Landfill Gas Investigation

Landfills and Fill Areas
Parcels 78(6), 79(6), 80(6), 227(7), 126(7), 229(7), and 82(7)

Fort McClellan, Calhoun County, Alabama

Prepared for:

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Task Order CK09
Contract No. DACA21-96-D-0018
Project No. 796886

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Executive Summary

In accordance with Contract Number DACA21-96-D-0018, Task Order CK09, Shaw Environmental, Inc. completed a landfill gas investigation at seven landfills and fill areas located at Fort McClellan, Alabama. The purpose of the investigation was to determine the absence or presence of methane gas or subsurface gas containing volatile organic compounds (VOC) at these sites. The landfills and fill areas investigated were:

- Landfill No. 1, Parcel 78(6)
- Landfill No. 2, Parcel 79(6)
- Landfill No. 3, Parcel 80(6)
- Fill Area East of Reilly Airfield and Former Post Garbage Dump, Parcels 227(7) and 126(7)
- Fill Area Northwest of Reilly Airfield, Parcel 229(7)
- Stump Dump, Parcel 82(7).

The assessment of landfill gas was initiated by performing a soil gas emission screening for landfill gas. A subsurface soil gas screening was performed along the perimeter and within each of the landfills and fill areas. Subsurface soil gas was screened for methane and other major landfill gas components. In addition, structures inside each survey perimeter and within a specified distance outside the waste limit of each fill area were screened for landfill gas and explosive gas accumulations.

One subsurface soil gas screening sample was collected in each landfill and fill area to quantify VOCs. The analytical sample was collected from the subsurface screening location with the highest methane or lowest oxygen concentration. The analytical data collected were used to determine if additional site-specific investigation efforts were required to further define the horizontal and vertical extent of the methane and/or VOC gas in the subsurface. Unexploded ordnance (UXO) surface sweeps and downhole surveys of barholes and/or auger borings were required to support field activities at the Stump Dump, Parcel 82(7). The surface sweeps and downhole surveys were conducted to identify anomalies for the purpose of UXO avoidance.

The results of the surface emission screening at the landfills and fill areas did not indicate the presence of VOCs along the perimeter or across the surface of these areas. Subsurface soil gas screening revealed minor amounts of methane at one screening location from Landfill No. 3 and at one location from the Stump Dump. Both of these results were well below the lower explosive limit. Methane was not detected in the screened structures and monitoring wells. The fixed-base laboratory analysis of the subsurface soil gas revealed the presence of VOCs at all the landfills and fill areas except Landfill No. 1. Concentrations of individual VOCs ranged from 0.9 to 1,220 parts per billion by volume (ppbv), with total VOC concentrations at these sites ranging from 61.7 to 3,184.7 ppbv.

The landfills and fill areas investigated herein ranged from 15 years to over 50 years in age. Because the landfills and fill areas contained "moderately decomposable" wastes (e.g., paper, textiles, and wood), methane gas generation would be steadily declining over time. Methane gas production peaks within six years after initial waste placement (U.S. Environmental Protection Agency, [EPA], 1991).

Based on the likely age of the waste within the landfills and fill areas and the absence of significant methane, Shaw believes that additional landfill gas investigation is not warranted at the landfills and fill areas.

1.0 Introduction

The U.S. Army Corps of Engineers (USACE), Mobile District, contracted Shaw Environmental, Inc. (Shaw) (formerly IT Corporation [IT]) to conduct a landfill gas investigation at seven landfills and fill areas located at Fort McClellan (FTMC) under Contract Number DACA21-96-D-0018, Task Order CK09.

The landfills and fill areas investigated were:

- Landfill No. 1, Parcel 78(6)
- Landfill No. 2, Parcel 79(6)
- Landfill No. 3, Parcel 80(6)
- Fill Area East of Reilly Airfield and Former Post Garbage Dump, Parcels 227(7) and 126(7)
- Fill Area Northwest of Reilly Airfield, Parcel 229(7)
- Stump Dump, Parcel 82(7).

Landfill gas is a by-product of the natural anaerobic decomposition of organic materials in solid waste. Landfill gas typically consists primarily of a mixture of methane and carbon dioxide, with trace concentrations of other gases and volatile organic compounds (VOC), depending on the composition and age of the solid waste. Methane and VOCs are the primary constituents of concern, from both regulatory and environmental health perspectives. Accumulated concentrations of methane over the lower flammable limit of 5 percent by volume will burn or explode when ignited. This lower limit, when expressed in parts per billion by volume (ppbv), is 5.0×10^7. Extended exposures to levels of some VOCs commonly detected in landfill gas may have health risk impacts. Small landfills containing organic waste may produce significant quantities of landfill gas for 30 to 60 years (or more) after the waste is disposed, depending on the configuration of the landfill and the internal moisture conditions.

1.1 Objectives

A landfill gas field sampling plan was prepared to provide technical guidance and rationale for surface emissions screening, subsurface soil gas screening, sample collection, and analysis at the landfills and fill areas (Shaw, 2003). The objectives of this investigation were as follows:

- Determine if there are detectable emissions of landfill gas, particularly methane, above the fill area surface
- Assess the presence and location of subsurface landfill gas, particularly methane
- Assess if subsurface landfill gas, particularly methane, is migrating into surrounding structures
- Quantify VOC concentrations in subsurface landfill gas.

1.2 Site Description and History

Fort McClellan is located in the foothills of the Appalachian Mountains of northeastern Alabama near the cities of Anniston and Weaver in Calhoun County. The post is approximately 60 miles northeast of Birmingham, 75 miles northwest of Auburn, and 95 miles west of Atlanta, Georgia. Fort McClellan consists of two main areas of government-owned properties: Main Post and Pelham Range. A third area, designated Choccolocco Corridor, was previously leased from the State of Alabama; however, the lease was terminated in May 1998. The size of each property is presented below:

Main Post	18,929 acres
Pelham Range	22,245 acres
Choccolocco Corridor (formerly leased)	4,488 acres

The Main Post is bounded on the east by the Choccolocco Corridor, which connects the Main Post with the Talladega National Forest. Pelham Range is located approximately 5 miles west of the Main Post and adjoins the Anniston Army Depot on the southwest. Pelham Range is bordered on the east by U.S. Highway 431.

Recent ongoing activities at FTMC can be divided into support activities, academic training, and practical training. Support activities included housing, feeding, and moving individuals during training. Academic training included classroom, laboratory, and field instruction. Practical training included weapons, artillery and explosives, vehicle operation and maintenance, and physical and tactical training activities. In September 1999, FTMC was closed under the Base Realignment and Closure Program.

1.2.1 Landfill No. 1, Parcel 78(6)

Landfill No. 1 is located in the western part of the Main Post of FTMC (Figure 1-1). This landfill was the FTMC sanitary landfill from 1945 to 1947. Aerial photographs taken in 1944 document the clearing for the landfill. The Landfill No. 1 parcel boundary covers approximately 6 acres. Currently, the landfill is wooded.

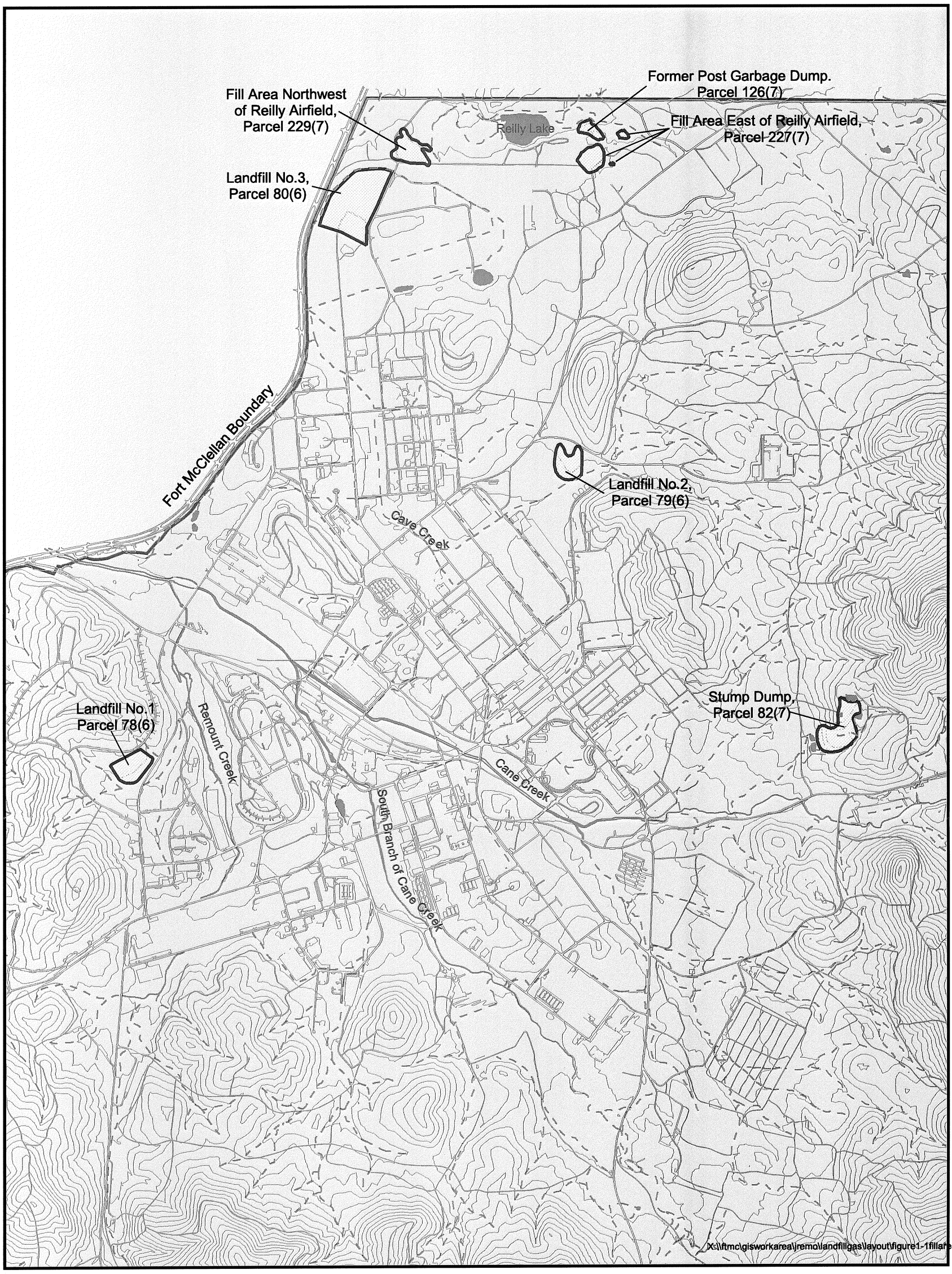


Figure 1-1 **Landfills and Fill Areas**
Fort McClellan, Alabama

2000 0 2000 Feet

NAD83 State Plane Coordinates

N

Shaw E & I, Inc.

U.S. Army Corps of Engineers Mobile District

Contract No.: DACA21-96-D-0018

Legend

- Surface Water Features (dashed where intermittent)
- Roads
- Topographic Contours (25-foot Interval)
- Surface Water Feature (may be ephemeral)
- Main Post
- Landfill/Fill Area Boundary

1.2.2 Landfill No. 2, Parcel 79(6)

Landfill No. 2 is located in the central part of the Main Post of FTMC (Figure 1-1). This 5.6-acre landfill was used as a sanitary landfill after the closure of Landfill No. 1 and was active from 1947 to an unknown date. However, landfilling activities were believed to have occurred as early as 1927 (Environmental Science and Engineering, Inc. [ESE], 1998), and review of aerial photographs suggests that dumping at Landfill No. 2 was discontinued prior to 1969.

1.2.3 Landfill No. 3, Parcel 80(6)

Landfill No. 3 is located in the northwest corner of the Main Post (Figure 1-1). This site was the Main Post sanitary landfill from 1946 to 1967 (ESE, 1998). The approximately 23-acre landfill was constructed using trenches that extend east-west across the site. The waste was placed in the trenches and subsequently covered with topsoil (Roy F. Weston, Inc., 1990). A complete manifest of all wastes deposited at the landfill is not available; however, it has been reported that empty pesticide containers and burned ammunition pallets or crates were disposed in this landfill. The pesticide containers were reported to have been triple-rinsed prior to disposal. Additionally, there is the potential for disposal of paint containers, fluorescent bulbs and ballasts, waste oil, and construction debris at this site (ESE, 1998). The landfill was not capped when it was closed in 1967, and settling is occurring.

1.2.4 Fill Area East of Reilly Airfield, Parcel 227(7), and the Former Post Garbage Dump, Parcel 126(7)

The Fill Area East of Reilly Airfield is located near the northern boundary of the Main Post, adjacent to the Former Post Garbage Dump near Reilly Airfield (Figure 1-1). The site contains several potential disposal areas identified in the Environmental Photographic Interpretation Center (EPIC) report (U.S. Environmental Protection Agency [EPA], 1990). The EPIC aerial photo composite dated 1949 annotates two ground scars with the label "Fill Area." The aerial photo composite dated 1961 annotates one site as "Pit" and another as "TR" (trench). This parcel encompasses four sites identified by EPIC. The parcel also includes an adjacent area of disturbed ground that was not identified in the EPIC report but which appeared to possibly contain mounded material (ESE, 1998). Information is not available regarding operations at this parcel. However, review of aerial photographs suggests that fill activities at Parcel 227(7) began in or prior to 1940 and ceased before September 1964. Combined, the areas total approximately 4.5 acres.

The Former Post Garbage Dump, Parcel 126(7), is located along the northern boundary of the Fill Area East of Reilly Airfield. The parcel covers approximately 2 acres. The site consists of a

steep north-facing slope that borders a wetland. There are no records of disposal activities at this parcel. However, review of aerial photographs suggests that fill dumping activities at Parcel 126(7) began in or prior to 1940 and ceased before September 1964.

1.2.5 Fill Area Northwest of Reilly Airfield, Parcel 229(7)

The Fill Area Northwest of Reilly Airfield (Figure 1-1) contains a potential disposal area identified in the EPIC report from the aerial photo composite dated 1954 (EPA, 1990). Linear mounds are visible in aerial photos at the northern margin of a cleared area (ground scar); however, investigative personnel did not observe these mounds during site visits in 1998. Several oil filters were noted lying on the west bank of the stream. It is unclear precisely which feature or features were interpreted by EPIC as being "Fill;" therefore, the original parcel encompasses the entire cleared area, including the area of the linear mounds. Review of aerial photographs suggests that fill activities at Parcel 229(7) began in or prior to 1940 and ceased before September 1964. The fill area is approximately 5.9 acres in size. Additional information is not available regarding operations at this parcel.

1.2.6 Stump Dump, Parcel 82(7)

The Stump Dump, Parcel 82(7), is located in the central portion of the Main Post (Figure 1-1). The dump is an open area with a soil cover. It has engineered features such as terraced decks and slopes. Surface runoff is controlled by man-made drainage ditches. Several detention ponds were constructed around the covered fill area to control surface water runoff. The Stump Dump is approximately 10 acres in size.

The Stump Dump is now inactive but was used as a disposal site from sometime prior to 1985 to 1988. The Stump Dump primarily received storm debris (trees, branches, and flood soil). Some limited unauthorized dumping of items such as construction debris (sheet rock, metal, and concrete) and other items (batteries, tires, and paint cans) also occurred at this location. After its closure the Stump Dump was covered with soil and vegetation and the detention ponds were installed.

2.0 Previous Investigations

This chapter contains a brief synopsis of investigations conducted at the landfills and fill areas. Detailed information about the investigations can be found in the *Draft Final Site Investigation and Fill Area Definition Report* (IT, 2002a) and the *Draft Final Engineering Evaluation/Cost Analysis* (EE/CA) (IT, 2002b). The fill area definition report presents the results of the investigations, including the determination of the nature and extent of fill material, identifies whether chemicals of concern are present in the environmental media, and provides site-specific data to support recommendations in the EE/CA. The EE/CA summarizes site characterization information and provides human health and ecological risk assessment in accordance with criteria of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). For landfills where CERCLA risks are identified, the EE/CA also identifies remedial action objectives, describes potential remedial action alternatives, contains analysis of these alternatives, and recommends a remedial action alternative.

Landfill No. 1, Parcel 78(6). This parcel was the subject of a remedial investigation (RI) by Science Applications International Corporation (SAIC). Fill area definition activities consisted of geophysical surveys, trenching, and installation of borings in fill material. Based on the results of the investigation, the fill material covers approximately 6.3 acres; the average depth of fill is estimated to extend to 11.5 feet below ground surface (bgs) (IT, 2002a). Based on data presented in the EE/CA and human health and ecological risk assessment results, Landfill No. 1 presents no unacceptable human health or ecological risk under CERCLA (IT, 2002b).

Landfill No. 2, Parcel 79(6). This parcel was included in the SAIC RI. In addition, surface soil sampling was performed at the site by Shaw. Fill area definition activities consisted of geophysical surveys, trenching, and installation of borings in fill material. Based on the results of the investigations, the fill material covers approximately 5.6 acres; the average depth of fill is estimated to extend to 8 feet bgs (IT, 2002b). Lead, polynuclear aromatic hydrocarbons, and arsenic in surface soils would pose an unacceptable risk for a potential resident. However, proposed reuse for Landfill No. 2 is passive recreation; the parcel does not present unacceptable human health risks for the recreational site user. Surface water and sediments present no unacceptable risks for ecological receptors; metals and other compounds in surface soils pose potential risks for ecological receptors. However, the screening-level ecological risk assessment (SLERA) identifies several uncertainty factors that may mitigate these risks (IT, 2002b).

Landfill No. 3, Parcel 80(6). This parcel was included in the SAIC RI, and a supplemental RI is currently being performed by Shaw to define the extent of groundwater contamination. Fill area definition activities consisted of trenching and installation of borings in fill material. Based on the results of the investigations, the fill material covers approximately 22.8 acres; the average depth of fill is estimated to extend to 17 feet bgs (IT, 2002a). Exposures to thallium in surface soil and trichloroethene and 1,1,2,2-tetrachloroethane in groundwater present unacceptable risks to a resident. Proposed reuse for Landfill No. 3 is passive recreation; the parcel presents no unacceptable human health risks for the recreational site user. Landfill No. 3 does not present any unacceptable risk to the ecological receptor. However, elevated levels of VOCs associated with landfilling activities have been detected in groundwater at the site (IT, 2002b).

Fill Area East of Reilly Airfield, Parcel 227(7), and the Former Post Garbage Dump, Parcel 126(7). These parcels were the subject of site investigations (SI) by Shaw. Fill area definition activities consisted of geophysical surveys, trenching, and installation of borings in fill material. Based on the results of the investigations, the total fill material at both parcels covers approximately 6.5 acres. The average depth of fill at Parcel 227(7) is estimated to extend to 8 feet bgs; the average depth of fill at Parcel 126(7) is estimated to extend to 3 feet bgs (IT, 2002a). The Fill Area East of Reilly Airfield and the Former Post Garbage Dump do not pose any unacceptable risks to human health under CERCLA. Metals and pesticides in soils, and metals and semivolatile organic compounds in surface water pose potential risks to ecological receptors. However, the SLERA identifies several uncertainty factors that could mitigate these risks (IT, 2002b).

Fill Area Northwest of Reilly Airfield, Parcel 229(7). This parcel was the subject of an SI by Shaw. Fill area definition activities consisted of geophysical surveys, trenching, and installation of borings in fill material. Based on the results of the investigation, the fill material covers approximately 5.9 acres; the average depth of fill is estimated to extend to 8 feet bgs (IT, 2002a). The Fill Area Northwest of Reilly Airfield does not present any unacceptable human health risks under CERCLA. Mercury in surface water presents a potential risk to ecological receptors. However, the SLERA identifies several uncertainty factors that could mitigate these risks (IT, 2002b).

Stump Dump, Parcel 82(7). This parcel was the subject of an SI by Shaw. Fill area definition activities consisted of installation of borings in fill material. The fill material covers approximately 10 acres; the average depth of fill is estimated to extend to 8 feet bgs (IT, 2002a). The Stump Dump presents no unacceptable human health or ecological risks under CERCLA (IT, 2002b).

3.0 Current Investigation Activities

This chapter summarizes the landfill gas investigation conducted by Shaw at the following landfills and fills areas:

- Landfill No. 1, Parcel 78(6)
- Landfill No. 2, Parcel 79(6)
- Landfill No. 3, Parcel 80(6)
- Fill Area East of Reilly Airfield and Former Post Garbage Dump, Parcels 227(7) and 126(7)
- Fill Area Northwest of Reilly Airfield, Parcel 229(7)
- Stump Dump, Parcel 82(7).

3.1 Unexploded Ordnance Avoidance

Unexploded ordnance (UXO) avoidance for the landfill gas investigation was required only at the Stump Dump, Parcel 82(7). UXO avoidance activities were performed following the methodology outlined in the *Installation-Wide Sampling and Analysis Plan* (SAP) (IT, 2002c). Shaw UXO personnel used a low-sensitivity magnetometer to perform a surface sweep for the screening locations prior to site access. After the site was cleared for access, subsurface screening locations were monitored by UXO personnel following procedures outlined in the SAP.

3.2 Landfill Gas Investigation

This investigation consisted of a three-phase approach to assess landfill gas at the landfills and fill areas. The investigation phases were as follows:

- Perform surface emissions screening following the code of federal regulations established in 40 CFR 60.755
- Collect subsurface soil gas screening data from barholes installed to 3 feet below grade
- Collect 1 soil gas sample from each landfill for fixed-base laboratory analysis.

3.2.1 Surface Gas Emissions Screening

The assessment of landfill gas was initiated by performing surface gas emission screening. This consisted of monitoring for landfill gas for each landfill or fill area using a calibrated flame ionization detector over a 30-meter grid pattern. Points that indicated any significant release of landfill gas were marked and staked. Data collected were recorded on prepared field data sheets (Appendix A).

3.2.2 Subsurface Soil Gas Screening

The subsurface soil gas screening consisted of driving a ½-inch solid steel bar into the ground at designated intervals (Table 3-1). The hole created was covered for 30 to 45 minutes to allow any gas present to accumulate in the headspace. These punched holes, or barholes, were then screened with a calibrated GEM 500 gas analyzer. Figures 3-1 through 3-6 show the approximate locations of the subsurface soil gas screening locations. Data collected were recorded on prepared field data sheets (Appendix A).

3.2.3 Subsurface Soil Gas Sample Collection

A gas sample was collected in a pressurized Summa® canister at the subsurface soil gas screening location showing the highest methane concentration or the lowest oxygen concentration at each of the landfills and fill areas. The 6-liter Summa canister (a specially prepared container) was shipped to a fixed-base laboratory for chemical analysis. The subsurface gas samples were analyzed using EPA Method TO-15 (for "toxic organic" air pollutants). The samples were analyzed using gas chromatography/mass spectrometry to determine the content of VOCs in the captured air. Table 3-2 lists the sample location, sample designation, and date collected. Figures 3-1 through 3-6 show the location of the subsurface soil gas sample at each landfill and fill area. Sample collection logs are presented in Appendix B. The data were reported in accordance with definitive data requirements of Chapter 2.0 of the USACE Engineer Manual 200-1-6, *Chemical Quality Assurance for Hazardous, Toxic, and Radioactive Waste Projects* (USACE, 1997). The analytical data are presented in tabular form in Appendix C.

3.2.4 Structure and Monitoring Well Screening

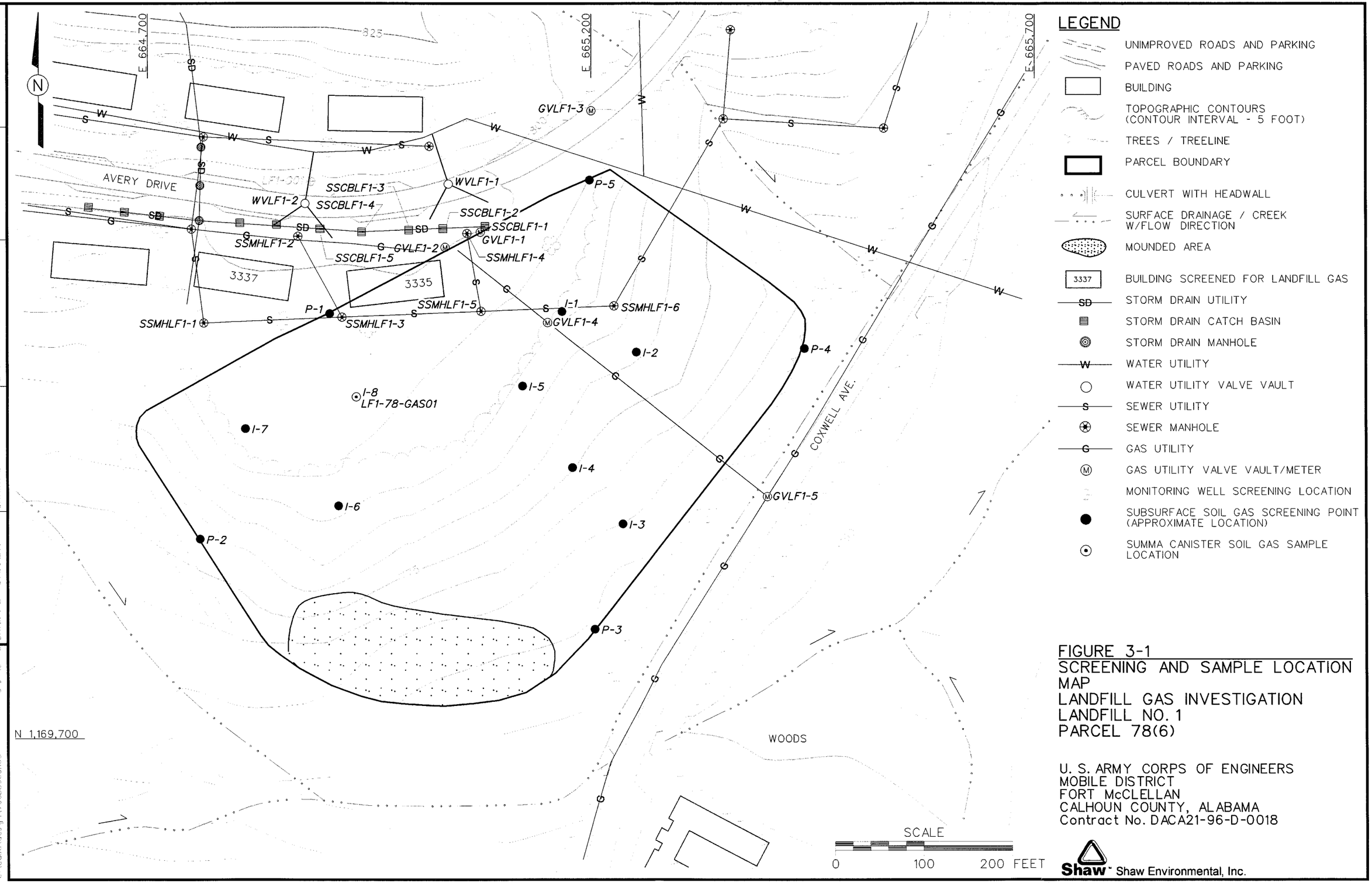
Surface and subsurface structures located within each landfill or fill area perimeter specified on Table 3-1 were screened for methane using a GEM 500 gas analyzer. Table 3-3 lists the structures, monitoring wells, and results identified for screening. Figures 3-1 through 3-6 show the locations of the screened structures and monitoring wells. Data collected were recorded on prepared field data sheets (Appendix A).

Table 3-1

Summary of Landfill Gas Field Investigation
Landfills and Fill Areas
Parcels 78(6), 79(6), 80(6), 227(7), 126(7), 229(7), and 82(7)
Fort McClellan, Calhoun County, Alabama

Parcel Name	Area (sq. ft.)	Estimated Fill Volume (cu. yds.)	Estimated Amount of Decomposable Waste	Approximate Interior Barhole Spacing (ft.)	No. of Interior Barholes	Approximate Perimeter Barhole Spacing (ft.)	No. of Perimeter Barholes	Structure Survey Radius (ft.)
Landfill No. 1	274,428	81,800	residual-to-none	200	8	400	5	100
Landfill No. 2	243,936	54,200	residual-to-none	200	7	400	5	100
Landfill No. 3	993,168	375,200	residual-to-substantial*	~30[A]	49	250	16	200
Fill Area East of Reilly Airfield	196,020	29,000	residual-to-none*	200	6	250	7	200
Former Post Garbage Dump	87,120	9,700	residual*	200	4	250	5	200
Fill Area Northwest of Reilly Airfield	255,697	53,000	residual*	~100[A]	6	250	7	200
Stump Dump	435,600	116,200	residual-to-substantial*	200	13	250	11	200
Totals	**2,485,969**	**719,100**			**93**		**55**	

* Interior barholes to be field located within known waste accumulation areas.
sq. ft. - Square feet.
cu. yards - Cubic yards.
ft. - Feet.
UXO - Unexploded ordnance.
[A] - 1 per fill area trench.



LEGEND

- UNIMPROVED ROADS AND PARKING
- PAVED ROADS AND PARKING
- BUILDING
- TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 5 FOOT)
- TREES / TREELINE
- PARCEL BOUNDARY
- CULVERT WITH HEADWALL
- SURFACE DRAINAGE / CREEK W/FLOW DIRECTION
- MOUNDED AREA
- 3337 — BUILDING SCREENED FOR LANDFILL GAS
- SD — STORM DRAIN UTILITY
- STORM DRAIN CATCH BASIN
- STORM DRAIN MANHOLE
- W — WATER UTILITY
- WATER UTILITY VALVE VAULT
- S — SEWER UTILITY
- SEWER MANHOLE
- G — GAS UTILITY
- M — GAS UTILITY VALVE VAULT/METER
- MONITORING WELL SCREENING LOCATION
- SUBSURFACE SOIL GAS SCREENING POINT (APPROXIMATE LOCATION)
- SUMMA CANISTER SOIL GAS SAMPLE LOCATION

FIGURE 3-1
SCREENING AND SAMPLE LOCATION MAP
LANDFILL GAS INVESTIGATION
LANDFILL NO. 1
PARCEL 78(6)

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

Shaw Environmental, Inc.

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DRAWN BY: D. SOMART
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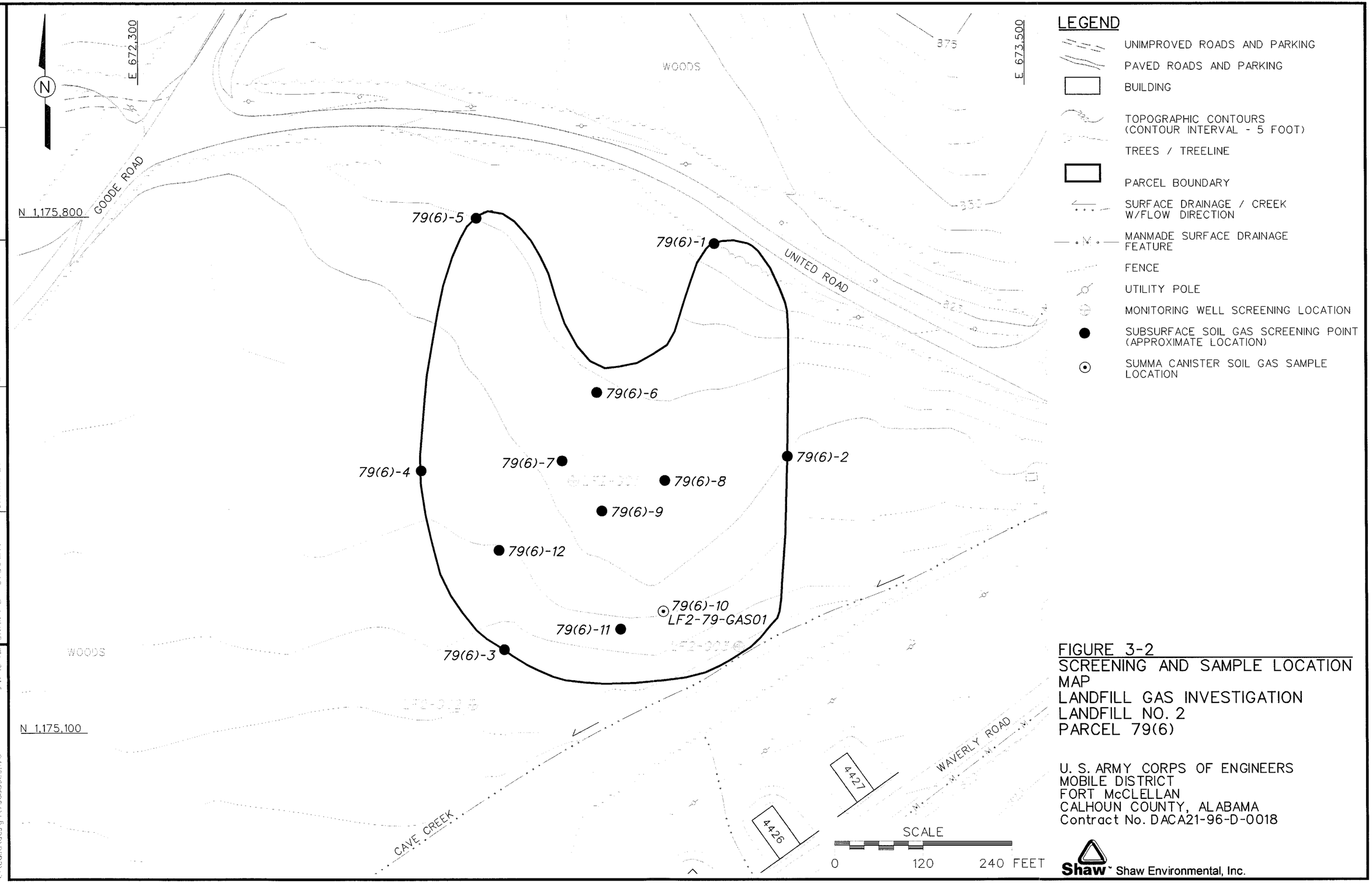
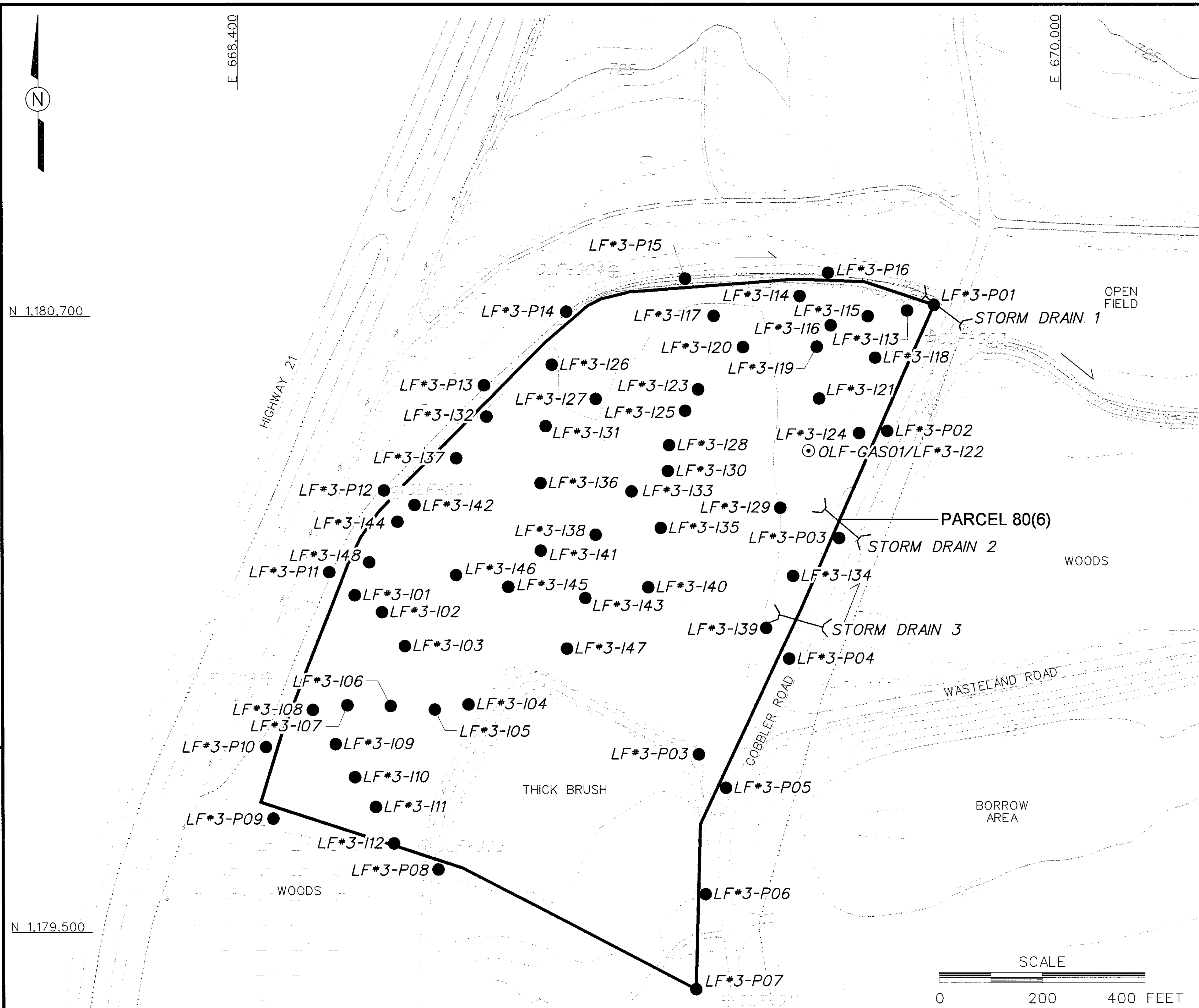


FIGURE 3-2
SCREENING AND SAMPLE LOCATION MAP
LANDFILL GAS INVESTIGATION
LANDFILL NO. 2
PARCEL 79(6)

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

Shaw Shaw Environmental, Inc.



LEGEND

- UNIMPROVED ROADS AND PARKING
- PAVED ROADS AND PARKING
- BUILDING
- TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 5 FOOT)
- TREES / TREELINE
- PARCEL BOUNDARY
- SURFACE DRAINAGE / CREEK W/FLOW DIRECTION
- STORM DRAIN / CULVERT
- FENCE
- UTILITY POLE
- MONITORING WELL SCREENING LOCATION
- SUBSURFACE SOIL GAS SCREENING POINT (APPROXIMATE LOCATION)
- SUMMA CANISTER SOIL GAS SAMPLE LOCATION

FIGURE 3-3
SCREENING AND SAMPLE LOCATION MAP
LANDFILL GAS INVESTIGATION
LANDFILL NO. 3
PARCEL 80(6)

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

Shaw Environmental, Inc.

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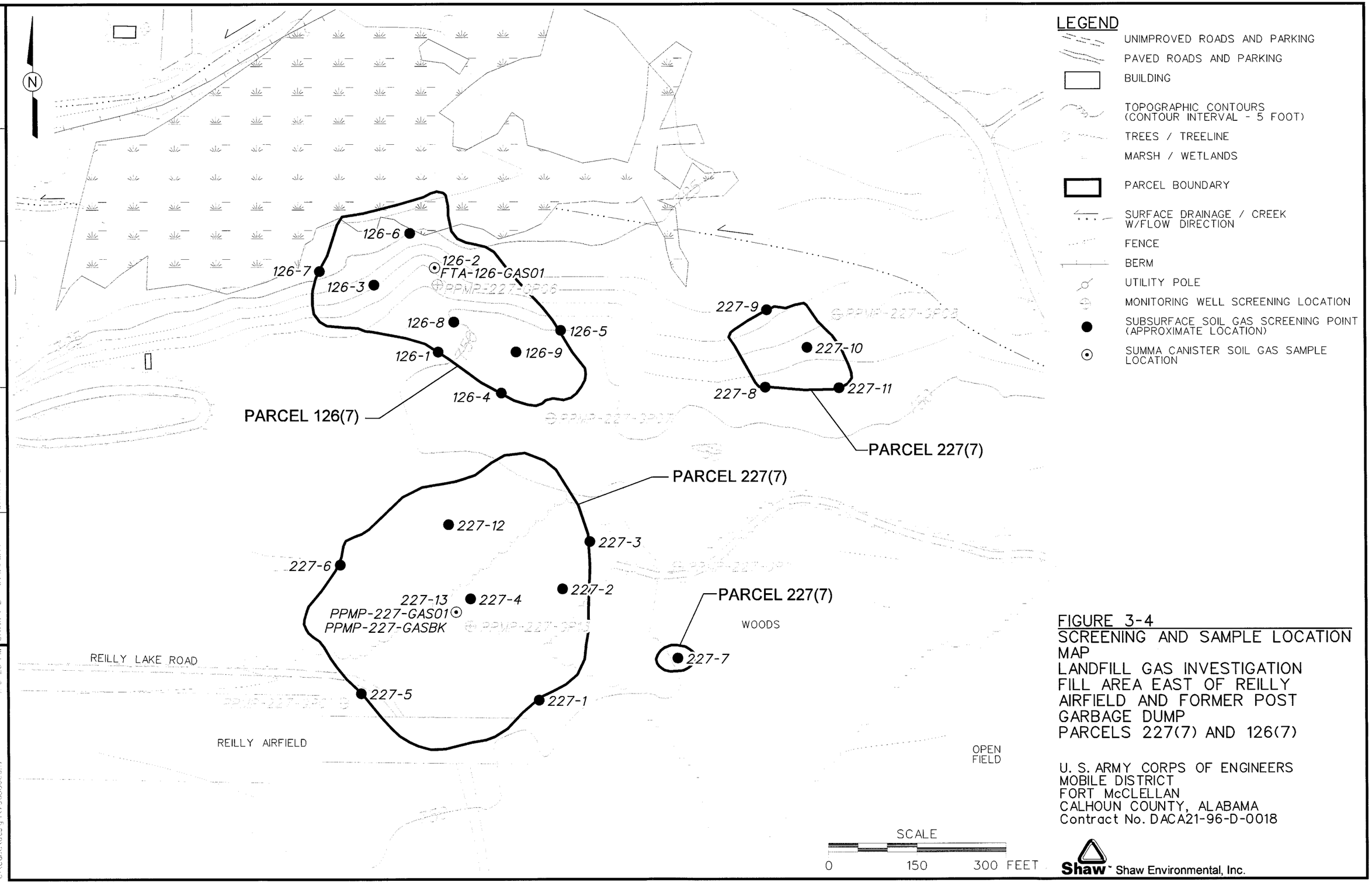

FIGURE 3-4
SCREENING AND SAMPLE LOCATION MAP
LANDFILL GAS INVESTIGATION
FILL AREA EAST OF REILLY AIRFIELD AND FORMER POST GARBAGE DUMP
PARCELS 227(7) AND 126(7)

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

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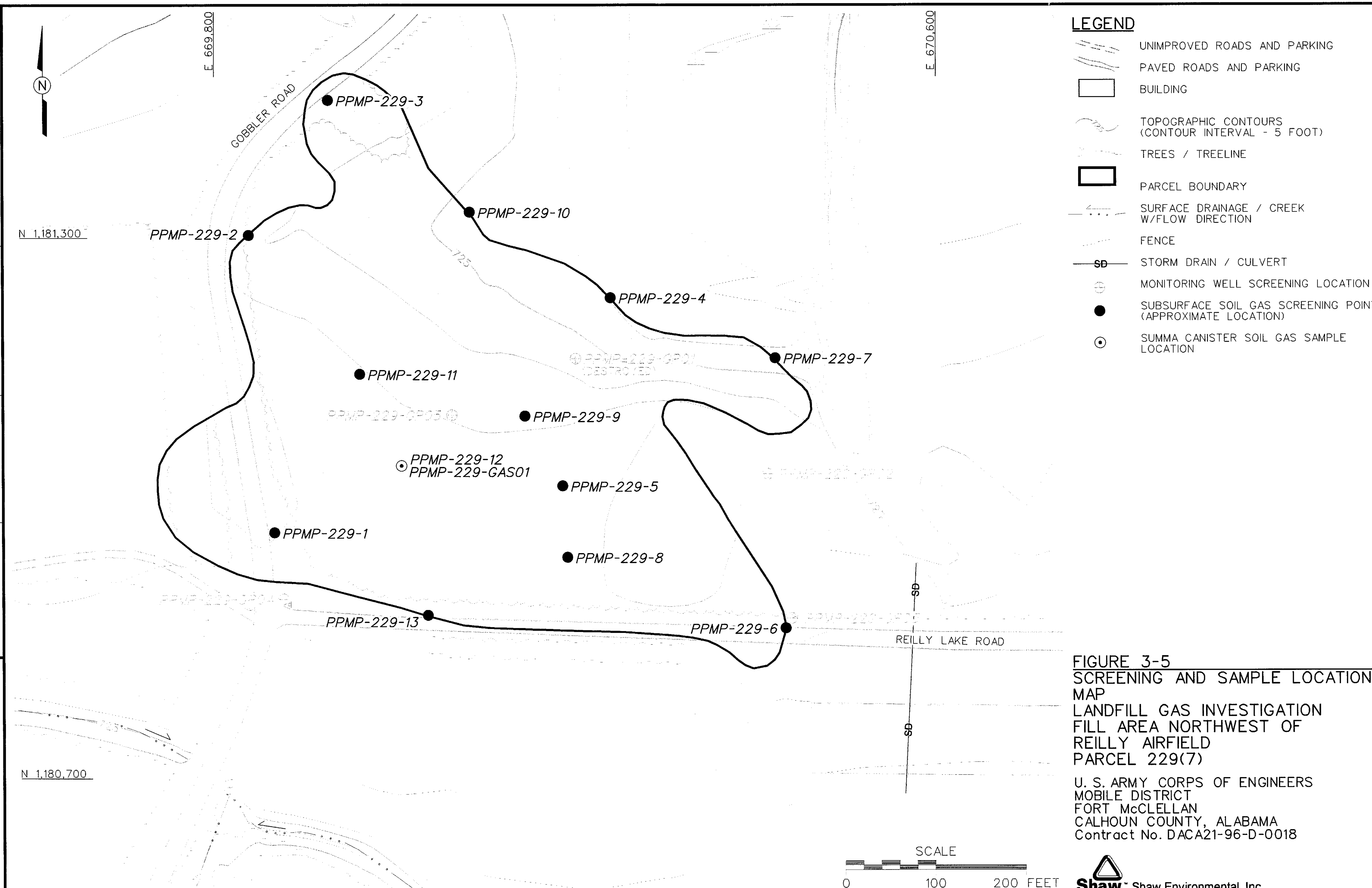

FIGURE 3-5
SCREENING AND SAMPLE LOCATION MAP
LANDFILL GAS INVESTIGATION
FILL AREA NORTHWEST OF REILLY AIRFIELD
PARCEL 229(7)

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

Shaw Environmental, Inc.

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ENGR. CHCK. BY: S. MORAN
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STARTING DATE: 07/24/03
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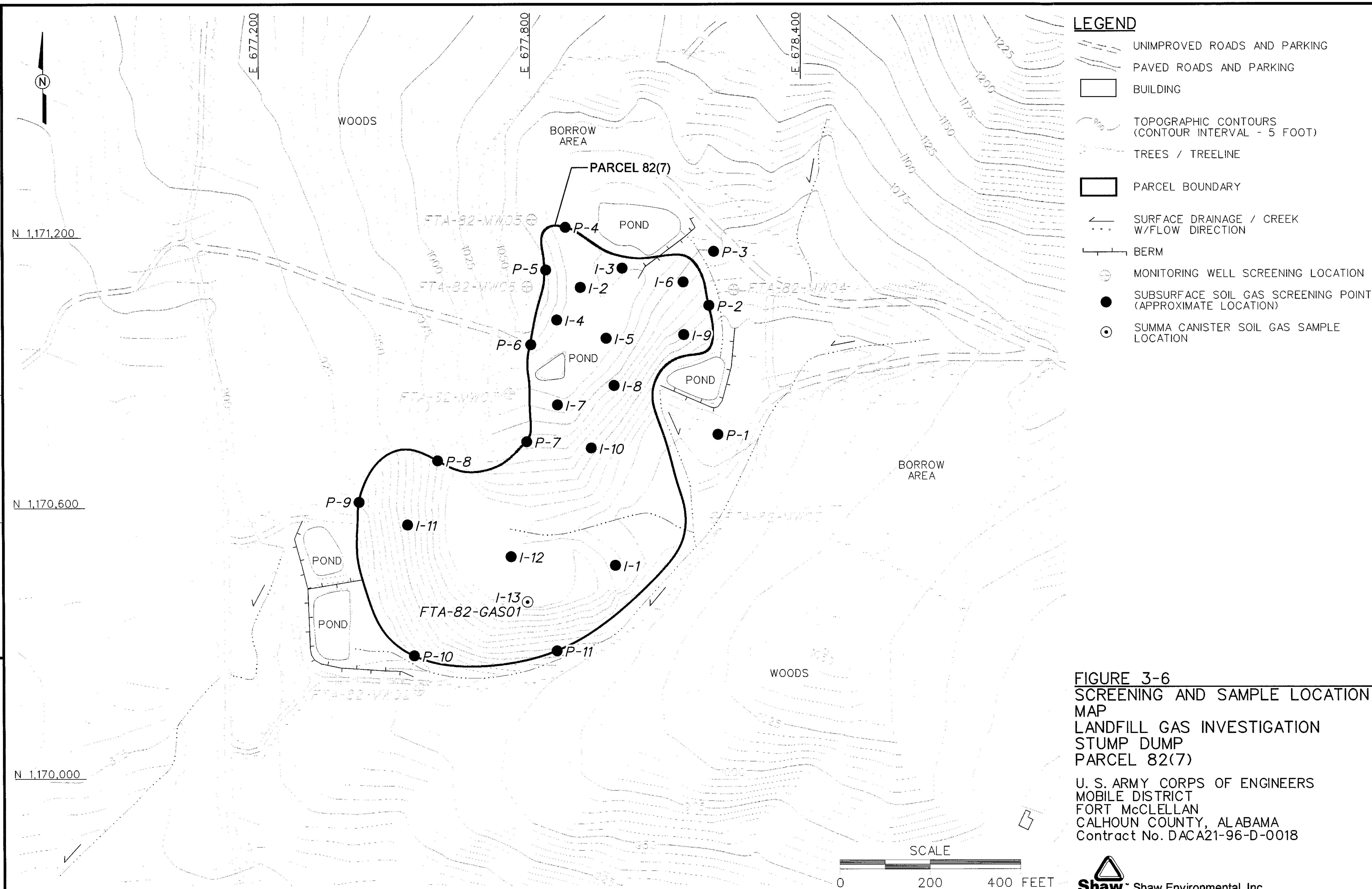

FIGURE 3-6
SCREENING AND SAMPLE LOCATION MAP
LANDFILL GAS INVESTIGATION
STUMP DUMP
PARCEL 82(7)

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

Shaw Environmental, Inc.

Table 3-2

Subsurface Soil Gas Sample Designations for Summa Canisters
Landfill and Fill Areas
Parcels 78(6), 79(6), 80(6), 227(7), 126(7), 229(7), and 82(7)
Fort McClellan, Calhoun County, Alabama

Parcel	Sample Location	Sample Designation	Date Sample Collected
Landfill No. 1	LF1-78-GAS01	LF1-78-GAS01-GS-**SH5001**-REG	13-May-03
Landfill No. 2	LF2-79-GAS01	LF2-79-GAS01-GS-**SH5002R**-REG	2-Jun-03
Landfill No. 3	OLF-80-GAS01	OLF-80-GAS01-GS-**SH5003**-REG	1-Oct-03
Fill Area East of Reilly Airfield	PPMP-227-GAS01	PPMP-227-GAS01-GS-**SH5005R**-REG	2-Jun-03
Former Post Garbage Dump	FTA-126-GAS01	FTA-126-GAS01-GS-**SH5006R**-REG	2-Jun-03
Fill Area Northwest of Reilly Airfield	PPMP-229-GAS01	PPMP-229-GAS01-GS-**SH5007**-REG PPMP-229-GAS01-GS-**SH5007R**-REG	13-May-03 2-Jun-03
Stump Dump	FTA-82-GAS01	FTA-82-GAS01-GS-**SH5008**-REG	2-Jun-03
Fill Area East of Reilly Airfield	Background Air	PPMP-227-GASBK-GS-**SH5009**-REG	12-Jun-03

Table 3-3

Summary of Perimeter Structures and Monitoring Well Screening
Landfills and Fill Areas
Parcels 78(6), 79(6), 80(6), 227(7), 126(7), 229(7), and 82(7)
Fort McClellan, Calhoun County, Alabama

Parcel Name	Parcel Number	Structure	Description	Results
Landfill No. 1	78(6)	Building No. 3337A and B	Single floor dwelling	No Methane Detected.
		Building No. 3335A and B	Single floor dwelling	No Methane Detected.
		WVLF1-1	Water Valve Vault	No Methane Detected.
		WVLF1-2	Water Valve Vault	No Methane Detected.
		GVLF1-1	Gas Valve/Meter Vault	Not accessible.
		GVLF1-2	Gas Valve/Meter Vault	Not accessible.
		GVLF1-3	Gas Valve/Meter Vault	Not accessible.
		GVLF1-4	Gas Valve/Meter Vault	Not accessible.
		GVLF1-5	Gas Valve/Meter Vault	Not accessible.
		SSCBLF1-1	Storm Sewer Catch Basin	No Methane Detected.
		SSCBLF1-2	Storm Sewer Catch Basin	No Methane Detected.
		SSCBLF1-3	Storm Sewer Catch Basin	No Methane Detected.
		SSCBLF1-4	Storm Sewer Catch Basin	No Methane Detected.
		SSCBLF1-5	Storm Sewer Catch Basin	No Methane Detected.
		SSMHLF1-1	Sanitary Sewer Manhole	Not accessible.
		SSMHLF1-2	Sanitary Sewer Manhole	No Methane Detected.
		SSMHLF1-3	Sanitary Sewer Manhole	No Methane Detected.
		SSMHLF1-4	Sanitary Sewer Manhole	No Methane Detected.
		SSMHLF1-5	Sanitary Sewer Manhole	No Methane Detected.
		SSMHLF1-6	Sanitary Sewer Manhole	No Methane Detected.
		LF-G01	Monitoring Well	No Methane Detected.
Landfill No. 2	79(6)	LF2-01	Monitoring Well	No Methane Detected.
		LF2-02	Monitoring Well	No Methane Detected.
		LF2-03	Monitoring Well	No Methane Detected.

Table 3-3

Summary of Perimeter Structures and Monitoring Well Screening
Landfills and Fill Areas
Parcels 78(6), 79(6), 80(6), 227(7), 126(7), 229(7), and 82(7)
Fort McClellan, Calhoun County, Alabama

Parcel Name	Parcel Number	Structure	Description	Results
Landfill No.3	80(6)	Storm Drain 1	Storm Drain	No Methane Detected.
		Storm Drain 2	Storm Drain	Filled with sediment.
		Storm Drain 3	Storm Drain	Filled with sediment.
		OLF-G01	Monitoring Well	No Methane Detected.
		OLF-G02	Monitoring Well	No Methane Detected.
		OLF-G03	Monitoring Well	No Methane Detected.
		OLF-G04	Monitoring Well	No Methane Detected.
		OLF-G08	Monitoring Well	No Methane Detected.
		OLF-G11	Monitoring Well	No Methane Detected.
Fill Area East of Reilly Airfield & Former Post Garbage Dump	227(7) 126(7)	PPMP-227-GP01	Monitoring Well	No Methane Detected.
		PPMP-227-GP06	Monitoring Well	No Methane Detected.
		PPMP-227-GP07	Monitoring Well	No Methane Detected.
		PPMP-227-GP08	Monitoring Well	No Methane Detected.
		PPMP-227-GP11	Monitoring Well	No Methane Detected.
		PPMP-227-GP13	Monitoring Well	No Methane Detected.
Fill Area Northwest of Reilly Airfield	229(7)	Storm Drain	Storm Drain	Not accessible.
		PPMP-229-GP01	Monitoring Well	Well destroyed.
		PPMP-229-GP02	Monitoring Well	No Methane Detected.
		PPMP-229-GP03	Monitoring Well	No Methane Detected.
		PPMP-229-GP04	Monitoring Well	No Methane Detected.
		PPMP-229-GP05	Monitoring Well	No Methane Detected.
Stump Dump	82(7)	FTA-82-MW02	Monitoring Well	No Methane Detected.
		FTA-82-MW03	Monitoring Well	No Methane Detected.
		FTA-82-MW04	Monitoring Well	No Methane Detected.
		FTA-82-MW05	Monitoring Well	No Methane Detected.
		FTA-82-MW06	Monitoring Well	No Methane Detected.
		FTA-82-MW07	Monitoring Well	No Methane Detected.

3.3 Survey of Sample Locations

Soil gas sample locations were surveyed using global positioning system and conventional civil survey techniques described in the SAP. Horizontal coordinates were referenced to the U.S. State Plane Coordinate System, Alabama East Zone, North American Datum of 1983. Elevations were referenced to the North American Vertical Datum of 1988. Horizontal coordinates and elevations are included in Appendix D.

3.4 Sample Preservation, Packing, and Shipping

Sample preservation, packing, and shipping followed the requirements specified in the field sampling plan (Shaw, 2003). Sample containers, sample volumes, and holding times for the analyses required for the landfill gas investigation are listed in the field sampling plan. Completed analysis request and chain-of-custody records (Appendix B) were included with each shipment to Air Toxics, Ltd. of Folsom, California.

4.0 Summary of Analytical Results

The results of the landfill gas investigation at the landfills and fill areas are discussed in the following sections.

4.1 Landfill No. 1, Parcel 78(7)

The surface gas emissions screening at Landfill No. 1 did not indicate the presence of any VOCs along the perimeter or across the surface of the landfill. Eight interior and five perimeter barholes were installed for the subsurface soil gas screening. Barhole screening did not reveal the presence of methane in the soil but did expose a nearly uniform oxygen concentration in the soil gas across the landfill. Because the oxygen concentration was uniform, the sample location LF1-78-GAS01 was randomly selected from the interior screening locations (Figure 3-1). The analytical results of the subsurface soil gas sample were below detection limits for all VOCs (Table 4-1). Structures and monitoring wells within 100 feet outside the perimeter of Landfill No. 1 were screened for methane (Figure 3-1). Methane was not detected in any of the structures or monitoring wells screened (Table 3-3).

4.2 Landfill No. 2, Parcel 79(7)

The surface gas emissions screening at Landfill No. 2 did not indicate the presence of any VOCs along the perimeter or across the surface of the landfill. Seven interior and five perimeter barholes were installed for the subsurface soil gas screening. Barhole screening did not reveal the presence of methane in the soil. Subsurface soil gas sample LF2-79-GAS01 was collected at the subsurface screening location (79[6]-10) with the lowest oxygen concentration (Figure 3-2). The analytical results revealed 22 VOCs in the sample, with concentrations ranging from 2.0 to 330 parts per billion by volume (ppbv) and a total VOC concentration of 1,365.8 ppbv (Table 4-1). Monitoring wells within the landfill and up to 100 feet outside the perimeter of the landfill were screened for methane (Figure 3-2). Methane was not detected in any of the screened monitoring wells (Table 3-3).

4.3 Landfill No. 3, Parcel 80(7)

Surface gas screenings were performed on two separate occasions at Landfill No. 3. Neither screening indicated the presence of any VOCs along the perimeter or across the surface of the landfill. Forty-nine interior and sixteen perimeter barholes were installed for the subsurface soil gas screening. Barhole screening revealed methane (1.7×10^7 ppbv) at one subsurface soil gas screening location (LF#3-I22) from which subsurface soil gas sample OLF-GAS01 was collected (Figure 3-3). The analytical results revealed 3 VOCs in the sample, with concentrations ranging

Table 4-1

Subsurface Soil Gas Analytical Results
Landfills and Fill Areas
Parcels 78(6), 79(6), 80(6), 227(7), 126(7), 229(7), and 82(7)
Fort McClellan, Calhoun County, Alabama

Landfill or Fill Area	Landfill No. 1	Landfill No. 2	Landfill No. 3	Fill Area East of Reilly Airfield	Former Post Garbage Dump	Fill Area Northwest of Reilly Airfield		Stump Dump	Background
Sample Date	5/13/2003	6/2/2003	10/1/2003	6/2/2003	6/2/2003	5/13/2003	6/2/2003	6/2/2003	6/12/2003
Sample Location	LF1-78-GAS01	LF2-79-GAS01	OLF-80-GAS01	PPMP-227-GAS01	FTA-126-GAS01	PPMP-229-GAS01		FTA-82-GAS01	PPMP-227-GASBK
Sample ID	SH5001	SH5002R	SH5003	SH5005R	SH5006R	SH5007	SH5007R	SH5008	SH5009
Compound	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
Freon 12	ND	ND	5.7	ND	ND	ND	ND	ND	ND
Freon 114	ND	ND	16.0	ND	ND	ND	ND	ND	ND
Chloromethane	ND	ND	ND	ND	ND	1.3	ND	0.9	ND
Vinyl Chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
Freon 11	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND
Freon 113	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	ND	ND	ND	2.0	ND	ND	ND	1.1	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	ND	ND	ND	3.2	ND	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	ND	3.1	ND	4.9	2.4	1.9	ND	1.1	ND
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	ND	2.0	ND	5.2	2.6	ND	3.3 J	2.1	ND
1,2-Dichloropropane	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	ND	150.0	ND	400.0	170.0	18.0	220.0	91.0	ND
trans-1,3-Dichloropropene	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	ND	3.4	ND	8.6	3.8	ND	5.0	2.1	ND
1,2-Dibromoethane (EDB)	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	ND	3.4	ND	7.3	3.5	ND	3.6	1.9	ND
Ethyl Benzene	ND	170.0	ND	360.0	170.0	4.5	180.0	100.0	ND
m,p-Xylene	ND	330.0	ND	680.0	330.0	9.2	330.0	200.0	ND
o-Xylene	ND	120.0	ND	240.0	110.0	2.5	110.0	70.0	ND
Styrene	ND	32.0	ND	76.0	34.0	ND	29.0	24.0	ND

Table 4-1

Subsurface Soil Gas Analytical Results
Landfills and Fill Areas
Parcels 78(6), 79(6), 80(6), 227(7), 126(7), 229(7), and 82(7)
Fort McClellan, Calhoun County, Alabama

Landfill or Fill Area	Landfill No. 1	Landfill No. 2	Landfill No. 3	Fill Area East of Reilly Airfield	Former Post Garbage Dump	Fill Area Northwest of Reilly Airfield		Stump Dump	Background
Sample Date	5/13/2003	6/2/2003	10/1/2003	6/2/2003	6/2/2003	5/13/2003	6/2/2003	6/2/2003	6/12/2003
Sample Location	LF1-78-GAS01	LF2-79-GAS01	OLF-80-GAS01	PPMP-227-GAS01	FTA-126-GAS01	PPMP-229-GAS01		FTA-82-GAS01	PPMP-227-GASBK
Sample ID	SH5001	SH5002R	SH5003	SH5005R	SH5006R	SH5007	SH5007R	SH5008	SH5009
Compound	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	ND	56.0	ND	120.0	54.0	ND	41.0	35.0	ND
1,2,4-Trimethylbenzene	ND	140.0	ND	320.0	140.0	ND	100.0	94.0	ND
1,3-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	ND	24.0	ND	65.0	26.0	ND	16.0	19.0	ND
alpha-Chlorotoluene	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	ND	3.4	ND	9.6	3.8	ND	ND	2.4	ND
1,2,4-Trichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	ND	ND	ND	ND	ND	ND	ND	ND	ND
Propylene	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Butadiene	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	ND	13.0	ND	54.0	23.0	5.3	53.0	20.0	ND
Carbon Disulfide	ND	15.0	40.0	ND	ND	ND	ND	ND	ND
2-Propanol	ND	8.3	ND	56.0	20.0	ND	120.0	5.8	ND
trans-1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Acetate	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone (Methyl Ethyl Ketone)	ND	23.0	ND	86.0	34.0	4.3	79.0	17.0	ND
Hexane	ND	57.0	ND	ND	ND	ND	ND	ND	ND
Tetrahydrofuran	ND	ND	ND	15.0	ND	ND	14.0	ND	ND
Cyclohexane	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dioxane	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone	ND	9.2	ND	34.0	13.0	ND	24.0	8.0	ND
2-Hexanone	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Ethyltoluene	ND	120.0	ND	270.0	120.0	ND	94.0	86.0	ND

Table 4-1

Subsurface Soil Gas Analytical Results
Landfills and Fill Areas
Parcels 78(6), 79(6), 80(6), 227(7), 126(7), 229(7), and 82(7)
Fort McClellan, Calhoun County, Alabama

Landfill or Fill Area	Landfill No. 1	Landfill No. 2	Landfill No. 3	Fill Area East of Reilly Airfield	Former Post Garbage Dump	Fill Area Northwest of Reilly Airfield		Stump Dump	Background
Sample Date	5/13/2003	6/2/2003	10/1/2003	6/2/2003	6/2/2003	5/13/2003	6/2/2003	6/2/2003	6/12/2003
Sample Location	LF1-78-GAS01	LF2-79-GAS01	OLF-80-GAS01	PPMP-227-GAS01	FTA-126-GAS01	PPMP-229-GAS01		FTA-82-GAS01	PPMP-227-GASBK
Sample ID	SH5001	SH5002R	SH5003	SH5005R	SH5006R	SH5007	SH5007R	SH5008	SH5009
Compound	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
Ethanol	ND	55.0	ND	360.0	100.0	57.0	1200.0	34.0	ND
Methyl tert-butyl ether	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptane	ND	28.0	ND	7.9	ND	ND	ND	ND	ND
Total VOCs	**0.0**	**1365.8**	**61.7**	**3184.7**	**1360.1**	**104.0**	**2618.6**	**815.4**	**0.0**

Analytical Notes
J - Estimated value.
ND - Nondetect.
ppbv - Parts per billion by volume.
E - Exceeds instrument calibration range.
S - Saturated Peak.
Q - Exceeds quality control limits.
U - Compound analyzed but not detected above the reporting limit.
UJ- Non-detected compound associated with low bias in the CCV.
N - The identification is based on presumptive evidence.
R - Resample.
BK - Background sample.
CCV - Continuing calibration verification.

from 5.7 to 40 ppbv and a total VOC concentration of 61.7 ppbv (Table 4-1). Structures and monitoring wells within the landfill, and up to 200 feet outside the perimeter of the landfill, were screened for methane (Figure 3-3). Methane was not detected in any of the screened structures or monitoring wells (Table 3-3).

4.4 Fill Area East of Reilly Airfield, Parcel 227(7)

The surface gas emissions screening at Parcel 227(7) did not indicate the presence of any VOCs along the perimeter or across the surface of the fill areas. Six interior and seven perimeter barholes were installed for the subsurface soil gas screening at Parcel 227(7). Barhole screening did not reveal the presence of methane in the soil. Subsurface soil gas sample PPMP-227-GAS01 was collected at the subsurface screening location (227-13) with the lowest oxygen concentration (Figure 3-4). The analytical results revealed 21 VOCs in the sample, with concentrations ranging from 2.0 to 680 ppbv and a total VOC concentration of 3,184.7 ppbv. An ambient air/background sample (PPMP-227-GASBK) was collected in a 6-liter summa canister at PPMP-227-GAS01. The analytical results of the ambient air/background sample were below detection limits (Table 4-1). Monitoring wells within the survey perimeter and up to 200 feet outside the perimeter of the fill area were screened for methane (Figure 3-4). Methane was not detected in any of the screened monitoring wells (Table 3-3).

4.5 Former Post Garbage Dump, Parcel 126(7)

The surface gas emissions screening at Parcel 126(7) did not indicate the presence of any VOCs along the perimeter or across the surface of the landfill. Four interior and five perimeter barholes were installed for the subsurface soil gas screening. Barhole screening did not reveal the presence of methane in the soil. A subsurface soil gas sample (FTA-126-GAS01) was collected at the subsurface screening location (126-2) with the lowest oxygen concentration (Figure 3-4). The analytical results revealed 19 VOCs in the sample, with concentrations ranging from 2.4 to 330 ppbv and a total VOC concentration of 1,360.1 ppbv (Table 4-1). Monitoring wells within the survey perimeter and up to 200 feet outside the perimeter of the dump were screened for methane (Figure 3-4). Methane was not detected in any of the screened monitoring wells (Table 3-3).

4.6 Fill Area Northwest of Reilly Airfield, Parcel 229(7)

The surface gas emissions screening at Parcel 229(7) did not indicate the presence of any VOCs along the perimeter or across the surface of the landfill. Six interior and seven perimeter barholes were installed for the subsurface soil gas screening. Barhole screening did not reveal the presence of methane in the soil. Subsurface soil gas sample PPMP-229-GAS01 was collected at the subsurface screening location (PPMP-229-12) with the lowest oxygen

concentration. Soil gas samples were collected from this sample location on May 13 and June 2, 2003 (Figure 3-5). The May analytical results revealed 9 VOCs in the sample, with concentrations ranging from 1.3 to 57.0 ppbv and a total VOC concentration of 104.0 ppbv. The June analytical results revealed 17 VOCs in the sample, with concentrations ranging from 3.3 to 1,220 ppbv and a total VOC concentration of 2,618.6 ppbv (Table 4-1). The initial sample was collected from saturated soil; therefore, an additional sample was collected at a later date when soil conditions were unsaturated. This accounts for the difference in VOC concentrations. Monitoring wells within the survey perimeter and up to 200 feet outside the perimeter of the fill area were screened for methane (Figure 3-5). Methane was not detected in any of the screened monitoring wells (Table 3-3).

4.7 Stump Dump, Parcel 82(7)

The surface gas emissions screening at Parcel 82(7) did not indicate the presence of any VOCs along the perimeter or across the surface of the landfill. Thirteen interior and eleven perimeter barholes were installed for the subsurface soil gas screening. Barhole screening revealed a trace detection (4.0×10^6 ppbv) of methane at one subsurface soil gas screening location (I-13), from which subsurface soil gas sample FTA-82-GAS01 was collected (Figure 3-6). The analytical results revealed concentrations of 21 VOCs, with concentrations ranging from 0.9 to 200.0 ppbv and a total VOC concentration of 815.4 ppbv (Table 4-1). Monitoring wells up to 200 feet outside the perimeter of Parcel 82(7) were screened for methane (Figure 3-6). Methane was not detected in any of the screened monitoring wells (Table 3-3).

5.0 Summary and Conclusions

The landfills and fill areas investigated ranged from 15 years to over 50 years in age. Because the landfills and fill areas contained "moderately decomposable" wastes (e.g., paper, textiles, and wood) methane gas generation would be steadily declining over time. Methane gas production peaks within six years after initial waste placement (EPA, 1991). The following section briefly summarizes the results of the investigations and presents the conclusions.

Landfill No. 1, Parcel 78(6). The results of the surface emissions screening and subsurface soil gas screening did not reveal the presence of methane gas at Landfill No. 1. Based on the age of the landfill (56 years) and the absence of methane, additional landfill gas investigation is not warranted.

Landfill No. 2, Parcel 79(6). The results of the surface emissions screening and subsurface soil gas screening did not reveal the presence of methane gas at Landfill No. 2. Based on the age of the landfill (34 years) and the absence of methane, additional landfill gas investigation is not warranted.

Landfill No. 3, Parcel 80(6). Although the results of the subsurface soil screening indicated the potential for finding methane gas, methane was detected in only one of 55 subsurface soil gas screening locations at a concentration (1.7×10^7 ppbv) well below the lower explosive limit (5.0×10^7 ppbv). Based on the age of the landfill (36 years) and the absence of significant methane, additional landfill gas investigation is not warranted.

Fill Area East of Reilly Airfield, Parcel, 227(7). The results of the surface emissions screening and subsurface soil gas screening did not reveal the presence of methane gas at Parcel 227(7). Based on the likely age of waste within the fill area (estimated at 40 years) and the absence of methane, additional landfill gas investigation is not warranted.

Former Post Garbage Dump, Parcel 126(7). The results of the surface emissions screening and subsurface soil gas screening did not reveal the presence of methane gas at Parcel 126(7). Based on the likely age of waste within the fill area (estimated at 40 years) and the absence of methane, additional landfill gas investigation is not warranted.

Fill Area Northwest of Reilly Airfield, Parcel 229(7). The results of the surface emissions screening and subsurface soil gas screening did not reveal the presence of methane gas at Parcel

229(7). Based on the likely age of waste within the fill area (estimated at 40 to 49 years) and the absence of methane, additional landfill gas investigation is not warranted.

Stump Dump, Parcel 82(7). Although the results of the subsurface soil screening indicated the potential for finding methane gas, methane was detected in only one of 24 subsurface soil gas screening locations at a concentration (4.0×10^6 ppbv) well below the lower explosive limit (5.0×10^7 ppbv). Based on the age of the fill area (15 years) and the absence of significant methane, additional landfill gas investigation is not warranted.

6.0 References

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ATTACHMENT 1

LIST OF ABBREVIATIONS AND ACRONYMS

List of Abbreviations and Acronyms

2,4-D	2,4-dichlorophenoxyacetic acid
2,4,5-T	2,4,5-trichlorophenoxyacetic acid
2,4,5-TP	2,4,5-trichlorophenoxypropionic acid
3D	3D International Environmental Group
AB	ambient blank
AbB3	Anniston gravelly clay loam, 2 to 6 percent slopes, severely eroded
AbC3	Anniston gravelly clay loam, 6 to 10 percent slopes, severely eroded
AbD3	Anniston and Allen gravelly clay loams, 10 to 15 percent slopes, eroded
Abs	skin absorption
ABS	dermal absorption factor
AC	hydrogen cyanide
ACAD	AutoCadd
AcB2	Anniston and Allen gravelly loams, 2 to 6 percent slopes, eroded
AcC2	Anniston and Allen gravelly loams, 6 to 10 percent slopes, eroded
AcD2	Anniston and Allen gravelly loams, 10 to 15 percent slopes, eroded
AcE2	Anniston and Allen gravelly loams, 15 to 25 percent slopes, eroded
ACGIH	American Conference of Governmental Industrial Hygienists
AdE	Anniston and Allen stony loam, 10 to 25 percent slope
ADEM	Alabama Department of Environmental Management
ADPH	Alabama Department of Public Health
AEC	U.S. Army Environmental Center
AEDA	ammunition, explosives, and other dangerous articles
AEL	airborne exposure limit
AET	adverse effect threshold
AF	soil-to-skin adherence factor
AHA	ammunition holding area
AL	Alabama
ALARNG	Alabama Army National Guard
ALAD	δ-aminolevulinic acid dehydratase
ALDOT	Alabama Department of Transportation
amb.	amber
amsl	above mean sea level
ANAD	Anniston Army Depot
AOC	area of concern
AP	armor piercing
APEC	areas of potential ecological concern
APT	armor-piercing tracer
AR	analysis request
ARAR	applicable or relevant and appropriate requirement
AREE	area requiring environmental evaluation
AS/SVE	air sparging/soil vapor extraction
ASP	Ammunition Supply Point
ASR	Archives Search Report
AST	aboveground storage tank
ASTM	American Society for Testing and Materials
AT	averaging time
ATSDR	Agency for Toxic Substances and Disease Registry
ATV	all-terrain vehicle
AUF	area use factor
AWARE	Associated Water and Air Resources Engineers, Inc.
AWQC	ambient water quality criteria
AWWSB	Anniston Water Works and Sewer Board
'B'	Analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero)
BCF	blank correction factor; bioconcentration factor
BCT	BRAC Cleanup Team
BERA	baseline ecological risk assessment
BEHP	bis(2-ethylhexyl)phthalate
BFB	bromofluorobenzene
BFE	base flood elevation
BG	Bacillus globigii
BGR	Bains Gap Road
bgs	below ground surface
BHC	hexachlorocyclohexane
BHHRA	baseline human health risk assessment
BIRTC	Branch Immaterial Replacement Training Center
bkg	background
bls	below land surface
BOD	biological oxygen demand
Bp	soil-to-plant biotransfer factors
BRAC	Base Realignment and Closure
Braun	Braun Intertec Corporation
BSAF	biota-to-sediment accumulation factors
BSC	background screening criterion
BTAG	Biological Technical Assistance Group
BTEX	benzene, toluene, ethyl benzene, and xylenes
BTOC	below top of casing
BTV	background threshold value
BW	biological warfare; body weight
BZ	breathing zone; 3-quinuclidinyl benzilate
C	ceiling limit value
Ca	carcinogen
$CaCO_3$	calcium carbonate
CAA	Clean Air Act
CAB	chemical warfare agent breakdown products
CACM	Chemical Agent Contaminated Media
CAMU	corrective action management unit
CBR	chemical, biological, and radiological
CCAL	continuing calibration
CCB	continuing calibration blank
CCV	continuing calibration verification
CD	compact disc
CDTF	Chemical Defense Training Facility
CEHNC	U.S. Army Engineering and Support Center, Huntsville
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERFA	Community Environmental Response Facilitation Act
CESAS	Corps of Engineers South Atlantic Savannah
CF	conversion factor
CFC	chlorofluorocarbon
CFDP	Center for Domestic Preparedness
CFR	Code of Federal Regulations
CG	phosgene (carbonyl chloride)
CGI	combustible gas indicator
ch	inorganic clays of high plasticity
CHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
CIH	Certified Industrial Hygienist
CK	cyanogen chloride
cl	inorganic clays of low to medium plasticity
Cl	chlorinated
CLP	Contract Laboratory Program
cm	centimeter
CN	chloroacetophenone
CNB	chloroacetophenone, benzene, and carbon tetrachloride
CNS	chloroacetophenone, chloropicrin, and chloroform
CO	carbon monoxide
CO_2	carbon dioxide
Co-60	cobalt-60
CoA	Code of Alabama
COC	chain of custody; chemical of concern
COE	Corps of Engineers
Con	skin or eye contact
COPC	chemical of potential concern
COPEC	constituent of potential ecological concern
CPSS	chemicals present in site samples
CQCSM	Contract Quality Control System Manager
CRDL	contract-required detection limit
CRL	certified reporting limit
CRQL	contract-required quantitation limit
CRZ	contamination reduction zone
Cs-137	cesium-137
CS	ortho-chlorobenzylidene-malononitrile
CSEM	conceptual site exposure model
CSM	conceptual site model
CT	central tendency
ctr.	container
CWA	chemical warfare agent; Clean Water Act
CWM	chemical warfare material; clear, wide mouth
CX	dichloroformoxime
'D'	duplicate; dilution
D&I	detection and identification
DAAMS	depot area agent monitoring station
DAF	dilution-attenuation factor
DANC	decontamination agent, non-corrosive
°C	degrees Celsius

List of Abbreviations and Acronyms *(Continued)*

°F	degrees Fahrenheit
DCA	dichloroethane
DCE	dichloroethene
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethene
DDT	dichlorodiphenyltrichloroethane
DEH	Directorate of Engineering and Housing
DEP	depositional soil
DFTPP	decafluorotriphenylphosphine
DI	deionized
DID	data item description
DIMP	di-isopropylmethylphosphonate
DM	dry matter; adamsite
DMBA	dimethylbenz(a)anthracene
DMMP	dimethylmethylphosphonate
DO	dissolved oxygen
DOD	U.S. Department of Defense
DOJ	U.S. Department of Justice
DOT	U.S. Department of Transportation
DP	direct-push
DPDO	Defense Property Disposal Office
DPT	direct-push technology
DQO	data quality objective
DRMO	Defense Reutilization and Marketing Office
DRO	diesel range organics
DS	deep (subsurface) soil
DS2	Decontamination Solution Number 2
DSERTS	Defense Site Environmental Restoration Tracking System
DWEL	drinking water equivalent level
E&E	Ecology and Environment, Inc.
EB	equipment blank
EBS	environmental baseline survey
EC_{50}	effects concentration for 50 percent of a population
ECBC	Edgewood Chemical Biological Center
ED	exposure duration
EDD	electronic data deliverable
EF	exposure frequency
EDQL	ecological data quality level
EE/CA	engineering evaluation and cost analysis
Elev.	elevation
EM	electromagnetic
EMI	Environmental Management Inc.
EM31	Geonics Limited EM31 Terrain Conductivity Meter
EM61	Geonics Limited EM61 High-Resolution Metal Detector
EOD	explosive ordnance disposal
EODT	explosive ordnance disposal team
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
EPIC	Environmental Photographic Interpretation Center
EPRI	Electrical Power Research Institute
ER	equipment rinsate
ERA	ecological risk assessment
ER-L	effects range-low
ER-M	effects range-medium
ESE	Environmental Science and Engineering, Inc.
ESMP	Endangered Species Management Plan
ESN	Environmental Services Network, Inc.
ESV	ecological screening value
ET	exposure time
EU	exposure unit
Exp.	explosives
E-W	east to west
EZ	exclusion zone
FAR	Federal Acquisition Regulations
FB	field blank
FD	field duplicate
FDC	Former Decontamination Complex
FDA	U.S. Food and Drug Administration
Fe^{+3}	ferric iron
Fe^{+2}	ferrous iron
FedEx	Federal Express, Inc.
FEMA	Federal Emergency Management Agency
FFCA	Federal Facilities Compliance Act
FFE	field flame expedient
FFS	focused feasibility study
FI	fraction of exposure
Fil	filtered
Flt	filtered
FMDC	Fort McClellan Development Commission
FML	flexible membrane liner
f_{oc}	fraction organic carbon
FOMRA	Former Ordnance Motor Repair Area
FOST	Finding of Suitability to Transfer
Foster Wheeler	Foster Wheeler Environmental Corporation
FR	Federal Register
Frtn	fraction
FS	field split; feasibility study
FSP	field sampling plan
ft	feet
ft/day	feet per day
ft/ft	feet per foot
ft/yr	feet per year
FTA	Fire Training Area
FTMC	Fort McClellan
FTRRA	FTMC Reuse & Redevelopment Authority
g	gram
g/m^3	gram per cubic meter
G-856	Geometrics, Inc. G-856 magnetometer
G-858G	Geometrics, Inc. G-858G magnetic gradiometer
GAF	gastrointestinal absorption factor
gal	gallon
gal/min	gallons per minute
GB	sarin (isopropyl methylphosphonofluoridate)
gc	clay gravels; gravel-sand-clay mixtures
GC	gas chromatograph
GCL	geosynthetic clay liner
GC/MS	gas chromatograph/mass spectrometer
GCR	geosynthetic clay liner
GFAA	graphite furnace atomic absorption
GIS	Geographic Information System
gm	silty gravels; gravel-sand-silt mixtures
gp	poorly graded gravels; gravel-sand mixtures
gpm	gallons per minute
GPR	ground-penetrating radar
GPS	global positioning system
GRA	general response action
GS	ground scar
GSA	General Services Administration; Geologic Survey of Alabama
GSBP	Ground Scar Boiler Plant
GSSI	Geophysical Survey Systems, Inc.
GST	ground stain
GW	groundwater
gw	well-graded gravels; gravel-sand mixtures
H&S	health and safety
HA	hand auger
HC	mixture of hexachloroethane, aluminum powder, and zinc oxide (smoke producer)
HCl	hydrochloric acid
HD	distilled mustard (bis-[dichloroethyl]sulfide)
HDPE	high-density polyethylene
HE	high explosive
HEAST	Health Effects Assessment Summary Tables
Herb.	herbicides
HHRA	human health risk assessment
HI	hazard index
H_2O_2	hydrogen peroxide
HPLC	high-performance liquid chromatography
HNO_3	nitric acid
HQ	hazard quotient
HQ_{screen}	screening-level hazard quotient
hr	hour
HRC	hydrogen releasing compound
HSA	hollow-stem auger
HTRW	hazardous, toxic, and radioactive waste
'I'	out of control, data rejected due to low recovery

IASPOW	Impact Area South of POW Training Facility
IATA	International Air Transport Authority
ICAL	initial calibration
ICB	initial calibration blank
ICP	inductively-coupled plasma
ICRP	International Commission on Radiological Protection
ICS	interference check sample
ID	inside diameter
IDL	instrument detection limit
IDLH	immediately dangerous to life or health
IDM	investigative-derived media
IDW	investigation-derived waste
IEUBK	Integrated Exposure Uptake Biokinetic
IF	ingestion factor; inhalation factor
ILCR	incremental lifetime cancer risk
IMPA	isopropylmethyl phosphonic acid
IMR	Iron Mountain Road
in.	inch
Ing	ingestion
Inh	inhalation
IP	ionization potential
IPS	International Pipe Standard
IR	ingestion rate
IRDMIS	Installation Restoration Data Management Information System
IRIS	Integrated Risk Information Service
IRP	Installation Restoration Program
IS	internal standard
ISCP	Installation Spill Contingency Plan
IT	IT Corporation
ITEMS	IT Environmental Management System™
'J'	estimated concentration
JeB2	Jefferson gravelly fine sandy loam, 2 to 6 percent slopes, eroded
JeC2	Jefferson gravelly fine sandy loam, 6 to 10 percent slopes, eroded
JfB	Jefferson stony fine sandy loam, 0 to 10 percent slopes have strong slopes
JPA	Joint Powers Authority
K	conductivity
K_d	soil-water distribution coefficient
kg	kilogram
KeV	kilo electron volt
K_{oc}	organic carbon partioning coefficient
K_{ow}	octonal-water partition coefficient
$KMnO_4$	potassium permanganate
L	liter; Lewisite (dichloro-[2-chloroethyl]sulfide)
L/kg/day	liters per kilogram per day
l	liter
LAW	light anti-tank weapon
lb	pound
LBP	lead-based paint
LC	liquid chromatography
LCS	laboratory control sample
LC_{50}	lethal concentration for 50 percent population tested
LD_{50}	lethal dose for 50 percent population tested
LEL	lower explosive limit
LOAEL	lowest-observed-advserse-effects-level
LRA	land redevelopment authority
LT	less than the certified reporting limit
LUC	land-use control
LUCAP	land-use control assurance plan
LUCIP	land-use control implementation plan
max	maximum
MB	method blank
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
MCPA	4-chloro-2-methylphenoxyacetic acid
MCPP	2-(2-methyl-4-chlorophenoxy)propionic acid
MCS	media cleanup standard
MD	matrix duplicate
MDC	maximum detected concentration
MDCC	maximum detected constituent concentration
MDL	method detection limit
mg	milligrams
mg/kg	milligrams per kilogram
mg/kg/day	milligram per kilogram per day
mg/kgbw/day	milligrams per kilogram of body weight per day
mg/L	milligrams per liter
mg/m^3	milligrams per cubic meter
mh	inorganic silts, micaceous or diatomaceous fine, sandy or silt soils
MHz	megahertz
µg/g	micrograms per gram
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
µmhos/cm	micromhos per centimeter
MeV	mega electron volt
min	minimum
MINICAMS	miniature continuous air monitoring system
ml	inorganic silts and very fine sands
mL	milliliter
mm	millimeter
MM	mounded material
MMBtu/hr	million Btu per hour
MNA	monitored natural attenuation
MnO_4-	permanganate ion
MOA	Memorandum of Agreement
MOGAS	motor vehicle gasoline
MOUT	Military Operations in Urban Terrain
MP	Military Police
MPA	methyl phosphonic acid
MPM	most probable munition
MQL	method quantitation limit
MR	molasses residue
MRL	method reporting limit
MS	matrix spike
mS/cm	millisiemens per centimeter
mS/m	millisiemens per meter
MSD	matrix spike duplicate
MTBE	methyl tertiary butyl ether
msl	mean sea level
MtD3	Montevallo shaly, silty clay loam, 10 to 40 percent slopes , severely eroded
mV	millivolts
MW	monitoring well
MWI&MP	Monitoring Well Installation and Management Plan
Na	sodium
NA	not applicable; not available
NAD	North American Datum
NAD83	North American Datum of 1983
$NaMnO_4$	sodium permanganate
NAVD88	North American Vertical Datum of 1988
NAS	National Academy of Sciences
NCEA	National Center for Environmental Assessment
NCP	National Contingency Plan
NCRP	National Council on Radiation Protection and Measurements
ND	not detected
NE	no evidence; northeast
ne	not evaluated
NEW	net explosive weight
NFA	No Further Action
NG	National Guard
NGP	National Guardsperson
ng/L	nanograms per liter
NGVD	National Geodetic Vertical Datum
Ni	nickel
NIC	notice of intended change
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards and Technology
NLM	National Library of Medicine
NO_3^-	nitrate
NPDES	National Pollutant Discharge Elimination System
NPW	net present worth
No.	number
NOAA	National Oceanic and Atmospheric Administration
NOAEL	no-observed-adverse-effects-level
NR	not requested; not recorded; no risk
NRC	National Research Council
NRCC	National Research Council of Canada

List of Abbreviations and Acronyms *(Continued)*

NRHP	National Register of Historic Places
NRT	near real time
ns	nanosecond
N-S	north to south
NS	not surveyed
NSA	New South Associates, Inc.
nT	nanotesla
nT/m	nanoteslas per meter
NTU	nephelometric turbidity unit
nv	not validated
O_2	oxygen
O_3	ozone
O&G	oil and grease
O&M	operation and maintenance
OB/OD	open burning/open detonation
OD	outside diameter
OE	ordnance and explosives
oh	organic clays of medium to high plasticity
OH•	hydroxyl radical
ol	organic silts and organic silty clays of low plasticity
OP	organophosphorus
ORC	Oxygen Releasing Compound
ORP	oxidation-reduction potential
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
OVM-PID/FID	organic vapor meter-photoionization detector/flame ionization detector
OWS	oil/water separator
oz	ounce
PA	preliminary assessment
PAH	polynuclear aromatic hydrocarbon
PARCCS	precision, accuracy, representativeness, comparability, completeness, and sensitivity
Parsons	Parsons Engineering Science, Inc.
Pb	lead
PBMS	performance-based measurement system
PC	permeability coefficient
PCB	polychlorinated biphenyl
PCDD	polychlorinated dibenzo-p-dioxins
PCDF	polychlorinated dibenzofurans
PCE	perchloroethene
PCP	pentachlorophenol
PDS	Personnel Decontamination Station
PEF	particulate emission factor
PEL	permissible exposure limit
PERA	preliminary ecological risk assessment
PES	potential explosive site
Pest.	pesticides
PETN	pentaerythritoltetranitrate
PFT	portable flamethrower
PG	professional geologist
PID	photoionization detector
PkA	Philo and Stendal soils local alluvium, 0 to 2 percent slopes
PM	project manager
POC	point of contact
POL	petroleum, oils, and lubricants
POTW	publicly owned treatment works
POW	prisoner of war
PP	peristaltic pump; Proposed Plan
ppb	parts per billion
ppbv	parts per billion by volume
PPE	personal protective equipment
ppm	parts per million
PPMP	Print Plant Motor Pool
ppt	parts per thousand
PR	potential risk
PRA	preliminary risk assessment
PRG	preliminary remediation goal
PS	chloropicrin
PSSC	potential site-specific chemical
pt	peat or other highly organic silts
PVC	polyvinyl chloride
QA	quality assurance
QA/QC	quality assurance/quality control
QAM	quality assurance manual
QAO	quality assurance officer
QAP	installation-wide quality assurance plan
QC	quality control
QST	QST Environmental, Inc.
qty	quantity
Qual	qualifier
R	rejected data; resample; retardation factor
R&A	relevant and appropriate
RA	remedial action
RAO	remedial action objective
RBC	risk-based concentration; red blood cell
RCRA	Resource Conservation and Recovery Act
RCWM	Recovered Chemical Warfare Material
RD	remedial design
RDX	cyclotrimethylenetrinitramine
ReB3	Rarden silty clay loams
REG	regular field sample
REL	recommended exposure limit
RFA	request for analysis
RfC	reference concentration
RfD	reference dose
RGO	remedial goal option
RI	remedial investigation
RL	reporting limit
RME	reasonable maximum exposure
ROD	Record of Decision
RPD	relative percent difference
RR	Range residue
RRF	relative response factor
RSD	relative standard deviation
RTC	Recruiting Training Center
RTECS	Registry of Toxic Effects of Chemical Substances
RTK	real-time kinematic
RWIMR	Ranges West of Iron Mountain Road
SA	exposed skin surface area
SAD	South Atlantic Division
SAE	Society of Automotive Engineers
SAIC	Science Applications International Corporation
SAP	installation-wide sampling and analysis plan
SARA	Superfund Amendments and Reauthorization Act
sc	clayey sands; sand-clay mixtures
Sch.	schedule
SCM	site conceptual model
SD	sediment
SDG	sample delivery group
SDWA	Safe Drinking Water Act
SDZ	safe distance zone; surface danger zone
SEMS	Southern Environmental Management & Specialties, Inc.
SF	cancer slope factor
SFSP	site-specific field sampling plan
SGF	standard grade fuels
Shaw	Shaw Environmental, Inc.
SHP	installation-wide safety and health plan
SI	site investigation
SINA	Special Interest Natural Area
SL	standing liquid
SLERA	screening-level ecological risk assessment
sm	silty sands; sand-silt mixtures
SM	Serratia marcescens
SMDP	Scientific Management Decision Point
s/n	signal-to-noise ratio
SO_4^{-2}	sulfate
SOD	soil oxidant demand
SOP	standard operating procedure
SOPQAM	U.S. EPA's *Standard Operating Procedure/Quality Assurance Manual*
sp	poorly graded sands; gravelly sands
SP	submersible pump
SPCC	system performance calibration compound
SPCS	State Plane Coordinate System
SPM	sample planning module

List of Abbreviations and Acronyms *(Continued)*

SQRT	screening quick reference tables
Sr-90	strontium-90
SRA	streamlined human health risk assessment
SRM	standard reference material
Ss	stony rough land, sandstone series
SS	surface soil
SSC	site-specific chemical
SSHO	site safety and health officer
SSHP	site-specific safety and health plan
SSL	soil screening level
SSSL	site-specific screening level
SSSSL	site-specific soil screening level
STB	supertropical bleach
STC	source-term concentration
STD	standard deviation
STEL	short-term exposure limit
STL	Severn-Trent Laboratories
STOLS	Surface Towed Ordnance Locator System®
Std. units	standard units
SU	standard unit
SUXOS	senior UXO supervisor
SVOC	semivolatile organic compound
SW	surface water
SW-846	U.S. EPA's *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*
SWMU	solid waste management unit
SWPP	storm water pollution prevention plan
SZ	support zone
TAL	target analyte list
TAT	turn around time
TB	trip blank
TBC	to be considered
TCA	trichloroethane
TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
TCDF	tetrachlorodibenzofurans
TCE	trichloroethene
TCL	target compound list
TCLP	toxicity characteristic leaching procedure
TDEC	Tennessee Department of Environment and Conservation
TDGCL	thiodiglycol
TDGCLA	thiodiglycol chloroacetic acid
TEA	triethylaluminum
Tetryl	trinitrophenylmethylnitramine
TERC	Total Environmental Restoration Contract
THI	target hazard index
TIC	tentatively identified compound
TLV	threshold limit value
TN	Tennessee
TNT	trinitrotoluene
TOC	top of casing; total organic carbon
TPH	total petroleum hydrocarbons
TR	target cancer risk
TRADOC	U.S. Army Training and Doctrine Command
TRPH	total recoverable petroleum hydrocarbons
TSCA	Toxic Substances Control Act
TSDF	treatment, storage, and disposal facility
TWA	time-weighted average
UCL	upper confidence limit
UCR	upper certified range
'U'	not detected above reporting limit
UIC	underground injection control
UF	uncertainty factor
USACE	U.S. Army Corps of Engineers
USACHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
USAEC	U.S. Army Environmental Center
USAEHA	U.S. Army Environmental Hygiene Agency
USACMLS	U.S. Army Chemical School
USAMPS	U.S. Army Military Police School
USATCES	U.S. Army Technical Center for Explosive Safety
USATEU	U.S. Army Technical Escort Unit
USATHAMA	U.S. Army Toxic and Hazardous Material Agency
USC	United States Code
USCS	Unified Soil Classification System
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	underground storage tank
UTL	upper tolerance level; upper tolerance limit
UXO	unexploded ordnance
UXOQCS	UXO Quality Control Supervisor
UXOSO	UXO safety officer
V	vanadium
VC	vinyl chloride
VOA	volatile organic analyte
VOC	volatile organic compound
VOH	volatile organic hydrocarbon
VQlfr	validation qualifier
VQual	validation qualifier
VX	nerve agent (O-ethyl-S-[diisopropylaminoethyl]-methylphosphonothiolate)
WAC	Women's Army Corps
Weston	Roy F. Weston, Inc.
WP	installation-wide work plan
WRS	Wilcoxon rank sum
WS	watershed
WSA	Watershed Screening Assessment
WWI	World War I
WWII	World War II
XRF	x-ray fluorescence
yd^3	cubic yards