

July 8, 2002

Ms. Eva Chu  
Alameda County Health Care Services Agency  
1131 Harbor Bay Parkway, Suite 250  
Alameda, CA 94502

**Subject:** *Revised Risk-Based Corrective Action Evaluation*  
Former Chevron Service Station No. 21-0208  
6006 International Boulevard, Oakland, California  
Report No. DG20208H.3C01

Dear Ms. Chu:

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 revised version of the RBCA was prepared in response and in accordance with Ms. Eva Chu's (Alameda County Health Care Services Agency (ACHCSA)) electronic mail to Gettler-Ryan, dated July 3, 2002. This Tier 2 RBCA was conducted with site-specific data from the former Chevron service station located at 6006 International Boulevard in Oakland, California. This RBCA was prepared to evaluate a residential use scenario. The site is currently developed and utilized for residential housing. The purpose of this work was to evaluate whether the residual hydrocarbons in the site soil 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). Two separate scenarios for the presence of groundwater were evaluated, where groundwater occurs at 6.5 feet and 10 feet below ground surface (bgs).

**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, therefore the groundwater ingestion pathway is considered incomplete. However, an industrial well is located approximately 1,700 feet southwest of the site and GR evaluated the groundwater exposure pathway related to the presence of a sensitive receptor. The following complete risk pathways were evaluated: subsurface soil and groundwater volatilization to indoor and outdoor air inhalation; and, ingestion and dermal contact from groundwater.

Where available, site specific physical data were used in this RBCA evaluation. Site specific parameters included maximum concentrations of TPHg, TPHd, BTEX and MtBE in both soil and groundwater, depth of affected soil (6.5 and 10 ft), pH (7.67), hydraulic conductivity (0.0019 cm/d), average groundwater gradient (0.0016 ft/ft), and thickness of affected subsurface soils (6.5 and 10 ft). Also utilized were the physical parameters of the building in the southeastern portion of the site (source area), including foundation area (2822 ft<sup>2</sup>), foundation perimeter (270 ft), building volume/area ratio (28 ft), and building air exchange rate (0.000654 1/s) (H&M Mechanical Group). The first depth to groundwater value utilized (6.5 ft) was calculated as an average of the depth to water measurements collected by Delta from the temporary wells on February 27 and March 27, 2002. The second depth to groundwater value utilized (10 ft) was selected by the ACHCSA. Where appropriate and consistent with site conditions, default values were used.

Previously, GR had performed the RBCA evaluation utilizing physical soil parameters analyzed from Geoprobe soil samples collected in the saturated zone (sand). The use of sampling methods for collecting undisturbed soil samples is explained in ASTM Standards D6169.98 "Standard Guide for Selection of Soil and Rock Sampling Devices used With Drill Rigs for Environmental Investigations", and D1587-00 "Standard Practice for Thin-Walled Tube Sampling of Soils for Geotechnical Purposes". Both ASTM standards indicate that the use of thick-walled, ring-lined,

split barrel, drive samplers result in disturbed samples not suitable for density, porosity, and other physical parameter analyses.

Since the physical parameters utilized in previous RBCA evaluations at the site appeared to be spurious, and that the primary exposure pathway of concern at the site is indoor air inhalation, the ASTM default vadose zone soil type (sandy clay) was selected for this revised RBCA. This soil type is based upon sieve analyses performed on the shallow soil samples collected on July 17, 2001. The sieve analyses performed are not affected by the sample collection method.

The Chemicals of Concern (COC) were evaluated at the maximum reported concentrations from soil sample B-4 @ 9.5 ft bgs, and the grab groundwater and temporary monitoring well samples from the site. Also utilized was the California adjusted oral slope factor for benzene (0.1) for this RBCA analysis. TPHg was evaluated by inputting the reported TPHg values from soil and groundwater into the aromatic fraction C08-C10. TPHd (weathered) was evaluated by dividing the total amount of TPHd into the following fractions for input: 20% C12-16 aliphatic; 55% C16-21 aliphatic; 15% C16-21 aromatic; and 10% C21-35 aromatic (Total Petroleum Hydrocarbon Criteria Working Group Series, Volume 5, June 1999).

## **Results of RBCA Analysis**

### Shallow Groundwater Scenario (6.5 ft bgs)

Based on information from previous site investigations and 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: 1) outdoor and indoor air exposures with cumulative risk factors of  $6.0E-9$  and  $6.8E-7$ ; and 2) groundwater ingestion with a cumulative risk factor of  $3.5E-105$  (Appendix A, Tier 2 Baseline Risk Summary Table). Using the residential risk factor of  $1.0E-6$  and site conditions, the SSTLs for BTEX, MtBE, TPHg and TPHd were determined to be below established Tier 2 SSTLs (Appendix A, SSTL Values) for all pathways evaluated. Pertinent input and output data including site specific parameters used in the analysis are presented in Appendix A.

### Deeper Groundwater Scenario (10 ft bgs)

Based on information from previous site investigations and 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: 1) outdoor and indoor air exposures with cumulative risk factors of  $2.9E-9$  and  $6.7E-7$ ; and 2) groundwater ingestion with a cumulative risk factor of  $3.5E-105$  (Appendix A, Tier 2 Baseline Risk Summary Table). Using the residential

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July 8, 2002  
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risk factor of 1.0E-6 and site conditions, the SSTLs for BTEX, MtBE, TPHg and TPHd were determined to be below established Tier 2 SSTLs (Appendix A, SSTL Values) for all pathways evaluated. Pertinent input and output data including site specific parameters used in the analysis are presented in Appendix B.

### **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). Since a service station is no longer present at the site, it is anticipated that dissolved concentrations of petroleum hydrocarbons will continue to attenuate over time, thereby also lowering the associated risk over time.

According to the RBCA decision making process, no further work is warranted to protect against human exposure via the exposure pathways evaluated. Since the groundwater beneath the site is neither currently utilized nor expected to be utilized in the future for drinking water purposes, and the fact that the site is currently developed for residential use, GR is of the opinion that no further work is warranted at the site. Based on the RBCA program and findings presented in this report, and that the groundwater beneath and in the vicinity of the site is not used for drinking water purposes, it is GR's opinion that 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) 631-1314.

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

DRAFT

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Jed A. Douglas  
Senior Geologist

DRAFT

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David W. Herzog  
Senior Geologist

DG20208H.3C01

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#### Attachments

- Figure 1: Site Location Map
- Figure 2: Site Plan
- Appendix A: Tier 2 RBCA Input/Output Data Shallow Groundwater Scenario
- Appendix B: Tier 2 RBCA Input/Output Data Deeper Groundwater Scenario

# GETTLER-RYAN INC.

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Phone (707) 789-3255, Fax (707) 789-3218

# FAX

JUL 09 2002

Date: July 8, 2002

Number of pages including cover sheet: 21

To: Eva Chu  
Alameda County  
Environmental Health

Phone: \_\_\_\_\_  
Fax phone: 510-337-9335  
CC: \_\_\_\_\_

From: Jed Douglas  
Phone: (707) 789-3255  
Fax phone: (707) 789-3218

Subject: Former Chevron 21-0208  
Oakland

REMARKS:  Urgent  For your review  Reply ASAP  Please comment

Eva, here are the sheets from the two revised RBCAs you requested. They both use maximum concentrations from B-4, default crack factor of 0.01 and the sandy clay soil type observed in the vadose zone and analyzed by sieve. Please let me know if you need anything else. Thanks, Jed

# Main Screen

RBCA Tool Kit for Chemical Releases  
Version 1.3a © 2000

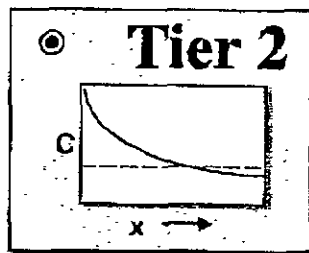
## 1. Project Information

Site Name:	Former Chevron Service Station No. 21-0208		
Location:	6006 International Blvd., Oakland, CA		
Compl. By:	J. Douglas		
Date:	8-Jul-02	Job ID:	DG20208H.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 ?

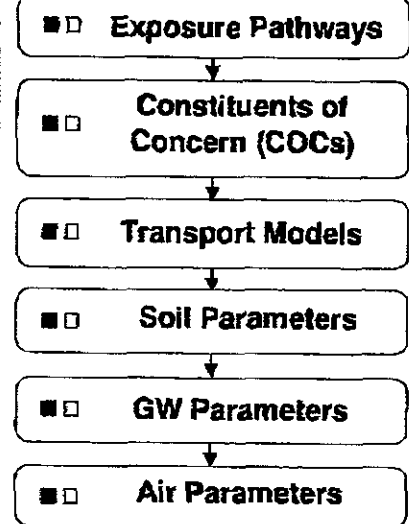
*Affects which input data are required*

- Baseline Risks (Forward mode)**
- RBCA Cleanup Standards (Backward mode)**

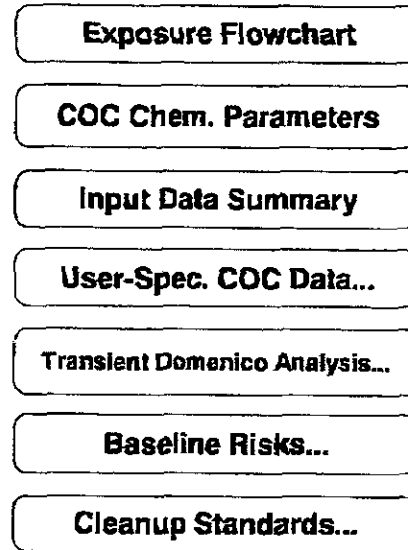
## 4. RBCA Evaluation Process

### Prepare Input Data

Data Complete? (  = yes,  = no)



### Review Output



## 5. Commands and Options

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

*Shallow  
water  
6-5 ft*

Site Name: Former Chevron Service Station No. 21-C Job ID: DG20208H3001  
 Location: 6006 International Blvd, Oakland, CA Date: 8-Jul-02  
 Comp. 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:** ?

- Benzene\*
- Toluene
- Ethylbenzene
- Xylene (mixed isomers)
- Methyl t-Butyl ether
- TPH - Arom >C08-C10
- TPH - Aliph >C12-C16
- TPH - Aliph >C16-C21
- TPH - Arom >C16-C21
- TPH - Arom >C21-C35

\* = Chemical with user-specified data

**Representative COC Concentration** ?

**Groundwater Source Zone**

(mg/L)	note
1.0E-1	
1.3E-2	
1.8E-1	
5.7E-2	
1.4E-1	
1.3E-1	
1.7E-0	
4.6E-0	
1.3E+0	
8.4E-1	

**Soil Source Zone**

(mg/kg)	note
1.9E-1	
5.0E-2	
1.3E+0	
4.5E-1	
4.3E-1	
3.4E+2	
2.2E+1	
6.1E+1	
1.7E+1	
1.1E+1	




# Site-Specific Soil Parameters

## 1. Soil Source Zone Characteristics

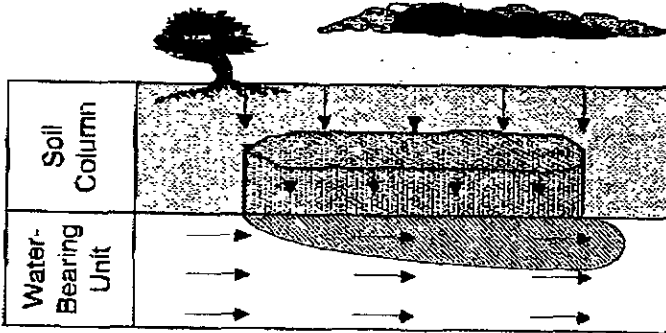
### Hydrogeology

General Case Construction

Depth to water-bearing unit	6.5	(ft)
Capillary zone thickness	0.787401576	(ft)
Soil column thickness	5.712598425	(ft)

### Affected Soil Zone

Depth to top of affected soils	0	(ft)	
Depth to base of affected soils	10	(ft)	
Affected soil area	100	100	(ft <sup>2</sup> )
Length of affected soil parallel to assumed wind direction	10	10	(ft)



Site Name: Former Chevron Service Station No. 51 0588D D/520205H-3001  
 Location: 6006 International Blvd. Oakland, CA Date: 6-3-02  
 Comp. By: J. Douglas

## 2. Surface Soil Column

Vadose Zone Capillary Fringe

### Predominant USCS Soil Type

CL: Sandy Clay

or

Enter Directly

Total porosity	0.36	(-)	
Volumetric water content	0.31	0.342	(-)
Volumetric air content	0.07	0.038	(-)
Dry bulk density	1.7	(kg/L)	
Vertical hydraulic conductivity	8.6E-2	(cm/d)	
Vapor permeability	1.1E-15	(ft <sup>2</sup> )	
Capillary zone thickness	7.9E-1	(ft)	

NA

or

### Partitioning Parameters

Fraction organic carbon	0.01	(-)
Soil/water pH	7.67	(-)

## 3. Commands and Options

Main Screen

Use Default Values

Print Sheet

Set Units

Help

## Site-Specific Groundwater Parameters

### 1. Water-Bearing Unit ?

#### Hydrogeology

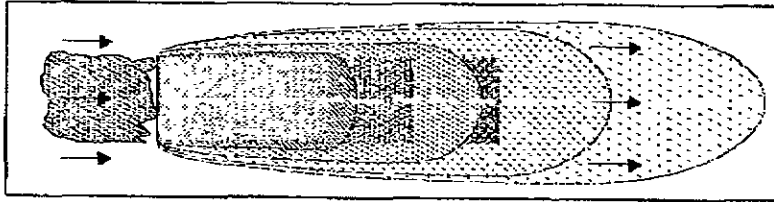
Groundwater Darcy velocity	3.0E-6	(cm/d)
Groundwater seepage velocity	8.0E-6	(cm/d)
<i>or</i>	↑ <i>or</i>	
Hydraulic conductivity	1.9E-3	(cm/d)
Hydraulic gradient	1.6E-3	(-)
Effective porosity	0.38	(-)

#### Sorption

Fraction organic carbon-saturated zone	0.001	(-)
Groundwater pH	6.20	(-)

### 2. Groundwater Source Zone ?

Groundwater plume width at source	147.6377953	(ft)
Plume (mixing zone) thickness at source	6.56167979	(ft)
<i>or</i>	Calculate	<i>or</i>



Site Name: Former Chevron Service Station No. 200005 DG20308-3000  
 Location: 6006 International Blvd. Oakland CA Date: 6 JUL-02  
 Compl By: J Douglas

### 3. Groundwater Dispersion ?

Model: ASTM Default	GW Ingestion	Soil Leaching to GW
Distance to GW receptors	Off-site 1	
<i>or</i> Enter Directly	700	
Longitudinal dispersivity	170	
Transverse dispersivity	56	
Vertical dispersivity	8.5	

### 5. Commands and Options

Main Screen

Use Default Values

Print Sheet

Set Units

Help

# Site-Specific Air Parameters

## 1. Outdoor Air Pathway

(?)

or

### Air Source Zone

Air mixing zone height

6.56167979 (ft)

Ambient air velocity in mixing zone

7.381889764 (ft/s)

## 2. Indoor Air Pathway

(?)

### Building Parameters

Building volume/area ratio

Residential  
28 (ft)

Foundation area

2822 (ft<sup>2</sup>)

Foundation perimeter

270 (ft)

Building air exchange rate

6.5E-4 (1/s)

Depth to bottom of foundation slab

0.49213 (ft)

Convective air flow through cracks

0.0E+0 (ft<sup>3</sup>/s)

Foundation thickness

0.492125984 (ft)

Foundation crack fraction

0.01 (-)

Volumetric water content of cracks

0.12 (-)

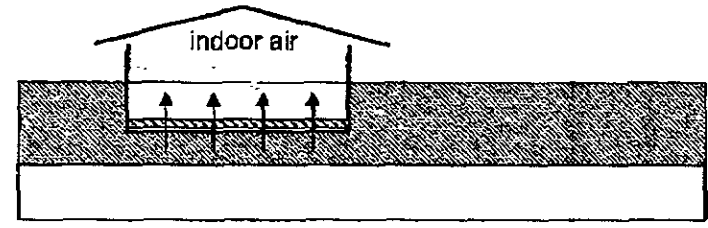
Volumetric air content of cracks

0.26 (-)

Indoor/Outdoor differential pressure

0 (g/cm/s<sup>2</sup>)

Site Name: Former Chevron Service Station  
 Location: 6036 International Blvd, Oakland, CA  
 Date: 5-Jul-02  
 Comp By: J. Douglas



## 3. Commands and Options

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

Site Name: Former Chevron Service Station No. 21-0208  
 Site Location: 6006 International Blvd., Oakland, CA

Completed By: J. Douglas  
 Date Completed: 8-Jul-02

<b>TIER 2 BASELINE RISK SUMMARY TABLE</b>										
EXPOSURE PATHWAY	BASELINE CARCINOGENIC RISK					BASELINE TOXIC EFFECTS				
	Individual CDC Risk		Cumulative CDC Risk		Risk Limit(s) Exceeded?	Hazard Quotient		Hazard Index		Toxicity Limit(s) Exceeded?
	Maximum Value	Target Risk	Total Value	Target Risk		Maximum Value	Applicable Limit	Total Value	Applicable Limit	
<b>OUTDOOR AIR EXPOSURE PATHWAYS</b>										
Complete:	6.0E-9	1.0E-6	6.0E-9	1.0E-5	<input type="checkbox"/>	2.3E-2	1.0E+0	3.1E-2	1.0E+0	<input type="checkbox"/>
<b>INDOOR AIR EXPOSURE PATHWAYS</b>										
Complete:	6.8E-7	1.0E-6	6.8E-7	1.0E-5	<input type="checkbox"/>	4.0E-1	1.0E+0	7.0E-1	1.0E+0	<input type="checkbox"/>
<b>SOIL EXPOSURE PATHWAYS</b>										
Complete:	NA	NA	NA	NA	<input type="checkbox"/>	NA	NA	NA	NA	<input type="checkbox"/>
<b>GROUNDWATER EXPOSURE PATHWAYS</b>										
Complete:	3.5E-105	1.0E-6	3.5E-105	1.0E-5	<input type="checkbox"/>	3.2E-100	1.0E+0	4.5E-100	1.0E+0	<input type="checkbox"/>
<b>SURFACE WATER EXPOSURE PATHWAYS</b>										
Complete:	NA	NA	NA	NA	<input type="checkbox"/>	NA	NA	NA	NA	<input type="checkbox"/>
<b>CRITICAL EXPOSURE PATHWAY (Maximum Values From Complete Pathways)</b>										
	6.8E-7	1.0E-6	6.8E-7	1.0E-5	<input type="checkbox"/>	4.0E-1	1.0E+0	7.0E-1	1.0E+0	<input type="checkbox"/>
	<i>Indoor Air</i>		<i>Indoor Air</i>			<i>Indoor Air</i>		<i>Indoor Air</i>		

### RBCA SITE ASSESSMENT

### Input Parameter Summary

Site Name: Former Chevron Service Station No 21-0000  
 Site Location: 6006 International Blvd., Oakland, CA

Completed By: J. Douglas  
 Date Completed: 8-Jul-02

Job ID: DG20206H.9CG1

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Exposure Parameters	Residential			Commercial/Industrial	
	Adult (days)	(1-18 yrs)	(1-18 yrs)	Chronic	Acute
AT <sub>c</sub> Averaging time for carcinogens (yr)	30			25	1
AT <sub>n</sub> Averaging time for non-carcinogens (yr)	30			25	1
BW Body weight (kg)	70	15	35	70	1
ED Exposure duration (yr)	30	6	16	26	1
v Averaging time for vapor flux (yr)	30			25	1
EF Exposure frequency (days/yr)	350			250	180
EF <sub>soil</sub> Exposure frequency for dermal exposure	350			250	
IR <sub>w</sub> Ingestion rate of water (L/day)	2			1	
IR <sub>s</sub> Ingestion rate of soil (mg/day)	100	200		50	100
SA Skin surface area (dressed) (cm <sup>2</sup> )	5800		2023	5800	5800
M Soil to skin adherence factor	1				
ET <sub>swim</sub> Swimming exposure time (hr/event)	3				
EV <sub>swim</sub> Swimming event frequency (events/yr)	12	12	12		
IR <sub>swim</sub> Water ingestion while swimming (L/hr)	0.05	0.5			
SA <sub>swim</sub> Skin surface area for swimming (cm <sup>2</sup> )	23000		8100		
IR <sub>fish</sub> Ingestion rate of fish (g/yr)	0.025				
F <sub>fish</sub> Contaminated fish fraction (unitless)	1				

Complete Exposure Pathways and Receptors	On-site	Off-site 1	Off-site 2
<b>Groundwater:</b>			
Groundwater Ingestion	None	Commercial	None
Soil Leaching to Groundwater Ingestion	None	None	None
<b>Applicable Surface Water Exposure Routes:</b>			
Swimming			NA
Fish Consumption			NA
Aquatic Life Protection			NA
<b>Soil:</b>			
Direct Ingestion and Dermal Contact	None		
<b>Outdoor Air:</b>			
Resuspension from Surface Soils	None	None	None
Volatilization from Soils	Residential	None	None
Volatilization from Groundwater	Residential	None	None
<b>Indoor Air:</b>			
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	(Unit)
Groundwater receptor	NA	1700	NA	(ft)
Soil leaching to groundwater receptor	NA	NA	NA	(ft)
Outdoor air inhalation receptor	0	NA	NA	(ft)

Target Health Risk Values	Individual	Cumulative
TR <sub>10<sup>-6</sup></sub> Target Risk (Class A/B carcinogens)	1.0E-6	1.0E-5
TR <sub>10<sup>-4</sup></sub> 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 & Edging model
Soil leaching model	NA
Use soil attenuation model (SAM) for leachate?	NA
Air dilution factor	NA
Groundwater dilution/attenuation factor	Domenico model w/ biodeg.

NOTE: NA = Not applicable

Surface Parameters	General	Construction	(Units)
A Source zone area	1.2E+2	NA	(ft <sup>2</sup> )
W Length of source zone area parallel to wind	1.0E+1	NA	(ft)
W <sub>gw</sub> Length of source zone area parallel to GW flow	NA	NA	(ft)
U <sub>amb</sub> Ambient air velocity in mixing zone	7.4E+0		(ft/s)
h <sub>mix</sub> Air mixing zone height	6.6E+0		(ft)
P <sub>a</sub> Area particulate emission rate	NA		(lb/yr-ft <sup>2</sup> )
L <sub>soil</sub> Thickness of affected surface soils	6.5E+0		(ft)

Surface Soil Column Parameters	Value	(Units)	
h <sub>cap</sub> Capillary zone thickness	7.9E+1	(ft)	
h <sub>v</sub> Vadose zone thickness	5.7E+0	(ft)	
ρ <sub>s</sub> Soil bulk density	1.7E+0	(g/cm <sup>3</sup> )	
f <sub>oc</sub> Fraction organic carbon	1.0E-2	(-)	
D <sub>y</sub> Soil total porosity	3.8E-1	(-)	
K <sub>vs</sub> Vertical hydraulic conductivity	8.6E-2	(cm/d)	
K <sub>v</sub> Vapor permeability	1.1E-15	(ft <sup>2</sup> /d)	
L <sub>gw</sub> Depth to groundwater	8.5E+0	(ft)	
L <sub>soil</sub> Depth to top of affected soils	0.0E+0	(ft)	
L <sub>base</sub> Depth to base of affected soils	1.0E+1	(ft)	
L <sub>soil</sub> Thickness of affected soils	1.0E+1	(ft)	
pH <sub>soil</sub> Soil/groundwater pH	7.7E+0	(-)	
θ <sub>v</sub> Volumetric water content	0.542	0.31 0.12	(-)
θ <sub>o</sub> Volumetric oil content	0.088	0.07 0.26	(-)

Building Parameters	Residential	Commercial	(Units)
L <sub>b</sub> Building volume/area ratio	2.8E+1	NA	(ft)
A <sub>b</sub> Foundation area	2.8E+3	NA	(ft <sup>2</sup> )
M <sub>soil</sub> Foundation perimeter	2.70E+2	NA	(ft)
ER Building air exchange rate	6.54E-4	NA	(1/hr)
L <sub>soil</sub> Foundation thickness	4.92E-1	NA	(ft)
Z <sub>con</sub> Depth to bottom of foundation slab	4.92E-1	NA	(ft)
γ Foundation crack fraction	1.00E-2	NA	(-)
ΔP Indoor/outdoor differential pressure	0.00E+0	NA	(lb/in <sup>2</sup> )
U <sub>soil</sub> Convective air flow through slab	0.00E+0	NA	(ft <sup>3</sup> /s-ft <sup>2</sup> )

Groundwater Parameters	Value	(Units)
d <sub>gw</sub> Groundwater mixing zone depth	NA	(ft)
q <sub>gw</sub> Net groundwater infiltration rate	NA	(ft/yr)
U <sub>gw</sub> Groundwater Darcy velocity	3.0E-6	(cm/d)
V <sub>gw</sub> Groundwater seepage velocity	8.0E-6	(cm/d)
K <sub>gw</sub> Saturated hydraulic conductivity	1.9E-3	(cm/d)
h <sub>gw</sub> Groundwater gradient	1.6E-3	(-)
S <sub>gw</sub> Width of groundwater source zone	1.6E+2	(ft)
Z <sub>gw</sub> Depth of groundwater source zone	6.6E+0	(ft)
θ <sub>gw</sub> Effective porosity in water-bearing unit	3.8E-1	(-)
f <sub>oc, gw</sub> Fraction organic carbon in water-bearing unit	1.0E-3	(-)
pH <sub>gw</sub> Groundwater pH	6.2E+0	(-)
Biodegradation considered?	1st Order	

Transport Parameters	Off-site 1	Off-site 2	Off-site 1	Off-site 2	(Units)
<b>Lateral Groundwater Transport</b>					
α <sub>l</sub> Longitudinal dispersivity	1.7E+2	NA	NA	NA	(ft)
α <sub>t</sub> Transverse dispersivity	5.6E+1	NA	NA	NA	(ft)
α <sub>v</sub> Vertical dispersivity	8.5E+0	NA	NA	NA	(ft)
<b>Lateral Outdoor Air Transport</b>					
α <sub>1</sub> Transverse dispersion coefficient	NA	NA	NA	NA	(ft)
α <sub>2</sub> Vertical dispersion coefficient	NA	NA	NA	NA	(ft)
ADF Air dispersion factor	NA	NA	NA	NA	(-)

Surface Water Parameters	Off-site 2	(Units)
Q <sub>sw</sub> Surface water flow rate	NA	(ft <sup>3</sup> /s)
W <sub>sw</sub> Width of GW plume at SW discharge	NA	(ft)
d <sub>sw</sub> Thickness of GW plume at SW discharge	NA	(ft)
D <sub>sw</sub> Groundwater-to-surface water diffusion factor	NA	(-)

RBCA SITE ASSESSMENT

Site Name: Former Chevron Service Station No. 21-0208  
 Site Location: 8008 International Blvd., Oakland, CA

Completed By: J. Douglas  
 Date Completed: 8-Jul-02

Job ID: DG20206HJ001

1 OF 1

SOIL (0 - 10 ft) SSTL VALUES

Target Risk (Class A & B) 1.0E-6  
 Target Risk (Class C) 1.0E-5  
 Target Hazard Quotient 3.0E-3

Groundwater DAF Option: Domenico - First Order  
 (One-directional vert. dispersion)

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

CONSTITUENTS OF CONCERN	Representative Concentration (mg/kg)	Soil Leaching to Groundwater Ingestion / Discharge to Surface Water				Soil Vol. to Indoor Air	Soil Volatilization to Outdoor Air				Surface Soil Inhalation, Ingestion, Dermal Contact		Applicable SSTL (mg/kg)	SSTL Exceeded?	Required CRF Only if "yes"
		On-site (0 ft)		Off-site 2 (0 ft)			On-site (0 ft)		Off-site 2 (0 ft)		On-site (0 ft)				
		None	None	None	Residential		Residential	Construction Worker	None	None	None	Construction Worker			
71-43-2 Benzene*	1.9E-1	NA	NA	NA	3.0E-1	7.9E+1	NA	NA	NA	NA	NA	3.0E-1	<input type="checkbox"/>	<1	
108-88-3 Toluene	5.0E-2	NA	NA	NA	5.4E+2	>7.9E+2	NA	NA	NA	NA	NA	5.4E+2	<input type="checkbox"/>	<1	
100-41-4 Ethylbenzene	1.3E+0	NA	NA	NA	>6.5E+2	>6.5E+2	NA	NA	NA	NA	NA	>6.5E+2	<input type="checkbox"/>	NA	
1330-20-7 Xylene (mixed isomers)	4.5E-1	NA	NA	NA	>5.1E+2	>5.1E+2	NA	NA	NA	NA	NA	>5.1E+2	<input type="checkbox"/>	NA	
1634-04-4 Methyl t-Butyl ether	4.3E-1	NA	NA	NA	5.9E+3	>1.5E+4	NA	NA	NA	NA	NA	5.9E+3	<input type="checkbox"/>	<1	
0-00-0 TPH - Arom >C08-C10	3.4E+2	NA	NA	NA	>1.0E+3	>1.0E+3	NA	NA	NA	NA	NA	>1.0E+3	<input type="checkbox"/>	NA	
0-00-0 TPH - Aliph >C12-C16	2.2E+1	NA	NA	NA	>3.8E+1	>3.8E+1	NA	NA	NA	NA	NA	>3.8E+1	<input type="checkbox"/>	NA	
0-00-0 TPH - Aliph >C16-C21	6.1E+1	NA	NA	NA	NC	NC	NA	NA	NA	NA	NA	NC	<input type="checkbox"/>	NA	
0-00-0 TPH - Arom >C18-C21	1.7E+1	NA	NA	NA	NC	NC	NA	NA	NA	NA	NA	NC	<input type="checkbox"/>	NA	
0-00-0 TPH - Arom >C21-C35	1.1E+1	NA	NA	NA	NC	NC	NA	NA	NA	NA	NA	NC	<input type="checkbox"/>	NA	

\* = 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. 21-0208

Completed By: J. Douglas

Job ID: DIG20208H.3C01

Site Location: 6006 International Blvd., Oakland, CA

Date Completed: 8-Jul-02

1 OF 1

GROUNDWATER SSTL VALUES

Target Risk (Class A & B) 1.0E-5

Target Risk (Class C) 1.0E-5

Target Hazard Quotient 1.0E+0

Groundwater DAF Option: Domestic - Fuel Order  
(One-directional vert. dispersion)

SSTL Results For Complete Exposure Pathways (\*X\* if Complete)

CONSTITUENTS OF CONCERN		Representative Concentration (mg/L)	X	Groundwater Ingestion			X	GW Vol. to Indoor Air	X	Groundwater Volatilization to Outdoor Air			Applicable SSTL (mg/L)	SSTL Exceeded? *X* if yes	Required CRF Only if "yes" left
			On-site (0 ft)	Off-site 1 (1700 ft)	Off-site 2 (0 ft)	On-site (0 ft)	On-site (0 ft)	Off-site 1 (0 ft)	Off-site 2 (0 ft)						
			None	Commercial	None	Residential	Residential	None	None						
71-43-2	Benzene*	1.0E-1	NA	>1.8E+3	NA	2.4E+0	4.0E+1	NA	NA	2.4E+0	<input type="checkbox"/>	<1			
108-88-3	Toluene	1.3E-2	NA	>5.2E+2	NA	>5.2E+2	>5.2E+2	NA	NA	>5.2E+2	<input type="checkbox"/>	NA			
100-41-4	Ethylbenzene	1.8E-1	NA	>1.7E+2	NA	>1.7E+2	>1.7E+2	NA	NA	>1.7E+2	<input type="checkbox"/>	NA			
1330-20-7	Xylene (mixed isomers)	5.7E-2	NA	>2.0E+2	NA	>2.0E+2	>2.0E+2	NA	NA	>2.0E+2	<input type="checkbox"/>	NA			
1634-04-4	Methyl 1-Butyl ether	1.4E-1	NA	>4.8E+4	NA	4.0E+4	>4.8E+4	NA	NA	4.0E+4	<input type="checkbox"/>	<1			
0-00-0	TPH - Arom >C08-C10	1.3E+1	NA	>6.5E+1	NA	>6.5E+1	>6.5E+1	NA	NA	>6.5E+1	<input type="checkbox"/>	NA			
0-00-0	TPH - Aliph >C12-C16	1.7E+0	NA	>7.6E-4	NA	>7.6E-4	>7.6E-4	NA	NA	>7.6E-4	<input type="checkbox"/>	NA			
0-00-0	TPH - Aliph >C16-C21	4.6E+0	NA	>2.5E-6	NA	NC	NC	NA	NA	>2.5E-6	<input type="checkbox"/>	NA			
0-00-0	TPH - Arom >C16-C21	1.3E+0	NA	>6.5E-1	NA	NC	NC	NA	NA	>6.5E-1	<input type="checkbox"/>	NA			
0-00-0	TPH - Arom >C21-C35	8.4E-1	NA	>5.6E-3	NA	NC	NC	NA	NA	>5.6E-3	<input type="checkbox"/>	NA			

\* = 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. 21-0208  
 Site Location: 6006 International Blvd., Oakland, CA

Completed By: J. Douglas  
 Date Completed: 8-Jul-02

Job ID: DG20208H.9C01

1 OF 1

**CALCULATION OF SSTL VALUES FOR TPH**

CONSTITUENTS OF CONCERN		Mass Fractions		Representative Concentrations		Calculated Concentration Limits		Applicable SSTL Values	
		Soil (-)	Groundwater (-)	Soil (mg/kg)	Groundwater (mg/L)	Residual Soil Concentration (mg/kg)	Solubility (mg/L)	Soils (0 - 10 ft) (mg/kg)	Groundwater (mg/L)
0-00-0	TPH - Arom >C08-C10	1.0E+0	5.3E-1	3.4E+2	1.3E+1	1.0E+3	6.5E+1	>1.0E+3	>6.5E+1
0-00-0	TPH - Aliph >C12-C16	9.0E-4	9.5E-2	2.2E+1	1.7E+0	3.8E+1	7.6E-4	>3.8E+1	>7.6E-4
0-00-0	TPH - Aliph >C16-C21	2.5E-3	2.6E-1	6.1E+1	4.6E+0	1.6E+1	2.5E-6	NC	>2.5E-6
0-00-0	TPH - Arom >C16-C21	6.8E-4	7.1E-2	1.7E+1	1.3E+0	1.0E+2	6.5E-1	NC	>6.5E-1
0-00-0	TPH - Arom >C21-C35	4.5E-4	4.7E-2	1.1E+1	8.4E-1	8.9E+0	6.6E-3	NC	>6.6E-3
<b>Total</b>		1.0E+0	1.0E+0	4.5E+2	2.1E+1	<b>Total TPH SSTL value</b>		>Res	>Sol

\* = Chemical with user-specified data

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

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FAX NO. 7077893218

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# Main Screen

RBCA Tool Kit for Chemical Releases  
Version 1.3a © 2000

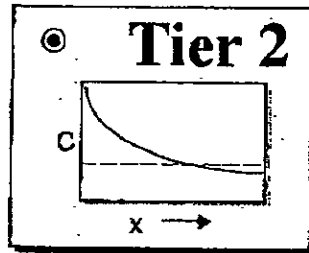
## 1. Project Information

Site Name:	Former Chevron Station No. 21-0208		
Location:	6006 International Blvd., Oakland, CA		
Compl. By:	J. Douglas		
Date:	8-Jul-02	Job ID:	DG20208H.3C01

## 2. Which Type of RBCA Analysis?



Generic Values  
On-Site  
Exposure



Site-Specific Values  
On- or Off-Site Exposure

## 3. Calculation Options

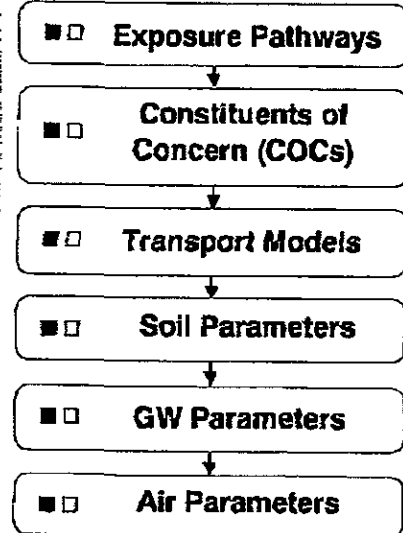
*Affects which input data are required*

- Baseline Risks (Forward mode)**
- RBCA Cleanup Standards (Backward mode)**

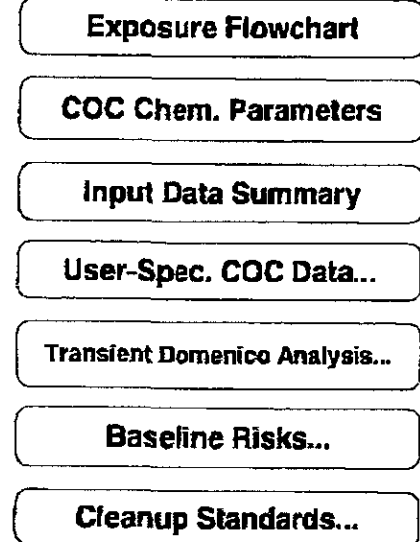
## 4. RBCA Evaluation Process

### Prepare Input Data

Data Complete? (  = yes,  = no)



### Review Output



## 5. Commands and Options

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

Deep  
water  
10 Kt

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Site Name: Former Chevron Station No. 21-0208  
 Location: 6006 International Blvd., Oakland, CA  
 Comp. By: J Douglas

Job ID: DG20209H-3C01  
 Date: 8-Jul-02

**Commands and Options**

**Source Media Constituents of Concern (COCs)**

Apply Raoult's Law

**Selected COCs**

COC Select:        ?

**Groundwater Source Zone**

**Soil Source Zone**

Benzene*
Toluene
Ethylbenzene
Xylene (mixed isomers)
Methyl t-Butyl ether
TPH - Arom >C08-C10
TPH - Aliph >C12-C16
TPH - Aliph >C16-C21
TPH - Arom >C16-C21
TPH - Arom >C21-C35

(mg/L)	note
1.0E-1	
1.3E-2	
1.8E-1	
5.7E-2	
1.4E-1	
1.3E-1	
1.7E-0	
4.6E-0	
1.3E-0	
8.4E-1	

(mg/kg)	note
1.9E-1	
5.0E-2	
1.3E+0	
4.5E-1	
4.3E-1	
3.4E+2	
2.2E+1	
6.1E+1	
1.7E+1	
1.1E+1	


\* = Chemical with user-specified data

# Site-Specific Soil Parameters

## 1. Soil Source Zone Characteristics (?)

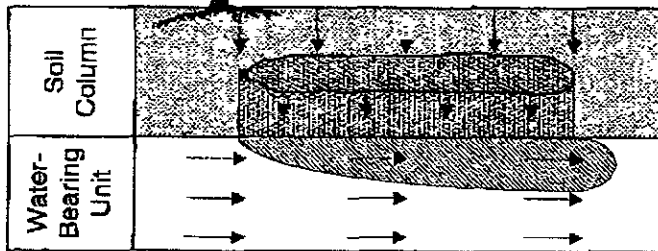
### Hydrogeology

General Case Construction

Depth to water-bearing unit	10	(ft)
Capillary zone thickness	3.787431575	(ft)
Soil column thickness	3.212598425	(ft)

### Affected Soil Zone

Depth to top of affected soils	0	(ft)	
Depth to base of affected soils	10	(ft)	
Affected soil area	100	100	(ft <sup>2</sup> )
Length of affected soil parallel to assumed wind direction	10	10	(ft)



Site Name: Former Chevron Station No. 21-0208 Job ID: DG20208P-3C61  
 Location: 6006 International Blvd., Oakland, CA Date: 8-Jul-02  
 Compl. By: J. Douglas

## 2. Surface Soil Column (?)

### Predominant USCS Soil Type

Vadose Zone Capillary Fringe

CL: Sandy Clay

or	Enter Directly	
Total porosity	0.38	(-)
Volumetric water content	0.31	(-)
Volumetric air content	0.07	(-)
Dry bulk density	1.7	(kg/L)
Vertical hydraulic conductivity	8.6E-2	(cm/d)
Vapor permeability	1.1E-15	(ft <sup>2</sup> )
Capillary zone thickness	7.9E-1	(ft)

NA

or

### Partitioning Parameters

Fraction organic carbon	0.01	(-)
Soil/water pH	7.67	(-)

## 3. Commands and Options

Main Screen

Use Default Values

Print Sheet

Set Units

Help

## Site-Specific Groundwater Parameters

### 1. Water-Bearing Unit (?)

**Hydrogeology**

Groundwater Darcy velocity  (cm/d)  
 Groundwater seepage velocity  (cm/d)  
 or   or

Hydraulic conductivity  (cm/d)  
 Hydraulic gradient  (-)  
 Effective porosity  (-)

**Sorption**

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

---

### 2. Groundwater Source Zone (?)

Groundwater plume width at source  (ft)  
 Plume (mixing zone) thickness at source  (ft)  
 or  or

Site Name: Former Chevron Station No. 21-0206 Job ID: DG20208H.300  
 Location: 6006 International Blvd., Oakland, CA Date: 8-Jul-02  
 Comp. By: J Douglas

### 3. Groundwater Dispersion (?)

Model:  GW Ingestion Soil Leaching to GW  
 Off-site 1

Distance to GW receptors  (ft)  
 or   or

Longitudinal dispersivity  (ft)  
 Transverse dispersivity  (ft)  
 Vertical dispersivity  (ft)

---

### 5. Commands and Options

Main Screen

Set Units

Use Default Values

Print Sheet

Help

# Site-Specific Air Parameters

Site Name: Former Chevron Station No 21-0008ID: DG26208H.3C0  
 Location: 6006 International Blvd., Oakland, CA Date: 8-Jul-02  
 Compl. By: J. Douglas

## 1. Outdoor Air Pathway

or

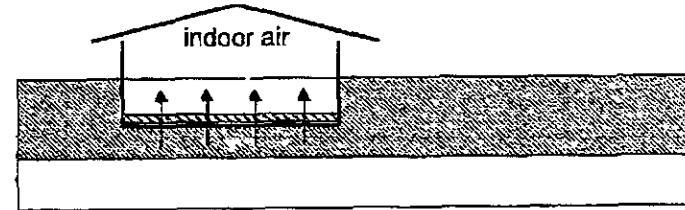
### Air Source Zone

Air mixing zone height  (ft)  
 Ambient air velocity in mixing zone  (ft/s)

## 2. Indoor Air Pathway

### Building Parameters

	Residential		
Building volume/area ratio	28		(ft)
Foundation area	2622		(ft <sup>2</sup> )
Foundation perimeter	270		(ft)
Building air exchange rate	6.5E-4		(1/s)
Depth to bottom of foundation slab	0.49213		(ft)
Convective air flow through cracks	0.0E+0		(ft <sup>3</sup> /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 <sup>2</sup> )



## 3. Commands and Options

**RBCA SITE ASSESSMENT**

**Baseline Risk Summary-All Pathways**

Site Name: Former Chevron Station No. 21-0208  
 Site Location: 6006 International Blvd., Oakland, CA

Completed By: J. Douglas  
 Date Completed: 8-Jul-02

1 of 1

**TIER 2 BASELINE RISK SUMMARY TABLE**

EXPOSURE PATHWAY	BASELINE CARCINOGENIC RISK					BASELINE TOXIC EFFECTS				
	Individual COC Risk		Cumulative COC Risk		Risk Limit(s) Exceeded?	Hazard Quotient		Hazard Index		Toxicity Limit(s) Exceeded?
	Maximum Value	Target Risk	Total Value	Target Risk		Maximum Value	Applicable Limit	Total Value	Applicable Limit	
<b>OUTDOOR AIR EXPOSURE PATHWAYS</b>										
Complete:	2.9E-9	1.0E-6	2.9E-9	1.0E-5	<input type="checkbox"/>	1.8E-2	1.0E+0	2.0E-2	1.0E+0	<input type="checkbox"/>
<b>INDOOR AIR EXPOSURE PATHWAYS</b>										
Complete:	6.7E-7	1.0E-6	6.7E-7	1.0E-5	<input type="checkbox"/>	3.1E-1	1.0E+0	6.1E-1	1.0E+0	<input type="checkbox"/>
<b>SOIL EXPOSURE PATHWAYS</b>										
Complete:	NA	NA	NA	NA	<input type="checkbox"/>	NA	NA	NA	NA	<input type="checkbox"/>
<b>GROUNDWATER EXPOSURE PATHWAYS</b>										
Complete:	3.5E-105	1.0E-6	3.5E-105	1.0E-5	<input type="checkbox"/>	3.2E-100	1.0E+0	4.5E-100	1.0E+0	<input type="checkbox"/>
<b>SURFACE WATER EXPOSURE PATHWAYS</b>										
Complete:	NA	NA	NA	NA	<input type="checkbox"/>	NA	NA	NA	NA	<input type="checkbox"/>
<b>CRITICAL EXPOSURE PATHWAY (Maximum Values From Complete Pathways)</b>										
	6.7E-7	1.0E-6	6.7E-7	1.0E-5	<input type="checkbox"/>	3.1E-1	1.0E+0	6.1E-1	1.0E+0	<input type="checkbox"/>
	Indoor Air		Indoor Air			Indoor Air		Indoor Air		

**RBCA SITE ASSESSMENT**

**Input Parameter Summary**

Site Name: Former Chevron Station No. 21-0208  
 Site Location: 6206 International Blvd., Oakland, CA

Completed By: J. Douglas  
 Date Completed: 8-Jul-02

Job ID: 0620238HJ2C01

1 OF 1

Exposure Parameters	Residential		Commercial/Industrial	
	Adult (18-64y)	13-17y	Child	Worker
AT <sub>c</sub> Averaging time for carcinogens (yr)	70			
AT <sub>n</sub> Averaging time for non-carcinogens (yr)	30		25	1
BW Body weight (kg)	70	35	70	
ED Exposure duration (yr)	30	16	25	1
τ Averaging time for vapor flux (yr)	30		25	1
EF Exposure frequency (days/yr)	350		250	180
EF <sub>D</sub> Exposure frequency for dermal exposure	350		250	
IR <sub>w</sub> Ingestion rate of water (L/day)	2		1	
IR <sub>s</sub> Ingestion rate of soil (mg/day)	180	231	50	100
SA Skin surface area (damaged) (cm <sup>2</sup> )	5800	2023	5800	5800
M Soil to skin adherence factor	1			
ET <sub>swim</sub> Swimming exposure time (events/day)	3			
EV <sub>swim</sub> Swimming event frequency (events/day)	12	12	12	
IR <sub>swim</sub> Water ingestion while swimming (L/hr)	0.05	0.5		
SA <sub>swim</sub> Skin surface area for swimming (cm <sup>2</sup> )	2900		8100	
IR <sub>fish</sub> Ingestion rate of fish (g/day)	0.025			
F <sub>fish</sub> Contaminated fish factor (unitless)	1			

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

Receptor Distance from Source Matrix	On-site	Off-site 1	Off-site 2	(Units)
Groundwater receptor	NA	1700	NA	(ft)
Soil leaching to groundwater receptor	NA	NA	NA	(ft)
Outdoor air inhalation receptor	0	NA	NA	(ft)

Target Health Risk Values	Individual	Cumulative
TR <sub>c</sub> Target Risk (class A/B carcinogens)	1.0E-6	1.0E-5
TR <sub>n</sub> Target Risk (class C carcinogens)	1.0E-6	
THQ Target Hazard Quotient (in an-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 & Ebinger model
Soil leaching model	NA
Lee soil attenuation model (SAM) for leachate?	NA
Air diffusion factor	NA
Groundwater dilution/attenuation factor	Domenico model w/ biodeg.

NOTE: NA = Not applicable

Surface Parameters	General	Construction	(Units)
A Source zone area	1.0E+2	NA	(ft <sup>2</sup> )
W Length of source zone area parallel to wind	1.0E+1	NA	(ft)
W <sub>GW</sub> Length of source zone area parallel to GW flow	NA	NA	(ft)
U <sub>amb</sub> Ambient air velocity in mixing zone	7.4E+0		(ft/s)
Z <sub>amb</sub> Air mixing zone height	6.5E+0		(ft)
P <sub>a</sub> Areal particulate emission rate	NA		(g/m <sup>2</sup> /day)
L <sub>amb</sub> Thickness of affected surface soils	1.0E+1		(ft)

Surface Soil Column Parameters	Value	(Units)
h <sub>cap</sub> Capillary zone thickness	7.9E-1	(ft)
h <sub>v</sub> Vadose zone thickness	9.2E+0	(ft)
ρ <sub>s</sub> Soil bulk density	1.7E+0	(g/cm <sup>3</sup> )
f <sub>oc</sub> Fraction organic carbon	1.0E-2	(-)
θ <sub>v</sub> Soil total porosity	3.8E-1	(-)
K <sub>vs</sub> Vertical hydraulic conductivity	8.6E-2	(cm/d)
k <sub>v</sub> Vapor permeability	1.1E-15	(m <sup>2</sup> /s)
L <sub>gw</sub> Depth to groundwater	1.0E-1	(ft)
L <sub>1</sub> Depth to top of affected soils	0.0E+0	(ft)
L <sub>2</sub> Depth to base of affected soils	1.0E-1	(ft)
L <sub>amb</sub> Thickness of affected soils	1.0E+1	(ft)
pH <sub>gw</sub> Soil/groundwater pH	7.7E+0	(-)
ω <sub>v</sub> Volvetric water content	0.342	0.31
U <sub>g</sub> Volvetric air content	0.035	0.07
		0.26

Building Parameters	Residential	Commercial	(Units)
V <sub>b</sub> Building volume/area ratio	2.80E+1	NA	(ft)
A <sub>b</sub> Foundation area	2.82E+8	NA	(ft <sup>2</sup> )
X <sub>mb</sub> Foundation perimeter	2.70E+2	NA	(ft)
ER Building air exchange rate	6.54E-1	NA	(1/hr)
L <sub>amb</sub> Foundation thickness	4.82E-1	NA	(ft)
Z <sub>amb</sub> Depth to bottom of foundation slab	4.92E-1	NA	(ft)
η Foundation crack fraction	1.00E-2	NA	(-)
ΔP Indoor/outdoor differential pressure	0.00E+0	NA	(g/cm <sup>2</sup> )
U <sub>g</sub> Convective air flow through slab	0.00E+0	NA	(ft <sup>3</sup> /s)

Groundwater Parameters	Value	(Units)
h <sub>gw</sub> Groundwater rising zone depth	NA	(ft)
I <sub>1</sub> Net groundwater infiltration rate	NA	(ft/day)
U <sub>gw</sub> Groundwater Darcy velocity	3.0E-6	(cm/d)
V <sub>gw</sub> Groundwater seepage velocity	8.0E-6	(cm/d)
K <sub>s</sub> Saturated hydraulic conductivity	1.9E-3	(cm/d)
i Groundwater gradient	1.6E-3	(-)
S <sub>w</sub> Width of groundwater source zone	1.5E+2	(ft)
S <sub>d</sub> Depth of groundwater source zone	6.6E-0	(ft)
μ <sub>eff</sub> Effective porosity in water-bearing unit	3.8E-1	(-)
f <sub>oc, gw</sub> Fraction organic carbon in water-bearing unit	1.0E-3	(-)
pH <sub>gw</sub> Groundwater pH	6.2E+0	(-)
Biodegradation considered?	Not Order	(-)

Transport Parameters	Off-site 1	Off-site 2	Off-site 1	Off-site 2	(Units)
<b>Leachate Groundwater Transport</b>					
α <sub>L</sub> Longitudinal dispersivity	1.7E+2	NA	NA	NA	(ft)
α <sub>T</sub> Transverse dispersivity	5.6E+1	NA	NA	NA	(ft)
α <sub>V</sub> Vertical dispersivity	8.5E+0	NA	NA	NA	(ft)
<b>Leachate Outdoor Air Transport</b>					
α <sub>L</sub> Transverse dispersion coefficient	NA	NA	NA	NA	(ft)
α <sub>V</sub> Vertical dispersion coefficient	NA	NA	NA	NA	(ft)
ADF Air dispersion factor	NA	NA	NA	NA	(-)

Surface Water Parameters	Off-site 2	(Units)
Q <sub>sw</sub> Surface water flowrate	NA	(ft <sup>3</sup> /s)
W <sub>sw</sub> Width of SW plume at SW discharge	NA	(ft)
h <sub>sw</sub> Thickness of SW plume at SW discharge	NA	(ft)
DF <sub>sw</sub> Groundwater-to-surface water dilution factor	NA	(-)

RBCA SITE ASSESSMENT

Site Name: Former Chevron Station No. 21-0208  
 Site Location: 6006 International Blvd., Oakland, CA

Completed By: J. Douglas  
 Date Completed: 6-30-02

Job ID: DG20208H3C01

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SOIL (0 - 10 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: Domenico - First Order  
 (One-dimensional, vertical dispersion)

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

CONSTITUENTS OF CONCERN	Representative Concentration (mg/kg)	Soil Leaching to Groundwater Ingestion / Discharge to Surface Water			X	Soil Vol to Indoor Air	X	Soil Volatilization to Outdoor Air				Surface Soil Inhalation, Ingestion, Dermal Contact		Applicable SSTL (mg/kg)	SSTL Exceeded? *w/ if yes	Required CRF Only if "yes" left
		On-site (D)	Off-site 1 (D)	Off-site 2 (D)				On-site (D)	Off-site 1 (D)	Off-site 2 (D)	On-site (D)	Construction Worker				
		None	None	None				Residential	Residential	Construction Worker	None	None	None			
71-43-2 Benzene*	1.8E-1	NA	NA	NA	3.0E-1	X	7.9E+1	NA	NA	NA	NA	NA	3.0E-1	<input type="checkbox"/>	<1	
108-88-3 Toluene	5.0E-2	NA	NA	NA	5.4E+2	X	>7.9E+2	NA	NA	NA	NA	NA	5.4E+2	<input type="checkbox"/>	<1	
100-41-4 Ethylbenzene	1.3E+0	NA	NA	NA	>6.5E+2	X	>6.5E+2	NA	NA	NA	NA	NA	>6.5E+2	<input type="checkbox"/>	NA	
1330-20-7 Xylene (mixed isomers)	4.5E-1	NA	NA	NA	>5.1E+2	X	>5.1E+2	NA	NA	NA	NA	NA	>5.1E+2	<input type="checkbox"/>	NA	
1634-04-4 Methyl t-Butyl ether	4.3E-1	NA	NA	NA	5.9E+3	X	>1.5E+4	NA	NA	NA	NA	NA	5.9E+3	<input type="checkbox"/>	<1	
0-00-0 TPH - Arom >C08-C10	3.4E+2	NA	NA	NA	>1.0E+3	X	>1.0E+3	NA	NA	NA	NA	NA	>1.0E+3	<input type="checkbox"/>	NA	
0-00-0 TPH - Aliph >C12-C16	2.2E+1	NA	NA	NA	>3.8E+1	X	>3.8E+1	NA	NA	NA	NA	NA	>3.8E+1	<input type="checkbox"/>	NA	
0-00-0 TPH - Aliph >C16-C21	6.7E+1	NA	NA	NA	NC		NC	NA	NA	NA	NA	NA	NC	<input type="checkbox"/>	NA	
0-00-0 TPH - Arom >C16-C21	1.7E+1	NA	NA	NA	NC		NC	NA	NA	NA	NA	NA	NC	<input type="checkbox"/>	NA	
0-00-0 TPH - Arom >C21-C35	1.1E+1	NA	NA	NA	NC		NC	NA	NA	NA	NA	NA	NC	<input type="checkbox"/>	NA	

\* = Chemical with user-specified data

\*w/ indicates risk-based target concentration greater than constituent residual saturation value. NA = Not applicable. NC = Not calculated.



RBCA SITE ASSESSMENT

Site Name: Former Chevron Station No. 21-0208  
 Site Location: 6006 International Blvd., Oakland, CA

Completed By: J. Douglas  
 Date Completed: 8-Jul-02

Job ID: DG20209H.3C01

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GROUNDWATER SSTL VALUES

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

Groundwater DAF Option: Domenico - First Order  
 (One-directional vert. dispersion)

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

CAS No.	Name	Representative Concentration (mg/L)	Groundwater Ingestion			GW Vol. to Indoor Air	Groundwater Volatilization to Outdoor Air			Applicable SSTL (mg/L)	SSTL Exceeded? "X" if yes	Required CRF Only if "yes" left
			On-site (D)	Off-site 1 (1700 ft)	Off-site 2 (D)	On-site (D)	On-site (D)	Off-site 1 (D)	Off-site 2 (D)			
71-43-2	Benzene*	1.0E-1	NA	>1.8E+3	NA	3.2E+0	5.4E+1	NA	NA	3.2E+0	<input type="checkbox"/>	<1
108-88-3	Toluene	1.3E-2	NA	>5.2E+2	NA	>5.2E+2	>5.2E+2	NA	NA	>5.2E+2	<input type="checkbox"/>	NA
100-41-4	Ethylbenzene	1.8E-1	NA	>1.7E+2	NA	>1.7E+2	>1.7E+2	NA	NA	>1.7E+2	<input type="checkbox"/>	NA
1330-20-7	Xylene (mixed isomers)	5.7E-2	NA	>2.0E+2	NA	>2.0E+2	>2.0E+2	NA	NA	>2.0E+2	<input type="checkbox"/>	NA
1634-04-4	Methyl t-Butyl ether	1.4E-1	NA	>4.8E+4	NA	>4.8E+4	>4.8E+4	NA	NA	>4.8E+4	<input type="checkbox"/>	NA
0-00-0	TPH - Arom >C08-C10	1.9E+1	NA	>6.5E+1	NA	>6.5E+1	>6.5E+1	NA	NA	>6.5E+1	<input type="checkbox"/>	NA
0-00-0	TPH - Aliph >C12-C16	1.7E+0	NA	>7.6E-4	NA	>7.6E-4	>7.6E-4	NA	NA	>7.6E-4	<input type="checkbox"/>	NA
0-00-0	TPH - Aliph >C16-C21	4.6E+0	NA	>2.5E-6	NA	NC	NC	NA	NA	>2.5E-6	<input type="checkbox"/>	NA
0-00-0	TPH - Arom >C16-C21	1.3E+0	NA	>6.5E-1	NA	NC	NC	NA	NA	>6.5E-1	<input type="checkbox"/>	NA
0-00-0	TPH - Arom >C21-C35	8.4E-1	NA	>6.6E-3	NA	NC	NC	NA	NA	>6.6E-3	<input type="checkbox"/>	NA

\* = Chemical with user-specified data

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

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RBCA SITE ASSESSMENT

TPH Criteria SSTL Worksheet

Site Name: Former Chevron Station No. 21-0208  
 Site Location: 6006 International Blvd., Oakland, CA

Completed By: J. Douglas  
 Date Completed: 8-Jul-02

Job ID: DG20208H.3C01

1 OF 1

CALCULATION OF SSTL VALUES FOR TPH

CONSTITUENTS OF CONCERN		Mass Fractions		Representative Concentrations		Calculated Concentration Limits		Applicable SSTL Values	
		Soil (%)	Groundwater (%)	Soil (mg/kg)	Groundwater (mg/L)	Residual Soil Concentration (mg/kg)	Solubility (mg/L)	Soils (0 - 10 ft) (mg/kg)	Groundwater (mg/L)
0-00-0	TPH - Arom >C08-C10	1.0E+0	5.3E-1	3.4E+2	1.3E+1	1.0E+3	6.5E+1	>1.0E+3	>6.5E+1
0-00-0	TPH - Aliph >C12-C16	9.0E-4	9.5E-2	2.2E+1	1.7E+0	3.8E+1	7.6E-4	>3.8E+1	>7.6E-4
0-00-0	TPH - Aliph >C16-C21	2.5E-3	2.6E-1	6.1E+1	4.6E+0	1.6E+1	2.5E-6	NC	>2.5E-6
0-00-0	TPH - Arom >C16-C21	6.8E-4	7.1E-2	1.7E+1	1.3E+0	1.0E+2	6.5E-1	NC	>6.5E-1
0-00-0	TPH - Arom >C21-C35	4.5E-4	4.7E-2	1.1E+1	8.4E-1	8.3E+0	6.6E-3	NC	>6.6E-3
Total		1.0E+0	1.0E+0	4.5E+2	2.1E+1	Total TPH SSTL value		>Res	>Sol

\* = Chemical with user-specified data

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

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PHX NW, 10/11/02/ELI0