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DECISION SUMMARY TECHNICAL DOCUMENT TO SUPPORT NO FURTHER ACTION AT SITE 11 FIRE DEPARTMENT TRAINING AREA 1 NAS FORT WORTH TX

4/1/1990

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NAVAL AIR STATION FORT WORTH JRB CARSWELL FIELD TEXAS

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 11, FIRE DEPARTMENT TRAINING AREA 1
CARSWELL AFB, TEXAS

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April 1990

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1.0 INTRODUCTION

This document summarizes the rationale for no further action (NFA) at Installation Restoration Program (IRP), Site 11, Fire Department Training Area 1 (FDTA 1), 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 11 is located in the southern part of Carswell AFB just west of Cody Drive and north of Landfill 5 (Figure 1-2). The land surface elevation is approximately 605 feet above mean sea level (MSL). The site now consists of a level, gravel-surfaced area on a drainage divide between an unnamed tributary of Farmers Branch and Farmers Branch.

1.2 Site History

This training area was the primary fire pit prior to 1963. The pit reportedly was adjacent to a small tributary to Farmers Branch, was gravel-lined, and had a low concrete curb around its perimeter. Several fire training exercises are reported to have taken place at this site each month, with waste oils and contaminated fuels being the primary flammable liquids used in the exercises. Small quantities of solvents are also reported to have been used in these exercises.

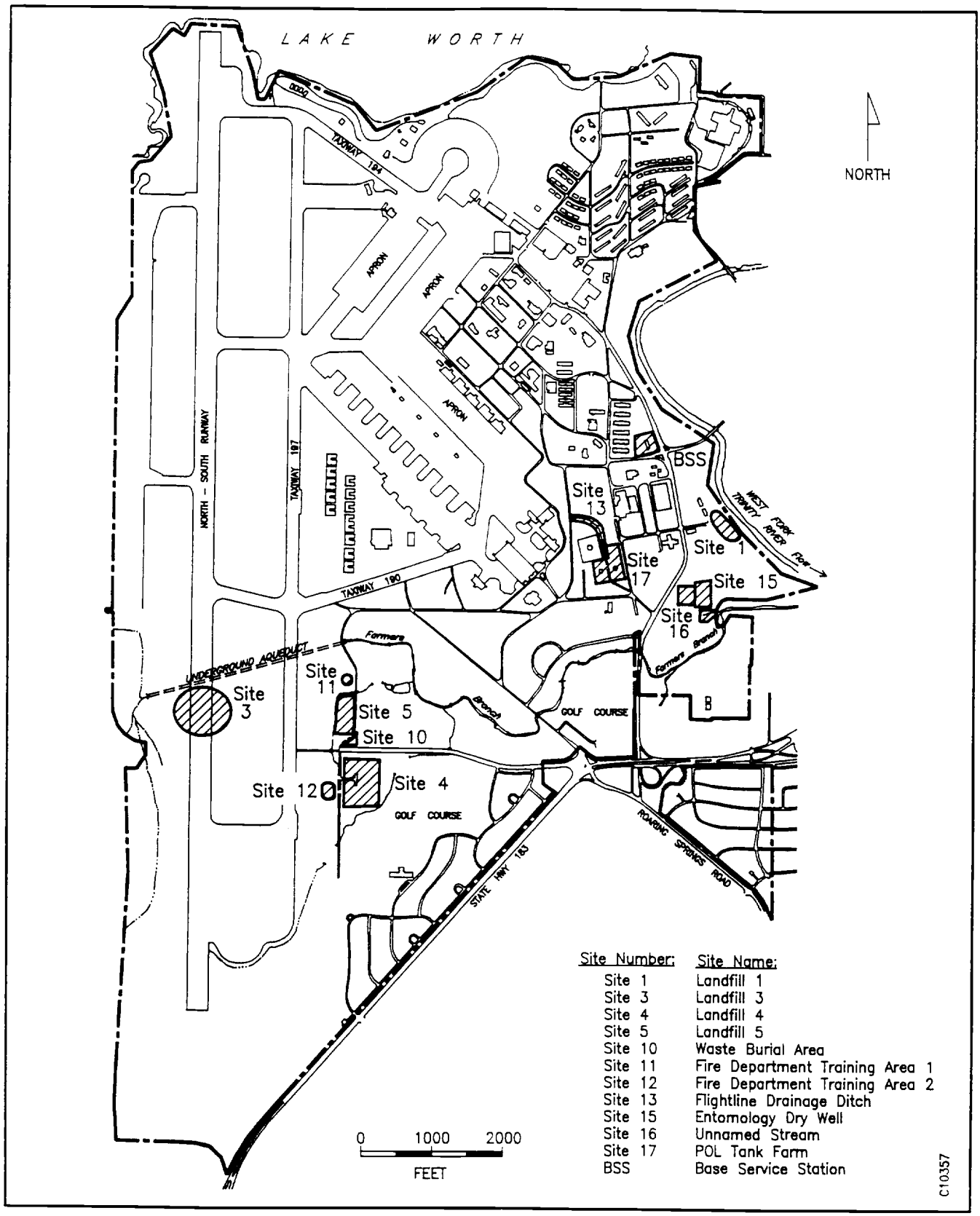

Figure 1-1. Location of IRP RI/FS Stage 2 Sites at Carswell AFB, Texas

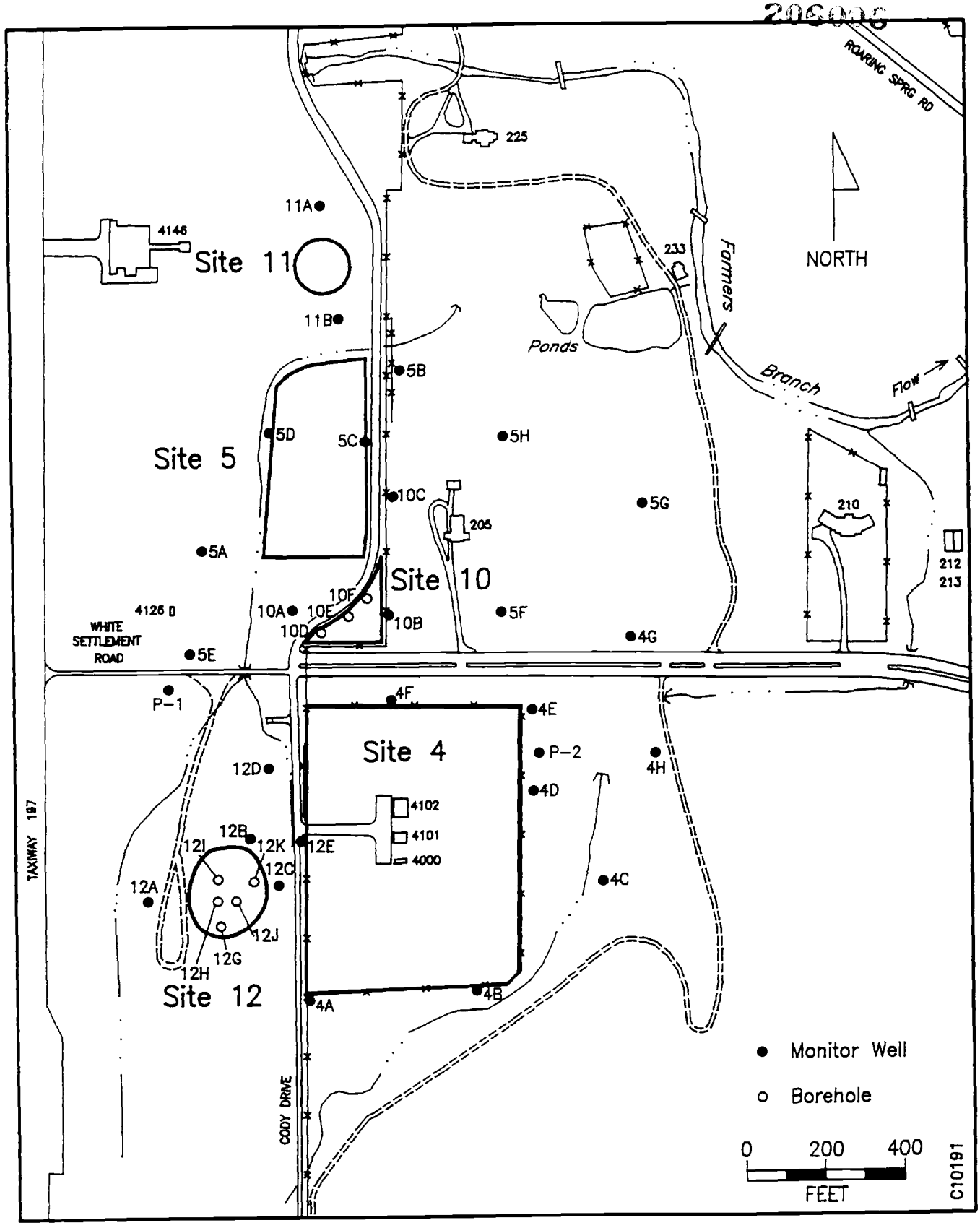

Figure 1-2. Location of Site 11 and the Flightline Area, Carswell AFB, Texas

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

The geologic interpretation at Site 11 is based on an evaluation of drilling logs developed during the installation of two upper zone monitor wells in Stage 1. Upper zone lithologies include surficial deposits of clayey silt with variable amounts of fine sand and gravel, underlain by sand and gravel deposits. The thickness of the upper zone is approximately 14 feet at both of the monitor well locations. Generally, the surficial clay and silt deposits are 5 feet in thickness and the sand and gravel deposits are 8 to 10

feet thick. Shale and limestone of the Goodland Formation underlie the upper zone materials at all locations.

2.2.2 Soil Contamination

Several field activities were accomplished during the RI/FS Stage 1 program to investigate the occurrence of contaminants in soil at Site 11.

Geophysical Survey

The geophysical surveys conducted at Site 11 were performed as extensions of the RI/FS Stage 1 work at Landfill 5, located just south of the site. Electromagnetic profiling data at Site 11 indicated that the range of ground conductivities is on the order of 20 to 40 millimhos/m, consistent with "background" conductivities.

The vertical electrical sounding (resistivity) data revealed a slight increase in resistivity for wider electrode spacing. A high resistivity material was interpreted to occur at a depth of 65 to 90 feet; this material may represent the Paluxy Formation, although there are no nearby deep borings to corroborate this interpretation of the geophysical data.

Soil Chemistry

Split-spoon samples collected during RI/FS Stage 1 monitor well installation were retained and visually examined for any evidence of contamination. Hand auger samples were collected at one location (11C) at the center of the site. Based on the depth and location of the samples, as well as the presence of water, samples of soil were selected for analysis of metals, oil and grease, and volatile organic compounds (EPA Methods 601 and 602). Results of the analyses are provided on Table 2-1. Table 2-2 provides a basis for evaluating metals results by comparing with background metals concentrations in United States soils.

TABLE 2-1. RESULTS OF RI/FS STAGE 1 SOIL SAMPLE ANALYSES, FIRE DEPARTMENT TRAINING AREA NO. 1 (SITE 11), CARSWELL AFB, TEXAS

Parameter	Location[1] 11A (9-10 ft)	11B (9-10 ft)	11C (0 ft)	11C (2 ft)	11C (4 ft)	11C (6 ft)
METALS (mg/Kg)						
Arsenic	14	<3	<3	<3 (<3,<3)	<3	<3
Barium	<0.23	<0.23	42	39.5 (47,32)	32	20
Cadmium	<0.23	<0.2	<0.39	<0.40 (<0.39,<0.4)	<0.4	<0.39
Chromium	3.0	2.0	6.4	7.6 (7.9,7.3)	6.5	7.1
Lead	<4	<4	8	12.5 (13,12)	13	<4
Mercury	0.14	0.21	0.11	0.14 (0.08,0.19)	0.11	0.15
Selenium	9	<4	11	16.5 (17,16)	20	9
Silver	3.1	<0.18	<0.2	(<0.2,0.72)	1.6	0.74
ORGANIC INDICATORS (mg/Kg)						
Oil and Grease	<10	<10	100	(2200,<10)	<10	<10
Phenols	<0.1	<0.1	<0.1	<0.1 (<0.1, <10)	<0.1	<0.1
INSECTICIDES[2] (mg/Kg)	ND	ND	ND	ND,ND	ND	ND
HERBICIDES[2] (mg/Kg)	ND	ND	ND	ND,ND	ND	ND
PURGEABLE HALOCARBONS[2] (mg/Kg)						
Trichloroethene	0.251	ND	0.249	ND,ND	ND	0.257
PURGEABLE AROMATICS[2] (mg/Kg)	ND	ND	ND	ND,ND	ND	ND

[1]Duplicate field sample results are reported. The average of the two analytical values is shown first, followed by the actual values in parenthesis "()".
[2]Parameters shown were detected (ND = not detected).

TABLE 2-2. 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).

The metals, except for selenium, and most organic indicator parameters in Site 11 soils are well within typical ranges for U.S. soils. The only detected volatile organic contaminant, trichloroethene (TCE), was found in low levels (less than 1 mg/Kg) in three soil samples. The low levels of TCE and selenium concentrations notwithstanding, the overall soil analytical results indicate that the soils at Site 11 have concentrations of metals and organic parameters at background levels.

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 ground water under unconfined conditions; 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.

At Site 11, ground water occurs in the upper zone materials at depths ranging from 6 feet at 11B to 9 feet at 11A. As at the other Flightline sites, the ground water exists under unconfined (water table) conditions,

and the occurrence and direction of movement of the ground water appears to be directly related to the configuration of the bedrock surface.

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 thickness of the Goodland/Walnut aquitard 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

RI/FS Stage 2 activities at FDTA 1 consisted of the collection and analysis of ground water from wells 11A and 11B. These upper zone monitor wells were installed during the Stage 1 program, which also included collection and analysis of ground water from monitor wells 11A and 11B.

During the Stage 1 investigation, ground water was sampled in February and March 1985. Samples were analyzed for metals, organic indicator compounds, herbicides, pesticides, and purgeable aromatic and halocarbon compounds. Results of the Stage 1 analyses are provided in Table 2-3.

Ground-water samples for the Stage 2 investigation were collected in February and April 1988. Samples were analyzed for water quality indicators, metals, petroleum hydrocarbons, purgeable halocarbon and aromatic compounds, and extractable organic compounds. Results of these analyses are provided in Table 2-4 (inorganic parameters) and Table 2-5 (organic parameters). Table 2-6 is a summary of field-determined parameters. These data are discussed relative to any apparent trends and in comparison to available primary drinking water standards in the following paragraphs.

Water Quality Indicators (Stage 2)--Only samples collected in Stage 2 were analyzed for the water quality indicator parameters identified in Table 2-4. No health effects-based maximum contaminant levels (MCLs) have been established for these parameters.

Metals--No ground-water samples from the Stage 1 investigation contained any heavy metals species at levels above their maximum contaminant levels (MCLs) for drinking water. There appears to be no relationship in the concentrations of metals relative to upgradient or downgradient positions of the monitor wells.

Results of ground water analyzed during Stage 2 indicated MCLs were exceeded by arsenic in the first (0.096 mg/L) and second (0.068 mg/L) sampling events at monitor well 11B. The chromium concentration (0.053 mg/L)

TABLE 2-3. RESULTS OF GROUND-WATER SAMPLE ANALYSES, FIRE TRAINING AREA 1 (SITE 11), CARSWELL AFB, TEXAS

Parameter	MONITOR WELL[1] 11A Feb	11A Mar	11B Feb	11B Mar
METALS (mg/l)				
Arsenic - ICP	<0.08	<0.08	<0.08	<0.08
Barium	0.18	0.18	0.18	0.16
Cadmium	<0.002	<0.002	<0.002	<0.002
Chromium	<0.005	<0.005	<0.005	<0.005
Lead - ICP	<0.08	<0.08	<0.08	<0.08
Mercury	0.0002	0.0003	0.0005	0.0002
Selenium - ICP	<0.08	<0.08	<0.08	<0.08
Silver	<0.002	<0.002	<0.002	<0.002
METALS (mg/L) - AA [resampled November 1985]				
Arsenic		0.004		0.041
Lead		<0.002		<0.002
Selenium		<0.003		<0.003
ORGANIC INDICATORS (mg/l)				
Oil & Grease	50 [55, 45]	<1	200	<1
Phenols	0.005	<0.005	0.005	<0.005
TOC	7	7	15	14
TOX	0.075 [0.01, 0.14]	0.03	0.04	0.25 [0.27, 0.23]
HERBICIDES[2] (ug/l)				
2,4,5-T	[ND, 0.2]	ND	ND	ND
PESTICIDES[2] (ug/L)	ND, ND	ND	ND	ND
PURGEABLE HALOCARBONS[2] (ug/l)				
Trichlorofluoromethane	2.35 [2.3, 2.4]	5.1 [4.4, 5.7]	ND, ND	[ND, 3.2]
Trichloroethylene	ND, ND	ND, ND	[ND, 1.4]	[ND, 1.8]
PURGEABLE AROMATICS[2] (ug/l)				
Benzene	ND, ND	ND, ND	ND, ND	2.6 [1.5, 3.6]

[1] Duplicate field sample results are reported. The average of the two analytical values is shown first, followed by the actual values used in parentheses "[ ]".

[2] Parameters shown were detected (ND = not detected).

TABLE 2-4. RESULTS OF INORGANIC ANALYSES FOR WATER SAMPLES, SITE 11 (FDTA 1), CARSWELL AFB, TEXAS

Primary Results										
			Monitor Well Sample ID							
			11A		11A		11B		11B	
PARAMETER	EPA Standards, Criteria (mg/L)		02-151		04-02		02-152		04-03	
			24-Feb-88		05-Apr-88		24-Feb-88		05-Apr-88	
Total Dissolved Solids mg/L										
Filterable Residue (TDS)			570.0	(1.0)	570.0	(1.0)	820.0	(1.0)	732.0	(1.0)
Fluoride mg/L										
Fluoride, SIE			0.25	()	0.24	()	0.22	()	0.20	()
Chloride mg/L										
Chloride			68.0	()	8.9	()	18.0	()	16.0	()
Nitrate mg/L as N										
Nitrate, colorimetric			0.64	()	0.59	()	ND	(0.020)	ND	(0.020)
Orthophosphate mg/L										
Orthophosphate			ND	(0.020)	0.040	(0.020)	ND	(0.020)	ND	(0.020)
Sulfate mg/L										
Sulfate, nephelometry			46.0	()	46.0	()	60.0	()	120.0	()
Metals ug/mL										
Arsenic, graphite AA	0.050(M)	0.050(R)	0.0020	()	0.0060^	()	0.096	()	0.068	()
Mercury	0.0020(M)	0.0030(R)	ND	(0.00012)	ND	(0.00012)	ND	(0.00012)	ND	(0.00012)
Lead, graphite AA	0.050(M)	0.020(R)	0.0050R+	()			0.036	()		
Selenium, graphite AA	0.010(M)	0.045(R)	NDR+	(0.0050)	ND	(0.0030)	ND	(0.0050)	ND	(0.0030)
Metal Screen (ICP) ug/mL										
Ag Silver	0.050(M)		ND	(0.0090)	0.0090	(0.0090)	ND	(0.0090)	ND	(0.0090)
Al Aluminum			4.7	(0.20)	13.0	(0.20)	32.0	(0.20)	20.0	(0.20)

EPA Standards and Criteria are designated: M-Maximum Contaminant Level (MCL) or R-Recommended Maximum Contaminant Level (RMCL) or other secondary standard.

R+: Matrix spike recovery and % difference (MS and MS dup) outside control limits.

^: Indicates duplicate analysis is not within control limits.

ND: Not detected at specified detection limit

( ): Detection limit

TABLE 2-4. RESULTS OF INORGANIC ANALYSES FOR WATER SAMPLES, SITE 11 (FDTA 1), CARSWELL AFB, TEXAS (cont.)

Primary Results				Monitor Well							
				Sample ID							
				Date Sampled							
				11A		11A		11B		11B	
		EPA Standards,		02-151		04-02		02-152		04 03	
PARAMETER		Criteria (mg/L)		24-Feb-88		05-Apr-88		24-Feb-88		05-Apr-88	
As	Arsenic	0.050(M)		ND	(0.30)	ND	(0.30)	ND	(0.30)	ND	(0.30)
B	Boron			ND	(0.60)	ND	(0.60)	ND	(0.60)	ND	(0.60)
Ba	Barium	1.0(M)	1.5(R)	0.18	(0.0090)	0.19	(0.0090)	0.25	(0.0090)	0.20	(0.0090)
Be	Beryllium			0.0010	(0.0010)	0.0020	(0.0010)	0.0020	(0.0010)	0.0060	(0.0010)
Ca	Calcium			170.0	(0.060)	220.0	(0.060)	350.0	(0.060)	320.0	(0.060)
Cd	Cadmium	0.010(M)	0.0050(R)	ND	(0.0030)	ND	(0.0030)	ND	(0.0030)	ND	(0.0030)
Co	Cobalt			ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Cr	Chromium	0.050(M)	0.12(R)	0.012	(0.0090)	0.024	(0.0090)	0.053	(0.0090)	0.044	(0.0090)
Cu	Copper	1.0(R)		ND	(0.010)	ND	(0.010)	0.040	(0.010)	0.030	(0.010)
Fe	Iron	0.30(R)		5.4	(0.030)	13.0	(0.030)	68.0	(0.030)	46.0	(0.030)
K	Potassium			5.4	(0.30)	7.4	(0.30)	5.3	(0.30)	3.8	(0.30)
Mg	Magnesium			10.0	(0.10)	13.0	(0.10)	13.0	(0.10)	11.0	(0.10)
Mn	Manganese	0.050(R)		0.22	(0.0030)	0.29	(0.0030)	1.5	(0.0030)	1.3	(0.0030)
Mo	Molybdenum			ND	(0.050)	ND	(0.050)	ND	(0.050)	ND	(0.050)
Na	Sodium			14.0	(0.080)	14.0	(0.080)	35.0	(0.080)	36.0	(0.080)
Ni	Nickel			ND	(0.020)	ND	(0.020)	0.050	(0.020)	0.030	(0.020)
Pb	Lead	0.050(M)	0.020(R)	ND	(0.050)	ND	(0.050)	0.10	(0.050)	0.060	(0.050)
Sb	Antimony			ND	(0.060)	ND	(0.060)	0.070	(0.060)	ND	(0.060)
Se	Selenium			ND	(0.30)	ND	(0.30)	ND	(0.30)	ND	(0.30)
Si	Silicon			19.0	(0.30)	30.0	(0.30)	80.0	(0.30)	41.0	(0.30)
Tl	Thallium			ND	(0.090)	ND	(0.090)	ND	(0.090)	ND	(0.090)
V	Vanadium			ND	(0.020)	0.030	(0.020)	0.11	(0.020)	0.080	(0.020)
Zn	Zinc	5.0(R)		0.023	(0.0060)	0.055	(0.0060)	0.098	(0.0060)	0.070	(0.0060)

EPA Standards and Criteria are designated: M Maximum Contaminant Level (MCL) or R Recommended Maximum Contaminant Level (RMCL) or other secondary standard.

R+: Matrix spike recovery and % difference (MS and MS dup) outside control limits.

^: Indicates duplicate analysis is not within control limits.

ND: Not detected at specified detection limit

( ): Detection limit

TABLE 2-5. RESULTS OF ORGANIC ANALYSES FOR WATER SAMPLES, SITE 11 (FDTA 1), CARSWELL AFB, TEXAS

Primary Results

PARAMETER	EPA Standards, Criteria		Monitor Well Sample ID / Date Sampled: 11A 02-151 24-Feb-88		11A 04-02 05-Apr-88		11B 02-152 24-Feb-88		11B 04-03 05-Apr-88	
Petroleum Hydrocarbons UG/L										
Petroleum Hydrocarbons			ND	(200.0)	ND	(200.0)	ND	(200.0)	ND	(200.0)
Purgeable Halocarbons UG/L										
1,1,1-Trichloroethane	200.0(M)	200.0(G)	ND	(0.090)	ND	(0.090)	ND	(0.090)	ND	(0.090)
1,1,2,2-Tetrachloroethane			ND	(0.12)	ND	(0.12)	ND	(0.12)	ND	(0.12)
1,1,2-Trichloroethane			ND	(0.070)	ND	(0.070)	ND	(0.070)	ND	(0.070)
1,1-Dichloroethane			ND	(0.090)	ND	(0.090)	ND	(0.090)	ND	(0.090)
1,1-Dichloroethene	7.0(M)	7.0(G)	ND	(0.10)	ND	(0.10)	ND	(0.10)	ND	(0.10)
1,2-Dichlorobenzene	620.0(G)		ND	(0.50)	ND	(0.50)	ND	(0.50)	ND	(0.50)
1,2-Dichloroethane	5.0(M)	0.0(G)	ND	(0.030)	ND	(0.030)	ND	(0.030)	ND	(0.030)
1,2-Dichloropropane			ND	(0.10)	ND	(0.10)	ND	(0.10)	ND	(0.10)
1,3-Dichlorobenzene	400.0(G)		ND	(0.30)	ND	(0.30)	ND	(0.30)	ND	(0.30)
1,4-Dichlorobenzene	750.0(M)	750.0(G)	ND	(0.40)	ND	(0.40)	ND	(0.40)	ND	(0.40)
2-Chloroethylvinyl ether			ND	(0.20)	ND	(0.20)	ND	(0.20)	ND	(0.20)
Bromodichloromethane			ND	(0.10)	ND	(0.10)	ND	(0.10)	ND	(0.10)
Bromoform			ND	(0.30)	ND	(0.30)	ND	(0.30)	ND	(0.30)
Bromomethane			ND	(1.2)	ND	(1.2)	ND	(1.2)	ND	(1.2)
Carbon tetrachloride	5.0(M)	0.0(G)	ND	(0.10)	ND	(0.10)	ND	(0.10)	ND	(0.10)
Chlorobenzene	60.0(G)		ND	(0.30)	ND	(0.30)	ND	(0.30)	ND	(0.30)
Chloroethane			ND	(0.50)	ND	(0.50)	ND	(0.50)	ND	(0.50)
Chloroform			ND	(0.050)	ND	(0.050)	ND	(0.050)	ND	(0.050)
Chloromethane			ND	(0.30)	ND	(0.30)	ND	(0.30)	ND	(0.30)
Dibromochloromethane			ND	(0.20)	ND	(0.20)	ND	(0.20)	ND	(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.

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

B: Detected in Reagent Blank; background subtraction not performed

J: Estimated value (GC test codes)

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 11 (FDTA 1), CARSWELL AFB, TEXAS (cont.)

Primary Results

PARAMETER	EPA Standards, Criteria		Monitor Well / Sample ID / Date Sampled: 11A 02-151 24-Feb-88		11A 04-02 05-Apr-88		11B 02-152 24-Feb-88		11B 04-03 05-Apr-88	
Methylene chloride			ND	(0.30)	ND	(0.30)	ND	(0.30)	ND	(0.30)
Tetrachloroethene	8.0(G)		ND	(0.030)	ND	(0.030)	ND	(0.030)	ND	(0.030)
Trichloroethene	5.0(M)	0.0(G)	ND	(0.20)	ND	(0.20)	ND	(0.20)	ND	(0.20)
Trichlorofluoromethane			ND	(0.10)	ND	(0.10)	ND	(0.10)	ND	(0.10)
Vinyl chloride	2.0(M)	0.0(G)	ND	(0.20)	ND	(0.20)	ND	(0.20)	ND	(0.20)
cis-1,3-Dichloropropene			ND&		ND&		ND&		ND&	
trans-1,2-Dichloroethene	70.0(G)		ND	(0.20)	ND	(0.20)	ND	(0.20)	ND	(0.20)
trans-1,3-Dichloropropene			ND	(0.30)	ND	(0.30)	ND	(0.30)	ND	(0.30)
Purgeable Aromatics UG/L										
1,2-Dichlorobenzene	620.0(G)		ND	(0.40)	ND	(0.40)	ND	(4.0)	ND	(0.40)
1,3-Dichlorobenzene	400.0(G)		ND	(0.40)	ND	(0.40)	ND	(4.0)	ND	(0.40)
1,4-Dichlorobenzene	750.0(M)	750.0(G)	ND	(0.30)	ND	(0.30)	ND	(3.0)	ND	(0.30)
Benzene	5.0(M)	0.0(G)	ND	(0.20)	ND	(0.20)	ND	(2.0)	ND	(0.20)
Chlorobenzene	60.0(G)		ND	(0.30)	ND	(0.30)	ND	(3.0)	ND	(0.30)
Ethylbenzene	680.0(G)		ND	(0.30)	ND	(0.30)	ND	(3.0)	ND	(0.30)
Toluene	2000.0(G)		0.60	(0.20)	13.0	(0.20)	3.2	(2.0)	19.0	(0.20)
m-Xylene			NDQ	(0.20)	ND	(0.20)	NDQ	(2.0)	ND	(0.20)
o-Xylene			ND	(0.10)	ND	(0.10)	ND	(1.0)	ND	(0.10)
p-Xylene			ND	(0.20)	ND	(0.20)	ND	(2.0)	ND	(0.20)
Extractable Priority Pollutants UG/L										
1,2,4-trichlorobenzene			ND	(1.9)	ND	(2.1)				
1,2-dichlorobenzene			ND	(1.9)	ND	(2.1)				

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

B: Detected in Reagent Blank; background subtraction not performed

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ND: Not detected at specified detection limit

( ): Detection limit

TABLE 2-5. RESULTS OF ORGANIC ANALYSES FOR WATER SAMPLES, SITE 11 (FDTA 1), CARSWELL AFB, TEXAS (cont.)

Primary Results

PARAMETER	EPA Standards, Criteria	Monitor Well / Sample ID / Date Sampled: 11A 02-151 24-Feb-88		11A 04-02 05-Apr-88		11B 02-152 24-Feb-88	11B 04-03 05-Apr-88
1,3-dichlorobenzene		ND	(1.9)	ND	(2.1)		
1,4-dichlorobenzene	750.0(G)	ND	(4.4)	ND	(4.8)		
2,4,5-trichlorophenol		ND	(10.0)	ND	(11.0)		
2,4,6-trichlorophenol		ND	(2.7)	ND	(2.9)		
2,4-dichlorophenol	3090.0(G)	ND	(2.7)	ND	(2.9)		
2,4-dimethylphenol	400.0(G)	ND	(2.7)	ND	(2.9)		
2,4-dinitrophenol		ND	(42.0)	ND	(46.0)		
2,4-dinitrotoluene		ND	(5.7)	ND	(6.2)		
2,6-dinitrotoluene		ND	(1.9)	ND	(2.1)		
2-chloronaphthalene		ND	(1.9)	ND	(2.1)		
2-chlorophenol		ND	(3.3)	ND	(3.6)		
2-methylnaphthalene		ND	(10.0)	ND	(11.0)		
2-methylphenol		ND	(10.0)	ND	(11.0)		
2-nitroaniline		ND	(50.0)	ND	(55.0)		
2-nitrophenol		ND	(3.6)	ND	(3.9)		
3,3'-dichlorobenzidine		ND	(17.0)	ND	(18.0)		
4,6-dinitro-2-methylphenol		ND	(24.0)	ND	(26.0)		
4-bromophenyl-phenylether		ND	(1.9)	ND	(2.1)		
4-chloro-3-methylphenol		ND	(3.0)	ND	(3.3)		
4-chloroaniline		ND	(10.0)	ND	(11.0)		
4-chlorophenyl-phenylether		ND	(4.2)	ND	(4.6)		
4-methylphenol		ND	(10.0)	ND	(11.0)		
4-nitroaniline		ND	(50.0)	ND	(55.0)		
4-nitrophenol		ND	(2.4)	ND	(2.6)		

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

B: Detected in Reagent Blank; background subtraction not performed

J: Estimated value (GC test codes)

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 11 (FDTA 1), CARSWELL AFB, TEXAS (cont.)

Primary Results

PARAMETER	EPA Standards, Criteria	Monitor Well / Sample ID / Date Sampled: 11A / 02-151 / 24-Feb-88		11A / 04-02 / 05-Apr-88		11B / 02-152 / 24-Feb-88		11B / 04-03 / 05-Apr-88	
acenaphthene	0.030(G)	ND	(1.9)	ND	(2.1)				
acenaphthylene		ND	(3.5)	ND	(3.8)				
aniline		ND	(10.0)						
anthracene		ND	(1.9)	ND	(2.1)				
benzidine		ND	(44.0)						
benzo(a)anthracene		ND	(7.8)	ND	(8.5)				
benzo(a)pyrene		ND	(2.5)	ND	(2.7)				
benzo(b)fluoranthene		ND	(4.8)	ND	(5.2)				
benzo(g,h,i)perylene		ND	(4.1)	ND	(4.5)				
benzo(k)fluoranthene		ND	(2.5)	ND	(2.7)				
benzoic acid		ND	(50.0)	ND	(55.0)				
benzyl alcohol		ND	(50.0)	ND	(55.0)				
bis(2-chloroethoxy)methane		ND	(5.3)	ND	(5.8)				
bis(2-chloroethyl) ether		ND	(5.7)	ND	(6.2)				
bis(2-chloroisopropyl)ether		ND	(5.7)	ND	(6.2)				
bis(2-ethylhexyl)phthalate	15000.0(G)	11.0B	(2.5)	ND	(2.7)				
butylbenzylphthalate	940.0(G)	ND	(2.5)	1.8J	(2.7)				
chrysene		ND	(2.5)	ND	(2.7)				
di-n-butylphthalate	35000.0(G)	6.1B	(2.5)	ND	(2.7)				
di-n-octyl phthalate		3.8B	(2.5)	2.0J	(2.7)				
dibenzo(a,h)anthracene		ND	(2.5)	ND	(2.7)				
dibenzofuran		ND	(10.0)	ND	(11.0)				
diethylphthalate		ND	(1.9)	ND	(2.1)				
dimethyl phthalate		ND	(1.6)	ND	(1.7)				

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
J: Estimated value (GC test codes)
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 11 (FDTA 1), CARSWELL AFB, TEXAS (cont.)

Primary Results

PARAMETER	EPA Standards, Criteria	Monitor Well Sample ID / Date Sampled: 11A 02-151 24-Feb-88		11A 04-02 05-Apr-88		11B 02-152 24-Feb-88	11B 04-03 05-Apr-88
fluoranthene	0.030(G)	ND	(2.2)	ND	(2.4)		
fluorene	0.030(G)	ND	(1.9)	ND	(2.1)		
hexachlorobenzene		ND	(1.9)	ND	(2.1)		
hexachlorobutadiene		ND	(0.90)	ND	(0.98)		
hexachlorocyclopentadiene		ND	(6.0)	ND	(6.5)		
hexachloroethane		ND	(1.6)	ND	(1.7)		
indeno(1,2,3-cd)pyrene		ND	(3.7)	ND	(4.0)		
isophorone	5200.0(G)	ND	(2.2)	ND	(2.4)		
n-nitroso-di-n-propylamine		ND	(12.0)	ND	(13.0)		
n-nitrosodimethylamine		ND	(10.0)				
n-nitrosodiphenylamine		ND	(1.9)	ND	(2.1)		
naphthalene	620.0(G)	ND	(1.6)	ND	(1.7)		
nitrobenzene		ND	(1.9)	ND	(2.1)		
pentachlorophenol	200.0(G)	ND	(3.6)	ND	(3.9)		
phenanthrene	0.030(G)	ND	(5.4)	ND	(5.9)		
phenol	3500.0(G)	ND	(1.5)	ND	(1.6)		
pyrene	0.030(G)	ND	(1.9)	ND	(2.1)		

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

J: Estimated value (GC test codes)

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 11 (FDTA 1), CARSWELL AFB, TEXAS

Analyte	Unit of Measure	Monitor Well Sample ID Date Sampled 11A 04-02 05-Apr-88		11B 04-03 05-Apr-88	
Alkalinity	mg/L			690.0	(5.0)
Specific Conductance	uMHOS/CM	830.0	(1.0)	1100.0	(10.0)
Temperature	C	17.0	(1.0)	16.0	(1.0)
pH	S.U.	6.7	(0.010)	6.8	(0.010)

( ): Detection Limit

exceeded the MCL at monitor well 11B in the first sampling round but not in the second sampling round. Lead concentrations were above the MCL at monitor well 11B during both sampling rounds using the ICPES* metal screen, however, this was not confirmed with the graphite atomic absorption analysis run on the first round sample only.

Purgeable Halocarbons--Ground water samples collected from monitor well 11B in both Stage 1 sampling rounds contained trichloroethene (TCE) in detectable concentrations in one of the duplicate splits. The maximum concentration was 1.8 μg/L. This is below the MCL for TCE. No purgeable halocarbons were detected in the ground water sampled during the Stage 2 investigation.

Purgeable Aromatics--During the Stage 1 investigation benzene was detected in monitor well 11B ranging from not detected to 3.6 μg/L. This concentration is below the MCL for benzene. During the Stage 2 investigation benzene was not detected, however toluene was found in all the ground-water samples. Concentrations ranged from 0.6 to 19 μg/L. These values are suspect because trip blanks contained up to 49.0 μg/L toluene. No MCL has been established for toluene, however, the non-enforceable maximum contaminant level goal (MCLG) for toluene is 2000 μg/L, far above the detected concentrations

Extractable Organic Compounds--Ground-water samples were analyzed for extractable organic compounds during the Stage 2 investigation only. Several phthalate compounds were detected in water samples from monitor well 11A. However, the compounds were detected at low, sometimes estimated levels, and were also detected in the reagent blank.

Petroleum Hydrocarbons (Stage 2)--Total petroleum hydrocarbons were not detected in the ground water from monitor wells 11A or 11B.

*Inductively Coupled Plasma Emission Spectrometry.

Organic Indicators (Stage 1)--Results of the oil and grease, phenols, total organic carbon (TOC), and total organic halogens (TOX) screening analyses were generally within the expected range for shallow alluvial ground water. Oil and grease concentrations decreased noticeably from the first sampling round to the second, however, there appeared to be no corresponding decrease in the other parameters for the same time period.

Pesticides and Herbicides (Stage 1)--No pesticides were detected in any Stage 1 ground-water samples. One herbicide compound, 2,4,5-TP was detected at a concentration of 0.2 μg/l in one sample from a duplicate pair collected from monitor well 11B during the first sampling round.

2.4 Surface Water

Site 11 consists of a level, gravel-surfaced area on a drainage divide between an unnamed tributary of Farmers Branch and Farmers Branch, an intermittent stream that flows eastward to the West Fork of the Trinity River. Lake Worth, the source of drinking water for Fort Worth and Carswell AFB, is located approximately 1.5 miles north of Site 11 and upstream of the point where Farmers Branch enters the West Fork of the Trinity River. The site is covered by vegetation so that surface runoff is minimized.

2.5 Receptors

Based on available exposure pathways, potential human receptors for exposure to contaminants originating from Site 11 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 Site 11 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 11 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 public health risks was used to determined the criteria for site remediation and to support the No Further Action alternative for Site 11.

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:

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

FDTA 1 could potentially release toluene and trichloroethene to the air via volatilization; and toluene, bis(2-ethylhexyl)phthalate, and metals to the ground and surface water via site leaching and surface runoff. Potentially significant contaminant transport and fate mechanisms in the air and ground and surface water media include: 1) air dispersion, 2) ground water migration, 3) transport in surface water, and 4) subsequent uptake by plants and animals. The transport of contaminants from FDTA 1 will be towards Farmers Branch, east of the site. Contaminant contributions from this site to Farmers Branch could be potentially derived from surface runoff as well as ground water discharge. Inhalation of ambient air is the most direct exposure pathway for contaminants to move from FDTA 1 to human receptors.

3.1 Soils

Contaminants must be present in exposed surface soil to be subject to significant surface runoff during precipitation. Although FDTA 1 is covered by vegetation, surface runoff could potentially dislodge soil particles at the surface and/or dissolve and transport soluble compounds present at the soil surface. Although numerous metals from the indicator chemical list were detected in the soil samples, only selenium was noted in concentrations exceeding the range of background concentrations in United States soils (Table 2-2). However, the solubility of selenium is low and it should pose no great health risk. Trichloroethene concentrations, detected in three soil samples, were all below 0.3 mg/Kg and should likewise pose no health risk.

3.2 Ground Water

All of the indicator chemicals were detected in the upper zone ground-water samples from FDTA 1. Chromium, arsenic, and lead, were reported in concentrations slightly above primary drinking water standards. However,

the detected concentrations, as well as those for the other metals and the water quality parameters are within the typical ranges for shallow, alluvial aquifers. Organic indicator chemicals (toluene and bis(2-ethyl-hexyl)phthalate) detected in ground-water samples are considered the result of laboratory cross-contamination. None of the detected indicator parameters represent impacts from past activities at FDTA 1. Since there are no apparent effects to ground water, there is no health risk associated with the ground-water pathway.

3.3 Surface Water

There is no direct discharge of contaminants from this site to surface water.

3.4 Air

VOCs present in soil or ground water are potentially subject to volatilization to the air by virtue of high vapor pressures. Toluene and trichloroethene were the only indicator chemicals detected at the site which could volatilize. However, the detected concentrations were very low and would not constitute a health risk via the air pathway. For example, the maximum predicted annual average emission of toluene from Site 11 is more than eight orders of magnitude lower than the Texas Air Control Board's Effects Screening Level.

3.5 Summary

FDTA 1 is a level, gravel-surfaced area located just east of the flightline. It is currently covered by grass. Exposure via ground-water pathways will not be a concern because previous activities at the site do not appear to have introduced contaminants to the upper zone ground water. Reported concentrations of VOCs in surface soils and ground water are very low and/or suspected of being non-representative. Therefore, while a potential release mechanism (volatilization) exists, the contaminant concentrations are insufficient to constituent a health risk through the air pathway. Potential

dermal exposure to surface water or exposure via ingestion are unlikely to pose any threats 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

Upper zone ground-water quality at Site 11 appears to be unaffected by past activities associated with FDTA 1 based on data from two on-site monitor wells. Volatilization of toluene to air may occur, but the predicted levels of emission pose no health risk. The 70-year cancer risks associated with all pathways (inhalation, ingestion, and contact with contaminated materials) are considered negligible or nonexistent. This site poses no significant impact on human health, and the recommended alternative is no further action at this site.

4.1 Alternatives Evaluation

Additional Ground-Water Monitoring

Arsenic and chromium were detected at levels slightly above MCLs in a downgradient upper zone monitor well. The detected concentrations are not atypical of ground-water quality in a shallow alluvial aquifer and are interpreted as reflecting natural conditions rather than effects from past site activities. Additional monitoring could confirm this interpretation. However, since the upper zone is not a source of drinking water to which the MCLs apply, additional monitoring is considered unnecessary and 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.

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.

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. Studies under the IRP are consistent with applicable Texas laws and regulations.

5.0 REGULATORY/PUBLIC INVOLVEMENT

The local newspaper notified the public of the availability of the IRP Phase I and Phase II, Stage I 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.

"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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