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July 15, 2002

Mr. Scott Seery
Alameda County Health Care Services
1153 Harbor Bay Parkway, Suite 250
Alameda, California 94502

JUL 19 2002

Subject: *Risk-Based Corrective Action Evaluation*
Former Chevron Service Station No. 9-0329
340 Highland Avenue
Piedmont, California
DG90329H.3C01

Mr. Seery:

At the request of Chevron Products Company (Chevron), Delta Environmental Consultants, Inc. network associate Gettler-Ryan Inc. (GR) is submitting this report to document the results of implementation of the Risk-Based Corrective Action (RBCA) planning process, as described in ASTM E2081-00 "Standard Guide for Risk-Based Corrective Action". This Tier 2 RBCA was conducted with site-specific data from the former Chevron service station located at 340 Highland Avenue in Piedmont, California. This RBCA was prepared to evaluate a future residential use scenario. The purpose of this work was to evaluate whether the residual hydrocarbons in the site soils and groundwater pose a risk to human health. This report describes site conditions and the RBCA model results for the site (Groundwater Services, Inc. RBCA Toolkit for Chemical Releases, version 1.3a).

Risk-Based Corrective Action (RBCA)

Tier 1 of the RBCA process involves comparison of the site constituent concentrations to generic Risk-Based Screening Levels (RBSL) to evaluate whether further evaluation and/or active remediation is warranted. RBSL values are derived from standard exposure equations and reasonable maximum exposure (RME) estimates per U.S. EPA guidelines. RBSL concentrations are designed to be protective of human health even if exposure occurs directly within the onsite area of impacted soil or groundwater, and inherently provides conservative estimates of potential threats to human health and the environment. According to the RBCA process, if Tier 1 limits are not exceeded, the user may proceed directly to compliance monitoring and/or no further action. However, if these defined screening levels are exceeded, the affected media may be addressed by: 1) remediating to the generic Tier 1 limits, if practicable; 2) conducting Tier 2 evaluation to develop site-specific remediation goals; or 3) implement an interim remedial action to abate risk "hot spots". Tier 2 analysis evaluates baseline risks both on and offsite, utilizing site specific soil, groundwater and air parameters. Additionally, Tier 2 analyses allow the use of transport models in calculating risks and cleanup standards related to offsite receptors, and utilizes Site Specific Target Levels (SSTL). The SSTL is a chemical of concern (COC) concentration limit (clean-up level) in the source medium derived by multiplying the risk-based exposure limit at the point of exposure by the natural attenuation factor for the exposure pathway.

Site Parameters

Complete exposure pathways are those that could pose a reasonable potential for contaminant contact with human or environmental receptors. Under Tier 2 RBCA, both onsite and offsite receptors apply. For the purpose of this Tier 2 evaluation, a residential exposure pathway with a risk factor of 1.0E-6 was evaluated for the site. Groundwater beneath and in the site vicinity is not used for drinking water purposes, however, groundwater ingestion and subsurface soil leaching to groundwater (ingestion) exposure pathways were evaluated as a worst case scenario. The following risk pathways were evaluated: subsurface soil and groundwater volatilization to indoor and outdoor air; and ingestion, dermal contact and inhalation from groundwater, surficial and subsurface soils.

Where available, site specific physical data were used in this RBCA evaluation. Site specific parameters included contaminated soil area (5,000 ft^2), depth to top of affected soil (5 ft), soil type (silty sand), length of affected soil parallel to wind (75 ft), length of affected soil parallel to groundwater flow (60 ft), groundwater gradient (0.13 ft/ft), thickness of affected subsurface soils (9 ft), groundwater plume width (60 ft) and groundwater plume thickness (12 ft). The depth of groundwater is estimated to be approximately 2 feet below ground surface (GR Fourth Quarter Event of November 26, 2001 Groundwater Monitoring and Sampling Report). Where appropriate and consistent with site conditions, default values were used. The Chemicals of Concern (COC) were evaluated with a conservative 95% Upper Control Limit (UCL) factor as well as the California adjusted oral slope factor for benzene (0.1) for this RBCA analysis. Total Petroleum Hydrocarbons as gasoline (TPHg) were evaluated by inputting the reported TPHg values from soil and groundwater into the aromatic fraction C8-C10 (Total Petroleum Hydrocarbon Criteria Working Group Series, Volume 5, June 1999).

Results of RBCA Analysis

Based on information from previous site investigations and current groundwater monitoring and sampling data, the Tier 2 RBCA program evaluated the complete exposure pathways identified at the site. The RBCA program findings for the identified pathways are surface soil exposure with a cumulative risk factor of 1.3E-8, subsurface soil and groundwater volatilization to outdoor and indoor air exposures with cumulative risk factors of 3.7E-9 and 2.4E-7, respectively, and groundwater ingestion with a cumulative risk factor of 2.7E-5 (Appendix A, Tier 2 Baseline Risk Summary Table). Using the residential risk factor of 1.0E-6 and site conditions, the SSTLs for benzene, toluene, ethylbenzene, and xylenes (BTEX), methyl tert-butyl ether (MtBE), and TPHg were determined to be below established Tier 2 SSTLs (Appendix A, SSTL Values) for all pathways except the groundwater ingestion pathway. According to the RBCA decision making process, further work is warranted to protect against exposure via the groundwater ingestion pathway. However, since the groundwater beneath the site is not utilized for drinking purposes, GR is of the opinion that no further work is warranted at the site. Pertinent input and output data including site specific parameters used in the analysis are presented in Appendix A.

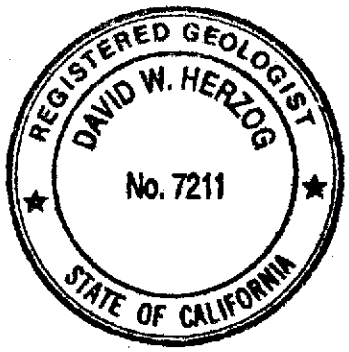
Conclusions And Recommendations

GR performed the RBCA evaluation for the assessment and response to petroleum hydrocarbons in the subsurface soil and groundwater beneath the subject site. A Tier 2 evaluation was performed utilizing available site specific data. **The results of these analyses confirm that current site conditions do not exceed the calculated Tier 2 SSTLs specific to the site (Appendix A), except with respect to benzene concentrations in groundwater.** Based on the RBCA program and findings presented in this report, and that the shallow groundwater beneath and in the vicinity of the site is not used for drinking water purposes, it is GR's opinion that no further work is warranted and the site should be considered for case closure.

If you have any questions or comments on the enclosed materials, please feel free to contact us at (916) 631-1300.

DELTA ENVIRONMENTAL CONSULTANTS, INC.
Network Associate **GETTLER-RYAN INC.**

Jed A. Douglas
Senior Geologist



David W. Herzog
Senior Geologist
R.G. 7211

Attachments: Figure 1. Site Location Map
Figure 2. Site Plan
Appendix A. Tier 2 RBCA Input/Output Data

Cc: Ms. Karen Streich, Chevron Products Company, P.O. Box 6004, San Ramon, CA 94583
Mr. Chuck Headlee, RWQCB-SFB, 1515 Clay Street, Suite 1400, Oakland, CA 94612
Mr. Frank Hoffman, Hoffman Investment Co., 1760 Willow Road, Hillsborough, CA 94010
Mir Ghafari & Fred Manoucheri, Texaco Service Station 340 Highland Ave., Piedmont, CA 94611
Mr. Jeff Orwig, Texaco Service Station, 340 Highland Ave., Piedmont, CA 94611
Mr. Jon Robbins, Chevron Products Law, P.O. Box 6004, Building T, Room T-4284, San Ramon, CA 94583
Mr. James Brownell, Delta Environmental Consultants, Inc.

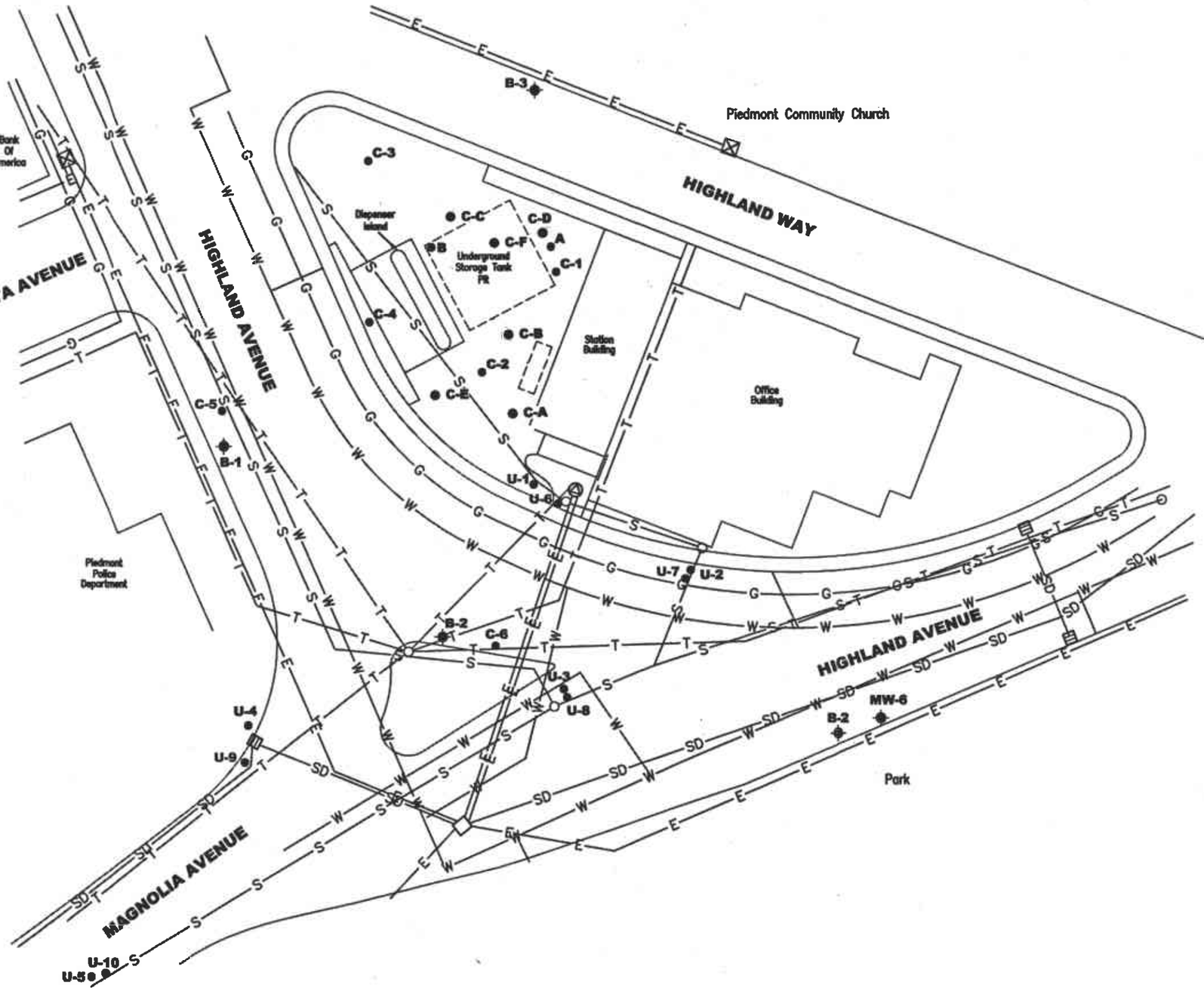
Former Chevron Station 9-0329

340 Highland Avenue

Piedmont, California

CAMBRIA

Vicinity Map



Source: Figure modified from drawing provided by Cambria.

EXPLANATION

- Groundwater monitoring well
- Soil boring
- Storm drain
- Electrical transformer
- Manhole

UNDERGROUND UTILITIES

- S — Sanitary sewer
- SD — Storm drain
- W — Water
- G — Natural gas
- E — Electric
- T — Telephone

FIGURE 2

UTILITY MAP
Chevron Service Station No. 9-0329
340 Highland Avenue
Peidmont, California

REVISED DATE

GETTLER-RYAN INC.
6747 Sierra Ct., Suite J
Dublin, CA 94568
(925) 551-7555

PROJECT NUMBER
DG90329C.4C01

REVIEWED BY

DATE
4/01

FILE NAME: P:\ENVIRO\CHEVRON\9-0329\V01\9-0329.DWG | Layout: Tab: Boring Rpt 4-01

Main Screen

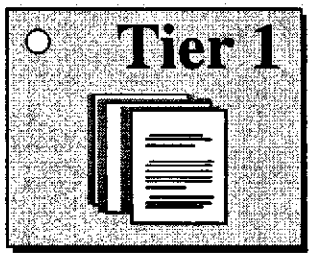
RBCA Tool Kit for Chemical Releases
Version 1.3a © 2000

1. Project Information

Site Name:	Former Chevron Service Station No. 9-0329		
Location:	340 Highland Ave., Piedmont, CA		
Compl. By:	J. Douglas		
Date:	10-May-02	Job ID:	DG90329H.3C01

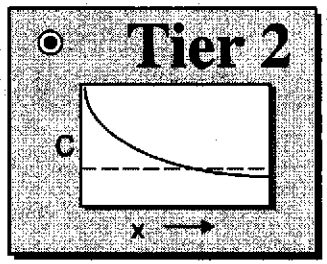
2. Which Type of RBCA Analysis?

○ Tier 1



Generic Values
On-Site
Exposure

◉ Tier 2



Site-Specific Values
On- or Off-Site Exposure

3. Calculation Options

Affects which input data are required

☑ ***Baseline Risks (Forward mode)***

☑ ***RBCA Cleanup Standards (Backward mode)***

4. RBCA Evaluation Process

Prepare Input Data

Data Complete? (■= yes, ■= no)

- ■□ Exposure Pathways
- ■□ Constituents of Concern (COCs)
- ■□ Transport Models
- ■□ Soil Parameters
- ■□ GW Parameters
- ■□ Air Parameters

Review Output

- Exposure Flowchart
- COC Chem. Parameters
- Input Data Summary
- User-Spec. COC Data...
- Transient Domenico Analysis...
- Baseline Risks...
- Cleanup Standards...

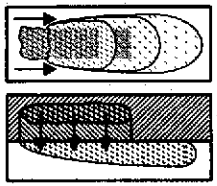
5. Commands and Options

New Site	Load Data...	Save Data As...	Quit
Print Sheet	Set Units	Custom Chem. Data...	*Help*

Exposure Pathway Identification

Site Name: Former Chevron Service Station No. 9-0329
Location: 340 Highland Ave., Piedmont, CA
Compl. By: J. Douglas
Job ID: DG90329H.3C01 Date: 10-May-02

1. Groundwater Exposure



Groundwater Ingestion/ Surface Water Impact

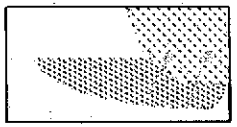
Receptor	Res.	None	None
Type:	On-site	Off-site1	Off-site2

Source Media:

Distance to GW receptors

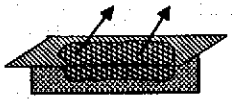
	On-site	Off-site1	Off-site2	
☑ Affected Groundwater	0	0	0	(ft)
☑ Affected Soils Leaching to Groundwater	0	0	0	(ft)

GW Discharge to Surface Water Exposure



☐ Swimming
☐ Fish Consumption
☐ Aquatic Life Protection
Enter ALP Criteria

2. Surface Soil Exposure

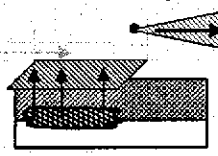


Direct Ingestion and Dermal Contact

Receptor	Res.	No off-site receptors
Type:	On-site	

Construction Worker ☑

3. Air Exposure

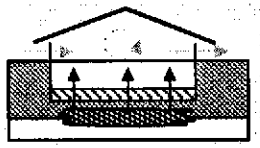


Volatilization and Particulates to Outdoor Air Inhalation

Receptor	Res.	None	None
Type:	On-site	Off-site1	Off-site2
	0	0	0 (ft)

Construction worker ☑

☑ Affected Soils--Volatilization to Ambient Outdoor Air
☑ Affected Groundwater--Volatilization to Ambient Outdoor Air
☑ Affected Surface Soils--Particulates to Ambient Outdoor Air



Volatilization to Indoor Air Inhalation

Receptor	Res.	No off-site receptors
Type:	On-site	

☑ Affected Soils--Volatilization to Enclosed Space
☑ Affected Groundwater--Volatilization to Enclosed Space

4. Commands and Options

Main Screen | Print Sheet | Set Units | Help

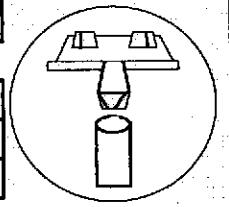
■□ Exposure Factors & Target Risks | Exposure Flowchart

Exposure Factors and Target Risk Limits

Site Name: Former Chevron Service Station No. 9-0329
Location: 340 Highland Ave., Piedmont, CA
Compl. By: J. Douglas
Job ID: DG90329H.3C01 Date: 10-May-02

1. Exposure Parameters

		Residential			Commercial	
Age Adjustment?		Adult	(Age 0-6)	(Age 0-16)	Chronic	Construc.
Averaging time, carcinogens (yr)		70				
Averaging time, non-carcinogens (yr)		30			25	1
Body weight (kg)		70	15	35	70	
Exposure duration (yr)		30	6	16	25	1
Exposure frequency (days/yr)		350			250	180
Dermal exposure frequency (days/yr)		350			250	
Skin surface area, soil contact (cm^2)	☐	5800		2023	5800	5800
Soil dermal adherence factor ($mg/cm^2/day$)		1				
Water ingestion rate (L/day)		2			1	
Soil ingestion rate (mg/day)	☐	100	200		50	100
Swimming exposure time (hr/event)		3				
Swimming event frequency (events/yr)		12	12	12		
Swimming water ingestion rate (L/hr)	☐	0.05	0.5			
Skin surface area, swimming (cm^2)	☐	23000		8100		
Fish consumption rate (kg/day)		0.025				
Contaminated fish fraction (unitless)		1				



2. Risk Goal Calculation Options

- ○ Individual Constitiuent Risk Goals Only
- ◉ Individual and Cumulative Risk Goals

3. Target Health Risk Limits

	Individual	Cumulative
Target Risk (Class A/B carcins.)	1.0E-6	1.0E-5
Target Risk (Class C carcinogens)	1.0E-5	
Target Hazard Quotient	1.0E+0	
Target Hazard Index		1.0E+0

4. Commands and Options

Return to Exposure Pathways

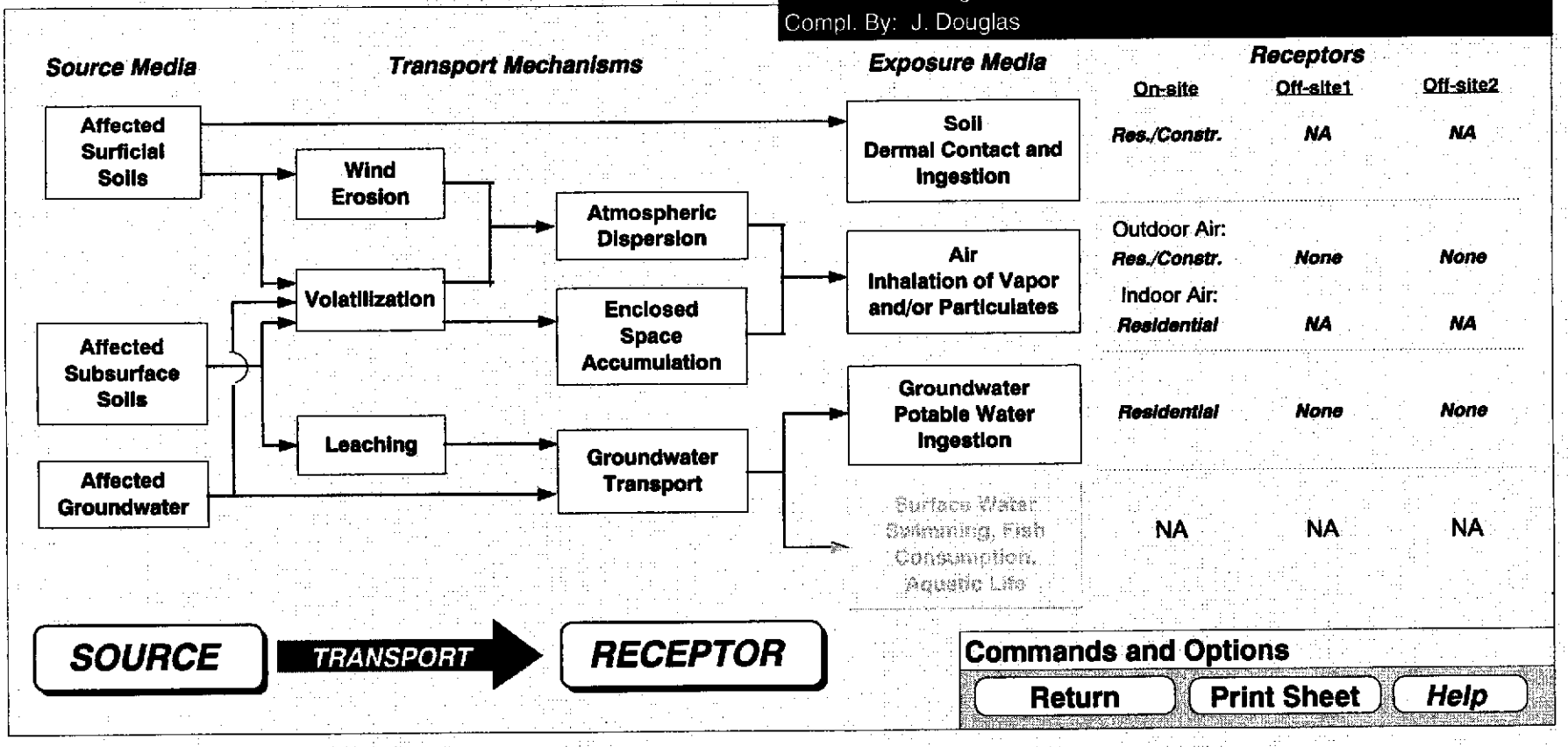
Use Default Values

Print Sheet

Help

Exposure Pathway Flowchart

Site Name: Former Chevron Service Station No[illegible]29DG90329H.3C01
Location: 340 Highland Ave., Piedmont, CA Date: 10-May-02
Compl. By: J. Douglas



Receptors	On-site	Off-site1	Off-site2
Soil Dermal Contact and Ingestion	*Res./Constr.*	*NA*	*NA*
Air Inhalation of Vapor and/or Particulates — Outdoor Air:	*Res./Constr.*	*None*	*None*
Air Inhalation of Vapor and/or Particulates — Indoor Air:	*Residential*	*NA*	*NA*
Groundwater Potable Water Ingestion	*Residential*	*None*	*None*
Surface Water Swimming, Fish Consumption, Aquatic Life	NA	NA	NA

Commands and Options

Return | Print Sheet | Help

RBCA Tool Kit for Chemical Releases, Version 1.3a

Site Name: Former Chevron Service Station No. 9-03; Job ID: DG90329H.3C01
Location: 340 Highland Ave., Piedmont, CA Date: 10-May-02
Compl. By: J. Douglas

Commands and Options

Main Screen | Print Sheet | Help

Source Media Constituents of Concern (COCs)

Apply Raoult's Law ?

Selected COCs

COC Select: Sort List: ?

Add/Insert | Top | MoveUp
Delete | Bottom | MoveDown

Representative COC Concentration ?

Selected COCs	Groundwater Source Zone (mg/L)	note	Soil Source Zone (mg/kg)	note	Mole Fraction in Source Material ?
Benzene*	2.3E-2		5.7E-2		
Toluene	3.8E-3		1.8E-1		
Ethylbenzene	9.4E-3		4.7E-1		
Xylene (mixed isomers)	5.7E-3		1.3E+0		
Methyl t-Butyl ether	1.9E-1		1.0E-3		
TPH - Arom >C08-C10	6.6E-1		9.0E+1		

Groundwater Source Zone: Enter Directly | ■ □ Enter Site Data
Soil Source Zone: Enter Directly | ■ □ Enter Site Data

* = Chemical with user-specified data

Commands and Options

Return | Print Sheet | *Help*

Site Name: Former Chevron Service Station No. 9-0329 Facility ID: RO0000329H.3C01
Location: 340 Highland Ave., Piedmont, CA Date: 10-May-02
Compl. By: J. Douglas

Groundwater Source Zone Concentration Calculator

Paste Defaults

UCL Percentile: 95%

Mean Option

Constituent	Detection Limit	No. of Samples	No. of Detects	Estimated Distribution of Data	Max. Conc.	Mean Conc.	UCL on Mean
	(mg/L)				*(mg/L)*	*(mg/L)*	*(mg/L)*
Benzene*	5.0E-4	12	12	Lognormal	1.1E+0	3.2E-3	2.3E-2
Toluene	5.0E-4	12	12	Lognormal	4.2E-2	1.3E-3	3.8E-3
Ethylbenzene	5.0E-4	12	12	Lognormal	2.9E-1	1.9E-3	9.4E-3
Xylene (mixed isomers)	5.0E-4	12	12	Lognormal	5.5E-2	1.7E-3	5.7E-3
Methyl t-Butyl ether	2.5E-3	12	12	Lognormal	7.2E+0	3.2E-2	1.9E-1
TPH - Arom >C08-C10	5.0E-2	12	12	Lognormal	9.5E+0	1.6E-1	6.6E-1

*** = Chemical with user-specified data**

Enter Analytical Data from Groundwater Source Zone (up to 50 Data Points)

Analytical Data

	1	2	3	4	5	6	7	8	9	10	11	12	13
ID	C-2	C-2	C-2	C-2	C-3	C-3	C-3	C-3	C-4	C-4	C-4	C-4	
Date	25-Feb-02	20-Aug-01	5-Apr-01	26-Nov-01	25-Feb-02	20-Aug-01	5-Apr-01	26-Nov-01	20-Aug-01	5-Jan-01	12-Jul-00	25-Feb-02	
	(mg/L)	*(mg/L)*	*(mg/L)*	*(mg/L)*	*(mg/L)*	*(mg/L)*	*(mg/L)*	*(mg/L)*	*(mg/L)*	*(mg/L)*	*(mg/L)*	*(mg/L)*	*(mg/L)*
	3.40E-1	1.10E+0	3.30E-1	6.50E-1	2.50E-4	2.50E-4	2.50E-4	2.50E-4	2.50E-4	2.50E-4	2.50E-4	2.50E-4	
	6.90E-3	4.20E-2	3.80E-2	1.30E-2	2.50E-4	2.50E-4	2.50E-4	2.50E-4	2.50E-4	2.50E-4	2.50E-4	1.80E-3	
	8.30E-2	2.90E-1	1.20E-1	6.60E-2	2.50E-4	2.50E-4	2.50E-4	2.50E-4	2.50E-4	2.50E-4	2.50E-4	2.50E-4	
	2.20E-2	5.50E-2	3.20E-2	4.40E-2	7.50E-4	2.50E-4	2.50E-4	7.50E-4	2.50E-4	2.50E-4	2.50E-4	7.50E-4	
	1.40E+0	7.20E+0	1.20E+0	3.10E+0	1.00E-3	1.25E-3	1.25E-3	1.25E-3	1.80E-2	2.70E-2	1.25E-3	2.40E-2	
	5.30E+0	7.30E+0	4.90E+0	9.50E+0	2.50E-2	2.50E-2	2.50E-2	2.50E-2	2.50E-2	2.50E-2	2.50E-2	2.50E-2	

Commands and Options

Return | Print Sheet | *Help*

Site Name: Former Chevron Service Station 9-0029H.3C01
Location: 340 Highland Ave., Piedmont, CA Date: 10-May-02
Compl. By: J. Douglas

Soil Source Zone Concentration Calculator

UCL Percentile: 95%

Paste Defaults | Mean Option

Constituent	Detection Limit (mg/kg)	No. of Samples	No. of Detects	Estimated Distribution of Data	Max. Conc. (mg/kg)	Mean Conc. (mg/kg)	UCL on Mean (mg/kg)
Benzene*	5.0E-3	7	7	Lognormal	1.6E-1	1.5E-2	5.7E-2
Toluene	5.0E-3	7	7	Lognormal	1.2E+0	2.6E-2	1.8E-1
Ethylbenzene	5.0E-3	7	7	Lognormal	1.2E+1	4.7E-2	4.7E-1
Xylene (mixed isomers)	5.0E-3	7	7	Lognormal	3.7E+1	1.2E-1	1.3E+0
Methyl t-Butyl ether	5.0E-2	1	1	-	1.0E-3	1.0E-3	NA
TPH - Arom >C08-C10	1.0E+0	7	7	Lognormal	1.6E+3	8.6E+0	9.0E+1

*** = Chemical with user-specified data**

Enter Analytical Data from Soil Source Zone (up to 50 Data Points)

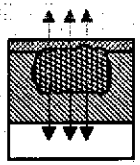
Analytical Data

	1	2	3	4	5	6	7	8	9	10	11	12	13
ID	U-6	C-A-5.5	C-A-10.5	C-B-5.5	C-E-6.5	C-E-11.5	C-E-14						
Date	21-Mar-01	15-Nov-90	15-Nov-90	12-Nov-90	13-Nov-90	15-Nov-90	12-Nov-90						
	(mg/kg)	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*
	2.50E-3	1.10E-1	5.00E-3	2.50E-3	1.60E-1	5.10E-2	7.00E-3						
	2.50E-3	1.20E+0	7.50E-3	2.50E-3	1.00E-1	5.10E-1	2.50E-3						
	2.50E-3	1.20E+1	7.50E-3	2.50E-3	1.00E-1	5.10E-1	1.90E-2						
	2.50E-3	3.70E+1	3.50E-2	2.10E-2	2.60E-1	1.40E+0	1.60E-2						
	1.00E-3												
	5.00E-1	1.60E+3	1.00E+0	5.00E-1	2.00E+1	2.20E+2	2.00E+0						

Transport Modeling Options

Site Name: Former Chevron Service Station No. 9-0329DG90329H.3C01
Location: 340 Highland Ave., Piedmont, CA Date: 10-May-02
Compl. By: J. Douglas

1. Vertical Transport, Surface Soil Column



Outdoor Air Volatilization Factors (?)

- ○ Surface soil volatilization model only
- ◉ Combination surface soil/Johnson & Ettinger models
  - Thickness of surface soil zone: 2 *(ft)*
- ○ User-specified VF from other model — Enter VF Values

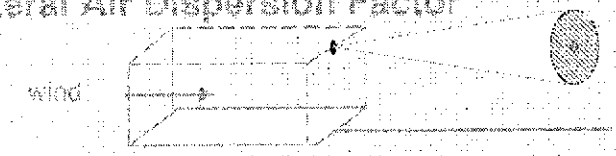
Indoor Air Volatilization Factors (?)

- ◉ Johnson & Ettinger model
- ○ User-specified VF from other model — Enter VF Values

Soil-to-Groundwater Leaching Factor

- ◉ ASTM Model (?)
  - ☐ Apply Soil Attenuation Model (SAM) — Enter Decay Rates
  - ☐ Allow first-order biodecay
- ○ User-specified LF from other model — Enter LF Values

2. Lateral Air Dispersion Factor

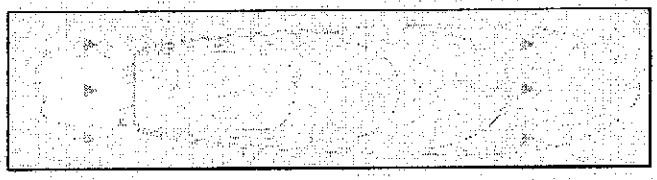


(?)

- ○ 3-D Gaussian dispersion model
- ○ User-Specified ADF

Off-site 1	Off-site 2	
1.00E+0	1.00E+0	*(-)*

3. Groundwater Dilution Attenuation Factor



Calculate DAF using Domenico Model (?)

- ○ Domenico equation with dispersion only (no biodegradation)
- ○ Domenico equation first-order decay — Enter Decay Rates
- ○ Modified Domenico equation using electron acceptor superposition — Enter Site Data

Enter Directly — Biodegradation Capacity: NC *(mg/L)*

— or —

User-Specified DAF Values

- ○ DAF values from other model or site data — Enter DAF Values

4. Commands and Options

Main Screen | Print Sheet | *Help*

Site-Specific Soil Parameters

Site Name: Former Chevron Service Station No. 9-0329 ID: DG90329H.3C01
Location: 340 Highland Ave., Piedmont, CA Date: 10-May-02
Compl. By: J. Douglas

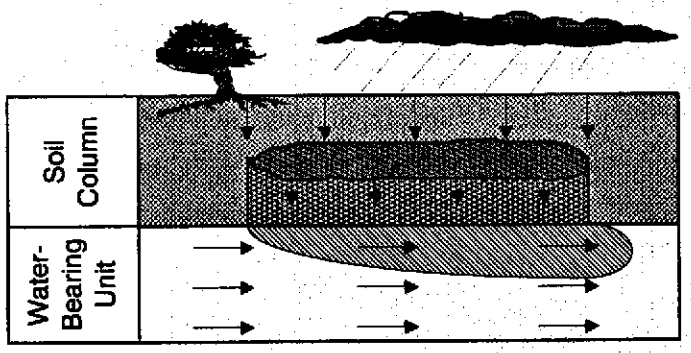
1. Soil Source Zone Characteristics

Hydrogeology

	General Case	Construction	
Depth to water-bearing unit	2		(ft)
Capillary zone thickness	0.295275591		(ft)
Soil column thickness	1.704724409		(ft)

Affected Soil Zone

Depth to top of affected soils	5		(ft)
Depth to base of affected soils	14		(ft)
Affected soil area	5000	5000	(ft^2)
Length of affected soil parallel to assumed wind direction	75	75	(ft)
Length of affected soil parallel to assumed GW flow direction	60		(ft)



2. Surface Soil Column

Vadose Zone Capillary Fringe

Predominant USCS Soil Type

SM: Silty Sand

or Enter Directly

	Vadose Zone	Capillary Fringe	
Total porosity	0.41		(-)
Volumetric water content	0.12	0.369	(-)
Volumetric air content	0.29	0.041	(-)
Dry bulk density	1.7		(kg/L)
Vertical hydraulic conductivity	8.6E+1		(cm/d)
Vapor permeability	1.1E-12		(ft^2)
Capillary zone thickness	3.0E-1		(ft)

Net Rainfall Infiltration

Net infiltration estimate	30	(in/yr)
or Calculate		
Average annual precipitation	0	(in/yr)

Partitioning Parameters

Fraction organic carbon	0.01	(-)
Soil/water pH	6.8	(-)

3. Commands and Options

Main Screen | Use Default Values | Print Sheet
Set Units | | Help

Site-Specific Groundwater Parameters

Site Name: Former Chevron Service Station No. 9-0329 DG90329H.3C01
Location: 340 Highland Ave., Piedmont, CA Date: 10-May-02
Compl. By: J. Douglas

1. Water-Bearing Unit

Hydrogeology

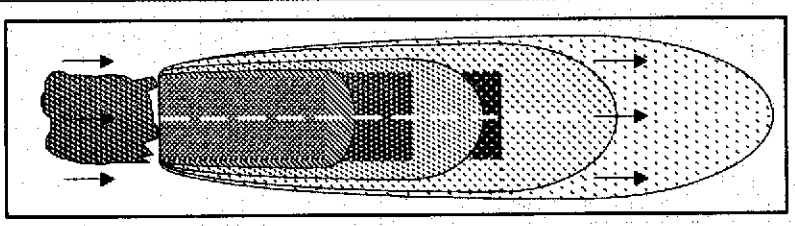
Groundwater Darcy velocity	8.9E+1	(cm/d)
Groundwater seepage velocity	2.3E+2	(cm/d)
or Enter Directly	↑ or	
Hydraulic conductivity	6.9E+2	(cm/d)
Hydraulic gradient	1.3E-1	(-)
Effective porosity	0.38	(-)

Sorption

Fraction organic carbon--saturated zone		(-)
Groundwater pH		(-)

2. Groundwater Source Zone

Groundwater plume width at source	60	(ft)
Plume (mixing zone) thickness at source	12	(ft)
or Calculate	↑ or	
Saturated thickness	0	(ft)
Length of source zone		(ft)



3. Groundwater Dispersion

Model:

	GW Ingestion		Soil Leaching to GW	
	Off-site 1	Off-site 2	Off-site 1	Off-site 2
Distance to GW receptors	0	0	0	0 (ft)
or NA	or		or	
Longitudinal dispersivity				(ft)
Transverse dispersivity				(ft)
Vertical dispersivity				(ft)

4. Groundwater Discharge to Surface Water

	Off-site 2	
Distance to GW/SW discharge point	NA	(ft)
Plume width at GW/SW discharge	0	(ft)
Plume thickness at GW/SW discharge	0	(ft)
Surface water flowrate at GW/SW discharge	0.0E+0	(ft^3/s)

5. Commands and Options

Main Screen | Use Default Values | Print Sheet
Set Units | | Help

Site-Specific Air Parameters

Site Name: Former Chevron Service Station No 9-0329 90329H.3C01
Location: 340 Highland Ave., Piedmont, CA Date: 10-May-02
Compl. By: J. Douglas

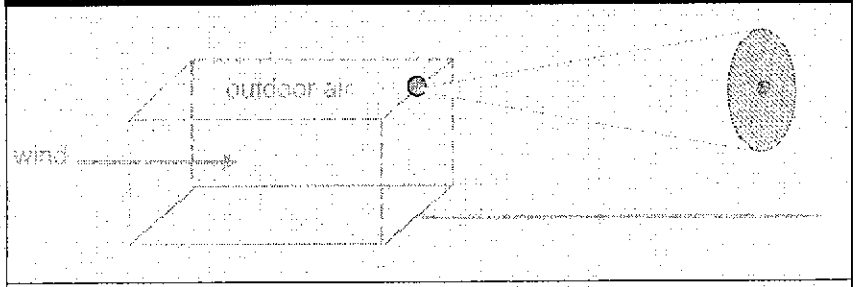
1. Outdoor Air Pathway

Dispersion In Air

	Off-site 1	Off-site 2	
Distance to offsite air receptor			(ft)
or	NA	or	
Horizontal dispersivity			(ft)
Vertical dispersivity			(ft)

Air Source Zone

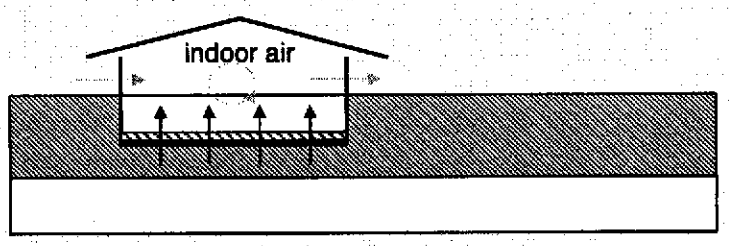
Air mixing zone height	6.56167979	(ft)
Ambient air velocity in mixing zone	7.381889764	(ft/s)
Areal particulate emission flux	6.9E-14	(g/cm^2/s)



2. Indoor Air Pathway

Building Parameters

	Residential	Commercial	
Building volume/area ratio	6.56168	9.84252	(ft)
Foundation area	753.474	753.474	(ft^2)
Foundation perimeter	111.549	111.549	(ft)
Building air exchange rate	1.4E-3	2.3E-4	(1/s)
Depth to bottom of foundation slab	0.49213	0.49213	(ft)
Convective air flow through cracks	0.0E+0	0.0E+0	(ft^3/s)
Foundation thickness	0.492125984		(ft)
Foundation crack fraction	0.01		(-)
Volumetric water content of cracks	0.12		(-)
Volumetric air content of cracks	0.26		(-)
Indoor/Outdoor differential pressure	0		(g/cm/s^2)



3. Commands and Options

Main Screen | Use Default Values | Print Sheet
Set Units | | Help

RBCA SITE ASSESSMENT | **Baseline Risk Summary-All Pathways**

Site Name: Former Chevron Service Station No. 9-0329
Site Location: 340 Highland Ave., Piedmont, CA
Completed By: J. Douglas
Date Completed: 10-May-02

TIER 2 BASELINE RISK SUMMARY TABLE

	BASELINE CARCINOGENIC RISK					BASELINE TOXIC EFFECTS				
	Individual COC Risk		Cumulative COC Risk		Risk	Hazard Quotient		Hazard Index		Toxicity
EXPOSURE PATHWAY	Maximum Value	Target Risk	Total Value	Target Risk	Limit(s) Exceeded?	Maximum Value	Applicable Limit	Total Value	Applicable Limit	Limit(s) Exceeded?
OUTDOOR AIR EXPOSURE PATHWAYS										
Complete:	3.7E-9	1.0E-6	3.7E-9	1.0E-5	☐	2.6E-3	1.0E+0	2.8E-3	1.0E+0	☐
INDOOR AIR EXPOSURE PATHWAYS										
Complete:	2.4E-7	1.0E-6	2.4E-7	1.0E-5	☐	5.8E-2	1.0E+0	7.0E-2	1.0E+0	☐
SOIL EXPOSURE PATHWAYS										
Complete:	1.3E-8	1.0E-6	1.3E-8	1.0E-5	☐	2.1E-2	1.0E+0	2.1E-2	1.0E+0	☐
GROUNDWATER EXPOSURE PATHWAYS										
Complete:	2.7E-5	1.0E-6	2.7E-5	1.0E-5	■	5.3E-1	1.0E+0	1.2E+0	1.0E+0	■
SURFACE WATER EXPOSURE PATHWAYS										
Complete:	NA	NA	NA	NA	☐	NA	NA	NA	NA	☐
CRITICAL EXPOSURE PATHWAY (Maximum Values From Complete Pathways)										
	2.7E-5	***1.0E-6***	***2.7E-5***	***1.0E-5***	■	***5.3E-1***	***1.0E+0***	***1.2E+0***	***1.0E+0***	■
	Groundwater		***Groundwater***			***Groundwater***		***Groundwater***		

CHEMICAL DATA FOR SELECTED COCs

Physical Property Data

Constituent	CAS Number	type	Molecular Weight (g/mole) MW	ref	Diffusion Coefficients: In air (cm2/s) Dair	ref	In water (cm2/s) Dwat	ref	log (Koc) or log(Kd) (@ 20 - 25 C) log(L/kg) partition		ref	Henry's Law Constant (@ 20 - 25 C) (atm-m3) mol	(unitless)	ref	Vapor Pressure (@ 20 - 25 C) (mm Hg)	ref	Solubility (@ 20 - 25 C) (mg/L)	ref	acid pKa	base pKb	ref
Benzene*	71-43-2	A	78.1	PS	8.80E-02	PS	9.80E-06	PS	1.77	Koc	PS	5.55E-03	2.29E-01	PS	9.52E+01	PS	1.75E+03	PS	-	-	-
Toluene	108-88-3	A	92.4	5	8.50E-02	A	9.40E-06	A	2.13	Koc	A	6.30E-03	2.60E-01	A	3.00E+01	4	5.15E+02	29	-	-	-
Ethylbenzene	100-41-4	A	106.2	PS	7.50E-02	PS	7.80E-06	PS	2.56	Koc	PS	7.88E-03	3.25E-01	PS	1.00E+01	PS	1.69E+02	PS	-	-	-
Xylene (mixed isomers)	1330-20-7	A	106.2	5	7.20E-02	A	8.50E-06	A	2.38	Koc	A	7.03E-03	2.90E-01	A	7.00E+00	4	1.98E+02	5	-	-	-
Methyl t-Butyl ether	1634-04-4	O	88.146	5	7.92E-02	6	9.41E-05	7	1.06	Koc	A	5.77E-04	2.38E-02	-	2.49E+02	-	4.80E+04	A	-	-	-
TPH - Arom >C08-C10	0-00-0	T	120	T	1.00E-01	T	1.00E-05	T	3.20	Koc	T	1.16E-02	4.80E-01	T	4.79E+00	-	6.50E+01	T	-	-	-

* = Chemical with user-specified data

Site Name: Former Chevron Service Station No. 9-0329

Site Location: 340 Highland Ave., Piedmont, CA

Completed By: J. Douglas

Date Completed: 10-May-02

Job ID: DG90329H.3C01

CHEMICAL DATA FOR SELECTED COCs

Toxicity Data

Constituent	Reference Dose (mg/kg/day) Oral RfD_oral	ref	Reference Dose (mg/kg/day) Dermal RfD_dermal	ref	Reference Conc. (mg/m3) Inhalation RfC_inhal	ref	Slope Factors 1/(mg/kg/day) Oral SF_oral	ref	Slope Factors 1/(mg/kg/day) Dermal SF_dermal	ref	Unit Risk Factor 1/(µg/m3) Inhalation URF_inhal	ref	EPA Weight of Evidence	Is Constituent Carcinogenic ?
Benzene*	3.00E-03	R	-	-	5.95E-03	R	1.00E-01	PS	2.99E-02	TX	8.29E-06	PS	A	TRUE
Toluene	2.00E-01	A,R	1.60E-01	TX	4.00E-01	A,R	-	-	-	-	-	-	D	FALSE
Ethylbenzene	1.00E-01	PS	9.70E-02	TX	1.00E+00	PS	-	-	-	-	-	-	D	FALSE
Xylene (mixed isomers)	2.00E+00	A,R	1.84E+00	TX	7.00E+00	A	-	-	-	-	-	-	D	FALSE
Methyl t-Butyl ether	1.00E-02	31	8.00E-03	TX	3.00E+00	R	-	-	-	-	-	-	-	FALSE
TPH - Arom >C08-C10	4.00E-02	T	-	-	2.00E-01	T	-	-	-	-	-	-	D	FALSE

* = Chemical with user-specifiec

Site Name: Former Chevron Se

Site Location: 340 Highland A

Miscellaneous Chemical Data

Constituent	Maximum Contaminant Level MCL (mg/L)	ref	Time-Weighted Average Workplace Criteria TWA (mg/m3)	ref	Aquatic Life Prot. Criteria AQL (mg/L)	ref	Bioconcentration Factor (L-wat/kg-fish)
Benzene*	5.00E-04	-	3.25E+00	-	-	-	12.6
Toluene	1.00E+00	56 FR 3526 (30 Jan 91)	1.47E+02	ACGIH	-	-	70
Ethylbenzene	7.00E-01	56 FR 3526 (30 Jan 91)	4.35E+02	PS	-	-	1
Xylene (mixed Isomers)	1.00E+01	56 FR 3526 (30 Jan 91)	4.34E+02	ACGIH	-	-	1
Methyl t-Butyl ether	-	-	6.00E+01	NIOSH	-	-	1
TPH - Arom >C08-C10	-	-	-	-	-	-	1

* = Chemical with user-specifiec

Site Name: Former Chevron Se

Site Location: 340 Highland A

CHEMICAL DATA FOR SELECTED COCs

Miscellaneous Chemical Data

Constituent	Dermal Relative Absorp. Factor (unitless)	Water Dermal Permeability Data: Dermal Permeability Coeff. (cm/hr)	Lag time for Dermal Exposure (hr)	Critical Exposure Time (hr)	Relative Contr of Derm Perm Coeff (unitless)	Water/Skin Derm Adsorp Factor (cm/event)	ref	Detection Limits: Groundwater (mg/L)	ref	Soil (mg/kg)	ref	Half Life (First-Order Decay) (days): Saturated	Unsaturated	ref
Benzene*	0.5	0.021	0.26	0.63	0.013	7.3E-2	D	0.002	S	0.005	S	720	720	H
Toluene	0.5	0.045	0.32	0.77	0.054	1.6E-1	D	0.002	S	0.005	S	28	28	H
Ethylbenzene	0.5	0.074	0.39	1.3	0.14	2.7E-1	D	0.002	S	0.005	S	228	228	H
Xylene (mixed isomers)	0.5	0.06	0.39	1.4	0.16	2.9E-1	D	0.005	S	0.005	S	360	360	H
Methyl t-Butyl ether	0.5	-	-	-	-	-	-	-	-	-	-	360	180	H
TPH - Arom >C08-C10	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-

* = Chemical with user-specifiec

Site Name: Former Chevron Se

Site Location: 340 Highland A

RBCA SITE ASSESSMENT

Input Parameter Summary

Site Name: Former Chevron Service Station No. 9-0329
Site Location: 340 Highland Ave., Piedmont, CA

Completed By: J. Douglas
Date Completed: 10-May-02

Job ID: DG90329H.3C01

Exposure Parameters		Residential			Commercial/Industrial	
		Adult	(1-6yrs)	(1-16 yrs)	Chronic	Construc.
AT_c	Averaging time for carcinogens (yr)	70				
AT_n	Averaging time for non-carcinogens (yr)	30			25	1
BW	Body weight (kg)	70	15	35	70	
ED	Exposure duration (yr)	30	6	16	25	1
τ	Averaging time for vapor flux (yr)	30			25	1
EF	Exposure frequency (days/yr)	350			250	180
EF_D	Exposure frequency for dermal exposure	350			250	
IR_w	Ingestion rate of water (L/day)	2			1	
IR_s	Ingestion rate of soil (mg/day)	100	200		50	100
SA	Skin surface area (dermal) (cm^2)	5800		2023	5800	5800
M	Soil to skin adherence factor	1				
ET_{swim}	Swimming exposure time (hr/event)	3				
EV_{swim}	Swimming event frequency (events/yr)	12	12	12		
IR_{swim}	Water ingestion while swimming (L/hr)	0.05	0.5			
SA_{swim}	Skin surface area for swimming (cm^2)	23000		8100		
IR_{fish}	Ingestion rate of fish (kg/yr)	0.025				
FI_{fish}	Contaminated fish fraction (unitless)	1				

Complete Exposure Pathways and Receptors	On-site	Off-site 1	Off-site 2
Groundwater:			
Groundwater Ingestion	Residential	None	None
Soil Leaching to Groundwater Ingestion	Residential	None	None
Applicable Surface Water Exposure Routes:			
Swimming			NA
Fish Consumption			NA
Aquatic Life Protection			NA
Soil:			
Direct Ingestion and Dermal Contact	Res./Constr.		
Outdoor Air:			
Particulates from Surface Soils	Res./Constr.	None	None
Volatilization from Soils	Res./Constr.	None	None
Volatilization from Groundwater	Residential	None	None
Indoor Air:			
Volatilization from Subsurface Soils	Residential	NA	NA
Volatilization from Groundwater	Residential	NA	NA

Receptor Distance from Source Media	On-site	Off-site 1	Off-site 2	(Units)
Groundwater receptor	0	NA	NA	(ft)
Soil leaching to groundwater receptor	0	NA	NA	(ft)
Outdoor air inhalation receptor	0	NA	NA	(ft)

Target Health Risk Values		Individual	Cumulative
TR_{ab}	Target Risk (class A&B carcinogens)	1.0E-6	1.0E-5
TR_c	Target Risk (class C carcinogens)	1.0E-5	
THQ	Target Hazard Quotient (non-carcinogenic risk)	1.0E+0	1.0E+0

Modeling Options	
RBCA tier	Tier 2
Outdoor air volatilization model	Surface & subsurface models
Indoor air volatilization model	Johnson & Ettinger model
Soil leaching model	ASTM leaching model
Use soil attenuation model (SAM) for leachate?	No
Air dilution factor	NA
Groundwater dilution-attenuation factor	NA

NOTE: NA = Not applicable

Surface Parameters		General	Construction	(Units)
A	Source zone area	5.0E+3	5.0E+3	(ft^2)
W	Length of source-zone area parallel to wind	7.5E+1	7.5E+1	(ft)
W_{gw}	Length of source-zone area parallel to GW flow	6.0E+1		(ft)
U_{air}	Ambient air velocity in mixing zone	7.4E+0		(ft/s)
δ_{air}	Air mixing zone height	6.6E+0		(ft)
P_a	Areal particulate emission rate	6.9E-14		(g/cm^2/s)
L_{ss}	Thickness of affected surface soils	2.0E+0		(ft)

Surface Soil Column Parameters		Value			(Units)
h_{cap}	Capillary zone thickness	3.0E-1			(ft)
h_v	Vadose zone thickness	1.7E+0			(ft)
ρ_s	Soil bulk density	1.7E+0			(g/cm^3)
f_{oc}	Fraction organic carbon	1.0E-2			(-)
θ_T	Soil total porosity	4.1E-1			(-)
K_{vs}	Vertical hydraulic conductivity	8.6E+1			(cm/d)
k_v	Vapor permeability	1.1E-12			(ft^2)
L_{gw}	Depth to groundwater	2.0E+0			(ft)
L_s	Depth to top of affected soils	5.0E+0			(ft)
L_{base}	Depth to base of affected soils	1.4E+1			(ft)
L_{subs}	Thickness of affected soils	9.0E+0			(ft)
pH	Soil/groundwater pH	6.8E+0			(-)
		capillary	vadose	foundation	
θ_w	Volumetric water content	0.369	0.12	0.12	(-)
θ_a	Volumetric air content	0.041	0.29	0.26	(-)

Building Parameters		Residential	Commercial	(Units)
L_b	Building volume/area ratio	6.56E+0	NA	(ft)
A_b	Foundation area	7.53E+2	NA	(ft^2)
X_{crk}	Foundation perimeter	1.12E+2	NA	(ft)
ER	Building air exchange rate	1.40E-3	NA	(1/s)
L_{crk}	Foundation thickness	4.92E-1	NA	(ft)
Z_{crk}	Depth to bottom of foundation slab	4.92E-1	NA	(ft)
η	Foundation crack fraction	1.00E-2	NA	(-)
dP	Indoor/outdoor differential pressure	0.00E+0	NA	(g/cm/s^2)
Q_s	Convective air flow through slab	0.00E+0	NA	(ft^3/s)

Groundwater Parameters		Value	(Units)
δ_{gw}	Groundwater mixing zone depth	1.2E+1	(ft)
I_f	Net groundwater infiltration rate	3.0E+1	(in/yr)
U_{gw}	Groundwater Darcy velocity	8.9E+1	(cm/d)
V_{gw}	Groundwater seepage velocity	2.3E+2	(cm/d)
K_s	Saturated hydraulic conductivity	NA	(cm/d)
i	Groundwater gradient	NA	(-)
S_w	Width of groundwater source zone	NA	(ft)
S_d	Depth of groundwater source zone	NA	(ft)
θ_{ef}	Effective porosity in water-bearing unit	NA	(-)
f_{oc-sat}	Fraction organic carbon in water-bearing unit	NA	(-)
pH_{sat}	Groundwater pH	NA	(-)
	Biodegradation considered?	NA	

Transport Parameters		Off-site 1	Off-site 2	Off-site 1	Off-site 2	(Units)
Lateral Groundwater Transport		Groundwater Ingestion		Soil Leaching to GW		
α_x	Longitudinal dispersivity	NA	NA	NA	NA	(ft)
α_y	Transverse dispersivity	NA	NA	NA	NA	(ft)
α_z	Vertical dispersivity	NA	NA	NA	NA	(ft)
Lateral Outdoor Air Transport		Soil to Outdoor Air Inhal.		GW to Outdoor Air Inhal.		
σ_y	Transverse dispersion coefficient	NA	NA	NA	NA	(ft)
σ_z	Vertical dispersion coefficient	NA	NA	NA	NA	(ft)
ADF	Air dispersion factor	NA	NA	NA	NA	(-)

Surface Water Parameters		Off-site 2	(Units)
Q_{sw}	Surface water flowrate	NA	(ft^3/s)
W_{pl}	Width of GW plume at SW discharge	NA	(ft)
δ_{pl}	Thickness of GW plume at SW discharge	NA	(ft)
DF_{sw}	Groundwater-to-surface water dilution factor	NA	(-)

RBCA SITE ASSESSMENT

Site Name: Former Chevron Service Station No. 9-0329 | Completed By: J. Douglas | Job ID: DG90329H.3C01

Site Location: 340 Highland Ave., Piedmont, CA | Date Completed: 10-May-02

SOIL (5 - 14 ft) SSTL VALUES

Target Risk (Class A & B) 1.0E-6
Target Risk (Class C) 1.0E-5
Target Hazard Quotient 1.0E+0

Groundwater DAF Option:

SSTL Results For Complete Exposure Pathways ("X" if Complete)

CONSTITUENTS OF CONCERN		Representative Concentration	X Soil Leaching to Groundwater Ingestion			X Soil Vol. to Indoor Air	X Soil Volatilization and Surface Soil Particulates to Outdoor Air				X Surface Soil Inhalation, Ingestion,Dermal Contact		Applicable SSTL	SSTL Exceeded ?	Required CRF
			On-site (0 ft)	Off-site 1 (0 ft)	Off-site 2 (0 ft)	On-site (0 ft)	On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)	On-site (0 ft)				Only if "yes" left
CAS No.	Name	(mg/kg)	Residential	None	None	Residential	Residential	Construction Worker	None	None	Residential	Construction Worker	(mg/kg)	"■" if yes	
71-43-2	Benzene*	2.4E-2	5.1E-2	NA	NA	1.7E-1	1.2E+1	>1.2E+3	NA	NA	1.8E+0	7.6E+1	5.1E-2	☐	<1
108-88-3	Toluene	5.3E-2	>7.5E+2	NA	NA	2.4E+2	>7.5E+2	>7.5E+2	NA	NA	3.9E+3	5.5E+3	2.4E+2	☐	<1
100-41-4	Ethylbenzene	1.1E-1	>6.3E+2	NA	NA	>6.3E+2	>6.3E+2	>6.3E+2	NA	NA	2.4E+3	3.3E+3	2.4E+3	☐	<1
1330-20-7	Xylene (mixed isomers)	2.4E-1	>5.0E+2	NA	NA	>5.0E+2	>5.0E+2	>5.0E+2	NA	NA	4.5E+4	6.3E+4	4.5E+4	☐	<1
1634-04-4	Methyl t-Butyl ether	1.0E-3	6.1E+0	NA	NA	1.9E+3	>9.4E+3	>9.4E+3	NA	NA	2.0E+2	2.8E+2	6.1E+0	☐	<1
0-00-0	TPH - Arom >C08-C10	2.0E+1	>1.0E+3	NA	NA	4.1E+2	>1.0E+3	>1.0E+3	NA	NA	9.7E+2	1.4E+3	4.1E+2	☐	<1

* = Chemical with user-specified data

">" indicates risk-based target concentration greater than constituent residual saturation value. NA = Not applicable. NC = Not calculated.

RBCA SITE ASSESSMENT

Site Name: Former Chevron Service Station No. 9-0329
Site Location: 340 Highland Ave., Piedmont, CA

Completed By: J. Douglas
Date Completed: 10-May-02

Job ID: DG90329H.3C01

GROUNDWATER SSTL VALUES

Target Risk (Class A & B) 1.0E-6
Target Risk (Class C) 1.0E-5
Target Hazard Quotient 1.0E+0

Groundwater DAF Option:

SSTL Results For Complete Exposure Pathways ("X" If Complete)

			X	Groundwater Ingestion			X	GW Vol. to Indoor Air	X	Groundwater Volatilization to Outdoor Air			Applicable SSTL	SSTL Exceeded ?	Required CRF
CONSTITUENTS OF CONCERN		Representative Concentration		On-site (0 ft)	Off-site 1 (0 ft)	Off-site 2 (0 ft)		On-site (0 ft)		On-site (0 ft)	Off-site 1 (0 ft)	Off-site 2 (0 ft)			Only if "yes"
CAS No.	Name	(mg/L)		Residential	None	None		Residential		Residential	None	None	(mg/L)	"■" if yes	left
71-43-2	Benzene*	2.3E-2		8.5E-4	NA	NA		2.3E-1		1.3E+1	NA	NA	8.5E-4	■	2.7E+1
108-88-3	Toluene	3.8E-3		7.3E+0	NA	NA		3.1E+2		>5.2E+2	NA	NA	7.3E+0	☐	<1
100-41-4	Ethylbenzene	9.4E-3		3.7E+0	NA	NA		>1.7E+2		>1.7E+2	NA	NA	3.7E+0	☐	<1
1330-20-7	Xylene (mixed isomers)	5.7E-3		7.3E+1	NA	NA		>2.0E+2		>2.0E+2	NA	NA	7.3E+1	☐	<1
1634-04-4	Methyl t-Butyl ether	1.9E-1		3.7E-1	NA	NA		9.5E+3		>4.8E+4	NA	NA	3.7E-1	☐	<1
0-00-0	TPH - Arom >C08-C10	6.6E-1		1.5E+0	NA	NA		>6.5E+1		>6.5E+1	NA	NA	1.5E+0	☐	<1

* = Chemical with user-specified data

">" indicates risk-based target concentration greater than constituent solubility value. NA = Not applicable. NC = Not calculated.

RBCA SITE ASSESSMENT | TPH Criteria SSTL Worksheet

Site Name: Former Chevron Service Station No. 9-0329
Site Location: 340 Highland Ave., Piedmont, CA

Completed By: J. Douglas
Date Completed: 10-May-02

Job ID: DG90329H.3C01

CALCULATION OF SSTL VALUES FOR TPH

CONSTITUENTS OF CONCERN		Mass Fractions		Representative Concentrations		Calculated Concentration Limits		Applicable SSTL Values	
		Soil	Groundwater	Soil	Groundwater	Residual Soil Concentration	Solubility	Soils (5 - 14 ft)	Groundwater
CAS No.	Name	(-)	(-)	(mg/kg)	(mg/L)	(mg/kg)	(mg/L)	(mg/kg)	(mg/L)
0-00-0	TPH - Arom >C08-C10	1.0E+0	1.0E+0	2.0E+1	6.6E-1	1.0E+3	6.5E+1	4.1E+2	1.5E+0
* = Chemical with user-specified data									
	Total	1.0E+0	1.0E+0	2.0E+1	6.6E-1		Total TPH SSTL value	4.1E+2	1.5E+0

">" indicates risk-based target concentration greater than constituent residual saturation value. NC = Not calculated.

RBCA SITE ASSESSMENT | **Cumulative Risk Worksheet**

Site Name: Former Chevron Service Station No. 9-0329 | Completed By: J. Douglas | Job ID: DG90329H.3C01

Site Location: 340 Highland Ave., Piedmont, CA | Date Completed: 10-May-02 | *1 OF 3*

CUMULATIVE RISK WORKSHEET

CONSTITUENTS OF CONCERN		Representative Concentration		Proposed CRF		Resultant Target Concentration	
CAS No.	Name	Soil (mg/kg)	Groundwater (mg/L)	Soil	GW	Soil (mg/kg)	Groundwater (mg/L)
71-43-2	Benzene*	2.4E-2	2.3E-2			2.4E-2	2.3E-2
108-88-3	Toluene	5.3E-2	3.8E-3			5.3E-2	3.8E-3
100-41-4	Ethylbenzene	1.1E-1	9.4E-3			1.1E-1	9.4E-3
1330-20-7	Xylene (mixed isomers)	2.4E-1	5.7E-3			2.4E-1	5.7E-3
1634-04-4	Methyl t-Butyl ether	1.0E-3	1.9E-1			1.0E-3	1.9E-1
0-00-0	TPH - Arom >C08-C10	2.0E+1	6.6E-1			2.0E+1	6.6E-1

Cumulative Values:

RBCA SITE ASSESSMENT | **Cumulative Risk Worksheet**

Site Name: Former Chevron Service Station No. 9-0 | Site Name: Former Chevron Service Station No. 9-0 | Completed By: J. Douglas | Job ID: DG90329H.3C01

Site Location: 340 Highland Ave., Piedmont, CA | Site Location: 340 Highland Ave., Piedmont, CA | Date Completed: 10-May-02 | *2 OF 3*

CUMULATIVE RISK WORKSHEET

Cumulative Target Risk: 1.0E-5 Target Hazard Index: 1.0E+0

ON-SITE RECEPTORS

CONSTITUENTS OF CONCERN		Outdoor Air Exposure: Residential Target Risk: 1.0E-6 / 1.0E-5	Outdoor Air Exposure: Residential Target HQ: 1.0E+0	Indoor Air Exposure: Residential Target Risk: 1.0E-6 / 1.0E-5	Indoor Air Exposure: Residential Target HQ: 1.0E+0	Soil Exposure: Residential Target Risk: 1.0E-6 / 1.0E-5	Soil Exposure: Residential Target HQ: 1.0E+0	Groundwater Exposure: Residential Target Risk: 1.0E-6 / 1.0E-5	Groundwater Exposure: Residential Target HQ: 1.0E+0
CAS No.	Name	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient
71-43-2	Benzene*	3.7E-9	1.8E-4	2.4E-7	1.1E-2	1.3E-8	3.2E-4	2.7E-5	2.1E-1
108-88-3	Toluene		3.4E-6		2.4E-4		1.4E-5		5.2E-4
100-41-4	Ethylbenzene		2.7E-6		1.3E-4		4.5E-5		2.6E-3
1330-20-7	Xylene (mixed isomers)		8.4E-7		4.7E-5		5.3E-6		7.8E-5
1634-04-4	Methyl t-Butyl ether		3.4E-6		2.1E-5		5.1E-6		5.3E-1
0-00-0	TPH - Arom >C08-C10		2.6E-3		5.8E-2		2.1E-2		4.5E-1
	Cumulative Values:	**3.7E-9**	**2.8E-3**	**2.4E-7**	**7.0E-2**	**1.3E-8**	**2.1E-2**	**2.7E-5** ■	**1.2E+0** ■

■ indicates risk level exceeding target risk

RBCA SITE ASSESSMENT | **Cumulative Risk Worksheet**

Site Name: Former Chevron Service Station No. 9-tSite Name: Former Chevron Service Station No. 9-03 Completed By: J. Douglas Job ID: DG90329H.3C01

Site Location: 340 Highland Ave., Piedmont, CA Site Location: 340 Highland Ave., Piedmont, CA Date Completed: 10-May-02

CUMULATIVE RISK WORKSHEET

Cumulative Target Risk: 1.0E-5 Target Hazard Index: 1.0E+0

Groundwater DAF Option: FALSE

OFF-SITE RECEPTORS

CONSTITUENTS OF CONCERN		Outdoor Air Exposure:				Groundwater Exposure:			
		None		None		None		None	
		Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0
CAS No.	Name	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient
71-43-2	Benzene*								
108-88-3	Toluene								
100-41-4	Ethylbenzene								
1330-20-7	Xylene (mixed isomers)								
1634-04-4	Methyl t-Butyl ether								
0-00-0	TPH - Arom >C08-C10								
Cumulative Values:		**0.0E+0**	**0.0E+0**	**0.0E+0**	**0.0E+0**	**0.0E+0**	**0.0E+0**	**0.0E+0**	**0.0E+0**

■ Indicates risk level exceeding target risk

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS ☐ (CHECKED IF PATHWAY IS ACTIVE)

SURFACE SOILS:
VAPOR AND DUST INHALATION

Constituents of Concern	1) Source Medium	2) NAF Value (m^3/kg) Receptor				3) Exposure Medium Outdoor Air: POE Conc. (mg/m^3) (1) / (2)			
	Soil Conc. (mg/kg)	On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)	On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)
		Residential	Construction Worker	None	None	Residential	Construction Worker	None	None
Benzene*	2.4E-2								
Toluene	5.3E-2								
Ethylbenzene	1.1E-1								
Xylene (mixed isomers)	2.4E-1								
Methyl t-Butyl ether	1.0E-3								
TPH - Arom >C08-C10	2.0E+1								

NOTE: NAF = Natural attenuation factor POE = Point of exposure

Site Name: Former Chevron Service Station No. 9-0329
Site Location: 340 Highland Ave., Piedmont, CA
Completed By: J. Douglas

Date Completed: 10-May-02
Job ID: DG90329H.3C01

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

SURFACE SOILS:

VAPOR AND DUST INHALATION (cont'd)

Constituents of Concern	4) Exposure Multiplier (EFxED)/(ATx365) (unitless)				5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4)			
	On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)	On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)
	Residential	Construction Worker	None	None	Residential	Construction Worker	None	None
Benzene*								
Toluene								
Ethylbenzene								
Xylene (mixed isomers)								
Methyl t-Butyl ether								
TPH - Arom >C08-C10								

* = Chemical with user-specified data

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr)

Site Name: Former Chevron Service Station No. 9-0329
Site Location: 340 Highland Ave., Piedmont, CA
Completed By: J. Douglas

Date Completed: 10-May-02
Job ID: DG90329H.3C01

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS ■ (CHECKED IF PATHWAY IS ACTIVE)

SUBSURFACE SOILS (5 - 14 ft):
VAPOR INHALATION

Constituents of Concern	1) Source Medium	2) NAF Value (m^3/kg) Receptor			3) Exposure Medium Outdoor Air: POE Conc. (mg/m^3) (1) / (2)		
	Soil Conc. (mg/kg)	On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None	On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None
Benzene*	2.4E-2	4.0E+4			5.9E-7		
Toluene	5.3E-2	4.0E+4			1.3E-6		
Ethylbenzene	1.1E-1	4.0E+4			2.6E-6		
Xylene (mixed isomers)	2.4E-1	4.0E+4			6.0E-6		
Methyl t-Butyl ether	1.0E-3	4.0E+4			2.5E-8		
TPH - Arom >C08-C10	2.0E+1	4.0E+4			5.1E-4		

NOTE: NAF = Natural attenuation factor POE = Point of exposure

Site Name: Former Chevron Service Station No. 9-0329
Site Location: 340 Highland Ave., Piedmont, CA
Completed By: J. Douglas

Date Completed: 10-May-02
Job ID: DG90329H.3C01

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

SUBSURFACE SOILS (5 - 14 ft):

VAPOR INHALATION (cont'd)

Constituents of Concern	4) Exposure Multiplier (EFxED)/(ATx365) (unitless)			5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4)		
	On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None	On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None
Benzene*	4.1E-1			2.4E-7		
Toluene	9.6E-1			1.3E-6		
Ethylbenzene	9.6E-1			2.5E-6		
Xylene (mixed isomers)	9.6E-1			5.7E-6		
Methyl t-Butyl ether	9.6E-1			2.4E-8		
TPH - Arom >C08-C10	9.6E-1			4.9E-4		

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr)

Site Name: Former Chevron Service Station No. 9-0329
Site Location: 340 Highland Ave., Piedmont, CA
Completed By: J. Douglas

Date Completed: 10-May-02
Job ID: DG90329H.3C01

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS ■ (CHECKED IF PATHWAY IS ACTIVE)

GROUNDWATER: VAPOR INHALATION

Exposure Concentration

Constituents of Concern	1) Source Medium	2) NAF Value (m^3/L) Receptor			3) Exposure Medium Outdoor Air: POE Conc. (mg/m^3) (1) / (2)		
	Groundwater Conc. (mg/L)	On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None	On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None
Benzene*	2.3E-2	4.5E+4			5.1E-7		
Toluene	3.8E-3	4.3E+4			8.8E-8		
Ethylbenzene	9.4E-3	4.3E+4			2.2E-7		
Xylene (mixed isomers)	5.7E-3	4.7E+4			1.2E-7		
Methyl t-Butyl ether	1.9E-1	1.8E+4			1.1E-5		
TPH - Arom >C08-C10	6.6E-1	2.5E+4			2.7E-5		

NOTE: NAF = Natural attenuation factor POE = Point of exposure

Site Name: Former Chevron Service Station No. 9-0329
Site Location: 340 Highland Ave., Piedmont, CA
Completed By: J. Douglas

Date Completed: 10-May-02
Job ID: DG90329H.3C01

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

GROUNDWATER: VAPOR INHALATION (cont'd)

Constituents of Concern	4) Exposure Multiplier (EFxED)/(ATx365) (unitless)			5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4)		
	On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None	On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None
Benzene*	4.1E-1			2.1E-7		
Toluene	9.6E-1			8.5E-8		
Ethylbenzene	9.6E-1			2.1E-7		
Xylene (mixed isomers)	9.6E-1			1.2E-7		
Methyl t-Butyl ether	9.6E-1			1.0E-5		
TPH - Arom >C08-C10	9.6E-1			2.6E-5		

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr)

Site Name: Former Chevron Service Station No. 9-0329
Site Location: 340 Highland Ave., Piedmont, CA
Completed By: J. Douglas

Date Completed: 10-May-02
Job ID: DG90329H.3C01

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

TOTAL PATHWAY EXPOSURE (mg/m^3)

(Sum average exposure concentrations from soil and groundwater routes.)

Constituents of Concern	On-site (0 ft) Residential	On-site (0 ft) Construction Worker	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None
Benzene*	4.5E-7			
Toluene	1.4E-6			
Ethylbenzene	2.7E-6			
Xylene (mixed isomers)	5.8E-6			
Methyl t-Butyl ether	1.0E-5			
TPH - Arom >C08-C10	5.1E-4			

Site Name: Former Chevron Service Station No. 9-0329
Site Location: 340 Highland Ave., Piedmont, CA
Completed By: J. Douglas

Date Completed: 10-May-02
Job ID: DG90329H.3C01

RBCA SITE ASSESSMENT

TIER 2 PATHWAY RISK CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS ■ **(CHECKED IF PATHWAYS ARE ACTIVE)**

CARCINOGENIC RISK

Constituents of Concern	(1) EPA Carcinogenic Classification	(2) Total Carcinogenic Exposure (mg/m^3)				(3) Inhalation Unit Risk Factor (µg/m^3)^-1	(4) Individual COC Risk (2) x (3) x 1000			
		On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)		On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)
		Residential	Construction Worker	None	None		Residential	Construction Worker	None	None
Benzene*	A	4.5E-7				8.3E-6	3.7E-9			
Toluene	D									
Ethylbenzene	D									
Xylene (mixed isomers)	D									
Methyl t-Butyl ether	-									
TPH - Arom >C08-C10	D									
Total Pathway Carcinogenic Risk =							**3.7E-9**			

Site Name: Former Chevron Service Station No. 9-0329
Site Location: 340 Highland Ave., Piedmont, CA

Completed By: J. Douglas
Date Completed: 10-May-02

Job ID: DG90329H.3C01

RBCA SITE ASSESSMENT

TIER 2 PATHWAY RISK CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS ■ **(CHECKED IF PATHWAYS ARE ACTIVE)**

TOXIC EFFECTS

Constituents of Concern	(5) Total Toxicant Exposure (mg/m^3) On-site (0 ft) Residential	On-site (0 ft) Construction Worker	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None	(6) Inhalation Reference Conc. (mg/m^3)	(7) Individual COC Hazard Quotient (5) / (6) On-site (0 ft) Residential	On-site (0 ft) Construction Worker	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None
Benzene*	1.1E-6				6.0E-3	1.8E-4			
Toluene	1.4E-6				4.0E-1	3.4E-6			
Ethylbenzene	2.7E-6				1.0E+0	2.7E-6			
Xylene (mixed isomers)	5.8E-6				7.0E+0	8.4E-7			
Methyl t-Butyl ether	1.0E-5				3.0E+0	3.4E-6			
TPH - Arom >C08-C10	5.1E-4				2.0E-1	2.6E-3			
Total Pathway Hazard Index =						**2.8E-3**			

Site Name: Former Chevron Service Station No. 9-0329
Site Location: 340 Highland Ave., Piedmont, CA

Completed By: J. Douglas
Date Completed: 10-May-02

Job ID: DG90329H.3C01

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

INDOOR AIR EXPOSURE PATHWAYS ■ (CHECKED IF PATHWAY IS ACTIVE)

SOILS (5 - 14 ft): VAPOR INTRUSION INTO ON-SITE BUILDINGS

Constituents of Concern	1) Source Medium Soil Conc. (mg/kg)	2) NAF Value (m^3/kg) Receptor Residential	3) Exposure Medium Indoor Air: POE Conc. (mg/m^3) (1) / (2) Residential	4) Exposure Multiplier (EFxED)/(ATx365) (unitless) Residential	5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4) Residential
Benzene*	2.4E-2	5.7E+2	4.2E-5	4.1E-1	1.7E-5
Toluene	5.3E-2	5.7E+2	9.4E-5	9.6E-1	9.0E-5
Ethylbenzene	1.1E-1	9.0E+2	1.2E-4	9.6E-1	1.1E-4
Xylene (mixed isomers)	2.4E-1	7.0E+2	3.4E-4	9.6E-1	3.3E-4
Methyl t-Butyl ether	1.0E-3	6.0E+2	1.7E-6	9.6E-1	1.6E-6
TPH - Arom >C08-C10	2.0E+1	1.9E+3	1.0E-2	9.6E-1	1.0E-2

* = Chemical with user-specified data

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr) NAF = Natural attenuation factor POE = Point of exposure

Site Name: Former Chevron Service Station No. 9-0329
Site Location: 340 Highland Ave., Piedmont, CA
Completed By: J. Douglas

Date Completed: 10-May-02
Job ID: DG90329H.3C01

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

INDOOR AIR EXPOSURE PATHWAYS ■ **(CHECKED IF PATHWAY IS ACTIVE)**

GROUNDWATER: VAPOR INTRUSION INTO ON-SITE BUILDINGS

Constituents of Concern	Exposure Concentration 1) Source Medium Groundwater Conc. (mg/L)	2) NAF Value (m^3/L) Receptor Residential	3) Exposure Medium Indoor Air: POE Conc. (mg/m^3) (1) / (2) Residential	4) Exposure Multiplier (EFxED)/(ATx365) (unitless) Residential	5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4) Residential
Benzene*	2.3E-2	7.8E+2	2.9E-5	4.1E-1	1.2E-5
Toluene	3.8E-3	7.4E+2	5.2E-6	9.6E-1	5.0E-6
Ethylbenzene	9.4E-3	7.2E+2	1.3E-5	9.6E-1	1.3E-5
Xylene (mixed isomers)	5.7E-3	7.9E+2	7.2E-6	9.6E-1	6.9E-6
Methyl t-Butyl ether	1.9E-1	3.0E+3	6.3E-5	9.6E-1	6.0E-5
TPH - Arom >C08-C10	6.6E-1	4.0E+2	1.7E-3	9.6E-1	1.6E-3

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr) NAF = Natural attenuation factor POE = Point of exposure

Site Name: Former Chevron Service Station No. 9-0329
Site Location: 340 Highland Ave., Piedmont, CA
Completed By: J. Douglas

Date Completed: 10-May-02
Job ID: DG90329H.3C01

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

INDOOR AIR EXPOSURE PATHWAYS

Constituents of Concern	TOTAL PATHWAY EXPOSURE (mg/m^3) *(Sum average exposure concentrations from soil and groundwater routes.)* Residential
Benzene*	2.9E-5
Toluene	9.5E-5
Ethylbenzene	1.3E-4
Xylene (mixed isomers)	3.3E-4
Methyl t-Butyl ether	6.2E-5
TPH - Arom >C08-C10	1.2E-2

Site Name: Former Chevron Service Station No. 9 Date Completed: 10-May-02
Site Location: 340 Highland Ave., Piedmont, CA Job ID: DG90329H.3C01
Completed By: J. Douglas

RBCA SITE ASSESSMENT

TIER 2 PATHWAY RISK CALCULATION

INDOOR AIR EXPOSURE PATHWAYS ■ **(CHECKED IF PATHWAYS ARE ACTIVE)**

CARCINOGENIC RISK

Constituents of Concern	(1) EPA Carcinogenic Classification	(2) Total Carcinogenic Exposure (mg/m^3) Residential	(3) Inhalation Unit Risk Factor (µg/m^3)^-1	(4) Individual COC Risk (2) x (3) x 1000 Residential
Benzene*	A	2.9E-5	8.3E-6	2.4E-7
Toluene	D			
Ethylbenzene	D			
Xylene (mixed isomers)	D			
Methyl t-Butyl ether	-			
TPH - Arom >C08-C10	D			

Total Pathway Carcinogenic Risk = **2.4E-7**

Site Name: Former Chevron Service Station No. 9-0329
Site Location: 340 Highland Ave., Piedmont, CA
Completed By: J. Douglas

Date Completed: 10-May-02
Job ID: DG90329H.3C01

RBCA SITE ASSESSMENT

TIER 2 PATHWAY RISK CALCULATION

INDOOR AIR EXPOSURE PATHWAYS ■ **(CHECKED IF PATHWAYS ARE ACTIVE)**

	TOXIC EFFECTS		
	(5) Total Toxicant Exposure (mg/m^3)	(6) Inhalation Reference Concentration (mg/m^3)	(7) Individual COC Hazard Quotient (5) / (6)
Constituents of Concern	Residential		Residential
Benzene*	6.8E-5	6.0E-3	1.1E-2
Toluene	9.5E-5	4.0E-1	2.4E-4
Ethylbenzene	1.3E-4	1.0E+0	1.3E-4
Xylene (mixed isomers)	3.3E-4	7.0E+0	4.7E-5
Methyl t-Butyl ether	6.2E-5	3.0E+0	2.1E-5
TPH - Arom >C08-C10	1.2E-2	2.0E-1	5.8E-2

Total Pathway Hazard Index = **7.0E-2**

Site Name: Former Chevron Service Station No. 9-0329
Site Location: 340 Highland Ave., Piedmont, CA
Completed By: J. Douglas

Date Completed: 10-May-02
Job ID: DG90329H.3C01

RBCA SITE ASSESSMENT

Site Name: Former Chevron Service Station N Site Location: 340 Highland Ave., Piedmor Completed By: J. Douglas Date Completed: 10-May-02 *1 OF 1*

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

SOIL EXPOSURE PATHWAY ■ **(CHECKED IF PATHWAY IS ACTIVE)**

SURFACE SOILS OR SEDIMENTS:
ON-SITE INGESTION AND DERMAL CONTACT

Constituents of Concern	1) Source/Exposure Medium	2) Exposure Multiplier (IR+SAxMxRAF)xEFxED/(BWxAT) (kg/kg/day)		3) Average Daily Intake Rate (mg/kg/day) (1) x (2)	
	Surface Soil Conc. (mg/kg)	Residential	Construction Worker	Residential	Construction Worker
Benzene*	2.4E-2	1.8E-5	4.2E-7	4.2E-7	9.8E-9
Toluene	5.3E-2	4.1E-5	2.9E-5	2.2E-6	1.5E-6
Ethylbenzene	1.1E-1	4.1E-5	2.9E-5	4.3E-6	3.1E-6
Xylene (mixed isomers)	2.4E-1	4.1E-5	2.9E-5	9.8E-6	6.9E-6
Methyl t-Butyl ether	1.0E-3	4.1E-5	2.9E-5	4.1E-8	2.9E-8
TPH - Arom >C08-C10	2.0E+1	4.1E-5	2.9E-5	8.3E-4	5.9E-4

NOTE: RAF = Relative absorption factor (-) AT = Averaging time (days) ED = Exposure duration (yrs) IR = Soil ingestion rate (mg/day)
M = Adherence factor (mg/cm^2) BW = Body weight (kg) EF = Exposure frequencey (days/yr) SA = Skin exposure area (cm^2/day)

Site Name: Former Chevron Service Station No. 9-0329
Site Location: 340 Highland Ave., Piedmont, CA
Completed By: J. Douglas
Date Completed: 10-May-02
Job ID: DG90329H.3C01

RBCA SITE ASSESSMENT

TIER 2 PATHWAY RISK CALCULATION

SOIL EXPOSURE PATHWAY ■ (CHECKED IF PATHWAY IS ACTIVE)

CARCINOGENIC RISK

Constituents of Concern	(1) EPA Carcinogenic Classification	(2) Total Carcinogenic Intake Rate (mg/kg/day) Residential (a) via Ingestion	Residential (b) via Dermal Contact	Construction Worker (c) via Ingestion	Construction Worker (d) via Dermal Contact	(3) Slope Factor (mg/kg/day)^-1 (a) Oral	(3) Slope Factor (mg/kg/day)^-1 (b) Dermal	(4) Individual COC Risk (2a)x(3a) + (2b)x(3b) Residential	(4) Individual COC Risk (2c)x(3a) + (2d)x(3b) Construction Worker
Benzene*	A	1.4E-8	4.0E-7	2.4E-10	9.6E-9	1.0E-1	3.0E-2	1.3E-8	3.1E-10
Toluene	D								
Ethylbenzene	D								
Xylene (mixed isomers)	D								
Methyl t-Butyl ether	-								
TPH - Arom >C08-C10	D								

* No dermal slope factor available--oral slope factor used.

Total Pathway Carcinogenic Risk = **1.3E-8** **3.1E-10**

Site Name: Former Chevron Service Station No. 9-0329
Site Location: 340 Highland Ave., Piedmont, CA
Completed By: J. Douglas

Date Completed: 10-May-02
Job ID: DG90329H.3C01

RBCA SITE ASSESSMENT

TIER 2 PATHWAY RISK CALCULATION

SOIL EXPOSURE PATHWAY ■ **(CHECKED IF PATHWAY IS ACTIVE)**

TOXIC EFFECTS

Constituents of Concern	(5) Total Toxicant Intake Rate (mg/kg/day)				(6) Oral Reference Dose (mg/kg-day)		(7) Individual COC Hazard Quotient	
	(a) via Ingestion	(b) via Dermal Contact	(c) via Ingestion	(d) via Dermal Contact	(a) Oral	(b) Dermal	(5a)/(6a) + (5b)/(6b)	(5c)/(6a) + (5d)/(6b)
	Residential		Construction Worker				Residential	Construction Worker
Benzene*	3.2E-8	9.4E-7	1.7E-8	6.7E-7	3.0E-3	3.0E-3*	3.2E-4	2.3E-4
Toluene	7.3E-8	2.1E-6	3.8E-8	1.5E-6	2.0E-1	1.6E-1	1.4E-5	9.6E-6
Ethylbenzene	1.4E-7	4.2E-6	7.4E-8	3.0E-6	1.0E-1	9.7E-2	4.5E-5	3.2E-5
Xylene (mixed isomers)	3.3E-7	9.5E-6	1.7E-7	6.8E-6	2.0E+0	1.8E+0	5.3E-6	3.8E-6
Methyl t-Butyl ether	1.4E-9	4.0E-8	7.0E-10	2.8E-8	1.0E-2	8.0E-3	5.1E-6	3.6E-6
TPH - Arom >C08-C10	2.8E-5	8.1E-4	1.4E-5	5.8E-4	4.0E-2	4.0E-2*	2.1E-2	1.5E-2

* No dermal reference dose available--oral reference dose used.

Total Pathway Hazard Index = **2.1E-2** **1.5E-2**

Site Name: Former Chevron Service Station No. 9-0329
Site Location: 340 Highland Ave., Piedmont, CA
Completed By: J. Douglas

Date Completed: 10-May-02
Job ID: DG90329H.3C01

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

GROUNDWATER EXPOSURE PATHWAYS ■ (CHECKED IF PATHWAY IS ACTIVE)

SOILS (5 - 14 ft): LEACHING TO GROUNDWATER INGESTION

Constituents of Concern	1) Source Medium	2) NAF Value (L/kg) Receptor			3) Exposure Medium Groundwater: POE Conc. (mg/L) (1)/(2)		
	Soil Conc. (mg/kg)	On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None	On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None
Benzene*	2.4E-2	6.0E+1			3.9E-4		
Toluene	5.3E-2	1.3E+2			4.2E-4		
Ethylbenzene	1.1E-1	3.2E+2			3.3E-4		
Xylene (mixed isomers)	2.4E-1	2.2E+2			1.1E-3		
Methyl t-Butyl ether	1.0E-3	1.7E+1			5.9E-5		
TPH - Arom >C08-C10	2.0E+1	1.4E+3			1.5E-2		

* = Chemical with user-specified data

NOTE: NAF = Natural attenuation factor POE = Point of exposure

Site Name: Former Chevron Service Station No. 9-0329
Site Location: 340 Highland Ave., Piedmont, CA
Completed By: J. Douglas

Date Completed: 10-May-02
Job ID: DG90329H.3C01

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

GROUNDWATER EXPOSURE PATHWAYS

SOILS (5 - 14 ft): LEACHING TO GROUNDWATER INGESTION (cont'd)

Constituents of Concern	4) Exposure Multiplier (IRxEFxED)/(BWxAT) (L/kg-day)			5) Average Daily Intake Rate (mg/kg/day) (3) x (4)		
	On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None	On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None
Benzene*	1.2E-2			4.6E-6		
Toluene	2.7E-2			1.2E-5		
Ethylbenzene	2.7E-2			8.9E-6		
Xylene (mixed isomers)	2.7E-2			3.0E-5		
Methyl t-Butyl ether	2.7E-2			1.6E-6		
TPH - Arom >C08-C10	2.7E-2			4.0E-4		

* = Chemical with user-specified data

NOTE: AT = Averaging time (days) ED = Exposure duration (yr) IR = Ingestion rate (mg/day)
BW = Body weight (kg) EF = Exposure frequency (days/yr)

Site Name: Former Chevron Service Station No. 9-0329 Completed By: J. Douglas Job ID: DG90329H.3(
Site Location: 340 Highland Ave., Piedmont, CA Date Completed: 10-May-02

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

GROUNDWATER EXPOSURE PATHWAYS ■ **(CHECKED IF PATHWAY IS ACTIVE)**

GROUNDWATER: INGESTION

	1) Source Medium	2) NAF Value (unitless) Receptor			3) Exposure Medium Groundwater: POE Conc. (mg/L) (1)/(2)		
Constituents of Concern	Groundwater Conc. (mg/L)	On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None	On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None
Benzene*	2.3E-2	1.0E+0			2.3E-2		
Toluene	3.8E-3	1.0E+0			3.8E-3		
Ethylbenzene	9.4E-3	1.0E+0			9.4E-3		
Xylene (mixed isomers)	5.7E-3	1.0E+0			5.7E-3		
Methyl t-Butyl ether	1.9E-1	1.0E+0			1.9E-1		
TPH - Arom >C08-C10	6.6E-1	1.0E+0			6.6E-1		

NOTE: NAF = Natural attenuation factor POE = Point of exposure

Site Name: Former Chevron Service Station No. 9-0329
:C(Site Location: 340 Highland Ave., Piedmont, CA
Completed By: J. Douglas

Date Completed: 10-May-02
Job ID: DG90329H.3C01

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

GROUNDWATER EXPOSURE PATHWAYS

GROUNDWATER INGESTION (cont'd)

Constituents of Concern	4) Exposure Multiplier (IRxEFxED)/(BWxAT) (L/kg/day)			5) Average Daily Intake Rate (mg/kg/day) (3) x (4)		
	On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None	On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None
Benzene*	1.2E-2			2.7E-4		
Toluene	2.7E-2			1.0E-4		
Ethylbenzene	2.7E-2			2.6E-4		
Xylene (mixed isomers)	2.7E-2			1.6E-4		
Methyl t-Butyl ether	2.7E-2			5.3E-3		
TPH - Arom >C08-C10	2.7E-2			1.8E-2		

* = Chemical with user-specified data

NOTE: AT = Averaging time (days) ED = Exposure duration (yr) IR = Ingestion rate (mg/day)
BW = Body weight (kg) EF = Exposure frequency (days/yr)

Site Name: Former Chevron Service Station No. 9-0329
Site Location: 340 Highland Ave., Piedmont, CA

Completed By: J. Douglas
Date Completed: 10-May-02

Job ID: DG90329H.3

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

GROUNDWATER EXPOSURE PATHWAYS

MAXIMUM PATHWAY INTAKE (mg/kg/day)

(Maximum intake of active pathways soil leaching & groundwater routes.)

Constituents of Concern	On-site (0 ft) Residential	Off-site 1 None	Off-site 2 None
Benzene*	2.7E-4		
Toluene	1.0E-4		
Ethylbenzene	2.6E-4		
Xylene (mixed isomers)	1.6E-4		
Methyl t-Butyl ether	5.3E-3		
TPH - Arom >C08-C10	1.8E-2		

* = Chemical with user-specified data

Site Name: Former Chevron Service Station No. 9-0329
3C Site Location: 340 Highland Ave., Piedmont, CA
Completed By: J. Douglas

Date Completed: 10-May-02
Job ID: DG90329H.3C01

RBCA SITE ASSESSMENT

TIER 2 PATHWAY RISK CALCULATION

GROUNDWATER EXPOSURE PATHWAYS ■ **(CHECKED IF PATHWAYS ARE ACTIVE)**

CARCINOGENIC RISK

Constituents of Concern	(1) EPA Carcinogenic Classification	(2) Maximum Carcinogenic Intake Rate (mg/kg/day)			(3) Oral Slope Factor (mg/kg-day)^-1	(4) Individual COC Risk (2) x (3)		
		On-site (0 ft) Residential	Off-site 1 None	Off-site 2 None		On-site (0 ft) Residential	Off-site 1 None	Off-site 2 None
Benzene*	A	2.7E-4			1.0E-1	2.7E-5		
Toluene	D							
Ethylbenzene	D							
Xylene (mixed isomers)	D							
Methyl t-Butyl ether	-							
TPH - Arom >C08-C10	D							
Total Pathway Carcinogenic Risk =						**2.7E-5**		

Site Name: Former Chevron Service Station No. 9-0329
Site Location: 340 Highland Ave., Piedmont, CA
Completed By: J. Douglas

Date Completed: 10-May-02
Job ID: DG90329H.3C01

RBCA SITE ASSESSMENT

TIER 2 PATHWAY RISK CALCULATION

GROUNDWATER EXPOSURE PATHWAYS ■ (CHECKED IF PATHWAYS ARE ACTIVE)

	TOXIC EFFECTS						
	(5) Maximum Toxicant Intake Rate (mg/kg/day)			(6) Oral Reference Dose (mg/kg/day)	(7) Individual COC Hazard Quotient (5) / (6)		
Constituents of Concern	On-site (0 ft) Residential	Off-site 1 None	Off-site 2 None		On-site (0 ft) Residential	Off-site 1 None	Off-site 2 None
Benzene*	6.3E-4			3.0E-3	2.1E-1		
Toluene	1.0E-4			2.0E-1	5.2E-4		
Ethylbenzene	2.6E-4			1.0E-1	2.6E-3		
Xylene (mixed isomers)	1.6E-4			2.0E+0	7.8E-5		
Methyl t-Butyl ether	5.3E-3			1.0E-2	5.3E-1		
TPH - Arom >C08-C10	1.8E-2			4.0E-2	4.5E-1		
Total Pathway Hazard Index =					**1.2E+0**		

Site Name: Former Chevron Service Station No. 9-0329
Site Location: 340 Highland Ave., Piedmont, CA
Completed By: J. Douglas

Date Completed: 10-May-02
Job ID: DG90329H.3C01