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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. 5
FIELD INVESTIGATION REPORT

Enron Gas Processing Company
Contract No. CPI 4051 LCD

Prepared by:

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1.0 Introduction

IT Corporation (IT) was contracted by Enron Gas Processing Company (Enron) to conduct a field investigation to evaluate 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. 5 (Hobbs 5). Hobbs 5 is located in the northeast quarter (NE ¼) of Section 14, Township 22-S, Range 37-E, Lea County, New Mexico, approximately 2.5 miles southeast of Eunice, New Mexico (Figure 1).

The two fiberglass tanks may have contained up to 8,820 gallons each of natural gas pipeline liquids (Figure 2). Release of the pipeline liquids occurred during the transfer of liquids from the southern tank to the northern tank. The tanks were operated from 1982 to January 1992. The exact dates and volumes of releases of pipeline liquids are unknown.

The tanks were removed in March 1992; an Enron representative was present during the tank removal activities. Approximately 1,200 cubic yards of soil were removed and placed on plastic sheeting in the northeast corner of the compressor station facility. The excavation is approximately 17 feet deep and is currently open. Enron is currently evaluating its options for treatment/disposal of the contaminated soil.

The work for this investigation consisted of drilling four soil borings, collecting and analyzing soil samples, field screening, lithologic descriptions of the sediments, interpreting the data, and presenting the findings of the field investigation 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 soil boring 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 September 30 to October 2, 1992.

2.0 Site Description

The Hobbs 5 site is outside the limits of any municipality; is bounded on the north, south, and west by range land and oil fields; and is bounded on the east by a paved road, beyond which are more range land and oil fields. The topography of the site is flat. Significant site improvements are shown on the site location map (Figure 1).

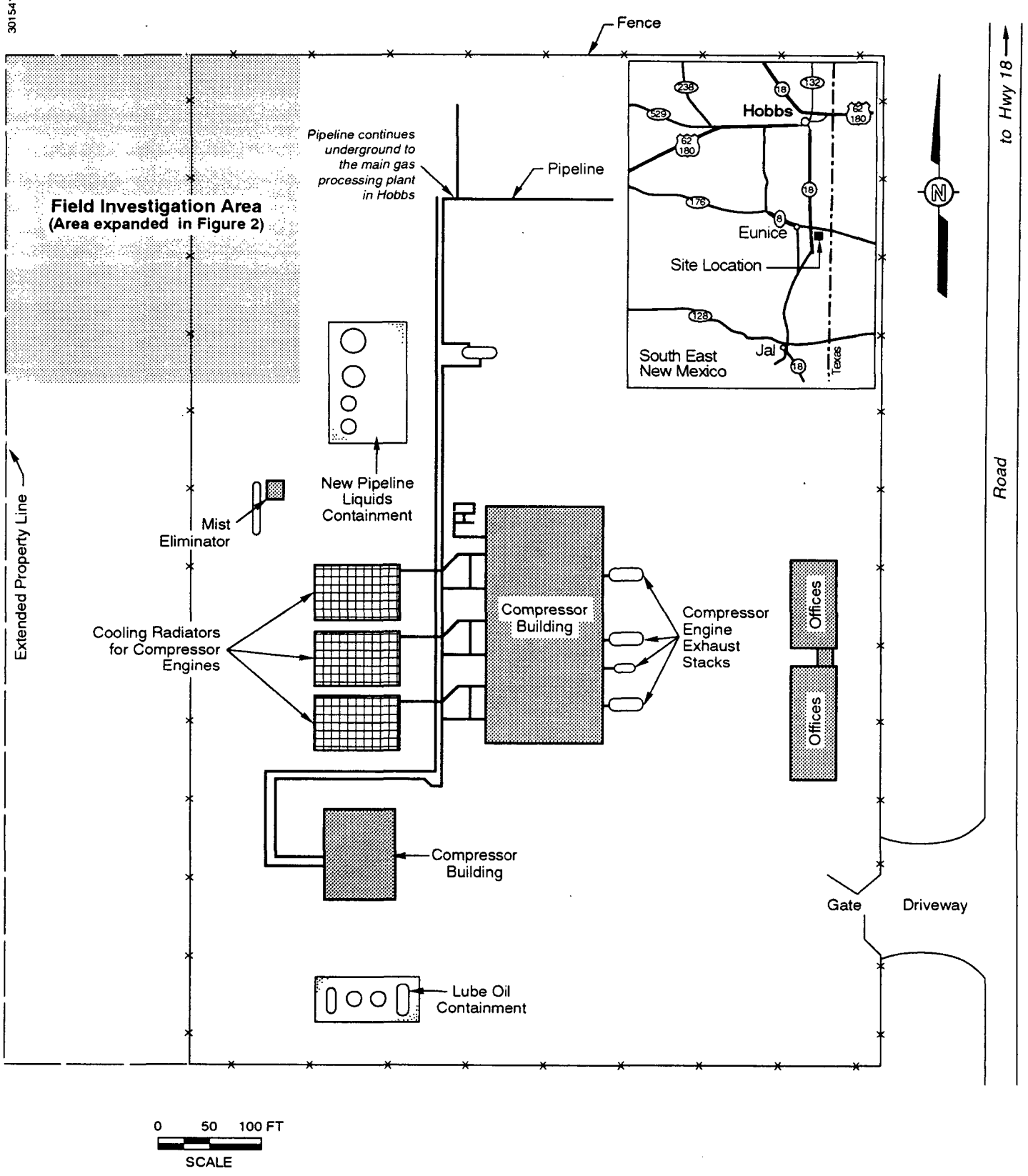


Figure 1

Site Location Map, Enron Gas Processing Company, Former Pipeline Liquids Storage Site, Hobbs Compressor Station No. 5, Eunice, New Mexico

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 semiconsolidated 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 and typically 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 consist 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 consist predominantly of sandstones that have been correlated by some geologists with the Santa Rosa Formation in northeastern New Mexico. Beneath these sandstones are approximately 500 feet of siltstones 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).

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 liquid storage tanks consists almost entirely of unconsolidated sand and, infrequently, silt. Soil Boring B-1 (Figure 2) was advanced to a depth of 61 feet below ground surface (bgs). B-1

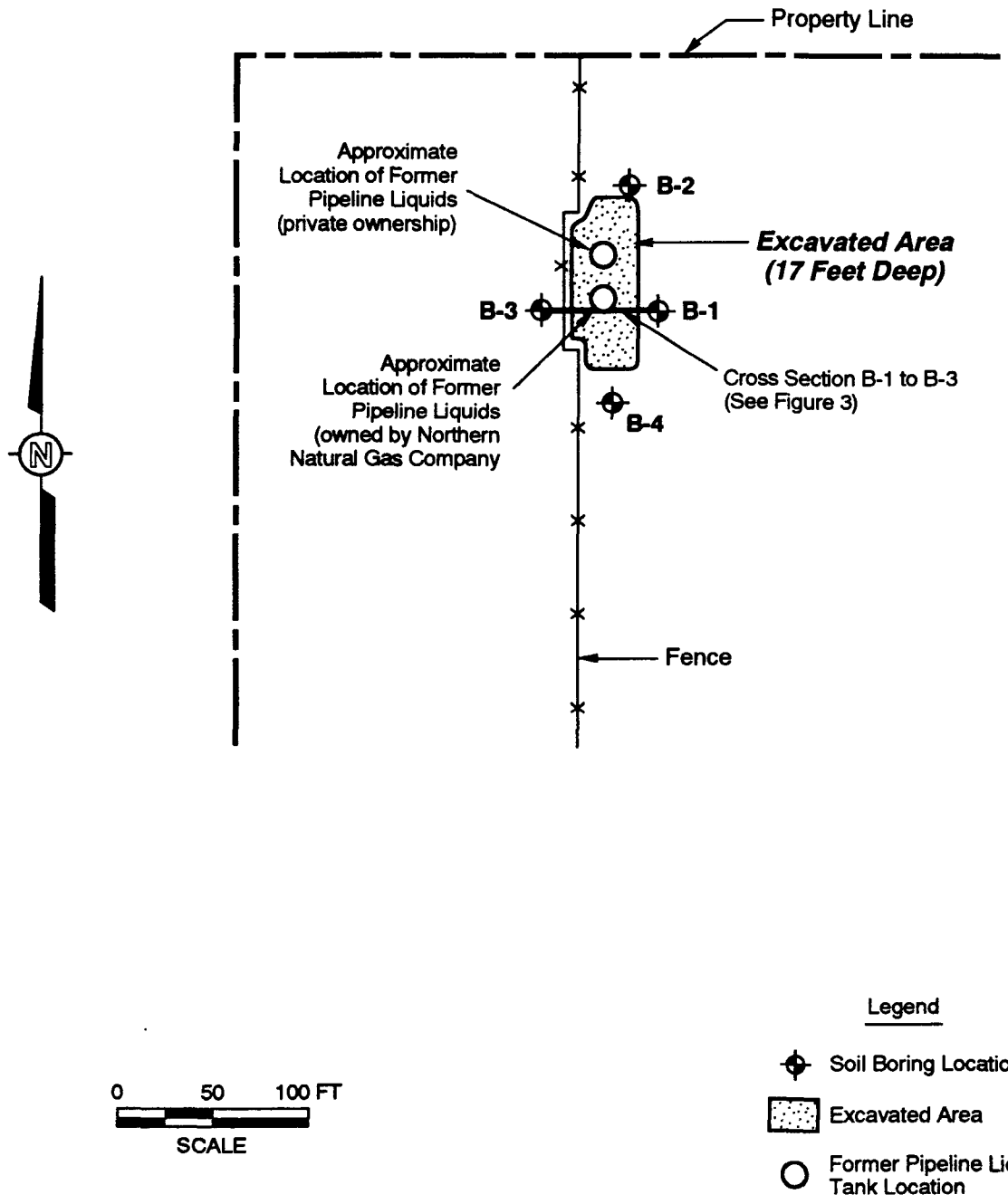


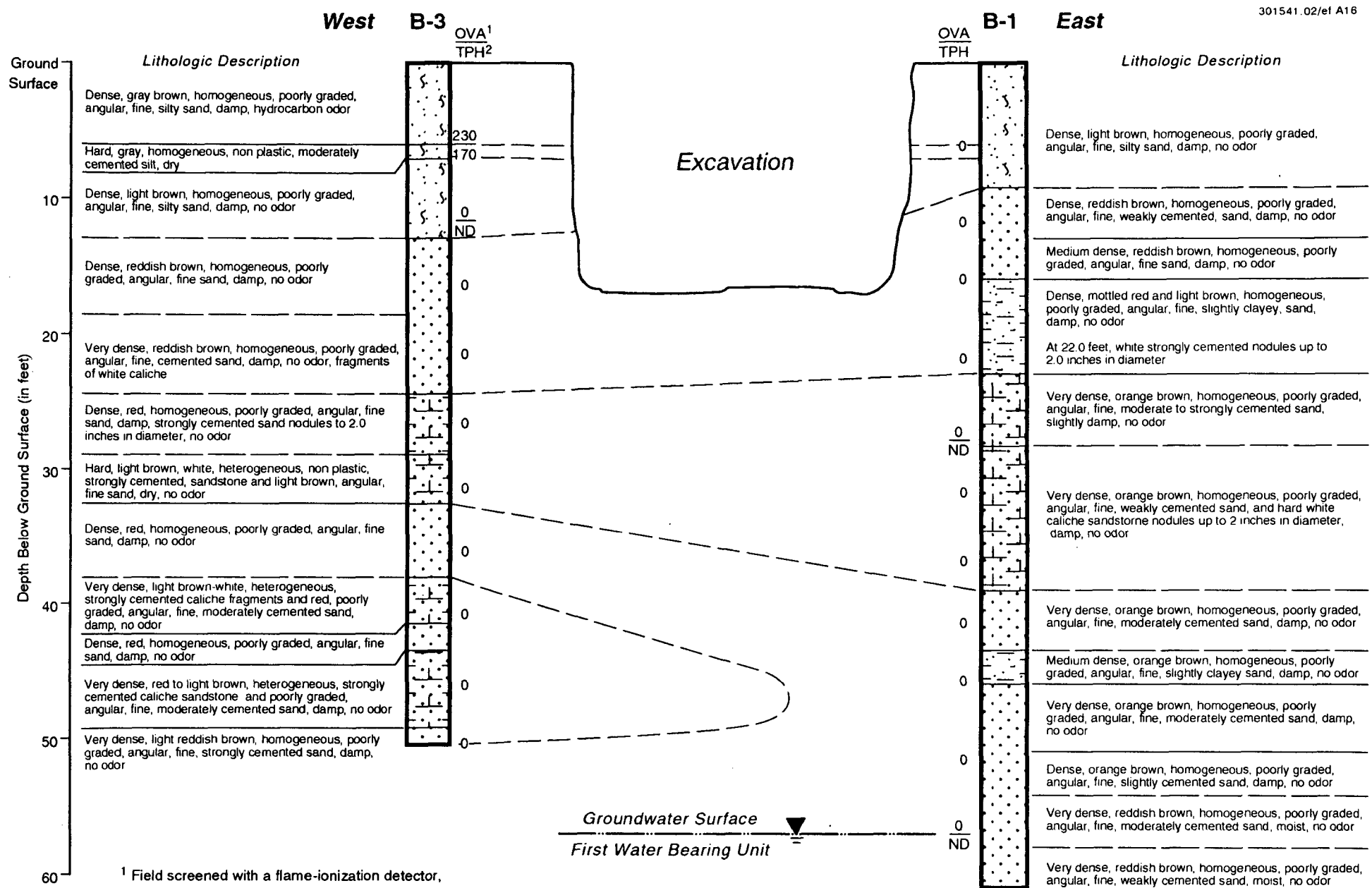
Figure 2

Boring Location Map, Enron Gas Processing Company Hobbs Compressor Station No. 5, Eunice, New Mexico

was the deepest boring advanced at the site. From the surface to approximately 9 feet bgs, a dense light-brown, silty sand was encountered. From approximately 9 to 13 feet bgs, a medium-dense, reddish-brown, fine-grained sand was logged. Below the sand, a dense mottled-red and light-brown, fine-grained, weakly cemented sand was encountered to 23 feet bgs. Toward the base of this sand unit, at approximately 22 feet bgs, white strongly cemented caliche fragments up to 2 inches in diameter were encountered. From approximately 23 to 29 feet bgs, a very dense, orange-brown, fine-grained, moderately cemented sand and strongly cemented sand were encountered. Below this sand unit, a very dense, orange-brown, fine-grained, weakly cemented sand with caliche fragments up to 2 inches in diameter was logged to approximately 39 feet bgs. From approximately 39 to 42.5 feet bgs, a very dense, orange-brown, fine-grained, moderately cemented sand was found. From approximately 42.5 to 45 feet bgs, medium-dense, orange-brown, fine-grained, slightly clayey sand was encountered. From approximately 45 feet bgs to the bottom of the boring at 61 feet bgs, a reddish-brown, fine-grained, weakly to moderately cemented sand was encountered.

The lithology encountered in Borings B-2, B-3, and B-4 were similar to B-1. Significant units common to all borings include a silt layer approximately 2 feet thick. The silt unit was logged in B-2, B-3, and B-4 at depths of approximately 6 to 8 feet bgs. The silt was visible on all four sides of the open excavation. The silt was not logged in B-1 due to the sampling interval. A caliche unit was logged in all four borings and is a strongly cemented unit of fine-grained sand. This sand occurred in B-1 from approximately 28.5 to 39.0 feet bgs; in B-2, from approximately 29 to 35 feet bgs; in B-3, from 29 to 32.5 feet bgs; and in B-4, from 30 to 33 feet bgs. The approximate thickness of the caliche unit is 9.5 feet in B-1, 6.0 feet in B-2, 3.5 feet in B-3, and 3.0 feet in B-4. Detailed logs of the soil borings are presented in Appendix A. An east-west cross section from B-1 to B-3 is presented in Figure 3, which details stratigraphy and analytical results encountered during the site assessment activities.

No hydrocarbon odors or staining were observed in any of the soil samples collected from the borings except in the 5- to 7-foot sample from B-3. This sample yielded a headspace screening value of 230 parts per million total volatile hydrocarbons. Details concerning the headspace screening are discussed in Section 4.0. Table 1 presents a summary of the headspace measurements of soil samples, sample depths, depths of the borings, and the peak



[1] Field screened with a flame-ionization detector, results in parts per million (ppm)

[2] Analytical method EPA Method 418.1, results in milligrams per kilogram (mg/kg), ND= concentrations below detection limits of 11 or 12 mg/kg

Figure 3
Cross Section B-1 to B-3
Enron Gas Processing Company
Hobbs No. 5 Compressor Station
Eunice, New Mexico

Table 1

Summary of Headspace Analysis
Enron Gas Processing Company
Former Pipeline Liquids Storage Site
Hobbs Compressor Station No. 5

Sample Number	Sampling Location	Sample Depth (feet)[a]	Sample Matrix	Peak Instrument Reading (ppm[b]	Date Sample Analyzed	Comments
B-1-1	B-1	6.5	Soil	0	9-30-92	
B-1-2	B-1	11.0	Soil	0	9-30-92	
B-1-3	B-1	16.0	Soil	0	9-30-92	
B-1-4	B-1	21.0	Soil	0	9-30-92	
B-1-5	B-1	27.0	Soil	0	9-30-92	
B-1-6	B-1	31.0	Soil	0	9-30-92	
B-1-7	B-1	36.0	Soil	0	9-30-92	
B-1-8	B-1	42.0	Soil	0	9-30-92	
B-1-9	B-1	47.0	Soil	0	9-30-92	
B-1-10	B-1	52.0	Soil	0	9-30-92	
B-1-11	B-1	57.0	Soil	0	9-30-92	
B-1-12	B-1	61.0	Soil	0	10-1-92	Total depth of boring at 61.0 ft
B-1-Water	B-1	57	Water	0	10-2-92	
B-2-1	B-2	6.0	Soil	0	10-1-92	
B-2-2	B-2	11.0	Soil	0	10-1-92	
B-2-3	B-2	16.0	Soil	0	10-1-92	
B-2-4	B-2	21.0	Soil	0	10-1-92	
B-2-5	B-2	26.0	Soil	0	10-1-92	
B-2-6	B-2	31.0	Soil	0	10-1-92	
B-2-7	B-2	36.0	Soil	0	10-1-92	
B-2-8	B-2	40.0	Soil	0	10-1-92	
B-2-9	B-2	46.0	Soil	0	10-1-92	
B-2-10	B-2	51.0	Soil	0	10-1-92	Total depth of boring at 52.0 ft

Refer to footnotes at end of table.

Table 1 *(Continued)*

Summary of Headspace Analysis
Enron Gas Processing Company
Former Pipeline Liquids Storage Site
Hobbs Compressor Station No. 5

Sample Number	Sampling Location	Sample Depth (feet)[a]	Sample Matrix	Peak Instrument Reading (ppm[b]	Date Sample Analyzed	Comments
B-3-1	B-3	6.0	Soil	230	10-1-92	
B-3-2	B-3	11.0	Soil	0	10-1-92	
B-3-3	B-3	16.0	Soil	0	10-1-92	
B-3-3	B-3	21.0	Soil	0	10-1-92	
B-3-5	B-3	26.0	Soil	0	10-1-92	
B-3-6	B-3	33.0	Soil	0	10-1-92	
B-3-7	B-3	36.0	Soil	0	10-2-92	
B-3-8	B-3	41.0	Soil	0	10-2-92	
B-3-9	B-3	46.0	Soil	0	10-2-92	
B-3-10	B-3	51.0	Soil	0	10-2-92	Total depth of boring at 51.5 ft
B-4-1	B-4	6.0	Soil	0	10-2-92	
B-4-2	B-4	11.0	Soil	0	10-2-92	
B-4-3	B-4	16.0	Soil	0	10-2-92	
B-4-4	B-4	21.0	Soil	0	10-2-92	
B-4-5	B-4	26.0	Soil	0	10-2-92	
B-4-6	B-4	31.0	Soil	0	10-2-92	Total depth of boring at 33.0 ft

[a]Feet below ground surface.
[b]Parts per million measured by a Foxboro 128-GC portable flame-ionization detector.

headspace readings. Field logs of headspace measurement data and field procedures are presented in Appendix B.

3.3.2 Hydrology

Groundwater was encountered in B-1 at approximately 57 feet bgs. Static groundwater, measured in the open boring approximately 48 hours after drilling B-1, was also measured at 57 feet bgs. Enron elected not to install groundwater monitoring wells since vadose zone conditions encountered did not indicate that hydrocarbons had migrated to a depth that would likely affect the groundwater.

4.0 Field Activities 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 HASP is applicable to IT personnel and subcontractors scheduled to perform work at the site; these personnel were briefed on the contents of the HASP before work began. A copy of the HASP was kept at the work site and was available for reference by appropriate parties during the work (a copy of the HASP is presented as Appendix C). The IT project geologist served as the Site Safety Officer.

A geologist from IT was at the site on September 30, October 1, and October 2, 1992, to observe drilling and collect soil samples from borings drilled near the perimeter of the former pipeline liquids storage tank excavation. The location 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 were installed to a total depth of approximately 33 feet to 61 feet bgs.

The drill rig was operated by Geo Projects International, Inc., of Austin, Texas. Downhole equipment was cleaned between borings with a high-pressure washer to minimize the possibility of cross contamination. The sampling equipment was cleaned between samples using a mixture of Alconox in water, a double tap-water rinse, and a final rinse with distilled water. The drilling was performed under the supervision of the IT project geologist. During

drilling, soil samples were collected at 5-foot intervals to log the encountered sediments and assess the presence of hydrocarbon-affected soil. Samples were obtained using an 24-inch-long split-spoon sampler equipped with four decontaminated 2½- by 6-inch 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). Description of the materials encountered during drilling and sampling are presented in Appendix A.

During sampling, a Foxboro Model 128-GC flame-ionization detector (FID) was used in conjunction with the headspace method (see Appendix B for IT field-screening protocol) to characterize the relative levels of light-end (i.e., less than C-8) hydrocarbons in the soil and groundwater. FID readings are useful for indicating relative levels of light-end 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. The field-screening results are presented in Appendix B. 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 an Enron 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 D.

Groundwater was encountered in Boring B-1 at a depth of 57 feet bgs. Static groundwater was measured in an open hole approximately 48 hours after drilling. The depth to groundwater was measured with a fiberglass engineer's tape and weight. A sample of the groundwater was drawn to the surface with a 1-inch-diameter polyvinyl chloride (PVC) bailer, transferred to a 12-ounce decontaminated glass jar, and screened for headspace as per the IT field procedures presented in Appendix B.

Cuttings generated during drilling were placed and sealed in 55-gallon drums and remain at the site for disposal by Enron. 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.

5.0 Laboratory Analyses and Results

The selection of the soil samples for laboratory analysis was based on field-screening results to determine the presence or absence of hydrocarbons in the vadose zone. In the event that concentrations of organic vapors were not detected during the headspace analysis, soil samples were selected from within 5 feet above the strongly cemented sand unit and the bottom of the boring; the exceptions are the samples collected from borings B-1 and B-3. In Boring B-1, a sample was collected from within 5 feet of the sand unit and immediately above the static water level. In B-3, soil samples were collected from the sample interval with the highest headspace reading. The sample 5 feet below the sample with the highest headspace reading and the sample collected from within 5 feet of the strongly cemented sand unit were also selected (Table 1, Table 2).

The soil samples were analyzed by 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 E. Detection limits for the tests performed are shown on the laboratory analytical reports. Results of the laboratory analyses (Table 2) indicate that TPH was detected at a concentration of 170 milligrams per kilogram (mg/kg) from Boring B-3, at a depth of approximately 6.5 feet bgs. Laboratory analyses for the remaining soil samples were below the detection limits for the requested tests. Laboratory detection limits are specified in Table 2.

6.0 Findings

The laboratory analytical results indicated that 170 mg/kg of TPH was detected in one sample collected from 6.5 to 7.0 feet bgs in Boring B-3. The laboratory analytical results for the soil sample collected from 11.0 to 11.5 feet bgs in Boring B-3 were below the detection limits of 12 mg/kg for TPH. The remaining soil samples selected for laboratory analyses were found to be below the detection limits of 11 or 12 mg/kg for TPH. Concentrations of BTEX were not detected above the detection limit of 50 micrograms per kilogram (µg/kg). Headspace readings performed during the investigation are consistent with the laboratory analytical results.

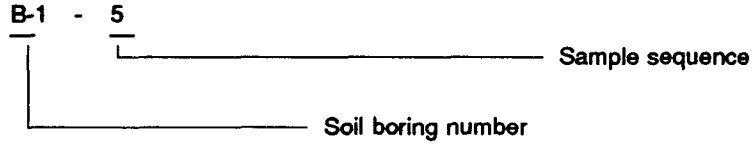
Groundwater was encountered in Boring B-1 at a depth of 57 feet bgs. A sample of the groundwater was collected from the borehole and screened for volatiles in the headspace with

Table 2

Results of Laboratory Analyses of Soil Samples
Enron Gas Processing Company
Former Pipeline Liquids Storage Site
Hobbs Compressor Station No. 5
Sample Collection Date: 9/30/92–10/2/92

Sample Number	Depth (ft bgs)[a]	TPH[b] (mg/kg)[c]	Benzene (µg/kg)[d]	Toluene (µg/kg)	Ethyl Benzene (µg/kg)	Total Xylenes (µg/kg)
B-1-5[e]	26.5-27	<11	<50	<50	<50	<50
B-1-11	56.5-57	<11	<50	<50	<50	<50
B-2-5	26-26.5	<11	<50	<50	<50	<50
B-2-10	51.5-52	<11	<50	<50	<50	<50
B-3-1	6.5-7.0	170	<50	<50	<50	<50
B-3-2	11.0-11.5	<12	<50	<50	<50	<50
B-3-5	26.0-26.5	<11	<50	<50	<50	<50
B-4-2	11.0-11.5	<12	<50	<50	<50	<50
B-4-4	21.0-21.5	<12	<50	<50	<50	<50

[a]ft bgs = Feet below ground surface.
[b]TPH = Total petroleum hydrocarbons.
[c]mg/kg = Milligrams per kilogram.
[d]µg/kg = Micrograms per kilogram.
[e]Sample designation:



NOTE: < = Less than the specified laboratory limit of detection.

an FID. Volatiles were not detected during the headspace screening of the groundwater sample.

Two significant stratigraphic units were encountered during the subsurface investigation. A light-brown silt layer approximately 2 feet thick was encountered in three of the four borings and was visible in the side walls of the former storage tank excavation. The silt layer was logged at the depth of approximately 6 to 8 feet bgs. A caliche layer approximately 3 to 6 feet thick was encountered in all four soil borings. The caliche unit was logged at depths ranging from 28.5 to 39 feet bgs. The silt and caliche layers appear to be low permeability media that are locally continuous across the site. These lithologic layers may impede the downward migration of the pipeline liquids and force the liquids to move laterally. Lateral contamination directly above the lithologic units was not observed in the soil borings, with the exception of the 6.5- to 7.0-foot sample collected from Boring B-3.

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.

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.

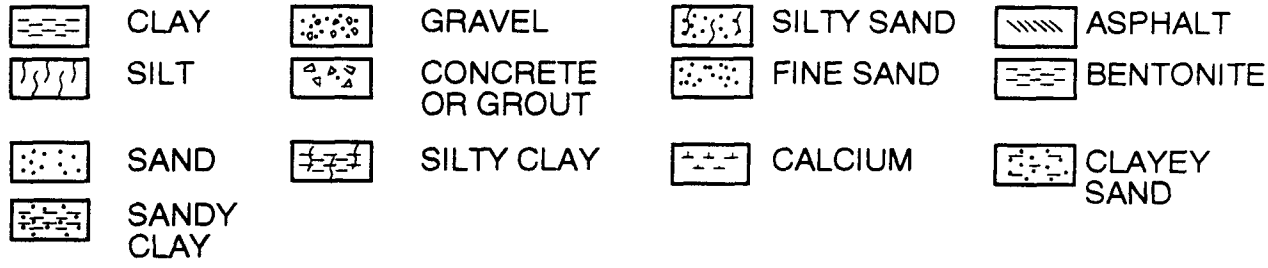
APPENDIX
A

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



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

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.

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.

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.

2.5" OD SPLIT BARREL SAMPLE

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

GROUND WATER LEVEL AND DATE

	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: 301541.02	PROJECT NAME: ENRON COMPRESSOR STATION NO. 5	
BORING NUMBER: B-1	COORDINATES: N/A	DATE: 9-30-92
ELEVATION: N/A	GWL: Depth N57 FT. Date/Time N/A	DATE STARTED: 9-30-92
ENGINEER/GEOLOGIST: J. S. RAUGUST	Depth N/A Date/Time N/A	DATE COMPLETED: 10-1-92
DRILLING METHODS: INGERSOLL-RAND MODEL TH60 AIR ROTARY		PAGE: 1 OF 2

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER/(12 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	LITHOLOGIC SYMBOL	REMARKS
5	B-1-1	NA	18"	Dense, light brown, homogeneous, poorly graded, angular, fine, silty sand, damp, no odor	sm		13:25 Hours FID = 0 ppm
10	B-1-2	NA	21"	Dense, reddish brown, homogeneous, poorly graded, angular, fine, weakly cemented, sand, damp, no odor (Driller notes change) 13 feet	sp		13:40 Hours FID = 0 ppm
15	B-1-3	NA	21"	Medium dense, reddish brown, homogeneous, poorly graded, angular, fine sand, damp, no odor 16 feet	sp		14:00 Hours FID = 0 ppm
20	B-1-4	NA	24"	Dense, mottled red and light brown, homogeneous, poorly graded, angular, fine, slightly clayey, sand, damp, no odor At 22.0 feet, white strongly cemented nodules up to 2.0 inches in diameter (Driller notes hard drilling) 23 feet	sc sc		14:20 Hours FID = 0 ppm
25	B-1-5	NA	24"	Very dense, orange brown, homogeneous, poorly graded, angular, fine, moderate to strongly cemented sand, slightly damp, no odor	sp		14:35 Hours FID = 0 ppm
30	B-1-6	NA	21"	Very dense, orange brown, homogeneous, poorly graded, angular, fine, weakly cemented sand, and hard white caliche nodules up to 2 inches in diameter, damp, no odor	sp		15:00 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: 301541.02	PROJECT NAME: ENRON COMPRESSOR STATION NO. 5	
BORING NUMBER: B-1	COORDINATES: N/A	DATE: 9-30-92
ELEVATION: N/A	GWL: Depth 57 FT. Date/Time 9/30/92	DATE STARTED: 9-30-92
ENGINEER/GEOLOGIST: J. S. RAUGUST	Depth N/A Date/Time N/A	DATE COMPLETED: 10-1-92
DRILLING METHODS: INGERSOLL-RAND MODEL TH60 AIR ROTARY		PAGE: 2 OF 2

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER/(12 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	LITHOLOGIC SYMBOL	REMARKS
	B-1-6	NA	21"	Very dense, orange brown, heterogeneous, poorly graded, angular, fine, moderately cemented sand, and white caliche nodules up to 1.0 inch in diameter, damp, no odor	sp		15:00 Hours
35	B-1-7	NA	18"		sp		15:15 Hours FID = 0 ppm
40	B-1-8	NA	24"	Very dense, orange brown, homogeneous, poorly graded, angular, fine, moderately cemented sand, damp, no odor	sp		15:35 Hours FID = 0 ppm
45	B-1-9	NA	24"	Medium dense, orange brown, homogeneous, poorly graded, angular, fine, slightly clayey sand, damp, no odor	sp		16:00 Hours FID = 0 ppm
50	B-1-10	NA	24"	Very dense, orange brown, homogeneous, poorly graded, angular, fine, moderately cemented sand, damp, no odor 51 feet Dense, orange brown, homogeneous, poorly graded, angular, fine, slightly cemented sand, damp, no odor	sp		16:30 Hours FID = 0 ppm
55	B-1-11	NA	24"	Very dense, reddish brown, homogeneous, poorly graded, angular, fine, moderately cemented sand, moist, no odor	sp		17:00 Hours FID = 0 ppm
60	B-1-12	NA	24"	Very dense, reddish brown, homogeneous, poorly graded, angular, fine, weakly cemented sand, moist, no odor	sp		07:45 Hours 10/1/92 FID = 0 ppm Soil sample moist, but drill pipe smeared with mud. Possible slow recovering sand formation

NOTES:

Boring terminated at 61', static groundwater at 57', grouted on 10-2-92

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: 301541.02	PROJECT NAME: ENRON COMPRESSOR STATION NO. 5	
BORING NUMBER: B-2	COORDINATES: N/A	DATE: 10-1-92
ELEVATION: N/A	GWL: Depth N/A Date/Time N/A	DATE STARTED: 10-1-92
ENGINEER/GEOLOGIST: J. S. RAUGUST	Depth N/A Date/Time N/A	DATE COMPLETED: 10-1-92
DRILLING METHODS: INGERSOLL-RAND MODEL TH60 AIR ROTARY		PAGE: 1 OF 2

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER/(12 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	LITHOLOGIC SYMBOL	REMARKS
				Medium dense, light brown, homogeneous, poorly graded, angular, fine sand, damp, no color			
				5.5 feet	sp		
5	B-2-1	NA	18"	Very stiff, light brown, homogeneous, non plastic, silt, damp, no odor	ml		9:55 Hours FID = 0 ppm
				6.5 feet			
				Medium dense, mottled red and light brown, homogeneous, poorly graded, angular, fine, clayey sand, damp, no odor			
10	B-2-2	NA	18"		sc		10:10 Hours FID = 0 ppm
				Dense, light brown, homogeneous, poorly graded, angular, fine, silty sand, damp, no odor			
				15.5 feet			
	B-2-3	NA	24"	Dense, reddish brown (some mottling with gray), homogeneous, poorly graded, angular, fine, silty sand, damp, no odor	sm		10:25 Hours FID = 0 ppm
20	B-2-4	NA	24"	Dense, mottled reddish and gray brown, heterogeneous, poorly graded, angular, fine, sand and gray caliche nodules up to 1.6 inches in diameter, no odor	sp		10:45 Hours FID = 0 ppm
25	B-2-5	NA	18"	Very dense, reddish brown, homogeneous, poorly graded, angular, fine, weakly cemented sand, damp, no odor	sp		11:00 Hours FID = 0 ppm
				(Driller notes gradational change) 28.5–30 feet			
30	B-2-6	NA	3" / 14"	Very hard, light brown-white, heterogeneous, strongly cemented sand and light brown, angular, fine, sand, damp, no odor Drilling still hard at 33 feet.	sp		11:15 Hours 11:30 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: 301541.02	PROJECT NAME: ENRON COMPRESSOR STATION NO. 5	
BORING NUMBER: B-2	COORDINATES: N/A	DATE: 10-1-92
ELEVATION: N/A	GWL: Depth N/A Date/Time N/A	DATE STARTED: 10-1-92
ENGINEER/GEOLOGIST: J. S. RAUGUST	Depth N/A Date/Time N/A	DATE COMPLETED: 10-1-92
DRILLING METHODS: INGERSOLL-RAND MODEL TH60 AIR ROTARY		PAGE: 2 OF 2

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER/(12 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	LITHOLOGIC SYMBOL	REMARKS
	B-2-6	NA	14"	Very hard, light brown, heterogeneous, strongly cemented sand, and poorly graded, angular, fine sand, damp, no odor	sp		11:30 Hours
35	B-2-7	NA	14"		sp		12:45 Hours FID = 0 ppm
40	B-2-8	NA	12"	Medium dense, reddish brown, homogeneous, poorly graded, angular, fine sand, damp, no odor	sp		13:15 Hours FID = 0 ppm
45	B-2-9	NA	24"		sp		
				Very hard, white, homogeneous, caliche, dry	sp		13:45 Hours FID = 0 ppm
50	B-2-10	NA	24"	Medium dense, reddish brown, homogeneous, poorly graded, angular, fine sand, damp, no odor Dense, reddish brown, homogeneous, poorly graded, angular, fine weakly to moderately cemented, damp, no odor	sp		14:00 Hours FID = 0 ppm
55							
60							

NOTES:

Boring terminated at 52.0 feet, grouted on 10-2-92

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: 301541.02	PROJECT NAME: ENRON COMPRESSOR STATION NO. 5	
BORING NUMBER: B-3	COORDINATES: N/A	DATE: 10-1-92
ELEVATION: N/A	GWL: Depth N/A Date/Time N/A	DATE STARTED: 10-2-92
ENGINEER/GEOLOGIST: J. S. RAUGUST	Depth N/A Date/Time N/A	DATE COMPLETED: 10-2-92
DRILLING METHODS: INGERSOLL-RAND MODEL TH60 AIR ROTARY		PAGE: 1 OF 2

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER/(12 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	LITHOLOGIC SYMBOL	REMARKS
5	B-3-1	NA	24"	Dense, gray brown, homogeneous, poorly graded, angular, fine, silty sand, damp, hydrocarbon odor	ml		15:30 Hours FID = 230 ppm
				Hard, gray, homogeneous, non plastic, moderately cemented silt, dry			
10	B-3-2	NA	18"	Dense, light brown, homogeneous, poorly graded, angular, fine, silty sand, damp, no odor	sm		15:40 Hours FID = 0 ppm
15	B-3-3	NA	24"	Dense, reddish brown, homogeneous, poorly graded, angular, fine sand, damp, no odor	sp		15:50 Hours FID = 0 ppm
20	B-3-4	NA	18"	Very dense, reddish brown, homogeneous, poorly graded, angular, fine, cemented sand, damp, no odor, fragments of white caliche	sp		16:05 Hours FID = 0 ppm
25	B-3-5	NA	14"	Dense, red, homogeneous, poorly graded, angular, fine sand, damp, strongly cemented sand nodules to 2.0 inches in diameter, no odor	sp		16:20 Hours FID = 0 ppm
				Driller notes hard drilling at 29 feet			
30	B-3-6	NA	6"	Hard, light brown, white, heterogeneous, non plastic, strongly cemented, sand and light brown, angular, fine sand, dry, no odor	sp		16:35Hours 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.

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INTERNATIONAL TECHNOLOGY CORPORATION

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 301541.02	PROJECT NAME: ENRON COMPRESSOR STATION NO. 5	
BORING NUMBER: B-4	COORDINATES: N/A	DATE: 10-2-92
ELEVATION: N/A	GWL: Depth N/A Date/Time N/A	DATE STARTED: 10-2-92
ENGINEER/GEOLOGIST: J. S. RAUGUST	Depth N/A Date/Time N/A	DATE COMPLETED: 10-2-92
DRILLING METHODS: INGERSOLL-RAND MODEL TH60 AIR ROTARY		PAGE: 1 OF 1

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER/(12 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	LITHOLOGIC SYMBOL	REMARKS
5	B-4-1	NA	18"	Medium dense, light brown, homogeneous, poorly graded, angular, fine sand, damp, no odor	sp		10:15 Hours FID = 0 ppm
				Hard, gray brown, homogeneous, non plastic, silt, damp, no odor	sm		
10	B-4-2	NA	18"	Dense, red brown, homogeneous, poorly graded, angular, fine silty sand, damp, no odor	sm		10:30 Hours FID = 0 ppm
15	B-4-3	NA	12"	Caliche fragments up to 0.2 inches in diameter at 15.5 feet	sm sp		10:40 Hours FID = 0 ppm
20	B-4-4	NA.	18"	Dense, red, homogeneous, poorly graded, angular, fine, weakly cemented sand, damp, no odor	sp		11:00 Hours FID = 0 ppm
				Hard drilling while sampling			
25	B-4-5	NA	12"	Hard, brown, white, heterogeneous, strongly cemented sand and light brown, poorly graded, angular, fine sand, dry, no odor	sp		11:15 Hours FID = 0 ppm
30	B-4-6	NA	12"	Very dense, red, homogeneous, poorly graded, angular, fine sand with cemented sand nodules up to 1.6 inches in diameter, damp, no odor, driller notes hard drilling			
	B-4-7	NA	18"	Hard, light brown, heterogeneous, strongly cemented sand, and light brown, poorly graded, angular, fine sand, dry, no odor	sp sp		11:35 Hours FID = 0 ppm 11:50 Hours

NOTES:

Boring terminated at 33.0 feet, grouted on 10-2-92

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 FIELD-SCREENING RESULTS AND PROCEDURES

INTERNATIONAL TECHNOLOGY CORPORATION

HEADSPACE TESTING FOR VOLATILES

PROJECT NAME: ENRON, HOBBS 5
ENGINEER/GEOLOGIST: J. S. RAUGUST
PROJECT NO.: 301541.02
DATE: 9-30-92
INSTRUMENT TYPE: FOXBORO MODEL 128-GC FID
CALIBRATION DATE: 9-30-92
SERIAL NO.: A51855
CALIBRATION GAS TYPE/CONCENTRATION: 97.8 ppm METHANE
PHOTOIONIZATION BULB POWER (ev): NA
ROOM TEMPERATURE (°F): 80°

SAMPLE NUMBER	SAMPLING LOCATION	SAMPLE DEPTH (FEET)	SAMPLE MATRIX	PEAK INSTRUMENT READING (ppm)	COMMENTS
B-1-1	B-1	6.5	SOIL	0	9-30-92
B-1-2	B-1	11.0	SOIL	0	9-30-92
B-1-3	B-1	16.0	SOIL	0	9-30-92
B-1-4	B-1	21.0	SOIL	0	9-30-92
B-1-5	B-1	27.0	SOIL	0	9-30-92
B-1-6	B-1	31.0	SOIL	0	9-30-92
B-1-7	B-1	36.0	SOIL	0	9-30-92
B-1-8	B-1	42.0	SOIL	0	9-30-92
B-1-9	B-1	47.0	SOIL	0	9-30-92
B-1-10	B-1	52.0	SOIL	0	9-30-92
B-1-11	B-1	57.0	SOIL	0	9-30-92
B-1-12	B-1	61.0	SOIL	0	10-1-92
B-1-WATER	B-1	57	WATER	0	10-2-92

INTERNATIONAL TECHNOLOGY CORPORATION

HEADSPACE TESTING FOR VOLATILES

PROJECT NAME: ENRON, HOBBS 5
ENGINEER/GEOLOGIST: J. S. RAUGUST
PROJECT NO.: 301541.02
DATE: 10-1-92
INSTRUMENT TYPE: FOXBORO MODEL 128-GC FID
CALIBRATION DATE: 10-1-92
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-2-1	B-2	6.0	SOIL	0	10-1-92
B-2-2	B-2	11.0	SOIL	0	10-1-92
B-2-3	B-2	16.0	SOIL	0	10-1-92
B-2-4	B-2	21.0	SOIL	0	10-1-92
B-2-5	B-2	26.0	SOIL	0	10-1-92
B-2-6	B-2	31.0	SOIL	0	10-1-92
B-2-7	B-2	36.0	SOIL	0	10-1-92
B-2-8	B-2	40.0	SOIL	0	10-1-92
B-2-9	B-2	46.0	SOIL	0	10-1-92
B-2-10	B-2	51.0	SOIL	0	10-1-92

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INTERNATIONAL TECHNOLOGY CORPORATION

HEADSPACE TESTING FOR VOLATILES

PROJECT NAME: ENRON, HOBBS 5
ENGINEER/GEOLOGIST: J. S. RAUGUST
PROJECT NO.: 301541.02
DATE: 10-1-92
INSTRUMENT TYPE: FOXBORO MODEL 128-GC FID
CALIBRATION DATE: 10-1-92, 10-2-92
SERIAL NO.: A51822
CALIBRATION GAS TYPE/CONCENTRATION: 97.8 ppm METHANE
PHOTOIONIZATION BULB POWER (eυ): NA
ROOM TEMPERATURE (°F): 70°

SAMPLE NUMBER	SAMPLING LOCATION	SAMPLE DEPTH (FEET)	SAMPLE MATRIX	PEAK INSTRUMENT READING (ppm)	COMMENTS
B-3-1	B-3	6.0	SOIL	230	10-1-92
B-3-2	B-3	11.0	SOIL	0	10-1-92
B-3-3	B-3	16.0	SOIL	0	10-1-92
B-3-4	B-3	21.0	SOIL	0	10-1-92
B-3-5	B-3	26.0	SOIL	0	10-1-92
B-3-6	B-3	33.0	SOIL	0	10-1-92
B-3-7	B-3	36.0	SOIL	0	10-2-92
B-3-8	B-3	41.0	SOIL	0	10-2-92
B-3-9	B-3	46.0	SOIL	0	10-2-92
B-3-10	B-3	51.0	SOIL	0	10-2-92

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INTERNATIONAL TECHNOLOGY CORPORATION

HEADSPACE TESTING FOR VOLATILES

PROJECT NAME: ENRON, HOBBS 5
ENGINEER/GEOLOGIST: J. S. RAUGUST
PROJECT NO.: 301541.02
DATE: 10-2-92
INSTRUMENT TYPE: FOXBORO MODEL 128-GC FID
CALIBRATION DATE: 10-2-92
SERIAL NO.: A51822
CALIBRATION GAS TYPE/CONCENTRATION: 97.8 ppm METHANE
PHOTOIONIZATION BULB POWER (ev): NA
ROOM TEMPERATURE (°F): 80°

SAMPLE NUMBER	SAMPLING LOCATION	SAMPLE DEPTH (FEET)	SAMPLE MATRIX	PEAK INSTRUMENT READING (ppm)	COMMENTS
B-4-1	B-4	6.0	SOIL	0	10-2-92
B-4-2	B-4	11.0	SOIL	0	10-2-92
B-4-3	B-4	16.0	SOIL	0	10-2-92
B-4-4	B-4	21.0	SOIL	0	10-2-92
B-4-5	B-4	26.0	SOIL	0	10-2-92
B-4-6	B-4	31.0	SOIL	0	10-2-92

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
SITE-SPECIFIC HEALTH AND SAFETY PLAN

INTERNATIONAL TECHNOLOGY CORPORATION

Health and Safety Plan

Project Name: Enron Liquid Fuels Company

Project Number: 301541.001 and 301541.002

Site: Hobbs #1 and Hobbs #5 Compressor Stations

Proposed Dates of Project: **Beginning Date:** 8/24/92 **Ending Date:** 8/31/92

Project Manager: J.S. Raugust Signature: J.S. Raugust Date: 9-30-92

Author: J.S. Raugust Signature: J.S. Raugust Date: 9-30-92

I have read and approved this Health and Safety Plan (HASP) with respect to present hazards, regulations, requirements, and IT Procedures.

Health & Safety Officer:

CERTIFICATION STAMP

Name: J. Ellis, CIH

Signature: J. Ellis

Date: 9-29-92

DECLARATION OF UNDERSTANDING

Site Health and Safety Plan Acknowledgement

I have read and understand this Health and Safety Plan (HASP), and agree to abide by the procedures and limitations specified here and in the IT "Safety Rules for Contractors".

Name	Signature	Employer	Employee Number	Date
1) J. Steven Raugust		IT Corporation	12600	9/30/92
2) James W. Dawson		IT Corporation	10144	
3) Michael N. Kreese		Enron Gas Processing	585-84-1912	9-30-92
4) JAMES WALKER		G.P.I		9-30-92
5) Tony Taberos		G.P.I		9/30/92
6) Amador Hernandez		G.P.I.	163	9/30/92
7) WILLIAM E ELLIOTT		Enron Gas Processing	525-17-4065	10-5-92
8)				
9)				
10)				

NOTES:

1. All personnel signing above must appear in part G, *Personnel Categorization.*
2. All contractors to IT must abide by the specifications and limitations contained in this HASP.
3. All personnel working on-site must sign this form.
4. This HASP is to be used in conjunction with the Tailgate Safety Meeting form, IT Employee Health and Safety Work Rules, and IT General Safety Rules for Contractors.

Section A General Project Information

Investigative Objective: Installation of fueling area vapor extraction wells.

Type of rig: Drilling rig air rotary hollow-stem combination-gardner-Denver.

Project Background Review:

Complete	X	Not Available	
Preliminary		Further Study	

Project HASP Summary

Level(s) of Protection:

A	B	C	D	Mix.	Mod.
			X		

Overall Hazard Estimate:

High	Moderate	Low	Unknown
		X	

Additional Documentation:

TLV Table	Full HASP	Sampling Methods	Other:	
			X	Training Cert., Analytical Data

Section B Site/Material Characteristics

Material Waste Type(s): [X] Liquid [ ] Solid [X] Gas [ ] Sludge **IN** [ ] Drums [ ] Tanks Soil Other

Characteristics: [X] Ignitable [ ] Corrosive [ ] Toxic [ ] Reactive

Facility:

Type: Natural Gas Compressor Station

Open? Yes

Closed? [ ] When?

Size? N/A

Terrain: Flat, paved

Indoors? No

Confined? No

Principal Disposal Method: Drill cuttings will be containerized in 55 gallon drums.

Confined Spaces: No confined spaces.

NOTE: Inspection/Test form completion required if confined space involved.

Additional Information Attached: [ ]

Site History: Leaks from USTs at plant sites in Summer 1992. Towels removed and some of the contaminated soil removed. This is a hydrogeologic investigation to assess the extent of the contamination.

Section C Hazard Analysis

Evaluation of the principal hazards for each site and operation identified in the Work Plan.

Chemical Substances:

Possible petroleum constituents in soil. Possible petroleum vapors in open borings, wells, and headspace jars.

Potential exposure to benzene.

Physical Agents: (Radio frequency, heat/cold stress, noise, UV, etc.)

Heat stress possible.

Radiological:

None expected.

Biological:

Snakes, bugs, etc.

Environmental: ("Physical" elements contributing to the potential for accidents)

Slip, trip, and fall hazards. Pinch and crush hazards associated with drilling equipment.

The site supervisor will evaluate hazards prior to work. Hazards will be mitigated if possible or the Health and Safety Officer will be contacted for upgrade of this plan.

Section D Site Control

Attach Map or Sketch (if available), Identify:

Work Zones		Required Levels of Protection	X	Known Hazards	
Perimeter		First Aid Equipment		Safety Equipment	

Personal Protection Required:

A	B	C	D	Mixed	Modified
		X	X		

Note: Minimum Level D equipment is hardhat, steel-toe boots, safety glasses, and coveralls. All hardhats, glasses, boots, etc. must be ANSI approved, Herring Protection.

Mixed (Areas/Levels):

Modified (Action Levels/Modifications): Half-face or full-face respirator with dust/organic vapor cartridges must be available on site if upgrade to Level C required. Upgrade at average breathing zone readings of 1 ppm.

NOTE: Minimum Level D equipment is steel-toe boots, safety glasses, and coveralls. All glasses, boots, etc., must be ANSI-approved.

Additional Personal Protective Equipment Information:

Surveillance Equipment:

	X		OVA/FID	
PID	FID	Detector Tubes	Types	
Oxygen	Explosimeter	Radiation	Heat Stress	Diffusion Badge
Toxic Gas	Particulate Sampling	OVA Sampling	BNAP Sampling	Other

Surveillance Frequency: Freq.: Continuous, every one-half hour or if conditions change.

Types(s) and Location(s):

Type(s):	FID
Location(s):	Breathing zones
Calibration:	Methane calibration has upgrade to Level C if breathing zone reading above 1 ppm. Calibrate beginning and end of each day.

Section E Site Operations/Documentation

Initial Hotline Location: To be established on site.

Initial Command Post Location:

Equipment Decon:

1	Steam or Alconox wash	4	
2	Distilled-water rinse (2)	5	
3		6	

Personnel Decon:

1	Equipment decon, wash boots, soap and water wash	4	Shower end of day
2	Tap-water rinse, rinse boots	5	
3	Field wash--hands/face	6	

Special Facilities Required: Portable steam cleaning unit at decontamination pad.

Site Entry Procedure:

Team Size: 3 **Prefield Briefing Date** N/A

Work Schedule: Daylight hours only

Schedule Limitations: N/A

Other Information: Team includes:
IT Geologist
Geoprojects International-drilling subcontractor
2 Drillers

Section F Emergency Procedures

Emergency Actions

Fire: Use of fire extinguisher, notify county personnel.

Explosion: Abandon site, notify county.

Weather: Cease operations if weather conditions unsafe.

PPE:

Injury: **See attached Accident Checklist**

Spill: N/A

PPE:

Police:	397-7546	**CHEMTREC:**	(800) 424-9300
Fire:	911	**Client:**	(713) 853-3594
Medical:	392-6581		

Section F Emergency Procedures (continued)

Chemical Exposure Actions

Substance	Symptoms of Exposure	Treatment	TWA	STEL	*Source	IDLH
Benzene	Headache, nausea, unconsciousness, dizziness, eye and skin irritant.	Fresh air, irrigate affected area, first aid/CPR, if required. Medical attention may be required.	1 ppm*	5 ppm*	PEL TLV REL	3000 ppm
Toluene	Headache, nausea, unconsciousness, dizziness, eye and skin irritant, weakness, dilated pupils, euphoria.	Fresh air, irrigate affected area, first aid/CPR, if required. Medical attention may be required.	100 ppm	150 ppm	PEL TLV REL	2000 ppm
Ethylbenzene	Headache, nausea, unconsciousness, dizziness, eye and skin irritant.	Fresh air, irrigate affected area, first aid/CPR, if required. Medical attention may be required.	100 ppm	125 ppm	PEL TLV REL	2000 ppm
Xylene	Headache, nausea, unconsciousness, dizziness, eye and skin irritant, drowsiness, staggering, corneal vacuolization if contact with eyes.	Fresh air, irrigate affected area, first aid/CPR, if required. Medical attention may be required.	100 ppm	~~125 ppm~~ 150	PEL TLV REL	1000 ppm
					PEL TLV REL	
					PEL TLV REL	

See attached

***PEL (OSHA)**
TLV (ACGIH)
REL (NIOSH)

INTERNATIONAL TECHNOLOGY CORPORATION

Name of Person(s) _____
Date of Incident _____
Time (24 hr clock) _____
Exact location of incident _____
Job Title _____ Job Number _____
Supervisor _____ _____
Printed Name Signature

Supervisor's Accident/Injury/Near Miss Checklist		
Step	**Action/Requirement**	**Date/Time** (24 hr clock)
1	Perform first aid/CPR, as appropriate, and get injured/ill to medical care immediately if required.	
2	Isolate and protect scene of accident (non-automobile)	
3	Report incident by phone to H&S professional and PC Manager immediately after situation is under control.	
4	Complete appropriate form(s) (due to PC Manager in 24 hrs): - Supervisor's Employee Injury Report (Form HS020A) - Vehicle Accident Report (Form HS020B) - Gen. Liability, Prop. Damage, & Loss Report (Form HS020C)	
5	Perform Accident/Incident Investigation as soon as possible and complete Accident Investigation Report (HS020F)	
6	Submit Accident Investigation Report to PC Manager	
7	Supervisor(s) and employee(s) shall meet with Accident Review board at time determined by PC Manager	
8	Employee and supervisor will sign Accident Review Board Report	
9	As required by report, supervisor(s) and employee(s) will perform steps or take actions as required by Accident Review Board Report	
10	Turn this form in to Health and Safety Manager	

NOTE: Employees are required to report all injuries, illnesses, accidents, and near misses.

Section G Personnel Information

1) Name:	Raugust, Jon S.	**2) Position/Title:**	Project Hydrogeologist
3) Duties:	Site Geologist	**4) Reports To:**	Jim Dawson
5) Initial Training Date:	3/16/88	**6) Special Training:**	
7) Refresher Training in the last 12 months			
Type:	HPR		HPL/SR, HPR, FA, CPR, DRIVE, QP, SUPER, CGT
Date Completed:	8/19/92		
8) Site Supervisor Training Required?	Yes [X] No [ ]	**9) Last Physical Date:**	8/18/92
Date Completed:	9/29/89		
10) Restrictions?	Yes [X] No [ ]	**11) Restriction:**	Hearing

1) Name:	Dawson, James	**2) Position/Title:**	Section Manager
3) Duties:	Project Manager	**4) Reports To:**	Keith Schardein
5) Initial Training Date:	6/10/88	**6) Special Training:**	
7) Refresher Training in the last 12 months			
Type:	HPR		HPL/SR, HPR, RAD, DRIVE, QP
Date Completed:	8/13/92		
8) Site Supervisor Training Required?	Yes [ ] No [X]	**9) Last Physical Date:**	2/25/92
Date Completed:			
10) Restrictions?	Yes [ ] No [X]	**11) Restriction:**	

APPENDIX
D

91A-9-91

APPENDIX D
SAMPLE CONTROL DOCUMENTATION

B210058

INTERNATIONAL TECHNOLOGY CORPORATION

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD*

Reference Document No. 318800
Page 1 of 1

Project Name/No.[1] ENRON
Sample Team Members[2] J.S. RAULUST
Profit Center No.[3] 3515
Project Manager[4] J. DAWSON TO BE PHONED IN
Purchase Order No.[6]
Required Report Date[11] NORMAL

Samples Shipment Date[7] 10-1-92
Lab Destination[8] ITAS AUSTIN
Lab Contact[9] KARMEN DEANE
Project Contact/Phone[12] STEVE RAULUST (505) 262-6600
Carrier/Waybill No.[13] FEDEX 2893960241 10/2/92 OS

Bill to:[5] IT ALBUQUERQUE

Report to:[10] STEVE RAULUST ITAS 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-1-5	SOIL	9/30/92 14:35	GLASS	2x125 ml	ICE	BTEX BY EPA 8020 TPH BY 418.1	GOOD LOG SEALED 10/2/92 OS	
B-1-11	SOIL	9-30-92 1700	GLASS	2½x6 INCH	ICE	↓	↓	
B-2-5	↓	10-1-92 11:00	↓	↓	↓	↓	↓	
B-2-10	↓	10-1-92 1400	↓	↓	↓	↓	↓	

Special Instructions:[23] VOLATILE HYDROCARBONS LOW CONCENTRATIONS

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: 10-1-92 Time: 14:15	1. Received by[28] (Signature/Affiliation)	Date: Time:
2. Relinquished by (Signature/Affiliation)	Date: 10-1-92 Time: 15:07	2. Received by (Signature/Affiliation)	Date: 10/2/92 Time: 0924
3. Relinquished by (Signature/Affiliation)	Date: Time:	3. Received by (Signature/Affiliation)	Date: Time:

Comments:[29]

MCA 3/15/91

INTERNATIONAL TECHNOLOGY CORPORATION

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD*

B210059

Reference Document No. 318799

Page 1 of 1

Project Name/No.[1] ENRON

Sample Team Members[2] J.S. RAUHUST

Profit Center No.[3] 3515

Project Manager[4] DAWSON

Purchase Order No.[6] WILL PHONE IN

Required Report Date[11] NORMAL

Samples Shipment Date[7] 10-2-92

Lab Destination[8] LTAS AUSTIN

Lab Contact[9] KARMEN DEANE

Project Contact/Phone[12] STEVE RAUHUST (505) 262-6600

Carrier/Waybill No.[13] HSB3159 50

Bill to:[5] IT ALBUQUERQUE

Report to:[10] STEVE RAUHUST 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-3-1	SOIL	10-1-92 1530	2½x6-INCH BRASS	2½x6 INCH	ICE	BTEX BY EPA 8020 TPH BY EPA 418.1	6000 17°C	
B-3-2	↓	10-1-92 15:40	↓	↓	↓	↓	See COC 10/5/92	
B-3-5	↓	10-1-92 16:20	↓	↓	↓	↓	↓	
B-4-2	↓	10-2-92 10:30	↓	↓	↓	↓	↓	
B-4-4	↓	10-2-92 11:00	↓	↓	↓	↓	↓	

Special Instructions:[23] VOLATILE HYDROCARBONS, LOW CONCENTRATIONS

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)	IT CORP	Date: 10-2-92 Time: 1400	1. Received by[28] (Signature/Affiliation)	Date: Time:
2. Relinquished by (Signature/Affiliation)	ENRON CORP	Date: 10-2-92 Time: 15:50	2. Received by (Signature/Affiliation)	Date: 10/5/92 Time: 0947
3. Relinquished by (Signature/Affiliation)		Date: Time:	3. Received by (Signature/Affiliation)	Date: Time:

Comments:[29]

MCA 3/15/91

White: To accompany samples Yellow: Field copy

*See back of form for special instructions.

APPENDIX
E

APPENDIX E
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: B2-10-058

This is the Certificate of Analysis for the following samples:

Client Work ID: SOIL 301541-002
Date Received: 10/02/92
Number of Samples: 4
Sample Type: SOIL

I. Introduction

Samples were labeled as follows:

SAMPLE IDENTIFICATION	LABORATORY #
B-1-5	B2-10-058-01
B-1-11	B2-10-058-02
B-2-5	B2-10-058-03
B-2-10	B2-10-058-04

Reviewed and Approved:

Jon Bartell
Laboratory Director

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

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

301541-002

Work Order: B2-10-058

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: SOIL

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

301541-002

Work Order: B2-10-058

SAMPLE ID: B-1-5
SAMPLE DATE: 09/30/92
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: SOIL

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

301541-002

Work Order: B2-10-058

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

SAMPLE ID: **B-1-5**
SAMPLE DATE: **09/30/92**
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: SOIL

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

301541-002

Work Order: B2-10-058

SAMPLE ID: B-1-11
SAMPLE DATE: 09/30/92
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

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

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

301541-002

Work Order: B2-10-058

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

SAMPLE ID: **B-1-11**
SAMPLE DATE: **09/30/92**
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: SOIL

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

301541-002

Work Order: B2-10-058

SAMPLE ID: **B-2-5**
SAMPLE DATE: **10/01/92**
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

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

Company: ENRON
Date: 10/12/92
Client Work ID: SOIL 301541-002 Work Order: B2-10-058

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

SAMPLE ID: **B-2-5**
SAMPLE DATE: **10/01/92**
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: SOIL

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

301541-002

Work Order: B2-10-058

SAMPLE ID: **B-2-10**
SAMPLE DATE: **10/01/92**
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: SOIL

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

301541-002

Work Order: B2-10-058

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

SAMPLE ID: **B-2-10**
SAMPLE DATE: **10/01/92**
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

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

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

301541-002

Work Order: B2-10-058

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.

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: B2-10-059

This is the Certificate of Analysis for the following samples:

Client Work ID: SOIL 301541-002
Date Received: 10/05/92
Number of Samples: 5
Sample Type: SOIL

I. Introduction

Samples were labeled as follows:

SAMPLE IDENTIFICATION	LABORATORY #
B-3-1	B2-10-059-01
B-3-2	B2-10-059-02
B-3-5	B2-10-059-03
B-4-2	B2-10-059-04
B-4-4	B2-10-059-05

Reviewed and Approved:

Jon Bartell
Laboratory Director

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

Company: ENRON
Date: 10/12/92
Client Work ID: SOIL 301541-002 Work Order: B2-10-059

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: SOIL

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

301541-002

Work Order: B2-10-059

SAMPLE ID: B-3-1
SAMPLE DATE: 10/01/92
SAMPLE MATRIX: SOIL

Test Name	Note Ref	Result	Reporting Limit	Units	Date Analyzed	Method Reference
9071 Prep & IR Analysis		170	13	mg/kg	10/11/92	EPA9071

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

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

301541-002

Work Order: B2-10-059

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

SAMPLE ID: **B-3-1**
SAMPLE DATE: **10/01/92**
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	101

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

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

301541-002

Work Order: B2-10-059

SAMPLE ID: B-3-2
SAMPLE DATE: 10/01/92
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

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

301541-002

IT ANALYTICAL SERVICES
AUSTIN, TX
(512) 892-6684
Work Order: B2-10-059

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

SAMPLE ID: **B-3-2**
SAMPLE DATE: **10/01/92**
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	102

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

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

301541-002

Work Order: B2-10-059

SAMPLE ID: B-3-5
SAMPLE DATE: 10/01/92
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: SOIL

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

301541-002

Work Order: B2-10-059

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

SAMPLE ID: **B-3-5**
SAMPLE DATE: **10/01/92**
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	101

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

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

301541-002

Work Order: B2-10-059

SAMPLE ID: B-4-2
SAMPLE DATE: 10/02/92
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

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

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

301541-002

Work Order: B2-10-059

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

SAMPLE ID: **B-4-2**
SAMPLE DATE: **10/02/92**
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	102

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

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

301541-002

Work Order: B2-10-059

SAMPLE ID: B-4-4
SAMPLE DATE: 10/02/92
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

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301541-002

Work Order: B2-10-059

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

SAMPLE ID: **B-4-4**
SAMPLE DATE: **10/02/92**
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	102

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Referenced notes for this work order:

B210059

Samples received at 17 degrees C.

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301541-002

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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.