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VOLUNTARY CORRECTIVE ACTION WORK PLAN RESOURCE CONSERVATION RECOVERY ACT FACILITY INVESTIGATION FOR PETROLEUM CONTAMINATED SOIL REMOVAL BUILDINGS MILLINGTON SUPPACT TN
6/9/1999
ENSAFE INC

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VOLUNTARY CORRECTIVE ACTION WORK PLAN
RCRA FACILITY INVESTIGATION
NAVAL SUPPORT ACTIVITY MID-SOUTH

PETROLEUM CONTAMINATED SOIL REMOVAL BUILDINGS S-362/SWMU 65, S-235, S-394, N-114/ SWMU 24, N-1211, N-105, N-108, S-203, SWMU 41, SWMU 43, SWMU 47, SWMU 48, AND SWMU 49

Revision: 2

CTO-0106

Prepared for:

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

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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 are complete, accurate, and comply with all requirements of the contract.

Date: June 9, 1999
Signature: _____
Name: Robert Smith
Title: Task Order Manager

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Acronyms and Abbreviations

AST	Aboveground storage tank
BCT	BRAC Cleanup Team
BEQ	Benzo(a)pyrene Equivalents
bls	Below land surface
BOS	Base Operation Services
BRAC	Base Closure and Realignment Act of 1990
BTX	Benzene, toluene, and xylenes
CHSP	Comprehensive Health and Safety Plan
cm/sec	Centimeters per second
CSI	Confirmatory Sampling Investigation
DA	Deep alluvium
DI	Deionized
DOT	Department of Transportation
DPT	Direct push technology
DQO	Data Quality Objectives
DRMO	Defense Reutilization Marketing Office
DRO	Diesel range organics
DSW	Division of Solid Waste
DUST	Department of Underground Storage Tanks
E/A&H	EnSafe/Allen & Hoshall
EBS	Environmental Baseline Study
EM	Electromagnetic
ERNA	Environmental Restoration Navy Account
FSA	Full Scan Analysis
GRO	Gasoline range organics
IDW	Investigation-derived waste
IR	Infrared
MCL	Maximum contaminant levels
µg/kg	Micrograms per kilogram
µg/L	Micrograms per liter
mg/kg	Milligrams per kilogram
MWR	Morale, Welfare, and Recreation
NAS	Naval Air Station
NET	National Environmental Testing
NSA	Naval Support Activity
OSWER	Office of Solid Waste and Emergency Response
PCB	Polychlorinated biphenyl
POLs	Petroleum, oil, and lubricants
POTW	Publicly Owned Treatment Works
PPE	Personal Protective Equipment
PRE	Preliminary Risk Evaluation
PWD	Public Works Division
QA/QC	Quality assurance/quality control

RBC	Risk-based concentration
RC	Reference concentration
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SSHSP	Site Specific Health and Safety Plan
SSL	Soil Screening Level
SSO	Site Safety Officer
SVOCs	Semivolatile Organic Compounds
SWMU	Solid Waste Management Unit
TCLP	Toxicity Characteristic Leaching Procedure
TDEC	Tennessee Department of Environment and Conservation
TPH	Total Petroleum Hydrocarbons
UA	Upper alluvium
USEPA	United States Environmental Protection Agency
UST	Underground storage tank
VCA	Voluntary Corrective Action
VOCs	Volatile Organic Compounds
yd^3	Cubic Yards

1.0 INTRODUCTION

As part of the U.S. Navy Installation Restoration Program, the following Voluntary Corrective Action (VCA) Work Plan has been prepared by EnSafe for the removal of soil primarily contaminated with petroleum at Building S-362 Training Mock-up Site [Solid Waste Management Unit (SWMU) 65], Building S-235, Facility S-394 Maintenance Shop, Facility N-114/SWMU 24 Auto Hobby Shop, Facility N-1211 Moral, Welfare, and Recreation Department golf course maintenance storage area, Facility N-105 Quonset Hut, Facility N-108 Maintenance Shop, Facility S-203 Storage Quonset Hut, SWMU 41 Salvage Yard No. 2, SWMU 43 Former Hazardous Waste Accumulation Point, SWMU 47 Former Hazardous Waste Accumulation Point, SWMU 48 Hazardous Waste Accumulation Points, and SWMU 49 Navy Exchange Service Station at Naval Support Activity (NAVSUPPACT or NSA) Mid-South, Millington, Tennessee (Figure 1.1). As a result of the closure of Naval Air Station (NAS) Memphis and its realignment as a Naval Support Activity, there have been several name changes at NSA Mid-South. Before October 1, 1995, the installation operated as NAS Memphis. From October 1, 1995, to October 1, 1998, NSA Mid-South was known as NSA Memphis. As part of the realignment, alphanumeric street names (e.g., 1st Avenue or E Street) were changed in 1998, and are referenced in parentheses following the first use of current street names.

The goal of the VCA is to remove and dispose of any petroleum-related contaminated soil in these areas, specifically where the Tennessee Department of Environment and Conservation (TDEC) site-cleanup level of 100 milligrams per kilogram (mg/kg) total petroleum hydrocarbons (TPH) was exceeded in surface-soil samples and areas where metals in soil exceeded acceptable risk levels. As requested by the PWD Env. Div., soil exceeding the TDEC cleanup level of 100 mg/kg at these sites will be removed down to a depth of 5 feet or until a concentration of TPH equal to or less than 100 mg/kg is achieved.

The excavation and disposal will adhere to applicable federal, state, and local laws and regulations. The primary references for this VCA work plan are the *Comprehensive Resource*

Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Work Plan (E/A&H, October 1994), the *Assembly E RCRA Facility Investigation (RFI) Report* (EnSafe, February 2, 1998), the *Assemblies G and H Confirmatory Site Investigation Report* (EnSafe, May 29, 1998), and the *Environmental Restoration Navy Account (ERNA) Gray Areas Investigation Report* (EnSafe, May 13, 1999).

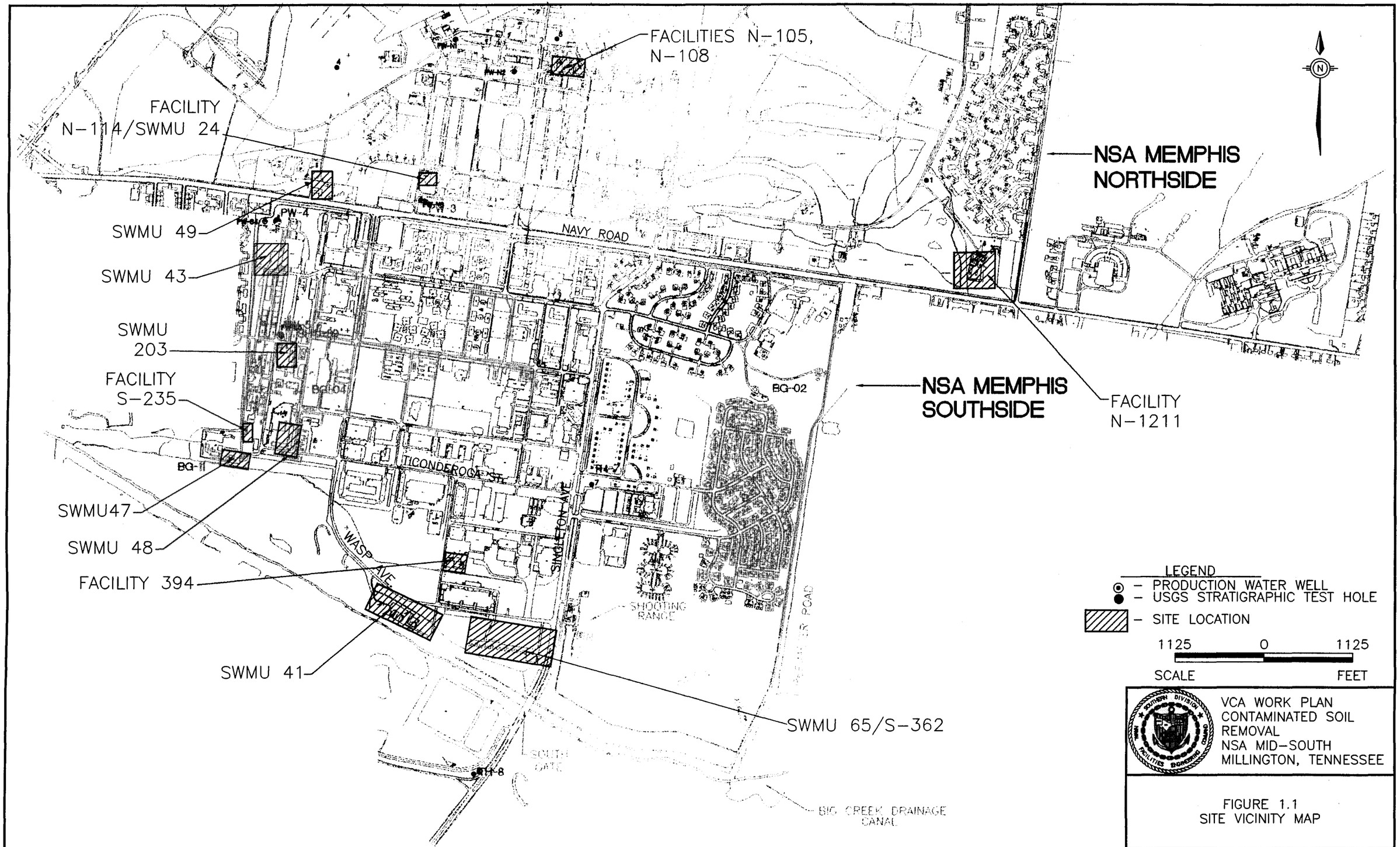
The primary objectives of this VCA are to:

- Excavate all soil in which petroleum and metals contamination exceeds acceptable risk levels and/or the TDEC site-specific cleanup level for petroleum, as identified in the *Assembly E RFI Report* (EnSafe, February 1998) and in the *ERNA Gray Areas Investigation Report* (EnSafe, May 1999).

- Confirm that remaining petroleum and metal concentrations in soil are less than the action levels.

- Properly dispose of excavated soil and return removal areas to pre-removal conditions.

Each section addressing site-specific removal needs is written as an independent VCA document for field purposes; therefore, information about preremoval activities, removal activities, post removal activities, and analytical requirements is repeated for each SWMU or facility.



LEGEND

- ⊙ – PRODUCTION WATER WELL
- ● – USGS STRATIGRAPHIC TEST HOLE
- ▨ – SITE LOCATION

1125 0 1125

SCALE FEET

VCA WORK PLAN
CONTAMINATED SOIL REMOVAL
NSA MID-SOUTH
MILLINGTON, TENNESSEE

FIGURE 1.1
SITE VICINITY MAP

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2.0 APPLICABLE CLEANUP LEVELS

2.1 Total Petroleum Hydrocarbons

TDEC soil-cleanup values from the memorandum *Policy Statement for Petroleum Contaminated Sites* (TDEC, 1997) were used for comparison, because no risk-based concentration (RBC) or soil screening level (SSL) values exist for total petroleum hydrocarbons (TPH) or TPH-gasoline range organics (GRO)/diesel range organics (DRO). TDEC has established three cleanup concentrations for TPH depending on soil permeability and aquifer classification: 100 mg/kg, 500 mg/kg, and 1,000 mg/kg. Initially, the TDEC cleanup level of 500 mg/kg for total TPH in nondrinking water aquifers [(i.e., the upper alluvium) with soil permeabilities ranging from 10^{-4} to 10^{-6} centimeters per second (cm/sec) (TDEC 1997)] was compared to total TPH concentrations in surface and subsurface soil. This cleanup level was chosen because 1.84E-6 cm/sec, a value representing the average soil permeability from 20 samples across the base, was used as the default for sites lacking permeability data (Appendix A); however, as requested by the PWD Env. Div., soil exceeding the TDEC cleanup level of 100 mg/kg at these sites will be removed down to a depth of 5 feet or until a concentration of TPH no more than 100 mg/kg is achieved. Currently, there are no permeability data for most of the removal sites addressed in this report; however, soil permeability for SWMU 65 was established to be 4.80E-6 cm/sec [see Appendix C of the *Assembly E RFI Report* (EnSafe, February 1998)], which sets the cleanup standard at 500 mg/kg. Soil at the designated excavation sites will be removed until TPH soil-screening concentrations indicates that remaining soil does not exceed the requested 100 mg/kg cleanup level, or below 5 feet, the site-specific TDEC cleanup level.

2.2 Metals

Lead is evaluated with respect to concentrations in the blood versus an established exposure percentage. The established standards for lead include a background reference concentration (RC) of 26.0 mg/kg for NSA Mid-South as described in *Reference Concentrations Technical Memorandum* (E/A&H, 1996) and the soil lead action level of 400 mg/kg established by the U.S. Environmental Protection Agency (USEPA) Office of Solid Waste and Emergency Response

(OSWER) in Directive 9355.4-12. The established standards for arsenic, cadmium, chromium, and copper are listed in Table 2.1.

Table 2.1
Standard Reference Values for Inorganic Constituents of Concern in mg/kg

Inorganic Constituent	RC	Industrial RBC	Residential RBC
Arsenic	14.7	3.8	0.43
Cadmium	1.54	100	3.9
Chromium	23.9	610	23
Copper	24.2	8,200	310

Results from the VCA confirmatory samples will be compared to these standards. If a detection exceeds both the RC and the industrial or residential RBCs, then risk will be assessed after excavation is complete to determine if the removal site still poses excess risk.

3.0 SITE-SPECIFIC REMOVAL ACTIVITIES

3.1 SWMU 65 Building S-362 Training Mock-up Site

3.1.1 Site Description

SWMU 65 is on the Southside of NSA Mid-South (Figure 1.1) and is part of Assembly E, one of eight SWMU assemblies defined for the NSA Mid-South RCRA Corrective Action Program. Assembly E is made up of six SWMUs (2, 9, 14, 38, 59, and 65) requiring full RFI characterization on the realigning portion of NSA Mid-South.

The Building S-362 Training Mock-Up Site (SWMU 65) was used from the early 1950s to approximately 1996 to train personnel in aircraft startup. SWMU 65 includes S-362, a concrete pad mock-up area with spaces for approximately 15 planes; Building S-1503, a wood storage shelter; Building S-346, the former engine test cell building (demolished 1999); and the surrounding grass-covered area. Various aircraft were parked on the concrete pads west of Building S-362 until 1996. Currently, the area is used by the U.S. Army Reserve to store vehicles.

SWMU 65 is bounded by the Big Creek Drainage Canal on the south and Singleton Avenue (formerly 7th Avenue) on the east. A broad grassy area and levee separate the concrete pads from Big Creek Drainage Canal. SWMU 65 topography slopes gently south toward the levee. Storm-water runoff from the concrete pads flows across the grassy area into a linear drainage depression on the south side of the site. An additional drainage depression bisects the site, conveying water from its west and east sides to the southern drainage depression. Drainage from both linear depressions enters a north-south drainage depression at the southeast corner of the site, where it exits the SWMU and eventually enters the Big Creek Drainage Canal at an outlet near Singleton Avenue. Figure 1.1 shows the location of SWMU 65.

Initially, two areas of primary concern were addressed within SWMU 65. At the first area, a JP-5 jet fuel spill occurred in 1992 at the easternmost concrete airplane pad. At the second area,

according to NSA Mid-South personnel interviewed at the time of the November 1994 Environmental Baseline Survey (EBS), two 30,000-gallon underground storage tanks (USTs), formerly used to fuel the test cell, had been located north of Building S-346 until they were removed in 1984. No free product was observed in the excavated area, but a hydrocarbon odor and discolored soil were noted. Underground piping likely transported the jet fuel to the test cell, but this piping has not been located.

3.1.2 Previous Investigations/Findings

The following sections describe the previous investigation results pertinent to this VCA work plan.

Spill Investigation

JP-5 Release Investigations (1992)

The first investigation was conducted in response to a 25-gallon jet propulsion fuel #5 (JP-5) release on April 28, 1992. On May 4, 1992, Navy personnel excavated the soil in the JP-5 spill area near the easternmost concrete airplane pad, collected four surface and subsurface-soil samples, then backfilled the area with the excavated material. The samples were submitted to a laboratory for TPH analysis. Analytical results indicated TPH concentrations ranging from 38,900 mg/kg at the surface to 5,090 mg/kg at a depth of approximately 6 feet below land surface (bls) near the spill area.

In October and November 1992, Memphis Environmental Center Inc. performed a second limited site investigation at SWMU 65 in response to the JP-5 spill (Figure 3.1.1). The investigation consisted of advancing four soil borings with a hollow-stem auger drill rig for soil sampling, and installing an upper alluvium groundwater monitoring well in each open borehole. Five additional soil borings were completed, three with a stainless-steel hand auger and two with the hollow-stem auger drill rig. Soil and groundwater samples were analyzed for TPH-GRO, TPH-DRO, and benzene, toluene, and xylene (BTX). Appendix A of the *Final Assembly E Site Investigation*

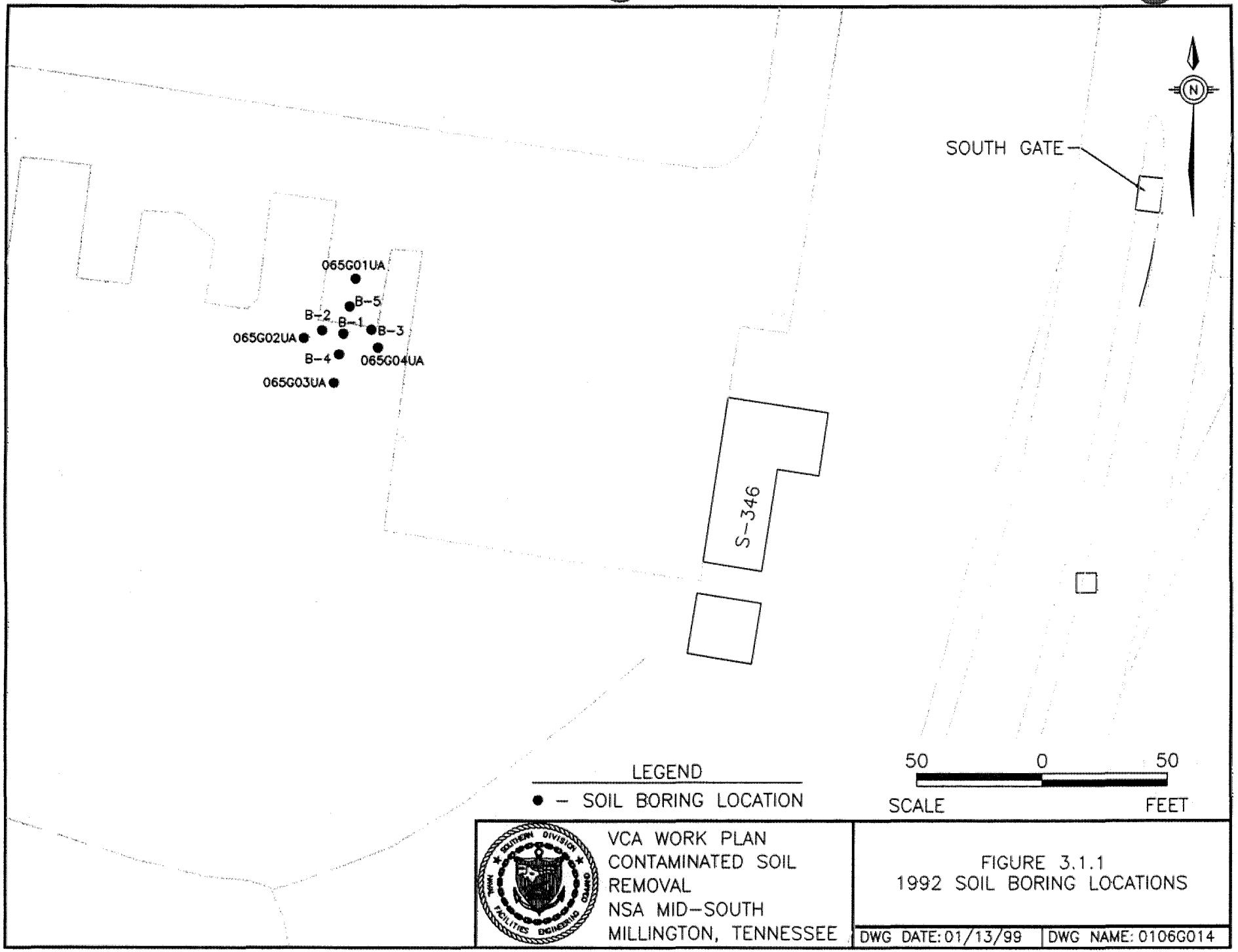

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FIGURE 3.1.1
1992 SOIL BORING LOCATIONS

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Plans (EnSafe/Allen & Hoshall [E/A&H] 1995), contains a copy of the *Site Investigation Report* (Memphis Environmental Center, 1992).

In summary, total TPH in soil, obtained by adding the GRO and DRO fractions, ranged from nondetect to 7,930 mg/kg. Most total TPH in the soil samples consisted of the TPH-DRO fraction, with concentrations increasing with depth in seven of the nine soil borings. The sum of BTX constituents in soil samples ranged from nondetect to 28.0 mg/kg. Most total BTX in the samples consisted of xylene. Table 3.1.1 summarizes the analytical results.

Table 3.1.1
Analytical Summary of Soil Samples — 1992 Site Investigation (mg/kg)

Sample Location	Depth (feet bls)	TPH-GRO[a]	TPH-DRO[a]	Total TPH[b]	Benzene	Toluene	Xylenes	Total BTX[c]
065G01UA[d]	1 - 3	49.3	2,820	2,869.3	ND	2.44	23.5	25.94
	3 - 5	34.1	801	835.1	ND	ND	3.45	3.45
065G02UA[d]	0 - 2	ND[e]	ND	ND	ND	ND	ND	ND
	4 - 6	ND	263	263	ND	ND	ND	ND
065G03UA[d]	0 - 2	ND	ND	ND	ND	ND	ND	ND
	4 - 6	102	595	697	ND	ND	11.2	11.2
065G04UA[d]	0 - 2	ND	ND	ND	ND	ND	ND	ND
	4 - 6	15.2	479	494.2	ND	ND	5.06	5.06
B-1	1 - 2	ND	7,930	7,930	ND	ND	2.06	2.06
	3 - 4	10.3	2,060	2,070.3	ND	ND	1.29	1.29
	4 - 5	18.4	5,160	5,178.4	ND	ND	5.19	5.19
B-2	0 - 1	ND	1,940	1,940	ND	ND	ND	ND
	1 - 2	ND	4,200	4,200	ND	ND	0.61	0.61
	4 - 5	23.1	2,450	2,473.1	ND	ND	2.69	2.69
B-3	2 - 4	ND	259	259	ND	ND	0.38	0.38
	4 - 6	37.8	670	707.8	ND	ND	6.91	6.91
B-4	0 - 2	ND	187	187	ND	ND	ND	ND
	4 - 6	19.2	939	958.2	ND	ND	4.54	4.54
B-5	1 - 2	10.8	189	199.8	ND	0.42	2.30	2.72
	4 - 5	118	3,810	3,928	ND	0.80	27.2	28.0

Notes:

a — TPH-GRO and TPH-DRO refer to total petroleum hydrocarbons — gasoline range organics and diesel range organics, respectively. TPH was analyzed using the TN Modified 8015 Method.
b — Total TPH refers to the sum of TPH-GRO and TPH-DRO concentrations.
c — Total BTX refers to the sum of benzene, toluene, and xylene concentrations. BTX was analyzed using SW-846 Method 8020.
d — The soil boring/monitoring well sample designations have been revised to reflect the current monitoring well identification system at NSA Mid-South. 065G01UA, 065G02UA, 065G03UA, and 065G04UA are the revised designations for MW-1, MW-2, MW-3, and MW-4, respectively.
e — ND = parameter not detected.
mg/kg — Milligrams per kilogram.

UST Investigation

Geophysical Survey (1995)

On July 18, 1995, E/A&H performed an electromagnetic (EM) geophysical survey at SWMU 65 to verify the former location of the two USTs used to fuel the engine test cell at Building S-346. The EM-31 survey included a conductivity survey and an in-phase (metal detection) survey. Geophysical anomalies from disturbed soil or metal objects were plotted on a map and compared to as-built engineering drawings obtained from the NSA Mid-South Public Works Department Environmental Division (PWD Env. Div.). The conductivity survey identified a significant anomaly corresponding to the former location of the USTs. This anomaly was not identified by the in-phase survey, indicating that the USTs had been removed. A strong, localized anomaly was identified along the southeastern boundary of the surveyed area. Although its source was not specifically determined, it may represent an area of disturbed soil corresponding to the tank removal. Two additional linear anomalies may represent buried utility lines. One anomaly bisected the survey area, and the second ran along the east side of the surveyed area. Attachment 5 of the *Final Assembly E Site Investigation Plans* (E/A&H, 1995) contains the *Geophysical Survey Report — SWMUs 14, 36, and 65, Naval Air Station Memphis* (E/A&H, 1995), which includes the geophysical data package for SWMU 65.

RFI Characterization (1998)

RFI characterization focused on the nature and extent of contamination in the following media:

- Surface and subsurface soil near the existing monitoring wells and the former UST area
- Groundwater in the upper and deep alluvium
- Sediment in the two linear drainage depressions

DPT Soil and Groundwater Samples

Prior to installing soil borings and monitoring wells as part of the RFI, a preliminary soil and groundwater screening investigation was conducted using direct push technology (DPT) operated by InSitu Technologies Inc. of Traveler's Rest, South Carolina (Figure 3.1.2). DPT screening results were used to determine the optimum locations and depths of the soil borings and monitoring wells. Based on the anticipated site constituents and sample analytical volume limitations, TPH-GRO and TPH-DRO were selected as indicator parameters for DPT soil samples, and volatile organic compounds (VOCs) as the indicator parameter for groundwater samples. The DPT investigation focused on the following areas:

- The JP-5 spill area and existing monitoring wells (065G01UA through 065G04UA) where petroleum hydrocarbon contamination was detected in the 1992 site investigation

- The former UST area, where a hydrocarbon odor was noted during removal of the USTs in 1984

- South of each concrete pad, where petroleum hydrocarbons would accumulate if spilled during airplane refueling and maintenance.

TPH-GRO and TPH-DRO were detected in many surface and subsurface-soil samples collected during the DPT investigation, but only TPH-GRO was detected in soil samples. The USEPA has established no RBC or SSL for TPH. Initially, the TDEC cleanup level of 500 mg/kg has been compared to total TPH concentrations in surface and subsurface soil from both DPT screening and soil sample locations. The 500 mg/kg cleanup level is for total TPH in nondrinking water aquifers [(i.e., the upper alluvium) with soil permeabilities ranging from 10^{-4} to 10^{-6} cm/sec (TDEC 1997)]. As requested by the PWD Env. Div., soil exceeding the TDEC cleanup level of 100 mg/kg at these sites will be removed down to a depth of 5 feet or until a concentration of TPH no more than 100 mg/kg is achieved. Below 5 feet, the site specific cleanup level of

500 mg/kg will apply. As shown in Table 3.1.2, the 500 mg/kg cleanup level for total TPH was exceeded only in the 5- to 7-foot interval sample from DPT soil location 065S0022 (910 mg/kg; Figure 3.1.2).

Table 3.1.2
Detected Concentrations of TPH-GRO and TPH-DRO in DPT Soil Samples
SWMU 65 — Building S-362 Training Mock-Up Site
(data in mg/kg)

Analyte[a]	Interval (ft bls)[b]	Number of Detections[a]	Range[c]	Mean[d]	TDEC Cleanup Standard[e]	TDEC Cleanup Standard Exceedances
TPH - GRO	0 - 2	9/30	0.055 - 1.5	0.488	100	0
	5 - 7	11/30	0.054 - 260	29	500	0
TPH - DRO	0 - 2	13/30	4.3 - 310	35	100	1 (065S0009)
	5 - 7	7/30	8.4 - 650	154	500	1 (065S0022)
Total TPH[f]	0 - 2	17/30	0.055 - 310	27	100	1 (065S0009)
	5 - 7	11/30	0.064 - 910	127	500	1 (065S0022)

Notes:

a — Sixty soil samples were collected from 30 locations. Thirty samples were collected from 0 to 2 feet bls, and 29 samples were collected from 5 to 7 feet bls. One sample was collected from 7 to 9 feet bls (location 065S0023) due to poor sample recovery in the 5- to 7-foot interval. The samples were submitted to the offsite laboratory for TPH-GRO and TPH-DRO analysis by the Tennessee Modified 8015 Method.

b — Interval shown is in feet below land surface.

c — Range lower limit is the lowest detected analyte concentration.

d — Mean based on detected analyte concentrations only.

e — No USEPA risk-based concentration or soil screening level has been established for TPH; therefore, the TDEC soil cleanup level of 500 mg/kg total TPH for nondrinking water aquifers with a soil permeability of 10^{-4} to 10^{-6} is used for comparison for samples collected at a depth greater than 5 feet bls. As requested by the PWD Env. Div., the TDEC cleanup level of 100 mg/kg will be applied to soil down to a depth of 5 feet below land surface. The cleanup standard was obtained from the *Policy Statement for Petroleum Contaminated Sites* (TDEC Memorandum, February 14, 1997).

f — Total TPH refers to the sum of TPH-GRO and TPH-DRO.

bls — Below land surface.

Follow-Up Soil Sampling

In June 1997, EnSafe personnel collected an additional soil sample from the former spill area at SWMU 65 at the direction of the Base Closure and Realignment Act (BRAC) Cleanup Team (BCT) to reconfirm spill contaminants. One soil sample was collected from 3 to 4 feet bls (065S003104; Figure 3.1.2) to determine if soil TPH concentrations exceeded any of the TDEC clean-up levels (TDEC, 1997). Although the laboratory data reflected a TPH value of 320 mg/kg, a total TPH concentration of 707 mg/kg in this sample was obtained by adding the GRO and DRO

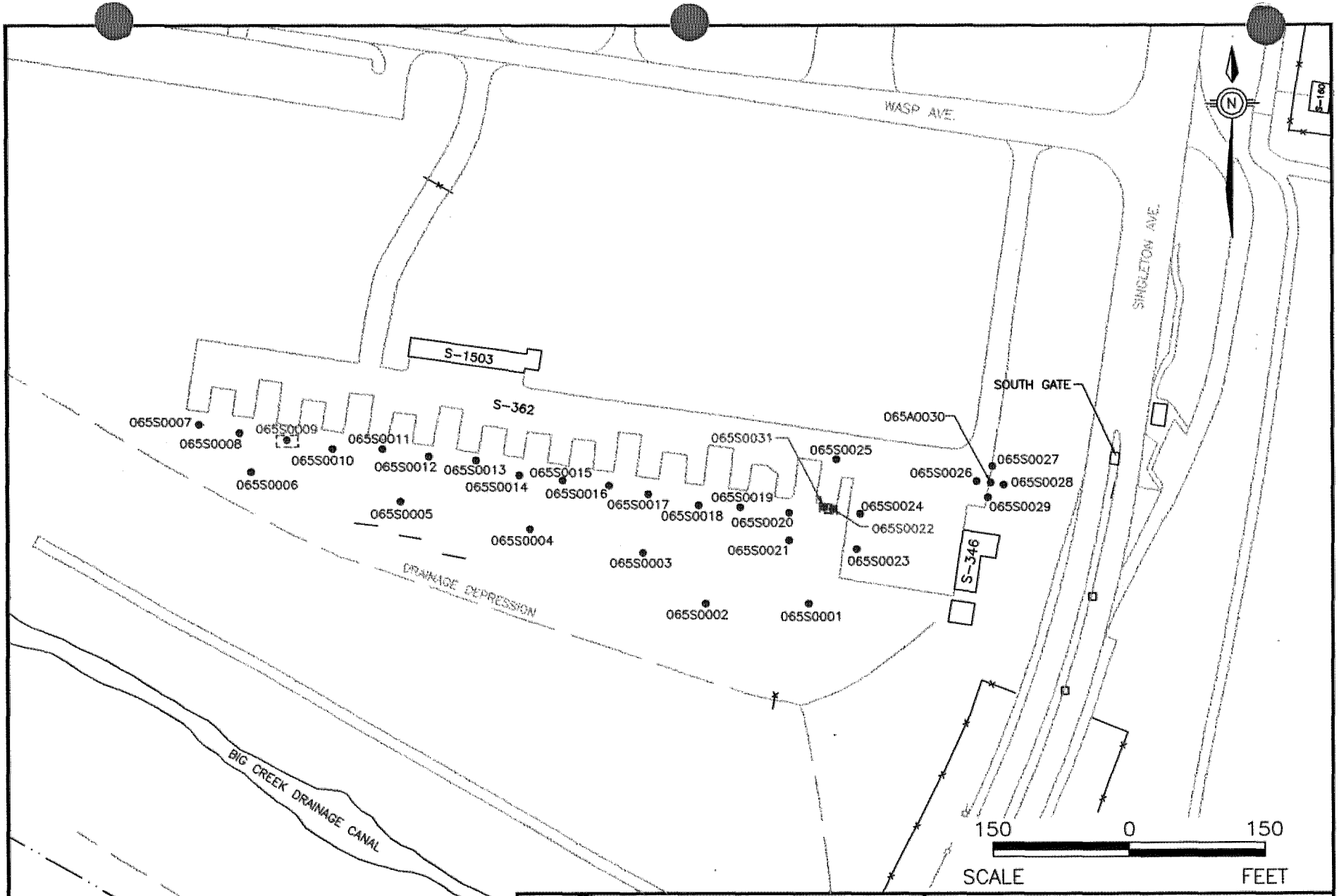

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FIGURE 3.1.2
BUILDING S-362/SWMU 65
GEOPROBE SAMPLE LOCATIONS
& REMOVAL LOCATION MAP

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fractions. The majority of total TPH in the sample consisted of the TPH-DRO fraction, with the concentration fractions in sample 065S003104 identified below:

- TPH (Method 418.1) at 320 mg/kg
- TPH-DRO (Tennessee Modified 8015 Method) at 700 mg/kg
- TPH-GRO (Tennessee Modified 8015 Method) at 7.3 mg/kg

3.1.3 Source Characterization

The spill area and the area around location 065S0009 has been identified as an area of primary concern during previous sampling events at SWMU 65:

- A concentration of 910 mg/kg total TPH was detected at 5 to 7 feet bls in soil boring 065S0022.

- A concentration of 707 mg/kg total TPH was detected at 3 to 4 feet bls in soil boring 065S0031.

- A concentration of 310 mg/kg total TPH was detected at 0 to 2 feet bls in soil boring 065S0009.

3.1.4 Removal Responsibilities

The following section outlines the actions to be conducted during the excavation of petroleum-contaminated soil at sample locations 065S0009, 065S0022, and 065S0031. The contractor will provide the equipment and personnel to excavate, stockpile, and dispose of the contaminated soil. EnSafe will assist the contractor as necessary, collect confirmation and soil-disposal samples, and report on removal activities in a VCA report. The following activities are further described in subsequent sections:

- EnSafe will plan field activities and schedule EnSafe personnel and equipment.

- EnSafe will review the following with the necessary personnel: the applicable portions of the *Comprehensive RFI Work Plan*, the *Comprehensive Health and Safety Plan* (CHSP) which is included as Appendix B, and the *Site-Specific Health and Safety Plan* (SSHSP) which is included as Appendix C.

- The contractor will coordinate the placement of contaminated-soil stockpiles with the NSA Mid-South PWD Env. Div. The contractor will place plastic on the ground surface before stockpiling soil in the designated areas.

- The contractor will excavate and stockpile all removed materials.

- EnSafe will provide sampling support during the removal activities.

- EnSafe will characterize any excavated soil in accordance with the TDEC Department of Underground Storage Tanks (DUST) and/or Division of Solid Waste (DSW) guidance.

- The contractor will backfill the excavated area with clean soil or other materials and cover the area with the equivalent of the original material. The contractor will use number 33C limestone in areas where vehicular traffic is possible, as specified by the NSA Mid-South PWD Env. Div.

- The contractor will cover the stockpile with plastic, install silt fencing, and maintain runoff control until the soil is properly disposed of. The contractor will coordinate disposal of soil and decontamination fluids resulting from field activities, including the preparation and filing of any special waste permits.

- The contractor will remove all construction materials.

- EnSafe will prepare a VCA report for the site.

3.1.5 Preremoval Activities

Activities to be conducted before removing the soil are discussed in the following sections.

Orientation Meeting

Before performing any field activities at SWMU 65, EnSafe personnel will hold an orientation meeting to review general and site-specific requirements for sampling and documentation. General discussion will include locations of the site field office, subject site, and designated decontamination areas. Sampling requirements to be discussed will include general sampling protocol, the sample-numbering system, quality assurance/quality control (QA/QC) sampling requirements, and sample packaging. Documentation requirements to be discussed will include the use of field forms, field logbooks, and photographic documentation.

The EnSafe Site Safety Officer (SSO) will review the CHSP and SSHSP (Appendices B and C) with EnSafe personnel before field activities begin. All EnSafe employees working onsite will be required to sign a form acknowledging that they are familiar with the plan and agree to abide by its guidelines. The SSHSP contains a copy of the compliance agreement form.

3.1.6 Removal Activities

Several activities will be conducted before and during soil removal. Specific tasks include soil excavation and soil screening. TDEC will be given at least two weeks notice by the NSA Mid-South PWD Env. Div. before any removal activities start.

Surface and Subsurface Soil Excavation

Two areas within the SWMU 65 complex will be excavated. One area of soil to be removed, which will encompass sample locations 065S0022 and 065S0031, is thought to be approximately 15 by 15 feet square and 10 feet deep at the spill area (Figure 3.1.1). Initially, 7 to 10 feet of soil will be excavated from the spill area, generating approximately 83 cubic yards (yd^3) of soil. The IR TPH analyzer will then be used to direct the excavation until a TPH concentration of 500 mg/kg has been achieved. The second area to be excavated around sample location 065S0009 is thought to be 5 by 5 feet square and 5 feet deep, generating approximately 4.6 yd^3. Otherwise, excavation will continue until field screening indicates that a TPH concentration of 100 mg/kg has been achieved.

Exploratory trenching during removal activities will be conducted in the area between the spill location and the concrete area to determine if additional soil will need to be removed. The trench to be dug with a backhoe will be the width of one bucket (approximately 2.5 feet), and 7 to 10 feet deep.

The contractor will stockpile the excavated soil onsite on plastic sheeting, and cover it with plastic to prevent cross-contamination and erosion. The contractor will be responsible for maintaining the plastic cover on the stockpiled soil. EnSafe will sample the pile for confirmation and disposal characterization and will request five-day turnaround for the disposal-profile samples. Upon receipt of the results, EnSafe will attach a summary of detections to the data package, and forward two copies to the NSA Mid-South PWD Env. Div. within five days. Contaminated soil will be properly disposed of in accordance with current USEPA and TDEC regulations.

Soil Screening

Using disposable spoons or decontaminated stainless-steel spoons and bowls, EnSafe personnel will collect soil samples from the excavation walls and base as each lift is removed. Personnel will not enter the excavation if it is deeper than 4 feet to comply with confined-space entry

regulations. These samples will be collected from the backhoe bucket, if necessary, and from the center of the bucket to avoid sample contamination from the bucket wall. The samples will be collected in accordance with procedures described in Section 4.4.3 of the *Comprehensive RFI Work Plan* (E/A&H, October 1994).

Samples will be screened using an infrared (IR) TPH Plus Field Analyzer, which performs analyses based on USEPA Method 418.1 (IR method). The excavation will continue until field screening demonstrates that the contaminated soil above a depth of 5 feet has been removed to concentrations less than 100 mg/kg and below a depth of 5 feet, to the site-specific remediation level of 500 mg/kg.

3.1.7 Postremoval Activities

Several activities will be conducted after soil is removed, including confirmation soil sampling, backfilling the excavation, and disposing of used personal protective equipment (PPE) and disposable sampling equipment.

Confirmation Soil Sampling

When field screening demonstrates that the contaminated soil has been removed to less than 100 mg/kg above 5 feet and to the site-specific remediation level of 500 mg/kg TPH below 5 feet deep, EnSafe will collect a five-part composite sample from each of the excavation walls and four grab samples from the excavation floor (one from each corner). These confirmation soil samples will be analyzed onsite using the TPH Plus Field Analyzer for TPH (Method 418.1), and at an offsite laboratory for Appendix IX metals (USEPA Method 6010/7000 series).

In the event that water is encountered in the excavation, the contractor will containerize it in properly labeled U.S. Department of Transportation (DOT)-approved 55-gallon drums. EnSafe will collect water samples for analyses of VOCs and oil and grease (other analyses may be required by the POTW). The drums will be placed in a secured location approved by the

NSA Mid-South PWD Env. Div. and remain at this location. The contractor will discharge the water to the sewer via an oil-water separator designated by the NSA Mid-South PWD Env. Div. after contacting the PWD for permission and specifications from the City of Millington POTW (publicly owned treatment works). If any water is not approved for discharge to the sewer, the NSA Mid-South PWD Env. Div. will arrange for its proper disposal. EnSafe will be responsible for collecting any water samples required by the disposal facility and obtaining any additional analyses to determine the appropriate means of disposal.

Backfill of the Excavation

The excavations will remain open until confirmation samples indicate that soil exceeding the TPH action level has been removed and the BCT has approved backfilling based on a review of the TPH and metals concentrations. A temporary fence or barricade will be placed around the excavation. Clean soil from an offsite source will be used by the contractor for backfill along with number 33C limestone in areas having vehicular traffic. The area will then be covered with the equivalent of the original material by the contractor.

Removal of Construction Materials

After the stockpiled soil has been removed, any debris or trash from field activities will be removed by the contractor. The area will be left as close as possible to its natural state.

Voluntary Corrective Action Report

EnSafe will prepare a report after the field activities are complete, and analytical results have been received, to address the following:

- Field activities, including a description of field screening and sampling.
- Analytical test results for confirmation samples collected after the soil removal.

- A diagram showing site features during the removal action. The diagram will include the location of the excavation, soil-sampling locations, and detected concentrations.

- Disposal manifests (if available at the time of report) and a description of the fate of water generated during the removal action, if any.

3.1.8 Analytical Requirements

Analytical requirements for the samples scheduled to be collected at SWMU 65 are summarized in Table 3.1.3. Confirmation samples will be analyzed for TPH (418.1; field IR) and Appendix IX metals (USEPA Method 6010/7000 series; offsite laboratory). One characterization sample for soil disposal, which will be collected using a decontaminated stainless-steel hand auger or spoon and bowl for every 100 yd^3 of soil (or less), will be analyzed for toxicity characteristic leaching procedure (TCLP) lead and TCLP benzene, in accordance with DSW special waste policy. EnSafe will collect any additional samples required by the disposal facility and submit them for analyses. Soil samples will be screened by the IR method, in accordance with the manufacturer's instructions.

Table 3.1.3
Sample Summary and Analytical Requirements

Sample Type	Matrix	Analytical Parameters	Rationale	Turnaround Time
Extent Verification	Soil	TPH based on USEPA Method 418.1	TPH is primary contaminant and technology is available to field screen.	Field Analysis
Confirmation	Soil	TPH Method 418.1 Appendix IX Metals	Due to past spills and/or releases, TPH and metals are present.	Field Analysis 5 days
Soil Disposal	Soil (Excavated Material)	TCLP lead TCLP benzene	In accordance with DSW special waste policy.	5 days

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3.2 Facility S-235

3.2.1 Site Description

Building S-235 is a corrugated metal frame structure on a concrete slab that currently houses the EnSafe field office, along with various storage rooms used by the NSA Mid-South PWD Env. Div. Approximately 30 feet from the southwest corner of the building and approximately 200 feet southwest of SWMU 59 is a set of former car maintenance ramps surrounded by grass and asphalt. The maintenance area consists of two concrete ramps approximately 25 feet long and 3 feet high. The area between the ramps is approximately 2 to 3 feet wide. Figure 3.2 provides a site map of Facility S-235.

3.2.2 Previous Investigations/Findings

No previous investigations are known to have been conducted for this site; however, the area was visually inspected by the BCT on July 13, 1998, at the recommendation of the NSA Mid-South PWD Env. Div. The soil between the ramps showed considerable petroleum staining, and some areas appeared to have been either asphalt or so saturated with petroleum as to become hardpan.

3.2.3 Source Characterization

Based on the assumed history of this site as a car maintenance area where vehicle oil was apparently changed, the presence of petroleum soil contamination exceeding acceptable levels in the immediate vicinity is highly probable. Although no formal samples have confirmed this suspicion, visual inspection suggests that an investigative soil removal should make further investigation unnecessary.

3.2.4 Removal Responsibilities

The following section outlines the actions to be conducted during the excavation of petroleum-contaminated soil at the car maintenance ramps southwest of Building S-235. The contractor will provide the equipment and personnel to excavate, stockpile, and dispose of the contaminated soil. EnSafe will assist the contractor as necessary, collect confirmation and soil-disposal samples, and report on the removal activities in a VCA report. The following activities, to be performed by the designated staff, are further described in subsequent sections.

- EnSafe will plan field activities and schedule EnSafe personnel and equipment.

- EnSafe will review the following with the necessary personnel: the applicable portions of the *Comprehensive RFI Work Plan*, the CHSP which is included as Appendix B, and the SSHSP which is included as Appendix C.

- The contractor will coordinate the placement of contaminated-soil stockpiles with the NSA Mid-South PWD Env. Div. The contractor will place plastic on the ground surface before stockpiling soil in the designated areas.

- The contractor will excavate and stockpile all removed materials.

- EnSafe will provide sampling support during removal activities.

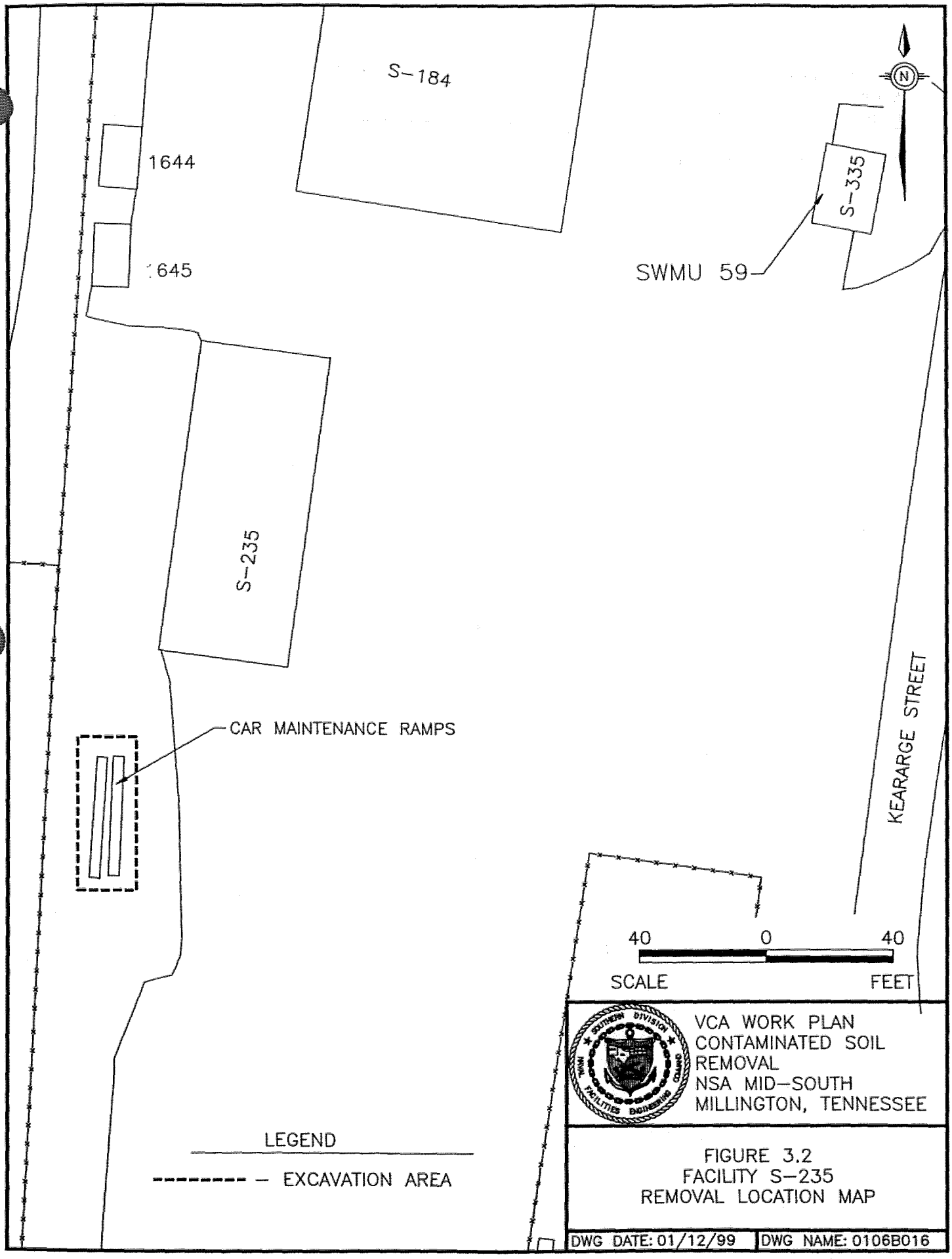
- EnSafe will characterize any excavated soil in accordance with the TDEC DUST and/or DSW guidance.

- The contractor will backfill the excavated area with clean soil or other materials and cover the area with the equivalent of the original material. The contractor will use number 33C limestone in areas where vehicular traffic is possible, as specified by the NSA Mid-South PWD Env. Div.

- The contractor will cover the stockpile with plastic, install silt fencing, and maintain runoff control the soil is properly disposed of. The contractor will coordinate disposal of soil and decontamination fluids resulting from field activities, including the preparation and filing of any special waste permits.

- The contractor will remove all construction materials.

- EnSafe will prepare a VCA report for the site.


S-184
1644
1645
S-335
SWMU 59
S-235
CAR MAINTENANCE RAMPS
KEARARGE STREET
N
40
0
40
SCALE
FEET
LEGEND
EXCAVATION AREA
VCA WORK PLAN
CONTAMINATED SOIL
REMOVAL
NSA MID-SOUTH
MILLINGTON, TENNESSEE
FIGURE 3.2
FACILITY S-235
REMOVAL LOCATION MAP
DWG DATE: 01/12/99
DWG NAME: 0106B016

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3.2.5 Preremoval Activities

Activities to be conducted before removing the soil are discussed in the following sections.

Orientation Meeting

Before performing any field activities at Building S-235, EnSafe personnel will hold an orientation meeting to review general and site-specific requirements for sampling and documentation. General discussion will include locations of the site field office, subject site, and designated decontamination areas. Sampling requirements to be discussed will include general sampling protocol, the sample-numbering system, QA/QC sampling requirements, and sample packaging. Documentation requirements to be discussed will include the use of field forms, field logbooks, and photographic documentation.

The EnSafe SSO will review the CHSP and SSHSP (Appendices B and C) with EnSafe personnel before any field activities begin. All EnSafe employees working onsite will be required to sign a form acknowledging that they are familiar with the plan and agree to abide by its guidelines. The SSHSP contains a copy of the compliance-agreement form.

3.2.6 Removal Activities

Several activities will be conducted before and during soil removal. Specific tasks include air monitoring, soil excavation, and soil screening. TDEC will be given at least two weeks notice by the NSA Mid-South PWD Env. Div. before any removal activities begin.

Surface and Subsurface Soil Excavation

Soil excavation will start with removal of soil between the ramps, in the area of heaviest staining, to a depth of 1 foot. The TPH analyzer will direct soil excavation, and removal of soil will continue until field screening indicates that soil less than 5 feet deep remaining on the sides and bottom of the excavation contains concentrations of TPH that are less than the action level of

100 mg/kg. The decision as to whether the ramps will also be removed will be based on the extent of the soil contamination present in the field screening results.

The contractor will stockpile the excavated soil onsite on plastic sheeting, and cover it with plastic to prevent cross-contamination and erosion. The contractor will be responsible for maintaining the plastic cover on the stockpiled soil. EnSafe will sample the pile for confirmation and disposal characterization and will request five-day turnaround for the disposal profile samples. Upon receipt of the results, EnSafe will attach a summary of detections to the data package, and forward two copies to the NSA Mid-South PWD Env. Div. within five days. Contaminated soil will be properly disposed of in accordance with current USEPA and TDEC regulations. The contractor will dispose of any special-waste soil, while any hazardous-waste soil will be disposed of by the NSA Mid-South PWD Env. Div.

Soil Screening

Using disposable spoons or decontaminated stainless-steel spoons and bowls, EnSafe personnel will collect soil samples from the excavation walls and base as each 1-foot thick lift is removed. Personnel will not enter the excavation if it is deeper than 4 feet to comply with confined-space entry regulations. These samples will be collected from the backhoe bucket, if necessary, and from the center of the bucket to avoid sample contamination from the bucket wall. The samples will be collected in accordance with procedures described in Section 4.4.3 of the *Comprehensive RFI Work Plan* (E/A&H, October 1994).

Samples will be screened using an IR TPH Plus Field Analyzer, which performs analyses based on USEPA Method 418.1 (IR method). The excavation will continue until field screening demonstrates that the contaminated soil has been removed to concentrations less than 100 mg/kg above 5 feet or to the site-specific remediation level of 500 mg/kg below 5 feet.

3.2.7 Postremoval Activities

Several activities will be conducted after soil is removed, including confirmation soil sampling, backfilling the excavation, and disposing of used PPE and disposable sampling equipment.

Confirmation Soil Sampling

When field screening demonstrates that the contaminated soil has been removed to less than the site-specific remediation level of 100 mg/kg TPH above 5 feet deep or to 500 mg/kg TPH below 5 feet deep, EnSafe will collect a five-part composite sample from each of the excavation walls and four grab samples from the excavation floor (one from each corner). These confirmation soil samples will be analyzed onsite using the TPH Plus Field Analyzer for TPH (Method 418.1), and at an offsite laboratory for Appendix IX metals (USEPA Method 6010/7000 series).

In the event that water is encountered in the excavation, the contractor will containerize it in properly labeled U.S. DOT-approved 55-gallon drums. EnSafe will collect water samples for analyses of VOCs and oil and grease. The drums will be placed in a secured location approved by the NSA Mid-South PWD Env. Div. and remain at this location. The contractor will discharge the water to the sewer via an oil-water separator designated by the NSA Mid-South PWD Env. Div. after contacting the PWD for permission and specifications from the City of Millington POTW (publicly owned treatment works). If any water is not approved for discharge to the sewer, then the NSA Mid-South PWD Env. Div. will arrange for its proper disposal. EnSafe will be responsible for collecting any water samples required by the disposal facility and obtaining any additional analyses to determine the appropriate means of disposal.

Backfill of the Excavation

The excavation will remain open until confirmation samples document that soil exceeding the TPH action level of 100 mg/kg (above 5 feet) has been removed and the BCT has approved backfilling based on a review of the TPH and metals concentrations. A temporary fence or barricade will be placed around the excavation. Clean soil from an offsite source will be used by the contractor

for backfill along with number 33C limestone in areas having vehicular traffic. The area will then be covered with the equivalent of the original material by the contractor.

Removal of Construction Materials

After stockpiled soil has been removed, any debris or trash from field activities will be removed by the contractor. The area will be left as close as possible to its natural state.

Voluntary Corrective Action Report

EnSafe will prepare a report after field activities are complete, and analytical results have been received, to address the following:

- Field activities, including a description of field screening and sampling.
- Analytical test results for confirmation samples collected after soil removal.
- A diagram showing site features during the removal action. The diagram will include the location of the excavation, soil-sampling locations, and detected concentrations.
- Disposal manifests (if available at the time of report) and a description of the fate of water generated during the removal action, if any.

3.2.8 Analytical Requirements

Analytical requirements for the samples scheduled to be collected at the car maintenance ramps at Building S-235 are summarized in Table 3.2.1. Confirmation samples will be analyzed for TPH (418.1) and Appendix IX metals (USEPA Method 6010/7000 series). One characterization sample for soil disposal, which will be collected using a decontaminated stainless-steel hand auger or spoon and bowl for every 100 yd^3 of soil (or less), will be analyzed for TCLP lead, and TCLP benzene, in accordance with DSW special waste policy. EnSafe will collect any additional

samples required by the disposal facility and submit them for analyses. Soil samples will be screened by the IR method, in accordance with the manufacturer's instructions.

Table 3.2.1
Sample Summary and Analytical Requirements

Sample Type	Matrix	Analytical Parameters	Rationale	Turnaround Time
Extent Verification	Soil	TPH based on USEPA Method 418.1	TPH is primary contaminant and technology is available to field screen.	Field Analysis
Confirmation	Soil	TPH Method 418.1 Appendix IX Metals	Due to past spills and/or releases, TPH and metals are present.	Field Analysis 5 days
Soil Disposal	Soil (Excavated Material)	TCLP lead TCLP benzene	In accordance with DSW special waste policy.	5 days

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3.3 Facility S-394

3.3.1 Site Description

This 8,400-square-foot, metal frame structure was built on a concrete slab in 1967. It is currently used for storage [*ERNA Gray Areas Investigation Report* (EnSafe, May 1999)]. In the past, it housed the mechanical maintenance shop and was used as the Air Support Maintenance School. Figure 3.3 provides a site map of Facility S-394.

3.3.2 Previous Investigations/Findings

Facility S-394 is associated with Facility S-197, which was originally built as a battery storage shed. Batteries were reportedly stored and possibly drained in a metal shed west of Facility S-197. A muriatic acid and 1,1,1-trichloroethane spill reportedly occurred on August 27, 1993, at the rear, west side of the building. A letter submitted to Mark Thomas of the TDEC Memphis field office states that the spill was cleaned up to the satisfaction of the State. Contaminated soil and debris were sent to Fischer Industrial of Gadsden, Alabama.

During the ERNA Gray Areas Investigation, surface and subsurface soil were collected to determine if hazardous materials/hazardous waste or petroleum products had been released at this site. As shown in Figure 3.3, samples were collected from three locations where a release could have occurred, based on previous site activities. Surface-soil samples (394S000101 and 394S000201) were analyzed for Appendix IX metals and TPH. A subsurface-soil, saturated loess sample (394S000315) was analyzed for VOCs. All samples were analyzed at Savannah Analytical Laboratory in Savannah, Georgia.

Organics in Soil

No VOCs were detected in subsurface soil. Results of TPH soil samples that exceeded the 100 mg/kg soil cleanup value are presented in Table 3.3.1.

Table 3.3.1
Gray Areas — Facility S-394 Petroleum Hydrocarbon Detections in Soil by Location (mg/kg)

Location	Depth (in feet)	Contaminant	Result
394X0002	01'	TPH	700

Inorganics in Soil

Inorganic soil-sample data that exceeded at least one standard reference value are presented in Table 3.3.2.

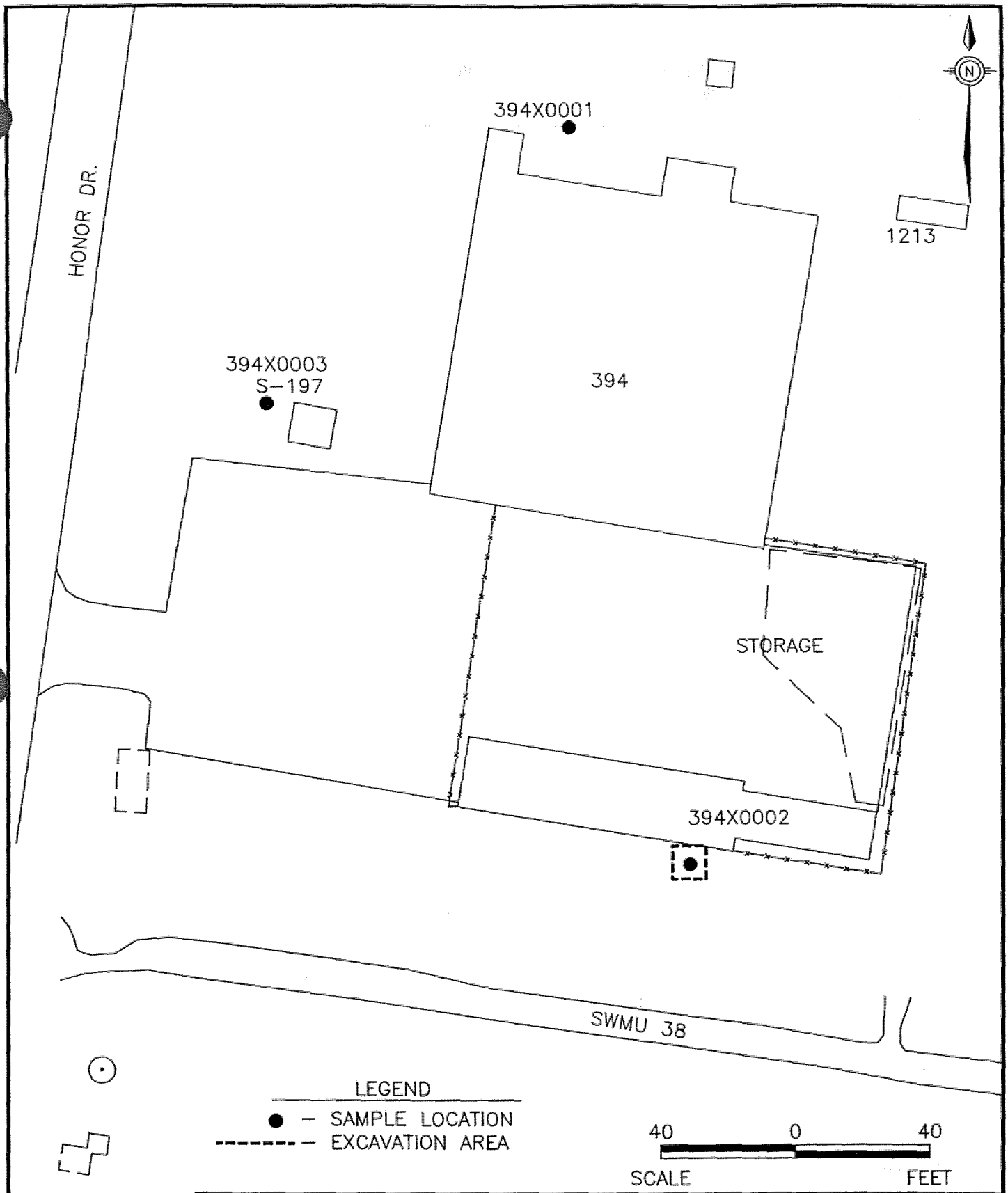
Although Preliminary Risk Evaluation (PRE) calculations [*ERNA Gray Areas Investigation Report* (EnSafe, May 1999)] show that Facility S-394 is suitable for industrial or residential land use, TPH was detected at a concentration of 700 mg/kg in sample 394S000201, which exceeds the TDEC soil-cleanup level of 100 mg/kg. The source of the TPH was not identified.

3.3.3 Source Characterization

Based on TPH detections in surface soil at location 394X0002 that exceeded the TDEC cleanup level of 100 mg/kg, a VCA was recommended for the petroleum-contaminated soil. Because no VOCs were detected in the saturated loess sample, no further groundwater investigation has been recommended in the *ERNA Gray Areas Investigation Report* (EnSafe, May 1999).

3.3.4 Removal Responsibilities

The following section outlines the actions to be conducted during the excavation of petroleum-contaminated soil at Facility S-394. The contractor will provide the equipment and personnel to excavate, stockpile, and dispose of the contaminated soil. EnSafe will assist the contractor as necessary, collect confirmation and soil-disposal samples, and report on the removal activities in a VCA report. The following activities to be performed by the designated staff, are further described in subsequent sections.



VCA WORK PLAN
CONTAMINATED SOIL
REMOVAL
NSA MID-SOUTH
MILLINGTON, TENNESSEE

FIGURE 3.3
FACILITY S-394
REMOVAL LOCATION MAP

DWG DATE: 01/14/99 | DWG NAME: 0106B014

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Table 3.3.2
Gray Areas — Facility 394 Inorganic Detections in Soil by Location (mg/kg)

Location	Depth (in feet)	Constituent	RC[a] Surface	RBC[b] Industrial	RBC[b] Residential	SSL[c]	Result
394X0001	01'	Arsenic (As)	14.6	3.8	0.43	1	7.1
		Barium (Ba)	223	14,000	550	82	135
		Cadmium (Cd)	1.54	100	3.9	0.4	0.74
		Chromium (Cr)	23.9	610	23	2	14.3
		Copper (Cu)	24.2	8,200	310	DNE	37.1
		Nickel (Ni)	20.6	4,100	160	7	13.4
		Selenium (Se)	DNE	1,000	39	0.3	0.34 J
		Zinc (Zn)	98	61,000	2,300	620	252
394X0002	01'	Arsenic (As)	14.6	3.8	0.43	1	7.3
		Barium (Ba)	223	14,000	550	82	91.1
		Chromium (Cr)	23.9	610	23	2	12.0
		Lead (Pb)	26.0	400	400	DNE	89.7 J
		Nickel (Ni)	20.6	4,100	160	7	9.1
		Selenium (Se)	DNE	1,000	39	0.3	0.85 J

Notes:
a — Background Reference Concentration (RC) from the August 1996 *Technical Memorandum — Reference Concentrations* (August 27, 1996, E/A&H).
b — Industrial and residential RBCs from the April 1999 *Risk-Based Concentration Table* (April 12, 1999, USEPA Region III RBC Memo).
c — Soil Screening Level (SSL) from the May 1996 *Generic Screening Levels* (May 1996, USEPA/OSWER SSL Guidance Document, EPA/540/R-95/128).
DNE — Does not exist.
J — Constituent detected at concentrations less than the method reporting limit; value estimated.

- EnSafe will plan field activities and schedule EnSafe personnel and equipment.

- EnSafe will review the following with the necessary personnel: the applicable portions of the *Comprehensive RFI Work Plan*, the CHSP which is included as Appendix B, and the SSHSP which is included as Appendix C.

- The contractor will coordinate the placement of contaminated-soil stockpiles with the NSA Mid-South PWD Env. Div. The contractor will place plastic on the ground surface before stockpiling soil in the designated areas.

- The contractor will excavate and stockpile all removed materials.

- EnSafe will provide sampling support during removal activities.

- EnSafe will characterize any excavated soil in accordance with the TDEC DUST and/or DSW guidance.

- The contractor will backfill the excavated area with clean soil or other materials and cover the area with the equivalent of the original material. The contractor will use number 33C limestone in areas where vehicular traffic is possible, as specified by the NSA Mid-South PWD Env. Div.

- The contractor will cover the stockpile with plastic, install silt fencing, and maintain runoff control until the soil is properly disposed of. The contractor will coordinate disposal of soil and decontamination fluids from field activities, including the preparation and filing of any special waste permits.

- The contractor will remove all construction materials.

- EnSafe will prepare a VCA report for the site.

3.3.5 Preremoval Activities

Activities to be conducted before removing the soil are discussed in the following sections.

Orientation Meeting

Before performing any field activities at Facility S-394, EnSafe personnel will hold an orientation meeting to review general and site-specific requirements for sampling and documentation. General discussion will include locations of the site field office, subject site, and designated decontamination areas. Sampling requirements to be discussed will include general sampling protocol, the sample-numbering system, QA/QC sampling requirements, and sample packaging. Documentation requirements to be discussed will include the use of field forms, field logbooks, and photographic documentation.

The EnSafe SSO will review the CHSP and SSHSP (Appendices B and C) with EnSafe personnel before any field activities begin. All EnSafe employees working onsite will be required to sign a form acknowledging that they are familiar with the plan and agree to abide by its guidelines. The SSHSP contains a copy of the compliance-agreement form.

3.3.6 Removal Activities

Several activities will be conducted before and during soil removal. Specific tasks include air monitoring, soil excavation, and soil screening. TDEC will be given at least two weeks notice by the NSA Mid-South PWD Env. Div. before any removal activities begin.

Surface and Subsurface Soil Excavation

Soil excavation will start with removal of 1 foot of soil within a 10-foot radius of location 394X0002. The TPH analyzer will be used to direct the excavation of soil and removal of 1-foot thick, 10-foot square lifts, which will continue until field screening indicates that soil remaining on the sides and bottom of the excavation contains concentrations of TPH that are less than the action level of 100 mg/kg.

The contractor will stockpile the excavated soil on plastic sheeting, and cover it with plastic to prevent cross-contamination and erosion. The contractor will be responsible for maintaining the

plastic cover on the stockpiled soil. EnSafe will sample the pile and request five-day turnaround for the disposal profile samples. Upon receipt of the results, EnSafe will attach a summary of detections to the data package, and forward two copies to the NSA Mid-South PWD Env. Div. within five days. Contaminated soil will be properly disposed of in accordance with current USEPA and TDEC regulations. The contractor will dispose of any special-waste soil, while any hazardous-waste soil will be disposed of by the NSA Mid-South PWD Env. Div.

Soil Screening

Using disposable spoons or decontaminated stainless-steel spoons and bowls, EnSafe personnel will collect soil samples from the excavation walls and base as each lift is removed. Personnel will not enter the excavation if it is deeper than 4 feet to comply with confined-space entry regulations. These samples will be collected from the backhoe bucket, if necessary, and from the center of the bucket to avoid sample contamination from the bucket wall. The samples will be collected in accordance with procedures described in Section 4.4.3 of the *Comprehensive RFI Work Plan* (E/A&H, October 1994).

Samples will be screened using an IR TPH Plus Field Analyzer, which performs analyses based on USEPA Method 418.1 (IR method). The excavation will continue until field screening demonstrates that the contaminated soil has been removed to concentrations less than the site-specific remediation level of 100 mg/kg (above 5 feet).

3.3.7 Postremoval Activities

Several activities will be conducted after soil is removed, including confirmation soil sampling, backfilling the excavation, and disposing of used PPE and disposable sampling equipment.

Confirmation Soil Sampling

When field screening demonstrates that the contaminated soil has been removed to less than the site-specific remediation level of 100 mg/kg TPH above 5 feet deep or 500 mg/kg TPH below 5 feet deep, EnSafe will collect a five-part composite sample from each of the excavation walls and four grab samples from the excavation floor (one from each corner). These confirmation soil samples will be analyzed onsite using the TPH Plus Field Analyzer for TPH (Method 418.1), and at an offsite laboratory for Appendix IX metals (USEPA Method 6010/7000 series).

In the event that water is encountered in the excavation, the contractor will containerize it in properly labeled U.S. DOT-approved 55-gallon drums. EnSafe will collect water samples for analyses of VOCs and oil and grease. The drums will be placed in a secured location approved by the NSA Mid-South PWD Env. Div. and remain at this location. The contractor will discharge the water to the sewer via an oil-water separator designated by the NSA Mid-South PWD Env. Div. after contacting the PWD for permission and specifications from the City of Millington POTW. If any water is not approved for discharge to the sewer, then the NSA Mid-South PWD Env. Div. will arrange for its proper disposal. EnSafe will be responsible for collecting any water samples required by the disposal facility and obtaining any additional analyses to determine the appropriate means of disposal.

Backfill of the Excavation

The excavation will remain open until confirmation samples document that soil exceeding the TPH action level of 100 mg/kg has been removed and the BCT has approved backfilling based on a review of the TPH and metals concentrations. A temporary fence or barricade will be placed around the excavation. Clean soil from an offsite source will be used by the contractor for backfill along with number 33C limestone in areas having vehicular traffic. The area will then be covered with the equivalent of the original material by the contractor.

Removal of Construction Materials

After stockpiled soil has been removed, any debris or trash from field activities will be removed by the contractor. The area will be left as close as possible to its natural state.

Voluntary Corrective Action Report

EnSafe will prepare a report after field activities are complete and analytical results have been received, to address the following:

- Field activities, including a description of field screening and sampling.
- Analytical test results for confirmation samples collected after soil removal.
- A diagram showing site features during the removal action. The diagram will include the location of the excavation, soil-sampling locations, and detected concentrations.
- Disposal manifests (if available at the time of report) and a description of the fate of water generated during the removal action, if any.

3.3.8 Analytical Requirements

Analytical requirements for the samples scheduled to be collected at Facility S-394 are summarized in Table 3.3.3. Confirmation samples will be analyzed for TPH (418.1; field IR) and Appendix IX metals (USEPA Method 6010/7000 series; offsite laboratory). One characterization sample for soil disposal, which will be collected using a decontaminated stainless-steel hand auger or spoon and bowl for every 100 yd^3 of soil (or less), will be analyzed for TCLP lead and TCLP benzene, in accordance with DSW special waste policy. EnSafe will collect any additional samples required by the disposal facility and submit them for analyses. Soil samples will be screened by the IR method, in accordance with the manufacturer's instructions.

Table 3.3.3
Sample Summary and Analytical Requirements

Sample Type	Matrix	Analytical Parameters	Rationale	Turnaround Time
Extent Verification	Soil	TPH based on USEPA Method 418.1	TPH is primary contaminant and technology is available to field screen.	Field Analysis
Confirmation	Soil	TPH Method 418.1 Appendix IX Metals	Due to past spills and/or releases, TPH and metals are present.	Field Analysis 5 days
Soil Disposal	Soil (Excavated Material)	TCLP lead TCLP benzene	In accordance with DSW special waste policy.	5 days

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3.4 Facility N-114/SWMU 24

3.4.1 Site Descriptions

Facility N-114

Facility N-114, a 40,000-square-foot covered garage area in the auto hobby shop at Astoria Avenue (formerly 1st Avenue) and Bougainville Street on the NSA Mid-South Northside, is used by base personnel to maintain personal automobiles. The sheet metal building is floored with concrete.

A large caustic dip tank formerly located in one corner of Facility N-114 was used to degrease engine blocks. This dip tank contained a drain valve and an overflow pipe that drained to an outside catch basin. According to a 1981 drawing, it is actually an old oil-water separator. An outdoor sump with a grate and concrete pad is used for radiator draining and flushing. A water/antifreeze mixture from this area drained to the same catch basin as the caustic dip tank. The catch basin leads to a small oil-water separator that drains directly to the sanitary-sewer system. During a 1990 RFA site inspection (ERC/EDGe, 1990), the open ditch on the north end of the site appeared stained from oil discharge in surface runoff. During a follow-up site visit, the catch basin was full of water and overflowing onto the surrounding soil. Surficial soil was sampled during the *ERNA Gray Areas Investigation* (EnSafe, May 1999) to determine if runoff and overflow from a catch basin had adversely affected soil.

SWMU 24

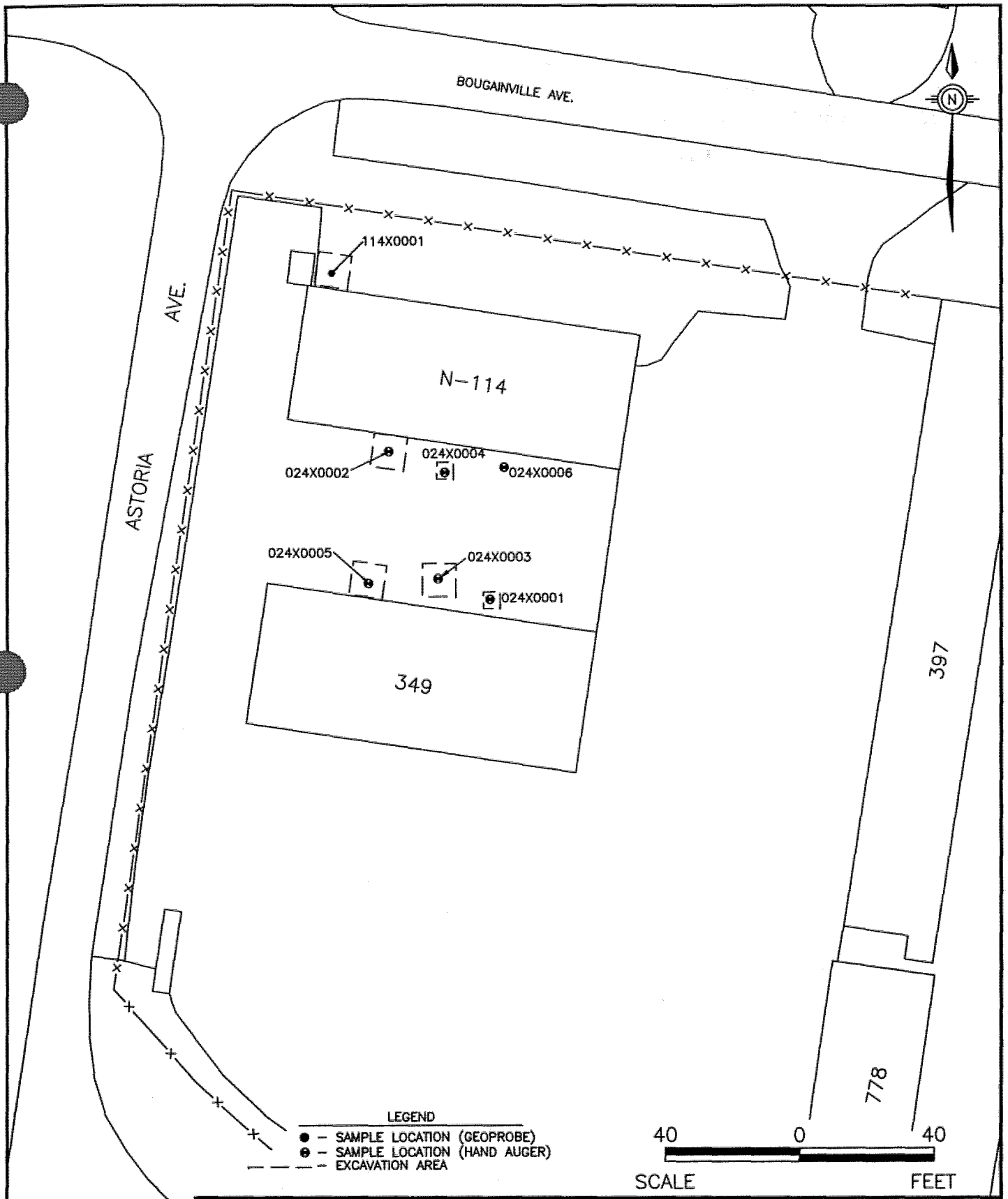
SWMU 24 formerly consisted of two aboveground waste oil tanks between Buildings N-114 (Auto Hobby Shop) and N-349. The aboveground storage tank (AST) next to Building N-349 was removed, leaving one 500-gallon AST. The tanks were used by NSA Mid-South personnel to change lubricants and other fluids in their private vehicles. The year the tanks came into use is not known. During the 1990 RFA site visit, soil discoloration surrounding the tanks was noted (ERC/EDGe, 1990). Figure 3.4 provides a site map of Facility N-114/SWMU 24.

3.4.2 Previous Investigations/ Findings

As documented in the *Assemblies G and H Confirmatory Sampling Investigation Report* (EnSafe, May 1998) and the *ERNA Gray Areas Investigation Report* (EnSafe, May 1999), surface and subsurface soil was sampled to determine if past activities had resulted in a hazardous-materials or hazardous-waste release. For the Gray Areas Investigation, one sample each was collected from the surface at 0 to 1 foot bls at locations 114X0001 and 397X0001 and one each from the saturated portion of the loess deposits at 12 to 15 feet bls at locations 114X0001 and 397X0001. The surface sample at Facility N-114 was analyzed for VOCs, semivolatile organic compounds (SVOCs), Appendix IX metals, TPH, and ethylene glycol. The subsurface sample at Facility N-114 was analyzed for VOCs. The surface sample at Facility N-397 was analyzed for VOCs, Appendix IX metals, and TPH. Its subsurface sample was analyzed for VOCs. During the Assemblies G and H confirmatory sampling investigation (CSI), six locations (024X0001, 024X0002, 024X0003, 024X0004, 024X0005 and 024X0006) were chosen for hand-auger soil-sample collection from the 0- to 1-foot and 3- to 4-foot intervals. Sample locations were based on discoloration of soil surrounding the remaining tank and the area beneath the tank that had been removed. Two of the surface-soil samples (024S000301 and 024S000401) were submitted for full scan analysis (FSA), while the remaining surface-soil samples and all of the subsurface-soil samples were analyzed for VOCs, SVOCs, Appendix IX metals, TPH, GRO, and DRO. All soil samples were analyzed at Savannah Analytical Laboratory in Savannah, Georgia.

Organics in Soil

Organic and TPH soil-sample data that exceed at least one standard reference value are presented in Tables 3.4.1 and 3.4.2.



VCA WORK PLAN
CONTAMINATED SOIL
REMOVAL
NSA MID-SOUTH
MILLINGTON, TENNESSEE

FIGURE 3.4
FACILITY N-114/SWMU 24
REMOVAL LOCATION MAP

DWG DATE: 06/01/99 | DWG NAME: 0106B015

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Table 3.4.1
Gray Areas — Facility N-114/SWMU 24 Organic Detections in Soil by Location (μg/kg)

Location	Depth (in feet)	Contaminant	RC[a]	RBC[b] Industrial	RBC[b] Residential	SSL[c]	Result
024X0003	01'	Tetrachloroethene	—	110,000	12,000	3	7.7

Notes:
a — Background Reference Concentration (RC) from the August 1996 *Technical Memorandum — Reference Concentrations* (August 27, 1996, E/A&H).
b — Industrial and residential RBCs from the April 1999 *Risk-Based Concentration Table* (April 12, 1999, USEPA Region III RBC Memo).
c — Soil Screening Level (SSL) from the May 1996 *Generic Screening Levels* (May 1996, USEPA/OSWER SSL Guidance Document, EPA/540/R-95/128).

Table 3.4.2
Gray Areas — Facility N-114/SWMU 24 Petroleum Hydrocarbon Detections by Location (mg/kg)

Location	Depth (in feet)	Contaminant	Result
114X0001	01'	TPH	1,900
024X0001	01'	TPH	330 J
024X0002	01'	Diesel	990
		TPH	2,900 J
024X0002	04'	TPH	1,100 J
024X0003	01'	TPH — DRO	120
		TPH	480 J
024X0004	01'	TPH	170 J
024X0004	04'	TPH	190 J
024X0005	01'	TPH	790 J

TPH was detected at a concentration of 1,900 mg/kg in Facility N-114 surface soil (Table 3.4.2). At SWMU 24, concentrations of 2,900 mg/kg and 790 mg/kg were detected in surface soil, and 1,100 mg/kg was detected in subsurface soil. All of these concentrations exceed the TDEC soil-cleanup level of 500 mg/kg.

Inorganics in Soil

Inorganic soil-sampling data that exceeded at least one standard reference value are presented in Table 3.4.3. Lead exceeded its soil screening level (400 mg/kg) at concentrations of 2,000 mg/kg at Facility N-114.

Table 3.4.3
Gray Areas — Facility N-114/SWMU 24 Inorganic Detections in Soil by Location (mg/kg)

Location	Depth (in feet)	Constituent	RC[a]	RBC[b] Industrial	RBC[b] Residential	SSL[c]	Result
114X0001	01'	Antimony (Sb)	DNE	82	3.1	0.3	2 J
		Arsenic (As)	14.6	3.8	0.43	1	11.4
		Barium (Ba)	223	14,000	550	82	359
		Beryllium (Be)	1	410	16	3	1.3
		Cadmium (Cd)	1.54	100	3.9	0.4	5.1
		Chromium (Cr)	23.9	610	23	2	27.3
		Copper (Cu)	24.2	8,200	310	DNE	93.6
		Lead (Pb)	26.0	400	400	DNE	2,000 J
		Nickel (Ni)	20.6	4,100	160	7	17.4
397X0001	01'	Arsenic (As)	14.6	3.8	0.43	1	8.9
		Barium (Ba)	223	14,000	550	82	149
		Cadmium (Cd)	1.54	100	3.9	0.4	0.81
		Chromium (Cr)	23.9	610	23	2	15.7
		Lead (Pb)	26.0	400	400	DNE	160 J
		Nickel (Ni)	20.6	4,100	160	7	18.9
		Selenium (Se)	DNE	1,000	39	0.3	0.35 J
		Zinc (Zn)	98	61,000	2,300	620	155
024X0001	01'	Arsenic (As)	14.6	3.8	0.43	1	7.9
		Barium (Ba)	223	14,000	550	82	173
		Chromium (Cr)	23.9	610	23	2	10.9 J
		Lead (Pb)	26.0	400	400	DNE	35.8 J
		Nickel (Ni)	20.6	4,100	160	7	17.1
		Selenium (Se)	DNE	1,000	39	0.3	0.43 J
024X0001	04'	Arsenic (As)	20.3	—	—	1	8
		Barium (Ba)	265	—	—	82	104
		Chromium (Cr)	28.3	—	—	2	9.8 J
		Nickel (Ni)	DNE	—	—	7	17.8

Table 3.4.3
Gray Areas — Facility N-114/SWMU 24 Inorganic Detections in Soil by Location (mg/kg)

Location	Depth (in feet)	Constituent	RC[a]	RBC[b] Industrial	RBC[b] Residential	SSL[c]	Result
024X0002	01'	Antimony (Sb)	DNE	82	3.1	0.3	0.48 J
		Arsenic (As)	14.6	3.8	0.43	1	17.1
		Barium (Ba)	223	14,000	550	82	147
		Chromium (Cr)	23.9	610	23	2	12.2 J
		Lead (Pb)	26.0	400	400	DNE	61.2 J
		Nickel (Ni)	20.6	4,100	160	7	13 J
024X0002	04'	Arsenic (As)	20.3	—	—	1	8.3
		Barium (Ba)	265	—	—	82	124
		Chromium (Cr)	28.3	—	—	2	10.5 J
		Nickel (Ni)	DNE	—	—	7	18.9 J
		Selenium (Se)	DNE	—	—	0.3	0.52 J
024X0003	01'	Arsenic (As)	14.6	3.8	0.43	1	8.1
		Barium (Ba)	223	14,000	550	82	171
		Chromium (Cr)	23.9	610	23	2	11.8 J
		Nickel (Ni)	20.6	4,100	160	7	20.5
		Selenium (Se)	DNE	1,000	39	0.3	0.54 J
024X0003	04'	Arsenic (As)	20.3	—	—	1	6.9
		Barium (Ba)	265	—	—	82	113
		Chromium (Cr)	28.3	—	—	2	10.2 J
		Nickel (Ni)	DNE	—	—	7	17.8
024X0004	01'	Antimony (Sb)	DNE	82	3.1	0.3	0.49 J
		Arsenic (As)	14.6	3.8	0.43	1	5.4
		Chromium (Cr)	23.9	610	23	2	10.3 J
		Nickel (Ni)	20.6	4,100	160	7	7.5 J
024X0004	04'	Arsenic (As)	20.3	—	—	1	8.1
		Barium (Ba)	265	—	—	82	102
		Chromium (Cr)	28.3	—	—	2	9 J
		Nickel (Ni)	DNE	—	—	7	16.4 J
		Selenium (Se)	DNE	—	—	0.3	0.63 J
024X0005	01'	Arsenic (As)	14.6	3.8	0.43	1	4.3 J
		Chromium (Cr)	23.9	610	23	2	10.2 J
		Nickel (Ni)	20.6	4,100	160	7	8
024X0005	04'	Arsenic (As)	20.3	—	—	1	6.9
		Barium (Ba)	265	—	—	82	90.6
		Chromium (Cr)	28.3	—	—	2	9.6 J
		Nickel (Ni)	DNE	—	—	7	17.5

Table 3.4.3
Gray Areas — Facility N-114/SWMU 24 Inorganic Detections in Soil by Location (mg/kg)

Location	Depth (in feet)	Constituent	RC[a]	RBC[b] Industrial	RBC[b] Residential	SSL[c]	Result
024X0006	01'	Antimony (Sb)	DNE	82	3.1	0.3	0.58 J
		Arsenic (As)	14.6	3.8	0.43	1	16.5
		Barium (Ba)	223	14,000	550	82	147
		Chromium (Cr)	23.9	610	23	2	8.8 J
		Nickel (Ni)	20.6	4,100	160	7	13.1 J
		Selenium (Se)	DNE	1,000	39	0.3	0.53 J
024X0006	04'	Antimony (Sb)	DNE	—	—	0.3	0.63 J
		Arsenic (As)	20.3	—	—	1	8.1
		Barium (Ba)	265	—	—	82	133
		Chromium (Cr)	28.3	—	—	2	9 J
		Nickel (Ni)	DNE	—	—	7	18 J
		Selenium (Se)	DNE	—	—	0.3	0.63 J

Notes:
a — Background Reference Concentration (RC) from the August 1996 *Technical Memorandum — Reference Concentrations* (August 27, 1996, E/A&H).
b — Industrial and residential RBCs from the April 1999 *Risk-Based Concentration Table* (April 12, 1999, USEPA Region III RBC Memo).
c — Soil Screening Level (SSL) from the May 1996 *Generic Screening Levels* (May 1996, USEPA/OSWER SSL Guidance Document, EPA/540/R-95/128).
DNE — Does not exist.
J — Constituent detected in concentrations less than the method reporting limit; value estimated.

3.4.3 Source Characterization

Based on TPH detections in surface or subsurface soil at locations 114X0001, 024X0001, 024X0002, 024X0003, 024X0004, and 024X0005 that exceeded the TDEC cleanup level of 100 mg/kg, a VCA was recommended to address soil contamination by removing any TPH and/or metals contamination detected at concentrations exceeding acceptable risk standards.

3.4.4 Removal Responsibilities

The following section outlines the actions to be conducted during the excavation of petroleum and lead-contaminated soil at Facility N-114 and SWMU 24. The contractor will provide the equipment and personnel to excavate, stockpile, and dispose of the contaminated soil. EnSafe will

assist the contractor as necessary, collect confirmation and soil-disposal samples, and report on the removal activities in a VCA report. The following activities to be performed by the designated staff, are further described in subsequent sections.

- EnSafe will plan field activities and schedule EnSafe personnel and equipment.

- EnSafe will review the following with the necessary personnel: the applicable portions of the *Comprehensive RFI Work Plan*, the CHSP which is included as Appendix B, and the SSHSP which is included as Appendix C.

- The contractor will coordinate the placement of contaminated-soil stockpiles with the NSA Mid-South PWD Env. Div. The contractor will place plastic on the ground surface before stockpiling soil in the designated areas.

- The contractor will excavate and stockpile all removed materials.

- EnSafe will provide sampling support during removal activities.

- EnSafe will characterize any excavated soil in accordance with the TDEC DUST and/or DSW guidance.

- The contractor will backfill the excavated area with clean soil or other materials and cover the area with the equivalent of the original material. The contractor will use number 33C limestone in areas where vehicular traffic is possible, as specified by the NSA Mid-South PWD Env. Div.

- The contractor will cover the stockpile with plastic, install silt fencing, and maintain runoff control until the soil is properly disposed of. The contractor will coordinate

disposal of soil and decontamination fluids from field activities, including the preparation and filing of any special waste permits.

- The contractor will remove all construction materials.

- EnSafe will prepare a VCA report for the site.

3.4.5 Preremoval Activities

Activities to be conducted before removing the soil are discussed in the following sections.

Orientation Meeting

Before performing any field activities at Facility N-114/SWMU 24, EnSafe personnel will hold an orientation meeting to review general and site-specific requirements for sampling and documentation. General discussion will include locations of the site field office, subject site, and designated decontamination areas. Sampling requirements to be discussed will include general sampling protocol, the sample-numbering system, QA/QC sampling requirements, and sample packaging. Documentation requirements to be discussed will include the use of field forms, field logbooks, and photographic documentation.

The EnSafe SSO will review the CHSP and SSHSP (Appendices B and C) with EnSafe personnel before any field activities begin. All EnSafe employees working onsite will be required to sign a form acknowledging that they are familiar with the plan and agree to abide by its guidelines. The SSHSP contains a copy of the compliance-agreement form.

3.4.6 Removal Activities

Several activities will be conducted before and during soil removal. Specific tasks include air monitoring, soil excavation, and soil screening. TDEC will be given at least two weeks notice by the NSA Mid-South PWD Env. Div. before any removal activities begin. Two metal car

ramps currently occupy the area between Buildings N-114 and 349 where SWMU 24 soil is to be excavated. Since these ramps are slated for removal, soil excavation at SWMU 24 locations will not begin until the ramps have been removed.

Surface and Subsurface Soil Excavation

Soil excavation at Facility N-114 will start with removal of a 2-foot deep by 10-foot square layer of soil centered on location 114X0001. If the corner of Building N-114 is encountered in the excavation, soil removal will continue vertically, but will not extend laterally beneath the building foundation. Also, samples will be collected from the excavation walls at the side of the building. The TPH analyzer will direct soil excavation and removal of 1-foot thick, 10-foot diameter lifts, which will continue until field screening indicates that remaining soil TPH concentrations are lower than the 100 mg/kg action level.

Soil excavation at SWMU 24 will start with removal of a 5-foot deep by 10-foot square layer of soil, extending 10 feet from the edge of Building N-114, centered on location 024X0002. Soil removal at the edge of the building will extend vertically, but not laterally, beneath the building foundation. Samples will be taken from the excavation wall at the side of the building. Soil will also be excavated from locations 024X0003 and 024X0005, where a 1-foot deep by 10-foot square layer of soil will be removed, extending 10 feet from the edge of Building 349, and centered on locations 024X0003 and 024X0005. Soil removal at the edge of the building will extend vertically, but not laterally, beneath the building foundation. Samples will be collected from the excavation wall at the side of the building. The TPH analyzer will direct soil excavation and removal of 1-foot thick by 10-foot diameter lifts, which will continue until field screening indicates that remaining soil TPH concentrations are less than the 100 mg/kg action level (above 5 feet deep). Soil will also be excavated from locations 024X0001 and 024X0004, where a 1-foot deep by 5-foot square layer of soil will be removed and centered on locations 024X0001 and 024X0004. Samples will be collected from the excavation wall at the side of the building. The TPH analyzer will direct soil excavation and removal of 1-foot thick by 5-foot diameter lifts,

which will continue until field screening indicates that remaining soil TPH concentrations are less than the 100 mg/kg action level (above 5 feet deep).

The contractor will stockpile the excavated soil on plastic sheeting, and cover it with plastic to prevent cross-contamination and erosion. The contractor will be responsible for maintaining the plastic cover on the stockpiled soil. EnSafe will sample the pile and request five-day turnaround for the disposal profile samples. Upon receipt of the results, EnSafe will attach a summary of detections to the data package, and forward two copies to the NSA Mid-South PWD Env. Div. within five days. Contaminated soil will be properly disposed of in accordance with current USEPA and TDEC regulations. The contractor will dispose of any special-waste soil, while any hazardous-waste soil will be disposed of by the NSA Mid-South PWD Env. Div.

Soil Screening

Using disposable spoons or decontaminated stainless-steel spoons and bowls, EnSafe personnel will collect soil samples from the excavation walls and base as each 10-foot square lift is removed. Personnel will not enter the excavation if it is deeper than 4 feet to comply with confined space entry regulations. These samples will be collected from the backhoe bucket, if necessary, from the center of the bucket to avoid sample contamination from the bucket wall. The samples will be collected in accordance with procedures described in Section 4.4.3 of the *Comprehensive RFI Work Plan* (E/A&H, October 1994).

Samples will be screened using an IR TPH Plus Field Analyzer, which performs analyses based on USEPA Method 418.1 (IR method). The excavation will continue until field screening demonstrates that the contaminated soil has been removed to concentrations less than the site-specific remediation level of 100 mg/kg.

3.4.7 Postremoval Activities

Several activities will be conducted after soil is removed, including confirmation soil sampling, backfilling the excavation, and disposing of used PPE and disposable sampling equipment.

Confirmation Soil Sampling

When field screening demonstrates that the contaminated soil has been removed to less than the site-specific remediation level of 100 mg/kg TPH above 5 feet deep or 500 mg/kg TPH below 5 feet deep, EnSafe will collect a five-part composite sample from each of the excavation walls and four grab samples from the excavation floor (one from each corner). These samples will be collected from the backhoe bucket, if necessary, from the center of the bucket to avoid sample contamination from the bucket wall. These confirmation soil samples will be analyzed onsite using the TPH Plus Field Analyzer for TPH (Method 418.1), and at an offsite laboratory for Appendix IX metals (USEPA Method 6010/7000 series).

In the event that water is encountered in the excavation, the contractor will containerize it in properly labeled U.S. DOT-approved 55-gallon drums. EnSafe will collect water samples for analyses of VOCs and oil and grease. The drums will be placed in a secured location approved by the NSA Mid-South PWD Env. Div. and remain at this location. The contractor will discharge the water to the sewer via an oil-water separator designated by the NSA Mid-South PWD Env. Div. after contacting the PWD for permission and specifications from the City of Millington POTW. If any water is not approved for discharge to the sewer, then the NSA Mid-South PWD Env. Div. will arrange for its proper disposal. EnSafe will be responsible for collecting any water samples required by the disposal facility and obtaining any additional analyses to determine the appropriate means of disposal.

Backfill of the Excavation

The excavation will remain open until confirmation samples document that soil exceeding the TPH action level of 100 mg/kg has been removed and the BCT has approved backfilling based on a

review of the TPH and metals concentrations. A temporary fence or barricade will be placed around the excavation. Clean soil from an offsite source will be used by the contractor for backfill, along with number 33C limestone in areas having vehicular traffic. The area will then be covered with the equivalent of the original material by the contractor.

Removal of Construction Materials

After stockpiled soil has been removed, any debris or trash from field activities will be removed by the contractor. The area will be left as close as possible to its natural state.

Voluntary Corrective Action Report

EnSafe will prepare a report after field activities are complete and analytical results have been received, to address the following:

- Field activities, including a description of field screening and sampling.
- Analytical test results for confirmation samples collected after soil removal.
- A diagram showing site features during the removal action. The diagram will include the location of the excavation, soil-sampling locations, and detected concentrations.
- Disposal manifests (if available at the time of report) and a description of the fate of water generated during removal action, if any.

3.4.8 Analytical Requirements

Analytical requirements for the samples to be collected at Facility N-114/SWMU 24 are summarized in Table 3.4.4. Confirmation samples will be analyzed for TPH (418.1) and Appendix IX metals (USEPA Method 6010/7000 series; offsite laboratory). One characterization sample for soil disposal, which will be collected using a decontaminated stainless-steel hand auger

or spoon and bowl for every 100 yd^3 or less of soil, will be analyzed for TCLP lead and TCLP benzene, in accordance with DSW special waste policy. EnSafe will collect any additional samples required by the disposal facility and submit them for analyses. Soil samples will be screened by the IR method, in accordance with the manufacturer's instructions.

Table 3.4.4
Sample Summary and Analytical Requirements

Sample Type	Matrix	Analytical Parameters	Rationale	Turnaround Time
Extent Verification	Soil	TPH based on USEPA Method 418.1	TPH is primary contaminant and technology is available to field screen.	Field Analysis
Confirmation	Soil	TPH Method 418.1 Appendix IX Metals	Due to past spills and/or releases, TPH and metals are present.	Field Analysis 5 days
Soil Disposal	Soil (Excavated Material)	TCLP lead TCLP benzene	In accordance with DSW special waste policy.	5 days

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3.5 Facility N-1211

3.5.1 Site Description

Facility N-1211 is a 4,320-square-foot wood-framed structure built on a concrete slab floor in 1958. It is currently used for storage and as a maintenance shop for golf-course equipment by the Morale, Welfare, and Recreation (MWR) department. Figure 1.1 provides a site location map of Facility N-1211.

From 1958 to 1968, it was used to store petroleum products such as oil, gasoline, transmission fluid, diesel, grease, etc. At the time of the *Environmental Baseline Survey* (EBS; November 1994), used oil and Freon were stored in a waste-oil facility onsite. Facility 1740, associated with Facility 1211, is used by MWR as a pest-control storage building. Also associated with this facility was an abandoned 1,000-gallon UST reported to contain fuel oil. According to the NSA Mid-South PWD Env. Div., this tank has been addressed under the UST program.

3.5.2 Previous Investigations/Findings

During the ERNA Gray Areas Investigation, surface and subsurface soils were sampled to determine if petroleum products, hazardous materials, or hazardous waste have been released at this site. Four samples (174S000101, 174S000201, 174S000301, and 174S000401) were collected from around doorways and ditches at the 0- to 1-foot interval. Because of the low groundwater yield of the loess, one saturated subsurface-soil sample was collected from the loess at location 174X0005.

Groundwater from the upper part of the fluvial deposits was also sampled at four locations and analyzed for VOCs. Shallow-soil samples were analyzed for metals, pesticides, herbicides, and TPH. The saturated loess sample was analyzed for VOCs and TPH. All soil and groundwater samples were analyzed at Savannah Analytical Laboratory in Savannah, Georgia. Figure 3.5 shows the site layout and sampling locations.

Organics in Soil

Organic and TPH soil samples that exceeded at least one standard reference value are presented in Tables 3.5.1 and 3.5.2.

Table 3.5.1
Gray Areas — Facility N-1211 Organic Detections in Soil by Location (μg/kg)

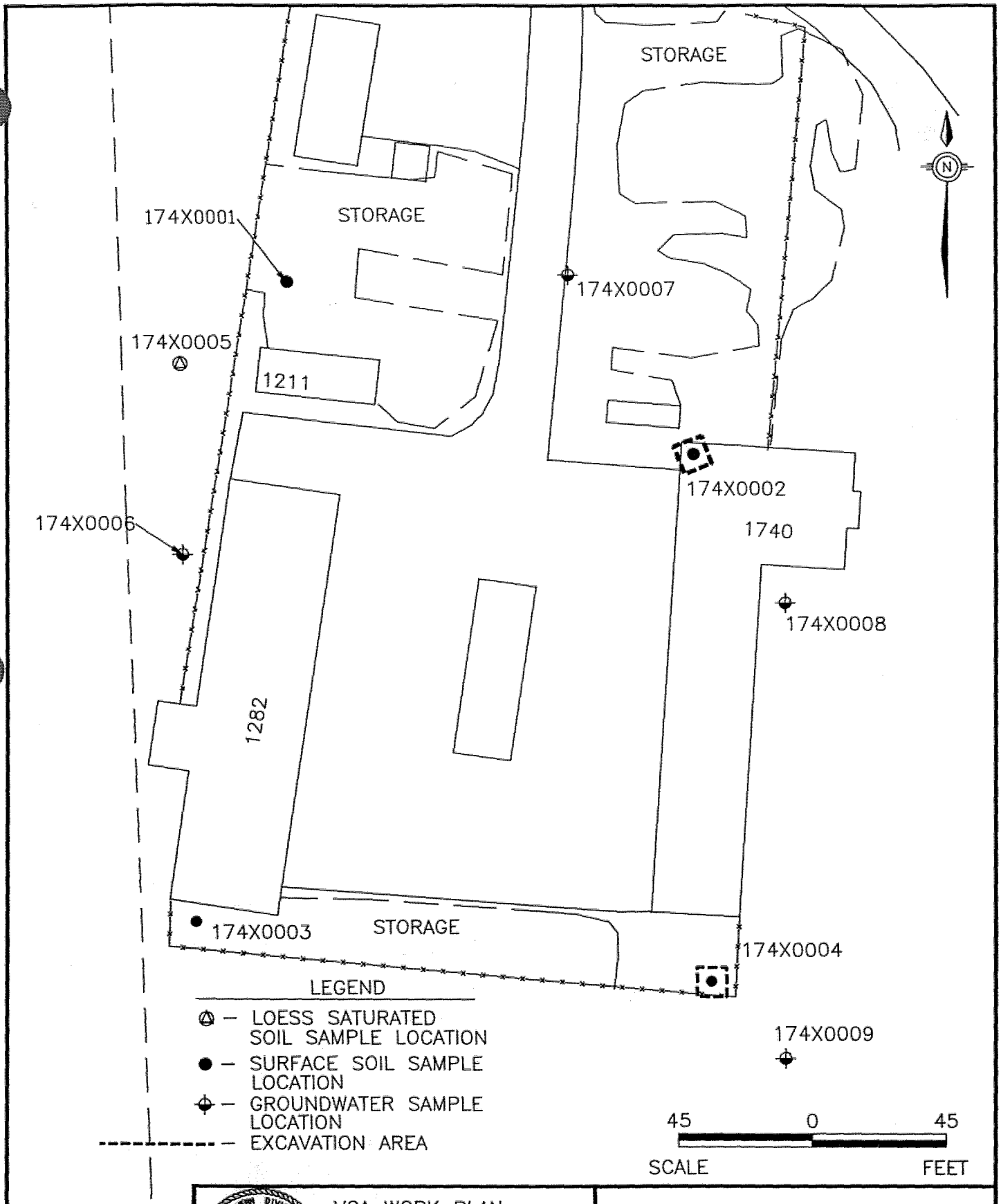
Location	Depth (in feet)	Contaminant	RC[a]	RBC[b] Industrial	RBC[b] Residential	SSL[c]	Result
174X0001	01'	Dieldrin	262	360	40	0.2	430
174X0002	01'	Dieldrin	262	360	40	0.2	16 J
174X0003	01'	Dieldrin	262	360	40	0.2	250
174X0004	01'	Dieldrin	262	360	40	0.2	72 JD

Notes:
a — Background Reference Concentration (RC) from the August 1996 *Technical Memorandum — Reference Concentrations* (August 27, 1996, E/A&H).
b — Industrial and residential RBCs from the April 1999 *Risk-Based Concentration Table* (April 12, 1999, USEPA Region III RBC Memo).
c — Soil Screening Level (SSL) from the May 1996 *Generic Screening Levels* (May 1996, USEPA/OSWER SSL Guidance Document, EPA/540/R-95/128).
J — Contaminant detected in concentrations less than the method reporting limit; value estimated.
D — Sample diluted to determine value.

The pesticide dieldrin was detected in sample 174S000101 (430 μg/kg) at a concentration exceeding all its standard reference values, but the PRE calculation [*ERNA Gray Areas Investigation Report* (EnSafe, May 1999)] did not indicate any excess risk associated with this concentration.

Table 3.5.2
Gray Areas — Facility N-1211 Petroleum Hydrocarbon Detections in Soil by Location (mg/kg)

Location	Depth (in feet)	Contaminant	Result
174X0002	01'	TPH	750
174X0004	01'	TPH	14,000



VCA WORK PLAN
CONTAMINATED SOIL REMOVAL
NSA MID-SOUTH
MILLINGTON, TENNESSEE

FIGURE 3.5
FACILITY 1211
REMOVAL LOCATION MAP

DWG DATE: 01/12/99 | DWG NAME: 0106B013

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TPH was detected at a concentration of 14,000 mg/kg in sample 174S000401 and 750 mg/kg in sample 174S000201. Both exceeded the site-specific TDEC cleanup level of 500 mg/kg.

Inorganics in Soil

Inorganic soil samples that exceeded at least one standard reference value are presented in Table 3.5.3.

Table 3.5.3
Gray Areas — Facility N-1211 Inorganic Detections in Soil by Location (mg/kg)

Location	Depth (in feet)	Constituent	RC[a] Surface	RBC[b] Industrial	RBC[b] Residential	SSL[c]	Result
174X0001	01'	Arsenic (As)	14.6	3.8	0.43	1	7.5
		Barium (Ba)	223	14,000	550	82	139
		Beryllium (Be)	1	1.3	0.15	3	0.5 J
		Chromium (Cr)	23.9	1,000	39	2	13.2
		Nickel (Ni)	20.6	4,100	160	7	14.0
		Selenium (Se)	DNE	1,000	39	0.3	0.58 J
174X0002	01'	Arsenic (As)	14.6	3.8	0.43	1	6.4
		Barium (Ba)	223	14,000	550	82	130
		Beryllium (Be)	1	1.3	0.15	3	0.5 J
		Chromium (Cr)	23.9	1,000	39	2	16.2
		Lead (Pb)	26.0	400	400	DNE	27.5 J
		Nickel (Ni)	20.6	4,100	160	7	11.8
		Selenium (Se)	DNE	1,000	39	0.3	0.5 J
174X0003	01'	Arsenic (As)	14.6	3.8	0.43	1	21.2
		Chromium (Cr)	23.9	1,000	39	2	28.2
		Lead (Pb)	26.0	400	400	DNE	34.5 J
		Nickel (Ni)	20.6	4,100	160	7	8.5
174X0004	01'	Arsenic (As)	14.6	3.8	0.43	1	54.6
		Barium (Ba)	223	14,000	550	82	113
		Cadmium (Cd)	1.54	100	3.9	0.4	4.4
		Chromium (Cr)	23.9	1,000	39	2	28.4
		Copper (Cu)	24.2	8,200	310	DNE	51.3
		Lead (Pb)	26.0	400	400	DNE	290 J
		Nickel (Ni)	20.6	4,100	160	7	12.8
		Selenium (Se)	DNE	1,000	39	0.3	0.88 J
		Zinc (Zn)	98	61,000	2,300	620	293

Notes:

a — Background Reference Concentration (RC) from the August 1996 *Technical Memorandum — Reference Concentrations* (August 27, 1996, E/A&H).

b — Industrial and residential RBCs from the April 1999 *Risk-Based Concentration Table* (April 12, 1999, USEPA Region III RBC Memo).

c — Soil Screening Level (SSL) from the May 1996 *Generic Screening Levels* (May 1996, USEPA/OSWER SSL Guidance Document, EPA/540/R-95/128).

DNE — Does not exist.

J — Constituent detected in concentrations less than the method reporting limit; value estimated.

Cadmium was detected at a concentration of 4.4 mg/kg in sample 174S000401, causing the residential PRE calculation to exceed the risk threshold of 1; the mean concentration (1.33 mg/kg) across the site did not exceed the RC (1.54 mg/kg). Arsenic was detected in samples 174S000301 (21.2 mg/kg) and 174S000401 (54.6 mg/kg) at concentrations exceeding all its standard reference values. PRE calculations for arsenic as a carcinogen using the concentration 54.6 mg/kg showed excess cancer risk associated with these concentrations. Also, the mean concentration (22.4 mg/kg) of arsenic across the site exceeded the RC (14.6 mg/kg). If the arsenic concentration of 21.2 mg/kg from sample 174 000301 is used to calculate the PRE excess cancer risk, the result is 4.9E-5, which is less than the risk threshold of 1E-4 [*Guidance on Preliminary Risk Evaluations for the Purpose of Reaching a Finding of Suitability to Lease, USEPA Region IV Memorandum* (November 1994)]. For these reasons, location 174X0003 will not be included in the TPH contaminated-soil removal.

3.5.3 Source Characterization

Based on TPH detections in surface soil at locations 174X0002 and 174X0004 that exceeded the TDEC cleanup level of 100 mg/kg, a VCA for surface soils was recommended. No VOC concentrations were detected in groundwater exceeding the standard reference values and, thus, no further groundwater investigation was recommended in the *ERNA Gray Areas Investigation Report* (EnSafe, May 1999).

3.5.4 Removal Responsibilities

The following section outlines the actions to be conducted during the excavation of petroleum-and metals-contaminated soil at Facility N-1211. The contractor will provide the equipment and personnel to excavate, stockpile, and dispose of the contaminated soil. EnSafe will assist the contractor as necessary, collect confirmation and soil-disposal samples, and report on the removal activities in a VCA report. The following activities to be performed by the designated staff, are further described in subsequent sections.

- EnSafe will plan field activities and schedule EnSafe personnel and equipment.

- EnSafe will review the following with the necessary personnel: the applicable portions of the *Comprehensive RFI Work Plan*, the CHSP which is included as Appendix B, and the SSHSP which is included as Appendix C.

- The contractor will coordinate the placement of contaminated-soil stockpiles with the NSA Mid-South PWD Env. Div. The contractor will place plastic on the ground surface before stockpiling soil in the designated areas.

- The contractor will excavate and stockpile all removed materials.

- EnSafe will provide sampling support during removal activities.

- EnSafe will characterize any excavated soil in accordance with the TDEC DUST and/or DSW guidance.

- The contractor will backfill the excavated area with clean soil or other materials and cover the area with the equivalent of the original material. The contractor will use number 33C limestone in areas where vehicular traffic is possible, as specified by the NSA Mid-South PWD Env. Div.

- The contractor will cover the stockpile with plastic, install silt fencing, and maintain runoff control until the soil is properly disposed of. The contractor will coordinate disposal of soil and decontamination fluids resulting from field activities, including the preparation and filing of any special waste permits.

- The contractor will remove all construction materials.

- EnSafe will prepare a VCA report for the site.

3.5.5 Preremoval Activities

Activities to be conducted before removing the soil are discussed in the following sections.

Orientation Meeting

Before performing any field activities at Facility N-1211, EnSafe personnel will hold an orientation meeting to review general and site-specific requirements for sampling and documentation. General discussion will include locations of the site field office, subject site, and designated decontamination areas. Sampling requirements to be discussed will include general sampling protocol, the sample-numbering system, QA/QC sampling requirements, and sample packaging. Documentation requirements to be discussed will include the use of field forms, field logbooks, and photographic documentation.

The EnSafe SSO will review the CHSP and SSHSP (Appendices B and C) with EnSafe personnel before any field activities begin. All EnSafe employees working onsite will be required to sign a form acknowledging that they are familiar with the plan and agree to abide by its guidelines. The SSHSP contains a copy of the compliance-agreement form.

3.5.6 Removal Activities

Several activities will be conducted before and during soil removal. Specific tasks include air monitoring, soil excavation, and soil screening. TDEC will be given at least two weeks notice by the NSA Mid-South PWD Env. Div. before any removal activities begin.

Surface and Subsurface Soil Excavation

Soil excavation will start with removal of a 2-foot deep by 10-foot square layer of soil centered on location 174X0004. Soil excavation at location 174X0002 will start with removal of a 1-foot

deep by 10-foot square layer of soil centered on location 174X0002. The TPH analyzer will direct soil excavation and removal of 1-foot thick by 10-foot square lifts, which will continue until field screening indicates that remaining soil TPH concentrations are lower than the 100 mg/kg action level.

The contractor will stockpile the excavated soil on plastic sheeting, and cover it with plastic to prevent cross-contamination and erosion. The contractor will be responsible for maintaining the plastic cover on the stockpiled soil. EnSafe will sample the pile and request five-day turnaround for the disposal profile samples. Upon receipt of the results, EnSafe will attach a summary of detections to the data package, and forward two copies to the NSA Mid-South PWD Env. Div. within five days. Contaminated soil will be properly disposed of in accordance with current USEPA and TDEC regulations. The contractor will dispose of any special-waste soil, while any hazardous-waste soil will be disposed of by the NSA Mid-South PWD Env. Div.

Soil Screening

Using disposable spoons or decontaminated stainless-steel spoons and bowls, EnSafe personnel will collect soil samples from the excavation walls and base as each 10-foot diameter lift is removed. Personnel will not enter the excavation if it is deeper than 4 feet to comply with confined space entry regulations. These samples will be collected from the backhoe bucket, if necessary, from the center of the bucket to avoid sample contamination from the bucket wall. The samples will be collected in accordance with procedures described in Section 4.4.3 of the *Comprehensive RFI Work Plan* (E/A&H, October 1994).

Samples will be screened using an IR TPH Plus Field Analyzer, which performs analyses based on USEPA Method 418.1 (IR method). The excavation will continue until field screening demonstrates that the contaminated soil has been removed to concentrations less than the site-specific remediation level of 100 mg/kg.

3.5.7 Postremoval Activities

Several activities will be conducted after soil is removed, including confirmation soil sampling, backfilling the excavation, and disposing of used PPE and disposable sampling equipment.

Confirmation Soil Sampling

When field screening demonstrates that the contaminated soil has been removed to less than the site-specific remediation level of 100 mg/kg TPH above 5 feet deep or 500 mg/kg TPH below 5 feet deep, EnSafe will collect a five-part composite sample from each of the excavation walls and four grab samples from the excavation floor (one from each corner). These confirmation soil samples will be analyzed onsite using the TPH Plus Field Analyzer for TPH (Method 418.1), and at an offsite laboratory for Appendix IX metals (USEPA Method 6010/7000 series).

In the event that water is encountered in the excavation, the contractor will containerize it in properly labeled U.S. DOT-approved 55-gallon drums. EnSafe will collect water samples for analyses of VOCs and oil and grease. The drums will be placed in a secured location approved by the NSA Mid-South PWD Env. Div. and remain at this location. The contractor will discharge the water to the sewer via an oil-water separator designated by the NSA Mid-South PWD Env. Div. after contacting the PWD for permission and specifications from the City of Millington POTW. If any water is not approved for discharge to the sewer, then the NSA Mid-South PWD Env. Div. will arrange for its proper disposal. EnSafe will be responsible for collecting any water samples required by the disposal facility and obtaining any additional analyses to determine the appropriate means of disposal.

Backfill of the Excavation

The excavation will remain open until confirmation samples document that soil exceeding the TPH action level of 100 mg/kg has been removed and the BCT has approved backfilling based on a review of the TPH and metals concentrations. A temporary fence or barricade will be placed around the excavation. Clean soil from an offsite source will be used by the contractor for

backfill, along with number 33C limestone in areas having vehicular traffic. The area will then be covered with the equivalent of the original material by the contractor.

Removal of Construction Materials

After stockpiled soil has been removed, any debris or trash from field activities will be removed by the contractor. The area will be left as close as possible to its natural state.

Voluntary Corrective Action Report

EnSafe will prepare a report after field activities are complete and analytical results have been received, to address the following:

- Field activities, including a description of field screening and sampling.
- Analytical test results for confirmation samples collected after soil removal.
- A diagram showing site features during the removal action. The diagram will include the location of the excavation, soil-sampling locations, and detected concentrations.
- Disposal manifests (if available at the time of report) and a description of the fate of water generated during the removal action, if any.

3.5.8 Analytical Requirements

Analytical requirements for the samples scheduled to be collected at Facility N-1211 are summarized in Table 3.5.4. Confirmation samples will be analyzed for TPH (Method 418.1) and Appendix IX metals (USEPA Method 6010/7000 series). One characterization sample for soil disposal, which will be collected using a decontaminated stainless-steel hand auger or spoon and bowl for every 100 yd^3 or less of soil, will be analyzed for TCLP lead and TCLP benzene, in accordance with DSW special waste policy. EnSafe will collect any additional samples required

by the disposal facility and submit them for the required analyses. Soil samples will be screened by the IR method, in accordance with the manufacturer's instructions.

Table 3.5.4

Sample Summary and Analytical Requirements

Sample Type	Matrix	Analytical Parameters	Rationale	Turnaround Time
Extent Verification	Soil	TPH based on USEPA Method 418.1	TPH is primary contaminant and technology is available to field screen.	Field Analysis
Confirmation	Soil	TPH Method 418.1 Appendix IX Metals	Due to past spills and/or releases, TPH and metals are present.	Field Analysis 5 days
Soil Disposal	Soil (Excavated Material)	TCLP lead TCLP benzene	In accordance with DSW special waste policy.	5 days

3.6 Facility N-105 — Quonset Hut

3.6.1 Site Description

This 4,000-square-foot steel-frame Quonset hut, which has metal siding and concrete floors, was built in 1949. It is currently used to store office furniture and supplies. Figure 1.1 provides a site location map of Facility N-105. According to historical maps and interviews, Facility N-105 has been used for corrosion control training in the past. Corrosion control is divided into two types of operations. One method is the application of anodes and cathodes to protect metals from oxidation/corrosion. The second method, which is the primary concern at Facility N-105, involves cleaning and painting metal aircraft or ship components. This method is consistent with the generation of waste solvents (VOCs) and paint wastes containing heavy metals. These operations often involved the use of chromic acid and various solvents (MEK, methylene chloride, toluene, xylene, etc.) and produced considerable amounts of paint waste.

3.6.2 Previous Investigations/Findings

During the ERNA Gray Areas Investigation, surface and subsurface soil were sampled to determine if hazardous materials/hazardous waste or petroleum products have been released at Facility N-105. As shown in Figure 3.6, two samples were collected from each of two locations. Two hand-auger soil samples (105S000101 and 105S000201) were collected from the surface (0 to 1 ft. bls) and two Geoprobe soil samples (105S000115 and 105S000215) were collected from the saturated zone in the loess (12 to 15 ft. bls). Because of low yields and slow recharge of the saturated zone in the loess, soil samples were collected from loess rather than groundwater. Sampling locations were selected based on the possibility of improper disposal practices (e.g., near back or side doors, adjacent drainage ditch, etc.). Samples were analyzed at Savannah Analytical Laboratory in Savannah, Georgia for VOCs, SVOCs, Appendix IX metals, and TPH.

Organics in Soil

Organic and TPH soil data for Facility N-105 samples that exceed at least one standard reference value are presented in Tables 3.6.1 and 3.6.2. Benzo(a)anthracene exceeded its soil-to-groundwater SSL (80 μg/kg) in sample 105S000201 at 95 μg/kg. The calculation of BEQ was less than the RC of 565 μg/kg, and is therefore not considered a COPC.

Table 3.6.1
Gray Areas — Facility N-105 Organic Detections in Soil by Location (μg/kg)

Location	Depth (in feet)	Contaminant	RC[a]	RBC[b] Industrial	RBC[b] Residential	SSL[c]	Result
105X0002	01'	Benzo(a)anthracene	—	7,800	880	80	95 J

Notes:
a — Background Reference Concentration (RC) from the August 1996 Technical Memorandum — Reference Concentrations (August 27, 1996, E/A&H Tech Memo).
b — Industrial and Residential RBCs from the April 1999 Risk-Based Concentration Table (April 12, 1999, USEPA Region III RBC Memo).
c — Soil Screening Level (SSL) from the May 1996 Generic Screening Levels (May 1996, USEPA/OSWER SSL Guidance Document, EPA/540/R-95/128).
J — Contaminant detected in a concentration less than the method reporting limit; value estimated.

Table 3.6.2
Gray Areas — Facility N-105 Petroleum Hydrocarbon Detections in Soil by Location (mg/kg)

Location	Depth (in feet)	Contaminant	Result
105X0001	01'	TPH	210
105X0002	15'	TPH	330 J

Inorganics in Soil

Inorganic soil-sample data that exceed at least one standard reference value are presented in Table 3.6.3.

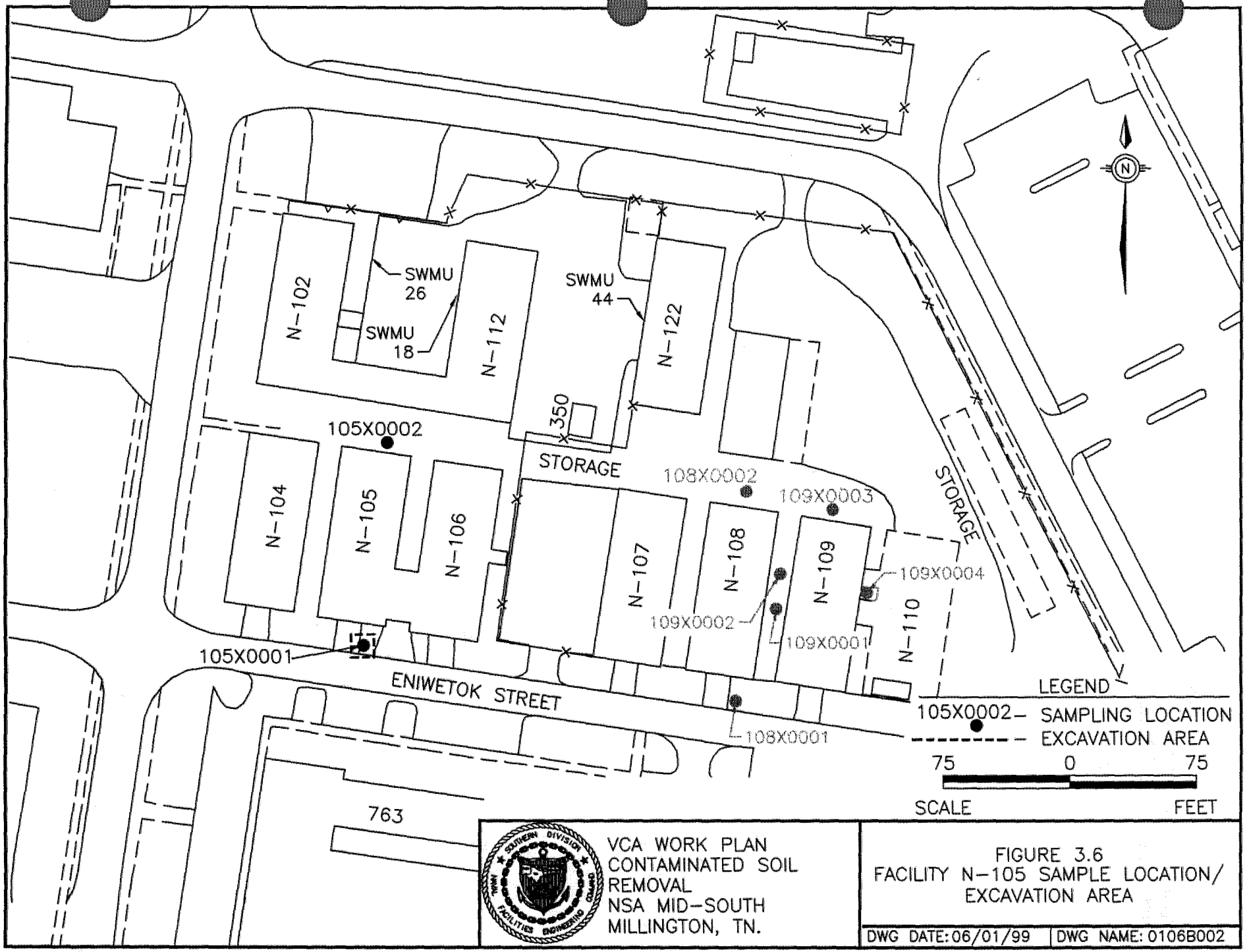
N
N-102
SWMU 26
SWMU 18
N-112
SWMU 44
N-122
350
105X0002
STORAGE
108X0002
109X0003
STORAGE
N-104
N-105
N-106
N-107
N-108
N-109
109X0004
109X0002
109X0001
N-110
105X0001
ENIWETOK STREET
108X0001
763
LEGEND
105X0002 – SAMPLING LOCATION
EXCAVATION AREA
75 0 75
SCALE FEET
VCA WORK PLAN
CONTAMINATED SOIL
REMOVAL
NSA MID-SOUTH
MILLINGTON, TN.
FIGURE 3.6
FACILITY N-105 SAMPLE LOCATION/
EXCAVATION AREA
DWG DATE: 06/01/99
DWG NAME: 0106B002

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Table 3.6.3
Gray Areas — Facility N-105 Inorganic Detections in Soil by Location (mg/kg)

Location	Depth (in feet)	Constituent	RC[a] Surface	RBC[b] Industrial	RBC[b] Residential	SSL[c]	Result
105X0001	01'	Arsenic (As)	14.6	3.8	0.43	1	6.7
		Beryllium (Be)	1	1.3	0.15	3	0.46 J
		Cadmium (Cd)	1.54	100	3.9	0.4	0.76
		Chromium (Cr)	23.9	1,000	39	2	10.9
		Lead (Pb)	26.0	400	400	DNE	28.7 J
		Nickel (Ni)	20.6	4,100	160	7	12.5
105X0001	15'	Arsenic (As)	20.3	—	—	1	6.1
		Chromium (Cr)	28.3	—	—	2	19.7
		Nickel (Ni)	DNE	—	—	7	11.2
105X0002	01'	Arsenic (As)	14.6	3.8	0.43	1	7.4
		Barium (Ba)	223	14,000	550	82	97.1
		Cadmium (Cd)	1.54	100	3.9	0.4	2.4
		Chromium (Cr)	23.9	1,000	39	2	17.4
		Copper (Cu)	24.2	8,200	310	DNE	27.2
		Lead (Pb)	26.0	400	400	DNE	47.5 J
		Nickel (Ni)	20.6	4,100	160	7	16.3
105X0002	15'	Antimony (Sb)	DNE	—	—	0.3	1 J
		Arsenic (As)	20.3	—	—	1	5.4
		Chromium (Cr)	28.3	—	—	2	14.9
		Nickel (Ni)	DNE	—	—	7	12.3

Notes:

a — Background Reference Concentration (RC) from the August 1996 Technical Memorandum — Reference Concentrations (August 27, 1996, E/A&H Tech Memo).

b — Industrial and Residential RBCs from the April 1999 Risk-Based Concentration Table (April 12, 1999, USEPA Region III RBC Memo).

c — Soil Screening Level (SSL) from the May 1996 Generic Screening Levels (May 1996, USEPA/OSWER SSL Guidance Document, EPA/540/R-95/128).

DNE — Does not exist.

J — Constituent detected in concentrations less than the method reporting limit; value estimated.

3.6.3 Source Characterization

Based on TPH detections in surface soil at location 105X0001 that exceeded the TDEC cleanup level of 100 mg/kg, a VCA was recommended to address soil contamination by removing any TPH contamination detected at concentrations exceeding acceptable risk standards.

3.6.4 Removal Responsibilities

The following section outlines the actions to be conducted during the excavation of petroleum-and metals-contaminated soil. The contractor will provide the equipment and personnel to excavate, stockpile, and dispose of the contaminated soil. EnSafe will assist the contractor as necessary, collect confirmation and soil-disposal samples, and report on the removal activities in a VCA report. The following activities to be performed by the designated staff, are further described in subsequent sections.

- EnSafe will plan field activities and schedule EnSafe personnel and equipment.

- EnSafe will review the following with the necessary personnel: the applicable portions of the *Comprehensive RFI Work Plan*, the CHSP which is included as Appendix B, and the SSHSP which is included as Appendix C.

- The contractor will coordinate the placement of contaminated-soil stockpiles with the NSA Mid-South PWD Env. Div. The contractor will place plastic on the ground surface before stockpiling soil in the designated areas.

- The contractor will excavate and stockpile all removed materials.

- EnSafe will provide sampling support during removal activities.

- EnSafe will characterize any excavated soil in accordance with the TDEC DUST and/or DSW guidance.

- The contractor will backfill the excavated area with clean soil or other materials and cover the area with the equivalent of the original material. The contractor will use number 33C limestone in areas where vehicular traffic is possible, as specified by the NSA Mid-South PWD Env. Div.

- The contractor will cover the stockpile with plastic, install silt fencing, and maintain runoff control until the soil is properly disposed of. The contractor will coordinate disposal of soil and decontamination fluids resulting from field activities, including the preparation and filing of any special waste permits.

- The contractor will remove all construction materials.

- EnSafe will prepare a VCA report for the site.

3.6.5 Preremoval Activities

Activities to be conducted before removing the soil are discussed in the following sections.

Orientation Meeting

Before performing any field activities, EnSafe personnel will hold an orientation meeting to review general and site-specific requirements for sampling and documentation. General discussion will include locations of the site field office, subject site, and designated decontamination areas. Sampling requirements to be discussed will include general sampling protocol, the sample-numbering system, QA/QC sampling requirements, and sample packaging. Documentation requirements to be discussed will include the use of field forms, field logbooks, and photographic documentation.

The SSO will review the CHSP and SSHSP (Appendices B and C) with EnSafe personnel before any field activities begin. All EnSafe employees working onsite will be required to sign a form acknowledging that they are familiar with the plan and agree to abide by its guidelines. The SSHSP contains a copy of the compliance-agreement form.

3.6.6 Removal Activities

Several activities will be conducted before and during soil removal. Specific tasks include air monitoring, soil excavation, and soil screening. TDEC will be given at least two weeks notice by the NSA Mid-South PWD Env. Div. before any removal activities begin.

Surface and Subsurface Soil Excavation

Soil excavation will start with removal of a 2-foot deep by 5-foot square layer of soil centered on location 105X0001. The TPH analyzer will direct soil excavation and removal of 1-foot thick by 5-foot square lifts, which will continue until field screening indicates that remaining soil TPH concentrations are lower than the 100 mg/kg action level.

The contractor will stockpile the excavated soil on plastic sheeting, and cover it with plastic to prevent cross-contamination and erosion. The contractor will be responsible for maintaining the plastic cover on the stockpiled soil. EnSafe will sample the pile and request five-day turnaround for the disposal profile samples. Upon receipt of the results, EnSafe will attach a summary of detections to the data package, and forward two copies to the NSA Mid-South PWD Env. Div. within five days. Contaminated soil will be properly disposed of in accordance with current USEPA and TDEC regulations. The contractor will dispose of any special-waste soil, while any hazardous-waste soil will be disposed of by the NSA Mid-South PWD Env. Div.

Soil Screening

Using disposable spoons or decontaminated stainless-steel spoons and bowls, EnSafe personnel will collect soil samples from the excavation walls and base as each 5-foot diameter lift is removed. Personnel will not enter the excavation if it is deeper than 4 feet to comply with confined space entry regulations. These samples will be collected from the backhoe bucket, if necessary, from the center of the bucket to avoid sample contamination from the bucket wall. The samples will be collected in accordance with procedures described in Section 4.4.3 of the *Comprehensive RFI Work Plan* (E/A&H, October 1994).

Samples will be screened using an IR TPH Plus Field Analyzer, which performs analyses based on USEPA Method 418.1 (IR method). The excavation will continue until field screening demonstrates that the contaminated soil has been removed to concentrations less than the site-specific remediation level of 100 mg/kg.

3.6.7 Postremoval Activities

Several activities will be conducted after soil is removed, including confirmation soil sampling, backfilling the excavation, and disposing of used PPE and disposable sampling equipment.

Confirmation Soil Sampling

When field screening demonstrates that the contaminated soil has been removed to less than the site-specific remediation level of 100 mg/kg TPH, EnSafe will collect a five-part composite sample from each of the excavation walls and four grab samples from the excavation floor (one from each corner). These confirmation soil samples will be analyzed onsite using the TPH Plus Field Analyzer for TPH (Method 418.1), and at an offsite laboratory for Appendix IX metals (USEPA Method 6010/7000 series).

In the event that water is encountered in the excavation, the contractor will containerize it in properly labeled U.S. DOT-approved 55-gallon drums. EnSafe will collect water samples for analyses of VOCs, and oil and grease. The drums will be placed in a secured location approved by the NSA Mid-South PWD Env. Div. and remain at this location. The contractor will discharge the water to the sewer via an oil-water separator designated by the NSA Mid-South PWD Env. Div. after contacting the PWD for permission and specifications from the City of Millington POTW (publicly owned treatment works). If any water is not approved for discharge to the sewer, then the NSA Mid-South PWD Env. Div. will arrange for its proper disposal. EnSafe will be responsible for collecting any water samples required by the disposal facility and obtaining any additional analyses to determine the appropriate means of disposal.

Backfill of the Excavation

The excavation will remain open until confirmation samples document that soil exceeding the TPH action level of 100 mg/kg has been removed and the BCT has approved backfilling based on a review of the TPH and metals concentrations. A temporary fence or barricade will be placed around the excavation. Clean soil from an offsite source will be used by the contractor for backfill along with number 33C limestone in areas having vehicular traffic. The area will then be covered with the equivalent of the original material by the contractor.

Removal of Construction Materials

After stockpiled soil has been removed, any debris or trash from field activities will be removed by the contractor. The area will be left as close as possible to its natural state.

Voluntary Corrective Action Report

EnSafe will prepare a report after field activities are complete and analytical results have been received, to address the following:

- Field activities, including a description of field screening and sampling.
- Analytical test results for confirmation samples collected after soil removal.
- A diagram showing site features during the removal action. The diagram will include the location of the excavation, soil-sample locations, and detected concentrations.
- Disposal manifests (if available at the time of report) and a description of the fate of water generated during the removal action, if any.

3.6.8 Analytical Requirements

Analytical requirements for the samples scheduled to be collected are summarized in Table 3.6.4. Confirmation samples will be analyzed for TPH (Method 418.1) and Appendix IX metals (USEPA Method 6010/7000 series). One characterization sample for soil disposal, which will be collected using a decontaminated stainless-steel hand auger or spoon and bowl for every 100 yd^3 or less of soil, will be analyzed for TCLP lead and TCLP benzene, in accordance with DSW special waste policy. EnSafe will collect any additional samples required by the disposal facility and submit them for the required analyses. Soil samples will be screened by the IR method, in accordance with the manufacturer's instructions.

Table 3.6.4
Sample Summary and Analytical Requirements

Sample Type	Matrix	Analytical Parameters	Rationale	Turnaround Time
Extent Verification	Soil	TPH based on USEPA Method 418.1	TPH is primary contaminant and technology is available to field screen.	Field Analysis
Confirmation	Soil	TPH Method 418.1 Appendix IX Metals	Due to past spills and/or releases, TPH and metals are present.	Field Analysis 5 days
Soil Disposal	Soil (Excavated Material)	TCLP lead TCLP benzene	In accordance with DSW special waste policy.	5 days

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3.7 Facility N-108 (Maintenance Shop)

3.7.1 Site Description

This Quonset hut (identical to N-105) houses offices and a maintenance shop where electrical parts (generators) are repaired. According to the NSA Mid-South PWD Env. Div., the Marine Corpsoccupied this facility from 1981 to 1995. Previous operations have reportedly included minor sandblasting and touch-up painting for vehicle maintenance. Before the Marine Corps occupied it, N-108 was listed only as a training facility.

3.7.2 Field Investigation/Findings

During the ERNA Gray Areas Investigation, surface and subsurface soil were sampled to determine if hazardous materials, hazardous waste, or petroleum products associated with painting and sandblasting have been released at Facility N-108. As shown in Figure 3.7, one surface sample was collected using a hand auger from each of two locations at 0 to 1 ft. bls and analyzed for SVOCs, Appendix IX metals, and TPH. A subsurface sample was also collected using a Geoprobe rig from each to the two locations from the saturated portion of the loess at 12 to 15 ft. bls and analyzed for VOCs, SVOCs, Appendix IX metals, and TPH. Sample locations were selected based on the possibility of improper disposal practices (e.g., near back and side doors, adjacent drainage ditch, etc.). Samples were analyzed at Savannah Analytical Laboratory in Savannah, Georgia. Figure 3.7 shows the site layout and sampling locations.

Organics in Soil

Organic and TPH soil data that exceeded at least one standard reference value are presented in Tables 3.7.1 and 3.7.2.

BEQ was retained as a COPC because it exceeded its standard reference values in sample 108S000201 (3,924 μg/kg), but the PRE calculation [ERNA Gray Areas Investigation Report (May 1999)] did not indicate any excess risk associated with this concentration.

Table 3.7.1
Gray Areas — Facility N-108 Organic Detections in Soil by Location (μg/kg)

Location	Depth (in feet)	Constituent	RC[a]	RBC[b] Industrial	RBC[b] Residential	SSL[c]	Result
108X0002	01'	BEQ	565	780	88	400	3,924
		Benzo(a)anthracene	—	7,800	880	80	2,200
		Benzo(b)fluoranthene	—	7,800	880	200	3,300
		Benzo(k)fluoranthene	—	78,000	8,800	2,000	2,200
		Benzo(a)pyrene	—	780	88	400	3,000
		Dibenz(a,h)anthracene	—	780	88	80	160 J
		Indeno(1,2,3-cd)pyrene	—	7,800	880	700	1,900
		Carbazole	—	290,000	32,000	30	210 J

Notes:
a — Background Reference Concentration (RC) from the August 1996 Technical Memorandum — Reference Concentrations (August 27, 1996, E/A&H Tech Memo).
b — Industrial and Residential RBCs from the April 1999 Risk-Based Concentration Table (April 12, 1999, USEPA Region III RBC Memo).
c — Soil Screening Level (SSL) from the May 1996 Generic Screening Levels (May 1996, USEPA/OSWER SSL Guidance Document, EPA/540/R-95/128).
J — Constituent detected below the method reporting limit; value estimated.

Table 3.7.2
Gray Areas — Facility N-108 Petroleum Hydrocarbon Detections by Location (mg/kg)

Location	Depth (in feet)	Constituent	Result
108X0002	01'	TPH	300

Inorganics in Soil

Results from inorganic soil sample data that exceed at least one standard reference value are presented in Table 3.7.3.

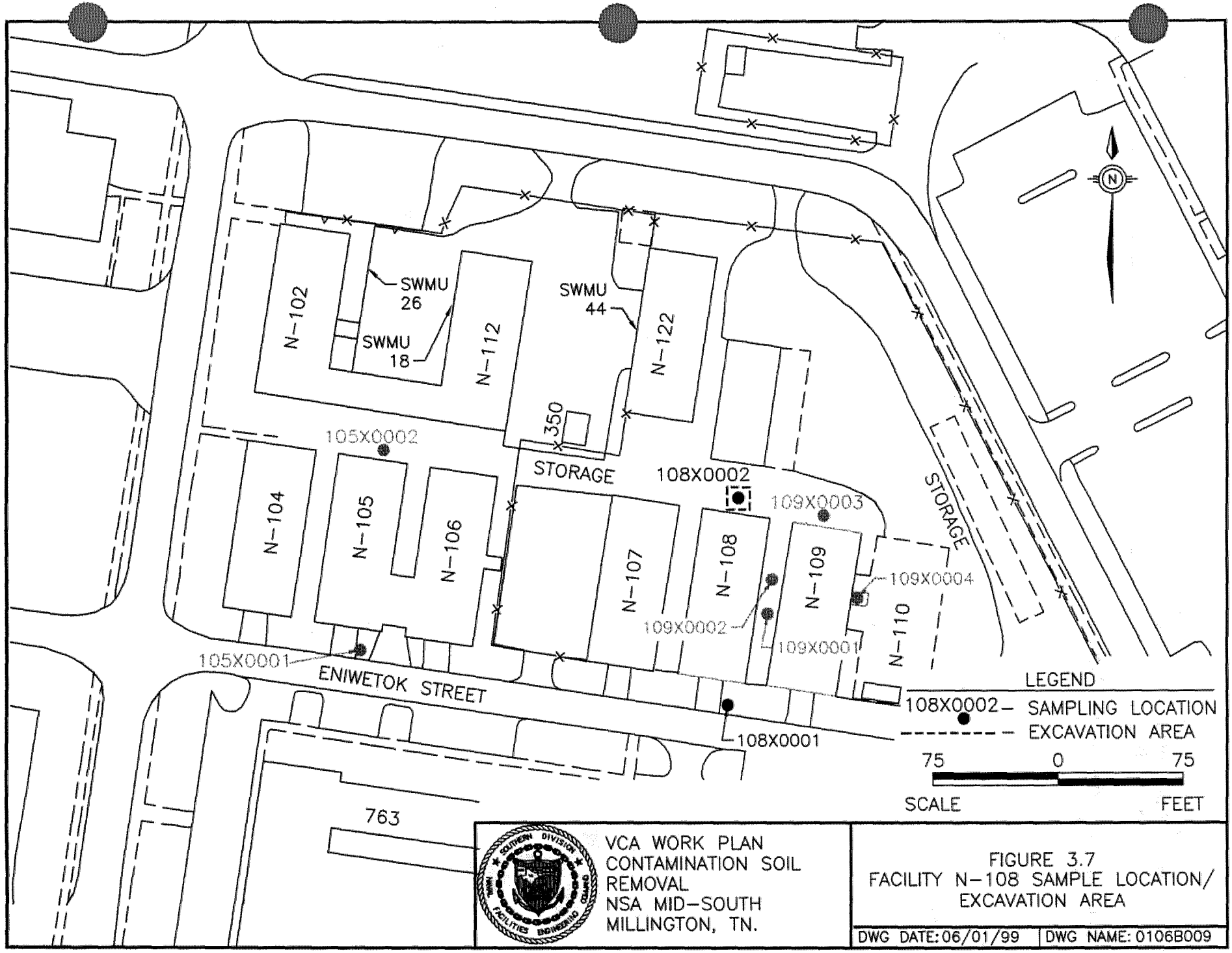
N-102
SWMU 26
SWMU 18
N-112
SWMU 44
N-122
350
105X0002
STORAGE
108X0002
109X0003
STORAGE
N-104
N-105
N-106
N-107
N-108
N-109
109X0004
109X0002
109X0001
N-110
105X0001
ENIWETOK STREET
108X0001
763
LEGEND
108X0002 – SAMPLING LOCATION
EXCAVATION AREA
75 0 75
SCALE FEET
VCA WORK PLAN
CONTAMINATION SOIL
REMOVAL
NSA MID-SOUTH
MILLINGTON, TN.
FIGURE 3.7
FACILITY N-108 SAMPLE LOCATION/
EXCAVATION AREA
DWG DATE: 06/01/99
DWG NAME: 0106B009

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Table 3.7.3
Gray Areas — Facility N-108 Inorganic Detections in Soil by Location (mg/kg)

Location	Depth (in feet)	Constituent	RC[a] Surface	RBC[b] Industrial	RBC[b] Residential	SSL[c]	Result
108X0001	01'	Arsenic (As)	14.6	3.8	0.43	1	11.9
		Barium (Ba)	223	14,000	550	82	124
		Beryllium (Be)	1	1.3	0.15	3	0.65
		Cadmium (Cd)	1.54	100	3.9	0.4	0.52 J
		Chromium (Cr)	23.9	1,000	39	2	17.2
		Nickel (Ni)	20.6	4,100	160	7	15.2
		Selenium (Se)	DNE	1,000	39	0.3	0.53 J
108X0001	15'	Arsenic (As)	20.3	—	—	1	7.8
		Nickel (Ni)	DNE	—	—	7	18
108X0002	01'	Arsenic (As)	14.6	3.8	0.43	1	8.8
		Barium (Ba)	223	265.12	550	82	116
		Beryllium (Be)	1	1.3	0.15	3	0.42 J
		Cadmium (Cd)	1.54	100	3.9	0.4	2.3
		Chromium (Cr)	23.9	1,000	39	2	26.9
		Copper (Cu)	24.2	8,200	310	DNE	32.2
		Lead (Pb)	26.0	400	400	DNE	87 J
		Nickel (Ni)	20.6	4,100	160	7	14
		Zinc (Zn)	98	61,000	2,300	620	137
108X0002	15'	Arsenic (As)	20.3	—	—	1	6.1
		Chromium (Cr)	28.3	—	—	2	12.9
		Nickel (Ni)	NA	—	—	7	15.7

Notes:

a — Background Reference Concentration (RC) from the August 1996 Technical Memorandum — Reference Concentrations (August 27, 1996, E/A&H Tech Memo).

b — Industrial and Residential RBCs from the April 1999 Risk-Based Concentration Table (April 12, 1999, USEPA Region III RBC Memo).

c — Soil Screening Level (SSL) from the May 1996 Generic Screening Levels (May 1996, USEPA/OSWER SSL Guidance Document, EPA/540/R-95/128).

DNE — Does not exist.

J — Constituent detected below the method reporting limit; value estimated.

3.7.3 Source Characterization

Based on TPH detections in surface soil at location 108X0002 that exceeded the TDEC cleanup level of 100 mg/kg, a VCA was recommended to address soil contamination by removing any TPH contamination detected at concentrations exceeding acceptable risk standards.

3.7.4 Removal Responsibilities

The following section outlines the actions to be conducted during the excavation of petroleum-and metals-contaminated soil. The contractor will provide the equipment and personnel to excavate, stockpile, and dispose of the contaminated soil. EnSafe will assist the contractor as necessary, collect confirmation and soil-disposal samples, and report on the removal activities in a VCA report. The following activities to be performed by the designated staff, are further described in subsequent sections.

- EnSafe will plan field activities and schedule EnSafe personnel and equipment.

- EnSafe will review the following with the necessary personnel: the applicable portions of the *Comprehensive RFI Work Plan*, the *Comprehensive Health and Safety Plan* (CHSP) which is included as Appendix B, and the *Site-Specific Health and Safety Plan* (SSHSP) which is included as Appendix C.

- The contractor will coordinate the placement of contaminated-soil stockpiles with the NSA Mid-South PWD Env. Div. The contractor will place plastic on the ground surface before stockpiling soil in the designated areas.

- The contractor will excavate and stockpile all removed materials.

- EnSafe will provide sampling support during removal activities.

- EnSafe will characterize any excavated soil in accordance with the TDEC DUST and/or DSW guidance.

- The contractor will backfill the excavated area with clean soil or other materials and cover the area with the equivalent of the original material. The contractor will use number 33C limestone in areas where vehicular traffic is possible, as specified by the NSA Mid-South PWD Env. Div.

- The contractor will cover the stockpile with plastic, install silt fencing, and maintain runoff control until the soil is properly disposed of. The contractor will coordinate disposal of soil and decontamination fluids resulting from field activities, including the preparation and filing of any special waste permits.

- The contractor will remove all construction materials.

- EnSafe will prepare a VCA report for the site.

3.7.5 Preremoval Activities

Activities to be conducted before removing the soil are discussed in the following sections.

Orientation Meeting

Before performing any field activities, EnSafe personnel will hold an orientation meeting to review general and site-specific requirements for sampling and documentation. General discussion will include locations of the site field office, subject site, and designated decontamination areas. Sampling requirements to be discussed will include general sampling protocol, the sample-numbering system, QA/QC sampling requirements, and sample packaging. Documentation requirements to be discussed will include the use of field forms, field logbooks, and photographic documentation.

The SSO will review the CHSP and SSHSP (Appendices B and C) with EnSafe personnel before any field activities begin. All EnSafe employees working onsite will be required to sign a form acknowledging that they are familiar with the plan and agree to abide by its guidelines. The SSHSP contains a copy of the compliance-agreement form.

3.7.6 Removal Activities

Several activities will be conducted before and during soil removal. Specific tasks include air monitoring, soil excavation, and soil screening. TDEC will be given at least two weeks notice by the NSA Mid-South PWD Env. Div. before any removal activities begin.

Surface and Subsurface Soil Excavation

Soil excavation will start with removal of a 2-foot deep by 5-foot square layer of soil centered on location 108X0002. The TPH analyzer will direct soil excavation and removal of 1-foot thick by 5-foot square lifts, which will continue until field screening indicates that remaining soil TPH concentrations are lower than the 100 mg/kg action level.

The contractor will stockpile the excavated soil on plastic sheeting, and cover it with plastic to prevent cross-contamination and erosion. The contractor will be responsible for maintaining the plastic cover on the stockpiled soil. EnSafe will sample the pile and request five-day turnaround for the disposal profile samples. Upon receipt of the results, EnSafe will attach a summary of detections to the data package, and forward two copies to the NSA Mid-South PWD Env. Div. within five days. Contaminated soil will be properly disposed of in accordance with current USEPA and TDEC regulations. The contractor will dispose of any special-waste soil, while any hazardous-waste soil will be disposed of by the NSA Mid-South PWD Env. Div.

Soil Screening

Using disposable spoons or decontaminated stainless-steel spoons and bowls, EnSafe personnel will collect soil samples from the excavation walls and base as each 5-foot diameter lift is

removed. Personnel will not enter the excavation if it is deeper than 4 feet to comply with confined space entry regulations. These samples will be collected from the backhoe bucket, if necessary, from the center of the bucket to avoid sample contamination from the bucket wall. The samples will be collected in accordance with procedures described in Section 4.4.3 of the *Comprehensive RFI Work Plan* (E/A&H, October 1994).

Samples will be screened using an IR TPH Plus Field Analyzer, which performs analyses based on USEPA Method 418.1 (IR method). The excavation will continue until field screening demonstrates that the contaminated soil has been removed to concentrations less than the site-specific remediation level of 100 mg/kg.

3.7.7 Postremoval Activities

Several activities will be conducted after soil is removed, including confirmation soil sampling, backfilling the excavation, and disposing of used PPE and disposable sampling equipment.

Confirmation Soil Sampling

When field screening demonstrates that the contaminated soil has been removed to less than the site-specific remediation level of 100 mg/kg TPH, EnSafe will collect a five-part composite sample from each of the excavation walls and four grab samples from the excavation floor (one from each corner). These confirmation soil samples will be analyzed onsite using the TPH Plus Field Analyzer for TPH (Method 418.1), and at an offsite laboratory for Appendix IX metals (USEPA Method 6010/7000 series).

In the event that water is encountered in the excavation, the contractor will containerize it in properly labeled U.S. DOT-approved 55-gallon drums. EnSafe will collect water samples for analyses of VOCs, and oil and grease. The drums will be placed in a secured location approved by the NSA Mid-South PWD Env. Div. and remain at this location. The contractor will discharge the water to the sewer via an oil-water separator designated by the NSA Mid-South

PWD Env. Div. after contacting the PWD for permission and specifications from the City of Millington POTW (publicly owned treatment works). If any water is not approved for discharge to the sewer, then the NSA Mid-South PWD Env. Div. will arrange for its proper disposal. EnSafe will be responsible for collecting any water samples required by the disposal facility and obtaining any additional analyses to determine the appropriate means of disposal.

Backfill of the Excavation

The excavation will remain open until confirmation samples document that soil exceeding the TPH action level of 100 mg/kg has been removed and the BCT has approved backfilling based on a review of the TPH and metals concentrations. A temporary fence or barricade will be placed around the excavation. Clean soil from an offsite source will be used by the contractor for backfill along with number 33C limestone in areas having vehicular traffic. The area will then be covered with the equivalent of the original material by the contractor.

Removal of Construction Materials

After stockpiled soil has been removed, any debris or trash from field activities will be removed by the contractor. The area will be left as close as possible to its natural state.

Voluntary Corrective Action Report

EnSafe will prepare a report after field activities are complete and analytical results have been received, to address the following:

- Field activities, including a description of field screening and sampling.
- Analytical test results for confirmation samples collected after soil removal.
- A diagram showing site features during the removal action. The diagram will include the location of the excavation, soil-sample locations, and detected concentrations.

- Disposal manifests (if available at the time of report) and a description of the fate of water generated during the removal action, if any.

3.7.8 Analytical Requirements

Analytical requirements for the samples scheduled to be collected are summarized in Table 3.7.4. Confirmation samples will be analyzed for TPH (Method 418.1) and Appendix IX metals (USEPA Method 6010/7000 series). One characterization sample for soil disposal, which will be collected using a decontaminated stainless-steel hand auger or spoon and bowl for every 100 yd^3 or less of soil, will be analyzed for TCLP lead and TCLP benzene, in accordance with DSW special waste policy. EnSafe will collect any additional samples required by the disposal facility and submit them for the required analyses. Soil samples will be screened by the IR method, in accordance with the manufacturer's instructions.

Table 3.7.4
Sample Summary and Analytical Requirements

Sample Type	Matrix	Analytical Parameters	Rationale	Turnaround Time
Extent Verification	Soil	TPH based on USEPA Method 418.1	TPH is primary contaminant and technology is available to field screen.	Field Analysis
Confirmation	Soil	TPH Method 418.1 Appendix IX Metals	Due to past spills and/or releases, TPH and metals are present.	Field Analysis 5 days
Soil Disposal	Soil (Excavated Material)	TCLP lead TCLP benzene	In accordance with DSW special waste policy.	5 days

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3.8 Facility S-203 — Quonset Hut (Storage)

3.8.1 Site Description

This 9,000-square-foot Quonset hut, which has a concrete slab floor and sheet metal walls, was built in 1947. The nearby Facility S-219, a small 546-square-foot brick structure built in 1949, was used to store petroleum, oils, and lubricants (POLs). Facility 1470, another nearby structure, is a metal cage on top of a 3-foot high concrete slab (121 square feet) which is currently not in use. Facilities S-219 and 1470 are associated with Facility S-203 because of their proximity and similar uses. Figure 1.1 shows the location of Facility S-203.

According to the Environmental Baseline Survey (EBS; E/A&H, 1993), Facilities S-203/ S-219/1470 have been used to store various supplies, including flammable liquids. According to the PWD Env. Div., Facility S-203 is currently used as the Hazardous Material Minimization Center and the Hazardous Waste Accumulation Area of the Base Operations Services (BOS) Contractor.

3.8.2 Field Investigation/Findings

During the ERNA Gray Areas Investigation, surface and subsurface soils were sampled to determine if petroleum products, hazardous materials, or hazardous waste have been released because of past or current site operations. This facility is in close proximity to SWMU 39, where chlorinated solvents have been detected in the fluvial deposits groundwater. SWMU 39 is currently undergoing a full RFI for groundwater. S-203 samples were collected from two intervals at three locations: from 0 to 1 ft. bls (203X0001, 203X0002, and 203X0003) and from the saturated portion of the loess at 12 to 15 ft. bls (203X0001, 203X0002, and 203X0003). Sample locations were based on the possibility of improper disposal practices (e.g., near back and side doors, adjacent to a drainage ditch). Surface-soil samples were analyzed for Appendix IX metals and TPH. Subsurface samples were analyzed for VOCs. Figure 3.8 shows the site layout and surveyed sampling locations. All samples were analyzed at Savannah Analytical Laboratory in Savannah, Georgia.

Organics in Soil

TPH soil-sampling data that exceeded at least one standard reference value are presented in Table 3.8.1. No organic compounds were detected exceeding their standard reference values.

Table 3.8.1
Gray Areas — Facility S-203 Petroleum Hydrocarbon Detections in Soil by Location (mg/kg)

Location	Depth (in feet)	Contaminant	Result
203X0003	01'	TPH	230

Inorganics in Soil

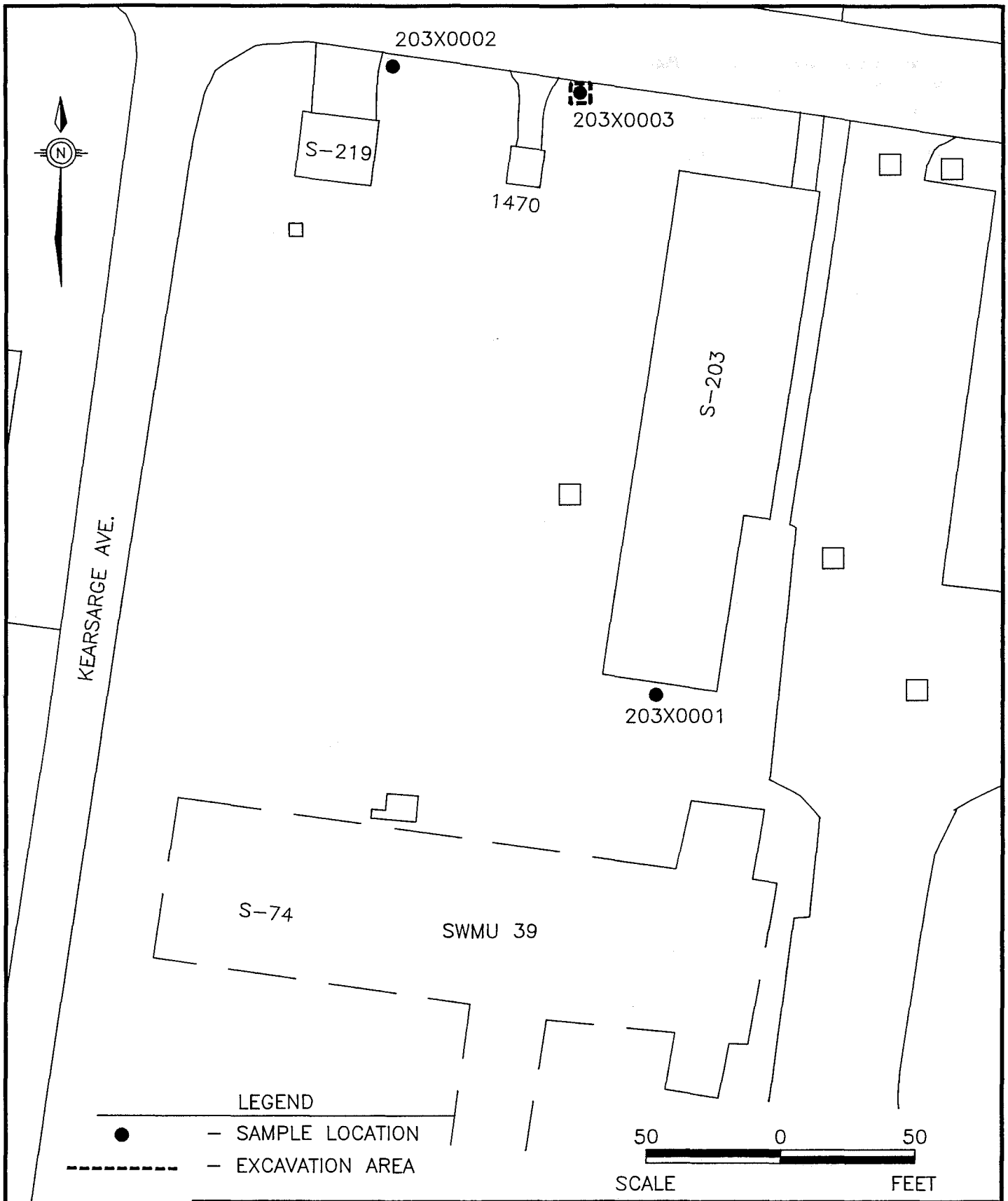
Inorganic soil-sampling data that exceeded at least one standard reference value are presented in Table 3.8.2.

3.8.3 Source Characterization

Based on TPH detections in surface soil at location 203X0003 that exceeded the TDEC cleanup level of 100 mg/kg, a VCA was recommended to address soil contamination by removing any TPH contamination detected at concentrations exceeding acceptable risk standards.

3.8.4 Removal Responsibilities

The following section outlines the actions to be conducted during the excavation of petroleum-and metals-contaminated soil. The contractor will provide the equipment and personnel to excavate, stockpile, and dispose of the contaminated soil. EnSafe will assist the contractor as necessary, collect confirmation and soil-disposal samples, and report on the removal activities in a VCA report. The following activities to be performed by the designated staff, are further described in subsequent sections.



VCA WORK PLAN
CONTAMINATED SOIL REMOVAL
NSA MID-SOUTH
MILLINGTON, TN.

FIGURE 3.8
FACILITY S-203
SAMPLE LOCATION MAP/
EXCAVATION AREA

DWG DATE: 06/01/99 | DWG NAME: 0106B003

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Table 3.8.2
Gray Areas — Facility S-203 Inorganic Detections in Soil by Location (mg/kg)

Location	Depth (in feet)	Constituent	RC[a] Surface	RBC[b] Industrial	RBC[b] Residential	SSL[c]	Result
203X0001	01'	Arsenic (As)	14.6	3.8	0.43	1	9.2
		Barium (Ba)	223	14,000	550	82	151
		Beryllium (Be)	1	1.3	0.15	3	0.61
		Cadmium (Cd)	1.54	100	3.9	0.4	0.46 J
		Chromium (Cr)	23.9	1,000	39	2	18.9
		Nickel (Ni)	20.6	4,100	160	7	20.5
		Selenium (Se)	DNE	1,000	39	0.3	0.37 J
203X0002	01'	Arsenic (As)	14.6	3.8	0.43	1	8.5
		Barium (Ba)	223	14,000	550	82	102
		Chromium (Cr)	23.9	1,000	39	2	14.0
		Lead (Pb)	26.0	400	400	DNE	28.6 J
		Nickel (Ni)	20.6	4,100	160	7	9.9
203X0003	01'	Arsenic (As)	14.6	3.8	0.43	1	11.1
		Barium (Ba)	223	14,000	550	82	86.2
		Beryllium (Be)	1	1.3	0.15	3	0.51 J
		Cadmium (Cd)	1.54	100	3.9	0.4	0.73
		Chromium (Cr)	23.9	1,000	39	2	17.3
		Copper (Cu)	24.2	8,200	310	DNE	30.3
		Lead (Pb)	26.0	400	400	DNE	176 J
		Nickel (Ni)	20.6	4,100	160	7	12.0
		Selenium (Se)	DNE	1,000	39	0.3	0.59 J
		Zinc (Zn)	98	61,000	2,300	620	126

Notes:

a — Background Reference Concentration (RC) from the August 1996 *Technical Memorandum — Reference Concentrations* (August 27, 1996, E/A&H Tech Memo).

b — Industrial and Residential RBCs from the April 1999 Risk-Based Concentration Table (April 12, 1999, USEPA Region III RBC Memo).

c — Soil Screening Level (SSL) from the May 1996 Generic Screening Levels (May 1996, USEPA/OSWER SSL Guidance Document, EPA/540/R-95/128).

DNE — Does not exist.

J — Constituent detected at concentrations less than the method reporting limit; value estimated.

- EnSafe will plan field activities and schedule EnSafe personnel and equipment.

- EnSafe will review the following with the necessary personnel: the applicable portions of the *Comprehensive RFI Work Plan*, the CHSP which is included as Appendix B, and the SSHSP which is included as Appendix C.

- The contractor will coordinate the placement of contaminated-soil stockpiles with the NSA Mid-South PWD Env. Div. The contractor will place plastic on the ground surface before stockpiling soil in the designated areas.

- The contractor will excavate and stockpile all removed materials.

- EnSafe will provide sampling support during removal activities.

- EnSafe will characterize any excavated soil in accordance with the TDEC DUST and/or DSW guidance.

- The contractor will backfill the excavated area with clean soil or other materials and cover the area with the equivalent of the original material. The contractor will use number 33C limestone in areas where vehicular traffic is possible, as specified by the NSA Mid-South PWD Env. Div.

- The contractor will cover the stockpile with plastic, install silt fencing, and maintain runoff control until the soil is properly disposed of. The contractor will coordinate disposal of soil and decontamination fluids resulting from field activities, including the preparation and filing of any special waste permits.

- The contractor will remove all construction materials.

- EnSafe will prepare a VCA report for the site.

3.8.5 Preremoval Activities

Activities to be conducted before removing the soil are discussed in the following sections.

Orientation Meeting

Before performing any field activities, EnSafe personnel will hold an orientation meeting to review general and site-specific requirements for sampling and documentation. General discussion will include locations of the site field office, subject site, and designated decontamination areas. Sampling requirements to be discussed will include general sampling protocol, the sample-numbering system, QA/QC sampling requirements, and sample packaging. Documentation requirements to be discussed will include the use of field forms, field logbooks, and photographic documentation.

The EnSafe SSO will review the CHSP and SSHSP (Appendices B and C) with EnSafe personnel before any field activities begin. All EnSafe employees working onsite will be required to sign a form acknowledging that they are familiar with the plan and agree to abide by its guidelines. The SSHSP contains a copy of the compliance-agreement form.

3.8.6 Removal Activities

Several activities will be conducted before and during soil removal. Specific tasks include air monitoring, soil excavation, and soil screening. TDEC will be given at least two weeks notice by the NSA Mid-South PWD Env. Div. before any removal activities begin.

Surface and Subsurface Soil Excavation

Soil excavation will start with removal of a 2-foot deep by 5-foot square layer of soil centered on location 203X0003. The TPH analyzer will direct soil excavation and removal of 1-foot thick by 5-foot square lifts, which will continue until field screening indicates that remaining soil TPH concentrations are lower than the 100 mg/kg action level.

The contractor will stockpile the excavated soil on plastic sheeting, and cover it with plastic to prevent cross-contamination and erosion. The contractor will be responsible for maintaining the plastic cover on the stockpiled soil. EnSafe will sample the pile and request five-day turnaround for the disposal profile samples. Upon receipt of the results, EnSafe will attach a summary of detections to the data package, and forward two copies to the NSA Mid-South PWD Env. Div. within five days. Contaminated soil will be properly disposed of in accordance with current USEPA and TDEC regulations. The contractor will dispose of any special-waste soil, while any hazardous-waste soil will be disposed of by the NSA Mid-South PWD Env. Div.

Soil Screening

Using disposable spoons or decontaminated stainless-steel spoons and bowls, EnSafe personnel will collect soil samples from the excavation walls and base as each 5-foot diameter lift is removed. Personnel will not enter the excavation if it is deeper than 4 feet to comply with confined space entry regulations. These samples will be collected from the backhoe bucket, if necessary, from the center of the bucket to avoid sample contamination from the bucket wall. The samples will be collected in accordance with procedures described in Section 4.4.3 of the *Comprehensive RFI Work Plan* (E/A&H, October 1994).

Samples will be screened using an IR TPH Plus Field Analyzer, which performs analyses based on USEPA Method 418.1 (IR method). The excavation will continue until field screening demonstrates that the contaminated soil has been removed to concentrations less than the site-specific remediation level of 100 mg/kg.

3.8.7 Postremoval Activities

Several activities will be conducted after soil is removed, including confirmation soil sampling, backfilling the excavation, and disposing of used PPE and disposable sampling equipment.

Confirmation Soil Sampling

When field screening demonstrates that the contaminated soil has been removed to less than the site-specific remediation level of 100 mg/kg TPH, EnSafe will collect a five-part composite sample from each of the excavation walls and four grab samples from the excavation floor (one from each corner). These confirmation soil samples will be analyzed onsite using the TPH Plus Field Analyzer for TPH (Method 418.1), and at an offsite laboratory for Appendix IX metals (USEPA Method 6010/7000 series).

In the event that water is encountered in the excavation, the contractor will containerize it in properly labeled U.S. DOT-approved 55-gallon drums. EnSafe will collect water samples for analyses of VOCs and oil and grease. The drums will be placed in a secured location approved by the NSA Mid-South PWD Env. Div. and remain at this location. The contractor will discharge the water to the sewer via an oil-water separator designated by the NSA Mid-South PWD Env. Div. after contacting the PWD for permission and specifications from the City of Millington POTW. If any water is not approved for discharge to the sewer, then the NSA Mid-South PWD Env. Div. will arrange for its proper disposal. EnSafe will be responsible for collecting any water samples required by the disposal facility and obtaining any additional analyses to determine the appropriate means of disposal.

Backfill of the Excavation

The excavation will remain open until confirmation samples document that soil exceeding the TPH action level of 100 mg/kg has been removed and the BCT has approved backfilling based on a review of the TPH and metals concentrations. A temporary fence or barricade will be placed around the excavation. Clean soil from an offsite source will be used by the contractor for

backfill, along with number 33C limestone in areas having vehicular traffic. The area will then be covered with the equivalent of the original material by the contractor.

Removal of Construction Materials

After stockpiled soil has been removed, any debris or trash from field activities will be removed by the contractor. The area will be left as close as possible to its natural state.

Voluntary Corrective Action Report

EnSafe will prepare a report after field activities are complete and analytical results have been received, to address the following:

- Field activities, including a description of field screening and sampling.
- Analytical test results for confirmation samples collected after soil removal.
- A diagram showing site features during the removal action. The diagram will include the location of the excavation, soil-sampling locations, and detected concentrations.
- Disposal manifests (if available at the time of report) and a description of the fate of water generated during the removal action, if any.

3.8.8 Analytical Requirements

Analytical requirements for the samples scheduled to be collected are summarized in Table 3.8.3. Confirmation samples will be analyzed for TPH (Method 418.1) and Appendix IX metals (USEPA Method 6010/7000 series). One characterization sample for soil disposal, which will be collected using a decontaminated stainless-steel hand auger or spoon and bowl for every 100 yd^3 or less of soil, will be analyzed for TCLP lead and TCLP benzene, in accordance with DSW special waste policy. EnSafe will collect any additional samples required by the disposal

facility and submit them for the required analyses. Soil samples will be screened by the IR method, in accordance with the manufacturer's instructions.

Table 3.8.3
Sample Summary and Analytical Requirements

Sample Type	Matrix	Analytical Parameters	Rationale	Turnaround Time
Extent Verification	Soil	TPH based on USEPA Method 418.1	TPH is primary contaminant and technology is available to field screen.	Field Analysis
Confirmation	Soil	TPH Method 418.1 Appendix IX Metals	Due to past spills and/or releases, TPH and metals are present.	Field Analysis 5 days
Soil Disposal	Soil (Excavated Material)	TCLP lead TCLP benzene	In accordance with DSW special waste policy.	5 days

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3.9 SWMU 41 — Salvage Yard No. 2

3.9.1 Site Description

SWMU 41 is an approximately 5,700-square-yard, asphalt-covered storage yard (Salvage Yard No. 2), designated as a nonhazardous storage area, near the southwest corner of the NSA Mid-South Southside (Figure 1-1). SWMU 41 is reported to have been in operation since 1944 and, although designated for nonhazardous storage, it may have received hazardous material. During a 1990 inspection, no visual evidence of a release was indentified (ERC/EDGe, 1990). This SWMU is reported to have been used by Defense Reutilization Marketing Office (DRMO) to store scrap metal, derelict equipment (planes, helicopters, etc.), tires, furniture, and batteries.

3.9.2 Field Investigation/Findings

The primary objective of the soil and groundwater investigation was to determine whether a release had occurred at SWMU 41. The soil investigation consisted of hand auger sampling of four sample locations. Soil samples were collected from the surface to approximately 1 foot deep. The four soil samples (041S000401, 041S000701, 041S001101, 041S001201) underwent FSA for risk assessment. Figure 3.9 shows the site layout and sampling locations. All soil samples were analyzed at Savannah Analytical Laboratory in Savannah, Georgia.

Because material may have been stored on the gravel prior to its being covered with asphalt, Geoprobe groundwater samples were collected from the deep alluvium (DA) at four sample locations (041X0001DA, 041X0003DA, 041X0006DA, and 041X0009DA) and the upper alluvium (UA) at four different sample locations (041X0002UA, 041X0005UA, 041X0008UA, and 041X0010UA). All groundwater samples were analyzed for VOCs at Savannah Analytical Laboratory in Savannah, Georgia.

Organics in Soil

The organic soil data and TPH soil data that exceeded at least one standard reference value are presented in Tables 3.9.1 and 3.9.2, respectively.

Table 3.9.1
Assemblies G and H — SWMU 41 Organic Detections in Soil by Location (μg/kg)

Location	Depth (in feet)	Contaminant	RC[a]	RBC[b] Industrial	RBC[b] Residential	SSL[c]	Result
041X0004	01'	Dieldrin[d]	262	360	40	0.2	0.67 J
041X0007	01'	Aroclor-1260	DNE	2,900	320	DNE	1,200
		Dieldrin[d]	262	360	40	0.2	17 J
041X0011	01'	Dieldrin[d]	262	360	40	0.2	4.8 J
041X0012	01'	Aroclor-1260	DNE	2,900	320	DNE	710
		Benzo(a)anthracene	DNE	7,800	880	80	160 J
		Dieldrin[d]	262	360	40	0.2	12 J

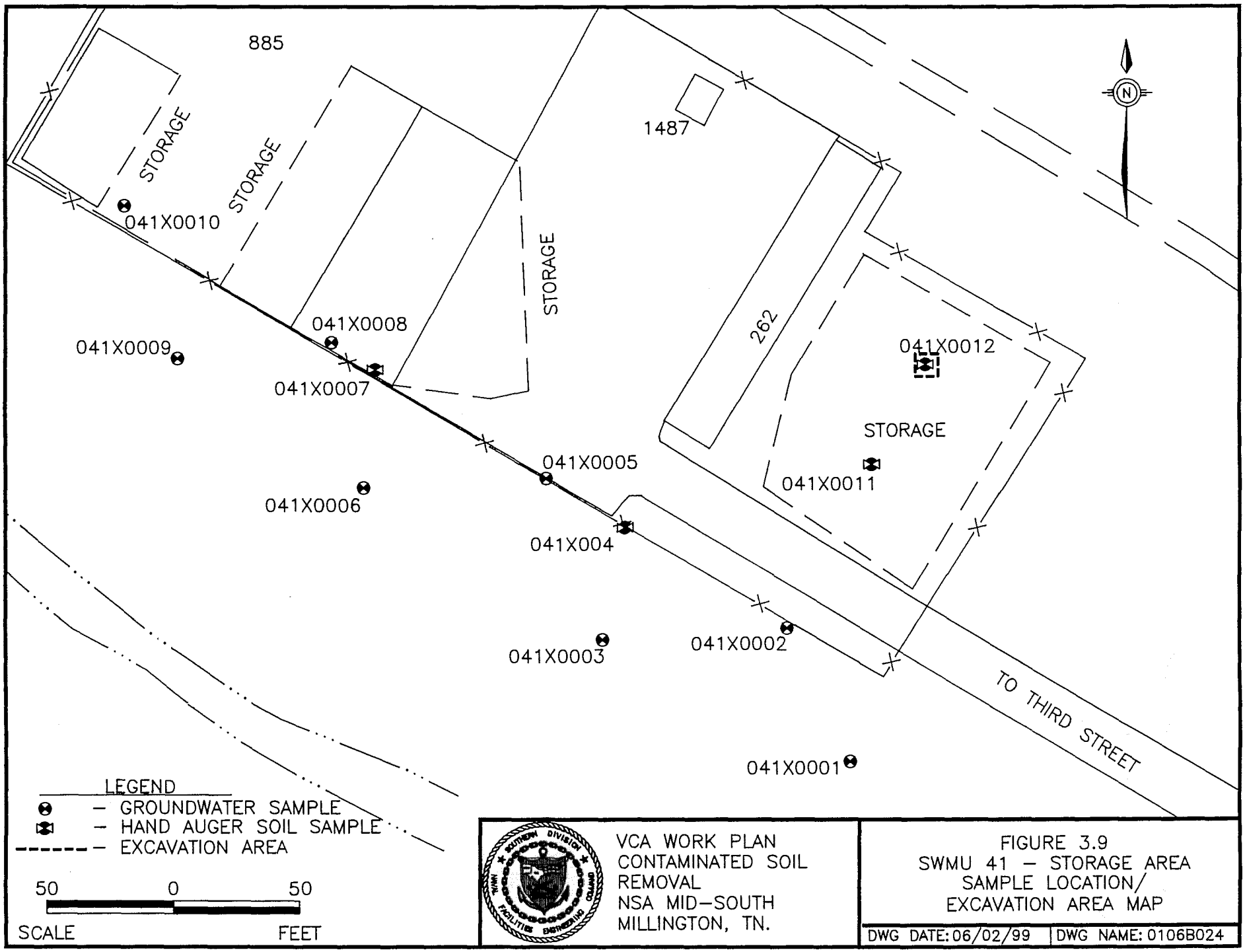
Notes:
a — Background Reference Concentration (RC) from the August 1996 *Technical Memorandum — Reference Concentrations* (August 27, 1996, E/A&H Tech Memo).
b — Industrial and residential RBCs from the April 1999 Risk-Based Concentration Table (April 12, 1999, USEPA Region III RBC Memo).
c — Soil Screening Level (SSL) from the May 1996 Generic Screening Levels (May 1996, USEPA/OSWER SSL Guidance Document, EPA/540/R-95/128).
d — Reference concentration for dieldrin determined from base-wide background sampling and screening.
DNE — Does not exist.
J — Contaminant detected in concentrations less than the method reporting limit; value estimated.

Table 3.9.2
Assemblies G and H — SWMU 41 Petroleum Hydrocarbon Detections in Soil by Location (mg/kg)

Location	Depth (in feet)	Constituent	Result
041X0012	01'	TPH	140 J

Note:
J — Contaminant detected in concentrations less than the method reporting limit; value estimated.

The polychlorinated biphenyl (PCB) Aroclor-1260 was detected in samples 041S000701 (1,200 μg/kg) and 041S001201 (710 μg/kg) at concentrations exceeding its residential RBC (320 μg/kg), but the PRE calculation [*Assemblies G and H CSI Report* (May 29, 1998)] did not indicate any excess risk associated with this concentration.


885
STORAGE
STORAGE
STORAGE
1487
262
STORAGE
041X0010
041X0009
041X0008
041X0007
041X0006
041X0005
041X004
041X0003
041X0002
041X0001
041X0012
041X0011
TO THIRD STREET
N
LEGEND
– GROUNDWATER SAMPLE
– HAND AUGER SOIL SAMPLE
– EXCAVATION AREA
50 0 50
SCALE FEET
SOUTHERN DIVISION NAVAL FACILITIES ENGINEERING COMMAND
VCA WORK PLAN
CONTAMINATED SOIL
REMOVAL
NSA MID–SOUTH
MILLINGTON, TN.
FIGURE 3.9
SWMU 41 – STORAGE AREA
SAMPLE LOCATION/
EXCAVATION AREA MAP
DWG DATE: 06/02/99
DWG NAME: 0106B024

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Inorganics in Soil

The inorganic soil data that exceeded at least one standard reference value are presented in Table 3.9.3.

Table 3.9.3
Assemblies G and H — SWMU 41 Inorganic Detections in Soil by Location (mg/kg)

Location	Depth (in feet)	Constituent	RC[A]	RBC[b] Industrial	RBC[b] Residential	SSL[c]	Result
041X0004	01'	Arsenic (As)	14.6	3.8	0.43	1	4.7 J
		Barium (Ba)	223	14,000	550	82	114
		Cadmium (Cd)	1.54	100	3.9	0.4	0.53 J
		Chromium (Cr)	24.0	610	23	2	11 J
		Nickel (Ni)	20.6	4,100	160	7	12.1
041X0007	01'	Arsenic (As)	14.6	3.8	0.43	1	7.3
		Barium (Ba)	223	14,000	550	82	115
		Cadmium (Cd)	1.54	100	3.9	0.4	8.5 J
		Chromium (Cr)	24.0	610	23	2	18.7 J
		Copper (Cu)	24.2	8,200	310	DNE	74.9 J
		Lead (Pb)	26.0	400[d]	400[d]	DNE	82.1 J
		Nickel (Ni)	20.6	4,100	160	7	15.8
		Zinc (Zn)	98	61,000	2,300	620	379 J
041X0011	01'	Arsenic (As)	14.6	3.8	0.43	1	4.6 J
		Cadmium (Cd)	1.54	100	3.9	0.4	25.1
		Chromium (Cr)	24.0	610	23	2	57.4 J
		Copper (Cu)	24.2	8,200	310	DNE	483 J
		Lead (Pb)	26.0	400[d]	400[d]	DNE	73 J
		Nickel (Ni)	20.6	4,100	160	7	10.5
		Zinc (Zn)	98	61,000	2,300	620	530 J

Table 3.9.3
Assemblies G and H — SWMU 41 Inorganic Detections in Soil by Location (mg/kg)

Location	Depth (in feet)	Constituent	RC[A]	RBC[b] Industrial	RBC[b] Residential	SSL[c]	Result
041X0012	01'	Arsenic (As)	14.6	3.8	0.43	1	4.4 J
		Cadmium (Cd)	1.54	100	3.9	0.4	53
		Chromium (Cr)	24.0	610	23	2	55.2 J
		Copper (Cu)	24.2	8,200	310	DNE	145 J
		Lead (Pb)	26.0	400[d]	400[d]	DNE	81 J
		Nickel (Ni)	20.6	4,100	160	7	13.3
		Selenium (Se)	DNE	1,000	39	0.3	0.61 J
		Zinc (Zn)	98	61,000	2,300	620	185 J

Notes:
a — Background Reference Concentration (RC) from the August 1996 *Technical Memorandum — Reference Concentrations* (August 27, 1996, E/A&H).
b — Industrial and residential RBCs from the April 1999 Risk-Based Concentration Table (April 12, 1999, USEPA Region III RBC Memo).
c — Soil Screening Level (SSL) from the May 1996 Generic Screening Levels (May 1996, USEPA/OSWER SSL Guidance Document, EPA/540/R-95/128).
d — Lead soil-cleanup value, as established by USEPA/OSWER directive #9355.4-12, substituted for RBC.
DNE — Does not exist.
J — Constituent detected in concentrations less than the method reporting limit; value estimated.

Cadmium was detected in samples 041S001101 (25.1 mg/kg) and 041S001201 (53 mg/kg) at concentrations exceeding its surface soil RC (1.54 mg/kg) and residential RBC (3.9 mg/kg). Chromium was detected in samples 041S001101 (57.4 mg/kg) and 041S001201 (55.2 mg/kg) at concentrations exceeding its surface-soil RC (24.0 mg/kg) and residential RBC (23 mg/kg). Copper was detected in sample 041S001101 (483 mg/kg) exceeding its surface-soil RC (24.2 mg/kg) and residential RBC (310 mg/kg). The PRE calculations [*Assemblies G and H CSI Report* (May 29, 1998)] for cadmium, chromium, and copper indicate excess risk associated with these concentrations. The residential PRE calculation for these inorganics exceeded the risk threshold of 1.

Groundwater Investigation

The groundwater VOC data for SWMU 41 are presented in Table 3.9.4.

Table 3.9.4
Assemblies G and H — SWMU 41 Detections in Groundwater by Location (μg/L)

Location	Depth (in feet)/Formation	Contaminant	RBC[a]	MCL[b]	Result
041X0008	27' / (UA)	1,2-Dichloroethane	0.12	5	59

Notes:
a — Tap-water RBC from the April 1999 Risk-Based Concentration Table (April 12, 1999, USEPA Region III RBC Memo).
b — MCL from USEPA National Primary Drinking Water Standards (October 1996, USEPA Office of Water, *Drinking Water Regulations and Health Advisories*).
UA — Upper alluvium

1,2-dichloroethane exceeded its tap-water RBC (0.12 μg/L) and MCL (5 μg/L) in sample 041G000827 (59 μg/L). The PRE calculations [*Assemblies G and H CSI Report* (May 29, 1998)] for 1,2-dichloroethane indicates excess risk associated with this concentration that warranted further investigation as defined in the technical memorandum — *Abbreviated Work Plan — Assemblies G and H Monitoring Well/DPT Sample Locations* (EnSafe, April 26, 1999) .

3.9.3 Source Characterization

Based on TPH detections in surface soil at location 041X0012 that exceeded the TDEC cleanup level of 100 mg/kg, a VCA was recommended to address soil contamination by removing any TPH contamination detected at concentrations exceeding acceptable cleanup standards.

3.9.4 Removal Responsibilities

The following section outlines the actions to be conducted during the excavation of petroleum-and metals-contaminated soil. The contractor will provide the equipment and personnel to excavate, stockpile, and dispose of the contaminated soil. EnSafe will assist the contractor as necessary,

collect confirmation and soil-disposal samples, and report on the removal activities in a VCA report. The following activities to be performed by the designated staff, are further described in subsequent sections.

- EnSafe will plan field activities and schedule EnSafe personnel and equipment.

- EnSafe will review the following with the necessary personnel: the applicable portions of the *Comprehensive RFI Work Plan*, the CHSP which is included as Appendix B, and the SSHSP which is included as Appendix C.

- The contractor will coordinate the placement of contaminated-soil stockpiles with the NSA Mid-South PWD Env. Div. The contractor will place plastic on the ground surface before stockpiling soil in the designated areas.

- The contractor will excavate and stockpile all removed materials.

- EnSafe will provide sampling support during removal activities.

- EnSafe will characterize any excavated soil in accordance with the TDEC DUST and/or DSW guidance.

- The contractor will backfill the excavated area with clean soil or other materials and cover the area with the equivalent of the original material. The contractor will use number 33C limestone in areas where vehicular traffic is possible, as specified by the NSA Mid-South PWD Env. Div.

- The contractor will cover the stockpile with plastic, install silt fencing, and maintain runoff control until the soil is properly disposed of. The contractor will coordinate

disposal of soil and decontamination fluids resulting from field activities, including the preparation and filing of any special waste permits.

- The contractor will remove all construction materials.

- EnSafe will prepare a VCA report for the site.

3.9.5 Preremoval Activities

Activities to be conducted before removing the soil are discussed in the following sections.

Orientation Meeting

Before performing any field activities, EnSafe personnel will hold an orientation meeting to review general and site-specific requirements for sampling and documentation. General discussion will include locations of the site field office, subject site, and designated decontamination areas. Sampling requirements to be discussed will include general sampling protocol, the sample-numbering system, QA/QC sampling requirements, and sample packaging. Documentation requirements to be discussed will include the use of field forms, field logbooks, and photographic documentation.

The SSO will review the CHSP and SSHSP (Appendices B and C) with EnSafe personnel before any field activities begin. All EnSafe employees working onsite will be required to sign a form acknowledging that they are familiar with the plan and agree to abide by its guidelines. The SSHSP contains a copy of the compliance-agreement form.

3.9.6 Removal Activities

Several activities will be conducted before and during soil removal. Specific tasks include air monitoring, soil excavation, and soil screening. TDEC will be given at least two weeks notice by the NSA Mid-South PWD Env. Div. before any removal activities begin.

Surface and Subsurface Soil Excavation

Soil excavation will start with removal of a 2-foot deep by 5-foot square layer of soil centered on location 041X0012. The TPH analyzer will direct soil excavation and removal of 1-foot thick by 5-foot square lifts, which will continue until field screening indicates that remaining soil TPH concentrations are lower than the 100 mg/kg action level.

The contractor will stockpile the excavated soil on plastic sheeting, and cover it with plastic to prevent cross-contamination and erosion. The contractor will be responsible for maintaining the plastic cover on the stockpiled soil. EnSafe will sample the pile and request five-day turnaround for the disposal profile samples. Upon receipt of the results, EnSafe will attach a summary of detections to the data package, and forward two copies to the NSA Mid-South PWD Env. Div. within five days. Contaminated soil will be properly disposed of in accordance with current USEPA and TDEC regulations. The contractor will dispose of any special-waste soil, while any hazardous-waste soil will be disposed of by the NSA Mid-South PWD Env. Div.

Soil Screening

Using disposable spoons or decontaminated stainless-steel spoons and bowls, EnSafe personnel will collect soil samples from the excavation walls and base as each 5-foot diameter lift is removed. Personnel will not enter the excavation if it is deeper than 4 feet to comply with confined space entry regulations. These samples will be collected from the backhoe bucket, if necessary, from the center of the bucket to avoid sample contamination from the bucket wall. The samples will be collected in accordance with procedures described in Section 4.4.3 of the *Comprehensive RFI Work Plan* (E/A&H, October 1994).

Samples will be screened using an IR TPH Plus Field Analyzer, which performs analyses based on USEPA Method 418.1 (IR method). The excavation will continue until field screening demonstrates that the contaminated soil has been removed to concentrations less than the site-specific remediation level of 100 mg/kg.

3.9.7 Postremoval Activities

Several activities will be conducted after soil is removed, including confirmation soil sampling, backfilling the excavation, and disposing of used PPE and disposable sampling equipment.

Confirmation Soil Sampling

When field screening demonstrates that the contaminated soil has been removed to less than the site-specific remediation level of 100 mg/kg TPH, EnSafe will collect a five-part composite sample from each of the excavation walls and four grab samples from the excavation floor (one from each corner). These confirmation soil samples will be analyzed onsite using the TPH Plus Field Analyzer for TPH (Method 418.1), and at an offsite laboratory for Appendix IX metals (USEPA Method 6010/7000 series).

In the event that water is encountered in the excavation, the contractor will containerize it in properly labeled U.S. DOT-approved 55-gallon drums. EnSafe will collect water samples for analyses of VOCs and oil and grease. The drums will be placed in a secured location approved by the NSA Mid-South PWD Env. Div. and remain at this location. The contractor will discharge the water to the sewer via an oil-water separator designated by the NSA Mid-South PWD Env. Div. after contacting the PWD for permission and specifications from the City of Millington POTW. If any water is not approved for discharge to the sewer, then the NSA Mid-South PWD Env. Div. will arrange for its proper disposal. EnSafe will be responsible for collecting any water samples required by the disposal facility and obtaining any additional analyses to determine the appropriate means of disposal.

Backfill of the Excavation

The excavation will remain open until confirmation samples document that soil exceeding the TPH action level of 100 mg/kg has been removed and the BCT has approved backfilling based on a review of the TPH and metals concentrations. A temporary fence or barricade will be placed around the excavation. Clean soil from an offsite source will be used by the contractor for

backfill, along with number 33C limestone in areas having vehicular traffic. The area will then be covered with the equivalent of the original material by the contractor.

Removal of Construction Materials

After stockpiled soil has been removed, any debris or trash from field activities will be removed by the contractor. The area will be left as close as possible to its natural state.

Voluntary Corrective Action Report

EnSafe will prepare a report after field activities are complete and analytical results have been received, to address the following:

- Field activities, including a description of field screening and sampling.
- Analytical test results for confirmation samples collected after soil removal.
- A diagram showing site features during the removal action. The diagram will include the location of the excavation, soil-sampling locations, and detected concentrations.
- Disposal manifests (if available at the time of report) and a description of the fate of water generated during the removal action, if any.

3.9.8 Analytical Requirements

Analytical requirements for the samples scheduled to be collected are summarized in Table 3.9.5. Confirmation samples will be analyzed for TPH (Method 418.1) and Appendix IX metals (USEPA Method 6010/7000 series). One characterization sample for soil disposal, which will be collected using a decontaminated stainless-steel hand auger or spoon and bowl for every 100 yd^3 or less of soil, will be analyzed for TCLP lead and TCLP benzene, in accordance with DSW special waste policy. EnSafe will collect any additional samples required by the disposal

facility and submit them for the required analyses. Soil samples will be screened by the IR method, in accordance with the manufacturer's instructions.

Table 3.9.5
Sample Summary and Analytical Requirements

Sample Type	Matrix	Analytical Parameters	Rationale	Turnaround Time
Extent Verification	Soil	TPH based on USEPA Method 418.1	TPH is primary contaminant and technology is available to field screen.	Field Analysis
Confirmation	Soil	TPH Method 418.1 Appendix IX Metals	Due to past spills and/or releases, TPH and metals are present.	Field Analysis 5 days
Soil Disposal	Soil (Excavated Material)	TCLP lead TCLP benzene	In accordance with DSW special waste policy.	5 days

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3.10 SWMU 43 — Former Hazardous Waste Accumulation Point

3.10.1 Site Description

SWMU 43 is a former hazardous waste accumulation point along the west side of former Building S-176 on the NSA Mid-South Southside (Figure 1-1). Building S-176 was demolished on January 28, 1986. Currently, the area where Building S-176 stood is covered with gravel and used as parking or for storage. The hazardous waste accumulation point at Building S-176 is reported to have operated from an unknown date until 1986. Limited information is available on the past use of SWMU 43 as a hazardous waste accumulation point. SWMU 43 is reported to have been used to store drummed waste paint and solvents. During a 1990 inspection, Building S-176 had already been demolished and the accumulation point was no longer in use (ERC/EDGe, 1990). In a 1951 drawing, Building S-176 was listed as a cement shed, while in a 1970's drawing, it was listed as family housing storage.

3.10.2 Field Investigation/Findings

The primary objective of the field investigation was to determine whether a release had occurred and consisted of hand-auger sampling at three sampling locations (043X0001, 043X0002, and 043X0003) in and around the former hazardous waste accumulation area. One of the three sample locations (043X0001) was in a nearby drainage ditch to determine whether surface contaminants had migrated via surface runoff. Soil samples were collected at locations 043X0002 and 043X0003 from beneath the gravel surface to 1 foot deep and from the 3-to-4 foot depth interval. The upper-interval soil samples were used to assess risk associated with any surface contaminants, while the lower-interval soil samples were used to inspect for contaminant migration from a potential release.

Two surface-soil samples from the most visibly stained areas underwent FSA for risk assessment purposes, while the remaining upper-interval soil sample from the ditch and the three lower-interval samples were analyzed for VOCs, SVOCs, and Appendix IX metals since these are indicators of the types of materials reported to be stored at the accumulation point. Figure 3.10

shows the site layout and surveyed sampling locations. All soil samples were analyzed at Savannah Analytical Laboratory in Savannah, Georgia.

Organics in Soil

The organic soil data and TPH soil data that exceeded at least one standard reference value are presented in Tables 3.10.1 and 3.10.2, respectively. There were no groundwater samples taken at SWMU 43.

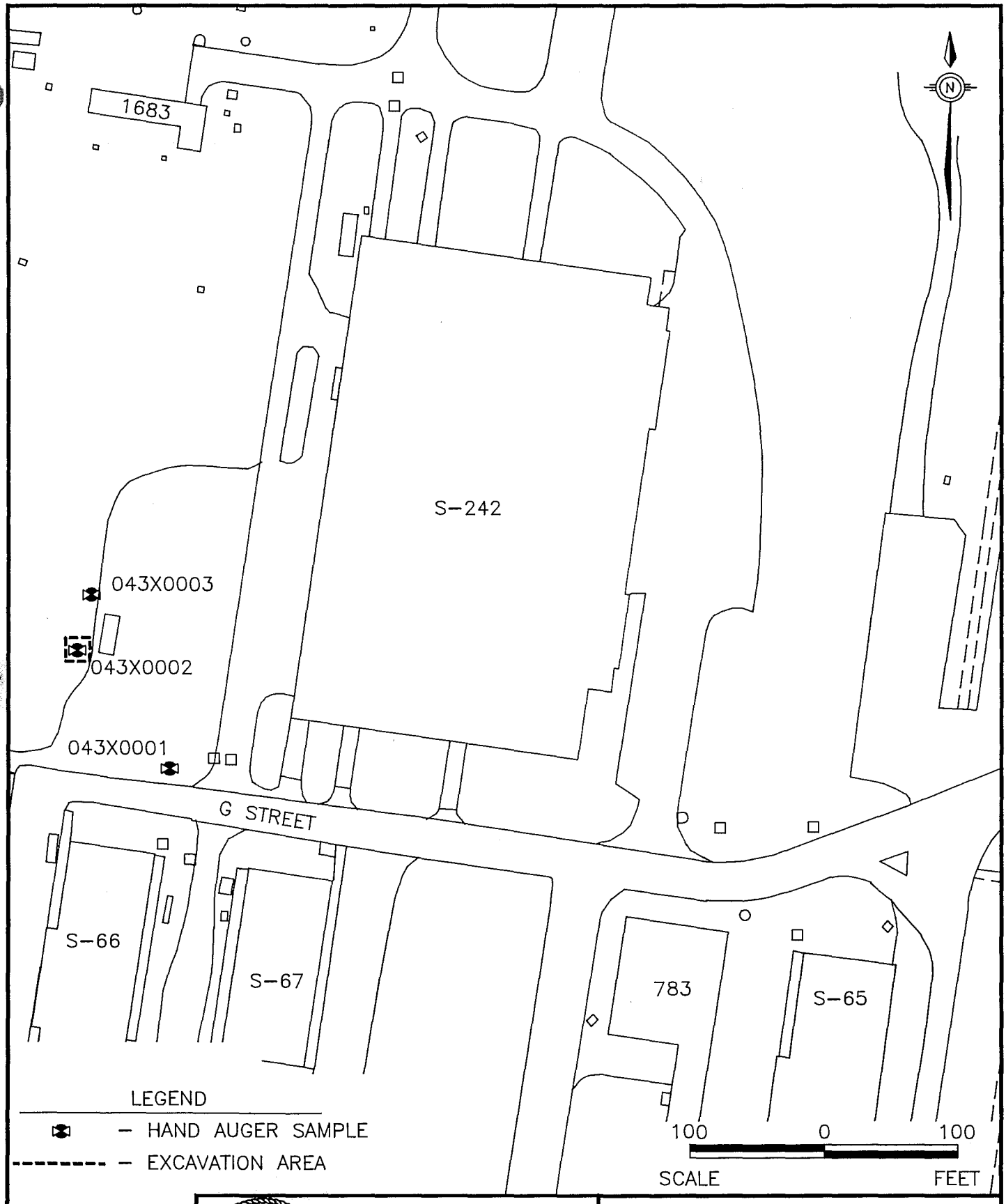
Table 3.10.1
Assemblies G and H — SWMU 43 Organic Detections in Soil by Location (µg/kg)

Location	Depth (in feet)	Contaminant	RC[a]	RBC[b] Industrial	RBC[b] Residential	SSL[c]	Result
043X0001	01'	Dieldrin[d]	262	360	40	0.2	13
043X0002	01'	Benzene	—	200,000	22,000	2	4 J
		Ethylbenzene	—	20,000,000	780,000	0.7	2.3 J
043X0003	01'	Benzene	—	200,000	22,000	2	3.1 J
		Benzo(a)pyrene	565	780	88	400	91 J
		Trichloroethene	—	520,000	58,000	3	5 J

Notes:
a — Background Reference Concentration (RC) from the August 1996 *Technical Memorandum — Reference Concentrations* (August 27, 1996, E/A&H).
b — Industrial and residential RBCs from the April 1999 Risk-Based Concentration Table (April 12, 1999, USEPA Region III RBC Memo).
c — Soil Screening Level (SSL) from the May 1996 Generic Screening Levels (May 1996, USEPA/OSWER SSL Guidance Document, EPA/540/R-95/128).
d — Reference concentration for dieldrin determined from base-wide background sampling and screening.
DNE — Does not exist.
J — Contaminant detected at concentrations less than the method reporting limit; value estimated.

Table 3.10.2
Assemblies G and H — SWMU 43 Petroleum Hydrocarbon Detections in Soil by Location (mg/kg)

Location	Depth (in feet)	Contaminant	Result
043X0002	01'	TPH - DRO	408
043X0002	04'	TPH	110



VCA WORK PLAN
CONTAMINATED SOIL
REMOVAL
NSA MID-SOUTH
MILLINGTON, TN.

FIGURE 3.10
SWMU 43 – FORMER S-176
SAMPLE LOCATION MAP

DWG DATE: 06/02/99 | DWG NAME: 0106B025

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Inorganics in Soil

The inorganic soil data that exceeded at least one standard reference value are presented in Table 3.10.3.

Table 3.10.3
Assemblies G and H — Preliminary SWMU 43 Inorganic Detections in Soil by Location (mg/kg)

Location	Depth (in feet)	Constituent	RC[a]	RBC[b] Industrial	RBC[b] Residential	SSL[c]	Result
043X0001	01'	Arsenic (As)	14.6	3.8	0.43	1	32.9
		Barium (Ba)	223	14,000	550	82	143
		Chromium (Cr)	24.0	610	23	2	17.4
		Lead (Pb)	26.0	400[d]	400[d]	DNE	38.4 J
		Nickel (Ni)	20.6	4,100	160	7	11.8 J
043X0001	04'	Arsenic (As)	20.3	—	—	1	10.3
		Barium (Ba)	265	—	—	82	155
		Chromium (Cr)	28.3	—	—	2	16.1
		Nickel (Ni)	DNE	—	—	7	15.1 J
043X0002	01'	Arsenic (As)	14.6	3.8	0.43	1	4.8
		Barium (Ba)	223	14,000	550	82	144
		Chromium (Cr)	24.0	610	23	2	9
		Nickel (Ni)	20.6	4,100	160	7	8.8 J
043X0002	04'	Arsenic (As)	20.3	—	—	1	6.6
		Barium (Ba)	265	—	—	82	199
		Chromium (Cr)	28.3	—	—	2	18.3
		Nickel (Ni)	DNE	—	—	7	17.8 J
043X0003	01'	Arsenic (As)	14.6	3.8	0.43	1	15.1
		Barium (Ba)	223	14,000	550	82	208
		Chromium (Cr)	24.0	610	23	2	12
		Cobalt (Co)	16.0	12,000	470	DNE	17 J
		Lead (Pb)	26.0	400[d]	400[d]	DNE	28.8 J
		Nickel (Ni)	20.6	4,100	160	7	18.4 J

Table 3.10.3
Assemblies G and H — Preliminary SWMU 43 Inorganic Detections in Soil by Location (mg/kg)

Location	Depth (in feet)	Constituent	RC[a]	RBC[b] Industrial	RBC[b] Residential	SSL[c]	Result
043X0003	04'	Arsenic (As)	20.3	—	—	1	11.3
		Barium (Ba)	265	—	—	82	223
		Cadmium (Cd)	3.24	—	—	0.4	0.43 J
		Chromium (Cr)	28.3	—	—	2	15.1
		Nickel (Ni)	DNE	—	—	7	24.5 J

Notes:
a — Background Reference Concentration (RC) from the August 1996 *Technical Memorandum — Reference Concentrations* (August 27, 1996, E/A&H).
b — Industrial and residential RBCs from the April 1999 Risk-Based Concentration Table (April 12, 1999, USEPA Region III RBC Memo).
c — Soil Screening Level (SSL) from the May 1996 Generic Screening Levels (May 1996, USEPA/OSWER SSL Guidance Document, EPA/540/R-95/128).
d — Lead soil-cleanup value, as established by USEPA/OSWER directive #9355.4-12, substituted for RBC.
DNE — Does not exist.
J — Constituent detected at concentrations less than the method reporting limit; value estimated.

Arsenic was identified as a COPC because it exceeded its surface-soil RC (14.6 mg/kg), residential RBC (0.43 mg/kg), and industrial RBC (3.8 mg/kg) in surface-soil samples 043S000101 (32.9 mg/kg) and 043S000301 (15.1 mg/kg). The residential PRE calculation [*Assemblies G and H CSI Report* (May 29, 1998)] indicates excess risk associated with the maximum detected concentration of arsenic as a noncarcinogen.

3.10.3 Source Characterization

Based on TPH detections in surface and subsurface soil at location 043X0002 that exceeded the TDEC cleanup level of 100 mg/kg, a VCA was recommended to address soil contamination by removing any TPH contamination detected at concentrations exceeding acceptable risk standards.

3.10.4 Removal Responsibilities

The following section outlines the actions to be conducted during the excavation of petroleum-and metals-contaminated soil. The contractor will provide the equipment and personnel to excavate,

stockpile, and dispose of the contaminated soil. EnSafe will assist the contractor as necessary, collect confirmation and soil-disposal samples, and report on the removal activities in a VCA report. The following activities to be performed by the designated staff, are further described in subsequent sections.

- EnSafe will plan field activities and schedule EnSafe personnel and equipment.

- EnSafe will review the following with the necessary personnel: the applicable portions of the *Comprehensive RFI Work Plan*, the CHSP which is included as Appendix B, and the SSHSP which is included as Appendix C.

- The contractor will coordinate the placement of contaminated-soil stockpiles with the NSA Mid-South PWD Env. Div. The contractor will place plastic on the ground surface before stockpiling soil in the designated areas.

- The contractor will excavate and stockpile all removed materials.

- EnSafe will provide sampling support during removal activities.

- EnSafe will characterize any excavated soil in accordance with the TDEC DUST and/or DSW guidance.

- The contractor will backfill the excavated area with clean soil or other materials and cover the area with the equivalent of the original material. The contractor will use number 33C limestone in areas where vehicular traffic is possible, as specified by the NSA Mid-South PWD Env. Div.

- The contractor will cover the stockpile with plastic, install silt fencing, and maintain runoff control until the soil is properly disposed of. The contractor will coordinate disposal of soil and decontamination fluids resulting from field activities, including the preparation and filing of any special waste permits.

- The contractor will remove all construction materials.

- EnSafe will prepare a VCA report for the site.

3.10.5 Preremoval Activities

Activities to be conducted before removing the soil are discussed in the following sections.

Orientation Meeting

Before performing any field activities, EnSafe personnel will hold an orientation meeting to review general and site-specific requirements for sampling and documentation. General discussion will include locations of the site field office, subject site, and designated decontamination areas. Sampling requirements to be discussed will include general sampling protocol, the sample-numbering system, QA/QC sampling requirements, and sample packaging. Documentation requirements to be discussed will include the use of field forms, field logbooks, and photographic documentation.

The SSO will review the CHSP and SSHSP (Appendices B and C) with EnSafe personnel before any field activities begin. All EnSafe employees working onsite will be required to sign a form acknowledging that they are familiar with the plan and agree to abide by its guidelines. The SSHSP contains a copy of the compliance-agreement form.

3.10.6 Removal Activities

Several activities will be conducted before and during soil removal. Specific tasks include air monitoring, soil excavation, and soil screening. TDEC will be given at least two weeks notice by the NSA Mid-South PWD Env. Div. before any removal activities begin.

Surface and Subsurface Soil Excavation

Soil excavation will start with removal of a 4-foot deep by 5-foot square layer of soil centered on location 043X0002. The TPH analyzer will direct soil excavation and removal of 1-foot thick by 5-foot square lifts, which will continue until field screening indicates that remaining soil TPH concentrations are lower than the 100 mg/kg action level.

The contractor will stockpile the excavated soil on plastic sheeting, and cover it with plastic to prevent cross-contamination and erosion. The contractor will be responsible for maintaining the plastic cover on the stockpiled soil. EnSafe will sample the pile and request five-day turnaround for the disposal profile samples. Upon receipt of the results, EnSafe will attach a summary of detections to the data package, and forward two copies to the NSA Mid-South PWD Env. Div. within five days. Contaminated soil will be properly disposed of in accordance with current USEPA and TDEC regulations. The contractor will dispose of any special-waste soil, while any hazardous-waste soil will be disposed of by the NSA Mid-South PWD Env. Div.

Soil Screening

Using disposable spoons or decontaminated stainless-steel spoons and bowls, EnSafe personnel will collect soil samples from the excavation walls and base as each 5-foot diameter lift is removed. Personnel will not enter the excavation if it is deeper than 4 feet to comply with confined space entry regulations. These samples will be collected from the backhoe bucket, if necessary, from the center of the bucket to avoid sample contamination from the bucket wall. The samples will be collected in accordance with procedures described in Section 4.4.3 of the *Comprehensive RFI Work Plan* (E/A&H, October 1994).

Samples will be screened using an IR TPH Plus Field Analyzer, which performs analyses based on USEPA Method 418.1 (IR method). The excavation will continue until field screening demonstrates that the contaminated soil has been removed to concentrations less than the site-specific remediation level of 100 mg/kg.

3.10.7 Postremoval Activities

Several activities will be conducted after soil is removed, including confirmation soil sampling, backfilling the excavation, and disposing of used PPE and disposable sampling equipment.

Confirmation Soil Sampling

When field screening demonstrates that the contaminated soil has been removed to less than the site-specific remediation level of 100 mg/kg TPH, EnSafe will collect a five-part composite sample from each of the excavation walls and four grab samples from the excavation floor (one from each corner). These confirmation soil samples will be analyzed onsite using the TPH Plus Field Analyzer for TPH (Method 418.1), and at an offsite laboratory for Appendix IX metals (USEPA Method 6010/7000 series).

In the event that water is encountered in the excavation, the contractor will containerize it in properly labeled U.S. DOT-approved 55-gallon drums. EnSafe will collect water samples for analyses of VOCs and oil and grease. The drums will be placed in a secured location approved by the NSA Mid-South PWD Env. Div. and remain at this location. The contractor will discharge the water to the sewer via an oil-water separator designated by the NSA Mid-South PWD Env. Div. after contacting the PWD for permission and specifications from the City of Millington POTW. If any water is not approved for discharge to the sewer, then the NSA Mid-South PWD Env. Div. will arrange for its proper disposal. EnSafe will be responsible for collecting any water samples required by the disposal facility and obtaining any additional analyses to determine the appropriate means of disposal.

Backfill of the Excavation

The excavation will remain open until confirmation samples document that soil exceeding the TPH action level of 100 mg/kg has been removed and the BCT has approved backfilling based on a review of the TPH and metals concentrations. A temporary fence or barricade will be placed around the excavation. Clean soil from an offsite source will be used by the contractor for backfill, along with number 33C limestone in areas having vehicular traffic. The area will then be covered with the equivalent of the original material by the contractor.

Removal of Construction Materials

After stockpiled soil has been removed, any debris or trash from field activities will be removed by the contractor. The area will be left as close as possible to its natural state.

Voluntary Corrective Action Report

EnSafe will prepare a report after field activities are complete and analytical results have been received, to address the following:

- Field activities, including a description of field screening and sampling.
- Analytical test results for confirmation samples collected after soil removal.
- A diagram showing site features during the removal action. The diagram will include the location of the excavation, soil-sampling locations, and detected concentrations.
- Disposal manifests (if available at the time of report) and a description of the fate of water generated during the removal action, if any.

3.10.8 Analytical Requirements

Analytical requirements for the samples scheduled to be collected are summarized in Table 3.10.4. Confirmation samples will be analyzed for TPH (Method 418.1) and Appendix IX metals (USEPA Method 6010/7000 series). One characterization sample for soil disposal, which will be collected using a decontaminated stainless-steel hand auger or spoon and bowl for every 100 yd^3 or less of soil, will be analyzed for TCLP lead and TCLP benzene, in accordance with DSW special waste policy. EnSafe will collect any additional samples required by the disposal facility and submit them for the required analyses. Soil samples will be screened by the IR method, in accordance with the manufacturer's instructions.

Table 3.10.4
Sample Summary and Analytical Requirements

Sample Type	Matrix	Analytical Parameters	Rationale	Turnaround Time
Extent Verification	Soil	TPH based on USEPA Method 418.1	TPH is primary contaminant and technology is available to field screen.	Field Analysis
Confirmation	Soil	TPH Method 418.1 Appendix IX Metals	Due to past spills and/or releases, TPH and metals are present.	Field Analysis 5 days
Soil Disposal	Soil (Excavated Material)	TCLP lead TCLP benzene	In accordance with DSW special waste policy.	5 days

3.11 SWMU 47 — Former Hazardous Waste Accumulation Point

3.11.1 Site Description

SWMU 47 is a former hazardous waste accumulation point on the south side of Building S-344 (former Seabees Compound), which is in the southwest corner of the NSA Mid-South Southside at the west end of Ticonderoga Street (formerly D Street; Figure 1.1). The SWMU is a concrete pad area that abuts Building S-344 and joins a concrete wash rack. The area south of the concrete is a grass field extending approximately 50 feet to the north bank of a tributary (SWMU 38) of Big Creek Drainage Canal. SWMU 47 is reported to have been used to store mineral spirits, waste oil, and hydraulic fluid from 1983 to 1992. No visual evidence of a release was identified during a 1990 inspection (ERC/EDGe, 1990).

3.11.2 Field Investigation/Findings

The primary objective of the field investigation was to determine whether a release had occurred and consisted of hand-auger sampling at five sample locations selected inside and outside the perimeter of the concrete pad and wash rack along the southeast end of Building S-344. Soil samples were collected from the surface below the grass, (0 to 1 foot deep) and the subsurface (3 to 4 feet deep). Two surface-soil samples (047S000201 and 047S000601) were collected from the most visibly stained area and underwent FSA for risk-assessment purposes, while the other three surface-soil samples (047S000301, 047S000401, and 047S000501) and three of the proposed five subsurface-soil samples (047S000204, 047S000304, 047S000404, 047S000504, and 047S000604) were analyzed for VOCs, SVOCs, Appendix IX metals, TPH, TPH-GRO, and TPH-DRO. The 3-to-4 foot interval was only sampled at locations 047X0002, 047X0004, and 047X0006 because subsurface concrete pieces and various other debris obstructed the hand auger. Geoprobe groundwater samples were collected for offsite-laboratory VOC analysis from the deep alluvium at two sample locations (047X0001 and 047X0007). Figure 3.11 shows the site layout and surveyed sampling locations. All soil and groundwater samples were analyzed at Savannah Analytical Laboratory in Savannah, Georgia.

Organics in Soil

The organic soil data and TPH soil data that exceeded at least one standard reference value are presented in Tables 3.11.1 and 3.11.2, respectively. BEQs were estimated in accordance with USEPA Region IV November 1995 Supplemental Guidance to RAGS Bulletin 2, as presented in Table 3.11.1 and discussed below. Only BEQs greater than 200 μg/kg are reported in Table 3.11.1.

Table 3.11.1
Assemblies G and H — SWMU 47 Organic Detections in Soil by Location (μg/kg)

Location	Depth (in feet)	Contaminant	RC[a]	RBC[b] Industrial	RBC[b] Residential	SSL[c]	Result
047X0002	01'	BEQ*	565	780	88	400	245
		Benzo(a)anthracene	—	7,800	880	80	200 J
		Benzo(b)fluoranthene	—	7,800	880	200	210 J
		Benzo(k)fluoranthene	—	78,000	8,800	2,000	170 J
		Benzo(a)pyrene	565	780	88	400	190 J
		Chrysene	—	780,000	88,000	8,000	210 J
		Indeno(1,2,3-cd)pyrene	—	7,800	880	700	120 J
		Dieldrin +	262	360	40	0.2	420
047X0002	04'	Benzo(a)anthracene	—	—	—	80	110 J
047X0004	01'	Benzo(a)anthracene	—	7,800	880	80	160 J
		Benzo(a)pyrene	565	780	88	400	100 J
		Carbazole	—	290,000	32,000	30	56 J
047X0005	01'	BEQ*	565	780	88	400	353
		Benzo(a)anthracene	—	7,800	880	80	320 J
		Benzo(b)fluoranthene	—	7,800	880	200	250 J
		Benzo(k)fluoranthene	—	78,000	8,800	2,000	360 J
		Benzo(a)pyrene	565	780	88	400	280 J
		Chrysene	—	780,000	88,000	8,000	380 J
		Indeno(1,2,3-cd)pyrene	—	7,800	880	700	120 J
		Carbazole	—	290,000	32,000	30	60 J

Table 3.11.1
Assemblies G and H — SWMU 47 Organic Detections in Soil by Location (μg/kg)

Location	Depth (in feet)	Contaminant	RC[a]	RBC[b] Industrial	RBC[b] Residential	SSL[c]	Result
047X0006	01'	Dieldrin+	262	360	40	0.2	26 J

Notes:
a — Background Reference Concentration (RC) from the August 1996 *Technical Memorandum — Reference Concentrations* (August 27, 1996, E/A&H).
b — Industrial and residential RBCs from the April 1999 Risk-Based Concentration Table (April 12, 1999, USEPA Region III RBC Memo).
c — Soil Screening Level (SSL) from the May 1996 Generic Screening Levels (May 1996, USEPA/OSWER SSL Guidance Document, EPA/540/R-95/128).
DNE — Does not exist.
J — Contaminant detected at concentrations less than the method reporting limit; value estimated.
* — Benzo(a)pyrene Equivalent (BEQ) was calculated in accordance with USEPA Region IV November 1995 Supplemental Guidance to RAGS Bulletin 2.
\+ — Reference concentration for dieldrin determined from base-wide background sampling and screening.

Dieldrin was retained as a COPC because it exceeded its RC (262 μg/kg), residential RBC (40 μg/kg), industrial RBC (360 μg/kg) in sample 047S000201 (420 μg/kg), but the PRE calculation [*Assemblies G and H CSI Report* (May 29, 1998)] did not indicate any excess risk associated with this concentration. BEQ exceeded its residential RBC (88 μg/kg) in two samples 047S000201 (245 μg/kg) and 047S000501 (353 μg/kg), but was not retained as a COPC because the concentrations did not exceed its RC (565 μg/kg).

Table 3.11.2
Assemblies G and H — SWMU 47 Petroleum Hydrocarbon Detections by Location (mg/kg)

Location	Depth (in feet)	Contaminant	Result
047X0002	01'	TPH	320
047X0006	01'	TPH	340

Inorganics in Soil

The inorganic soil data that exceeded at least one standard reference value are presented in Table 3.11.3.

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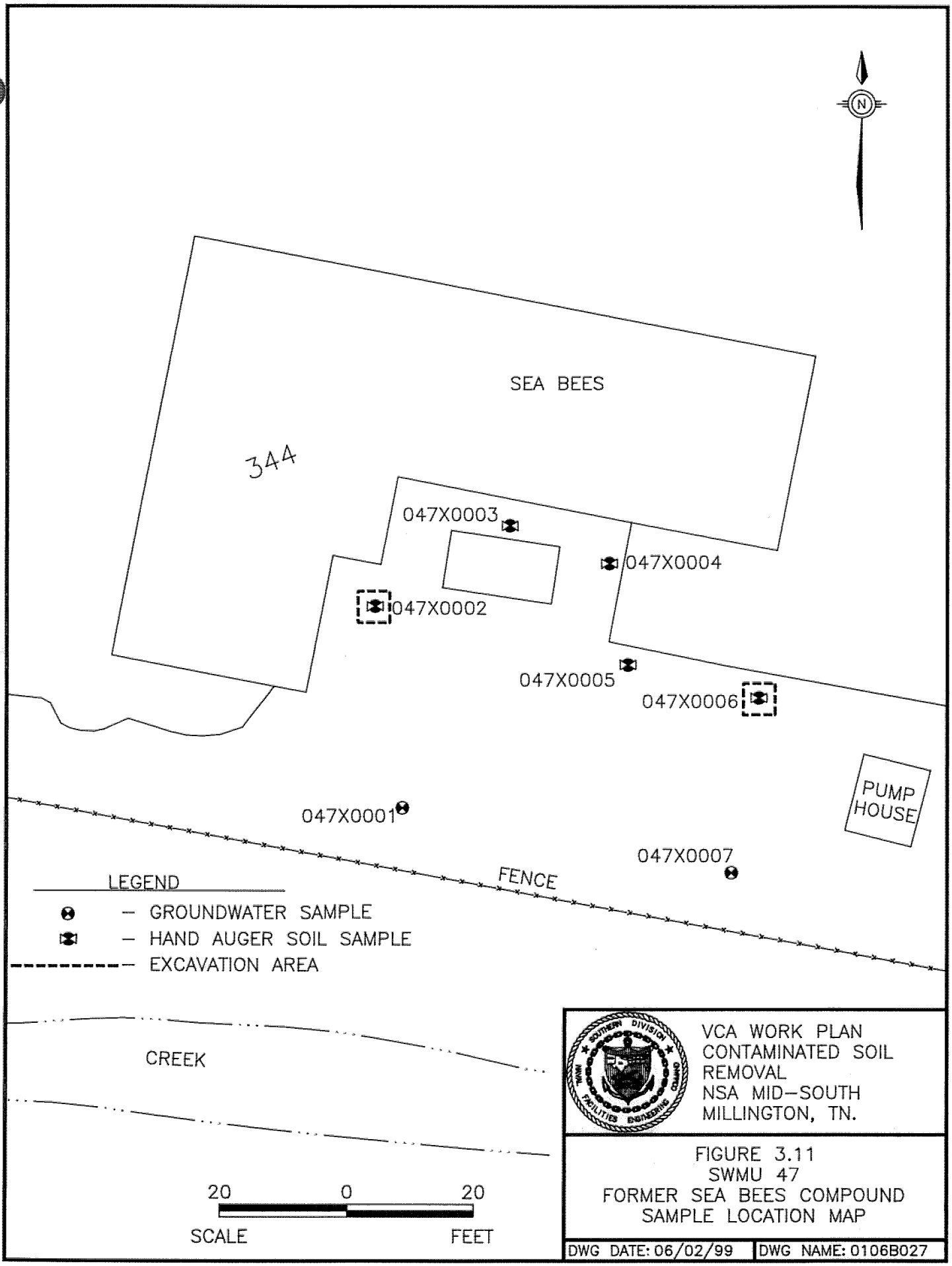

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FIGURE 3.11
SWMU 47
FORMER SEA BEES COMPOUND
SAMPLE LOCATION MAP

DWG DATE: 06/02/99 | DWG NAME: 0106B027

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Table 3.11.3
Assemblies G and H — SWMU 47 Inorganic Detections in Soil by Location (mg/kg)

Location	Depth (in feet)	Constituent	RC[a]	RBC[b] Industrial	RBC[b] Residential	SSL[c]	Result
047X0002	01'	Arsenic (As)	14.6	3.8	0.43	1	5.3
		Barium (Ba)	223	14,000	550	82	93.3
		Chromium (Cr)	24.0	1,000	39	2	9.5
		Lead (Pb)	26.0	400[d]	400[d]	DNE	45.8 J
		Nickel (Ni)	20.6	4,100	160	7	10.2 J
047X0002	04'	Arsenic (As)	20.3	—	—	1	4.4
		Barium (Ba)	265	—	—	82	144
		Chromium (Cr)	28.3	—	—	2	10.6
		Nickel (Ni)	DNE	—	—	7	13.2 J
047X0003	01'	Arsenic (As)	14.6	3.8	0.43	1	10.7
		Barium (Ba)	223	14,000	550	82	135
		Cadmium (Cd)	1.54	100	4	0.4	0.47 J
		Chromium (Cr)	24.0	1,000	39	2	13.9
		Nickel (Ni)	20.6	4,100	160	7	15.9 J
047X0004	01'	Arsenic (As)	14.6	3.8	0.43	1	7.7
		Barium (Ba)	223	14,000	550	82	109
		Chromium (Cr)	24.0	1,000	39	2	12.2
		Lead (Pb)	26.0	400[d]	400[d]	DNE	33.2 J
		Nickel (Ni)	20.6	4,100	160	7	12.6 J
		Zinc (Zn)	98	61,000	2,300	620	106 J
047X0004	04'	Arsenic (As)	20.3	—	—	1	8.1
		Barium (Ba)	265	—	—	82	125
		Chromium (Cr)	28.3	—	—	2	10.8
		Lead (Pb)	19.8	—	—	DNE	19.9 J
		Nickel (Ni)	DNE	—	—	7	14.5 J
047X0005	01'	Arsenic (As)	14.6	3.8	0.43	1	7
		Barium (Ba)	223	14,000	550	82	82.6
		Chromium (Cr)	24.0	1,000	39	2	9
		Lead (Pb)	26.0	400[d]	400[d]	DNE	35.7 J
		Nickel (Ni)	20.6	4,100	160	7	9.4 J

Table 3.11.3
Assemblies G and H — SWMU 47 Inorganic Detections in Soil by Location (mg/kg)

Location	Depth (in feet)	Constituent	RC[a]	RBC[b] Industrial	RBC[b] Residential	SSL[c]	Result
047X0006	01'	Arsenic (As)	14.6	3.8	0.43	1	8.8
		Barium (Ba)	223	14,000	550	82	118
		Chromium (Cr)	24.0	1,000	39	2	11.6
		Lead (Pb)	26.0	400[d]	400[d]	DNE	31.7 J
		Nickel (Ni)	20.6	4,100	160	7	13.4 J
047X0006	04'	Arsenic (As)	20.3	—	—	1	3.2
		Chromium (Cr)	28.3	—	—	2	5.5

Notes:

a — Background Reference Concentration (RC) from the August 1996 *Technical Memorandum — Reference Concentrations* (August 27, 1996, E/A&H).

b — Industrial and residential RBCs from the April 1999 Risk-Based Concentration Table (April 12, 1999, USEPA Region III RBC Memo).

c — Soil Screening Level (SSL) from the May 1996 Generic Screening Levels (May 1996, USEPA/OSWER SSL Guidance Document, EPA/540/R-95/128).

d — Lead soil-cleanup value, as established by USEPA/OSWER directive #9355.4-12, substituted for RBC.

DNE — Does not exist.

J — Constituent detected at concentrations less than the method reporting limit; value estimated.

Groundwater

Two groundwater samples were taken at SWMU 47; however, no contaminants were detected in these samples.

3.11.3 Source Characterization

Based on TPH detections in surface soil at locations 047X0002 and 047X0006 that exceeded the TDEC cleanup level of 100 mg/kg, a VCA was recommended to address soil contamination by removing any TPH and/or metals-contaminated soil that exceeded acceptable risk standards.

3.11.4 Removal Responsibilities

The following section outlines the actions to be conducted during the excavation of petroleum-and metals-contaminated soil. The contractor will provide the equipment and personnel to excavate, stockpile, and dispose of the contaminated soil. EnSafe will assist the contractor as necessary, collect confirmation and soil-disposal samples, and report on the removal activities in a VCA report. The following activities to be performed by the designated staff, are further described in subsequent sections.

- EnSafe will plan field activities and schedule EnSafe personnel and equipment.

- EnSafe will review the following with the necessary personnel: the applicable portions of the *Comprehensive RFI Work Plan*, the CHSP which is included as Appendix B, and the SSHSP which is included as Appendix C.

- The contractor will coordinate the placement of contaminated-soil stockpiles with the NSA Mid-South PWD Env. Div. The contractor will place plastic on the ground surface before stockpiling soil in the designated areas.

- The contractor will excavate and stockpile all removed materials.

- EnSafe will provide sampling support during removal activities.

- EnSafe will characterize any excavated soil in accordance with the TDEC DUST and/or DSW guidance.

- The contractor will backfill the excavated area with clean soil or other materials and cover the area with the equivalent of the original material. The contractor will use number 33C

limestone in areas where vehicular traffic is possible, as specified by the NSA Mid-South PWD Env. Div.

- The contractor will cover the stockpile with plastic, install silt fencing, and maintain runoff control until the soil is properly disposed of. The contractor will coordinate disposal of soil and decontamination fluids resulting from field activities, including the preparation and filing of any special waste permits.

- The contractor will remove all construction materials.

- EnSafe will prepare a VCA report for the site.

3.11.5 Preremoval Activities

Activities to be conducted before removing the soil are discussed in the following sections.

Orientation Meeting

Before performing any field activities, EnSafe personnel will hold an orientation meeting to review general and site-specific requirements for sampling and documentation. General discussion will include locations of the site field office, subject site, and designated decontamination areas. Sampling requirements to be discussed will include general sampling protocol, the sample-numbering system, QA/QC sampling requirements, and sample packaging. Documentation requirements to be discussed will include the use of field forms, field logbooks, and photographic documentation.

The SSO will review the CHSP and SSHSP (Appendices B and C) with EnSafe personnel before any field activities begin. All EnSafe employees working onsite will be required to sign a form acknowledging that they are familiar with the plan and agree to abide by its guidelines. The SSHSP contains a copy of the compliance-agreement form.

3.11.6 Removal Activities

Several activities will be conducted before and during soil removal. Specific tasks include air monitoring, soil excavation, and soil screening. TDEC will be given at least two weeks notice by the NSA Mid-South PWD Env. Div. before any removal activities begin.

Surface and Subsurface Soil Excavation

Soil excavation will start with removal of a 2-foot deep by 5-foot square layer of soil centered on locations 047X0002 and 047X0006. The TPH analyzer will direct soil excavation and removal of 1-foot thick by 5-foot square lifts, which will continue until field screening indicates that remaining soil TPH concentrations are lower than the 100 mg/kg action level.

The contractor will stockpile the excavated soil on plastic sheeting, and cover it with plastic to prevent cross-contamination and erosion. The contractor will be responsible for maintaining the plastic cover on the stockpiled soil. EnSafe will sample the pile and request five-day turnaround for the disposal profile samples. Upon receipt of the results, EnSafe will attach a summary of detections to the data package, and forward two copies to the NSA Mid-South PWD Env. Div. within five days. Contaminated soil will be properly disposed of in accordance with current USEPA and TDEC regulations. The contractor will dispose of any special-waste soil, while any hazardous-waste soil will be disposed of by the NSA Mid-South PWD Env. Div.

Soil Screening

Using disposable spoons or decontaminated stainless-steel spoons and bowls, EnSafe personnel will collect soil samples from the excavation walls and base as each 5-foot diameter lift is removed. Personnel will not enter the excavation if it is deeper than 4 feet to comply with confined space entry regulations. These samples will be collected from the backhoe bucket, if necessary, from the center of the bucket to avoid sample contamination from the bucket wall. The samples will be collected in accordance with procedures described in Section 4.4.3 of the *Comprehensive RFI Work Plan* (E/A&H, October 1994).

Samples will be screened using an IR TPH Plus Field Analyzer, which performs analyses based on USEPA Method 418.1 (IR method). The excavation will continue until field screening demonstrates that the contaminated soil has been removed to concentrations less than the site-specific remediation level of 100 mg/kg.

3.11.7 Postremoval Activities

Several activities will be conducted after soil is removed, including confirmation soil sampling, backfilling the excavation, and disposing of used PPE and disposable sampling equipment.

Confirmation Soil Sampling

When field screening demonstrates that the contaminated soil has been removed to less than the site-specific remediation level of 100 mg/kg TPH, EnSafe will collect a five-part composite sample from each of the excavation walls and four grab samples from the excavation floor (one from each corner). These confirmation soil samples will be analyzed onsite using the TPH Plus Field Analyzer for TPH (Method 418.1), and at an offsite laboratory for Appendix IX metals (USEPA Method 6010/7000 series).

In the event that water is encountered in the excavation, the contractor will containerize it in properly labeled U.S. DOT-approved 55-gallon drums. EnSafe will collect water samples for analyses of VOCs and oil and grease. The drums will be placed in a secured location approved by the NSA Mid-South PWD Env. Div. and remain at this location. The contractor will discharge the water to the sewer via an oil-water separator designated by the NSA Mid-South PWD Env. Div. after contacting the PWD for permission and specifications from the City of Millington POTW. If any water is not approved for discharge to the sewer, then the NSA Mid-South PWD Env. Div. will arrange for its proper disposal. EnSafe will be responsible for collecting any water samples required by the disposal facility and obtaining any additional analyses to determine the appropriate means of disposal.

Backfill of the Excavation

The excavation will remain open until confirmation samples document that soil exceeding the TPH action level of 100 mg/kg has been removed and the BCT has approved backfilling, based on a review of the TPH and metals concentrations. A temporary fence or barricade will be placed around the excavation. Clean soil from an offsite source will be used by the contractor for backfill, along with number 33C limestone in areas having vehicular traffic. The area will then be covered with the equivalent of the original material by the contractor.

Removal of Construction Materials

After stockpiled soil has been removed, any debris or trash from field activities will be removed by the contractor. The area will be left as close as possible to its natural state.

Voluntary Corrective Action Report

EnSafe will prepare a report after field activities are complete and analytical results have been received, to address the following:

- Field activities, including a description of field screening and sampling.
- Analytical test results for confirmation samples collected after soil removal.
- A diagram showing site features during the removal action. The diagram will include the location of the excavation, soil-sampling locations, and detected concentrations.
- Disposal manifests (if available at the time of report) and a description of the fate of water generated during the removal action, if any.

3.11.8 Analytical Requirements

Analytical requirements for the samples scheduled to be collected are summarized in Table 3.11.4. Confirmation samples will be analyzed for TPH (Method 418.1) and Appendix IX metals (USEPA Method 6010/7000 series). One characterization sample for soil disposal, which will be collected using a decontaminated stainless-steel hand auger or spoon and bowl for every 100 yd^3 or less of soil, will be analyzed for TCLP lead and TCLP benzene, in accordance with DSW special waste policy. EnSafe will collect any additional samples required by the disposal facility and submit them for the required analyses. Soil samples will be screened by the IR method, in accordance with the manufacturer's instructions.

Table 3.11.4
Sample Summary and Analytical Requirements

Sample Type	Matrix	Analytical Parameters	Rationale	Turnaround Time
Extent Verification	Soil	TPH based on USEPA Method 418.1	TPH is primary contaminant and technology is available to field screen.	Field Analysis
Confirmation	Soil	TPH Method 418.1 Appendix IX Metals	Due to past spills and/or releases, TPH and metals are present.	Field Analysis 5 days
Soil Disposal	Soil (Excavated Material)	TCLP lead TCLP benzene	In accordance with DSW special waste policy.	5 days

3.12 SWMU 48 — Hazardous Waste Accumulation Points

3.12.1 Site Description

SWMU 48 consists of various inactive hazardous waste accumulation points for containerized paint thinner and degreasing agents on the service side (west) of the Building S-9 complex, just outside overhead doors to work bays. It is bordered by Building S-9 on its east and south and by SWMU 17 on its west. SWMU 48 is located approximately 150 feet north of Ticonderoga Avenue (formerly D Street) (Figure 1.1) and is reported to have been operated since 1950 and to have stored waste thinners, degreasers, and batteries.

3.12.2 Field Investigation/Findings

The primary objectives of the field investigation were to determine whether a release had occurred. Eight hand-auger samples were collected from four locations (048X0001, 048X0002, 048X0003, and 048X0004), one outside each bay on the western side of Building S-9 in the area of the hazardous waste accumulation point (SWMU 48). The soil samples were collected from below the asphalt or concrete to approximately 1 foot deep and from 3 to 4 feet deep using a hand auger. The soil samples were analyzed for VOCs, DRO, GRO, TPH, and Appendix IX metals. Sample analytical methods include analytes that indicate the types of materials once stored at SWMU 48. Figure 3.12 shows the site layout and surveyed sampling locations. All of the soil samples were analyzed at Savannah Analytical Laboratory in Savannah, Georgia.

Organics in Soil

Acetone was the only organic detected in SWMU 48 soil samples. All acetone detections in surface-soil samples were less than the residential and industrial RBCs and soil-to-groundwater SSL. TPH soil data that exceeded at least one standard reference value are presented in Table 3.12.1.

Table 3.12.1
Assemblies G and H — SWMU 48 Petroleum Hydrocarbon Detections in Soil by Location (mg/kg)

Location	Depth (in feet)	Constituent	Result
048X0001	01'	TPH	160 J
048X0001	04'	TPH	120 J
048X0002	01'	TPH	200 J
048X0002	04'	TPH	150 J
048X0003	01'	TPH	230 J
048X0004	01'	TPH	140 J
048X0004	04'	TPH	140 J

Inorganics in Soil

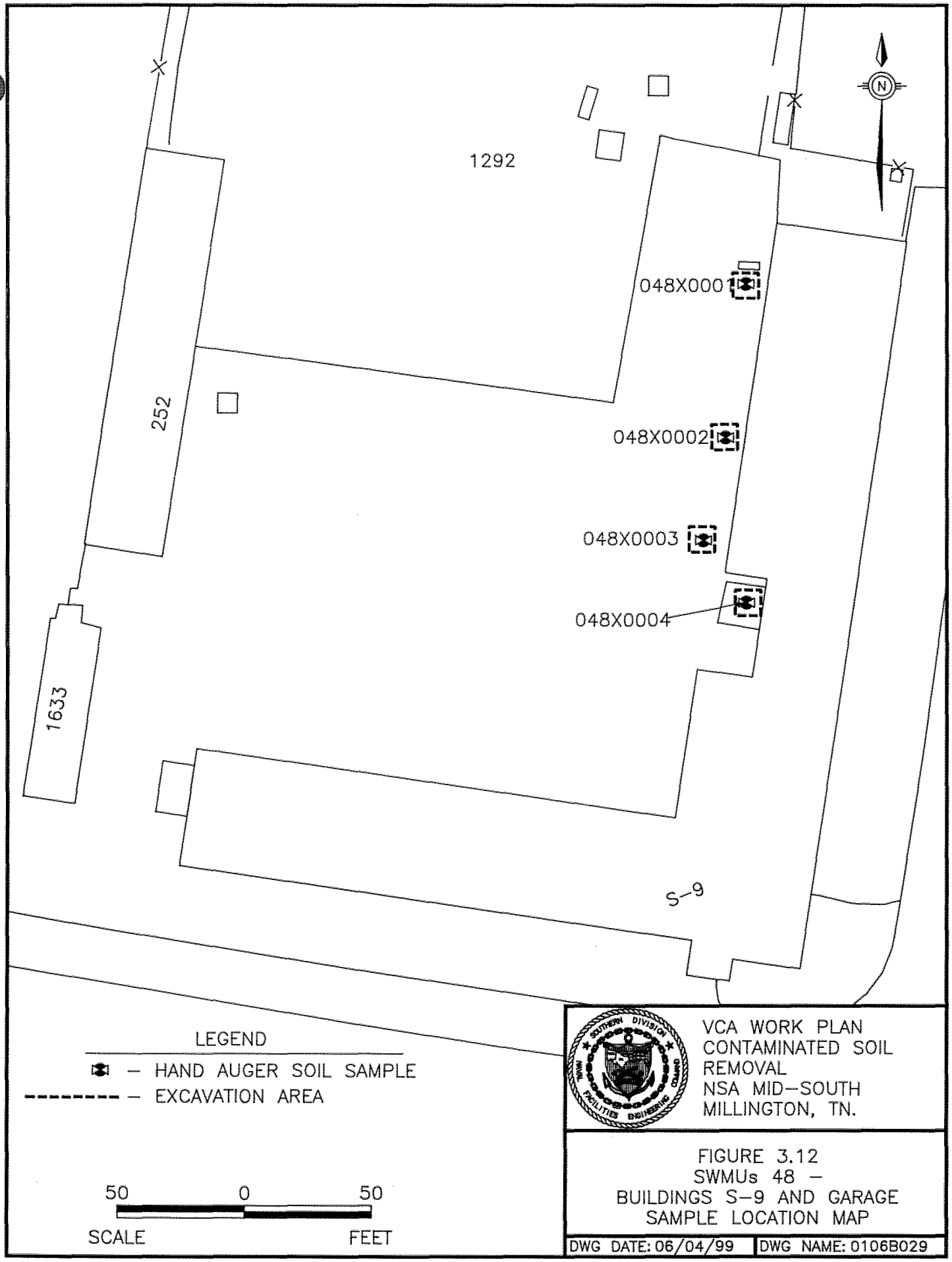
The inorganic soil data that exceeded at least one standard reference value are presented in Table 3.12.2.

3.12.3 Source Characterization

Based on TPH detections in surface and subsurface soil at locations 048X0001, 048X0002, 048X0003, and 048X0004 that exceeded the TDEC cleanup level of 100 mg/kg, a VCA was recommended to address soil contamination by removing any TPH-contaminated soil exceeded acceptable risk standards.

3.12.4 Removal Responsibilities

The following section outlines the actions to be conducted during the excavation of petroleum-and metals-contaminated soil. The contractor will provide the equipment and personnel to excavate, stockpile, and dispose of the contaminated soil. EnSafe will assist the contractor as necessary, collect confirmation and soil-disposal samples, and report on the removal activities in a VCA report. The following activities to be performed by the designated staff, are further described in subsequent sections.



VCA WORK PLAN
CONTAMINATED SOIL REMOVAL
NSA MID-SOUTH
MILLINGTON, TN.

FIGURE 3.12
SWMUs 48 –
BUILDINGS S-9 AND GARAGE
SAMPLE LOCATION MAP

DWG DATE: 06/04/99 | DWG NAME: 0106B029

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Table 3.12.2
Assemblies G and H — SWMU 48 Inorganic Detections in Soil by Location (mg/kg)

Location	Depth (in feet)	Constituent	RC[a] Surface	RBC[b] Industrial	RBC[b] Residential	SSL[c]	Result
048X0001	01'	Arsenic (As)	14.6	3.8	0.43	1	3.9
		Chromium (Cr)	24.0	1,000	39	2	20.6 J
		Nickel (Ni)	20.6	4,100	160	7	13.2 J
048X0001	04'	Antimony (Sb)	DNE	—	—	0.3	0.63 J
		Arsenic (As)	20.3	—	—	1	11.3
		Barium (Ba)	265	—	—	82	83.8
		Chromium (Cr)	28.3	—	—	2	16 J
		Nickel (Ni)	DNE	—	—	7	15.1 J
		Selenium (Se)	DNE	—	—	0.3	0.74 J
048X0002	01'	Arsenic (As)	14.6	3.8	0.43	1	6.7
		Barium (Ba)	223	14,000	550	82	86.9
		Chromium (Cr)	24.0	1,000	39	2	9.8 J
		Cobalt (Co)	16.0	12,000	470	DNE	23.6 J
		Nickel (Ni)	20.6	4,100	160	7	14 J
		Selenium (Se)	DNE	1,000	39	0.3	0.42 J
048X0002	04'	Arsenic (As)	20.3	—	—	1	12.6
		Barium (Ba)	265	—	—	82	96.7
		Chromium (Cr)	28.3	—	—	2	18.1 J
		Nickel (Ni)	DNE	—	—	7	15.8 J
		Selenium (Se)	DNE	—	—	0.3	0.42 J
048X0003	01'	Arsenic (As)	14.6	3.8	0.43	1	8.1
		Barium (Ba)	223	14,000	550	82	118
		Chromium (Cr)	24.0	1,000	39	2	12.5 J
		Nickel (Ni)	20.6	4,100	160	7	14.7 J

Table 3.12.2
Assemblies G and H — SWMU 48 Inorganic Detections in Soil by Location (mg/kg)

Location	Depth (in feet)	Constituent	RC[a] Surface	RBC[b] Industrial	RBC[b] Residential	SSL[c]	Result
048X0003	04'	Arsenic (As)	20.3	—	—	1	13
		Chromium (Cr)	28.3	—	—	2	13.2 J
		Nickel (Ni)	DNE	—	—	7	16.3 J
048X0004	01'	Antimony (Sb)	DNE	82	3.1	0.3	0.43 J
		Arsenic (As)	14.6	3.8	0.43	1	6.9
		Chromium (Cr)	24.0	1,000	39	2	9.7 J
		Nickel (Ni)	20.6	4,100	160	7	10.9 J
		Thallium (Tl)	DNE	DNE	DNE	0.04	0.75 J
048X0004	04'	Arsenic (As)	20.3	—	—	1	11.9
		Barium (Ba)	265	—	—	82	183
		Chromium (Cr)	28.3	—	—	2	14.6 J
		Nickel (Ni)	DNE	—	—	7	19.2 J

Notes:

a — Background Reference Concentration (RC) from the August 1996 *Technical Memorandum — Reference Concentrations* (August 27, 1996, E/A&H Tech Memo).
b — Industrial and residential RBCs from the April 1999 *Risk-Based Concentration Table* (April 12, 1999, USEPA Region III RBC Memo).
c — Soil Screening Level (SSL) from the May 1996 *Generic Screening Levels* (May 1996, USEPA/OSWER SSL Guidance Document, EPA/540/R-95/128).
d — Lead soil-cleanup value, as established by USEPA/OSWER directive #9355.4-12, substituted for RBC.
DNE — Does not exist.
J — Constituent detected at concentrations less than the method reporting limit; value estimated.

- EnSafe will plan field activities and schedule EnSafe personnel and equipment.

- EnSafe will review the following with the necessary personnel: the applicable portions of the *Comprehensive RFI Work Plan*, the CHSP which is included as Appendix B, and the SSHSP which is included as Appendix C.

- The contractor will coordinate the placement of contaminated-soil stockpiles with the NSA Mid-South PWD Env. Div. The contractor will place plastic on the ground surface before stockpiling soil in the designated areas.

- The contractor will excavate and stockpile all removed materials.

- EnSafe will provide sampling support during removal activities.

- EnSafe will characterize any excavated soil in accordance with the TDEC DUST and/or DSW guidance.

- The contractor will backfill the excavated area with clean soil or other materials and cover the area with the equivalent of the original material. The contractor will use number 33C limestone in areas where vehicular traffic is possible, as specified by the NSA Mid-South PWD Env. Div.

- The contractor will cover the stockpile with plastic, install silt fencing, and maintain runoff control until the soil is properly disposed of. The contractor will coordinate disposal of soil and decontamination fluids resulting from field activities, including the preparation and filing of any special waste permits.

- The contractor will remove all construction materials.

- EnSafe will prepare a VCA report for the site.

3.12.5 Preremoval Activities

Activities to be conducted before removing the soil are discussed in the following sections.

Orientation Meeting

Before performing any field activities, EnSafe personnel will hold an orientation meeting to review general and site-specific requirements for sampling and documentation. General discussion will include locations of the site field office, subject site, and designated decontamination areas. Sampling requirements to be discussed will include general sampling protocol, the sample-numbering system, QA/QC sampling requirements, and sample packaging. Documentation requirements to be discussed will include the use of field forms, field logbooks, and photographic documentation.

The SSO will review the CHSP and SSHSP (Appendices B and C) with EnSafe personnel before any field activities begin. All EnSafe employees working onsite will be required to sign a form acknowledging that they are familiar with the plan and agree to abide by its guidelines. The SSHSP contains a copy of the compliance-agreement form.

3.12.6 Removal Activities

Several activities will be conducted before and during soil removal. Specific tasks include air monitoring, soil excavation, and soil screening. TDEC will be given at least two weeks notice by the NSA Mid-South PWD Env. Div. before any removal activities begin.

Surface and Subsurface Soil Excavation

Soil excavation will start with removal of a 4-foot deep by 5-foot square layer of soil centered on locations 048X0001, 048X0002, 048X0003, and 048X0004. The TPH analyzer will direct soil excavation and removal of 1-foot thick by 5-foot square lifts, which will continue until field screening indicates that remaining soil TPH concentrations are lower than the 100 mg/kg action level.

The contractor will stockpile the excavated soil on plastic sheeting, and cover it with plastic to prevent cross-contamination and erosion. The contractor will be responsible for maintaining the

plastic cover on the stockpiled soil. EnSafe will sample the pile and request five-day turnaround for the disposal profile samples. Upon receipt of the results, EnSafe will attach a summary of detections to the data package, and forward two copies to the NSA Mid-South PWD Env. Div. within five days. Contaminated soil will be properly disposed of in accordance with current USEPA and TDEC regulations. The contractor will dispose of any special-waste soil, while any hazardous-waste soil will be disposed of by the NSA Mid-South PWD Env. Div.

Soil Screening

Using disposable spoons or decontaminated stainless-steel spoons and bowls, EnSafe personnel will collect soil samples from the excavation walls and base as each 5-foot diameter lift is removed. Personnel will not enter the excavation if it is deeper than 4 feet to comply with confined space entry regulations. These samples will be collected from the backhoe bucket, if necessary, from the center of the bucket to avoid sample contamination from the bucket wall. The samples will be collected in accordance with procedures described in Section 4.4.3 of the *Comprehensive RFI Work Plan* (E/A&H, October 1994).

Samples will be screened using an IR TPH Plus Field Analyzer, which performs analyses based on USEPA Method 418.1 (IR method). The excavation will continue until field screening demonstrates that the contaminated soil has been removed to concentrations less than the site-specific remediation level of 100 mg/kg.

3.12.7 Postremoval Activities

Several activities will be conducted after soil is removed, including confirmation soil sampling, backfilling the excavation, and disposing of used PPE and disposable sampling equipment.

Confirmation Soil Sampling

When field screening demonstrates that the contaminated soil has been removed to less than the site-specific remediation level of 100 mg/kg TPH, EnSafe will collect a five-part composite sample from each of the excavation walls and four grab samples from the excavation floor (one from each corner). These confirmation soil samples will be analyzed onsite using the TPH Plus Field Analyzer for TPH (Method 418.1), and at an offsite laboratory for Appendix IX metals (USEPA Method 6010/7000 series).

In the event that water is encountered in the excavation, the contractor will containerize it in properly labeled U.S. DOT-approved 55-gallon drums. EnSafe will collect water samples for analyses of VOCs and oil and grease. The drums will be placed in a secured location approved by the NSA Mid-South PWD Env. Div. and remain at this location. The contractor will discharge the water to the sewer via an oil-water separator designated by the NSA Mid-South PWD Env. Div. after contacting the PWD for permission and specifications from the City of Millington POTW. If any water is not approved for discharge to the sewer, then the NSA Mid-South PWD Env. Div. will arrange for its proper disposal. EnSafe will be responsible for collecting any water samples required by the disposal facility and obtaining any additional analyses to determine the appropriate means of disposal.

Backfill of the Excavation

The excavation will remain open until confirmation samples document that soil exceeding the TPH action level of 100 mg/kg has been removed and the BCT has approved backfilling based on a review of the TPH and metals concentrations. A temporary fence or barricade will be placed around the excavation. Clean soil from an offsite source will be used by the contractor for backfill, along with number 33C limestone in areas having vehicular traffic. The area will then be covered with the equivalent of the original material by the contractor.

Removal of Construction Materials

After stockpiled soil has been removed, any debris or trash from field activities will be removed by the contractor. The area will be left as close as possible to its natural state.

Voluntary Corrective Action Report

EnSafe will prepare a report after field activities are complete and analytical results have been received, to address the following:

- Field activities, including a description of field screening and sampling.
- Analytical test results for confirmation samples collected after soil removal.
- A diagram showing site features during the removal action. The diagram will include the location of the excavation, soil-sampling locations, and detected concentrations.
- Disposal manifests (if available at the time of report) and a description of the fate of water generated during the removal action, if any.

3.12.8 Analytical Requirements

Analytical requirements for the samples scheduled to be collected are summarized in Table 3.12.3. Confirmation samples will be analyzed for TPH (Method 418.1) and Appendix IX metals (USEPA Method 6010/7000 series). One characterization sample for soil disposal, which will be collected using a decontaminated stainless-steel hand auger or spoon and bowl for every 100 yd^3 or less of soil, will be analyzed for TCLP lead and TCLP benzene, in accordance with DSW special waste policy. EnSafe will collect any additional samples required by the disposal facility and submit them for the required analyses. Soil samples will be screened by the IR method, in accordance with the manufacturer's instructions.

Table 3.12.3
Sample Summary and Analytical Requirements

Sample Type	Matrix	Analytical Parameters	Rationale	Turnaround Time
Extent Verification	Soil	TPH based on USEPA Method 418.1	TPH is primary contaminant and technology is available to field screen.	Field Analysis
Confirmation	Soil	TPH Method 418.1 Appendix IX Metals	Due to past spills and/or releases, TPH and metals are present.	Field Analysis 5 days
Soil Disposal	Soil (Excavated Material)	TCLP lead TCLP benzene	In accordance with DSW special waste policy.	5 days

3.13 SMWU 49 — Navy Exchange Service Station

3.13.1 Site Description

SWMU 49 is approximately 150 feet north of Navy Road (Figure 1.1) on the NSA Mid-South Northside. SWMU 49 is bounded to the north by a wooded area and to the south by SWMU 19, Navy Road, and Building N-341 of the Navy Exchange Service Station. SWMU 49 is bordered to the east by Building N-757 of the Navy Exchange Service Station and to the northwest by the Aircraft Fire Fighting Training Facility (SWMU 5). SWMU 49 is reported to have been operated as a hazardous waste accumulation point for Building N-757 from 1969 through 1986. This accumulation point was used for automobile batteries, waste paints, containerized waste mineral spirits, and tires.

3.13.2 Field Investigation/Findings

The objective of the field investigation was to better define the extent of potential contamination and consisted of hand-auger sampling from 0 to 1 foot and 3 to 4 feet deep at one sample location (049X0001) within the hazardous waste accumulation area. The surface-soil sample at this location underwent FSA and was used for assessing risk and inspecting for surface spills, while the subsurface-soil sample was analyzed for VOCs, SVOCs, TPH, chlorinated pesticides/PCBs, and Appendix IX metals to assess the extent of contamination. The groundwater investigation consisted of Geoprobe sampling collected from six locations (049X0002, 049X0003, 049X0004, 049X0005, 049X0006, and 049X0007) on the northwest end of Building N-757 and in the direction of SWMU 5 to see if contaminant migration had occurred. Figure 3.13 shows the site layout and surveyed sampling locations. All soil and groundwater samples were analyzed for VOCs at Savannah Analytical Laboratory in Savannah, Georgia.

Organics in Soil

The organic soil data and TPH soil data that exceeded at least one of the standard reference values are presented in Tables 3.13.1 and 3.13.2, respectively.

Table 3.13.1
Assemblies G and H — Preliminary SWMU 49 Organic Detections in Soil by Location (µg/kg)

Location	Depth (in feet)	Contaminant	RC[a]	RBC[b] Industrial	RBC[b] Residential	SSL[c]	Result
049X0001	01'	Dieldrin +	262	360	40	0.2	46 J

Notes:
a — Background Reference Concentration (RC) from the August 1996 *Technical Memorandum — Reference Concentrations* (August 27, 1996, E/A&H).
b — Industrial and residential RBCs from the April 1999 Risk-Based Concentration Table (April 12, 1999, USEPA Region III RBC Memo).
c — Soil Screening Level (SSL) from the May 1996 Generic Screening Levels (May 1996, USEPA/OSWER SSL Guidance Document, EPA/540/R-95/128).
J — Contaminant detected at concentrations less than the method reporting limit; value estimated.
+ — Reference concentration for dieldrin determined from base-wide background sampling and screening.

Table 3.13.2
Assemblies G and H — SWMU 49 Petroleum Hydrocarbon Detections in Soil by Location (mg/kg)

Location	Depth (in feet)	Contaminant	Result
049X0001	01'	TPH	280

Inorganics in Soil

The inorganic soil data that exceeded at least one of the standard reference values samples are presented in Table 3.13.3.

Groundwater

Six groundwater samples were collected at SWMU 49; however, no VOCs were detected in these samples.

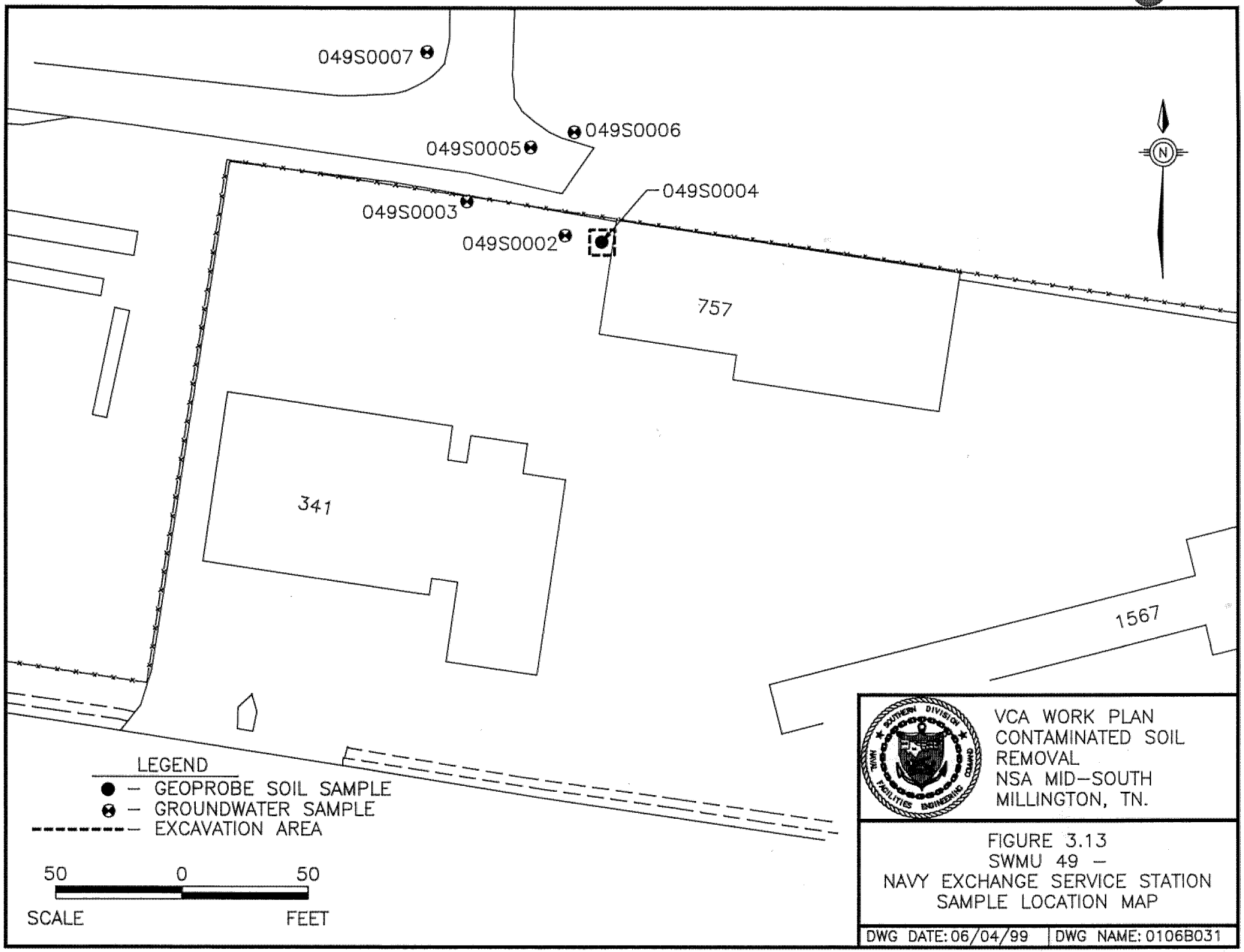
049S0007
049S0006
049S0005
049S0004
049S0003
049S0002
757
341
1567
N
LEGEND
● – GEOPROBE SOIL SAMPLE
⊗ – GROUNDWATER SAMPLE
– – – – – – – – – EXCAVATION AREA
50 0 50
SCALE FEET
VCA WORK PLAN
CONTAMINATED SOIL
REMOVAL
NSA MID–SOUTH
MILLINGTON, TN.
FIGURE 3.13
SWMU 49 –
NAVY EXCHANGE SERVICE STATION
SAMPLE LOCATION MAP
DWG DATE: 06/04/99
DWG NAME: 0106B031

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Table 3.13.3
Assemblies G and H — Preliminary SWMU 49 Inorganic Detections in Soil by Location (mg/kg)

Location	Depth (in feet)	Constituent	RC[a] Surface	RBC[b] Industrial	RBC[b] Residential	SSL[c]	Result
049X0001	01'	Arsenic (As)	14.6	3.8	0.43	1	7.2
		Barium (Ba)	223	14,000	550	82	84.2
		Chromium (Cr)	24.0	1,000	39	2	9.3 J
		Lead (Pb)	26.0	400[d]	400[d]	DNE	48.7 J
		Nickel (Ni)	20.6	4,100	160	7	7.8
049X0001	04'	Arsenic (As)	20.3	—	—	1	5.6 J
		Barium (Ba)	265	—	—	82	143
		Chromium (Cr)	28.3	—	—	2	14.8 J
		Nickel (Ni)	DNE	—	—	7	14.6
		Selenium (Se)	DNE	—	—	0.3	0.64 J

Notes:
a — Background Reference Concentration (RC) from the August 1996 *Technical Memorandum — Reference Concentrations* (August 27, 1996, E/A&H Tech Memo).
b — Industrial and residential RBCs from the April 1999 Risk-Based Concentration Table (April 12, 1999, USEPA Region III RBC Memo).
c — Soil Screening Level (SSL) from the May 1996 Generic Screening Levels (May 1996, USEPA/OSWER SSL Guidance Document, EPA/540/R-95/128).
d — Lead soil-cleanup value, as established by USEPA/OSWER directive #9355.4-12, substituted for RBC.
DNE — Does not exist.
J — Constituent detected at concentrations less than the method reporting limit; value estimated.

3.13.3 Source Characterization

Based on TPH detections in surface soil at location 049X0001 that exceeded the TDEC cleanup level of 100 mg/kg, a VCA was recommended to address soil contamination by removing any TPH-contaminated soil exceeded acceptable risk standards.

3.13.4 Removal Responsibilities

The following section outlines the actions to be conducted during the excavation of petroleum-and metals-contaminated soil. The contractor will provide the equipment and personnel to excavate, stockpile, and dispose of the contaminated soil. EnSafe will assist the contractor as necessary,

collect confirmation and soil-disposal samples, and report on the removal activities in a VCA report. The following activities to be performed by the designated staff, are further described in subsequent sections.

- EnSafe will plan field activities and schedule EnSafe personnel and equipment.

- EnSafe will review the following with the necessary personnel: the applicable portions of the *Comprehensive RFI Work Plan*, the CHSP which is included as Appendix B, and the SSHSP which is included as Appendix C.

- The contractor will coordinate the placement of contaminated-soil stockpiles with the NSA Mid-South PWD Env. Div. The contractor will place plastic on the ground surface before stockpiling soil in the designated areas.

- The contractor will excavate and stockpile all removed materials.

- EnSafe will provide sampling support during removal activities.

- EnSafe will characterize any excavated soil in accordance with the TDEC DUST and/or DSW guidance.

- The contractor will backfill the excavated area with clean soil or other materials and cover the area with the equivalent of the original material. The contractor will use number 33C limestone in areas where vehicular traffic is possible, as specified by the NSA Mid-South PWD Env. Div.

- The contractor will cover the stockpile with plastic, install silt fencing, and maintain runoff control until the soil is properly disposed of. The contractor will coordinate

disposal of soil and decontamination fluids resulting from field activities, including the preparation and filing of any special waste permits.

- The contractor will remove all construction materials.

- EnSafe will prepare a VCA report for the site.

3.13.5 Preremoval Activities

Activities to be conducted before removing the soil are discussed in the following sections.

Orientation Meeting

Before performing any field activities, EnSafe personnel will hold an orientation meeting to review general and site-specific requirements for sampling and documentation. General discussion will include locations of the site field office, subject site, and designated decontamination areas. Sampling requirements to be discussed will include general sampling protocol, the sample-numbering system, QA/QC sampling requirements, and sample packaging. Documentation requirements to be discussed will include the use of field forms, field logbooks, and photographic documentation.

The SSO will review the CHSP and SSHSP (Appendices B and C) with EnSafe personnel before any field activities begin. All EnSafe employees working onsite will be required to sign a form acknowledging that they are familiar with the plan and agree to abide by its guidelines. The SSHSP contains a copy of the compliance-agreement form.

3.13.6 Removal Activities

Several activities will be conducted before and during soil removal. Specific tasks include air monitoring, soil excavation, and soil screening. TDEC will be given at least two weeks notice by the NSA Mid-South PWD Env. Div. before any removal activities begin.

Surface and Subsurface Soil Excavation

Soil excavation will start with removal of a 2-foot deep by 5-foot square layer of soil centered on location 049X0001. The TPH analyzer will direct soil excavation and removal of 1-foot thick by 5-foot square lifts, which will continue until field screening indicates that remaining soil TPH concentrations are lower than the 100 mg/kg action level.

The contractor will stockpile the excavated soil on plastic sheeting, and cover it with plastic to prevent cross-contamination and erosion. The contractor will be responsible for maintaining the plastic cover on the stockpiled soil. EnSafe will sample the pile and request five-day turnaround for the disposal profile samples. Upon receipt of the results, EnSafe will attach a summary of detections to the data package, and forward two copies to the NSA Mid-South PWD Env. Div. within five days. Contaminated soil will be properly disposed of in accordance with current USEPA and TDEC regulations. The contractor will dispose of any special-waste soil, while any hazardous-waste soil will be disposed of by the NSA Mid-South PWD Env. Div.

Soil Screening

Using disposable spoons or decontaminated stainless-steel spoons and bowls, EnSafe personnel will collect soil samples from the excavation walls and base as each 5-foot diameter lift is removed. Personnel will not enter the excavation if it is deeper than 4 feet to comply with confined space entry regulations. These samples will be collected from the backhoe bucket, if necessary, from the center of the bucket to avoid sample contamination from the bucket wall. The samples will be collected in accordance with procedures described in Section 4.4.3 of the *Comprehensive RFI Work Plan* (E/A&H, October 1994).

Samples will be screened using an IR TPH Plus Field Analyzer, which performs analyses based on USEPA Method 418.1 (IR method). The excavation will continue until field screening demonstrates that the contaminated soil has been removed to concentrations less than the site-specific remediation level of 100 mg/kg.

3.13.7 Postremoval Activities

Several activities will be conducted after soil is removed, including confirmation soil sampling, backfilling the excavation, and disposing of used PPE and disposable sampling equipment.

Confirmation Soil Sampling

When field screening demonstrates that the contaminated soil has been removed to less than the site-specific remediation level of 100 mg/kg TPH, EnSafe will collect a five-part composite sample from each of the excavation walls and four grab samples from the excavation floor (one from each corner). These confirmation soil samples will be analyzed onsite using the TPH Plus Field Analyzer for TPH (Method 418.1), and at an offsite laboratory for Appendix IX metals (USEPA Method 6010/7000 series).

In the event that water is encountered in the excavation, the contractor will containerize it in properly labeled U.S. DOT-approved 55-gallon drums. EnSafe will collect water samples for analyses of VOCs and oil and grease. The drums will be placed in a secured location approved by the NSA Mid-South PWD Env. Div. and remain at this location. The contractor will discharge the water to the sewer via an oil-water separator designated by the NSA Mid-South PWD Env. Div. after contacting the PWD for permission and specifications from the City of Millington POTW. If any water is not approved for discharge to the sewer, then the NSA Mid-South PWD Env. Div. will arrange for its proper disposal. EnSafe will be responsible for collecting any water samples required by the disposal facility and obtaining any additional analyses to determine the appropriate means of disposal.

Backfill of the Excavation

The excavation will remain open until confirmation samples document that soil exceeding the TPH action level of 100 mg/kg has been removed and the BCT has approved backfilling based on a review of the TPH and metals concentrations. A temporary fence or barricade will be placed around the excavation. Clean soil from an offsite source will be used by the contractor for

backfill, along with number 33C limestone in areas having vehicular traffic. The area will then be covered with the equivalent of the original material by the contractor.

Removal of Construction Materials

After stockpiled soil has been removed, any debris or trash from field activities will be removed by the contractor. The area will be left as close as possible to its natural state.

Voluntary Corrective Action Report

EnSafe will prepare a report after field activities are complete and analytical results have been received, to address the following:

- Field activities, including a description of field screening and sampling.
- Analytical test results for confirmation samples collected after soil removal.
- A diagram showing site features during the removal action. The diagram will include the location of the excavation, soil-sampling locations, and detected concentrations.
- Disposal manifests (if available at the time of report) and a description of the fate of water generated during the removal action, if any.

3.13.8 Analytical Requirements

Analytical requirements for the samples scheduled to be collected are summarized in Table 3.13.4. Confirmation samples will be analyzed for TPH (Method 418.1) and Appendix IX metals (USEPA Method 6010/7000 series). One characterization sample for soil disposal, which will be collected using a decontaminated stainless-steel hand auger or spoon and bowl for every 100 yd^3 or less of soil, will be analyzed for TCLP lead and TCLP benzene, in accordance with DSW special waste policy. EnSafe will collect any additional samples required by the disposal

facility and submit them for the required analyses. Soil samples will be screened by the IR method, in accordance with the manufacturer's instructions.

Table 3.13.4
Sample Summary and Analytical Requirements

Sample Type	Matrix	Analytical Parameters	Rationale	Turnaround Time
Extent Verification	Soil	TPH based on USEPA Method 418.1	TPH is primary contaminant and technology is available to field screen.	Field Analysis
Confirmation	Soil	TPH Method 418.1 Appendix IX Metals	Due to past spills and/or releases, TPH and metals are present.	Field Analysis 5 days
Soil Disposal	Soil (Excavated Material)	TCLP lead TCLP benzene	In accordance with DSW special waste policy.	5 days

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4.0 STANDARD PROCEDURES

4.1 Sample Management

Samples will be managed in accordance with Sections 4.12 and 5 of the *Comprehensive RFI Work Plan* (E/A&H, 1994).

4.2 Sample Custody

Sample custody will be maintained in accordance with Section 4.12.5 of the *Comprehensive RFI Work Plan* (E/A&H, 1994).

4.3 Quality Assurance/Quality Control

QA/QC procedures to be followed during sampling activities will be in accordance with Section 4.14.2 of the *Comprehensive RFI Work Plan* (E/A&H, 1994).

4.4 Decontamination Procedures

Decontamination will be performed in accordance with Section 4.11 of the *Comprehensive RFI Work Plan* (E/A&H, 1994).

4.5 Investigation-Derived Waste

Investigation-derived waste (IDW) will be handled in accordance with Section 4.13 of the *Comprehensive RFI Work Plan* (E/A&H, 1994) and the *Investigation-Derived Waste Management Plan* (E/A&H, 1995). The NSA Mid-South PWD Env. Div. will properly dispose of all IDW.

4.6 Quality Assurance Plan

The quality assurance procedures presented in Section 4.14 of the *Comprehensive RFI Work Plan* (E/A&H, 1994) will be followed for sampling during removal activities.

4.7 Data Management Plan

The data management procedures presented in Section 5 of the *Comprehensive RFI Work Plan* (E/A&H, 1994) will be followed for sampling during removal activities.

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5.0 HEALTH AND SAFETY PLAN

The contractor is responsible for the soil removal, and as such shall provide a written health and safety plan for removal activities that shall meet, at a minimum, the requirements specified in the EnSafe CHSP and include all site-specific information concerning types of activities, site contaminants, etc. The contractor's health and safety plan will be submitted to TDEC for review prior to its implementation. During confirmation sampling, EnSafe personnel will comply with the CHSP (Appendix B) and the SSHSP (Appendix C).

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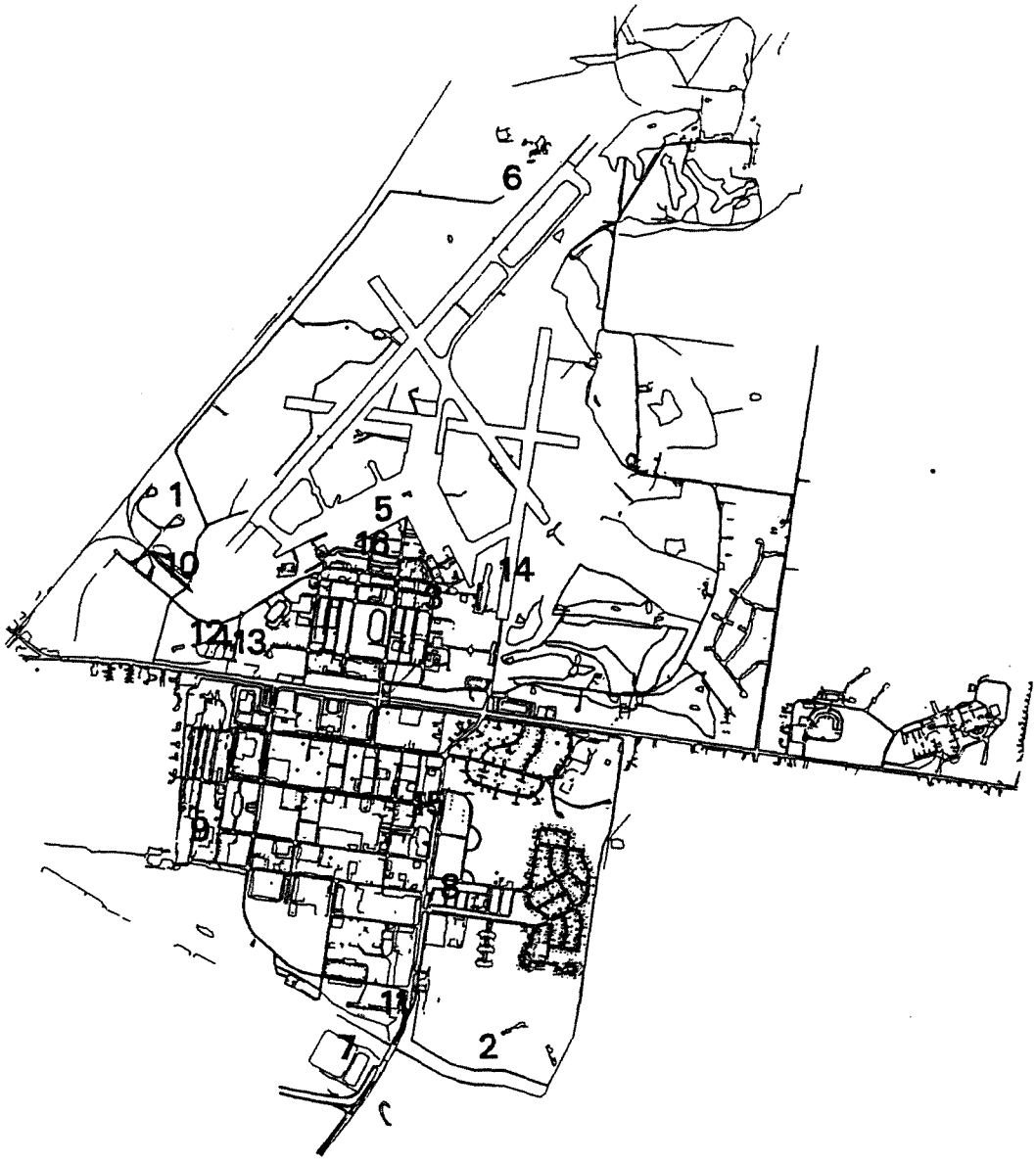
Appendix A
Permeability Data



LEGEND

1 SITE REFERENCE NUMBER

0 feet 6000

RCRA FACILITY
INVESTIGATION
NSA MEMPHIS
MILLINGTON, TENNESSEE

FIGURE 1
SITE LOCATION AND
REFERENCE

Table A.1
Loess/Shallow Alluvium Permeability Data Summary
NSA Memphis

Reference No.	Sample ID	Site	Depth	Date	Coefficient of Permeability (cm/sec)
1	NFFS005517	North Fuel Farm		03/17/97	2.20e-06
2	002S003019	002	19	02/26/96	2.30e-06
	002S002919	002	19	02/28/96	6.80e-07
3	003S000420	003	20	02/27/95	1.40e-07
4	005S000620	005	20	02/27/95	1.40e-07
5	007S000922	007	22	03/13/95	9.50e-07
6	008G02FL05	008	05	03/13/95	3.00e-08
7	009S01DA18	009	18	02/29/96	9.60e-07
8	014S01LF10	014	10	02/22/96	4.20e-07
9	059S03UF15	059	15	03/22/96	5.70e-07
10	060S003022	060	22	02/27/95	1.70e-07
11	065S06DA16	065	16	03/01/96	4.80e-06
12	MW-02	UST 1508	7	10/92	8.40e-08
	MW-02	UST 1508	11	10/92	8.60e-07
13	MW-11	UST 1489	7	10/92	6.30e-08
	MW-11	UST 1489	11	10/92	5.50e-08
14	SB-8	Former Flying Club	10	6/93	1.10e-06
15	SB-5	Bldg. S-50	8.5	8/93	3.80e-08
	SB-5	Bldg. S-50	13	8/93	1.30e-05
16		UST 304/1239		2/95	8.30e-06
		Minimum Value			3.00e-08
		Maximum Value			1.30e-05
		Average Value			1.84e-06

Appendix B

Comprehensive Health and Safety Plan

7.0 COMPREHENSIVE HEALTH AND SAFETY PLAN (CHASP)

A Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) is being conducted at the Naval Air Station (NAS) Memphis, Tennessee. The purpose of this program is to assess the nature and extent of contamination at the site and to determine if follow-up action is required to maintain compliance with environmental regulations.

This Comprehensive Health and Safety Plan (CHASP) is applicable to field operations to be conducted during the RFI at NAS Memphis. The Navy project contract number with EnSafe/Allen & Hoshall (E/A&H) is N62467-89-D-0318. A Site-Specific Health and Safety Plan (SSHSP) will be developed and implemented to address site-specific activities and hazards.

The provisions of this plan are mandatory for E/A&H personnel and those personnel under contract to E/A&H or the Navy e.g., the United States Geological Survey (USGS) whose work responsibilities call for them to enter a work zone (See 7.3 Work Areas). Such personnel must read this plan and sign the plan acceptance form (See Attachment C) before starting site activities. In addition, such personnel will operate in accordance with the most current requirements of 29 CFR 1910.120, *Standards for Hazardous Waste Workers and Emergency Responders* (HAZWOPER). These regulations include the following provisions for employees exposed to hazardous substances, health hazards, or safety hazards: training as described in 120(e), medical surveillance as described in 120(f), and personal protective equipment (PPE) described in 120(g).

All non-E/A&H personnel present in E/A&H work areas shall either adopt and abide by this CHASP and the corresponding SSHSP or shall have their own safety plan which, at a minimum, meets the requirements of the E/A&H CHASP and SSHSP.

- contamination reduction zone (CRZ), and the
- support zone (SZ).

Field personnel shall enter the SZ and don their PPE, then they will move through the CRZ and into the EZ. After completing their work or when taking a break they will leave the EZ through the CRZ, decontaminate themselves and their equipment, and leave the area through the SZ.

The exclusion zone is the area being investigated, sampled, or otherwise of interest. It is where chemical contamination is known or suspected to exist. The EZ includes the work area except for areas set aside as either the CRZ or SZ. The EZ will be defined and demarcated in the field; in the case of drilling, the EZ is typically about 50 feet in diameter with the borehole located in the middle.

Only authorized personnel that meet the training requirements of OSHA 29 CFR 1910.120 (40 hour HAZWOPER course/8-hour annual refresher course/24-hour supervised onsite training or equivalent) are permitted within the exclusion and contamination reduction zones. Documentation of these certifications will be maintained on site, as well as in the site trailer, at all times. Prior to entering the EZ, and at all times when in the EZ, all personnel shall be outfitted in and properly use all required PPE. A checkpoint may be established at the edge of the EZ to regulate the flow of personnel and equipment in and out of the area.

When using Level A, B, or C PPE, all personnel entering the EZ must use the "buddy system". All persons entering the EZ must be able to:

- Provide his or her partner with assistance
- Observe his or her partner for signs of chemical or heat exposure
- Periodically check the integrity of his or her partner's protective clothing
- Notify the shift supervisor, his representative, or others if emergency help is needed

7.1.2 Work Area Access

A file will be maintained onsite that includes a current OSHA initial HAZWOPER training certificate (or copy) and an up-to-date refresher certificate for all employees involved in field activities. Employees that are unsure that a copy of their certificate is onsite shall bring a copy of their certificate with them and present it to the Site Health and Safety Officer before beginning field work. Personnel that fail to meet or abide by the criteria established in the CHASP or SSHSP shall be restricted from entering work areas.

Subcontractors, DOD oversight personnel, and other site visitors must provide the Site Health and Safety Officer with documentation showing that their HAZWOPER training is current and must agree to comply with this CHASP and the corresponding SSHSP or equivalent health and safety requirements prior to site entry. Personnel that fail to meet or abide by the criteria established in the CHASP or SSHSP shall be restricted from entering work areas.

The Site Health and Safety Officer may suspend site work and may instruct personnel to evacuate the area. Examples of situations when this may happen are:

- Site conditions have changed, for whatever reason, such that the SSHSP does not adequately address the current situation,
- Safety precautions being used are inadequate for the situation, or
- Personnel including E/A&H, subcontractors, visitors, or DOD are or may be exposed to an immediate health hazard.

7.1.3 Site History and Description

A review of the existing site data will be conducted to assess the potential hazards to be encountered by E/A&H and contractor personnel and addressed in the SSHSP. The location of NAS Memphis is shown on Figure 2-1, Vicinity Map.

Health recommended exposure limits (NIOSH RELs), auto-ignition temperatures, and flammability ranges. Material Safety Data Sheets for these materials will be included in Attachment A of each SIP.

7.4 Operations and Physical Hazards

Field personnel should be aware of and act in a manner to minimize the dangers associated with physical hazards typically encountered during environmental investigations. These hazards include heat-related illnesses, uneven terrain, slippery surfaces, lifting, and use of heavy equipment. Electrical lines may be present either above or below ground, and underground gas lines may be present. Prior to the initiation of drilling activities, drilling locations must be cleared by the Naval Public Works Center (PWC).

Heavy equipment and drill rig operations will be conducted in accordance with the procedures outlined in Attachment A — *Drilling Safety Guide*, provided in this plan. Personnel conducting drill rig operations shall keep clear of all moving parts. To prevent entanglement with the drill rig, loose clothing shall not be worn. The Site Supervisor and Site Health and Safety Officer shall be aware of the potential for heat stress and other weather-related illnesses, and shall implement appropriate work regimens to minimize the likelihood of field personnel becoming ill. When conducting operations or survey work on foot, personnel will walk at all times. Running greatly increases the probability of slipping, tripping, and falling. When working in areas that support habitat for poisonous snakes, personnel shall wear protective chaps made of a heavy material designed to prevent snake bites to the legs.

7.5 Employee protection

Employee protection for this project includes standard safe work practices, NAS Memphis rules of conduct, PPE, personal decontamination procedures, equipment for extreme weather conditions, work limitations, and exposure evaluation.

- Due to the possible presence of underground utilities (including electric, natural gas, water, sewer, telephone, etc.), the activity and local utility representatives should be contacted and requested to identify all lines at the ground surface using characteristic spray paint or labeled stakes. A 3-yard buffer zone should be maintained during all subsurface investigations.

- Due to the flammable properties of some of the potential chemical hazards, all spark or ignition sources should be bonded and/or grounded or mitigated before soil boring advancement or other site activities begin.

7.5.2 NAS Memphis General Rules of Conduct:

- Liquor, firearms, narcotics, tape recorders, and other contraband items are not permitted on the premises.

- Any violation of local, state, or federal laws, or conduct which is outside the generally accepted moral standards of the community is prohibited.

- Violation of the Espionage Act. willfully hindering or limiting production, or sabotage is not permitted.

- Willfully damaging or destroying property or removing government records is forbidden.

- Misappropriation or unauthorized altering of any government records is forbidden.

- Securing government tools in a personal or contractor's tool box is forbidden.

- Gambling in any form, selling tickets or articles, taking orders, soliciting subscriptions, taking up collections, etc., is forbidden.

Table 7-1
Level of Protection and Criteria

Level of Protection	Criteria for Use	Equipment
Level A	• When atmospheres are "immediately dangerous to life and health" (IDLH in the NIOSH/OSHA Pocket Guide to Chemical Hazards or other guides.) • When known atmospheres or potential situations exist that would effect the skin or eyes or be absorbed into the body through these surfaces. Consult standard references to obtain concentrations hazardous to skin, eyes, or mucous membranes. • Potential situations include those where immersion may occur, vapors may be generated, or splashing may occur through site activities. • Where atmospheres are oxygen deficient. • When the type(s) and or potential concentration of toxic substances are not known.	• Positive-pressure full facepiece self-contained breathing apparatus (SCBA) or positive-pressure supplied air respirator with escape SCBA. • Fully-encapsulating chemical protective suit. • Chemical-resistant inner and outer gloves. • Steel toe and shank chemical resistant boots. • Hard hat under suit. • Two-way radios worn inside suit. • Optional: coveralls, long cotton underwear, disposable protective suit, gloves and boots, over fully encapsulating suit.
Level B	• When respiratory protection is warranted and cartridge respirators are not appropriate. Examples of these conditions are: When work areas contain less than 19.5 percent oxygen, When expected contaminants do not have appropriate warning properties e.g. vinyl chloride, or When cartridges are not available to protect against all contaminants of concern.	• Chemical resistant clothes, long sleeves, hooded, one or two pieces. • Positive-pressure full facepiece supplied air breathing apparatus or airline system with a 30-minute escape bottle. • Hard hat. • Inner gloves and chemical resistant gloves. • Steel toe and shank boots. • Optional: coveralls and disposable outer boots.
Level C	• When respiratory protection is warranted and cartridge respirators are appropriate. • When work areas contain at least 19.5 percent oxygen.	• Chemical resistant clothes, long sleeves, hood optional, one or two pieces. • Full-facepiece, air purifying respirator equipped with cartridges suitable for the hazard. • Hard hat. • Inner gloves and chemical resistant gloves. • Steel toe and shank boots. • Coveralls and disposable outer boots.

The Project Health and Safety Officer will determine the appropriate level of PPE prior to the initial entry based on the best available information. PPE requirements are subject to change as site information is updated or changes. **The decision to upgrade or downgrade levels of PPE shall be made by the Project Health and Safety Officer.**

Field activities which disturb soils will be initiated in Modified Level D protection except when stated otherwise in the SSHSP or site conditions (e.g., sampling results from previous studies) indicate that modified Level D is inappropriate. Modified Level D protection consists of a hard hat, appropriate chemical-resistant gloves (vinyl or nitrile), eye protection, and chemical-resistant, steel-toed and shank boots. Work coveralls (full length sleeves and pants) will be worn if free product or contaminants identified as skin irritants are encountered. This level of protection was selected because the levels of contamination detected in previous studies were low and free product was not detected.

PPE upgrades to Level C will be initiated if airborne concentrations exceeds 2 ppm above the background concentration in the breathing zone or if concentrations of any contaminant exceeds 50 percent of the OSHA PEL. See Table 7-1 for the specific criteria for use and the equipment required for each level of protection.

7.5.4 Air Monitoring

Previous site work indicates that workers may potentially be exposed to low concentrations of numerous chemicals including volatile organic compounds (VOCs), halogenated compounds, and combustible gases/vapors. Based on site history and existing sampling data, "worst case" contaminated areas will be identified prior to initiation of field activities.

Air monitoring using a photoionization detector (PID) and/or other appropriate sampling equipment will be conducted prior to beginning field activities at a new EZ and during ground disturbing activities. The PID will be field calibrated to measure VOCs relative to a 100 ppm

On a daily basis, PIDs, CGIs, and other monitoring equipment shall be calibrated or their proper function verified before being used. Throughout the day this equipment shall be periodically checked to ensure that it is working properly. A final calibration shall be conducted at the end of the work day at which time each instrument will be checked to ensure that it is free from surface contamination. Field staff shall record in their field notebooks the fact that they conducted these calibrations and checks and note whether the equipment was or was not functioning properly. When equipment is not functioning properly, it should be brought to the attention of the Site Supervisor or Site Health and Safety Officer who will arrange for repairs and/or replacement of that equipment as needed.

7.5.5 Procedures and Equipment for Extreme Weather Conditions

The seasonal climate in Memphis can be expected to be hot with high relative humidity in the summer months and moderately cold to extremely cold in the winter months. Therefore, heat-and-cold stress will be of concern for all personnel. Adverse weather conditions are important considerations in planning and conducting site operations. Extremes in hot and cold weather can cause physical discomfort, loss of efficiency, and personal injury.

7.5.5.1 Exposure to Hot Weather

Heat stress can result when the protective clothing decreases natural body ventilation even when temperatures are moderate. Various levels of personal protection may require wearing low permeability disposable suits, gloves, and boots which will prevent most natural body ventilation. Discomfort due to increased sweating and body temperature (heat stress) will be expected at the work site.

Heat stress is the metabolic and environmental heat to which an individual is exposed. The manifestations of heat strain are the adjustments made by an individual in response to the stress. The three most important categories of heat-induced illness are: heat exhaustion, heat cramps, and heat stroke. These disorders can occur when the normal responses to increased sweat

Heat cramps result when the working muscles go into painful spasms. This may occur in people who perspire profusely in heat and who drink large quantities of water, but who fail to replace their bodies' salt. It is the low salt content in the blood that causes the cramping. The abdominal muscles as well as the muscles in the arms and legs may be affected. The cramps may appear during or even after work hours. Persons on a low sodium diet should not be given salt. A physician must be consulted for care of people with this condition.

Heat stroke is the most serious of the health problems that can arise while working in hot environments. It is caused by the breakdown of the thermo-regulatory system under conditions of stress. When this happens, perspiration stops, and the body can no longer regulate its own temperature.

Heat Stroke Symptoms — A heat stroke victim may be identified by hot, dry, and unusually red or spotted skin. The body core temperature can exceed 105°F. Mental confusion, irritability, and chills are common. These are all early warning signs of heat stroke; if the sufferer is not removed from the hot environment at once, more severe symptoms can follow, including unconsciousness, delirium, and convulsions, possibly ending in death.

Heat Stroke Treatment — Heat stroke must be treated as a major medical emergency; medical assistance must be summoned immediately.

Additional treatment:

- First aid must be administered.
- Individual must be moved to a cool location.
- Individual must be cooled through wetting, fanning, or immersion.

Care should be taken to avoid over-cooling and to begin treatment for shock by raising the legs. Early recognition and treatment of heat stroke are the only means of preventing permanent brain damage or death.

Frostbite is a condition in which the cold temperature forms ice crystals in the cells and tissues, dehydrating protoplasm and killing tissues. At the same time, circulation of the blood is blocked. Frostbite could lead to gangrene and amputation.

Frostbite damage occurs in several degrees:

- Frost nip, or incipient frostbite is characterized by sudden whitening of the skin.

- When superficial frostbite occurs, the skin has a waxy or whitish look and is firm to the touch; however, the tissue underneath has retained it resiliency.

- In deep frostbite, the tissues are cold, pale, and solid. The injury is severe. In addition to frostbite, other physiological reactions to cold may be experienced as well. Trench foot, for example, may result from prolonged exposure to low temperatures near, though possibly above, freezing. Walking on the foot is very painful. In very severe cases, the flesh dies and the foot may have to be amputated. Immersion foot is very similar although it is less severe. Although amputation is unusual, some mobility of the limb is lost. Blisters may occur around the lips, nostrils, and eyelids.

Chilblain (pernio), which is an inflammation of the hands and feet caused by exposure to cold and moisture, is characterized by a recurrent localized itching, swelling, and painful inflammation on the fingers, toes, or ears, produced by mild frostbite. Such a sequence produces severe spasms and is accompanied by pain.

Hypothermia occurs when the body loses heat faster than it can produce it. The initial reaction involves the constriction of blood vessels in the hands and feet in an attempt to conserve the heat. After the initial reaction, involuntary shivering begins in an attempt to produce more heat.

- **Never ignore shivering.** Persistent shivering is a clear warning that a person is on the verge of hypothermia. Allow for the fact that exposure greatly reduces normal endurance. Warmth generated by physical activity may be the only factor preventing hypothermia.

7.5.6 Personal Decontamination

A CRZ will be established immediate to each sampling/boring site and will include a station for decontaminating equipment and personnel. The CRZ will be covered with sheets of 6-mil polyethylene (typically an area 20-feet by 20-feet is sufficient) with specific stations that will accommodate the removal and disposal of the protective clothing, boot covers, gloves, and respiratory protection if required.

As a general rule, equipment will be decontaminated using a soap and clean water wash solution. Equipment decontamination will be completed by personnel in Level D PPE. In the event of inclement weather (e.g., lightning) or an emergency requiring immediate evacuation, all contaminated equipment will be wrapped and taped in 6-mil polyethylene sheeting and tagged as "contaminated" for later decontamination.

Personnel working in the CRZ will be in one Level of PPE lower than personnel in the EZ. For example, if personnel in the EZ are in Level B, decon workers will be in Level C.

7.5.6.1 Personal Decontamination Procedures

The decontamination procedures, based on Level D protection, will consist of the following:

- Brushing heavily soiled boots and rinsing outer gloves and boots with soap and water.
- Removing outer gloves and depositing them in a plastic-lined container.
- Removing outer chemical protective clothing.

specified in 29 CFR 1910.120(e). All supervisors must complete an additional 8 hours of training in site management. All personnel must complete an 8-hour refresher training course on an annual basis in order to continue working at the site.

7.5.8 Exposure Evaluation

All personnel scheduled for site activities will have had a baseline physical examination which includes a stressing exam of the neurologic, cardiopulmonary, musculoskeletal and dermatological systems, pulmonary function testing, multi-chemistry panel and urinalysis, and will have been declared fit for duty. An exposure history form will be completed for each worker participating in site activities. An examination and updated occupational history will be repeated on an annual basis and upon termination of employment, as required by 29 CFR 1910.120(f). The content of the annual or termination examination will be the same as the baseline physical. A qualified physician will review the results of the annual examination and exposure data and request further tests or issue medical clearances as appropriate.

After any job-related injury or illness, there will be a medical examination to determine fitness for duty or any job restrictions. The Site Health and Safety Manager will review the results with the examining physician before releasing the employee for work. A similar examination will be performed if an employee has missed at least three days of work due to a non-job related injury or illness requiring medical attention. Medical records shall be maintained by the employer or the physician for at least 30 years following the termination of employment.

7.6 Medical Monitoring Program

All E/A&H or USGS personnel who enter hazardous-waste/spill sites or have the potential for exposure to hazardous materials from these sites must participate in the E/A&H Medical Monitoring Program or an equivalent program. The program is conducted by E/A&H's company doctor with the company Health and Safety Officer. The purpose of the program is to identify any pre-existing illnesses or problems that would put an employee at unusual risk

7.6.1 Preplacement Examinations

Each E/A&H employee will be given a preplacement examination: to identify any preexisting illness or problem that would put the employee at an unusual risk from certain exposures; to assure that each employee can safely use negative-pressure respirators; and to develop a database to assess any exposure-related events detected during periodic medical monitoring. Data accumulation will include variables such as age, sex, race, smoking history, prior employment history, and other conditions that might bear upon the occurrence of subsequent events once employment begins.

The preplacement examination includes:

- Occupational history including previous chemical and carcinogenic exposures.
- Medical history including demographic data, family history, personal habits, past medical history, and a review of current systems.
- Fertility history.
- Physical examination stressing the neurologic, cardiopulmonary, musculoskeletal, and dermatological systems.
- Physiological parameters including blood pressure and visual acuity testing.
- Pulmonary function testing including FVC, FEVI, and FEV 25-75.
- Electrocardiogram.
- PA and lateral chest X-ray.

The company doctor will review the results of annual examination and exposure data and request further tests or issue medical clearances as appropriate. An examination will also be administered when an employee leaves the company. The company doctor will be consulted for the contents of the exam except when the employee has had an exam within 6 months, or when there has been no site work since the last examination.

7.6.3 Return-to-Work Examinations

After any job-related injury or illness, a medical examination is required to determine fitness for duty or to identify any job restrictions. The medical examiner will review the results of this back-to-work examination with the company doctor before releasing the employee for work. A similar examination will be performed if an employee has missed at least three days of work due to a non-job-related injury requiring medical attention.

7.6.4 Confidentiality

Medical records will be maintained in a confidential manner so that only authorized persons will have access to the records. The authorized personnel will include medical staff of the joint venture or contract medical personnel, the individual, the individual's personal physician, or the individual's designated representative. Upon written request, the individual may obtain a copy of the medical file which will be provided within 15 days of the receipt of the written request. Information used for research, testing, statistical, or epidemiologic purposes will have all identifying data removed including the identity of the individual. Any medical information or findings obtained which do not affect the individual's job performance will not be made available to E/A&H in order to maintain the patient-physician confidentiality. Upon death, retirement, resignation, or other termination of services, the records will be retained by E/A&H or contracting physician.

- Field staff participate in the E/A&H Medical surveillance program (or in the case of subcontractors, an equivalent program).

- Field staff attend safety and health "kick-off" orientation and other site safety briefings.

The Site Supervisor is also responsible for assuring that field staff who may be exposed to unique or special hazards have the training or experience necessary to safely conduct their work.

7.7.2 Responsibilities of Site Health and Safety Officer

The responsibilities of the Site Health and Safety Officer include:

- Providing the Site Supervisor with technical input on site health and safety issues.

- Observing field personnel and reporting to the Site Supervisor on the effectiveness of the CHASP and SSHSP, and observing whether field staff are utilizing proper work practices and decontamination procedures.

- Reporting significant safety violations to the Project Manager and/or Project Health and Safety Officer.

- Conducting safety briefings during field activities.

- Assuring that a copy of the Health and Safety Plan is maintained onsite during all field activities.

- Maintaining a file of HAZWOPER training certificates and appropriate refresher training certificates for onsite personnel.

- Properly utilizing required PPE, including respiratory protective equipment.

- Having up to date HAZWOPER training and then providing the Site Supervisor with documentation that their training is current.

- Being an up to date participant in an acceptable medical surveillance program.

- Using the buddy system when wearing respiratory protective equipment. When working in Level C or higher, a third person shall be at the work area. This person shall be suitably equipped to provide logistical and safety support to the entry team.

- Being fit-tested and physically capable of using a respirator. Should the use of respiratory protection be required, then field workers shall not have facial hair which interferes with achieving a proper fit.

In addition, field staff should always be alert and use their senses (sight, smell, etc.) to identify and react to potentially dangerous situations. When working in the EZ, visual contact should be maintained between personnel and field personnel should be close enough to assist each other during an emergency. Procedures for leaving a contaminated area must be planned and implemented before going onsite in accordance with the SSHSP.

The number of personnel and equipment in the contaminated area should be kept to a minimum in order to achieve effective site operations. All visitors to the job site must comply with the SSHSP procedures. PPE may be modified for visitors depending on the situation. Modifications must be approved by the Project Health and Safety Officer.

Mark Taylor, SOUTHDIV Engineer-in-Charge will be contacted after appropriate emergency measures have been initiated onsite.

7.8.1 Site Resources

Cellular telephones will be used for emergency use and communication/coordination with NAS Memphis. First aid and eye wash equipment will be available at the work area.

7.8.2 Emergency Procedures

Conditions which may constitute an emergency include any member of the field crew being involved in an accident or experiencing any adverse effects or symptoms of exposure while onsite, or if a condition is discovered that suggests the existence of a situation more hazardous than anticipated.

The following emergency procedures should be followed:

- Site work area entrance and exit routes will be planned and emergency escape routes delineated by the Site Health and Safety Officer.

- If any member of the field team experiences any effects or symptoms of exposure while on the scene, the entire field crew will immediately halt work and act according to the instructions provided by the Site Health and Safety Officer.

- For applicable site activities, wind indicators visible to all onsite personnel will be provided by the Site Health and Safety Officer that indicate possible routes for upwind escape.

are provided in Attachment B of this CHASP. Directions from individual sites to the NAS Memphis South Gate will be provided as Attachment B of each SIP.

7.9 Forms

The following forms will be used in implementing this CHASP:

Plan Acceptance Form
Plan Feedback Form
Exposure History Form
Accident Report Form

A SSHSP Plan Acceptance Form will be filled out by all employees working on the site before site activities begin. The Plan Feedback Form will be filled out by the Site Health and Safety Officer and any other onsite employee who wishes to fill one out. The Exposure History Form will be completed by both the Project Manager and the individual(s) for whom the form is intended. Examples of each form are provided in Attachment C of this plan.

All completed forms must be returned to the Task Order Manager at EnSafe/Allen & Hoshall, Memphis, Tennessee.

ATTACHMENT A

ENSAFE CORPORATE *HEALTH AND SAFETY MANUAL*

DRILLING SAFETY GUIDE

Appendix B

Drilling Safety Guide

Drilling Safety Guide

EnSafe is concerned about employee safety while working on or around drill rigs as well as when traveling to and from a drilling site, moving the drill rig and tools from location to location on a site, and during maintenance of the drill rig. Every drill crew will have a designated safety supervisor. The safety supervisor will have the responsibility for ensuring that all drilling operations are conducted in a safe manner. All personnel working on, with, or around a drill rig will be under the jurisdiction of the rig safety supervisor.

Drill Rig Safety Supervisor

The safety supervisor for the drill crew will be the drill rig operator. However, the EnSafe safety officer still maintains the overall safety responsibility for the site. The drill crew safety supervisor is a direct representative of the site health and safety supervisor and will report any safety problems directly to the site health and safety officer. The drill rig safety supervisor will:

- Be the leader in using proper personal protective equipment. He/she will set an example for other personnel to follow.
- Enforce the requirements of the health and safety plan and take appropriate actions when other personal are not following the requirements of the health and safety plan.
- Ensure that all drill rig and associated drill rig equipment is properly maintained.
- Ensure that all drill rig operating personnel are thoroughly familiar with the drill operations.
- Enspect the drill rig and associated drill rig equipment for damage before starting drilling operations. Check for structural damage, loose bolts or nuts, correct tension in chains and cables, loose or missing guards or protective covers, fluid leaks, damaged hoses and/or damaged pressure gauges and pressure relief valves.
- Test all emergency and warning devices such as emergency shut-down switches at least daily (prior to starting drilling operations). Drilling will not be permitted until all emergency and warning devices are functioning.
- Conduct a safety briefing daily before starting drilling operations. Any new employee will receive a copy of the drilling operations safety manual, and the drill rig manufacturer's operating and maintenance manual.
- Ensure that each employee reads and understands the drill rig manufacturer's operating and maintenance manual.
- Observe the mental, emotional, and physical capabilities of each worker.
- Ensure that each drill rig has a first aid kit and fire extinguisher.
- Maintain a list of emergency contact telephone numbers. This list will be posted in a prominent location and each drill rig employee will be informed of the list's location.

Drill Rig Personnel Protective Equipment

For most geotechnical, mineral, and/or groundwater drilling, drill rig personal protective equipment will include the following:

- Hard hat
- Safety shoes with steel toe and steel shank (or equivalent)
- Gloves
- Safety glasses with side shields
- Close-fitting but comfortable clothes
- Hearing protection

It is important that clothing does not have loose ends, straps, drawstrings or belts, or other unfastened parts that might become caught in or on a rotating or translating part of the drill rig.

Rings, necklaces, or other jewelry will not be worn during drilling operations.

Additional protective equipment may be required by the Site-Specific Health and Safety Plan.

Drill Rig Housekeeping

The following housekeeping measures must be taken for all drilling operations.

- Suitable storage locations will be provided for all tools, materials, and supplies. The storage should be conveniently located and will provide for safe handling of all supplies.
- Drill tools, supplies, and materials will not be transported on the drill rig unless the drill rig is designed and equipped to carry drill tools, supplies, and materials.
- Pipe, drill rods, casing, augers, and similar drilling tools when stored will be stacked in a manner that will prevent spreading, rolling, or sliding.
- Penetration or other driving hammers will be secured to prevent movement when not in use.
- Work areas, platforms, walkways, scaffolding, and other access ways will be kept free of materials, debris and obstructions and substances such as ice, grease, or oil that could cause a surface to become slick or otherwise hazardous.
- Never store gasoline in a nonapproved container. Red, nonsparking, vented containers marked with the word gasoline will be used. The fill spout will have a flame arrester.
- Prior to drilling, adequate site clearing and leveling will be performed to accommodate the drill rig and supplies and to provide a safe working area. Drilling will not be started when tree limbs, unstable ground or site obstructions cause unsafe tool handling conditions.

Maintenance Safety

Well maintained drilling equipment makes drilling operations safer. When performing equipment/tool maintenance, the follow safety precautions will be followed:

- Safety glasses will be worn when maintenance is performed on drill rigs or drilling tools.
- Shut down the drill rig engine to make repairs or adjustments to the rig or to lubricate fittings (except to make repairs or adjustments that can only be made while the engine is running).
- Always block the wheels or lower the leveling jacks or both. Set the hand brake before working under a drill rig.
- Release all pressure on hydraulic systems, the drilling fluid system, and the air operating system of the drill rig prior to performing maintenance.
- Use extreme caution when opening drain plugs and radiator caps and other pressurized plugs and caps.
- Allow time for the engine and exhaust to cool before performing maintenance on these systems.
- Never weld or cut on or near the fuel tank.
- Do not use gasoline or other volatile or flammable liquids as a cleaning agent.
- Follow the manufacturer's recommendations for quantity and type of lubricants, hydraulic fluids and coolants.
- Replace all caps, filler plugs, protective guards or panels, and high pressure hose clamps and chains or cables that have been removed during maintenance.
- Perform a safety inspection prior to starting drilling equipment after maintenance is performed.

Safe Use of Hand Tools

There are a large number of hand tools that can be used on or around a drill rig. The most important rule of hand tools is to use a tool for its intended purpose. The following are a few general and specific safety rules to follow when using hand tools.

- When using a hammer, wear safety glasses and require all others around you to wear safety glasses.
- When using a chisel, wear safety glasses and require all others around you to wear safety glasses.
- Keep all tools cleaned and stored in an orderly manner.
- Use wrenches on nuts, not pliers.
- Use screwdrivers with blades that fit the screw slot.
- When using a wrench on a tight nut, use some penetrating oil, use the largest wrench available that fits the nut, when possible pull on the wrench handle rather than pushing, and apply force to the wrench with both hands when possible and with both feet firmly placed. Do not push or pull with one or both feet on the drill rig or the side of a mud pit or some other blocking-

off device. Always assume that you may lose your footing. To avoid serious injury if you fall, remove sharp objects from the area near you.

- Keep all pipe wrenches clean and in good repair. The jaws of pipe wrenches will be wire brushed frequently to prevent accumulation of dirt and grease which cause wrenches to slip.
- Never use pipe wrenches in place of a rod holding device.
- Replace hock and heel jaws when visibly worn.
- When breaking tool joints on the ground or on a drilling platform, position hands so that fingers will not be smashed between the wrench handle and the ground or the platform if the wrench were to slip or the joint suddenly to let go.

Safety During Drilling Operations

- Do not drive a drill rig from hole to hole with the mast (derrick) in the raised position.
- Before raising the mast, look up to check for overhead obstructions.
- Before raising the mast, all drill rig personnel (except the person raising the mast) and visitors will be cleared from the area immediately to the rear and sides of the mast. All drill rig personnel and visitors will be informed that the mast is being raised prior to raising the mast.
- All drill rig personnel and visitors will be instructed to stand clear of the drill rig immediately prior to and during starting of the engine.
- All gear boxes will be in the neutral position, all hoist levers will be disengaged, all hydraulic levers will be in the nonactuating positions, and the cathead rope will not be on the cathead before starting the drill rig engine.
- The drill rig must be leveled and stabilized with leveling jacks and/or solid cribbing before the mast is raised. The drill rig will be leveled if settling occurs after initial setup.
- The mast will be lowered only when the leveling jacks are down. The leveling jacks must be in the down position until the mast is completely lowered.
- Secure and/or lock the mast according to the drill rig manufacturer's recommendations before starting drilling operations.
- The drill rig must only be operated from the control position. If the operator must leave the control position, the rotary drive and the feed control must be placed in the neutral position. The drill engine will be shut down when the operator leaves the vicinity of the drill rig.
- Throwing or dropping of tools is not permitted. All tools will be carefully passed by hand between personnel or a hoist line will be used.
- When drilling within an enclosed area, ensure that fumes are exhausted out of the area. Exhaust fumes can be toxic and may not be detected by smell.
- Clean mud and grease from boots before mounting the drill platform. Use hand holds and railings. Watch for slippery ground when dismounting from the drill platform.
- Do not touch any metal parts of the drill rig with exposed flesh during freezing weather. Freezing of moist skin to metal can occur almost instantaneously.
- All unattended boreholes must be covered or otherwise protected to prevent drill rig personnel, site visitors, or animals from stepping or falling into the hole.

- Do not attempt to use one or both hands to carry tools when climbing ladders.

Working on Derrick Platforms

- When working on a derrick platform, us a safety belt and a lifeline. The safety belt will be at least 4 inches wide and will fit snugly but comfortably. The lifeline, will be less than 6 feet long and attached to the derrick.
- The safety belt and lifeline will be strong enough to withstand the dynamic force of a 250-pound weight falling 6 feet.
- A safety climbing device will be used when climbing to a derrick platform that is higher than 20 feet.
- The lifeline will be fastened to the derrick just above the derrick platform to a structural member that is not attached to the platform or to other lines or cables supporting the platform.
- Tools will be securely attached to the platform with safety lines. Do not attach a tool to a line attached to the wrist or other body part.
- When working on a derrick platform, do not guide drill rods or pipe into racks or other supports by taking hold of a moving hoist line or a traveling block.
- Derrick platforms over 4 feet above the ground will have toe boards and safety railings.

Working on the Ground

- Workers on the ground must avoid going under elevated platforms.
- Terminate drilling operations and, if possible, lower the mast during an electrical storm.
- Overhead and buried utilities must be located and marked on all boring location plans and boring assignment sheets.
- When there are overhead electrical power lines at or near a drilling site or project, consider all wire to be charged and dangerous.
- Watch for sagging power lines before entering a site. Do not lift power lines to gain entry. Call the utility to have them lift the power lines or to deenergize the power.
- Operations adjacent to overhead lines are prohibited unless one of the following conditions is satisfied:
  - — Power has been shut off and positive means taken to prevent the lines from being energized.
  - — Equipment, or any part, does not have the capability of coming within the following minimum clearance from energized overhead lines, or the equipment has been positioned and blocked to assure no part, including cables, can come within the minimum clearances listed in the adjacent table.

Power lines nominal system kv	Minimum required clearance
0-50	10 feet
51-100	12 feet
101-200	15 feet
201-300	20 feet
301-500	25 feet
501-750	35 feet
751-1000	45 feet

- While in transit with boom lowered and no load, the equipment clearance will be a minimum of 4 feet for voltages less than 50kv, 10 feet for voltages 51kv to 345kv, and 16 feet for voltages over 345kv.
- Before working near transmitter towers where an electrical charge can be induced in the equipment or materials being handled, the transmitter will be de-energized. The following precautions will be taken to dissipate induced voltages:
  - The equipment will be provided with an electrical ground to the upper rotating structure supporting the boom.
  - Ground jumper cables will be attached to materials being handled by boom equipment when electrical charge may be induced while working near energized transmitters. Crews will be provided nonconductive poles having large alligator clips or other similar protection to attach the ground cable to the load. Insulating gloves will be used.
- Continue to watch overhead power lines. Both hoist lines and overhead power lines can be moved toward each other by the wind.
- If there are any questions concerning drill rig operations on a site in the vicinity of overhead power lines, call the power company. The power company will provide expert advice as a public service.
- Look for warning signs indicating underground utilities. Underground utilities may be located a considerable distance away from the warning sign. Call the utility and jointly determine the precise location of all underground utility lines, mark and flag the locations, and determine the specific precautions to be taken to ensure safe drilling operations.

Wire Rope Safety

- All wire ropes and fittings will be visually inspected at least once a week for abrasion, broken wires, wear, reduction in rope diameter, reduction in wire diameter, fatigue, corrosion, damage from heat, improper reeving, jamming, crushing, bird caging, kinking, core protrusion, and damage to lifting hardware.
- Wire ropes must be replaced when inspection indicates excessive damage. The *Wire Rope User's Manual* may be used as a guide for determining excessive damage.
- Wire ropes that have not been used for a period of a month or more will be thoroughly inspected before being returned to service.
- All manufactured and end fittings and connections must be installed according to the manufacturer's specifications.
- Swivel bearings on ball-bearing type hoisting swivels must be inspected and lubricated daily to ensure that the swivel rotates freely under load.
- Do not drill through or rotate drill through a slipping device, do not hoist more that 10 feet of the drill rod column above the top of the last (mast), do not hoist a rod column with loose tool joints, and do not make up, tighten, or loosen tool hoists while the rod column is being supported by a rod slipping device.

- Do not attempt to brake the fall of a drill rod column with your hands or by increasing tension on the rod slipping device.
- Wire ropes must be properly matched with each sheave. The sheave will pinch wire rope that is too large. Wire rope that is too small will groove the sheave. Once a sheave is grooved, it will severely pinch and damage larger sized wire rope.
- Use tool handling hoists only for vertical lifting of tools. Do not use tool handling hoists to pull on objects away from the drill rig.
- All hoisting hooks will be equipped with safety latches.
- When tools or similar loads cannot be raised with a hoist, disconnect the hoist line and connect the tools directly to the feed mechanism of the drill. Do not use hydraulic leveling jacks for added pull for the hoist line or the feed mechanism of the drill.
- Minimize shock loading of a wire rope; apply loads smoothly and steadily.
- Avoid sudden loading in cold weather.
- Never use frozen ropes.
- Protect wire rope from sharp corners or edges.
- Replace faulty guides and rollers.
- Replace worn sheaves or worn sheave bearings.
- Know the safe working load of the equipment and tackle. Never exceed safe working limits.
- Periodically inspect clutches and brakes of hoists.
- Always wear gloves when handling wire ropes.
- Do not guide wire rope onto hoist drums with your hands.
- After installation of a new wire rope, the first lift must be a light load to allow the wire rope to adjust.
- Never leave a load suspended when the hoist is unattended.
- Never use a hoist line to ride up the mast.

Cathead and Rope Hoist Safety

- Keep the cathead clean and free of rust and oil and/or grease. The cathead must be cleaned with a wire brush when it becomes rusty.
- Check the cathead for rope-wear grooves. If a rope groove forms that is deeper than 1/8-inch, the cathead must be replaced.
- Always start work with a clean, dry, sound rope. A wet or oily rope may grab the cathead and cause drill tools or other items to be rapidly hoisted to the top of the mast. If the rope grabs the cathead or otherwise becomes tangled in the drum, release the rope and sound the alarm for all personnel to clear the area rapidly.
- The rope must not be permitted to contact chemicals.
- Never wrap the rope from a cathead around a hand, wrist, arm, foot, ankle, leg, or any other body part.
- Attach the hammer to the ropeusing a knot that will not slip, such as a bowline.

- A minimum of 18 inches must be maintained between the operating hand and the cathead drum when driving samplers, casing , or other tools. Be aware that the rope advances toward the cathead with each hammer blow as the sampler or other drilling tool advances into the ground. Loosen grip on the rope as the hammer falls. Maintaining a tight grip on the rope increases the chances of being pulled into the cathead.
- Do not use a rope that is longer than necessary. A rope that is too long can form a ground loop or otherwise become entangled with the operator's legs.
- Do not leave a cathead unattended with the rope wrapped on the drum.
- Position all other hoist lines to prevent contact with the operating cathead rope.
- The cathead operator must be on a level surface with good, firm footing conditions.

Auger Safety

- The drill rig must be level, the clutch or hydraulic rotation control disengaged, the transmission in low gear and the engine running at low RPM when starting an auger boring.
- Seat the auger head below the ground surface with an adequate amount of downward pressure prior to rotation.
- Observe the auger head while slowly engaging the clutch or rotation control and start rotation. Stay clear of the auger.
- Slowly rotate the auger and auger head while continuing to apply downward pressure. Keep one hand on the clutch or the rotation control at all times until the auger has penetrated about one foot or more below the surface.
- Follow manufacturer's recommended methods for securing the auger to the power coupling.
- Never place hands or fingers under the bottom of an auger section when hoisting the auger over the top of the auger section in the ground or other hard surfaces such as the drill rig platform.
- Never place feet under the auger section that is being hoisted.
- Stay clear of rotating augers and other rotating components of the drill rig.
- Never reach behind or around a rotating auger.
- Use a long-handle shovel to move auger cuttings away from the auger.
- Augers will be cleaned only when the drill rig is in neutral and the augers have stopped rotating.

Rotary and Core Drilling Safety

- Water swivels and hoist plugs must be lubricated and checked for frozen bearings before use.
- Drill rod chuck jaws must be checked periodically and replaced as necessary.
- The weight of the drill rod string and other expected hoist loads must not exceed the hoist and sheave capacities.
- Only the operator of the drill rig will brake or set a manual chuck to ensure that rotation of the chuck will not occur prior to removing the wrench from the chuck.

- The drill rod chuck jaws will not be used to brake drill rods during lowering into the hole.
- Drill rods will not be held or lowered into the hole with pipe wrenches.
- Do not attempt to grab falling drill rods with hands or wrenches.
- In the event of a plugged bit or other circulation blockage, the high pressure in the piping and hose between the pump and the obstruction must be relieved or bled down prior to breaking the first tool joint.
- Use a rubber or other suitable rod wiper to clean rods during removal from the hole. Do not use hands to clean drilling fluids from the drill rods.
- Do not lean unsecured drill rods against the mast.

ATTACHMENT B

DIRECTIONS TO EMERGENCY MEDICAL FACILITIES

DIRECTIONS TO THE NEAREST MEDICAL FACILITIES

The nearest hospital **and** the nearest facility capable of treating chemical burns are the same facility, which is located at Methodist North Hospital. Therefore, there is only one set of directions.

Nearest Hospital

Methodist North Hospital
3960 Covington Pike
Memphis, Tennessee

Emergency Room Telephone Number - (901) 372-5211

Directions to Methodist North Hospital from NAS Memphis Main Gate:

1. Exit base through South Gate (Singleton Parkway).
2. Continue on Singleton Parkway through the stop signs.
4 Singleton Parkway and Covington Pike will intersect at a red light (about 5 miles).
4. You will see the entrance to the emergency room 700 feet past this light on the left.

Also, refer to the Route to Hospital Map on the following page.

Appendix C

Site Specific Health and Safety Plan

4.0 SITE-SPECIFIC HEALTH AND SAFETY PLAN

This SSHSP has been written to complement the CHSP. Site-specific details presented in this SSHSP include: potential site contaminants, proposed site activities, action levels (ALs), and initial level of personal protective equipment (PPE). Copies of this plan and the CHSP must be onsite during all field operations. All work will comply with U.S. Army Corps of Engineers *Safety and Health Requirements Manual* (EM 385-1-1) September 1996.

4.1 Applicability

The provisions of this plan are mandatory for EnSafe personnel, who shall read the plan and sign the plan acceptance form before starting site activities. In addition, personnel will operate in accordance with the most current requirements of Title 29 Code of Federal Regulations (CFR) 1910.120, Standards for Hazardous Waste Operators and Emergency Response (HAZWOPER). These regulations include the following provisions for employees: training 1910.120(e), medical surveillance 1910.120(f), and PPE 1910.120(g).

All non-EnSafe personnel present at the work areas shall either adopt and abide by this SSHSP and the corresponding CHSP or shall have their own safety plans which, at minimum, meet the requirements of this SSHSP and the CHSP.

This SSHSP applies to standard field procedures and tasks such as collecting soil and water samples and the nonroutine task of trenching. Other non-routine procedures and tasks involving non-routine risks are not covered in this plan. Examples of **procedures** that are **not covered** in this plan are:

- Confined space entry
- Locating and/or recovering UXO

- Sampling, handling, or removing unidentified drums

Should it be necessary to conduct these or other "high-risk" tasks, specific health and safety procedures must be developed, approved, and implemented before these tasks may proceed.

4.1.1 Authorized Personnel

• NSA Memphis Contact	Rob Williamson
• TOM/Project Manager	Robert Smith
• Project Health and Safety Officer (PHSO)	Doug Petty, IHIT
• Site Supervisor	Carol Davis
• Site Health and Safety Officer (SHSO)	To Be Determined

4.1.2 Responsibilities of Key Field Staff

It is the overall responsibility of the PHSO to develop and implement the SSHSP. The TOM and PHSO shall approve any changes or modifications to this SSHSP. The SHSO will implement the SSHSP under the PHSO's direction. Health- and safety-related duties may be delegated to qualified individuals by the PHSO or the TOM.

Responsibilities of Site Supervisor

The site supervisor will direct site operations and, relative to health and safety, is responsible for ensuring that:

- Field staff follow the CHSP, SSHSP, and other safety and health standard operating procedures (SOPs). Personnel who repeatedly do not comply shall be retrained and/or instructed to leave the site and not allowed to return.
- Field staff have current HAZWOPER training.
- Field staff know who the PHSO and SHSO are.

- Field staff know the site-specific health and safety concerns.
- The onsite supply of health and safety equipment is adequate.
- Field staff participate in the EnSafe medical surveillance program (or in the case of subcontractors, an equivalent program).
- Field staff attend health and safety "kick-off" orientation and other site safety briefings.

The site supervisor is also responsible for ensuring that field staff who may be exposed to unique or special hazards have the training or experience necessary to safely conduct their work.

Responsibilities of Site Health and Safety Officer

The responsibilities of the SHSO include:

- Providing the site supervisor technical input on site health and safety issues.
- Observing field personnel and reporting to the site supervisor on the effectiveness of the CHSP and SSHSP and whether field staff are using proper work practices and decontamination procedures.
- Reporting significant safety violations to the project manager and/or PHSO.
- Conducting safety briefings as he/she deems appropriate, or when requested by the site supervisor.
- Ensuring that a copy of the appropriate health and safety plans are maintained onsite during field activities.
- Maintaining a file of HAZWOPER training certificates and appropriate refresher training certificates for onsite personnel.

The SHSO will have the following qualifications: (1) 40 hours of Occupational Safety and Health Administration (OSHA) training or equivalent experience, (2) 24 hours of supervisory training or equivalent experience, (3) knowledge of the health and safety concerns for the specific

work tasks being conducted, (4) training in the use of the air-monitoring equipment, (5) ability to interpret the data collected with the instruments, (6) familiarity with symptoms of chemical exposure, heat stress, and cold exposure, and (7) knowledge of the location and proper use of onsite safety equipment. He/she will also be familiar with this health and safety plan.

Responsibilities of Onsite Field Staff

The health and safety responsibilities of field staff include:

- Being familiar with and complying with the CHSP and SSHSP.
- Attending site health and safety briefings and being aware of anticipated chemical, physical, and biological hazards and knowing what to do when these hazards are encountered.
- Being trained on PPE use, safe work practices, decontamination procedures to be followed, emergency procedures, and communications.
- Properly using required PPE, including respiratory protective equipment.
- Having up-to-date HAZWOPER training and providing the site supervisor with documentation of that training.
- Being an up-to-date participant in the EnSafe medical monitoring program.
- Using the buddy system when wearing respiratory protective equipment.
- Being fit-tested and physically capable of using a respirator (when one is required). Should respiratory protection be required, field workers shall not have facial hair that interferes with its proper fit.

In addition, field staff should always be alert and use their senses (sight, smell, taste, etc.), to identify and react to potentially dangerous situations. When working in the exclusion zone (EZ), visual contact should be maintained with other personnel in the area; field personnel should be

close enough to assist each other in an emergency. Procedures for leaving the EZ must be planned and all necessary equipment present before entering the EZ.

To maintain effective site operations, minimize the number of personnel and equipment in the contaminated area. Site visitors shall comply with the CHSP and this SSHSP, and have the same responsibilities as field staff. PPE requirements may be modified for visitors, depending on the situation. Modifications must be approved by the PHSO.

4.2 Work Zones

Section 3.1 of the CHSP describes the function and interrelation the three work zones at a sampling site or location:

- EZ
- Contaminant Reduction Zone (CRZ)
- Support Zone (SZ)

When determined appropriate by the TOM with input from the RPM, these work zones will be established and used during fieldwork covered under this SSHSP. Each work zone will be clearly marked with cones, barricades, or caution tape, as appropriate, and access to them will be controlled. As a minimum, the area where samples are handled and sampling equipment is decontaminated will be delineated. If needed, a large-equipment decontamination area will be constructed near the EZ.

Authorized personnel will be allowed access to work areas as long as they follow the requirements of this SSHSP and the CHSP, in particular Section 3.2 of the CHSP.

4.3 Site Investigations

This work plan includes subsections that briefly describe each site, including known or suspected site-specific physical and chemical hazards. Additional site-specific information and individual site maps can be found in Section 3 of this work plan. The EZ, CRZ, and SZ for each site will be established in the field as determined necessary. The use and locations of these zones depend on the work task, layout of the site, meteorological conditions, and logistical factors.

4.3.1 SWMU 65 Building S-362

SWMU 65 is on the Southside of NSA Memphis, and is part of Assembly E, one of eight SWMU assemblies defined for the NSA Memphis Resource Conservation and Recovery Act (RCRA) Corrective Action Program. Assembly E comprises six SWMUs (2, 9, 14, 38, 59, and 65) requiring full RCRA Facility Investigation (RFI) characterization on the closing portion of NSA Memphis.

The Building S-362 Training Mock-Up Site has been used since the early 1950s to train personnel in aircraft startup. SWMU 65 includes S-362, a concrete pad mock-up area with spaces for approximately 15 planes; Building S-1503, a wood storage shelter; Building S-346, the former engine test cell building; and the surrounding grass-covered area. Various aircraft were parked on the concrete pads west of Building S-362.

SWMU 65 is bounded by the Big Creek Drainage Canal on the south and Seventh Avenue on the east. A broad grassy area and levee separate the concrete pad areas from Big Creek Drainage Canal. SWMU 65 topography slopes gently south. Storm water runoff from the concrete pads flows across the grassy area into a linear drainage depression along the south side of the site. An additional drainage depression bisects the site, conveying water from its west and east sides to the southern drainage depression. Drainage from both linear depressions enters a

north-south drainage depression at the site's southeast corner, where it exits the SWMU and eventually enters the Big Creek Drainage Canal at an outlet near Seventh Avenue.

Two 30,000-gallon USTs, formerly used to fuel the test cell, were present north of Building S-346. The USTs were removed in 1984, and no free product was observed in the excavated area; however, a hydrocarbon odor and discolored soil were noted in the excavation. Underground piping likely transported the jet fuel to the test cell; however, this piping has not been located.

4.3.2 Facility 394

This 8,400-square-foot, metal frame structure was built on a concrete slab in 1967. It currently houses the mechanical maintenance shop that supports the mechanical schools on base. In the past, it was used as the Air Support Maintenance School.

4.3.3 Facility N-114/SWMU 24

Facility N-114 is a 40,000-square foot covered garage area in the auto hobby shop at First Avenue and Bougainville Street on the NSA Memphis Northside, which is used by base personnel to maintain personal automobiles. The sheet-metal building is floored with concrete.

A large caustic dip tank in one corner of Facility N-114 is used to degrease engine blocks. This dip tank contains a drain-valve and an over-flow pipe that drain to an outside catch basin. According to a 1981 drawing, it is actually an old oil separator. An outdoor sump with a grate and concrete pad is used for radiator draining and flushing. The water/antifreeze mixture from this area drains to the same catch basin as the caustic dip tank. The catch basin leads to a small oil separator that drains directly to the sanitary sewer system. During a 1990 inspection, the open ditch on the north end of the site appeared stained from oil discharge in surface runoff. Discoloration of soil surrounding the tanks was also noted (ERC/EDGe, 1990). During a follow-

up site visit, the catch basin was full of water and overflowing onto the surrounding soil. Surficial soil was sampled during the ERNA Gray Areas Investigation to determine if runoff and overflow from a catch basin has adversely affected soil.

SWMU 24 formerly consisted of two aboveground waste oil tanks located between Buildings N-114 (Auto Hobby Shop) and N-349. The AST located next to Building N-349 was removed leaving one 500-gallon AST. They were used by NSA Memphis personnel for changing lubricants and other fluids in their private vehicles. The year the tanks began operating is not known.

4.3.4 Facility N-1211

Facility N-1211 is a 4,320-square foot wood framed structure built on a concrete slab floor in 1958. It is currently used for storage by the Morale, Welfare, and Recreation (MWR) department and as a maintenance shop for golf course equipment.

From 1958 to 1968, it was used to store petroleum products such as oil, gasoline, transmission fluid, diesel, grease, etc. At the time of the EBS survey, used oil and Freon, were stored in a waste oil facility onsite. Facility 174, associated with Facility 1211, is used by MWR as a pest control building. Also associated with this facility was an abandoned 1,000-gallon UST reported to contain approximately 1,000 gallons of fuel oil. According to the NSA Memphis PWO, this tank has been addressed under the UST program.

4.4 Site Activities

Field activities include confirmatory soil sampling using hand augers. Fieldwork is detailed in Sections 2 and 3 of this work plan.

4.5 Chemical Hazards and PPE Requirements

The potential contaminants for the Voluntary Corrective Action are petroleum products, metals (e.g., cadmium and lead), and pesticides. Table 4-1 lists exposure guidelines for these contaminants.

It is important that the PPE specified for the project protect against known and suspected site hazards. Protective equipment is selected based on the types, concentrations, and routes of personal exposure that may be encountered. In situations where the types of materials and possibilities of contact are unknown or the hazards are not clearly identifiable, a more subjective determination must be made of the PPE required, and a greater emphasis is placed on experience and sound safety practices.

Table 4-1
Exposure Limits for Expected Site Chemical Hazards

Name	Odor[a] Threshold	OSHA PEL[b]	ACGIH TLV[c]	NIOSH REL[d]	Auto-Ignition (°F)	Flammable Range
Arsenic	N.A.	0.5 mg/m³	0.01 mg/m³	0.02 mg/m³ C	N.A.	N.A.
Beryllium	N.A.	0.002 mg/m³	0.002 mg/m³	0.005 mg/m³ C	N.A.	N.A.
Cadmium	N.A.	0.06 mg/m³ ceiling	0.05 mg/m³	Potential Occupational Carcinogen	N.A	N.A.
Lead	N.A.	0.05 mg/m³	0.05 mg/m³	0.1 mg/m³	N.A.	N.A.
Diesel	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Fog Oil	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Gasoline	N.A.	N.A.	890 mg/m³	N.A.	N.A.	N.A.
Motor Oil	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Dieldrin	N.A.	0.25 mg/m³	N.A.	0.25 mg/m³	N.A.	N.A.

Notes:
[a] = Odor Threshold for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989.
[b] = Permissible Exposure Limits (PELs) legal standards enforced by OSHA and found in CFR 1910.1000.
[c] = Threshold Limit Values, and Short-Term Exposure Limits (TLVs and STELs) are recommended guidelines developed by the American Conference for Governmental Industrial Hygienist (ACGIH).
[d] = Recommended Exposure Limits (RELs) are non-enforceable guidelines developed by the National Institute of Occupational Safety and Health Administration (NIOSH) to support OSHA.
N.A. = Not Applicable
ppm = parts per million
mg/m³ = milligrams per cubic meter

PPE for Confirmatory Sampling:

The initial level of PPE for confirmatory sampling is Level D, which includes:

- Chemical-resistant coveralls (optional)
- Chemical-resistant outer gloves; inner gloves or glove liners (optional)
- Steel toe and steel shank boots
- Hard hat
- Safety glasses with side shields or safety goggles
- Chemical-resistant outer boots (optional)

PPE requirements are subject to change as site information changes or is updated. A decision to deviate from specified levels of PPE as contained in the SSHSP must be made or reviewed by the PHSO.

4.6 General Operational and Physical Hazards

Field personnel should be aware of and act in a manner to minimize the dangers associated with physical hazards typically encountered during environmental investigations as discussed in Section 7.1 of the CHSP. At NSA Memphis, these hazards include heat-related illnesses, snakes, insects, poisonous plants, uneven terrain, slippery surfaces, lifting, and using heavy equipment. Electrical lines may be present either above or below ground, and underground gas, fuel, water, steam, sanitary, and storm water drainage lines may be present.

The Site Supervisor shall be aware of the potential for heat stress (discussed in Appendix C of the CHSP). When necessary, work regimens should be implemented to minimize the potential for employee illness.

4.6.1 Employee Protection

Employee protection for this project is addressed in several ways including the use of: work limitations, specified PPE, air monitoring, decontamination procedures, standard safe work practices, general rules of conduct, procedures for extreme weather conditions, and medical surveillance.

4.6.2 Work Limitations

All site activities will be conducted during daylight only. All personnel scheduled for these activities will have completed initial health and safety training and actual field training as specified in 29 CFR 1910.120(e). All supervisors must complete an additional eight hours of HAZWOPER

Site Supervisor Training. All personnel must complete an eight-hour refresher training course annually to continue working onsite.

4.6.3 Personnel and Equipment Decontamination

As needed, a CRZ will be established next to the EZs established for invasive activities and will include stations for decontaminating personnel, PPE, and equipment. Decontamination procedures are discussed in Section 3.3 and 7.8 of the CHSP.

4.7 Standard Safe Work Practices

Standard safe work practices required at Gray Areas include:

- Eating, drinking, chewing gum or tobacco, smoking, or any other activity that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in any area designated as contaminated, unless authorized by the SHSO.
- Hands and face must be thoroughly washed when a person leaves the work area.
- No contact lenses will be worn in work areas during invasive activities.
- Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as practical after leaving the CRZ.
- Contact with contaminated or suspected contaminated surfaces should be avoided. Whenever possible, do not walk through puddles, leachate, or discolored surfaces, or lean, sit, or place equipment on drums, containers, or soil suspected of being contaminated.
- Medicine and alcohol can exacerbate the effects from exposure to toxic chemicals. Prescribed drugs should be not be taken by personnel on cleanup or response operations where the potential for absorption, inhalation, or ingestion of toxic substances exists, unless specifically approved by a qualified physician. Consumption of alcoholic beverages is prohibited.

- Adequate side and overhead clearance must be maintained to ensure that the drill rig boom does not touch or pass close to any overhead power lines or other overhead obstacles or obstructions.
- Local utility representatives shall be requested to identify all underground utilities. Utility lines should be marked using characteristic spray paint or labeled stakes. A buffer zone, 3 yards to either site of a utility line, should be maintained during all subsurface investigations.
- Due to the flammable properties of the potential chemical hazards, all spark or ignition sources should be bonded and/or grounded or mitigated before soil boring advancement or other site activities begin.

4.8 General Rules of Conduct

The following general rules of conduct are required for anyone working on this project:

- Liquor, firearms, narcotics, and other contraband items are not permitted on the premises.
- Any violation of local, state, or federal laws, or conduct which is outside the generally accepted moral standards of the community is prohibited.
- Violation of the Espionage Act, willfully hindering or limiting production, or sabotage is not permitted.
- Willfully damaging or destroying property, or removing government records is forbidden.
- Misappropriation or unauthorized alteration of any government record is forbidden.
- Securing government tools in a personal or contractor's tool box is forbidden.
- Gambling in any form, selling tickets or articles, taking orders, soliciting subscriptions, taking up collections, etc., is forbidden.
- Doing personal work in any government shop or office, using government property or material for unauthorized purposes, or using government telephones for unnecessary or unauthorized local or long-distance telephone calls is forbidden.

- Compliance with posted signs and notices is required.
- Boisterousness and noisy or offensive work habits, abusive language, or any oral, written, symbolic, or other communicative expression that tends to disrupt work or morale of others is forbidden.
- Fighting or threatening bodily harm to another is forbidden.
- Defacing any government property is forbidden.
- Wearing shorts of any type and/or offensive logos, pictures, or phrases on clothing is forbidden. Shirts, shoes, and pants or slacks, or cover-all type garments will be worn at all times on government property.

4.9 Medical Monitoring Program

This topic is discussed Section 4.5 of the CHSP.

4.10 Emergency Information and Procedures

All hazardous waste site activities present a risk to onsite personnel. During routine operations, risk is minimized by establishing good work practices, staying alert, and using proper PPE. Unpredictable events such as physical injury, chemical exposure, or fire may occur and must be anticipated. Emergency contacts to be used during fieldwork at NSA Memphis are listed in Table 4-2.

4.10.1 Site Resources

A cellular telephone will be available in the SZ for routine and emergency communications/coordination with NSA Memphis personnel. First-aid and eyewash equipment will be available at the work area and in each field office. All field team members have been certified in first-aid and cardiopulmonary resuscitation.

4.10.2 Emergency Procedures

Examples of an emergency include:

- A fire, explosion, or similar event at or near the site whether related to this project or not.
- When a member of the field crew sustains a significant injury, or experiences symptoms of chemical exposure, or other health problem.
- When a condition is discovered which suggests that site conditions are immediately more dangerous or hazardous than anticipated.

In an emergency, the following procedures should be followed:

- If it is necessary to evacuate the area, immediately proceed to a rally point and remain there until instructed otherwise.
- Use planned escape routes. Emergency exit routes and proper use of emergency equipment will be defined for all personnel during an initial safety meeting.

Table 4-2
Emergency Contacts

Contact	Agency or Organization	Telephone
Rob Williamson	NSA Memphis	
Ambulance		911
Emergency Room	Methodist North Hospital	901/384-5211 911
Southern Poison Control Center		800/942-5969 901/528-6048
Fire Department		911
Police		911
Robert Smith	Task Order Manager	901/372-7962
John Borowski	Project Health and Safety Officer	901/372-7962

- If a member of the field crew experiences effects or symptoms of exposure while on the scene, the field crew will immediately halt work and act according to the instructions provided by the Site Supervisor or, in his/her absence, the SHSO.
- For applicable site activities, including all Level B activities, use wind indicators to continuously indicate upwind, preferred escape routes, from downwind routes.
- Investigate conditions(s) suggesting that site conditions may be more hazardous than anticipated. Record the condition observed and the decisions made in the safety logbook, or in the field logbook if no safety logbook is being maintained. If there are doubts about how to proceed, suspend work and leave the area until the PHSO has evaluated the situation and provided the appropriate instructions to the field team.
- If an accident occurs, the Site Supervisor is to complete an Accident Report Form for submittal to the TOM and NSA Memphis.
- If a member of the field crew suffers a personal injury, the SHSO will call 911 for ambulance emergency response, if needed. Ambulance service will be used to transport any injured persons. Next alert appropriate response agencies as the situation dictates. Complete an Accident Response Form for any such incident.
- If a member of the field crew suffers a chemical exposure, flush the affected areas immediately with copious amounts of clean water, and if the situation dictates, the SHSO should alert appropriate emergency response agencies, or personally ensure that the exposed individual is transported to the nearest medical treatment facility for prompt treatment. (See Figure 4-1 for directions to the emergency medical facilities.) If a patient is contaminated, the ambulance and/or hospital will be notified prior to receiving the patient. An Accident Report Form will be completed for any such incident. Additional information on appropriate chemical exposure treatment methods will be provided through Material Safety Data Sheets (MSDS) in Appendix C.

4.10.3 Forms

The following forms will be used in implementing this health and safety plan:

- Plan Acceptance Form
- Plan Feedback Form
- Accident Report Form

An SSHSP Plan Acceptance Form will be filled out by all employees onsite before activities begin. The Plan Feedback Form will be filled out by the SHSO and any other onsite employee who wishes to do so. Examples of all forms are included in this plan. All completed forms must be returned to the TOM at EnSafe, Memphis, Tennessee.

4.10.4 Directions to the Nearest Medical Facility

The nearest hospital **and** the nearest facility capable of treating chemical burns are the same facility, which is Methodist North Hospital, 3960 New Covington Pike, Memphis, Tennessee 38128. Therefore, there is only one set of directions (see map on following page).

Directions to Methodist North Hospital from NSA Memphis:

1) Exit base through south gate (Singleton Parkway).
2) Continue on Singleton Parkway through stop signs.
3) Singleton Parkway and Covington Pike will intersect at a red light (about 5 miles).
4) Entrance to the emergency room is 700 feet past this light on the left.

Map to hospital

PLAN ACCEPTANCE FORM

PROJECT HEALTH AND SAFETY PLAN

INSTRUCTIONS: This form is to be completed by each person working on the project site and returned to: EnSafe, Memphis, Tennessee.

Job No: CTO 0106

Contract No: N62467-89-0318

Project: NSA Memphis Voluntary Corrective Action Field Activities

I have read and understand the contents of the above plan and agree to perform my work in accordance with it.

_____
Signed

_____
Print Name

_____
Company

_____
Date

EMPLOYEE EXPOSURE HISTORY FORM

Employee: _____

Job Name: _____

Date(s) From/To: _____

Hours Onsite: _____

Contaminants (Suspected/Reported):

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(See Attached Laboratory Analysis)

PLAN FEEDBACK FORM

Problems with plan requirements:

Unexpected situations encountered:

Recommendations for revisions:

ACCIDENT REPORT FORM

<table>
<tr><td colspan="2">SUPERVISOR'S REPORT OF ACCIDENT</td><td colspan="2">DO NOT USE FOR MOTOR VEHICLE OR AIRCRAFT ACCIDENTS</td></tr>
<tr><td colspan="2">TO</td><td colspan="2">FROM

TELEPHONE (Include area code)</td></tr>
<tr><td colspan="4">NAME OF INJURED OR ILL WORKER AND COMPANY</td></tr>
<tr><td colspan="4">WORKER'S SOCIAL SECURITY NUMBER</td></tr>
<tr><td>DATE OF ACCIDENT</td><td>TIME OF ACCIDENT</td><td colspan="2">EXACT LOCATION OF ACCIDENT</td></tr>
<tr><td colspan="4">NARRATIVE DESCRIPTION OF ACCIDENT</td></tr>
<tr><td colspan="3">NATURE OF ILLNESS OR INJURY
AND PART OF BODY INVOLVED</td><td>LOST TIME
YES ☐
NO ☐</td></tr>
<tr><td colspan="4">PROBABLE DISABILITY (Check one)

FATAL ☐ LOST WORK DAY WITH ____DAYS AWAY FROM WORK ☐ LOST WORK DAY WITH ____DAYS OF RESTRICTED ACTIVITY ☐ NO LOST WORK DAY ☐ FIRST-AID ONLY ☐</td></tr>
<tr><td colspan="4">CORRECTIVE ACTION RECOMMENDED (By whom and by when)</td></tr>
<tr><td colspan="2">NAME OF SUPERVISOR (Print)</td><td colspan="2">TITLE</td></tr>
<tr><td colspan="2"></td><td colspan="2">DATE</td></tr>
</table>