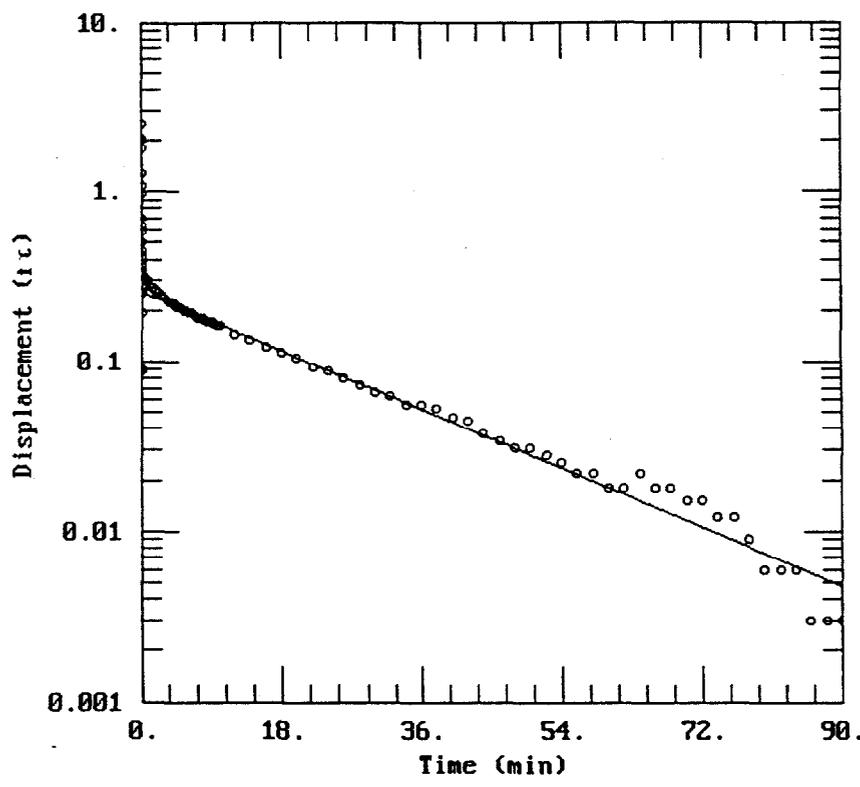


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**Appendix C**  
**Slug Test Graphs and Results**

CLIENT: NSAMEM	COMPANY: EnSafe Inc.
LOCATION: Millington, Tennessee	PROJECT: 0136-001

## Falling Head Test N12G01LS



DATA SET:  
 MW01FALL.AQT  
 02/20/98

AQUIFER MODEL:  
 Unconfined  
 SOLUTION METHOD:  
 Bouwer-Rice

TEST DATA:  
 $H_0 = 1.3$  ft  
 $r_c = 0.083$  ft  
 $r_w = 0.3333$  ft  
 $L = 10.55$  ft  
 $b = 10.55$  ft  
 $H = 10.55$  ft

PARAMETER ESTIMATES:  
 $K = 3.777E-05$  ft/min  
 $y_0 = 0.2548$  ft

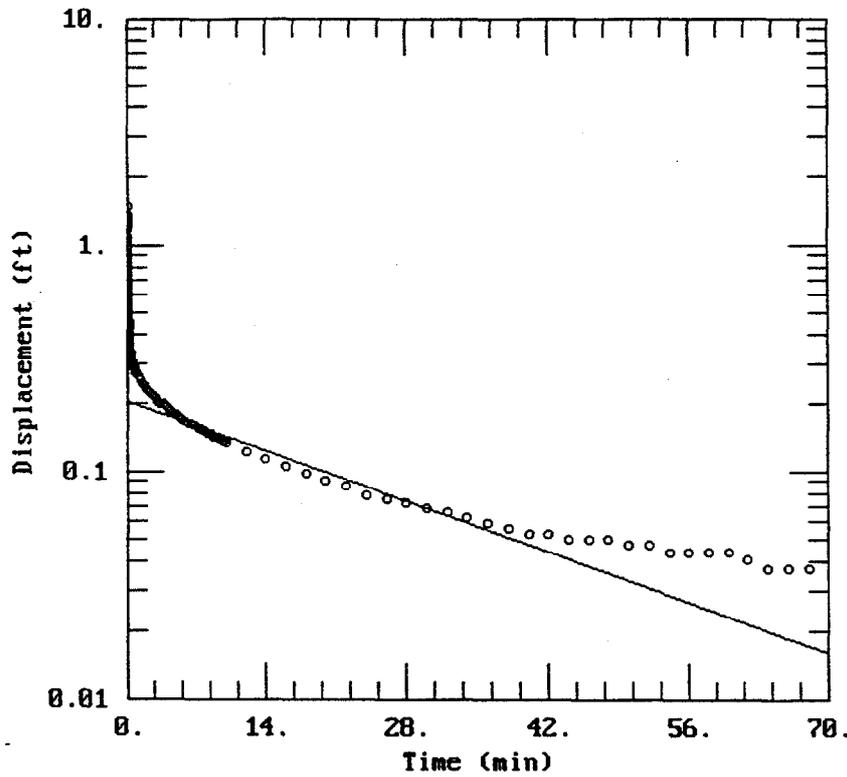
CLIENT: NSAMEM

COMPANY: EnSafe Inc.

LOCATION: Millington, Tennessee

PROJECT: 0136-001

### Rising Head Test N12G01LS



DATA SET:  
MW01RISE.AQT  
02/20/98

AQUIFER MODEL:  
Unconfined  
SOLUTION METHOD:  
Bower-Rice

TEST DATA:  
H0 = 1.3 ft  
rc = 0.083 ft  
rw = 0.3333 ft  
L = 10.55 ft  
b = 10.55 ft  
H = 10.55 ft

PARAMETER ESTIMATES:  
K = 3.092E-05 ft/min  
y0 = 0.202 ft

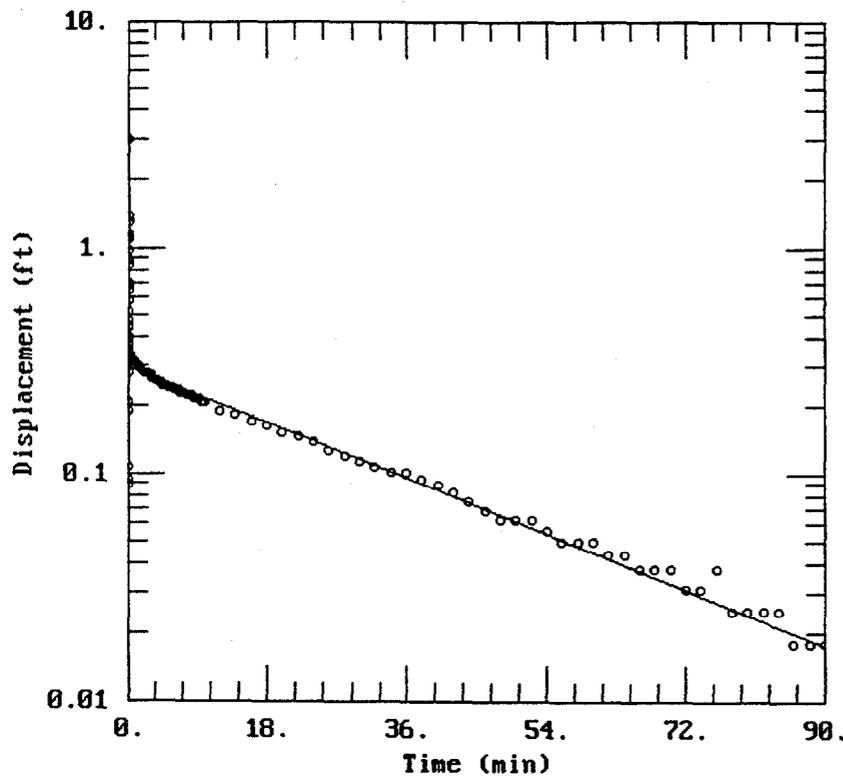
CLIENT: NSAMEM

COMPANY: EnSafe Inc.

LOCATION: Millington, Tennessee

PROJECT: 0136-001

### Falling Head Test N12G02LS



DATA SET:  
MW02FALL.AQT  
02/20/98

AQUIFER MODEL:  
Unconfined  
SOLUTION METHOD:  
Bower-Rice

TEST DATA:  
H0 = 1.3 ft  
rc = 0.083 ft  
rw = 0.3333 ft  
L = 9.68 ft  
b = 9.68 ft  
H = 9.68 ft

PARAMETER ESTIMATES:  
K = 2.83E-05 ft/min  
y0 = 0.294 ft

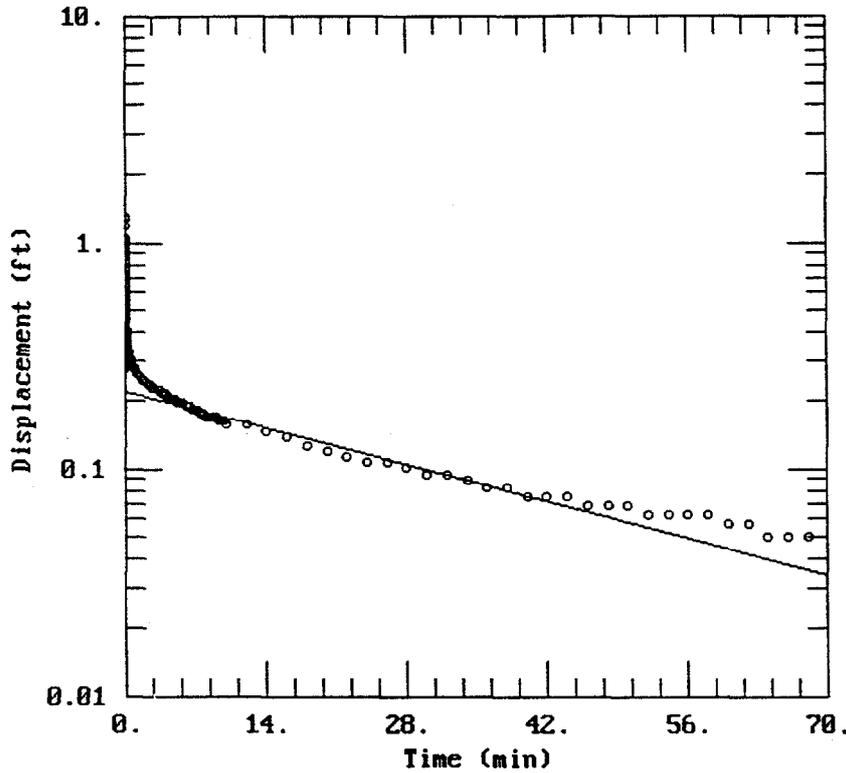
CLIENT: NSAMEM

COMPANY: EnSafe Inc.

LOCATION: Millington, Tennessee

PROJECT: 0136-001

### Rising Head Test N12G02LS



DATA SET:  
MW02RISE.AQT  
02/20/98

AQUIFER MODEL:  
Unconfined  
SOLUTION METHOD:  
Bower-Rice

TEST DATA:  
H0 = 1.3 ft  
rc = 0.083 ft  
rw = 0.3333 ft  
L = 9.68 ft  
b = 9.68 ft  
H = 9.68 ft

PARAMETER ESTIMATES:  
K = 2.393E-05 ft/min  
y0 = 0.2172 ft

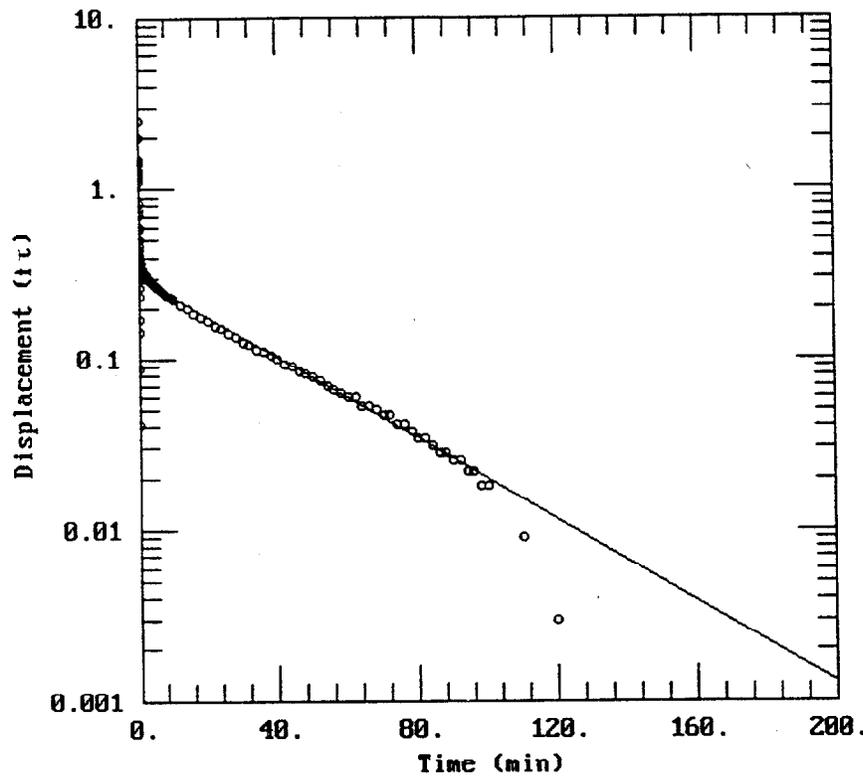
CLIENT: NSAMEM

COMPANY: EnSafe Inc.

LOCATION: Millington, Tennessee

PROJECT: 0136-001

### Falling Head Test N12G04LS



DATA SET:  
MW04FALL.AQT  
02/20/98

AQUIFER MODEL:  
Unconfined  
SOLUTION METHOD:  
Bower-Rice

TEST DATA:  
H0 = 1.3 ft  
rc = 0.083 ft  
rw = 0.3333 ft  
L = 8.43 ft  
b = 8.43 ft  
H = 8.43 ft

PARAMETER ESTIMATES:  
K = 2.703E-05 ft/min  
y0 = 0.3015 ft

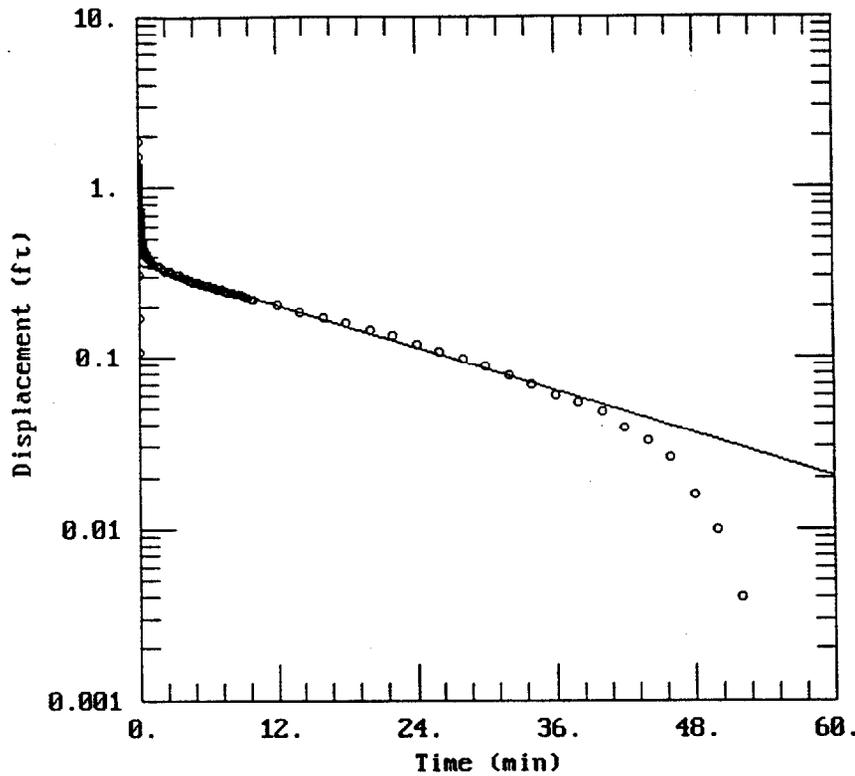
CLIENT: NSAMEM

COMPANY: EnSafe Inc.

LOCATION: Millington, Tennessee

PROJECT: 0136-001

### Rising Head Test N12G04LS



DATA SET:  
MW04RISE.AQT  
02/20/98

AQUIFER MODEL:  
Unconfined  
SOLUTION METHOD:  
Bouwer-Rice

TEST DATA:  
H0 = 1.3 ft  
rc = 0.083 ft  
rw = 0.3333 ft  
L = 8.43 ft  
b = 8.43 ft  
H = 8.43 ft

PARAMETER ESTIMATES:  
K = 4.782E-05 ft/min  
y0 = 0.3626 ft

Falling Head Test N12G01LS

compny

EnSafe Inc.

r no

0-001

ent

NSAMEM

locsit

Millington, Tennessee

tstdat

2/9/98

units

1

0

0

slugt5

1.3

0.083

0.3333

10.55

10.55

10.55

0

1

189

0.0033 2.062 1

0.0066 0.693 1

0.01 1.835 1

0.0133 2.49 1

0.0166 2.011 1

0.0266 0.088 1

0.03 0.977 1

0.0333 1.078 1

0.0366 0.636 1

0.04 0.091 1

0.0466 0.195 1

0.05 0.507 1

0.0533 0.592 1

0.0566 0.444 1

0.06 0.255 1

0.0633 0.192 1

0.0666 0.271 1

0.07 0.381 1

0.0733 0.419 1

0.0766 0.368 1

0.08 0.302 1

0.0833 0.28 1

0.0866 0.305 1

0.09 0.343 1

0.0933 0.356 1

0.0966 0.34 1

0.1 0.318 1

0.1033 0.308 1

0.1066 0.318 1

0.11 0.331 1

0.1133 0.334 1

0.1166 0.331 1

0.12 0.321 1

0.1233 0.318 1

0.1266 0.321 1

0.13	0.327	1
0.1333	0.327	1
0.1366	0.327	1
0.14	0.324	1
0.1433	0.321	1
0.1466	0.321	1
0.15	0.324	1
0.1533	0.324	1
0.1566	0.324	1
0.16	0.324	1
0.1633	0.324	1
0.1666	0.324	1
0.17	0.324	1
0.1733	0.324	1
0.1766	0.324	1
0.18	0.324	1
0.1833	0.324	1
0.1866	0.321	1
0.19	0.321	1
0.1933	0.321	1
0.1966	0.321	1
0.2	0.321	1
0.2033	0.321	1
0.2066	0.321	1
0.21	0.321	1
0.2133	0.321	1
0.2166	0.321	1
0.22	0.321	1
0.2233	0.321	1
0.23	0.321	1
0.2366	0.321	1
0.2733	0.318	1
0.29	0.318	1
0.3066	0.318	1
0.3233	0.318	1
0.34	0.315	1
0.3566	0.315	1
0.3733	0.315	1
0.39	0.315	1
0.4066	0.312	1
0.4233	0.312	1
0.44	0.312	1
0.4566	0.312	1
0.4733	0.308	1
0.49	0.308	1
0.5066	0.308	1
0.5233	0.308	1
0.54	0.308	1
0.5566	0.305	1
0.5733	0.305	1
0.59	0.305	1
0.6066	0.305	1
0.6233	0.302	1
0.64	0.302	1
0.6566	0.302	1
0.6733	0.302	1
0.69	0.299	1
0.7066	0.299	1
0.7233	0.299	1
0.74	0.299	1

0.7566	0.299	1
0.7733	0.299	1
0.79	0.296	1
0.766	0.296	1
233	0.296	1
84	0.296	1
0.8566	0.293	1
0.8733	0.293	1
0.89	0.293	1
1.09	0.283	1
1.29	0.277	1
1.49	0.271	1
1.69	0.264	1
1.89	0.261	1
2.09	0.255	1
2.29	0.252	1
2.49	0.245	1
2.69	0.242	1
2.89	0.239	1
3.09	0.236	1
3.29	0.23	1
3.49	0.226	1
3.69	0.223	1
3.89	0.22	1
4.09	0.217	1
4.29	0.214	1
4.49	0.211	1
4.69	0.211	1
4.99	0.208	1
9	0.204	1
9	0.201	1
5.49	0.198	1
5.69	0.198	1
5.89	0.195	1
6.09	0.195	1
6.29	0.192	1
6.49	0.189	1
6.69	0.189	1
6.89	0.185	1
7.09	0.182	1
7.29	0.182	1
7.49	0.179	1
7.69	0.179	1
7.89	0.176	1
8.09	0.176	1
8.29	0.173	1
8.49	0.173	1
8.69	0.17	1
8.89	0.17	1
9.09	0.167	1
9.29	0.167	1
9.49	0.163	1
9.69	0.163	1
9.89	0.163	1
89	0.145	1
89	0.135	1
89	0.122	1
17.89	0.113	1
19.89	0.104	1
21.89	0.094	1

23.89	0.088	1
25.89	0.081	1
27.89	0.072	1
29.89	0.066	1
31.89	0.063	1
33.89	0.056	1
35.89	0.056	1
37.89	0.053	1
39.89	0.047	1
41.89	0.044	1
43.89	0.037	1
45.89	0.034	1
47.89	0.031	1
49.89	0.031	1
51.89	0.028	1
53.89	0.025	1
55.89	0.022	1
57.89	0.022	1
59.89	0.018	1
61.89	0.018	1
63.89	0.022	1
65.89	0.018	1
67.89	0.018	1
69.89	0.015	1
71.89	0.015	1
73.89	0.012	1
75.89	0.012	1
77.89	0.009	1
79.89	0.006	1
81.89	0.006	1
83.89	0.006	1
85.89	0.003	1
87.89	0.003	1
89.89	0.003	1
<end>		

Rising Head Test N12G01LS

compny

EnSafe Inc.

F jno

5-001

ent

NSAMEM

locsit

Millington, Tennessee

tstdat

2/9/98

units

1

0

0

slugt5

1.3

0.083

0.3333

10.55

10.55

10.55

0

1

199

0.0034 0.75 1

0.01 1.352 1

0.0134 0.466 1

0.0167 1.286 1

0.02 1.497 1

0.0234 1.301 1

0.0267 1.021 1

0.03 1.163 1

0.0334 1.216 1

0.0367 1.071 1

0.04 1.021 1

0.0434 1.084 1

0.0467 1.04 1

0.05 0.974 1

0.0534 0.967 1

0.0567 0.958 1

0.06 0.926 1

0.0634 0.898 1

0.0667 0.885 1

0.07 0.87 1

0.0734 0.841 1

0.0767 0.819 1

0.08 0.807 1

0.0834 0.788 1

0.0867 0.766 1

0.09 0.75 1

0.0934 0.734 1

0.0967 0.718 1

0.1 0.699 1

0.1034 0.687 1

0.1067 0.671 1

0.11 0.658 1

0.1134 0.643 1

0.1167 0.63 1

0.12 0.617 1

0.1234	0.605	1
0.1267	0.595	1
0.13	0.583	1
0.1334	0.573	1
0.1367	0.564	1
0.14	0.554	1
0.1434	0.545	1
0.1467	0.535	1
0.15	0.526	1
0.1534	0.52	1
0.1567	0.51	1
0.16	0.504	1
0.1634	0.498	1
0.1667	0.491	1
0.17	0.485	1
0.1734	0.479	1
0.1767	0.472	1
0.18	0.466	1
0.1834	0.463	1
0.1867	0.457	1
0.19	0.454	1
0.1934	0.447	1
0.1967	0.444	1
0.2	0.441	1
0.2034	0.435	1
0.2067	0.431	1
0.21	0.428	1
0.2134	0.425	1
0.2167	0.422	1
0.22	0.419	1
0.2234	0.416	1
0.2267	0.413	1
0.23	0.409	1
0.2334	0.406	1
0.2367	0.403	1
0.24	0.4	1
0.2434	0.397	1
0.2467	0.394	1
0.25	0.394	1
0.2534	0.39	1
0.2567	0.387	1
0.26	0.387	1
0.2634	0.384	1
0.2667	0.381	1
0.27	0.381	1
0.2734	0.378	1
0.2767	0.378	1
0.28	0.375	1
0.2834	0.375	1
0.2867	0.372	1
0.3034	0.365	1
0.32	0.359	1
0.3367	0.353	1
0.3534	0.346	1
0.37	0.34	1
0.3767	0.337	1
0.4034	0.334	1
0.42	0.327	1
0.4367	0.324	1
0.4534	0.321	1

0.47	0.318	1
0.4867	0.315	1
0.5034	0.315	1
0	0.312	1
0.67	0.308	1
0.534	0.305	1
0.57	0.305	1
0.5867	0.302	1
0.6034	0.299	1
0.62	0.299	1
0.6367	0.296	1
0.6534	0.296	1
0.67	0.293	1
0.6867	0.293	1
0.7034	0.29	1
0.72	0.29	1
0.7367	0.286	1
0.7534	0.286	1
0.77	0.286	1
0.7867	0.283	1
0.8034	0.28	1
0.82	0.28	1
0.8367	0.28	1
0.8534	0.277	1
0.87	0.277	1
0.8867	0.277	1
0.9034	0.274	1
0.92	0.274	1
0.9367	0.274	1
0.9534	0.274	1
1.0534	0.261	1
1.3534	0.252	1
1.5534	0.245	1
1.7534	0.239	1
1.9534	0.233	1
2.1534	0.227	1
2.3534	0.223	1
2.5534	0.217	1
2.7534	0.214	1
2.9534	0.211	1
3.1534	0.204	1
3.3534	0.201	1
3.5534	0.198	1
3.7534	0.195	1
3.9534	0.192	1
4.1534	0.189	1
4.3534	0.186	1
4.5534	0.182	1
4.7534	0.179	1
4.9534	0.179	1
5.1534	0.176	1
5.3534	0.173	1
5.5534	0.17	1
5.7534	0.167	1
5.9534	0.167	1
6.0534	0.163	1
6.1534	0.163	1
6.2534	0.163	1
6.5534	0.16	1
6.7534	0.16	1
6.9534	0.157	1

7.1534	0.154	1
7.3534	0.154	1
7.5534	0.151	1
7.534	0.151	1
7.534	0.148	1
7.1534	0.145	1
8.3534	0.145	1
8.5534	0.145	1
8.7534	0.141	1
8.9534	0.141	1
9.1534	0.138	1
9.3534	0.138	1
9.5534	0.135	1
9.7534	0.135	1
9.9534	0.132	1
11.9534	0.122	1
13.9534	0.113	1
15.9534	0.104	1
17.9534	0.097	1
19.9534	0.091	1
21.9534	0.085	1
23.9534	0.078	1
25.9534	0.075	1
27.9534	0.072	1
29.9534	0.069	1
31.9534	0.066	1
33.9534	0.063	1
35.9534	0.059	1
37.9534	0.056	1
39.9534	0.053	1
41.9534	0.053	1
43.9534	0.05	1
45.9534	0.05	1
47.9534	0.05	1
49.9534	0.047	1
51.9534	0.047	1
53.9534	0.044	1
55.9534	0.044	1
57.9534	0.044	1
59.9534	0.044	1
61.9534	0.041	1
63.9534	0.037	1
65.9534	0.037	1
67.9534	0.037	1

<end>

Falling Head Test N12G02LS

compny

EnSafe Inc.

r jno

6-001

ent

NSAMEM

locsit

Millington, Tennessee

tstdat

2/9/98

units

1

0

0

slugt5

1.3

0.083

0.3333

9.68

9.68

9.68

0

1

188

0.0033 0.373 1

0.0067 0.518 1

0.01 0.683 1

0.0133 0.885 1

167 0.847 1

2 1.107 1

0.0233 0.088 1

0.0267 1.157 1

0.03 1.372 1

0.0333 2.999 1

0.0367 1.303 1

0.04 0.702 1

0.05 0.208 1

0.0533 0.967 1

0.0567 1.081 1

0.06 0.651 1

0.0633 0.107 1

0.07 0.094 1

0.0733 0.449 1

0.0767 0.651 1

0.08 0.582 1

0.0833 0.354 1

0.0867 0.189 1

0.09 0.189 1

0.0933 0.316 1

0.0967 0.442 1

0.1 0.474 1

0.1033 0.404 1

0.1067 0.309 1

11 0.278 1

133 0.303 1

167 0.366 1

0.12 0.398 1

0.1233 0.392 1

0.1267 0.347 1

0.13	0.322	1
0.1333	0.322	1
0.1367	0.341	1
0.14	0.366	1
0.1433	0.366	1
0.1467	0.354	1
0.15	0.341	1
0.1533	0.335	1
0.1567	0.341	1
0.16	0.347	1
0.1633	0.354	1
0.1667	0.354	1
0.17	0.347	1
0.1733	0.341	1
0.1767	0.341	1
0.18	0.347	1
0.1833	0.347	1
0.1867	0.347	1
0.19	0.347	1
0.1933	0.341	1
0.1967	0.341	1
0.2	0.341	1
0.2033	0.347	1
0.2067	0.347	1
0.21	0.347	1
0.2133	0.341	1
0.2167	0.341	1
0.22	0.341	1
0.2367	0.335	1
0.24533	0.335	1
0.257	0.335	1
0.2867	0.335	1
0.3033	0.335	1
0.32	0.335	1
0.3367	0.328	1
0.3533	0.328	1
0.37	0.328	1
0.3867	0.328	1
0.4033	0.328	1
0.42	0.328	1
0.4367	0.328	1
0.4533	0.322	1
0.47	0.328	1
0.4867	0.322	1
0.5033	0.322	1
0.52	0.322	1
0.5367	0.322	1
0.5533	0.322	1
0.57	0.322	1
0.5867	0.322	1
0.6033	0.322	1
0.62	0.316	1
0.6367	0.316	1
0.6533	0.316	1
0.67	0.316	1
0.6867	0.316	1
0.7033	0.316	1
0.72	0.316	1
0.7367	0.316	1
0.7533	0.316	1

0.77	0.316	1
0.7867	0.316	1
0.8033	0.316	1
0.82	0.309	1
0.8367	0.309	1
0.8533	0.309	1
0.87	0.309	1
0.8867	0.309	1
1.0867	0.303	1
1.2867	0.297	1
1.4867	0.291	1
1.6867	0.284	1
1.8867	0.284	1
2.0867	0.278	1
2.2867	0.278	1
2.4867	0.278	1
2.6867	0.272	1
2.8867	0.272	1
3.0867	0.265	1
3.2867	0.265	1
3.4867	0.259	1
3.6867	0.259	1
3.8867	0.253	1
4.0867	0.253	1
4.2867	0.253	1
4.4867	0.246	1
4.6867	0.246	1
4.8867	0.246	1
5.0867	0.24	1
5.2867	0.24	1
5.4867	0.24	1
5.6867	0.24	1
5.8867	0.234	1
6.0867	0.234	1
6.2867	0.234	1
6.4867	0.234	1
6.6867	0.227	1
6.8867	0.227	1
7.0867	0.227	1
7.2867	0.227	1
7.4867	0.221	1
7.6867	0.221	1
7.8867	0.221	1
8.0867	0.221	1
8.2867	0.221	1
8.4867	0.215	1
8.6867	0.215	1
8.8867	0.215	1
9.0867	0.215	1
9.2867	0.215	1
9.4867	0.208	1
9.6867	0.208	1
9.8867	0.208	1
11.8867	0.189	1
13.8867	0.183	1
15.8867	0.17	1
17.8867	0.164	1
19.8867	0.151	1
21.8867	0.145	1
23.8867	0.139	1

25.8867	0.126	1
27.8867	0.12	1
29.8867	0.113	1
31.8867	0.107	1
33.8867	0.101	1
35.8867	0.101	1
37.8867	0.094	1
39.8867	0.088	1
41.8867	0.082	1
43.8867	0.075	1
45.8867	0.069	1
47.8867	0.063	1
49.8867	0.063	1
51.8867	0.063	1
53.8867	0.056	1
55.8867	0.05	1
57.8867	0.05	1
59.8867	0.05	1
61.8867	0.044	1
63.8867	0.044	1
65.8867	0.038	1
67.8867	0.038	1
69.8867	0.038	1
71.8867	0.031	1
73.8867	0.031	1
75.8867	0.038	1
77.8867	0.025	1
79.8867	0.025	1
81.8867	0.025	1
83.8867	0.025	1
85.8867	0.018	1
87.8867	0.018	1
89.8867	0.018	1
<end>		

Rising Head Test N12G02LS

compy

EnSafe Inc.

Project

6-001

Plant

NSAMEM

Locs

Millington, Tennessee

Test Date

2/9/98

Units

1

0

0

slug

1.3

0.083

0.3333

9.68

9.68

9.68

0

1

203

0.0034 0.278 1

0.0067 0.411 1

0.01 0.322 1

0.0134 0.721 1

234 0.512 1

267 0.531 1

0.0334 0.651 1

0.0367 0.537 1

0.04 0.309 1

0.0434 0.493 1

0.0467 1.283 1

0.05 1.201 1

0.0534 1.043 1

0.0567 1.043 1

0.06 1.056 1

0.0634 1.018 1

0.0667 0.955 1

0.07 0.923 1

0.0734 0.91 1

0.0767 0.885 1

0.08 0.847 1

0.0834 0.803 1

0.0867 0.784 1

0.09 0.758 1

0.0934 0.746 1

0.0967 0.708 1

0.1 0.683 1

0.1034 0.664 1

0.1067 0.651 1

0.11 0.632 1

134 0.607 1

167 0.594 1

0.12 0.575 1

0.1234 0.544 1

0.1267 0.537 1

0.13	0.531	1
0.1334	0.518	1
0.1367	0.499	1
0.14	0.493	1
0.1434	0.487	1
0.1467	0.48	1
0.15	0.48	1
0.1534	0.461	1
0.1567	0.455	1
0.16	0.449	1
0.1634	0.449	1
0.1667	0.442	1
0.17	0.436	1
0.1734	0.43	1
0.1767	0.423	1
0.18	0.423	1
0.1834	0.417	1
0.1867	0.411	1
0.19	0.411	1
0.1934	0.404	1
0.1967	0.404	1
0.2	0.398	1
0.2034	0.398	1
0.2067	0.392	1
0.21	0.392	1
0.2134	0.385	1
0.2167	0.385	1
0.22	0.379	1
0.2234	0.379	1
0.2267	0.379	1
0.23	0.373	1
0.2334	0.373	1
0.2367	0.373	1
0.24	0.366	1
0.2434	0.366	1
0.2467	0.366	1
0.25	0.36	1
0.2534	0.36	1
0.2567	0.36	1
0.26	0.36	1
0.2634	0.354	1
0.2667	0.354	1
0.27	0.354	1
0.2734	0.347	1
0.2767	0.354	1
0.28	0.347	1
0.2834	0.347	1
0.2867	0.347	1
0.29	0.347	1
0.2934	0.341	1
0.2967	0.341	1
0.3	0.341	1
0.3034	0.341	1
0.3067	0.341	1
0.3134	0.341	1
0.314	0.335	1
0.31567	0.328	1
0.3734	0.328	1
0.39	0.322	1
0.4067	0.322	1

0.4234	0.316	1
0.44	0.316	1
0.4567	0.309	1
0.734	0.309	1
	0.309	1
.067	0.303	1
0.5234	0.303	1
0.54	0.303	1
0.5567	0.303	1
0.5734	0.303	1
0.59	0.297	1
0.6067	0.297	1
0.6234	0.297	1
0.64	0.29	1
0.6567	0.29	1
0.6734	0.29	1
0.69	0.29	1
0.7067	0.29	1
0.7234	0.29	1
0.74	0.284	1
0.7567	0.284	1
0.7734	0.284	1
0.79	0.284	1
0.8067	0.284	1
0.8234	0.284	1
0.84	0.284	1
0.8567	0.278	1
0.8734	0.278	1
0.89	0.278	1
.167	0.278	1
.234	0.278	1
.94	0.278	1
0.9567	0.272	1
0.9734	0.272	1
1.1734	0.265	1
1.3734	0.259	1
1.5734	0.253	1
1.7734	0.246	1
1.9734	0.246	1
2.1734	0.24	1
2.3734	0.234	1
2.5734	0.234	1
2.7734	0.227	1
2.9734	0.227	1
3.1734	0.221	1
3.3734	0.221	1
3.5734	0.215	1
3.7734	0.215	1
3.9734	0.215	1
4.1734	0.208	1
4.3734	0.208	1
4.5734	0.202	1
4.7734	0.202	1
4.9734	0.202	1
5.1734	0.196	1
.734	0.196	1
.734	0.196	1
5.7734	0.196	1
5.9734	0.189	1
6.1734	0.189	1

6.3734	0.189	1
6.5734	0.183	1
6.7734	0.183	1
6.734	0.183	1
6.734	0.183	1
6.5734	0.177	1
7.5734	0.177	1
7.7734	0.177	1
7.9734	0.17	1
8.1734	0.17	1
8.3734	0.17	1
8.5734	0.17	1
8.7734	0.17	1
8.9734	0.17	1
9.1734	0.164	1
9.3734	0.164	1
9.5734	0.164	1
9.7734	0.164	1
9.9734	0.158	1
11.9734	0.158	1
13.9734	0.145	1
15.9734	0.139	1
17.9734	0.126	1
19.9734	0.12	1
21.9734	0.113	1
23.9734	0.107	1
25.9734	0.107	1
27.9734	0.101	1
29.9734	0.094	1
31.9734	0.094	1
33.9734	0.088	1
35.9734	0.082	1
37.9734	0.082	1
39.9734	0.075	1
41.9734	0.075	1
43.9734	0.075	1
45.9734	0.069	1
47.9734	0.069	1
49.9734	0.069	1
51.9734	0.063	1
53.9734	0.063	1
55.9734	0.063	1
57.9734	0.063	1
59.9734	0.057	1
61.9734	0.057	1
63.9734	0.05	1
65.9734	0.05	1
67.9734	0.05	1
<end>		

Falling Head Test N12G04LS

compny

EnSafe Inc.

Project no

5-001

Client

NSAMEM

Location

Millington, Tennessee

Test date

2/9/98

Units

1

0

0

slugt5

1.3

0.083

0.3333

8.43

8.43

8.43

0

1

210

0.0033 0.58 1

0.0066 1.989 1

0.01 1.254 1

0.0133 0.088 1

0.0166 0.239 1

0.02 1.302 1

0.0233 2.513 1

0.0266 1.5 1

0.03 1.201 1

0.0333 0.753 1

0.0366 1.166 1

0.04 1.418 1

0.0433 0.041 1

0.0466 0.173 1

0.05 0.722 1

0.0533 1.113 1

0.0566 0.353 1

0.06 0.34 1

0.0666 0.479 1

0.07 0.829 1

0.0733 0.753 1

0.0766 0.365 1

0.08 0.145 1

0.0833 0.268 1

0.0866 0.51 1

0.09 0.605 1

0.0933 0.479 1

0.0966 0.324 1

0.1 0.296 1

0.1033 0.391 1

0.1066 0.479 1

0.11 0.469 1

0.1133 0.397 1

0.1166 0.35 1

0.12 0.368 1

0.1233	0.416	1
0.1266	0.435	1
0.13	0.413	1
0.1333	0.378	1
0.1366	0.372	1
0.14	0.391	1
0.1433	0.409	1
0.1466	0.406	1
0.15	0.391	1
0.1533	0.381	1
0.1566	0.384	1
0.16	0.394	1
0.1633	0.397	1
0.1666	0.391	1
0.17	0.384	1
0.1733	0.384	1
0.1766	0.387	1
0.18	0.391	1
0.1833	0.391	1
0.1866	0.387	1
0.19	0.384	1
0.1933	0.384	1
0.1966	0.384	1
0.2	0.384	1
0.2033	0.384	1
0.2066	0.381	1
0.21	0.381	1
0.2133	0.384	1
0.2166	0.384	1
0.22	0.384	1
0.2233	0.381	1
0.2266	0.381	1
0.23	0.381	1
0.2333	0.381	1
0.2366	0.381	1
0.24	0.381	1
0.2433	0.381	1
0.2466	0.381	1
0.25	0.381	1
0.2533	0.381	1
0.2566	0.381	1
0.26	0.378	1
0.2633	0.378	1
0.28	0.378	1
0.2966	0.378	1
0.3133	0.375	1
0.33	0.375	1
0.3466	0.375	1
0.3633	0.375	1
0.38	0.372	1
0.3966	0.372	1
0.4133	0.372	1
0.43	0.368	1
0.4466	0.368	1
0.4633	0.368	1
0.48	0.368	1
0.4966	0.365	1
0.5133	0.365	1
0.53	0.365	1
0.5466	0.365	1

0.5633	0.365	1
0.58	0.365	1
0.5966	0.362	1
0.6133	0.362	1
0.63	0.362	1
0.6466	0.362	1
0.6633	0.362	1
0.68	0.359	1
0.6966	0.359	1
0.7133	0.359	1
0.73	0.359	1
0.7466	0.359	1
0.7633	0.356	1
0.78	0.356	1
0.7966	0.356	1
0.8133	0.356	1
0.83	0.356	1
0.8466	0.353	1
0.8633	0.353	1
0.88	0.353	1
0.8966	0.353	1
0.9133	0.353	1
0.93	0.35	1
1.13	0.343	1
1.33	0.337	1
1.53	0.334	1
1.73	0.327	1
1.93	0.321	1
2.13	0.318	1
2.33	0.315	1
2.53	0.309	1
2.73	0.305	1
2.93	0.302	1
3.13	0.299	1
3.33	0.296	1
3.53	0.293	1
3.73	0.29	1
3.93	0.286	1
4.13	0.283	1
4.33	0.28	1
4.53	0.277	1
4.73	0.274	1
4.93	0.274	1
5.13	0.271	1
5.33	0.268	1
5.53	0.268	1
5.73	0.264	1
5.93	0.261	1
6.13	0.261	1
6.33	0.258	1
6.53	0.255	1
6.73	0.255	1
6.93	0.252	1
7.13	0.249	1
7.33	0.249	1
7.53	0.245	1
7.73	0.245	1
7.93	0.242	1
8.13	0.239	1
8.33	0.239	1

8.53	0.236	1
8.73	0.236	1
8.93	0.236	1
9.3	0.233	1
3	0.23	1
53	0.23	1
9.73	0.23	1
9.93	0.227	1
11.93	0.211	1
13.93	0.198	1
15.93	0.186	1
17.93	0.176	1
19.93	0.167	1
21.93	0.157	1
23.93	0.151	1
25.93	0.141	1
27.93	0.135	1
29.93	0.126	1
31.93	0.123	1
33.93	0.113	1
35.93	0.11	1
37.93	0.104	1
39.93	0.1	1
41.93	0.094	1
43.93	0.091	1
45.93	0.085	1
47.93	0.082	1
49.93	0.078	1
51.93	0.075	1
93	0.069	1
93	0.066	1
57.93	0.063	1
59.93	0.059	1
61.93	0.059	1
63.93	0.053	1
65.93	0.053	1
67.93	0.05	1
69.93	0.047	1
71.93	0.047	1
73.93	0.041	1
75.93	0.041	1
77.93	0.037	1
79.93	0.034	1
81.93	0.034	1
83.93	0.031	1
85.93	0.028	1
87.93	0.028	1
89.93	0.025	1
91.93	0.025	1
93.93	0.022	1
95.93	0.022	1
97.93	0.018	1
99.93	0.018	1
109.93	0.009	1
109.93	0.003	1

d>

Rising Head Test N12G04LS

compy

EnSafe Inc.

r jno

6-001

ient

NSAMEM

locsit

Millington, Tennessee

tstdat

2/10/98

units

1

0

0

slugt5

1.3

0.083

0.3333

8.43

8.43

8.43

0

1

205

0.0033 0.171 1

0.0066 0.309 1

0.01 0.986 1

0.0133 0.737 1

2 0.108 1

.233 1.037 1

.0266 0.933 1

0.03 0.545 1

0.0333 0.438 1

0.0366 1.339 1

0.04 1.878 1

0.0433 1.27 1

0.0466 0.838 1

0.05 1.273 1

0.0533 1.528 1

0.0566 1.185 1

0.06 0.964 1

0.0633 1.185 1

0.0666 1.308 1

0.07 1.116 1

0.0733 0.993 1

0.0766 1.1 1

0.08 1.166 1

0.0833 1.056 1

0.0866 0.98 1

0.09 1.027 1

0.0933 1.052 1

0.0966 0.996 1

0.1 0.945 1

.033 0.961 1

.066 0.97 1

.1 0.936 1

0.1133 0.901 1

0.1166 0.901 1

0.12 0.901 1

0.1233	0.879	1
0.1266	0.854	1
0.13	0.848	1
0.1333	0.841	1
0.1366	0.829	1
0.14	0.81	1
0.1433	0.797	1
0.1466	0.791	1
0.15	0.778	1
0.1533	0.766	1
0.1566	0.753	1
0.16	0.744	1
0.1633	0.734	1
0.1666	0.725	1
0.17	0.712	1
0.1733	0.703	1
0.1766	0.696	1
0.18	0.687	1
0.1833	0.677	1
0.1866	0.668	1
0.19	0.658	1
0.1933	0.652	1
0.1966	0.643	1
0.2	0.636	1
0.2033	0.627	1
0.2066	0.621	1
0.21	0.614	1
0.2133	0.608	1
0.2166	0.602	1
0.22	0.595	1
0.2233	0.589	1
0.2266	0.583	1
0.23	0.58	1
0.2333	0.573	1
0.2366	0.57	1
0.24	0.564	1
0.2433	0.561	1
0.2466	0.554	1
0.25	0.551	1
0.2533	0.548	1
0.2566	0.542	1
0.26	0.539	1
0.2633	0.535	1
0.2666	0.532	1
0.27	0.529	1
0.2733	0.526	1
0.2766	0.523	1
0.28	0.52	1
0.2833	0.517	1
0.2866	0.513	1
0.29	0.513	1
0.2933	0.51	1
0.2966	0.507	1
0.3	0.507	1
0.3033	0.504	1
0.3066	0.501	1
0.31	0.501	1
0.3133	0.498	1
0.3166	0.498	1
0.32	0.494	1

0.3233	0.491	1
0.3266	0.491	1
0.33	0.488	1
0.333	0.488	1
	0.479	1
0.3666	0.472	1
0.3833	0.466	1
0.4	0.463	1
0.4166	0.457	1
0.4333	0.45	1
0.45	0.447	1
0.4666	0.444	1
0.4833	0.438	1
0.5	0.435	1
0.5166	0.431	1
0.5333	0.431	1
0.55	0.428	1
0.5666	0.425	1
0.5833	0.422	1
0.6	0.419	1
0.6166	0.416	1
0.6333	0.416	1
0.65	0.413	1
0.6666	0.409	1
0.6833	0.406	1
0.7	0.406	1
0.7166	0.403	1
0.7333	0.403	1
0.75	0.4	1
0.7666	0.4	1
0.7833	0.397	1
0.8	0.397	1
0.8166	0.394	1
0.8333	0.394	1
0.85	0.39	1
0.8666	0.39	1
0.8833	0.387	1
0.9	0.387	1
0.9166	0.387	1
0.9333	0.384	1
0.95	0.384	1
0.9666	0.384	1
0.9833	0.381	1
1	0.381	1
1.2	0.372	1
1.4	0.363	1
1.6	0.354	1
1.8	0.347	1
2	0.341	1
2.2	0.335	1
2.4	0.328	1
2.6	0.325	1
2.8	0.322	1
3	0.316	1
3	0.313	1
	0.309	1
	0.306	1
3.8	0.3	1
4	0.297	1
4.2	0.294	1

4.4	0.29	1
4.6	0.287	1
4.8	0.284	1
F	0.281	1
	0.278	1
*	0.275	1
5.6	0.272	1
5.8	0.268	1
6	0.265	1
6.2	0.265	1
6.4	0.262	1
6.6	0.259	1
6.8	0.256	1
7	0.253	1
7.2	0.253	1
7.4	0.249	1
7.6	0.246	1
7.8	0.243	1
8	0.243	1
8.2	0.24	1
8.4	0.237	1
8.6	0.237	1
8.8	0.234	1
9	0.231	1
9.2	0.231	1
9.4	0.227	1
9.6	0.227	1
9.8	0.221	1
10	0.221	1
	0.202	1
	0.186	1
12	0.171	1
18	0.158	1
20	0.145	1
22	0.133	1
24	0.12	1
26	0.108	1
28	0.098	1
30	0.089	1
32	0.079	1
34	0.07	1
36	0.06	1
38	0.054	1
40	0.048	1
42	0.038	1
44	0.032	1
46	0.026	1
48	0.016	1
50	0.01	1
52	0.004	1

<end>

**Appendix D**  
**Site Ranking Form**

## UST SITE RANKING FORM

Facility ID Number: \_\_\_\_\_ - N/A \_\_\_\_\_

Facility Name: Facility N-12

Facility Address: Naval Support Activity Memphis

Date Ranking Form completed: 4/3/98

### Geologic and Hydrogeologic Factors

1	<b>Minimum depth to the water table</b>		
	< 5.0 Feet		50
	5.1 to 10.0 Feet		45
	10.1 to 15.0 Feet		40
	15.1 to 30.0 Feet		35
	30.1 to 50.0 Feet		25
	50.1 to 75.0 Feet		15
	75.1 to 100.0 Feet		10
	> 100.0 Feet		5
Document, date, and page number where information can be verified: Contamination Assessment Report 4/3/98 25		<b>Score</b>	45
2	<b>Minimum distance between water table and contaminated soil</b>		
	< 5.0 Feet		50
	5.1 to 10.0 Feet		45
	10.1 to 15.0 Feet		40
	15.1 to 30.0 Feet		35
	30.1 to 50.0 Feet		25
	50.1 to 75.0 Feet		15
	75.1 to 100.0 Feet		10
	> 100.0 Feet		5
	No soil contamination		0
Document, date, and page number where information can be verified: Contamination Assessment Report 4/3/98 20		<b>Score</b>	50
3	<b>Soil permeability</b>		
	Undetermined		30
	> 10 <sup>-4</sup> cm/sec		30
	10 <sup>-4</sup> to 10 <sup>-6</sup> cm/sec		20
	< 10 <sup>-6</sup> cm/sec		10
Document, date, and page number where information can be verified: Contamination Assessment Report 4/3/98 21		<b>Score</b>	20
4	<b>Calculated ground water flow rate</b>		
	< 10 feet/day		3
	10 to 40 feet/day		6
	40 to 90 feet/day		12
	90 to 130 feet/day		18
	130 to 260 feet/day		24
	> 260 feet/day		30
	Karst		30
Document, date, and page number where information can be verified: Contamination Assessment Report 4/3/98 32		<b>Score</b>	3

**Receptor Factors**

5	Basements/Crawl Spaces/Utility Vaults		
	<50 feet from known contamination	150	
	50.1 to 100.0 feet from known contamination	75	
	100.1 to 200.0 feet from known contamination	50	
	200.1 to 300.0 feet from known contamination	25	
	>300.1 feet from known contamination	0	
Document, date, and page number where information can be verified:		Score	0
Contamination Assessment Report 4/3/98 pages 2-11			
6	Sanitary sewer mains and service lines		
	<50 feet from known contamination	75	
	50.1 to 100.0 feet from known contamination	40	
	100.1 to 200.0 feet from known contamination	20	
	200.1 to 300.0 feet from known contamination	10	
	>300.1 feet from known contamination	0	
Document, date, and page number where information can be verified:		Score	75
Contamination Assessment Report 4/3/98 page 9			
7	Storm water sewers		
	<50 feet from known contamination	50	
	50.1 to 100.0 feet from known contamination	30	
	100.1 to 200.0 feet from known contamination	10	
	200.1 to 300.0 feet from known contamination	5	
	>300.1 feet from known contamination	0	
Document, date and page number where information can be verified:		Score	50
Contamination Assessment Report 4/3/98 page 7			
8	Other subsurface utilities (i.e. natural gas, water, electric, telephone, etc.)		
	<50 feet from known contamination	75	
	50.1 to 100.0 feet from known contamination	40	
	100.1 to 200.0 feet from known contamination	20	
	200.1 to 300.0 feet from known contamination	10	
	>300.1 feet from known contamination	0	
Document, date, and page number where information can be verified:		Score	75
Contamination Assessment Report 4/3/98 page 8, 6,10, 2			
9	Public water supply source		
	<0.1 mile	300	
	0.1 to 0.25 mile	200	
	0.25 to 0.5 mile	100	
	>0.51 mile	0	
Document, date, and page number where information can be verified:		Score	0
Contamination Assessment Report 4/3/98 page 39 and 45			
10	Private water supply source		
	<0.1 mile	200	
	0.1 to 0.25 mile	150	
	0.25 to 0.5 mile	100	
	>0.51 mile	0	
Document, date, and page number where information can be verified:		Score	0
Contamination Assessment Report 4/3/98 page 39			
11	Distance to surface water		
	<0.1 mile	25	
	0.1 to 0.25 mile	15	
	0.25 to 0.5 mile	10	
	>0.51 mile	0	
Document, date, and page number where information can be verified:		Score	0
Contamination Assessment Report 4/3/98 page 11			

# Contaminant Factors

Table 1

Contaminant Concentrations	A. Max Contam. Levels	B. App. Cleanup Levels	C. Cont. Conc. Ratio A/B
Benzene in ground water	150	70	2.14
TPH in ground water	.72	1	0.72
Benzene in soil	825	50,000	0.016
TPH in soil	95.1	500	0.19

Document, date, and page numbers where information can be verified:

12	Benzene in ground water		
	< 1.0		0
	1.1 to 10.0		25
	10.1 to 50.0		50
	50.1 to 100.0		100
	100.1 to 500.0		200
	> 500.1		300
	Score		25
13	TPH in ground water		
	< 1.0		0
	1.1 to 10.0		20
	10.1 to 50.0		40
	50.1 to 100.0		80
	100.1 to 500.0		120
	> 500.1		200
	Score		0
14	Benzene in soil		
	< 1.0		0
	1.1 to 5.0		25
	5.1 to 10.0		50
	10.1 to 50.0		100
	>50.1		200
	Score		0
15	TPH in soil		
	< 1.0		0
	1.1 to 5.0		20
	5.1 to 10.0		40
	10.1 to 50.0		80
	>50.1		100
	Score		0
16	Total site score		343