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DRAFT FINAL INSTALLATION RESTORATION PROGRAM STAGE 1 WEAPONS STORAGE AREA SITE WSA-1 NAS FORT WORTH TX

10/1/1988

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NAVAL AIR STATION
FORT WORTH JRB
CARSWELL FIELD
TEXAS

ADMINISTRATIVE RECORD
COVER SHEET

AR File Number 27

File: 17A-1
D.B.

27

INSTALLATION RESTORATION PROGRAM
STAGE 1

CARSWELL AFB, TEXAS

RADIAN CORPORATION
8501 MO-PAC BOULEVARD
P. O. BOX 201088
AUSTIN, TEXAS 78720-1088

OCTOBER 1988

DRAFT REPORT
WEAPONS STORAGE AREA SITE WSA-1

PREPARED FOR:

HEADQUARTERS STRATEGIC AIR COMMAND
(HQ SAC/DE)
OFFUTT AIR FORCE BASE, NEBRASKA 68113-5001

UNITED STATES AIR FORCE
OCCUPATIONAL & ENVIRONMENTAL HEALTH LABORATORY
TECHNICAL SERVICES DIVISION (USAFOEHL/TS)
BROOKS AIR FORCE BASE, TEXAS 78235-5501

RADIAN CORPORATION

- D R A F T -

INSTALLATION RESTORATION PROGRAM

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FOR

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HEADQUARTERS STRATEGIC AIR COMMAND
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USAF CONTRACT NO. F33615-84-D-4402, DELIVERY ORDER NO. 0006/02
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EXECUTIVE SUMMARY

Background

Carswell Air Force Base (AFB) is located in north-central Texas in Tarrant County, six miles west of downtown Fort Worth. The base operates the Weapons Storage Area (WSA) facility five miles west of the base on White Settlement Road. In December, 1987, the Texas Water Commission (TWC) was notified that a release of fuel oil had occurred at a 1000-gallon underground storage tank near Building 8514 at the WSA. Persuant to Section 26.351 of the Texas Water Code, the TWC requested Carswell AFB to supply information regarding the possible release of fuel oil and data regarding the nature and extent of contamination, if any. On 24 July 1988, Radian Corporation was authorized by the U.S. Air Force Occupational and Environmental Health Laboratory (USAFOEHL) to perform a subsurface investigation of the underground storage tank area to determine the nature and extent of fuel oil contamination (if any). The investigation was conducted under USAF Contract Nos. F33615-87-D-4023/0004/03 and F33615-84-D-4402/0006/02.

Scope of Work

The field investigation consisted of the drilling of 10 shallow boreholes, collection of soil and rock samples, and surveying of the locations. The soil and rock samples were submitted for chemical analysis of petroleum hydrocarbons and volatile organic compounds. The results of these laboratory tests were reported to USAFOEHL in an Informal Technical Information Report (Radian, 1988).

Findings

The underground storage tank is in an excavation approximately 7 to 8 feet deep and backfilled with a sandy silt material. Surface drainage at the tank is to the north, leading toward an unnamed tributary of Live Oak Creek. Drilling at the WSA-1 site revealed a thin zone of clayey soil

underlain by dense, fossiliferous limestone. Ten boreholes were drilled to a maximum depth of ten feet below the land surface. Ground water was not encountered in the investigation. It is estimated that ground water occurs at depths of 50 to 60 feet below land surface based on the elevation of Live Oak Creek and its tributary which border the WSA.

Results of chemical analyses of soil indicate that petroleum hydrocarbons occur in the backfill material, but not extending under or away from the excavation itself. Petroleum hydrocarbons reached a maximum of 1,300 $\mu g/g$ in the excavation itself, at the center and base of the excavation (in sample 9B). Volatile organic compounds were detected in two soil samples from the backfill material. The compounds consisted of 1,1,2,2 tetrachloroethane, 4-methyl-2-pentanone, methyl ethyl ketone, xylene, and methylene chloride.

Based on the observation of dense fossiliferous limestone, lack of ground water, and limited occurrence of petroleum hydrocarbons in the backfill, the extent of petroleum hydrocarbon contamination appears to be limited to the backfill material and the excavation itself. There was no evidence to indicate migration of petroleum hydrocarbon compounds at the surface or in subsurface materials. Based on the observation of the texture, lithology, and relative permeabilities of materials, it would be difficult for hydrocarbon contaminants to migrate away from the relatively permeable backfill material in the absence of ground water or a significant hydraulic head contrast between the backfill and surrounding soil.

Recommendation

Since the extent of petroleum hydrocarbon contamination is limited to the backfill of the underground storage tank and does not occur in limestone strata surrounding the area, the following recommendation would appear to be a prudent action. The tank should be removed and all backfill material excavated and replaced by clean backfill. During excavation operations, observations of the base of the pit should be made for possible occurrence of ground water. In addition, sampling and analysis of soil at the base of the

pit and at the west side of the pit wall near the concrete pad should be conducted to verify that all material with petroleum hydrocarbons has been removed.

1.0 INTRODUCTION

Carswell Air Force Base (AFB) is located in north-central Texas in Tarrant County, six miles west of downtown Fort Worth. The base operates the Weapons Storage Area (WSA) facility five miles west of the base on White Settlement Road (Figure 1-1). In December, 1987, the Texas Water Commission (TWC) was notified that a release of fuel oil had occurred at a 1000-gallon underground storage tank near Building 8514 at the WSA. Figure 1-2 illustrates the features of the WSA, with the underground tank near Building 8514 designated as the WSA-1 site by the U.S. Air Force.

Persuant to Section 26.351 of the Texas Water Code, the TWC requested Carswell AFB to supply information regarding the possible release of fuel oil and data regarding the nature and extent of contamination, if any. On 24 July 1988, Radian Corporation was authorized by the U.S. Air Force Occupational and Environmental Health Laboratory (USAFOEHL) to perform a subsurface investigation of the underground storage tank area to determine the nature and extent of fuel oil contamination (if any). The investigation was conducted under USAF Contract Nos. F33615-87-D-4023/0004/03 and F33615-84-D-4402/0006/02.

The field investigation consisted of the drilling of 10 shallow boreholes, collection of soil and rock samples, and surveying of the locations. The soil and rock samples were submitted for chemical analysis of petroleum hydrocarbons and volatile organic compounds. The results of these laboratory tests were reported to USAFOEHL in an Informal Technical Information Report (Radian, 1988). This document reports the findings and conclusions of the WSA-1 investigation.

1.1 Scope of Work

The scope of work authorized by USAFOEHL included the following activities:

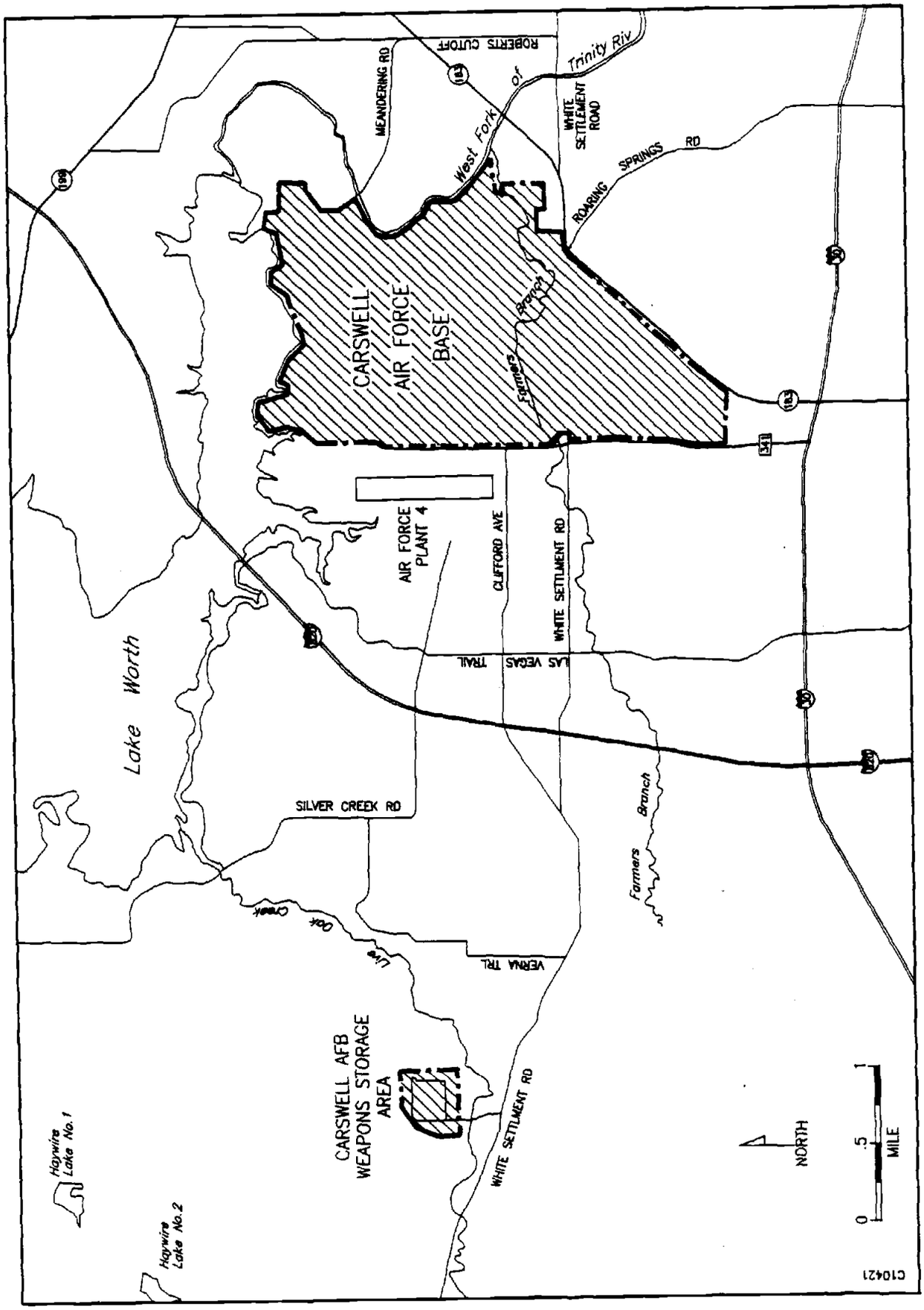

Figure 1-1. Location of Carswell AFB and the Weapons Storage Area, Fort Worth Area, Texas

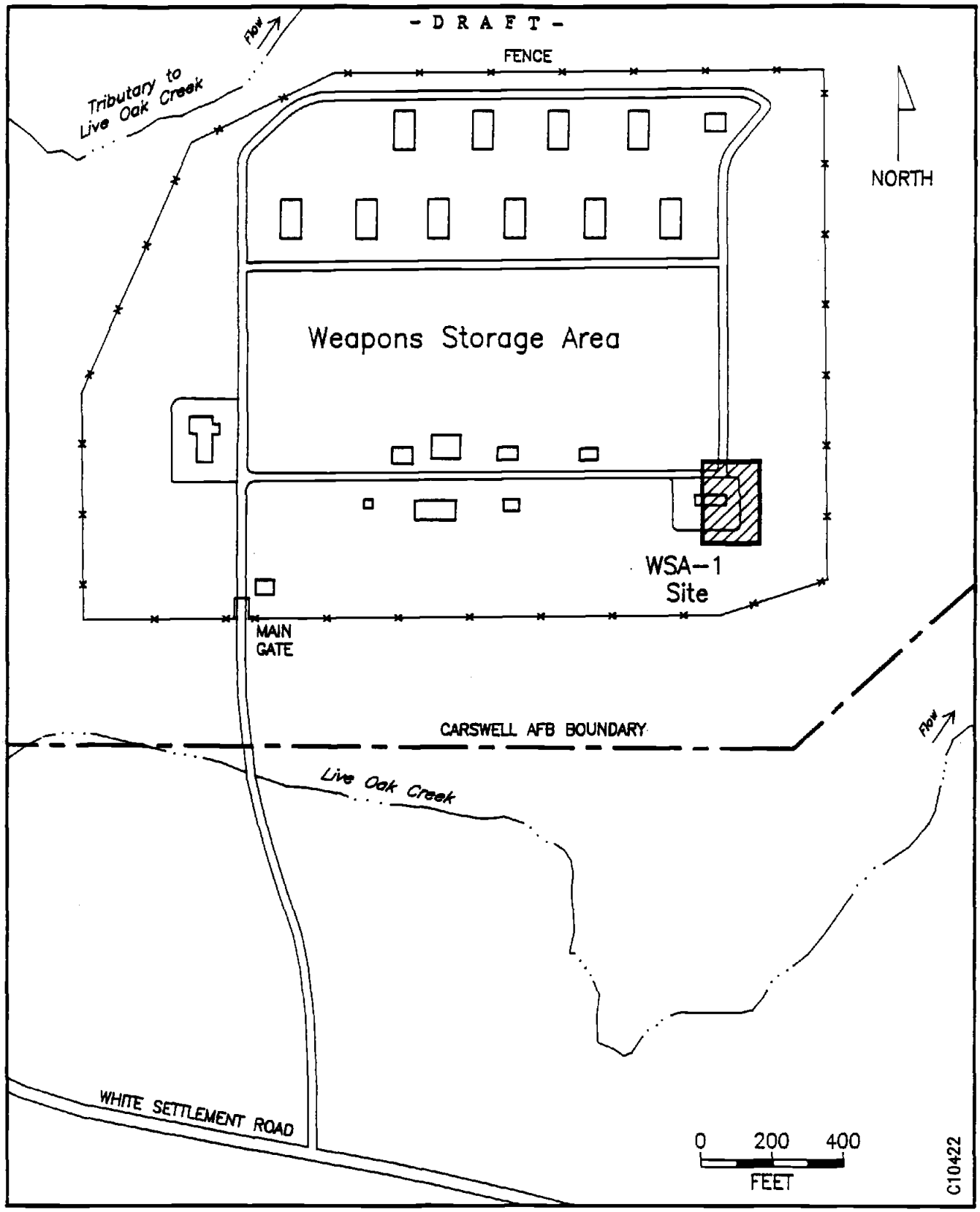

Figure 1-2. Location of WSA-1 Site at Weapons Storage Area, Carswell AFB, Texas

- Drilling at 10 locations in the vicinity of the tank using hollow-stem augering and rock coring techniques.

- Collection of soil and rock samples from the boreholes and analysis of selected samples for total petroleum hydrocarbons (EPA 418.1) and volatile organic compounds (SW 8240).

- Ground-water samples were authorized to be collected and analyzed, but no ground water was encountered during drilling.

- Surveying of all drilling locations for elevation and Texas State Plane coordinates.

1.2 Report Organization

Section 2 describes the main regional and local hydrogeologic features, based primarily on work performed for the Installation Restoration Program (IRP) at the WSA. The field and analytical techniques are described in Section 3. Section 4 contains the results and significance of findings and Section 5 provides QA/QC results. Conclusions and recommendations are provided in Section 6. The appendices contain various supporting information. Appendix A has the logs of drilling operations, Appendix B has chemical analytical data sheets, and Appendix C has the QA/QC data.

2.0 HYDROGEOLOGIC SETTING

This section contains summary descriptions of the main geologic and hydrologic features of the Weapons Storage Area at Carswell AFB.

2.1 Soils

The surface soils at the WSA have been identified as Brackett clay loam and Sanger-Urban land complex by the U.S.D.A. Soil Conservation Service (1981). The Brackett soil typically consists of 8 to 17 inches of moderately alkaline, gray clay loam. Below that to a depth of 40 inches is interbedded, pale yellow silty marl and soft weathered chalk. The soil is well drained and has moderately slow permeability. The root zone of the Brackett soil is shallow.

The Sanger-Urban land complex lies west and northwest of the site and is about 45 to 70 percent Sanger soil, 15 to 35 percent Urban land, and less than 25 percent closely similar soils. The Sanger soil typically is moderately alkaline calcareous clay to a depth of 49 inches. From a depth of 20 to 80 inches the soil is moderately alkaline, calcareous silty clay which commonly contains limestone fragments in the lower portion. The soil is well drained and has a very slow permeability. The root zone is deep and natural fertility is high (U.S.D.A., Soil Conservation Service, 1981).

2.2 Geology

Carswell AFB and the WSA are located on a series of Cretaceous-age sedimentary formations consisting of limestone, shale, and sandstone. No major faults or fracture zones have been mapped near the base or the WSA. The geologic units generally dip 35 to 40 feet per mile toward the southeast. Figure 2-1 is a geologic map that illustrates the surface geologic features of the WSA.

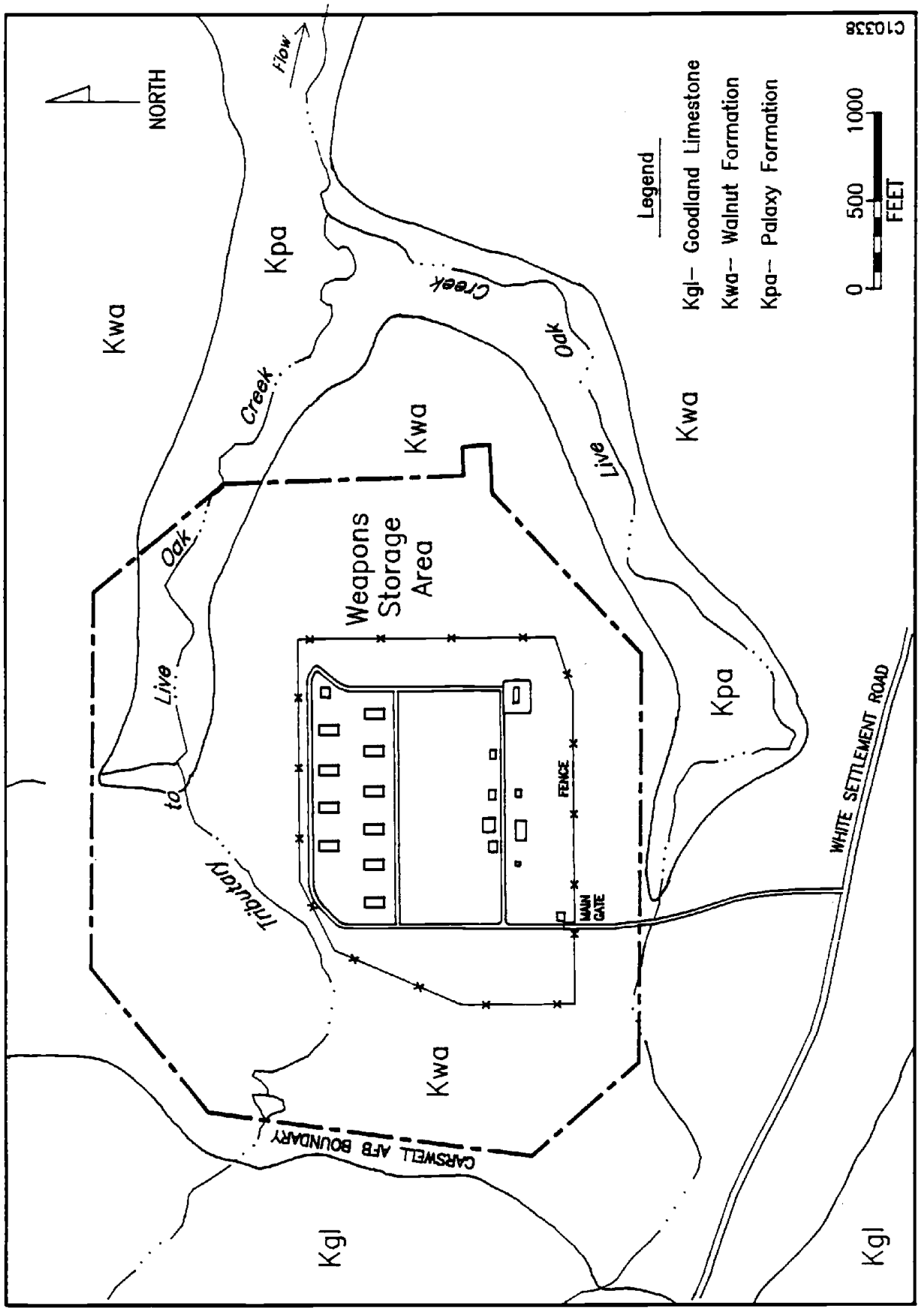

Figure 2-1. Geologic Map of the WSA Area, Carswell AFB, Texas (Barnes, 1972)

Stratigraphy

The Lower Cretaceous-age Walnut Formation of the Fredericksburg Group crops out at the WSA (Barnes, 1972). This unit is composed of shell-agglomerate limestone with varying amounts of clay and shale. The limestone is usually fractured and contains considerable jointing and flaking. According to driller's reports, this unit may have a thickness of approximately 45 feet.

The Paluxy Sand of the Trinity Group underlies the Walnut Formation and crops out in the Live Oak Creek area near the WSA. The Paluxy Sand may be divided into upper and lower sand members. The sands in the upper part of the Paluxy are reported by drillers to be fine-grained and shaley. The lower sand member generally consists of two separate and distinct sand strata which may vary in thickness and lithology. The Paluxy is composed principally of sand with lesser amounts of clay, sandy clay, shale, and lignite. The Paluxy may range in thickness from 140 to 190 feet (Leggett, 1957).

2.3 Hydrogeology

The shallow geologic formations (less than 300 feet below ground surface) found under the WSA may be grouped into three hydrogeologic units: 1) the Walnut Formation Aquitard consisting predominantly of dry limestone with some locally perched ground water; 2) the Paluxy Sand Aquifer; and 3) an aquitard of relatively impermeable limestone in the Glen Rose Formation.

Walnut Formation Aquitard

The Walnut Formation Aquitard is composed of moist clay and shale layers interbedded with dry limestone strata. The Walnut Formation is typically dry and is not a source of ground water in the area. However,

drillers in the area report that small amounts of ground water enter the borehole while drilling through the Walnut Formation, suggesting that limited amounts of ground water may occur in the Walnut along bedding planes and fractures (Hargis and Associates, 1985).

Paluxy Aquifer

The Paluxy Aquifer is the principal source of ground water in the vicinity of the Weapons Storage Area. Ground water in the upper part of the Paluxy is believed to exist under unconfined conditions. Most of the water wells in the area are completed in the lower section of the Paluxy Aquifer, which has a larger grain size and higher permeability.

Most recharge to the Paluxy occurs where the formation crops out west and north of the WSA along the Clear Fork of the Trinity River and along tributaries to the West Fork and South Fork of the Trinity River. Regional ground-water flow in the Paluxy is southeastward in the direction of the regional dip.

Transmissivities in the Paluxy Aquifer range from 1,263 to 13,808 gpd/ft (CH2M Hill, 1984). In the vicinity of Carswell AFB, hydraulic conductivities range from 13 to 140 gpd/ft^2 (based on a saturated aquifer thickness of 100 ft). Well yields within the Paluxy Aquifer range from 10 to 480 gallons per minute (gpm), and average approximately 100 gpm.

Glen Rose Aquitard

Below the Paluxy are the fine-grained limestone, shale, marl, and sandstone beds of the Glen Rose Formation. Although the sands in the Glen Rose yield small amounts of water to wells in Fort Worth and western Tarrant County, the relatively impermeable limestone is an aquitard restricting water movement between the Paluxy Aquifer above the Twin Mountains Aquifer below.

2.4 Ground-Water Quality and Use

Water quality in the Paluxy Aquifer is generally good and is satisfactory for potable use. Table 2-1 shows the range of chemical constituents in Paluxy ground water reported by the Texas Department of Water Resources.

The Paluxy Aquifer is an important source of potable ground water for the Fort Worth area. Many of the communities surrounding Carswell AFB develop their municipal water supplies from the Paluxy Aquifer (e.g. White Settlement). Ground water is also used by many of the surrounding farms and ranches for agricultural and livestock purposes. Because of its extensive use as a potable and municipal water supply, water levels in the Paluxy have declined over the years. Water levels in the immediate vicinity of Carswell AFB have not decreased as much as in the Fort Worth area because of the close proximity of Lake Worth which is a source of recharge for the Paluxy Aquifer.

Water Well Inventory

As required by the TWS a well inventory was conducted to locate all water wells that lie within one-half mile of the site of the underground fuel oil tank. Texas Water Commission records were used to supply the information on the wells. The water well information is provided on Table 2-2, while the well locations are shown in Figure 2-2.

2.5 Hydrology

The Weapons Storage Area lies within the drainage area of Live Oak Creek which flows into Lake Worth. Lake Worth is a reservoir created by damming the West Fork of the Trinity River near Carswell AFB. The WSA is on a broad ridge between Live Oak Creek and a tributary to Live Oak Creek.

TABLE 2-1. RANGE OF CONSTITUENTS IN GROUND WATER FROM SELECTED WELLS IN THE PALUXY FORMATION, TARRANT COUNTY

Constituent or Property	Concentration
Bicarbonate (HCO_3)	177-689
Boron (B)	0.1-0.6
Calcium (Ca)	0-120
Chloride (Cl)	5-117
Fluoride (F)	0-4.5
Iron (Fe)	0-9.9
Magnesium (Mg)	0-43
Nitrate (NO_3)	0-10.0
Silica (SiO_2)	1-30
Sodium (Na)	11-740
Sulfate (SO_4)	6-1,080
Dissolved Solids	264-2,176
Total Hardness ($CaCO_3$)	2-401
Percent Sodium (%)	7.1-99.5
pH	7.1-9.2
Sodium-Absorption Ratio (SAR)	0.2-68.8
Residual Sodium Carbonate (RSC)	0-10.0
Specific Conductance (μmhos at 25°C)	427-3,193

Note: Analyses given are in milligrams per liter except percent sodium, specific conductance, pH, SAR, and RSC.

Source: Texas Department of Water Resources, 1982.

TABLE 2-2. INVENTORY OF WATER WELLS WITHIN 0.5 MILES OF THE UNDERGROUND FUEL OIL TANK AT THE WEAPONS STORAGE AREA, CARSWELL AFB, TEXAS

TWC Well #	Owner	Driller	Date Drilled	Depth (ft. BGS)	Well Construction Diameter (inches)	Casing/ Screen	Interval (ft. BGS)	Water Level (ft. BGS)	Formation	Use
(1) 32-12-901	Carswell AFB		Late 40s	±220					Paluxy	Public
(2) 32-12-902	Carswell AFB		Late 40s	±220					Paluxy	Public
(3) 32-12-9D	A. Burton	Romine Drilling Company	6/25/83	320	4.5	C S	0-200 200-320	200	Paluxy	Domestic
(4) 32-12-9D (a)	J.E. Covington	Romine Drilling Company	6/21/83	320	4.5	C S	0-220 220-320	220	Paluxy	Domestic
(5) 32-12-9D (b)	P. Chuchro	Thurman Water Well Service	9/25/81	254	4	C S	0-176 176-254	110	Paluxy	Domestic
(6) 32-12-9G	D. Alexander	Watts Drilling Company	Aug. 1982	200	4.5			95	Paluxy	Domestic
(7) 32-12-9G (a)	B. Johnson	Watts Drilling Company	Dec. 1979	200	5			110	Paluxy	Domestic
(8) 32-12-9G (b)	C. Everett	Watts Drilling Company	Aug. 1983	210	4.5			90	Paluxy	Domestic
(9) 32-12-9J	R. Gomez	Thurman Water Well Service	4/14/81	240	4	C S	0-180 180-240	100	Paluxy	Domestic
(10) 32-12-9M	R.L. Pendelton	Romine Drilling Company	Feb. 1983	300	4.5	C S	0-200 200-300		Paluxy	Domestic

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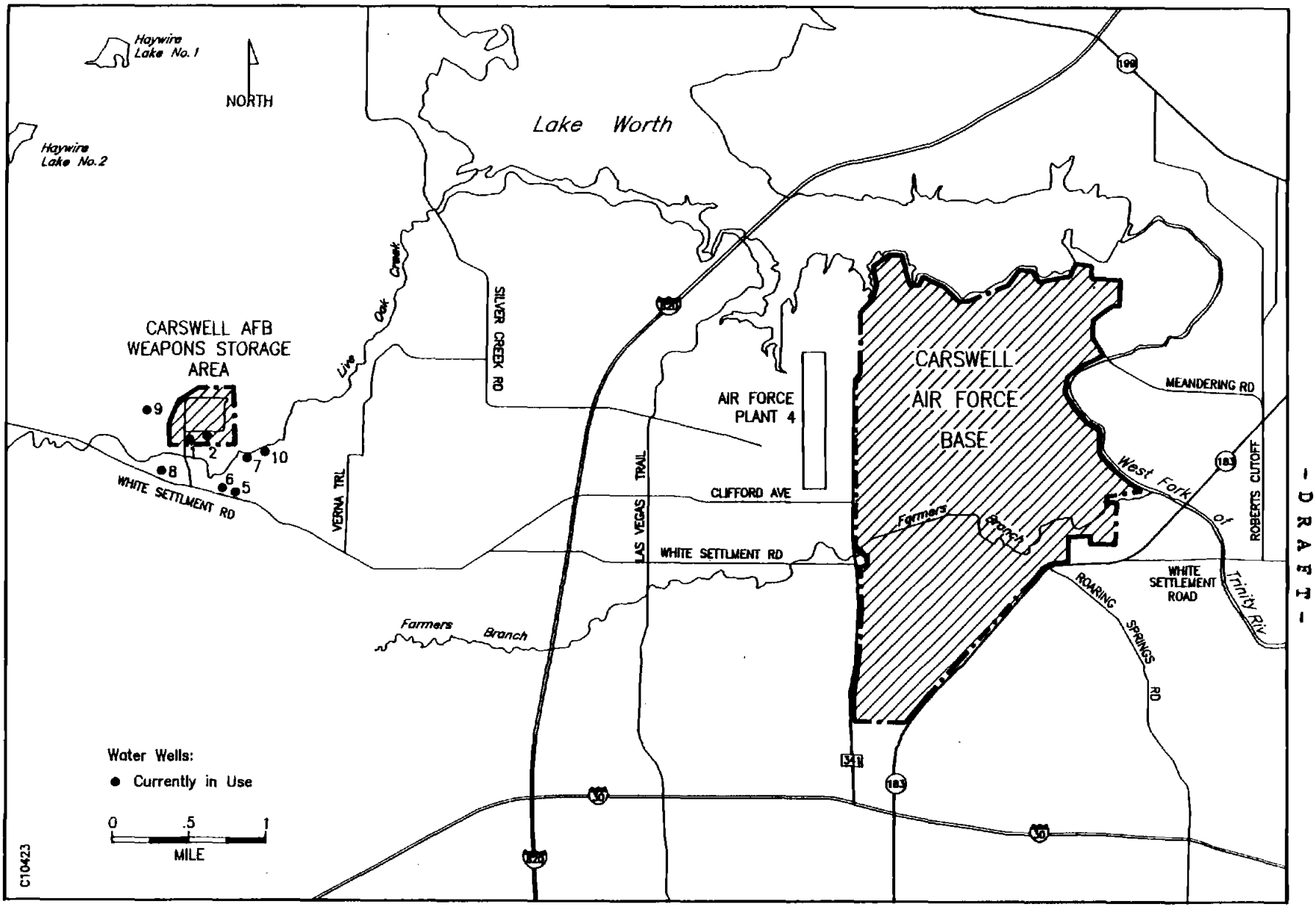

Figure 2-2. Locations of Water Wells Near the Weapons Storage Area, Carswell AFB, Texas

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Mean annual precipitation at Carswell AFB is 32 inches. May is the wettest month, while the period from November to March is the driest. The average annual temperature for Carswell AFB is 66°F. The monthly mean temperatures vary from 45°F in January to 86°F in July (Carswell AFB records for the period 1946-1978).

3.0 INVESTIGATION METHODS

The following sections describe the field and laboratory methods used for the WSA-1 investigation. Field activities included drilling, rock coring, and soil sampling. Laboratory work consisted of chemical analysis of soil samples for total petroleum hydrocarbons and volatile organic compounds.

The methods and techniques for the WSA-1 investigation were, where possible, identical to those used for the Carswell AFB IRP Phase II Stage 2 investigation.

3.1 Field Methods

Soil Augering

A Mobile Drill B-61 auger rig equipped with 5-foot lengths of 7-inch continuous flight augers was used for the WSA-1 drilling program. The hollow-stem auger method allowed for accurate examination of soil conditions and the ability to recover soil samples for chemical analysis. Since no drilling fluids were used, the possibility of contaminating any ground water with drilling mud did not exist. After each borehole was completed, the drilling rig, auger flights, and equipment were decontaminated with a high temperature, high-pressure sprayer using Base potable water.

Rock Drilling

Drilling with the hollow-stem augers resulted in refusal conditions at shallow depths due to the occurrence of limestone of the Walnut Formation. To continue drilling, either solid-stem augers or rock coring equipment were used. The solid-stem augers were able to penetrate greater depths of the rock, allowing collection of pulverized rock cuttings on the auger flights. Selected samples of cuttings were submitted for chemical analysis.

Rock coring was accomplished using an NX core barrel and clean, potable water. Samples of core lines were retrieved for lithologic description and evaluation.

All boreholes and coreholes were grouted to the land surface after sampling was completed.

Soil Sampling

Samples were collected from both soil auger boreholes and rock coring holes during the WSA-1 field program. Samples of soil were collected with a Shelby tube in the upper 5-feet of the borehole, with the remainder of the samples collected with a 5-foot long continuous split-barrel sampler. Samples were collected in the continuous sampler as the auger was advanced in 5-foot increments. The samples were recovered at the surface and described in terms of lithology, texture, and moisture. After each sampling event, the continuous sampler was washed with soap and water, rinsed with water, and then given a final rinse with deionized water. The selection of soil samples collected for chemical analysis was based on visible evidence of contamination of the soil. Rock cuttings produced by solid-stem augering were obtained at the land surface as they were brought up by the auger flights. Samples selected for analysis were cooled to 4°C and shipped to Radian's laboratories in Austin, Texas.

Field Quality Assurance/Quality Control (QA/QC)

Field QA/QC sampling was performed to provide a measure of the accuracy of the analytical results. The following QA/QC samples were collected, as discussed in the Carswell AFB IRP Phase II Stage 2 QAPP.

Ten percent field replicates were collected (all parameters analyzed) for soil samples. A single sample was collected, then divided into two equal parts for the purpose of analysis. Field replicates were indistinguishable from other analytical samples so that personnel performing the analyses were not able to determine which samples were duplicates.

3.2 Laboratory Analytical Program

The Radian Corporation laboratory in Austin, Texas performed all chemical analyses soil samples for the WSA-1 program. The following paragraphs summarize the features of the chemical analyses performed on soil samples.

EPA Method 418.1--Petroleum Hydrocarbons (Infrared)--Oil and grease is a measure of biodegradable animal greases and vegetable oils, whereas petroleum hydrocarbons are considered mineral oils. A sample of 1 liter volume is collected in a wide-mouth glass bottle. The sample is acidified to <2 pH with H_2SO_4 as a means of preventing microbial activity. Serial extraction with fluorocarbon-113 is accomplished in a separatory funnel, with interferences removed in silica gel adsorbant. Analysis is performed by infrared spectrophotometry.

EPA Method 8240--GC/MS for Volatile Organics-This method is based upon a purge-and-trap, gas chromatographic-mass spectrometric (GC/MS) procedure and may be used to determine volatile organic compounds in a variety of solid matrices. It is applicable to nearly all type of samples, regardless of water content. The detection limit of EPA Method 8240 for an individual compound is approximately 1 ug/L (wet weight) in solid samples. For samples containing more than 1 mg/g of total volatile material, the detection limit is proportionately higher.

The volatile compounds are introduced to the GC by the purge-and-trap method, using water as the solvent and dispersion medium. The components are separated via the GC and detected using a mass spectrometer which provides both qualitative and quantitative information.

4.0 RESULTS AND SIGNIFICANCE OF FINDINGS

This section describes the results of drilling operations and chemical analyses of soil and rock at the WSA-1 site at Carswell AFB, Texas.

4.1 Subsurface Conditions

Figure 4-1 illustrates the locations of the ten boreholes drilled in the vicinity of the underground tank. Two cross-sections, provided in Figures 4-2 and 4-3, illustrate the geologic conditions at the site.

Based on logs of drilling operations (Appendix A), the site is underlain by a silty clay to clayey silt surface soil ranging in thickness from 1 to 4 feet. The surface soil is generally dark brown with a moderate to stiff consistency and contains rock, shell and limestone fragments. Underlying the soil is a dense fossiliferous limestone, which is light brown to gray and contains shell fragments in a crystalline calcite matrix.

The underground storage tank lies in a pit excavated in the limestone to a depth of 7 to 8 feet below ground surface. Fill material was found to consist of rock, sand, silt, and clay. The approximate dimensions of the pit, illustrated on Figure 4-1, was determined by visual inspection of the land surface and by the geologic logs of closely-spaced borings near the tank. Directly west of the tank is a reinforced concrete pad approximately 12-inches thick.

Ground water was not encountered in any of the soil borings. Based upon the elevations of the creek beds of Live Oak Creek and its tributary, the water table is estimated to occur 50 to 60 feet below the site, with shallow ground-water flow probably to the creeks north and south of the WSA.

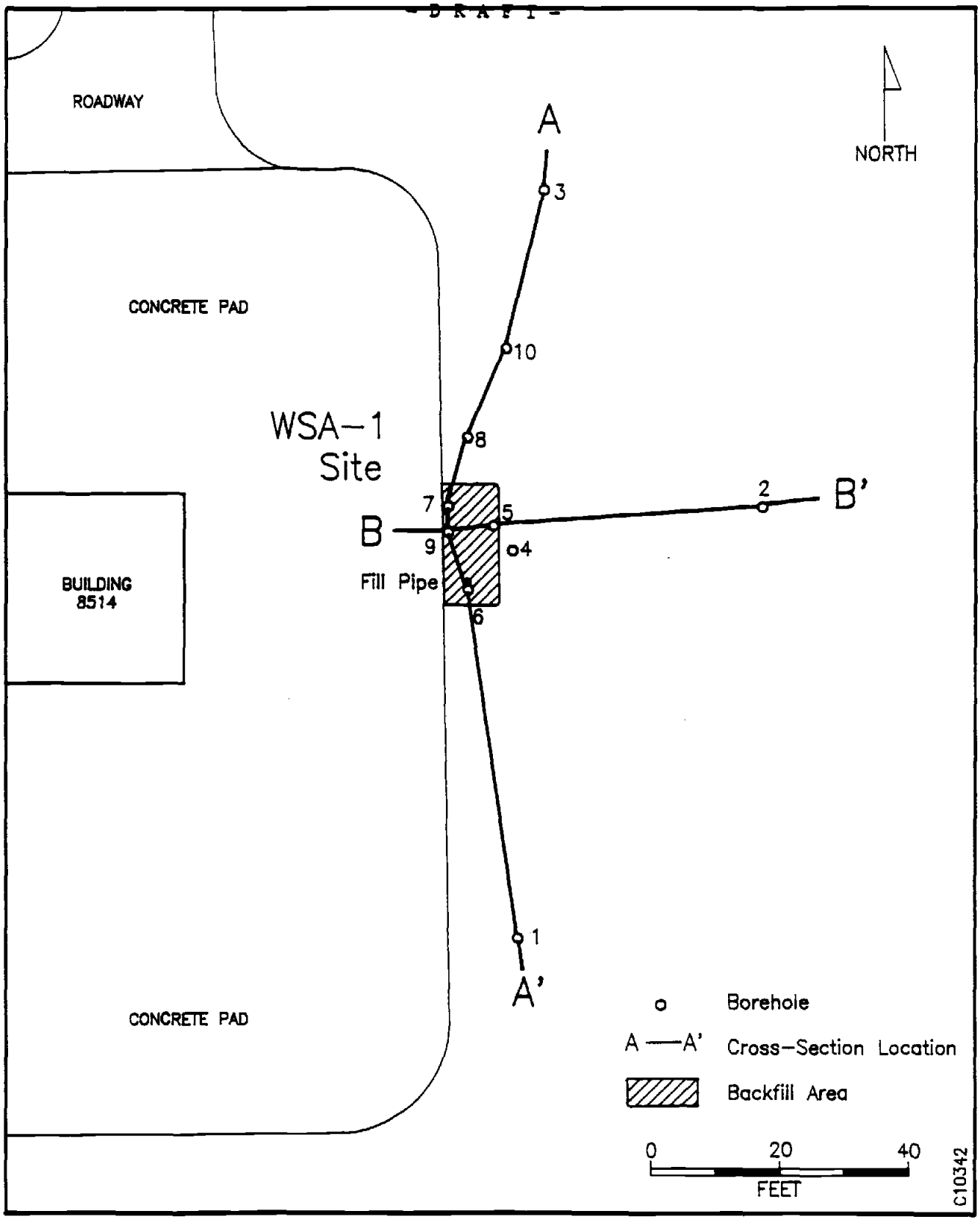

Figure 4-1. Location of Boreholes at WSA-1 Site, Carswell AFB, Texas

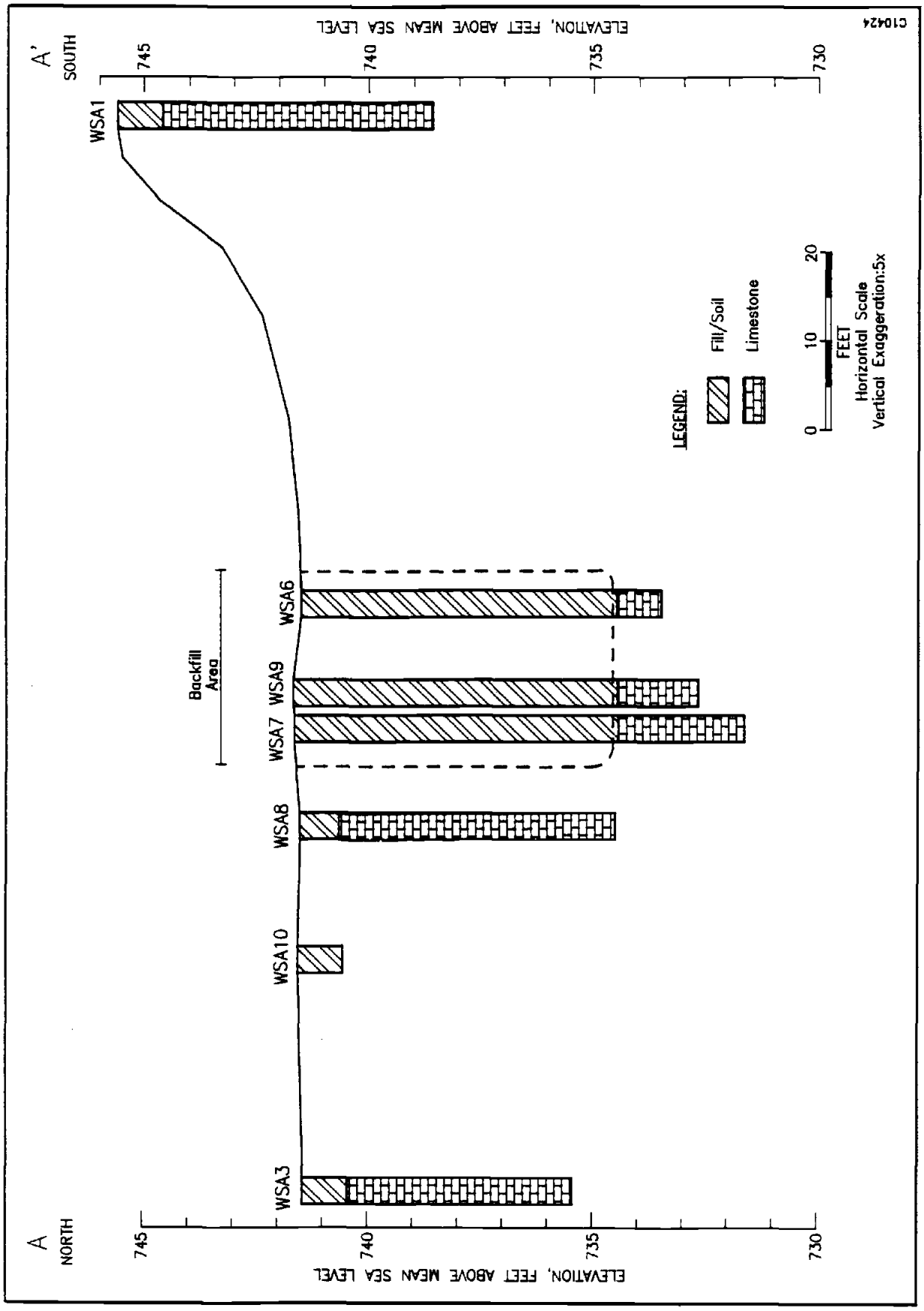

Figure 4-2. Geologic Cross-Section A-A', WSA-1 Site, Carswell AFB, Texas

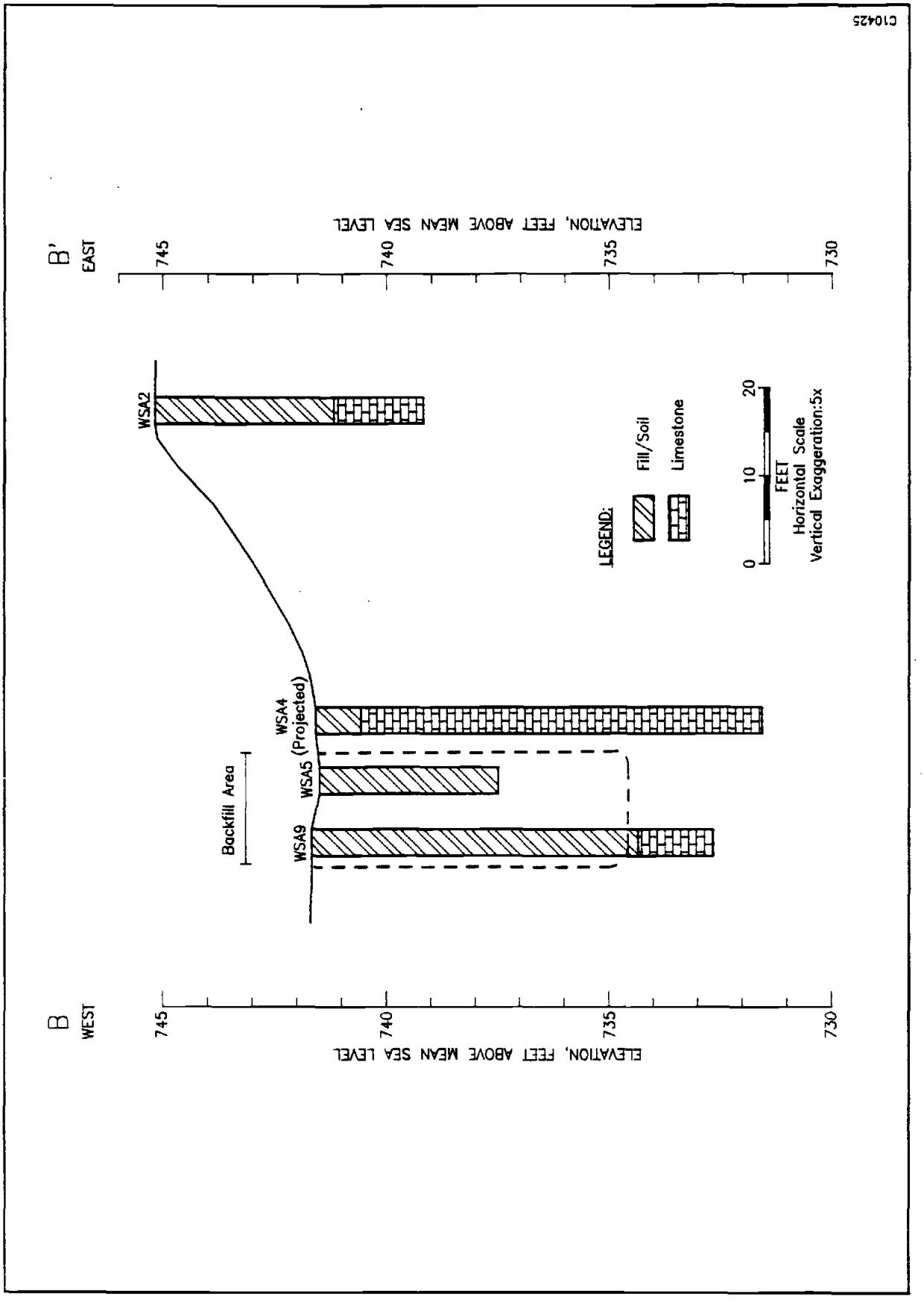

Figure 4-3. Geologic Cross-Section B-B', WSA-1 Site, Carswell AFB, Texas

4.2 Chemical Analytical Results

Near-surface soils (less than 10 feet below ground surface) were sampled at ten locations around the site of the underground tank. The samples were analyzed for organic compounds as described in Section 3.0. Laboratory analyses consisted of total petroleum hydrocarbons (TPH) by infrared spectrophotometry (EPA Method 418.1) and a spectrum analysis for volatile organics by gas chromatography/mass spectrometry (EPA Method 8240). Results of the soil analyses are provided in Table 4-1.

Total Petroleum Hydrocarbons

Total petroleum hydrocarbons (TPH) were detected in soil samples from four locations, boreholes 4, 6, 7, and 9. These locations are in or directly adjacent to the underground tank backfill. At borehole 4, the sample from a depth of 2-3 feet (sample 4B) contained 28 $\mu g/g$ TPH, although this value was less than 5 times the sample detection limit. Borehole 4 was drilled adjacent to, but not in, the backfill material. Sample 6A from borehole 6 (from a depth of 0-2 feet in the backfill material) was submitted in duplicate, and yielded TPH results of 270 $\mu g/g$ and 150 $\mu g/g$. The highest concentrations for TPH were found in samples from boreholes 7 and 9, both completed in the backfill material. Sample 7B from borehole 7 (from a depth of 4-6 feet) contained 750 $\mu g/g$ TPH. Sample 9A from a depth of 2-4 feet contained 40 $\mu g/g$ and < 20 $\mu g/g$ TPH (duplicate sample). Sample 9B from borehole 9 (from a depth of 6-7 feet) contained 1,300 $\mu g/g$ TPH. Sample 9C from a depth of 7-8 feet contained 20 $\mu g/g$ TPH.

Volatile Organic Compounds

Two samples in the backfill material were found to contain detectable levels of volatile organic compounds. The compound 1,1,2,2 tetrachloroethane occurred at a concentration of 3.6 $\mu g/kg$ in sample 9B. Sample 7B also contained the following concentrations of volatile organic compounds:

TABLE 4-1. RESULTS OF ORGANIC ANALYSES FOR SOIL SAMPLES, SITE WSA-1, CARSWELL AFB, TEXAS

Primary Results

	Monitor Well			
	Sample ID	WSA-1	WSA-1	
	Date Sampled	1A	1B	
	Beg. Depth - End Depth	04-Aug-88	04-Aug-88	
PARAMETER		0 - 1	1 - 2	
Volatile Organic Compounds ug/Kg				
1,1,1-Trichloroethane			ND	(2.0)
1,1,2,2-Tetrachloroethane			ND	(2.0)
1,1,2-Trichloroethane			ND	(2.0)
1,1-Dichloroethane			ND	(2.0)
1,1-Dichloroethene			ND	(2.0)
1,2,3-Trichloropropane			ND	(2.0)
1,2-Dichloroethane			ND	(2.0)
1,2-Dichloropropane			ND	(2.0)
2-Hexanone			ND	(10.0)
4-Methyl-2-pentanone			ND	(2.0)
Acetone			ND	(25.0)
Acrolein			ND	(100.0)
Acrylonitrile			ND	(10.0)
Benzene			ND	(2.0)
Bromoform			ND	(2.0)
Bromomethane			ND	(2.0)
Carbon Disulfide			ND	(2.0)
Carbon Tetrachloride			ND	(2.0)
Chlorobenzene			ND	(2.0)
Chlorodibromomethane			ND	(2.0)
Chloroethane			ND	(2.0)
Chloroethyl vinyl ether			ND	(2.0)
Chloroform			ND	(2.0)
Chloromethane			ND	(2.0)
Dibromomethane			ND	(2.0)
Dichlorobromomethane			ND	(2.0)
Dichlorodifluoromethane			ND	(2.0)

ND: Not detected at specified detection limit

( ): Detection limit

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TABLE 4-1. RESULTS OF ORGANIC ANALYSES FOR SOIL SAMPLES, SITE WSA-1, CARSWELL AFB, TEXAS

Primary Results

	Monitor Well			
	Sample ID			
	Date Sampled			
	Beg. Depth - End Depth			
	WSA-1		WSA-1	
	1A		1B	
	04-Aug-88		04-Aug-88	
PARAMETER	0 - 1		1 - 2	
Ethyl benzene			ND	(2.0)
Ethyl methacrylate			ND	(50.0)
Iodomethane			ND	(2.0)
Methyl ethyl ketone			ND	(10.0)
Methylene chloride			ND	(10.0)
Styrene			ND	(2.0)
Tetrachloroethylene			ND	(2.0)
Toluene			ND	(2.0)
Trans-1,4-dichloro-2-buten			ND	(2.0)
Trichloroethene			ND	(2.0)
Trichlorofluoromethane			ND	(10.0)
Vinyl acetate			ND	(2.0)
Vinyl chloride			ND	(2.0)
Xylenes			ND	(2.0)
cis-1,3-Dichloropropene			ND	(2.0)
trans-1,2-Dichloroethene			ND	(2.0)
trans-1,3-Dichloropropene			ND	(2.0)
Petroleum Hydrocarbons ug/g				
Hydrocarbons, Total	ND	(19.0)	ND	(19.0)

ND: Not detected at specified detection limit

( ): Detection limit

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TABLE 4-1. RESULTS OF ORGANIC ANALYSES FOR SOIL SAMPLES, SITE WSA-2, CARSWELL AFB, TEXAS

Primary Results

	Monitor Well		
	Sample ID		
	Date Sampled		
	Beg. Depth - End Depth		
	WSA-2	WSA-2	WSA-2
	2A	2B	2C
	04-Aug-88	04-Aug-88	04-Aug-88
PARAMETER	0 - 2	4 - 5	5 - 6
Volatile Organic Compounds ug/Kg			
1,1,1-Trichloroethane		ND (2.0)	
1,1,2,2-Tetrachloroethane		ND (2.0)	
1,1,2-Trichloroethane		ND (2.0)	
1,1-Dichloroethane		ND (2.0)	
1,1-Dichloroethene		ND (2.0)	
1,2,3-Trichloropropane		ND (2.0)	
1,2-Dichloroethane		ND (2.0)	
1,2-Dichloropropane		ND (2.0)	
2-Hexanone		ND (10.0)	
4-Methyl-2-pentanone		ND (2.0)	
Acetone		ND (25.0)	
Acrolein		ND (100.0)	
Acrylonitrile		ND (10.0)	
Benzene		ND (2.0)	
Bromoform		ND (2.0)	
Bromomethane		ND (2.0)	
Carbon Disulfide		ND (2.0)	
Carbon Tetrachloride		ND (2.0)	
Chlorobenzene		ND (2.0)	
Chlorodibromomethane		ND (2.0)	
Chloroethane		ND (2.0)	
Chloroethyl vinyl ether		ND (2.0)	
Chloroform		ND (2.0)	
Chloromethane		ND (2.0)	
Dibromomethane		ND (2.0)	
Dichlorobromomethane		ND (2.0)	
Dichlorodifluoromethane		ND (2.0)	

ND: Not detected at specified detection limit

( ): Detection limit

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TABLE 4-1. RESULTS OF ORGANIC ANALYSES FOR SOIL SAMPLES, SITE WSA-2, CARSWELL AFB, TEXAS

Primary Results

	Monitor Well					
	Sample ID					
	Date Sampled					
	Beg. Depth - End Depth					
	WSA-2		WSA-2		WSA-2	
	2A		2B		2C	
	04-Aug-88		04-Aug-88		04-Aug-88	
PARAMETER	0 - 2		4 - 5		5 - 6	
Ethyl benzene			ND	(2.0)		
Ethyl methacrylate			ND	(50.0)		
Iodomethane			ND	(2.0)		
Methyl ethyl ketone			ND	(10.0)		
Methylene chloride			ND	(10.0)		
Styrene			ND	(2.0)		
Tetrachloroethylene			ND	(2.0)		
Toluene			ND	(2.0)		
Trans-1,4-dichloro-2-buten			ND	(2.0)		
Trichloroethene			ND	(2.0)		
Trichlorofluoromethane			ND	(10.0)		
Vinyl acetate			ND	(2.0)		
Vinyl chloride			ND	(2.0)		
Xylenes			ND	(2.0)		
cis-1,3-Dichloropropene			ND	(2.0)		
trans-1,2-Dichloroethene			ND	(2.0)		
trans-1,3-Dichloropropene			ND	(2.0)		
Petroleum Hydrocarbons ug/g						
Hydrocarbons, Total	ND	(20.0)	ND	(20.0)	ND	(20.0)

ND: Not detected at specified detection limit

( ): Detection limit

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TABLE 4-1. RESULTS OF ORGANIC ANALYSES FOR SOIL SAMPLES, SITE WSA-3, CARSWELL AFB, TEXAS

Primary Results

	Monitor Well			
	Sample ID	WSA-3	WSA-3	
	Date Sampled	3B	3A	
	Beg. Depth - End Depth	04-Aug-88	04-Aug-88	
PARAMETER		1 - 5	0 - 1	
Volatile Organic Compounds ug/Kg				
1,1,1-Trichloroethane			ND	(2.0)
1,1,2,2-Tetrachloroethane			ND	(2.0)
1,1,2-Trichloroethane			ND	(2.0)
1,1-Dichloroethane			ND	(2.0)
1,1-Dichloroethene			ND	(2.0)
1,2,3-Trichloropropane			ND	(2.0)
1,2-Dichloroethane			ND	(2.0)
1,2-Dichloropropane			ND	(2.0)
2-Hexanone			ND	(10.0)
4-Methyl-2-pentanone			ND	(2.0)
Acetone			ND	(25.0)
Acrolein			ND	(100.0)
Acrylonitrile			ND	(10.0)
Benzene			ND	(2.0)
Bromoform			ND	(2.0)
Bromomethane			ND	(2.0)
Carbon Disulfide			ND	(2.0)
Carbon Tetrachloride			ND	(2.0)
Chlorobenzene			ND	(2.0)
Chlorodibromomethane			ND	(2.0)
Chloroethane			ND	(2.0)
Chloroethyl vinyl ether			ND	(2.0)
Chloroform			ND	(2.0)
Chloromethane			ND	(2.0)
Dibromomethane			ND	(2.0)
Dichlorobromomethane			ND	(2.0)

*B: Less than 5 times the detection limit; Detected in Blank; Background subtraction not performed.

ND: Not detected at specified detection limit

( ): Detection limit

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TABLE 4-1. RESULTS OF ORGANIC ANALYSES FOR SOIL SAMPLES, SITE WSA-3, CARSWELL AFB, TEXAS

Primary Results

	Monitor Well			
	Sample ID			
	Date Sampled			
	Beg. Depth - End Depth			
	WSA-3		WSA-3	
	3B		3A	
	04-Aug-88		04-Aug-88	
PARAMETER	1 - 5		0 - 1	
Dichlorodifluoromethane			ND	(2.0)
Ethyl benzene			ND	(2.0)
Ethyl methacrylate			ND	(50.0)
Iodomethane			ND	(2.0)
Methyl ethyl ketone			ND	(10.0)
Methylene chloride			22.0*B	(10.0)
Styrene			ND	(2.0)
Tetrachloroethylene			ND	(2.0)
Toluene			ND	(2.0)
Trans-1,4-dichloro-2-buten			ND	(2.0)
Trichloroethene			ND	(2.0)
Trichlorofluoromethane			ND	(10.0)
Vinyl acetate			ND	(2.0)
Vinyl chloride			ND	(2.0)
Xylenes			ND	(2.0)
cis-1,3-Dichloropropene			ND	(2.0)
trans-1,2-Dichloroethene			ND	(2.0)
trans-1,3-Dichloropropene			ND	(2.0)
Petroleum Hydrocarbons ug/g				
Hydrocarbons, Total	ND	(17.0)	ND	(19.0)

*B: Less than 5 times the detection limit; Detected in Blank; Background subtraction not performed.

ND: Not detected at specified detection limit

( ): Detection limit

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TABLE 4-1. RESULTS OF ORGANIC ANALYSES FOR SOIL SAMPLES, SITE WSA-4, CARSWELL AFB, TEXAS

Primary Results

	Monitor Well		
	Sample ID		
	Date Sampled		
	Beg. Depth - End Depth		
	WSA-4	WSA-4	WSA-4
	4B	4C	4A
	04-Aug-88	04-Aug-88	04-Aug-88
PARAMETER	2 - 3	5 - 7	0 - 1
Volatile Organic Compounds ug/Kg			
1,1,1-Trichloroethane			ND (2.0)
1,1,2,2-Tetrachloroethane			ND (2.0)
1,1,2-Trichloroethane			ND (2.0)
1,1-Dichloroethane			ND (2.0)
1,1-Dichloroethene			ND (2.0)
1,2,3-Trichloropropane			ND (2.0)
1,2-Dichloroethane			ND (2.0)
1,2-Dichloropropane			ND (2.0)
2-Hexanone			ND (10.0)
4-Methyl-2-pentanone			ND (2.0)
Acetone			ND (25.0)
Acrolein			ND (100.0)
Acrylonitrile			ND (10.0)
Benzene			ND (2.0)
Bromoform			ND (2.0)
Bromomethane			ND (2.0)
Carbon Disulfide			ND (2.0)
Carbon Tetrachloride			ND (2.0)
Chlorobenzene			ND (2.0)
Chlorodibromomethane			ND (2.0)
Chloroethane			ND (2.0)
Chloroethyl vinyl ether			ND (2.0)
Chloroform			ND (2.0)
Chloromethane			ND (2.0)
Dibromomethane			ND (2.0)

*: Less than 5 times the detection limit

*B: Less than 5 times the detection limit; Detected in Blank; Background subtraction not performed.

ND: Not detected at specified detection limit

( ): Detection limit

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TABLE 4-1. RESULTS OF ORGANIC ANALYSES FOR SOIL SAMPLES, SITE WSA-4, CARSWELL AFB, TEXAS

Primary Results

	Monitor Well					
	Sample ID					
	Date Sampled					
	Beg. Depth - End Depth					
	WSA-4		WSA-4		WSA-4	
	4B		4C		4A	
	04-Aug-88		04-Aug-88		04-Aug-88	
PARAMETER	2 - 3		5 - 7		0 - 1	
Dichlorobromomethane					ND	(2.0)
Dichlorodifluoromethane					ND	(2.0)
Ethyl benzene					ND	(2.0)
Ethyl methacrylate					ND	(50.0)
Iodomethane					ND	(2.0)
Methyl ethyl ketone					ND	(10.0)
Methylene chloride					10.0*B	(10.0)
Styrene					ND	(2.0)
Tetrachloroethylene					ND	(2.0)
Toluene					ND	(2.0)
Trans-1,4-dichloro-2-buten					ND	(2.0)
Trichloroethene					ND	(2.0)
Trichlorofluoromethane					ND	(10.0)
Vinyl acetate					ND	(2.0)
Vinyl chloride					ND	(2.0)
Xylenes					ND	(2.0)
cis-1,3-Dichloropropene					ND	(2.0)
trans-1,2-Dichloroethene					ND	(2.0)
trans-1,3-Dichloropropene					ND	(2.0)
Petroleum Hydrocarbons ug/g						
Hydrocarbons, Total	28.0*	()	ND	(18.0)	ND	(18.0)

*: Less than 5 times the detection limit

*B: Less than 5 times the detection limit; Detected in Blank; Background subtraction not performed.

ND: Not detected at specified detection limit

( ): Detection limit

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TABLE 4-1. RESULTS OF ORGANIC ANALYSES FOR SOIL SAMPLES, SITE WSA-5 and WSA-6, CARSWELL AFB, TEXAS

Primary Results

	Monitor Well			
	Sample ID			
	Date Sampled			
	Beg. Depth - End Depth			
	WSA-5	WSA-5	WSA-6	WSA-6
	5A	5A	6A	6A
	04-Aug-88	04-Aug-88	04-Aug-88	04-Aug-88
PARAMETER	0 - 2	0 - 2	0 - 2	0 - 2
Volatile Organic Compounds ug/Kg				
1,1,1-Trichloroethane	ND (2.0)	ND (2.0)		
1,1,2,2-Tetrachloroethane	ND (2.0)	ND (2.0)		
1,1,2-Trichloroethane	ND (2.0)	ND (2.0)		
1,1-Dichloroethane	ND (2.0)	ND (2.0)		
1,1-Dichloroethene	ND (2.0)	ND (2.0)		
1,2,3-Trichloropropane	ND (2.0)	ND (2.0)		
1,2-Dichloroethane	ND (2.0)	ND (2.0)		
1,2-Dichloropropane	ND (2.0)	ND (2.0)		
2-Hexanone	ND (10.0)	ND (10.0)		
4-Methyl-2-pentanone	ND (2.0)	ND (2.0)		
Acetone	ND (25.0)	ND (25.0)		
Acrolein	ND (100.0)	ND (100.0)		
Acrylonitrile	ND (10.0)	ND (10.0)		
Benzene	ND (2.0)	ND (2.0)		
Bromoform	ND (2.0)	ND (2.0)		
Bromomethane	ND (2.0)	ND (2.0)		
Carbon Disulfide	ND (2.0)	ND (2.0)		
Carbon Tetrachloride	ND (2.0)	ND (2.0)		
Chlorobenzene	ND (2.0)	ND (2.0)		
Chlorodibromomethane	ND (2.0)	ND (2.0)		
Chloroethane	ND (2.0)	ND (2.0)		
Chloroethyl vinyl ether	ND (2.0)	ND (2.0)		
Chloroform	ND (2.0)	ND (2.0)		
Chloromethane	ND (2.0)	ND (2.0)		
Dibromomethane	ND (2.0)	ND (2.0)		
Dichlorobromomethane	ND (2.0)	ND (2.0)		

*B: Less than 5 times the detection limit; Detected in Blank; Background subtraction not performed.

ND: Not detected at specified detection limit

( ): Detection limit

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TABLE 4-1. RESULTS OF ORGANIC ANALYSES FOR SOIL SAMPLES, SITE WSA-5 AND WSA-6, CARSWELL AFB, TEXAS

Primary Results

	Monitor Well							
	Sample ID							
	Date Sampled							
	Beg. Depth - End Depth							
	WSA-5		WSA-5		WSA-6		WSA-6	
	5A		5A		6A		6A	
	04-Aug-88		04-Aug-88		04-Aug-88		04-Aug-88	
PARAMETER	0 - 2		0 - 2		0 - 2		0 - 2	
Dichlorodifluoromethane	ND	(2.0)	ND	(2.0)				
Ethyl benzene	ND	(2.0)	ND	(2.0)				
Ethyl methacrylate	ND	(50.0)	ND	(50.0)				
Iodomethane	ND	(2.0)	ND	(2.0)				
Methyl ethyl ketone	ND	(10.0)	ND	(10.0)				
Methylene chloride	17.0*B	(10.0)	20.0*B	(10.0)				
Styrene	ND	(2.0)	ND	(2.0)				
Tetrachloroethylene	ND	(2.0)	ND	(2.0)				
Toluene	ND	(2.0)	ND	(2.0)				
Trans-1,4-dichloro-2-buten	ND	(2.0)	ND	(2.0)				
Trichloroethene	ND	(2.0)	ND	(2.0)				
Trichlorofluoromethane	ND	(10.0)	ND	(10.0)				
Vinyl acetate	ND	(2.0)	ND	(2.0)				
Vinyl chloride	ND	(2.0)	ND	(2.0)				
Xylenes	ND	(2.0)	ND	(2.0)				
cis-1,3-Dichloropropene	ND	(2.0)	ND	(2.0)				
trans-1,2-Dichloroethene	ND	(2.0)	ND	(2.0)				
trans-1,3-Dichloropropene	ND	(2.0)	ND	(2.0)				
Petroleum Hydrocarbons ug/g								
Hydrocarbons, Total	ND	(17.0)			270.0	()	150.0	()

*B: Less than 5 times the detection limit; Detected in Blank; Background subtraction not performed.

ND: Not detected at specified detection limit

( ): Detection limit

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TABLE 4-1. RESULTS OF ORGANIC ANALYSES FOR SOIL SAMPLES, SITE WSA-6, CARSWELL AFB, TEXAS

Primary Results

	Monitor Well Sample ID Date Sampled Beg. Depth - End Depth			
	WSA-6 6B 04-Aug-88 2 - 4		WSA-6 6C 04-Aug-88 4 - 6	WSA-6 6C 04-Aug-88 4 - 6
PARAMETER				
Volatile Organic Compounds ug/Kg				
1,1,1-Trichloroethane	ND	(2.0)		
1,1,2,2-Tetrachloroethane	ND	(2.0)		
1,1,2-Trichloroethane	ND	(2.0)		
1,1-Dichloroethane	ND	(2.0)		
1,1-Dichloroethene	ND	(2.0)		
1,2,3-Trichloropropane	ND	(2.0)		
1,2-Dichloroethane	ND	(2.0)		
1,2-Dichloropropane	ND	(2.0)		
2-Hexanone	ND	(10.0)		
4-Methyl-2-pentanone	ND	(2.0)		
Acetone	ND	(25.0)		
Acrolein	ND	(100.0)		
Acrylonitrile	ND	(10.0)		
Benzene	ND	(2.0)		
Bromoform	ND	(2.0)		
Bromomethane	ND	(2.0)		
Carbon Disulfide	ND	(2.0)		
Carbon Tetrachloride	ND	(2.0)		
Chlorobenzene	ND	(2.0)		
Chlorodibromomethane	ND	(2.0)		
Chloroethane	ND	(2.0)		
Chloroethyl vinyl ether	ND	(2.0)		
Chloroform	ND	(2.0)		
Chloromethane	ND	(2.0)		
Dibromomethane	ND	(2.0)		
Dichlorobromomethane	ND	(2.0)		

*B: Less than 5 times the detection limit; Detected in Blank; Background subtraction not performed.

ND: Not detected at specified detection limit

( ): Detection limit

- D R A F T -

TABLE 4-1. RESULTS OF ORGANIC ANALYSES FOR SOIL SAMPLES, SITE WSA-6, CARSWELL AFB, TEXAS

Primary Results

	Monitor Well					
	Sample ID					
	Date Sampled					
	Beg. Depth - End Depth					
	WSA-6		WSA-6		WSA-6	
	6B		6C		6C	
	04-Aug-88		04-Aug-88		04-Aug-88	
PARAMETER	2 - 4		4 - 6		4 - 6	
Dichlorodifluoromethane	ND	(2.0)				
Ethyl benzene	ND	(2.0)				
Ethyl methacrylate	ND	(50.0)				
Iodomethane	ND	(2.0)				
Methyl ethyl ketone	ND	(10.0)				
Methylene chloride	18.0*B	(10.0)				
Styrene	ND	(2.0)				
Tetrachloroethylene	ND	(2.0)				
Toluene	ND	(2.0)				
Trans-1,4-dichloro-2-buten	ND	(2.0)				
Trichloroethene	ND	(2.0)				
Trichlorofluoromethane	ND	(10.0)				
Vinyl acetate	ND	(2.0)				
Vinyl chloride	ND	(2.0)				
Xylenes	ND	(2.0)				
cis-1,3-Dichloropropene	ND	(2.0)				
trans-1,2-Dichloroethene	ND	(2.0)				
trans-1,3-Dichloropropene	ND	(2.0)				
Petroleum Hydrocarbons ug/g						
Hydrocarbons, Total	ND	(19.0)	ND	(19.0)	ND	(15.0)

*B: Less than 5 times the detection limit; Detected in Blank; Background subtraction not performed.

ND: Not detected at specified detection limit

( ): Detection limit

- D R A F T -

TABLE 4-1. RESULTS OF ORGANIC ANALYSES FOR SOIL SAMPLES, SITE WSA-7, CARSWELL AFB, TEXAS

Primary Results

	Monitor Well			
	Sample ID			
	Date Sampled			
	Beg. Depth - End Depth			
	WSA-7		WSA-7	
	7B		7A	
	05-Aug-88		05-Aug-88	
PARAMETER	4 - 6		2 - 4	
Volatile Organic Compounds ug/Kg				
1,1,1-Trichloroethane	ND	(2.0)		
1,1,2,2-Tetrachloroethane	55.0	(2.0)		
1,1,2-Trichloroethane	ND	(2.0)		
1,1-Dichloroethane	ND	(2.0)		
1,1-Dichloroethene	ND	(2.0)		
1,2,3-Trichloropropane	ND	(2.0)		
1,2-Dichloroethane	ND	(2.0)		
1,2-Dichloropropane	ND	(2.0)		
2-Hexanone	ND	(10.0)		
4-Methyl-2-pentanone	57.0	(2.0)		
Acetone	ND	(25.0)		
Acrolein	ND	(100.0)		
Acrylonitrile	ND	(10.0)		
Benzene	ND	(2.0)		
Bromoform	ND	(2.0)		
Bromomethane	ND	(2.0)		
Carbon Disulfide	ND	(2.0)		
Carbon Tetrachloride	ND	(2.0)		
Chlorobenzene	ND	(2.0)		
Chlorodibromomethane	ND	(2.0)		
Chloroethane	ND	(2.0)		
Chloroethyl vinyl ether	ND	(2.0)		
Chloroform	ND	(2.0)		
Chloromethane	ND	(2.0)		
Dibromomethane	ND	(2.0)		

*: Less than 5 times the detection limit

*B: Less than 5 times the detection limit; Detected in Blank; Background subtraction not performed.

ND: Not detected at specified detection limit

( ): Detection limit

- D R A F T -

TABLE 4-1. RESULTS OF ORGANIC ANALYSES FOR SOIL SAMPLES, SITE WSA-7, CARSWELL AFB, TEXAS

Primary Results

	Monitor Well			
	Sample ID			
	Date Sampled			
	Beg. Depth - End Depth			
	WSA-7		WSA-7	
	7B		7A	
	05-Aug-88		05-Aug-88	
PARAMETER	4 - 6		2 - 4	
Dichlorobromomethane	ND	(2.0)		
Dichlorodifluoromethane	ND	(2.0)		
Ethyl benzene	ND	(2.0)		
Ethyl methacrylate	ND	(50.0)		
Iodomethane	ND	(2.0)		
Methyl ethyl ketone	15.0*	(10.0)		
Methylene chloride	23.0*B	(10.0)		
Styrene	ND	(2.0)		
Tetrachloroethylene	ND	(2.0)		
Toluene	ND	(2.0)		
Trans-1,4-dichloro-2-buten	ND	(2.0)		
Trichloroethene	ND	(2.0)		
Trichlorofluoromethane	ND	(10.0)		
Vinyl acetate	ND	(2.0)		
Vinyl chloride	ND	(2.0)		
Xylenes	5.6*	(2.0)		
cis-1,3-Dichloropropene	ND	(2.0)		
trans-1,2-Dichloroethene	ND	(2.0)		
trans-1,3-Dichloropropene	ND	(2.0)		
Petroleum Hydrocarbons ug/g				
Hydrocarbons, Total	750.0	()	ND	(20.0)

*: Less than 5 times the detection limit

*B: Less than 5 times the detection limit; Detected in Blank; Background subtraction not performed.

ND: Not detected at specified detection limit

( ): Detection limit

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TABLE 4-1. RESULTS OF ORGANIC ANALYSES FOR SOIL SAMPLES, SITE WSA-8, CARSWELL AFB, TEXAS

Primary Results

		Monitor Well		
		Sample ID		
		Date Sampled		
		Beg. Depth - End Depth		
	WSA-8	WSA-8		WSA-8
	8A	8B		8C
	05-Aug-88	05-Aug-88		05-Aug-88
PARAMETER	0 - 1	3 - 7		7 - 7
Volatile Organic Compounds ug/Kg				
1,1,1-Trichloroethane		ND	(2.0)	
1,1,2,2-Tetrachloroethane		ND	(2.0)	
1,1,2-Trichloroethane		ND	(2.0)	
1,1-Dichloroethane		ND	(2.0)	
1,1-Dichloroethene		ND	(2.0)	
1,2,3-Trichloropropane		ND	(2.0)	
1,2-Dichloroethane		ND	(2.0)	
1,2-Dichloropropane		ND	(2.0)	
2-Hexanone		ND	(10.0)	
4-Methyl-2-pentanone		ND	(2.0)	
Acetone		ND	(25.0)	
Acrolein		ND	(100.0)	
Acrylonitrile		ND	(10.0)	
Benzene		ND	(2.0)	
Bromoform		ND	(2.0)	
Bromomethane		ND	(2.0)	
Carbon Disulfide		ND	(2.0)	
Carbon Tetrachloride		ND	(2.0)	
Chlorobenzene		ND	(2.0)	
Chlorodibromomethane		ND	(2.0)	
Chloroethane		ND	(2.0)	
Chloroethyl vinyl ether		ND	(2.0)	
Chloroform		ND	(2.0)	
Chloromethane		ND	(2.0)	
Dibromomethane		ND	(2.0)	
Dichlorobromomethane		ND	(2.0)	

*B: Less than 5 times the detection limit; Detected in Blank; Background subtraction not performed.

ND: Not detected at specified detection limit

( ): Detection limit

- DRAFT -

TABLE 4-1. RESULTS OF ORGANIC ANALYSES FOR SOIL SAMPLES, SITE WSA-8, CARSWELL AFB, TEXAS

Primary Results

	Monitor Well					
	Sample ID					
	Date Sampled					
	Beg. Depth - End Depth					
	WSA-8		WSA-8		WSA-8	
	8A		8B		8C	
	05-Aug-88		05-Aug-88		05-Aug-88	
PARAMETER	0 - 1		3 - 7		7 - 7	
Dichlorodifluoromethane			ND	(2.0)		
Ethyl benzene			ND	(2.0)		
Ethyl methacrylate			ND	(50.0)		
Iodomethane			ND	(2.0)		
Methyl ethyl ketone			ND	(10.0)		
Methylene chloride			20.0*B	(10.0)		
Styrene			ND	(2.0)		
Tetrachloroethylene			ND	(2.0)		
Toluene			ND	(2.0)		
Trans-1,4-dichloro-2-buten			ND	(2.0)		
Trichloroethene			ND	(2.0)		
Trichlorofluoromethane			ND	(10.0)		
Vinyl acetate			ND	(2.0)		
Vinyl chloride			ND	(2.0)		
Xylenes			ND	(2.0)		
cis-1,3-Dichloropropene			ND	(2.0)		
trans-1,2-Dichloroethene			ND	(2.0)		
trans-1,3-Dichloropropene			ND	(2.0)		
Petroleum Hydrocarbons ug/g						
Hydrocarbons, Total	ND	(19.0)	ND	(19.0)	ND	(20.0)

*B: Less than 5 times the detection limit; Detected in Blank; Background subtraction not performed.

ND: Not detected at specified detection limit

( ): Detection limit

- DRAFT -

TABLE 4-1. RESULTS OF ORGANIC ANALYSES FOR SOIL SAMPLES, SITE WSA-9, CARSWELL AFB, TEXAS

Primary Results

	Monitor Well		
	Sample ID		
	Date Sampled		
	Beg. Depth - End Depth		
	WSA-9	WSA-9	WSA-9
	9A	9A	9B
	05-Aug-88	05-Aug-88	05-Aug-88
PARAMETER	2 - 4	2 - 4	6 - 9
Volatile Organic Compounds ug/Kg			
1,1,1-Trichloroethane			ND (2.0)
1,1,2,2-Tetrachloroethane			3.6* (2.0)
1,1,2-Trichloroethane			ND (2.0)
1,1-Dichloroethane			ND (2.0)
1,1-Dichloroethene			ND (2.0)
1,2,3-Trichloropropane			ND (2.0)
1,2-Dichloroethane			ND (2.0)
1,2-Dichloropropane			ND (2.0)
2-Hexanone			ND (10.0)
4-Methyl-2-pentanone			ND (2.0)
Acetone			ND (25.0)
Acrolein			ND (100.0)
Acrylonitrile			ND (10.0)
Benzene			ND (2.0)
Bromoform			ND (2.0)
Bromomethane			ND (2.0)
Carbon Disulfide			ND (2.0)
Carbon Tetrachloride			ND (2.0)
Chlorobenzene			ND (2.0)
Chlorodibromomethane			ND (2.0)
Chloroethane			ND (2.0)
Chloroethyl vinyl ether			ND (2.0)
Chloroform			ND (2.0)
Chloromethane			ND (2.0)
Dibromomethane			ND (2.0)

*: Less than 5 times the detection limit

*B: Less than 5 times the detection limit; Detected in Blank; Background subtraction not performed.

ND: Not detected at specified detection limit

( ): Detection limit

- DRAFT -

TABLE 4-1. RESULTS OF ORGANIC ANALYSES FOR SOIL SAMPLES, SITE WSA-9, CARSWELL AFB, TEXAS

Primary Results

	Monitor Well					
	Sample ID					
	Date Sampled					
	Beg. Depth - End Depth					
	WSA-9		WSA-9		WSA-9	
	9A		9A		9B	
	05-Aug-88		05-Aug-88		05-Aug-88	
PARAMETER	2 - 4		2 - 4		6 - 9	
Dichlorobromomethane					ND	(2.0)
Dichlorodifluoromethane					ND	(2.0)
Ethyl benzene					ND	(2.0)
Ethyl methacrylate					ND	(50.0)
Iodomethane					ND	(2.0)
Methyl ethyl ketone					ND	(10.0)
Methylene chloride					24.0*B	(10.0)
Styrene					ND	(2.0)
Tetrachloroethylene					ND	(2.0)
Toluene					ND	(2.0)
Trans-1,4-dichloro-2-buten					ND	(2.0)
Trichloroethene					ND	(2.0)
Trichlorofluoromethane					ND	(10.0)
Vinyl acetate					ND	(2.0)
Vinyl chloride					ND	(2.0)
Xylenes					ND	(2.0)
cis-1,3-Dichloropropene					ND	(2.0)
trans-1,2-Dichloroethene					ND	(2.0)
trans-1,3-Dichloropropene					ND	(2.0)
Petroleum Hydrocarbons ug/g						
Hydrocarbons, Total	40.0*	()	ND	(20.0)	1300.0	()

*: Less than 5 times the detection limit

*B: Less than 5 times the detection limit; Detected in Blank; Background subtraction not performed.

ND: Not detected at specified detection limit

( ): Detection limit

- DRAFT -

TABLE 4-1. RESULTS OF ORGANIC ANALYSES FOR SOIL SAMPLES, SITE WSA-9 AND WSA-10, CARSWELL AFB, TEXAS

Primary Results

	Monitor Well		
	Sample ID	WSA-9	WSA-10
	Date Sampled	9C	10A
	Beg. Depth - End Depth	05-Aug-88	05-Aug-88
PARAMETER		9 - 9	0 - 1
Volatile Organic Compounds ug/Kg			
1,1,1-Trichloroethane		ND	(2.0)
1,1,2,2-Tetrachloroethane		ND	(2.0)
1,1,2-Trichloroethane		ND	(2.0)
1,1-Dichloroethane		ND	(2.0)
1,1-Dichloroethene		ND	(2.0)
1,2,3-Trichloropropane		ND	(2.0)
1,2-Dichloroethane		ND	(2.0)
1,2-Dichloropropane		ND	(2.0)
2-Hexanone		ND	(10.0)
4-Methyl-2-pentanone		ND	(2.0)
Acetone		ND	(25.0)
Acrolein		ND	(100.0)
Acrylonitrile		ND	(10.0)
Benzene		ND	(2.0)
Bromoform		ND	(2.0)
Bromomethane		ND	(2.0)
Carbon Disulfide		ND	(2.0)
Carbon Tetrachloride		ND	(2.0)
Chlorobenzene		ND	(2.0)
Chlorodibromomethane		ND	(2.0)
Chloroethane		ND	(2.0)
Chloroethyl vinyl ether		ND	(2.0)
Chloroform		ND	(2.0)
Chloromethane		ND	(2.0)
Dibromomethane		ND	(2.0)

*: Less than 5 times the detection limit

*B: Less than 5 times the detection limit; Detected in Blank; Background subtraction not performed.

ND: Not detected at specified detection limit

( ): Detection limit

- D R A F T -

TABLE 4-1. RESULTS OF ORGANIC ANALYSES FOR SOIL SAMPLES, SITE WSA-9 AND WSA-10, CARSWELL AFB, TEXAS

Primary Results

	Monitor Well			
	Sample ID			
	Date Sampled			
	Beg. Depth - End Depth			
	WSA-9		WSA-10	
	9C		10A	
	05-Aug-88		05-Aug-88	
PARAMETER	9 - 9		0 - 1	
Dichlorobromomethane			ND	(2.0)
Dichlorodifluoromethane			ND	(2.0)
Ethyl benzene			ND	(2.0)
Ethyl methacrylate			ND	(50.0)
Iodomethane			ND	(2.0)
Methyl ethyl ketone			ND	(10.0)
Methylene chloride			13.0*B	(10.0)
Styrene			ND	(2.0)
Tetrachloroethylene			ND	(2.0)
Toluene			ND	(2.0)
Trans-1,4-dichloro-2-buten			ND	(2.0)
Trichloroethene			ND	(2.0)
Trichlorofluoromethane			ND	(10.0)
Vinyl acetate			ND	(2.0)
Vinyl chloride			ND	(2.0)
Xylenes			ND	(2.0)
cis-1,3-Dichloropropene			ND	(2.0)
trans-1,2-Dichloroethene			ND	(2.0)
trans-1,3-Dichloropropene			ND	(2.0)
Petroleum Hydrocarbons ug/g				
Hydrocarbons, Total	20.0*	()	ND	(19.0)

*: Less than 5 times the detection limit

*B: Less than 5 times the detection limit; Detected in Blank; Background subtraction not performed.

ND: Not detected at specified detection limit

( ): Detection limit

- D R A F T -

Compound	Concentration (μg/kg)
1,1,2,2 Tetrachloroethane	55
4-Methyl-2-pentanone	57
Methyl ethyl ketone	15
Xylenes	5.6

Most of the soil samples analyzed for volatile organic compounds contained detectable methylene chloride (10-24 μg/kg). However, a lab air blank contained methylene chloride at a concentration of 12.0 ng/g. Therefore, the methylene chloride detected in the samples is attributed to laboratory contamination of the samples.

5.0 QUALITY ASSURANCE AND QUALITY CONTROL

The objective of quality assurance and quality control (QA/QC) efforts associated with WSA-1 investigation was to ensure that data collected were of known and sufficient quality to qualitatively and quantitatively characterize the underground storage tank area at Bldg. 8514 at the Weapon Storage Area.

5.1 Summary and Approach

Overall, QA/QC data associated with the WSA-1 investigation indicate that the measurement data are acceptable and defensible. The QA/QC data indicate that the quality control mechanisms effectively ensured that measurement data were reliable within Carswell AFB IRP Phase II Stage 2 specifications. Sampling and analytical variability was within expected limits, except for analyses of total petroleum hydrocarbons. Total variability for total petroleum hydrocarbon analyses was slightly higher then expected. Also, for volatile organic compounds analyses, sample contamination with methylene chloride may have occurred during extraction. Blank samples of extraction laboratory air indicated methylene chloride was present at concentrations less then 1.5 times the instrument detection limit (IDL). Thus, while false positive response for methylene chloride is recognized it should not significantly affect data interpretation. Complete QA/QC data for the WSA-1 investigation are provided in Appendix C.

5.2 Blank Sample Analyses

Holding Times

All samples were run within method-specified holding times.

Laboratory Blanks

System blanks were used to quantitate false positive responses due to system configurations. The analytical system was shocked, that is no sample was injected, and the response analyzed. No false positive responses were noted for volatile halocarbons by method SW8240.

Laboratory air blanks were used to quantitate false positive responses due to laboratory solvents, preservatives and handling. False positive responses for each analyte by method are listed in Tables C-1 and C-2 of Appendix C. Only methylene chloride was noted as a potential sample contaminant due to the sample preparation process.

5.3 Quality Control Check Samples

Quality control check samples (QCCS) containing analytes at known concentrations were analyzed to assess analytical performance in the absence of matrix effects. Tables C-3 and C-4 of Appendix C summarizes QCCS recoveries for all analytes by matrix and method. Mean percent recoveries for total petroleum hydrocarbons in a soil matrix by method E418.1 were within the laboratory bias objectives. Repeatability, as expressed by coefficient of variation (CV%), were within laboratory accuracy objectives.

5.4 Spiked Samples

Spiked samples are those to which known amounts of the analytes of interest have been added. These include both matrix spike and surrogate spike analyses. Matrix spikes are made by adding target analytes to an aliquot of the sample. The recovery of matrix spikes indicates matrix effects on sample analyses. Surrogate spikes are readily identifiable species not normally found in the sample matrix that are added to assess method control. Surrogate spikes are added to each sample before analysis for the target compounds. Matrix spike results are summarized in Table C-5 of Appendix C. Surrogate spike results are summarized in Table C-6 of Appendix C.

Spiked Sample Results For Organic Analyses

Spiked sample results for organic analyses in soils were within QAPP specified acceptance criteria (Table C-7 of Appendix C). No measurement bias was indicated and analytical precision was as expected for method SW8240. No matrix interferences were detected as demonstrated by little measurement bias and good analytical precision for method SW8240 matrix surrogate spikes.

5.5 Duplicate Samples and Duplicate Analyses

Duplicate samples were collected to quantitate overall (total) variability in sample collection and analysis. Duplicate analyses were performed on samples to quantitate analytical variability (or analytical precision). Table C-8 of Appendix C provides precision estimates by source of variability. Total and sample variability for method SW8240 is difficult to quantitate because only one duplicate field sample was taken and methylene chloride was the only analyte detected in each duplicate. However, methylene chloride results and surrogate results were within expected levels of variability. Similarly only one sample was analyzed in duplicate to quantitate analytical variability. This sample was a matrix spiked sample which gives more information since 5 analytes were spiked as well as the surrogates, but still only one set of pairs must be used to quantitate variability. For this one pair variability was within expected levels. Seven samples were used to estimate variability for method 418.1, total hydrocarbons. Total variability was not within expected levels (CV = 67%, expected CV = 50%), however analytical variability was within expected levels (CV = 29%). This implies total variability for total hydrocarbon analyses in soils is highly dependent on sampling procedures and spatial variability where samples are taken (Table C-9 of Appendix C).

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

The following conclusions are based on the results of field and laboratory work at the underground storage tank area (WSA-1) at the Weapons Storage Area, Carswell AFB, Texas.

1. Drilling at the WSA-1 site revealed a thin zone of clayey soil underlain by dense, fossiliferous limestone. Ten boreholes were drilled to a maximum depth of ten feet below the land surface. Ground water was not encountered in the investigation. It is estimated that ground water occurs at depths of 50 to 60 feet below land surface based on the elevation of Live Oak Creek and its tributary which border the WSA.

2. The underground storage tank is in an excavation approximately 7 to 8 feet deep and backfilled with a sandy silt material. Surface drainage at the tank is to the north, leading toward an unnamed tributary of Live Oak Creek.

3. Results of chemical analyses of soil indicate that petroleum hydrocarbons occur in the backfill material, but not extending under or away from the excavation itself. Petroleum hydrocarbons reached a maximum of 1,300 $\mu g/g$ in the excavation itself, at the center and base of the excavation (in sample 9B). Volatile organic compounds were detected in two soil samples from the backfill material. The compounds consisted of 1,1,2,2 tetrachloroethane, 4-methyl-2-pentanone, methyl ethyl ketone, xylene, and methylene chloride.

4. Based on the observation of dense fossiliferous limestone, lack of ground water, and limited occurrence of petroleum hydrocarbons in the backfill, the extent of petroleum

hydrocarbon contamination appears to be limited to the backfill material and the excavation itself. There was no evidence to indicate migration of petroleum hydrocarbon compounds at the surface or in subsurface materials. Based on the observation of the texture, lithology, and relative permeabilities of materials, it would be difficult for hydrocarbon contaminants to migrate away from the relatively permeable backfill material in the absence of ground water or a significant hydraulic head contrast between the backfill and surrounding soil.

6.2 Recommendation

Since the extent of petroleum hydrocarbon contamination is limited to the backfill of the underground storage tank and does not occur in limestone strata surrounding the area, the following recommendation would appear to be a prudent action.

- The tank should be removed and all backfill material excavated and replaced by clean backfill. During excavation operations, observations of the base of the pit should be made for possible occurrence of ground water. In addition, sampling and analysis of soil at the base of the pit and at the west side of the pit wall near the concrete pad should be conducted to verify that all material with petroleum hydrocarbons has been removed.

7.0 REFERENCES

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Leggat, E.R., 1957. "Geology and Ground-Water Resources of Tarrant County, Texas". Texas Board of Water Engineers Bulletin 5709, September 1957.

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APPENDIX A

Geologic Logs

- D R A F T -

DRILLING LOG | RADIAN CORPORATION	INSTALLATION: CARSWELL AFB, TX | SHEET 1 OF 1 SHEETS
1. PROJECT: CARSWELL AFB, IRP PHASE II STAGE 2	7. TOTAL DEPTH OF HOLE: 7 ft BGL
	8. DATUM FOR ELEVATION SHOWN: sea level
2. LOCATION: Site WSA	9. MANUFACTURER'S DESIGNATION OF DRILL: Mobile Drill B-61
3. DRILLING AGENCY: Atec Associates	10. NO. OF SAMPLES TAKEN: 2
4. HOLE NO.: WSA-1	11. ELEVATION GROUND WATER:
5. NAME OF GEOLOGIST: Grant McIntyre	12. DATE HOLE ESTABLISHED: 8/4/88
6. COORDINATES OF HOLE: X: 1994959.19 Y: 401992.25	13. ELEVATION TOP OF HOLE: 745.59 ft MSL

Depth (Ft.)	Graphic Log	Sample ID	Soil Class/Code	Visual Description
0		1A	S/SLCL	SILTY CLAY, DRK BROWN; DRY; STIFF, MODERATE PLASTICITY; LIMESTONE FRAGMENTS; ORGANIC DEBRIS
1		1B	R/LMSN	LIMESTONE, LT. BROWN; DRY; DRILL CUTTINGS·POWDERY TEXTURE WITH SHELL FRAGMENTS
5			R/LMSN	
7			/	END OF BORING - 7 FEET.

- D R A F T -

DRILLING LOG | RADIAN CORPORATION	INSTALLATION: CARSWELL AFB, TX | SHEET 1 OF 1 SHEETS
1. PROJECT: CARSWELL AFB, IRP PHASE II STAGE 2	7. TOTAL DEPTH OF HOLE: 6 ft BGL
	8. DATUM FOR ELEVATION SHOWN: sea level
2. LOCATION: Site WSA	9. MANUFACTURER'S DESIGNATION OF DRILL: Mobile Drill B-61
3. DRILLING AGENCY: Atec Associates	10. NO. OF SAMPLES TAKEN: 3
4. HOLE NO.: WSA-2	11. ELEVATION GROUND WATER:
5. NAME OF GEOLOGIST: Grant McIntyre	12. DATE HOLE ESTABLISHED: 8/4/88
6. COORDINATES OF HOLE: X: 1994997.5 Y: 402060.24	13. ELEVATION TOP OF HOLE: 745.20 ft MSL

Depth (Ft.)	Graphic Log	Sample ID	Soil Class/Code	Visual Description
0		2A	S/SLSM	CLAYEY SILT, DRK BROWN; DRY; MED.SOFT; LIMESTONE FRAGMENTS; ORGANIC DEBRIS
4		2B	S/SLCL	DRK BROWN W/STREAKS OF YELLOW & ORANGE; DRY; VERY STIFF; LM. FRAGMENTS; BOTTOM 1" OF SAMPLE CONTACT W/ WEATHERED LIMESTONE
5		2C	R/LMSN	LIMESTONE, LT. BROWN TO GRAY; DRY; DRILL CUTTINGS - POWDERY WITH SHELL FRAGMENTS.
6			/	END OF BORING - 6 FEET.

- D R A F T -

DRILLING LOG	RADIAN CORPORATION	INSTALLATION: CARSWELL AFB, TX	SHEET 1 OF 1 SHEETS

1. PROJECT: CARSWELL AFB, IRP PHASE II STAGE 2	7. TOTAL DEPTH OF HOLE: 6 ft BGL
	8. DATUM FOR ELEVATION SHOWN: sea level
2. LOCATION: Site WSA	9. MANUFACTURER'S DESIGNATION OF DRILL: Mobile Drill B-61
3. DRILLING AGENCY: Atec Associates	10. NO. OF SAMPLES TAKEN: 2
4. HOLE NO.: WSA-3	11. ELEVATION GROUND WATER:
5. NAME OF GEOLOGIST: Grant McIntyre	12. DATE HOLE ESTABLISHED: 8/4/88
6. COORDINATES OF HOLE: X: 1994963.27 Y: 402110.01	13. ELEVATION TOP OF HOLE: 741.44 ft MSL

Depth (Ft.)	Graphic Log	Sample ID	Soil Class/Code	Visual Description
0		3A	S/SLSM	CLAYEY SILT, DRK BROWN; DRY; VERY STIFF; ROCK AND SHELL FRAGMENTS; BOTTOM HALF INCH CONTACT W/ LIMESTONE.
1		3B	R/LMSN	LIMESTONE, LT. BROWN TO LT. GRAY; DRY; DRILL CUTTINGS - POWDERY; SHELL FRAGMENTS.
5			R/LMSN	LT. BROWN; DRY; DRILL CUTTINGS - POWDERY.
6			/	END OF BORING - 6 FEET.

- D R A F T -

DRILLING LOG	RADIAN CORPORATION	INSTALLATION: CARSWELL AFB, TX	SHEET 1 OF 1 SHEETS

1. PROJECT: CARSWELL AFB, IRP PHASE II STAGE 2	7. TOTAL DEPTH OF HOLE: 10 ft BGL
	8. DATUM FOR ELEVATION SHOWN: sea level
2. LOCATION: Site WSA	9. MANUFACTURER'S DESIGNATION OF DRILL: Mobile Drill B-61
3. DRILLING AGENCY: Atec Associates	10. NO. OF SAMPLES TAKEN: 3
4. HOLE NO.: WSA-4	11. ELEVATION GROUND WATER:
5. NAME OF GEOLOGIST: Grant McIntyre	12. DATE HOLE ESTABLISHED: 8/4/88
6. COORDINATES OF HOLE: X: 1994958.47 Y: 402053.96	13. ELEVATION TOP OF HOLE: 741.54 ft MSL

Depth (Ft.)	Graphic Log	Sample ID	Soil Class/Code	Visual Description
0		4A	S/SLSM	CLAYEY SILT, MEDIUM BROWN; MOIST, SOFT; FEW ROCK & SHELL FRAGMENTS; TRACE SAND.
2		4B	R/LMSN	LIMESTONE, LT. BROWN TO GRAY; DRILL CUTTINGS - POWDERY; ROCK AND SHELL FRAGMENTS.
5		4C	R/LMSN	WHITISH GRAY; MOIST; SLIGHT ODOR
9			R/LMSN	DARK GRAY; MOIST; DRILL CUTTINGS - FINE.
10			/	END OF BORING - 10 FEET.

- D R A F T -

DRILLING LOG | RADIAN CORPORATION	INSTALLATION: CARSWELL AFB, TX | SHEET 1 OF 1 SHEETS
1. PROJECT: CARSWELL AFB, IRP PHASE II STAGE 2	7. TOTAL DEPTH OF HOLE: 4 ft BGL
	8. DATUM FOR ELEVATION SHOWN: sea level
2. LOCATION: Site WSA	9. MANUFACTURER'S DESIGNATION OF DRILL: Mobile Drill B-61
3. DRILLING AGENCY: Atec Associates	10. NO. OF SAMPLES TAKEN: 1
4. HOLE NO.: WSA-5	11. ELEVATION GROUND WATER:
5. NAME OF GEOLOGIST: Grant McIntyre	12. DATE HOLE ESTABLISHED: 8/4/88
6. COORDINATES OF HOLE: X: 1994955.86 Y: 402057.93	13. ELEVATION TOP OF HOLE: 741.52 ft MSL

Depth (Ft.)	Graphic Log	Sample ID	Soil Class/Code	Visual Description
0		5A	S/SLSM	CLAYEY SILT, DARK BROWN; DRY; SHELL FRAGMENTS; VERY STIFF.
3			F/OTHR	FILL MATERIAL - SAND, SILT & ROCK FRAGMENTS.
4			/	END OF BORING - 4 FEET.

- D R A F T -

DRILLING LOG | RADIAN CORPORATION	INSTALLATION: CARSWELL AFB, TX | SHEET 1 OF 1 SHEETS
1. PROJECT: CARSWELL AFB, IRP PHASE II STAGE 2	7. TOTAL DEPTH OF HOLE: 8 ft BGL
	8. DATUM FOR ELEVATION SHOWN: sea level
2. LOCATION: Site WSA	9. MANUFACTURER'S DESIGNATION OF DRILL: Mobile Drill B-61
3. DRILLING AGENCY: Atec Associates	10. NO. OF SAMPLES TAKEN: 3
4. HOLE NO.: WSA-6	11. ELEVATION GROUND WATER:
5. NAME OF GEOLOGIST: Grant McIntyre	12. DATE HOLE ESTABLISHED: 8/4/88
6. COORDINATES OF HOLE: X: 1994951.57 Y: 402047.4	13. ELEVATION TOP OF HOLE: 741.47 ft MSL

Depth (Ft.)	Graphic Log	Sample ID	Soil Class/Code	Visual Description
0		6A	S/SLSM	CLAYEY SILT, LT. TO MEDIUM BROWN; DRY; ROCK AND SHELL FRAGMENTS; STIFF, CLAY NODULES.
2		6B	F/OTHR	FILL MATERIAL - LT TO MED. BROWN; SAND, SILT, AND CLAY; MOIST, SLIGHT PETROLEOUM ODOR.
4		6C	F/OTHR	FILL MATERIAL - LT TO MED. BROWN; SAND, SILT, AND CLAY; MOIST, SLIGHT PETROLEUM ODOR.
6			F/OTHR	
6.5			R/LMSN	LIMESTONE, LT. BROWN TO GRAY; MOIST; FEW SHELL FRAGMENTS; DRILL CUTTINGS - VERY FINE.
8			/	END OF BORING - 8 FEET.

- D R A F T -

DRILLING LOG | RADIAN CORPORATION	INSTALLATION: CARSWELL AFB, TX | SHEET 1 OF 1 SHEETS
1. PROJECT: CARSWELL AFB, IRP PHASE II STAGE 2	7. TOTAL DEPTH OF HOLE: 10 ft BGL
	8. DATUM FOR ELEVATION SHOWN: sea level
2. LOCATION: Site WSA	9. MANUFACTURER'S DESIGNATION OF DRILL: Mobile Drill B-61
3. DRILLING AGENCY: Atec Associates	10. NO. OF SAMPLES TAKEN: 3
4. HOLE NO.: WSA-7	11. ELEVATION GROUND WATER:
5. NAME OF GEOLOGIST: Grant McIntyre	12. DATE HOLE ESTABLISHED: 8/5/88
6. COORDINATES OF HOLE: X: 1994948.79 Y: 402060.56	13. ELEVATION TOP OF HOLE: 741.63 ft MSL

Depth (Ft.)	Graphic Log	Sample ID	Soil Class/Code	Visual Description
0			F/OTHR	FILL MATERIAL - SAND, SILT, AND CLAY; TOP 12 IN.-MEDIUM BROWN; BOTTOM 8 IN.-MED. TO DARK GRAY. ROCK AND SHELL FRAGMENTS.
2		7A	F/OTHR	FILL MATERIAL - SAND, SILT, AND CLAY; DRK BROWN; MOIST; SOFT; ROCK AND SHELL FRAGMENTS.
4		7B	F/OTHR	FILL MATERIAL - ROCK & SHELL FRAGMENTS; WOOD PIECES; STRONG PETROLEUM ODOR.
8		7C	R/LMSN	LIMESTONE, WHITISH-GRAY; CEMENTED SHELL FRAGMENTS; RECRYSTALLIZED CALCITE.
10			/	END OF BORING - 10 FEET.

- D R A F T -

DRILLING LOG | RADIAN CORPORATION	INSTALLATION: CARSWELL AFB, TX | SHEET 1 OF 1 SHEETS
1. PROJECT: CARSWELL AFB, IRP PHASE II STAGE 2	7. TOTAL DEPTH OF HOLE: 7 ft BGL
	8. DATUM FOR ELEVATION SHOWN: sea level
2. LOCATION: Site WSA	9. MANUFACTURER'S DESIGNATION OF DRILL: Mobile Drill B-61
3. DRILLING AGENCY: Atec Associates	10. NO. OF SAMPLES TAKEN: 3
4. HOLE NO.: WSA-8	11. ELEVATION GROUND WATER:
5. NAME OF GEOLOGIST: Grant McIntyre	12. DATE HOLE ESTABLISHED: 8/5/88
6. COORDINATES OF HOLE: X: 1994951.75 Y: 402071.03	13. ELEVATION TOP OF HOLE: 741.50 ft MSL

Depth (Ft.)	Graphic Log	Sample ID	Soil Class/Code	Visual Description
0		8A	S/SLCL	LT. BROWN; DRY; STIFF; ROCK AND SHELL FRAGMENTS.
3		8B	R/LMSN	LIMESTONE, LT. BROWN TO GRAY; DRILL CUTTINGS - POWDERY.
7		8C	R/LMSN	LT. BROWN TO GRAY; DRY; DRILL CUTTINGS - POWDERY (VERY FINE). END OF BORING - 7 FEET.

-DRAFT-

DRILLING LOG	RADIAN CORPORATION	INSTALLATION: CARSWELL AFB, TX	SHEET 1 OF 1 SHEETS

1. PROJECT: CARSWELL AFB, IRP PHASE II STAGE 2	7. TOTAL DEPTH OF HOLE: 9 ft BGL
	8. DATUM FOR ELEVATION SHOWN: sea level
2. LOCATION: Site WSA	9. MANUFACTURER'S DESIGNATION OF DRILL: Mobile Drill B-61
3. DRILLING AGENCY: Atec Associates	10. NO. OF SAMPLES TAKEN: 3
4. HOLE NO.: WSA-9	11. ELEVATION GROUND WATER:
5. NAME OF GEOLOGIST: Grant McIntyre	12. DATE HOLE ESTABLISHED: 8/5/88
6. COORDINATES OF HOLE: X: 1994948.08 Y: 402056.65	13. ELEVATION TOP OF HOLE: 741.65 ft MSL

Depth (Ft.)	Graphic Log	Sample ID	Soil Class/Code	Visual Description
0			/	
2		9A	F/OTHR	FILL MATERIAL - DARK ORANGE-BROWN, MOIST; ORGANIC DEBRIS.
4			F/OTHR	FILL MATERIAL - CLAY, SAND, SILT; DARK BROWN, MOIST.
6		9B	F/OTHR	FILL MATERIAL - CLAY, SAND, SILT; DRK BROWN W/BLACK STREAKS; ORGANIC DEBRI; PETRO ODOR.
9		9C	R/LMSN	LIMESTONE, LT. BROWN TO GRAY; MOIST; DRILL CUTINGS - VERY FINE. END OF BORING - 9 FEET.

DRAFT

DRILLING LOG | RADIAN CORPORATION	INSTALLATION: CARSWELL AFB, TX | SHEET 1 OF 1 SHEETS
1. PROJECT: CARSWELL AFB, IRP PHASE II STAGE 2	7. TOTAL DEPTH OF HOLE: 1 ft BGL
	8. DATUM FOR ELEVATION SHOWN: sea level
2. LOCATION: Site WSA	9. MANUFACTURER'S DESIGNATION OF DRILL: Mobile Drill B-61
3. DRILLING AGENCY: Atec Associates	10. NO. OF SAMPLES TAKEN: 1
4. HOLE NO.: WSA-10	11. ELEVATION GROUND WATER:
5. NAME OF GEOLOGIST: Grant McIntyre	12. DATE HOLE ESTABLISHED: 8/5/88
6. COORDINATES OF HOLE: X: 1994957.24 Y: 402085.95	13. ELEVATION TOP OF HOLE: 741.55 ft MSL

Depth (Ft.)	Graphic Log	Sample ID	Soil Class/Code	Visual Description
0		10A	S/SLCL	SILTY CLAY, LT.TO MED. BROWN; DRY; STIFF; FEW ROCK & SHELL FRAGMENTS; ORGANIC DEBRIS.
1			/	END OF BORING - 1 FOOT.

APPENDIX B

Chemical Analytical Data

RAS - Austin REPORT

Work Order # 88-08-054

Received: 08/05/88

08/26/88 07:28:59

REPORT TO: Radian
B1.4
Austin

ATTEN: Larry French

CLIENT: CARSWELL D06 SAMPLES 26
COMPANY: Carswell AFB
FACILITY: 601/602

WORK ID: WSA
TAKEN: WGM
TRANS: WGM
TYPE:
P.O. #: 214-114-06-42
INV. #: 12144

PREPARED BY: Radian Analytical Services
8501 Mo-pac Bl.
PO Box 201088
Austin, TX 78720-1088

ATTEN:
PHONE: 512-454-4797

Larry K. Mutscheller
CERTIFIED BY

CONTACT: SMITH

Previously Reported on 08/24/88.

Footnotes and Comments

* Indicates a value less than 5 times the detection limit. Potential error for such low values ranges between 50 and 100%.

@ Indicates that spike recovery for this analysis on the specific matrix was not within acceptable limits indicating an interferent present.

- DRAFT -

B-2

SAMPLE IDENTIFICATION

01	08-01
02	08-02
03	08-03
04	08-04
05	08-05
06	08-06
07	08-07
08	08-08
09	08-09
10	08-10
11	08-11
12	08-11 dup
13	08-12
14	08-13
15	08-13 dup
16	08-14
17	08-15
18	08-16
19	08-18

TEST CODES and NAMES used on this report

HC IR	Hydrocarbons, Total
PREP W	Special preparation

Received: 08/05/88

RAS - Austin REPORT
08/26/88 07:28:59

Work Order # 88-08-054

SAMPLE IDENTIFICATION

20 08-19
21 08-20
22 08-21
23 08-21 dup
24 08-22
25 08-23
26 08-24

-DRAFT-

Received: 08/05/88

RAS - Austin REPORT
Results By Test

Work Order # 88-08-054

SAMPLE Sample Id	Test: HC IR mg/L	Test: PREP W date complete
01 08-01	<19 ug/g	08/12/88
02 08-02	<19 ug/g	08/12/88
03 08-03	<20 ug/g	08/12/88
04 08-04	<20 ug/g	08/12/88
05 08-05	<20 ug/g	08/12/88
06 08-06	<19 ug/g	08/12/88
07 08-07	<17 ug/g	08/12/88
08 08-08	<18 ug/g	08/12/88
09 08-09	28* ug/g	08/12/88
10 08-10	<17 ug/g	08/12/88
11 08-11	270 ug/g	08/12/88
12 08-11 dup	150 ug/g	08/12/88
13 08-12	<19 ug/g	08/12/88
14 08-13	<19 ug/g	08/12/88

-DRAFT-

ceived: 08/05/88

RAS - Austin REPORT
Results By Test

Work Order # 88-08-054
Continued From Above

SAMPLE Sample Id	Test: HC IR mg/L	Test: PREP W date complete
15	<15	08/12/88
08-13 dup	ug/g	
16	<18	08/12/88
08-14	ug/g	
17	<20	08/12/88
08-15	ug/g	
18	750	08/12/88
08-16	ug/g	
19	<19	08/12/88
08-18	ug/g	
20	<19	08/12/88
08-19	ug/g	
21	<20	08/12/88
08-20	ug/g	
22	40*	08/12/88
08-21	ug/g	
23	<20	08/12/88
08-21 dup	ug/g	
24	1300	08/12/88
08-22	ug/g	
25	20*	08/12/88
08-23	ug/g	
26	<19	08/12/88
08-24	ug/g	

-DRAFT-

RADIAN CORPORATION

- D R A F T -

Client: CARSWELL AFB
RADIAN INTERNAL
NA

01A (08-02)
02A (08-04)
03A (08-06)
04A (08-08)

EPA METHOD 8240

Lab No: A8-08-042

RESULTS IN ng/g

CAS #	COMPOUND	01A	02A	03A	04A
67-64-1	Acetone	<25	<25	<25	<25
107-02-8	Acrolein	<100	<100	<100	<100
107-13-1	Acrylonitrile	<10	<10	<10	<10
71-43-2	Benzene	<2.0	<2.0	<2.0	<2.0
75-25-2	Bromoform	<2.0	<2.0	<2.0	<2.0
74-83-9	Bromomethane	<2.0	<2.0	<2.0	<2.0
124-48-1	Chlorodibromomethane	<2.0	<2.0	<2.0	<2.0
75-00-3	Chloroethane	<2.0	<2.0	<2.0	<2.0
108-90-7	Chlorobenzene	<2.0	<2.0	<2.0	<2.0
75-15-0	Carbon Disulfide	<2.0	<2.0	<2.0	<2.0
56-23-5	Carbon Tetrachloride	<2.0	<2.0	<2.0	<2.0
67-66-3	Chloroform	<2.0	<2.0	<2.0	<2.0
74-87-3	Chloromethane	<2.0	<2.0	<2.0	<2.0
110-75-8	2-Chloroethyl vinyl ether	<2.0	<2.0	<2.0	<2.0
74-95-3	Dibromomethane	<2.0	<2.0	<2.0	<2.0
75-71-8	Dichlorodifluoromethane	<2.0	<2.0	<2.0	<2.0
75-34-3	1,1-Dichloroethane	<2.0	<2.0	<2.0	<2.0
107-06-2	1,2-Dichloroethane	<2.0	<2.0	<2.0	<2.0
156-60-5	trans-1,2-Dichloroethane	<2.0	<2.0	<2.0	<2.0
75-35-4	1,1-Dichloroethene	<2.0	<2.0	<2.0	<2.0
75-27-4	Dichlorobromomethane	<2.0	<2.0	<2.0	<2.0
78-87-5	1,2-Dichloropropane	<2.0	<2.0	<2.0	<2.0
10061-01-5	cis-1,3-Dichloropropene	<2.0	<2.0	<2.0	<2.0
10061-02-6	trans-1,3-Dichloropropene	<2.0	<2.0	<2.0	<2.0
97-63-2	Ethyl methacrylate	<50	<50	<50	<50
100-41-4	Ethyl benzene	<2.0	<2.0	<2.0	<2.0
591-78-6	2-Hexanone	<10	<10	<10	<10
74-88-4	Iodomethane	<2.0	<2.0	<2.0	<2.0
75-09-2	Methylene chloride	<10	<10	22*B	10*B
78-93-3	Methyl ethyl ketone	<10	<10	<10	<10
108-10-1	4-Methyl-2-pentanone	<2.0	<2.0	<2.0	<2.0
100-42-5	Styrene	<2.0	<2.0	<2.0	<2.0
79-34-5	1,1,2,2-Tetrachloroethane	<2.0	<2.0	<2.0	<2.0
127-18-4	Tetrachloroethylene	<2.0	<2.0	<2.0	<2.0
108-88-3	Toluene	<2.0	<2.0	<2.0	<2.0
79-01-6	Trichloroethene	<2.0	<2.0	<2.0	<2.0
71-55-6	1,1,1-Trichloroethane	<2.0	<2.0	<2.0	<2.0
79-00-5	1,1,2-Trichloroethane	<2.0	<2.0	<2.0	<2.0
75-69-4	Trichlorofluoromethane	<10	<10	<10	<10
96-18-4	1,2,3-Trichloropropane	<2.0	<2.0	<2.0	<2.0
75-01-4	Vinyl chloride	<2.0	<2.0	<2.0	<2.0
108-05-4	Vinyl acetate	<2.0	<2.0	<2.0	<2.0
110-57-6	Transl,4dichloro-2-butene	<2.0	<2.0	<2.0	<2.0
1330-20-7	Xylenes	<2.0	<2.0	<2.0	<2.0

Client: CARSWELL AFB
RADIAN INTERNAL
NA

05A (08-10)
06A (08-12)
07A (08-10) DUPLICATE
08A (08-16)

EPA METHOD 8240

Lab No: A8-08-042

RESULTS IN ng/g

CAS #	COMPOUND	05A	06A	07A	08A
67-64-1	Acetone	<25	<25	<25	<25
107-02-8	Acrolein	<100	<100	<100	<100
107-13-1	Acrylonitrile	<10	<10	<10	<10
71-43-2	Benzene	<2.0	<2.0	<2.0	<2.0
75-25-2	Bromoform	<2.0	<2.0	<2.0	<2.0
74-83-9	Bromomethane	<2.0	<2.0	<2.0	<2.0
124-48-1	Chlorodibromomethane	<2.0	<2.0	<2.0	<2.0
75-00-3	Chloroethane	<2.0	<2.0	<2.0	<2.0
108-90-7	Chlorobenzene	<2.0	<2.0	<2.0	<2.0
75-15-0	Carbon Disulfide	<2.0	<2.0	<2.0	<2.0
56-23-5	Carbon Tetrachloride	<2.0	<2.0	<2.0	<2.0
67-66-3	Chloroform	<2.0	<2.0	<2.0	<2.0
74-87-3	Chloromethane	<2.0	<2.0	<2.0	<2.0
110-75-8	2-Chloroethyl vinyl ether	<2.0	<2.0	<2.0	<2.0
74-95-3	Dibromomethane	<2.0	<2.0	<2.0	<2.0
75-71-8	Dichlorodifluoromethane	<2.0	<2.0	<2.0	<2.0
75-34-3	1,1-Dichloroethane	<2.0	<2.0	<2.0	<2.0
107-06-2	1,2-Dichloroethane	<2.0	<2.0	<2.0	<2.0
156-60-5	trans-1,2-Dichloroethane	<2.0	<2.0	<2.0	<2.0
75-35-4	1,1-Dichloroethene	<2.0	<2.0	<2.0	<2.0
75-27-4	Dichlorobromomethane	<2.0	<2.0	<2.0	<2.0
78-87-5	1,2-Dichloropropane	<2.0	<2.0	<2.0	<2.0
10061-01-5	cis-1,3-Dichloropropene	<2.0	<2.0	<2.0	<2.0
10061-02-6	trans-1,3-Dichloropropene	<2.0	<2.0	<2.0	<2.0
97-63-2	Ethyl methacrylate	<50	<50	<50	<50
100-41-4	Ethyl benzene	<2.0	<2.0	<2.0	<2.0
591-78-6	2-Hexanone	<10	<10	<10	<10
74-88-4	Iodomethane	<2.0	<2.0	<2.0	<2.0
75-09-2	Methylene chloride	17*B	18*B	20*B	23*B
78-93-3	Methyl ethyl ketone	<10	<10	<10	15*
108-10-1	4-Methyl-2-pentanone	<2.0	<2.0	<2.0	57
100-42-5	Styrene	<2.0	<2.0	<2.0	<2.0
79-34-5	1,1,2,2-Tetrachloroethane	<2.0	<2.0	<2.0	55
127-18-4	Tetrachloroethylene	<2.0	<2.0	<2.0	<2.0
108-88-3	Toluene	<2.0	<2.0	<2.0	<2.0
79-01-6	Trichloroethene	<2.0	<2.0	<2.0	<2.0
71-55-6	1,1,1-Trichloroethane	<2.0	<2.0	<2.0	<2.0
79-00-5	1,1,2-Trichloroethane	<2.0	<2.0	<2.0	<2.0
75-69-4	Trichlorofluoromethane	<10	<10	<10	<10
96-18-4	1,2,3-Trichloropropane	<2.0	<2.0	<2.0	<2.0
75-01-4	Vinyl chloride	<2.0	<2.0	<2.0	<2.0
108-05-4	Vinyl acetate	<2.0	<2.0	<2.0	<2.0
110-57-6	Trans1,4dichloro-2-butene	<2.0	<2.0	<2.0	<2.0
1330-20-7	Xylenes	<2.0	<2.0	<2.0	5.6*

Client: CARSWELL AFB
RADIAN INTERNAL
NA

09A (08-19)
10A (08-22)
11A (08-24)
12A System Blank

EPA METHOD 8240

Lab No: A8-08-042

RESULTS IN ng/g

CAS #	COMPOUND	09A	10A	11A	12A
67-64-1	Acetone	<25	<25	<25	<25
107-02-8	Acrolein	<100	<100	<100	<100
107-13-1	Acrylonitrile	<10	<10	<10	<10
71-43-2	Benzene	<2.0	<2.0	<2.0	<2.0
75-25-2	Bromoform	<2.0	<2.0	<2.0	<2.0
74-83-9	Bromomethane	<2.0	<2.0	<2.0	<2.0
124-48-1	Chlorodibromomethane	<2.0	<2.0	<2.0	<2.0
75-00-3	Chloroethane	<2.0	<2.0	<2.0	<2.0
108-90-7	Chlorobenzene	<2.0	<2.0	<2.0	<2.0
75-15-0	Carbon Disulfide	<2.0	<2.0	<2.0	<2.0
56-23-5	Carbon Tetrachloride	<2.0	<2.0	<2.0	<2.0
67-66-3	Chloroform	<2.0	<2.0	<2.0	<2.0
74-87-3	Chloromethane	<2.0	<2.0	<2.0	<2.0
110-75-8	2-Chloroethyl vinyl ether	<2.0	<2.0	<2.0	<2.0
74-95-3	Dibromomethane	<2.0	<2.0	<2.0	<2.0
75-71-8	Dichlorodifluoromethane	<2.0	<2.0	<2.0	<2.0
75-34-3	1,1-Dichloroethane	<2.0	<2.0	<2.0	<2.0
107-06-2	1,2-Dichloroethane	<2.0	<2.0	<2.0	<2.0
156-60-5	trans-1,2-Dichloroethane	<2.0	<2.0	<2.0	<2.0
75-35-4	1,1-Dichloroethene	<2.0	<2.0	<2.0	<2.0
75-27-4	Dichlorobromomethane	<2.0	<2.0	<2.0	<2.0
78-87-5	1,2-Dichloropropane	<2.0	<2.0	<2.0	<2.0
10061-01-5	cis-1,3-Dichloropropene	<2.0	<2.0	<2.0	<2.0
10061-02-6	trans-1,3-Dichloropropene	<2.0	<2.0	<2.0	<2.0
97-63-2	Ethyl methacrylate	<50	<50	<50	<50
100-41-4	Ethyl benzene	<2.0	<2.0	<2.0	<2.0
591-78-6	2-Hexanone	<10	<10	<10	<10
74-38-4	Iodomethane	<2.0	<2.0	<2.0	<2.0
75-09-2	Methylene chloride	20*B	24*B	13*B	<10
78-93-3	Methyl ethyl ketone	<10	<10	<10	<10
108-10-1	4-Methyl-2-pentanone	<2.0	<2.0	<2.0	<2.0
100-42-5	Styrene	<2.0	<2.0	<2.0	<2.0
79-34-5	1,1,2,2-Tetrachloroethane	<2.0	3.6*	<2.0	<2.0
127-18-4	Tetrachloroethylene	<2.0	<2.0	<2.0	<2.0
108-88-3	Toluene	<2.0	<2.0	<2.0	<2.0
79-01-6	Trichloroethene	<2.0	<2.0	<2.0	<2.0
71-55-6	1,1,1-Trichloroethane	<2.0	<2.0	<2.0	<2.0
79-00-5	1,1,2-Trichloroethane	<2.0	<2.0	<2.0	<2.0
75-69-4	Trichlorofluoromethane	<10	<10	<10	<10
96-18-4	1,2,3-Trichloropropane	<2.0	<2.0	<2.0	<2.0
75-01-4	Vinyl chloride	<2.0	<2.0	<2.0	<2.0
108-05-4	Vinyl acetate	<2.0	<2.0	<2.0	<2.0
110-57-6	Transl,4dichloro-2-butene	<2.0	<2.0	<2.0	<2.0
1330-20-7	Xylenes	<2.0	<2.0	<2.0	<2.0

13A XT Lab Room Air Blank

Client: CARSWELL AFB
RADIAN INTERNAL
NA

EPA METHOD 8240

Lab No: A8-08-042

RESULTS IN ng/g

CAS #	COMPOUND	13A
67-64-1	Acetone	<25
107-02-8	Acrolein	<100
107-13-1	Acrylonitrile	<10
71-43-2	Benzene	<2.0
75-25-2	Bromoform	<2.0
74-83-9	Bromomethane	<2.0
124-48-1	Chlorodibromomethane	<2.0
75-00-3	Chloroethane	<2.0
108-90-7	Chlorobenzene	<2.0
75-15-0	Carbon Disulfide	<2.0
56-23-5	Carbon Tetrachloride	<2.0
67-66-3	Chloroform	<2.0
74-87-3	Chloromethane	<2.0
110-75-8	2-Chloroethyl vinyl ether	<2.0
74-95-3	Dibromomethane	<2.0
75-71-8	Dichlorodifluoromethane	<2.0
75-34-3	1,1-Dichloroethane	<2.0
107-06-2	1,2-Dichloroethane	<2.0
156-60-5	trans-1,2-Dichloroethane	<2.0
75-35-4	1,1-Dichloroethene	<2.0
75-27-4	Dichlorobromomethane	<2.0
78-87-5	1,2-Dichloropropane	<2.0
10061-01-5	cis-1,3-Dichloropropene	<2.0
10061-02-6	trans-1,3-Dichloropropene	<2.0
97-63-2	Ethyl methacrylate	<50
100-41-4	Ethyl benzene	<2.0
591-78-6	2-Hexanone	<10
74-88-4	Iodomethane	<2.0
75-09-2	Methylene chloride	12*
78-93-3	Methyl ethyl ketone	<10
108-10-1	4-Methyl-2-pentanone	<2.0
100-42-5	Styrene	<2.0
79-34-5	1,1,2,2-Tetrachloroethane	<2.0
127-18-4	Tetrachloroethylene	<2.0
108-88-3	Toluene	<2.0
79-01-6	Trichloroethene	<2.0
71-55-6	1,1,1-Trichloroethane	<2.0
79-00-5	1,1,2-Trichloroethane	<2.0
75-69-4	Trichlorofluoromethane	<10
96-18-4	1,2,3-Trichloropropane	<2.0
75-01-4	Vinyl chloride	<2.0
108-05-4	Vinyl acetate	<2.0
110-57-6	Trans1,4dichloro-2-butene	<2.0
1330-20-7	Xylenes	<2.0

Client: CARSWELL AFB
RADIAN INTERNAL
NA

01A (08-02)
02A (08-04)
03A (08-06)
04A (08-08)

EPA METHOD 8240

Lab No: A8-08-042

RESULTS IN ng/g

CAS #	COMPOUND	01A	02A	03A	04A
	SURROGATE RECOVERIES	(results in % recovery)			
	d4-1,2-dichloroethane	87	89	91	87
	d8-toluene	95	92	93	92
	p-bromofluorobenzene	105	106	98	100

NOTES AND DEFINITIONS FOR THIS REPORT.
QC = OUTSIDE CONTROL LIMITS.
* = LESS THAN 5 TIMES THE DETECTION LIMIT.
B = DETECTED IN REAGENT BLANK; BACKGROUND SUBTRACTION NOT PERFORMED.
ND = NOT DETECTED AT DETECTION LIMIT.
NA = NOT ANALYZED.
N\A =STANDARD NOT AVAILABLE. COMPOUND WAS SEARCHED USING AN NBS LIBRARY OF 42,000 COMPOUNDS.
NS = NOT SPIKED.

Client: CARSWELL AFB
RADIAN INTERNAL
NA

05A (08-10)
06A (08-12)
07A (08-10) DUPLICATE
08A (08-16)

EPA METHOD 8240

Lab No: A8-08-042

RESULTS IN ng/g

CAS #	COMPOUND	05A	06A	07A	08A
	SURROGATE RECOVERIES (results in % recovery)				
	d4-1,2-dichloroethane	85	86	88	87
	d8-toluene	93	93	94	82
	p-bromofluorobenzene	104	103	98	118

NOTES AND DEFINITIONS FOR THIS REPORT.
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B = DETECTED IN REAGENT BLANK; BACKGROUND SUBTRACTION NOT PERFORMED.
ND = NOT DETECTED AT DETECTION LIMIT.
NA = NOT ANALYZED.
N\A =STANDARD NOT AVAILABLE. COMPOUND WAS SEARCHED USING AN NBS LIBRARY OF 42,000 COMPOUNDS.
NS = NOT SPIKED.

Client: CARSWELL AFB
RADIAN INTERNAL
NA

09A (08-19)
10A (08-22)
11A (08-24)
12A System Blank

EPA METHOD 8240

Lab No: A8-08-042

RESULTS IN ng/g

CAS #	COMPOUND	09A	10A	11A	12A
	SURROGATE RECOVERIES	(results in % recovery)			
	d4-1,2-dichloroethane	90	91	89	86
	d8-toluene	94	86	92	93
	p-bromofluorobenzene	103	101	99	106

NOTES AND DEFINITIONS FOR THIS REPORT.
QC = OUTSIDE CONTROL LIMITS.
* = LESS THAN 5 TIMES THE DETECTION LIMIT.
B = DETECTED IN REAGENT BLANK; BACKGROUND SUBTRACTION NOT PERFORMED.
ND = NOT DETECTED AT DETECTION LIMIT.
NA = NOT ANALYZED.
N\A =STANDARD NOT AVAILABLE. COMPOUND WAS SEARCHED USING AN NBS LIBRARY OF 42,000 COMPOUNDS.
NS = NOT SPIKED.

13A XT Lab Room Air Blank

Client: CARSWELL AFB
RADIAN INTERNAL
NA

EPA METHOD 8240

Lab No: A8-08-042

RESULTS IN ng/g

CAS #	COMPOUND	13A
	SURROGATE RECOVERIES (results in % recovery)	
	d4-1,2-dichloroethane	87
	d8-toluene	104
	p-bromofluorobenzene	109

NOTES AND DEFINITIONS FOR THIS REPORT.
QC = OUTSIDE CONTROL LIMITS.
* = LESS THAN 5 TIMES THE DETECTION LIMIT.
B = DETECTED IN REAGENT BLANK; BACKGROUND SUBTRACTION NOT PERFORMED.
ND = NOT DETECTED AT DETECTION LIMIT.
NA = NOT ANALYZED.
N\A =STANDARD NOT AVAILABLE. COMPOUND WAS SEARCHED USING AN NBS LIBRARY OF 42,000 COMPOUNDS.
NS = NOT SPIKED.

14A 08-10 MS
15A 08-10 MSD

Client: CARSWELL AFB
RADIAN INTERNAL
NA

MATRIX SPIKES 8240

Lab No: A8-08-042

RESULTS IN %

CAS #	COMPOUND	14A	15A
71-43-2	Benzene	109	106
108-90-7	Chlorobenzene	112	111
75-35-4	1,1-Dichloroethene	92	111
108-88-3	Toluene	119	117
79-01-6	Trichloroethene	106	106

SURROGATE RECOVERIES	(results in % recovery)	
d4-1,2-dichloroethane	89	89
d8-toluene	95	94
p-bromofluorobenzene	101	105

NOTES AND DEFINITIONS FOR THIS REPORT.
QC = OUTSIDE CONTROL LIMITS.
* = LESS THAN 5 TIMES THE DETECTION LIMIT.
B = DETECTED IN REAGENT BLANK; BACKGROUND SUBTRACTION NOT PERFORMED.
ND = NOT DETECTED AT DETECTION LIMIT.
NA = NOT ANALYZED.
N\A = NOT AVAILABLE.
NS = NOT SPIKED.

TABLE C-1. SUMMARY OF BLANK RESULTS - CARSWELL AFB - WEAPON STORAGE AREA

SUMMARY OF BLANK RESULTS FOR MATRIX = a

Method Type	Parameter	Total Number of Blanks	Total Number above Detection Limit	Concentration Range Minimum - Maximum	Maximum Detection Limit
Volatile Halocarbons (8240)					
l					
	1,1,1-Trichloroethane	1	0		2.0
	1,1,2,2-Tetrachloroethane	1	0		2.0
	1,1,2-Trichloroethane	1	0		2.0
	1,1-Dichloroethane	1	0		2.0
	1,1-Dichloroethene	1	0		2.0
	1,2,3-Trichloropropane	1	0		2.0
	1,2-Dichloroethane	1	0		2.0
	1,2-Dichloropropane	1	0		2.0
	2-Hexanone	1	0		10.0
	4-Methyl-2-pentanone	1	0		2.0
	Acetone	1	0		25.0
	Acrolein	1	0		100.0
	Acrylonitrile	1	0		10.0
	Benzene	1	0		2.0
	Bromoform	1	0		2.0
	Bromomethane	1	0		2.0
	Carbon Disulfide	1	0		2.0
	Carbon Tetrachloride	1	0		2.0
	Chlorobenzene	1	0		2.0
	Chlorodibromomethane	1	0		2.0
	Chloroethane	1	0		2.0
	Chloroethyl vinyl ether	1	0		2.0
	Chloroform	1	0		2.0
	Chloromethane	1	0		2.0
	Dibromomethane	1	0		2.0
	Dichlorobromomethane	1	0		2.0
	Dichlorodifluoromethane	1	0		2.0
	Ethyl benzene	1	0		2.0
	Ethyl methacrylate	1	0		50.0
	Iodomethane	1	0		2.0
	Methyl ethyl ketone	1	0		10.0
	Methylene chloride	1	1	12.0 - 12.0	
	Styrene	1	0		2.0
	Tetrachloroethylene	1	0		2.0
	Toluene	1	0		2.0
	Trans-1,4-dichloro-2-buten	1	0		2.0
	Trichloroethene	1	0		2.0
	Trichlorofluoromethane	1	0		10.0

TABLE C-1. (Cont.)

SUMMARY OF BLANK RESULTS FOR MATRIX = a

Method Type	Parameter	Total Number of Blanks	Total Number above Detection Limit	Concentration Range Minimum - Maximum	Maximum Detection Limit
Volatile Halocarbons (8240)					
l					
	Vinyl acetate	1	0		2.0
	Vinyl chloride	1	0		2.0
	Xylenes	1	0		2.0
	cis-1,3-Dichloropropene	1	0		2.0
	trans-1,2-Dichloroethene	1	0		2.0
	trans-1,3-Dichloropropene	1	0		2.0
System Blank					
	1,1,1-Trichloroethane	1	0		2.0
	1,1,2,2-Tetrachloroethane	1	0		2.0
	1,1,2-Trichloroethane	1	0		2.0
	1,1-Dichloroethane	1	0		2.0
	1,1-Dichloroethene	1	0		2.0
	1,2,3-Trichloropropane	1	0		2.0
	1,2-Dichloroethane	1	0		2.0
	1,2-Dichloropropane	1	0		2.0
	2-Hexanone	1	0		10.0
	4-Methyl-2-pentanone	1	0		2.0
	Acetone	1	0		25.0
	Acrolein	1	0		100.0
	Acrylonitrile	1	0		10.0
	Benzene	1	0		2.0
	Bromoform	1	0		2.0
	Bromomethane	1	0		2.0
	Carbon Disulfide	1	0		2.0
	Carbon Tetrachloride	1	0		2.0
	Chlorobenzene	1	0		2.0
	Chlorodibromomethane	1	0		2.0
	Chloroethane	1	0		2.0
	Chloroethyl vinyl ether	1	0		2.0
	Chloroform	1	0		2.0
	Chloromethane	1	0		2.0
	Dibromomethane	1	0		2.0
	Dichlorobromomethane	1	0		2.0
	Dichlorodifluoromethane	1	0		2.0
	Ethyl benzene	1	0		2.0
	Ethyl methacrylate	1	0		50.0
	Iodomethane	1	0		2.0
	Methyl ethyl ketone	1	0		10.0

TABLE C-1. (Cont.)

SUMMARY OF BLANK RESULTS FOR MATRIX = a

Method Type	Parameter	Total Number of Blanks	Total Number above Detection Limit	Concentration Range Minimum - Maximum	Maximum Detection Limit
Volatile Halocarbons (8240)					
System Blank					
	Methylene chloride	1	0		10.0
	Styrene	1	0		2.0
	Tetrachloroethylene	1	0		2.0
	Toluene	1	0		2.0
	Trans-1,4-dichloro-2-buten	1	0		2.0
	Trichloroethene	1	0		2.0
	Trichlorofluoromethane	1	0		10.0
	Vinyl acetate	1	0		2.0
	Vinyl chloride	1	0		2.0
	Xylenes	1	0		2.0
	cis-1,3-Dichloropropene	1	0		2.0
	trans-1,2-Dichloroethene	1	0		2.0
	trans-1,3-Dichloropropene	1	0		2.0

TABLE C-2. DETAILED BLANK RESULTS - CARSWELL AFB - WEAPON STORAGE AREA

Date/Matrix/Type	Parameter	Detection Flag	Measured Value
Volatile Halocarbons (8240)			
12-Aug-88 a l	1,1,1-Trichloroethane	ND	2.0000
12-Aug-88 a s	1,1,1-Trichloroethane	ND	2.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 2.0
12-Aug-88 a l	1,1,2,2-Tetrachloroethane	ND	2.0000
12-Aug-88 a s	1,1,2,2-Tetrachloroethane	ND	2.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 2.0
12-Aug-88 a l	1,1,2-Trichloroethane	ND	2.0000
12-Aug-88 a s	1,1,2-Trichloroethane	ND	2.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 2.0
12-Aug-88 a l	1,1-Dichloroethane	ND	2.0000
12-Aug-88 a s	1,1-Dichloroethane	ND	2.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 2.0
12-Aug-88 a l	1,1-Dichloroethene	ND	2.0000
12-Aug-88 a s	1,1-Dichloroethene	ND	2.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 2.0
12-Aug-88 a l	1,2,3-Trichloropropane	ND	2.0000
12-Aug-88 a s	1,2,3-Trichloropropane	ND	2.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 2.0
12-Aug-88 a l	1,2-Dichloroethane	ND	2.0000
12-Aug-88 a s	1,2-Dichloroethane	ND	2.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 2.0

TABLE C-2. (Cont.)

Date/Matrix/Type	Parameter	Detection Flag	Measured Value
Volatile Halocarbons (8240)			
12-Aug-88 a l	1,2-Dichloropropane	ND	2.0000
12-Aug-88 a s	1,2-Dichloropropane	ND	2.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 2.0
12-Aug-88 a l	2-Hexanone	ND	10.0000
12-Aug-88 a s	2-Hexanone	ND	10.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 10.0
12-Aug-88 a l	4-Methyl-2-pentanone	ND	2.0000
12-Aug-88 a s	4-Methyl-2-pentanone	ND	2.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 2.0
12-Aug-88 a l	Acetone	ND	25.0000
12-Aug-88 a s	Acetone	ND	25.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 25.0
12-Aug-88 a l	Acrolein	ND	100.0000
12-Aug-88 a s	Acrolein	ND	100.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 100.0
12-Aug-88 a l	Acrylonitrile	ND	10.0000
12-Aug-88 a s	Acrylonitrile	ND	10.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 10.0
12-Aug-88 a l	Benzene	ND	2.0000
12-Aug-88 a s	Benzene	ND	2.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 2.0

TABLE C-2. (Cont.)

Date/Matrix/Type	Parameter	Detection Flag	Measured Value
Volatile Halocarbons (8240)			
12-Aug-88 a l	Bromoform	ND	2.0000
12-Aug-88 a s	Bromoform	ND	2.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 2.0
12-Aug-88 a l	Bromomethane	ND	2.0000
12-Aug-88 a s	Bromomethane	ND	2.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 2.0
12-Aug-88 a l	Carbon Disulfide	ND	2.0000
12-Aug-88 a s	Carbon Disulfide	ND	2.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 2.0
12-Aug-88 a l	Carbon Tetrachloride	ND	2.0000
12-Aug-88 a s	Carbon Tetrachloride	ND	2.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 2.0
12-Aug-88 a l	Chlorobenzene	ND	2.0000
12-Aug-88 a s	Chlorobenzene	ND	2.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 2.0
12-Aug-88 a l	Chlorodibromomethane	ND	2.0000
12-Aug-88 a s	Chlorodibromomethane	ND	2.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 2.0
12-Aug-88 a l	Chloroethane	ND	2.0000
12-Aug-88 a s	Chloroethane	ND	2.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 2.0

TABLE C-2. (Cont.)

Date/Matrix/Type	Parameter	Detection Flag	Measured Value
Volatile Halocarbons (8240)			
12-Aug-88 a l	Chloroethyl vinyl ether	ND	2.0000
12-Aug-88 a s	Chloroethyl vinyl ether	ND	2.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 2.0
12-Aug-88 a l	Chloroform	ND	2.0000
12-Aug-88 a s	Chloroform	ND	2.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 2.0
12-Aug-88 a l	Chloromethane	ND	2.0000
12-Aug-88 a s	Chloromethane	ND	2.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 2.0
12-Aug-88 a l	Dibromomethane	ND	2.0000
12-Aug-88 a s	Dibromomethane	ND	2.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 2.0
12-Aug-88 a l	Dichlorobromomethane	ND	2.0000
12-Aug-88 a s	Dichlorobromomethane	ND	2.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 2.0
12-Aug-88 a l	Dichlorodifluoromethane	ND	2.0000
12-Aug-88 a s	Dichlorodifluoromethane	ND	2.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 2.0
12-Aug-88 a l	Ethyl benzene	ND	2.0000
12-Aug-88 a s	Ethyl benzene	ND	2.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 2.0

TABLE C-2. (Cont.)

Date/Matrix/Type	Parameter	Detection Flag	Measured Value
Volatile Halocarbons (8240)			
12-Aug-88 a l	Ethyl methacrylate	ND	50.0000
12-Aug-88 a s	Ethyl methacrylate	ND	50.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 50.0
12-Aug-88 a l	Iodomethane	ND	2.0000
12-Aug-88 a s	Iodomethane	ND	2.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 2.0
12-Aug-88 a l	Methyl ethyl ketone	ND	10.0000
12-Aug-88 a s	Methyl ethyl ketone	ND	10.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 10.0
12-Aug-88 a l	Methylene chloride	<5X	12.0000
12-Aug-88 a s	Methylene chloride	ND	10.0000
	Total Number of Blanks = 2		Concentration Range 12.0 - 12.0
	Total Number above Detection Limit = 1		Maximum Detection Limit = 10.0
12-Aug-88 a l	Styrene	ND	2.0000
12-Aug-88 a s	Styrene	ND	2.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 2.0
12-Aug-88 a l	Tetrachloroethylene	ND	2.0000
12-Aug-88 a s	Tetrachloroethylene	ND	2.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 2.0
12-Aug-88 a l	Toluene	ND	2.0000
12-Aug-88 a s	Toluene	ND	2.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 2.0

TABLE C-2. (Cont.)

Date/Matrix/Type	Parameter	Detection Flag	Measured Value
Volatile Halocarbons (8240)			
12-Aug-88 a l	Trans-1,4-dichloro-2-buten	ND	2.0000
12-Aug-88 a s	Trans-1,4-dichloro-2-buten	ND	2.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 2.0
12-Aug-88 a l	Trichloroethene	ND	2.0000
12-Aug-88 a s	Trichloroethene	ND	2.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 2.0
12-Aug-88 a l	Trichlorofluoromethane	ND	10.0000
12-Aug-88 a s	Trichlorofluoromethane	ND	10.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 10.0
12-Aug-88 a l	Vinyl acetate	ND	2.0000
12-Aug-88 a s	Vinyl acetate	ND	2.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 2.0
12-Aug-88 a l	Vinyl chloride	ND	2.0000
12-Aug-88 a s	Vinyl chloride	ND	2.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 2.0
12-Aug-88 a l	Xylenes	ND	2.0000
12-Aug-88 a s	Xylenes	ND	2.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 2.0
12-Aug-88 a l	cis-1,3-Dichloropropene	ND	2.0000
12-Aug-88 a s	cis-1,3-Dichloropropene	ND	2.0000
	Total Number of Blanks = 2		Concentration Range NC
	Total Number above Detection Limit = 0		Maximum Detection Limit = 2.0

TABLE C-2. (Cont.)

Date/Matrix/Type	Parameter	Detection Flag	Measured Value
Volatile Halocarbons (8240)			
12-Aug-88 a l	trans-1,2-Dichloroethene	ND	2.0000
12-Aug-88 a s	trans-1,2-Dichloroethene	ND	2.0000
	Total Number of Blanks = 2	Concentration Range	NC
	Total Number above Detection Limit = 0	Maximum Detection Limit = 2.0	
12-Aug-88 a l	trans-1,3-Dichloropropene	ND	2.0000
12-Aug-88 a s	trans-1,3-Dichloropropene	ND	2.0000
	Total Number of Blanks = 2	Concentration Range	NC
	Total Number above Detection Limit = 0	Maximum Detection Limit = 2.0	

TABLE C-3. SUMMARY OF QUALITY CONTROL SAMPLE RESULTS - CARSWELL AFB - WEAPON STORAGE AREA

SUMMARY OF QCCS RESULTS FOR MATRIX = s

Parameter	Number of Samples	Mean % Recovery	CV (%)
Hydrocarbons, Total			
Control Sample			
HC_IR	6	100.8	3.7

TABLE C-4. DETAILED CONTROL SAMPLE RESULTS - CARSWELL AFB - WEAPON STORAGE AREA

Date/Matrix/Type	Parameter	True Value	Meas Value	% Recovery
Hydrocarbons, Total				
15-Aug-88 s c HC_IR		200.0	210.0	105.00
15-Aug-88 s c HC_IR		200.0	207.0	103.50
15-Aug-88 s c HC_IR		200.0	204.0	102.00
15-Aug-88 s c HC_IR		200.0	204.0	102.00
15-Aug-88 s c HC_IR		200.0	193.0	96.50
15-Aug-88 s c HC_IR		200.0	192.0	96.00

Number of Samples = 6 Mean % Recovery = 100.8 CV (%) = 3.7

TABLE C-5. SUMMARY OF MATRIX SPIKE RESULTS - CARSWELL AFB - WEAPON STORAGE AREA

SUMMARY OF MATRIX SPIKE RESULTS FOR MATRIX = s

Parameter	Number of Samples	Mean % Recovery	Standard Deviation	Number Below Acceptance Limits	Number Above Acceptance Limits	(Matrix) Acceptance Criteria
Volatile Halocarbons (8240)						
matrix spike						
1,1-Dichloroethene	2	101.5	13.43503	0	0	.0 - 234.0
Benzene	2	107.5	2.12132	0	0	37.0 - 151.0
Chlorobenzene	2	111.5	.70711	0	0	37.0 - 160.0
Toluene	2	118.0	1.41421	0	0	47.0 - 163.0
Trichloroethene	2	106.0	.00000	0	0	71.0 - 157.0

- D R A F T -

TABLE C-6. SUMMARY OF SURROGATE SPIKE RESULTS - CARSWELL AFB - WEAPON STORAGE AREA

SUMMARY OF SURROGATE SPIKE RESULTS FOR MATRIX = a

Parameter	Number of Samples	Mean % Recovery	Standard Deviation	Number Below Acceptance Limits	Number Above Acceptance Limits	(Matrix) Acceptance Criteria
Volatile Halocarbons (8240)						
Surrogate - Reg. Sample						
d4-1,2-dichloroethane	2	86.5	.70711	0	0	39.0 - 156.0
d8-toluene	2	98.5	7.77817	0	0	87.0 - 146.0
p-bromofluorobenzene	2	107.5	2.12132	0	0	55.0 - 167.0

- D R A F T -

TABLE C-6. (Cont.)

SUMMARY OF SURROGATE SPIKE RESULTS FOR MATRIX = s

Parameter	Number of Samples	Mean % Recovery	Standard Deviation	Number Below Acceptance Limits	Number Above Acceptance Limits	(Matrix) Acceptance Criteria
Volatile Halocarbons (8240)						
Surrogate - Reg. Sample						
d4-1,2-dichloroethane	11	88.2	1.99089	0	0	44.0 - 159.0
d8-toluene	11	91.5	3.90803	0	0	76.0 - 118.0
p-bromofluorobenzene	11	103.2	5.63592	0	0	80.0 - 136.0
matrix spike						
d4-1,2-dichloroethane	2	89.0	.00000	0	0	44.0 - 159.0
d8-toluene	2	94.5	.70711	0	0	76.0 - 118.0
p-bromofluorobenzene	2	103.0	2.82843	0	0	80.0 - 136.0

- D R A F T -

TABLE C-7. DETAILED SPIKE RESULTS - CARSWELL AFB - WEAPON STORAGE AREA

Date/Matrix/Type	Parameter	Sample Result	Spiked Sample Result	Spike Added	% Recovery
Volatile Halocarbons (8240)					
12-Aug-88 s m	1,1-Dichloroethene	0.00000	92.0	100.0	92.00
12-Aug-88 s m	1,1-Dichloroethene	0.00000	111.0	100.0	111.00
	Number of Samples = 2		Below acceptance = 0		
	Mean % Recovery = 101		Above acceptance = 0		
	Standard Deviation = 13.43		Acceptance Criteria .00 - 234.00		
12-Aug-88 s m	Benzene	0.00000	109.0	100.0	109.00
12-Aug-88 s m	Benzene	0.00000	106.0	100.0	106.00
	Number of Samples = 2		Below acceptance = 0		
	Mean % Recovery = 107		Above acceptance = 0		
	Standard Deviation = 2.12		Acceptance Criteria 37.00 - 151.00		
12-Aug-88 s m	Chlorobenzene	0.00000	111.0	100.0	111.00
12-Aug-88 s m	Chlorobenzene	0.00000	112.0	100.0	112.00
	Number of Samples = 2		Below acceptance = 0		
	Mean % Recovery = 111		Above acceptance = 0		
	Standard Deviation = .70		Acceptance Criteria 37.00 - 160.00		
12-Aug-88 s m	Toluene	0.00000	117.0	100.0	117.00
12-Aug-88 s m	Toluene	0.00000	119.0	100.0	119.00
	Number of Samples = 2		Below acceptance = 0		
	Mean % Recovery = 118		Above acceptance = 0		
	Standard Deviation = 1.41		Acceptance Criteria 47.00 - 163.00		
12-Aug-88 s m	Trichloroethene	0.00000	106.0	100.0	106.00
12-Aug-88 s m	Trichloroethene	0.00000	106.0	100.0	106.00
	Number of Samples = 2		Below acceptance = 0		
	Mean % Recovery = 106		Above acceptance = 0		
	Standard Deviation = .00		Acceptance Criteria 71.00 - 157.00		
12-Aug-88 a N	d4-1,2-dichloroethane	0.00000	87.0	100.0	87.00
12-Aug-88 a N	d4-1,2-dichloroethane	0.00000	86.0	100.0	86.00
12-Aug-88 s N	d4-1,2-dichloroethane	0.00000	91.0	100.0	91.00
12-Aug-88 s N	d4-1,2-dichloroethane	0.00000	91.0	100.0	91.00
12-Aug-88 s N	d4-1,2-dichloroethane	0.00000	90.0	100.0	90.00

NC: Not Calculable

TABLE C-7. (Cont.)

Date/Matrix/Type	Parameter	Sample Result	Spiked Sample Result	Spike Added	% Recovery
Volatile Halocarbons (8240)					
12-Aug-88 s N	d4-1,2-dichloroethane	0.00000	87.0	100.0	87.00
12-Aug-88 s N	d4-1,2-dichloroethane	0.00000	85.0	100.0	85.00
12-Aug-88 s N	d4-1,2-dichloroethane	0.00000	87.0	100.0	87.00
12-Aug-88 s N	d4-1,2-dichloroethane	0.00000	89.0	100.0	89.00
12-Aug-88 s N	d4-1,2-dichloroethane	0.00000	86.0	100.0	86.00
12-Aug-88 s N	d4-1,2-dichloroethane	0.00000	88.0	100.0	88.00
12-Aug-88 s N	d4-1,2-dichloroethane	0.00000	87.0	100.0	87.00
12-Aug-88 s N	d4-1,2-dichloroethane	0.00000	89.0	100.0	89.00
12-Aug-88 s m	d4-1,2-dichloroethane	0.00000	89.0	100.0	89.00
12-Aug-88 s m	d4-1,2-dichloroethane	0.00000	89.0	100.0	89.00
Number of Samples = 15			Below acceptance = 0		
Mean % Recovery = 88			Above acceptance = 0		
Standard Deviation = 1.83			Acceptance Criteria 44.00 - 159.00		
12-Aug-88 a N	d8-toluene	0.00000	104.0	100.0	104.00
12-Aug-88 a N	d8-toluene	0.00000	93.0	100.0	93.00
12-Aug-88 s N	d8-toluene	0.00000	92.0	100.0	92.00
12-Aug-88 s N	d8-toluene	0.00000	92.0	100.0	92.00
12-Aug-88 s N	d8-toluene	0.00000	94.0	100.0	94.00
12-Aug-88 s N	d8-toluene	0.00000	93.0	100.0	93.00
12-Aug-88 s N	d8-toluene	0.00000	95.0	100.0	95.00
12-Aug-88 s N	d8-toluene	0.00000	82.0	100.0	82.00
12-Aug-88 s N	d8-toluene	0.00000	92.0	100.0	92.00
12-Aug-88 s N	d8-toluene	0.00000	93.0	100.0	93.00
12-Aug-88 s N	d8-toluene	0.00000	94.0	100.0	94.00
12-Aug-88 s N	d8-toluene	0.00000	93.0	100.0	93.00
12-Aug-88 s N	d8-toluene	0.00000	86.0	100.0	86.00
12-Aug-88 s m	d8-toluene	0.00000	95.0	100.0	95.00
12-Aug-88 s m	d8-toluene	0.00000	94.0	100.0	94.00
Number of Samples = 15			Below acceptance = 0		
Mean % Recovery = 92			Above acceptance = 0		
Standard Deviation = 4.66			Acceptance Criteria 76.00 - 118.00		
12-Aug-88 a N	p-bromofluorobenzene	0.00000	109.0	100.0	109.00
12-Aug-88 a N	p-bromofluorobenzene	0.00000	106.0	100.0	106.00
12-Aug-88 s N	p-bromofluorobenzene	0.00000	103.0	100.0	103.00
12-Aug-88 s N	p-bromofluorobenzene	0.00000	103.0	100.0	103.00
12-Aug-88 s N	p-bromofluorobenzene	0.00000	106.0	100.0	106.00

NC: Not Calculable

TABLE C-7. (Cont.)

Date/Matrix/Type	Parameter	Sample Result	Spiked Sample Result	Spike Added	% Recovery
Volatile Halocarbons (8240)					
12-Aug-88 s N	p-bromofluorobenzene	0.00000	105.0	100.0	105.00
12-Aug-88 s N	p-bromofluorobenzene	0.00000	101.0	100.0	101.00
12-Aug-88 s N	p-bromofluorobenzene	0.00000	98.0	100.0	98.00
12-Aug-88 s N	p-bromofluorobenzene	0.00000	104.0	100.0	104.00
12-Aug-88 s N	p-bromofluorobenzene	0.00000	99.0	100.0	99.00
12-Aug-88 s N	p-bromofluorobenzene	0.00000	100.0	100.0	100.00
12-Aug-88 s N	p-bromofluorobenzene	0.00000	118.0	100.0	118.00
12-Aug-88 s N	p-bromofluorobenzene	0.00000	98.0	100.0	98.00
12-Aug-88 s m	p-bromofluorobenzene	0.00000	105.0	100.0	105.00
12-Aug-88 s m	p-bromofluorobenzene	0.00000	101.0	100.0	101.00

Number of Samples = 15
Mean % Recovery = 103
Standard Deviation = 5.09

Below acceptance = 0
Above acceptance = 0
Acceptance Criteria 80.00 - 136.00

NC: Not Calculable

TABLE C-8. PRECISION ESTIMATES BY SOURCE OF VARIABILITY - CARSWELL AFB - WEAPON STORAGE AREA

SAMPLE MATRIX = s

Parameter	# of Pairs	Range of Means		Pooled SD	Pooled CV
Volatile Halocarbons (8240)					
Field Duplicate					
1,1,1-Trichloroethane	1	ND -	ND	NC	NC
1,1,2,2-Tetrachloroethane	1	ND -	ND	NC	NC
1,1,2-Trichloroethane	1	ND -	ND	NC	NC
1,1-Dichloroethane	1	ND -	ND	NC	NC
1,1-Dichloroethene	1	ND -	ND	NC	NC
1,2,3-Trichloropropane	1	ND -	ND	NC	NC
1,2-Dichloroethane	1	ND -	ND	NC	NC
1,2-Dichloropropane	1	ND -	ND	NC	NC
2-Hexanone	1	ND -	ND	NC	NC
4-Methyl-2-pentanone	1	ND -	ND	NC	NC
Acetone	1	ND -	ND	NC	NC
Acrolein	1	ND -	ND	NC	NC
Acrylonitrile	1	ND -	ND	NC	NC
Benzene	1	ND -	ND	NC	NC
Bromoform	1	ND -	ND	NC	NC
Bromomethane	1	ND -	ND	NC	NC
Carbon Disulfide	1	ND -	ND	NC	NC
Carbon Tetrachloride	1	ND -	ND	NC	NC
Chlorobenzene	1	ND -	ND	NC	NC
Chlorodibromomethane	1	ND -	ND	NC	NC
Chloroethane	1	ND -	ND	NC	NC
Chloroethyl vinyl ether	1	ND -	ND	NC	NC
Chloroform	1	ND -	ND	NC	NC
Chloromethane	1	ND -	ND	NC	NC
Dibromomethane	1	ND -	ND	NC	NC
Dichlorobromomethane	1	ND -	ND	NC	NC
Dichlorodifluoromethane	1	ND -	ND	NC	NC
Ethyl benzene	1	ND -	ND	NC	NC
Ethyl methacrylate	1	ND -	ND	NC	NC
Iodomethane	1	ND -	ND	NC	NC
Methyl ethyl ketone	1	ND -	ND	NC	NC
Methylene chloride	1	18.5 -	18.5	2.12	11.5
Styrene	1	ND -	ND	NC	NC
Tetrachloroethylene	1	ND -	ND	NC	NC
Toluene	1	ND -	ND	NC	NC
Trans-1,4-dichloro-2-buten	1	ND -	ND	NC	NC
Trichloroethene	1	ND -	ND	NC	NC
Trichlorofluoromethane	1	ND -	ND	NC	NC
Vinyl acetate	1	ND -	ND	NC	NC

NC: Not Calculable

TABLE C-8. (Cont.)

SAMPLE MATRIX = s

Parameter	# of Pairs	Range of Means		Pooled SD	Pooled CV
Vinyl chloride	1	ND -	ND	NC	NC
Xylenes	1	ND -	ND	NC	NC
cis-1,3-Dichloropropene	1	ND -	ND	NC	NC
d4-1,2-dichloroethane	1	86.5 -	86.5	2.12	2.5
d8-toluene	1	93.5 -	93.5	0.71	0.8
p-bromofluorobenzene	1	101.0 -	101.0	4.24	4.2
trans-1,2-Dichloroethene	1	ND -	ND	NC	NC
trans-1,3-Dichloropropene	1	ND -	ND	NC	NC
Matrix Spike Duplicate					
1,1-Dichloroethene	1	101.5 -	101.5	13.44	13.2
Benzene	1	107.5 -	107.5	2.12	2.0
Chlorobenzene	1	111.5 -	111.5	0.71	0.6
Toluene	1	118.0 -	118.0	1.41	1.2
Trichloroethene	1	106.0 -	106.0	0.00	0.0
d4-1,2-dichloroethane	1	89.0 -	89.0	0.00	0.0
d8-toluene	1	94.5 -	94.5	0.71	0.7
p-bromofluorobenzene	1	103.0 -	103.0	2.83	2.7
Hydrocarbons, Total					
Analytical Dup (At Instrument)					
HC_IR	7	ND -	271.0	61.00	29.0
Field Duplicate					
HC_IR	3	ND -	210.0	61.85	66.5

NC: Not Calculable

TABLE C-9. PRECISION ESTIMATES (TOTAL VARIABILITY) FOR SOIL SAMPLES - CARSWELL AFB - WEAPON STORAGE AREA

Parameter	# of Pairs	Range of Means	Pooled SD	Pooled CV
Volatile Halocarbons (8240)				
1,1,1-Trichloroethane	1	ND - ND	NC	NC
1,1,2,2-Tetrachloroethane	1	ND - ND	NC	NC
1,1,2-Trichloroethane	1	ND - ND	NC	NC
1,1-Dichloroethane	1	ND - ND	NC	NC
1,1-Dichloroethene	2	ND - 101.5	13.4350	13.2
1,2,3-Trichloropropane	1	ND - ND	NC	NC
1,2-Dichloroethane	1	ND - ND	NC	NC
1,2-Dichloropropane	1	ND - ND	NC	NC
2-Hexanone	1	ND - ND	NC	NC
4-Methyl-2-pentanone	1	ND - ND	NC	NC
Acetone	1	ND - ND	NC	NC
Acrolein	1	ND - ND	NC	NC
Acrylonitrile	1	ND - ND	NC	NC
Benzene	2	ND - 107.5	2.1213	2.0
Bromoform	1	ND - ND	NC	NC
Bromomethane	1	ND - ND	NC	NC
Carbon Disulfide	1	ND - ND	NC	NC
Carbon Tetrachloride	1	ND - ND	NC	NC
Chlorobenzene	2	ND - 111.5	0.7071	0.6
Chlorodibromomethane	1	ND - ND	NC	NC
Chloroethane	1	ND - ND	NC	NC
Chloroethyl vinyl ether	1	ND - ND	NC	NC
Chloroform	1	ND - ND	NC	NC
Chloromethane	1	ND - ND	NC	NC
Dibromomethane	1	ND - ND	NC	NC
Dichlorobromomethane	1	ND - ND	NC	NC
Dichlorodifluoromethane	1	ND - ND	NC	NC
Ethyl benzene	1	ND - ND	NC	NC
Ethyl methacrylate	1	ND - ND	NC	NC
Iodomethane	1	ND - ND	NC	NC

NC: Not Calculable

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TABLE C-9. (Cont.)

Parameter	# of Pairs	Range of Means	Pooled SD	Pooled CV
Methyl ethyl ketone	1	ND - ND	NC	NC
Methylene chloride	1	18.5 - 18.5	2.1213	11.5
Styrene	1	ND - ND	NC	NC
Tetrachloroethylene	1	ND - ND	NC	NC
Toluene	2	ND - 118.0	1.4142	1.2
Trans-1,4-dichloro-2-buten	1	ND - ND	NC	NC
Trichloroethene	2	ND - 106.0	0.0000	0.0
Trichlorofluoromethane	1	ND - ND	NC	NC
Vinyl acetate	1	ND - ND	NC	NC
Vinyl chloride	1	ND - ND	NC	NC
Xylenes	1	ND - ND	NC	NC
cis-1,3-Dichloropropene	1	ND - ND	NC	NC
d4-1,2-dichloroethane	2	86.5 - 89.0	1.5000	1.7
d8-toluene	2	93.5 - 94.5	0.7071	0.8
p-bromofluorobenzene	2	101.0 - 103.0	3.6056	3.5
trans-1,2-Dichloroethene	1	ND - ND	NC	NC
trans-1,3-Dichloropropene	1	ND - ND	NC	NC
Hydrocarbons, Total				
HC_IR	10	ND - 271.0	61.4248	51.3

NC: Not Calculable

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