RELEASE REPORT

ANNUAL MONITORING REPORT

EOTT PIPELINE COMPANY
TNM 96-16
LEA COUNTY, NEW MEXICO

PREPARED FOR:

EOTT PIPELINE COMPANY
P. O. BOX
MIDLAND, TEXAS 79704

Ms. Lennah Frost

PREPARED BY:

ENVIRONMENTAL TECHNOLOGY GROUP, INC.
4600 WEST WALL STREET
MIDLAND, TEXAS 79704

March 2000

TABLE OF CONTENTS

INTRODUCTION

Environmental Technology Group, Inc. (ETGI), on behalf of EOTT Energy Corp. (EOTT), prepared this annual report in compliance with the New Mexico Oil Conservation Division (OCD) letter of May 1998, requiring submittal of an annual report by April 1 of each year. The report presents the results of the quarterly ground water monitoring events only. For reference, a site location map is provided as Figure 1.

Ground water monitoring was conducted during the fourth quarter in 1999 to assess the levels and extent of dissolved phase and free phase petroleum hydrocarbon constituents. The groundwater monitoring events consisted of measuring static water levels in the monitoring wells, checking for the presence of phase-separated hydrocarbons (PSH), and purging and sampling of each well exhibiting sufficient recharge. Monitoring wells containing measurable levels of PSH were not sampled.

FIELD ACTIVITIES

The site monitoring well was gauged and sampled on December 3, 1999. During the sampling event, the monitoring well, designated to be sampled, was purged of approximately 3 well volumes of water or until the wells were dry using a PVC bailer or electrical Grundfos Pump. Groundwater was allowed to recharge and samples were obtained using disposable Teflon samplers. Monitoring wells with a measurable presence of PSH were not sampled. Water samples were stored in clean, glass containers provided by the laboratory and placed on ice in the field. Purge water was collected in a polystyrene tank and disposed of by Pate Trucking, Hobbs, New Mexico, utilizing a licensed disposal facility (OCD AO SWD-730).

GROUNDWATER GRADIENT

Location of the monitoring well is depicted on Figure 2. The ground water elevation data are provided as Table 1. The ground water gradient can not be determined with one well at the site. The depth to groundwater, as measured from the top of the well casing, was 58.40 feet for the shallow alluvial aquifer. There was no PSH detected in the monitoring well.

LABORATORY RESULTS

The ground water sample, collected during the fourth quarter, was hand delivered to Environmental Laboratory of Texas, Midland, Texas for determination of benzene, toluene, ethyl benzene and total xylenes (BTEX) concentrations by EPA Method SW846-8020 and 8021B. The ground water chemistry data are provided as Table 2 and the Laboratory Report is provided as Appendix A.

Laboratory results for the site ground water sample indicated that BTEX concentrations were below detection limits. The TPH concentrations were also below detection limits.

SUMMARY

This report presents the results of the single monitoring event conducted in the calendar year 1999. No PSH was detected in the site well during the event. Dissolved phase concentrations of BTEX and TPH were non-detect in the monitoring well.

FIGURES

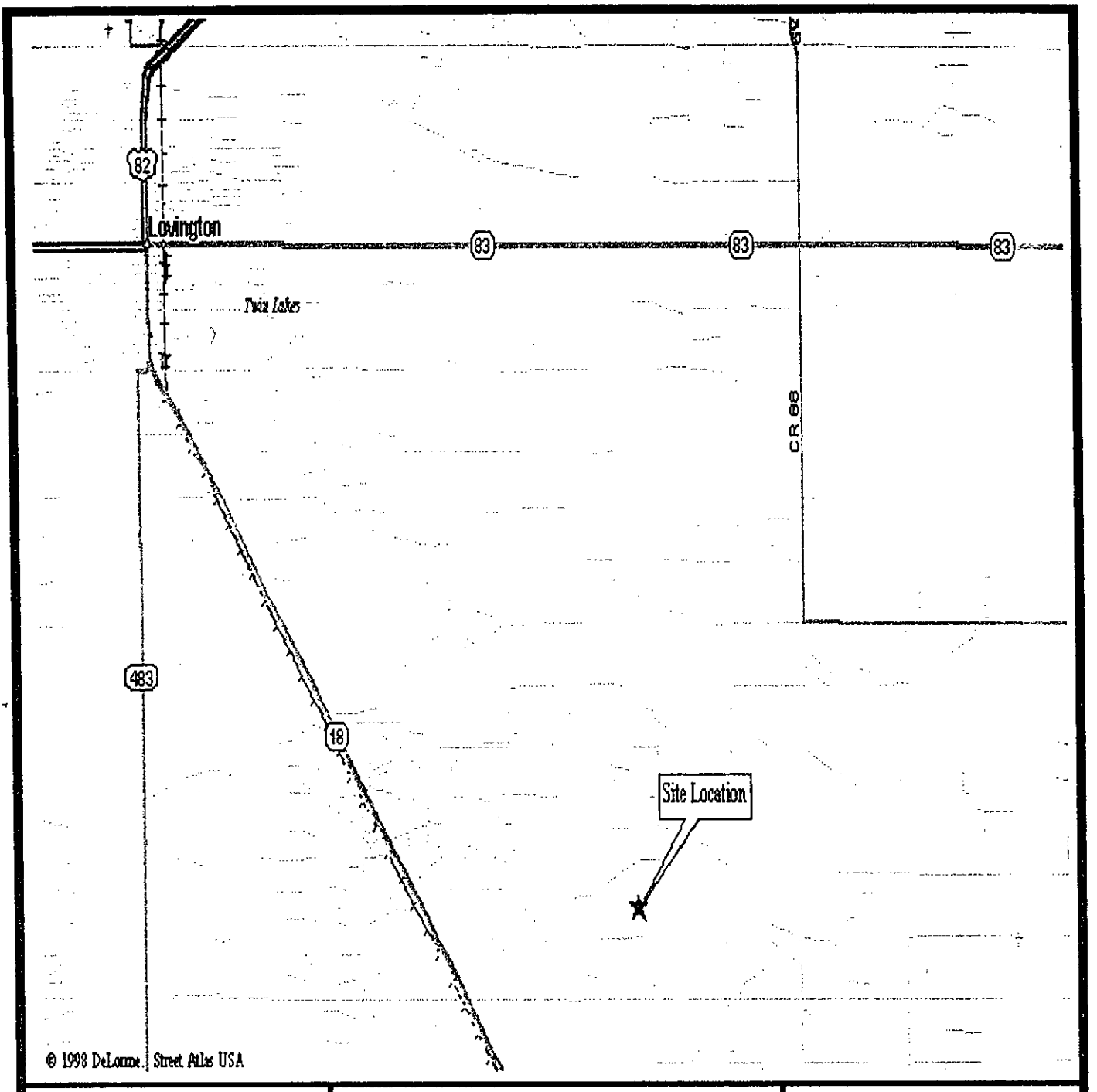
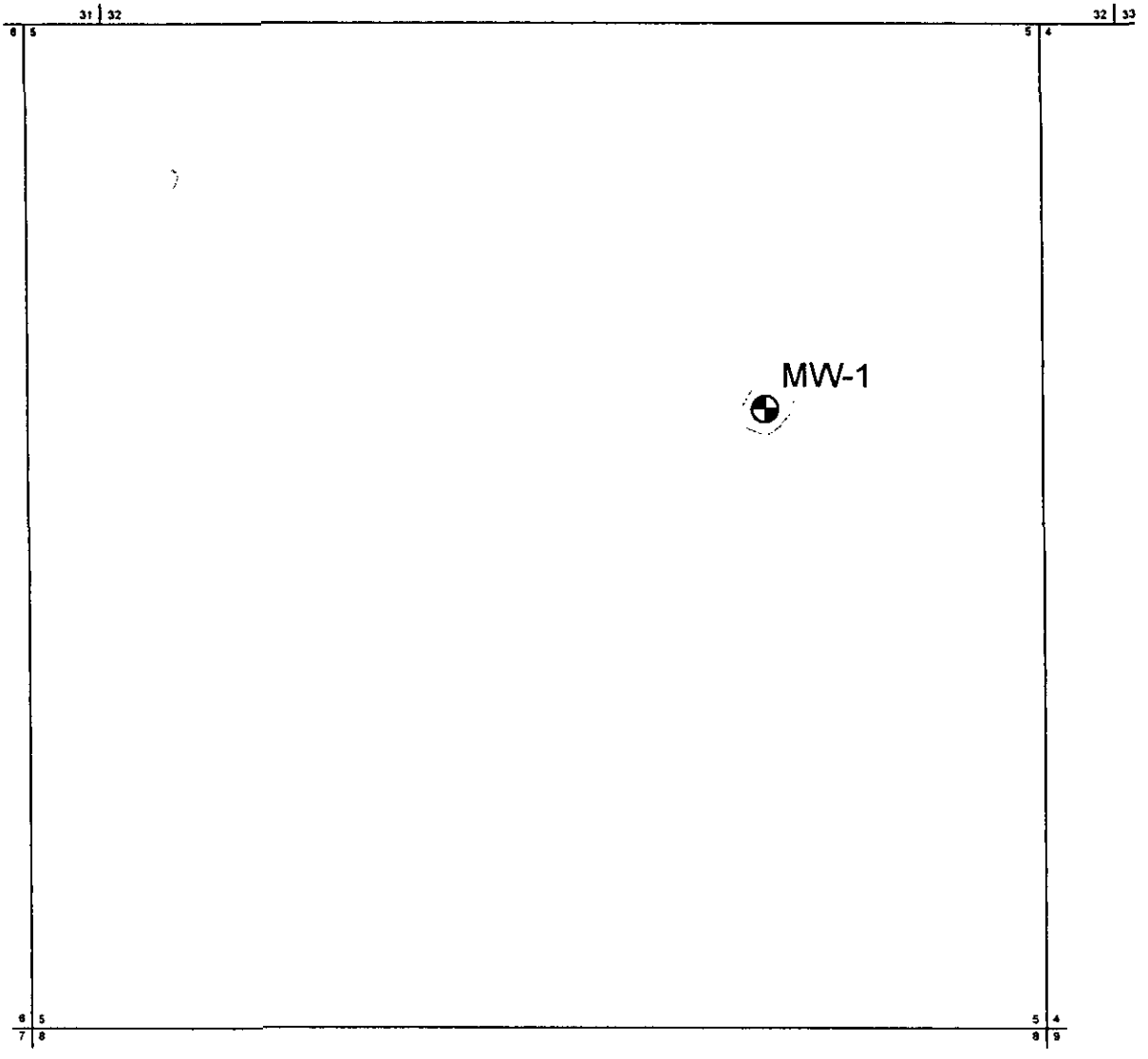


FIGURE 1	Site Location Map	Environmental Technology Group, Inc.
Not To Scale	EOTT Energy Corp. TNM 96-16 Lea County, NM	03 - 08 - 00 RS
		ETGI Project # EOT 1015C



LEGEND:

KEI Monitoring Well Location

Figure 2
Site Map

EOTT Energy Corp.
TNM 96-16
Lea County, NM

Environmental Technology Group, INC.

Scale: 1" = 80'	Prep By: RS	Checked By: KD
March 8, 2000	ETGI Project # EOT 1015C	

TABLES

TABLE 1
GROUNDWATER ELEVATION TABLE
TNM 96-16
LEA COUNTY, NM
ETGI PROJECT# EOT1015C

WELL NUMBER	CASING WELL ELEVATION	DEPTH TO PRODUCT	DEPTH TO WATER	PSH THICKNESS	CORRECTED GROUNDWATER ELEVATION
MW-1	3792.27	ND	58.40	0.00	3,733.87

TABLE 2
GROUND WATER CHEMISTRY
TNM 96-16
LEA COUNTY, NEW MEXICO
ETGI PROJECT# EOT1015C

SAMPLE LOCATION	SAMPLE DATE	Methods: EPA SW 846-8021B, 5030					Methods: EPA SW 846-8015M GRO/DRO	
		BENZENE (mg/L)	TOLUENE (mg/L)	ETHYL-BENZENE (mg/L)	m,p-XYLENE (mg/L)	o-XYLENE (mg/L)	GRO C6-C10 (mg/L)	DRO >C10-C25 (mg/L)
MW-1	12/03/00	<0.100	<0.100	<0.100	<0.100	<0.100	<0.5	<0.5

APPENDIX A

ENVIRONMENTAL LAB OF , INC.

"Don't Treat Your Soil Like Dirt!"

ENVIRONMENTAL TECHNOLOGY GROUP, INC.
ATTN: MR. JESSE TAYLOR
P.O. BOX 4845
MIDLAND, TEXAS 79704
FAX: 505-392-3760

Sample Type: Water
Sample Condition: Intact/Iced/HCl
Project #: EOT1015C
Project Name: TNM 96-16
Project Location: Monument, N.M.

Sampling Date: 12/03/99
Receiving Date: 12/10/99
Analysis Date: 12/13/99

ELT#	FIELD CODE	BENZENE mg/L	TOLUENE mg/L	ETHYLBENZENE mg/L	m,p-XYLENE mg/L	o-XYLENE mg/L
22207	MW-1	<0.001	<0.001	<0.001	<0.001	<0.001
	% IA	93	89	90	90	90
	% EA	91	88	89	89	88
	BLANK	<0.001	<0.001	<0.001	<0.001	<0.001

METHODS: EPA SW 846-8021B,5030

Raland K. Tuttle

12-13-99
Date

ENVIRONMENTAL LAB OF , INC.

"Don't Treat Your Soil Like Dirt!"

ENVIRONMENTAL TECHNOLOGY GROUP, INC.
ATTN: MR. JESSE TAYLOR
P.O. BOX 4845
MIDLAND, TEXAS 79704
FAX: 505-392-3760

Sample Type: Water
Sample Condition: Intact/Iced/HCl
Project #: EOT1015C
Project Name: TNM 96-16
Project Location: Lea County, N.M.

Sampling Date: 12/03/99
Receiving Date: 12/10/99
Analysis Date: 12/10/99

ELT#	FIELD CODE	GRO C6-C10 mg/L	DRO >C10-C25 mg/L
22207	MW-1	<0.5	<0.5
	%INSTRUMENT ACCURACY	114	106
	% EXTRACTION ACCURACY	105	78
	BLANK	<0.5	<0.5

Methods: EPA SW 846-8015M GRO/DRO

Raland K. Tuttle

12-13-99
Date

Environmental Lab of Texas, Inc.

12600 West I-20 East Odessa, Texas 79763
(915) 563-1800 FAX (915) 563-1713

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST

COC 047

Project Manager: Jesse Taylor	Phone #: (915) 664-9160
	FAX #: (505) 392-3760
Company Name & Address: ETGI P.O. Box 4845 Midland Tx 79704	
Project #: 601015C	Project Name: TNM 96-16
Project Location: Lea County, NM	Sampler Signature: Sylmon Casas

LAB # (LAB USE ONLY)	FIELD CODE	# CONTAINERS	Volume/Amount	MATRIX: WATER	SOIL	AIR	SLUDGE	OTHER	PRESERVATIVE METHOD: HCL	HNO3	ICE	NONE	OTHER	SAMPLING: DATE (1999)	TIME	BTEX 8021B/5030	TPH 418.1	TCLP Metals Ag As Ba Cd Cr Pb Hg Se	Total Metals Ag As Ba Cd Cr Pb Hg Se	TCLP Volatiles	TCLP Semi Volatiles	TDS	RCI	TPH 8015 DRO/GRO
22207	mw 1	3	V.5	X					X		X			12-3	1035	X								✓

Relinquished by:	Date:	Times:	Received by:
Sylmon Casas	12/09/99	1300	
	12-10-99	11:45	McMurry
			Received by Laboratory:

REMARKS

Mail Results ; Ken Patton

Invoice : Lennah Frost 1015M

EOTT Energy Partners

Site 96-16
Closure Report

Whole Earth Environmental
19606 San Gabriel
Houston, Tx. 77084

Executive Summary

Location
The site is located approximately two miles east of the Navajo Refinery located on NM Hwy. 18 between Hobbs and Lovington, New Mexico. (See attached plat map). The spill consisted of an unknown volume of crude oil from a ruptured two-inch steel gathering line. There are no streams or permanent surface water impoundments within two miles of the site.

Previous Investigations
The site has been previously characterized in two reports. The first was an initial spill response report generated by Environmental Spill Control for Texas – New Mexico Pipeline Company dated May 20, 1996. Environmental Spill Control removed the stained soils to a depth of approximately nine feet below ground level and placed the contaminated materials in two piles at either end of the excavation. No discernable remediation activities were performed on the contamination piles. The site configuration prior to final excavation is represented by a schematic, (Figure 1), and a photograph included within this Executive Summary

The second investigation was undertaken for Texas – New Mexico Pipeline by KEI (Job No. 610088-1) dated June 26, 1998. KEI took two series of soil borings at the site. The first soil boring (SB-1) indicated TPH concentrations of 33.4 ppm and non-detectable concentrations of BTEX at a depth of 32.5' below the excavated portion of the site. The boring was taken from a depth approximately 9' below ground level, therefore the total depth to the sampling point is 41.5'. The second soil boring showed TPH concentrations of 570 ppm and total BTEX of 5.97 ppm also at a depth of 41.5' below ground level. (KEI test summary enclosed as Table 1 within this section).

Extent of Contamination
Based on the previous site investigations, on July 28th, Whole Earth excavated the shallow end of the pit to a total depth of six feet below ground level and then took a series of five discrete soil samples randomly across the pit bottom. These field tests are documented within the Field Analytical section of this report. The approximate location of each test point is diagramed on the July 28th Field Testing Schematic. The shallow end bottom and side walls were found to have low TPH concentrations (<200 ppm) and the

area was then re-filled to a depth of approximately 3 ½' below ground level with fresh soils obtained from a "borrow pit" located south of the excavation. The purpose of re-filling the excavation was to allow a trackhoe access to the deeper end of the location.

Excavation continued within the deeper end of the site for four days until we encountered a dense sandstone lens at a depth of approximately 35' below ground level. Field testing of the soil using Method 418.1 revealed TPH concentrations of between 2,120 and 9,810 ppm within the various soil horizons. The soil type was heavily fractured calichi and the contamination appeared to follow vertical fissures and re-concentrate at various depths as more solid ledges were encountered.

Water Investigation

On August 11th, Adkins Engineering drilled a recovery well at the southeast edge of the excavation and an additional monitoring well at a point 100' to the southeast of the recovery well. The wells were developed, cased and secured in accordance with Mr. Olson's instructions of July 22. Only clean cuttings were allowed to be placed within the bore annulus. Soil samples were obtained at 5' increments throughout the drilling of the recovery well (reference ELT nos. 19180 – 19188 within the Laboratory Analytical section of this report), and were generally found to be nominal. A spike of 770 ppm TPH was found immediately atop the sandstone layer at a depth of 35-40'.

The wells were developed, cased and secured in accordance with Mr. Olson's instructions of July 22. Water samples were drawn from both wells on August 13th and were analyzed for RCRA 8 Metals, volatile and semi-volatile compounds, BTEX, cations and anions. All concentrations were within NMWQCC acceptance standards.

Liner Installation

At the point of final excavation, a 20 mil liner was spread over the entire excavation. The sides of the liner were brought to surface and the excavation re-filled with remediated soils. Each three foot lift was analyzed in the field and a composite sample for each lift collected for later laboratory analysis. All contaminant concentrations were found to be within acceptance standards (reference ELT nos. 19170 – 19179 within the Laboratory Analytical section of this report).

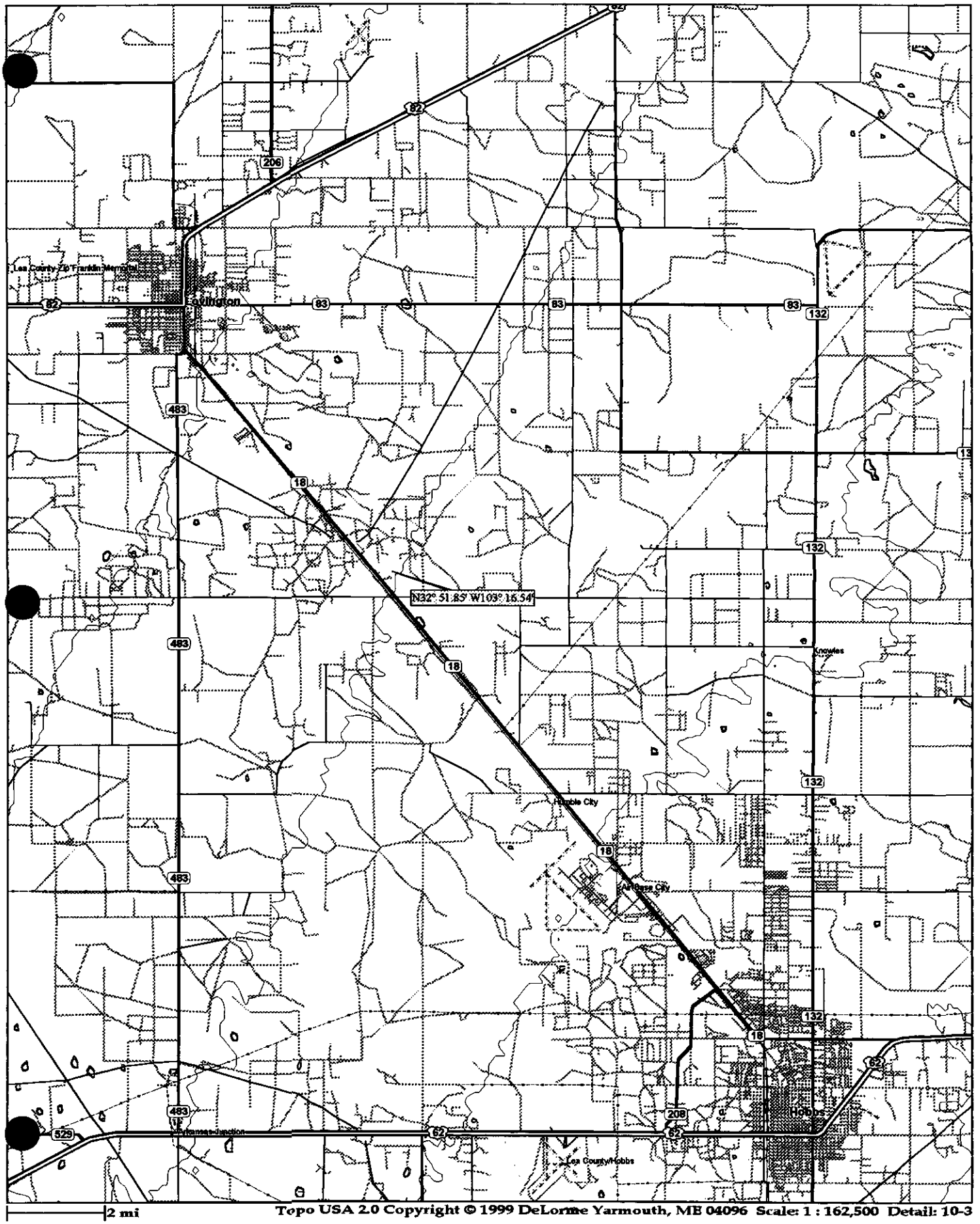
A top liner was installed over the pit at a depth of approximately 5' below ground level. The side walls of the lower liner were extended over the top liner and folded towards the pit center. No plastic was allowed nearer than 3' below ground surface.

Conclusions

It appears that the contamination plume stopped at the surface of the sandstone layer at a depth of approximately 35-40'. There is no evidence of any contaminant migrating into the water table, and it is believed that all significant concentrations were excavated and placed within an impermeable polyethylene barrier.

Recommendations

Due to the sensitivity of the area as being the principal watershed for the City of Lovington, we recommend that both the recovery and monitor wells be tested on an annual basis for a period of four years. If no contaminant concentrations are found to exceed NMWQCC standards, the wells may be permanently plugged and abandoned. Should significant concentrations be discovered, we propose to install a windmill atop the recovery well and initiate an active recovery of the contamination plume.


Lea County-Zip Franklin Memorial
Lovington
N32° 51.85' W103° 16.54'
Knowles
Humble City
Hobbs
Lea County/Hobbs
2 mi
Topo USA 2.0 Copyright © 1999 DeLorme Yarmouth, ME 04096 Scale: 1 : 162,500 Detail: 10-3

Pit remediation and Closure Report

Operator: EOTT Energy Partners Telephone: (915) 684-3467

Address: P.O. Box 1660 Midland, Tx. 79702

Facility or Well Name: Spill 96-16

Location: Unit or Qtr / Qtr Sec.: Sec 11 T 15S R 37E County Lea

Pit Type: Separator ____ Dehydrator ____ Other Flow line Leak

Land Type: BLM ____, State ____, Fee X Other ____

Pit Location: Pit Dimensions: length 84' width 52' depth 36'

Reference: wellhead ____ other ____

Footage from reference : ____

Direction from reference: ____ Degrees ____ East North ____

____ West South ____

Depth to Ground Water:

Less than 50 feet (20 points)
50 feet to 99 feet (10 points)
Greater than 100 feet (0 points) 10

Wellhead Protection Area:

Yes (20 points)
No (0 points) 0

Distance to Surface Water:

Less than 200 feet (20 Points)
200 feet to 1000 feet (10 points)
Greater than 1000 feet (0 points) 0

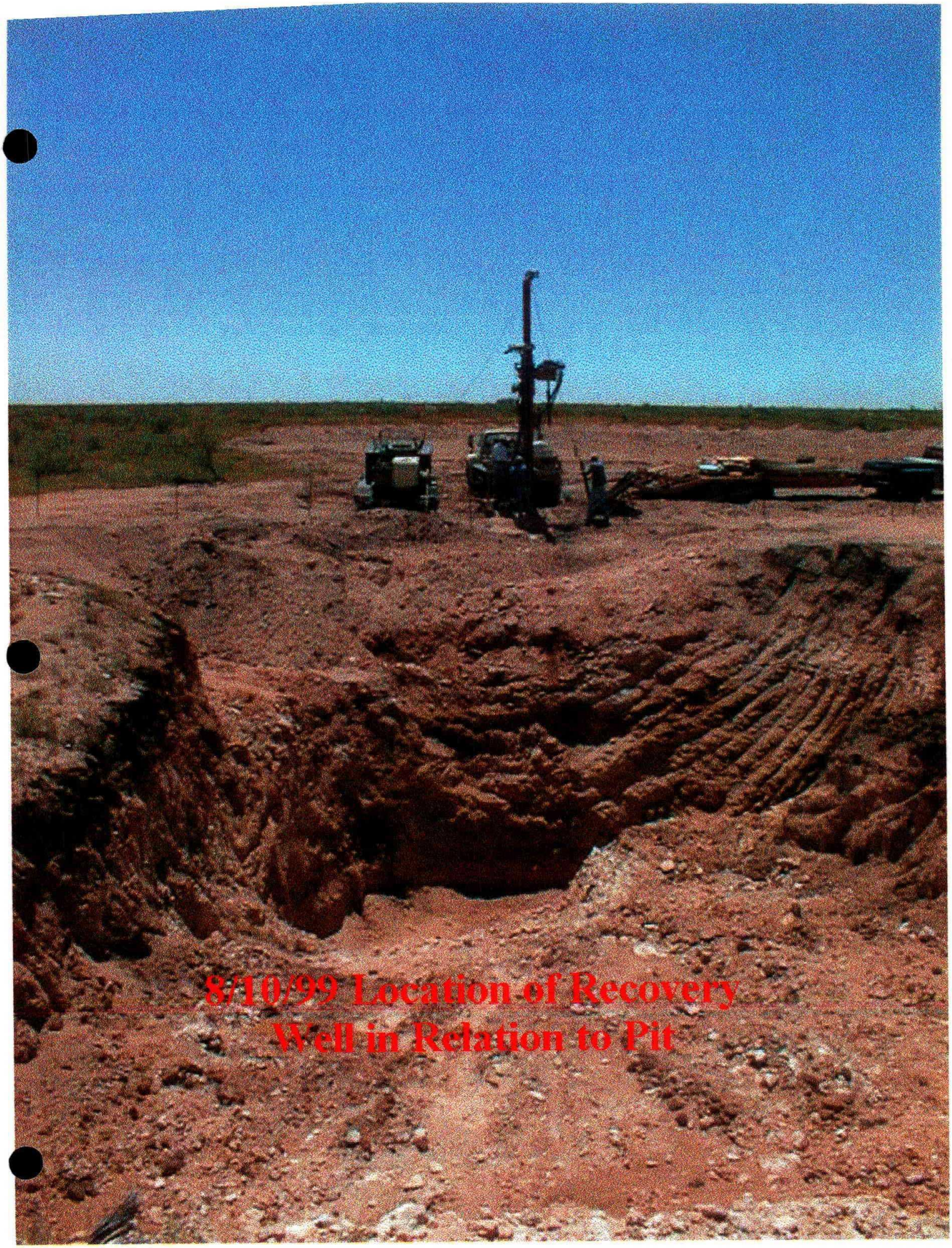
Ranking Score (Total Points): 10

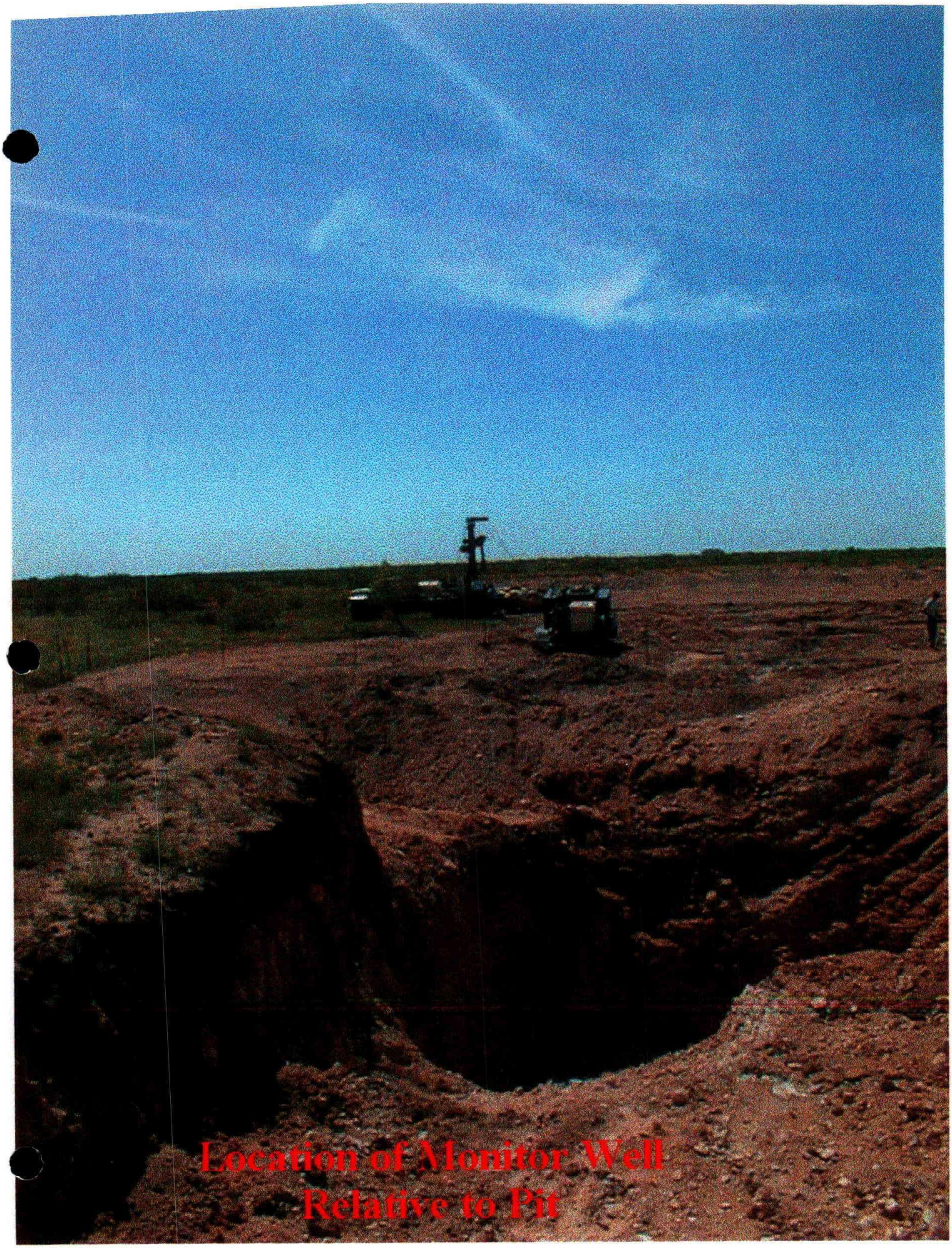
TABLE I

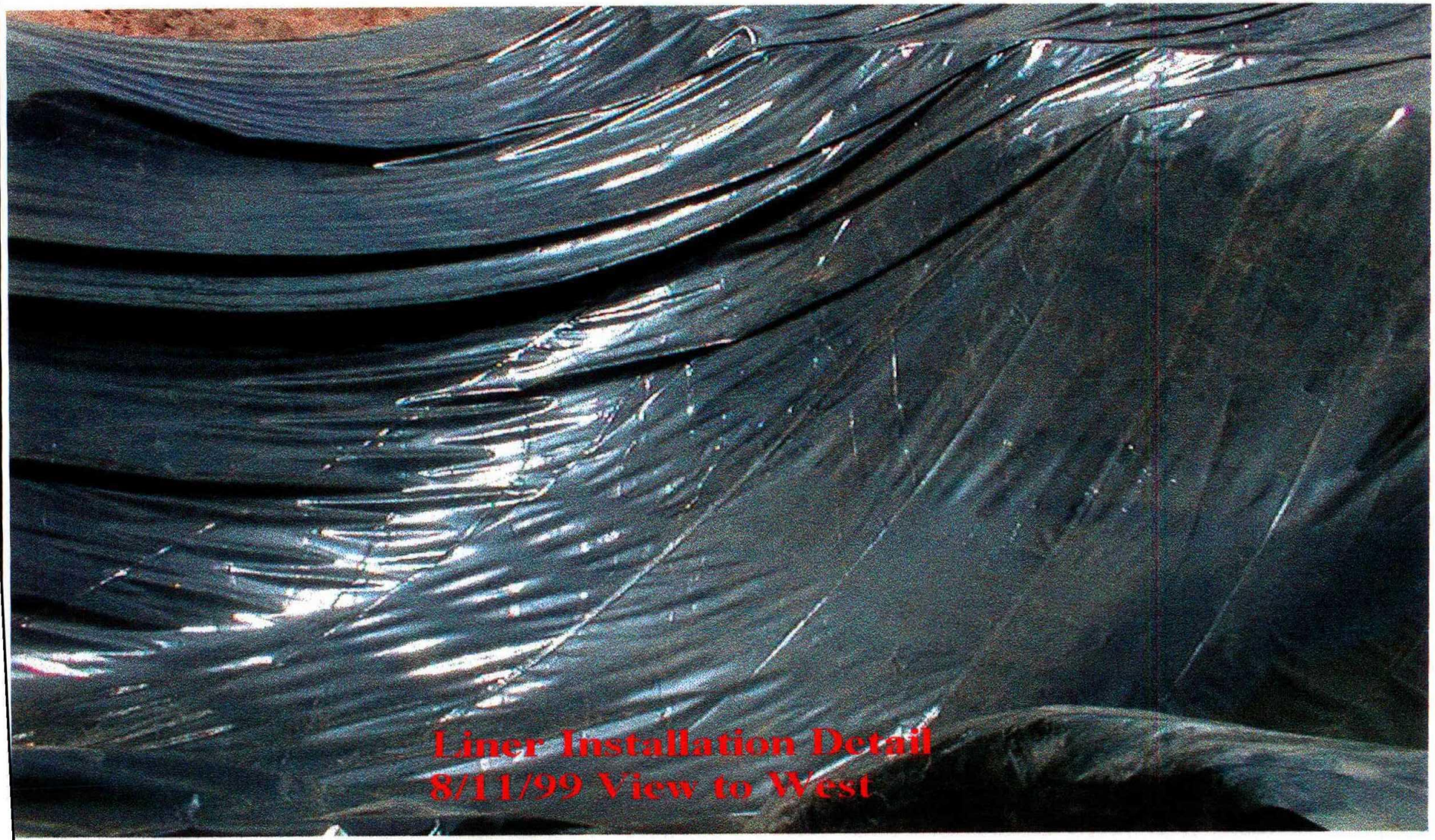
SUMMARY OF SOIL RESULTS - BTEX AND TPH
TEXAS - NEW MEXICO PIPE LINE COMPANY
TNM-96-16
LEA COUNTY, NEW MEXICO

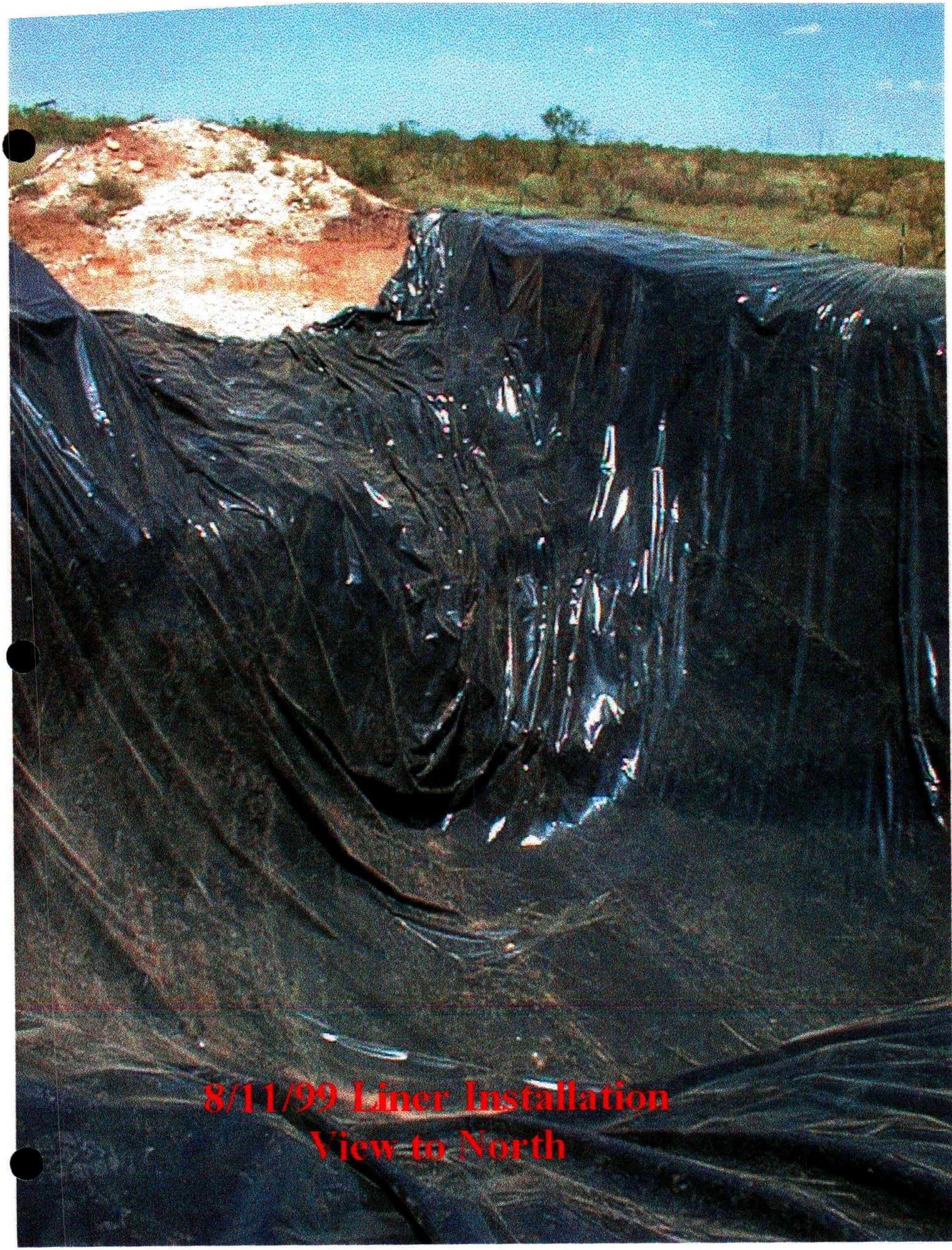
SAMPLE LOCATION	SAMPLE DATE	DEPTH (feet)	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYL-BENZENE (mg/kg)	XYLENES (mg/kg)	TOTAL BTEX (mg/kg)	TPH (mg/kg)
SB-1	03/09/98	0 - 2.5	3.08	56.60	59.80	136.00	255.48	9570
SB-1	03/09/98	15 - 17.5	4.00	28.40	15.00	65.20	112.60	4020
SB-1	03/09/98	30 - 32.5	ND	ND	ND	ND	ND	33.4
SB-2	03/09/98	0 - 2.5	2.19	0.74	4.40	22.06	29.39	2110
SB-2	03/09/98	15 - 17.5	ND	ND	0.036	0.273	0.309	428
SB-2	03/09/98	30 - 32.5	0.029	0.040	0.910	4.978	5.957	570


Site Prior to Whole Earth Excavation


8/10/99 Location of Recovery
Well in Relation to Pit


Location of Monitor Well
Relative to Pit


Liner Installation Detail
8/11/99 View to West



8/11/99 Liner Installation
View to North


8/12/99 Top Liner
Installation Detail

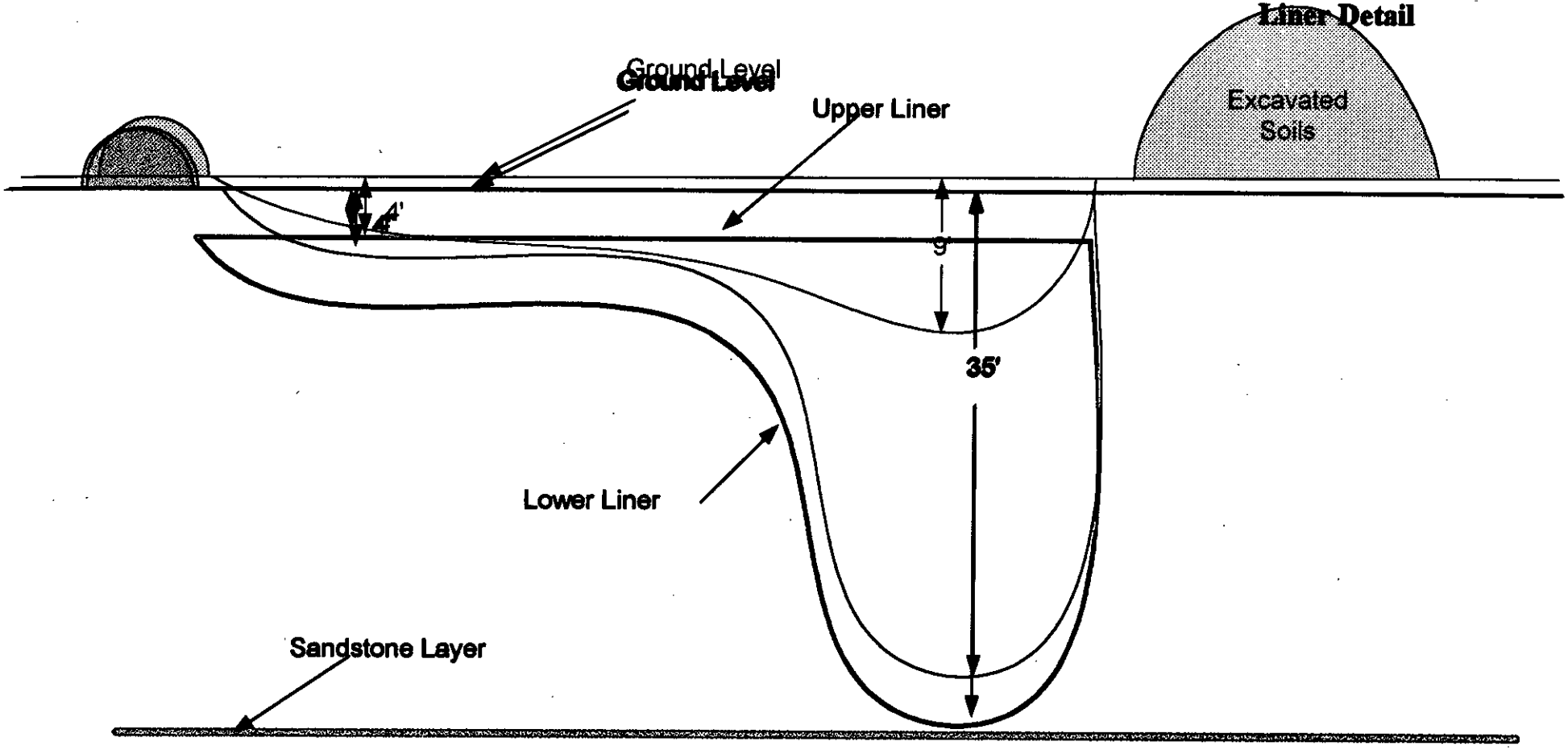

8/12/99 Final Lift Prior
to Installation of Top Liner

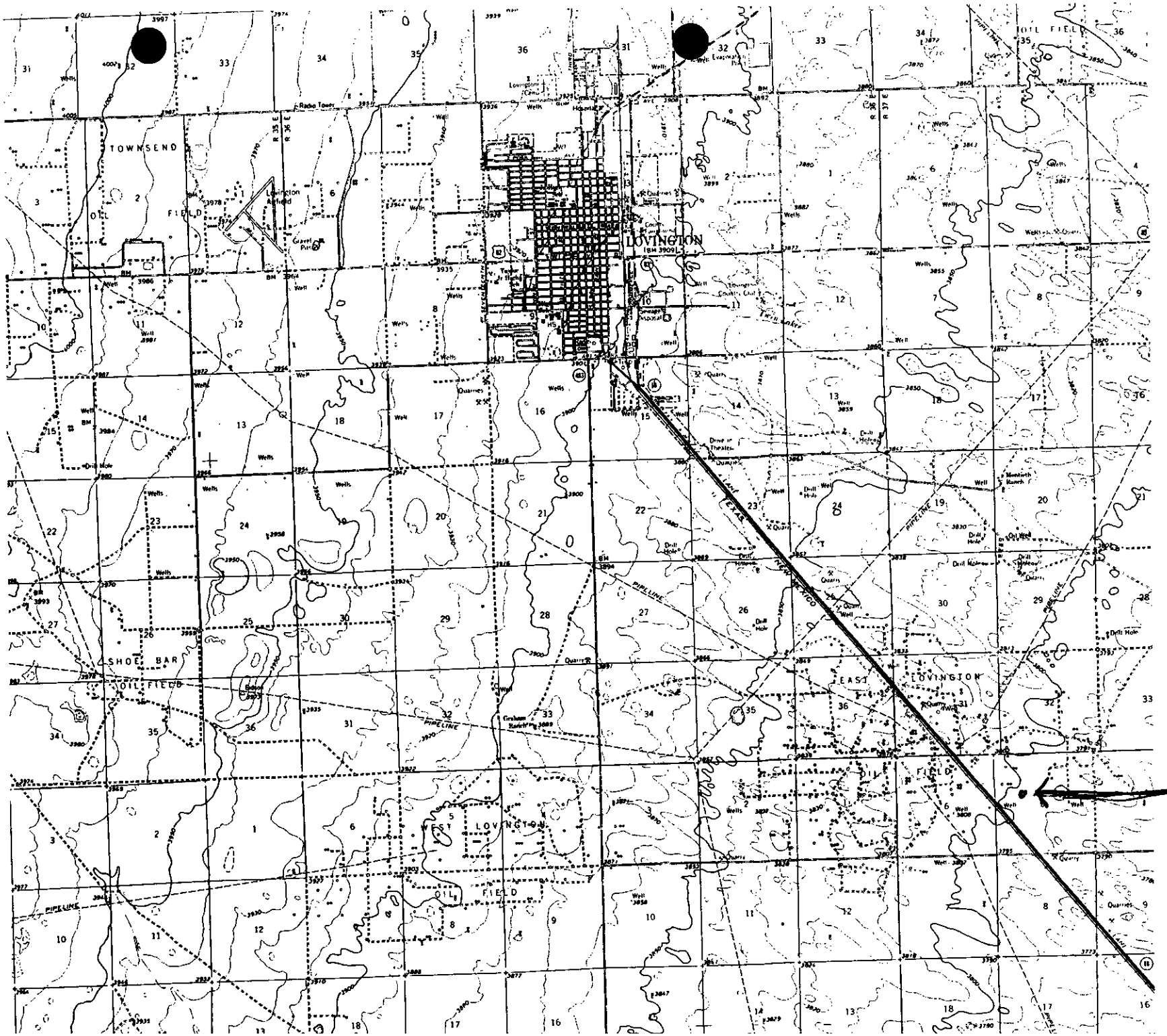
8/13/99 Final Contouring
View to North From Edge
Of Spread Zone

EOTT Energy Partners
Site 96-16
Figure 2
Final Excavation

EOTT Energy Partners
Site 96-16
Figure 1
Original Excavation

EOTT Energy Partners
Site 96-16
Figure 3
Liner Detail




TOWNSEND
OIL FIELD
LOVINGTON
SHOE BAR
OIL FIELD
EAST LOVINGTON
OIL FIELD
WEST LOVINGTON
OIL FIELD
PIPELINE
Site 96-16

Protocol

Included within this section are a copy of the Whole Earth remediation protocol PR-17A submitted to the NMOCD on July 1, 1999 and a copy of Mr. Bill Olson's response dated July 22, 1999.

Remediation Protocol
EOTT Energy Partners
Project 96-16

1.0 Purpose

This protocol is to provide a detailed outline of the steps to be employed in the remediation of a spill area located between Hobbs and Lovington, New Mexico.

2.0 Scope

This protocol is site specific for the EOTT 96-16 remediation project.

3.0 Preliminary

Prior to any field operations, Whole Earth Environmental shall conduct the following activities:

3.1 Client Review

3.1.1 Whole Earth shall meet with cognizant personnel within EOTT to review this protocol and make any requested modifications or alterations.

3.1.2 Changes to this protocol will be documented and submitted for final review by EOTT prior to the initiation of actual field work.

4.0 Safety

4.1 Prior to work on the site, Whole Earth shall obtain the location and phone numbers of the nearest emergency medical treatment facility. We will review all safety related issues with the appropriate EOTT personnel, sub-contractors and exchange phone numbers.

4.2 A tailgate safety meeting shall be held and documented each day. All sub-contractors must attend and sign the daily log-in sheet.

4.3 Anyone allowed on to location must be wearing sleeved shirts, steel toed boots, and long pants. Each vehicle must be equipped with two way communication capabilities.

4.4 Prior to any excavation, New Mexico One Call will be notified. The One Call notification number will be included within the closure report. If lines are discovered within the area to be excavated they shall be marked with pin flags on either side of the line at maximum five foot intervals.

5.0 Remediation Procedure

5.1 All soils containing a TPH concentration >5,000 ppm, and all soils containing a benzene concentration>10ppm or a total BTEX concentration >50ppm will be excavated and placed immediately adjacent to the excavation. The side walls and bottom of the excavation will be field tested for TPH and BTEX concentrations in accordance with WEQP-06 and WEQP-19.

5.2 The Hobbs branch of the OCD will be notified to witness the final confirmation sampling of the side walls and bottom of the excavation. Samples will be collected in accordance with WEQP-77 and analyzed for TPH and BTEX.

5.3 The excavated soils will be mixed and blended with sub-strait materials to achieve a maximum concentration of 5,000 ppm TPH, 10 ppm benzene and 50 ppm total BTEX concentration. A confirmation composite sample will be collected and analyzed in accordance with 5.2 of this protocol.

6.0 Modeling

6.1 The bottom hole benzene concentrations and the depth to ground water will be determined and included within a VADSAT contaminant migration model. The modeled results should project that no benzene concentrations exceeding NMWQCC standards of 10 ppb shall be allowed to impact the ground water within a 100 year model span.

6.2 The modeled results will be submitted to the Sante Fe office of the NMOCD prior to any materials being re-deposited within the excavation.

7.0 Liner

7.1 Upon approval by the NMOCD, Whole Earth will install a 30 mil polyethylene liner within the excavation. The liner will extend up the side walls to a point within 5' of the ground surface. The excavated soils will be replaced within the liner at concentrations not to exceed those described in paragraph 5.2 of this protocol.

7.2 An additional polyethylene top cover will be erected atop the excavation and overlapped with the bowl liner to insure that no surface water will infiltrate the main plume area. The top liner should be slightly domed to accommodate subsidence and to direct a drainage path away from the main plume. The top of the liner shall be at least 3' below ground level.

8.0 Groundwater Remediation and Monitoring

8.1 A recovery well will be drilled, cased and developed to a total depth of 105' and will incorporate a minimum of 30' of 4" slotted PVC screen. The well will be backfilled with cuttings, sand packed sealed with bentonite. The top 10' of the well will be cemented to surface.

8.2 A windmill will be erected over the recovery well. The windmill will be equipped with a "down hole" oil-water separator. The free phase product will be pumped to surface and directed to an above ground storage tank for subsequent removal for re-processing. The storage tank will be netted to insure that it poses no risk to wildlife.

8.3 The lateral extent of the plume will be defined by a 2" monitor well constructed with a minimum of 20' of slotted screen. All other construction details will be in accordance with paragraph 8.1 of this protocol.

9.0 Monitoring

9.1 Both the recovery well and delineation well will be initially sampled for the presence and concentrations of RCRA 8 metals, BTEX, criteria PAH's, chlorides and major cations and anions. Sample collection will be in accordance with WEQP-76.

9.2 Both wells will be sampled on a quarterly basis for the presence and concentration of BTEX. After four consecutive quarters in which the BTEX concentrations within the source and monitor wells show BTEX concentrations in accordance with NMWQCC standards, the wells will be re-analyzed for RCRA 8 metals, criteria PAH's, chlorides and major cations and anions. If the test results show concentrations within acceptable NMWQCC standards, EOTT will request final site closure. Once approved, the recovery and monitor wells will be grouted to surface and the site re-contoured to match background topography.

10.0 Closure Report

10.1 At the conclusion of the project, Whole Earth shall prepare a closure report which contains the following minimum information:

- Photographs of the location prior to remediation
- Photographs of the location at time of final closure
- Plat map showing sampling locations
- All pre-closure contaminant concentrations
- Contaminant concentrations at the conclusion of the project
- Copies of this protocol and all testing procedures
- Copies of each days tailgate safety meeting
- Copies of daily calibration logs for each instrument
- Independent split sample laboratory analyses
- Copies of the VADSAT contaminate migration model
- MSDS sheets of the liner
- Construction details of the monitor and recovery wells
- A hydrogeological survey map indicating the depth and direction of the groundwater and locations of the recovery and monitor wells

STATE OF NEW MEXICO
ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT
OIL CONSERVATION DIVISION
2040 S. PACHECO
SANTA FE, NEW MEXICO 87505
(505) 827-7131

July 22, 1999

CERTIFIED MAIL
RETURN RECEIPT NO: Z-274-520-685

Ms. Lennah Frost
EOTT Energy Pipeline Limited Partnership
P.O. Box 1660
Midland, Texas 79702

RE: REMEDIATION PLAN
SITE 96-16

Dear Ms. Frost:

The New Mexico Oil Conservation Division (OCD) has reviewed EOTT Energy Pipeline Limited Partnership's (EOTT) July 1, 1999 "DENTON GATHERING AREA LEAKSITE – DARR ANGEL RANCH, SEC 11, T-15-S, R-37-E, LEA COUNTY, NEW MEXICO" which was submitted on behalf of EOTT by their consultant Whole Earth Environmental, Inc. This document contains EOTT's proposed work plan for investigation and remediation of soil and ground water contamination resulting from a crude oil spill at EOTT's 96-16 site.

The above referenced work plan **is approved** with the following conditions:

1. Due to the use of ground water as a municipal water supply in this area, contaminated soils in excess of the OCD's guidelines shall be excavated to the extent practicable.

2. The OCD defers comment on the results of the modeling until the extent of contamination is determined and the model is calibrated using actual site field data.

3. The recovery well shall be installed directly downgradient and as close as possible to the source of the leak.

4. The vertical extent of soil contamination shall be determined during the drilling of the recovery well. Soil samples shall be obtained at five foot intervals starting at the elevation of the bottom of the excavation and continuing to the top of the water table. The soil samples will be sampled and analyzed for concentrations of total petroleum hydrocarbons (TPH) and benzene, toluene, ethylbenzene and xylene (BTEX) using EPA approved methods and quality assurance/quality control (QA/QC) procedures.

5. If ground water is contaminated in excess of New Mexico Water Quality Control Commission (WQCC) standards, EOTT shall install a sufficient number of monitor wells to determine the extent of contamination.

6. EOTT shall complete all monitor and recovery wells as follows:

✓a. At least 15 feet of well screen shall be placed across the water table interface with 5 feet of the well screen above the water table and 10 feet of the well screen below the water table.

✓b. An appropriately sized gravel pack shall be set in the annulus around the well screen from the bottom of the hole to 2-3 feet above the top of the well screen.

✓c. A 2-3 foot bentonite plug shall be placed above the gravel pack.

d. **The annular space above the bentonite plug shall not be backfilled with cuttings.** The remainder of the hole from the bentonite plug to the surface shall be grouted to the surface with cement containing 3-5% bentonite.

✓e. A concrete pad and locking well cover shall be placed around the well at the surface.

✓f. The well shall be developed after construction using EPA approved procedures.

7. No less than 48 hours after the wells are developed, ground water from all monitor wells shall be purged, sampled and analyzed for concentrations of BTEX, polycyclic aromatic hydrocarbons (PAH) and **WQCC metals** using EPA approved methods and QA/QC procedures.

✓8. A 5 point composite verification sample shall be obtained from each 3 foot lift of remediated material placed onto the liner system. The soil samples will be sampled and analyzed for concentrations of TPH and BTEX using EPA approved methods and quality assurance/quality control (QA/QC) procedures.

N/A 9. All below grade lines used for conveying fluids from recovery wells to the above ground storage tank shall be pressure tested to 3 psi above operating pressure prior to operation.

N/A 10.. All recovered oil shall be stored in a closed tank and the tank shall be bermed to contain one and one-third times the volume of the largest tank or all interconnected tanks.

N/A 11. All wastes generated shall be disposed of at an OCD approved facility.

12. EOTT shall submit the results of the soil remediation and investigation actions to the OCD in a comprehensive report. The report shall be submitted to the OCD Santa Fe Office by September 24, 1999 with a copy provided to the OCD Hobbs District Office and shall include:

a. A description of all investigation, remediation and monitoring activities which have occurred including conclusions and recommendations.

b. A geologic/lithologic log and well completion diagram for each monitor well.

c. A water table potentiometric map showing the location of spills, excavated areas, monitor wells, recovery wells, and any other pertinent site features as well as the direction and magnitude of the hydraulic gradient.

d. Isopleth maps for contaminants of concern which were observed during the investigations.

e. Summary tables of all soil and ground water quality sampling results and copies of all laboratory analytical data sheets and associated QA/QC data taken within the past year.

N/A f. The disposition of all wastes generated.

N/A g. The results of any below grade line testing.

h. Specific as built construction information on the liner system.

N/A i. The results of any below grade line testing.

N/A j. A plan for addressing soil contamination which remains in place between the liner system and the ground water.

✓13. EOTT shall notify the OCD at least 24 hours in advance of all scheduled activities such that the OCD has the opportunity to witness the events and split samples.

Please be advised that OCD approval does not limit EOTT to the proposed work plan should the investigation actions fail to adequately define or remediate contamination related to EOTT's activities, or if contamination exists which is outside the scope of the work plan. In addition, OCD approval does not relieve EOTT of responsibility for compliance with any other federal, state or local laws and regulations.

If you have any questions or comments, please contact me at (505) 827-7154 .

Sincerely,

William C. Olson
Hydrologist
Environmental Bureau

xc: Chris Williams, OCD Hobbs District Office
Mike Griffin, Whole Earth Environmental, Inc.

Procedures

Included within this section are copies of the detailed sample collection and field testing procedures employed on this project.

QP-06 Rev. C

WHOLE EARTH ENVIRONMENTAL
QUALITY PROCEDURE

Procedure for Conducting Field TPH Analysis

Completed By:	Approved By:	Effective Date: 02/15/97

1.0 Purpose

To define the procedure to be used in conducting total percentage hydrocarbon testing in accordance with EPA Method 418.1 (modified) using the "MEGA" TPH Analyzer.

2.0 Scope

This procedure is to be used for field testing and on site remediation information.

3.0 Procedure

3.1 The G.A.C. "MEGA" TPH analyzer is an instrument that measures concentrations of aliphatic hydrocarbons by means of infra-red spectrometry. It is manufactured to our specifications and can accurately measure concentrations from two parts per million through 100,000 parts per million. The unit is factory calibrated however minor calibration adjustments may be made in the field. Quality Procedure 25 defines the field calibration methods to be employed.

3.2 Prior to taking the machine into the field, insert a 500 ppm and 5,000 ppm calibration standard into the sample port of the machine. Zero out the Range dial until the instrument records the exact standard reading.

3.3 Once in the field, insert a large and small cuvette filled with clean Freon 113 into the sample port of the machine. Use the range dial to zero in the reading. If the machine does not zero, do not attempt to adjust the span dial. Immediately implement Quality Procedure 25 .

3.4 Place a 100 g. weight standard on the field scale to insure accuracy. Zero out the scale as necessary.

3.5 Tare a clean 100 ml. sample vial with the Teflon cap removed. Add 10 g. (+/- .01 g), of sample soil into the vial taking care to remove rocks or vegetable matter from the sample to be tested. If the sample is wet, add up to 5 g. silica gel or anhydrous sodium sulfate to the sample after weighing.

3.6 Dispense 10 ml. Freon 113 into the sample vial.

3.7 Cap the vial and shake for five minutes.

3.8 Carefully decant the liquid contents of the vial into a filter/desiccant cartridge and affix the cartridge cap. Recap the sample vial and set aside.

3.9 Insert the metal tip of the pressure syringe into the cap opening and slowly pressurize. **WARNING: APPLY ONLY ENOUGH PRESSURE ON THE SYRINGE TO EFFECT FLOW THROUGH THE FILTERS. TOO MUCH PRESSURE MAY CAUSE THE CAP TO SEPARATE FROM THE BODY OF THE CARTRIDGE.** Once flow is established through the cartridge direct the flow into the 5 cm. cuvette until the cuvette is full. Reverse the pressure on the syringe and remove the syringe tip from the cartridge cap. Set the cartridge aside in vertical position.

3.10 The cuvette has two clear and two frosted sides. Hold the cuvette by the frosted sides and carefully insert into the sample port of the machine. Read the right hand digital read-out of the instrument. If the reading is less than 1,000 ppm. the results shall be recorded in the field Soil Analysis Report. If the result is higher than 1,000 ppm, continue with the dilution procedure.

4.0 Dilution Procedure

4.1 When initial readings are greater than 1,000 ppm using the 5 cm. cuvette, pour the contents of the 5 cm. cuvette into a 1 cm. cuvette. Insert the 1. cm cuvette into the metal holder and insert into the test port of the instrument.

4.1 Read the left hand digital read-out of the machine. If the results are less than 10,000 ppm, record the results into the field Soil Analysis Report. If greater than 10,000 ppm, continue the dilution process. **Concentrations >10,000 ppm are to be used for field screen purposes only.**

4.2 Pour the contents of the small cuvette into a graduated glass pipette. Add 10 ml. pure Freon 113 into the pipette. Shake the contents and pour into the 1cm. cuvette. Repeat step 4.2. adding two zeros to the end of the displayed number. If the reported result is greater than 100,000 ppm. the accuracy of further readings through additional dilutions is extremely questionable. **Do not use for reporting purposes.**

4.4 **Pour all sample Freon into the recycling container.**

5.0 Split Samples

5.1 Each tenth test sample shall be a split sample. Decant approximately one half of the extraction solvent through a filter cartridge and insert into the instrument to obtain a concentration reading. Clean and rinse the cuvette and decant the remainder of the fluid to obtain a second concentration reading from the same sample. If the second reading varies by more than 1% from the original, it will be necessary to completely recalibrate the instrument.

QP-25

WHOLE EARTH ENVIRONMENTAL
QUALITY PROCEDURE

Procedure for Instrument Calibration
and Quality Assurance Analysis for
General Analysis "MEGA" TPH Analyzer

Completed By: Approved By: Effective Date: / /

1.0 Purpose

This procedure outlines the methods to be employed in calibrating the GAC MEGA TPH analyzer and for determining and reporting of accuracy curves.

2.0 Scope

This procedure shall be followed each day that the instrument is used.

3.0 Procedure

3.1 Turn the instrument on and allow to warm up with no cuvette in the receptacle. The instrument will take between five and ten minutes to come to equilibrium as can be determined by the concentration display readings moving a maximum of 5 ppm on the low scale. If the instrument continues to display erratic readings greater than 5 ppm, remove the cover and check both the mirrors and chopper to insure cleanliness.

3.2 All TPH standards shall be purchased form Environmental Resources Corporation and as a condition of their manufacture subject to independent certification by third party laboratories. Each standard is received with a calibration certificate.

3.3 Insert the low range (100 ppm) calibration standard into the receiving port and note the result on the right hand digital display. If the displayed reading is less than 98 ppm or greater than 102 ppm, remove the circuit board cover panel and zero out the instrument in accordance with QP-26.

(Note: Except in New Mexico, set the span to read 105% of actual standard).

3.4 Repeat the process with the mid range (500 ppm) calibration standard. If the displayed reading is less than 490 ppm or greater than 510 ppm zero out the span as described in QP-26.

3.5 Repeat the process again with the 1,000 and 5,000 ppm calibration standards.

3.6 Pour clean Freon 113 into a filter cartridge and extract into 10 ml cuvette. Insert the cuvette into the receiving port and zero out the instrument reading using the far right adjustment knob on the instrument. Repeat using the 1 ml cuvette and the left hand zero dial.

4.0 Determining & Reporting Instrument Accuracy

4.1 After making the fine adjustment with the zero dials reinsert each calibration standard into the instrument and note the concentration values. ***If <u>any</u> concentration value exceeds 2% of the standard set point, repeat all steps in section 3.0 of this Procedure.*** Note the actual concentration values displayed by the instrument after each calibration standard.

4.2 The four calibration standards shall be used in reporting span deviation as follows:

Standards Range			
100 ppm	**500 ppm**	**1,000 ppm**	**5,000 ppm**
0-250 ppm	251-750 ppm	751-2,500 ppm	2,501-10,000 ppm

4.3 Divide the actual instrument reading value of each calibration sample by the concentration shown on the standard (e.g.. 501 ppm instrument reading / 500 ppm standard = 1.002%). These readings shall be reported for each test performed.

5.0 Re-calibration

5.1 If any sample exceeds the concentration of 1,000 ppm on the 10 ml cuvette or 10,000 ppm on the 1 ml cuvette, the cuvette must be thoroughly rinsed with clean Freon and the instrument re-zeroed in accordance with 3.6 of this procedure.

QP-55

WHOLE EARTH ENVIRONMENTAL
QUALITY PROCEDURE

Procedure for Instrument Calibration and Quality Assurance Analysis for Photovac Gas Chromatograph

Completed By:	Approved By:	Effective Date: / /

1.0 Purpose

This procedure outlines the methods to be employed in calibrating the Photovac analyzer in the BTEX mode and for determining and reporting of accuracy curves.

2.0 Scope

This procedure shall be followed each day that the instrument is used.

3.0 Procedure

Start-up

3.1 Turn the instrument on and press the Battery button. A battery status report will appear on the screen. If the charge level is less than 8.0, either charge the battery or insert a fresh battery pack.

3.2 Open carrier gas valve on right side of instrument. The instrument is now tuning the lamp. If any "boot" problems occur during warm-up, the "chck" symbol will appear on the screen. Pressing TUTOR will prompt the instrument to provide details. The instrument will not progress beyond the start-up mode until all prompts are cleared.

3.3 The next screen display will be "purj" and will last approximately ten minutes. The instrument is purging the column.

Calibrate

3.4 Connect the regulator to cylinder of calibration gas. Connect calibration adapter and tee assembly to both the regulator and instrument. **DO NOT FORCE ANY CONNECTION!**

3.5 Inspect the open end of the tee vent to insure unobstructed flow.

3.6 Enter CAL on the key pad. The instrument will query "benzene?". Following the prompts and using the key pad, set the concentrations to those defined on the calibration gas bottle. Follow the same procedure for toluene, ethyl-benzene and xylene. After each compound, the instrument will read that the next analysis will be a calibration.

3.7 Press ENTER on key pad. The instrument will calibrate itself for the concentrations specified.

Confirmation Sample

3.8 After each calibration, run the calibration gas through the instrument once again. The display readings should be **exactly** those of the concentrations displayed on the calibration gas bottle. **If they are not, the instrument needs factory calibration; do not use.**

4.0 Re-calibration

4.1 The instrument is designed with software that prompts you to recalibrate each day, each thirty minutes of use, and after running a sample with high concentrations of one or more of the detected compounds.

5.0 Reporting Instrument Accuracy

5.1 The instrument accuracy as certified by the factory is 15% within one decade of instrument set point. Lower detection limits are 0.1 ppm for benzene and 1.0 ppm for toluene, ethylbenzene and xylene.

5.2 These standards and detection limits must be shown on all reports in which the instrument is used.

QP-76 (Rev. A)

WHOLE EARTH ENVIRONMENTAL
QUALITY PROCEDURE

Procedure for Obtaining Water Samples (Cased Wells)
Using One Liter Bailer

Completed By: Approved By: Effective Date: / /

1.0 Purpose

This procedure outlines the methods to be employed in obtaining water samples from cased monitoring wells.

2.0 Scope

This procedure shall be used for developed, cased water monitoring wells. It is not to be used for standing water samples such as ponds or streams.

3.0 Preliminary

3.1 Obtain sterile sampling containers from the testing laboratory designated to conduct analyses of the water. The shipment should include a Certificate of Compliance from the manufacturer of the collection bottle or vial and a Serial Number for the lot of containers. Retain this Certificate for future documentation purposes.

3.2 The following table shall be used to select the appropriate sampling container, preservative method and holding times for the various elements and compounds to be analyzed.

Compound to be Analyzed	Sample Container Size	Sample Container Description	Cap Requirements	Preservative	Maximum Hold Time
BTEX	40 ml.	VOA Container	Teflon Lined	HCl	7 days
TPH	1 liter	clear glass	Teflon Lined	HCl	28 days
PAH	1 liter	clear glass	Teflon Lined	Ice	7 days
Cation / Anion	1 liter	clear glass	Teflon Lined	None	48 Hrs.
Metals	1 liter	HD polyethylene	Any Plastic	Ice / HNO_3	28 Days
TDS	300 ml.	clear glass	Any Plastic	Ice	7 Days

4.0 Chain of Custody

4.1 Prepare a Sample Plan. The plan will list the well identification and the individual tests to be performed at that location. The sampler will check the list against the available inventory of appropriate sample collection bottles to insure against shortage.

4.2 Transfer the data to the Laboratory Chain of Custody Form. Complete all sections of the form except those that relate to the time of delivery of the samples to the laboratory.

4.3 Pre-label the sample collection jars. Include all requested information except time of collection. (Use a fine point Sharpie to insure that the ink remains on the label). Affix the labels to the jars.

5.0 Bailing Procedure

5.1 Identify the well from the site schematics. Place pre-labeled jar(s) next to the well. Remove the bolts from the well cover and place the cover with the bolts nearby. Remove the plastic cap from the well bore by first lifting the metal lever and then unscrewing the entire assembly.

5.2 The well may be equipped with an individual 1 liter bailing tube. If so, use the tube to bail a volume of water from the well bore equal to 10 liters for each 5' of well bore in the water table. (This assumes a 2" dia. Well bore).

5.3 Take care to insure that the bailing device and string do not become cross-contaminated. A clean pair of rubber gloves should be used when handling either the retrieval string or bailer. The retrieval string should not be allowed to come into contact with the ground.

6.0 Sampling Procedure

6.1 Once the well has been bailed in accordance with 5.2 of this procedure, a sample may be decanted into the appropriate sample collection jar directly from the bailer. The collection jar should be filled to the brim. Once the jar is sealed, turn the jar over to detect any bubbles that may be present. Add additional water to remove all bubbles from the sample container.

6.2 Note the time of collection on the sample collection jar with a fine Sharpie.

6.3 Place the sample directly on ice for transport to the laboratory. The preceding table shows the maximum hold times between collection and testing for the various analyses.

6.4 Complete the Chain of Custody form to include the collection times for each sample. Deliver all samples to the laboratory.

7.0 Documentation

7.1 The testing laboratory shall provide the following minimum information:

A. Client, Project and sample name.
B. Signed copy of the original Chain of Custody Form including data on the time the sample was received by the lab.
C. Results of the requested analyses
D. Test Methods employed
E. Quality Control methods and results

QP-77

WHOLE EARTH ENVIRONMENTAL
QUALITY PROCEDURE

Procedure for Obtaining
Soil Samples for Transportation to a Laboratory

Completed By: Approved By: Effective Date: / /

1.0 Purpose

This procedure outlines the methods to be employed when obtaining soil samples to be taken to a laboratory for analysis.

2.0 Scope

This procedure shall be used for developed, cased water monitoring wells. It is not to be used for standing water samples such as ponds or streams.

3.0 Preliminary

3.1 Obtain sterile sampling containers from the testing laboratory designated to conduct analyses of the soil. The shipment should include a Certificate of Compliance from the manufacturer of the collection bottle or vial and a Serial Number for the lot of containers. Retain this Certificate for future documentation purposes.

3.2 If collecting TPH, BTEX, RCRA 8 metals, cation / anions or O&G, the sample jar may be a clear 4 oz. container with Teflon lid. If collecting PAH's, use an amber 4 oz. container with Teflon lid.

4.0 Chain of Custody

4.1 Prepare a Sample Plan. The plan will list the number, location and designation of each planned sample and the individual tests to be performed on the sample. The sampler will check the list against the available inventory of appropriate sample collection bottles to insure against shortage.

4.2 Transfer the data to the Laboratory Chain of Custody Form. Complete all sections of the form except those that relate to the time of delivery of the samples to the laboratory.

4.3 Pre-label the sample collection jars. Include all requested information except time of collection. (Use a fine point Sharpie to insure that the ink remains on the label). Affix the labels to the jars.

5.0 Sampling Procedure

5.1 Go to the sampling point with the sample container. If not analyzing for ions or metals, use a trowel to obtain the soil. Do not touch the soil with your bare hands. Use new latex gloves with each sample to help minimize any cross-contamination.

5.2 Pack the soil tightly into the container leaving the top slightly domed. Screw the lid down tightly. Enter the time of collection onto the sample collection jar label.

5.3 Place the sample directly on ice for transport to the laboratory.

5.4 Complete the Chain of Custody form to include the collection times for each sample. Deliver all samples to the laboratory.

7.0 Documentation

7.1 The testing laboratory shall provide the following minimum information:

A. Client, Project and sample name.
B. Signed copy of the original Chain of Custody Form including data on the time the sample was received by the lab.
C. Results of the requested analyses
D. Test Methods employed
E. Quality Control methods and results

Field Analytical Testing

Included within this section are the results of field TPH testing and instrument calibration conducted by Whole Earth Environmental on the materials being re-deposited within the excavated pit.

Whole Earth Environmental, Inc
Field Analysis

Client Name: EOTT Energy Partners
Facility Name: 96-16
Technician: M. Griffin
Geo-coordinates: See Enclosed

Date: August 12, 1999
Contact: Lennah Frost
Phone: (915) 684-3467

TPH Analyzer	1152
E.C. Analyzer	N / A
VOC Analyzer	N / A
Geiger Counter	N / A
Chromatograph	N / A
HMB	N / A

Sample No.	Test Type	Time	Result	U/M	Sample Description
1	TPH (418.1)	7:13	1,710	ppm	sandy calichi, 5-10% clay
2	TPH (418.1)	7:13	2,230	ppm	sandy calichi, 5-10% clay
3	TPH (418.1)	7:25	4,160	ppm	sandy calichi, 5-10% clay
4	TPH (418.1)	7:40	347	ppm	sandy calichi, 5-10% clay
5	TPH (418.1)	8:07	594	ppm	sandy calichi, 5-10% clay
6	TPH (418.1)	8:22	5,140	ppm	sandy calichi, 5-10% clay
7	TPH (418.1)	8:22	4,630	ppm	sandy calichi, 5-10% clay (retest)
8	TPH (418.1)	9:45	956	ppm	sandy calichi, 5-10% clay
9	TPH (418.1)	9:45	3,550	ppm	sandy calichi, 5-10% clay
10	TPH (418.1)	9:45	781	ppm	sandy calichi, 5-10% clay
11	TPH (418.1)	9:45	2,260	ppm	sandy calichi, 5-10% clay
12	TPH (418.1)	10:20	2,420	ppm	sandy calichi, 5-10% clay
13	TPH (418.1)	10:20	633	ppm	sandy calichi, 5-10% clay
14	TPH (418.1)	11:05	1,280	ppm	sandy calichi, 5-10% clay
15	TPH (418.1)	13:17	488	ppm	sandy calichi, 5-10% clay
16	TPH (418.1)	13:17	2,740	ppm	sandy calichi, 5-10% clay
17	TPH (418.1)	15:44	5,290	ppm	sandy calichi, 5-10% clay
18	TPH (418.1)	15:44	4,780	ppm	sandy calichi, 5-10% clay (retest)
19	TPH (418.1)	16:08	1,520	ppm	sandy calichi, 5-10% clay
20	TPH (418.1)	16:08	1,620	ppm	sandy calichi, 5-10% clay

Calibration No.	Time	Std. Conc.	Result	U / M	Technician
1	6:15	100	106	ppm	MG
2	6:15	200	223	ppm	MG
2	6:15	500	541	ppm	MG
4	6:15	1,000	1,043	ppm	MG
5					
6					
7					
8					

Reviewed & Approved

Whole Earth Environmental, Inc
Field Analysis

Client Name: EOTT Energy Partners
Facility Name: 96-16
Technician: E. Werner
Geo-coordinates: See Enclosed

Date: July 1, 1999
Contact: Lennah Frost
Phone: (915) 684-3467

TPH Analyzer	1152
E.C. Analyzer	N / A
VOC Analyzer	N / A
Geiger Counter	N / A
Chromatograph	N / A
HMB	N / A

Sample No.	Test Type	Time	Result	U/M	Sample Description
1	**TPH (418.1)**	10:15	6,110	**ppm**	**Deep bottom 28' bgl**
2	**TPH (418.1)**	11:20	4,790	**ppm**	**Deep bottom 32' bgl**
3	**TPH (418.1)**	14:15	2,120	**ppm**	**Deep bottom 35' bgl**
4	**TPH (418.1)**	14:15	4,860	**ppm**	**Deep bottom 35' bgl**
5	**TPH (418.1)**	14:15	4,820	**ppm**	**Deep bottom 35' bgl**
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

Calibration No.	Time	Std. Conc.	Result	U / M	Technician
1	7:30	100	121	ppm	EW
2	7:30	200	201	ppm	EW
2	7:30	500	536	ppm	EW
4	7:30	1,000	1,050	ppm	EW
5					
6					
7					
8					

Reviewed & Approved

Whole Earth Environmental, Inc
Field Analysis

Client Name: EOTT Energy Partners
Facility Name: 96-16
Technician: E. Werner
Geo-coordinates: See Enclosed

Date: June 29, 1999
Contact: Lennah Frost
Phone: (915) 684-3467

TPH Analyzer	1152
E.C. Analyzer	N / A
VOC Analyzer	N / A
Geiger Counter	N / A
Chromatograph	N / A
HMB	N / A

Sample No.	Test Type	Time	Result	U/M	Sample Description
1	**TPH (418.1)**	9:45	6,320	**ppm**	**Deep bottom 15' bgl**
2	**TPH (418.1)**	10:35	5,960	**ppm**	**Deep bottom 18' bgl**
3	**TPH (418.1)**	10:35	7,360	**ppm**	**Deep bottom 18' bgl**
4	**TPH (418.1)**	13:20	8,510	**ppm**	**Deep bottom 21' bgl**
5	**TPH (418.1)**	15:45	9,810	**ppm**	**Deep bottom 25' bgl**
6	**TPH (418.1)**	18:10	6,740	**ppm**	**Deep bottom 28' bgl**
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

Calibration No.	Time	Std. Conc.	Result	U / M	Technician
1	7:15	100	114	ppm	EW
2	7:15	200	207	ppm	EW
2	7:15	500	531	ppm	EW
4	7:15	1,000	1,090	ppm	EW
5					
6					
7					
8					

Reviewed & Approved

Whole Earth Environmental, Inc
Field Analysis

Client Name: EOTT Energy Partners
Facility Name: 96-16
Technician: E. Werner
Geo-coordinates: See Enclosed

Date: June 28, 1999
Contact: Lennah Frost
Phone: (915) 684-3467

TPH Analyzer	1152
E.C. Analyzer	N / A
VOC Analyzer	N / A
Geiger Counter	N / A
Chromatograph	N / A
HMB	N / A

Sample No.	Test Type	Time	Result	U/M	Sample Description
1	**TPH (418.1)**	9:55	56	**ppm**	**Shallow bottom 5' bgl**
2	**TPH (418.1)**	9:55	102	**ppm**	**Shallow bottom 5' bgl**
3	**TPH (418.1)**	9:55	89	**ppm**	**Shallow bottom 5' bgl**
4	**TPH (418.1)**	9:55	74	**ppm**	**Shallow bottom 5' bgl**
5	**TPH (418.1)**	9:55	163	**ppm**	**Shallow bottom 5' bgl**
6	**TPH (418.1)**	10:30	206	**ppm**	**West wall 5' bgl**
7	**TPH (418.1)**	10:30	41	**ppm**	**East wall 5' bgl**
8	**TPH (418.1)**	10:30	116	**ppm**	**West ledge wall 6' bgl**
9	**TPH (418.1)**	10:30	284	**ppm**	**East ledge wall 6' bgl**
10	**TPH (418.1)**	10:30	578	**ppm**	**East deep wall 9' bgl**
11	**TPH (418.1)**	12:15	>10,000	**ppm**	**Deep bottom 9' bgl**
12	**TPH (418.1)**	12:15	>10,000	**ppm**	**Deep bottom 9' bgl**
13					
14					
15					
16					
17					
18					
19					
20					

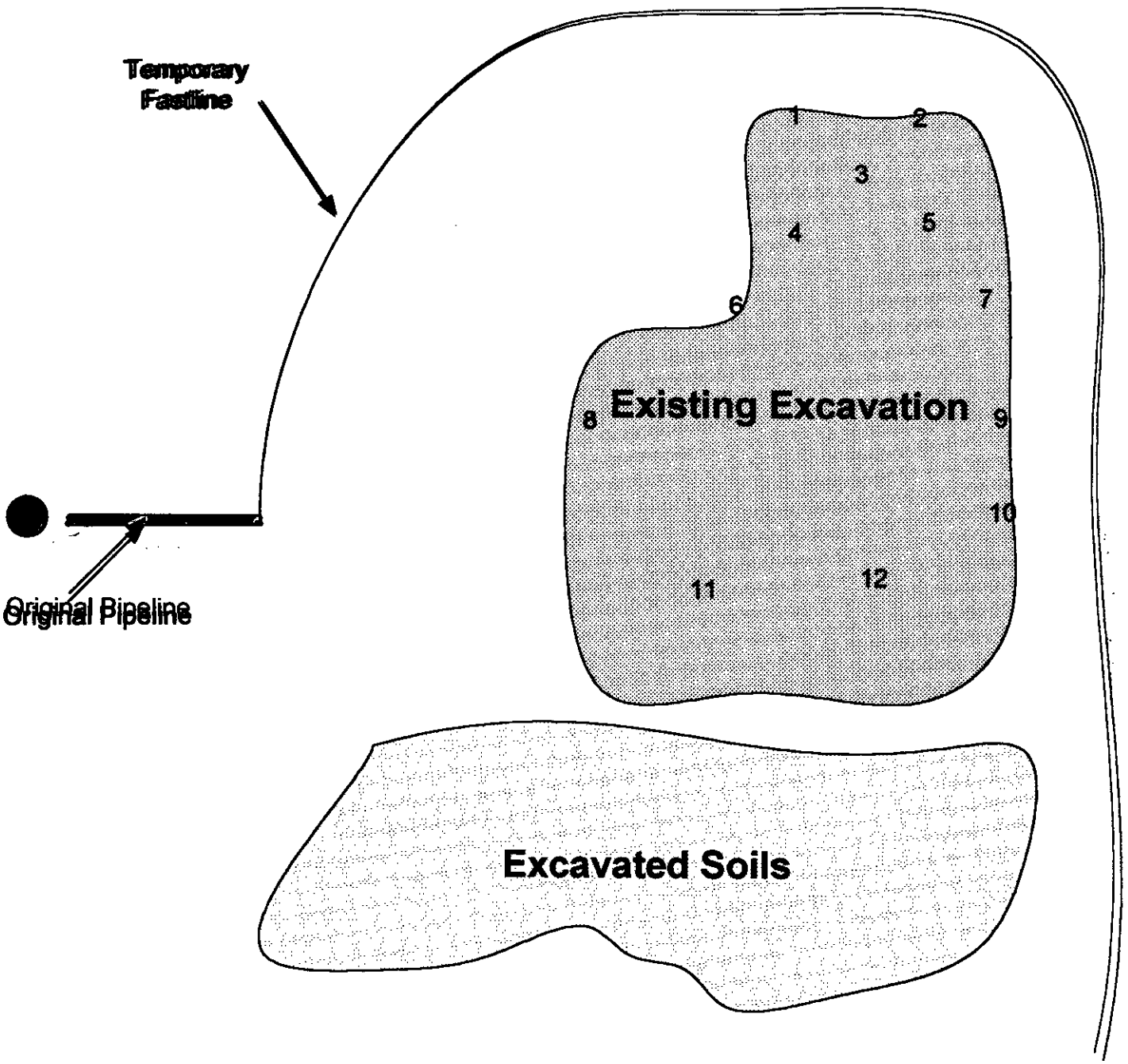
Calibration No.	Time	Std. Conc.	Result	U / M	Technician
1	9:30	100	112	ppm	EW
2	9:30	200	251	ppm	EW
2	9:30	500	537	ppm	EW
4	9:30	1,000	1,150	ppm	EW
5					
6					
7					
8					

Reviewed & Approved

EOTT Energy Partners
Spill Diagram Site 96-16

EOTT Energy Partners
Spill Diagram

Site 96-16



Laboratory Analytical Reports

Included within this section are copies of the chain of custody forms and analytical results for remediated materials being replaced within the excavation. Additionally included is a copy of the results of soil sampling conducted during the drilling of the recovery well located immediately adjacent to the excavation.

Env[illegible]nmental Lab of Texas, Inc.

12600 West I-20 [illegible]iesa, Texas 79763
(915) 563-1800 FAX (915) 563-1713

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQ[illegible]T

Project Manager: Elliot Werner
Phone #:
FAX #:

Company Name & Address: Whole Earth 96-16

Project #: 96-16
Project Name :

Project Location: Lovington
Sampler Signature:

LAB # (LAB USE ONLY)	FIELD CODE	# CONTAINERS	Volume/Amount	MATRIX: WATER	SOIL	AIR	SLUDGE	OTHER	PRESERVATIVE METHOD: HCL	HNO3	ICE	NONE	OTHER	SAMPLING: DATE	TIME	ANALYSIS REQUEST: BTEX 8020/5030	TPH 418.1	TCLP Metals Ag As Ba Cd Cr Pb Hg Se	Total Metals Ag As Ba Cd Cr Pb Hg Se	TCLP Volatiles	TCLP Semi Volatiles	TDS	RCI	8015 DRO
18486	N Wall	1	4oz		✓						✓			6-30-99	1700	✓								✓
18487	S Wall				✓						✓			7-1-99	1315	✓								✓
18488	E Wall				✓						✓			6-30-99		✓								✓
18489	W Wall				✓						✓			6-30-99		✓								✓
18490	Btm	✓	✓		✓						✓			7-1-99		✓								✓

Relinquished by:	Date:	Time:	Received by:
[illegible]	7-2-99	10:45	[illegible]
Relinquished by:	Date:	Time:	Received by:
Relinquished by:	Date:	Time:	Received by Laboratory:

REMARKS

ENVIRONMENTAL LAB OF , INC.

"Don't Treat Your Soil Like Dirt!"

WHOLE EARTH ENVIRONMENTAL
ATTN: MR. ELLIOT WERNER
19606 SAN GABRIEL
HOUSTON, TEXAS 77084
FAX: 281-646-8996

Sample Type: Soil
Sample Condition: Intact/Iced
Project #: 96-16
Project Name: None Given
Project Location: Lovington

Sampling Date: See below
Receiving Date: 07/02/99
Analysis Date: 07/02/99

ELT#	FIELD CODE /SAMPLE DATE	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYLBENZENE (mg/kg)	m,p-XYLENE (mg/kg)	o-XYLENE (mg/kg)	TPH (DRO) C10-C28 (mg/kg)
18486	N Wall 06/30/99	<0.100	<0.100	<0.100	<0.100	<0.100	<10
18487	S Wall 07/01/99	<0.100	0.175	0.171	0.662	0.445	1261
18488	E Wall 06/30/99	<0.100	<0.100	<0.100	<0.100	<0.100	37
18489	W Wall 06/30/99	<0.100	<0.100	<0.100	<0.100	<0.100	<10
18490	Btm. 07/01/99	<0.100	0.219	0.196	0.759	0.484	849
	%IA	93	91	89	88	89	102
	%EA	102	96	91	90	95	95
	BLANK	<0.100	<0.100	<0.100	<0.100	<0.100	<10

METHODS: EPA SW 846-8020,5030, 8015M DRO

Raland K. Tuttle

7-6-99
Date

ENVIRONMENTAL LAB OF , INC.

"Don't Treat Your Soil Like Dirt!"

WHOLE EARTH ENVIRONMENTAL
ATTN: MR. MIKE GRIFFIN
19606 SAN GABRIEL
HOUSTON, TEXAS 77084
FAX: 281-646-8996

Sample Type: Soil
Sample Condition: Intact/ Iced
Project #: 96-16
Project Name: None Given
Project Location: Lovington

Sampling Date: 07/01/99
Receving Date: 07/02/99
Analysis Date: 07/22/99

ELT#	FIELD CODE	TPH mg/kg
18490	Bottom	2860

% INSTRUMENT ACCURACY	99
% EXTRACTION ACCURACY	111
BLANK	<10

METHODS: EPA 416.1

Raland K. Tuttle

7-22-99
Date

ENVIRONMENTAL LAB OF , INC.

"Don't Treat Your Soil Like Dirt!"

WHOLE EARTH ENVIRONMENTAL
ATTN: MR. MIKE GRIFFIN
19606 SAN GABRIEL
HOUSTON, TEXAS 77084
FAX: 281-646-8996

Sample Type: Soil
Sample Condition: Intact/Iced
Project #: 98-16 Backfill
Project Name: EOTT
Project Location: Lovington, N.M.

Sampling Date: 08/12/99
Receiving Date: 08/13/99
Analysis Date: 08/16/99

ELT#	FIELD CODE	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYLBENZENE (mg/kg)	m,p-XYLENE (mg/kg)	o-XYLENE (mg/kg)
19170	Lift 1	<0.100	0.598	0.722	2.48	2.64
19171	Lift 2	<0.100	0.744	0.548	1.74	1.82
19172	Lift 3	<0.100	0.411	0.388	1.16	1.27
19173	Lift 4	<0.100	0.756	0.503	1.58	1.51
19174	Lift 5	<0.100	0.742	0.515	1.91	1.98
19175	Lift 6	0.109	0.744	0.669	1.88	1.34
19176	Lift 7	<0.100	0.337	0.228	0.786	0.654
19177	Lift 8	<0.100	0.444	0.409	1.25	1.05
19178	Lift 9	<0.100	0.133	0.223	0.790	0.737
19179	Lift 10	<0.100	0.169	0.246	0.813	0.715
%IA		97	90	88	86	89
%EA		89	87	85	83	85
BLANK		<0.100	<0.100	<0.100	<0.100	<0.100

METHODS: EPA SW 846-8020,5030

Raland K. Tuttle

8-23-99
Date

ENVIRONMENTAL LAB OF , INC.

"Don't Treat Your Soil Like Dirt!"

WHOLE EARTH ENVIRONMENTAL
ATTN: MR. MIKE GRIFFIN
19606 SAN GABRIEL
HOUSTON, TEXAS 77084
FAX: 281-646-8996

Sample Type: Soil
Sample Condition: Intact/Iced
Project #: 96-16 Backfill
Project Name: EOTT
Project Location: Lovington, N.M.

Sampling Date: 08/12/99
Receiving Date: 08/13/99
Analysis Date: 08/19/99

ELT#	FIELD CODE	DRO C10-C28 (mg/kg)
19170	Lift 1	55
19171	Lift 2	1994
19172	Lift 3	562
19173	Lift 4	2807
19174	Lift 5	1814
19175	Lift 6	293
19176	Lift 7	303
19177	Lift 8	1445
19178	Lift 9	684
19179	Lift 10	508
	QUALITY CONTROL	510
	TRUE VALUE	500
	% PRECISION	102

Methods: EPA SW 846-8015M DRO

Roland K. Tuttle — 8-23-99

Roland K. Tuttle — Date

ENVIRONMENTAL
LAB OF TEXAS, INC.
"Don't Treat Your Soil Like Dirt!"

WHOLE EARTH ENVIRONMENTAL
ATTN: MR. MIKE GRIFFIN
19606 SAN GABRIEL
HOUSTON, TEXAS 77084
FAX: 281-646-8996

Sample Type: Soil
Sample Condition: Intact/Iced
Project #: 96-16 Backfill
Project Name: EOTT
Project Location: Lovington, N.M.

Sampling Date: 08/12/99
Receiving Date: 08/13/99
Analysis Date: 08/25/99

ELT#	FIELD CODE	GRO C6-C10 (mg/kg)
19170	Lift 1	501
19171	Lift 2	127
19172	Lift 3	186
19173	Lift 4	126
19174	Lift 5	191
19175	Lift 6	51
19176	Lift 7	54
19177	Lift 8	85
19178	Lift 9	32
19179	Lift 10	174
	QUALITY CONTROL	489
	TRUE VALUE	500
	% PRECISION	98

Methods: EPA SW 846-8015M GRO

Raland K. Tuttle

8-28-99
Date

Environmental Lab of Texas, Inc.

12600 West I-20 East Odessa, Texas 79763
(915) 563-1800 FAX (915) 563-1713

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: M. Griffin
Phone #: (800) 854-4358
FAX #: (281) 646-8996
Company Name & Address: Whole Earth Environ.
Project #: 96-16 Backfill
Project Name: EOTT
Project Location: Lovington, NM
Sampler Signature:

ANALYSIS REQUEST

LAB # (LAB USE ONLY)	FIELD CODE	# CONTAINERS	Volume/Amount	MATRIX: WATER	SOIL	AIR	SLUDGE	OTHER	PRESERVATIVE METHOD: HCL	HNO3	ICE	NONE	OTHER	SAMPLING: DATE	TIME	BTEX #8021/5030	TPH 418.1	TCLP Metals Ag As Ba Cd Cr Pb Hg Se	Total Metals Ag As Ba Cd Cr Pb Hg Se	TCLP Volatiles	TCLP Semi Volatiles	TDS	RCI	8015 DRO
19170	Lift 1	✓			✓						✓			8-12		✓	✓							✓
19171	Lift 2	✓			✓						✓			8-12		✓	✓							✓
19172	Lift 3	✓			✓						✓			8-12		✓	✓							✓
19173	Lift 4	✓			✓						✓			8-12		✓	✓							✓
19174	Lift 5	✓			✓						✓			8-12		✓	✓							✓
19175	Lift 6	✓			✓						✓			8-12		✓	✓							✓
19176	Lift 7	✓			✓						✓			8-12		✓	✓							✓
19177	Lift 8	✓			✓						✓			8-12		✓	✓							✓
19178	Lift 9	✓			✓						✓			8-12		✓	✓							✓
19179	Lift 10	✓			✓						✓			8-12		✓	✓							✓

Relinquished by:	Date:	Time:	Received by:
M. Griffin	8-13-99	1050	[illegible]
Relinquished by:	Date:	Time:	Received by:
Relinquished by:	Date:	Time:	Received by Laboratory:

REMARKS

ENVIRONMENTAL
LAB OF TEXAS, INC.

"Don't Treat Your Soil Like Dirt!"

WHOLE EARTH ENVIRONMENTAL
ATTN: MR. MIKE GRIFFIN
19606 SAN GABRIEL
HOUSTON, TEXAS 77084
FAX: 281-646-8998

Sample Type: Soil
Sample Condition: Intact/Iced
Project #: 96-18
Project Name: EOTT
Project Location: Lovington, N.M.

Sampling Date: 08/11/99
Receiving Date: 08/13/99
Analysis Date: TPH 08/14/99
Analysis Date: BTEX 08/16/99

ELT#	FIELD CODE /SAMPLE DATE	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYLBENZENE (mg/kg)	m,p-XYLENE (mg/kg)	o-XYLENE (mg/kg)	TPH (mg/kg)
19180	25'	<0.100	<0.100	<0.100	<0.100	<0.100	<10
19181	30'	<0.100	<0.100	0.115	0.435	0.320	<10
19182	35'	<0.100	<0.100	<0.100	0.250	0.173	<10
19183	40	<0.100	0.330	0.345	0.250	0.350	770
19184	45'	<0.100	<0.100	<0.100	0.244	0.164	70
19185	50'	<0.100	<0.100	0.141	0.503	0.372	<10
19186	55'	<0.100	<0.100	<0.100	0.169	<0.100	<10
19187	60'	<0.100	<0.100	<0.100	0.163	0.103	<10
19188	65'	<0.100	<0.100	<0.100	<0.100	<0.100	30
	%IA	97	90	88	86	89	100
	%EA	89	87	85	83	85	107
	BLANK	<0.100	<0.100	<0.100	<0.100	<0.100	<10

METHODS: EPA SW 846-8020,5030, EPA 418.1

Raland K. Tuttle

8-19-99
Date

Water Investigation

Included within this section are the schematics for the recovery and monitor wells, topographical map indicating the surface gradient, and copies of the chain of custody and laboratory analytical results for water samples obtained from each well.

Atkins Engineering Associates, Inc.
P.O. Box 3156
Roswell, New Mexico 88202

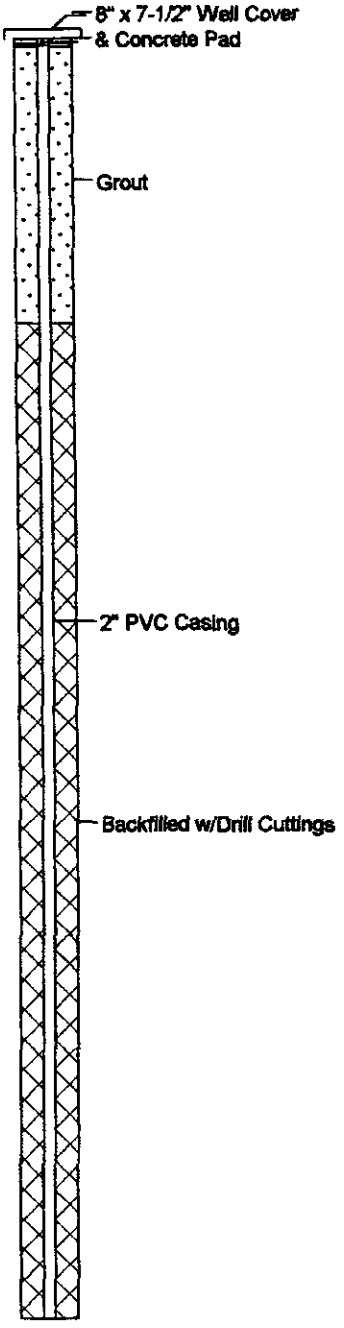
LOG OF BORING EOTT MW #1

Whole Earth Environmental
19606 San Gabriel
Houston, TX 77084

Date	: 8-11-99	*Site Location*	: Section 5, T17S., R37E.
Drill Start	: 8:45 A.M.	Auger Type	: Hollow Stem R33E
Drill End	: 1:30 P.M.	Logged By	: Mort Bates
Boring Location	: 100 ft. E. of Recovery Well		

Well: EOTT MW-1
Elev.:

Depth in feet	GRAPHIC	USCS	Samples	DESCRIPTION
0		CL		Silty Clay w/Caliche Rock, Firm, Dry
5				Caliche, Tan, Hard, Dry
10				Caliche w/Clay, Tan, Firm, Dry
15				
20				
25		SM		Silty Sand, Tan, Soft, Dry
30				
35		SM		Cemented Sand w/Silty Clay, Tan, Firm, Dry
40		SP		Sand, Tan, Loose, Dry
45				



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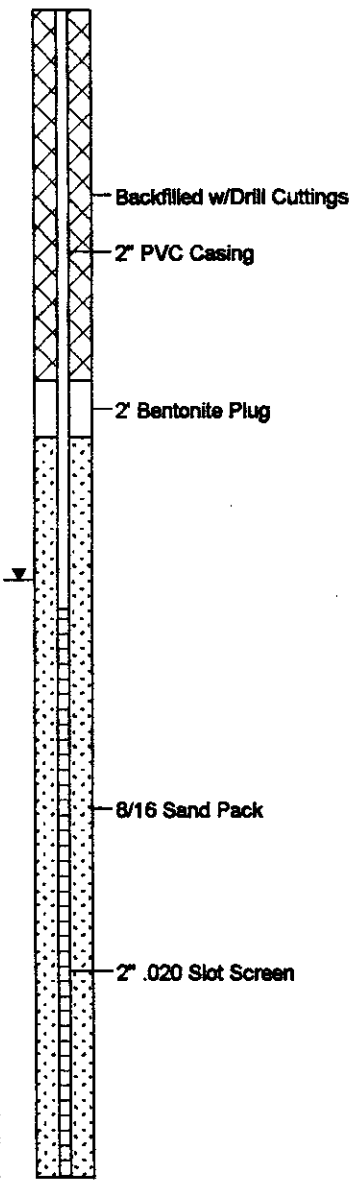
Atkins Engineering Associates, Inc. P.O. Box 3156 Roswell, New Mexico 88202	LOG OF BORING EOTT MW #1 (Page 2 of 2)
Whole Earth Environmental 19606 San Gabriel Houston, TX 77084	Date : 8-11-99 Drill Start : 8:45 A.M. Drill End : 1:30 P.M. Boring Location : 100 ft. E. of Recovery Well Site Location : Section 5, T17S., R37E. Auger Type : Hollow Stem R33E Logged By : Mort Bates

Depth in feet	GRAPHIC	USCS	Samples	DESCRIPTION
45				Sand, Tan, Loose, Dry
50		SP		
55				Sand, Tan, Soft, Moist
60		SP		
65				Sand w/Gravel, Tan, Firm, Wet WL @ 65 Ft.
70		SW		
75				
80		CL		Sandy Clay, Tan, Firm, Wet
85				TD = 86 Ft.
90				



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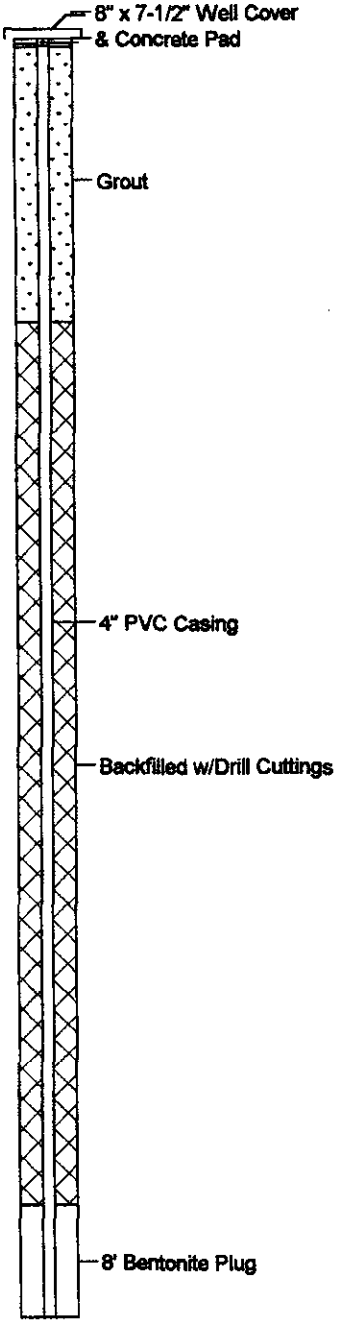
Atkins Engineering Associates, Inc. P.O. Box 3156 Roswell, New Mexico 88202	LOG OF BORING EOTT Recovery Well (Page 1 of 2)

Whole Earth Environmental
19606 San Gabriel
Houston, TX 77084

Date	: 8-10-99	Site Location	: Section 5, T17S., R37E.
Drill Start	: 11:05 A.M.	Auger Type	: Hollow Stem R33E
Drill End	: 6:00 P.M.	Logged By	: Mort Bates
Boring Location	: S.E. Corner of Pit		

Depth in feet	GRAPHIC	USCS	Samples	DESCRIPTION
0		CL		Silty Clay w/Caliche Rock, Brown, Firm, Dry
10				Caliche Rock, Hard, Dry
20				Caliche, Chalk, Tan, Loose, Dry
25		SM		Silty Sand, Tan, Loose, Dry
35		SM		Cemented Sand, Tan, Firm, Dry
		SM		Cemented Sand, Tan, Hard, Dry
40		SP		Sand, Tan, Soft, Damp
45				

Well: EOTT Recovery Well
Elev.:



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Atkins Engineering Associates, Inc.
P.O. Box 3156
Roswell, New Mexico 88202

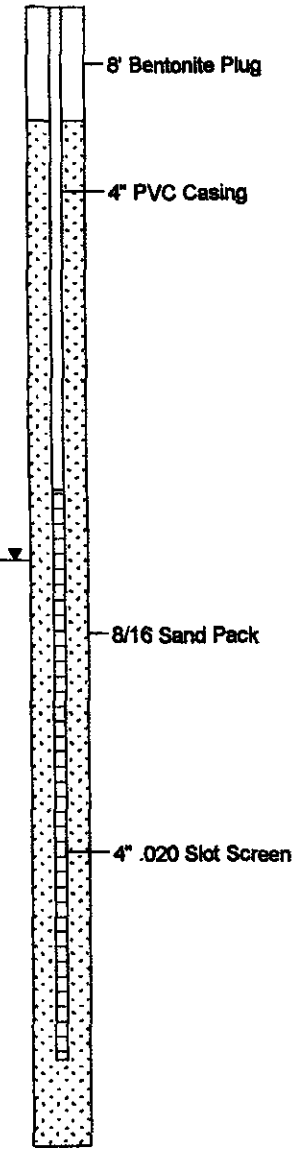
LOG OF BORING EOTT Recovery Well

Whole Earth Environmental
19606 San Gabriel
Houston, TX 77084

Date	: 8-10-99	Site Location	: Section 5, T17S., R37E.
Drill Start	: 11:05 A.M.	Auger Type	: Hollow Stem R33E
Drill End	: 6:00 P.M.	Logged By	: Mort Bates
Boring Location	: S.E. Corner of Pit		

Depth in feet	GRAPHIC	USCS	Samples	DESCRIPTION
45				
50				
55		SP		
60				
65				WL @ 64.49 Ft. Sand, Tan, Soft, Wet
70		SP		
75				
80		CL		Sandy Clay, Tan, Stiff, Wet
85				TD = 85 Ft.
90				

Well: EOTT Recovery Well
Elev.:



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08-17-1999

ENVIRONMENTAL LAB OF , INC.

"Don't Treat Your Soil Like Dirt!"

WHOLE EARTH ENVIRONMENTAL
ATTN: MR. MIKE GRIFFIN
19606 SAN GABRIEL
HOUSTON, TEXAS 77084
FAX: 1-281-646-8996

Sample Type: Water
Sample Condition: Intact/ Iced/ HCl
Project #: 96-16 Recovery & Monitor Well
Project Name: EOTT
Project Location: Lovington, N.M.

Sampling Date: 08/13/99
Receiving Date: 08/13/99
Analysis Date: 08/13/99

ELT#	FIELD CODE	BENZENE mg/L	TOLUENE mg/L	ETHYLBENZENE mg/L	m,p-XYLENE mg/L	o-XYLENE mg/L
19191	(M) Monitor Well	0.001	0.001	<0.001	0.001	0.001
19192	(R) Recovery Well	0.005	0.003	0.001	0.003	0.002
	% IA	96	88	85	86	89
	% EA	94	91	91	90	92
	BLANK	<0.001	<0.001	<0.001	<0.001	<0.001

METHODS: SW 846-8020,5030

Raland K. Tuttle

8-26-99
Date

ENVIRONMENTAL
LAB OF TEXAS, INC.
"Don't Treat Your Soil Like Dirt!"

WHOLE EARTH ENVIRONMENTAL
ATTN: MR. MIKE GRIFFIN
19606 SAN GABRIEL
HOUSTON, TEXAS 77084
FAX: 281-646-8998

Sample Type: Water
sample Condition: Intact/Iced
Project #: 96-16 Recovery & monitor Well
Project Name: EOTT
Project Location: Lovington, N.M.

Sampling Date: 08/13/99
Receiving Date: 08/13/99
Analysis Date: 8/18 & 8/19/99

DISSOLVED METALS (mg/L)

ELT#	Field Code	Ag	As	Ba	Cd	Cr	Hg	Pb	Se
19193	Monitor	<0.01	<0.002	<0.10	<0.005	<0.03	<0.002	<0.10	<0.002
	REPORTING LIMIT	0.01	0.002	0.10	0.005	0.03	0.002	0.10	0.002
	% IA	102	102	101	96	99	95	101	109
	% EA	114	98	90	95	100	99	104	117

METHODS: EPA SW 846-3050, 7760, 7062, 7080, 7130, 7190, 7470, 7420, 7742

Raland K. Tuttle

8-26-99
Date

ENVIRONMENTAL LAB OF , INC.

"Don't Treat Your Soil Like Dirt!"

WHOLE EARTH ENVIRONMENTAL
ATTN: MR. MIKE GRIFFIN
19606 SAN GABRIEL
HOUSTON, TEXAS 77084
FAX: 1-281-646-8996

Sample Type: Water
Sample Condition: Intact/ Iced
Project #: 96-16 Recovery & Monitor Well
Project Name: EOTT
Project Location: Lovington, N.M.

Sampling Date: 08/13/99
Receiving Date: 08/13/99
Analysis Date: See Below

ELT#	FIELD CODE	Sulfate mg/L	Chloride mg/L	Carbonate mg/L	Bicarbonate mg/L	Nitrate mg/L
19193	Monitor	167	44	0	130	1.9
QUALITY CONTROL		53.4	5140	*	*	9.9
TRUE VALUE		50.0	5000	*	*	10.0
% PRECISION		107	103	*	*	99
ANALYSIS DATE		8/14/99	8/25/99	8/24/99	8/24/99	8/19/99

METHODS: EPA 375.4, 325.3, 310, 353.3

Raland K. Tuttle

8-26-99
Date

ENVIRONMENTAL LAB OF , INC.

"Don't Treat Your Soil Like Dirt!"

WHOLE EARTH ENVIRONMENTAL
ATTN: MR. MIKE GRIFFIN
19606 SAN GABRIEL
HOUSTON, TEXAS 77084
FAX: 1-281-846-8996

Sample Type: Water
Sample Condition: Intact/ Iced
Project #: 96-16 Recovery & Monitor Well
Project Name: EOTT
Project Location: Lovington, N.M.

Sampling Date: 08/13/99
Receiving Date: 08/13/99
Analysis Date: 08/18/99

ELT#	FIELD CODE	Ca mg/L	Na mg/L	Mg mg/L	K mg/L
19193	Monitor	58.0	39.8	17.06	5.10
% INSTRUMENT ACCURACY		104	97	100	94
% EXTRACTION ACCURACY		98	98	106	94
BLANK		<1.00	<1.00	<0.50	<0.50

METHODS: SW 846-7140, 7770, 7450, 7610

Raland K. Tuttle

8-26-99
Date

ENVIRONMENTAL
LAB OF TEXAS, INC.
"Don't Treat Your Soil Like Dirt!"

WHOLE EARTH ENVIRONMENTAL
ATTN: MR. MIKE GRIFFIN
19606 SAN GABRIEL
HOUSTON, TEXAS 77084
FAX: 281-648-8996

Sample Type: Water
Sample Condition: Intact/Iced
Project #: 96-16 Recovery & Monitor Well
Project Name: EOTT
Project Location: Lovington, N.M.

Sampling Date: 08/13/99
Receiving Date: 08/13/99
Extraction Date: 08/17/99
Analysis Date: 08/23/99
Field Code: Monitor

ELT# 19193

8270 COMPOUNDS	REPORTING LIMIT	Concentration mg/L	%IA	RPD	% EA
Acenaphthene	0.0100	ND	80	10.22	72
Acenaphthylene	0.0100	ND	80		
Anthracene	0.0100	ND	94		
Benzo (a) anthracene	0.0100	ND	104		
Benzo (a) pyrene	0.0100	ND	106		
Benzo (b) fluoranthene	0.0100	ND	102		
Benzo (g,h,i) perylene	0.0100	ND	118		
Benzo (k) fluoranthene	0.0100	ND	110		
4-Bromophenyl-phenylether	0.0100	ND	98		
Butylbenzylphthalate	0.0100	ND	108		
Carbazole	0.0100	ND	96		
4-Chloro-3-methylphenol	0.0100	ND	96	13.51	79
4-Chloroaniline	0.0100	ND	82		
Bis (2-chloroethoxy) methane	0.0100	ND	90		
Bis (2-chloroethyl) ether	0.0100	ND	102		
Bis (2-chloroisopropyl) ether	0.0100	ND	74		
2- Chloronaphthalene	0.0100	ND	84		
2-Chlorophenol	0.0100	ND	88	1.40	72
4-Chlorophenyl-phenylether	0.0100	ND	90		
Chrysene	0.0100	ND	126		
Dibenzofuran	0.0100	ND	86		
Dibenz (a,h) anthracene	0.0100	ND	138		
1,2-Dichlorobenzene	0.0100	ND	82		
1,3-Dichlorobenzene	0.0100	ND	80		
1,4-Dichlorobenzene	0.0100	ND	84	1.57	63
3,3'-Dichlorobenzidine	0.0200	ND	N/A		
2,4-Dichlorophenol	0.0100	ND	92		
Diethylphthalate	0.0100	ND	88		
2,4-Dimethylphenol	0.0100	ND	64		
Dimethylphthalate	0.0100	ND	86		
Di-n-Butylphthalate	0.0100	ND	104		
4,6-Dinitro-2-methylphenol	0.0250	ND	128		
2,4-Dinitrophenol	0.0250	ND	114		
2,4-Dinitrotoluene	0.0100	ND	108	8.70	84

ELT# 19193

8270 COMPOUNDS	Reporting Limits	Concentration mg/L	%IA	RPD	%EA	
2,6-Dinitrotoluene	0.0100	ND	108			
Di-n-octylphthalate	0.0100	ND	122			
Fluoranthene	0.0100	ND	102			
Fluorene	0.0100	ND	80			
Hexachlorobenzene	0.0100	ND	108			
Hexachlorobutadiene	0.0100	ND	92			
Hexachlorocyclopentadiene	0.0100	ND	62			
Hexachloroethane	0.0100	ND	82			
Indeno (1,2,3-cd) pyrene	0.0100	ND	122			
Isophorone	0.0100	ND	104			
2-Methylnaphthalene	0.0100	ND	88			
2-Methylphenol	0.0100	ND	88			
3 and 4-Methylphenol	0.0100	ND	82			
Naphthalene	0.0100	ND	80			
2-Nitroaniline	0.0250	ND	104			
3-Nitroaniline	0.0250	ND	104			
4-Nitroaniline	0.0250	ND	90			
Nitrobenzene	0.0100	ND	98			
2-Nitrophenol	0.0100	ND	96			
4-Nitrophenol	0.0250	ND	114	8.70	84	
N-Nitroso-Di-n-Propylamine	0.0100	ND	86	4.14	74	
N-Nitrosodiphenylamine	0.0100	ND	94			
Pentachlorophenol	0.0250	ND	88	6.54	79	
Phenanthrene	0.0100	ND	96			
Phenol	0.0100	ND	110	3.51	87	
Pyrene	0.0100	ND	112	2.44	83	
Bis (2-ethylhexyl) phthalate	0.0100	ND	104			
1,2,4-Trichlorobenzene	0.0100	ND	88	1.38	73	
2,4,5-Trichlorophenol	0.0250	ND	94			
2,4,6-Trichlorophenol	0.0100	ND	94			

METHOD: EPA SW 846-8270C, 3510

SURROGATES	% RECOVERY
2-Fluorophenol SURR	42
Phenol-d5 SURR	30
Nitrobenzene-d5 SURR	67
2-Fluorobiphenyl SURR	64
2,4,6-Tribromophenol SURR	101
Terphenyl-d14 SURR	54

Raland K. Tuttle

8-26-97
Date

ENVIRONMENTAL
LAB OF , INC.
"Don't Treat Your Soil Like Dirt!"

WHOLE EARTH ENVIRONMENTAL
ATTN: MR. MIKE GRIFFIN
19606 SAN GABRIEL
HOUSTON, TEXAS 77084
FAX: 281-646-8986

Sample Type: Water
Sample Condition: Intact/Iced
Project #: 96-16 Recovery & Monitor Well
Project Name: EOTT
Project Location: Lovington, N.M.
Field Code: Monitor

Sampling Date: 08/13/99
Receiving Date: 08/13/99
Analysis Date: 08/25/99

Volatiles EPA SW 846-8260, (mg/l) Compounds	ELT# 19193	PQL	%Dev	Method Blank	% EA
Chloromethane	ND	0.001	-19.5	ND	
Vinyl chloride	ND	0.001	-23.0	ND	
Bromomethane	ND	0.001	-0.7	ND	
Chloroethane	ND	0.001	2.5	ND	
Trichlorofluoromethane	ND	0.001	-14.2	ND	
Acetone	ND	0.010	-10.0	ND	
1,1-Dichloroethene	ND	0.001	9.1	ND	90
Iodomethane	ND	0.010	-14.3	ND	
Vinyl Acetate	ND	0.010	11.2	ND	
Carbon Disulfide	ND	0.001	2.6	ND	
Methylene Chloride	ND	0.001	-2.4	ND	
trans-1,2-Dichloroethene	ND	0.001	11.0	ND	
1,1-Dichloroethane	ND	0.001	10.9	ND	
2-Butanone	ND	0.010	16.9	ND	
cis-1,2-dichloroethene	ND	0.001	11.5	ND	
Bromochloromethane	ND	0.001	6.2	ND	
Chloroform	ND	0.001	0.8	ND	
1,1,1-Trichloroethane	ND	0.001	12.6	ND	
Carbon Tetrachloride	ND	0.001	6.9	ND	
Benzene	ND	0.001	11.1	ND	93
1,2 Dichloroethane	ND	0.001	8.0	ND	
Trichloroethene	ND	0.001	0.2	ND	99
1,2-Dichloropropane	ND	0.001	5.4	ND	
Dibromomethane	ND	0.001	-1.2	ND	
Bromodichloromethane	ND	0.001	3.0	ND	
2-Hexanone	ND	0.010	32.9	ND	
4-Methyl 2-Pentanone	ND	0.010	24.6	ND	
cis 1,3 Dichloropropene	ND	0.001	-1.7	ND	
Toluene	0.001	0.001	-0.7	ND	101
trans 1,3-Dichloropropene	ND	0.001	1.7	ND	
1,1,2-Trichloroethane	ND	0.001	10.8	ND	
Dibromochloromethane	ND	0.001	-2.0	ND	

WHOLE EARTH ENVIRONMENTAL
ATTN: MR. MIKE GRIFFIN
19606 SAN GABRIEL
HOUSTON, TEXAS 77084
FAX: 281-646-8996

Sample Type: Water
Sample Condition: Intact/Iced
Project #: 96-16 Recovery & Monitor Well
Project Name: EOTT
Project Location: Lovington, N.M.
Field Code: Monitor

Sampling Date: 08/13/99
Receiving Date: 08/13/99
Analysis Date: 08/25/99

Volatiles EPA SW 846-8260, (mg/l) Compounds	ELT# 19193	PQL	%Dev	Method Blank	% EA
Tetrachloroethene	ND	0.001	-5.1	ND	
Chlorobenzene	ND	0.001	4.6	ND	98
1,1,1,2-Tetrachloroethane	ND	0.001	-6.6	ND	
Ethylbenzene	ND	0.001	-5.3	ND	
m&p Xylene	ND	0.001	-7.3	ND	
o-Xylene	0.001	0.001	-9.6	ND	
Styrene	ND	0.001	-5.7	ND	
Bromoform	ND	0.001	12.1	ND	
1,1,2,2-Tetrachloroethane	ND	0.001	5.1	ND	
1,2,3-Trichloropropane	ND	0.001	-21.7	ND	
1,4-Dichlorobenzene	ND	0.001	4.1	ND	
1,2-Dichlorobenzene	ND	0.001	7.4	ND	
1,2-Dibromo-3-Chloropropane	ND	0.001	35.4	ND	

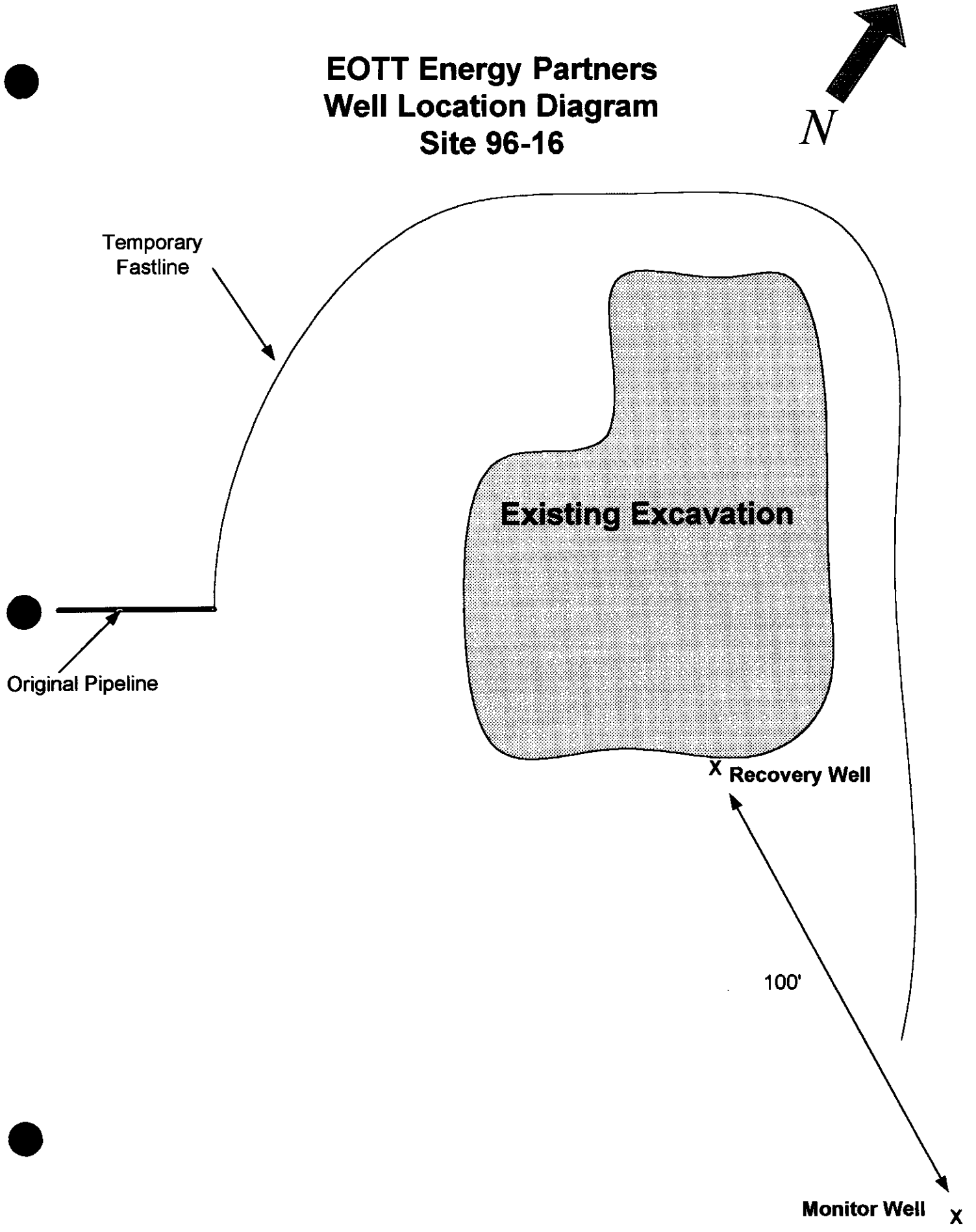
SYSTEM MONITORING COMPOUNDS	% RECOVERY
Dibromofluoromethane	107
Toluene-d8	100
4-Bromofluorobenzene	98

ND=<PQL

Raland K. Tuttle

8-26-99
Date

EOTT Energy Partners
Well Location Diagram
Site 96-16



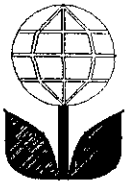
EOTT Energy Partners

RECEIVED

JUL 0 7 1999

ENVIRONMENTAL BUREAU
OIL CONSERVATION DIVISION

Site 96-16
Remediation Protocol



Whole Earth Environmental
19606 San Gabriel
Houston, Tx. 77084

WHOLE EARTH

Whole Earth Environmental, Inc.
19606 San Gabriel, Houston, Texas 77084
281/492-7077 • Fax: 281/646-8996

RECEIVED
JUL 0 7 1999
Environmental Bureau
Oil Conservation Division

July 1, 1999

New Mexico Oil Conservation Division
2040 South Pacheco
Sante Fe, New Mexico 87505

Attn: Bill Olson

Dear Bill:
Enclosed, please find a copy of our remediation protocol for Eott Energy's 96-16 site. Though we have not yet sampled the ground water beneath the spill site, I'm fairly confidant that we will encounter free phase product on the water table when we do actually core it down.

Anticipating this result, I've gone ahead with a remediation protocol in which the plume will be excavated to a TPH concentration of <5,000 ppm, a liner installed and the remediated materials re-deposited within the lined excavation at <5,000 ppm TPH concentrations. I took your and Mr. Anderson's advise and included a top cover for the encapsulated plume so as to insure that it is completely sealed off in all directions.

We've found an oil / water separator that is powered by a windmill and which promises recovery rates of up to 720 gallons per day of free phase product. If this technology works at only one-hundredth of it's stated potential, we will have discovered an efficient, low cost method of obtaining product recovery at remote locations.

As we are midway into this project, I would sincerely appreciate it if you could give the enclosed plan your earliest possible review.

Warmest personal regards,

Mike Griffin
President
Whole Earth Environmental, Inc.

Site Profile

Location
The spill site is located approximately two miles east of the Navajo Refinery located on NM Hwy. 18 between Hobbs and Lovington, New Mexico. (See attached geo-coordinate maps). There are no surface streams or water wells within one mile of the site.

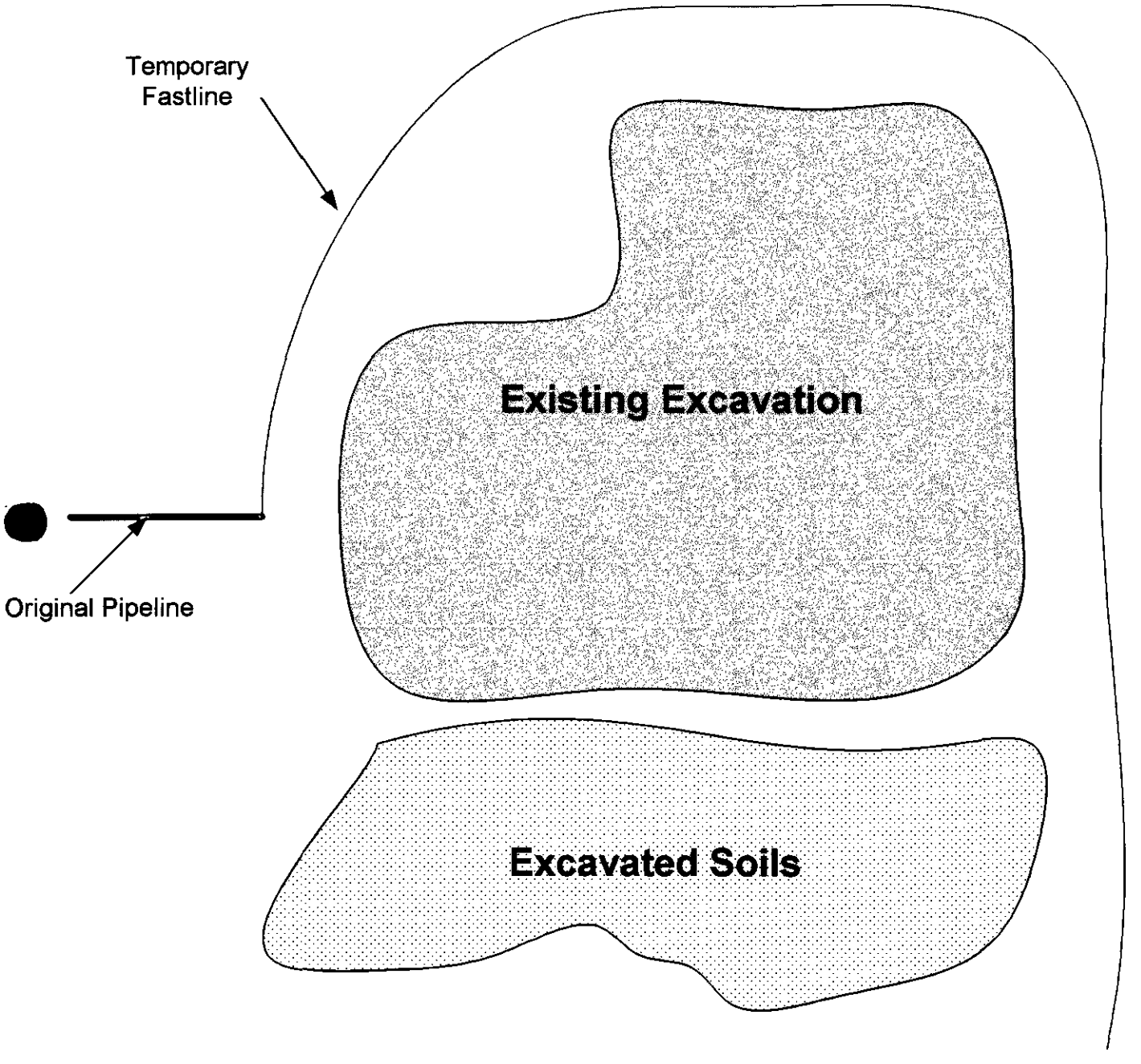
Previous Investigations
The site has been previously characterized in two reports. The first was an initial spill response report generated by Environmental Spill Control and dated May 20, 1996. The second was generated by KEI (Job No. 610088-1) dated June 26, 1998.

KEI took two series of soil borings at the site. The first soil boring (SB-1) indicated TPH concentrations of 33.4 ppm and non-detectable concentrations of BTEX at a depth of 32.5' below the excavated portion of the site. The boring was taken from the excavated portion of the site approximately 9' below ground level, therefore the total depth to the sampling point is 41.5'. The second soil boring showed TPH concentrations of 570 ppm and total BTEX of 5.97 ppm also at a depth of 41.5' below ground level. (KEI test summary enclosed).

Remediation History
The site was previously excavated to a depth of approximately 9' at the southern end of the spill and ramped to the north, (see enclosed photographs). Based on the previous analytical data, Whole Earth Environmental attempted to continue the excavation to a depth sufficient to achieve contaminant concentrations of <100 ppm TPH, <10 ppm benzene and <50 ppm total BTEX.

The excavation efforts were discontinued at a total depth of 35' below ground level when field testing revealed TPH concentrations <1,000 ppm. The excavation was then sampled on all four side-walls and bottom, contoured and graded to accept a liner.

EOTT Energy Partners
Spill Diagram
Site 96-16



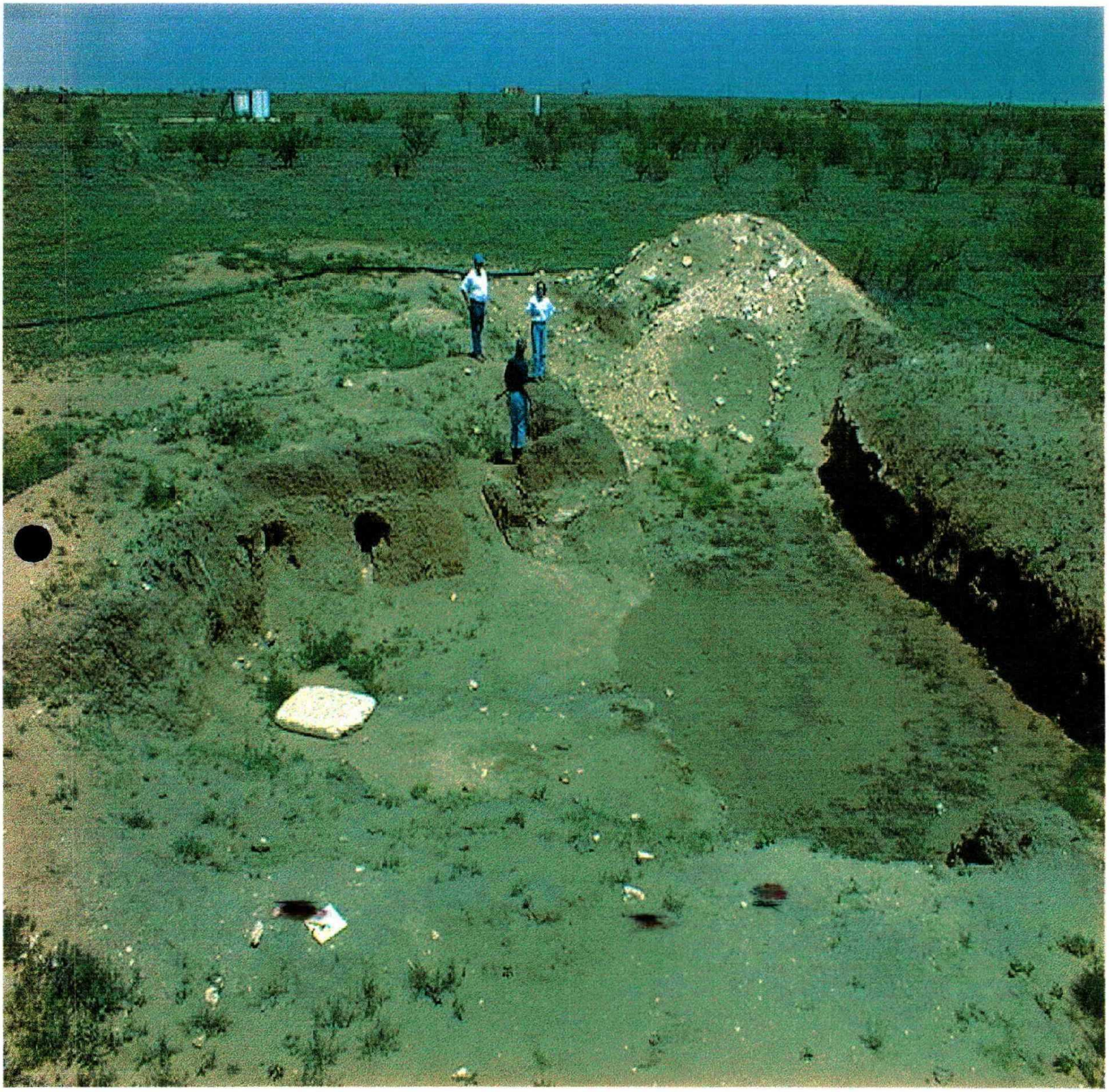


TABLE I

SUMMARY OF SOIL RESULTS - BTEX AND TPH
TEXAS - NEW MEXICO PIPE LINE COMPANY
TNM-96-16
LEA COUNTY, NEW MEXICO

SAMPLE LOCATION	SAMPLE DATE	DEPTH (feet)	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYL-BENZENE (mg/kg)	XYLENES (mg/kg)	TOTAL BTEX (mg/kg)	TPH (mg/kg)
SB-1	03/09/98	0 - 2.5	3.08	56.60	59.80	136.00	255.48	9570
SB-1	03/09/98	15 - 17.5	4.00	28.40	15.00	65.20	112.60	4020
SB-1	03/09/98	30 - 32.5	ND	ND	ND	ND	ND	33.4
SB-2	03/09/98	0 - 2.5	2.19	0.74	4.40	22.06	29.39	2110
SB-2	03/09/98	15 - 17.5	ND	ND	0.036	0.273	0.309	428
SB-2	03/09/98	30 - 32.5	0.029	0.040	0.910	4.978	5.957	570

Protocol

This section contains a copy of the remediation protocol we plan to employ on this project.

4.4 Prior to any excavation, New Mexico One Call will be notified. The One Call notification number will be included within the closure report. If lines are discovered within the area to be excavated they shall be marked with pin flags on either side of the line at maximum five foot intervals.

5.0 Remediation Procedure

5.1 All soils containing a TPH concentration >5,000 ppm, and all soils containing a benzene concentration>10ppm or a total BTEX concentration >50ppm will be excavated and placed immediately adjacent to the excavation. The side walls and bottom of the excavation will be field tested for TPH and BTEX concentrations in accordance with WEQP-06 and WEQP-19.

5.2 The Hobbs branch of the OCD will be notified to witness the final confirmation sampling of the side walls and bottom of the excavation. Samples will be collected in accordance with WEQP-77 and analyzed for TPH and BTEX.

5.3 The excavated soils will be mixed and blended with sub-strait materials to achieve a maximum concentration of 5,000 ppm TPH, 10 ppm benzene and 50 ppm total BTEX concentration. A confirmation composite sample will be collected and analyzed in accordance with 5.2 of this protocol.

6.0 Modeling

6.1 The bottom hole benzene concentrations and the depth to ground water will be determined and included within a VADSAT contaminant migration model. The modeled results should project that no benzene concentrations exceeding NMWQCC standards of 10 ppb shall be allowed to impact the ground water within a 100 year model span.

6.2 The modeled results will be submitted to the Sante Fe office of the NMOCD prior to any materials being re-deposited within the excavation.

7.0 Liner

7.1 Upon approval by the NMOCD, Whole Earth will install a 30 mil polyethylene liner within the excavation. The liner will extend up the side walls to a point within 5' of the ground surface. The excavated soils will be replaced within the liner at concentrations not to exceed those described in paragraph 5.2 of this protocol.

7.2 An additional polyethylene top cover will be erected atop the excavation and overlapped with the bowl liner to insure that no surface water will infiltrate the main plume area. The top liner should be slightly domed to accommodate subsidence and to direct a drainage path away from the main plume. The top of the liner shall be at least 3' below ground level.

8.0 Groundwater Remediation and Monitoring

8.1 A recovery well will be drilled, cased and developed to a total depth of 105' and will incorporate a minimum of 30' of 4" slotted PVC screen. The well will be backfilled with cuttings, sand packed sealed with bentonite. The top 10' of the well will be cemented to surface.

8.2 A windmill will be erected over the recovery well. The windmill will be equipped with a "down hole" oil-water separator. The free phase product will be pumped to surface and directed to an above ground storage tank for subsequent removal for re-processing. The storage tank will be netted to insure that it poses no risk to wildlife.

8.3 The lateral extent of the plume will be defined by a 2" monitor well constructed with a minimum of 20' of slotted screen. All other construction details will be in accordance with paragraph 8.1 of this protocol.

9.0 Monitoring

9.1 Both the recovery well and delineation well will be initially sampled for the presence and concentrations of RCRA 8 metals, BTEX, criteria PAH's, chlorides and major cations and anions. Sample collection will be in accordance with WEQP-76.

9.2 Both wells will be sampled on a quarterly basis for the presence and concentration of BTEX. After four consecutive quarters in which the BTEX concentrations within the source and monitor wells show BTEX concentrations in accordance with NMWQCC standards, the wells will be re-analyzed for RCRA 8 metals, criteria PAH's, chlorides and major cations and anions. If the test results show concentrations within acceptable NMWQCC standards, EOTT will request final site closure. Once approved, the recovery and monitor wells will be grouted to surface and the site re-contoured to match background topography.

10.0 Closure Report

10.1 At the conclusion of the project, Whole Earth shall prepare a closure report which contains the following minimum information:

- Photographs of the location prior to remediation
- Photographs of the location at time of final closure
- Plat map showing sampling locations
- All pre-closure contaminant concentrations
- Contaminant concentrations at the conclusion of the project
- Copies of this protocol and all testing procedures
- Copies of each days tailgate safety meeting
- Copies of daily calibration logs for each instrument
- Independent split sample laboratory analyses
- Copies of the VADSAT contaminate migration model
- MSDS sheets of the liner
- Construction details of the monitor and recovery wells
- A hydrogeological survey map indicating the depth and direction of the groundwater and locations of the recovery and monitor wells

Procedures

This section contains copies of the detailed sample collection and field testing procedures we plan to employ on this project.

QP-06 Rev. C

WHOLE EARTH ENVIRONMENTAL
QUALITY PROCEDURE

Procedure for Conducting Field TPH Analysis

Completed By:	Approved By:	Effective Date: 02/15/97

1.0 Purpose

To define the procedure to be used in conducting total percentage hydrocarbon testing in accordance with EPA Method 418.1 (modified) using the "MEGA" TPH Analyzer.

2.0 Scope

This procedure is to be used for field testing and on site remediation information.

3.0 Procedure

3.1 The G.A.C. "MEGA" TPH analyzer is an instrument that measures concentrations of aliphatic hydrocarbons by means of infra-red spectrometry. It is manufactured to our specifications and can accurately measure concentrations from two parts per million through 100,000 parts per million. The unit is factory calibrated however minor calibration adjustments may be made in the field. Quality Procedure 25 defines the field calibration methods to be employed.

3.2 Prior to taking the machine into the field, insert a 500 ppm and 5,000 ppm calibration standard into the sample port of the machine. Zero out the Range dial until the instrument records the exact standard reading.

3.3 Once in the field, insert a large and small cuvette filled with clean Freon 113 into the sample port of the machine. Use the range dial to zero in the reading. If the machine does not zero, do not attempt to adjust the span dial. Immediately implement Quality Procedure 25 .

3.4 Place a 100 g. weight standard on the field scale to insure accuracy. Zero out the scale as necessary.

3.5 Tare a clean 100 ml. sample vial with the Teflon cap removed. Add 10 g. (+/- .01 g), of sample soil into the vial taking care to remove rocks or vegetable matter from the sample to be tested. If the sample is wet, add up to 5 g. silica gel or anhydrous sodium sulfate to the sample after weighing.

3.6 Dispense 10 ml. Freon 113 into the sample vial.

3.7 Cap the vial and shake for five minutes.

3.8 Carefully decant the liquid contents of the vial into a filter/desiccant cartridge and affix the cartridge cap. Recap the sample vial and set aside.

3.9 Insert the metal tip of the pressure syringe into the cap opening and slowly pressurize. **WARNING: APPLY ONLY ENOUGH PRESSURE ON THE SYRINGE TO EFFECT FLOW THROUGH THE FILTERS. TOO MUCH PRESSURE MAY CAUSE THE CAP TO SEPARATE FROM THE BODY OF THE CARTRIDGE.** Once flow is established through the cartridge direct the flow into the 5 cm. cuvette until the cuvette is full. Reverse the pressure on the syringe and remove the syringe tip from the cartridge cap. Set the cartridge aside in vertical position.

3.10 The cuvette has two clear and two frosted sides. Hold the cuvette by the frosted sides and carefully insert into the sample port of the machine. Read the right hand digital read-out of the instrument. If the reading is less than 1,000 ppm. the results shall be recorded in the field Soil Analysis Report. If the result is higher than 1,000 ppm, continue with the dilution procedure.

4.0 Dilution Procedure

4.1 When initial readings are greater than 1,000 ppm using the 5 cm. cuvette, pour the contents of the 5 cm. cuvette into a 1 cm. cuvette. Insert the 1. cm cuvette into the metal holder and insert into the test port of the instrument.

4.1 Read the left hand digital read-out of the machine. If the results are less than 10,000 ppm, record the results into the field Soil Analysis Report. If greater than 10,000 ppm, continue the dilution process. **Concentrations >10,000 ppm are to be used for field screen purposes only.**

4.2 Pour the contents of the small cuvette into a graduated glass pipette. Add 10 ml. pure Freon 113 into the pipette. Shake the contents and pour into the 1cm. cuvette. Repeat step 4.2. adding two zeros to the end of the displayed number. If the reported result is greater than 100,000 ppm. the accuracy of further readings through additional dilutions is extremely questionable. **Do not use for reporting purposes.**

4.4 **Pour all sample Freon into the recycling container.**

5.0 Split Samples

5.1 Each tenth test sample shall be a split sample. Decant approximately one half of the extraction solvent through a filter cartridge and insert into the instrument to obtain a concentration reading. Clean and rinse the cuvette and decant the remainder of the fluid to obtain a second concentration reading from the same sample. If the second reading varies by more than 1% from the original, it will be necessary to completely recalibrate the instrument.

QP-19

WHOLE EARTH ENVIRONMENTAL
QUALITY PROCEDURE

Sampling and Testing Protocol
BTEX Speciation in Soil

Completed By:	Approved By:	Effective Date: / /

1.0 Purpose

This procedure is to be used to determine the concentrations of Benzene, Toluene, Ethyl-Benzene and Xylene (BTEX) in soils.

2.0 Scope

This procedure is to be used as the standard field measurement for soil BTEX concentrations. It is not to be used as a substitute for full spectrographic speciation of organic compounds.

3.0 Procedure

3.1 Sample Collection and Preparation

3.1.1 Collect at least 500 g. of soil from the sample collection point. Take care to insure that the sample is representative of the general background to include visible concentrations of hydrocarbons and soil types. If necessary, prepare a composite sample of soils obtained at several points in the sample area. Take care to insure that no loose vegetation, rocks or liquids are included in the sample(s).

3.1.2 The soil sample(s) shall be immediately inserted into a one quart or larger polyethylene freezer bag and sealed. When sealed, the bag should contain a nearly equal space between the soil sample and trapped air.

3.1.3 The sealed samples shall be allowed to set for a minimum of five minutes at a minimum temperature of 70°F.

3.1.4 The sealed sample bag should be massaged to break up any clods, and to provide the soil sample with as much exposed surface area as practically possible.

3.2 Sampling Procedure

3.2.1 The instrument to be used in conducting VOC concentration testing shall be a Photovac Ion-chromatograph with BTEX Module. Prior to use the instrument shall be zeroed out in accordance with QP-55.

3.2.2 Carefully open one end of the collection bag and insert the probe tip into the bag taking care that the probe tip not touch the soil sample or the side walls of the bag. If VOC analysis was conducted on the sample prior to BTEX analysis, care should be taken to insure that a sufficient air volume exists in the bag to provide accurate results. **If the available air space within the bag is insufficient to run a full analysis, the sample shall be discarded.**

3.2.3 Set the instrument to retain the highest result reading value. Record the reading onto the Field Analytical Report Form and additionally enter the location code into the instrument data logger.

4.0 After testing, the soil samples shall be returned to the sampling location, and the bags collected for off-site disposal. **IN NO CASE SHALL THE SAME BAG BE USED TWICE. EACH SAMPLE CONTAINER MUST BE DISCARDED AFTER EACH USE.**

QP-25

WHOLE EARTH ENVIRONMENTAL
QUALITY PROCEDURE

Procedure for Instrument Calibration and Quality Assurance Analysis for General Analysis "MEGA" TPH Analyzer

Completed By: Approved By: Effective Date: / /

1.0 Purpose

This procedure outlines the methods to be employed in calibrating the GAC MEGA TPH analyzer and for determining and reporting of accuracy curves.

2.0 Scope

This procedure shall be followed each day that the instrument is used.

3.0 Procedure

3.1 Turn the instrument on and allow to warm up with no cuvette in the receptacle. The instrument will take between five and ten minutes to come to equilibrium as can be determined by the concentration display readings moving a maximum of 5 ppm on the low scale. If the instrument continues to display erratic readings greater than 5 ppm, remove the cover and check both the mirrors and chopper to insure cleanliness.

3.2 All TPH standards shall be purchased form Environmental Resources Corporation and as a condition of their manufacture subject to independent certification by third party laboratories. Each standard is received with a calibration certificate.

3.3 Insert the low range (100 ppm) calibration standard into the receiving port and note the result on the right hand digital display. If the displayed reading is less than 98 ppm or greater than 102 ppm, remove the circuit board cover panel and zero out the instrument in accordance with QP-26.

(Note: Except in New Mexico, set the span to read 105% of actual standard).

3.4 Repeat the process with the mid range (500 ppm) calibration standard. If the displayed reading is less than 490 ppm or greater than 510 ppm zero out the span as described in QP-26.

3.5 Repeat the process again with the 1,000 and 5,000 ppm calibration standards.

3.6 Pour clean Freon 113 into a filter cartridge and extract into 10 ml cuvette. Insert the cuvette into the receiving port and zero out the instrument reading using the far right adjustment knob on the instrument. Repeat using the 1 ml cuvette and the left hand zero dial.

4.0 Determining & Reporting Instrument Accuracy

4.1 After making the fine adjustment with the zero dials reinsert each calibration standard into the instrument and note the concentration values. ***If <u>any</u> concentration value exceeds 2% of the standard set point, repeat all steps in section 3.0 of this Procedure.*** Note the actual concentration values displayed by the instrument after each calibration standard.

4.2 The four calibration standards shall be used in reporting span deviation as follows:

Standards Range			
100 ppm	**500 ppm**	**1,000 ppm**	**5,000 ppm**
0-250 ppm	251-750 ppm	751-2,500 ppm	2,501-10,000 ppm

4.3 Divide the actual instrument reading value of each calibration sample by the concentration shown on the standard (e.g.. 501 ppm instrument reading / 500 ppm standard = 1.002%). These readings shall be reported for each test performed.

5.0 Re-calibration

5.1 If any sample exceeds the concentration of 1,000 ppm on the 10 ml cuvette or 10,000 ppm on the 1 ml cuvette, the cuvette must be thoroughly rinsed with clean Freon and the instrument re-zeroed in accordance with 3.6 of this procedure.

QP-55

WHOLE EARTH ENVIRONMENTAL
QUALITY PROCEDURE

Procedure for Instrument Calibration and Quality Assurance Analysis for Photovac Gas Chromatograph

Completed By: Approved By: Effective Date: / /

1.0 Purpose

This procedure outlines the methods to be employed in calibrating the Photovac analyzer in the BTEX mode and for determining and reporting of accuracy curves.

2.0 Scope

This procedure shall be followed each day that the instrument is used.

3.0 Procedure

Start-up

3.1 Turn the instrument on and press the Battery button. A battery status report will appear on the screen. If the charge level is less than 8.0, either charge the battery or insert a fresh battery pack.

3.2 Open carrier gas valve on right side of instrument. The instrument is now tuning the lamp. If any "boot" problems occur during warm-up, the "chck" symbol will appear on the screen. Pressing TUTOR will prompt the instrument to provide details. The instrument will not progress beyond the start-up mode until all prompts are cleared.

3.3 The next screen display will be "purj" and will last approximately ten minutes. The instrument is purging the column.

Calibrate

3.4 Connect the regulator to cylinder of calibration gas. Connect calibration adapter and tee assembly to both the regulator and instrument. **DO NOT FORCE ANY CONNECTION!**

3.5 Inspect the open end of the tee vent to insure unobstructed flow.

3.6 Enter CAL on the key pad. The instrument will query "benzene?". Following the prompts and using the key pad, set the concentrations to those defined on the calibration gas bottle. Follow the same procedure for toluene, ethyl-benzene and xylene. After each compound, the instrument will read that the next analysis will be a calibration.

3.7 Press ENTER on key pad. The instrument will calibrate itself for the concentrations specified.

Confirmation Sample

3.8 After each calibration, run the calibration gas through the instrument once again. The display readings should be **exactly** those of the concentrations displayed on the calibration gas bottle. **If they are not, the instrument needs factory calibration; do not use.**

4.0 Re-calibration

4.1 The instrument is designed with software that prompts you to recalibrate each day, each thirty minutes of use, and after running a sample with high concentrations of one or more of the detected compounds.

5.0 Reporting Instrument Accuracy

5.1 The instrument accuracy as certified by the factory is 15% within one decade of instrument set point. Lower detection limits are 0.1 ppm for benzene and 1.0 ppm for toluene, ethylbenzene and xylene.

5.2 These standards and detection limits must be shown on all reports in which the instrument is used.

WHOLE EARTH ENVIRONMENTAL

QP-76 (Rev. A)

WHOLE EARTH ENVIRONMENTAL
QUALITY PROCEDURE

Procedure for Obtaining Water Samples (Cased Wells) Using One Liter Bailer

Completed By: Approved By: Effective Date: / /

1.0 Purpose

This procedure outlines the methods to be employed in obtaining water samples from cased monitoring wells.

2.0 Scope

This procedure shall be used for developed, cased water monitoring wells. It is not to be used for standing water samples such as ponds or streams.

3.0 Preliminary

3.1 Obtain sterile sampling containers from the testing laboratory designated to conduct analyses of the water. The shipment should include a Certificate of Compliance from the manufacturer of the collection bottle or vial and a Serial Number for the lot of containers. Retain this Certificate for future documentation purposes.

3.2 The following table shall be used to select the appropriate sampling container, preservative method and holding times for the various elements and compounds to be analyzed.

Compound to be Analyzed	Sample Container Size	Sample Container Description	Cap Requirements	Preservative	Maximum Hold Time
BTEX	40 ml.	VOA Container	Teflon Lined	HCl	7 days
TPH	1 liter	clear glass	Teflon Lined	HCl	28 days
PAH	1 liter	clear glass	Teflon Lined	Ice	7 days
Cation / Anion	1 liter	clear glass	Teflon Lined	None	48 Hrs.
Metals	1 liter	HD polyethylene	Any Plastic	Ice / HNO_3	28 Days
TDS	300 ml.	clear glass	Any Plastic	Ice	7 Days

4.0 Chain of Custody

4.1 Prepare a Sample Plan. The plan will list the well identification and the individual tests to be performed at that location. The sampler will check the list against the available inventory of appropriate sample collection bottles to insure against shortage.

4.2 Transfer the data to the Laboratory Chain of Custody Form. Complete all sections of the form except those that relate to the time of delivery of the samples to the laboratory.

4.3 Pre-label the sample collection jars. Include all requested information except time of collection. (Use a fine point Sharpie to insure that the ink remains on the label). Affix the labels to the jars.

5.0 Bailing Procedure

5.1 Identify the well from the site schematics. Place pre-labeled jar(s) next to the well. Remove the bolts from the well cover and place the cover with the bolts nearby. Remove the plastic cap from the well bore by first lifting the metal lever and then unscrewing the entire assembly.

5.2 The well may be equipped with an individual 1 liter bailing tube. If so, use the tube to bail a volume of water from the well bore equal to 10 liters for each 5' of well bore in the water table. (This assumes a 2" dia. Well bore).

5.3 Take care to insure that the bailing device and string do not become cross-contaminated. A clean pair of rubber gloves should be used when handling either the retrieval string or bailer. The retrieval string should not be allowed to come into contact with the ground.

6.0 Sampling Procedure

6.1 Once the well has been bailed in accordance with 5.2 of this procedure, a sample may be decanted into the appropriate sample collection jar directly from the bailer. The collection jar should be filled to the brim. Once the jar is sealed, turn the jar over to detect any bubbles that may be present. Add additional water to remove all bubbles from the sample container.

6.2 Note the time of collection on the sample collection jar with a fine Sharpie.

6.3 Place the sample directly on ice for transport to the laboratory. The preceding table shows the maximum hold times between collection and testing for the various analyses.

6.4 Complete the Chain of Custody form to include the collection times for each sample. Deliver all samples to the laboratory.

7.0 Documentation

7.1 The testing laboratory shall provide the following minimum information:

A. Client, Project and sample name.
B. Signed copy of the original Chain of Custody Form including data on the time the sample was received by the lab.
C. Results of the requested analyses
D. Test Methods employed
E. Quality Control methods and results

QP-77

WHOLE EARTH ENVIRONMENTAL
QUALITY PROCEDURE

Procedure for Obtaining Soil Samples for Transportation to a Laboratory

Completed By: Approved By: Effective Date: / /

1.0 Purpose

This procedure outlines the methods to be employed when obtaining soil samples to be taken to a laboratory for analysis.

2.0 Scope

This procedure shall be used for developed, cased water monitoring wells. It is not to be used for standing water samples such as ponds or streams.

3.0 Preliminary

3.1 Obtain sterile sampling containers from the testing laboratory designated to conduct analyses of the soil. The shipment should include a Certificate of Compliance from the manufacturer of the collection bottle or vial and a Serial Number for the lot of containers. Retain this Certificate for future documentation purposes.

3.2 If collecting TPH, BTEX, RCRA 8 metals, cation / anions or O&G, the sample jar may be a clear 4 oz. container with Teflon lid. If collecting PAH's, use an amber 4 oz. container with Teflon lid.

4.0 Chain of Custody

4.1 Prepare a Sample Plan. The plan will list the number, location and designation of each planned sample and the individual tests to be performed on the sample. The sampler will check the list against the available inventory of appropriate sample collection bottles to insure against shortage.

4.2 Transfer the data to the Laboratory Chain of Custody Form. Complete all sections of the form except those that relate to the time of delivery of the samples to the laboratory.

Modeling Data Entry
Eott Energy Corporation
Site 96-16
Benzene Migration Model

Control Data	Entry	U / M
Deterministic	Yes	
Monte Carlo	No	
Evaporation of Chemicals	No	
Adsorbed Phase Biodecay	No	
Low Permeability Layer Below Contamination	Not Present	

Source Data		
Waste Zone Thickness	40	Feet
Waste Zone Area	800	Square Feet
Ratio of Length to Width	1:1	
Soil Thickness Above Waste Zone	35	Feet
Contaminant Concentration in Soil / Waste Zone	10	ppm (benzene)
Hydrocarbon Concentration in Soil / Waste Zone	5,000	ppm

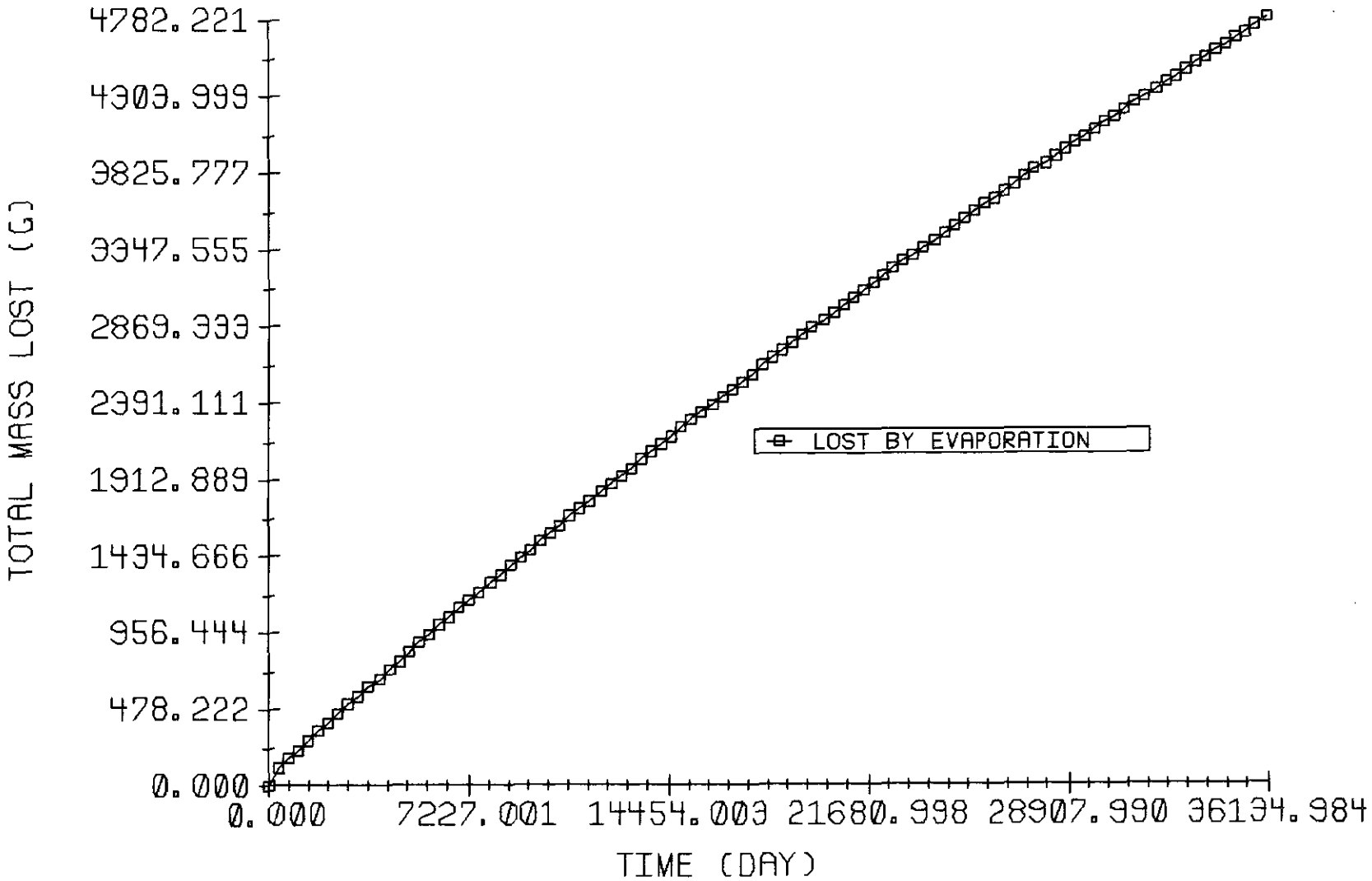
Chemical Data	
Benzene	Yes

Unsaturated Zone		
Biodecay Cooefficient	0.001	1 / day
Organic Carbon Fraction	1.00E-06	
Soil Database	Sandy Clay	
Hydrological Database	Sedimentary	
Unsaturated Zone Thickness	9.23	meter
Soil Database	Sandy Clay	
van Genuchten n	1.09	(Default)
Residual Water Content	0.01001	
Unsaturated Zone Dispersivity	0	Internally

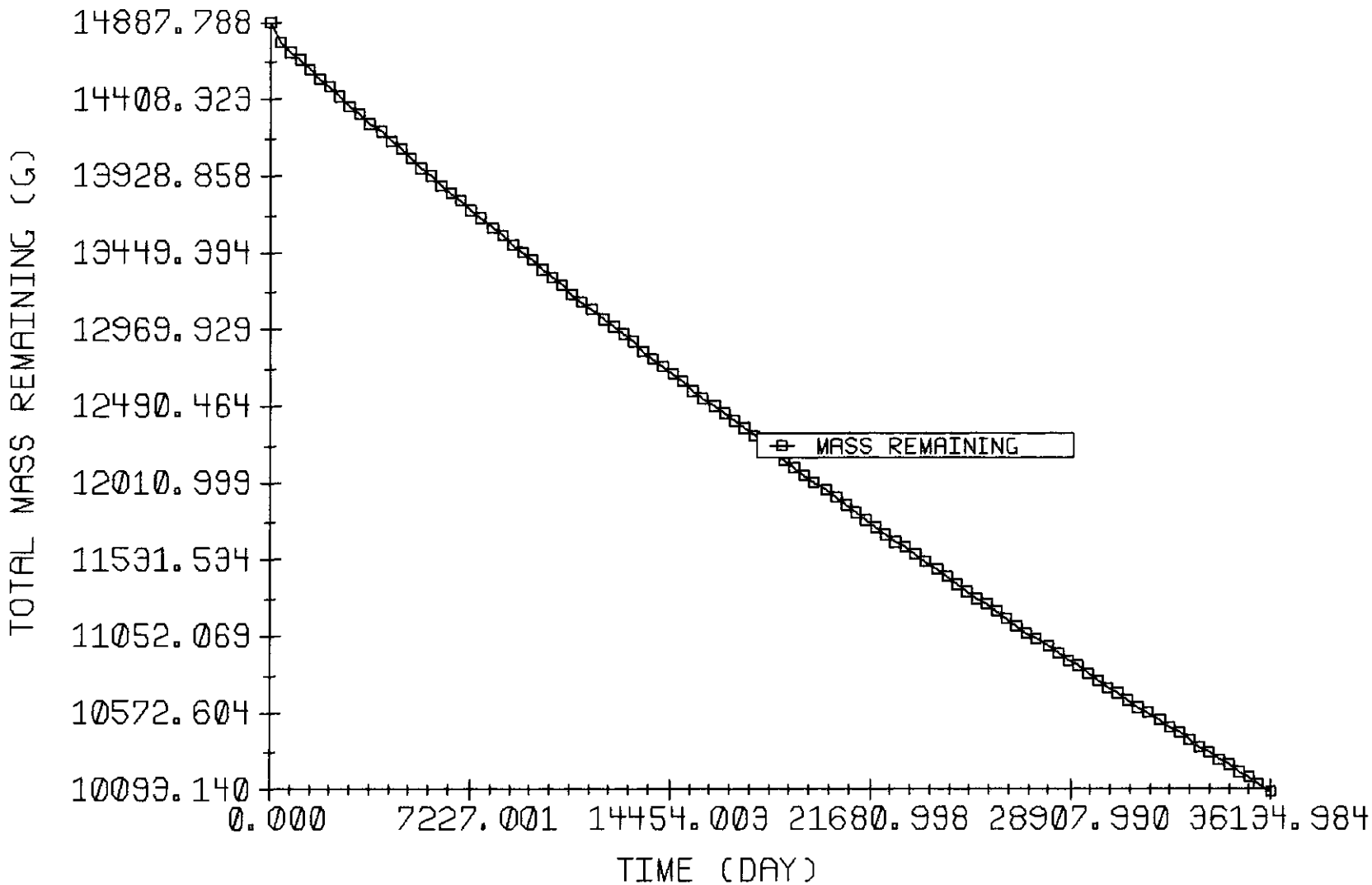
Saturated Zone		
Biodecay Cooefficient	0.001	1 / day
Aquifer Porosity	0.2	(Default)
Organic Carbon Fraction	0	Internally
Longitudinal Dispersivity	0	Internally
Ratio of Long. / Trans. Dispersivities	3	
Ratio of Trans. / Vert. Dispersivities	87	Default
Hydrological Database	Sedimentary	
Aquifer Thickness	10	meters
Aquifer Gradient	0.023	
Saturated Hydraulic Conductivity	0.13	meters / day

Net Infiltration Rate	0.00001	ft. / day

MASS LOST VS TIME



MASS REMAINING VS TIME



BASELINE RISK ASSESSMENT REPORT

TEXAS-NEW MEXICO PIPE LINE COMPANY
TNM-96-16
LEA COUNTY, NEW MEXICO

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San Antonio, Texas 78238
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BASELINE RISK ASSESSMENT REPORT

TEXAS-NEW MEXICO PIPE LINE COMPANY
TNM-96-16
LEA COUNTY, NEW MEXICO

PREPARED FOR:

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Job No. 610088

January 14, 1999

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EXECUTIVE SUMMARY

The Texas-New Mexico Pipe Line Company (TNMPL) release site designated as TNM-96-16 in Lea County, New Mexico was evaluated according to the United States Environmental Protection Agency (EPA) guidance documents listed in the REFERENCES section. The objective of the assessment was to evaluate the actual or reasonable potential for public and environmental exposure to constituents of concern, to evaluate the potential human health risks from that exposure, and to determine risk-based cleanup levels for constituents which pose an unacceptable risk.

The site is a crude oil pipeline release identified as TNM-96-16 in Lea County, New Mexico. A Site Location Map showing the location of the site in relation to the surrounding area is presented as FIG. 1. Details of the site are shown on FIG. 2.

The soils on site are sands and caliche. Ground water was not encountered on site during drilling (to a depth of approximately 38 feet bgs). There are no existing registered water wells within a one-half mile radius of the site. The site is in a remote, undeveloped rural location.

Based on the results of laboratory analyses, the constituents of concern are BTEX, TPH, and the polynuclear aromatic hydrocarbons (PAHs) chrysene, fluorene, naphthalene, and phenanthrene.

Complete pathways selected for exposure assessment included:

- on-site residents – ingestion of ground water (ground water protection)
- on-site residents - ingestion of soil, dermal contact with soil, and inhalation of volatiles and particulates from soil
- construction workers - ingestion of soil, dermal contact with soil, and inhalation of volatiles and particulates from soil

The estimated risks are presented on WORKSHEETS 4 and 5. When the resulting risks were unacceptable, Site Specific Target Levels (SSTLs) which result in acceptable risks were calculated. Detected site concentrations are compared to the SSTLs on WORKSHEET 7.

The maximum total carcinogenic risk and maximum total hazard index for each type of pathway is presented below:

	SOIL PATHWAYS (0-15 feet)	GROUND WATER PROTECTION PATHWAYS
Maximum Total Carcinogenic Risk	4.48×10^{-7}	0.00
Maximum Total Hazard Index	7.92	0.50

The most stringent SSTL for each constituent of concern in soil is compared to the maximum detected site concentrations below.

CONSTITUENT	SOIL SSTL (0'-15') (mg/kg)	MAXIMUM SOIL CONCENTRATION (0'-15') (mg/kg)
Ethylbenzene	355	59.8
Fluorene	9.63	1.3
Naphthalene	9.46	2.1
Phenanthrene	4.44	3.9
Toluene	63.6	56.6
Xylenes	144	136
TPH	3,070	30,900

Analysis of the risk assessment for the site indicates corrective action is required for soil. We recommend an evaluation of remedial alternatives for this site.

INTRODUCTION

This report presents the methodology and results of a baseline risk assessment conducted for the Texas-New Mexico Pipe Line Company release site designated as TNM-96-16 in Lea County, New Mexico. The site is located in the NW/4, SW/4 of Section 4, Township 17 South, Range 32 East. This risk assessment follows the approach included in the United States Environmental Protection Agency (EPA) guidance documents listed in the REFERENCES section. These guidance documents were used because they contain the most pertinent information for conducting risk assessments and because they are used and approved by the EPA. These documents are intended to provide guidance only, and considerable professional judgment must be exercised in applying these guidance documents to site-specific risk assessments. Consequently, this risk assessment incorporates several conservative (protective) assumptions in evaluating potential risks at the Texas-New Mexico Pipe Line Company site.

The objective of the assessment was to evaluate the actual or reasonable potential for public and environmental exposure to constituents of concern, to evaluate the potential risk from that exposure, and to determine risk-based cleanup levels for constituents which pose an unacceptable risk.

Conducting the baseline risk assessment requires:

- identification of the constituent(s) of concern and their toxicity
- identification of potential receptors at the site
- identification of exposure scenarios for each receptor
- quantification of exposure, dose and risk to each receptor
- calculation of site specific risk-based cleanup levels for constituents which pose an unacceptable risk

CHRONOLOGY OF PREVIOUS SITE ACTIVITIES

A chronological listing of significant events and activities is presented below.

4/24/96:	Crude oil pipeline spill of approximately 430 barrels discovered. Oil Or Product Loss Report completed.
5/20/96:	Environmental Spill Control conducted site investigation; four soil borings installed to define lateral extent of contamination.
7/30/96:	Spill area excavated by TNMPL.
3/9/98:	KEI installed two soil borings to delineate vertical extent of contamination.
6/18/98:	KEI collects samples from excavated area and from stockpiled soils.
7/20/98:	KEI submits Draft Soil Remediation Work Plan.

A description of the procedures and conclusions of KEI's site investigation activities, including the results of laboratory analysis of soil and ground water samples, is presented in the Subsurface Investigation Report, April 30, 1998.

CONSTITUENTS OF CONCERN

The following compounds were detected by laboratory analysis and make up the constituents of concern (COCs) for this site: benzene, toluene, ethylbenzene, and xylenes (BTEX), total petroleum hydrocarbons (TPH), and the PAHs chrysene, fluorene, naphthalene, and phenanthrene.

METHODOLOGY TO CALCULATE HAZARD QUOTIENT FOR TPH

Crude oil is a mixture of numerous hydrocarbons, many of which have no published toxicity factors. Therefore, a surrogate approach involving the assignment of conservative toxicity values and chemical property values to mass fraction groups based on their number of carbon atoms and structural similarities was implemented in order to estimate the hazard quotient for crude oil as a whole. The surrogate approach consists of a 4 step process.

- Identify groups of compounds based on their number of carbon atoms and structural similarities and measure the mass fraction of each group in the crude oil sample. The results of this "fingerprinting" analysis are presented in APPENDIX A.
- Identify representative toxicity values and chemical property values for groups of compounds identified above.
- Estimate the hazard quotient for each mass fraction group using the same equations used for individual compounds.
- Compute the hazard quotient for the crude oil as a whole by weighting the results for each group on a mass fraction basis. The following equation is used to compute the weighted hazard quotient for TPH:

$$HQ_w = \Sigma (HQ_i \times m_i)$$

where

HQ_w = the weighted hazard quotient
HQ_i = the hazard quotient of mass fraction group 'i' (unitless)
m_i = the mass fraction of group 'i' in the product (mg/mg)

The results of the implementation of this approach for the crude oil sample obtained at the subject site are presented on each calculation sheet.

EXPOSURE ASSESSMENT

SITE CONDITIONS

The TNM-96-16 release site occurs on undeveloped, remote rural land along a crude oil pipeline located in Lea County, New Mexico. The land is slightly rolling to flat with sparse native grasses. This risk assessment is based on the assumption that the excavation in the source area will be backfilled with clean soil and stockpiled soils will be treated or removed.

The soils on site are sands and caliche. Ground water was not encountered on site during drilling (at depths up to 38 feet) so ground water data is unavailable. According to the New

Mexico State Engineer Office, a depth of 139 feet was recorded on January 12, 1996, in an observation well estimated to be 1 mile east of the site.

Land Use

It is possible that the site may not remain vacant, but could be used for residential or commercial purposes. The nearest residence is more than 0.5 miles away. Adjacent land use consists of range land and tank batteries.

Water Use

There are no existing registered water wells within a one-half mile radius of the site. The drinking water in the vicinity of this site is supplied from an aquifer at depths of greater than 100 feet.

RECEPTORS OF CONCERN

On-site receptors of concern include:

- residents
- workers
- site visitors
- construction workers

Off-site receptors of concern include:

- residents
- workers

The exposure assumptions for the on-site resident are greater in every instance than those for the on-site worker, the site visitor, the off-site resident, and the off-site worker. Therefore, the on-site worker, the site visitor, the off-site resident, and the off-site worker pathways are not considered in this risk assessment.

The construction worker scenario assumes that a pit 10m x 10m x 5m is excavated at the site and the construction worker spends 8 hours a day / 5 days a week in the pit for a period of 3 months, the assumed duration of construction.

MEDIA OF CONCERN

Soil

Exposure to COCs present in the soils at the site can occur by incidental ingestion of contaminated soil and dermal contact with contaminated soil. Additionally, COCs present in the soil may leach into the ground water.

Air

Volatile emissions from residual hydrocarbons in soil at the site could lead to exposure through inhalation. Dispersion and transport of these volatiles in the atmosphere may cause on-site and off-site ambient air concentrations to be impacted. Due to the potential of contaminants to adsorb to particulates, inhalation of contaminated particulates is also possible during construction activities.

Ground Water

Assuming that a future resident installed a domestic well on site, exposure to COCs present in the ground water under the site could occur by ingestion of drinking water.

COMPLETE EXPOSURE PATHWAYS

Ground water is greater than 15 feet deep, therefore, exposure to volatile emissions from ground water and exposure through dermal contact with ground water are considered incomplete pathways.

Ground water was not encountered on site during drilling and no registered water wells exist within 0.5 miles of the site; however, to be conservative, it was assumed that a water well would be installed on the site for residential domestic use. Therefore, exposure to contaminants via ingestion of drinking water is considered a complete pathway for on-site residents under future conditions.

Complete pathways selected for exposure assessment included:

- on-site residents – ingestion of ground water (ground water protection)
- on-site residents - ingestion of soil, dermal contact with soil, and inhalation of volatiles and particulates from soil
- construction workers - ingestion of soil, dermal contact with soil, and inhalation of volatiles and particulates from soil

ESTIMATION OF RECEPTOR POINT CONCENTRATIONS

The above scenarios require that the contaminant concentrations in soil, ground water, and air at the point where exposure with the human receptor occurs be estimated. Site specific data is available for subsurface soil concentrations at the site. On-site ambient air concentrations, when needed, were estimated using screening level contaminant fate and transport equations. On-site ground water concentrations were estimated using a dilution/attenuation factor (DAF) calculated from the Jury and AT123D models. The DAF predicts the potential migration from soil into ground water for each constituent of concern. A summary of DAF calculations is provided in APPENDIX E. Potential ground water concentrations were then calculated by multiplying the soil concentration times the respective DAF for each constituent of concern.

The site-specific input parameters used in these calculations are presented in WORKSHEET 2. COC-specific parameters and risk equations are presented in APPENDIX B and APPENDIX C.

The following conservative assumptions were used in these calculations:

For the soil pathways:

- The maximum COC soil concentrations detected between 0 and 15 feet during assessment activities at the site exist homogeneously in the subsurface from the ground surface to a depth of 15 feet throughout the soil source area.

- It was assumed that a residence will be constructed in the source area.
- It was assumed that for non-carcinogens a child resident will ingest 200 mg of soil per day, 350 days per year for 6 years, for carcinogens an adult resident will ingest 124 mg of soil per day, 350 days per year for 30 years, and for both carcinogens and non-carcinogens that an adult resident will inhale 15 m^3 of air per day and will have 5800 cm^2 of skin surface area in contact with the soil, 350 days per year for 30 years. These exposure parameters represent the maximum potential (worst-case) exposure assumptions listed in EPA guidelines.
- It was assumed that a construction worker will inhale 20 m^3/day, will ingest 480 mg/day, and will have 3300 cm^2 of skin surface area in contact with the soil 5 days/week for 12 weeks.

For the ground water protection pathway:

- The maximum COC soil concentrations detected in the vadose zone during assessment activities at the site exist homogeneously in the vadose zone throughout the soil source area.
- It was assumed that a new domestic drinking water well will be installed in the middle of the source area.
- The depth to water was assumed to be 139 feet below ground surface.
- It was assumed that the resident will ingest 2 liters of ground water per day, 350 days per year for 30 years. These exposure parameters represent the maximum potential (worst-case) exposure assumptions listed in EPA guidelines.

EXPOSURE FACTORS AND ESTIMATION OF DOSE

The receptor point concentrations are combined with exposure factors to estimate dose using the relationships described in EPA RAGS. Exposure factor assumptions are chosen to reflect EPA guidance and site-specific conditions and represent conservative and reasonable estimates of potential exposure. Exposure factors used in this risk assessment are presented in WORKSHEET 3.

Note that for the residential soil ingestion pathway the age-adjusted ingestion rate is used with the other adult exposure factors for carcinogens and the child ingestion rate is used with the other child exposure factors for toxicants.

RISK CHARACTERIZATION

The overall impact to human health due to exposure to chemicals is estimated by combining the estimated dose and the critical toxicity values (slope factor for carcinogens, reference dose for non-carcinogens). A carcinogenic risk value was calculated for benzene and a Hazard Quotient value was calculated for each non-carcinogen considered a constituent of concern. The Hazard Quotients were then summed to calculate the total Hazard Index for each soil pathway. The calculated carcinogenic risk and the Hazard Index values for each pathway are summarized in WORKSHEET 4 for soil (0 to 15 feet) and WORKSHEET 5 for

vadose zone soil. The risk calculation equations, exposure factor inputs, and chemical-specific inputs such as toxicity values are presented in APPENDIX B and APPENDIX C.

The maximum total carcinogenic risk and maximum total Hazard Index for each type of pathway is presented below:

	SOIL PATHWAYS (0-15 feet)	GROUND WATER PROTECTION PATHWAYS
Maximum Total Carcinogenic Risk	4.48×10^{-7}	0.00
Maximum Total Hazard Index	7.92	0.50

The carcinogenic risk does not exceed the acceptable level of 1.0×10^{-6}. The Hazard Index exceeds the acceptable level of 1.0 for the soil (0-15 feet) pathway.

RISK-BASED TARGET LEVEL CALCULATIONS

For each complete pathway with estimated risk over the acceptable levels, Site-Specific Target Levels (SSTLs) were calculated for each COC. The same conservative assumptions and input parameters used in the risk calculations were used in the SSTL calculations to ensure those concentration limits will be protective of human health. The SSTL calculations are presented in APPENDIX D. The SSTLs for soil are presented in WORKSHEET 7.

The most stringent SSTL for each constituent of concern in soil is compared to the maximum detected site concentrations below.

CONSTITUENT	SOIL SSTL (0'-15') (mg/kg)	MAXIMUM SOIL CONCENTRATION (0'-15') (mg/kg)
Ethylbenzene	355	59.8
Fluorene	9.63	1.3
Naphthalene	9.46	2.1
Phenanthrene	4.44	3.9
Toluene	63.6	56.6
Xylenes	144	136
TPH	3,070	30,900

UNCERTAINTIES

As in any risk assessment, there is uncertainty in the results obtained. There may be uncertainty in the following components of these assessments:

- delineation of contaminants in the subsurface
- future use of the site and surrounding land use
- modeling input parameters
- exposure pathway analysis
- chemical toxicity values

Although uncertainty exists, the conservative nature of the risk assessment conducted makes it unlikely that small changes in these components would impact the conclusion for this site.

CONCLUSIONS

Analysis of the risk assessment for the site indicates corrective action is required for soil. We recommend an evaluation of remedial alternatives for this site.

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BASELINE RISK ASSESSMENT

Texas-New Mexico Pipe Line Co.
TNM-96-16
Lea County, New Mexico

WORKSHEET 1
EXPOSURE PATHWAY ANALYSIS

Ground Water

Potential Exposure Pathways	Y/N	Explanation / Source
Is Ground Water Ingestion Pathway Complete?	N	Ground water data unavailable. See ground water protection pathway.
Is Construction Worker Pathway Complete?	N	Ground water is > 15 feet deep.
Is Inhalation of Volatiles Pathway Complete?	N	Ground water is > 15 feet deep.

Soils

Potential Exposure Pathways	Y/N	Explanation / Source
Is Inhalation/Ingestion Pathway Complete?	Y	Contaminants of concern detected in soil 0'-15'.
Is Construction Worker Pathway Complete?	Y	Construction activity in the source area is possible.
Is Construction Worker Exposed to Both Soil and Ground Water Simultaneously?	N	One pathway is closed.
Is Ground Water Protection Pathway Complete?	Y	Contaminants of concern detected in vadose zone soil . Ground water concentrations modelled using the Jury and AT123D models.

BASELINE RISK ASSESSMENT

Texas-New Mexico Pipe Line Co.
TNM-96-16
Lea County, New Mexico

WORKSHEET 2
SITE-SPECIFIC INPUT PARAMETERS - SOIL

Soil Parameters			
Parameter	**Value**	**Units**	**Comments**
Soil Bulk Density:	1.8	g/cc	Default Value.
Total Porosity in the Vadose Zone:	0.32	—	Default Value.
Moisture Content in the Vadose Zone:	0.1	—	Default Value.
Fraction of Organic Carbon in Vadose Zone:	0.009	—	Measured from a sample collected at a depth of 6 to 8 feet on March 9, 1998.
Width of Source Area	62.0	ft	See FIGURE 2.
Total Soil Source Area	1,842	ft^2	See FIGURE 2.
Width of Source Area, Costruction Worker	15.5	ft	Default Value.
Total Soil Source Area, Construction Worker	1,170	ft^2	Default Value.

Air Parameters			
Parameter	**Value**	**Units**	**Comments**
Average Wind Speed	4.92	m/sec	
Average Wind Speed, Construction Worker	0.492	m/sec	Assumed to be 10% of average wind speed.
Diffusion Height	6.5	ft	Based on height of person
Distance to Residential Receptor	0	ft	See FIGURE 1.
Distance to Commercial Receptor	0	ft	See FIGURE 1.

BASELINE RISK ASSESSMENT

Texas-New Mexico Pipe Line Co.
TNM-96-16
Lea County, New Mexico

WORKSHEET 3
EXPOSURE INPUT PARAMETERS - SOIL

Input Parameters	Units	Resident		Worker	Construction Worker	Con. Wkr. Units
		Adult	Child			
Body weight	kg	70	15	70	70	kg
Averaging Time (carcinogens)	years	70		70	70	years
Averaging Time (non-carcinogens) - soil	years	30	6	25	0.24	years
Averaging Time (non-carcinogens) - ground water	years	30		25	0.06	years
Exposure Frequency	days/yr	350	350	250	5	days/wk
Exposure Frequency, dermal contact w/ soil	days/yr	350		250	5	days/wk
Exposure Duration, soil	years	30	6	25	12	weeks
Exposure Duration, ground water	years	30		25	3	weeks
Inhalation Rate	m^3/day	15		20	20	m^3/day
Soil Ingestion Rate	mg/day		200	50	480	mg/day
Age-adjusted Soil Ingestion Rate	mg-yr/kg-day	124				
Water Ingestion Rate	liters/day	2		1		
Skin Surface Area in contact w/ soil	cm^2	5800		5800	3300	cm^2
Soil to Skin Adherence Factor	mg/cm^2	1		1	0.12	mg/cm^2
Skin Surface Area in contact w/ ground water					6170	cm^2
Dermal Contact Event Frequency					2	events/day
Duration of Dermal Contact Event					2	hr

BASELINE RISK ASSESSMENT

Texas-New Mexico Pipe Line Co.
TNM-96-16
Lea County, New Mexico

WORKSHEET 4
RISK and HAZARD INDEX CALCULATED FOR SUBSURFACE SOIL

Risk and Hazard Index for SOILS – 0 to 15 feet

'X' indicates pathway is complete:		X	X	X
Constituent of Concern	Soil Concentrations Maximum (mg/kg)	On-Site Worker Inhalation + Ingestion+Dermal	On-Site Resident Inhalation + Ingestion+Dermal	Construction Worker Inhalation + Ingestion+Dermal
Carcinogens				
Benzene	3.08e+0	1.61e-7	3.19e-7	5.27e-8
Chrysene	1.10e+0	6.98e-8	1.29e-7	1.75e-10
	Total Risk:	2.31e-7	4.48e-7	5.28e-8
Non-Carcinogens				
Ethylbenzene	5.98e+1	5.38e-4	7.88e-3	1.18e-2
Fluorene	1.30e+0	2.02e-4	6.75e-4	2.15e-4
Naphthalene	2.10e+0	3.46e-4	1.11e-3	1.10e-3
Phenanthrene	3.90e+0	9.96e-4	1.32e-2	5.11e-3
Toluene	5.66e+1	1.31e-3	4.75e-3	4.45e-2
Xylene (mixed isomers)	1.36e+2	1.83e-3	2.59e-3	6.60e-2
TPH - New Method	3.09e+4	2.41e+0	7.89e+0	4.90e+0
	Hazard Index:	2.41e+0	7.92e+0	5.03e+0

BASELINE RISK ASSESSMENT

Texas-New Mexico Pipe Line Co.
TNM-96-16
Lea County, New Mexico

WORKSHEET 5
RISK and HAZARD INDEX CALCULATED
FOR SOIL (GROUND WATER PROTECTION)

Risk and Hazard Index for SOIL - GROUND WATER PROTECTION

'X' indicates pathway is complete:		X		X		
Constituent of Concern	Soil Concentrations Maximum (mg/kg)	On-Site Worker Ingestion	On-Site Worker Inhalation	On-Site Resident Ingestion	On-Site Resident Inhalation	Constr. Worker Inhalation + Dermal
Carcinogens						
Benzene	4.00e+0	0.00e+0		0.00e+0		
Chrysene	1.10e+0	0.00e+0		0.00e+0		
	Total Risk:	0.00e+0		0.00e+0		
Non-Carcinogens						
Ethylbenzene	5.98e+1	0.00e+0		0.00e+0		
Fluorene	1.30e+0	0.00e+0		0.00e+0		
Naphthalene	2.10e+0	0.00e+0		0.00e+0		
Phenanthrene	3.90e+0	0.00e+0		0.00e+0		
Toluene	5.66e+1	0.00e+0		0.00e+0		
Xylene (mixed isomers)	1.36e+2	0.00e+0		0.00e+0		
TPH - New Method	3.09e+4	1.79e-1		5.00e-1		
	Hazard Index:	1.79e-1		5.00e-1		

TARGET LEVEL CALCULATIONS

Texas-New Mexico Pipe Line Co.
TNM-96-16
Lea County, New Mexico

WORKSHEET 6
EXPOSURE PATHWAYS WITH UNACCEPTABLE RISK

Ground Water

Potential Exposure Pathways	Y/N	Explanation / Source
Is Ground Water Ingestion Pathway Complete and Without Controls and Creates Risk?	N	See Ground Water Protection pathway. Controls proposed or in place: None
Is Construction Worker Pathway Complete and Without Controls and Creates Risk?	N	Ground water is > 15 feet deep. Controls proposed or in place: None
Is Inhalation of Volatiles Pathway Complete and Without Controls and Creates Risk?	N	Ground water is > 15 feet deep. Controls proposed or in place: None

Soils

Potential Exposure Pathways	Y/N	Explanation / Source
Is Inhalation/Ingestion Pathway Complete and Without Controls and Creates Risk?	Y	Maximum soil concentrations create unacceptable risk. No impervious cover over soil source area. Controls proposed or in place: None
Is Construction Worker Pathway Complete and Without Controls and Creates Risk?	Y	Maximum soil concentrations create unacceptable risk. Construction activity in the source area is possible. Controls proposed or in place: None
Is Construction Worker Exposed to Both Soil and Ground Water Simultaneously?	N	Ground water is > 15 feet deep. Controls proposed or in place: None
Is Ground Water Protection Pathway Complete and Without Controls and Creates Risk?	Y	Maximum soil concentrations create unacceptable risk (GWP pathway). Controls proposed or in place: None

TARGET LEVEL CALCULATIONS

Texas-New Mexico Pipe Line Co.
TNM-96-16
Lea County, New Mexico

WORKSHEET 7
SITE CONCENTRATIONS COMPARED TO SITE-SPECIFIC TARGET LEVELS (SSTL's) FOR SUBSURFACE SOIL

SSTL's for SUBSURFACE SOILS -- 0 to 15 feet BGS

'X' indicates pathway is complete:		X	X	X	X		
Constituent of Concern		On-Site Worker Inh+Ing+Der (mg/kg)	On-Site Resident Inh+Ing+Der (mg/kg)	Construction Worker Inh+Ing+Der (mg/kg)	Critical SSTL (mg/kg)	Soil Concentrations Maximum (mg/kg)	Soil Concentrations 95th UCL (mg/kg)
Non-Carcinogens	HQ's						
Ethylbenzene	0.070	>1,513	5.31e+2	3.55e+2	3.55e+2	5.98e+1	N/A
Fluorene	0.005	3.22e+1	9.63e+0	3.03e+1	9.63e+0	1.30e+0	N/A
Naphthalene	0.005	3.03e+1	9.46e+0	9.59e+0	9.46e+0	2.10e+0	N/A
Phenanthrene	0.015	5.87e+1	4.44e+0	1.15e+1	4.44e+0	3.90e+0	N/A
Toluene	0.050	>1,501	5.96e+2	6.36e+1	6.36e+1	5.66e+1	N/A
Xylene (mixed isomers)	0.070	>446	>446	1.44e+2	1.44e+2	1.36e+2	N/A
TPH - New Method	0.785	1.01e+4	3.07e+3	4.95e+3	3.07e+3	3.09e+4	N/A
Hazard Index:	1.000						

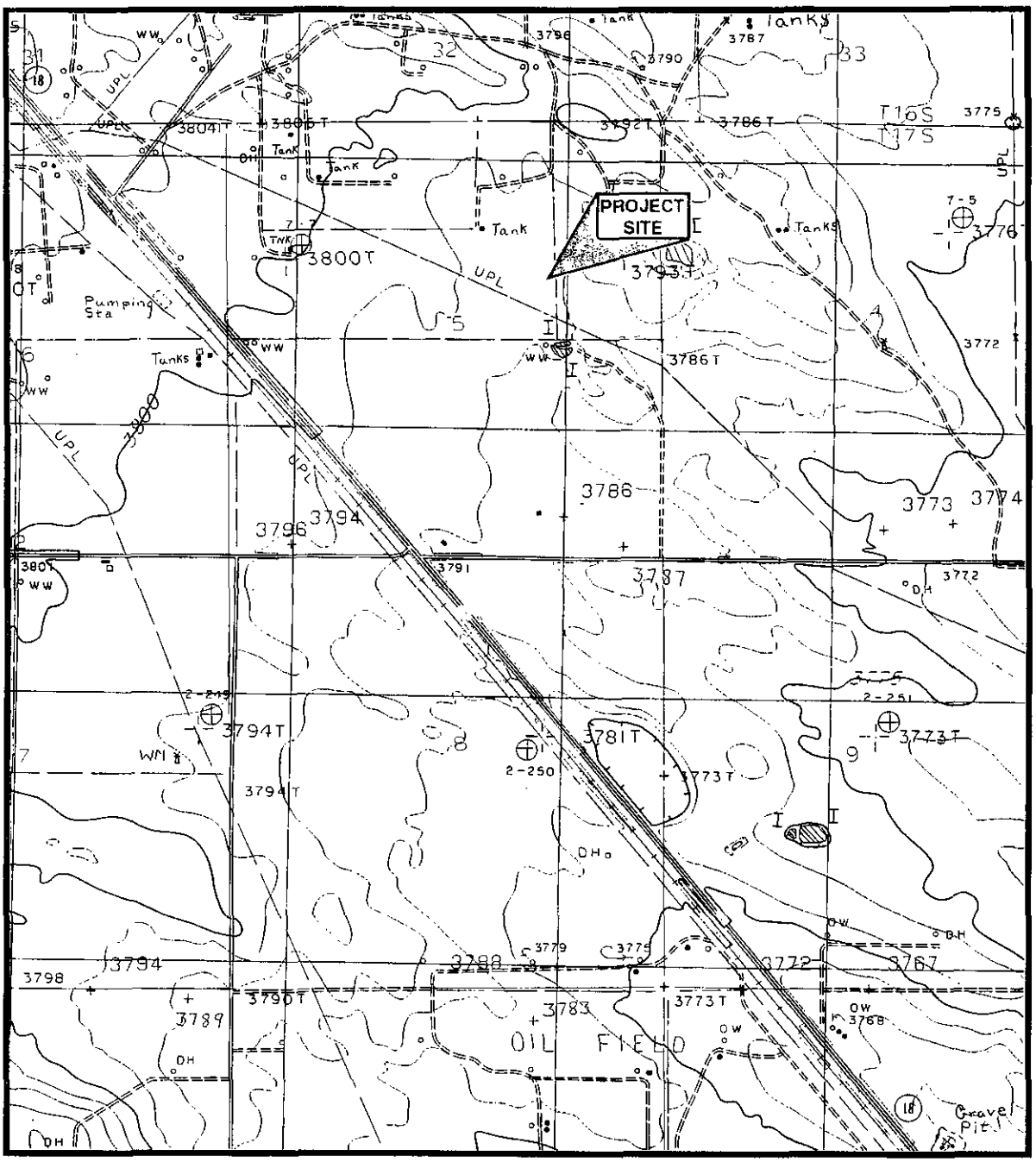
NOTE:

95th UCL = One-sided upper 95th confidence limit of the mean
SSTL = Site Specific Target Level

LOVINGTON SE QUADRANGLE

NEW MEXICO - LEA CO.

PRINTED 1985



SCALE 1:24000

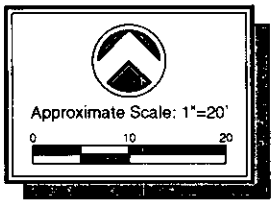
1 0 1/2 1 MILE

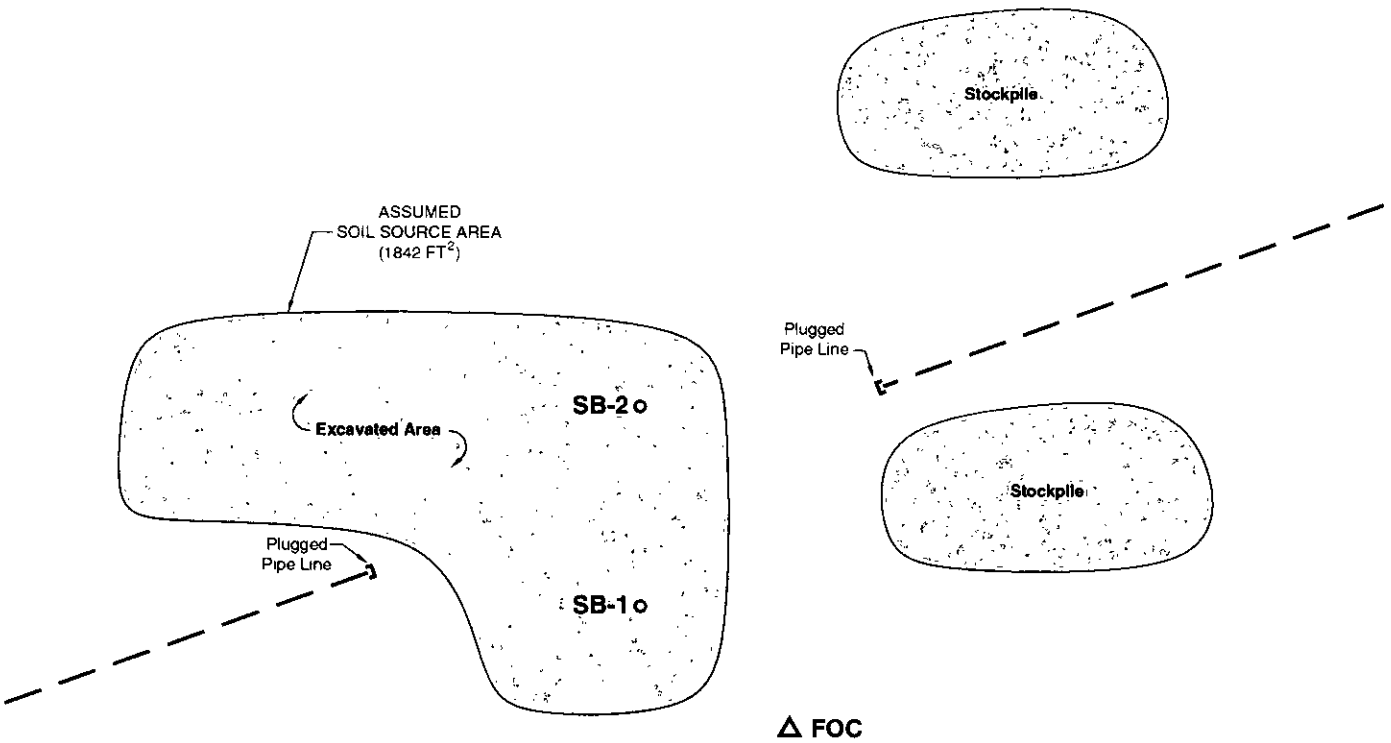
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 5 FEET

SITE LOCATION AND ADJACENT PROPERTIES MAP	**610088**
TEXAS - NEW MEXICO PIPELINE CO TNM-96-16 LEA COUNTY, NEW MEXICO	**FIG 1**





NOTE:

The FOC sample was obtained at approximatley 6 to 8 feet below ground surface.

LEGEND

- Soil sample collected by hand auger on March 9, 1998.
- Soil Boring advanced by KEI on March 9, 1998.
- Stockpile
- Approximate Location of Excavation Area

09/04/98-RM g:\sadh\projects\tnmpl\610088\V610088SS

k·e·i	*SOIL SOURCE AREA MAP*	610088
	TEXAS - NEW MEXICO PIPE LINE CO. TNM-96-16 LEA COUNTY, NEW MEXICO	FIG 2

Texas-New Mexico Pipe Line Co.
TNM-96-16
Lea County, New Mexico

TPH MASS FRACTIONS
AND RELATIVE CONCENTRATIONS

TPH Mass Fractions and Relative Concentrations

Constituent of Concern	Fingerprint (mg/kg)	Mass Fraction (%)	Maximum Concentration (mg/kg)
TPH - New Method	30,900	100%	30,900
TPH-Arom-EC>8-10	0	0.00%	0
TPH-Arom-EC>10-12	19	0.06%	19
TPH-Arom-EC>12-16	2,064	6.68%	2,064
TPH-Arom-EC>16-21	5,587	18.08%	5,587
TPH-Arom-EC>21-35	2,351	7.61%	2,351
TPH-Aliph-EC 5-6	0	0.00%	0
TPH-Aliph-EC>6-8	0	0.00%	0
TPH-Aliph-EC>8-10	114	0.37%	114
TPH-Aliph-EC>10-12	677	2.19%	677
TPH-Aliph-EC>12-16	4,456	14.42%	4,456
TPH-Aliph-EC>16-35	15,635	50.60%	15,635

Calculation Sheet
GROUND WATER PROTECTION
Worker -- Ingestion of Ground Water Pathway

Texas-New Mexico Pipe Line Co. TNM-96-16 Lea County, New Mexico	BW (kg)	IRgw (L/day)	EF (days/yr)	ED (years)	foc ---	Dist (m)
	70	1.0	250	25	0.009	0

For carcinogens: $Risk = Conc_{s-v} * DAF * IR_{gw} * EF * ED * SF / BW * 70 * 365$

For non-carcinogens: $HQ = Conc_{s-v} * DAF * IR_{gw} * EF / RfD * BW * 365$

Constituent of Concern	SF (1/mg/kg-d)	RfD (mg/kg-d)	$Conc_{s-v}$ (mg/kg)	DAF ---	$Conc_{gwp}$ (mg/L)	Risk or HQ
Carcinogens						
Benzene	2.90e-2		4.00e+0	0.00e+0	0.00e+0	0.00e+0
Chrysene	7.30e-3		1.10e+0	0.00e+0	0.00e+0	0.00e+0
					Total Risk:	0.00e+0
Non-Carcinogens						
Ethylbenzene		1.00e-1	5.98e+1	0.00e+0	0.00e+0	0.00e+0
Fluorene		4.00e-2	1.30e+0	0.00e+0	0.00e+0	0.00e+0
Naphthalene		4.00e-2	2.10e+0	0.00e+0	0.00e+0	0.00e+0
Phenanthrene		4.00e-3	3.90e+0	0.00e+0	0.00e+0	0.00e+0
Toluene		2.00e-1	5.66e+1	0.00e+0	0.00e+0	0.00e+0
Xylene (mixed isomers)		2.00e+0	1.36e+2	0.00e+0	0.00e+0	0.00e+0
TPH - New Method						1.79e-1
					Hazard Index:	1.79e-1
TPH-Arom-EC>8-10		4.00e-2	0.00e+0	1.36e-2	0.00e+0	0.00e+0
TPH-Arom-EC>10-12		4.00e-2	1.85e+1	1.12e-3	2.08e-2	5.08e-3
TPH-Arom-EC>12-16		4.00e-2	2.06e+3	4.64e-9	9.58e-6	2.34e-6
TPH-Arom-EC>16-21		3.00e-2	5.59e+3	0.00e+0	0.00e+0	0.00e+0
TPH-Arom-EC>21-35		3.00e-2	2.35e+3	0.00e+0	0.00e+0	0.00e+0
TPH-Aliph-EC 5-6		6.00e-2	0.00e+0	4.07e-2	0.00e+0	0.00e+0
TPH-Aliph-EC>6-8		6.00e-2	0.00e+0	1.72e-2	0.00e+0	0.00e+0
TPH-Aliph-EC>8-10		1.00e-1	1.14e+2	5.15e-3	5.89e-1	5.76e-2
TPH-Aliph-EC>10-12		1.00e-1	6.77e+2	1.17e-3	7.92e-1	7.75e-2
TPH-Aliph-EC>12-16		1.00e-1	4.46e+3	8.80e-5	3.92e-1	3.84e-2
TPH-Aliph-EC>16-35		2.00e+0	1.56e+4	0.00e+0	0.00e+0	0.00e+0

NOTES:

Conc(s-v) = Concentration in soil vadose zone
Conc(gwp) = Concentration in ground water
SF = Slope Factor
HQ = Hazard Quotient
RfD = Reference Dose
foc = fraction organic carbon
BW = Body Weight
IR_{GW} = Ingestion Rate
EF = Exposure Frequency
ED = Exposure Duration
Risk = Carcinogenic Risk
DAF = Dilution attenuation factor

Calculation Sheet
GROUND WATER PROTECTION
Resident -- Ingestion of Ground Water Pathway

Texas-New Mexico Pipe Line Co. TNM-96-16 Lea County, New Mexico	BW (kg)	IRgw (L/day)	EF (days/yr)	ED (years)	foc ---	Dist (m)
	70	2.0	350	30	0.009	0

For carcinogens: $Risk = Conc_{s-v} * DAF * IR_{gw} * EF * ED * SF / BW * 70 * 365$

For non-carcinogens: $HQ = Conc_{s-v} * DAF * IR_{gw} * EF / RfD * BW * 365$

Constituent of Concern	SF (1/mg/kg-d)	RfD (mg/kg-d)	$Conc_{s-v}$ (mg/kg)	DAF ---	$Conc_{gwp}$ (mg/L)	Risk or HQ
Carcinogens						
Benzene	2.90e-2		4.00e+0	0.00e+0	0.00e+0	0.00e+0
Chrysene	7.30e-3		1.10e+0	0.00e+0	0.00e+0	0.00e+0
					Total Risk:	0.00e+0
Non-Carcinogens						
Ethylbenzene		1.00e-1	5.98e+1	0.00e+0	0.00e+0	0.00e+0
Fluorene		4.00e-2	1.30e+0	0.00e+0	0.00e+0	0.00e+0
Naphthalene		4.00e-2	2.10e+0	0.00e+0	0.00e+0	0.00e+0
Phenanthrene		4.00e-3	3.90e+0	0.00e+0	0.00e+0	0.00e+0
Toluene		2.00e-1	5.66e+1	0.00e+0	0.00e+0	0.00e+0
Xylene (mixed isomers)		2.00e+0	1.36e+2	0.00e+0	0.00e+0	0.00e+0
TPH - New Method						5.00e-1
					Hazard Index:	5.00e-1
TPH-Arom-EC>8-10		4.00e-2	0.00e+0	1.36e-2	0.00e+0	0.00e+0
TPH-Arom-EC>10-12		4.00e-2	1.85e+1	1.12e-3	2.08e-2	1.42e-2
TPH-Arom-EC>12-16		4.00e-2	2.06e+3	4.64e-9	9.58e-6	6.56e-6
TPH-Arom-EC>16-21		3.00e-2	5.59e+3	0.00e+0	0.00e+0	0.00e+0
TPH-Arom-EC>21-35		3.00e-2	2.35e+3	0.00e+0	0.00e+0	0.00e+0
TPH-Aliph-EC 5-6		6.00e-2	0.00e+0	4.07e-2	0.00e+0	0.00e+0
TPH-Aliph-EC>6-8		6.00e-2	0.00e+0	1.72e-2	0.00e+0	0.00e+0
TPH-Aliph-EC>8-10		1.00e-1	1.14e+2	5.15e-3	5.89e-1	1.61e-1
TPH-Aliph-EC>10-12		1.00e-1	6.77e+2	1.17e-3	7.92e-1	2.17e-1
TPH-Aliph-EC>12-16		1.00e-1	4.46e+3	8.80e-5	3.92e-1	1.07e-1
TPH-Aliph-EC>16-35		2.00e+0	1.56e+4	0.00e+0	0.00e+0	0.00e+0

NOTES:

Conc(s-v) = Concentration in soil vadose zone
Conc(gwp) = Concentration in ground water
SF = Slope Factor
HQ = Hazard Quotient
RfD = Reference Dose
foc = fraction organic carbon
BW = Body Weight
IR_{GW} = Ingestion Rate
EF = Exposure Frequency
ED = Exposure Duration
Risk = Carcinogenic Risk
DAF = Dilution attenuation factor

Calculation of Risk
Worker -- Inhalation of Volatiles from Soil

Texas-New Mexico Pipe Line Co. TNM-96-16 Lea County, New Mexico	BW (kg)	IRair (m^3/day)	EF (days/yr)	ED (years)	LS (m)	V (m/s)	DH (m)	A (m^2)	B (g/cc)	E —	foc —	PEF (kg/m^3)
	70	20	250	25	19	4.92	2.0	171	1.80	0.32	0.009	1.802E-11

For carcinogens: $Risk = (Conc_{soil} * (VF + PEF) / DAF) * IR_{air} * EF * ED * SF / BW * 70 * 365$

For non-carcinogens: $HQ = (Conc_{soil} * (VF + PEF) / DAF) * IR_{air} * EF * (1/RfD) / BW * 365$

$VF = (2 * Dei * E * Kas * 10\text{-}3) / (LS * V * DH / A) * (3.14 * alpha * ED * 3.15E+7)^{0.5}$

Dist (m)	DAF
0	1.00

Constituent of Concern	$Conc_{soil}$ (mg/kg)	SF (1/mg/kg-d)	RfD (mg/kg-d)	Dei (cm^2/sec)	Kd (cm^3/g)	H' —	Kas (g /cm^3)	alpha (cm^2/sec)	VF (m^3/kg)	Risk or HQ
Carcinogens										
Benzene	3.08e+0	2.91e-2		2.05e-2	7.49e-1	2.32e-1	3.11e-1	1.07e-3	2.32e-5	1.45e-7
Chrysene	1.10e+0	6.10e-3		5.45e-3	1.80e+3	4.37e-5	2.43e-8	2.36e-11	3.26e-9	1.54e-12
									Total Risk:	1.45e-7
Non-Carcinogens										
Ethylbenzene	5.98e+1		2.86e-1	1.64e-2	9.87e+0	2.67e-1	2.71e-2	7.88e-5	5.99e-6	2.45e-4
Fluorene	1.30e+0		4.00e-2	1.38e-2	6.52e+1	2.67e-3	4.10e-5	1.00e-7	2.13e-7	1.35e-6
Naphthalene	2.10e+0		4.00e-2	1.30e-2	1.16e+1	5.38e-2	4.64e-3	1.07e-5	2.20e-6	2.26e-5
Phenanthrene	3.90e+0		4.00e-3	1.19e-3	1.27e+2	6.63e-3	5.21e-5	1.10e-8	7.05e-8	1.34e-5
Toluene	5.66e+1		1.14e-1	1.84e-2	2.72e+0	2.65e-1	9.75e-2	3.14e-4	1.21e-5	1.18e-3
Xylene (mixed isomers)	1.36e+2		2.00e-1	1.63e-2	2.16e+0	2.93e-1	1.36e-1	3.83e-4	1.35e-5	1.79e-3
TPH - New Method	3.09e+4									8.15e-2
									Hazard Index:	8.47e-2
TPH-Arom-EC>8-10	0.00e+0		5.71e-2	2.20e-2	1.43e+1	4.84e-1	3.39e-2	1.32e-4	7.76e-6	0.00e+0
TPH-Arom-EC>10-12	1.85e+1		5.71e-2	2.20e-2	2.26e+1	1.36e-1	6.03e-3	2.35e-5	3.26e-6	2.07e-4
TPH-Arom-EC>12-16	2.06e+3		5.71e-2	2.20e-2	4.51e+1	5.16e-2	1.14e-3	4.47e-6	1.42e-6	1.00e-2
TPH-Arom-EC>16-21	5.59e+3		3.00e-2	2.20e-2	1.43e+2	1.18e-1	8.26e-4	3.22e-6	1.21e-6	4.40e-2
TPH-Arom-EC>21-35	2.35e+3		3.00e-2	2.20e-2	1.13e+3	6.65e-3	5.87e-6	2.29e-8	1.02e-7	1.56e-3
TPH-Aliph-EC 5-6	0.00e+0		5.71e-2	2.20e-2	7.15e+0	3.28e+1	4.58e+0	9.86e-3	1.21e-4	0.00e+0
TPH-Aliph-EC>6-8	0.00e+0		5.71e-2	2.20e-2	3.58e+1	4.85e+1	1.35e+0	4.26e-3	5.44e-5	0.00e+0
TPH-Aliph-EC>8-10	1.14e+2		2.86e-1	2.20e-2	2.85e+2	7.92e+1	2.78e-1	1.04e-3	2.27e-5	1.78e-3
TPH-Aliph-EC>10-12	6.77e+2		2.86e-1	2.20e-2	2.26e+3	1.23e+2	5.45e-2	2.11e-4	9.86e-6	4.57e-3
TPH-Aliph-EC>12-16	4.46e+3		2.86e-1	2.20e-2	4.51e+4	5.25e+2	1.16e-2	4.54e-5	4.54e-6	1.38e-2
TPH-Aliph-EC>16-35	1.56e+4		2.00e+0	2.20e-2	9.00e+6	6.57e+4	7.29e-3	2.85e-5	3.59e-6	5.49e-3

NOTES:

Conc(soil) = Concentration in soil (0-15 feet)
Risk = Carcinogenic Risk
SF = Slope Factor
HQ = Hazard Quotient
RfD = Reference Dose
DAF = Dilution attenuation factor

BW = body weight
AT = averaging time
IR_A = Inhalation rate
EF = exposure frequency
ED = exposure duration
LS = Length of Source Area

V = Velocity of Wind
DH = Diffusion Height
A = Area of Soil Source
B = Bulk Soil Density
E = Effective Porosity
Dei = effective diffusion coefficient

H' = unitless Henry's Law Constant
Kd = organic carbon partition coefficient * foc
foc = fraction organic carbon
Kas = H' / Kd
alpha = Dei * E / (E + B / Kas)
PEF = Particulate Emissions Factor

Calculation of Risk
Worker – Ingestion of Soil & Dermal Contact with Soil

Texas-New Mexico Pipe Line Co. TNM-96-16 Lea County, New Mexico	BW (kg)	CF (mg/kg)	IRsoil (mg/day)	EF (days/yr)	ED (years)	EF_{dermal} (days/yr)	SA (cm^2)	AF (mg/cm^2)
	70	1.00E+06	50	250	25	250	5,800	1.00

For carcinogens: $Risk_{ING} = Conc_{soil} * IR_{soil} * EF * ED * SF / BW * 70 * 365 * CF$

$Risk_{DER} = Conc_{soil} * SA * AF * ABS * EF * ED * SF / BW * 70 * 365 * CF$

For non-carcinogens: $HQ_{ING} = Conc_{soil} * IR_{soil} * EF * (1/RfD) / BW * 365 * CF$

$HQ_{DER} = Conc_{soil} * SA * AF * ABS * EF * (1/RfD) / BW * 365 * CF$

Constituent of Concern	$Conc_{soil}$ (mg/kg)	SFo (1/mg/kg-d)	RfDo (mg/kg-d)	$Risk_{ING}$ or HQ_{ING}	SFd (1/mg/kg-d)	RfDd (mg/kg-d)	ABS —	$Risk_{DER}$ or HQ_{DER}
Carcinogens								
Benzene	3.08e+0	0.029		1.56E-08	0.029		0.000	0.00E+00
Chrysene	1.10e+0	0.0073		1.40E-09	0.0236		0.130	6.84E-08
			Total Risk:	1.70e-8			**Total Risk:**	6.84e-8
Non-Carcinogens								
Ethylbenzene	5.98e+1		0.10	2.93E-04		0.10	0.000	0.00E+00
Fluorene	1.30e+0		0.04	1.59E-05		0.04	0.100	1.84E-04
Naphthalene	2.10e+0		0.04	2.57E-05		0.04	0.100	2.98E-04
Phenanthrene	3.90e+0		0.00	4.77E-04		0.02	0.050	5.05E-04
Toluene	5.66e+1		0.20	1.38E-04		0.20	0.000	0.00E+00
Xylene (mixed isomers)	1.36e+2		2.00	3.33E-05		2.00	0.000	0.00E+00
TPH - New Method	3.09e+4			1.84E-01				2.14E+00
			Hazard Index:	1.85e-1			**Hazard Index:**	2.14e+0
TPH-Arom-EC>8-10	0.00e+0		0.04	0.00E+00		0.04	0.100	0.00E+00
TPH-Arom-EC>10-12	1.85e+1		0.04	2.27E-04		0.04	0.100	2.63E-03
TPH-Arom-EC>12-16	2.06e+3		0.04	2.52E-02		0.04	0.100	2.93E-01
TPH-Arom-EC>16-21	5.59e+3		0.03	9.11E-02		0.03	0.100	1.06E+00
TPH-Arom-EC>21-35	2.35e+3		0.03	3.83E-02		0.03	0.100	4.45E-01
TPH-Aliph-EC 5-6	0.00e+0		0.06	0.00E+00		0.06	0.100	0.00E+00
TPH-Aliph-EC>6-8	0.00e+0		0.06	0.00E+00		0.06	0.100	0.00E+00
TPH-Aliph-EC>8-10	1.14e+2		0.10	5.59E-04		0.10	0.100	6.49E-03
TPH-Aliph-EC>10-12	6.77e+2		0.10	3.31E-03		0.10	0.100	3.84E-02
TPH-Aliph-EC>12-16	4.46e+3		0.10	2.18E-02		0.10	0.100	2.53E-01
TPH-Aliph-EC>16-35	1.56e+4		2.00	3.82E-03		2.00	0.100	4.44E-02

NOTES:

Conc(soil) = Concentration in soil (0-15 feet)
Risk = Carcinogenic Risk
SF = Slope Factor
HQ = Hazard Quotient
RfD = Reference Dose
BW = body weight
AT = averaging time
IR_{soil} = Ingestion rate
EF = exposure frequency
ED = exposure duration
SA = skin surface area
AF = adherence factor
ABS = dermal absorption fra

Calculation of Risk
Worker -- Combined Risk for Soil
Texas-New Mexico Pipe Line Co.

If On-Site: $Risk_{wkr\text{-}SOIL} = Risk_{ING} + Risk_{DER} + Risk_{INHAL}$

If Off-Site: $Risk_{wkr\text{-}SOIL} = Risk_{INHAL}$

Constituent of Concern	$Risk_{ING}$ or HQ_{ING}	$Risk_{DER}$ or HQ_{DER}	$Risk_{INHAL}$ or HQ_{INHAL}	$Risk_{wkr\text{-}SOIL}$ or $HQ_{wkr\text{-}SOIL}$
Carcinogens				
Benzene	1.56E-08	0.00E+00	1.45E-07	1.61E-07
Chrysene	1.40E-09	6.84E-08	1.54E-12	6.98E-08
Non-Carcinogens				
Ethylbenzene	2.93E-04	0.00E+00	2.45E-04	5.38E-04
Fluorene	1.59E-05	1.84E-04	1.35E-06	2.02E-04
Naphthalene	2.57E-05	2.98E-04	2.26E-05	3.46E-04
Phenanthrene	4.77E-04	5.05E-04	1.34E-05	9.96E-04
Toluene	1.38E-04	0.00E+00	1.18E-03	1.31E-03
Xylene (mixed isomers)	3.33E-05	0.00E+00	1.79E-03	1.83E-03
TPH - New Method	1.84E-01	2.14E+00	8.15E-02	2.41E+00
TPH-Arom-EC>8-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TPH-Arom-EC>10-12	2.27E-04	2.63E-03	2.07E-04	3.06E-03
TPH-Arom-EC>12-16	2.52E-02	2.93E-01	1.00E-02	3.28E-01
TPH-Arom-EC>16-21	9.11E-02	1.06E+00	4.40E-02	1.19E+00
TPH-Arom-EC>21-35	3.83E-02	4.45E-01	1.56E-03	4.85E-01
TPH-Aliph-EC 5-6	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TPH-Aliph-EC>6-8	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TPH-Aliph-EC>8-10	5.59E-04	6.49E-03	1.78E-03	8.83E-03
TPH-Aliph-EC>10-12	3.31E-03	3.84E-02	4.57E-03	4.63E-02
TPH-Aliph-EC>12-16	2.18E-02	2.53E-01	1.38E-02	2.89E-01
TPH-Aliph-EC>16-35	3.82E-03	4.44E-02	5.49E-03	5.37E-02

NOTES:

Risk = Carcinogenic Risk
HQ = Hazard Quotient

Calculation of Risk
Resident -- Inhalation of Volatiles from Soil

Texas-New Mexico Pipe Line Co. TNM-96-16 Lea County, New Mexico	BW (kg)	IRair (m^3/day)	EF (days/yr)	ED (years)	LS (m)	V (m/s)	DH (m)	A (m^2)	B (g/cc)	E --	foc --	PEF (kg/m^3)
	70	15	350	30	19	4.92	2.0	171	1.80	0.32	0.009	1.802E-11

For carcinogens: $Risk = (Conc_{soil} * (VF + PEF) / DAF) * IR_{air} * EF * ED * SF / BW * 70 * 365$

For non-carcinogens: $HQ = (Conc_{soil} * (VF + PEF) / DAF) * IR_{air} * EF * (1/RfD) / BW * 365$

$VF = (2 * Dei * E * Kas * 10\text{-}3) / (LS * V * DH / A) * (3.14 * alpha * ED * 3.15E+7)^{0.5}$

Dist (m)	DAF
0	1.00

Constituent of Concern	$Conc_{soil}$ (mg/kg)	SF (1/mg/kg-d)	RfD (mg/kg-d)	Dei (cm^2/sec)	Kd (cm^3/g)	H' --	Kas (g /cm^3)	alpha (cm^2/sec)	VF (m^3/kg)	Risk or HQ
Carcinogens										
Benzene	3.08e+0	2.91e-2		2.05e-2	7.49e-1	2.32e-1	3.11e-1	1.07e-3	2.32e-5	1.67e-7
Chrysene	1.10e+0	6.10e-3		5.45e-3	1.80e+3	4.37e-5	2.43e-8	2.36e-11	3.26e-9	1.77e-12
									Total Risk:	1.67e-7
Non-Carcinogens										
Ethylbenzene	5.98e+1		2.86e-1	1.64e-2	9.87e+0	2.67e-1	2.71e-2	7.88e-5	5.99e-6	2.35e-4
Fluorene	1.30e+0		4.00e-2	1.38e-2	6.52e+1	2.67e-3	4.10e-5	1.00e-7	2.13e-7	1.30e-6
Naphthalene	2.10e+0		4.00e-2	1.30e-2	1.16e+1	5.38e-2	4.64e-3	1.07e-5	2.20e-6	2.16e-5
Phenanthrene	3.90e+0		4.00e-3	1.19e-3	1.27e+2	6.63e-3	5.21e-5	1.10e-8	7.05e-8	1.29e-5
Toluene	5.66e+1		1.14e-1	1.84e-2	2.72e+0	2.65e-1	9.75e-2	3.14e-4	1.21e-5	1.13e-3
Xylene (mixed isomers)	1.36e+2		2.00e-1	1.63e-2	2.16e+0	2.93e-1	1.36e-1	3.83e-4	1.35e-5	1.72e-3
TPH - New Method	3.09e+4									7.81e-2
									Hazard Index:	8.12e-2
TPH-Arom-EC>8-10	0.00e+0		5.71e-2	2.20e-2	1.43e+1	4.84e-1	3.39e-2	1.32e-4	7.76e-6	0.00e+0
TPH-Arom-EC>10-12	1.85e+1		5.71e-2	2.20e-2	2.26e+1	1.36e-1	6.03e-3	2.35e-5	3.26e-6	1.99e-4
TPH-Arom-EC>12-16	2.06e+3		5.71e-2	2.20e-2	4.51e+1	5.16e-2	1.14e-3	4.47e-6	1.42e-6	9.63e-3
TPH-Arom-EC>16-21	5.59e+3		3.00e-2	2.20e-2	1.43e+2	1.18e-1	8.26e-4	3.22e-6	1.21e-6	4.22e-2
TPH-Arom-EC>21-35	2.35e+3		3.00e-2	2.20e-2	1.13e+3	6.65e-3	5.87e-6	2.29e-8	1.02e-7	1.50e-3
TPH-Aliph-EC 5-6	0.00e+0		5.71e-2	2.20e-2	7.15e+0	3.28e+1	4.58e+0	9.86e-3	1.21e-4	0.00e+0
TPH-Aliph-EC>6-8	0.00e+0		5.71e-2	2.20e-2	3.58e+1	4.85e+1	1.35e+0	4.26e-3	5.44e-5	0.00e+0
TPH-Aliph-EC>8-10	1.14e+2		2.86e-1	2.20e-2	2.85e+2	7.92e+1	2.78e-1	1.04e-3	2.27e-5	1.70e-3
TPH-Aliph-EC>10-12	6.77e+2		2.86e-1	2.20e-2	2.26e+3	1.23e+2	5.45e-2	2.11e-4	9.86e-6	4.38e-3
TPH-Aliph-EC>12-16	4.46e+3		2.86e-1	2.20e-2	4.51e+4	5.25e+2	1.16e-2	4.54e-5	4.54e-6	1.33e-2
TPH-Aliph-EC>16-35	1.56e+4		2.00e+0	2.20e-2	9.00e+6	6.57e+4	7.29e-3	2.85e-5	3.59e-6	5.26e-3

NOTES:

Conc(soil) = Concentration in soil (0-15 feet)
Risk = Carcinogenic Risk
SF = Slope Factor
HQ = Hazard Quotient
RfD = Reference Dose

BW = body weight
AT = averaging time
IR_A = Inhalation rate
EF = exposure frequency
ED = exposure duration
LS = Length of Source Area

V = Velocity of Wind
DH = Diffusion Height
A = Area of Soil Source
B = Bulk Soil Density
E = Effective Porosity
Dei = effective diffusion coefficient

H' = unitless Henry's Law Constant
Kd = organic carbon partition coefficient * foc
foc = fraction organic carbon
Kas = H' / Kd
alpha = Dei * E / (E + B / Kas)
PEF = Particulate Emissions Factor

Calculation of Risk
Resident -- Ingestion of Soil & Dermal Contact with Soil

Texas-New Mexico Pipe Line Co. TNM-96-16 Lea County, New Mexico	BW (kg)	CF (mg/kg)	IRsoil (mg/day)	EF (days/yr)	ED (years)	EF_{dermal} (days/yr)	SA (cm^2)	AF (mg/cm^2)
	70	1.00E+06	124	350	30	350	5,800	1.00

For carcinogens:

$Risk_{ING} = Conc_{soil} * IR_{soil} * EF * ED * SF / BW * 70 * 365 * CF$

$Risk_{DER} = Conc_{soil} * SA * AF * ABS * EF * ED * SF / BW * 70 * 365 * CF$

For non-carcinogens:

$HQ_{ING} = Conc_{soil} * IR_{soil} * EF * (1/RfD) / BW * 365 * CF$

$HQ_{DER} = Conc_{soil} * SA * AF * ABS * EF * (1/RfD) / BW * 365 * CF$

Constituent of Concern	$Conc_{soil}$ (mg/kg)	SFo (1/mg/kg-d)	RfDo (mg/kg-d)	$Risk_{ING}$ or HQ_{ING}	SFd (1/mg/kg-d)	RfDd (mg/kg-d)	ABS --	$Risk_{DER}$ or HQ_{DER}
Carcinogens								
Benzene	3.08e+0	0.029		1.52E-07	0.029		0.000	0.00E+00
Chrysene	1.10e+0	0.0073		1.36E-08	0.0236		0.130	1.15E-07
			Total Risk:	1.65e-7			**Total Risk:**	1.15e-7
Non-Carcinogens								
Ethylbenzene	5.98e+1		0.10	7.65E-03		0.10	0.000	0.00E+00
Fluorene	1.30e+0		0.04	4.16E-04		0.04	0.100	2.58E-04
Naphthalene	2.10e+0		0.04	6.71E-04		0.04	0.100	4.17E-04
Phenanthrene	3.90e+0		0.00	1.25E-02		0.02	0.050	7.07E-04
Toluene	5.66e+1		0.20	3.62E-03		0.20	0.000	0.00E+00
Xylene (mixed isomers)	1.36e+2		2.00	8.69E-04		2.00	0.000	0.00E+00
TPH - New Method	3.09e+4			4.82E+00				3.00E+00
			Hazard Index:	4.85e+0			**Hazard Index:**	3.00e+0
TPH-Arom-EC>8-10	0.00e+0		0.04	0.00E+00		0.04	0.100	0.00E+00
TPH-Arom-EC>10-12	1.85e+1		0.04	5.93E-03		0.04	0.100	3.68E-03
TPH-Arom-EC>12-16	2.06e+3		0.04	6.60E-01		0.04	0.100	4.10E-01
TPH-Arom-EC>16-21	5.59e+3		0.03	2.38E+00		0.03	0.100	1.48E+00
TPH-Arom-EC>21-35	2.35e+3		0.03	1.00E+00		0.03	0.100	6.23E-01
TPH-Aliph-EC 5-6	0.00e+0		0.06	0.00E+00		0.06	0.100	0.00E+00
TPH-Aliph-EC>6-8	0.00e+0		0.06	0.00E+00		0.06	0.100	0.00E+00
TPH-Aliph-EC>8-10	1.14e+2		0.10	1.46E-02		0.10	0.100	9.08E-03
TPH-Aliph-EC>10-12	6.77e+2		0.10	8.65E-02		0.10	0.100	5.38E-02
TPH-Aliph-EC>12-16	4.46e+3		0.10	5.70E-01		0.10	0.100	3.54E-01
TPH-Aliph-EC>16-35	1.56e+4		2.00	1.00E-01		2.00	0.100	6.21E-02

NOTES:

Conc(soil) = Concentration in soil (0-15 feet)
Risk = Carcinogenic Risk
SF = Slope Factor
HQ = Hazard Quotient

RfD = Reference Dose
BW = body weight
AT = averaging time

IR_{soil} = Ingestion rate
EF = exposure frequency
ED = exposure duration

SA = skin surface area
AF = adherence factor
ABS = dermal absorption fraction

Calculation of Risk
Resident – Combined Risk for Soil
Texas-New Mexico Pipe Line Co.

If On-Site: $Risk_{res\text{-}SOIL} = Risk_{ING} + Risk_{DER} + Risk_{INHAL}$

If Off-Site: $Risk_{res\text{-}SOIL} = Risk_{INHAL}$

Constituent of Concern	$Risk_{ING}$ or HQ_{ING}	$Risk_{DER}$ or HQ_{DER}	$Risk_{INHAL}$ or HQ_{INHAL}	$Risk_{res\text{-}SOIL}$ or $HQ_{res\text{-}SOIL}$
Carcinogens				
Benzene	1.52E-07	0.00E+00	1.67E-07	3.19E-07
Chrysene	1.36E-08	1.15E-07	1.77E-12	1.29E-07
Non-Carcinogens				
Ethylbenzene	7.65E-03	0.00E+00	2.35E-04	7.88E-03
Fluorene	4.16E-04	2.58E-04	1.30E-06	6.75E-04
Naphthalene	6.71E-04	4.17E-04	2.16E-05	1.11E-03
Phenanthrene	1.25E-02	7.07E-04	1.29E-05	1.32E-02
Toluene	3.62E-03	0.00E+00	1.13E-03	4.75E-03
Xylene (mixed isomers)	8.69E-04	0.00E+00	1.72E-03	2.59E-03
TPH - New Method	4.82E+00	3.00E+00	7.81E-02	7.89E+00
TPH-Arom-EC>8-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TPH-Arom-EC>10-12	5.93E-03	3.68E-03	1.99E-04	9.81E-03
TPH-Arom-EC>12-16	6.60E-01	4.10E-01	9.63E-03	1.08E+00
TPH-Arom-EC>16-21	2.38E+00	1.48E+00	4.22E-02	3.90E+00
TPH-Arom-EC>21-35	1.00E+00	6.23E-01	1.50E-03	1.63E+00
TPH-Aliph-EC 5-6	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TPH-Aliph-EC>6-8	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TPH-Aliph-EC>8-10	1.46E-02	9.08E-03	1.70E-03	2.54E-02
TPH-Aliph-EC>10-12	8.65E-02	5.38E-02	4.38E-03	1.45E-01
TPH-Aliph-EC>12-16	5.70E-01	3.54E-01	1.33E-02	9.37E-01
TPH-Aliph-EC>16-35	1.00E-01	6.21E-02	5.26E-03	1.67E-01

NOTES:

Risk = Carcinogenic Risk
HQ = Hazard Quotient

Calculation of Risk
Construction Worker – Inhalation of Volatiles from Soil

Texas-New Mexico Pipe Line Co. TNM-96-16 Lea County, New Mexico	BW (kg)	IRair (m^3/day)	EF (days/yr)	ED (years)	LS (m)	V (m/s)	DH (m)	A (m^2)	B (g/cc)	E —	foc —	PEF (kg/m^3)
	70	20	5	12	5	0.49	2.0	109	1.80	0.32	0.009	4.58e-11

For carcinogens: $Risk = Conc_{soil} * (VF + PEF) * IR_{air} * EF * ED * SF / BW * 70 * 365$

For non-carcinogens: $HQ = Conc_{soil} * (VF + PEF) * IR_{air} * EF * (1/RfD) / BW * 365$

$VF = (2 * Dei * E * Kas * 10\text{-}3) / (LS * V * DH / A) * (3.14 * alpha * ED * 3.15E+7)^{0.5}$

Constituent of Concern	$Conc_{soil}$ (mg/kg)	SF (1/mg/kg-d)	RfD (mg/kg-d)	Dei (cm^2/sec)	Kd (cm^3/g)	H' —	Kas (g /cm^3)	alpha (cm^2/sec)	VF (m^3/kg)	Risk or HQ
Carcinogens										
Benzene	3.08e+0	2.91e-2		2.05e-2	7.49e-1	2.32e-1	3.11e-1	1.07e-3	2.32e-5	5.12e-8
Chrysene	1.10e+0	6.10e-3		5.45e-3	1.80e+3	4.37e-5	2.43e-8	2.36e-11	3.26e-9	5.39e-13
									Total Risk:	5.12e-8
Non-Carcinogens										
Ethylbenzene	5.98e+1		2.86e-1	1.64e-2	9.87e+0	2.67e-1	2.71e-2	7.88e-5	5.99e-6	8.99e-3
Fluorene	1.30e+0		4.00e-2	1.38e-2	6.52e+1	2.67e-3	4.10e-5	1.00e-7	2.13e-7	4.96e-5
Naphthalene	2.10e+0		4.00e-2	1.30e-2	1.16e+1	5.38e-2	4.64e-3	1.07e-5	2.20e-6	8.28e-4
Phenanthrene	3.90e+0		4.00e-3	1.19e-3	1.27e+2	6.63e-3	5.21e-5	1.10e-8	7.05e-8	4.93e-4
Toluene	5.66e+1		1.14e-1	1.84e-2	2.72e+0	2.65e-1	9.75e-2	3.14e-4	1.21e-5	4.31e-2
Xylene (mixed isomers)	1.36e+2		2.00e-1	1.63e-2	2.16e+0	2.93e-1	1.36e-1	3.83e-4	1.35e-5	6.57e-2
TPH - New Method	3.09e+4									2.99e+0
									Hazard Index:	3.11e+0
TPH-Arom-EC>8-10	0.00e+0		5.71e-2	2.20e-2	1.43e+1	4.84e-1	3.39e-2	1.32e-4	7.76e-6	0.00e+0
TPH-Arom-EC>10-12	1.85e+1		5.71e-2	2.20e-2	2.26e+1	1.36e-1	6.03e-3	2.35e-5	3.26e-6	7.60e-3
TPH-Arom-EC>12-16	2.06e+3		5.71e-2	2.20e-2	4.51e+1	5.16e-2	1.14e-3	4.47e-6	1.42e-6	3.68e-1
TPH-Arom-EC>16-21	5.59e+3		3.00e-2	2.20e-2	1.43e+2	1.18e-1	8.26e-4	3.22e-6	1.21e-6	1.61e+0
TPH-Arom-EC>21-35	2.35e+3		3.00e-2	2.20e-2	1.13e+3	6.65e-3	5.87e-6	2.29e-8	1.02e-7	5.73e-2
TPH-Aliph-EC 5-6	0.00e+0		5.71e-2	2.20e-2	7.15e+0	3.28e+1	4.58e+0	9.86e-3	1.21e-4	0.00e+0
TPH-Aliph-EC>6-8	0.00e+0		5.71e-2	2.20e-2	3.58e+1	4.85e+1	1.35e+0	4.26e-3	5.44e-5	0.00e+0
TPH-Aliph-EC>8-10	1.14e+2		2.86e-1	2.20e-2	2.85e+2	7.92e+1	2.78e-1	1.04e-3	2.27e-5	6.52e-2
TPH-Aliph-EC>10-12	6.77e+2		2.86e-1	2.20e-2	2.26e+3	1.23e+2	5.45e-2	2.11e-4	9.86e-6	1.68e-1
TPH-Aliph-EC>12-16	4.46e+3		2.86e-1	2.20e-2	4.51e+4	5.25e+2	1.16e-2	4.54e-5	4.54e-6	5.08e-1
TPH-Aliph-EC>16-35	1.56e+4		2.00e+0	2.20e-2	9.00e+6	6.57e+4	7.29e-3	2.85e-5	3.59e-6	2.01e-1

NOTES:

Conc(soil) = Concentration in soil (0-15 feet)
Risk = Carcinogenic Risk
SF = Slope Factor
HQ = Hazard Quotient
RfD = Reference Dose
DAF = Dilution attenuation factor

BW = body weight
AT = averaging time
IR_A = Inhalation rate
EF = exposure frequency
ED = exposure duration
LS = Length of Source Area

V = Velocity of Wind
DH = Diffusion Height
A = Area of Soil Source
B = Bulk Soil Density
E = Effective Porosity
Dei = effective diffusion coefficient

H' = unitless Henry's Law Constant
Kd = organic carbon partition coefficient * foc
foc = fraction organic carbon
Kas = H' / Kd
alpha = Dei * E / (E + B / Kas)
PEF = Particulate Emissions Factor

Calculation of Risk
Construction Worker -- Ingestion of Soil & Dermal Contact with Soil

Texas-New Mexico Pipe Line Co. TNM-96-16 Lea County, New Mexico	BW (kg)	CF (mg/kg)	IRsoil (mg/day)	EF (days/yr)	ED (years)	EF_{dermal} (days/yr)	SA (cm^2)	AF (mg/cm^2)
	70	1.00E+06	480	5	12	5	3,300	0.12

For carcinogens: $Risk_{ING} = Conc_{soil} * IR_{soil} * EF * ED * SF / BW * 70 * 365 * CF$

$Risk_{DER} = Conc_{soil} * SA * AF * ABS * EF * ED * SF / BW * 70 * 365 * CF$

For non-carcinogens: $HQ_{ING} = Conc_{soil} * IR_{soil} * EF * (1/RfD) / BW * 365 * CF$

$HQ_{DER} = Conc_{soil} * SA * AF * ABS * EF * (1/RfD) / BW * 365 * CF$

Constituent of Concern	$Conc_{soil}$ (mg/kg)	SFo (1/mg/kg-d)	RfDo (mg/kg-d)	$Risk_{ING}$ or HQ_{ING}	SFd (1/mg/kg-d)	RfDd (mg/kg-d)	ABS —	$Risk_{DER}$ or HQ_{DER}
Carcinogens								
Benzene	3.08e+0	0.029		1.44E-09	0.029		0.000	0.00E+00
Chrysene	1.10e+0	0.0073		1.29E-10	0.0236		0.130	4.48E-11
			Total Risk:	1.57e-9		**Total Risk:**		4.48e-11
Non-Carcinogens								
Ethylbenzene	5.98e+1		0.10	2.81E-03		0.10	0.000	0.00E+00
Fluorene	1.30e+0		0.04	1.53E-04		0.04	0.100	1.26E-05
Naphthalene	2.10e+0		0.04	2.47E-04		0.04	0.100	2.03E-05
Phenanthrene	3.90e+0		0.00	4.58E-03		0.02	0.050	3.45E-05
Toluene	5.66e+1		0.20	1.33E-03		0.20	0.000	0.00E+00
Xylene (mixed isomers)	1.36e+2		2.00	3.19E-04		2.00	0.000	0.00E+00
TPH - New Method	3.09e+4			1.77E+00				1.46E-01
			Hazard Index:	1.78e+0		**Hazard Index:**		1.46e-1
TPH-Arom-EC>8-10	0.00e+0		0.04	0.00E+00		0.04	0.100	0.00E+00
TPH-Arom-EC>10-12	1.85e+1		0.04	2.18E-03		0.04	0.100	1.80E-04
TPH-Arom-EC>12-16	2.06e+3		0.04	2.42E-01		0.04	0.100	2.00E-02
TPH-Arom-EC>16-21	5.59e+3		0.03	8.75E-01		0.03	0.100	7.22E-02
TPH-Arom-EC>21-35	2.35e+3		0.03	3.68E-01		0.03	0.100	3.04E-02
TPH-Aliph-EC 5-6	0.00e+0		0.06	0.00E+00		0.06	0.100	0.00E+00
TPH-Aliph-EC>6-8	0.00e+0		0.06	0.00E+00		0.06	0.100	0.00E+00
TPH-Aliph-EC>8-10	1.14e+2		0.10	5.37E-03		0.10	0.100	4.43E-04
TPH-Aliph-EC>10-12	6.77e+2		0.10	3.18E-02		0.10	0.100	2.62E-03
TPH-Aliph-EC>12-16	4.46e+3		0.10	2.09E-01		0.10	0.100	1.73E-02
TPH-Aliph-EC>16-35	1.56e+4		2.00	3.67E-02		2.00	0.100	3.03E-03

NOTES:

Conc(soil) = Concentration in soil (0-15 feet)
Risk = Carcinogenic Risk
SF = Slope Factor
HQ = Hazard Quotient
RfD = Reference Dose
BW = body weight
AT = averaging time
IR_{soil} = Ingestion rate
EF = exposure frequency
ED = exposure duration
SA = skin surface area
AF = adherence factor
ABS = dermal absorption fraction

Calculation of Risk
Construction Worker – Combined Risk for Soil
Texas-New Mexico Pipe Line Co.

$$Risk_{CW\text{-}SOIL} = Risk_{ING} + Risk_{DER} + Risk_{INHAL}$$

Constituent of Concern	$Risk_{ING}$ or HQ_{ING}	$Risk_{DER}$ or HQ_{DER}	$Risk_{INHAL}$ or HQ_{INHAL}	$Risk_{CW\text{-}SOIL}$ or $HQ_{CW\text{-}SOIL}$
Carcinogens				
Benzene	1.44E-09	0.00E+00	5.12E-08	5.27E-08
Chrysene	1.29E-10	4.48E-11	5.39E-13	1.75E-10
Non-Carcinogens				
Ethylbenzene	2.81E-03	0.00E+00	8.99E-03	1.18E-02
Fluorene	1.53E-04	1.26E-05	4.96E-05	2.15E-04
Naphthalene	2.47E-04	2.03E-05	8.28E-04	1.10E-03
Phenanthrene	4.58E-03	3.45E-05	4.93E-04	5.11E-03
Toluene	1.33E-03	0.00E+00	4.31E-02	4.45E-02
Xylene (mixed isomers)	3.19E-04	0.00E+00	6.57E-02	6.60E-02
TPH - New Method	1.77E+00	1.46E-01	2.99E+00	4.90E+00
TPH-Arom-EC>8-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TPH-Arom-EC>10-12	2.18E-03	1.80E-04	7.60E-03	9.95E-03
TPH-Arom-EC>12-16	2.42E-01	2.00E-02	3.68E-01	6.31E-01
TPH-Arom-EC>16-21	8.75E-01	7.22E-02	1.61E+00	2.56E+00
TPH-Arom-EC>21-35	3.68E-01	3.04E-02	5.73E-02	4.56E-01
TPH-Aliph-EC 5-6	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TPH-Aliph-EC>6-8	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TPH-Aliph-EC>8-10	5.37E-03	4.43E-04	6.52E-02	7.10E-02
TPH-Aliph-EC>10-12	3.18E-02	2.62E-03	1.68E-01	2.02E-01
TPH-Aliph-EC>12-16	2.09E-01	1.73E-02	5.08E-01	7.34E-01
TPH-Aliph-EC>16-35	3.67E-02	3.03E-03	2.01E-01	2.41E-01

NOTES:

Risk = Carcinogenic Risk
HQ = Hazard Quotient

Calculation of Site-Specific Target Levels
Worker -- Inhalation of Volatiles from Soil

Texas-New Mexico Pipe Line Co. TNM-96-16 Lea County, New Mexico	BW (kg)	IRair (m^3/day)	EF (days/yr)	ED (years)	LS (m)	V (m/s)	DH (m)	A (m^2)	B (g/cc)	E --	foc --	PEF (kg/m^3)
	70	20	250	25	19	4.92	2.0	171	1.80	0.32	0.009	1.802E-11

For carcinogens: $SSTL = DAF * TR * BW * 70 * 365 / IR_{air} * EF * ED * SF * (VF + PEF)$

For non-carcinogens: $SSTL = DAF * HQ * BW * 365 / IR_{air} * EF * (1/RfD) * (VF + PEF)$

$VF = (2 * Dei * E * Kas * 10\text{-}3) / (LS * V * DH / A) * (3.14 * alpha * ED * 3.15E+7)^{0.5}$

DAF
1.00

Constituent of concern	TR --	SF (1/mg/kg-d)	HQ --	RfD (mg/kg-d)	Dei (cm^3/sec)	Kd (cm^3/g)	H' --	Kas (g /cm^3)	alpha (cm^3/sec)	VF (m^3/kg)		SSTL (mg/kg)
Non-Carcinogens												
Ethylbenzene			0.07	0.29	1.64e-2	9.87e+0	2.67e-1	2.71e-2	7.88e-5	5.99e-6		1.71e+4
Fluorene			0.01	0.04	1.38e-2	6.52e+1	2.67e-3	4.10e-5	1.00e-7	2.13e-7		4.81e+3
Naphthalene			0.01	0.04	1.30e-2	1.16e+1	5.38e-2	4.64e-3	1.07e-5	2.20e-6		4.65e+2
Phenanthrene			0.02	0.00	1.19e-3	1.27e+2	6.63e-3	5.21e-5	1.10e-8	7.05e-8		4.35e+3
Toluene			0.05	0.11	1.84e-2	2.72e+0	2.65e-1	9.75e-2	3.14e-4	1.21e-5		2.41e+3
Xylene (mixed isomers)			0.07	0.20	1.63e-2	2.16e+0	2.93e-1	1.36e-1	3.83e-4	1.35e-5		5.31e+3
TPH - New Method			0.79									2.98e+5
TPH-Arom-EC>8-10			0.000	0.06	2.20e-2	1.43e+1	4.84e-1	3.39e-2	1.32e-4	7.76e-6		3.76e+4
TPH-Arom-EC>10-12			0.001	0.06	2.20e-2	2.26e+1	1.36e-1	6.03e-3	2.35e-5	3.26e-6		8.95e+4
TPH-Arom-EC>12-16			0.067	0.06	2.20e-2	4.51e+1	5.16e-2	1.14e-3	4.47e-6	1.42e-6		2.05e+5
TPH-Arom-EC>16-21			0.181	0.03	2.20e-2	1.43e+2	1.18e-1	8.26e-4	3.22e-6	1.21e-6		1.27e+5
TPH-Arom-EC>21-35			0.076	0.03	2.20e-2	1.13e+3	6.65e-3	5.87e-6	2.29e-8	1.02e-7		1.51e+6
TPH-Aliph-EC 5-6			0.000	0.06	2.20e-2	7.15e+0	3.28e+1	4.58e+0	9.86e-3	1.21e-4		2.41e+3
TPH-Aliph-EC>6-8			0.000	0.06	2.20e-2	3.58e+1	4.85e+1	1.35e+0	4.26e-3	5.44e-5		5.36e+3
TPH-Aliph-EC>8-10			0.004	0.29	2.20e-2	2.85e+2	7.92e+1	2.78e-1	1.04e-3	2.27e-5		6.43e+4
TPH-Aliph-EC>10-12			0.022	0.29	2.20e-2	2.26e+3	1.23e+2	5.45e-2	2.11e-4	9.86e-6		1.48e+5
TPH-Aliph-EC>12-16			0.144	0.29	2.20e-2	4.51e+4	5.25e+2	1.16e-2	4.54e-5	4.54e-6		3.22e+5
TPH-Aliph-EC>16-35			0.506	2.00	2.20e-2	9.00e+6	6.57e+4	7.29e-3	2.85e-5	3.59e-6		2.85e+6

NOTES:

SSTL = Site specific Target Level
TR = Target Risk
SF = Slope Factor
HQ = hazard quotient
RfD = Reference Dose
DAF = Dilution attenuation factor

BW = body weight
AT = averaging time
IR_A = Inhalation rate
EF = exposure frequency
ED = exposure duration
LS = Length of Source Area

V = Velocity of Wind
DH = Diffusion Height
A = Area of Soil Source
B = Bulk Soil Density
E = Effective Porosity
Dei = effective diffusion coefficient

H' = unitless Henry's Law Constant
Kd = organic carbon partition coefficient * foc
foc = fraction organic carbon
Kas = H' / Kd
alpha = Dei * E / (E + B / Kas)
PEF = Particulate Emissions Factor

Calculation of Site-Specific Target Levels
Worker – Ingestion of Soil & Dermal Contact with Soil

Texas-New Mexico Pipe Line Co. TNM-96-16 Lea County, New Mexico	BW (kg)	CF (mg/kg)	IRsoil (mg/day)	EF (days/yr)	ED (years)	EF_{dermal} (days/yr)	SA (cm^2)	AF (mg/cm^2)
	70	1.00E+06	50	250	25	250	5,800	1.00

For carcinogens:

$$SSTL_{ING} = TR * BW * 70 * 365 * CF / IR_{soil} * EF * ED * SF$$

$$SSTL_{DER} = TR * BW * 70 * 365 * CF / SA * AF * ABS * EF * ED * SF$$

For non-carcinogens:

$$SSTL_{ING} = HQ * BW * 365 * CF / IR_{soil} * EF * (1/RfD)$$

$$SSTL_{DER} = HQ * BW * 365 * CF / SA * AF * ABS * EF * (1/RfD)$$

Constituent of Concern	TR ---	SFo (1/mg/kg-d)	HQ ---	RfDo (mg/kg-d)	$SSTL_{ING}$ (mg/kg)	SFd (1/mg/kg-d)	RfDd (mg/kg-d)	ABS ---	$SSTL_{DER}$ (mg/kg)
Non-Carcinogens									
Ethylbenzene			0.07	0.10	1.43e+4		0.10	0.000	9.99e+99
Fluorene			0.01	0.04	4.09e+2		0.04	0.100	3.52e+1
Naphthalene			0.01	0.04	4.09e+2		0.04	0.100	3.52e+1
Phenanthrene			0.02	0.00	1.23e+2		0.02	0.050	1.16e+2
Toluene			0.05	0.20	2.04e+4		0.20	0.000	9.99e+99
Xylene (mixed isomers)			0.07	2.00	2.86e+5		2.00	0.000	9.99e+99
TPH - New Method			0.79		1.32e+5				1.13e+4
TPH-Arom-EC>8-10			0.000	0.04	8.18e+4		0.04	0.100	7.05e+3
TPH-Arom-EC>10-12			0.001	0.04	8.18e+4		0.04	0.100	7.05e+3
TPH-Arom-EC>12-16			0.067	0.04	8.18e+4		0.04	0.100	7.05e+3
TPH-Arom-EC>16-21			0.181	0.03	6.13e+4		0.03	0.100	5.29e+3
TPH-Arom-EC>21-35			0.076	0.03	6.13e+4		0.03	0.100	5.29e+3
TPH-Aliph-EC 5-6			0.000	0.06	1.23e+5		0.06	0.100	1.06e+4
TPH-Aliph-EC>6-8			0.000	0.06	1.23e+5		0.06	0.100	1.06e+4
TPH-Aliph-EC>8-10			0.004	0.10	2.04e+5		0.10	0.100	1.76e+4
TPH-Aliph-EC>10-12			0.022	0.10	2.04e+5		0.10	0.100	1.76e+4
TPH-Aliph-EC>12-16			0.144	0.10	2.04e+5		0.10	0.100	1.76e+4
TPH-Aliph-EC>16-35			0.506	2.00	4.09e+6		2.00	0.100	3.52e+5

NOTES:

SSTL = Site specific Target Level
TR = Target Risk
SF = Slope Factor
HQ = hazard quotient
RfD = Reference Dose
BW = body weight
AT = averaging time
IR_{soil} = Ingestion rate
EF = exposure frequency
ED = exposure duration
SA = skin surface area
AF = adherence factor
ABS = dermal absorption fraction

Calculation of Site-Specific Target Levels
Worker -- Combined SSTL for Soil
Texas-New Mexico Pipe Line Co.

If On-Site: $$SSTL_{wkr\text{-}SOIL} = \frac{1}{\left((1 / SSTL_{ING}) + (1 / SSTL_{DER}) + (1 / SSTL_{INHAL}) \right)}$$

If Off-Site: $$SSTL_{wkr\text{-}SOIL} = SSTL_{INHAL}$$

Constituent of Concern	$SSTL_{ING}$ (mg/kg)	$SSTL_{DER}$ (mg/kg)	$SSTL_{INHAL}$ (mg/kg)	$SSTL_{wkr\text{-}SOIL}$ (mg/kg)
Non-Carcinogens				
Ethylbenzene	1.43e+4	9.99e+99	1.71e+4	7.78e+3
Fluorene	4.09e+2	3.52e+1	4.81e+3	3.22e+1
Naphthalene	4.09e+2	3.52e+1	4.65e+2	3.03e+1
Phenanthrene	1.23e+2	1.16e+2	4.35e+3	5.87e+1
Toluene	2.04e+4	9.99e+99	2.41e+3	2.15e+3
Xylene (mixed isomers)	2.86e+5	9.99e+99	5.31e+3	5.22e+3
TPH - New Method	1.32e+5	1.13e+4	2.98e+5	1.01e+4

NOTES:
SSTL = Site specific Target Level

Calculation of Site-Specific Target Levels
Resident -- Inhalation of Volatiles from Soil

Texas-New Mexico Pipe Line Co. TNM-96-16 Lea County, New Mexico	BW (kg)	IRair (m^3/day)	EF (days/yr)	ED (years)	LS (m)	V (m/s)	DH (m)	A (m^2)	B (g/cc)	E —	foc —	PEF (kg/m^3)
	70	15	350	30	19	4.92	2.0	171	1.80	0.32	0.009	1.802E-11

For carcinogens: $SSTL = DAF * TR * BW * 70 * 365 / IR_{air} * EF * ED * SF * (VF + PEF)$

For non-carcinogens: $SSTL = DAF * HQ * BW * 365 / IR_{air} * EF * (1/RfD) * (VF + PEF)$

$VF = (2 * Dei * E * Kas * 10\text{-}3) / (LS * V * DH / A) * (3.14 * alpha * ED * 3.15E+7)^{0.5}$

DAF
1.00

Constituent of Concern	TR —	SF (1/mg/kg-d)	HQ ---	RfD (mg/kg-d)	Dei (cm^2/sec)	Kd (cm^3/g)	H' —	Kas (g /cm^3)	alpha (cm^2/sec)	VF (m^3/kg)		SSTL (mg/kg)
Non-Carcinogens												
Ethylbenzene			0.07	0.29	1.64e-2	9.87e+0	2.67e-1	2.71e-2	7.88e-5	5.47e-6		1.78e+4
Fluorene			0.01	0.04	1.38e-2	6.52e+1	2.67e-3	4.10e-5	1.00e-7	1.94e-7		5.01e+3
Naphthalene			0.01	0.04	1.30e-2	1.16e+1	5.38e-2	4.64e-3	1.07e-5	2.01e-6		4.85e+2
Phenanthrene			0.02	0.00	1.19e-3	1.27e+2	6.63e-3	5.21e-5	1.10e-8	6.43e-8		4.54e+3
Toluene			0.05	0.11	1.84e-2	2.72e+0	2.65e-1	9.75e-2	3.14e-4	1.11e-5		2.51e+3
Xylene (mixed isomers)			0.07	0.20	1.63e-2	2.16e+0	2.93e-1	1.36e-1	3.83e-4	1.23e-5		5.54e+3
TPH - New Method			0.79									3.11e+5
TPH-Arom-EC>8-10			0.00	0.06	2.20e-2	1.43e+1	4.84e-1	3.39e-2	1.32e-4	7.08e-6		3.93e+4
TPH-Arom-EC>10-12			0.00	0.06	2.20e-2	2.26e+1	1.36e-1	6.03e-3	2.35e-5	2.98e-6		9.34e+4
TPH-Arom-EC>12-16			0.07	0.06	2.20e-2	4.51e+1	5.16e-2	1.14e-3	4.47e-6	1.30e-6		2.14e+5
TPH-Arom-EC>16-21			0.18	0.03	2.20e-2	1.43e+2	1.18e-1	8.26e-4	3.22e-6	1.10e-6		1.33e+5
TPH-Arom-EC>21-35			0.08	0.03	2.20e-2	1.13e+3	6.65e-3	5.87e-6	2.29e-8	9.29e-8		1.57e+6
TPH-Aliph-EC 5-6			0.00	0.06	2.20e-2	7.15e+0	3.28e+1	4.58e+0	9.86e-3	1.11e-4		2.52e+3
TPH-Aliph-EC>6-8			0.00	0.06	2.20e-2	3.58e+1	4.85e+1	1.35e+0	4.26e-3	4.97e-5		5.60e+3
TPH-Aliph-EC>8-10			0.00	0.29	2.20e-2	2.85e+2	7.92e+1	2.78e-1	1.04e-3	2.07e-5		6.71e+4
TPH-Aliph-EC>10-12			0.02	0.29	2.20e-2	2.26e+3	1.23e+2	5.45e-2	2.11e-4	9.00e-6		1.55e+5
TPH-Aliph-EC>12-16			0.14	0.29	2.20e-2	4.51e+4	5.25e+2	1.16e-2	4.54e-5	4.14e-6		3.36e+5
TPH-Aliph-EC>16-35			0.51	2.00	2.20e-2	9.00e+6	6.57e+4	7.29e-3	2.85e-5	3.28e-6		2.97e+6

NOTES:

SSTL = Site specific Target Level
TR = Target Risk
SF = Slope Factor
HQ = hazard quotient
RfD = Reference Dose
DAF = Dilution attenuation factor

BW = body weight
AT = averaging time
IR_A = Inhalation rate
EF = exposure frequency
ED = exposure duration
LS = Length of Source Area

V = Velocity of Wind
DH = Diffusion Height
A = Area of Soil Source
B = Bulk Soil Density
E = Effective Porosity
Dei = effective diffusion coefficient

H' = unitless Henry's Law Constant
Kd = organic carbon partition coefficient * foc
foc = fraction organic carbon
Kas = H' / Kd
alpha = Dei * E / (E + B / Kas)
PEF = Particulate Emissions Factor

Calculation of Site-Specific Target Levels
Resident – Ingestion of Soil & Dermal Contact with Soil

Texas-New Mexico Pipe Line Co. TNM-96-16 Lea County, New Mexico	BW (kg)	CF (mg/kg)	IRsoil (mg/day)	EF (days/yr)	ED (years)	EF_{dermal} (days/yr)	SA (cm^2)	AF (mg/cm^2)
	70	1.00E+06	124	350	30	350	5,800	1.00

For carcinogens:

$SSTL_{ING} = TR * BW * 70 * 365 * CF / IR_{soil} * EF * ED * SF$

$SSTL_{DER} = TR * BW * 70 * 365 * CF / SA * AF * ABS * EF * ED * SF$

For non-carcinogens:

$SSTL_{ING} = HQ * BW * 365 * CF / IR_{soil} * EF * (1/RfD)$

$SSTL_{DER} = HQ * BW * 365 * CF / SA * AF * ABS * EF * (1/RfD)$

Constituent of Concern	TR ---	SFo (1/mg/kg-d)	HQ —	RfDo (mg/kg-d)	$SSTL_{ING}$ (mg/kg)	SFd (1/mg/kg-d)	RfDd (mg/kg-d)	ABS —	$SSTL_{DER}$ (mg/kg)
Non-Carcinogens									
Ethylbenzene			0.07	0.10	5.48e+2		0.10	0.000	9.99e+99
Fluorene			0.01	0.04	1.56e+1		0.04	0.100	2.52e+1
Naphthalene			0.01	0.04	1.56e+1		0.04	0.100	2.52e+1
Phenanthrene			0.02	0.00	4.69e+0		0.02	0.050	8.27e+1
Toluene			0.05	0.20	7.82e+2		0.20	0.000	9.99e+99
Xylene (mixed isomers)			0.07	2.00	1.10e+4		2.00	0.000	9.99e+99
TPH - New Method			0.79		5.03e+3				8.10e+3
TPH-Arom-EC>8-10			0.00	0.04	3.13e+3		0.04	0.100	5.03e+3
TPH-Arom-EC>10-12			0.00	0.04	3.13e+3		0.04	0.100	5.03e+3
TPH-Arom-EC>12-16			0.07	0.04	3.13e+3		0.04	0.100	5.03e+3
TPH-Arom-EC>16-21			0.18	0.03	2.35e+3		0.03	0.100	3.78e+3
TPH-Arom-EC>21-35			0.08	0.03	2.35e+3		0.03	0.100	3.78e+3
TPH-Aliph-EC 5-6			0.00	0.06	4.69e+3		0.06	0.100	7.55e+3
TPH-Aliph-EC>6-8			0.00	0.06	4.69e+3		0.06	0.100	7.55e+3
TPH-Aliph-EC>8-10			0.00	0.10	7.82e+3		0.10	0.100	1.26e+4
TPH-Aliph-EC>10-12			0.02	0.10	7.82e+3		0.10	0.100	1.26e+4
TPH-Aliph-EC>12-16			0.14	0.10	7.82e+3		0.10	0.100	1.26e+4
TPH-Aliph-EC>16-35			0.51	2.00	1.56e+5		2.00	0.100	2.52e+5

NOTES:

SSTL = Site specific Target Level
TR = Target Risk
SF = Slope Factor
HQ = hazard quotient
RfD = Reference Dose
BW = body weight
AT = averaging time
IR_{soil} = Ingestion rate
EF = exposure frequency
ED = exposure duration
SA = skin surface area
AF = adherence factor
ABS = dermal absorption fraction

Calculation of Site-Specific Target Levels
Resident -- Combined SSTL for Soil
Texas-New Mexico Pipe Line Co.

If On-Site: $SSTL_{res\text{-}SOIL} = \dfrac{1}{((1 / SSTL_{ING}) + (1 / SSTL_{DER}) + (1 / SSTL_{INHAL}))}$

If Off-Site: $SSTL_{res\text{-}SOIL} = SSTL_{INHAL}$

Constituent of Concern	$SSTL_{ING}$ (mg/kg)	$SSTL_{DER}$ (mg/kg)	$SSTL_{INHAL}$ (mg/kg)	$SSTL_{res\text{-}SOIL}$ (mg/kg)
Non-Carcinogens				
Ethylbenzene	5.48e+2	9.99e+99	1.78e+4	5.31e+2
Fluorene	1.56e+1	2.52e+1	5.01e+3	9.63e+0
Naphthalene	1.56e+1	2.52e+1	4.85e+2	9.46e+0
Phenanthrene	4.69e+0	8.27e+1	4.54e+3	4.44e+0
Toluene	7.82e+2	9.99e+99	2.51e+3	5.96e+2
Xylene (mixed isomers)	1.10e+4	9.99e+99	5.54e+3	3.68e+3
TPH - New Method	5.03e+3	8.10e+3	3.11e+5	3.07e+3

NOTES:

SSTL = Site specific Target Level

Calculation of Site-Specific Target Levels
Construction Worker – Inhalation of Volatiles from Soil
Texas-New Mexico Pipe Line Co.

Texas-New Mexico Pipe Line Co. TNM-96-16 Lea County, New Mexico	BW (kg)	IRair (m^3/day)	EF (days/wk)	ED (weeks)	LS (m)	V (m/s)	DH (m)	A (m^2)	B (g/cc)	E –	foc –	PEF (kg/m^3)
	70	20	5	12	19	4.92	2.0	109	1.80	0.32	0.009	4.579E-11

For carcinogens: $SSTL = TR * BW * 70 * 365 / IR_{air} * EF * ED * SF * (VF + PEF)$

For non-carcinogens: $SSTL = HQ * BW * 365 / IR_{air} * EF * (1/RfD) * (VF + PEF)$

$VF = (2 * Dei * E * Kas * 10\text{-}3) / (LS * V * DH / A) * (3.14 * alpha * ED * 3.15E+7)^{0.5}$

Constituent of Concern	TR –	SF (1/mg/kg-d)	HQ –	RfD (mg/kg-d)	Dei (cm^2/sec)	Kd (cm^3/g)	H' –	Kas (g /cm^3)	alpha (cm^2/sec)	VF (m^3/kg)		SSTL (mg/kg)
Non-Carcinogens												
Ethylbenzene			0.07	0.29	1.64e-2	9.87e+0	2.67e-1	2.71e-2	7.88e-5	5.47e-6		4.65e+2
Fluorene			0.01	0.04	1.38e-2	6.52e+1	2.67e-3	4.10e-5	1.00e-7	1.94e-7		1.31e+2
Naphthalene			0.01	0.04	1.30e-2	1.16e+1	5.38e-2	4.64e-3	1.07e-5	2.01e-6		1.27e+1
Phenanthrene			0.02	0.00	1.19e-3	1.27e+2	6.63e-3	5.21e-5	1.10e-8	6.43e-8		1.19e+2
Toluene			0.05	0.11	1.84e-2	2.72e+0	2.65e-1	9.75e-2	3.14e-4	1.11e-5		6.56e+1
Xylene (mixed isomers)			0.07	0.20	1.63e-2	2.16e+0	2.93e-1	1.36e-1	3.83e-4	1.23e-5		1.45e+2
TPH - New Method			0.79									8.12e+3
TPH-Arom-EC>8-10			0.00	0.06	2.20e-2	1.43e+1	4.84e-1	3.39e-2	1.32e-4	7.08e-6		1.03e+3
TPH-Arom-EC>10-12			0.00	0.06	2.20e-2	2.26e+1	1.36e-1	6.03e-3	2.35e-5	2.98e-6		2.44e+3
TPH-Arom-EC>12-16			0.07	0.06	2.20e-2	4.51e+1	5.16e-2	1.14e-3	4.47e-6	1.30e-6		5.60e+3
TPH-Arom-EC>16-21			0.18	0.03	2.20e-2	1.43e+2	1.18e-1	8.26e-4	3.22e-6	1.10e-6		3.46e+3
TPH-Arom-EC>21-35			0.08	0.03	2.20e-2	1.13e+3	6.65e-3	5.87e-6	2.29e-8	9.29e-8		4.11e+4
TPH-Aliph-EC 5-6			0.00	0.06	2.20e-2	7.15e+0	3.28e+1	4.58e+0	9.86e-3	1.11e-4		6.58e+1
TPH-Aliph-EC>6-8			0.00	0.06	2.20e-2	3.58e+1	4.85e+1	1.35e+0	4.26e-3	4.97e-5		1.46e+2
TPH-Aliph-EC>8-10			0.00	0.29	2.20e-2	2.85e+2	7.92e+1	2.78e-1	1.04e-3	2.07e-5		1.75e+3
TPH-Aliph-EC>10-12			0.02	0.29	2.20e-2	2.26e+3	1.23e+2	5.45e-2	2.11e-4	9.00e-6		4.04e+3
TPH-Aliph-EC>12-16			0.14	0.29	2.20e-2	4.51e+4	5.25e+2	1.16e-2	4.54e-5	4.14e-6		8.77e+3
TPH-Aliph-EC>16-35			0.51	2.00	2.20e-2	9.00e+6	6.57e+4	7.29e-3	2.85e-5	3.28e-6		7.76e+4

NOTES:

SSTL = Site specific Target Level
TR = Target Risk
SF = Slope Factor
HQ = hazard quotient
RfD = Reference Dose

BW = body weight
AT = averaging time
IR_A = Inhalation rate
EF = exposure frequency
ED = exposure duration
LS = Length of Source Area

V = Velocity of Wind
DH = Diffusion Height
A = Area of Soil Source
B = Bulk Soil Density
E = Effective Porosity
Dei = effective diffusion coefficient

H' = unitless Henry's Law Constant
Kd = organic carbon partition coefficient * foc
foc = fraction organic carbon
Kas = H' / Kd
alpha = Dei * E / (E + B / Kas)
PEF = Particulate Emissions Factor

Calculation of Site-Specific Target Levels
Construction Worker – Ingestion of Soil & Dermal Contact with Soil

Texas-New Mexico Pipe Line Co. TNM-96-16 Lea County, New Mexico	BW (kg)	CF (mg/kg)	IRsoil (mg/day)	EF (days/wk)	ED (weeks)	SA (cm^2)	AF (mg/cm^2)
	70	1.00E+06	480	5	12	3,300	0.12

For carcinogens:

$SSTL_{ING} = TR * BW * 70 * 365 * CF / IR_{soil} * EF * ED * SF$

$SSTL_{DER} = TR * BW * 70 * 365 * CF / SA * AF * ABS * EF * ED * SF$

For non-carcinogens:

$SSTL_{ING} = HQ * BW * 365 * CF / IR_{soil} * EF * (1/RfD)$

$SSTL_{DER} = HQ * BW * 365 * CF / SA * AF * ABS * EF * (1/RfD)$

Constituent of Concern	TR –	SFo (1/mg/kg-d)	HQ –	RfDo (mg/kg-d)	$SSTL_{ING}$ (mg/kg)	SFd (1/mg/kg-d)	RfDd (mg/kg-d)	ABS –	$SSTL_{DER}$ (mg/kg)
Non-Carcinogens									
Ethylbenzene			0.07	0.10	1.49e+3		0.10	0.000	9.99e+99
Fluorene			0.01	0.04	4.26e+1		0.04	0.100	5.16e+2
Naphthalene			0.01	0.04	4.26e+1		0.04	0.100	5.16e+2
Phenanthrene			0.02	0.00	1.28e+1		0.02	0.050	1.70e+3
Toluene			0.05	0.20	2.13e+3		0.20	0.000	9.99e+99
Xylene (mixed isomers)			0.07	2.00	2.98e+4		2.00	0.000	9.99e+99
TPH - New Method			0.79		1.37e+4				1.66e+5
TPH-Arom-EC>8-10			0.00	0.04	8.52e+3		0.04	0.100	1.03e+5
TPH-Arom-EC>10-12			0.00	0.04	8.52e+3		0.04	0.100	1.03e+5
TPH-Arom-EC>12-16			0.07	0.04	8.52e+3		0.04	0.100	1.03e+5
TPH-Arom-EC>16-21			0.18	0.03	6.39e+3		0.03	0.100	7.74e+4
TPH-Arom-EC>21-35			0.08	0.03	6.39e+3		0.03	0.100	7.74e+4
TPH-Aliph-EC 5-6			0.00	0.06	1.28e+4		0.06	0.100	1.55e+5
TPH-Aliph-EC>6-8			0.00	0.06	1.28e+4		0.06	0.100	1.55e+5
TPH-Aliph-EC>8-10			0.00	0.10	2.13e+4		0.10	0.100	2.58e+5
TPH-Aliph-EC>10-12			0.02	0.10	2.13e+4		0.10	0.100	2.58e+5
TPH-Aliph-EC>12-16			0.14	0.10	2.13e+4		0.10	0.100	2.58e+5
TPH-Aliph-EC>16-35			0.51	2.00	4.26e+5		2.00	0.100	5.16e+6

NOTES:

SSTL = Site specific Target Level
TR = Target Risk
SF = Slope Factor
HQ = hazard quotient
RfD = Reference Dose
BW = body weight
AT = averaging time
IR_{soil} = Ingestion rate
EF = exposure frequency
ED = exposure duration
SA = skin surface area
AF = adherence factor
ABS = dermal absorption fraction

Calculation of Site-Specific Target Levels
Construction Worker -- Combined SSTL for Soil
Texas-New Mexico Pipe Line Co.

$$SSTL_{CW\text{-}SOIL} = \frac{1}{\left((1 / SSTL_{ING}) + (1 / SSTL_{DER}) + (1 / SSTL_{INHAL}) \right)}$$

Constituent of Concern	$SSTL_{ING}$ (mg/kg)	$SSTL_{DER}$ (mg/kg)	$SSTL_{INHAL}$ (mg/kg)	$SSTL_{CW\text{-}SOIL}$ (mg/kg)
Non-Carcinogens				
Ethylbenzene	1.49e+3	9.99e+99	4.65e+2	3.55e+2
Fluorene	4.26e+1	5.16e+2	1.31e+2	3.03e+1
Naphthalene	4.26e+1	5.16e+2	1.27e+1	9.59e+0
Phenanthrene	1.28e+1	1.70e+3	1.19e+2	1.15e+1
Toluene	2.13e+3	9.99e+99	6.56e+1	6.36e+1
Xylene (mixed isomers)	2.98e+4	9.99e+99	1.45e+2	1.44e+2
TPH - New Method	1.37e+4	1.66e+5	8.12e+3	4.95e+3

NOTES:

SSTL = Site specific Target Level

Jury Output File
Analysis for Example Problem

*** COMMON INPUT PARAMETERS ***

PARAMETER NAME	UNITS	VALUE
Porosity	(cc/cc)	0.25
Bulk Density	(g/cc)	1.8
Water Content	(cc/cc)	0.1
Fractional Organic Carbon	(mg/mg)	9.00E-03
Incorporation Depth	(cm)	1010
Clean Soil Thickness	(cm)	200
Simulation Time	(yrs)	70
Length of Soil Column	(cm)	4240
Infiltration Rate	(cm/day)	5.55E-02
Source Length	(m)	12.5
Source Width	(m)	18.9
Boundary Layer Thickness	(cm)	5

Chemical Specific Input Parameters for Benzene

Parameter Name	Units	Value
Total Soil Concentration	(mg/kg)	1
Diffusion Coeff. in Air	(cm^2/day)	7517
Diffusion Coeff. in Water	(cm^2/day)	0.8467
Henrys Constant	[(mg/L)/(mg/L)]	0.249
Organic Carbon Part. Coeff.	(cc/g)	83
Lumped Chemical Decay Rate	(1/day)	5.48E-04

Outputs for Benzene

Time = 1 yrs

Cumulative Emissions to Air	(g)	58.42
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 2 yrs

Cumulative Emissions to Air	(g)	147
Advective Mass Loading Rate to Groundwater	(g/day)	3.42E-40
Diffusive Mass Loading Rate to Groundwater	(g/day)	3E-38
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	3.03E-38

Time = 3 yrs

Cumulative Emissions to Air	(g)	214.3
Advective Mass Loading Rate to Groundwater	(g/day)	1.24E-27
Diffusive Mass Loading Rate to Groundwater	(g/day)	6.15E-26
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	6.27E-26

Time = 4 yrs

Cumulative Emissions to Air	(g)	263.6
Advective Mass Loading Rate to Groundwater	(g/day)	2.22E-21
Diffusive Mass Loading Rate to Groundwater	(g/day)	7.65E-20
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	7.87E-20

Time = 5 yrs

Cumulative Emissions to Air	(g)	300
Advective Mass Loading Rate to Groundwater	(g/day)	1.19E-17
Diffusive Mass Loading Rate to Groundwater	(g/day)	3.12E-16
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	3.24E-16

Time = 10 yrs

Cumulative Emissions to Air	(g)	382.7
Advective Mass Loading Rate to Groundwater	(g/day)	2.11E-10
Diffusive Mass Loading Rate to Groundwater	(g/day)	2.5E-09
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	2.71E-09

Time = 15 yrs

Cumulative Emissions to Air	(g)	403.4
Advective Mass Loading Rate to Groundwater	(g/day)	3.05E-08
Diffusive Mass Loading Rate to Groundwater	(g/day)	2.33E-07
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	2.63E-07

Time = 20 yrs

Cumulative Emissions to Air	(g)	409
Advective Mass Loading Rate to Groundwater	(g/day)	2.32E-07
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.29E-06
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.52E-06

Time = 25 yrs

Cumulative Emissions to Air	(g)	410.6
Advective Mass Loading Rate to Groundwater	(g/day)	5.33E-07
Diffusive Mass Loading Rate to Groundwater	(g/day)	2.33E-06
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	2.86E-06

Time = 30 yrs

Cumulative Emissions to Air	(g)	411
Advective Mass Loading Rate to Groundwater	(g/day)	6.7E-07
Diffusive Mass Loading Rate to Groundwater	(g/day)	2.4E-06
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	3.07E-06

Time = 35 yrs

Cumulative Emissions to Air	(g)	411.1
Advective Mass Loading Rate to Groundwater	(g/day)	5.94E-07
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.79E-06
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	2.38E-06

Time = 40 yrs

Cumulative Emissions to Air	(g)	411.2
Advective Mass Loading Rate to Groundwater	(g/day)	4.22E-07
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.09E-06
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.51E-06

Time = 45 yrs

Cumulative Emissions to Air	(g)	411.2
Advective Mass Loading Rate to Groundwater	(g/day)	2.58E-07
Diffusive Mass Loading Rate to Groundwater	(g/day)	5.79E-07
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	8.36E-07

Time = 50 yrs

Cumulative Emissions to Air	(g)	411.2
Advective Mass Loading Rate to Groundwater	(g/day)	1.41E-07
Diffusive Mass Loading Rate to Groundwater	(g/day)	2.79E-07
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	4.2E-07

Time = 55 yrs

Cumulative Emissions to Air	(g)	411.2
Advective Mass Loading Rate to Groundwater	(g/day)	7.17E-08
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.25E-07
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.97E-07

Time = 60 yrs

Cumulative Emissions to Air	(g)	411.2
Advective Mass Loading Rate to Groundwater	(g/day)	3.43E-08
Diffusive Mass Loading Rate to Groundwater	(g/day)	5.34E-08
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	8.77E-08

Time = 65 yrs

Cumulative Emissions to Air	(g)	411.2
Advective Mass Loading Rate to Groundwater	(g/day)	1.56E-08
Diffusive Mass Loading Rate to Groundwater	(g/day)	2.19E-08
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	3.75E-08

Time = 70 yrs

Cumulative Emissions to Air	(g)	411.2
Advective Mass Loading Rate to Groundwater	(g/day)	6.87E-09
Diffusive Mass Loading Rate to Groundwater	(g/day)	8.65E-09
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.55E-08

Chemical Specific Input Parameters for Chrysene

PARAMETER NAME	UNITS	VALUE
Total Soil Concentration	(mg/kg)	1
Diffusion Coeff. in Air	(cm^2/day)	3905
Diffusion Coeff. in Water	(cm^2/day)	0.8182
Henrys Constant	[(mg/L)/(mg/L)]	4.69E-05
Organic Carbon Part. Coeff.	(cc/g)	2.00E+05
Lumped Chemical Decay Rate	(1/day)	0

Outputs for Chrysene

Time = 1 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 2 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 3 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 4 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 5 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 10 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 15 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 20 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 25 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 30 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 35 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 40 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 45 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 50 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 55 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 60 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 65 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 70 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Chemical Specific Input Parameters for Ethylbenzene

PARAMETER NAME	UNITS	VALUE
Total Soil Concentration	(mg/kg)	1
Diffusion Coeff. in Air	(cm^2/day)	5702
Diffusion Coeff. in Water	(cm^2/day)	0.5875
Henrys Constant	[(mg/L)/(mg/L)]	0.287
Organic Carbon Part. Coeff.	(cc/g)	1100
Lumped Chemical Decay Rate	(1/day)	0

Outputs for Ethylbenzene

Time = 1 yrs

Cumulative Emissions to Air	(g)	0.000161
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 2 yrs

Cumulative Emissions to Air	(g)	0.07794
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 3 yrs

Cumulative Emissions to Air	(g)	0.7542
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 4 yrs

Cumulative Emissions to Air	(g)	2.577
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 5 yrs

Cumulative Emissions to Air	(g)	5.681
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 10 yrs

Cumulative Emissions to Air	(g)	35.04
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 15 yrs

Cumulative Emissions to Air	(g)	74.93
Advective Mass Loading Rate to Groundwater	(g/day)	4.21E-73
Diffusive Mass Loading Rate to Groundwater	(g/day)	9.3E-71
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 20 yrs

Cumulative Emissions to Air	(g)	117.3
Advective Mass Loading Rate to Groundwater	(g/day)	1.25E-55
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.62E-53
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 25 yrs

Cumulative Emissions to Air	(g)	159.4
Advective Mass Loading Rate to Groundwater	(g/day)	3.9E-45
Diffusive Mass Loading Rate to Groundwater	(g/day)	3.5E-43
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	3.53E-43

Time = 30 yrs

Cumulative Emissions to Air	(g)	200.2
Advective Mass Loading Rate to Groundwater	(g/day)	3.93E-38
Diffusive Mass Loading Rate to Groundwater	(g/day)	2.68E-36
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	2.72E-36

Time = 35 yrs

Cumulative Emissions to Air	(g)	239.6
Advective Mass Loading Rate to Groundwater	(g/day)	4E-33
Diffusive Mass Loading Rate to Groundwater	(g/day)	2.19E-31
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	2.23E-31

Time = 40 yrs

Cumulative Emissions to Air	(g)	277.3
Advective Mass Loading Rate to Groundwater	(g/day)	2.3E-29
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.05E-27
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.07E-27

Time = 45 yrs

Cumulative Emissions to Air	(g)	313.5
Advective Mass Loading Rate to Groundwater	(g/day)	1.94E-26
Diffusive Mass Loading Rate to Groundwater	(g/day)	7.58E-25
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	7.78E-25

Time = 50 yrs

Cumulative Emissions to Air	(g)	348.3
Advective Mass Loading Rate to Groundwater	(g/day)	4.29E-24
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.46E-22
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.51E-22

Time = 55 yrs

Cumulative Emissions to Air	(g)	381.6
Advective Mass Loading Rate to Groundwater	(g/day)	3.56E-22
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.08E-20
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.11E-20

Time = 60 yrs

Cumulative Emissions to Air	(g)	413.7
Advective Mass Loading Rate to Groundwater	(g/day)	1.42E-20
Diffusive Mass Loading Rate to Groundwater	(g/day)	3.87E-19
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	4.01E-19

Time = 65 yrs

Cumulative Emissions to Air	(g)	444.6
Advective Mass Loading Rate to Groundwater	(g/day)	3.23E-19
Diffusive Mass Loading Rate to Groundwater	(g/day)	7.97E-18
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	8.29E-18

Time = 70 yrs

Cumulative Emissions to Air	(g)	474.3
Advective Mass Loading Rate to Groundwater	(g/day)	4.71E-18
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.06E-16
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.11E-16

Chemical Specific Input Parameters for Toluene

PARAMETER NAME	UNITS	VALUE
Total Soil Concentration	(mg/kg)	1
Diffusion Coeff. in Air	(cm^2/day)	6739
Diffusion Coeff. in Water	(cm^2/day)	0.743
Henrys Constant	[(mg/L)/(mg/L)]	0.284
Organic Carbon Part. Coeff.	(cc/g)	300
Lumped Chemical Decay Rate	(1/day)	0

Outputs for Toluene

Time = 1 yrs

Cumulative Emissions to Air	(g)	3.157
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 2 yrs

Cumulative Emissions to Air	(g)	24.34
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 3 yrs

Cumulative Emissions to Air	(g)	56.46
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 4 yrs

Cumulative Emissions to Air	(g)	92.31
Advective Mass Loading Rate to Groundwater	(g/day)	3.49E-65
Diffusive Mass Loading Rate to Groundwater	(g/day)	7.24E-63
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 5 yrs

Cumulative Emissions to Air	(g)	129
Advective Mass Loading Rate to Groundwater	(g/day)	1.07E-52
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.49E-50
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 10 yrs

Cumulative Emissions to Air	(g)	301
Advective Mass Loading Rate to Groundwater	(g/day)	1.13E-27
Diffusive Mass Loading Rate to Groundwater	(g/day)	5.68E-26
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	5.8E-26

Time = 15 yrs

Cumulative Emissions to Air	(g)	447.4
Advective Mass Loading Rate to Groundwater	(g/day)	2.71E-19
Diffusive Mass Loading Rate to Groundwater	(g/day)	8.16E-18
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	8.43E-18

Time = 20 yrs

Cumulative Emissions to Air	(g)	573.2
Advective Mass Loading Rate to Groundwater	(g/day)	4.37E-15
Diffusive Mass Loading Rate to Groundwater	(g/day)	9.35E-14
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	9.79E-14

Time = 25 yrs

Cumulative Emissions to Air	(g)	683.1
Advective Mass Loading Rate to Groundwater	(g/day)	1.5E-12
Diffusive Mass Loading Rate to Groundwater	(g/day)	2.48E-11
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	2.63E-11

Time = 30 yrs

Cumulative Emissions to Air	(g)	780.1
Advective Mass Loading Rate to Groundwater	(g/day)	7.45E-11
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.01E-09
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.08E-09

Time = 35 yrs

Cumulative Emissions to Air	(g)	866.6
Advective Mass Loading Rate to Groundwater	(g/day)	1.23E-09
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.4E-08
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.52E-08

Time = 40 yrs

Cumulative Emissions to Air	(g)	944.1
Advective Mass Loading Rate to Groundwater	(g/day)	1.01E-08
Diffusive Mass Loading Rate to Groundwater	(g/day)	9.96E-08
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.1E-07

Time = 45 yrs

Cumulative Emissions to Air	(g)	1014
Advective Mass Loading Rate to Groundwater	(g/day)	5.26E-08
Diffusive Mass Loading Rate to Groundwater	(g/day)	4.55E-07
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	5.07E-07

Time = 50 yrs

Cumulative Emissions to Air	(g)	1078
Advective Mass Loading Rate to Groundwater	(g/day)	1.97E-07
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.52E-06
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.72E-06

Time = 55 yrs

Cumulative Emissions to Air	(g)	1135
Advective Mass Loading Rate to Groundwater	(g/day)	5.85E-07
Diffusive Mass Loading Rate to Groundwater	(g/day)	4.07E-06
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	4.66E-06

Time = 60 yrs

Cumulative Emissions to Air	(g)	1188
Advective Mass Loading Rate to Groundwater	(g/day)	1.45E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	9.19E-06
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.06E-05

Time = 65 yrs

Cumulative Emissions to Air	(g)	1237
Advective Mass Loading Rate to Groundwater	(g/day)	3.14E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.82E-05
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	2.14E-05

Time = 70 yrs

Cumulative Emissions to Air	(g)	1282
Advective Mass Loading Rate to Groundwater	(g/day)	6.09E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	3.26E-05
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	3.87E-05

Chemical Specific Input Parameters for Xylene

PARAMETER NAME	UNITS	VALUE
Total Soil Concentration	(mg/kg)	1
Diffusion Coeff. in Air	(cm^2/day)	6221
Diffusion Coeff. in Water	(cm^2/day)	0.6739
Henrys Constant	[(mg/L)/(mg/L)]	0.315
Organic Carbon Part. Coeff.	(cc/g)	240
Lumped Chemical Decay Rate	(1/day)	0

Outputs for Xylene

Time = 1 yrs

Cumulative Emissions to Air	(g)	7.133
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 2 yrs

Cumulative Emissions to Air	(g)	41.01
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 3 yrs

Cumulative Emissions to Air	(g)	85.58
Advective Mass Loading Rate to Groundwater	(g/day)	2.952E-68
Diffusive Mass Loading Rate to Groundwater	(g/day)	6.898E-66
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 4 yrs

Cumulative Emissions to Air	(g)	132.3
Advective Mass Loading Rate to Groundwater	(g/day)	7.324E-52
Diffusive Mass Loading Rate to Groundwater	(g/day)	.1020E-48
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 5 yrs

Cumulative Emissions to Air	(g)	178.4
Advective Mass Loading Rate to Groundwater	(g/day)	.5157E-41
Diffusive Mass Loading Rate to Groundwater	(g/day)	.5034E-39
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.5086E-39

Time = 10 yrs

Cumulative Emissions to Air	(g)	384.4
Advective Mass Loading Rate to Groundwater	(g/day)	.2887E-21
Diffusive Mass Loading Rate to Groundwater	(g/day)	.1093E-19
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.1121E-19

Time = 15 yrs

Cumulative Emissions to Air	(g)	553.2
Advective Mass Loading Rate to Groundwater	(g/day)	.1202E-14
Diffusive Mass Loading Rate to Groundwater	(g/day)	.2792E-13
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.2912E-13

Time = 20 yrs

Cumulative Emissions to Air	(g)	694.8
Advective Mass Loading Rate to Groundwater	(g/day)	.2556E-11
Diffusive Mass Loading Rate to Groundwater	(g/day)	.4267E-10
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.4523E-10

Time = 25 yrs

Cumulative Emissions to Air	(g)	816.0
Advective Mass Loading Rate to Groundwater	(g/day)	.2597E-09
Diffusive Mass Loading Rate to Groundwater	(g/day)	.3378E-08
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.3638E-08

Time = 30 yrs

Cumulative Emissions to Air	(g)	912.0
Advective Mass Loading Rate to Groundwater	(g/day)	.5745E-08
Diffusive Mass Loading Rate to Groundwater	(g/day)	.6114E-07
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.6688E-07

Time = 35 yrs

Cumulative Emissions to Air	(g)	1013.
Advective Mass Loading Rate to Groundwater	(g/day)	.5304E-07
Diffusive Mass Loading Rate to Groundwater	(g/day)	.4771E-06
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.5301E-06

Time = 40 yrs

Cumulative Emissions to Air	(g)	1094.
Advective Mass Loading Rate to Groundwater	(g/day)	.2832E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	.2204E-05
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.2487E-05

Time = 45 yrs

Cumulative Emissions to Air	(g)	1167.
Advective Mass Loading Rate to Groundwater	(g/day)	.1049E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	.7187E-05
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.8237E-05

Time = 50 yrs

Cumulative Emissions to Air	(g)	1231.
Advective Mass Loading Rate to Groundwater	(g/day)	.3003E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	.1836E-04
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.2136E.04

Time = 55 yrs

Cumulative Emissions to Air	(g)	1290.
Advective Mass Loading Rate to Groundwater	(g/day)	7124E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	.3930E-04
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.4642E-04

Time = 60 yrs

Cumulative Emissions to Air	(g)	1343.
Advective Mass Loading Rate to Groundwater	(g/day)	.1467E-04
Diffusive Mass Loading Rate to Groundwater	(g/day)	.7367E-04
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.8834E-04

Time = 65 yrs

Cumulative Emissions to Air	(g)	1391.
Advective Mass Loading Rate to Groundwater	(g/day)	.2709E-04
Diffusive Mass Loading Rate to Groundwater	(g/day)	.1247E-03
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.1518E-03

Time = 70 yrs

Cumulative Emissions to Air	(g)	1436.
Advective Mass Loading Rate to Groundwater	(g/day)	.4588E-04
Diffusive Mass Loading Rate to Groundwater	(g/day)	.1949E-03
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.2407E-03

AT123D Output File
Analysis for Example Problem

Chemicals in the analysis
Benzene
Chrysene
Ethylbenzene
Toluene
Xylene

Number of years simulated: 70

GENERAL INPUT DATA
****

NO. OF POINTS IN X-DIRECTION	1
NO. OF POINTS IN Y-DIRECTION	1
NO. OF POINTS IN Z-DIRECTION	10
NO. OF ROOTS: NO. OF SERIES TERMS	1000
NO. OF BEGINNING TIME STEPS	1
NO. OF ENDING TIME STEP	70
NO. OF TIME INTERVALS FOR PRINTED OUT SOLUTION	1
INSTANTANEOUS SOURCE CONTROL = 0 FOR INSTANT SOURCE	1
SOURCE CONDITION CONTROL = 0 FOR STEADY SOURCE	70
INTERMITTENT OUTPUT CONTROL = 0 NO SUCH OUTPUT	1
CASE CONTROL =1 THERMAL, = 2 FOR CHEMICAL, = 3 RAD	2
X-COORDINATE OF RECEPTOR WELL (METERS)	6.25E+00
Y-COORDINATE OF RECEPTOR WELL (METERS)	9.46E+00
AQUIFER DEPTH, = 0.0 FOR INFINITE DEEP (METERS) ...	3.05E+00
AQUIFER WIDTH, = 0.0 FOR INFINITE WIDE (METERS) ...	0.00E+00
BEGIN POINT OF X-SOURCE LOCATION (METERS)	0.00E+00
END POINT OF X-SOURCE LOCATION (METERS)	1.25E+01
BEGIN POINT OF Y-SOURCE LOCATION (METERS)	0.00E+00
END POINT OF Y-SOURCE LOCATION (METERS)	1.89E+01
BEGIN POINT OF Z-SOURCE LOCATION (METERS)	0.00E+00
END POINT OF Z-SOURCE LOCATION (METERS)	0.00E+00
POROSITY	2.50E-01
HYDRAULIC CONDUCTIVITY (METER/YEAR)	3.15E+01
HYDRAULIC GRADIENT	2.00E-02
LONGITUDINAL DISPERSIVITY (METER)	0.00E+00
LATERAL DISPERSIVITY (METER)	0.00E+00
VERTICAL DISPERSIVITY (METER)	0.00E+00
BULK DENSITY OF THE SOIL (KG/M**3)	1.80E+03
TIME INTERVAL SIZE FOR THE DESIRED SOLUTION (YR) ..	1.00E+00
DISCHARGE TIME (YR)	7.00E+01

INPUT DATA/RESULTS FOR CHEMICAL: Benzene

INST. WASTE RELEASE (KG) VALID FOR INST CASE ONLY..	1.00E+00
DISTRIBUTION COEFFICIENT, KD (M**3/KG)	1.66E-03
MOLECULAR DIFFUSION COEFFICIENT (M**2/YR)	3.09E-02
DECAY CONSTANT (1/YR).....	7.30E-01

LIST OF TRANSIENT SOURCE RELEASE RATE

.000E+00	.111E-37	.229E-25	.287E-19	.118E-15
.280E-13	.130E-11	.218E-10	.186E-09	.989E-09
.373E-08	.109E-07	.259E-07	.531E-07	.960E-07
.157E-06	.236E-06	.332E-06	.440E-06	.556E-06
.672E-06	.784E-06	.886E-06	.974E-06	.104E-05
.110E-05	.113E-05	.114E-05	.114E-05	.112E-05
.109E-05	.104E-05	.991E-06	.933E-06	.870E-06
.805E-06	.739E-06	.675E-06	.612E-06	.552E-06
.495E-06	.441E-06	.392E-06	.347E-06	.305E-06
.268E-06	.234E-06	.204E-06	.177E-06	.153E-06
.133E-06	.114E-06	.981E-07	.841E-07	.720E-07
.614E-07	.523E-07	.445E-07	.378E-07	.320E-07
.271E-07	.229E-07	.193E-07	.163E-07	.137E-07
.115E-07	.964E-08	.808E-08	.677E-08	

RETARDATION FACTOR	1.30E+01
RETARDED SEEPAGE VELOCITY (M/YR)	1.95E-01
RETARDED LONGITUDINAL DISPERSION COEF. (M**2/YR) ..	9.55E-03
RETARDED LATERAL DISPERSION COEFFICIENT (M**2/YR) .	9.55E-03
RETARDED VERTICAL DISPERSION COEFFICIENT (M**2/YR).	9.55E-03

time [yr] = 1.00	avg. conc. [mg/l] = .000E+00
time [yr] = 5.00	avg. conc. [mg/l] = .000E+00
time [yr] = 10.0	avg. conc. [mg/l] = .000E+00
time [yr] = 15.0	avg. conc. [mg/l] = .307E-07
time [yr] = 20.0	avg. conc. [mg/l] = .225E-06
time [yr] = 25.0	avg. conc. [mg/l] = .684E-06
time [yr] = 30.0	avg. conc. [mg/l] = .713E-06
time [yr] = 35.0	avg. conc. [mg/l] = .725E-06
time [yr] = 40.0	avg. conc. [mg/l] = .420E-06
time [yr] = 45.0	avg. conc. [mg/l] = .284E-06
time [yr] = 50.0	avg. conc. [mg/l] = .128E-06
time [yr] = 55.0	avg. conc. [mg/l] = .704E-07
time [yr] = 60.0	avg. conc. [mg/l] = .277E-07
time [yr] = 65.0	avg. conc. [mg/l] = .138E-07
time [yr] = 70.0	avg. conc. [mg/l] = .424E-08

INPUT DATA/RESULTS FOR CHEMICAL: Chrysene

INST. WASTE RELEASE (KG) VALID FOR INST CASE ONLY..	1.00E+00
DISTRIBUTION COEFFICIENT, KD (M**3/KG)	4.00E+00
MOLECULAR DIFFUSION COEFFICIENT (M**2/YR)	2.99E-02
DECAY CONSTANT (1/YR)...........................	0.00E+00

LIST OF TRANSIENT SOURCE RELEASE RATE

.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	

RETARDATION FACTOR	2.88E+04
RETARDED SEEPAGE VELOCITY (M/YR)	8.75E-05
RETARDED LONGITUDINAL DISPERSION COEF. (M**2/YR) ..	4.15E-06
RETARDED LATERAL DISPERSION COEFFICIENT (M**2/YR) .	4.15E-06
RETARDED VERTICAL DISPERSION COEFFICIENT (M**2/YR).	4.15E-06

time [yr] =		avg. conc. [mg/l] =
time [yr] =	1.00	.000E+00
time [yr] =	5.00	.000E+00
time [yr] =	10.0	.000E+00
time [yr] =	15.0	.000E+00
time [yr] =	20.0	.000E+00
time [yr] =	25.0	.000E+00
time [yr] =	30.0	.000E+00
time [yr] =	35.0	.000E+00
time [yr] =	40.0	.000E+00
time [yr] =	45.0	.000E+00
time [yr] =	50.0	.000E+00
time [yr] =	55.0	.000E+00
time [yr] =	60.0	.000E+00
time [yr] =	65.0	.000E+00
time [yr] =	70.0	.000E+00

INPUT DATA/RESULTS FOR CHEMICAL: Ethylbenzene

INST. WASTE RELEASE (KG) VALID FOR INST CASE ONLY..	1.00E+00
DISTRIBUTION COEFFICIENT, KD (M**3/KG)	2.20E-02
MOLECULAR DIFFUSION COEFFICIENT (M**2/YR)	2.14E-02
DECAY CONSTANT (1/YR).....	1.10E+00

LIST OF TRANSIENT SOURCE RELEASE RATE

.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.322E-46	.245E-44	.129E-42
.502E-41	.149E-39	.345E-38	.645E-37	.992E-36
.128E-34	.140E-33	.133E-32	.110E-31	.813E-31
.535E-30	.318E-29	.172E-28	.854E-28	.391E-27
.166E-26	.658E-26	.245E-25	.857E-25	.284E-24
.892E-24	.267E-23	.763E-23	.209E-22	.549E-22
.139E-21	.340E-21	.801E-21	.183E-20	.406E-20
.876E-20	.184E-19	.376E-19	.750E-19	.146E-18
.279E-18	.521E-18	.955E-18	.172E-17	.303E-17
.525E-17	.895E-17	.150E-16	.248E-16	

RETARDATION FACTOR	1.59E+02
RETARDED SEEPAGE VELOCITY (M/YR)	1.58E-02
RETARDED LONGITUDINAL DISPERSION COEF. (M**2/YR) ..	5.38E-04
RETARDED LATERAL DISPERSION COEFFICIENT (M**2/YR) .	5.38E-04
RETARDED VERTICAL DISPERSION COEFFICIENT (M**2/YR).	5.38E-04

time [yr] = 1.00	avg. conc. [mg/l] = .000E+00
time [yr] = 5.00	avg. conc. [mg/l] = .000E+00
time [yr] = 10.0	avg. conc. [mg/l] = .000E+00
time [yr] = 15.0	avg. conc. [mg/l] = .000E+00
time [yr] = 20.0	avg. conc. [mg/l] = .000E+00
time [yr] = 25.0	avg. conc. [mg/l] = .000E+00
time [yr] = 30.0	avg. conc. [mg/l] = .000E+00
time [yr] = 35.0	avg. conc. [mg/l] = .000E+00
time [yr] = 40.0	avg. conc. [mg/l] = .000E+00
time [yr] = 45.0	avg. conc. [mg/l] = .000E+00
time [yr] = 50.0	avg. conc. [mg/l] = .000E+00
time [yr] = 55.0	avg. conc. [mg/l] = .000E+00
time [yr] = 60.0	avg. conc. [mg/l] = .000E+00
time [yr] = 65.0	avg. conc. [mg/l] = .000E+00
time [yr] = 70.0	avg. conc. [mg/l] = .000E+00

INPUT DATA/RESULTS FOR CHEMICAL: Toluene

INST. WASTE RELEASE (KG) VALID FOR INST CASE ONLY..	1.00E+00
DISTRIBUTION COEFFICIENT, KD (M**3/KG)	6.00E-03
MOLECULAR DIFFUSION COEFFICIENT (M**2/YR)	2.71E-02
DECAY CONSTANT (1/YR).....	1.20E+00

LIST OF TRANSIENT SOURCE RELEASE RATE

.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.877E-42	.630E-36	.154E-31	.397E-28	.212E-25
.358E-23	.257E-21	.955E-20	.211E-18	.308E-17
.320E-16	.253E-15	.158E-14	.817E-14	.357E-13
.136E-12	.455E-12	.138E-11	.379E-11	.961E-11
.227E-10	.502E-10	.105E-09	.208E-09	.395E-09
.717E-09	.126E-08	.212E-08	.348E-08	.555E-08
.862E-08	.131E-07	.194E-07	.281E-07	.400E-07
.561E-07	.772E-07	.105E-06	.140E-06	.185E-06
.242E-06	.312E-06	.397E-06	.502E-06	.628E-06
.778E-06	.957E-06	.117E-05	.141E-05	.170E-05
.203E-05	.241E-05	.284E-05	.333E-05	.388E-05
.451E-05	.520E-05	.598E-05	.684E-05	.780E-05
.885E-05	.100E-04	.113E-04	.126E-04	

RETARDATION FACTOR	4.42E+01
RETARDED SEEPAGE VELOCITY (M/YR)	5.70E-02
RETARDED LONGITUDINAL DISPERSION COEF. (M**2/YR) ..	2.45E-03
RETARDED LATERAL DISPERSION COEFFICIENT (M**2/YR) .	2.45E-03
RETARDED VERTICAL DISPERSION COEFFICIENT (M**2/YR).	2.45E-03

time [yr] = 1.00	avg. conc. [mg/l] = .000E+00
time [yr] = 5.00	avg. conc. [mg/l] = .000E+00
time [yr] = 10.0	avg. conc. [mg/l] = .000E+00
time [yr] = 15.0	avg. conc. [mg/l] = .000E+00
time [yr] = 20.0	avg. conc. [mg/l] = .000E+00
time [yr] = 25.0	avg. conc. [mg/l] = .000E+00
time [yr] = 30.0	avg. conc. [mg/l] = .000E+00
time [yr] = 35.0	avg. conc. [mg/l] = .000E+00
time [yr] = 40.0	avg. conc. [mg/l] = .386E-08
time [yr] = 45.0	avg. conc. [mg/l] = .272E-07
time [yr] = 50.0	avg. conc. [mg/l] = .715E-07
time [yr] = 55.0	avg. conc. [mg/l] = .278E-06
time [yr] = 60.0	avg. conc. [mg/l] = .485E-06
time [yr] = 65.0	avg. conc. [mg/l] = .136E-05
time [yr] = 70.0	avg. conc. [mg/l] = .187E-05

INPUT DATA/RESULTS FOR CHEMICAL: Xylene

INST. WASTE RELEASE (KG) VALID FOR INST CASE ONLY..	1.00E+00
DISTRIBUTION COEFFICIENT, KD (M**3/KG)	4.80E-03
MOLECULAR DIFFUSION COEFFICIENT (M**2/YR)	2.46E-02
DECAY CONSTANT (1/YR).....	7.30E-01

LIST OF TRANSIENT SOURCE RELEASE RATE

.000E+00	.000E+00	.000E+00	.000E+00	.186E-39
.532E-33	.215E-28	.611E-25	.294E-22	.409E-20
.231E-18	.666E-17	.114E-15	.129E-14	.106E-13
.669E-13	.339E-12	.143E-11	.519E-11	.165E-10
.470E-10	.122E-09	.289E-09	.640E-09	.133E-08
.260E-08	.485E-08	.864E-08	.148E-07	.244E-07
.390E-07	.605E-07	.912E-07	.134E-06	.194E-06
.273E-06	.378E-06	.514E-06	.688E-06	.908E-06
.118E-05	.152E-05	.194E-05	.242E-05	.301E-05
.370E-05	.451E-05	.546E-05	.655E-05	.780E-05
.922E-05	.108E-04	.126E-04	.147E-04	.169E-04
.195E-04	.222E-04	.253E-04	.286E-04	.322E-04
.362E-04	.405E-04	.451E-04	.501E-04	.554E-04
.611E-04	.672E-04	.737E-04	.806E-04	

RETARDATION FACTOR	3.56E+01
RETARDED SEEPAGE VELOCITY (M/YR)	7.09E-02
RETARDED LONGITUDINAL DISPERSION COEF. (M**2/YR) ..	2.77E-03
RETARDED LATERAL DISPERSION COEFFICIENT (M**2/YR) .	2.77E-03
RETARDED VERTICAL DISPERSION COEFFICIENT (M**2/YR).	2.77E-03

time [yr] = 1.00	avg. conc. [mg/l] = .000E+00
time [yr] = 5.00	avg. conc. [mg/l] = .000E+00
time [yr] = 10.0	avg. conc. [mg/l] = .000E+00
time [yr] = 15.0	avg. conc. [mg/l] = .000E+00
time [yr] = 20.0	avg. conc. [mg/l] = .000E+00
time [yr] = 25.0	avg. conc. [mg/l] = .000E+00
time [yr] = 30.0	avg. conc. [mg/l] = .416E-08
time [yr] = 35.0	avg. conc. [mg/l] = .524E-07
time [yr] = 40.0	avg. conc. [mg/l] = .214E-06
time [yr] = 45.0	avg. conc. [mg/l] = .994E-06
time [yr] = 50.0	avg. conc. [mg/l] = .216E-05
time [yr] = 55.0	avg. conc. [mg/l] = .621E-05
time [yr] = 60.0	avg. conc. [mg/l] = .976E-05
time [yr] = 65.0	avg. conc. [mg/l] = .216E-04
time [yr] = 70.0	avg. conc. [mg/l] = .281E-04

Jury Output File
Analysis for Example Problem

*** COMMON INPUT PARAMETERS ***

PARAMETER NAME	UNITS	VALUE
Porosity	(cc/cc)	0.25
Bulk Density	(g/cc)	1.8
Water Content	(cc/cc)	0.1
Fractional Organic Carbon	(mg/mg)	9.00E-03
Incorporation Depth	(cm)	1010
Clean Soil Thickness	(cm)	200
Simulation Time	(yrs)	70
Length of Soil Column	(cm)	4240
Infiltration Rate	(cm/day)	5.55E-02
Source Length	(m)	12.5
Source Width	(m)	18.9
Boundary Layer Thickness	(cm)	5

Chemical Specific Input Parameters for Fluorene

Parameter Name	Units	Value
Total Soil Concentration	(mg/kg)	1
Diffusion Coeff. in Air	(cm^2/day)	5478
Diffusion Coeff. in Water	(cm^2/day)	1.149
Henrys Constant	[(mg/L)/(mg/L)]	2.86E-03
Organic Carbon Part. Coeff.	(cc/g)	7300
Lumped Chemical Decay Rate	(1/day)	0

Outputs for Fluorene

Time = 1 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 2 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 3 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 4 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 5 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 10 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 15 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 20 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 25 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 30 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 35 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 40 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 45 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 50 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 55 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 60 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 65 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 70 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Chemical Specific Input Parameters for Naphthalene

Parameter Name	Units	Value
Total Soil Concentration	(mg/kg)	1
Diffusion Coeff. in Air	(cm^2/day)	5098
Diffusion Coeff. in Water	(cm^2/day)	0.648
Henrys Constant	[(mg/L)/(mg/L)]	5.78E-02
Organic Carbon Part. Coeff.	(cc/g)	1300
Lumped Chemical Decay Rate	(1/day)	0

Outputs for Naphthalene

Time = 1 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 2 yrs

Cumulative Emissions to Air	(g)	-4.3E-11
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 3 yrs

Cumulative Emissions to Air	(g)	5.19E-10
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 4 yrs

Cumulative Emissions to Air	(g)	5.93E-08
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 5 yrs

Cumulative Emissions to Air	(g)	2.47E-06
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 10 yrs

Cumulative Emissions to Air	(g)	0.006019
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 15 yrs

Cumulative Emissions to Air	(g)	0.09951
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 20 yrs

Cumulative Emissions to Air	(g)	0.4428
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 25 yrs

Cumulative Emissions to Air	(g)	1.14
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 30 yrs

Cumulative Emissions to Air	(g)	2.209
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 35 yrs

Cumulative Emissions to Air	(g)	3.617
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 40 yrs

Cumulative Emissions to Air	(g)	5.315
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 45 yrs

Cumulative Emissions to Air	(g)	7.248
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 50 yrs

Cumulative Emissions to Air	(g)	9.367
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 55 yrs

Cumulative Emissions to Air	(g)	11.63
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 60 yrs

Cumulative Emissions to Air	(g)	14
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 65 yrs

Cumulative Emissions to Air	(g)	16.45
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 70 yrs

Cumulative Emissions to Air	(g)	18.96
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Chemical Specific Input Parameters for Phenanthrene

Parameter Name	Units	Value
Total Soil Concentration	(mg/kg)	1
Diffusion Coeff. in Air	(cm^2/day)	4493
Diffusion Coeff. in Water	(cm^2/day)	0.5124
Henrys Constant	[(mg/L)/(mg/L)]	7.11E-03
Organic Carbon Part. Coeff.	(cc/g)	1.40E+04
Lumped Chemical Decay Rate	(1/day)	0

Outputs for Phenanthrene

Time = 1 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 2 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 3 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 4 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 5 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 10 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 15 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 20 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 25 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 30 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 35 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 40 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 45 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 50 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 55 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 60 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 65 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 70 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Chemical Specific Input Parameters for TPH-AL05-06

Parameter Name	Units	Value
Total Soil Concentration	(mg/kg)	1
Diffusion Coeff. in Air	(cm^2/day)	8640
Diffusion Coeff. in Water	(cm^2/day)	0.864
Henrys Constant	[(mg/L)/(mg/L)]	1410
Organic Carbon Part. Coeff.	(cc/g)	794
Lumped Chemical Decay Rate	(1/day)	0

Outputs for TPH-AL05-06

Time = 1 yrs

Cumulative Emissions to Air	(g)	2375
Advective Mass Loading Rate to Groundwater	(g/day)	2.39E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.04456
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.04456

Time = 2 yrs

Cumulative Emissions to Air	(g)	2929
Advective Mass Loading Rate to Groundwater	(g/day)	1.9E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.1745
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.1745

Time = 3 yrs

Cumulative Emissions to Air	(g)	3201
Advective Mass Loading Rate to Groundwater	(g/day)	3.28E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.1914
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.1915

Time = 4 yrs

Cumulative Emissions to Air	(g)	3369
Advective Mass Loading Rate to Groundwater	(g/day)	3.91E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.1598
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.1598

Time = 5 yrs

Cumulative Emissions to Air	(g)	3487
Advective Mass Loading Rate to Groundwater	(g/day)	4.07E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.1226
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.1226

Time = 10 yrs

Cumulative Emissions to Air	(g)	3785
Advective Mass Loading Rate to Groundwater	(g/day)	3.11E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.02512
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.02515

Time = 15 yrs

Cumulative Emissions to Air	(g)	3920
Advective Mass Loading Rate to Groundwater	(g/day)	2.21E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.001151
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.001173

Time = 20 yrs

Cumulative Emissions to Air	(g)	4001
Advective Mass Loading Rate to Groundwater	(g/day)	1.64E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.0054
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00538

Time = 25 yrs

Cumulative Emissions to Air	(g)	4057
Advective Mass Loading Rate to Groundwater	(g/day)	1.27E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00711
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.0071

Time = 30 yrs

Cumulative Emissions to Air	(g)	4098
Advective Mass Loading Rate to Groundwater	(g/day)	1.02E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00728
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00727

Time = 35 yrs

Cumulative Emissions to Air	(g)	4130
Advective Mass Loading Rate to Groundwater	(g/day)	8.43E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00693
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00693

Time = 40 yrs

Cumulative Emissions to Air	(g)	4156
Advective Mass Loading Rate to Groundwater	(g/day)	7.1E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00643
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00642

Time = 45 yrs

Cumulative Emissions to Air	(g)	4178
Advective Mass Loading Rate to Groundwater	(g/day)	6.09E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.0059
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.0059

Time = 50 yrs

Cumulative Emissions to Air	(g)	4196
Advective Mass Loading Rate to Groundwater	(g/day)	5.29E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00541
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.0054

Time = 55 yrs

Cumulative Emissions to Air	(g)	4212
Advective Mass Loading Rate to Groundwater	(g/day)	4.66E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00495
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00495

Time = 60 yrs

Cumulative Emissions to Air	(g)	4225
Advective Mass Loading Rate to Groundwater	(g/day)	4.14E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00455
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00454

Time = 65 yrs

Cumulative Emissions to Air	(g)	4237
Advective Mass Loading Rate to Groundwater	(g/day)	3.71E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00419
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00418

Time = 70 yrs

Cumulative Emissions to Air	(g)	4248
Advective Mass Loading Rate to Groundwater	(g/day)	3.35E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00386
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00386

Chemical Specific Input Parameters for TPH-AL06-08

Parameter Name	Units	Value
Total Soil Concentration	(mg/kg)	1
Diffusion Coeff. in Air	(cm^2/day)	8640
Diffusion Coeff. in Water	(cm^2/day)	0.864
Henrys Constant	[(mg/L)/(mg/L)]	2120
Organic Carbon Part. Coeff.	(cc/g)	3980
Lumped Chemical Decay Rate	(1/day)	0

Outputs for TPH-AL06-08

Time = 1 yrs

Cumulative Emissions to Air	(g)	2264
Advective Mass Loading Rate to Groundwater	(g/day)	7.86E-07
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.02497
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.02497

Time = 2 yrs

Cumulative Emissions to Air	(g)	2837
Advective Mass Loading Rate to Groundwater	(g/day)	8.61E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.1361
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.1361

Time = 3 yrs

Cumulative Emissions to Air	(g)	3121.
Advective Mass Loading Rate to Groundwater	(g/day)	.1693E-04
Diffusive Mass Loading Rate to Groundwater	(g/day)	.1719
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.1719

Time = 4 yrs

Cumulative Emissions to Air	(g)	3298.
Advective Mass Loading Rate to Groundwater	(g/day)	.2165E-04
Diffusive Mass Loading Rate to Groundwater	(g/day)	.1561
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.1561

Time = 5 yrs

Cumulative Emissions to Air	(g)	3422.
Advective Mass Loading Rate to Groundwater	(g/day)	.2355E-04
Diffusive Mass Loading Rate to Groundwater	(g/day)	.1271
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.1272

Time = 10 yrs

Cumulative Emissions to Air	(g)	3738.
Advective Mass Loading Rate to Groundwater	(g/day)	.1985E-04
Diffusive Mass Loading Rate to Groundwater	(g/day)	.3302E-01
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.3304E-01

Time = 15 yrs

Cumulative Emissions to Air	(g)	3881.
Advective Mass Loading Rate to Groundwater	(g/day)	.1457E-04
Diffusive Mass Loading Rate to Groundwater	(g/day)	.5582E-02
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.5596E-02

Time = 20 yrs

Cumulative Emissions to Air	(g)	3967.
Advective Mass Loading Rate to Groundwater	(g/day)	.1101E-04
Diffusive Mass Loading Rate to Groundwater	(g/day)	.2909E-02
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.2898E-02

Time = 25 yrs

Cumulative Emissions to Air	(g)	4027.
Advective Mass Loading Rate to Groundwater	(g/day)	.8630E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	.5652E-02
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.5644E-02

Time = 30 yrs

Cumulative Emissions to Air	(g)	4070.
Advective Mass Loading Rate to Groundwater	(g/day)	.6979E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	.6396E-02
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.6389E-02

Time = 35 yrs

Cumulative Emissions to Air	(g)	4105.
Advective Mass Loading Rate to Groundwater	(g/day)	.5787E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	.6386E-02
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.6381E-02

Time = 40 yrs

Cumulative Emissions to Air	(g)	4132.
Advective Mass Loading Rate to Groundwater	(g/day)	.4895E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	.6091E-02
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.6086E-02

Time = 45 yrs

Cumulative Emissions to Air	(g)	4155.
Advective Mass Loading Rate to Groundwater	(g/day)	.4209E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	.5698E-02
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.5694E-02

Time = 50 yrs

Cumulative Emissions to Air	(g)	4174.
Advective Mass Loading Rate to Groundwater	(g/day)	.3668E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	.5288E-02
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.5285E-02

Time = 55 yrs

Cumulative Emissions to Air	(g)	4191.
Advective Mass Loading Rate to Groundwater	(g/day)	.3233E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	.4894E-02
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.4891E-02

Time = 60 yrs

Cumulative Emissions to Air	(g)	4205.
Advective Mass Loading Rate to Groundwater	(g/day)	.2878E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	.4528E-02
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.4525E-02

Time = 65 yrs

Cumulative Emissions to Air	(g)	4218.
Advective Mass Loading Rate to Groundwater	(g/day)	.2593E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	.4195E-02
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.4193E-02

Time = 70 yrs

Cumulative Emissions to Air	(g)	4230.
Advective Mass Loading Rate to Groundwater	(g/day)	.2335E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	.3894E-02
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.3891E-02

AT123D Output File
Analysis for Example Problem

Chemicals in the analysis
Fluorene
Naphthalene
Phenanthrene
TPH-AL05-06
TPH-AL06-08

Number of years simulated: 70

GENERAL INPUT DATA
****

NO. OF POINTS IN X-DIRECTION	1
NO. OF POINTS IN Y-DIRECTION	1
NO. OF POINTS IN Z-DIRECTION	10
NO. OF ROOTS: NO. OF SERIES TERMS	1000
NO. OF BEGINNING TIME STEPS	1
NO. OF ENDING TIME STEP	70
NO. OF TIME INTERVALS FOR PRINTED OUT SOLUTION	1
INSTANTANEOUS SOURCE CONTROL = 0 FOR INSTANT SOURCE	1
SOURCE CONDITION CONTROL = 0 FOR STEADY SOURCE	70
INTERMITTENT OUTPUT CONTROL = 0 NO SUCH OUTPUT	1
CASE CONTROL =1 THERMAL, = 2 FOR CHEMICAL, = 3 RAD	2

X-COORDINATE OF RECEPTOR WELL (METERS)	6.25E+00
Y-COORDINATE OF RECEPTOR WELL (METERS)	9.46E+00
AQUIFER DEPTH, = 0.0 FOR INFINITE DEEP (METERS) ...	3.05E+00
AQUIFER WIDTH, = 0.0 FOR INFINITE WIDE (METERS) ...	0.00E+00
BEGIN POINT OF X-SOURCE LOCATION (METERS)	0.00E+00
END POINT OF X-SOURCE LOCATION (METERS)	1.25E+01
BEGIN POINT OF Y-SOURCE LOCATION (METERS)	0.00E+00
END POINT OF Y-SOURCE LOCATION (METERS)	1.89E+01
BEGIN POINT OF Z-SOURCE LOCATION (METERS)	0.00E+00
END POINT OF Z-SOURCE LOCATION (METERS)	0.00E+00

POROSITY	2.50E-01
HYDRAULIC CONDUCTIVITY (METER/YEAR)	3.15E+01
HYDRAULIC GRADIENT	2.00E-02
LONGITUDINAL DISPERSIVITY (METER)	0.00E+00
LATERAL DISPERSIVITY (METER)	0.00E+00
VERTICAL DISPERSIVITY (METER)	0.00E+00

BULK DENSITY OF THE SOIL (KG/M**3)	1.80E+03
TIME INTERVAL SIZE FOR THE DESIRED SOLUTION (YR) ..	1.00E+00
DISCHARGE TIME (YR)	7.00E+01

INPUT DATA/RESULTS FOR CHEMICAL: Fluorene

INST. WASTE RELEASE (KG) VALID FOR INST CASE ONLY..	1.00E+00
DISTRIBUTION COEFFICIENT, KD (M**3/KG)	1.46E-01
MOLECULAR DIFFUSION COEFFICIENT (M**2/YR)	4.19E-02
DECAY CONSTANT (1/YR)............................	0.00E+00

LIST OF TRANSIENT SOURCE RELEASE RATE

.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	

RETARDATION FACTOR	1.05E+03
RETARDED SEEPAGE VELOCITY (M/YR)	2.40E-03
RETARDED LONGITUDINAL DISPERSION COEF. (M**2/YR) ..	1.59E-04
RETARDED LATERAL DISPERSION COEFFICIENT (M**2/YR) .	1.59E-04
RETARDED VERTICAL DISPERSION COEFFICIENT (M**2/YR).	1.59E-04

time [yr] = 1.00	avg. conc. [mg/l] = .000E+00
time [yr] = 5.00	avg. conc. [mg/l] = .000E+00
time [yr] = 10.0	avg. conc. [mg/l] = .000E+00
time [yr] = 15.0	avg. conc. [mg/l] = .000E+00
time [yr] = 20.0	avg. conc. [mg/l] = .000E+00
time [yr] = 25.0	avg. conc. [mg/l] = .000E+00
time [yr] = 30.0	avg. conc. [mg/l] = .000E+00
time [yr] = 35.0	avg. conc. [mg/l] = .000E+00
time [yr] = 40.0	avg. conc. [mg/l] = .000E+00
time [yr] = 45.0	avg. conc. [mg/l] = .000E+00
time [yr] = 50.0	avg. conc. [mg/l] = .000E+00
time [yr] = 55.0	avg. conc. [mg/l] = .000E+00
time [yr] = 60.0	avg. conc. [mg/l] = .000E+00
time [yr] = 65.0	avg. conc. [mg/l] = .000E+00
time [yr] = 70.0	avg. conc. [mg/l] = .000E+00

INPUT DATA/RESULTS FOR CHEMICAL: Naphthalene

INST. WASTE RELEASE (KG) VALID FOR INST CASE ONLY..	1.00E+00
DISTRIBUTION COEFFICIENT, KD (M**3/KG)	2.60E-02
MOLECULAR DIFFUSION COEFFICIENT (M**2/YR)	2.37E-02
DECAY CONSTANT (1/YR)............................	0.00E+00

LIST OF TRANSIENT SOURCE RELEASE RATE

.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	

RETARDATION FACTOR	1.88E+02
RETARDED SEEPAGE VELOCITY (M/YR)	1.34E-02
RETARDED LONGITUDINAL DISPERSION COEF. (M**2/YR) ..	5.03E-04
RETARDED LATERAL DISPERSION COEFFICIENT (M**2/YR) .	5.03E-04
RETARDED VERTICAL DISPERSION COEFFICIENT (M**2/YR).	5.03E-04

time [yr] =	1.00	avg. conc. [mg/l] =	.000E+00
time [yr] =	5.00	avg. conc. [mg/l] =	.000E+00
time [yr] =	10.0	avg. conc. [mg/l] =	.000E+00
time [yr] =	15.0	avg. conc. [mg/l] =	.000E+00
time [yr] =	20.0	avg. conc. [mg/l] =	.000E+00
time [yr] =	25.0	avg. conc. [mg/l] =	.000E+00
time [yr] =	30.0	avg. conc. [mg/l] =	.000E+00
time [yr] =	35.0	avg. conc. [mg/l] =	.000E+00
time [yr] =	40.0	avg. conc. [mg/l] =	.000E+00
time [yr] =	45.0	avg. conc. [mg/l] =	.000E+00
time [yr] =	50.0	avg. conc. [mg/l] =	.000E+00
time [yr] =	55.0	avg. conc. [mg/l] =	.000E+00
time [yr] =	60.0	avg. conc. [mg/l] =	.000E+00
time [yr] =	65.0	avg. conc. [mg/l] =	.000E+00
time [yr] =	70.0	avg. conc. [mg/l] =	.000E+00

INPUT DATA/RESULTS FOR CHEMICAL: Phenanthrene

INST. WASTE RELEASE (KG) VALID FOR INST CASE ONLY..	1.00E+00
DISTRIBUTION COEFFICIENT, KD (M**3/KG)	2.80E-01
MOLECULAR DIFFUSION COEFFICIENT (M**2/YR)	1.87E-02
DECAY CONSTANT (1/YR)............................	0.00E+00

LIST OF TRANSIENT SOURCE RELEASE RATE

.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	

RETARDATION FACTOR	2.02E+03
RETARDED SEEPAGE VELOCITY (M/YR)	1.25E-03
RETARDED LONGITUDINAL DISPERSION COEF. (M**2/YR) ..	3.71E-05
RETARDED LATERAL DISPERSION COEFFICIENT (M**2/YR) .	3.71E-05
RETARDED VERTICAL DISPERSION COEFFICIENT (M**2/YR).	3.71E-05

time [yr] =	1.00	avg. conc. [mg/l] =	.000E+00
time [yr] =	5.00	avg. conc. [mg/l] =	.000E+00
time [yr] =	10.0	avg. conc. [mg/l] =	.000E+00
time [yr] =	15.0	avg. conc. [mg/l] =	.000E+00
time [yr] =	20.0	avg. conc. [mg/l] =	.000E+00
time [yr] =	25.0	avg. conc. [mg/l] =	.000E+00
time [yr] =	30.0	avg. conc. [mg/l] =	.000E+00
time [yr] =	35.0	avg. conc. [mg/l] =	.000E+00
time [yr] =	40.0	avg. conc. [mg/l] =	.000E+00
time [yr] =	45.0	avg. conc. [mg/l] =	.000E+00
time [yr] =	50.0	avg. conc. [mg/l] =	.000E+00
time [yr] =	55.0	avg. conc. [mg/l] =	.000E+00
time [yr] =	60.0	avg. conc. [mg/l] =	.000E+00
time [yr] =	65.0	avg. conc. [mg/l] =	.000E+00
time [yr] =	70.0	avg. conc. [mg/l] =	.000E+00

INPUT DATA/RESULTS FOR CHEMICAL: TPH-AL05-06

INST. WASTE RELEASE (KG) VALID FOR INST CASE ONLY..	1.00E+00
DISTRIBUTION COEFFICIENT, KD (M**3/KG)	1.59E-02
MOLECULAR DIFFUSION COEFFICIENT (M**2/YR)	3.15E-02
DECAY CONSTANT (1/YR)...........................	0.00E+00

LIST OF TRANSIENT SOURCE RELEASE RATE

.163E-01	.637E-01	.699E-01	.583E-01	.448E-01
.333E-01	.245E-01	.178E-01	.129E-01	.918E-02
.638E-02	.426E-02	.264E-02	.139E-02	.428E-03
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	

RETARDATION FACTOR	1.15E+02
RETARDED SEEPAGE VELOCITY (M/YR)	2.19E-02
RETARDED LONGITUDINAL DISPERSION COEF. (M**2/YR) ..	1.09E-03
RETARDED LATERAL DISPERSION COEFFICIENT (M**2/YR) .	1.09E-03
RETARDED VERTICAL DISPERSION COEFFICIENT (M**2/YR).	1.09E-03

time [yr] = 1.00 avg. conc. [mg/l] = .119E-03

time [yr] = 5.00 avg. conc. [mg/l] = .407E-01

time [yr] = 10.0 avg. conc. [mg/l] = .390E-01

time [yr] = 15.0 avg. conc. [mg/l] = .319E-01

time [yr] = 20.0 avg. conc. [mg/l] = .278E-01

time [yr] = 25.0 avg. conc. [mg/l] = .260E-01

time [yr] = 30.0 avg. conc. [mg/l] = .249E-01

time [yr] = 35.0 avg. conc. [mg/l] = .241E-01

time [yr] = 40.0 avg. conc. [mg/l] = .234E-01

time [yr] = 45.0 avg. conc. [mg/l] = .229E-01

time [yr] = 50.0 avg. conc. [mg/l] = .225E-01

time [yr] = 55.0 avg. conc. [mg/l] = .222E-01

time [yr] = 60.0 avg. conc. [mg/l] = .219E-01

time [yr] = 65.0 avg. conc. [mg/l] = .216E-01

time [yr] = 70.0 avg. conc. [mg/l] = .214E-01

INPUT DATA/RESULTS FOR CHEMICAL: TPH-AL06-08

INST. WASTE RELEASE (KG) VALID FOR INST CASE ONLY..	1.00E+00
DISTRIBUTION COEFFICIENT, KD (M**3/KG)	7.96E-02
MOLECULAR DIFFUSION COEFFICIENT (M**2/YR)	3.15E-02
DECAY CONSTANT (1/YR)............................	0.00E+00

LIST OF TRANSIENT SOURCE RELEASE RATE

.911E-02	.497E-01	.627E-01	.570E-01	.464E-01
.363E-01	.279E-01	.212E-01	.160E-01	.121E-01
.897E-02	.657E-02	.469E-02	.321E-02	.204E-02
.112E-02	.379E-03	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	

RETARDATION FACTOR	5.74E+02
RETARDED SEEPAGE VELOCITY (M/YR)	4.39E-03
RETARDED LONGITUDINAL DISPERSION COEF. (M**2/YR) ..	2.20E-04
RETARDED LATERAL DISPERSION COEFFICIENT (M**2/YR) .	2.20E-04
RETARDED VERTICAL DISPERSION COEFFICIENT (M**2/YR).	2.20E-04

time [yr] =	avg. conc. [mg/l] =
1.00	.134E-04
5.00	.163E-01
10.0	.172E-01
15.0	.139E-01
20.0	.109E-01
25.0	.936E-02
30.0	.835E-02
35.0	.765E-02
40.0	.715E-02
45.0	.677E-02
50.0	.648E-02
55.0	.624E-02
60.0	.606E-02
65.0	.591E-02
70.0	.578E-02

Jury Output File
Analysis for Example Problem

*** COMMON INPUT PARAMETERS ***

PARAMETER NAME	UNITS	VALUE
Porosity	(cc/cc)	0.25
Bulk Density	(g/cc)	1.8
Water Content	(cc/cc)	0.1
Fractional Organic Carbon	(mg/mg)	9.00E-03
Incorporation Depth	(cm)	1010
Clean Soil Thickness	(cm)	200
Simulation Time	(yrs)	70
Length of Soil Column	(cm)	4240
Infiltration Rate	(cm/day)	5.55E-02
Source Length	(m)	12.5
Source Width	(m)	18.9
Boundary Layer Thickness	(cm)	5

Chemical Specific Input Parameters for TPH-AL08-10

Parameter Name	Units	Value
Total Soil Concentration	(mg/kg)	1
Diffusion Coeff. in Air	(cm^2/day)	8640
Diffusion Coeff. in Water	(cm^2/day)	0.864
Henrys Constant	[(mg/L)/(mg/L)]	3410
Organic Carbon Part. Coeff.	(cc/g)	3.16E+04
Lumped Chemical Decay Rate	(1/day)	0

Outputs for TPH-AL08-10

Time = 1 yrs

Cumulative Emissions to Air	(g)	1796
Advective Mass Loading Rate to Groundwater	(g/day)	1.16E-08
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.000975
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.000975

Time = 2 yrs

Cumulative Emissions to Air	(g)	2426
Advective Mass Loading Rate to Groundwater	(g/day)	6.7E-07
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.02853
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.02853

Time = 3 yrs

Cumulative Emissions to Air	(g)	2759
Advective Mass Loading Rate to Groundwater	(g/day)	2.52E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.07125
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.07125

Time = 4 yrs

Cumulative Emissions to Air	(g)	2972
Advective Mass Loading Rate to Groundwater	(g/day)	4.62E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.09646
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.09647

Time = 5 yrs

Cumulative Emissions to Air	(g)	3123
Advective Mass Loading Rate to Groundwater	(g/day)	6.34E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.1033
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.1033

Time = 10 yrs

Cumulative Emissions to Air	(g)	3516
Advective Mass Loading Rate to Groundwater	(g/day)	8.9E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.05955
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.05956

Time = 15 yrs

Cumulative Emissions to Air	(g)	3697
Advective Mass Loading Rate to Groundwater	(g/day)	7.86E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.02629
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.0263

Time = 20 yrs

Cumulative Emissions to Air	(g)	3807
Advective Mass Loading Rate to Groundwater	(g/day)	6.54E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.01072
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.01073

Time = 25 yrs

Cumulative Emissions to Air	(g)	3882
Advective Mass Loading Rate to Groundwater	(g/day)	5.44E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.003305
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.00331

Time = 30 yrs

Cumulative Emissions to Air	(g)	3938
Advective Mass Loading Rate to Groundwater	(g/day)	4.57E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00038
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00038

Time = 35 yrs

Cumulative Emissions to Air	(g)	3982
Advective Mass Loading Rate to Groundwater	(g/day)	3.9E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00226
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00226

Time = 40 yrs

Cumulative Emissions to Air	(g)	4017
Advective Mass Loading Rate to Groundwater	(g/day)	3.37E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00321
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00321

Time = 45 yrs

Cumulative Emissions to Air	(g)	4046
Advective Mass Loading Rate to Groundwater	(g/day)	2.95E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00367
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00366

Time = 50 yrs

Cumulative Emissions to Air	(g)	4071
Advective Mass Loading Rate to Groundwater	(g/day)	2.6E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00385
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00384

Time = 55 yrs

Cumulative Emissions to Air	(g)	4092
Advective Mass Loading Rate to Groundwater	(g/day)	2.32E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00387
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00387

Time = 60 yrs

Cumulative Emissions to Air	(g)	4111
Advective Mass Loading Rate to Groundwater	(g/day)	2.08E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00381
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00381

Time = 65 yrs

Cumulative Emissions to Air	(g)	4127
Advective Mass Loading Rate to Groundwater	(g/day)	1.88E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.0037
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.0037

Time = 70 yrs

Cumulative Emissions to Air	(g)	4142
Advective Mass Loading Rate to Groundwater	(g/day)	1.72E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00357
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00356

Chemical Specific Input Parameters for TPH-AL10-12

PARAMETER NAME	UNITS	VALUE
Total Soil Concentration	(mg/kg)	1
Diffusion Coeff. in Air	(cm^2/day)	8640
Diffusion Coeff. in Water	(cm^2/day)	0.864
Henrys Constant	[(mg/L)/(mg/L)]	5410
Organic Carbon Part. Coeff.	(cc/g)	2.51E+05
Lumped Chemical Decay Rate	(1/day)	0

Outputs for TPH-AL10-12

Time = 1 yrs

Cumulative Emissions to Air	(g)	859.4
Advective Mass Loading Rate to Groundwater	(g/day)	3.44E-16
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.44E-10
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.44E-10

Time = 2 yrs

Cumulative Emissions to Air	(g)	1422
Advective Mass Loading Rate to Groundwater	(g/day)	4.42E-11
Diffusive Mass Loading Rate to Groundwater	(g/day)	8.9E-06
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	8.9E-06

Time = 3 yrs

Cumulative Emissions to Air	(g)	1795
Advective Mass Loading Rate to Groundwater	(g/day)	2.4E-09
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.000322
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.000322

Time = 4 yrs

Cumulative Emissions to Air	(g)	2062
Advective Mass Loading Rate to Groundwater	(g/day)	1.82E-08
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.001835
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.001835

Time = 5 yrs

Cumulative Emissions to Air	(g)	2264
Advective Mass Loading Rate to Groundwater	(g/day)	6.19E-08
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.005012
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.005012

Time = 10 yrs

Cumulative Emissions to Air	(g)	2838
Advective Mass Loading Rate to Groundwater	(g/day)	6.76E-07
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.02727
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.02727

Time = 15 yrs

Cumulative Emissions to Air	(g)	3122
Advective Mass Loading Rate to Groundwater	(g/day)	1.33E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.0344
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.0344

Time = 20 yrs

Cumulative Emissions to Air	(g)	3299
Advective Mass Loading Rate to Groundwater	(g/day)	1.7E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.03122
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.03122

Time = 25 yrs

Cumulative Emissions to Air	(g)	3423
Advective Mass Loading Rate to Groundwater	(g/day)	1.85E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.02543
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.02543

Time = 30 yrs

Cumulative Emissions to Air	(g)	3515
Advective Mass Loading Rate to Groundwater	(g/day)	1.87E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.01986
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.01987

Time = 35 yrs

Cumulative Emissions to Air	(g)	3588
Advective Mass Loading Rate to Groundwater	(g/day)	1.82E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.01525
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.01525

Time = 40 yrs

Cumulative Emissions to Air	(g)	3647
Advective Mass Loading Rate to Groundwater	(g/day)	1.74E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.01161
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.01161

Time = 45 yrs

Cumulative Emissions to Air	(g)	3696
Advective Mass Loading Rate to Groundwater	(g/day)	1.65E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.00878
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.008782

Time = 50 yrs

Cumulative Emissions to Air	(g)	3738
Advective Mass Loading Rate to Groundwater	(g/day)	1.56E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.006596
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.006597

Time = 55 yrs

Cumulative Emissions to Air	(g)	3774
Advective Mass Loading Rate to Groundwater	(g/day)	1.46E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.004904
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.004905

Time = 60 yrs

Cumulative Emissions to Air	(g)	3806
Advective Mass Loading Rate to Groundwater	(g/day)	1.37E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.003588
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.003589

Time = 65 yrs

Cumulative Emissions to Air	(g)	3834
Advective Mass Loading Rate to Groundwater	(g/day)	1.29E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.002559
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.00256

Time = 70 yrs

Cumulative Emissions to Air	(g)	3859
Advective Mass Loading Rate to Groundwater	(g/day)	1.21E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.00175
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.001752

Chemical Specific Input Parameters for TPH-AL12-16

PARAMETER NAME	UNITS	VALUE
Total Soil Concentration	(mg/kg)	1
Diffusion Coeff. in Air	(cm^2/day)	8640
Diffusion Coeff. in Water	(cm^2/day)	0.864
Henrys Constant	[(mg/L)/(mg/L)]	2.25E+04
Organic Carbon Part. Coeff.	(cc/g)	5.01E+06
Lumped Chemical Decay Rate	(1/day)	0

Outputs for TPH-AL12-16

Time = 1 yrs

Cumulative Emissions to Air	(g)	193.6
Advective Mass Loading Rate to Groundwater	(g/day)	3.44E-49
Diffusive Mass Loading Rate to Groundwater	(g/day)	3.66E-42
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	3.66E-42

Time = 2 yrs

Cumulative Emissions to Air	(g)	436.6
Advective Mass Loading Rate to Groundwater	(g/day)	2.4E-28
Diffusive Mass Loading Rate to Groundwater	(g/day)	9.84E-22
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	9.84E-22

Time = 3 yrs

Cumulative Emissions to Air	(g)	646.8
Advective Mass Loading Rate to Groundwater	(g/day)	2.32E-21
Diffusive Mass Loading Rate to Groundwater	(g/day)	5.84E-15
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	5.84E-15

Time = 4 yrs

Cumulative Emissions to Air	(g)	830.8
Advective Mass Loading Rate to Groundwater	(g/day)	7.49E-18
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.37E-11
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.37E-11

Time = 5 yrs

Cumulative Emissions to Air	(g)	993.6
Advective Mass Loading Rate to Groundwater	(g/day)	9.78E-16
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.4E-09
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.4E-09

Time = 10 yrs

Cumulative Emissions to Air	(g)	1587
Advective Mass Loading Rate to Groundwater	(g/day)	1.86E-11
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.3E-05
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.3E-05

Time = 15 yrs

Cumulative Emissions to Air	(g)	1964
Advective Mass Loading Rate to Groundwater	(g/day)	5.33E-10
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.000248
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.000248

Time = 20 yrs

Cumulative Emissions to Air	(g)	2228
Advective Mass Loading Rate to Groundwater	(g/day)	2.91E-09
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.00102
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.00102

Time = 25 yrs

Cumulative Emissions to Air	(g)	2425
Advective Mass Loading Rate to Groundwater	(g/day)	8.06E-09
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.002269
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.002269

Time = 30 yrs

Cumulative Emissions to Air	(g)	2579
Advective Mass Loading Rate to Groundwater	(g/day)	1.58E-08
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.003706
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.003706

Time = 35 yrs

Cumulative Emissions to Air	(g)	2703
Advective Mass Loading Rate to Groundwater	(g/day)	2.53E-08
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.005073
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.005073

Time = 40 yrs

Cumulative Emissions to Air	(g)	2807
Advective Mass Loading Rate to Groundwater	(g/day)	3.55E-08
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.00622
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.00622

Time = 45 yrs

Cumulative Emissions to Air	(g)	2895
Advective Mass Loading Rate to Groundwater	(g/day)	4.59E-08
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.007095
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.007095

Time = 50 yrs

Cumulative Emissions to Air	(g)	2971
Advective Mass Loading Rate to Groundwater	(g/day)	5.58E-08
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.007699
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.007699

Time = 55 yrs

Cumulative Emissions to Air	(g)	3037
Advective Mass Loading Rate to Groundwater	(g/day)	6.49E-08
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.008064
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.008064

Time = 60 yrs

Cumulative Emissions to Air	(g)	3095
Advective Mass Loading Rate to Groundwater	(g/day)	7.3E-08
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.008231
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.008231

Time = 65 yrs

Cumulative Emissions to Air	(g)	3147
Advective Mass Loading Rate to Groundwater	(g/day)	8.01E-08
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.008243
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.008243

Time = 70 yrs

Cumulative Emissions to Air	(g)	3194
Advective Mass Loading Rate to Groundwater	(g/day)	8.62E-08
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.008136
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.008136

Chemical Specific Input Parameters for TPH-AL16-35

PARAMETER NAME	UNITS	VALUE
Total Soil Concentration	(mg/kg)	1
Diffusion Coeff. in Air	(cm^2/day)	8640
Diffusion Coeff. in Water	(cm^2/day)	0.864
Henrys Constant	[(mg/L)/(mg/L)]	2.66E+05
Organic Carbon Part. Coeff.	(cc/g)	1.00E+09
Lumped Chemical Decay Rate	(1/day)	0

Outputs for TPH-AL16-35

Time = 1 yrs

Cumulative Emissions to Air	(g)	0.01396
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 2 yrs

Cumulative Emissions to Air	(g)	1.013
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 3 yrs

Cumulative Emissions to Air	(g)	5.146
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 4 yrs

Cumulative Emissions to Air	(g)	12.67
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 5 yrs

Cumulative Emissions to Air	(g)	22.88
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 10 yrs

Cumulative Emissions to Air	(g)	93.6
Advective Mass Loading Rate to Groundwater	(g/day)	1.91E-77
Diffusive Mass Loading Rate to Groundwater	(g/day)	5.59E-69
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 15 yrs

Cumulative Emissions to Air	(g)	173.6
Advective Mass Loading Rate to Groundwater	(g/day)	6.14E-55
Diffusive Mass Loading Rate to Groundwater	(g/day)	8.77E-47
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 20 yrs

Cumulative Emissions to Air	(g)	252.7
Advective Mass Loading Rate to Groundwater	(g/day)	1.15E-43
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.06E-35
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.06E-35

Time = 25 yrs

Cumulative Emissions to Air	(g)	328.8
Advective Mass Loading Rate to Groundwater	(g/day)	6.81E-37
Diffusive Mass Loading Rate to Groundwater	(g/day)	4.63E-29
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	4.63E-29

Time = 30 yrs

Cumulative Emissions to Air	(g)	401.5
Advective Mass Loading Rate to Groundwater	(g/day)	2.27E-32
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.22E-24
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.22E-24

Time = 35 yrs

Cumulative Emissions to Air	(g)	470.9
Advective Mass Loading Rate to Groundwater	(g/day)	3.9E-29
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.73E-21
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.73E-21

Time = 40 yrs

Cumulative Emissions to Air	(g)	537.3
Advective Mass Loading Rate to Groundwater	(g/day)	1.05E-26
Diffusive Mass Loading Rate to Groundwater	(g/day)	3.96E-19
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	3.96E-19

Time = 45 yrs

Cumulative Emissions to Air	(g)	600.9
Advective Mass Loading Rate to Groundwater	(g/day)	8.23E-25
Diffusive Mass Loading Rate to Groundwater	(g/day)	2.69E-17
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	2.69E-17

Time = 50 yrs

Cumulative Emissions to Air	(g)	661.9
Advective Mass Loading Rate to Groundwater	(g/day)	2.7E-23
Diffusive Mass Loading Rate to Groundwater	(g/day)	7.83E-16
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	7.83E-16

Time = 55 yrs

Cumulative Emissions to Air	(g)	720.4
Advective Mass Loading Rate to Groundwater	(g/day)	4.73E-22
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.23E-14
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.23E-14

Time = 60 yrs

Cumulative Emissions to Air	(g)	776.7
Advective Mass Loading Rate to Groundwater	(g/day)	5.16E-21
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.21E-13
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.21E-13

Time = 65 yrs

Cumulative Emissions to Air	(g)	830.9
Advective Mass Loading Rate to Groundwater	(g/day)	3.9E-20
Diffusive Mass Loading Rate to Groundwater	(g/day)	8.41E-13
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	8.41E-13

Time = 70 yrs

Cumulative Emissions to Air	(g)	883
Advective Mass Loading Rate to Groundwater	(g/day)	2.22E-19
Diffusive Mass Loading Rate to Groundwater	(g/day)	4.41E-12
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	4.41E-12

Chemical Specific Input Parameters for TPH-AR08-10

PARAMETER NAME	UNITS	VALUE
Total Soil Concentration	(mg/kg)	1
Diffusion Coeff. in Air	(cm^2/day)	8640
Diffusion Coeff. in Water	(cm^2/day)	0.864
Henrys Constant	[(mg/L)/(mg/L)]	20.4
Organic Carbon Part. Coeff.	(cc/g)	1590
Lumped Chemical Decay Rate	(1/day)	0

Outputs for TPH-AR08-10

Time = 1 yrs

Cumulative Emissions to Air	(g)	575.4
Advective Mass Loading Rate to Groundwater	(g/day)	9.83E-20
Diffusive Mass Loading Rate to Groundwater	(g/day)	2.6E-16
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	2.6E-16

Time = 2 yrs

Cumulative Emissions to Air	(g)	1036
Advective Mass Loading Rate to Groundwater	(g/day)	8.83E-12
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.07E-08
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.08E-08

Time = 3 yrs

Cumulative Emissions to Air	(g)	1376.
Advective Mass Loading Rate to Groundwater	(g/day)	.4280E-08
Diffusive Mass Loading Rate to Groundwater	(g/day)	.3406E-05
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.3410E-05

Time = 4 yrs

Cumulative Emissions to Air	(g)	1637.
Advective Mass Loading Rate to Groundwater	(g/day)	.9783E-07
Diffusive Mass Loading Rate to Groundwater	(g/day)	.5812E-04
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.5822E-04

Time = 5 yrs

Cumulative Emissions to Air	(g)	1843.
Advective Mass Loading Rate to Groundwater	(g/day)	.6516E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	.3099E-03
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.3106E-03

Time = 10 yrs

Cumulative Emissions to Air	(g)	2466.
Advective Mass Loading Rate to Groundwater	(g/day)	.3021E-04
Diffusive Mass Loading Rate to Groundwater	(g/day)	.7261E-02
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.7291E-02

Time = 15 yrs

Cumulative Emissions to Air	(g)	2793.
Advective Mass Loading Rate to Groundwater	(g/day)	.1043E-03
Diffusive Mass Loading Rate to Groundwater	(g/day)	.1661E-01
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.1671E-01

Time = 20 yrs

Cumulative Emissions to Air	(g)	3001.
Advective Mass Loading Rate to Groundwater	(g/day)	.1827E-03
Diffusive Mass Loading Rate to Groundwater	(g/day)	.2136E-01
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.2154E-01

Time = 25 yrs

Cumulative Emissions to Air	(g)	3148.
Advective Mass Loading Rate to Groundwater	(g/day)	.2433E-03
Diffusive Mass Loading Rate to Groundwater	(g/day)	.2209E-01
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.2233E-01

Time = 30 yrs

Cumulative Emissions to Air	(g)	3259.
Advective Mass Loading Rate to Groundwater	(g/day)	.2835E-03
Diffusive Mass Loading Rate to Groundwater	(g/day)	.2069E-01
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.2097E-01

Time = 35 yrs

Cumulative Emissions to Air	(g)	3347.
Advective Mass Loading Rate to Groundwater	(g/day)	.3070E-03
Diffusive Mass Loading Rate to Groundwater	(g/day)	.1843E-01
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.1873E-01

Time = 40 yrs

Cumulative Emissions to Air	(g)	3419.
Advective Mass Loading Rate to Groundwater	(g/day)	.3184E-03
Diffusive Mass Loading Rate to Groundwater	(g/day)	.1598E-01
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.1630E-01

Time = 45 yrs

Cumulative Emissions to Air	(g)	3479.
Advective Mass Loading Rate to Groundwater	(g/day)	.3215E-03
Diffusive Mass Loading Rate to Groundwater	(g/day)	.1365E-01
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.1397E-01

Time = 50 yrs

Cumulative Emissions to Air	(g)	3530.
Advective Mass Loading Rate to Groundwater	(g/day)	.3191E-03
Diffusive Mass Loading Rate to Groundwater	(g/day)	.1156E-01
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.1188E-01

Time = 55 yrs

Cumulative Emissions to Air	(g)	3575.
Advective Mass Loading Rate to Groundwater	(g/day)	.3131E-03
Diffusive Mass Loading Rate to Groundwater	(g/day)	.9734E-02
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.1005E-01

Time = 60 yrs

Cumulative Emissions to Air	(g)	3613.
Advective Mass Loading Rate to Groundwater	(g/day)	.3049E-03
Diffusive Mass Loading Rate to Groundwater	(g/day)	.8168E-02
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.8473E-02

Time = 65 yrs

Cumulative Emissions to Air	(g)	3648.
Advective Mass Loading Rate to Groundwater	(g/day)	.2954E-03
Diffusive Mass Loading Rate to Groundwater	(g/day)	.6834E-02
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.7130E-02

Time = 70 yrs

Cumulative Emissions to Air	(g)	3678.
Advective Mass Loading Rate to Groundwater	(g/day)	.2853E-03
Diffusive Mass Loading Rate to Groundwater	(g/day)	.5702E-02
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.5987E-02

AT123D Output File
Analysis for Example Problem

Chemicals in the analysis
TPH-AL08-10
TPH-AL10-12
TPH-AL12-16
TPH-AL16-35
TPH-AR08-10

Number of years simulated: 70

GENERAL INPUT DATA
****

NO. OF POINTS IN X-DIRECTION	1
NO. OF POINTS IN Y-DIRECTION	1
NO. OF POINTS IN Z-DIRECTION	10
NO. OF ROOTS: NO. OF SERIES TERMS	1000
NO. OF BEGINNING TIME STEPS	1
NO. OF ENDING TIME STEP	70
NO. OF TIME INTERVALS FOR PRINTED OUT SOLUTION	1
INSTANTANEOUS SOURCE CONTROL = 0 FOR INSTANT SOURCE	1
SOURCE CONDITION CONTROL = 0 FOR STEADY SOURCE	70
INTERMITTENT OUTPUT CONTROL = 0 NO SUCH OUTPUT	1
CASE CONTROL =1 THERMAL, = 2 FOR CHEMICAL, = 3 RAD	2
X-COORDINATE OF RECEPTOR WELL (METERS)	6.25E+00
Y-COORDINATE OF RECEPTOR WELL (METERS)	9.46E+00
AQUIFER DEPTH, = 0.0 FOR INFINITE DEEP (METERS) ...	3.05E+00
AQUIFER WIDTH, = 0.0 FOR INFINITE WIDE (METERS) ...	0.00E+00
BEGIN POINT OF X-SOURCE LOCATION (METERS)	0.00E+00
END POINT OF X-SOURCE LOCATION (METERS)	1.25E+01
BEGIN POINT OF Y-SOURCE LOCATION (METERS)	0.00E+00
END POINT OF Y-SOURCE LOCATION (METERS)	1.89E+01
BEGIN POINT OF Z-SOURCE LOCATION (METERS)	0.00E+00
END POINT OF Z-SOURCE LOCATION (METERS)	0.00E+00
POROSITY	2.50E-01
HYDRAULIC CONDUCTIVITY (METER/YEAR)	3.15E+01
HYDRAULIC GRADIENT	2.00E-02
LONGITUDINAL DISPERSIVITY (METER)	0.00E+00
LATERAL DISPERSIVITY (METER)	0.00E+00
VERTICAL DISPERSIVITY (METER)	0.00E+00
BULK DENSITY OF THE SOIL (KG/M**3)	1.80E+03
TIME INTERVAL SIZE FOR THE DESIRED SOLUTION (YR) ..	1.00E+00
DISCHARGE TIME (YR)	7.00E+01

INPUT DATA/RESULTS FOR CHEMICAL: TPH-AL08-10

INST. WASTE RELEASE (KG) VALID FOR INST CASE ONLY..	1.00E+00
DISTRIBUTION COEFFICIENT, KD (M**3/KG)	6.32E-01
MOLECULAR DIFFUSION COEFFICIENT (M**2/YR)	3.15E-02
DECAY CONSTANT (1/YR).....	0.00E+00

LIST OF TRANSIENT SOURCE RELEASE RATE

.356E-03	.104E-01	.260E-01	.352E-01	.377E-01
.363E-01	.330E-01	.291E-01	.253E-01	.217E-01
.186E-01	.158E-01	.134E-01	.114E-01	.960E-02
.809E-02	.680E-02	.569E-02	.474E-02	.392E-02
.321E-02	.260E-02	.207E-02	.161E-02	.121E-02
.861E-03	.558E-03	.294E-03	.633E-04	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	

RETARDATION FACTOR	4.55E+03
RETARDED SEEPAGE VELOCITY (M/YR)	5.54E-04
RETARDED LONGITUDINAL DISPERSION COEF. (M**2/YR) ..	2.77E-05
RETARDED LATERAL DISPERSION COEFFICIENT (M**2/YR) .	2.77E-05
RETARDED VERTICAL DISPERSION COEFFICIENT (M**2/YR).	2.77E-05

time [yr] = 1.00	avg. conc. [mg/l] = .662E-07
time [yr] = 5.00	avg. conc. [mg/l] = .267E-02
time [yr] = 10.0	avg. conc. [mg/l] = .507E-02
time [yr] = 15.0	avg. conc. [mg/l] = .515E-02
time [yr] = 20.0	avg. conc. [mg/l] = .444E-02
time [yr] = 25.0	avg. conc. [mg/l] = .383E-02
time [yr] = 30.0	avg. conc. [mg/l] = .328E-02
time [yr] = 35.0	avg. conc. [mg/l] = .290E-02
time [yr] = 40.0	avg. conc. [mg/l] = .264E-02
time [yr] = 45.0	avg. conc. [mg/l] = .244E-02
time [yr] = 50.0	avg. conc. [mg/l] = .229E-02
time [yr] = 55.0	avg. conc. [mg/l] = .216E-02
time [yr] = 60.0	avg. conc. [mg/l] = .205E-02
time [yr] = 65.0	avg. conc. [mg/l] = .195E-02
time [yr] = 70.0	avg. conc. [mg/l] = .187E-02

INPUT DATA/RESULTS FOR CHEMICAL: TPH-AL10-12

INST. WASTE RELEASE (KG) VALID FOR INST CASE ONLY..	1.00E+00
DISTRIBUTION COEFFICIENT, KD (M**3/KG)	5.02E+00
MOLECULAR DIFFUSION COEFFICIENT (M**2/YR)	3.15E-02
DECAY CONSTANT (1/YR).....	0.00E+00

LIST OF TRANSIENT SOURCE RELEASE RATE

.526E-10	.325E-05	.117E-03	.670E-03	.183E-02
.345E-02	.527E-02	.705E-02	.864E-02	.995E-02
.110E-01	.117E-01	.122E-01	.125E-01	.126E-01
.125E-01	.123E-01	.121E-01	.118E-01	.114E-01
.110E-01	.106E-01	.101E-01	.971E-02	.928E-02
.885E-02	.843E-02	.803E-02	.763E-02	.725E-02
.688E-02	.653E-02	.620E-02	.587E-02	.557E-02
.527E-02	.500E-02	.473E-02	.448E-02	.424E-02
.401E-02	.379E-02	.359E-02	.339E-02	.321E-02
.303E-02	.286E-02	.270E-02	.255E-02	.241E-02
.227E-02	.214E-02	.202E-02	.190E-02	.179E-02
.168E-02	.158E-02	.149E-02	.140E-02	.131E-02
.123E-02	.115E-02	.107E-02	.100E-02	.934E-03
.870E-03	.808E-03	.749E-03	.693E-03	

RETARDATION FACTOR	3.61E+04
RETARDED SEEPAGE VELOCITY (M/YR)	6.97E-05
RETARDED LONGITUDINAL DISPERSION COEF. (M**2/YR) ..	3.49E-06
RETARDED LATERAL DISPERSION COEFFICIENT (M**2/YR) .	3.49E-06
RETARDED VERTICAL DISPERSION COEFFICIENT (M**2/YR).	3.49E-06

time [yr] = 1.00	avg. conc. [mg/l] = .000E+00
time [yr] = 5.00	avg. conc. [mg/l] = .133E-04
time [yr] = 10.0	avg. conc. [mg/l] = .268E-03
time [yr] = 15.0	avg. conc. [mg/l] = .707E-03
time [yr] = 20.0	avg. conc. [mg/l] = .945E-03
time [yr] = 25.0	avg. conc. [mg/l] = .112E-02
time [yr] = 30.0	avg. conc. [mg/l] = .115E-02
time [yr] = 35.0	avg. conc. [mg/l] = .117E-02
time [yr] = 40.0	avg. conc. [mg/l] = .113E-02
time [yr] = 45.0	avg. conc. [mg/l] = .109E-02
time [yr] = 50.0	avg. conc. [mg/l] = .103E-02
time [yr] = 55.0	avg. conc. [mg/l] = .988E-03
time [yr] = 60.0	avg. conc. [mg/l] = .930E-03
time [yr] = 65.0	avg. conc. [mg/l] = .883E-03
time [yr] = 70.0	avg. conc. [mg/l] = .833E-03

INPUT DATA/RESULTS FOR CHEMICAL: TPH-AL12-16

INST. WASTE RELEASE (KG) VALID FOR INST CASE ONLY..	1.00E+00
DISTRIBUTION COEFFICIENT, KD (M**3/KG)	1.00E+02
MOLECULAR DIFFUSION COEFFICIENT (M**2/YR)	3.15E-02
DECAY CONSTANT (1/YR).....	0.00E+00

LIST OF TRANSIENT SOURCE RELEASE RATE

.134E-41	.359E-21	.213E-14	.498E-11	.510E-09
.110E-07	.972E-07	.494E-06	.174E-05	.473E-05
.107E-04	.209E-04	.369E-04	.598E-04	.905E-04
.130E-03	.178E-03	.234E-03	.299E-03	.372E-03
.453E-03	.539E-03	.631E-03	.728E-03	.828E-03
.931E-03	.104E-02	.114E-02	.125E-02	.135E-02
.146E-02	.156E-02	.166E-02	.176E-02	.185E-02
.194E-02	.203E-02	.211E-02	.219E-02	.227E-02
.234E-02	.241E-02	.247E-02	.253E-02	.259E-02
.264E-02	.269E-02	.273E-02	.277E-02	.281E-02
.284E-02	.287E-02	.290E-02	.292E-02	.294E-02
.296E-02	.298E-02	.299E-02	.300E-02	.300E-02
.301E-02	.301E-02	.301E-02	.301E-02	.301E-02
.300E-02	.300E-02	.299E-02	.298E-02	

RETARDATION FACTOR	7.21E+05
RETARDED SEEPAGE VELOCITY (M/YR)	3.49E-06
RETARDED LONGITUDINAL DISPERSION COEF. (M**2/YR) ..	1.75E-07
RETARDED LATERAL DISPERSION COEFFICIENT (M**2/YR) .	1.75E-07
RETARDED VERTICAL DISPERSION COEFFICIENT (M**2/YR).	1.75E-07

time [yr] = 1.00	avg. conc. [mg/l] = .000E+00
time [yr] = 5.00	avg. conc. [mg/l] = .000E+00
time [yr] = 10.0	avg. conc. [mg/l] = .310E-08
time [yr] = 15.0	avg. conc. [mg/l] = .203E-06
time [yr] = 20.0	avg. conc. [mg/l] = .139E-05
time [yr] = 25.0	avg. conc. [mg/l] = .491E-05
time [yr] = 30.0	avg. conc. [mg/l] = .106E-04
time [yr] = 35.0	avg. conc. [mg/l] = .192E-04
time [yr] = 40.0	avg. conc. [mg/l] = .285E-04
time [yr] = 45.0	avg. conc. [mg/l] = .398E-04
time [yr] = 50.0	avg. conc. [mg/l] = .500E-04
time [yr] = 55.0	avg. conc. [mg/l] = .614E-04
time [yr] = 60.0	avg. conc. [mg/l] = .706E-04
time [yr] = 65.0	avg. conc. [mg/l] = .805E-04
time [yr] = 70.0	avg. conc. [mg/l] = .880E-04

INPUT DATA/RESULTS FOR CHEMICAL: TPH-AL16-35

INST. WASTE RELEASE (KG) VALID FOR INST CASE ONLY..	1.00E+00
DISTRIBUTION COEFFICIENT, KD (M**3/KG)	2.00E+04
MOLECULAR DIFFUSION COEFFICIENT (M**2/YR)	3.15E-02
DECAY CONSTANT (1/YR).....	0.00E+00

LIST OF TRANSIENT SOURCE RELEASE RATE

.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.322E-46
.189E-43	.528E-41	.786E-39	.691E-37	.387E-35
.148E-33	.405E-32	.831E-31	.132E-29	.169E-28
.177E-27	.156E-26	.117E-25	.769E-25	.444E-24
.229E-23	.106E-22	.450E-22	.175E-21	.630E-21
.211E-20	.661E-20	.195E-19	.545E-19	.144E-18
.365E-18	.882E-18	.204E-17	.456E-17	.982E-17
.204E-16	.413E-16	.808E-16	.154E-15	.286E-15
.518E-15	.917E-15	.159E-14	.269E-14	.449E-14
.733E-14	.118E-13	.186E-13	.289E-13	.443E-13
.670E-13	.998E-13	.147E-12	.214E-12	.307E-12
.436E-12	.613E-12	.854E-12	.118E-11	

RETARDATION FACTOR	1.44E+08
RETARDED SEEPAGE VELOCITY (M/YR)	1.75E-08
RETARDED LONGITUDINAL DISPERSION COEF. (M**2/YR) ..	8.76E-10
RETARDED LATERAL DISPERSION COEFFICIENT (M**2/YR) .	8.76E-10
RETARDED VERTICAL DISPERSION COEFFICIENT (M**2/YR).	8.76E-10

time [yr] = 1.00	avg. conc. [mg/l] = .000E+00
time [yr] = 5.00	avg. conc. [mg/l] = .000E+00
time [yr] = 10.0	avg. conc. [mg/l] = .000E+00
time [yr] = 15.0	avg. conc. [mg/l] = .000E+00
time [yr] = 20.0	avg. conc. [mg/l] = .000E+00
time [yr] = 25.0	avg. conc. [mg/l] = .000E+00
time [yr] = 30.0	avg. conc. [mg/l] = .000E+00
time [yr] = 35.0	avg. conc. [mg/l] = .000E+00
time [yr] = 40.0	avg. conc. [mg/l] = .000E+00
time [yr] = 45.0	avg. conc. [mg/l] = .000E+00
time [yr] = 50.0	avg. conc. [mg/l] = .000E+00
time [yr] = 55.0	avg. conc. [mg/l] = .000E+00
time [yr] = 60.0	avg. conc. [mg/l] = .000E+00
time [yr] = 65.0	avg. conc. [mg/l] = .000E+00
time [yr] = 70.0	avg. conc. [mg/l] = .000E+00

INPUT DATA/RESULTS FOR CHEMICAL: TPH-AR08-10

INST. WASTE RELEASE (KG) VALID FOR INST CASE ONLY..	1.00E+00
DISTRIBUTION COEFFICIENT, KD (M**3/KG)	3.18E-02
MOLECULAR DIFFUSION COEFFICIENT (M**2/YR)	3.15E-02
DECAY CONSTANT (1/YR).....	0.00E+00

LIST OF TRANSIENT SOURCE RELEASE RATE

.948E-16	.392E-08	.124E-05	.212E-04	.113E-03
.339E-03	.728E-03	.127E-02	.193E-02	.266E-02
.342E-02	.417E-02	.487E-02	.552E-02	.610E-02
.660E-02	.703E-02	.737E-02	.765E-02	.786E-02
.802E-02	.811E-02	.817E-02	.818E-02	.815E-02
.810E-02	.801E-02	.791E-02	.779E-02	.765E-02
.751E-02	.735E-02	.718E-02	.701E-02	.684E-02
.666E-02	.648E-02	.630E-02	.613E-02	.595E-02
.577E-02	.560E-02	.543E-02	.526E-02	.510E-02
.494E-02	.478E-02	.463E-02	.448E-02	.434E-02
.419E-02	.406E-02	.392E-02	.379E-02	.367E-02
.355E-02	.343E-02	.331E-02	.320E-02	.309E-02
.299E-02	.289E-02	.279E-02	.269E-02	.260E-02
.251E-02	.243E-02	.234E-02	.226E-02	

RETARDATION FACTOR	2.30E+02
RETARDED SEEPAGE VELOCITY (M/YR)	1.10E-02
RETARDED LONGITUDINAL DISPERSION COEF. (M**2/YR) ..	5.49E-04
RETARDED LATERAL DISPERSION COEFFICIENT (M**2/YR) .	5.49E-04
RETARDED VERTICAL DISPERSION COEFFICIENT (M**2/YR).	5.49E-04

time [yr] = 1.00	avg. conc. [mg/l] = .000E+00
time [yr] = 5.00	avg. conc. [mg/l] = .513E-05
time [yr] = 10.0	avg. conc. [mg/l] = .595E-03
time [yr] = 15.0	avg. conc. [mg/l] = .303E-02
time [yr] = 20.0	avg. conc. [mg/l] = .559E-02
time [yr] = 25.0	avg. conc. [mg/l] = .840E-02
time [yr] = 30.0	avg. conc. [mg/l] = .993E-02
time [yr] = 35.0	avg. conc. [mg/l] = .115E-01
time [yr] = 40.0	avg. conc. [mg/l] = .121E-01
time [yr] = 45.0	avg. conc. [mg/l] = .129E-01
time [yr] = 50.0	avg. conc. [mg/l] = .131E-01
time [yr] = 55.0	avg. conc. [mg/l] = .135E-01
time [yr] = 60.0	avg. conc. [mg/l] = .134E-01
time [yr] = 65.0	avg. conc. [mg/l] = .136E-01
time [yr] = 70.0	avg. conc. [mg/l] = .134E-01

Jury Output File
Analysis for Example Problem

*** COMMON INPUT PARAMETERS ***

PARAMETER NAME	UNITS	VALUE
Porosity	(cc/cc)	0.25
Bulk Density	(g/cc)	1.8
Water Content	(cc/cc)	0.1
Fractional Organic Carbon	(mg/mg)	9.00E-03
Incorporation Depth	(cm)	1010
Clean Soil Thickness	(cm)	200
Simulation Time	(yrs)	70
Length of Soil Column	(cm)	4240
Infiltration Rate	(cm/day)	5.55E-02
Source Length	(m)	12.5
Source Width	(m)	18.9
Boundary Layer Thickness	(cm)	5

Chemical Specific Input Parameters for TPH-AR10-12

PARAMETER NAME	UNITS	VALUE
Total Soil Concentration	(mg/kg)	1
Diffusion Coeff. in Air	(cm^2/day)	8640
Diffusion Coeff. in Water	(cm^2/day)	0.864
Henrys Constant	[(mg/L)/(mg/L)]	5.82
Organic Carbon Part. Coeff.	(cc/g)	2510
Lumped Chemical Decay Rate	(1/day)	0

Outputs for TPH-AR10-12

Time = 1 yrs

Cumulative Emissions to Air	(g)	70.61
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 2 yrs

Cumulative Emissions to Air	(g)	205.4
Advective Mass Loading Rate to Groundwater	(g/day)	7.35E-44
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.88E-40
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.88E-40

Time = 3 yrs

Cumulative Emissions to Air	(g)	335.6
Advective Mass Loading Rate to Groundwater	(g/day)	1.23E-30
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.76E-27
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.77E-27

Time = 4 yrs

Cumulative Emissions to Air	(g)	456
Advective Mass Loading Rate to Groundwater	(g/day)	5.21E-24
Diffusive Mass Loading Rate to Groundwater	(g/day)	5.2E-21
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	5.2E-21

Time = 5 yrs

Cumulative Emissions to Air	(g)	567.4
Advective Mass Loading Rate to Groundwater	(g/day)	5.07E-20
Diffusive Mass Loading Rate to Groundwater	(g/day)	3.86E-17
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	3.87E-17

Time = 10 yrs

Cumulative Emissions to Air	(g)	1022
Advective Mass Loading Rate to Groundwater	(g/day)	5.39E-12
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.89E-09
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.89E-09

Time = 15 yrs

Cumulative Emissions to Air	(g)	1358
Advective Mass Loading Rate to Groundwater	(g/day)	2.76E-09
Diffusive Mass Loading Rate to Groundwater	(g/day)	6.33E-07
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	6.35E-07

Time = 20 yrs

Cumulative Emissions to Air	(g)	1616
Advective Mass Loading Rate to Groundwater	(g/day)	6.5E-08
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.12E-05
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.12E-05

Time = 25 yrs

Cumulative Emissions to Air	(g)	1820
Advective Mass Loading Rate to Groundwater	(g/day)	4.41E-07
Diffusive Mass Loading Rate to Groundwater	(g/day)	6.02E-05
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	6.06E-05

Time = 30 yrs

Cumulative Emissions to Air	(g)	1988
Advective Mass Loading Rate to Groundwater	(g/day)	1.59E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.000182
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.000183

Time = 35 yrs

Cumulative Emissions to Air	(g)	2127
Advective Mass Loading Rate to Groundwater	(g/day)	4.02E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.000393
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.000397

Time = 40 yrs

Cumulative Emissions to Air	(g)	2246
Advective Mass Loading Rate to Groundwater	(g/day)	8.04E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.000691
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.000699

Time = 45 yrs

Cumulative Emissions to Air	(g)	2348
Advective Mass Loading Rate to Groundwater	(g/day)	1.38E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.001054
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.001068

Time = 50 yrs

Cumulative Emissions to Air	(g)	2438
Advective Mass Loading Rate to Groundwater	(g/day)	2.12E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.001459
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.00148

Time = 55 yrs

Cumulative Emissions to Air	(g)	2517
Advective Mass Loading Rate to Groundwater	(g/day)	3.01E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.00188
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.00191

Time = 60 yrs

Cumulative Emissions to Air	(g)	2588
Advective Mass Loading Rate to Groundwater	(g/day)	4.01E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.002296
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.002336

Time = 65 yrs

Cumulative Emissions to Air	(g)	2651
Advective Mass Loading Rate to Groundwater	(g/day)	5.1E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.002691
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.002742

Time = 70 yrs

Cumulative Emissions to Air	(g)	2709
Advective Mass Loading Rate to Groundwater	(g/day)	6.24E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.003053
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.003116

Chemical Specific Input Parameters for TPH-AR12-16

PARAMETER NAME	UNITS	VALUE
Total Soil Concentration	(mg/kg)	1
Diffusion Coeff. in Air	(cm^2/day)	8640
Diffusion Coeff. in Water	(cm^2/day)	0.864
Henrys Constant	[(mg/L)/(mg/L)]	2.25
Organic Carbon Part. Coeff.	(cc/g)	5010
Lumped Chemical Decay Rate	(1/day)	0

Outputs for TPH-AR12-16

Time = 1 yrs

Cumulative Emissions to Air	(g)	0.4265
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 2 yrs

Cumulative Emissions to Air	(g)	7.457
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 3 yrs

Cumulative Emissions to Air	(g)	23.17
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 4 yrs

Cumulative Emissions to Air	(g)	44.26
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 5 yrs

Cumulative Emissions to Air	(g)	68.3
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 10 yrs

Cumulative Emissions to Air	(g)	199.8
Advective Mass Loading Rate to Groundwater	(g/day)	1.16E-44
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.17E-41
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.17E-41

Time = 15 yrs

Cumulative Emissions to Air	(g)	327.1
Advective Mass Loading Rate to Groundwater	(g/day)	2.94E-31
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.67E-28
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.67E-28

Time = 20 yrs

Cumulative Emissions to Air	(g)	444.7
Advective Mass Loading Rate to Groundwater	(g/day)	1.54E-24
Diffusive Mass Loading Rate to Groundwater	(g/day)	6.04E-22
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	6.06E-22

Time = 25 yrs

Cumulative Emissions to Air	(g)	553.5
Advective Mass Loading Rate to Groundwater	(g/day)	1.7E-20
Diffusive Mass Loading Rate to Groundwater	(g/day)	5.09E-18
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	5.11E-18

Time = 30 yrs

Cumulative Emissions to Air	(g)	654.6
Advective Mass Loading Rate to Groundwater	(g/day)	8.58E-18
Diffusive Mass Loading Rate to Groundwater	(g/day)	2.07E-15
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	2.08E-15

Time = 35 yrs

Cumulative Emissions to Air	(g)	748.8
Advective Mass Loading Rate to Groundwater	(g/day)	7.39E-16
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.5E-13
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.51E-13

Time = 40 yrs

Cumulative Emissions to Air	(g)	837.1
Advective Mass Loading Rate to Groundwater	(g/day)	2.11E-14
Diffusive Mass Loading Rate to Groundwater	(g/day)	3.68E-12
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	3.7E-12

Time = 45 yrs

Cumulative Emissions to Air	(g)	919.8
Advective Mass Loading Rate to Groundwater	(g/day)	2.87E-13
Diffusive Mass Loading Rate to Groundwater	(g/day)	4.41E-11
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	4.44E-11

Time = 50 yrs

Cumulative Emissions to Air	(g)	997.5
Advective Mass Loading Rate to Groundwater	(g/day)	2.33E-12
Diffusive Mass Loading Rate to Groundwater	(g/day)	3.2E-10
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	3.22E-10

Time = 55 yrs

Cumulative Emissions to Air	(g)	1071
Advective Mass Loading Rate to Groundwater	(g/day)	1.3E-11
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.61E-09
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.62E-09

Time = 60 yrs

Cumulative Emissions to Air	(g)	1140
Advective Mass Loading Rate to Groundwater	(g/day)	5.46E-11
Diffusive Mass Loading Rate to Groundwater	(g/day)	6.16E-09
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	6.22E-09

Time = 65 yrs

Cumulative Emissions to Air	(g)	1205
Advective Mass Loading Rate to Groundwater	(g/day)	1.85E-10
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.92E-08
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.93E-08

Time = 70 yrs

Cumulative Emissions to Air	(g)	1267
Advective Mass Loading Rate to Groundwater	(g/day)	5.25E-10
Diffusive Mass Loading Rate to Groundwater	(g/day)	5.04E-08
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	5.1E-08

Chemical Specific Input Parameters for TPH-AR16-21

PARAMETER NAME	UNITS	VALUE
Total Soil Concentration	(mg/kg)	1
Diffusion Coeff. in Air	(cm^2/day)	8640
Diffusion Coeff. in Water	(cm^2/day)	0.864
Henrys Constant	[(mg/L)/(mg/L)]	0.54
Organic Carbon Part. Coeff.	(cc/g)	1.58E+04
Lumped Chemical Decay Rate	(1/day)	0

Outputs for TPH-AR16-21

Time = 1 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	*(g/day)*	*0*

Time = 2 yrs

Cumulative Emissions to Air	(g)	7.11E-12
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 3 yrs

Cumulative Emissions to Air	(g)	7.72E-08
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 4 yrs

Cumulative Emissions to Air	(g)	9.21E-06
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 5 yrs

Cumulative Emissions to Air	(g)	0.000174
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 10 yrs

Cumulative Emissions to Air	(g)	0.08447
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 15 yrs

Cumulative Emissions to Air	(g)	0.8201
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 20 yrs

Cumulative Emissions to Air	(g)	2.81
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 25 yrs

Cumulative Emissions to Air	(g)	6.209
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 30 yrs

Cumulative Emissions to Air	(g)	10.9
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 35 yrs

Cumulative Emissions to Air	(g)	16.68
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 40 yrs

Cumulative Emissions to Air	(g)	23.35
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 45 yrs

Cumulative Emissions to Air	(g)	30.73
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 50 yrs

Cumulative Emissions to Air	(g)	38.67
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 55 yrs

Cumulative Emissions to Air	(g)	47.05
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 60 yrs

Cumulative Emissions to Air	(g)	55.77
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 65 yrs

Cumulative Emissions to Air	(g)	64.76
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 70 yrs

Cumulative Emissions to Air	(g)	73.96
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	7.85E-77
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Chemical Specific Input Parameters for TPH-AR21-35

PARAMETER NAME	UNITS	VALUE
Total Soil Concentration	(mg/kg)	1
Diffusion Coeff. in Air	(cm^2/day)	8640
Diffusion Coeff. in Water	(cm^2/day)	0.864
Henrys Constant	[(mg/L)/(mg/L)]	2.83E-02
Organic Carbon Part. Coeff.	(cc/g)	1.26E+05
Lumped Chemical Decay Rate	(1/day)	0

Outputs for TPH-AR21-35

Time = 1 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 2 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 3 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 4 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 5 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 10 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 15 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 20 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 25 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 30 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 35 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 40 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 45 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 50 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 55 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 60 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 65 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 70 yrs

Cumulative Emissions to Air	(g)	0
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	0
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

AT123D Output File
Analysis for Example Problem

Chemicals in the analysis
TPH-AR10-12
TPH-AR12-16
TPH-AR16-21
TPH-AR21-35

Number of years simulated: 70

GENERAL INPUT DATA
****

NO. OF POINTS IN X-DIRECTION	1
NO. OF POINTS IN Y-DIRECTION	1
NO. OF POINTS IN Z-DIRECTION	10
NO. OF ROOTS: NO. OF SERIES TERMS	1000
NO. OF BEGINNING TIME STEPS	1
NO. OF ENDING TIME STEP	70
NO. OF TIME INTERVALS FOR PRINTED OUT SOLUTION	1
INSTANTANEOUS SOURCE CONTROL = 0 FOR INSTANT SOURCE	1
SOURCE CONDITION CONTROL = 0 FOR STEADY SOURCE	70
INTERMITTENT OUTPUT CONTROL = 0 NO SUCH OUTPUT	1
CASE CONTROL =1 THERMAL, = 2 FOR CHEMICAL, = 3 RAD	2

X-COORDINATE OF RECEPTOR WELL (METERS)	6.25E+00
Y-COORDINATE OF RECEPTOR WELL (METERS)	9.46E+00
AQUIFER DEPTH, = 0.0 FOR INFINITE DEEP (METERS) ...	3.05E+00
AQUIFER WIDTH, = 0.0 FOR INFINITE WIDE (METERS) ...	0.00E+00
BEGIN POINT OF X-SOURCE LOCATION (METERS)	0.00E+00
END POINT OF X-SOURCE LOCATION (METERS)	1.25E+01
BEGIN POINT OF Y-SOURCE LOCATION (METERS)	0.00E+00
END POINT OF Y-SOURCE LOCATION (METERS)	1.89E+01
BEGIN POINT OF Z-SOURCE LOCATION (METERS)	0.00E+00
END POINT OF Z-SOURCE LOCATION (METERS)	0.00E+00

POROSITY	2.50E-01
HYDRAULIC CONDUCTIVITY (METER/YEAR)	3.15E+01
HYDRAULIC GRADIENT	2.00E-02
LONGITUDINAL DISPERSIVITY (METER)	0.00E+00
LATERAL DISPERSIVITY (METER)	0.00E+00
VERTICAL DISPERSIVITY (METER)	0.00E+00

BULK DENSITY OF THE SOIL (KG/M**3)	1.80E+03
TIME INTERVAL SIZE FOR THE DESIRED SOLUTION (YR) ..	1.00E+00
DISCHARGE TIME (YR)	7.00E+01

INPUT DATA/RESULTS FOR CHEMICAL: TPH-AR10-12

INST. WASTE RELEASE (KG) VALID FOR INST CASE ONLY..	1.00E+00
DISTRIBUTION COEFFICIENT, KD (M**3/KG)	5.02E-02
MOLECULAR DIFFUSION COEFFICIENT (M**2/YR)	3.15E-02
DECAY CONSTANT (1/YR).....	0.00E+00

LIST OF TRANSIENT SOURCE RELEASE RATE

.000E+00	.686E-40	.644E-27	.190E-20	.141E-16
.529E-14	.360E-12	.846E-11	.979E-10	.691E-09
.340E-08	.128E-07	.391E-07	.102E-06	.232E-06
.476E-06	.898E-06	.157E-05	.260E-05	.410E-05
.611E-05	.882E-05	.123E-04	.167E-04	.221E-04
.286E-04	.363E-04	.452E-04	.554E-04	.669E-04
.798E-04	.941E-04	.110E-03	.127E-03	.145E-03
.165E-03	.186E-03	.208E-03	.231E-03	.255E-03
.280E-03	.306E-03	.334E-03	.361E-03	.390E-03
.419E-03	.449E-03	.479E-03	.509E-03	.540E-03
.571E-03	.603E-03	.634E-03	.666E-03	.697E-03
.729E-03	.760E-03	.791E-03	.822E-03	.853E-03
.883E-03	.913E-03	.943E-03	.972E-03	.100E-02
.103E-02	.106E-02	.108E-02	.111E-02	

RETARDATION FACTOR	3.62E+02
RETARDED SEEPAGE VELOCITY (M/YR)	6.95E-03
RETARDED LONGITUDINAL DISPERSION COEF. (M**2/YR) ..	3.48E-04
RETARDED LATERAL DISPERSION COEFFICIENT (M**2/YR) .	3.48E-04
RETARDED VERTICAL DISPERSION COEFFICIENT (M**2/YR).	3.48E-04

time [yr] = 1.00	avg. conc. [mg/l] = .000E+00
time [yr] = 5.00	avg. conc. [mg/l] = .000E+00
time [yr] = 10.0	avg. conc. [mg/l] = .000E+00
time [yr] = 15.0	avg. conc. [mg/l] = .233E-07
time [yr] = 20.0	avg. conc. [mg/l] = .629E-06
time [yr] = 25.0	avg. conc. [mg/l] = .585E-05
time [yr] = 30.0	avg. conc. [mg/l] = .211E-04
time [yr] = 35.0	avg. conc. [mg/l] = .621E-04
time [yr] = 40.0	avg. conc. [mg/l] = .122E-03
time [yr] = 45.0	avg. conc. [mg/l] = .231E-03
time [yr] = 50.0	avg. conc. [mg/l] = .347E-03
time [yr] = 55.0	avg. conc. [mg/l] = .529E-03
time [yr] = 60.0	avg. conc. [mg/l] = .691E-03
time [yr] = 65.0	avg. conc. [mg/l] = .930E-03
time [yr] = 70.0	avg. conc. [mg/l] = .112E-02

INPUT DATA/RESULTS FOR CHEMICAL: TPH-AR12-16

INST. WASTE RELEASE (KG) VALID FOR INST CASE ONLY..	1.00E+00
DISTRIBUTION COEFFICIENT, KD (M**3/KG)	1.00E-01
MOLECULAR DIFFUSION COEFFICIENT (M**2/YR)	3.15E-02
DECAY CONSTANT (1/YR).....	0.00E+00

LIST OF TRANSIENT SOURCE RELEASE RATE

.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.174E-45	.427E-41
.166E-37	.163E-34	.550E-32	.808E-30	.609E-28
.267E-26	.748E-25	.145E-23	.204E-22	.221E-21
.191E-20	.135E-19	.806E-19	.414E-18	.186E-17
.747E-17	.270E-16	.889E-16	.270E-15	.759E-15
.200E-14	.495E-14	.116E-13	.258E-13	.549E-13
.112E-12	.220E-12	.416E-12	.761E-12	.135E-11
.233E-11	.392E-11	.643E-11	.103E-10	.162E-10
.249E-10	.377E-10	.559E-10	.817E-10	.118E-09
.167E-09	.233E-09	.322E-09	.439E-09	.592E-09
.790E-09	.104E-08	.136E-08	.177E-08	.227E-08
.289E-08	.365E-08	.458E-08	.571E-08	.706E-08
.867E-08	.106E-07	.128E-07	.155E-07	

RETARDATION FACTOR	7.22E+02
RETARDED SEEPAGE VELOCITY (M/YR)	3.49E-03
RETARDED LONGITUDINAL DISPERSION COEF. (M**2/YR) ..	1.75E-04
RETARDED LATERAL DISPERSION COEFFICIENT (M**2/YR) .	1.75E-04
RETARDED VERTICAL DISPERSION COEFFICIENT (M**2/YR).	1.75E-04

time [yr] = 1.00	avg. conc. [mg/l] = .000E+00
time [yr] = 5.00	avg. conc. [mg/l] = .000E+00
time [yr] = 10.0	avg. conc. [mg/l] = .000E+00
time [yr] = 15.0	avg. conc. [mg/l] = .000E+00
time [yr] = 20.0	avg. conc. [mg/l] = .000E+00
time [yr] = 25.0	avg. conc. [mg/l] = .000E+00
time [yr] = 30.0	avg. conc. [mg/l] = .000E+00
time [yr] = 35.0	avg. conc. [mg/l] = .000E+00
time [yr] = 40.0	avg. conc. [mg/l] = .000E+00
time [yr] = 45.0	avg. conc. [mg/l] = .000E+00
time [yr] = 50.0	avg. conc. [mg/l] = .000E+00
time [yr] = 55.0	avg. conc. [mg/l] = .000E+00
time [yr] = 60.0	avg. conc. [mg/l] = .000E+00
time [yr] = 65.0	avg. conc. [mg/l] = .172E-08
time [yr] = 70.0	avg. conc. [mg/l] = .464E-08

INPUT DATA/RESULTS FOR CHEMICAL: TPH-AR16-21

INST. WASTE RELEASE (KG) VALID FOR INST CASE ONLY..	1.00E+00
DISTRIBUTION COEFFICIENT, KD (M**3/KG)	3.16E-01
MOLECULAR DIFFUSION COEFFICIENT (M**2/YR)	3.15E-02
DECAY CONSTANT (1/YR)............................	0.00E+00

LIST OF TRANSIENT SOURCE RELEASE RATE

.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	

RETARDATION FACTOR	2.28E+03
RETARDED SEEPAGE VELOCITY (M/YR)	1.11E-03
RETARDED LONGITUDINAL DISPERSION COEF. (M**2/YR) ..	5.54E-05
RETARDED LATERAL DISPERSION COEFFICIENT (M**2/YR) .	5.54E-05
RETARDED VERTICAL DISPERSION COEFFICIENT (M**2/YR).	5.54E-05

time [yr] = 1.00 avg. conc. [mg/l] = .000E+00

time [yr] = 5.00 avg. conc. [mg/l] = .000E+00

time [yr] = 10.0 avg. conc. [mg/l] = .000E+00

time [yr] = 15.0 avg. conc. [mg/l] = .000E+00

time [yr] = 20.0 avg. conc. [mg/l] = .000E+00

time [yr] = 25.0 avg. conc. [mg/l] = .000E+00

time [yr] = 30.0 avg. conc. [mg/l] = .000E+00

time [yr] = 35.0 avg. conc. [mg/l] = .000E+00

time [yr] = 40.0 avg. conc. [mg/l] = .000E+00

time [yr] = 45.0 avg. conc. [mg/l] = .000E+00

time [yr] = 50.0 avg. conc. [mg/l] = .000E+00

time [yr] = 55.0 avg. conc. [mg/l] = .000E+00

time [yr] = 60.0 avg. conc. [mg/l] = .000E+00

time [yr] = 65.0 avg. conc. [mg/l] = .000E+00

time [yr] = 70.0 avg. conc. [mg/l] = .000E+00

INPUT DATA/RESULTS FOR CHEMICAL: TPH-AR21-35

INST. WASTE RELEASE (KG) VALID FOR INST CASE ONLY..	1.00E+00
DISTRIBUTION COEFFICIENT, KD (M**3/KG)	2.52E+00
MOLECULAR DIFFUSION COEFFICIENT (M**2/YR)	3.15E-02
DECAY CONSTANT (1/YR)............................	0.00E+00

LIST OF TRANSIENT SOURCE RELEASE RATE

.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	

RETARDATION FACTOR	1.81E+04
RETARDED SEEPAGE VELOCITY (M/YR)	1.39E-04
RETARDED LONGITUDINAL DISPERSION COEF. (M**2/YR) ..	6.95E-06
RETARDED LATERAL DISPERSION COEFFICIENT (M**2/YR) .	6.95E-06
RETARDED VERTICAL DISPERSION COEFFICIENT (M**2/YR).	6.95E-06

time [yr] =	1.00	avg. conc. [mg/l] =	.000E+00
time [yr] =	5.00	avg. conc. [mg/l] =	.000E+00
time [yr] =	10.0	avg. conc. [mg/l] =	.000E+00
time [yr] =	15.0	avg. conc. [mg/l] =	.000E+00
time [yr] =	20.0	avg. conc. [mg/l] =	.000E+00
time [yr] =	25.0	avg. conc. [mg/l] =	.000E+00
time [yr] =	30.0	avg. conc. [mg/l] =	.000E+00
time [yr] =	35.0	avg. conc. [mg/l] =	.000E+00
time [yr] =	40.0	avg. conc. [mg/l] =	.000E+00
time [yr] =	45.0	avg. conc. [mg/l] =	.000E+00
time [yr] =	50.0	avg. conc. [mg/l] =	.000E+00
time [yr] =	55.0	avg. conc. [mg/l] =	.000E+00
time [yr] =	60.0	avg. conc. [mg/l] =	.000E+00
time [yr] =	65.0	avg. conc. [mg/l] =	.000E+00
time [yr] =	70.0	avg. conc. [mg/l] =	.000E+00

SUBSURFACE INVESTIGATION REPORT

SOIL BORINGS SB-1, SB-2

TEXAS - NEW MEXICO PIPE LINE COMPANY
TNM-96-16
LEA COUNTY, NEW MEXICO

5309 Wurzbach, Suite 100
San Antonio, Texas 78238
(210) 680-3767
(210) 680-3763 FAX

SUBSURFACE INVESTIGATION REPORT
SOIL BORINGS SB-1, SB-2

TEXAS - NEW MEXICO PIPE LINE COMPANY
TNM-96-16
LEA COUNTY, NEW MEXICO

PREPARED FOR:

TEXAS - NEW MEXICO PIPE LINE COMPANY
P. O. Box 1030
Jal, New Mexico 88252

Mr. Tony Savoie

PREPARED BY:
KEI

Monica A. Sfentz
Project Manager

Theresa Nix
Project Manager

Pat Bullinger, P.E.

KEI Job No. 610088-1

June 26, 1998

TABLE OF CONTENTS

PURPOSE AND SCOPE

The purpose of the subsurface investigation was to delineate the vertical extent of hydrocarbon impact at the site within the apparent source area. Previous activities at the site consisted of the advancement of 4 soil borings to delineate the lateral extent of impact and to estimate the apparent volume of soil to be excavated from the site. That report was generated by Environmental Spill Control, Inc. and dated May 20, 1996. The site location is shown on FIG. 1.

SOIL INVESTIGATION

The subsurface investigation consisted of drilling 2 soil borings (designated SB-1 and SB-2) within the previously excavated area. The borings were drilled to an approximate depth of 41.5 feet below the ground surface, 32.5 feet below the surface of the excavated area. This depth placed the bottom of the borings approximately 5 feet below any apparently impacted soils as determined by the visual inspection of samples in the field. Soil samples were collected at selected intervals from 9 feet below the ground surface to the bottom of the boring. The soils were classified in the field, soil samples were field screened, and selected samples were prepared and shipped to the laboratory for analysis. Upon completion of sampling activities, each soil boring was backfilled to the surface with a cement/bentonite grout.

Ground water was not encountered in either of the soil borings. The depth to ground water is suspected to be between 75 and 90 feet below the ground surface. The locations of the soil borings are presented on FIG. 2.

SOIL DESCRIPTION

The subsurface soil profile was classified in general accordance with the Unified Soil Classification System by visually observing the soil samples obtained during the assessment. Depths given are referenced from the surface of the excavated area, 9 feet below the ground surface, unless otherwise noted. In general, 3 soil types were encountered. A general description, approximate thickness, and head-space sample results for each soil type are as follows:

Soil Type I

This soil type consisted of white caliche gravel encountered at the surface of each boring and again at a depth of approximately 13 feet. The observed thickness of this soil type ranged from 4 to 7 feet. The caliche gravel was sandy, contained sandstone gravel, and was dry. Head-space readings from samples of this soil type varied from 99 ppm to 753 ppm.

Soil Type II

This soil type consisted of red sand and was encountered at a depth of approximately 4.5 feet at both boring locations. The sand contained calcareous nodules in the upper 2 to 3 feet and organic material in the lower 5 to 7 feet. This soil type was dry to slightly moist. The observed thickness of this soil type varied from 8 to 9 feet. Head-space readings from samples of this soil type ranged from 304 ppm to 598 ppm.

Soil Type III
This soil type consisted of light brown sand and was encountered from a depth of approximately 19 feet to the bottom of the sample in both borings. The sand was fine-grained and contained sandstone gravel. The observed thickness of this soil type was approximately 13.5 feet. Head-space readings from samples of this soil type ranged from 44 ppm to 117 ppm.

Logs indicating the subsurface soil profile, depths at which soil samples were obtained, head-space results, and laboratory results are presented on FIG. 3.

ANALYTICAL RESULTS

Three soil samples were selected from each soil boring based on the following criteria:

- The sample collected between 0 and 2.5 feet below the surface of the excavated area.
- The sample collected between 15 and 17.5 feet below the surface of the excavated area.
- The sample at the bottom of each soil boring.

Soil samples selected for analytical testing consisted of the following:

- Six samples from the soil borings were tested for benzene, toluene, ethylbenzene, and xylenes (BTEX) and total petroleum hydrocarbons diesel range organics (TPH-DRO).
- One soil sample from soil boring SB-1 (exhibiting the highest concentration of TPH by EPA Method 8015 DRO) was tested for SPLP TPH, SPLP Volatile Organic Compounds (VOCs), and SPLP Semi-volatile Organic Compounds (SVOCs).
- One hand-augered sample was collected outside of the excavated area and analyzed for fraction of organic carbon (FOC) and moisture content. The location of this sample is shown on FIG. 2.

- Laboratory results for the selected samples indicated the following concentration ranges:

CONSTITUENT	CONCENTRATION RANGE
BENZENE	ND to 4.00 mg/kg
BTEX	ND to 255.48 mg/kg
TPH	33.4 to 9,570 mg/kg
SPLP TPH	6.8 mg/kg
BENZENE	0.057 mg/L
ETHYLBENZENE	0.568 mg/L
ISOPROPYLBENZENE	0.080 mg/L
NAPHTHALENE	0.044 to 0.160 mg/L
TOLUENE	1.364* mg/L
1,2,4-TRIMETHYLBENZENE	0.260 mg/L
1,3,5-TRIMETHYLBENZENE	0.083 mg/L
m,p-XYLENES	0.869 mg/L

CONSTITUENT	CONCENTRATION RANGE
n-PROPYLBENZENE	0.067 mg/L
o-XYLENE	0.596 mg/L
2-METHYLNAPHTHALENE	0.042 mg/L
FOC	0.9%
MOISTURE CONTENT	3.5%

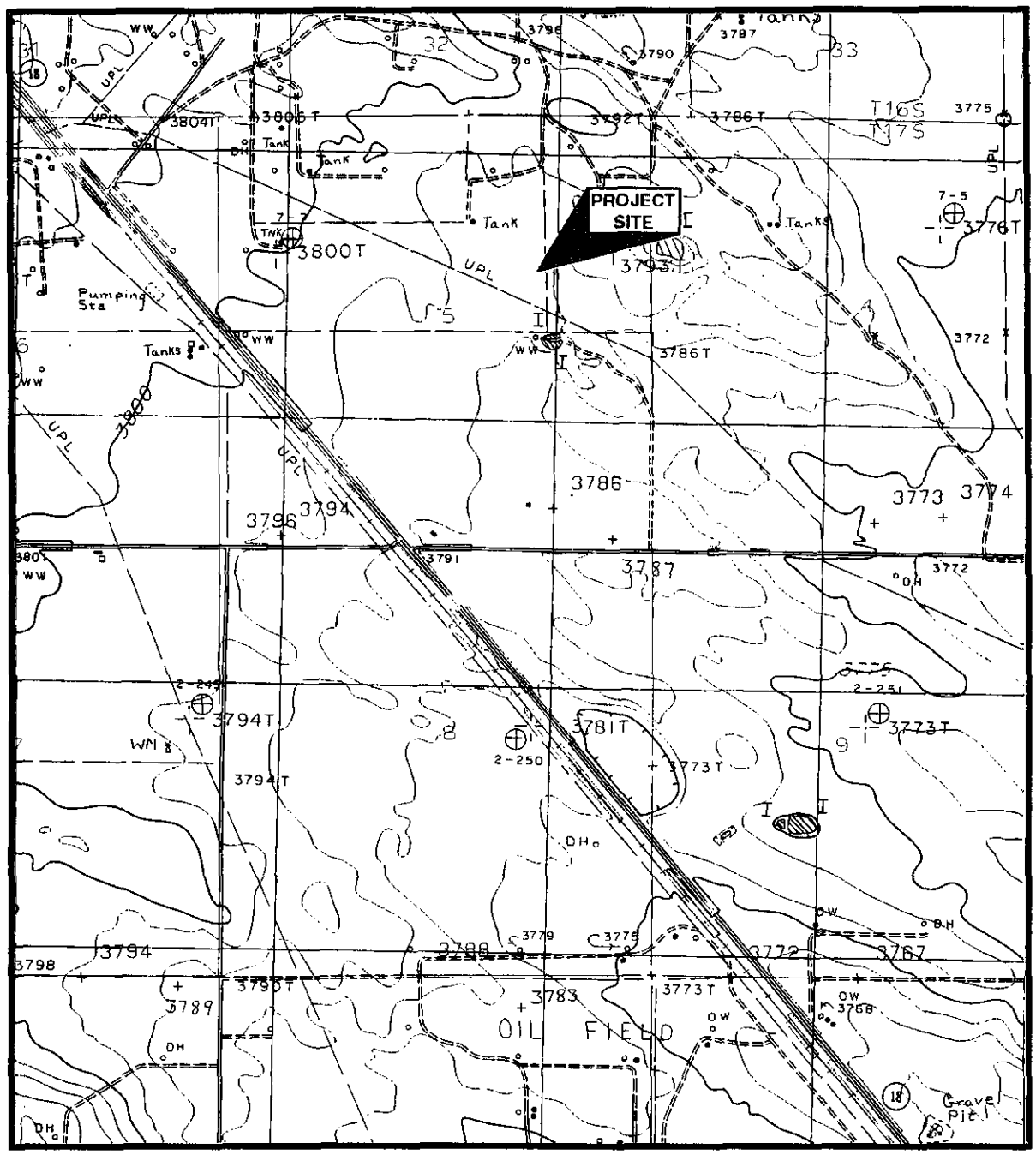
* Indicates constituent was detected above the method calibration limits.

SPLP VOC and SPLP SVOC constituents not listed above were ND. Soil laboratory results are summarized in TABLES I through III. Soil analytical laboratory reports and chain-of-custody documentation are presented in APPENDIX A. Quality Assurance/Quality Control Procedures are presented in APPENDIX B.

LOVINGTON SE QUADRANGLE

NEW MEXICO - LEA CO.

PRINTED 1985



SCALE 1:24000

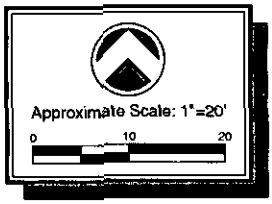
1 1/2 0 1 MILE

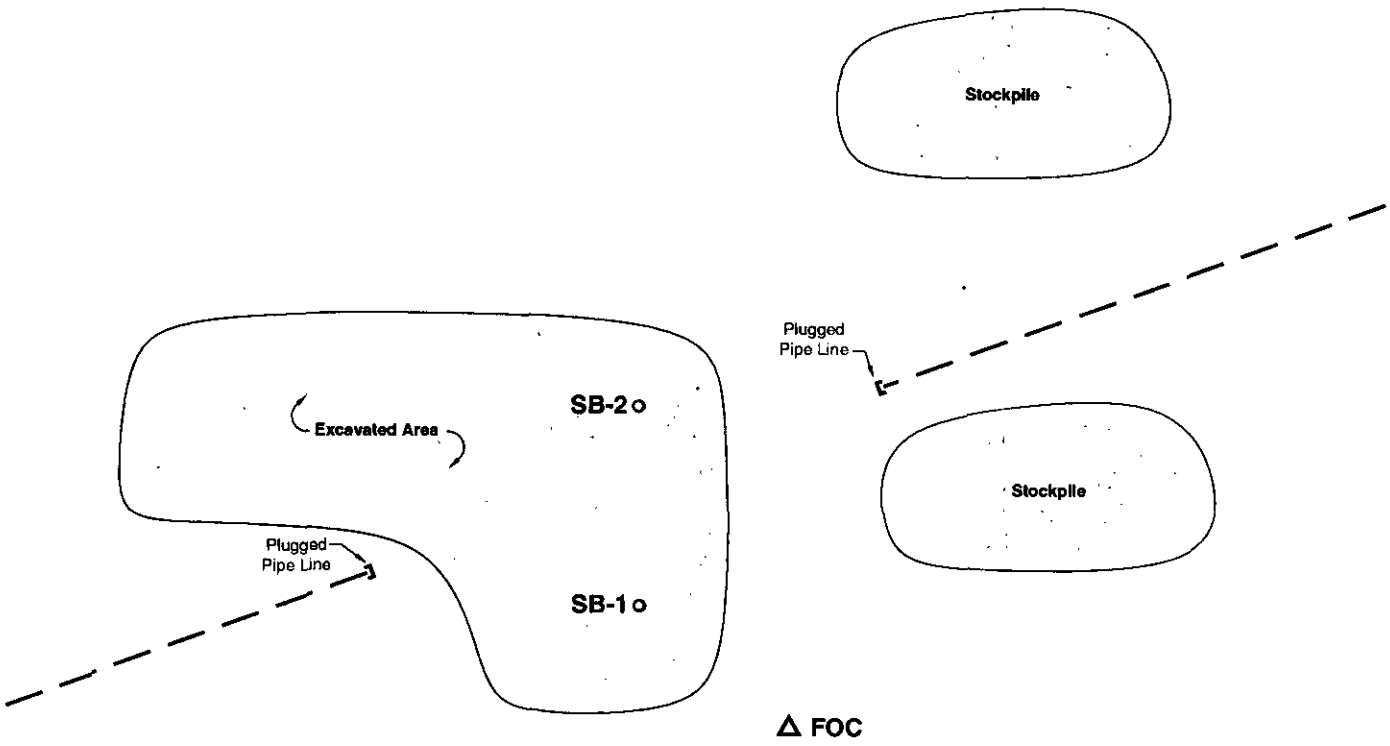
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 5 FEET

k·e·i	*SITE LOCATION MAP*	610088
	TEXAS - NEW MEXICO PIPE LINE CO. TNM-96-16 LEA COUNTY, NEW MEXICO	FIG 1





NOTE:

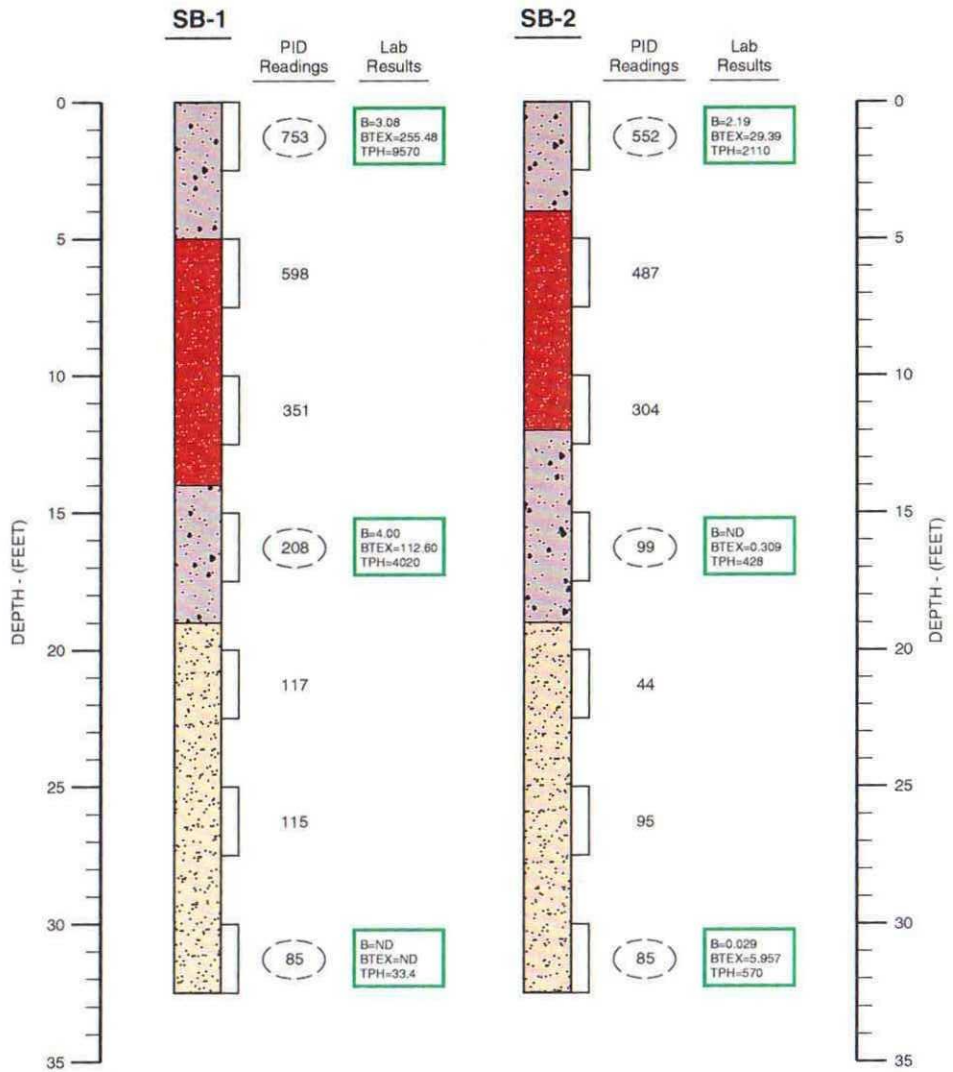
The FOC sample was obtained at approximatley 6 to 8 feet below ground surface.

LEGEND

- Soil sample collected by hand auger on March 9, 1998.
- Soil Boring advanced by KEI on March 9, 1998.
- Stockpile
- Approximate Location of Excavation Area

04/28/98-DF g:\eadft\projects\tnm\610088\(610088)

k·e·i	*SITE DETAILS*	610088
	TEXAS - NEW MEXICO PIPE LINE CO. TNM-96-16 LEA COUNTY, NEW MEXICO	FIG 2



LEGEND

- Caliche, sandy with sandstone gravel, white, dry.
- Sand (SM), contains some organic material and calcareous nodules, red, dry to slightly moist.
- Sand (SM), fine-grained with sandstone gravel, light brown.
- Indicates the depth interval from which a soil sample was selected and prepared for field head-space and/or laboratory analysis.
- Indicates sample selected for laboratory analysis.

B = Benzene Concentration (ppm)
BTEX = Total BTEX concentration (ppm)
TPH = Total Petroleum Hydrocarbon Concentration (mg/kg)

PID = Head-space readings in ppm obtained with a photoionization detector.
ND = Indicates the concentration was below laboratory detection limits.

NOTES:

1. The soil borings were drilled on March 9, 1998.
2. Ground water was not encountered during the field investigation.
3. The depths indicated are referenced from the bottom of the excavation, approximately 9 feet below the ground surface.
4. The soil borings were backfilled with a cement/bentonite grout.
5. The lines between material types shown on the profile log represent approximate boundaries. Actual transitions may be gradual.

k·e·i

LOG AND DETAILS OF SOIL BORINGS

TEXAS - NEW MEXICO PIPE LINE CO. TNM-96-16 LEA COUNTY, NEW MEXICO

610088

FIG 3

GENERAL NOTES

ND - Indicates constituent was not detected above the method detection limit.

Method detection or reporting limits:

BTEX	-	0.020 to 0.40 mg/kg
TPH	-	10.0 to 500 mg/kg
SPLP TPH	-	0.9 mg/L
SPLP VOCs	-	0.025 to 0.050 mg/L
SPLP SVOCs	-	0.025 to 0.063 mg/L
FOC	-	0.1%
Moisture Content	-	0.1%

Laboratory test methods:

BTEX	-	EPA Method SW846-8020
TPH	-	Modified EPA Method 8015-DRO
SPLP TPH	-	EPA Method 1312/418.1
SPLP VOCs	-	EPA Method SW846-1312/8260
SPLP SVOCs	-	EPA Method SW846-1312/8270
FOC	-	ASTM Method D2974
Moisture Content	-	ASTM 2216-71

TABLE I

SUMMARY OF SOIL RESULTS - BTEX AND TPH
TEXAS - NEW MEXICO PIPE LINE COMPANY
TNM-96-16
LEA COUNTY, NEW MEXICO

SAMPLE LOCATION	SAMPLE DATE	DEPTH (feet)	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYL-BENZENE (mg/kg)	XYLENES (mg/kg)	TOTAL BTEX (mg/kg)	TPH (mg/kg)
SB-1	03/09/98	0 - 2.5	3.08	56.60	59.80	136.00	255.48	9570
SB-1	03/09/98	15 - 17.5	4.00	28.40	15.00	65.20	112.60	4020
SB-1	03/09/98	30 - 32.5	ND	ND	ND	ND	ND	33.4
SB-2	03/09/98	0 - 2.5	2.19	0.74	4.40	22.06	29.39	2110
SB-2	03/09/98	15 - 17.5	ND	ND	0.036	0.273	0.309	428
SB-2	03/09/98	30 - 32.5	0.029	0.040	0.910	4.978	5.957	570

TABLE II

SUMMARY OF SOIL RESULTS - SPLP
TEXAS - NEW MEXICO PIPE LINE COMPANY
TNM-96-16
LEA COUNTY, NEW MEXICO

PARAMETER	CONCENTRATION (mg/L)
VOCs:	
Benzene	0.057
Ethylbenzene	0.568
Isopropylbenzene	0.080
Naphthalene	0.160
Toluene	1.364*
1,2,4-Trimethylbenzene	0.260
1,3,5-Trimethylbenzene	0.083
m,p-Xylenes	0.869
n-Propylbenzene	0.067
o-Xylene	0.596
SVOCs:	
2-Methylnaphthalene	0.042
Naphthalene	0.044
TPH	6.8

NOTES:

1. The sample was obtained on 03/09/98 from SB-1 at 0 to 2.5 feet.
2. * Indicates the result was beyond calibration limits.
3. Those constituents not listed were ND.

TABLE III

SUMMARY OF SOIL RESULTS - GEOTECHNICAL
TEXAS - NEW MEXICO PIPE LINE COMPANY
TNM-96-16
LEA COUNTY, NEW MEXICO

PARAMETER	CONCENTRATION (%)
Organic Content (FOC)	0.9
Moisture Content	3.5

NOTES:

1. The sample was collected on 03/09/98 at approximately 6 to 8 feet below ground surface.
2. The sample location is identified on FIG. 2.

ANALYTICAL REPORT 1-80927

for

K.E.I. Consultants, Inc.

Project Manager: Theresa Nix

Project Name: TNM-96-16

Project Id: 610088

April 1, 1998

HOUSTON - DALLAS - SAN ANTONIO

11381 Meadowglen Lane Suite L * Houston, Texas 77082-2647
Phone (281) 589-0692 Fax (281) 589-0695

XENCO Laboratories
11381 Meadowglen Suite L
Houston, Texas 77082-2647
(281) 589-0692 Fax: (281) 589-0695
Houston - Dallas - San Antonio - Latin America

April 1, 1998

Project Manager: Theresa Nix
K.E.I. Consultants, Inc.
5309 Wurzbach Rd. Suite 100
San Antonio, TX 78238

Reference: **XENCO Report No.: 1-80927**
Project Name: TNM-96-16
Project ID: 610088
Project Address: Lea County
New Mexico

Dear Theresa Nix:

We are reporting to you the results of the analyses performed on the samples received under the project name referenced above and identified with XENCO Chain of Custody Number 1-80927. All results being reported to you apply only to the samples analyzed, properly identified with a Laboratory ID number. This letter documents the official transmission of the contents of the report and validates the information contained within.

All the results for the quality control samples passed thorough examination. Also, all parameters for data reduction and validation checked satisfactorily. In view of this, we are able to release the analytical data for this report within acceptance criteria for accuracy, precision, completeness or properly flagged.

The validity and integrity of this report will remain intact as long as it is accompanied by this letter and reproduced in full, unless written approval is granted by XENCO Laboratories. This report will be filed for at least 3 years in our archives and after that time it will be destroyed without further notice, unless otherwise arranged with you. The samples received, and described as recorded in COC No. 1-80927 will be filed for 60 days, and after that time they will be properly disposed of without further notice, unless otherwise arranged with you. We reserve the right to return to you any unused samples, extracts or solutions related to them if we consider so necessary (e.g., samples identified as hazardous waste, sample sizes exceeding analytical standard practices, controlled substances under regulated protocols, etc).

XENCO operates under the A2LA guidelines. Our Quality System meets ISO/IEC Guide 25 requirements which is strictly implemented and enforced through our standard QA/QC procedures.

We thank you for selecting XENCO Laboratories to serve your analytical needs. If you have any questions concerning this report, please feel free to contact us at any time.

Sincerely,

Eddie Yonemoto, Ph.D.
Technical Director

XENCO Laboratories

CERTIFICATE OF ANALYSIS SUMMARY 1-80927

K.E.I. Consultants, Inc.

Project ID: 610088 | ***Project Name: TNM-96-16*** | **Date Received in Lab :** Mar 12, 1998 09:45

Project Manager: Theresa Nix | **Date Report Faxed:** Apr 1, 1998

Project Location: Lea County New Mexico | **XENCO contact :** Carlos Castro/Edward Yonemoto

Analysis Requested	*Lab ID:*	180927 001		180927 002		180927 003		180927 004		180927 005		180927 006	
	Field ID:	SB-1		SB-1		SB-1		SB-2		SB-2		SB-2	
	Depth:	0-2.5		15-17.5		30-32.5		0-2.5		15-17.5		30-32.5	
	Matrix:	Solid		Solid		Solid		Solid		Solid		Solid	
	Sampled:	03/09/98 12:56		03/09/98 13:14		03/09/98 13:30		03/09/98 13:45		03/09/98 14:06		03/09/98 14:35	
TPH-DRO (Diesel)	*Analyzed:*	03/18/98		03/18/98		03/18/98		03/18/98		03/18/98		03/18/98	
EPA 8015 M	*Units:*	mg/kg	R.L.	mg/kg	R.L.	mg/kg	R.L.	mg/kg	R.L.	mg/kg	R.L.	mg/kg	R.L.
Total Petroleum Hydrocarbons		9570	(500)	4020	(250)	33.4	(10.0)	2110	(250)	428	(200)	570	(50.0)
BTEX	*Analyzed:*	03/13/98		03/13/98		03/13/98		03/13/98		03/13/98		03/13/98	
EPA 8020	*Units:*	ppm	R.L.	ppm	R.L.	ppm	R.L.	ppm	R.L.	ppm	R.L.	ppm	R.L.
Benzene		3.08	(0.20)	4.00	(0.10)	< 0.020	(0.020)	2.19	(0.10)	< 0.020	(0.020)	0.029	(0.020)
Toluene		56.60	(0.20)	28.40	(0.10)	< 0.020	(0.020)	0.74	(0.10)	< 0.020	(0.020)	0.040	(0.020)
Ethylbenzene		59.80	(0.20)	15.00	(0.10)	< 0.020	(0.020)	4.40	(0.10)	0.036	(0.020)	0.910	(0.020)
m,p-Xylenes		88.80	(0.40)	45.00	(0.20)	< 0.040	(0.040)	13.30	(0.20)	0.147	(0.040)	3.280	(0.040)
o-Xylene		47.20	(0.20)	20.20	(0.10)	< 0.020	(0.020)	8.76	(0.10)	0.126	(0.020)	1.698	(0.020)
Total BTEX		255.48		112.60		N.D.		29.39		0.309		5.957	
SPLP-Semivolatiles	*Analyzed:*	03/26/98											
EPA1312/8270	*Units:*	mg/L	R.L.										
Acenaphthene		< 0.025	(0.025)										
Acenaphthylene		< 0.025	(0.025)										
Anthracene		< 0.025	(0.025)										
Benzo(a)anthracene		< 0.025	(0.025)										
Benzo(a)pyrene		< 0.025	(0.025)										
Benzo(b)fluoranthene		< 0.025	(0.025)										
Benzo(g,h,i)perylene		< 0.025	(0.025)										
Benzo(k)fluoranthene		< 0.025	(0.025)										
4-Bromophenyl-phenylether		< 0.025	(0.025)										
Butyl benzyl phthalate		< 0.025	(0.025)										
Carbazole		< 0.025	(0.025)										
4-Chloro-3-Methylphenol		< 0.025	(0.025)										

Edward H. Yonemoto, Ph.D.
Technical Director

XENCO Laboratories

CERTIFICATE OF ANALYSIS SUMMARY 1-80927

K.E.I. Consultants, Inc.

Project ID: 610088
Project Name: TNM-96-16
Date Received in Lab : Mar 12, 1998 09:45
Project Manager: Theresa Nix
Date Report Faxed: Apr 1, 1998
Project Location: Lea County New Mexico
XENCO contact : Carlos Castro/Edward Yonemoto

Analysis Requested	*Lab ID:*	180927 001	180927 002	180927 003	180927 004	180927 005	180927 006
	Field ID:	SB-1	SB-1	SB-1	SB-2	SB-2	SB-2
	Depth:	0-2.5	15-17.5	30-32.5	0-2.5	15-17.5	30-32.5
	Matrix:	Solid	Solid	Solid	Solid	Solid	Solid
	Sampled:	03/09/98 12:56	03/09/98 13:14	03/09/98 13:30	03/09/98 13:45	03/09/98 14:06	03/09/98 14:35
EPA1312/8270	*Analyzed:*	03/26/98					
	Units:	mg/L R.L.					
4-Chloroaniline		< 0.025 (0.025)					
2-Chloronaphthalene		< 0.025 (0.025)					
2-Chlorophenol		< 0.025 (0.025)					
4-Chlorophenyl-phenyl ether		< 0.025 (0.025)					
Chrysene		< 0.025 (0.025)					
Di-n-butyl phthalate		< 0.025 (0.025)					
Di-n-octyl phthalate		< 0.025 (0.025)					
Dibenzo(a,h)anthracene		< 0.025 (0.025)					
Dibenzofuran		< 0.025 (0.025)					
1,2-Dichlorobenzene		< 0.025 (0.025)					
1,3-Dichlorobenzene		< 0.025 (0.025)					
1,4-Dichlorobenzene		< 0.025 (0.025)					
3,3'-Dichlorobenzidine		< 0.025 (0.025)					
2,4-Dichlorophenol		< 0.025 (0.025)					
Diethyl phthalate		< 0.025 (0.025)					
2,4-Dimethylphenol		< 0.025 (0.025)					
Dimethyl phthalate		< 0.025 (0.025)					
4,6-Dinitro-2-methylphenol		< 0.063 (0.063)					
2,4-Dinitrophenol		< 0.063 (0.063)					
2,4-Dinitrotoluene		< 0.025 (0.025)					
2,6-Dinitrotoluene		< 0.025 (0.025)					
Fluoranthene		< 0.025 (0.025)					
Fluorene		< 0.025 (0.025)					
Hexachlorobenzene		< 0.025 (0.025)					

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Analysis Requested	*Lab ID:*	180927 001	180927 002	180927 003	180927 004	180927 005	180927 006
	Field ID:	SB-1	SB-1	SB-1	SB-2	SB-2	SB-2
	Depth:	0-2.5	15-17.5	30-32.5	0-2.5	15-17.5	30-32.5
	Matrix:	Solid	Solid	Solid	Solid	Solid	Solid
	Sampled:	03/09/98 12:56	03/09/98 13:14	03/09/98 13:30	03/09/98 13:45	03/09/98 14:06	03/09/98 14:35
EPA1312/8270	*Analyzed:*	03/26/98					
	Units:	mg/L R.L.					
Hexachlorobutadiene		< 0.025 (0.025)					
Hexachlorocyclopentadiene		< 0.025 (0.025)					
Hexachloroethane		< 0.025 (0.025)					
Indeno(1,2,3-cd)pyrene		< 0.025 (0.025)					
Isophorone		< 0.025 (0.025)					
2-Methylnaphthalene		0.042 (0.025)					
2-Methylphenol		< 0.025 (0.025)					
4-Methylphenol		< 0.025 (0.025)					
N-Nitroso-di-n-propylamine		< 0.025 (0.025)					
N-Nitrosodiphenylamine		< 0.025 (0.025)					
Naphthalene		0.044 (0.025)					
2-Nitroaniline		< 0.063 (0.063)					
3-Nitroaniline		< 0.063 (0.063)					
4-Nitroaniline		< 0.063 (0.063)					
Nitrobenzene		< 0.025 (0.025)					
2-Nitrophenol		< 0.025 (0.025)					
4-Nitrophenol		< 0.025 (0.025)					
Pentachlorophenol		< 0.063 (0.063)					
Phenanthrene		< 0.025 (0.025)					
Phenol		< 0.025 (0.025)					
Pyrene		< 0.025 (0.025)					
1,2,4-Trichlorobenzene		< 0.025 (0.025)					
2,4,5-Trichlorophenol		< 0.063 (0.063)					
2,4,6-Trichlorophenol		< 0.025 (0.025)					

Edward H. Yonemoto, Ph.D.
Technical Director

XENCO Laboratories

CERTIFICATE OF ANALYSIS SUMMARY 1-80927

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Date Received in Lab : Mar 12, 1998 09:45
Project Manager: Theresa Nix
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XENCO contact : Carlos Castro/Edward Yonemoto

Analysis Requested	*Lab ID:*	180927 001	180927 002	180927 003	180927 004	180927 005	180927 006
	Field ID:	SB-1	SB-1	SB-1	SB-2	SB-2	SB-2
	Depth:	0-2.5	15-17.5	30-32.5	0-2.5	15-17.5	30-32.5
	Matrix:	Solid	Solid	Solid	Solid	Solid	Solid
	Sampled:	03/09/98 12:56	03/09/98 13:14	03/09/98 13:30	03/09/98 13:45	03/09/98 14:06	03/09/98 14:35
EPA1312/8270	*Analyzed:*	03/26/98					
	Units:	mg/L R.L.					
bis [2-Chloroethoxy] methane		< 0.025 (0.025)					
bis [2-Chloroethyl] ether		< 0.025 (0.025)					
bis [2-Chloroisopropyl] ether		< 0.025 (0.025)					
bis [2-Ethylhexyl] phthalate		< 0.025 (0.025)					
SPLP Volatiles EPA 8260	*Analyzed:*	03/30/98					
	Units:	mg/L R.L.					
Benzene		0.057 (0.025)					
Bromobenzene		< 0.025 (0.025)					
Bromochloromethane		< 0.025 (0.025)					
Bromodichloromethane		< 0.025 (0.025)					
Bromoform		< 0.025 (0.025)					
Bromomethane		< 0.025 (0.025)					
Carbon Tetrachloride		< 0.025 (0.025)					
Chlorobenzene		< 0.025 (0.025)					
Chloroethane		< 0.050 (0.050)					
Chloroform		< 0.025 (0.025)					
Chloromethane		< 0.050 (0.050)					
2-Chlorotoluene		< 0.025 (0.025)					
4-Chlorotoluene		< 0.025 (0.025)					
1,2-Dibromo-3-chloropropane		< 0.025 (0.025)					
Dibromochloromethane		< 0.025 (0.025)					
1,2-Dibromoethane		< 0.025 (0.025)					
Dibromomethane		< 0.025 (0.025)					

Edward H. Yonemoto, Ph.D.
Technical Director

XENCO Laboratories

CERTIFICATE OF ANALYSIS SUMMARY 1-80927

K.E.I. Consultants, Inc.

Project ID: 610088
Project Name: *TNM-96-16*
Date Received in Lab : Mar 12, 1998 09:45
Project Manager: Theresa Nix
Date Report Faxed: Apr 1, 1998
Project Location: Lea County New Mexico
XENCO contact : Carlos Castro/Edward Yonemoto

Analysis Requested	Lab ID:	180927 001	180927 002	180927 003	180927 004	180927 005	180927 006
	Field ID:	SB-1	SB-1	SB-1	SB-2	SB-2	SB-2
	Depth:	0-2.5	15-17.5	30-32.5	0-2.5	15-17.5	30-32.5
	Matrix:	Solid	Solid	Solid	Solid	Solid	Solid
	Sampled:	03/09/98 12:56	03/09/98 13:14	03/09/98 13:30	03/09/98 13:45	03/09/98 14:06	03/09/98 14:35
	Analyzed:	03/30/98					
EPA 8260	Units:	mg/L R.L.					
1,2-Dichlorobenzene		< 0.025 (0.025)					
1,3-Dichlorobenzene		< 0.025 (0.025)					
1,4-Dichlorobenzene		< 0.025 (0.025)					
Dichlorodifluoromethane		< 0.025 (0.025)					
1,1-Dichloroethane		< 0.025 (0.025)					
1,2-Dichloroethane		< 0.025 (0.025)					
1,1-Dichloroethene		< 0.025 (0.025)					
1,2-Dichloropropane		< 0.025 (0.025)					
1,3-Dichloropropane		< 0.025 (0.025)					
2,2-Dichloropropane		< 0.025 (0.025)					
1,1-Dichloropropene		< 0.025 (0.025)					
Ethylbenzene		0.568 (0.025)					
Hexachlorobutadiene		< 0.025 (0.025)					
Isopropylbenzene		0.080 (0.025)					
MTBE		< 0.050 (0.050)					
Methylene chloride		< 0.050 (0.050)					
Naphthalene		0.160 (0.025)					
Styrene		< 0.025 (0.025)					
1,1,1,2-Tetrachloroethane		< 0.025 (0.025)					
1,1,2,2-Tetrachloroethane		< 0.025 (0.025)					
Tetrachloroethene		< 0.025 (0.025)					
Toluene		** 1.364 (0.025)					
1,2,3-Trichlorobenzene		< 0.025 (0.025)					
1,2,4-Trichlorobenzene		< 0.025 (0.025)					

Edward S. Yonemoto, Ph.D.
Technical Director

XENCO Laboratories

CERTIFICATE OF ANALYSIS SUMMARY 1-80927

K.E.I. Consultants, Inc.

Project ID: 610088
Project Name: TNM-96-16
Date Received in Lab : Mar 12, 1998 09:45
Project Manager: Theresa Nix
Date Report Faxed: Apr 1, 1998
Project Location: Lea County New Mexico
XENCO contact : Carlos Castro/Edward Yonemoto

Analysis Requested	*Lab ID:*	180927 001	180927 002	180927 003	180927 004	180927 005	180927 006
	Field ID:	SB-1	SB-1	SB-1	SB-2	SB-2	SB-2
	Depth:	0-2.5	15-17.5	30-32.5	0-2.5	15-17.5	30-32.5
	Matrix:	Solid	Solid	Solid	Solid	Solid	Solid
	Sampled:	03/09/98 12:56	03/09/98 13:14	03/09/98 13:30	03/09/98 13:45	03/09/98 14:06	03/09/98 14:35
EPA 8260	*Analyzed:*	03/30/98					
	Units:	mg/L R.L.					
1,1,1-Trichloroethane		< 0.025 (0.025)					
1,1,2-Trichloroethane		< 0.025 (0.025)					
Trichloroethene		< 0.025 (0.025)					
Trichlorofluoromethane		< 0.025 (0.025)					
1,2,3-Trichloropropane		< 0.025 (0.025)					
1,2,4-Trimethylbenzene		0.260 (0.025)					
1,3,5-Trimethylbenzene		0.083 (0.025)					
Vinyl chloride		< 0.025 (0.025)					
cis-1,2-Dichloroethene		< 0.025 (0.025)					
cis-1,3-Dichloropropene		< 0.025 (0.025)					
m,p-Xylenes		0.869 (0.025)					
n-Butylbenzene		< 0.025 (0.025)					
n-Propylbenzene		0.067 (0.025)					
o-Xylene		0.596 (0.025)					
p-Isopropyltoluene		< 0.025 (0.025)					
sec-Butylbenzene		< 0.025 (0.025)					
tert-Butylbenzene		< 0.025 (0.025)					
trans-1,2-Dichloroethene		< 0.025 (0.025)					
trans-1,3-Dichloropropene		< 0.025 (0.025)					
** Result beyond calibration limits							
SPLP TPH	*Analyzed:*	03/26/98					
1312/418.1	*Units:*	ppm R.L.					
Total Petroleum Hydrocarbons		6.8 (0.9)					

Edward H. Yonemoto, Ph.D.
Technical Director

XENCO Laboratories

CERTIFICATE OF ANALYSIS SUMMARY 1-80927

K.E.I. Consultants, Inc.

Project ID: 610088 | ***Project Name: TNM-96-16*** | **Date Received in Lab :** Mar 12, 1998 09:45

Project Manager: Theresa Nix | **Date Report Faxed:** Apr 1, 1998

Project Location: Lea County New Mexico | **XENCO contact :** Carlos Castro/Edward Yonemoto

Analysis Requested	*Lab ID:*	180927 007						
	Field ID:	FOC						
	Depth:							
	Matrix:	Solid						
	Sampled:	03/09/98 14:45						
Moisture Content **ASTM 2216-71**	*Analyzed:*	03/16/98						
	Units:	%	R.L.					
Moisture Content		3.5	(0.1)					
Organic Content **ASTM D2974**	*Analyzed:*	03/16/98						
	Units:	%	R.L.					
Organic Content		0.9	(0.1)					

Edward H. Yonemoto, Ph.D.
Technical Director

XENCO Laboratories

Certificate Of Quality Control for Batch : 18Z99A92

SW- 846 8015 M TPH- DRO (Diesel)

Date Validated: Mar 19, 1998 13:30
Date Analyzed: Mar 17, 1998 20:11
QA/QC Manager: Sunil Ajai, M.S.

Analyst: OR
Matrix: Solid

	BLANK SPIKE ANALYSIS						
Parameter	[A] Blank Result mg/kg	[B] Blank Spike Result mg/kg	[C] Blank Spike Amount mg/kg	[D] Detection Limit mg/kg	[E] QC Blank Spike Recovery %	[F] LIMITS Recovery Range %	[G] Qualifier
Total Petroleum Hydrocarbons	< 10.00	86.17	100	10.00	86.2	65-135	

Blank Spike Recovery [E] = 100*(B-A)/(C)
N.C. = Not calculated, data below detection limit
N.D. = Below detection limit
All results are based on MDL and validated for QC purposes only

Edward H. Yonemoto, Ph.D.
Technical Director

XENCO Laboratories

Certificate Of Quality Control for Batch : 18Z99A92

SW- 846 8015 M TPH- DRO (Diesel)

Date Validated: Mar 19, 1998 13:30
Date Analyzed: Mar 17, 1998 22:00
QA/QC Manager: Sunil Ajai, M.S.

Analyst: OR
Matrix: Solid

	MATRIX SPIKE / MATRIX SPIKE DUPLICATE AND RECOVERY										
Q.C. Sample ID 180926- 003	[A] Sample Result	[B] Matrix Spike Result	[C] Matrix Spike Duplicate Result	[D] Matrix Spike Amount	[E] Detection Limit	Matrix Limit Relative Difference	[F] QC Spike Relative Difference	[G] QC Matrix Spike Recovery	[H] QC M.S.D. Recovery	[I] Matrix Spike Recovery Range	[J] Qualifier
Parameter	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	%	%	%	%	
Total Petroleum Hydrocarbons	28.34	117	118	100	10.00	30.0	0.9	88.7	89.7	65-135	

Spike Relative Difference [F] = 200*(B-C)/(B+C)
Matrix Spike Recovery [G] = 100*(B-A)/[D]
M.S.D. = Matrix Spike Duplicate
M.S.D. Recovery [H] = 100*(C-A)/[D]
N.D. = Below detection limit or not detected
All results are based on MDL and validated for QC purposes

Edward H. Yonemoto, Ph.D.
Technical Director

XENCO Laboratories

Certificate Of Quality Control for Batch : 18A25A88

SW- 846 5030/8020 BTEX

Date Validated: Mar 16, 1998 11:30
Date Analyzed: Mar 13, 1998 11:04
QA/QC Manager: Sunil Ajai, M.S.

Analyst: HL
Matrix: Solid

	BLANK SPIKE ANALYSIS						
Parameter	[A] Blank Result ppm	[B] Blank Spike Result ppm	[C] Blank Spike Amount ppm	[D] Detection Limit ppm	[E] QC Blank Spike Recovery %	[F] LIMITS Recovery Range %	[G] Qualifier
Benzene	< 0.0010	0.0933	0.1000	0.0010	93.3	65-135	
Toluene	< 0.0010	0.0906	0.1000	0.0010	90.6	65-135	
Ethylbenzene	< 0.0010	0.0927	0.1000	0.0010	92.7	65-135	
m,p-Xylenes	< 0.0020	0.1850	0.2000	0.0020	92.5	65-135	
o-Xylene	< 0.0010	0.0920	0.1000	0.0010	92.0	65-135	

Blank Spike Recovery [E] = 100*(B-A)/(C)
N.C. = Not calculated, data below detection limit
N.D. = Below detection limit
MDL results are based on MDL and validated for QC purposes only

Edward H. Yonemoto, Ph.D.
Technical Director

XENCO Laboratories

Certificate Of Quality Control for Batch : 18A25A88

SW- 846 5030/8020 BTEX

Date Validated: Mar 16, 1998 11:30
Date Analyzed: Mar 13, 1998 14:54
QA/QC Manager: Sunil Ajai, M.S.

Analyst: HL
Matrix: Solid

	MATRIX SPIKE / MATRIX SPIKE DUPLICATE AND RECOVERY										
Q.C. Sample ID 180926- 003	[A] Sample Result	[B] Matrix Spike Result	[C] Matrix Spike Duplicate Result	[D] Matrix Spike Amount	[E] Detection Limit	Matrix Limit Relative Difference	[F] QC Spike Relative Difference	[G] QC Matrix Spike Recovery	[H] QC M.S.D. Recovery	[I] Matrix Spike Recovery Range	[J] Qualifier
Parameter	ppm	ppm	ppm	ppm	ppm	%	%	%	%	%	
Benzene	< 0.020	1.864	1.908	2.000	0.020	25.0	2.3	93.2	95.4	65-135	
Toluene	< 0.020	1.830	1.852	2.000	0.020	25.0	1.2	91.5	92.6	65-135	
Ethylbenzene	< 0.020	1.906	1.898	2.000	0.020	25.0	0.4	95.3	94.9	65-135	
m,p-Xylenes	< 0.040	3.760	3.760	4.000	0.040	25.0	0.0	94.0	94.0	65-135	
o-Xylene	< 0.020	1.886	1.892	2.000	0.020	25.0	0.3	94.3	94.6	65-135	

Spike Relative Difference [F] = 200*(B-C)/(B+C)
Matrix Spike Recovery [G] = 100*(B-A)/[D]
M S D. = Matrix Spike Duplicate
M S.D. Recovery [H] = 100*(C-A)/[D]
N.D. = Below detection limit or not detected
All results are based on MDL and validated for QC purposes

Edward H. Yonemoto, Ph.D.
Technical Director

XENCO Laboratories

Certificate Of Quality Control for Batch : 18A23A93

EPA1312/8260 SPLP Volatiles

Date Validated: Mar 31, 1998 17:00
Date Analyzed: Mar 30, 1998 11:38
QA/QC Manager: Sunil Ajai, M.S.

Analyst: CE
Matrix: Solid

	BLANK SPIKE ANALYSIS						
Parameter	[A] Blank Result mg/L	[B] Blank Spike Result mg/L	[C] Blank Spike Amount mg/L	[D] Detection Limit mg/L	[E] QC LIMITS Blank Spike Recovery %	[F] Recovery Range %	[G] Qualifier
Benzene	< 0.0010	0.0481	0.0500	0.0010	96.2	66-142	
Chlorobenzene	< 0.0010	0.0487	0.0500	0.0010	97.4	60-133	
1,1-Dichloroethene	< 0.0040	0.0486	0.0500	0.0040	97.2	59-172	
Toluene	< 0.0010	0.0475	0.0500	0.0010	95.0	59-139	
Trichloroethene	< 0.0030	0.0507	0.0500	0.0030	101.4	62-137	

nk Spike Recovery [E] = 100*(B-A)/(C)
N.C. = Not calculated. data below detection limit
N.D. = Below detection limit
results are based on MDL and validated for QC purposes only

Edward H. Yonemoto, Ph.D.
Technical Director

XENCO Laboratories

Certificate Of Quality Control for Batch : 18A23A93

EPA1312/8260 SPLP Volatiles

Date Validated: Mar 31, 1998 17:00
Date Analyzed: Mar 30, 1998 18:19
QA/QC Manager: Sunil Ajai, M.S.

Analyst: CE
Matrix: Solid

	MATRIX SPIKE / MATRIX SPIKE DUPLICATE AND RECOVERY										
Q.C. Sample ID 180927- 001	[A] Sample Result	[B] Matrix Spike Result	[C] Matrix Spike Duplicate Result	[D] Matrix Spike Amount	[E] Detection Limit	Matrix Limit Relative Difference	[F] QC Spike Relative Difference	[G] QC Matrix Spike Recovery	[H] QC M.S.D. Recovery	[I] Matrix Spike Recovery Range	[J] Qualifier
Parameter	mg/L	mg/L	mg/L	mg/L	mg/L	%	%	%	%	%	
Benzene	0.0570	0.2670	0.2575	0.2500	0.0050	20.0	3.6	84.0	80.2	66-142	
Chlorobenzene	< 0.0050	0.2305	0.2195	0.2500	0.0050	20.0	4.9	92.2	87.8	60-133	
1,1-Dichloroethene	< 0.0200	0.2190	0.2025	0.2500	0.0200	25.0	7.8	87.6	81.0	59-172	
Toluene	1.3645	1.3500	1.3035	0.2500	0.0050	20.0	3.5	5.8	24.4	59-139	A
Trichloroethene	< 0.0150	0.2230	0.2140	0.2500	0.0150	20.0	4.1	89.2	85.6	62-137	

(A) Recovery affected by high analyte concentration in sample (matrix effect)
Spike Relative Difference [F] = 200*(B-C)/(B+C)
Matrix Spike Recovery [G] = 100*(B-A)/[D]
M S.D. = Matrix Spike Duplicate
M.S D. Recovery [H] = 100*(C-A)/[D]
N.D. = Below detection limit or not detected
All results are based on MDL and validated for QC purposes

Edward H. Yonemoto, Ph.D.
Technical Director

XENCO Laboratories

Certificate Of Quality Control for Batch : 18A34B35

EPA 1311/8270 TCLP Semi-volatiles

Date Validated: Mar 26, 1998 15:10
Date Analyzed: Mar 26, 1998 03:54
QA/QC Manager: Sunil Ajai, M.S.

Analyst: LC
Matrix: Solid

BLANK SPIKE / BLANK SPIKE DUPLICATE AND RECOVERY

Parameter	[A] Blank Result mg/L	[B] Blank Spike Result mg/L	[C] Blank Spike Duplicate Result mg/L	[D] Blank Spike Amount mg/L	[E] Detection Limit mg/L	Blank Limit Relative Difference %	[F] QC Spike Relative Difference %	[G] QC Blank Spike Recovery %	[H] QC B.S.D. Recovery %	[I] Blank Spike Recovery Range %	[J] Qualifier
Acenaphthene	< 0.0050	0.2035	0.2155	0.2500	0.0050	19.0	5.7	81.4	86.2	46-118	
4-Chloro-3-Methylphenol	< 0.0050	0.1830	0.1610	0.2500	0.0050	33.0	12.8	73.2	64.4	23-97	
2-Chlorophenol	< 0.0050	0.1740	0.1510	0.2500	0.0050	28.7	14.2	69.6	60.4	27-123	
1,4-Dichlorobenzene	< 0.0050	0.2000	0.2055	0.2500	0.0050	32.1	2.7	80.0	82.2	36-97	
2,4-Dinitrotoluene	< 0.0050	0.1825	0.1955	0.2500	0.0050	21.8	6.9	73.0	78.2	24-96	
N-Nitroso-di-n-propylamine	< 0.0050	0.1875	0.1960	0.2500	0.0050	55.4	4.4	75.0	78.4	41-116	
4-Nitrophenol	< 0.0100	0.0560	0.0555	0.2500	0.0100	47.2	0.9	22.4	22.2	10-80	
Pentachlorophenol	< 0.0050	0.0650	0.0560	0.2500	0.0050	48.9	14.9	26.0	22.4	9-103	
Phenol	< 0.0050	0.0910	0.0775	0.2500	0.0050	22.6	16.0	36.4	31.0	12-89	
Pyrene	< 0.0100	0.2220	0.2360	0.2500	0.0100	25.2	6.1	88.8	94.4	26-127	
1,2,4-Trichlorobenzene	< 0.0100	0.2135	0.2245	0.2500	0.0100	23.0	5.0	85.4	89.8	39-98	

Spike Relative Difference [F] = 200*(B-C)/(B+C)
Blank Spike Recovery [G] = 100*(B-A)/[D]
B.S.D. = Blank Spike Duplicate
B.S.D. Recovery [H] = 100*(C-A)/[D]
N.D. = Below detection limit or not detected
All results are based on MDL and validated for QC purposes

Edward H. Yonemoto, Ph.D.
Technical Director

XENCO Laboratories

Certificate Of Quality Control for Batch : 18A07C31

EPA 418.1 Total Petroleum Hydrocarbons

Date Validated: Mar 26, 1998 14:35
Date Analyzed: Mar 26, 1998 14:04
QA/QC Manager: Sunil Ajai, M.S.

Analyst: EZ
Matrix: Liquid

	BLANK SPIKE / BLANK SPIKE DUPLICATE AND RECOVERY										
Parameter	[A] Blank Result ppm	[B] Blank Spike Result ppm	[C] Blank Spike Duplicate Result ppm	[D] Blank Spike Amount ppm	[E] Detection Limit ppm	Blank Limit Relative Difference %	[F] QC Spike Relative Difference %	[G] QC Blank Spike Recovery %	[H] QC B.S.D. Recovery %	[I] Blank Spike Recovery Range %	[J] Qualifier
Total Petroleum Hydrocarbons	< 0.40	6.51	6.92	6.93	0.40	25.0	6.1	94.0	99.9	70-125	

Spike Relative Difference [F] = 200*(B-C)/(B+C)
Blank Spike Recovery [G] = 100*(B-A)/[D]
B.S.D. = Blank Spike Duplicate
B.S.D. Recovery [H] = 100*(C-A)/[D]
N.D. = Below detection limit or not detected
All results are based on MDL and validated for QC purposes

Edward H. Yonemoto, Ph.D.
Technical Director

XENCO Laboratories

Certificate Of Quality Control for Batch : 18A19A97

ASTM 2216- 71 Moisture Content

Date Validated: Mar 17, 1998 09:00
Date Analyzed: Mar 16, 1998 14:05
QA/QC Manager: Sunil Ajai, M.S.

Analyst: IF
Matrix: Solid

	MATRIX DUPLICATE ANALYSIS					
Q.C. Sample ID 180926- 011	[A] Sample Result	[B] Duplicate Result	[C]	[D] QC	[E] LIMITS	[F]
Parameter			Detection Limit	Relative Difference	Relative Difference	Qualifier
	%	%	%	%	%	
Moisture Content	11.20	10.70	0.1	4.6	20.0	

Relative Difference [D] = 200*(B-A)/(B+A)
N.C. = Not calculated, data below detection limit
N.D. = Below detection limit
All results are based on MDL and validated for QC purposes only

Edward T. Yonemoto, Ph.D.
Technical Director

XENCO Laboratories

Certificate Of Quality Control for Batch : 18A19A98

ASTM D2974 Organic Content

Date Validated: Mar 17, 1998 09:05
Date Analyzed: Mar 16, 1998 14:05
QA/QC Manager: Sunil Ajai, M.S.

Analyst: IF
Matrix: Solid

	MATRIX DUPLICATE ANALYSIS					
Q.C. Sample ID 180926- 011	[A] Sample Result	[B] Duplicate Result	[C]	[D] QC	[E] LIMITS	[F]
Parameter			Detection Limit	Relative Difference	Relative Difference	Qualifier
	%	%	%	%	%	
Organic Content	1.01	1.00	0.1	1.0	20.0	

Relative Difference [D] = 200*(B-A)/(B+A)
N.C. = Not calculated, data below detection limit
N.D. = Below detection limit
All results are based on MDL and validated for QC purposes only

Edward H. Tonemoto, Ph.D.
Technical Director

XENCO Laboratories

ANALYTICAL CHAIN OF CUSTODY REPORT
CHRONOLOGY OF SAMPLES

K.E.I. Consultants, Inc.

Project ID: 610088
Project Manager: Theresa Nix
Project Location: Lea County
New Mexico

Project Name: TNM-96-16

XENCO COC#: 1-80927
Date Received in Lab: Mar 12, 1998 09:45 by LY
XENCO contact : Carlos Castro/Edward Yonemoto

	Field ID	Lab. ID	Method Name	Method ID	Units	Turn Around	Date and Time			
							Sample Collected	Addition Requested	Extraction	Analysis
1	SB-1 (0-2.5)	180927-001	BTEX	SW-846	ppm	Standard	Mar 9, 1998 12:56		Mar 13, 1998 by HL	Mar 13, 1998 19:22 by HL
2			TPH8015M-D	SW-846 8015 M	mg/kg	Standard	Mar 9, 1998 12:56		Mar 12, 1998 by OL	Mar 18, 1998 02:57 by OR
3			SPLP TPH	EPA	ppm	7 days	Mar 9, 1998 12:56	Mar20,1998 09:00	Mar 26, 1998 by EZ	Mar 26, 1998 14:20 by EZ
4			VOA (8260)	EPA1312/8260	mg/kg	7 days	Mar 9, 1998 12:56	Mar20,1998 09:00	Mar 30, 1998 by CE	Mar 30, 1998 17:42 by CE
5			SPLP-SV(TCL)	SW846-1312/82	ug/L	7 days	Mar 9, 1998 12:56	Mar20,1998 09:00	Mar 25, 1998 by SS	Mar 26, 1998 18:34 by LC
6	SB-1 (15-17.5)	180927-002	BTEX	SW-846	ppm	Standard	Mar 9, 1998 13:14		Mar 13, 1998 by HL	Mar 13, 1998 16:50 by HL
7			TPH8015M-D	SW-846 8015 M	mg/kg	Standard	Mar 9, 1998 13:14		Mar 12, 1998 by OL	Mar 18, 1998 03:24 by OR
8	SB-1 (30-32.5)	180927-003	BTEX	SW-846	ppm	Standard	Mar 9, 1998 13:30		Mar 13, 1998 by HL	Mar 13, 1998 15:52 by HL
9			TPH8015M-D	SW-846 8015 M	mg/kg	Standard	Mar 9, 1998 13:30		Mar 12, 1998 by OL	Mar 18, 1998 03:51 by OR
10	SB-2 (0-2.5)	180927-004	BTEX	SW-846	ppm	Standard	Mar 9, 1998 13:45		Mar 13, 1998 by HL	Mar 13, 1998 17:09 by HL
11			TPH8015M-D	SW-846 8015 M	mg/kg	Standard	Mar 9, 1998 13:45		Mar 12, 1998 by OL	Mar 18, 1998 04:18 by OR
12	SB-2 (15-17.5)	180927-005	BTEX	SW-846	ppm	Standard	Mar 9, 1998 14:06		Mar 13, 1998 by HL	Mar 13, 1998 17:27 by HL
13			TPH8015M-D	SW-846 8015 M	mg/kg	Standard	Mar 9, 1998 14:06		Mar 12, 1998 by OL	Mar 18, 1998 05:37 by OR
14	SB-2 (30-32.5)	180927-006	BTEX	SW-846	ppm	Standard	Mar 9, 1998 14:35		Mar 13, 1998 by HL	Mar 13, 1998 16:11 by HL
15			TPH8015M-D	SW-846 8015 M	mg/kg	Standard	Mar 9, 1998 14:35		Mar 12, 1998 by OL	Mar 18, 1998 05:15 by OR
16	FOC	180927-007	Moisture	ASTM 2216-71	%	Standard	Mar 9, 1998 14:45		Mar 16, 1998 by IF	Mar 16, 1998 14:15 by IF
17			Org. Content	ASTM D2974	%	Standard	Mar 9, 1998 14:45		Mar 16, 1998 by IF	Mar 16, 1998 14:15 by IF

XENCO Laboratories
11381 Meadowglen Suite L Houston, Texas 77082
(713) 589-0692 Fax (713) 589-0695

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST FORM

Lab. Batch # 80927-SA

Contractor: K.e.i Consultants
Phone (210) 680-3767
Address: 5309 Wurzbach, Suite 100 San Antonio TX. 78238
Project Name: TNM-96-16
Project Director: Mike Hawthorne
Project Location: Lea County, New Mexico
Project Manager: Therese Nix
Sampler Signature: [signature]
Project No. 610088

No. coolers this shipment:
Carrier: UPS
Airbill No.
Contractor COC #
Quote #:
P.O. No: 8820

Analyses requested: SW-846-8020 BTEX (8020/8020-8021); TPH (418.1) 8015 modified DRO; SPLP TPH 1312; SPLP VOC's SW846-1312/8260; SPLP SVOC's SW846-1312/8270; Please Hold

Turn-around: ASAP; 24 hrs; 48 hrs; (Standard)

Field ID	Date	Time	Depth	Soil	Water	Comp	Grab	Container Size	Container Type P, G	Ice	Other	Sample Description	No. of Containers Total	BTEX	TPH	SPLP TPH	SPLP VOC's	SPLP SVOC's	Please Hold	Remarks	LAB ONLY ID #
1 SB-1 Depth 0-2.5	3-9-98	12:56		/			/	9oz		/			1	/	/	/	/	/			1
2 SB-1 Depth 15-17.5	↓	13:11		↓			↓	↓		↓			1	↓	↓	↓	↓	↓			2
3 SB-1 Depth 30-32.5	↓	13:30		↓			↓	↓		↓			1	↓	↓	↓	↓	↓			3
4 SB-2 Depth 0-2.5	↓	13:45		↓			↓	↓		↓			1	↓	↓	↓	↓	↓			4
5 SB-2 Depth 15-17.5	↓	14:06		↓			↓	↓		↓			1	↓	↓	↓	↓	↓			5
6 SB-2 Depth 30-32.5	↓	14:35		↓			↓	↓		↓			1	↓	↓	↓	↓	↓			6
7 North wall	↓	15:05		↓		/		↓		↓			1						/	Please call Therese Nix for Analysis	7
8 South wall	↓	15:10		↓		↓		↓		↓			1						/	"	8
9 East wall	↓	15:15		↓		↓		↓		↓			1						/	"	9
10 West wall	↓	15:20		↓		↓		↓		↓			1						/	"	10

Relinquished by: (Signature)	DATE	TIME	Received by: (Signature)	DATE	TIME
[signature]	3-11-98	16:00			
			Received For Laboratory by: UPS [signature]	3/12/98	9:48

Remarks: Soil Sample w/highest TPH value will be analyzed for the following
- SPLP TPH = EPA Method 1312
- SPLP VOC's = SW846-1312/8260
- SPLP SVOC's = SW846-1312/8270

Pink (Contractor), Yellow & White (Lab).

* Pre-scheduling is recommended

Precision Analytical Services

XENCO Laboratories
11381 Meadowglen Suite L Houston, Texas 77082
(713) 589-0692 Fax (713) 589-0695

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST FORM

Lab. Batch # 180927-8A

Contractor: Kleinfelder Consultants Phone (210) 680-3767
Address: 5309 Wurzbach, Suite 100 S.A., TX 78238
Project Name: TNM 96-16 Project Director: Mike Hawthorne
Project Location: Lea County, New Mexico Project Manager: Theresa Nix
Sampler Signature: Project No. 6100788

No. coolers this shipment: Contractor COC #
Carrier: UPS Quote #:
Airbill No. P.O. No: 8820

Field ID	Date	Time	DEPTH	SOIL	WATER	COMP	GRAB	Container Size	Container Type P, G	Preservative Ice	Preservative Other	Sample Description	No of CONTAINERS Total	BTEX (8030/8020-602)	TPH (418.1)	ASTM "Fraction" Foc D2974	Moist Content	Please Hold	Remarks	LAB ONLY ID #
1 EXCAVATION Bottom	3-9-98	15:25		/		/		902		/			1						Please Call Theresa Nix for Analysis	1
2 FOC	3-9-98	14:45		/			/			/			1			/	/			2
3																				3
4																				4
5																				5
6																				6
7																				7
8																				8
9																				9
10																				10

Turn-around: * ASAP * 24 hrs 48 hrs (Standard)

SAMPLE CHARACTERIZATION: Unl Dies Ker Unknown; Waste Oil; PIT No: Tank No:

Relinquished by: (Signature)	DATE	TIME	Received by: (Signature)	DATE	TIME
	3-11-98	16:00			
			Received For Laboratory by UPS	3/12/98	945

Remarks

Pink (Contractor), Yellow & White (Lab)

* Pre-scheduling is recommended

Precision Analytical Services

QA/QC PROCEDURES

DECONTAMINATION OF EQUIPMENT

Prior to drilling at each boring location, the auger bit was cleaned with Liqui-Nox detergent and rinsed with distilled water.

SOIL SAMPLING

Samples of the subsurface soils were obtained through the collection of auger cuttings at discrete intervals during drilling utilizing a hydraulic drilling rig. Representative soil samples were divided into two separate portions using clean, disposable gloves and clean sampling tools. One portion of the soil sample was placed in a disposable sample bag. The bag was labeled and sealed for head-space analysis using a photoionization detector (PID) calibrated to a 100 ppm isobutylene standard. Each sample was allowed to volatilize for approximately 30 minutes at ambient temperature prior to conducting the analysis.

The other portion of the soil sample was placed in a sterile glass container equipped with a Teflon-lined lid furnished by the analytical laboratory. The container was filled to capacity to limit the amount of head-space present. Each container was labeled and placed on ice in an insulated cooler. Upon selection of samples for analysis, the cooler was sealed for shipment to the laboratory. Proper chain-of-custody documentation was maintained throughout the sampling process.

Soil samples were express mailed to Xenco Laboratories of San Antonio, Texas for BTEX, TPH-DRO, SPLP SVOC, SPLP VOC, SPLP TPH, FOC, and moisture content analyses using the methods described below. Soil samples were analyzed for BTEX, TPH, and SPLP analyses within 14 days following the collection date.

The soil samples were analyzed for BTEX concentrations in accordance with EPA Method SW846-8020, for TPH concentrations in accordance with modified EPA Method 8015-DRO, for SPLP TPH concentrations in accordance with EPA Method 1312/418.1, for SPLP VOC concentrations in accordance with EPA Method SW846-1312/8260, for SPLP SVOC concentrations in accordance with EPA Method SW846-1312/8270, for FOC concentrations in accordance with ASTM Method D2974, and for moisture content in accordance with ASTM 2216-71.

LABORATORY PROTOCOL

The laboratory was responsible for proper QA/QC procedures. These procedures were transmitted with the laboratory reports.