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DECISION SUMMARY TECHNICAL DOCUMENT TO SUPPORT NO FURTHER ACTION AT SITE 3 LANDFILL 3 NAS FORT WORTH TX

4/1/1990

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CARSWELL FIELD
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ADMINISTRATIVE RECORD
COVER SHEET

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DECISION SUMMARY
TECHNICAL DOCUMENT TO SUPPORT NO FURTHER ACTION
U. S. AIR FORCE
INSTALLATION RESTORATION PROGRAM
SITE 3, LANDFILL 3
CARSWELL AFB, TEXAS

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1.0 INTRODUCTION

This document summarizes the rationale for no further action (NFA) at Installation Restoration Program (IRP), Site 3, Landfill 3, Carswell Air Force Base (AFB), Fort Worth, Texas. This section provides a description and history of the site. Additional sections describe current site status, including the presence or absence of contaminants, data analysis and the risk assessment that led to the NFA decision. The last two sections evaluate the NFA decision for compliance with environmental laws and describe regulatory/ public involvement in the decision.

1.1 Site Location and Description

Carswell AFB is located six miles west of the center of Fort Worth (population 414,652) in Tarrant County, Texas. Carswell AFB is surrounded by areas of residential, commercial, recreational, and industrial land use. The topography of the base is fairly flat, except for areas near Farmers Branch and the Trinity River. Figure 1-1 shows an overview of the base and the location of IRP RI/FS sites.

Site 3, Landfill 3 is believed to be located under the present runway, immediately south of the culvert that carries the flow of Farmers Branch. The landfill apparently occupied a ravine that was present when the runway ended north of Farmers Branch. Figure 1-2 shows the approximate configuration of Landfill 3. The land surface ranges in elevation from 635 feet to 671 feet above mean sea level (MSL). Evidence of past disposal activities is not visible on the surface. Surface drainage is generally to the east (toward Farmers Branch) and west (toward a closed depression between the runway and taxiway), with the main runway being the drainage divide.

1.2 Site History

Landfill 3 was used between 1950 and 1952 for the burial of many types of waste. However, construction rubble was the dominant waste disposed.

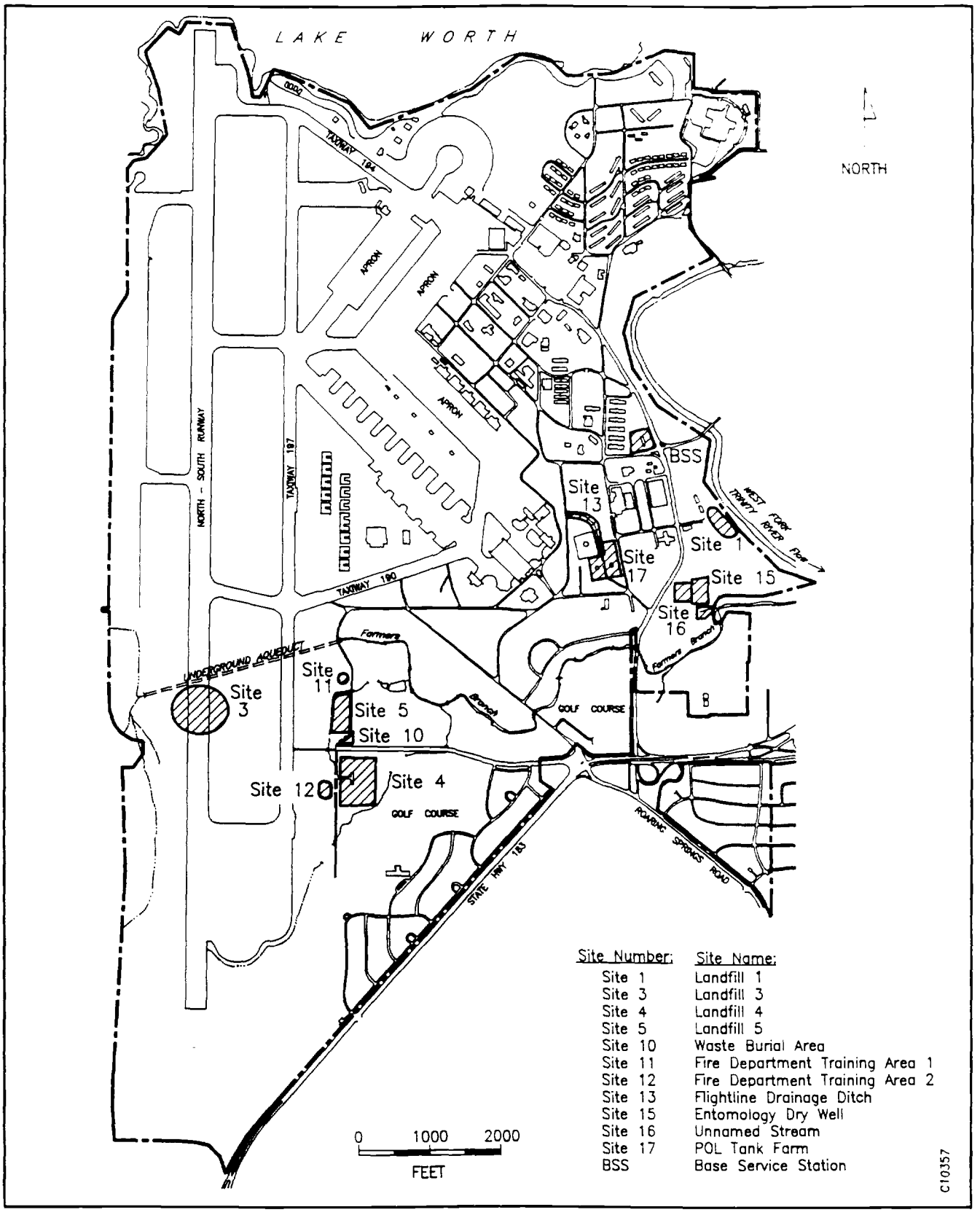

Figure 1-1. Location of IRP RI/FS Stage 2 Sites at Carswell AFB, Texas

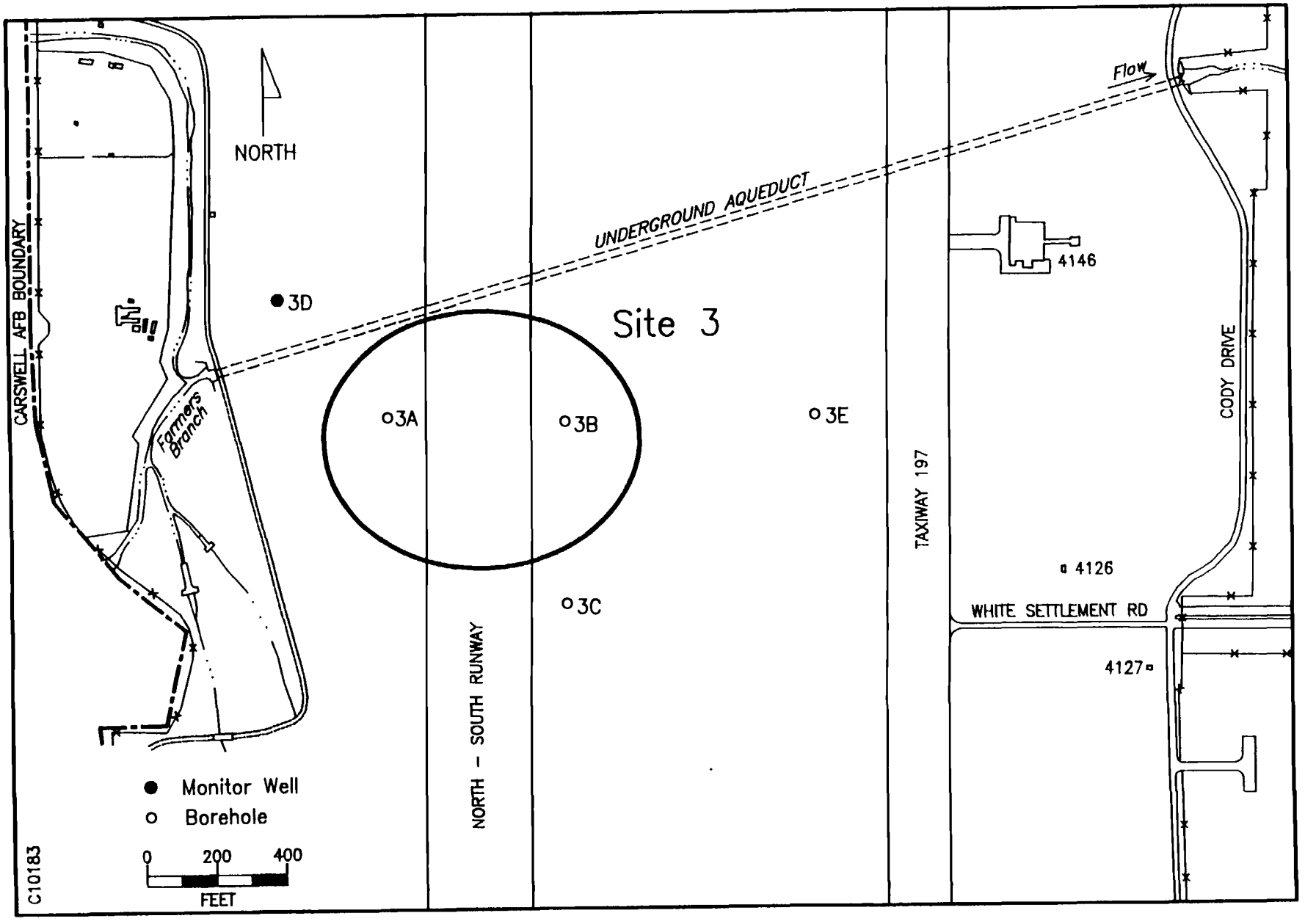

Figure 1-2. Location of Sampling Points at Site 3 (Landfill 3), Carswell AFB, Texas

2.0 CURRENT SITE STATUS

2.1 Physiography and Climate

The majority of Carswell AFB is located within the Grand Prairie section of the Central Lowlands Physiographic Province. This area is characterized by broad terrace surfaces sloping gently eastward, interrupted by westward-facing escarpments. The topography of the base is fairly flat except for areas near Farmers Branch and the Trinity River. The land is typically grass covered and treeless, except for isolated stands of upland timber. The northwestern part of Carswell AFB is within the Western Cross Timbers Physiographic Province that is characterized by rolling topography and a heavy growth of post and blackjack oaks. Elevations on the base range from a high of approximately 690 feet MSL at the southwest corner of the base to a low of approximately 550 feet MSL at the east side of the base.

The climate of Carswell AFB is humid subtropical with hot summers and dry winters. Mean annual precipitation at Carswell AFB is 32 inches, with the wettest months being April and May. Thunderstorm activity occurs an average of 45 days per year. The greatest number of these storms occur between April and June, with a maximum precipitation of 5.9 inches recorded in a 24-hour period.

2.2 Soils

2.2.1 Soil Description

Subsurface conditions at Site 3 have been investigated using direct (drilling/sampling) and indirect (surface geophysical) techniques. Upper zone deposits consist of clayey silt at the surface, grading into silty clay a few feet deep. This silty clay, possibly a fill material associated with runway construction, rests directly on bedrock without the sand and gravel deposits observed at the other Flightline sites east of the runway. Generally, the surficial clay and silt deposits are 10 to 20 feet thick. The shallowest depth to bedrock is 12 feet at the southernmost borehole, 3C. The

thinning of upper zone alluvial deposits at Site 3 toward the south is consistent with the trend observed at Sites 4 and 12 and the occurrence of bedrock outcrops south of the Flightline sites.

The bedrock encountered under these surficial deposits was shale and limestone of the Goodland Formation. This bedrock was encountered at less than 20 feet at all locations.

2.2.2 Soil Contamination

Several field activities were accomplished during the RI/FS Stage 1 and Stage 2 programs to investigate the occurrence of contaminants in the soil at Site 3. Stage 1 activities were limited to geophysical surveys. Stage 2 activities included drilling and sampling of five soil borings. One of the borings was completed as a monitor well from which ground-water samples were collected.

2.2.2.1 Geophysical Survey

Work performed at Landfill 3 (Site 3) consisted of geophysical surveys (electromagnetic profiling (EMP) and vertical electrical sounding (VES)).

Landfill 3 is believed to be located directly underneath and on both sides of the main runway. The site is approximately 600 feet south of the underground aqueduct that carries the flow of Farmers Branch. Because no surveys could be conducted on the runway itself due to steel reinforcement of the concrete, a grid was set up on both sides of the runway.

Ground conductivity was read directly using the Geonics EM31 and EM34-3. By using both the EM31 and EM34-3, the apparent conductivities were measured at three different depths of investigation. The depth of investigation was approximately 10 feet with the EM31 (horizontal dipoles), 20 feet with the EM-31 (vertical dipoles), and 50 feet with the EM34-3 with 20 meters

of separation. With measurements at two different depths of investigation, an estimate can be made of the thickness of the area of interest.

The EM31 (horizontal dipoles) shows background values of conductivity between 40 and 60 millimhos/m over most of the area on both the east and west sides of the runway. Background conductivity readings for the EM31 (vertical dipoles) generally ranged from 50 to 80 millimhos/m and background conductivity values for the EM34-3 generally ranged from 60 to 90 millimhos/m over the area of investigation. Thus, a general increase in conductivity is observed with increasing depth throughout the Landfill 3 area. Lateral variations in conductivity are most likely due to variable soil conditions. All conductivity maps indicate the presence of high-conductivity anomalies, primarily associated with cultural features such as the runway. Data from VES sites show low resistivities for the entire depth of exploration.

2.2.2.2 Soil Borings

Split-spoon samples were collected and visually examined for evidence of contamination during drilling. Five soil borings (3A-3E) were completed, with 3D completed as a monitor well. Based on the depth and location of the soil samples, and the presence of water, samples were selected for analysis of moisture content, metals, oil and grease, volatile organic compounds, and semivolatile organic compounds. Results of soil sample analyses are provided in Table 2-1 (inorganic parameters) and Table 2-2 (organic parameters). Table 2-3 gives the ranges of metals concentrations in United States soils for comparison to the results at Landfill 3.

Heavy Metals--Heavy metals were detected at normal ranges in soil samples from boreholes 3A-3E, with the exception of arsenic in 3B (from 19-21 feet). However, this value is noted as possibly having an interferant present. As expected in soils composed, in part, of weathered limestone, calcium values are high, averaging over 200,000 mg/Kg in soils from Landfill 3.

TABLE 2-1. RESULTS OF INORGANIC ANALYSES FOR SOIL SAMPLES, SITE 3 (LANDFILL 3), CARSWELL AFB, TEXAS

	Primary Results					
	Monitor Well					
	Sample ID					
	Date Sampled					
	Beg. Depth - End Depth					
	3A		3B		3C	
	3A-5		3B-6		3C-4	
	26-Jan-88		26-Jan-88		27-Jan-88	
PARAMETER	(14 - 18)		(19 - 19.5)		(9 - 12)	
Soil Moisture % MOISTURE						
Dry Weight Determination	11.0		17.0		17.0	
Metals MG/KG						
Arsenic, graphite AA	6.6		11.0R		5.2	
Mercury	ND	(0.050)	ND	(0.050)	ND	(0.050)
Selenium, graphite AA	ND	(0.29)	NDR	(0.29)	ND@	(1.2)
Metal Screen (ICP) MG/KG						
Ag Silver	ND	(0.83)	ND	(0.87)	ND	(0.81)
Al Aluminum	6600.0B	(19.0)	9500.0^	(19.0)	6500.0	(18.0)
As Arsenic	NDR	(28.0)	ND	(29.0)	ND	(27.0)
B Boron	NDR	(56.0)	ND	(58.0)	ND	(54.0)
Ba Barium	24.0	(0.83)	29.0E	(0.87)	20.0	(0.81)
Be Beryllium	0.1	(0.093)	0.5E	(0.096)	0.2	(0.090)
Ca Calcium	160000.0B	(22.0)	120000.0^	(23.0)	220000.0	(22.0)
Cd Cadmium	ND	(0.28)	ND	(0.29)	ND	(0.27)
Co Cobalt	ND	(0.93)	2.2	(0.96)	ND	(0.90)
Cr Chromium	10.0	(0.83)	15.0E	(0.87)	12.0	(0.81)
Cu Copper	ND	(0.93)	5.2	(0.96)	ND	(0.90)
Fe Iron	6700.0B	(2.8)	14000.0E	(2.9)	6500.0	(2.7)
K Potassium	700.0R	(110.0)	2200.0^	(120.0)	800.0	(110.0)

@: Indicates that the analytical spike recovery for this analysis was not within acceptance limits indicating an interferent present.

B: Detected in Reagent Blank; background subtraction not performed

E: The reported value is estimated due to the presence of an interferant.

R: Indicates that the matrix spike recovery for this analysis was not within acceptance limits indicating an interferent present.

^: Indicates duplicate analysis is not within control limits.

^E: Estimated value due to matrix interference. Duplicate analysis % difference outside control limits.

ND: Not detected at specified detection limit

( ): Detection limit

205030

TABLE 2-1. RESULTS OF INORGANIC ANALYSES FOR SOIL SAMPLES, SITE 3 (LANDFILL 3), CARSWELL AFB, TEXAS (Cont.)

		Primary Results					
		Monitor Well					
		Sample ID					
		Date Sampled					
		Beg. Depth - End Depth					
		3A		3B		3C	
		3A-5		3B-6		3C-4	
		26-Jan-88		26-Jan-88		27-Jan-88	
PARAMETER		(14 - 18)		(19 - 19.5)		(9 - 12)	
Mg	Magnesium	2100.0R	(9.3)	2400.0	(9.6)	2300.0	(9.0)
Mn	Manganese	170.0	(0.28)	110.0^	(0.29)	120.0	(0.27)
Mo	Molybdenum	ND	(19.0)	ND	(19.0)	ND	(18.0)
Na	Sodium	140.0	(7.4)	150.0E	(7.7)	230.0	(7.2)
Ni	Nickel	6.0	(1.9)	11.0E	(1.9)	4.0	(1.8)
Pb	Lead	ND	(4.6)	10.0	(4.8)	5.0	(4.5)
Sb	Antimony	40.0R	(22.0)	40.0	(23.0)	90.0	(22.0)
Se	Selenium	ND	(28.0)	ND	(29.0)	ND	(27.0)
Si	Silicon	350.0R	(28.0)	360.0^	(29.0)	260.0	(27.0)
Tl	Thallium	ND	(33.0)	ND	(35.0)	40.0	(32.0)
V	Vanadium	16.0	(1.9)	14.0^E	(1.9)	22.0	(1.8)
Zn	Zinc	12.0	(0.56)	22.0^	(0.58)	10.0	(0.54)

@: Indicates that the analytical spike recovery for this analysis was not within acceptance limits indicating an interferent present.

B: Detected in Reagent Blank; background subtraction not performed

E: The reported value is estimated due to the presence of an interferant.

R: Indicates that the matrix spike recovery for this analysis was not within acceptance limits indicating an interferent present.

^: Indicates duplicate analysis is not within control limits.

^E: Estimated value due to matrix interference. Duplicate analysis % difference outside control limits.

ND: Not detected at specified detection limit

( ): Detection limit

205021

TABLE 2-1. RESULTS OF INORGANIC ANALYSES FOR SOIL SAMPLES, SITE 3 (LANDFILL 3), CARSWELL AFB, TEXAS (Cont.)

	Primary Results			
	Monitor Well			
	Sample ID			
	Date Sampled			
	Beg. Depth - End Depth			
	3D		3E	
	3D-4		3E-5	
	27-Jan-88		27-Jan-88	
PARAMETER	(9 - 15)		(14 - 16)	
Soil Moisture % MOISTURE				
Dry Weight Determination	11.0		8.0	
Metals MG/KG				
Arsenic, graphite AA	6.5		4.8	
Mercury	ND	(0.050)	ND	(0.050)
Selenium, graphite AA	ND	(0.30)	ND	(0.30)
Metal Screen (ICP) MG/KG				
Ag Silver	ND	(0.86)	ND	(0.83)
Al Aluminum	3800.0	(19.0)	4600.0	(18.0)
As Arsenic	ND	(29.0)	ND	(28.0)
B Boron	ND	(57.0)	ND	(55.0)
Ba Barium	41.0	(0.86)	27.0	(0.83)
Be Beryllium	0.1	(0.095)	0.1	(0.092)
Ca Calcium	270000.0	(23.0)	260000.0	(22.0)
Cd Cadmium	ND	(0.29)	ND	(0.28)
Co Cobalt	1.5	(0.95)	ND	(0.92)
Cr Chromium	9.2	(0.86)	9.6	(0.83)
Cu Copper	ND	(0.95)	ND	(0.92)
Fe Iron	6900.0	(2.9)	6000.0	(2.8)
K Potassium	400.0	(110.0)	500.0	(110.0)
Mg Magnesium	2500.0	(9.5)	2400.0	(9.2)
Mn Manganese	280.0	(0.29)	220.0	(0.28)
Mo Molybdenum	ND	(19.0)	ND	(18.0)
Na Sodium	190.0	(7.6)	150.0	(7.3)
Ni Nickel	4.0	(1.9)	3.0	(1.8)
Pb Lead	ND	(4.8)	ND	(4.6)

ND: Not detected at specified detection limit

( ): Detection limit

285082

TABLE 2-1. RESULTS OF INORGANIC ANALYSES FOR SOIL SAMPLES, SITE 3 (LANDFILL 3), CARSWELL AFB, TEXAS (Cont.)

		Primary Results			
		Monitor Well			
		Sample ID			
		Date Sampled			
		Beg. Depth - End Depth			
		3D		3E	
		3D-4		3E-5	
		27-Jan-88		27-Jan-88	
PARAMETER		(9 - 15)		(14 - 16)	
Sb	Antimony	50.0	(23.0)	70.0	(22.0)
Se	Selenium	ND	(29.0)	ND	(28.0)
Si	Silicon	340.0	(29.0)	350.0	(28.0)
Tl	Thallium	ND	(34.0)	ND	(33.0)
V	Vanadium	22.0	(1.9)	17.0	(1.8)
Zn	Zinc	6.4	(0.57)	8.8	(0.55)

ND: Not detected at specified detection limit

( ): Detection limit

205013

TABLE 2-2. RESULTS OF ORGANIC ANALYSES FOR SOIL SAMPLES, SITE 3 (LANDFILL 3), CARSWELL AFB, TEXAS

Primary Results

	Monitor Well					
	Sample ID					
	Date Sampled					
	Beg. Depth - End Depth					
	3A		3B		3C	
	3A-5		3B-6		3C-4	
	26-Jan-88		26-Jan-88		27-Jan-88	
PARAMETER	14 - 18		19 - 19.5		9 - 12	
Oil & Grease MG/KG						
Oil and grease, infrared	48.0		32.0		ND	(5.0)
Volatile Organic Compounds MG/KG						
1,1,1-trichloroethane	ND	(0.0043)	ND	(0.0045)	ND	(0.0044)
1,1,2,2-tetrachloroethane	ND	(0.0077)	ND	(0.0082)	ND	(0.0080)
1,1,2-trichloroethane	ND	(0.0056)	ND	(0.0060)	ND	(0.0058)
1,2-dichloroethane	ND	(0.0031)	ND	(0.0033)	ND	(0.0032)
1,2-dichloropropane	ND	(0.0067)	ND	(0.0071)	ND	(0.0070)
2-butanone	ND	(0.028)	ND	(0.030)	ND	(0.029)
2-chloroethylvinyl ether	ND	(0.0056)				
2-hexanone	ND	(0.040)	ND	(0.043)	ND	(0.042)
4-methyl-2-pentanone	ND	(0.052)	ND	(0.055)	ND	(0.053)
Benzene	ND	(0.0049)	ND	(0.0052)	ND	(0.0051)
Ethylbenzene	ND	(0.0081)	ND	(0.0086)	ND	(0.0084)
Toluene	ND	(0.0067)	ND	(0.0071)	ND	(0.0070)
Trichloroethene	ND	(0.0021)	ND	(0.0023)	ND	(0.0022)
acetone	0.020B	(0.0084)	0.034B	(0.0089)	0.027B	(0.0087)
bromodichloromethane	ND	(0.0025)	ND	(0.0026)	ND	(0.0026)
bromoform	ND	(0.0053)	ND	(0.0056)	ND	(0.0055)
bromomethane	ND	(0.0056)	ND	(0.0060)	ND	(0.0058)
carbon disulfide	ND	(0.0019)	ND	(0.0020)	ND	(0.0020)
carbon tetrachloride	ND	(0.0031)	ND	(0.0033)	ND	(0.0032)
chlorobenzene	ND	(0.0067)	ND	(0.0071)	ND	(0.0070)
chloroethane	ND	(0.0056)	ND	(0.0060)	ND	(0.0058)

B: Detected in Reagent Blank; background subtraction not performed

BJ: Analyte detected in blank. Estimated value below detection limit

J: Estimated value (GC test codes)

ND: Not detected at specified detection limit

( ): Detection limit

205024

TABLE 2-2. RESULTS OF ORGANIC ANALYSES FOR SOIL SAMPLES, SITE 3 (LANDFILL 3), CARSWELL AFB, TEXAS (Cont.)

Primary Results

	Monitor Well					
	Sample ID					
	Date Sampled					
	Beg. Depth - End Depth					
	3A		3B		3C	
	3A-5		3B-6		3C-4	
	26-Jan-88		26-Jan-88		27-Jan-88	
PARAMETER	14 - 18		19 - 19.5		9 - 12	
chloroform	ND	(0.0018)	ND	(0.0019)	ND	(0.0019)
chloromethane	ND	(0.0056)	ND	(0.0060)	ND	(0.0058)
cis-1,3-Dichloropropene	ND	(0.0056)	ND	(0.0060)	ND	(0.0058)
dibromochloromethane	ND	(0.0035)	ND	(0.0037)	ND	(0.0036)
methylene chloride	0.026B	(0.0031)	0.0065B	(0.0033)	0.0029B	(0.0032)
styrene	ND	(0.0034)	ND	(0.0036)	ND	(0.0035)
tetrachloroethene	ND	(0.0046)	ND	(0.0049)	ND	(0.0048)
total xylenes	ND	(0.0052)	ND	(0.0055)	ND	(0.0053)
trans-1,3-Dichloropropene	ND	(0.0056)	ND	(0.0060)	ND	(0.0058)
vinyl acetate	ND	(0.0077)	ND	(0.0082)	ND	(0.0080)
vinyl chloride	ND	(0.0056)	ND	(0.0060)	ND	(0.0058)
Semivolatile Organic Compounds MG/KG						
1,2,4-trichlorobenzene	ND	(0.14)	ND	(0.15)	ND	(0.15)
1,2-dichlorobenzene	ND	(0.14)	ND	(0.15)	ND	(0.15)
1,3-dichlorobenzene	ND	(0.14)	ND	(0.15)	ND	(0.15)
1,4-dichlorobenzene	ND	(0.33)	ND	(0.35)	ND	(0.35)
2,4,5-trichlorophenol	ND	(0.74)	ND	(0.80)	ND	(0.80)
2,4,6-trichlorophenol	ND	(0.20)	ND	(0.22)	ND	(0.21)
2,4-dichlorophenol	ND	(0.20)	ND	(0.22)	ND	(0.21)
2,4-dimethylphenol	ND	(0.20)	ND	(0.22)	ND	(0.21)
2,4-dinitrophenol	ND	(3.1)	ND	(3.4)	ND	(3.3)
2,4-dinitrotoluene	ND	(0.42)	ND	(0.46)	ND	(0.45)
2,6-dinitrotoluene	ND	(0.14)	ND	(0.15)	ND	(0.15)
2-chloronaphthalene	ND	(0.14)	ND	(0.15)	ND	(0.15)

B: Detected in Reagent Blank; background subtraction not performed

BJ: Analyte detected in blank. Estimated value below detection limit.

J: Estimated value (GC test codes)

ND: Not detected at specified detection limit

(·): Detection limit

205075

TABLE 2-2. RESULTS OF ORGANIC ANALYSES FOR SOIL SAMPLES, SITE 3 (LANDFILL 3), CARSWELL AFB, TEXAS (Cont.)

Primary Results

	Monitor Well					
	Sample ID					
	Date Sampled					
	Beg. Depth - End Depth					
	3A		3B		3C	
	3A-5		3B-6		3C-4	
	26-Jan-88		26-Jan-88		27-Jan-88	
PARAMETER	14 - 18		19 - 19.5		9 - 12	
2-chlorophenol	ND	(0.24)	ND	(0.26)	ND	(0.26)
2-methylnaphthalene	ND	(0.74)	ND	(0.80)	ND	(0.80)
2-methylphenol	ND	(0.74)	ND	(0.80)	ND	(0.80)
2-nitroaniline	ND	(3.7)	ND	(4.0)	ND	(4.0)
2-nitrophenol	ND	(0.27)	ND	(0.29)	ND	(0.29)
3,3'-dichlorobenzidine	ND	(1.2)	ND	(1.3)	ND	(1.3)
3-nitroaniline	ND	(3.7)	ND	(4.0)	ND	(4.0)
4,6-dinitro-2-methylphenol	ND	(1.8)	ND	(1.9)	ND	(1.9)
4-bromophenyl-phenylether	ND	(0.14)	ND	(0.15)	ND	(0.15)
4-chloro-3-methylphenol	ND	(0.22)	ND	(0.24)	ND	(0.24)
4-chloroaniline	ND	(0.74)	ND	(0.80)	ND	(0.80)
4-chlorophenyl-phenylether	ND	(0.31)	ND	(0.34)	ND	(0.33)
4-methylphenol	ND	(0.74)	ND	(0.80)	ND	(0.80)
4-nitroaniline	ND	(3.7)	ND	(4.0)	ND	(4.0)
4-nitrophenol	ND	(0.18)	ND	(0.19)	ND	(0.19)
acenaphthene	ND	(0.14)	ND	(0.15)	ND	(0.15)
acenaphthylene	ND	(0.26)	ND	(0.28)	ND	(0.28)
anthracene	ND	(0.14)	ND	(0.15)	ND	(0.15)
benzo(a)anthracene	ND	(0.58)	ND	(0.63)	ND	(0.62)
benzo(a)pyrene	ND	(0.19)	ND	(0.20)	ND	(0.20)
benzo(b)fluoranthene	ND	(0.36)	ND	(0.38)	ND	(0.38)
benzo(k)fluoranthene	ND	(0.19)	ND	(0.20)	ND	(0.20)
benzoic acid	ND	(3.7)	ND	(4.0)	ND	(4.0)
benzyl alcohol	ND	(3.7)	ND	(4.0)	ND	(4.0)
bis(2-chloroethoxy)methane	ND	(0.39)	ND	(0.43)	ND	(0.42)

B: Detected in Reagent Blank; background subtraction not performed

BJ: Analyte detected in blank. Estimated value below detection limit.

J: Estimated value (GC test codes)

ND: Not detected at specified detection limit

( ): Detection limit

205015

TABLE 2-2. RESULTS OF ORGANIC ANALYSES FOR SOIL SAMPLES, SITE 3 (LANDFILL 3), CARSWELL AFB, TEXAS (Cont.)

Primary Results

	Monitor Well					
	Sample ID					
	Date Sampled					
	Beg. Depth - End Depth					
	3A		3B		3C	
	3A-5		3B-6		3C-4	
	26-Jan-88		26-Jan-88		27-Jan-88	
PARAMETER	14 - 18		19 - 19.5		9 - 12	
bis(2-chloroethyl) ether	ND	(0.42)	ND	(0.46)	ND	(0.45)
bis(2-chloroisopropyl)ether	ND	(0.42)	ND	(0.46)	ND	(0.45)
bis(2-ethylhexyl)phthalate	0.25	(0.19)	0.19J	(0.20)	0.087J	(0.20)
butylbenzylphthalate	ND	(0.19)	ND	(0.20)	ND	(0.20)
chrysene	ND	(0.19)	ND	(0.20)	ND	(0.20)
di-n-butylphthalate	0.30B	(0.19)	0.72B	(0.20)	0.11BJ	(0.20)
di-n-octyl phthalate	ND	(0.19)	0.29	(0.20)	ND	(0.20)
dibenzo(a,h)anthracene	ND	(0.19)	ND	(0.20)	ND	(0.20)
dibenzofuran	ND	(0.74)	ND	(0.80)	ND	(0.80)
diethylphthalate	ND	(0.14)	ND	(0.15)	ND	(0.15)
dimethyl phthalate	ND	(0.12)	ND	(0.13)	ND	(0.13)
fluoranthene	ND	(0.16)	ND	(0.18)	ND	(0.17)
fluorene	ND	(0.14)	ND	(0.15)	ND	(0.15)
hexachlorobenzene	ND	(0.14)	ND	(0.15)	ND	(0.15)
hexachlorobutadiene	ND	(0.067)	ND	(0.072)	ND	(0.072)
hexachlorocyclopentadiene	ND	(0.44)	ND	(0.48)	ND	(0.48)
hexachloroethane	ND	(0.12)	ND	(0.13)	ND	(0.13)
indeno(1,2,3-cd)pyrene	ND	(0.27)	ND	(0.30)	ND	(0.29)
isophorone	ND	(0.16)	ND	(0.18)	ND	(0.17)
n-nitroso-di-n-propylamine	ND	(0.89)	ND	(0.96)	ND	(0.95)
n-nitrosodiphenylamine	ND	(0.14)	ND	(0.15)	ND	(0.15)
naphthalene	ND	(0.12)	ND	(0.13)	ND	(0.13)
nitrobenzene	ND	(0.14)	ND	(0.15)	ND	(0.15)
pentachlorophenol	ND	(0.27)	ND	(0.29)	ND	(0.29)
phenanthrene	ND	(0.40)	ND	(0.43)	ND	(0.43)

B: Detected in Reagent Blank; background subtraction not performed

BJ: Analyte detected in blank. Estimated value below detection limit.

J: Estimated value (GC test codes)

ND: Not detected at specified detection limit

( ): Detection limit

TABLE 2-2. RESULTS OF ORGANIC ANALYSES FOR SOIL SAMPLES, SITE 3 (LANDFILL 3), CARSWELL AFB, TEXAS (Cont.)

Primary Results

	Monitor Well					
	Sample ID					
	Date Sampled					
	Beg. Depth - End Depth					
	3A		3B		3C	
	3A-5		3B-6		3C-4	
	26-Jan-88		26-Jan-88		27-Jan-88	
PARAMETER	14 - 18		19 - 19.5		9 - 12	
phenol	ND	(0.11)	ND	(0.12)	ND	(0.12)
pyrene	ND	(0.14)	ND	(0.15)	ND	(0.15)

B: Detected in Reagent Blank; background subtraction not performed

BJ: Analyte detected in blank. Estimated value below detection limit.

J: Estimated value (GC test codes)

ND: Not detected at specified detection limit

( ): Detection limit

205013

TABLE 2-2. RESULTS OF ORGANIC ANALYSES FOR SOIL SAMPLES, SITE 3 (LANDFILL 3), CARSWELL AFB, TEXAS (Cont.)

Primary Results

	Monitor Well			
	Sample ID			
	Date Sampled			
	Beg. Depth - End Depth			
	3D		3E	
	3D-4		3E-5	
	27-Jan-88		27-Jan-88	
PARAMETER	9 - 15		14 - 16	
Oil & Grease MG/KG				
Oil and grease, infrared	ND	(5.0)	ND	(5.0)
Volatile Organic Compounds MG/KG				
1,1,1-trichloroethane	ND	(0.0043)	ND	(0.0041)
1,1,2,2-tetrachloroethane	ND	(0.0077)	ND	(0.0075)
1,1,2-trichloroethane	ND	(0.0056)	ND	(0.0055)
1,2-dichloroethane	ND	(0.0031)	ND	(0.0031)
1,2-dichloropropane	ND	(0.0067)	ND	(0.0065)
2-butanone	ND	(0.028)	ND	(0.027)
2-hexanone	ND	(0.040)	ND	(0.039)
4-methyl-2-pentanone	ND	(0.052)	ND	(0.050)
Benzene	ND	(0.0049)	ND	(0.0048)
Ethylbenzene	ND	(0.0081)	ND	(0.0078)
Toluene	0.0076	(0.0067)	ND	(0.0065)
Trichloroethene	ND	(0.0021)	ND	(0.0021)
acetone	ND	(0.0084)	0.016	(0.0082)
bromodichloromethane	ND	(0.0025)	ND	(0.0024)
bromoform	ND	(0.0053)	ND	(0.0051)
bromomethane	ND	(0.0056)	ND	(0.0055)
carbon disulfide	ND	(0.0019)	ND	(0.0019)
carbon tetrachloride	ND	(0.0031)	ND	(0.0031)
chlorobenzene	ND	(0.0067)	ND	(0.0065)
chloroethane	ND	(0.0056)	ND	(0.0055)
chloroform	ND	(0.0018)	ND	(0.0017)
chloromethane	ND	(0.0056)	ND	(0.0055)

B: Detected in Reagent Blank; background subtraction not performed

J: Estimated value (GC test codes)

ND: Not detected at specified detection limit

( ): Detection limit

205001

TABLE 2-2. RESULTS OF ORGANIC ANALYSES FOR SOIL SAMPLES, SITE 3 (LANDFILL 3), CARSWELL AFB, TEXAS (Cont.)

Primary Results

	Monitor Well			
	Sample ID			
	Date Sampled			
	Beg. Depth - End Depth			
	3D		3E	
	3D-4		3E-5	
	27-Jan-88		27-Jan-88	
PARAMETER	9 - 15		14 - 16	
cis-1,3-Dichloropropene	ND	(0.0056)	ND	(0.0055)
dibromochloromethane	ND	(0.0035)	ND	(0.0034)
methylene chloride	0.0061B	(0.0031)	0.0044B	(0.0031)
styrene	ND	(0.0034)	ND	(0.0033)
tetrachloroethene	ND	(0.0046)	ND	(0.0045)
total xylenes	ND	(0.0052)	ND	(0.0050)
trans-1,3-Dichloropropene	ND	(0.0056)	ND	(0.0055)
vinyl acetate	ND	(0.0077)	ND	(0.0075)
vinyl chloride	ND	(0.0056)	ND	(0.0055)
Semivolatile Organic Compounds MG/KG				
1,2,4-trichlorobenzene	ND	(0.14)	ND	(0.14)
1,2-dichlorobenzene	ND	(0.14)	ND	(0.14)
1,3-dichlorobenzene	ND	(0.14)	ND	(0.14)
1,4-dichlorobenzene	ND	(0.33)	ND	(0.32)
2,4,5-trichlorophenol	ND	(0.74)	ND	(0.72)
2,4,6-trichlorophenol	ND	(0.20)	ND	(0.19)
2,4-dichlorophenol	ND	(0.20)	ND	(0.19)
2,4-dimethylphenol	ND	(0.20)	ND	(0.19)
2,4-dinitrophenol	ND	(3.1)	ND	(3.0)
2,4-dinitrotoluene	ND	(0.42)	ND	(0.41)
2,6-dinitrotoluene	ND	(0.14)	ND	(0.14)
2-chloronaphthalene	ND	(0.14)	ND	(0.14)
2-chlorophenol	ND	(0.24)	ND	(0.24)
2-methylnaphthalene	ND	(0.74)	ND	(0.72)
2-methylphenol	ND	(0.74)	ND	(0.72)

B: Detected in Reagent Blank; background subtraction not performed

J: Estimated value (GC test codes)

ND: Not detected at specified detection limit

( ): Detection limit

205102

TABLE 2-2. RESULTS OF ORGANIC ANALYSES FOR SOIL SAMPLES, SITE 3 (LANDFILL 3), CARSWELL AFB, TEXAS (Cont.)

Primary Results

	Monitor Well			
	Sample ID			
	Date Sampled			
	Beg. Depth - End Depth			
	3D		3E	
	3D-4		3E-5	
	27-Jan-88		27-Jan-88	
PARAMETER	9 - 15		14 - 16	
2-nitroaniline	ND	(3.7)	ND	(3.6)
2-nitrophenol	ND	(0.27)	ND	(0.26)
3,3'-dichlorobenzidine	ND	(1.2)	ND	(1.2)
3-nitroaniline	ND	(3.7)	ND	(3.6)
4,6-dinitro-2-methylphenol	ND	(1.8)	ND	(1.7)
4-bromophenyl-phenylether	ND	(0.14)	ND	(0.14)
4-chloro-3-methylphenol	ND	(0.22)	ND	(0.22)
4-chloroaniline	ND	(0.74)	ND	(0.72)
4-chlorophenyl-phenylether	ND	(0.31)	ND	(0.30)
4-methylphenol	ND	(0.74)	ND	(0.72)
4-nitroaniline	ND	(3.7)	ND	(3.6)
4-nitrophenol	ND	(0.18)	ND	(0.17)
acenaphthene	ND	(0.14)	ND	(0.14)
acenaphthylene	ND	(0.26)	ND	(0.25)
anthracene	ND	(0.14)	ND	(0.14)
benzo(a)anthracene	ND	(0.58)	ND	(0.56)
benzo(a)pyrene	ND	(0.19)	ND	(0.18)
benzo(b)fluoranthene	ND	(0.36)	ND	(0.35)
benzo(k)fluoranthene	ND	(0.19)	ND	(0.18)
benzoic acid	ND	(3.7)	ND	(3.6)
benzyl alcohol	ND	(3.7)	ND	(3.6)
bis(2-chloroethoxy)methane	ND	(0.39)	ND	(0.38)
bis(2-chloroethyl) ether	ND	(0.42)	ND	(0.41)
bis(2-chloroisopropyl)ether	ND	(0.42)	ND	(0.41)
bis(2-ethylhexyl)phthalate	0.17J	(0.19)	0.10J	(0.18)
butylbenzylphthalate	ND	(0.19)	ND	(0.18)

B: Detected in Reagent Blank; background subtraction not performed

J: Estimated value (GC test codes)

ND: Not detected at specified detection limit

( ): Detection limit

205031

TABLE 2-2. RESULTS OF ORGANIC ANALYSES FOR SOIL SAMPLES, SITE 3 (LANDFILL 3), CARSWELL AFB, TEXAS (Cont.)

Primary Results

	Monitor Well			
	Sample ID			
	Date Sampled			
	Beg. Depth - End Depth			
	3D		3E	
	3D-4		3E-5	
	27-Jan-88		27-Jan-88	
PARAMETER	9 - 15		14 - 16	
chrysene	ND	(0.19)	ND	(0.18)
di-n-butylphthalate	ND	(0.19)	ND	(0.18)
di-n-octyl phthalate	0.50	(0.19)	0.23	(0.18)
dibenzo(a,h)anthracene	ND	(0.19)	ND	(0.18)
dibenzofuran	ND	(0.74)	ND	(0.72)
diethylphthalate	ND	(0.14)	ND	(0.14)
dimethyl phthalate	ND	(0.12)	ND	(0.12)
fluoranthene	ND	(0.16)	ND	(0.16)
fluorene	ND	(0.14)	ND	(0.14)
hexachlorobenzene	ND	(0.14)	ND	(0.14)
hexachlorobutadiene	ND	(0.067)	ND	(0.065)
hexachlorocyclopentadiene	ND	(0.44)	ND	(0.43)
hexachloroethane	ND	(0.12)	ND	(0.12)
indeno(1,2,3-cd)pyrene	ND	(0.27)	ND	(0.27)
isophorone	ND	(0.16)	ND	(0.16)
n-nitroso-di-n-propylamine	ND	(0.89)	ND	(0.86)
n-nitrosodiphenylamine	ND	(0.14)	ND	(0.14)
naphthalene	ND	(0.12)	ND	(0.12)
nitrobenzene	ND	(0.14)	ND	(0.14)
pentachlorophenol	ND	(0.27)	ND	(0.26)
phenanthrene	ND	(0.40)	ND	(0.39)
phenol	ND	(0.11)	ND	(0.11)
pyrene	ND	(0.14)	ND	(0.14)

B: Detected in Reagent Blank; background subtraction not performed

J: Estimated value (GC test codes)

ND: Not detected at specified detection limit

( ): Detection limit

205020

TABLE 2-3. BACKGROUND CONCENTRATIONS FOR SELECTED METALS IN UNITED STATES SOILS[a]

Metal	Concentration (mg/Kg)		
	Mean	Geometric Deviation	Range
Aluminum	47,000	2.48	5,000 - > 100,000
Antimony	0.48	2.27	< 1 - 8.8
Arsenic	5.2	2.23	< 0.1 -97
Barium	440	2.14	10 - 5,000
Beryllium	0.63	2.38	< 1 - 15
Cadmium[b]	< 1	--	< 1 - 10
Chromium	37	2.37	1 - 2,000
Cobalt	6.7	1.97	< 3 - 50
Copper	17	2.44	< 1 - 700
Iron	18,000	2.38	100 - > 100,000
Lead	16	1.86	< 10 - 700
Manganese	330	2.77	< 2 - 7,000
Mercury	0.058	2.52	< 0.01 - 4.6
Molybdenum	0.59	2.72	< 3 - 15
Nickel	13	2.31	< 5 - 700
Selenium	0.26	2.46	< 0.1 - 4.3
Silver[b]	< 0.5	--	< 0.5 - 5
Thallium	8.6	1.53	2.2 - 31
Vanadium	58	2.25	< 7 - 500
Zinc	48	1.91	< 5 - 2, 900

[a] Shacklette, H. T., and J. G. Boerngen, USGS Professional Paper 1270 (1984).
[b] Conner, J. J., and H. T. Shacklette, USGS Professional Paper 574-F (1975).

Oil and Grease--Oil and grease were detected in soil samples from boreholes 3A and 3B. At 3A, an oil and grease concentration of 48 mg/Kg was found at 14-18 feet. At 3B, 32 mg/Kg of oil and grease were measured at 19-21 feet. Oil and grease was not detected in soil samples from locations 3C-3F.

Volatile Organic Compounds--Toluene was detected in the soil sample from 3D at a concentration of 0.0076 mg/Kg. It was the only purgeable aromatic compound detected at Site 3. Methylene chloride and acetone (purgeable halocarbon compounds) were detected in all soil samples, but were also detected in the reagent blank.

Semivolatile Organic Compounds--Various phthalate compounds were detected in the soil samples. However, these compounds were also detected in the reagent blank, and background subtraction was not performed.

2.3 Ground Water

2.3.1 Hydrogeologic Setting

The geologic formations located in the Carswell AFB area may be divided into the following five hydrogeologic units, listed from the shallowest to deepest: 1) an upper zone in the alluvial terrace deposits associated with the Trinity River containing unconfined ground water; 2) predominantly dry limestone of the Goodland and Walnut Formations; 3) an aquifer in the Paluxy Sand; 4) an aquitard of relatively impermeable limestone in the Glen Rose Formation; and 5) a major aquifer in the sandstone of the Twin Mountains Formation. The three uppermost hydrogeologic units encountered during site investigations at Carswell AFB are described below.

Upper Zone - The upper zone ground water occurs within the alluvial deposits at Carswell AFB. Low permeability is typical of this alluvium because of the large amounts of clay and silt. However, zones of greater permeability occur in the gravels of former channel deposits. Recharge to the water-bearing deposits is local, from rainfall and infiltration from stream channels and drainage ditches. The direction of ground water

flow is generally controlled by the bedrock topography of the Walnut Formation. Ground-water flow in the alluvium is generally eastward, toward the West Fork of the Trinity River.

Ground water was only encountered in the upper zone at one location at Site 3, monitor well 3D. Well 3D is located in a topographic low, not far from Farmers Branch, suggesting a possible hydraulic connection between shallow ground water and surface water. With well 3D being the only control point of ground water flow east of Taxiway 197, contouring of water levels in the upper zone is not possible at Site 3. However, since the land surface at well 3D slopes towards a tributary of Farmers Branch at the west boundary of Carswell AFB, it is probable that ground water flows to the west toward the same tributary.

Goodland/Walnut Formations - The unconfined ground water present in the alluvium is separated from the aquifers below by the low permeability limestones and shales of the Goodland Limestone and Walnut Formation that act as an aquitard. The aquitard is composed of moist clay and shale layers interbedded with dry limestone beds. Though primarily dry, drillers in the area report that small amounts of water enter the borehole while drilling through the Walnut Formation, suggesting that ground water may be moving through the Walnut Formation along bedding planes (Hargis and Associates, 1985). The combined thickness of the Goodland/Walnut formations is approximately 25 feet or greater beneath most of Carswell AFB. However, the top of the aquitard is an erosional surface and erosion may have reduced the thickness of the limestone in isolated areas.

Paluxy Aquifer - The Paluxy aquifer is the shallowest bedrock aquifer underlying Carswell AFB. In the Carswell AFB area, water in the uppermost part of the Paluxy would naturally occur under confined conditions beneath the Goodland/Walnut formations. However, extensive ground water pumping in the Fort Worth area, including the City of White Settlement, has lowered the Paluxy potentiometric surface below the top of the formation, resulting in unconfined conditions beneath the base. With the Paluxy Formation having an upper and lower sand member, and the lower member having larger

grain size and higher permeability, most water wells are completed in the lower section of the Paluxy aquifer.

Recharge to the Paluxy aquifer occurs where the formation crops out west of Carswell AFB in the Air Force Plant 4 area. The Paluxy also crops out north of the base in the bed of Lake Worth. The lake represents a significant recharge point for the aquifer and creates a potentiometric high in its vicinity. Regional ground water flow within the Paluxy is southeastward in the direction of the regional dip.

2.3.2 Ground-Water Contamination

After installation of monitor well 3D in Stage 2, ground water was sampled for chemical analysis in February and April 1988. Samples were analyzed for water quality indicators, metals, oil and grease, petroleum hydrocarbons, phenols, purgeable halocarbons, purgeable aromatics, organochlorine pesticides, chlorinated phenoxy acid herbicides, and extractable organics. Results of analyses are provided in Table 2-4 (inorganic parameters) and Table 2-5 (organic parameters). Field measurements are listed in Table 2-6. These data are discussed relative to notable variations in results between sampling rounds and in comparison to available primary drinking water standards in the following paragraphs.

Water Quality Indicators--Water quality indicators remained fairly stable between the February and April sampling rounds. The greatest change was an increase in sulfate concentration from 140 mg/L in Round 1 to 330 mg/L in Round 2.

Metals--Chromium and arsenic concentrations in ground-water samples from well 3D exceeded their maximum contaminant levels (MCLs) for drinking water. Chromium, detected at 0.13 mg/L, exceeded the MCL in both rounds. Arsenic exceeded the MCL in the first round only (0.060 mg/L). No consistent trend in metals concentrations between sampling rounds was apparent.

TABLE 2-4. RESULTS OF INORGANIC ANALYSES FOR WATER SAMPLES, SITE 3 (LANDFILL 3), CARSWELL AFB, TEXAS

Primary Results

PARAMETER	EPA Standards, Criteria		Monitor Well Sample ID Date Sampled 3D 02-150 24-Feb-88		3D 03-44 05-Mar-88		3D 04-01 05-Apr-88	
Total Dissolved Solids MG/L								
Total Dissolved Solids			840.0	(1.0)			780.0	(1.0)
Fluoride MG/L								
Fluoride	4.0(M)	2.0(G)	0.40				0.36	
Chloride MG/L								
Chloride	250.0(G)		36.0				32.0	
Nitrate MG/L								
Nitrate, colorimetric			0.29				0.28	
Orthophosphate MG/L								
Orthophosphate			ND	(0.020)			0.030	(0.020)
Sulfate MG/L								
Sulfate, nephelometry	250.0(G)		140.0				330.0	
Metals MG/L								
Arsenic, graphite AA	0.050(M)		0.060				0.046	
Mercury	0.0020(M)		ND	(0.00012)			ND	(0.00012)
Lead, graphite AA	0.050(M)		0.021				0.042	
Selenium, graphite AA	0.010(M)		ND@	(0.0050)			ND	(0.0030)
Metal Screen (ICP) MG/L								
Ag Silver			ND	(0.0090)			ND	(0.0090)
Al Aluminum			66.0	(0.20)			77.0	(0.20)

EPA Standards and Criteria are designated: M-Maximum Contaminant Level (MCL), G-Maximum Contaminant Level Goal (MCLG) or other secondary or proposed standard.

@: Indicates that the analytical spike recovery for this analysis was not within acceptance limits indicating an interferent present.

ND: Not detected at specified detection limit

( ): Detection limit

205027

TABLE 2-4. RESULTS OF INORGANIC ANALYSES FOR WATER SAMPLES, SITE 3 (LANDFILL 3), CARSWELL AFB, TEXAS (Cont.)

Primary Results

PARAMETER		EPA Standards, Criteria	Monitor Well Sample ID Date Sampled 3D 02-150 24-Feb-88		3D 03-44 05-Mar-88	3D 04-01 05-Apr-88	
As	Arsenic	0.050(M)	ND	(0.30)		ND	(0.30)
B	Boron		ND	(0.60)		ND	(0.60)
Ba	Barium	1.0(M)	0.37	(0.0090)		0.46	(0.0090)
Be	Beryllium		0.0030	(0.0010)		0.0090	(0.0010)
Ca	Calcium		1100.0	(0.12)		1300.0	(0.12)
Cd	Cadmium	0.010(M)	ND	(0.0030)		ND	(0.0030)
Co	Cobalt		ND	(0.010)		ND	(0.010)
Cr	Chromium	0.050(M)	0.13	(0.0090)		0.13	(0.0090)
Cu	Copper	1.0(G)	0.020	(0.010)		0.010	(0.010)
Fe	Iron	0.30(G)	56.0	(0.030)		67.0	(0.030)
K	Potassium		12.0	(0.30)		13.0	(0.30)
Mg	Magnesium		29.0	(0.10)		30.0	(0.10)
Mn	Manganese	0.050(G)	1.1	(0.0030)		1.6	(0.0030)
Mo	Molybdenum		ND	(0.050)		ND	(0.050)
Na	Sodium		27.0	(0.080)		26.0	(0.080)
Ni	Nickel		0.060	(0.020)		0.050	(0.020)
Pb	Lead	0.050(M)	ND	(0.050)		ND	(0.050)
Sb	Antimony		0.18	(0.060)		ND	(0.060)
Se	Selenium	0.010(M)	ND	(0.30)		ND	(0.30)
Si	Silicon		140.0	(0.30)		120.0	(0.30)
Tl	Thallium		ND	(0.090)		ND	(0.090)
V	Vanadium		0.21	(0.020)		0.19	(0.020)
Zn	Zinc	5.0(G)	0.11	(0.0060)		0.11	(0.0060)

EPA Standards and Criteria are designated: M-Maximum Contaminant Level (MCL), G-Maximum Contaminant Level Goal (MCLG) or other secondary or proposed standard.

@: Indicates that the analytical spike recovery for this analysis was not within acceptance limits indicating an interferent present.

ND: Not detected at specified detection limit

( ): Detection limit

205028

TABLE 2-5. RESULTS OF ORGANIC ANALYSES FOR WATER SAMPLES, SITE 3 (LANDFILL 3), CARSWELL AFB, TEXAS

Primary Results

PARAMETER	EPA Standards, Criteria		Monitor Well Sample ID Date Sampled 3D 02-150 24-Feb-88		3D 03-44 05-Mar-88		3D 04-01 05-Apr-88	
Oil & Grease MG/L								
Oil and grease, infrared			NA		ND	(0.20)	ND	(0.20)
Petroleum Hydrocarbons UG/L								
Petroleum Hydrocarbons			300.0				ND	(200.0)
Phenols UG/L								
2,4,6-trichlorophenol			ND	(0.60)			ND	(0.60)
2,4-dichlorophenol	3090.0(G)		ND	(0.50)			ND	(0.50)
2,4-dimethylphenol	400.0(G)		ND	(0.30)			ND	(0.30)
2,4-dinitrophenol			ND	(13.0)			ND	(13.0)
2-chlorophenol			ND	(0.20)			0.25C	(0.20)
2-methyl-4,6-dinitrophenol			ND	(16.0)			ND	(16.0)
2-nitrophenol			ND	(2.0)			ND	(2.0)
4-chloro-3-methylphenol			ND	(0.40)			ND	(0.40)
4-nitrophenol			ND	(2.5)			ND	(2.5)
pentachlorophenol	200.0(G)		ND	(7.5)			ND	(7.5)
phenol	3500.0(G)		ND	(0.20)			0.58C	(0.20)
Purgeable Halocarbons UG/L								
1,1,1-Trichloroethane	200.0(M)	200.0(G)	ND	(0.090)			ND	(0.090)
1,1,2,2-Tetrachloroethane			ND	(0.12)			ND	(0.12)

EPA Standards and Criteria are designated: M-Maximum Contaminant Level (MCL), G-Maximum Contaminant Level Goal (MCLG) or other secondary or proposed standard.

&: cis-1,3-Dichloropropene cannot be quantitated due to coelution.
B: Detected in Reagent Blank; background subtraction not performed
BJ: Analyte detected in blank. Estimated value below detection limit.
C: Second Column Confirmed
NA: not analyzed
Q: Daily EPA QC recovery outside 95% confidence limit.
ND: Not detected at specified detection limit
(·): Detection limit

205023

TABLE 2-5. RESULTS OF ORGANIC ANALYSES FOR WATER SAMPLES, SITE 3 (LANDFILL 3), CARSWELL AFB, TEXAS (Cont.)

Primary Results

PARAMETER	EPA Standards, Criteria		Monitor Well Sample ID Date Sampled 3D 02-150 24-Feb-88		3D 03-44 05-Mar-88	3D 04-01 05-Apr-88	
1,1,2-Trichloroethane			ND	(0.070)		ND	(0.070)
1,1-Dichloroethane			ND	(0.090)		ND	(0.090)
1,1-Dichloroethene	7.0(M)	7.0(G)	ND	(0.10)		ND	(0.10)
1,2-Dichlorobenzene	620.0(G)		ND	(0.50)		ND	(0.50)
1,2-Dichloroethane	5.0(M)	0.0(G)	ND	(0.030)		ND	(0.030)
1,2-Dichloropropane			ND	(0.10)		ND	(0.10)
1,3-Dichlorobenzene	400.0(G)		ND	(0.30)		ND	(0.30)
1,4-Dichlorobenzene	750.0(M)	750.0(G)	ND	(0.40)		ND	(0.40)
2-Chloroethylvinyl ether			ND	(0.20)		ND	(0.20)
Bromodichloromethane			ND	(0.10)		ND	(0.10)
Bromoform			ND	(0.30)		ND	(0.30)
Bromomethane			ND	(1.2)		ND	(1.2)
Carbon tetrachloride	5.0(M)	0.0(G)	ND	(0.10)		ND	(0.10)
Chlorobenzene	60.0(G)		ND	(0.30)		ND	(0.30)
Chloroethane			ND	(0.50)		ND	(0.50)
Chloroform			ND	(0.050)		ND	(0.050)
Chloromethane			ND	(0.30)		ND	(0.30)
Dibromochloromethane			ND	(0.20)		ND	(0.20)
Methylene chloride			ND	(0.30)		ND	(0.30)
Tetrachloroethene	8.0(G)		ND	(0.030)		ND	(0.030)
Trichloroethene	5.0(M)	0.0(G)	0.70	(0.20)		0.70	(0.20)
Trichlorofluoromethane			ND	(0.10)		ND	(0.10)

EPA Standards and Criteria are designated: M-Maximum Contaminant Level (MCL), G-Maximum Contaminant Level Goal (MCLG) or other secondary or proposed standard.

&: cis-1,3-Dichloropropene cannot be quantitated due to coelution.

B: Detected in Reagent Blank; background subtraction not performed

BJ: Analyte detected in blank. Estimated value below detection limit.

C: Second Column Confirmed

NA: not analyzed

Q: Daily EPA QC recovery outside 95% confidence limit.

ND: Not detected at specified detection limit

( ): Detection limit

TABLE 2-5. RESULTS OF ORGANIC ANALYSES FOR WATER SAMPLES, SITE 3 (LANDFILL 3), CARSWELL AFB, TEXAS (Cont.)

Primary Results

PARAMETER	EPA Standards, Criteria		Monitor Well Sample ID / Date Sampled: 3D 02-150 24-Feb-88		3D 03-44 05-Mar-88	3D 04-01 05-Apr-88	
Vinyl chloride	2.0(M)	0.0(G)	ND	(0.20)		ND	(0.20)
cis-1,3-Dichloropropene			ND&			ND&	
trans-1,2-Dichloroethene	70.0(G)		ND	(0.20)		ND	(0.20)
trans-1,3-Dichloropropene			ND	(0.30)		ND	(0.30)
Purgeable Aromatics UG/L							
1,2-Dichlorobenzene	620.0(G)		ND	(0.80)		ND	(0.40)
1,3-Dichlorobenzene	400.0(G)		ND	(0.80)		ND	(0.40)
1,4-Dichlorobenzene	750.0(M)	750.0(G)	ND	(0.60)		ND	(0.30)
Benzene	5.0(M)	0.0(G)	ND	(0.40)		ND	(0.20)
Chlorobenzene	60.0(G)		ND	(0.60)		ND	(0.30)
Ethylbenzene	680.0(G)		ND	(0.60)		ND	(0.30)
Toluene	2000.0(G)		0.60	(0.40)		1.5	(0.20)
m-Xylene			ND	(0.40)		ND	(0.20)
o-Xylene			ND	(0.20)		ND	(0.10)
p-Xylene			NDQ	(0.40)		NDQ	(0.20)
Organochlorine Pesticides UG/L							
4,4'-DDD			ND	(0.010)		ND	(0.054)
4,4'-DDE			ND	(0.010)		ND	(0.054)
4,4'-DDT			ND	(0.020)		ND	(0.11)
PCB-1016			ND	(0.10)		ND	(2.7)

EPA Standards and Criteria are designated: M-Maximum Contaminant Level (MCL), G-Maximum Contaminant Level Goal (MCLG) or other secondary or proposed standard.

&: cis-1,3-Dichloropropene cannot be quantitated due to coelution.
B: Detected in Reagent Blank; background subtraction not performed
BJ: Analyte detected in blank. Estimated value below detection limit.
C: Second Column Confirmed
NA: not analyzed
Q: Daily EPA QC recovery outside 95% confidence limit.
ND: Not detected at specified detection limit
( ): Detection limit

TABLE 2-5. RESULTS OF ORGANIC ANALYSES FOR WATER SAMPLES, SITE 3 (LANDFILL 3), CARSWELL AFB, TEXAS (Cont.)

Primary Results

PARAMETER	EPA Standards, Criteria	Monitor Well Sample ID Date Sampled 3D 02-150 24-Feb-88		3D 03-44 05-Mar-88	3D 04-01 05-Apr-88	
PCB-1221		ND	(0.20)		ND	(5.4)
PCB-1232		ND	(0.20)		ND	(5.4)
PCB-1242		ND	(0.10)		ND	(2.7)
PCB-1248		ND	(0.10)		ND	(0.54)
PCB-1254		ND	(0.20)		ND	(1.1)
PCB-1260		ND	(0.20)		ND	(1.1)
aldrin		ND	(0.010)		ND	(0.27)
alpha-BHC		ND	(0.010)		ND	(0.27)
beta-BHC		ND	(0.010)		ND	(0.27)
chlordane		ND	(0.050)		ND	(1.4)
delta-BHC		ND	(0.010)		ND	(0.27)
dieldrin		ND	(0.010)		ND	(0.054)
endosulfan I		ND	(0.010)		ND	(0.054)
endosulfan II		ND	(0.030)		ND	(0.16)
endosulfan sulphate		ND	(0.050)		ND	(0.27)
endrin	0.20(M)	ND	(0.010)		ND	(0.054)
endrin aldehyde		ND	(0.020)		ND	(0.11)
endrin ketone		ND	(0.050)		ND	(0.27)
gamma-BHC (lindane)		ND	(0.010)		ND	(0.27)
heptachlor		ND	(0.010)		ND	(0.27)
heptachlor epoxide		ND	(0.010)		ND	(0.27)
methoxychlor	100.0(M)	ND	(0.050)		ND	(0.27)

EPA Standards and Criteria are designated: M-Maximum Contaminant Level (MCL), G-Maximum Contaminant Level Goal (MCLG) or other secondary or proposed standard.

&: cis-1,3-Dichloropropene cannot be quantitated due to coelution.

B: Detected in Reagent Blank; background subtraction not performed

BJ: Analyte detected in blank. Estimated value below detection limit.

C: Second Column Confirmed

NA: not analyzed

Q: Daily EPA QC recovery outside 95% confidence limit.

ND: Not detected at specified detection limit

( ): Detection limit

205082

TABLE 2-5. RESULTS OF ORGANIC ANALYSES FOR WATER SAMPLES, SITE 3 (LANDFILL 3), CARSWELL AFB, TEXAS (Cont.)

Primary Results

PARAMETER	EPA Standards, Criteria	Monitor Well Sample ID Date Sampled 3D 02-150 24-Feb-88		3D 03-44 05-Mar-88	3D 04-01 05-Apr-88	
toxaphene	5.0(M)	ND	(0.50)		ND	(2.7)
Chlorinated Phenoxy Acid Herbicides UG/L						
2,4,5-T		ND	(0.20)		ND	(0.10)
2,4,5-TP (Silvex)	10.0(M)	ND	(0.20)		ND	(0.10)
2,4-D	100.0(M)	ND	(1.0)		ND	(0.50)
Extractable Priority Pollutants UG/L						
1,2,4-trichlorobenzene		ND	(1.9)		ND	(1.9)
1,2-dichlorobenzene		ND	(1.9)		ND	(1.9)
1,3-dichlorobenzene		ND	(1.9)		ND	(1.9)
1,4-dichlorobenzene	750.0(G)	ND	(4.4)		ND	(4.4)
2,4,5-trichlorophenol		ND	(10.0)		ND	(10.0)
2,4,6-trichlorophenol		ND	(2.7)		ND	(2.7)
2,4-dichlorophenol	3090.0(G)	ND	(2.7)		ND	(2.7)
2,4-dimethylphenol	400.0(G)	ND	(2.7)		ND	(2.7)
2,4-dinitrophenol		ND	(42.0)		ND	(42.0)
2,4-dinitrotoluene		ND	(5.7)		ND	(5.7)
2,6-dinitrotoluene		ND	(1.9)		ND	(1.9)
2-chloronaphthalene		ND	(1.9)		ND	(1.9)
2-chlorophenol		ND	(3.3)		ND	(3.3)
2-methylnaphthalene		ND	(10.0)		ND	(10.0)

EPA Standards and Criteria are designated: M-Maximum Contaminant Level (MCL), G-Maximum Contaminant Level Goal (MCLG) or other secondary or proposed standard.

&: cis-1,3-Dichloropropene cannot be quantitated due to coelution.

B: Detected in Reagent Blank; background subtraction not performed

BJ: Analyte detected in blank. Estimated value below detection limit.

C: Second Column Confirmed

NA: not analyzed

Q: Daily EPA QC recovery outside 95% confidence limit.

ND: Not detected at specified detection limit

( ): Detection limit

205035

TABLE 2-5. RESULTS OF ORGANIC ANALYSES FOR WATER SAMPLES, SITE 3 (LANDFILL 3), CARSWELL AFB, TEXAS (Cont.)

Primary Results

PARAMETER	EPA Standards, Criteria	Monitor Well Sample ID Date Sampled 3D 02-150 24-Feb-88		3D 03-44 05-Mar-88	3D 04-01 05-Apr-88	
2-methylphenol		ND	(10.0)		ND	(10.0)
2-nitroaniline		ND	(50.0)		ND	(50.0)
2-nitrophenol		ND	(3.6)		ND	(3.6)
3,3'-dichlorobenzidine		ND	(17.0)		ND	(17.0)
4,6-dinitro-2-methylphenol		ND	(24.0)		ND	(24.0)
4-bromophenyl-phenylether		ND	(1.9)		ND	(1.9)
4-chloro-3-methylphenol		ND	(3.0)		ND	(3.0)
4-chloroaniline		ND	(10.0)		ND	(10.0)
4-chlorophenyl-phenylether		ND	(4.2)		ND	(4.2)
4-methylphenol		ND	(10.0)		ND	(10.0)
4-nitroaniline		ND	(50.0)		ND	(50.0)
4-nitrophenol		ND	(2.4)		ND	(2.4)
acenaphthene	0.030(G)	ND	(1.9)		ND	(1.9)
acenaphthylene		ND	(3.5)		ND	(3.5)
aniline		ND	(10.0)		ND	(10.0)
anthracene		ND	(1.9)		ND	(1.9)
benzidine		ND	(44.0)		ND	(44.0)
benzo(a)anthracene		ND	(7.8)		ND	(7.8)
benzo(a)pyrene		ND	(2.5)		ND	(2.5)
benzo(b)fluoranthene		ND	(4.8)		ND	(4.8)
benzo(g,h,i)perylene		ND	(4.1)		ND	(4.1)
benzo(k)fluoranthene		ND	(2.5)		ND	(2.5)

EPA Standards and Criteria are designated: M-Maximum Contaminant Level (MCL), G-Maximum Contaminant Level Goal (MCLG) or other secondary or proposed standard.

&: cis-1,3-Dichloropropene cannot be quantitated due to coelution.

B: Detected in Reagent Blank; background subtraction not performed

BJ: Analyte detected in blank. Estimated value below detection limit.

C: Second Column Confirmed

NA: not analyzed

Q: Daily EPA QC recovery outside 95% confidence limit.

ND: Not detected at specified detection limit

( ): Detection limit

205032

TABLE 2-5. RESULTS OF ORGANIC ANALYSES FOR WATER SAMPLES, SITE 3 (LANDFILL 3), CARSWELL AFB, TEXAS (Cont.)

Primary Results

PARAMETER	EPA Standards, Criteria	Monitor Well Sample ID Date Sampled 3D 02-150 24-Feb-88		3D 03-44 05-Mar-88	3D 04-01 05-Apr-88	
benzoic acid		ND	(50.0)		ND	(50.0)
benzyl alcohol		ND	(50.0)		ND	(50.0)
bis(2-chloroethoxy)methane		ND	(5.3)		ND	(5.3)
bis(2-chloroethyl) ether		ND	(5.7)		ND	(5.7)
bis(2-chloroisopropyl)ether		ND	(5.7)		ND	(5.7)
bis(2-ethylhexyl)phthalate	15000.0(G)	110.0B	(2.5)		190.0	(2.5)
butylbenzylphthalate	940.0(G)	ND	(2.5)		2.9	(2.5)
chrysene		ND	(2.5)		ND	(2.5)
di-n-butylphthalate	35000.0(G)	1.6BJ	(2.5)		ND	(2.5)
di-n-octyl phthalate		1.5BJ	(2.5)		ND	(2.5)
dibenzo(a,h)anthracene		ND	(2.5)		ND	(2.5)
dibenzofuran		ND	(10.0)		ND	(10.0)
diethylphthalate		ND	(1.9)		ND	(1.9)
dimethyl phthalate		ND	(1.6)		ND	(1.6)
fluoranthene	0.030(G)	ND	(2.2)		ND	(2.2)
fluorene	0.030(G)	ND	(1.9)		ND	(1.9)
hexachlorobenzene		ND	(1.9)		ND	(1.9)
hexachlorobutadiene		ND	(0.90)		ND	(0.90)
hexachlorocyclopentadiene		ND	(6.0)		ND	(6.0)
hexachloroethane		ND	(1.6)		ND	(1.6)
indeno(1,2,3-cd)pyrene		ND	(3.7)		ND	(3.7)
isophorone	5200.0(G)	ND	(2.2)		ND	(2.2)

EPA Standards and Criteria are designated: M-Maximum Contaminant Level (MCL), G-Maximum Contaminant Level Goal (MCLG) or other secondary or proposed standard.

&: cis-1,3-Dichloropropene cannot be quantitated due to coelution.

B: Detected in Reagent Blank; background subtraction not performed

BJ: Analyte detected in blank. Estimated value below detection limit.

C: Second Column Confirmed

NA: not analyzed

Q: Daily EPA QC recovery outside 95% confidence limit.

ND: Not detected at specified detection limit

( ): Detection limit

TABLE 2-5. RESULTS OF ORGANIC ANALYSES FOR WATER SAMPLES, SITE 3 (LANDFILL 3), CARSWELL AFB, TEXAS (Cont.)

Primary Results

PARAMETER	EPA Standards, Criteria	Monitor Well Sample ID Date Sampled 3D 02-150 24-Feb-88		3D 03-44 05-Mar-88	3D 04-01 05-Apr-88	
n-nitroso-di-n-propylamine		ND	(12.0)		ND	(12.0)
n-nitrosodimethylamine		ND	(10.0)		ND	(10.0)
n-nitrosodiphenylamine		ND	(1.9)		ND	(1.9)
naphthalene	620.0(G)	ND	(1.6)		ND	(1.6)
nitrobenzene		ND	(1.9)		ND	(1.9)
pentachlorophenol	200.0(G)	ND	(3.6)		ND	(3.6)
phenanthrene	0.030(G)	ND	(5.4)		ND	(5.4)
phenol	3500.0(G)	ND	(1.5)		ND	(1.5)
pyrene	0.030(G)	ND	(1.9)		ND	(1.9)

EPA Standards and Criteria are designated: M-Maximum Contaminant Level (MCL), G-Maximum Contaminant Level Goal (MCLG) or other secondary or proposed standard.

&: cis-1,3-Dichloropropene cannot be quantitated due to coelution.
B: Detected in Reagent Blank; background subtraction not performed
BJ: Analyte detected in blank. Estimated value below detection limit.
C: Second Column Confirmed
NA: not analyzed
Q: Daily EPA QC recovery outside 95% confidence limit.
ND: Not detected at specified detection limit
( ): Detection limit

TABLE 2-6. RESULTS OF FIELD ANALYSES FOR WATER SAMPLES, SITE 3 (LANDFILL 3), CARSWELL AFB, TEXAS

Analyte	Unit of Measure	Monitor Well Sample ID Date Sampled 3D 04-01 05-Apr-88	
Specific Conductance	uMHOS/CM	1040.0	(10.0)
Temperature	C	17.0	(1.0)
pH	S.U.	6.8	(0.010)

( ): Detection Limit

205087

Oil and Grease--Oil and grease was below the detection limit in ground water from both sampling rounds at well 3D.

Petroleum Hydrocarbons--Petroleum hydrocarbons were detected at a concentration of 0.30 mg/L in the first round sample from monitor well 3D. In Round 2, however, no petroleum hydrocarbons were detected.

Phenols--Phenol (0.58 μg/L) and 2-chlorophenol (0.25 μg/L) were detected in the second round sample from 3D. Both of these findings were confirmed by second column analysis. Neither of these, nor any other phenolic compounds were detected in the first round sample.

Purgeable Halocarbons--Trichloroethene (TCE) was detected in low levels (0.70 μg/L) in both water samples taken at 3D. This level is well below the MCL for TCE (5 μg/L). It was the only purgeable halocarbon compound detected in the ground water samples from Site 3.

Purgeable Aromatics--Toluene was detected during both sample rounds at 3D, ranging from 0.6 μg/L (Round 1) to 1.5 μg/L (Round 2). These values are suspect because trip blanks contained up to 49.0 μg/L toluene (see Section 4.5.2.2 of the RI/FS Stage 2 report). No MCL has been established for toluene, however, the detected concentrations are far below the maximum contaminant level goal (MCLG) of 2000 μg/L. The MCLG is a non-enforceable guideline for drinking water.

Organochlorine Pesticides and Chlorinated Phenoxy Acid Herbicides--No pesticides or herbicides were detected in either ground-water samples from monitor well 3D.

Extractable Organic Compounds--Bis(2-ethylhexyl)phthalate, butylbenzylphthalate, di-n-butylphthalate, and di-n-octylphthalate were detected in ground-water samples from well 3D. With the exception of bis(2-ethylhexyl)phthalate, the concentrations were below 5 μg/L and were also usually detected in the reagent blank. Bis(2-ethylhexyl)phthalate ranged

between 110-190 μg/L. This compound was also detected in the reagent blank during the first sampling round.

2.4 Surface Water

Site 3 is located beneath the north-south runway and just south of the underground aqueduct that channels flow to Farmers Branch. Surface runoff patterns within Landfill 3 eventually lead to either Farmers Branch west of the runway or to a closed topographic depression east of the runway. However, there is no avenue for direct discharge of contaminants from this site to surface water because Landfill 3 is located under a runway or is grass-covered. Thus the path of surface water drainage precludes the transport of contaminants from Landfill 3 to Lake Worth, the sole surface water source of drinking water in the area which is located more than 1.5 miles north (up-stream) of Site 3.

2.5 Receptors

Based on available exposure pathways, potential human receptors for exposure to any contaminants originating from Landfill 3 include: 1) persons residing and/or working in nearby areas, particularly downwind of the site; 2) persons ingesting meat and dairy products from animals exposed to contaminants in the ambient air or contaminated surface water; 3) persons ingesting fish or other aquatic organisms exposed to contaminated surface water; and 4) persons swimming or participating in other contact sports in contaminated water.

Potential wildlife receptors include: 1) terrestrial organisms with habitats close to Landfill 3 that inhale ambient air and ingest surface water, particularly from Farmers Branch, and 2) aquatic organisms in Farmers Branch and the West Fork of the Trinity River.

3.0 DATA ANALYSIS/RISK ASSESSMENT

A baseline risk assessment was performed at Site 3 as part of the evaluation of the environmental conditions and as a guide to the selection of a feasible remediation approach, if necessary. The methodology used in the baseline risk assessment involved several sequential steps to derive the values and assumptions necessary to calculate exposure, dose, and risk. The steps included selecting and characterizing indicator chemicals, estimating contaminant release rates, determining contaminant transport and fate, evaluating exposure pathways, and developing exposure scenarios. These tasks produced inputs to a computerized risk assessment model, the Radian Risk Assessment Model (R-RAM), which calculates pollutant-specific estimates of exposure, dose, and risk for direct and indirect routes of exposure. This assessment provided information regarding:

1) The characteristics of chemical releases from the site;

2) Potential routes for human exposure;

3) Potential violations of accepted standards and criteria involving possible chemical releases; and

4) Potential danger to public health resulting from a chemical release.

This assessment, based upon potential public health risks was used to determine the criteria for site remediation and to support the No Further Action alternative for Site 3.

Uninterrupted routes between on-site chemical sources, a chemical release, and human exposure, must exist to create a public health risk. If any of the four following elements is not present at a particular site, then the exposure route is incomplete, and no threat to public health exists:

- A source of chemical contamination and a release mechanism;
- An environmental transport medium;
- A point of human exposure; and
- A human exposure route to such an exposure point.

Landfill 3 potentially releases VOCs (toluene, methylene chloride, and/or trichloroethene) to the air via volatilization and VOCs, bis(2-ethylhexyl)-phthalate, and metals to the ground water via site leaching. Possible modes of contaminant release from Landfill 3 include: 1) fugitive dust generation, 2) leaching to ground water, 3) surface water, and 4) volatilization to the air.

3.1 Soils

Contaminants must be present in exposed surface soil to be subject to significant surface runoff or fugitive dust generation. Because most of Landfill 3 is believed to be located under the present runway or is grass covered, any contaminants present would tend to be retained in the soil.

3.2 Ground Water

At Landfill 3, ground water in the upper zone was encountered at only one location (3D). Other borehole locations at or near the landfill were dry. Chromium and arsenic were reported in concentrations above their MCLs. However, while elevated relative to primary drinking water standards, these and other metals concentrations were consistent with the normal range for shallow alluvial ground water. The bed of Farmers Branch is cut into the same bedrock that forms the base of the upper zone; therefore any ground water would be expected to discharge directly to Farmers Branch or be lost through evapotranspiration as it exits the upper zone materials near the creek. While ground-water flow directions cannot be determined on the basis of one well, it is likely that ground water flows to the west toward Farmers Branch since this is the direction of topographic slope from 3D. The probable path of ground-water flow precludes migration of contaminants from Landfill 3 to any domestic or agricultural use wells in the area.

3.3 Surface Water

Since VOCs remain in a gaseous state and do not deposit on the ground, surface water in the area is not subject to contamination via emissions to the air from Landfill 3. If any contaminants reach Farmers Branch via ground-water migration or runoff, they would be subject to dilution and movement with the surface flow downstream to the West Fork of the Trinity River located east of the base. The West Fork of the Trinity River is downstream of Lake Worth, which is the source of drinking water for Fort Worth and Carswell AFB.

3.4 Air

Emissions of VOCs from Landfill 3 could occur if any of the detected compounds are representative. The compounds would disperse in the ambient atmosphere according to local meteorological conditions. Annual ambient air concentrations of methylene chloride, toluene, and trichloroethene resulting from volatilization of these compounds at the concentrations reported in samples from Landfill 3 were estimated using the ISCLT model, and were found to be insignificant (RI/FS-Stage 2, Radian, 1988).

3.5 Summary

Based on the combination of drilling observations and chemical analyses at Stage 2 sampling points, past landfilling operations at Site 3 do not appear to have significantly affected subsurface conditions or to pose an environmental threat. This conclusion is supported by the lack of waste materials in borehole samples and the "normal" levels of metals and sparse, low-level occurrences of volatile or halogenated organic compounds detected in site samples. The organic compounds may be in large part attributable to laboratory cross-contamination. The ground-water does not appear to be a complete pathway because of its limited occurrence locally (only one of four on-site borings encountered upper zone ground water). Reported concentrations of VOCs in surface soils and ground water are suspected of being non-repre-

sentative and furthermore are too low to constitute a health risk via volatilization to air. Any contaminants reaching surface water would be subject to dilution, and at the concentrations detected in site samples, would be unlikely to pose a threat to human health. Therefore, based on analysis of available data, there is no substantial current or future risk to public health resulting from this site.

4.0 SELECTED ACTION

Site 3 does not appear to be the source of contaminants detected in some samples. Most of the organic compounds detected are suspected as being the result of cross-contamination, and concentrations of metals are typical for a shallow alluvial aquifer.

Also, uninterrupted routes between the potential chemical sources and human exposure do not appear to exist. Therefore, this site poses no significant threat to human health, and the recommended alternative is no further action at this site.

4.1 Alternatives Evaluation

Further Study - One alternative to no further action is further study. The boundaries of Landfill 3 identified in the preliminary assessment were not confirmed during the RI/FS Stage 2 sampling efforts. Arsenic and chromium, the contaminants reported above the MCLs in the upper zone ground water, were detected northwest of the predicted location of the landfill and on the other side of the underground aqueduct from the landfill.

Further study might help identify the boundaries of the landfill as well as the source of arsenic and chromium detected at well 3D. It is unlikely, however, that further study will significantly alter the present finding that the site poses no significant threat to human health or the environment. Therefore, the alternative of further study is not recommended.

4.2 Consistency with Environmental Laws

The Air Force coordinated with the U.S. EPA and the Texas Water Commission (TWC) during the planning and execution of this project to address federal, state, and local concerns.

All relevant and applicable federal, state, and local laws, regulations, standards, policies, and criteria were reviewed as part of the remedial alternative review process. These criteria are mandated by the Superfund Amendments and Reauthorization Act (SARA) to be reviewed and met as applicable or relevant and appropriate requirements (ARARS). Table 4-1 summarizes these criteria.

The IRP serves as the basis for remedial actions at Air Force Installations under the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980. Table 4-1 summarizes the relevant laws and regulations. Studies under the IRP are consistent with applicable Texas laws and regulations.

TABLE 4-1. SUMMARY OF LAWS, REGULATIONS, STANDARDS, POLICIES, AND CRITERIA APPLICABLE OR RELEVANT AND APPROPRIATE TO THE STUDY

Law, Regulation, Standard Policy or Criterion	Analysis
Resource Conservation and Recovery Act	Implementation of source controls will be consistent with current RCRA regulations including standards for owners and operators of TSD facilities and closure performance standards.
Clean Air Act and National Ambient Air Quality Standards	Considered for alternatives involving emissions such as incineration. The no action alternative is unaffected.
DOT Hazardous Material Transport Rules	Affects alternatives requiring the off-site transport of hazardous materials. Includes use of properly constructed and marked vehicles, use of a licensed transporter, and manifesting. The no-action alternative is unaffected.
Federal Water Quality Criteria (FWQC)	Any alternative affected would ensure that the substantive requirements of the FWQC would be attained; however, there are no nearby surface waters affected by the site.
National Environmental Policy Act (NEPA)	The IRP program as conducted at this site is functionally equivalent to NEPA requirements.
Worker Health and Safety (OSHA)	Any alternative selected must ensure worker health and safety.
National Pollutant Discharge & Elimination System (NPDES)	Any alternative affected would meet NPDES requirements. The no-action alternative is unaffected.
EPA Ground-Water Strategy	Applicable to all alternatives.

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5.0 REGULATORY/PUBLIC INVOLVEMENT

The local newspaper notified the public of the availability of the IRP Phase I and Phase II, Stage 1 reports for review. Copies of these reports, located at the Fort Worth City Planning Department and City Library, were available for inspection and review. No comments were received, therefore no public meetings were held to discuss the project.

The draft final report is being submitted to EPA Region 6 and the Texas Water Commission for review.

> "This action is taken under the authority of the Air Force under Executive Order 12580 to conduct removal in accordance with Section 104 of CERCLA (42 USC 9604). In accordance with 10 USC 2705, immediate notification of this decision will be provided to USEPA Region 6 and to the Texas Water Commission for review and comment prior to implementation.

CHARLES A. JACKSON, Colonel, USAF
Base Civil Engineer

DONALD G. COOK, Colonel, USAF
Chairman, Environmental Protection Committee

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