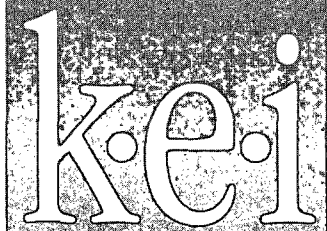


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BASELINE RISK ASSESSMENT REPORT

TEXAS - NEW MEXICO PIPE LINE COMPANY

TNM-96-15

LEA COUNTY, NEW MEXICO



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BASELINE RISK ASSESSMENT REPORT

**TEXAS - NEW MEXICO PIPE LINE COMPANY
TNM-96-15
LEA COUNTY, NEW MEXICO**

PREPARED FOR:

TEXAS-NEW MEXICO PIPE LINE COMPANY

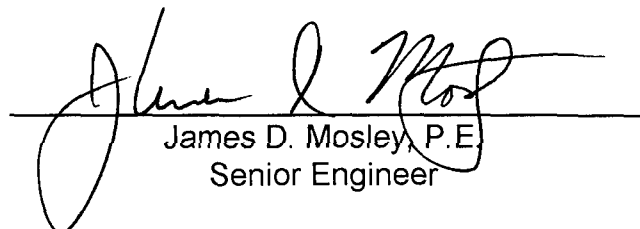
P. O. Box 1030
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Mr. Tony Savoie

PREPARED BY:

KEI

M. Kay Hawthorne, REM
Senior Scientist

A handwritten signature in black ink, appearing to read 'James D. Mosley', is written over a horizontal line.

James D. Mosley, P.E.
Senior Engineer

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EXECUTIVE SUMMARY

The Texas-New Mexico Pipe Line Company release site designated as TNM-96-15 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-96-15 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 sand, sandy clay, clay and caliche. Ground water was not encountered on site during drilling (to a depth of approximately 33 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, naphthalene, pyrene 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	8.20×10^{-7}	1.13×10^{-7}
Maximum Total Hazard Index	2.99	0.542

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)
Benzene	4.5	3.48
Chrysene	>4	0.4
Ethylbenzene	52.7	43.0
Naphthalene	18.1	4.9
Phenanthrene	2.95	2.0
Pyrene	7.81	.40
Toluene	20.1	18.9
Xylenes	76.1	57.7
TPH	3,060	10,000

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 (TNMPL) release site designated as TNM-96-15 in Lea County, New Mexico. The site is located in Section 17, Township 18 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.

4/96: Crude oil pipeline release discovered. Initial response activities included:

- pipeline repair
- excavation of heavily impacted soils

3/9/98: KEI installed two soil borings to delineate vertical extent of contamination.

6/24/98: 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, May 1, 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

(BTX), total petroleum hydrocarbons (TPH), and the polynuclear aromatic hydrocarbons (PAHs) chrysene, pyrene, 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:

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

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-96-15 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.

The soils on site are sand, sandy clay, clay and caliche. Ground water was not encountered on site during drilling (at depths up to 33 feet) so ground water data is unavailable. According to the Geology and Ground-Water Conditions in Southern Lea County, New Mexico, a well located approximately 2 miles northeast of the site recorded a depth of 86 feet.

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 consists of vegetated sand dunes.

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 ground water.

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 m³ of air per day and will have 5800 cm² 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 m³/day, will ingest 480 mg/day, and will have 3300 cm² 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 86 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	8.20×10^{-7}	1.13×10^{-7}
Maximum Total Hazard Index	2.99	0.542

The carcinogenic risk exceeds 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)
Benzene	4.5	3.48
Chrysene	>4	0.4
Ethylbenzene	52.7	43.0
Naphthalene	18.1	4.9
Phenanthrene	2.95	2.0
Pyrene	7.81	.40
Toluene	20.1	18.9
Xylenes	76.1	57.7
TPH	3,060	10,000

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-96-15
Lea County, New Mexico

WORKSHEET 1 EXPOSURE PATHWAY ANALYSIS

<i>Ground Water</i>		
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.

<i>Soils</i>		
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-96-15
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:	0.010	---	Measured from a sample obtained at a depth of 5-6 feet on March 10, 1998.
Width of Source Area	120.0	ft	See FIGURE 2.
Total Soil Source Area	12,000	ft ²	See FIGURE 2.
Width of Source Area, Construction 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	Assumed to be 10% of average wind speed.
Average Wind Speed, Construction Worker	0.492	m/sec	
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-96-15
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-96-15
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
<u>Carcinogens</u> Benzene Chrysene	3.48e+0	5.41e-7	7.74e-7	5.64e-8
	4.00e-1	2.54e-8	4.67e-8	6.35e-11
	Total Risk:	5.67e-7	8.20e-7	5.64e-8
<u>Non-Carcinogens</u> Ethylbenzene Naphthalene Phenanthrene Pyrene Toluene Xylene (mixed isomers) TPH - New Method	4.30e+1	7.73e-4	6.04e-3	8.15e-3
	4.90e+0	9.23e-4	2.70e-3	2.46e-3
	2.00e+0	5.26e-4	6.78e-3	2.61e-3
	4.00e-1	2.51e-4	5.12e-4	8.09e-5
	1.89e+1	1.30e-3	2.41e-3	1.41e-2
	5.77e+1	2.44e-3	2.69e-3	2.66e-2
	1.00e+4	9.59e-1	2.97e+0	1.86e+0
Hazard Index:		9.65e-1	2.99e+0	1.92e+0

BASELINE RISK ASSESSMENT

Texas-New Mexico Pipe Line Co.
TNM-96-15
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:						
Constituent of Concern	Soil Concentrations Maximum (mg/kg)	On-Site Worker		On-Site Resident		Constr. Worker Inhalation + Dermal
		Ingestion	Inhalation	Ingestion	Inhalation	
<u>Carcinogens</u> Benzene Chrysene	3.48e+0	3.36e-8		1.13e-7		
	4.00e-1	0.00e+0		0.00e+0		
	Total Risk:	3.36e-8		1.13e-7		
<u>Non-Carcinogens</u> Ethylbenzene Naphthalene Phenanthrene Pyrene Toluene	4.30e+1	0.00e+0		0.00e+0		
	4.90e+0	0.00e+0		0.00e+0		
	2.00e+0	0.00e+0		0.00e+0		
	4.00e-1	0.00e+0		0.00e+0		
	1.89e+1	5.82e-4		1.63e-3		
Xylene (mixed isomers) TPH - New Method	5.77e+1	6.53e-4		1.83e-3		
	1.00e+4	1.93e-1		5.39e-1		
	Hazard Index:	1.94e-1		5.42e-1		

TARGET LEVEL CALCULATIONS

Texas-New Mexico Pipe Line Co.

TNM-96-15

Lea County, New Mexico

WORKSHEET 6

EXPOSURE PATHWAYS WITH UNACCEPTABLE RISK

<i>Ground Water</i>		
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

<i>Soils</i>		
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-96-15
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	On-Site <u>Worker</u> Inh+Ing+Der (mg/kg)	X	On-Site <u>Resident</u> Inh+Ing+Der (mg/kg)	Construction <u>Worker</u> Inh+Ing+Der (mg/kg)	X	Critical SSTL (mg/kg)	Soil	
									Maximum (mg/kg)	95th UCL (mg/kg)
Constituent of Concern	<u>Carcinogens</u>									
	Benzene		6.43e+0 >4		4.50e+0 >4	6.17e+1 >4		4.50e+0 >4	3.48e+0 4.00e-1	N/A N/A
	Chrysene									
	<u>Non-Carcinogens</u>									
	<u>HQ's</u>									
	Ethylbenzene	0.010	5.56e+2		7.12e+1	5.27e+1		5.27e+1	4.30e+1	N/A
	Naphthalene	0.010	5.31e+1		1.81e+1	2.00e+1		1.81e+1	4.90e+0	N/A
	Phenanthrene	0.010	3.80e+1		2.95e+0	7.67e+0		2.95e+0	2.00e+0	N/A
	Pyrene	0.010	1.60e+1		7.81e+0	>49		7.81e+0	4.00e-1	N/A
	Toluene	0.015	2.18e+2		1.18e+2	2.01e+1		2.01e+1	1.89e+1	N/A
Xylene (mixed isomers)	0.035	>493		>493	7.61e+1		7.61e+1	5.77e+1	N/A	
TPH - New Method	0.910	9.49e+3		3.06e+3	4.89e+3		3.06e+3	1.00e+4	N/A	
Hazard Index:										

Note:

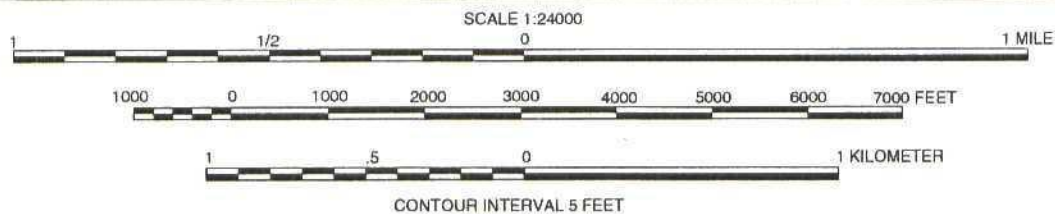
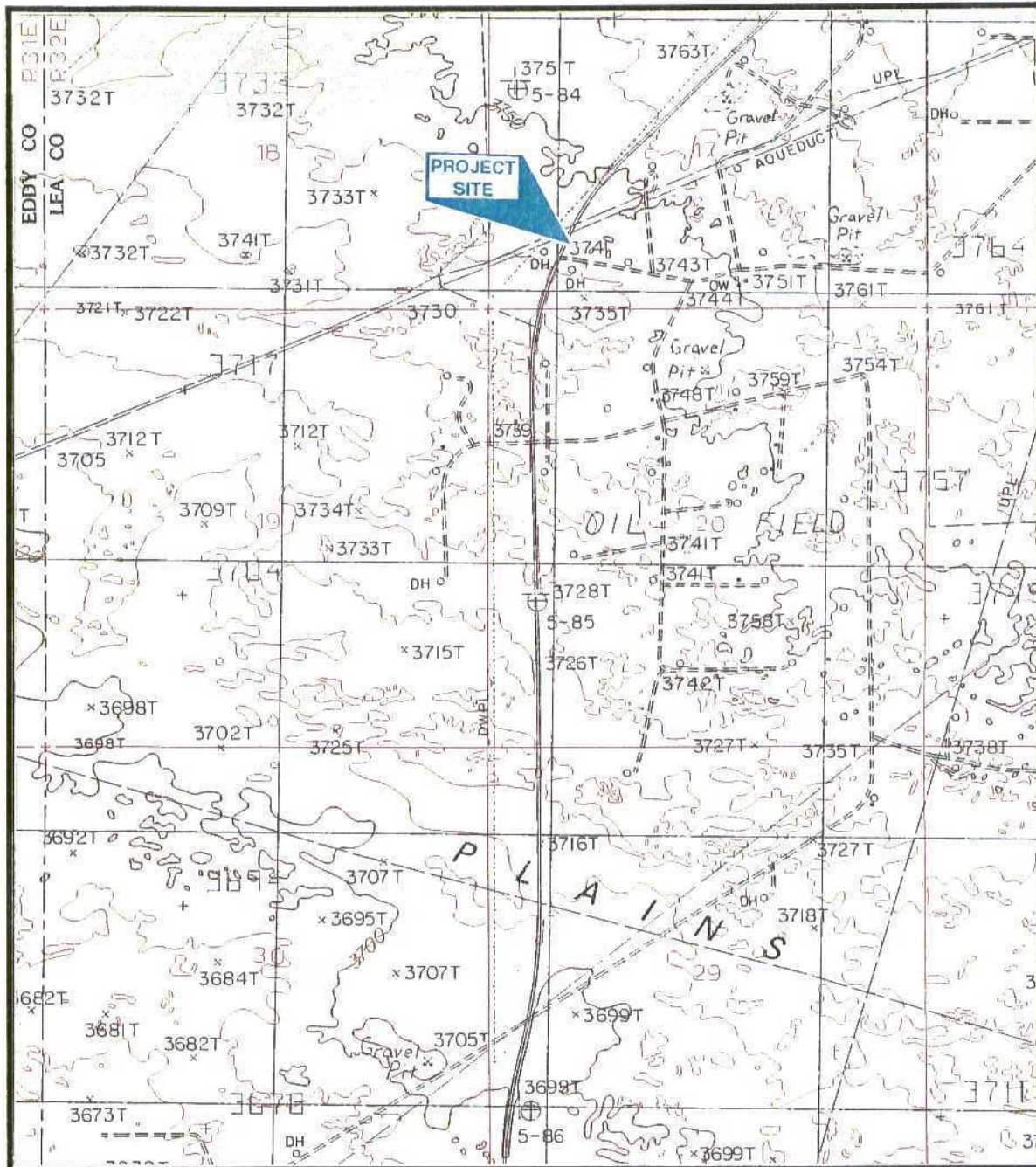
95th UCL = One-sided upper 95th confidence limit of the mean

SSTL = Site Specific Target Level

GREENWOOD LAKE QUADRANGLE

NEW MEXICO

PRINTED 1985



SITE LOCATION AND ADJACENT PROPERTIES MAP

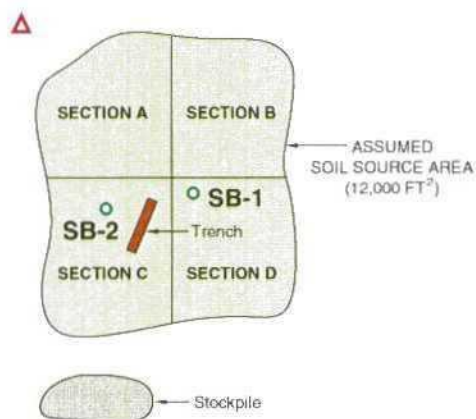
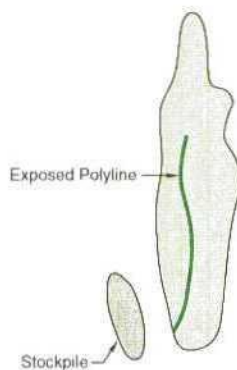
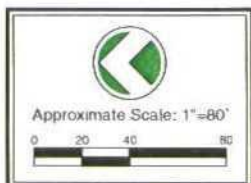
TNMPL

TNM - 96 - 15

LEA COUNTY, NEW MEXICO

610089

FIG 1



DIRT ROAD

LEGEND

- Soil Boring Locations drilled on March 9, 1998.
- Background sample obtained with a hand auger on March 10, 1998.
- Stained Area
- Stockpile

09-04-98 RM G:SAFETY PROJECTS\TNMPL\610089\6100892531

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SOIL SOURCE AREA MAP

TNMPL

TNM-96-15

LEA COUNTY, NEW MEXICO

610089

FIG 2

Texas-New Mexico Pipe Line Co.

TNM-96-15

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	10,000	100%	10,000
TPH-Arom-EC>8-10	40	0.40%	40
TPH-Arom-EC>10-12	220	2.20%	220
TPH-Arom-EC>12-16	923	9.23%	923
TPH-Arom-EC>16-21	1,324	13.24%	1,324
TPH-Arom-EC>21-35	1,115	11.15%	1,115
TPH-Aliph-EC 5-6	0	0.00%	0
TPH-Aliph-EC>6-8	0	0.00%	0
TPH-Aliph-EC>8-10	198	1.98%	198
TPH-Aliph-EC>10-12	665	6.65%	665
TPH-Aliph-EC>12-16	1,690	16.90%	1,690
TPH-Aliph-EC>16-35	3,826	38.26%	3,826

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

Texas-New Mexico Pipe Line Co. TNM-96-15 Lea County, New Mexico	BW (kg) 70	IR _{gw} (L/day) 1.0	EF (days/yr) 250	ED (years) 25	foc -- 0.01	Dist (m) 0
---	------------------	------------------------------------	------------------------	---------------------	-------------------	------------------

For carcinogens: $\text{Risk} = \text{Conc}_{s-v} * \text{DAF} * \text{IR}_{gw} * \text{EF} * \text{ED} * \text{SF} / \text{BW} * 70 * 365$

For non-carcinogens: $\text{HQ} = \text{Conc}_{s-v} * \text{DAF} * \text{IR}_{gw} * \text{EF} / \text{RfD} * \text{BW} * 365$

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
<u>Carcinogens</u>						
Benzene	2.90e-2		3.48e+0	9.53e-5	3.32e-4	3.36e-8
Chrysene	7.30e-3		4.00e-1	0.00e+0	0.00e+0	0.00e+0
Total Risk:						3.36e-8
<u>Non-Carcinogens</u>						
Ethylbenzene		1.00e-1	4.30e+1	0.00e+0	0.00e+0	0.00e+0
Naphthalene		4.00e-2	4.90e+0	0.00e+0	0.00e+0	0.00e+0
Phenanthrene		4.00e-3	2.00e+0	0.00e+0	0.00e+0	0.00e+0
Pyrene		3.00e-2	4.00e-1	0.00e+0	0.00e+0	0.00e+0
Toluene		2.00e-1	1.89e+1	6.29e-4	1.19e-2	5.82e-4
Xylene (mixed isomers)		2.00e+0	5.77e+1	2.31e-3	1.33e-1	6.53e-4
TPH - New Method						1.93e-1
Hazard Index:						1.94e-1
TPH-Arom-EC>8-10		4.00e-2	4.00e+1	4.34e-3	1.74e-1	4.25e-2
TPH-Arom-EC>10-12		4.00e-2	2.20e+2	1.50e-3	3.30e-1	8.07e-2
TPH-Arom-EC>12-16		4.00e-2	9.23e+2	1.75e-6	1.62e-3	3.95e-4
TPH-Arom-EC>16-21		3.00e-2	1.32e+3	0.00e+0	0.00e+0	0.00e+0
TPH-Arom-EC>21-35		3.00e-2	1.12e+3	0.00e+0	0.00e+0	0.00e+0
TPH-Aliph-EC 5-6		6.00e-2	0.00e+0	1.02e-2	0.00e+0	0.00e+0
TPH-Aliph-EC>6-8		6.00e-2	0.00e+0	4.96e-3	0.00e+0	0.00e+0
TPH-Aliph-EC>8-10		1.00e-1	1.98e+2	1.81e-3	3.58e-1	3.51e-2
TPH-Aliph-EC>10-12		1.00e-1	6.65e+2	4.10e-4	2.73e-1	2.67e-2
TPH-Aliph-EC>12-16		1.00e-1	1.69e+3	4.34e-5	7.33e-2	7.18e-3
TPH-Aliph-EC>16-35		2.00e+0	3.83e+3	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.	BW	IR _{gw}	EF	ED	foc	Dist
TNM-96-15	(kg)	(L/day)	(days/yr)	(years)	---	(m)
Lea County, New Mexico	70	2.0	350	30	0.010	0

For carcinogens: $\text{Risk} = \text{Conc}_{s-v} * \text{DAF} * \text{IR}_{gw} * \text{EF} * \text{ED} * \text{SF} / \text{BW} * 70 * 365$

For non-carcinogens: $\text{HQ} = \text{Conc}_{s-v} * \text{DAF} * \text{IR}_{gw} * \text{EF} / \text{RfD} * \text{BW} * 365$

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
<u>Carcinogens</u>						
Benzene	2.90e-2		3.48e+0	9.53e-5	3.32e-4	1.13e-7
Chrysene	7.30e-3		4.00e-1	0.00e+0	0.00e+0	0.00e+0
Total Risk:						1.13e-7
<u>Non-Carcinogens</u>						
Ethylbenzene		1.00e-1	4.30e+1	0.00e+0	0.00e+0	0.00e+0
Naphthalene		4.00e-2	4.90e+0	0.00e+0	0.00e+0	0.00e+0
Phenanthrene		4.00e-3	2.00e+0	0.00e+0	0.00e+0	0.00e+0
Pyrene		3.00e-2	4.00e-1	0.00e+0	0.00e+0	0.00e+0
Toluene		2.00e-1	1.89e+1	6.29e-4	1.19e-2	1.63e-3
Xylene (mixed isomers)		2.00e+0	5.77e+1	2.31e-3	1.33e-1	1.83e-3
TPH - New Method						5.39e-1
Hazard Index:						5.42e-1
TPH-Arom-EC>8-10		4.00e-2	4.00e+1	4.34e-3	1.74e-1	1.19e-1
TPH-Arom-EC>10-12		4.00e-2	2.20e+2	1.50e-3	3.30e-1	2.26e-1
TPH-Arom-EC>12-16		4.00e-2	9.23e+2	1.75e-6	1.62e-3	1.11e-3
TPH-Arom-EC>16-21		3.00e-2	1.32e+3	0.00e+0	0.00e+0	0.00e+0
TPH-Arom-EC>21-35		3.00e-2	1.12e+3	0.00e+0	0.00e+0	0.00e+0
TPH-Aliph-EC 5-6		6.00e-2	0.00e+0	1.02e-2	0.00e+0	0.00e+0
TPH-Aliph-EC>6-8		6.00e-2	0.00e+0	4.96e-3	0.00e+0	0.00e+0
TPH-Aliph-EC>8-10		1.00e-1	1.98e+2	1.81e-3	3.58e-1	9.82e-2
TPH-Aliph-EC>10-12		1.00e-1	6.65e+2	4.10e-4	2.73e-1	7.47e-2
TPH-Aliph-EC>12-16		1.00e-1	1.69e+3	4.34e-5	7.33e-2	2.01e-2
TPH-Aliph-EC>16-35		2.00e+0	3.83e+3	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-96-15 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	37	4.92	2.0	1116	1.80	0.32	0.01	6.066E-11

For carcinogens:

$$\text{Risk} = (\text{Conc}_{\text{soil}} * (\text{VF} + \text{PEF}) / \text{DAF}) * \text{IR}_{\text{air}} * \text{EF} * \text{ED} * \text{SF} / \text{BW} * 70 * 365$$

For non-carcinogens:

$$\text{HQ} = (\text{Conc}_{\text{soil}} * (\text{VF} + \text{PEF}) / \text{DAF}) * \text{IR}_{\text{air}} * \text{EF} * (\text{1/RfD}) / \text{BW} * 365$$

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

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 ² /g)	H'	Kas (g/cm ³)	alpha (cm ² /sec)	VF (m ³ /kg)	Risk or HQ
Carcinogens										
Benzene	3.48e+0	2.91e-2		2.05e-2	8.32e-1	2.32e-1	2.80e-1	9.70e-4	7.40e-5	5.23e-7
Chrysene	4.00e-1	6.10e-3		5.45e-3	2.00e+3	4.37e-5	2.19e-8	2.12e-11	1.04e-8	1.79e-12
										Total Risk: 5.23e-7
Non-Carcinogens										
Ethylbenzene	4.30e+1		2.86e-1	1.64e-2	1.10e+1	2.67e-1	2.44e-2	7.10e-5	1.91e-5	5.63e-4
Naphthalene	4.90e+0		4.00e-2	1.30e-2	1.29e+1	5.38e-2	4.17e-3	9.61e-6	7.02e-6	1.68e-4
Phenanthrene	2.00e+0		4.00e-3	1.19e-3	1.41e+2	6.63e-3	4.69e-5	9.89e-9	2.25e-7	2.20e-5
Pyrene	4.00e-1		3.00e-2	5.98e-3	3.80e+2	2.13e-4	5.59e-7	5.94e-10	5.51e-8	1.44e-7
Toluene	1.89e+1		1.14e-1	1.84e-2	3.02e+0	2.65e-1	8.77e-2	2.83e-4	3.86e-5	1.25e-3
Xylene (mixed isomers)	5.77e+1		2.00e-1	1.63e-2	2.40e+0	2.93e-1	1.22e-1	3.45e-4	4.29e-5	2.43e-3
TPH - New Method	1.00e+4									1.06e-1
										Hazard Index: 1.11e-1
TPH-Arom-EC>8-10	4.00e+1		5.71e-2	2.20e-2	1.58e+1	4.84e-1	3.05e-2	1.19e-4	2.48e-5	3.39e-3
TPH-Arom-EC>10-12	2.20e+2		5.71e-2	2.20e-2	2.51e+1	1.36e-1	5.42e-3	2.12e-5	1.04e-5	7.85e-3
TPH-Arom-EC>12-16	9.23e+2		5.71e-2	2.20e-2	5.01e+1	5.16e-2	1.03e-3	4.02e-6	4.54e-6	1.43e-2
TPH-Arom-EC>16-21	1.32e+3		3.00e-2	2.20e-2	1.58e+2	1.18e-1	7.43e-4	2.90e-6	3.85e-6	3.33e-2
TPH-Arom-EC>21-35	1.12e+3		3.00e-2	2.20e-2	1.26e+3	6.65e-3	5.29e-6	2.06e-8	3.25e-7	2.36e-3
TPH-Aliph-EC 5-6	0.00e+0		5.71e-2	2.20e-2	7.94e+0	3.28e+1	4.12e+0	9.29e-3	3.78e-4	0.00e+0
TPH-Aliph-EC>6-8	0.00e+0		5.71e-2	2.20e-2	3.98e+1	4.85e+1	1.22e+0	3.91e-3	1.72e-4	0.00e+0
TPH-Aliph-EC>8-10	1.98e+2		2.86e-1	2.20e-2	3.16e+2	7.92e+1	2.51e-1	9.37e-4	7.23e-5	9.81e-3
TPH-Aliph-EC>10-12	6.65e+2		2.86e-1	2.20e-2	2.51e+3	1.23e+2	4.91e-2	1.90e-4	3.15e-5	1.43e-2
TPH-Aliph-EC>12-16	1.69e+3		2.86e-1	2.20e-2	5.01e+4	5.25e+2	1.05e-2	4.09e-5	1.45e-5	1.68e-2
TPH-Aliph-EC>16-35	3.83e+3		2.00e+0	2.20e-2	1.00e+7	6.57e+4	6.57e-3	2.56e-5	1.15e-5	4.29e-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_{air} = 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-96-15 Lea County, New Mexico	BW (kg)	CF (mg/kg)	IR _{soil} (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:

$$\text{Risk}_{\text{ING}} = \text{Conc}_{\text{soil}} * \text{IR}_{\text{soil}} * \text{EF} * \text{ED} * \text{SF} / \text{BW} * 70 * 365 * \text{CF}$$

$$\text{Risk}_{\text{DER}} = \text{Conc}_{\text{soil}} * \text{SA} * \text{AF} * \text{ABS} * \text{EF} * \text{ED} * \text{SF} / \text{BW} * 70 * 365 * \text{CF}$$

For non-carcinogens:

$$\text{HQ}_{\text{ING}} = \text{Conc}_{\text{soil}} * \text{IR}_{\text{soil}} * \text{EF} * (1/\text{RfD}) / \text{BW} * 365 * \text{CF}$$

$$\text{HQ}_{\text{DER}} = \text{Conc}_{\text{soil}} * \text{SA} * \text{AF} * \text{ABS} * \text{EF} * (1/\text{RfD}) / \text{BW} * 365 * \text{CF}$$

Constituent of Concern	Conc _{soil} (mg/kg)	Sf _o (1/mg/kg-d)	RfD _o (mg/kg-d)	Risk _{ING} or HQ _{ING}
<u>Carcinogens</u>				
Benzene	3.48e+0	0.029		1.76E-08
Chrysene	4.00e-1	0.0073		5.10E-10
			Total Risk:	1.81e-8
<u>Non-Carcinogens</u>				
Ethylbenzene	4.30e+1		0.10	2.10E-04
Naphthalene	4.90e+0		0.04	5.99E-05
Phenanthrene	2.00e+0		0.00	2.45E-04
Pyrene	4.00e-1		0.03	6.52E-06
Toluene	1.89e+1		0.20	4.62E-05
Xylene (mixed isomers)	5.77e+1		2.00	1.41E-05
TPH - New Method	1.00e+4			6.77E-02
			Hazard Index:	6.83e-2
TPH-Arom-EC>8-10	4.00e+1		0.04	4.89E-04
TPH-Arom-EC>10-12	2.20e+2		0.04	2.69E-03
TPH-Arom-EC>12-16	9.23e+2		0.04	1.13E-02
TPH-Arom-EC>16-21	1.32e+3		0.03	2.16E-02
TPH-Arom-EC>21-35	1.12e+3		0.03	1.82E-02
TPH-Aliph-EC 5-6	0.00e+0		0.06	0.00E+00
TPH-Aliph-EC>6-8	0.00e+0		0.06	0.00E+00
TPH-Aliph-EC>8-10	1.98e+2		0.10	9.69E-04
TPH-Aliph-EC>10-12	6.65e+2		0.10	3.25E-03
TPH-Aliph-EC>12-16	1.69e+3		0.10	8.27E-03
TPH-Aliph-EC>16-35	3.83e+3		2.00	9.36E-04

Sf _d (1/mg/kg-d)	RfD _d (mg/kg-d)	ABS	Risk _{DER} or HQ _{DER}
0.029		0.000	0.00E+00
0.0236		0.130	2.49E-08
		Total Risk:	2.49e-8
		0.10	0.00E+00
		0.04	6.95E-04
		0.02	2.59E-04
		0.01	2.44E-04
		0.20	0.00E+00
		2.00	0.00E+00
			7.85E-01
		Hazard Index:	7.86e-1
		0.04	5.68E-03
		0.04	3.12E-02
		0.04	1.31E-01
		0.03	2.50E-01
		0.03	2.11E-01
		0.06	0.00E+00
		0.06	0.00E+00
		0.10	1.12E-02
		0.10	3.77E-02
		0.10	9.59E-02
		2.00	1.09E-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
Worker - Combined Risk for Soil
 Texas-New Mexico Pipe Line Co.

If On-Site: $\text{Risk}_{\text{WKR-SOIL}} = \text{Risk}_{\text{ING}} + \text{Risk}_{\text{DER}} + \text{Risk}_{\text{INHAL}}$

If Off-Site: $\text{Risk}_{\text{WKR-SOIL}} = \text{Risk}_{\text{INHAL}}$

Constituent of Concern	Risk _{ING} or HQ _{ING}	Risk _{DER} or HQ _{DER}	Risk _{INHAL} or HQ _{INHAL}	Risk _{WKR-SOIL} or HQ _{WKR-SOIL}
<u>Carcinogens</u>				
Benzene	1.76E-08	0.00E+00	5.23E-07	5.41E-07
Chrysene	5.10E-10	2.49E-08	1.79E-12	2.54E-08
<u>Non-Carcinogens</u>				
Ethylbenzene	2.10E-04	0.00E+00	5.63E-04	7.73E-04
Naphthalene	5.99E-05	6.95E-04	1.68E-04	9.23E-04
Phenanthrene	2.45E-04	2.59E-04	2.20E-05	5.26E-04
Pyrene	6.52E-06	2.44E-04	1.44E-07	2.51E-04
Toluene	4.62E-05	0.00E+00	1.25E-03	1.30E-03
Xylene (mixed isomers)	1.41E-05	0.00E+00	2.43E-03	2.44E-03
TPH - New Method	6.77E-02	7.85E-01	1.06E-01	9.59E-01
TPH-Arom-EC>8-10	4.89E-04	5.68E-03	3.39E-03	9.56E-03
TPH-Arom-EC>10-12	2.69E-03	3.12E-02	7.85E-03	4.18E-02
TPH-Arom-EC>12-16	1.13E-02	1.31E-01	1.43E-02	1.57E-01
TPH-Arom-EC>16-21	2.16E-02	2.50E-01	3.33E-02	3.05E-01
TPH-Arom-EC>21-35	1.82E-02	2.11E-01	2.36E-03	2.31E-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	9.69E-04	1.12E-02	9.81E-03	2.20E-02
TPH-Aliph-EC>10-12	3.25E-03	3.77E-02	1.43E-02	5.53E-02
TPH-Aliph-EC>12-16	8.27E-03	9.59E-02	1.68E-02	1.21E-01
TPH-Aliph-EC>16-35	9.36E-04	1.09E-02	4.29E-03	1.61E-02

NOTES:

Risk = Carcinogenic Risk
 HQ = Hazard Quotient

Calculation of Risk
Resident -- Inhalation of Volatiles from Soil

Texas-New Mexico Pipe Line Co. TNM-96-15 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	37	4.92	2.0	1116	1.80	0.32	0.01	6.066E-11

For carcinogens:

$$\text{Risk} = (\text{Conc}_{\text{soil}} * (\text{VF} + \text{PEF}) / \text{DAF}) * \text{IR}_{\text{air}} * \text{EF} * \text{ED} * \text{SF} / \text{BW} * 70 * 365$$

For non-carcinogens:

$$\text{HQ} = (\text{Conc}_{\text{soil}} * (\text{VF} + \text{PEF}) / \text{DAF}) * \text{IR}_{\text{air}} * \text{EF} * (\text{1/RfD}) / \text{BW} * 365$$

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

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 ² /g)	H'	Kas (g /cm ³)	alpha (cm ² /sec)	VF (m ³ /kg)	Risk or HQ
Carcinogens										
Benzene	3.48e+0	2.91e-2		2.05e-2	8.32e-1	2.32e-1	2.80e-1	9.70e-4	7.40e-5	6.02e-7
Chrysene	4.00e-1	6.10e-3		5.45e-3	2.00e+3	4.37e-5	2.19e-8	2.12e-11	1.04e-8	2.06e-12
Total Risk:										6.02e-7
Non-Carcinogens										
Ethylbenzene	4.30e+1		2.86e-1	1.64e-2	1.10e+1	2.67e-1	2.44e-2	7.10e-5	1.91e-5	5.40e-4
Naphthalene	4.90e+0		4.00e-2	1.30e-2	1.29e+1	5.38e-2	4.17e-3	9.61e-6	7.02e-6	1.61e-4
Phenanthrene	2.00e+0		4.00e-3	1.19e-3	1.41e+2	6.63e-3	4.69e-5	9.89e-9	2.25e-7	2.11e-5
Pyrene	4.00e-1		3.00e-2	5.98e-3	3.80e+2	2.13e-4	5.59e-7	5.94e-10	5.51e-8	1.38e-7
Toluene	1.89e+1		1.14e-1	1.84e-2	3.02e+0	2.65e-1	8.77e-2	2.83e-4	3.86e-5	1.20e-3
Xylene (mixed isomers)	5.77e+1		2.00e-1	1.63e-2	2.40e+0	2.93e-1	1.22e-1	3.45e-4	4.29e-5	2.33e-3
TPH - New Method	1.00e+4									1.02e-1
Hazard Index:										1.06e-1
TPH-Arom-EC>8-10	4.00e+1		5.71e-2	2.20e-2	1.58e+1	4.84e-1	3.05e-2	1.19e-4	2.48e-5	3.25e-3
TPH-Arom-EC>10-12	2.20e+2		5.71e-2	2.20e-2	2.51e+1	1.36e-1	5.42e-3	2.12e-5	1.04e-5	7.52e-3
TPH-Arom-EC>12-16	9.23e+2		5.71e-2	2.20e-2	5.01e+1	5.16e-2	1.03e-3	4.02e-6	4.54e-6	1.37e-2
TPH-Arom-EC>16-21	1.32e+3		3.00e-2	2.20e-2	1.58e+2	1.18e-1	7.43e-4	2.90e-6	3.85e-6	3.19e-2
TPH-Arom-EC>21-35	1.12e+3		3.00e-2	2.20e-2	1.26e+3	6.65e-3	5.29e-6	2.06e-8	3.25e-7	2.27e-3
TPH-Aliph-EC 5-6	0.00e+0		5.71e-2	2.20e-2	7.94e+0	3.28e+1	4.12e+0	9.29e-3	3.78e-4	0.00e+0
TPH-Aliph-EC>6-8	0.00e+0		5.71e-2	2.20e-2	3.98e+1	4.85e+1	1.22e+0	3.91e-3	1.72e-4	0.00e+0
TPH-Aliph-EC>8-10	1.98e+2		2.86e-1	2.20e-2	3.16e+2	7.92e+1	2.51e-1	9.37e-4	7.23e-5	9.40e-3
TPH-Aliph-EC>10-12	6.65e+2		2.86e-1	2.20e-2	2.51e+3	1.23e+2	4.91e-2	1.90e-4	3.15e-5	1.37e-2
TPH-Aliph-EC>12-16	1.69e+3		2.86e-1	2.20e-2	5.01e+4	5.25e+2	1.05e-2	4.09e-5	1.45e-5	1.61e-2
TPH-Aliph-EC>16-35	3.83e+3		2.00e+0	2.20e-2	1.00e+7	6.57e+4	6.57e-3	2.56e-5	1.15e-5	4.11e-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_{air} = 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-96-15 Lea County, New Mexico	BW (kg)	CF (mg/kg)	IR _{soil} (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:

$$\text{Risk}_{\text{ING}} = \text{Conc}_{\text{soil}} * \text{IR}_{\text{soil}} * \text{EF} * \text{ED} * \text{SF} / \text{BW} * 70 * 365 * \text{CF}$$

$$\text{Risk}_{\text{DER}} = \text{Conc}_{\text{soil}} * \text{SA} * \text{AF} * \text{ABS} * \text{EF} * \text{ED} * \text{SF} / \text{BW} * 70 * 365 * \text{CF}$$

For non-carcinogens:

$$\text{HQ}_{\text{ING}} = \text{Conc}_{\text{soil}} * \text{IR}_{\text{soil}} * \text{EF} * (1/\text{RfD}) / \text{BW} * 365 * \text{CF}$$

$$\text{HQ}_{\text{DER}} = \text{Conc}_{\text{soil}} * \text{SA} * \text{AF} * \text{ABS} * \text{EF} * (1/\text{RfD}) / \text{BW} * 365 * \text{CF}$$

Constituent of Concern	Conc _{soil} (mg/kg)	Sf _o (1/mg/kg-d)	RfD _o (mg/kg-d)	Risk _{ING} or HQ _{ING}	Sf _d (1/mg/kg-d)	RfD _d (mg/kg-d)	ABS	Risk _{DER} or HQ _{DER}
<u>Carcinogens</u>								
Benzene	3.48e+0	0.029		1.71E-07	0.029		0.000	0.00E+00
Chrysene	4.00e-1	0.0073		4.96E-09	0.0236		0.130	4.18E-08
			Total Risk:	1.76e-7				4.18e-8
<u>Non-Carcinogens</u>								
Ethylbenzene	4.30e+1		0.10	5.50E-03		0.10	0.000	0.00E+00
Naphthalene	4.90e+0		0.04	1.57E-03		0.04	0.100	9.73E-04
Phenanthrene	2.00e+0		0.00	6.39E-03		0.02	0.050	3.63E-04
Pyrene	4.00e-1		0.03	1.70E-04		0.01	0.100	3.42E-04
Toluene	1.89e+1		0.20	1.21E-03		0.20	0.000	0.00E+00
Xylene (mixed isomers)	5.77e+1		2.00	3.69E-04		2.00	0.000	0.00E+00
TPH - New Method	1.00e+4			1.77E+00				1.10E+00
			Hazard Index:	1.78e+0				1.10e+0
TPH-Arom-EC>8-10	4.00e+1		0.04	1.28E-02		0.04	0.100	7.95E-03
TPH-Arom-EC>10-12	2.20e+2		0.04	7.03E-02		0.04	0.100	4.37E-02
TPH-Arom-EC>12-16	9.23e+2		0.04	2.95E-01		0.04	0.100	1.83E-01
TPH-Arom-EC>16-21	1.32e+3		0.03	5.64E-01		0.03	0.100	3.51E-01
TPH-Arom-EC>21-35	1.12e+3		0.03	4.75E-01		0.03	0.100	2.95E-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	1.98e+2		0.10	2.53E-02		0.10	0.100	1.57E-02
TPH-Aliph-EC>10-12	6.65e+2		0.10	8.50E-02		0.10	0.100	5.28E-02
TPH-Aliph-EC>12-16	1.69e+3		0.10	2.16E-01		0.10	0.100	1.34E-01
TPH-Aliph-EC>16-35	3.83e+3		2.00	2.45E-02		2.00	0.100	1.52E-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: $\text{Risk}_{\text{res-soil}} = \text{Risk}_{\text{ing}} + \text{Risk}_{\text{der}} + \text{Risk}_{\text{inhal}}$

If Off-Site: $\text{Risk}_{\text{res-soil}} = \text{Risk}_{\text{inhal}}$

Constituent of Concern	Risk _{ing} or HQ _{ing}	Risk _{der} or HQ _{der}	Risk _{inhal} or HQ _{inhal}	Risk _{res-soil} or HQ _{res-soil}
<u>Carcinogens</u>				
Benzene	1.71E-07	0.00E+00	6.02E-07	7.74E-07
Chrysene	4.96E-09	4.18E-08	2.06E-12	4.67E-08
<u>Non-Carcinogens</u>				
Ethylbenzene	5.50E-03	0.00E+00	5.40E-04	6.04E-03
Naphthalene	1.57E-03	9.73E-04	1.61E-04	2.70E-03
Phenanthrene	6.39E-03	3.63E-04	2.11E-05	6.78E-03
Pyrene	1.70E-04	3.42E-04	1.38E-07	5.12E-04
Toluene	1.21E-03	0.00E+00	1.20E-03	2.41E-03
Xylene (mixed isomers)	3.69E-04	0.00E+00	2.33E-03	2.69E-03
TPH - New Method	1.77E+00	1.10E+00	1.02E-01	2.97E+00
TPH-Arom-EC>8-10	1.28E-02	7.95E-03	3.25E-03	2.40E-02
TPH-Arom-EC>10-12	7.03E-02	4.37E-02	7.52E-03	1.22E-01
TPH-Arom-EC>12-16	2.95E-01	1.83E-01	1.37E-02	4.92E-01
TPH-Arom-EC>16-21	5.64E-01	3.51E-01	3.19E-02	9.47E-01
TPH-Arom-EC>21-35	4.75E-01	2.95E-01	2.27E-03	7.73E-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	2.53E-02	1.57E-02	9.40E-03	5.04E-02
TPH-Aliph-EC>10-12	8.50E-02	5.28E-02	1.37E-02	1.52E-01
TPH-Aliph-EC>12-16	2.16E-01	1.34E-01	1.61E-02	3.66E-01
TPH-Aliph-EC>16-35	2.45E-02	1.52E-02	4.11E-03	4.38E-02

NOTES:

Risk = Carcinogenic Risk
 HQ = Hazard Quotient

**Calculation of Risk
Construction Worker - Inhalation of Volatiles from Soil**

Texas-New Mexico Pipe Line Co. TNM-96-15 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	0.01	4.58e-11

For carcinogens:

$$\text{Risk} = \text{Conc}_{\text{soil}} * (\text{VF} + \text{PEF}) * \text{IR}_{\text{air}} * \text{EF} * \text{ED} * \text{SF} / \text{BW} * 70 * 365$$

For non-carcinogens:

$$\text{HQ} = \text{Conc}_{\text{soil}} * (\text{VF} + \text{PEF}) * \text{IR}_{\text{air}} * \text{EF} * (\text{1/RfD}) / \text{BW} * 365$$

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

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	3.48e+0	2.91e-2		2.05e-2	8.32e-1	2.32e-1	2.80e-1	9.70e-4	7.40e-5	5.48e-8
Chrysene	4.00e-1	6.10e-3		5.45e-3	2.00e+3	4.37e-5	2.19e-8	2.12e-11	1.04e-8	1.86e-13
Total Risk:										5.48e-8
Non-Carcinogens										
Ethylbenzene	4.30e+1		2.86e-1	1.64e-2	1.10e+1	2.67e-1	2.44e-2	7.10e-5	1.91e-5	6.13e-3
Naphthalene	4.90e+0		4.00e-2	1.30e-2	1.29e+1	5.38e-2	4.17e-3	9.61e-6	7.02e-6	1.83e-3
Phenanthrene	2.00e+0		4.00e-3	1.19e-3	1.41e+2	6.63e-3	4.69e-5	9.89e-9	2.25e-7	2.40e-4
Pyrene	4.00e-1		3.00e-2	5.98e-3	3.80e+2	2.13e-4	5.59e-7	5.94e-10	5.51e-8	1.57e-6
Toluene	1.89e+1		1.14e-1	1.84e-2	3.02e+0	2.65e-1	8.77e-2	2.83e-4	3.86e-5	1.37e-2
Xylene (mixed isomers)	5.77e+1		2.00e-1	1.63e-2	2.40e+0	2.93e-1	1.22e-1	3.45e-4	4.29e-5	2.64e-2
TPH - New Method	1.00e+4									1.16e+0
Hazard Index:										1.21e+0
TPH-Arom-EC>8-10	4.00e+1		5.71e-2	2.20e-2	1.58e+1	4.84e-1	3.05e-1	1.19e-4	2.48e-5	3.70e-2
TPH-Arom-EC>10-12	2.20e+2		5.71e-2	2.20e-2	2.51e+1	1.36e-1	5.42e-3	2.12e-5	1.04e-5	8.55e-2
TPH-Arom-EC>12-16	9.23e+2		5.71e-2	2.20e-2	5.01e+1	5.16e-2	1.03e-3	4.02e-6	4.54e-6	1.56e-1
TPH-Arom-EC>16-21	1.32e+3		3.00e-2	2.20e-2	1.58e+2	1.18e-1	7.43e-4	2.90e-6	3.85e-6	3.63e-1
TPH-Arom-EC>21-35	1.12e+3		3.00e-2	2.20e-2	1.26e+3	6.65e-3	5.29e-6	2.06e-8	3.25e-7	2.58e-2
TPH-Aliph-EC 5-6	0.00e+0		5.71e-2	2.20e-2	7.94e+0	3.28e+1	4.12e+0	9.29e-3	3.78e-4	0.00e+0
TPH-Aliph-EC>6-8	0.00e+0		5.71e-2	2.20e-2	3.98e+1	4.85e+1	1.22e+0	3.91e-3	1.72e-4	0.00e+0
TPH-Aliph-EC>8-10	1.98e+2		2.86e-1	2.20e-2	3.16e+2	7.92e+1	2.51e-1	9.37e-4	7.23e-5	1.07e-1
TPH-Aliph-EC>10-12	6.65e+2		2.86e-1	2.20e-2	2.51e+3	1.23e+2	4.91e-2	1.90e-4	3.15e-5	1.56e-1
TPH-Aliph-EC>12-16	1.69e+3		2.86e-1	2.20e-2	5.01e+4	5.25e+2	1.05e-2	4.09e-5	1.45e-5	1.83e-1
TPH-Aliph-EC>16-35	3.83e+3		2.00e+0	2.20e-2	1.00e+7	6.57e+4	6.57e-3	2.56e-5	1.15e-5	4.67e-2

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-96-15 Lea County, New Mexico	BW (kg)	CF (mg/kg)	IR _{soil} (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:

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

For non-carcinogens:

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

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

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

Constituent of Concern	Conc _{soil} (mg/kg)	SF _o (1/mg/kg-d)	RfD _o (mg/kg-d)	Risk _{ING} or HQ _{ING}	SF _d (1/mg/kg-d)	RfD _d (mg/kg-d)	ABS	Risk _{DER} or HQ _{DER}
Carcinogens								
Benzene	3.48e+0	0.029		1.63E-09	0.029		0.000	0.00E+00
Chrysene	4.00e-1	0.0073		4.70E-11	0.0236		0.130	1.63E-11
			Total Risk:	1.67e-9				1.63e-11
Non-Carcinogens								
Ethylbenzene	4.30e+1		0.10	2.02E-03		0.10	0.000	0.00E+00
Naphthalene	4.90e+0		0.04	5.75E-04		0.04	0.100	4.75E-05
Phenanthrene	2.00e+0		0.00	2.35E-03		0.02	0.050	1.77E-05
Pyrene	4.00e-1		0.03	6.26E-05		0.01	0.100	1.67E-05
Toluene	1.89e+1		0.20	4.44E-04		0.20	0.000	0.00E+00
Xylene (mixed isomers)	5.77e+1		2.00	1.36E-04		2.00	0.000	0.00E+00
TPH - New Method	1.00e+4			6.50E-01				5.36E-02
			Hazard Index:	6.55e-1				5.37e-2
TPH-Arom-EC>8-10	4.00e+1		0.04	4.70E-03		0.04	0.100	3.87E-04
TPH-Arom-EC>10-12	2.20e+2		0.04	2.58E-02		0.04	0.100	2.13E-03
TPH-Arom-EC>12-16	9.23e+2		0.04	1.08E-01		0.04	0.100	8.94E-03
TPH-Arom-EC>16-21	1.32e+3		0.03	2.07E-01		0.03	0.100	1.71E-02
TPH-Arom-EC>21-35	1.12e+3		0.03	1.75E-01		0.03	0.100	1.44E-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	1.98e+2		0.10	9.30E-03		0.10	0.100	7.67E-04
TPH-Aliph-EC>10-12	6.65e+2		0.10	3.12E-02		0.10	0.100	2.58E-03
TPH-Aliph-EC>12-16	1.69e+3		0.10	7.94E-02		0.10	0.100	6.55E-03
TPH-Aliph-EC>16-35	3.83e+3		2.00	8.98E-03		2.00	0.100	7.41E-04

NOTES:

Conc(sol) = 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.

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

Constituent of Concern	Risk _{ING} or HQ _{ING}	Risk _{DER} or HQ _{DER}	Risk _{INHAL} or HQ _{INHAL}	Risk _{CW-SOIL} or HQ _{CW-SOIL}
<u>Carcinogens</u>				
Benzene	1.63E-09	0.00E+00	5.48E-08	5.64E-08
Chrysene	4.70E-11	1.63E-11	1.86E-13	6.35E-11
<u>Non-Carcinogens</u>				
Ethylbenzene	2.02E-03	0.00E+00	6.13E-03	8.15E-03
Naphthalene	5.75E-04	4.75E-05	1.83E-03	2.46E-03
Phenanthrene	2.35E-03	1.77E-05	2.40E-04	2.61E-03
Pyrene	6.26E-05	1.67E-05	1.57E-06	8.09E-05
Toluene	4.44E-04	0.00E+00	1.37E-02	1.41E-02
Xylene (mixed isomers)	1.36E-04	0.00E+00	2.64E-02	2.66E-02
TPH - New Method	6.50E-01	5.36E-02	1.16E+00	1.86E+00
TPH-Arom-EC>8-10	4.70E-03	3.87E-04	3.70E-02	4.20E-02
TPH-Arom-EC>10-12	2.58E-02	2.13E-03	8.55E-02	1.13E-01
TPH-Arom-EC>12-16	1.08E-01	8.94E-03	1.56E-01	2.74E-01
TPH-Arom-EC>16-21	2.07E-01	1.71E-02	3.63E-01	5.87E-01
TPH-Arom-EC>21-35	1.75E-01	1.44E-02	2.58E-02	2.15E-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	9.30E-03	7.67E-04	1.07E-01	1.17E-01
TPH-Aliph-EC>10-12	3.12E-02	2.58E-03	1.56E-01	1.90E-01
TPH-Aliph-EC>12-16	7.94E-02	6.55E-03	1.83E-01	2.69E-01
TPH-Aliph-EC>16-35	8.98E-03	7.41E-04	4.67E-02	5.65E-02

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-96-15 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	37	4.92	2.0	1116	1.80	0.32	0.01	6.066E-11

For carcinogens:

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

For non-carcinogens:

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

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

DAF
1.00

Constituent of concern	TR	SF (1/mg/kg-d)	HQ	RfD (mg/kg-d)	Dei (cm ² /sec)	Kd (cm ² /g)	H'	Kas (g/cm ³)	alpha (cm ² /sec)	VF (m ³ /kg)	SSTL (mg/kg)
<u>Carcinogens</u>											
Benzene	1.00e-6	2.91e-2			2.05e-2	8.32e-1	2.32e-1	2.80e-1	9.70e-4	7.40e-5	6.65e+0
Chrysene	1.00e-6	6.10e-3			5.45e-3	2.00e+3	4.37e-5	2.19e-8	2.12e-11	1.04e-8	2.24e+5
<u>Non-Carcinogens</u>											
Ethylbenzene			0.01	0.29	1.64e-2	1.10e+1	2.67e-1	2.44e-2	7.10e-5	1.91e-5	7.64e+2
Naphthalene			0.01	0.04	1.30e-2	1.29e+1	5.38e-2	4.17e-3	9.61e-6	7.02e-6	2.91e+2
Phenanthrene			0.01	0.00	1.19e-3	1.41e+2	6.63e-3	4.69e-5	9.89e-9	2.25e-7	9.08e+2
Pyrene			0.01	0.03	5.98e-3	3.80e+2	2.13e-4	5.59e-7	5.94e-10	5.51e-8	2.78e+4
Toluene			0.02	0.11	1.84e-2	3.02e+0	2.65e-1	8.77e-2	2.83e-4	3.86e-5	2.26e+2
Xylene (mixed isomers)			0.04	0.20	1.63e-2	2.40e+0	2.93e-1	1.22e-1	3.45e-4	4.29e-5	8.33e+2
TPH - New Method			0.91								8.55e+4
TPH-Arom-EC>8-10			0.004	0.06	2.20e-2	1.58e+1	4.84e-1	3.05e-2	1.19e-4	2.48e-5	1.18e+4
TPH-Arom-EC>10-12			0.022	0.06	2.20e-2	2.51e+1	1.36e-1	5.42e-3	2.12e-5	1.04e-5	2.80e+4
TPH-Arom-EC>12-16			0.092	0.06	2.20e-2	5.01e+1	5.16e-2	1.03e-3	4.02e-6	4.54e-6	6.43e+4
TPH-Arom-EC>16-21			0.132	0.03	2.20e-2	1.58e+2	1.18e-1	7.43e-4	2.90e-6	3.85e-6	3.98e+4
TPH-Arom-EC>21-35			0.112	0.03	2.20e-2	1.26e+3	6.65e-3	5.29e-6	2.06e-8	3.25e-7	4.72e+5
TPH-Aliph-EC 5-6			0.000	0.06	2.20e-2	7.94e+0	3.28e+1	4.12e+0	9.29e-3	3.78e-4	7.73e+2
TPH-Aliph-EC>6-8			0.000	0.06	2.20e-2	3.98e+1	4.85e+1	1.22e+0	3.91e-3	1.72e-4	1.70e+3
TPH-Aliph-EC>8-10			0.020	0.29	2.20e-2	3.16e+2	7.92e+1	2.51e-1	9.37e-4	7.23e-5	2.02e+4
TPH-Aliph-EC>10-12			0.067	0.29	2.20e-2	2.51e+3	1.23e+2	4.91e-2	1.90e-4	3.15e-5	4.64e+4
TPH-Aliph-EC>12-16			0.169	0.29	2.20e-2	5.01e+4	5.25e+2	1.05e-2	4.09e-5	1.45e-5	1.01e+5
TPH-Aliph-EC>16-35			0.383	2.00	2.20e-2	1.00e+7	6.57e+4	6.57e-3	2.56e-5	1.15e-5	8.92e+5

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-96-15 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
	SSTL _{ING} = TR * BW * 70 * 365 * CF / IR _{soil} * EF * ED * SF							
For carcinogens:								
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)	SF _d (1/mg/kg-d)	RfD _d (mg/kg-d)	ABS	SSTL _{DER} (mg/kg)
<u>Carcinogens</u>									
Benzene	1.00e-6	2.90e-2			1.97e+2	2.90e-2		0.000	9.99e+99
Chrysene	1.00e-6	7.30e-3			7.84e+2	2.36e-2		0.130	1.61e+1
<u>Non-Carcinogens</u>									
Ethylbenzene			0.01	0.10	2.04e+3		0.10	0.000	9.99e+99
Naphthalene			0.01	0.04	8.18e+2		0.04	0.100	7.05e+1
Phenanthrene			0.01	0.00	8.18e+1		0.02	0.050	7.72e+1
Pyrene			0.01	0.03	6.13e+2		0.01	0.100	1.64e+1
Toluene			0.02	0.20	6.13e+3		0.20	0.000	9.99e+99
Xylene (mixed isomers)			0.04	2.00	1.43e+5		2.00	0.000	9.99e+99
TPH - New Method			0.91		1.34e+5				1.16e+4
TPH-Arom-EC>8-10			0.004	0.04	8.18e+4		0.04	0.100	7.05e+3
TPH-Arom-EC>10-12			0.022	0.04	8.18e+4		0.04	0.100	7.05e+3
TPH-Arom-EC>12-16			0.092	0.04	8.18e+4		0.04	0.100	7.05e+3
TPH-Arom-EC>16-21			0.132	0.03	6.13e+4		0.03	0.100	5.29e+3
TPH-Arom-EC>21-35			0.112	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			0.020	0.10	2.04e+5		0.10	0.100	1.76e+4
TPH-Aliph-EC>10-12			0.067	0.10	2.04e+5		0.10	0.100	1.76e+4
TPH-Aliph-EC>12-16			0.169	0.10	2.04e+5		0.10	0.100	1.76e+4
TPH-Aliph-EC>16-35			0.383	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.

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

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

Constituent of Concern	SSTL _{ING} (mg/kg)	SSTL _{DER} (mg/kg)	SSTL _{INHAL} (mg/kg)	SSTL _{wkr-SOIL} (mg/kg)
<u>Carcinogens</u>				
Benzene	1.97e+2	9.99e+99	6.65e+0	6.43e+0
Chrysene	7.84e+2	1.61e+1	2.24e+5	1.58e+1
<u>Non-Carcinogens</u>				
Ethylbenzene	2.04e+3	9.99e+99	7.64e+2	5.56e+2
Naphthalene	8.18e+2	7.05e+1	2.91e+2	5.31e+1
Phenanthrene	8.18e+1	7.72e+1	9.08e+2	3.80e+1
Pyrene	6.13e+2	1.64e+1	2.78e+4	1.60e+1
Toluene	6.13e+3	9.99e+99	2.26e+2	2.18e+2
Xylene (mixed isomers)	1.43e+5	9.99e+99	8.33e+2	8.28e+2
TPH - New Method	1.34e+5	1.16e+4	8.55e+4	9.49e+3

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-96-15 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	37	4.92	2.0	1116	1.80	0.32	0.01	6.066E-11

For carcinogens:

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

For non-carcinogens:

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

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

DAF
1.00

Constituent of Concern	TR	SF (1/mg/kg-d)	HQ	RfD (mg/kg-d)	Dei (cm ² /sec)	Kd (cm ² /g)	H'	Kas (g/cm ³)	alpha (cm ² /sec)	VF (m ³ /kg)	SSTL (mg/kg)
Carcinogens											
Benzene	1.00e-6	2.91e-2		0.29	1.64e-2	1.10e+1	2.67e-1	2.44e-2	7.10e-5	1.75e-5	5.78e+0
Chrysene	1.00e-6	6.10e-3		0.04	1.30e-2	1.29e+1	5.38e-2	4.17e-3	9.61e-6	6.41e-6	1.95e+5
Non-Carcinogens											
Ethylbenzene			0.01	0.01	1.19e-3	1.41e+2	6.63e-3	4.69e-5	9.89e-9	2.05e-7	7.97e+2
Naphthalene			0.01	0.01	5.98e-3	3.80e+2	2.13e-4	5.59e-7	5.94e-10	5.03e-8	3.04e+2
Phenanthrene			0.01	0.01	1.84e-2	3.02e+0	2.65e-1	8.77e-2	2.83e-4	3.53e-5	9.48e+2
Pyrene			0.02	0.02	1.63e-2	2.40e+0	2.93e-1	1.22e-1	3.45e-4	3.92e-5	2.90e+4
Toluene			0.04	0.04							2.36e+2
Xylene (mixed isomers)			0.91	0.20							8.69e+2
TPH - New Method											8.92e+4
TPH-Arom-EC>8-10			0.00	0.06	2.20e-2	1.58e+1	4.84e-1	3.05e-2	1.19e-4	2.26e-5	1.23e+4
TPH-Arom-EC>10-12			0.02	0.06	2.20e-2	2.51e+1	1.36e-1	5.42e-3	2.12e-5	9.51e-6	2.92e+4
TPH-Arom-EC>12-16			0.09	0.06	2.20e-2	5.01e+1	5.16e-2	1.03e-3	4.02e-6	4.14e-6	6.71e+4
TPH-Arom-EC>16-21			0.13	0.03	2.20e-2	1.58e+2	1.18e-1	7.43e-4	2.90e-6	3.52e-6	4.15e+4
TPH-Arom-EC>21-35			0.11	0.03	2.20e-2	1.26e+3	6.65e-3	5.29e-6	2.06e-8	2.97e-7	4.92e+5
TPH-Aliph-EC 5-6			0.00	0.06	2.20e-2	7.94e+0	3.28e+1	4.12e+0	9.29e-3	3.45e-4	8.06e+2
TPH-Aliph-EC>6-8			0.00	0.06	2.20e-2	3.98e+1	4.85e+1	1.22e+0	3.91e-3	1.57e-4	1.77e+3
TPH-Aliph-EC>8-10			0.02	0.29	2.20e-2	3.16e+2	7.92e+1	2.51e-1	9.37e-4	6.60e-5	2.11e+4
TPH-Aliph-EC>10-12			0.07	0.29	2.20e-2	2.51e+3	1.23e+2	4.91e-2	1.90e-4	2.87e-5	4.84e+4
TPH-Aliph-EC>12-16			0.17	0.29	2.20e-2	5.01e+4	5.25e+2	1.05e-2	4.09e-5	1.32e-5	1.05e+5
TPH-Aliph-EC>16-35			0.38	2.00	2.20e-2	1.00e+7	6.57e+4	6.57e-3	2.56e-5	1.05e-5	9.30e+5

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-96-15 Lea County, New Mexico	BW (kg)	CF (mg/kg)	IR _{soil} (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	SF _o (1/mg/kg-d)	HQ	RfDo (mg/kg-d)	SSTL _{ING} (mg/kg)	SF _d (1/mg/kg-d)	RfD _d (mg/kg-d)	ABS	SSTL _{DER} (mg/kg)
Carcinogens									
Benzene	1.00e-6	2.90e-2			2.03e+1	2.90e-2		0.000	9.99e+99
Chrysene	1.00e-6	7.30e-3			8.06e+1	2.36e-2		0.130	9.57e+0
Non-Carcinogens									
Ethylbenzene			0.01	0.10	7.82e+1		0.10	0.000	9.99e+99
Naphthalene			0.01	0.04	3.13e+1		0.04	0.100	5.03e+1
Phenanthrene			0.01	0.00	3.13e+0		0.02	0.050	5.51e+1
Pyrene			0.01	0.03	2.35e+1		0.01	0.100	1.17e+1
Toluene			0.02	0.20	2.35e+2		0.20	0.000	9.99e+99
Xylene (mixed isomers)			0.04	2.00	5.48e+3		2.00	0.000	9.99e+99
TPH - New Method			0.91		5.15e+3				8.28e+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			0.02	0.04	3.13e+3		0.04	0.100	5.03e+3
TPH-Arom-EC>12-16			0.09	0.04	3.13e+3		0.04	0.100	5.03e+3
TPH-Arom-EC>16-21			0.13	0.03	2.35e+3		0.03	0.100	3.78e+3
TPH-Arom-EC>21-35			0.11	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			0.02	0.10	7.82e+3		0.10	0.100	1.26e+4
TPH-Aliph-EC>10-12			0.07	0.10	7.82e+3		0.10	0.100	1.26e+4
TPH-Aliph-EC>12-16			0.17	0.10	7.82e+3		0.10	0.100	1.26e+4
TPH-Aliph-EC>16-35			0.38	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.

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

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

Constituent of Concern	SSTL _{ING} (mg/kg)	SSTL _{DER} (mg/kg)	SSTL _{INHAL} (mg/kg)	SSTL _{res-SOIL} (mg/kg)
<u>Carcinogens</u>				
Benzene	2.03e+1	9.99e+99	5.78e+0	4.50e+0
Chrysene	8.06e+1	9.57e+0	1.95e+5	8.56e+0
<u>Non-Carcinogens</u>				
Ethylbenzene	7.82e+1	9.99e+99	7.97e+2	7.12e+1
Naphthalene	3.13e+1	5.03e+1	3.04e+2	1.81e+1
Phenanthrene	3.13e+0	5.51e+1	9.48e+2	2.95e+0
Pyrene	2.35e+1	1.17e+1	2.90e+4	7.81e+0
Toluene	2.35e+2	9.99e+99	2.36e+2	1.18e+2
Xylene (mixed isomers)	5.48e+3	9.99e+99	8.69e+2	7.50e+2
TPH - New Method	5.15e+3	8.28e+3	8.92e+4	3.06e+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. TNM-96-15 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	37	4.92	2.0	109	1.80	0.32	0.01	4.579E-11

For carcinogens:

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

For non-carcinogens:

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

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

Constituent of Concern	TR	SF (1/mg/kg-d)	HQ	RfD (mg/kg-d)	Dei (cm ² /sec)	Kd (cm ² /g)	H'	Kas (g/cm ³)	alpha (cm ² /sec)	VF (m ³ /kg)	SSTL (mg/kg)
<u>Carcinogens</u>											
Benzene	1.00e-6	2.91e-2		0.29	2.05e-2	8.32e-1	2.32e-1	2.80e-1	9.70e-4	6.75e-5	6.36e+1
Chrysene	1.00e-6	6.10e-3		0.04	5.45e-3	2.00e+3	4.37e-5	2.19e-8	2.12e-11	9.51e-9	2.15e+6
<u>Non-Carcinogens</u>											
Ethylbenzene			0.01	0.01	1.64e-2	1.10e+1	2.67e-1	2.44e-2	7.10e-5	1.75e-5	7.01e+1
Naphthalene			0.01	0.01	1.30e-2	1.29e+1	5.38e-2	4.17e-3	9.61e-6	6.41e-6	2.67e+1
Phenanthrene			0.01	0.00	1.19e-3	1.41e+2	6.63e-3	4.69e-5	9.89e-9	2.05e-7	8.34e+1
Pyrene			0.01	0.03	5.98e-3	3.80e+2	2.13e-4	5.59e-7	5.94e-10	5.03e-8	2.55e+3
Toluene			0.02	0.11	1.84e-2	3.02e+0	2.65e-1	8.77e-2	2.83e-4	3.53e-5	2.08e+1
Xylene (mixed isomers)			0.04	0.20	1.63e-2	2.40e+0	2.93e-1	1.22e-1	3.45e-4	3.92e-5	7.65e+1
TPH - New Method			0.91								7.85e+3
TPH-Arom-EC>8-10			0.00	0.06	2.20e-2	1.58e+1	4.84e-1	3.05e-2	1.19e-4	2.26e-5	1.08e+3
TPH-Arom-EC>10-12			0.02	0.06	2.20e-2	2.51e+1	1.36e-1	5.42e-3	2.12e-5	9.51e-6	2.57e+3
TPH-Arom-EC>12-16			0.09	0.06	2.20e-2	5.01e+1	5.16e-2	1.03e-3	4.02e-6	4.14e-6	5.91e+3
TPH-Arom-EC>16-21			0.13	0.03	2.20e-2	1.58e+2	1.18e-1	7.43e-4	2.90e-6	3.52e-6	3.65e+3
TPH-Arom-EC>21-35			0.11	0.03	2.20e-2	1.26e+3	6.65e-3	5.29e-6	2.06e-8	2.97e-7	4.33e+4
TPH-Aliph-EC 5-6			0.00	0.06	2.20e-2	7.94e+0	3.28e+1	4.12e+0	9.29e-3	3.45e-4	7.09e+1
TPH-Aliph-EC>6-8			0.00	0.06	2.20e-2	3.98e+1	4.85e+1	1.22e+0	3.91e-3	1.57e-4	1.56e+2
TPH-Aliph-EC>8-10			0.02	0.29	2.20e-2	3.16e+2	7.92e+1	2.51e-1	9.37e-4	6.60e-5	1.85e+3
TPH-Aliph-EC>10-12			0.07	0.29	2.20e-2	2.51e+3	1.23e+2	4.91e-2	1.90e-4	2.87e-5	4.26e+3
TPH-Aliph-EC>12-16			0.17	0.29	2.20e-2	5.01e+4	5.25e+2	1.05e-2	4.09e-5	1.32e-5	9.25e+3
TPH-Aliph-EC>16-35			0.38	2.00	2.20e-2	1.00e+7	6.57e+4	6.57e-3	2.56e-5	1.05e-5	8.18e+4

NOTES:

SSTL = Site specific Target Level	BW = body weight	V = Velocity of Wind	H' = unitless Henry's Law Constant
TR = Target Risk	AT = averaging time	DH = Diffusion Height	Kd = organic carbon partition coefficient * foc
SF = Slope Factor	IR _A = Inhalation rate	A = Area of Soil Source	foc = fraction organic carbon
HQ = hazard quotient	EF = exposure frequency	B = Bulk Soil Density	Kas = H' / Kd
RfD = Reference Dose	ED = exposure duration	E = Effective Porosity	alpha = Dei * E / (E + B / Kas)
	LS = Length of Source Area	Dei = effective diffusion coefficient	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-96-15 Lea County, New Mexico	BW (kg)	CF (mg/kg)	IR _{soil} (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:

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

For non-carcinogens:

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

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

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

Constituent of Concern	TR	SFo (1/mg/kg-d)	HQ	RfDo (mg/kg-d)	SSTL _{ING} (mg/kg)	SF _d (1/mg/kg-d)	RfD _d (mg/kg-d)	ABS	SSTL _{DER} (mg/kg)
<u>Carcinogens</u>									
Benzene	1.00e-6	2.90e-2			2.14e+3	2.90e-2		0.000	9.99e+99
Chrysene	1.00e-6	7.30e-3			8.51e+3	2.36e-2		0.130	2.45e+4
<u>Non-Carcinogens</u>									
Ethylbenzene			0.01	0.10	2.13e+2		0.10	0.000	9.99e+99
Naphthalene			0.01	0.04	8.52e+1		0.04	0.100	1.03e+3
Phenanthrene			0.01	0.00	8.52e+0		0.02	0.050	1.13e+3
Pyrene			0.01	0.03	6.39e+1		0.01	0.100	2.40e+2
Toluene			0.02	0.20	6.39e+2		0.20	0.000	9.99e+99
Xylene (mixed isomers)			0.04	2.00	1.49e+4		2.00	0.000	9.99e+99
TPH - New Method			0.91		1.40e+4				1.70e+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			0.02	0.04	8.52e+3		0.04	0.100	1.03e+5
TPH-Arom-EC>12-16			0.09	0.04	8.52e+3		0.04	0.100	1.03e+5
TPH-Arom-EC>16-21			0.13	0.03	6.39e+3		0.03	0.100	7.74e+4
TPH-Arom-EC>21-35			0.11	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			0.02	0.10	2.13e+4		0.10	0.100	2.58e+5
TPH-Aliph-EC>10-12			0.07	0.10	2.13e+4		0.10	0.100	2.58e+5
TPH-Aliph-EC>12-16			0.17	0.10	2.13e+4		0.10	0.100	2.58e+5
TPH-Aliph-EC>16-35			0.38	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.

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

Constituent of Concern	SSTL _{ING} (mg/kg)	SSTL _{DER} (mg/kg)	SSTL _{INHAL} (mg/kg)	SSTL _{CW-SOIL} (mg/kg)
<u>Carcinogens</u>				
Benzene	2.14e+3	9.99e+99	6.36e+1	6.17e+1
Chrysene	8.51e+3	2.45e+4	2.15e+6	6.30e+3
<u>Non-Carcinogens</u>				
Ethylbenzene	2.13e+2	9.99e+99	7.01e+1	5.27e+1
Naphthalene	8.52e+1	1.03e+3	2.67e+1	2.00e+1
Phenanthrene	8.52e+0	1.13e+3	8.34e+1	7.67e+0
Pyrene	6.39e+1	2.40e+2	2.55e+3	4.95e+1
Toluene	6.39e+2	9.99e+99	2.08e+1	2.01e+1
Xylene (mixed isomers)	1.49e+4	9.99e+99	7.65e+1	7.61e+1
TPH - New Method	1.40e+4	1.70e+5	7.85e+3	4.89e+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)	1.00E-02
Incorporation Depth	(cm)	457
Clean Soil Thickness	(cm)	0
Simulation Time	(yrs)	70
Length of Soil Column	(cm)	2620
Infiltration Rate	(cm/day)	5.55E-02
Source Length	(m)	30.5
Source Width	(m)	36.6
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)	7427
Advective Mass Loading Rate to Groundwater	(g/day)	1.74E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.1078
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.1078

Time = 2 yrs

Cumulative Emissions to Air	(g)	8068
Advective Mass Loading Rate to Groundwater	(g/day)	1.01E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.2864
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.2864

Time = 3 yrs

Cumulative Emissions to Air	(g)	8360
Advective Mass Loading Rate to Groundwater	(g/day)	1.45E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.2468
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.2468

Time = 4 yrs

Cumulative Emissions to Air	(g)	8537
Advective Mass Loading Rate to Groundwater	(g/day)	1.53E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.1747
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.1747

Time = 5 yrs

Cumulative Emissions to Air	(g)	8658
Advective Mass Loading Rate to Groundwater	(g/day)	1.48E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.1177
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.1177

Time = 10 yrs
=====

Cumulative Emissions to Air	(g)	8960
Advective Mass Loading Rate to Groundwater	(g/day)	9.5E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.01041
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.01042

Time = 15 yrs
=====

Cumulative Emissions to Air	(g)	9095
Advective Mass Loading Rate to Groundwater	(g/day)	6.33E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00762
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00761

Time = 20 yrs
=====

Cumulative Emissions to Air	(g)	9176
Advective Mass Loading Rate to Groundwater	(g/day)	4.55E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.01071
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.01071

Time = 25 yrs
=====

Cumulative Emissions to Air	(g)	9231
Advective Mass Loading Rate to Groundwater	(g/day)	3.46E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.01053
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.01053

Time = 30 yrs
=====

Cumulative Emissions to Air	(g)	9271
Advective Mass Loading Rate to Groundwater	(g/day)	2.74E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00961
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.0096

Time = 35 yrs
=====

Cumulative Emissions to Air	(g)	9303
Advective Mass Loading Rate to Groundwater	(g/day)	2.24E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00859
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00858

Time = 40 yrs
=====

Cumulative Emissions to Air	(g)	9329
Advective Mass Loading Rate to Groundwater	(g/day)	1.87E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00764
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00764

Time = 45 yrs
=====

Cumulative Emissions to Air	(g)	9350
Advective Mass Loading Rate to Groundwater	(g/day)	1.59E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00682
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00682

Time = 50 yrs
=====

Cumulative Emissions to Air	(g)	9368
Advective Mass Loading Rate to Groundwater	(g/day)	1.38E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00612
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00611

Time = 55 yrs
=====

Cumulative Emissions to Air	(g)	9383
Advective Mass Loading Rate to Groundwater	(g/day)	1.21E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00551
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00551

Time = 60 yrs
=====

Cumulative Emissions to Air	(g)	9396
Advective Mass Loading Rate to Groundwater	(g/day)	1.07E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.005
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00499

Time = 65 yrs
=====

Cumulative Emissions to Air	(g)	9408
Advective Mass Loading Rate to Groundwater	(g/day)	9.57E-07
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00455
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00455

Time = 70 yrs
=====

Cumulative Emissions to Air	(g)	9419
Advective Mass Loading Rate to Groundwater	(g/day)	8.62E-07
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00416
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00416

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)	5921
Advective Mass Loading Rate to Groundwater	(g/day)	4.94E-11
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.6E-05
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.6E-05

Time = 2 yrs

Cumulative Emissions to Air	(g)	6909
Advective Mass Loading Rate to Groundwater	(g/day)	3.63E-08
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.005669
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.005669

Time = 3 yrs

Cumulative Emissions to Air	(g)	7386
Advective Mass Loading Rate to Groundwater	(g/day)	3.06E-07
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.0312
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.0312

Time = 4 yrs

Cumulative Emissions to Air	(g)	7680
Advective Mass Loading Rate to Groundwater	(g/day)	8.25E-07
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.06157
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.06157

Time = 5 yrs

Cumulative Emissions to Air	(g)	7885
Advective Mass Loading Rate to Groundwater	(g/day)	1.42E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.08215
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.08215

Time = 10 yrs

Cumulative Emissions to Air	(g)	8403
Advective Mass Loading Rate to Groundwater	(g/day)	3.01E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.07427
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.07427

Time = 15 yrs

Cumulative Emissions to Air	(g)	8637
Advective Mass Loading Rate to Groundwater	(g/day)	3.02E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.04063
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.04063

Time = 20 yrs

Cumulative Emissions to Air	(g)	8778
Advective Mass Loading Rate to Groundwater	(g/day)	2.68E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.02086
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.02086

Time = 25 yrs

Cumulative Emissions to Air	(g)	8874
Advective Mass Loading Rate to Groundwater	(g/day)	2.31E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.01016
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.01016

Time = 30 yrs

Cumulative Emissions to Air	(g)	8945
Advective Mass Loading Rate to Groundwater	(g/day)	1.99E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.004248
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.00425

Time = 35 yrs

Cumulative Emissions to Air	(g)	9001
Advective Mass Loading Rate to Groundwater	(g/day)	1.73E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.000892
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.000893

Time = 40 yrs

Cumulative Emissions to Air	(g)	9045
Advective Mass Loading Rate to Groundwater	(g/day)	1.51E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00106
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00105

Time = 45 yrs
=====

Cumulative Emissions to Air	(g)	9082
Advective Mass Loading Rate to Groundwater	(g/day)	1.33E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00219
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00219

Time = 50 yrs
=====

Cumulative Emissions to Air	(g)	9114
Advective Mass Loading Rate to Groundwater	(g/day)	1.19E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00285
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00285

Time = 55 yrs
=====

Cumulative Emissions to Air	(g)	9141
Advective Mass Loading Rate to Groundwater	(g/day)	1.07E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00322
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00322

Time = 60 yrs
=====

Cumulative Emissions to Air	(g)	9164
Advective Mass Loading Rate to Groundwater	(g/day)	9.62E-07
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.0034
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.0034

Time = 65 yrs
=====

Cumulative Emissions to Air	(g)	9185
Advective Mass Loading Rate to Groundwater	(g/day)	8.74E-07
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00347
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00347

Time = 70 yrs
=====

Cumulative Emissions to Air	(g)	9204
Advective Mass Loading Rate to Groundwater	(g/day)	7.98E-07
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00347
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00347

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)	3485
Advective Mass Loading Rate to Groundwater	(g/day)	2.18E-30
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.64E-23
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.64E-23

Time = 2 yrs

Cumulative Emissions to Air	(g)	4664
Advective Mass Loading Rate to Groundwater	(g/day)	1.43E-18
Diffusive Mass Loading Rate to Groundwater	(g/day)	4.43E-12
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	4.43E-12

Time = 3 yrs

Cumulative Emissions to Air	(g)	5362
Advective Mass Loading Rate to Groundwater	(g/day)	1.35E-14
Diffusive Mass Loading Rate to Groundwater	(g/day)	2.63E-08
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	2.63E-08

Time = 4 yrs

Cumulative Emissions to Air	(g)	5834
Advective Mass Loading Rate to Groundwater	(g/day)	1.36E-12
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.94E-06
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.94E-06

Time = 5 yrs

Cumulative Emissions to Air	(g)	6180
Advective Mass Loading Rate to Groundwater	(g/day)	2.2E-11
Diffusive Mass Loading Rate to Groundwater	(g/day)	2.47E-05
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	2.47E-05

Time = 10 yrs

Cumulative Emissions to Air	(g)	7116
Advective Mass Loading Rate to Groundwater	(g/day)	5.68E-09
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.003092
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.003092

Time = 15 yrs

Cumulative Emissions to Air	(g)	7562
Advective Mass Loading Rate to Groundwater	(g/day)	3.27E-08
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.01155
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.01155

Time = 20 yrs

Cumulative Emissions to Air	(g)	7836
Advective Mass Loading Rate to Groundwater	(g/day)	7.19E-08
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.01847
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.01847

Time = 25 yrs

Cumulative Emissions to Air	(g)	8026
Advective Mass Loading Rate to Groundwater	(g/day)	1.09E-07
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.02155
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.02155

Time = 30 yrs

Cumulative Emissions to Air	(g)	8167
Advective Mass Loading Rate to Groundwater	(g/day)	1.37E-07
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.0218
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.0218

Time = 35 yrs

Cumulative Emissions to Air	(g)	8278
Advective Mass Loading Rate to Groundwater	(g/day)	1.56E-07
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.0205
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.0205

Time = 40 yrs

Cumulative Emissions to Air	(g)	8367
Advective Mass Loading Rate to Groundwater	(g/day)	1.68E-07
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.01854
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.01854

Time = 45 yrs

Cumulative Emissions to Air	(g)	8442
Advective Mass Loading Rate to Groundwater	(g/day)	1.74E-07
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.01639
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.01639

Time = 50 yrs

Cumulative Emissions to Air	(g)	8505
Advective Mass Loading Rate to Groundwater	(g/day)	1.77E-07
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.0143
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.0143

Time = 55 yrs

Cumulative Emissions to Air	(g)	8560
Advective Mass Loading Rate to Groundwater	(g/day)	1.77E-07
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.01237
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.01237

Time = 60 yrs

Cumulative Emissions to Air	(g)	8607
Advective Mass Loading Rate to Groundwater	(g/day)	1.74E-07
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.01065
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.01065

Time = 65 yrs

Cumulative Emissions to Air	(g)	8650
Advective Mass Loading Rate to Groundwater	(g/day)	1.71E-07
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.009139
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.009139

Time = 70 yrs

Cumulative Emissions to Air	(g)	8687
Advective Mass Loading Rate to Groundwater	(g/day)	1.67E-07
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.007823
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.007823

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)	871.5
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)	1234
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)	1511
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)	1746
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)	1952
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)	2756
Advective Mass Loading Rate to Groundwater	(g/day)	1.65E-47
Diffusive Mass Loading Rate to Groundwater	(g/day)	3.15E-39
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	3.15E-39

Time = 15 yrs
=====

Cumulative Emissions to Air	(g)	3351
Advective Mass Loading Rate to Groundwater	(g/day)	9.89E-35
Diffusive Mass Loading Rate to Groundwater	(g/day)	9.94E-27
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	9.94E-27

Time = 20 yrs
=====

Cumulative Emissions to Air	(g)	3819
Advective Mass Loading Rate to Groundwater	(g/day)	2.52E-28
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.7E-20
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.7E-20

Time = 25 yrs
=====

Cumulative Emissions to Air	(g)	4200
Advective Mass Loading Rate to Groundwater	(g/day)	1.81E-24
Diffusive Mass Loading Rate to Groundwater	(g/day)	9.12E-17
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	9.12E-17

Time = 30 yrs
=====

Cumulative Emissions to Air	(g)	4517
Advective Mass Loading Rate to Groundwater	(g/day)	6.82E-22
Diffusive Mass Loading Rate to Groundwater	(g/day)	2.75E-14
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	2.75E-14

Time = 35 yrs
=====

Cumulative Emissions to Air	(g)	4786
Advective Mass Loading Rate to Groundwater	(g/day)	4.77E-20
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.61E-12
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.61E-12

Time = 40 yrs
=====

Cumulative Emissions to Air	(g)	5017
Advective Mass Loading Rate to Groundwater	(g/day)	1.17E-18
Diffusive Mass Loading Rate to Groundwater	(g/day)	3.36E-11
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	3.36E-11

Time = 45 yrs
=====

Cumulative Emissions to Air	(g)	5219
Advective Mass Loading Rate to Groundwater	(g/day)	1.41E-17
Diffusive Mass Loading Rate to Groundwater	(g/day)	3.55E-10
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	3.55E-10

Time = 50 yrs
=====

Cumulative Emissions to Air	(g)	5397
Advective Mass Loading Rate to Groundwater	(g/day)	1.04E-16
Diffusive Mass Loading Rate to Groundwater	(g/day)	2.33E-09
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	2.33E-09

Time = 55 yrs
=====

Cumulative Emissions to Air	(g)	5556
Advective Mass Loading Rate to Groundwater	(g/day)	5.34E-16
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.08E-08
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.08E-08

Time = 60 yrs
=====

Cumulative Emissions to Air	(g)	5699
Advective Mass Loading Rate to Groundwater	(g/day)	2.1E-15
Diffusive Mass Loading Rate to Groundwater	(g/day)	3.86E-08
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	3.86E-08

Time = 65 yrs
=====

Cumulative Emissions to Air	(g)	5827
Advective Mass Loading Rate to Groundwater	(g/day)	6.7E-15
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.13E-07
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.13E-07

Time = 70 yrs
=====

Cumulative Emissions to Air	(g)	5944
Advective Mass Loading Rate to Groundwater	(g/day)	1.82E-14
Diffusive Mass Loading Rate to Groundwater	(g/day)	2.83E-07
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	2.83E-07

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)	5158
Advective Mass Loading Rate to Groundwater	(g/day)	4.13E-12
Diffusive Mass Loading Rate to Groundwater	(g/day)	8.3E-09
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	8.3E-09

Time = 2 yrs

Cumulative Emissions to Air	(g)	6270
Advective Mass Loading Rate to Groundwater	(g/day)	1.33E-07
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.000126
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.000126

Time = 3 yrs

Cumulative Emissions to Air	(g)	6831
Advective Mass Loading Rate to Groundwater	(g/day)	.4318E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	.2687E-02
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.2691E-02

Time = 4 yrs

Cumulative Emissions to Air	(g)	7184
Advective Mass Loading Rate to Groundwater	(g/day)	.2384E-04
Diffusive Mass Loading Rate to Groundwater	(g/day)	.1097E-01
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.1100E-01

Time = 5 yrs

Cumulative Emissions to Air	(g)	7432
Advective Mass Loading Rate to Groundwater	(g/day)	.6409E-04
Diffusive Mass Loading Rate to Groundwater	(g/day)	.2325E-01
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.2332E-01

Time = 10 yrs

Cumulative Emissions to Air	(g)	8067
Advective Mass Loading Rate to Groundwater	(g/day)	.3552E-03
Diffusive Mass Loading Rate to Groundwater	(g/day)	.5896E-01
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.5931E-01

Time = 15 yrs

Cumulative Emissions to Air	(g)	8357
Advective Mass Loading Rate to Groundwater	(g/day)	.5010E-03
Diffusive Mass Loading Rate to Groundwater	(g/day)	.4982E-01
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.5032E-01

Time = 20 yrs

Cumulative Emissions to Air	(g)	8531
Advective Mass Loading Rate to Groundwater	(g/day)	.5275E-03
Diffusive Mass Loading Rate to Groundwater	(g/day)	.3480E-01
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.3533E-01

Time = 25 yrs

Cumulative Emissions to Air	(g)	8651
Advective Mass Loading Rate to Groundwater	(g/day)	.5055E-03
Diffusive Mass Loading Rate to Groundwater	(g/day)	.2316E-01
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.2367E-01

Time = 30 yrs

Cumulative Emissions to Air	(g)	8740
Advective Mass Loading Rate to Groundwater	(g/day)	.4676E-03
Diffusive Mass Loading Rate to Groundwater	(g/day)	.1513E-01
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.1560E-01

Time = 35 yrs

Cumulative Emissions to Air	(g)	8809
Advective Mass Loading Rate to Groundwater	(g/day)	.4270E-03
Diffusive Mass Loading Rate to Groundwater	(g/day)	.9706E-02
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.1013E-01

Time = 40 yrs

Cumulative Emissions to Air	(g)	8865
Advective Mass Loading Rate to Groundwater	(g/day)	.3883E-03
Diffusive Mass Loading Rate to Groundwater	(g/day)	.6020E-02
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.6408E-02

Time = 45 yrs
=====

Cumulative Emissions to Air	(g)	8912
Advective Mass Loading Rate to Groundwater	(g/day)	.3533E-03
Diffusive Mass Loading Rate to Groundwater	(g/day)	.3489E-02
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.3842E-02

Time = 50 yrs
=====

Cumulative Emissions to Air	(g)	8951
Advective Mass Loading Rate to Groundwater	(g/day)	.3222E-03
Diffusive Mass Loading Rate to Groundwater	(g/day)	.1730E-02
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.2052E-02

Time = 55 yrs
=====

Cumulative Emissions to Air	(g)	8985
Advective Mass Loading Rate to Groundwater	(g/day)	.2947E-03
Diffusive Mass Loading Rate to Groundwater	(g/day)	.4959E-03
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.7906E-03

Time = 60 yrs
=====

Cumulative Emissions to Air	(g)	9014
Advective Mass Loading Rate to Groundwater	(g/day)	.2706E-03
Diffusive Mass Loading Rate to Groundwater	(g/day)	.3767E-03
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.1061E-03

Time = 65 yrs
=====

Cumulative Emissions to Air	(g)	9040
Advective Mass Loading Rate to Groundwater	(g/day)	.2493E-03
Diffusive Mass Loading Rate to Groundwater	(g/day)	.9958E-03
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.7465E-03

Time = 70 yrs
=====

Cumulative Emissions to Air	(g)	9063
Advective Mass Loading Rate to Groundwater	(g/day)	.2305E-03
Diffusive Mass Loading Rate to Groundwater	(g/day)	.1435E-02
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.1204E-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)	1.53E+01
Y-COORDINATE OF RECEPTOR WELL (METERS)	1.83E+01
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)	3.05E+01
BEGIN POINT OF Y-SOURCE LOCATION (METERS)	0.00E+00
END POINT OF Y-SOURCE LOCATION (METERS)	3.66E+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

.394E-01	.105E+00	.901E-01	.638E-01	.430E-01
.284E-01	.185E-01	.118E-01	.707E-02	.380E-02
.149E-02	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.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] = .155E-05
time [yr] = 5.00	avg. conc. [mg/l] = .181E-02
time [yr] = 10.0	avg. conc. [mg/l] = .141E-02
time [yr] = 15.0	avg. conc. [mg/l] = .103E-02
time [yr] = 20.0	avg. conc. [mg/l] = .848E-03
time [yr] = 25.0	avg. conc. [mg/l] = .739E-03
time [yr] = 30.0	avg. conc. [mg/l] = .664E-03
time [yr] = 35.0	avg. conc. [mg/l] = .609E-03
time [yr] = 40.0	avg. conc. [mg/l] = .565E-03
time [yr] = 45.0	avg. conc. [mg/l] = .529E-03
time [yr] = 50.0	avg. conc. [mg/l] = .500E-03
time [yr] = 55.0	avg. conc. [mg/l] = .475E-03
time [yr] = 60.0	avg. conc. [mg/l] = .453E-03
time [yr] = 65.0	avg. conc. [mg/l] = .434E-03
time [yr] = 70.0	avg. conc. [mg/l] = .418E-03

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

.582E-05	.207E-02	.114E-01	.225E-01	.300E-01
.333E-01	.337E-01	.322E-01	.298E-01	.271E-01
.243E-01	.216E-01	.191E-01	.169E-01	.148E-01
.130E-01	.114E-01	.998E-02	.873E-02	.761E-02
.663E-02	.576E-02	.499E-02	.431E-02	.371E-02
.317E-02	.269E-02	.227E-02	.189E-02	.155E-02
.125E-02	.979E-03	.737E-03	.520E-03	.326E-03
.152E-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

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] = .109E-03
time [yr] = 10.0	avg. conc. [mg/l] = .343E-03
time [yr] = 15.0	avg. conc. [mg/l] = .410E-03
time [yr] = 20.0	avg. conc. [mg/l] = .378E-03
time [yr] = 25.0	avg. conc. [mg/l] = .342E-03
time [yr] = 30.0	avg. conc. [mg/l] = .299E-03
time [yr] = 35.0	avg. conc. [mg/l] = .265E-03
time [yr] = 40.0	avg. conc. [mg/l] = .236E-03
time [yr] = 45.0	avg. conc. [mg/l] = .215E-03
time [yr] = 50.0	avg. conc. [mg/l] = .200E-03
time [yr] = 55.0	avg. conc. [mg/l] = .188E-03
time [yr] = 60.0	avg. conc. [mg/l] = .177E-03
time [yr] = 65.0	avg. conc. [mg/l] = .169E-03
time [yr] = 70.0	avg. conc. [mg/l] = .161E-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

.598E-23	.162E-11	.959E-08	.706E-06	.902E-05
.479E-04	.154E-03	.361E-03	.687E-03	.113E-02
.167E-02	.227E-02	.292E-02	.357E-02	.421E-02
.482E-02	.539E-02	.590E-02	.635E-02	.674E-02
.707E-02	.735E-02	.757E-02	.774E-02	.787E-02
.795E-02	.800E-02	.801E-02	.800E-02	.796E-02
.789E-02	.781E-02	.772E-02	.761E-02	.748E-02
.735E-02	.721E-02	.707E-02	.692E-02	.677E-02
.661E-02	.646E-02	.630E-02	.614E-02	.598E-02
.583E-02	.567E-02	.552E-02	.537E-02	.522E-02
.507E-02	.493E-02	.479E-02	.465E-02	.452E-02
.438E-02	.425E-02	.413E-02	.401E-02	.389E-02
.377E-02	.366E-02	.355E-02	.344E-02	.334E-02
.323E-02	.314E-02	.304E-02	.295E-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] = .362E-06
time [yr] = 15.0	avg. conc. [mg/l] = .378E-05
time [yr] = 20.0	avg. conc. [mg/l] = .102E-04
time [yr] = 25.0	avg. conc. [mg/l] = .187E-04
time [yr] = 30.0	avg. conc. [mg/l] = .258E-04
time [yr] = 35.0	avg. conc. [mg/l] = .324E-04
time [yr] = 40.0	avg. conc. [mg/l] = .367E-04
time [yr] = 45.0	avg. conc. [mg/l] = .402E-04
time [yr] = 50.0	avg. conc. [mg/l] = .420E-04
time [yr] = 55.0	avg. conc. [mg/l] = .435E-04
time [yr] = 60.0	avg. conc. [mg/l] = .437E-04
time [yr] = 65.0	avg. conc. [mg/l] = .440E-04
time [yr] = 70.0	avg. conc. [mg/l] = .434E-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	.774E-43	.115E-38
.297E-35	.206E-32	.521E-30	.597E-28	.363E-26
.132E-24	.313E-23	.521E-22	.645E-21	.621E-20
.481E-19	.309E-18	.168E-17	.797E-17	.333E-16
.125E-15	.422E-15	.131E-14	.376E-14	.100E-13
.252E-13	.596E-13	.134E-12	.286E-12	.586E-12
.115E-11	.219E-11	.400E-11	.711E-11	.123E-10
.206E-10	.337E-10	.540E-10	.845E-10	.130E-09
.195E-09	.289E-09	.420E-09	.602E-09	.851E-09
.118E-08	.163E-08	.221E-08	.297E-08	.394E-08
.518E-08	.675E-08	.870E-08	.111E-07	.141E-07
.177E-07	.221E-07	.274E-07	.338E-07	.413E-07
.502E-07	.606E-07	.728E-07	.869E-07	

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-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	.774E-43	.115E-38
.297E-35	.206E-32	.521E-30	.597E-28	.363E-26
.132E-24	.313E-23	.521E-22	.645E-21	.621E-20
.481E-19	.309E-18	.168E-17	.797E-17	.333E-16
.125E-15	.422E-15	.131E-14	.376E-14	.100E-13
.252E-13	.596E-13	.134E-12	.286E-12	.586E-12
.115E-11	.219E-11	.400E-11	.711E-11	.123E-10
.206E-10	.337E-10	.540E-10	.845E-10	.130E-09
.195E-09	.289E-09	.420E-09	.602E-09	.851E-09
.118E-08	.163E-08	.221E-08	.297E-08	.394E-08
.518E-08	.675E-08	.870E-08	.111E-07	.141E-07
.177E-07	.221E-07	.274E-07	.338E-07	.413E-07
.502E-07	.606E-07	.728E-07	.869E-07	

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

.303E-08	.462E-04	.982E-03	.401E-02	.851E-02
.131E-01	.168E-01	.194E-01	.210E-01	.216E-01
.217E-01	.212E-01	.204E-01	.194E-01	.184E-01
.172E-01	.161E-01	.150E-01	.139E-01	.129E-01
.119E-01	.110E-01	.102E-01	.937E-02	.864E-02
.796E-02	.732E-02	.674E-02	.620E-02	.569E-02
.523E-02	.480E-02	.441E-02	.404E-02	.370E-02
.338E-02	.309E-02	.282E-02	.257E-02	.234E-02
.212E-02	.192E-02	.174E-02	.156E-02	.140E-02
.125E-02	.111E-02	.983E-03	.862E-03	.749E-03
.644E-03	.546E-03	.454E-03	.368E-03	.289E-03
.214E-03	.144E-03	.791E-04	.182E-04	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00

RETARDATION FACTOR	2.30E+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] = .220E-03
time [yr] = 10.0	avg. conc. [mg/l] = .210E-02
time [yr] = 15.0	avg. conc. [mg/l] = .379E-02
time [yr] = 20.0	avg. conc. [mg/l] = .418E-02
time [yr] = 25.0	avg. conc. [mg/l] = .434E-02
time [yr] = 30.0	avg. conc. [mg/l] = .415E-02
time [yr] = 35.0	avg. conc. [mg/l] = .402E-02
time [yr] = 40.0	avg. conc. [mg/l] = .380E-02
time [yr] = 45.0	avg. conc. [mg/l] = .365E-02
time [yr] = 50.0	avg. conc. [mg/l] = .348E-02
time [yr] = 55.0	avg. conc. [mg/l] = .334E-02
time [yr] = 60.0	avg. conc. [mg/l] = .321E-02
time [yr] = 65.0	avg. conc. [mg/l] = .312E-02
time [yr] = 70.0	avg. conc. [mg/l] = .305E-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)	1.00E-02
Incorporation Depth	(cm)	457
Clean Soil Thickness	(cm)	0
Simulation Time	(yrs)	70
Length of Soil Column	(cm)	2620
Infiltration Rate	(cm/day)	5.55E-02
Source Length	(m)	30.5
Source Width	(m)	36.6
Boundary Layer Thickness	(cm)	5

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)	8060
Advective Mass Loading Rate to Groundwater	(g/day)	4.75E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.5651
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.5652

Time = 2 yrs

Cumulative Emissions to Air	(g)	8531
Advective Mass Loading Rate to Groundwater	(g/day)	7.33E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.3514
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.3515

Time = 3 yrs

Cumulative Emissions to Air	(g)	8743
Advective Mass Loading Rate to Groundwater	(g/day)	6.59E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.1584
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.1584

Time = 4 yrs

Cumulative Emissions to Air	(g)	8870
Advective Mass Loading Rate to Groundwater	(g/day)	5.51E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.0664
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.06645

Time = 5 yrs

Cumulative Emissions to Air	(g)	8957
Advective Mass Loading Rate to Groundwater	(g/day)	4.59E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.02226
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.0223

Time = 10 yrs
=====

Cumulative Emissions to Air	(g)	9173
Advective Mass Loading Rate to Groundwater	(g/day)	2.2E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.02112
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.0211

Time = 15 yrs
=====

Cumulative Emissions to Air	(g)	9270
Advective Mass Loading Rate to Groundwater	(g/day)	1.33E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.01914
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.01913

Time = 20 yrs
=====

Cumulative Emissions to Air	(g)	9327
Advective Mass Loading Rate to Groundwater	(g/day)	9.08E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.01528
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.01527

Time = 25 yrs
=====

Cumulative Emissions to Air	(g)	9366
Advective Mass Loading Rate to Groundwater	(g/day)	6.7E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.01224
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.01224

Time = 30 yrs
=====

Cumulative Emissions to Air	(g)	9395
Advective Mass Loading Rate to Groundwater	(g/day)	5.21E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.01001
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.01

Time = 35 yrs
=====

Cumulative Emissions to Air	(g)	9418
Advective Mass Loading Rate to Groundwater	(g/day)	4.19E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00835
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00835

Time = 40 yrs
=====

Cumulative Emissions to Air	(g)	9436
Advective Mass Loading Rate to Groundwater	(g/day)	3.47E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00709
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00709

Time = 45 yrs

Cumulative Emissions to Air	(g)	9451
Advective Mass Loading Rate to Groundwater	(g/day)	2.93E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00611
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00611

Time = 50 yrs

Cumulative Emissions to Air	(g)	9464
Advective Mass Loading Rate to Groundwater	(g/day)	2.52E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00533
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00533

Time = 55 yrs

Cumulative Emissions to Air	(g)	9475
Advective Mass Loading Rate to Groundwater	(g/day)	2.2E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00471
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00471

Time = 60 yrs

Cumulative Emissions to Air	(g)	9484
Advective Mass Loading Rate to Groundwater	(g/day)	1.94E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00419
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00419

Time = 65 yrs

Cumulative Emissions to Air	(g)	9493
Advective Mass Loading Rate to Groundwater	(g/day)	1.73E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00377
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00376

Time = 70 yrs

Cumulative Emissions to Air	(g)	9500
Advective Mass Loading Rate to Groundwater	(g/day)	1.55E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00341
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.0034

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)	2547
Advective Mass Loading Rate to Groundwater	(g/day)	2.23E-48
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.24E-44
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.26E-44

Time = 2 yrs

Cumulative Emissions to Air	(g)	3551
Advective Mass Loading Rate to Groundwater	(g/day)	5.71E-26
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.04E-22
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.04E-22

Time = 3 yrs

Cumulative Emissions to Air	(g)	4232
Advective Mass Loading Rate to Groundwater	(g/day)	1.83E-18
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.96E-15
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.96E-15

Time = 4 yrs

Cumulative Emissions to Air	(g)	4731
Advective Mass Loading Rate to Groundwater	(g/day)	1.08E-14
Diffusive Mass Loading Rate to Groundwater	(g/day)	8.15E-12
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	8.16E-12

Time = 5 yrs

Cumulative Emissions to Air	(g)	5115
Advective Mass Loading Rate to Groundwater	(g/day)	2.02E-12
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.18E-09
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.18E-09

Time = 10 yrs

Cumulative Emissions to Air	(g)	6227
Advective Mass Loading Rate to Groundwater	(g/day)	7.82E-08
Diffusive Mass Loading Rate to Groundwater	(g/day)	2.16E-05
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	2.16E-05

Time = 15 yrs

Cumulative Emissions to Air	(g)	6790
Advective Mass Loading Rate to Groundwater	(g/day)	2.71E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.000489
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.000491

Time = 20 yrs

Cumulative Emissions to Air	(g)	7143
Advective Mass Loading Rate to Groundwater	(g/day)	1.55E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.002064
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.002079

Time = 25 yrs

Cumulative Emissions to Air	(g)	7391
Advective Mass Loading Rate to Groundwater	(g/day)	4.25E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.004466
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.004508

Time = 30 yrs

Cumulative Emissions to Air	(g)	7578
Advective Mass Loading Rate to Groundwater	(g/day)	8.07E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.006959
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.00704

Time = 35 yrs

Cumulative Emissions to Air	(g)	7725
Advective Mass Loading Rate to Groundwater	(g/day)	0.000125
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.009039
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.009163

Time = 40 yrs

Cumulative Emissions to Air	(g)	7845
Advective Mass Loading Rate to Groundwater	(g/day)	0.000169
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.01052
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.01069

Time = 45 yrs

=====

Cumulative Emissions to Air	(g)	7944
Advective Mass Loading Rate to Groundwater	(g/day)	0.00021
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.01142
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.01163

Time = 50 yrs

=====

Cumulative Emissions to Air	(g)	8029
Advective Mass Loading Rate to Groundwater	(g/day)	0.000246
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.01183
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.01208

Time = 55 yrs

=====

Cumulative Emissions to Air	(g)	8102
Advective Mass Loading Rate to Groundwater	(g/day)	0.000278
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.01187
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.01215

Time = 60 yrs

=====

Cumulative Emissions to Air	(g)	8167
Advective Mass Loading Rate to Groundwater	(g/day)	0.000304
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.01165
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.01195

Time = 65 yrs

=====

Cumulative Emissions to Air	(g)	8223
Advective Mass Loading Rate to Groundwater	(g/day)	0.000324
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.01124
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.01156

Time = 70 yrs

=====

Cumulative Emissions to Air	(g)	8274
Advective Mass Loading Rate to Groundwater	(g/day)	0.000341
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.01072
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.01106

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)	1129
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)	1597
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)	1955
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)	2256
Advective Mass Loading Rate to Groundwater	(g/day)	1.06E-60
Diffusive Mass Loading Rate to Groundwater	(g/day)	3.69E-57
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 5 yrs

Cumulative Emissions to Air	(g)	2520
Advective Mass Loading Rate to Groundwater	(g/day)	2.4E-49
Diffusive Mass Loading Rate to Groundwater	(g/day)	5.29E-46
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 10 yrs
=====

Cumulative Emissions to Air	(g)	3512
Advective Mass Loading Rate to Groundwater	(g/day)	1.38E-26
Diffusive Mass Loading Rate to Groundwater	(g/day)	9.9E-24
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	9.91E-24

Time = 15 yrs
=====

Cumulative Emissions to Air	(g)	4186
Advective Mass Loading Rate to Groundwater	(g/day)	5.78E-19
Diffusive Mass Loading Rate to Groundwater	(g/day)	2.43E-16
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	2.44E-16

Time = 20 yrs
=====

Cumulative Emissions to Air	(g)	4681
Advective Mass Loading Rate to Groundwater	(g/day)	3.9E-15
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.16E-12
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.16E-12

Time = 25 yrs
=====

Cumulative Emissions to Air	(g)	5062
Advective Mass Loading Rate to Groundwater	(g/day)	7.91E-13
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.82E-10
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.82E-10

Time = 30 yrs
=====

Cumulative Emissions to Air	(g)	5367
Advective Mass Loading Rate to Groundwater	(g/day)	2.78E-11
Diffusive Mass Loading Rate to Groundwater	(g/day)	5.19E-09
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	5.22E-09

Time = 35 yrs
=====

Cumulative Emissions to Air	(g)	5619
Advective Mass Loading Rate to Groundwater	(g/day)	3.56E-10
Diffusive Mass Loading Rate to Groundwater	(g/day)	5.63E-08
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	5.66E-08

Time = 40 yrs
=====

Cumulative Emissions to Air	(g)	5830
Advective Mass Loading Rate to Groundwater	(g/day)	2.43E-09
Diffusive Mass Loading Rate to Groundwater	(g/day)	3.32E-07
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	3.35E-07

Time = 45 yrs
=====

Cumulative Emissions to Air	(g)	6011
Advective Mass Loading Rate to Groundwater	(g/day)	1.09E-08
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.31E-06
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.32E-06

Time = 50 yrs
=====

Cumulative Emissions to Air	(g)	6168
Advective Mass Loading Rate to Groundwater	(g/day)	3.61E-08
Diffusive Mass Loading Rate to Groundwater	(g/day)	3.9E-06
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	3.93E-06

Time = 55 yrs
=====

Cumulative Emissions to Air	(g)	6306
Advective Mass Loading Rate to Groundwater	(g/day)	9.64E-08
Diffusive Mass Loading Rate to Groundwater	(g/day)	9.42E-06
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	9.52E-06

Time = 60 yrs
=====

Cumulative Emissions to Air	(g)	6429
Advective Mass Loading Rate to Groundwater	(g/day)	2.19E-07
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.95E-05
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.97E-05

Time = 65 yrs
=====

Cumulative Emissions to Air	(g)	6539
Advective Mass Loading Rate to Groundwater	(g/day)	4.38E-07
Diffusive Mass Loading Rate to Groundwater	(g/day)	3.59E-05
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	3.63E-05

Time = 70 yrs
=====

Cumulative Emissions to Air	(g)	6638
Advective Mass Loading Rate to Groundwater	(g/day)	7.92E-07
Diffusive Mass Loading Rate to Groundwater	(g/day)	6.01E-05
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	6.09E-05

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)	309.8
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)	439
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)	537.9
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 = 4 yrs

Cumulative Emissions to Air	(g)	621.2
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)	694.4
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)	981.1
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)	1200
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)	1384
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)	1546
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)	1692
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)	1826
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)	1950
Advective Mass Loading Rate to Groundwater	(g/day)	1.53E-78
Diffusive Mass Loading Rate to Groundwater	(g/day)	2.41E-75
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 45 yrs

Cumulative Emissions to Air	(g)	2067
Advective Mass Loading Rate to Groundwater	(g/day)	2.67E-70
Diffusive Mass Loading Rate to Groundwater	(g/day)	3.14E-67
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 50 yrs

Cumulative Emissions to Air	(g)	2177
Advective Mass Loading Rate to Groundwater	(g/day)	1.06E-63
Diffusive Mass Loading Rate to Groundwater	(g/day)	9.71E-61
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 55 yrs

Cumulative Emissions to Air	(g)	2281
Advective Mass Loading Rate to Groundwater	(g/day)	2.65E-58
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.98E-55
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 60 yrs

Cumulative Emissions to Air	(g)	2380
Advective Mass Loading Rate to Groundwater	(g/day)	8.41E-54
Diffusive Mass Loading Rate to Groundwater	(g/day)	5.26E-51
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 65 yrs

Cumulative Emissions to Air	(g)	2475
Advective Mass Loading Rate to Groundwater	(g/day)	5.44E-50
Diffusive Mass Loading Rate to Groundwater	(g/day)	2.9E-47
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 70 yrs

Cumulative Emissions to Air	(g)	2566
Advective Mass Loading Rate to Groundwater	(g/day)	1.01E-46
Diffusive Mass Loading Rate to Groundwater	(g/day)	4.68E-44
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	4.62E-44

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)	22.53
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)	32.91
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)	40.87
Advective Mass Loading Rate to Groundwater	(g/day)	.0000
Diffusive Mass Loading Rate to Groundwater	(g/day)	.0000
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.0000

Time = 4 yrs

Cumulative Emissions to Air	(g)	47.58
Advective Mass Loading Rate to Groundwater	(g/day)	.0000
Diffusive Mass Loading Rate to Groundwater	(g/day)	.0000
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.0000

Time = 5 yrs

Cumulative Emissions to Air	(g)	53.48
Advective Mass Loading Rate to Groundwater	(g/day)	.0000
Diffusive Mass Loading Rate to Groundwater	(g/day)	.0000
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.0000

Time = 10 yrs

Cumulative Emissions to Air	(g)	76.54
Advective Mass Loading Rate to Groundwater	(g/day)	.0000
Diffusive Mass Loading Rate to Groundwater	(g/day)	.0000
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.0000

Time = 15 yrs

Cumulative Emissions to Air	(g)	94.14
Advective Mass Loading Rate to Groundwater	(g/day)	.0000
Diffusive Mass Loading Rate to Groundwater	(g/day)	.0000
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.0000

Time = 20 yrs

Cumulative Emissions to Air	(g)	108.9
Advective Mass Loading Rate to Groundwater	(g/day)	.0000
Diffusive Mass Loading Rate to Groundwater	(g/day)	.0000
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.0000

Time = 25 yrs

Cumulative Emissions to Air	(g)	121.9
Advective Mass Loading Rate to Groundwater	(g/day)	.0000
Diffusive Mass Loading Rate to Groundwater	(g/day)	.0000
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.0000

Time = 30 yrs

Cumulative Emissions to Air	(g)	133.5
Advective Mass Loading Rate to Groundwater	(g/day)	.0000
Diffusive Mass Loading Rate to Groundwater	(g/day)	.0000
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.0000

Time = 35 yrs

Cumulative Emissions to Air	(g)	144.2
Advective Mass Loading Rate to Groundwater	(g/day)	.0000
Diffusive Mass Loading Rate to Groundwater	(g/day)	.0000
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.0000

Time = 40 yrs

Cumulative Emissions to Air	(g)	154.1
Advective Mass Loading Rate to Groundwater	(g/day)	.0000
Diffusive Mass Loading Rate to Groundwater	(g/day)	.0000
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.0000

Time = 45 yrs

=====

Cumulative Emissions to Air	(g)	163.4
Advective Mass Loading Rate to Groundwater	(g/day)	.0000
Diffusive Mass Loading Rate to Groundwater	(g/day)	.0000
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.0000

Time = 50 yrs

=====

Cumulative Emissions to Air	(g)	172.2
Advective Mass Loading Rate to Groundwater	(g/day)	.0000
Diffusive Mass Loading Rate to Groundwater	(g/day)	.0000
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.0000

Time = 55 yrs

=====

Cumulative Emissions to Air	(g)	180.5
Advective Mass Loading Rate to Groundwater	(g/day)	.0000
Diffusive Mass Loading Rate to Groundwater	(g/day)	.0000
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.0000

Time = 60 yrs

=====

Cumulative Emissions to Air	(g)	188.4
Advective Mass Loading Rate to Groundwater	(g/day)	.0000
Diffusive Mass Loading Rate to Groundwater	(g/day)	.0000
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.0000

Time = 65 yrs

=====

Cumulative Emissions to Air	(g)	196.0
Advective Mass Loading Rate to Groundwater	(g/day)	.0000
Diffusive Mass Loading Rate to Groundwater	(g/day)	.0000
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.0000

Time = 70 yrs

=====

Cumulative Emissions to Air	(g)	203.3
Advective Mass Loading Rate to Groundwater	(g/day)	.0000
Diffusive Mass Loading Rate to Groundwater	(g/day)	.0000
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.0000

AT123D Output File
Analysis for Example Problem

Chemicals in the analysis

TPH-AL05-06

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)	1.53E+01
Y-COORDINATE OF RECEPTOR WELL (METERS)	1.83E+01
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)	3.05E+01
BEGIN POINT OF Y-SOURCE LOCATION (METERS)	0.00E+00
END POINT OF Y-SOURCE LOCATION (METERS)	3.66E+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-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

.206E+00	.128E+00	.578E-01	.243E-01	.814E-02
.733E-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	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.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] = .320E-03
time [yr] = 5.00	avg. conc. [mg/l] = .102E-01
time [yr] = 10.0	avg. conc. [mg/l] = .624E-02
time [yr] = 15.0	avg. conc. [mg/l] = .529E-02
time [yr] = 20.0	avg. conc. [mg/l] = .489E-02
time [yr] = 25.0	avg. conc. [mg/l] = .466E-02
time [yr] = 30.0	avg. conc. [mg/l] = .449E-02
time [yr] = 35.0	avg. conc. [mg/l] = .436E-02
time [yr] = 40.0	avg. conc. [mg/l] = .426E-02
time [yr] = 45.0	avg. conc. [mg/l] = .418E-02
time [yr] = 50.0	avg. conc. [mg/l] = .411E-02
time [yr] = 55.0	avg. conc. [mg/l] = .405E-02
time [yr] = 60.0	avg. conc. [mg/l] = .400E-02
time [yr] = 65.0	avg. conc. [mg/l] = .396E-02
time [yr] = 70.0	avg. conc. [mg/l] = .392E-02

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

.451E-44	.380E-22	.715E-15	.298E-11	.431E-09
.117E-07	.122E-06	.701E-06	.270E-05	.790E-05
.188E-04	.385E-04	.701E-04	.116E-03	.179E-03
.260E-03	.360E-03	.477E-03	.610E-03	.759E-03
.920E-03	.109E-02	.127E-02	.146E-02	.165E-02
.184E-02	.202E-02	.221E-02	.239E-02	.257E-02
.274E-02	.290E-02	.306E-02	.321E-02	.334E-02
.347E-02	.359E-02	.371E-02	.381E-02	.390E-02
.399E-02	.406E-02	.413E-02	.419E-02	.424E-02
.429E-02	.433E-02	.436E-02	.439E-02	.441E-02
.442E-02	.443E-02	.444E-02	.444E-02	.443E-02
.443E-02	.441E-02	.440E-02	.438E-02	.436E-02
.434E-02	.431E-02	.428E-02	.425E-02	.422E-02
.419E-02	.415E-02	.412E-02	.408E-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] = .887E-07
time [yr] = 15.0	avg. conc. [mg/l] = .687E-05
time [yr] = 20.0	avg. conc. [mg/l] = .428E-04
time [yr] = 25.0	avg. conc. [mg/l] = .145E-03
time [yr] = 30.0	avg. conc. [mg/l] = .278E-03
time [yr] = 35.0	avg. conc. [mg/l] = .477E-03
time [yr] = 40.0	avg. conc. [mg/l] = .641E-03
time [yr] = 45.0	avg. conc. [mg/l] = .854E-03
time [yr] = 50.0	avg. conc. [mg/l] = .995E-03
time [yr] = 55.0	avg. conc. [mg/l] = .118E-02
time [yr] = 60.0	avg. conc. [mg/l] = .128E-02
time [yr] = 65.0	avg. conc. [mg/l] = .143E-02
time [yr] = 70.0	avg. conc. [mg/l] = .150E-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	.193E-45
.523E-38	.106E-32	.999E-29	.123E-25	.362E-23
.378E-21	.181E-19	.477E-18	.786E-17	.890E-16
.742E-15	.481E-14	.253E-13	.112E-12	.424E-12
.142E-11	.423E-11	.115E-10	.287E-10	.666E-10
.145E-09	.296E-09	.576E-09	.107E-08	.191E-08
.327E-08	.542E-08	.870E-08	.136E-07	.207E-07
.307E-07	.446E-07	.636E-07	.889E-07	.122E-06
.165E-06	.220E-06	.290E-06	.376E-06	.482E-06
.612E-06	.768E-06	.955E-06	.118E-05	.144E-05
.174E-05	.209E-05	.249E-05	.295E-05	.347E-05
.406E-05	.475E-05	.547E-05	.629E-05	.721E-05
.821E-05	.932E-05	.105E-04	.118E-04	.133E-04
.148E-04	.165E-04	.183E-04	.202E-04	

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] = .406E-08
time [yr] = 45.0	avg. conc. [mg/l] = .218E-07
time [yr] = 50.0	avg. conc. [mg/l] = .692E-07
time [yr] = 55.0	avg. conc. [mg/l] = .210E-06
time [yr] = 60.0	avg. conc. [mg/l] = .457E-06
time [yr] = 65.0	avg. conc. [mg/l] = .101E-05
time [yr] = 70.0	avg. conc. [mg/l] = .175E-05

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	.000E+00
.000E+00	.000E+00	.000E+00	.280E-47	.112E-46
.504E-46	.233E-45	.102E-44	.425E-44	

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	.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

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)	1.00E-02
Incorporation Depth	(cm)	457
Clean Soil Thickness	(cm)	0
Simulation Time	(yrs)	70
Length of Soil Column	(cm)	2620
Infiltration Rate	(cm/day)	5.55E-02
Source Length	(m)	30.5
Source Width	(m)	36.6
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)	2337
Advective Mass Loading Rate to Groundwater	(g/day)	2.75E-44
Diffusive Mass Loading Rate to Groundwater	(g/day)	5.1E-42
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	5.13E-42

Time = 2 yrs

Cumulative Emissions to Air	(g)	3021
Advective Mass Loading Rate to Groundwater	(g/day)	4.35E-23
Diffusive Mass Loading Rate to Groundwater	(g/day)	2.7E-21
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	2.75E-21

Time = 3 yrs

Cumulative Emissions to Air	(g)	3389
Advective Mass Loading Rate to Groundwater	(g/day)	4.82E-16
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.76E-14
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.81E-14

Time = 4 yrs

Cumulative Emissions to Air	(g)	3606
Advective Mass Loading Rate to Groundwater	(g/day)	1.52E-12
Diffusive Mass Loading Rate to Groundwater	(g/day)	3.91E-11
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	4.06E-11

Time = 5 yrs

Cumulative Emissions to Air	(g)	3740
Advective Mass Loading Rate to Groundwater	(g/day)	1.8E-10
Diffusive Mass Loading Rate to Groundwater	(g/day)	3.58E-09
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	3.76E-09

Time = 10 yrs
=====

Cumulative Emissions to Air	(g)	3973
Advective Mass Loading Rate to Groundwater	(g/day)	1.53E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.4E-05
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.56E-05

Time = 15 yrs
=====

Cumulative Emissions to Air	(g)	4014
Advective Mass Loading Rate to Groundwater	(g/day)	1.61E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	9.44E-05
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.000111

Time = 20 yrs
=====

Cumulative Emissions to Air	(g)	4024
Advective Mass Loading Rate to Groundwater	(g/day)	3.05E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.000128
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.000159

Time = 25 yrs
=====

Cumulative Emissions to Air	(g)	4026
Advective Mass Loading Rate to Groundwater	(g/day)	2.87E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	9.17E-05
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.00012

Time = 30 yrs
=====

Cumulative Emissions to Air	(g)	4027
Advective Mass Loading Rate to Groundwater	(g/day)	1.89E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	4.8E-05
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	6.69E-05

Time = 35 yrs
=====

Cumulative Emissions to Air	(g)	4027
Advective Mass Loading Rate to Groundwater	(g/day)	1.03E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	2.11E-05
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	3.14E-05

Time = 40 yrs
=====

Cumulative Emissions to Air	(g)	4027
Advective Mass Loading Rate to Groundwater	(g/day)	4.92E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	8.34E-06
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.33E-05

Time = 45 yrs
=====

Cumulative Emissions to Air	(g)	4027
Advective Mass Loading Rate to Groundwater	(g/day)	2.18E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	3.08E-06
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	5.26E-06

Time = 50 yrs
=====

Cumulative Emissions to Air	(g)	4027
Advective Mass Loading Rate to Groundwater	(g/day)	9.12E-07
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.08E-06
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	2E-06

Time = 55 yrs
=====

Cumulative Emissions to Air	(g)	4027
Advective Mass Loading Rate to Groundwater	(g/day)	3.67E-07
Diffusive Mass Loading Rate to Groundwater	(g/day)	3.69E-07
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	7.36E-07

Time = 60 yrs
=====

Cumulative Emissions to Air	(g)	4027
Advective Mass Loading Rate to Groundwater	(g/day)	1.44E-07
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.22E-07
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	2.66E-07

Time = 65 yrs
=====

Cumulative Emissions to Air	(g)	4027
Advective Mass Loading Rate to Groundwater	(g/day)	5.52E-08
Diffusive Mass Loading Rate to Groundwater	(g/day)	3.97E-08
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	9.48E-08

Time = 70 yrs
=====

Cumulative Emissions to Air	(g)	4027
Advective Mass Loading Rate to Groundwater	(g/day)	2.08E-08
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.26E-08
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	3.35E-08

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)	687.9
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 = 2 yrs

Cumulative Emissions to Air	(g)	967.9
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 = 3 yrs

Cumulative Emissions to Air	(g)	1180
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)	1358
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)	1513
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)	2110
Advective Mass Loading Rate to Groundwater	(g/day)	4.04E-62
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.29E-59
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 15 yrs
=====

Cumulative Emissions to Air	(g)	2554
Advective Mass Loading Rate to Groundwater	(g/day)	2.48E-42
Diffusive Mass Loading Rate to Groundwater	(g/day)	3.54E-40
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	3.57E-40

Time = 20 yrs
=====

Cumulative Emissions to Air	(g)	2913
Advective Mass Loading Rate to Groundwater	(g/day)	2.03E-32
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.8E-30
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.82E-30

Time = 25 yrs
=====

Cumulative Emissions to Air	(g)	3214
Advective Mass Loading Rate to Groundwater	(g/day)	1.84E-26
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.17E-24
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.19E-24

Time = 30 yrs
=====

Cumulative Emissions to Air	(g)	3471
Advective Mass Loading Rate to Groundwater	(g/day)	1.76E-22
Diffusive Mass Loading Rate to Groundwater	(g/day)	8.65E-21
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	8.83E-21

Time = 35 yrs
=====

Cumulative Emissions to Air	(g)	3695
Advective Mass Loading Rate to Groundwater	(g/day)	1.24E-19
Diffusive Mass Loading Rate to Groundwater	(g/day)	4.96E-18
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	5.09E-18

Time = 40 yrs
=====

Cumulative Emissions to Air	(g)	3891
Advective Mass Loading Rate to Groundwater	(g/day)	1.7E-17
Diffusive Mass Loading Rate to Groundwater	(g/day)	5.76E-16
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	5.94E-16

Time = 45 yrs

Cumulative Emissions to Air	(g)	4064
Advective Mass Loading Rate to Groundwater	(g/day)	7.91E-16
Diffusive Mass Loading Rate to Groundwater	(g/day)	2.31E-14
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	2.39E-14

Time = 50 yrs

Cumulative Emissions to Air	(g)	4220
Advective Mass Loading Rate to Groundwater	(g/day)	1.71E-14
Diffusive Mass Loading Rate to Groundwater	(g/day)	4.4E-13
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	4.58E-13

Time = 55 yrs

Cumulative Emissions to Air	(g)	4359
Advective Mass Loading Rate to Groundwater	(g/day)	2.13E-13
Diffusive Mass Loading Rate to Groundwater	(g/day)	4.89E-12
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	5.1E-12

Time = 60 yrs

Cumulative Emissions to Air	(g)	4486
Advective Mass Loading Rate to Groundwater	(g/day)	1.75E-12
Diffusive Mass Loading Rate to Groundwater	(g/day)	3.62E-11
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	3.79E-11

Time = 65 yrs

Cumulative Emissions to Air	(g)	4602
Advective Mass Loading Rate to Groundwater	(g/day)	1.04E-11
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.96E-10
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	2.07E-10

Time = 70 yrs

Cumulative Emissions to Air	(g)	4707
Advective Mass Loading Rate to Groundwater	(g/day)	4.81E-11
Diffusive Mass Loading Rate to Groundwater	(g/day)	8.32E-10
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	8.81E-10

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)	1398
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)	1956
Advective Mass Loading Rate to Groundwater	(g/day)	8.32E-73
Diffusive Mass Loading Rate to Groundwater	(g/day)	4.69E-70
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 3 yrs

Cumulative Emissions to Air	(g)	2375
Advective Mass Loading Rate to Groundwater	(g/day)	2.61E-49
Diffusive Mass Loading Rate to Groundwater	(g/day)	6.01E-47
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 4 yrs

Cumulative Emissions to Air	(g)	2718
Advective Mass Loading Rate to Groundwater	(g/day)	1.53E-37
Diffusive Mass Loading Rate to Groundwater	(g/day)	2.09E-35
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	2.11E-35

Time = 5 yrs

Cumulative Emissions to Air	(g)	3010
Advective Mass Loading Rate to Groundwater	(g/day)	1.8E-30
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.72E-28
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.74E-28

Time = 10 yrs

Cumulative Emissions to Air	(g)	4018
Advective Mass Loading Rate to Groundwater	(g/day)	2.81E-16
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.05E-14
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.07E-14

Time = 15 yrs

Cumulative Emissions to Air	(g)	4628
Advective Mass Loading Rate to Groundwater	(g/day)	1.65E-11
Diffusive Mass Loading Rate to Groundwater	(g/day)	3.77E-10
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	3.93E-10

Time = 20 yrs

Cumulative Emissions to Air	(g)	5045
Advective Mass Loading Rate to Groundwater	(g/day)	4.15E-09
Diffusive Mass Loading Rate to Groundwater	(g/day)	6.84E-08
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	7.25E-08

Time = 25 yrs

Cumulative Emissions to Air	(g)	5352
Advective Mass Loading Rate to Groundwater	(g/day)	1.17E-07
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.5E-06
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.62E-06

Time = 30 yrs

Cumulative Emissions to Air	(g)	5590
Advective Mass Loading Rate to Groundwater	(g/day)	1.09E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	1.15E-05
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	1.26E-05

Time = 35 yrs

Cumulative Emissions to Air	(g)	5780
Advective Mass Loading Rate to Groundwater	(g/day)	5.41E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	4.81E-05
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	5.35E-05

Time = 40 yrs

Cumulative Emissions to Air	(g)	5937
Advective Mass Loading Rate to Groundwater	(g/day)	1.8E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.000138
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.000156

Time = 45 yrs

Cumulative Emissions to Air	(g)	6070
Advective Mass Loading Rate to Groundwater	(g/day)	4.55E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.000306
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.000351

Time = 50 yrs

Cumulative Emissions to Air	(g)	6183
Advective Mass Loading Rate to Groundwater	(g/day)	9.52E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.000569
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.000664

Time = 55 yrs

Cumulative Emissions to Air	(g)	6281
Advective Mass Loading Rate to Groundwater	(g/day)	0.000174
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.00093
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.001103

Time = 60 yrs

Cumulative Emissions to Air	(g)	6367
Advective Mass Loading Rate to Groundwater	(g/day)	0.000285
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.001379
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.001664

Time = 65 yrs

Cumulative Emissions to Air	(g)	6444
Advective Mass Loading Rate to Groundwater	(g/day)	0.00043
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.0019
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.00233

Time = 70 yrs

Cumulative Emissions to Air	(g)	6512
Advective Mass Loading Rate to Groundwater	(g/day)	0.00061
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.002469
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.003079

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)	7947
Advective Mass Loading Rate to Groundwater	(g/day)	2.21E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.4642
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.4642

Time = 2 yrs

Cumulative Emissions to Air	(g)	8449
Advective Mass Loading Rate to Groundwater	(g/day)	4.19E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.3684
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.3685

Time = 3 yrs

Cumulative Emissions to Air	(g)	8676
Advective Mass Loading Rate to Groundwater	(g/day)	4.05E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.1892
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.1892

Time = 4 yrs

Cumulative Emissions to Air	(g)	8812
Advective Mass Loading Rate to Groundwater	(g/day)	3.51E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.0916
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.09164

Time = 5 yrs

Cumulative Emissions to Air	(g)	8905
Advective Mass Loading Rate to Groundwater	(g/day)	2.99E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	0.04091
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0.04094

Time = 10 yrs
=====

Cumulative Emissions to Air	(g)	9136
Advective Mass Loading Rate to Groundwater	(g/day)	0.000015
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.01681
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.01679

Time = 15 yrs
=====

Cumulative Emissions to Air	(g)	9239
Advective Mass Loading Rate to Groundwater	(g/day)	9.18E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.01793
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.01792

Time = 20 yrs
=====

Cumulative Emissions to Air	(g)	9301
Advective Mass Loading Rate to Groundwater	(g/day)	6.33E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.01498
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.01497

Time = 25 yrs
=====

Cumulative Emissions to Air	(g)	9343
Advective Mass Loading Rate to Groundwater	(g/day)	4.69E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.01228
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.01227

Time = 30 yrs
=====

Cumulative Emissions to Air	(g)	9374
Advective Mass Loading Rate to Groundwater	(g/day)	3.65E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.01017
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.01017

Time = 35 yrs
=====

Cumulative Emissions to Air	(g)	9398
Advective Mass Loading Rate to Groundwater	(g/day)	2.95E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00856
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00855

Time = 40 yrs
=====

Cumulative Emissions to Air	(g)	9417
Advective Mass Loading Rate to Groundwater	(g/day)	2.44E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00731
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00731

Time = 45 yrs

Cumulative Emissions to Air	(g)	9434
Advective Mass Loading Rate to Groundwater	(g/day)	2.07E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00633
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00633

Time = 50 yrs

Cumulative Emissions to Air	(g)	9447
Advective Mass Loading Rate to Groundwater	(g/day)	1.78E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00555
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00555

Time = 55 yrs

Cumulative Emissions to Air	(g)	9459
Advective Mass Loading Rate to Groundwater	(g/day)	1.55E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00491
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00491

Time = 60 yrs

Cumulative Emissions to Air	(g)	9469
Advective Mass Loading Rate to Groundwater	(g/day)	1.37E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00438
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00438

Time = 65 yrs

Cumulative Emissions to Air	(g)	9478
Advective Mass Loading Rate to Groundwater	(g/day)	1.22E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00394
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00394

Time = 70 yrs

Cumulative Emissions to Air	(g)	9486
Advective Mass Loading Rate to Groundwater	(g/day)	1.1E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00357
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	-0.00357

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)	1572
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)	2196
Advective Mass Loading Rate to Groundwater	(g/day)	9.92E-58
Diffusive Mass Loading Rate to Groundwater	(g/day)	3.28E-55
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 3 yrs

Cumulative Emissions to Air	(g)	2661
Advective Mass Loading Rate to Groundwater	(g/day)	.3254E-38
Diffusive Mass Loading Rate to Groundwater	(g/day)	.4959E-36
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.4991E-36

Time = 4 yrs

Cumulative Emissions to Air	(g)	3036
Advective Mass Loading Rate to Groundwater	(g/day)	.6145E-29
Diffusive Mass Loading Rate to Groundwater	(g/day)	.5898E-27
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.5960E-27

Time = 5 yrs

Cumulative Emissions to Air	(g)	3349
Advective Mass Loading Rate to Groundwater	(g/day)	.2317E-23
Diffusive Mass Loading Rate to Groundwater	(g/day)	.1608E-21
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.1631E-21

Time = 10 yrs

Cumulative Emissions to Air	(g)	4388
Advective Mass Loading Rate to Groundwater	(g/day)	.3718E-12
Diffusive Mass Loading Rate to Groundwater	(g/day)	.1061E-10
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.1098E-10

Time = 15 yrs

Cumulative Emissions to Air	(g)	4987
Advective Mass Loading Rate to Groundwater	(g/day)	.2196E-08
Diffusive Mass Loading Rate to Groundwater	(g/day)	.3920E-07
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.4139E-07

Time = 20 yrs

Cumulative Emissions to Air	(g)	5386
Advective Mass Loading Rate to Groundwater	(g/day)	.1750E-06
Diffusive Mass Loading Rate to Groundwater	(g/day)	.2266E-05
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.2441E-05

Time = 25 yrs

Cumulative Emissions to Air	(g)	5675
Advective Mass Loading Rate to Groundwater	(g/day)	.2455E-05
Diffusive Mass Loading Rate to Groundwater	(g/day)	.2488E-04
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.2733E-04

Time = 30 yrs

Cumulative Emissions to Air	(g)	5896
Advective Mass Loading Rate to Groundwater	(g/day)	.1432E-04
Diffusive Mass Loading Rate to Groundwater	(g/day)	.1187E-03
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.1331E-03

Time = 35 yrs

Cumulative Emissions to Air	(g)	6072
Advective Mass Loading Rate to Groundwater	(g/day)	.5028E-04
Diffusive Mass Loading Rate to Groundwater	(g/day)	.3514E-03
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.4017E-03

Time = 40 yrs

Cumulative Emissions to Air	(g)	6216
Advective Mass Loading Rate to Groundwater	(g/day)	.1281E-03
Diffusive Mass Loading Rate to Groundwater	(g/day)	.7707E-03
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.8988E-03

Time = 45 yrs
=====

Cumulative Emissions to Air	(g)	6337
Advective Mass Loading Rate to Groundwater	(g/day)	.2631E-03
Diffusive Mass Loading Rate to Groundwater	(g/day)	.1384E-02
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.1647E-02

Time = 50 yrs
=====

Cumulative Emissions to Air	(g)	6440
Advective Mass Loading Rate to Groundwater	(g/day)	.4641E-03
Diffusive Mass Loading Rate to Groundwater	(g/day)	.2162E-02
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.2626E-02

Time = 55 yrs
=====

Cumulative Emissions to Air	(g)	6529
Advective Mass Loading Rate to Groundwater	(g/day)	.7329E-03
Diffusive Mass Loading Rate to Groundwater	(g/day)	.3051E-02
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.3784E-02

Time = 60 yrs
=====

Cumulative Emissions to Air	(g)	6607
Advective Mass Loading Rate to Groundwater	(g/day)	.1065E-02
Diffusive Mass Loading Rate to Groundwater	(g/day)	.3993E-02
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.5058E-02

Time = 65 yrs
=====

Cumulative Emissions to Air	(g)	6676
Advective Mass Loading Rate to Groundwater	(g/day)	.1451E-02
Diffusive Mass Loading Rate to Groundwater	(g/day)	.4932E-02
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.6383E-02

Time = 70 yrs
=====

Cumulative Emissions to Air	(g)	6737
Advective Mass Loading Rate to Groundwater	(g/day)	.1879E-02
Diffusive Mass Loading Rate to Groundwater	(g/day)	.5824E-02
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	.7704E-02

AT123D Output File
Analysis for Example Problem

Chemicals in the analysis

Benzene
Ethylbenzene
Toluene
TPH-AL06-08
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)	1.53E+01
Y-COORDINATE OF RECEPTOR WELL (METERS)	1.83E+01
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)	3.05E+01
BEGIN POINT OF Y-SOURCE LOCATION (METERS)	0.00E+00
END POINT OF Y-SOURCE LOCATION (METERS)	3.66E+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).....	0.00E+00

LIST OF TRANSIENT SOURCE RELEASE RATE

.187E-41	.100E-20	.662E-14	.148E-10	.137E-08
.258E-07	.196E-06	.847E-06	.250E-05	.568E-05
.106E-04	.171E-04	.247E-04	.327E-04	.404E-04
.470E-04	.522E-04	.557E-04	.576E-04	.579E-04
.568E-04	.546E-04	.515E-04	.479E-04	.439E-04
.398E-04	.357E-04	.317E-04	.279E-04	.244E-04
.212E-04	.183E-04	.157E-04	.134E-04	.114E-04
.970E-05	.819E-05	.689E-05	.578E-05	.484E-05
.404E-05	.336E-05	.279E-05	.232E-05	.192E-05
.158E-05	.131E-05	.108E-05	.886E-06	.728E-06
.598E-06	.490E-06	.402E-06	.329E-06	.269E-06
.220E-06	.179E-06	.146E-06	.119E-06	.971E-07
.791E-07	.644E-07	.524E-07	.426E-07	.346E-07
.281E-07	.228E-07	.185E-07	.151E-07	

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] = .526E-06
time [yr] = 15.0	avg. conc. [mg/l] = .146E-04
time [yr] = 20.0	avg. conc. [mg/l] = .448E-04
time [yr] = 25.0	avg. conc. [mg/l] = .751E-04
time [yr] = 30.0	avg. conc. [mg/l] = .890E-04
time [yr] = 35.0	avg. conc. [mg/l] = .949E-04
time [yr] = 40.0	avg. conc. [mg/l] = .953E-04
time [yr] = 45.0	avg. conc. [mg/l] = .945E-04
time [yr] = 50.0	avg. conc. [mg/l] = .932E-04
time [yr] = 55.0	avg. conc. [mg/l] = .920E-04
time [yr] = 60.0	avg. conc. [mg/l] = .911E-04
time [yr] = 65.0	avg. conc. [mg/l] = .903E-04
time [yr] = 70.0	avg. conc. [mg/l] = .896E-04

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).....	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	.136E-45	.218E-42	.130E-39
.349E-37	.483E-35	.387E-33	.195E-31	.663E-30
.161E-28	.293E-27	.413E-26	.466E-25	.434E-24
.340E-23	.228E-22	.134E-21	.694E-21	.322E-20
.135E-19	.521E-19	.184E-18	.605E-18	.186E-17
.535E-17	.146E-16	.375E-16	.922E-16	.217E-15
.488E-15	.106E-14	.221E-14	.446E-14	.872E-14
.166E-13	.307E-13	.552E-13	.971E-13	.167E-12
.281E-12	.463E-12	.750E-12	.119E-11	.186E-11
.286E-11	.433E-11	.647E-11	.952E-11	.138E-10
.199E-10	.282E-10	.395E-10	.549E-10	.754E-10
.103E-09	.138E-09	.185E-09	.245E-09	

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).....	0.00E+00

LIST OF TRANSIENT SOURCE RELEASE RATE

.000E+00	.000E+00	.224E-46	.769E-35	.636E-28
.256E-23	.495E-20	.143E-17	.117E-15	.392E-14
.693E-13	.757E-12	.571E-11	.322E-10	.144E-09
.531E-09	.168E-08	.467E-08	.116E-07	.265E-07
.556E-07	.109E-06	.201E-06	.353E-06	.591E-06
.951E-06	.147E-05	.221E-05	.323E-05	.459E-05
.638E-05	.871E-05	.116E-04	.151E-04	.195E-04
.248E-04	.310E-04	.384E-04	.469E-04	.568E-04
.680E-04	.806E-04	.948E-04	.111E-03	.128E-03
.147E-03	.168E-03	.191E-03	.216E-03	.242E-03
.271E-03	.301E-03	.333E-03	.367E-03	.403E-03
.440E-03	.479E-03	.520E-03	.563E-03	.607E-03
.653E-03	.700E-03	.749E-03	.799E-03	.851E-03
.903E-03	.957E-03	.101E-02	.107E-02	

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] = .140E-08
time [yr] = 25.0	avg. conc. [mg/l] = .637E-07
time [yr] = 30.0	avg. conc. [mg/l] = .610E-06
time [yr] = 35.0	avg. conc. [mg/l] = .384E-05
time [yr] = 40.0	avg. conc. [mg/l] = .127E-04
time [yr] = 45.0	avg. conc. [mg/l] = .375E-04
time [yr] = 50.0	avg. conc. [mg/l] = .784E-04
time [yr] = 55.0	avg. conc. [mg/l] = .161E-03
time [yr] = 60.0	avg. conc. [mg/l] = .264E-03
time [yr] = 65.0	avg. conc. [mg/l] = .440E-03
time [yr] = 70.0	avg. conc. [mg/l] = .629E-03

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

.169E+00	.134E+00	.691E-01	.334E-01	.149E-01
.504E-02	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.000E+00	.000E+00	.000E+00	.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] = 1.00	avg. conc. [mg/l] = .529E-04
time [yr] = 5.00	avg. conc. [mg/l] = .496E-02
time [yr] = 10.0	avg. conc. [mg/l] = .298E-02
time [yr] = 15.0	avg. conc. [mg/l] = .230E-02
time [yr] = 20.0	avg. conc. [mg/l] = .195E-02
time [yr] = 25.0	avg. conc. [mg/l] = .172E-02
time [yr] = 30.0	avg. conc. [mg/l] = .157E-02
time [yr] = 35.0	avg. conc. [mg/l] = .145E-02
time [yr] = 40.0	avg. conc. [mg/l] = .137E-02
time [yr] = 45.0	avg. conc. [mg/l] = .131E-02
time [yr] = 50.0	avg. conc. [mg/l] = .126E-02
time [yr] = 55.0	avg. conc. [mg/l] = .122E-02
time [yr] = 60.0	avg. conc. [mg/l] = .119E-02
time [yr] = 65.0	avg. conc. [mg/l] = .116E-02
time [yr] = 70.0	avg. conc. [mg/l] = .114E-02

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).....	0.00E+00

LIST OF TRANSIENT SOURCE RELEASE RATE

.000E+00	.000E+00	.182E-36	.218E-27	.595E-22
.247E-18	.941E-16	.804E-14	.254E-12	.401E-11
.381E-10	.248E-09	.121E-08	.468E-08	.151E-07
.420E-07	.103E-06	.230E-06	.470E-06	.891E-06
.159E-05	.268E-05	.432E-05	.669E-05	.998E-05
.144E-04	.202E-04	.277E-04	.371E-04	.486E-04
.625E-04	.790E-04	.984E-04	.121E-03	.147E-03
.176E-03	.208E-03	.245E-03	.284E-03	.328E-03
.375E-03	.426E-03	.481E-03	.539E-03	.601E-03
.666E-03	.735E-03	.807E-03	.881E-03	.958E-03
.104E-02	.112E-02	.121E-02	.129E-02	.138E-02
.147E-02	.156E-02	.166E-02	.175E-02	.185E-02
.194E-02	.204E-02	.214E-02	.223E-02	.233E-02
.243E-02	.252E-02	.262E-02	.272E-02	

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] = .739E-07
time [yr] = 25.0	avg. conc. [mg/l] = .158E-05
time [yr] = 30.0	avg. conc. [mg/l] = .945E-05
time [yr] = 35.0	avg. conc. [mg/l] = .411E-04
time [yr] = 40.0	avg. conc. [mg/l] = .106E-03
time [yr] = 45.0	avg. conc. [mg/l] = .251E-03
time [yr] = 50.0	avg. conc. [mg/l] = .449E-03
time [yr] = 55.0	avg. conc. [mg/l] = .792E-03
time [yr] = 60.0	avg. conc. [mg/l] = .117E-02
time [yr] = 65.0	avg. conc. [mg/l] = .175E-02
time [yr] = 70.0	avg. conc. [mg/l] = .231E-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)	1.00E-02
Incorporation Depth	(cm)	457
Clean Soil Thickness	(cm)	0
Simulation Time	(yrs)	70
Length of Soil Column	(cm)	2620
Infiltration Rate	(cm/day)	5.55E-02
Source Length	(m)	30.5
Source Width	(m)	36.6
Boundary Layer Thickness	(cm)	5

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)	0.06434
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)	0.1186
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)	0.1674
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)	0.212
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)	0.2535
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)	0.4273
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)	0.5644
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)	0.6776
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)	0.7737
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)	0.8567
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)	0.9292
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)	0.9932
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)	1.05
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 = 50 yrs

Cumulative Emissions to Air	(g)	1.101
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)	1.147
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)	1.189
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)	1.226
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)	1.261
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)	262.2
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)	366.9
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 = 3 yrs

Cumulative Emissions to Air	(g)	445.3
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 = 4 yrs

Cumulative Emissions to Air	(g)	510
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)	566
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)	777
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)	929.7
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)	1052
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)	1156
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)	1246
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)	1326
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)	1399
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)	1465
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)	1525
Advective Mass Loading Rate to Groundwater	(g/day)	0
Diffusive Mass Loading Rate to Groundwater	(g/day)	6.18E-76
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 55 yrs

Cumulative Emissions to Air	(g)	1581
Advective Mass Loading Rate to Groundwater	(g/day)	5.94E-71
Diffusive Mass Loading Rate to Groundwater	(g/day)	4.94E-69
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 60 yrs

Cumulative Emissions to Air	(g)	1633
Advective Mass Loading Rate to Groundwater	(g/day)	4.48E-65
Diffusive Mass Loading Rate to Groundwater	(g/day)	3E-63
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 65 yrs

Cumulative Emissions to Air	(g)	1682
Advective Mass Loading Rate to Groundwater	(g/day)	4.22E-60
Diffusive Mass Loading Rate to Groundwater	(g/day)	2.35E-58
Advective & Diffusive Mass Loading Rate to Groundwater	(g/day)	0

Time = 70 yrs

Cumulative Emissions to Air	(g)	1727
Advective Mass Loading Rate to Groundwater	(g/day)	7.75E-56
Diffusive Mass Loading Rate to Groundwater	(g/day)	3.66E-54
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)	23.96
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

Time = 2 yrs

Cumulative Emissions to Air	(g)	34.51
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)	42.43
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)	49
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)	54.69
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)	76.22
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)	91.88
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 = 20 yrs

Cumulative Emissions to Air	(g)	104.5
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)	115.2
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)	124.6
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)	132.9
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 = 40 yrs

Cumulative Emissions to Air	(g)	140.5
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)	147.3
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 = 50 yrs
=====

Cumulative Emissions to Air	(g)	153.7
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)	159.5
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)	165
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)	170.2
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)	175
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 Pyrene

PARAMETER NAME	UNITS	VALUE
Total Soil Concentration	(mg/kg)	1
Diffusion Coeff. in Air	(cm^2/day)	4147
Diffusion Coeff. in Water	(cm^2/day)	0.8726
Henrys Constant	[(mg/L)/(mg/L)]	2.28E-04
Organic Carbon Part. Coeff.	(cc/g)	3.80E+04
Lumped Chemical Decay Rate	(1/day)	0

Outputs for Pyrene

Time = 1 yrs

Cumulative Emissions to Air	(g)	1.16
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)	1.893
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)	2.464
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)	2.937
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)	3.343
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)	4.8
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)	5.752
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)	6.444
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)	6.975
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)	7.396
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)	7.738
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)	8.021
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)	8.258
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)	8.459
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)	8.63
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)	8.778
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)	8.905
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)	9.017
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
Chrysene
Naphthalene
Phenanthrene
Pyrene

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)	1.53E+01
Y-COORDINATE OF RECEPTOR WELL (METERS)	1.83E+01
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)	3.05E+01
BEGIN POINT OF Y-SOURCE LOCATION (METERS)	0.00E+00
END POINT OF Y-SOURCE LOCATION (METERS)	3.66E+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: 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	.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] = 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

[illegible]

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	.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: Pyrene

INST. WASTE RELEASE (KG) VALID FOR INST CASE ONLY..	1.00E+00
DISTRIBUTION COEFFICIENT, KD (M**3/KG)	7.60E-01
MOLECULAR DIFFUSION COEFFICIENT (M**2/YR)	3.19E-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	.000E+00
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00

RETARDATION FACTOR	5.47E+03
RETARDED SEEPAGE VELOCITY (M/YR)	4.60E-04
RETARDED LONGITUDINAL DISPERSION COEF. (M**2/YR) ..	2.33E-05
RETARDED LATERAL DISPERSION COEFFICIENT (M**2/YR) .	2.33E-05
RETARDED VERTICAL DISPERSION COEFFICIENT (M**2/YR).	2.33E-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