

ENVIRONMENTAL  
PROTECTION  
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**Chevron**

July 10, 1996

Ms. Juliet Shin  
Alameda County Health Care Services  
Department of Environmental Health  
1131 Harbor Bay Parkway, Suite 250  
Alameda, CA 94502-6577

**Chevron USA Products Company**  
~~2440 Camino Ramon~~  
~~San Ramon, CA 94583~~  
PO Box 5004  
San Ramon, CA 94583-0804

**Marketing Department**  
Phone 510 842 9500

Re: **Former Chevron Service Station #9-5630**  
**997 Grant Avenue, San Lorenzo, California**

Dear Ms. Shin:

Enclosed is a revised Health Risk Evaluation to Chevron's original Health Risk Evaluation, dated December 12, 1995. This revised Health Risk Evaluation was done to address the comments noted in your letter of May 17, 1996, and after review of the Health Risk Evaluation by your office.

This Health Risk Evaluation-Addendum report, dated July 2, 1996, addresses the four concerns that were raised in the review of the original Health Risk Evaluation. These concerns are:

1. Residential exposure scenario.
2. Ingestion scenario for construction workers.
3. Children scenarios.
4. SESOIL "crack factor".

Under the Residential Exposure Scenario, the revised benzene risk levels ranged from  $3 \times 10^{-8}$  to  $8 \times 10^{-11}$  to  $4 \times 10^{-12}$  for the inhalation, dermal, and ingestion pathways. These results are consistent with the original model results that ranged from  $3 \times 10^{-8}$  to  $8.6 \times 10^{-11}$ .

For the Ingestion Scenario, the revised benzene risk levels for the inhalation, dermal and ingestion pathways were calculated from  $4 \times 10^{-7}$  to  $3 \times 10^{-10}$  to  $4.5 \times 10^{-12}$ . These values were higher than originally calculated, but are still below the  $1 \times 10^{-6}$  risk threshold for benzene exposure.


For the Children Scenario, the exposure pathways for inhalation, dermal and ingestion were calculated for benzene risk levels as  $1.5 \times 10^{-7}$  to  $4 \times 10^{-10}$  to  $4 \times 10^{-11}$ . These scenarios were not originally calculated but the risk ranges now calculated are below the  $1 \times 10^{-6}$  risk threshold and therefore, the child would not be exposed to the contaminants at this site.

For the SESOIL "crack factor"; it was not possible to incorporate a "crack factor" into the SESOIL model, and therefore the ASTM RBCA equation was used to supplement this SESOIL modeling effort in determining the risks associated with the volatilization of vapors into an enclosed space. Applying the Vfwesp equation at this site indicated that the current groundwater benzene concentration of 4.6ppb was equal to a  $1 \times 10^{-7}$  risk.

Ms. Juliet Shin  
July 10, 1996  
Former Service Station 9-5630  
Page 2

If you have any questions, call me at (510) 842-9136.

Sincerely,  
CHEVRON PRODUCTS COMPANY

A handwritten signature in cursive script that reads "Philip R. Briggs".

Philip R. Briggs  
Site Assessment and Remediation Project Manager

cc: Ms. Bette Owen, Chevron

## MEMORANDUM

Richmond, California  
July 2, 1996

**Health Risk Evaluation - Addendum  
Former Chevron Station #9-5630  
997 Grant Avenue, San Lorenzo CA**

**Mr. Phil Briggs:**  
San Ramon, California

This memorandum is in response to the May 17, 1996 letter from Ms. Juliet Shin of the Alameda County Health Care Services, regarding their review of our December 12, 1995 Health Risk Evaluation for the above referenced site. Comments generated during their review are addressed in this Addendum to our original submittal. The revised Health Risk Evaluation (HRE) takes into account the concerns raised regarding: 1) Residential exposure duration, 2) Ingestion scenario for construction workers, 3) Soil exposure scenarios for children and 4) Addresses the "crack factor" concerns raised regarding SESOIL. Also, all soil exposure pathways (ingestion, inhalation and dermal) for Resident, Child and Construction Worker were modeled in this revised HRE and the results of these changes are discussed below.

1) Residential Exposure Scenario (9-5630R.SAV) - The originally modeled exposure duration was changed from 9 years to 30 years, as required by DTSC and EPA guidelines, and the associated benzene risk levels ranged from  $3 \times 10^{-8}$  to  $8 \times 10^{-11}$  to  $4 \times 10^{-12}$  for the inhalation, dermal and ingestion pathways. These results are consistent with the original model results that ranged from  $3 \times 10^{-8}$  to  $8.6 \times 10^{-11}$ . The Hazard Indices calculated for ethylbenzene, toluene and xylene were all well below 1.0.

2) Ingestion Scenario for Construction Worker (9-5630CW.SAV) - The soil ingestion pathway was added for a site construction and the duration of exposure for all three pathways was also changed to 30 years from 0.25 years. The resulting calculated benzene risk levels for the inhalation, dermal and ingestion pathways ranged from  $4 \times 10^{-7}$  to  $3 \times 10^{-10}$  to  $4.5 \times 10^{-12}$  for the inhalation, dermal and ingestion pathways. These values were higher than originally calculated, but are still below the  $1 \times 10^{-6}$  risk threshold for benzene exposure. The Hazard Indices for ethylbenzene, toluene and xylene were all well below 1.0.

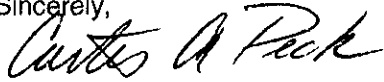
3) Children Scenarios (9-5630CH.SAV) - These scenarios for soil exposure were not originally calculated and the results of conservatively modeling these exposure pathways for children gave associated risk ranges of  $1.5 \times 10^{-7}$  to  $4 \times 10^{-10}$  to  $4 \times 10^{-11}$  for the inhalation, dermal and ingestion pathways. These are below the  $1 \times 10^{-6}$  risk threshold and would not represent a threat to the health of the child exposed to the contaminants at this site. The Hazard Indices calculated for ethylbenzene, toluene and xylene were below 1.0.

4) SESOIL "crack factor" - It was acknowledged that SESOIL was not capable of determining the health risk associated with volatilization of contaminants from a groundwater plume beneath the site. For this reason, the ASTM RBCA Vapor Volatilization equation (VFwesp equation) for volatilization of contaminants from groundwater to enclosed spaces was modeled for this site. The VFwesp equation does include a "crack factor" for the intrusion of subsurface vapors into enclosed spaces. The VFwesp equation was described in the text and the solved equation was included with the report. The results of applying the VFwesp equation at this site indicated that

the then current groundwater benzene concentration of 4.6 ppb was equivalent to a  $1 \times 10^{-7}$  risk at this site. Therefore, as it is not possible to incorporate a crack factor into the SESOIL model, the ASTM RBCA equation was used to supplement the SESOIL modeling effort in determining the risks associated with the volatilization of vapors into an enclosed space.

Please contact me at 510-242-7086 with questions or comments regarding this addendum the Health Risk Evaluation of December 12, 1995.

Sincerely,



Curtis A. Peck  
Lead Hydrogeologist



Attachments:

- 1) Residential Evaluation - 9-5630R.SAV
- 2) Child Evaluation - 9-5630CH.SAV
- 3) Construction Worker Evaluation - 9-5630CW.SAV
- 4) ACHCS 5/17/96 Letter - copy

## The following chemicals were selected:

Benzene  
Ethylbenzene  
Toluene  
Xylene

## Data for Fate and Transport Models

## Sesoil Model - Deterministic

## Model Control Parameters

Simulation Time (max=100) [years]	50
Number of soil layers	2
Sublayers in layer 1	1
Sublayers in layer 2	1
Volatile emissions:	Yes

## Climate Parameters

Surface Temperature [C]	16
Evapotranspiration [cm/day]	0.001
Precipitation [cm/yr]	50
Storm duration [days]	2
Number of storms [yr <sup>-1</sup> ]	6
Length of Rainy Season [months]	5

## Soil Column Data

Effective porosity [-]	0.25
Dry Wt. Soil Bulk Density [g/cm <sup>3</sup> ]	1.7
X-dimension of the source [m]	10
Y-dimension of the source [m]	10

## Layer 1

Thickness of Layer [m]	1.2
Intrinsic Permeability [cm <sup>2</sup> ]	1e-9
Fraction Organic Carbon [-]	0.05
Benzene Load [kg]	0.009
Ethylbenzene Load [kg]	0.002
Toluene Load [kg]	0.002
Xylene Load [kg]	0.031

## Layer 2

Thickness of Layer [m]	2.44
Intrinsic Permeability [cm <sup>2</sup> ]	1e-9
Fraction Organic Carbon [-]	0.05
Benzene Load [kg]	0.71
Ethylbenzene Load [kg]	0.58
Toluene Load [kg]	0.79
Xylene Load [kg]	0.62

## Sesoil Chemical Specific Parameters

## Benzene

Solubility [mg/l]	1750
Diffusion Coeff. in Air [cm <sup>2</sup> /s]	0.087
Henrys Constant [Atm/m <sup>3</sup> /mol]	2.49E-01
Koc [ug/gOC/ug/ml]	83
Degradation Rate Constant in Unsaturated Zc	0.00E+00s
Vapor Pressure [mmHg]	95.2

## Ethylbenzene

Solubility [mg/l]	152
Diffusion Coeff. in Air [cm <sup>2</sup> /s]	0.066
Henrys Constant [Atm/m <sup>3</sup> /mol]	2.87E-01
Koc [ug/gOC/ug/ml]	1100
Degradation Rate Constant in Unsaturated Zc	0.00E+00
Vapor Pressure [mmHg]	7

## Toluene

Solubility [mg/l]	535
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Diffusion Coeff. in Air [cm <sup>2</sup> /s]	0.078
Henrys Constant [Atm/m <sup>3</sup> /mol]	2.84E-01
Koc [ug/gOC/ug/ml]	300
Degradation Rate Constant in Unsaturated Zc	0.00E+00]
Vapor Pressure [mmHg]	28.1
<b>Xylene</b>	
Solubility [mg/l]	198
Diffusion Coeff. in Air [cm <sup>2</sup> /s]	0.072
Henrys Constant [Atm/m <sup>3</sup> /mol]	3.15E-01
Koc [ug/gOC/ug/ml]	240
Degradation Rate Constant in Unsaturated Zc	0.00E+00]
Vapor Pressure [mmHg]	10

### Sesoil Model - Deterministic

#### Model Control Parameters

Simulation Time (max=100) [years]	50
Number of soil layers	2
Sublayers in layer 1	1
Sublayers in layer 2	1
Volatile emissions:	Yes

#### Climate Parameters

Surface Temperature [C]	16
Evapotranspiration [cm/day]	0.001
Precipitation [cm/yr]	50
Storm duration [days]	2
Number of storms [yr <sup>-1</sup> ]	6
Length of Rainy Season [months]	5

#### Soil Column Data

Effective porosity [-]	0.25
Dry Wt. Soil Bulk Density [g/cm <sup>3</sup> ]	1.7
X-dimension of the source [m]	10
Y-dimension of the source [m]	10
<b>Layer 1</b>	
Thickness of Layer [m]	1.2
Intrinsic Permeability [cm <sup>2</sup> ]	1e-9
Fraction Organic Carbon [-]	0.05
Benzene Load [kg]	0.009
Ethylbenzene Load [kg]	0.002
Toluene Load [kg]	0.002
Xylene Load [kg]	0.031
<b>Layer 2</b>	
Thickness of Layer [m]	2.44
Intrinsic Permeability [cm <sup>2</sup> ]	1e-9
Fraction Organic Carbon [-]	0.05
Benzene Load [kg]	0.71
Ethylbenzene Load [kg]	0.58
Toluene Load [kg]	0.79
Xylene Load [kg]	0.62

#### Sesoil Chemical Specific Parameters

<b>Benzene</b>	
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Diffusion Coeff. in Air [cm <sup>2</sup> /s]	0.087
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Koc [ug/gOC/ug/ml]	83
Degradation Rate Constant in Unsaturated Zc	0.0E+00s]
Vapor Pressure [mmHg]	95.2
<b>Ethylbenzene</b>	
Solubility [mg/l]	152
Diffusion Coeff. in Air [cm <sup>2</sup> /s]	0.066
Henrys Constant [Atm/m <sup>3</sup> /mol]	2.87E-01
Koc [ug/gOC/ug/ml]	1100
Degradation Rate Constant in Unsaturated Zc	0.00E+00]

Vapor Pressure [mmHg]	7
Toluene	
Solubility [mg/l]	535
Diffusion Coeff. in Air [cm <sup>2</sup> /s]	0.078
Henrys Constant [Atm/m <sup>3</sup> /mol]	2.84E-01
Koc [ug/gOC/ug/ml]	300
Degradation Rate Constant in Unsaturated Zc	0.00E+00]
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Xylene	
Solubility [mg/l]	198
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Koc [ug/gOC/ug/ml]	240
Degradation Rate Constant in Unsaturated Zc	0.00E+00]
Vapor Pressure [mmHg]	10

**Box Dispersion Model - Deterministic**

Wind Speed [m/s]	2.5
Height of Box [m]	2
Width of Box [m]	2

**Data for Risk Assessment**

**Body Weight and Lifetime - Deterministic**

Average Weight (kg)	70
Lifetime (yrs)	70

**Inhalation of Soil Emissions**

Exposure Frequency [days/yr]	350
Exposure Duration [years]	30
Inhalation Rate [m <sup>3</sup> /hr]	0.833
Time Outdoors [hours/day]	3

**Inhalation of Soil Emissions Chemical Specific Parameters**

Benzene	
Bioavailability [fraction]	1
Ethylbenzene	
Bioavailability [fraction]	1
Toluene	
Bioavailability [fraction]	1
Xylene	
Bioavailability [fraction]	1

**Dermal Contact with Soil**

Exposure Frequency [days/yr]	350
Exposure Duration [years]	30
Skin Surface Area [cm <sup>2</sup> ]	3120.
Adherence Factor [mg/cm <sup>2</sup> ]	0.6

**Dermal Contact Chemical Specific Parameters**

Benzene	
Dermal Absorption Factors [fraction]	1
Ethylbenzene	
Dermal Absorption Factors [fraction]	1
Toluene	
Dermal Absorption Factors [fraction]	1
Xylene	
Dermal Absorption Factors [fraction]	1

**Ingestion of Soil**

Exposure Frequency [days/yr]	350
Exposure Duration [years]	30
Ingestion Rate [mg/day]	100
Fraction Soil Contaminated [-]	1

**Ingestion of Soil Chemical Specific Parameters**

Benzene	
: Bioavailability [fraction]	1
Ethylbenzene	
Bioavailability [fraction]	1
Toluene	
Bioavailability [fraction]	1
Xylene	
Bioavailability [fraction]	1

**Oral Dose**

Benzene	
Slope Factor [ 1/(mg/kg-day) ]	0.029
Reference Dose [mg/kg-day]	ND
Ethylbenzene	
Slope Factor [ 1/(mg/kg-day) ]	NA
Reference Dose [mg/kg-day]	0.1
Toluene	
Slope Factor [ 1/(mg/kg-day) ]	NA
Reference Dose [mg/kg-day]	0.2
Xylene	
Slope Factor [ 1/(mg/kg-day) ]	NA
Reference Dose [mg/kg-day]	2

**Dermal Dose**

Benzene	
Slope Factor [ 1/(mg/kg-day) ]	0.029
Reference Dose [mg/kg-day]	ND
Ethylbenzene	
Slope Factor [ 1/(mg/kg-day) ]	NA
Reference Dose [mg/kg-day]	0.1
Toluene	
Slope Factor [ 1/(mg/kg-day) ]	NA
Reference Dose [mg/kg-day]	0.2
Xylene	
Slope Factor [ 1/(mg/kg-day) ]	NA
Reference Dose [mg/kg-day]	2

**Inhalation Dose**

Benzene	
Slope Factor [ 1/(mg/kg-day) ]	0.029
Reference Dose [mg/kg-day]	ND
Ethylbenzene	
Slope Factor [ 1/(mg/kg-day) ]	NA
Reference Dose [mg/kg-day]	2.86E-1
Toluene	
Slope Factor [ 1/(mg/kg-day) ]	NA
Reference Dose [mg/kg-day]	1.14E-1
Xylene	
Slope Factor [ 1/(mg/kg-day) ]	NA
Reference Dose [mg/kg-day]	0.2



Chemical Intake Analysis - #9-5630 - RESIDENT

**Carcinogenic Risk by Chemical for Each Route of Concern**

<b>Chemical</b>	<b>Inhalation of Soil Emissions</b>	<b>Dermal Contact With Soil</b>	<b>Soil Ingestion</b>	<b>Total</b>
Benzene	3.21E-08	8.09E-11	4.32E-12	3.22E-08
Ethylbenzene	ND	ND	ND	0.00E+00
Toluene	ND	ND	ND	0.00E+00
Xylene	ND	ND	ND	0.00E+00
<b>Total</b>	<b>3.21E-08</b>	<b>8.09E-11</b>	<b>4.32E-12</b>	<b>3.22E-08</b>

**Hazard Index by Chemical for Each Route of Concern**

<b>Chemical</b>	<b>Inhalation of Soil Emissions</b>	<b>Dermal Contact With Soil</b>	<b>Soil Ingestion</b>	<b>Total</b>
Benzene	ND	ND	ND	0.00E+00
Ethylbenzene	2.18E-06	2.32E-07	1.24E-08	2.42E-06
Toluene	2.01E-05	1.00E-07	5.36E-09	2.02E-05
Xylene	5.43E-07	3.67E-10	1.96E-11	5.43E-07
<b>Total</b>	<b>2.28E-05</b>	<b>3.32E-07</b>	<b>1.78E-08</b>	<b>2.32E-05</b>

Deterministic Run

ND = Not Determined because RfD or Slope Factor not entered

NA = Not Applicable

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(#9-5630 - RESIDENT

**Total Dose for Each Chemical of Concern**

<b>Chemical</b>	<b>Daily Intake (DI) [mg/kg-d]</b>	<b>Chronic Daily Intake (CDI) [mg/kg-d]</b>	<b>Lifetime Average Daily Dose (LADD) [mg/kg-d]</b>
Benzene	2.70E-06	2.59E-06	1.11E-06
Ethylbenzene	6.75E-07	6.47E-07	2.77E-07
Toluene	2.42E-06	2.32E-06	9.94E-07
Xylene	1.14E-07	1.09E-07	4.69E-08

Deterministic Run

NA = Not Applicable

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Chemical Intake Analysis - #9-5630 - RESIDENT  
**Dose by Chemical for Each Route of Concern (mg/kg-day)**

**Inhalation of Soil Emissions**

	<b>Intake</b>	<b>Value</b>
Benzene	DI	2.70E-06
	CDI	2.59E-06
	LADD	1.11E-06
Ethylbenzene	DI	6.49E-07
	CDI	6.23E-07
	LADD	2.67E-07
Toluene	DI	2.40E-06
	CDI	2.30E-06
	LADD	9.84E-07
Xylene	DI	1.13E-07
	CDI	1.09E-07
	LADD	4.65E-08

**Dermal Contact With Soil**

	<b>Intake</b>	<b>Value</b>
Benzene	DI	6.79E-09
	CDI	6.51E-09
	LADD	2.79E-09
Ethylbenzene	DI	2.42E-08
	CDI	2.32E-08
	LADD	9.94E-09
Toluene	DI	2.09E-08
	CDI	2.01E-08
	LADD	8.60E-09
Xylene	DI	7.65E-10
	CDI	7.34E-10
	LADD	3.14E-10

**Soil Ingestion**

	<b>Intake</b>	<b>Value</b>
Benzene	DI	3.63E-10
	CDI	3.48E-10
	LADD	1.49E-10
Ethylbenzene	DI	1.29E-09
	CDI	1.24E-09

Toluene	LADD	5.31E-10
	DI	1.12E-09
	CDI	1.07E-09
Xylene	LADD	4.60E-10
	DI	4.09E-11
	CDI	3.92E-11
	LADD	1.68E-11

Deterministic Run

NA = Not Applicable

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## Analysis for #9-5630 SESOIL MODEL

## Volatile Emissions

Averaging Time* [Years]	Benzene [kg/year]	Ethylbenzene [kg/year]	Toluene [kg/year]	Xylene [kg/year]
5	8.41E-02	6.10E-03	3.42E-02	5.46E-03
10	6.06E-02	6.06E-03	3.16E-02	2.98E-03
15	4.50E-02	6.01E-03	2.87E-02	2.00E-03
20	3.51E-02	5.93E-03	2.59E-02	1.50E-03
25	2.84E-02	5.84E-03	2.33E-02	1.20E-03
30	2.38E-02	5.74E-03	2.12E-02	1.00E-03
35	2.05E-02	5.63E-03	1.93E-02	8.57E-04
40	1.79E-02	5.51E-03	1.76E-02	7.50E-04
45	1.59E-02	5.39E-03	1.61E-02	6.67E-04
50	1.43E-02	5.08E-03	1.48E-02	6.00E-04
55	1.43E-02	5.08E-03	1.48E-02	6.00E-04
60	1.43E-02	5.08E-03	1.48E-02	6.00E-04
65	1.43E-02	5.08E-03	1.48E-02	6.00E-04
70	1.43E-02	5.08E-03	1.48E-02	6.00E-04
75	1.43E-02	5.08E-03	1.48E-02	6.00E-04

\*The maximum RUNNING average concentration is shown for these averaging times.

For example, the maximum 5-year average concentration may not occur in the first five years.

To find out when the maximum RUNNING concentrations occurred, view the charts.

Simulation Time = 50 Years

06/10/96 17:11

Analysis for #9-5630 SESOIL MODEL  
**Receptor Point Concentration in Soil**

Averaging Time* [Years]	Benzene [mg/kg]	Ethylbenzene [mg/kg]	Toluene [mg/kg]	Xylene [mg/kg]
5	8.99E-04	9.62E-04	1.27E-03	1.56E-04
10	6.46E-04	9.56E-04	1.17E-03	8.51E-05
15	4.80E-04	9.47E-04	1.06E-03	5.72E-05
20	3.74E-04	9.35E-04	9.58E-04	4.29E-05
25	3.03E-04	9.21E-04	8.63E-04	3.43E-05
30	2.54E-04	9.05E-04	7.83E-04	2.86E-05
35	2.18E-04	8.88E-04	7.12E-04	2.45E-05
40	1.91E-04	8.69E-04	6.50E-04	2.15E-05
45	1.70E-04	8.50E-04	5.96E-04	1.91E-05
50	1.53E-04	8.02E-04	5.49E-04	1.72E-05
55	1.53E-04	8.02E-04	5.49E-04	1.72E-05
60	1.53E-04	8.02E-04	5.49E-04	1.72E-05
65	1.53E-04	8.02E-04	5.49E-04	1.72E-05
70	1.53E-04	8.02E-04	5.49E-04	1.72E-05
75	1.53E-04	8.02E-04	5.49E-04	1.72E-05

\*The maximum RUNNING average concentration is shown for these averaging times.

For example, the maximum 5-year average concentration may not occur in the first five years.

To find out when the maximum RUNNING concentrations occurred, view the charts.

Simulation Time = 50 Years

06/10/96 17:11

Analysis for #9-5630 SESOIL MODEL  
**Receptor Point Concentration in Air**

Averaging Time* [Years]	Benzene [mg/m <sup>3</sup> ]	Ethylbenzene [mg/m <sup>3</sup> ]	Toluene [mg/m <sup>3</sup> ]	Xylene [mg/m <sup>3</sup> ]
5	2.67E-04	1.93E-05	1.08E-04	1.73E-05
10	1.92E-04	1.92E-05	1.00E-04	9.43E-06
15	1.43E-04	1.90E-05	9.11E-05	6.34E-06
20	1.11E-04	1.88E-05	8.21E-05	4.76E-06
25	9.02E-05	1.85E-05	7.40E-05	3.81E-06
30	7.55E-05	1.82E-05	6.71E-05	3.17E-06
35	6.49E-05	1.78E-05	6.10E-05	2.72E-06
40	5.68E-05	1.75E-05	5.58E-05	2.38E-06
45	5.05E-05	1.71E-05	5.11E-05	2.11E-06
50	4.54E-05	1.61E-05	4.70E-05	1.90E-06
55	4.54E-05	1.61E-05	4.70E-05	1.90E-06
60	4.54E-05	1.61E-05	4.70E-05	1.90E-06
65	4.54E-05	1.61E-05	4.70E-05	1.90E-06
70	4.54E-05	1.61E-05	4.70E-05	1.90E-06
75	4.54E-05	1.61E-05	4.70E-05	1.90E-06

\*The maximum RUNNING average concentration is shown for these averaging times.

For example, the maximum 5-year average concentration may not occur in the first five years.

To find out when the maximum RUNNING concentrations occurred, view the charts.

Simulation Time = 75 Years

06/10/96 17:11

Chemicals in the analysis:

Benzene  
Ethylbenzene  
Toluene  
Xylene

Chemical Intake Analysis

Deterministic Run

PARAMETER NAME	UNITS	VALUE
Body Weight	kg	.150E+02
Life Time	yr	.700E+02
Exposure Duration Inhalation	yr	.300E+02
Exposure Frequency Inhalation	dy/yr	.350E+03
Exposure Time - Outdoor Air	hr	.300E+01
Air Inhalation Rate	m <sup>3</sup> /hr	.833E+00
Exposure Duration Soil Contact	yr	.300E+02
Exposure Freq Soil Contact	dy/yr	.350E+03
Skin Surface Area-Soil Contact	cm <sup>2</sup>	.200E+04
Adherence Factor	mg/cm <sup>2</sup>	.100E+01
Exposure Duration Soil Ingestion	yr	.300E+02
Exposure Freq Soil Ingestion	dy/yr	.350E+03
Soil Ingestion Rate	mg/day	.200E+03
Fraction Soil Contaminated	(-)	.100E+01

Benzene

PARAMETER NAME	UNITS	VALUE
Inhalation Soil Bioavailibility (-)		.100E+01
Absorption Coefficient	mg/cm <sup>2</sup>	.100E+01
Soil Ingestion Bioavailibility (-)		.100E+01
Oral Slope Factor	kg-dy/mg	.290E-01
Oral Reference Dose	mg/kg-dy	-.100E+01
Inhalation Slope Factor	kg-dy/mg	.290E-01
Inhalation Reference Dose	mg/kg/dy	-.100E+01
Dermal Slope Factor	kg-dy/mg	.290E-01
Dermal Reference Dose	mg/kg-dy	-.100E+01

Ethylbenzene

PARAMETER NAME	UNITS	VALUE
Inhalation Soil Bioavailibility (-)		.100E+01
Absorption Coefficient	mg/cm <sup>2</sup>	.100E+01
Soil Ingestion Bioavailibility (-)		.100E+01
Oral Slope Factor	kg-dy/mg	-.100E+01
Oral Reference Dose	mg/kg-dy	.100E+00
Inhalation Slope Factor	kg-dy/mg	-.100E+01
Inhalation Reference Dose	mg/kg/dy	.286E+00
Dermal Slope Factor	kg-dy/mg	-.100E+01
Dermal Reference Dose	mg/kg-dy	.100E+00

Toluene

PARAMETER NAME	UNITS	VALUE
Inhalation Soil Bioavailibility (-)		.100E+01
Absorption Coefficient	mg/cm <sup>2</sup>	.100E+01
Soil Ingestion Bioavailibility (-)		.100E+01
Oral Slope Factor	kg-dy/mg	-.100E+01
Oral Reference Dose	mg/kg-dy	.200E+00
Inhalation Slope Factor	kg-dy/mg	-.100E+01
Inhalation Reference Dose	mg/kg/dy	.114E+00
Dermal Slope Factor	kg-dy/mg	-.100E+01
Dermal Reference Dose	mg/kg-dy	.200E+00



Xylene

PARAMETER NAME	UNITS	VALUE
Inhalation Soil Bioavailability (-)		.100E+01
Absorption Coefficient	mg/cm <sup>2</sup>	.100E+01
Soil Ingestion Bioavailability (-)		.100E+01
Oral Slope Factor	kg-dy/mg	-.100E+01
Oral Reference Dose	mg/kg-dy	.200E+01
Inhalation Slope Factor	kg-dy/mg	-.100E+01
Inhalation Reference Dose	mg/kg/dy	.200E+00
Dermal Slope Factor	kg-dy/mg	-.100E+01
Dermal Reference Dose	mg/kg-dy	.200E+01

SUMMARY OF THE OUTPUTS  
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NOTE: A negative RfD, SF, risk, HQ, indicates that RfD or SF was not input -- a dummy negative value was used.

INHALATION OF SOIL EMISSIONS

	Daily Intake (mg/kg-dy)	Chronic Daily Intake (mg/kg-dy)	Life Av Daily Dose (mg/kg-dy)	Risk (-)	Hazard Quotient (-)
Benzene	.126E-04	.121E-04	.517E-05	.150E-06	-.121E-04
Ethylbenzene	.303E-05	.291E-05	.125E-05	-.125E-05	.102E-04
Toluene	.112E-04	.107E-04	.459E-05	-.459E-05	.940E-04
Xylene	.528E-06	.507E-06	.217E-06	-.217E-06	.253E-05

DERMAL CONTACT WITH SOIL

	Daily Intake (mg/kg-dy)	Chronic Daily Intake (mg/kg-dy)	Life Av Daily Dose (mg/kg-dy)	Risk (-)	Hazard Quotient (-)
Benzene	.339E-07	.325E-07	.139E-07	.403E-09	-.325E-07
Ethylbenzene	.121E-06	.116E-06	.496E-07	-.496E-07	.116E-05
Toluene	.104E-06	.100E-06	.429E-07	-.429E-07	.500E-06
Xylene	.381E-08	.366E-08	.157E-08	-.157E-08	.183E-08

INGESTION OF SOIL

	Daily Intake (mg/kg-dy)	Chronic Daily Intake (mg/kg-dy)	Life Av Daily Dose (mg/kg-dy)	Risk (-)	Hazard Quotient (-)
Benzene	.339E-08	.325E-08	.139E-08	.403E-10	-.325E-08
Ethylbenzene	.121E-07	.116E-07	.496E-08	-.496E-08	.116E-06
Toluene	.104E-07	.100E-07	.429E-08	-.429E-08	.500E-07
Xylene	.381E-09	.366E-09	.157E-09	-.157E-09	.183E-09

**The following chemicals were selected:**

Benzene  
Ethylbenzene  
Toluene  
Xylene

**Data for Fate and Transport Models****Sesoil Model - Deterministic****Model Control Parameters**

Simulation Time (max=100) [years]	50
Number of soil layers	2
Sublayers in layer 1	1
Sublayers in layer 2	1
Volatile emissions:	Yes

**Climate Parameters**

Surface Temperature [C]	16
Evapotranspiration [cm/day]	0.001
Precipitation [cm/yr]	50
Storm duration [days]	2
Number of storms [yr <sup>-1</sup> ]	6
Length of Rainy Season [months]	5

**Soil Column Data**

Effective porosity [-]	0.25
Dry Wt. Soil Bulk Density [g/cm <sup>3</sup> ]	1.7
X-dimension of the source [m]	10
Y-dimension of the source [m]	10
Layer 1	
Thickness of Layer [m]	1.2
Intrinsic Permeability [cm <sup>2</sup> ]	1e-9
Fraction Organic Carbon [-]	0.05
Benzene Load [kg]	0.009
Ethylbenzene Load [kg]	0.002
Toluene Load [kg]	0.002
Xylene Load [kg]	0.031
Layer 2	
Thickness of Layer [m]	2.44
Intrinsic Permeability [cm <sup>2</sup> ]	1e-9
Fraction Organic Carbon [-]	0.05
Benzene Load [kg]	0.71
Ethylbenzene Load [kg]	0.58
Toluene Load [kg]	0.79
Xylene Load [kg]	0.62

**Sesoil Chemical Specific Parameters**

Benzene	
Solubility [mg/l]	1750
Diffusion Coeff. in Air [cm <sup>2</sup> /s]	0.087
Henrys Constant [Atm/m <sup>3</sup> /mol]	2.49E-01
Koc [ug/gOC/ug/ml]	83
Degradation Rate Constant in Unsaturated Zc	0.00E+00s]
Vapor Pressure [mmHg]	95.2
Ethylbenzene	
Solubility [mg/l]	152
Diffusion Coeff. in Air [cm <sup>2</sup> /s]	0.066
Henrys Constant [Atm/m <sup>3</sup> /mol]	2.87E-01
Koc [ug/gOC/ug/ml]	1100
Degradation Rate Constant in Unsaturated Zc	0.00E+00]
Vapor Pressure [mmHg]	7
Toluene	
Solubility [mg/l]	535

Diffusion Coeff. in Air [cm <sup>2</sup> /s]	0.078
Henrys Constant [Atm/m <sup>3</sup> /mol]	2.84E-01
Koc [ug/gOC/ug/ml]	300
Degradation Rate Constant in Unsaturated Zc	0.00E+00]
Vapor Pressure [mmHg]	28.1
<b>Xylene</b>	
Solubility [mg/l]	198
Diffusion Coeff. in Air [cm <sup>2</sup> /s]	0.072
Henrys Constant [Atm/m <sup>3</sup> /mol]	3.15E-01
Koc [ug/gOC/ug/ml]	240
Degradation Rate Constant in Unsaturated Zc	0.00E+00]
Vapor Pressure [mmHg]	10

### Sesoil Model - Deterministic

#### Model Control Parameters

Simulation Time (max=100) [years]	50
Number of soil layers	2
Sublayers in layer 1	1
Sublayers in layer 2	1
Volatile emissions:	Yes

#### Climate Parameters

Surface Temperature [C]	16
Evapotranspiration [cm/day]	0.001
Precipitation [cm/yr]	50
Storm duration [days]	2
Number of storms [yr <sup>-1</sup> ]	6
Length of Rainy Season [months]	5

#### Soil Column Data

Effective porosity [-]	0.25
Dry Wt. Soil Bulk Density [g/cm <sup>3</sup> ]	1.7
X-dimension of the source [m]	10
Y-dimension of the source [m]	10
<b>Layer 1</b>	
Thickness of Layer [m]	1.2
Intrinsic Permeability [cm <sup>2</sup> ]	1e-9
Fraction Organic Carbon [-]	0.05
Benzene Load [kg]	0.009
Ethylbenzene Load [kg]	0.002
Toluene Load [kg]	0.002
Xylene Load [kg]	0.031
<b>Layer 2</b>	
Thickness of Layer [m]	2.44
Intrinsic Permeability [cm <sup>2</sup> ]	1e-9
Fraction Organic Carbon [-]	0.05
Benzene Load [kg]	0.71
Ethylbenzene Load [kg]	0.58
Toluene Load [kg]	0.79
Xylene Load [kg]	0.62

#### Sesoil Chemical Specific Parameters

<b>Benzene</b>	
Solubility [mg/l]	1750
Diffusion Coeff. in Air [cm <sup>2</sup> /s]	0.087
Henrys Constant [Atm/m <sup>3</sup> /mol]	2.49E-01
Koc [ug/gOC/ug/ml]	83
Degradation Rate Constant in Unsaturated Zc	0.0E+00s]
Vapor Pressure [mmHg]	95.2
<b>Ethylbenzene</b>	
Solubility [mg/l]	152
Diffusion Coeff. in Air [cm <sup>2</sup> /s]	0.066
Henrys Constant [Atm/m <sup>3</sup> /mol]	2.87E-01
Koc [ug/gOC/ug/ml]	1100
Degradation Rate Constant in Unsaturated Zc	0.00E+00]

Vapor Pressure [mmHg]	7
Toluene	
Solubility [mg/l]	535
Diffusion Coeff. in Air [cm <sup>2</sup> /s]	0.078
Henrys Constant [Atm/m <sup>3</sup> /mol]	2.84E-01
Koc [ug/gOC/ug/ml]	300
Degradation Rate Constant in Unsaturated Zc	0.00E+00]
Vapor Pressure [mmHg]	28.1

Xylene	
Solubility [mg/l]	198
Diffusion Coeff. in Air [cm <sup>2</sup> /s]	0.072
Henrys Constant [Atm/m <sup>3</sup> /mol]	3.15E-01
Koc [ug/gOC/ug/ml]	240
Degradation Rate Constant in Unsaturated Zc	0.00E+00]
Vapor Pressure [mmHg]	10

#### Box Dispersion Model - Deterministic

Wind Speed [m/s]	2.5
Height of Box [m]	2
Width of Box [m]	2

#### Data for Risk Assessment

##### Body Weight and Lifetime - Deterministic

Average Weight (kg)	70
Lifetime (yrs)	70

##### Inhalation of Soil Emissions

Exposure Frequency [days/yr]	365
Exposure Duration [years]	30
Inhalation Rate [m <sup>3</sup> /hr]	3
Time Outdoors [hours/day]	9

##### Inhalation of Soil Emissions Chemical Specific Parameters

Benzene	
Bioavailability [fraction]	1
Ethylbenzene	
Bioavailability [fraction]	1
Toluene	
Bioavailability [fraction]	1
Xylene	
Bioavailability [fraction]	1

##### Dermal Contact with Soil

Exposure Frequency [days/yr]	365
Exposure Duration [years]	30
Skin Surface Area [cm <sup>2</sup> ]	3120.
Adherence Factor [mg/cm <sup>2</sup> ]	2

##### Dermal Contact Chemical Specific Parameters

Benzene	
Dermal Absorption Factors [fraction]	1
Ethylbenzene	
Dermal Absorption Factors [fraction]	1
Toluene	
Dermal Absorption Factors [fraction]	1
Xylene	
Dermal Absorption Factors [fraction]	1

##### Ingestion of Soil

Exposure Frequency [days/yr]	365
Exposure Duration [years]	30
Ingestion Rate [mg/day]	100
Fraction Soil Contaminated [-]	1

**Ingestion of Soil Chemical Specific Parameters**

Benzene	
Bioavailability [fraction]	1
Ethylbenzene	
Bioavailability [fraction]	1
Toluene	
Bioavailability [fraction]	1
Xylene	
Bioavailability [fraction]	1

**Oral Dose**

Benzene	
Slope Factor [ 1/(mg/kg-day) ]	0.029
Reference Dose [mg/kg-day]	ND
Ethylbenzene	
Slope Factor [ 1/(mg/kg-day) ]	NA
Reference Dose [mg/kg-day]	0.1
Toluene	
Slope Factor [ 1/(mg/kg-day) ]	NA
Reference Dose [mg/kg-day]	0.2
Xylene	
Slope Factor [ 1/(mg/kg-day) ]	NA
Reference Dose [mg/kg-day]	2

**Dermal Dose**

Benzene	
Slope Factor [ 1/(mg/kg-day) ]	0.029
Reference Dose [mg/kg-day]	ND
Ethylbenzene	
Slope Factor [ 1/(mg/kg-day) ]	NA
Reference Dose [mg/kg-day]	0.1
Toluene	
Slope Factor [ 1/(mg/kg-day) ]	NA
Reference Dose [mg/kg-day]	0.2
Xylene	
Slope Factor [ 1/(mg/kg-day) ]	NA
Reference Dose [mg/kg-day]	2

**Inhalation Dose**

Benzene	
Slope Factor [ 1/(mg/kg-day) ]	0.029
Reference Dose [mg/kg-day]	ND
Ethylbenzene	
Slope Factor [ 1/(mg/kg-day) ]	NA
Reference Dose [mg/kg-day]	2.86E-1
Toluene	
Slope Factor [ 1/(mg/kg-day) ]	NA
Reference Dose [mg/kg-day]	1.14E-1
Xylene	
Slope Factor [ 1/(mg/kg-day) ]	NA
Reference Dose [mg/kg-day]	0.2

Chemical Intake Analysis #9-5630 - CONSTRUCTION WORKER

**Carcinogenic Risk by Chemical for Each Route of Concern**

Chemical	Inhalation of Soil Emissions	Dermal Contact With Soil	Soil Ingestion	Total
Benzene	3.62E-07	2.81E-10	4.51E-12	3.62E-07
Ethylbenzene	ND	ND	ND	0.00E+00
Toluene	ND	ND	ND	0.00E+00
Xylene	ND	ND	ND	0.00E+00
Total	3.62E-07	2.81E-10	4.51E-12	3.62E-07

**Hazard Index by Chemical for Each Route of Concern**

Chemical	Inhalation of Soil Emissions	Dermal Contact With Soil	Soil Ingestion	Total
Benzene	ND	ND	ND	0.00E+00
Ethylbenzene	2.45E-05	8.07E-07	1.29E-08	2.53E-05
Toluene	2.27E-04	3.49E-07	5.59E-09	2.27E-04
Xylene	6.12E-06	1.28E-09	2.04E-11	6.12E-06
Total	2.58E-04	1.16E-06	1.85E-08	2.59E-04

Deterministic Run

ND = Not Determined because RfD or Slope Factor not entered

NA = Not Applicable

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(#9-5630 - CONSTRUCTION WORKER

**Total Dose for Each Chemical of Concern**

<b>Chemical</b>	<b>Daily Intake (DI) [mg/kg-d]</b>	<b>Chronic Daily Intake (CDI) [mg/kg-d]</b>	<b>Lifetime Average Daily Dose (LADD) [mg/kg-d]</b>
Benzene	2.92E-05	2.92E-05	1.25E-05
Ethylbenzene	7.10E-06	7.10E-06	3.04E-06
Toluene	2.60E-05	2.60E-05	1.11E-05
Xylene	1.23E-06	1.23E-06	5.25E-07

Deterministic Run

NA = Not Applicable

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Chemical Intake Analysis - #9-5630 - CONSTRUCTION WORKER  
Dose by Chemical for Each Route of Concern (mg/kg-day)

**Inhalation of Soil Emissions**

	Intake	Value
Benzene	DI	2.91E-05
	CDI	2.91E-05
	LADD	1.25E-05
Ethylbenzene	DI	7.02E-06
	CDI	7.02E-06
	LADD	3.01E-06
Toluene	DI	2.59E-05
	CDI	2.59E-05
	LADD	1.11E-05
Xylene	DI	1.22E-06
	CDI	1.22E-06
	LADD	5.24E-07

**Dermal Contact With Soil**

	Intake	Value
Benzene	DI	2.26E-08
	CDI	2.26E-08
	LADD	9.70E-09
Ethylbenzene	DI	8.07E-08
	CDI	8.07E-08
	LADD	3.46E-08
Toluene	DI	6.98E-08
	CDI	6.98E-08
	LADD	2.99E-08
Xylene	DI	2.55E-09
	CDI	2.55E-09
	LADD	1.09E-09

**Soil Ingestion**

	Intake	Value
Benzene	DI	3.63E-10
	CDI	3.63E-10
	LADD	1.55E-10
Ethylbenzene	DI	1.29E-09
	CDI	1.29E-09



Toluene	LADD	5.54E-10
	DI	1.12E-09
	CDI	1.12E-09
Xylene	LADD	4.79E-10
	DI	4.09E-11
	CDI	4.09E-11
	LADD	1.75E-11

Deterministic Run

NA = Not Applicable

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## Analysis for #9-5630 SESOIL MODEL

## Volatile Emissions

Averaging Time* [Years]	Benzene [kg/year]	Ethylbenzene [kg/year]	Toluene [kg/year]	Xylene [kg/year]
5	8.41E-02	6.10E-03	3.42E-02	5.46E-03
10	6.06E-02	6.06E-03	3.16E-02	2.98E-03
15	4.50E-02	6.01E-03	2.87E-02	2.00E-03
20	3.51E-02	5.93E-03	2.59E-02	1.50E-03
25	2.84E-02	5.84E-03	2.33E-02	1.20E-03
30	2.38E-02	5.74E-03	2.12E-02	1.00E-03
35	2.05E-02	5.63E-03	1.93E-02	8.57E-04
40	1.79E-02	5.51E-03	1.76E-02	7.50E-04
45	1.59E-02	5.39E-03	1.61E-02	6.67E-04
50	1.43E-02	5.08E-03	1.48E-02	6.00E-04
55	1.43E-02	5.08E-03	1.48E-02	6.00E-04
60	1.43E-02	5.08E-03	1.48E-02	6.00E-04
65	1.43E-02	5.08E-03	1.48E-02	6.00E-04
70	1.43E-02	5.08E-03	1.48E-02	6.00E-04
75	1.43E-02	5.08E-03	1.48E-02	6.00E-04

\*The maximum RUNNING average concentration is shown for these averaging times.  
 For example, the maximum 5-year average concentration may not occur in the first five years.  
 To find out when the maximum RUNNING concentrations occurred, view the charts.

Simulation Time = 50 Years

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Analysis for #9-5630 SESOIL MODEL  
Receptor Point Concentration in Soil

Averaging Time* [Years]	Benzene [mg/kg]	Ethylbenzene [mg/kg]	Toluene [mg/kg]	Xylene [mg/kg]
5	8.99E-04	9.62E-04	1.27E-03	1.56E-04
10	6.46E-04	9.56E-04	1.17E-03	8.51E-05
15	4.80E-04	9.47E-04	1.06E-03	5.72E-05
20	3.74E-04	9.35E-04	9.58E-04	4.29E-05
25	3.03E-04	9.21E-04	8.63E-04	3.43E-05
30	2.54E-04	9.05E-04	7.83E-04	2.86E-05
35	2.18E-04	8.88E-04	7.12E-04	2.45E-05
40	1.91E-04	8.69E-04	6.50E-04	2.15E-05
45	1.70E-04	8.50E-04	5.96E-04	1.91E-05
50	1.53E-04	8.02E-04	5.49E-04	1.72E-05
55	1.53E-04	8.02E-04	5.49E-04	1.72E-05
60	1.53E-04	8.02E-04	5.49E-04	1.72E-05
65	1.53E-04	8.02E-04	5.49E-04	1.72E-05
70	1.53E-04	8.02E-04	5.49E-04	1.72E-05
75	1.53E-04	8.02E-04	5.49E-04	1.72E-05

\*The maximum RUNNING average concentration is shown for these averaging times.

For example, the maximum 5-year average concentration may not occur in the first five years.

To find out when the maximum RUNNING concentrations occurred, view the charts.

Simulation Time = 50 Years

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Analysis for #9-5630 SESOIL MODEL  
**Receptor Point Concentration in Air**

Averaging Time* [Years]	Benzene [mg/m <sup>3</sup> ]	Ethylbenzene [mg/m <sup>3</sup> ]	Toluene [mg/m <sup>3</sup> ]	Xylene [mg/m <sup>3</sup> ]
5	2.67E-04	1.93E-05	1.08E-04	1.73E-05
10	1.92E-04	1.92E-05	1.00E-04	9.43E-06
15	1.43E-04	1.90E-05	9.11E-05	6.34E-06
20	1.11E-04	1.88E-05	8.21E-05	4.76E-06
25	9.02E-05	1.85E-05	7.40E-05	3.81E-06
30	7.55E-05	1.82E-05	6.71E-05	3.17E-06
35	6.49E-05	1.78E-05	6.10E-05	2.72E-06
40	5.68E-05	1.75E-05	5.58E-05	2.38E-06
45	5.05E-05	1.71E-05	5.11E-05	2.11E-06
50	4.54E-05	1.61E-05	4.70E-05	1.90E-06
55	4.54E-05	1.61E-05	4.70E-05	1.90E-06
60	4.54E-05	1.61E-05	4.70E-05	1.90E-06
65	4.54E-05	1.61E-05	4.70E-05	1.90E-06
70	4.54E-05	1.61E-05	4.70E-05	1.90E-06
75	4.54E-05	1.61E-05	4.70E-05	1.90E-06

\*The maximum RUNNING average concentration is shown for these averaging times.  
 For example, the maximum 5-year average concentration may not occur in the first five years.  
 To find out when the maximum RUNNING concentrations occurred, view the charts.

Simulation Time = 75 Years

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Chemicals in the analysis:

Benzene  
Ethylbenzene  
Toluene  
Xylene

Chemical Intake Analysis

Deterministic Run

PARAMETER NAME	UNITS	VALUE
Body Weight	kg	.700E+02
Life Time	yr	.700E+02
Exposure Duration Inhalation	yr	.300E+02
Exposure Frequency Inhalation	dy/yr	.365E+03
Exposure Time - Outdoor Air	hr	.900E+01
Air Inhalation Rate	m <sup>3</sup> /hr	.300E+01
Exposure Duration Soil Contact	yr	.300E+02
Exposure Freq Soil Contact	dy/yr	.365E+03
Skin Surface Area-Soil Contact	cm <sup>2</sup>	.312E+04
Adherence Factor	mg/cm <sup>2</sup>	.200E+01
Exposure Duration Soil Ingestion	yr	.300E+02
Exposure Freq Soil Ingestion	dy/yr	.365E+03
Soil Ingestion Rate	mg/day	.100E+03
Fraction Soil Contaminated	(-)	.100E+01

Benzene

PARAMETER NAME	UNITS	VALUE
Inhalation Soil Bioavailibility (-)		.100E+01
Absorption Coefficient	mg/cm <sup>2</sup>	.100E+01
Soil Ingestion Bioavailibility (-)		.100E+01
Oral Slope Factor	kg-dy/mg	.290E-01
Oral Reference Dose	mg/kg-dy	-.100E+01
Inhalation Slope Factor	kg-dy/mg	.290E-01
Inhalation Reference Dose	mg/kg/dy	-.100E+01
Dermal Slope Factor	kg-dy/mg	.290E-01
Dermal Reference Dose	mg/kg-dy	-.100E+01

Ethylbenzene

PARAMETER NAME	UNITS	VALUE
Inhalation Soil Bioavailibility (-)		.100E+01
Absorption Coefficient	mg/cm <sup>2</sup>	.100E+01
Soil Ingestion Bioavailibility (-)		.100E+01
Oral Slope Factor	kg-dy/mg	-.100E+01
Oral Reference Dose	mg/kg-dy	.100E+00
Inhalation Slope Factor	kg-dy/mg	-.100E+01
Inhalation Reference Dose	mg/kg/dy	.286E+00
Dermal Slope Factor	kg-dy/mg	-.100E+01
Dermal Reference Dose	mg/kg-dy	.100E+00

Toluene

PARAMETER NAME	UNITS	VALUE
Inhalation Soil Bioavailibility (-)		.100E+01
Absorption Coefficient	mg/cm <sup>2</sup>	.100E+01
Soil Ingestion Bioavailibility (-)		.100E+01
Oral Slope Factor	kg-dy/mg	-.100E+01
Oral Reference Dose	mg/kg-dy	.200E+00
Inhalation Slope Factor	kg-dy/mg	-.100E+01
Inhalation Reference Dose	mg/kg/dy	.114E+00
Dermal Slope Factor	kg-dy/mg	-.100E+01
Dermal Reference Dose	mg/kg-dy	.200E+00

## Xylene

PARAMETER NAME	UNITS	VALUE
Inhalation Soil Bioavailability (-)		.100E+01
Absorption Coefficient	mg/cm <sup>2</sup>	.100E+01
Soil Ingestion Bioavailability (-)		.100E+01
Oral Slope Factor	kg-dy/mg	-.100E+01
Oral Reference Dose	mg/kg-dy	.200E+01
Inhalation Slope Factor	kg-dy/mg	-.100E+01
Inhalation Reference Dose	mg/kg/dy	.200E+00
Dermal Slope Factor	kg-dy/mg	-.100E+01
Dermal Reference Dose	mg/kg-dy	.200E+01

## SUMMARY OF THE OUTPUTS

\*\*\*\*\*

NOTE: A negative RfD, SF, risk, HQ, indicates that RfD or SF was not input -- a dummy negative value was used.

## INHALATION OF SOIL EMISSIONS

	Daily Intake (mg/kg-dy)	Chronic Daily Intake (mg/kg-dy)	Life Av Daily Dose (mg/kg-dy)	Risk (-)	Hazard Quotient (-)
Benzene	.291E-04	.291E-04	.125E-04	.362E-06	-.291E-04
Ethylbenzene	.702E-05	.702E-05	.301E-05	-.301E-05	.245E-04
Toluene	.259E-04	.259E-04	.111E-04	-.111E-04	.227E-03
Xylene	.122E-05	.122E-05	.524E-06	-.524E-06	.612E-05

## DERMAL CONTACT WITH SOIL

	Daily Intake (mg/kg-dy)	Chronic Daily Intake (mg/kg-dy)	Life Av Daily Dose (mg/kg-dy)	Risk (-)	Hazard Quotient (-)
Benzene	.226E-07	.226E-07	.970E-08	.281E-09	-.226E-07
Ethylbenzene	.807E-07	.807E-07	.346E-07	-.346E-07	.807E-06
Toluene	.698E-07	.698E-07	.299E-07	-.299E-07	.349E-06
Xylene	.255E-08	.255E-08	.109E-08	-.109E-08	.128E-08

## INGESTION OF SOIL

	Daily Intake (mg/kg-dy)	Chronic Daily Intake (mg/kg-dy)	Life Av Daily Dose (mg/kg-dy)	Risk (-)	Hazard Quotient (-)
Benzene	.363E-09	.363E-09	.155E-09	.451E-11	-.363E-09
Ethylbenzene	.129E-08	.129E-08	.554E-09	-.554E-09	.129E-07
Toluene	.112E-08	.112E-08	.479E-09	-.479E-09	.559E-08
Xylene	.409E-10	.409E-10	.175E-10	-.175E-10	.204E-10

ALAMEDA COUNTY  
HEALTH CARE SERVICES



AGENCY  
DAVID J. KEARS, Agency Director

Alameda County CC4580  
Environmental Health Services  
1131 Harbor Bay Pkwy., #250  
Alameda CA 94502-6577  
(510)567-6700 FAX(510)337-9335

May 17, 1996

P.R.B.

Phil Briggs  
Chevron USA Products Co.  
P.O. Box 5004  
San Ramon, CA 94583-0804

Post-It® Fax Note 7671		Date 5-29-96	# of pages 1
To CURT PEAC	From PHIL BRIGGS		
Co./Dept. CHEVRON	Co. CHEVRON		
Phone #	Phone # 510 842 9126		
Fax # CTN 694-7857	Fax # 510 842-8932		

STID 775

Re: Response to the December 12, 1995 Health Risk Evaluation for Former Chevron Station #9-5630, located at 997 Grant Avenue, San Lorenzo, California

Dear Mr. Briggs,

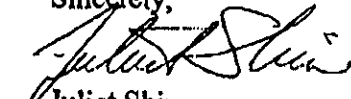
This office has reviewed the December 12, 1995 Health Risk Evaluation for the above site. The following are a list of comments that should be addressed and incorporated into a revised risk evaluation:

- o The residential exposure scenario should be modeled for a 30 year, not a 9 year, exposure period, per DTSC and EPA guidelines;
- o An ingestion scenario for potential construction workers should be developed;
- o Scenarios for children should be incorporated; and
- o The SESOIL model that was used in the Risk Evaluation does not incorporate a "crack factor". Please incorporate this factor into the assessment.

Please submit a revised Health Risk Evaluation addressing the above concerns within 45 days of the date of this letter.

If you have any questions or comments, please feel free to contact me at (510) 567-6763.

Sincerely,

  
Juliet Shin  
Senior Hazardous Materials Specialist

cc: Larry Blazer, Alameda County District Attorney's Office

Acting Chief-File

Chemical Intake Analysis - #9-5630 - RESIDENT

Carcinogenic Risk by Chemical for Each Route of Concern

Chemical	Inhalation of Soil Emissions	Dermal Contact With Soil	Soil Ingestion	Total
Benzene	3.21E-08	8.09E-11	4.32E-12	3.22E-08
Ethylbenzene	ND	ND	ND	0.00E+00
Toluene	ND	ND	ND	0.00E+00
Xylene	ND	ND	ND	0.00E+00
Total	3.21E-08	8.09E-11	4.32E-12	3.22E-08

Hazard Index by Chemical for Each Route of Concern

Chemical	Inhalation of Soil Emissions	Dermal Contact With Soil	Soil Ingestion	Total
Benzene	ND	ND	ND	0.00E+00
Ethylbenzene	2.18E-06	2.32E-07	1.24E-08	2.42E-06
Toluene	2.01E-05	1.00E-07	5.36E-09	2.02E-05
Xylene	5.43E-07	3.67E-10	1.96E-11	5.43E-07
Total	2.28E-05	3.32E-07	1.78E-08	2.32E-05

Deterministic Run

ND = Not Determined because RfD or Slope Factor not entered

NA = Not Applicable

06/11/96 08:48



Chemical Intake Analysis - #9-5630 - CHILD EXPOSURE

Carcinogenic Risk by Chemical for Each Route of Concern

Chemical	Inhalation of Soil Emissions	Dermal Contact With Soil	Soil Ingestion	Total
Benzene	1.50E-07	4.03E-10	4.03E-11	1.50E-07
Ethylbenzene	ND	ND	ND	0.00E+00
Toluene	ND	ND	ND	0.00E+00
Xylene	ND	ND	ND	0.00E+00
Total	1.50E-07	4.03E-10	4.03E-11	1.50E-07

Hazard Index by Chemical for Each Route of Concern

Chemical	Inhalation of Soil Emissions	Dermal Contact With Soil	Soil Ingestion	Total
Benzene	ND	ND	ND	0.00E+00
Ethylbenzene	1.02E-05	1.16E-06	1.16E-07	1.15E-05
Toluene	9.40E-05	5.00E-07	5.00E-08	9.46E-05
Xylene	2.53E-06	1.83E-09	1.83E-10	2.53E-06
Total	1.07E-04	1.66E-06	1.66E-07	1.09E-04

Deterministic Run

ND = Not Determined because RfD or Slope Factor not entered

NA = Not Applicable

06/10/96 17:19

Chemical Intake Analysis #9-5630 - CONSTRUCTION WORKER

Carcinogenic Risk by Chemical for Each Route of Concern

Chemical	Inhalation of Soil Emissions	Dermal Contact With Soil	Soil Ingestion	Total
Benzene	3.62E-07	2.81E-10	4.51E-12	3.62E-07
Ethylbenzene	ND	ND	ND	0.00E+00
Toluene	ND	ND	ND	0.00E+00
Xylene	ND	ND	ND	0.00E+00
Total	3.62E-07	2.81E-10	4.51E-12	3.62E-07

Hazard Index by Chemical for Each Route of Concern

Chemical	Inhalation of Soil Emissions	Dermal Contact With Soil	Soil Ingestion	Total
Benzene	ND	ND	ND	0.00E+00
Ethylbenzene	2.45E-05	8.07E-07	1.29E-08	2.53E-05
Toluene	2.27E-04	3.49E-07	5.59E-09	2.27E-04
Xylene	6.12E-06	1.28E-09	2.04E-11	6.12E-06
Total	2.58E-04	1.16E-06	1.85E-08	2.59E-04

Deterministic Run

ND = Not Determined because RfD or Slope Factor not entered

NA = Not Applicable

06/10/96 16:58

Analysis for Residential Risk at #9-5630

**Carcinogenic Risk by Chemical for Each Route of Concern**

<b>Chemical</b>	<b>Inhalation of Soil Emissions</b>	<b>Dermal Contact With Soil</b>	<b>Total</b>
Benzene	3.40E-08	8.59E-11	3.41E-08
Ethylbenzene	ND	ND	0.00E+00
Toluene	ND	ND	0.00E+00
Xylene	ND	ND	0.00E+00
<b>Total</b>	<b>3.40E-08</b>	<b>8.59E-11</b>	<b>3.41E-08</b>

**Hazard Index by Chemical for Each Route of Concern**

<b>Chemical</b>	<b>Inhalation of Soil Emissions</b>	<b>Dermal Contact With Soil</b>	<b>Total</b>
Benzene	ND	ND	0.00E+00
Ethylbenzene	2.31E-06	2.47E-07	2.56E-06
Toluene	3.26E-05	1.62E-07	3.28E-05
Xylene	2.96E-06	2.00E-09	2.96E-06
<b>Total</b>	<b>3.79E-05</b>	<b>4.11E-07</b>	<b>3.83E-05</b>

Deterministic Run

ND = Not Determined because RfD or Slope Factor not entered

NA = Not Applicable

12/11/95 15:47

Chemical Intake Analysis For Construction Worker - #9-5630

**Carcinogenic Risk by Chemical for Each Route of Concern**

Chemical	Inhalation of Soil Emissions	Dermal Contact With Soil	Total
Benzene	7.59E-09	5.91E-12	7.60E-09
Ethylbenzene	ND	ND	0.00E+00
Toluene	ND	ND	0.00E+00
Xylene	ND	ND	0.00E+00
Total	7.59E-09	5.91E-12	7.60E-09

**Hazard Index by Chemical for Each Route of Concern**

Chemical	Inhalation of Soil Emissions	Dermal Contact With Soil	Total
Benzene	ND	ND	0.00E+00
Ethylbenzene	1.86E-05	6.11E-07	1.92E-05
Toluene	2.61E-04	4.02E-07	2.61E-04
Xylene	2.38E-05	4.96E-09	2.38E-05
Total	3.03E-04	1.02E-06	3.04E-04

Deterministic Run

ND = Not Determined because RfD or Slope Factor not entered

NA = Not Applicable

12/11/95 15:35

**The following chemicals were selected:**

Benzene  
Ethylbenzene  
Toluene  
Xylene

**Data for Fate and Transport Models****Sesoil Model - Deterministic****Model Control Parameters**

Simulation Time (max=100) [years]	50
Number of soil layers	2
Sublayers in layer 1	1
Sublayers in layer 2	1
Volatile emissions:	Yes

**Climate Parameters**

Surface Temperature [C]	16
Evapotranspiration [cm/day]	0.001
Precipitation [cm/yr]	50
Storm duration [days]	2
Number of storms [yr <sup>-1</sup> ]	6
Length of Rainy Season [months]	5

**Soil Column Data**

Effective porosity [-]	0.25
Dry Wt. Soil Bulk Density [g/cm <sup>3</sup> ]	1.7
X-dimension of the source [m]	10
Y-dimension of the source [m]	10
Layer 1	
Thickness of Layer [m]	1.2
Intrinsic Permeability [cm <sup>2</sup> ]	1e-9
Fraction Organic Carbon [-]	0.05
Benzene Load [kg]	0.009
Ethylbenzene Load [kg]	0.002
Toluene Load [kg]	0.002
Xylene Load [kg]	0.031
Layer 2	
Thickness of Layer [m]	2.44
Intrinsic Permeability [cm <sup>2</sup> ]	1e-9
Fraction Organic Carbon [-]	0.05
Benzene Load [kg]	0.71
Ethylbenzene Load [kg]	0.58
Toluene Load [kg]	0.79
Xylene Load [kg]	0.62

**Sesoil Chemical Specific Parameters**

Benzene	
Solubility [mg/l]	1750
Diffusion Coeff. in Air [cm <sup>2</sup> /s]	0.087
Henrys Constant [Atm/m <sup>3</sup> /mol]	2.49E-01
Koc [ug/gOC/ug/ml]	83
Degradation Rate Constant in Unsaturated Zc	0.0E+00s
Vapor Pressure [mmHg]	95.2
Ethylbenzene	
Solubility [mg/l]	152
Diffusion Coeff. in Air [cm <sup>2</sup> /s]	0.066
Henrys Constant [Atm/m <sup>3</sup> /mol]	2.87E-01
Koc [ug/gOC/ug/ml]	1100
Degradation Rate Constant in Unsaturated Zc	0.00E+00]
Vapor Pressure [mmHg]	7
Toluene	
Solubility [mg/l]	535

Diffusion Coeff. in Air [cm <sup>2</sup> /s]	0.078
Henrys Constant [Atm/m <sup>3</sup> /mol]	2.84E-01
K <sub>oc</sub> [ug/gOC/ug/ml]	300
Degradation Rate Constant in Unsaturated Zc	0.00E+00]
Vapor Pressure [mmHg]	28.1
<b>Xylene</b>	
Solubility [mg/l]	198
Diffusion Coeff. in Air [cm <sup>2</sup> /s]	0.072
Henrys Constant [Atm/m <sup>3</sup> /mol]	3.15E-01
K <sub>oc</sub> [ug/gOC/ug/ml]	240
Degradation Rate Constant in Unsaturated Zc	0.00E+00]
Vapor Pressure [mmHg]	10

### Sesoi Model - Deterministic

#### Model Control Parameters

Simulation Time (max=100) [years]	50
Number of soil layers	2
Sublayers in layer 1	1
Sublayers in layer 2	1
Volatile emissions:	Yes

#### Climate Parameters

Surface Temperature [C]	16
Evapotranspiration [cm/day]	0.001
Precipitation [cm/yr]	50
Storm duration [days]	2
Number of storms [yr <sup>-1</sup> ]	6
Length of Rainy Season [months]	5

#### Soil Column Data

Effective porosity [-]	0.25
Dry Wt. Soil Bulk Density [g/cm <sup>3</sup> ]	1.7
X-dimension of the source [m]	10
Y-dimension of the source [m]	10
<b>Layer 1</b>	
Thickness of Layer [m]	1.2
Intrinsic Permeability [cm <sup>2</sup> ]	1e-9
Fraction Organic Carbon [-]	0.05
Benzene Load [kg]	0.009
Ethylbenzene Load [kg]	0.002
Toluene Load [kg]	0.002
Xylene Load [kg]	0.031
<b>Layer 2</b>	
Thickness of Layer [m]	2.44
Intrinsic Permeability [cm <sup>2</sup> ]	1e-9
Fraction Organic Carbon [-]	0.05
Benzene Load [kg]	0.71
Ethylbenzene Load [kg]	0.58
Toluene Load [kg]	0.79
Xylene Load [kg]	0.62

#### Sesoi Chemical Specific Parameters

<b>Benzene</b>	
Solubility [mg/l]	1750
Diffusion Coeff. in Air [cm <sup>2</sup> /s]	0.087
Henrys Constant [Atm/m <sup>3</sup> /mol]	2.49E-01
K <sub>oc</sub> [ug/gOC/ug/ml]	83
Degradation Rate Constant in Unsaturated Zc	0.0E+00s]
Vapor Pressure [mmHg]	95.2
<b>Ethylbenzene</b>	
Solubility [mg/l]	152
Diffusion Coeff. in Air [cm <sup>2</sup> /s]	0.066
Henrys Constant [Atm/m <sup>3</sup> /mol]	2.87E-01
K <sub>oc</sub> [ug/gOC/ug/ml]	1100
Degradation Rate Constant in Unsaturated Zc	0.00E+00]

Vapor Pressure [mmHg]	7
<b>Toluene</b>	
Solubility [mg/l]	535
Diffusion Coeff. in Air [cm <sup>2</sup> /s]	0.078
Henrys Constant [Atm/m <sup>3</sup> /mol]	2.84E-01
Koc [ug/gOC/ug/ml]	300
Degradation Rate Constant in Unsaturated Zone [1/d]	0.00E+00
Vapor Pressure [mmHg]	28.1
<b>Xylene</b>	
Solubility [mg/l]	198
Diffusion Coeff. in Air [cm <sup>2</sup> /s]	0.072
Henrys Constant [Atm/m <sup>3</sup> /mol]	3.15E-01
Koc [ug/gOC/ug/ml]	240
Degradation Rate Constant in Unsaturated Zone [1/d]	0.00E+00
Vapor Pressure [mmHg]	10

### Box Dispersion Model - Deterministic

Wind Speed [m/s]	2.5
Height of Box [m]	2
Width of Box [m]	2

### Data for Risk Assessment

#### Body Weight and Lifetime - Deterministic

Average Weight (kg)	15
Lifetime (yrs)	70

#### Inhalation of Soil Emissions

Exposure Frequency [days/yr]	350
Exposure Duration [years]	30
Inhalation Rate [m <sup>3</sup> /hr]	0.833
Time Outdoors [hours/day]	3

#### Inhalation of Soil Emissions Chemical Specific Parameters

<b>Benzene</b>	
Bioavailability [fraction]	1
<b>Ethylbenzene</b>	
Bioavailability [fraction]	1
<b>Toluene</b>	
Bioavailability [fraction]	1
<b>Xylene</b>	
Bioavailability [fraction]	1

#### Dermal Contact with Soil

Exposure Frequency [days/yr]	350
Exposure Duration [years]	30
Skin Surface Area [cm <sup>2</sup> ]	2000.
Adherence Factor [mg/cm <sup>2</sup> ]	1.0

#### Dermal Contact Chemical Specific Parameters

<b>Benzene</b>	
Dermal Absorption Factors [fraction]	1
<b>Ethylbenzene</b>	
Dermal Absorption Factors [fraction]	1
<b>Toluene</b>	
Dermal Absorption Factors [fraction]	1
<b>Xylene</b>	
Dermal Absorption Factors [fraction]	1

#### Ingestion of Soil

Exposure Frequency [days/yr]	350
Exposure Duration [years]	30
Ingestion Rate [mg/day]	200.
Fraction Soil Contaminated [-]	1

**Ingestion of Soil Chemical Specific Parameters**

Benzene	
Bioavailability [fraction]	1
Ethylbenzene	
Bioavailability [fraction]	1
Toluene	
Bioavailability [fraction]	1
Xylene	
Bioavailability [fraction]	1

**Oral Dose**

Benzene	
Slope Factor [ 1/(mg/kg-day) ]	0.029
Reference Dose [mg/kg-day]	ND
Ethylbenzene	
Slope Factor [ 1/(mg/kg-day) ]	NA
Reference Dose [mg/kg-day]	0.1
Toluene	
Slope Factor [ 1/(mg/kg-day) ]	NA
Reference Dose [mg/kg-day]	0.2
Xylene	
Slope Factor [ 1/(mg/kg-day) ]	NA
Reference Dose [mg/kg-day]	2

**Dermal Dose**

Benzene	
Slope Factor [ 1/(mg/kg-day) ]	0.029
Reference Dose [mg/kg-day]	ND
Ethylbenzene	
Slope Factor [ 1/(mg/kg-day) ]	NA
Reference Dose [mg/kg-day]	0.1
Toluene	
Slope Factor [ 1/(mg/kg-day) ]	NA
Reference Dose [mg/kg-day]	0.2
Xylene	
Slope Factor [ 1/(mg/kg-day) ]	NA
Reference Dose [mg/kg-day]	2

**Inhalation Dose**

Benzene	
Slope Factor [ 1/(mg/kg-day) ]	0.029
Reference Dose [mg/kg-day]	ND
Ethylbenzene	
Slope Factor [ 1/(mg/kg-day) ]	NA
Reference Dose [mg/kg-day]	2.86E-1
Toluene	
Slope Factor [ 1/(mg/kg-day) ]	NA
Reference Dose [mg/kg-day]	1.14E-1
Xylene	
Slope Factor [ 1/(mg/kg-day) ]	NA
Reference Dose [mg/kg-day]	0.2



Chemical Intake Analysis - #9-5630 - CHILD EXPOSURE

**Carcinogenic Risk by Chemical for Each Route of Concern**

Chemical	Inhalation of Soil Emissions	Dermal Contact With Soil	Soil Ingestion	Total
Benzene	1.50E-07	4.03E-10	4.03E-11	1.50E-07
Ethylbenzene	ND	ND	ND	0.00E+00
Toluene	ND	ND	ND	0.00E+00
Xylene	ND	ND	ND	0.00E+00
Total	1.50E-07	4.03E-10	4.03E-11	1.50E-07

**Hazard Index by Chemical for Each Route of Concern**

Chemical	Inhalation of Soil Emissions	Dermal Contact With Soil	Soil Ingestion	Total
Benzene	ND	ND	ND	0.00E+00
Ethylbenzene	1.02E-05	1.16E-06	1.16E-07	1.15E-05
Toluene	9.40E-05	5.00E-07	5.00E-08	9.46E-05
Xylene	2.53E-06	1.83E-09	1.83E-10	2.53E-06
Total	1.07E-04	1.66E-06	1.66E-07	1.09E-04

Deterministic Run

ND = Not Determined because RfD or Slope Factor not entered

NA = Not Applicable

06/10/96 17:19

(#9-5630 CHILD EXPOSURE

**Total Dose for Each Chemical of Concern**

<b>Chemical</b>	<b>Daily Intake (DI) [mg/kg-d]</b>	<b>Chronic Daily Intake (CDI) [mg/kg-d]</b>	<b>Lifetime Average Daily Dose (LADD) [mg/kg-d]</b>
Benzene	1.26E-05	1.21E-05	5.19E-06
Ethylbenzene	3.16E-06	3.03E-06	1.30E-06
Toluene	1.13E-05	1.08E-05	4.64E-06
Xylene	5.32E-07	5.11E-07	2.19E-07

Deterministic Run

NA = Not Applicable

06/10/96 17:19

Chemical Intake Analysis - #9-5630 - CHILD EXPOSURE  
Dose by Chemical for Each Route of Concern (mg/kg-day)

**Inhalation of Soil Emissions**

	<b>Intake</b>	<b>Value</b>
Benzene	DI	1.26E-05
	CDI	1.21E-05
	LADD	5.17E-06
Ethylbenzene	DI	3.03E-06
	CDI	2.91E-06
	LADD	1.25E-06
Toluene	DI	1.12E-05
	CDI	1.07E-05
	LADD	4.59E-06
Xylene	DI	5.28E-07
	CDI	5.07E-07
	LADD	2.17E-07

**Dermal Contact With Soil**

	<b>Intake</b>	<b>Value</b>
Benzene	DI	3.39E-08
	CDI	3.25E-08
	LADD	1.39E-08
Ethylbenzene	DI	1.21E-07
	CDI	1.16E-07
	LADD	4.96E-08
Toluene	DI	1.04E-07
	CDI	1.00E-07
	LADD	4.29E-08

Xylene	DI	3.81E-09
	CDI	3.66E-09
	LADD	1.57E-09

**Soil Ingestion**

	<b>Intake</b>	<b>Value</b>
Benzene	DI	3.39E-09
	CDI	3.25E-09
	LADD	1.39E-09
Ethylbenzene	DI	1.21E-08
	CDI	1.16E-08
	LADD	4.96E-09
Toluene	DI	1.04E-08
	CDI	1.00E-08
	LADD	4.29E-09
Xylene	DI	3.81E-10
	CDI	3.66E-10
	LADD	1.57E-10

Deterministic Run

NA = Not Applicable

06/10/96 17:19

## Analysis for #9-5630 SESOIL MODEL

**Volatile Emissions**

Averaging Time* [Years]	Benzene [kg/year]	Ethylbenzene [kg/year]	Toluene [kg/year]	Xylene [kg/year]
5	8.41E-02	6.10E-03	3.42E-02	5.46E-03
10	6.06E-02	6.06E-03	3.16E-02	2.98E-03
15	4.50E-02	6.01E-03	2.87E-02	2.00E-03
20	3.51E-02	5.93E-03	2.59E-02	1.50E-03
25	2.84E-02	5.84E-03	2.33E-02	1.20E-03
30	2.38E-02	5.74E-03	2.12E-02	1.00E-03
35	2.05E-02	5.63E-03	1.93E-02	8.57E-04
40	1.79E-02	5.51E-03	1.76E-02	7.50E-04
45	1.59E-02	5.39E-03	1.61E-02	6.67E-04
50	1.43E-02	5.08E-03	1.48E-02	6.00E-04
55	1.43E-02	5.08E-03	1.48E-02	6.00E-04
60	1.43E-02	5.08E-03	1.48E-02	6.00E-04
65	1.43E-02	5.08E-03	1.48E-02	6.00E-04
70	1.43E-02	5.08E-03	1.48E-02	6.00E-04
75	1.43E-02	5.08E-03	1.48E-02	6.00E-04

\*The maximum RUNNING average concentration is shown for these averaging times.

For example, the maximum 5-year average concentration may not occur in the first five years.

To find out when the maximum RUNNING concentrations occurred, view the charts.

Simulation Time = 50 Years

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Analysis for #9-5630 SESOIL MODEL  
**Receptor Point Concentration in Soil**

Averaging Time* [Years]	Benzene [mg/kg]	Ethylbenzene [mg/kg]	Toluene [mg/kg]	Xylene [mg/kg]
5	8.99E-04	9.62E-04	1.27E-03	1.56E-04
10	6.46E-04	9.56E-04	1.17E-03	8.51E-05
15	4.80E-04	9.47E-04	1.06E-03	5.72E-05
20	3.74E-04	9.35E-04	9.58E-04	4.29E-05
25	3.03E-04	9.21E-04	8.63E-04	3.43E-05
30	2.54E-04	9.05E-04	7.83E-04	2.86E-05
35	2.18E-04	8.88E-04	7.12E-04	2.45E-05
40	1.91E-04	8.69E-04	6.50E-04	2.15E-05
45	1.70E-04	8.50E-04	5.96E-04	1.91E-05
50	1.53E-04	8.02E-04	5.49E-04	1.72E-05
55	1.53E-04	8.02E-04	5.49E-04	1.72E-05
60	1.53E-04	8.02E-04	5.49E-04	1.72E-05
65	1.53E-04	8.02E-04	5.49E-04	1.72E-05
70	1.53E-04	8.02E-04	5.49E-04	1.72E-05
75	1.53E-04	8.02E-04	5.49E-04	1.72E-05

\*The maximum RUNNING average concentration is shown for these averaging times.

For example, the maximum 5-year average concentration may not occur in the first five years.

To find out when the maximum RUNNING concentrations occurred, view the charts.

Simulation Time = 50 Years

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Analysis for #9-5630 SESOIL MODEL  
**Receptor Point Concentration in Air**

Averaging Time* [Years]	Benzene [mg/m <sup>3</sup> ]	Ethylbenzene [mg/m <sup>3</sup> ]	Toluene [mg/m <sup>3</sup> ]	Xylene [mg/m <sup>3</sup> ]
5	2.67E-04	1.93E-05	1.08E-04	1.73E-05
10	1.92E-04	1.92E-05	1.00E-04	9.43E-06
15	1.43E-04	1.90E-05	9.11E-05	6.34E-06
20	1.11E-04	1.88E-05	8.21E-05	4.76E-06
25	9.02E-05	1.85E-05	7.40E-05	3.81E-06
30	7.55E-05	1.82E-05	6.71E-05	3.17E-06
35	6.49E-05	1.78E-05	6.10E-05	2.72E-06
40	5.68E-05	1.75E-05	5.58E-05	2.38E-06
45	5.05E-05	1.71E-05	5.11E-05	2.11E-06
50	4.54E-05	1.61E-05	4.70E-05	1.90E-06
55	4.54E-05	1.61E-05	4.70E-05	1.90E-06
60	4.54E-05	1.61E-05	4.70E-05	1.90E-06
65	4.54E-05	1.61E-05	4.70E-05	1.90E-06
70	4.54E-05	1.61E-05	4.70E-05	1.90E-06
75	4.54E-05	1.61E-05	4.70E-05	1.90E-06

\*The maximum RUNNING average concentration is shown for these averaging times.

For example, the maximum 5-year average concentration may not occur in the first five years.

To find out when the maximum RUNNING concentrations occurred, view the charts.

Simulation Time = 75 Years

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Chemicals in the analysis:

Benzene  
Ethylbenzene  
Toluene  
Xylene

Chemical Intake Analysis

Deterministic Run

PARAMETER NAME	UNITS	VALUE
Body Weight	kg	.700E+02
Life Time	yr	.700E+02
Exposure Duration Inhalation	yr	.300E+02
Exposure Frequency Inhalation	dy/yr	.350E+03
Exposure Time - Outdoor Air	hr	.300E+01
Air Inhalation Rate	m <sup>3</sup> /hr	.833E+00
Exposure Duration Soil Contact	yr	.300E+02
Exposure Freq Soil Contact	dy/yr	.350E+03
Skin Surface Area-Soil Contact	cm <sup>2</sup>	.312E+04
Adherence Factor	mg/cm <sup>2</sup>	.600E+00
Exposure Duration Soil Ingestion	yr	.300E+02
Exposure Freq Soil Ingestion	dy/yr	.350E+03
Soil Ingestion Rate	mg/day	.100E+03
Fraction Soil Contaminated	(-)	.100E+01

Benzene

PARAMETER NAME	UNITS	VALUE
Inhalation Soil Bioavailibility (-)		.100E+01
Absorption Coefficient	mg/cm <sup>2</sup>	.100E+01
Soil Ingestion Bioavailibility (-)		.100E+01
Oral Slope Factor	kg-dy/mg	.290E-01
Oral Reference Dose	mg/kg-dy	-.100E+01
Inhalation Slope Factor	kg-dy/mg	.290E-01
Inhalation Reference Dose	mg/kg/dy	-.100E+01
Dermal Slope Factor	kg-dy/mg	.290E-01
Dermal Reference Dose	mg/kg-dy	-.100E+01

Ethylbenzene

PARAMETER NAME	UNITS	VALUE
Inhalation Soil Bioavailibility (-)		.100E+01
Absorption Coefficient	mg/cm <sup>2</sup>	.100E+01
Soil Ingestion Bioavailibility (-)		.100E+01
Oral Slope Factor	kg-dy/mg	-.100E+01
Oral Reference Dose	mg/kg-dy	.100E+00
Inhalation Slope Factor	kg-dy/mg	-.100E+01
Inhalation Reference Dose	mg/kg/dy	.286E+00
Dermal Slope Factor	kg-dy/mg	-.100E+01
Dermal Reference Dose	mg/kg-dy	.100E+00

Toluene

PARAMETER NAME	UNITS	VALUE
Inhalation Soil Bioavailibility (-)		.100E+01
Absorption Coefficient	mg/cm <sup>2</sup>	.100E+01
Soil Ingestion Bioavailibility (-)		.100E+01
Oral Slope Factor	kg-dy/mg	-.100E+01
Oral Reference Dose	mg/kg-dy	.200E+00
Inhalation Slope Factor	kg-dy/mg	-.100E+01
Inhalation Reference Dose	mg/kg/dy	.114E+00
Dermal Slope Factor	kg-dy/mg	-.100E+01
Dermal Reference Dose	mg/kg-dy	.200E+00



Xylene

PARAMETER NAME	UNITS	VALUE
Inhalation Soil Bioavailibility (-)		.100E+01
Absorption Coefficient	mg/cm^2	.100E+01
Soil Ingestion Bioavailibility (-)		.100E+01
Oral Slope Factor	kg-dy/mg	-.100E+01
Oral Reference Dose	mg/kg-dy	.200E+01
Inhalation Slope Factor	kg-dy/mg	-.100E+01
Inhalation Reference Dose	mg/kg/dy	.200E+00
Dermal Slope Factor	kg-dy/mg	-.100E+01
Dermal Reference Dose	mg/kg-dy	.200E+01

SUMMARY OF THE OUTPUTS  
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NOTE: A negative RfD, SF, risk, HQ, indicates that RfD or SF was not input -- a dummy negative value was used.

INHALATION OF SOIL EMISSIONS

	Daily Intake (mg/kg-dy)	Chronic Daily Intake (mg/kg-dy)	Life Av Daily Dose (mg/kg-dy)	Risk (-)	Hazard Quotient (-)
Benzene	.270E-05	.259E-05	.111E-05	.321E-07	-.259E-05
Ethylbenzene	.649E-06	.623E-06	.267E-06	-.267E-06	.218E-05
Toluene	.240E-05	.230E-05	.984E-06	-.984E-06	.201E-04
Xylene	.113E-06	.109E-06	.465E-07	-.465E-07	.543E-06

DERMAL CONTACT WITH SOIL

	Daily Intake (mg/kg-dy)	Chronic Daily Intake (mg/kg-dy)	Life Av Daily Dose (mg/kg-dy)	Risk (-)	Hazard Quotient (-)
Benzene	.679E-08	.651E-08	.279E-08	.809E-10	-.651E-08
Ethylbenzene	.242E-07	.232E-07	.994E-08	-.994E-08	.232E-06
Toluene	.209E-07	.201E-07	.860E-08	-.860E-08	.100E-06
Xylene	.765E-09	.734E-09	.314E-09	-.314E-09	.367E-09

INGESTION OF SOIL

	Daily Intake (mg/kg-dy)	Chronic Daily Intake (mg/kg-dy)	Life Av Daily Dose (mg/kg-dy)	Risk (-)	Hazard Quotient (-)
Benzene	.363E-09	.348E-09	.149E-09	.432E-11	-.348E-09
Ethylbenzene	.129E-08	.124E-08	.531E-09	-.531E-09	.124E-07
Toluene	.112E-08	.107E-08	.460E-09	-.460E-09	.536E-08
Xylene	.409E-10	.392E-10	.168E-10	-.168E-10	.196E-10