Barbara
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DEPARTMENT OF THE ARMY

U.S. ARMY WHITE SANDS MISSILE RANGE
WHITE SANDS MISSILE RANGE, NEW MEXICO 88002-

April 15, 1996

REPLY TO ATTENTION OF

Directorate of Environment and Safety

RECEIVED APR 1996

Mr. Benito Garcia
Hazardous and Radioactive Materials Bureau
New Mexico Environment Department
P.O. Box 26110
Santa Fe, NM 87502

Dear Mr. Garcia:

White Sands Missile Range (WSMR) has been actively pursuing remediation efforts at the Temperature Test Facility (TTF). In 1988 at this facility, a release of methylene chloride (MeCl) was identified and a RCRA cap was constructed to mitigate the possibility of MeCl migration from the site. Consequently in 1995, WSMR performed an investigation to identify the extent of all the MeCl contamination at the TTF so that a soil vapor extraction system could be installed to properly remediate this site.

Attached for your review and comment, is the final draft of the investigation report entitled, "RCRA Facility Investigation Report , Temperature Test Facility - White Sands Missile Range, New Mexico". We request any comments or suggested modifications from your staff regarding the report so that we may finalize the document. A response concerning our report at your earliest convenience is appreciated. Please contact Mr. Hector Magallanes, (505) 678-2073, should you or your staff have questions regarding the TTF RFI Report submitted for review.

Sincerely,

Thomas A. Ladd

Thomas A. Ladd
Director, Environment and Safety

Attachment

Copy Furnished:
Mr. James Harris, U.S. EPA, Region VI, Dallas, TX

RCRA FACILITY INVESTIGATION REPORT TEMPERATURE TEST FACILITY WHITE SANDS MISSILE RANGE, NEW MEXICO

Prepared for
Department of the Army
U.S. Army Engineers District
Tulsa District Corps of Engineers
Tulsa, Oklahoma
March 1996

Woodward-Clyde

Woodward-Clyde Federal Services
10975 El Monte, Suite 100
Overland Park, Kansas 66211

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WCFS Project F93102

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Term	Definition
1,1-DCA	1,1-Dichloroethane
1,1-DCE	1,1-Dichloroethene
1,1,1-TCA	1,1,1-Trichloroethane
AB	Ambient Blank
bgs	below ground surface
CDAP	Chemical Data Acquisition Plan
CMS	Corrective Measures Study
COCs	Chemicals of Concern
EB	Equipment Blank
ECD	Electron Capture Detector
ERC	Environmental and Energy Services Company
FID	Flame Ionization Detector
FSAP	Field Sampling and Analysis Plan
GC	Gas Chromatograph
GC/MS	Gas Chromatograph/Mass Spectrometer
GCL	Geoscience Consultants Limited
GC/PID/ECD	Gas Chromatograph/Photoionization Detector/Electron Capture Detector
gpm	gallons per minute
HDPE	High Density Polyethylene
HEEA	Health and Environmental Effects Analysis
HELSTF	High Energy Laser System Test Facility
HSA	Hollow Stem Auger
HSPP	Health and Safety Program Plan
IDWMP	Investigation Derived Waste Management Plan
MCL	Maximum Contaminant Level
MeCl	Methylene Chloride

Term	Definition
MIBK	4-Methyl-2-Pentanone (also known as methyl isobutyl ketone)
mmHg	millimeters of mercury
MS	Matrix Spike
MSD	Matrix Spike Duplicate
m.s.l.	mean sea level
NGVD	National Geodetic Vertical Datum
PCE	Tetrachloroethene
PID	Photoionization Detector
ppb	parts per billion
PPE	Personal Protective Equipment
ppm	parts per million
QA	Quality Assurance
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SCEM	Site Conceptual Exposure Models
SMR	Small Missile Range
SOW	Scope of Work
SRC	Stallion Range Center
TCA	1,1,1-Trichlorethane
TCE	Trichloroethene
TECOM	U.S. Army Test and Evaluation Command
TTF	Temperature Test Facility
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
VES	Vapor Extraction Study
VOCs	Volatile Organic Compounds
WCFS	Woodward-Clyde Federal Services
WSMR	White Sands Missile Range

0.0
EXECUTIVE SUMMARY

0.1 Woodward-Clyde Federal Services (WCFS) under contract to the Tulsa District, U.S. Army Corps of Engineers (USACE) has conducted RCRA Facility Investigation (RFI) field activities at the Temperature Test Facility (TTF) located within the White Sands Missile Range (WSMR). This report presents the findings from those field investigations and summarizes previous field work conducted at the TTF.

0.2 The TTF was constructed to test military hardware under simulated extreme weather conditions by inducing a wide range of temperature and climatic conditions. In July 1983 releases of the refrigerant methylene chloride (MeCl) began occurring at the TTF due to faulty seals. These releases were subsequently collected by the floor drain system and transferred to a high density polyethylene (HDPE) lined surface evaporation pond located east of the TTF building. This evaporation pond was not engineered to receive significant quantities of solvent and in January 1985 TTF personnel discovered the liner had failed. This liner failure allowed release of solvent laden process water into the underlying soils. The evaporation pond was subsequently removed from service and closed in 1988 by construction of a RCRA cap.

0.3 WCFS prepared project planning documents and following review and approval conducted RFI field activities to supplement previous investigations conducted at the TTF between 1985 and 1992. The previous investigations identified that a plume of MeCl, with low concentrations of other solvents, existed from the southwest corner of the former evaporation pond to the northeast corner of the TTF building. The purpose of the WCFS investigation was to further delineate the vertical and horizontal extent of contamination, identify additional release sources, and provide sufficient information to prepare this RFI Report and perform a Corrective Measures Study (CMS), if warranted.

0.4 WCFS data collection activities were performed in two phases. In June 1994, soil gas samples were collected from the 17 existing soil gas monitoring wells during the initial phase of investigation. These wells were sampled prior to the other investigation activities in order to further define the potential contaminants of concern. In March 1995, the second phase of the field activities included the collection and analysis of 100 shallow soil gas samples, 9 deep

soil gas samples, 120 soil samples (one each from the 9 deep soil gas borings and the remainder from 12 deep soil borings), and groundwater samples from 4 existing RCRA groundwater monitoring wells.

0.5 A summary of the samples collected during the investigation is presented below:

Date	Soil Samples	Water Samples	Soil Gas Samples	Field Replicate		Rinsates	Trip Blanks	Method	Laboratory
				QA	QC				
3/95	120	4		14	14	12	3	SW-846 Method 8240	Quanterra
3/95			109	0	6			Field Screening GC/MSD	Plains Environmental Services
6/94			17	0	2			TO-14	Enseco Air Toxics
6/94			17	0	2			Field Screening GC/PID/ECD	Plains Environmental Services

Summary of Findings

0.6 Soil gas monitoring well samples collected in June 1994 were field screened for volatile organic compounds (VOCs) using a GC\PID\ECD. Samples were also collected from these wells and shipped to Enseco Air Toxics for analysis of VOCs by EPA Method TO-14. VOCs detected included:

- 1,1,1-Trichloroethane
- 1,1-Dichloroethane
- 1,1-Dichloroethene
- Chloroform
- Methylene Chloride
- Tetrachlorethene
- Trichloroethene
- trans-1,2-Dichloroethene
- Freon 11

0.7 **Table 0-1** presents a statistical review of the soil gas monitoring well field screening and laboratory analytical results.

0.8 Shallow soil gas samples were collected in March 1995 from a depth of approximately 20 feet below ground surface (bgs) using a Geoprobe™ unit. This depth corresponds to the estimated depth of the bottom of Alluvial Unit 1, which is defined as a poorly sorted, sandy gravel and gravelly sand up to 20 feet thick. These samples were analyzed in the field for VOCs using a van mounted GC\MS. VOCs detected included:

- 1,1-Dichloroethene
- 1,1,1-Trichloroethane
- Tetrachlorethene
- Trichloroethene
- Freon 11
- Freon 113

0.9 **Table 0-2** presents a statistical review of the shallow soil gas field screening results.

0.10 Deep soil gas samples were also collected in March 1995. These samples were collected with the aid of a drill rig from an average depth of 41 feet bgs. This depth corresponds to the lower part of Alluvial Unit 3, which is poorly cemented, gravelly sand. These samples were also analyzed in the field for VOCs using a GC\MS. VOCs detected included:

- 1,1-Dichloroethene
- 1,1,1-Trichloroethane
- Tetrachloroethene
- Trichloroethene
- Chloroform
- Freon 11
- Freon 113

0.11 **Table 0-3** presents a statistical review of the deep soil gas field screening results.

0.12 In conjunction with the deep soil gas sampling, a single soil sample was collected from each of the 9 deep soil gas borings and shipped to Quanterra Environmental (formerly Enseco) for analysis of VOCs by EPA SW-846, Method 8240. These soil samples were collected after collecting the soil gas samples at an elevation in the boring slightly below that of the soil gas sample. Of the 9 soil samples collected from the deep soil gas borings and submitted for the analysis of VOCs by Method 8240, only the sample from DB04 had a detectable concentration of VOCs. Acetone, at a concentration of 12 μg/kg, was the only VOC detected in the soil

sample collected from DB04 at approximately 47 feet bgs. The corresponding deep soil gas sample exhibited the presence of 1,1-DCE (20 μg/L), 1,1,1-TCA (12 μg/L), PCE (10 μg/L), TCE (23 μg/L), chloroform (2 μg/L), and Freon 11 (36 μg/L). Acetone was not among the analytes detected in the deep soil gas sample.

0.13 The soil boring investigation included the installation of 12 deep soil borings using hollow stem auger drilling techniques and the collection and analysis of 111 soil samples. The objective of the soil boring investigation was to further define the vertical and horizontal extent of VOCs in the unsaturated soils along the perimeter of the TTF building and the former evaporative pond cap. Eleven soil borings (SB01 through SB11) were drilled to an average depth of 80 feet bgs (i.e. the upper part of Unit 9). The twelfth boring (SB12) was drilled to a depth of approximately 152 feet bgs. Samples were shipped to Quanterra Environmental for analysis of VOCs by EPA SW-846, Method 8240. VOCs detected included:

- Acetone
- Methylene Chloride
- Toluene

0.14 **Table 0-4** presents a statistical review of the soil sample analytical results.

0.15 During the March 1995 field investigation, groundwater samples were collected from the four existing RCRA groundwater monitoring wells and shipped to Quanterra Environmental for analysis of VOCs by EPA SW-846, Method 8240. The objective of the groundwater investigation was to determine if VOCs were present in the groundwater above detection limits. No VOCs were detected in the groundwater samples analyzed.

Data Assessment

0.16 Prior to completing this RFI Report, the data was assessed with respect to the quality assurance objectives accuracy, precision, completeness, comparability, sensitivity, and representativeness. Based on the review of the data generated, the data was judged scientifically valid and useable, as qualified by the WCFS data assessment and by the laboratory, and sufficient for use in the White Sands Missile Range, Temperature Test Facility RCRA Facility Investigation Report. Both the analytical and mobile labs performed in a technically acceptable

fashion. The USACE concurred with these findings as stated in their Chemical Data Quality Review (USACE, 1995).

Fate and Transport

0.17 As part of the RFI report preparation, contaminant fate and transport analysis for the compounds detected at the TTF was conducted. Contaminant fate following release to the environment is a function of its physical and chemical properties as well as site-specific characteristics. Emphasis was placed on MeCl as the primary contaminant of concern.

0.18 Potential migration pathways and mechanisms were also evaluated including: air transport mechanisms, surface water transport mechanisms, and groundwater transport mechanisms. Because of the RCRA cap covering the former evaporation pond it was determined that air transport and surface water transport mechanisms at the TTF are of minor concern. The RCRA cap eliminates exposed areas of potentially contaminated soil making volatilization from contaminated soil, fugitive dust emissions of contaminated soil, and surface water contact with contaminated soil unlikely. Air transport and surface water transport were eliminated as potential migratory pathways for contamination at the TTF.

0.19 The combination of the RCRA cap and the low annual rainfall associated with the desert climate result in a limited potential for MeCl to desorb from contaminated subsurface soils to infiltrating surface water. However, there is a potential that MeCl contaminated process wastewater released prior to the construction of the RCRA cap may currently be migrating towards the saturated zone. Groundwater sampling conducted to date indicates that VOCs potentially migrating through the unsaturated zone have not impacted groundwater. The potential for unsaturated zone and saturated zone migration cannot currently be quantified with a meaningful degree of certainty.

Health and Environmental Effects Analysis

0.20 A Health and Environmental Effects Analysis (HEEA) is an integral part of the RFI process and was conducted during preparation of this report. The objective is to evaluate the impact of a release on human health and the environment. Exposure pathways to the contaminants of concern must be complete and a receptor must be present for there to be a risk.

0.21 The HEEA approach includes:

- identifying chemicals of concern
- reviewing contaminant fate and transport
- conducting a qualitative exposure assessment
- conducting a qualitative assessment of risk
- evaluating uncertainty

0.22 Exposure pathways involving soil, groundwater, surface water and air were evaluated. In general, based on the current and assumed future land use scenarios which assume that WSMR will remain an active military facility, no complete exposure pathways exist for potential human health and ecological receptors at the site. This determination is based on the fact that:

- the majority of the contaminated soil is covered by a RCRA cap, asphalt, or concrete

- only five low detections of VOCs were observed in four borings installed outside the covered areas including four detections of acetone ranging from 12 μg/kg to 43 μg/kg and one detection of MeCl at 11 μg/kg

- groundwater at the site is not contaminated

- groundwater at the TTF is not used (although it has the potential to be used as a drinking water supply)

0.23 Based on the assumptions presented below there are currently no risks to human or ecological receptors. Although it is possible that increased testing demands may require expansion of the TTF, this expansion would likely be in areas outside the RCRA cap because of regulatory constraints/limitations disallowing disturbance of the cap. In addition, the current water supply for WSMR is expected to remain adequate, and in use, into the foreseeable future. These combined factors make risks to future human and ecological receptors unlikely.

Conclusions

0.24 Based on previous information and the results of this RFI, conclusions regarding the current status of the TTF are provided.

0.25 The vertical and horizontal extent of VOCs in the unsaturated soils along the perimeter of the TTF building and the RCRA cap have been defined. MeCl contamination and to a much lessor extent other VOCs (e.g., TCE, PCE, TCA, Freon 11) exist in subsurface soil under the RCRA cap and other areas in the vicinity of the TTF covered by concrete and asphalt parking areas. The contamination has migrated to a depth of approximately 100 feet bgs, but has not migrated appreciably to soil outside the perimeter of the RCRA cap or other covered areas as evidenced by the data obtained from the deep soil borings. Only five low detections of VOCs were observed in borings installed outside the covered areas including four detections of acetone ranging from 12 μg/kg to 43 μg/kg and one detection of MeCl at 11 μg/kg. No VOC contamination has been detected in the groundwater located at a depth of approximately 200 feet bgs below the TTF.

0.26 There are currently no complete exposure pathways to contaminants at the site for potential human (on-site workers) or ecological receptors (animal and plant communities) because:

- all contaminated soil is covered by the RCRA cap or other concrete or asphalt covered areas
- groundwater at the TTF is neither contaminated nor used

0.27 Based on the most reasonable future land use scenario, that is land use at TTF and WSMR will not change in the foreseeable future, no complete exposure pathways are predicted for potential future human or ecological receptors because:

- contaminated soil will remain covered by the RCRA cap and other concrete and asphalt covered areas
- groundwater at TTF is downgradient from the WSMR water supply and is not expected to be used as a water supply

0.28 However, the potential exists for future contamination of the underlying groundwater table. This potential threat was not quantified in this report, but could become an issue if the land use changes in the future and that aquifer is used for domestic purposes.

0.29 The transport mechanisms that are theoretically most likely to result in contaminant migration are lateral and vertical migration in the vadose zone, and potential percolation/leaching of MeCl from the vadose zone to the underlying aquifer. Existing sampling data indicate that MeCl has migrated to approximately 95 feet bgs in the vadose zone but migration to groundwater has not occurred at the TTF, although it is theoretically possible. The presence of various attenuation and retardation factors including the retarding clay, lack of infiltrating water, and the RCRA cap will reduce or eliminate the vertical migration pathways as a threat to groundwater.

0.30 Potential air and surface water migration pathways and transport mechanisms are not considered to be of concern at the TTF due to site conditions and lack of exposure potential. While the lateral and vertical migration of MeCl and other contaminants in the form of soil gas in the vadose zone is possible (due to elevated soil gas concentrations and the generally porous nature and lack of moisture of the upper subsurface soils), the ongoing vapor extraction would limit such migration and reduce the concentrations of contaminants.

0.31 Corrective Measures Studies (CMS) for media of concern are not necessary at this time because an appropriate cleanup effort for MeCl in soil and soil gas is already underway. This cleanup effort consists of a soil vapor extraction system that is removing MeCl and other VOCs present in the vadose zone beneath the RCRA cap and in the general vicinity of the TTF (Dow, 1995). A pilot vapor extraction study at TTF concluded that vapor extraction was the most appropriate remediation method for the site and provided a plan for using existing and additional air monitoring wells for remediation (ERC, 1990). The results and recommendations of the pilot study served as the basis for development of the current remedial effort (Dow, 1995).

Recommendations

0.32 Present efforts to cleanup soil beneath the RCRA cap should continue as described in Dow (1995). Dow reported that the current cleanup goal of 50 mg/kg MeCl in soil could be achieved in the sandy soil after a period of approximately 1 month, but to achieve similar levels for clayey soils could take a year. The current cleanup goal for soil represents a relative removal in excess of 90 percent of the estimated mass of MeCl in the sandy soil (Dow, 1995). However, the extent that this cleanup effort will reduce the potential for the MeCl to

significantly impact groundwater at the site has not been ascertained. Thus, it is recommended that a final soil cleanup level be selected based on a reasonable likelihood that it would be protective against future groundwater contamination. Additional fate and transport studies and modeling may need to be conducted in order to predict these levels and assess their potential effects on groundwater in the underlying aquifer.

0.33 Quantitative contaminant transport modeling predicting the fate and transport of MeCl in subsurface soil should be performed using site-specific information on the MeCl plume and on subsurface soil characteristics. The goal of this analysis would be to:

- estimate the probability that MeCl might reach and contaminate groundwater under current site conditions
- estimate the potential extent (if any) of future MeCl contamination of groundwater under current site conditions
- estimate a soil cleanup level that would be protective in the event that future groundwater contamination occurs

0.34 The cleanup level estimated in the fate and transport modeling should be used as the target soil cleanup goal. Cleanup efforts should be designed to achieve the soil cleanup goal. Following cleanup, sampling and analysis of subsurface soil should be performed to confirm that the target soil cleanup level has been achieved.

0.35 Groundwater should continue to be monitored for MeCl during and after soil cleanup to confirm that the remedial action has successfully prevented groundwater contamination. If contamination reaches groundwater a trigger level at which corrective action would be taken should be determined. Potential trigger levels for MeCl include the maximum contaminant level, or MCL, (5 μg/L) or a conservative risk-based concentration developed using an assumed downgradient receptor.

TABLE 0-1
STATISTICAL REVIEW OF SOIL GAS MONITORING WELL FIELD SCREENING AND ANALYTICAL RESULTS
TEMPERATURE TEST FACILITY
RCRA FACILITY INVESTIGATION
WHITE SANDS MISSILE RANGE, NEW MEXICO

FIELD SCREENING RESULTS

Compound (ug/L)	Number of Samples	Number of Detections	CONCENTRATION			Maximum Concentration
			Average	Median	Maximum	Sample ID
1,1-Dichloroethene	17	17	29	21	104	WSTF-0027-5080
1,1-Dichlorothane	17	0				
Freons (qualitative)	17	0				
Methylene Chloride	17	7	1584	449	4500	WSTF-9202-5092
Chloroform	17	16	2	1	6	WSTF-9202-5092
1,1,1-Trichloroethane	17	17	10	8	30	WSTF-9202-5092
Trichloroethene	17	17	17	12	49	WSTF-9202-5092
Tetrachloroethene	17	17	15	10	63	WSTF-9202-5092

LABORATORY ANALYTICAL RESULTS

Compound (ppb)	Number of Samples	Number of Detections	CONCENTRATION			Maximum Concentration
			Average	Median	Maximum	Sample ID
1,1,1-Trichloroethane	17	12	2557	780	7400	WSTF-0011-5058
1,1,2,2-Tetrachloroethane	17	0				
Freon 113 (1,1,2 Trichloro-1,2,2-trifluoroethane)	17	0				
1,1,2-Trichloroethane	17	0				
1,1-Dichloroethane	17	4	103	85	230	WSTF-0019-5085
1,1-Dichloroethene	17	13	9198	7800	25000	WSTF-0027-5080
1,2,4-Trichlorobenzene	17	0				
1,2,4-Trimethylbenzene	17	0				
1,2-Dibromoethane (EDB)	17	0				
1,2-Dichloro-1,1,2,2-tetrafluoroethane	17	0				
1,2-Dichlorobenzene	17	0				
1,2-Dichloroethane	17	0				
1,2-Dichloropropane	17	0				
1,3,5-Trimethylbenzene	17	0				
1,3-Dichlorobenzene	17	0				
1,4-Dichlorobenzene	17	0				
2-Butanone	17	0				
2-Hexanone	17	0				
4-Ethyl toluene	17	0				
4-Methyl-2-pentanone	17	0				
Acetone	17	0				
Benzene	17	0				
Benzyl chloride	17	0				
Bromodichloromethane	17	0				
Bromoform	17	0				
Bromomethane	17	0				
Carbon disulfide	17	0				
Carbon tetrachloride	17	0				
Chlorobenzene	17	0				
Chlorodifluoromethane	17	0				
Chloroethane	17	0				
Chloroform	17	11	359	230	1400	WSTF-0027-5080
Chloromethane	17	0				
Dibromochloromethane	17	0				
Dichlorodifluoromethane	17	0				
Ethylbenzene	17	0				
Hexachlorobutadiene	17	0				
Methylene chloride	17	8	6757020	424000	42000000	WSTF-9202-5092
Styrene	17	0				
Tetrachloroethene	17	12	4579	3100	16000	WSTF-0027-5080
Toluene	17	0				
Trichloroethene (TCE)	17	13	5533	4100	17000	WSTF-0027-5080
Freon 11 (Trichlorofluoromethane)	17	14	9458	8650	26000	WSTF-0027-5080
Vinyl acetate	17	0				
Vinyl chloride	17	0				
Xylenes (total)	17	0				
cis-1,2-Dichloroethene	17	0				
cis-1,3-Dichloropropene	17	0				
trans-1,2-Dichloroethene	17	11	504	300	1900	WSTF-0027-5080
trans-1,3-Dichloropropene	17	0				

TABLE 0-2
STATISTICAL REVIEW OF SHALLOW SOIL GAS ON-SITE FIELD ANALYTICAL RESULTS
TEMPERATURE TEST FACILITY
RCRA FACILITY INVESTIGATION
WHITE SANDS MISSILE RANGE, NEW MEXICO

Compound (ug/L)	Number of samples	Number of Detections	CONCENTRATION			Maximum Concentration Sample ID
			Average	Median	Maximum	
1,1-Dichloroethene	100	53	5	4	15	WSTF-B039-5020
1,1-Dichlorothane	100	0				
1,1,1- Trichloroethane	100	35	4	3	10	WSTF-B047-5020
Tetrachloroethene	100	27	3	3	8	WSTF-B047-5020
Trichloroethene	100	34	4	3	9	WSTF-B047-5020
Methylene Chloride	100	0				
Chloroform	100	0				
Freon- 11	100	69	18	11	67	WSTF-B042-5020
Freon- 113	100	6	59	31	169	WSTF-B043-5020
Freon- 502	100	0				
Freon- 22	100	0				

TABLE 0-3
STATISTICAL REVIEW OF DEEP SOIL GAS ON-SITE FIELD ANALYTICAL RESULTS
TEMPERATURE TEST FACILITY
RCRA FACILITY INVESTIGATION
WHITE SANDS MISSILE RANGE, NEW MEXICO

Compound (ug/L)	Number of Samples	Number of Detections	CONCENTRATION			Maximum Concentration Sample ID
			Average	Median	Maximum	
1,1-Dichloroethene	9	5	11	16	20	WSTF-DB04-5046
1,1-Dichlorothane	9					
1,1,1- Trichloroethane	9	3	12	12	16	WSTF-DB03-5047
Tetrachloroethene	9	4	9	9	18	WSTF-DB03-5047
Trichloroethene	9	5	16	14	36	WSTF-DB03-5047
Methylene Chloride	9					
Chloroform	9	2	3	2.5	3	WSTF-DB03-5047
Freon- 11	9	6	35	23	83	WSTF-DB03-5047
Freon- 113	9	1	20	20	20	WSTF-DB03-5047
Freon- 502	9					
Freon- 22	9					

TABLE 0-4
STATISTICAL REVIEW OF SOIL SAMPLE ANALYTICAL RESULTS FOR DEEP SOIL BORINGS
TEMPERATURE TEST FACILITY
RCRA FACILITY INVESTIGATION
WHITE SANDS MISSILE RANGE, NEW MEXICO

Compound (ug/kg)	Number of samples	Number of Detections	CONCENTRATION			Maximum Concentration
			Average	Median	Maximum	Sample ID
1,1,1-Trichloroethane	111					
Freon 113 (1,1,2 Trichloro-1,2,2-trifluoroethane)	111					
1,1,2,2-Tetrachloroethane	111					
1,1,2-Trichloroethane	111					
1,1-Dichloroethane	111					
1,1-Dichloroethene	111					
1,2-Dichloroethane	111					
1,2-Dichloroethene (total)	111					
1,2-Dichloropropane	111					
2-Butanone (MEK)	111					
2-Hexanone	111					
4-Methyl-2-pentanone (MIBK)	111					
Acetone	111	11	36	19	110	WSTF-SB12-2082
Benzene	111					
Bromodichloromethane	111					
Bromoform	111					
Bromomethane	111					
Carbon disulfide	111					
Carbon tetrachloride	111					
Chlorobenzene	111					
Chloroethane	111					
Chloroform	111					
Chloromethane	111					
Dibromochloromethane	111					
Ethylbenzene	111					
Methylene chloride	111	6	279	50	1400	WSTF-SB12-2095
Styrene	111					
Tetrachloroethene	111					
Toluene	111	1	7	7	7	WSTF-SB08-2074
Trichloroethene (TCE)	111					
Freon 11 (Trichlorofluoromethane)	111					
Vinyl acetate	111					
Vinyl chloride	111					
Xylenes (total)	111					
cis-1,3-Dichloropropene	111					
trans-1,3-Dichloropropene	111					

1.0
INTRODUCTION

1.1 BACKGROUND

1.1.1 Woodward-Clyde Federal Services (WCFS) under contract to the Tulsa District, U.S. Army Corps of Engineers (USACE) conducted a RCRA Facility Investigation (RFI) at the Temperature Test Facility (TTF) located within the White Sands Missile Range (WSMR). WSMR is a U.S. Army Installation under the jurisdiction of the U.S. Army Test and Evaluation Command (TECOM). The TTF is located just east of the WSMR Main Post area which is approximately 30 miles east of Las Cruces, New Mexico, and 40 miles north of El Paso, Texas (Figure 1-1).

1.1.2 WSMR has conducted previous investigations at the facility including soil gas surveys, soil borings, soil sampling and analysis, and the installation and sampling of vadose zone (soil gas) monitoring wells and groundwater monitoring wells. These investigations conducted between 1985 and 1992 indicated that a plume of MeCl, with low concentrations of other solvents, existed from approximately the southwest corner of the former evaporation pond to the northeast corner of the TTF (GCL, 1987 and WSMR, 1992b).

1.1.3 The objective of the RFI at the TTF is to supplement the information from previous investigations. This includes further delineation of the vertical and horizontal extent of contamination, identifying additional release sources, and providing sufficient data to complete the RFI Report and perform a Corrective Measures Study (CMS), if warranted. This objective was accomplished by reviewing the existing site data and by conducting additional RFI field investigation activities in June 1994 and March 1995.

1.1.4 Specifically the RFI field investigation focused on the following objectives:

- Evaluate potential contamination around the perimeter of the TTF building from leaky floor drains and pipelines

- Verify the extent of the MeCl contamination south of the former evaporative pond as originally characterized during the initial contamination assessment performed by Geoscience Consultants Ltd. (GCL, 1987)

- Evaluate potential vertical and horizontal migration of volatile organic compounds (VOCs) away from the evaporative pond cap

1.1.5 The RFI data collection activities were performed in two phases. In June 1994, soil gas samples were collected from the 17 existing soil gas monitoring wells during the initial phase of investigation. These wells were sampled prior to the other investigation activities in order to further define the potential contaminants of concern. In March 1995, the second phase of the field activities included the collection and analysis of 100 shallow soil gas samples, 9 deep soil gas samples, 120 soil samples (one each from the 9 deep soil gas borings and the remainder from 12 deep soil borings), and groundwater samples from 4 existing RCRA groundwater monitoring wells. **Table 1-1** presents a summary of the samples collected during the investigation and **Table 1-2** cross references field sample numbers with laboratory sample numbers (see Section 3.11 for a discussion on sample labeling and identification). **Figure 1-2** depicts the sampling locations.

1.1.6 Prior to field investigation activities, the project planning documents listed below were prepared and submitted for review and comment. Comments received from USACE, WSMR, the State of New Mexico, and USEPA Region VI were addressed and the documents revised and issued as Final in February 1995. Subsequent activities are being conducted in general accordance with these approved project planning documents:

- Work Plan for the RCRA Facility Investigation at the Temperature Test Facility, White Sands Missile Range, New Mexico (WCFS, 1995a)

- Field Sampling and Analysis Plan (FSAP) for the RCRA Facility Investigation at the Temperature Test Facility, White Sands Missile Range, New Mexico (WCFS, 1995b)

- Chemical Data Acquisition Plan (CDAP) for the RCRA Facility Investigation at the Temperature Test Facility, White Sands Missile Range, New Mexico (WCFS, 1995c)

- Health and Safety Program Plan (HSPP) for the RCRA Facility Investigation at the Temperature Test Facility, White Sands Missile Range, New Mexico (WCFS, 1995d)

1.1.7 The individual activities are further described in Section 2.0.

1.2 PURPOSE OF REPORT

1.2.1 This document presents the RFI Report which was prepared to document the RFI activities and findings by presenting a discussion of the previous investigations performed at the facility, a discussion of the RFI field work as described in the approved project plans, and a discussion of the field data and analytical results of samples collected during the RFI. The data were evaluated and analyzed to further define the contamination type, source or sources, extent, direction, rate of migration and distance the contamination has traveled at the facility. The data were also evaluated against established health and environmental criteria to determine the need for corrective measures.

1.2.2 Prior to completing this RFI Report, the Data Validation and Summary Report (WCFS, 1995e) organized and presented the RFI field and laboratory data in order to facilitate data assessment. This RFI Report was completed after comments related to the Data Validation and Summary Report were addressed and resolved.

1.3 REPORT ORGANIZATION

1.3.1 This section describes the organization and content of the RFI Report. A short description of each section of this report is presented below.

- **Section 1.0** provides an introduction to the TTF and WSMR, including history, geographical and physical descriptions, current operations, and summaries of previous investigations.

- **Section 2.0** summarizes the investigation activities which were performed at the TTF as part of this RFI. These investigations included shallow and deep soil gas sampling, subsurface soil sampling, soil gas monitoring well sampling and groundwater monitoring well sampling. The methodology and rationale for the field activities also are presented in this section.

- **Section 3.0** presents the physical characteristics of the TTF and surrounding areas. The discussion includes information on physiography, meteorology, geology, and hydrology.

- **Section 4.0** summarizes the analytical results of the field sampling, and summaries the nature and extent of contamination.

- **Section 5.0** discusses contaminant fate and transport. The discussion includes contaminant persistence and mobility, screening of potential routes of the contamination, and contaminant migration.

- **Section 6.0** summarizes potential health and environmental effects. The section reviews the potential exposure routes, and possible human health and environmental effects related to the TTF.

- **Section 7.0** presents the summary and the conclusions of the RFI.

- **Section 8.0** contains references which are cited in the RFI Report.

1.4 SITE BACKGROUND - WHITE SAND MISSILE RANGE

1.4.1 WSMR covers an area of approximately 3,500 square miles and was established July 9, 1945, as White Sands Proving Ground. WSMR is located in the Tularosa Basin, about 30 miles east of Las Cruces, New Mexico, and 40 miles north of El Paso, Texas (**Figure 1-1**). The overall facility provides support to the Army, Navy, Air Force, National Aeronautics and Space Administration, rocket, missile, and laser weapon technologies.

1.4.2 This portion of the New Mexico desert was selected for the nation's first rocket center for several reasons: the land was already controlled or owned by the government, the area had almost year-round clear weather and unlimited visibility, the desert was sparsely populated, and it afforded relatively easy recovery of spent missiles. On July 16, 1945, the world's first atomic device was detonated, on the northern portion of the range, at an area now known as Trinity Site. Missile testing at the range began in September 1945 and its name was officially changed to WSMR in 1958 (WCFS, 1995a).

1.4.3 WSMR represents the consolidation of six component parcels of land in the Tularosa Basin of central New Mexico which included: the Fort Bliss Transfer Area, Alamogordo Bombing Range, San Andres National Wildlife Refuge, Jornada Experimental Range, and

Ordnance/California Institute of Technology Area. This land consolidation was known as the Department of Defense "Integrated Range." In May 1952, all public lands in the Integrated Range were placed under the responsibility of the Department of the Army. In 1963, the Air Force transferred all its leases to the Army with the exception of the Holloman Supplemental Area and Holloman Air Force Base. At present, the WSMR occupies an area of approximately 3,500 square miles (WCFS, 1995a).

1.4.4 The range headquarters (the Main Base) of the WSMR is located in Dona Ana County, New Mexico in the southwestern part of the Tularosa Basin. The TTF is located 2.5 miles east of the Main Post and lies at an elevation of approximately 4,030 feet above sea level.

1.5 SITE BACKGROUND - TEMPERATURE TEST FACILITY

1.5.1 The TTF was designed to simulate extreme weather conditions by inducing a wide range of temperature and climatic variations including freezing rain. Materials and equipment are tested under these extreme conditions to determine their capabilities under climatic duress. The contract for construction of the TTF was awarded by the U.S. Army Corps of Engineers on September 25, 1981 and construction was completed in early 1984.

1.5.2 In July 1983, prior to beneficial occupancy by WSMR personnel, releases of the refrigerant methylene chloride (MeCl) began occurring at the facility due to faulty seals. These releases of MeCl were collected by the floor drain system and subsequently transferred to a high density polyethylene (HDPE) (Warner, 1995) lined surface evaporation pond located east of the TTF building. The evaporation pond was not engineered to receive significant quantities of solvent laden wastewater and in January 1985 TTF personnel discovered the evaporation pond liner had failed, allowing the release of solvent contaminated process water into the underlying soils. The evaporation pond was subsequently removed from use and closed by constructing a RCRA cap over the evaporation pond and surrounding area (WSMR, 1992b). Since that time a stainless steel evaporation pond has been used to contain process wastewater (WSMR, 1992b). It has also been reported that sporadic discharges from the expansion tank and a relief valve resulted in additional releases of MeCl (GCL, 1987).

1.5.3 The TTF is comprised of primary and secondary cooling systems. The primary cooling system is located entirely within the TTF building. Refrigerants used in the primary cooling

system include Freon 22 and Freon 503. Freon 113 also has been used at the TTF mainly as a cleaning agent (WSMR, 1992b).

1.5.4 The secondary cooling system, which includes units both inside and outside the TTF building, is a closed pressurized loop including numerous expansion and storage tanks. Refrigerants were also used in the secondary cooling system as a heat transfer medium (brine). The brine flows directly through the heat exchangers in order to control the temperature of the two large test chambers. Approximately 15,000 gallons of fluid are required for the three brine loops (hot, cold, ambient). Prior to 1991, MeCl was used extensively for this purpose (secondary cooling system brine). The MeCl was stored in underground tanks immediately east of the TTF building (**Figure 1-3**). These tanks were part of a "closed loop" system designed to permit the recirculation and reuse of the refrigerant.

1.5.5 All tanks are pressurized during the facility operations except for the relief tank, which receives the flow from relief valves located along the pressurized system within the building and stores the refrigerant for reuse. The relief tank was pumped periodically, and the refrigerant from it returned to the system via a small process tank located inside the TTF building (WSMR, 1992b).

1.5.6 Originally, wastewater generated by freezing rain experiments and other processes was piped by gravity flow from floor drains in the TTF building into a 1,050 gallon interceptor tank about 150 feet southeast of the building (**Figure 1-3**). From there the wastewater was drained to a 10,000-square foot surface area, HDPE-lined evaporation pond located approximately 200 feet east of the TTF building (**Figure 1-3**). Non-process wastewater (sewage) from the facility was piped to a drain field north of the evaporation pond (WSMR, 1992b).

1.5.7 In 1991, as part of a major redesign of the TTF, MeCl was replaced with Syltherm™ as the heat transfer medium for the secondary cooling system. Syltherm™ is considered an "environmentally safer" heat transfer medium (WSMR, 1992b). As a part of the redesign, other operational modifications were also undertaken. The closure of the original HDPE-lined wastewater evaporation pond was completed in 1988 by installing a RCRA cap. The closure included removing the pond and installing a RCRA cap over the site which extends 320 feet east of the TTF building. The cap consists of a 2-foot layer of compacted clay topped with 2 inches of sand, a flexible synthetic membrane barrier, 2 more inches of sand, a 1-foot thick

stabilized aggregate drainage layer, and a 2-inch thick surface layer of crushed rock (USACE, 1993).

1.5.8 **Figure 1-2** shows the limits of the RCRA cap. The RCRA cap, which is located east of the TTF building, extends from the asphalt pad west to the perimeter fence and from the south culvert north to the north culvert.

1.6 SUMMARY OF PREVIOUS INVESTIGATIONS

1.6.1 The following sections present discussions of previous investigations pertaining to the TTF. Included in chronological order are the summaries from previous investigations conducted by Southwest Engineering (Section 1.7), Geoscience Consultants Ltd. (GCL,1987) (Section 1.8), Bath & Associates, Inc. (1989) (Section 1.9), ERC Environmental and Energy Services (1990) (Section 1.10), and Cortez III Environmental Services (1992a and 1992b) (Section 1.11).

1.7 SUMMARY OF PREVIOUS INVESTIGATIONS - SOUTHWEST ENGINEERING

1.7.1 In response to the release of potentially contaminated process wastewater into the subsurface, soil borings were completed by Southwest Engineering Inc. under the direction of WSMR personnel. Nine soil borings were completed by Southwest Engineering of Las Cruces, New Mexico (**Figure 1-4**) in the vicinity of the evaporation pond. Analytical results from these borings indicated that MeCl was present in the alluvial units underlying the site. The highest concentrations were generally isolated in the silty and clayey strata between 50 and 75 feet below ground surface (bgs) (GCL, 1987).

1.8 SUMMARY OF PREVIOUS INVESTIGATIONS - GEOSCIENCE CONSULTANTS LTD.

1.8.1 Following the initial borings completed by Southwest Engineering, Inc., Geoscience Consultants, Ltd. (GCL) commenced a phased field investigation program to perform an additional contamination assessment. The purpose of the GCL assessment was to define the lateral and vertical extent of contamination, to estimate the volume of contaminants in the soil, and evaluate if groundwater beneath the facility had been contaminated. GCL initiated their

study in June 1985 and completed the Final Contamination Assessment Report in May 1987 (GCL, 1987).

1.8.2 GCL approached the contamination assessment in three phases. The initial phase involved a soil gas survey. The second phase consisted of a shallow and deep borehole sampling program. The final phase involved the installation of vadose zone monitoring wells, and the installation and sampling of groundwater monitoring wells.

1.8.3 Soil Gas Survey: During June and July 1985, a shallow soil gas survey was conducted in the vicinity of the evaporation pond and the TTF building. The primary objectives of the soil gas survey were to define the concentrations of contaminants in the shallow soil gas and delineate their extent surrounding the evaporation pond. Soil gas samples were collected from a total of 50 locations from a depth of 5 to 6 feet bgs in the vicinity of the TTF **(Figure 1-5)**. The soil gas survey indicated that contamination existed beneath the site from at least four compounds; MeCl, TCE, TCA and PCE. The highest concentrations of MeCl detected (270 and 750 μg/L) in the shallow soil gas were at sampling locations near the southwest corner of the evaporation pond. In the area northwest of the evaporation pond, between the pond and the TTF building, soil gas analysis for MeCl was inhibited by the presence of an unidentified component which eluted slightly before MeCl in the gas chromatograph (GC) column. The component was suspected to be Freon 11. Freons were known to have been used at the TTF. Because of the interference the detection limit for MeCl was elevated to 20 μg/L for points near the TTF building. No MeCl was detected above this elevated detection limit but the possibility of MeCl contamination outside the minimum contour line presented by GCL could not be ruled out.

1.8.4 In addition to MeCl, three other chlorinated hydrocarbons (TCA, TCE, and PCE) were detected during the GCL shallow soil gas investigation. TCA was present at concentrations of up to 200 μg/L beneath the evaporation pond. TCA was also detected at 90 μg/L near a relief valve approximately 100 feet east of the TTF building. The detected TCA plume extent was estimated to be greater than the MeCl plume. Both TCE and PCE were also found in the shallow soil gas at slightly lower concentrations than TCA. As with TCA, the highest concentrations of TCE and PCE detected were beneath the southern end of the evaporation pond and near the relief valve.

1.8.5 Soil Boring Program and Installation of Vadose Zone Monitoring Wells: From the information gained in the soil gas investigation, GCL located 19 boreholes to define the vertical extent of contamination as well as to more precisely define the site stratigraphy (**Figure 1-4**). The borings were also intended to confirm the lateral extent of contamination indicated by the soil gas investigation. During Phase I drilling, 12 boreholes (10 through 21) were completed to depths of 100 feet bgs. Boring locations were selected based on the location of process equipment at the TTF, data from the soil gas survey, and data from soil borings 1 through 9 previously installed by Southwest Engineering. The objective of Phase I drilling was to:

- investigate the extent of subsurface contamination
- correlate subsurface contamination and site geology
- install soil gas monitoring wells to permit vadose zone monitoring over time
- provide additional data to aid in the selection of Phase II borings if required

1.8.6 Soil samples taken from the borehole at 2.5 foot intervals were analyzed by the WSMR chemical laboratory for MeCl, TCA, TCE, and PCE. Split samples were also sent to an outside analytical laboratory for QA/QC purposes. The analytical results from these boreholes necessitated the second phase of drilling.

1.8.7 Phase II drilling consisted of installing 7 boreholes (22 through 27 and 29). Phase II borings included 2 borings to a depth of 200 feet bgs, 1 boring to a depth of 150 feet bgs, and 4 borings to a depth of 100 feet bgs. Soil samples from these borings were also submitted for the analysis of MeC1, TCA, TCE and PCE.

1.8.8 During Phase I and Phase II drilling, 14 of the 19 boreholes drilled were completed as soil gas monitoring wells. However, 4 of these soil gas monitoring wells were removed during the installation of the RCRA cap. The removed wells included soil gas monitoring wells 10, 12, 13, and 26.

1.8.9 The GCL study preliminarily identified 9 alluvial units in the upper part of the unsaturated zone at the TTF. GCL reported that in general the units displayed a shallow dip toward the southeast; however, the contacts between the units were irregular and the units varied widely in thickness across the length and width of the site.

1.8.10 The nature of the alluvial fill was typified by the various lithologies identified in the log of borehole 22 which was installed to 200 feet bgs at the west edge of the former evaporation pond. There it was reported that approximately 40 percent of the total depth consisted of predominantly sandy material, about 30 percent was predominantly silty material, and approximately 30 percent was predominantly clay. GCL reported that mixtures of several size classifications within stratigraphic units was common (GCL, 1987).

1.8.11 The results of the GCL study showed that MeC1 was the compound present in the subsurface soils with the highest frequency of detection and highest concentrations. TCA, TCE and PCE were also present but generally at concentrations of an order of magnitude lower than MeC1. GCL concluded that the primary MeC1 plume was centered beneath the southwest corner of the evaporation pond and a secondary plume was centered beneath the expansion tanks adjacent to the east wall of the TTF. The maximum MeC1 concentration observed within the primary plume was 678 ppm at a depth of 65 to 75 feet bgs. The secondary plume had a maximum MeC1 concentration of 18 ppm at approximately the same depth. Maximum concentrations were centered in the stratigraphic units containing a high percentage of clay and fines.

1.8.12 GCL also reported that a small amount of MeC1 had penetrated to depths greater than 100 feet bgs. MeC1 was observed at depths between 137.5 feet and 195 feet bgs in borehole 22. The maximum concentration reported below 100 feet bgs was 0.099 ppm at a depth of 152.5 feet bgs. Although these minor concentrations were observed at depths greater than 100 feet bgs, GCL concluded that downward spread of the contamination had been restricted by the low-permeability clay rich alluvial layer present from 50 to 100 feet bgs.

1.8.13 Installation of Groundwater Wells: Four RCRA groundwater wells (**Figure 1-4**) and one exploratory piezometer were installed by GCL in September 1986. Contamination by MeCl, TCA, TCE or PCE was not observed in the groundwater which lies at a depth of over 200 feet bgs.

1.9 SUMMARY OF PREVIOUS INVESTIGATIONS - BATH & ASSOCIATES, INC.

1.9.1 A leak and cathodic protection test was conducted at the TTF on December 27 and 28, 1989, by Bath & Associates, Inc. for Dynaspan Services Company (Bath, 1989). The purpose

of the drainage system leak test was to ensure that the drainage system was a completely closed system and that no MeCl could escape into the ground. Bath & Associates witnessed a leak test on the complete facility drainage system including the interceptor tank, underground storage tank and 90-foot diameter above-ground tank. They also witnessed a test of the cathodic protection system for the 90-foot diameter above-ground tank.

1.9.2 Pneumatic pressure tests conducted on the piping system revealed leaks. A standing water test on the interceptor tank indicated the presence of leaks. A pneumatic test of the holding tank did not reveal leaks, but was not conclusive. Visual inspection of the evaporation pond revealed no observable flaws.

1.9.3 Bath & Associates, Inc. concluded that at least some portions of the system were leaking and that more thorough testing was required to ascertain whether other portions of the system were free from leaks.

1.10 SUMMARY OF PREVIOUS INVESTIGATIONS - ERC ENVIRONMENTAL AND ENERGY SERVICES CO.

1.10.1 A pilot vapor extraction study (VES) designed to evaluate the vapor extraction of MeCl at the TTF was performed by ERC Environmental and Energy Services Co., (ERC, 1990). The pilot study was conducted over a 5-day period, within which five different extraction/observation arrays were tested. Data pertaining to the chemical composition and flow characteristics of soil air were collected in order to recommend design criteria for a full-scale remediation system. During the pilot study, soil gas monitoring well ERC-1 was installed (**Figure 1-4**). The ERC pilot study concluded that vapor extraction was the best method of remediation for the site and provided a plan using existing and additional air monitoring wells for remediation.

1.11 SUMMARY OF PREVIOUS INVESTIGATIONS - CORTEZ III ENVIRONMENTAL SERVICES

1.11.1 A study was conducted to determine the possible movement of the existing MeCl contamination towards groundwater or if the presence of numerous clay layers had impeded the downward movement of the MeCl at the TTF (Coretz III, 1992a and 1992b). The study was

conducted in September and October of 1992 by Cortez III Environmental Services, Engineers from New Mexico State University, and the WSMR MTD-AA Chemistry Laboratory.

1.11.2 Two air monitoring wells (9201 and 9202) were completed in the vicinity of the former evaporation pond (**Figure 1-4**). The initial boring (9201) was terminated at 120 feet below ground surface (bgs). MeCl was detected beginning at 70 feet bgs and in every 2.5-foot sample interval to the 120 feet bgs, the termination depth. A maximum concentration of 583 mg/kg was reported at 77.5 feet bgs and a concentration of 2.3 mg/kg was reported in the bottom of the boring. Cortex III concluded that the concentrations of methylene chloride were detected at expected concentrations and within the same lithologic unit.

1.11.3 The second boring (9202) was terminated at 100 feet bgs. MeCl was initially detected at 57.5 feet bgs at a concentration of 0.02 mg/kg. The maximum MeCl concentration (183 mg/kg) was observed at 80 feet bgs and the bottom of the boring had a concentration of 51.4 mg/kg. Cortez III concluded that it was not possible, with the information that was received from borehole 9202, to make any determination of the origin, areal extent, or amount of methylene chloride near the TTF building, but that there was contamination near the TTF building that was not determined during the 1985 contamination assessment. Cortez III identified three possible sources: the contamination could be from the main plume moving in an unexpected direction, an undefined contamination moving out from under the TTF building, or an additional source of contamination which occurred after the assessment in 1985. The Cortez III reports did not conclude whether MeCl contamination was or was not migrating towards groundwater.

1.12 SUMMARY OF CURRENT FIELD ACTIVITY - DOW ENVIRONMENTAL

1.12.1 In March 1995, Dow Environmental, Inc., (Dow) initiated soil vapor extraction for the removal of the MeCl and other VOCs present in the vadose zone in the area of the original evaporation pond. The study is currently on-going (Dow, 1995).

2.0
PHYSICAL CHARACTERIZATION

2.1 SURFACE FEATURES

2.1.1 The terrain of WSMR ranges from desert flats to rugged mountains. Most of the mountainous area is very steep, broken land which is predominantly covered with rock. Most surface drainage is toward the center of the range in the vicinity of Lake Lucero and the Alkali Flats. A perennial surface water stream is created by effluent from a sewage treatment plant located five miles east of the Main Post sewage treatment plant.

2.1.2 The TTF lies at an elevation of approximately 4,010 feet above mean sea level (m.s.l.) in the southwestern part of the Tularosa Basin. The average slope of the land surface at the TTF is approximately 1 percent to the east.

2.2 METEOROLOGY AND CLIMATOLOGY

2.2.1 The climate of the southern Tularosa Basin is arid to semi-arid with average annual precipitation of about 8 inches per year. Most of the rain is produced by local convective thunderstorms during the summer months. At the White Sands National Monument, 30 miles northeast of the TTF, average annual precipitation is 8.11 inches, 4.68 inches of which is recorded during the months of June through September; mean annual snowfall is 2.3 inches. At Las Cruces, 20 miles southwest of the TTF and southwest of the Organ Mountains, average annual precipitation is 8.49 inches, 5.12 inches of which falls during June through September; mean annual snowfall is 3.3 inches. Mean monthly temperatures at White Sands National Monument range from 39.7 degrees Fahrenheit in December to 80.6 degrees Fahrenheit in July; those at Las Cruces range from 41.6 degrees Fahrenheit in January to 79.5 degrees Fahrenheit in July (GCL, 1987).

2.2.2 At the WSMR Main Post, snowfall is infrequent, although heavy snows have occurred. With an average rainfall of only 10.8 inches, mostly occurring during late summer as thunderstorms, often accompanied by hail, it is considered a dry area (WSMR, 1992b). Intense localized storms have caused flash flooding in the past. The average summer high temperature

is 92 degrees Fahrenheit with lows of about 65 degrees Fahrenheit. During the winter months (December through February), the average high is 57 degrees Fahrenheit, with an average low of 36 degrees Fahrenheit. Average annual humidity is 37 percent.

2.2.3 Wind is a significant climatic factor at WSMR, especially from February through May. The prevailing southerly winds blow unimpeded across the desert and at times reach gale proportions. Wind storms may last for days in the spring.

2.2.4 Very little surface water exists on WSMR due to the low precipitation and high evaporation rates. An exception is during intense localized storms during which flash flooding can occur. The TTF area is not within the 100-year flood plain. Surface drainage in the region originates in the mountains and flows across the alluvial fans to the basin floor. This drainage terminates in Lake Lucero, the lowest portion of the basin. Accumulations of storm run-off in natural depressions on the bolson surface provide recharge for the primary aquifer in the Main Post area. Although the local drainage courses are oriented toward the center of the basin, the regional drainage is to the south.

2.2.5 Salt Creek originates at the southern end of the Oscura Mountains and empties into the Alkali Flats. Three Rivers Creek originates in the Sacramento Mountains east of WSMR and also terminates in the Alkali Flats. These two creeks and several smaller creeks are dry except immediately following excessive rainfall or snow melt in the mountains. One large spring (Mal Pais Spring) on the southwest edge of the eastern lava flow discharges to the basin floor. Lake Lucero contains gypsum water and the Mal Pais Spring is saline. None of the surface water on the Installation is potable.

2.3 REGIONAL GEOLOGY

2.3.1 WSMR lies within the Mexican Highland section of the Basin and Range Province. This physiographic section is characterized by a series of tilted fault blocks forming longitudinal, asymmetric ridges or mountains, and broad intervening basins. The major portion of WSMR lies within the Tularosa Basin which is a down faulted graben about 6,500 square miles in area in the eastern part of the province; the northwest portion lies within the Jornada del Muerto Basin. The TTF is located in the southwestern part of the Tularosa Basin. The Tularosa Basin is bounded on the west by the Organ and San Andres Mountains, which are separated by St.

Augustine Pass. Approximately five miles further to the northeast are the Oscura Mountains which extend to the northern range boundary. The eastern limit of Tularosa Basin lies just outside WSMR proper, and is formed from north-to-south by the Jicarilla, Sierra Blanca and Sacramento Mountains. The TTF lies near the mouth of a structural embayment which separates the Organ Mountains and the San Augustin Mountains on the southwestern margin of the basin.

2.3.2 The Precambrian granite and quartzite basement complex is overlain by Pennsylvanian age rocks in the northern third of the WSMR area and early Paleozoic rocks in the southern two-thirds of the WSMR. Rocks of Permian age overlie the Pennsylvanian rocks, possibly disconformably. Triassic age strata lie, apparently conformably, on the Permian rocks. A thick sequence of Cretaceous age rocks overlie Triassic rocks and generally is best exposed in the eastern and northwestern parts of the area.

2.3.3 Tertiary and Quaternary sediments in the Tularosa Basin were derived by weathering, principally from Paleozoic and Mesozoic age rocks. These deposits generally have a chemical and mineralogic character similar to those of the rocks from which they were derived.

2.3.4 Five Quaternary-age depositional units have been defined within the Tularosa Basin (Orr and Myers, 1986). The uppermost unit consists of alluvial fan deposits, which dominantly border the basin. The underlying units consists of fluvial-eolian gravel, sand and clay deposits. The third unit is composed of thick lacustrine deposits occurring surficially in the northern parts of the basin, and at depth in the south. The underlying fourth unit is the playa/evaporite deposits of the Lucero Lake area. The basal Quaternary unit is an extensive coarse-grained deposit which was penetrated in the lower 2400 feet of a stratigraphic test boring T-14 at WSMR (ERC, 1990).

2.4 SITE GEOLOGY

2.4.1 As discussed in Section 2.3, Regional Geology, sediments underlying the TTF are bolson deposits consisting of playa, eolian, fluvial, and distal alluvial fan deposits. The alluvial fans emanated from the Organ Mountains located approximately 4 miles west of the site. The silts, sands, and gravels of the bolson deposits (generally porous) are interbedded with clays. Relatively thick lenses of clays and silts may have been deposited in closed basins containing

dry lakes (playas), such as Lake Lucero located north of the TTF. Older soil horizons (paleosols) may be recognized locally as fine-grained caliche layers or oxidized zones, or by the presence of root molds. Nine bolson fill units were defined in the upper approximately 100 feet part of the unsaturated zone at the TTF during previous investigations (GCL, 1987). Depth to groundwater in the site area is approximately 210 feet bgs.

2.4.2 During the March 1995 field operations, a total of 21 soil borings were drilled using the HSA drilling method and sampled. The locations of the 21 soil borings are presented on **Figure 2-1**. As discussed in Section 3.5, 9 deep soil gas borings (DB01 through DB09) were advanced to the lower part of Unit 3 for the purpose of collecting one deep soil gas sample and one soil sample for analysis from each of the borings. The deep soil gas boring depths ranged from 41.4 feet (DB06) to 52 feet bgs (DB05).

2.4.3 Eleven deep soil borings (SB01 through SB11) were advanced to the top of Unit 9 for the purpose of collecting soil samples for chemical analyses and geotechnical testing. These soil boring depths ranged from 75 feet to 82.5 feet bgs. A twelfth soil boring, SB12, was advanced to a depth of 152.5 feet bgs (auger refusal) for the purpose of collecting soil samples for chemical analyses and determine the vertical extent of the contamination in the soils. The results of the chemical analyses are discussed in Section 4.8.

2.4.4 Soil cores were collected continuously with the 5-foot split-barrel sampler from each of the 21 borings. The core lithologies were described in accordance with ASTM D2488-90 and screened with the FID for the presence of VOCs. The highest FID reading for each core segment, along with the lithological descriptions, were recorded on the respective soil boring record forms. The completed soil boring forms are presented in **Appendix A**. An additional 8 bolson fill units were tentatively identified in soil boring SB12 which penetrated to 152.5 feet bgs.

2.4.5 Unit 1 is generally described as a medium to coarse-grained poorly graded sand becoming a well graded sand at a depth of approximately 5 feet bgs which extended to a depth of approximately 20 feet bgs. One sample was collected for geotechnical analysis from the basal portion of Unit 1 in boring SB01 which is located in the northwestern portion of the TTF site. This geotechnical sample was classified as a fine to coarse-grained poorly graded sand

(SP-SM) with a trace of silt and gravel. The sample had a water content of 3.5 percent, a uniformity coefficient of 10.7, and a D_{10} size of 0.075 mm.

2.4.6 Unit 1 is underlain by approximately 8 feet of Unit 2 that is generally described as a lean clay to lean clay with sand. Unit 2 occurs from approximately 20 feet to 25 feet bgs. One sample was collected for geotechnical analysis from Unit 2 in boring SB03 which is located in the southeastern portion of the TTF site. This geotechnical sample was classified as fine to coarse-grained silty clayey sand (SC) with a water content of 8.2 percent.

2.4.7 Unit 2 is underlain by approximately 30 feet of Unit 3 which extends to a depth of approximately 55 feet bgs. Unit 3 has been subdivided into upper and lower subunits. Upper subunit of Unit 3 generally consists of fine to coarse-grained well graded sand with varying amounts of caliche cement and nodules. Lower subunit of Unit 3 is generally a fine to coarse-grained poorly graded to well graded sand with no caliche. One sample was collected for geotechnical analysis from the lower subunit of Unit 3 in boring SB01 which is located in the northwestern portion of the TTF site. This geotechnical sample was classified as a fine to coarse-grained silty sand (SM). The sample had a water content of 6.9 percent.

2.4.8 Units 1, 2, and 3 appear to be continuous, flat-lying units that have a uniform combined thickness of approximately 55 to 60 feet within the TTF site as illustrated on Geological Cross Sections A-A' and B-B', **Figures 2-3** and **2-4** respectively. The lines of the geological cross sections are presented on **Figure 2-2**.

2.4.9 Unit 3 is underlain by Unit 4 in the north and northeastern portions of the TTF site (borings SB02, SB04, and SB11); Unit 5 in the western, southwestern, and eastern portions of the TTF site (borings SB01, SB03, SB06, SB07, SB08, SB10, and SB12); and by Unit 6 (boring SB05) and Unit 7 (boring SB09) in the most southwesterly portion of the TTF site. **Figure 2-5** presents a subcrop map of the units underlying Unit 3 in the area of the TTF. Progressively older lithological units immediately underlie Unit 3 in a southwesterly direction.

2.4.10 The lithology of Unit 4 is generally a sandy lean clay to silt. Unit 4 was present in three borings (borings SB02, SB04, and SB11) which were located along the north and northeastern portions of the TTF site as illustrated on **Figure 2-5**. Unit 4, when present, extends to depths ranging from 52 to 62 feet bgs. Unit 4 apparently is thickest (approximately

6 feet thick) where Units 5 through 9 are structurally low as shown by the data from soil gas monitoring well borings 22 and 29 on Cross Sections A-A' and soil gas monitoring well boring 27 on Cross Section B-B'. Unit 4 is interpreted to be playa deposit that was deposited within the structurally low area. One sample was collected for geotechnical analysis from Unit 4 in boring SB04 which is located in the northwestern portion of the TTF site. This geotechnical sample was classified as a silty fine to coarse-grained silty sand (SM) with a trace of fine gravel. The sample had a water content of 3 percent, a uniformity coefficient of 29.4, and a D_{10} size of 0.0085 mm.

2.4.11 Unit 5 is generally a lean clay to sandy lean clay. Unit 5 was present in all borings except soil borings SB05 and SB09 which were located in the southwesterly portion of the site. As in Unit 4, Unit 5 is interpreted to be playa deposit and is apparently thickest (approximately 10 feet thick) where Units 6 through 9 are structurally low. Unit 5 extends to depths ranging from approximately 59 feet to 67 feet bgs. One sample was collected for geotechnical analysis from Unit 5 in boring SB03 which is located in the southeastern portion of the TTF site. This geotechnical sample was classified as a fat clay (CH) with some fine to coarse-grained sand. The sample had a soil moisture content of 23.9 percent, a liquid limit of 69, and a plastic limit of 27.

2.4.12 The lithology of Unit 6 is a silty sand to poorly graded sand. Unit 6 was present in all but boring SB09. Unit 6 also is thickest (approximately 8 feet thick) where Units 7 through 9 are structurally low. Unit 6 extends to depths ranging from approximately 55 feet to 75 feet bgs.

2.4.13 One sample was collected for geotechnical analysis from Unit 6 in boring SB01 which was located in the northwestern portion of the TTF site. This geotechnical sample was classified as a sandy silty clay (SM) with a water content of 13.8 percent, a liquid limit of 31, and a plastic limit of 16. Unit 6 is underlain by Unit 7 in most of the site area with the exception of the northeastern portion of the TTF site (boring SB11) where Unit 6 is underlain by Unit 9.

2.4.14 The lean clay to sandy lean clay of Unit 7 contains caliche nodules, caliche cement, and root molds. Unit 7 ranges in thickness from approximately 6.5 feet to 24 feet and extends to depths of approximately 70 feet to 92 feet bgs. As in the units discussed above, Unit 7 is

thickest (approximately 24 feet) where Units 8 and 9 are structurally low in the TTF area of the former evaporative pond. One sample was collected for geotechnical analysis from Unit 7 in boring SB03 which is located in the southeastern portion of the TTF site. This geotechnical sample was classified as clayey silt (MH) with a water content of 25.2 percent, a liquid limit of 60, and a plastic limit of 32. Unit 7 is underlain by Unit 8 in most of the site area with the exception of the northeastern portion of the site (boring SB11) where Units 7 and 8 are absent.

2.4.15 Unit 8 consists of silt, silty sand, and fine to medium-grained poorly graded sand. The sand generally has a uniform thickness of approximately 7.5 feet across the site area. Unit 8 extends to depths ranging from approximately 73 feet to 96 feet bgs. One sample was collected for geotechnical analysis from Unit 8 in boring SB01 which is located in the northwestern portion of the TTF site. This geotechnical sample was classified as a fine-grained poorly graded sand (SP) with a trace of medium-grained sand and silt. The sample had a water content of 3.3 percent, a uniformity coefficient of 1.87, and a D_{10} size of 0.16 mm. Unit 8 was underlain by Unit 9 in all of the borings in the site area.

2.4.16 Unit 9 is a lean clay with some manganese staining, waxy appearance, and fractures (possibly desiccation cracks). Borings SB01 through SB11 penetrated only the upper portion of Unit 9. Boring SB12 penetrated 19 feet into Unit 9 and was the only boring installed during this investigation to fully penetrate Unit 9. Only two of the previously drilled borings (22 and 29) fully penetrated Unit 9. Unit 9 was reported to be approximately 4 feet and 9 feet thick in borings 22 and 29, respectively. Structurally the top of Unit 9 was generally 20 feet or more lower in borings 22, 27, and 29 (shown on Cross Sections A-A' and B-B') to the top of Unit 9 in borings SB01 through SB12. The portion of the site in which Unit 9 is structurally low is elongated in an east-west direction and passes through the former evaporative pond area as illustrated by the structural contour map of the top of Unit 9 (**Figure 2-6**). However, the base of Unit 9 appears to be generally flat-lying throughout the site as illustrated on Cross Section A-A' (borings SB12 and 22). This indicates that the upper portion of Unit 9 was probably removed by erosion prior to the deposition of the overlying units. One sample was collected for geotechnical analysis from Unit 9 in boring SB03 which is located in the southeastern portion of the TTF site. This geotechnical sample was classified as a lean clay (CL) with a trace of medium-grained sand. The sample had a water content of 18 percent, a liquid limit of 43, and a plastic limit of 24.

2.4.17 Units 10 through 17 (penetrated by boring SB12) consisted of alternating beds approximately 5 feet thick of poorly graded sand/silty sand/silt with lean clay. Boring SB12 was advanced to a total depth of 152 feet into Unit 17 before encountering auger refusal.

2.4.18 These units are generally consistent with those described by GCL (GCL, 1987).

2.5 REGIONAL HYDROGEOLOGY

2.5.1 The primary aquifer in the Main Post area is a wedge-shaped unconfined aquifer in the bolson deposits of the Tularosa Basin. Of particular significance to the groundwater resources of the Main Post area is the re-entrant or indentation of a large alluvial apron into the Organ Mountains. Seemingly, this re-entrant has entrapped a larger quantity of freshwater than commonly occurs along the mountain front, and is a major groundwater source for the Main Post area. Recharge for the aquifer is supplied by drainage from the alluvial fans and infiltration of storm run-off in natural depressions on the bolson surface. Beneath and to the east of the freshwater wedge, the groundwater is saline. The central part of the Tularosa Basin, east of the Main Post, contains saline water. The source of the groundwater at WSMR is from precipitation, of which only 25 percent reaches the saturated zone. Yearly precipitation ranges from less than 7 inches in the Tularosa Basin to 25 inches in the higher mountains. At present, the only groundwater use within 5 miles of the TTF is the WSMR Main Post well field, located upgradient about 3 miles northwest of the TTF.

2.5.2 The natural groundwater flow direction in the Main Post Area is to the east, toward the center of the valley. In the Main Post area, groundwater flow is greatly affected by pumping from the Main Post well field, which provides potable water for the Main Post and adjacent facilities. The overall impact on groundwater elevation and flow direction varies with the rate of pumping from each well and with recharge from the vicinity of the mountains to the west. Under static, non-pumping conditions, the depth to groundwater may be expected to vary from 200 to 300 feet below general ground level in the Main Post area. Dependent upon groundwater withdrawal rates, depth to groundwater in the Main Post area may be greater than 350 feet.

2.5.3 Eleven water supply wells located throughout the Main Post area have a combined capacity in excess of 14 million gallons per day. The average depth of the wells is

approximately 768 feet. The water level depth in the 11 wells ranges from 305 to 400 feet bgs. The water-bearing zone is comprised of unconsolidated sand, gravel and clay. It is estimated that the freshwater-bearing zone could be up to 1,722 feet thick near the western edge of the basin and pinches out just west of the Don Anna-Otero County boundary where saline water is encountered.

2.5.4 In the Main Post area, all well water is chlorinated at a central station prior to entering the distribution network. Potable water for the housing area is fluoridated. The addition of chlorine and fluoride is the only treatment required. The distribution network consists of 6 to 12-inch diameter asbestos cement, cast iron and galvanized lines, and three elevated and two ground storage tanks.

2.5.5 Because of the enormous size of the Installation, each work area has its own potable water distribution system rather than one system for the entire Installation. The Small Missile Range (SMR) is located some 6.8 miles north of the Main Post area and overlies a potable water aquifer. Potable water for this site is supplied by one well with a capacity of 73 gallons per minute (gpm).

2.5.6 The High Energy Laser System Test Facility (HELSTF) area lies some 11 miles north of the SMR complex. Two wells located 8.1 miles from the site supply 120 to 140 gpm of potable water to a ground level storage tank at the HELSTF.

2.5.7 The Stallion Range Center (SRC) is in the northwestern sector of the Installation. Two wells provide non-potable water to an electrodialysis plant. This plant was installed in 1969 and consists of two desalination units in one building; each unit is capable of producing 50 to 66 gallons of potable water per day. A ground storage tank, distribution lines, and pumps furnish potable water within the SRC.

2.5.8 Because there are no potable water sources at other range stations, water is hauled by tanker to these locations. Included are such areas as North Oscura Peak and Crew Shelter, Oscura Range Center, Salinas Peak Crew Shelter, Rhodes Canyon Range Center, and many instrumentation sites throughout the range. Each site is equipped with storage tanks and small water pressure systems as required.

2.6 SITE HYDROGEOLOGY

2.6.1 The Tularosa Basin is a closed groundwater basin in which any precipitation which is not rapidly evaporated flows centripetally toward playas in the central part of the basin. Groundwater in the Tularosa Basin is contained in an unconfined, water-table aquifer whose upper surface approximately parallels the surface topography of the alluvial fill (GCL, 1987).

2.6.2 West of the TTF, the water table lies approximately 200 feet bgs and has a gradient of about 0.008 (42 feet per mile) to the east. The gradient decreases to less than 0.002 (10 feet per mile) in the vicinity of the TTF and the water table lies approximately 220 feet bgs. The aquifer underlying the TTF is used as the source of domestic and process water for the WSMR Headquarters area and other facilities. A groundwater divide is located between the TTF and the WSMR supply wells, imposed as the result of flow reversal in the cone of depression produced by the Main Post well field. Pumpage by WSMR supply wells has produced a large cone of depression centered about 1.5 miles north of the Headquarters area. Continued pumpage can be expected to cause eastward and southeastward expansion of this cone of depression, reducing the elevation of the water table along the groundwater divide to the southeast of the cone of depression (GCL, 1987). Groundwater levels in the vicinity of the supply wells have declined as much as 75 feet since 1949 as a result of pumping.

2.6.3 In a study by Geoscience Consultants Ltd. (GCL, 1987), the maximum additional drawdown or decline in groundwater levels near the TTF over a period of 30 years from the present would reduce the groundwater elevation in the Main Post well field to an elevation of about 3,860 feet. Since the present groundwater elevation at the TTF is 3,812 feet, this appears insufficient to induce reversal of the flow from TTF; thus, a groundwater divide will still exist between TTF and the Main Post well field.

2.6.4 Aquifer transmissivity estimates from wells in the vicinity of WSMR Headquarters range from 160 ft^2/day to 79,000 ft^2/day, with wells in close proximity to each other commonly showing a wide range of values (Orr and Myers, 1986). The wide variance in aquifer test results may be caused by a variety of factors, including, heterogeneity of the alluvial fill, particularly with regard to grain size, varying well completion methods and depths, and boundary effects imposed by bedrock in the subsurface within a short distance of many supply wells.

2.6.5 Groundwater in the vicinity of the WSMR Post Headquarters is moderately hard, but of good quality for domestic use. Eleven supply wells north and east of the Post Headquarters presently derive water from the alluvial aquifer. Dissolved solids in groundwater increase with distance eastward from the mountain front, reflecting the increased residence time of water moving from the mountain front toward the center of the Tularosa Basin. In 1985, well T-14, located at Hood Tank, 1.5 miles northeast of the TTF, yielded a water sample from a depth of 300 feet bgs which had a specific conductance of over 2,000 micromohs per centimeter, more than twice that of other wells in the WSMR Main Post Area. The dissolved solids concentration in mg/L of groundwater is commonly about 0.65 times the specific conductance, indicating that this water sample from well T-14 had a total dissolved solids concentration of about 1,300 mg/L.

3.1 OVERVIEW OF FIELD ACTIVITIES

3.1.1 This section presents an overview of the field investigation activities. As previously stated the investigation activities included soil gas sampling and analysis, shallow and deep soil gas sampling and analysis, soil boring sampling and analysis, and groundwater sampling and analysis.

3.1.2 Field activities were performed in two phases. In June 1994, soil gas samples were collected from 17 existing soil gas monitoring wells. In March 1995, the second phase of the field activities included the collection and analysis of 100 shallow soil gas samples, 9 deep soil gas samples, 120 soil samples and groundwater samples from 4 existing RCRA groundwater monitoring wells (**Figure 1-2**).

3.1.3 A sequential approach was used during the field investigation of the soils at the TTF. The existing soil gas monitoring wells were initially sampled with one of the objectives being to further define the contaminants of concern for the RFI. During the second phase of the field investigation the shallow and deep soil gas samples were collected with one of the objectives being to determine the locations of the soil borings for the collection and analysis of soil samples.

3.1.4 Prior to all intrusive activities underground utilities were located by WSMR personnel. WCFS received verbal approval from the WSMR Facility Engineer prior to beginning intrusive operations.

3.2 SOIL GAS INVESTIGATION

3.2.1 The soil gas investigation involved the collection and analysis of soil gas from 17 existing soil gas monitoring wells in June 1994, and the collection and analysis of 100 shallow and 9 deep soil gas samples in March 1995 (**Figure 1-2**). The objective of sampling the existing soil gas monitoring wells was to further define the potential contaminants of concern

for the RFI and their present concentrations. The objectives of collecting the shallow and deep soil gas samples were to characterize the horizontal extent of VOCs in the vadose zone along the perimeters of the TTF building and the former evaporative pond cap, and aid in selecting soil boring locations for the collection and analysis of soil samples.

3.2.2 During the soil gas sampling activities described in Sections 3.3, 3.4, and 3.5, calibration standards were analyzed at the beginning and end of each day of sampling, and between every 10 samples for purposes of verifying the calibration of the laboratory equipment. The standards included compounds whose peaks occurred within the expected operating range of the compounds of interest. One field blank was collected at the beginning of each day and one field duplicate was collected after every 10 samples for Quality Assurance/Quality Control (QA/QC) purposes.

3.3 SOIL GAS MONITORING WELL SAMPLING

3.3.1 In June 1994, soil gas samples were collected from the 17 existing soil gas monitoring wells (**Figure 1-2**). The existing soil gas monitoring wells sampled were:

Well Number	Installed by	Lithologic Unit(s) Open in Well	Screen Interval (feet)
11	GCL, 1985	Lower 3	46-54.5
14	GCL, 1985	6	67-78
16	GCL, 1985	5 and 6	62.5-68
17	GCL, 1985	Not shown on GCL boring log	NA - depth of well 82
18	GCL, 1985	Lower 3	45-50
19	GCL, 1985	6 and 7	69-73.5
20	GCL, 1985	5 and 6	72-78
21	GCL, 1985	6	69-78
22	GCL, 1986	6	64-74
24	GCL, 1986	6	66-71
25	GCL, 1986	6	65-71
27	GCL, 1986	6	72-78
29	GCL, 1986	Lower 3	47.5-53.5
ERC-1	ERC, 1990	4 and 5	59-65

Well Number	Installed by	Lithologic Unit(s) Open in Well	Screen Interval (feet)
9201	Cortez III, 1992	Units 10,11 and 12 [1]	105-115
9202	Cortez III, 1992	Unit 8 [1]	87-97
0000	Not Reported	[1]	NA - depth of well 77

[1] Boring log not available to determine units screened. Therefore, units screened were estimated from offsetting boring logs.

3.3.2 Each soil gas sample was screened in the field for the following list of VOCs using a van mounted (mobile laboratory) gas chromatograph/photoionization detector/electron captor detector (GC/PID/ECD).

Soil Gas Analytes
MeCl
1,1-DCE
1,1-DCA
1,1,1-TCA
PCE
TCE
Chloroform
Freons (qualitative)

3.3.3 Prior to sampling, the monitoring wells were purged by placing a PVC cap on the top of the well casing and sealing it with putty. Approximately 1 foot of 1/4 inch O.D. Teflon tubing was then inserted into a drilled hole located on the PVC cap. The Teflon tubing was also sealed with putty and a length of silicon tubing was connected from the vacuum system to the exposed end of the Teflon tubing. [**Note:** Tubing blanks run on the silicon tubing and "putty" were non-detectable for VOCs.] A vacuum was applied for sufficient time to purge the monitoring well of approximately 3 well volumes of air. The well volume was initially calculated by sounding the bottom of the well with a weighted tape and calculating a well volume.

3.3.4 After purging was complete, 1 cc of soil gas was collected by inserting a new disposable syringe into the silicon tubing. This soil gas sample was immediately injected into a field GC

for analysis. The equipment used included a laboratory grade GC and computerized data processing station for data acquisition. A Shimadzu GC Model GC-14 equipped with flame ionization detector (FID), photoionization detector (PID), and an electron capture detector (ECD) provided a wide range of sensitivity for detecting VOCs. The GC system used a J&W Scientific DB-624 magebore capillary column which separated the wide range of VOCs. The data station consisted of a Shimadzu Data Processor Model C-R4A dual channel, dual disks process which acquired, stored, and calculated chromatographic results.

3.3.5 After obtaining the field screening sample, an additional sample for analysis off-site by Enseco Air Toxics was collected by sharply crimping the silicon tubing forming an air tight seal and disconnecting it from the vacuum system. The silicon tubing then was connected to a laboratory clean, stainless steel cylinder (Summa canister) at negative pressure (30" Hg). Once connected, the crimp was released and the valve on the cylinder was opened which allowed the soil gas to fill the container. Once the container was filled the cylinder valve was closed and the silicon tubing was removed from the cylinder. The cylinders were then shipped to Enseco Air Toxics for analysis by EPA Method TO-14. All samples were shipped using chain-of-custody protocol. Completed chain-of-custody forms for the RFI field activities are contained in **Appendix B**.

3.4 SHALLOW SOIL GAS SAMPLING

3.4.1 In March of 1995, 100 shallow soil gas samples were collected using a Geoprobe™ Model 8-M sampling system. **Figure 1-2** presents these sampling locations.

3.4.2 The shallow soil gas samples were collected from a depth of approximately 20 feet bgs. This depth corresponds to the estimated depth of the bottom of Alluvial Unit 1, which is defined as a poorly sorted, sandy gravel and gravelly sand up to 20 feet thick (GCL, 1987).

3.4.3 The sample locations were concentrated around the north, west, and south sides of the TTF building with a lesser concentration of locations along the east, south and north sides of the RCRA cap. Initially 100 potential shallow soil gas sampling locations were proposed (WCFS, 1995a). The final scope of the soil gas investigation included fewer soil gas sampling locations, but was sufficient to characterize the nature and extent of soil gas contamination without collecting unnecessary data.

3.4.4 Sampling began with the locations surrounding the perimeters of the TTF and the RCRA cap. Locations 25-31, 36, 42, 43, 46-48, 53, 65-71, 73, 75, 76, 82-85, and 96-100 were sampled first (**Figure 1-2**). If a soil gas analyte was detected at one of these locations, the locations in the next row which were normal to and diagonal from the first location, were subsequently sampled. Use of the algorithm resulted in 6 of the 100 initially proposed shallow soil gas sampling points not being sampled. In addition, 4 of the 100 initially proposed shallow soil gas sampling points (37, 38, 40, and 41) were eliminated due to surface or subsurface obstructions. Ten sampling locations which were not among the 100 initially proposed shallow soil gas sampling points were subsequently added to further delineate potential vadose zone contamination at the TTF. These locations are also shown on **Figure 1-2**.

3.4.5 Using the Geoprobe™ system, shallow soil gas samples were collected from undisturbed soil by probing directly into the soil with a 1-inch diameter rods. Where asphalt was present, the probe rods were driven through the asphalt. Where concrete was present, a percussion hammer drill was used to drill through the concrete before attaching the probe rods.

3.4.6 Once the sampling van was positioned over the sampling location, the rods were pushed or hydraulically driven to the desired sampling depth. Upon reaching the sampling depth, the rods were retracted approximately 2 inches to remove the drive point from the point holder which created an annular space for soil gas withdrawal. New 1/4-inch O.D. polyethylene tubing was inserted through the probe rod's annulus space and threaded into the point holder forming a continuous, gas sampling line. A length of silicon tubing was then connected from the vacuum system to the exposed end of the polyethylene tubing. The decline of vacuum pressure with time at a given location and depth was used to verify that the porosity of the soil was sufficient to withdraw a representative soil gas sample. The vacuum pump was operated for sufficient time to purge 7 volumes of the polyethylene tubing and silicon tubing of residual air/gas prior to sample collection. After purging was completed, 1 cc of soil gas was collected by inserting a new disposable syringe into the silicon tubing. The soil gas sample was immediately injected into the field GC/MS for analysis.

3.4.7 Each soil gas sample was analyzed in the field for VOCs using a truck mounted (mobile laboratory) gas chromatograph/mass spectrometer (GC/MS). The equipment used included laboratory grade gas chromatograph (GC) and computerized data processing station for data acquisition. HP5890A GC equipped with an HP5971A MSD (mass selective detector) provided

ppm sensitivity for identifying a wide range of VOCs. The system used a J&W Scientific DB-624 magebore capillary column which separated the wide range of VOCs. Dual data was captured, processed, and stored with a HP5971A MSD/DOS ChemStation System. The Wiley database of 130,000 MS spectra was used to identify unknown compounds.

3.4.8 All soil gas samples were analyzed in the field for the following list of compounds:

Soil Gas Analytes
MeCl
1,1,1-TCA
TCE
PCE
1,1-DCE
1,1-DCA
Freon 22 (qualitative)
Freon 503 (qualitative)
Freon 113
Freon 11

3.4.9 Off-site laboratory analysis of soil gas was not conducted during the March 1995 field activities in accordance with the approved project plans (WCFS, 1995a,b,c).

3.4.10 Following sampling, the probe rods were removed and the used polyethylene tubing was discarded. The used rods were set aside to await decontamination prior to reuse at another sampling location. Upon completion of soil gas sampling at each location, the probe holes were backfilled from the surface by pouring powdered bentonite into the open hole and patching the asphalt or concrete where appropriate.

3.4.11 On asphalt and concrete sample locations, the information was marked with spray paint and paint pen. All other sampling locations were marked with a wooden lath or survey pin for future reference and surveying. All information pertinent to soil gas analysis was recorded in a field logbook or field log sheet.

3.5 DEEP SOIL GAS SAMPLING

3.5.1 In March of 1995, 9 deep soil gas samples were collected from an average depth of 41 feet bgs. Each deep soil gas sample was analyzed for VOCs in the field using the same field laboratory equipment described above for the shallow soil gas sampling. Deep soil gas samples were collected from the lower part of Alluvial Unit 3, which is poorly cemented, gravelly sand. The sample locations were located around the north, west, and south sides of the TTF building, and along the south and east sides of the former evaporation pond. **Figure 1-2** presents the locations of the 9 deep soil gas borings.

3.5.2 Deep soil gas samples were collected with the aid of a hollow stem auger (HSA) drill rig. A pilot hole was drilled using a Failing F-10 drill rig with 4½-inch I.D., hollow-stem augers. Soil samples were continuously collected and the boring was visually logged by a site geologist. Upon reaching the target interval (lower part of alluvial Unit 3), the continuous sampler was removed.

3.5.3 Clean Teflon™ tubing (1/4 O.D.) was threaded into the point holder of the soil gas probe. The soil gas probe was attached to the drill rods and sent down through the hollow stem augers. The probe was pushed into the soil until refusal of the tool occurred (from ½ to 2 feet into the soil) and then retracted approximately 1 inch to remove the drive point which created an annular space for the soil gas withdrawal. A length of silicon tubing was then connected from the vacuum system to the exposed end of the Teflon tubing which was attached to the soil gas probe. The decline of vacuum pressure with time at a given location and depth was used to verify that the porosity of the soil was sufficient to withdraw a representative sample. The vacuum pump was operated for sufficient time to purge 7 volumes of the tubing and silicon rubber Telfon™ tubing of residual air/gas prior to sample collection. After purging was completed, 1 cc of soil gas was collected by inserting a new disposable syringe into the silicon tubing. The soil gas sample was immediately injected into the field GC/MS for analysis.

3.5.4 Following soil gas sampling, the probe and Teflon tubing were removed and set aside to await decontamination prior to reuse at another sampling location and a 3½-inch O.D., 2.5-foot split-barrel sampler was used to collect a soil sample for off-site analysis of VOCs. The soil samples were collected from the lower part of Alluvial Unit 3 at approximately 1 foot below the soil gas sample depth. **Table 3-1** summarizes the depth of the soil and soil gas

samples collected for analysis and the total depth of each boring. Sampling methods and analysis are further described in Section 3.8.

3.5.5 Upon completion of the soil sampling, the borehole was grouted to the ground surface. The cement grout was mixed in proportions of 94 pounds of Portland cement, 6 pounds of powdered bentonite, and a maximum of 10 gallons of water. The grout was tremied through the hollow-stem augers as they were removed from the borehole in 10-foot increments. The bentonite was mixed with the water prior to adding the cement. Borings advanced in asphalt were patched using premixed asphalt patch. No borings were advanced in areas where concrete was present.

3.5.6 On asphalt sample locations, the information was marked with spray paint and paint pens. All other sampling locations were marked with a wooden lath or survey pin for future reference and surveying. All information pertinent to deep soil gas boring was recorded in a field logbook or field log sheet.

3.5.7 Boring logs are presented in **Appendix A**. **Appendix C** presents a summary of the field FID readings measured on the soil samples during drilling.

3.6 SOIL BORING PLAN

3.6.1 The soil boring investigation included the drilling of 12 deep soil borings using a HSA drill rig (**Figure 1-2**) and the collection and analysis of 111 soil samples. The objective of the soil boring investigation was to characterize the vertical and horizontal extent of VOCs in the unsaturated soils along the perimeter of the TTF building and the former evaporative pond.

3.6.2 Eleven soil borings (SB01 through SB11) were drilled to an average depth of 80 feet bgs (i.e. the upper part of Unit 9). Their locations were selected based on historical data and professional judgement. Originally the borings were to be located based on the results of the soil gas survey; however, the shallow and deep soil gas analysis detected only minor amounts of contamination so historical information and professional judgement were employed. The 11 borings were drilled and the soil samples collected in accordance with the approved project plans (WCFS, 1995a,b,c).

3.6.3 The twelfth boring (SB12) was drilled to a depth of approximately 152 feet bgs. This boring was installed to evaluate the vertical extent of VOCs detected in SB08 and SB10. Soil samples from these borings contained high concentrations of VOCs as measured on-site by the FID. This location was also selected because it is reportedly in the general vicinity of a former interceptor tank which leaked during a leak test performed by Dynaspan Services Company in December 1989 (Bath, 1989).

3.6.4 Boring logs are presented in **Appendix A**. **Table 3-2** presents a summary of the depth and thickness of the subsurface lithologic units observed at the site. **Appendix C** presents a summary of the field FID readings measured on the soil samples during drilling.

3.6.5 Soil samples were analyzed using USEPA SW-846, Method 8240, for the list of VOCs presented in **Table 3-3** which includes Freon 11 (trichlorofluoromethane) and Freon 113 (1,1,2 trichloro-1,2,2-trifluoroethane). Freon 22 and Freon 503 were deleted from the original list of analytes because their high volatility made collection of representative samples difficult, and their volatility and low boiling points rendered them unamenable to analysis using Method 8240 without modification. Since there is no standard acceptable method for modifying Method 8240 to quantify Freon 22 (chlorodifluoromethane) and Freon 503 (trifluoromethane/ chlorotrifluoromethane) in soil samples and since they were not qualitatively detected in the soil gas samples, it was decided that the qualitative assessment of absence using the GC/MS to analyze the soil gas samples was adequate and they were dropped from the list of soil analytes.

3.6.6 Quality Assurance (QA) procedures were performed in general accordance with the FSAP (WCFS, 1995b) and CDAP (WCFS, 1995c). QA/QC samples (field triplicates) were collected at a rate of approximately 10 percent (i.e., 1 for every investigative 10 samples). Two of the three samples were sent to the WCFS subcontract analytical laboratory (Quanterra) as a regular field sample and as a replicate for QC purposes. The third sample was sent to USACE-SWD analytical laboratory as a QA sample. The QA/QC samples were collected to insure that the analytical laboratory could provide reproducible analytical results.

3.6.7 With the exception of one day that adverse weather caused the early cessation of field activity, a rinsate blank was submitted for every day of soil sampling. The rinsate blank was prepared by pouring ASTM Type II Reagent Grade Water (Fisher Scientific Optima H_2O) through the decontaminated split-barrel sampler used to collect soil samples and into the

appropriate container for analyses. The purpose of the rinsate blank was to insure that cross-contamination of samples did not occur through improperly cleaned equipment.

3.6.8 One field ambient blank was collected by pouring the ASTM Type II Reagent Grade Water directly into a sample container. The ambient blank sample was collected to assess the effects of background conditions, potential sample container contamination and the quality of the ASTM Type II Reagent Grade water.

3.6.9 Results of the equipment blank, ambient blank and rinsate samples are presented in **Table 3-4**.

3.7 DEPTH OF SOIL SAMPLING

3.7.1 Soil borings were advanced using hollow-stem augers. Soil samples were collected continuously using a 5-foot split-barrel sampler and the samples were visually logged by a site geologist for the purpose of preparing a boring log (**Appendix A**). Soil samples for VOC analysis were collected from each boring relative to the lithologic units as summarized in the following table:

VOC Sample	Depth
1	Bottom of Unit 1
2	Bottom of Unit 2
3	Bottom of Unit 3
4	Bottom of Unit 4
5	Bottom of Unit 5
6	Bottom of Unit 6
7	Top of Unit 7
8	Bottom of Unit 7
9	Bottom of Unit 8
10	Top of Unit 9

Additional focus was placed on Unit 7 because GCL reported that VOC concentrations were generally detected in the upper part of Unit 7 but not detected in the lower part of Unit 7. This suggests that Unit 7 may be acting as a barrier to vertical migration of VOCs.

3.7.2 For soil boring SB12, which was advanced below the top of Unit 9, one soil sample was collected for analysis approximately every 10 feet below the top of Unit 9.

3.7.3 In accordance with the work plan (WCFS, 1995a), additional focus was placed on Unit 7 because GCL reported that VOCs were generally detected in the upper part of Unit 7 but not detected in the lower part of Unit 7 (GCL, 1987). This suggests that Unit 7 acts as a barrier to the vertical migration of VOCs.

3.7.4 In addition to the samples collected for chemical analysis, one geotechnical sample was collected from each of the nine alluvial units (Section 3.9).

3.8 SOIL BORING SAMPLING PROCEDURES

3.8.1 Soil borings were advanced using a Failing F-10 drill rig with 4½-inch I.D., hollow-stem augers equipped with a continuous core sampling device. Samples were collected continuously from the ground surface using a 3½-inch O.D., 5-foot split-barrel sampler. Samples were retrieved by wire line with the hollow stem augers remaining in place. As drill cuttings were produced, they were discharged onto visquene around the borehole. The cuttings were shoveled into a soil bin and transported to a dumpster for storage prior to characterization and disposal according to the Investigation Derived Waste Management Plan (IDWMP) (WCFS, 1995b).

3.8.2 Upon reaching the ground surface, the split-barrel sampler was split open exposing the core. The core was rapidly removed from the sampler and placed on clean aluminum foil that was spread out on the sampling table with the orientation of the sample confirmed (i.e., top of core or bottom of core). Any material appearing to be slough was removed. The core was split lengthwise (down the center) with a clean knife, thus dividing the core in half. The FID was used to measure the levels of ionizable organic vapors along the length of the core by passing the probe end along the narrow space between the two core halves as the core was split. Upon determining the lithologic unit for collection, the VOC samples for laboratory analysis were immediately collected. The sample containers for VOC analysis (1.5-inch diameter 4-ounce glass jars) were filled immediately with soil from a discrete interval of about 0.5 feet. The samples were not composited and care was taken to minimize the disturbance of the sample. The jars were filled as full as possible to eliminate air space. All sample jars were labeled and placed in ice-filled coolers immediately following collection and kept cool. Depending on the

consistency of the unconsolidated material, the samples were collected with a sharp edged stainless-steel scoop or the sample jar itself.

3.8.3 After the VOC samples were collected, the core was described by an experienced geologist in general accordance with ASTM D2488-90. Descriptions including color, consistency/density, plasticity or grain size, moisture, FID readings and other pertinent information were recorded on the Soil Boring Log Form.

3.8.4 Upon reaching total depth of the borehole, the boreholes were grouted to the ground surface. The cement grout was mixed in proportions of 94 pounds of Portland cement, 6 pounds of powdered bentonite, and a maximum of 10 gallons of water. The bentonite was mixed with the water prior to adding the cement. The grout was tremied through the hollow-stem augers as they were removed from the borehole in 10 foot increments. Borings advanced in asphalt were patched using premixed asphalt patch. No borings were advanced in areas where concrete was present.

3.8.5 On asphalt sample locations, the boring locations were marked with spray paint and paint pens. All other sampling locations were marked with a wooden lath or survey pin for future reference and surveying. All information pertinent to soil sampling was recorded in a field logbook or field log sheet.

3.9 GEOTECHNICAL SOIL SAMPLING PROCEDURES

3.9.1 Nine geotechnical samples were collected from the soil borings during the investigation. One geotechnical sample was collected from each of the nine alluvial units.

Alluvial Unit	Borehole
1	SB01
2	SB03
3	SB01
4	SB06
5	SB03
6	SB01
7	SB03

Alluvial Unit	Borehole
8	SB01
9	SB03

3.9.2 Geotechnical soil samples were collected from the same 3½-inch O.D., 5-foot split-barrel sampler as the chemical samples. After VOC samples were collected and recovery measured, soil samples for geotechnical analysis were placed in 32-oz. jars. The jars were filled as full as possible to eliminate air space. The geotechnical samples were sent to the laboratory using chain-of-custody protocol.

3.9.3 All samples were tested at the geotechnical laboratory for moisture content (ASTM DD2216-90) and grain size distribution (ASTM D421-85/D422-63). Based on visual observation, the grain size distribution analysis consists of either a combined washed sieve and hydrometer analysis, or a washed sieve analysis or hydrometer alone. The Atterberg limits (ASTM D4318-84) were performed on any soils described in the field as cohesive. The laboratory physical tests were used to assist in classifying soils and evaluating remediation methods.

3.9.4 **Table 3-5** presents a summary of the geotechnical test results for the 9 samples collected during the RFI.

3.10 GROUNDWATER SAMPLING PLAN

3.10.1 During the March 1995 field investigation, groundwater samples were collected from the four existing RCRA groundwater monitoring wells and analyzed for VOCs. The objective of the groundwater investigation was to determine if VOCs were present in the groundwater above detection limits.

3.10.2 Each groundwater sample was analyzed for the list of VOCs presented in **Table 3-3** using USEPA SW-846, Method 8240.

3.10.3 Groundwater monitoring well E-3 (upgradient well) was sampled first. At monitoring well E-1 a triplicate groundwater sample was collected for QA/QC purposes. Two of the three samples were sent to the WCFS subcontract analytical laboratory (Quanterra) as a regular field

sample and as a replicate for QC purposes. The third sample was sent to USACE-SWD analytical laboratory as a QA sample. In addition, a rinsate blank was also collected at monitoring well E-1 and submitted for analysis. The rinsate blank was prepared by pouring ASTM Type II Reagent Grade Water through a decontaminated PVC tubing used in the collection of the groundwater sample. One trip blank was submitted with every cooler containing groundwater samples. Rinsate and trip blank results are presented in **Table 3-4**.

3.10.4 Field parameters measured during the purging of the groundwater monitoring wells included salinity, conductivity, temperature, and pH. A summary of the groundwater monitoring well purging parameters is presented in **Table 3-6**.

3.10.5 Prior to sampling, the field team measured and recorded the depth to water, depth to bottom of casing, and the casing radius on the sample collection field sheet. Additionally, the team calculated the height of the water column (feet), and standing volume (gallons) of water in the well to determine the quantity of groundwater to be purged.

3.10.6 All wells were purged prior to sampling with dedicated, positive gas displacement bladder pumps which were previously installed in the TTF monitoring wells. Purging of all wells continued until a minimum of 5 casing volumes were removed from each well and the field parameters of pH, temperature, and conductivity were stable. An Omega pH meter, a celsius thermometer, and a YSI scientific specific conductance meter were used to take groundwater parameter measurements. Groundwater parameters were recorded every one-half well volume during purging and the total volume of fluids purged from the well were recorded.

3.10.7 Following purging, the wells were sampled using the dedicated bladder pump. Vials for VOCs were filled in a manner that prevented air bubbles from forming in the vial after placement of the cap.

3.11 SAMPLE LABELING AND IDENTIFICATION

3.11.1 In order to track the samples from collection through shipment and analysis, a unique sample designation was used which reflected the sample location, the medium sampled, and the depth of the soil gas, and soil samples collected during the investigation. A twelve-digit sample

identification designation consisting of three four-character fields was used. All sample identification designations had the following format:

WSTF - hhhh - xaaa - bb

These designations represented the following:

WS = White Sand Missile Range
TF = Temperature Test Facility
hhhh = boring number or monitoring well number where:
- B001 = Shallow soil gas soil boring 001
- DB01 = Deep soil gas boring 01
- SB01 = Soil Boring 01 (for collection of soil samples)
- 00E1 = Groundwater Monitoring Well 00E1
- 0001 = Soil Gas Monitoring well 0001
- x = Indicates the sample medium where:
  - 1 = Groundwater
  - 2 = Soil
  - 5 = Soil gas

aaa = Depth in feet bgs
bb = Modifier (when needed) where:
- QA = a sample replicate for USACE-SWD lab
- QC = a sample replicate for Quanterra lab
- MS/MSD = Matrix Spike/Matrix Spike Duplicate
- EB = Equipment blank
- TB = Trip blank
- AB = Ambient blank

3.12 SAMPLE PACKING AND SHIPPING

3.12.1 After sample collection, the exterior of each sample container was rinsed with deionized water. The soil and groundwater samples for chemical analysis were chilled to 4°C by placing the samples in an ice bath. Prior to shipping, the samples were packed in an ice chest in a manner intended to minimize breakage. For the soil and groundwater samples collected for chemical analysis, ice was double bagged in sealed Ziplock™ bags and added to the sample shuttle to keep the samples at the required temperature.

3.12.2 All environmental samples were shipped using chain-of-custody protocol described in the CDAP (WCFS, 1995c). Copies of the completed chain-of-custody forms are presented in **Appendix B**.

3.13 EQUIPMENT DECONTAMINATION

3.13.1 Decontamination of equipment was performed to minimize potential cross-contamination of samples collected at the site. All decontamination water was containerized according to the IDWMP.

3.13.2 A decontamination pad was constructed of multiple layers of heavy plastic sheeting placed on a sloping area near the TTF. This pad was used to decontaminate the drill rig and its associated equipment (bits, HSAs, drill rods, etc.) during the field investigation. All drilling equipment was cleaned with a high-pressure hot water/steam-cleaning unit.

3.13.3 Decontamination of soil gas sampling rods took place on a special rack placed inside a visquene lined box for secondary containment. The rods were washed in an Alconox detergent and potable water wash, rinsed thoroughly with potable water, and allowed to air dry. The soil gas sampling probe point holders and tubing adapters were decontaminated by washing with an Alconox solution and rinsing with deionized water.

3.13.4 All other soil sampling equipment (split-barrel sampler, stainless steel bowls and knives, etc.) was decontaminated by washing in an Alconox detergent and potable water wash, rinsing thoroughly with potable water to remove the detergent, and rinsing thoroughly with distilled water as a final step. If the equipment was not used immediately the item was placed on plastic sheeting or stored in a clean plastic bag until used.

3.13.5 The water level indicator was decontaminated prior to each use during groundwater sampling. Decontamination procedures included rinsing with ASTM Type II or equivalent water and wiping the tape with an ASTM Type II water-moistened paper towel.

3.14 INVESTIGATION DERIVED WASTE MANAGEMENT

3.14.1 An Investigation Derived Waste Management Plan (IDWMP) was prepared for use during RFI field activities. The IDWMP was structured so that it could be used to manage the different waste streams generated during the performance of the various field investigations. The various waste generated included drill cuttings, decontamination fluids, purge fluids, visquene, personal protection equipment (PPE), and general trash.

3.14.2 General trash material was assumed to be non-contaminated and was placed in a dumpster provided by WSMR. All other materials were containerized in drums or 30 cubic yard rolloff dumpsters. The drums and dumpster contents were clearly and legibly labeled on the exterior of each container with a non-oxidizing, non-fading paint stick. Waste characterization and disposition was conducted by Dow Environmental on behalf of the Government.

3.14.3 Approximately 25 cubic yards of drill cuttings (soils) were generated during the RFI. Drill cuttings from borings at the TTF were managed in two covered dumpsters located near the contractor's yard at WSMR. At the completion of the investigative activities, the soils in the dumpsters were sampled by WCFS personnel and given to Dow Environmental for characterization. The soils were determined by laboratory analysis to be non-hazardous and suitable for disposal in the WSMR landfill. The drill cuttings were transported to the landfill and disposed on April 27, 1995. Analytical results from the waste characterization and the approval to dispose of the cuttings is presented in **Appendix D**.

3.14.4 The decontamination of the drill rig, drilling and sampling equipment, and the purging and sampling of groundwater monitoring wells resulted in the generation of wastewater. Wastewater from decontamination was containerized in eighteen DOT 17E closed-top 55-gallon drums. Purge water was containerized in four 35 gallon closed-top polyethylene drums. The material was turned over to Dow Environmental for characterization and disposal.

3.14.5 PPE generated waste included Tyvek™ coveralls, disposable nitrile and vinyl gloves, outer heavy duty vinyl and cotton work gloves. The PPE and visquene waste were placed in double plastic bags and containerized in fourteen DOT 17H open-top 55-gallon drums. The material was turned over to Dow Environmental for characterization and disposal.

3.15 SURVEYING PROCEDURES AND STANDARDS

3.15.1 As part of the field investigation activities, a location and elevation survey was conducted on the soil gas sampling locations and the soil boring locations. Each boring was topographically surveyed by a New Mexico Registered Land Surveyor to document horizontal and vertical boring coordinates using the state planar coordinate system and the National Geodetic Vertical Datum (NGVD) of 1927. Horizontal locations were accurate to +/- 1.0 foot and elevations were accurate to +/- 0.1 foot.

3.15.2 One soil boring (SB12) was added after surveying, the boring location was estimated by triangulation from three previously surveyed locations. Three soil borings (SB03, SB05, and SB11) were moved after surveying due to surface/subsurface obstructions. Distance and compass direction were measured from the staked/surveyed location and the surveyed locations were extrapolated accordingly. Survey information is presented in **Appendix E**.

4.0
NATURE AND EXTENT OF CONTAMINATION

4.1 INTRODUCTION

4.1.1 This section discusses the nature and extent of contamination based upon the analytical results of samples collected during the current and previous field investigations conducted at the TTF. The information presented here focuses primarily on the data generated during the recently completed RFI field work since it has not been presented to date.

4.1.2 Prior to use in this RFI Report, the new data were assessed with respect to the quality assurance objectives of accuracy, precision, completeness, comparability, sensitivity and representativeness. Data assessment findings for all the laboratory analytical data presented in this section were presented in the Data Validation and Summary Report (WCFS, 1995e). That report concluded that the data were scientifically valid and useable, as qualified by the WCFS data assessment and by the analytical laboratory. USACE reached the same conclusion in their Chemical Data Quality Review. A copy of the USACE Chemical Data Quality Review (USACE, 1995) is presented in **Appendix F**. Both the analytical and mobile labs performed in a technically acceptable manner.

4.2 SOIL GAS SURVEY

4.2.1 The soil gas investigation involved the collection and analysis of soil gas samples collected from the existing soil gas monitoring wells in June 1994, and the collection and analysis of shallow and deep soil gas samples in March 1995. The objectives of sampling the existing soil gas monitoring wells were to further define the contaminants of concern for the RFI and their current concentrations. The objectives of collecting the shallow and deep soil gas samples were to characterize the horizontal extent of VOC contamination in the vadose zone along the perimeters of the TTF building and the former evaporative pond as defined by the RCRA cap and to assist in determining the locations of the soil borings for the collection and analysis of soil samples.

4.3 SOIL GAS MONITORING WELL SURVEY - FIELD INVESTIGATION RESULTS

4.3.1 In June 1994, soil gas samples were collected from 17 existing soil gas monitoring wells. The soil gas monitoring wells were completed at various depths as described in Section 3.3.

4.3.2 A mobile laboratory containing a van mounted GC/PID/ECD was used to perform field screening for VOCs on the samples collected. The field screening results are presented in **Table 4-1**. In addition to the field screening, each sample was also submitted for off-site laboratory analysis by EPA Method TO-14. The off-site laboratory analytical results for the soil gas monitoring wells are presented in **Table 4-2**. In addition to detecting the VOCs that were observed during the field screening process, the off-site laboratory analyses identified several additional VOCs not detected in the field screening process.

4.3.3 The off-site laboratory analytical data reported nine different VOCs present in the soil gas samples collected from the existing soil gas monitoring wells. The VOCs included:

- 1,1-dichloroethane (1,1-DCA)
- 1,1-dichloroethene (1,1-DCE)
- chloroform
- 1,1,1-trichloroethane (TCA)
- tetrachloroethene (PCE)
- trichloroethene (TCE)
- methylene chloride (MeCl)
- trichlorofluoromethane (Freon 11)
- and trans-1,2-dichloroethene

4.3.4 **Table 4-3** shows the number of occurrences of each detected VOC, the average concentration of each detected VOC, and the maximum concentration of each detected VOC and its corresponding sample location for that sample based on the laboratory data.

4.3.5 Consistent with previous investigations, the VOC having the highest concentration in the soil gas samples collected from the soil gas monitoring wells was MeCl. As shown in **Figure 4-1**, the highest concentrations of MeCl were detected in soil gas monitoring wells 9202, 20, and 9201, which had concentrations of 42,000,000 ppb, 9,800,000 ppb, and 1,400,000 ppb, respectively. The screened intervals for these soil gas monitoring wells ranged from 72 to 115 feet bgs. Wells 9202 and 20 are located in the area southeast of the TTF building where

a 1,050 gallon interceptor tank was located before being removed in 1991. Well 9201 is located just west of the former evaporative pond. Lower concentrations of MeCl were detected in the shallow soil gas monitoring wells.

4.3.6 The remaining eight VOCs detected in the soil gas monitoring wells were generally observed at maximum concentrations three orders of magnitude lower than MeCl. Four of the VOCs were detected at concentrations ranging for 16,000 ppb to 26,000 ppb. These included PCE (16,000 ppb), TCE (17,000 ppb), 1,1-DCE (25,000 ppb) and Freon 11 (26,000 ppb). The remaining four VOCs were detected at concentrations ranging from 230 ppb (1,1-DCA) to 7,400 (1,1,1-TCA) compared to the maximum MeCl concentration of 42,000,000 ppb.

4.3.7 The remaining eight VOCs detected in the soil gas monitoring wells were generally located in two areas (**Figures 4-2, 4-3, 4-4, and 4-5**). One area is on the northeast side of the TTF building and is centered around soil gas monitoring well 27. A former relief valve, which was removed in 1991, was reportedly located in this area. A second area is located southeast of the TTF building and is centered around soil gas monitoring wells 19 and 22. The southwestern corner of the former evaporation pond, which was removed in 1988, was located in this area. For the remaining eight VOCs, the soil gas monitoring wells showed no significant variation between the wells completed at different depths. As shown in Figures 4-2, 4-3, 4-4, and 4-5, shallow soil gas monitoring wells 11 and 18 are in close proximity to the deep(er) soil gas monitoring wells 22, 23, and 9201. As with MeCl, it appears that the concentration of each of the remaining VOCs was a factor of its spatial relationship to its sources and not the depth of the soil gas monitoring well.

4.4 SOURCE OF VOC CONTAMINATION IN SOIL GAS MONITORING WELLS SOILS

4.4.1 The distribution of the contaminants in the soil gas samples suggest that the source location of the MeCl is different than the source location(s) for the other VOCs. The detected MeCl contamination suggests that the former interceptor tank was a primary source with the former evaporation pond a secondary source. The other VOCs detected in the soil gas monitoring wells suggests that both the former evaporation pond and the former relief valve were the potential sources for the contamination.

4.4.2 The spatial relationship of the shallow versus deep soil gas monitoring wells makes a quantitative statement regarding the changes in the concentration of MeCl with depth impossible. When available, the screen interval of each soil gas monitoring well was shown on the Figure 4-1. Lower concentrations of MeCl were detected in the shallow soil gas monitoring wells. However, it appears this factor is due to the spatial relationship to the sources of the MeCl and not to the depth of the soil gas monitoring wells. This conclusion was supported by the fact that the deep soil gas monitoring wells 14, 23, 25, and 27 (screen intervals greater than 70 feet bgs) had no MeCl detected in their soil gas samples. Whereas, shallow soil gas monitoring well 29 had 19 ppm of MeCl detected in its soil gas sample. The MeCl detected in well 29 appears to correlate into the MeCl plume detected in the deep soil gas monitoring wells located to the west.

4.5 SHALLOW SOIL GAS SURVEY - FIELD INVESTIGATION RESULTS

4.5.1 In March 1995, 100 shallow soil gas samples were collected using a Geoprobe™ Model 8-M. Each soil gas sample was analyzed for VOCs in the field using a truck (mobile laboratory) mounted GC/MS as discussed in Section 3.4. The shallow soil gas samples were collected from a depth of approximately 20 feet bgs. This depth corresponds to the estimated depth of the bottom of Alluvial Unit 1, which is defined as a well graded sand, sandy gravel and gravely sand which extends to approximately 20 feet bgs (GCL, 1987). **Figure 1-2** illustrates the locations of the shallow soil gas borings. The GC/MS field analytical results are presented in **Table 4-4**.

4.5.2 Six different VOCs were detected in the shallow soil gas survey at the TTF. They include:

- 1,1-DCE
- TCA
- PCE
- TCE
- Freon 11 (Trichlorofluoromethane)
- Freon 113 (1,1,2 Trichloro-1,2,2-trifluoroethane)

4.5.3 **Table 4-5** shows the number of occurrences of each detected VOC, the average concentration of each detected VOC, and the maximum concentration of each detected VOC and its corresponding sample location for that sample.

4.5.4 Freon 11 was the most common VOC detected in the shallow soil gas survey at the TTF. The maximum concentrations were observed in B-042 (67 μg/L) and B-043 (60 μg/L) located on the southeast side of the TTF building. B-082 (54 μg/L) and B-096 (50 μg/L) were the next highest detections of Freon 11. These borings are located to the northeast of the TTF building. All other detections were less than 50 μg/L. **Figure 4-6** presents an isopleth drawing of the Freon 11 concentrations. As shown in **Figure 4-7**, Freon 113 was colocated with the Freon 11 in the area south of the TTF building at a maximum concentration of 169 μg/L. Freon 113 was detected in 6 of 100 shallow soil gas samples and all the detections were south of the building as shown on **Figure 4-7**. The limits of the Freon 11 and Freon 113 soil gas anomalies appear to be defined.

4.5.5 The remaining four VOCs detected in the shallow soil gas survey of the TTF all have similar areal extent to that of Freon 11. Except for 1,1-DCE, all of the other detected VOCs in the shallow soil gas survey (TCA, PCE, and TCE) had concentrations less than or equal to 10 μg/L. The maximum detected concentration for 1,1-DCE detected was 15 μg/L which occurred in a shallow soil gas boring (B-039). Boring B-039 was located in the outside row of the shallow soil gas survey south of the TTF building. Analyses of soil samples collected from the deep soil boring SB09, which was located approximately 30 feet south of B-039, did not detect any VOC contamination. For this reason, the areal extent of all of the detected VOCs in the shallow soil gas survey appear to be defined.

4.6 PREVIOUS SHALLOW SOIL GAS INVESTIGATIONS

4.6.1 There is a good correlation between the results of the shallow soil gas survey performed in this RFI and an earlier shallow soil gas survey performed by GCL (GCL, 1987). In the GCL investigation, soil gas samples were collected from 50 locations at sample depths which ranged from 5 to 6 feet bgs (**Figure 4-8**). Though the GCL data was from a shallower depth, the areal extent and the concentrations of the detected VOCs in the GCL soil gas survey correlated well with the shallow soil gas results acquired during this field investigation. The GCL data indicated that soil contamination from MeCl, TCE, TCA, and PCE has occurred in the area east

of the TTF building (**Figure 4-9**). In addition, GCL also tentatively identified Freon 11 in high concentrations in the same general area. The GCL data indicated that two possible distinct sources of the VOC contamination appeared to exist east of the TTF building. One source appeared to be directly related to the former evaporation pond. This anomaly had concentrations of MeCl up to 750 μg/L in the shallow soil gas along with other chlorinated hydrocarbons (TCA, TCE, PCE). The second possible source occurred near the former relief valve approximately 100 feet northeast of the TTF building. This feature had no MeCl above its detection limit of 20 μg/L, but did have TCA, TCE, PCE and the tentatively identified Freon 11 compound present.

4.7 SOURCE OF VOC CONTAMINATION IN SHALLOW SOIL GAS

4.7.1 Based on the results of the shallow soil gas samples, the source of the Freons and other chlorinated hydrocarbons detected in this RFI appears related to the former interceptor tank, former relief valve, and former evaporation pond or their associated piping.

4.7.2 The VOCs northeast of the TTF building appears related to the contamination detected by GCL which was interpreted to be associated with the former relief valve. Comparing the shallow soil gas survey data collected in the GCL investigation with that collected in this investigation, the anomalies detected during this RFI appear to confirm the outer limits of the soil gas anomalies reported by GCL.

4.7.3 The areal extent of detected VOCs on the south side of the TTF building could indicate a possible source of contamination from within the building. Bath & Associates, Inc. (1989) performed pneumatic pressure test on the piping system within the TTF building that did indicate the presence of leaks. However, the contamination detected in soil boring SB12 suggests that VOCs detected in the shallow soil gas are more likely related to a former interceptor tank or its associated piping.

4.7.4 MeCl was not detected in any of the RFI shallow soil gas samples. As stated previously, one objective of this RFI was to define the lateral extent of MeCl contamination at the TTF. The results of the shallow soil gas investigation conducted during this RFI confirm that the lateral extent of MeCl in the shallow soils has been defined.

4.8 DEEP SOIL GAS SURVEY RESULTS - FIELD INVESTIGATION RESULTS

4.8.1 In March 1995, 9 deep soil gas samples were collected using the Geoprobe™ unit in combination with a HSA drilling rig. Each soil gas sample was analyzed for VOCs in the field using a truck (mobile laboratory) mounted GC/MS as discussed in Section 3.5. Deep soil gas samples were collected from the lower part of Alluvial Unit 3, which is a poorly cemented, gravelly sand. The average depth of the deep soil gas sample was 41 feet bgs. **Figure 1-2** illustrates the locations of the 9 deep soil gas borings. The GC/MS field analytical results are reported in **Table 4-4**.

4.8.2 Seven different VOCs were detected in the deep soil gas survey at the TTF including:

- 1,1-DCE
- TCA
- PCE
- TCE
- Chloroform
- Freon 11
- Freon 113

4.8.3 **Table 4-6** shows the number of occurrences of each detected VOC, the average concentration of each detected VOC, and the maximum concentration of each detected VOC and its corresponding sample location.

4.8.4 The presence of the two detected Freons in the deep soil gas survey parallel their areal occurrence in the shallow soil gas survey at the TTF. Freon 11 was the most common VOC detected in the deep soil gas survey at the TTF detected in 6 of 9 samples analyzed. **Figure 4-10** illustrates that the highest concentrations of Freon 11 in the deep soil gas survey were located northeast of the TTF building (maximum 74 μg/L) and adjacent to the southeast side of the TTF building (maximum 83 μg/L) paralleling the findings of the shallow soil gas survey. In the deep soil gas survey, Freon 113 was associated with the Freon 11 in the area adjacent to the southeast side of the TTF building at a maximum concentration of 20 μg/L as shown in **Figure 4-10**. However, it should be noted that Freon 113 was only detected in 1 of 9 samples analyzed.

4.8.5 The remaining five detected VOCs in the deep soil gas survey at the TTF ranged from 2 μg/L to 36 μg/L and have a similar areal extent to that of the Freon 11. Except for Freon 113, the detected VOC concentrations were at slightly higher concentrations in the deep soil gas survey than detected in the shallow soil gas survey.

4.8.6 The deep soil gas samples were collected from the lower part of Unit 3. **Figure 4-10** also shows the individual VOC concentrations detected in the soil gas samples collected from soil gas monitoring wells 11, 18 and 29, those completed in Unit 3, and in the deep soil gas borings. As shown by **Figure 4-10**, the VOC detected in the deep soil gas borings were lower than the individual VOC concentrations detected in the nearest soil gas monitoring wells which are located within the area of the RCRA cap. This factor indicates that the areal extent of VOCs detected in the soil gas monitoring wells completed in Unit 3 has been defined.

4.8.7 In addition to the 9 deep soil gas samples collected, one soil sample was collected from each of the 9 deep soil gas borings. The soil samples were collected from the lower part of Alluvial Unit 3 at a depth approximately one foot below the soil gas sample depth. Each soil sample was analyzed for the list of VOCs presented in **Table 3-3** using SW-846 Method 8240. Only one of these soil samples had a VOC present above its detection limit Deep soil gas boring DB04 had 12 µg/kg of acetone at a depth of 47 feet bgs. It should be noted that the detection limit for acetone in the deep soil gas sample soil borings ranged from 10 to 12 μg/kg. **Table 4-7** presents the results of the deep soil gas boring soil samples.

4.9 SOURCE OF VOC CONTAMINATION IN THE DEEP SOIL GAS

4.9.1 Based on the results of the deep soil gas samples and the soil gas monitoring well samples, the sources of the Freons and other chlorinated hydrocarbons detected in this RFI appear to be related to the former interceptor tank, former relief valve, and former evaporation pond or their associated piping.

4.9.2 The VOCs detected in the shallow and deep soil gas samples appear to have a common source. The VOCs detected in the deep soil gas northeast of the TTF building appear related to the former relief valve. The VOCs detected south of the TTF building may be related to a source from within the building, but the contamination detected in boring SB12 indicates that a more likely source is the former interceptor tank or its associated piping.

4.9.3 In addition, the deep soil gas data indicate that the extent of VOC contaminants has been defined and that they have not spread laterally away from the RCRA cap.

4.10 SOILS

4.10.1 Twelve deep soil borings were drilled for the collection and analysis of soil samples. The objective of the soil boring investigation was to characterize the vertical and horizontal extent of VOCs in the unsaturated soil along the perimeter of the TTF building and the former evaporative pond as defined by the RCRA cap. **Figure 1-2** illustrates the locations of the twelve deep soil borings.

4.10.2 Eleven soil borings (SB01 through SB11) were drilled to an average depth of 80 feet bgs. These 11 borings were drilled into the upper part of Unit 9 as defined by GCL (GCL, 1987). One additional boring (SB12) was drilled to a depth of approximately 152.5 feet bgs to evaluate the vertical extent of VOCs near the soil borings SB08 and SB10 and the former interceptor storage tank. Borings SB08 and SB10 had the highest VOC concentrations detected using the on-site FID during drilling.

4.10.3 Soil samples were analyzed for the list of VOCs in **Table 3-3** by SW-846 Method 8240. **Table 4-8** presents the analytical results and **Table 4-9** shows the number of occurrences of each detected VOC, the average concentration of each detected VOC, and the maximum concentration of each detected VOC and its corresponding sample location for that sample.

4.11 SOIL ANALYTICAL RESULTS

4.11.1 Three different VOCs were detected in the soil samples collected for analyses. They included MeCl, acetone, and toluene. **Figure 4-11** shows the individual VOC concentrations detected in the soil samples collected from the deep soil borings.

4.11.2 MeCl was detected in 6 of the 111 soil boring samples analyzed at concentrations ranging from 6 μg/kg to 1,400 μg/kg. Three of the six detections were in SB12 from 72 to 95 feet bgs in concentrations ranging from 59 μg/kg to 1,400 μg/kg. The maximum MeCl concentration observed (1,400 μg/kg) was in soil boring SB12 at 95 feet bgs. MeCl also was

detected once each in soil borings SB07, SB08, and SB10 at lower concentrations that ranged from 6 to 40 μg/kg.

4.11.3 Acetone was detected in 11 of the 111 soil boring samples at concentrations ranging from 12 μg/kg to 110 μg/kg. SB06, SB07, SB08, SB09, SB10, and SB12 exhibited acetone above the detection limit. The maximum acetone concentration (110 μg/kg) was detected in soil boring SB12 at 82 feet bgs. It should be noted that 7 of the acetone detections were between 12 μg/kg and 15 μg/kg. The acetone detection limit was 10 μg/kg.

4.11.4 Toluene was detected in one soil sample from soil boring SB08 at 6.7 μg/kg at 74 feet bgs.

4.12 PREVIOUS SOIL INVESTIGATIONS

4.12.1 GCL (1987) installed 19 boreholes to define the vertical extent of contamination as well as to more precisely define the site stratigraphy. Soil samples taken from the borehole were analyzed by the WSMR chemical laboratory for MeCl, TCA, TCE, and PCE. The results of the GCL study showed that MeCl was the compound present in the subsurface soils with the highest frequency of detection and highest concentrations. TCA, TCE and PCE were also present but generally at concentrations of an order of magnitude lower than MeCl. GCL concluded that the primary MeC1 plume was centered beneath the southwest corner of the evaporation pond and a secondary plume was centered beneath the expansion tanks adjacent to the east wall of the TTF. The maximum MeCl concentration observed within the primary plume was 678 ppm at a depth of 65 to 75 feet bgs. The secondary plume had a maximum MeCl concentration of 18 ppm at approximately the same depth. Maximum concentrations were centered in the stratigraphic units containing a high percentage of clay and fines.

4.12.2 GCL also reported that a small amount of MeCl had penetrated to depths greater than 100 feet bgs. MeCl was observed at depths between 137.5 feet and 195 feet bgs in borehole 22. The maximum concentration reported below 100 feet bgs was 0.099 ppm at a depth of 152.5 feet bgs. Although these minor concentrations were observed at depths greater than 100 feet bgs, GCL concluded that downward spread of the contamination had been restricted by the low-permeability clay rich alluvial layer found at depths of 50 to 100 feet bgs.

4.13 SOURCE OF VOC CONTAMINATION IN SOILS

4.13.1 The source of the MeCl contamination detected in the soil during the RFI appears related to the former relief valve (SB7) and the former interceptor tank (SB12). The vertical extent is limited to approximately 100 feet bgs. The source of the acetone contamination detected during the RFI appears correlated with the occurrence of MeCl in the soil samples. This correlation suggests that the acetone source also is related to either the former relief valve or former interceptor tank. However, acetone was not detected in the analysis of the soil gas monitoring wells or in the shallow and deep soil gas borings. In addition, there are no known historical uses or sources for the acetone at the TTF.

4.14 GROUNDWATER

4.14.1 In March 1995, groundwater samples were collected from the four existing RCRA groundwater monitoring wells and analyzed by EPA Method 8240 for VOCs. The objective of the groundwater investigation was to determine if VOCs were present in the groundwater above detection limits. **Figure 1-2** illustrates the locations of the four existing RCRA monitoring wells.

4.14.2 Groundwater samples were collected from all of the RCRA groundwater monitoring wells using dedicated bladder pumps. Results of water quality parameters measured during sampling are presented in **Table 3-6**. No VOCs above their detection limits were found in the groundwater at the TTF. **Table 4-10** presents the results of the groundwater samples.

4.14.3 These results are consistent with the results of all previous sampling events which have shown non-detectable levels of VOCs in the groundwater.

4.15 SUMMARY OF CONTAMINATION DETECTED AT TTF

4.15.1 The results of the shallow soil gas, deep soil gas, and soil analytical data collected during this RFI confirm that the lateral extent of VOC contamination has been defined. The data indicate that the VOC contamination is limited primarily to the area under the RCRA cap and the paved and building-covered areas at the site.

4.15.2 Consistent with previous investigations, the VOC having the highest concentration in the soil gas and soil samples collected was MeCl. The remaining detected VOCs concentrations in the soil gas and soil samples are orders of magnitudes lower than the MeCl concentrations.

4.15.3 The sources of the VOC contamination appear to be the former evaporation pond, former relief valve, and former interceptor tank. All of these sites are presently covered by the RCRA cap. However, the low concentrations of VOC detected in the shallow and deep soil gas and soil samples along the south side of the TTF building could be related to a source from within the building.

4.15.4 No VOC contamination was detected in the groundwater at the TTF.

5.0
CONTAMINANT FATE AND TRANSPORT

5.1 INTRODUCTION

5.1.1 The fate of a contaminant after its release into an environmental medium is a function of its physical and chemical properties as well as site-specific characteristics such as soil organic content. A contaminant fate and transport analysis includes an evaluation of the mobility and persistence of the contaminant in environmental media and potential migration pathways as influenced by site characteristics. Such an analysis utilizes applicable information in order to assess a contaminant's transport within and across media and the effects of natural attenuation, degradation and other physical, chemical and biological transformation processes. The contaminant fate and transport analysis, along with site-specific sampling data, identifies currently impacted environmental media and those with a potential to be impacted. This section presents a qualitative assessment of the fate and transport of the contaminants found at the TTF with particular emphasis on MeCl.

5.1.2 This section begins with a discussion on general contaminant persistence and mobility processes followed by a contaminant-specific presentation of the properties that affect fate and transport. The potential migration pathways and mechanisms are then evaluated followed by a discussion on contaminant fate and transport conclusions.

5.1.3 Historical information indicates that the contaminant of primary concern released to the environment at the TTF is MeCl. Previous investigations conducted by WSMR at the TTF had also identified the presence of a MeCl plume in the unsaturated zone along with low concentrations of other solvents beneath the former evaporation pond and its immediate vicinity. Findings from the March 1994 and June 1995 WCFS field investigation are consistent with previous investigations and confirm that MeCl was the most commonly detected compound at elevated concentrations in soils and soil gas at the TTF and that other VOCs were present at lower concentrations. The other contaminants detected by WCFS were generally detected at concentrations 2 to 3 orders of magnitude lower than MeCl in soil gas and/or soil samples. As a result, the focus of this qualitative discussion on contaminant fate and transport is MeCl, with

relevant physical and chemical information being presented for the other detected contaminants for the sake of completeness.

5.1.4 In summary, the WCFS investigation revealed the presence of the following contaminants in soil and soil gas at the TTF.

Soil Gas Monitoring Well Sampling	Shallow Soil Gas Sampling (20 feet bgs)	Deep Soil Gas Sampling (Base of Unit 3 46 to 51 feet bgs)	Deep Soil Sampling (10 feet bgs to 152.5 feet bgs)
1,1-DCA 1,1-DCE Chloroform 1,1,1-TCA PCE TCE MeCl Freon 11 trans-1,2-DCE	1,1-DCE 1,1,1-TCA PCE TCE Freon 11 Freon 113	1,1-DCE 1,1,1-TCA PCE TCE Chloroform Freon 11 Freon 113	MeCl Acetone Toluene

5.1.5 Groundwater samples did not indicate the presence of any of the contaminants analyzed.

5.2 CONTAMINANT PERSISTENCE AND MOBILITY

5.2.1 This section discusses the general physical and chemical properties which influence persistence and mobility of contaminants in environmental media. A contaminant-specific discussion of the relevant physical and chemical properties of MeCl and the other VOCs detected at the TTF is presented in **Appendix G**. The relevant physical and chemical properties are presented in **Table 5-1**.

5.2.2 **Volatilization** - Volatilization is the process of conversion of a contaminant from the aqueous or liquid phase to the gaseous phase. Contaminants affected by this process can be transferred into a gaseous form and subsequently mix or disperse in the vadose zone (soil gas) or air. Volatilization is a function of the physico-chemical properties of the contaminant, and depending on the medium in which the contaminant is present, volatilization may be a function of one or more of the following:

- solubility
- vapor pressure
- Henry's Law constant
- adsorption

5.2.3 Environmental characteristics including water content, temperature, and atmospheric conditions, also affect volatilization. Typically, contaminants with a Henry's Law constant greater than $1x10^{-3}$ atm-m^3/mol are considered to be highly volatile, while those with a Henry's Law constant less than $1x10^{-7}$ atm-m^3/mol are considered to be less volatile than water. Contaminants detected at the TTF have Henry's Law constant ranging from $5.26x10^{-1}$ atm-m^3/mol (Freon 113) to $2.68x10^{-3}$ atm-m^3/mol (MeCl) which places them all in the highly volatile category. In terms of vapor pressure, contaminants with vapor pressures greater than $1x10^{-2}$ millimeters of mercury (mmHg) are considered to be highly volatile whereas contaminants with vapor pressures less than $1x10^{-6}$ mmHg are considered to be the least volatile. Contaminants detected at the TTF have vapor pressures ranging from 18.49 mmHg (PCE) to 802 mmHg (Freon 11) which places them all in the highly volatile category. MeCl has a vapor pressure of 434.9 mmHg.

5.2.4 **<u>Water Solubility</u>** - Water solubility exerts a strong influence over the persistence and mobility of contaminants. Water solubility is defined as the maximum amount of a contaminant that can dissolve in pure water at a given temperature. Generally, the higher the water solubility, the greater is the subsurface mobility of a contaminant. All organic contaminants are soluble in water to some extent. Typical water solubilities for organic contaminants range from 0.001 mg/L to 100 mg/L at ambient temperatures, with values exceeding 100 mg/L for some contaminants. MeCl has a water solubility of 13,000 mg/L at 25°C giving it the highest water solubility of the contaminants detected at the TTF except for acetone which is totally soluble in water.

5.2.5 **<u>Soil Adsorption</u>** - The term organic carbon partition coefficient (K_{oc}) defines the capacity of an organic contaminant to adsorb onto soils. K_{oc} is mathematically defined as the ratio of the amount of contaminant adsorbed per unit weight of organic carbon in the soil to the concentration of the contaminant in solution at equilibrium. Typical K_{oc} values range from 1 ml/gm to $1x10^7$ ml/gm. Generally, the higher the K_{oc}, the greater is the capacity for adsorption of the contaminant onto soils. The K_{oc} for MeCl is 8.8 ml/gm. K_{oc} values for the other contaminants detected at the TTF range from 22 ml/gm (acetone) to 364 ml/gm (PCE).

5.2.6 A second property which is often used to evaluate the adsorption capacity of organic contaminants is the octanol-water partition coefficient (K_{ow}). K_{ow} defines the distribution of the contaminant between an aqueous phase and a nonaqueous organic phase and is reported as a log number. Generally, the higher the log K_{ow}, the lower the solubility and mobility of the contaminant. Organic contaminants with a high K_{ow} tend to bioaccumulate. Organic contaminants with a log K_{ow} less than 4 exhibit high water solubility and, therefore, high mobility and lower bioaccumulation potential. Log K_{ow} values for the contaminants detected at the TTF range from -0.24 (acetone) to 3.40 (PCE). MeCl has a log K_{ow} of 1.25.

5.2.7 **Biodegradation** - Microorganisms that are naturally occurring in soils and water are capable of breaking down organic contaminants. The rate of such a break-down or degradation is influenced by factors such as: nature and size of the microbial population, presence of a suitable substrate or energy source, pH, temperature and moisture content of the medium, presence of inert elements, availability of essential nutrients, concentration of the organic contaminant, availability of oxygen, adsorption, etc. Biodegradation rates are measured in terms of a half-life of an organic contaminant which is defined as the time required to reduce the concentration of the contaminant in half.

5.2.8 **Bio-uptake** - Plants absorb or assimilate a number of contaminants which are then degraded, metabolized or otherwise rendered harmless. Uptake by plants in the root zone can affect the mobility and persistence of contaminants in environmental media. Certain contaminants are not affected by the degradation and metabolic processes occurring in plants and as such tend to accumulate in plants. Such contaminants are typically very stable, exhibit low water solubility and high lipid and fatty tissue solubility. These persistent contaminants have a low rate of elimination and once the host plant dies, they are released into the surrounding soils. This process is of minor significance at the TTF as this area is an active facility and the area of interest is covered by a RCRA cap, and vegetation in the area of contamination is not present. Root systems of vegetation outside the area of contamination would generally not be expected to extend into the contamination.

5.2.9 **Aqueous Dispersion** - Transport of dissolved contaminants by the bulk motion of water is termed advection. Hydrodynamic dispersion causes the contaminant to spread out from any advective path. Hydrodynamic dispersion is a natural process which causes contaminant dilution. Hydrodynamic dispersion occurs because of mechanical mixing and molecular

diffusion. Mechanical mixing occurs due to differing water velocities within pore spaces caused by friction between the water and soil grains; differing pore sizes in the soil through which water is moving resulting in differing velocities; and differing flow path lengths caused by tortuous route and the branching and intermeshing of flowpaths.

5.2.10 In addition to mechanical dispersion, diffusion processes also occur due to ionic or molecular concentration gradients. However, diffusion is not as predominant as mechanical dispersion, and it only occurs at points of low groundwater velocity.

5.2.11 Aqueous dispersion results in attenuation of contaminants by dilution and spreading of the plume. This helps other attenuation processes such as adsorption and biodegradation due to increased exposure to soils, nutrients and biomass.

5.2.12 In addition to the main processes described above, other processes also occur which could influence the fate, mobility and persistence of contaminants in environmental media. These processes include photolysis, oxidation and hydrolysis, and are estimated to have minor impacts on MeCl at the TTF.

5.3 POTENTIAL MIGRATION PATHWAYS AND MECHANISMS

5.3.1 The MeCl that is present beneath the former evaporation pond at the TTF could potentially migrate by several mechanisms and pathways depending on the composition of the environmental media, characteristics of the media and inter-relationship of the media. The mechanisms by which MeCl could potentially migrate via air, soil gas, surface water and groundwater include:

- Volatilization from exposed contaminated surface soil or shallow subsurface soil, contaminated surface water and/or contaminated groundwater and subsequent airborne transport
- Fugitive dust emissions
- Contact between surface water and contaminated surface soil resulting in contaminated surface water runoff

- Leaching of contaminants by infiltrating water with possible vertical migration to groundwater

- Vertical transport in the vadose zone resulting from contaminant releases due to spills and/or discharge

- Soil gas transport in subsurface soils

- Migration of any contamination reaching the saturated zone

5.3.2 The potential transport mechanisms listed above are evaluated in the following sections in terms of air, surface water, soil gas, and groundwater migration pathways. However, because of current site conditions which include a RCRA cap and other areas covered by the TTF building and paved staging and parking areas, the leaching of contaminants from subsurface soil into groundwater and their potential lateral and vertical migration pathways in the vadose zone are considered the most significant. In addition, the TTF was redesigned in 1991 and MeCl was replaced in the system. Consequently, the potential for on-going releases of MeCl from TTF has been eliminated and the only MeCl potentially available for environmental transport at the present time is MeCl which was released prior to 1991. Although lateral and vertical transport of residual MeCl in the vadose zone is possible given the porous nature and low moisture content of upper subsurface soils, the ongoing soil gas remediation by means of vapor extraction would limit such migration and reduce VOC concentrations in the subsurface.

5.3.3 **<u>Air Transport Mechanisms</u>** - The primary mechanisms by which contaminants at the TTF could enter the air are:

- volatilization from contaminated soil
- volatilization from contaminated surface water
- volatilization from contaminated groundwater
- wind erosion

5.3.4 To date, the groundwater has been shown to be free of contamination and removal of MeCl from the secondary cooling system and closure of the evaporation pond removed surface water volatilization as a source of MeCl to the air. In addition, the potential for volatilization from contaminated surface soil is minimal for two reasons. Any concentrations of contaminants in surface soils rapidly decrease after release due to the highly volatile nature of the contaminants. Currently, the RCRA cap covers the location of the former evaporation pond

where the primary release of MeCl occurred. Therefore, the RCRA cap almost completely eliminates any exposed areas of potentially contaminated surface soil. The potential for fugitive dust generation is minimal for the same two reasons discussed above. Therefore, potential for air transport of contaminants at the TTF is negligible.

5.3.5 Beginning in March 1995, a vapor extraction system has been in place for removal of MeCl and other detected contaminants from the vadose zone in the area of the former evaporation pond. Therefore, the only potential remaining air pathway is a leak in the vapor extraction system. The potential for a leak is of minor concern in a properly designed, constructed and operated system such as the one at the TTF. Consequently, air transport mechanisms have been eliminated as potential migratory pathways of concern for contaminants at the TTF.

5.3.6 **Surface Water Transport Mechanisms** - The WSMR area has been classified as a dry area with an average annual rainfall of approximately 10.8 inches. Most rain typically occurs as late summer thunderstorms with some flash-flooding occurring from intense localized storms. The TTF area is not located within the 100-year floodplain and stormwater generally drains via surface depressions to the south. As a result very little surface water exists on WSMR.

5.3.7 The redesign of the TTF and removal of MeCl from the secondary cooling system eliminated a potentially active source of surface water releases. The field sampling investigations conducted over the years at the TTF indicate that MeCl is primarily confined to the deeper subsurface soils at the TTF. Moreover, the RCRA cap covering the former evaporation pond area minimizes the likelihood of stormwater runoff being contaminated.

5.3.8 In addition to the lack of potential surface water exposures as discussed above, the physical and chemical characteristics of MeCl preclude its presence in surface water for long periods of time even if it were present. MeCl is not a persistent contaminant due to its high vapor pressure and Henry's Law constant and has a half-life of only 3 to 5.6 hours in surface water with rapid evaporation being the primary removal mechanism.

5.3.9 Since the potentially contaminated surface soil associated with the former evaporation pond has been capped there is no potential for surface water to come into contact with

contaminated soils and the surface water transport mechanisms have been eliminated as potential migratory pathways of concern for contaminants at the TTF.

5.3.10 **Groundwater Transport Mechanisms** - As previously discussed, several field investigations have been conducted at the TTF in order to characterize the nature and extent of contamination at the facility. Numerous soil gas, soil and groundwater samples have been collected and analyzed for MeCl and other volatile organics (including Freons) suspected to have been released to the environment.

5.3.11 Field investigation findings have consistently indicated the presence of MeCl and other halogenated hydrocarbons in soil gas and subsurface soils in the vicinity of the TTF. It is important to note that to date none of the contaminants detected in soil and soil gas have been detected in the groundwater samples collected from the existing RCRA monitoring wells.

5.3.12 Based on the results of the field investigations, MeCl is known to be limited to subsurface soils in the vadose zone at depths generally above 100 feet bgs although some low levels of MeCl were detected at depths of greater than 100 feet bgs (GCL, 1987). The WCFS investigation concluded that there has been minimal lateral migration at the depths investigated.

5.3.13 Since the MeCl beneath the former evaporation pond is generally confined to subsurface soils (74 to 95 feet bgs) in the vadose zone at a distance of approximately 100 feet above groundwater, vertical migration through the unsaturated zone, and horizontal and vertical groundwater transport in the saturated zone are the primary mechanisms of interest. Infiltration of rainwater through contaminated unsaturated zone soils could potentially transport contaminants to groundwater. However, the combination of the RCRA cap and low rainfall associated with the desert climate, virtually eliminate the potential for water to infiltrate from the ground surface through the area of contamination to the saturated zone. Therefore, there is limited potential for MeCl to desorb from contaminated subsurface soils to infiltrating surface water. If contaminants were present in the infiltrating water they would be subject to degradation processes as the water migrates through the unsaturated zone.

5.3.14 It should be noted that prior to placement of the RCRA cap, process wastewater contaminated with MeCl was released when the HDPE liner in a surface evaporation pond located east of the TTF building failed. There is a potential that these fluids are currently

migrating through the unsaturated zone and/or some quantity of these fluids have reached the saturated zone although groundwater sampling conducted to date indicates that VOCs potentially migrating through the unsaturated zone have not impacted groundwater.

5.3.15 The potential for unsaturated zone and saturated zone migration cannot currently be quantified with a meaningful degree of certainty for the following reasons:

- The fluid release volume and date are unknown
- Material properties necessary to quantify partially saturated flow through the unsaturated zone for the nine geologic units including saturated hydraulic conductivity, residual water content, saturated water content, and shape factor (which defines the relationship between partially saturated hydraulic conductivity and moisture content) are not defined at the TTF
- Data are not available to calibrate and verify groundwater models which could be used to represent flow and transport

5.3.16 Overall, the potential for unsaturated zone and saturated zone migration can be qualified as low for the following reasons:

- Contaminants have not been detected in groundwater samples collected from existing monitoring wells at the TTF
- The vapor extraction program is mitigating the potential for lateral and vertical migration of MeCl by removing VOC mass from the subsurface
- Only low levels of MeCl have been reported below the estimated depth of Unit 9 including 0.099 mg/kg of MeCl at a depth of 100 feet bgs and 2.3 mg/kg of MeCl at a depth of 120 feet bgs reported by GCL and Cortez III, respectively
- Unit 9 is clay and may be acting to some degree as a barrier to vertical migration
- Unit 9 and lower units as observed in boring SB12 are estimated to have a fairly high organic carbon content which is conducive to MeCl adsorption

6.0
HEALTH AND ENVIRONMENTAL EFFECTS ANALYSIS

6.1 INTRODUCTION

6.1.1 A Health and Environmental Effects Analysis (HEEA) is an integral part of the RFI process. The intent of the HEEA is to evaluate the impact of a release on human health and the environment. As part of this analysis, it is critical to evaluate the extent of any release in terms of lateral and vertical migration since this may be the determining factor in concluding whether or not an exposure pathway is complete. If an exposure pathway is not complete, the threat to human health and the environment is lacking even though there may have been a release. A complete pathway is defined by having four elements:

- a source and mechanism of a release
- a transport medium
- a point of contact between the receptor and contaminated medium
- in route of exposure (ingestion, direct contact or inhalation)

6.1.2 For an exposure pathway to be complete, all four elements and a receptor must be present.

6.1.3 The following background information provides evidence of a release and also provides an indication of the lateral and vertical extent of the release.

6.2 BACKGROUND

6.2.1 Over a period of several years prior to 1991, MeCl was available for release into the environment at the TTF. The resultant MeCl migrated vertically in subsurface soil to a depth of approximately 100 feet bgs. In 1991, use of MeCl as a refrigerant at the site was discontinued and existing sources of MeCl (piping and storage tanks) were removed. A RCRA cap was placed over the area surrounding the contaminated soil in 1988. The TTF is currently an operating facility with on-site workers.

6.2.2 As part of this RFI at the TTF, soil gas, soil, and groundwater samples were obtained at the TTF to further characterize the nature and extent of the contamination. Results from this investigation confirmed previous findings including:

- Contamination of soil in the vicinity of the TTF consisted of MeCl and much lower concentrations of other VOCs.
- The maximum depth of the MeCl contamination observed during this investigation was approximately 100 feet bgs (SB12) although GCL and Cortez III observed contamination at depths below 100 feet bgs.
- The groundwater table (at approximately 200 feet bgs) has not been contaminated by VOCs. In addition, the RFI sampling program provided new information indicating that the MeCl plume in subsurface soil had not migrated laterally beyond the perimeter of the RCRA cap.

6.2.3 An interim removal action (soil vapor extraction) at the site was initiated in March, 1995, in an effort to clean up the soil beneath the cap and to prevent future MeCl contamination of groundwater (Dow, 1995). Presently, a soil vapor extraction system is removing and treating contaminated soil gas from beneath the RCRA cap. A tentative cleanup goal of 50 mg/kg MeCl in soil has been set (Dow, 1995).

6.3 PURPOSE OF AND APPROACH TO THE ANALYSIS

6.3.1 The purpose of this health and environmental effects analysis is to:

- Use up-to-date site data on nature and extent of contaminant levels to evaluate current or potential future impacts of the site on human and ecological receptors;
- Make recommendations regarding cleanup levels for media of concern; and
- Evaluate the potential need for a Corrective Measures Study (CMS) for each medium of concern.

6.3.2 The approach to this analysis consists of the following components:

- Identification of chemicals of concern (COCs)

- A review of contaminant fate and transport that potentially relates to exposure
- A qualitative exposure assessment, including development of human and ecological site conceptual exposure models (SCEM), identification of potentially exposed human and ecological populations, and evaluation of potential exposure routes
- A qualitative assessment of risk to human and ecological populations
- A qualitative analysis of uncertainty associated with the assessment of risk
- Summary
- Recommendations

6.4 IDENTIFICATION OF CHEMICALS OF CONCERN (COCS)

6.4.1 COCs are chemicals that are present in environmental media that are related to site activities and could contribute significantly to overall risk. COCs are the focus of fate and transport assessment, risk assessment, and remedy selection. This section identifies and discusses the COCs in soil and groundwater at TTF.

6.5 IDENTIFICATION OF COCs IN SOIL

6.5.1 The surrounding area is now covered by a RCRA cap. Contamination of subsurface soil at the site was assessed in a series of investigations before the installation of the RCRA cap (Section 1.6), and most recently in the RFI (Sections 2.0 and 4.0). In these investigations, soil boring samples and shallow and deep soil gas samples were evaluated to determine type and concentration of contaminants and horizontal and vertical extent of the contaminant plume. The results of the analyses are described below.

6.5.2 Soil beneath RCRA cap: Contamination of soil in the area beneath the RCRA cap as defined by soil and soil gas samples consists of MeCl and much lower concentrations of other VOCs, including DCA, TCA, 1,1-DCE, 1,2-DCE, TCE, PCE, chloroform, and Freon 11. GCL reported that MeCl was present in soil samples at parts per million (ppm) levels, whereas TCA, TCE, and PCE were present in parts per billion (ppb) levels (GCL, 1987). Similarly, in soil

gas samples collected for the RFI from beneath the RCRA cap, MeCl concentrations were at least 3 orders of magnitude (1,000 times) higher than concentrations of other detected VOCs.

6.5.3 Soil outside of RCRA cap perimeter: Soil and soil gas samples obtained during the RFI outside of the perimeter of the RCRA cap indicate that MeCl contamination of soil has not migrated beyond the perimeter of the RCRA cap or other covered areas including the TTF building, and asphalt and concrete parking areas. MeCl was not detected in 100 shallow soil gas and 9 deep soil gas samples obtained from soil outside the perimeter of the cap, and was detected (low ppb) in only 6 of 120 soil boring samples from the same area. Low concentrations (ppb to low ppm) of other VOCs were detected in shallow and deep soil gas samples from outside of the perimeter of the RCRA cap or other asphalt and concrete covered areas, including TCA, DCE, TCE, PCE, chloroform, Freon 11, and Freon 113; however, in soil boring samples from this area only acetone and toluene were detected. During the investigation, acetone was detected 11 times at concentrations ranging from 12 μg/kg to 110 μg/kg and toluene was only detected once at a concentration of 6.7 μg/kg. These low VOC concentrations indicate that significant contamination of soil outside the perimeter of the cap or other asphalt or concrete covered areas has not occurred.

6.6 IDENTIFICATION OF COCS IN GROUNDWATER

6.6.1 To date, no VOCs above the detection limit were found in groundwater samples from RCRA monitoring wells on the site. Therefore, no COCs were identified in groundwater at the TTF site.

6.7 CONTAMINANT FATE AND TRANSPORT

6.7.1 Fate and transport of MeCl was evaluated qualitatively, along with site-specific sampling data, to identify currently impacted environmental media and those with the potential to be impacted (Section 5.0). This information was then used in the exposure assessment to estimate potential exposure pathways to identified receptor populations.

6.8 PERSISTENCE, MOBILITY, AND ENVIRONMENTAL FATE

6.8.1 Chemical properties that tend to drive the fate and transport of MeCl include:

- High volatility
- High solubility in water
- Low octanol-water partition coefficient

6.8.2 Owing to these properties, MeCl is considered to be a relatively "non-persistence" chemical in surface water and surface soils by virtue of its high volatility but can be considered to be persistent in the atmosphere since MeCl does not readily undergo photolysis (i.e. chemical decomposition by induced light or other radiant energy).

6.8.3 In subsurface soil and groundwater, MeCl demonstrates substantial migration potential because of its relatively high water solubility. MeCl would also be expected to migrate as "soil gas" in the vadose zone. Biodegradation may occur in the vadose zone and groundwater at a slow rate.

6.9 SCREENING OF POTENTIAL ROUTES OF MIGRATION OF MeCl

6.9.1 As discussed in Section 5.3, methylene chloride could potentially migrate by several mechanisms and pathways including:

- Volatilization from exposed contaminated surface soil or shallow subsurface soil and subsequent airborne transport
- Fugitive dust emissions
- Contact between surface water and contaminated surface soil resulting in contaminated surface water runoff
- Leaching of contaminants by infiltrating water with possible vertical migration to groundwater
- Vertical transport in the vadose zone resulting from contaminant releases due to spills and/or discharge
- Soil gas transport in subsurface soils
- Migration of any contamination reaching the saturated zone

6.9.2 Each of these transport mechanisms for the TTF site was evaluated in detail in Section 5.0. Due to the presence of a RCRA cap lateral and vertical migration pathways in subsurface soil via soil gas transport and leaching from subsurface soil into groundwater are considered primary pathways. Air and surface water transport are not significant at the TTF. The pathway analysis is summarized below.

6.9.3 Air Pathway and Mechanisms: Air transport pathways (i.e., volatilization from surface soil and surface water and wind erosion from soil) are not considered to be migratory pathways of concern at TTF because:

- The RCRA cap prevents volatilization or wind erosion of contaminants from soil into air
- Surface soil outside the perimeter of the cap is not contaminated with MeCl
- The RCRA cap prevents contact between stormwater and contaminated soil, therefore, volatilization of contaminants from surface water cannot occur

6.9.4 Surface Water Pathway and Mechanisms: Surface water transport pathways are not considered to be migratory pathways of concern at TTF because stormwater does not come into contact with contaminated soil.

6.9.5 Soil Pathways and Mechanisms: Contaminants could potentially migrate in soil via fugitive dust emissions, stormwater transport of contaminated surface soil, percolating rainwater with possible migration to groundwater, lateral and vertical migration in the vadose zone via soil gas transport.

6.9.6 Since there is no exposed contaminated surface soil on the site transport of contaminants in soil via fugitive dust emissions and surface water pathways is not occurring. In addition, sampling studies indicate that significant horizontal migration of MeCl in soils outside of the perimeter of the cap, paved areas, and building perimeter has not occurred. Vertical migration of MeCl in subsurface soil to depths of approximately 100 feet bgs has been documented, however, on-going remediation efforts to remove most of the MeCl from soil beneath the cap will further impede migration of MeCl in subsurface soil.

6.9.7 Groundwater Pathway and Mechanisms: Contaminants could enter groundwater via percolation through contaminated subsurface soil. MeCl has been detected at a maximum depth of approximately 100 feet bgs in subsurface soil, but has not been detected in groundwater. It is unlikely that groundwater below the site will become contaminated because:

- The RCRA cap decreases or prevents percolation of rainwater through contaminated soil
- Samples collected from boring SB12 did not indicate further vertical migration of the MeCl plume and samples collected from soil borings SB1 through SB11 did not indicate lateral expansion of the MeCl plume at depth
- The vertical distance between contaminated subsurface soil and groundwater is large and it is likely that the silt, sandy clay, and caliche layers at or near the TTF combined with the low moisture levels in subsurface soil are acting as retarding features limiting the vertical migration of MeCl toward the groundwater
- On-going remediation of MeCl is expected to greatly reduce the total mass of MeCl in soil, decreasing the probability that contaminants could traverse the 100 foot vertical distance between contaminated soil and the groundwater table.

6.10 CONTAMINANT FATE AND TRANSPORT CONCLUSIONS

6.10.1 This qualitative contaminant fate and transport analysis indicates that transport processes for MeCl are limited to migration in the vadose zone via soil gas transport and percolation of rainwater. Other potential migration pathways and transport mechanisms were evaluated and were not considered to be of concern, primarily because of the limiting characteristics of the site.

6.11 QUALITATIVE EXPOSURE ASSESSMENT

6.11.1 An exposure assessment is the key step in a risk assessment and is always performed to evaluate the potential for chemical exposure among human and ecological receptor populations at the TTF site. A qualitative exposure assessment was performed for this risk assessment. The steps in this qualitative exposure assessment include:

- Identification of current and potential future land use scenarios;
- Identification of potential receptor populations; and,
- Evaluation of potential pathways for completeness.

6.12 IDENTIFICATION OF CURRENT AND POTENTIAL FUTURE LAND USE SCENARIOS

6.12.1 The TTF is an operating facility on the WSMR and is located in an unpopulated area of WSMR, isolated from other potential receptor populations. The nearest WSMR residence is at the Main Post approximately 2.5 miles from the TTF. Therefore, only TTF workers are expected to be on or near the site.

6.12.2 WSMR is not on the BRACC (Base Realignment and Closure Commission) list indicating that there are no known plans for base closure. TTF, as with the rest of the WSMR, is expected to remain active for the foreseeable future. It is possible that increased testing demands at the TTF will require expansion of the facility. However, this expansion would likely be in areas outside the RCRA cap because of regulatory constraints/limitations disallowing disturbance of the RCRA cap, or outside other asphalt and concrete paved areas where the majority of the contamination is known to exist. In addition, future land use involving recreational or residential settings are considered to be highly unlikely and as such are not evaluated in this HEEA. The current water supply for WSMR, from a well field near the Main Post upgradient from TTF, is expected to remain adequate and in use for the foreseeable future. As a result, the future use of groundwater from the TTF site is considered to be unlikely.

6.12.3 Current and likely future land use scenarios at TTF consist of continued operation of the facility by on-site workers with water supplied from the Main Post well field upgradient from TTF.

6.13 IDENTIFICATION OF POTENTIAL RECEPTOR POPULATIONS

6.13.1 Potential receptor populations are defined as current or future human, plant, or animal populations that could come in contact with site-related contaminants and thus potentially be at risk. Potential human receptors include current and future workers at the site, who are

expected to spend the majority of their time inside of TTF or in an office building adjacent to TTF.

6.13.2 Potential ecological receptors consist of wildlife and vegetation at or near the TTF site. Plant and animal communities endemic to WSMR have been described in WCFS (1995f). The habitat immediately adjacent to the TTF is not suitable for the majority of wildlife known to occur at WSMR, however, evidence for coyotes, kangaroo rats, badgers, and some birds was observed during a field reconnaissance of the area around the TTF. Honey mesquite comprises approximately 75 percent of the total vegetation in the project area (WCFS, 1995a).

6.13.3 Because current site conditions will not change in the foreseeable future, it is therefore reasonable to state that the area around the TTF will continue to support the existing habitat with its corresponding plant and animal communities. Thus, potential future ecological receptors are expected to be similar to current ecological receptors.

6.14 EVALUATION OF POTENTIAL EXPOSURE PATHWAYS

6.14.1 An exposure pathway is a mechanism by which a receptor may come in contact with a chemical. As previously stated, there are 4 major elements which define a complete exposure pathway. These elements are:

- A source and mechanism of chemical release;
- A transport mechanism for the chemical;
- A point of potential receptor contact with the medium (e.g., an exposure point);
- A route of exposure (e.g., ingestion, inhalation, dermal contact, root uptake) for the receptor to come in contact with.

6.14.2 The absence of any one of these elements indicates that the pathway is incomplete and no exposure can occur. Potential exposure pathways for human and ecological receptors at TTF are depicted in site conceptual exposure models (SCEM) in **Figures 6-1** and **6-2**, and discussed in the following sections.

6.15 PATHWAYS INVOLVING SOIL

6.15.1 As discussed previously, the primary source of MeCl contamination at the site was from MeCl refrigerant released into soil in the area now covered with a RCRA cap. The resultant MeCl plume migrated vertically in subsurface soil, but has not migrated horizontally beyond the perimeter of the RCRA cap or other areas covered by asphalt and/or concrete.

6.15.2 Pathways associated with surface soil are incomplete for current and future human and ecological receptors because:

- no exposure to contaminated soil can occur because of the RCRA cap and asphalt and concrete
- no significant contamination is present in surface soil outside of the perimeter of the cap

6.15.3 Pathways associated with subsurface soil are incomplete for current and future human and ecological receptors because:

- No direct exposure to contaminated subsurface soil under the RCRA cap can occur.
- Subsurface soil outside of the RCRA cap and other asphalt and concrete areas is not contaminated. Thus, activities disturbing subsurface soil (e.g., construction) outside of the RCRA cap area would not result in exposure because no significant contamination is present in this area.

6.15.4 It is concluded that pathways associated with surface and subsurface soil are incomplete for current and future human and ecological receptors.

6.16 PATHWAYS INVOLVING GROUNDWATER

6.16.1 Pathways associated with exposure to groundwater are incomplete for current and future receptors because groundwater from the site is neither used nor is it likely to be used in the foreseeable future. At present, the only groundwater use within 5 miles of the TTF is from a well field at the WSMR Main Post, centered upgradient about 3 miles northwest of the site. These wells supply the majority of the water used at WSMR, including that for the TTF. A

groundwater divide is located between TTF and the well field at the Main Post. GCL predicted that a groundwater divide would be anticipated to remain between TTF and the Main Post well field even after 30 years of continuous pumping of water at the maximum current rate (GCL, 1987). Thus, groundwater beneath the TTF site is expected to continue to flow away from wells supplying water to WSMR Main Post area and well field. Assuming that groundwater at or downgradient from the TTF site will not be used, pathways associated with groundwater are incomplete for receptors.

6.16.2 Most importantly groundwater pathways are considered incomplete because MeCl (and other VOCs) have not been detected in groundwater at the site, indicating that no transport mechanisms currently exist between subsurface soil containing MeCl and groundwater beneath the site. The lack of a viable transport mechanism is probably related to:

- The large distance between groundwater and contaminated subsurface soil (approximately 100 feet).
- The presence of the RCRA cap which impedes or prevents percolation of rainwater through the contaminated soil under the cap. The lack of a driving force for percolation of MeCl through subsurface soil may have eliminated the capacity for the MeCl plume to migrate vertically, as evidenced by similar estimates of maximum depth of the plume in 1986 (GCL, 1987) and 1995 (WCFS, 1995a).

6.16.3 Silt, sand clay, and caliche layers at or near to the MeCl plume, and low moisture levels in subsurface soil, may each be acting as retarding features.

6.16.4 For similar reasons, it is unlikely that contamination of groundwater will occur in the future. In addition, an interim remedial action (a soil vapor extraction system) is currently underway to remove MeCl and other VOCs from contaminated soil beneath the cap (Dow, 1995). The expected large reduction in total mass of MeCl in soil should decrease the probability that contaminants will migrate the approximate 100 foot vertical distance between contaminated soil and groundwater (Dow, 1995). However, the actual probability that this remedial action will prevent future contamination of groundwater has not been determined.

6.16.5 It is concluded that pathways associated with groundwater are incomplete for current and future human and ecological receptors.

6.17 PATHWAYS INVOLVING AIR

6.17.1 Airborne contaminants can be derived from two possible sources:

- Direct volatilization of contaminants in soil and water; and
- Fugitive dust emissions from soil-adsorbed contaminants.

6.17.2 Inhalation of indoor and/or outdoor VOCs from contaminated surface or subsurface soils is an incomplete pathway for current and future human and ecological receptors because VOCs under the RCRA cap are not released into the atmosphere and surface and subsurface soil outside of the perimeter of the cap do not contain significant concentrations of VOCs.

6.17.3 For similar reasons, no current or future exposure to contaminated fugitive dust can occur. In addition, MeCl is highly volatile and would not be expected to become entrained to dust particles. Thus, pathways associated with fugitive dust emissions are incomplete for all current and future human and ecological receptors.

6.17.4 This concluded that pathways associated with air are incomplete for current and future human and ecological receptors.

6.18 PATHWAYS INVOLVING SURFACE WATER

6.18.1 Contaminated soil at the site is covered with a RCRA cap which prevents stormwater runoff from contacting contaminated soil. Thus, pathways associated with surface water runoff are incomplete for current and future human and ecological receptors.

6.19 SUMMARY FOR EXPOSURE ASSESSMENT

6.19.1 Based on current and future use scenarios, no complete exposure routes exist for current potential human and ecological receptors at the site, because:

- Contaminated soil is covered by a RCRA cap
- Surface and subsurface soil outside of the cap is not contaminated
- Groundwater from the site is not contaminated
- Groundwater from the site is not used

6.20 QUALITATIVE ASSESSMENT OF RISK

6.20.1 In this section, the results from the exposure assessment are used to assess the presence or absence of risk from exposure to contaminants at the site. In the absence of any complete exposure pathways there are no points of contact and, therefore, no risks for current or future human or ecological receptors for the following reasons:

- all pathways associated with soil at the site are incomplete and no exposure to MeCl in soil can occur
- groundwater at TTF is neither contaminated nor used

6.20.2 In the event that groundwater at TTF becomes contaminated with MeCl, there could be a threat to future receptors if:

- groundwater contamination exceeds health protective levels
- contaminated groundwater is used as water supply by receptors

6.21 QUALITATIVE ANALYSIS OF UNCERTAINTY IN THE ASSESSMENT OF RISK

6.21.1 This section discusses the primary uncertainties in the assessment of risk and how they may affect results and conclusions. Primary uncertainties in the analysis are related to:

- Uncertainty about future contamination of the groundwater table at TTF
- Uncertainty about the potential impact to future receptors at the site if groundwater at TTF becomes contaminated

6.21.2 These uncertainties affect the ability to predict the potential impact of contaminants at the site on future receptors, and, therefore, to predict the extent of remediation necessary to prevent the site from impacting future receptors.

6.21.3 Uncertainty about the actual probability for future contamination of the groundwater table at TTF arises from the following data gaps:

- The concentration of MeCl and vertical extent of the MeCl plume in subsurface soil immediately beneath the RCRA cap have not been fully characterized because of regulatory constraints/limitations disallowing exploratory borings through the existing RCRA cap

- A quantitative analysis of fate and transport of MeCl in subsurface soil has not been performed

6.21.4 Uncertainty about the potential impact to future receptors at the site if groundwater at TTF becomes contaminated is related to:

- Uncertainty regarding the likelihood that the groundwater from TTF will ever be used

- Uncertainty regarding the likelihood that groundwater from TTF will continue to flow away from the WSMR water supply at the Main Post, 3 miles upgradient from TTF

6.21.5 Based on projected water use by WSMR and other future land use scenarios it is unlikely that groundwater from the TTF site will be used in the future. It is also unlikely, based on a study by Geoscience Consultants Ltd. (GCL, 1987), that continued groundwater use from the WSMR water supply at the Main Post at the current rate would induce a reversal of the flow of groundwater from TTF (i.e., it is unlikely that groundwater from TTF will begin to flow towards the WSMR water supply at the Main Post in the future). Therefore, it is unlikely that future contamination of groundwater at TTF could result in contamination of the WSMR water supply.

6.21.6 There is some uncertainty as to the probability that groundwater at the site will eventually become contaminated. This uncertainty could be reduced by performing quantitative contaminant transport modeling for MeCl in subsurface soil. However, even if the groundwater at TTF became contaminated, the lack of a future receptor population would still result in an incomplete pathway.

6.22 SUMMARY

6.22.1 This health and environmental effects analysis indicated that MeCl contamination at the TTF site does not present a threat to human or ecological receptors at this time, primarily

because contaminated soil is under a RCRA cap and groundwater at TTF is neither contaminated nor is it used as a water supply. However, the potential, albeit limited, for groundwater contamination in the future from continued vertical migration of the MeCl plume still exists. A preferred outcome of the remedial action would be to clean up contaminated soil to a level that would prevent future groundwater contamination.

7.0
CONCLUSIONS AND RECOMMENDATIONS

7.1 SUMMARY

7.1.1 Woodward-Clyde Federal Services (WCFS) under contract to the Tulsa District, U.S. Army Corps of Engineers (USACE) conducted RCRA Facility Investigation (RFI) activities at the Temperature Test Facility (TTF) located within the White Sands Missile Range (WSMR). In January 1985, it was discovered that significant quantities of solvent laden wastewater had been released into the soil at the TTF. Subsequent investigations concluded MeCl and low concentrations of other solvents had contaminated the soil east of the TTF building. In 1991, MeCl use at the site was discontinued. The area surrounding the contaminated soil was covered with a RCRA cap in 1988.

7.1.2 The purpose of the WCFS investigation was to further delineate the vertical and horizontal extent of contamination, identify additional release sources, conduct a Health and Environmental Evaluation Analysis (HEEA), and provide sufficient information to complete the RFI Report and perform a Corrective Measures Study (CMS), if warranted.

7.1.3 WCFS data collection activities were performed in two phases. In June 1994, soil gas samples were collected from the 17 existing soil gas monitoring wells during the initial phase of investigation. In March 1995, the second phase of the field activities included the collection and analysis of 100 shallow soil gas samples, 9 deep soil gas samples, 120 soil samples (one each from the 9 deep soil gas borings and the remainder from 12 deep soil borings), and groundwater samples from 4 existing RCRA groundwater monitoring wells.

7.1.4 An interim removal action (a soil vapor extraction system) is currently underway in an effort to clean up soil beneath the RCRA cap and prevent contamination of groundwater by MeCl.

7.2 CONCLUSIONS

7.2.1 Based on previous information and the results of this RFI, conclusions regarding the current status of the TTF are provided.

7.2.2 The vertical and horizontal extent of VOCs in the unsaturated soils along the perimeter of the TTF building and the RCRA cap have been defined. MeCl contamination and to a much lessor extent other VOCs (e.g., TCE, PCE, TCA, Freon 11) exists in subsurface soil under the RCRA cap and other areas in the vicinity of the TTF covered by concrete and asphalt parking areas. The contamination has migrated to a depth of approximately 100 feet bgs, but has not migrated horizontally to soil outside the perimeter of the RCRA cap or other cover areas. No VOC contamination has been detected in the groundwater located at a depth of approximately 200 feet bgs below the TTF.

7.2.3 There are currently no complete exposure pathways to contaminants at the site for potential human (on-site workers) or ecological receptors (animal and plant communities) because:

- all contaminated soil is covered by the RCRA cap or other concrete or asphalt covered areas
- groundwater at the TTF is neither contaminated nor used

7.2.4 Based on the most reasonable future land use scenario that land use at TTF and WSMR will not change in the foreseeable future, no complete exposure pathways are predicted for potential future human or ecological receptors because:

- contaminated soil will remain covered by the RCRA cap and other concrete and asphalt covered areas
- groundwater at TTF is downgradient from the WSMR water supply and is not expected to be used as a water supply

7.2.5 However, the potential exists for future contamination of the underlying groundwater table. This potential threat was not quantified in this report, but could become an issue if the land use changes in the future and that aquifer is used for domestic purposes.

7.2.6 The transport mechanisms that are theoretically most likely to result in contaminant migrations is the lateral and vertical migration in the vadose zone and potential percolation/leaching of MeCl from the vadose zone to the underlying aquifer. Existing sampling data indicate that MeCl has migrated to approximately 95 feet bgs in the vadose zone but migration to groundwater has not occurred at the TTF, although it is theoretically possible. It is likely that the effects of various attenuation and retardation factors including the presence of retarding clay, lack of infiltrating water and the RCRA cap will reduce the contaminant concentrations.

7.2.7 Potential air and surface water migration pathways and transport mechanisms are not considered to be of concern at the TTF due to site conditions and lack of exposure potential. While the lateral and vertical migration of MeCl and other contaminants in the form of soil gas in the vadose zone is possible (due to elevated soil gas concentrations and the generally porous nature and lack of moisture of the upper subsurface soils), the ongoing vapor extraction would limit such migration and reduce concentrations of contaminants to levels at which they will not be of concern.

7.2.8 Corrective Measures Studies (CMS) for media of concern are not necessary at this time because an appropriate cleanup effort for MeCl in soil and soil gas is already underway. This cleanup effort consists of a soil vapor extraction system that is removing MeCl and other VOCs present in the vadose zone beneath the RCRA cap and in the general vicinity of the TTF (Dow, 1995). A pilot vapor extraction study at TTF concluded that vapor extraction was the most appropriate remediation method for the site and provided a plan for using existing and additional air monitoring wells for remediation (ERC, 1990). The results and recommendations of the pilot study served as the basis for development of the current remedial effort (Dow, 1995).

7.3 RECOMMENDATIONS

7.3.1 Present efforts to cleanup soil beneath the RCRA cap should continue as described in Dow (1995). Dow reported that the current cleanup goal of 50 mg/kg MeCl in soil could be achieved in the sandy soil after a period of approximately 1 month, but to achieve similar levels for clayey soils could take a year. The current cleanup goal for soil represents a relative removal in excess of 90 percent of the estimated mass of MeCl in the sandy soil (Dow, 1995).

However, the extent that this cleanup effort will reduce the potential for the MeCl to significantly impact groundwater at the site has not been ascertained. Thus, it is recommended that a final soil cleanup level be selected based on a reasonable likelihood that it would be protective against future groundwater contamination. Additional fate and transport studies and modeling may need to be conducted in order to predict these levels and assess their potential effects on groundwater in the underlying aquifer.

7.3.2 Quantitative contaminant transport modeling predicting the fate and transport of MeCl in subsurface soil should be performed using site-specific information on the MeCl plume and on subsurface soil characteristics. The goal of this analysis would be to:

- estimate the probability that MeCl might reach and contaminate groundwater under current site conditions
- estimate the potential extent (if any) of future MeCl contamination of groundwater under current site conditions
- estimate a soil cleanup level that would be protective in the event that future groundwater contamination occurs

7.3.3 The cleanup level estimated in the fate and transport modeling should be used as the target soil cleanup goal. Cleanup efforts should continue as necessary to achieve the soil cleanup goal. Following cleanup, sampling and analysis of subsurface soil should be performed to confirm that the target soil cleanup level has been achieved.

7.3.4 Groundwater should continue to be monitored for MeCl during and after soil cleanup to confirm that the remedial action has successfully prevented groundwater contamination. If contamination reaches groundwater a trigger level at which corrective action would be taken should be determined. Potential trigger levels for MeCl include the maximum contaminant level, or MCL, (5 μg/L) or a conservative risk-based concentration developed using an assumed downgradient receptor.

8.0
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TABLE 1-1
Sample Summary
Temperature Test Facility
RCRA Facility Investigation
White Sands Missile Range, New Mexico

Date Sampled	No. of Soil Samples	No. of Water Samples	No. of Gas Samples	Field Replicate		Rinsates	Trip Blanks	Analysis	Method	Laboratory
				QA	QC					
3/95	120	4		14	14	12	3	VOC	SW-846 Method 8240	Quanterra
3/95			109	6	6			VOC	Field Screening GC/PIC/ECD	Plains Environmental Services
6/94			17	2	2			VOC	TO-14	Enseco Air Toxics
6/94			17	2	2			VOC	Field Screening GC/MSD	Plains Environmental Services

TABLE 1-2
Cross Reference of Field/Laboratory Sample Numbers
Temperature Test Facility
RCRA Facility Investigation
White Sands Missile Range, New Mexico

Sample Delivery Group	Field Sample Number	Lab Sample Number	Matrix	Analysis	Analytical Laboratory
040965	WSTF-DB01-2048	040965-0001-SA	soil	VOC	QUANTERRA
040965	WSTF-DB02-2048	040965-0002-SA	soil	VOC	QUANTERRA
040965	WSTF-DB04-2047	040965-0003-SA	soil	VOC	QUANTERRA
040965	WSTF-DB05-2052	040965-0004-SA	soil	VOC	QUANTERRA
040965	WSTF-DB06-2041	040965-0007-SA	soil	VOC	QUANTERRA
040965	WSTF-DB07-2045	040965-0005-SA	soil	VOC	QUANTERRA
040965	WSTF-DB08-2043	040965-0006-SA	soil	VOC	QUANTERRA
041007	WSTF-DB03-2050	041007-0002-SA	soil	VOC	QUANTERRA
041007	WSTF-DB09-2050	041007-0001-SA	soil	VOC	QUANTERRA
041007	WSTF-DB09-2050-EB	041007-0003-EB	water	VOC	QUANTERRA
041007	WSTF-SB02-2002	041007-0008-SA	soil	VOC	QUANTERRA
041007	WSTF-SB02-2012	041007-0007-SA	soil	VOC	QUANTERRA
041007	WSTF-SB02-2050	041007-0006-SA	soil	VOC	QUANTERRA
041007	WSTF-SB02-2052	041007-0009-SA	soil	VOC	QUANTERRA
041007	WSTF-SB02-2052 MS/MSD	041007-0009-MS	soil	VOC	QUANTERRA
041007	WSTF-SB02-2052 MS/MSD	041007-0009-SD	soil	VOC	QUANTERRA
041007	WSTF-SB02-2052-QC	041007-0004-SA	soil	VOC	QUANTERRA
041007	WSTF-SB02-2059	041007-0010-SA	soil	VOC	QUANTERRA
041007	WSTF-SB02-2059 MS/MSD	041007-0010-MS	soil	VOC	QUANTERRA
041007	WSTF-SB02-2059 MS/MSD	041007-0010-SD	soil	VOC	QUANTERRA
041007	WSTF-SB02-2059-QC	041007-0005-SA	soil	VOC	QUANTERRA
041007	WSTF-SB02-2064	041007-0013-SA	soil	VOC	QUANTERRA
041007	WSTF-SB02-2065	041007-0011-SA	soil	VOC	QUANTERRA
041007	WSTF-SB02-2072	041007-0012-SA	soil	VOC	QUANTERRA
041007	WSTF-SB02-2078	041007-0014-SA	soil	VOC	QUANTERRA
041007	WSTF-SB02-2079	041007-0015-SA	soil	VOC	QUANTERRA
041007	WSTF-SB02-2083-EB	041007-0016-EB	water	VOC	QUANTERRA
041029	WSTF-SB01-2017	041029-0011-SA	soil	VOC	QUANTERRA
041029	WSTF-SB01-2025	041029-0012-SA	soil	VOC	QUANTERRA
041029	WSTF-SB01-2050-EB	041029-0013-EB	water	VOC	QUANTERRA
041029	WSTF-SB01-2057	041029-0014-SA	soil	VOC	QUANTERRA
041029	WSTF-SB01-2057-QC	041029-0015-SA	soil	VOC	QUANTERRA
041029	WSTF-SB01-2061	041029-0018-SA	soil	VOC	QUANTERRA
041029	WSTF-SB01-2061-MS/SD	041029-0018-MS	soil	VOC	QUANTERRA
041029	WSTF-SB01-2061-MS/SD	041029-0018-SD	soil	VOC	QUANTERRA
041029	WSTF-SB01-2062	041029-0016-SA	soil	VOC	QUANTERRA
041029	WSTF-SB01-2063	041029-0017-SA	soil	VOC	QUANTERRA
041029	WSTF-SB01-2072	041029-0019-SA	soil	VOC	QUANTERRA
041029	WSTF-SB01-2076	041029-0020-SA	soil	VOC	QUANTERRA
041029	WSTF-SB01-2080	041029-0021-SA	soil	VOC	QUANTERRA

TABLE 1-2
Cross Reference of Field/Laboratory Sample Numbers
Temperature Test Facility
RCRA Facility Investigation
White Sands Missile Range, New Mexico

Sample Delivery Group	Field Sample Number	Lab Sample Number	Matrix	Analysis	Analytical Laboratory
041029	WSTF-SB03-2010	041029-0001-SA	soil	VOC	QUANTERRA
041029	WSTF-SB03-2021	041029-0002-SA	soil	VOC	QUANTERRA
041029	WSTF-SB03-2053	041029-0003-SA	soil	VOC	QUANTERRA
041029	WSTF-SB03-2060	041029-0004-SA	soil	VOC	QUANTERRA
041029	WSTF-SB03-2063	041029-0005-SA	soil	VOC	QUANTERRA
041029	WSTF-SB03-2063 QC	041029-0010-SA	soil	VOC	QUANTERRA
041029	WSTF-SB03-2065	041029-0006-SA	soil	VOC	QUANTERRA
041029	WSTF-SB03-2070	041029-0007-SA	soil	VOC	QUANTERRA
041029	WSTF-SB03-2073	041029-0008-SA	soil	VOC	QUANTERRA
041029	WSTF-SB03-2074	041029-0009-SA	soil	VOC	QUANTERRA
041141	WSTF-0001-0000-TB	041141-0024-TB	water	VOC	QUANTERRA
041141	WSTF-00E3-1000	041141-0014-SA	water	VOC	QUANTERRA
041141	WSTF-SB04-2016	041141-0012-SA	soil	VOC	QUANTERRA
041141	WSTF-SB04-2016-MS/MSD	041141-0012-MS	soil	VOC	QUANTERRA
041141	WSTF-SB04-2016-MS/MSD	041141-0012-SD	soil	VOC	QUANTERRA
041141	WSTF-SB04-2016-QC	041141-0013-SA	soil	VOC	QUANTERRA
041141	WSTF-SB04-2025	041141-0016-SA	soil	VOC	QUANTERRA
041141	WSTF-SB04-2056	041141-0017-SA	soil	VOC	QUANTERRA
041141	WSTF-SB04-2057	041141-0018-SA	soil	VOC	QUANTERRA
041141	WSTF-SB04-2062	041141-0019-SA	soil	VOC	QUANTERRA
041141	WSTF-SB04-2063	041141-0020-SA	soil	VOC	QUANTERRA
041141	WSTF-SB04-2071	041141-0021-SA	soil	VOC	QUANTERRA
041141	WSTF-SB04-2077-EB	041141-0015-EB	water	VOC	QUANTERRA
041141	WSTF-SB04-2078	041141-0022-SA	soil	VOC	QUANTERRA
041141	WSTF-SB04-2079	041141-0023-SA	soil	VOC	QUANTERRA
041141	WSTF-SB06-2017	041141-0001-SA	soil	VOC	QUANTERRA
041141	WSTF-SB06-2022	041141-0002-SA	soil	VOC	QUANTERRA
041141	WSTF-SB06-2057	041141-0003-SA	soil	VOC	QUANTERRA
041141	WSTF-SB06-2060	041141-0004-SA	soil	VOC	QUANTERRA
041141	WSTF-SB06-2061	041141-0005-SA	soil	VOC	QUANTERRA
041141	WSTF-SB06-2062	041141-0006-SA	soil	VOC	QUANTERRA
041141	WSTF-SB06-2073	041141-0007-SA	soil	VOC	QUANTERRA
041141	WSTF-SB06-2075-EB	041141-0008-EB	water	VOC	QUANTERRA
041141	WSTF-SB06-2080	041141-0009-SA	soil	VOC	QUANTERRA
041141	WSTF-SB06-2080-QC	041141-0011-SA	soil	VOC	QUANTERRA
041141	WSTF-SB06-2081	041141-0010-SA	soil	VOC	QUANTERRA
041157	WSTF-0002-0000-TB	041157-0013-TB	water	VOC	QUANTERRA
041157	WSTF-00E2-1000	041157-0011-SA	water	VOC	QUANTERRA
041157	WSTF-00E4-1000	041157-0012-SA	water	VOC	QUANTERRA
041157	WSTF-SB08-2017	041157-0001-SA	soil	VOC	QUANTERRA
041157	WSTF-SB08-2017-QC	041157-0002-SA	soil	VOC	QUANTERRA

TABLE 1-2
Cross Reference of Field/Laboratory Sample Numbers
Temperature Test Facility
RCRA Facility Investigation
White Sands Missile Range, New Mexico

Sample Delivery Group	Field Sample Number	Lab Sample Number	Matrix	Analysis	Analytical Laboratory
041157	WSTF-SB08-2025	041157-0003-SA	soil	VOC	QUANTERRA
041157	WSTF-SB08-2059	041157-0004-SA	soil	VOC	QUANTERRA
041157	WSTF-SB08-2060	041157-0005-SA	soil	VOC	QUANTERRA
041157	WSTF-SB08-2061	041157-0006-SA	soil	VOC	QUANTERRA
041157	WSTF-SB08-2062	041157-0007-SA	soil	VOC	QUANTERRA
041157	WSTF-SB08-2074	041157-0008-SA	soil	VOC	QUANTERRA
041157	WSTF-SB08-2079	041157-0009-SA	soil	VOC	QUANTERRA
041157	WSTF-SB08-2080	041157-0010-SA	soil	VOC	QUANTERRA
041172	WSTF-SB10-2010-EB	041172-0001-EB	water	VOC	QUANTERRA
041172	WSTF-SB10-2012	041172-0002-SA	soil	VOC	QUANTERRA
041172	WSTF-SB10-2012-MS/MSD	041172-0002-MS	soil	VOC	QUANTERRA
041172	WSTF-SB10-2012-MS/MSD	041172-0002-SD	soil	VOC	QUANTERRA
041172	WSTF-SB10-2012-QC	041172-0003-SA	soil	VOC	QUANTERRA
041172	WSTF-SB10-2021	041172-0004-SA	soil	VOC	QUANTERRA
041172	WSTF-SB10-2059	041172-0005-SA	soil	VOC	QUANTERRA
041172	WSTF-SB10-2060	041172-0006-SA	soil	VOC	QUANTERRA
041172	WSTF-SB10-2061	041172-0007-SA	soil	VOC	QUANTERRA
041172	WSTF-SB10-2062	041172-0008-SA	soil	VOC	QUANTERRA
041172	WSTF-SB10-2071	041172-0009-SA	soil	VOC	QUANTERRA
041172	WSTF-SB10-2073	041172-0010-SA	soil	VOC	QUANTERRA
041172	WSTF-SB10-2078	041172-0011-SA	soil	VOC	QUANTERRA
041189	WSTF-SB05-2017	041189-0010-SA	soil	VOC	QUANTERRA
041189	WSTF-SB05-2021	041189-0011-SA	soil	VOC	QUANTERRA
041189	WSTF-SB05-2054	041189-0012-SA	soil	VOC	QUANTERRA
041189	WSTF-SB05-2054-MS/MSD	041189-0012-MS	soil	VOC	QUANTERRA
041189	WSTF-SB05-2054-MS/MSD	041189-0012-SD	soil	VOC	QUANTERRA
041189	WSTF-SB05-2054-QC	041189-0013-SA	soil	VOC	QUANTERRA
041189	WSTF-SB05-2055	041189-0014-SA	soil	VOC	QUANTERRA
041189	WSTF-SB05-2056	041189-0015-SA	soil	VOC	QUANTERRA
041189	WSTF-SB05-2070	041189-0016-SA	soil	VOC	QUANTERRA
041189	WSTF-SB05-2075	041189-0017-SA	soil	VOC	QUANTERRA
041189	WSTF-SB05-2076	041189-0018-SA	soil	VOC	QUANTERRA
041189	WSTF-SB09-2017	041189-0001-SA	soil	VOC	QUANTERRA
041189	WSTF-SB09-2021	041189-0002-SA	soil	VOC	QUANTERRA
041189	WSTF-SB09-2057	041189-0003-SA	soil	VOC	QUANTERRA
041189	WSTF-SB09-2057-QC	041189-0004-SA	soil	VOC	QUANTERRA
041189	WSTF-SB09-2060	041189-0005-SA	soil	VOC	QUANTERRA
041189	WSTF-SB09-2072	041189-0006-SA	soil	VOC	QUANTERRA
041189	WSTF-SB09-2072-EB	041189-0009-EB	water	VOC	QUANTERRA
041189	WSTF-SB09-2078	041189-0007-SA	soil	VOC	QUANTERRA
041189	WSTF-SB09-2079	041189-0008-SA	soil	VOC	QUANTERRA

TABLE 1-2
Cross Reference of Field/Laboratory Sample Numbers
Temperature Test Facility
RCRA Facility Investigation
White Sands Missile Range, New Mexico

Sample Delivery Group	Field Sample Number	Lab Sample Number	Matrix	Analysis	Analytical Laboratory
041208	WSTF-SB11-2016	041208-0001-SA	soil	VOC	QUANTERRA
041208	WSTF-SB11-2016 MS/MSD	041208-0001-MS	soil	VOC	QUANTERRA
041208	WSTF-SB11-2016 MS/MSD	041208-0001-SD	soil	VOC	QUANTERRA
041208	WSTF-SB11-2017	041208-0002-SA	soil	VOC	QUANTERRA
041208	WSTF-SB11-2052	041208-0003-SA	soil	VOC	QUANTERRA
041208	WSTF-SB11-2054	041208-0004-SA	soil	VOC	QUANTERRA
041208	WSTF-SB11-2065	041208-0005-SA	soil	VOC	QUANTERRA
041208	WSTF-SB11-2067	041208-0006-SA	soil	VOC	QUANTERRA
041208	WSTF-SB11-2070	041208-0007-SA	soil	VOC	QUANTERRA
041208	WSTF-SB11-2070-QC	041208-0008-SA	soil	VOC	QUANTERRA
041209	WSTF-0001-1000-AB	041209-0010-AB	water	VOC	QUANTERRA
041209	WSTF-0003-0000-TB	041209-0016-TB	water	VOC	QUANTERRA
041209	WSTF-00E1-1000	041209-0014-SA	water	VOC	QUANTERRA
041209	WSTF-00E1-1000-EB	041209-0008-EB	water	VOC	QUANTERRA
041209	WSTF-00E1-1000-MS/MSD	041209-0014-MS	water	VOC	QUANTERRA
041209	WSTF-00E1-1000-MS/MSD	041209-0014-SD	water	VOC	QUANTERRA
041209	WSTF-00E1-1000-QC	041209-0015-SA	water	VOC	QUANTERRA
041209	WSTF-SB07-2017	041209-0002-SA	soil	VOC	QUANTERRA
041209	WSTF-SB07-2017-QC	041209-0001-SA	soil	VOC	QUANTERRA
041209	WSTF-SB07-2022	041209-0003-SA	soil	VOC	QUANTERRA
041209	WSTF-SB07-2057	041209-0004-SA	soil	VOC	QUANTERRA
041209	WSTF-SB07-2058-EB	041209-0009-EB	water	VOC	QUANTERRA
041209	WSTF-SB07-2059	041209-0005-SA	soil	VOC	QUANTERRA
041209	WSTF-SB07-2060	041209-0006-SA	soil	VOC	QUANTERRA
041209	WSTF-SB07-2061	041209-0007-SA	soil	VOC	QUANTERRA
041209	WSTF-SB07-2072	041209-0011-SA	soil	VOC	QUANTERRA
041209	WSTF-SB07-2078	041209-0012-SA	soil	VOC	QUANTERRA
041209	WSTF-SB07-2079	041209-0013-SA	soil	VOC	QUANTERRA
041256	WSTF-SB12-2010-EB	041256-0001-EB	water	VOC	QUANTERRA
041256	WSTF-SB12-2017	041256-0003-SA	soil	VOC	QUANTERRA
041256	WSTF-SB12-2022	041256-0004-SA	soil	VOC	QUANTERRA
041256	WSTF-SB12-2022-EB	041256-0002-EB	water	VOC	QUANTERRA
041256	WSTF-SB12-2058	041256-0005-SA	soil	VOC	QUANTERRA
041256	WSTF-SB12-2059	041256-0006-RA	soil	VOC	QUANTERRA
041256	WSTF-SB12-2059	041256-0006-SA	soil	VOC	QUANTERRA
041256	WSTF-SB12-2060	041256-0008-RA	soil	VOC	QUANTERRA
041256	WSTF-SB12-2060	041256-0008-SA	soil	VOC	QUANTERRA
041256	WSTF-SB12-2061	041256-0007-SA	soil	VOC	QUANTERRA
041256	WSTF-SB12-2072	041256-0009-SA	soil	VOC	QUANTERRA
041256	WSTF-SB12-2081	041256-0010-SA	soil	VOC	QUANTERRA
041256	WSTF-SB12-2082	041256-0011-SA	soil	VOC	QUANTERRA

TABLE 1-2
Cross Reference of Field/Laboratory Sample Numbers
Temperature Test Facility
RCRA Facility Investigation
White Sands Missile Range, New Mexico

Sample Delivery Group	Field Sample Number	Lab Sample Number	Matrix	Analysis	Analytical Laboratory
041256	WSTF-SB12-2095	041256-0012-SA	soil	VOC	QUANTERRA
041256	WSTF-SB12-2103	041256-0013-SA	soil	VOC	QUANTERRA
041256	WSTF-SB12-2113	041256-0014-SA	soil	VOC	QUANTERRA
041256	WSTF-SB12-2123	041256-0015-SA	soil	VOC	QUANTERRA
041256	WSTF-SB12-2133	041256-0016-SA	soil	VOC	QUANTERRA
041256	WSTF-SB12-2142	041256-0017-SA	soil	VOC	QUANTERRA
041256	WSTF-SB12-2142-EB	041256-0020-EB	water	VOC	QUANTERRA
041256	WSTF-SB12-2142-MS/MSD	041256-0017-MS	soil	VOC	QUANTERRA
041256	WSTF-SB12-2142-MS/MSD	041256-0017-SD	soil	VOC	QUANTERRA
041256	WSTF-SB12-2142-QC	041256-0018-SA	soil	VOC	QUANTERRA
041256	WSTF-SB12-2152	041256-0019-SA	soil	VOC	QUANTERRA
106237	WSTF-0011-5058	106237-0003-SA	air	VOC	ENSECO
106237	WSTF-0016-5070	106237-0010-SA	air	VOC	ENSECO
106237	WSTF-0017-5082	106237-0007-SA	air	VOC	ENSECO
106237	WSTF-0018-5052	106237-0009-SA	air	VOC	ENSECO
106237	WSTF-0019-5085	106237-0008-SA	air	VOC	ENSECO
106237	WSTF-0021-5080	106237-0001-SA	air	VOC	ENSECO
106237	WSTF-0022-5080	106237-0005-SA	air	VOC	ENSECO
106237	WSTF-0022-5080-QC	106237-0006-SA	air	VOC	ENSECO
106237	WSTF-0023-5085	106237-0004-SA	air	VOC	ENSECO
106237	WSTF-0024-5072	106237-0002-SA	air	VOC	ENSECO
106243	WSTF-0000-5077	106243-0009-SA	air	VOC	ENSECO
106243	WSTF-0014-5100	106243-0001-SA	air	VOC	ENSECO
106243	WSTF-0020-5077	106243-0002-SA	air	VOC	ENSECO
106243	WSTF-0025-5078	106243-0003-SA	air	VOC	ENSECO
106243	WSTF-0027-5080	106243-0004-SA	air	VOC	ENSECO
106243	WSTF-0029-5058	106243-0005-SA	air	VOC	ENSECO
106243	WSTF-0029-5058-QC	106243-0006-SA	air	VOC	ENSECO
106243	WSTF-9201-5089	106243-0007-SA	air	VOC	ENSECO
106243	WSTF-9202-5092	106243-0008-SA	air	VOC	ENSECO

TABLE 3-1
Summary of Subsurface Lithologic Units and Sample Depths for the Deep Gas Borings
Temperature Test Facility
RCRA Facility Investigation
White Sands Missile Range, New Mexico

Borehole Number	Top of Unit 2 (feet bgs)	Top of Upper Unit 3 (feet bgs)	Top of Lower Unit 3 (feet bgs)	Boring Depth Prior to Soil Gas Sampling (feet bgs)	Approximate Depth of Soil Gas Sample (feet bgs)	Approximate Depth of Soil Sample for Chemical Analysis (feet bgs)
WSTF-DB01	16.5	24	40.5	45.4	47.4	48.4
WSTF-DB02	16.5	25	41.0	45.5	47.0	48.0
WSTF-DB03	20	26	42.0	47.3	49.0	50.0
WSTF-DB04	20	25	41.5	45.2	46.2	47.2
WSTF-DB05	15.5	27.8	45.0	48.5	50.0	52.0
WSTF-DB06	10	21	36.0	39.9	40.4	41.4
WSTF-DB07	12.5	21	40.0	40.0	42.0	45.0
WSTF-DB08	15.5	25.5	35.0	40.0	42.0	43.0
WSTF-DB09	10.5	26	42.3	47.5	49.0	50.0

bgs=below ground surface

TABLE 3-2
Summary of Subsurface Lithologic Units for Soil Borings
Temperature Test Facility
RCRA Facility Investigation
White Sands Missile Range, New Mexico

	Lower Limit of Lithological Unit (feet bgs/elevation)									
Boring Number (Elevation)	**Unit 1**	**Unit 2**	**Upper Unit 3**	**Lower Unit 3**	**Unit 4**	**Unit 5**	**Unit 6**	**Unit 7**	**Unit 8**	**Unit 9**
WSTF-SB01 (4034.71)	17/4017.71	25/4009.71	42.5/3992.21	57.5/3977.21	Absent	61/3973.71	62.5/3972.21	72.5/3962.21	79.8/3954.91	82.5/3952.21 TD
WSTF-SB02 (4024.90)	10.5/4014.40	20/4004.90	35/3989.90	50.5/3974.40	52/3972.90	59.5/3965.40	64/3960.90	72.5/3952.40	78/3946.90	82.5/3942.40 TD
WSTF-SB03 (4024.90)	10.5/4014.40	21/4003.90	36.5/3988.40	53/3971.90	Absent	60/3964.90	63.5/3961.40	70/3954.90	73/3951.90	80/3944.90 TD
WSTF-SB04 (4034.06)	16.5/4017.56	25/4009.06	42.5/3991.56	56/3978.06	57/3977.06	60/3974.06	62/3972.06	75/3959.06	78.5/3955.56	80/3954.06 TD
WSTF-SB05 (4027.82)*	17/4010.82	21/4006.82	39/3988.82	54/3973.82	Absent	Absent	55.7/3972.12	70.5/3957.32	75/3952.82	77.5/3950.32 TD
WSTF-SB06 (4034.44)	20/4014.44	25/4009.44	43/3991.44	57/3977.44	Absent	60/3974.44	61/3973.44	73/3961.44	80/3954.44	82.5/3951.94 TD
WSTF-SB07 (4034.31)	21/4013.31	25/4009.31	44/3990.31	57/3977.31	Absent	59.5/3974.81	61/3973.31	72.5/3961.81	78/3956.31	80/3954.31 TD
WSTF-SB08 (4032.14)	17/4015.14	25/4007.14	40/3992.14	59/3973.14	Absent	60/3972.14	61/3971.14	74/3958.14	79/3953.14	82.5/3949.64 TD
WSTF-SB09 (4031.13)	20/4011.13	21/4010.13	45/3986.13	57.5/3973.63	Absent	Absent	Absent	72.5/3958.63	78.9/3952.23	79/3952.13 TD
WSTF-SB10 (4033.31)	12/4021.31	20.5/4012.81	40/3993.31	59/3974.31	Absent	60/3973.31	61/3972.31	71/3962.31	77.5/3955.81	82.5/3950.81 TD
WSTF-SB11 (4027.31)	16/4011.31	17/4010.31	40/3987.31	52.5/3974.81	54/3973.31	65/3962.31	69/3958.31	Absent	Absent	75/3952.31 TD
WSTF-SB12 (4032)*	20/4012	22/4010	40/3992	58/3974	Absent	59.5/3972.5	60/3972	72/3960	81/3951	100/3932
WSTF-SB12-cont.	**Unit 10**	**Unit 11**	**Unit 12**	**Unit 13**	**Unit 14**	**Unit 15**	**Unit 16**	**Unit 17**		
	106/3926	115/3917	120/3912	124.5/3907.5	134/3898	135/3897	145/3887	152.5/3879.5 TD		

bgs=below ground surface

*=estimated

TABLE 3-3

SOIL AND WATER ANALYTES AND REPORTING LIMITS
USEPA SW-846 - METHOD 8240
TEMPERATURE TEST FACILITY
RCRA FACILITY INVESTIGATION
WHITE SANDS MISSILE RANGE, NEW MEXICO

Compound	Reporting Limits	
	Soil (μg/kg)	Water (μg/L)
Acetone	10	10
Benzene	5.0	5.0
Bromodichloromethane	5.0	5.0
Bromoform	5.0	5.0
Bromomethane	10	10
2-Butanone (MEK)	10	10
Carbon disulfide	5.0	5.0
Carbon tetrachloride	5.0	5.0
Chlorobenzene	5.0	5.0
Chloroethane	10	10
Chloroform	5.0	5.0
Chloromethane	10	10
Dibromochloromethane	5.0	5.0
1,1-Dichloroethane	5.0	5.0
1,2-Dichloroethane	5.0	5.0
1,1-Dichloroethene	5.0	5.0
1,2-Dichlorothene (total)	5.0	5.0
1,2-Dichloropropane	5.0	5.0
cis-1,3-Dichloropropene	5.0	5.0
trans-1,2-Dichloropropene	5.0	5.0
Ethylbenzene	5.0	5.0
2-Hexanone	10	10
Methylene Chloride	5.0	5.0
4-Methyl-2-pentanone (MIBK)	10	10
Styrene	5.0	5.0
1,1,2,2-Tetrachloroethane	5.0	5.0
Tetrachloroethene	5.0	5.0
Toluene	5.0	5.0
1,1,1-Trichloroethane	5.0	5.0
1,1,2-Trichloroethane	5.0	5.0
Trichloroethene	5.0	5.0
Trichlorofluoromethane (Freon 11)	5.0	5.0
1,1,2 Trichloro-1,2,2-trifluoroethane (Freon 113)	10	10
Vinyl acetate	10	10
Vinyl chloride	10	10
Xylenes	5.0	5.0

Table 3-4
Equipment Blanks, Trip Blanks, and Ambient Water Sample Laboratory Analytical Results
Temperature Test Facility RCRA Facility Investigation
White Sands Missile Range, New Mexico

WCFS Sample No.:	WSTF-0001-0000-TB			WSTF-0001-1000-AB			WSTF-0002-0000-TB			WSTF-0003-0000-TB			WSTF-00E1-1000-EB			WSTF-DB09-2050-EB		
Quanterra Sample No.:	041141-0024-TB			041209-0010-AB			041157-0013-TB			041209-0016-TB			041209-0008-EB			041007-0003-EB		
	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL
VOLATILES (ug/L)																		
1,1,1-Trichloroethane		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
1,1,2 Trichloro-1,2,2-trifluoroethane		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)
1,1,2,2-Tetrachloroethane		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
1,1,2-Trichloroethane		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
1,1-Dichloroethane		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
1,1-Dichloroethene		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
1,2-Dichloroethane		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
1,2-Dichloroethene (total)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
1,2-Dichloropropane		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
2-Butanone (MEK)		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)
2-Hexanone		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)
4-Methyl-2-pentanone (MIBK)		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)
Acetone		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)
Benzene		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Bromodichloromethane		ND	(5)	5.3				ND	(5)		ND	(5)	5				ND	(5)
Bromoform		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Bromomethane		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)
Carbon disulfide		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Carbon tetrachloride		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Chlorobenzene		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Chloroethane		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)
Chloroform		ND	(5)	27				ND	(5)		ND	(5)	26			27		
Chloromethane		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)
Dibromochloromethane		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Ethylbenzene		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Methylene chloride		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Styrene		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Tetrachloroethene		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Toluene		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Trichloroethene (TCE)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Trichlorofluoromethane		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Vinyl acetate		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)
Vinyl chloride		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)
Xylenes (total)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
cis-1,3-Dichloropropene		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
trans-1,3-Dichloropropene		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)

R = result, Q = qualifier, QL = quantitation limit

(ND= non detect)

Table 3-4
Equipment Blanks, Trip Blanks, and Ambient Water Sample Laboratory Analytical Results
Temperature Test Facility RCRA Facility Investigation
White Sands Missile Range, New Mexico

WCFS Sample No.:	WSTF-SB01-2050-EB			WSTF-SB02-2083-EB			WSTF-SB04-2077-EB			WSTF-SB06-2075-EB			WSTF-SB07-2058-EB			WSTF-SB09-2072-EB		
Quanterra Sample No.:	041029-0013-EB			041007-0016-EB			041141-0015-EB			041141-0008-EB			041209-0009-EB			041189-0009-EB		
	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL
VOLATILES (ug/L)																		
1,1,1-Trichloroethane		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
1,1,2 Trichloro-1,2,2-trifluoroethane		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)
1,1,2,2-Tetrachloroethane		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
1,1,2-Trichloroethane		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
1,1-Dichloroethane		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
1,1-Dichloroethene		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
1,2-Dichloroethane		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
1,2-Dichloroethene (total)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
1,2-Dichloropropane		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
2-Butanone (MEK)		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)
2-Hexanone		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)
4-Methyl-2-pentanone (MIBK)		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)
Acetone		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)	13		
Benzene		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Bromodichloromethane	5.4				ND	(5)		ND	(5)	5.4			5			5.6		
Bromoform		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Bromomethane		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)
Carbon disulfide		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Carbon tetrachloride		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Chlorobenzene		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Chloroethane		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)
Chloroform	29			29			27			29			24			34		
Chloromethane		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)
Dibromochloromethane		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Ethylbenzene		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Methylene chloride		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Styrene		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Tetrachloroethene		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Toluene		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Trichloroethene (TCE)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Trichlorofluoromethane		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Vinyl acetate		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)
Vinyl chloride		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)
Xylenes (total)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
cis-1,3-Dichloropropene		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
trans-1,3-Dichloropropene		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)

R = result, Q = qualifier, QL = quantitation limit

(ND= non detect)

Table 3-4
Equipment Blanks, Trip Blanks, and Ambient Water Sample Laboratory Analytical Results
Temperature Test Facility RCRA Facility Investigation
White Sands Missile Range, New Mexico

WCFS Sample No.:	WSTF-SB10-2010-EB			WSTF-SB12-2010-EB			WSTF-SB12-2022-EB			WSTF-SB12-2142-EB		
Quanterra Sample No.:	041172-0001-EB			041256-0001-EB			041256-0002-EB			041256-0020-EB		
	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL
VOLATILES (ug/L)												
1,1,1-Trichloroethane		ND	(5)		ND	(5)		ND	(5)		ND	(5)
1,1,2 Trichloro-1,2,2-trifluoroethane		ND	(10)		ND	(10)		ND	(10)		ND	(10)
1,1,2,2-Tetrachloroethane		ND	(5)		ND	(5)		ND	(5)		ND	(5)
1,1,2-Trichloroethane		ND	(5)		ND	(5)		ND	(5)		ND	(5)
1,1-Dichloroethane		ND	(5)		ND	(5)		ND	(5)		ND	(5)
1,1-Dichloroethene		ND	(5)		ND	(5)		ND	(5)		ND	(5)
1,2-Dichloroethane		ND	(5)		ND	(5)		ND	(5)		ND	(5)
1,2-Dichloroethene (total)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
1,2-Dichloropropane		ND	(5)		ND	(5)		ND	(5)		ND	(5)
2-Butanone (MEK)		ND	(10)		ND	(10)		ND	(10)		ND	(10)
2-Hexanone		ND	(10)		ND	(10)		ND	(10)		ND	(10)
4-Methyl-2-pentanone (MIBK)		ND	(10)		ND	(10)		ND	(10)		ND	(10)
Acetone		ND	(10)		ND	(10)		ND	(10)		ND	(10)
Benzene		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Bromodichloromethane	5.5				ND	(5)		ND	(5)		ND	(5)
Bromoform		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Bromomethane		ND	(10)		ND	(10)		ND	(10)		ND	(10)
Carbon disulfide		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Carbon tetrachloride		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Chlorobenzene		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Chloroethane		ND	(10)		ND	(10)		ND	(10)		ND	(10)
Chloroform	28			18			22			19		
Chloromethane		ND	(10)		ND	(10)		ND	(10)		ND	(10)
Dibromochloromethane		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Ethylbenzene		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Methylene chloride	5.4				ND	(5)		ND	(5)		ND	(5)
Styrene		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Tetrachloroethene		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Toluene		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Trichloroethene (TCE)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Trichlorofluoromethane		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Vinyl acetate		ND	(10)		ND	(10)		ND	(10)		ND	(10)
Vinyl chloride		ND	(10)		ND	(10)		ND	(10)		ND	(10)
Xylenes (total)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
cis-1,3-Dichloropropene		ND	(5)		ND	(5)		ND	(5)		ND	(5)
trans-1,3-Dichloropropene		ND	(5)		ND	(5)		ND	(5)		ND	(5)

R = result, Q = qualifier, QL = quantitation limit

(ND= non detect)

TABLE 3-5
Summary of Geotechnical Test Results
Temperature Test Facility
RCRA Facility Investigation
White Sands Missile Range, New Mexico

Boring	Depth (feet)	Water Content %	Liquid Limit	Plastic Limit	Plastic Ind	USCS Symbol (*)	Sieve Minus No. 200 (%)	Hydrometer % Minus 2 um (%)
WSTF-SB01	17	3.5	---	np	---	SP-SM	10.1	3
WSTF-SB01	57	6.9	---	np	---	SM	31.6	8
WSTF-SB01	62	13.8	31	16	15	CL	61.2	17
WSTF-SB01	76	3.3	---	---	---	SP	3.4	2
WSTF-SB03	21	8.2	30	19	11	SC	43.1	13
WSTF-SB03	60	23.9	69	27	42	CH	73	43
WSTF-SB03	65	25.2	60	32	28	MH	91.7	---
WSTF-SB03	74	18	43	24	19	CL	66.4	33
WSTF-SB04	57	3	---	np	---	SM	38.8	4

Note:
--- No Data Reported
* - plasticity of fines for USCS symbol based on visual observation unless Atterburg limits reported.

TABLE 3-6
Summary of Groundwater Monitoring Well
Purging Parameters
Temperature Test Facility
RCRA Facility Investigation
White Sands Missile Range, New Mexico

MW E-1						
DATE	PURGE WATER REMOVED (gallons)	LAST WATER CHARACTERISTIC MEASUREMENTS				
		VOLUME (gallons)	pH	CONDUCTIVITY (micromoh/cm)	TEMPERATURE (celsius)	LAST WATER RECOVERED
3/27/95	20	16 18 20	9.25 9.3 9.2	290 290 290	22.5 22.5 21.5	Clear

MW E-2						
DATE	PURGE WATER REMOVED (gallons)	LAST WATER CHARACTERISTIC MEASUREMENTS				
		VOLUME (gallons)	pH	CONDUCTIVITY (micromoh/cm)	TEMPERATURE (celsius)	LAST WATER RECOVERED
3/23/95	28	22.4 25.2 28	8 7.99 7.98	300 300 300	20.5 21 20	Clear

MW E-3						
DATE	PURGE WATER REMOVED (gallons)	LAST WATER CHARACTERISTIC MEASUREMENTS				
		VOLUME (gallons)	pH	CONDUCTIVITY (micromoh/cm)	TEMPERATURE (celsius)	LAST WATER RECOVERED
3/23/95	14	11.2 12.6 14	8.43 8.4 8.4	300 300 300	23 23 23	Clear

MW E-4						
DATE	PURGE WATER REMOVED (gallons)	LAST WATER CHARACTERISTIC MEASUREMENTS				
		VOLUME (gallons)	pH	CONDUCTIVITY (micromoh/cm)	TEMPERATURE (celsius)	LAST WATER RECOVERED
3/24/95	47	37.6 42.3 47	8.26 8.26 8.25	365 365 365	23 23 23	Clear

Note: SAMPLED WITH DEDICATED BLADDER PUMP

TABLE 4-1
Soil Gas Monitoring Well
GC/PID/ECD
On-Site Field Screening Results
Temperature Test Facility
RCRA Facility Investigation
White Sands Missile Range, New Mexico

		1,1-Dichloroethene	1,1-Dichlorothane	1,1,1-Trichloroethane	Tetrachloroethene	Trichloroethene	Methylene Chloride	Chloroform	Freons (qualitative)
REPORTING LIMITS (ug/L)		0.05	0.5	0.01	0.01	0.01	0.5	0.1	NA
Sample ID	Date								
WSTF-0000-5077	6/30/94	2.89	ND	1.15	1.4	2.13	ND	0.1	Detected
WSTF-0011-5058	6/29/94	45.8	ND	21.9	24.9	23.8	26.9	1.4	Detected
WSTF-0014-5100	6/30/94	6.08	ND	0.44	2.3	4.1	ND	0.1	Detected
WSTF-0016-5070	6/29/94	4.62	ND	0.71	1.24	1.59	ND	ND	Detected
WSTF-0017-5082	6/29/94	9.9	ND	1.7	3.66	5.95	ND	0.4	Detected
WSTF-0018-5052	6/29/94	21.9	ND	9.53	9.75	10.8	ND	0.7	Detected
WSTF-0019-5085	6/29/94	62	ND	3.15	21.3	32.1	17.9	2.4	Detected
WSTF-0020-5077	6/30/94	34	ND	22.6	20.2	20.1	>4,200	0.5	Detected
WSTF-0021-5080	6/29/94	54.1	ND	>16	23.8	48.9	>1,300	4.7	Detected
WSTF-0022-5080	6/29/94	21.3	ND	14.5	12.9	14.6	449	0.7	Detected
WSTF-0022-5080 DUP	6/29/94	24.1	ND	15.5	15.2	16	616	1	Detected
WSTF-0023-5085	6/29/94	23.6	ND	8.25	10	12.1	ND	0.7	Detected
WSTF-0024-5072	6/29/94	21.4	ND	19.8	15.6	12	ND	0.5	Detected
WSTF-0025-5078	6/30/94	9.13	ND	0.73	3.01	5.2	ND	0.2	Detected
WSTF-0027-5080	6/30/94	104	ND	29.9	63.2	49.3	ND	5.8	Detected
WSTF-0029-5058	6/30/94	2.42	ND	0.6	1.05	1.65	ND	0.1	Detected
WSTF-0029-5058 DUP	6/30/94	2.63	ND	0.6	1.35	1.9	3.02	0.1	Detected
WSTF-9201-5089	6/30/94	60.6	ND	13.4	27.8	33.1	593	3.4	Detected
WSTF-9202-5092	6/30/94	11.1	ND	4.25	5.3	7.8	>4,500	1.2	Detected

ND=Not detected

DUP=Duplicate Sample

ug/L=Micrograms per liter

>=Detector saturation occured during analysis. Values represent minimum concentration of compound present.

Soil Gas Monitoring Well Laboratory Analytical Results
Temperature Test Facility RCRA Facility Investigation
White Sands Missile Range, New Mexico

WCFS Sample No.:	WSTF-0000-5077			WSTF-0011-5058			WSTF-0014-5100			WSTF-0016-5070			WSTF-0017-5082			WSTF-0018-5052			WSTF-0019-5085		
Enseco Air Toxics Sample No.:	106243-0009-SA			106237-0003-SA			106243-0001-SA			106237-0010-SA			106237-0007-SA			106237-0009-SA			106237-0008-SA		
	Well No. 00			Well No. 11			Well No. 14			Well No. 16			Well No. 17			Well No. 18			Well No. 19		
	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL
VOLATILES (ppb (v/v))																					
1,1,1-Trichloroethane	190			7400			79			270			850			2800			710		
1,1,2,2-Tetrachloroethane		ND	(26)		ND	(200)		ND	(20)		ND	(36)		ND	(42)		ND	(73)		ND	(190)
1,1,2-Trichloro-1,2,2-trifluoroethane		ND	(26)		ND	(200)		ND	(20)		ND	(36)		ND	(42)		ND	(73)		ND	(190)
1,1,2-Trichloroethane		ND	(26)		ND	(200)		ND	(20)		ND	(36)		ND	(42)		ND	(73)		ND	(190)
1,1-Dichloroethane		ND	(26)		ND	(200)		ND	(20)		ND	(36)	84			85			230		
1,1-Dichloroethene	790			16000			1800			2400			6100			7900			19000		
1,2,4-Trichlorobenzene		ND	(52)		ND	(400)		ND	(40)		ND	(72)		ND	(84)		ND	(150)		ND	(390)
1,2,4-Trimethylbenzene		ND	(26)		ND	(200)		ND	(20)		ND	(36)		ND	(42)		ND	(73)		ND	(190)
1,2-Dibromoethane (EDB)		ND	(26)		ND	(200)		ND	(20)		ND	(36)		ND	(42)		ND	(73)		ND	(190)
1,2-Dichloro-1,1,2,2-tetrafluoroethane		ND	(26)		ND	(200)		ND	(20)		ND	(36)		ND	(42)		ND	(73)		ND	(190)
1,2-Dichlorobenzene		ND	(26)		ND	(200)		ND	(20)		ND	(36)		ND	(42)		ND	(73)		ND	(190)
1,2-Dichloroethane		ND	(26)		ND	(200)		ND	(20)		ND	(36)		ND	(42)		ND	(73)		ND	(190)
1,2-Dichloropropane		ND	(26)		ND	(200)		ND	(20)		ND	(36)		ND	(42)		ND	(73)		ND	(190)
1,3,5-Trimethylbenzene		ND	(26)		ND	(200)		ND	(20)		ND	(36)		ND	(42)		ND	(73)		ND	(190)
1,3-Dichlorobenzene		ND	(26)		ND	(200)		ND	(20)		ND	(36)		ND	(42)		ND	(73)		ND	(190)
1,4-Dichlorobenzene		ND	(26)		ND	(200)		ND	(20)		ND	(36)		ND	(42)		ND	(73)		ND	(190)
2-Butanone		ND	(130)		ND	(1000)		ND	(100)		ND	(180)		ND	(210)		ND	(370)		ND	(970)
2-Hexanone		ND	(52)		ND	(400)		ND	(40)		ND	(72)		ND	(84)		ND	(150)		ND	(390)
4-Ethyl toluene		ND	(26)		ND	(200)		ND	(20)		ND	(36)		ND	(42)		ND	(73)		ND	(190)
4-Methyl-2-pentanone		ND	(52)		ND	(400)		ND	(40)		ND	(72)		ND	(84)		ND	(150)		ND	(390)
Acetone		ND	(130)		ND	(1000)		ND	(100)		ND	(180)		ND	(210)		ND	(370)		ND	(970)
Benzene		ND	(26)		ND	(200)		ND	(20)		ND	(36)		ND	(42)		ND	(73)		ND	(190)
Benzyl chloride		ND	(26)		ND	(200)		ND	(20)		ND	(36)		ND	(42)		ND	(73)		ND	(190)
Bromodichloromethane		ND	(26)		ND	(200)		ND	(20)		ND	(36)		ND	(42)		ND	(73)		ND	(190)
Bromoform		ND	(26)		ND	(200)		ND	(20)		ND	(36)		ND	(42)		ND	(73)		ND	(190)
Bromomethane		ND	(26)		ND	(200)		ND	(20)		ND	(36)		ND	(42)		ND	(73)		ND	(190)
Carbon disulfide		ND	(130)		ND	(1000)		ND	(100)		ND	(180)		ND	(210)		ND	(370)		ND	(970)
Carbon tetrachloride		ND	(26)		ND	(200)		ND	(20)		ND	(36)		ND	(42)		ND	(73)		ND	(190)
Chlorobenzene		ND	(26)		ND	(200)		ND	(20)		ND	(36)		ND	(42)		ND	(73)		ND	(190)
Chlorodifluoromethane		ND	(52)		ND	(400)		ND	(40)		ND	(72)		ND	(84)		ND	(150)		ND	(390)
Chloroethane		ND	(52)		ND	(400)		ND	(40)		ND	(72)		ND	(84)		ND	(150)		ND	(390)
Chloroform	28			540			34				ND	(36)	230			250			730		
Chloromethane		ND	(52)		ND	(400)		ND	(40)		ND	(72)		ND	(84)		ND	(150)		ND	(390)
Dibromochloromethane		ND	(26)		ND	(200)		ND	(20)		ND	(36)		ND	(42)		ND	(73)		ND	(190)
Dichlorodifluoromethane		ND	(26)		ND	(200)		ND	(20)		ND	(36)		ND	(42)		ND	(73)		ND	(190)
Ethylbenzene		ND	(26)		ND	(200)		ND	(20)		ND	(36)		ND	(42)		ND	(73)		ND	(190)
Hexachlorobutadiene		ND	(52)		ND	(400)		ND	(40)		ND	(72)		ND	(84)		ND	(150)		ND	(390)
Methylene chloride	840				ND	(200)		ND	(20)		ND	(36)		ND	(42)		ND	(73)	7300		
Styrene		ND	(26)		ND	(200)		ND	(20)		ND	(36)		ND	(42)		ND	(73)		ND	(190)
Tetrachloroethene	370			9500			590			740			2600			3600			6800		
Toluene		ND	(26)		ND	(200)		ND	(20)		ND	(36)		ND	(42)		ND	(73)		ND	(190)
Trichloroethene (TCE)	500			8800			910			780			4100			4000			12000		
Trichlorofluoromethane	1700			21000			900			2400			4400			9400			7900		
Vinyl acetate		ND	(130)		ND	(1000)		ND	(100)		ND	(180)		ND	(210)		ND	(370)		ND	(970)
Vinyl chloride		ND	(26)		ND	(200)		ND	(20)		ND	(36)		ND	(42)		ND	(73)		ND	(190)
Xylenes (total)		ND	(26)		ND	(200)		ND	(20)		ND	(36)		ND	(42)		ND	(73)		ND	(190)
cis-1,2-Dichloroethene		ND	(26)		ND	(200)		ND	(20)		ND	(36)		ND	(42)		ND	(73)		ND	(190)
cis-1,3-Dichloropropene		ND	(26)		ND	(200)		ND	(20)		ND	(36)		ND	(42)		ND	(73)		ND	(190)
trans-1,2-Dichloroethene	33			920			54			86			290			360			830		
trans-1,3-Dichloropropene		ND	(26)		ND	(200)		ND	(20)		ND	(36)		ND	(42)		ND	(73)		ND	(190)

R = result, Q = qualifier, QL = quantitation limit

(ND= non detect)

Soil Gas Monitoring Well Laboratory Analytical Results
Temperature Test Facility RCRA Facility Investigation
White Sands Missile Range, New Mexico

WCFS Sample No.:	WSTF-0020-5077			WSTF-0021-5080			WSTF-0022-5080			WSTF-0022-5080-QC			WSTF-0023-5085			WSTF-0024-5072			WSTF-0025-5078		
Enseco Air Toxics Sample No.:	106243-0002-SA			106237-0001-SA			106237-0005-SA			106237-0006-SA			106237-0004-SA			106237-0002-SA			106243-0003-SA		
	Well No. 20			Well No. 21			Well No. 22			Well No. 22			Well No. 23			Well No. 24			Well No. 25		
	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL
VOLATILES (ppb (v/v))																					
1,1,1-Trichloroethane		ND	(200000)		ND	(600)		ND	(10000)		ND	(9400)	4500			7000			160		
1,1,2,2-Tetrachloroethane		ND	(200000)		ND	(600)		ND	(10000)		ND	(9400)		ND	(200)		ND	(78)		ND	(39)
1,1,2-Trichloro-1,2,2-trifluoroethane		ND	(200000)		ND	(600)		ND	(10000)		ND	(9400)		ND	(200)		ND	(78)		ND	(39)
1,1,2-Trichloroethane		ND	(200000)		ND	(600)		ND	(10000)		ND	(9400)		ND	(200)		ND	(78)		ND	(39)
1,1-Dichloroethane		ND	(200000)		ND	(600)		ND	(10000)		ND	(9400)		ND	(200)		ND	(78)		ND	(39)
1,1-Dichloroethene		ND	(200000)		ND	(600)		ND	(10000)		ND	(9400)	14000			7800			3000		
1,2,4-Trichlorobenzene		ND	(390000)		ND	(1200)		ND	(20000)		ND	(19000)		ND	(400)		ND	(160)		ND	(78)
1,2,4-Trimethylbenzene		ND	(200000)		ND	(600)		ND	(10000)		ND	(9400)		ND	(200)		ND	(78)		ND	(39)
1,2-Dibromoethane (EDB)		ND	(200000)		ND	(600)		ND	(10000)		ND	(9400)		ND	(200)		ND	(78)		ND	(39)
1,2-Dichloro-1,1,2,2-tetrafluoroethane		ND	(200000)		ND	(600)		ND	(10000)		ND	(9400)		ND	(200)		ND	(78)		ND	(39)
1,2-Dichlorobenzene		ND	(200000)		ND	(600)		ND	(10000)		ND	(9400)		ND	(200)		ND	(78)		ND	(39)
1,2-Dichloroethane		ND	(200000)		ND	(600)		ND	(10000)		ND	(9400)		ND	(200)		ND	(78)		ND	(39)
1,2-Dichloropropane		ND	(200000)		ND	(600)		ND	(10000)		ND	(9400)		ND	(200)		ND	(78)		ND	(39)
1,3,5-Trimethylbenzene		ND	(200000)		ND	(600)		ND	(10000)		ND	(9400)		ND	(200)		ND	(78)		ND	(39)
1,3-Dichlorobenzene		ND	(200000)		ND	(600)		ND	(10000)		ND	(9400)		ND	(200)		ND	(78)		ND	(39)
1,4-Dichlorobenzene		ND	(200000)		ND	(600)		ND	(10000)		ND	(9400)		ND	(200)		ND	(78)		ND	(39)
2-Butanone		ND	(980000)		ND	(3000)		ND	(51000)		ND	(47000)		ND	(1000)		ND	(390)		ND	(190)
2-Hexanone		ND	(390000)		ND	(1200)		ND	(20000)		ND	(19000)		ND	(400)		ND	(160)		ND	(78)
4-Ethyl toluene		ND	(200000)		ND	(600)		ND	(10000)		ND	(9400)		ND	(200)		ND	(78)		ND	(39)
4-Methyl-2-pentanone		ND	(390000)		ND	(1200)		ND	(20000)		ND	(19000)		ND	(400)		ND	(160)		ND	(78)
Acetone		ND	(980000)		ND	(3000)		ND	(51000)		ND	(47000)		ND	(1000)		ND	(390)		ND	(190)
Benzene		ND	(200000)		ND	(600)		ND	(10000)		ND	(9400)		ND	(200)		ND	(78)		ND	(39)
Benzyl chloride		ND	(200000)		ND	(600)		ND	(10000)		ND	(9400)		ND	(200)		ND	(78)		ND	(39)
Bromodichloromethane		ND	(200000)		ND	(600)		ND	(10000)		ND	(9400)		ND	(200)		ND	(78)		ND	(39)
Bromoform		ND	(200000)		ND	(600)		ND	(10000)		ND	(9400)		ND	(200)		ND	(78)		ND	(39)
Bromomethane		ND	(200000)		ND	(600)		ND	(10000)		ND	(9400)		ND	(200)		ND	(78)		ND	(39)
Carbon disulfide		ND	(980000)		ND	(3000)		ND	(51000)		ND	(47000)		ND	(1000)		ND	(390)		ND	(190)
Carbon tetrachloride		ND	(200000)		ND	(600)		ND	(10000)		ND	(9400)		ND	(200)		ND	(78)		ND	(39)
Chlorobenzene		ND	(200000)		ND	(600)		ND	(10000)		ND	(9400)		ND	(200)		ND	(78)		ND	(39)
Chlorodifluoromethane		ND	(390000)		ND	(1200)		ND	(20000)		ND	(19000)		ND	(400)		ND	(160)		ND	(78)
Chloroethane		ND	(390000)		ND	(1200)		ND	(20000)		ND	(19000)		ND	(400)		ND	(160)		ND	(78)
Chloroform		ND	(200000)		ND	(600)		ND	(10000)		ND	(9400)	420			210			73		
Chloromethane		ND	(390000)		ND	(1200)		ND	(20000)		ND	(19000)		ND	(400)		ND	(160)		ND	(78)
Dibromochloromethane		ND	(200000)		ND	(600)		ND	(10000)		ND	(9400)		ND	(200)		ND	(78)		ND	(39)
Dichlorodifluoromethane		ND	(200000)		ND	(600)		ND	(10000)		ND	(9400)		ND	(200)		ND	(78)		ND	(39)
Ethylbenzene		ND	(200000)		ND	(600)		ND	(10000)		ND	(9400)		ND	(200)		ND	(78)		ND	(39)
Hexachlorobutadiene		ND	(390000)		ND	(1200)		ND	(20000)		ND	(19000)		ND	(400)		ND	(160)		ND	(78)
Methylene chloride	9800000			68000			780000			850000				ND	(200)		ND	(78)		ND	(39)
Styrene		ND	(200000)		ND	(600)		ND	(10000)		ND	(9400)		ND	(200)		ND	(78)		ND	(39)
Tetrachloroethene		ND	(200000)		ND	(600)		ND	(10000)		ND	(9400)	7200			6100			1100		
Toluene		ND	(200000)		ND	(600)		ND	(10000)		ND	(9400)		ND	(200)		ND	(78)		ND	(39)
Trichloroethene (TCE)		ND	(200000)		ND	(600)		ND	(10000)		ND	(9400)	7800			4200			1600		
Trichlorofluoromethane		ND	(200000)		ND	(600)	15000			17000			16000			10000			2000		
Vinyl acetate		ND	(980000)		ND	(3000)		ND	(51000)		ND	(47000)		ND	(1000)		ND	(390)		ND	(190)
Vinyl chloride		ND	(200000)		ND	(600)		ND	(10000)		ND	(9400)		ND	(200)		ND	(78)		ND	(39)
Xylenes (total)		ND	(200000)		ND	(600)		ND	(10000)		ND	(9400)		ND	(200)		ND	(78)		ND	(39)
cis-1,2-Dichloroethene		ND	(200000)		ND	(600)		ND	(10000)		ND	(9400)		ND	(200)		ND	(78)		ND	(39)
cis-1,3-Dichloropropene		ND	(200000)		ND	(600)		ND	(10000)		ND	(9400)		ND	(200)		ND	(78)		ND	(39)
trans-1,2-Dichloroethene		ND	(200000)		ND	(600)		ND	(10000)		ND	(9400)	750			300				ND	(39)
trans-1,3-Dichloropropene		ND	(200000)		ND	(600)		ND	(10000)		ND	(9400)		ND	(200)		ND	(78)		ND	(39)

R = result, Q = qualifier, QL = quantitation limit

(ND= non detect)

Soil Gas Monitoring Well Laboratory Analytical Results
Temperature Test Facility RCRA Facility Investigation
White Sands Missile Range, New Mexico

WCFS Sample No.:	WSTF-0027-5080			WSTF-0029-5058			WSTF-0029-5058-QC			WSTF-9201-5089			WSTF-9202-5092		
Enseco Air Toxics Sample No.:	106243-0004-SA			106243-0005-SA			106243-0006-SA			106243-0007-SA			106243-0008-SA		
	Well No. 27			Well No. 29			Well No. 29			Well No. 01			Well No. 02		
	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL
VOLATILES (ppb (v/v))															
1,1,1-Trichloroethane	6600			120			110				ND	(7800)		ND	(670000)
1,1,2,2-Tetrachloroethane		ND	(390)		ND	(9.7)		ND	(9.7)		ND	(7800)		ND	(670000)
1,1,2-Trichloro-1,2,2-trifluoroethane		ND	(390)		ND	(9.7)		ND	(9.7)		ND	(7800)		ND	(670000)
1,1,2-Trichloroethane		ND	(390)		ND	(9.7)		ND	(9.7)		ND	(7800)		ND	(670000)
1,1-Dichloroethane		ND	(390)	11			10				ND	(7800)		ND	(670000)
1,1-Dichloroethene	25000			780			680			15000				ND	(670000)
1,2,4-Trichlorobenzene		ND	(780)		ND	(19)		ND	(19)		ND	(16000)		ND	(1300000)
1,2,4-Trimethylbenzene		ND	(390)		ND	(9.7)		ND	(9.7)		ND	(7800)		ND	(670000)
1,2-Dibromoethane (EDB)		ND	(390)		ND	(9.7)		ND	(9.7)		ND	(7800)		ND	(670000)
1,2-Dichloro-1,1,2,2-tetrafluoroethane		ND	(390)		ND	(9.7)		ND	(9.7)		ND	(7800)		ND	(670000)
1,2-Dichlorobenzene		ND	(390)		ND	(9.7)		ND	(9.7)		ND	(7800)		ND	(670000)
1,2-Dichloroethane		ND	(390)		ND	(9.7)		ND	(9.7)		ND	(7800)		ND	(670000)
1,2-Dichloropropane		ND	(390)		ND	(9.7)		ND	(9.7)		ND	(7800)		ND	(670000)
1,3,5-Trimethylbenzene		ND	(390)		ND	(9.7)		ND	(9.7)		ND	(7800)		ND	(670000)
1,3-Dichlorobenzene		ND	(390)		ND	(9.7)		ND	(9.7)		ND	(7800)		ND	(670000)
1,4-Dichlorobenzene		ND	(390)		ND	(9.7)		ND	(9.7)		ND	(7800)		ND	(670000)
2-Butanone		ND	(1900)		ND	(49)		ND	(49)		ND	(39000)		ND	(3300000)
2-Hexanone		ND	(780)		ND	(19)		ND	(19)		ND	(16000)		ND	(1300000)
4-Ethyl toluene		ND	(390)		ND	(9.7)		ND	(9.7)		ND	(7800)		ND	(670000)
4-Methyl-2-pentanone		ND	(780)		ND	(19)		ND	(19)		ND	(16000)		ND	(1300000)
Acetone		ND	(1900)		ND	(49)		ND	(49)		ND	(39000)		ND	(3300000)
Benzene		ND	(390)		ND	(9.7)		ND	(9.7)		ND	(7800)		ND	(670000)
Benzyl chloride		ND	(390)		ND	(9.7)		ND	(9.7)		ND	(7800)		ND	(670000)
Bromodichloromethane		ND	(390)		ND	(9.7)		ND	(9.7)		ND	(7800)		ND	(670000)
Bromoform		ND	(390)		ND	(9.7)		ND	(9.7)		ND	(7800)		ND	(670000)
Bromomethane		ND	(390)		ND	(9.7)		ND	(9.7)		ND	(7800)		ND	(670000)
Carbon disulfide		ND	(1900)		ND	(49)		ND	(49)		ND	(39000)		ND	(3300000)
Carbon tetrachloride		ND	(390)		ND	(9.7)		ND	(9.7)		ND	(7800)		ND	(670000)
Chlorobenzene		ND	(390)		ND	(9.7)		ND	(9.7)		ND	(7800)		ND	(670000)
Chlorodifluoromethane		ND	(780)		ND	(19)		ND	(19)		ND	(16000)		ND	(1300000)
Chloroethane		ND	(780)		ND	(19)		ND	(19)		ND	(16000)		ND	(1300000)
Chloroform	1400			33			29				ND	(7800)		ND	(670000)
Chloromethane		ND	(780)		ND	(19)		ND	(19)		ND	(16000)		ND	(1300000)
Dibromochloromethane		ND	(390)		ND	(9.7)		ND	(9.7)		ND	(7800)		ND	(670000)
Dichlorodifluoromethane		ND	(390)		ND	(9.7)		ND	(9.7)		ND	(7800)		ND	(670000)
Ethylbenzene		ND	(390)		ND	(9.7)		ND	(9.7)		ND	(7800)		ND	(670000)
Hexachlorobutadiene		ND	(780)		ND	(19)		ND	(19)		ND	(16000)		ND	(1300000)
Methylene chloride		ND	(390)	18			14			1400000			42000000		
Styrene		ND	(390)		ND	(9.7)		ND	(9.7)		ND	(7800)		ND	(670000)
Tetrachloroethene	16000			350			360				ND	(7800)		ND	(670000)
Toluene		ND	(390)		ND	(9.7)		ND	(9.7)		ND	(7800)		ND	(670000)
Trichloroethene (TCE)	17000			440			440			9800				ND	(670000)
Trichlorofluoromethane	26000			710			630			15000				ND	(670000)
Vinyl acetate		ND	(1900)		ND	(49)		ND	(49)		ND	(39000)		ND	(3300000)
Vinyl chloride		ND	(390)		ND	(9.7)		ND	(9.7)		ND	(7800)		ND	(670000)
Xylenes (total)		ND	(390)		ND	(9.7)		ND	(9.7)		ND	(7800)		ND	(670000)
cis-1,2-Dichloroethene		ND	(390)		ND	(9.7)		ND	(9.7)		ND	(7800)		ND	(670000)
cis-1,3-Dichloropropene		ND	(390)		ND	(9.7)		ND	(9.7)		ND	(7800)		ND	(670000)
trans-1,2-Dichloroethene	1900			26			23				ND	(7800)		ND	(670000)
trans-1,3-Dichloropropene		ND	(390)		ND	(9.7)		ND	(9.7)		ND	(7800)		ND	(670000)

R = result, Q = qualifier, QL = quantitation limit

(ND= non detect)

TABLE 4-3
STATISTICAL REVIEW OF SOIL GAS MONITORING WELL FIELD SCREENING AND ANALYTICAL RESULTS
TEMPERATURE TEST FACILITY
RCRA FACILITY INVESTIGATION
WHITE SANDS MISSILE RANGE, NEW MEXICO

FIELD SCREENING RESULTS

Compound (ug/L)	Number of Samples	Number of Detections	CONCENTRATION Average	Median	Maximum	Maximum Concentration Sample ID
1,1-Dichloroethene	17	17	29	21	104	WSTF-0027-5080
1,1-Dichlorothane	17	0				
Freons (qualitative)	17	0				
Methylene Chloride	17	7	1584	449	4500	WSTF-9202-5092
Chloroform	17	16	2	1	6	WSTF-9202-5092
1,1,1-Trichloroethane	17	17	10	8	30	WSTF-9202-5092
Trichloroethene	17	17	17	12	49	WSTF-9202-5092
Tetrachloroethene	17	17	15	10	63	WSTF-9202-5092

LABORATORY ANALYTICAL RESULTS

Compound (ppb)	Number of Samples	Number of Detections	CONCENTRATION Average	Median	Maximum	Maximum Concentration Sample ID
1,1,1-Trichloroethane	17	12	2557	780	7400	WSTF-0011-5058
1,1,2,2-Tetrachloroethane	17	0				
Freon 113 (1,1,2 Trichloro-1,2,2-trifluoroethane)	17	0				
1,1,2-Trichloroethane	17	0				
1,1-Dichloroethane	17	4	103	85	230	WSTF-0019-5085
1,1-Dichloroethene	17	13	9198	7800	25000	WSTF-0027-5080
1,2,4-Trichlorobenzene	17	0				
1,2,4-Trimethylbenzene	17	0				
1,2-Dibromoethane (EDB)	17	0				
1,2-Dichloro-1,1,2,2-tetrafluoroethane	17	0				
1,2-Dichlorobenzene	17	0				
1,2-Dichloroethane	17	0				
1,2-Dichloropropane	17	0				
1,3,5-Trimethylbenzene	17	0				
1,3-Dichlorobenzene	17	0				
1,4-Dichlorobenzene	17	0				
2-Butanone	17	0				
2-Hexanone	17	0				
4-Ethyl toluene	17	0				
4-Methyl-2-pentanone	17	0				
Acetone	17	0				
Benzene	17	0				
Benzyl chloride	17	0				
Bromodichloromethane	17	0				
Bromoform	17	0				
Bromomethane	17	0				
Carbon disulfide	17	0				
Carbon tetrachloride	17	0				
Chlorobenzene	17	0				
Chlorodifluoromethane	17	0				
Chloroethane	17	0				
Chloroform	17	11	359	230	1400	WSTF-0027-5080
Chloromethane	17	0				
Dibromochloromethane	17	0				
Dichlorodifluoromethane	17	0				
Ethylbenzene	17	0				
Hexachlorobutadiene	17	0				
Methylene chloride	17	8	6757020	424000	42000000	WSTF-9202-5092
Styrene	17	0				
Tetrachloroethene	17	12	4579	3100	16000	WSTF-0027-5080
Toluene	17	0				
Trichloroethene (TCE)	17	13	5533	4100	17000	WSTF-0027-5080
Freon 11 (Trichlorofluoromethane)	17	14	9458	8650	26000	WSTF-0027-5080
Vinyl acetate	17	0				
Vinyl chloride	17	0				
Xylenes (total)	17	0				
cis-1,2-Dichloroethene	17	0				
cis-1,3-Dichloropropene	17	0				
trans-1,2-Dichloroethene	17	11	504	300	1900	WSTF-0027-5080
trans-1,3-Dichloropropene	17	0				

TABLE 4-4
Shallow and Deep Soil Gas Samples
GC/MS
On-Site Field Analytical Results
Temperature Test Facility
RCRA Facility Investigation
White Sands Missile Range, New Mexico

		1,1-Dichloroethene	1,1-Dichlorothane	1,1,1- Trichloroethane	Tetrachloroethene	Trichloroethene	Methylene Chloride	Chloroform	Freon- 11	Freon- 113	Freon- 503	Freon- 22
REPORTING LIMITS (ug/L)		1.	1.	1.	1.	1.	1.	1.	1.	1.	qualatative	qualatative
SHALLOW SOIL GAS SAMPLES (Sample ID)	Date											
WSTF-B001-5020	3/11/1995	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WSTF-B002-5020	3/11/1995	ND	ND	ND	ND	ND	ND	ND	2	ND	ND	ND
WSTF-B003-5020	3/11/1995	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WSTF-B004-5020	3/14/1995	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WSTF-B005-5020	3/11/1995	ND	ND	ND	ND	ND	ND	ND	5	ND	ND	ND
WSTF-B006-5020	3/11/1995	ND	ND	ND	ND	ND	ND	ND	5	ND	ND	ND
WSTF-B007-5020	3/11/1995	ND	ND	ND	ND	ND	ND	ND	5	ND	ND	ND
WSTF-B008-5020	3/11/1995	1	ND	ND	ND	ND	ND	ND	7	ND	ND	ND
WSTF-B009-5020	3/11/1995	2	ND	ND	ND	ND	ND	ND	9	ND	ND	ND
WSTF-B010-5020	3/12/1995	2	ND	ND	ND	ND	ND	ND	8	ND	ND	ND
WSTF-B011-5020	3/12/1995	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WSTF-B012-5020	3/12/1995	3	ND	ND	ND	ND	ND	ND	12	ND	ND	ND
WSTF-B013-5020	3/11/1995	3	ND	2	2	2	ND	ND	14	ND	ND	ND
WSTF-B014-5020	3/11/1995	3	ND	1	ND	ND	ND	ND	14	ND	ND	ND
WSTF-B015-5020	3/11/1995	2	ND	ND	ND	ND	ND	ND	7	ND	ND	ND
WSTF-B016-5020	3/11/1995	1	ND	ND	ND	ND	ND	ND	8	ND	ND	ND
WSTF-B017-5020	3/11/1995	ND	ND	ND	ND	ND	ND	ND	4	ND	ND	ND
WSTF-B018-5020	3/10/1995	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WSTF-B019-5020	3/14/1995	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WSTF-B020-5020	3/11/1995	ND	ND	ND	ND	ND	ND	ND	3	ND	ND	ND
WSTF-B021-5020	3/11/1995	ND	ND	ND	ND	ND	ND	ND	4	ND	ND	ND

TABLE 4-4
Shallow and Deep Soil Gas Samples
GC/MS
On-Site Field Analytical Results
Temperature Test Facility
RCRA Facility Investigation
White Sands Missile Range, New Mexico

		1,1-Dichloroethene	1,1-Dichlorothane	1,1,1- Trichloroethane	Tetrachloroethene	Trichloroethene	Methylene Chloride	Chloroform	Freon- 11	Freon- 113	Freon- 503	Freon- 22
REPORTING LIMITS (ug/L)		1.	1.	1.	1.	1.	1.	1.	1.	1.	qualatative	qualatative
WSTF-B022-5020	3/11/1995	ND	ND	ND	ND	ND	ND	ND	3	ND	ND	ND
WSTF-B023-5020	3/11/1995	ND	ND	ND	ND	ND	ND	ND	5	ND	ND	ND
WSTF-B024-5020	3/10/1995	ND	ND	ND	ND	ND	ND	ND	5	ND	ND	ND
WSTF-B024-5020 DUP	3/10/1995	ND	ND	ND	ND	ND	ND	ND	5	ND	ND	ND
WSTF-B025-5020	3/10/1995	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WSTF-B026-5020	3/10/1995	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WSTF-B027-5020	3/10/1995	ND	ND	ND	ND	ND	ND	ND	8	ND	ND	ND
WSTF-B028-5020	3/9/1995	2	ND	1	ND	ND	ND	ND	10	ND	ND	ND
WSTF-B029-5020	3/9/1995	2	ND	1	1	1	ND	ND	11	ND	ND	ND
WSTF-B030-5020	3/9/1995	3	ND	2	2	3	ND	ND	13	ND	ND	ND
WSTF-B031-5020	3/9/1995	5	ND	3	3	3	ND	ND	22	ND	ND	ND
WSTF-B032-5020	3/11/1995	5	ND	3	1	3	ND	ND	25	ND	ND	ND
WSTF-B033-5020	3/12/1995	5	ND	3	2	2	ND	ND	20	ND	ND	ND
WSTF-B034-5020	3/12/1995	7	ND	4	3	5	ND	ND	27	ND	ND	ND
WSTF-B035-5020	3/12/1995	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WSTF-B036-5020	3/9/1995	11	ND	7	7	7	ND	ND	35	ND	ND	ND
WSTF-B039-5020	3/12/1995	15	ND	6	3	8	ND	ND	37	ND	ND	ND
WSTF-B040-5020	3/12/1995	9	ND	3	ND	8	ND	ND	38	12	ND	ND
WSTF-B042-5020	3/10/1995	7	ND	6	7	8	ND	ND	67	104	ND	ND
WSTF-B043-5020	3/10/1995	7	ND	7	5	7	ND	ND	60	169	ND	ND
WSTF-B043-5020 DUP	3/10/1995	9	ND	8	7	10	ND	ND	67	189	ND	ND
WSTF-B045-5020	3/12/1995	9	ND	7	4	9	ND	ND	32	13	ND	ND
WSTF-B046-5020	3/10/1995	6	ND	6	5	6	ND	ND	20	8	ND	ND
WSTF-B047-5020	3/9/1995	1	ND	10	8	9	ND	ND	38	48	ND	ND

TABLE 4-4
Shallow and Deep Soil Gas Samples
GC/MS
On-Site Field Analytical Results
Temperature Test Facility
RCRA Facility Investigation
White Sands Missile Range, New Mexico

		1,1-Dichloroethene	1,1-Dichlorothane	1,1,1- Trichloroethane	Tetrachloroethene	Trichloroethene	Methylene Chloride	Chloroform	Freon- 11	Freon- 113	Freon- 503	Freon- 22
REPORTING LIMITS (ug/L)		1.	1.	1.	1.	1.	1.	1.	1.	1.	qualatative	qualatative
WSTF-B048-5020	3/10/1995	5	ND	4	4	4	ND	ND	9	ND	ND	ND
WSTF-B049-5020	3/12/1995	8	ND	5	3	7	ND	ND	15	ND	ND	ND
WSTF-B050-5020	3/13/1995	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WSTF-B050-5020 DUP	3/13/1995	5	ND	ND	ND	ND	ND	ND	9	ND	ND	ND
WSTF-B051-5020	3/13/1995	1	ND	2	1	3	ND	ND	1	ND	ND	ND
WSTF-B052-5020	3/12/1995	5	ND	2	2	3	ND	ND	8	ND	ND	ND
WSTF-B053-5020	3/10/1995	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WSTF-B054-5020	3/12/1995	4	ND	ND	1	3	ND	ND	7	ND	ND	ND
WSTF-B057-5020	3/13/1995	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WSTF-B060-5020	3/13/1995	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WSTF-B061-5020	3/13/1995	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WSTF-B062-5020	3/13/1995	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WSTF-B063-5020	3/13/1995	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WSTF-B064-5020	3/13/1995	ND	ND	ND	ND	ND	ND	ND	1	ND	ND	ND
WSTF-B064-5020 DUP	3/13/1995	1	ND	ND	ND	ND	ND	ND	2	ND	ND	ND
WSTF-B065-5020	3/10/1995	2	ND	ND	1	2	ND	ND	2	ND	ND	ND
WSTF-B066-5020	3/10/1995	2	ND	ND	ND	1	ND	ND	2	ND	ND	ND
WSTF-B067-5020	3/10/1995	1	ND	ND	ND	1	ND	ND	1	ND	ND	ND
WSTF-B068-5020	3/10/1995	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WSTF-B069-5020	3/10/1995	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WSTF-B070-5020	3/10/1995	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WSTF-B071-5020	3/10/1995	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WSTF-B073-5020	3/10/1995	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WSTF-B075-5020	3/10/1995	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 4-4
Shallow and Deep Soil Gas Samples
GC/MS
On-Site Field Analytical Results
Temperature Test Facility
RCRA Facility Investigation
White Sands Missile Range, New Mexico

		1,1-Dichloroethene	1,1-Dichlorothane	1,1,1- Trichloroethane	Tetrachloroethene	Trichloroethene	Methylene Chloride	Chloroform	Freon- 11	Freon- 113	Freon- 503	Freon- 22
REPORTING LIMITS (ug/L)		1.	1.	1.	1.	1.	1.	1.	1.	1.	qualatative	qualatative
WSTF-B076-5020	3/10/1995	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WSTF-B077-5020	3/11/1995	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WSTF-B078-5020	3/11/1995	ND	ND	ND	ND	ND	ND	ND	4	ND	ND	ND
WSTF-B079-5020	3/11/1995	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WSTF-B079-5020 DUP	3/11/1995	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WSTF-B080-5020	3/11/1995	2	ND	ND	ND	ND	ND	ND	10	ND	ND	ND
WSTF-B081-5020	3/11/1995	4	ND	2	1	2	ND	ND	22	ND	ND	ND
WSTF-B082-5020	3/8/1995	12	ND	7	5	7	ND	ND	54	ND	ND	ND
WSTF-B083-5020	3/8/1995	8	ND	6	ND	1	ND	ND	31	ND	ND	ND
WSTF-B084-5020	3/8/1995	2	ND	ND	ND	ND	ND	ND	7	ND	ND	ND
WSTF-B085-5020	3/8/1995	ND	ND	ND	ND	ND	ND	ND	3	ND	ND	ND
WSTF-B086-5020	3/12/1995	4	ND	2	ND	ND	ND	ND	30	ND	ND	ND
WSTF-B087-5020	3/12/1995	3	ND	2	ND	2	ND	ND	32	ND	ND	ND
WSTF-B088-5020	3/12/1995	3	ND	2	ND	ND	ND	ND	24	ND	ND	ND
WSTF-B089-5020	3/12/1995	2	ND	ND	ND	ND	ND	ND	13	ND	ND	ND
WSTF-B090-5020	3/12/1995	ND	ND	ND	ND	ND	ND	ND	8	ND	ND	ND
WSTF-B091-5020	3/12/1995	ND	ND	ND	ND	ND	ND	ND	7	ND	ND	ND
WSTF-B092-5020	3/12/1995	3	ND	1	ND	ND	ND	ND	25	ND	ND	ND
WSTF-B093-5020	3/12/1995	5	ND	2	ND	2	ND	ND	36	ND	ND	ND
WSTF-B094-5020	3/12/1995	7	ND	4	2	3	ND	ND	45	ND	ND	ND
WSTF-B095-5020	3/12/1995	8	ND	4	2	4	ND	ND	48	ND	ND	ND
WSTF-B096-5020	3/8/1995	10	ND	7	6	7	ND	ND	50	ND	ND	ND
WSTF-B097-5020	3/9/1995	7	ND	4	3	4	ND	ND	39	ND	ND	ND
WSTF-B098-5020	3/9/1995	7	ND	4	5	5	ND	ND	40	ND	ND	ND

TABLE 4-4
Shallow and Deep Soil Gas Samples
GC/MS
On-Site Field Analytical Results
Temperature Test Facility
RCRA Facility Investigation
White Sands Missile Range, New Mexico

		1,1-Dichloroethene	1,1-Dichlorothane	1,1,1- Trichloroethane	Tetrachloroethene	Trichloroethene	Methylene Chloride	Chloroform	Freon- 11	Freon- 113	Freon- 503	Freon- 22
REPORTING LIMITS (ug/L)		1.	1.	1.	1.	1.	1.	1.	1.	1.	qualatative	qualatative
WSTF-B099-5020	3/9/1995	3	ND	1	ND	1	ND	ND	19	ND	ND	ND
WSTF-B100-5020	3/9/1995	ND	ND	ND	ND	ND	ND	ND	8	ND	ND	ND
WSTF-B101-5020	3/14/1995	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WSTF-B102-5020	3/14/1995	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WSTF-B103-5020	3/14/1995	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WSTF-B104-5020	3/14/1995	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WSTF-B105-5020	3/14/1995	ND	ND	ND	ND	ND	ND	ND	5	ND	ND	ND
WSTF-B106-5020	3/14/1995	ND	ND	ND	ND	ND	ND	ND	10	ND	ND	ND
WSTF-B107-5020	3/14/1995	1	ND	ND	ND	ND	ND	ND	12	ND	ND	ND
WSTF-B108-5020	3/14/1995	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WSTF-B109-5020	3/14/1995	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WSTF-B110-5020	3/15/1995	2	ND	ND	ND	ND	ND	ND	13	ND	ND	ND

TABLE 4-4
Shallow and Deep Soil Gas Samples
GC/MS
On-Site Field Analytical Results
Temperature Test Facility
RCRA Facility Investigation
White Sands Missile Range, New Mexico

		1,1-Dichloroethene	1,1-Dichlorothane	1,1,1- Trichloroethane	Tetrachloroethene	Trichloroethene	Methylene Chloride	Chloroform	Freon- 11	Freon- 113	Freon- 503	Freon- 22
REPORTING LIMITS (ug/L)		**1.**	**1.**	**1.**	**1.**	**1.**	**1.**	**1.**	**1.**	**1.**	**qualatative**	**qualatative**
DEEP SOIL GAS SAMPLES												
WSTF-DB01-5047	3/10/1995	2	ND	ND	ND	3	ND	ND	10	ND	ND	ND
WSTF-DB02-5047	3/10/1995	ND	ND	ND	1	ND	ND	ND	ND	ND	ND	ND
WSTF-DB03-5047	3/13/1995	16	ND	16	18	36	ND	3	83	20	ND	ND
WSTF-DB04-5046	3/11/1995	20	ND	12	10	23	ND	2	36	ND	ND	ND
WSTF-DB05-5051	3/11/1995	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WSTF-DB06-5047	3/13/1995	2	ND	ND	ND	2	ND	ND	2	ND	ND	ND
WSTF-DB07-5042	3/12/1995	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WSTF-DB08-5042	3/12/1995	ND	ND	ND	ND	ND	ND	ND	2	ND	ND	ND
WSTF-DB09-5047	3/14/1995	17	ND	9	8	14	ND	ND	74	ND	ND	ND
WSTF-DB09-5047 DUP	3/14/1995	13	ND	7	6	11	ND	ND	58	ND	ND	ND

ND=Not detected
DUP=Duplicate Sample
ug/L=Micrograms per liter

TABLE 4-5
STATISTICAL REVIEW OF SHALLOW SOIL GAS ON-SITE FIELD ANALYTICAL RESULTS
TEMPERATURE TEST FACILITY
RCRA FACILITY INVESTIGATION
WHITE SANDS MISSILE RANGE, NEW MEXICO

Compound (ug/L)	Number of samples	Number of Detections	CONCENTRATION			Maximum Concentration Sample ID
			Average	Median	Maximum	
1,1-Dichloroethene	100	53	5	4	15	WSTF-B039-5020
1,1-Dichlorothane	100	0				
1,1,1- Trichloroethane	100	35	4	3	10	WSTF-B047-5020
Tetrachloroethene	100	27	3	3	8	WSTF-B047-5020
Trichloroethene	100	34	4	3	9	WSTF-B047-5020
Methylene Chloride	100	0				
Chloroform	100	0				
Freon- 11	100	69	18	11	67	WSTF-B042-5020
Freon- 113	100	6	59	31	169	WSTF-B043-5020
Freon- 502	100	0				
Freon- 22	100	0				

TABLE 4-6
STATISTICAL REVIEW OF DEEP SOIL GAS ON-SITE FIELD ANALYTICAL RESULTS
TEMPERATURE TEST FACILITY
RCRA FACILITY INVESTIGATION
WHITE SANDS MISSILE RANGE, NEW MEXICO

Compound (ug/L)	Number of Samples	Number of Detections	CONCENTRATION			Maximum Concentration Sample ID
			Average	Median	Maximum	
1,1-Dichloroethene	9	5	11	16	20	WSTF-DB04-5046
1,1-Dichlorothane	9					
1,1,1- Trichloroethane	9	3	12	12	16	WSTF-DB03-5047
Tetrachloroethene	9	4	9	9	18	WSTF-DB03-5047
Trichloroethene	9	5	16	14	36	WSTF-DB03-5047
Methylene Chloride	9					
Chloroform	9	2	3	2.5	3	WSTF-DB03-5047
Freon- 11	9	6	35	23	83	WSTF-DB03-5047
Freon- 113	9	1	20	20	20	WSTF-DB03-5047
Freon- 502	9					
Freon- 22	9					

Table 4-7
Deep Soil Gas Boring Soil Samples Laboratory Analytical Results
Temperature Test Facility RCRA Facility Investigation
White Sands Missile Range, New Mexico

WCFS Sample No.:	WSTF-DB01-2048			WSTF-DB02-2048			WSTF-DB03-2050			WSTF-DB04-2047			WSTF-DB05-2052			WSTF-DB06-2041			WSTF-DB07-2045		
Quanterra Sample No.:	040965-0001-SA			040965-0002-SA			041007-0002-SA			040965-0003-SA			040965-0004-SA			040965-0007-SA			040965-0005-SA		
	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL
Moisture Content (%)																					
Water	16			12			19			18			11			13			3.7		
VOLATILES (ug/kg)																					
1,1,1-Trichloroethane		ND	(6)		ND	(5.7)		ND	(6.2)		ND	(6.1)		ND	(5.6)		ND	(5.7)		ND	(5.2)
1,1,2 Trichloro-1,2,2-trifluoroethane		ND	(12)		ND	(11)		ND	(12)		ND	(12)		ND	(11)		ND	(11)		ND	(10)
1,1,2,2-Tetrachloroethane		ND	(6)		ND	(5.7)		ND	(6.2)		ND	(6.1)		ND	(5.6)		ND	(5.7)		ND	(5.2)
1,1,2-Trichloroethane		ND	(6)		ND	(5.7)		ND	(6.2)		ND	(6.1)		ND	(5.6)		ND	(5.7)		ND	(5.2)
1,1-Dichloroethane		ND	(6)		ND	(5.7)		ND	(6.2)		ND	(6.1)		ND	(5.6)		ND	(5.7)		ND	(5.2)
1,1-Dichloroethene		ND	(6)		ND	(5.7)		ND	(6.2)		ND	(6.1)		ND	(5.6)		ND	(5.7)		ND	(5.2)
1,2-Dichloroethane		ND	(6)		ND	(5.7)		ND	(6.2)		ND	(6.1)		ND	(5.6)		ND	(5.7)		ND	(5.2)
1,2-Dichloroethene (total)		ND	(6)		ND	(5.7)		ND	(6.2)		ND	(6.1)		ND	(5.6)		ND	(5.7)		ND	(5.2)
1,2-Dichloropropane		ND	(6)		ND	(5.7)		ND	(6.2)		ND	(6.1)		ND	(5.6)		ND	(5.7)		ND	(5.2)
2-Butanone (MEK)		ND	(12)		ND	(11)		ND	(12)		ND	(12)		ND	(11)		ND	(11)		ND	(10)
2-Hexanone		ND	(12)		ND	(11)		ND	(12)		ND	(12)		ND	(11)		ND	(11)		ND	(10)
4-Methyl-2-pentanone (MIBK)		ND	(12)		ND	(11)		ND	(12)		ND	(12)		ND	(11)		ND	(11)		ND	(10)
Acetone		ND	(12)		ND	(11)		ND	(12)	12				ND	(11)		ND	(11)		ND	(10)
Benzene		ND	(6)		ND	(5.7)		ND	(6.2)		ND	(6.1)		ND	(5.6)		ND	(5.7)		ND	(5.2)
Bromodichloromethane		ND	(6)		ND	(5.7)		ND	(6.2)		ND	(6.1)		ND	(5.6)		ND	(5.7)		ND	(5.2)
Bromoform		ND	(6)		ND	(5.7)		ND	(6.2)		ND	(6.1)		ND	(5.6)		ND	(5.7)		ND	(5.2)
Bromomethane		ND	(12)		ND	(11)		ND	(12)		ND	(12)		ND	(11)		ND	(11)		ND	(10)
Carbon disulfide		ND	(6)		ND	(5.7)		ND	(6.2)		ND	(6.1)		ND	(5.6)		ND	(5.7)		ND	(5.2)
Carbon tetrachloride		ND	(6)		ND	(5.7)		ND	(6.2)		ND	(6.1)		ND	(5.6)		ND	(5.7)		ND	(5.2)
Chlorobenzene		ND	(6)		ND	(5.7)		ND	(6.2)		ND	(6.1)		ND	(5.6)		ND	(5.7)		ND	(5.2)
Chloroethane		ND	(12)		ND	(11)		ND	(12)		ND	(12)		ND	(11)		ND	(11)		ND	(10)
Chloroform		ND	(6)		ND	(5.7)		ND	(6.2)		ND	(6.1)		ND	(5.6)		ND	(5.7)		ND	(5.2)
Chloromethane		ND	(12)		ND	(11)		ND	(12)		ND	(12)		ND	(11)		ND	(11)		ND	(10)
Dibromochloromethane		ND	(6)		ND	(5.7)		ND	(6.2)		ND	(6.1)		ND	(5.6)		ND	(5.7)		ND	(5.2)
Ethylbenzene		ND	(6)		ND	(5.7)		ND	(6.2)		ND	(6.1)		ND	(5.6)		ND	(5.7)		ND	(5.2)
Methylene chloride		ND	(6)		ND	(5.7)		ND	(6.2)		ND	(6.1)		ND	(5.6)		ND	(5.7)		ND	(5.2)
Styrene		ND	(6)		ND	(5.7)		ND	(6.2)		ND	(6.1)		ND	(5.6)		ND	(5.7)		ND	(5.2)
Tetrachloroethene		ND	(6)		ND	(5.7)		ND	(6.2)		ND	(6.1)		ND	(5.6)		ND	(5.7)		ND	(5.2)
Toluene		ND	(6)		ND	(5.7)		ND	(6.2)		ND	(6.1)		ND	(5.6)		ND	(5.7)		ND	(5.2)
Trichloroethene (TCE)		ND	(6)		ND	(5.7)		ND	(6.2)		ND	(6.1)		ND	(5.6)		ND	(5.7)		ND	(5.2)
Trichlorofluoromethane		ND	(6)		ND	(5.7)		ND	(6.2)		ND	(6.1)		ND	(5.6)		ND	(5.7)		ND	(5.2)
Vinyl acetate		ND	(12)		ND	(11)		ND	(12)		ND	(12)		ND	(11)		ND	(11)		ND	(10)
Vinyl chloride		ND	(12)		ND	(11)		ND	(12)		ND	(12)		ND	(11)		ND	(11)		ND	(10)
Xylenes (total)		ND	(6)		ND	(5.7)		ND	(6.2)		ND	(6.1)		ND	(5.6)		ND	(5.7)		ND	(5.2)
cis-1,3-Dichloropropene		ND	(6)		ND	(5.7)		ND	(6.2)		ND	(6.1)		ND	(5.6)		ND	(5.7)		ND	(5.2)
trans-1,3-Dichloropropene		ND	(6)		ND	(5.7)		ND	(6.2)		ND	(6.1)		ND	(5.6)		ND	(5.7)		ND	(5.2)

R = result, Q = qualifier, QL = quantitation limit

(ND= non detect)

Table 4-7
Deep Soil Gas Boring Soil Samples Laboratory Analytical Results
Temperature Test Facility RCRA Facility Investigation
White Sands Missile Range, New Mexico

WCFS Sample No.:	WSTF-DB08-2043			WSTF-DB09-2050		
Quanterra Sample No.:	040965-0006-SA			041007-0001-SA		
	R	Q	QL	R	Q	QL
Moisture Content (%)						
Water	4.2			8		
VOLATILES (ug/kg)						
1,1,1-Trichloroethane		ND	(5.2)		ND	(5.4)
1,1,2 Trichloro-1,2,2-trifluoroethane		ND	(10)		ND	(11)
1,1,2,2-Tetrachloroethane		ND	(5.2)		ND	(5.4)
1,1,2-Trichloroethane		ND	(5.2)		ND	(5.4)
1,1-Dichloroethane		ND	(5.2)		ND	(5.4)
1,1-Dichloroethene		ND	(5.2)		ND	(5.4)
1,2-Dichloroethane		ND	(5.2)		ND	(5.4)
1,2-Dichloroethene (total)		ND	(5.2)		ND	(5.4)
1,2-Dichloropropane		ND	(5.2)		ND	(5.4)
2-Butanone (MEK)		ND	(10)		ND	(11)
2-Hexanone		ND	(10)		ND	(11)
4-Methyl-2-pentanone (MIBK)		ND	(10)		ND	(11)
Acetone		ND	(10)		ND	(11)
Benzene		ND	(5.2)		ND	(5.4)
Bromodichloromethane		ND	(5.2)		ND	(5.4)
Bromoform		ND	(5.2)		ND	(5.4)
Bromomethane		ND	(10)		ND	(11)
Carbon disulfide		ND	(5.2)		ND	(5.4)
Carbon tetrachloride		ND	(5.2)		ND	(5.4)
Chlorobenzene		ND	(5.2)		ND	(5.4)
Chloroethane		ND	(10)		ND	(11)
Chloroform		ND	(5.2)		ND	(5.4)
Chloromethane		ND	(10)		ND	(11)
Dibromochloromethane		ND	(5.2)		ND	(5.4)
Ethylbenzene		ND	(5.2)		ND	(5.4)
Methylene chloride		ND	(5.2)		ND	(5.4)
Styrene		ND	(5.2)		ND	(5.4)
Tetrachloroethene		ND	(5.2)		ND	(5.4)
Toluene		ND	(5.2)		ND	(5.4)
Trichloroethene (TCE)		ND	(5.2)		ND	(5.4)
Trichlorofluoromethane		ND	(5.2)		ND	(5.4)
Vinyl acetate		ND	(10)		ND	(11)
Vinyl chloride		ND	(10)		ND	(11)
Xylenes (total)		ND	(5.2)		ND	(5.4)
cis-1,3-Dichloropropene		ND	(5.2)		ND	(5.4)
trans-1,3-Dichloropropene		ND	(5.2)		ND	(5.4)

R = result, Q = qualifier, QL = quantitation limit

(ND= non detect)

TABLE 4-8
Deep Soil Boring Soil Samples Laboratory Analytical Results
Temperature Test Facility RCRA Facility Investigation
White Sands Missile Range, New Mexico

WCFS Sample No.:	WSTF-SB01-2017			WSTF-SB01-2025			WSTF-SB01-2057			WSTF-SB01-2057-QC			WSTF-SB01-2061		
Quanterra Sample No.:	041029-0011-SA			041029-0012-SA			041029-0014-SA			041029-0015-SA			041029-0018-SA		
	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL
Moisture Content (%)															
Water	6.6			13			5.7			4.9			15		
VOLATILES (ug/kg)															
1,1,1-Trichloroethane		ND	(5.4)		ND	(5.8)		ND	(5.3)		ND	(5.3)		ND	(5.9)
1,1,2 Trichloro-1,2,2-trifluoroethane		ND	(11)		ND	(12)		ND	(11)		ND	(11)		ND	(12)
1,1,2,2-Tetrachloroethane		ND	(5.4)		ND	(5.8)		ND	(5.3)		ND	(5.3)		ND	(5.9)
1,1,2-Trichloroethane		ND	(5.4)		ND	(5.8)		ND	(5.3)		ND	(5.3)		ND	(5.9)
1,1-Dichloroethane		ND	(5.4)		ND	(5.8)		ND	(5.3)		ND	(5.3)		ND	(5.9)
1,1-Dichloroethene		ND	(5.4)		ND	(5.8)		ND	(5.3)		ND	(5.3)		ND	(5.9)
1,2-Dichloroethane		ND	(5.4)		ND	(5.8)		ND	(5.3)		ND	(5.3)		ND	(5.9)
1,2-Dichloroethene (total)		ND	(5.4)		ND	(5.8)		ND	(5.3)		ND	(5.3)		ND	(5.9)
1,2-Dichloropropane		ND	(5.4)		ND	(5.8)		ND	(5.3)		ND	(5.3)		ND	(5.9)
2-Butanone (MEK)		ND	(11)		ND	(12)		ND	(11)		ND	(11)		ND	(12)
2-Hexanone		ND	(11)		ND	(12)		ND	(11)		ND	(11)		ND	(12)
4-Methyl-2-pentanone (MIBK)		ND	(11)		ND	(12)		ND	(11)		ND	(11)		ND	(12)
Acetone		ND	(11)		ND	(12)		ND	(11)		ND	(11)		ND	(12)
Benzene		ND	(5.4)		ND	(5.8)		ND	(5.3)		ND	(5.3)		ND	(5.9)
Bromodichloromethane		ND	(5.4)		ND	(5.8)		ND	(5.3)		ND	(5.3)		ND	(5.9)
Bromoform		ND	(5.4)		ND	(5.8)		ND	(5.3)		ND	(5.3)		ND	(5.9)
Bromomethane		ND	(11)		ND	(12)		ND	(11)		ND	(11)		ND	(12)
Carbon disulfide		ND	(5.4)		ND	(5.8)		ND	(5.3)		ND	(5.3)		ND	(5.9)
Carbon tetrachloride		ND	(5.4)		ND	(5.8)		ND	(5.3)		ND	(5.3)		ND	(5.9)
Chlorobenzene		ND	(5.4)		ND	(5.8)		ND	(5.3)		ND	(5.3)		ND	(5.9)
Chloroethane		ND	(11)		ND	(12)		ND	(11)		ND	(11)		ND	(12)
Chloroform		ND	(5.4)		ND	(5.8)		ND	(5.3)		ND	(5.3)		ND	(5.9)
Chloromethane		ND	(11)		ND	(12)		ND	(11)		ND	(11)		ND	(12)
Dibromochloromethane		ND	(5.4)		ND	(5.8)		ND	(5.3)		ND	(5.3)		ND	(5.9)
Ethylbenzene		ND	(5.4)		ND	(5.8)		ND	(5.3)		ND	(5.3)		ND	(5.9)
Methylene chloride		ND	(5.4)		ND	(5.8)		ND	(5.3)		ND	(5.3)		ND	(5.9)
Styrene		ND	(5.4)		ND	(5.8)		ND	(5.3)		ND	(5.3)		ND	(5.9)
Tetrachloroethene		ND	(5.4)		ND	(5.8)		ND	(5.3)		ND	(5.3)		ND	(5.9)
Toluene		ND	(5.4)		ND	(5.8)		ND	(5.3)		ND	(5.3)		ND	(5.9)
Trichloroethene (TCE)		ND	(5.4)		ND	(5.8)		ND	(5.3)		ND	(5.3)		ND	(5.9)
Trichlorofluoromethane		ND	(5.4)		ND	(5.8)		ND	(5.3)		ND	(5.3)		ND	(5.9)
Vinyl acetate		ND	(11)		ND	(12)		ND	(11)		ND	(11)		ND	(12)
Vinyl chloride		ND	(11)		ND	(12)		ND	(11)		ND	(11)		ND	(12)
Xylenes (total)		ND	(5.4)		ND	(5.8)		ND	(5.3)		ND	(5.3)		ND	(5.9)
cis-1,3-Dichloropropene		ND	(5.4)		ND	(5.8)		ND	(5.3)		ND	(5.3)		ND	(5.9)
trans-1,3-Dichloropropene		ND	(5.4)		ND	(5.8)		ND	(5.3)		ND	(5.3)		ND	(5.9)

R = result, Q = qualifier, QL = quantitation limit

(ND= non detect)

TABLE 4-8
Deep Soil Boring Soil Samples Laboratory Analytical Results
Temperature Test Facility RCRA Facility Investigation
White Sands Missile Range, New Mexico

WCFS Sample No.:	WSTF-SB01-2062			WSTF-SB01-2063			WSTF-SB01-2072			WSTF-SB01-2076			WSTF-SB01-2080		
Quanterra Sample No.:	041029-0016-SA			041029-0017-SA			041029-0019-SA			041029-0020-SA			041029-0021-SA		
	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL
Moisture Content (%)															
Water	12			14			19			4.6			20		
VOLATILES (ug/kg)															
1,1,1-Trichloroethane		ND	(5.7)		ND	(5.8)		ND	(6.2)		ND	(5.2)		ND	(6.3)
1,1,2 Trichloro-1,2,2-trifluoroethane		ND	(11)		ND	(12)		ND	(12)		ND	(10)		ND	(13)
1,1,2,2-Tetrachloroethane		ND	(5.7)		ND	(5.8)		ND	(6.2)		ND	(5.2)		ND	(6.3)
1,1,2-Trichloroethane		ND	(5.7)		ND	(5.8)		ND	(6.2)		ND	(5.2)		ND	(6.3)
1,1-Dichloroethane		ND	(5.7)		ND	(5.8)		ND	(6.2)		ND	(5.2)		ND	(6.3)
1,1-Dichloroethene		ND	(5.7)		ND	(5.8)		ND	(6.2)		ND	(5.2)		ND	(6.3)
1,2-Dichloroethane		ND	(5.7)		ND	(5.8)		ND	(6.2)		ND	(5.2)		ND	(6.3)
1,2-Dichloroethene (total)		ND	(5.7)		ND	(5.8)		ND	(6.2)		ND	(5.2)		ND	(6.3)
1,2-Dichloropropane		ND	(5.7)		ND	(5.8)		ND	(6.2)		ND	(5.2)		ND	(6.3)
2-Butanone (MEK)		ND	(11)		ND	(12)		ND	(12)		ND	(10)		ND	(13)
2-Hexanone		ND	(11)		ND	(12)		ND	(12)		ND	(10)		ND	(13)
4-Methyl-2-pentanone (MIBK)		ND	(11)		ND	(12)		ND	(12)		ND	(10)		ND	(13)
Acetone		ND	(11)		ND	(12)		ND	(12)		ND	(10)		ND	(13)
Benzene		ND	(5.7)		ND	(5.8)		ND	(6.2)		ND	(5.2)		ND	(6.3)
Bromodichloromethane		ND	(5.7)		ND	(5.8)		ND	(6.2)		ND	(5.2)		ND	(6.3)
Bromoform		ND	(5.7)		ND	(5.8)		ND	(6.2)		ND	(5.2)		ND	(6.3)
Bromomethane		ND	(11)		ND	(12)		ND	(12)		ND	(10)		ND	(13)
Carbon disulfide		ND	(5.7)		ND	(5.8)		ND	(6.2)		ND	(5.2)		ND	(6.3)
Carbon tetrachloride		ND	(5.7)		ND	(5.8)		ND	(6.2)		ND	(5.2)		ND	(6.3)
Chlorobenzene		ND	(5.7)		ND	(5.8)		ND	(6.2)		ND	(5.2)		ND	(6.3)
Chloroethane		ND	(11)		ND	(12)		ND	(12)		ND	(10)		ND	(13)
Chloroform		ND	(5.7)		ND	(5.8)		ND	(6.2)		ND	(5.2)		ND	(6.3)
Chloromethane		ND	(11)		ND	(12)		ND	(12)		ND	(10)		ND	(13)
Dibromochloromethane		ND	(5.7)		ND	(5.8)		ND	(6.2)		ND	(5.2)		ND	(6.3)
Ethylbenzene		ND	(5.7)		ND	(5.8)		ND	(6.2)		ND	(5.2)		ND	(6.3)
Methylene chloride		ND	(5.7)		ND	(5.8)		ND	(6.2)		ND	(5.2)		ND	(6.3)
Styrene		ND	(5.7)		ND	(5.8)		ND	(6.2)		ND	(5.2)		ND	(6.3)
Tetrachloroethene		ND	(5.7)		ND	(5.8)		ND	(6.2)		ND	(5.2)		ND	(6.3)
Toluene		ND	(5.7)		ND	(5.8)		ND	(6.2)		ND	(5.2)		ND	(6.3)
Trichloroethene (TCE)		ND	(5.7)		ND	(5.8)		ND	(6.2)		ND	(5.2)		ND	(6.3)
Trichlorofluoromethane		ND	(5.7)		ND	(5.8)		ND	(6.2)		ND	(5.2)		ND	(6.3)
Vinyl acetate		ND	(11)		ND	(12)		ND	(12)		ND	(10)		ND	(13)
Vinyl chloride		ND	(11)		ND	(12)		ND	(12)		ND	(10)		ND	(13)
Xylenes (total)		ND	(5.7)		ND	(5.8)		ND	(6.2)		ND	(5.2)		ND	(6.3)
cis-1,3-Dichloropropene		ND	(5.7)		ND	(5.8)		ND	(6.2)		ND	(5.2)		ND	(6.3)
trans-1,3-Dichloropropene		ND	(5.7)		ND	(5.8)		ND	(6.2)		ND	(5.2)		ND	(6.3)

R = result, Q = qualifier, QL = quantitation limit

(ND= non detect)

TABLE 4-8
Deep Soil Boring Soil Samples Laboratory Analytical Results
Temperature Test Facility RCRA Facility Investigation
White Sands Missile Range, New Mexico

WCFS Sample No.:	WSTF-SB02-2002			WSTF-SB02-2012			WSTF-SB02-2050			WSTF-SB02-2052			WSTF-SB02-2052-QC			WSTF-SB02-2059		
Quanterra Sample No.:	041007-0008-SA			041007-0007-SA			041007-0006-SA			041007-0009-SA			041007-0004-SA			041007-0010-SA		
	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL
Moisture Content (%)																		
Water	6.2			13			6.2			15			17			19		
VOLATILES (ug/kg)																		
1,1,1-Trichloroethane		ND	(5.3)		ND	(5.7)		ND	(5.3)		ND	(5.9)		ND	(6)		ND	(6.2)
1,1,2 Trichloro-1,2,2-trifluoroethane		ND	(11)		ND	(11)		ND	(11)		ND	(12)		ND	(12)		ND	(12)
1,1,2,2-Tetrachloroethane		ND	(5.3)		ND	(5.7)		ND	(5.3)		ND	(5.9)		ND	(6)		ND	(6.2)
1,1,2-Trichloroethane		ND	(5.3)		ND	(5.7)		ND	(5.3)		ND	(5.9)		ND	(6)		ND	(6.2)
1,1-Dichloroethane		ND	(5.3)		ND	(5.7)		ND	(5.3)		ND	(5.9)		ND	(6)		ND	(6.2)
1,1-Dichloroethene		ND	(5.3)		ND	(5.7)		ND	(5.3)		ND	(5.9)		ND	(6)		ND	(6.2)
1,2-Dichloroethane		ND	(5.3)		ND	(5.7)		ND	(5.3)		ND	(5.9)		ND	(6)		ND	(6.2)
1,2-Dichloroethene (total)		ND	(5.3)		ND	(5.7)		ND	(5.3)		ND	(5.9)		ND	(6)		ND	(6.2)
1,2-Dichloropropane		ND	(5.3)		ND	(5.7)		ND	(5.3)		ND	(5.9)		ND	(6)		ND	(6.2)
2-Butanone (MEK)		ND	(11)		ND	(11)		ND	(11)		ND	(12)		ND	(12)		ND	(12)
2-Hexanone		ND	(11)		ND	(11)		ND	(11)		ND	(12)		ND	(12)		ND	(12)
4-Methyl-2-pentanone (MIBK)		ND	(11)		ND	(11)		ND	(11)		ND	(12)		ND	(12)		ND	(12)
Acetone		ND	(11)		ND	(11)		ND	(11)		ND	(12)		ND	(12)		ND	(12)
Benzene		ND	(5.3)		ND	(5.7)		ND	(5.3)		ND	(5.9)		ND	(6)		ND	(6.2)
Bromodichloromethane		ND	(5.3)		ND	(5.7)		ND	(5.3)		ND	(5.9)		ND	(6)		ND	(6.2)
Bromoform		ND	(5.3)		ND	(5.7)		ND	(5.3)		ND	(5.9)		ND	(6)		ND	(6.2)
Bromomethane		ND	(11)		ND	(11)		ND	(11)		ND	(12)		ND	(12)		ND	(12)
Carbon disulfide		ND	(5.3)		ND	(5.7)		ND	(5.3)		ND	(5.9)		ND	(6)		ND	(6.2)
Carbon tetrachloride		ND	(5.3)		ND	(5.7)		ND	(5.3)		ND	(5.9)		ND	(6)		ND	(6.2)
Chlorobenzene		ND	(5.3)		ND	(5.7)		ND	(5.3)		ND	(5.9)		ND	(6)		ND	(6.2)
Chloroethane		ND	(11)		ND	(11)		ND	(11)		ND	(12)		ND	(12)		ND	(12)
Chloroform		ND	(5.3)		ND	(5.7)		ND	(5.3)		ND	(5.9)		ND	(6)		ND	(6.2)
Chloromethane		ND	(11)		ND	(11)		ND	(11)		ND	(12)		ND	(12)		ND	(12)
Dibromochloromethane		ND	(5.3)		ND	(5.7)		ND	(5.3)		ND	(5.9)		ND	(6)		ND	(6.2)
Ethylbenzene		ND	(5.3)		ND	(5.7)		ND	(5.3)		ND	(5.9)		ND	(6)		ND	(6.2)
Methylene chloride		ND	(5.3)		ND	(5.7)		ND	(5.3)		ND	(5.9)		ND	(6)		ND	(6.2)
Styrene		ND	(5.3)		ND	(5.7)		ND	(5.3)		ND	(5.9)		ND	(6)		ND	(6.2)
Tetrachloroethene		ND	(5.3)		ND	(5.7)		ND	(5.3)		ND	(5.9)		ND	(6)		ND	(6.2)
Toluene		ND	(5.3)		ND	(5.7)		ND	(5.3)		ND	(5.9)		ND	(6)		ND	(6.2)
Trichloroethene (TCE)		ND	(5.3)		ND	(5.7)		ND	(5.3)		ND	(5.9)		ND	(6)		ND	(6.2)
Trichlorofluoromethane		ND	(5.3)		ND	(5.7)		ND	(5.3)		ND	(5.9)		ND	(6)		ND	(6.2)
Vinyl acetate		ND	(11)		ND	(11)		ND	(11)		ND	(12)		ND	(12)		ND	(12)
Vinyl chloride		ND	(11)		ND	(11)		ND	(11)		ND	(12)		ND	(12)		ND	(12)
Xylenes (total)		ND	(5.3)		ND	(5.7)		ND	(5.3)		ND	(5.9)		ND	(6)		ND	(6.2)
cis-1,3-Dichloropropene		ND	(5.3)		ND	(5.7)		ND	(5.3)		ND	(5.9)		ND	(6)		ND	(6.2)
trans-1,3-Dichloropropene		ND	(5.3)		ND	(5.7)		ND	(5.3)		ND	(5.9)		ND	(6)		ND	(6.2)

R = result, Q = qualifier, QL = quantitation limit

(ND= non detect)

TABLE 4-8
Deep Soil Boring Soil Samples Laboratory Analytical Results
Temperature Test Facility RCRA Facility Investigation
White Sands Missile Range, New Mexico

WCFS Sample No.:	WSTF-SB02-2059-QC			WSTF-SB02-2064			WSTF-SB02-2065			WSTF-SB02-2072			WSTF-SB02-2078			WSTF-SB02-2079		
Quanterra Sample No.:	041007-0005-SA			041007-0013-SA			041007-0011-SA			041007-0012-SA			041007-0014-SA			041007-0015-SA		
	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL
Moisture Content (%)																		
Water	19			6.5			19			15			15			18		
VOLATILES (ug/kg)																		
1,1,1-Trichloroethane		ND	(6.2)		ND	(5.3)		ND	(6.2)		ND	(5.9)		ND	(5.9)		ND	(6.1)
1,1,2 Trichloro-1,2,2-trifluoroethane		ND	(12)		ND	(11)		ND	(12)		ND	(12)		ND	(12)		ND	(12)
1,1,2,2-Tetrachloroethane		ND	(6.2)		ND	(5.3)		ND	(6.2)		ND	(5.9)		ND	(5.9)		ND	(6.1)
1,1,2-Trichloroethane		ND	(6.2)		ND	(5.3)		ND	(6.2)		ND	(5.9)		ND	(5.9)		ND	(6.1)
1,1-Dichloroethane		ND	(6.2)		ND	(5.3)		ND	(6.2)		ND	(5.9)		ND	(5.9)		ND	(6.1)
1,1-Dichloroethene		ND	(6.2)		ND	(5.3)		ND	(6.2)		ND	(5.9)		ND	(5.9)		ND	(6.1)
1,2-Dichloroethane		ND	(6.2)		ND	(5.3)		ND	(6.2)		ND	(5.9)		ND	(5.9)		ND	(6.1)
1,2-Dichloroethene (total)		ND	(6.2)		ND	(5.3)		ND	(6.2)		ND	(5.9)		ND	(5.9)		ND	(6.1)
1,2-Dichloropropane		ND	(6.2)		ND	(5.3)		ND	(6.2)		ND	(5.9)		ND	(5.9)		ND	(6.1)
2-Butanone (MEK)		ND	(12)		ND	(11)		ND	(12)		ND	(12)		ND	(12)		ND	(12)
2-Hexanone		ND	(12)		ND	(11)		ND	(12)		ND	(12)		ND	(12)		ND	(12)
4-Methyl-2-pentanone (MIBK)		ND	(12)		ND	(11)		ND	(12)		ND	(12)		ND	(12)		ND	(12)
Acetone		ND	(12)		ND	(11)		ND	(12)		ND	(12)		ND	(12)		ND	(12)
Benzene		ND	(6.2)		ND	(5.3)		ND	(6.2)		ND	(5.9)		ND	(5.9)		ND	(6.1)
Bromodichloromethane		ND	(6.2)		ND	(5.3)		ND	(6.2)		ND	(5.9)		ND	(5.9)		ND	(6.1)
Bromoform		ND	(6.2)		ND	(5.3)		ND	(6.2)		ND	(5.9)		ND	(5.9)		ND	(6.1)
Bromomethane		ND	(12)		ND	(11)		ND	(12)		ND	(12)		ND	(12)		ND	(12)
Carbon disulfide		ND	(6.2)		ND	(5.3)		ND	(6.2)		ND	(5.9)		ND	(5.9)		ND	(6.1)
Carbon tetrachloride		ND	(6.2)		ND	(5.3)		ND	(6.2)		ND	(5.9)		ND	(5.9)		ND	(6.1)
Chlorobenzene		ND	(6.2)		ND	(5.3)		ND	(6.2)		ND	(5.9)		ND	(5.9)		ND	(6.1)
Chloroethane		ND	(12)		ND	(11)		ND	(12)		ND	(12)		ND	(12)		ND	(12)
Chloroform		ND	(6.2)		ND	(5.3)		ND	(6.2)		ND	(5.9)		ND	(5.9)		ND	(6.1)
Chloromethane		ND	(12)		ND	(11)		ND	(12)		ND	(12)		ND	(12)		ND	(12)
Dibromochloromethane		ND	(6.2)		ND	(5.3)		ND	(6.2)		ND	(5.9)		ND	(5.9)		ND	(6.1)
Ethylbenzene		ND	(6.2)		ND	(5.3)		ND	(6.2)		ND	(5.9)		ND	(5.9)		ND	(6.1)
Methylene chloride		ND	(6.2)		ND	(5.3)		ND	(6.2)		ND	(5.9)		ND	(5.9)		ND	(6.1)
Styrene		ND	(6.2)		ND	(5.3)		ND	(6.2)		ND	(5.9)		ND	(5.9)		ND	(6.1)
Tetrachloroethene		ND	(6.2)		ND	(5.3)		ND	(6.2)		ND	(5.9)		ND	(5.9)		ND	(6.1)
Toluene		ND	(6.2)		ND	(5.3)		ND	(6.2)		ND	(5.9)		ND	(5.9)		ND	(6.1)
Trichloroethene (TCE)		ND	(6.2)		ND	(5.3)		ND	(6.2)		ND	(5.9)		ND	(5.9)		ND	(6.1)
Trichlorofluoromethane		ND	(6.2)		ND	(5.3)		ND	(6.2)		ND	(5.9)		ND	(5.9)		ND	(6.1)
Vinyl acetate		ND	(12)		ND	(11)		ND	(12)		ND	(12)		ND	(12)		ND	(12)
Vinyl chloride		ND	(12)		ND	(11)		ND	(12)		ND	(12)		ND	(12)		ND	(12)
Xylenes (total)		ND	(6.2)		ND	(5.3)		ND	(6.2)		ND	(5.9)		ND	(5.9)		ND	(6.1)
cis-1,3-Dichloropropene		ND	(6.2)		ND	(5.3)		ND	(6.2)		ND	(5.9)		ND	(5.9)		ND	(6.1)
trans-1,3-Dichloropropene		ND	(6.2)		ND	(5.3)		ND	(6.2)		ND	(5.9)		ND	(5.9)		ND	(6.1)

R = result, Q = qualifier, QL = quantitation limit

(ND= non detect)

TABLE 4-8
Deep Soil Boring Soil Samples Laboratory Analytical Results
Temperature Test Facility RCRA Facility Investigation
White Sands Missile Range, New Mexico

WCFS Sample No.:	WSTF-SB03-2010			WSTF-SB03-2021			WSTF-SB03-2053			WSTF-SB03-2060			WSTF-SB03-2063		
Quanterra Sample No.:	041029-0001-SA			041029-0002-SA			041029-0003-SA			041029-0004-SA			041029-0005-SA		
	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL
Moisture Content (%)															
Water	3.3			6.2			9.1			14			20		
VOLATILES (ug/kg)															
1,1,1-Trichloroethane		ND	(5.2)		ND	(5.3)		ND	(5.5)		ND	(5.8)		ND	(6.3)
1,1,2 Trichloro-1,2,2-trifluoroethane		ND	(10)		ND	(11)		ND	(11)		ND	(12)		ND	(13)
1,1,2,2-Tetrachloroethane		ND	(5.2)		ND	(5.3)		ND	(5.5)		ND	(5.8)		ND	(6.3)
1,1,2-Trichloroethane		ND	(5.2)		ND	(5.3)		ND	(5.5)		ND	(5.8)		ND	(6.3)
1,1-Dichloroethane		ND	(5.2)		ND	(5.3)		ND	(5.5)		ND	(5.8)		ND	(6.3)
1,1-Dichloroethene		ND	(5.2)		ND	(5.3)		ND	(5.5)		ND	(5.8)		ND	(6.3)
1,2-Dichloroethane		ND	(5.2)		ND	(5.3)		ND	(5.5)		ND	(5.8)		ND	(6.3)
1,2-Dichloroethene (total)		ND	(5.2)		ND	(5.3)		ND	(5.5)		ND	(5.8)		ND	(6.3)
1,2-Dichloropropane		ND	(5.2)		ND	(5.3)		ND	(5.5)		ND	(5.8)		ND	(6.3)
2-Butanone (MEK)		ND	(10)		ND	(11)		ND	(11)		ND	(12)		ND	(13)
2-Hexanone		ND	(10)		ND	(11)		ND	(11)		ND	(12)		ND	(13)
4-Methyl-2-pentanone (MIBK)		ND	(10)		ND	(11)		ND	(11)		ND	(12)		ND	(13)
Acetone		ND	(10)		ND	(11)		ND	(11)		ND	(12)		ND	(13)
Benzene		ND	(5.2)		ND	(5.3)		ND	(5.5)		ND	(5.8)		ND	(6.3)
Bromodichloromethane		ND	(5.2)		ND	(5.3)		ND	(5.5)		ND	(5.8)		ND	(6.3)
Bromoform		ND	(5.2)		ND	(5.3)		ND	(5.5)		ND	(5.8)		ND	(6.3)
Bromomethane		ND	(10)		ND	(11)		ND	(11)		ND	(12)		ND	(13)
Carbon disulfide		ND	(5.2)		ND	(5.3)		ND	(5.5)		ND	(5.8)		ND	(6.3)
Carbon tetrachloride		ND	(5.2)		ND	(5.3)		ND	(5.5)		ND	(5.8)		ND	(6.3)
Chlorobenzene		ND	(5.2)		ND	(5.3)		ND	(5.5)		ND	(5.8)		ND	(6.3)
Chloroethane		ND	(10)		ND	(11)		ND	(11)		ND	(12)		ND	(13)
Chloroform		ND	(5.2)		ND	(5.3)		ND	(5.5)		ND	(5.8)		ND	(6.3)
Chloromethane		ND	(10)		ND	(11)		ND	(11)		ND	(12)		ND	(13)
Dibromochloromethane		ND	(5.2)		ND	(5.3)		ND	(5.5)		ND	(5.8)		ND	(6.3)
Ethylbenzene		ND	(5.2)		ND	(5.3)		ND	(5.5)		ND	(5.8)		ND	(6.3)
Methylene chloride		ND	(5.2)		ND	(5.3)		ND	(5.5)		ND	(5.8)		ND	(6.3)
Styrene		ND	(5.2)		ND	(5.3)		ND	(5.5)		ND	(5.8)		ND	(6.3)
Tetrachloroethene		ND	(5.2)		ND	(5.3)		ND	(5.5)		ND	(5.8)		ND	(6.3)
Toluene		ND	(5.2)		ND	(5.3)		ND	(5.5)		ND	(5.8)		ND	(6.3)
Trichloroethene (TCE)		ND	(5.2)		ND	(5.3)		ND	(5.5)		ND	(5.8)		ND	(6.3)
Trichlorofluoromethane		ND	(5.2)		ND	(5.3)		ND	(5.5)		ND	(5.8)		ND	(6.3)
Vinyl acetate		ND	(10)		ND	(11)		ND	(11)		ND	(12)		ND	(13)
Vinyl chloride		ND	(10)		ND	(11)		ND	(11)		ND	(12)		ND	(13)
Xylenes (total)		ND	(5.2)		ND	(5.3)		ND	(5.5)		ND	(5.8)		ND	(6.3)
cis-1,3-Dichloropropene		ND	(5.2)		ND	(5.3)		ND	(5.5)		ND	(5.8)		ND	(6.3)
trans-1,3-Dichloropropene		ND	(5.2)		ND	(5.3)		ND	(5.5)		ND	(5.8)		ND	(6.3)

R = result, Q = qualifier, QL = quantitation limit

(ND= non detect)

TABLE 4-8
Deep Soil Boring Soil Samples Laboratory Analytical Results
Temperature Test Facility RCRA Facility Investigation
White Sands Missile Range, New Mexico

WCFS Sample No.:	WSTF-SB03-2063 QC			WSTF-SB03-2065			WSTF-SB03-2070			WSTF-SB03-2073			WSTF-SB03-2074		
Quanterra Sample No.:	041029-0010-SA			041029-0006-SA			041029-0007-SA			041029-0008-SA			041029-0009-SA		
	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL
Moisture Content (%)															
Water	19			19			13			15			16		
VOLATILES (ug/kg)															
1,1,1-Trichloroethane		ND	(6.1)		ND	(6.2)		ND	(5.8)		ND	(5.9)		ND	(6)
1,1,2 Trichloro-1,2,2-trifluoroethane		ND	(12)		ND	(12)		ND	(12)		ND	(12)		ND	(12)
1,1,2,2-Tetrachloroethane		ND	(6.1)		ND	(6.2)		ND	(5.8)		ND	(5.9)		ND	(6)
1,1,2-Trichloroethane		ND	(6.1)		ND	(6.2)		ND	(5.8)		ND	(5.9)		ND	(6)
1,1-Dichloroethane		ND	(6.1)		ND	(6.2)		ND	(5.8)		ND	(5.9)		ND	(6)
1,1-Dichloroethene		ND	(6.1)		ND	(6.2)		ND	(5.8)		ND	(5.9)		ND	(6)
1,2-Dichloroethane		ND	(6.1)		ND	(6.2)		ND	(5.8)		ND	(5.9)		ND	(6)
1,2-Dichloroethene (total)		ND	(6.1)		ND	(6.2)		ND	(5.8)		ND	(5.9)		ND	(6)
1,2-Dichloropropane		ND	(6.1)		ND	(6.2)		ND	(5.8)		ND	(5.9)		ND	(6)
2-Butanone (MEK)		ND	(12)		ND	(12)		ND	(12)		ND	(12)		ND	(12)
2-Hexanone		ND	(12)		ND	(12)		ND	(12)		ND	(12)		ND	(12)
4-Methyl-2-pentanone (MIBK)		ND	(12)		ND	(12)		ND	(12)		ND	(12)		ND	(12)
Acetone		ND	(12)		ND	(12)		ND	(12)		ND	(12)		ND	(12)
Benzene		ND	(6.1)		ND	(6.2)		ND	(5.8)		ND	(5.9)		ND	(6)
Bromodichloromethane		ND	(6.1)		ND	(6.2)		ND	(5.8)		ND	(5.9)		ND	(6)
Bromoform		ND	(6.1)		ND	(6.2)		ND	(5.8)		ND	(5.9)		ND	(6)
Bromomethane		ND	(12)		ND	(12)		ND	(12)		ND	(12)		ND	(12)
Carbon disulfide		ND	(6.1)		ND	(6.2)		ND	(5.8)		ND	(5.9)		ND	(6)
Carbon tetrachloride		ND	(6.1)		ND	(6.2)		ND	(5.8)		ND	(5.9)		ND	(6)
Chlorobenzene		ND	(6.1)		ND	(6.2)		ND	(5.8)		ND	(5.9)		ND	(6)
Chloroethane		ND	(12)		ND	(12)		ND	(12)		ND	(12)		ND	(12)
Chloroform		ND	(6.1)		ND	(6.2)		ND	(5.8)		ND	(5.9)		ND	(6)
Chloromethane		ND	(12)		ND	(12)		ND	(12)		ND	(12)		ND	(12)
Dibromochloromethane		ND	(6.1)		ND	(6.2)		ND	(5.8)		ND	(5.9)		ND	(6)
Ethylbenzene		ND	(6.1)		ND	(6.2)		ND	(5.8)		ND	(5.9)		ND	(6)
Methylene chloride		ND	(6.1)		ND	(6.2)		ND	(5.8)		ND	(5.9)		ND	(6)
Styrene		ND	(6.1)		ND	(6.2)		ND	(5.8)		ND	(5.9)		ND	(6)
Tetrachloroethene		ND	(6.1)		ND	(6.2)		ND	(5.8)		ND	(5.9)		ND	(6)
Toluene		ND	(6.1)		ND	(6.2)		ND	(5.8)		ND	(5.9)		ND	(6)
Trichloroethene (TCE)		ND	(6.1)		ND	(6.2)		ND	(5.8)		ND	(5.9)		ND	(6)
Trichlorofluoromethane		ND	(6.1)		ND	(6.2)		ND	(5.8)		ND	(5.9)		ND	(6)
Vinyl acetate		ND	(12)		ND	(12)		ND	(12)		ND	(12)		ND	(12)
Vinyl chloride		ND	(12)		ND	(12)		ND	(12)		ND	(12)		ND	(12)
Xylenes (total)		ND	(6.1)		ND	(6.2)		ND	(5.8)		ND	(5.9)		ND	(6)
cis-1,3-Dichloropropene		ND	(6.1)		ND	(6.2)		ND	(5.8)		ND	(5.9)		ND	(6)
trans-1,3-Dichloropropene		ND	(6.1)		ND	(6.2)		ND	(5.8)		ND	(5.9)		ND	(6)

R = result, Q = qualifier, QL = quantitation limit

(ND= non detect)

TABLE 4-8
Deep Soil Boring Soil Samples Laboratory Analytical Results
Temperature Test Facility RCRA Facility Investigation
White Sands Missile Range, New Mexico

WCFS Sample No.:	WSTF-SB04-2016			WSTF-SB04-2016-QC			WSTF-SB04-2025			WSTF-SB04-2056			WSTF-SB04-2057		
Quanterra Sample No.:	041141-0012-SA			041141-0013-SA			041141-0016-SA			041141-0017-SA			041141-0018-SA		
	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL
Moisture Content (%)															
Water	13			10			10			3.6			3.7		
VOLATILES (ug/kg)															
1,1,1-Trichloroethane		ND	(5.7)		ND	(5.6)		ND	(5.6)		ND	(5.2)		ND	(5.2)
1,1,2 Trichloro-1,2,2-trifluoroethane		ND	(11)		ND	(11)		ND	(11)		ND	(10)		ND	(10)
1,1,2,2-Tetrachloroethane		ND	(5.7)		ND	(5.6)		ND	(5.6)		ND	(5.2)		ND	(5.2)
1,1,2-Trichloroethane		ND	(5.7)		ND	(5.6)		ND	(5.6)		ND	(5.2)		ND	(5.2)
1,1-Dichloroethane		ND	(5.7)		ND	(5.6)		ND	(5.6)		ND	(5.2)		ND	(5.2)
1,1-Dichloroethene		ND	(5.7)		ND	(5.6)		ND	(5.6)		ND	(5.2)		ND	(5.2)
1,2-Dichloroethane		ND	(5.7)		ND	(5.6)		ND	(5.6)		ND	(5.2)		ND	(5.2)
1,2-Dichloroethene (total)		ND	(5.7)		ND	(5.6)		ND	(5.6)		ND	(5.2)		ND	(5.2)
1,2-Dichloropropane		ND	(5.7)		ND	(5.6)		ND	(5.6)		ND	(5.2)		ND	(5.2)
2-Butanone (MEK)		ND	(11)		ND	(11)		ND	(11)		ND	(10)		ND	(10)
2-Hexanone		ND	(11)		ND	(11)		ND	(11)		ND	(10)		ND	(10)
4-Methyl-2-pentanone (MIBK)		ND	(11)		ND	(11)		ND	(11)		ND	(10)		ND	(10)
Acetone		ND	(11)		ND	(11)		ND	(11)		ND	(10)		ND	(10)
Benzene		ND	(5.7)		ND	(5.6)		ND	(5.6)		ND	(5.2)		ND	(5.2)
Bromodichloromethane		ND	(5.7)		ND	(5.6)		ND	(5.6)		ND	(5.2)		ND	(5.2)
Bromoform		ND	(5.7)		ND	(5.6)		ND	(5.6)		ND	(5.2)		ND	(5.2)
Bromomethane		ND	(11)		ND	(11)		ND	(11)		ND	(10)		ND	(10)
Carbon disulfide		ND	(5.7)		ND	(5.6)		ND	(5.6)		ND	(5.2)		ND	(5.2)
Carbon tetrachloride		ND	(5.7)		ND	(5.6)		ND	(5.6)		ND	(5.2)		ND	(5.2)
Chlorobenzene		ND	(5.7)		ND	(5.6)		ND	(5.6)		ND	(5.2)		ND	(5.2)
Chloroethane		ND	(11)		ND	(11)		ND	(11)		ND	(10)		ND	(10)
Chloroform		ND	(5.7)		ND	(5.6)		ND	(5.6)		ND	(5.2)		ND	(5.2)
Chloromethane		ND	(11)		ND	(11)		ND	(11)		ND	(10)		ND	(10)
Dibromochloromethane		ND	(5.7)		ND	(5.6)		ND	(5.6)		ND	(5.2)		ND	(5.2)
Ethylbenzene		ND	(5.7)		ND	(5.6)		ND	(5.6)		ND	(5.2)		ND	(5.2)
Methylene chloride		ND	(5.7)		ND	(5.6)		ND	(5.6)		ND	(5.2)		ND	(5.2)
Styrene		ND	(5.7)		ND	(5.6)		ND	(5.6)		ND	(5.2)		ND	(5.2)
Tetrachloroethene		ND	(5.7)		ND	(5.6)		ND	(5.6)		ND	(5.2)		ND	(5.2)
Toluene		ND	(5.7)		ND	(5.6)		ND	(5.6)		ND	(5.2)		ND	(5.2)
Trichloroethene (TCE)		ND	(5.7)		ND	(5.6)		ND	(5.6)		ND	(5.2)		ND	(5.2)
Trichlorofluoromethane		ND	(5.7)		ND	(5.6)		ND	(5.6)		ND	(5.2)		ND	(5.2)
Vinyl acetate		ND	(11)		ND	(11)		ND	(11)		ND	(10)		ND	(10)
Vinyl chloride		ND	(11)		ND	(11)		ND	(11)		ND	(10)		ND	(10)
Xylenes (total)		ND	(5.7)		ND	(5.6)		ND	(5.6)		ND	(5.2)		ND	(5.2)
cis-1,3-Dichloropropene		ND	(5.7)		ND	(5.6)		ND	(5.6)		ND	(5.2)		ND	(5.2)
trans-1,3-Dichloropropene		ND	(5.7)		ND	(5.6)		ND	(5.6)		ND	(5.2)		ND	(5.2)

R = result, Q = qualifier, QL = quantitation limit

(ND= non detect)

TABLE 4-8
Deep Soil Boring Soil Samples Laboratory Analytical Results
Temperature Test Facility RCRA Facility Investigation
White Sands Missile Range, New Mexico

WCFS Sample No.:	WSTF-SB04-2062			WSTF-SB04-2063			WSTF-SB04-2071			WSTF-SB04-2078			WSTF-SB04-2079		
Quanterra Sample No.:	041141-0019-SA			041141-0020-SA			041141-0021-SA			041141-0022-SA			041141-0023-SA		
	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL
Moisture Content (%)															
Water	11			11			12			12			19		
VOLATILES (ug/kg)															
1,1,1-Trichloroethane		ND	(5.6)		ND	(5.6)		ND	(5.7)		ND	(5.7)		ND	(6.2)
1,1,2 Trichloro-1,2,2-trifluoroethane		ND	(11)		ND	(11)		ND	(11)		ND	(11)		ND	(12)
1,1,2,2-Tetrachloroethane		ND	(5.6)		ND	(5.6)		ND	(5.7)		ND	(5.7)		ND	(6.2)
1,1,2-Trichloroethane		ND	(5.6)		ND	(5.6)		ND	(5.7)		ND	(5.7)		ND	(6.2)
1,1-Dichloroethane		ND	(5.6)		ND	(5.6)		ND	(5.7)		ND	(5.7)		ND	(6.2)
1,1-Dichloroethene		ND	(5.6)		ND	(5.6)		ND	(5.7)		ND	(5.7)		ND	(6.2)
1,2-Dichloroethane		ND	(5.6)		ND	(5.6)		ND	(5.7)		ND	(5.7)		ND	(6.2)
1,2-Dichloroethene (total)		ND	(5.6)		ND	(5.6)		ND	(5.7)		ND	(5.7)		ND	(6.2)
1,2-Dichloropropane		ND	(5.6)		ND	(5.6)		ND	(5.7)		ND	(5.7)		ND	(6.2)
2-Butanone (MEK)		ND	(11)		ND	(11)		ND	(11)		ND	(11)		ND	(12)
2-Hexanone		ND	(11)		ND	(11)		ND	(11)		ND	(11)		ND	(12)
4-Methyl-2-pentanone (MIBK)		ND	(11)		ND	(11)		ND	(11)		ND	(11)		ND	(12)
Acetone		ND	(11)		ND	(11)		ND	(11)		ND	(11)		ND	(12)
Benzene		ND	(5.6)		ND	(5.6)		ND	(5.7)		ND	(5.7)		ND	(6.2)
Bromodichloromethane		ND	(5.6)		ND	(5.6)		ND	(5.7)		ND	(5.7)		ND	(6.2)
Bromoform		ND	(5.6)		ND	(5.6)		ND	(5.7)		ND	(5.7)		ND	(6.2)
Bromomethane		ND	(11)		ND	(11)		ND	(11)		ND	(11)		ND	(12)
Carbon disulfide		ND	(5.6)		ND	(5.6)		ND	(5.7)		ND	(5.7)		ND	(6.2)
Carbon tetrachloride		ND	(5.6)		ND	(5.6)		ND	(5.7)		ND	(5.7)		ND	(6.2)
Chlorobenzene		ND	(5.6)		ND	(5.6)		ND	(5.7)		ND	(5.7)		ND	(6.2)
Chloroethane		ND	(11)		ND	(11)		ND	(11)		ND	(11)		ND	(12)
Chloroform		ND	(5.6)		ND	(5.6)		ND	(5.7)		ND	(5.7)		ND	(6.2)
Chloromethane		ND	(11)		ND	(11)		ND	(11)		ND	(11)		ND	(12)
Dibromochloromethane		ND	(5.6)		ND	(5.6)		ND	(5.7)		ND	(5.7)		ND	(6.2)
Ethylbenzene		ND	(5.6)		ND	(5.6)		ND	(5.7)		ND	(5.7)		ND	(6.2)
Methylene chloride		ND	(5.6)		ND	(5.6)		ND	(5.7)		ND	(5.7)		ND	(6.2)
Styrene		ND	(5.6)		ND	(5.6)		ND	(5.7)		ND	(5.7)		ND	(6.2)
Tetrachloroethene		ND	(5.6)		ND	(5.6)		ND	(5.7)		ND	(5.7)		ND	(6.2)
Toluene		ND	(5.6)		ND	(5.6)		ND	(5.7)		ND	(5.7)		ND	(6.2)
Trichloroethene (TCE)		ND	(5.6)		ND	(5.6)		ND	(5.7)		ND	(5.7)		ND	(6.2)
Trichlorofluoromethane		ND	(5.6)		ND	(5.6)		ND	(5.7)		ND	(5.7)		ND	(6.2)
Vinyl acetate		ND	(11)		ND	(11)		ND	(11)		ND	(11)		ND	(12)
Vinyl chloride		ND	(11)		ND	(11)		ND	(11)		ND	(11)		ND	(12)
Xylenes (total)		ND	(5.6)		ND	(5.6)		ND	(5.7)		ND	(5.7)		ND	(6.2)
cis-1,3-Dichloropropene		ND	(5.6)		ND	(5.6)		ND	(5.7)		ND	(5.7)		ND	(6.2)
trans-1,3-Dichloropropene		ND	(5.6)		ND	(5.6)		ND	(5.7)		ND	(5.7)		ND	(6.2)

R = result, Q = qualifier, QL = quantitation limit

(ND= non detect)

TABLE 4-8
Deep Soil Boring Soil Samples Laboratory Analytical Results
Temperature Test Facility RCRA Facility Investigation
White Sands Missile Range, New Mexico

WCFS Sample No.:	WSTF-SB05-2017			WSTF-SB05-2021			WSTF-SB05-2054			WSTF-SB05-2054-QC			WSTF-SB05-2055		
Quanterra Sample No.:	041189-0010-SA			041189-0011-SA			041189-0012-SA			041189-0013-SA			041189-0014-SA		
	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL
Moisture Content (%)															
Water	2			7.7			2			2.1			5.1		
VOLATILES (ug/kg)															
1,1,1-Trichloroethane		ND	(5.1)		ND	(5.4)		ND	(5.1)		ND	(5.1)		ND	(5.3)
1,1,2 Trichloro-1,2,2-trifluoroethane		ND	(10)		ND	(11)		ND	(10)		ND	(10)		ND	(11)
1,1,2,2-Tetrachloroethane		ND	(5.1)		ND	(5.4)		ND	(5.1)		ND	(5.1)		ND	(5.3)
1,1,2-Trichloroethane		ND	(5.1)		ND	(5.4)		ND	(5.1)		ND	(5.1)		ND	(5.3)
1,1-Dichloroethane		ND	(5.1)		ND	(5.4)		ND	(5.1)		ND	(5.1)		ND	(5.3)
1,1-Dichloroethene		ND	(5.1)		ND	(5.4)		ND	(5.1)		ND	(5.1)		ND	(5.3)
1,2-Dichloroethane		ND	(5.1)		ND	(5.4)		ND	(5.1)		ND	(5.1)		ND	(5.3)
1,2-Dichloroethene (total)		ND	(5.1)		ND	(5.4)		ND	(5.1)		ND	(5.1)		ND	(5.3)
1,2-Dichloropropane		ND	(5.1)		ND	(5.4)		ND	(5.1)		ND	(5.1)		ND	(5.3)
2-Butanone (MEK)		ND	(10)		ND	(11)		ND	(10)		ND	(10)		ND	(11)
2-Hexanone		ND	(10)		ND	(11)		ND	(10)		ND	(10)		ND	(11)
4-Methyl-2-pentanone (MIBK)		ND	(10)		ND	(11)		ND	(10)		ND	(10)		ND	(11)
Acetone		ND	(10)		ND	(11)		ND	(10)		ND	(10)		ND	(11)
Benzene		ND	(5.1)		ND	(5.4)		ND	(5.1)		ND	(5.1)		ND	(5.3)
Bromodichloromethane		ND	(5.1)		ND	(5.4)		ND	(5.1)		ND	(5.1)		ND	(5.3)
Bromoform		ND	(5.1)		ND	(5.4)		ND	(5.1)		ND	(5.1)		ND	(5.3)
Bromomethane		ND	(10)		ND	(11)		ND	(10)		ND	(10)		ND	(11)
Carbon disulfide		ND	(5.1)		ND	(5.4)		ND	(5.1)		ND	(5.1)		ND	(5.3)
Carbon tetrachloride		ND	(5.1)		ND	(5.4)		ND	(5.1)		ND	(5.1)		ND	(5.3)
Chlorobenzene		ND	(5.1)		ND	(5.4)		ND	(5.1)		ND	(5.1)		ND	(5.3)
Chloroethane		ND	(10)		ND	(11)		ND	(10)		ND	(10)		ND	(11)
Chloroform		ND	(5.1)		ND	(5.4)		ND	(5.1)		ND	(5.1)		ND	(5.3)
Chloromethane		ND	(10)		ND	(11)		ND	(10)		ND	(10)		ND	(11)
Dibromochloromethane		ND	(5.1)		ND	(5.4)		ND	(5.1)		ND	(5.1)		ND	(5.3)
Ethylbenzene		ND	(5.1)		ND	(5.4)		ND	(5.1)		ND	(5.1)		ND	(5.3)
Methylene chloride		ND	(5.1)		ND	(5.4)		ND	(5.1)		ND	(5.1)		ND	(5.3)
Styrene		ND	(5.1)		ND	(5.4)		ND	(5.1)		ND	(5.1)		ND	(5.3)
Tetrachloroethene		ND	(5.1)		ND	(5.4)		ND	(5.1)		ND	(5.1)		ND	(5.3)
Toluene		ND	(5.1)		ND	(5.4)		ND	(5.1)		ND	(5.1)		ND	(5.3)
Trichloroethene (TCE)		ND	(5.1)		ND	(5.4)		ND	(5.1)		ND	(5.1)		ND	(5.3)
Trichlorofluoromethane		ND	(5.1)		ND	(5.4)		ND	(5.1)		ND	(5.1)		ND	(5.3)
Vinyl acetate		ND	(10)		ND	(11)		ND	(10)		ND	(10)		ND	(11)
Vinyl chloride		ND	(10)		ND	(11)		ND	(10)		ND	(10)		ND	(11)
Xylenes (total)		ND	(5.1)		ND	(5.4)		ND	(5.1)		ND	(5.1)		ND	(5.3)
cis-1,3-Dichloropropene		ND	(5.1)		ND	(5.4)		ND	(5.1)		ND	(5.1)		ND	(5.3)
trans-1,3-Dichloropropene		ND	(5.1)		ND	(5.4)		ND	(5.1)		ND	(5.1)		ND	(5.3)

R = result, Q = qualifier, QL = quantitation limit

(ND= non detect)

TABLE 4-8
Deep Soil Boring Soil Samples Laboratory Analytical Results
Temperature Test Facility RCRA Facility Investigation
White Sands Missile Range, New Mexico

WCFS Sample No.:	WSTF-SB05-2056			WSTF-SB05-2070			WSTF-SB05-2075			WSTF-SB05-2076		
Quanterra Sample No.:	041189-0015-SA			041189-0016-SA			041189-0017-SA			041189-0018-SA		
	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL
Moisture Content (%)												
Water	15			11			5.8			20		
VOLATILES (ug/kg)												
1,1,1-Trichloroethane		ND	(5.9)		ND	(5.6)		ND	(5.3)		ND	(6.3)
1,1,2 Trichloro-1,2,2-trifluoroethane		ND	(12)		ND	(11)		ND	(11)		ND	(13)
1,1,2,2-Tetrachloroethane		ND	(5.9)		ND	(5.6)		ND	(5.3)		ND	(6.3)
1,1,2-Trichloroethane		ND	(5.9)		ND	(5.6)		ND	(5.3)		ND	(6.3)
1,1-Dichloroethane		ND	(5.9)		ND	(5.6)		ND	(5.3)		ND	(6.3)
1,1-Dichloroethene		ND	(5.9)		ND	(5.6)		ND	(5.3)		ND	(6.3)
1,2-Dichloroethane		ND	(5.9)		ND	(5.6)		ND	(5.3)		ND	(6.3)
1,2-Dichloroethene (total)		ND	(5.9)		ND	(5.6)		ND	(5.3)		ND	(6.3)
1,2-Dichloropropane		ND	(5.9)		ND	(5.6)		ND	(5.3)		ND	(6.3)
2-Butanone (MEK)		ND	(12)		ND	(11)		ND	(11)		ND	(13)
2-Hexanone		ND	(12)		ND	(11)		ND	(11)		ND	(13)
4-Methyl-2-pentanone (MIBK)		ND	(12)		ND	(11)		ND	(11)		ND	(13)
Acetone		ND	(12)		ND	(11)		ND	(11)		ND	(13)
Benzene		ND	(5.9)		ND	(5.6)		ND	(5.3)		ND	(6.3)
Bromodichloromethane		ND	(5.9)		ND	(5.6)		ND	(5.3)		ND	(6.3)
Bromoform		ND	(5.9)		ND	(5.6)		ND	(5.3)		ND	(6.3)
Bromomethane		ND	(12)		ND	(11)		ND	(11)		ND	(13)
Carbon disulfide		ND	(5.9)		ND	(5.6)		ND	(5.3)		ND	(6.3)
Carbon tetrachloride		ND	(5.9)		ND	(5.6)		ND	(5.3)		ND	(6.3)
Chlorobenzene		ND	(5.9)		ND	(5.6)		ND	(5.3)		ND	(6.3)
Chloroethane		ND	(12)		ND	(11)		ND	(11)		ND	(13)
Chloroform		ND	(5.9)		ND	(5.6)		ND	(5.3)		ND	(6.3)
Chloromethane		ND	(12)		ND	(11)		ND	(11)		ND	(13)
Dibromochloromethane		ND	(5.9)		ND	(5.6)		ND	(5.3)		ND	(6.3)
Ethylbenzene		ND	(5.9)		ND	(5.6)		ND	(5.3)		ND	(6.3)
Methylene chloride		ND	(5.9)		ND	(5.6)		ND	(5.3)		ND	(6.3)
Styrene		ND	(5.9)		ND	(5.6)		ND	(5.3)		ND	(6.3)
Tetrachloroethene		ND	(5.9)		ND	(5.6)		ND	(5.3)		ND	(6.3)
Toluene		ND	(5.9)		ND	(5.6)		ND	(5.3)		ND	(6.3)
Trichloroethene (TCE)		ND	(5.9)		ND	(5.6)		ND	(5.3)		ND	(6.3)
Trichlorofluoromethane		ND	(5.9)		ND	(5.6)		ND	(5.3)		ND	(6.3)
Vinyl acetate		ND	(12)		ND	(11)		ND	(11)		ND	(13)
Vinyl chloride		ND	(12)		ND	(11)		ND	(11)		ND	(13)
Xylenes (total)		ND	(5.9)		ND	(5.6)		ND	(5.3)		ND	(6.3)
cis-1,3-Dichloropropene		ND	(5.9)		ND	(5.6)		ND	(5.3)		ND	(6.3)
trans-1,3-Dichloropropene		ND	(5.9)		ND	(5.6)		ND	(5.3)		ND	(6.3)

R = result, Q = qualifier, QL = quantitation limit

(ND= non detect)

TABLE 4-8
Deep Soil Boring Soil Samples Laboratory Analytical Results
Temperature Test Facility RCRA Facility Investigation
White Sands Missile Range, New Mexico

WCFS Sample No.:	WSTF-SB06-2017			WSTF-SB06-2022			WSTF-SB06-2057			WSTF-SB06-2060			WSTF-SB06-2061		
Quanterra Sample No.:	041141-0001-SA			041141-0002-SA			041141-0003-SA			041141-0004-SA			041141-0005-SA		
	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL
Moisture Content (%)															
Water	5.9			11			6.1			14			17		
VOLATILES (ug/kg)															
1,1,1-Trichloroethane		ND	(5.3)		ND	(5.6)		ND	(5.3)		ND	(5.8)		ND	(6.1)
1,1,2 Trichloro-1,2,2-trifluoroethane		ND	(11)		ND	(11)		ND	(11)		ND	(12)		ND	(12)
1,1,2,2-Tetrachloroethane		ND	(5.3)		ND	(5.6)		ND	(5.3)		ND	(5.8)		ND	(6.1)
1,1,2-Trichloroethane		ND	(5.3)		ND	(5.6)		ND	(5.3)		ND	(5.8)		ND	(6.1)
1,1-Dichloroethane		ND	(5.3)		ND	(5.6)		ND	(5.3)		ND	(5.8)		ND	(6.1)
1,1-Dichloroethene		ND	(5.3)		ND	(5.6)		ND	(5.3)		ND	(5.8)		ND	(6.1)
1,2-Dichloroethane		ND	(5.3)		ND	(5.6)		ND	(5.3)		ND	(5.8)		ND	(6.1)
1,2-Dichloroethene (total)		ND	(5.3)		ND	(5.6)		ND	(5.3)		ND	(5.8)		ND	(6.1)
1,2-Dichloropropane		ND	(5.3)		ND	(5.6)		ND	(5.3)		ND	(5.8)		ND	(6.1)
2-Butanone (MEK)		ND	(11)		ND	(11)		ND	(11)		ND	(12)		ND	(12)
2-Hexanone		ND	(11)		ND	(11)		ND	(11)		ND	(12)		ND	(12)
4-Methyl-2-pentanone (MIBK)		ND	(11)		ND	(11)		ND	(11)		ND	(12)		ND	(12)
Acetone	43				ND	(11)		ND	(11)		ND	(12)		ND	(12)
Benzene		ND	(5.3)		ND	(5.6)		ND	(5.3)		ND	(5.8)		ND	(6.1)
Bromodichloromethane		ND	(5.3)		ND	(5.6)		ND	(5.3)		ND	(5.8)		ND	(6.1)
Bromoform		ND	(5.3)		ND	(5.6)		ND	(5.3)		ND	(5.8)		ND	(6.1)
Bromomethane		ND	(11)		ND	(11)		ND	(11)		ND	(12)		ND	(12)
Carbon disulfide		ND	(5.3)		ND	(5.6)		ND	(5.3)		ND	(5.8)		ND	(6.1)
Carbon tetrachloride		ND	(5.3)		ND	(5.6)		ND	(5.3)		ND	(5.8)		ND	(6.1)
Chlorobenzene		ND	(5.3)		ND	(5.6)		ND	(5.3)		ND	(5.8)		ND	(6.1)
Chloroethane		ND	(11)		ND	(11)		ND	(11)		ND	(12)		ND	(12)
Chloroform		ND	(5.3)		ND	(5.6)		ND	(5.3)		ND	(5.8)		ND	(6.1)
Chloromethane		ND	(11)		ND	(11)		ND	(11)		ND	(12)		ND	(12)
Dibromochloromethane		ND	(5.3)		ND	(5.6)		ND	(5.3)		ND	(5.8)		ND	(6.1)
Ethylbenzene		ND	(5.3)		ND	(5.6)		ND	(5.3)		ND	(5.8)		ND	(6.1)
Methylene chloride		ND	(5.3)		ND	(5.6)		ND	(5.3)		ND	(5.8)		ND	(6.1)
Styrene		ND	(5.3)		ND	(5.6)		ND	(5.3)		ND	(5.8)		ND	(6.1)
Tetrachloroethene		ND	(5.3)		ND	(5.6)		ND	(5.3)		ND	(5.8)		ND	(6.1)
Toluene		ND	(5.3)		ND	(5.6)		ND	(5.3)		ND	(5.8)		ND	(6.1)
Trichloroethene (TCE)		ND	(5.3)		ND	(5.6)		ND	(5.3)		ND	(5.8)		ND	(6.1)
Trichlorofluoromethane		ND	(5.3)		ND	(5.6)		ND	(5.3)		ND	(5.8)		ND	(6.1)
Vinyl acetate		ND	(11)		ND	(11)		ND	(11)		ND	(12)		ND	(12)
Vinyl chloride		ND	(11)		ND	(11)		ND	(11)		ND	(12)		ND	(12)
Xylenes (total)		ND	(5.3)		ND	(5.6)		ND	(5.3)		ND	(5.8)		ND	(6.1)
cis-1,3-Dichloropropene		ND	(5.3)		ND	(5.6)		ND	(5.3)		ND	(5.8)		ND	(6.1)
trans-1,3-Dichloropropene		ND	(5.3)		ND	(5.6)		ND	(5.3)		ND	(5.8)		ND	(6.1)

R = result, Q = qualifier, QL = quantitation limit

(ND= non detect)

TABLE 4-8
Deep Soil Boring Soil Samples Laboratory Analytical Results
Temperature Test Facility RCRA Facility Investigation
White Sands Missile Range, New Mexico

WCFS Sample No.:	WSTF-SB06-2062			WSTF-SB06-2073			WSTF-SB06-2080			WSTF-SB06-2080-QC			WSTF-SB06-2081		
Quanterra Sample No.:	041141-0006-SA			041141-0007-SA			041141-0009-SA			041141-0011-SA			041141-0010-SA		
	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL
Moisture Content (%)															
Water	13			13			3.9			10			20		
VOLATILES (ug/kg)															
1,1,1-Trichloroethane		ND	(5.7)		ND	(5.8)		ND	(5.2)		ND	(5.6)		ND	(6.2)
1,1,2 Trichloro-1,2,2-trifluoroethane		ND	(11)		ND	(12)		ND	(10)		ND	(11)		ND	(12)
1,1,2,2-Tetrachloroethane		ND	(5.7)		ND	(5.8)		ND	(5.2)		ND	(5.6)		ND	(6.2)
1,1,2-Trichloroethane		ND	(5.7)		ND	(5.8)		ND	(5.2)		ND	(5.6)		ND	(6.2)
1,1-Dichloroethane		ND	(5.7)		ND	(5.8)		ND	(5.2)		ND	(5.6)		ND	(6.2)
1,1-Dichloroethene		ND	(5.7)		ND	(5.8)		ND	(5.2)		ND	(5.6)		ND	(6.2)
1,2-Dichloroethane		ND	(5.7)		ND	(5.8)		ND	(5.2)		ND	(5.6)		ND	(6.2)
1,2-Dichloroethene (total)		ND	(5.7)		ND	(5.8)		ND	(5.2)		ND	(5.6)		ND	(6.2)
1,2-Dichloropropane		ND	(5.7)		ND	(5.8)		ND	(5.2)		ND	(5.6)		ND	(6.2)
2-Butanone (MEK)		ND	(11)		ND	(12)		ND	(10)		ND	(11)		ND	(12)
2-Hexanone		ND	(11)		ND	(12)		ND	(10)		ND	(11)		ND	(12)
4-Methyl-2-pentanone (MIBK)		ND	(11)		ND	(12)		ND	(10)		ND	(11)		ND	(12)
Acetone		ND	(11)		ND	(12)		ND	(10)		ND	(11)		ND	(12)
Benzene		ND	(5.7)		ND	(5.8)		ND	(5.2)		ND	(5.6)		ND	(6.2)
Bromodichloromethane		ND	(5.7)		ND	(5.8)		ND	(5.2)		ND	(5.6)		ND	(6.2)
Bromoform		ND	(5.7)		ND	(5.8)		ND	(5.2)		ND	(5.6)		ND	(6.2)
Bromomethane		ND	(11)		ND	(12)		ND	(10)		ND	(11)		ND	(12)
Carbon disulfide		ND	(5.7)		ND	(5.8)		ND	(5.2)		ND	(5.6)		ND	(6.2)
Carbon tetrachloride		ND	(5.7)		ND	(5.8)		ND	(5.2)		ND	(5.6)		ND	(6.2)
Chlorobenzene		ND	(5.7)		ND	(5.8)		ND	(5.2)		ND	(5.6)		ND	(6.2)
Chloroethane		ND	(11)		ND	(12)		ND	(10)		ND	(11)		ND	(12)
Chloroform		ND	(5.7)		ND	(5.8)		ND	(5.2)		ND	(5.6)		ND	(6.2)
Chloromethane		ND	(11)		ND	(12)		ND	(10)		ND	(11)		ND	(12)
Dibromochloromethane		ND	(5.7)		ND	(5.8)		ND	(5.2)		ND	(5.6)		ND	(6.2)
Ethylbenzene		ND	(5.7)		ND	(5.8)		ND	(5.2)		ND	(5.6)		ND	(6.2)
Methylene chloride		ND	(5.7)		ND	(5.8)		ND	(5.2)		ND	(5.6)		ND	(6.2)
Styrene		ND	(5.7)		ND	(5.8)		ND	(5.2)		ND	(5.6)		ND	(6.2)
Tetrachloroethene		ND	(5.7)		ND	(5.8)		ND	(5.2)		ND	(5.6)		ND	(6.2)
Toluene		ND	(5.7)		ND	(5.8)		ND	(5.2)		ND	(5.6)		ND	(6.2)
Trichloroethene (TCE)		ND	(5.7)		ND	(5.8)		ND	(5.2)		ND	(5.6)		ND	(6.2)
Trichlorofluoromethane		ND	(5.7)		ND	(5.8)		ND	(5.2)		ND	(5.6)		ND	(6.2)
Vinyl acetate		ND	(11)		ND	(12)		ND	(10)		ND	(11)		ND	(12)
Vinyl chloride		ND	(11)		ND	(12)		ND	(10)		ND	(11)		ND	(12)
Xylenes (total)		ND	(5.7)		ND	(5.8)		ND	(5.2)		ND	(5.6)		ND	(6.2)
cis-1,3-Dichloropropene		ND	(5.7)		ND	(5.8)		ND	(5.2)		ND	(5.6)		ND	(6.2)
trans-1,3-Dichloropropene		ND	(5.7)		ND	(5.8)		ND	(5.2)		ND	(5.6)		ND	(6.2)

R = result, Q = qualifier, QL = quantitation limit

(ND= non detect)

TABLE 4-8
Deep Soil Boring Soil Samples Laboratory Analytical Results
Temperature Test Facility RCRA Facility Investigation
White Sands Missile Range, New Mexico

WCFS Sample No.:	WSTF-SB07-2017			WSTF-SB07-2017-QC			WSTF-SB07-2022			WSTF-SB07-2057			WSTF-SB07-2059		
Quanterra Sample No.:	041209-0002-SA			041209-0001-SA			041209-0003-SA			041209-0004-SA			041209-0005-SA		
	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL
Moisture Content (%)															
Water	5.7			7.1			7.6			2.4			5.3		
VOLATILES (ug/kg)															
1,1,1-Trichloroethane		ND	(5.3)		ND	(5.4)		ND	(5.4)		ND	(5.1)		ND	(5.3)
1,1,2 Trichloro-1,2,2-trifluoroethane		ND	(11)		ND	(11)		ND	(11)		ND	(10)		ND	(11)
1,1,2,2-Tetrachloroethane		ND	(5.3)		ND	(5.4)		ND	(5.4)		ND	(5.1)		ND	(5.3)
1,1,2-Trichloroethane		ND	(5.3)		ND	(5.4)		ND	(5.4)		ND	(5.1)		ND	(5.3)
1,1-Dichloroethane		ND	(5.3)		ND	(5.4)		ND	(5.4)		ND	(5.1)		ND	(5.3)
1,1-Dichloroethene		ND	(5.3)		ND	(5.4)		ND	(5.4)		ND	(5.1)		ND	(5.3)
1,2-Dichloroethane		ND	(5.3)		ND	(5.4)		ND	(5.4)		ND	(5.1)		ND	(5.3)
1,2-Dichloroethene (total)		ND	(5.3)		ND	(5.4)		ND	(5.4)		ND	(5.1)		ND	(5.3)
1,2-Dichloropropane		ND	(5.3)		ND	(5.4)		ND	(5.4)		ND	(5.1)		ND	(5.3)
2-Butanone (MEK)		ND	(11)		ND	(11)		ND	(11)		ND	(10)		ND	(11)
2-Hexanone		ND	(11)		ND	(11)		ND	(11)		ND	(10)		ND	(11)
4-Methyl-2-pentanone (MIBK)		ND	(11)		ND	(11)		ND	(11)		ND	(10)		ND	(11)
Acetone		ND	(11)		ND	(11)		ND	(11)		ND	(10)		ND	(11)
Benzene		ND	(5.3)		ND	(5.4)		ND	(5.4)		ND	(5.1)		ND	(5.3)
Bromodichloromethane		ND	(5.3)		ND	(5.4)		ND	(5.4)		ND	(5.1)		ND	(5.3)
Bromoform		ND	(5.3)		ND	(5.4)		ND	(5.4)		ND	(5.1)		ND	(5.3)
Bromomethane		ND	(11)		ND	(11)		ND	(11)		ND	(10)		ND	(11)
Carbon disulfide		ND	(5.3)		ND	(5.4)		ND	(5.4)		ND	(5.1)		ND	(5.3)
Carbon tetrachloride		ND	(5.3)		ND	(5.4)		ND	(5.4)		ND	(5.1)		ND	(5.3)
Chlorobenzene		ND	(5.3)		ND	(5.4)		ND	(5.4)		ND	(5.1)		ND	(5.3)
Chloroethane		ND	(11)		ND	(11)		ND	(11)		ND	(10)		ND	(11)
Chloroform		ND	(5.3)		ND	(5.4)		ND	(5.4)		ND	(5.1)		ND	(5.3)
Chloromethane		ND	(11)		ND	(11)		ND	(11)		ND	(10)		ND	(11)
Dibromochloromethane		ND	(5.3)		ND	(5.4)		ND	(5.4)		ND	(5.1)		ND	(5.3)
Ethylbenzene		ND	(5.3)		ND	(5.4)		ND	(5.4)		ND	(5.1)		ND	(5.3)
Methylene chloride		ND	(5.3)		ND	(5.4)		ND	(5.4)		ND	(5.1)		ND	(5.3)
Styrene		ND	(5.3)		ND	(5.4)		ND	(5.4)		ND	(5.1)		ND	(5.3)
Tetrachloroethene		ND	(5.3)		ND	(5.4)		ND	(5.4)		ND	(5.1)		ND	(5.3)
Toluene		ND	(5.3)		ND	(5.4)		ND	(5.4)		ND	(5.1)		ND	(5.3)
Trichloroethene (TCE)		ND	(5.3)		ND	(5.4)		ND	(5.4)		ND	(5.1)		ND	(5.3)
Trichlorofluoromethane		ND	(5.3)		ND	(5.4)		ND	(5.4)		ND	(5.1)		ND	(5.3)
Vinyl acetate		ND	(11)		ND	(11)		ND	(11)		ND	(10)		ND	(11)
Vinyl chloride		ND	(11)		ND	(11)		ND	(11)		ND	(10)		ND	(11)
Xylenes (total)		ND	(5.3)		ND	(5.4)		ND	(5.4)		ND	(5.1)		ND	(5.3)
cis-1,3-Dichloropropene		ND	(5.3)		ND	(5.4)		ND	(5.4)		ND	(5.1)		ND	(5.3)
trans-1,3-Dichloropropene		ND	(5.3)		ND	(5.4)		ND	(5.4)		ND	(5.1)		ND	(5.3)

R = result, Q = qualifier, QL = quantitation limit

(ND= non detect)

TABLE 4-8
Deep Soil Boring Soil Samples Laboratory Analytical Results
Temperature Test Facility RCRA Facility Investigation
White Sands Missile Range, New Mexico

WCFS Sample No.:	WSTF-SB07-2060			WSTF-SB07-2061			WSTF-SB07-2072			WSTF-SB07-2078			WSTF-SB07-2079		
Quanterra Sample No.:	041209-0006-SA			041209-0007-SA			041209-0011-SA			041209-0012-SA			041209-0013-SA		
	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL
Moisture Content (%)															
Water	12			12			16			12			20		
VOLATILES (ug/kg)															
1,1,1-Trichloroethane		ND	(5.6)		ND	(5.7)		ND	(6)		ND	(5.7)		ND	(6.3)
1,1,2 Trichloro-1,2,2-trifluoroethane		ND	(11)		ND	(11)		ND	(12)		ND	(11)		ND	(13)
1,1,2,2-Tetrachloroethane		ND	(5.6)		ND	(5.7)		ND	(6)		ND	(5.7)		ND	(6.3)
1,1,2-Trichloroethane		ND	(5.6)		ND	(5.7)		ND	(6)		ND	(5.7)		ND	(6.3)
1,1-Dichloroethane		ND	(5.6)		ND	(5.7)		ND	(6)		ND	(5.7)		ND	(6.3)
1,1-Dichloroethene		ND	(5.6)		ND	(5.7)		ND	(6)		ND	(5.7)		ND	(6.3)
1,2-Dichloroethane		ND	(5.6)		ND	(5.7)		ND	(6)		ND	(5.7)		ND	(6.3)
1,2-Dichloroethene (total)		ND	(5.6)		ND	(5.7)		ND	(6)		ND	(5.7)		ND	(6.3)
1,2-Dichloropropane		ND	(5.6)		ND	(5.7)		ND	(6)		ND	(5.7)		ND	(6.3)
2-Butanone (MEK)		ND	(11)		ND	(11)		ND	(12)		ND	(11)		ND	(13)
2-Hexanone		ND	(11)		ND	(11)		ND	(12)		ND	(11)		ND	(13)
4-Methyl-2-pentanone (MIBK)		ND	(11)		ND	(11)		ND	(12)		ND	(11)		ND	(13)
Acetone	19				ND	(11)	12				ND	(11)		ND	(13)
Benzene		ND	(5.6)		ND	(5.7)		ND	(6)		ND	(5.7)		ND	(6.3)
Bromodichloromethane		ND	(5.6)		ND	(5.7)		ND	(6)		ND	(5.7)		ND	(6.3)
Bromoform		ND	(5.6)		ND	(5.7)		ND	(6)		ND	(5.7)		ND	(6.3)
Bromomethane		ND	(11)		ND	(11)		ND	(12)		ND	(11)		ND	(13)
Carbon disulfide		ND	(5.6)		ND	(5.7)		ND	(6)		ND	(5.7)		ND	(6.3)
Carbon tetrachloride		ND	(5.6)		ND	(5.7)		ND	(6)		ND	(5.7)		ND	(6.3)
Chlorobenzene		ND	(5.6)		ND	(5.7)		ND	(6)		ND	(5.7)		ND	(6.3)
Chloroethane		ND	(11)		ND	(11)		ND	(12)		ND	(11)		ND	(13)
Chloroform		ND	(5.6)		ND	(5.7)		ND	(6)		ND	(5.7)		ND	(6.3)
Chloromethane		ND	(11)		ND	(11)		ND	(12)		ND	(11)		ND	(13)
Dibromochloromethane		ND	(5.6)		ND	(5.7)		ND	(6)		ND	(5.7)		ND	(6.3)
Ethylbenzene		ND	(5.6)		ND	(5.7)		ND	(6)		ND	(5.7)		ND	(6.3)
Methylene chloride		ND	(5.6)		ND	(5.7)	6				ND	(5.7)		ND	(6.3)
Styrene		ND	(5.6)		ND	(5.7)		ND	(6)		ND	(5.7)		ND	(6.3)
Tetrachloroethene		ND	(5.6)		ND	(5.7)		ND	(6)		ND	(5.7)		ND	(6.3)
Toluene		ND	(5.6)		ND	(5.7)		ND	(6)		ND	(5.7)		ND	(6.3)
Trichloroethene (TCE)		ND	(5.6)		ND	(5.7)		ND	(6)		ND	(5.7)		ND	(6.3)
Trichlorofluoromethane		ND	(5.6)		ND	(5.7)		ND	(6)		ND	(5.7)		ND	(6.3)
Vinyl acetate		ND	(11)		ND	(11)		ND	(12)		ND	(11)		ND	(13)
Vinyl chloride		ND	(11)		ND	(11)		ND	(12)		ND	(11)		ND	(13)
Xylenes (total)		ND	(5.6)		ND	(5.7)		ND	(6)		ND	(5.7)		ND	(6.3)
cis-1,3-Dichloropropene		ND	(5.6)		ND	(5.7)		ND	(6)		ND	(5.7)		ND	(6.3)
trans-1,3-Dichloropropene		ND	(5.6)		ND	(5.7)		ND	(6)		ND	(5.7)		ND	(6.3)

R = result, Q = qualifier, QL = quantitation limit

(ND= non detect)

TABLE 4-8
Deep Soil Boring Soil Samples Laboratory Analytical Results
Temperature Test Facility RCRA Facility Investigation
White Sands Missile Range, New Mexico

WCFS Sample No.:	WSTF-SB08-2017			WSTF-SB08-2017-QC			WSTF-SB08-2025			WSTF-SB08-2059			WSTF-SB08-2060		
Quanterra Sample No.:	041157-0001-SA			041157-0002-SA			041157-0003-SA			041157-0004-SA			041157-0005-SA		
	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL
Moisture Content (%)															
Water	5.4			2.4			11			12			12		
VOLATILES (ug/kg)															
1,1,1-Trichloroethane		ND	(5.3)		ND	(5.1)		ND	(5.6)		ND	(5.7)		ND	(5.7)
1,1,2 Trichloro-1,2,2-trifluoroethane		ND	(11)		ND	(10)		ND	(11)		ND	(11)		ND	(11)
1,1,2,2-Tetrachloroethane		ND	(5.3)		ND	(5.1)		ND	(5.6)		ND	(5.7)		ND	(5.7)
1,1,2-Trichloroethane		ND	(5.3)		ND	(5.1)		ND	(5.6)		ND	(5.7)		ND	(5.7)
1,1-Dichloroethane		ND	(5.3)		ND	(5.1)		ND	(5.6)		ND	(5.7)		ND	(5.7)
1,1-Dichloroethene		ND	(5.3)		ND	(5.1)		ND	(5.6)		ND	(5.7)		ND	(5.7)
1,2-Dichloroethane		ND	(5.3)		ND	(5.1)		ND	(5.6)		ND	(5.7)		ND	(5.7)
1,2-Dichloroethene (total)		ND	(5.3)		ND	(5.1)		ND	(5.6)		ND	(5.7)		ND	(5.7)
1,2-Dichloropropane		ND	(5.3)		ND	(5.1)		ND	(5.6)		ND	(5.7)		ND	(5.7)
2-Butanone (MEK)		ND	(11)		ND	(10)		ND	(11)		ND	(11)		ND	(11)
2-Hexanone		ND	(11)		ND	(10)		ND	(11)		ND	(11)		ND	(11)
4-Methyl-2-pentanone (MIBK)		ND	(11)		ND	(10)		ND	(11)		ND	(11)		ND	(11)
Acetone		ND	(11)		ND	(10)		ND	(11)		ND	(11)		ND	(11)
Benzene		ND	(5.3)		ND	(5.1)		ND	(5.6)		ND	(5.7)		ND	(5.7)
Bromodichloromethane		ND	(5.3)		ND	(5.1)		ND	(5.6)		ND	(5.7)		ND	(5.7)
Bromoform		ND	(5.3)		ND	(5.1)		ND	(5.6)		ND	(5.7)		ND	(5.7)
Bromomethane		ND	(11)		ND	(10)		ND	(11)		ND	(11)		ND	(11)
Carbon disulfide		ND	(5.3)		ND	(5.1)		ND	(5.6)		ND	(5.7)		ND	(5.7)
Carbon tetrachloride		ND	(5.3)		ND	(5.1)		ND	(5.6)		ND	(5.7)		ND	(5.7)
Chlorobenzene		ND	(5.3)		ND	(5.1)		ND	(5.6)		ND	(5.7)		ND	(5.7)
Chloroethane		ND	(11)		ND	(10)		ND	(11)		ND	(11)		ND	(11)
Chloroform		ND	(5.3)		ND	(5.1)		ND	(5.6)		ND	(5.7)		ND	(5.7)
Chloromethane		ND	(11)		ND	(10)		ND	(11)		ND	(11)		ND	(11)
Dibromochloromethane		ND	(5.3)		ND	(5.1)		ND	(5.6)		ND	(5.7)		ND	(5.7)
Ethylbenzene		ND	(5.3)		ND	(5.1)		ND	(5.6)		ND	(5.7)		ND	(5.7)
Methylene chloride		ND	(5.3)		ND	(5.1)		ND	(5.6)		ND	(5.7)		ND	(5.7)
Styrene		ND	(5.3)		ND	(5.1)		ND	(5.6)		ND	(5.7)		ND	(5.7)
Tetrachloroethene		ND	(5.3)		ND	(5.1)		ND	(5.6)		ND	(5.7)		ND	(5.7)
Toluene		ND	(5.3)		ND	(5.1)		ND	(5.6)		ND	(5.7)		ND	(5.7)
Trichloroethene (TCE)		ND	(5.3)		ND	(5.1)		ND	(5.6)		ND	(5.7)		ND	(5.7)
Trichlorofluoromethane		ND	(5.3)		ND	(5.1)		ND	(5.6)		ND	(5.7)		ND	(5.7)
Vinyl acetate		ND	(11)		ND	(10)		ND	(11)		ND	(11)		ND	(11)
Vinyl chloride		ND	(11)		ND	(10)		ND	(11)		ND	(11)		ND	(11)
Xylenes (total)		ND	(5.3)		ND	(5.1)		ND	(5.6)		ND	(5.7)		ND	(5.7)
cis-1,3-Dichloropropene		ND	(5.3)		ND	(5.1)		ND	(5.6)		ND	(5.7)		ND	(5.7)
trans-1,3-Dichloropropene		ND	(5.3)		ND	(5.1)		ND	(5.6)		ND	(5.7)		ND	(5.7)

R = result, Q = qualifier, QL = quantitation limit

(ND= non detect)

TABLE 4-8
Deep Soil Boring Soil Samples Laboratory Analytical Results
Temperature Test Facility RCRA Facility Investigation
White Sands Missile Range, New Mexico

WCFS Sample No.:	WSTF-SB08-2061			WSTF-SB08-2062			WSTF-SB08-2074			WSTF-SB08-2079			WSTF-SB08-2080		
Quanterra Sample No.:	041157-0006-SA			041157-0007-SA			041157-0008-SA			041157-0009-SA			041157-0010-SA		
	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL
Moisture Content (%)															
Water	14			11			18			3			18		
VOLATILES (ug/kg)															
1,1,1-Trichloroethane		ND	(5.8)		ND	(5.6)		ND	(6.1)		ND	(5.2)		ND	(6.1)
1,1,2 Trichloro-1,2,2-trifluoroethane		ND	(12)		ND	(11)		ND	(12)		ND	(10)		ND	(12)
1,1,2,2-Tetrachloroethane		ND	(5.8)		ND	(5.6)		ND	(6.1)		ND	(5.2)		ND	(6.1)
1,1,2-Trichloroethane		ND	(5.8)		ND	(5.6)		ND	(6.1)		ND	(5.2)		ND	(6.1)
1,1-Dichloroethane		ND	(5.8)		ND	(5.6)		ND	(6.1)		ND	(5.2)		ND	(6.1)
1,1-Dichloroethene		ND	(5.8)		ND	(5.6)		ND	(6.1)		ND	(5.2)		ND	(6.1)
1,2-Dichloroethane		ND	(5.8)		ND	(5.6)		ND	(6.1)		ND	(5.2)		ND	(6.1)
1,2-Dichloroethene (total)		ND	(5.8)		ND	(5.6)		ND	(6.1)		ND	(5.2)		ND	(6.1)
1,2-Dichloropropane		ND	(5.8)		ND	(5.6)		ND	(6.1)		ND	(5.2)		ND	(6.1)
2-Butanone (MEK)		ND	(12)		ND	(11)		ND	(12)		ND	(10)		ND	(12)
2-Hexanone		ND	(12)		ND	(11)		ND	(12)		ND	(10)		ND	(12)
4-Methyl-2-pentanone (MIBK)		ND	(12)		ND	(11)		ND	(12)		ND	(10)		ND	(12)
Acetone		ND	(12)		ND	(11)	58				ND	(10)	59		
Benzene		ND	(5.8)		ND	(5.6)		ND	(6.1)		ND	(5.2)		ND	(6.1)
Bromodichloromethane		ND	(5.8)		ND	(5.6)		ND	(6.1)		ND	(5.2)		ND	(6.1)
Bromoform		ND	(5.8)		ND	(5.6)		ND	(6.1)		ND	(5.2)		ND	(6.1)
Bromomethane		ND	(12)		ND	(11)		ND	(12)		ND	(10)		ND	(12)
Carbon disulfide		ND	(5.8)		ND	(5.6)		ND	(6.1)		ND	(5.2)		ND	(6.1)
Carbon tetrachloride		ND	(5.8)		ND	(5.6)		ND	(6.1)		ND	(5.2)		ND	(6.1)
Chlorobenzene		ND	(5.8)		ND	(5.6)		ND	(6.1)		ND	(5.2)		ND	(6.1)
Chloroethane		ND	(12)		ND	(11)		ND	(12)		ND	(10)		ND	(12)
Chloroform		ND	(5.8)		ND	(5.6)		ND	(6.1)		ND	(5.2)		ND	(6.1)
Chloromethane		ND	(12)		ND	(11)		ND	(12)		ND	(10)		ND	(12)
Dibromochloromethane		ND	(5.8)		ND	(5.6)		ND	(6.1)		ND	(5.2)		ND	(6.1)
Ethylbenzene		ND	(5.8)		ND	(5.6)		ND	(6.1)		ND	(5.2)		ND	(6.1)
Methylene chloride		ND	(5.8)		ND	(5.6)	40				ND	(5.2)		ND	(6.1)
Styrene		ND	(5.8)		ND	(5.6)		ND	(6.1)		ND	(5.2)		ND	(6.1)
Tetrachloroethene		ND	(5.8)		ND	(5.6)		ND	(6.1)		ND	(5.2)		ND	(6.1)
Toluene		ND	(5.8)		ND	(5.6)	6.7				ND	(5.2)		ND	(6.1)
Trichloroethene (TCE)		ND	(5.8)		ND	(5.6)		ND	(6.1)		ND	(5.2)		ND	(6.1)
Trichlorofluoromethane		ND	(5.8)		ND	(5.6)		ND	(6.1)		ND	(5.2)		ND	(6.1)
Vinyl acetate		ND	(12)		ND	(11)		ND	(12)		ND	(10)		ND	(12)
Vinyl chloride		ND	(12)		ND	(11)		ND	(12)		ND	(10)		ND	(12)
Xylenes (total)		ND	(5.8)		ND	(5.6)		ND	(6.1)		ND	(5.2)		ND	(6.1)
cis-1,3-Dichloropropene		ND	(5.8)		ND	(5.6)		ND	(6.1)		ND	(5.2)		ND	(6.1)
trans-1,3-Dichloropropene		ND	(5.8)		ND	(5.6)		ND	(6.1)		ND	(5.2)		ND	(6.1)

R = result, Q = qualifier, QL = quantitation limit

(ND= non detect)

TABLE 4-8
Deep Soil Boring Soil Samples Laboratory Analytical Results
Temperature Test Facility RCRA Facility Investigation
White Sands Missile Range, New Mexico

WCFS Sample No.:	WSTF-SB09-2017			WSTF-SB09-2021			WSTF-SB09-2057			WSTF-SB09-2057-QC			WSTF-SB09-2060			WSTF-SB09-2072			WSTF-SB09-2078			WSTF-SB09-2079		
Quanterra Sample No.:	041189-0001-SA			041189-0002-SA			041189-0003-SA			041189-0004-SA			041189-0005-SA			041189-0006-SA			041189-0007-SA			041189-0008-SA		
	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL
Moisture Content (%)																								
Water	2.6			15			3.2			6			4.1			13			2.6			22		
VOLATILES (ug/kg)																								
1,1,1-Trichloroethane		ND	(5.1)		ND	(5.9)		ND	(5.2)		ND	(5.3)		ND	(5.2)		ND	(5.7)		ND	(5.1)		ND	(6.4)
1,1,2 Trichloro-1,2,2-trifluoroethane		ND	(10)		ND	(12)		ND	(10)		ND	(11)		ND	(10)		ND	(11)		ND	(10)		ND	(13)
1,1,2,2-Tetrachloroethane		ND	(5.1)		ND	(5.9)		ND	(5.2)		ND	(5.3)		ND	(5.2)		ND	(5.7)		ND	(5.1)		ND	(6.4)
1,1,2-Trichloroethane		ND	(5.1)		ND	(5.9)		ND	(5.2)		ND	(5.3)		ND	(5.2)		ND	(5.7)		ND	(5.1)		ND	(6.4)
1,1-Dichloroethane		ND	(5.1)		ND	(5.9)		ND	(5.2)		ND	(5.3)		ND	(5.2)		ND	(5.7)		ND	(5.1)		ND	(6.4)
1,1-Dichloroethene		ND	(5.1)		ND	(5.9)		ND	(5.2)		ND	(5.3)		ND	(5.2)		ND	(5.7)		ND	(5.1)		ND	(6.4)
1,2-Dichloroethane		ND	(5.1)		ND	(5.9)		ND	(5.2)		ND	(5.3)		ND	(5.2)		ND	(5.7)		ND	(5.1)		ND	(6.4)
1,2-Dichloroethene (total)		ND	(5.1)		ND	(5.9)		ND	(5.2)		ND	(5.3)		ND	(5.2)		ND	(5.7)		ND	(5.1)		ND	(6.4)
1,2-Dichloropropane		ND	(5.1)		ND	(5.9)		ND	(5.2)		ND	(5.3)		ND	(5.2)		ND	(5.7)		ND	(5.1)		ND	(6.4)
2-Butanone (MEK)		ND	(10)		ND	(12)		ND	(10)		ND	(11)		ND	(10)		ND	(11)		ND	(10)		ND	(13)
2-Hexanone		ND	(10)		ND	(12)		ND	(10)		ND	(11)		ND	(10)		ND	(11)		ND	(10)		ND	(13)
4-Methyl-2-pentanone (MIBK)		ND	(10)		ND	(12)		ND	(10)		ND	(11)		ND	(10)		ND	(11)		ND	(10)		ND	(13)
Acetone		ND	(10)	14				ND	(10)		ND	(11)		ND	(10)		ND	(11)		ND	(10)		ND	(13)
Benzene		ND	(5.1)		ND	(5.9)		ND	(5.2)		ND	(5.3)		ND	(5.2)		ND	(5.7)		ND	(5.1)		ND	(6.4)
Bromodichloromethane		ND	(5.1)		ND	(5.9)		ND	(5.2)		ND	(5.3)		ND	(5.2)		ND	(5.7)		ND	(5.1)		ND	(6.4)
Bromoform		ND	(5.1)		ND	(5.9)		ND	(5.2)		ND	(5.3)		ND	(5.2)		ND	(5.7)		ND	(5.1)		ND	(6.4)
Bromomethane		ND	(10)		ND	(12)		ND	(10)		ND	(11)		ND	(10)		ND	(11)		ND	(10)		ND	(13)
Carbon disulfide		ND	(5.1)		ND	(5.9)		ND	(5.2)		ND	(5.3)		ND	(5.2)		ND	(5.7)		ND	(5.1)		ND	(6.4)
Carbon tetrachloride		ND	(5.1)		ND	(5.9)		ND	(5.2)		ND	(5.3)		ND	(5.2)		ND	(5.7)		ND	(5.1)		ND	(6.4)
Chlorobenzene		ND	(5.1)		ND	(5.9)		ND	(5.2)		ND	(5.3)		ND	(5.2)		ND	(5.7)		ND	(5.1)		ND	(6.4)
Chloroethane		ND	(10)		ND	(12)		ND	(10)		ND	(11)		ND	(10)		ND	(11)		ND	(10)		ND	(13)
Chloroform		ND	(5.1)		ND	(5.9)		ND	(5.2)		ND	(5.3)		ND	(5.2)		ND	(5.7)		ND	(5.1)		ND	(6.4)
Chloromethane		ND	(10)		ND	(12)		ND	(10)		ND	(11)		ND	(10)		ND	(11)		ND	(10)		ND	(13)
Dibromochloromethane		ND	(5.1)		ND	(5.9)		ND	(5.2)		ND	(5.3)		ND	(5.2)		ND	(5.7)		ND	(5.1)		ND	(6.4)
Ethylbenzene		ND	(5.1)		ND	(5.9)		ND	(5.2)		ND	(5.3)		ND	(5.2)		ND	(5.7)		ND	(5.1)		ND	(6.4)
Methylene chloride		ND	(5.1)		ND	(5.9)		ND	(5.2)		ND	(5.3)		ND	(5.2)		ND	(5.7)		ND	(5.1)		ND	(6.4)
Styrene		ND	(5.1)		ND	(5.9)		ND	(5.2)		ND	(5.3)		ND	(5.2)		ND	(5.7)		ND	(5.1)		ND	(6.4)
Tetrachloroethene		ND	(5.1)		ND	(5.9)		ND	(5.2)		ND	(5.3)		ND	(5.2)		ND	(5.7)		ND	(5.1)		ND	(6.4)
Toluene		ND	(5.1)		ND	(5.9)		ND	(5.2)		ND	(5.3)		ND	(5.2)		ND	(5.7)		ND	(5.1)		ND	(6.4)
Trichloroethene (TCE)		ND	(5.1)		ND	(5.9)		ND	(5.2)		ND	(5.3)		ND	(5.2)		ND	(5.7)		ND	(5.1)		ND	(6.4)
Trichlorofluoromethane		ND	(5.1)		ND	(5.9)		ND	(5.2)		ND	(5.3)		ND	(5.2)		ND	(5.7)		ND	(5.1)		ND	(6.4)
Vinyl acetate		ND	(10)		ND	(12)		ND	(10)		ND	(11)		ND	(10)		ND	(11)		ND	(10)		ND	(13)
Vinyl chloride		ND	(10)		ND	(12)		ND	(10)		ND	(11)		ND	(10)		ND	(11)		ND	(10)		ND	(13)
Xylenes (total)		ND	(5.1)		ND	(5.9)		ND	(5.2)		ND	(5.3)		ND	(5.2)		ND	(5.7)		ND	(5.1)		ND	(6.4)
cis-1,3-Dichloropropene		ND	(5.1)		ND	(5.9)		ND	(5.2)		ND	(5.3)		ND	(5.2)		ND	(5.7)		ND	(5.1)		ND	(6.4)
trans-1,3-Dichloropropene		ND	(5.1)		ND	(5.9)		ND	(5.2)		ND	(5.3)		ND	(5.2)		ND	(5.7)		ND	(5.1)		ND	(6.4)

R = result, Q = qualifier, QL = quantitation limit

(ND= non detect)

TABLE 4-8
Deep Soil Boring Soil Samples Laboratory Analytical Results
Temperature Test Facility RCRA Facility Investigation
White Sands Missile Range, New Mexico

WCFS Sample No.:	WSTF-SB10-2012			WSTF-SB10-2012-QC			WSTF-SB10-2021			WSTF-SB10-2059			WSTF-SB10-2060		
Quanterra Sample No.:	041172-0002-SA			041172-0003-SA			041172-0004-SA			041172-0005-SA			041172-0006-SA		
	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL
Moisture Content (%)															
Water	1.7			2			11			10			8.5		
VOLATILES (ug/kg)															
1,1,1-Trichloroethane		ND	(5.1)		ND	(5.1)		ND	(5.6)		ND	(5.6)		ND	(5.5)
1,1,2 Trichloro-1,2,2-trifluoroethane		ND	(10)		ND	(10)		ND	(11)		ND	(11)		ND	(11)
1,1,2,2-Tetrachloroethane		ND	(5.1)		ND	(5.1)		ND	(5.6)		ND	(5.6)		ND	(5.5)
1,1,2-Trichloroethane		ND	(5.1)		ND	(5.1)		ND	(5.6)		ND	(5.6)		ND	(5.5)
1,1-Dichloroethane		ND	(5.1)		ND	(5.1)		ND	(5.6)		ND	(5.6)		ND	(5.5)
1,1-Dichloroethene		ND	(5.1)		ND	(5.1)		ND	(5.6)		ND	(5.6)		ND	(5.5)
1,2-Dichloroethane		ND	(5.1)		ND	(5.1)		ND	(5.6)		ND	(5.6)		ND	(5.5)
1,2-Dichloroethene (total)		ND	(5.1)		ND	(5.1)		ND	(5.6)		ND	(5.6)		ND	(5.5)
1,2-Dichloropropane		ND	(5.1)		ND	(5.1)		ND	(5.6)		ND	(5.6)		ND	(5.5)
2-Butanone (MEK)		ND	(10)		ND	(10)		ND	(11)		ND	(11)		ND	(11)
2-Hexanone		ND	(10)		ND	(10)		ND	(11)		ND	(11)		ND	(11)
4-Methyl-2-pentanone (MIBK)		ND	(10)		ND	(10)		ND	(11)		ND	(11)		ND	(11)
Acetone		ND	(10)		ND	(10)		ND	(11)		ND	(11)		ND	(11)
Benzene		ND	(5.1)		ND	(5.1)		ND	(5.6)		ND	(5.6)		ND	(5.5)
Bromodichloromethane		ND	(5.1)		ND	(5.1)		ND	(5.6)		ND	(5.6)		ND	(5.5)
Bromoform		ND	(5.1)		ND	(5.1)		ND	(5.6)		ND	(5.6)		ND	(5.5)
Bromomethane		ND	(10)		ND	(10)		ND	(11)		ND	(11)		ND	(11)
Carbon disulfide		ND	(5.1)		ND	(5.1)		ND	(5.6)		ND	(5.6)		ND	(5.5)
Carbon tetrachloride		ND	(5.1)		ND	(5.1)		ND	(5.6)		ND	(5.6)		ND	(5.5)
Chlorobenzene		ND	(5.1)		ND	(5.1)		ND	(5.6)		ND	(5.6)		ND	(5.5)
Chloroethane		ND	(10)		ND	(10)		ND	(11)		ND	(11)		ND	(11)
Chloroform		ND	(5.1)		ND	(5.1)		ND	(5.6)		ND	(5.6)		ND	(5.5)
Chloromethane		ND	(10)		ND	(10)		ND	(11)		ND	(11)		ND	(11)
Dibromochloromethane		ND	(5.1)		ND	(5.1)		ND	(5.6)		ND	(5.6)		ND	(5.5)
Ethylbenzene		ND	(5.1)		ND	(5.1)		ND	(5.6)		ND	(5.6)		ND	(5.5)
Methylene chloride		ND	(5.1)		ND	(5.1)		ND	(5.6)		ND	(5.6)		ND	(5.5)
Styrene		ND	(5.1)		ND	(5.1)		ND	(5.6)		ND	(5.6)		ND	(5.5)
Tetrachloroethene		ND	(5.1)		ND	(5.1)		ND	(5.6)		ND	(5.6)		ND	(5.5)
Toluene		ND	(5.1)		ND	(5.1)		ND	(5.6)		ND	(5.6)		ND	(5.5)
Trichloroethene (TCE)		ND	(5.1)		ND	(5.1)		ND	(5.6)		ND	(5.6)		ND	(5.5)
Trichlorofluoromethane		ND	(5.1)		ND	(5.1)		ND	(5.6)		ND	(5.6)		ND	(5.5)
Vinyl acetate		ND	(10)		ND	(10)		ND	(11)		ND	(11)		ND	(11)
Vinyl chloride		ND	(10)		ND	(10)		ND	(11)		ND	(11)		ND	(11)
Xylenes (total)		ND	(5.1)		ND	(5.1)		ND	(5.6)		ND	(5.6)		ND	(5.5)
cis-1,3-Dichloropropene		ND	(5.1)		ND	(5.1)		ND	(5.6)		ND	(5.6)		ND	(5.5)
trans-1,3-Dichloropropene		ND	(5.1)		ND	(5.1)		ND	(5.6)		ND	(5.6)		ND	(5.5)

R = result, Q = qualifier, QL = quantitation limit

(ND= non detect)

TABLE 4-8
Deep Soil Boring Soil Samples Laboratory Analytical Results
Temperature Test Facility RCRA Facility Investigation
White Sands Missile Range, New Mexico

WCFS Sample No.:	WSTF-SB10-2061			WSTF-SB10-2062			WSTF-SB10-2071			WSTF-SB10-2073			WSTF-SB10-2078		
Quanterra Sample No.:	041172-0007-SA			041172-0008-SA			041172-0009-SA			041172-0010-SA			041172-0011-SA		
	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL
Moisture Content (%)															
Water	8.5			9.4			16			3.9			20		
VOLATILES (ug/kg)															
1,1,1-Trichloroethane		ND	(5.5)		ND	(5.5)		ND	(5.9)		ND	(5.2)		ND	(6.2)
1,1,2 Trichloro-1,2,2-trifluoroethane		ND	(11)		ND	(11)		ND	(12)		ND	(10)		ND	(12)
1,1,2,2-Tetrachloroethane		ND	(5.5)		ND	(5.5)		ND	(5.9)		ND	(5.2)		ND	(6.2)
1,1,2-Trichloroethane		ND	(5.5)		ND	(5.5)		ND	(5.9)		ND	(5.2)		ND	(6.2)
1,1-Dichloroethane		ND	(5.5)		ND	(5.5)		ND	(5.9)		ND	(5.2)		ND	(6.2)
1,1-Dichloroethene		ND	(5.5)		ND	(5.5)		ND	(5.9)		ND	(5.2)		ND	(6.2)
1,2-Dichloroethane		ND	(5.5)		ND	(5.5)		ND	(5.9)		ND	(5.2)		ND	(6.2)
1,2-Dichloroethene (total)		ND	(5.5)		ND	(5.5)		ND	(5.9)		ND	(5.2)		ND	(6.2)
1,2-Dichloropropane		ND	(5.5)		ND	(5.5)		ND	(5.9)		ND	(5.2)		ND	(6.2)
2-Butanone (MEK)		ND	(11)		ND	(11)		ND	(12)		ND	(10)		ND	(12)
2-Hexanone		ND	(11)		ND	(11)		ND	(12)		ND	(10)		ND	(12)
4-Methyl-2-pentanone (MIBK)		ND	(11)		ND	(11)		ND	(12)		ND	(10)		ND	(12)
Acetone	15				ND	(11)		ND	(12)		ND	(10)		ND	(12)
Benzene		ND	(5.5)		ND	(5.5)		ND	(5.9)		ND	(5.2)		ND	(6.2)
Bromodichloromethane		ND	(5.5)		ND	(5.5)		ND	(5.9)		ND	(5.2)		ND	(6.2)
Bromoform		ND	(5.5)		ND	(5.5)		ND	(5.9)		ND	(5.2)		ND	(6.2)
Bromomethane		ND	(11)		ND	(11)		ND	(12)		ND	(10)		ND	(12)
Carbon disulfide		ND	(5.5)		ND	(5.5)		ND	(5.9)		ND	(5.2)		ND	(6.2)
Carbon tetrachloride		ND	(5.5)		ND	(5.5)		ND	(5.9)		ND	(5.2)		ND	(6.2)
Chlorobenzene		ND	(5.5)		ND	(5.5)		ND	(5.9)		ND	(5.2)		ND	(6.2)
Chloroethane		ND	(11)		ND	(11)		ND	(12)		ND	(10)		ND	(12)
Chloroform		ND	(5.5)		ND	(5.5)		ND	(5.9)		ND	(5.2)		ND	(6.2)
Chloromethane		ND	(11)		ND	(11)		ND	(12)		ND	(10)		ND	(12)
Dibromochloromethane		ND	(5.5)		ND	(5.5)		ND	(5.9)		ND	(5.2)		ND	(6.2)
Ethylbenzene		ND	(5.5)		ND	(5.5)		ND	(5.9)		ND	(5.2)		ND	(6.2)
Methylene chloride		ND	(5.5)		ND	(5.5)		ND	(5.9)		ND	(5.2)	11		
Styrene		ND	(5.5)		ND	(5.5)		ND	(5.9)		ND	(5.2)		ND	(6.2)
Tetrachloroethene		ND	(5.5)		ND	(5.5)		ND	(5.9)		ND	(5.2)		ND	(6.2)
Toluene		ND	(5.5)		ND	(5.5)		ND	(5.9)		ND	(5.2)		ND	(6.2)
Trichloroethene (TCE)		ND	(5.5)		ND	(5.5)		ND	(5.9)		ND	(5.2)		ND	(6.2)
Trichlorofluoromethane		ND	(5.5)		ND	(5.5)		ND	(5.9)		ND	(5.2)		ND	(6.2)
Vinyl acetate		ND	(11)		ND	(11)		ND	(12)		ND	(10)		ND	(12)
Vinyl chloride		ND	(11)		ND	(11)		ND	(12)		ND	(10)		ND	(12)
Xylenes (total)		ND	(5.5)		ND	(5.5)		ND	(5.9)		ND	(5.2)		ND	(6.2)
cis-1,3-Dichloropropene		ND	(5.5)		ND	(5.5)		ND	(5.9)		ND	(5.2)		ND	(6.2)
trans-1,3-Dichloropropene		ND	(5.5)		ND	(5.5)		ND	(5.9)		ND	(5.2)		ND	(6.2)

R = result, Q = qualifier, QL = quantitation limit

(ND= non detect)

TABLE 4-8
Deep Soil Boring Soil Samples Laboratory Analytical Results
Temperature Test Facility RCRA Facility Investigation
White Sands Missile Range, New Mexico

WCFS Sample No.:	WSTF-SB11-2016			WSTF-SB11-2017			WSTF-SB11-2052			WSTF-SB11-2054			WSTF-SB11-2065			WSTF-SB11-2067			WSTF-SB11-2070			WSTF-SB11-2070-QC		
Quanterra Sample No.:	041208-0001-SA			041208-0002-SA			041208-0003-SA			041208-0004-SA			041208-0005-SA			041208-0006-SA			041208-0007-SA			041208-0008-SA		
	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL
Moisture Content (%)																								
Water	6.8			5.4			1.4			3.8			16			1.4			19			18		
VOLATILES (ug/kg)																								
1,1,1-Trichloroethane		ND	(5.4)		ND	(5.3)		ND	(5.1)		ND	(5.2)		ND	(6)		ND	(5.1)		ND	(6.2)		ND	(6.1)
1,1,2 Trichloro-1,2,2-trifluoroethane		ND	(11)		ND	(11)		ND	(10)		ND	(10)		ND	(12)		ND	(10)		ND	(12)		ND	(12)
1,1,2,2-Tetrachloroethane		ND	(5.4)		ND	(5.3)		ND	(5.1)		ND	(5.2)		ND	(6)		ND	(5.1)		ND	(6.2)		ND	(6.1)
1,1,2-Trichloroethane		ND	(5.4)		ND	(5.3)		ND	(5.1)		ND	(5.2)		ND	(6)		ND	(5.1)		ND	(6.2)		ND	(6.1)
1,1-Dichloroethane		ND	(5.4)		ND	(5.3)		ND	(5.1)		ND	(5.2)		ND	(6)		ND	(5.1)		ND	(6.2)		ND	(6.1)
1,1-Dichloroethene		ND	(5.4)		ND	(5.3)		ND	(5.1)		ND	(5.2)		ND	(6)		ND	(5.1)		ND	(6.2)		ND	(6.1)
1,2-Dichloroethane		ND	(5.4)		ND	(5.3)		ND	(5.1)		ND	(5.2)		ND	(6)		ND	(5.1)		ND	(6.2)		ND	(6.1)
1,2-Dichloroethene (total)		ND	(5.4)		ND	(5.3)		ND	(5.1)		ND	(5.2)		ND	(6)		ND	(5.1)		ND	(6.2)		ND	(6.1)
1,2-Dichloropropane		ND	(5.4)		ND	(5.3)		ND	(5.1)		ND	(5.2)		ND	(6)		ND	(5.1)		ND	(6.2)		ND	(6.1)
2-Butanone (MEK)		ND	(11)		ND	(11)		ND	(10)		ND	(10)		ND	(12)		ND	(10)		ND	(12)		ND	(12)
2-Hexanone		ND	(11)		ND	(11)		ND	(10)		ND	(10)		ND	(12)		ND	(10)		ND	(12)		ND	(12)
4-Methyl-2-pentanone (MIBK)		ND	(11)		ND	(11)		ND	(10)		ND	(10)		ND	(12)		ND	(10)		ND	(12)		ND	(12)
Acetone		ND	(11)		ND	(11)		ND	(10)		ND	(10)		ND	(12)		ND	(10)		ND	(12)		ND	(12)
Benzene		ND	(5.4)		ND	(5.3)		ND	(5.1)		ND	(5.2)		ND	(6)		ND	(5.1)		ND	(6.2)		ND	(6.1)
Bromodichloromethane		ND	(5.4)		ND	(5.3)		ND	(5.1)		ND	(5.2)		ND	(6)		ND	(5.1)		ND	(6.2)		ND	(6.1)
Bromoform		ND	(5.4)		ND	(5.3)		ND	(5.1)		ND	(5.2)		ND	(6)		ND	(5.1)		ND	(6.2)		ND	(6.1)
Bromomethane		ND	(11)		ND	(11)		ND	(10)		ND	(10)		ND	(12)		ND	(10)		ND	(12)		ND	(12)
Carbon disulfide		ND	(5.4)		ND	(5.3)		ND	(5.1)		ND	(5.2)		ND	(6)		ND	(5.1)		ND	(6.2)		ND	(6.1)
Carbon tetrachloride		ND	(5.4)		ND	(5.3)		ND	(5.1)		ND	(5.2)		ND	(6)		ND	(5.1)		ND	(6.2)		ND	(6.1)
Chlorobenzene		ND	(5.4)		ND	(5.3)		ND	(5.1)		ND	(5.2)		ND	(6)		ND	(5.1)		ND	(6.2)		ND	(6.1)
Chloroethane		ND	(11)		ND	(11)		ND	(10)		ND	(10)		ND	(12)		ND	(10)		ND	(12)		ND	(12)
Chloroform		ND	(5.4)		ND	(5.3)		ND	(5.1)		ND	(5.2)		ND	(6)		ND	(5.1)		ND	(6.2)		ND	(6.1)
Chloromethane		ND	(11)		ND	(11)		ND	(10)		ND	(10)		ND	(12)		ND	(10)		ND	(12)		ND	(12)
Dibromochloromethane		ND	(5.4)		ND	(5.3)		ND	(5.1)		ND	(5.2)		ND	(6)		ND	(5.1)		ND	(6.2)		ND	(6.1)
Ethylbenzene		ND	(5.4)		ND	(5.3)		ND	(5.1)		ND	(5.2)		ND	(6)		ND	(5.1)		ND	(6.2)		ND	(6.1)
Methylene chloride		ND	(5.4)		ND	(5.3)		ND	(5.1)		ND	(5.2)		ND	(6)		ND	(5.1)		ND	(6.2)		ND	(6.1)
Styrene		ND	(5.4)		ND	(5.3)		ND	(5.1)		ND	(5.2)		ND	(6)		ND	(5.1)		ND	(6.2)		ND	(6.1)
Tetrachloroethene		ND	(5.4)		ND	(5.3)		ND	(5.1)		ND	(5.2)		ND	(6)		ND	(5.1)		ND	(6.2)		ND	(6.1)
Toluene		ND	(5.4)		ND	(5.3)		ND	(5.1)		ND	(5.2)		ND	(6)		ND	(5.1)		ND	(6.2)		ND	(6.1)
Trichloroethene (TCE)		ND	(5.4)		ND	(5.3)		ND	(5.1)		ND	(5.2)		ND	(6)		ND	(5.1)		ND	(6.2)		ND	(6.1)
Trichlorofluoromethane		ND	(5.4)		ND	(5.3)		ND	(5.1)		ND	(5.2)		ND	(6)		ND	(5.1)		ND	(6.2)		ND	(6.1)
Vinyl acetate		ND	(11)		ND	(11)		ND	(10)		ND	(10)		ND	(12)		ND	(10)		ND	(12)		ND	(12)
Vinyl chloride		ND	(11)		ND	(11)		ND	(10)		ND	(10)		ND	(12)		ND	(10)		ND	(12)		ND	(12)
Xylenes (total)		ND	(5.4)		ND	(5.3)		ND	(5.1)		ND	(5.2)		ND	(6)		ND	(5.1)		ND	(6.2)		ND	(6.1)
cis-1,3-Dichloropropene		ND	(5.4)		ND	(5.3)		ND	(5.1)		ND	(5.2)		ND	(6)		ND	(5.1)		ND	(6.2)		ND	(6.1)
trans-1,3-Dichloropropene		ND	(5.4)		ND	(5.3)		ND	(5.1)		ND	(5.2)		ND	(6)		ND	(5.1)		ND	(6.2)		ND	(6.1)

R = result, Q = qualifier, QL = quantitation limit

(ND= non detect)

TABLE 4-8
Deep Soil Boring Soil Samples Laboratory Analytical Results
Temperature Test Facility RCRA Facility Investigation
White Sands Missile Range, New Mexico

WCFS Sample No.:	WSTF-SB12-2017			WSTF-SB12-2022			WSTF-SB12-2058			WSTF-SB12-2059			WSTF-SB12-2060			WSTF-SB12-2061		
Quanterra Sample No.:	041256-0003-SA			041256-0004-SA			041256-0005-SA			041256-0006-RA			041256-0008-RA			041256-0007-SA		
	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL
Moisture Content (%)																		
Water	2.8			16			2.8			14			10			11		
VOLATILES (ug/kg)																		
1,1,1-Trichloroethane		ND	(5.1)		ND	(5.9)		ND	(5.1)		ND	(5.8)		ND	(5.6)		ND	(5.6)
1,1,2 Trichloro-1,2,2-trifluoroethane		ND	(10)		ND	(12)		ND	(10)		ND	(12)		ND	(11)		ND	(11)
1,1,2,2-Tetrachloroethane		ND	(5.1)		ND	(5.9)		ND	(5.1)		ND	(5.8)		ND	(5.6)		ND	(5.6)
1,1,2-Trichloroethane		ND	(5.1)		ND	(5.9)		ND	(5.1)		ND	(5.8)		ND	(5.6)		ND	(5.6)
1,1-Dichloroethane		ND	(5.1)		ND	(5.9)		ND	(5.1)		ND	(5.8)		ND	(5.6)		ND	(5.6)
1,1-Dichloroethene		ND	(5.1)		ND	(5.9)		ND	(5.1)		ND	(5.8)		ND	(5.6)		ND	(5.6)
1,2-Dichloroethane		ND	(5.1)		ND	(5.9)		ND	(5.1)		ND	(5.8)		ND	(5.6)		ND	(5.6)
1,2-Dichloroethene (total)		ND	(5.1)		ND	(5.9)		ND	(5.1)		ND	(5.8)		ND	(5.6)		ND	(5.6)
1,2-Dichloropropane		ND	(5.1)		ND	(5.9)		ND	(5.1)		ND	(5.8)		ND	(5.6)		ND	(5.6)
2-Butanone (MEK)		ND	(10)		ND	(12)		ND	(10)		ND	(12)		ND	(11)		ND	(11)
2-Hexanone		ND	(10)		ND	(12)		ND	(10)		ND	(12)		ND	(11)		ND	(11)
4-Methyl-2-pentanone (MIBK)		ND	(10)		ND	(12)		ND	(10)		ND	(12)		ND	(11)		ND	(11)
Acetone		ND	(10)		ND	(12)		ND	(10)		ND	(12)	14			12		
Benzene		ND	(5.1)		ND	(5.9)		ND	(5.1)		ND	(5.8)		ND	(5.6)		ND	(5.6)
Bromodichloromethane		ND	(5.1)		ND	(5.9)		ND	(5.1)		ND	(5.8)		ND	(5.6)		ND	(5.6)
Bromoform		ND	(5.1)		ND	(5.9)		ND	(5.1)		ND	(5.8)		ND	(5.6)		ND	(5.6)
Bromomethane		ND	(10)		ND	(12)		ND	(10)		ND	(12)		ND	(11)		ND	(11)
Carbon disulfide		ND	(5.1)		ND	(5.9)		ND	(5.1)		ND	(5.8)		ND	(5.6)		ND	(5.6)
Carbon tetrachloride		ND	(5.1)		ND	(5.9)		ND	(5.1)		ND	(5.8)		ND	(5.6)		ND	(5.6)
Chlorobenzene		ND	(5.1)		ND	(5.9)		ND	(5.1)		ND	(5.8)		ND	(5.6)		ND	(5.6)
Chloroethane		ND	(10)		ND	(12)		ND	(10)		ND	(12)		ND	(11)		ND	(11)
Chloroform		ND	(5.1)		ND	(5.9)		ND	(5.1)		ND	(5.8)		ND	(5.6)		ND	(5.6)
Chloromethane		ND	(10)		ND	(12)		ND	(10)		ND	(12)		ND	(11)		ND	(11)
Dibromochloromethane		ND	(5.1)		ND	(5.9)		ND	(5.1)		ND	(5.8)		ND	(5.6)		ND	(5.6)
Ethylbenzene		ND	(5.1)		ND	(5.9)		ND	(5.1)		ND	(5.8)		ND	(5.6)		ND	(5.6)
Methylene chloride		ND	(5.1)		ND	(5.9)		ND	(5.1)		ND	(5.8)		ND	(5.6)		ND	(5.6)
Styrene		ND	(5.1)		ND	(5.9)		ND	(5.1)		ND	(5.8)		ND	(5.6)		ND	(5.6)
Tetrachloroethene		ND	(5.1)		ND	(5.9)		ND	(5.1)		ND	(5.8)		ND	(5.6)		ND	(5.6)
Toluene		ND	(5.1)		ND	(5.9)		ND	(5.1)		ND	(5.8)		ND	(5.6)		ND	(5.6)
Trichloroethene (TCE)		ND	(5.1)		ND	(5.9)		ND	(5.1)		ND	(5.8)		ND	(5.6)		ND	(5.6)
Trichlorofluoromethane		ND	(5.1)		ND	(5.9)		ND	(5.1)		ND	(5.8)		ND	(5.6)		ND	(5.6)
Vinyl acetate		ND	(10)		ND	(12)		ND	(10)		ND	(12)		ND	(11)		ND	(11)
Vinyl chloride		ND	(10)		ND	(12)		ND	(10)		ND	(12)		ND	(11)		ND	(11)
Xylenes (total)		ND	(5.1)		ND	(5.9)		ND	(5.1)		ND	(5.8)		ND	(5.6)		ND	(5.6)
cis-1,3-Dichloropropene		ND	(5.1)		ND	(5.9)		ND	(5.1)		ND	(5.8)		ND	(5.6)		ND	(5.6)
trans-1,3-Dichloropropene		ND	(5.1)		ND	(5.9)		ND	(5.1)		ND	(5.8)		ND	(5.6)		ND	(5.6)

R = result, Q = qualifier, QL = quantitation limit

(ND= non detect)

TABLE 4-8
Deep Soil Boring Soil Samples Laboratory Analytical Results
Temperature Test Facility RCRA Facility Investigation
White Sands Missile Range, New Mexico

WCFS Sample No.:	WSTF-SB12-2072			WSTF-SB12-2081			WSTF-SB12-2082			WSTF-SB12-2095			WSTF-SB12-2103			WSTF-SB12-2113		
Quanterra Sample No.:	041256-0009-SA			041256-0010-SA			041256-0011-SA			041256-0012-SA			041256-0013-SA			041256-0014-SA		
	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL
Moisture Content (%)																		
Water	18			2.8			23			16			8.9			17		
VOLATILES (ug/kg)																		
1,1,1-Trichloroethane		ND	(6.1)		ND	(5.1)		ND	(6.5)		ND	(60)		ND	(5.5)		ND	(6)
1,1,2 Trichloro-1,2,2-trifluoroethane		ND	(12)		ND	(10)		ND	(13)		ND	(120)		ND	(11)		ND	(12)
1,1,2,2-Tetrachloroethane		ND	(6.1)		ND	(5.1)		ND	(6.5)		ND	(60)		ND	(5.5)		ND	(6)
1,1,2-Trichloroethane		ND	(6.1)		ND	(5.1)		ND	(6.5)		ND	(60)		ND	(5.5)		ND	(6)
1,1-Dichloroethane		ND	(6.1)		ND	(5.1)		ND	(6.5)		ND	(60)		ND	(5.5)		ND	(6)
1,1-Dichloroethene		ND	(6.1)		ND	(5.1)		ND	(6.5)		ND	(60)		ND	(5.5)		ND	(6)
1,2-Dichloroethane		ND	(6.1)		ND	(5.1)		ND	(6.5)		ND	(60)		ND	(5.5)		ND	(6)
1,2-Dichloroethene (total)		ND	(6.1)		ND	(5.1)		ND	(6.5)		ND	(60)		ND	(5.5)		ND	(6)
1,2-Dichloropropane		ND	(6.1)		ND	(5.1)		ND	(6.5)		ND	(60)		ND	(5.5)		ND	(6)
2-Butanone (MEK)		ND	(12)		ND	(10)		ND	(13)		ND	(120)		ND	(11)		ND	(12)
2-Hexanone		ND	(12)		ND	(10)		ND	(13)		ND	(120)		ND	(11)		ND	(12)
4-Methyl-2-pentanone (MIBK)		ND	(12)		ND	(10)		ND	(13)		ND	(120)		ND	(11)		ND	(12)
Acetone	46				ND	(10)	110				ND	(120)		ND	(11)		ND	(12)
Benzene		ND	(6.1)		ND	(5.1)		ND	(6.5)		ND	(60)		ND	(5.5)		ND	(6)
Bromodichloromethane		ND	(6.1)		ND	(5.1)		ND	(6.5)		ND	(60)		ND	(5.5)		ND	(6)
Bromoform		ND	(6.1)		ND	(5.1)		ND	(6.5)		ND	(60)		ND	(5.5)		ND	(6)
Bromomethane		ND	(12)		ND	(10)		ND	(13)		ND	(120)		ND	(11)		ND	(12)
Carbon disulfide		ND	(6.1)		ND	(5.1)		ND	(6.5)		ND	(60)		ND	(5.5)		ND	(6)
Carbon tetrachloride		ND	(6.1)		ND	(5.1)		ND	(6.5)		ND	(60)		ND	(5.5)		ND	(6)
Chlorobenzene		ND	(6.1)		ND	(5.1)		ND	(6.5)		ND	(60)		ND	(5.5)		ND	(6)
Chloroethane		ND	(12)		ND	(10)		ND	(13)		ND	(120)		ND	(11)		ND	(12)
Chloroform		ND	(6.1)		ND	(5.1)		ND	(6.5)		ND	(60)		ND	(5.5)		ND	(6)
Chloromethane		ND	(12)		ND	(10)		ND	(13)		ND	(120)		ND	(11)		ND	(12)
Dibromochloromethane		ND	(6.1)		ND	(5.1)		ND	(6.5)		ND	(60)		ND	(5.5)		ND	(6)
Ethylbenzene		ND	(6.1)		ND	(5.1)		ND	(6.5)		ND	(60)		ND	(5.5)		ND	(6)
Methylene chloride	59				ND	(5.1)	160			1400				ND	(5.5)		ND	(6)
Styrene		ND	(6.1)		ND	(5.1)		ND	(6.5)		ND	(60)		ND	(5.5)		ND	(6)
Tetrachloroethene		ND	(6.1)		ND	(5.1)		ND	(6.5)		ND	(60)		ND	(5.5)		ND	(6)
Toluene		ND	(6.1)		ND	(5.1)		ND	(6.5)		ND	(60)		ND	(5.5)		ND	(6)
Trichloroethene (TCE)		ND	(6.1)		ND	(5.1)		ND	(6.5)		ND	(60)		ND	(5.5)		ND	(6)
Trichlorofluoromethane		ND	(6.1)		ND	(5.1)		ND	(6.5)		ND	(60)		ND	(5.5)		ND	(6)
Vinyl acetate		ND	(12)		ND	(10)		ND	(13)		ND	(120)		ND	(11)		ND	(12)
Vinyl chloride		ND	(12)		ND	(10)		ND	(13)		ND	(120)		ND	(11)		ND	(12)
Xylenes (total)		ND	(6.1)		ND	(5.1)		ND	(6.5)		ND	(60)		ND	(5.5)		ND	(6)
cis-1,3-Dichloropropene		ND	(6.1)		ND	(5.1)		ND	(6.5)		ND	(60)		ND	(5.5)		ND	(6)
trans-1,3-Dichloropropene		ND	(6.1)		ND	(5.1)		ND	(6.5)		ND	(60)		ND	(5.5)		ND	(6)

R = result, Q = qualifier, QL = quantitation limit

(ND= non detect)

TABLE 4-8
Deep Soil Boring Soil Samples Laboratory Analytical Results
Temperature Test Facility RCRA Facility Investigation
White Sands Missile Range, New Mexico

WCFS Sample No.:	WSTF-SB12-2123			WSTF-SB12-2133			WSTF-SB12-2142			WSTF-SB12-2142-QC			WSTF-SB12-2152		
Quanterra Sample No.:	041256-0015-SA			041256-0016-SA			041256-0017-SA			041256-0018-SA			041256-0019-SA		
	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL
Moisture Content (%)															
Water	15			9.5			20			4.2			22		
VOLATILES (ug/kg)															
1,1,1-Trichloroethane		ND	(5.9)		ND	(5.5)		ND	(6.2)		ND	(5.2)		ND	(6.4)
1,1,2 Trichloro-1,2,2-trifluoroethane		ND	(12)		ND	(11)		ND	(12)		ND	(10)		ND	(13)
1,1,2,2-Tetrachloroethane		ND	(5.9)		ND	(5.5)		ND	(6.2)		ND	(5.2)		ND	(6.4)
1,1,2-Trichloroethane		ND	(5.9)		ND	(5.5)		ND	(6.2)		ND	(5.2)		ND	(6.4)
1,1-Dichloroethane		ND	(5.9)		ND	(5.5)		ND	(6.2)		ND	(5.2)		ND	(6.4)
1,1-Dichloroethene		ND	(5.9)		ND	(5.5)		ND	(6.2)		ND	(5.2)		ND	(6.4)
1,2-Dichloroethane		ND	(5.9)		ND	(5.5)		ND	(6.2)		ND	(5.2)		ND	(6.4)
1,2-Dichloroethene (total)		ND	(5.9)		ND	(5.5)		ND	(6.2)		ND	(5.2)		ND	(6.4)
1,2-Dichloropropane		ND	(5.9)		ND	(5.5)		ND	(6.2)		ND	(5.2)		ND	(6.4)
2-Butanone (MEK)		ND	(12)		ND	(11)		ND	(12)		ND	(10)		ND	(13)
2-Hexanone		ND	(12)		ND	(11)		ND	(12)		ND	(10)		ND	(13)
4-Methyl-2-pentanone (MIBK)		ND	(12)		ND	(11)		ND	(12)		ND	(10)		ND	(13)
Acetone	12			12				ND	(12)		ND	(10)		ND	(13)
Benzene		ND	(5.9)		ND	(5.5)		ND	(6.2)		ND	(5.2)		ND	(6.4)
Bromodichloromethane		ND	(5.9)		ND	(5.5)		ND	(6.2)		ND	(5.2)		ND	(6.4)
Bromoform		ND	(5.9)		ND	(5.5)		ND	(6.2)		ND	(5.2)		ND	(6.4)
Bromomethane		ND	(12)		ND	(11)		ND	(12)		ND	(10)		ND	(13)
Carbon disulfide		ND	(5.9)		ND	(5.5)		ND	(6.2)		ND	(5.2)		ND	(6.4)
Carbon tetrachloride		ND	(5.9)		ND	(5.5)		ND	(6.2)		ND	(5.2)		ND	(6.4)
Chlorobenzene		ND	(5.9)		ND	(5.5)		ND	(6.2)		ND	(5.2)		ND	(6.4)
Chloroethane		ND	(12)		ND	(11)		ND	(12)		ND	(10)		ND	(13)
Chloroform		ND	(5.9)		ND	(5.5)		ND	(6.2)		ND	(5.2)		ND	(6.4)
Chloromethane		ND	(12)		ND	(11)		ND	(12)		ND	(10)		ND	(13)
Dibromochloromethane		ND	(5.9)		ND	(5.5)		ND	(6.2)		ND	(5.2)		ND	(6.4)
Ethylbenzene		ND	(5.9)		ND	(5.5)		ND	(6.2)		ND	(5.2)		ND	(6.4)
Methylene chloride		ND	(5.9)		ND	(5.5)		ND	(6.2)		ND	(5.2)		ND	(6.4)
Styrene		ND	(5.9)		ND	(5.5)		ND	(6.2)		ND	(5.2)		ND	(6.4)
Tetrachloroethene		ND	(5.9)		ND	(5.5)		ND	(6.2)		ND	(5.2)		ND	(6.4)
Toluene		ND	(5.9)		ND	(5.5)		ND	(6.2)		ND	(5.2)		ND	(6.4)
Trichloroethene (TCE)		ND	(5.9)		ND	(5.5)		ND	(6.2)		ND	(5.2)		ND	(6.4)
Trichlorofluoromethane		ND	(5.9)		ND	(5.5)		ND	(6.2)		ND	(5.2)		ND	(6.4)
Vinyl acetate		ND	(12)		ND	(11)		ND	(12)		ND	(10)		ND	(13)
Vinyl chloride		ND	(12)		ND	(11)		ND	(12)		ND	(10)		ND	(13)
Xylenes (total)		ND	(5.9)		ND	(5.5)		ND	(6.2)		ND	(5.2)		ND	(6.4)
cis-1,3-Dichloropropene		ND	(5.9)		ND	(5.5)		ND	(6.2)		ND	(5.2)		ND	(6.4)
trans-1,3-Dichloropropene		ND	(5.9)		ND	(5.5)		ND	(6.2)		ND	(5.2)		ND	(6.4)

R = result, Q = qualifier, QL = quantitation limit

(ND= non detect)

TABLE 4-9
STATISTICAL REVIEW OF SOIL SAMPLE ANALYTICAL RESULTS FOR DEEP SOIL BORINGS
TEMPERATURE TEST FACILITY
RCRA FACILITY INVESTIGATION
WHITE SANDS MISSILE RANGE, NEW MEXICO

Compound (ug/kg)	Number of samples	Number of Detections	CONCENTRATION			Maximum Concentration
			Average	Median	Maximum	Sample ID
1,1,1-Trichloroethane	111					
Freon 113 (1,1,2 Trichloro-1,2,2-trifluoroethane)	111					
1,1,2,2-Tetrachloroethane	111					
1,1,2-Trichloroethane	111					
1,1-Dichloroethane	111					
1,1-Dichloroethene	111					
1,2-Dichloroethane	111					
1,2-Dichloroethene (total)	111					
1,2-Dichloropropane	111					
2-Butanone (MEK)	111					
2-Hexanone	111					
4-Methyl-2-pentanone (MIBK)	111					
Acetone	111	11	36	19	110	WSTF-SB12-2082
Benzene	111					
Bromodichloromethane	111					
Bromoform	111					
Bromomethane	111					
Carbon disulfide	111					
Carbon tetrachloride	111					
Chlorobenzene	111					
Chloroethane	111					
Chloroform	111					
Chloromethane	111					
Dibromochloromethane	111					
Ethylbenzene	111					
Methylene chloride	111	6	279	50	1400	WSTF-SB12-2095
Styrene	111					
Tetrachloroethene	111					
Toluene	111	1	7	7	7	WSTF-SB08-2074
Trichloroethene (TCE)	111					
Freon 11 (Trichlorofluoromethane)	111					
Vinyl acetate	111					
Vinyl chloride	111					
Xylenes (total)	111					
cis-1,3-Dichloropropene	111					
trans-1,3-Dichloropropene	111					

Table 4-10
Groundwater Sampling Laboratory Analytical Results
Temperature Test Facility RCRA Facility Investigation
White Sands Missile Range, New Mexico

WCFS Sample No.:	WSTF-00E1-1000			WSTF-00E1-1000-QC			WSTF-00E2-1000			WSTF-00E3-1000			WSTF-00E4-1000		
Quanterra Sample No.:	041209-0014-SA			041209-0015-SA			041157-0011-SA			041141-0014-SA			041157-0012-SA		
	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL	R	Q	QL
VOLATILES (ug/L)															
1,1,1-Trichloroethane		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
1,1,2 Trichloro-1,2,2-trifluoroethane		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)
1,1,2,2-Tetrachloroethane		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
1,1,2-Trichloroethane		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
1,1-Dichloroethane		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
1,1-Dichloroethene		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
1,2-Dichloroethane		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
1,2-Dichloroethene (total)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
1,2-Dichloropropane		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
2-Butanone (MEK)		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)
2-Hexanone		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)
4-Methyl-2-pentanone (MIBK)		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)
Acetone		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)
Benzene		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Bromodichloromethane		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Bromoform		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Bromomethane		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)
Carbon disulfide		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Carbon tetrachloride		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Chlorobenzene		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Chloroethane		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)
Chloroform		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Chloromethane		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)
Dibromochloromethane		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Ethylbenzene		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Methylene chloride		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Styrene		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Tetrachloroethene		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Toluene		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Trichloroethene (TCE)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Trichlorofluoromethane		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
Vinyl acetate		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)
Vinyl chloride		ND	(10)		ND	(10)		ND	(10)		ND	(10)		ND	(10)
Xylenes (total)		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
cis-1,3-Dichloropropene		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)
trans-1,3-Dichloropropene		ND	(5)		ND	(5)		ND	(5)		ND	(5)		ND	(5)

R = result, Q = qualifier, QL = quantitation limit

(ND= non detect)

TABLE 5-1

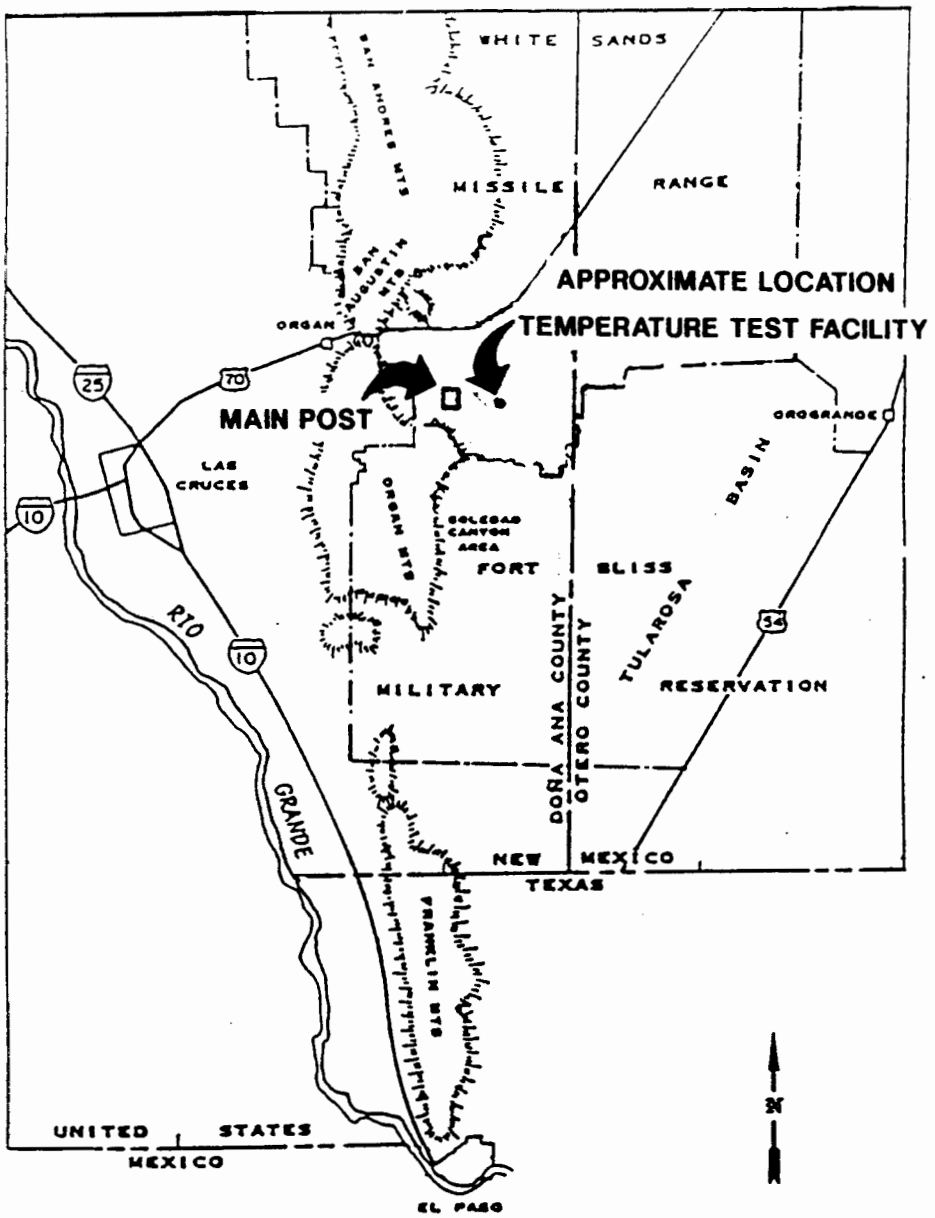
RELEVANT PHYSICAL AND CHEMICAL PROPERTIES OF THE COMPOUNDS DETECTED

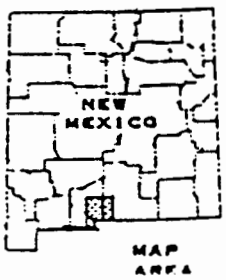
Contaminant	Mol. Formula	Mol. Wt.	Henry's Law Constant Atm-m^3/mol	Water Solubility at 25°C (mg/l)	Vapor Pressure at 25°C (mm Hg)	Log K_{ow}	K_{oc}
Methylene Chloride	CH_2Cl_2	84.94	2.68×10^{-3}	13,000	434.9	1.25	8.8
1,1-Dichloroethane	$C_2H_4Cl_2$	98.96	5.87×10^{-3}	5,060	227	1.79	30
1,1-Dichloroethene	$C_2H_2Cl_2$	96.94	2.29×10^{-2}	210	591	1.84	65
Chloroform	$CHCl_3$	119.39	4.35×10^{-3}	7,950	246	1.97	31
Freon-11	CCl_3F	137.38	9.7×10^{-2}	1,080	802.8	2.53	159
Freon-113	$C_2Cl_3F_3$	187.38	5.26×10^{-1}	170	362.5	3.16	NA
trans-1,2-Dichloroethene	$C_2H_2Cl_2$	96.94	6.72×10^{-3}	6,300	340	2.06	59
Tetrachloroethene	C_2Cl_4	165.82	1.49×10^{-2}	150.3	18.49	3.40	364
1,1,1-Trichloroethane	$C_2H_3Cl_3$	133.42	8×10^{-3}	1,495	123.7	2.49	152
Trichloroethene	C_2HCl_3	131.40	1.03×10^{-2}	1,100	69	2.42	126
Acetone	C_3H_6O	58.09	3.67×10^{-5}	Miscible	231	-0.24	2.2
Toluene	C_7H_8	92.13	5.94×10^{-3}	534.8	28.4	2.73	300

	Half Life (days)			
Contaminant	Soil	Air	Surface Water	Groundwater
Methylene Chloride	7 - 28	53.2	3-5.6	14 - 56
1,1-Dichloroethane	32 154	45	1-5	64 - 154
1,1-Dichloroethene	<1 - 4	2	1-6	56 - 132
Chloroform	26 - 260	80	0.3-30	56 - 5 years
Freon-11	180 - 365	52-207 years (Troposphere)	4.3 hours	1 year - 2 years
Freon-113	180 - 365	20 years	4 hours	1 year - 2 years
trans-1,2-Dichloroethene	28 - 180	2.1	1-6	56 - 8 years
Tetrachloroethene	180 - 365	47	1-30	1 year - 2 years
1,1,1-Trichloroethane	140 - 243	2.2 years - 4.8 years	0.14-7	140 - 1.5 years
Trichloroethene	180 - 365	3.7	1-90	330 - 4.5 years
Acetone	1 - 7	22	20 hours	2 - 14
Toluene	4 - 22	1.3	0.17	7 - 28

Sources: Handbook of Environmental Fate and Exposure Data for Organic Chemicals, Lewis Publishers, 1991.
Handbook of Environmental Degradation Rates, Lewis Publishers, 1991.
Superfund Public Health Evaluation Manual, EPA/540/1-86/060, October 1986.

FIGURES

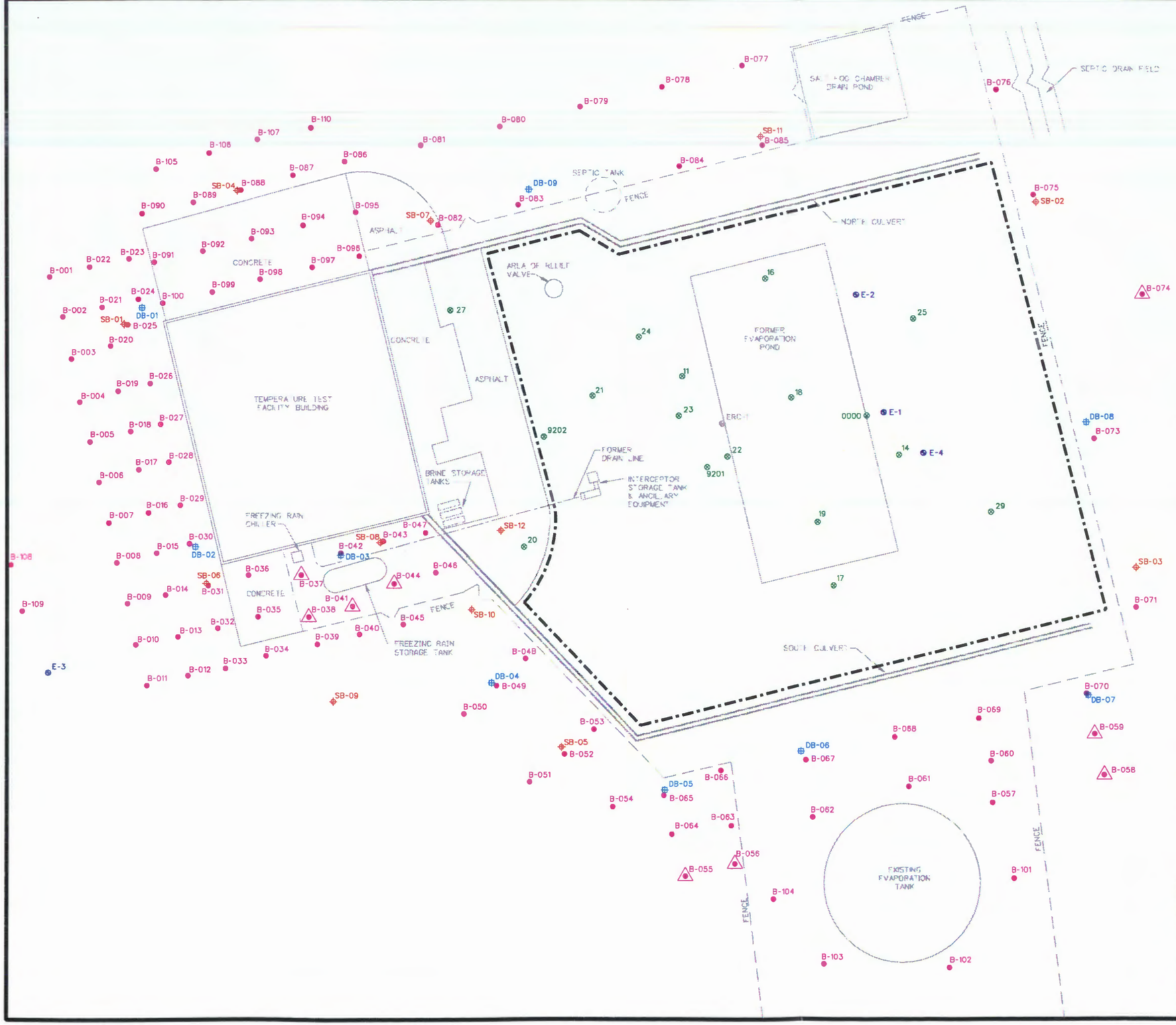




Woodward-Clyde Overland Park, Kansas		U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS TULSA, OKLAHOMA
Designed by: DLL	U.S. Army Corps of Engineers	RCRA FACILITY INVESTIGATION TEMPERATURE TEST FACILITY WHITE SANDS MISSILE RANGE, NEW MEXICO
Drawn by: DLL		SITE LOCATION
Checked by:	Scale: NONE	Sheet number:
Submitted by:	Date: JULY, 1994	
	Dwg. No.: 1-1	

ACAD FILE:

R.T. SC: 1=1



LEGEND:

- APPROXIMATE LOCATION OF EXISTING GROUNDWATER MONITORING WELLS
- APPROXIMATE LOCATION OF EXISTING SOIL GAS MONITORING WELLS
- DEEP SOIL BORING LOCATION
- SHALLOW SOIL GAS SURVEY LOCATIONS NOT PERFORMED DUE TO APPLICATION OF THE ALGORITHM OR SUBSURFACE/ SURFACE OBSTRUCTION
- SHALLOW SOIL GAS SURVEY LOCATIONS
- DEEP SOIL GAS SURVEY LOCATIONS
- AREA OF RCRA CAP

N

60 0 60 120

SCALE FEET

Revisions			
Symbol	Descriptions	Date	Apprv'd

Woodward–Clyde Federal Services

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
TULSA, OKLAHOMA

Designed by: D.J.K.
Drawn by: P.C.S.
Checked by: D.C.C.
Submitted by:

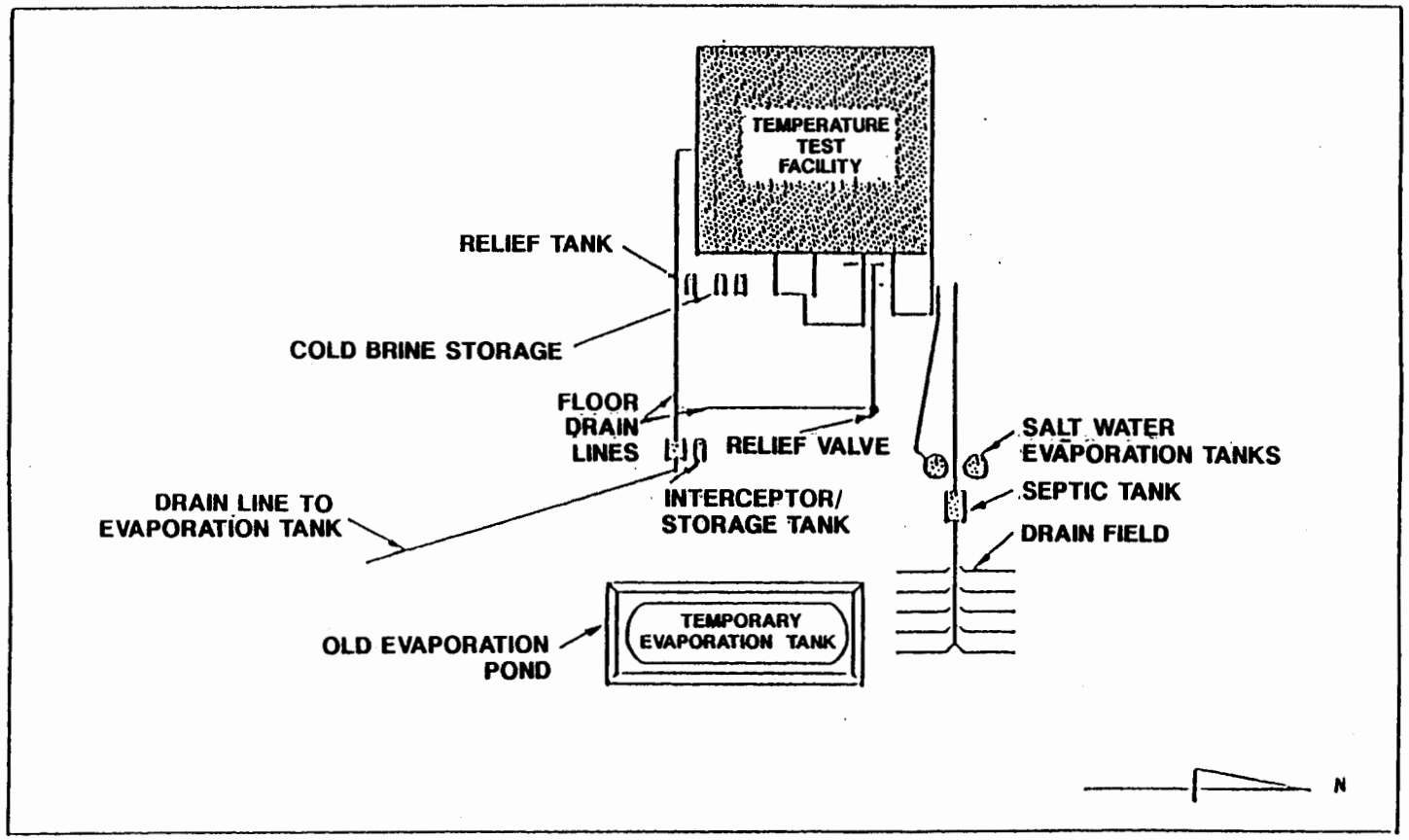
U.S. Army Corps of Engineers

TEMPERATURE TEST FACILITY
WHITE SANDS MISSILE RANGE
NEW MEXICO

1995 RFI
SAMPLING LOCATIONS

Scale: 1 IN = 60 FEET
Date: MARCH, 1996
Fig. No.: 1-2
Sheet number: 1-1

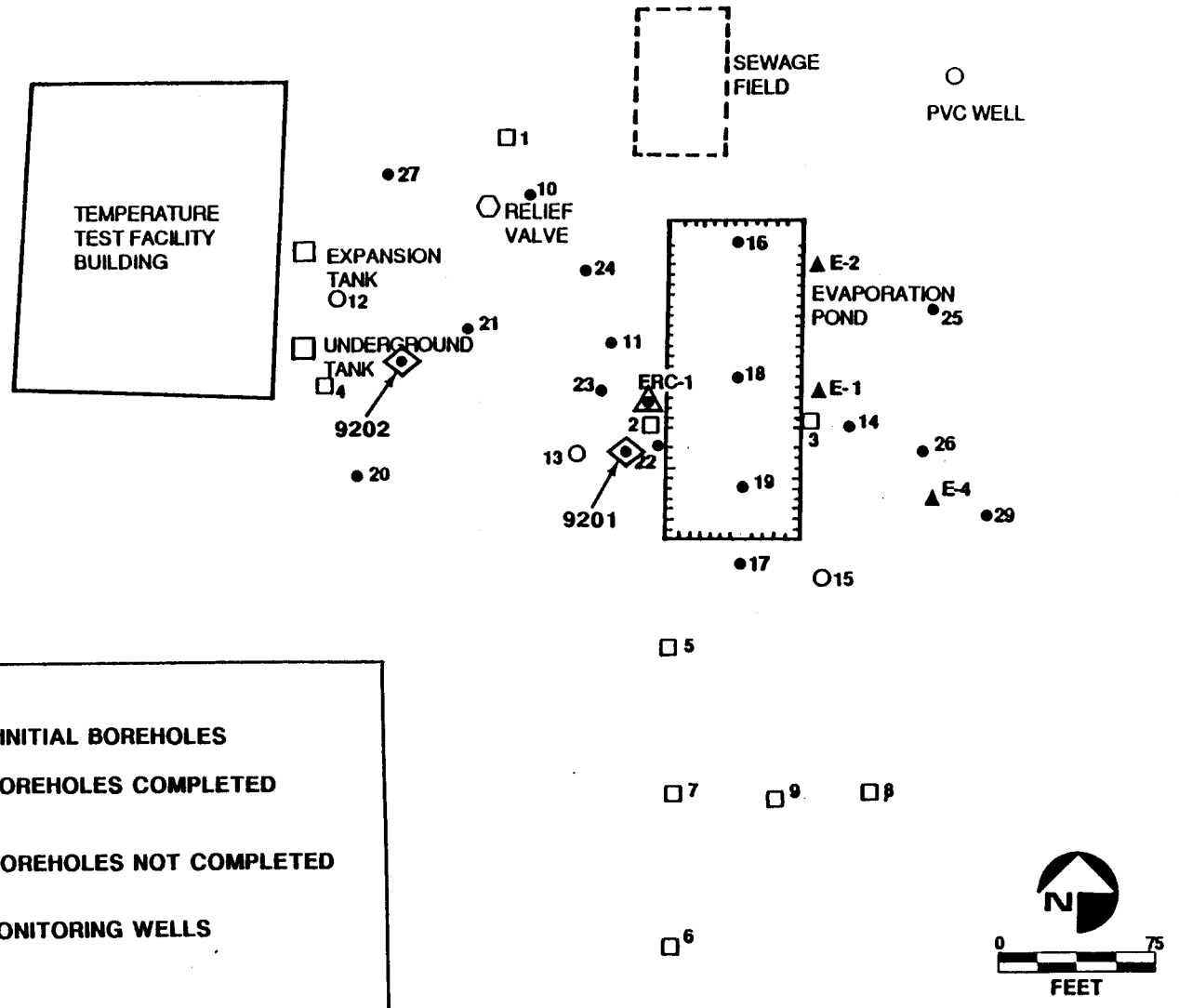
MCS FILE: OKLA-18 REF. FILE: OKLA-014



NOT TO SCALE

SOURCE: WSMR, 1992b (MODIFIED)

TITLE	
FORMER LOCATION OF AUXILLARY UNITS	
Woodward-Clyde Federal Services	PROJ NO F93102
	FIG. 1-3



LEGEND

- □ SOUTHWESTERN INITIAL BOREHOLES
- ● GCL PHASE 1-2 BOREHOLES COMPLETED AS AIR WELLS
- ○ GCL PHASE 1-2 BOREHOLES NOT COMPLETED AS AIR WELLS
- ▲ GROUNDWATER MONITORING WELLS
- ERC BOREHOLES
- CORTEZ III BOREHOLES

SOURCE: GCL, 1985 (MODIFIED)

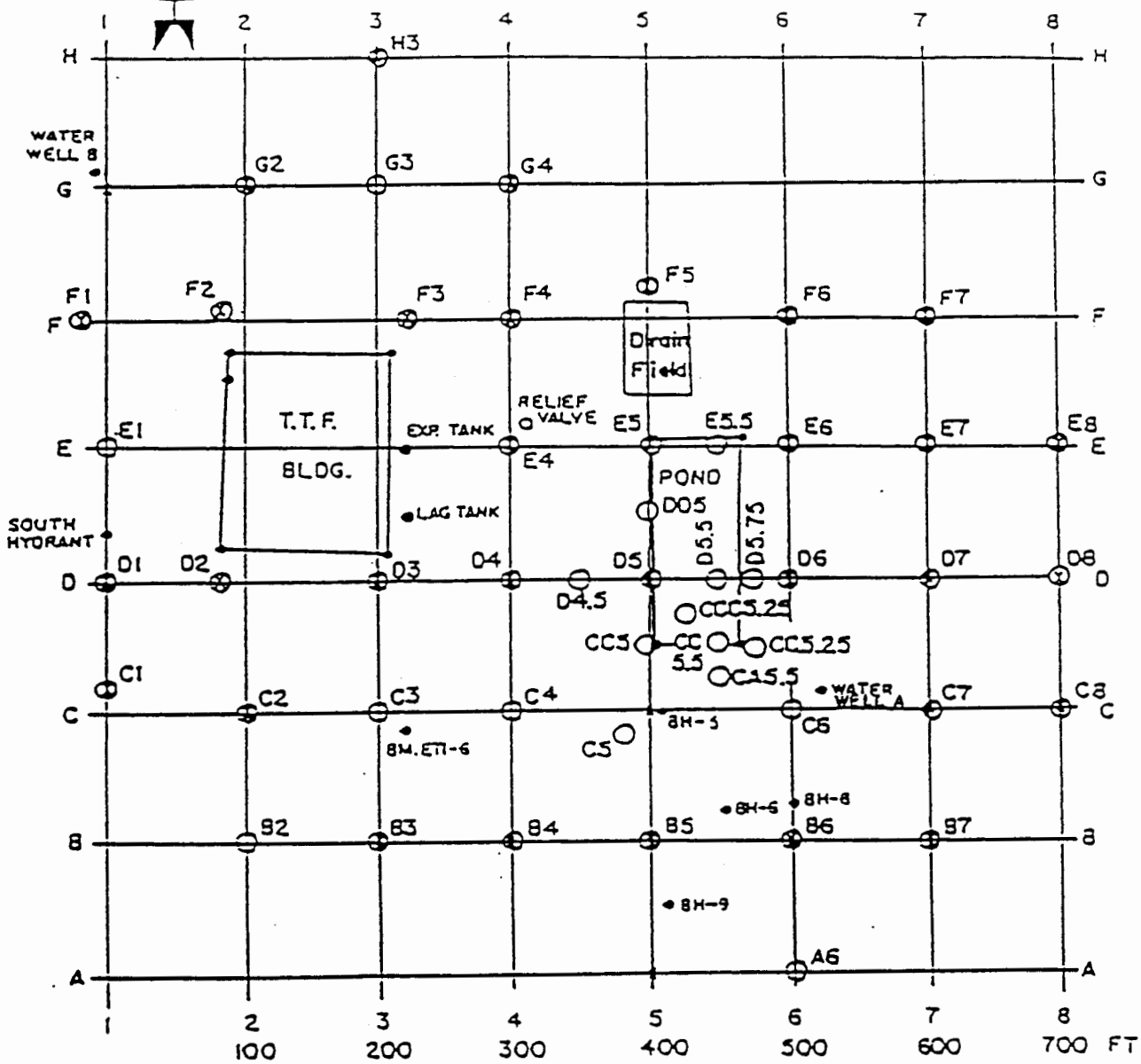
TITLE LOCATION OF ALL BOREHOLES AND SOIL GAS WELLS AT T.T.F. INSTALLED PRIOR TO THE 1995 RFI

Woodward-Clyde Federal Services

PROJ NO F93102

FIG. 1-4

SAMPLE LOCATIONS



LEGEND

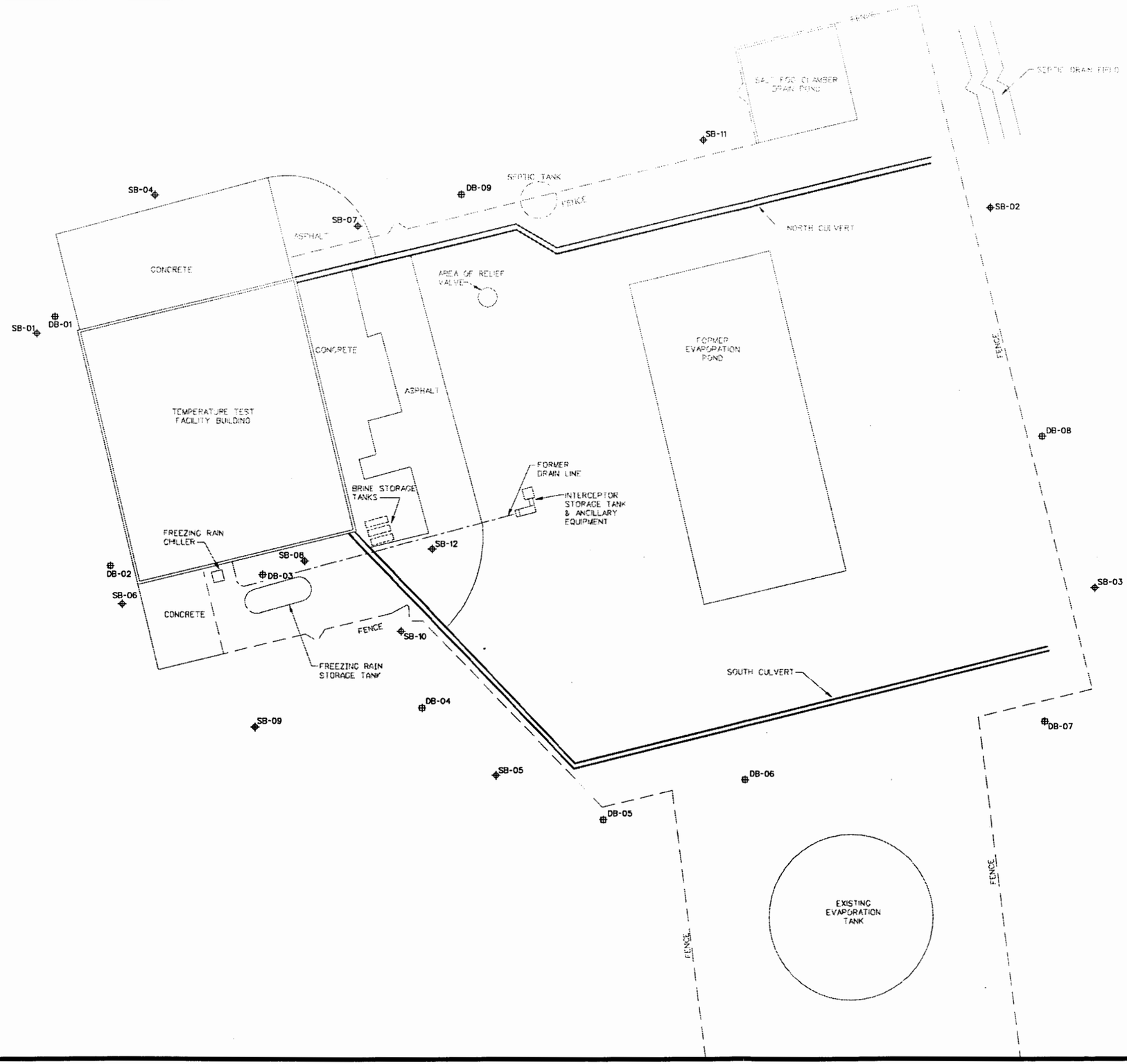
x SURVEYED POINT (GRID)

○ 84 SAMPLE POINT

0 100' 200'
SCALE

SOURCE: GCL, 1987

TITLE	LOCATION OF SHALLOW SOIL GAS SURVEYS PERFORMED PRIOR TO THE 1995 RFI
Woodward-Clyde Federal Services	PROJ NO F93102
	FIG. 1-5



LEGEND:

⊕ DEEP SOIL BORING LOCATION

DEEP SOIL GAS SURVEY LOCATION

N

60 0 60 120

SCALE FEET

Revisions			
Symbol	Descriptions	Date	Apprv'd

Woodward-Clyde Federal Services

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
TULSA, OKLAHOMA

Designed by: D.J.K.

Drawn by: P.C.S.

Checked by: D.C.C.

Submitted by:

U.S. Army Corps of Engineers

TEMPERATURE TEST FACILITY
WHITE SANDS MISSILE RANGE
NEW MEXICO

DEEP SOIL GAS SURVEY AND DEEP SOIL BORING LOCATIONS

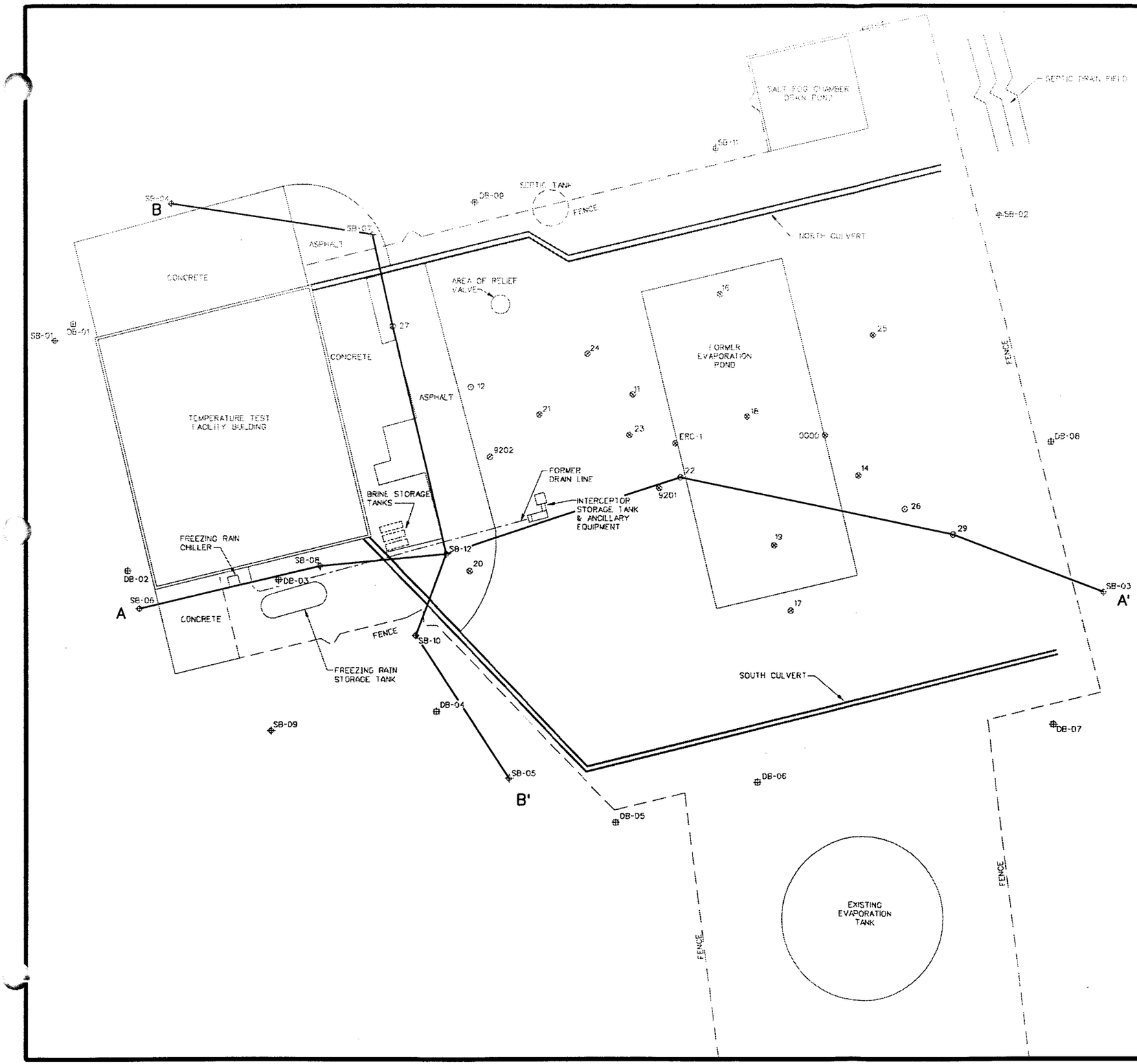
Scale: 1 IN = 60 FEET

Date: MARCH, 1996

Fig. No.: 2-1

Sheet number: 1-1

MCS FILE: OKLA-15 REF. FILE: OKLA-01A



LEGEND:

- ⊞ LOCATION OF DEEP SOIL GAS BORINGS DRILLED DURING THE SUBJECT RFI
- ⊕ LOCATION OF DEEP SOIL BORINGS DRILLED DURING THE SUBJECT RFI
- ⊗ APPROXIMATE LOCATION OF EXISTING SOIL GAS MONITORING WELLS
- ⊙ APPROXIMATE LOCATION OF FORMER SOIL GAS MONITORING WELLS

N

60 0 60 120

SCALE FEET

Revisions			
Symbol	Descriptions	Date	Apprv'd

Woodward-Clyde Federal Services

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
TULSA, OKLAHOMA

Designed by: D.J.K.

Drawn by: P.C.S.

Checked by: D.C.C.

Submitted by:

U.S. Army Corps of Engineers

TEMPERATURE TEST FACILITY
WHITE SANDS MISSILE RANGE
NEW MEXICO

LINES OF GEOLOGICAL CROSS SECTIONS A-A' AND B-B'

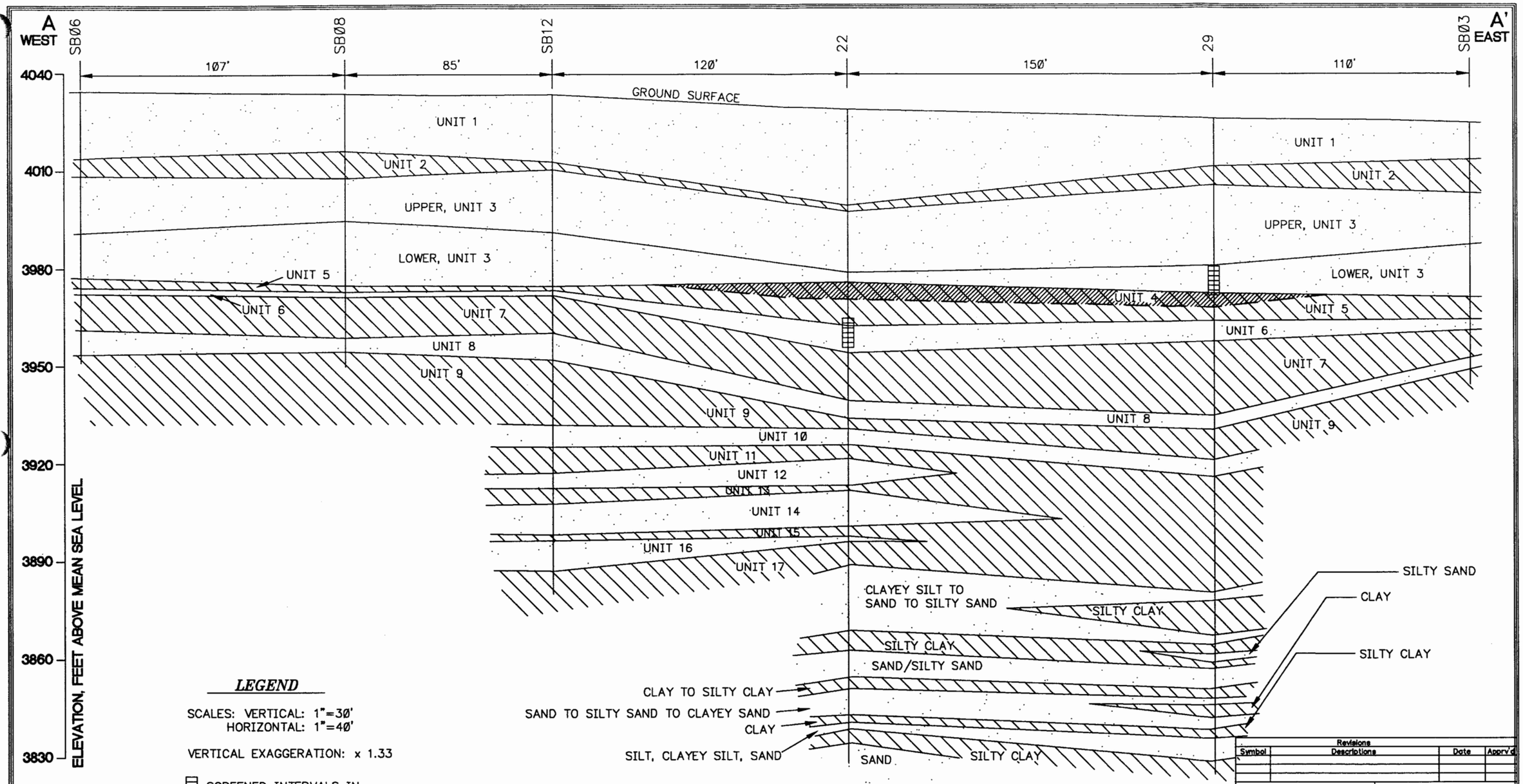
Scale: 1 IN = 60 FEET

Date: MARCH, 1996

Fig. No.: 2-2

Sheet number: 1-1

MCS FILE: OKLA-05 REF. FILE: OKLA-01A



LEGEND

SCALES: VERTICAL: 1"=30'
HORIZONTAL: 1"=40'

VERTICAL EXAGGERATION: x 1.33

SCREENED INTERVALS IN SOIL GAS MONITORING WELLS

Revisions			
Symbol	Descriptions	Date	Apprv'd

Woodward-Clyde Federal Services

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TULSA, OKLAHOMA

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U.S. Army Corps of Engineers

TEMPERATURE TEST FACILITY
WHITE SANDS MISSILE RANGE
NEW MEXICO

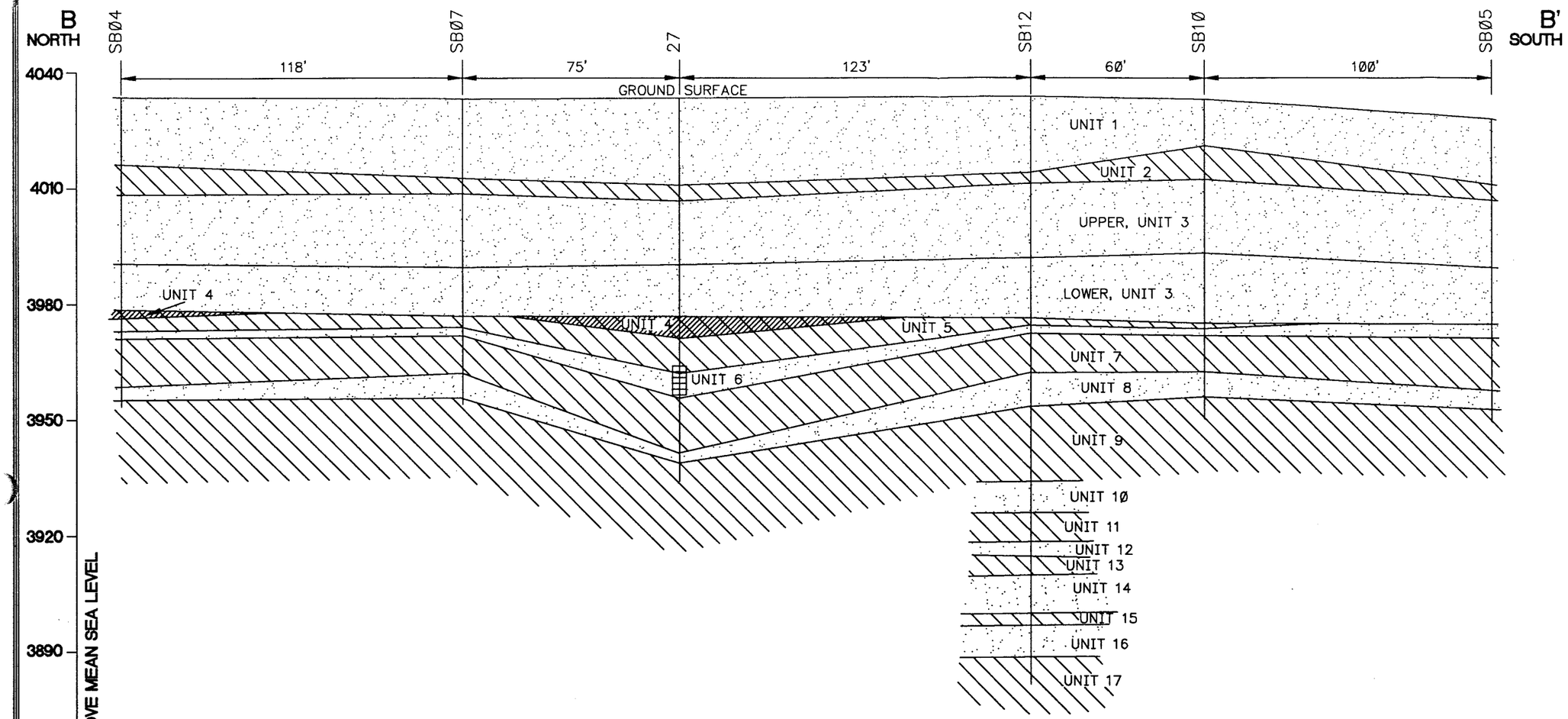
GEOLOGICAL CROSS SECTION
A–A'

Scale: AS SHOWN
Date: MARCH, 1996
Dwg. No.: 2–3
Sheet number: 1 — 1

ACAD FILE: 95038M01

ACAD 12_c4
06/21/95 08:22

ACAD FILE: 95038M01
P.C.S. SC: 1=1



LEGEND

SCALES: VERTICAL: 1"=30'
HORIZONTAL: 1"=40'

VERTICAL EXAGGERATION: x 1.33

SCREENED INTERVALS IN SOIL GAS MONITORING WELLS

Revisions			
Symbol	Descriptions	Date	Apprv'd

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TEMPERATURE TEST FACILITY
WHITE SANDS MISSILE RANGE
NEW MEXICO

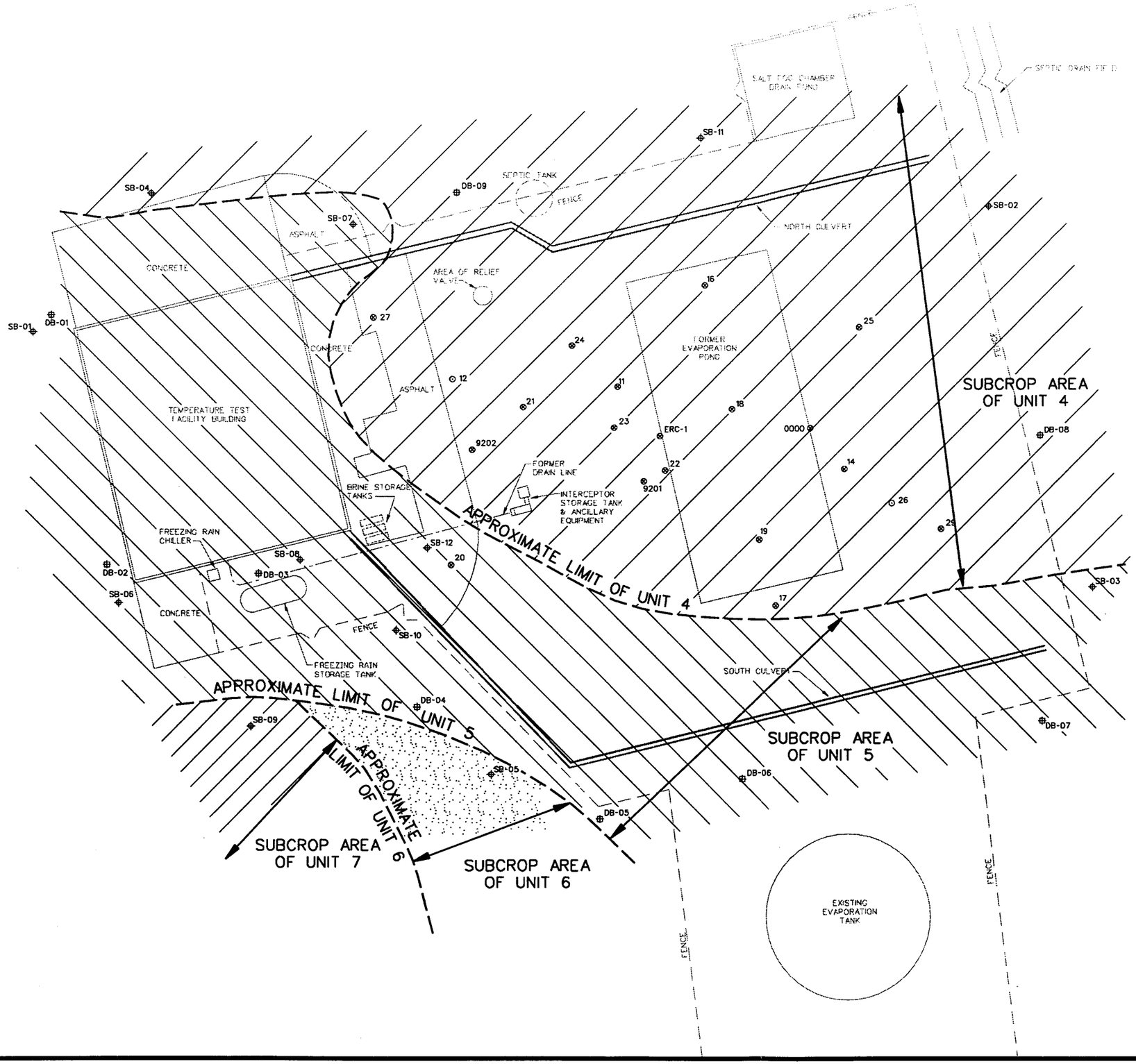
GEOLOGICAL CROSS SECTION
B–B'

Scale: AS SHOWN
Date: MARCH, 1998
Dwg. No.: 2–4
Sheet number: 1 — 1

ACAD FILE: 95038M02

ACAD 12_c4
08/21/95 08:31:

ACAD FILE: 95038M02
P.C.S. SC: 1=1



LEGEND:

- LOCATION OF DEEP SOIL GAS BORINGS DRILLED DURING THE SUBJECT RFI
- LOCATION OF DEEP SOIL BORINGS DRILLED DURING THE SUBJECT RFI
- APPROXIMATE LOCATION OF EXISTING SOIL GAS MONITORING WELLS
- APPROXIMATE LOCATION OF FORMER SOIL GAS MONITORING WELLS

N

60 0 60 120

SCALE FEET

Revisions			
Symbol	Descriptions	Date	Apprv'd

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U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
TULSA, OKLAHOMA

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U.S. Army Corps of Engineers

TEMPERATURE TEST FACILITY
WHITE SANDS MISSILE RANGE
NEW MEXICO

SUBCROP MAP OF UNITS UNDERLYING UNIT 3

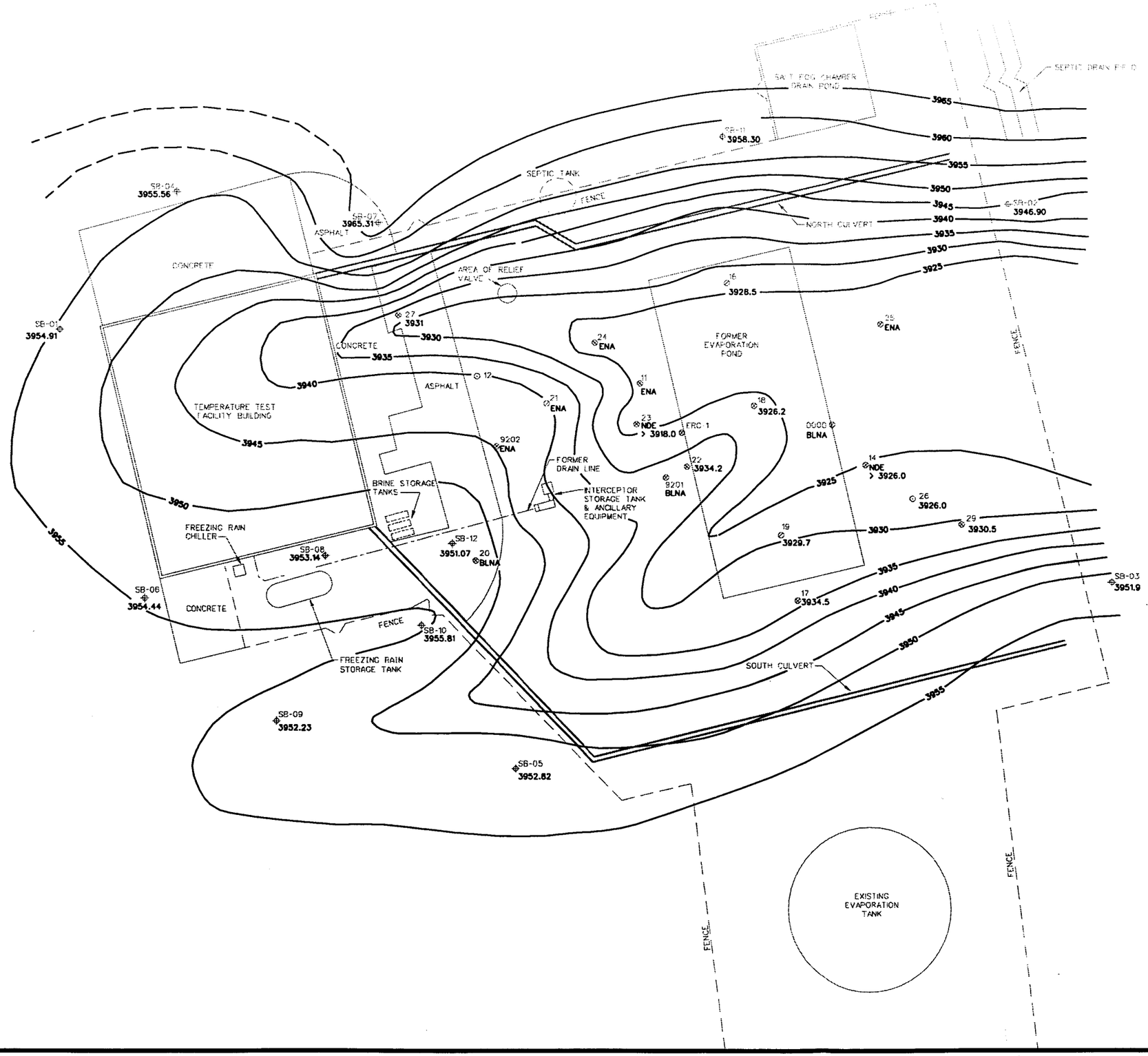
Scale: 1 IN = 60 FEET

Date: MARCH, 1996

Fig. No.: 2-5

Sheet number: 1-1

MCS FILE: OKLA-03 REF. FILE: OKLA-01A



LEGEND:

⊞	LOCATION OF DEEP SOIL GAS BORINGS DRILLED DURING THE SUBJECT RFI
⊕	LOCATION OF DEEP SOIL BORINGS DRILLED DURING THE SUBJECT RFI
⊗	APPROXIMATE LOCATION OF EXISTING SOIL GAS MONITORING WELLS
⊙	APPROXIMATE LOCATION OF FORMER SOIL GAS MONITORING WELLS
ENA	ELEVATION NOT AVAILABLE FOR LOCATION
BLNA	BORING LOG NOT AVAILABLE FOR LOCATION

NOTE: DATUM IS NAD83

N

60 0 60 120

SCALE FEET

Revisions			
Symbol	Descriptions	Date	Apprv'd

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U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
TULSA, OKLAHOMA

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Submitted by:

U.S. Army Corps of Engineers

TEMPERATURE TEST FACILITY
WHITE SANDS MISSILE RANGE
NEW MEXICO

STRUCTURAL CONTOUR MAP
TOP OF UNIT 9

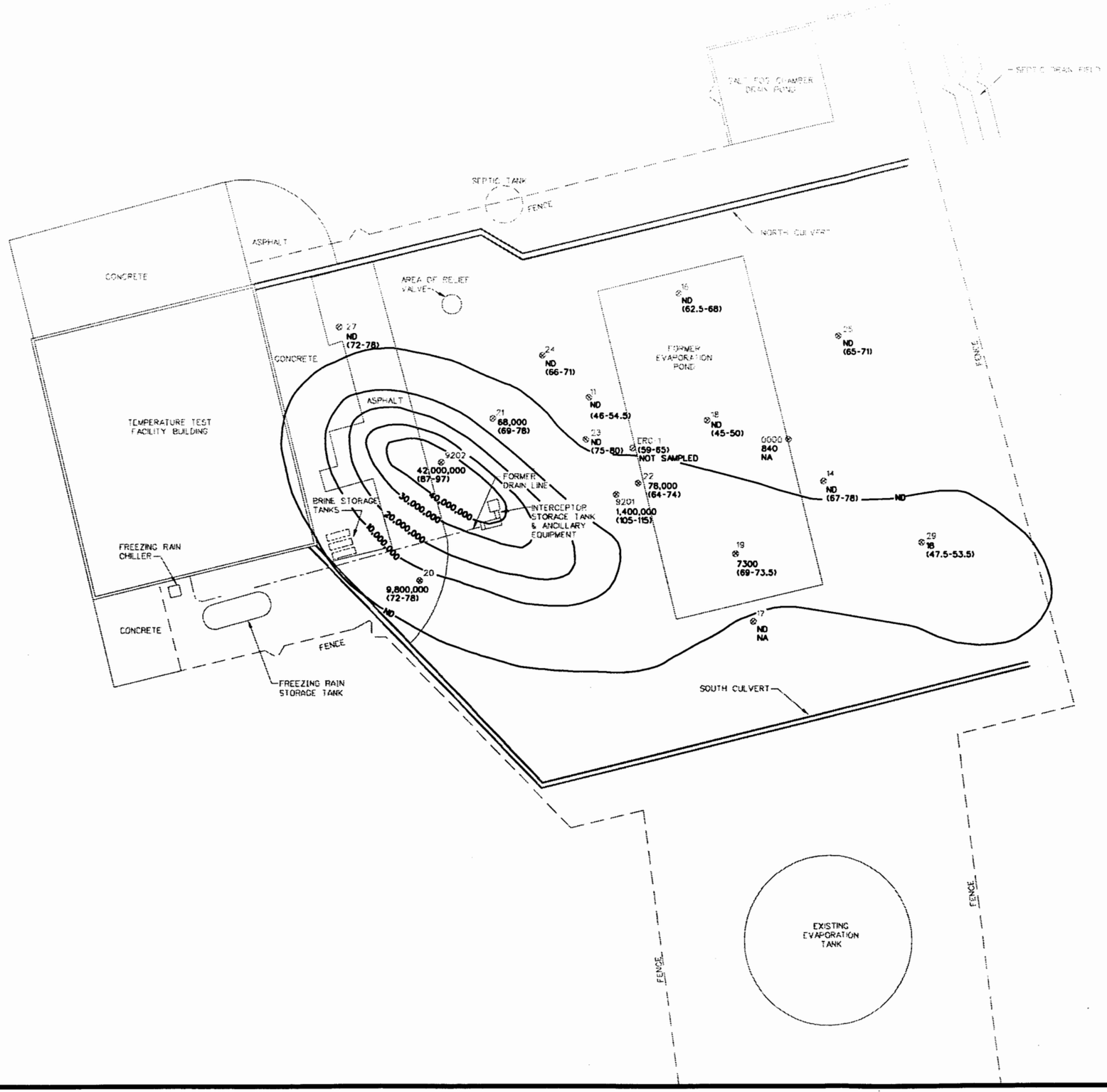
Scale: 1 IN = 60 FEET

Date: MARCH, 1996

Fig. No.: 2-6

Sheet number: 1-1

MCS FILE: OKLA-04 RDF FILE: OKLA-01A



LEGEND:

⊗ 27 — APPROXIMATE LOCATION OF EXISTING SOIL GAS MONITORING WELLS

27 — METHYLENE CHLORIDE CONCENTRATION (ppb)

(45-50) — SCREEN INTERVAL DEPTH (FEET) BELOW GROUND SURFACE

N

60 0 60 120

SCALE FEET

Revisions			
Symbol	Descriptions	Date	Apprv'd

Woodward-Clyde Federal Services

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
TULSA, OKLAHOMA

Designed by: D.J.K.

Drawn by: P.C.S.

Checked by: D.C.C.

Submitted by:

U.S. Army Corps of Engineers

TEMPERATURE TEST FACILITY
WHITE SANDS MISSILE RANGE
NEW MEXICO

METHYLENE CHLORIDE CONCENTRATIONS (ppb) IN SOIL GAS MONITORING WELLS

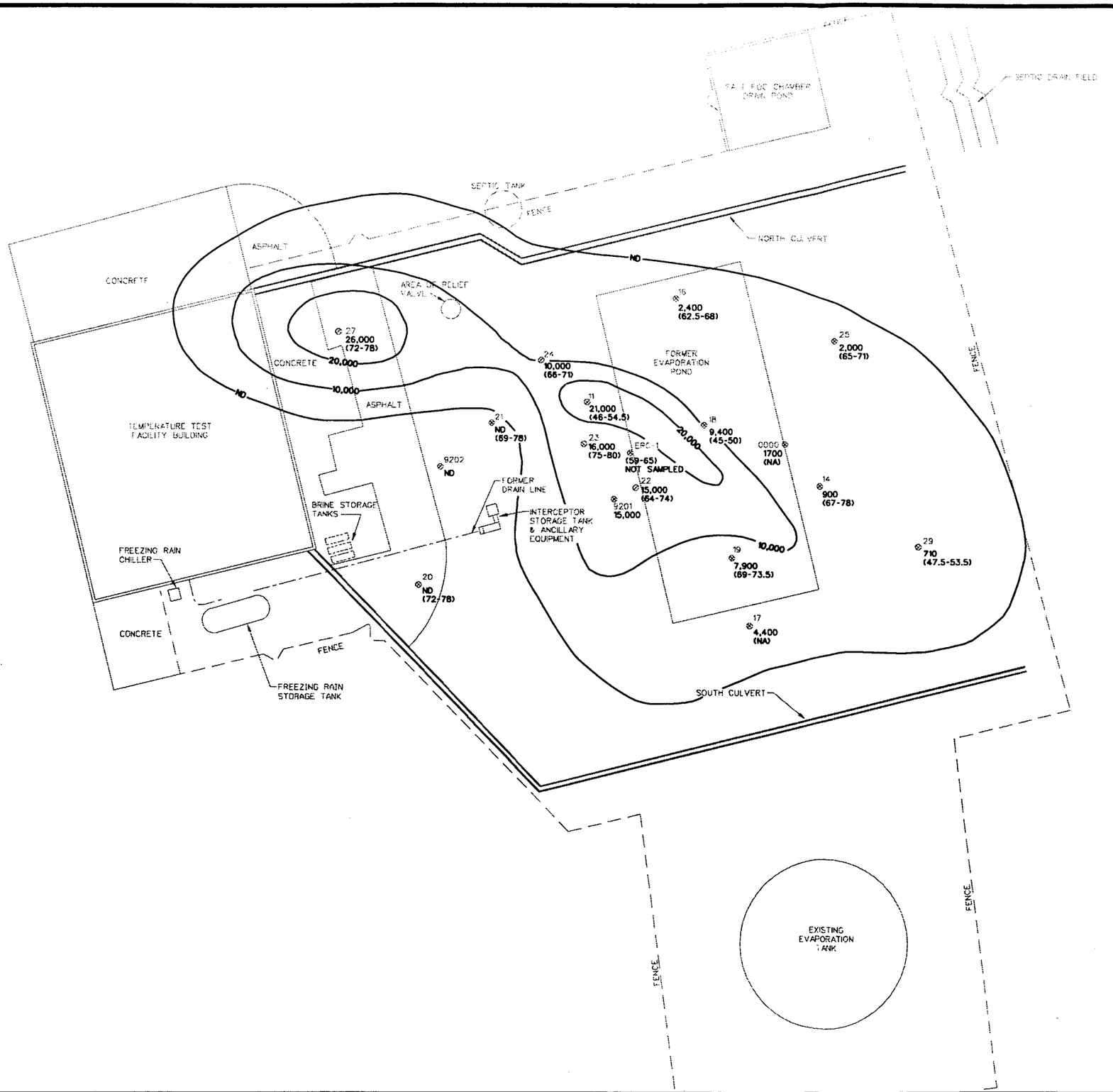
Scale: 1 IN = 60 FEET

Date: MARCH, 1996

Fig. No.: 4-1

Sheet number: 1-1

MCS FILE: OKLA-02 REF. FILE: OKLA-01A



LEGEND:

⊗ 900 — APPROXIMATE LOCATION OF EXISTING SOIL GAS MONITORING WELLS
└ FREON 11 CONCENTRATION (ppb)

(45-50) — SCREEN INTERVAL DEPTH (FEET) BELOW GROUND SURFACE

N

60 0 60 120
SCALE FEET

Revisions			
Symbol	Descriptions	Date	Apprv'd

Woodward–Clyde Federal Services

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
TULSA, OKLAHOMA

Designed by: D.J.K.
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Checked by: D.C.C.
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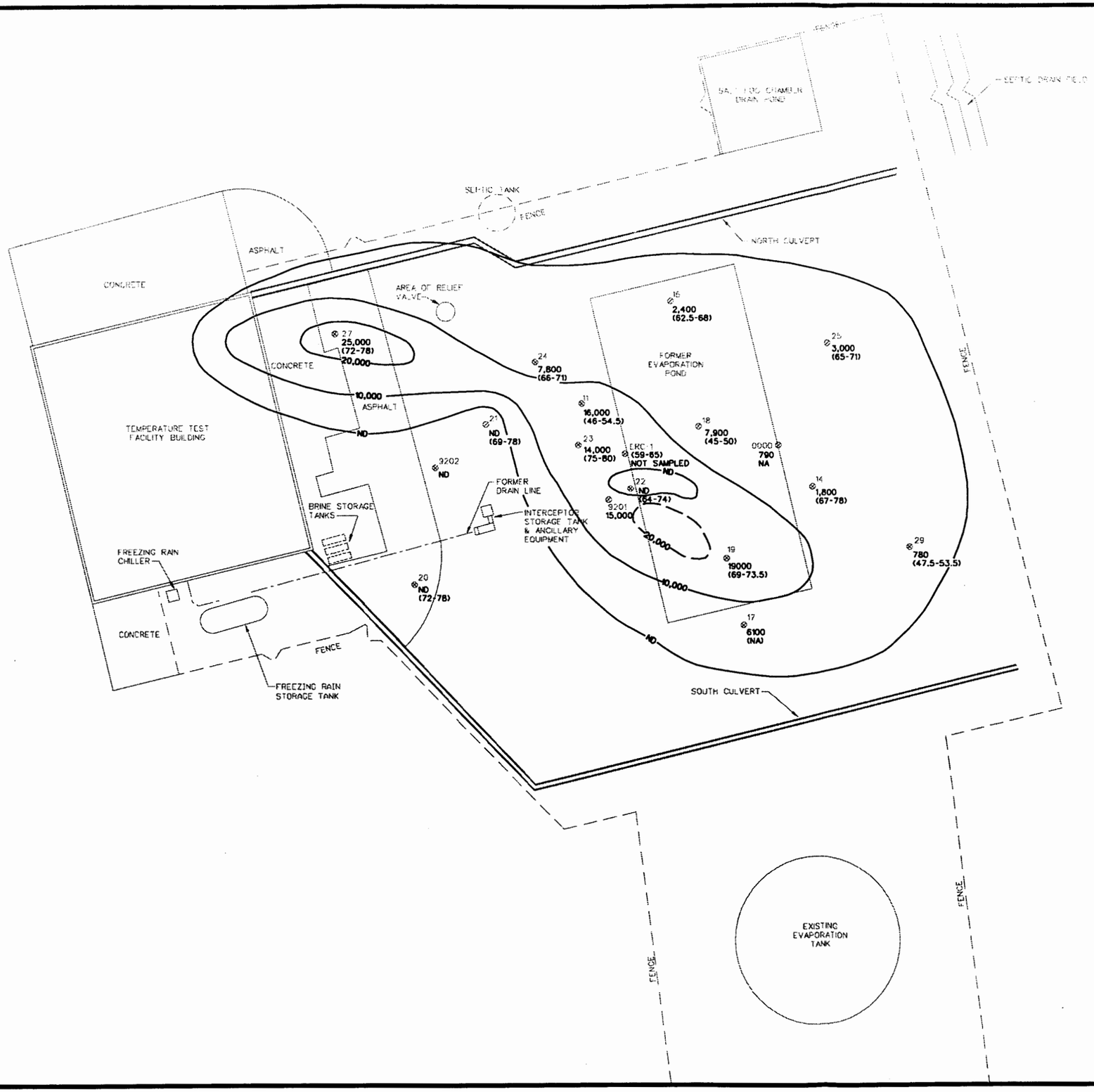
U.S. Army Corps of Engineers

TEMPERATURE TEST FACILITY
WHITE SANDS MISSILE RANGE
NEW MEXICO

FREON 11 CONCENTRATIONS (ppb) IN SOIL GAS MONITORING WELLS

Scale: 1 IN - 60 FEET
Date: MARCH, 1996
Fig. No.: 4-2
Sheet number: 1-1

MCS FILE: OKLA-09 REF. FILE: OKLA-01A



LEGEND:

⊗ 790 — APPROXIMATE LOCATION OF EXISTING SOIL GAS MONITORING WELLS
790 — 1-1-DICHLOROETHENE CONCENTRATION (ppb)

(45-50) — SCREEN INTERVAL DEPTH (FEET) BELOW GROUND SURFACE

N

60 0 60 120
SCALE FEET

Revisions			
Symbol	Descriptions	Date	Apprv'd

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U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
TULSA, OKLAHOMA

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Submitted by:

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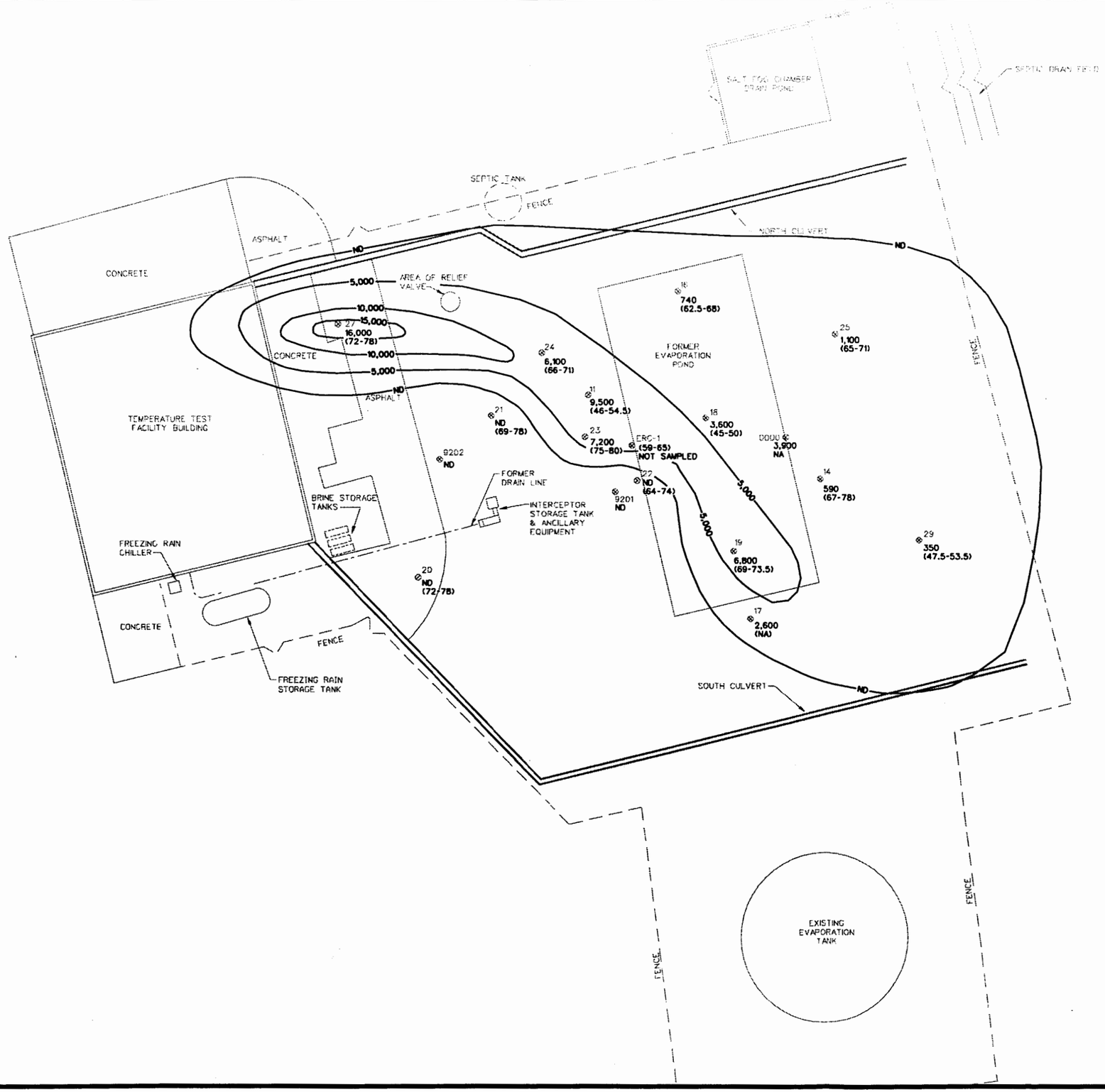
TEMPERATURE TEST FACILITY
WHITE SANDS MISSILE RANGE
NEW MEXICO

1-1-DICHLOROETHENE CONCENTRATIONS (ppb) IN SOIL GAS MONITORING WELLS

Scale: 1 IN = 60 FEET
Date: MARCH, 1996
Fig. No.: 4-3
Sheet number: 1-1

MCS FILE: DGLA-11 REF. FILE: DGLA-01A



LEGEND:

⊗ 28 — APPROXIMATE LOCATION OF EXISTING SOIL GAS MONITORING WELLS
└— TETRACHLOROETHENE CONCENTRATION (ppb)

(45-50) — SCREEN INTERVAL DEPTH (FEET) BELOW GROUND SURFACE

N

60 0 60 120
SCALE FEET

Revisions			
Symbol	Descriptions	Date	Apprv'd

Woodward-Clyde Federal Services

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
TULSA, OKLAHOMA

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Checked by: D.C.C.
Submitted by:

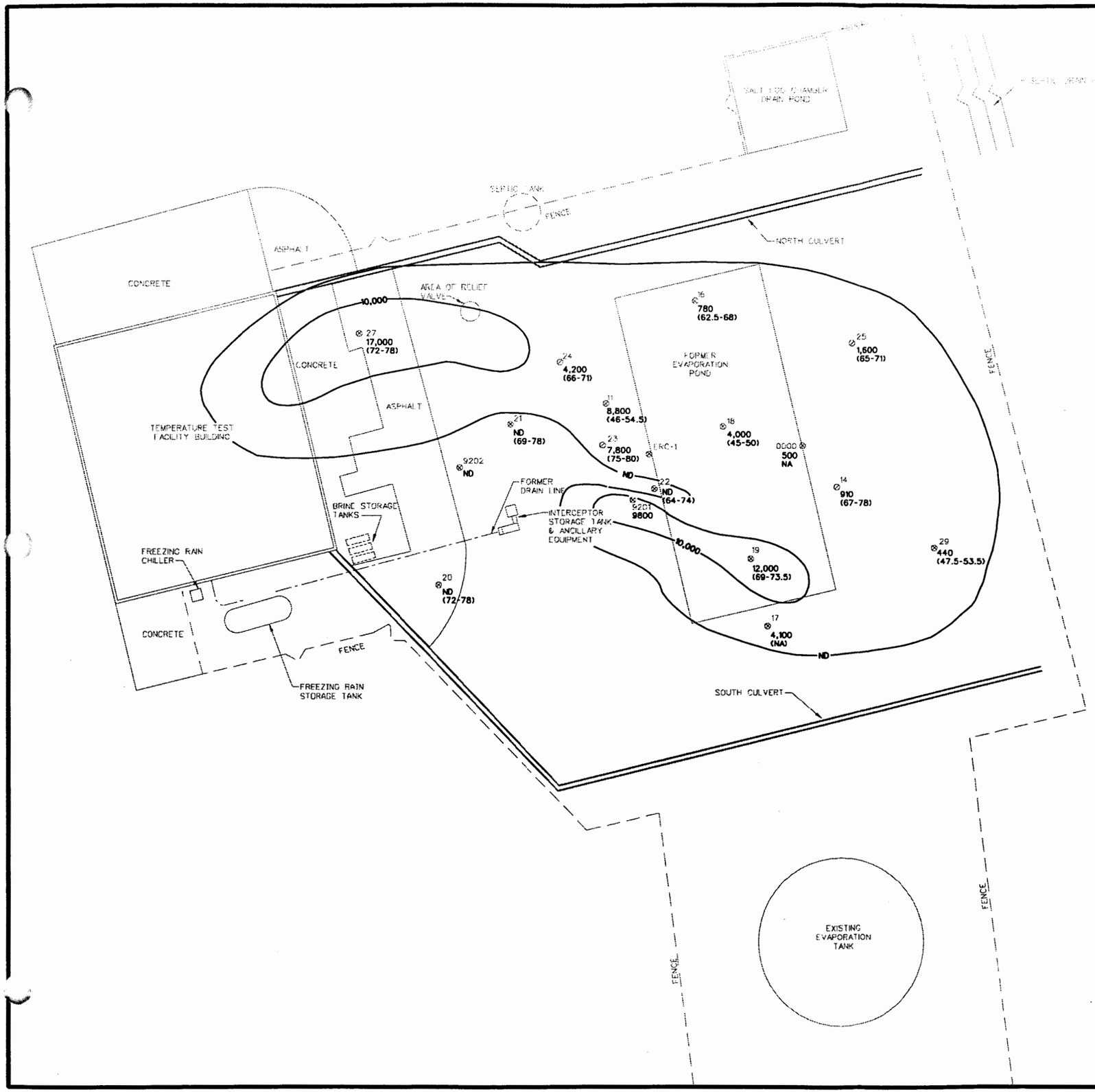
U.S. Army Corps of Engineers

TEMPERATURE TEST FACILITY
WHITE SANDS MISSILE RANGE
NEW MEXICO

TETRACHLOROETHENE CONCENTRATIONS (ppb) IN SOIL GAS MONITORING WELLS

Scale: 1 IN = 60 FEET
Date: MARCH, 1996
Fig. No.: 4-4
Sheet number: 1-1

MCS FILE: OKLA-08 REF. FILE: OKLA-01A



LEGEND:

⊗ 500 — APPROXIMATE LOCATION OF EXISTING SOIL GAS MONITORING WELLS
500 — TRICHLOROETHENE (TCE) CONCENTRATION (ppb)

(45-50) — SCREEN INTERVAL DEPTH (FEET) BELOW GROUND SURFACE

N

60 0 60 120
SCALE FEET

Revisions			
Symbol	Descriptions	Date	Apprv'd

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TULSA, OKLAHOMA

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Checked by: D.C.C.
Submitted by:

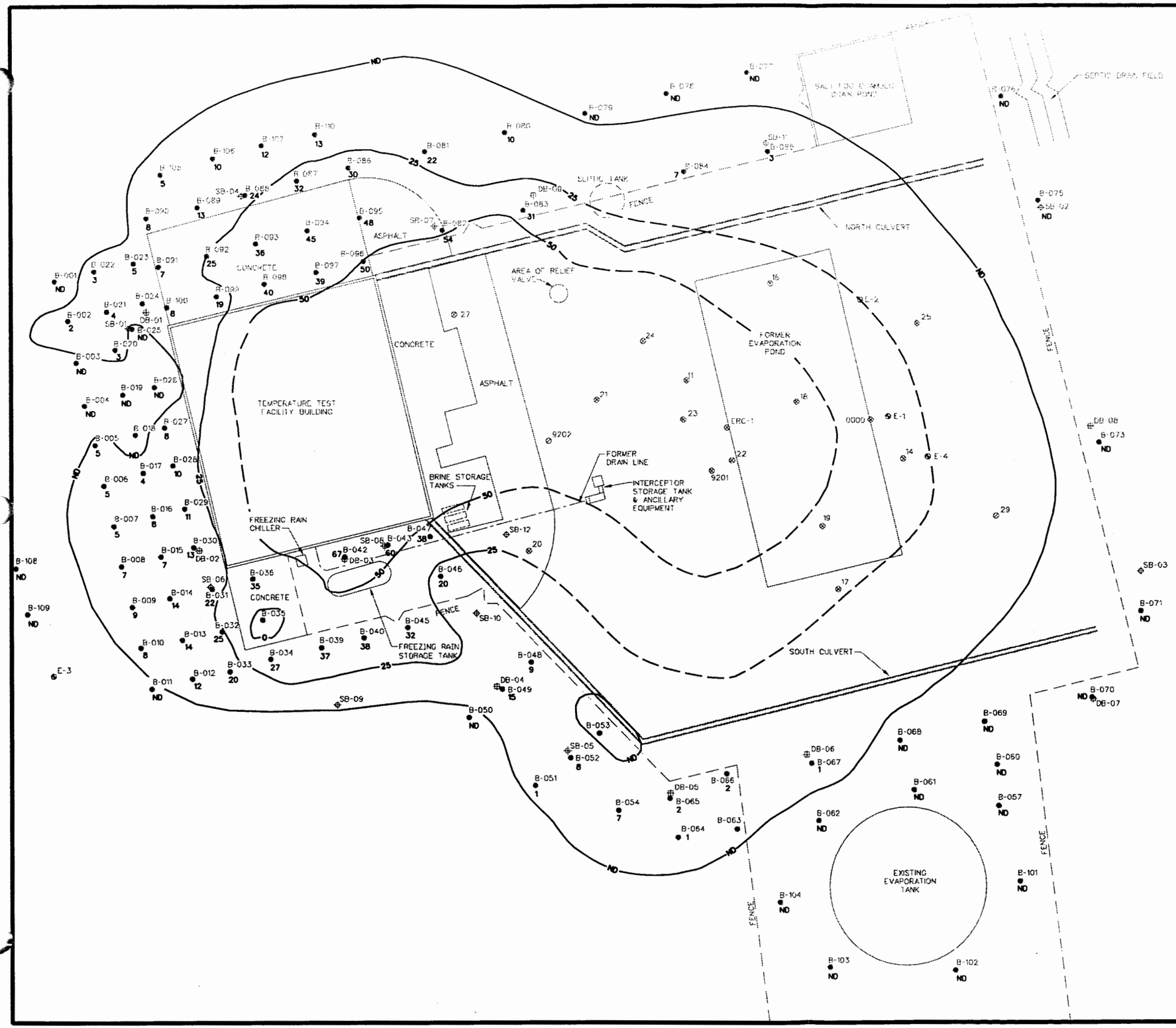
U.S. Army Corps of Engineers

TEMPERATURE TEST FACILITY
WHITE SANDS MISSILE RANGE
NEW MEXICO

TRICHLOROETHENE (TCE) CONCENTRATIONS (ppb) IN SOIL GAS MONITORING WELLS

Scale: 1 IN = 60 FEET
Date: MARCH, 1996
Fig. No.: 4-5
Sheet number: 1-1

UCS FILE: OKLA-10 REF. FILE: OKLA-01A



LEGEND:

- APPROXIMATE LOCATION OF GROUNDWATER MONITORING WELLS
- DEEP SOIL GAS SURVEY LOCATION
- DEEP SOIL BORING LOCATION
- SHALLOW SOIL GAS SURVEY LOCATIONS
- 27 — APPROXIMATE LOCATION OF EXISTING SOIL GAS MONITORING WELLS
  - FREON 11 CONCENTRATION (ug/L)
- ND — NOT DETECTED

N

60 0 60 120

SCALE FEET

Revisions			
Symbol	Descriptions	Date	Apprv'd

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TULSA, OKLAHOMA

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TEMPERATURE TEST FACILITY
WHITE SANDS MISSILE RANGE
NEW MEXICO

FREON 11 CONCENTRATIONS (ug/L) IN SHALLOW SOIL GAS

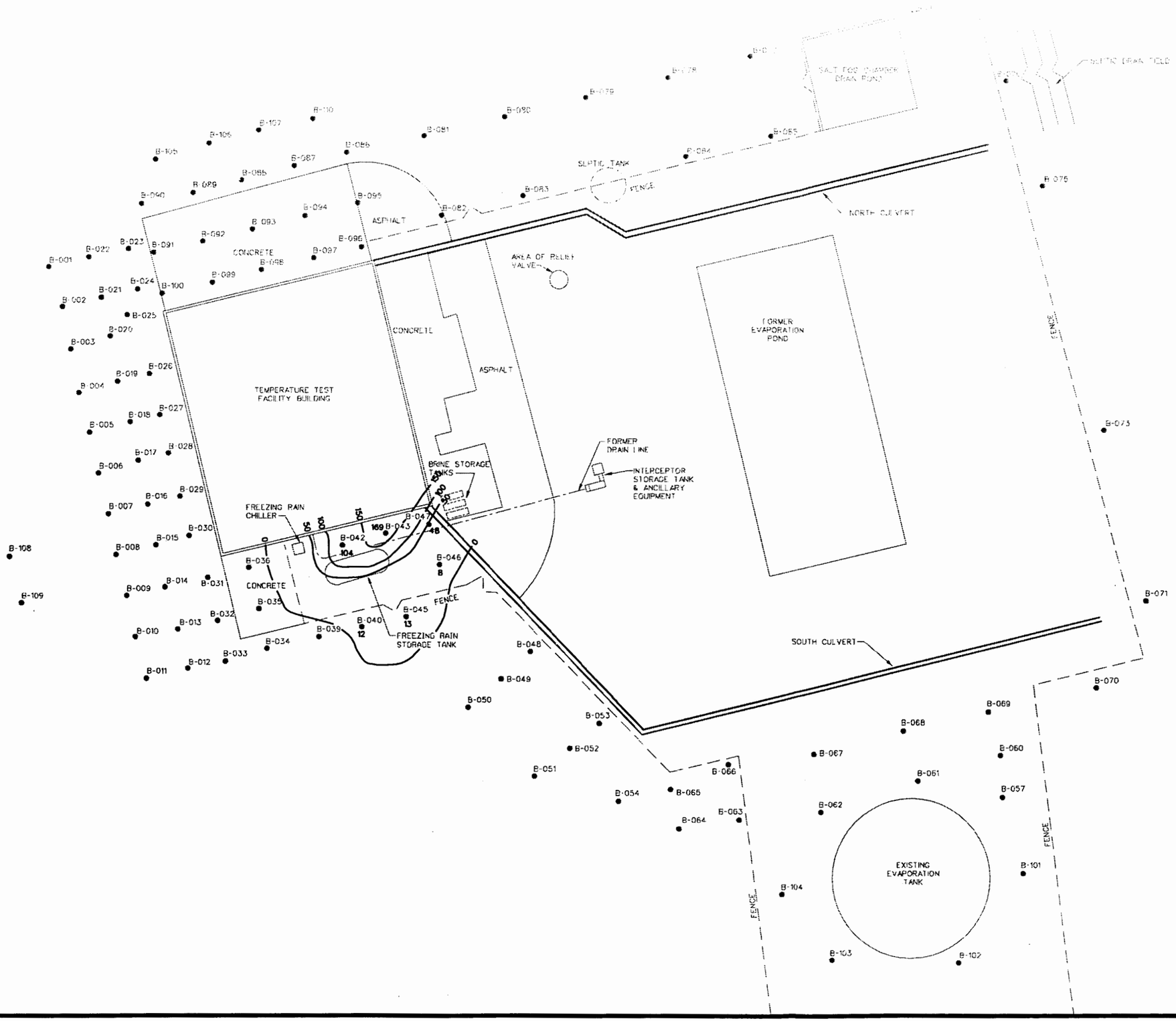
Scale: 1 IN = 60 FEET

Date: MARCH, 1996

Fig. No.: 4-6

Sheet number: 1-1

MCS FILE: OKLA-08 REF. FILE: OKLA-01A



LEGEND:

● 13 — SHALLOW SOIL GAS SURVEY LOCATIONS; FREON 113 CONCENTRATION (ug/L)

FREON 113 WAS NOT DETECTED AT SOIL GAS BORINGS WITH NO CONCENTRATION VALVE.

N

60 0 60 120

SCALE FEET

Revisions			
Symbol	Descriptions	Date	Apprv'd

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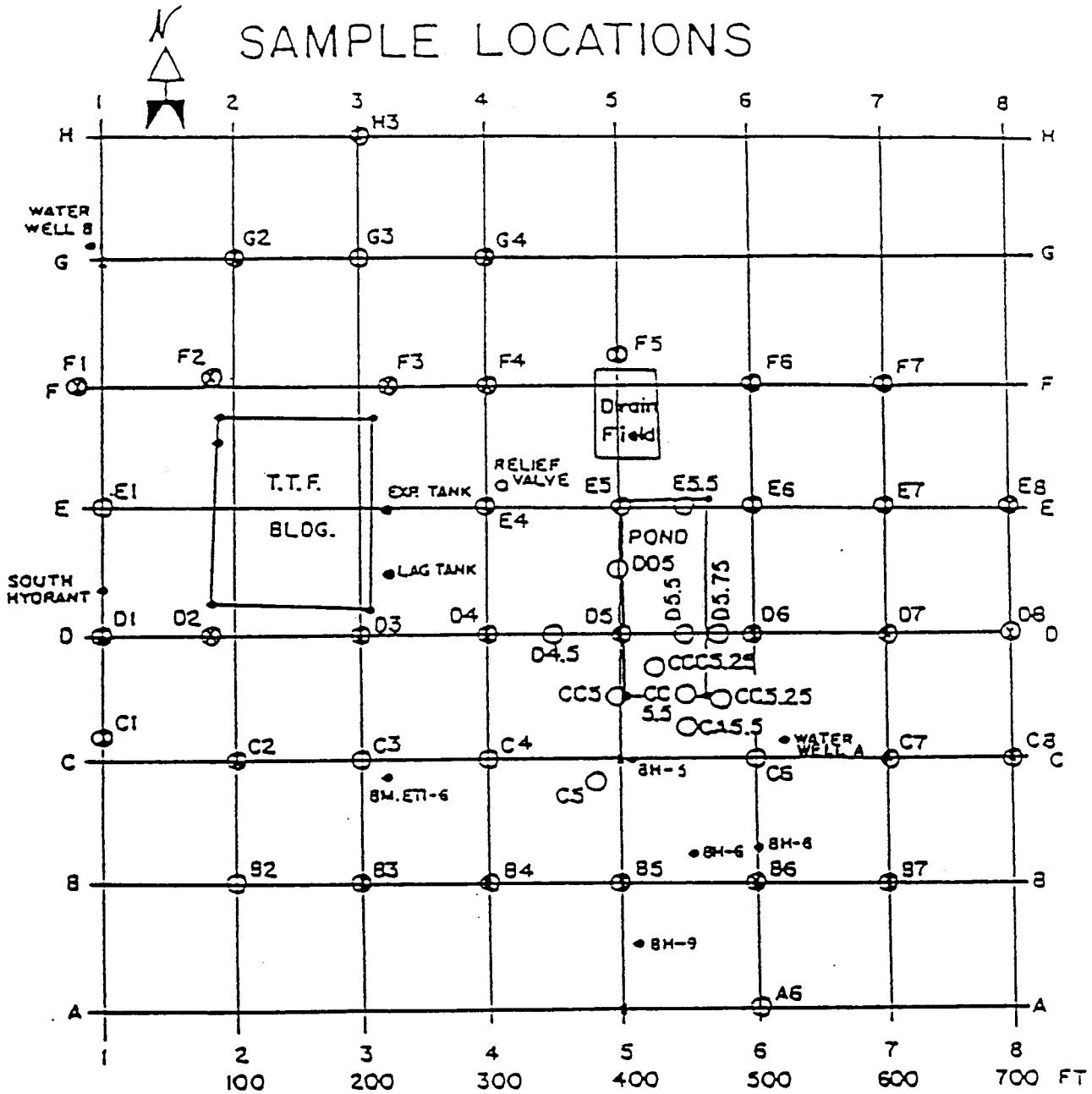
TEMPERATURE TEST FACILITY
WHITE SANDS MISSILE RANGE
NEW MEXICO

FREON 113 CONCENTRATIONS (ug/L) IN SHALLOW SOIL GAS

Scale: 1 IN = 60 FEET
Date: MARCH, 1996
Fig. No.: 4-7
Sheet number: 1-1

MCS FILE: OKLA-07 REF. FILE: OKLA-014

SAMPLE LOCATIONS



LEGEND

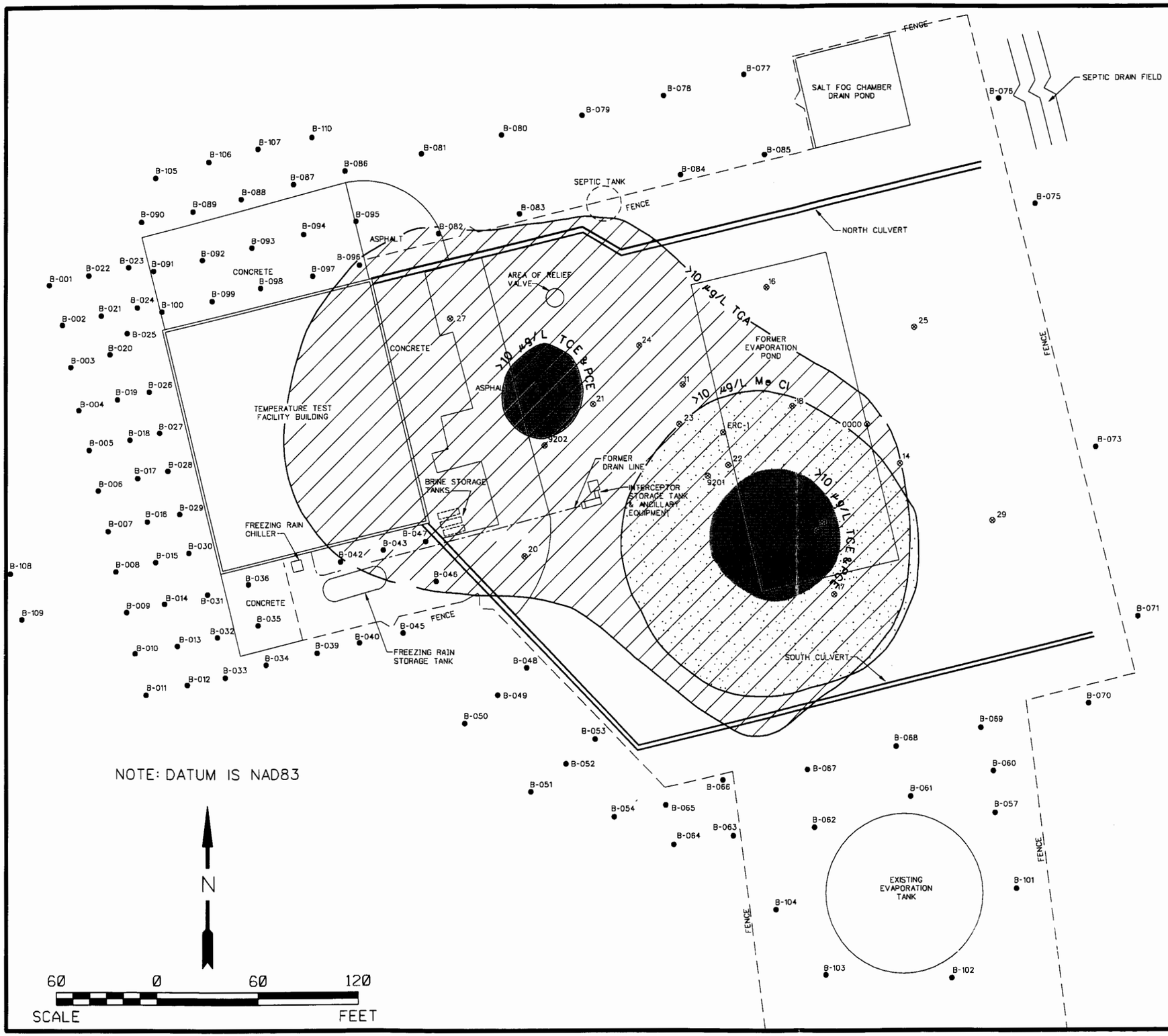
x SURVEYED POINT (GRID)

○ 84 SAMPLE POINT

0 100' 200'
SCALE

SOURCE: GCL, 1987

TITLE	LOCATION OF SHALLOW SOIL GAS SURVEYS PERFORMED PRIOR TO THE 1995 RFI
Woodward-Clyde Federal Services	PROJ NO F93102
	FIG. 4-8



LEGEND:

- ⊗ APPROXIMATE LOCATION OF EXISTING SOIL GAS MONITORING WELLS
- ● SHALLOW SOIL GAS SURVEY LOCATIONS
- APPROXIMATE AREA IN 1987 WITH >10 µg/L OF TCA AT 5'-6' bgs
- APPROXIMATE AREA IN 1987 WITH >10 µg/L OF TCE AND >10 µg/L OF PCE AT 5'-6' bgs
- APPROXIMATE AREA IN 1987 WITH >10 µg/L OF MeCl AT 5'-6' bgs

FOR SHALLOW SOIL GAS SAMPLING LOCATIONS AND ANALYTICAL DATA SEE GCL, 1987

Revisions			
Symbol	Descriptions	Date	Apprv'd

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Submitted by:

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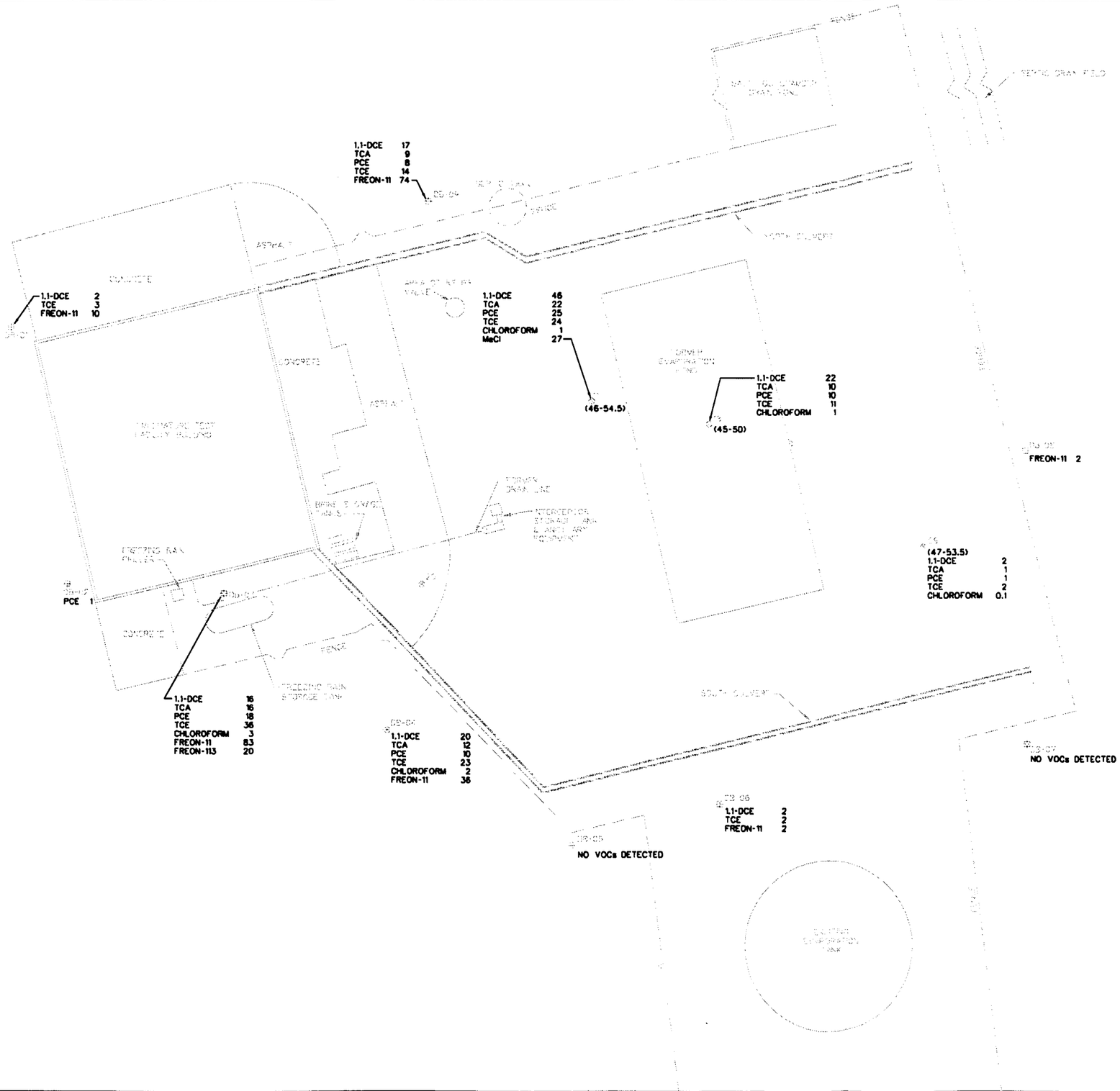
TEMPERATURE TEST FACILITY
WHITE SANDS MISSILE RANGE
NEW MEXICO

AREAS WITH HIGH VOC CONCENTRATIONS IN 1985 SHALLOW SOIL GAS SURVEYS

Scale: 1 IN = 60 FEET
Date: MARCH, 1996
Fig. No.: 4-9
Sheet number: 1-1

MCS FILE: OKLA-18 REF FILE: OKLA-01A



LEGEND:

⊕ DEEP SOIL GAS SURVEY LOCATION

⊗ APPROXIMATE LOCATION OF EXISTING SHALLOW SOIL GAS MONITORING WELLS

(45-50) SCREEN INTERVAL DEPTH (FEET) BELOW GROUND LEVEL

ALL VOC CONCENTRATIONS IN ug/L

DEEP SOIL GAS DATA:
3/95 ON-SITE FIELD ANALYTICAL DATA

SOIL GAS MONITORING WELL DATA:
6/95 ON-SITE FIELD SCREENING RESULTS

N

60 0 60 120
SCALE FEET

Revisions			
Symbol	Descriptions	Date	Apprv'd

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Checked by: D.C.C.
Submitted by:

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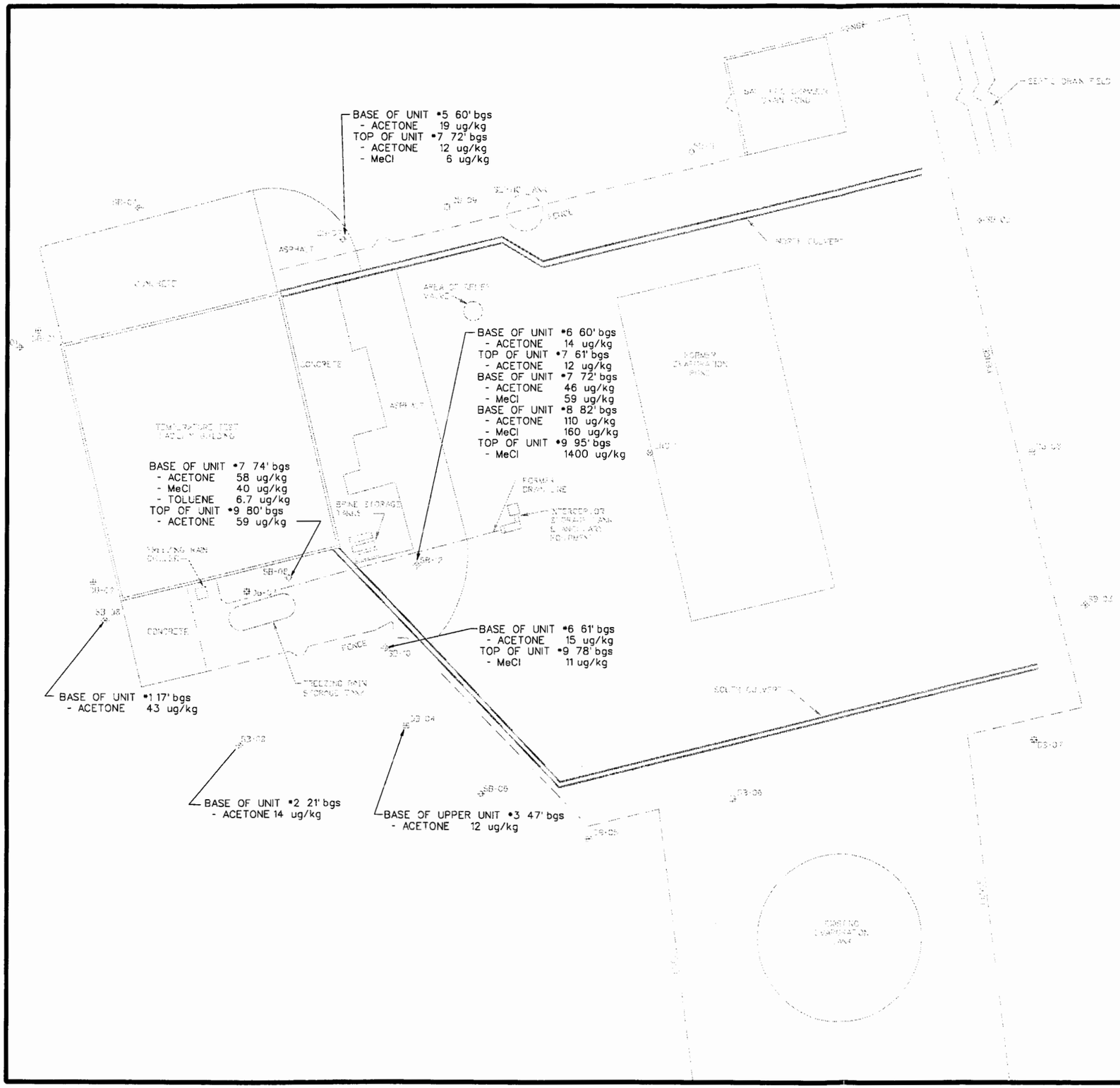
TEMPERATURE TEST FACILITY
WHITE SANDS MISSILE RANGE
NEW MEXICO

CONCENTRATION OF DETECTED VOCs ug/L IN DEEP SOIL GAS BORINGS AND EXISTING SHALLOW SOIL GAS MONITORING WELLS

Scale: 1 IN = 60 FEET
Date: MARCH, 1996
Fig. No.: 4-10
Sheet number: 1-1

MCS FILE: OKLA-13 REF FILE: OKLA-01A



LEGEND:

⌗ DEEP SOIL GAS SURVEY LOCATION

⌖ DEEP SOIL BORING LOCATION

NOTE: DATUM IS NAD83

N

60 0 60 120

SCALE FEET

Revisions			
Symbol	Descriptions	Date	Apprv'd

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Checked by: D.C.C.

Submitted by:

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TEMPERATURE TEST FACILITY
WHITE SANDS MISSILE RANGE
NEW MEXICO

CONCENTRATIONS OF VOCs IN SOIL ANALYSIS

Scale: 1 IN = 60 FEET

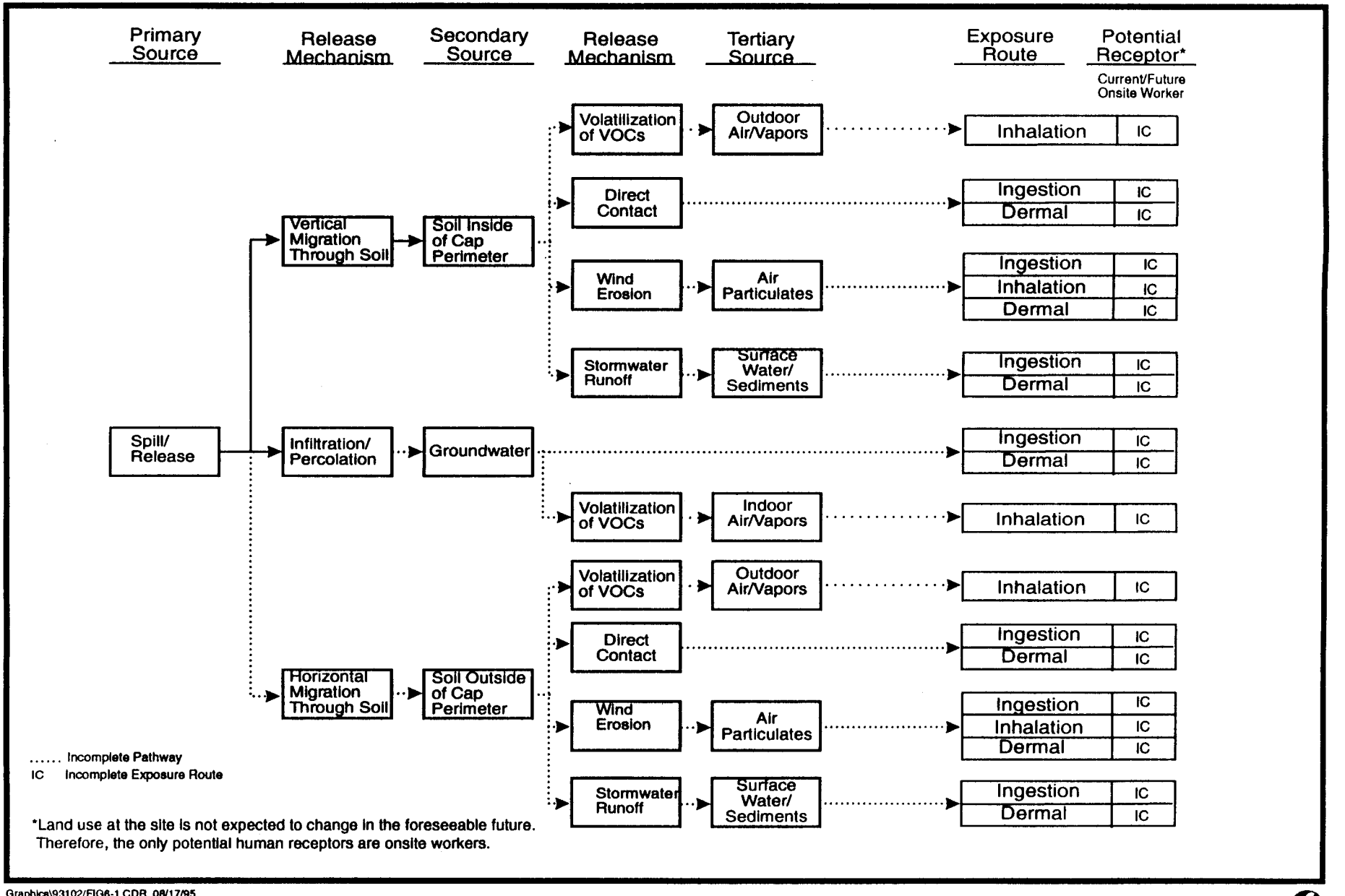
Date: MARCH, 1996

Fig. No.: 4-11

Sheet number: 1-1

MCS FILE: OKLA-12 REF FILE: OKLA 01A

FIGURE 6-1 Site Conceptual Exposure Model for Potential Human Receptors Temperature Test Facility, RCRA Facility Investigation White Sands Missile Range, New Mexico

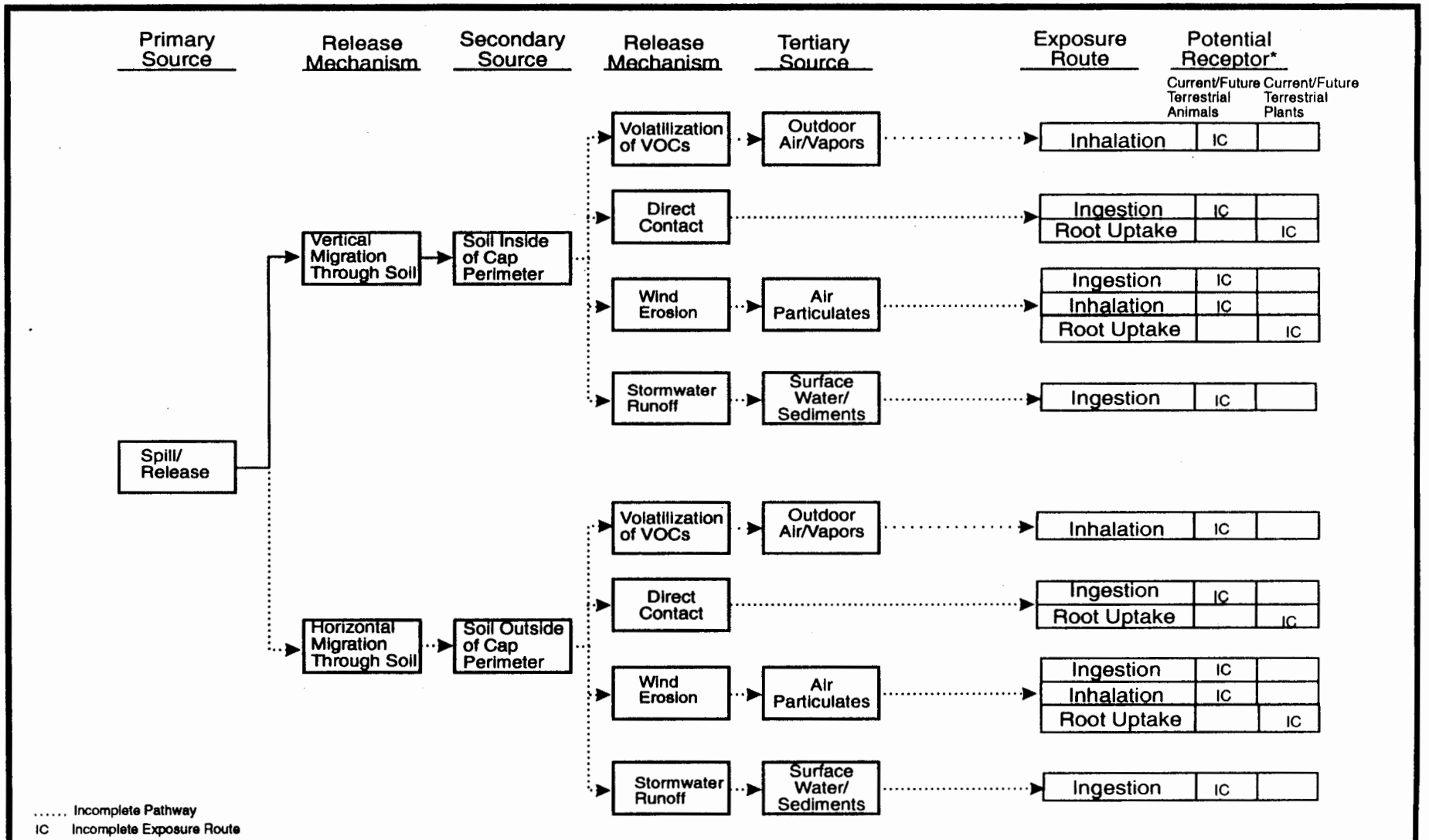


*Land use at the site is not expected to change in the foreseeable future. Therefore, the only potential human receptors are onsite workers.

Graphics\93102/FIG6-1.CDR 08/17/95

Woodward-Clyde

FIGURE 6-2 Site Conceptual Exposure Model for Potential Ecological Receptors Temperature Test Facility, RCRA Facility Investigation, White Sands Missile Range, New Mexico



*Land use at the site is not expected to change in the foreseeable future, therefore it is likely that the site will continue to support the existing habitat with its corresponding plant and animal communities.

Graphics\93102/FIG6-2.CDR 08/17/95

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APPENDIX A
BORING LOGS

BORING RECORD

GEOLOG. UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FID SOIL GAS PPM x 1.0 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	SAMPLE FID READING	SAMPLE RECOVERY	SAMPLE DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:								BACKGROUND OVM READING SOIL: 1.5 PPM AIR: 1.5 PPM
	0	POORLY GRADED SAND: 10YR4/6, DARK YELLOWISH BROWN, LOOSE, FINE TO MEDIUM GRAINED, 1/2% FINE GRAVEL (~5MM)	SP				1.8	2.5	5.0	0
	5	BECOMING 10YR5/6, YELLOWISH BROWN, VERY LOOSE, MEDIUM TO COARSE GRAINED, 1% GRAVEL (5MM)					1.5	1.8	10.0	5
	10	10-12 FEET POORLY GRADED SAND, MEDIUM TO COARSE GRAINED, 5-7% FINE GRAVEL (4MM)					1.5	2.0	15.0	10
BASE OF UNIT 1	15						1.75	2.5	20.0	15 WSTF-SB01-2017 GT
BASE OF UNIT 2	17.0	LEAN CLAY W/SAND: 7.5YR4/4, BROWN, STIFF TO VERY STIFF, LOW PLASTICITY, 15% SILT OR FINE SAND	CL				1.75	2.5	25.0	20 WSTF-SB01-2025
UPPER UNIT 3	20						1.75	1.5	30.0	25
	25	WELL GRADED SAND: 10YR5/8, YELLOWISH BROWN, VERY LOOSE TO LOOSE, FINE TO COARSE GRAINED, 5% GRAVEL, (UP TO 20MM)	SW				1.75	2.5	35.0	30
	30	ABUNDANT CALICHE NODULES AND CEMENT AT 30'								
	35									35

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

WHITE SANDS MISSILE RANGE
JOB NAME/NUMBER **TEMP. TEST FACILITY**

BORING NUMBER **WSTF-SB01**

DATE DRILLED 3/16/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY D.J.K. DRAWING NO. 95038811
DRAWN BY: RML PAGE 1 OF 3

BORING RECORD

GEOLOGIC UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG
		Start: Stop: GROUND SURFACE:		
	35	SAME AS ABOVE		
BASE OF UPPER UNIT 3	40			
	42.5	WELL GRADED SAND: 7.5YR4/6, STRONG BROWN, MEDIUM DENSE TO DENSE, FINE TO COARSE GRAINED, 3% GRAVEL (UP TO 10MM),	SW	
	45			
	50			
BASE OF LOWER UNIT 3	55			
	57.5	LEAN CLAY W/ SAND: 5YR5/4, REDDISH BROWN, STIFF TO VERY STIFF, 30% SILT/FINE SAND, NO PLASTICITY	CL	
BASE OF UNIT 5	60			
BASE OF UNIT 6	61.0	SILTY SAND: 7.5YR6/4, LIGHT BROWN, DENSE, FINE TO MEDIUM GRAINED, 20% SILT, POORLY GRADED	SM	
UNIT 7	62.5	LEAN CLAY: 7.5YR6/4, LIGHT BROWN, DENSE, NO PLASTICITY, 20% SILT, 2-5% CALICHE NODULES	CL	
	65			
	70			

FID SOIL GAS PPM x 1.0 (2 4 6 8 10 12 14 16 18)

SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
				BACKGROUND OVM READING SOIL: 1.5 PPM AIR: 1.5 PPM
	1.75	1.0	37.5	
	1.4	2.0	40.0	
	1.25	2.5	42.5	
	1.25	2.5	45.0	
	1.5	2.5	47.5	
	1.5	2.5	50.0	
	1.5	2.5	52.5	
	1.54	2.5	55.0	
	4.0	2.5	57.5	WSTF-SB01-2057 QA/QC, GT
	1.25	2.5	60.0	
	1.25	2.5	62.5	WSTF-SB01-2061 MS & MSD WSTF-SB01-2062 GT WSTF-SB01-2063
	1.25	2.5	65.0	
	1.25	2.5	67.5	
	1.25	2.5	70.0	

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

WHITE SANDS MISSILE RANGE
JOB NAME/NUMBER **TEMP. TEST FACILITY**

BORING NUMBER **WSTF-SB01**

DATE DRILLED 3/16/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY D.J.K. DRAWING NO. 95038B11
DRAWN BY: RML PAGE 2 OF 3

BORING RECORD

GEOLOG. UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FID SOIL GAS PPM x 1.0 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:								BACKGROUND OVM READING: SOIL: 1.5 PPM AIR: 1.5 PPM
	70									70
BASE OF UNIT 7		SAME AS ABOVE	CL				1.25	2.5	72.5	WSTF-SB01-2072
	72.5	POORLY GRADED SAND: 10YR6/8, BROWNISH YELLOW, LOOSE, FINE GRAINED	SP				1.25	1.3	75.0	
	75									75
							1.25	1.3	77.5	WSTF-SB01-2076 GT
BASE OF UNIT 8	79.8						1.25	2.5	80.0	WSTF-SB01-2080
UNIT 9	80	LEAN CLAY: 7.5YR4/4, BROWN, VERY STIFF TO HARD, APPEARS TO BE Mn DENDRITIC PATTERNS ON CLAY FRACTURES	CL				1.25	2.5	82.5	80
	82.5	TOTAL DEPTH: 82.5 FEET								
	85									85
	90									90
	95									95
	100									100
	105									105

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

JOB NAME/NUMBER **WHITE SANDS MISSILE RANGE TEMP. TEST FACILITY**

BORING NUMBER **WSTF-SB01**

DATE DRILLED 3/16/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY D.J.K. DRAWING NO. 95038B11
DRAWN BY: RML PAGE 3 OF 3

BORING RECORD

GEOLOGY	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FID SOIL GAS PPM x 1.0 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
		Start Stop GROUND SURFACE:								BACKGROUND OVM READING SOIL: 1.5 PPM AIR: 1.5 PPM
	0	POORLY GRADED SAND: 7.5YR4/4, BROWN, LOOSE, FINE TO MEDIUM GRAINED, WITH 1% GRAVEL (UP TO 30MM)	SP				1.5	2.5	5.0	0 WSTF-SB02-2002
	5	BECOMING 10YR5/4, YELLOWISH BROWN, VERY LOOSE, MEDIUM TO COARSE GRAINED, ANGULAR, WITH 1% GRAVEL (UP TO 10MM), MOIST					1.5	2.5	10.0	5
BASE OF UNIT 1	10 10.5	LEAN CLAY W/ SAND: 10YR5/6, YELLOWISH BROWN, SOFT TO MEDIUM STIFF, LOW PLASTICITY, 20% SAND, FINE TO COARSE GRAINED, MOIST	CL				1.5	2.5	15.0	10 WSTF-SB02-2012
	15	ABUNDANT ROOT MOLDS AT 15 FEET SAND WITH GRAVEL, 10YR 5/6, YELLOWISH BROWN, VERY LOOSE, FROM 16 TO 16.5'					1.5	3.5	20.0	15
BASE OF UNIT 2	20	WELL GRADED SAND: 7.5YR6/4, LIGHT BROWN, LOOSE, FINE TO COARSE GRAINED WITH 2% GRAVEL (UP TO 10MM), 1% CALICHE NODULES	SW				1.5	4.0	25.0	20
	25	GRAVEL UP TO 40MM AT 25 FEET					1.5	2.5	30.0	25
BASE OF UPPER UNIT 3	30	ABUNDANT CALICHE CEMENT AND NODULES AT 30 FEET 7.5YR6/4, LIGHT BROWN, MEDIUM DENSE					1.5	2.5	35.0	30
	35									35

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)

WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

JOB NAME/NUMBER **WHITE SANDS MISSILE RANGE TEMP. TEST FACILITY**

BORING NUMBER **WSTF-SB02**

DATE DRILLED 3/15/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY D.J.K. DRAWING NO. 95038812
DRAWN BY: RML PAGE 1 OF 3

BORING RECORD

GEOLOG. UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FID SOIL GAS PPM x 1.0 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:								BACKGROUND OVM READING SOIL 1.5 PPM AIR: 1.5 PPM
	35	POORLY GRADED SAND: 7.5YR4/6, STRONG BROWN, FINE TO MEDIUM GRAINED, LOOSE TO DENSE, WITH 1% GRAVEL (UP TO 10MM)	SP				1.25	2.5	40.0	35
	40	VERY LOOSE AT 40'					1.25	2.5	45.0	40
	45	BECOMING FINE TO COARSE GRAINED WITH 5% GRAVEL (5MM)					1.25	2.5	50.0	45 WSTF-SB02-2050
BASE OF LOWER UNIT 3	50									50
BASE OF UNIT 4	50.5	SANDY LEAN CLAY: 10YR5/6, YELLOWISH BROWN, STIFF TO VERY STIFF, LOW PLASTICITY, 30% SAND, FINE TO MEDIUM GRAINED, 1/2% GRAVEL (5MM)	CL				1.25	2.5	52.5	WSTF-SB02-2052 QA/QC MS & MSD
	52.0	LEAN CLAY: 7.5YR7/2, PINKISH GRAY TO 7/OUGHT GRAY, LOW PLASTICITY, 25% SILT,	CL				1.25	2.5	55.0	
	55	BECOMING 2.5YR5/4, REDDISH BROWN, AT 57 FEET, MOTTLED WITH LIGHT GRAY, CALICHE CEMENT					1.25	2.5	57.5	55
BASE OF UNIT 5	59.5						1.25	2.5	60.0	WSTF-SB02-2059 QA/QC MS & MSD
	60	SILTY SAND: 5YR5/4, REDDISH BROWN, MEDIUM DENSE, FINE TO MEDIUM GRAINED, POORLY GRADED, VERY LOOSE AT 62.5 FEET, APPROX. 20% SILT	SM				1.25	1.5	62.5	60
BASE OF UNIT 6	64.0						1.25	2.5	65.0	WSTF-SB02-2064 WSTF-SB02-2065
UNIT 7	65	LEAN CLAY: MOTTLED 2.5YR5/4, REDDISH BROWN, AND 2.5Y6/2, LIGHT BROWNISH GRAY, HARD, 5% CALICHE NODULES, 15% SILT, NO PLASTICITY, ROOT MOLDS, AND ROOT MOLDS WHICH APPEAR TO BE FILLED WITH CALICHE, THIN SAND LENSES					1.25	2.5	67.5	65
	70						1.25	2.5	70.0	70

CME CONTINUOUS AUGER SAMPLER	WATER TABLE (TIME OF BORING)
STANDARD PENETRATION TEST	LABORATORY TEST LOCATION
UNDISTURBED SAMPLE	PENETROMETER (TONS/SQ. FT.)
WATER TABLE (24 HOURS)	NR: NO RECOVERY

JOB NAME/NUMBER **WHITE SANDS MISSILE RANGE TEMP. TEST FACILITY**

BORING NUMBER **WSTF-SB02**

DATE DRILLED 3/15/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY D.J.K. DRAWING NO. 95038812
DRAWN BY: RML PAGE 2 OF 3

BORING RECORD

GEOLOG. UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FID SOIL GAS PPM x 10 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:								BACKGROUND OVM READING SOIL 1.5 PPM AIR: 1.5 PPM
	70	SAME AS ABOVE	CL				1.0	2.5	72.5	70
BASE OF UNIT 7	72.5	SILTY SAND: 7.5YR4/6, STRONG BROWN, FINE GRAINED, SOFT TO MEDIUM DENSE, POORLY GRADED, UNIFORM TEXTURE	SM				1.0	2.5	75.0	WSTF-SB02-2072
	75						1.25	2.5	77.5	75
BASE OF UNIT 8	78.0	LEAN CLAY: 2.5YR5/4, REDDISH BROWN, SOFT TO MEDIUM STIFF, 30% SILT, CALICHE NODULES (40MM) 1% LOW PLASTICITY	CL				1.0	2.5	80.0	WSTF-SB02-2078 WSTF-SB02-2079
UNIT 9	80						1.0	2.5	82.5	80
	82.5	TOTAL DEPTH: 82.5 FEET								
	85									85
	90									90
	95									95
	100									100
	105									105

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

JOB NAME/NUMBER **WHITE SANDS MISSILE RANGE TEMP. TEST FACILITY**

BORING NUMBER **WSTF-SB02**

DATE DRILLED 3/15/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS..
LOGGED BY L.L.W.
CHECKED BY D.J.K.
DRAWN BY: RML

DRAWING NO. 95038B12

BORING RECORD

GEOLOG. UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FID SOIL GAS PPM x 1.0 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:								BACKGROUND DYM READING SOIL: 2.2 PPM AIR: 2.2 PPM
	0	POORLY GRADED SAND: 10YR4/6, DARK YELLOWISH BROWN, LOOSE, FINE TO MEDIUM GRAINED WITH ~ 1% COARSE SAND, MOIST	SP				1.25	2.0	5.0	0
	5	BECOMING WELL GRADED SAND, 10YR6/6, BROWNISH YELLOW, FINE TO COARSE GRAINED, 5% GRAVEL (5MM)	SW				1.25	1.5	10.0	5 WSTF-SB03-2010
BASE OF UNIT 1	10 10.5	LEAN CLAY WITH SAND: 7.5YR 5/4, BROWN, STIFF, LOW PLASTICITY, 20% FINE GRAINED SAND	CL				1.4	1.0	15.0	10
	15						1.2	2.0	20.0	15
BASE OF UNIT 2	20 21.0	GRADING TO CLAYEY SAND AT 20 FEET								20 WSTF-SB03-2021 GT
UPPER UNIT 3		WELL GRADED SAND: 7.5YR5/6, STRONG BROWN, DENSE TO MEDIUM DENSE, FINE TO COARSE GRAINED, CALICHE CEMENT AND NODULES CEMENT AND NODULES	SW				1.2	2.5	25.0	
	25						1.2	2.5	30.0	25
	30	WITH ABUNDANT CALICHE NODULES AND CEMENT AT 30 FEET					1.2	2.5	32.5 35.0	30
	35									35

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

WHITE SANDS MISSILE RANGE
JOB NAME/NUMBER **TEMP. TEST FACILITY**

BORING NUMBER **WSTF-SB03**

DATE DRILLED 3/15-16/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY D.K.L. DRAWING NO. 95038813
DRAWN BY: RML PAGE 1 OF 3

ROBERTS/SCHORNICK
& ASSOCIATES, INC.
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(405) 321-3895

BORING RECORD

GEOLOG. UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FID SOIL GAS PPM x 1.0 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:								BACKGROUND OVM READING SOIL: 2.0 PPM AIR: 2.0 PPM
BASE OF UPPER UNIT 3	35	SAME AS ABOVE	SW					2.5		35
	36.5	POORLY GRADED SAND: 10YR5/6, YELLOWISH BROWN, LOOSE TO MEDIUM DENSE, FINE TO MEDIUM GRAINED, WITH 1% GRAVEL (5MM), MOIST	SP				4.0		40.0	
	40							2.5		40
							2.0		45.0	
	45							2.5		45
							2.0		50.0	
	50							2.0		50
BASE OF LOWER UNIT 3							1.25		52.5	
	53.0	SANDY LEAN CLAY: 5YR6/4, REDDISH YELLOW, STIFF TO VERY STIFF, LOW PLASTICITY, 30% SILT/FINE GRAINED SAND, MOIST, CALICHE CEMENT AND NODULES 10%	CL				1.1	2.5		WSTF-SB03-2053
	55								55.0	55
							1.1	2.5		
									57.5	
							1.1	2.5		
BASE OF UNIT 5		BECOMING HIGHLY PLASTIC	CH						60.0	WSTF-SB03-2060 GT
	60	POORLY GRADED SAND: 5YR6/4, LIGHT REDDISH BROWN, LOOSE TO MEDIUM DENSE, FINE GRAINED, 20% SILT AND CLAY AT BASE	SP-SM				1.1	1.0		60
									62.5	
BASE OF UNIT 6								2.0		WSTF-SB03-2063 QA/QC
	63.5	LEAN CLAY W/ SAND: 5YR6/4, LIGHT REDDISH BROWN, STIFF TO VERY STIFF, 20% SILT/FINE SAND, 5% CALICHE NODULES	MH/CL				1.1		65.0	WSTF-SB03-2065 GT
	65									65
								2.0		
		SILT FROM 65 TO 67'					1.1		67.5	
								2.5		
BASE OF UNIT 7		BECOMING ELASTIC AT 69'					1.1		70.0	WSTF-SB03-2070
	70									70

CME CONTINUOUS AUGER SAMPLER

STANDARD PENETRATION TEST

UNDISTURBED SAMPLE

WATER TABLE (24 HOURS)

WATER TABLE (TIME OF BORING)

LABORATORY TEST LOCATION

PENETROMETER (TONS/SQ. FT.)

NR: NO RECOVERY

JOB NAME/NUMBER **WHITE SANDS MISSILE RANGE TEMP. TEST FACILITY**

BORING NUMBER **WSTF-SB03**

DATE DRILLED 3/15-16/95

DRILLING METHOD HSA

DRILLED BY STEWART BROS.

LOGGED BY L.L.W.

CHECKED BY D.K.L.

DRAWING NO. 95038813

DRAWN BY: RML

BORING RECORD

GEOLOG. UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FID SOIL GAS PPM x 1.0 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:								BACKGROUND OVM READING SOIL 0.0 PPM AIR: 0.0 PPM
	70	CLAYEY SAND: 5YR6/4, LIGHT REDDISH BROWN, MEDIUM DENSE TO DENSE, 30% CLAY/SILT, 70% FINE GRAINED SAND	SC				1.0	2.5	72.5	70
BASE OF UNIT 8 UNIT 9	73.0	LEAN CLAY: 5YR5/4, REDDISH BROWN, VERY STIFF, LOW TO NO PLASTICITY, 15% SILT, 1% CALICHE NODULES NO CALICHE NODULES	CL				1.1		75.0	WSTF-SB03-2073 WSTF-SB03-2074 GT
	75						1.0	2.5	77.5	75
							1.0	2.5	80.0	
	80	TOTAL DEPTH: 80.0 FEET								80
	85									85
	90									90
	95									95
	100									100
	105									105

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

JOB NAME/NUMBER **WHITE SANDS MISSILE RANGE TEMP. TEST FACILITY**

BORING NUMBER **WSTF-SB03**

DATE DRILLED 3/15-16/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS..
LOGGED BY L.L.W.
CHECKED BY D.K.L.
DRAWN BY: RWL

DRAWING NO. 95038813
PAGE 3 OF 3

BORING RECORD

GEOLOG. UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FID SOIL GAS PPM x 1.0 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	SAMPLE FID READING	SAMPLE RECOVERY	SAMPLE DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:								BACKGROUND DWM READING SOIL: 1.0 PPM AIR: 1.0 PPM
	0 / 0.5	GRAVEL: FILL	FILL					1.5	1.0	0
		POORLY GRADED SAND: 7.5YR4/4, BROWN, LOOSE, FINE TO MEDIUM GRAINED	SP						5.0	
	5	WITH 1/2% GRAVEL AT 5 FEET (5MM)						2.0	10.0	5
	10	BECOMING 7.5YR7/4, PINK WITH 3% GRAVEL AT 11 FEET (5-10MM) VERY LOOSE, WELL GRADED	SW					2.0	15.0	10
BASE OF UNIT 1	15							2.0		15 WSTF-SB04-2016 QA/QC MS & MSD
	16.5	LEAN CLAY: 7.5YR5/6, STRONG BROWN, 80 FEET, LOW PLASTICITY, 25 % SILT,	CL						20.0	
	20	WITH 3% GRAVEL (5-10MM) AT 20 FEET						5.0		20
		WITH 1% CALICHE NODULES AT 22 FEET								
BASE OF UNIT 2		WITH 7% COARSE SAND AND FINE GRAVEL (5MM) AT 24 FEET							25.0	WSTF-SB04-2025
UPPER UNIT 3	25	WELL GRADED SAND: 7.5YR5/6, STRONG BROWN, LOOSE TO MEDIUM DENSE, FINE TO COARSE GRAINED, 10% SILT, WITH 5% GRAVEL (UP TO 30MM) 1/2% CALICHE NODULES	SW					2.5	30.0	25
	30	BECOMING 7.5YR7/4, PINK AT 32 FEET, LOOSE, FINE TO MEDIUM GRAINED, CALICHE NODULES, 20MM DIAMETER						3.5	35.0	30
	35									35

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

WHITE SANDS MISSILE RANGE
JOB NAME/NUMBER **TEMP. TEST FACILITY**

BORING NUMBER **WSTF-SB04**

DATE DRILLED 3/23/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY D.J.K.
DRAWING NO. 95038814
DRAWN BY: RML
PAGE 1 OF 3

ROBERTS/SCHORNICK
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(405) 321-3895

BORING RECORD

GEOLOG. UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FID SOIL GAS PPM x 1.0 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	SAMPLE FID READING	SAMPLE RECOVERY	SAMPLE DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:								BACKGROUND OVM READING SOIL 1.2 PPM AIR: 1.2 PPM
	35	SAME AS ABOVE	SW					2.5	37.5	35
								2.5	40.0	
	40							2.5	42.5	40
BASE OF UPPER UNIT 3	42.5	POORLY GRADED SAND: 10YR5/8, YELLOWISH BROWN, DENSE, FINE TO COARSE GRAINED, WITH 1% GRAVEL (5-10MM) WITH 3% GRAVEL (5MM) AND VERY LOOSE AT 45.0	SP					2.5	45.0	
	45							2.5	47.5	45
								2.5	50.0	
	50							1.0	52.5	50
								2.5	55.0	
BASE OF LOWER UNIT 3	55							2.5		55
UNIT 4	56.0	SILT: 10YR6/4, LIGHT YELLOWISH BROWN, DENSE, 10% CLAY, 10% COARSE AND MEDIUM SAND, ROOT MOLDS	ML							WSTF-SB04-2056
	57.0	LEAN CLAY/SILT: 7.5YR5/6, STRONG BROWN, DENSE, STIFF, 50% SILT, 50% CLAY	ML/CL					2.5	57.5	WSTF-SB04-2057 CT
UNIT 5								2.5	60.0	
	60	SILTY SAND: 7.5YR5/6, STRONG BROWN, DENSE, FINE TO MEDIUM GRAINED, POORLY GRADED, 20% SILT	SM					2.5	62.5	60
UNIT 6	62.0	LEAN CLAY: 7.5YR6/4, LIGHT BROWN, MOTTLED WITH WHITE CALICHE CEMENT AND NODULES, 15% SILT, 10% CALICHE NODULES, ROOT MOLDS 1% CALICHE AT 65 FEET	CL							WSTF-SB04-2062
UNIT 7								2.5	65.0	WSTF-SB04-2063
	65							2.5	67.5	65
		68-69.5 SILT 10YR7/2, LIGHT GRAY						2.5	70.0	
	70	69.5-70.0 HARD CALICHE LAYER								70

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

JOB NAME/NUMBER **WHITE SANDS MISSILE RANGE TEMP. TEST FACILITY**

BORING NUMBER **WSTF-SB04**

DATE DRILLED 3/23/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY D.J.K.
DRAWING NO. 95038B14
DRAWN BY: RML
PAGE 2 OF 3

BORING RECORD

GEOLOG. UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FID SOIL GAS PPM x 10 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	SAMPLE FID READING	SAMPLE RECOVERY	SAMPLE DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:								BACKGROUND OVM READING SOIL: 1.0 PPM AIR: 1.0 PPM
	70	SAME AS ABOVE 71 FEET, CLAYEY SILT	CL					0.5	75.0	WSTF-SB04-2071
BASE OF UNIT 7	75	SILTY SAND: 10YR6/4, LIGHT YELLOWISH BROWN, VERY LOOSE, FINE GRAINED, 20% SILT	SM					2.0	77.5	
UNIT 8	78.5							2.5		WSTF-SB04-2078
UNIT 9		LEAN CLAY: 7.5YR5/4, BROWN, STIFF, VERY STIFF, NO PLASTICITY, WAXEY APPEARANCE	CL						80.0	WSTF-SB04-2079
	80	TOTAL DEPTH: 80.0 FEET								
	85									
	90									
	95									
	100									
	105									

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

JOB NAME/NUMBER **WHITE SANDS MISSILE RANGE TEMP. TEST FACILITY**

BORING NUMBER **WSTF-SB04**

DATE DRILLED 3/23/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS..
LOGGED BY L.L.W.
CHECKED BY D.J.K.
DRAWN BY: RML
DRAWING NO. 95038814
PAGE 3 OF 3

BORING RECORD

GEOLOG UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FID SOIL GAS PPM x 1.0 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:								BACKGROUND OVM READING SOIL: 1.5 PPM AIR: 1.5 PPM
	0	WELL GRADED SAND: 10YR4/6, DARK YELLOWISH BROWN, LOOSE, FINE TO COARSE GRAINED, WITH 2% GRAVEL (5MM)	SW				1.5	1.4	5.0	0
	5	WITH 7% GRAVEL (UP TO 10MM), VERY LOOSE, AT 5 FEET, 10YR5/6, YELLOWISH BROWN, WELL GRADED					1.7	1.0	10.0	5
	10	WITH 10% GRAVEL (UP TO 40MM)					1.7	2.0	15.0	10
BASE OF UNIT 1	15	BECOMING SILTY SAND: 10YR5/6, YELLOWISH BROWN, VERY LOOSE, FINE TO COARSE GRAINED, WELL GRADED	SM					2.5		15 WSTF-SB05-2017
BASE OF UNIT 2	17.0 20	LEAN CLAY: 10YR4/6, DARK YELLOWISH BROWN, STIFF, 20% SILT, MOIST	CL				1.5		20.0	20 WSTF-SB05-2021
UPPER UNIT 3	21.0	CLAYEY SAND: 5YR4/6, YELLOWISH RED, LOOSE, FINE TO COARSE GRAINED, 1% GRAVEL (UP TO 30MM) 20% CLAY.	SC				1.5	1.5	25.0	
	25	BECOMING SILTY SAND: 7.5YR6/6, REDDISH YELLOW, FINE TO MEDIUM GRAINED, WITH 1% GRAVEL (5MM) 15% SILT	SM				1.5	1.0	30.0	25
	30	CALICHE NODULES AND CEMENT AT 31 FEET					1.5	1.0	35.0	30
	35									35

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

WHITE SANDS MISSILE RANGE
JOB NAME/NUMBER **TEMP. TEST FACILITY**

BORING NUMBER **WSTF-SB05**

DATE DRILLED 3/26/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY D.J.K. DRAWING NO. 95038B15
DRAWN BY: RML PAGE 1 OF 3

BORING RECORD

GEOLOG. UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG
		Start: Stop: GROUND SURFACE:		
BASE OF UPPER UNIT 3	35	POORLY GRADED SAND: 7.5YR6/6, REDDISH YELLOW, LOOSE TO DENSE, FINE TO MEDIUM GRAINED, SOME COARSE GRAINS, WITH 1% GRAVEL (5 TO 10MM), 10% CALICHE NODULES	SP	
	39.0	WELL GRADED SAND: 7.5YR5/4, BROWN, DENSE, FINE TO COARSE GRAINED, WITH 5% GRAVEL (5 TO 10MM)	SW	
	40	BECOMING VERY LOOSE AT 42.5, 10% SILT 10% GRAVEL (5-15MM) 47.5 TO 49 FEET		
	45			
	50			
BASE OF LOWER UNIT 3	54.0	SILTY SAND: 10YR6/6, BROWNISH YELLOW, VERY LOOSE, FINE GRAINED, 30% SILT	SM	
UNIT 6	55			
UNIT 7	55.7	SANDY LEAN CLAY: 7.5YR5/6, STRONG BROWN, MOTTLED WITH WHITE, CALICHE CEMENT AND NODULES, 35% SILT/FINE GRAINED SAND, ROOT MOLDS AT 57.5 FEET, SOFT TO HARD	CL	
	60			
	65	BECOMING MOTTLED 2.5Y6/3 LIGHT YELLOWISH BROWN, WITH 5YR6/4, LIGHT REDDISH BROWN		
	70			

FID SOIL GAS PPM x 1.0: 2 4 6 8 10 12 14 16 18

SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
				BACKGROUND OVM READING SOIL: 1.5 PPM AIR: 1.5 PPM
	2.0	2.5	37.5	
	2.0	2.5	40.0	
	2.5	2.5	42.5	
	2.5L	2.5	45.0	
	3.5	2.0	47.5	
	2.75		50.0	
	2.75	2.0	52.5	
	2.75		55.0	WSTF-SB05-2054 QA/QC MS/MSD WSTF-SB05-2055 WSTF-SB05-2056
	2.5	2.5	57.5	
	2.0	2.5	60.0	
	2.0		62.5	
	2.0	2.5	65.0	
	2.5	2.5	67.5	
	2.0	2.5	70.0	

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

JOB NAME/NUMBER **WHITE SANDS MISSILE RANGE TEMP. TEST FACILITY**

BORING NUMBER **WSTF-SB05**

DATE DRILLED 3/26/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY D.J.K. DRAWING NO. 95038B15
DRAWN BY: RML PAGE 2 OF 3

BORING RECORD

GEOLOG UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FID SOIL GAS PPM x 1.0 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
		Start: Stop:								BACKGROUND OVM READING SOIL: 1.5 PPM AIR: 1.5 PPM
BASE OF UNIT 7		GROUND SURFACE:								
	70									70
	70.5	SAME AS ABOVE	CL					2.5		
		POORLY GRADED SAND/SILTY SAND: 10YR6/4, LIGHT YELLOWISH BROWN, SILT OR FINE GRAINED SAND TO MEDIUM GRAINED SAND, VERY LOOSE BECOMING INTERBEDDED WITH SILTY CLAY, 5YR5/4, REDDISH BROWN	SP				2.25		72.5	
BASE OF UNIT 8							2.0	2.5	75.0	WSTF-SB05-2070
	75									75
UNIT 9		LEAN CLAY: 5YR5/3, REDDISH BROWN, HARD, LOW TO NO PLASTICITY, FEW CALICHE NODULES	CL				5.0	2.5	77.5	WSTF-SB05-2075 WSTF-SB05-2076
	77.5	TOTAL DEPTH: 77.5 FEET								
	80									80
	85									85
	90									90
	95									95
	100									100
	105									105

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

WHITE SANDS MISSILE RANGE
JOB NAME/NUMBER **TEMP. TEST FACILITY**

BORING NUMBER **WSTF-SB05**

DATE DRILLED 3/26/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY D.J.K. DRAWING NO. 95038B15
DRAWN BY: RML PAGE 3 OF 3

BORING RECORD

GEOLOG UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FID SOIL GAS PPM x 1.0 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:								BACKGROUND OVM READING SOIL: 1.0 PPM AIR: 1.0 PPM
	0	GRAVEL: FILL	FILL							0
	0.5	POORLY GRADED SAND: 7.5YR3/3, DARK BROWN, FINE TO MEDIUM GRAINED, LOOSE, WITH 1% GRAVEL (5-10MM)	SP				1.0	2.0	5.0	
	5	BECOMING 10YR6/4, LIGHT YELLOWISH BROWN, VERY LOOSE, FINE TO COARSE GRAINED, WITH 3% GRAVEL	SW				1.0	2.3	10.0	5
	10	WITH 5% GRAVEL (15MM)					1.0	2.5	15.0	10
BASE OF UNIT 1	15						1.0	2.2	20.0	15 WSTF-SB06-2017
UNIT 2	20	LEAN CLAY W/ SAND: 5YR4/6, YELLOWISH RED, SOFT TO MEDIUM DENSE, 10% SILT, 15% FINE TO MEDIUM SAND	CL				1.0	2.5	25.0	20 WSTF-SB06-2022
UPPER UNIT 3	25	WELL GRADED SAND: 7.5YR5/6, STRONG BROWN, LOOSE, FINE TO COARSE GRAINED, WITH 5% GRAVEL, (5-10MM), 2% CALICHE NODULES	SW				1.0	2.0	30.0	25
	30						1.0	2.5	35.0	30
	35									35

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

WHITE SANDS MISSILE RANGE
JOB NAME/NUMBER **TEMP. TEST FACILITY**

BORING NUMBER **WSTF-SB06**

DATE DRILLED 3/22/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY D.J.K. DRAWING NO. 95038B16
DRAWN BY: RML PAGE 1 OF 3

BORING RECORD

GEOLOG UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:						BACKGROUND OVM READING SOIL: 1.0 PPM AIR: 1.0 PPM
	35	ONE COBBLE IN EXCESS OF 0.3 FEET DIAMETER	SW		1.0	2.4	40.0	
	40	1/2% CALICHE NODULES			1.0	2.5	42.5	
BASE OF UPPER UNIT 3	43.0	WELL GRADED SAND: 10YR5/6, YELLOWISH BROWN, LOOSE FINE TO COARSE GRAINED, WITH 3% GRAVEL (UP TO 10MM)	SW		1.0		45.0	
	45				1.0	2.5	47.5	
	50				1.0		50.0	
					1.0	2.0	52.5	
					1.0	2.5	55.0	
BASE OF LOWER UNIT 3	55	BECOMING SILTY, INCREASE IN COARSE SAND TO 7% AT 57 FEET	SM		1.0	2.5	57.5	WSTF-SB06-2057
UNIT 5	57.0	LEAN CLAY: 10YR7/3, VERY PALE BROWN, STIFF, 20% SILT, NO PLASTICITY, 5YR5/4, REDDISH BROWN AT 58 FEET	CL		1.0	2.5	60.0	WSTF-SB06-2060
UNIT 6	60	POORLY GRADED SAND: 5YR5/6, YELLOWISH RED, MEDIUM DENSE, FINE GRAINED	SP					WSTF-SB06-2061 WSTF-SB06-2062
UNIT 7	61.0	LEAN CLAY: 7.5YR7/4, PINK, VERY STIFF, 10% CALICHE NODULES AND 10-15% SILT, ROOT MOLDS	CL		1.0		62.5	
	65	Mn NODULES AT 65 FEET			1.0	2.5	65.0	
					1.0	2.5	67.5	
	70				1.0	0.0	70.0	

FID SOIL GAS PPM x 1.0: 2 4 6 8 10 12 14 16 18

GRAPHIC LOG

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

JOB NAME/NUMBER **WHITE SANDS MISSILE RANGE TEMP. TEST FACILITY**

BORING NUMBER **WSTF-SB06**

DATE DRILLED 3/22/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY D.J.K.
DRAWING NO. 95038816
DRAWN BY: RML
PAGE 2 OF 3

BORING RECORD

GEOLOG UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FID SOIL GAS PPM x 10 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	SAMPLE FID READING	SAMPLE RECOVERY	SAMPLE DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:								BACKGROUND OVM READING SOIL: 1.0 PPM AIR: 1.0 PPM
	70	SAME AS ABOVE	CL				1.0	2.5	72.5	70
BASE OF UNIT 7	73.0	POORLY GRADED SAND: 10YR7/6, YELLOW, VERY LOOSE, FINE GRAINED	SP				1.0	2.5	75.0	WSTF-SB06-2073
BASE OF UNIT 8	75	LEAN CLAY: 7.5YR4/4, REDDISH BROWN, STIFF, NO PLASTICITY, INTERBEDDED WITH SILT, 10YR7/3, VERY PALE BROWN	CL				1.0	2.5	77.5	WSTF-SB06-2080 QA/QC 75
UNIT 9	75.8	POORLY GRADED SAND: 10YR7/6, YELLOW, VERY LOOSE, FINE GRAINED	SP				1.0	2.5	80.0	
	80	LEAN CLAY: 7.5YR5/4, BROWN, STIFF TO CRUMBLY, NO PLASTICITY, Mn NODULES IN PART, CALICHE NODULES IN PART	CL				1.0	2.5	82.5	80 WSTF-SB06-2081
	82.5	TOTAL DEPTH: 82.5 FEET								
	85									85
	90									90
	95									95
	100									100
	105									105

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

JOB NAME/NUMBER **WHITE SANDS MISSILE RANGE TEMP. TEST FACILITY**

BORING NUMBER **WSTF-SB06**

DATE DRILLED 3/22/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY D.J.K. DRAWING NO. 95038B16
DRAWN BY: RML PAGE 3 OF 3

BORING RECORD

GEOLOG. UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FID SOIL GAS PPM x 1.0 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:								BACKGROUND OVM READING SOIL: 1.75 PPM AIR: 1.75 PPM
	0	POORLY GRADED SAND: 7.5YR4/3, BROWN, LOOSE, FINE TO MEDIUM GRAINED, WITH 2% GRAVEL (5MM), MOIST	SP				2.25	2.5	5.0	0
	5	BECOMING 7.5YR5/4, BROWN, VERY LOOSE, MOIST, FINE TO MEDIUM GRAINED, WITH 1% GRAVEL (5MM)					3.0	2.5	10.0	5
	10						3.0	1.5	15.0	10
	15						1.75	2.0	20.0	15
BASE OF UNIT 1	20						1.75	2.0	25.0	20 WSTF-SB07-2017 QA/QC
UNIT 2	21.0	LEAN CLAY W/ SAND: 7.5YR5/6, STRONG BROWN, STIFF 15% FINE TO COARSE SAND, MOIST, LOW PLASTICITY	CL							WSTF-SB07-2022
UPPER UNIT 3	25	POORLY GRADED SAND: 7.5YR7/4, PINK, MOTTLED WITH WHITE CALICHE, LOOSE, FINE TO MEDIUM GRAINED, WITH 1% GRAVEL, (5–10MM), 5% CALICHE NODULES (10–15MM)	SP				3.25	2.5	30.0	25
	30	DENSE, ROOT MOLDS, GRAVEL (10 TO 30MM)					2.0	2.5	35.0	30
	35	~55% CALICHE CEMENT, DENSE LARGE COBBLE (70MM), 10% SILT								35

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

WHITE SANDS MISSILE RANGE
JOB NAME/NUMBER **TEMP. TEST FACILITY**

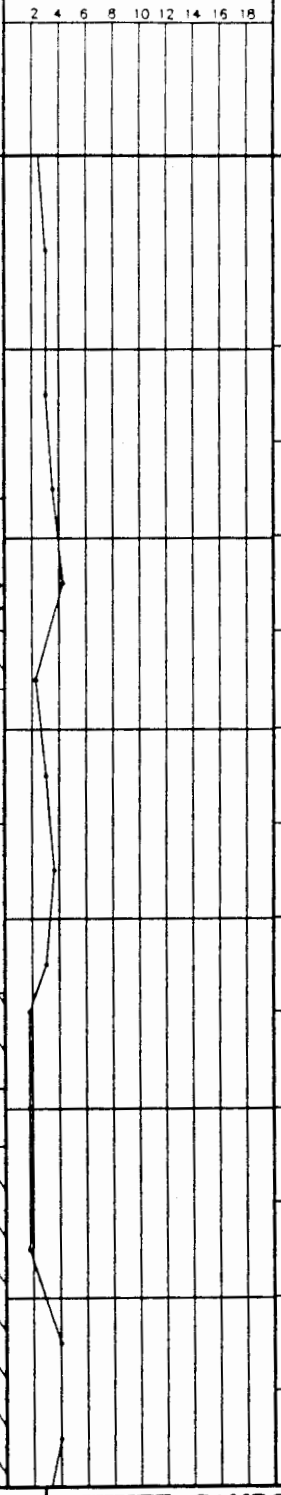
BORING NUMBER **WSTF-SB07**

DATE DRILLED 3/27/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY D.J.K. DRAWING NO. 95038817
DRAWN BY: RML PAGE 1 OF 3

BORING RECORD

GEOLOG. UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG
		Start: Stop: GROUND SURFACE:		
	35	SAME AS ABOVE	SP	
	40	BECOMING LOOSE TO DENSE, FINE TO MEDIUM GRAINED, 1% GRAVEL (5MM), 5% CALICHE NODULES		
BASE OF UPPER UNIT 3	44.0			
	45	SAND: 7.5YR 6/4, LIGHT BROWN, VERY LOOSE, 10% SILT/FINE GRAINED SAND, BECOMING WELL GRADED SAND WITH SILT, 10YR5/4, YELLOWISH BROWN, VERY LOOSE, FINE TO COARSE GRAINED, 10% SILT, 10% GRAVEL, (5M)	SW-SM	
	47.5	SANDY LEAN CLAY: 7.5YR5/4, BROWN, STIFF TO HARD, NO PLASTICITY, 35% FINE TO COARSE SAND, 1% CALICHE NODULES, FEW ROOT MOLDS	CL	
	49.0	SILTY SAND: 7.5YR6/4, LIGHT BROWN, VERY LOOSE, FINE TO MEDIUM GRAINED, 15% SILT, POORLY GRADED	SM	
	50			
	52.5	POORLY GRADED SAND: 10YR6/6, BROWNISH YELLOW, VERY LOOSE, FINE TO COARSE SAND, WITH 7% GRAVEL (5-15MM)	SP	
	55			
BASE OF LOWER UNIT 3	57.0	LEAN CLAY: 7.5YR5/4, BROWN, HARD, 15% SILT/FINE TO MEDIUM GRAINED SAND, ROOT MOLDS	CL	
BASE OF UNIT 5	59.5	POORLY GRADED SAND: 7.5YR5/6, STRONG BROWN, VERY LOOSE, FINE GRAINED SAND	SP	
UNIT 6	60			
UNIT 7	61.0	LEAN CLAY: 7.5YR5/4, BROWN, HARD, 15% SILT OR FINE GRAINED SAND TO MEDIUM GRAINED SAND MOTTLED WITH CALICHE CEMENT AND NODULES 64 FEET, 2.5YR7/2, LIGHT GRAY, LEAN CLAY WITH CALICHE NODULES AND ROOT MOLDS	CL	
	65			
	70			

FID SOIL GAS PPM x 1.0



SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
				BACKGROUND OVM READING: SOIL 1.75 PPM, AIR: 1.75 PPM
	3.0	2.5	40.0	
	3.0	2.5	42.5	
	3.5	2.5	45.0	
	4.25	1.5	47.5	
	2.25	2.5	50.0	
	3.0	2.5	52.5	
	3.6	2.0	55.0	
	3.0	2.0	57.5	WSTF-SB07-2057
	1.75	2.5	60.0	WSTF-SB07-2059
	1.75	2.5	62.5	WSTF-SB07-2060 WSTF-SB07-2061
	1.7	2.5	65.0	
	4.0	2.5	67.5	
	4.0	2.5	70.0	

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

JOB NAME/NUMBER **WHITE SANDS MISSILE RANGE TEMP. TEST FACILITY**

BORING NUMBER **WSTF-SB07**

DATE DRILLED 3/27/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY D.J.K. DRAWING NO. 95038B17
DRAWN BY: RML PAGE 2 OF 3

BORING RECORD

GEOLOG. UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FID SOIL GAS PPM x 1.0 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:								BACKGROUND OVM READING SOIL 1.75 PPM AIR: 1.75 PPM
	70	SAME AS ABOVE	CL				2.5	2.5	72.5	70
BASE OF UNIT 7	72.5	SILTY SAND: 10YR6/4, LIGHT YELLOWISH BROWN, VERY LOOSE, FINE TO MEDIUM GRAINED, 20% SILT, POORLY GRADED	SM				1.75	2.5	75.0	WSTF-SB07-2072
	75	SILT, 10YR6/4, LIGHT YELLOWISH BROWN, VERY LOOSE, 75 TO 77.5 FT.					2.0	2.0	77.5	75
BASE OF UNIT 8	78.0							2.5		WSTF-SB07-2078 WSTF-SB07-2079
UNIT 9		LEAN CLAY: 5YR5/4, REDDISH BROWN, STIFF TO HARD, WAXEY, Mn STAINING	SL				3.0		80.0	
	80	TOTAL DEPTH: 90.0 FEET								80
	85									85
	90									90
	95									95
	100									100
	105									105

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

JOB NAME/NUMBER **WHITE SANDS MISSILE RANGE TEMP. TEST FACILITY**

BORING NUMBER **WSTF-SB07**

DATE DRILLED 3/27/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY D.J.K. DRAWING NO. 95038B17
DRAWN BY: RML PAGE 3 OF 3

BORING RECORD

GEOLOG. UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FID SOIL GAS PPM x 100.0 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:								BACKGROUND OVM READING SOIL: 2.0 PPM AIR: 2.0 PPM
	0	ASPHALT:	ASPHALT							0
	0.5	SILTY SAND: 7.5YR4/4, BROWN, LOOSE, FINE TO MEDIUM GRAINED, WITH 1% GRAVEL (5MM), 15% SILT, POORLY GRADED	SM				2.1	2.5	5.0	
	5	BECOMING WELL GRADED SAND, 7.5YR4/4, BROWN, LOOSE, FINE TO COARSE, WITH 3% GRAVEL (UP TO 15MM) MOIST	SW				3.0	2.5	10.0	5
	10	BECOMING 10YR6/6, BROWNISH YELLOW, VERY LOOSE, FINE TO COARSE GRAINED, WITH 10% GRAVEL (15MM), MOIST					2.5	1.0	15.0	10
BASE OF UNIT 1	15						3.5	2.5	20.0	15 WSTF-SB08-2017 QA/QC
	17.0	SANDY LEAN CLAY: 7.5YR6/6, BROWNISH YELLOW, SOFT, 30% FINE TO COARSE SAND	CL							
BASE OF UNIT 2	20	20 TO 21.5 FT., FINE TO COARSE GRAINED SAND 21.5 FT. LEAN CLAY, 7.5YR5/6, STRONG BROWN, LOW PLASTICITY, STIFF, MOIST					2.25	2.5	25.0	20 WSTF-SB08-2025
UPPER UNIT 3	25	WELL GRADED SAND WITH GRAVEL: 5YR5/6, YELLOWISH RED, LOOSE TO DENSE, FINE TO COARSE GRAINED WITH 15% GRAVEL (UP TO 25MM), CALICHE IN PART	SW				2.0	1.3	30.0	25
	30	CALICHE CEMENT AT 32 FT.					2.5	1.5	35.0	30
	35 35.0									35

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

JOB NAME/NUMBER **WHITE SANDS MISSILE RANGE TEMP. TEST FACILITY**

BORING NUMBER **WSTF-SB08**

DATE DRILLED 3/23-24/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY D.J.K. DRAWING NO. 95038818
DRAWN BY: RML PAGE 1 OF 3

BORING RECORD

GEOLOG. UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:							BACKGROUND OVM READING SOIL: 2.0 PPM AIR: 2.0 PPM
BASE OF UPPER UNIT 3	35	POORLY GRADED SAND: 7.5YR7/4, PINK, DENSE, FINE TO MEDIUM GRAINED WITH 0.5% GRAVEL (5MM), 7% CALICHE NODULES, (UP TO 20MM)	SP			2.0	2.5	40.0	
	40	WELL GRADED SAND: 7.5YR5/4, BROWN, DENSE, FINE TO COARSE GRAINED WITH 2% GRAVEL (5MM), LOOSE AT 42.5 FT	SW			4	2.5	42.5	
						3.5		45.0	
	45					4.5	2.5	47.5	
	47.5	LEAN CLAY WITH SAND: 7.5YR5/6, STRONG BROWN, VERY STIFF, NO PLASTICITY WITH 1% GRAVEL (5-10MM), 15% FINE TO COARSE SAND	CL			2.75		50.0	
	48.5	POORLY GRADED SAND: 7.5YR5/6, STRONG BROWN, FINE TO MEDIUM GRAINED WITH 2% GRAVEL (5MM), VERY LOOSE	SP						
	50					7	1.0	52.5	
						8	2.5	55.0	
	55					100	2.5	57.5	
BASE OF LOWER UNIT 3		10YR5/6, YELLOWISH BROWN, 5% GRAVEL (UP TO 35MM) AT 57.7 FT				300	2.5	60.0	WSTF-SB08-2059 WSTF-SB08-2060
UNIT 5	59.0	LEAN CLAY: 7.5YR5/4, BROWN, MEDIUM STIFF, NO PLASTICITY, 40% SILT	CL						
UNIT 6	60	SILTY SAND: 7.5YR6/8, REDDISH YELLOW, VERY LOOSE, FINE GRAINED, POORLY GRADED, 30% SILT	SM			500	2.5	62.5	WSTF-SB08-2061 WSTF-SB08-2062
UNIT 7	61.0	SANDY LEAN CLAY: 7.5YR6/4, LIGHT BROWN, VERY STIFF, NO PLASTICITY, ROOT MOLDS, 30% FINE TO MEDIUM GRAINED SAND, 1% CALICHE NODULES 64-66 FT, 10% CALICHE NODULES, NUMEROUS ROOT MOLDS	CL			1000	2.5	65.0	
	65					60	1.0	67.5	
						900		70.0	
	70								

FID SOIL GAS PPM X 100.0 (2 4 6 8 10 12 14 16 18)

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

WHITE SANDS MISSILE RANGE
JOB NAME/NUMBER **TEMP. TEST FACILITY**

BORING NUMBER **WSTF-SB08**

DATE DRILLED 3/23-24/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY D.J.K. DRAWING NO. 95038818
DRAWN BY: RML PAGE 2 OF 3

BORING RECORD

GEOLOG. UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:							BACKGROUND OVM READING SOIL 2.0 PPM AIR: 2.0 PPM
	70	LEAN CLAY, 2.5Y6/2, LIGHT BROWNISH GRAY, HARD, NO PLASTICITY	CL		1	900	2.5	72.5	
BASE OF UNIT 7	74.0	SILTY SAND: 10YR7/3, VERY PALE BROWN, FINE TO MEDIUM GRAINED, VERY LOOSE, POORLY GRADED	SM		1	1750		75.0	WSTF-SB08-2074
	75	LEAN CLAY: 7.5YR5/4, BROWN, HARD, LOW PLASTICITY	CL		1	1300	2.0	77.5	
BASE OF UNIT 8	77.0	POORLY GRADED SAND: 10YR6/4, LIGHT YELLOWISH, BROWN, FINE TO MEDIUM GRAINED, VERY LOOSE	SM		1	1000	2.5	80.0	WSTF-SB08-2079 WSTF-SB08-2080
UNIT 9	79.0	LEAN CLAY: 7.5YR5/4, BROWN, STIFF, LOW PLASTICITY, 10% SILT	CL		1	0.0		82.5	
	82.5	TOTAL DEPTH: 82.5 FEET							

FID SOIL GAS PPM x 100.0 (2 4 6 8 10 12 14 16 18)

70 75 80 85 90 95 100 105

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

JOB NAME/NUMBER **WHITE SANDS MISSILE RANGE TEMP. TEST FACILITY**

BORING NUMBER **WSTF-SB08**

DATE DRILLED 3/23-24/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY D.J.K. DRAWING NO. 95038818
DRAWN BY: RML PAGE 3 OF 3

BORING RECORD

GEOLOG. UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:						BACKGROUND OVM READING SOIL: 3.0 PPM AIR: 3.0 PPM
	0	WELL GRADED SAND: 7.5YR5/4, BROWN, MOIST, LOOSE, FINE TO COARSE GRAINED WITH 2% GRAVEL (5 TO 10MM), 3% GRAVEL (UP TO 20MM)	SW		2.0	2.5	5.0	
	5				3.0	2.0	10.0	
	10	BECOMING 10YR6/6, BROWNISH YELLOW, VERY LOOSE, MEDIUM TO COARSE GRAINED WITH 10% GRAVEL (UP TO 20MM)			2.5	1.0	15.0	
BASE OF UNIT 1	15				2.0	2.5	20.0	WSTF-SB09-2017
UNIT 2	20	LEAN CLAY: 7.5YR5/4, BROWN, SOFT, LOW PLASTICITY, 10% SILT, MOIST	CL			2.5		WSTF-SB09-2021
UPPER UNIT 3	21.0	CLAYEY SAND: 5YR4/6, REDDISH YELLOW, LOOSE, FINE TO COARSE GRAINED WITH 2% GRAVEL (5 TO 10MM), 15% CLAY, MOIST	SC		2.0		25.0	
	25				2.0	2.0	30.0	
	30	BECOMING 7.5YR5/6, STRONG, VERY LOOSE, FINE TO COARSE GRAINED, 2% GRAVEL (5MM), 3% CALICHE, NODULES (5MM), WELL GRADED	SW		3.0	1.0	35.0	
	35							

FID SOIL GAS PPM x 1.0: 2 4 6 8 10 12 14 16 18

- CME CONTINUOUS AUGER SAMPLER
- STANDARD PENETRATION TEST
- UNDISTURBED SAMPLE
- WATER TABLE (24 HOURS)
- WATER TABLE (TIME OF BORING)
- LABORATORY TEST LOCATION
- PENETROMETER (TONS/SQ. FT.)
- NR: NO RECOVERY

JOB NAME/NUMBER **WHITE SANDS MISSILE RANGE TEMP. TEST FACILITY**

BORING NUMBER **WSTF-SB09**

DATE DRILLED 3/25/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY B.J.S. DRAWING NO. 95038B19
DRAWN BY: RML PAGE 1 OF 3

BORING RECORD

GEOLOG. UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:						BACKGROUND OVM READING SOIL: 0.0 PPM AIR: 2.0 PPM
	35	WELL GRADED SAND: 7.5YR7/4, PINK, MOTTLED WITH WHITE CALICHE NODULES AND CEMENT, LOOSE TO MEDIUM DENSE, FINE TO COARSE GRAINED. 2% GRAVEL (5 TO 10MM)	SW		2.0	1.0	40.0	35
BASE OF UPPER UNIT 3	40				1.5		45.0	40
	45	SILT: 10YR6/4, LIGHT YELLOWISH BROWN, DENSE, 1% GRAVEL (5MM), LARGE COBBLE (80MM), CALICHE NODULES, ROOT MOILDS, CALICHE CEMENT AT 47 FT.	ML		2.0	2.5	47.5	45
	50	BECOMING WELL GRADED SAND: 10YR6/4, LIGHT YELLOWISH BROWN, VERY LOOSE, FINE TO COARSE GRAINED WITH 7% GRAVEL (5 TO 50MM)	SW			1.0	52.5	50
					4.0	2.5	55.0	
BASE OF LOWER UNIT 3	55				4	2.5	57.5	55 WSTF-SB09-2057 QA/QC
UNIT 7	57.5	SILTY SAND: 7.5YR6/4, LIGHT BROWN, DENSE TO VERY DENSE, 30% SILT, FINE GRAINED SAND, FEW CALICHE NODULES (3MM), 7.5YR6/4, LIGHT BROWN	SM		2.0	2.0	60.0	WSTF-SB09-2060
	60				2.0	2.5	62.5	60
	64.0	SANDY LEAN CLAY: 10YR7/3, VERY PALE BROWN, STIFF TO HARD, 30% SILT FINE GRAINED SAND, MOTTLED WITH WHITE CALICHE, 2.5YR6/2, LIGHT BROWNISH GRAY AT 67 FT.	CL		1.75	2.5	65.0	
	65				1.5	2.5	67.5	65
	70				1.75	2.5	70.0	70

FID SOIL GAS PPM x 1.0 (2 4 6 8 10 12 14 16 18)

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

WHITE SANDS MISSILE RANGE
JOB NAME/NUMBER **TEMP. TEST FACILITY**

BORING NUMBER **WSTF-SB09**

DATE DRILLED 3/25/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY B.J.S. DRAWING NO. 95038B19
DRAWN BY: RML PAGE 2 OF 3

BORING RECORD

GEOLOG. UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:						BACKGROUND OVM READING SOIL: 0.0 PPM AIR: 2.0 PPM
BASE OF UNIT 7	70	LEAN CLAY WITH SAND: MOTTLED, 2.5YR6/3, LIGHT YELLOWISH BROWN, AND 7.5YR6/4, LIGHT BROWN, 15% SILT FINE SAND	CL		3.0	2.5	72.5	WSTF-SB09-2072
	72.5	SILT WITH SAND: 10YR7/3, VERY PALE BROWN, LOOSE, 15% FINE SAND	ML		9.0	2.5	75.0	
	73.3	LEAN CLAY: 2.5YR5/3, REDDISH BROWN, STIFF TO HARD, 0.5% CALICHE NODULES (5 TO 10MM), 0.1 FT. CALICHE LAYER AT TOP	CL					
	75	BECOMING LEAN CLAY INTERBEDDED WITH SILT AT 77.5 FT. MN STAINING AT 79 FT			15	2.5	77.5	
BASE OF UNIT 8	77.5	POORLY GRADED SAND: 10YR6/4, LIGHT YELLOWISH BROWN, VERY LOOSE, FINE TO MEDIUM GRAINED, 10% SILT	SP		0.0	0.2	79.0	WSTF-SB09-2078 WSTF-SB09-2079
UNIT 9	78.9 79.0	LEAN CLAY: 5/4, REDDISH BROWN, STIFF TO HARD, CALICHE NODULES (5MM), MN STAINING	CL					
	80	TOTAL DEPTH: 79.0 FEET						
	85							
	90							
	95							
	100							
	105							

FID SOIL GAS PPM x 10: 2 4 6 8 10 12 14 16 18

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

WHITE SANDS MISSILE RANGE
JOB NAME/NUMBER **TEMP. TEST FACILITY**

BORING NUMBER **WSTF-SB09**

DATE DRILLED 3/25/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY B.J.S.
DRAWING NO. 95038B19
DRAWN BY: RML
PAGE 3 OF 3

BORING RECORD

GEOLOG. UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FID SOIL GAS PPM x 75.0 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:								BACKGROUND OVM READING SOIL 3.0 PPM AIR: 3.0 PPM
	0	WELL GRADED SAND: 7.5YR5/3, BROWN, LOOSE, FINE TO COARSE GRAINED WITH 2% GRAVEL (5 TO 10MM)	SW				2.0	2.5	5.0	0
	5						2.0	2.0	10.0	5
BASE OF UNIT 1	10	BECOMING 10YR5/6, YELLOWISH BROWN, VERY LOOSE, FINE TO COARSE GRAINED, 3% GRAVEL (5 TO 10MM)					2.0	1.0	15.0	10 WSTF-SB10-2012 QA/QC, MS/MSD
BASE OF UNIT 2	12.0 15	LEAN CLAY WITH SAND: 5YR5/6, YELLOWISH RED, HARD, NO PLASTICITY, 15% SILT/FINE GRAINED SAND, FEW COARSE GRAINES	CL				2.25	0.0	20.0	15 WSTF-SB10-2021
UPPER UNIT 3	20 20.5	SILTY SAND: 5YR4/6, YELLOWISH RED, LOOSE WITH 1% GRAVEL (5MM), 15% SILT, SOME 2MM CALICHE NODULES, WELL GRADED	SM				2.25	1.0	25.0	20
	25	10% CALICHE NODULES AT 26.5 FT					3.5	1.3	30.0	25
	30	7.5YR6/4, LIGHT BROWN					2.0	1.0	35.0	30
	35									35

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

ROBERTS/SCHORNICK
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ENVIRONMENTAL CONSULTANTS
3700 W. ROBINSON
NORMAN, OKLAHOMA 73072
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JOB NAME/NUMBER **WHITE SANDS MISSILE RANGE TEMP. TEST FACILITY**

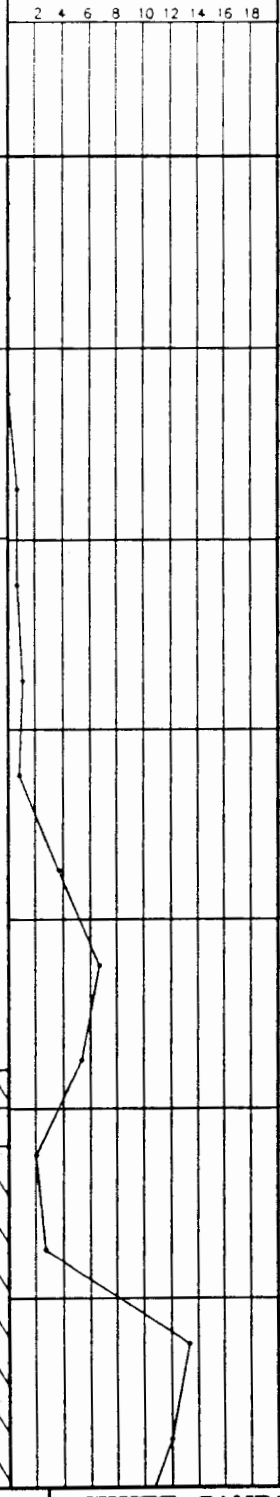
BORING NUMBER **WSTF-SB10**

DATE DRILLED 3/24&25/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY D.J.K.
DRAWN BY: RML
DRAWING NO. 95038.01 B20
PAGE 1 OF 3

BORING RECORD

GEOLOG. UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION
		Start: Stop: GROUND SURFACE:	
BASE OF UPPER UNIT 3	35–40	15–20% CALICHE NODULES AND CEMENT AT 36 FT	SM
	40–45	POORLY GRADED SAND: 7.5YR6/4, LIGHT BROWN, LOOSE TO MEDIUM DENSE, FINE TO MEDIUM GRAINED, 1% GRAVEL (5MM)	SP
	45–55	SILTY SAND: 10YR6/6, BROWNISH YELLOW, VERY LOOSE, FINE TO MEDIUM GRAINED, FEW COARSE GRAINES, 1% CALICHE NODULES DENSE FROM 48 TO 48.5 FT.	SM
BASE OF LOWER UNIT 3	55–59.0	SOME COARSE GRAVEL (40MM) AT 57 FT.	SM
UNIT 5	59.0–60	SANDY LEAN CLAY: 7.5YR6/4, LIGHT BROWN, STIFF TO HARD, FEW CALICHE NODULES, 30% SILT OR FINE GRAVEL TO MEDIUM GRAINED SAND	SL
UNIT 6	60–61.0	SILTY SAND: 7.5YR6/4, LIGHT BROWN, VERY LOOSE, FINE GRAINED, POORLY GRADED	SM
UNIT 7	61.0–70	LEAN CLAY WITH SAND: 5YR6/4, LIGHT REDDISH BROWN, STIFF TO HARD WITH 2% GRAVEL (5 TO 10MM), 20% FINE TO COARSE SAND, CALICHE NODULES, ROOT MOLDS AT 62 FT.	CL

GRAPHIC LOG



SAMPLE NUMBER	FID READING	RECOVERY	DEPTH
	2.0	2.5	37.5
	3.0	2.5	40.0
	2.25	2.5	42.5
	50	2.5	45.0
	50	2.5	47.5
	80	2.0	50.0
	60	2.5	52.5
	275	2.5	55.0
	500	2.5	57.5
	400	2.5	60.0
	150	2.5	62.5
	200	2.5	65.0
	1000	2.5	67.5
	900	2.5	70.0

REMARKS

BACKGROUND OVM READING
SOIL: 0.0 PPM
AIR: 0.0 PPM

WSTF-SB10-2059
WSTF-SB10-2060
WSTF-SB10-2061
WSTF-SB10-2062

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

JOB NAME/NUMBER **WHITE SANDS MISSILE RANGE TEMP. TEST FACILITY**

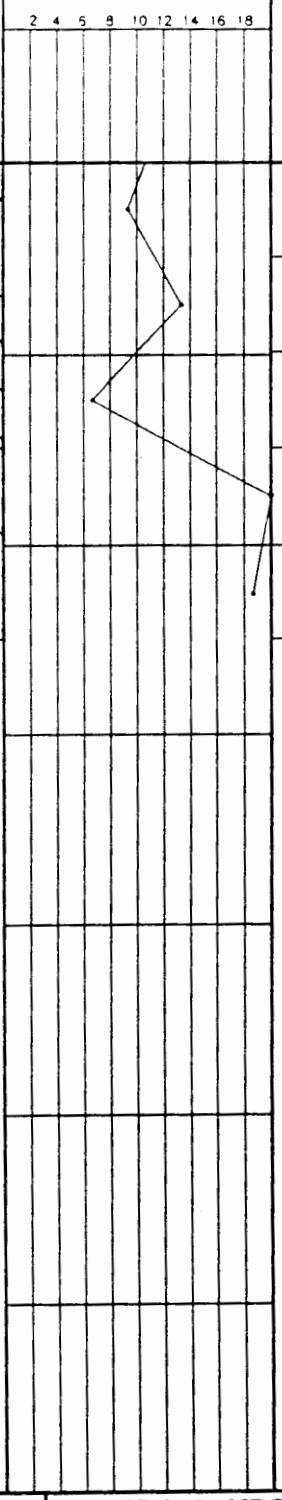
BORING NUMBER **WSTF-SB10**

DATE DRILLED 3/24&25/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY D.J.K.
DRAWN BY: RML
DRAWING NO. 95038.01 B20
PAGE 2 OF 3

BORING RECORD

GEOLOG. UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG
		Start: Stop: GROUND SURFACE:		
BASE OF UNIT 7	70	2.5YR6/3, LIGHT YELLOWISH BROWN, ROOT MOLDS AT 65 FT		
	71.0	SILTY SAND: 2.5YR7/3, PALE YELLOW, LOOSE, FINE GRAINED, 30% SILT	SM	
	73.5	LEAN CLAY: MOTTLED 5YR6/6, REDDISH YELLOW AND 5YR8/2, PINKISH WHITE, STIFF, 15% SILT INTERBEDDED WITH SILTY SAND, 2.5YR7/3, PALE YELLOW, LOOSE, FINE GRAINED	CL&SM	
BASE OF UNIT 8	75			
UNIT 9	77.5	CLAYEY SAND/LEAN CLAY: 7.5YR6/3, LIGHT BROWN, FINE TO MEDIUM GRAINED SAND, 45 TO 55% CALICHE NODULES (UP TO 60MM)	SC/CL	
	80			
	82.5	TOTAL DEPTH: 82.5 FEET		
	85			
	90			
	95			
	100			
	105			

FID SOIL GAS PPM x 75.0



SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
1	700	1.0	72.5	WSTF-SB10-2071
1	1000	2.5	75.0	WSTF-SB10-2073
1	500	0.5	77.5	WSTF-SB10-2078
1	1500	1.5		
	1400	2.5	82.5	

BACKGROUND OVM READING
SOIL: 0.0 PPM
AIR: 0.0 PPM

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

JOB NAME/NUMBER **WHITE SANDS MISSILE RANGE TEMP. TEST FACILITY**

BORING NUMBER **WSTF-SB10**

DATE DRILLED 3/24&25/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY D.J.K.
DRAWING NO. 95038.01 B20
DRAWN BY: RML
PAGE 3 OF 3

BORING RECORD

GEOLOG UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:							BACKGROUND OVM READING SOIL: 0.0 PPM AIR: 1.5 PPM
	0	POORLY GRADED SAND: 7.5YR5/4, BROWN, VERY LOOSE, FINE TO MEDIUM GRAINED, WITH 1% GRAVEL (5MM)	SP			1.5	2.5	5.0	0
	5	BECOMING 10YR6/6, BROWNISH YELLOW AT 5 FT				1.5	1.0	10.0	5
	10	BECOMING WELL GRADED SAND, 7.5YR4/6, STRONG BROWN, VERY LOOSE, FINE TO COARSE GRAINED WITH 3% GRAVEL (5 TO 10MM) AT 10 FT	SW			1.5	2.0	15.0	10 WSTF-SB11-2016 MS/MSD
BASE OF UNIT 1	15						2.0		15 WSTF-SB11-2017
UNIT 2	16.0 17.0	LEAN CLAY: 7.5YR5/6, STRONG BROWN, HARD, LOW PLASTICITY, ROOT MOLDS, 30% SILT CLAYEY SILTY SAND: 2.5YR4/6, RED, LOOSE, 20% CLAY, 20% SILT, 1/2% CALICHE NODULES (3MM)	CL SC-SM			1.5		20.0	
UPPER UNIT 3	20	BECOMING WELL GRADED SAND, MOTTLED 7.5YR6/4, LIGHT BROWN WITH WHITE CALICHE, DENSE, FINE TO COARSE SAND WITH 1% GRAVEL (5 TO 10MM) 30% CALICHE NODULES AT 20 FT	SW			2.5	1.0	22.5	20
						2.0	2.5	25.0	
	25					2.0	2.5	27.5	25
	30							30.0	30
	35							35.0	35

FID SOIL GAS PPM x 1.0 (2 4 6 8 10 12 14 16 18)

CME CONTINUOUS AUGER SAMPLER	WATER TABLE (TIME OF BORING)
STANDARD PENETRATION TEST	LABORATORY TEST LOCATION
UNDISTURBED SAMPLE	PENETROMETER (TONS/SQ. FT.)
WATER TABLE (24 HOURS)	NR: NO RECOVERY

JOB NAME/NUMBER **WHITE SANDS MISSILE RANGE TEMP. TEST FACILITY**

BORING NUMBER **WSTF-SB11**

DATE DRILLED 3/28/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY B.J.S. DRAWING NO. 95038821
DRAWN BY: RML PAGE 1 OF 3

BORING RECORD

GEOLOG UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FID SOIL GAS PPM x 1.0 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:								BACKGROUND OVM READING SOIL 0.0 PPM AIR 1.5 PPM
	35	LESS CALICHE (5%) LOOSE AT 22.5 BECOMING WELL GRADED SAND: 10YR6/6, REDDISH YELLOW, VERY DENSE, FINE TO COARSE GRAINED WITH 3% GRAVEL (5 TO 10MM), 3-5% CALICHE NODULES, ROOT MOLDS AT 35 FT.	SW				1.5	2.5	37.5	35
BASE OF UPPER UNIT 3							1.25	1.5	40.0	
	40	WELL GRADED SAND: 10YR6/4, LIGHT YELLOWISH BROWN, VERY DENSE, FINE TO COARSE, 5% SILT, WELL GRADED	SW				1.5	2.5	42.5	40
							1.5	2.5	45.0	
	45	BECOMING SILTY WITH 5% SILT, 5% GRAVEL (5 TO 15MM) AT 45 FT					1.5	2.5	47.5	45
							1.5	2.5	50.0	
	50						1.5	2.5	52.5	50
BASE OF LOWER UNIT 3		7.5YR7/3, PINK AT 50 FT.								WSTF-SB11-2052
UNIT 4	52.5	SANDY LEAN CLAY: 10YR6/4, LIGHT YELLOWISH BROWN, STIFF TO HARD, LOW PLASTICITY, 30% SILT AND FINE GRAINED SAND	CL				1.5	2.5		WSTF-SB11-2054
	54.0	SANDY LEAN CLAY: 7.5YR5/4, BROWN, STIFF TO HARD, LOW TO NO PLASTICITY, 30% FINE TO MEDIUM GRAINED SAND, ROOT MOLDS AND CALICHE NODULES (1%), 5% CALICHE NODULES AT 55 FT	CL				1.5	2.5	55.0	55
	57.0	CLAYEY SAND: 7.5YR6/4, LIGHT BROWN, LOOSE 40% CLAY, FINE GRAINED	ML			1	1.5	2.5	57.5	
	58.0	LEAN CLAY: 7.5YR6/4, LIGHT BROWN, HARD, 10% SILT, ROOT MOLDS, 5% CALICHE NODULES (15MM) SOME CALICHE CEMENT, TRACE OF GRAVEL (10MM)	CL			1	1.5	2.5	60.0	60
	60	60 FT., 2.5YR5/3, LIGHT OLIVE BROWN, WAXEY LAYER				1	1.5	2.5	62.5	
BASE OF UNIT 5						1	1.5	2.5	65.0	WSTF-SB11-2065
	65	SILTY WELL GRADED SAND: 10YR6/4, LIGHT BROWNISH YELLOW, VERY LOOSE, FINE TO COARSE GRAINED, 3% GRAVEL (UP TO 30MM) 10% SILT	SW			1	1.5	2.5	67.5	65 WSTF-SB11-2067
	67.0	SILTY SAND: 10YR6/4, LIGHT YELLOWISH BROWN, LOOSE, FINE GRAINED, 20% SILT	SM			1	1.5	2.5	70.0	
BASE OF UNIT 6										
BASE OF UNIT 9	69.0	LEAN CLAY: 5YR4/4, REDDISH BROWN, HARD, WAXEY LAYER Mn STAINING, 1% CALICHE	CL							WSTF-SB11-2070 QA/QC
	70									70

CME CONTINUOUS AUGER SAMPLER

STANDARD PENETRATION TEST

UNDISTURBED SAMPLE

WATER TABLE (24 HOURS)

WATER TABLE (TIME OF BORING)

LABORATORY TEST LOCATION

PENETROMETER (TONS/SQ. FT.)

NR: NO RECOVERY

WHITE SANDS MISSILE RANGE

JOB NAME/NUMBER **TEMP. TEST FACILITY**

BORING NUMBER **WSTF-SB11**

DATE DRILLED 3/28/95

DRILLING METHOD HSA

DRILLED BY STEWART BROS.

LOGGED BY L.L.W.

CHECKED BY B.J.S. DRAWING NO. 95038821

DRAWN BY: RML PAGE 2 OF 3

BORING RECORD

GEOLOG. UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FID SOIL GAS PPM x 1.0 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	SAMPLE FID READING	SAMPLE RECOVERY	SAMPLE DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:								BACKGROUND OVM READING SOIL: 2.2 PPM AIR: 1.5 PPM
UNIT 9	70	NODULES	a				1.5	2.5	72.5	70
							1.0	2.5	75.0	
	75	TOTAL DEPTH: 75.0 FEET								75
	80									80
	85									85
	90									90
	95									95
	100									100
	105									105

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

WHITE SANDS MISSILE RANGE
JOB NAME/NUMBER **TEMP. TEST FACILITY**

BORING NUMBER **WSTF-SB11**

DATE DRILLED 3/28/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY B.J.S.
DRAWN BY: RML
DRAWING NO. 95038B21
PAGE 3 OF 3

BORING RECORD

GEOLOG. UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FID SOIL GAS PPM X 150.0 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:								BACKGROUND OVM READING SOIL: 0.0 PPM AIR: 1.5 PPM
	0	ASPHALT:	FILL					2.5		0
	0.3	LEAN CLAY: 7.5YR4/3, DARK BROWN, STIFF TO HARD, LOW PLASTICITY	CL							
	2.3	SILTY SAND: 7.5YR4/6, STRONG BROWN, DENSE WITH 3% GRAVEL (5 TO 70MM), 20% SILT, WELL GRADED, FINE TO COARSE SAND.	SM				1.5		5.0	
	5							2.5		5
							2.5		10.0	
	10	BECOMING POORLY GRADED SAND, LOOSE, FINE TO MEDIUM GRAINED WITH 3% GRAVEL (5 TO 10 MM), 5% SILT AT 10 FT.								10
							2.0		15.0	
	15							2.5		15
							1.5		20.0	
BASE OF UNIT 1										WSTF-SB12-2017
	20	LEAN CLAY: 7.5YR5/6, STRONG BROWN, HARD, LOW TO NO PLASTICITY, 25% SILT	CL					2.5		20
UNIT 2										WSTF-SB12-2022
	22.0	SILTY CLAYEY SAND: 7.5YR5/6, STRONG BROWN, LOOSE, FINE TO COARSE GRAINED, 1% GRAVEL (5 TO 10MM), 10% SILT, 10% CLAY, WELL GRADED, FEW CALICHE NODULES	SM				3.5		25.0	
	25	25 FT. NO CLAY						2.5		25
UPPER UNIT 3		SOME CALICHE CEMENT AT 30 FT (10%)								
									30.0	
	30							2.5		30
							7		35.0	
	35									35

CME CONTINUOUS AUGER SAMPLER	WATER TABLE (TIME OF BORING)
STANDARD PENETRATION TEST	LABORATORY TEST LOCATION
UNDISTURBED SAMPLE	PENETROMETER (TONS/SQ. FT.)
WATER TABLE (24 HOURS)	NR: NO RECOVERY

JOB NAME/NUMBER **WHITE SANDS MISSILE RANGE TEMP. TEST FACILITY**

BORING NUMBER **WSTF-SB-12**

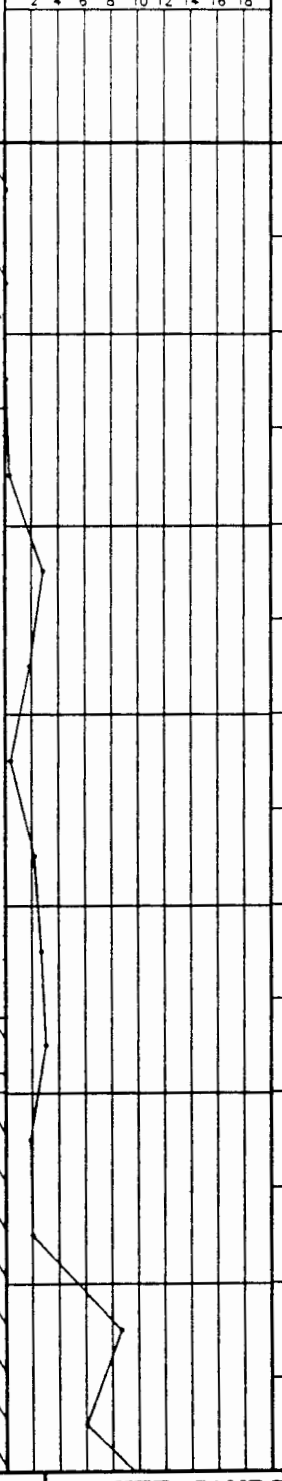
DATE DRILLED 3/28&29/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY B.J.S. DRAWING NO. 95038822
DRAWN BY: RML PAGE 1 OF 5

BORING RECORD

GEOLOG. UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION
		Start: Stop: GROUND SURFACE:	
	35	BECOMING WELL GRADED SAND, 7.5YR6/6, REDDISH YELLOW, LOOSE, FINE TO COARSE GRAINED, 1% GRAVEL (5 TO 10MM), 10% SILT, 10% CALICHE NODULES AT 35 FT.	
BASE OF UPPER UNIT 3	40	HARD CALICHE CEMENTED SAND AT 42 FT.	
	42.0	POORLY GRADED SAND WITH SILT: 7.5YR6/4, LIGHT BROWN, LOOSE, FINE TO MEDIUM GRAINED, .5% CALICHE NODULES, POORLY GRADED, 1% SILT 3% GRAVEL (5-10MM) AT 52 FT.	SP-SM
	45		
	50		
	55	BECOMING WELL GRADED SAND, 10YR5/4, YELLOWISH BROWN, VERY LOOSE, FINE TO COARSE GRAINED WITH 5-7% GRAVEL (5-25MM) WELL GRADED	
BASE OF LOWER UNIT 3	58.0	LEAN CLAY: 5YR4/6, YELLOWISH RED, HARD, 10% SILT, 10% FINE SAND, NO PLASTICITY	CL
UNIT 5	59.5	SILTY SAND: 7.5YR6/4, LIGHT BROWN, LOOSE, 20% SILT, FINE TO MEDIUM GRAINED SAND, POORLY GRADED	SP-SM
UNIT 6	60	LEAN CLAY: 5YR5/4, REDDISH BROWN, HARD, MOTTLED WITH WHITE CALICHE NODULES, NO PLASTICITY, ROOT MOLDS	CL
UNIT 7	65	5YR6/4, LIGHT REDDISH BROWN AT 61 FT Mn STAINING AT 62.5 FT.	
	70	67.5 FT MOTTLED 5YR6/4, LIGHT REDDISH BROWN, AND 2.5YR6/3, LIGHT YELLOWISH BROWN WITH Mn STAINING	

GRAPHIC LOG

FID SOIL GAS PPM x 150.0



SAMPLE NUMBER	FID READING	RECOVERY	DEPTH
	13	2.5	37.5
	11	2.5	40.0
	11	2.5	42.5
	50	2.5	45.0
	425	2.5	47.5
	275	2.5	50.0
	60.0		52.5
	325	1.5	55.0
	400	2.5	57.5
	450	2.5	60.0
	275	2.5	62.5
1	300	2.5	65.0
1	1300		67.5
1	900	2.5	70.0

REMARKS

BACKGROUND OVM READING:
SOIL: 0.0 PPM
AIR: 1.5 PPM

WSTF-SB12-2058
WSTF-SB12-2059
WSTF-SB12-2060
WSTF-SB12-2061

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

JOB NAME/NUMBER **WHITE SANDS MISSILE RANGE TEMP. TEST FACILITY**

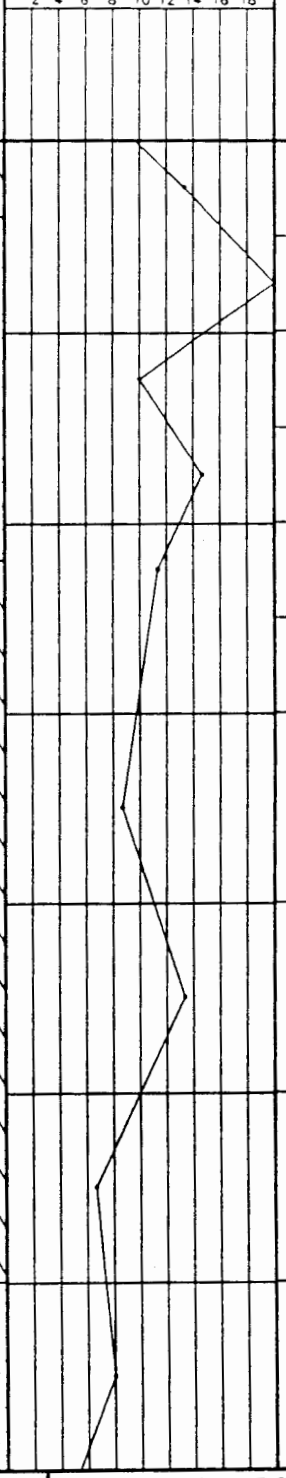
BORING NUMBER **WSTF-SB-12**

DATE DRILLED 3/28&29/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY B.J.S. DRAWING NO. 95038822
DRAWN BY: RML PAGE 2 OF 5

BORING RECORD

GEOLOG. UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG
		Start: Stop: GROUND SURFACE:		
BASE OF UNIT 7	70	AS ABOVE		
	72.0	SILTY SAND: 10YR6/4, LIGHT YELLOWISH BROWN, VERY LOOSE, FINE TO MEDIUM GRAINED, POORLY GRADED, MOIST, 2% GRAVEL (5-15MM) AT 72 FT. 10% SILT	SM	
BASE OF UNIT 8	75			
	80			
	81.0	LEAN CLAY: 7.5YR5/3, BROWN, STIFF TO VERY STIFF, CRUMBLY, Mn STAINING, WAXEY APPEARANCE, LOW TO NO PLASTICITY, MINOR AMOUNT OF CALICHE NODULES (1/2%)	CL	
	85			
	90			
	95			
BASE OF UNIT 9	100	POORLY GRADED SAND: 7.5YR5/4, BROWN, VERY LOOSE, FINE TO MEDIUM GRAINED WITH 7% SILT, GRADES TO SILTY SAND AT 7.5YR5/4	SP	
	105			

FID SOIL GAS PPM x 150.0



SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
	2000	2.5	72.5	WSTF-SB12-2072
	3000	2.5	75.0	
	1500	2.5	77.5	
	2200	2.5	80.0	WSTF-SB12-2081
	1700	2.5	82.5	WSTF-SB12-2082
		0.0	85.0	
	1300	2.5	90.0	
	2000	5.0	95.0	WSTF-SB12-2095
	1000	5.0	100.0	
	1200	3.5	105.0	WSTF-SB12-2103

BACKGROUND OVM READING
SOIL 0.0 PPM
AIR: 1.5 PPM

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

WHITE SANDS MISSILE RANGE
JOB NAME/NUMBER **TEMP. TEST FACILITY**

BORING NUMBER **WSTF-SB-12**

DATE DRILLED 3/28&29/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY B.J.S. DRAWING NO. 35038822
DRAWN BY: RML PAGE 3 OF 5

BORING RECORD

GEOLOG UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FID SOIL GAS PPM x 150.0 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:								BACKGROUND OVM READING SOIL: 0.0 PPM AIR: 1.5 PPM
Base of UNIT 10	105	AS ABOVE								105
	106.0	LEAN CLAY: 7.5YR5/3, BROWN, STIFF TO HARD, 5-10% SILT, 1% CALICHE NODULES	CL				400	5.0	110.0	
	110						300	3.0	113.0	110 WSTF-SB12-2113
BASE OF UNIT 11							0.0	0.0	115.0	
	115	SILTY SAND: 10YR7/4, VERY PALE BROWN, VERY LOOSE, FINE GRAINED, 20% SILT, POORLY GRADED	SM				40	4.0	120.0	115
BASE OF UNIT 12	120	LEAN CLAY: 7.5YR5/4, BROWN, HARD, LOW TO NO PLASTICITY, 15% SILT, 1/2% CALICHE NODULES (20MM)	CL				300	5.0	125.0	120 WSTF-SB12-2123
BASE OF UNIT 13	124.5									
	125	POORLY GRADED SAND: 10YR7/4, VERY PALE BROWN, VERY LOOSE, FINE TO MEDIUM GRAINED WITH 5% SILT	SP				350.0	2.5	130.0	125
	130	DENSE FROM 130 TO 134 FT.					80	5.0	135.0	130 WSTF-SB12-2133
BASE OF UNIT 14	134.0									
UNIT 15	135	LEAN CLAY: 7.5YR5/3, BROWN, HARD, 20% SILT, 0.1 FT. CALICHE LAYER	CL							135
		SILT: 10YR8/4, VERY PALE BROWN, SO FT. LOOSE	ML				50	1.5	140.0	
	140									140

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

JOB NAME/NUMBER **WHITE SANDS MISSILE RANGE TEMP. TEST FACILITY**

BORING NUMBER **WSTF-SB-12**

DATE DRILLED 3/28&29/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY B.J.S. DRAWING NO. 95038822
DRAWN BY: RML PAGE 4 OF 5

BORING RECORD

GEOLOG. UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FID SOIL GAS PPM x 150.0 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:								BACKGROUND OVM READING SOIL: 2.2 PPM AIR: 1.5 PPM
	140	AS ABOVE				1	30	2.0	145.0	WSTF-SB12-2142 QA/QC, MS/MSD
BASE OF UNIT 16	145	LEAN CLAY: 7.5YR5/4, BROWN, HARD, Mn STAINING ALONG POSSIBLE VERTICAL FRACTURES SUBLAMINATION AT 150 FT. 10% SAND, FINE GRAINED	CL			1	10	5.0	150.0	
UNIT 17	150					1	30	2.5	152.5	WSTF-SB12-2152
	152.5	TOTAL DEPTH: 152.5 FEET								
	155									
	160									
	165									
	170									
	175									

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

JOB NAME/NUMBER **WHITE SANDS MISSILE RANGE TEMP. TEST FACILITY**

BORING NUMBER **WSTF-SB-12**

DATE DRILLED 3/28&29/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY B.J.S.
DRAWING NO. 95038B22
DRAWN BY: RML
PAGE 5 OF 5

BORING RECORD

GEOLOG. UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FID SOIL GAS PPM x 1.0 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
		Start: Stop. GROUND SURFACE:								BACKGROUND OVM READING SOIL: 0.0 PPM AIR: 0.0 PPM
	0									0
	0.5	GRAVEL FILL	FILL							
		WELL GRADED SAND: 10YR5/4, YELLOWISH BROWN, VERY LOOSE, MOIST, FINE TO COARSE GRAINED, SURROUNDED TO ROUNDED, APPROXIMATELY 10% COARSE SANDS	SW				2.0	2.5	5.0	
	5									5
							2.0	2.0	10.0	
	10	WELL GRADED SAND: 10YR6/6, BROWNISH YELLOW, VERY LOOSE, MOIST, MEDIUM TO COARSE SAND, 2% GRAVEL (25 MM), SUBROUNDED TO ANGULAR	SW				2.0	1.0	15.0	10
	15	30% GRAVEL AT 15.5' (10MM)						3.0		15
BASE OF UNIT 1	16.5	LEAN CLAY/SANDY LEAN CLAY: 10YR4/6, DARK YELLOWISH BROWN, SOFT, MOIST, LOW PLASTICITY, SAND, FINE TO MEDIUM GRAINED, 10% SILT, 10 TO 40% SAND	CL/ML				2.0		20.0	
	20	GRADATIONAL COLOR CHANGE TO 7.5YR4/6, STRONG BROWN, 10% SILT, 20% SAND, 5YR5/6, YELLOWISH RED AT 22' BGS, NUMEROUS ROOT MOLDS					4	5.0	25.0	20
BASE OF UNIT 2	24.0									
	24.5	WELL GRADED SAND W/ GRAVEL: 5YR5/6, YELLOWISH RED, LOOSE, MEDIUM TO COARSE SAND, FINE GRAVEL, 20% GRAVEL, 80% SAND	SW							
	25	WELL GRADED SAND W/ GRAVEL : 7.5YR6/4, LIGHT BROWN, LOOSE TO MEDIUM DENSE, FINE TO COARSE GRAINED SAND, 15% GRAVEL (10 MM), CALICHE CEMENT SUBROUNDED TO ANGULAR 7.5YR5/6, STRONG BROWN AT 26.5	SW				1.5	3.4	30.0	25
UPPER UNIT 3	30						1.5	3.0	35.0	30
	35									35

CME CONTINUOUS AUGER SAMPLER	WATER TABLE (TIME OF BORING)
STANDARD PENETRATION TEST	LABORATORY TEST LOCATION
UNDISTURBED SAMPLE	PENETROMETER (TONS/SQ. FT.)
WATER TABLE (24 HOURS)	NR: NO RECOVERY

WHITE SANDS MISSILE RANGE

JOB NAME/NUMBER **TEMP. TEST FACILITY**

BORING NUMBER **WSTF-DB01**

DATE DRILLED 3/9/95 & 3/10/95

DRILLING METHOD HSA

DRILLED BY STEWART BROS.

LOGGED BY L.L.W.

CHECKED BY D.J.K. DRAWING NO. 95038801

DRAWN BY: RML PAGE 1 OF 2

BORING RECORD

GEOLOG. UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FID SOIL GAS PPM x 10 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	SAMPLE FID READING	SAMPLE RECOVERY	SAMPLE DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:								BACKGROUND OVM READING SOIL: 0.0 PPM AIR: 0.0 PPM
BASE OF UPPER UNIT 3	35	35 TO 39 FT., ABUNDANT CALICHE NODULES AND CEMENT, ROOT MOLDS	SW				1.5	4.0	40.0	35
LOWER UNIT 3	40 40.5	WELL GRADED SAND: 10YR5/6, YELLOWISH BROWN, MEDIUM DENSE TO DENSE, FINE TO COARSE GRAINED, LAMINATED IN PART AUGER REFUSAL AT 41 FT., UTILIZE CENTER BIT TO 42 FT., RE-INSTALLED SPLIT BARREL AT 42 FT.	SW				1.5	5.0	45.0	40
	45 45.4	TOTAL DEPTH: 45.4 FEET NOTE: 1. SOIL PROBE PUSHED FROM 45.4 TO 47.4 FEET BGS. 2. CONTINUOUS SAMPLER ADVANCED TO 48.4 FEET BGS. 3. SOIL SAMPLE COLLECTED FOR LAB. ANALYSIS FROM INTERVAL 47.4 TO 48.4 FEET BGS. 4. SAMPLE NO. (SOIL) WSTF-DB01-2048. 5. SOIL GAS SAMPLE WSTF-DB01-5047.								45
	50									50
	55									55
	60									60
	65									65
	70									70

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

JOB NAME/NUMBER **WHITE SANDS MISSILE RANGE TEMP. TEST FACILITY**

BORING NUMBER **WSTF-DB01**

DATE DRILLED 3/9/95 & 3/10/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY D.J.K. DRAWING NO. 95038B01
DRAWN BY: RML PAGE 2 OF 2

BORING RECORD

GEOLOG. UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FID SOIL GAS PPM x 1.0 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:								BACKGROUND OVM READING SOIL: 3.0 PPM AIR: 1.0 PPM
	0	GRAVEL: FILL	FILL							0
	0.5	POORLY GRADED SAND: 7.5YR4/4, DARK BROWN, VERY LOOSE, MOIST, FINE TO MEDIUM GRAINED, SUBROUNDED TO ANGULAR	SP				2	1.5	5.0	
	5						2	2.0	10.0	5
	10	WELL GRADED SAND W/GRAVEL: 7.5YR6/4, LIGHT BROWN VERY LOOSE, FINE TO MEDIUM GRAINED, 20% GRAVEL (10 MM), MOIST	SW				2	2.0	15.0	10
BASE OF UNIT 1	15						2	2.0	20.0	15
	16.5	SANDY LEAN CLAY W/ GRAVEL: 7.5YR5/6, STRONG BROWN, SOFT, MOIST, 15% SAND, 15% GRAVEL (20MM),	CL				2	2.0	25.0	20
BASE OF UNIT 2	20						2	2.0	30.0	
UPPER UNIT 3	25	POORLY GRADED SAND: 7.5YR6/6, REDDISH YELLOW, VERY LOOSE, MOIST, FINE TO MEDIUM GRAIN, 5% GRAVEL (UP TO 15MM)	SP				2	2.5	35.0	25
	30						2	2.0		30
	32.0	WELL GRADED SAND: 7.5YR6/6, REDDISH YELLOW, VERY LOOSE TO MEDIUM DENSE, CLAICHE CEMENT	SW				2			
	35									35

CME CONTINUOUS AUGER SAMPLER	WATER TABLE (TIME OF BORING)
STANDARD PENETRATION TEST	LABORATORY TEST LOCATION
UNDISTURBED SAMPLE	PENETROMETER (TONS/SQ. FT.)
WATER TABLE (24 HOURS)	NR: NO RECOVERY

TEMPERATURE TEST FACILITY

JOB NAME/NUMBER **TEMP. TEST FACILITY**

BORING NUMBER **WSTF-DB02**

DATE DRILLED 3/10/95

DRILLING METHOD HSA

DRILLED BY STEWART BROS.

LOGGED BY L.L.W.

CHECKED BY D.J.K. DRAWING NO. 95038B02

DRAWN BY: RML PAGE 1 OF 2

BORING RECORD

GEOLOG. UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	F.D. SOIL GAS PPM x 1.0 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
		Start: Stop: GROUND SURFACE.								BACKGROUND OVM READING SOIL 0.0 PPM AIR 4.0 PPM
	35	SAME AS ABOVE	SW				2	2.0	40.0	35
BASE OF UPPER UNIT 3	40							2.5		40
LOWER UNIT 3	41.0	WELL GRADED SAND: 7.5YR5/4, BROWN, DENSE, FINE TO COARSE GRAINED, 5% FINE GRAVEL	SW				2		45.0	
	45									45
	45.5	TOTAL DEPTH: 45.5 FEET NOTES: 1. TOTAL BORING DEPTH 45.5 FEET 2. SOIL GAS PROBE PUSHED TO 47 FEET 3. CONTINUOUS SAMPLER ADVANCED TO 48 FEET 4. COIL COLLECTED FROM INTERVAL 47 TO 48 FEET FOR LAB. ANALYSIS 5. SOIL SAMPLE NO. WSTF-DB02-2048 6. SOIL GAS SAMPLE NO. WSTF-DB02-5047								
	50									50
	55									55
	60									60
	65									65
	70									70

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

TEMPERATURE TEST FACILITY

JOB NAME/NUMBER **TEMP. TEST FACILITY**

BORING NUMBER **WSTF-DB02**

DATE DRILLED 3/10/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY D.J.K. DRAWING NO. 95038B02
DRAWN BY: RML PAGE 2 OF 3

BORING RECORD

GEOLOG. UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FID SOIL GAS PPM x 1.5 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:								BACKGROUND O.M. READING SOIL: 1.5 PPM AIR: 1.5 PPM
	0	POORLY GRADED SAND: 7.5YR4/6, STRONG BROWN, VERY LOOSE, FINE TO MEDIUM GRAINED, ~2% GRAVEL (5MM)	SP				2.0	3.8	5.0	0
	5						2.0	2.5	10.0	5
	10						2.0	0.0	15.0	10
BASE OF UNIT 1	15						2.0	2.5	20.0	15
BASE OF UNIT 2	20	SANDY LEAN CLAY: 7.5YR4/4, DARK BROWN, MEDIUM STIFF TO STIFF, 30% FINE TO MEDIUM GRAINED SAND, NO PLASTICITY, OCCASIONALLY FINE GRAVEL	CL				1.5	2.5	25.0	20
UPPER UNIT 3	25 26.0	POORLY GRADED SAND: 7.5YR5/6, STRONG BROWN, LOOSE TO VERY LOOSE, FINE TO MEDIUM GRAINED	SP				1.5	2.5	30.0	25
	30 32.0	POORLY GRADED SAND W/ SILT, SOME ANGULAR (45MM), 10-15% SILT, MINOR AMOUNT OF CALICHE NODULES, 7.5YR7/6, REDDISH YELLOW, MEDIUM DENSE TO DENSE, FINE TO MEDIUM GRAINED, WITH NUMEROUS CALICHE NODULES & CEMENT	SP-SM				1.5	2.5	35.0	30
	35									35

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

WHITE SANDS MISSILE RANGE
JOB NAME/NUMBER **TEMP. TEST FACILITY**

BORING NUMBER **WSTF-DB03**

DATE DRILLED 3/13/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY D.J.K.
DRAWN BY: RML
DRAWING NO. 95038B03
PAGE 1 OF 2

BORING RECORD

GEOLOGIC UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FID SOIL GAS PPM X 1.5 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	SAMPLE FID READING	SAMPLE RECOVERY	SAMPLE DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:								BACKGROUND OVM READING SOIL 1.5 PPM AIR 1.5 PPM
	35	POORLY GRADED SAND: 7.5YR7/6, REDDISH YELLOW, MEDIUM DENSE TO DENSE, FINE TO MEDIUM GRAINED NUMBERS CALICHE NODULES AND CEMENT	SP				1.5	2.5	40.0	35
BASE OF UPPER UNIT 3	40							2.5		40
LOWER UNIT 3	42.0	POORLY GRADED SAND: 7.5YR5/6, STRONG BROWN, LOOSE, FINE TO MEDIUM GRAINED, WITH 1% GRAVEL (UP TO 10MM), ANGULAR	SP				1.5		45.0	
	45						1.5	2.5	47.0	45
	47.3	TOTAL DEPTH: 47.3 FEET NOTES: 1. SOIL PROBE PUSHED TO 49 FEET BGS 2. CONTINUOUS SAMPLER ADVANCED TO 50 FT. BGS 3. SOIL COLLECTED FROM INTERVAL 49 TO 50 FT. FOR LABORATORY ANALYSIS 4. SOIL GAS SAMPLE NO. WSTF-DB03-5049 5. SOIL SAMPLE NO WSTF-DB03-2050								
	50									50
	55									55
	60									60
	65									65
	70									70

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

JOB NAME/NUMBER **WHITE SANDS MISSILE RANGE TEMP. TEST FACILITY**

BORING NUMBER **WSTF-DB03**

DATE DRILLED 3/13/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY D.J.K. DRAWING NO. 95038B03
DRAWN BY: RML PAGE 2 OF 2

BORING RECORD

GEOLOG. UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FID SOIL GAS PPM x 1.0 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:								BACKGROUND OVM READING SOIL 0.0 PPM AIR 0.0 PPM
	0 0.3	GRAVEL: FILL	FILL							0
		WELL GRADED SAND: 5YR4/4, REDDISH BROWN, LOOSE, MOIST, FINE TO COARSE GRAINED, 2% GRAVEL (10MM), SUBROUNDED TO ANGULAR	SW				2.0	3.0	5.0	
	5	7.5YR5/6 STRONG BROWN AT 5', VERY LOOSE					2.0	2.0	10.0	5
	10	WELL GRADED SAND: 7.5YR6/6, REDDISH YELLOW, VERY LOOSE, FINE TO COARSE GRAINED, 20% COARSE SAND, 10% GRAVEL (UP TO 30MM)	SW				2.0	0.0	15.0	10
BASE OF UNIT 1	15						2.0	2.5	20.0	15
BASE OF UNIT 2	20	SANDY LEAN CLAY W/ GRAVEL: 5YR5/8, YELLOWISH RED, STIFF, 20% SAND, 20% GRAVEL (30MM), NO PLASTICITY, CALICHE NODULES AT BASE, NUMEROUS ROOT MOLDS	CL				2.0	3.0	25.0	20
UPPER UNIT 3	25	WELL GRADED SAND: CALICHE NODULES, 7.5YR6/6, REDDISH YELLOW, LOOSE, FINE TO COARSE GRAINED, 2% GRAVEL (15MM)	SW				2.0	2.0	30.0	25
	30	ABUNDANT CALICHE CEMENT AT 30 FEET					2.0	5.0	35.0	30
	35									35

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

JOB NAME/NUMBER **WHITE SANDS MISSILE RANGE TEMP. TEST FACILITY**

BORING NUMBER **WSTF-DB04**

DATE DRILLED 3/11/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY D.J.K.
DRAWING NO. 95038804
DRAWN BY: RML
PAGE 1 OF 2

BORING RECORD

GEOLOGIC UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FID SOIL GAS PPM x 1.0 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:								BACKGROUND OVM READING SOIL: 2.0 PPM AIR: 2.0 PPM
	35	SAME AS ABOVE	SW				2.0	3.5	40.0	35
BASE OF UPPER UNIT 3	40						4.0	3.0	45.0	40
LOWER UNIT 3	41.5	POORLY GRADED SAND: 10YR6/4, LIGHT YELLOWISH, BROWN, VERY LOOSE, FINE TO COARSE GRAINED (90% FINE TO MEDIUM GRAINED), 1% FINE GRAVEL (9MM)	SP							
	45 45.2	TOTAL DEPTH: 45.2 FEET NOTES: 1. SOIL PROBE PUSHED TO 46.2 FEET BGL 2. CONTINUOUS SAMPLER ADVANCED TO 47.2 FEET BGL 3. SOIL SAMPLER COLLECTED FOR LABORATORY ANALYSIS FROM INTERVAL 46–47 FEET BGL 4. SOIL GAS SAMPLE NO. WSTF-DB04-5046 5. SOIL SAMPLE NO WSTF-DB04-2047 6. 2 PPM INCREASE OVER BACKGROUND FOR 40 TO 45 FEET								45
	50									50
	55									55
	60									60
	65									65
	70									70

CME CONTINUOUS AUGER SAMPLER	WATER TABLE (TIME OF BORING)
STANDARD PENETRATION TEST	LABORATORY TEST LOCATION
UNDISTURBED SAMPLE	PENETROMETER (TONS/SQ. FT.)
WATER TABLE (24 HOURS)	NR: NO RECOVERY

JOB NAME/NUMBER **WHITE SANDS MISSILE RANGE TEMP. TEST FACILITY**

BORING NUMBER **WSTF-DB04**

DATE DRILLED 3/11/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY D.J.K. DRAWING NO. 95038804
DRAWN BY: RML PAGE 2 OF 2

BORING RECORD

GEOLOG UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FID SOIL GAS PPM x 2.0 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:								BACKGROUND OVM READING SOIL 0.0 PPM AIR: 0.0 PPM
	0	POORLY GRADED SAND: 7.5YR4/4, BROWN, LOOSE, MOIST, FINE TO COARSE (1%) GRAINED	SP				2.0	2.0	5.0	0
	5	WELL GRADED SAND: 10YR5/6, YELLOWISH BROWN, VERY LOOSE, FINE TO COARSE GRAINED, COBBLES IN PART (0.25 FEET), FINE GRAVEL (15MM)	SW				2.0	2.0	10.0	5
	10						2.0	2.0	15.0	10
BASE OF UNIT 1	15									15
	15.5	SANDY LEAN CLAY: 5YR5/6, REDDISH BROWN, STIFF TO VERY STIFF, NO PLASTICITY, 1% GRAVEL, 30% SAND, (FINE TO COARSE GRAINED)	CL				2.0	2.0	20.0	
	20	WELL GRADED SAND W/ GRAVEL : 5YR5/6, REDDISH BROWN, LOOSE FROM 20.5 TO 20.9'					2.0	1.5	25.0	20
BASE OF UNIT 2	25						2	3.0	30.0	25
	27.8	WELL GRADED SAND: 7.5YR7/4, PINK, DENSE, FINE TO COARSE GRAINED, GRAVEL (10MM), $CaCO_3$ CEMENT (CALICHE) ABUNDANT CALICHE NODULES AT 30 FEET	SW							
UPPER UNIT 3	30						2	1.5	35.0	30
	35									35

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

JOB NAME/NUMBER **WHITE SANDS MISSILE RANGE TEMP. TEST FACILITY**

BORING NUMBER **WSTF-DB05**

DATE DRILLED 3/11/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY D.J.K. DRAWING NO. 95038B05
DRAWN BY: RML PAGE 1 OF 2

BORING RECORD

GEOLOGIC UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FIELD TEST DATA PPM x 2.2 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	SAMPLE HNU READING	SAMPLE RECOVERY	SAMPLE DEPTH	REMARKS
		Start: Stop GROUND SURFACE								BACKGROUND DVM READING SOIL 2.2 PPM AIR 2.2 PPM
	35	APPROX 1% GRAVEL AT 35 FEET, LARGE CALICHE NODULES (0.3 FEET) SAND GENERALLY FINE TO MEDIUM GRAINED	SW				2	3.0	40.0	35
BASE OF UPPER UNIT 3	40						2	0.0	45.0	40
LOWER UNIT 3	45	WELL GRADED SAND: 10YR6/4, LIGHT YELLOWISH BROWN, VERY LOOSE, FINE TO COARSE GRAINED, 1% GRAVEL (UP TO 25MM)	SW				2.0	2.5	48.5	45
	48.5	TOTAL DEPTH: 48.5 FEET NOTE: 1. SOIL PROBE PUSHED FROM 48.5 TO 51 FEET BGS 2. CONTINUOUS SAMPLER ADVANCED TO 52 FEET BGS 3. SOIL SAMPLE COLLECTED FROM 50' TO 51 FEET BGS FOR LABORATORY ANALYSIS 4. SOIL SAMPLE NO WSTF-DB05-2052 5. SOIL GAS SAMPLE NO. WSTF-DB05-5051								
	50									50
	55									55
	60									60
	65									65
	70									70

- CME CONTINUOUS AUGER SAMPLER
- STANDARD PENETRATION TEST
- UNDISTURBED SAMPLE
- WATER TABLE (24 HOURS)
- WATER TABLE (TIME OF BORING)
- LABORATORY TEST LOCATION
- PENETROMETER (TONS/SQ. FT.)
- NR: NO RECOVERY

JOB NAME/NUMBER **WHITE SANDS MISSILE RANGE TEMP. TEST FACILITY**

BORING NUMBER **WSTF-DB05**

DATE DRILLED 3/11/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY D.J.K.
DRAWN BY: PML

DRAWING NO 95038805
PAGE 2 OF 2

BORING RECORD

GEOLOG UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FID SOIL GAS PPM x 1.0 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS: BACKGROUND GAS READING SOIL 1.2 PPM AIR 1.2 PPM
		Start: Stop: GROUND SURFACE:								
	0	POORLY GRADED SAND: 7.5YR4/4, DARK BROWN, VERY LOOSE, FINE TO MEDIUM GRAINED, 1% GRAVEL (UP TO 10MM)	SP				1.0	2.0	5.0	0
BASE OF UNIT 1	5	BECOMING FINE TO COARSE GRAINED, 10% GRAVEL (20MM) WITH OCCASIONAL COBBLE (0.3 FEET)	SW				1.0	1.0	10.0	5
	10	SANDY LEAN CLAY: 7.5YR4/4, BROWN, SOFT, NO PLASTICITY, GRAVEL 5% (5-10MM), 30% SAND, FINE TO MEDIUM GRAINED	CL				1.0	2.3	15.0	10
BASE OF UNIT 2	15	SAND AND GRAVEL % DECREASE AT 17 FEET, 1% GRAVEL, 10% FINE TO MEDIUM SAND					1.0	3.0	20.0	15
UPPER UNIT 3	20 / 21.0	WELL GRADED SAND: 7.5YR5/4, BROWN, MEDIUM DENSE, FINE TO COARSE GRAINED, 3% GRAVEL (UP TO 25MM), CALICHE CEMENT IN PART	SW				1.0	1.5	25.0	20
	25						1.0	3.0	30.0	25
	30	BECOMING DENSE TO VERY DENSE AT 30 FEET, CALICHE NODULES AND CEMENT ABUNDANT, ROOT MOLDS IN PART					1.0	2.8	35.0	30
	35									35

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

WHITE SANDS MISSILE RANGE
JOB NAME/NUMBER **TEMP. TEST FACILITY**

BORING NUMBER **WSTF-DB06**

DATE DRILLED 3/13/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY D.J.K. DRAWING NO. 95038B06
DRAWN BY: RML PAGE 1 OF 2

BORING RECORD

GEOLOGIC UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FIELD DATA ppm	SAMPLE NUMBER	SAMPLE HID READING	SAMPLE RECOVERY	SAMPLE DEPTH	REMARKS
		Start: Stop GROUND SURFACE.								BACKGROUND SYM READING SOIL ___ ppm AIR ___ ppm
	35	SAME AS ABOVE	SW					2.8		35
	36.0	POORLY GRADED SAND: 7.5YR6/6, REDDISH YELLOW, VERY LOOSE, FINE TO MEDIUM GRAINED, 1-2% GRAVEL (5MM)	SP				1.0			
	39.9								39.9	
	40	TOTAL DEPTH: 39.9 FEET NOTES: 1. SOIL PROBE PUSHED TO 40.4 FEET BGS 2. CONTINUOUS SAMPLER ADVANCED TO 41.4' BGS 3. SOIL SAMPLE COLLECTED FROM 4. SOIL GAS SAMPLE NO. WSTF-DB06-5040 5. SOIL SAMPLE NO WSTF-DB06-2041								40
	45									45
	50									50
	55									55
	60									60
	65									65
	70									70

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

JOB NAME/NUMBER **WHITE SANDS MISSILE RANGE TEMP. TEST FACILITY**

BORING NUMBER **WSTF-DB06**

DATE DRILLED 3/13/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY D.J.K. DRAWING NO. 95038806
DRAWN BY: RML PAGE 2 OF 2

BORING RECORD

GEOLOG. UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FID SOIL GAS PPM X 1.0 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:								BACKGROUND DAM READING SOIL: 1.5 PPM AIR: 1.5 PPM
	0	POORLY GRADED SAND: 10YR5/6, YELLOWISH BROWN, LOOSE, MOIST, FINE TO MEDIUM GRAINED, 1% GRAVEL (UP TO 10MM)	SP				1.5	2.0	5.0	0
	5	BECOMING WELL GRADED SAND W/ GRAVEL: 10YR5/6, YELLOWISH BROWN, VERY LOOSE, FINE TO COARSE GRAINED, 20% GRAVEL (UP TO 30MM)	SW				1.5	1.5	10.0	5
BASE OF UNIT 1	10						1.5	3.0	15.0	10
	12.5	SANDY LEAN CLAY: 7.5YR5/4, BROWN, 30% SAND, (FINE TO COARSE GRAINED), VERY STIFF	CL				1.5	3.5	20.0	15
BASE OF UNIT 2	20						1.5	3.0	25.0	20
UPPER UNIT 3	21.0	WELL GRADED SAND W/ GRAVEL: 7.5YR6/6, REDDISH YELLOW, LOOSE, FINE TO COARSE GRAINED, 15% ANGULAR GRAVEL, (UP TO 15MM), CALICHE CEMENT IN PART	SW				1.5	3.0	30.0	25
	30	ABUNDANT ROOT MOLDS AND CALICHE NODULES AT 30'					1.5	3.0	35.0	30
	35									35

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

JOB NAME/NUMBER **WHITE SANDS MISSILE RANGE TEMP. TEST FACILITY**

BORING NUMBER **WSTF-DB07**

DATE DRILLED 3/12/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY D.J.K. DRAWING NO. 95038807
DRAWN BY: RWL PAGE 1 OF 2

BORING RECORD

GEOLOG UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FID SOIL GAS PPM x 1.0 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:								BACKGROUND OVM READING SOIL: 1.5 PPM AIR: 1.5 PPM
BASE OF UPPER UNIT 3	35	SAME AS ABOVE	SW				1.5	2.0	40.0	35
LOWER UNIT 3	40	POORLY GRADED SAND: 7.5YR7/3, PINK, LOOSE, FINE GRAINED SAND	SP				1.5	2.0	42.0	40
	42.0	BECOMING 10YR6/6, BROWNISH YELLOW, FINE TO COARSE GRAINED, 20% GRAVEL (UP TO 40MM) AT 42 FEET TOTAL DEPTH: 42.0 FEET NOTES: 1. SOIL PROBE PUSHED TO 42 FEET 2. CONTINUOUS SAMPLER ADVANCED TO 45 FEET FOR SOIL SAMPLE FOR LABORATORY ANALYSIS (NO RECOVERY FROM 40 TO 43 FEET) 3. SOIL SAMPLE COLLECTED FROM INTERVAL 44 TO 45 FEET 4. SOIL SAMPLE NO WSTF-DB07-2045 5. SOIL GAS SAMPLE NO. WSTF-DB07-5042								
	45									45
	50									50
	55									55
	60									60
	65									65
	70									70

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

JOB NAME/NUMBER **WHITE SANDS MISSILE RANGE TEMP. TEST FACILITY**

BORING NUMBER **WSTF-DB07**

DATE DRILLED 3/12/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY D.J.K.
DRAWN BY: RML

DRAWING NO. 95038807
PAGE 2 OF 2

BORING RECORD

GEOLOG. UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FID SOIL GAS PPM x 1.2 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:								BACKGROUND DRM READING SOIL 1.75 PPM AIR 1.75 PPM
	0	WELL GRADED SAND: 7.5YR4/6, STRONG BROWN, LOOSE, FINE TO COARSE GRAINED, 1% GRAVEL (UP TO 20MM)	SW				1.75	2.0	5.0	0
	5						1.75	1.5	10.0	5
	10						1.75	1.0	15.0	10
BASE OF UNIT 1	15 15.5	LEAN CLAY WITH SAND: 7.5YR5/4, BROWN, SOFT, LOW PLASTICITY, 20% SAND, MOSTLY FINE GRAINED, FEW COARSE SAND GRAINS	CL				1.75	1.0	20.0	15
	20	5YR5/8, YELLOWISH RED, 30% SAND, FINE TO COARSE GRAINED, ROOT MOLDS					1.75	1.0	25.0	20
BASE OF UNIT 2	25 25.5	WELL GRADED SAND: 7.5YR7/4, PINK, LOOSE, FINE TO COARSE GRAINED CALICHE CEMENT ABUNDANT, WELL GRADED 1% GRAVEL (5-10MM)	SW				1.75	1.5	30.0	25
	30	ABUNDANT CALICHE NODULES AT 30 FEET					1.75	2.5	35.0	30
BASE OF UPPER UNIT 3	35									35

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

JOB NAME/NUMBER **WHITE SANDS MISSILE RANGE TEMP. TEST FACILITY**

BORING NUMBER **WSTF-DB08**

DATE DRILLED 3/12/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY D.J.K.
DRAWN BY: RML
DRAWING NO. 95038808
PAGE 1 OF 3

BORING RECORD

GEOLOGIC UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FID SOIL GAS PPM x 1.0 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	SAMPLE FID READING	SAMPLE RECOVERY	SAMPLE DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:								BACKGROUND OVM READING SOIL: 1.75 PPM AIR: 1.75 PPM
LOWER UNIT 3	35	POORLY GRADED SAND: 7.5YR6/4, PINK, VERY LOOSE, FINE TO MEDIUM GRAINED, 1% GRAVEL (UP TO 10MM)	SP				1.75	2.5	40.0	35
	40	TOTAL DEPTH: 40.0 FEET NOTES: 1. SOIL GAS PROBE PUSHED TO 42 FEET BGS 2. CONTINUOUS SAMPLES ADVANCED TO 43 FEET BGS 3. SOIL SAMPLE COLLECTED FROM 40 TO 43 FEET BGS FROM LABORATORY ANALYSIS 4. SOIL SAMPLE NO. WSTF-DB08-2043 5. SOIL GAS SAMPLE NO. WSTF-DB08-5042								40
	45									45
	50									50
	55									55
	60									60
	65									65
	70									70

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

JOB NAME/NUMBER **WHITE SANDS MISSILE RANGE TEMP. TEST FACILITY**

BORING NUMBER **WSTF-DB08**

DATE DRILLED 3/12/95
DRILLING METHOD HSA
DRILLED BY STEWART BROS.
LOGGED BY L.L.W.
CHECKED BY D.J.K. DRAWING NO. 95038B08
DRAWN BY: RML PAGE 2 OF 2

BORING RECORD

GEOLOG. UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FID SOIL GAS PPM x 1.0 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	FID READING	RECOVERY	DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:								BACKGROUND OVM READING SOIL 1.0 PPM AIR 1.0 PPM
	0	POORLY GRADED SAND: 7.5YR4/6, STRONG BROWN, LOOSE, FINE TO MEDIUM GRAINED WITH ~1% COARSE SAND, 1% ANGULAR GRAVEL (UP TO 40MM)	SP				1.0	2.2	5.0	0
	5	FINE TO MEDIUM GRAINED AT 5 FT WITH NO GRAVEL OR COURSE SAND					1.0	2.0	10.0	5
BASE OF UNIT 1	10	WELL GRADED SAND: MEDIUM TO COARSE GRAINED 10% GRAVEL, (UP TO 50MM), VERY LOOSE	SW					2.5		10
	11.5	SANDY LEAN CLAY: 7.5YR4/6, STRONG BROWN, VERY STIFF, NO PLASTICITY, 30% FINE TO MEDIUM GRAINED SAND	CL				1.0		15.0	
	15	SILTY SAND: 7.5YR4/6, STRONG BROWN, FINE TO MEDIUM GRAINED, 5% GRAVEL (UP TO 10MM), 30% SILT, VERY LOOSE 5% GRAVEL AT BASE	SM					2.5		15
	17.3	SANDY LEAN CLAY: 7.5YR4/6, STRONG BROWN, VERY STIFF, NO PLASTICITY, 30% FINE TO MEDIUM GRAINED SAND ROOT MOLDS, CALICHE NODULES, AND 2% COARSE SAND AT 22 FEET	CL				1.0		20.0	
	20						1.0	2.5	25.0	20
BASE OF UNIT 2	25							4.5		25
	26.0	WELL GRADED SAND: 7.5YR7/4, PINK, LOOSE TO DENSE, CALICHE NODULES AND CEMENT ABUNDANT, FINE TO COARSE GRAINED, 5% GRAVEL (ANGULAR, UP TO 10MM)	SW				1.0		30.0	
UPPER UNIT 3	30	ROOT MOLDS AT 34 FEET					1.0	2.5	35.0	30
	35									35

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

JOB NAME/NUMBER **WHITE SANDS MISSILE RANGE TEMP. TEST FACILITY**

BORING NUMBER **WSTF-DB09**

DATE DRILLED 3/14/95
DRILLING METHOD STEWART BROS.
DRILLED BY HSA
LOGGED BY L.L.W.
CHECKED BY D.J.K.
DRAWN BY: RML

DRAWING NO. 35038B09

BORING RECORD

GEOLOGIC UNIT	DEPTH (FEET)	LITHOLOGIC DESCRIPTION	UNIFIED SOIL CLASSIFICATION	GRAPHIC LOG	FID SOIL GAS PPM x 1.0 (2 4 6 8 10 12 14 16 18)	SAMPLE NUMBER	SAMPLE FID READING	SAMPLE RECOVERY	SAMPLE DEPTH	REMARKS
		Start: Stop: GROUND SURFACE:								BACKGROUND O.M. READING SOIL 1.2 PPM AIR 1.2 PPM
	35	SAME AS ABOVE	SW				1.0	2.5	40.0	35
BASE OF UPPER UNIT 3	40						1.0	5.1	45.0	40
LOWER UNIT 3	42.3	SILTY SAND: 7.5YR7/4, PINK, FINE TO MEDIUM GRAINED, MEDIUM DENSE TO DENSE, 30% SILT, ROOTS AND ROOT MOLDS, POORLY GRADED	SM				1.0	2.5	47.5	45
	45									
	47.5	TOTAL DEPTH: 47.5 FEET NOTES: 1. SOIL GAS PROBE PUSHED FROM 47.5 FEET TO 40 FEET 2. CONTINUOUS SAMPLER ADVANCED TO 50 FEET FOR SOIL SAMPLE FOR ANALYTICAL TESTING 3. SOIL SAMPLE COLLECTED FROM 49 TO 50 FEET BGS 4. SOIL SAMPLE NO. WSTF-DB09-2050 5. SOIL GAS SAMPLE NO. WSTF-DB09-5049								
	50									50
	55									55
	60									60
	65									65
	70									70

CME CONTINUOUS AUGER SAMPLER
STANDARD PENETRATION TEST
UNDISTURBED SAMPLE
WATER TABLE (24 HOURS)
WATER TABLE (TIME OF BORING)
LABORATORY TEST LOCATION
PENETROMETER (TONS/SQ. FT.)
NR: NO RECOVERY

JOB NAME/NUMBER **WHITE SANDS MISSILE RANGE TEMP. TEST FACILITY**

BORING NUMBER **WSTF-DB09**

DATE DRILLED 3/14/95
DRILLING METHOD STEWART BROS.
DRILLED BY HSA
LOGGED BY L.L.W.
CHECKED BY D.J.K.
DRAWING NO. 95038809
DRAWN BY: RML
PAGE 2 OF 2

APPENDIX B
CHAIN-OF-CUSTODY FORMS

4955 Yarrow Street
Arvada, Colorado 80002

303 421-6611 Telephone
303 431-7171 Fax

Quanterra Environmental Services

SAMPLE SAFE™ CONDITIONS

QUANTERRA CLIENT: Woodward-Clyde Federal Service (WCFS)	PACKED BY: Kennedy
PROJECT: White Sands Missile Range	SEAL INTACT UPON RECEIPT BY SAMPLING COMPANY:
SAMPLING COMPANY: WCFS	SEALED FOR SHIPPING BY:
SAMPLING SITE: Temp Test Facility	SEAL NUMBER:
TEAM LEADER: Kennedy	SEAL INTACT UPON RECEIPT BY LAB: ☒ Yes ☐ No

SEAL NUMBER: | SAMPLING STATUS: ☑ Done ☐ Continuing Until

SEAL NUMBER: | CONDITION OF CONTENTS: | INITIAL CONTENTS TEMP: 4 °C

CONTENTS TEMPERATURE UPON RECEIPT BY LAB: 06 5.0 °C

DATE	TIME	SAMPLE ID/DESCRIPTION		SAMPLE TYPE	# CONTAINERS	ANALYSIS PARAMETERS	REMARKS
3/29/95	15:15	WSTF-SB12-2010-EB	01	water	3-40ml vial HCL	VOC-8240	*
3/29/95	06:35	" - " -2022-EB	02	"	"	" "	*
"	06:30	" - " -2017	03	Soil	2-4oz	" "	*
"	06:45	" - " -2022	04	"	"	" "	*
"	09:45	" - " -2058	05	"	"	" "	*
"	09:50	" - " -2059	06	"	"	" "	*
"	10:10	" - " -2061	07	"	"	" "	*
"	10:00	" - " -2060	08	"	"	" "	*
"	11:05	" - " -2072	09	"	"	" "	*
"	12:30	" " -2081	10	"	"	" "	*

CUSTODY TRANSFERS PRIOR TO SHIPPING

RELINQUISHED BY (SIGNED)	RECEIVED BY (SIGNED)	DATE	TIME
[signature]	[signature]	3/30/95 ~~3/29/95~~	18:00

SHIPPING DETAILS

DELIVERED TO SHIPPER BY: Nick Jock

METHOD OF SHIPMENT: Fed Exp

AIRBILL NUMBER: 306005561

RECEIVED FOR LAB: QES

SIGNED: [signature]

DATE/TIME: 3/31/95 0930

QUANTERRA PROJECT NUMBER: 41256

QUA-4119

White - CLIENT Pink - LAB

4955 Yarrow Street
Arvada, Colorado 80002

303 421-6611 Telephone
303 431-7171 Fax

Quanterra Environmental Services

2 of 3

QUANTERRA CLIENT: Woodward-Clyde Federal Services.	PACKED BY: Kennedy
PROJECT: White Sand Missile Range	SEAL INTACT UPON RECEIPT BY SAMPLING COMPANY:
SAMPLING COMPANY: WCFS.	SEALED FOR SHIPPING BY:
SAMPLING SITE: Temp Test Facility	SEAL NUMBER:
TEAM LEADER: Kennedy	SEAL INTACT UPON RECEIPT BY LAB: ☐ Yes ☐ No

SAMPLE SAFE™ CONDITIONS

SEAL NUMBER:

CONDITION OF CONTENTS:

INITIAL CONTENTS TEMP: 4 °C

SAMPLING STATUS: ☑ Done ☐ Continuing Until

CONTENTS TEMPERATURE UPON RECEIPT BY LAB: °C

DATE	TIME	SAMPLE ID/DESCRIPTION		SAMPLE TYPE	# CONTAINERS	ANALYSIS PARAMETERS	REMARKS
3/29/95	DSK ~~12~~ 12:45	WSTF-SB12-2082	11	Soil	2-4oz	VOC 8240	*
~~"~~	~~12:30~~ 12:30	~~" - " - 2081~~		~~"~~	~~"~~	~~" "~~	~~DSK~~
"	13:20	" - " - 2095	12	"	"	" "	*
"	13:50	" - " - 2103	13	"	"	" "	*
"	17:19	" - " - 2113	14	"	"	" "	*
"	17:55	" - " - 2123	15	"	"	" "	*
"	18:25	" - " - 2133	16	"	"	" "	*
"	~~08:15~~ 08:15 DSK	" - " - 2142	17	"	"	" "	*
3/30/95	"	" - " - 2142-QC	18	"	"		*
"	"	" - - 2142-MS/MSD	17MS/SD "		3 4-oz		*

CUSTODY TRANSFERS PRIOR TO SHIPPING

RELINQUISHED BY (SIGNED)	RECEIVED BY (SIGNED)	DATE	TIME
[signature]		3/30/95	18:00

SHIPPING DETAILS

DELIVERED TO SHIPPER BY: Nickish

METHOD OF SHIPMENT: Fed Exp

AIRBILL NUMBER: 3060055561

RECEIVED FOR LAB: SIGNED: DATE/TIME:

QUANTERRA PROJECT NUMBER:

QUA-4119

White - CLIENT Pink - LAB

4955 Yarrow Street
Arvada, Colorado 80002

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Quanterra Environ Services

SAMPLE SAFE™ CONDITIONS

QUANTERRA CLIENT: Woodward-Clyde Federal Service (WCFS)	PACKED BY: Kennedy
PROJECT: White Sands Missile Range	SEAL INTACT UPON RECEIPT BY SAMPLING COMPANY:
SAMPLING COMPANY: WCFS	SEALED FOR SHIPPING BY:
SAMPLING SITE: Temp TEST Facility	SEAL NUMBER:
TEAM LEADER: Kennedy	SEAL INTACT UPON RECEIPT BY LAB: ☐ Yes ☐ No

SEAL NUMBER:
CONDITION OF CONTENTS:
INITIAL CONTENTS TEMP: 4 °C
SAMPLING STATUS: ☑ Done ☐ Continuing Until
CONTENTS TEMPERATURE UPON RECEIPT BY LAB: °C

DATE	TIME	SAMPLE ID/DESCRIPTION	SAMPLE TYPE	# CONTAINERS	ANALYSIS PARAMETERS	REMARKS
3/30/95	08:45	WSTF-8812-2152 19	Soil	2-4oz	VOC 8240	
3/30/95	08:15	" - " - 2142 - EB 20	Water	3-40ml	rinsed w/ HCl VOC 8240	

CUSTODY TRANSFERS PRIOR TO SHIPPING

RELINQUISHED BY (SIGNED)	RECEIVED BY (SIGNED)	DATE	TIME
[signature]		3/30/95	
	D	~~3/31/95~~	1800

SHIPPING DETAILS

DELIVERED TO SHIPPER BY: Nixish
METHOD OF SHIPMENT: Fed Exp
AIRBILL NUMBER: 306045561
RECEIVED FOR LAB:
SIGNED:
DATE/TIME:
QUANTERRA PROJECT NUMBER:

QUA-4119

White - CLIENT Pink - LAB

CHAIN OF CUSTODY

Quanterra Incorporated
4955 Yarrow Street
Arvada, Colorado 80002

303 421-6611 Telephone
303 431-7171 Fax

Quanterra Environmental Services

Page 1 of 1

QUANTERRA CLIENT: Woodward-Clyde Federal Services (WCFS)

PROJECT: White Sands Missile Range

SAMPLING COMPANY: WCFS

SAMPLING SITE: Temp. Test Facility

TEAM LEADER: Kennedy

SAMPLE SAFE™ CONDITIONS

PACKED BY: Kennedy

SEAL INTACT UPON RECEIPT BY SAMPLING COMPANY:

SEALED FOR SHIPPING BY:

SEAL NUMBER:

SEAL NUMBER:

CONDITION OF CONTENTS:

INITIAL CONTENTS TEMP: 4 °C

SAMPLING STATUS: ☐ Done ☑ Continuing Until

SEAL INTACT UPON RECEIPT BY LAB: ☑ Yes ☐ No

CONTENTS TEMPERATURE UPON RECEIPT BY LAB: QES 32°C

DATE	TIME	SAMPLE ID/DESCRIPTION		SAMPLE TYPE	# CONTAINERS	ANALYSIS PARAMETERS	REMARKS
3/28/95	07:00	WSTF - SB11 - 2Ø16	01	Soil	2-4oz	VOC 8240	
"	07:15	" - " - 2Ø17	02	"	"	" "	
"	10:30	" - " - 2Ø52	03	"	"	" "	
"	10:45	" - " - 2Ø54	04	"	"	" "	
"	11:00	" - " - 2Ø65	05	"	"	" "	
"	11:35	" - " - 2Ø67	06	"	"	" "	
"	07:00	" - " - 2Ø16 ms/msD	01 ms/SD	"	3-4oz	" "	
"	12:30	" - " - 2Ø70	07	"	"	" "	
"	12:30	" - " - 2Ø70-QC	08	"	"	" "	
		DSK					

CUSTODY TRANSFERS PRIOR TO SHIPPING

RELINQUISHED BY (SIGNED)	RECEIVED BY (SIGNED)	DATE	TIME
[signature]		3/29/95	18:00

SHIPPING DETAILS

DELIVERED TO SHIPPER BY: Nickish

METHOD OF SHIPMENT: Fed Exp

AIRBILL NUMBER: 3060055294

RECEIVED FOR LAB: [signature]

SIGNED: [signature] QES

DATE/TIME: 3/29/95 0900

QUANTERRA PROJECT NUMBER: 41208

QUA-4119

White - CLIENT Pink - LAB

CHAIN OF CUSTODY

4955 Yarrow Street
Arvada, Colorado 80002

303 421-6611 Telephone
303 431-7171 Fax

Quanterra Environmental Services

SAMPLE SAFE™ CONDITIONS

QUANTERRA CLIENT: Woodward-Clyde Federal Services	PACKED BY: Nickisch
PROJECT: Temperature Test Facility (TTF) White Sands Missile Range (WSMR)	SEAL INTACT UPON RECEIPT BY SAMPLING COMPANY:
SAMPLING COMPANY: WCFS	SEALED FOR SHIPPING BY:
SAMPLING SITE: TTF	SEAL NUMBER:
TEAM LEADER: Kennedy	SEAL INTACT UPON RECEIPT BY LAB: ☒ Yes ☐ No

SEAL NUMBER: ; SAMPLING STATUS: ☐ Done ☒ Continuing Until

SEAL NUMBER: ; CONDITION OF CONTENTS: ; INITIAL CONTENTS TEMP: 4 °C

CONTENTS TEMPERATURE UPON RECEIPT BY LAB: QES 2.4 °C

DATE	TIME	SAMPLE ID/DESCRIPTION		SAMPLE TYPE	# CONTAINERS	ANALYSIS PARAMETERS	REMARKS
3/27/95	0800	WSTF-SB07-2017-QC	01	Soil	2-4oz	VOC - 8240	
3/27/95	0800	WSTF-SB07-2017	02	Soil	2-4oz	VOC - 8240	
3/27/95	0805	WSTF-SB07-2022	03	Soil	2-4oz	VOC - 8240	
3/27/95	1000	WSTF-SB07-2067	04	Soil	2-4oz	VOC - 8240	
3/27/95	1010	WSTF-SB07-2059	05	Soil	2-4oz	VOC - 8240	
3/27/95	1020	WSTF-SB07-2060	06	Soil	2-4oz	VOC - 8240	
3/27/95	1030	WSTF-SB07-2061	07	Soil	2-4oz	VOC - 8240	
3/27/95	0945	WSTF-0061-1000-EB	08	Water	3-40ml vial w/HCl	VOC - 8240	
3/27/95	1010	WSTF-SB07-2058-EB	09	Water	3-40ml vial w/HCl	VOC - 8240	
3/27/95	1000	WSTF-0001-1000-Amb	10	Water	3-40ml vial w/HCl	VOC - 8240	

CUSTODY TRANSFERS PRIOR TO SHIPPING

RELINQUISHED BY (SIGNED)	RECEIVED BY (SIGNED)	DATE	TIME
[signature]		3/28/95	10:30

SHIPPING DETAILS

DELIVERED TO SHIPPER BY: Nickisch

METHOD OF SHIPMENT: FedEx

AIRBILL NUMBER: 0073414891

RECEIVED FOR LAB: QES

SIGNED: [signature]

DATE/TIME: 3/29/95 0900

QUANTERRA PROJECT NUMBER: 41209

QUA-4119

White - CLIENT Pink - LAB

CHAIN OF CUSTODY

4955 Yarrow Street
Arvada, Colorado 80002

303 421-6611 Telephone
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Quanterra Environmental Services

2 of 2

SAMPLE SAFE™ CONDITIONS

QUANTERRA CLIENT: Woodward-Clyde Federal Services	PACKED BY: Nickisch
PROJECT: Temp. Test Facility (TTF) White Sands Missile Range (WSMR)	SEAL INTACT UPON RECEIPT BY SAMPLING COMPANY:
SAMPLING COMPANY: WCFS	SEALED FOR SHIPPING BY:
SAMPLING SITE: TTF	SEAL NUMBER:
TEAM LEADER: Kennedy	SEAL INTACT UPON RECEIPT BY LAB: ☒ Yes ☐ No

SEAL NUMBER: ; SAMPLING STATUS: ☐ Done ☒ Continuing Until

CONDITION OF CONTENTS:

INITIAL CONTENTS TEMP.: 4 °C

CONTENTS TEMPERATURE UPON RECEIPT BY LAB: QES 2.4 °C

DATE	TIME	SAMPLE ID/DESCRIPTION		SAMPLE TYPE	# CONTAINERS	ANALYSIS PARAMETERS	REMARKS
3/27/95	1115	WSTF-SB07-2072	11	Soil	2-4oz	VOC-8240	
3/27/95	1230	WSTF-SB07-2078	12	Soil	2-4oz	VOC-8240	
3/27/95	1240	WSTF-SB07-2079	13	Soil	2-4oz	VOC-8240	
3/27/95	1305	WSTF-00E1-1000	14	Water	4-40ml vial	VOC-8240	HCl
3/27/95	1305	WSTF-00E1-1000-QC	15	Water	3-40ml vial	VOC-8240	HCl
3/27/95	1305	WSTF-00E1-1000-MS/MSD	16 MS/SD	Water	6-40ml vial	VOC-8240	HCl
3/27/95	—	WSTF-0003-0000-TB	16	Water	3 40ml vial	VOC-8240	Trip Blank

CUSTODY TRANSFERS PRIOR TO SHIPPING

RELINQUISHED BY (SIGNED)	RECEIVED BY (SIGNED)	DATE	TIME
[signature]		3/28/95	10:20

SHIPPING DETAILS

DELIVERED TO SHIPPER BY: Nickisch

METHOD OF SHIPMENT: Fed Ex

AIRBILL NUMBER: 0073414891

RECEIVED FOR LAB: QES

SIGNED: [signature]

DATE/TIME: 3/29/95 0900

QUANTERRA PROJECT NUMBER: 41209

QUA-4119

White - CLIENT Pink - LAB

4955 Yarrow Street
Arvada, Colorado 80002

303 421-6611 Telephone
303 431-7171 Fax

Quanterra Environmental Services

1 of 2

QUANTERRA CLIENT: Woodward-Clyde Federal Services (WCFS)

PROJECT: Temp Test Facility (TTF) - White Sand Missile Range (WSMR)

SAMPLING COMPANY: WCFS

SAMPLING SITE: TTF

TEAM LEADER: Kennedy

SAMPLE SAFE™ CONDITIONS

PACKED BY: Kennedy

SEAL NUMBER:

SEAL INTACT UPON RECEIPT BY SAMPLING COMPANY:

CONDITION OF CONTENTS:

SEALED FOR SHIPPING BY:

INITIAL CONTENTS TEMP: 4 °C

SEAL NUMBER:

SAMPLING STATUS: ☐ Done ☑ Continuing Until

SEAL INTACT UPON RECEIPT BY LAB: ☒ Yes ☐ No

CONTENTS TEMPERATURE UPON RECEIPT BY LAB: QES 1.6°C

DATE	TIME	SAMPLE ID/DESCRIPTION		SAMPLE TYPE	# CONTAINERS	ANALYSIS PARAMETERS		REMARKS
3/25/95	11:00	WSTF-SB09-2017	01	Soil	2-4oz	VOC - 8240		
"	11:30	" - " - 2021	02	"	"	"	"	
"	13:45	" - " - 2057	03	"	"	"	"	
"	13:45	" - " - " - QC	04	"	"	"	"	
"	14:00	" - " - 2060	05	"	"	"	"	
3/26/95	~~06:50~~ 06:50	" - " - 2072	06	"	"	"	"	
3/26/95	07:15	" - " - 2078	07	"	"	"	"	
"	07:30	" - " - 2079	08	"	"	"	"	
"	06:40	" - SB09 - 2072-EB	09	Water	3-40ml Vials w/HCl	"	"	
3/26/95	11:20	" - SB05 - 2017	10	Soil	2-4oz	"	"	

CUSTODY TRANSFERS PRIOR TO SHIPPING

RELINQUISHED BY (SIGNED)	RECEIVED BY (SIGNED)	DATE	TIME
[signature]		3/27/95	18:00

SHIPPING DETAILS

DELIVERED TO SHIPPER BY: Nickish

METHOD OF SHIPMENT: Fed Exp

AIRBILL NUMBER: 0073414972

RECEIVED FOR LAB: QES

SIGNED: [signature]

DATE/TIME: 3/28/95 0930

QUANTERRA PROJECT NUMBER: 41189

QUA 4119

White - CLIENT Pink - LAB

CHAIN OF CUSTODY

4955 Yarrow Street
Arvada, Colorado 80002

303 421-6611 Telephone
303 431-7171 Fax

Quanterra Environmental Services

2 of 2

QUANTERRA CLIENT: WCFS	
PROJECT: TTF - WSMR	
SAMPLING COMPANY: WCFS	
SAMPLING SITE: TTF	
TEAM LEADER: Kennedy	

SAMPLE SAFE™ CONDITIONS

PACKED BY: Kennedy	SEAL NUMBER:
SEAL INTACT UPON RECEIPT BY SAMPLING COMPANY:	CONDITION OF CONTENTS:
SEALED FOR SHIPPING BY:	INITIAL CONTENTS TEMP: 4 °C
SEAL NUMBER:	SAMPLING STATUS: ☐ Done ☑ Continuing Until
SEAL INTACT UPON RECEIPT BY LAB: ☒ Yes ☐ No	CONTENTS TEMPERATURE UPON RECEIPT BY LAB: QES 1.6 °C

DATE	TIME	SAMPLE ID/DESCRIPTION	SAMPLE TYPE	# CONTAINERS	ANALYSIS PARAMETERS	REMARKS
3/26/95	11:30	WSTF - SB05 - 2021 11	Soil	2-4oz	VOC-8240	
"	13:30	" - " - 2054 12	"	"	"	
"	13:30	" - " - " - QC13	"	"	"	
"	13:30	" - " - " - 12 MS/SD - ms/msd	"	"	" "	
"	13:45	" - " - 2055 14	"	"	" "	
"	13:50	" - " - 2056 15	"	"	" "	
~~"~~	~~13:15~~	~~" - " - 2054 EB~~	~~water~~	3-40ml vials-HCL	~~" "~~	
"	14:30	" - " - 2070 16	soil	2-4oz	" "	
"	15:00	" - " - 2075 17	"	"	" "	
"	15:20	" - " - 2076 18	"	"	" "	

CUSTODY TRANSFERS PRIOR TO SHIPPING

RELINQUISHED BY (SIGNED)	RECEIVED BY (SIGNED)	DATE	TIME
[signature]		3/27/95	18:00

SHIPPING DETAILS

DELIVERED TO SHIPPER BY: Nelson	
METHOD OF SHIPMENT: FedExp	AIRBILL NUMBER: 0073 4 4972
RECEIVED FOR LAB: QES	SIGNED: [signature] / DATE/TIME: 3/28/95 09:30
QUANTERRA PROJECT NUMBER: 41189	

QUA 4119

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Environmental Services

Page 1 of 2

QUANTERRA CLIENT: Woodward-Clyde Federal Service (WCFS)

PROJECT: White Sand Missile Range

SAMPLING COMPANY: WCFS

SAMPLING SITE: Temp Test Facility

TEAM LEADER: Kennedy

SAMPLE SAFE™ CONDITIONS

PACKED BY: Kennedy

SEAL NUMBER:

SEAL INTACT UPON RECEIPT BY SAMPLING COMPANY:

CONDITION OF CONTENTS:

SEALED FOR SHIPPING BY:

INITIAL CONTENTS TEMP: 4 °C

SEAL NUMBER:

SAMPLING STATUS: ☐ Done ☐ Continuing Until

SEAL INTACT UPON RECEIPT BY LAB: ☒ Yes ☐ No

CONTENTS TEMPERATURE UPON RECEIPT BY LAB: QES 0.4°C

DATE	TIME	SAMPLE ID/DESCRIPTION	SAMPLE TYPE	# CONTAINERS	ANALYSIS PARAMETERS	REMARKS
3/24/95	14:25	WSTF - SB10 - 2010 - EB	water	3-40 ml w/ HCL	VOC-8240	01
"	14:35	" - " - 2012	Soil	2-4oz	" "	02
"	"	" - " - 2012-QC	"	"	" "	03
"	"	" - " - 2012-MS/MSD	"	3-4 oz	" "	04 MS/SD
"	14:50	" - " - 2021	"	2-4 oz	" "	04
"	16:00	" - " - 2059	"	"	" "	05
"	16:15	" - " - 2060	"	"	" "	06
"	16:30	" - " - 2061	"	"	" "	07
"	16:45	" " - 2062	"	"	" "	08
"	17:15	" " - 2071	"	"	" "	09

CUSTODY TRANSFERS PRIOR TO SHIPPING

RELINQUISHED BY (SIGNED)	RECEIVED BY (SIGNED)	DATE	TIME
[signature]		3/25/95	18:00

SHIPPING DETAILS

DELIVERED TO SHIPPER BY: Nukish

METHOD OF SHIPMENT: Fed. Exp

AIRBILL NUMBER: 0073414821

RECEIVED FOR LAB: QES

SIGNED: [signature]

DATE/TIME: 3/27/95

QUANTERRA PROJECT NUMBER: 41172

QUA-4119

White - CLIENT Pink - LAB

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Quanterra Environmental Services

Page 2 of 2

SAMPLE SAFE™ CONDITIONS

QUANTERRA CLIENT: Woodward-Clyde Federal Service (WCFS)	PACKED BY: Kennedy
	SEAL NUMBER:
PROJECT: White Sands missil Range	SEAL INTACT UPON RECEIPT BY SAMPLING COMPANY:
	CONDITION OF CONTENTS:
SAMPLING COMPANY: WCFS	SEALED FOR SHIPPING BY:
	INITIAL CONTENTS TEMP.: 4 °C
SAMPLING SITE: Temp Test Facility	SEAL NUMBER:
	SAMPLING STATUS: ☐ Done ☒ Continuing Until
TEAM LEADER: Kennedy	SEAL INTACT UPON RECEIPT BY LAB: ☒ Yes ☐ No
	CONTENTS TEMPERATURE UPON RECEIPT BY LAB: QES 0.4 °C

DATE	TIME	SAMPLE ID/DESCRIPTION	SAMPLE TYPE	# CONTAINERS	ANALYSIS PARAMETERS	REMARKS
3/24/95	17:30	WSTF - SB1Ø - 2Ø73	Soil	2-4oz	VOC-8240	10
3/25/95	07:45	" - SB1Ø - 2Ø78	"	"	" "	"

CUSTODY TRANSFERS PRIOR TO SHIPPING

RELINQUISHED BY (SIGNED)	RECEIVED BY (SIGNED)	DATE	TIME
[signature]		3/25/95	18:00

SHIPPING DETAILS

DELIVERED TO SHIPPER BY: Nickish

METHOD OF SHIPMENT: Fed Exp

AIRBILL NUMBER: 0073414880 21 DSIC

RECEIVED FOR LAB: QES

SIGNED: [signature]

DATE/TIME: 3/27/95 08

QUANTERRA PROJECT NUMBER: 41172

QUA-4119

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Environmental Services

Page 1 of 3

SAMPLE SAFE™ CONDITIONS

QUANTERRA CLIENT: Woodward-Clyde Federal Services (WCFS)	PACKED BY: Kennedy
PROJECT: White Sands Missile Range	SEAL INTACT UPON RECEIPT BY SAMPLING COMPANY:
SAMPLING COMPANY: WCFS	SEALED FOR SHIPPING BY:
SAMPLING SITE: Temp Test Facility	SEAL NUMBER:
TEAM LEADER: Kennedy	SEAL INTACT UPON RECEIPT BY LAB: ☒ Yes ☐ No

SEAL NUMBER: SAMPLING STATUS: ☐ Done ☑ Continuing Until

CONDITION OF CONTENTS:

INITIAL CONTENTS TEMP: 4 °C

CONTENTS TEMPERATURE UPON RECEIPT BY LAB: QES 4.9 °C

DATE	TIME	SAMPLE ID/DESCRIPTION		SAMPLE TYPE	# CONTAINERS	ANALYSIS PARAMETERS	REMARKS
3/23/95	16:30	WSTF-SB08-2017	01	Soil	2-4oz	VOC (8240)	
"	"	" - " - " - QC	02	"	"	" "	
"	16:40	" - " - 2025	03	"	"	" "	
3/24/95	08:50	" - " - 2059	04	"	"	" "	
"	09:00	" - " - 2060	05	"	"	" "	
"	09:05	" - " - 2061	06	"	"	" "	
"	09:07	" - " - 2062	07	"	"	" "	
"	10:30	" - " - 2074	08	"	"	" "	
"	10:45	" - " - 2079	09	"	"	" "	
"	11:00	" - " - 2080	10	"	"	" "	

CUSTODY TRANSFERS PRIOR TO SHIPPING

RELINQUISHED BY (SIGNED)	RECEIVED BY (SIGNED)	DATE	TIME
[signature]		3/24/95	18:00

SHIPPING DETAILS

DELIVERED TO SHIPPER BY: Nick Kisch

METHOD OF SHIPMENT: Fed Exp

AIRBILL NUMBER: 007341 4880

RECEIVED FOR LAB: QES

SIGNED: [signature]

DATE/TIME: 3/25/95 10:

QUANTERRA PROJECT NUMBER: 41157

QUA 4119

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Environmental Services

2 of 2

SAMPLE SAFE™ CONDITIONS

QUANTERRA CLIENT: Woodward-Clyde Federal Services (WCFS)

PROJECT: White Sands Missile Range

SAMPLING COMPANY: WCFS

SAMPLING SITE: Temp Test Facility

TEAM LEADER: Kennedy

PACKED BY: Kennedy

SEAL INTACT UPON RECEIPT BY SAMPLING COMPANY:

SEALED FOR SHIPPING BY:

SEAL NUMBER:

SEAL NUMBER:

CONDITION OF CONTENTS:

INITIAL CONTENTS TEMP: 4 °C

SAMPLING STATUS: ☐ Done ☒ Continuing Until

SEAL INTACT UPON RECEIPT BY LAB: ☒ Yes ☐ No

CONTENTS TEMPERATURE UPON RECEIPT BY LAB: QES 4.9 °C

DATE	TIME	SAMPLE ID/DESCRIPTION		SAMPLE TYPE	# CONTAINERS	ANALYSIS PARAMETERS	REMARKS
3/23/95	20:15	WSFF - ØØE2 - 1ØØØ	11	water	4-40ml vial w/ HCl	VOC - 8240	
3/24/95	14:30	" - ØØE4 - 1ØØØ	12	"	"	" "	
3/24/95	—	WSTF - ØØØ2 - 0000 - TB	13	"	3-40ml	" "	Trip Blank

CUSTODY TRANSFERS PRIOR TO SHIPPING

RELINQUISHED BY (SIGNED)	RECEIVED BY (SIGNED)	DATE	TIME
[signature]		3/24/95	18:00

SHIPPING DETAILS

DELIVERED TO SHIPPER BY: Nickish.

METHOD OF SHIPMENT: FedExp.

AIRBILL NUMBER: 0073414880

RECEIVED FOR LAB: QES

SIGNED: [signature]

DATE/TIME: 3/25/95 10:

QUANTERRA PROJECT NUMBER: 41157

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Environmental Services

2 of 3

SAMPLE SAFE™ CONDITIONS

PACKED BY: Kennedy	SEAL NUMBER:
SEAL INTACT UPON RECEIPT BY SAMPLING COMPANY:	CONDITION OF CONTENTS:
SEALED FOR SHIPPING BY:	INITIAL CONTENTS TEMP.: 4 °C
SEAL NUMBER:	SAMPLING STATUS: ☐ Done ☐ ~~Continuing~~ Until
SEAL INTACT UPON RECEIPT BY LAB: ☒ Yes ☐ No	CONTENTS TEMPERATURE UPON RECEIPT BY LAB: QES 0.8 °C

QUANTERRA CLIENT: Woodward-Clyde Federal Services (WCFS)

PROJECT: Temp. Test Facility @ White Sand Missile Range

SAMPLING COMPANY: WCFS

SAMPLING SITE: Temp Test Facility

TEAM LEADER: Kennedy

DATE	TIME	SAMPLE ID/DESCRIPTION		SAMPLE TYPE	# CONTAINERS	ANALYSIS PARAMETERS	REMARKS
3/22/95	12:00	WSTF-SB06-2017	01	Soil	2-4oz	VOC (8240)	
"	12:10	" - " -2022	02	"	"	"	
"	14:00	" - " -2057	03	"	"	"	
"	14:30	" - " -2060	04	"	"	"	
"	14:45	" - " -2061	05	"	"	"	
"	15:00	" - " -2062	06	"	"	"	
"	16:15	" - " -2073	07	"	"	"	
"	14:20	" - " -2075-EB	08	Water	3-40ml	vial w HCL VOC (8240)	
"	16:45	" - " -2080	09	Soil	2-4oz	VOC (8240)	
"	17:00	" - " ~~2081~~ 2081	10	Soil	2-4oz	" "	

CUSTODY TRANSFERS PRIOR TO SHIPPING

RELINQUISHED BY (SIGNED)	RECEIVED BY (SIGNED)	DATE	TIME
[signature]		3/23/95	18:00

SHIPPING DETAILS

DELIVERED TO SHIPPER BY: Nick Kisch

METHOD OF SHIPMENT: Fed Exp

AIRBILL NUMBER: 0073414961

RECEIVED FOR LAB: QES

SIGNED: [signature]

DATE/TIME: 3/24/95 0910

QUANTERRA PROJECT NUMBER: 41141

QUA-4119

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Quanterra Environmental Services

QUANTERRA CLIENT: Woodward-Clyde Federal Services

PROJECT: Temp Test Facility @ WSMR

SAMPLING COMPANY: WCFS

SAMPLING SITE: Temp TEST Facility

TEAM LEADER: Kennedy

SAMPLE SAFE™ CONDITIONS

PACKED BY: Kennedy

SEAL NUMBER:

SEAL INTACT UPON RECEIPT BY SAMPLING COMPANY:

CONDITION OF CONTENTS:

SEALED FOR SHIPPING BY:

INITIAL CONTENTS TEMP: 4 °C

SEAL NUMBER:

SAMPLING STATUS: ☐ Done ☒ Continuing Until

SEAL INTACT UPON RECEIPT BY LAB: ☒ Yes ☐ No

CONTENTS TEMPERATURE UPON RECEIPT BY LAB: @ 5 0.8°C

DATE	TIME	SAMPLE ID/DESCRIPTION	SAMPLE TYPE	# CONTAINERS	ANALYSIS PARAMETERS	REMARKS
3/22/95	16:45	WSTF - SB06 - 2080 - ~~QA~~ QC one 11	Soil	2-4oz	VOC (8240)	
3/23/95	08:30	" - SB04 - 2016 12	"	"	"	
"	"	" - " - " - QC 13	"	"	"	
" "	"	" - " - " - MS/MSD 12 MS/SD	"	3-4oz	"	
"	12:10	" - OU23 - 1000 14	water	4-40 ml vials w/ HCl	VOC (8240)	
"	13:45	" - SB04 - 2077 - EB 15	"	3-40 ml vials w/ HCl	" "	
"	09:00	" - SB04 - 2025 16	Soil	2-4oz	VOC (8240)	
"	11:30	" - " - 2056 17	"	2-4oz	" "	
"	11:45	" - " - 2057 18	"	"	" "	
"	12:00	" - " - 2062 19	"	"	" "	

CUSTODY TRANSFERS PRIOR TO SHIPPING

RELINQUISHED BY (SIGNED)	RECEIVED BY (SIGNED)	DATE	TIME
[signature]		3/23/95	18:00

SHIPPING DETAILS

DELIVERED TO SHIPPER BY: Nickish.

METHOD OF SHIPMENT: Fed Exp

AIRBILL NUMBER: 0073 4961

RECEIVED FOR LAB: QES

SIGNED: [signature]

DATE/TIME: 3/24/95 0?

QUANTERRA PROJECT NUMBER:

QUA 4119

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QUANTERRA Environmental Services

Page 3 of 3

SAMPLE SAFE™ CONDITIONS

QUANTERRA CLIENT: WCRS	PACKED BY: Kennedy
PROJECT: Temp Test Facility - White Sands Missile Range	SEAL INTACT UPON RECEIPT BY SAMPLING COMPANY:
SAMPLING COMPANY: KWCFS	SEALED FOR SHIPPING BY:
SAMPLING SITE: Temp. Test Facility	SEAL NUMBER:
TEAM LEADER: Kennedy	SEAL INTACT UPON RECEIPT BY LAB: ☒ Yes ☐ No

SEAL NUMBER:

CONDITION OF CONTENTS:

INITIAL CONTENTS TEMP: 4 °C

SAMPLING STATUS: ☐ Done ☒ Continuing Until

CONTENTS TEMPERATURE UPON RECEIPT BY LAB: QES 0.8°C

DATE	TIME	SAMPLE ID/DESCRIPTION		SAMPLE TYPE	# CONTAINERS	ANALYSIS PARAMETERS	REMARKS
3/23/95	12:05	WSTF - SB04-2063	20	Soil	2-4oz	VOC 8240	
3/23/95	13:00	" - SB04-2071	21	"	"	" "	
"	13:50	" - " -2078	22	"	"	" "	
"	14:00	" - " -2079	23	"	"	" "	
"	—	" - 0001-0000-TB	24	water	3-40ml vial	" "	Trip Blank

CUSTODY TRANSFERS PRIOR TO SHIPPING

RELINQUISHED BY (SIGNED)	RECEIVED BY (SIGNED)	DATE	TIME
[signature]		3/23/95	18 00

SHIPPING DETAILS

DELIVERED TO SHIPPER BY: Nickisch

METHOD OF SHIPMENT: Fed Exp

AIRBILL NUMBER: 0073414961

RECEIVED FOR LAB: QES

SIGNED: [signature]

DATE/TIME: 3/24/95 01

QUANTERRA PROJECT NUMBER:

QUA-4119

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Quanterra Environm. Services

3

Page 1 of 3

SAMPLE SAFE™ CONDITIONS

QUANTERRA CLIENT: Woodward Clyde Federal Service (WCFS)	PACKED BY: Kennedy
PROJECT: Temp. Test Facility (TTF) White Sand missil Range (WSMR)	SEAL INTACT UPON RECEIPT BY SAMPLING COMPANY:
SAMPLING COMPANY: WCFS	SEALED FOR SHIPPING BY:
SAMPLING SITE: TTF	SEAL NUMBER:
TEAM LEADER: Kennedy	SEAL INTACT UPON RECEIPT BY LAB: ☒ Yes ☐ No

SEAL NUMBER:

CONDITION OF CONTENTS:

INITIAL CONTENTS TEMP: 4 °C

SAMPLING STATUS: ☒ Done ☐ Continuing Until

CONTENTS TEMPERATURE UPON RECEIPT BY LAB: QES 1.7 °C

DATE	TIME	SAMPLE ID/DESCRIPTION		SAMPLE TYPE	# CONTAINERS	ANALYSIS PARAMETERS	REMARKS
3/15/95	16:30	WSTF-SB03-2010	01	~~2-4oz~~ Soils	2-4oz	VOC 8240	
3/15/95	16:50	" " -2021	02	Soils	"	"	
3/16/95	07:35	" - " -2053	03	"	"	"	
"	07:50	" - " -2060	04	"	"	"	
"	08:15	" - " -2063	05	"	"	"	
"	08:30	" - " -2065	06	"	"	"	
"	09:00	" - " -2070	07	"	"	"	
"	09:15	" - " -2073	08	"	"	"	
"	09:30	" - " -2074	09	"	"	"	
"	08:15	" - " -2063 QC	10	"	"	"	

CUSTODY TRANSFERS PRIOR TO SHIPPING

RELINQUISHED BY (SIGNED)	RECEIVED BY (SIGNED)	DATE	TIME
[signature]		3/16/95	1800

SHIPPING DETAILS

DELIVERED TO SHIPPER BY: ~~Fed. Exp.~~ Nickisch.

METHOD OF SHIPMENT: Fed Exp

AIRBILL NUMBER: 0073414943

RECEIVED FOR LAB: QES

SIGNED: [signature]

DATE/TIME: 3/17/95 08:

QUANTERRA PROJECT NUMBER: 41029

QUA 4119

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Quanterra Environ Services

QUANTERRA CLIENT: WCFS	
PROJECT: TTF - WSMR	
SAMPLING COMPANY: WCFS	
SAMPLING SITE: TTF	
TEAM LEADER: Kennedy	

SAMPLE SAFE™ CONDITIONS

PACKED BY	SEAL NUMBER
SEAL INTACT UPON RECEIPT BY SAMPLING COMPANY	CONDITION OF CONTENTS
SEALED FOR SHIPPING BY	INITIAL CONTENTS TEMP 4.6 °C
SEAL NUMBER	SAMPLING STATUS ☐ Done ☑ Continuing Until
SEAL INTACT UPON RECEIPT BY LAB ☒ Yes ☐ No	CONTENTS TEMPERATURE UPON RECEIPT BY LAB QES 1.7 °C

DATE	TIME	SAMPLE ID/DESCRIPTION		SAMPLE TYPE	# CONTAINERS	ANALYSIS PARAMETERS	REMARKS
3/16/95	13:00	WSTF - SB01 - 2017	11	Soil	2-4oz	VOC (8240)	
"	13:15	" - " - 2025	12	"	"		
"	13:45	" - " - 2050-EB	13	water	3-40ml	Vial w/ HCL	
"	15:00 14:30 DSK	" - " - 2057	14	Soil	2-4oz	" "	
"	15:00	" - " - 2057-QC	15	"	"		
"	16:00	" - " - 2062	16	"	"		✓ ✓
"	16:15	" - " - 2063	17	"	"		✓ ✓
"	15:45	" - " - 2061	18	"	"		✓ ✓
"	15:45	" - " - 2061-MS/MSD	18 MS/SD	"	"		✓ ✓ ✓
"	16:35	" - " 2072	19	"	"		

CUSTODY TRANSFERS PRIOR TO SHIPPING

RELINQUISHED BY (SIGNED)	RECEIVED BY (SIGNED)	DATE	TIME
[signature]		3/16/95	18:00

SHIPPING DETAILS

DELIVERED TO SHIPPER BY: Nickison	
METHOD OF SHIPMENT: FedExp	AIRBILL NUMBER: 0073414943
RECEIVED FOR LAB: QES	SIGNED: [signature] DATE/TIME: 3/17/95 08:[illegible]
QUANTERRA PROJECT NUMBER	

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Quanterra Environmental Services

SAMPLE SAFE™ CONDITIONS

QUANTERRA CLIENT: WCFS	PACKED BY: Kennedy
PROJECT: TTF-WSMR	SEAL INTACT UPON RECEIPT BY SAMPLING COMPANY:
SAMPLING COMPANY: WCFS	SEALED FOR SHIPPING BY:
SAMPLING SITE: TTF	SEAL NUMBER:
TEAM LEADER: Kennedy	SEAL INTACT UPON RECEIPT BY LAB: ☒ Yes ☐ No

SEAL NUMBER:

CONDITION OF CONTENTS:

INITIAL CONTENTS TEMP: 9 °C

SAMPLING STATUS: ☐ Done ☑ Continuing Until

CONTENTS TEMPERATURE UPON RECEIPT BY LAB: QES 1.7 °C

DATE	TIME	SAMPLE ID/DESCRIPTION	SAMPLE TYPE	# CONTAINERS	ANALYSIS PARAMETERS	REMARKS
3/16/95 ~~10:42~~	16:45	WSTF-SB01-2076 20	Soil	2-4oz	VOC (8240)	
3/16/95	16:55	" - " - 2080 21	Soil	"	" "	

CUSTODY TRANSFERS PRIOR TO SHIPPING

RELINQUISHED BY (SIGNED)	RECEIVED BY (SIGNED)	DATE	TIME
[signature]		3/16/95	18:00

SHIPPING DETAILS

DELIVERED TO SHIPPER BY: Nick Kisch

METHOD OF SHIPMENT: Fed Exp

AIRBILL NUMBER: 607341-4943

RECEIVED FOR LAB: QES

SIGNED: [signature]

DATE/TIME: 3/17/95 08:10

QUANTERRA PROJECT NUMBER:

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Quanterra Environmental Services

Page 1 of 2

QUANTERRA CLIENT: Woodward-Clyde Federal Services (WCFS)	
PROJECT: Temp. Test Facility - White Sand Missile Range	
SAMPLING COMPANY: (WCFS)	
SAMPLING SITE: Temp. Test Facility	
TEAM LEADER: Kennedy	

SAMPLE SAFE™ CONDITIONS

PACKED BY: Kennedy	SEAL NUMBER:
SEAL INTACT UPON RECEIPT BY SAMPLING COMPANY:	CONDITION OF CONTENTS: Good
SEALED FOR SHIPPING BY:	INITIAL CONTENTS TEMP: = 4 °C
SEAL NUMBER:	SAMPLING STATUS: ☐ Done ☑ Continuing Until
SEAL INTACT UPON RECEIPT BY LAB: ☑ Yes ☐ No	CONTENTS TEMPERATURE UPON RECEIPT BY LAB: 3.2 °C

DATE	TIME	SAMPLE ID/DESCRIPTION	SAMPLE TYPE	# CONTAINERS	ANALYSIS PARAMETERS	REMARKS	
3/14/95	12:00	WST F-DB09-2050	Soils	2-4oz Glass	VOC (8240)		-01
3/13/95	16:20	" -DB03-2050	"	"	" "		-02
3/14/95	11:30	" -DB09-2050-EB	water	3-~~[illegible]~~ 40ml Vials	" "	Pres. w/ HCl	-03
3/15/95	12:00	" -SB02-2052-QC	Soils	2-4oz Glass	" "		-04
"	12:10	" - " -2059-QC	"	"	" "		-05
"	11:45	" -SB02-2050	"	"	"		-06
"	09:50	" - " -2012	"	"	" "		-07
"	09:35	" - " -2002	"	"	" "		-08
"	12:00	" - " -2052		"	" "		-09
"	12:00	" " -2052 MS/MSD	"	3-4oz	" "		-09 MS/MSD

CUSTODY TRANSFERS PRIOR TO SHIPPING

RELINQUISHED BY (SIGNED)	RECEIVED BY (SIGNED)	DATE	TIME
[signature]		3/15/95	18:00

SHIPPING DETAILS

DELIVERED TO SHIPPER BY: Kennedy	
METHOD OF SHIPMENT: Fed Exp	AIRBILL NUMBER: 0073414946
RECEIVED FOR LAB: QR	SIGNED: Anthony James / DATE/TIME: 3/16/95
QUANTERRA PROJECT NUMBER: 41007	

QUA 4119

White - CLIENT Pink - LAB

'HA... OF --ST--!
Quanterra Incorporated
4955 Yarrow Street
Arvada, Colorado 80002

303 421-6611 Telephone
303 431-7171 Fax

Quanterra Environmental Services

Page 2 of 2

QUANTERRA CLIENT: Woodward-Clyde Federal Services (WCFS)

PROJECT: Temp TEST Facility (TTF) - White Sands Missile Range

SAMPLING COMPANY: WCFS

SAMPLING SITE: TTT

TEAM LEADER: Kennedy

SAMPLE SAFE™ CONDITIONS

PACKED BY: Kennedy

SEAL NUMBER:

SEAL INTACT UPON RECEIPT BY SAMPLING COMPANY:

CONDITION OF CONTENTS:

SEALED FOR SHIPPING BY:

INITIAL CONTENTS TEMP: 4 °C

SEAL NUMBER:

SAMPLING STATUS: ☐ Done ☑ Continuing Until

SEAL INTACT UPON RECEIPT BY LAB: ☑ Yes ☐ No

CONTENTS TEMPERATURE UPON RECEIPT BY LAB: 3.2 °C

DATE	TIME	SAMPLE ID/DESCRIPTION	SAMPLE TYPE	# CONTAINERS	ANALYSIS PARAMETERS	REMARKS
3/15/95	12:10	WSTF-SB02-2059	Soils	2-4oz	VOC (8240)	-10
"	12:10	" - " - " MS/MSD	"	3-4oz	"	-10 MS/MSD
"	13:15	" - " - 2065	"	2-4oz	"	-11
"	13:35	" - " - 2072	"	"	"	-12
"	13:05	" - " - 2064	"	"	"	-13
"	14:05	" - " - 2078	"	"	"	-14
"	14:10	" - " - 2079	"	"	"	-15

CUSTODY TRANSFERS PRIOR TO SHIPPING

RELINQUISHED BY (SIGNED)	RECEIVED BY (SIGNED)	DATE	TIME
[signature]		3/15/95	18:00

SHIPPING DETAILS

DELIVERED TO SHIPPER BY: Kennedy

METHOD OF SHIPMENT: Fed Exp

AIRBILL NUMBER: 0073414946

RECEIVED FOR LAB: QDL

SIGNED: Anthony Turner

DATE/TIME: 3/16/95

QUANTERRA PROJECT NUMBER: 41087

QDA 4119

White - CLIENT Pink - LAB

CHAIN OF CUSTODY RECORD

SOUTHWEST LABORATORY OF OKLAHOMA, INC.
1700 W. Albany • Broken Arrow, Oklahoma 74012-1421
Office: 918-251-2858 • Fax 918-251-2599

SAMPLING FIRM	CLIENT CONTACT	PHONE NUMBER
Woodward-Clyde (W-C)	WC	405-677-2041

P.O. or PROPOSAL NUMBER	PROJECT NAME
	Temp. Test Facility - White Sand Missil Range

SAMPLER (Signature)

ANALYTICAL TESTS REQUESTED

QDL # 40965

SAMPLE NO	DATE	TIME	COMP.	GRAB	LOCATION	MATRIX	NUMBER OF CONTAINERS	VOC (8240)								REMARKS
	3/10/95	11:15			WSTF-DB01-2048	Soil	2 3ozs ~~2 4oz~~	X								-01
	3/10/95	14:45			" - DB02-2048	"	2 4oz	X								-02
	3/11/95	9:50 ~~10:50~~			" - DB04-2047	"	"	X								-03
	3/11/95	14:00			" - DB05-2052	"	"	X								-04
	3/12/95	11:20			" - DB07-2045	"	"	X								-05
	3/12/95	16:25			" DB08-2043	"	"	X								-06
	3/13/95	11:30			" - DB06-~~2054~~ 2041	"	"	X								-07

RELINQUISHED BY: (Signature)	DATE	TIME	RECEIVED BY: (Signature)
	3/13/95	16:00	

RELINQUISHED BY: (Signature)	DATE	TIME	RECEIVED BY: (Signature)

RELINQUISHED BY: (Signature)	DATE	TIME	RECEIVED BY: (Signature)

RELINQUISHED BY: (Signature)	DATE	TIME	RECEIVED FOR LABORABORY BY: (Signature)
	3/14/95	0830	QDL

RELINQUISHED BY: (Signature)	DATE	TIME	RECEIVED BY: (Signature)

REMARKS:

SR012-119203

Enseco
A Corning Company

CHAIN OF CUSTODY RECORD

☐ 2544 Industrial Ave., West Sacramento, CA. 95691-3435 (916) 372-1393
☐ 7440 Lincoln Way, Garden Grove, CA. 92641-1432 (714) 898-6370
☐ 18501 East Gale Ave., City of Industry, CA. 91748-1321 (818) 965-1006
☐ Mobile Labs, 1 (800) ENSECO-8

10243

DATE	CHAIN OF CUSTODY NUMBER
6/30	18516
LAB NUMBER	Page 1 of 1

CLIENT: Woodward-Clyde Federal Service
PROJECT MANAGER: Dave Convey
ADDRESS: 10975 El Monte, Suite 100
TELEPHONE NUMBER (AREA CODE): 913-344-1156
CITY: Overland Park | STATE: KS | ZIP CODE: 66211
SITE CONTACT: Dan Kennedy
TELEPHONE NUMBER (AREA CODE):
PROJECT NAME: RCRA Fac Inv. @ the Temp. Test Facility
CONTRACT/PURCHASE ORDER/QUOTE NO.: F9435 F93102 Task 3D

ANALYSES: VOC including Freon TO-14

SAMPLE NO./IDENTIFICATION	DATE	TIME	LAB/SAMPLE NUMBER	SAMPLE TYPE LIQ.	AIR	SOLID	NO. OF CONTAINERS	VOC including Freon TO-14	Sample Condition/ REMARKS
WSTF-0014-5100	6/30/94	10:30			Y		1	✓	Initial Canister Press 29" in 6 L size
WSTF-0020-5077	"	09:25			Y		1	✓	"
WSTF-0025-5078	"	11:05			Y		1	✓	"
WSTF-0027-5080	"	08:00			Y		1	✓	"
WSTF-0029-5058	"	10:10			Y		1	✓	"
WSTF-0029-5058-QC	"	10:12			Y		1	✓	"
WSTF-9201-5089	"	09:50			Y		1	✓	"
WSTF-9202-5092	"	08:40			Y		1	✓	"
WSTF-0000-5077	"	11:25			Y		1	✓	"
									* also include 3 unused canisters

DO THE SAMPLE(S) POSE ANY POTENTIAL HAZARD(S)? IF YES, PLEASE EXPLAIN

SAMPLERS (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE	TIME
[signature]	[signature]		6/30/94	18:00

RECEIVED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)	DATE	TIME

RECEIVED FOR LABORATORY BY		DATE	TIME		DATE	TIME
[signature]	RECEIVED	7/1/94	915	ACCEPTED		

METHOD OF SHIPMENT: Fed Exp. 9050975416, MPS 9378745466, " 9378745415

SPECIAL INSTRUCTIONS

The delivery of samples and the signature on this chain of custody form constitutes authorization to perform the analyses specified above under the **Enseco** Terms and Conditions, unless a contract or purchase order has been executed and is sited above.

SAMPLE DESPOSITION:
1. Storage time requested: Per Contract days (Samples will be stored for thirty (30) days without additional charge; thereafter storage charges will be billed at the published rates.)
2. Sample to be returned to client: ☐ Yes ☐ No (**Enseco** will dispose of unreturned samples for a charge of $15.00. Disposal will be by incineration wherever possible; otherwise, as appropriate, according to legal requirements.)

DISTRIBUTION: WHITE - With Report; CANARY - To **ENSECO**; PINK - To Courier; GOLDENROD - To Sample Control

Enseco
A Corning Company

CHAIN OF CUSTODY RECORD

45-A

☐ 2544 Industrial Ave., West Sacramento, CA. 95691-3435 (916) 372-1393
☐ 7440 Lincoln Way, Garden Grove, CA. 92641-1432 (714) 898-6370
☐ 18501 East Gale Ave., City of Industry, CA. 91748-1321 (818) 965-1006
☐ Mobile Labs, 1 (800) ENSECO-8

DATE: 6/29
CHAIN OF CUSTODY NUMBER: 18515
LAB NUMBER: 106337
Page 1 of 1

CLIENT: Woodward-Clyde Federal Services
PROJECT MANAGER: Dave Convey
ADDRESS: 10995 El Monte, Suite 100
TELEPHONE NUMBER (AREA CODE): 913-344 1156
CITY: Overland Park | STATE: KS | ZIP CODE: 66211
SITE CONTACT: Dan Kennedy
PROJECT NAME: RCRA Facility Inv. @ the Temp. Test Facility - WSMS
TELEPHONE NUMBER (AREA CODE):
CONTRACT/PURCHASE ORDER/QUOTE NO.: ~~F935~~ F93102 Task 3D

ANALYSES: VOC including Freons TO-14

SAMPLE NO./IDENTIFICATION	DATE	TIME	LAB/SAMPLE NUMBER	SAMPLE TYPE LIQ.	AIR	SOLID	NO. OF CONTAINERS	VOC including Freons TO-14	Sample Condition/ REMARKS
WSTF-0021-5080	6/29	09:40			X		1	✓	Initial canister P.S. 1 [illegible]
WSTF-0024-5072	6/29/94	10:30			X		1	✓	" "
WSTF-0011-5058	6/29/94	10:50			X		1	✓	" "
WSTF-0023-5085	6/29/94	11:20			X		1	✓	" "
WSTF-0022-5080	6/29/94	11:50			X		1	✓	" "
WSTF-0022-5080-QC	6/29/94	11:53			X		1	✓	" "
WSTF-0017-5082	6/29/94	13:00			X		1	✓	" "
WSTF-0019-~~5085~~ 5035	6/29/94	13:30			X		1	✓	" "
WSTF-0018-5052	6/29/94	14:55			X		1	✓	" "
WSTF-0016-5070	6/29/94	15:20			X		1	✓	" "

DO THE SAMPLE(S) POSE ANY POTENTIAL HAZARD(S)? IF YES, PLEASE EXPLAIN: No

SAMPLERS (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE	TIME
[signature]	[signature]		6/29/94	18:00

RECEIVED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)	DATE	TIME

RECEIVED FOR LABORATORY BY	RECEIVED	DATE	TIME	ACCEPTED	DATE	TIME
[signature]		6/30	1000			

METHOD OF SHIPMENT: Fed Exp 9050975883, MSP 9304326254 & MSP 9304326263

SPECIAL INSTRUCTIONS:

The delivery of samples and the signature on this chain of custody form constitutes authorization to perform the analyses specified above under the **Enseco** Terms and Conditions, unless a contract or purchase order has been executed and is sited above.

SAMPLE DESPOSITION:

1. Storage time requested: Per contract days (Samples will be stored for thirty (30) days without additional charge; thereafter storage charges will be billed at the published rates.)
2. Sample to be returned to client: ☐ Yes ☐ No (**Enseco** will dispose of unreturned samples for a charge of $15.00. Disposal will be by incineration wherever possible; otherwise, as appropriate, according to legal requirements.)

DISTRIBUTION: WHITE - With Report; CANARY - To **ENSECO**, PINK - To Courier; GOLDENROD - To Sample Control

APPENDIX C
SUMMARY OF FIELD FLAME IONIZATION DETECTOR (FID) READINGS

SUMMARY OF SOIL FID READINGS, TEMPERATURE TEST FACILITY, WHITE SANDS MISSILE RANGE, NM

SOIL BORING ID	DATE DRILLED	CORE INTERVAL (feet bgs)	FID READING, (ppm)	BACKGROUND FID READING (ppm)
WSTF-DB01	3/9/95-	0.0 - 2.5	2.0	SOIL: 2
	3/10/95	2.5 - 5.0	NR	AIR: 3
		5.0 - 7.0	2.0	
		7.0 - 10.0	NR	
		10.0 - 11.0	2.0	
		11.0 - 15.0	NR	
		15.0 - 18.0	2.0	
		18.0 - 20.0	NR	
		20.0 - 25.0	2.0	
		25.0 - 28.4	1.5	
		28.4 - 30.0	NR	
		30.0 - 33.0	1.5	
		33.0 - 35.0	NR	
		35.0 - 39.0	1.5	
		39.0 - 40.0	NR	
		40.0 - 45.0	1.5	
WSTF-DB02	3/10/95	0.0 - 1.5	2.0	SOIL: 2
		1.5 - 5.0	NR	AIR: 4
		5.0 - 6.5	2.0	
		6.5 - 10.0	NR	
		10.0 - 12.0	2.0	
		12.0 - 15.0	NR	
		15.0 - 17.0	2.0	
		17.0 - 20.0	NR	
		20.0 - 22.0	2.0	
		22.0 - 25.0	NR	
		25.0 - 27.0	2.0	
		27.0 - 30.0	NR	
		30.0 - 32.0	2.0	
		32.0 - 35.0	NR	
		35.0 - 37.0	2.0	
		37.0 - 40.0	NR	
		40.0 - 42.5	2.0	
WSTF-DB03	3/13/95	0 - 3.8	2.0	SOIL: 1.5
		3.8 - 5.0	NR	AIR: 1.5
		5.0 - 7.5	2.0	
		7.5 - 10.0	NR	
		10.0 - 15.0	2.0	
		15.0 - 17.5	2.0	
		17.5 - 20.0	NR	
		20.0 - 22.5	1.5	
		22.5 - 25.0	NR	
		25.0 - 27.5	1.5	
		27.5 - 30.0	NR	
		30.0 - 32.5	1.5	
		32.5 - 35.0	NR	
		35.0 - 37.5	1.5	
		37.5 - 40.0	NR	

SUMMARY OF SOIL FID READINGS, TEMPERATURE TEST FACILITY, WHITE SANDS MISSILE RANGE, NM

SOIL BORING ID	DATE DRILLED	CORE INTERVAL (feet bgs)	FID READING, (ppm)	BACKGROUND FID READING (ppm)
		40.0 - 42.5	1.5	
		42.5 - 45.0	NR	
		45.0 - 47.0	1.5	
WSTF-DB04	3/11/95	0.0 - 3.0	2.0	SOIL: 2
		3.0 - 5.0	NR	AIR: 2
		5.0 - 7.0	2.0	
		7.0 - 10.0	NR	
		10.0 - 15.0	2.0	
		15.0 - 17.5	2.0	
		17.5 - 20.0	NR	
		20.0 - 23.0	2.0	
		23.0 - 25.0	NR	
		25.0 - 27.0	2.0	
		27.0 - 30.0	NR	
		30.0 - 35.0	2.0	
		35.0 - 38.5	2.0	
		38.5 - 40.0	NR	
		40.0 - 43.0	4.0	
		43.0 - 45.0	NR	
WSTF-DB05	3/11/95	0.0 - 2.0	2.0	SOIL: 2
		2.0 - 5.0	NR	AIR: 2
		5.0 - 7.0	2.0	
		7.0 - 10.0	NR	
		10.0 - 12.0	2.0	
		12.0 - 15.0	NR	
		15.0 - 17.0	2.0	
		17.0 - 20.0	NR	
		20.0 - 21.5	2.0	
		21.5 - 25.0	NR	
		25.0 - 28.0	2.0	
		28.0 - 30.0	NR	
		30.0 - 31.5	2.0	
		31.5 - 35.0	NR	
		35.0 - 38.0	2.0	
		38.0 - 40.0	NR	
		40.0 - 45.0	2.0	
		45.0 - 47.5	2.0	
		47.5 - 48.5	NR	
WSTF-DB06	3/13/95	0.0 - 2.0	1.0	SOIL: 1
		2.0 - 5.0	NR	AIR: 1
		5.0 - 6.0	1.0	
		6.0 - 10.0	NR	
		10.0 - 12.3	1.0	
		12.3 - 15.0	NR	
		15.0 - 18.0	1.0	
		18.0 - 20.0	NR	
		20.0 - 21.5	1.0	

SUMMARY OF SOIL FID READINGS, TEMPERATURE TEST FACILITY, WHITE SANDS MISSILE RANGE, NM

SOIL BORING ID	DATE DRILLED	CORE INTERVAL (feet bgs)	FID READING, (ppm)	BACKGROUND FID READING (ppm)
		21.5 - 25.0	NR	
		25.0 - 28.0	1.0	
		28.0 - 30.0	NR	
		30.0 - 32.8	1.0	
		32.8 - 35.0	NR	
		35.0 - 37.8	1.0	
		37.8 - 40.0	NR	
WSTF-DB07	3/12/95	0.0 - 2.0	1.5	SOIL: 1.5
		2.0 - 5.0	NR	AIR: 1.5
		5.0 - 6.5	1.5	
		6.5 - 10.0	NR	
		10.0 - 13.0	1.5	
		13.0 - 15.0	NR	
		15.0 - 18.5	1.5	
		18.5 - 20.0	NR	
		20.0 - 23.0	1.5	
		23.0 - 25.0	NR	
		25.0 - 28.0	1.5	
		28.0 - 30.0	NR	
		30.0 - 33.0	1.5	
		33.0 - 35.0	NR	
		35.0 - 37.0	1.5	
		37.0 - 40.0	NR	
WSTF-DB08	3/12/95	0.0 - 2.0	1.75	SOIL: 1.75
		2.0 - 5.0	NR	AIR: 1.75
		5.0 - 6.5	1.75	
		6.5 - 10.0	NR	
		10.0 - 11.0	1.75	
		11.0 - 15.0	NR	
		15.0 - 16.0	1.75	
		16.0 - 20.0	NR	
		20.0 - 21.0	1.75	
		21.0 - 25.0	NR	
		25.0 - 26.5	1.75	
		26.5 - 30.0	NR	
		30.0 - 32.5	1.75	
		32.5 - 35.0	NR	
		35.0 - 37.5	1.75	
		37.5 - 40.0	NR	
WSTF-DB09	3/14/95	0.0 - 2.2	1.0	SOIL: 1.0
		2.2 - 5.0	NR	AIR: 1.0
		5.0 - 7.0	1.0	
		7.0 - 10.0	NR	
		10.0 - 12.5	1.0	
		12.5 - 15.0	NR	
		15.0 - 17.5	1.0	
		17.5 - 20.0	NR	

SUMMARY OF SOIL FID READINGS, TEMPERATURE TEST FACILITY, WHITE SANDS MISSILE RANGE, NM

SOIL BORING ID	DATE DRILLED	CORE INTERVAL (feet bgs)	FID READING, (ppm)	BACKGROUND FID READING (ppm)
		20.0 - 22.5	1.0	
		22.5 - 25.0	NR	
		25.0 - 29.5	1.0	
		29.5 - 30.0	NR	
		30.0 - 32.5	1.0	
		32.5 - 35.0	NR	
		35.0 - 37.5	1.0	
		37.5 - 40.0	NR	
		40.0 - 45.1	1.0	
		45.1 - 47.5	1.0	
WSTF-SB01	3/16/95	0.0 - 2.5	1.8	SOIL: 1.5
		2.5 - 5.0	NR	AIR: 1.5 - 2.0
		5.0 - 6.8	1.5	
		6.8 - 10.0	NR	
		10.0 - 12.0	1.5	
		12.0 - 15.0	NR	
		15.0 - 17.5	1.75	
		17.5 - 20.0	NR	
		20.0 - 22.5	1.75	
		22.5 - 25.0	NR	
		25.0 - 26.5	1.75	
		26.5 - 30.0	NR	
		30.0 - 32.5	1.75	
		32.5 - 35.0	NR	
		35.0 - 36.0	1.75	
		36.0 - 37.5	NR	
		37.5 - 39.5	1.4	
		39.5 - 40.0	NR	
		40.0 - 42.5	1.25	
		42.5 - 45.0	1.25	
		45.0 - 47.5	1.5	
		47.5 - 50.0	1.5	
		50.0 - 52.5	1.5	
		52.5 - 55.0	1.5	
		55.0 - 57.5	4.0	
		57.5 - 60.0	1.25	
		60.0 - 62.5	1.25	
		62.5 - 65.0	1.25	
		65.0 - 67.5	1.25	
		67.5 - 70.0	1.25	
		70.0 - 72.5	1.25	
		72.5 - 73.8	1.25	
		73.8 - 75.0	NR	
		75.0 - 76.3	1.25	
		76.3 - 77.5	NR	
		77.5 - 80.0	1.25	
		80.0 - 82.5	1.25	
WSTF-SB02	3/15/95	0.0 - 2.5	1.5	SOIL: 1.5

SUMMARY OF SOIL FID READINGS, TEMPERATURE TEST FACILITY, WHITE SANDS MISSILE RANGE, NM

SOIL BORING ID	DATE DRILLED	CORE INTERVAL (feet bgs)	FID READING, (ppm)	BACKGROUND FID READING (ppm)
		2.5 - 5.0	NR	AIR: 1.5
		5.0 - 7.5	1.5	
		7.5 - 10.0	NR	
		10.0 - 12.5	1.5	
		12.5 - 15.0	NR	
		15.0 - 18.5	1.5	
		18.5 - 20.0	NR	
		20.0 - 24.0	1.5	
		24.0 - 25.0	NR	
		25.0 - 27.5	1.5	
		27.5 - 30.0	NR	
		30.0 - 32.5	1.5	
		32.5 - 35.0	NR	
		35.0 - 37.5	1.25	
		37.5 - 40.0	NR	
		40.0 - 42.5	1.25	
		42.5 - 45.0	NR	
		45.0 - 47.5	1.25	
		47.5 - 50.0	NR	
		50.0 - 52.5	1.25	
		52.5 - 55.0	1.25	
		55.0 - 57.5	1.25	
		57.5 - 60.0	1.25	
		60.0 - 61.5	1.25	
		61.5 - 62.5	NR	
		62.5 - 65.0	1.25	
		65.0 - 67.5	1.25	
		67.5 - 70.0	1.25	
		70.0 - 72.5	1.0	
		72.5 - 75.0	1.0	
		75.0 - 77.5	1.25	
		77.5 - 80.0	1.0	
		80.0 - 82.5	1.0	
WSTF-SB03	3/15/95-3/16/95	0.0 - 2.0	1.25	SOIL: 2
		2.0 - 5.0	NR	AIR: 2
		5.0 - 6.5	1.25	
		6.5 - 10.0	NR	
		10.0 - 11.0	1.4	
		11.0 - 15.0	NR	
		15.0 - 17.0	1.2	
		17.0 - 20.0	NR	
		20.0 - 22.5	1.2	
		22.5 - 25.0	NR	
		25.0 - 27.5	1.2	
		27.5 - 30.0	NR	
		30.0 - 32.5	1.2	
		32.5 - 35.0	NR	
		35.0 - 37.5	4.0	
		37.5 - 40.0	NR	

SUMMARY OF SOIL FID READINGS, TEMPERATURE TEST FACILITY, WHITE SANDS MISSILE RANGE, NM

SOIL BORING ID	DATE DRILLED	CORE INTERVAL (feet bgs)	FID READING, (ppm)	BACKGROUND FID READING (ppm)
		40.0 - 42.5	2.0	
		42.5 - 45.0	NR	
		45.0 - 46.4	2.0	
		46.4 - 50.0	NR	
		50.0 - 52.0	1.25	
		52.0 - 52.5	NR	
		52.5 - 55.0	1.1	
		55.0 - 57.5	1.1	
		57.5 - 60.0	1.1	
		60.0 - 61.0	1.1	
		61.0 - 62.5	NR	
		62.5 - 64.5	1.1	
		64.5 - 65.0	NR	
		65.0 - 67.0	1.1	
		67.0 - 67.5	NR	
		67.5 - 70.0	1.1	
		70.0 - 72.5	1.0	
		72.5 - 75.0	1.1	
		75.0 - 77.5	1.0	
		77.5 - 80.0	1.0	
WSTF-SB04	3/23/95	FID NOT FUNCTIONING DURING SB04		
WSTF-SB05	3/26/95	0.0 - 1.4	1.5	SOIL: 1.5
		1.4 - 5.0	NR	AIR: 1.5
		5.0 - 6.0	1.7	
		6.0 - 10.0	NR	
		10.0 - 12.0	1.7	
		12.0 - 15.0	NR	
		15.0 - 17.5	1.5	
		17.5 - 20.0	NR	
		20.0 - 21.5	1.5	
		21.5 - 25.0	NR	
		25.0 - 26.0	1.5	
		26.0 - 30.0	NR	
		30.0 - 31.0	1.5	
		31.0 - 35.0	NR	
		35.0 - 37.5	2.0	
		37.5 - 40.0	2.0	
		40.0 - 42.5	2.5	
		42.5 - 45.0	2.5	
		45.0 - 47.0	3.5	
		47.0 - 47.5	NR	
		47.5 - 49.5	2.75	
		49.5 - 50.0	NR	
		50.0 - 52.0	2.75	
		52.0 - 52.5	NR	
		52.5 - 54.5	2.75	
		54.5 - 55.0	NR	
		55.0 - 57.5	2.5	

SUMMARY OF SOIL FID READINGS, TEMPERATURE TEST FACILITY, WHITE SANDS MISSILE RANGE, NM

SOIL BORING ID	DATE DRILLED	CORE INTERVAL (feet bgs)	FID READING, (ppm)	BACKGROUND FID READING (ppm)
		57.5 - 60.0	2.0	
		60.0 - 62.5	2.0	
		62.5 - 65.0	2.0	
		65.0 - 67.5	2.5	
		67.5 - 70.0	2.0	
		70.0 - 72.5	2.25	
		72.5 - 75.0	2.0	
		75.0 - 77.5	5.0	
WSTF-SB06	3/22/95	0.0 - 2.0	1.0	SOIL: 1.0
		2.0 - 5.0	NR	AIR: 1.0
		5.0 - 7.3	1.0	
		7.3 - 10.0	NR	
		10.0 - 12.5	1.0	
		12.5 - 15.0	NR	
		15.0 - 17.2	1.0	
		17.2 - 20.0	NR	
		20.0 - 22.5	1.0	
		22.5 - 25.0	NR	
		25.0 - 27.0	1.0	
		27.0 - 30.0	NR	
		30.0 - 32.5	1.0	
		32.5 - 35.0	NR	
		35.0 - 37.4	1.0	
		37.4 - 40.0	NR	
		40.0 - 42.5	1.0	
		42.5 - 45.0	1.0	
		45.0 - 47.5	1.0	
		47.5 - 50.0	1.0	
		50.0 - 52.0	1.0	
		52.0 - 52.5	NR	
		52.5 - 55.0	1.0	
		55.0 - 57.5	1.0	
		57.5 - 60.0	1.0	
		60.0 - 62.5	1.0	
		62.5 - 65.0	1.0	
		65.0 - 67.5	1.0	
		67.5 - 70.0	1.0	
		70.0 - 72.5	1.0	
		72.5 - 75.0	1.0	
		75.0 - 77.5	1.0	
		77.5 - 80.0	1.0	
		80.0 - 82.5	1.0	
WSTF-SB07	3/27/95	0.0 - 2.5	2.25	AIR: 1.75
		2.5 - 5.0	NR	SOIL: 1.75
		5.0 - 7.5	3.0	
		7.5 - 10.0	NR	
		10.0 - 11.5	3.0	
		11.5 - 15.0	NR	

SUMMARY OF SOIL FID READINGS, TEMPERATURE TEST FACILITY, WHITE SANDS MISSILE RANGE, NM

SOIL BORING ID	DATE DRILLED	CORE INTERVAL (feet bgs)	FID READING, (ppm)	BACKGROUND FID READING (ppm)
		15.0 - 17.0	1.75	
		17.0 - 20.0	NR	
		20.0 - 22.0	1.75	
		22.0 - 25.0	NR	
		25.0 - 27.5	3.25	
		27.5 - 30.0	NR	
		30.0 - 32.5	2.0	
		32.5 - 35.0	NR	
		35.0 - 37.5	3.0	
		37.5 - 40.0	NR	
		40.0 - 42.5	3.0	
		42.5 - 45.0	3.5	
		45.0 - 46.5	4.25	
		46.5 - 47.5	NR	
		47.5 - 50.0	2.25	
		50.0 - 52.5	3.0	
		52.5 - 54.5	3.6	
		54.5 - 55.0	NR	
		55.0 - 57.0	3.0	
		57.0 - 57.5	NR	
		57.5 - 60.0	1.75	
		60.0 - 62.5	1.75	
		62.5 - 65.0	1.7	
		65.0 - 67.5	4.0	
		67.5 - 70.0	4.0	
		70.0 - 72.5	2.5	
		72.5 - 75.0	1.75	
		75.0 - 77.0	2.0	
		77.0 - 77.5	NR	
		77.5 - 80.0	3.0	
WSTF-SB08	3/23/95-	0.0 - 2.5	2.1	SOIL: 2.0
	3/24/95	2.5 - 5.0	NR	AIR: 2.0
		5.0 - 7.5	3.0	
		7.5 - 10.0	NR	
		10.0 - 11.0	2.5	
		11.0 - 15.0	NR	
		15.0 - 17.5	3.5	
		17.5 - 20.0	NR	
		20.0 - 22.5	2.25	
		22.5 - 25.0	NR	
		25.0 - 26.3	2.0	
		26.3 - 30.0	NR	
		30.0 - 31.5	2.5	
		31.5 - 35.0	NR	
		35.0 - 37.5	2.0	
		37.5 - 40.0	NR	
		40.0 - 42.5	4.0	
		42.5 - 45.0	3.5	
		45.0 - 47.5	4.5	

SUMMARY OF SOIL FID READINGS, TEMPERATURE TEST FACILITY, WHITE SANDS MISSILE RANGE, NM

SOIL BORING ID	DATE DRILLED	CORE INTERVAL (feet bgs)	FID READING, (ppm)	BACKGROUND FID READING (ppm)
		47.5 - 50.0	2.75	
		50.0 - 51.0	7.0	
		51.0 - 52.5	NR	
		52.5 - 55.0	8.0	
		55.0 - 57.5	100.0	
		57.5 - 60.0	300.0	
		60.0 - 62.5	500.0	
		62.5 - 65.0	1000.0	
		65.0 - 66.0	60.0	
		66.0 - 67.5	NR	
		67.5 - 68.5	900.0	
		68.5 - 70.0	NR	
		70.0 - 72.5	900.0	
		72.5 - 75.0	1750.0	
		75.0 - 77.5	1300.0	
		77.5 - 80.0	1000.0	
		80.0 - 82.5	NR	
WSTF-SB09	3/25/95	0.0 - 2.5	2.0	SOIL: 2.0
		2.5 - 5.0	NR	AIR: 2.0
		5.0 - 7.0	3.0	
		7.0 - 10.0	NR	
		10.0 - 15.0	2.5	
		15.0 - 17.5	2.0	
		17.5 - 20.0	NR	
		20.0 - 22.5	2.0	
		22.5 - 25.0	NR	
		25.0 - 27.0	2.0	
		27.0 - 30.0	NR	
		30.0 - 31.0	3.0	
		31.0 - 35.0	NR	
		35.0 - 36.0	2.0	
		36.0 - 40.0	NR	
		40.0 - 45.0	1.5	
		45.0 - 47.5	2.0	
		47.5 - 50.0	NR	
		50.0 - 51.0	2.0	
		51.0 - 52.5	NR	
		52.5 - 55.0	4.0	
		55.0 - 57.5	4.0	
		57.5 - 59.5	2.0	
		59.5 - 60.0	NR	
		60.0 - 62.5	2.0	
		62.5 - 65.0	1.75	
		65.0 - 67.5	1.5	
		67.5 - 70.0	1.75	
		70.0 - 72.5	3.0	
		72.5 - 75.0	9.0	
		75.0 - 77.5	15.0	
		77.5 - 79.0	NR	

SUMMARY OF SOIL FID READINGS, TEMPERATURE TEST FACILITY, WHITE SANDS MISSILE RANGE, NM

SOIL BORING ID	DATE DRILLED	CORE INTERVAL (feet bgs)	FID READING, (ppm)	BACKGROUND FID READING (ppm)
WSTF-SB10	3/24/95-	0.0 - 2.5	2.0	SOIL: 2.0
	3/25/95	2.5 - 5.0	NR	AIR: 2.0
		5.0 - 7.0	2.0	
		7.0 - 10.0	NR	
		10.0 - 11.0	2.0	
		11.0 - 15.0	NR	
		15.0 - 20.0	2.25	
		20.0 - 21.0	2.25	
		21.0 - 25.0	NR	
		25.0 - 26.3	3.5	
		26.3 - 30.0	NR	
		30.0 - 31.0	2.0	
		31.0 - 35.0	NR	
		35.0 - 37.5	2.0	
		37.5 - 40.0	3.0	
		40.0 - 42.5	2.25	
		42.5 - 45.0	50.0	
		45.0 - 47.5	50.0	
		47.5 - 49.5	80.0	
		49.5 - 50.0	NR	
		50.0 - 52.0	60.0	
		52.0 - 52.5	NR	
		52.5 - 55.0	275.0	
		55.0 - 57.5	500.0	
		57.5 - 60.0	400.0	
		60.0 - 62.5	150.0	
		62.5 - 65.0	200.0	
		65.0 - 67.5	1000.0	
		67.5 - 70.0	900.0	
		70.0 - 71.0	700.0	
		71.0 - 72.5	NR	
		72.5 - 75.0	1000.0	
		75.0 - 75.5	500.0	
		75.5 - 77.5	NR	
		77.5 - 79.0	1500.0	
		79.0 - 80.0	NR	
		80.0 - 82.5	1400.0	
WSTF-SB11	3/28/95	0.0 - 2.5	1.5	SOIL: 1.5
		2.5 - 5.0	NR	AIR: 1.5
		5.0 - 6.0	1.5	
		6.0 - 10.0	NR	
		10.0 - 12.0	1.5	
		12.0 - 15.0	NR	
		15.0 - 17.0	1.5	
		17.0 - 20.0	NR	
		20.0 - 21.0	2.5	
		21.0 - 22.5	NR	
		22.5 - 25.0	2.0	

SUMMARY OF SOIL FID READINGS, TEMPERATURE TEST FACILITY, WHITE SANDS MISSILE RANGE, NM

SOIL BORING ID	DATE DRILLED	CORE INTERVAL (feet bgs)	FID READING, (ppm)	BACKGROUND FID READING (ppm)
		25.0 - 27.5	2.0	
		27.5 - 35.0	NR	
		35.0 - 37.5	1.5	
		37.5 - 39.0	1.25	
		39.0 - 40.0	NR	
		40.0 - 42.5	1.5	
		42.5 - 45.0	1.5	
		45.0 - 47.5	1.5	
		47.5 - 50.0	1.5	
		50.0 - 52.5	1.5	
		52.5 - 55.0	1.5	
		55.0 - 57.5	1.5	
		57.5 - 60.0	1.5	
		60.0 - 62.5	1.5	
		62.5 - 65.0	1.5	
		65.0 - 67.5	1.5	
		67.5 - 70.0	1.5	
		70.0 - 72.5	1.5	
		72.5 - 75.0	1.0	
WSTF-SB12	3/28/95-3/29/95	0.0 - 2.5	1.5	SOIL: 1.5
		2.5 - 5.0	NR	AIR: 1.5
		5.0 - 7.5	2.5	
		7.5 - 10.0	NR	
		10.0 - 15.0	2.0	
		15.0 - 17.5	1.5	
		17.5 - 20.0	NR	
		20.0 - 22.5	3.5	
		22.5 - 30.0	NR	
		30.0 - 32.5	7.0	
		32.5 - 35.0	NR	
		35.0 - 37.5	13.0	
		37.5 - 40.0	11.0	
		40.0 - 42.5	11.0	
		42.5 - 45.0	50.0	
		45.0 - 47.5	425.0	
		47.5 - 50.0	275.0	
		50.0 - 52.5	600.0	
		52.5 - 54.0	325.0	
		54.0 - 55.0	NR	
		55.0 - 57.5	400.0	
		57.5 - 60.0	450.0	
		60.0 - 62.5	275.0	
		62.5 - 65.0	300.0	
		65.0 - 67.5	1300.0	
		67.5 - 70.0	900.0	
		70.0 - 72.5	2000.0	
		72.5 - 75.0	3000.0	
		75.0 - 77.5	1500.0	
		77.5 - 80.0	2200.0	

SUMMARY OF SOIL FID READINGS, TEMPERATURE TEST FACILITY, WHITE SANDS MISSILE RANGE, NM

SOIL BORING ID	DATE DRILLED	CORE INTERVAL (feet bgs)	FID READING, (ppm)	BACKGROUND FID READING (ppm)
		80.0 - 82.5	1700.0	
		82.5 - 85.0	NR	
		85.0 - 87.5	1300.0	
		87.5 - 90.0	NR	
		90.0 - 95.0	2000.0	
		95.0 - 100.0	1000.0	
		100.0 - 103.5	1200.0	
		103.5 - 105.0	NR	
		105.0 - 110.0	400.0	
		110.0 - 113.0	300.0	
		113.0 - 115.0	NR	
		115.0 - 119.0	40.0	
		119.0 - 120.0	NR	
		120.0 - 125.0	300.0	
		125.0 - 127.5	350.0	
		127.5 - 130.0	NR	
		130.0 - 135.0	80.0	
		135.0 - 136.5	50.0	
		136.5 - 140.0	NR	
		140.0 - 142.0	30.0	
		142.0 - 145.0	NR	
		145.0 - 150.0	10.0	
		150.0 - 152.5	30.0	

APPENDIX D
SOIL CUTTINGS LABORATORY ANALYTICAL RESULTS/AUTHORIZATION TO DISPOSE MEMO

F95102/2.2

FAX COVER SHEET

Dow Environmental

Mid-Atlantic Operations
15204 OMEGA DRIVE, SUITE 200
ROCKVILLE, MARYLAND 20850
TEL: 301/948-0040
FAX: 301/948-0242

COMPANY NAME:	WOODWARD. CLYDE
CONTACT NAME:	D. CONVEY
FAX NUMBER:	913 - 344 - 1012

SENDER:	BOB BAILEY
DESCRIPTION/MESSAGE:	THE ATTACHED MEMO
FROM THE TULSA ENG. DISTRICT OFFICE	
AUTHORIZES DISPOSITION OF YOUR SOIL CUTTINGS	
AT THE WSMR LANDFILL.	
	Bob

NUMBER OF PAGES (INCLUDING COVER):	2
DATE SENT:	25/4/95

IF THERE ARE ANY PROBLEMS WITH THIS TRANSMISSION, PLEASE CALL (301) 948-0040 IMMEDIATELY.

Date: 24 April 1995

To: Bob Bailey, Dow Environmental, Inc.

From: Randall L. Bratcher, HTRW Resident Office

Subject: Roll-off Box Test Results, D.O. No. 0005, White Sands Missile Range (WSMR)

1. In reference to your letter RHB-95-092 dated 18 April 1995 which recommends on-site disposal of the soil into the WSMR landfill as non-hazardous, please proceed with coordinating with Woodward-Clyde as soon as possible to obtain transportation to dispose of the soil as per your recommendation. As you know, Woodward-Clyde is anxious to dispose of the soil in order to reduce rental costs for the roll-off box.

[redacted]

3. I will be out of the office for the majority of this week. If you have any questions, please contact me at 918-669-7505.

Randall L. Bratcher

Randall L. Bratcher
Civil Engineering Technician
HTRW Resident Office

encl

Dow Environmental Inc.
15204 Omega Drive
Suite 200
Rockville, Maryland 20850
Fax: (301) 948-6094
(301) 948-0040

RHB-95-092
April 18, 1995

APR 19 1995
RECEIVED

Mr. Clif B. Warren, P.E.
HTRW Cost Plus Contract
Resident Office
Department of The Army
U. S. Army Corps of Engineers
Tulsa District
1645 S. 101st East Avenue
Tulsa, Oklahoma 74128

Subject: Contract No. DACA56-93-D-0016, Delivery Order 0005
Removal of Investigative Derived Waste
White Sands Missile Range, New Mexico
Hazard Determination Report (Mod #2)

Dear Mr. Warren:

The purpose of this letter is to report that the drill cuttings (IDW) generated by Woodward Clyde are not contaminated or hazardous.

A fax copy of each laboratory report is attached. A hard copy will be provided with the Data Validation Report.

Recommend that the contents of both rollon/rolloff boxes be placed into the White Sands Missile Range (WSMR) landfill.

Sincerely,

Robert H. Bailey

Robert H. Bailey
Project Manager

RHB:jdp

3 Enclosures: a/s

cc: R. Bratcher
J. Hall
File

TALEM, INC.

306 West Broadway Avenue
Fort Worth, Texas 76104
817/335-1186
Metro/654-0443

Mailing Address:
P.O. Box 3270
Fort Worth, Texas 76113

Attention: Robert Bailey
Reported to: Dow Environmental
15204 Omega Dr. Suite 200
Rockville, MD 20850

Date of Report: 04/17/95

Lab ID.: 2453 03/31/95 1

Identification: White Sands Missile Range; IDW #1

Date Collected:
Time Collected:
Collected by: CST

	Results	Quality Control	
Arsenic, TCLP EPA 6010A ICP-Atomic Emission Spectrometric Method; Test Methods For Evaluating Solid Waste, SW-846, Vol IA, Ed 3, 11/86.	<0.50 mg/L 04/11/95 17:00 SPS	Blank: Standard Expected: Standard Result: Duplicates: Spike%:	0.127 1.00 1.07 5.28 4.82 101
Barium, TCLP EPA 6010A -Atomic Emission Spectrometric Method; Test Methods For Evaluating Solid Waste, SW-846, Vol IA, Ed 3, 11/86.	0.13 mg/L 04/11/95 17:00 SPS	Blank: Standard Expected: Standard Result: Duplicates: Spike%:	-0.0007 0.500 0.532 5.27 5.67 107
Cadmium, TCLP EPA 6010A ICP-Atomic Emission Spectrometric Method; Test Methods For Evaluating Solid Waste, SW-846, Vol IA, Ed 3, 11/86.	<0.10 mg/L 04/11/95 17:00 SPS	Blank: Standard Expected: Standard Result: Duplicates: Spike%:	-0.0009 0.500 0.524 5.06 5.37 104

TALEM, INC.

Tyler Tull

Per: Tyler Tull
V. P. Environmental Services

Distribution of Report:
Dow Environmental

(for inquiries contact Mona Dillard)

TALEM, INC.

306 West Broadway Avenue
Fort Worth, Texas 76104
817/335-1186
Metro/654-0443

Mailing Address:
P.O. Box 3270
Fort Worth, Texas 76113

Attention: Robert Bailey
Reported to: Dow Environmental
15204 Omega Dr. Suite 200
Rockville, MD 20850

Date of Report: 04/17/95

Lab ID.: 2453 03/31/95 1

Identification: White Sands Missile Range; IDW #1

Date Collected:
Time Collected:
Collected by: CST

	Results	Quality Control	
Chromium, TCLP EPA 6010A ICP-Atomic Emission Spectrometric Method; Test Methods For Evaluating Solid Waste, SW-846, Vol IA, Ed 3, 11/86.	<0.20 mg/L 04/11/95 17:00 SPS	Blank: Standard Expected: Standard Result: Duplicates: Spike%:	-0.0029 0.500 0.496 4.79 5.16 100
Total Petroleum Hydrocarbons 418.1 Hydrcrb, Tot Recvrble, IR Spec; Meths For Chem Analy of Water & Wastes, EPA 600/4-79-020, Ed 3, 03/83.	<10* mg/Kg 04/11/95 15:00 DTW	Blank: Standard Expected: Standard Result: Duplicates: Spike%:	0.0 93.4 69.9 86.2 83.9 91
Mercury, TCLP EPA 7470 AA, Hg in Liquid Waste (MCV Technique); Test Methods For Eval Solid Waste, SW-846, Vol IA, Ed 3, 11/86.	<0.0050 mg/L 04/11/95 18:50 DMM	Blank: Standard Expected: Standard Result: Duplicates: Spike%:	0.00109 0.0100 0.00972 0.0234 0.0225 92

*EPA 9071 Extraction.

TALEM, INC.

Tyler Tull

Per: Tyler Tull
V. P. Environmental Services

Distribution of Report:
Dow Environmental

(for inquiries contact Mona Dillard)

TALEM, INC.

306 West Broadway Avenue
Fort Worth, Texas 76104
817/335-1186
Metro/654-0443

Mailing Address:
P.O. Box 3270
Fort Worth, Texas 76113

Attention: Robert Bailey
Reported to: Dow Environmental
15204 Omega Dr. Suite 200
Rockville, MD 20850

Date of Report: 04/17/95

Lab ID.: 2453 03/31/95 1

Identification: White Sands Missile Range; IDW #1

Date Collected:
Time Collected:
Collected by: CST

	Results	Quality Control	
Lead, TCLP EPA 6010A ICP-Atomic Emission Spectrometric Method; Test Methods For Evaluating Solid Waste, SW-846, Vol IA, Ed 3, 11/86.	<0.50 mg/L 04/11/95 17:00 SPS	Blank: Standard Expected: Standard Result: Duplicates: Spike%:	-0.100 0.500 0.478 5.07 4.74 98
Selenium, TCLP 6010A -Atomic Emission Spectrometric Method; Test Methods For Evaluating Solid Waste, SW-846, Vol IA, Ed 3, 11/86.	<0.50 mg/L 04/11/95 17:00 SPS	Blank: Standard Expected: Standard Result: Duplicates: Spike%:	0.0128 1.00 0.931 5.87 5.23 111

TALEM, INC.

Per: Tyler Tull
V. P. Environmental Services

Distribution of Report:
Dow Environmental

(for inquiries contact Mona Dillard)

TALEM, INC.

306 West Broadway Avenue
Fort Worth, Texas 76104
817/335-1186
Metro/654-0443

Mailing Address:
P.O. Box 3270
Fort Worth, Texas 76113

Attention: Robert Bailey
Reported to: Dow Environmental
15204 Omega Dr. Suite 200
Rockville, MD 20850

Date of Report: 04/17/95

Lab ID.: 2453 03/31/95 1

Identification: White Sands Missile Range; IDW #1

Date Collected:
Time Collected:
Collected by: CST

	Results	Quality Control
Purgeable Organics EPA 8240A GC/MS For Volatile Organics: Purg & Trap or Dir Inj; Test Methods For Eval Solid Waste, SW-846, Vol IB, Ed 3, 11/86.	See attached mg/Kg 04/10/95 19:56 JRR	See attached QC Report
Semivolatile Organic Compounds 8270A GC/MS For Semivol Organics, Capillary Column; Test Methds For Evaluating Solid Waste, SW-846, Vol IB, Ed 3, 11/86.	See attached mg/Kg 04/13/95 21:44 DTW	See attached QC Report
Silver, TCLP EPA 6010A ICP-Atomic Emission Spectro- metric Method; Test Methods For Evaluating Solid Waste, SW-846, Vol IA, Ed 3, 11/86.	0.012 mg/L 04/07/95 17:01 SPS	Blank: 0.00390 Standard Expected: 0.0500 Standard Result: 0.0519 Duplicates: 0.0666 0.0674 Spike%: 109

TALEM, INC.

Tyler Tull

Per: Tyler Tull
V. P. Environmental Services

Distribution of Report:
Dow Environmental

(for inquiries contact Nona Dillard)

TALEM, Inc.
Purgeables (EPA 8240A)

Sample ID: 2453 03/31/95 1
Customer ID: White Sands Missile Range; IDW #1

Sample Matrix: soil

Date of Analysis: 04/10/95
Extraction Method: Purge and Trap

Dilution Factor: 1.0
nd - None Detected

Per: Tyler Tull
Tyler Tull
V. P. Environmental Services

****

SURROGATES & VALUES OBTAINED

Compound Name	Detection Limit (mg/Kg)	Value Obtained (mg/Kg)	Recovery (%)
1,2-Dichloroethane D4			114
D8-Toluene			110
Bromofluorobenzene			100
Dichlorodifluorormethane	0.50	nd	
Chloromethane	0.50	nd	
Vinyl Chloride	0.50	nd	
Bromomethane	0.50	nd	
Chloroethane	0.50	nd	
Trichlorofluoromethane	0.50	nd	
Acetone	1.0	nd	
1,1-Dichloroethane	0.50	nd	
Carbon Disulfide	0.50	nd	
Methylene Chloride	1.0	nd	
trans-1,2-Dichloroethene	0.50	nd	
1,1-Dichloroethene	0.50	nd	
Vinyl Acetate	0.50	nd	
cis-1,2-Dichloroethene	0.50	nd	
2-Butanone (MEK)	1.0	nd	
Chloroform	0.50	nd	
1,1,1-Trichloroethane	0.50	nd	
Carbon Tetrachloride	0.50	nd	
Benzene	0.50	nd	
1,2-Dichloroethane	0.50	nd	
Trichloroethene	0.50	nd	
1,2-Dichloropropene	0.50	nd	

TALEM, Inc.
Purgeables (EPA 8240A)

Sample ID: 2453 03/31/95 1
Customer ID: White Sands Missile Range; IDW #1

Sample Matrix: soil

Date of Analysis: 04/10/95
Extraction Method: Purge and Trap

Dilution Factor: 1.0
nd = None Detected

Per: Tyler Tull
Tyler Tull
V. P. Environmental Services

****

SURROGATES & VALUES OBTAINED

Compound Name	Detection Limit (mg/Kg)	Value Obtained (mg/Kg)	Recovery (%)
Bromodichloromethane	0.50	nd	
2-Chloroethyl Vinyl Ether	0.50	nd	
cis-1,3-Dichloropropene	0.50	nd	
4-Methyl-2-Pentanone	0.50	nd	
Toluene	0.50	nd	
trans-1,3-Dichloropropene	0.50	nd	
1,1,2-Trichloroethane	0.50	nd	
Tetrachloroethene	0.50	nd	
2-Hexanone	0.50	nd	
Dibromochloromethane	0.50	nd	
Chlorobenzene	0.50	nd	
1,1,1,2-Tetrachloroethane	0.50	nd	
Ethylbenzene	0.50	nd	
m,p Xylene	0.50	nd	
o-Xylene	0.50	nd	
Styrene	0.50	nd	
Bromoform	0.50	nd	
1,1,2,2-Tetrachloroethane	0.50	nd	
1,3-Dichlorobenzene	0.50	nd	
1,4-Dichlorobenzene	0.50	nd	
1,2-Dichlorobenzene	0.50	nd	

105/MMD/124

TALEM, Inc.
Semivolatiles (EPA 8270A)

Sample ID: 2453 03/31/95 1
Customer Description: White Sands Missile Range; IDW #1
Sample Matrix: soil
Extraction Method: EPA 3550

Date of Analysis: 04/13/95
Dilution Factor: 1.0
Date of Extraction: 04/06/95

Per: Tyler Tull
Tyler Tull
V. P. Environmental Services

****

SURROGATES & VALUES OBTAINED

Compound Name	Detection Limit (mg/Kg)	Value Obtained (mg/Kg)	Recovery (%)
1,2-Dichlorobenzene D4 (Surrogate)			63
Nitrobenzene D5 (Surrogate)			68
2-Fluorobiphenyl (Surrogate)			77
Terphenyl D14 (Surrogate)			83
2-Chlorophenol D4 (Surrogate)			66
Phenol-D5 (Surrogate)			67
2-Fluorophenol (Surrogate)			55
2,4,6-Tribromophenol (Surrogate)			79
Pyridine	0.33	nd	
N-Nitrosodimethylamine	0.33	nd	
Phenol	0.33	nd	
Bis(2-Chloroethyl)Ether	0.33	nd	
2-Chlorophenol	0.33	nd	
1,3-Dichlorobenzene	0.33	nd	
1,4-Dichlorobenzene	0.33	nd	
Benzyl Alcohol	0.33	nd	
1,2-Dichlorobenzene	0.33	nd	
2-Methylphenol	0.33	nd	
Bis(2-Chloroisopropyl)Ether	0.33	nd	
4-Methylphenol	0.33	nd	
N-Nitroso-di-N-propylamine	0.33	nd	
Hexachloroethane	0.33	nd	
Nitrobenzene	0.33	nd	
Isophorone	0.33	nd	
2-Nitrophenol	0.33	nd	
2,4-Dimethylphenol	0.33	nd	
Benzoic Acid	0.33	nd	
Bis(2-Chloroethoxy)Methane	0.33	nd	
2,4-Dichlorophenol	0.33	nd	
1,2,4-Trichlorobenzene	0.33	nd	
Naphthalene	0.33	nd	
4-Chloroaniline	0.33	nd	
Hexachlorobutadiene	0.33	nd	
4-Chloro-3-Methylphenol	0.33	nd	
2-Methylnaphthalene	0.33	nd	
Hexacyclochloropentadiene	0.33	nd	

TALEM, Inc.
Semivolatiles (EPA 8270A)

Sample ID: 2453 03/31/95 1
Customer Description: White Sands Missile Range; IDW #1
Sample Matrix: soil
Extraction Method: EPA 3550

Date of Analysis: 04/13/95
Dilution Factor: 1.0
Date of Extraction: 04/06/95

Per: Tyler Tull
Tyler Tull
V. P. Environmental Services

Compound Name	Detection Limit (mg/Kg)	Value Obtained (mg/Kg)
2,4,6-Trichlorophenol	0.33	nd
2,4,5-Trichlorophenol	0.33	nd
2-Chloronaphthalene	0.33	nd
2-Nitroaniline	0.33	nd
Dimethyl Phthalate	0.33	nd
Acenaphthylene	0.33	nd
2,6-Dinitrotoluene	0.33	nd
3-Nitroaniline	0.33	nd
Acenaphthene	0.33	nd
2,4-Dinitrophenol	0.33	nd
4-Nitrophenol	0.33	nd
Dibenzofuran	0.33	nd
2,4-Dinitrotoluene	0.33	nd
Diethyl Phthalate	0.33	nd
4-Chlorophenyl Phenyl Ether	0.33	nd
Fluorene	0.33	nd
4-Nitroaniline	0.33	nd
4,6-Dinitro-2-Methylphenol	0.33	nd
N-Nitrosodiphenylamine	0.33	nd
4-Bromophenyl Phenyl Ether	0.33	nd
Hexachlorobenzene	0.33	nd
1,2-Diphenylhydrazine	0.33	nd
Pentachlorophenol	0.33	nd
Phenanthrene	0.33	nd
Anthracene	0.33	nd
Di-N-Butyl Phthalate	0.33	nd
Fluoranthene	0.33	nd
Pyrene	0.33	nd
Benzidine	0.33	nd
Butyl Benzyl Phthalate	0.33	nd
3,3'Dichlorobenzidine	0.33	nd
Benzo(a)Anthracene	0.33	nd
Chrysene	0.33	nd
Bis(2-Ethylhexyl)Phthalate	0.33	nd
Di-N-Octylphthalate	0.33	nd
Benzo(b)Fluoranthene	0.33	nd
Benzo(k)Fluoranthene	0.33	nd
Benzo(a)Pyrene	0.33	nd
Indeno(1,2,3-cd)Pyrene	0.33	nd
Dibenzo(a,h)Anthracene	0.33	nd
Benzo(g,h,i)Perylene	0.33	nd

TALEM, INC.

04/17/95 10:04

TALEM, Inc.

Analytical/Quality Control Report

306 West Broadway Avenue
Fort Worth, Texas 76104
817/335-1186 Metro/654/0443

ATTENTION: Robert Bailey
REPORTED TO: Dow Environmental
15204 Omega Dr. Suite 200
Rockville MD 20850

LABORATORY ID: 2453 03/31/95 1
COLLECTED BY: CST
DATE RECEIVED: 03/31/95
DATE COLLECTED:

SAMPLE IDENTIFICATION: White Sands Missile Range; IDW #1
SAMPLE MATRIX: soil
CHAIN OF CUSTODY NUMBER: 53678

ANALYTE	Rprtd Result	Unit	DLim Used	Analyst					QC Unit
Silver, TCLP	0.012	mg/L	0.010	SPS	Spike QC Dup QC	2453 03/31/95 1 2453 03/31/95 1			mg/L

QC ANALYTE	Ast	Date of Analysis	Procedure	Unit	Blank	QC Dlim	Spk %	Dups	RPD (%)	Check Sample True/Measured	QC# %Rec
Silver, TCLP	SPS	04/07/95	EPA 6010A	mg/L	0.00190	0.010	109	0.0666		0.0500	51555
							110	0.0674	1.1	0.0519	104

ANALYTE	Rprtd Result	Unit	DLim Used	Analyst					QC Unit
Total Petroleum Hydrocarbons	<10*	mg/Kg	10	DTW	Spike QC Dup QC	2453 03/31/95 3 2453 03/31/95 3			mg/Kg

QC ANALYTE	Ast	Date of Analysis	Procedure	Unit	Blank	QC Dlim	Spk %	Dups	RPD (%)	Check Sample True/Measured	QC# %Rec
Total Petroleum Hydrocarbons	DTW	04/11/95	EPA 418.1	mg/Kg	0.00	10	92	86.2		93.4	51605
							90	83.9	2.7	69.9	75

ANALYTE	Rprtd Result	Unit	DLim Used	Analyst					QC Unit
Arsenic, TCLP	<0.50	mg/L	0.50	SPS	Spike QC Dup QC	2453 03/31/95 1 2453 03/31/95 1			mg/L

QC ANALYTE	Ast	Date of Analysis	Procedure	Unit	Blank	QC Dlim	Spk %	Dups	RPD (%)	Check Sample True/Measured	QC# %Rec
Arsenic, TCLP	SPS	04/11/95	EPA 6010A	mg/L	0.127	0.50	106	5.28		1.00	51615
							96	4.82	9.1	1.07	107

ANALYTE	Rprtd Result	Unit	DLim Used	Analyst					QC Unit
Barium, TCLP	0.13	mg/L	0.10	SPS	Spike QC Dup QC	2453 03/31/95 1 2453 03/31/95 1			mg/L

QC ANALYTE	Ast	Date of Analysis	Procedure	Unit	Blank	QC Dlim	Spk %	Dups	RPD (%)	Check Sample True/Measured	QC# %Rec
Barium, TCLP	SPS	04/11/95	EPA 6010A	mg/L	0.00	0.10	103	5.27		0.500	51616
							111	5.67	7.3	0.532	106

ANALYTE	Rprtd Result	Unit	DLim Used	Analyst					QC Unit
Cadmium, TCLP	<0.10	mg/L	0.10	SPS	Spike QC Dup QC	2453 03/31/95 1 2453 03/31/95 1			mg/L

QC ANALYTE	Ast	Date of Analysis	Procedure	Unit	Blank	QC Dlim	Spk %	Dups	RPD (%)	Check Sample True/Measured	QC# %Rec
Cadmium, TCLP	SPS	04/11/95	EPA 6010A	mg/L	0.00	0.10	101	5.06		0.500	51617
							107	5.37	5.9	0.524	105

TALEM, INC.

04/17/95 10:04

TALEM, Inc.

Analytical/Quality Control Report

LABORATORY ID: 2453 03/31/95 1
COLLECTED BY: CST
DATE RECEIVED: 03/31/95
DATE COLLECTED:

SAMPLE IDENTIFICATION: White Sands Missile Range; IDW #1
SAMPLE MATRIX: soil
CHAIN OF CUSTODY NUMBER: 53678

ANALYTE	Rprtd Result	Unit	DLim Used	Analyst						QC Unit
Chromium, TCLP	<0.20	mg/L	0.20	SPS	Spike QC		2453 03/31/95 1			mg/L
					Dup QC		2453 03/31/95 1			mg/L

QC ANALYTE	Ast	Date of Analysis	Procedure	Unit	Blank	QC Dlim	Spk %	Dups	RPD (%)	Check Sample True/Measured	QC# %Rec
Chromium, TCLP	SPS	04/11/95	EPA 6010A	mg/L	0.00	0.20	96	4.79		0.500	51618
							103	5.16	7.4	0.496	99

ANALYTE	Rprtd Result	Unit	DLim Used	Analyst						QC Unit
Lead, TCLP	<0.50	mg/L	0.50	SPS	Spike QC		2453 03/31/95 1			mg/L
					Dup QC		2453 03/31/95 1			mg/L

QC ANALYTE	Ast	Date of Analysis	Procedure	Unit	Blank	QC Dlim	Spk %	Dups	RPD (%)	Check Sample True/Measured	QC# %Rec
Lead, TCLP	SPS	04/11/95	EPA 6010A	mg/L	0.00	0.50	101	5.07		0.500	51619
							95	4.74	6.7	0.478	96

ANALYTE	Rprtd Result	Unit	DLim Used	Analyst						QC Unit
Selenium, TCLP	<0.50	mg/L	0.50	SPS	Spike QC		2453 03/31/95 1			mg/L
					Dup QC		2453 03/31/95 1			mg/L

QC ANALYTE	Ast	Date of Analysis	Procedure	Unit	Blank	QC Dlim	Spk %	Dups	RPD (%)	Check Sample True/Measured	QC# %Rec
Selenium, TCLP	SPS	04/11/95	EPA 6010A	mg/L	0.0128	0.50	117	5.87		1.00	51621
							105	5.23	12	0.931	93

ANALYTE	Rprtd Result	Unit	DLim Used	Analyst						QC Unit
Mercury, TCLP	<0.0050	mg/L	0.0050	DMM	Spike QC		2453 03/31/95 1			mg/L
					Dup QC		2453 03/31/95 1			mg/L

QC ANALYTE	Ast	Date of Analysis	Procedure	Unit	Blank	QC Dlim	Spk %	Dups	RPD (%)	Check Sample True/Measured	QC# %Rec
Mercury, TCLP	DMM	04/11/95	EPA 7470	mg/L	0.00109	0.0050	94	0.0234		0.0100	51641
							90	0.0225	3.9	0.00972	97

ANALYTE	Rprtd Result	Unit	DLim Used	Analyst						QC Unit
Purgeable Organics	See attached	mg/Kg	0.50	JRR	Spike QC					mg/L
					Dup QC		256 04/06/95 3			mg/L

QC ANALYTE	Ast	Date of Analysis	Procedure	Unit	Blank	QC Dlim	Spk %	Dups	RPD (%)	Check Sample True/Measured	QC# %Rec
1,1-Dichloroeth(yl)ene	JRR	04/10/95	EPA 8240A	mg/Kg	0.00	0.50	97	4.85		5.00	51683
							93	4.66	3.9	3.92	78
Trichloroeth(yl)ene	JRR	04/10/95	EPA 8240A	mg/Kg	0.00	0.50	110	5.49		5.00	51683
							131	6.54	17	4.88	98
4-Bromofluorobenzene (surr)	JRR	04/10/95	EPA 8240A	% Rcvry	0.00	10	91	4.54		5.00	51683
							77	3.83	17	4.02	80
Benzene	JRR	04/10/95	EPA 8240A	mg/Kg	0.00	0.50	87	4.34		5.00	51683
							80	4.02	7.6	3.71	74
Chlorobenzene	JRR	04/10/95	EPA 8240A	mg/Kg	0.00	0.50	102	5.08		5.00	51683
							103	5.13	.97	4.56	91
1,2-Dichloroethane-d4 (surr)	JRR	04/10/95	EPA 8240A	% Rcvry	0.00	10	95	4.75		5.00	51683
							92	4.58	3.6	4.46	89

TALEM, INC.

04/17/95 10:04

TALEM, Inc.

Analytical/Quality Control Report

LABORATORY ID: 2453 03/31/95 1
COLLECTED BY: CST
DATE RECEIVED: 03/31/95
DATE COLLECTED:

SAMPLE IDENTIFICATION: White Sands Missile Range; IDW #1
SAMPLE MATRIX: soil
CHAIN OF CUSTODY NUMBER: 53678

Toluene-d8 (surr)	JRR	04/10/95	EPA 8240A	% Rcvry	0.00	10	92	4.62		5.00	51683
							85	4.24	8.5	4.38	88
Toluene	JRR	04/10/95	EPA 8240A	mg/Kg	0.00	0.50	88	4.41		5.00	51683
							87	4.36	1.1	3.86	77

ANALYTE	Rprtd Result	Unit	DLim Used	Analyst					QC Unit
Semivolatile Organic Compounds	See attached	mg/Kg	0.33	DTW	Spike QC	173	04/07/95	2	mg/L
					Dup QC	173	04/07/95	2	

QC ANALYTE	Ast	Date of Analysis	Procedure	Unit	Blank	QC Dlim	Spk %	Dups	RPD (%)	Check Sample True/Measured	QC# %Rec
1,2,4-Trichlorobenzene	DTW	04/13/95	EPA 8270A	mg/Kg	0.00	0.33	72	1.19		1.66	51742
							88	1.46	20	1.32	80
1,4-Dichlorobenzene	DTW	04/13/95	EPA 8270A	mg/Kg	0.00	0.33	69	1.14		1.66	51742
							82	1.36	18	1.24	75
2,4,6-Tribromophenol (surr)	DTW	04/13/95	EPA 8270A	% Rcvry	0.00	13	83	2.07		2.50	51742
							88	2.19	5.6	2.47	99
2,4-Dinitrotoluene	DTW	04/13/95	EPA 8270A	mg/Kg	0.00	0.33	97	1.61		1.66	51742
							96	1.60	.62	1.58	95
2-Chlorophenol	DTW	04/13/95	EPA 8270A	mg/Kg	0.00	0.33	67	1.68		2.50	51742
							79	1.98	16	1.91	76
2-Chlorophenol-d4 (surr)	DTW	04/13/95	EPA 8270A	% Rcvry	0.00	13	56	1.39		2.50	51742
							68	1.69	19	1.56	62
2-Fluorobiphenyl (surr)	DTW	04/13/95	EPA 8270A	% Rcvry	0.00	20	63	1.05		1.66	51742
							76	1.26	18	1.34	81
2-Fluorophenol (surr)	DTW	04/13/95	EPA 8270A	% Rcvry	0.00	13	56	1.39		2.50	51742
							70	1.74	22	1.51	60
4-Chloro-3-methylphenol	DTW	04/13/95	EPA 8270A	mg/Kg	0.00	0.33	87	2.17		2.50	51742
							97	2.42	11	2.95	118
4-Nitrophenol	DTW	04/13/95	EPA 8270A	mg/Kg	0.00	0.33	83	2.08		2.50	51742
							96	2.39	14	2.20	88
Acenaphthene	DTW	04/13/95	EPA 8270A	mg/Kg	0.00	0.33	81	1.35		1.66	51742
							93	1.55	14	1.78	107
1,2-Dichlorobenzene-d4 (surr)	DTW	04/13/95	EPA 8270A	% Rcvry	0.00	20	52	0.856		1.66	51742
							64	1.06	21	0.916	55
Nitrobenzene-d5 (surr)	DTW	04/13/95	EPA 8270A	% Rcvry	0.00	20	54	0.900		1.66	51742
							69	1.15	24	1.02	61
N-Nitroso-di-n-propylamine	DTW	04/13/95	EPA 8270A	mg/Kg	0.00	0.33	73	1.21		1.66	51742
							84	1.40	14	1.44	87
Phenol-d5 (surr)	DTW	04/13/95	EPA 8270A	% Rcvry	0.00	13	58	1.45		2.50	51742
							69	1.73	18	1.73	69
Pentachlorophenol	DTW	04/13/95	EPA 8270A	mg/Kg	0.00	0.33	113	2.83		2.50	51742
							110	2.75	2.8	2.52	101
Phenol(s) by GC/MS	DTW	04/13/95	EPA 8270A	mg/Kg	0.00	0.33	67	1.68		2.50	51742
							78	1.96	15	2.04	82
Pyrene	DTW	04/13/95	EPA 8270A	mg/Kg	0.00	0.33	72	1.19		1.66	51742
							65	1.08	9.6	1.16	70
p-Terphenyl-d14 (surr)	DTW	04/13/95	EPA 8270A	% Rcvry	0.00	20	85	1.41		1.66	51742
							82	1.37	2.8	1.59	96

TALEM, INC.

306 West Broadway Avenue
Fort Worth, Texas 76104
817/335-1186
Metro/654-0443

Mailing Address:
P.O. Box 3270
Fort Worth, Texas 76113

Attention: Robert Bailey
Reported to: Dow Environmental
15204 Omega Dr. Suite 200
Rockville, MD 20850

Date of Report: 04/17/95

Lab ID.: 2453 03/31/95 3

Identification: White Sands Missile Range; IDW #2
QC

Date Collected:
Time Collected:
Collected by: CST

	Results	Quality Control	
Arsenic, TCLP EPA 6010A ICP-Atomic Emission Spectrometric Method; Test Methods For Evaluating Solid Waste, SW-846, Vol IA, Ed 3, 11/86.	<0.50 mg/L 04/11/95 17:00 SPS	Blank: Standard Expected: Standard Result: Duplicates: Spike%:	0.127 1.00 1.07 5.28 4.82 101
Barium, TCLP EPA 6010A ICP-Atomic Emission Spectrometric Method; Test Methods For Evaluating Solid Waste, SW-846, Vol IA, Ed 3, 11/86.	0.28 mg/L 04/11/95 17:00 SPS	Blank: Standard Expected: Standard Result: Duplicates: Spike%:	-0.0007 0.500 0.532 5.27 5.67 107
Cadmium, TCLP EPA 6010A ICP-Atomic Emission Spectrometric Method; Test Methods For Evaluating Solid Waste, SW-846, Vol IA, Ed 3, 11/86.	<0.10 mg/L 04/11/95 17:00 SPS	Blank: Standard Expected: Standard Result: Duplicates: Spike%:	-0.0009 0.500 0.524 5.06 5.37 104

TALEM, INC.

Tyler Tull

Per: Tyler Tull
V. P. Environmental Services

Distribution of Report:
Dow Environmental

(for inquiries contact Mona Dillard)

TALEM, INC.

306 West Broadway Avenue
Fort Worth, Texas 76104
817/335-1186
Metro/654-0443

Mailing Address:
P.O. Box 3270
Fort Worth, Texas 76113

Attention: Robert Bailey
Reported to: Dow Environmental
15204 Omega Dr. Suite 200
Rockville, MD 20850

Date of Report: 04/17/95

Lab ID.: 2453 03/31/95 3

Identification: White Sands Missile Range; IDW #2
QC

Date Collected:
Time Collected:
Collected by: CST

	Results	Quality Control	
Chromium, TCLP EPA 6010A ICP-Atomic Emission Spectrometric Method; Test Methods For Evaluating Solid Waste, SW-846, Vol IA, Ed 3, 11/86.	<0.20 mg/L 04/11/95 17:00 SPS	Blank: Standard Expected: Standard Result: Duplicates: Spike%:	-0.0029 0.500 0.496 4.79 5.16 100
Total Petroleum Hydrocarbons EPA 418.1 Hydrcrb, Tot Recvrble, IR Spec; Meths For Chem Analy of Water & Wastes, EPA 600/4-79-020, Ed 3, 03/83.	<10* mg/Kg 04/11/95 15:00 DTW	Blank: Standard Expected: Standard Result: Duplicates: Spike%:	0.0 93.4 69.9 86.2 83.9 91
Mercury, TCLP EPA 7470 AA, Hg in Liquid Waste (MCV Technique); Test Methods For Eval Solid Waste, SW-846, Vol IA, Ed 3, 11/86.	<0.0050 mg/L 04/11/95 18:50 DMM	Blank: Standard Expected: Standard Result: Duplicates: Spike%:	0.00109 0.0100 0.00972 0.0234 0.0225 92

*EPA 9071 Extraction.

TALEM, INC.

Tyler Tull

Per: Tyler Tull
V. P. Environmental Services

Distribution of Report:
Dow Environmental

(for inquiries contact Mona Dillard)

TALEM, INC.

306 West Broadway Avenue
Fort Worth, Texas 76104
817/335-1186
Metro/654-0443

Mailing Address:
P.O. Box 3270
Fort Worth, Texas 76113

Attention: Robert Bailey
Reported to: Dow Environmental
15204 Omega Dr. Suite 200
Rockville, MD 20850

Date of Report: 04/17/95

Lab ID.: 2453 03/31/95 3

Identification: White Sands Missile Range; IDW #2
QC

Date Collected:
Time Collected:
Collected by: CST

	Results	Quality Control	
Lead, TCLP EPA 6010A ICP-Atomic Emission Spectrometric Method; Test Methods For Evaluating Solid Waste, SW-846, Vol IA, Ed 3, 11/86.	<0.50 mg/L 04/11/95 17:00 SPS	Blank: Standard Expected: Standard Result: Duplicates: Spike%:	-0.100 0.500 0.478 5.07 4.74 98
Selenium, TCLP 6010A -Atomic Emission Spectrometric Method; Test Methods For Evaluating Solid Waste, SW-846, Vol IA, Ed 3, 11/86.	<0.50 mg/L 04/11/95 17:00 SPS	Blank: Standard Expected: Standard Result: Duplicates: Spike%:	0.0128 1.00 0.931 5.87 5.23 111

Distribution of Report:
Dow Environmental

(for inquiries contact Mona Dillard)

TALEM, INC.

Per: Tyler Tull
V. P. Environmental Services

TALEM, INC.

306 West Broadway Avenue
Fort Worth, Texas 76104
817/335-1186
Metro/654-0443

Mailing Address:
P.O. Box 3270
Fort Worth, Texas 76113

Attention: Robert Bailey
Reported to: Dow Environmental
15204 Omega Dr. Suite 200
Rockville, MD 20850

Date of Report: 04/17/95

Lab ID.: 2453 03/31/95 3

Identification: White Sands Missile Range; IDW #2
QC

Date Collected:
Time Collected:
Collected by: CST

	Results	Quality Control
Purgeable Organics EPA 8240A GC/MS For Volatile Organics: Purg & Trap or Dir Inj; Test Methods For Eval Solid Waste, SW-846, Vol IB, Ed 3, 11/86.	See attached mg/Kg 04/10/95 19:56 JRR	See attached QC Report
Semivolatile Organic Compounds EPA 8270A GC/MS For Semivol Organics, Capillary Column; Test Methds For Evaluating Solid Waste, SW-846, Vol IB, Ed 3, 11/86.	See attached mg/Kg 04/13/95 21:44 DTW	See attached QC Report
Silver, TCLP EPA 6010A ICP-Atomic Emission Spectro- metric Method; Test Methods For Evaluating Solid Waste, SW-846, Vol IA, Ed 3, 11/86.	<0.010 mg/L 04/07/95 17:01 SPS	Blank: 0.00390 Standard Expected: 0.0500 Standard Result: 0.0519 Duplicates: 0.0666 0.0674 Spike%: 109

TALEM, INC.

Tyler Tull

Per: Tyler Tull
V. P. Environmental Services

Distribution of Report:
Dow Environmental

(for inquiries contact Mona Dillard)

TALEM, Inc.
Purgeables (EPA 8240A)

Sample ID: 2453 03/31/95 3 Sample Matrix: soil
Customer ID: White Sands Missile Range; IDW #2 QC

Date of Analysis: 04/10/95 Dilution Factor: 1.0
Extraction Method: Purge and Trap nd = None Detected

Per: Tyler Tull
Tyler Tull
V. P. Environmental Services

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SURROGATES & VALUES OBTAINED

Compound Name	Detection Limit (mg/Kg)	Value Obtained (mg/Kg)	Recovery (%)
1,2-Dichloroethane D4			92
D8-Toluene			92
Bromofluorobenzene			86
Dichlorodifluoromethane	0.50	nd	
Chloromethane	0.50	nd	
Vinyl Chloride	0.50	nd	
Bromomethane	0.50	nd	
Chloroethane	0.50	nd	
Trichlorofluoromethane	0.50	nd	
Acetone	1.0	nd	
1,1-Dichloroethane	0.50	nd	
Carbon Disulfide	0.50	nd	
Methylene Chloride	1.0	nd	
trans-1,2-Dichloroethene	0.50	nd	
1,1-Dichloroethene	0.50	nd	
Vinyl Acetate	0.50	nd	
cis-1,2-Dichloroethene	0.50	nd	
2-Butanone (MEK)	1.0	nd	
Chloroform	0.50	nd	
1,1,1-Trichloroethane	0.50	nd	
Carbon Tetrachloride	0.50	nd	
Benzene	0.50	nd	
1,2-Dichloroethane	0.50	nd	
Trichloroethene	0.50	nd	
1,2-Dichloropropene	0.50	nd	

TALEM, Inc.
Purgeables (EPA 8240A)

Sample ID: 2453 03/31/95 3
Customer ID: White Sands Missile Range; IDW #2 QC

Sample Matrix: soil

Date of Analysis: 04/10/95
Extraction Method: Purge and Trap

Dilution Factor: 1.0
nd - None Detected

Per: Tyler Tull
Tyler Tull
V. P. Environmental Services

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SURROGATES & VALUES OBTAINED

Compound Name	Detection Limit (mg/Kg)	Value Obtained (mg/Kg)	Recovery (%)
Bromodichloromethane	0.50	nd	
2-Chloroethyl Vinyl Ether	0.50	nd	
cis-1,3-Dichloropropene	0.50	nd	
4-Methyl-2-Pentanone	0.50	nd	
Toluene	0.50	nd	
trans-1,3-Dichloropropene	0.50	nd	
1,1,2-Trichloroethane	0.50	nd	
Tetrachloroethene	0.50	nd	
2-Hexanone	0.50	nd	
Dibromochloromethane	0.50	nd	
Chlorobenzene	0.50	nd	
1,1,1,2-Tetrachloroethane	0.50	nd	
Ethylbenzene	0.50	nd	
m,p Xylene	0.50	nd	
o-Xylene	0.50	nd	
Styrene	0.50	nd	
Bromoform	0.50	nd	
1,1,2,2-Tetrachloroethane	0.50	nd	
1,3-Dichlorobenzene	0.50	nd	
1,4-Dichlorobenzene	0.50	nd	
1,2-Dichlorobenzene	0.50	nd	

105/MMD/128

TALEM, Inc.
Semivolatiles (EPA 8270A)

Sample ID: 2453 03/31/95 3
Customer Description: White Sands Missile Range; IDW #2 QC
Sample Matrix: soil
Extraction Method: EPA 3550

Date of Analysis: 04/13/95
Dilution Factor: 1.0
Date of Extraction: 04/06/95

Per: Tyler Tull
Tyler Tull
V. P. Environmental Services

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SURROGATES & VALUES OBTAINED

Compound Name	Detection Limit (mg/Kg)	Value Obtained (mg/Kg)	Recovery (%)
1,2-Dichlorobenzene D4 (Surrogate)			41
Nitrobenzene D5 (Surrogate)			42
2-Fluorobiphenyl (Surrogate)			52
Terphenyl D14 (Surrogate)			69
2-Chlorophenol D4 (Surrogate)			43
Phenol-D5 (Surrogate)			44
2-Fluorophenol (Surrogate)			36
2,4,6-Tribromophenol (Surrogate)			63
Pyridine	0.33	nd	
N-Nitrosodimethylamine	0.33	nd	
Phenol	0.33	nd	
Bis(2-Chloroethyl)Ether	0.33	nd	
2-Chlorophenol	0.33	nd	
1,3-Dichlorobenzene	0.33	nd	
1,4-Dichlorobenzene	0.33	nd	
Benzyl Alcohol	0.33	nd	
1,2-Dichlorobenzene	0.33	nd	
2-Methylphenol	0.33	nd	
Bis(2-Chloroisopropyl)Ether	0.33	nd	
4-Methylphenol	0.33	nd	
N-Nitroso-di-N-propylamine	0.33	nd	
Hexachloroethane	0.33	nd	
Nitrobenzene	0.33	nd	
Isophorone	0.33	nd	
2-Nitrophenol	0.33	nd	
2,4-Dimethylphenol	0.33	nd	
Benzoic Acid	0.33	nd	
Bis(2-Chloroethoxy)Methane	0.33	nd	
2,4-Dichlorophenol	0.33	nd	
1,2,4-Trichlorobenzene	0.33	nd	
Naphthalene	0.33	nd	
4-Chloroaniline	0.33	nd	
Hexachlorobutadiene	0.33	nd	
4-Chloro-3-Methylphenol	0.33	nd	
2-Methylnaphthalene	0.33	nd	
Hexacyclochloropentadiene	0.33	nd	

TALEM, Inc.
Semivolatiles (EPA 8270A)

Sample ID: 2453 03/31/95 3
Customer Description: White Sands Missile Range; IDW #2 QC
Sample Matrix: soil
Extraction Method: EPA 3550

Date of Analysis: 04/13/95
Dilution Factor: 1.0
Date of Extraction: 04/06/95

Per: Tyler Tull
Tyler Tull
V. P. Environmental Services

Compound Name	Detection Limit (mg/Kg)	Value Obtained (mg/Kg)
2,4,6-Trichlorophenol	0.33	nd
2,4,5-Trichlorophenol	0.33	nd
2-Chloronaphthalene	0.33	nd
2-Nitroaniline	0.33	nd
Dimethyl Phthalate	0.33	nd
Acenaphthylene	0.33	nd
2,6-Dinitrotoluene	0.33	nd
3-Nitroaniline	0.33	nd
Acenaphthene	0.33	nd
2,4-Dinitrophenol	0.33	nd
4-Nitrophenol	0.33	nd
Dibenzofuran	0.33	nd
2,4-Dinitrotoluene	0.33	nd
Diethyl Phthalate	0.33	nd
4-Chlorophenyl Phenyl Ether	0.33	nd
Fluorene	0.33	nd
4-Nitroaniline	0.33	nd
4,6-Dinitro-2-Methylphenol	0.33	nd
N-Nitrosodiphenylamine	0.33	nd
4-Bromophenyl Phenyl Ether	0.33	nd
Hexachlorobenzene	0.33	nd
1,2-Diphenylhydrazine	0.33	nd
Pentachlorophenol	0.33	nd
Phenanthrene	0.33	nd
Anthracene	0.33	nd
Di-N-Butyl Phthalate	0.33	nd
Fluoranthene	0.33	nd
Pyrene	0.33	nd
Benzidine	0.33	nd
Butyl Benzyl Phthalate	0.33	nd
3,3'Dichlorobenzidine	0.33	nd
Benzo(a)Anthracene	0.33	nd
Chrysene	0.33	nd
Bis(2-Ethylhexyl)Phthalate	0.33	nd
Di-N-Octylphthalate	0.33	nd
Benzo(b)Fluoranthene	0.33	nd
Benzo(k)Fluoranthene	0.33	nd
Benzo(a)Pyrene	0.33	nd
Indeno(1,2,3-cd)Pyrene	0.33	nd
Dibenzo(a,h)Anthracene	0.33	nd
Benzo(g,h,i)Perylene	0.33	nd

TALEM, INC.

04/17/95 10:04

TALEM, Inc.

Analytical/Quality Control Report

MLS Page: 1

306 West Broadway Avenue
Fort Worth, Texas 76104
817/335-1186 Metro/654/0443

ATTENTION: Robert Bailey
REPORTED TO: Dow Environmental
15204 Omega Dr. Suite 200
Rockville MD 20850

LABORATORY ID: 2453 03/31/95 3
COLLECTED BY: CST
DATE RECEIVED: 03/31/95
DATE COLLECTED:

SAMPLE IDENTIFICATION: White Sands Missile Range; IDW #2 QC
SAMPLE MATRIX: soil
CHAIN OF CUSTODY NUMBER: 53678

ANALYTE	Rprtd Result	Unit	DLim Used	Analyst				QC Unit
Silver, TCLP	<0.010	mg/L	0.010	SPS	Spike QC	2453	03/31/95 1	mg/L
					Dup QC	2453	03/31/95 1	

QC ANALYTE	Ast	Date of Analysis	Procedure	Unit	Blank	QC Dlim	Spk %	Dups	RPD (%)	Check Sample True/Measured	QC# %Rec
Silver, TCLP	SPS	04/07/95	EPA 6010A	mg/L	0.00390	0.010	109	0.0666		0.0500	51555
							110	0.0674	1.1	0.0519	104

ANALYTE	Rprtd Result	Unit	DLim Used	Analyst				QC Unit
Total Petroleum Hydrocarbons	<10[4]	mg/Kg	10	DTW	Spike QC	2453	03/31/95 3	mg/Kg
					Dup QC	2453	03/31/95 3	

QC ANALYTE	Ast	Date of Analysis	Procedure	Unit	Blank	QC Dlim	Spk %	Dups	RPD (%)	Check Sample True/Measured	QC# %Rec
Total Petroleum Hydrocarbons	DTW	04/11/95	EPA 418.1	mg/Kg	0.00	10	92	86.2		93.4	51605
							90	83.9	2.7	69.9	75

ANALYTE	Rprtd Result	Unit	DLim Used	Analyst				QC Unit
Arsenic, TCLP	<0.50	mg/L	0.50	SPS	Spike QC	2453	03/31/95 1	mg/L
					Dup QC	2453	03/31/95 1	

QC ANALYTE	Ast	Date of Analysis	Procedure	Unit	Blank	QC Dlim	Spk %	Dups	RPD (%)	Check Sample True/Measured	QC# %Rec
Arsenic, TCLP	SPS	04/11/95	EPA 6010A	mg/L	0.127	0.50	106	5.28		1.00	51615
							96	4.82	9.1	1.07	107

ANALYTE	Rprtd Result	Unit	DLim Used	Analyst				QC Unit
Barium, TCLP	0.28	mg/L	0.10	SPS	Spike QC	2453	03/31/95 1	mg/L
					Dup QC	2453	03/31/95 1	

QC ANALYTE	Ast	Date of Analysis	Procedure	Unit	Blank	QC Dlim	Spk %	Dups	RPD (%)	Check Sample True/Measured	QC# %Rec
Barium, TCLP	SPS	04/11/95	EPA 6010A	mg/L	0.00	0.10	103	5.27		0.500	51616
							111	5.67	7.3	0.532	106

ANALYTE	Rprtd Result	Unit	DLim Used	Analyst				QC Unit
Cadmium, TCLP	<0.10	mg/L	0.10	SPS	Spike QC	2453	03/31/95 1	mg/L
					Dup QC	2453	03/31/95 1	

QC ANALYTE	Ast	Date of Analysis	Procedure	Unit	Blank	QC Dlim	Spk %	Dups	RPD (%)	Check Sample True/Measured	QC# %Rec
Cadmium, TCLP	SPS	04/11/95	EPA 6010A	mg/L	0.00	0.10	101	5.06		0.500	51617
							107	5.37	5.9	0.524	105

APR 17 '95 15:48 TALEM INC FT WORTH TX

TALEM, INC.

04/17/95 10:04

TALEM, Inc.

Analytical/Quality Control Report

LABORATORY ID: 2453 03/31/95 3
COLLECTED BY: CST
DATE RECEIVED: 03/31/95
DATE COLLECTED:

SAMPLE IDENTIFICATION: White Sands Missile Range; IDW #2 QC
SAMPLE MATRIX: soil
CHAIN OF CUSTODY NUMBER: 53678

ANALYTE	Rprtd Result	Unit	DLim Used	Analyst	Spike QC	2453 03/31/95 1	QC Unit
Chromium, TCLP	<0.20	mg/L	0.20	SPS	Dup QC	2453 03/31/95 1	mg/L

QC ANALYTE	Ast	Date of Analysis	Procedure	Unit	Blank	QC Dlim	Spk %	Dups	RPD (%)	Check Sample True/Measured	QC# %Rec
Chromium, TCLP	SPS	04/11/95	EPA 6010A	mg/L	0.00	0.20	96	4.79		0.500	51618
							103	5.16	7.4	0.496	99

ANALYTE	Rprtd Result	Unit	DLim Used	Analyst	Spike QC	2453 03/31/95 1	QC Unit
Lead, TCLP	<0.50	mg/L	0.50	SPS	Dup QC	2453 03/31/95 1	mg/L

QC ANALYTE	Ast	Date of Analysis	Procedure	Unit	Blank	QC Dlim	Spk %	Dups	RPD (%)	Check Sample True/Measured	QC# %Rec
Lead, TCLP	SPS	04/11/95	EPA 6010A	mg/L	0.00	0.50	101	5.07		0.500	51619
							95	4.74	6.7	0.478	96

ANALYTE	Rprtd Result	Unit	DLim Used	Analyst	Spike QC	2453 03/31/95 1	QC Unit
Selenium, TCLP	<0.50	mg/L	0.50	SPS	Dup QC	2453 03/31/95 1	mg/L

QC ANALYTE	Ast	Date of Analysis	Procedure	Unit	Blank	QC Dlim	Spk %	Dups	RPD (%)	Check Sample True/Measured	QC# %Rec
Selenium, TCLP	SPS	04/11/95	EPA 6010A	mg/L	0.0128	0.50	117	5.87		1.00	51621
							105	5.23	12	0.931	93

ANALYTE	Rprtd Result	Unit	DLim Used	Analyst	Spike QC	2453 03/31/95 1	QC Unit
Mercury, TCLP	<0.0050	mg/L	0.0050	DMM	Dup QC	2453 03/31/95 1	mg/L

QC ANALYTE	Ast	Date of Analysis	Procedure	Unit	Blank	QC Dlim	Spk %	Dups	RPD (%)	Check Sample True/Measured	QC# %Rec
Mercury, TCLP	DMM	04/11/95	EPA 7470	mg/L	0.00109	0.0050	94	0.0234		0.0100	51641
							90	0.0225	3.9	0.00972	97

ANALYTE	Rprtd Result	Unit	DLim Used	Analyst	Spike QC	256 04/06/95 3	QC Unit
Purgeable Organics	See attached	mg/Kg	0.50	JRR	Dup QC		mg/L

QC ANALYTE	Ast	Date of Analysis	Procedure	Unit	Blank	QC Dlim	Spk %	Dups	RPD (%)	Check Sample True/Measured	QC# %Rec
1,1-Dichloroeth(yl)ene	JRR	04/10/95	EPA 8240A	mg/Kg	0.00	0.50	97	4.85		5.00	51683
							93	4.66	3.9	3.92	78
Trichloroeth(yl)ene	JRR	04/10/95	EPA 8240A	mg/Kg	0.00	0.50	110	5.49		5.00	51683
							131	6.54	17	1.88	98
4-Bromofluorobenzene (surr)	JRR	04/10/95	EPA 8240A	% Rcvry	0.00	10	91	4.54		5.00	51683
							77	3.83	17	4.02	80
Benzene	JRR	04/10/95	EPA 8240A	mg/Kg	0.00	0.50	87	4.34		5.00	51683
							80	4.02	7.6	3.71	74
Chlorobenzene	JRR	04/10/95	EPA 8240A	mg/Kg	0.00	0.50	102	5.08		5.00	51683
							103	5.13	.97	4.56	91
1,2-Dichloroethane-d4 (surr)	JRR	04/10/95	EPA 8240A	% Rcvry	0.00	10	95	4.75		5.00	51683
							92	4.58	3.6	4.46	89

TALEM, INC.

04/17/95 10:04

TALEM, Inc.

Analytical/Quality Control Report

LABORATORY ID: 2453 03/31/95 3
COLLECTED BY: CST
DATE RECEIVED: 03/31/95
DATE COLLECTED:

SAMPLE IDENTIFICATION: White Sands Missile Range, IDW #2 QC
SAMPLE MATRIX: soil
CHAIN OF CUSTODY NUMBER: 53678

Toluene-d8 (surr)	JRR	04/10/95	EPA 8240A	% Recvry	0.00	10	92	4.62		5.00	51683
							85	4.24	8.5	4.38	88
Toluene	JRR	04/10/95	EPA 8240A	mg/Kg	0.00	0.50	88	4.41		5.00	51683
							87	4.36	1.1	3.86	77

ANALYTE	Rprtd Result	Unit	DLim Used	Analyst					QC Unit
Semivolatile Organic Compounds	See attached	mg/Kg	0.33	DTW	Spike QC	173	04/07/95	2	mg/L
					Dup QC	173	04/07/95	2	

QC ANALYTE	Ast	Date of Analysis	Procedure	Unit	Blank	QC Dlim	Spk %	Dupe	RPD (%)	Check Sample True/Measured	QC# %Rec
1,2,4-Trichlorobenzene	DTW	04/13/95	EPA 8270A	mg/Kg	0.00	0.33	72	1.19		1.66	51742
							88	1.46	20	1.32	80
1,4-Dichlorobenzene	DTW	04/13/95	EPA 8270A	mg/Kg	0.00	0.33	69	1.14		1.66	51742
							62	1.36	18	1.24	75
2,4,6-Tribromophenol (surr)	DTW	04/13/95	EPA 8270A	% Recvry	0.00	13	83	2.07		2.50	51742
							88	2.19	5.6	2.47	99
2,4-Dinitrotoluene	DTW	04/13/95	EPA 8270A	mg/Kg	0.00	0.33	97	1.61		1.66	51742
							96	1.60	.62	1.58	95
2-Chlorophenol	DTW	04/13/95	EPA 8270A	mg/Kg	0.00	0.33	67	1.68		2.50	51742
							79	1.98	16	1.91	76
2-Chlorophenol-d4 (surr)	DTW	04/13/95	EPA 8270A	% Recvry	0.00	13	56	1.39		2.50	51742
							68	1.69	19	1.56	62
2-Fluorobiphenyl (surr)	DTW	04/13/95	EPA 8270A	% Recvry	0.00	20	63	1.05		1.66	51742
							76	1.26	18	1.34	81
2-Fluorophenol (surr)	DTW	04/13/95	EPA 8270A	% Recvry	0.00	13	56	1.39		2.50	51742
							70	1.74	22	1.51	60
4-Chloro-3-methylphenol	DTW	04/13/95	EPA 8270A	mg/Kg	0.00	0.33	87	2.17		2.50	51742
							97	2.42	11	2.95	118
4-Nitrophenol	DTW	04/13/95	EPA 8270A	mg/Kg	0.00	0.33	83	2.08		2.50	51742
							96	2.39	14	2.20	88
Acenaphthene	DTW	04/13/95	EPA 8270A	mg/Kg	0.00	0.33	81	1.35		1.66	51742
							93	1.55	14	1.78	107
1,2-Dichlorobenzene-d4 (surr)	DTW	04/13/95	EPA 8270A	% Recvry	0.00	20	52	0.856		1.66	51742
							64	1.06	21	0.916	55
Nitrobenzene-d5 (surr)	DTW	04/13/95	EPA 8270A	% Recvry	0.00	20	54	0.900		1.66	51742
							69	1.15	24	1.02	61
N-Nitroso-di-n-propylamine	DTW	04/13/95	EPA 8270A	mg/Kg	0.00	0.33	73	1.21		1.66	51742
							84	1.40	14	1.44	87
Phenol-d5 (surr)	DTW	04/13/95	EPA 8270A	% Recvry	0.00	13	58	1.45		2.50	51742
							69	1.73	18	1.73	69
Pentachlorophenol	DTW	04/13/95	EPA 8270A	mg/Kg	0.00	0.33	113	2.83		2.50	51742
							110	2.75	2.8	2.52	101
Phenol(s) by GC/MS	DTW	04/13/95	EPA 8270A	mg/Kg	0.00	0.33	67	1.68		2.50	51742
							78	1.96	15	2.04	82
Pyrene	DTW	04/13/95	EPA 8270A	mg/Kg	0.00	0.33	72	1.19		1.66	51742
							65	1.08	9.6	1.16	70
p-Terphenyl-d14 (surr)	DTW	04/13/95	EPA 8270A	% Recvry	0.00	20	85	1.41		1.66	51742
							82	1.37	2.8	1.59	96

TALEM, INC.

306 West Broadway Avenue
Fort Worth, Texas 76104
817/335-1186
Metro/654-0443

Mailing Address:
P.O. Box 3270
Fort Worth, Texas 76113

Attention: Robert Bailey
Reported to: Dow Environmental
15204 Omega Dr. Suite 200
Rockville, MD 20850

Date of Report: 04/17/95

Lab ID.: 2453 03/31/95 2

Identification: White Sands Missile Range; IDN #2

Date Collected:
Time Collected:
Collected by: CST

	Results	Quality Control	
Arsenic, TCLP EPA 6010A ICP-Atomic Emission Spectrometric Method; Test Methods For Evaluating Solid Waste, SW-846, Vol IA, Ed 3, 11/86.	<0.50 mg/L 04/11/95 17:00 SPS	Blank: Standard Expected: Standard Result: Duplicates: Spike%:	0.127 1.00 1.07 5.28 4.82 101
Barium, TCLP EPA 6010A I[illegible]tomic Emission Spectrometric Method; Test Methods For Evaluating Solid Waste, SW-846, Vol IA, Ed 3, 11/86.	0.29 mg/L 04/11/95 17:00 SPS	Blank: Standard Expected: Standard Result: Duplicates: Spike%:	-0.0007 0.500 0.532 5.27 5.67 107
Cadmium, TCLP EPA 6010A ICP-Atomic Emission Spectrometric Method; Test Methods For Evaluating Solid Waste, SW-846, Vol IA, Ed 3, 11/86.	<0.10 mg/L 04/11/95 17:00 SPS	Blank: Standard Expected: Standard Result: Duplicates: Spike%:	-0.0009 0.500 0.524 5.06 5.37 104

TALEM, INC.

Per: Tyler Tull
V. P. Environmental Services

Distribution of Report:
Dow Environmental

(for inquiries contact Mona Dillard)

TALEM, INC.

306 West Broadway Avenue
Fort Worth, Texas 76104
817/335-1186
Metro/654-0443

Mailing Address:
P.O. Box 3270
Fort Worth, Texas 76113

Attention: Robert Bailey
Reported to: Dow Environmental
15204 Omega Dr. Suite 200
Rockville, MD 20850

Date of Report: 04/17/95

Lab ID.: 2453 03/31/95 2

Identification: White Sands Missile Range; IDW #2

Date Collected:
Time Collected:
Collected by: CST

	Results	Quality Control	
Chromium, TCLP EPA 6010A ICP-Atomic Emission Spectrometric Method; Test Methods For Evaluating Solid Waste, SW-846, Vol IA, Ed 3, 11/86.	<0.20 mg/L 04/11/95 17:00 SPS	Blank: Standard Expected: Standard Result: Duplicates: Spike%:	-0.0029 0.500 0.496 4.79 5.16 100
Total Petroleum Hydrocarbons EPA 418.1 Hydrcrb, Tot Recvrble, IR Spec; Meths For Chem Analy of Water & Wastes, EPA 600/4-79-020, Ed 3, 03/83.	<10* mg/Kg 04/11/95 15:00 DTW	Blank: Standard Expected: Standard Result: Duplicates: Spike%:	0.0 93.4 69.9 86.2 83.9 91
Mercury, TCLP EPA 7470 AA, Hg in Liquid Waste (MCV Technique); Test Methods For Eval Solid Waste, SW-846, Vol IA, Ed 3, 11/86.	<0.0050 mg/L 04/11/95 18:50 DMM	Blank: Standard Expected: Standard Result: Duplicates: Spike%:	0.00109 0.0100 0.00972 0.0234 0.0225 92

*EPA 9071 Extraction.

TALEM, INC.

Tyler Tull

Per: Tyler Tull
V. P. Environmental Services

Distribution of Report:
Dow Environmental

(for inquiries contact Mona Dillard)

TALEM, INC.

306 West Broadway Avenue
Fort Worth, Texas 76104
817/335-1186
Metro/654-0443

Mailing Address:
P.O. Box 3270
Fort Worth, Texas 76113

Attention: Robert Bailey
Reported to: Dow Environmental
15204 Omega Dr. Suite 200
Rockville, MD 20850

Date of Report: 04/17/95

Lab ID.: 2453 03/31/95 2

Identification: White Sands Missile Range; IDW #2

Date Collected:
Time Collected:
Collected by: CST

	Results	Quality Control	
Lead, TCLP EPA 6010A ICP-Atomic Emission Spectrometric Method; Test Methods For Evaluating Solid Waste, SW-846, Vol IA, Ed 3, 11/86.	<0.50 mg/L 04/11/95 17:00 SPS	Blank: Standard Expected: Standard Result: Duplicates: Spike%:	-0.100 0.500 0.478 5.07 4.74 98
Selenium, TCLP [illegible]010A [illegible]tomic Emission Spectrometric Method; Test Methods For Evaluating Solid Waste, SW-846, Vol IA, Ed 3, 11/86.	<0.50 mg/L 04/11/95 17:00 SPS	Blank: Standard Expected: Standard Result: Duplicates: Spike%:	0.0128 1.00 0.931 5.87 5.23 111

Distribution of Report:
Dow Environmental

(for inquiries contact Mona Dillard)

TALEM, INC.

Tyler Tull

Per: Tyler Tull
V. P. Environmental Services

TALEM, INC.

306 West Broadway Avenue
Fort Worth, Texas 76104
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Metro/654-0443

Mailing Address:
P.O. Box 3270
Fort Worth, Texas 76113

Attention: Robert Bailey
Reported to: Dow Environmental
15204 Omega Dr. Suite 200
Rockville, MD 20850

Date of Report: 04/17/95

Lab ID.: 2453 03/31/95 2

Identification: White Sands Missile Range; IDW #2

Date Collected:
Time Collected:
Collected by: CST

	Results	Quality Control
Purgeable Organics EPA 8240A GC/MS For Volatile Organics: Purg & Trap or Dir Inj; Test Methods For Eval Solid Waste, SW-846, Vol IB, Ed 3, 11/86.	See attached mg/Kg 04/10/95 19:56 JRR	See attached QC Report
[illegible]volatile Organic Compounds [illegible]8270A GC/MS For Semivol Organics, Capillary Column; Test Methds For Evaluating Solid Waste, SW-846, Vol IB, Ed 3, 11/86.	See attached mg/Kg 04/13/95 21:44 DTW	See attached QC Report
Silver, TCLP EPA 6010A ICP-Atomic Emission Spectro- metric Method; Test Methods For Evaluating Solid Waste, SW-846, Vol IA, Ed 3, 11/86.	<0.010 mg/L 04/07/95 17:01 SPS	Blank: 0.00390 Standard Expected: 0.0500 Standard Result: 0.0519 Duplicates: 0.0666 0.0674 Spike%: 109

TALEM, INC.

Tyler Tull

Per: Tyler Tull
V. P. Environmental Services

Distribution of Report:
Dow Environmental

(For inquiries contact Mona Dillard)

TALEM, Inc.
Purgeables (EPA 8240A)

Sample ID: 2453 03/31/95 2
Customer ID: White Sands Missile Range; IDW #2

Sample Matrix: soil

Date of Analysis: 04/10/95
Extraction Method: Purge and Trap

Dilution Factor: 1.0
nd = None Detected

Per: Tyler Tull
Tyler Tull
V. P. Environmental Services

****

SURROGATES & VALUES OBTAINED

Compound Name	Detection Limit (mg/Kg)	Value Obtained (mg/Kg)	Recovery (%)
1,2-Dichloroethane D4			92
D8-Toluene			94
Bromofluorobenzene			86
Dichlorodifluorormethane	0.50	nd	
Chloromethane	0.50	nd	
Vinyl Chloride	0.50	nd	
Bromomethane	0.50	nd	
Chloroethane	0.50	nd	
Trichlorofluoromethane	0.50	nd	
Acetone	1.0	nd	
1,1-Dichloroethane	0.50	nd	
Carbon Disulfide	0.50	nd	
Methylene Chloride	1.0	nd	
trans-1,2-Dichloroethene	0.50	nd	
1,1-Dichloroethene	0.50	nd	
Vinyl Acetate	0.50	nd	
cis-1,2-Dichloroethene	0.50	nd	
2-Butanone (MEK)	1.0	nd	
Chloroform	0.50	nd	
1,1,1-Trichloroethane	0.50	nd	
Carbon Tetrachloride	0.50	nd	
Benzene	0.50	nd	
1,2-Dichloroethane	0.50	nd	
Trichloroethene	0.50	nd	
1,2-Dichloropropene	0.50	nd	

105/MMD/125

TALEM, Inc.
Purgeables (EPA 8240A)

Sample ID: 2453 03/31/95 2
Customer ID: White Sands Missile Range; IDW #2

Sample Matrix: soil

Date of Analysis: 04/10/95
Extraction Method: Purge and Trap

Dilution Factor: 1.0
nd = None Detected

Per: Tyler Tull
Tyler Tull
V. P. Environmental Services

****

SURROGATES & VALUES OBTAINED

Compound Name	Detection Limit (mg/Kg)	Value Obtained (mg/Kg)	Recovery (%)
Bromodichloromethane	0.50	nd	
2-Chloroethyl Vinyl Ether	0.50	nd	
cis-1,3-Dichloropropene	0.50	nd	
4-Methyl-2-Pentanone	0.50	nd	
Toluene	0.50	nd	
trans-1,3-Dichloropropene	0.50	nd	
1,1,2-Trichloroethane	0.50	nd	
Tetrachloroethene	0.50	nd	
2-Hexanone	0.50	nd	
Dibromochloromethane	0.50	nd	
Chlorobenzene	0.50	nd	
1,1,1,2-Tetrachloroethane	0.50	nd	
Ethylbenzene	0.50	nd	
m,p Xylene	0.50	nd	
o-Xylene	0.50	nd	
Styrene	0.50	nd	
Bromoform	0.50	nd	
1,1,2,2-Tetrachloroethane	0.50	nd	
1,3-Dichlorobenzene	0.50	nd	
1,4-Dichlorobenzene	0.50	nd	
1,2-Dichlorobenzene	0.50	nd	

105/MMD/126

TALEM, Inc.
Semivolatiles (EPA 8270A)

Sample ID: 2453 03/31/95 2
Customer Description: White Sands Missile Range; IDW #2
Sample Matrix: soil
Extraction Method: EPA 3550

Date of Analysis: 04/13/95
Dilution Factor: 1.0
Date of Extraction: 04/06/95

Per: Tyler Tull
Tyler Tull
V. P. Environmental Services

****

SURROGATES & VALUES OBTAINED

Compound Name	Detection Limit (mg/Kg)	Value Obtained (mg/Kg)	Recovery (%)
1,2-Dichlorobenzene D4 (Surrogate)			37
Nitrobenzene D5 (Surrogate)			40
2-Fluorobiphenyl (Surrogate)			50
Terphenyl D14 (Surrogate)			60
2-Chlorophenol D4 (Surrogate)			39
Phenol-D5 (Surrogate)			41
2-Fluorophenol (Surrogate)			32
2,4,6-Tribromophenol (Surrogate)			53
Pyridine	0.33	nd	
N-Nitrosodimethylamine	0.33	nd	
Phenol	0.33	nd	
Bis(2-Chloroethyl)Ether	0.33	nd	
2-Chlorophenol	0.33	nd	
1,3-Dichlorobenzene	0.33	nd	
1,4-Dichlorobenzene	0.33	nd	
Benzyl Alcohol	0.33	nd	
1,2-Dichlorobenzene	0.33	nd	
2-Methylphenol	0.33	nd	
Bis(2-Chloroisopropyl)Ether	0.33	nd	
4-Methylphenol	0.33	nd	
N-Nitroso-di-N-propylamine	0.33	nd	
Hexachloroethane	0.33	nd	
Nitrobenzene	0.33	nd	
Isophorone	0.33	nd	
2-Nitrophenol	0.33	nd	
2,4-Dimethylphenol	0.33	nd	
Benzoic Acid	0.33	nd	
Bis(2-Chloroethoxy)Methane	0.33	nd	
2,4-Dichlorophenol	0.33	nd	
1,2,4-Trichlorobenzene	0.33	nd	
Naphthalene	0.33	nd	
4-Chloroaniline	0.33	nd	
Hexachlorobutadiene	0.33	nd	
4-Chloro-3-Methylphenol	0.33	nd	
2-Methylnaphthalene	0.33	nd	
Hexacyclochloropentadiene	0.33	nd	

104/MMD/138

TALEM, Inc.
Semivolatiles (EPA 8270A)

Sample ID: 2453 03/31/95 2 Date of Analysis: 04/13/95
Customer Description: White Sands Missile Range; IDW #2
Sample Matrix: soil Dilution Factor: 1.0
Extraction Method: EPA 3550 Date of Extraction: 04/06/95

Per: Tyler Tull
Tyler Tull
V. P. Environmental Services

Compound Name	Detection Limit (mg/Kg)	Value Obtained (mg/Kg)
2,4,6-Trichlorophenol	0.33	nd
2,4,5-Trichlorophenol	0.33	nd
2-Chloronaphthalene	0.33	nd
2-Nitroaniline	0.33	nd
Dimethyl Phthalate	0.33	nd
Acenaphthylene	0.33	nd
2,6-Dinitrotoluene	0.33	nd
3-Nitroaniline	0.33	nd
Acenaphthene	0.33	nd
2,4-Dinitrophenol	0.33	nd
4-Nitrophenol	0.33	nd
Dibenzofuran	0.33	nd
2,4-Dinitrotoluene	0.33	nd
Diethyl Phthalate	0.33	nd
4-Chlorophenyl Phenyl Ether	0.33	nd
Fluorene	0.33	nd
4-Nitroaniline	0.33	nd
4,6-Dinitro-2-Methylphenol	0.33	nd
N-Nitrosodiphenylamine	0.33	nd
4-Bromophenyl Phenyl Ether	0.33	nd
Hexachlorobenzene	0.33	nd
1,2-Diphenylhydrazine	0.33	nd
Pentachlorophenol	0.33	nd
Phenanthrene	0.33	nd
Anthracene	0.33	nd
Di-N-Butyl Phthalate	0.33	nd
Fluoranthene	0.33	nd
Pyrene	0.33	nd
Benzidine	0.33	nd
Butyl Benzyl Phthalate	0.33	nd
3,3'Dichlorobenzidine	0.33	nd
Benzo(a)Anthracene	0.33	nd
Chrysene	0.33	nd
Bis(2-Ethylhexyl)Phthalate	0.33	nd
Di-N-Octylphthalate	0.33	nd
Benzo(b)Fluoranthene	0.33	nd
Benzo(k)Fluoranthene	0.33	nd
Benzo(a)Pyrene	0.33	nd
Indeno(1,2,3-cd)Pyrene	0.33	nd
Dibenzo(a,h)Anthracene	0.33	nd
Benzo(g,h,i)Perylene	0.33	nd

TALEM, INC.

04/17/95 10:04

TALEM, Inc.

Analytical/Quality Control Report

306 West Broadway Avenue
Fort Worth, Texas 76104
817/335-1186 Metro/654/0443

ATTENTION: Robert Bailey
REPORTED TO: Dow Environmental
15204 Omega Dr. Suite 200
Rockville MD 20850

LABORATORY ID: 2453 03/31/95 2
COLLECTED BY: CST
DATE RECEIVED: 03/31/95
DATE COLLECTED:

SAMPLE IDENTIFICATION: White Sands Missile Range; IDW #2
SAMPLE MATRIX: soil
CHAIN OF CUSTODY NUMBER: 53678

ANALYTE	Rprtd Result	Unit	DLim Used	Analyst				
Silver, TCLP	<0.010	mg/L	0.010	SPS	Spike QC Dup QC	2453 03/31/95 1 2453 03/31/95 1		QC Unit mg/L

QC ANALYTE	Ast	Date of Analysis	Procedure	Unit	Blank	QC Dlim	Spk %	Dups	RPD (%)	Check Sample True/Measured	QC# %Rec
Silver, TCLP	SPS	04/07/95	EPA 6010A	mg/L	0.00390	0.010	109	0.0666		0.0500	51555
							110	0.0674	1.1	0.0519	104

ANALYTE	Rprtd Result	Unit	DLim Used	Analyst				
Total Petroleum Hydrocarbons	<10*	mg/Kg	10	DTW	Spike QC Dup QC	2453 03/31/95 3 2453 03/31/95 3		QC Unit mg/Kg

QC ANALYTE	Ast	Date of Analysis	Procedure	Unit	Blank	QC Dlim	Spk %	Dups	RPD (%)	Check Sample True/Measured	QC# %Rec
Total Petroleum Hydrocarbons	DTW	04/11/95	EPA 418.1	mg/Kg	0.00	10	92	86.2		93.4	51605
							90	83.9	2.7	69.9	75

ANALYTE	Rprtd Result	Unit	DLim Used	Analyst				
Arsenic, TCLP	<0.50	mg/L	0.50	SPS	Spike QC Dup QC	2453 03/31/95 1 2453 03/31/95 1		QC Unit mg/L

QC ANALYTE	Ast	Date of Analysis	Procedure	Unit	Blank	QC Dlim	Spk %	Dups	RPD (%)	Check Sample True/Measured	QC# %Rec
Arsenic, TCLP	SPS	04/11/95	EPA 6010A	mg/L	0.127	0.50	106	5.28		1.00	51615
							96	4.82	9.1	1.07	107

ANALYTE	Rprtd Result	Unit	DLim Used	Analyst				
Barium, TCLP	0.29	mg/L	0.10	SPS	Spike QC Dup QC	2453 03/31/95 1 2453 03/31/95 1		QC Unit mg/L

QC ANALYTE	Ast	Date of Analysis	Procedure	Unit	Blank	QC Dlim	Spk %	Dups	RPD (%)	Check Sample True/Measured	QC# %Rec
Barium, TCLP	SPS	04/11/95	EPA 6010A	mg/L	0.00	0.10	103	5.27		0.500	51616
							111	5.67	7.3	0.532	106

ANALYTE	Rprtd Result	Unit	DLim Used	Analyst				
Cadmium, TCLP	<0.10	mg/L	0.10	SPS	Spike QC Dup QC	2453 03/31/95 1 2453 03/31/95 1		QC Unit mg/L

QC ANALYTE	Ast	Date of Analysis	Procedure	Unit	Blank	QC Dlim	Spk %	Dups	RPD (%)	Check Sample True/Measured	QC# %Rec
Cadmium, TCLP	SPS	04/11/95	EPA 6010A	mg/L	0.00	0.10	101	5.06		0.500	51617
							107	5.37	5.9	0.524	105

TALEM, INC.

04/17/95 10:04 — TALEM, Inc. — MLS Page: 2

Analytical/Quality Control Report

LABORATORY ID: 2453 03/31/95 2
COLLECTED BY: CST
DATE RECEIVED: 03/31/95
DATE COLLECTED:

SAMPLE IDENTIFICATION: White Sands Missile Range; IDW #2
SAMPLE MATRIX: soil
CHAIN OF CUSTODY NUMBER: 53678

ANALYTE	Rprtd Result	Unit	DLim Used	Analyst	Spike QC / Dup QC	2453 03/31/95 1	QC Unit
Chromium, TCLP	<0.20	mg/L	0.20	SPS			mg/L

QC ANALYTE	Ast	Date of Analysis	Procedure	Unit	Blank	QC Dlim	Spk %	Dups	RPD (%)	Check Sample True/Measured	QC# %Rec
Chromium, TCLP	SPS	04/11/95	EPA 6010A	mg/L	0.00	0.20	96	4.79		0.500	51613
							103	5.16	7.4	0.496	99

ANALYTE	Rprtd Result	Unit	DLim Used	Analyst	Spike QC / Dup QC	2453 03/31/95 1	QC Unit
Lead, TCLP	<0.50	mg/L	0.50	SPS			mg/L

QC ANALYTE	Ast	Date of Analysis	Procedure	Unit	Blank	QC Dlim	Spk %	Dups	RPD (%)	Check Sample True/Measured	QC# %Rec
Lead, TCLP	SPS	04/11/95	EPA 6010A	mg/L	0.00	0.50	101	5.07		0.500	51619
							95	4.74	6.7	0.478	96

ANALYTE	Rprtd Result	Unit	DLim Used	Analyst	Spike QC / Dup QC	2453 03/31/95 1	QC Unit
Selenium, TCLP	<0.50	mg/L	0.50	SPS			mg/L

QC ANALYTE	Ast	Date of Analysis	Procedure	Unit	Blank	QC Dlim	Spk %	Dups	RPD (%)	Check Sample True/Measured	QC# %Rec
Selenium, TCLP	SPS	04/11/95	EPA 6010A	mg/L	0.0128	0.50	117	5.87		1.00	51621
							105	5.23	12	0.931	93

ANALYTE	Rprtd Result	Unit	DLim Used	Analyst	Spike QC / Dup QC	2453 03/31/95 1	QC Unit
Mercury, TCLP	<0.0050	mg/L	0.0050	DMM			mg/L

QC ANALYTE	Ast	Date of Analysis	Procedure	Unit	Blank	QC Dlim	Spk %	Dups	RPD (%)	Check Sample True/Measured	QC# %Rec
Mercury, TCLP	DMM	04/11/95	EPA 7470	mg/L	0.00109	0.0050	94	0.0234		0.0100	51641
							90	0.0225	3.9	0.00972	97

ANALYTE	Rprtd Result	Unit	DLim Used	Analyst	Spike QC / Dup QC	256 04/06/95 3	QC Unit
Purgeable Organics	See attached	mg/Kg	0.50	JRR			mg/L

QC ANALYTE	Ast	Date of Analysis	Procedure	Unit	Blank	QC Dlim	Spk %	Dups	RPD (%)	Check Sample True/Measured	QC# %Rec
1,1-Dichloroeth(yl)ene	JRR	04/10/95	EPA 8240A	mg/Kg	0.00	0.50	97	4.85		5.00	51683
							93	4.66	3.9	3.92	78
Trichloroeth(yl)ene	JRR	04/10/95	EPA 8240A	mg/Kg	0.00	0.50	110	5.49		5.00	51683
							131	6.54	17	4.88	98
4-Bromofluorobenzene (surr)	JRR	04/10/95	EPA 8240A	% Rcvry	0.00	10	91	4.54		5.00	51683
							77	3.83	17	4.02	80
Benzene	JRR	04/10/95	EPA 8240A	mg/Kg	0.00	0.50	87	4.34		5.00	51683
							80	4.02	7.6	3.71	74
Chlorobenzene	JRR	04/10/95	EPA 8240A	mg/Kg	0.00	0.50	102	5.08		5.00	51683
							103	5.13	.97	4.56	91
1,2-Dichloroethane-d4 (surr)	JRR	04/10/95	EPA 8240A	% Rcvry	0.00	10	95	4.75		5.00	51683
							92	4.58	3.6	4.46	89

TALEM, INC.

04/17/95 10:04

TALEM, Inc.

Analytical/Quality Control Report

MLS Page: 3

LABORATORY ID: 2453 03/31/95 2
COLLECTED BY: CST
DATE RECEIVED: 03/31/95
DATE COLLECTED:

SAMPLE IDENTIFICATION: White Sands Missile Range; IDW #2
SAMPLE MATRIX: soil
CHAIN OF CUSTODY NUMBER: 53678

Toluene-d8 (surr)	JRR	04/10/95	EPA 8240A	% Rcvry	0.00	10	92	4.62		5.00	51693
							85	4.24	8.5	4.38	88
Toluene	JRR	04/10/95	EPA 8240A	mg/Kg	0.00	0.50	88	4.41		5.00	51693
							87	4.36	1.1	3.86	77

ANALYTE	Rprtd Result	Unit	DLim Used	Analyst	Spike QC	173	04/07/95	2	QC Unit
Semivolatile Organic Compounds	See attached	mg/Kg	0.33	DTW	Dup QC	173	04/07/95	2	mg/L

QC ANALYTE	Anr	Date of Analysis	Procedure	Unit	Blank	QC Dlim	Spk %	Dups	RPD (%)	Check Sample True/Measured	QC# %Rec
1,2,4-Trichlorobenzene	DTW	04/13/95	EPA 8270A	mg/Kg	0.00	0.33	72	1.19		1.66	51742
							88	1.46	20	1.32	80
1,4-Dichlorobenzene	DTW	04/13/95	EPA 8270A	mg/Kg	0.00	0.33	69	1.14		1.66	51742
							82	1.36	18	1.24	75
2,4,6-Tribromophenol (surr)	DTW	04/13/95	EPA 8270A	% Rcvry	0.00	13	83	2.07		2.50	51742
							88	2.19	5.6	2.47	99
2,4-Dinitrotoluene	DTW	04/13/95	EPA 8270A	mg/Kg	0.00	0.33	97	1.61		1.66	51742
							96	1.60	.62	1.58	95
2-Chlorophenol	DTW	04/13/95	EPA 8270A	mg/Kg	0.00	0.33	67	1.68		2.50	51742
							79	1.98	16	1.91	76
2-Chlorophenol-d4 (surr)	DTW	04/13/95	EPA 8270A	% Rcvry	0.00	13	56	1.39		2.50	51742
							68	1.69	19	1.56	62
2-Fluorobiphenyl (surr)	DTW	04/13/95	EPA 8270A	% Rcvry	0.00	20	63	1.05		1.66	51742
							76	1.26	18	1.34	81
2-Fluorophenol (surr)	DTW	04/13/95	EPA 8270A	% Rcvry	0.00	13	56	1.39		2.50	51742
							70	1.74	22	1.51	60
4-Chloro-3-methylphenol	DTW	04/13/95	EPA 8270A	mg/Kg	0.00	0.33	87	2.17		2.50	51742
							97	2.42	11	2.95	118
4-Nitrophenol	DTW	04/13/95	EPA 8270A	mg/Kg	0.00	0.33	83	2.08		2.50	51742
							96	2.39	14	2.20	88
Acenaphthene	DTW	04/13/95	EPA 8270A	mg/Kg	0.00	0.33	81	1.35		1.66	51742
							93	1.55	14	1.78	107
1,2-Dichlorobenzene-d4 (surr)	DTW	04/13/95	EPA 8270A	% Rcvry	0.00	20	52	0.856		1.66	51742
							64	1.06	21	0.916	55
Nitrobenzene-d5 (surr)	DTW	04/13/95	EPA 8270A	% Rcvry	0.00	20	54	0.900		1.66	51742
							69	1.15	24	1.02	61
N-Nitroso-di-n-propylamine	DTW	04/13/95	EPA 8270A	mg/Kg	0.00	0.33	73	1.21		1.66	51742
							84	1.40	14	1.44	87
Phenol-d5 (surr)	DTW	04/13/95	EPA 8270A	% Rcvry	0.00	13	58	1.45		2.50	51742
							69	1.73	18	1.73	69
Pentachlorophenol	DTW	04/13/95	EPA 8270A	mg/Kg	0.00	0.33	113	2.83		2.50	51742
							110	2.75	2.8	2.52	101
Phenol(s) by GC/MS	DTW	04/13/95	EPA 8270A	mg/Kg	0.00	0.33	67	1.68		2.50	51742
							78	1.96	15	2.04	82
Pyrene	DTW	04/13/95	EPA 8270A	mg/Kg	0.00	0.33	72	1.19		1.66	51742
							65	1.08	9.6	1.16	70
p-Terphenyl-d14 (surr)	DTW	04/13/95	EPA 8270A	% Rcvry	0.00	20	85	1.41		1.66	51742
							82	1.37	2.8	1.59	96

APPENDIX E
SURVEYING FIELD NOTES

Surveyor Abbreviations

Hor. ∡ R.T. = horizontal angle right (degrees/minutes/seconds)

Dist. = distance in U.S. Survey feet (NAD 27)

Vert. ∡ = vertical angle (degrees/minutes/seconds)

H.I. = height of instrument

H.R. = height of rod

I HEREBY CERTIFY THAT I AM A REGISTERED PROFESSIONAL SURVEYOR UNDER THE LAWS OF THE STATE OF NEW MEXICO, THAT THIS PLAT WAS PREPARED FROM FIELD NOTES MADE BY ME OR UNDER MY DIRECTION, THAT IT IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF MEETING OR EXCEEDING THE MINIMUM REQUIREMENTS OF THE STANDARDS FOR LAND SURVEYS IN THE STATE OF NEW MEXICO.

Walter C. Black 04/04/95

WALTER C. BLACK, RPS #8081 DATE

FILE: 95104DT1 BY: WCB
DATE: 23/03/95 TIME: LATE
AUTOCAD 12 c2

SOUTHWEST ENGINEERING, INC.

475 ARCHULETA ROAD, LAS CRUCES, NEW MEXICO 88005 (505) 526-3381

BDR2436S 091494

Field Book 32

BORING LOC'S.

T @ TEST BL-1, B.S. TOWER

H.I. = 5.16

HOR. ∠ RT.	DIST.	VERT. ∠	DESC.		
124-34-25	172.52	88-57-15 (2'1300'T)2	FENCE COR. N. of N.E. BLD. COR		3
122-46-45	182.96	88-07-15	N.E. COR. BLDG. B-025		4
150-12-15	285.43	89-26-45	~~NE COR. BLDG~~		5
149-58-55	301.57	89-26-50	B-020		6
152-05-10	323.23	89-35-25	B-003	H.R. = ~~4.84~~ 5.16	7
156-00-40	309.88	90-27-50	B-002		8
153-48-55	288.97	89-27-35	B-021		9
151-27-05	270.22	89-26-50	B ~~014~~ 024		10
150-21-15	272.38	89-24-00	PB-01		11
156-00-40	257.71	89-26-05	B-023		12
158-26-35	279.02	89-31-20	B-022		13
160-23-35	301.15	89-33-35	B-001		14
159-42-00	234.86	88-46-15	B-090	H.R. = 8.16	15
153-22-45	248.07	88-40-00	B-091		16
150-33-55	286.62	88-51-15	SB-01		17
148-47-25	261.96	88-40-50	B-100		18
163-54-30	212.80	89-08-55	B-105		19
155-57-15	207.02	88-35-35	B-089		20
149-25-05	223.08	88-31-45	B-092		21
144-27-35	238.06	88-32-50	B-099		22
139-35-05	215.38	88-23-50	B-098		23
144-33-20	198.75	88-21-10	B-093		24

HOR. ∡ RT.	DIST.	VERT. ∡	DESC.	HTR.	
151-45-00	181.19	88-23-35	B-088	8.16	25
152-11-00	183.02	88-24-30	SB-04		26
160-57-25	181.33	89-04-10	B-106		27
156-53-15	153.56	88-55-30	B-107		28
145-44-15	154.05	88-06-10	B-087		29
138-05-20	174.83	88-08-05	B-094		30
132-57-40	194.12	88-12-50	B-097		31
125-42-50	177.38	88-03-40	B-096		32
129-35-25	153.80	87-52-30	B-095		33
137-19-25	130.05	87-45-55	B-086		34
149-47-25	125.85	88-42-30	B-110		35
118-00-35	104.36	87-41-10	B-081		36
112-30-50	147.61	87-55-50	SB-07		37
110-42-05	149.78	87-59-40	B-082		38
91-16-50	143.08	88-52-35	B-083		39
87-43-10	136.30	88-56-50	DB-09		40
90-01-25	95.37	89-19-45	B-080		41
63-21-25	110.14	89-33-10	B-079		42
45-36-30	142.09	90-08-35	B-078		43
57-22-15	177.25	90-09-10	B-084		44
46-03-55	211.72	90-27-10	B-085		45
45-32-15	213.86	90-27-05	SB-05		46
34-50-20	181.53	90-26-00	B-077		47
41-52-50	236.57	—	FENCE COR.		48

HOR. ∡ RT.	DIST.	VERT. ∡	DESC.		
29-31-35	206.76	—	FENCE COR.	(H.R. 8.16)	49
20-48-00	307.43	—	FENCE COR.		50
29-04-25	332.87	90-46-55	B-076		51
37-47-20	371.59	90-37-30	B-075		52
41-47-45	454.26	90-39-45	B-074		53
52-08-25	463.08	90-29-20	DB-08		54
52-45-25	472.73	90-30-00	B-073		55
52-00-25	545.64	90-34-35	B-072		56
59-41-50	555.88	90-26-15	B-071		57
59-30-20	553.44	90-25-30	SB-03		58
65-28-40	571.87	90-22-30	B-070		59
65-28-55	573.08	90-22-05	DB-07		61
66-39-30	593.27	90-22-40	B-059		61
67-43-10	615.65	90-23-20	B-058		62
62-15-25	578.24	—	FENCE COR.		63
68-17-25	546.55	—	FENCE COR.		64
76-28-15	720.12	—	FENCE COR.		65
90-40-40	668.15	—	FENCE COR.		66
87-29-55	496.92	—	FENCE COR.		67
92-17-15	494.13	—	FENCE COR. 069		68
71-34-35	543.19	89-55-10	B-~~066~~	H.R.=12.16	69
72-28-00	568.21	89-58-25	B-060		70
73-44-00	589.28	90-10-05	B-057		71
74-59-50	633.84	90-25-55	B-101		72

HOR. ∠ RT.	DIST.	VERT. ∠	DESC.		
77-32-40	554.85	90-25-30	B-061	H.R.=12.16	73
76-47-15	525.07	90-06-40	B-068		74
82-43-05	512.72	89-54-35	B-067		75
82-47-10	506.79	89-48-25	DB-06		76
83-46-40	545.50	90-21-20	B-062		77
87-46-25	582.25	90-12-35	B-104		78
86-19-55	628.62	90-12-15	B-103		79
80-16-10	660.89	90-16-00	B-102		80
88-19-25	499.77	89-44-45	B-066		81
88-49-10	532.84	89-48-20	B-063		82
89-19-55	555.03	89-57-30	B-056		83
92-28-50	553.98	89-44-25	B-055		84
92-39-05	527.75	89-43-15	B-064		85
92-31-55	504.20	89-39-30	B-065		86
92-35-35	504.04	89-39-45	DB-05		87
96-07-55	504.21	89-33-55	B-054		88
4' LT. 96-08-00	456.56	89-34-10			—
106-15-10	367.72	—	FENCE COR		89
104-49-55	363.08	—	FENCE COR		90
109-13-05	320.72	88-16-10	3' C/S BLD. COR.		91
105-25-15	378.13	88-44-15	SB-10		92
155-37-20	379.57	89-03-50	TRAV PT. @ SEWER #1 CLEAN-OUT	H.R.=7.16	93
				1636.18	

TRAV PT. #1
∠ @ (GENER C/O), B.S. TEST BL-1 H.I.=4.93

HOR. ∠ RT.	DIST.	VERT. ∠	DESC.		
44-09-40	60.80	89-57-10	B-004	H.R.=6.93	94
39-00-15	83.81	89-39-55	B-019		95
36-52-55	103.00	89-39-20	B-026		96
19-18-15	119.33	89-39-00	N.W. COR. BLDG.		97
49-51-20	110.03	89-44-20	B-027		98
54-01-55	93.39	89-46-10	B-018		99
63-00-55	72.05	90-00-25	B-005		100
76-27-45	88.28	90-03-45	B-006		101
65-38-40	105.09	89-49-00	B-107		02
60-13-05	120.24	89-49-05	B-028		03
69-30-05	136.85	89-51-40	B-029		04
75-34-00	122.81	89-58-30	B-016		05
85-10-10	108.21	90-03-55	B-007		06
120-15-20	101.87	89-18-40	B-108		07
119-35-20	130.01	89-27-30	B-109		08
91-26-55	128.92	90-06-15	B-008		09
82-36-05	141.48	89-57-10	B-015		10
76-10-00	153.59	89-53-55	B-030		11
75-58-55	157.27	89-46-55	DB-02		12
80-37-40	175.81	89-54-55	SB-06		13
80-43-25	177.48	89-55-05	B-031		14
87-55-30	162.56	89-58-45	B-014		15
95-29-25	151.93	90-02-30	B-009		16

HOR. ∠ RT.	DIST.	VERT. ∠	DESC.		
98-50-25	175.00	90-01-40	B-010	H.R. = 6.93	119
91-33-00	186.17	90-01-45	B-013		118
85-19-05	198.72	89-58-30	B-032		120
88-58-10	219.09	89-59-05	B-033		121
94-21-35	207.96	90-00-20	B-012		122
101-01-55	199.30	90-02-30	B-011		123
118-26-25	137.65	90-06-40	TRAV. PT. #2 SET NAIL		124
∠ @ TRAV. PT. #2, B.S. TRAV. PT. #1			H.I. = 5.40		
HOR. ∠ RT.	DIST.	VERT. ∠	DESC.		
86-21-15	119.37	87-25-00	S.W. COR. BLDG.	H.R. = 12.40	125
90-56-15	133.75	87-37-50	B-036		126
101-34-45	136.65	87-49-45	B-035		127
111-02-30	142.79	88-03-35	B-034		[illegible]
107-22-20	172.37	88-23-35	B-039		129
117-34-40	187.33	88-42-40	SB-09		130
105-05-00	197.23	88-39-30	B-040		131
103-18-45	223.27	88-52-55	B-045		132
114-51-00	265.56	89-53-50	B-050		133
120-35-10	314.16	90-02-30	B-051		134
116-46-00	329.84	89-50-35	B-052		135
113-42-20	343.87	89-56-35	B-053		136
107-10-35	297.75	89-30-35	B-048		137
110-42-00	282.16	89-22-05	B-049		138
110-26-40	278.72	89-19-25	DB-04		139

HOR. ART.	DIST.	VERT. A	DESC.
96-04-25	244.75	88-11-25	B-046
90-18-35	242.75	88-04-30	B-047
90-08-35	216.80	87-49-10	B-043
90-12-55	214.84	87-48-20	SB-08
96-56-40	219.06	87-56-15	B-044
100-11-35	193.30	87-38-00	B-041
101-59-15	167.40	87-13-05	B-038
90-31-45	190.39	87-29-25	B-042
90-52-35	189.97	87-27-30	DB-03
93-11-30	164.85	87-06-10	B-037
104-54-25	163.48	—	FENCE COR.
87-49-05	157.33	—	FENCE COR.

H.R. = ~~140~~ 15.40

141
142
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APPENDIX F
CHEMICAL DATA QUALITY REVIEW - U.S. ARMY CORPS OF ENGINEERS, SOUTHWESTERN DIVISION

F93102/6.2.5

U.S. ARMY CORPS OF ENGINEERS
SOUTHWESTERN DIVISION

White Sands Missile Range
RCRA Facility Investigation at the
Temperature Test Facility

June 1994 & March 1995

Chemical Data Quality Review

Prepared by: Tulsa District Corps of Engineers
June 1995

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White Sands Missile Range
RCRA Facility Investigation at the
Temperature Test Facility

June 1994 & March 1995

1.0 Discussion.

Woodward-Clyde Consultants (WCC) were contracted by the U.S. Army Corps of Engineers Tulsa District to conduct a RCRA investigation at the White Sands Missile Range Temperature Test Facility.

WCC indicated that soil gas monitoring well samples were collected in June 1994 and were field screened for volatile organics using a gas chromatograph\photoionization detector\ electron capture detector (GC\PID\ECD) technique. Samples were also collected from these wells and distributed to Enseco Air Toxics for analysis of volatile organics by EPA method TO-14.

WCC indicated that both shallow and deep soil gas samples were collected in March 1995. These samples were analyzed in the field for volatile organics by a vehicle mounted gas chromatograph/mass spectrometer (GCMS).

WCC indicated that Plains Environmental Services performed field screening services in June 1994 and March 1995.

WCC indicated that a single soil sample was collected from each of the 9 deep soil gas borings and distributed to Quanterra Environmental (Formerly Enseco) for analysis of volatile organics by EPA SW-846 method 8240.

WCC indicated that 111 soil samples were collected during the installation of 12 deep soil borings (hollow stem auger technique). The soil samples were distributed to Quanterra Environmental for analysis of volatile organics by EPA SW-846 method 8240.

WCC indicated that four existing RCRA groundwater monitoring wells were sampled. The samples were shipped to Quanterra Environmental for analysis of volatile organics by EPA SW-846 method 8240.

WCC collected 4 groundwater samples, 3 travel blanks, 13 rinsate/equipment blanks, 15 quality control (QC) duplicate samples, and 13 quality assurance (QA) duplicate samples during March 1995.

These environmental samples were collected and analyzed in accordance with state and federal guidance documents which establish definitive analytical/technical elements, i.e., SW-846 and EPA series methods.

Certain field analyses such as pH, temperature, and conductivity are performed in the field. These samples are collected and analyzed in accordance with state and federal guidance documents which establish analytical screening data elements.

The WCC sampling crew(s) distributed the quality assurance samples to the U.S. Army Corps of Engineers (USACE) Southwestern Division Laboratory (SWD). SWD distributed these samples to Inchcape Environmental Services (NDRC Laboratories) All labs have been validated by the Missouri River Division (MRD) USACE.

The samples were all documented in SWD Report #16269. The SWD report includes laboratory case narratives and quality control reviews from each lab. An overall data quality review has been organized in the following sections of this report.

Details of this review; reported holding times, surrogate and spike recoveries, relative percent differences (RPDs), calibration data, mass spectra, chromatograms, GC/MS performance standards, and other lab quality control information are available from the Tulsa District USACE, Chemistry and Industrial Hygiene Section, upon request.

2.0 Standards of Comparability.

The U.S. Army Corps of Engineers (USACE) assures that chemical data results generated from in-house programs and architect-engineering contracts are both accurate and reliable. This is accomplished by following the guidelines set fourth in ER 1110-1-263; Chemical Data Quality Management for Hazardous Waste Remedial Activities. Other guidance documents associated with sampling, analysis, and validation include, but are not limited to, "RCRA Groundwater Monitoring Draft Technical Guidance; EPA/530-R-93-001 (November 1992)", "Compendium of ERT Soil Sampling and Geophysics Procedures; EPA/540/P-91/006 (January 1991)", "USACE MCX-Sampling and Analysis Requirements for Measurement of Chemicals in the Environment (June 1993)", "National Functional Guidelines For Organic Data Review (June 1991)", and "National Functional Guidelines For Evaluating Inorganics Analyses (July 1988)."

The U.S. Army Corps of Engineers requires that the contractor select USACE Missouri River Division (MRD) approved laboratories. Each of the laboratories is required to have in place a laboratory quality control program which certifies that the data generated from the lab is accurate and reliable. The contractor initiates another level of review to insure that the data is accurate and reliable. Parallel to these activities, the USACE requires that the contractor collect quality assurance (QA) samples and distribute them to government laboratories. A similar review and validation process is conducted upon the QA samples.

Upon receipt of the contractor's sample data, contractor's data validation report, USACE QA sample data, and USACE QA data validation report, the USACE District office initiates another review. The District office reviews the findings of both the contractor and USACE QA data validation reports, and determines if the generated data is indeed accurate, reliable, and complete. Inconsistencies found between the field, quality control duplicate, and quality assurance duplicate samples are investigated. Guidelines previously mentioned are employed to assess the validity of the results, as well as sound professional judgement. As a District guideline, differences in field and QA duplicate sample results that are greater than a factor of two for aqueous samples and a factor of five for soil/sediment samples are considered to fall outside typical quality control ranges. Differences which cannot be analytically interpreted are noted.

When the U.S. Army Corps of Engineers elects to perform all or some of the investigation functions in-house, the procedures previously mentioned are still observed.

3.0 Chain of Custody Synopsis.

Analytical Methods						
Sample ID	TO-14	8240				
Samples collected on 6/29/94						
WSTF-0021-5080	2					
WSTF-0024-5072	2					
WSTF-0011-5058	2					
WSTF-0023-5085	2					
WSTF-0022-5080	2					
WSTF-0022-5080 QC	2					
WSTF-0017-5082	2					
WSTF-0019-5085	2					
WSTF-0018-5052	2					
WSTF-0016-5070	2					

Notes:

1 Quanterra Environmental (Formerly Enseco)
2 Enseco Air Toxics
3 NDRC Laboratories (Inchcape Environmental Services)

3.0 Chain of Custody Synopsis (continued).

Analytical Methods						
Sample ID	TO-14	8240				
Samples collected on 6/30/94						
WSTF-0014-5100	2					
WSTF-0020-5077	2					
WSTF-0025-5078	2					
WSTF-0027-5080	2					
WSTF-0029-5058	2					
WSTF-0029-5058 QC	2					
WSTF-9201-5089	2					
WSTF-9202-5092	2					
WSTF-0000-5077	2					

Notes:

1 Quanterra Environmental (Formerly Enseco)
2 Enseco Air Toxics
3 NDRC Laboratories (Inchcape Environmental Services)

3.0 Chain of Custody Synopsis (continued).

Analytical Methods						
Sample ID	TO-14	8240				
Samples collected on 3/10/95						
WSTF-DB01-2048		2				
WSTF-DB02-2048		2				

Notes:

1 Quanterra Environmental (Formerly Enseco)
2 Enseco Air Toxics
3 NDRC Laboratories (Inchcape Environmental Services)

3.0 Chain of Custody Synopsis (continued).

Analytical Methods						
Sample ID	TO-14	8240				
Samples collected on 3/11/95						
WSTF-DB04-2042		2				
WSTF-DB05-2052		2				

Notes:

1 Quanterra Environmental (Formerly Enseco)
2 Enseco Air Toxics
3 NDRC Laboratories (Inchcape Environmental Services)

3.0 Chain of Custody Synopsis (continued).

Analytical Methods						
Sample ID	TO-14	8240				
Samples collected on 3/12/95						
WSTF-D807-2045		2				
WSTF-D808-2043		2				

Notes:

1 Quanterra Environmental (Formerly Enseco)
2 Enseco Air Toxics
3 NDRC Laboratories (Inchcape Environmental Services)

3.0 Chain of Custody Synopsis (continued).

Analytical Methods						
Sample ID	TO-14	8240				
Samples collected on 3/13/95						
WSTF-DB03-2050		2				
WSTF-DB06-2041		2				

Notes:

1 Quanterra Environmental (Formerly Enseco)
2 Enseco Air Toxics
3 NDRC Laboratories (Inchcape Environmental Services)

3.0 Chain of Custody Synopsis (continued).

Analytical Methods						
Sample ID	TO-14	8240				
Samples collected on 3/14/95						
WSTF-DB09-2050		2				
WSTF-DB09-2050 EB		2				

Notes:

1 Quanterra Environmental (Formerly Enseco)
2 Enseco Air Toxics
3 NDRC Laboratories (Inchcape Environmental Services)

3.0 Chain of Custody Synopsis (continued).

Analytical Methods						
Sample ID	TO-14	8240				
Samples collected on 3/15/95						
WSTF-SB02-2059		2				
WSTF-SB02-2059 QC		2				
WSTF-SB02-2059 QA		3				
WSTF-SB02-2059 MS/MSD		2				
WSTF-SB02-2065		2				
WSTF-SB02-2072		2				
WSTF-SB02-2064		2				
WSTF-SB02-2078		2				
WSTF-SB02-2079		2				
WSTF-SB02-2012		2				
WSTF-SB02-2050		2				
WSTF-SB02-2052		2				
WSTF-SB02-2052 QC		2				
WSTF-SB02-2052 QA		3				
WSTF-SB02-2052 MS/MSD		2				
WSTF-SB02-2002		2				
WSTF-SB03-2010		2				
WSTF-SB03-2021		2				

Notes:

1 Quanterra Environmental (Formerly Enseco)
2 Enseco Air Toxics
3 NDRC Laboratories (Inchcape Environmental Services)

3.0 Chain of Custody Synopsis (continued).

Analytical Methods						
Sample ID	TO-14	8240				
Samples collected on 3/16/95						
WSTF-SB01-2076		2				
WSTF-SB01-2080		2				
WSTF-SB01-2017		2				
WSTF-SB01-2025		2				
WSTF-SB01-2050 EB		2				
WSTF-SB01-2057		2				
WSTF-SB01-2057 QC		2				
WSTF-SB01-2057 QA		3				
WSTF-SB01-2062		2				
WSTF-SB01-2063		2				
WSTF-SB01-2061		2				
WSTF-SB01-2061 MS/MSD		2				
WSTF-SB01-2072		2				
WSTF-SB03-2053		2				
WSTF-SB03-2060		2				
WSTF-SB03-2065		2				
WSTF-SB03-2063		2				
WSTF-SB03-2063 QC		2				
WSTF-SB03-2063 QA		3				
WSTF-SB03-2065		2				
WSTF-SB03-2070		2				
WSTF-SB03-2074		2				

Notes:

1 Quanterra Environmental (Formerly Enseco)
2 Enseco Air Toxics
3 NDRC Laboratories (Inchcape Environmental Services)

3.0 Chain of Custody Synopsis (continued).

Analytical Methods						
Sample ID	TO-14	8240				
Samples collected on 3/22/95						
WSTF-SB06-2017		2				
WSTF-SB06-2022		2				
WSTF-SB06-2057		2				
WSTF-SB06-2060		2				
WSTF-SB06-2061		2				
WSTF-SB06-2062		2				
WSTF-SB06-2073		2				
WSTF-SB06-2075 EB		2				
WSTF-SB06-2080		2				
WSTF-SB06-2080 QC		2				
WSTF-SB06-2080 QA		3				
WSTF-SB06-2081		2				

Notes:

1 Quanterra Environmental (Formerly Enseco)
2 Enseco Air Toxics
3 NDRC Laboratories (Inchcape Environmental Services)

3.0 Chain of Custody Synopsis (continued).

Analytical Methods						
Sample ID	TO-14	8240				
Samples collected on 3/23/95						
WSTF-SB04-2016		2				
WSTF-SB04-2016 QC		2				
WSTF-SB04-2016 QA		3				
WSTF-SB04-2016 MS/MSD		2				
WSTF-0023-1000		2				
WSTF-SB04-2077 EB		2				
WSTF-SB04-2025		2				
WSTF-SB04-2056		2				
WSTF-SB04-2057		2				
WSTF-SB04-2062		2				
WSTF-SB04-2063		2				
WSTF-SB04-2071		2				
WSTF-SB04-2078		2				
WSTF-SB04-2079		2				
WSTF-0001-0000 TB		2				
WSTF-00E2-1000		2				
WSTF-SB08-2017		2				
WSTF-SB08-2017 QC		2				
WSTF-SB08-2017 QA		3				
WSTF-SB08-2025		2				

Notes:

1 Quanterra Environmental (Formerly Enseco)
2 Enseco Air Toxics
3 NDRC Laboratories (Inchcape Environmental Services)

3.0 Chain of Custody Synopsis (continued).

Analytical Methods						
Sample ID	TO-14	8240				
Samples collected on 3/24/95						
WSTF-SB10-2010 EB		2				
WSTF-SB10-2012		2				
WSTF-SB10-2012 QC		2				
WSTF-SB10-2012 QA		3				
WSTF-SB10-2012 MS/MSD		2				
WSTF-SB10-2021		2				
WSTF-SB10-2059		2				
WSTF-SB10-2060		2				
WSTF-SB10-2061		2				
WSTF-SB10-2062		2				
WSTF-SB10-2071		2				
WSTF-SB10-2073		2				
WSTF-SB08-2059		2				
WSTF-SB08-2060		2				
WSTF-SB08-2061		2				
WSTF-SB08-2062		2				
WSTF-SB08-2074		2				
WSTF-SB08-2079		2				
WSTF-SB08-2080		2				

Notes:

1 Quanterra Environmental (Formerly Enseco)
2 Enseco Air Toxics
3 NDRC Laboratories (Inchcape Environmental Services)

3.0 Chain of Custody Synopsis (continued).

Analytical Methods						
Sample ID	TO-14	8240				
Samples collected on 3/25/95						
WSTF-SB10-2078		2				
WSTF-SB09-2017		2				
WSTF-SB09-2021		2				
WSTF-SB09-2057		2				
WSTF-SB09-2057 QC		2				
WSTF-SB09-2057 QA		3				
WSTF-SB09-2060		2				

Notes:

1 Quanterra Environmental (Formerly Enseco)
2 Enseco Air Toxics
3 NDRC Laboratories (Inchcape Environmental Services)

3.0 Chain of Custody Synopsis (continued).

Analytical Methods						
Sample ID	TO-14	8240				
Samples collected on 3/26/95						
WSTF-SB09-2072		2				
WSTF-SB09-2078		2				
WSTF-SB09-2079		2				
WSTF-SB09-2072 EB		2				
WSTF-SB09-2017		2				
WSTF-SB05-2021		2				
WSTF-SB05-2054		2				
WSTF-SB05-2054 QC		2				
WSTF-SB05-2054 QA		3				
WSTF-SB05-2054 MS/MSD		2				
WSTF-SB05-2055		2				
WSTF-SB05-2056		2				
WSTF-SB05-2055		2				
WSTF-SB05-2056		2				
WSTF-SB05-2070		2				
WSTF-SB05-2075		2				
WSTF-SB05-2076		2				

Notes:

1 Quanterra Environmental (Formerly Enseco)
2 Enseco Air Toxics
3 NDRC Laboratories (Inchcape Environmental Services)

3.0 Chain of Custody Synopsis (continued).

Analytical Methods						
Sample ID	TO-14	8240				
Samples collected on 3/27/95						
WSTF-SB07-2072		2				
WSTF-SB07-2078		2				
WSTF-SB07-2079		2				
WSTF-00E1-1000		2				
WSTF-00E1-1000 QC		2				
WSTF-00E1-1000 QA		3				
WSTF-00E1-1000 MS/MSD		2				
WSTF-0003-0000 TB		2				
WSTF-SB07 2017		2				
WSTF-SB07-2017 QC		2				
WSTF-SB07-2017 QA		3				
WSTF-SB07-2017 MS/MSD		2				
WSTF-SB07-2022		2				
WSTF-SB07-2067		2				
WSTF-SB07-2059		2				
WSTF-SB07-2060		2				
WSTF-SB07-2061		2				
WSTF-00E1-1000 EB		2				
WSTF-SB07-2058 EB		2				
WSTF-0001-1000		2				

Notes:

1 Quanterra Environmental (Formerly Enseco)
2 Enseco Air Toxics
3 NDRC Laboratories (Inchcape Environmental Services)

3.0 Chain of Custody Synopsis (continued).

Analytical Methods						
Sample ID	TO-14	8240				
Samples collected on 3/28/95						
WSTF-SB11-2016		2				
WSTF-SB11-2017		2				
WSTF-SB11-2052		2				
WSTF-SB11-2054		2				
WSTF-SB11-2065		2				
WSTF-SB11-2067		2				
WSTF-SB11-2016 MS/MSD		2				
WSTF-SB11-2070		2				
WSTF-SB11 2070 QC		2				
WSTF-SB11-2070 QA		3				
WSTF-SB12-2010 EB		2				

Notes:

1 Quanterra Environmental (Formerly Enseco)
2 Enseco Air Toxics
3 NDRC Laboratories (Inchcape Environmental Services)

3.0 Chain of Custody Synopsis (continued).

Analytical Methods						
Sample ID	TO-14	8240				
Samples collected on 3/29/95						
WSTF-SB12-2022 EB		2				
WSTF-SB12-2017		2				
WSTF-SB12-2022		2				
WSTF-SB12-2058		2				
WSTF-SB12-2059		2				
WSTF-SB12-2061		2				
WSTF-SB12-2060		2				
WSTF-SB12-2072		2				
WSTF-SB12 2081		2				
WSTF-SB12-2082		2				
WSTF-SB12-2081		2				
WSTF-SB12-2082		2				
WSTF-SB12-2095		2				
WSTF-SB12-2103		2				
WSTF-SB12-2113		2				
WSTF-SB12-2123		2				
WSTF-SB12-2133		2				

Notes:

1 Quanterra Environmental (Formerly Enseco)
2 Enseco Air Toxics
3 NDRC Laboratories (Inchcape Environmental Services)

3.0 Chain of Custody Synopsis (continued).

Analytical Methods						
Sample ID	TO-14	8240				
Samples collected on 3/30/95						
WSTF-SB12-2142		2				
WSTF-SB12-2142 QC		2				
WSTF-SB12-2142 QA		3				
WSTF-SB12-2142 MS/MSD		2				
WSTF-SB12-2152		2				
WSTF-SB12-2142 EB		2				

Notes:

1 Quanterra Environmental (Formerly Enseco)
2 Enseco Air Toxics
3 NDRC Laboratories (Inchcape Environmental Services)

4.0 Sample WSTF-SB02-2052.

A QA duplicate soil boring, WSTF-SB02-2052, was collected and analyzed at a laboratory under contract to the USACE. Both the field and QA duplicate samples were analyzed within the appropriate holding time.

4.1 Volatile Organics. SW-846 method 8240 was requested to analyze the soil media for volatile organic analytes. An evaluation of both the field and QA duplicate sample indicated that the results are consistent. No analytes were detected.

5.0 Sample WSTF-SB02-2059.

A QA duplicate soil boring, WSTF-SB02-2059, was collected and analyzed at a laboratory under contract to the USACE. Both the field and QA duplicate samples were analyzed within the appropriate holding time.

5.1 Volatile Organics. SW-846 method 8240 was requested to analyze the soil media for volatile organic analytes. An evaluation of both the field and QA duplicate sample indicated that the results are consistent. No analytes were detected.

6.0 Sample WSTF-SB03-2063.

A QA duplicate soil boring, WSTF-SB03-2063, was collected and analyzed at a laboratory under contract to the USACE. Both the field and QA duplicate samples were analyzed within the appropriate holding time.

6.1 Volatile Organics. SW-846 method 8240 was requested to analyze the soil media for volatile organic analytes. An evaluation of both the field and QA duplicate sample indicated that the results are consistent. No analytes were detected.

7.0 Sample WSTF-SB01-2057.

A QA duplicate soil boring, WSTF-SB01-2057, was collected and analyzed at a laboratory under contract to the USACE. Both the field and QA duplicate samples were analyzed within the appropriate holding time.

7.1 Volatile Organics. SW-846 method 8240 was requested to analyze the soil media for volatile organic analytes. An evaluation of both the field and QA duplicate sample indicated that the results are consistent. No analytes were detected.

8.0 Sample WSTF-SB06-2080.

A QA duplicate soil boring, WSTF-SB06-2080, was collected and analyzed at a laboratory under contract to the USACE. Both the field and QA duplicate samples were analyzed within the appropriate holding time.

8.1 Volatile Organics. SW-846 method 8240 was requested to analyze the soil media for volatile organic analytes. An evaluation of both the field and QA duplicate sample indicated that the results are consistent. No analytes were detected.

9.0 Sample WSTF-SB04-2016.

A QA duplicate soil boring, WSTF-SB04-2016, was collected and analyzed at a laboratory under contract to the USACE. Both the field and QA duplicate samples were analyzed within the appropriate holding time.

9.1 Volatile Organics. SW-846 method 8240 was requested to analyze the soil media for volatile organic analytes. An evaluation of both the field and QA duplicate sample indicated that the results are consistent. No analytes were detected.

10.0 Sample WSTF-SB08-2017.

A QA duplicate soil boring, WSTF-SB08-2017, was collected and analyzed at a laboratory under contract to the USACE. Both the field and QA duplicate samples were analyzed within the appropriate holding time.

10.1 Volatile Organics. SW-846 method 8240 was requested to analyze the soil media for volatile organic analytes. An evaluation of both the field and QA duplicate sample indicated that the results are consistent. No analytes were detected.

11.0 Sample WSTF-SB10-2012.

A QA duplicate soil boring, WSTF-SB10-2012, was collected and analyzed at a laboratory under contract to the USACE. Both the field and QA duplicate samples were analyzed within the appropriate holding time.

11.1 Volatile Organics. SW-846 method 8240 was requested to analyze the soil media for volatile organic analytes. An evaluation of both the field and QA duplicate sample indicated that the results are consistent. No analytes were detected.

12.0 Sample WSTF-SB09-2057.

A QA duplicate soil boring, WSTF-SB09-2057, was collected and analyzed at a laboratory under contract to the USACE. Both the field and QA duplicate samples were analyzed within the appropriate holding time.

12.1 Volatile Organics. SW-846 method 8240 was requested to analyze the soil media for volatile organic analytes. An evaluation of both the field and QA duplicate sample indicated that the results are consistent. No analytes were detected.

13.0 Sample WSTF-SB05-2054.

A QA duplicate soil boring, WSTF-SB05-2054, was collected and analyzed at a laboratory under contract to the USACE. Both the field and QA duplicate samples were analyzed within the appropriate holding time.

13.1 Volatile Organics. SW-846 method 8240 was requested to analyze the soil media for volatile organic analytes. An evaluation of both the field and QA duplicate sample indicated that the results are consistent. No analytes were detected.

14.0 Sample WSTF-SB07-2017.

A QA duplicate soil boring, WSTF-SB07-2017, was collected and analyzed at a laboratory under contract to the USACE. Both the field and QA duplicate samples were analyzed within the appropriate holding time.

14.1 Volatile Organics. SW-846 method 8240 was requested to analyze the soil media for volatile organic analytes. An evaluation of both the field and QA duplicate sample indicated that the results are consistent. No analytes were detected.

15.0 Sample WSTF-00E1-1000.

A QA duplicate groundwater well sample, WSTF-00E1-1000, was collected and analyzed at a laboratory under contract to the USACE. Both the field and QA duplicate samples were analyzed within the appropriate holding time.

15.1 Volatile Organics. SW-846 method 8240 was requested to analyze the water media for volatile organic analytes. An evaluation of both the field and QA duplicate sample indicated that the results are consistent. No analytes were detected.

16.0 Sample WSTF-SB11-2070.

A QA duplicate soil boring, WSTF-SB11-2070, was collected and analyzed at a laboratory under contract to the USACE. Both the field and QA duplicate samples were analyzed within the appropriate holding time.

16.1 Volatile Organics. SW-846 method 8240 was requested to analyze the soil media for volatile organic analytes. An evaluation of both the field and QA duplicate sample indicated that the results are consistent. No analytes were detected.

17.0 Sample WSTF-SB12-2142.

A QA duplicate soil boring, WSTF-SB12-2142, was collected and analyzed at a laboratory under contract to the USACE. Both the field and QA duplicate samples were analyzed within the appropriate holding time.

17.1 Volatile Organics. SW-846 method 8240 was requested to analyze the soil media for volatile organic analytes. An evaluation of both the field and QA duplicate sample indicated that the results are consistent. No analytes were detected.

18.0 Technical Summary.

18.1 Woodward-Clyde Consultants Data Validation.

18.1.1 Blank Contamination. WCC indicated that several of the soil rinsate (equipment blank) samples detected the presence of acetone, bromodichloromethane, chloroform, and methylene chloride. WCC had analyzed ambient blanks, and determined that 'the water used for rinsate applications was contaminated with bromodichloromethane and chloroform which are commonly found in municipal water supplies treated with chlorine. No investigative samples associated with the contaminated rinsates contained either of these compounds, therefore the results were not affected.'

Furthermore, 'the only volatile organic analytes detected in the method blanks include acetone and methylene chloride. These compounds were detected at estimated concentrations below the reporting limit. These compounds were found in some of the associated samples at a level above the reporting limit but less than ten times the amount found in the method blank. These two compounds were qualified as not detected in the associated samples according to EPA SW-846 guidelines.'

18.1.2 Holding Times. Two samples were reanalyzed outside the holding time, they include WSTF-SB12-2059 and WSTF-SB12-2060. 'WSTF-SB12-2059 was reanalyzed as a result of one low surrogate and one low internal standard recovery. WSTF-SB12-2060 was reanalyzed as a result of one low internal standard recovery.' Details of these minor problems are discussed in WCC's data validation report under the Representativeness section.

18.1.3 Chain of Custody. A Southwest Laboratory of Oklahoma (SWLO) chain of custody (COC) form was used to document sample shipments to Quanterra Laboratories. The SWLO identification has been crossed off the COC form. No Quanterra Laboratory identification is listed on the COC, however the COC was received by an official of Quanterra Laboratory.

18.2 Southwestern Division Laboratory - USACE.

18.2.1 QA/QC Duplicate Sampling. The USACE was not sceduled to receive any QA duplicate (confirmation) samples from the either the June 1994 or March 1995 soil gas sampling episodes. WCC collected QC duplicate samples whenever appropriate to support data accuracy and precision.

18.2.2 Chain of Custody. SWD laboratory indicated that WCC's COCs did not indicate a point of contact or phone number for sample shipments on the 27, 28, and 31 March 1995. No other problems were observed.

19.0 Conclusion.

An overall evaluation of the June 1994 & March 1995, White Sands Missile Range RCRA Investigation, Temperature Test Facility, indicates that sampling procedures and laboratory analyses have been adequately completed and that the data should be considered accurate and reliable.

James Horn

James Horn,
Act. Chief, CIH Section

ck/JH

APPENDIX G
FATE AND TRANSPORT EVALUATIONS

APPENDIX G
PERSISTENCE, MOBILITY AND ENVIRONMENTAL FATE OF CONTAMINANTS DETECTED AT THE TTF

This appendix discusses the persistence, mobility and environmental fate of methylene chloride (MeCl) and other contaminants detected during the latest phases of sampling. As discussed earlier, MeCl is the primary focus of the past and present investigation activities conducted at the TTF. For the sake of completeness, the relevant physical and chemical properties of the other contaminants detected during the WCFS investigations are summarized briefly below and presented in **Table 5-1**.

METHYLENE CHLORIDE (MeCl)

MeCl is also known as dichloromethane. MeCl is a colorless liquid with a mild, sweet odor. It does not occur naturally in the environment and its presence in environmental media is primarily from industrial sources. When released to the atmosphere, MeCl degrades by reacting with hydroxyl ions and has a half-life of several months. It does not undergo direct photolysis. When spilled on land, MeCl evaporates from the surface into the atmosphere because of its high vapor pressure. Although it is likely that MeCl could leach through soil and enter groundwater, there is little data to support this pathway. The fate of MeCl in groundwater is unknown. Releases to surface waters result in rapid evaporation (half life: 3 to 5.6 hours). Biodegradation is likely but it is usually overshadowed by evaporation. Information concerning biodegradation in aquifers is scarce. Bioconcentration is not believed to be significant due to its low octanol-water partition coefficient.

Under laboratory conditions MeCl hydrolyses with subsequent oxidation and reduction to form methyl chloride, methanol, formic acid and formaldehyde. The ultimate degradation products of MeCl are carbon dioxide and hydrochloric acid.

Limited soil adsorption data indicate that MeCl adsorbs to soil in the following order: sand < dolomite limestone < clay < peat moss. The relevant physical and chemical properties of MeCl are presented in **Table 5-1**.

1,1-DICHLOROETHANE (1,1-DCA)

1,1-DCA does not occur as a natural product and its presence in environmental media is as a result of industrial use. If released into the atmosphere, 1,1-DCA degrades by reacting with hydroxyl radicals after considerable dispersion. If released on land, it evaporates rapidly due to high vapor pressure. It is likely that it leaches to groundwater where its fate is unknown. 1,1-DCA is moderately soluble in water. Due to its high volatilization rate (half life: 24 hours to 9 days), 1,1-DCA is removed rapidly from surface water with little bioconcentration or biodegradation. It exhibits little adsorption to soil organic matter. 1,1-DCA has been shown to degrade to vinyl chloride under anoxic conditions.

1,1-DICHLOROETHENE (1,1-DCE)

1,1-DCE is a man-made product which is also known as vinylidene chloride. It is produced and possibly released in the manufacture of plastic wrap, adhesives and synthetic fibers. 1,1-DCE can also be formed during the hydrolysis of 1,1,1-trichloroethane and the anaerobic degradation of trichloroethene. When released into the atmosphere, 1,1-DCE degrades rapidly (half-life: 11 hours) through reaction with hydroxyl radicals. When the compound is released on land, it will partition to the atmosphere via evaporation and to the groundwater via percolation. Once 1,1-DCE is in groundwater, it will undergo slow degradation and hydrolysis. 1,1-DCE in surface water will be lost primarily to the atmosphere through evaporation (half-life: 1 to 6 days) with very little of the compound adsorbing to sediment. 1,1-DCE is not expected to bioconcentrate significantly based on its low octanol-water partition coefficient. Some studies have shown that 1,1-DCE does undergo biodegradation with a degradation time of 1 to 3 weeks in simulated landfill conditions. 1,1-DCE is transformed into vinyl chloride under anoxic conditions. In the presence of nitrogen oxide, the compound has also been shown to produce degradation products including phosgene, chloracetyl chloride, formic acid, hydrochloric acid, carbon monoxide, formaldehyde and ozone.

CHLOROFORM

Chloroform is an industrial solvent and intermediate that is also known as trichloromethane. It is also produced and released to the environment as a byproduct of chlorination of drinking water, municipal sewage and cooling water. Due to its high vapor pressure and high volatility,

chloroform will evaporate into the atmosphere from both land and water. The compound has been known to be transported long distances in the atmosphere where it reacts with hydroxyl radicals. Chloroform has a half-life of up to a few months in the atmosphere. Chloroform released on land may also leach into the groundwater where it may biodegrade slowly. Biodegradation of chloroform is not completely understood, however slow biodegradation is known to occur under the proper microbial conditions. Chloroform in water environments will not likely undergo hydrolysis or photodegradation. Likewise, chloroform is not expected to significantly bioconcentrate.

FREON 11

Freon 11 is also known as trichlorofluoromethane. It is found to occur naturally in volcanoes. It is widely used as a refrigerant, foaming agent, solvent and degreaser, and a fire extinguishing agent. Prior to December 1978, Freon 11 was also used as a propellant in aerosol sprays. Freon 11 released to the air is considered to be very stable in the troposphere with a half-life of 52 to 207 years. The compound has been transported long distances in the atmosphere and is found away from known sources. However, Freon 11 is lost from the troposphere into the stratosphere where it undergoes photolysis. Freon 11, which may be cleaned out of the atmosphere by rain, is considered to re-volatilize quickly and re-enter the troposphere. Freon 11 may, however, also be transported from soil to groundwater where it is relatively stable and therefore persistent. Much like on land, the compound will be lost to air through evaporation from surface water. Freon 11 is not expected to biodegrade or bioconcentrate significantly.

FREON 113

Freon 113 is also known as 1,1,2-trichloro-1,2,2-trifluoroethane. Freon 113 is not a naturally-occurring compound. Freon 113 is potentially released into the environment during its production, storage or transport, from exhaust of turbine engines, its use as a foaming agent, refrigerant, and solvent as well as its use in the manufacture of fluoropolymers. Almost all of the Freon 113 released into soil or surface water is expected to be released into the atmosphere via volatilization (due to its high vapor pressure). Much like Freon 11, Freon 113 is considered to be stable in the troposphere. Therefore, the only pathway for removal in the atmosphere is the diffusion of Freon 113 into the stratosphere where direct photolysis is expected to occur

over the course of time. The degradation of Freon 113, however, is slow with a half-life in the stratosphere of 63 to 122 years. Although Freon 113 is expected to volatilize rapidly from soil, it is possible that the compound could leach into groundwater. Once in groundwater, its fate is not known. Bioconcentration and adsorption to soils and sediments are expected to be limited.

TRANS-1,2-DICHLOROETHENE

trans-1,2-Dichloroethene is found in the environment resulting from releases during production of the compound and its use as a solvent and extractant, in organic synthesis, and in the manufacture of perfumes, lacquers, and thermoplastics. The cis-isomer is more common; however, most of the laboratory methods used do not distinguish between isomers. Since the trans-isomer is a priority pollutant, it is sometimes mistakenly assumed to be present at greater proportions than actual conditions. trans-1,2-Dichloroethene is found in landfill situations as a product of the presence of industrial solvents such as trichloroethene, tetrachloroethene and 1,1,2,2-tetrachloroethane. trans-1,2-Dichloroethene released into the air will react with hydroxyl radicals or will be taken out of the atmosphere by rain. If the compound is released into soil it is expected to be volatilized and evaporated into the air or leached into groundwater. Once in groundwater, trans-1,2-Dichloroethene will biodegrade slowly. trans-1,2-Dichloroethene in surface water will be lost into air primarily through volatilization. The bioconcentration potential for trans-1,2-Dichloroethene is low, as is the potential for adsorption to soil. The degradation product observed under anoxic conditions is vinyl chloride.

TETRACHLOROETHENE

Tetrachloroethene is also known as perchloroethylene (PCE). PCE is a man-made compound used in the dry cleaning industry and in metal degreasing. If found in the atmosphere, PCE will degrade through reaction with hydroxyl radicals or chlorine atoms. Its persistence in the atmosphere can range from a half-life of 1 hour to 2 months. In addition, PCE can be washed out of the atmosphere by rain due to its solubility in water. Releases of PCE in soil will evaporate fairly quickly due to its high vapor pressure. PCE can also leave soil through leaching into groundwater through sandy soils. Once in groundwater, PCE is expected to biodegrade slowly, if acclimated microorganisms are present. PCE in surface water will be lost primarily through evaporation. Although the speed of evaporation will vary depending on wind

and mixing conditions, the process of volatilization is expected to occur in all seasons. Biodegradation in anaerobic soils is expected to be an important removal process. Hydrolysis is, not considered an important process in the degradation of PCE. Bioconcentration of PCE is expected to be insignificant.

1,1,1-TRICHLOROETHANE (1,1,1-TCA)

1,1,1-TCA is not a naturally-occurring compound. It is also known as methyl chloroform and is used in metal degreasing and as a solvent and aerosol. 1,1,1-TCA is slowly degraded in the atmosphere where hydroxyl radicals react with the compound in the troposphere (half-life of 6 months to 25 years). The rate of atmospheric degradation is increased if chlorine radicals of nitrogen oxides are present or if 1,1,1-TCA diffuses into the stratosphere. 1,1,1,-TCA is also removed from the atmosphere by rain. If 1,1,1-TCA is released to soils, it is expected to be lost rapidly to the atmosphere and some into groundwater. 1,1,1-TCA in surface water will be lost primarily through volatilization. It is not expected to biodegrade or adsorb significantly in aquatic environment. The potential for 1,1,1-TCA to hydrolyze or bioconcentrate is considered minimal. Sequential dehalogenation of 1,1,1-TCA by microbial agents under laboratory conditions produces 1,1-DCA, cis-1,2-dichloroethene, trans-1,2-dichloroethene, chloroethane, vinyl chloride, and acetic acid.

TRICHLOROETHENE (TCE)

TCE is used as an industrial metal degreaser with possible releases into the environment through evaporation during use, spills and leaks. TCE in the atmosphere is expected to react fairly quickly (especially under smog conditions). It will not undergo direct photolysis. Evaporation into the air from soil and water is the primary release mechanism due to the compound's high vapor pressure. Although TCE will be lost from soil primarily through volatilization, it can leach into groundwater where it can remain for a relatively long period of time. Similar to soils, TCE in surface water will be lost quickly through evaporation. The half-life of TCE in water is estimated to be on the order of minutes to hours. Biodegradation, photo-oxidation, hydrolysis, adsorption to sediments and bioconcentration are all considered relatively insignificant processes. Under laboratory conditions TCE degrades to cis-1,2-dichloroethene, trans-1,2-dichloroethene, vinyl chloride, and 1,2-dichloroethene.

ACETONE

Acetone is a naturally-occurring metabolite found in vegetation, insects and human breath. Acetone is also produced naturally as a result of volcanoes and forest fires. Acetone is produced for use in the manufacture of methacrylates, as a solvent, and as a chemical intermediate in the production of methyl ethyl ketone and other chemicals. Acetone, once released into the atmosphere, will undergo photolysis and reaction with hydroxyl radicals. The average half-life of acetone in the atmosphere is 22 days. Acetone, like many other atmospheric pollutants, is washed out by rain. Releases of acetone into soils will volatilize into air and leach into groundwater. Some evidence suggests that acetone biodegrades fairly quickly in soils. Acetone in surface water will also volatilize and biodegrade rather rapidly. The bioconcentration potential of acetone is considered negligible.

TOLUENE

Toluene is both a naturally-occurring and man-made product. Its natural sources are volcanoes, forest fires, and crude oil. As an industrial chemical, toluene is used in solvents and thinners and is found in the atmosphere from volatilization from petroleum fuels and from motor vehicle exhaust. Once released into the atmosphere, toluene will degrade moderately quickly through reaction with hydroxyl radicals. Toluene's half-life in the atmosphere is estimated to be from 3 hours to approximately a day. Toluene will not undergo direct photolysis. Toluene spills to soils will be lost via evaporation and microbial degradation. It may also leach from spills into groundwater where it may biodegrade slowly. Toluene is not expected to hydrolyze significantly in normal environmental situations. Toluene in surface water will, likewise, volatilize and biodegrade depending on specific conditions. The half-life of toluene in surface water is on the order of days to weeks. Toluene is not expected to adsorb significantly to sediments or bioconcentrate in aquatic organisms. Toluene degrades in the laboratory to (+)-cis-2,3-dihydroxyl-1-methyl cyclohexa-1,4-diane, cis-2,3-dihydroxyl-2,3-dihydrotoluene, 3-methyl catechol, benzyl alcohol, benzaldehyde, benzoic acid and catechol. Toluene has also been shown to degrade completely to carbon dioxide.