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REPORTS

DATE:

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INTERNATIONAL
TECHNOLOGY
CORPORATION

RESPONSIVE TO THE NEEDS OF ENVIRONMENTAL MANAGEMENT

FORMER LIQUID PIPELINE CONDENSATE STORAGE SITE
HOBBS COMPRESSOR STATION NO. 1
FIELD INVESTIGATION REPORT

Prepared for:

Enron Gas Processing Company
Contract No. CP14051LCD

Prepared by:

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Table of Contents

List of Tables

List of Figures

1.0 Introduction

IT Corporation (IT) was contracted by Enron Gas Processing Company (Enron) to conduct a field investigation to assess whether hydrocarbons are present in the soil and groundwater in the vicinity of two partially buried, fiberglass storage tanks at Enron's Hobbs Compressor Station No. 1 (Hobbs 1). Hobbs 1 is located in the southeast quarter (SE ¼) of Section 25, Township 21-S, Range 36-E, Lea County, New Mexico, approximately 3 miles west of Eunice, New Mexico (Figure 1).

The two fiberglass tanks used at the Hobbs site from 1982 to January 1992, may have contained up to 1,260 gallons each of natural gas pipeline liquids. Release of the pipeline liquids would have occurred as a result of overflow while transferring liquids from tank to tank; however, the exact dates and volumes of these releases are unknown. The tanks were removed in March 1992 (an Enron representative was present during the tank removal activities). Approximately 2,200 cubic yards of soil were removed and placed on plastic sheeting on the north side of the facility; Enron is considering its options for treatment/ disposal of this soil containing petroleum hydrocarbons.

In a November 16, 1992, telephone conversation with IT, Enron personnel indicated that an aboveground tank farm and two associated underground storage tanks may have been located at the subject location prior to 1982. The tank farm was operated independently of Enron Gas Processing by Enron Oil Trading and Transportation.

The work for this investigation consisted of drilling four soil borings, collecting and analyzing soil samples, field-screening, lithologic description of the sediments, interpreting field and laboratory data, and presenting conclusions concerning the presence or absence of hydrocarbons in the soil in the vicinity of the two tanks. Enron elected not to continue with groundwater assessment activities (i.e., installation of groundwater monitoring wells) since vadose zone conditions encountered during drilling activities indicated that hydrocarbon constituents had not migrated to a depth that would likely affect the groundwater. Field work for this investigation was conducted from October 3 to October 6, 1992.

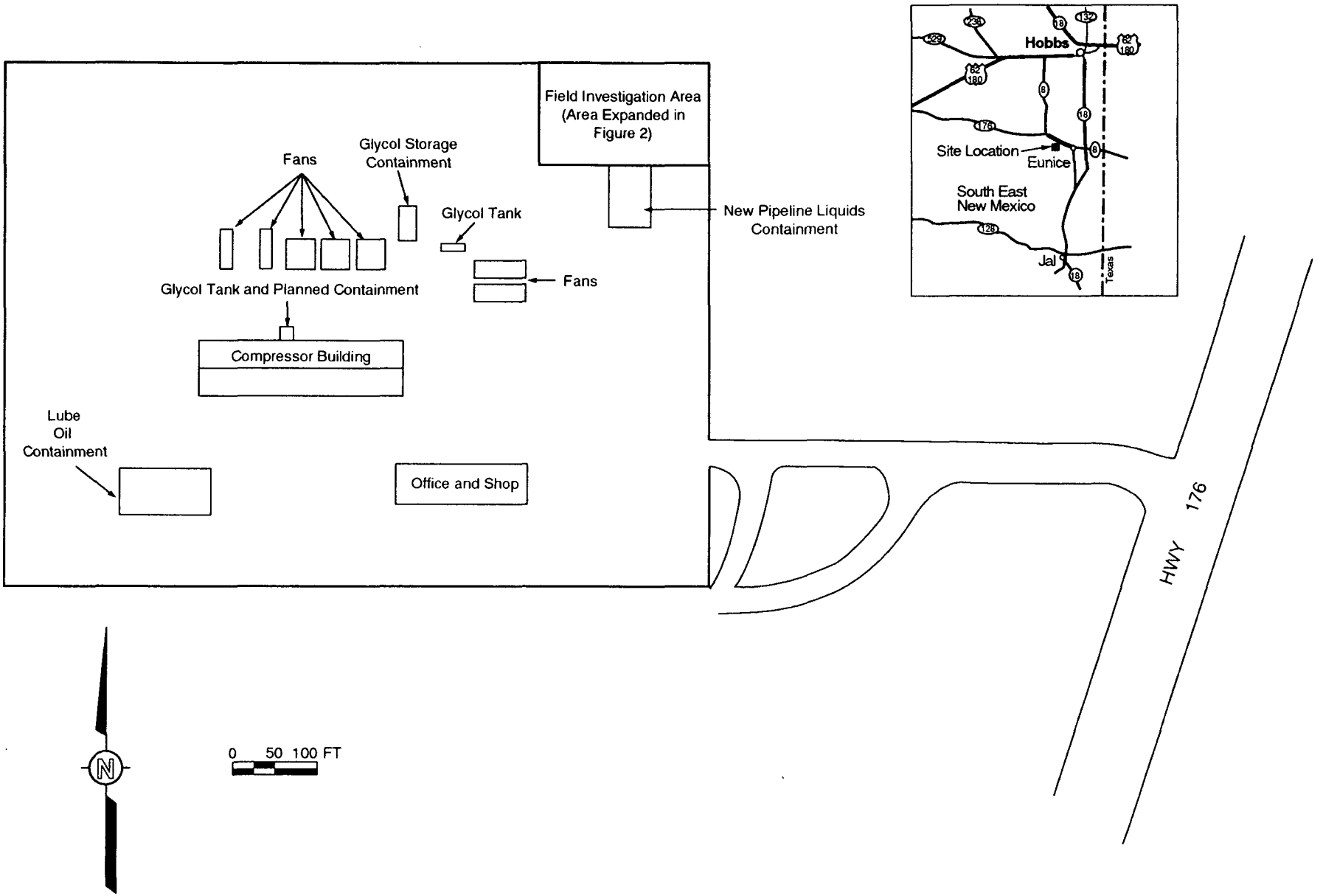


Figure 1
Site Location Map, Enron Gas Processing Company
Hobbs No. 1 Compressor Station, Eunice, New Mexico

2.0 Site Description, Hobbs 1

The Hobbs 1 site is located in Lea County, New Mexico. The site is bounded on all sides by range land and oil fields owned by the State of New Mexico, and the topography is flat. Significant site improvements are shown on the site location map (Figure 1). The locations of the excavation and soil borings are presented on Figure 2.

3.0 Regional and Site-Specific Geology and Hydrology

3.1 Regional Geology

The towns of Hobbs and Eunice in southeastern New Mexico are constructed over the unconsolidated or consolidated sand, silt, and clay of the Pliocene Ogallala Formation. These deposits are locally veneered with younger windblown sand; stream-deposited clay; silt, sand, and gravel; or (colluvial) deposits. Most of the town of Hobbs is built directly on the Ogallala Formation. At Eunice, a surface veneer of windblown sand is common. Typically, the sand veneer is 2 to 5 feet thick. In southeastern New Mexico, the Ogallala Formation ranges from a few inches to approximately 300 feet in thickness and commonly is capped with a hard caliche-cemented layer that may be up to 60 feet thick. The Ogallala overlies the Triassic Dockum Group (Nicholson and Clebsch, 1961), which is typically over 1,100 feet thick in the area. The uppermost Triassic sediments in the Hobbs-Eunice area consists predominantly of clays and siltstones locally enclosing porous and permeable sandstone stringers and lenses. This upper unit is typically over 300 feet thick and has been correlated with the Chinle Formation of northwestern New Mexico. The next underlying 300 feet consists predominantly of sandstone units and has been correlated with the Santa Rosa Formation in northeastern New Mexico by some geologists. Beneath these sandstone units are approximately 500 feet of interbedded siltstone units and clay. All units are nearly horizontal, dipping gently toward the east.

3.2 Regional Hydrology

Hobbs and Eunice derive their public water supply principally from the Ogallala Formation, which produces copious amounts of water from depths of 200 to 300 feet. A few deeper wells produce water from the sandstones in the Dockum Group, which is the principal aquifer to the west of the area of interest. Oil Center is the only community close to Hobbs or Eunice that obtains its public water supply from the Triassic rocks (Dockum Group).

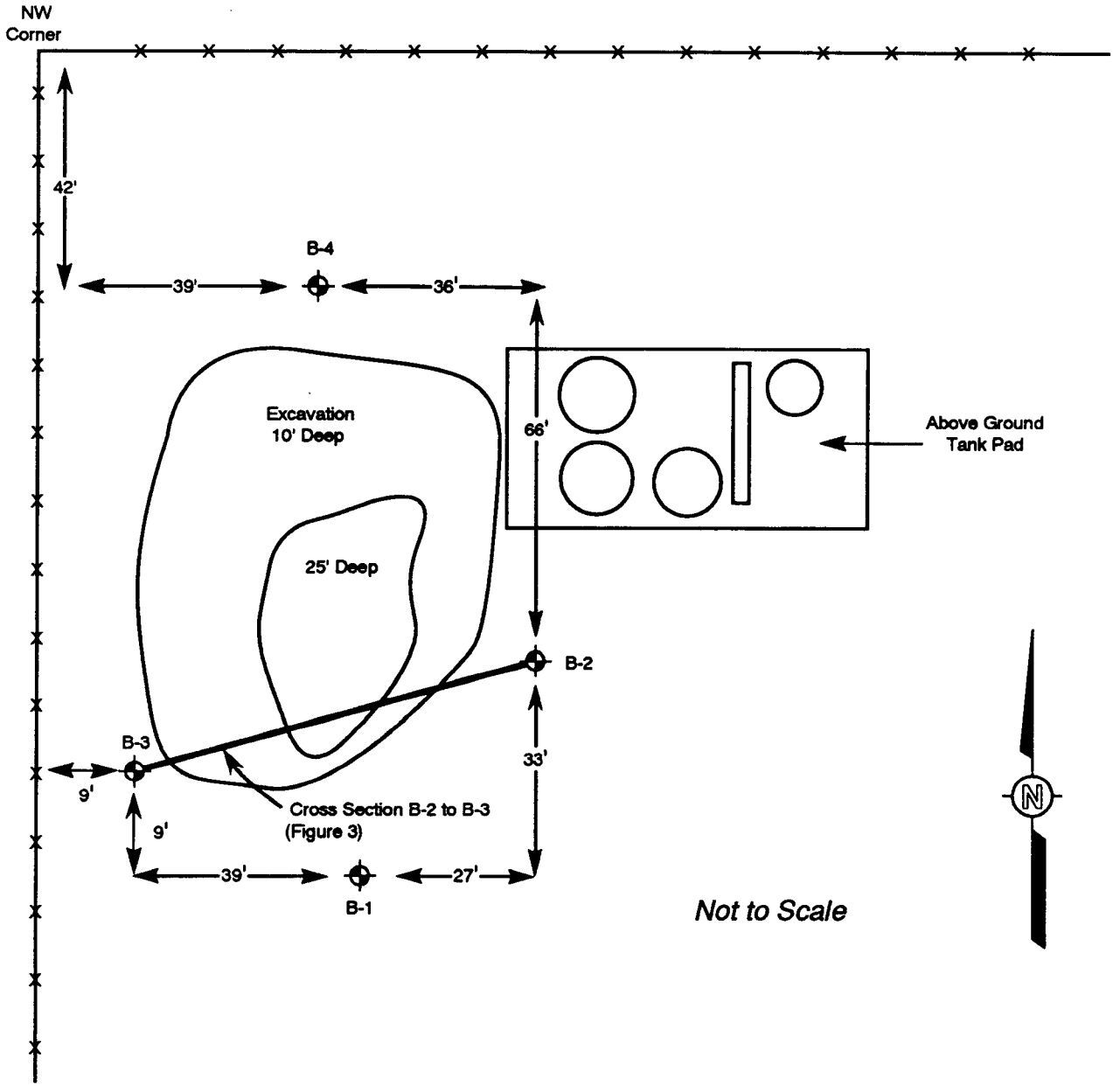


Figure 2
Boring Location Map Plan
ENRON Gas Processing Company Hobbs No. 1 Compressor Station
Eunice, New Mexico

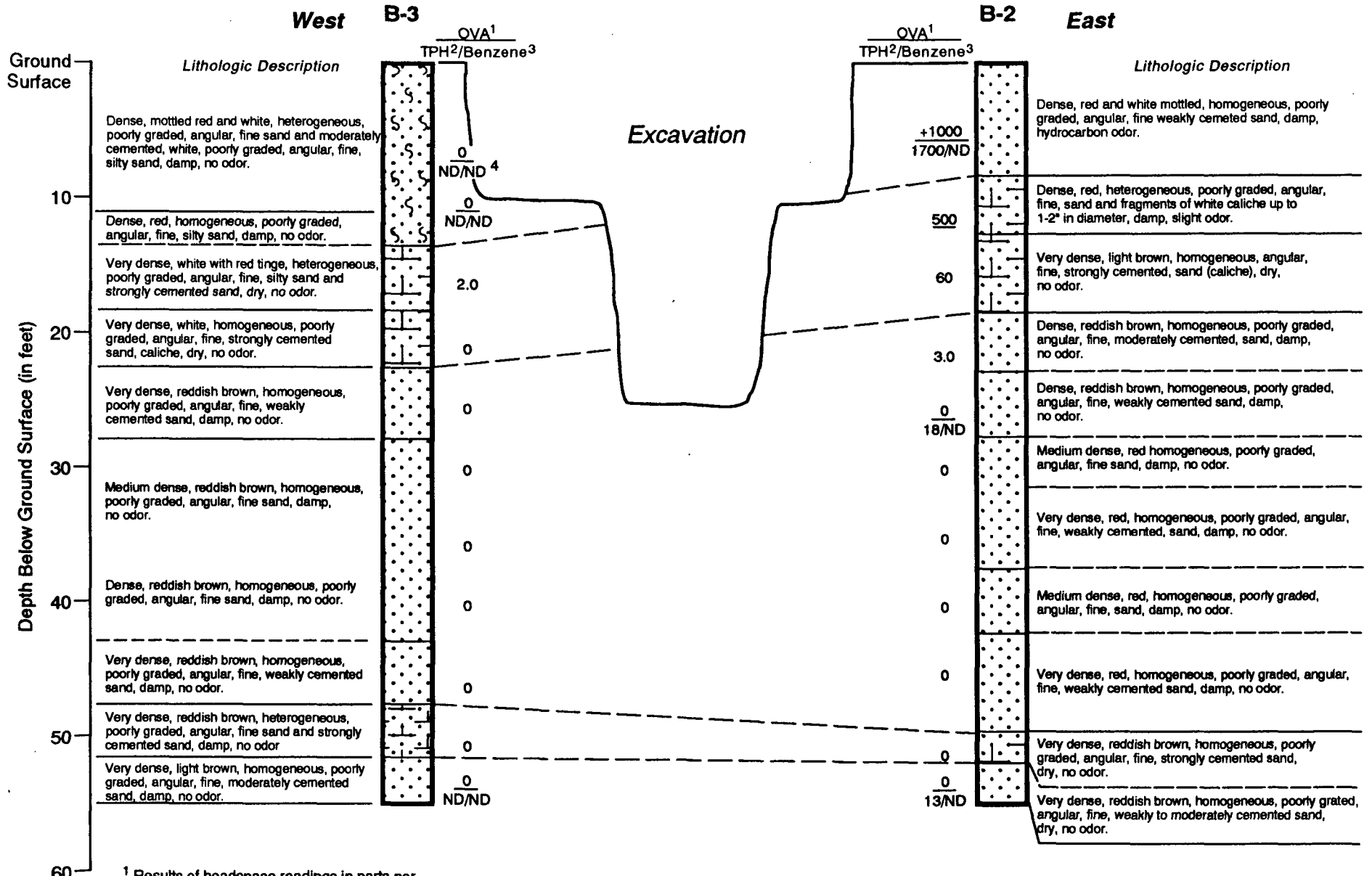
The Ogallala Aquifer in this area has been designated as moderately vulnerable to contamination from surface discharges (Wilson, 1981).

3.3 Site-Specific Geology and Hydrology

3.3.1 Geology

The site-specific geology immediately underlying the location of the former pipeline liquids storage tanks consists almost entirely of unconsolidated sand and infrequently silty sand. Soil Boring B-1 is representative of the lithology observed in the four soil borings advanced at this site. From the land surface to approximately 9 feet below ground surface (bgs), a very dense, red, fine, moderately cemented sand was encountered. From approximately 9 to 14 feet bgs, a dense, fine-grained, light-brown, silty sand with caliche fragments was logged. Beneath the silty sand, a very dense, red-and-white-mottled, fine-grained, moderately cemented sand was encountered from approximately 14 to 19 feet bgs. From approximately 19 to 29 feet bgs, a very dense, red, fine-grained, moderately cemented sand was logged. From approximately 29 to 33 feet bgs, a medium-dense, red, fine-grained, sand was encountered. Beneath the fine-grained sand, a medium-dense, red, fine-grained sand with caliche fragments was logged from approximately 33 to 38 feet bgs. A dense, red, fine-grained, moderately cemented sand was logged from approximately 33 to 50 feet bgs. From approximately 50 to 53.5 feet bgs, a very dense, light-brown sand was encountered. Below this sand, a very dense, light-orange-brown, fine-grained, weakly cemented sand was logged from approximately 53.5 feet bgs to the bottom of the boring at 56.5 feet bgs.

Detailed logs of Borings B-1, B-2, B-3, and B-4 are presented as Appendix A. At least one unit appears to be locally continuous across the site. A strongly cemented sand was logged in B-1 from approximately 50.5 to 53.5 feet bgs, in B-2 from approximately 51 to 53.5 feet bgs, in B-3 from approximately 49.5 to 53.5 feet bgs, and in B-4 from approximately 55 feet to the bottom of the boring at 56.5 feet bgs. The boring locations are shown on Figure 2. A geologic cross section from B-3 to B-2 is presented as Figure 3.



[1] Results of headspace readings in parts per million (ppm), NA indicates not analyzed.

[2] Results from laboratory method EPA 418.1 reported in milligrams per kilogram (mg/kg).

[3] Results from laboratory method EPA 8020 reported in micrograms per kilogram (µg/kg).

[4] ND indicates constituent concentration below the detection limits reported on Table 1.

Figure 3
Geologic Cross Section B-3 to B-2
Enron Gas Processing Company
Hobbs No. 1 Compressor Station
Eunice, New Mexico

0 10 20 FT
HORIZONTAL SCALE

3.3.2 Hydrology

No groundwater was encountered in any of the soil borings. A records search of state well-log data, conducted by Enron, indicated that groundwater is present at a depth of approximately 72 feet bgs, 1 mile northeast of the site. Enron elected not to install groundwater monitoring wells since vadose zone conditions encountered did not indicate that hydrocarbon constituents had migrated to a depth that would likely affect the groundwater.

4.0 Field Work and Methods

Field work performed by IT on behalf of Enron at the work site was conducted in accordance with IT's site health and safety plan (HASP), dated September 30, 1992. This plan describes the basic safety requirements for the drilling project at the work site. The site HASP is applicable to personnel and subcontractors of IT. Personnel and subcontractors of IT scheduled to perform work at the site were briefed on the contents of the site HASP before work began, a copy of which was kept at the work site and was available for reference by appropriate parties during the work. The IT project geologist served as the Site Safety Officer.

A geologist from IT was on site from October 3 through October 5, 1992, to observe drilling and collect soil samples from borings drilled near the perimeter of the former storage tank excavation. The locations of Borings B-1 through B-4 are shown on Figure 2. The borings were located to evaluate hydrocarbon migration in the subsurface soils in the vicinity of the excavation.

The soil borings were drilled using an Ingersol-Rand, Model TH60, air-rotary drilling rig, equipped with an 8-inch-diameter drill bit. The borings extended to a total depth of approximately 56 feet to 57 feet bgs. Groundwater was not encountered during drilling of the four soil borings.

The drill rig was operated by Geo Projects International, Inc., of Austin, Texas. Downhole equipment was cleaned with a high-pressure, hot-water washer between borings to minimize the possibility of cross contamination. The sampling equipment was cleaned between samples using a mixture of Alconox in distilled water, a double tap-water rinse, and a final rinse with distilled water. The drilling was performed under the guidance of the IT project geologist. During drilling, soil samples were collected at 5-foot intervals to log the encountered sediments and to assess the presence of hydrocarbon-affected soil. Samples were obtained

using a 24-inch-long, split-spoon sampler equipped with four decontaminated 2½- by 6-inch clean brass sleeves. Samples were collected in undisturbed sediment ahead of the drill bit. Samples and drill cuttings were classified according to the "Standard Practice for Description and Identification of Soils" (Visual-Manual Procedure) (IT, 1988). Descriptions of the materials encountered during drilling and sampling are presented in the "Visual Classification of Soils," Appendix A.

During sampling, a Foxboro Model 128-GC flame-ionization detector (FID) was used in conjunction with the headspace method to characterize relative levels of light-end hydrocarbons (i.e., less than C-8). FID readings are useful for indicating relative levels of hydrocarbons but may not correlate directly with levels measured by laboratory analysis. The FID responds to a range of volatile organic chemical compounds and was used to monitor for volatile hydrocarbons that may be present in the soil. Levels detected in this manner were recorded in the field and subsequently used as a basis for selecting soil samples for chemical analysis. Table 1 presents a summary of the headspace sample depths, depths of borings, and the peak headspace readings. The field-screening results are presented in Appendix B. Upon completion of drilling and sampling Borings B-1 through B-4, each boring was backfilled to the ground surface with a grout slurry consisting of water, Portland cement, and 5 percent bentonite powder.

Cuttings generated during drilling were placed and sealed in 55-gallon drums and remain at the site for disposal by Enron. Soil samples selected for possible chemical analysis were promptly sealed with aluminum foil, plastic caps, and tape. They were then labeled and placed in iced storage for transport to the analytical laboratory. Chain-of-custody records were initiated in the field by the IT Project Geologist. Either the IT geologist or Enron's representative shipped the samples to the laboratory via Federal Express Priority Overnight Delivery for the requested analyses. Copies of the sample control documentation are included in Appendix C.

5.0 Laboratory Analyses and Results

The selected soil samples were analyzed at the IT Analytical Services Laboratory in Austin, Texas for total petroleum hydrocarbon (TPH), using U.S. Environmental Protection Agency (EPA) Method 418.1, and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX), using EPA Method 8020. Copies of laboratory analytical reports for the soil chemical analyses are included in Appendix D. Results of the laboratory analyses have been

Table 1

Summary of Headspace Analyses
Enron Gas Processing Company
Former Pipeline Liquids Storage Site
Hobbs Compressor Station No.1
Sample Dates: 10/3 - 4/92

Sample Number	Sampling Location	Sample Depth (Feet)	Sample Matrix	Peak Instrument Reading (ppm)[b]	Date Sample Analyzed	Comments
B-1-1	B-1	6.0	Soil	+1000	10-3-92	
B-1-2	B-1	11.5	Soil	+1000	10-3-92	
B-1-3	B-1	16.5	Soil	0	10-3-92	
B-1-4	B-1	21.0	Soil	0	10-3-92	
B-1-5	B-1	26.0	Soil	0	10-3-92	
B-1-6	B-1	31.0	Soil	0	10-3-92	
B-1-7	B-1	36.0	Soil	0	10-3-92	
B-1-8	B-1	42.0	Soil	0	10-3-92	
B-1-9	B-1	46.0	Soil	0	10-3-92	
B-1-10	B-1	51.0	Soil	0	10-3-92	
B-1-11	B-1	55.0	Soil	0	10-3-92	Total Depth of Boring 56.5 ft.
B-2-1	B-2	6.5	Soil	+1000	10-3-92	
B-2-2	B-2	11.0	Soil	500	10-3-92	
B-2-3	B-2	16.0	Soil	60	10-3-92	
B-2-4	B-2	21.0	Soil	3	10-3-92	
B-2-6	B-2	30.0	Soil	0	10-3-92	
B-2 -7	B-2	36.0	Soil	0	10-3-92	
B-2-8	B-2	40.0	Soil	0	10-3-92	
B-2-9	B-2	46.0	Soil	0	10-3-92	
B-2-10	B-2	51.0	Soil	0	10-4-92	
B-2-11	B-2	56.0	Soil	0	10-4-92	Total Depth of Boring 56.5 ft.
B-3-1	B-3	6.5	Soil	0	10-4-92	
B-3-2	B-3	11.0	Soil	0	10-4-92	

Table 1

Summary of Headspace Analyses
Enron Gas Processing Company
Former Pipeline Liquids Storage Site
Hobbs Compressor Station No.1 *(Continued)*
Sample Dates: 10/3 - 4/92

Sample Number	Sampling Location	Sample Depth (Feet)	Sample Matrix	Peak Instrument Reading (ppm)[b]	Date Sample Analyzed	Comments
B-3-3	B-3	16.0	Soil	2.0	10-4-92	
B-3-4	B-3	21.0	Soil	0	10-4-92	
B-3-5	B-3	26.0	Soil	0	10-4-92	
B-3-6	B-3	31.0	Soil	0	10-4-92	
B-3-7	B-3	37.0	Soil	0	10-4-92	
B-3-8	B-3	41.0	Soil	0	10-4-92	
B-3-9	B-3	46.0	Soil	0	10-4-92	
B-3-10	B-3	51.0	Soil	0	10-4-92	
B-3-11	B-3	56.0	Soil	0	10-4-92	Total Depth of Boring 57.0 FT.
B-4-1	B-4	7.0	Soil	160	10-4-92	
B-4-2	B-4	11.0	Soil	30	10-4-92	
B-4-3	B-4	15.0	Soil	500	10-4-92	
B-4-4	B-4	21.0	Soil	55	10-4-92	
B-4-5	B-4	25.0	Soil	0	10-4-92	
B-4-6	B-4	30.0	Soil	0	10-4-92	
B-4-7	B-4	36.0	Soil	2.0	10-4-92	
B-4-8	B-4	41.0	Soil	0	10-4-92	
B-4-9	B-4	51.0	Soil	0	10-4-92	
B-4-10	B-4	56.0	Soil	9.0	10-4-92	Total Depth of Boring 56.0 FT.

summarized in Table 2. Detection limits for the tests performed are also shown on the laboratory analytical reports and in Table 2.

Results from the laboratory analyses indicate that TPH was detected at concentrations ranging from less than the detection limits of 11 or 12 milligrams per kilogram (mg/kg) to 9,500 mg/kg. Soil sample B-1-1, collected from a depth of approximately 6.5 to 7.0 feet bgs at Boring B-1, had a TPH concentration of 9,500 mg/kg. TPH concentrations were also elevated at Boring B-2. Soil sample B-2-1, collected from a depth of approximately 6.5 to 7.0 feet bgs, had a TPH concentration of 1,700 mg/kg.

Results of the laboratory analyses indicate that concentrations of benzene, toluene, ethylbenzene, and total xylenes (BTEX) ranged from less than the detection limit of 50 micrograms per kilogram (µg/kg) to a combined concentration of 50,000 µg/kg. Concentrations of these compounds were elevated in the 6.5 to 7.0-foot sample collected in Boring B-1 (50,000 µg/kg) and the 6.5- to 7.0-foot sample collected from Boring B-2 (790 µg/kg). Concentrations of total xylenes were found at 90 µg/kg in the 55.5- to 56.0-foot sample collected from Boring B-4.

Benzene was not found at concentrations above the detection limits in any of the soil samples submitted for laboratory analyses. A detection limit of 500 µg/kg was used for the 6.5- to 7.0-foot sample collected from B-1. A detection limit of 50 µg/kg was used for all other laboratory samples submitted for benzene analysis.

6.0 Findings

Published literature indicates that a windblown sand veneer, typically 2 to 5 feet thick, overlies the Ogallala Formation in the vicinity of the Hobbs 1 facility. At least one cemented layer of sand was observed in all four soil borings, which ranges in depth from approximately 49.5 to 55.0 feet bgs. The thickness of this sand ranges from at least 1.5 feet in Boring B-4 to 4 feet in Boring B-4. Groundwater was not encountered in any of the borings above the terminal depth of soil boring B-3 (57.0 feet). Information provided by Enron indicates groundwater at a depth of approximately 72 feet bgs in a well located 1 mile northeast of the site.

Results from the laboratory analyses indicate that TPH was detected at concentrations ranging from less than the detection limits of 11 or 12 mg/kg to 9,500 mg/kg. Soil sample B-1-1, had

Table 2

Results of Laboratory Analyses of Soil Samples
Enron Gas Processing Company
Hobbs Compressor Station No. 1
Sample Collection Date: October 3–6, 1992

Sample Number	Depth[a]	TPH[b]	Benzene[c]	Toluene[c]	Ethyl-benzene[c]	Total Xylenes[c]
B-1-1	6.5-7.0	9500	<500	6,000	20,000	24,000
B-1-3	16.0-16.5	25	<50	<50	<50	<50
B-1-11	56-56.5	15	<50	<50	<50	<50
B-2-1	6.5-7.0	1700	<50	110	790	<50
B-2-5	25.5-26	18	<50	<50	<50	<50
B-2-11	56.0-56.5	13	<50	<50	<50	<50
B-3-3	15.0-15.5	<11	<50	<50	<50	<50
B-3-11	56.5-57.0	<12	<50	<50	<50	<50
B-4-3	15.0-15.5	19	<50	<50	<50	<50
B-4-5	26.0-26.5	13	<50	<50	<50	<50
B-4-11	55.5-56.0	13	<50	<50	<50	90

[a]Depth = Sample depth in feet below ground surface.
[b]TPH = Total petroleum hydrocarbons. Results in milligrams per kilogram (mg/kg).
[c]Results in micrograms per kilogram (µg/kg).
Note: < = Less than the specified laboratory limit of detection.
Note: Sample designation: B-1 = Soil boring number; -1 = sample sequence.

a TPH concentration of 9,500 mg/kg. TPH concentrations were also elevated at Boring B-2, collected from a depth of approximately 6.5 to 7.0 feet bgs, with a TPH concentration of 1,700 mg/kg.

Results of the laboratory analyses indicate that concentrations of BTEX ranged from less than the detection limits of 50 µg/kg to a combined concentration of 50,000 µg/kg. Concentrations of these compounds in the 6.5 to 7.0-foot sample collected from Boring B-1 and the 6.5- to 7.0-foot sample collected from Boring B-2 were 50,000 µg/kg and 790 µg/kg, respectively. A total xylene concentration of 90 µg/kg was detected in the 55.5- to 56.0-foot sample collected from Boring B-4.

Benzene was not found at concentrations above the detection limits in any of the soil samples submitted for laboratory analyses. A detection limit of 500 µg/kg was used for the 6.5- to 7.0-foot sample collected from Boring B-1. A detection limit of 50 µg/kg was used for all other laboratory samples submitted for laboratory analysis of benzene.

7.0 Limitations

Evaluation of the geologic and environmental conditions at the site for the purpose of this investigation is made from a limited number of observation points. Subsurface conditions may vary from the data points available. Additional work, including further subsurface investigation, can reduce the inherent uncertainties associated with this type of investigation.

8.0 References

IT Corporation (IT), 1988, "Visual Field Classification of Subsurface Materials, Manual of Practice," IT Corporation, Albuquerque, New Mexico.

Nicholson, A., Jr., and A. Clebsch, Jr., 1961, "Geology and Ground-Water Conditions in Southern Lea County, New Mexico," *Ground-Water Report 6*, New Mexico Bureau of Mines and Mineral Resources, Socorro, New Mexico, 123 pp.

Wilson, L., 1981, "Potential for Ground-Water Pollution in New Mexico," *Environmental Geology and Hydrology in New Mexico*, Special Publication No. 10, New Mexico Geological Society, Socorro, New Mexico.

APPENDIX
A

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APPENDIX A
VISUAL CLASSIFICATION OF SOILS

301541.02 A3

GENERAL NOTES AND LEGEND

Symbols to be used for designation of subsurface materials on all boring logs and subsurface sections


CLAY


GRAVEL


SILTY SAND


ASPHALT


SILT


CONCRETE OR GROUT


FINE SAND


BENTONITE


SAND


SILTY CLAY


CALCIUM


CLAYEY SAND


SANDY CLAY

DENSITY	STANDARD PENETRATION RESISTANCE
VERY LOOSE	0 – 4
LOOSE	5 – 10
MEDIUM LOOSE	11 – 30
DENSE	31 – 50
VERY DENSE	OVER 50

THE BORING LOGS AND RELATED INFORMATION DEPICT SUBSURFACE CONDITIONS ONLY AT THE SPECIFIC LOCATION AND DATES INDICATED. SOIL CONDITIONS AND WATER LEVELS AT OTHER LOCATIONS MAY DIFFER FROM CONDITIONS OCCURRING AT THESE BORING LOCATIONS. THE PASSAGE OF TIME MAY RESULT IN A CHANGE IN THE CONDITIONS AT THESE BORING LOCATIONS.

STANDARD PENETRATION RESISTANCE IS THE NUMBER OF BLOWS REQUIRED TO DRIVE A 2.5 INCH O.D. SPLIT BARREL SAMPLER 12 INCHES USING A 140 POUND HAMMER FALLING FREELY THROUGH 30 INCHES. THE SAMPLER WAS DRIVEN 18 INCHES AND THE NUMBER OF BLOWS RECORDED FOR EACH 6 INCH INTERVAL. THE RESISTANCE TO PENETRATION IS INDICATED ON THE DRAWING AS BLOWS PER FOOT.


2.5" OD SPLIT BARREL SAMPLE

75/0 5 PENETRATION REFUSAL RESISTANCE AND FRACTIONAL INCREMENT DRIVEN IN FEET

GROUND WATER LEVEL AND DATE

NOTE 1

Note: The range of standard penetration resistance are based on the SPT-Standard Penetration Test (ASTM D1586). The ranges provide at best only a crude indication of the density of coarse grained soils.

	GRAVEL		SAND			
COBBLES	COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY

USCS CLASSIFICATION FOR SOILS

BOULDER	COBBLE	PEBBLE	GRANULE	VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY	INDIVIDUAL PARTICLES
BOULDER CONGLOMERATE	COBBLE CONGLOMERATE	PEBBLE CONGLOMERATE	GRANULE CONGLOMERATE	VERY COARSE SANDSTONE	COARSE SANDSTONE	MEDIUM SANDSTONE	FINE SANDSTONE	VERY FINE SANDSTONE	SANDSTONE	CLAYSTONE AND SHALE	CONSOLIDATED ROCK

WENTWORTH SCALE FOR ROCK

301541.02 A5

GENERAL NOTES AND LEGEND

USCS CLASSIFICATION FOR SOILS

COARSE-GRAINED SOILS

CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
GRAVELS WITH FINES (APPRECIABLE AMOUNT) OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
	GC	CLAYEY GRAVELS GRAVEL-SAND-CLAY MIXTURES
CLEAN SANDS (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
SANDS WITH FINES (APPRECIABLE AMOUNT) OF FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES
	SC	CLAYEY SANDS, SAND-CLAY MIXTURES

FINE-GRAINED/HIGHLY ORGANIC SOILS

SILTS AND CLAYS LIQUID LIMITS (LESS THAN 50)	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
SILTS AND CLAYS LIQUID LIMIT (GREATER THAN 50)	MH	INORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	CH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS
	OH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
HIGHLY ORGANIC SOILS	PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

U S C S **UNIFIED SOIL CLASSIFICATION SYSTEM (CAPITAL LETTERS INDICATE LAB TEST CLASSIFICATION, LOWER CASE LETTERS INDICATE VISUAL FIELD CLASSIFICATION)**

INTERNATIONAL TECHNOLOGY CORPORATION

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 301541.01	PROJECT NAME: ENRON, COMPRESSOR STATION NO. 1	
BORING NUMBER: B-1	COORDINATES: N/A	DATE: 10-3-92
ELEVATION: N/A	GWL: Depth N/A Date/Time N/A	DATE STARTED: 10-3-92
ENGINEER/GEOLOGIST: J.S. Raugust	Depth N/A Date/Time N/A	DATE COMPLETED: 10-3-92
DRILLING METHODS: INGERSOL RAND MODEL TH 60 AIR ROTARY		PAGE: 1 of 2

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER/(in.)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	LITHOLGIC SYMBOL	REMARKS
5	B-1-1	NA	18"	Very dense, red, homogeneous, poorly graded, angular, fine, moderately cemented sand, damp, no odor. (odor in Headspace)	sp		10:15 Hours FID = +1000 ppm
10	B-1-2	NA	24"	Dense, light brown, homogeneous, poorly graded, angular, fine silty sand, occasional caliche fragments up to 0.8 inches in diameter, damp, no odor. (odor in Headspace)	sm		10:20 Hours FID = +1000 ppm
15	B-1-3	NA	21"	Very dense, red and white mottled, homogeneous, poorly graded, angular, fine, moderately cemented sand, damp, no odor.	sp		10:30 Hours FID =0 ppm
20	B-1-4	NA	12"	Very dense, light reddish brown, homogeneous, poorly graded, angular, fine, moderately cemented sand, damp, no odor.	sp		10:45 Hours FID = 0 ppm
25	B-1-5	NA	18"	Very dense, red, homogeneous, poorly graded, angular, fine, moderately cemented sand, damp, no odor.	sp		11:05 Hours FID =0 ppm
30	B-1-6	NA	18"	Medium dense, red, homogeneous, poorly graded, angular, fine sand, damp no odor.	sp		11:10 Hours FID = 0 ppm

NOTES:

Description and classification of the sediments encountered are based on field observations made by the IT geologist supervising the drilling activities.

INTERNATIONAL TECHNOLOGY CORPORATION

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 301541.01	PROJECT NAME: ENRON, COMPRESSOR STATION NO. 1	
BORING NUMBER: B-1	COORDINATES: N/A	DATE: 10-3-92
ELEVATION: N/A	GWL: Depth N/A Date/Time N/A	DATE STARTED: 10-3-92
ENGINEER/GEOLOGIST: J.S. Raugust	Depth N/A Date/Time N/A	DATE COMPLETED: 10-3-92
DRILLING METHODS: INGERSOL RAND MODEL TH 60 AIR ROTARY		PAGE: 2 of 2

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER/(in.)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	LITHOLGIC SYMBOL	REMARKS
35	B-1-7	NA	18"	Medium dense, red, heterogeneous, poorly graded, angular, fine, sand and caliche fragments up to 1.5 inches in diameter, damp, no odor.	sp		11:25 Hours FID = 0 ppm
40	B-1-8	NA	24"	Dense, red, homogeneous, poorly graded, angular, fine, moderately cemented sand, damp, no odor.	sp		11:45 Hours FID = 0 ppm 13:15 Hours FID = 0 ppm
45	B-1-9	NA	24"	Dense, red, homogeneous, poorly graded, angular, fine, moderately cemented sand, damp, no odor.	sp		13:30 Hours FID = 0 ppm
50	B-1-10	NA	18"	Very dense, light brown w/ orange tinge, homogeneous, poorly graded, angular, fine, strongly cemented sand, dry, no odor. Driller Notes(Softer Drilling at 53.5 Ft.)	sp		13:50 Hours FID = 0 ppm
55	B-1-11	NA	18"	Very dense, light brown w/ orange tinge, homogeneous, poorly graded, angular, fine, weakly cemented sand–damp, no odor.	sp		FID = 0 ppm
60							

NOTES:

Bottom of Boring @ 56.5 Feet, Grouted on 10-5-92

Description and classification of the sediments encountered are based on field observations made by the IT geologist supervising the drilling activities.

INTERNATIONAL TECHNOLOGY CORPORATION

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 301541.01	PROJECT NAME: ENRON COMPRESSOR STATION NO. 1	
BORING NUMBER: B-2	COORDINATES: N/A	DATE: 10-3-92
ELEVATION: N/A	GWL: Depth N/A Date/Time N/A	DATE STARTED: 10-3-92
ENGINEER/GEOLOGIST: J.S. Raugust	Depth N/A Date/Time N/A	DATE COMPLETED: 10-3-92
DRILLING METHODS: INGERSOL RAND MODEL TH 60 AIR ROTARY		PAGE: 1 of 2

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER/(in.)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	LITHOLGIC SYMBOL	REMARKS
5	B-2-1	NA	24"	Dense, red and white mottled, homogeneous, poorly graded, angular, fine weakly cemeted sand, damp, hydrocarbon odor.	sp		15:20 FID = + 1000 ppm
10	B-2-2	NA	21"	Dense, red, heterogeneous, poorly graded, angular, fine, sand and fragments of white caliche up to 1-2" in diameter, damp, slight odor. Driller notes: hard drilling @ 13 feet.	sp		15:30 FID = 500 ppm
15	B-2-3	NA	18"	Very dense, light brown, homogeneous, angular, fine, strongly cemented, sand (caliche), dry, no odor. Driller Notes: hard drilling @ 19'	sp		15:45 FID = 60 ppm
20	B-2-4	NA	12"	Dense, reddish brown, homogeneous, poorly graded, angular, fine, moderately cemented, sand, damp, no odor.	sp		15:55 FID = 3 ppm
25	B-2-5	NA	12"	Dense, reddish brown, homogeneous, poorly graded, angular, fine, weakly cemented sand, damp, no odor.	sp		16:10 FID = 0 ppm
30	B-2-6	NA	12"	Medium dense, red homogeneous, poorly graded, angular, fine sand, damp, no odor.	sp		16:25 FID = 0 ppm

NOTES:

Description and classification of the sediments encountered are based on field observations made by the IT geologist supervising the drilling activities.

INTERNATIONAL TECHNOLOGY CORPORATION

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 301541.01	PROJECT NAME: ENRON COMPRESSOR STATION NO. 1	
BORING NUMBER: B-2	COORDINATES: N/A	DATE: 10-3-92
ELEVATION: N/A	GWL: Depth N/A Date/Time N/A	DATE STARTED: 10-3-92
ENGINEER/GEOLOGIST: J.S. Raugust	Depth N/A Date/Time N/A	DATE COMPLETED: 10-3-92
DRILLING METHODS: INGERSOL RAND MODEL TH 60 AIR ROTARY		PAGE: 2 of 2

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER/(in.)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	LITHOLGIC SYMBOL	REMARKS
35	B-2-7	NA	18"	Very dense, red, homogeneous, poorly graded, angular, fine, weakly cemented, sand, damp, no odor.	sp		16:40 Hours FID = 0 ppm
40	B-2-8	NA	12"	Medium dense, red, homogeneous, poorly graded, angular, fine, sand, damp, no odor.	sp		17:00 Hours FID = 0 ppm
45	B-2-9	NA	20"	Very dense, red, homogeneous, poorly graded, angular, fine, weakly cemented sand, damp, no odor.	sp		1 7:25 Hours FID = 0 ppm
50	B-2-10	NA	18"		sp		
				Very dense, reddish brown, homogeneous, poorly graded, angular, fine, strongly cemented sand, dry, no odor.	sp		07:30 Hours 10-4-92 FID = 0 ppm
55	B-2-11	NA	18"	Very dense, reddish brown, homogeneous, poorly grated, angular, fine, weakly to moderately cemented sand, dry, no odor.	sp		08:00 Hours FID = 0 ppm

NOTES:

Bottom of Boring @ 56.5 Feet, Grouted on 10-5-92

Description and classification of the sediments encountered are based on field observations made by the IT geologist supervising the drilling activities.

INTERNATIONAL TECHNOLOGY CORPORATION

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 301541.01	PROJECT NAME: ENRON COMPRESSOR STATION NO. 1	
BORING NUMBER: B-3	COORDINATES: N/A	DATE: 10-3-92
ELEVATION: N/A	GWL: Depth N/A Date/Time N/A	DATE STARTED: 10-4-92
ENGINEER/GEOLOGIST: J.S. Raugust	Depth N/A Date/Time N/A	DATE COMPLETED: 10-4-92
DRILLING METHODS: INGERSOL RAND MODEL TH 60 AIR ROTARY		PAGE: 1 of 2

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER/(in.)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	LITHOLGIC SYMBOL	REMARKS
5	B-3-1	NA	18"	Dense, mottled red and white, heterogeneous, poorly graded, angular, fine sand and moderately cemented, white, poorly graded, angular, fine, silty sand, damp, no odor.	sm		08:45 Hours FID = 0 ppm
10	B-3-2	NA	20"		sm		08:51 Hours FID = 0 ppm
				Dense, red, homogeneous, poorly graded, angular, fine, silty sand, damp, no odor.			
15	B-3-3	NA	18"	Very dense, white with red tinge, heterogeneous, poorly graded, angular, fine, silty sand and strongly cemented sand, dry, no odor.	sm		09:00 Hours FID = 2 ppm
20	B-3-4	NA	12"	Very dense, white, homogeneous, poorly graded, angular, fine, strongly cemented sand, dry, no odor.	sp		09:20 Hours FID = 0 ppm
25	B-3-5	NA	12"	Very dense, reddish brown, homogeneous, poorly graded, angular, fine, weakly cemented sand, damp, no odor.	sp		09:35 Hours FID = 0 ppm
30	B-3-6	NA	18"	Medium dense, reddish brown, homogeneous, poorly graded, angular, fine sand, damp, no odor.	sp		09:47 Hours FID = 0 ppm

NOTES:

Description and classification of the sediments encountered are based on field observations made by the IT geologist supervising the drilling activities.

INTERNATIONAL TECHNOLOGY CORPORATION

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 301541.01	PROJECT NAME: ENRON COMPRESSOR STATION NO. 1	
BORING NUMBER: B-3	COORDINATES: N/A	DATE: 10-4-92
ELEVATION: N/A	GWL: Depth N/A Date/Time N/A	DATE STARTED: 10-4-92
ENGINEER/GEOLOGIST: J.S. Raugust	Depth N/A Date/Time N/A	DATE COMPLETED: 10-4-92
DRILLING METHODS: INGERSOL RAND MODEL TH 60 AIR ROTARY		PAGE: 2 of 2

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER/(in.)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	LITHOLGIC SYMBOL	REMARKS
35	B-3-7	NA	24"	Medium dense, reddish brown, homogeneous, poorly graded, angular, fine sand, damp, no odor.	sp		10:05 Hours FID = 0 ppm
40	B-3-8	NA	20"	Dense, reddish brown, homogeneous, poorly graded, angular, fine sand, damp, no odor.	sp		10:25 Hours FID = 0 ppm
45	B-3-9	NA	18"	Very dense, reddish brown, homogeneous, poorly graded, angular, fine, weakly cemented sand, damp, no odor. (Driller Notes: hard drilling at 49.5 Ft.)	sp		10:45 Hours FID = 0 ppm
50	B-3-10	NA	12"	Very dense, reddish brown, heterogeneous, poorly graded, angular, fine sand and strongly cemented sand, damp, no odor (Driller Notes: drilling easier at 53.5 Ft.)	sp		FID = 0 ppm
55	B-3-11	NA	24	Very dense, light brown, homogeneous, poorly graded, angular, fine, moderately cemented sand, damp, no odor.	sp		11:00 Hours FID = 0 ppm
60							

NOTES:

Bottom of Boring @ 57.0 Feet, Grouted on 10-5-92

Description and classification of the sediments encountered are based on field observations made by the IT geologist supervising the drilling activities.

INTERNATIONAL TECHNOLOGY CORPORATION

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 301541.01	PROJECT NAME: ENRON COMPRESSOR STATION NO.1	
BORING NUMBER: B-4	COORDINATES: N/A	DATE: 10-4-92
ELEVATION: N/A	GWL: Depth N/A Date/Time N/A	DATE STARTED: 10-4-92
ENGINEER/GEOLOGIST: J.S. Raugust	Depth N/A Date/Time N/A	DATE COMPLETED: 10-4-92
DRILLING METHODS: INGERSOL RAND MODEL TH 60 AIR ROTARY		PAGE: 1 of 2

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER/(in.)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	LITHOLGIC SYMBOL	REMARKS
5	B-4-1	NA	24"	Dense, mottled red and white, homogeneous, poorly graded, angular, fine, moderately cemented, sand, damp, no odor.	sp		13:05 Hours FID = 160 ppm
10	B-4-2	NA	18"	Dense, dark brown with white stringers, homogeneous, poorly graded, angular, fine clayey sand, damp, no odor, blocky structure.	sc		13:15 Hours FID = 30 ppm
15	B-4-3	NA	12"		sc		
				Very dense, white, homogeneous, poorly graded, angular, fine, strongly cemented sand, dry, no odor.	sp		13:25 Hours FID = 500 ppm
20	B-4-4	NA	12"	Very dense, light brown, homogeneous, poorly graded, angular, fine, moderately cemented sand, dry, no odor.	sp		13:40 Hours FID = 55 ppm
25	B-4-5	NA	18"	Medium dense, red, homogeneous, poorly graded, angular, fine, sand, damp, no odor.	sp		13:55 Hours FID = 0 ppm
30	B-4-6	NA	21"		sp		14:00 Hours FID = 0 ppm

NOTES:

Description and classification of the sediments encountered are based on field observations made by the IT geologist supervising the drilling activities.

INTERNATIONAL TECHNOLOGY CORPORATION

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 301541.01	PROJECT NAME: ENRON COMPRESSOR STATION NO. 1	
BORING NUMBER: B-4	COORDINATES: N/A	DATE: 10-4-92
ELEVATION: N/A	GWL: Depth N/A Date/Time N/A	DATE STARTED: 10-4-92
ENGINEER/GEOLOGIST: J.S. Raugust	Depth N/A Date/Time N/A	DATE COMPLETED: 10-4-92
DRILLING METHODS: INGERSOL RAND MODEL TH 60 AIR ROTARY		PAGE: 2 of 2

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER/(in.)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	LITHOLGIC SYMBOL	REMARKS
35	B-4-7	NA	18"	Dense, light reddish brown, homogeneous, poorly graded, angular, fine, moderately cemented sand, damp, no odor.	sp		14:25 Hours FID = 2 ppm
40	B-4-8	NA	18"		sp		14:40 Hours FID = 0 ppm
45	B-4-9	NA	18"	Dense, reddish brown, homogeneous, poorly graded, angular, fine, weakly cemented, sand, damp, no odor.	sp		14:55 Hours FID = 0 ppm
50	B-4-10	NA	15"	Very dense, light brown, homogeneous, poorly graded, angular, fine, moderately cemented sand, damp, no odor.	sp		15:20 Hours FID = 9 ppm
55	B-4-11	NA	13"	Very dense, light reddish brown, heterogeneous, poorly graded, angular, fine sand and strongly cemented sand, dry, no odor.	sp		15:45 Hours
60							

NOTES:

Total depth of Boring 56 Feet, Grouted on 10-5-92

Description and classification of the sediments encountered are based on field observations made by the IT geologist supervising the drilling activities.

APPENDIX
B

APPENDIX B
HEADSPACE SCREENING RESULTS AND PROCEDURES

301541 01 A9

INTERNATIONAL TECHNOLOGY CORPORATION

HEADSPACE TESTING FOR VOLATILES

PROJECT NAME: ENRON, HOBBS NO. 1
ENGINEER/GEOLOGIST: J. S. RAUGUST
PROJECT NO.: 301541.01
DATE: 10-3-92
INSTRUMENT TYPE: FOXBORO MODEL 128-GC FID
CALIBRATION DATE: 10-3-92
SERIAL NO.: A51822
CALIBRATION GAS TYPE/CONCENTRATION: 97.8 ppm METHANE
PHOTOIONIZATION BULB POWER (eυ): NA
ROOM TEMPERATURE (°F): 80°

SAMPLE NUMBER	SAMPLING LOCATION	SAMPLE DEPTH (FEET)	SAMPLE MATRIX	PEAK INSTRUMENT READING (ppm)	COMMENTS
B-1-1	B-1	6.0	SOIL	+1000	10-3-92
B-1-2	B-1	11.5	SOIL	+1000	10-3-92
B-1-3	B-1	16.5	SOIL	0	10-3-92
B-1-4	B-1	21.0	SOIL	0	10-3-92
B-1-5	B-1	26.0	SOIL	0	10-3-92
B-1-6	B-1	31.0	SOIL	0	10-3-92
B-1-7	B-1	36.0	SOIL	0	10-3-92
B-1-8	B-1	42.0	SOIL	0	10-3-92
B-1-9	B-1	46.0	SOIL	0	10-3-92
B-1-10	B-1	51.0	SOIL	0	10-3-92
B-1-11	B-1	55.0	SOIL	0	10-3-92

301541 01 A10

INTERNATIONAL TECHNOLOGY CORPORATION

HEADSPACE TESTING FOR VOLATILES

PROJECT NAME: ENRON, HOBBS NO.1
PROJECT NO.: 301541.01
INSTRUMENT TYPE: FOXBORO MODEL 128-GC FID
SERIAL NO.: A51822
PHOTOIONIZATION BULB POWER (eυ): NA

ENGINEER/GEOLOGIST: J. S. RAUGUST
DATE: 10-3-92, 10-4-92
CALIBRATION DATE: 10-3-92, 10-4-92
CALIBRATION GAS TYPE/CONCENTRATION: 97.8 ppm METHANE
ROOM TEMPERATURE (°F): 75°

SAMPLE NUMBER	SAMPLING LOCATION	SAMPLE DEPTH (FEET)	SAMPLE MATRIX	PEAK INSTRUMENT READING (ppm)	COMMENTS
B-2-1	B-2	6.5	SOIL	+1000	10-3-92
B-2-2	B-2	11.0	SOIL	500	10-3-92
B-2-3	B-2	16.0	SOIL	60	10-3-92
B-2-4	B-2	21.0	SOIL	3	10-3-92
B-2-6	B-2	30.0	SOIL	0	10-3-92
B-2 -7	B-2	36.0	SOIL	0	10-3-92
B-2-8	B-2	40.0	SOIL	0	10-3-92
B-2-9	B-2	46.0	SOIL	0	10-3-92
B-2-10	B-2	51.0	SOIL	0	10-4-92
B-2-11	B-2	56.0	SOIL	0	10-4-92

INTERNATIONAL TECHNOLOGY CORPORATION

HEADSPACE TESTING FOR VOLATILES

PROJECT NAME: ENRON, HOBBS NO.1
PROJECT NO.: 301541.01
INSTRUMENT TYPE: FOXBORO MODEL 128-GC FID
SERIAL NO.: A51822
PHOTOIONIZATION BULB POWER (eυ): NA

ENGINEER/GEOLOGIST: J. S. RAUGUST
DATE: 10-4-92
CALIBRATION DATE: 10-4-92
CALIBRATION GAS TYPE/CONCENTRATION: 97.8 ppm METHANE
ROOM TEMPERATURE (°F): 80°

SAMPLE NUMBER	SAMPLING LOCATION	SAMPLE DEPTH (FEET)	SAMPLE MATRIX	PEAK INSTRUMENT READING (ppm)	COMMENTS
B-3-1	B-3	6.5	SOIL	0	10-4-92
B-3-2	B-3	11.0	SOIL	0	10-4-92
B-3-3	B-3	16.0	SOIL	2.0	10-4-92
B-3-4	B-3	21.0	SOIL	0	10-4-92
B-3-5	B-3	26.0	SOIL	0	10-4-92
B-3-6	B-3	31.0	SOIL	0	10-4-92
B-3-7	B-3	37.0	SOIL	0	10-4-92
B-3-8	B-3	41.0	SOIL	0	10-4-92
B-3-9	B-3	46.0	SOIL	0	10-4-92
B-3-10	B-3	51.0	SOIL	0	10-4-92
B-3-11	B-3	56.0	SOIL	0	10-4-92

INTERNATIONAL TECHNOLOGY CORPORATION

HEADSPACE TESTING FOR VOLATILES

PROJECT NAME: ENRON, HOBBS NO. 1
PROJECT NO.: 301541.01
INSTRUMENT TYPE: FOXBORO MODEL 128-GC FID
SERIAL NO.: A51822
PHOTOIONIZATION BULB POWER (ev): NA

ENGINEER/GEOLOGIST: J. S. RAUGUST
DATE: 10-4-92
CALIBRATION DATE: 10-4-92
CALIBRATION GAS TYPE/CONCENTRATION: 97.8 ppm METHANE
ROOM TEMPERATURE (°F): 80°

SAMPLE NUMBER	SAMPLING LOCATION	SAMPLE DEPTH (FEET)	SAMPLE MATRIX	PEAK INSTRUMENT READING (ppm)	COMMENTS
B-4-1	B-4	7.0	SOIL	160	10-4-92
B-4-2	B-4	11.0	SOIL	30	10-4-92
B-4-3	B-4	15.0	SOIL	500	10-4-92
B-4-4	B-4	21.0	SOIL	55	10-4-92
B-4-5	B-4	25.0	SOIL	0	10-4-92
B-4-6	B-4	30.0	SOIL	0	10-4-92
B-4-7	B-4	36.0	SOIL	2.0	10-4-92
B-4-8	B-4	41.0	SOIL	0	10-4-92
B-4-9	B-4	51.0	SOIL	0	10-4-92
B-4-10	B-4	56.0	SOIL	9.0	10-4-92

STANDARD OPERATING PROCEDURE 09

FIELD SCREENING OF VOLATILE ORGANIC COMPOUNDS

1.0 PURPOSE

To define a method that ensures acceptable, consistent soil vapor screening for onsite assessment of organic vapor contamination of soils. Included is the use of a photoionization detector (PID), a flame-ionization detector (FID), and use of a direct extraction/colorimetric method for the analysis of soils potentially contaminated with heavy hydrocarbons (e.g., diesel).

2.0 DISCUSSION

The PID and FID are useful tools as general survey instruments at hazardous waste sites. Both the PID and FID are capable of detecting and measuring real-time concentrations of many organic and inorganic vapors in the air. A PID is similar to an FID in application. The PID has somewhat broader capabilities because it can detect certain inorganic vapors. Conversely, the PID is unable to respond to certain low molecular weight hydrocarbons (like methane and ethane) that are readily detected by FID instruments.

Soil vapor screening may be used as a reconnaissance tool to delineate the extent of volatile organic contamination resulting from ground water and vadose-zone contamination. The "headspace" method involves collecting a sample of soil in a jar, allowing vapors to accumulate, then analyzing the concentration of vapors above the soil with a PID or FID.

For soils potentially contaminated with heavy hydrocarbons such as diesel, kerosene, or JP-4 jet fuel, the headspace method is not acceptable. Heavy hydrocarbon contamination may be assessed in the field using a direct extraction technique, such as the HNU-Hanby® Method. This method involves the collection of a small soil sample (usually 10 grams) which is reacted with a solvent. The extracted hydrocarbon and solvent solution is decanted and further reacted with a catalyst. The catalyst causes a colorimetric response upon reaction with hydrocarbons, and the resulting color is compared with known concentrations of the contaminant on a color chart. The direct extraction method is normally corroborated with a laboratory sample from the terminal depth of a boring.

3.0 DEFINITIONS

None

4.0 PROCEDURES

4.1 Headspace Field Method

4.1.1 Preparation

4.1.1.1 Office

A. Coordinate schedules/actions with the field and installation staff.

B. Obtain appropriate permission for property access.

C. Assemble the equipment and supplies listed in Appendix 6.1. Ensure the proper operation of the instrument(s) and perform the proper procedures for calibrating/adjusting the instrument(s).

4.1.1.2 Documentation

A. Obtain and start a Daily Field Activity Log, Daily Job Log, or logbook.

B. Record results of the equipment check in the log.

C. Obtain a sufficient number of the appropriate data collection forms (i.e., Sample Collection Logs, Analysis Request and Chain of Custody Record forms, etc.).

D. Record the calibration data on the appropriate form.

4.1.1.3 Field

A. Follow the start-up procedure, operational check, and calibration check for the appropriate instrument being used. If using a PID or FID, follow procedures described is SOP 3, Health and Safety Monitoring of Organic Vapors.

B. Set the function switch to the appropriate range. If the concentrations of gases or vapors is unknown, set the function switch to the 0 to 20 ppm range; adjust the range if necessary.

C. With the exception of the probe's inlet and exhaust, wrap the PID or FID in clear plastic to prevent it from becoming contaminated and to prevent water from getting inside the instrument in the event of precipitation.

4.1.2 Operation

A. Fill a clean 0.5 liter (16 ounce) or larger jar half full of soil sample.

B. Seal the top of the jar with clean aluminum foil.

C. Ensure sample is at 15° to 20°C (approximately 60° to 80°F). A warm water bath or vehicle heater should be used before testing if necessary.

D. Aromatic hydrocarbon concentrations must be allowed to develop in the headspace of the sample jar for 5 minutes. During this headspace development period, the sample should be shaken vigorously for a total of 1 minute (care should be taken not the puncture the aluminum foil).

E. Immediately pierce the aluminum foil seal with the probe of either a PID or FID, and read the highest (peak) measurement.

Note: If significant moisture is present in the soil, water vapor may affect the response of either instrument, especially the PID. A typical water vapor response differs from an organic vapor response in that the former will produce a slow increase in apparent concentration and may never show a distinct peak. The organic vapor response is normally a sharp rise to a peak, followed by a gradual decline.

4.1.3 Post Operation

4.1.3.1 Field

A. When the activity is completed, or at the end of the day, carefully clean the outside of the PID/FID with a damp disposable towel to remove any visible dirt. Return the instrument to a secure area and place on charge. Glass jars used for headspace screening are usually disposed of; however, it is not uncommon for the jars in which a sample yielded a non-detect response to be decontaminated and reused.

B. Ensure that all equipment is accounted for, and decontaminated (see SOP 24, Field Decontamination).

C. Make sure all survey or sampling locations are properly staked and the location ID is readily visible on the location stake.

4.1.3.2 Documentation

A. Record any uncompleted work (like site restoration or long-term additional monitoring) in the Daily Log or logbook.

B. Complete daily log entries, verify the accuracy of entries, and sign/initial all pages.

C. Review data collection forms for completeness.

4.1.3.3 Office

A. Deliver original forms and daily logs to the site manager for technical review. He/she will review, sign forms, and transmit to the document control officer (copies to the files) for eventual delivery to the Department of Energy.

B. Inventory equipment and supplies. Repair or replace all broken or damaged equipment. Replace expendable items and recharge the batteries. Return equipment to the equipment manager and report incidents of malfunction or damage.

5.0 REFERENCES

Foxboro Analytical (A Division of the Foxboro Company), 1985, "Instruction and Service Manual, Century Systems Portable Organic Vapor Analyzer, Model OVA-128," New Haven, Connecticut.

HNU Systems, Inc, 1986, "Instruction Manual for the Trace Gas Analyzer Model PI-101," Newton, Massachusetts.

New Mexico Environment Department (NMED), 1990, "Underground Storage Tank Regulations," Underground Storage Tank Bureau Regulations, Section XII, Appendix C: Soil Testing for Petroleum Releases, Environmental Improvement Board, Santa Fe, New Mexico.

U.S. Environmental Protection Agency (EPA), 1987, "A Compendium of Superfund Field Operations Methods," EPA-500/P-87/001, U.S. Government Printing Office, Washington, D.C.

APPENDIX C

APPENDIX C
SAMPLE CONTROL DOCUMENTATION

INTERNATIONAL TECHNOLOGY CORPORATION

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD*

821085

Reference Document No. 318798

Page 1 of 2

Project Name/No.[1] ENRON 301541.01

Sample Team Members[2] J.S. ROUQUST

Profit Center No.[3] 3515

Project Manager[4] DAWSON

Purchase Order No.[6]

Required Report Date[11] NORMAL

Samples Shipment Date[7] 10-5-91

Lab Destination[8] ITAS AUSTIN

Lab Contact[9] KARMEN DEANE

Project Contact/Phone[12] STEVE ROUQUST

Carrier/Waybill No.[13] 14583159 46

Bill to:[5] IT ALBUQUERQUE

Report to:[10] STEVE ROUQUST
IT ALBUQUERQUE

ONE CONTAINER PER LINE

Sample Number[14]	Sample Description/Type[15]	Date/Time Collected[16]	Container Type[17]	Sample Volume[18]	Preservative[19]	Requested Testing Program[20]	Condition on Receipt[21]	Disposal Record No.[22]
B-4-3	SOIL	10-4-92 13:25	BRASS	2½ x 6-INCH	ICE	BTEX BY EPA 8020 TPH BY 418.1	GOOD 4°C	
B-4-5		10-4-92 13:55					See COC	
B-4-11		10-4-92 15:45						
B-3-3		10-4-92 0900						
B-3-11		10-4-92 1100						
B-2-1		10-3-92 15:20						
B-2-5		10-3-92 16:10						
B-2-11		10-4-92 0600						

Special Instructions:[23] VOLATILE ORGANIC COMPOUNDS

Possible Hazard Identification:[24] LOW
Non-hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐

Sample Disposal:[25]
Return to Client ☐ Disposal by Lab ☒ Archive (mos.)

Turnaround Time Required:[26]
Normal ☒ Rush ☐

QC Level:[27]
I. ☒ II. ☐ III. ☐ Project Specific (specify):

1. Relinquished by[28] (Signature/Affiliation)	Date: 10-5-92 Time: 0935	1. Received by[28] (Signature/Affiliation)	Date: 10/6/92 Time:
2. Relinquished by (Signature/Affiliation)	Date: 10-5-92 Time: 10:00	2. Received by (Signature/Affiliation)	Date: 10/6/92 Time: 1241
3. Relinquished by (Signature/Affiliation)	Date: Time:	3. Received by (Signature/Affiliation)	Date: Time:

Comments:[29]

Yellow: Field copy

*See back of form for special instructions.

MCA 2/15/91

B210085

INTERNATIONAL TECHNOLOGY CORPORATION

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD (cont.)*

Reference Document No.[30] 31E798

Page 2 of 2

Project Name ENRON, Houston

Project No. 301541.01

Samples Shipment Date 10-5-92

ONE CONTAINER PER LINE

Sample[14] Number	Sample[15] Description/Type	Date/Time[16] Collected	Container[17] Type	Sample[18] Volume	Pre-[19] servative	Requested Testing[20] Program	Condition on[21] Receipt	Disposal[22] Record No.
B-1-1	SOIL	10-3-92 10:15	BRASS	2½ BY 6-INCH	ICE	BTEX BY EPA 8020 TPH BY 418.1	Good 1°C	
B-1-3	"	10-3-92 10:30	"	"	"	" "	See COC	
B-1-11	"	10-3-92 13:50	"	"	"	" "	"	

White: To accompany samples Yellow: Field copy

*See back of form for special instructions.

APPENDIX
D

APPENDIX D
ANALYTICAL REPORTS FROM ITAS—AUSTIN, TEXAS

INTERNATIONAL TECHNOLOGY CORPORATION

ANALYTICAL SERVICES

CERTIFICATE OF ANALYSIS

ENRON
IT ALBUQUERQUE
5301 CENTRAL AVENUE NE #700
ALBUQUERQUE NM 87108
STEVE RAUGUST

Date: 10/12/92

Work Order: B2-10-085

This is the Certificate of Analysis for the following samples:

Client Work ID: SOILS 301541-001
Date Received: 10/06/92
Number of Samples: 11
Sample Type: SOILS

I. Introduction

Samples were labeled as follows:

SAMPLE IDENTIFICATION	LABORATORY #
B-4-3	B2-10-085-01
B-4-5	B2-10-085-02
B-4-11	B2-10-085-03
B-3-3	B2-10-085-04
B-3-11	B2-10-085-05
B-2-1	B2-10-085-06
B-2-5	B2-10-085-07
B-2-11	B2-10-085-08
B-1-1	B2-10-085-09
B-1-3	B2-10-085-10
B-1-11	B2-10-085-11

Reviewed and Approved:

Jon Bartell
Laboratory Director

IT ANALYTICAL SERVICES
AUSTIN, TX
(512) 892-6684

Company: ENRON
Date: 10/12/92
Client Work ID: SOILS 301541-001 Work Order: B2-10-085

II. QA/QC

The results presented in this report meet the statement of work requirements in accordance with Quality Control and Quality Assurance protocol except as noted in Section IV or in an optional sample narrative at the end of Section III.

In the presented analytical data, 'ND' or '<' indicates that the compound is not detected at the specified limit.

III. Analytical Data

The following page(s) supply results for requested analyses performed on the samples listed above.

The test results relate to tested items only. ITAS-Austin reserves the right to control report production except in whole.

Company: ENRON
Date: 10/12/92
Client Work ID: SOILS

IT ANALYTICAL SERVICES
AUSTIN, TX
(512) 892-6684

301541-001

Work Order: B2-10-085

SAMPLE ID: B-4-3
SAMPLE DATE: 10/04/92
SAMPLE MATRIX: SOIL

Test Name	Note Ref	Result	Reporting Limit	Units	Date Analyzed	Method Reference
9071 Prep & IR Analysis		19	12	mg/kg	10/11/92	EPA9071

Company: ENRON
Date: 10/12/92
Client Work ID: SOILS

IT ANALYTICAL SERVICES
AUSTIN, TX
(512) 892-6684

301541-001

Work Order: B2-10-085

TEST NAME: **BTEX - Purge and Trap**
METHOD REFERENCE: **EPA8020**

SAMPLE ID: **B-4-3**
SAMPLE DATE: **10/04/92**
SAMPLE MATRIX: **SOIL**
ANALYSIS DATE: **10/07/92**
DILUTION FACTOR: **50**
UNITS: **ug/kg**

	Result	Reporting Limit
Benzene	ND	50
Ethylbenzene	ND	50
Toluene	ND	50
Xylenes (total)	ND	50

Total BTEX concentration: Not Detected

Surrogates	% Recovery
4-Bromofluorobenzene	100

Company: ENRON
Date: 10/12/92
Client Work ID: SOILS

IT ANALYTICAL SERVICES
AUSTIN, TX
(512) 892-6684

301541-001

Work Order: B2-10-085

SAMPLE ID: B-4-5
SAMPLE DATE: 10/04/92
SAMPLE MATRIX: SOIL

Test Name	Note Ref	Result	Reporting Limit	Units	Date Analyzed	Method Reference
9071 Prep & IR Analysis		13	11	mg/kg	10/11/92	EPA9071

IT ANALYTICAL SERVICES
AUSTIN, TX
(512) 892-6684

Company: ENRON
Date: 10/12/92
Client Work ID: SOILS 301541-001 Work Order: B2-10-085

TEST NAME: **BTEX - Purge and Trap**
METHOD REFERENCE: **EPA8020**

SAMPLE ID: **B-4-5**
SAMPLE DATE: **10/04/92**
SAMPLE MATRIX: **SOIL**
ANALYSIS DATE: **10/07/92**
DILUTION FACTOR: **50**
UNITS: **ug/kg**

	Result	Reporting Limit
Benzene	ND	50
Ethylbenzene	ND	50
Toluene	ND	50
Xylenes (total)	ND	50

Total BTEX concentration: Not Detected

Surrogates	% Recovery
4-Bromofluorobenzene	100

Company: ENRON
Date: 10/12/92
Client Work ID: SOILS

301541-001

IT ANALYTICAL SERVICES
AUSTIN, TX
(512) 892-6684

Work Order: B2-10-085

SAMPLE ID: B-4-11
SAMPLE DATE: 10/04/92
SAMPLE MATRIX: SOIL

Test Name	Note Ref	Result	Reporting Limit	Units	Date Analyzed	Method Reference
9071 Prep & IR Analysis		13	11	mg/kg	10/11/92	EPA9071

IT ANALYTICAL SERVICES
AUSTIN, TX
(512) 892-6684

Company: ENRON
Date: 10/12/92
Client Work ID: SOILS 301541-001 Work Order: B2-10-085

TEST NAME: **BTEX - Purge and Trap**
METHOD REFERENCE: **EPA8020**

SAMPLE ID: **B-4-11**
SAMPLE DATE: **10/04/92**
SAMPLE MATRIX: **SOIL**
ANALYSIS DATE: **10/07/92**
DILUTION FACTOR: **50**
UNITS: **ug/kg**

	Result	Reporting Limit
Benzene	ND	50
Ethylbenzene	ND	50
Toluene	ND	50
Xylenes (total)	90	50
Total BTEX concentration:	90	ug/kg

Surrogates	% Recovery
4-Bromofluorobenzene	98

Company: ENRON
Date: 10/12/92
Client Work ID: SOILS

IT ANALYTICAL SERVICES
AUSTIN, TX
(512) 892-6684

301541-001

Work Order: B2-10-085

SAMPLE ID: B-3-3
SAMPLE DATE: 10/04/92
SAMPLE MATRIX: SOIL

Test Name	Note Ref	Result	Reporting Limit	Units	Date Analyzed	Method Reference
9071 Prep & IR Analysis		ND	11	mg/kg	10/11/92	EPA9071

Company: ENRON
Date: 10/12/92
Client Work ID: SOILS

IT ANALYTICAL SERVICES
AUSTIN, TX
(512) 892-6684

301541-001

Work Order: B2-10-085

TEST NAME: **BTEX - Purge and Trap**
METHOD REFERENCE: **EPA8020**

SAMPLE ID: **B-3-3**
SAMPLE DATE: **10/04/92**
SAMPLE MATRIX: **SOIL**
ANALYSIS DATE: **10/07/92**
DILUTION FACTOR: **50**
UNITS: **ug/kg**

	Result	Reporting Limit
Benzene	ND	50
Ethylbenzene	ND	50
Toluene	ND	50
Xylenes (total)	ND	50

Total BTEX concentration: Not Detected

Surrogates	% Recovery
4-Bromofluorobenzene	99

Company: ENRON
Date: 10/12/92
Client Work ID: SOILS

IT ANALYTICAL SERVICES
AUSTIN, TX
(512) 892-6684

301541-001

Work Order: B2-10-085

SAMPLE ID: **B-3-11**
SAMPLE DATE: **10/04/92**
SAMPLE MATRIX: **SOIL**

Test Name	Note Ref	Result	Reporting Limit	Units	Date Analyzed	Method Reference
9071 Prep & IR Analysis		ND	12	mg/kg	10/11/92	EPA9071

IT ANALYTICAL SERVICES
AUSTIN, TX
(512) 892-6684

Company: ENRON
Date: 10/12/92
Client Work ID: SOILS

301541-001

Work Order: B2-10-085

TEST NAME: **BTEX - Purge and Trap**
METHOD REFERENCE: **EPA8020**

SAMPLE ID: **B-3-11**
SAMPLE DATE: **10/04/92**
SAMPLE MATRIX: **SOIL**
ANALYSIS DATE: **10/07/92**
DILUTION FACTOR: **50**
UNITS: **ug/kg**

	Result	Reporting Limit
Benzene	ND	50
Ethylbenzene	ND	50
Toluene	ND	50
Xylenes (total)	ND	50

Total BTEX concentration: Not Detected

Surrogates	% Recovery
4-Bromofluorobenzene	100

Company: ENRON
Date: 10/12/92
Client Work ID: SOILS

IT ANALYTICAL SERVICES
AUSTIN, TX
(512) 892-6684

301541-001

Work Order: B2-10-085

SAMPLE ID: B-2-1
SAMPLE DATE: 10/03/92
SAMPLE MATRIX: SOIL

Test Name	Note Ref	Result	Reporting Limit	Units	Date Analyzed	Method Reference
9071 Prep & IR Analysis		1700	120	mg/kg	10/11/92	EPA9071

Company: ENRON
Date: 10/12/92
Client Work ID: SOILS

IT ANALYTICAL SERVICES
AUSTIN, TX
(512) 892-6684

301541-001

Work Order: B2-10-085

TEST NAME: **BTEX - Purge and Trap**
METHOD REFERENCE: **EPA8020**

SAMPLE ID: **B-2-1**
SAMPLE DATE: **10/03/92**
SAMPLE MATRIX: **SOIL**
ANALYSIS DATE: **10/08/92**
DILUTION FACTOR: **50**
UNITS: **ug/kg**

	Result	Reporting Limit
Benzene	ND	50
Ethylbenzene	790	50
Toluene	110	50
Xylenes (total)	ND	50
Total BTEX concentration:	900	ug/kg

Surrogates	% Recovery
4-Bromofluorobenzene	102

Company: ENRON
Date: 10/12/92
Client Work ID: SOILS

IT ANALYTICAL SERVICES
AUSTIN, TX
(512) 892-6684

301541-001

Work Order: B2-10-085

SAMPLE ID: B-2-5
SAMPLE DATE: 10/03/92
SAMPLE MATRIX: SOIL

Test Name	Note Ref	Result	Reporting Limit	Units	Date Analyzed	Method Reference
9071 Prep & IR Analysis		18	11	mg/kg	10/11/92	EPA9071

IT ANALYTICAL SERVICES
AUSTIN, TX
(512) 892-6684

Company: ENRON
Date: 10/12/92
Client Work ID: SOILS

301541-001

Work Order: B2-10-085

TEST NAME: **BTEX - Purge and Trap**
METHOD REFERENCE: **EPA8020**

SAMPLE ID: **B-2-5**
SAMPLE DATE: **10/03/92**
SAMPLE MATRIX: **SOIL**
ANALYSIS DATE: **10/08/92**
DILUTION FACTOR: **50**
UNITS: **ug/kg**

	Result	Reporting Limit
Benzene	ND	50
Ethylbenzene	ND	50
Toluene	ND	50
Xylenes (total)	ND	50

Total BTEX concentration: Not Detected

Surrogates	% Recovery
4-Bromofluorobenzene	99

Company: ENRON
Date: 10/12/92
Client Work ID: SOILS

IT ANALYTICAL SERVICES
AUSTIN, TX
(512) 892-6684

301541-001

Work Order: B2-10-085

SAMPLE ID: **B-2-11**
SAMPLE DATE: **10/04/92**
SAMPLE MATRIX: **SOIL**

Test Name	Note Ref	Result	Reporting Limit	Units	Date Analyzed	Method Reference
9071 Prep & IR Analysis		13	11	mg/kg	10/11/92	EPA9071

IT ANALYTICAL SERVICES
AUSTIN, TX
(512) 892-6684

Company: ENRON
Date: 10/12/92
Client Work ID: SOILS

301541-001

Work Order: B2-10-085

TEST NAME: **BTEX - Purge and Trap**
METHOD REFERENCE: **EPA8020**

SAMPLE ID: **B-2-11**
SAMPLE DATE: **10/04/92**
SAMPLE MATRIX: **SOIL**
ANALYSIS DATE: **10/08/92**
DILUTION FACTOR: **50**
UNITS: **ug/kg**

	Result	Reporting Limit
Benzene	ND	50
Ethylbenzene	ND	50
Toluene	ND	50
Xylenes (total)	ND	50

Total BTEX concentration: Not Detected

Surrogates	% Recovery
4-Bromofluorobenzene	99

Company: ENRON
Date: 10/12/92
Client Work ID: SOILS

301541-001

IT ANALYTICAL SERVICES
AUSTIN, TX
(512) 892-6684

Work Order: B2-10-085

SAMPLE ID: B-1-1
SAMPLE DATE: 10/03/92
SAMPLE MATRIX: SOIL

Test Name	Note Ref	Result	Reporting Limit	Units	Date Analyzed	Method Reference
9071 Prep & IR Analysis		9500	290	mg/kg	10/11/92	EPA9071

Company: ENRON
Date: 10/12/92
Client Work ID: SOILS

IT ANALYTICAL SERVICES
AUSTIN, TX
(512) 892-6684

301541-001

Work Order: B2-10-085

TEST NAME: **BTEX - Purge and Trap**
METHOD REFERENCE: **EPA8020**

SAMPLE ID: **B-1-1**
SAMPLE DATE: **10/03/92**
SAMPLE MATRIX: **SOIL**
ANALYSIS DATE: **10/07/92**
DILUTION FACTOR: **500**
UNITS: **ug/kg**

	Result	Reporting Limit
Benzene	ND	500
Ethylbenzene	20000	500
Toluene	6000	500
Xylenes (total)	24000	500
Total BTEX concentration:	50000	ug/kg

Surrogates	% Recovery
4-Bromofluorobenzene	104

Company: ENRON
Date: 10/12/92
Client Work ID: SOILS

IT ANALYTICAL SERVICES
AUSTIN, TX
(512) 892-6684

301541-001

Work Order: B2-10-085

SAMPLE ID: B-1-3
SAMPLE DATE: 10/03/92
SAMPLE MATRIX: SOIL

Test Name	Note Ref	Result	Reporting Limit	Units	Date Analyzed	Method Reference
9071 Prep & IR Analysis		25	11	mg/kg	10/11/92	EPA9071

Company: ENRON
Date: 10/12/92
Client Work ID: SOILS

IT ANALYTICAL SERVICES
AUSTIN, TX
(512) 892-6684

301541-001

Work Order: B2-10-085

TEST NAME: **BTEX - Purge and Trap**
METHOD REFERENCE: **EPA8020**

SAMPLE ID: **B-1-3**
SAMPLE DATE: **10/03/92**
SAMPLE MATRIX: **SOIL**
ANALYSIS DATE: **10/08/92**
DILUTION FACTOR: **50**
UNITS: **ug/kg**

	Result	Reporting Limit
Benzene	ND	50
Ethylbenzene	ND	50
Toluene	ND	50
Xylenes (total)	ND	50

Total BTEX concentration: Not Detected

Surrogates	% Recovery
4-Bromofluorobenzene	99

IT ANALYTICAL SERVICES
AUSTIN, TX
(512) 892-6684

Company: ENRON
Date: 10/12/92
Client Work ID: SOILS

301541-001

Work Order: B2-10-085

SAMPLE ID: B-1-11
SAMPLE DATE: 10/03/92
SAMPLE MATRIX: SOIL

Test Name	Note Ref	Result	Reporting Limit	Units	Date Analyzed	Method Reference
9071 Prep & IR Analysis		15	11	mg/kg	10/11/92	EPA9071

Company: ENRON
Date: 10/12/92
Client Work ID: SOILS

IT ANALYTICAL SERVICES
AUSTIN, TX
(512) 892-6684

301541-001

Work Order: B2-10-085

TEST NAME: **BTEX - Purge and Trap**
METHOD REFERENCE: **EPA8020**

SAMPLE ID: **B-1-11**
SAMPLE DATE: **10/03/92**
SAMPLE MATRIX: **SOIL**
ANALYSIS DATE: **10/08/92**
DILUTION FACTOR: **50**
UNITS: **ug/kg**

	Result	Reporting Limit
Benzene	ND	50
Ethylbenzene	ND	50
Toluene	ND	50
Xylenes (total)	ND	50

Total BTEX concentration: Not Detected

Surrogates	% Recovery
4-Bromofluorobenzene	99

IT ANALYTICAL SERVICES
AUSTIN, TX
(512) 892-6684

Company: ENRON
Date: 10/12/92
Client Work ID: SOILS

301541-001

Work Order: B2-10-085

IV. Methodology

Requested analyses were performed according to the following methods.

TEST NAME 9071 Prep & IR Analysis TEST CODE **9071IR**

9071 Prep and IR Analysis	Method 9071, SW846, Test Methods for Evaluating Solid Waste, Third Edition. Soxhlet extraction from Method 9071 using freon and infrared analysis of the extract using Method 418.1.

TEST NAME BTEX - Purge and Trap TEST CODE **BTEX**

BTEX	Method 8020, SW-846, Test Methods for Evaluating Solid Wastes, Third Edition. This technique uses a purge and trap with gas chromatography (GC) and photo ionization detection (PID) with a five point curve. This method exceeds the requirement of Method 602.