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8:58 am, Dec 31, 2009

Alameda County  
Environmental Health

**Aaron Costa**  
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Marketing Business Unit

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Alameda County Health Care Services  
1131 Harbor Bay Parkway, Suite 250  
Alameda, CA 94502-6577

Re: Former Chevron Service Station No. 9-0020  
1633 Harrison Street  
Oakland, CA

I have reviewed the attached report dated December 30, 2009.

I agree with the conclusions and recommendations presented in the referenced report. This information in this report is accurate to the best of my knowledge and all local Agency/Regional Board guidelines have been followed. This report was prepared by Conestoga Rovers Associates, upon who assistance and advice I have relied.

This letter is submitted pursuant to the requirements of California Water Code Section 13267(b)(1) and the regulating implementation entitled Appendix A pertaining thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge.

Sincerely,

A handwritten signature in black ink that reads "Aaron Costa".

Aaron Costa  
Project Manager

Attachment: Report



## **ADDITIONAL ONSITE INVESTIGATION REPORT**

**CHEVRON #9-0020  
1633 HARRISON STREET  
OAKLAND, CA  
FUEL LEAK CASE RO0000143**

**Prepared For:**

**Mr. Mark Detterman  
Alameda County Environmental Health  
1131 Harbor Bay Parkway, Suite 250  
Alameda, CA 94502-6577**

**DECEMBER 30, 2009**

**REF. NO. 311956 (7)**

This report is printed on recycled paper

**Prepared by:  
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## ADDITIONAL ONSITE INVESTIGATION REPORT

CHEVRON #9-0020  
1633 HARRISON STREET  
OAKLAND, CA  
FUEL LEAK CASE RO0000143

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Charlotte Evans



---

Brandon Wilken PG #7564

DECEMBER 30, 2009  
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## 1.0 INTRODUCTION

### 1.1 GENERAL

Conestoga-Rovers & Associates (CRA) submits this *Additional Onsite Investigation Report* on behalf of Chevron Environmental Management Company (Chevron) for the site referenced above. CRA conducted this investigation per the July 24, 2009 *Work Plan for Additional Onsite Investigation* as approved by Alameda County Environmental Health (ACEH) in a letter dated September 24, 2009 (Appendix A). This investigation was performed to further delineate hydrocarbons in soil and groundwater in the area near the former second generation underground storage tank (UST) pit. At the request of ACEH, CRA also installed and sampled two additional soil vapor probes in the vicinity of former groundwater monitoring well MW-7, outside the 2008 excavation extents. The site background, a summary of field activities and CRA's conclusions and recommendations are presented below.

### 1.2 SITE DESCRIPTION

The site is a former Chevron service station located on the southwest corner at the intersection of Harrison Street and 17<sup>th</sup> Street in Oakland, California. The site is located in downtown Oakland in an area of commercial and multi-unit residential land use (Figure 1). Chevron operated a service station on the site until 1972. There have been at least two different configurations of the facilities at the site (Figure 2). All facilities were removed at the time of station closure. Since December 1, 1975, the site has been used as a parking lot, which is currently operated by Douglas Parking. A future redevelopment as a multi-story senior housing facility is proposed at the site.

A total of 23 soil borings, 16 groundwater monitoring wells and 7 soil vapor wells have been installed at the site. A summary of environmental investigations conducted at the site is included in Appendix B.

### 1.3 SITE GEOLOGY AND HYDROGEOLOGY

The site is located along the eastern margin of the San Francisco Bay and is within the East Bay Plain. The East Bay Plain lies within the Coast Range Geomorphic Province and is characterized by broad alluvial fan margins slopping westward towards the San Francisco Bay. The eastern part of the plain in the Oakland area is marked by the Hayward fault, which runs along the base of the Diablo Range escarpment. The site is

underlain by the upper Holocene alluvial fan deposits that overlay Pleistocene alluvial fan deposits. Franciscan Formation bedrock underlies the alluvium at depth. Some of these sediments are Holocene and Pleistocene Merritt sands. Unconsolidated sediments beneath the site and site vicinity consist primarily of silty sands with some intermittent sandy, clayey and gravelly silts to approximately 30 feet below grade (fbg).

Local topography is flat and the site is approximately 40 feet above mean sea level. Historical depth to groundwater onsite has ranged from approximately 11 to 22 fbg. Groundwater flow direction is typically east to northeast at a gradient of 0.008 to 0.01. The regional groundwater flow direction, based on the topography and natural drainage patterns in the area, appears to be towards Lake Merritt, located approximately 1,600 feet east of the site.

## 2.0 ADDITIONAL ONSITE INVESTIGATION

CRA advanced two direct-push soil borings (SB7 and SB8) immediately downgradient of the second generation UST pit to further delineate hydrocarbons in soil and groundwater the area. Debris, including large concrete and asphalt pieces, was encountered in three boring locations attempted between the former UST pit and SB7. These boring locations were abandoned in order to ensure sampling of only native soil. CRA also installed nested soil vapor probes at 5 and 10 fbg (VP-7) immediately downgradient of the 2008 excavation extent. Details of this investigation are presented below.

### 2.1 SOIL BORING ADVANCEMENT AND VAPOR WELL INSTALLATION

**Project Personnel:** CRA personnel Ian Hull and Belew Yifru conducted all fieldwork under the supervision of California Professional Geologist Brandon S. Wilken, P.G. #7564.

**Permits:** All work was performed under Alameda County Public Works Permit W2009-0955 (Appendix C).

**Drilling Company:** Vapor Tech Services of Berkeley, California (C-57 #916085) advanced the borings and installed the soil vapor probes.

**Subsurface Clearance:** CRA notified Underground Service Alert to coordinate the location of underground utilities at the site. CRA also hired a private utility locator to confirm utility locations and locate any unmarked utilities. An unknown buried object was found in the vicinity of SB8 by the private utility locator. It is assumed to be debris from the 2<sup>nd</sup> generation UST pit. The first 8 feet of the borings were cleared using a hand auger.

**Drilling Dates:** On October 14, 2009, soil borings SB7 and SB8 were advanced and two nested vapor probes were installed in vapor well VP-7.

**Soil Borings:** Soil borings SB7 and SB8 were advanced to 28 and 29 fbg, respectively, using direct-push hydraulic rods lined with 4-foot acetate liners into undisturbed soil. SB7 was attempted three times prior to the final boring being advanced. Debris was encountered each time, presumably from the 2<sup>nd</sup> generation UST pit. CRA geologists continuously logged soil according to the Unified Soil Classification System (USCS) ASTM D 2488-06 guidelines and screened soils with a photo ionization detector and visual methods. Borings logs are included in Appendix D.

**Nested Soil Vapor Probe Installation and Construction:** CRA installed nested vapor probes at 5 and 10 fbg in vapor well VP-7 near former well MW-7. The total depth of the boring was 10.5 fbg. Soil samples were collected using a hand auger and are described as disturbed samples. Each vapor probe was constructed of a permeable porcelain filter with a ¼-inch push-to-connect fitting to ¼-inch Teflon® tubing. Probes were placed at approximately 5 and 10 fbg and surrounded by a 12-inch sand pack. Approximately 12-inches of dry granulated bentonite were placed above the sand pack, followed by hydrated granular bentonite to seal off the screened interval. The soil vapor well was finished at the surface using a traditional well vault.

**Soil and Grab-Groundwater Sample Collection and Handling:** Approximately one 6-inch long soil sample was collected every 5 feet for laboratory analysis and at obvious changes in soils, at depth intervals where hydrocarbon concentrations have been previously detected and where hydrocarbon staining or PID readings were observed. Grab-groundwater samples were collected at first encountered groundwater using disposable bailers. All samples were sealed, capped, labeled, logged on chain-of-custody forms, placed on ice and transported to Lancaster Laboratory of Pennsylvania, a Chevron- and California-approved laboratory, for analysis.

**Soil and Grab-Groundwater Chemical Analysis:** Select soil and grab-groundwater samples were analyzed for the following:



- Total Petroleum Hydrocarbons as diesel (TPHd), with silica gel cleanup, and as gasoline (TPHg) by modified EPA Method 8015
- Benzene, toluene, ethylbenzene and xylenes (BTEX), methyl tert-butyl ether (MTBE), di-isopropyl ether (DIPE), ethyl tertiary butyl ether (ETBE), tertiary amyl methyl ether (TAME) and tertiary butyl alcohol (TBA) and lead scavengers 1,2-dichloroethane and 1,2-dibromoethane by EPA Method 8260B

Cumulative soil and grab-groundwater analytical data is presented in Tables 1 and 2, respectively. Laboratory analytical reports are included in Appendix E.

**Waste Disposal:** Soil cuttings generated were placed in drums and labeled appropriately. These wastes will be transported to the appropriate Chevron-approved disposal facility following receipt of analytical profile results.

## 2.2 SOIL VAPOR SAMPLING

CRA collected vapor samples from all soil vapor probes currently at the site. Details of this sampling event are presented below.

**Personnel and Sampling Date:** CRA staff member Ian Hull collected the soil vapor samples from the vapor probes on October 26, 2009.

**Weather Conditions during Sampling:** During vapor sampling, the weather was calm, clear and sunny. Ambient air temperature varied from 60 to 75 degrees Fahrenheit. Regionally, the ground was dry and no precipitation had fallen for at least 72 hours.

**Soil Vapor Sample Collection and Handling:** Vapor samples were collected using 1-liter Summa™ canisters in a manifold system, connected to the sampling tubing at each vapor point. Approximately three probe volumes were purged before sampling. The same flow rate was used for purging and sampling. During sampling, the vacuum of the Summa™ canister was used to draw soil vapor through the flow controller until a negative pressure of approximately 5-inches of mercury was observed on the vacuum gauge. After sampling, the Summa™ canisters were packaged and sent to the Air Toxics laboratory of Folsom, California under chain-of-custody for analysis.

**Leak Testing:** In accordance with the California Environmental Protection Agency Department of Toxic Substance Control's *Advisory Active Soil Gas Investigations* guidance document, dated January 28, 2003, leak testing was performed during sampling.

Laboratory grade helium was used to determine if ambient air was entering the Summa™ canisters during sampling. A shroud was used to surround the vapor sampling equipment and the connection between the sampling equipment and the vapor probe tubing. A helium detector was used to quantify helium concentrations inside the shroud. An atmosphere of at least 80 percent helium was maintained for the duration of vapor sampling. No helium was detected in any samples.

*Soil Vapor Chemical Analysis:* Soil vapor samples were analyzed by the following methods:

- TPHg, BTEX, MTBE and naphthalene by EPA Method TO-15 (GC/MS)
- Oxygen (O<sub>2</sub>), carbon dioxide (CO<sub>2</sub>), nitrogen (N<sub>2</sub>), methane (CH<sub>4</sub>) and helium by ASTM D-1946 (GC/TCD)

Cumulative soil vapor analytical data is presented in Table 3. Laboratory analytical reports are included in Appendix E.

### 3.0 HYDROCARBON DISTRIBUTION

#### 3.1 SOIL

TPHd was only detected at 14 milligrams per kilogram (mg/kg) in SB7 at 20.5 fbg. No other petroleum hydrocarbons were detected in soil samples collected during this investigation. Cumulative soil analytical data is presented in Table 1 and Appendix E.

#### 3.2 GROUNDWATER

No petroleum hydrocarbons were detected in grab-groundwater samples from borings SB7 and SB8. Cumulative grab-groundwater data is presented in Table 2 and Appendix E.

### 3.3 VAPOR

TPHg was detected in most vapor probes at the site; however, TPHg concentrations only exceeded residential soil gas ESLs<sup>1</sup> in the probes in vapor well VP-7. TPHg had maximum detections in VP-7 of 75,000 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ) at 5 fbg and of 5,400,000  $\mu\text{g}/\text{m}^3$  at 10 fbg. Benzene was detected in VP-7 at 37  $\mu\text{g}/\text{m}^3$  at 5 fbg and at 280  $\mu\text{g}/\text{m}^3$  at 10 fbg. Both TPHg and benzene concentrations in VP-7 attenuate towards the ground surface. TPHg concentrations decrease by two orders of magnitude from 10 to 5 fbg in VP-7. Benzene concentrations decrease by one order of magnitude from 10 to 5 fbg in VP-7 and were below ESLs for residential exposure at 5 fbg. These results have been incorporated into an updated risk assessment.

## 4.0 UPDATED RISK ASSESSMENT

### 4.1 RISKS POSED TO HUMAN HEALTH

Chevron conducted an onsite Tier II Risk-Based Corrective Action (RBCA) evaluation, dated May 21, 2007, and submitted the results of this evaluation in CRA's *Risk Assessment and Proposed Vapor Survey*, dated May 25, 2007. The RBCA evaluation has been updated with additional soil vapor results, including probe VP-7. This evaluation was conducted to determine if potential exposure pathways exist, to estimate potential risk due to the residual concentrations of petroleum hydrocarbons left in the soil, and to identify any data gaps. Exposure pathways were evaluated for ingestion of soil, dermal contact with soil, ingestion of groundwater, dermal contact with groundwater and inhalation of dust and vapors. Soil vapor data had been collected onsite and was almost 20 years old and was considered unusable for modeling. Soil vapor probes were installed in 2007 and 2009 and sampled, and undisturbed soil samples were collected to analyze for physical parameters to provide site specific data for the purpose of modeling current site conditions for potential risk from vapor intrusion. An *Evaluation of Vapor Intrusion to Indoor Air from Soil Vapor* is included in Appendix F. Below are the results of the RBCA evaluation and the vapor intrusion evaluation.

The proposed senior housing development plans call for the entire site to be covered by buildings or concrete floors. Landscaping will only be along the street fronts and there is a planned exterior landscaped courtyard that will be located above the garage area on

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<sup>1</sup> Environmental Screening Levels (ESLs) soil gas (Vapor Intrusion concerns) for commercial/industrial land use from the 2007 *Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater* by the California Regional Water Quality Control Board, San Francisco Bay Region Interim Final November 2007, revised May 2008, Table E

the second floor. Future residents should have no direct contact with soil. The only potential direct contact with impacted soil would be by construction/utility workers during future construction. The maximum detected concentration of TPHg in shallow soil is 600 mg/kg and does not exceed the TPHg environmental screening level (ESL) for construction/trench workers of 6,000 mg/kg.

Historical depth to groundwater across the site ranges from 11.62 fbg to 22.12 fbg, so there is no expected direct contact to groundwater for either future residents or construction/utility workers.

Soil vapor data was collected on October 29, 2009 from VP-1R, VP-2, VP-3, VP-4R, VP-5R, VP-6 and newly installed VP-7. Previous sampling events occurred on June 13, 2007 and April 10, 2008 and results from those events are used in the risk evaluation. Only concentrations of TPHg, BTEX, naphthalene, and chloroform have been detected in various vapor wells. An evaluation of potential vapor intrusion into buildings was conducted based on California Environmental Protection Agency (Cal-EPA) and United States Environmental Protection Agency (USEPA) guidelines. This risk assessment was updated to include the addition of new soil vapor data, maximum concentrations detected (as compared to the 95 Upper Confidence Level), the addition of ethylbenzene inhalation slope factor and reference dose for chloroform, use of the most recent version of the Johnson & Ettinger model and adoption of newer Cal-EPA and USEPA approaches to estimating risks and hazards. All of this data, along with the risk evaluation tables are included in an *Evaluation of Vapor Intrusion to Indoor Air from Soil Vapor* (Appendix F).

The potential excess cancer risks were estimated to be  $4 \times 10^{-7}$  and  $8 \times 10^{-8}$  for onsite adult and child residents, respectively, and the noncancer hazard index for onsite child residents was estimated to be 0.005. An acceptable level range for excess cancer risks are from  $1 \times 10^{-6}$  to  $1 \times 10^{-4}$  and an acceptable hazard index is less than 1, as defined by Cal-EPA, the USEPA and other regulatory agencies. This indicates that, given this particular exposure scenario, potential vapor intrusion does not present a health threat to individuals residing in future onsite buildings.

#### **4.2 RISKS POSED TO THE ENVIRONMENT**

Hydrocarbon impact in the soil in the vicinity of former groundwater monitoring well MW-7 was well defined from previous investigations. The majority of impacted soil that may have been contributing to offsite elevated hydrocarbon concentrations in groundwater was removed by bucket auger drilling techniques and it was agreed by

Chevron and ACEH that this would sufficiently remove the need for any potential future onsite remediation.

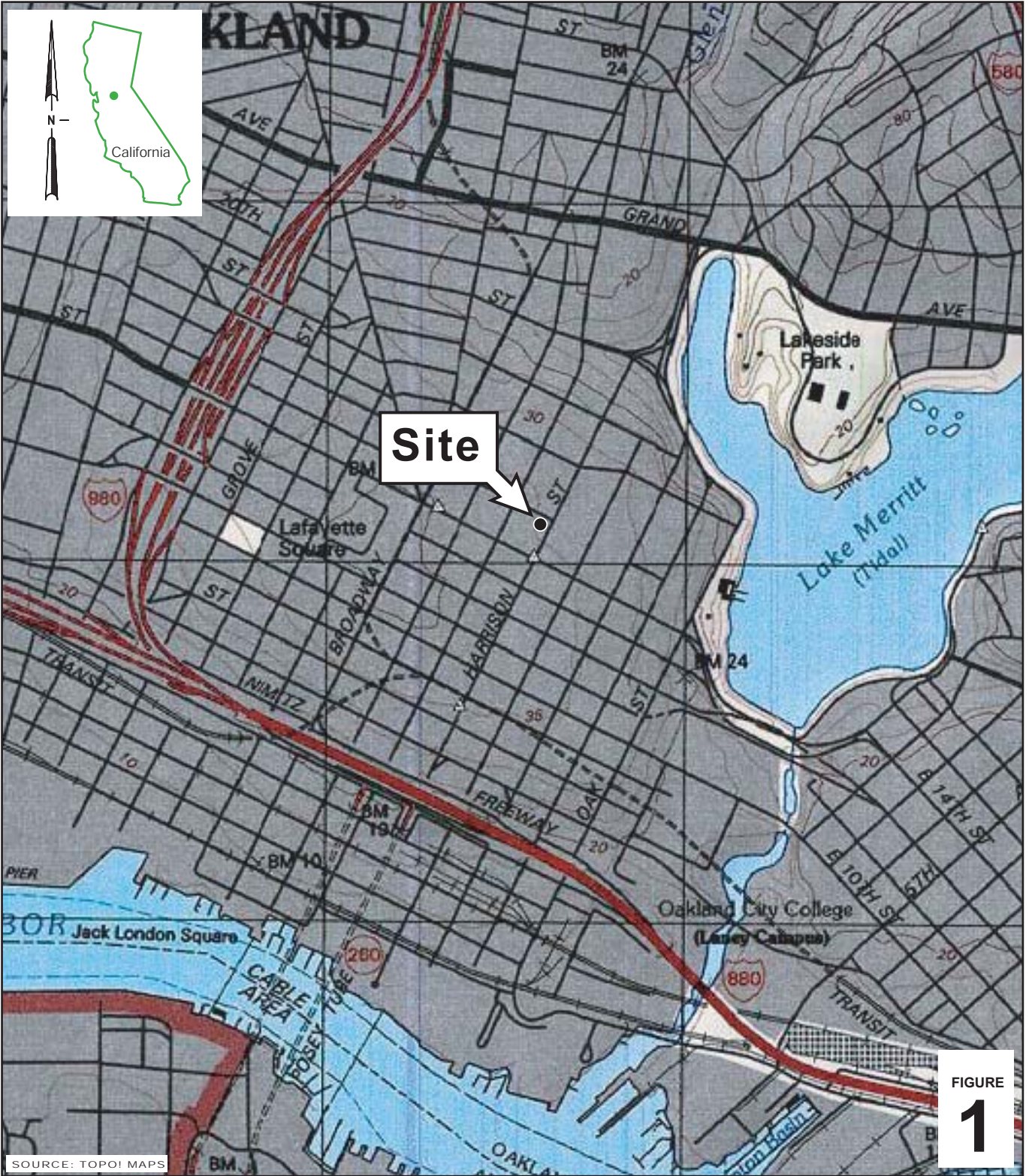
## 5.0 CONCLUSIONS

Analytical data from this investigation indicates the former second generation UST pit is not a source of residual petroleum hydrocarbons at this site. Except for TPHg in VP-7, hydrocarbon concentrations in soil vapor at the site are below residential ESLs. Based on the TPHg attenuation pattern at VP-7, TPHg concentrations from 5 fbg to the surface potentially will attenuate by at least one order of magnitude. The risk assessment, updated to include the current soil vapor results, indicate that the sub-surface conditions do not pose any potential risk to future onsite residents.

All other necessary work onsite, including destruction of the soil vapor wells, excavation and bottom sampling of the second generation UST pit, and additional over-excavation of the used oil UST pit will be completed at the time of redevelopment construction.

## FIGURES





1:19-0020 OAKLAND\FIGURES\VICINITY-MAP.A1

FIGURE 1

SOURCE: TOPOI MAPS

0 1/8 1/4 1/2 1

SCALE : 1" = 1/4 MILE

**Former Chevron Station 9-0020**  
 1633 Harrison Street  
 Oakland, California



**CONESTOGA-ROVERS  
 & ASSOCIATES**

**Vicinity Map**





## TABLES

TABLE 1

**SOIL ANALYTICAL DATA  
FORMER CHEVRON SERVICE STATION 9-0020  
1633 HARRISON STREET, OAKLAND, CALIFORNIA**

Sample ID	Sample Date	Sample Depth (fbg)	TPHd	TPHg	Benzene	Toluene	Ethyl- benzene	Total Xylenes	MTBE	TBA	DIPE	ETBE	TAME	EDB
<b>ESLs - Shallow Soil (Table A)</b>			<b>83</b>	<b>83</b>	<b>0.044</b>	<b>2.9</b>	<b>2.3</b>	<b>2.3</b>	<b>0.023</b>	<b>0.075</b>	<b>NE</b>	<b>NE</b>	<b>NE</b>	<b>0.00033</b>
<b>ESLs - Deep Soil (Table C)</b>			<b>83</b>	<b>83</b>	<b>0.044</b>	<b>2.9</b>	<b>3.3</b>	<b>2.3</b>	<b>0.023</b>	<b>0.075</b>	<b>NE</b>	<b>NE</b>	<b>NE</b>	<b>0.00033</b>
SB7	10/14/09	5.0	<4.0	<1.0	<0.0005	<0.001	<0.001	<0.001	<0.0005	<0.020	<0.001	<0.001	<0.001	<0.001
SB7	10/14/09	10.0	<4.0	<1.0	<0.0005	<0.0009	<0.0009	<0.0009	<0.0005	<0.019	<0.0009	<0.0009	<0.0009	<0.0009
SB7	10/14/09	15.0	<4.0	<1.0	<0.0005	<0.001	<0.001	<0.001	<0.0005	<0.021	<0.001	<0.001	<0.001	<0.001
SB7	10/14/09	20.5	14	<1.0	<0.0005	<0.001	<0.001	<0.001	<0.0005	<0.019	<0.001	<0.001	<0.001	<0.001
SB7	10/14/09	23.5	<4.0	<1.0	<0.0005	<0.001	<0.001	<0.001	<0.0005	<0.020	<0.001	<0.001	<0.001	<0.001
SB7	10/14/09	26.5	<4.0	<1.0	<0.0005	<0.001	<0.001	<0.001	<0.0005	<0.021	<0.001	<0.001	<0.001	<0.001
SB8	10/14/09	5.0	<4.0	<1.0	<0.0005	<0.001	<0.001	<0.001	<0.0005	<0.020	<0.001	<0.001	<0.001	<0.001
SB8	10/14/09	10.0	<4.0	<1.0	<0.0005	<0.001	<0.001	<0.001	<0.0005	<0.020	<0.001	<0.001	<0.001	<0.001
SB8	10/14/09	15.0	<4.0	<1.0	<0.0005	<0.001	<0.001	<0.001	<0.0005	<0.021	<0.001	<0.001	<0.001	<0.001
SB8	10/14/09	19.5	<4.0	<1.0	<0.0005	<0.001	<0.001	<0.001	<0.0005	<0.021	<0.001	<0.001	<0.001	<0.001
SB8	10/14/09	24.5	<4.0	<1.0	<0.0005	<0.0009	<0.0009	<0.0009	<0.0005	<0.019	<0.0009	<0.0009	<0.0009	<0.0009
SB8	10/14/09	28.5	<4.0	<1.0	<0.0005	<0.001	<0.001	<0.001	<0.0005	<0.020	<0.001	<0.001	<0.001	<0.001
VP-7	10/14/09	5.0	<4.0	<1.0	<0.0005	<0.001	<0.001	<0.001	<0.0005	<0.020	<0.001	<0.001	<0.001	<0.001
VP-7	10/14/09	10.0	<4.0	<1.0	<0.0005	<0.001	<0.001	<0.001	<0.0005	<0.019	<0.001	<0.001	<0.001	<0.001

TABLE 1

**SOIL ANALYTICAL DATA  
FORMER CHEVRON SERVICE STATION 9-0020  
1633 HARRISON STREET, OAKLAND, CALIFORNIA**

Sample ID	Sample Date	Sample Depth (fbg)	TPHd	TPHg	Benzene	Toluene	Ethyl- benzene	Total Xylenes	MTBE	TBA	DIPE	ETBE	TAME	EDB
ESLs - Shallow Soil (Table A)			83	83	0.044	2.9	2.3	2.3	0.023	0.075	NE	NE	NE	0.00033
ESLs - Deep Soil (Table C)			83	83	0.044	2.9	3.3	2.3	0.023	0.075	NE	NE	NE	0.00033

**Abbreviations/Notes:**

Total Petroleum hydrocarbons as Diesel (TPHd) by modified EPA method 8015B with Silica Gel Cleanup.

Total petroleum hydrocarbons as gasoline (TPHg) by EPA method 8015.

Benzene, toluene, ethylbenzene, xylenes (BTEX) and methyl tert-butyl alcohol (MTBE) by EPA method 8260.

Environmental Screening Levels (ESLs) for shallow and deep soil in areas where groundwater is a current or potential drinking water resource from *Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater* prepared by the California Regional Water Quality Control Board - San Francisco Bay Region Interim Final November 2007, Revised May 2008.

fbg = Feet below grade.

NE = Not established.

<x = Not detected above lab detection limit.

-- = Not analyzed or not applicable.

**TABLE 1**  
**SOIL ANALYTICAL DATA**  
**FORMER CHEVRON SERVICE STATION 9-0020**  
**1633 HARRISON STREET, OAKLAND, CALIFORNIA**

<i>1,2-DCA</i>
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<i>0.0045</i>
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<0.001
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TABLE 1

SOIL ANALYTICAL DATA  
FORMER CHEVRON SERVICE STATION 9-0020  
1633 HARRISON STREET, OAKLAND, CALIFORNIA

	<i>1,2-DCA</i>
—————→	
	<u>0.0045</u>
	<u>0.0045</u>

on

TABLE 2

**GRAB-GROUNDWATER ANALYTICAL DATA  
FORMER CHEVRON STATION 9-0020  
1633 HARRISON STREET OAKLAND, CALIFORNIA**

Sample ID	Sample Date	Sample Depth (fbg)	TPHd	TPHg	Benzene	Toluene	Ethyl- benzene	Total Xylenes	MTBE	TBA	DIPE	ETBE	TAME	EDB	1,2- DCA
<i>ESLs - Groundwater</i>			100	100	1.0	40	30	20	5.0	12	NE	NE	NE	0.05	0.5
SB7	10/14/09	23.0	<320	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5
SB8	10/14/09	24.0	<320	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5

**Abbreviations/Notes:**

Total petroleum hydrocarbons as diesel (TPHd) by modified EPA Method 8015B with silca gel cleanup.

Total petroleum hydrocarbons as gasoline (TPHg) by modified EPA Method 8015B.

Benzene, toluene, ethylbenzene, total xylenes (BTEX), methyl tertiary butyl ether (MTBE), t-butyl alcohol (TBA), di-isopropyl ether (DIPE), ethyl t-butyl ether (ETBE), t-amyl methyl ether (TAME), 1,2-dibromoethane (EDB) and 1,2-dichloroethane (1,2-DCA) by

Environmental Screening Levels (ESLs) for groundwater that is a current or potential drinking water source from *Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater* prepared by the California Regional Water Quality Control Board - San Francisco Bay Region Interim Final November 2007, Revised May 2008.

Fbg = Feet below grade.

NE = Not established.

<x = Not detected above laboratory method detection limit x.

-- = Not analyzed or not applicable.

TABLE 3

CUMULATIVE SOIL VAPOR ANALYTICAL DATA  
FORMER CHEVRON STATION 9-0020  
1633 HARRISON STREET, OAKLAND, CALIFORNIA

Sample ID	Sample Date	Sample Depth (fbg)	TPH (C5+)	TPHg (By TO-3)	TPHg (By TO-15)	Benzene	Toluene	Ethyl-benzene	Total Xylenes <sup>1</sup>	MTBE	TBA	DIPE	ETBE	TAME	EDB	1,2-DCA	Naphthalene	Chloroform	Ethanol	Other HVOCs	Iso-butane <sup>2</sup> ppbv	Concentrations reported in % volume					
																						O <sub>2</sub>	CO <sub>2</sub>	N <sub>2</sub>	CH <sub>4</sub>	Helium	
<b>ESLs - Soil Gas, Residential</b>			<b>10,000</b>	<b>10,000</b>	<b>10,000</b>	<b>280</b>	<b>63,000</b>	<b>980</b>	<b>21,000</b>	<b>9,400</b>	<b>NE</b>	<b>NE</b>	<b>NE</b>	<b>NE</b>	<b>4.1</b>	<b>94</b>	<b>72</b>	<b>460</b>	<b>NE</b>	<b>--</b>	<b>--</b>	<b>NE</b>	<b>NE</b>	<b>NE</b>	<b>NE</b>	<b>NE</b>	
VP-1-5	06/18/07	5.0-5.5	1,000,000	1,100,000	--	110	220	480	1,000	<56	<190	<260	<260	<260	<120	<63	<330	<46	<120	ND	ND	4.5	10	--	--	--	
VP-1-5	LAB DUPLICATE		1,100,000	1,100,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.6	10	--	--	--
VP-1-10	06/18/07	10.0-10.5	2,600,000	2,600,000	--	2,600	2,000	4,800	5,000	<21	<70	<97	<97	<97	<44	<23	740	<17	<44	ND	ND	5.0	6.1	--	--	--	
VP-1R-5	04/10/08	5.0-5.5	--	<240	--	<3.7	<4.4	<5.0	<5.0	<4.2	<14	<19	<19	<19	<9.0	<4.7	<24	<3.4	<8.8	ND	--	4.6	0.29	--	--	<0.12	
VP-1R-5*	10/26/09	5.0-5.5	--	--	<97	<3.8	<4.5	<5.1	<5.1	<4.3	--	--	--	--	--	--	<25UJ	--	--	--	--	13	4.3	83	<0.00024	<0.12	
VP-1R-10	04/10/08	10.0-10.5	--	<230	--	<3.6	<4.3	<5.0	<5.0	<4.1	<14	<19	<19	<19	<8.8	<4.6	<24	<3.4	<8.6	ND	--	2.3	0.20	--	--	<0.11	
VP-1R-10	LAB DUPLICATE		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.3	0.20	--	--	<0.11	
VP-1R-10*	10/26/09	10.0-10.5	--	--	<99	<3.9	<4.6	<5.2	<5.2	<4.4	--	--	--	--	--	--	<25UJ	--	--	--	--	10	5.5	84	<0.00024	<0.12	
VP-2-5	06/18/07	5.0-5.5	9,300	8,900	--	7.9	420	170	530	<4.4	<15	<21	<21	<21	<9.5	<5.0	<26	14	<9.3	ND	--	16	1.2	--	--	--	
VP-2-5	04/10/08	5.0-5.5	--	1,600	--	<3.9	<4.6	<5.2	8.2	<4.4	<15	<20	<20	<20	<9.3	<4.9	<25	<3.5	<9.1	ND	--	15	2.8	--	--	<0.12	
VP-2-5	LAB DUPLICATE		--	1,500	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
VP-2-5	10/26/09	5.0-5.5	--	--	290J	<3.9	9.4	<5.3	17	<4.4	--	--	--	--	--	--	<26UJ	--	--	--	--	15	3.7	81	<0.00024	<0.12	
VP-2-10	06/18/07	10.0-10.5	4,300	4,000	--	12	280	66	260	<4.4	<15	<20	<20	<20	<9.3	<4.9	<25	<3.5	<9.1	ND	--	16	2.3	--	--	--	
VP-2-10	LAB DUPLICATE		4,500	4,200	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
VP-2-10	04/10/08	10.0-10.5	--	<250	--	<3.9	<4.6	<5.4	<5.4	<4.4	<15	<21	<21	<21	<9.5	<5.0	<26	<3.6	<9.3	ND	--	14	3.6	--	--	<0.12	
VP-2-10 DUP	04/10/08	10.0-10.5	--	<250	--	<3.9	<4.6	<5.4	<5.4	<4.4	<15	<21	<21	<21	<9.5	<5.0	<26	<3.6	<9.3	ND	--	14	3.6	--	--	<0.12	
VP-2-10	10/26/09	10.0-10.5	--	--	3,900J	<4.1	<4.9	<5.6	<5.6	<4.7	--	--	--	--	--	--	<27UJ	--	--	--	--	14	4.7	81	<0.00026	<0.13	
VP-2-10 DUP	10/26/09	10.0-10.5	--	--	250J	<4.0	<4.8	<5.5	<5.5	<4.6	--	--	--	--	--	--	<26UJ	--	--	--	--	15	4.9	80	<0.00025	<0.13	
VP-3-5	06/18/07	5.0-5.5	9,100	8,200	--	29	600	120	490	<4.4	<15	<20	<20	<20	<9.3	<4.9	<25	<3.5	<9.1	ND	--	16	0.80	--	--	--	
VP-3-5 DUP	06/18/07	5.0-5.5	9,100	8,200	--	28	590	120	490	<4.4	<15	<20	<20	<20	<9.3	<4.9	<25	4.3	<9.1	ND	--	16	0.79	--	--	--	
VP-3-5	04/10/08	5.0-5.5	--	330	--	<3.4	6.5	7.8	32	<3.9	<13	<18	<18	<18	<8.3	<4.4	<23	<3.2	<8.1	8.1 a	--	13	2.1	--	--	<0.11	
VP-3-5	LAB DUPLICATE		--	--	--	<3.4	6.4	8.3	32	<3.9	<13	<18	<18	<18	<8.3	<4.4	<23	<3.2	<8.1	8.0 a	--	--	--	--	--	--	
VP-3-5	10/26/09	5.0-5.5	--	--	310J	<4.1	<4.8	<5.5	<5.5	<4.6	--	--	--	--	--	--	<27UJ	--	--	--	--	13	3.1	84	<0.00026	<0.13	
VP-3-10	06/18/07	10.0-10.5	11,000	10,000	--	56	1,000	170	630	<4.4	<15	<20	<20	<20	<9.3	<4.9	<25	4.3	<9.1	ND	ND	15	0.93	--	--	--	
VP-3-10	LAB DUPLICATE		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	15	0.93	--	--	--	
VP-3-10	04/10/08	10.0-10.5	--	<250	--	<3.9	<4.6	<5.2	<5.2	<4.4	<15	<20	<20	<20	<9.3	<4.9	<25	<3.5	<9.1	ND	--	16	1.7	--	--	<0.12	
VP-3-10	10/26/09	10.0-10.5	--	--	<100	<4.0	<4.8	<5.5	<5.5	<4.6	--	--	--	--	--	--	<26UJ	--	--	--	--	13	4.6	82	<0.00025	<0.13	

TABLE 3

CUMULATIVE SOIL VAPOR ANALYTICAL DATA  
FORMER CHEVRON STATION 9-0020  
1633 HARRISON STREET, OAKLAND, CALIFORNIA

Sample ID	Sample Date	Sample Depth (fbg)	TPH (C5+)	TPHg (By TO-3)	TPHg (By TO-15)	Benzene	Toluene	Ethyl-benzene	Total Xylenes <sup>1</sup>	MTBE	TBA	DIPE	ETBE	TAME	EDB	1,2-DCA	Naphthalene	Chloroform	Ethanol	Other HVOCs	Iso-butane <sup>2</sup> ppbv	Concentrations reported in % volume				
																						O <sub>2</sub>	CO <sub>2</sub>	N <sub>2</sub>	CH <sub>4</sub>	Helium
<b>ESLs - Soil Gas, Residential</b>			<b>10,000</b>	<b>10,000</b>	<b>10,000</b>	<b>280</b>	<b>63,000</b>	<b>980</b>	<b>21,000</b>	<b>9,400</b>	<b>NE</b>	<b>NE</b>	<b>NE</b>	<b>NE</b>	<b>4.1</b>	<b>94</b>	<b>72</b>	<b>460</b>	<b>NE</b>	<b>--</b>	<b>--</b>	<b>NE</b>	<b>NE</b>	<b>NE</b>	<b>NE</b>	<b>NE</b>
VP-4-5	06/18/07	5.0-5.5	14,000	13,000	--	26	620	130	520	<4.4	<15	<20	<20	<20	<9.3	<4.9	<25	<3.5	18	ND	--	14	0.88	--	--	--
VP-4-10	06/18/07	10.0-10.5	10,000	9,800	--	15	310	120	280	<4.3	<14	<20	<20	<20	<9.1	<4.8	<25	<3.5	<9.0	ND	--	13	2.9	--	--	--
VP-4-10	LAB DUPLICATE		--	--	--	14	310	120	280	<4.3	<14	<20	<20	<20	<9.1	<4.8	<25	<3.5	<9.0	ND	--	--	--	--	--	--
VP-4R-5	04/10/08	5.0-5.5	--	380	--	<3.6	<4.2	<4.9	<4.9	<4.0	<14	<19	<19	<19	<8.6	<4.5	<23	10	<8.4	20 a	--	8.1	0.56	--	--	<0.11
VP-4R-5	10/26/09	5.0-5.5	--	--	340J	<3.6	<4.2	<4.9	<4.9	<4.1	--	--	--	--	--	--	<24UJ	--	--	--	--	9.8	3.8	86	<0.00023	<0.11
VP-4R-10	04/10/08	10.0-10.5	--	1,100	--	6.3	10	<5.6	15	<4.6	<16	<22	<22	<22	<9.9	<5.2	<27	4.0	<9.7	15 a	--	7.7	2.7	--	--	<0.13
VP-4R-10	10/26/09	10.0-10.5	--	--	690J	<3.6	<4.3	<4.9	14	<4.1	--	--	--	--	--	--	<24UJ	--	--	--	--	7.7	6.2	86	<0.00023	<0.11
VP-5-5	06/18/07	5.0-5.5	20,000	19,000	--	35	820	160	590	<4.3	<14	<20	<20	<20	<9.1	<4.8	<25	6.4	<9.0	ND	--	17	0.15	--	--	--
VP-5-10	06/18/07	10.0-10.5	8,100	6,900	--	9.0	160	42	130	<4.2	<14	<19	<19	<19	<9.0	<4.7	<24	<3.4	<8.8	ND	--	18	1.1	--	--	--
VP-5-10 DUP	06/18/07	10.0-10.5	4,900	4,300	--	8.0	160	34	110	<4.4	<15	<20	<20	<20	<9.3	<4.9	<25	<3.5	<9.1	ND	--	18	1.0	--	--	--
VP-5R-5	04/10/08	5.0-5.5	--	440	--	<3.3	7.7	<4.4	5.3	<3.7	<12	<17	<17	<17	<7.9	<4.1	<21	5.3	<7.7	18 a	--	15	0.056	--	--	<0.10
VP-5R-5 DUP	04/10/08	5.0-5.5	--	590	--	<3.6	<4.3	<5.0	<5.0	<4.1	<14	<19	<19	<19	<8.8	<4.6	<24	5.1	<8.6	19 a	--	15	0.054	--	--	<0.11
VP-5R-5	10/26/09	5.0-5.5	--	--	260J	<4.0	<4.7	<5.4	<5.4	<4.5	--	--	--	--	--	--	<26UJ	--	--	--	--	4.6	1.4	94	<0.00025	<0.12
VP-5R-5 DUP	10/26/09	5.0-5.5	--	--	190J	<3.9	<4.6	<5.3	8.3	<4.4	--	--	--	--	--	--	<26UJ	--	--	--	--	4.5	1.4	94	<0.00025	<0.12
VP-5R-10	04/10/08	10.0-10.5	--	680	--	14	<4.4	<5.0	9.4	<4.2	<14	<19	<19	<19	<9.0	<4.7	<24	<3.4	<8.8	10 a	--	11	0.60	--	--	<0.12
VP-5R-10	10/26/09	10.0-10.5	--	--	460J	<8.6	<10	<12	<12	<9.7	--	--	--	--	--	--	<56UJ	--	--	--	--	4.8	2.6	93	<0.00025	<0.13
VP-5R-10	LAB DUPLICATE		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.8	2.6	93	<0.00054	<0.27
VP-6-5	06/18/07	5.0-5.5	41,000	38,000	--	28	320	130	320	<4.2	<14	<19	<19	<19	<9.0	<4.7	110	<3.4	<8.8	ND	--	14	1.8	--	--	--
VP-6-5	04/10/08	5.0-5.5	--	860	--	4.4	17	<5.4	28	<4.4	<15	<21	<21	<21	<9.5	<5.0	<26	<3.6	<9.3	ND	--	11	6.0	--	--	<0.12
VP-6-5	10/26/09	5.0-5.5	--	--	<100	<3.9	11	<5.3	11	<4.4	--	--	--	--	--	--	<26UJ	--	--	--	--	9.6	8.3	82	<0.00025	<0.12
VP-6-10	06/18/07	10.0-10.5	17,000	15,000	--	20	450	95	330	<4.2	<14	<19	<19	<19	<9.0	<4.7	29	<3.4	<8.8	ND	ND	12	1.4	--	--	--
VP-6-10	04/10/08	10.0-10.5	--	4,600	--	<3.6	<4.3	<5.0	<5.0	<4.1	<14	<19	<19	<19	<8.8	<4.6	<24	<3.4	<8.6	ND	--	9.4	8.1	--	--	<0.11
VP-6-10	10/26/09	10.0-10.5	--	--	<99	<3.9	<4.6	<5.2	<5.2	<4.4	--	--	--	--	--	--	<25UJ	--	--	--	--	7.4	11	82	<0.00024	<0.12
VP-7-5	10/26/09	5.0-5.5	--	--	75,000J	37	28	<11	15	<8.9	--	--	--	--	--	--	<52UJ	--	--	--	--	7.0	<0.025	93	0.026	<0.12
VP-7-5	LAB DUPLICATE		--	--	77,000J	37	27	<11	15	<8.9	--	--	--	--	--	--	<52UJ	--	--	--	--	--	--	--	--	--



TABLE 3

CUMULATIVE SOIL VAPOR ANALYTICAL DATA  
 FORMER CHEVRON STATION 9-0020  
 1633 HARRISON STREET, OAKLAND, CALIFORNIA

Sample ID	Sample Date	Sample Depth (fbg)	TPH (C5+)	TPHg	TPHg	Benzene	Toluene	Ethyl-	Total	MTBE	TBA	DIPE	ETBE	TAME	EDB	1,2-	Naph-	Chloro-	Ethanol	Other	Iso-	O <sub>2</sub>	CO <sub>2</sub>	N <sub>2</sub>	CH <sub>4</sub>	Helium		
				(By TO-3)	(By TO-15)			benzene	Xylenes <sup>1</sup>							DCA	alene	form		HVOCs							butane <sup>2</sup>	
			← Concentrations reported in micrograms per cubic meter (µg/m <sup>3</sup> ) →																					Concentrations reported in % volume				
<b>ESLs - Soil Gas, Residential</b>			<b>10,000</b>	<b>10,000</b>	<b>10,000</b>	280	63,000	980	21,000	9,400	NE	NE	NE	NE	4.1	94	72	460	NE	--	--	NE	NE	NE	NE	NE		
VP-7-10	10/26/09	10.0-10.5	--	--	<b>5,400,000</b>	280	<160	<190	<190	<150	--	--	--	--	--	--	<900	--	--	--	--	1.4	<0.026	97	1.8	<0.13		
VP-7-10	LAB DUPLICATE		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.5	<0.026	97	1.8	<0.13		

**Abbreviations/Notes:**

Total petroleum hydrocarbons C5+ (TPH C5+) by EPA Method TO-3, originally reported in micrograms per liter (µg/L) and converted to µg/m<sup>3</sup> using Air Toxics Units Conversion Calculator.

Total petroleum hydrocarbons as gasoline (TPHg) by EPA Method TO-3 or TO-15 as noted. TO-3 concentrations originally reported in µg/L and converted to µg/m<sup>3</sup> using Air Toxics Units Conversion Calculator.

Benzene, toluene, ethylbenzene and xylenes (BTEX) and by EPA TO-15.

Methyl tertiary butyl ether (MTBE), tert butyl ether (TBA), isopropyl ether (DIPE), ethyl-tert-butyl ether (ETBE), tert amyl-methyl ether (TAME), 1,2-dibromoethane (EDB), 1,2-dichloroethane (1,2-DCA), naphthalene, chloroform and ethanol by EPA Method TO-1

Other Highly Volatile Organic Compounds (HVOCs) = Tetrachloroethane, trichloroethane, trans-1,2-dichloroethane, cis-1,2-dichloroethane, 1,1-dichloroethane, carbon tetrachloride, 1,1,1-trichloroethane, 1,2-dichloropropane.

Oxygen (O<sub>2</sub>), carbon dioxide (CO<sub>2</sub>), nitrogen (N<sub>2</sub>), methane (CH<sub>4</sub>) and helium by method ASTM D-1946M.

Environmental Screening Levels (ESLs) for shallow soil gas in residential land from *Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater* prepared by the California Regional Water Quality Control Board - San Francisco Bay Region Interim Final November 2007, Revised May 2008.

NE = Not established.

1 = Displaying only highest xylene value (either xylene-m,p or xylene-o) detected.

2 = Constituent used as leak detector determined as a Tentatively Identified Compound (TICs) by Modified EPA Method TO-15.

J = Estimated value due to bias in the CCV.

UJ = Non-detected compound associated with low bias in the CCV.

a = No other HVOCs detected except Tetrachloroethane at concentrations reported. Tetrachloroethane ESL = 410 µg/m<sup>3</sup>.

Fbg = Feet below grade.

ND = Not detected above various laboratory method detection limits.

<X = Not detected above laboratory method detection limit x.

-- = Not analyzed/not applicable.

\* = Samples were originally labeled as VP-1-5 and VP-1-10, but were in fact collected from VP-1R-5 and VP-1R-10. VP-1 was destroyed during the 2008 excavation and replaced with VP-1R.

**BOLD** = Concentration exceeds applicable ESL.

APPENDIX A

REGULATORY CORRESPONDENCE



ENVIRONMENTAL HEALTH SERVICES  
ENVIRONMENTAL PROTECTION  
1131 Harbor Bay Parkway, Suite 250  
Alameda, CA 94502-6577  
(510) 567-6700  
FAX (510) 337-9335

September 24, 2009

Mr. Aaron Costa  
6001 Bollinger Canyon Road, Room 3360  
PO Box 6012  
San Ramon, CA 94583-2324  
(sent via electronic mail to [acosta@chevron.com](mailto:acosta@chevron.com))

Mr. Shadrick Small  
Oakland Housing Authority  
1805 Harrison Street  
Oakland, CA 94612  
(sent via electronic mail to [ssmall@oakha.org](mailto:ssmall@oakha.org))

Subject: Approval of Two Work Plans With Modifications; Fuel Leak Case No. RO0000143 (Global ID # T0600100304), Chevron #9-0020, 1633 Harrison Street, Oakland, CA 94612

Dear Mr. Costa and Mr. Small:

I have been recently assigned to your case; please send all future correspondence or inquiries to my attention. It will be greatly appreciated. First off, thank you for submitting the *Work Plan for Monitoring Well Installation and Offsite Investigation*, dated June 11, 2009, and *Work Plan for Additional Onsite Investigation*, dated July 24, 2009; each was prepared by Conestoga Rovers Associates (CRA). Based on Alameda County Environmental Health (ACEH) staff review of the referenced documents and of the case file we generally concur with the proposed scope of work, provided that the modifications requested in the technical comments below are addressed and incorporated during the field implementation. Submittal of a revised Work Plan is not required unless an alternate scope of work outside that described in the Work Plan and technical comments below is proposed.

We request that you address the following technical comments, perform the proposed work, and send us the technical reports requested below. Please provide 72-hour advance written notification to this office (e-mail preferred to: [mark.detterman@acgov.org](mailto:mark.detterman@acgov.org)) prior to the start of field activities.

### **TECHNICAL COMMENTS**

1. **Offsite Groundwater Plume Delineation** – The June 11, 2009 work plan proposes to install two soil bores in the vicinity of well MW-16 to assist in the delineation of the offsite groundwater plume.
  - a. ACEH additionally requests the installation of one soil bore along the north side of 17<sup>th</sup> Street, west of Harrison Street, to fill a data gap in the downgradient extent of delineation.
  - b. The June 11, 2009 work plan does not detail the collection of grab groundwater samples, or sampling protocols, from the proposed downgradient soil bores in the vicinity of well MW-16 to be used to assist in the delineation of the downgradient extent of the dissolved plume. Please ensure grab groundwater samples are collected from the two proposed and the one requested downgradient bores, the grab groundwater collection protocols conform to grab groundwater protocols outlined in the July 24, 2009, work plan for onsite work, and that the analytical suite is as discussed further below at all bore locations.

**2. Clarifications to Work Plans** – With modifications and clarifications ACEH is in general concurrence with the work proposed in both the referenced work plans. These modifications and clarifications include:

- a. **Representative Shallow Soil Samples** - Both work plans propose hand clearing or use of an air knife to a depth of eight feet below grade surface (bgs). ACEH agrees that hand clearing soil bores is an important step, and recognizes that Chevron corporate preferences exist; however, ACEH is concerned that proposed total depth for hand clearing the bores may preclude collection of important shallow soil data including analytical sample collection. ACEH is also concerned that use of an air knife will volatilize target compounds resulting in low-biased analytical results. As detailed in Figure 2 of both work plans it would appear that adequate lateral control of utility line locations is currently understood, will be further refined through the use of Underground Services Alert (USA), and the use of a private utility locator. Utility line burial depths are also available from City offices. Within these constraints, please collect representative shallow soil bore data. Please ensure proper collection of shallow soil samples includes adequate instrumental screening, sampling, and analysis, if appropriate.
- b. **Collection and Analysis of Soil & Groundwater** – ACEH generally concurs with the proposed collection and the selected analytical suite outlined for soil and groundwater data contained in both work plans; however, ACEH did not locate details for the minimum number of soil samples proposed to be submitted for analysis. Please ensure that the soil samples collected are also analyzed as outlined in the work plans. In addition to your proposed soil sampling, ACEH requests that soil samples be collected and submitted for analysis from the capillary fringe, saturated zone, and areas with high PID readings.

Review of Table 1 *Comprehensive Analytic Results for Soil* contained in the June 28, 2007 *Remedial Action Plan* by CRA, or in other compilations of soil data in the case file did not locate analytical results for EBD and EDC in exploratory soil bores (EBD and other fuel additives were collected at the base of all remedial bucket auger soil bores, and all were non-detectable at the limits of the excavations). Please add this analyte to the soil and groundwater analytical suite for the pending work. Additional sampling may or may not be warranted thereafter depending upon results.

- c. **Well Survey** – ACEH generally concurs with the proposed survey of new well MW-17 to mean sea level contained in the *Work Plan for Monitoring Well Installation and Offsite Investigation*, dated June 11, 2009; however, please ensure the well is also surveyed to Geotracker standards for upload to the Geotracker database.
- d. **Well MW-17 Screen Interval** – The June 11, 2009 work plan indicates that the well screen will be 10 feet in length between 15 and 25 feet bgs. In general, ACEH generally recommends the use of monitoring wells designed with sand pack intervals of 5 feet or less; as these wells will likely be representative of depth discrete groundwater conditions. ACEH in particular calls to your attention the well and bore log for downgradient well MW-9, wherein an apparent 4-inch thick clay within a 11 foot section of fine sand separates the vadose zone from an impacted water-bearing zone. This well used an appropriate 5-foot well screen between 20 to 25 feet bgs (see attachment).
- e. **Semi-Annual Sampling of New Well MW-17** – The *Work Plan for Monitoring Well Installation and Offsite Investigation*, dated June 11, 2009, proposes to sample new well MW-17 semi-annually. Please ensure well MW-17 is monitored and sampled on a quarterly interval for a period of one year.
- f. **Soil Vapor Sampling Protocol** – ACEH generally concurs with the proposed soil vapor sampling protocol. The *Work Plan for Additional Onsite Investigation* dated July 24, 2009, indicates that leak testing will use laboratory grade helium; however, the work plan or Attachment C “Standard Field Procedures” do not specify or otherwise indicate that a shroud will be utilized. Please ensure that a shroud is used for leak testing while collecting the vapor samples.

## **TECHNICAL REPORT REQUEST**

Please submit technical reports to Alameda County Environmental Health (Attention: Mr. Mark Detterman), according to the following schedule:

- **December 30, 2009** – Soil and Groundwater Investigation Report

Reports are requested pursuant to California Health and Safety Code Section 25296.10. 23 CCR Sections 2652 through 2654, and 2721 through 2728 outline the responsibilities of a responsible party in response to an unauthorized release from a petroleum UST system, and require your compliance with this request.

## **ELECTRONIC SUBMITTAL OF REPORTS**

ACEH's Environmental Cleanup Oversight Programs (LOP and SLIC) require submission of reports in electronic form. The electronic copy replaces paper copies and is expected to be used for all public information requests, regulatory review, and compliance/enforcement activities. Instructions for submission of electronic documents to the Alameda County Environmental Cleanup Oversight Program FTP site are provided on the attached "Electronic Report Upload Instructions." Submission of reports to the Alameda County FTP site is an addition to existing requirements for electronic submittal of information to the State Water Resources Control Board (SWRCB) Geotracker website. In September 2004, the SWRCB adopted regulations that require electronic submittal of information for all groundwater cleanup programs. For several years, responsible parties for cleanup of leaks from underground storage tanks (USTs) have been required to submit groundwater analytical data, surveyed locations of monitoring wells, and other data to the Geotracker database over the Internet. Beginning July 1, 2005, these same reporting requirements were added to Spills, Leaks, Investigations, and Cleanup (SLIC) sites. Beginning July 1, 2005, electronic submittal of a complete copy of all reports for all sites is required in Geotracker (in PDF format). Please visit the SWRCB website for more information on these requirements ([http://www.swrcb.ca.gov/ust/electronic\\_submittal/report\\_rqmts.shtml](http://www.swrcb.ca.gov/ust/electronic_submittal/report_rqmts.shtml)).

## **PERJURY STATEMENT**

All work plans, technical reports, or technical documents submitted to ACEH must be accompanied by a cover letter from the responsible party that states, at a minimum, the following: "I declare, under penalty of perjury, that the information and/or recommendations contained in the attached document or report is true and correct to the best of my knowledge." This letter must be signed by an officer or legally authorized representative of your company. Please include a cover letter satisfying these requirements with all future reports and technical documents submitted for this fuel leak case.

## **PROFESSIONAL CERTIFICATION & CONCLUSIONS/RECOMMENDATIONS**

The California Business and Professions Code (Sections 6735, 6835, and 7835.1) requires that work plans and technical or implementation reports containing geologic or engineering evaluations and/or judgments be performed under the direction of an appropriately registered or certified professional. For your submittal to be considered a valid technical report, you are to present site specific data, data interpretations, and recommendations prepared by an appropriately licensed professional and include the professional registration stamp, signature, and statement of professional certification. Please ensure all that all technical reports submitted for this fuel leak case meet this requirement.

Mr. Aaron Costa and Mr. Shadrick Small  
September 24, 2009  
RO0000143, Page 4

#### UNDERGROUND STORAGE TANK CLEANUP FUND

Please note that delays in investigation, later reports, or enforcement actions may result in your becoming ineligible to receive grant money from the state's Underground Storage Tank Cleanup Fund (Senate Bill 2004) to reimburse you for the cost of cleanup.

#### AGENCY OVERSIGHT

If it appears as though significant delays are occurring or reports are not submitted as requested, we will consider referring your case to the Regional Board or other appropriate agency, including the County District Attorney, for possible enforcement actions. California Health and Safety Code, Section 25299.76 authorizes enforcement including administrative action or monetary penalties of up to \$10,000 per day for each day of violation.

Should you have any questions, please contact me at (510) 567-6876 or send me an electronic mail message at [mark.detterman@acgov.org](mailto:mark.detterman@acgov.org).

Sincerely,

Mark E. Detterman, PG, CEG  
Hazardous Materials Specialist

cc: Charlotte Evans, Conestoga-Rovers & Assoc., 5900 Hollis Street, Suite A, Emeryville, CA 94608  
(sent via electronic mail to [cevans@croworld.com](mailto:cevans@croworld.com))  
Leroy Griffin, Oakland Fire Department, 250 Frank H. Ogawa Plaza, Suite 3341, Oakland, CA 94612-2032  
(sent via electronic mail to [lgriffin@oaklandnet.com](mailto:lgriffin@oaklandnet.com))  
Karl Lauff, Christian Church Homes, 303 Hegenberger Road, Suite 201, Oakland, CA 94621-1419  
(sent via electronic mail to [klauff@cchnc.org](mailto:klauff@cchnc.org))  
Jerian Alexander, Fugro West, Inc., 502 Giuseppe Court, Suite 11, Roseville, CA 95678  
(sent via electronic mail to [jalexander@fugro.com](mailto:jalexander@fugro.com))

Donna Drogos, File

<b>Alameda County Environmental Cleanup Oversight Programs (LOP and SLIC)</b>	<b>ISSUE DATE:</b> July 5, 2005
	<b>REVISION DATE:</b> March 27, 2009
	<b>PREVIOUS REVISIONS:</b> December 16, 2005, October 31, 2005
<b>SECTION:</b> Miscellaneous Administrative Topics & Procedures	<b>SUBJECT:</b> Electronic Report Upload (ftp) Instructions

The Alameda County Environmental Cleanup Oversight Programs (LOP and SLIC) require submission of all reports in electronic form to the county's ftp site. Paper copies of reports will no longer be accepted. The electronic copy replaces the paper copy and will be used for all public information requests, regulatory review, and compliance/enforcement activities.

#### REQUIREMENTS

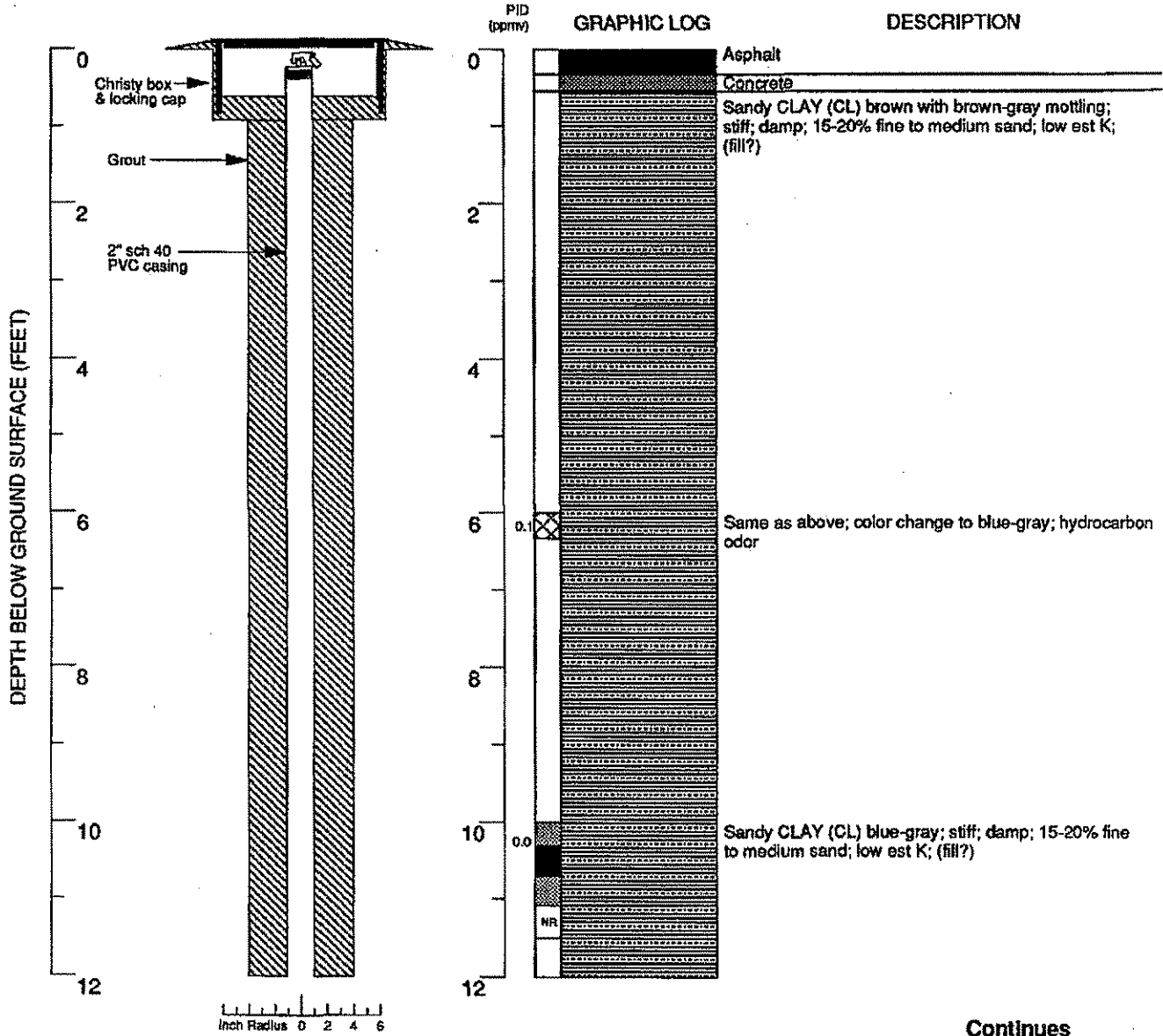
- Entire report including cover letter must be submitted to the ftp site as a **single portable document format (PDF) with no password protection**. (Please do not submit reports as attachments to electronic mail.)
- It is **preferable** that reports be converted to PDF format from their original format, (e.g., Microsoft Word) rather than scanned.
- Signature pages and perjury statements **must** be included and have either original or electronic signature.
- **Do not password protect the document**. Once indexed and inserted into the correct electronic case file, the document will be secured in compliance with the County's current security standards and a password. **Documents with password protection will not be accepted.**
- Each page in the PDF document should be rotated in the direction that will make it easiest to read on a computer monitor.
- Reports must be named and saved using the following naming convention:  
RO#\_Report Name\_Year-Month-Date (e.g., RO#5555\_WorkPlan\_2005-06-14)

#### Additional Recommendations

- A separate copy of the tables in the document should be submitted by e-mail to your Caseworker in **Excel** format. These are for use by assigned Caseworker only.

#### Submission Instructions

- 1) Obtain User Name and Password:
  - a) Contact the Alameda County Environmental Health Department to obtain a User Name and Password to upload files to the ftp site.
    - i) Send an e-mail to [dehloptoxic@acgov.org](mailto:dehloptoxic@acgov.org)  
Or
    - ii) Send a fax on company letterhead to (510) 337-9335, to the attention of My Le Huynh.
  - b) In the subject line of your request, be sure to include **"ftp PASSWORD REQUEST"** and in the body of your request, include the **Contact Information, Site Addresses**, and the **Case Numbers (RO# available in Geotracker) you will be posting for**.
- 2) Upload Files to the ftp Site
  - a) Using Internet Explorer (IE4+), go to <ftp://alcoftp1.acgov.org>
    - (i) Note: Netscape and Firefox browsers will not open the FTP site.
  - b) Click on File, then on Login As.
  - c) Enter your User Name and Password. (Note: Both are Case Sensitive.)
  - d) Open "My Computer" on your computer and navigate to the file(s) you wish to upload to the ftp site.
  - e) With both "My Computer" and the ftp site open in separate windows, drag and drop the file(s) from "My Computer" to the ftp window.
- 3) Send E-mail Notifications to the Environmental Cleanup Oversight Programs
  - a) Send email to [dehloptoxic@acgov.org](mailto:dehloptoxic@acgov.org) notify us that you have placed a report on our ftp site.
  - b) Copy your Caseworker on the e-mail. Your Caseworker's e-mail address is the entire first name then a period and entire last name @acgov.org. (e.g., firstname.lastname@acgov.org)
  - c) The subject line of the e-mail must start with the RO# followed by **Report Upload**. (e.g., Subject: RO1234 Report Upload) If site is a new case without an RO# use the street address instead.
  - d) If your document meets the above requirements and you follow the submission instructions, you will receive a notification by email indicating that your document was successfully uploaded to the ftp site.



Continues

Logged by: Julie Noffke  
 Project Mgr: Len Niles  
 Dates Drilled: 6/20/90

Drilling Company: B & F Drilling Co., Inc.  
 Drilling Method: 8" Hollow stem auger  
 Driller: Bruce Cox

Well Head Completion: Christy box & locking cap  
 Type of Sampler: 2" split barrel  
 TD (Total Depth): 27.5 ft.

**EXPLANATION**

- ☒ Water level during drilling
- ☒ Water level in completed well
- ▨ Location of recovered drill sample
- Location of sample sealed for chemical analysis
- ▩ Sieve sample
- ☒ Grab sample
- Contacts: Solid where certain
- ..... Dotted where approximate
- - - Dashed where uncertain
- ////// Hachured where gradational
- est K Estimated permeability (hydraulic conductivity) 1K = primary 2K = secondary
- NR No recovery

Boring Log and Well Completion Details  
 MW-9 (Boring B-16)

Chevron Service Station #90020  
 Oakland, California

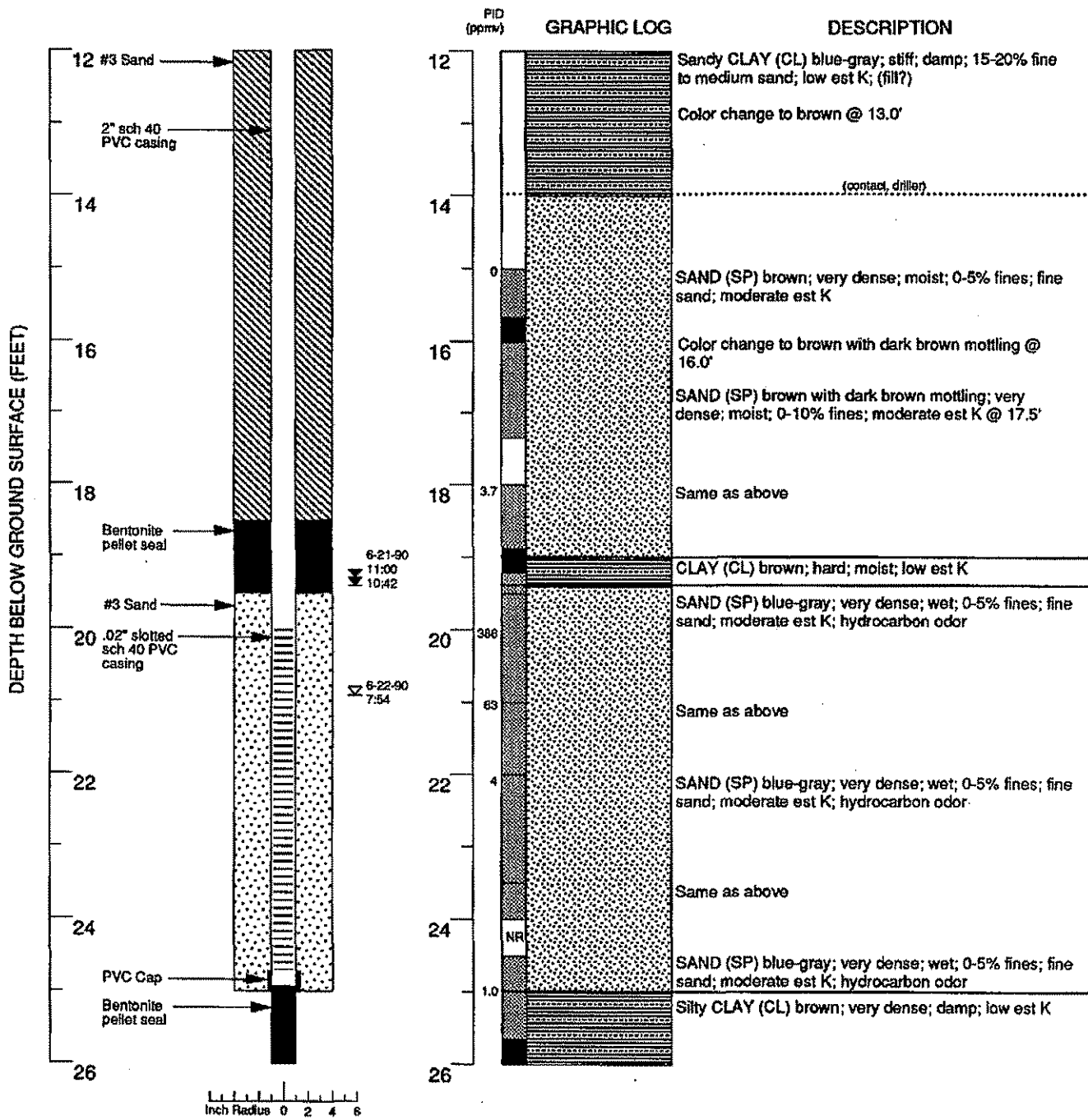
WESTERN GEOLOGIC RESOURCES, INC.

MONITOR  
 WELL

9

1-012.04

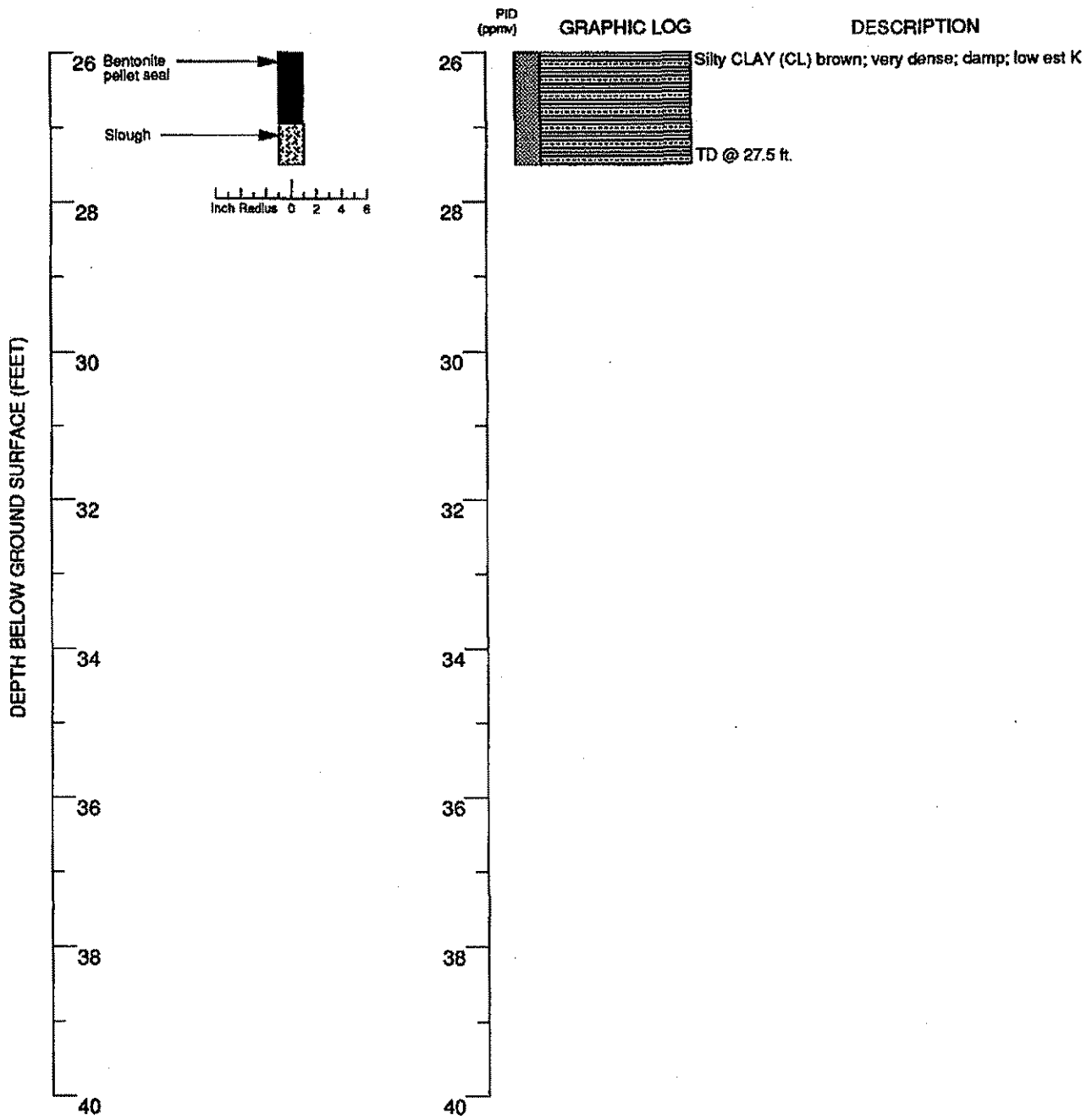




Continues

EXPLANATION	
	Water level during drilling
	Water level in completed well
	Location of recovered drill sample
	Location of sample sealed for chemical analysis
	Sieve sample
	Grab sample
	Contacts: Solid where certain
	Dotted where approximate
	Dashed where uncertain
	Hachured where gradational
	est K Estimated permeability (hydraulic conductivity) 1K = primary 2K = secondary
	NR No recovery

Boring Log and Well Completion Details MW-9 (Boring B-16)		MONITOR WELL
Chevron Service Station #90020 Oakland, California		
WESTERN GEOLOGIC RESOURCES, INC.		9
		1-012.04



**EXPLANATION**

- ☒ Water level during drilling
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Boring Log and Well Completion Details  
MW-9 (Boring B-16)

Chevron Service Station #90020  
Oakland, California

WESTERN GEOLOGIC RESOURCES, INC.

MONITOR WELL

9

1-012.04

APPENDIX B

SUMMARY OF PREVIOUS ENVIRONMENTAL INVESTIGATIONS

## SUMMARY OF PREVIOUS ENVIRONMENTAL WORK

**1988 Soil Vapor Survey Investigation:** EA Engineering, Science, and Technology, Inc. (EA) conducted a soil vapor survey in January 1988. Twenty two samples were collected at 11 locations throughout the site. The highest hydrocarbon concentrations were detected in the vicinity of the former used-oil underground storage tank (UST) in the southwestern section of the site. Additional information is available in EA's January 27, 1988 *Soil Vapor Contaminant Assessment Report of Investigation*.

**1988 Monitoring Well Installation:** Western Geologic Resources (WGR) installed wells MW-1 through MW-3 in October 1988. No benzene, toluene, ethylbenzene, and xylenes (BTEX) or total fuel hydrocarbons were detected in groundwater samples from the three wells. However, halogenated volatile organic compounds (HVOCs) were detected. Additional information is available in WGR's January 24, 1989 *Soil Sampling and Monitoring Well Installation Letter*.

**1989 Soil Boring and Monitoring Well Installation:** WGR advanced five soil borings and completed them as wells MW-4 through MW-8. Total petroleum hydrocarbons as diesel (TPHd) were detected in soil up to 600 milligrams per kilogram (mg/kg) at 9.6 feet below grade (fbg) near the former used-oil UST. Total petroleum hydrocarbons as gasoline (TPHg) were detected at a concentration of 50,000 mg/kg at 23.5 fbg in well MW-7, near the northeastern corner of the property. Additional information is available in WGR's June 1989 *Subsurface Investigation*.

**June 1990 Offsite Well Installation:** In June 1990, WGR installed offsite wells MW-9 through MW-12 to delineate the extent of hydrocarbons downgradient and crossgradient of the site. No hydrocarbons were detected in any soil samples. A grab-groundwater sample from well MW-9 contained 5,700 micrograms per liter ( $\mu\text{g/L}$ ) TPHg and 47  $\mu\text{g/L}$  benzene. Offsite wells MW-10 through MW-12 contained HVOC concentrations. Additional information is available in WGR's July 1990 *Off-Site Subsurface Investigation*.

**October 1991 Offsite Well Installation:** Pacific Environmental Group (PEG) installed well MW-13 to further evaluate the dissolved hydrocarbon plume's extent, and upgradient monitoring well MW-14 to investigate the suspected offsite origin of HVOCs. Additionally, soil borings B-A through B-D were advanced to assess the extent of elevated hydrocarbons detected in well MW-7. Hydrocarbon concentrations were only detected in boring B-D at 120 mg/kg TPHg and up to 1.8 mg/kg benzene. Additional information is available in PEG's January 14, 1992 *Subsurface Investigation Report*.

**December 1991 Soil Vapor Extraction Feasibility Test:** PEG applied positive and negative pressures to well MW-4 using a regenerative blower and measured pressure in surrounding

wells. Soil vapor measurements and samples were collected. PEG recommended evaluating additional remedial technologies. Additional information is available in PEG's April 1, 1992 *Soil Vapor Extraction Feasibility Test Letter*.

**November December 1992 Offsite Well Installation:** Groundwater Technology Inc. (GTI) installed offsite wells MW-15 and MW-16 to further delineate the dissolved hydrocarbon plume downgradient. No hydrocarbons were detected in soil samples. Additional information is available in GTI's February 18, 1993 *Additional Environmental Assessment Report*.

**January 1992 Soil Excavation:** PEG oversaw the excavation of hydrocarbon impacted soil from the vicinity of well MW-4 and a trench excavation 30 foot in length by 5 foot deep across the former USTs to confirm that the USTs had been removed from the site. Removal of the USTs was confirmed; however, construction debris, such as concrete slabs and piping, were observed beneath the surface in the area of the former USTs. Additional information is available in PEG's June 2, 1992 *Soil Excavation Letter Report*.

**1992 Chlorinated Hydrocarbon Investigation:** Geraghty & Miller, Inc. (G-M) evaluated the HVOC distribution pattern based on existing monitoring well data and analytical data from remedial activity. The report concluded that that HVOCs detected in groundwater beneath the site were emanating from an offsite source. Additional information is available in G-M's October 5, 1992 *Evaluation of Chlorinated Hydrocarbon Distribution*.

**July to December 1993 SVE Remediation System Installation and Operation:** A soil vapor extraction (SVE) system was installed and operated at the site from July 1, 1993 through December 12, 1993. Evaluation of the system showed minimal effectiveness. Augmentation of the system with additional wells was evaluated and, due to low permeability soils, it was determined that efficiency would not be appreciably enhanced. The system was shut down in December 1993, and all system equipment was removed in December 1996. Additional information is available in G-M's *Quarterly Groundwater Treatment System Compliance Report*.

**June 2004 Additional Subsurface Investigation:** In anticipation of future site development, which was proposed to include subsurface parking, Cambria Environmental Technology, Inc., (Cambria) advanced soil borings B-17 through B-25 to further define residual hydrocarbon impacts in soils beneath the site and to pre-profile soils for appropriate disposal options. Results confirmed hydrocarbon impacts in soil in the vicinity of well MW-7 that appeared to have originated from the first generation dispenser island, previously located approximately 15 feet upgradient of the well. Additional information is available in Cambria's October 14, 2004 *Subsurface Investigation Report*.

***April 2007 Onsite Subsurface Investigation:*** Conestoga-Rovers & Associates (CRA) advanced soil borings SB1 through SB4 up gradient of well MW-7 to define the extent of petroleum hydrocarbons associated with a first generation dispenser island. TPHg and benzene concentrations were detected in soil at 19.5 fbg in borings SB1, SB2, and SB3, with maximum concentrations of 140 mg/kg TPHg and 0.002 mg/kg benzene. TPHg and benzene were detected in grab-groundwater samples from borings SB1, SB2, and SB3, with maximum concentrations of 11,000 micrograms per liter ( $\mu\text{g/L}$ ) and 10  $\mu\text{g/L}$ , respectively. Additional information is available in CRA's May 25, 2007 *Onsite Subsurface Investigation Report*.

***June 2007 Soil Vapor Survey Installation and Investigation:*** CRA installed six nested soil vapor probes onsite. Vapor samples were collected from all probes and the highest hydrocarbon concentrations were detected in probe VP-1 at 10 fbg in the vicinity of the former used oil UST in the southwestern section of the site. TPHg and benzene were detected in soil vapor from all vapor points with maximum concentrations in VP-1 at 10 fbg were 2,600,000 micrograms per meter cubed ( $\mu\text{g/m}^3$ ) and 2,600  $\mu\text{g/m}^3$ , respectively. Additional information is available in CRA's June 28, 2007 *Vapor Probe Survey Report*.

***January - March 2008 Soil Excavation:*** CRA oversaw the excavation of hydrocarbon impacted soil from the vicinity of well MW-7 and in the area of the formerly removed used-oil UST. The soil excavation in the vicinity of well MW-7 used large diameter bucket augers and the resulting boreholes were immediately grouted. Additional soil in the vicinity of the former used-oil UST was excavated with a backhoe. Approximately 922 cubic yards of soil were removed. Well MW-7 and VP-1 were destroyed during the excavations. VP-1R was installed to replace VP-1. Additional information is available in CRA's July 11, 2008 *Remedial Activities Report*.

## APPENDIX C

### PERMITS

# Alameda County Public Works Agency - Water Resources Well Permit



399 Elmhurst Street  
Hayward, CA 94544-1395  
Telephone: (510)670-6633 Fax:(510)782-1939

Application Approved on: 10/07/2009 By jamesy

Permit Numbers: W2009-0955  
Permits Valid from 10/14/2009 to 12/30/2009

Application Id: 1254354944242  
Site Location: Former Chevron Station 9-0020

City of Project Site:Oakland

Project Start Date: 1633 Harrison street @ 17th Street  
10/14/2009

Completion Date:12/30/2009

Assigned Inspector: Contact John Shouldice at (510) 670-5424 or johns@acpwa.org

Applicant: Conestoga-Rovers & Associates - Ian Hull  
5900 Hollis Street, Suite A, Emeryville, CA 94608

Phone: 510-420-3344

Property Owner: Housing Authority of the City of Oakland  
1619 Harrison Street, Oakland, CA 94612

Phone: --

Client: Chevron Environmental Management Company  
6111 Bollinger Canyon Road, BR-Y 3660, San Ramon, CA 94583

Phone: --

Total Due: \$265.00  
Receipt Number: WR2009-0377 Total Amount Paid: \$265.00  
Payer Name : Conestoga-Rovers & Associates Paid By: CHECK PAID IN FULL

## Works Requesting Permits:

Borehole(s) for Geo Probes-Sampling 24 to 72 hours only - 3 Boreholes  
Driller: Vapor Tech Services - Lic #: 916085 - Method: DP

Work Total: \$265.00

### Specifications

Permit Number	Issued Dt	Expire Dt	# Boreholes	Hole Diam	Max Depth
W2009-0955	10/07/2009	01/12/2010	3	2.00 in.	35.00 ft

### Specific Work Permit Conditions

1. Backfill bore hole by tremie with cement grout or cement grout/sand mixture. Upper two-three feet replaced in kind or with compacted cuttings. All cuttings remaining or unused shall be containerized and hauled off site. The containers shall be clearly labeled to the ownership of the container and labeled hazardous or non-hazardous.
2. Boreholes shall not be left open for a period of more than 24 hours. All boreholes left open more than 24 hours will need approval from Alameda County Public Works Agency, Water Resources Section. All boreholes shall be backfilled according to permit destruction requirements and all concrete material and asphalt material shall be to Caltrans Spec or County/City Codes. No borehole(s) shall be left in a manner to act as a conduit at any time.
3. Permittee shall assume entire responsibility for all activities and uses under this permit and shall indemnify, defend and save the Alameda County Public Works Agency, its officers, agents, and employees free and harmless from any and all expense, cost, liability in connection with or resulting from the exercise of this Permit including, but not limited to, properly damage, personal injury and wrongful death.
4. Applicant shall contact John Shouldice for an inspection time at 510-670-5424 at least five (5) working days prior to starting, once the permit has been approved. Confirm the scheduled date(s) at least 24 hours prior to drilling.
5. Permittee, permittee's contractors, consultants or agents shall be responsible to assure that all material or waters generated during drilling, boring destruction, and/or other activities associated with this Permit will be safely handled, properly managed, and disposed of according to all applicable federal, state, and local statutes regulating such. In no



## Alameda County Public Works Agency - Water Resources Well Permit

case shall these materials and/or waters be allowed to enter, or potentially enter, on or off-site storm sewers, dry wells, or waterways or be allowed to move off the property where work is being completed.

6. Copy of approved drilling permit must be on site at all times. Failure to present or show proof of the approved permit application on site shall result in a fine of \$500.00.

7. Prior to any drilling activities onto any public right-of-ways, it shall be the applicants responsibilities to contact and coordinate a Underground Service Alert (USA), obtain encroachment permit(s), excavation permit(s) or any other permits required for that City or to the County and follow all City or County Ordinances. It shall also be the applicants responsibilities to provide to the Cities or to Alameda County a Traffic Safety Plan for any lane closures or detours planned. No work shall begin until all the permits and requirements have been approved or obtained.

8. Permit is valid only for the purpose specified herein. No changes in construction procedures, as described on this permit application. Boreholes shall not be converted to monitoring wells, without a permit application process.

---

Well Construction-Vapor Monitoring Well-Vapor Monitoring Well - 0 Wells

Driller: Vapor Technology Services - Lic #: 916085 - Method: Hand

**Work Total: \*\* \$0.00**

**\*\* Cancelled Work. Total amount adjusted. \*\***

### Specifications

Permit #	Issued Date	Expire Date	Owner Well Id	Hole Diam.	Casing Diam.	Seal Depth	Max. Depth
* Cancelled *			VP-7	3.00 in.	0.50 in.	3.50 ft	11.00 ft

---

# PROGRAMS AND SERVICES

## Well Standards Program

The Alameda County Public Works Agency, Water Resources is located at:

399 Elmhurst Street

Hayward, CA 94544

For Driving Directions or General Info, Please Contact 510-670-5480 or [wells@acpwa.org](mailto:wells@acpwa.org)

For Drilling Permit information and process contact [James Yoo](mailto:James.Yoo@acpwa.org) at

Phone: 510-670-6633

FAX: 510-782-1939

Email: [Jamesy@acpwa.org](mailto:Jamesy@acpwa.org)

Alameda County Public Works is the administering agency of [General Ordinance Code, Chapter 6.88](#) . The purpose of this chapter is to provide for the regulation of groundwater wells and exploratory holes as required by [California Water Code](#). The provisions of these laws are administered and enforced by Alameda County Public Works Agency through its Well Standards Program.

**Drilling Permit Jurisdictions in Alameda County:** There are four jurisdictions in Alameda County.

### Location: Agency with Jurisdiction Contact Number

Berkeley City of Berkeley Ph: 510-981-7460

Fax: 510-540-5672

Fremont, Newark, Union City Alameda County Water District Ph: 510-668-4460

Fax: 510-651-1760

Pleasanton, Dublin, Livermore, Sunol [Zone 7 Water Agency](#) Ph: 925-454-5000

Fax: 510-454-5728

**The Alameda County Public Works Agency, Water Resources** has the responsibility and authority to issue drilling permits and to enforce the County Water Well Ordinance 73-68. This jurisdiction covers the western Alameda County area of **Oakland, Alameda, Piedmont, Emeryville, Albany, San Leandro, San Lorenzo, Castro Valley, and Hayward** . The purpose of the drilling permits are to ensure that any new well or the destruction of wells, including geotechnical investigations and environmental sampling within the above jurisdiction and within Alameda County will not cause pollution or contamination of ground water or otherwise jeopardize the health, safety or welfare of the people of Alameda County.

**Permits** are required for all work pertaining to wells and exploratory holes at any depth within the jurisdiction of the Well Standards Program. A completed [permit application \(30 Kb\)\\*](#) , along with a site map, should be submitted at least **ten (10) working days prior to the planned start of work**. Submittals should be sent to the address or fax number provided on the application form. When submitting an application via fax, please use a high resolution scan to retain legibility.

### Fees

**Beginning April 11, 2005** , the following fees shall apply:

A permit to construct, rehabilitate, or destroy wells, including cathodic protection wells, but excluding dewatering wells (\*Horizontal hillside dewatering and dewatering for construction period only), shall cost \$300.00 per well.

A permit to bore exploratory holes, including temporary test wells, shall cost \$200 per site. A site includes the project parcel as well as any adjoining parcels.

Please make checks payable to: **Treasurer, County of Alameda**

### Permit Fees are exempt to State & Federal Projects

Applicants shall submit a letter from the agency requesting the fee exemption.

**Scheduling Work/Inspections:**

Alameda County Public Works Agency (ACPWA), Water Resources Section requires scheduling and inspection of permitted work. All drilling activities must be scheduled in advance. Availability of inspections will vary from week to week and will come on a first come, first served bases. To ensure inspection availability on your desired or driller scheduled date, the following procedures are required:

Please contact **James Yoo at 510-670-6633** to schedule the inspection date and time (You must have drilling permit approved prior to scheduling).

Schedule the work as far in advance as possible (at least 5 days in advance); and confirm the scheduled drilling date(s) at least 24 hours prior to drilling.

Once the work has been scheduled, an ACPWA Inspector will coordinate the inspection requirements as well as how the Inspector can be reached if they are not at the site when Inspection is required. Expect for special circumstances given, all work will require the inspection to be conducted during the working hours of 8:30am to 2:30pm., Monday to Friday, excluding holidays.

**Request for Permit Extension:**

Permits are only valid from the start date to the completion date as stated on the drilling permit application and Conditions of Approval. To request an extension of a drilling permit application, applicants must request in writing prior to the completion date as set forth in the Conditions of Approval of the drilling permit application. Please send fax or email to Water Resources Section, Fax 510-782-1939 or email at [wells@acpwa.org](mailto:wells@acpwa.org). There are no additional fees for permit extensions or for re-scheduling inspection dates. You may not extend your drilling permit dates beyond 90 days from the approval date of the permit application. **NO refunds** shall be given back after 90 days and the permit shall be deemed voided.

**Cancel a Drilling Permit:**

Applicants may cancel a drilling permit only in writing by mail, fax or email to Water Resources Section, Fax 510-782-1939 or email at [wells@acpwa.org](mailto:wells@acpwa.org). If you do not cancel your drilling permit application before the drilling completion date or notify in writing within 90 days, Alameda County Public Works Agency, Water Resources Section may void the permit and No refunds may be given back.

**Refunds/Service Charge:**

A service charge of \$25.00 dollars for the first check returned and \$35.00 dollars for each subsequent check returned.

Applicants who cancel a drilling permit application **before** we issue the approved permit(s), will receive a **FULL** refund (at any amount) and will be mailed back within two weeks.

Applicants who cancel a drilling permit application **after** a permit has been issued will then be charged a service fee of \$50.00 (fifty Dollars).

To collect the remaining funds will be determined by the amount of the refund to be refunded (see process below).

Board of Supervisors Minute Order, File No. 9763, dated January 9, 1996, gives blanket authority to the Auditor-Controller to process claims, from all County departments for the refund of fees which do not exceed \$500 (Five Hundred Dollars)(with the exception of the County Clerk whose limit is \$1,500).

Refunds over the amounts must be authorized by the Board of Supervisors Minute Order, File No. 9763 require specific approval by the Board of Supervisors. The forms to request for refunds under \$500.00 (Five Hundred Dollars) are available at this office or any County Offices. If the amount is exceeded, a Board letter and Minute Order must accompany the claim. Applicant shall fill out the request form and the County Fiscal department will process the request.

**Enforcement**

Penalty. Any person who does any work for which a permit is required by this chapter and who fails to obtain a permit shall be guilty of a misdemeanor punishable by fine not exceeding Five Hundred Dollars (\$500.00) or by imprisonment not exceeding six months, or by both such fine and imprisonment, and such person shall be deemed guilty of a separate offense for each and every day or portion thereof during which any such

violation is committed, continued, or permitted, and shall be subject to the same punishment as for the original offense. (Prior gen. code §3-160.6)

**Enforcement actions will be determined by this office on a case-by-case basis**

Drilling without a permit shall be the cost of the permit(s) and a fine of \$500.00 (Five Hundred Dollars).

**Well Completion Reports** (State DWR-188 forms) must be filed with the Well Standards Program within 60 days of completing work. Staff will review the report, assign a state well number, and then forward it to the California Department of Water Resources (DWR). Drillers should not send completed reports to DWR directly. Failure to file a Well Completion Report or deliberate falsification of the information is a misdemeanor; it is also grounds for disciplinary action by the Contractors' State License Board. Also note that filed Well Completion Reports are considered private record protected by state law and can only be released to the well owner or those specifically authorized by government agencies.

See our website ([www.acgov.org/pwa/wells/index.shtml](http://www.acgov.org/pwa/wells/index.shtml)) for links to additional forms.

APPENDIX D

BORING LOGS



Cambria Environmental Technology, Inc.  
 5900 Hollis Street, Suite A  
 Emeryville, CA 94608  
 Telephone: 510-420-0700  
 Fax: 510-420-9170

# BORING / WELL LOG

CLIENT NAME	Chevron Environmental Management Company	BORING/WELL NAME	SB7
JOB/SITE NAME	9-0020	DRILLING STARTED	14-Oct-09
LOCATION	1633 Harrison Street, Oakland, California	DRILLING COMPLETED	14-Oct-09
PROJECT NUMBER	CRA 311956	WELL DEVELOPMENT DATE (YIELD)	NA
DRILLER	Vapor Tech Services (C57 #916085)	GROUND SURFACE ELEVATION	NA
DRILLING METHOD	Direct-Push	TOP OF CASING ELEVATION	NA
BORING DIAMETER	2"	SCREENED INTERVALS	NA
LOGGED BY	Belew Yifru	DEPTH TO WATER (First Encountered)	25.00 fbg (14-Oct-09) ▼
REVIEWED BY	Brandon S. Wilken, P.G. #7564	DEPTH TO WATER (Static)	23.00 fbg ▼
REMARKS	Utility cleared with hand augers to 8 fbg		

PID (ppm)	BLOW COUNTS	SAMPLE ID	EXTENT DEPTH (fbg)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH (fbg)	WELL DIAGRAM
						<b>ASPHALT</b>	0.5	
						<b>SAND with silt (FILL):</b> Yellowish orange; poorly graded medium sand; moist; non-plastic.	2.5	Concrete
				ML		<b>SILT with sand:</b> Light brown; soft; moist; low estimated plasticity.	6.0	
2		SB7-S -5	5	ML				
				ML		<b>SILT:</b> Light brown; firm; moist; moderate estimated plasticity	10.0	
2		SB7-S -10	10			<b>SAND with silt:</b> Light brown; soft; moist; fine grained sand; non-plastic.		
						@ 13 fbg consistency changes to hard.		
0		SB7-S -15	15			@ 17 fbg consistency changes to soft.		Portland Type III Cement
				SP SM				
			20					

WELL LOG (PID): I:\CHEVRON\3119-1311956-1311956-BORING LOGS GPJ DEFAULT.GDT 12/30/09

Continued Next Page



Cambria Environmental Technology, Inc.  
 5900 Hollis Street, Suite A  
 Emeryville, CA 94608  
 Telephone: 510-420-0700  
 Fax: 510-420-9170

# BORING / WELL LOG

CLIENT NAME	Chevron Environmental Management Company	BORING/WELL NAME	SB7
JOB/SITE NAME	9-0020	DRILLING STARTED	14-Oct-09
LOCATION	1633 Harrison Street, Oakland, California	DRILLING COMPLETED	14-Oct-09

Continued from Previous Page

PID (ppm)	BLOW COUNTS	SAMPLE ID	EXTENT	DEPTH (fbg)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH (fbg)	WELL DIAGRAM
5		SB7-S -20.5							
1		SB7-S -23.5		25			@ 25 fbg moisture condition changes to wet		
1		SB7-S -26.5			ML		<u>SILT with sand</u> : Dark brown; firm; wet; low estimated plasticity.	27.0 28.0	
									Bottom of Boring @ 28 fbg

WELL LOG (PID) I:\CHEVRON\3119-1311956-1315373-1311956-BORING LOGS.GPJ DEFAULT.GDT 12/30/09



Cambria Environmental Technology, Inc.  
 5900 Hollis Street, Suite A  
 Emeryville, CA 94608  
 Telephone: 510-420-0700  
 Fax: 510-420-9170

# BORING / WELL LOG

CLIENT NAME	Chevron Environmental Management Company	BORING/WELL NAME	SB8
JOB/SITE NAME	9-0020	DRILLING STARTED	14-Oct-09
LOCATION	1633 Harrison Street, Oakland, California	DRILLING COMPLETED	14-Oct-09
PROJECT NUMBER	CRA 311956	WELL DEVELOPMENT DATE (YIELD)	NA
DRILLER	Vapor Tech Services (C57 #916085)	GROUND SURFACE ELEVATION	NA
DRILLING METHOD	Direct-Push	TOP OF CASING ELEVATION	NA
BORING DIAMETER	2"	SCREENED INTERVALS	NA
LOGGED BY	Belew Yifru	DEPTH TO WATER (First Encountered)	25.00 fbg (14-Oct-09)
REVIEWED BY	Brandon S. Wilken, P.G. #7564	DEPTH TO WATER (Static)	24.00 fbg
REMARKS	Utility cleared with hand augers to 8 fbg		

PID (ppm)	BLOW COUNTS	SAMPLE ID	EXTENT	DEPTH (fbg)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH (fbg)	WELL DIAGRAM
							<b>ASPHALT</b>	0.5	<p>Concrete</p> <p>Portland Type I/II Cement</p>
							<b>SAND (FILL):</b> Light brown; soft; moist; medium sand; non-plastic.	2.5	
					SM		<b>Silty SAND:</b> Brown; soft; moist; poorly graded fine sand; non-plastic.	5.0	
2		SB8-S-5		5				6.0	
					ML		<b>Sandy SILT:</b> Dark brown; firm; moist; low estimated plasticity.	8.0	
							<b>Clayey SAND:</b> Dark brown; firm; moist; poorly graded fine sand; moderate-plasticity.	10.0	
3		SB8-S-10		10	SC			12.0	
							<b>SAND with silt:</b> Brown; firm; moist; poorly graded fine sand; non-plastic.	15.0	
3		SB8-S-15		15					
					SP SM				
2		SB8-S-19.5		20					

Continued Next Page

WELL LOG (PID) \\CHEVRON\3119-0311956-11315373-11311956-BORING LOGS.CPJ DEFAULT.GDT 12/30/09



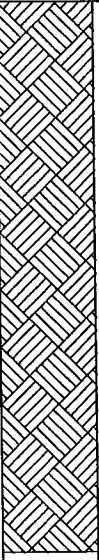


Cambria Environmental Technology, Inc.  
 5900 Hollis Street, Suite A  
 Emeryville, CA 94608  
 Telephone: 510-420-0700  
 Fax: 510-420-9170

# BORING / WELL LOG

CLIENT NAME	Chevron Environmental Management Company	BORING/WELL NAME	SB8
JOB/SITE NAME	9-0020	DRILLING STARTED	14-Oct-09
LOCATION	1633 Harrison Street, Oakland, California	DRILLING COMPLETED	14-Oct-09

Continued from Previous Page

PID (ppm)	BLOW COUNTS	SAMPLE ID	EXTENT DEPTH (fbg)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH (fbg)	WELL DIAGRAM
2		SB8-S -24.5	25			@ 25 fbg moisture conditions change to wet	27.0	 <p>Bottom of Boring @ 29 fbg</p>
2		SB8-S -28.5		ML		<u>SILT with sand</u> : Brown; firm; wet; low estimated plasticity.	29.0	

WELL LOG (PID) I:\CHEVRON\13119-1311956-BORING LOGS.GPJ DEFAULT.GDT 12/30/09



Cambria Environmental Technology, Inc.  
 5900 Hollis Street, Suite A  
 Emeryville, CA 94608  
 Telephone: 510-420-0700  
 Fax: 510-420-9170

# BORING / WELL LOG

CLIENT NAME	Chevron Environmental Management Company	BORING/WELL NAME	VP-7
JOB/SITE NAME	9-0020	DRILLING STARTED	14-Oct-09
LOCATION	1633 Harrison Street, Oakland, California	DRILLING COMPLETED	14-Oct-09
PROJECT NUMBER	CRA 311956	WELL DEVELOPMENT DATE (YIELD)	NA
DRILLER	Vapor Tech Services (C57 #916085)	GROUND SURFACE ELEVATION	NA
DRILLING METHOD	Hand Auger	TOP OF CASING ELEVATION	NA
BORING DIAMETER	2.75"	SCREENED INTERVALS	NA
LOGGED BY	Belew Yifru	DEPTH TO WATER (First Encountered)	NA
REVIEWED BY	Brandon S. Wilken, P.G. #7564	DEPTH TO WATER (Static)	NA
REMARKS	Utility cleared with hand augers to total depth		

PID (ppm)	BLOW COUNTS	SAMPLE ID	EXTENT DEPTH (fbg)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH (fbg)	WELL DIAGRAM
2		VP-7- S-5	5	ML		<u>ASPHALT</u> <u>SAND/CEMENT SLURRY (FILL)</u> <u>SILT</u> : Brown; soft; moist; trace fine grained sand; low estimated plasticity.	0.5 1.5	<p>Bentonite/ Portland mixture</p> <p>Bentonite Seal</p> <p>Monterey Sand #2/12</p>
2		VP-7- S-10	10	SM		<u>SILT</u> : Brown; firm; moist; moderate estimated plasticity. <u>Silty SAND</u> : Brown; soft; moist; non-plastic.	6.5 8.0 10.5	

WELL LOG (PID) I:\CHEVRON\3119-3311956-1315373-1311956-BORING LOGS.GPJ DEFAULT.GDT 12/30/09

APPENDIX E

LABORATORY ANALYTICAL REPORTS

APPENDIX F

EVALUATION OF VAPOR INTRUSION TO INDOOR AIR FROM VAPOR SOIL

APPENDIX E

LABORATORY ANALYTICAL REPORTS

## ANALYTICAL RESULTS

Prepared for:

ChevronTexaco  
6001 Bollinger Canyon Rd L4310  
San Ramon CA 94583

925-842-8582

Prepared by:

Lancaster Laboratories  
2425 New Holland Pike  
Lancaster, PA 17605-2425

October 28, 2009

Project: 90020

Samples arrived at the laboratory on Friday, October 16, 2009. The PO# for this group is 0015040460 and the release number is COSTA. The group number for this submittal is 1166665.

<u>Client Sample Description</u>	<u>Lancaster Labs (LLI) #</u>
SB7-S-5-091014 Grab Soil	5807656
SB7-S-10-091014 Grab Soil	5807657
SB7-S-15-091014 Grab Soil	5807658
SB7-S-20.5-091014 Grab Soil	5807659
SB7-S-23.5-091014 Grab Soil	5807660
SB7-S-26.5-091014 Grab Soil	5807661
SB8-S-5-091014 Grab Soil	5807662
SB8-S-15-091014 Grab Soil	5807663
SB8-S-10-091014 Grab Soil	5807664
SB8-S-19.5-091014 Grab Soil	5807665
SB8-S-24.5-091014 Grab Soil	5807666
SB8-S-28.5-091014 Grab Soil	5807667
VP-7-S-5-091014 Grab Soil	5807668
VP-7-S-10-091014 Grab Soil	5807669
SB7-W-23-091014 Grab Water	5807670
SB8-W-24-091014 Grab Water	5807671

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

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Chevron

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CRA

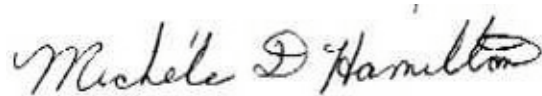
Attn: CRA EDD

Attn: Charlotte Evans

Attn: Ian Hull

Questions? Contact your Client Services Representative  
Angela M Miller at (717) 656-2300

Respectfully Submitted,



Miche'le D. Hamilton  
Group Leader

**Sample Description:** SB7-S-5-091014 Grab Soil  
 Facility# 90020 CRAW  
 1633 Harrison St-Oakland T0600100304 SB7

LLI Sample # SW 5807656  
 LLI Group # 1166665  
 CA

**Project Name:** 90020

Collected: 10/14/2009 10:35 by IH

Account Number: 10880

Submitted: 10/16/2009 09:00

ChevronTexaco

Reported: 10/28/2009 at 13:24

6001 Bollinger Canyon Rd L4310

Discard: 11/28/2009

San Ramon CA 94583

SB7-5

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
<b>GC/MS</b>	<b>Volatiles</b>	<b>SW-846 8260B</b>	<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>	
07361	t-Amyl methyl ether	994-05-8	N.D.	0.001	0.005	1.02
07361	Benzene	71-43-2	N.D.	0.0005	0.005	1.02
07361	t-Butyl alcohol	75-65-0	N.D.	0.020	0.10	1.02
07361	1,2-Dibromoethane	106-93-4	N.D.	0.001	0.005	1.02
07361	1,2-Dichloroethane	107-06-2	N.D.	0.001	0.005	1.02
07361	Ethyl t-butyl ether	637-92-3	N.D.	0.001	0.005	1.02
07361	Ethylbenzene	100-41-4	N.D.	0.001	0.005	1.02
07361	di-Isopropyl ether	108-20-3	N.D.	0.001	0.005	1.02
07361	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.0005	0.005	1.02
07361	Toluene	108-88-3	N.D.	0.001	0.005	1.02
07361	Xylene (Total)	1330-20-7	N.D.	0.001	0.005	1.02
<b>GC</b>	<b>Volatiles</b>	<b>SW-846 8015B modified</b>	<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>	
01725	TPH-GRO N. CA soil C6-C12	n.a.	N.D.	1.0	1.0	25
<b>GC</b>	<b>Extractable TPH</b>	<b>SW-846 8015B</b>	<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>	
<b>w/Si Gel</b>						
02222	TPH-DRO soil C10-C28 w/Si Gel	n.a.	N.D.	4.0	12	1

### General Sample Comments

State of California Lab Certification No. 2501

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

### Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07361	BTEX+5 Oxygenates+EDC+EDB	SW-846 8260B	1	A092972AA	10/24/2009 16:20	Kerri E Koch	1.02
00374	GC/MS - Bulk Sample Prep	SW-846 5030A	1	200928919522	10/16/2009 15:42	Eric L Vera	n.a.
00374	GC/MS - Bulk Sample Prep	SW-846 5030A	2	200928919522	10/16/2009 15:43	Eric L Vera	n.a.
06646	GC/MS HL Bulk Sample Prep	SW-846 5030A	1	200928919522	10/16/2009 15:41	Eric L Vera	n.a.
01725	TPH-GRO N. CA soil C6-C12	SW-846 8015B modified	1	09292A16B	10/20/2009 12:09	Marie D John	25
01150	GC - Bulk Soil Prep	SW-846 5030A	1	200928919522	10/16/2009 15:43	Eric L Vera	n.a.
02222	TPH-DRO soil C10-C28 w/Si Gel	SW-846 8015B	1	092930003A	10/21/2009 14:53	Diane V Do	1
07004	Extraction - DRO (Soils)	SW-846 3550B	1	092930003A	10/20/2009 17:30	Sally L Appleyard	1

\*=This limit was used in the evaluation of the final result



**Sample Description:** SB7-S-10-091014 Grab Soil  
 Facility# 90020 CRAW  
 1633 Harrison St-Oakland T0600100304 SB7

LLI Sample # SW 5807657  
 LLI Group # 1166665  
 CA

**Project Name:** 90020

Collected: 10/14/2009 10:56 by IH

Account Number: 10880

Submitted: 10/16/2009 09:00

ChevronTexaco

Reported: 10/28/2009 at 13:24

6001 Bollinger Canyon Rd L4310

Discard: 11/28/2009

San Ramon CA 94583

710SB

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
<b>GC/MS</b>	<b>Volatiles</b>	<b>SW-846 8260B</b>	<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>	
07361	t-Amyl methyl ether	994-05-8	N.D.	0.0009	0.005	0.94
07361	Benzene	71-43-2	N.D.	0.0005	0.005	0.94
07361	t-Butyl alcohol	75-65-0	N.D.	0.019	0.094	0.94
07361	1,2-Dibromoethane	106-93-4	N.D.	0.0009	0.005	0.94
07361	1,2-Dichloroethane	107-06-2	N.D.	0.0009	0.005	0.94
07361	Ethyl t-butyl ether	637-92-3	N.D.	0.0009	0.005	0.94
07361	Ethylbenzene	100-41-4	N.D.	0.0009	0.005	0.94
07361	di-Isopropyl ether	108-20-3	N.D.	0.0009	0.005	0.94
07361	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.0005	0.005	0.94
07361	Toluene	108-88-3	N.D.	0.0009	0.005	0.94
07361	Xylene (Total)	1330-20-7	N.D.	0.0009	0.005	0.94
<b>GC</b>	<b>Volatiles</b>	<b>SW-846 8015B modified</b>	<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>	
01725	TPH-GRO N. CA soil C6-C12	n.a.	N.D.	1.0	1.0	25
<b>GC Extractable TPH</b>	<b>SW-846 8015B</b>		<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>	
<b>w/Si Gel</b>						
02222	TPH-DRO soil C10-C28 w/Si Gel	n.a.	N.D.	4.0	12	1

### General Sample Comments

State of California Lab Certification No. 2501

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

### Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07361	BTEX+5 Oxygenates+EDC+EDB	SW-846 8260B	1	A092972AA	10/24/2009 16:42	Kerri E Koch	0.94
00374	GC/MS - Bulk Sample Prep	SW-846 5030A	1	200928919522	10/16/2009 15:50	Eric L Vera	n.a.
00374	GC/MS - Bulk Sample Prep	SW-846 5030A	2	200928919522	10/16/2009 15:50	Eric L Vera	n.a.
06646	GC/MS HL Bulk Sample Prep	SW-846 5030A	1	200928919522	10/16/2009 15:49	Eric L Vera	n.a.
01725	TPH-GRO N. CA soil C6-C12	SW-846 8015B modified	1	09292A16B	10/20/2009 12:47	Marie D John	25
01150	GC - Bulk Soil Prep	SW-846 5030A	1	200928919522	10/16/2009 15:49	Eric L Vera	n.a.
02222	TPH-DRO soil C10-C28 w/Si Gel	SW-846 8015B	1	092930003A	10/21/2009 16:16	Diane V Do	1
07004	Extraction - DRO (Soils)	SW-846 3550B	1	092930003A	10/20/2009 17:30	Sally L Appleyard	1

\*=This limit was used in the evaluation of the final result

**Sample Description:** SB7-S-15-091014 Grab Soil  
 Facility# 90020 CRAW  
 1633 Harrison St-Oakland T0600100304 SB7

LLI Sample # SW 5807658  
 LLI Group # 1166665  
 CA

**Project Name:** 90020

Collected: 10/14/2009 11:20 by IH

Account Number: 10880

Submitted: 10/16/2009 09:00

ChevronTexaco

Reported: 10/28/2009 at 13:24

6001 Bollinger Canyon Rd L4310

Discard: 11/28/2009

San Ramon CA 94583

SB715

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
<b>GC/MS</b>	<b>Volatiles</b>	<b>SW-846 8260B</b>	<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>	
07361	t-Amyl methyl ether	994-05-8	N.D.	0.001	0.005	1.06
07361	Benzene	71-43-2	N.D.	0.0005	0.005	1.06
07361	t-Butyl alcohol	75-65-0	N.D.	0.021	0.11	1.06
07361	1,2-Dibromoethane	106-93-4	N.D.	0.001	0.005	1.06
07361	1,2-Dichloroethane	107-06-2	N.D.	0.001	0.005	1.06
07361	Ethyl t-butyl ether	637-92-3	N.D.	0.001	0.005	1.06
07361	Ethylbenzene	100-41-4	N.D.	0.001	0.005	1.06
07361	di-Isopropyl ether	108-20-3	N.D.	0.001	0.005	1.06
07361	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.0005	0.005	1.06
07361	Toluene	108-88-3	N.D.	0.001	0.005	1.06
07361	Xylene (Total)	1330-20-7	N.D.	0.001	0.005	1.06
<b>GC</b>	<b>Volatiles</b>	<b>SW-846 8015B modified</b>	<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>	
01725	TPH-GRO N. CA soil C6-C12	n.a.	N.D.	1.0	1.0	25
<b>GC Extractable TPH</b>	<b>SW-846 8015B</b>		<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>	
<b>w/Si Gel</b>						
02222	TPH-DRO soil C10-C28 w/Si Gel	n.a.	N.D.	4.0	12	1

### General Sample Comments

State of California Lab Certification No. 2501

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

### Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07361	BTEX+5 Oxygenates+EDC+EDB	SW-846 8260B	1	A092972AA	10/24/2009 17:06	Kerri E Koch	1.06
00374	GC/MS - Bulk Sample Prep	SW-846 5030A	1	200928919522	10/16/2009 16:01	Eric L Vera	n.a.
00374	GC/MS - Bulk Sample Prep	SW-846 5030A	2	200928919522	10/16/2009 15:59	Eric L Vera	n.a.
06646	GC/MS HL Bulk Sample Prep	SW-846 5030A	1	200928919522	10/16/2009 16:00	Eric L Vera	n.a.
01725	TPH-GRO N. CA soil C6-C12	SW-846 8015B modified	1	09292A16B	10/20/2009 13:25	Marie D John	25
01150	GC - Bulk Soil Prep	SW-846 5030A	1	200928919522	10/16/2009 16:00	Eric L Vera	n.a.
02222	TPH-DRO soil C10-C28 w/Si Gel	SW-846 8015B	1	092930003A	10/21/2009 16:37	Diane V Do	1
07004	Extraction - DRO (Soils)	SW-846 3550B	1	092930003A	10/20/2009 17:30	Sally L Appleyard	1

\*=This limit was used in the evaluation of the final result

**Sample Description:** SB7-S-20.5-091014 Grab Soil  
 Facility# 90020 CRAW  
 1633 Harrison St-Oakland T0600100304 SB7

LLI Sample # SW 5807659  
 LLI Group # 1166665  
 CA

**Project Name:** 90020

Collected: 10/14/2009 11:45 by IH

Account Number: 10880

Submitted: 10/16/2009 09:00

ChevronTexaco

Reported: 10/28/2009 at 13:24

6001 Bollinger Canyon Rd L4310

Discard: 11/28/2009

San Ramon CA 94583

SB720

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
<b>GC/MS</b>	<b>Volatiles</b>	<b>SW-846 8260B</b>	<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>	
07361	t-Amyl methyl ether	994-05-8	N.D.	0.001	0.005	0.96
07361	Benzene	71-43-2	N.D.	0.0005	0.005	0.96
07361	t-Butyl alcohol	75-65-0	N.D.	0.019	0.096	0.96
07361	1,2-Dibromoethane	106-93-4	N.D.	0.001	0.005	0.96
07361	1,2-Dichloroethane	107-06-2	N.D.	0.001	0.005	0.96
07361	Ethyl t-butyl ether	637-92-3	N.D.	0.001	0.005	0.96
07361	Ethylbenzene	100-41-4	N.D.	0.001	0.005	0.96
07361	di-Isopropyl ether	108-20-3	N.D.	0.001	0.005	0.96
07361	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.0005	0.005	0.96
07361	Toluene	108-88-3	N.D.	0.001	0.005	0.96
07361	Xylene (Total)	1330-20-7	N.D.	0.001	0.005	0.96
<b>GC</b>	<b>Volatiles</b>	<b>SW-846 8015B modified</b>	<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>	
01725	TPH-GRO N. CA soil C6-C12	n.a.	N.D.	1.0	1.0	25
<b>GC Extractable TPH</b>	<b>SW-846 8015B</b>		<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>	
<b>w/Si Gel</b>						
02222	TPH-DRO soil C10-C28 w/Si Gel	n.a.	14	4.0	12	1

### General Sample Comments

State of California Lab Certification No. 2501

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

### Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07361	BTEX+5 Oxygenates+EDC+EDB	SW-846 8260B	1	A092972AA	10/24/2009 17:28	Kerri E Koch	0.96
00374	GC/MS - Bulk Sample Prep	SW-846 5030A	1	200928919522	10/16/2009 16:08	Eric L Vera	n.a.
00374	GC/MS - Bulk Sample Prep	SW-846 5030A	2	200928919522	10/16/2009 16:08	Eric L Vera	n.a.
06646	GC/MS HL Bulk Sample Prep	SW-846 5030A	1	200928919522	10/16/2009 16:07	Eric L Vera	n.a.
01725	TPH-GRO N. CA soil C6-C12	SW-846 8015B modified	1	09292A16B	10/20/2009 14:03	Marie D John	25
01150	GC - Bulk Soil Prep	SW-846 5030A	1	200928919522	10/16/2009 16:07	Eric L Vera	n.a.
02222	TPH-DRO soil C10-C28 w/Si Gel	SW-846 8015B	1	092930003A	10/21/2009 15:56	Diane V Do	1
07004	Extraction - DRO (Soils)	SW-846 3550B	1	092930003A	10/20/2009 17:30	Sally L Appleyard	1

\*=This limit was used in the evaluation of the final result

**Sample Description:** SB7-S-23.5-091014 Grab Soil  
**Facility#** 90020 CRAW  
**1633 Harrison St-Oakland T0600100304 SB7**

**LLI Sample #** SW 5807660  
**LLI Group #** 1166665  
**CA**

**Project Name:** 90020

Collected: 10/14/2009 11:50 by IH

Account Number: 10880

Submitted: 10/16/2009 09:00

ChevronTexaco

Reported: 10/28/2009 at 13:24

6001 Bollinger Canyon Rd L4310

Discard: 11/28/2009

San Ramon CA 94583

SB723

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
<b>GC/MS</b>	<b>Volatiles</b>	<b>SW-846 8260B</b>	<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>	
07361	t-Amyl methyl ether	994-05-8	N.D.	0.001	0.005	1
07361	Benzene	71-43-2	N.D.	0.0005	0.005	1
07361	t-Butyl alcohol	75-65-0	N.D.	0.020	0.10	1
07361	1,2-Dibromoethane	106-93-4	N.D.	0.001	0.005	1
07361	1,2-Dichloroethane	107-06-2	N.D.	0.001	0.005	1
07361	Ethyl t-butyl ether	637-92-3	N.D.	0.001	0.005	1
07361	Ethylbenzene	100-41-4	N.D.	0.001	0.005	1
07361	di-Isopropyl ether	108-20-3	N.D.	0.001	0.005	1
07361	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.0005	0.005	1
07361	Toluene	108-88-3	N.D.	0.001	0.005	1
07361	Xylene (Total)	1330-20-7	N.D.	0.001	0.005	1
<b>GC</b>	<b>Volatiles</b>	<b>SW-846 8015B modified</b>	<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>	
01725	TPH-GRO N. CA soil C6-C12	n.a.	N.D.	1.0	1.0	25
<b>GC</b>	<b>Extractable TPH</b>	<b>SW-846 8015B</b>	<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>	
<b>w/Si Gel</b>						
02222	TPH-DRO soil C10-C28 w/Si Gel	n.a.	N.D.	4.0	12	1

### General Sample Comments

State of California Lab Certification No. 2501

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

### Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07361	BTEX+5 Oxygenates+EDC+EDB	SW-846 8260B	1	B092971AA	10/24/2009 11:02	Kristen D Pelliccia	1
00374	GC/MS - Bulk Sample Prep	SW-846 5030A	1	200928919522	10/16/2009 16:31	Eric L Vera	n.a.
00374	GC/MS - Bulk Sample Prep	SW-846 5030A	2	200928919522	10/16/2009 16:30	Eric L Vera	n.a.
06646	GC/MS HL Bulk Sample Prep	SW-846 5030A	1	200928919522	10/16/2009 16:31	Eric L Vera	n.a.
01725	TPH-GRO N. CA soil C6-C12	SW-846 8015B modified	1	09292A16A	10/19/2009 16:10	Marie D John	25
01150	GC - Bulk Soil Prep	SW-846 5030A	1	200928919522	10/16/2009 16:24	Eric L Vera	n.a.
01150	GC - Bulk Soil Prep	SW-846 5030A	2	200928919522	10/16/2009 16:25	Eric L Vera	n.a.
01150	GC - Bulk Soil Prep	SW-846 5030A	3	200928919522	10/16/2009 16:26	Eric L Vera	n.a.
01150	GC - Bulk Soil Prep	SW-846 5030A	4	200928919522	10/16/2009 16:27	Eric L Vera	n.a.
01150	GC - Bulk Soil Prep	SW-846 5030A	5	200928919522	10/16/2009 16:28	Eric L Vera	n.a.
02222	TPH-DRO soil C10-C28 w/Si Gel	SW-846 8015B	1	092930003A	10/21/2009 16:58	Diane V Do	1

\*=This limit was used in the evaluation of the final result



# Analysis Report

2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 • 717-656-2300 Fax: 717-656-2681 • www.lancasterlabs.com

**Sample Description:** SB7-S-23.5-091014 Grab Soil  
Facility# 90020 CRAW  
1633 Harrison St-Oakland T0600100304 SB7

LLI Sample # SW 5807660  
LLI Group # 1166665  
CA

**Project Name:** 90020

Collected: 10/14/2009 11:50 by IH

Account Number: 10880

Submitted: 10/16/2009 09:00

ChevronTexaco

Reported: 10/28/2009 at 13:24

6001 Bollinger Canyon Rd L4310

Discard: 11/28/2009

San Ramon CA 94583

SB723

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### Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07004	Extraction - DRO (Soils)	SW-846 3550B	1	092930003A	10/20/2009 17:30	Sally L Appleyard	1

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\*=This limit was used in the evaluation of the final result

**Sample Description: SB7-S-26.5-091014 Grab Soil**  
**Facility# 90020 CRAW**  
**1633 Harrison St-Oakland T0600100304 SB7**

**LLI Sample # SW 5807661**  
**LLI Group # 1166665**  
**CA**

**Project Name: 90020**

Collected: 10/14/2009 11:58 by IH

Account Number: 10880

Submitted: 10/16/2009 09:00

ChevronTexaco

Reported: 10/28/2009 at 13:24

6001 Bollinger Canyon Rd L4310

Discard: 11/28/2009

San Ramon CA 94583

SB726

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
<b>GC/MS</b>	<b>Volatiles</b>	<b>SW-846 8260B</b>	<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>	
07361	t-Amyl methyl ether	994-05-8	N.D.	0.001	0.005	1.06
07361	Benzene	71-43-2	N.D.	0.0005	0.005	1.06
07361	t-Butyl alcohol	75-65-0	N.D.	0.021	0.11	1.06
07361	1,2-Dibromoethane	106-93-4	N.D.	0.001	0.005	1.06
07361	1,2-Dichloroethane	107-06-2	N.D.	0.001	0.005	1.06
07361	Ethyl t-butyl ether	637-92-3	N.D.	0.001	0.005	1.06
07361	Ethylbenzene	100-41-4	N.D.	0.001	0.005	1.06
07361	di-Isopropyl ether	108-20-3	N.D.	0.001	0.005	1.06
07361	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.0005	0.005	1.06
07361	Toluene	108-88-3	N.D.	0.001	0.005	1.06
07361	Xylene (Total)	1330-20-7	N.D.	0.001	0.005	1.06
<b>GC</b>	<b>Volatiles</b>	<b>SW-846 8015B modified</b>	<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>	
01725	TPH-GRO N. CA soil C6-C12	n.a.	N.D.	1.0	1.0	25
<b>GC</b>	<b>Extractable TPH</b>	<b>SW-846 8015B</b>	<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>	
<b>w/Si Gel</b>						
02222	TPH-DRO soil C10-C28 w/Si Gel	n.a.	N.D.	4.0	12	1

### General Sample Comments

State of California Lab Certification No. 2501

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

### Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07361	BTEX+5 Oxygenates+EDC+EDB	SW-846 8260B	1	B092971AA	10/24/2009 11:24	Kristen D Pelliccia	1.06
00374	GC/MS - Bulk Sample Prep	SW-846 5030A	1	200928919522	10/16/2009 16:40	Eric L Vera	n.a.
00374	GC/MS - Bulk Sample Prep	SW-846 5030A	2	200928919522	10/16/2009 16:41	Eric L Vera	n.a.
06646	GC/MS HL Bulk Sample Prep	SW-846 5030A	1	200928919522	10/16/2009 16:43	Eric L Vera	n.a.
01725	TPH-GRO N. CA soil C6-C12	SW-846 8015B modified	1	09292A16B	10/20/2009 14:41	Marie D John	25
01150	GC - Bulk Soil Prep	SW-846 5030A	1	200928919522	10/16/2009 16:41	Eric L Vera	n.a.
02222	TPH-DRO soil C10-C28 w/Si Gel	SW-846 8015B	1	092930003A	10/21/2009 17:19	Diane V Do	1
07004	Extraction - DRO (Soils)	SW-846 3550B	1	092930003A	10/20/2009 17:30	Sally L Appleyard	1

\*=This limit was used in the evaluation of the final result

**Sample Description: SB8-S-5-091014 Grab Soil**  
**Facility# 90020 CRAW**  
**1633 Harrison St-Oakland T0600100304 SB8**

**LLI Sample # SW 5807662**  
**LLI Group # 1166665**  
**CA**

**Project Name: 90020**

Collected: 10/14/2009 12:35 by IH

Account Number: 10880

Submitted: 10/16/2009 09:00

ChevronTexaco

Reported: 10/28/2009 at 13:24

6001 Bollinger Canyon Rd L4310

Discard: 11/28/2009

San Ramon CA 94583

SB8-5

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
<b>GC/MS</b>	<b>Volatiles</b>	<b>SW-846 8260B</b>	<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>	
07361	t-Amyl methyl ether	994-05-8	N.D.	0.001	0.005	1.01
07361	Benzene	71-43-2	N.D.	0.0005	0.005	1.01
07361	t-Butyl alcohol	75-65-0	N.D.	0.020	0.10	1.01
07361	1,2-Dibromoethane	106-93-4	N.D.	0.001	0.005	1.01
07361	1,2-Dichloroethane	107-06-2	N.D.	0.001	0.005	1.01
07361	Ethyl t-butyl ether	637-92-3	N.D.	0.001	0.005	1.01
07361	Ethylbenzene	100-41-4	N.D.	0.001	0.005	1.01
07361	di-Isopropyl ether	108-20-3	N.D.	0.001	0.005	1.01
07361	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.0005	0.005	1.01
07361	Toluene	108-88-3	N.D.	0.001	0.005	1.01
07361	Xylene (Total)	1330-20-7	N.D.	0.001	0.005	1.01

<b>GC Volatiles</b>	<b>SW-846 8015B modified</b>	<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>		
01725	TPH-GRO N. CA soil C6-C12	n.a.	N.D.	1.0	1.0	25

<b>GC Extractable TPH w/Si Gel</b>	<b>SW-846 8015B</b>	<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>		
02222	TPH-DRO soil C10-C28 w/Si Gel	n.a.	N.D.	4.0	12	1

### General Sample Comments

State of California Lab Certification No. 2501

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

### Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07361	BTEX+5 Oxygenates+EDC+EDB	SW-846 8260B	1	B092971AA	10/24/2009 11:47	Kristen D Pelliccia	1.01
00374	GC/MS - Bulk Sample Prep	SW-846 5030A	1	200928919522	10/16/2009 16:50	Eric L Vera	n.a.
00374	GC/MS - Bulk Sample Prep	SW-846 5030A	2	200928919522	10/16/2009 16:48	Eric L Vera	n.a.
06646	GC/MS HL Bulk Sample Prep	SW-846 5030A	1	200928919522	10/16/2009 16:50	Eric L Vera	n.a.
01725	TPH-GRO N. CA soil C6-C12	SW-846 8015B modified	1	09292A16B	10/20/2009 15:20	Marie D John	25
01150	GC - Bulk Soil Prep	SW-846 5030A	1	200928919522	10/16/2009 16:51	Eric L Vera	n.a.
02222	TPH-DRO soil C10-C28 w/Si Gel	SW-846 8015B	1	092930003A	10/21/2009 17:40	Diane V Do	1
07004	Extraction - DRO (Soils)	SW-846 3550B	1	092930003A	10/20/2009 17:30	Sally L Appleyard	1

\*=This limit was used in the evaluation of the final result

**Sample Description: SB8-S-15-091014 Grab Soil**  
**Facility# 90020 CRAW**  
**1633 Harrison St-Oakland T0600100304 SB8**

**LLI Sample # SW 5807663**  
**LLI Group # 1166665**  
**CA**

**Project Name: 90020**

Collected: 10/14/2009 13:50 by IH

Account Number: 10880

Submitted: 10/16/2009 09:00

ChevronTexaco

Reported: 10/28/2009 at 13:24

6001 Bollinger Canyon Rd L4310

Discard: 11/28/2009

San Ramon CA 94583

SB815

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
<b>GC/MS</b>	<b>Volatiles</b>	<b>SW-846 8260B</b>	<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>	
07361	t-Amyl methyl ether	994-05-8	N.D.	0.001	0.005	1.06
07361	Benzene	71-43-2	N.D.	0.0005	0.005	1.06
07361	t-Butyl alcohol	75-65-0	N.D.	0.021	0.11	1.06
07361	1,2-Dibromoethane	106-93-4	N.D.	0.001	0.005	1.06
07361	1,2-Dichloroethane	107-06-2	N.D.	0.001	0.005	1.06
07361	Ethyl t-butyl ether	637-92-3	N.D.	0.001	0.005	1.06
07361	Ethylbenzene	100-41-4	N.D.	0.001	0.005	1.06
07361	di-Isopropyl ether	108-20-3	N.D.	0.001	0.005	1.06
07361	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.0005	0.005	1.06
07361	Toluene	108-88-3	N.D.	0.001	0.005	1.06
07361	Xylene (Total)	1330-20-7	N.D.	0.001	0.005	1.06

<b>GC Volatiles</b>	<b>SW-846 8015B modified</b>	<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>		
01725	TPH-GRO N. CA soil C6-C12	n.a.	N.D.	1.0	1.0	25

<b>GC Extractable TPH w/Si Gel</b>	<b>SW-846 8015B</b>	<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>		
02222	TPH-DRO soil C10-C28 w/Si Gel	n.a.	N.D.	4.0	12	1

### General Sample Comments

State of California Lab Certification No. 2501

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

### Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07361	BTEX+5 Oxygenates+EDC+EDB	SW-846 8260B	1	B092971AA	10/24/2009 12:09	Kristen D Pelliccia	1.06
00374	GC/MS - Bulk Sample Prep	SW-846 5030A	1	200928919522	10/16/2009 16:55	Eric L Vera	n.a.
00374	GC/MS - Bulk Sample Prep	SW-846 5030A	2	200928919522	10/16/2009 16:54	Eric L Vera	n.a.
06646	GC/MS HL Bulk Sample Prep	SW-846 5030A	1	200928919522	10/16/2009 16:53	Eric L Vera	n.a.
01725	TPH-GRO N. CA soil C6-C12	SW-846 8015B modified	1	09292A16B	10/20/2009 15:58	Marie D John	25
01150	GC - Bulk Soil Prep	SW-846 5030A	1	200928919522	10/16/2009 16:54	Eric L Vera	n.a.
02222	TPH-DRO soil C10-C28 w/Si Gel	SW-846 8015B	1	092930003A	10/21/2009 18:01	Diane V Do	1
07004	Extraction - DRO (Soils)	SW-846 3550B	1	092930003A	10/20/2009 17:30	Sally L Appleyard	1

\*=This limit was used in the evaluation of the final result



**Sample Description:** SB8-S-10-091014 Grab Soil  
 Facility# 90020 CRAW  
 1633 Harrison St-Oakland T0600100304 SB8

LLI Sample # SW 5807664  
 LLI Group # 1166665  
 CA

**Project Name:** 90020

Collected: 10/14/2009 14:00 by IH

Account Number: 10880

Submitted: 10/16/2009 09:00

ChevronTexaco

Reported: 10/28/2009 at 13:24

6001 Bollinger Canyon Rd L4310

Discard: 11/28/2009

San Ramon CA 94583

810SB

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
<b>GC/MS</b>	<b>Volatiles</b>	<b>SW-846 8260B</b>	<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>	
07361	t-Amyl methyl ether	994-05-8	N.D.	0.001	0.005	0.99
07361	Benzene	71-43-2	N.D.	0.0005	0.005	0.99
07361	t-Butyl alcohol	75-65-0	N.D.	0.020	0.099	0.99
07361	1,2-Dibromoethane	106-93-4	N.D.	0.001	0.005	0.99
07361	1,2-Dichloroethane	107-06-2	N.D.	0.001	0.005	0.99
07361	Ethyl t-butyl ether	637-92-3	N.D.	0.001	0.005	0.99
07361	Ethylbenzene	100-41-4	N.D.	0.001	0.005	0.99
07361	di-Isopropyl ether	108-20-3	N.D.	0.001	0.005	0.99
07361	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.0005	0.005	0.99
07361	Toluene	108-88-3	N.D.	0.001	0.005	0.99
07361	Xylene (Total)	1330-20-7	N.D.	0.001	0.005	0.99
<b>GC</b>	<b>Volatiles</b>	<b>SW-846 8015B modified</b>	<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>	
01725	TPH-GRO N. CA soil C6-C12	n.a.	N.D.	1.0	1.0	25
<b>GC</b>	<b>Extractable TPH</b>	<b>SW-846 8015B</b>	<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>	
<b>w/Si Gel</b>						
02222	TPH-DRO soil C10-C28 w/Si Gel	n.a.	N.D.	4.0	12	1

### General Sample Comments

State of California Lab Certification No. 2501

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

### Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07361	BTEX+5 Oxygenates+EDC+EDB	SW-846 8260B	1	B092971AA	10/24/2009 12:32	Kristen D Pelliccia	0.99
00374	GC/MS - Bulk Sample Prep	SW-846 5030A	1	200928919522	10/16/2009 16:58	Eric L Vera	n.a.
00374	GC/MS - Bulk Sample Prep	SW-846 5030A	2	200928919522	10/16/2009 16:59	Eric L Vera	n.a.
06646	GC/MS HL Bulk Sample Prep	SW-846 5030A	1	200928919522	10/16/2009 17:00	Eric L Vera	n.a.
01725	TPH-GRO N. CA soil C6-C12	SW-846 8015B modified	1	09292A16B	10/20/2009 16:36	Marie D John	25
01150	GC - Bulk Soil Prep	SW-846 5030A	1	200928919522	10/16/2009 17:00	Eric L Vera	n.a.
02222	TPH-DRO soil C10-C28 w/Si Gel	SW-846 8015B	1	092930003A	10/21/2009 18:22	Diane V Do	1
07004	Extraction - DRO (Soils)	SW-846 3550B	1	092930003A	10/20/2009 17:30	Sally L Appleyard	1

\*=This limit was used in the evaluation of the final result

**Sample Description: SB8-S-19.5-091014 Grab Soil**  
**Facility# 90020 CRAW**  
**1633 Harrison St-Oakland T0600100304 SB8**

**LLI Sample # SW 5807665**  
**LLI Group # 1166665**  
**CA**

**Project Name: 90020**

Collected: 10/14/2009 14:10 by IH

Account Number: 10880

Submitted: 10/16/2009 09:00

ChevronTexaco

Reported: 10/28/2009 at 13:24

6001 Bollinger Canyon Rd L4310

Discard: 11/28/2009

San Ramon CA 94583

SB819

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
<b>GC/MS</b>	<b>Volatiles</b>	<b>SW-846 8260B</b>	<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>	
07361	t-Amyl methyl ether	994-05-8	N.D.	0.001	0.005	1.04
07361	Benzene	71-43-2	N.D.	0.0005	0.005	1.04
07361	t-Butyl alcohol	75-65-0	N.D.	0.021	0.10	1.04
07361	1,2-Dibromoethane	106-93-4	N.D.	0.001	0.005	1.04
07361	1,2-Dichloroethane	107-06-2	N.D.	0.001	0.005	1.04
07361	Ethyl t-butyl ether	637-92-3	N.D.	0.001	0.005	1.04
07361	Ethylbenzene	100-41-4	N.D.	0.001	0.005	1.04
07361	di-Isopropyl ether	108-20-3	N.D.	0.001	0.005	1.04
07361	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.0005	0.005	1.04
07361	Toluene	108-88-3	N.D.	0.001	0.005	1.04
07361	Xylene (Total)	1330-20-7	N.D.	0.001	0.005	1.04
<b>GC</b>	<b>Volatiles</b>	<b>SW-846 8015B modified</b>	<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>	
01725	TPH-GRO N. CA soil C6-C12	n.a.	N.D.	1.0	1.0	25
<b>GC</b>	<b>Extractable TPH</b>	<b>SW-846 8015B</b>	<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>	
<b>w/Si Gel</b>						
02222	TPH-DRO soil C10-C28 w/Si Gel	n.a.	N.D.	4.0	12	1

### General Sample Comments

State of California Lab Certification No. 2501

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

### Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07361	BTEX+5 Oxygenates+EDC+EDB	SW-846 8260B	1	B092971AA	10/24/2009 12:54	Kristen D Pelliccia	1.04
00374	GC/MS - Bulk Sample Prep	SW-846 5030A	1	200928919522	10/16/2009 17:05	Eric L Vera	n.a.
00374	GC/MS - Bulk Sample Prep	SW-846 5030A	2	200928919522	10/16/2009 17:04	Eric L Vera	n.a.
06646	GC/MS HL Bulk Sample Prep	SW-846 5030A	1	200928919522	10/16/2009 17:03	Eric L Vera	n.a.
01725	TPH-GRO N. CA soil C6-C12	SW-846 8015B modified	1	09292A16B	10/20/2009 17:14	Marie D John	25
01150	GC - Bulk Soil Prep	SW-846 5030A	1	200928919522	10/16/2009 17:03	Eric L Vera	n.a.
02222	TPH-DRO soil C10-C28 w/Si Gel	SW-846 8015B	1	092930003A	10/21/2009 18:43	Diane V Do	1
07004	Extraction - DRO (Soils)	SW-846 3550B	1	092930003A	10/20/2009 17:30	Sally L Appleyard	1

\*=This limit was used in the evaluation of the final result

**Sample Description: SB8-S-24.5-091014 Grab Soil**  
**Facility# 90020 CRAW**  
**1633 Harrison St-Oakland T0600100304 SB8**

**LLI Sample # SW 5807666**  
**LLI Group # 1166665**  
**CA**

**Project Name: 90020**

Collected: 10/14/2009 14:20 by IH

Account Number: 10880

Submitted: 10/16/2009 09:00

ChevronTexaco

Reported: 10/28/2009 at 13:24

6001 Bollinger Canyon Rd L4310

Discard: 11/28/2009

San Ramon CA 94583

SB824

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
<b>GC/MS</b>	<b>Volatiles</b>	<b>SW-846 8260B</b>	<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>	
07361	t-Amyl methyl ether	994-05-8	N.D.	0.0009	0.005	0.93
07361	Benzene	71-43-2	N.D.	0.0005	0.005	0.93
07361	t-Butyl alcohol	75-65-0	N.D.	0.019	0.093	0.93
07361	1,2-Dibromoethane	106-93-4	N.D.	0.0009	0.005	0.93
07361	1,2-Dichloroethane	107-06-2	N.D.	0.0009	0.005	0.93
07361	Ethyl t-butyl ether	637-92-3	N.D.	0.0009	0.005	0.93
07361	Ethylbenzene	100-41-4	N.D.	0.0009	0.005	0.93
07361	di-Isopropyl ether	108-20-3	N.D.	0.0009	0.005	0.93
07361	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.0005	0.005	0.93
07361	Toluene	108-88-3	N.D.	0.0009	0.005	0.93
07361	Xylene (Total)	1330-20-7	N.D.	0.0009	0.005	0.93
<b>GC</b>	<b>Volatiles</b>	<b>SW-846 8015B modified</b>	<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>	
01725	TPH-GRO N. CA soil C6-C12	n.a.	N.D.	1.0	1.0	25
<b>GC Extractable TPH</b>	<b>SW-846 8015B</b>		<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>	
<b>w/Si Gel</b>						
02222	TPH-DRO soil C10-C28 w/Si Gel	n.a.	N.D.	4.0	12	1

### General Sample Comments

State of California Lab Certification No. 2501

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

### Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07361	BTEX+5 Oxygenates+EDC+EDB	SW-846 8260B	1	B092972AA	10/25/2009 04:10	Holly Berry	0.93
00374	GC/MS - Bulk Sample Prep	SW-846 5030A	1	200928919522	10/16/2009 17:07	Eric L Vera	n.a.
00374	GC/MS - Bulk Sample Prep	SW-846 5030A	2	200928919522	10/16/2009 17:07	Eric L Vera	n.a.
06646	GC/MS HL Bulk Sample Prep	SW-846 5030A	1	200928919522	10/16/2009 17:09	Eric L Vera	n.a.
01725	TPH-GRO N. CA soil C6-C12	SW-846 8015B modified	1	09292A16B	10/20/2009 17:52	Marie D John	25
01150	GC - Bulk Soil Prep	SW-846 5030A	1	200928919522	10/16/2009 17:08	Eric L Vera	n.a.
02222	TPH-DRO soil C10-C28 w/Si Gel	SW-846 8015B	1	092930003A	10/21/2009 19:04	Diane V Do	1
07004	Extraction - DRO (Soils)	SW-846 3550B	1	092930003A	10/20/2009 17:30	Sally L Appleyard	1

\*=This limit was used in the evaluation of the final result

**Sample Description: SB8-S-28.5-091014 Grab Soil**  
**Facility# 90020 CRAW**  
**1633 Harrison St-Oakland T0600100304 SB8**

**LLI Sample # SW 5807667**  
**LLI Group # 1166665**  
**CA**

**Project Name: 90020**

Collected: 10/14/2009 14:28 by IH

Account Number: 10880

Submitted: 10/16/2009 09:00

ChevronTexaco

Reported: 10/28/2009 at 13:24

6001 Bollinger Canyon Rd L4310

Discard: 11/28/2009

San Ramon CA 94583

SB828

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
<b>GC/MS</b>	<b>Volatiles</b>	<b>SW-846 8260B</b>	<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>	
07361	t-Amyl methyl ether	994-05-8	N.D.	0.001	0.005	0.98
07361	Benzene	71-43-2	N.D.	0.0005	0.005	0.98
07361	t-Butyl alcohol	75-65-0	N.D.	0.020	0.098	0.98
07361	1,2-Dibromoethane	106-93-4	N.D.	0.001	0.005	0.98
07361	1,2-Dichloroethane	107-06-2	N.D.	0.001	0.005	0.98
07361	Ethyl t-butyl ether	637-92-3	N.D.	0.001	0.005	0.98
07361	Ethylbenzene	100-41-4	N.D.	0.001	0.005	0.98
07361	di-Isopropyl ether	108-20-3	N.D.	0.001	0.005	0.98
07361	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.0005	0.005	0.98
07361	Toluene	108-88-3	N.D.	0.001	0.005	0.98
07361	Xylene (Total)	1330-20-7	N.D.	0.001	0.005	0.98
<b>GC</b>	<b>Volatiles</b>	<b>SW-846 8015B modified</b>	<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>	
01725	TPH-GRO N. CA soil C6-C12	n.a.	N.D.	1.0	1.0	25
<b>GC Extractable TPH</b>	<b>SW-846 8015B</b>		<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>	
<b>w/Si Gel</b>						
02222	TPH-DRO soil C10-C28 w/Si Gel	n.a.	N.D.	4.0	12	1

### General Sample Comments

State of California Lab Certification No. 2501

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

### Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07361	BTEX+5 Oxygenates+EDC+EDB	SW-846 8260B	1	B092972AA	10/25/2009 04:33	Holly Berry	0.98
00374	GC/MS - Bulk Sample Prep	SW-846 5030A	1	200928919522	10/16/2009 17:12	Eric L Vera	n.a.
00374	GC/MS - Bulk Sample Prep	SW-846 5030A	2	200928919522	10/16/2009 17:12	Eric L Vera	n.a.
06646	GC/MS HL Bulk Sample Prep	SW-846 5030A	1	200928919522	10/16/2009 17:13	Eric L Vera	n.a.
01725	TPH-GRO N. CA soil C6-C12	SW-846 8015B modified	1	09292A16B	10/20/2009 18:30	Marie D John	25
01150	GC - Bulk Soil Prep	SW-846 5030A	1	200928919522	10/16/2009 17:13	Eric L Vera	n.a.
02222	TPH-DRO soil C10-C28 w/Si Gel	SW-846 8015B	1	092930003A	10/21/2009 19:25	Diane V Do	1
07004	Extraction - DRO (Soils)	SW-846 3550B	1	092930003A	10/20/2009 17:30	Sally L Appleyard	1

\*=This limit was used in the evaluation of the final result

**Sample Description:** VP-7-S-5-091014 Grab Soil  
 Facility# 90020 CRAW  
 1633 Harrison St-Oakland T0600100304 VP-7

LLI Sample # SW 5807668  
 LLI Group # 1166665  
 CA

**Project Name:** 90020

Collected: 10/14/2009 15:45 by IH

Account Number: 10880

Submitted: 10/16/2009 09:00

ChevronTexaco

Reported: 10/28/2009 at 13:24

6001 Bollinger Canyon Rd L4310

Discard: 11/28/2009

San Ramon CA 94583

VP7-5

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
<b>GC/MS</b>	<b>Volatiles</b>	<b>SW-846 8260B</b>	<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>	
07361	t-Amyl methyl ether	994-05-8	N.D.	0.001	0.005	1.02
07361	Benzene	71-43-2	N.D.	0.0005	0.005	1.02
07361	t-Butyl alcohol	75-65-0	N.D.	0.020	0.10	1.02
07361	1,2-Dibromoethane	106-93-4	N.D.	0.001	0.005	1.02
07361	1,2-Dichloroethane	107-06-2	N.D.	0.001	0.005	1.02
07361	Ethyl t-butyl ether	637-92-3	N.D.	0.001	0.005	1.02
07361	Ethylbenzene	100-41-4	N.D.	0.001	0.005	1.02
07361	di-Isopropyl ether	108-20-3	N.D.	0.001	0.005	1.02
07361	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.0005	0.005	1.02
07361	Toluene	108-88-3	N.D.	0.001	0.005	1.02
07361	Xylene (Total)	1330-20-7	N.D.	0.001	0.005	1.02
<b>GC</b>	<b>Volatiles</b>	<b>SW-846 8015B modified</b>	<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>	
01725	TPH-GRO N. CA soil C6-C12	n.a.	N.D.	1.0	1.0	25
<b>GC Extractable TPH</b>	<b>SW-846 8015B</b>		<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>	
<b>w/Si Gel</b>						
02222	TPH-DRO soil C10-C28 w/Si Gel	n.a.	N.D.	4.0	12	1

### General Sample Comments

State of California Lab Certification No. 2501

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

### Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07361	BTEX+5 Oxygenates+EDC+EDB	SW-846 8260B	1	B092972AA	10/25/2009 04:55	Holly Berry	1.02
00374	GC/MS - Bulk Sample Prep	SW-846 5030A	1	200928919522	10/16/2009 18:42	Eric L Vera	n.a.
00374	GC/MS - Bulk Sample Prep	SW-846 5030A	2	200928919522	10/16/2009 18:41	Eric L Vera	n.a.
06646	GC/MS HL Bulk Sample Prep	SW-846 5030A	1	200928919522	10/16/2009 18:42	Eric L Vera	n.a.
01725	TPH-GRO N. CA soil C6-C12	SW-846 8015B modified	1	09292A16B	10/20/2009 19:08	Marie D John	25
01150	GC - Bulk Soil Prep	SW-846 5030A	1	200928919522	10/16/2009 18:41	Eric L Vera	n.a.
02222	TPH-DRO soil C10-C28 w/Si Gel	SW-846 8015B	1	092930003A	10/21/2009 19:46	Diane V Do	1
07004	Extraction - DRO (Soils)	SW-846 3550B	1	092930003A	10/20/2009 17:30	Sally L Appleyard	1

\*=This limit was used in the evaluation of the final result

**Sample Description:** VP-7-S-10-091014 Grab Soil  
**Facility#** 90020 CRAW  
**1633 Harrison St-Oakland T0600100304 VP-7**

**LLI Sample #** SW 5807669  
**LLI Group #** 1166665  
**CA**

**Project Name:** 90020

Collected: 10/14/2009 16:05 by IH

Account Number: 10880

Submitted: 10/16/2009 09:00

ChevronTexaco

Reported: 10/28/2009 at 13:24

6001 Bollinger Canyon Rd L4310

Discard: 11/28/2009

San Ramon CA 94583

VP710

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
<b>GC/MS</b>	<b>Volatiles</b>	<b>SW-846 8260B</b>	<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>	
07361	t-Amyl methyl ether	994-05-8	N.D.	0.001	0.005	0.95
07361	Benzene	71-43-2	N.D.	0.0005	0.005	0.95
07361	t-Butyl alcohol	75-65-0	N.D.	0.019	0.095	0.95
07361	1,2-Dibromoethane	106-93-4	N.D.	0.001	0.005	0.95
07361	1,2-Dichloroethane	107-06-2	N.D.	0.001	0.005	0.95
07361	Ethyl t-butyl ether	637-92-3	N.D.	0.001	0.005	0.95
07361	Ethylbenzene	100-41-4	N.D.	0.001	0.005	0.95
07361	di-Isopropyl ether	108-20-3	N.D.	0.001	0.005	0.95
07361	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.0005	0.005	0.95
07361	Toluene	108-88-3	N.D.	0.001	0.005	0.95
07361	Xylene (Total)	1330-20-7	N.D.	0.001	0.005	0.95
<b>GC</b>	<b>Volatiles</b>	<b>SW-846 8015B modified</b>	<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>	
01725	TPH-GRO N. CA soil C6-C12	n.a.	N.D.	1.0	1.0	25
<b>GC Extractable TPH</b>	<b>SW-846 8015B</b>		<b>mg/kg</b>	<b>mg/kg</b>	<b>mg/kg</b>	
<b>w/Si Gel</b>						
02222	TPH-DRO soil C10-C28 w/Si Gel	n.a.	N.D.	4.0	12	1

### General Sample Comments

State of California Lab Certification No. 2501

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

### Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07361	BTEX+5 Oxygenates+EDC+EDB	SW-846 8260B	1	B092972AA	10/25/2009 05:18	Holly Berry	0.95
00374	GC/MS - Bulk Sample Prep	SW-846 5030A	1	200928919522	10/16/2009 18:49	Eric L Vera	n.a.
00374	GC/MS - Bulk Sample Prep	SW-846 5030A	2	200928919522	10/16/2009 18:49	Eric L Vera	n.a.
06646	GC/MS HL Bulk Sample Prep	SW-846 5030A	1	200928919522	10/16/2009 18:48	Eric L Vera	n.a.
01725	TPH-GRO N. CA soil C6-C12	SW-846 8015B modified	1	09292A16B	10/20/2009 19:45	Marie D John	25
01150	GC - Bulk Soil Prep	SW-846 5030A	1	200928919522	10/16/2009 18:48	Eric L Vera	n.a.
02222	TPH-DRO soil C10-C28 w/Si Gel	SW-846 8015B	1	092930003A	10/21/2009 20:06	Diane V Do	1
07004	Extraction - DRO (Soils)	SW-846 3550B	1	092930003A	10/20/2009 17:30	Sally L Appleyard	1

\*=This limit was used in the evaluation of the final result



# Analysis Report

2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 • 717-656-2300 Fax: 717-656-2681 • www.lancasterlabs.com

Sample Description: SB7-W-23-091014 Grab Water  
Facility# 90020 CRAW  
1633 Harrison St-Oakland T0600100304 SB7

LLI Sample # WW 5807670  
LLI Group # 1166665  
CA

Project Name: 90020

Collected: 10/14/2009 17:30 by IH

Account Number: 10880

Submitted: 10/16/2009 09:00

ChevronTexaco

Reported: 10/28/2009 at 13:24

6001 Bollinger Canyon Rd L4310

Discard: 11/28/2009

San Ramon CA 94583

23SB7

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
<b>GC/MS</b>	<b>Volatiles</b>	<b>SW-846 8260B</b>	<b>ug/l</b>	<b>ug/l</b>	<b>ug/l</b>	
06058	t-Amyl methyl ether	994-05-8	N.D.	0.5	1	1
06058	Benzene	71-43-2	N.D.	0.5	1	1
06058	t-Butyl alcohol	75-65-0	N.D.	2	5	1
06058	1,2-Dibromoethane	106-93-4	N.D.	0.5	1	1
06058	1,2-Dichloroethane	107-06-2	N.D.	0.5	1	1
06058	Ethyl t-butyl ether	637-92-3	N.D.	0.5	1	1
06058	Ethylbenzene	100-41-4	N.D.	0.5	1	1
06058	di-Isopropyl ether	108-20-3	N.D.	0.5	1	1
06058	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.5	1	1
06058	Toluene	108-88-3	N.D.	0.5	1	1
06058	Xylene (Total)	1330-20-7	N.D.	0.5	1	1
<b>GC</b>	<b>Volatiles</b>	<b>SW-846 8015B</b>	<b>ug/l</b>	<b>ug/l</b>	<b>ug/l</b>	
01728	TPH-GRO N. CA water C6-C12	n.a.	N.D.	50	100	1
<b>GC</b>	<b>Extractable TPH w/Si Gel</b>	<b>SW-846 8015B</b>	<b>ug/l</b>	<b>ug/l</b>	<b>ug/l</b>	
02216	TPH-DRO water C10-C28 w/Si Gel	n.a.	N.D.	320	1,000	1
Due to the nature of the sample matrix, a reduced aliquot was used for analysis. The reporting limits were raised accordingly.						

### General Sample Comments

State of California Lab Certification No. 2501  
Trip blank vials were not received by the laboratory for this sample group.

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

### Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06058	BTEX+5 Oxygenates+EDC+EDB	SW-846 8260B	1	Z092921AA	10/19/2009 17:02	Ginelle L Feister	1
01163	GC/MS VOA Water Prep	SW-846 5030B	1	Z092921AA	10/19/2009 17:02	Ginelle L Feister	1
01728	TPH-GRO N. CA water C6-C12	SW-846 8015B	1	09293D20A	10/21/2009 02:26	Tyler O Griffin	1
01146	GC VOA Water Prep	SW-846 5030B	1	09293D20A	10/21/2009 02:26	Tyler O Griffin	1
02216	TPH-DRO water C10-C28 w/Si Gel	SW-846 8015B	1	092900007A	10/19/2009 16:20	Diane V Do	1
07003	Extraction - DRO (Waters)	SW-846 3510C	1	092900007A	10/19/2009 02:45	Roman Kuropatkin	1

\*=This limit was used in the evaluation of the final result

**Sample Description: SB8-W-24-091014 Grab Water**  
**Facility# 90020 CRAW**  
**1633 Harrison St-Oakland T0600100304 SB8**

**LLI Sample # WW 5807671**  
**LLI Group # 1166665**  
**CA**

**Project Name: 90020**

Collected: 10/14/2009 17:45 by IH

Account Number: 10880

Submitted: 10/16/2009 09:00

ChevronTexaco

Reported: 10/28/2009 at 13:24

6001 Bollinger Canyon Rd L4310

Discard: 11/28/2009

San Ramon CA 94583

24SB8

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
<b>GC/MS</b>	<b>Volatiles</b>	<b>SW-846 8260B</b>	<b>ug/l</b>	<b>ug/l</b>	<b>ug/l</b>	
06058	t-Amyl methyl ether	994-05-8	N.D.	0.5	1	1
06058	Benzene	71-43-2	N.D.	0.5	1	1
06058	t-Butyl alcohol	75-65-0	N.D.	2	5	1
06058	1,2-Dibromoethane	106-93-4	N.D.	0.5	1	1
06058	1,2-Dichloroethane	107-06-2	N.D.	0.5	1	1
06058	Ethyl t-butyl ether	637-92-3	N.D.	0.5	1	1
06058	Ethylbenzene	100-41-4	N.D.	0.5	1	1
06058	di-Isopropyl ether	108-20-3	N.D.	0.5	1	1
06058	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.5	1	1
06058	Toluene	108-88-3	N.D.	0.5	1	1
06058	Xylene (Total)	1330-20-7	N.D.	0.5	1	1
<b>GC</b>	<b>Volatiles</b>	<b>SW-846 8015B</b>	<b>ug/l</b>	<b>ug/l</b>	<b>ug/l</b>	
01728	TPH-GRO N. CA water C6-C12	n.a.	N.D.	50	100	1
<b>GC</b>	<b>Extractable TPH</b>	<b>SW-846 8015B</b>	<b>ug/l</b>	<b>ug/l</b>	<b>ug/l</b>	
<b>w/Si Gel</b>						
02216	TPH-DRO water C10-C28 w/Si Gel	n.a.	N.D.	320	1,000	1
Due to the nature of the sample matrix, a reduced aliquot was used for analysis. The reporting limits were raised accordingly.						

### General Sample Comments

State of California Lab Certification No. 2501  
Trip blank vials were not received by the laboratory for this sample group.

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

### Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06058	BTEX+5 Oxygenates+EDC+EDB	SW-846 8260B	1	Z092921AA	10/19/2009 17:28	Ginelle L Feister	1
01163	GC/MS VOA Water Prep	SW-846 5030B	1	Z092921AA	10/19/2009 17:28	Ginelle L Feister	1
01728	TPH-GRO N. CA water C6-C12	SW-846 8015B	1	09293D20A	10/21/2009 02:47	Tyler O Griffin	1
01146	GC VOA Water Prep	SW-846 5030B	1	09293D20A	10/21/2009 02:47	Tyler O Griffin	1
02216	TPH-DRO water C10-C28 w/Si Gel	SW-846 8015B	1	092900007A	10/19/2009 16:42	Diane V Do	1
07003	Extraction - DRO (Waters)	SW-846 3510C	1	092900007A	10/19/2009 02:45	Roman Kuropatkin	1



## Quality Control Summary

 Client Name: ChevronTexaco  
 Reported: 10/28/09 at 01:24 PM

Group Number: 1166665

Matrix QC may not be reported if site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

### Laboratory Compliance Quality Control

<u>Analysis Name</u>	<u>Blank Result</u>	<u>Blank MDL**</u>	<u>Blank LOQ</u>	<u>Report Units</u>	<u>LCS %REC</u>	<u>LCSD %REC</u>	<u>LCS/LCSD Limits</u>	<u>RPD</u>	<u>RPD Max</u>
Batch number: A092972AA Sample number(s): 5807656-5807659									
t-Amyl methyl ether	N.D.	0.001	0.005	mg/kg	106	97	69-124	9	30
Benzene	N.D.	0.0005	0.005	mg/kg	101	96	80-120	6	30
t-Butyl alcohol	N.D.	0.020	0.10	mg/kg	96	95	71-122	1	30
1,2-Dibromoethane	N.D.	0.001	0.005	mg/kg	109	100	80-120	9	30
1,2-Dichloroethane	N.D.	0.001	0.005	mg/kg	109	101	71-129	8	30
Ethyl t-butyl ether	N.D.	0.001	0.005	mg/kg	101	93	70-122	8	30
Ethylbenzene	N.D.	0.001	0.005	mg/kg	100	95	80-120	5	30
di-Isopropyl ether	N.D.	0.001	0.005	mg/kg	102	95	73-121	7	30
Methyl Tertiary Butyl Ether	N.D.	0.0005	0.005	mg/kg	112	101	74-121	10	30
Toluene	N.D.	0.001	0.005	mg/kg	98	94	80-120	4	30
Xylene (Total)	N.D.	0.001	0.005	mg/kg	97	92	80-120	5	30
Batch number: B092971AA Sample number(s): 5807660-5807665									
t-Amyl methyl ether	N.D.	0.001	0.005	mg/kg	94		69-124		
Benzene	N.D.	0.0005	0.005	mg/kg	96		80-120		
t-Butyl alcohol	N.D.	0.020	0.10	mg/kg	117		71-122		
1,2-Dibromoethane	N.D.	0.001	0.005	mg/kg	98		80-120		
1,2-Dichloroethane	N.D.	0.001	0.005	mg/kg	100		71-129		
Ethyl t-butyl ether	N.D.	0.001	0.005	mg/kg	86		70-122		
Ethylbenzene	N.D.	0.001	0.005	mg/kg	94		80-120		
di-Isopropyl ether	N.D.	0.001	0.005	mg/kg	88		73-121		
Methyl Tertiary Butyl Ether	N.D.	0.0005	0.005	mg/kg	97		74-121		
Toluene	N.D.	0.001	0.005	mg/kg	93		80-120		
Xylene (Total)	N.D.	0.001	0.005	mg/kg	93		80-120		
Batch number: B092972AA Sample number(s): 5807666-5807669									
t-Amyl methyl ether	N.D.	0.001	0.005	mg/kg	93		69-124		
Benzene	N.D.	0.0005	0.005	mg/kg	95		80-120		
t-Butyl alcohol	N.D.	0.020	0.10	mg/kg	104		71-122		
1,2-Dibromoethane	N.D.	0.001	0.005	mg/kg	99		80-120		
1,2-Dichloroethane	N.D.	0.001	0.005	mg/kg	98		71-129		
Ethyl t-butyl ether	N.D.	0.001	0.005	mg/kg	87		70-122		
Ethylbenzene	N.D.	0.001	0.005	mg/kg	93		80-120		
di-Isopropyl ether	N.D.	0.001	0.005	mg/kg	88		73-121		
Methyl Tertiary Butyl Ether	N.D.	0.0005	0.005	mg/kg	99		74-121		
Toluene	N.D.	0.001	0.005	mg/kg	92		80-120		
Xylene (Total)	N.D.	0.001	0.005	mg/kg	92		80-120		
Batch number: Z092921AA Sample number(s): 5807670-5807671									
t-Amyl methyl ether	N.D.	0.5	1	ug/l	91		77-120		
Benzene	N.D.	0.5	1	ug/l	95		79-120		
t-Butyl alcohol	N.D.	2.	5	ug/l	89		73-120		
1,2-Dibromoethane	N.D.	0.5	1	ug/l	89		80-120		
1,2-Dichloroethane	N.D.	0.5	1	ug/l	92		70-130		
Ethyl t-butyl ether	N.D.	0.5	1	ug/l	90		76-120		
Ethylbenzene	N.D.	0.5	1	ug/l	96		79-120		

\*- Outside of specification

\*\*-This limit was used in the evaluation of the final result for the blank

- (1) The result for one or both determinations was less than five times the LOQ.
- (2) The unspiked result was more than four times the spike added.

## Quality Control Summary

 Client Name: ChevronTexaco  
 Reported: 10/28/09 at 01:24 PM

Group Number: 1166665

### Laboratory Compliance Quality Control

<u>Analysis Name</u>	<u>Blank Result</u>	<u>Blank MDL**</u>	<u>Blank LOQ</u>	<u>Report Units</u>	<u>LCS %REC</u>	<u>LCSD %REC</u>	<u>LCS/LCSD Limits</u>	<u>RPD</u>	<u>RPD Max</u>
di-Isopropyl ether	N.D.	0.5	1	ug/l	89		71-124		
Methyl Tertiary Butyl Ether	N.D.	0.5	1	ug/l	94		76-120		
Toluene	N.D.	0.5	1	ug/l	96		79-120		
Xylene (Total)	N.D.	0.5	1	ug/l	98		80-120		
Batch number: 09292A16A Sample number(s): 5807660									
TPH-GRO N. CA soil C6-C12	N.D.	1.0	1.0	mg/kg	95	88	67-119	7	30
Batch number: 09292A16B Sample number(s): 5807656-5807659,5807661-5807669									
TPH-GRO N. CA soil C6-C12	N.D.	1.0	1.0	mg/kg	95	88	67-119	7	30
Batch number: 09293D20A Sample number(s): 5807670-5807671									
TPH-GRO N. CA water C6-C12	N.D.	50.	100	ug/l	109	109	75-135	0	30
Batch number: 092900007A Sample number(s): 5807670-5807671									
TPH-DRO water C10-C28 w/Si Gel	N.D.	32.	100	ug/l	101	100	56-122	1	20
Batch number: 092930003A Sample number(s): 5807656-5807669									
TPH-DRO soil C10-C28 w/Si Gel	N.D.	4.0	12	mg/kg	100		76-117		

### Sample Matrix Quality Control

 Unspiked (UNSPK) = the sample used in conjunction with the matrix spike  
 Background (BKG) = the sample used in conjunction with the duplicate

<u>Analysis Name</u>	<u>MS %REC</u>	<u>MSD %REC</u>	<u>MS/MSD Limits</u>	<u>RPD</u>	<u>RPD MAX</u>	<u>BKG Conc</u>	<u>DUP Conc</u>	<u>DUP RPD</u>	<u>Dup RPD Max</u>
Batch number: A092972AA Sample number(s): 5807656-5807659 UNSPK: P800822									
t-Amyl methyl ether	92	91	59-123	1	30				
Benzene	96	102	55-143	5	30				
t-Butyl alcohol	154*	208*	47-153	29	30				
1,2-Dibromoethane	89	87	54-129	3	30				
1,2-Dichloroethane	94	93	53-143	1	30				
Ethyl t-butyl ether	92	93	58-124	0	30				
Ethylbenzene	94	105	44-141	11	30				
di-Isopropyl ether	97	98	59-133	0	30				
Methyl Tertiary Butyl Ether	93	90	55-129	4	30				
Toluene	96	103	50-146	6	30				
Xylene (Total)	93	103	44-136	9	30				
Batch number: B092971AA Sample number(s): 5807660-5807665 UNSPK: P808917									
t-Amyl methyl ether	73	84	59-123	13	30				
Benzene	80	89	55-143	8	30				
t-Butyl alcohol	77	88	47-153	11	30				
1,2-Dibromoethane	69	78	54-129	10	30				
1,2-Dichloroethane	77	87	53-143	9	30				
Ethyl t-butyl ether	67	80	58-124	15	30				
Ethylbenzene	72	83	44-141	12	30				
di-Isopropyl ether	69	80	59-133	12	30				
Methyl Tertiary Butyl Ether	75	85	55-129	10	30				
Toluene	74	84	50-146	10	30				
Xylene (Total)	70	81	44-136	13	30				

\*- Outside of specification

\*\*-This limit was used in the evaluation of the final result for the blank

- (1) The result for one or both determinations was less than five times the LOQ.
- (2) The unspiked result was more than four times the spike added.

## Quality Control Summary

 Client Name: ChevronTexaco  
 Reported: 10/28/09 at 01:24 PM

Group Number: 1166665

### Sample Matrix Quality Control

 Unspiked (UNSPK) = the sample used in conjunction with the matrix spike  
 Background (BKG) = the sample used in conjunction with the duplicate

<u>Analysis Name</u>	<u>MS %REC</u>	<u>MSD %REC</u>	<u>MS/MSD Limits</u>	<u>RPD</u>	<u>RPD MAX</u>	<u>BKG Conc</u>	<u>DUP Conc</u>	<u>DUP RPD</u>	<u>Dup RPD Max</u>
Batch number: B092972AA	Sample number(s): 5807666-5807669 UNSPK: P808369								
t-Amyl methyl ether	91	96	59-123	11	30				
Benzene	98	99	55-143	6	30				
t-Butyl alcohol	166*	142	47-153	10	30				
1,2-Dibromoethane	96	97	54-129	7	30				
1,2-Dichloroethane	98	101	53-143	8	30				
Ethyl t-butyl ether	85	91	58-124	13	30				
Ethylbenzene	96	96	44-141	6	30				
di-Isopropyl ether	88	91	59-133	9	30				
Methyl Tertiary Butyl Ether	96	100	55-129	10	30				
Toluene	97	96	50-146	5	30				
Xylene (Total)	94	94	44-136	5	30				
Batch number: Z092921AA	Sample number(s): 5807670-5807671 UNSPK: P807598								
t-Amyl methyl ether	92	93	75-122	1	30				
Benzene	99	100	80-126	1	30				
t-Butyl alcohol	90	90	67-119	0	30				
1,2-Dibromoethane	89	91	77-116	2	30				
1,2-Dichloroethane	94	95	66-141	1	30				
Ethyl t-butyl ether	90	93	74-122	3	30				
Ethylbenzene	100	102	71-134	2	30				
di-Isopropyl ether	91	92	70-129	1	30				
Methyl Tertiary Butyl Ether	96	96	72-126	1	30				
Toluene	100	99	80-125	1	30				
Xylene (Total)	102	105	79-125	2	30				
Batch number: 09293D20A	Sample number(s): 5807670-5807671 UNSPK: P806750								
TPH-GRO N. CA water C6-C12	127		63-154						
Batch number: 092930003A	Sample number(s): 5807656-5807669 UNSPK: 5807656 BKG: 5807656								
TPH-DRO soil C10-C28 w/Si Gel	99		30-159			N.D.	N.D.	0 (1)	20

### Surrogate Quality Control

Surrogate recoveries which are outside of the QC window are confirmed unless attributed to dilution or otherwise noted on the Analysis Report.

 Analysis Name: BTEX+5 Oxygenates+EDC+EDB  
 Batch number: A092972AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
5807656	86	87	87	84
5807657	88	89	86	85
5807658	88	89	87	85
5807659	89	93	85	84
Blank	87	90	86	84
LCS	88	95	87	88
LCSD	87	90	88	89
MS	82	83	92	80

\*- Outside of specification

\*\*-This limit was used in the evaluation of the final result for the blank

- (1) The result for one or both determinations was less than five times the LOQ.
- (2) The unspiked result was more than four times the spike added.

## Quality Control Summary

 Client Name: ChevronTexaco  
 Reported: 10/28/09 at 01:24 PM

Group Number: 1166665

### Surrogate Quality Control

MSD	81	77	93	81
Limits:	71-114	70-109	70-123	70-111
Analysis Name: BTEX+5 Oxygenates+EDC+EDB				
Batch number: B092971AA				
	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
5807660	97	94	98	86
5807661	97	95	97	86
5807662	97	96	98	86
5807663	99	98	97	87
5807664	97	95	98	86
5807665	98	96	98	87
Blank	98	99	97	88
LCS	100	101	99	92
MS	103	107	98	94
MSD	101	102	99	92
Limits:	71-114	70-109	70-123	70-111

Analysis Name: BTEX+5 Oxygenates+EDC+EDB				
Batch number: B092972AA				
	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
5807666	99	97	100	87
5807667	99	98	100	86
5807668	97	93	100	86
5807669	98	97	101	88
Blank	99	97	102	88
LCS	101	104	101	93
MS	102	101	103	90
MSD	102	102	102	90
Limits:	71-114	70-109	70-123	70-111

Analysis Name: BTEX+5 Oxygenates+EDC+EDB				
Batch number: Z092921AA				
	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
5807670	87	83	87	81
5807671	87	83	86	82
Blank	85	82	87	81
LCS	86	84	88	84
MS	85	84	87	84
MSD	86	84	88	85
Limits:	80-116	77-113	80-113	78-113

 Analysis Name: TPH-GRO N. CA soil C6-C12  
 Batch number: 09292A16A  
 Trifluorotoluene-F

5807660	75
Blank	82
LCS	80
LCSD	75

\*- Outside of specification

\*\*-This limit was used in the evaluation of the final result for the blank

- (1) The result for one or both determinations was less than five times the LOQ.
- (2) The unspiked result was more than four times the spike added.

## Quality Control Summary

Client Name: ChevronTexaco  
Reported: 10/28/09 at 01:24 PM

Group Number: 1166665

### Surrogate Quality Control

Limits: 61-122

Analysis Name: TPH-GRO N. CA soil C6-C12  
Batch number: 09292A16B  
Trifluorotoluene-F

5807656	74
5807657	70
5807658	67
5807659	73
5807661	76
5807662	75
5807663	71
5807664	75
5807665	68
5807666	70
5807667	76
5807668	77
5807669	76
Blank	77
LCS	80
LCSD	75

Limits: 61-122

Analysis Name: TPH-GRO N. CA water C6-C12  
Batch number: 09293D20A  
Trifluorotoluene-F

5807670	100
5807671	100
Blank	101
LCS	132
LCSD	132
MS	135

Limits: 63-135

Analysis Name: TPH-DRO water C10-C28 w/Si Gel  
Batch number: 092900007A  
Orthoterphenyl

5807670	90
5807671	96
Blank	104
LCS	111
LCSD	114

Limits: 54-127

Analysis Name: TPH-DRO soil C10-C28 w/Si Gel  
Batch number: 092930003A  
Orthoterphenyl

5807656	103
5807657	102
5807658	104
5807659	101

\*- Outside of specification

\*\* - This limit was used in the evaluation of the final result for the blank

- (1) The result for one or both determinations was less than five times the LOQ.
- (2) The unspiked result was more than four times the spike added.

## Quality Control Summary

Client Name: ChevronTexaco  
Reported: 10/28/09 at 01:24 PM

Group Number: 1166665

### Surrogate Quality Control

5807660	102
5807661	103
5807662	106
5807663	104
5807664	105
5807665	107
5807666	108
5807667	99
5807668	106
5807669	102
Blank	106
DUP	97
LCS	112
MS	104

---

Limits: 59-129

\*- Outside of specification

\*\* - This limit was used in the evaluation of the final result for the blank

- (1) The result for one or both determinations was less than five times the LOQ.
- (2) The unspiked result was more than four times the spike added.

# Chevron California Region Analysis Request/Chain of Custody



101509-01 1044

Acct. #: 10880

For Lancaster Laboratories use only  
Sample #: 58071056-71

SCR#: 250702

Group# 1166665

Facility #: 9-0020 (AIL)  
 Site Address: 1633 HARRISON STREET, OAKLAND, CA  
 Chevron PM: ARON COSTA Lead Consultant: CRA  
 Consultant/Office: EMERYVILLE  
 Consultant Prj. Mgr.: CHARLOTTE EVANS  
 Consultant Phone #: 510-420-3351 Fax #: 510-420-9170  
 Sampler: IAN HULL  
 Service Order #: \_\_\_\_\_  Non SAR: \_\_\_\_\_

Analyses Requested									
Preservation Codes									
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Preservative Codes**  
 H = HCl      T = Thiosulfate  
 N = HNO<sub>3</sub>    B = NaOH  
 S = H<sub>2</sub>SO<sub>4</sub>    O = Other

J value reporting needed  
 Must meet lowest detection limits possible for 8260 compounds

8021 MTBE Confirmation  
 Confirm highest hit by 8260  
 Confirm all hits by 8260  
 Run \_\_\_ oxy's on highest hit  
 Run \_\_\_ oxy's on all hits

Field Point Name	Matrix	Repeat Sample	Top Depth	Year Month Day	Time Collected	New Field Pt.	Composite	Total Number of Containers	BTEX + MTBE 8260	TPH 8015 MOD GRO	TPH 8015 MOD DRO Silica Gel Cleanup	8260 full scan	Oxygenates (LEAD SCANS)	Lead 7420
SB7	SOIL	NO	5	2009 10 14	1035	YES	X	1	X	X	X	X	X	
SB7			10		1056									
SB7			15		1120									
SB7			20.5		1145									
SB7			23.5		1150									
SB7			26.5		1158									
SB8			5		1235									
SB8			15		1350									
SB8			10		1400									
SB8			19.5		1410									
SB8			24.5		1420									
SB8			28.5		1428									

**Comments / Remarks**  
 EMAIL RESULTS TO:  
 CEVANS ihull  
 EDF DATA TO:  
 dchare  
 ALL @craworld.com

**Turnaround Time Requested (TAT) (please circle)**  
 (STD. TAT) 72 hour      48 hour  
 24 hour              4 day              5 day

**Data Package Options (please circle if required)**  
 QC Summary      Type I - Full  
 Type VI (Raw Data)       Coelt Deliverable not needed  
 WIP (RWQCB)  
 Disk

Relinquished by: <u>Ian Hull</u>	Date: <u>10/14/09</u>	Time: <u>20:00</u>	Received by: <u>SECURE LOCATION</u>	Date:	Time:
Relinquished by: <u>Bulent YIFRU</u>	Date: <u>10/15/09</u>	Time: <u>9:50</u>	Received by: <u>[Signature]</u>	Date: <u>10/15/09</u>	Time: <u>9:50</u>
Relinquished by: <u>[Signature]</u>	Date: <u>10/15/09</u>	Time:	Received by: <u>FedEx</u>	Date: <u>10/15/09</u>	Time:
Relinquished by Commercial Carrier: UPS <u>FedEx</u> Other _____	Temperature Upon Receipt: <u>13.24</u> C°		Received by: <u>[Signature]</u>	Date: <u>10/16/09</u>	Time: <u>09:00</u>
Custody Seals Intact?			Yes	No	







## Lancaster Laboratories Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

<b>N.D.</b>	none detected	<b>BMQL</b>	Below Minimum Quantitation Level
<b>TNTC</b>	Too Numerous To Count	<b>MPN</b>	Most Probable Number
<b>IU</b>	International Units	<b>CP Units</b>	cobalt-chloroplatinate units
<b>umhos/cm</b>	micromhos/cm	<b>NTU</b>	nephelometric turbidity units
<b>C</b>	degrees Celsius	<b>F</b>	degrees Fahrenheit
<b>Cal</b>	(diet) calories	<b>lb.</b>	pound(s)
<b>meq</b>	milliequivalents	<b>kg</b>	kilogram(s)
<b>g</b>	gram(s)	<b>mg</b>	milligram(s)
<b>ug</b>	microgram(s)	<b>l</b>	liter(s)
<b>ml</b>	milliliter(s)	<b>ul</b>	microliter(s)
<b>m3</b>	cubic meter(s)	<b>fib &gt;5 um/ml</b>	fibers greater than 5 microns in length per ml
<b>&lt;</b>	less than – The number following the sign is the <u>limit of quantitation</u> , the smallest amount of analyte which can be reliably determined using this specific test.		
<b>&gt;</b>	greater than		
<b>ppm</b>	parts per million – One ppm is equivalent to one milligram per kilogram (mg/kg), or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter of gas per liter of gas.		
<b>ppb</b>	parts per billion		
<b>Dry weight basis</b>	Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture.		

U.S. EPA data qualifiers:

### Organic Qualifiers

<b>A</b>	TIC is a possible aldol-condensation product
<b>B</b>	Analyte was also detected in the blank
<b>C</b>	Pesticide result confirmed by GC/MS
<b>D</b>	Compound quantitated on a diluted sample
<b>E</b>	Concentration exceeds the calibration range of the instrument
<b>J</b>	Estimated value
<b>N</b>	Presumptive evidence of a compound (TICs only)
<b>P</b>	Concentration difference between primary and confirmation columns >25%
<b>U</b>	Compound was not detected
<b>X,Y,Z</b>	Defined in case narrative

### Inorganic Qualifiers

<b>B</b>	Value is <CRDL, but ≥IDL
<b>E</b>	Estimated due to interference
<b>M</b>	Duplicate injection precision not met
<b>N</b>	Spike amount not within control limits
<b>S</b>	Method of standard additions (MSA) used for calculation
<b>U</b>	Compound was not detected
<b>W</b>	Post digestion spike out of control limits
<b>*</b>	Duplicate analysis not within control limits
<b>+</b>	Correlation coefficient for MSA <0.995

Analytical test results for methods listed on the laboratories' accreditation scope meet all requirements of NELAC unless otherwise noted under the individual analysis.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. This report shall not be reproduced except in full, without the written approval of the laboratory.

**WARRANTY AND LIMITS OF LIABILITY** – In accepting analytical work, we warrant the accuracy of test results for the sample as submitted. THE FOREGOING EXPRESS WARRANTY IS EXCLUSIVE AND IS GIVEN IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED. WE DISCLAIM ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING A WARRANTY OF FITNESS FOR PARTICULAR PURPOSE AND WARRANTY OF MERCHANTABILITY. IN NO EVENT SHALL LANCASTER LABORATORIES BE LIABLE FOR INDIRECT, SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES INCLUDING, BUT NOT LIMITED TO, DAMAGES FOR LOSS OF PROFIT OR GOODWILL REGARDLESS OF (A) THE NEGLIGENCE (EITHER SOLE OR CONCURRENT) OF LANCASTER LABORATORIES AND (B) WHETHER LANCASTER LABORATORIES HAS BEEN INFORMED OF THE POSSIBILITY OF SUCH DAMAGES. We accept no legal responsibility for the purposes for which the client uses the test results. No purchase order or other order for work shall be accepted by Lancaster Laboratories which includes any conditions that vary from the Standard Terms and Conditions of Lancaster Laboratories and we hereby object to any conflicting terms contained in any acceptance or order submitted by client.

11/16/2009

Ms. Charlotte Evans  
Conestoga-Rovers Associates  
5900 Hollis Street  
Suite A  
Emeryville CA 94608

Project Name: Chevron 9-0020  
Project #: 311956  
Workorder #: 0910671A

Dear Ms. Charlotte Evans

The following report includes the data for the above referenced project for sample(s) received on 10/29/2009 at Air Toxics Ltd.

The data and associated QC analyzed by Modified TO-15 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kyle Vagadori at 916-985-1000 if you have any questions regarding the data in this report.

Regards,



Kyle Vagadori  
Project Manager

**WORK ORDER #: 0910671A**

Work Order Summary

<b>CLIENT:</b>	Ms. Charlotte Evans Conestoga-Rovers Associates (CRA) 5900 Hollis Street Suite A Emeryville, CA 94608	<b>BILL TO:</b>	Ms. Charlotte Evans Conestoga-Rovers Associates (CRA) 5900 Hollis Street Suite A Emeryville, CA 94608
<b>PHONE:</b>	510-420-3351	<b>P.O. #</b>	40-4025577
<b>FAX:</b>	510-420-9170	<b>PROJECT #</b>	311956 Chevron 9-0020
<b>DATE RECEIVED:</b>	10/29/2009	<b>CONTACT:</b>	Kyle Vagadori
<b>DATE COMPLETED:</b>	11/16/2009		

<u>FRACTION #</u>	<u>NAME</u>	<u>TEST</u>	<u>RECEIPT VAC./PRES.</u>	<u>FINAL PRESSURE</u>
01A	VP-1-5	Modified TO-15	4.4 "Hg	15 psi
02A	VP-1-10	Modified TO-15	5.0 "Hg	15 psi
03A	VP-2-5	Modified TO-15	5.2 "Hg	15 psi
04A	VP-2-10	Modified TO-15	6.6 "Hg	15 psi
05A	VP-2-10 DUP	Modified TO-15	6.0 "Hg	15 psi
06A	VP-3-5	Modified TO-15	6.2 "Hg	15 psi
07A	VP-3-10	Modified TO-15	6.0 "Hg	15 psi
08A	VP-4R-5	Modified TO-15	3.2 "Hg	15 psi
09A	VP-4R-10	Modified TO-15	3.4 "Hg	15 psi
10A	VP-5R-5	Modified TO-15	5.6 "Hg	15 psi
11A	VP-5R-5 DUP	Modified TO-15	5.4 "Hg	15 psi
12A	VP-6-5	Modified TO-15	5.4 "Hg	15 psi
13A	VP-6-10	Modified TO-15	5.0 "Hg	15 psi
14A	VP-7-5	Modified TO-15	5.6 "Hg	15 psi
14AA	VP-7-5 Lab Duplicate	Modified TO-15	5.6 "Hg	15 psi
15A	VP-7-10	Modified TO-15	6.4 "Hg	15 psi
16A	VP-5R-10	Modified TO-15	6.0 "Hg	15 psi

Continued on next page

**WORK ORDER #: 0910671A**

Work Order Summary

<b>CLIENT:</b>	Ms. Charlotte Evans Conestoga-Rovers Associates (CRA) 5900 Hollis Street Suite A Emeryville, CA 94608	<b>BILL TO:</b>	Ms. Charlotte Evans Conestoga-Rovers Associates (CRA) 5900 Hollis Street Suite A Emeryville, CA 94608
<b>PHONE:</b>	510-420-3351	<b>P.O. #</b>	40-4025577
<b>FAX:</b>	510-420-9170	<b>PROJECT #</b>	311956 Chevron 9-0020
<b>DATE RECEIVED:</b>	10/29/2009	<b>CONTACT:</b>	Kyle Vagadori
<b>DATE COMPLETED:</b>	11/16/2009		

<u>FRACTION #</u>	<u>NAME</u>	<u>TEST</u>	<u>RECEIPT VAC./PRES.</u>	<u>FINAL PRESSURE</u>
17A	Trip Blank	Modified TO-15	28.6 "Hg	15 psi
18A	Lab Blank	Modified TO-15	NA	NA
18B	Lab Blank	Modified TO-15	NA	NA
19A	CCV	Modified TO-15	NA	NA
19B	CCV	Modified TO-15	NA	NA
20A	LCS	Modified TO-15	NA	NA
20B	LCS	Modified TO-15	NA	NA

CERTIFIED BY: 

DATE: 11/16/09

Laboratory Director

Certification numbers: CA NELAP - 02110CA, LA NELAP/LELAP- AI 30763, NJ NELAP - CA004  
NY NELAP - 11291, UT NELAP - 9166389892, AZ Licensure AZ0719

Name of Accrediting Agency: NELAP/Florida Department of Health, Scope of Application: Clean Air Act,  
Accreditation number: E87680, Effective date: 07/01/09, Expiration date: 06/30/10

Air Toxics Ltd. certifies that the test results contained in this report meet all requirements of the NELAC standards

This report shall not be reproduced, except in full, without the written approval of Air Toxics Ltd.

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630  
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

**LABORATORY NARRATIVE  
Modified TO-15 Std & Soil Gas  
Conestoga-Rovers Associates  
Workorder# 0910671A**

Seventeen 1 Liter Summa Canister (100% Certified) samples were received on October 29, 2009. The laboratory performed analysis via modified EPA Method TO-15 using GC/MS in the Full Scan mode. The method involves concentrating up to 1.0 liter of air. The concentrated aliquot is then flash vaporized and swept through a water management system to remove water vapor. Following dehumidification, the sample passes directly into the GC/MS for analysis.

This workorder was independently validated prior to submittal using 'USEPA National Functional Guidelines' as generally applied to the analysis of volatile organic compounds in air. A rules-based, logic driven, independent validation engine was employed to assess completeness, evaluate pass/fail of relevant project quality control requirements and verification of all quantified amounts.

Method modifications taken to run these samples are summarized in the table below. Specific project requirements may over-ride the ATL modifications.

<i>Requirement</i>	<i>TO-15</i>	<i>ATL Modifications</i>
Daily CCV	+/- 30% Difference	<= 30% Difference with two allowed out up to <=40%.; flag and narrate outliers
Sample collection media	Summa canister	ATL recommends use of summa canisters to insure data defensibility, but will report results from Tedlar bags at client request
Method Detection Limit	Follow 40CFR Pt.136 App. B	The MDL met all relevant requirements in Method TO-15 (statistical MDL less than the LOQ). The concentration of the spiked replicate may have exceeded 10X the calculated MDL in some cases

**Receiving Notes**

There were no receiving discrepancies.

**Analytical Notes**

All Quality Control Limit failures and affected sample results are noted by flags. Each flag is defined at the bottom of this Case Narrative and on each Sample Result Summary page. Target compound non-detects in the samples that are associated with high bias in QC analyses have not been flagged.

Dilution was performed on samples VP-7-5 and VP-7-10 due to the presence of high level non-target species.

**Definition of Data Qualifying Flags**

Eight qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

- J - Estimated value.
- E - Exceeds instrument calibration range.
- S - Saturated peak.
- Q - Exceeds quality control limits.
- U - Compound analyzed for but not detected above the reporting limit.
- UJ- Non-detected compound associated with low bias in the CCV
- N - The identification is based on presumptive evidence.

File extensions may have been used on the data analysis sheets and indicates as follows:

- a-File was requantified
- b-File was quantified by a second column and detector
- r1-File was requantified for the purpose of reissue



**Summary of Detected Compounds  
MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

**Client Sample ID: VP-1-5**

**Lab ID#: 0910671A-01A**

No Detections Were Found.

**Client Sample ID: VP-1-10**

**Lab ID#: 0910671A-02A**

No Detections Were Found.

**Client Sample ID: VP-2-5**

**Lab ID#: 0910671A-03A**

<b>Compound</b>	<b>Rpt. Limit (ppbv)</b>	<b>Amount (ppbv)</b>	<b>Rpt. Limit (ug/m3)</b>	<b>Amount (ug/m3)</b>
Toluene	1.2	2.5	4.6	9.4
m,p-Xylene	1.2	4.0	5.3	17
o-Xylene	1.2	1.7	5.3	7.3
TPH ref. to Gasoline (MW=100)	24	71 J	100	290 J

**Client Sample ID: VP-2-10**

**Lab ID#: 0910671A-04A**

<b>Compound</b>	<b>Rpt. Limit (ppbv)</b>	<b>Amount (ppbv)</b>	<b>Rpt. Limit (ug/m3)</b>	<b>Amount (ug/m3)</b>
TPH ref. to Gasoline (MW=100)	26	950 J	100	3900 J

**Client Sample ID: VP-2-10 DUP**

**Lab ID#: 0910671A-05A**

<b>Compound</b>	<b>Rpt. Limit (ppbv)</b>	<b>Amount (ppbv)</b>	<b>Rpt. Limit (ug/m3)</b>	<b>Amount (ug/m3)</b>
TPH ref. to Gasoline (MW=100)	25	61 J	100	250 J

**Client Sample ID: VP-3-5**

**Lab ID#: 0910671A-06A**

<b>Compound</b>	<b>Rpt. Limit (ppbv)</b>	<b>Amount (ppbv)</b>	<b>Rpt. Limit (ug/m3)</b>	<b>Amount (ug/m3)</b>
TPH ref. to Gasoline (MW=100)	26	75 J	100	310 J

**Client Sample ID: VP-3-10**

**Lab ID#: 0910671A-07A**



**Summary of Detected Compounds  
MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

**Client Sample ID: VP-3-10**

**Lab ID#: 0910671A-07A**

No Detections Were Found.

**Client Sample ID: VP-4R-5**

**Lab ID#: 0910671A-08A**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
TPH ref. to Gasoline (MW=100)	23	83 J	92	340 J

**Client Sample ID: VP-4R-10**

**Lab ID#: 0910671A-09A**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
m,p-Xylene	1.1	3.2	5.0	14
o-Xylene	1.1	1.2	5.0	5.3
TPH ref. to Gasoline (MW=100)	23	170 J	93	690 J

**Client Sample ID: VP-5R-5**

**Lab ID#: 0910671A-10A**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
TPH ref. to Gasoline (MW=100)	25	63 J	100	260 J

**Client Sample ID: VP-5R-5 DUP**

**Lab ID#: 0910671A-11A**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
m,p-Xylene	1.2	1.9	5.3	8.3
TPH ref. to Gasoline (MW=100)	25	47 J	100	190 J

**Client Sample ID: VP-6-5**

**Lab ID#: 0910671A-12A**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Toluene	1.2	2.8	4.6	11
m,p-Xylene	1.2	2.5	5.3	11



**Summary of Detected Compounds  
MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

**Client Sample ID: VP-6-10**

**Lab ID#: 0910671A-13A**

No Detections Were Found.

**Client Sample ID: VP-7-5**

**Lab ID#: 0910671A-14A**

<b>Compound</b>	<b>Rpt. Limit (ppbv)</b>	<b>Amount (ppbv)</b>	<b>Rpt. Limit (ug/m3)</b>	<b>Amount (ug/m3)</b>
Benzene	2.5	11	7.9	37
Toluene	2.5	7.3	9.3	28
m,p-Xylene	2.5	3.4	11	15
TPH ref. to Gasoline (MW=100)	50	18000 J	200	75000 J

**Client Sample ID: VP-7-5 Lab Duplicate**

**Lab ID#: 0910671A-14AA**

<b>Compound</b>	<b>Rpt. Limit (ppbv)</b>	<b>Amount (ppbv)</b>	<b>Rpt. Limit (ug/m3)</b>	<b>Amount (ug/m3)</b>
Benzene	2.5	11	7.9	37
Toluene	2.5	7.2	9.3	27
m,p-Xylene	2.5	3.4	11	15
TPH ref. to Gasoline (MW=100)	50	19000 J	200	77000 J

**Client Sample ID: VP-7-10**

**Lab ID#: 0910671A-15A**

<b>Compound</b>	<b>Rpt. Limit (ppbv)</b>	<b>Amount (ppbv)</b>	<b>Rpt. Limit (ug/m3)</b>	<b>Amount (ug/m3)</b>
Benzene	43	86	140	280
TPH ref. to Gasoline (MW=100)	860	1300000	3500	5400000

**Client Sample ID: VP-5R-10**

**Lab ID#: 0910671A-16A**

<b>Compound</b>	<b>Rpt. Limit (ppbv)</b>	<b>Amount (ppbv)</b>	<b>Rpt. Limit (ug/m3)</b>	<b>Amount (ug/m3)</b>
TPH ref. to Gasoline (MW=100)	54	110 J	220	460 J

**Client Sample ID: Trip Blank**

**Lab ID#: 0910671A-17A**



**Summary of Detected Compounds**  
**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

**Client Sample ID: Trip Blank**

**Lab ID#: 0910671A-17A**

No Detections Were Found.

Client Sample ID: VP-1-5

Lab ID#: 0910671A-01A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>t111309</b>	<b>Date of Collection:</b> 10/26/09 5:00:00 PM
<b>Dil. Factor:</b>	<b>2.37</b>	<b>Date of Analysis:</b> 11/13/09 01:38 PM

<b>Compound</b>	<b>Rpt. Limit (ppbv)</b>	<b>Amount (ppbv)</b>	<b>Rpt. Limit (ug/m3)</b>	<b>Amount (ug/m3)</b>
Benzene	1.2	Not Detected	3.8	Not Detected
Ethyl Benzene	1.2	Not Detected	5.1	Not Detected
Toluene	1.2	Not Detected	4.5	Not Detected
m,p-Xylene	1.2	Not Detected	5.1	Not Detected
o-Xylene	1.2	Not Detected	5.1	Not Detected
Methyl tert-butyl ether	1.2	Not Detected	4.3	Not Detected
Naphthalene	4.7	Not Detected UJ	25	Not Detected UJ
TPH ref. to Gasoline (MW=100)	24	Not Detected	97	Not Detected

UJ = Non-detected compound associated with low bias in the CCV

**Container Type: 1 Liter Summa Canister (100% Certified)**

<b>Surrogates</b>	<b>%Recovery</b>	<b>Method Limits</b>
1,2-Dichloroethane-d4	95	70-130
Toluene-d8	104	70-130
4-Bromofluorobenzene	98	70-130

Client Sample ID: VP-1-10

Lab ID#: 0910671A-02A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	t111310	<b>Date of Collection:</b> 10/26/09 5:33:00 PM
<b>Dil. Factor:</b>	2.42	<b>Date of Analysis:</b> 11/13/09 02:41 PM

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Benzene	1.2	Not Detected	3.9	Not Detected
Ethyl Benzene	1.2	Not Detected	5.2	Not Detected
Toluene	1.2	Not Detected	4.6	Not Detected
m,p-Xylene	1.2	Not Detected	5.2	Not Detected
o-Xylene	1.2	Not Detected	5.2	Not Detected
Methyl tert-butyl ether	1.2	Not Detected	4.4	Not Detected
Naphthalene	4.8	Not Detected UJ	25	Not Detected UJ
TPH ref. to Gasoline (MW=100)	24	Not Detected	99	Not Detected

UJ = Non-detected compound associated with low bias in the CCV

**Container Type: 1 Liter Summa Canister (100% Certified)**

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	93	70-130
Toluene-d8	104	70-130
4-Bromofluorobenzene	97	70-130

Client Sample ID: VP-2-5

Lab ID#: 0910671A-03A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	t111311	<b>Date of Collection:</b> 10/26/09 3:10:00 PM
<b>Dil. Factor:</b>	2.44	<b>Date of Analysis:</b> 11/13/09 03:19 PM

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Benzene	1.2	Not Detected	3.9	Not Detected
Ethyl Benzene	1.2	Not Detected	5.3	Not Detected
Toluene	1.2	2.5	4.6	9.4
m,p-Xylene	1.2	4.0	5.3	17
o-Xylene	1.2	1.7	5.3	7.3
Methyl tert-butyl ether	1.2	Not Detected	4.4	Not Detected
Naphthalene	4.9	Not Detected UJ	26	Not Detected UJ
TPH ref. to Gasoline (MW=100)	24	71 J	100	290 J

UJ = Non-detected compound associated with low bias in the CCV

J = Estimated value due to bias in the CCV.

**Container Type: 1 Liter Summa Canister (100% Certified)**

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	93	70-130
Toluene-d8	104	70-130
4-Bromofluorobenzene	97	70-130

Client Sample ID: VP-2-10

Lab ID#: 0910671A-04A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	t111312	<b>Date of Collection:</b> 10/26/09 3:33:00 PM
<b>Dil. Factor:</b>	2.59	<b>Date of Analysis:</b> 11/13/09 05:00 PM

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Benzene	1.3	Not Detected	4.1	Not Detected
Ethyl Benzene	1.3	Not Detected	5.6	Not Detected
Toluene	1.3	Not Detected	4.9	Not Detected
m,p-Xylene	1.3	Not Detected	5.6	Not Detected
o-Xylene	1.3	Not Detected	5.6	Not Detected
Methyl tert-butyl ether	1.3	Not Detected	4.7	Not Detected
Naphthalene	5.2	Not Detected UJ	27	Not Detected UJ
TPH ref. to Gasoline (MW=100)	26	950 J	100	3900 J

UJ = Non-detected compound associated with low bias in the CCV

J = Estimated value due to bias in the CCV.

**Container Type: 1 Liter Summa Canister (100% Certified)**

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	92	70-130
Toluene-d8	103	70-130
4-Bromofluorobenzene	98	70-130

Client Sample ID: VP-2-10 DUP

Lab ID#: 0910671A-05A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	t111313	<b>Date of Collection:</b> 10/26/09 3:33:00 PM
<b>Dil. Factor:</b>	2.53	<b>Date of Analysis:</b> 11/13/09 05:36 PM

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Benzene	1.3	Not Detected	4.0	Not Detected
Ethyl Benzene	1.3	Not Detected	5.5	Not Detected
Toluene	1.3	Not Detected	4.8	Not Detected
m,p-Xylene	1.3	Not Detected	5.5	Not Detected
o-Xylene	1.3	Not Detected	5.5	Not Detected
Methyl tert-butyl ether	1.3	Not Detected	4.6	Not Detected
Naphthalene	5.1	Not Detected UJ	26	Not Detected UJ
TPH ref. to Gasoline (MW=100)	25	61 J	100	250 J

UJ = Non-detected compound associated with low bias in the CCV

J = Estimated value due to bias in the CCV.

**Container Type: 1 Liter Summa Canister (100% Certified)**

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	96	70-130
Toluene-d8	105	70-130
4-Bromofluorobenzene	97	70-130



Client Sample ID: VP-3-5

Lab ID#: 0910671A-06A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	t111314	<b>Date of Collection:</b> 10/26/09 4:03:00 PM
<b>Dil. Factor:</b>	2.55	<b>Date of Analysis:</b> 11/13/09 06:15 PM

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Benzene	1.3	Not Detected	4.1	Not Detected
Ethyl Benzene	1.3	Not Detected	5.5	Not Detected
Toluene	1.3	Not Detected	4.8	Not Detected
m,p-Xylene	1.3	Not Detected	5.5	Not Detected
o-Xylene	1.3	Not Detected	5.5	Not Detected
Methyl tert-butyl ether	1.3	Not Detected	4.6	Not Detected
Naphthalene	5.1	Not Detected UJ	27	Not Detected UJ
TPH ref. to Gasoline (MW=100)	26	75 J	100	310 J

UJ = Non-detected compound associated with low bias in the CCV

J = Estimated value due to bias in the CCV.

**Container Type: 1 Liter Summa Canister (100% Certified)**

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	94	70-130
Toluene-d8	106	70-130
4-Bromofluorobenzene	98	70-130

Client Sample ID: VP-3-10

Lab ID#: 0910671A-07A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	t111315	<b>Date of Collection:</b> 10/26/09 4:27:00 PM
<b>Dil. Factor:</b>	2.53	<b>Date of Analysis:</b> 11/13/09 06:51 PM

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Benzene	1.3	Not Detected	4.0	Not Detected
Ethyl Benzene	1.3	Not Detected	5.5	Not Detected
Toluene	1.3	Not Detected	4.8	Not Detected
m,p-Xylene	1.3	Not Detected	5.5	Not Detected
o-Xylene	1.3	Not Detected	5.5	Not Detected
Methyl tert-butyl ether	1.3	Not Detected	4.6	Not Detected
Naphthalene	5.1	Not Detected UJ	26	Not Detected UJ
TPH ref. to Gasoline (MW=100)	25	Not Detected	100	Not Detected

UJ = Non-detected compound associated with low bias in the CCV

**Container Type: 1 Liter Summa Canister (100% Certified)**

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	93	70-130
Toluene-d8	105	70-130
4-Bromofluorobenzene	96	70-130

Client Sample ID: VP-4R-5

Lab ID#: 0910671A-08A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	t111316	<b>Date of Collection:</b> 10/26/09 6:04:00 PM
<b>Dil. Factor:</b>	2.26	<b>Date of Analysis:</b> 11/13/09 08:05 PM

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Benzene	1.1	Not Detected	3.6	Not Detected
Ethyl Benzene	1.1	Not Detected	4.9	Not Detected
Toluene	1.1	Not Detected	4.2	Not Detected
m,p-Xylene	1.1	Not Detected	4.9	Not Detected
o-Xylene	1.1	Not Detected	4.9	Not Detected
Methyl tert-butyl ether	1.1	Not Detected	4.1	Not Detected
Naphthalene	4.5	Not Detected UJ	24	Not Detected UJ
TPH ref. to Gasoline (MW=100)	23	83 J	92	340 J

UJ = Non-detected compound associated with low bias in the CCV

J = Estimated value due to bias in the CCV.

**Container Type: 1 Liter Summa Canister (100% Certified)**

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	94	70-130
Toluene-d8	104	70-130
4-Bromofluorobenzene	95	70-130

Client Sample ID: VP-4R-10

Lab ID#: 0910671A-09A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	t111317	<b>Date of Collection:</b> 10/26/09 6:39:00 PM
<b>Dil. Factor:</b>	2.28	<b>Date of Analysis:</b> 11/13/09 08:41 PM

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Benzene	1.1	Not Detected	3.6	Not Detected
Ethyl Benzene	1.1	Not Detected	4.9	Not Detected
Toluene	1.1	Not Detected	4.3	Not Detected
m,p-Xylene	1.1	3.2	5.0	14
o-Xylene	1.1	1.2	5.0	5.3
Methyl tert-butyl ether	1.1	Not Detected	4.1	Not Detected
Naphthalene	4.6	Not Detected UJ	24	Not Detected UJ
TPH ref. to Gasoline (MW=100)	23	170 J	93	690 J

UJ = Non-detected compound associated with low bias in the CCV

J = Estimated value due to bias in the CCV.

**Container Type: 1 Liter Summa Canister (100% Certified)**

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	93	70-130
Toluene-d8	106	70-130
4-Bromofluorobenzene	95	70-130

Client Sample ID: VP-5R-5

Lab ID#: 0910671A-10A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	t111318	<b>Date of Collection:</b> 10/26/09 1:07:00 PM
<b>Dil. Factor:</b>	2.48	<b>Date of Analysis:</b> 11/13/09 09:17 PM

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Benzene	1.2	Not Detected	4.0	Not Detected
Ethyl Benzene	1.2	Not Detected	5.4	Not Detected
Toluene	1.2	Not Detected	4.7	Not Detected
m,p-Xylene	1.2	Not Detected	5.4	Not Detected
o-Xylene	1.2	Not Detected	5.4	Not Detected
Methyl tert-butyl ether	1.2	Not Detected	4.5	Not Detected
Naphthalene	5.0	Not Detected UJ	26	Not Detected UJ
TPH ref. to Gasoline (MW=100)	25	63 J	100	260 J

UJ = Non-detected compound associated with low bias in the CCV

J = Estimated value due to bias in the CCV.

**Container Type: 1 Liter Summa Canister (100% Certified)**

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	93	70-130
Toluene-d8	105	70-130
4-Bromofluorobenzene	95	70-130

Client Sample ID: VP-5R-5 DUP

Lab ID#: 0910671A-11A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	t111319	Date of Collection:	10/26/09 1:07:00 PM
Dil. Factor:	2.46	Date of Analysis:	11/13/09 09:53 PM

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Benzene	1.2	Not Detected	3.9	Not Detected
Ethyl Benzene	1.2	Not Detected	5.3	Not Detected
Toluene	1.2	Not Detected	4.6	Not Detected
m,p-Xylene	1.2	1.9	5.3	8.3
o-Xylene	1.2	Not Detected	5.3	Not Detected
Methyl tert-butyl ether	1.2	Not Detected	4.4	Not Detected
Naphthalene	4.9	Not Detected UJ	26	Not Detected UJ
TPH ref. to Gasoline (MW=100)	25	47 J	100	190 J

UJ = Non-detected compound associated with low bias in the CCV

J = Estimated value due to bias in the CCV.

Container Type: 1 Liter Summa Canister (100% Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	94	70-130
Toluene-d8	104	70-130
4-Bromofluorobenzene	95	70-130

Client Sample ID: VP-6-5

Lab ID#: 0910671A-12A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	t111320	<b>Date of Collection:</b> 10/26/09 7:40:00 PM
<b>Dil. Factor:</b>	2.46	<b>Date of Analysis:</b> 11/13/09 10:29 PM

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Benzene	1.2	Not Detected	3.9	Not Detected
Ethyl Benzene	1.2	Not Detected	5.3	Not Detected
Toluene	1.2	2.8	4.6	11
m,p-Xylene	1.2	2.5	5.3	11
o-Xylene	1.2	Not Detected	5.3	Not Detected
Methyl tert-butyl ether	1.2	Not Detected	4.4	Not Detected
Naphthalene	4.9	Not Detected UJ	26	Not Detected UJ
TPH ref. to Gasoline (MW=100)	25	Not Detected	100	Not Detected

UJ = Non-detected compound associated with low bias in the CCV

**Container Type: 1 Liter Summa Canister (100% Certified)**

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	93	70-130
Toluene-d8	104	70-130
4-Bromofluorobenzene	96	70-130

Client Sample ID: VP-6-10

Lab ID#: 0910671A-13A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	t111321	<b>Date of Collection:</b> 10/26/09 7:15:00 PM
<b>Dil. Factor:</b>	2.42	<b>Date of Analysis:</b> 11/13/09 11:06 PM

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Benzene	1.2	Not Detected	3.9	Not Detected
Ethyl Benzene	1.2	Not Detected	5.2	Not Detected
Toluene	1.2	Not Detected	4.6	Not Detected
m,p-Xylene	1.2	Not Detected	5.2	Not Detected
o-Xylene	1.2	Not Detected	5.2	Not Detected
Methyl tert-butyl ether	1.2	Not Detected	4.4	Not Detected
Naphthalene	4.8	Not Detected UJ	25	Not Detected UJ
TPH ref. to Gasoline (MW=100)	24	Not Detected	99	Not Detected

UJ = Non-detected compound associated with low bias in the CCV

**Container Type: 1 Liter Summa Canister (100% Certified)**

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	96	70-130
Toluene-d8	104	70-130
4-Bromofluorobenzene	97	70-130



Client Sample ID: VP-7-5

Lab ID#: 0910671A-14A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	t111322	<b>Date of Collection:</b> 10/26/09 11:33:00 AM
<b>Dil. Factor:</b>	4.96	<b>Date of Analysis:</b> 11/13/09 11:42 PM

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Benzene	2.5	11	7.9	37
Ethyl Benzene	2.5	Not Detected	11	Not Detected
Toluene	2.5	7.3	9.3	28
m,p-Xylene	2.5	3.4	11	15
o-Xylene	2.5	Not Detected	11	Not Detected
Methyl tert-butyl ether	2.5	Not Detected	8.9	Not Detected
Naphthalene	9.9	Not Detected UJ	52	Not Detected UJ
TPH ref. to Gasoline (MW=100)	50	18000 J	200	75000 J

UJ = Non-detected compound associated with low bias in the CCV

J = Estimated value due to bias in the CCV.

**Container Type: 1 Liter Summa Canister (100% Certified)**

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	98	70-130
Toluene-d8	106	70-130
4-Bromofluorobenzene	97	70-130

Client Sample ID: VP-7-5 Lab Duplicate

Lab ID#: 0910671A-14AA

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	t111324	Date of Collection:	10/26/09 11:33:00 AM
Dil. Factor:	4.96	Date of Analysis:	11/14/09 12:54 AM

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Benzene	2.5	11	7.9	37
Ethyl Benzene	2.5	Not Detected	11	Not Detected
Toluene	2.5	7.2	9.3	27
m,p-Xylene	2.5	3.4	11	15
o-Xylene	2.5	Not Detected	11	Not Detected
Methyl tert-butyl ether	2.5	Not Detected	8.9	Not Detected
Naphthalene	9.9	Not Detected UJ	52	Not Detected UJ
TPH ref. to Gasoline (MW=100)	50	19000 J	200	77000 J

UJ = Non-detected compound associated with low bias in the CCV

J = Estimated value due to bias in the CCV.

Container Type: 1 Liter Summa Canister (100% Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	98	70-130
Toluene-d8	106	70-130
4-Bromofluorobenzene	96	70-130

Client Sample ID: VP-7-10

Lab ID#: 0910671A-15A

**MODIFIED EPA METHOD TO-15 GC/MS**

<b>File Name:</b>	<b>w111416</b>	<b>Date of Collection: 10/26/09 11:52:00 AM</b>
<b>Dil. Factor:</b>	<b>8.57</b>	<b>Date of Analysis: 11/15/09 12:38 PM</b>

<b>Compound</b>	<b>Rpt. Limit (ppbv)</b>	<b>Amount (ppbv)</b>	<b>Rpt. Limit (ug/m3)</b>	<b>Amount (ug/m3)</b>
Methyl tert-butyl ether	43	Not Detected	150	Not Detected
Benzene	43	86	140	280
Toluene	43	Not Detected	160	Not Detected
Ethyl Benzene	43	Not Detected	190	Not Detected
m,p-Xylene	43	Not Detected	190	Not Detected
o-Xylene	43	Not Detected	190	Not Detected
TPH ref. to Gasoline (MW=100)	860	1300000	3500	5400000
Naphthalene	170	Not Detected	900	Not Detected

**Container Type: 1 Liter Summa Canister (100% Certified)**

<b>Surrogates</b>	<b>%Recovery</b>	<b>Method Limits</b>
1,2-Dichloroethane-d4	125	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	106	70-130

Client Sample ID: VP-5R-10

Lab ID#: 0910671A-16A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	t111323	<b>Date of Collection:</b> 10/26/09 1:25:00 PM
<b>Dil. Factor:</b>	5.39	<b>Date of Analysis:</b> 11/14/09 12:18 AM

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Benzene	2.7	Not Detected	8.6	Not Detected
Ethyl Benzene	2.7	Not Detected	12	Not Detected
Toluene	2.7	Not Detected	10	Not Detected
m,p-Xylene	2.7	Not Detected	12	Not Detected
o-Xylene	2.7	Not Detected	12	Not Detected
Methyl tert-butyl ether	2.7	Not Detected	9.7	Not Detected
Naphthalene	11	Not Detected UJ	56	Not Detected UJ
TPH ref. to Gasoline (MW=100)	54	110 J	220	460 J

UJ = Non-detected compound associated with low bias in the CCV

J = Estimated value due to bias in the CCV.

**Container Type: 1 Liter Summa Canister (100% Certified)**

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	99	70-130
Toluene-d8	104	70-130
4-Bromofluorobenzene	96	70-130

Client Sample ID: Trip Blank

Lab ID#: 0910671A-17A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

File Name:	t111325	Date of Collection:	10/26/09 7:41:00 PM
Dil. Factor:	1.00	Date of Analysis:	11/14/09 01:31 AM

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Benzene	0.50	Not Detected	1.6	Not Detected
Ethyl Benzene	0.50	Not Detected	2.2	Not Detected
Toluene	0.50	Not Detected	1.9	Not Detected
m,p-Xylene	0.50	Not Detected	2.2	Not Detected
o-Xylene	0.50	Not Detected	2.2	Not Detected
Methyl tert-butyl ether	0.50	Not Detected	1.8	Not Detected
Naphthalene	2.0	Not Detected UJ	10	Not Detected UJ
TPH ref. to Gasoline (MW=100)	10	Not Detected	41	Not Detected

UJ = Non-detected compound associated with low bias in the CCV

**Container Type: 1 Liter Summa Canister (100% Certified)**

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	93	70-130
Toluene-d8	104	70-130
4-Bromofluorobenzene	97	70-130

Client Sample ID: Lab Blank

Lab ID#: 0910671A-18A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>t111308</b>	<b>Date of Collection: NA</b>
<b>Dil. Factor:</b>	<b>1.00</b>	<b>Date of Analysis: 11/13/09 12:41 PM</b>

<b>Compound</b>	<b>Rpt. Limit (ppbv)</b>	<b>Amount (ppbv)</b>	<b>Rpt. Limit (ug/m3)</b>	<b>Amount (ug/m3)</b>
Benzene	0.50	Not Detected	1.6	Not Detected
Ethyl Benzene	0.50	Not Detected	2.2	Not Detected
Toluene	0.50	Not Detected	1.9	Not Detected
m,p-Xylene	0.50	Not Detected	2.2	Not Detected
o-Xylene	0.50	Not Detected	2.2	Not Detected
Methyl tert-butyl ether	0.50	Not Detected	1.8	Not Detected
Naphthalene	2.0	Not Detected UJ	10	Not Detected UJ
TPH ref. to Gasoline (MW=100)	10	Not Detected	41	Not Detected

UJ = Non-detected compound associated with low bias in the CCV

**Container Type: NA - Not Applicable**

<b>Surrogates</b>	<b>%Recovery</b>	<b>Method Limits</b>
1,2-Dichloroethane-d4	95	70-130
Toluene-d8	104	70-130
4-Bromofluorobenzene	96	70-130

Client Sample ID: Lab Blank

Lab ID#: 0910671A-18B

**MODIFIED EPA METHOD TO-15 GC/MS**

<b>File Name:</b>	<b>w111407</b>	<b>Date of Collection: NA</b>
<b>Dil. Factor:</b>	<b>1.00</b>	<b>Date of Analysis: 11/14/09 09:10 PM</b>

<b>Compound</b>	<b>Rpt. Limit (ppbv)</b>	<b>Amount (ppbv)</b>	<b>Rpt. Limit (ug/m3)</b>	<b>Amount (ug/m3)</b>
Methyl tert-butyl ether	5.0	Not Detected	18	Not Detected
Benzene	5.0	Not Detected	16	Not Detected
Toluene	5.0	Not Detected	19	Not Detected
Ethyl Benzene	5.0	Not Detected	22	Not Detected
m,p-Xylene	5.0	Not Detected	22	Not Detected
o-Xylene	5.0	Not Detected	22	Not Detected
TPH ref. to Gasoline (MW=100)	100	Not Detected	410	Not Detected
Naphthalene	20	Not Detected	100	Not Detected

**Container Type: NA - Not Applicable**

<b>Surrogates</b>	<b>%Recovery</b>	<b>Method Limits</b>
1,2-Dichloroethane-d4	98	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	96	70-130

Client Sample ID: CCV

Lab ID#: 0910671A-19A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>t111302</b>	<b>Date of Collection: NA</b>
<b>Dil. Factor:</b>	<b>1.00</b>	<b>Date of Analysis: 11/13/09 07:32 AM</b>

<b>Compound</b>	<b>%Recovery</b>
Benzene	116
Ethyl Benzene	117
Toluene	118
m,p-Xylene	117
o-Xylene	115
Methyl tert-butyl ether	115
Naphthalene	67 Q
TPH ref. to Gasoline (MW=100)	140 Q

Q = Exceeds Quality Control limits.

**Container Type: NA - Not Applicable**

<b>Surrogates</b>	<b>%Recovery</b>	<b>Method Limits</b>
1,2-Dichloroethane-d4	94	70-130
Toluene-d8	106	70-130
4-Bromofluorobenzene	97	70-130



**Client Sample ID: CCV**

**Lab ID#: 0910671A-19B**

**MODIFIED EPA METHOD TO-15 GC/MS**

<b>File Name:</b>	<b>w111403</b>	<b>Date of Collection: NA</b>
<b>Dil. Factor:</b>	<b>1.00</b>	<b>Date of Analysis: 11/14/09 07:08 PM</b>

<b>Compound</b>	<b>%Recovery</b>
Methyl tert-butyl ether	120
Benzene	110
Toluene	110
Ethyl Benzene	113
m,p-Xylene	115
o-Xylene	116
TPH ref. to Gasoline (MW=100)	117
Naphthalene	115

**Container Type: NA - Not Applicable**

<b>Surrogates</b>	<b>%Recovery</b>	<b>Method Limits</b>
1,2-Dichloroethane-d4	96	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	101	70-130

Client Sample ID: LCS

Lab ID#: 0910671A-20A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>t111303</b>	<b>Date of Collection: NA</b>
<b>Dil. Factor:</b>	<b>1.00</b>	<b>Date of Analysis: 11/13/09 08:17 AM</b>

<b>Compound</b>	<b>%Recovery</b>
Benzene	115
Ethyl Benzene	113
Toluene	120
m,p-Xylene	114
o-Xylene	114
Methyl tert-butyl ether	113
Naphthalene	76
TPH ref. to Gasoline (MW=100)	Not Spiked

**Container Type: NA - Not Applicable**

<b>Surrogates</b>	<b>%Recovery</b>	<b>Method Limits</b>
1,2-Dichloroethane-d4	96	70-130
Toluene-d8	105	70-130
4-Bromofluorobenzene	98	70-130

Client Sample ID: LCS

Lab ID#: 0910671A-20B

**MODIFIED EPA METHOD TO-15 GC/MS**

<b>File Name:</b>	<b>w111404</b>	<b>Date of Collection: NA</b>
<b>Dil. Factor:</b>	<b>1.00</b>	<b>Date of Analysis: 11/14/09 07:40 PM</b>

<b>Compound</b>	<b>%Recovery</b>
Methyl tert-butyl ether	85
Benzene	80
Toluene	76
Ethyl Benzene	85
m,p-Xylene	86
o-Xylene	87
TPH ref. to Gasoline (MW=100)	Not Spiked
Naphthalene	125

**Container Type: NA - Not Applicable**

<b>Surrogates</b>	<b>%Recovery</b>	<b>Method Limits</b>
1,2-Dichloroethane-d4	96	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	104	70-130

11/10/2009

Ms. Charlotte Evans  
Conestoga-Rovers Associates  
5900 Hollis Street  
Suite A  
Emeryville CA 94608

Project Name: Chevron 9-0020  
Project #: 311956  
Workorder #: 0910671B

Dear Ms. Charlotte Evans

The following report includes the data for the above referenced project for sample(s) received on 10/29/2009 at Air Toxics Ltd.

The data and associated QC analyzed by Modified ASTM D-1946 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kyle Vagadori at 916-985-1000 if you have any questions regarding the data in this report.

Regards,



Kyle Vagadori  
Project Manager

**WORK ORDER #: 0910671B**

Work Order Summary

<b>CLIENT:</b>	Ms. Charlotte Evans Conestoga-Rovers Associates (CRA) 5900 Hollis Street Suite A Emeryville, CA 94608	<b>BILL TO:</b>	Ms. Charlotte Evans Conestoga-Rovers Associates (CRA) 5900 Hollis Street Suite A Emeryville, CA 94608
<b>PHONE:</b>	510-420-3351	<b>P.O. #</b>	40-4025577
<b>FAX:</b>	510-420-9170	<b>PROJECT #</b>	311956 Chevron 9-0020
<b>DATE RECEIVED:</b>	10/29/2009	<b>CONTACT:</b>	Kyle Vagadori
<b>DATE COMPLETED:</b>	11/10/2009		

<u>FRACTION #</u>	<u>NAME</u>	<u>TEST</u>	<u>RECEIPT VAC./PRES.</u>	<u>FINAL PRESSURE</u>
01A	VP-1-5	Modified ASTM D-1946	4.4 "Hg	15 psi
02A	VP-1-10	Modified ASTM D-1946	5.0 "Hg	15 psi
03A	VP-2-5	Modified ASTM D-1946	5.2 "Hg	15 psi
04A	VP-2-10	Modified ASTM D-1946	6.6 "Hg	15 psi
05A	VP-2-10 DUP	Modified ASTM D-1946	6.0 "Hg	15 psi
06A	VP-3-5	Modified ASTM D-1946	6.2 "Hg	15 psi
07A	VP-3-10	Modified ASTM D-1946	6.0 "Hg	15 psi
08A	VP-4R-5	Modified ASTM D-1946	3.2 "Hg	15 psi
09A	VP-4R-10	Modified ASTM D-1946	3.4 "Hg	15 psi
10A	VP-5R-5	Modified ASTM D-1946	5.6 "Hg	15 psi
11A	VP-5R-5 DUP	Modified ASTM D-1946	5.4 "Hg	15 psi
12A	VP-6-5	Modified ASTM D-1946	5.4 "Hg	15 psi
13A	VP-6-10	Modified ASTM D-1946	5.0 "Hg	15 psi
14A	VP-7-5	Modified ASTM D-1946	5.6 "Hg	15 psi
15A	VP-7-10	Modified ASTM D-1946	6.4 "Hg	15 psi
15AA	VP-7-10 Lab Duplicate	Modified ASTM D-1946	6.4 "Hg	15 psi
16A	VP-5R-10	Modified ASTM D-1946	6.0 "Hg	15 psi


Continued on next page

**WORK ORDER #: 0910671B**

Work Order Summary

<b>CLIENT:</b>	Ms. Charlotte Evans Conestoga-Rovers Associates (CRA) 5900 Hollis Street Suite A Emeryville, CA 94608	<b>BILL TO:</b>	Ms. Charlotte Evans Conestoga-Rovers Associates (CRA) 5900 Hollis Street Suite A Emeryville, CA 94608
<b>PHONE:</b>	510-420-3351	<b>P.O. #</b>	40-4025577
<b>FAX:</b>	510-420-9170	<b>PROJECT #</b>	311956 Chevron 9-0020
<b>DATE RECEIVED:</b>	10/29/2009	<b>CONTACT:</b>	Kyle Vagadori
<b>DATE COMPLETED:</b>	11/10/2009		

<u>FRACTION #</u>	<u>NAME</u>	<u>TEST</u>	<u>RECEIPT VAC./PRES.</u>	<u>FINAL PRESSURE</u>
16AA	VP-5R-10 Lab Duplicate	Modified ASTM D-1946	6.0 "Hg	15 psi
17A	Trip Blank	Modified ASTM D-1946	28.6 "Hg	15 psi
18A	Lab Blank	Modified ASTM D-1946	NA	NA
18B	Lab Blank	Modified ASTM D-1946	NA	NA
18C	Lab Blank	Modified ASTM D-1946	NA	NA
18D	Lab Blank	Modified ASTM D-1946	NA	NA
19A	LCS	Modified ASTM D-1946	NA	NA
19B	LCS	Modified ASTM D-1946	NA	NA

CERTIFIED BY:   
Laboratory Director

DATE: 11/10/09

Certification numbers: CA NELAP - 02110CA, LA NELAP/LELAP- AI 30763, NJ NELAP - CA004  
 NY NELAP - 11291, UT NELAP - 9166389892, AZ Licensure AZ0719  
 Name of Accrediting Agency: NELAP/Florida Department of Health, Scope of Application: Clean Air Act,  
 Accreditation number: E87680, Effective date: 07/01/09, Expiration date: 06/30/10  
 Air Toxics Ltd. certifies that the test results contained in this report meet all requirements of the NELAC standards  
 This report shall not be reproduced, except in full, without the written approval of Air Toxics Ltd.

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630  
 (916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

**LABORATORY NARRATIVE**  
**Modified ASTM D-1946**  
**Conestoga-Rovers Associates**  
**Workorder# 0910671B**

Seventeen 1 Liter Summa Canister (100% Certified) samples were received on October 29, 2009. The laboratory performed analysis via Modified ASTM Method D-1946 for Methane and fixed gases in air using GC/FID or GC/TCD. The method involves direct injection of 1.0 mL of sample.

On the analytical column employed for this analysis, Oxygen coelutes with Argon. The corresponding peak is quantitated as Oxygen.

Since Nitrogen is used to pressurize samples, the reported Nitrogen values are calculated by adding all the sample components and subtracting from 100%.

Method modifications taken to run these samples are summarized in the table below. Specific project requirements may over-ride the ATL modifications.

<i>Requirement</i>	<i>ASTM D-1946</i>	<i>ATL Modifications</i>
Calibration	A single point calibration is performed using a reference standard closely matching the composition of the unknown.	A 3-point calibration curve is performed. Quantitation is based on a daily calibration standard which may or may not resemble the composition of the associated samples.
Reference Standard	The composition of any reference standard must be known to within 0.01 mol % for any component.	The standards used by ATL are blended to a $\geq 95\%$ accuracy.
Sample Injection Volume	Components whose concentrations are in excess of 5 % should not be analyzed by using sample volumes greater than 0.5 mL.	The sample container is connected directly to a fixed volume sample loop of 1.0 mL on the GC. Linear range is defined by the calibration curve. Bags are loaded by vacuum.
Normalization	Normalize the mole percent values by multiplying each value by 100 and dividing by the sum of the original values. The sum of the original values should not differ from 100% by more than 1.0%.	Results are not normalized. The sum of the reported values can differ from 100% by as much as 15%, either due to analytical variability or an unusual sample matrix.
Precision	Precision requirements established at each concentration level.	Duplicates should agree within 25% RPD for detections > 5 X's the RL.

### **Receiving Notes**

There were no receiving discrepancies.

### **Analytical Notes**

There were no analytical discrepancies.

### **Definition of Data Qualifying Flags**

Seven qualifiers may have been used on the data analysis sheets and indicate as follows:

B - Compound present in laboratory blank greater than reporting limit.

J - Estimated value.

E - Exceeds instrument calibration range.

S - Saturated peak.

Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the detection limit.

M - Reported value may be biased due to apparent matrix interferences.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified

b-File was quantified by a second column and detector

r1-File was requantified for the purpose of reissue



**Summary of Detected Compounds**  
**NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946**

**Client Sample ID: VP-1-5**

**Lab ID#: 0910671B-01A**

<b>Compound</b>	<b>Rpt. Limit (%)</b>	<b>Amount (%)</b>
Oxygen	0.24	13
Nitrogen	0.24	83
Carbon Dioxide	0.024	4.3

**Client Sample ID: VP-1-10**

**Lab ID#: 0910671B-02A**

<b>Compound</b>	<b>Rpt. Limit (%)</b>	<b>Amount (%)</b>
Oxygen	0.24	10
Nitrogen	0.24	84
Carbon Dioxide	0.024	5.5

**Client Sample ID: VP-2-5**

**Lab ID#: 0910671B-03A**

<b>Compound</b>	<b>Rpt. Limit (%)</b>	<b>Amount (%)</b>
Oxygen	0.24	15
Nitrogen	0.24	81
Carbon Dioxide	0.024	3.7

**Client Sample ID: VP-2-10**

**Lab ID#: 0910671B-04A**

<b>Compound</b>	<b>Rpt. Limit (%)</b>	<b>Amount (%)</b>
Oxygen	0.26	14
Nitrogen	0.26	81
Carbon Dioxide	0.026	4.7

**Client Sample ID: VP-2-10 DUP**

**Lab ID#: 0910671B-05A**

<b>Compound</b>	<b>Rpt. Limit (%)</b>	<b>Amount (%)</b>
Oxygen	0.25	15
Nitrogen	0.25	80

**Summary of Detected Compounds**  
**NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946**

**Client Sample ID: VP-2-10 DUP**

**Lab ID#: 0910671B-05A**

Carbon Dioxide	0.025	4.9
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**Client Sample ID: VP-3-5**

**Lab ID#: 0910671B-06A**

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.26	13
Nitrogen	0.26	84
Carbon Dioxide	0.026	3.1

**Client Sample ID: VP-3-10**

**Lab ID#: 0910671B-07A**

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.25	13
Nitrogen	0.25	82
Carbon Dioxide	0.025	4.6

**Client Sample ID: VP-4R-5**

**Lab ID#: 0910671B-08A**

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.23	9.8
Nitrogen	0.23	86
Carbon Dioxide	0.023	3.8

**Client Sample ID: VP-4R-10**

**Lab ID#: 0910671B-09A**

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.23	7.7
Nitrogen	0.23	86
Carbon Dioxide	0.023	6.2

**Summary of Detected Compounds**  
**NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946**

**Client Sample ID: VP-5R-5**

**Lab ID#: 0910671B-10A**

<b>Compound</b>	<b>Rpt. Limit (%)</b>	<b>Amount (%)</b>
Oxygen	0.25	4.6
Nitrogen	0.25	94
Carbon Dioxide	0.025	1.4

**Client Sample ID: VP-5R-5 DUP**

**Lab ID#: 0910671B-11A**

<b>Compound</b>	<b>Rpt. Limit (%)</b>	<b>Amount (%)</b>
Oxygen	0.25	4.5
Nitrogen	0.25	94
Carbon Dioxide	0.025	1.4

**Client Sample ID: VP-6-5**

**Lab ID#: 0910671B-12A**

<b>Compound</b>	<b>Rpt. Limit (%)</b>	<b>Amount (%)</b>
Oxygen	0.25	9.6
Nitrogen	0.25	82
Carbon Dioxide	0.025	8.3

**Client Sample ID: VP-6-10**

**Lab ID#: 0910671B-13A**

<b>Compound</b>	<b>Rpt. Limit (%)</b>	<b>Amount (%)</b>
Oxygen	0.24	7.4
Nitrogen	0.24	82
Carbon Dioxide	0.024	11

**Client Sample ID: VP-7-5**

**Lab ID#: 0910671B-14A**

<b>Compound</b>	<b>Rpt. Limit (%)</b>	<b>Amount (%)</b>
Oxygen	0.25	7.0
Nitrogen	0.25	93

**Summary of Detected Compounds**  
**NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946**

**Client Sample ID: VP-7-5**

**Lab ID#: 0910671B-14A**

Methane	0.00025	0.026
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**Client Sample ID: VP-7-10**

**Lab ID#: 0910671B-15A**

<b>Compound</b>	<b>Rpt. Limit (%)</b>	<b>Amount (%)</b>
Oxygen	0.26	1.4
Nitrogen	0.26	97
Methane	0.00026	1.8

**Client Sample ID: VP-7-10 Lab Duplicate**

**Lab ID#: 0910671B-15AA**

<b>Compound</b>	<b>Rpt. Limit (%)</b>	<b>Amount (%)</b>
Oxygen	0.26	1.5
Nitrogen	0.26	97
Methane	0.00026	1.8

**Client Sample ID: VP-5R-10**

**Lab ID#: 0910671B-16A**

<b>Compound</b>	<b>Rpt. Limit (%)</b>	<b>Amount (%)</b>
Oxygen	0.25	4.8
Nitrogen	0.25	93
Carbon Dioxide	0.025	2.6

**Client Sample ID: VP-5R-10 Lab Duplicate**

**Lab ID#: 0910671B-16AA**

<b>Compound</b>	<b>Rpt. Limit (%)</b>	<b>Amount (%)</b>
Oxygen	0.54	4.8
Nitrogen	0.54	93
Carbon Dioxide	0.054	2.6

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**Summary of Detected Compounds**  
**NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946**

**Client Sample ID: Trip Blank**

**Lab ID#: 0910671B-17A**

<b>Compound</b>	<b>Rpt. Limit (%)</b>	<b>Amount (%)</b>
Nitrogen	0.10	100

**Client Sample ID: VP-1-5**

**Lab ID#: 0910671B-01A**

**NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946**

<b>File Name:</b>	<b>9110510</b>	<b>Date of Collection: 10/26/09 5:00:00 PM</b>
<b>Dil. Factor:</b>	<b>2.37</b>	<b>Date of Analysis: 11/5/09 11:07 AM</b>

<b>Compound</b>	<b>Rpt. Limit (%)</b>	<b>Amount (%)</b>
Oxygen	0.24	13
Nitrogen	0.24	83
Carbon Dioxide	0.024	4.3
Methane	0.00024	Not Detected
Helium	0.12	Not Detected

**Container Type: 1 Liter Summa Canister (100% Certified)**



Client Sample ID: VP-1-10

Lab ID#: 0910671B-02A

**NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946**

File Name:	9110511	Date of Collection:	10/26/09 5:33:00 PM
Dil. Factor:	2.42	Date of Analysis:	11/5/09 11:28 AM

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.24	10
Nitrogen	0.24	84
Carbon Dioxide	0.024	5.5
Methane	0.00024	Not Detected
Helium	0.12	Not Detected

Container Type: 1 Liter Summa Canister (100% Certified)



Client Sample ID: VP-2-5

Lab ID#: 0910671B-03A

**NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946**

File Name:	9110512	Date of Collection:	10/26/09 3:10:00 PM
Dil. Factor:	2.44	Date of Analysis:	11/5/09 12:02 PM

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.24	15
Nitrogen	0.24	81
Carbon Dioxide	0.024	3.7
Methane	0.00024	Not Detected
Helium	0.12	Not Detected

Container Type: 1 Liter Summa Canister (100% Certified)





Client Sample ID: VP-2-10

Lab ID#: 0910671B-04A

**NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946**

File Name:	9110513	Date of Collection:	10/26/09 3:33:00 PM
Dil. Factor:	2.59	Date of Analysis:	11/5/09 12:30 PM

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.26	14
Nitrogen	0.26	81
Carbon Dioxide	0.026	4.7
Methane	0.00026	Not Detected
Helium	0.13	Not Detected

Container Type: 1 Liter Summa Canister (100% Certified)



Client Sample ID: VP-2-10 DUP

Lab ID#: 0910671B-05A

**NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946**

File Name:	9110514	Date of Collection:	10/26/09 3:33:00 PM
Dil. Factor:	2.53	Date of Analysis:	11/5/09 12:56 PM

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.25	15
Nitrogen	0.25	80
Carbon Dioxide	0.025	4.9
Methane	0.00025	Not Detected
Helium	0.13	Not Detected

Container Type: 1 Liter Summa Canister (100% Certified)

**Client Sample ID: VP-3-5**

**Lab ID#: 0910671B-06A**

**NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946**

<b>File Name:</b>	<b>9110515</b>	<b>Date of Collection: 10/26/09 4:03:00 PM</b>
<b>Dil. Factor:</b>	<b>2.55</b>	<b>Date of Analysis: 11/5/09 01:33 PM</b>

<b>Compound</b>	<b>Rpt. Limit (%)</b>	<b>Amount (%)</b>
Oxygen	0.26	13
Nitrogen	0.26	84
Carbon Dioxide	0.026	3.1
Methane	0.00026	Not Detected
Helium	0.13	Not Detected

**Container Type: 1 Liter Summa Canister (100% Certified)**



Client Sample ID: VP-3-10

Lab ID#: 0910671B-07A

**NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946**

File Name:	9110516	Date of Collection:	10/26/09 4:27:00 PM
Dil. Factor:	2.53	Date of Analysis:	11/5/09 01:56 PM

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.25	13
Nitrogen	0.25	82
Carbon Dioxide	0.025	4.6
Methane	0.00025	Not Detected
Helium	0.13	Not Detected

Container Type: 1 Liter Summa Canister (100% Certified)



Client Sample ID: VP-4R-5

Lab ID#: 0910671B-08A

**NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946**

File Name:	9110517	Date of Collection:	10/26/09 6:04:00 PM
Dil. Factor:	2.26	Date of Analysis:	11/5/09 02:22 PM

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.23	9.8
Nitrogen	0.23	86
Carbon Dioxide	0.023	3.8
Methane	0.00023	Not Detected
Helium	0.11	Not Detected

Container Type: 1 Liter Summa Canister (100% Certified)



Client Sample ID: VP-4R-10

Lab ID#: 0910671B-09A

**NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946**

File Name:	9110518	Date of Collection:	10/26/09 6:39:00 PM
Dil. Factor:	2.28	Date of Analysis:	11/5/09 02:50 PM

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.23	7.7
Nitrogen	0.23	86
Carbon Dioxide	0.023	6.2
Methane	0.00023	Not Detected
Helium	0.11	Not Detected

Container Type: 1 Liter Summa Canister (100% Certified)



Client Sample ID: VP-5R-5

Lab ID#: 0910671B-10A

**NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946**

File Name:	9110519	Date of Collection:	10/26/09 1:07:00 PM
Dil. Factor:	2.48	Date of Analysis:	11/5/09 03:11 PM

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.25	4.6
Nitrogen	0.25	94
Carbon Dioxide	0.025	1.4
Methane	0.00025	Not Detected
Helium	0.12	Not Detected

Container Type: 1 Liter Summa Canister (100% Certified)



Client Sample ID: VP-5R-5 DUP

Lab ID#: 0910671B-11A

**NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946**

File Name:	9110520	Date of Collection:	10/26/09 1:07:00 PM
Dil. Factor:	2.46	Date of Analysis:	11/5/09 03:35 PM

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.25	4.5
Nitrogen	0.25	94
Carbon Dioxide	0.025	1.4
Methane	0.00025	Not Detected
Helium	0.12	Not Detected

Container Type: 1 Liter Summa Canister (100% Certified)





Client Sample ID: VP-6-5

Lab ID#: 0910671B-12A

**NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946**

File Name:	9110521	Date of Collection:	10/26/09 7:40:00 PM
Dil. Factor:	2.46	Date of Analysis:	11/5/09 03:57 PM

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.25	9.6
Nitrogen	0.25	82
Carbon Dioxide	0.025	8.3
Methane	0.00025	Not Detected
Helium	0.12	Not Detected

Container Type: 1 Liter Summa Canister (100% Certified)



Client Sample ID: VP-6-10

Lab ID#: 0910671B-13A

**NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946**

File Name:	9110522	Date of Collection:	10/26/09 7:15:00 PM
Dil. Factor:	2.42	Date of Analysis:	11/5/09 04:18 PM

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.24	7.4
Nitrogen	0.24	82
Carbon Dioxide	0.024	11
Methane	0.00024	Not Detected
Helium	0.12	Not Detected

Container Type: 1 Liter Summa Canister (100% Certified)



Client Sample ID: VP-7-5

Lab ID#: 0910671B-14A

**NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946**

File Name:	9110533	Date of Collection: 10/26/09 11:33:00 A
Dil. Factor:	2.48	Date of Analysis: 11/5/09 08:59 PM

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.25	7.0
Nitrogen	0.25	93
Carbon Dioxide	0.025	Not Detected
Methane	0.00025	0.026
Helium	0.12	Not Detected

Container Type: 1 Liter Summa Canister (100% Certified)



Client Sample ID: VP-7-10

Lab ID#: 0910671B-15A

**NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946**

File Name:	9110534	Date of Collection: 10/26/09 11:52:00 A
Dil. Factor:	2.57	Date of Analysis: 11/5/09 09:23 PM

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.26	1.4
Nitrogen	0.26	97
Carbon Dioxide	0.026	Not Detected
Methane	0.00026	1.8
Helium	0.13	Not Detected

Container Type: 1 Liter Summa Canister (100% Certified)



Client Sample ID: VP-7-10 Lab Duplicate

Lab ID#: 0910671B-15AA

**NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946**

File Name:	9110535	Date of Collection: 10/26/09 11:52:00 A
Dil. Factor:	2.57	Date of Analysis: 11/5/09 09:49 PM

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.26	1.5
Nitrogen	0.26	97
Carbon Dioxide	0.026	Not Detected
Methane	0.00026	1.8
Helium	0.13	Not Detected

Container Type: 1 Liter Summa Canister (100% Certified)



Client Sample ID: VP-5R-10

Lab ID#: 0910671B-16A

**NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946**

File Name:	9110523	Date of Collection:	10/26/09 1:25:00 PM
Dil. Factor:	2.53	Date of Analysis:	11/5/09 04:40 PM

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.25	4.8
Nitrogen	0.25	93
Carbon Dioxide	0.025	2.6
Methane	0.00025	Not Detected
Helium	0.13	Not Detected

Container Type: 1 Liter Summa Canister (100% Certified)



Client Sample ID: VP-5R-10 Lab Duplicate

Lab ID#: 0910671B-16AA

**NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946**

File Name:	9110526	Date of Collection:	10/26/09 1:25:00 PM
Dil. Factor:	5.37	Date of Analysis:	11/5/09 05:55 PM

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.54	4.8
Nitrogen	0.54	93
Carbon Dioxide	0.054	2.6
Methane	0.00054	Not Detected
Helium	0.27	Not Detected

Container Type: 1 Liter Summa Canister (100% Certified)



Client Sample ID: Trip Blank

Lab ID#: 0910671B-17A

**NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946**

File Name:	9110525	Date of Collection:	10/26/09 7:41:00 PM
Dil. Factor:	1.00	Date of Analysis:	11/5/09 05:33 PM

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.10	Not Detected
Nitrogen	0.10	100
Carbon Dioxide	0.010	Not Detected
Methane	0.00010	Not Detected
Helium	0.050	Not Detected

Container Type: 1 Liter Summa Canister (100% Certified)



Client Sample ID: Lab Blank

Lab ID#: 0910671B-18A

**NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946**

File Name:	9110504	Date of Collection: NA
Dil. Factor:	1.00	Date of Analysis: 11/5/09 08:40 AM

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.10	Not Detected
Nitrogen	0.10	Not Detected
Carbon Dioxide	0.010	Not Detected
Methane	0.00010	Not Detected

Container Type: NA - Not Applicable



Client Sample ID: Lab Blank

Lab ID#: 0910671B-18B

**NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946**

File Name:	9110503b	Date of Collection: NA
Dil. Factor:	1.00	Date of Analysis: 11/5/09 08:18 AM

Compound	Rpt. Limit (%)	Amount (%)
Helium	0.050	Not Detected

Container Type: NA - Not Applicable

**Client Sample ID: Lab Blank**

**Lab ID#: 0910671B-18C**

**NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946**

<b>File Name:</b>	<b>9110532</b>	<b>Date of Collection: NA</b>
<b>Dil. Factor:</b>	<b>1.00</b>	<b>Date of Analysis: 11/5/09 08:24 PM</b>

<b>Compound</b>	<b>Rpt. Limit (%)</b>	<b>Amount (%)</b>
Oxygen	0.10	Not Detected
Nitrogen	0.10	Not Detected
Carbon Dioxide	0.010	Not Detected
Methane	0.00010	Not Detected

**Container Type: NA - Not Applicable**



**Client Sample ID: Lab Blank**

**Lab ID#: 0910671B-18D**

**NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946**

<b>File Name:</b>	<b>9110531b</b>	<b>Date of Collection: NA</b>
<b>Dil. Factor:</b>	<b>1.00</b>	<b>Date of Analysis: 11/5/09 08:03 PM</b>

<b>Compound</b>	<b>Rpt. Limit (%)</b>	<b>Amount (%)</b>
Helium	0.050	Not Detected

**Container Type: NA - Not Applicable**

Client Sample ID: LCS

Lab ID#: 0910671B-19A

**NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946**

<b>File Name:</b>	<b>9110528</b>	<b>Date of Collection: NA</b>
<b>Dil. Factor:</b>	<b>1.00</b>	<b>Date of Analysis: 11/5/09 06:49 PM</b>

<b>Compound</b>	<b>%Recovery</b>
Oxygen	102
Nitrogen	103
Carbon Dioxide	104
Methane	99
Helium	104

**Container Type: NA - Not Applicable**

Client Sample ID: LCS

Lab ID#: 0910671B-19B

**NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946**

File Name:	9110544	Date of Collection: NA
Dil. Factor:	1.00	Date of Analysis: 11/6/09 10:18 AM

Compound	%Recovery
Oxygen	100
Nitrogen	100
Carbon Dioxide	102
Methane	102
Helium	104

Container Type: NA - Not Applicable





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180 BLUE RAVINE ROAD, SUITE B  
FOLSOM, CA 95630-4719  
(916) 983-1000 FAX (916) 936-1020

Project Manager: CHARLOTTE EVANS  
Collected by: (Print and Sign) IAN HULL  
Company: CRA Email: cevanse@craeworld.com  
Address: 5900 HOLLIS ST. STE A01 City: EMERYVILLE State: CA Zip: 94608  
Phone: 510-420-2351 Fax: 510-420-9170

Project Info:  
PO # 40-4025577  
Project # 311956  
Project Name CHEVRON 9-0020

Turn Around Time:  
 Normal  
 Rush  
Lab Use Only  
Pressurized by:  
Date:  
Pressurization Gas:  
specify: \_\_\_\_\_

Lab ID	Field Sample ID (Location)	Can #	Date of Collection	Time of Collection	Analyses Requested	Canister Pressure/Vacuum	
						Initial	Final
	VP-5F-5 DUF	1359	10/26/2009	1307	TO-15: TPH <sub>3</sub> , BTEX	4-30	-4
	VP-6-5	35636		1940	MTBE, NAPHTHALENE	4-30	-6
	VP-6-10	34620		1915	ASTM D-1946: O <sub>2</sub>	4-30	-6
	VP-7-5	35631		1133	CO <sub>2</sub> , N <sub>2</sub> , CH <sub>4</sub>	4-30	-5.5
	VP-7-10	20497		1152	HELIUM	4-30	-7
	VP-5F-10	35597	10/26/2009	1325		4-30	-5
	TRIP BLANK	36420	10/26/2009	1941		-	-

Relinquished by: (signature) <u>Ian Hull</u> Date/Time <u>10/26/2009 20:00</u>	Received by: (signature) _____ Date/Time _____	Notes: <u>SEE PAGE 1</u>
Relinquished by: (signature) <u>Ian Hull</u> Date/Time <u>10/27/2009 10:00</u>	Received by: (signature) _____ Date/Time _____	
Relinquished by: (signature) _____ Date/Time _____	Received by: (signature) _____ Date/Time _____	

Lab Use Only	Shipper Name	City	State	Country	Global Seal in Place	or Other
					Yes No None	

Pruned CDP Received on 10/27/09





**CHAIN-OF-CUSTODY RECORD**

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180 BLUE RAVINE ROAD, SUITE B  
FOLSOM, CA 95630-4719  
(916) 985-1000 FAX (916) 985-1020

Project Manager CHARLOTTE EVANS  
 Collected by: (Print and Sign) IAN HULL  
 Company CRA Email cevens@craworld.com  
 Address 5900 HOLLIS ST., SUITE A City EMERYVILLE State CA Zip 94608  
 Phone 510-420-3351 Fax 510-420-9170

<b>Project Info:</b> P.O. # <u>40-4025577</u> Project # <u>311956</u> Project Name <u>CHEVRON 9-0020</u>	<b>Turn Around Time:</b> <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Rush <small>specify</small>	<small>Lab Use Only</small> Pressurized by: <u>BS</u> Date: <u>10/30/09</u> Pressurization Gas: <input checked="" type="checkbox"/> N <sub>2</sub> <input type="checkbox"/> He
---	---	--

Lab I.D.	Field Sample I.D. (Location)	Can #	Date of Collection	Time of Collection	Analyses Requested	Canister Pressure/Vacuum			
						Initial	Final	Receipt	Final (psi)
01A	VP-1-5	2037	10/26/2009	1700	TO-15: TPH, BTEX,	L-30	-5	4.4" Hg	15.0 psi
02A	VP-1-10	2126		1733	MTBE,	L-30	-5	5.0" Hg	
03A	VP-2-5	12357		1510	NAPHTHALENE	L-30	-6	5.2" Hg	
04A	VP-2-10	2122		1533	ASTM D-1946:	L-30	-6	6.16" Hg	
05A	VP-2-10 DUP	11834		1533	O <sub>2</sub> , CO <sub>2</sub> , N <sub>2</sub> ,	L-30	-6	6.0" Hg	
06A	VP-3-5	36560		1603	CH <sub>4</sub> , HELIUM	L-30	-6	6.2" Hg	
07A	VP-3-10	34105		1627		L-30	-6	6.0" Hg	
08A	VP-4R-5	36505		1804		L-30	-4	3.2" Hg	
09A	VP-4R-10	34634		1839		L-30	-4	3.4" Hg	
10A	VP-5R-5	36459		1307		L-30	-4	5.6" Hg	

Relinquished by: (signature) <u>Ian Hull</u> Date/Time <u>10/26/2009 20:00</u>	Received by: (signature) <u>SECURE LOCATION</u> Date/Time	<b>Notes:</b> • EMAIL RESULTS TO ihull@craworld and PM above • RESULTS in ppbv + ug/m <sup>3</sup>
Relinquished by: (signature) <u>Ian Hull</u> Date/Time <u>10/27/2009 10:00</u>	Received by: (signature) <u>FEDEX</u> Date/Time	
Relinquished by: (signature) _____ Date/Time	Received by: (signature) <u>Monica Engelen</u> Date/Time <u>ATZ 10/26/09 020</u>	

Lab Use Only	Shipper Name	Air Bill #	Temp (°C)	Condition	Custody Seals Intact?	Work Order #
	<u>Fed Ex</u>		<u>NA</u>	<u>Good</u>	Yes No <u>None</u>	<u>0910671</u>



**CHAIN-OF-CUSTODY RECORD**

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180 BLUE RAVINE ROAD, SUITE B  
FOLSOM, CA 95630-4719  
(916) 985-1000 FAX (916) 985-1020

Project Manager CHARLOTTE EVANS  
 Collected by: (Print and Sign) IAN HULL  
 Company CRA Email cevans@craworld.com  
 Address 5900 HOLLIS ST., STE. ACITY EMERYVILLE State CA Zip 94608  
 Phone 510-420-3351 Fax 510-420-9170

<b>Project Info:</b> P.O. # <u>40-4025577</u> Project # <u>311956</u> Project Name <u>CHEVRON 9-0020</u>	<b>Turn Around Time:</b> <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Rush <small>specify</small>	<small>Lab Use Only</small> Pressurized by: <u>BS</u> Date: <u>10/30/09</u> Pressurization Gas: <input checked="" type="checkbox"/> N <input type="checkbox"/> He
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Lab I.D.	Field Sample I.D. (Location)	Can #	Date of Collection	Time of Collection	Analyses Requested	Canister Pressure/Vacuum			
						Initial	Final	Receipt	Final (psi)
11A	VP-SR-5 DUP	1359	10/26/2009	1307	TO-15: TPH <sub>g</sub> , BTEX	L-30	-4	5.4" Hg	15.0" Hg
12A	VP-6-5	35636		1940	MTBE, NAPHTHALENE	L-30	-6	5.4" Hg	
13A	VP-6-10	34620		1915	ASTM D-1946: O <sub>2</sub>	L-30	-6	5.0" Hg	
14A	VP-7-5	35631		1133	CO <sub>2</sub> , N <sub>2</sub> , CH <sub>4</sub>	L-30	-5.5	5.6" Hg	
15A	VP-7-10	2049		1152	HELIUM	L-30	-7	6.4" Hg	
									6.0" Hg
								23.0" Hg	

Relinquished by: (signature) <u>IAN HULL</u> Date/Time <u>10/26/2009 20:00</u>	Received by: (signature) <u>SECURE LOCATION</u> Date/Time	<b>Notes:</b> <u>SEE PAGE 1</u>
Relinquished by: (signature) <u>IAN HULL</u> Date/Time <u>10/27/2009 10:00</u>	Received by: (signature) <u>FEDEX</u> Date/Time	
Relinquished by: (signature)	Received by: (signature) <u>Monica Egezen ATZ 10/26/09 920</u> Date/Time	

Lab Use Only	Shipper Name	Air Bill #	Temp (°C)	Condition	Custody Seals intact?	Work Order #
	<u>Fed Ex</u>		<u>MA</u>	<u>Good</u>	Yes No <u>(None)</u>	<u>0910671</u>

APPENDIX F

EVALUATION OF VAPOR INTRUSION TO INDOOR AIR FROM VAPOR SOIL



**Table 2. Input Parameters Used to Estimate Indoor Air Risks and Hazards  
Former Chevron Station No. 9-0020, Oakland, California**

<b>Parameter</b>	<b>Value</b>	<b>Units</b>	<b>Source</b>
Source vapor concentration, $C_{\text{source}}$	Chemical-specific	$\mu\text{g}/\text{m}^3$	Measured (Table 1)
Depth below grade to bottom of enclosed space floor <sup>1</sup>	15	cm	Model default
Shallowest soil vapor sampling depth below grade	152.4 (5)	cm (ft)	Assumed
Average soil temperature	24 (75)	$^{\circ}\text{C}$ ( $^{\circ}\text{F}$ )	DTSC indoor air guidance default
Vadose zone SCS soil type	Sand (S)	-	Assumed
Average vadose zone soil dry bulk density <sup>2</sup>	1.83	$\text{g}/\text{cm}^3$	Measured
Average vadose zone total porosity <sup>2</sup>	32.4%	percent	Measured
Average air-filled porosity <sup>2</sup>	4.5%	percent	Measured
Average vadose zone soil water-filled porosity <sup>2</sup>	27.9%	percent	Measured

<sup>1</sup> Assumes slab-on-grade building foundation.

<sup>2</sup> Average based on samples collected 4/27/07 (SB-1) and 6/13/07 (VP-1) at 10 and 9.5 fbg, respectively.

**Table 3. Exposure Parameters Used to Estimate Indoor Air Risks  
Former Chevron Station No. 9-0020, Oakland, California**

Parameter	Symbol	Units	Value	Source
Infinite source building concentration	$C_{\text{building}}$	$\mu\text{g}/\text{m}^3$	Chemical-specific	Modeled
Exposure frequency-resident	$EF_r$	days/year	350	USEPA, 1991; DTSC, 1992
Exposure duration-adult resident	$ED_{\text{adult}}$	years	30	USEPA, 1991; DTSC, 1992
Exposure duration-child resident	$ED_{\text{child}}$	years	6	USEPA, 1991; DTSC, 1992
Averaging time-adult and child (carcinogens)	$AT_c$	days	25,550	USEPA, 1989
Averaging time-child (noncarcinogens)	$AT_{\text{nc-c}}$	days	2,190	ED x 365

**Table 4. Inhalation Toxicity Criteria  
Former Chevron Station No. 9-0020, Oakland, California**

<b>Chemical</b>	<b>Inhalation RfC <math>\mu\text{g}/\text{m}^3</math></b>	<b>Inhalation Unit Risk <math>(\mu\text{g}/\text{m}^3)^{-1}</math></b>
Benzene	3.00E+01	2.9E-05
Chloroform	9.77E+01	2.6E-05
Ethylbenzene	1.00E+03	2.5E-06
Naphthalene	3.00E+00	3.4E-05
Toluene	5.00E+03	NC
Xylenes	1.00E+02	NC

RfC = Reference concentration

IUR = Inhalation unit risk

NC = Noncarcinogen

Source of RfDs = USEPA (2009) Integrated Risk Information System

Source of IURs = Cal/EPA OEHHA (2009) Toxicity Criteria Database

**Table 5. Estimated Noncancer Hazards and Excess Lifetime Cancer Risks  
Site-Wide Maximum Soil Vapor Concentrations  
Former Chevron Station No. 9-0020, Oakland, California**

**Equations:**

$$\text{Risk}_{\text{adult}} = (C_{\text{building}} * EF_r * ED_{\text{adult}} * IUR) / AT_c$$

$$\text{Risk}_{\text{child}} = (C_{\text{building}} * EF_r * ED_{\text{child}} * IUR) / AT_c$$

$$\text{Hazard Quotient} = (C_{\text{building}} * EF_r * ED_{\text{child}}) / (AT_{\text{nc-c}} * RfC)$$

<b>Chemical</b>	<b>Maximum Soil Vapor Concentration<sup>1</sup> (µg/m<sup>3</sup>)</b>	<b>Predicted Indoor Air Concentration<sup>2</sup> C<sub>building</sub> (µg/m<sup>3</sup>)</b>	<b>Child Estimated Noncancer Hazard</b>	<b>Adult Estimated Cancer Risk</b>	<b>Child Estimated Cancer Risk</b>
Benzene	2,600	1.87E-02	6.0E-04	2.2E-07	4.5E-08
Chloroform	10	8.96E-05	8.8E-07	9.6E-10	1.9E-10
Ethylbenzene	4,800	2.76E-02	2.6E-05	2.8E-08	5.6E-09
Naphthalene	740	1.17E-02	3.7E-03	1.6E-07	3.3E-08
Toluene	2,000	1.36E-02	2.6E-06	NC	NC
Xylenes	5,000	2.98E-02	2.9E-04	NC	NC
<b>Total</b>			<b>5.E-03</b>	<b>4.E-07</b>	<b>8.E-08</b>

<sup>1</sup> Indoor air chemical concentrations were predicted from maximum soil vapor concentrations collected across the site. See Table 1.

<sup>2</sup> Source: USEPA's (2003) SG-SCREEN model Version 2.0 modified by Cal/EPA's HERD on 2/4/09.  
NC = Noncarcinogen



## **EVALUATION OF VAPOR INTRUSION TO INDOOR AIR FROM SOIL VAPOR FORMER CHEVRON STATION NUMBER 9-0020**

**Introduction:** Risks and hazards were estimated for indoor air exposures to chemicals of potential concern (COPCs) identified in soil vapor at the former Chevron Service Station Number 9-0020 located at 1633 Harrison Street, Oakland, California. The main purpose of this report is to answer the question, "Could residual concentrations of chemicals in soil vapor pose adverse health effects to future occupants of a residential building located on the site?" In general, risk and hazard estimates provide an answer to that question. It is understood that in order to develop a residential building at the site, a Remedial Action Plan, including a Tier II Risk-Based Corrective Action (RBCA) evaluation for the site, will be required and approved by Alameda County Health Care Services (ACHCS). The results of this soil vapor evaluation may be used to support a RBCA process and closure for the site.

This evaluation describes the methods and assumptions used to evaluate potential vapor intrusion exposures to future onsite residents. Based on the results of this evaluation, potential health risks for adult and child residents exposed to vapors that could migrate from COPCs identified in soil vapor onsite are within acceptable levels. The potential excess cancer risks were estimated to be  $4 \times 10^{-7}$  and  $8 \times 10^{-8}$  for onsite adult and child residents, respectively, and the noncancer hazard index for onsite child residents was estimated to be 0.005. This indicates that, given this particular exposure scenario, potential vapor intrusion does not present a health threat to individuals residing in future onsite buildings. The following sections describe the methods and information that were used to arrive at this conclusion.

**Site Description:** Currently, the site consists of an asphalt paved parking lot. The areas immediately adjacent to the site are commercial and multi-unit residences. The site is expected to be redeveloped as a multi-story senior housing facility with a slab-on-grade building foundation. The entire property area not included as part of the building complex will be paved and used for parking. Future landscaping will consist of potted plants placed on top of the pavement.

COPCs have been detected in soil, groundwater, and soil vapor samples collected onsite. A soil vapor survey was conducted at the site in January 1988. Twenty-two samples were collected at eleven locations around the site ranging from 3 to 13 feet below grade (fbg). The highest Total Petroleum Hydrocarbon as gasoline concentrations were detected in the vicinity of the former used-oil underground storage tank. Benzene, toluene, ethylbenzene, and xylenes (BTEX) were not detected above the laboratory reporting limit in any sample, with the exception of toluene and xylenes detected in one sample at low concentrations.

A second round of soil vapor sampling was conducted on June 13, 2007. Soil vapor samples were collected from six locations, VP-1 to VP-6 (See Figure 2 of the Remedial Action Plan, 2007, for the sample locations). For each soil vapor sample location, the probe depth intervals were from 5.0 to 5.5 fbg, and 10.0 to 10.5 fbg. Soil vapor sample

locations VP-1 through VP-3 are located outside of the proposed building footprint, while soil vapor sample locations VP-4 through VP-6 are located within the proposed building footprint.

From January to February 2008, remedial actions were completed onsite. In the southwest corner of the site, approximately 112 cubic yards were removed by over-excavation in the vicinity of the former used-oil tank. In the northeast corner of the site, within proposed footprint of the proposed multi-story senior housing facility, approximately 810 cubic yards of soil were removed from 105 borings using bucket augers. Vapor wells VP-1, VP-4 and VP-5 were destroyed and re-installed once the remedial actions were completed.

A third round of soil vapor sampling was conducted on April 10, 2008. Soil vapor samples were collected from six locations, VP-1R, VP-2, VP-3, VP-4R, VP-5R and VP-6. The sample locations denoted with an "R" are replacements for those that were destroyed during excavations. For each soil vapor sample location, the probe depth intervals were from 5.0 to 5.5 fbg, and 10.0 to 10.5 fbg. Soil vapor sample locations VP-1R through VP-3 are located outside of the proposed building footprint, while soil vapor sample locations VP-4R through VP-6 are located within the proposed building footprint.

A fourth round of soil vapor sampling was conducted on October 26, 2009. Soil vapor samples were collected from seven locations, VP-1R, VP-2, VP-3, VP-4R, VP-5R, VP-6 and VP-7. The sample locations denoted with an "R" are replacements for those that were destroyed during excavations. For each soil vapor sample location, the probe depth intervals were from 5.0 to 5.5 fbg, and 10.0 to 10.5 fbg. Soil vapor sample locations VP-1R through VP-3 are located outside of the proposed building footprint, while soil vapor sample locations VP-4R through VP-7 are located within the proposed building footprint.

As described in the Conestoga-Rovers & Associate (CRA, 2007) Soil Vapor Survey Report, soil vapor samples were analyzed using modified EPA Method TO-15. Of the suite of chemicals analyzed, the specific chemicals detected above the laboratory reporting limit in soil vapor include; BTEX, chloroform, and naphthalene. These 6 chemicals are considered the COPCs in soil vapor for the site. Table 1 presents the concentrations of COPCs detected in soil vapor. Ethanol was also detected from 5 to 5.5 fbg at one sample location, VP-4, at a concentration of 18  $\mu\text{g}/\text{m}^3$ . However, it was not selected as a COPC because it is not recognized as carcinogenic or noncarcinogenic by the USEPA or Cal-EPA's Office of Environmental Health Hazard Assessment (OEHHA). No other individual constituents were detected above the laboratory reporting limit.

**Exposure Assessment:** The COPCs in soil vapor have the potential to volatilize. Therefore, the most likely exposure pathway for future onsite residents is inhalation of vapors which have migrated from soil vapor through soil into buildings.

Following Cal-EPA Department of Toxic Substances Control (DTSC, 2004) guidance, it was assumed that the maximum concentrations of COPCs detected in the soil vapor samples collected onsite could serve as the vapor source. Concentrations of the COPCs were based on the soil vapor analytical data collected by Conestoga-Rovers & Associates (CRA) on June 13, 2007, April 10, 2008, and October 26, 2009 (Table 1). The maximum concentrations of BTEX, chloroform and naphthalene in soil vapor collected from VP-1 to VP-7 are: 2,600; 2,000; 4,800; 5,000; 10; and 740  $\mu\text{g}/\text{m}^3$ , respectively. The maximum soil vapor concentrations of BTEX and naphthalene were detected in VP-1 at 10-10.5 fbg. The maximum soil vapor concentration of chloroform was detected in VP-4R at 5-5.5 fbg. Both of the locations at which the maximum concentrations were detected are outside the footprint of the proposed building.

A scientific model for evaluating the migration of volatile chemicals from soil vapor to indoor air, SG-SCREEN (Version 2.0), developed by the USEPA (2003) and modified by the Cal-EPA DTSC was used to predict concentrations of the volatile chemicals in indoor air based on their concentrations in soil vapor. The SG-SCREEN model was last modified on February 4, 2009 and is based on the Johnson and Ettinger (1991) indoor air vapor intrusion model, often referred to as the J&E Model. Based on recent construction schemes, the proposed building will have a slab-on-grade foundation.

In addition to maximum chemical concentrations in soil vapor, site-specific characteristics of soils at the property were used in the SG-SCREEN model, when available, and were assumed to represent the characteristics of site soils. Table 2 presents the input parameters used to estimate indoor air levels of the COPCs. The shallowest soil vapor sampling depth below grade was 5 feet. The soil type was assumed to be sand. Soil physical parameters were measured on April 27, 2007 at 10 fbg from SB1 and again on June 13, 2007 at 9.5 fbg from VP-1 by CRA (2007). Average vadose zone soil dry bulk density and porosities were used from these data. The average vadose zone soil dry bulk density is 1.83  $\text{g}/\text{cm}^3$ , the average vadose zone total porosity is 32.4 percent, and the average air and water-filled porosities are 4.5 percent and 27.9, respectively. Cal-EPA DTSC default assumptions were used for all other soil properties.

The indoor air concentrations of the COPCs predicted by the SG-SCREEN model were then used to estimate potential health risks and hazards to future onsite residents. The exposure parameters used to estimate potential exposures to residents are summarized in Table 3. Standard default parameters, as recommended by DTSC (1992) and USEPA (1989; 1991), were used.

**Inhalation Toxicity Criteria:** The USEPA's (2009) Integrated Risk Information System (IRIS) and Cal-EPA's OEHHA (2009) have established specific toxicity criteria for BTEX, chloroform, and naphthalene for use in risk evaluations. Following standard practice for sites located in California, if available, the most recent OEHHA inhalation toxicity criteria were used. If unavailable, then toxicity criteria established by the USEPA were used. Table 4 presents the inhalation toxicity criteria used in this evaluation.

**Risk Characterization:** Using standard equations recommended by Cal-EPA and USEPA, the predicted indoor air concentrations, and exposure assumptions and toxicity criteria described above, the potential health risks and hazards were estimated for future onsite residents. The potential health risks presented by carcinogenic chemicals, such as benzene, are described in terms of excess cancer risk, or the probability of getting cancer over a lifetime that may be associated with the particular exposures evaluated. Noncarcinogenic chemicals, such as toluene and xylenes are expressed in terms of a hazard index or a ratio of the chemical exposure estimate to a “safe” dose.

Based on indoor air concentrations predicted by the SG-SCREEN model results shown in Attachment A, Table 5 presents the estimated excess lifetime cancer risks and noncancer hazard index for future onsite adult and child residents assuming maximum site-wide COPC soil vapor concentrations. Tables A-1 to A-12 in Attachment A present the SG-SCREEN model runs for each COPC assuming slab-on-grade building foundation assuming maximum site-wide COPC soil vapor concentrations as the source beneath a future building structure.

As shown in Table 5, with maximum site-wide COPC soil vapor concentrations used as the source, assuming a standard slab-on-grade building foundation of 15 cm, the potential excess cancer risks were estimated to be  $4 \times 10^{-7}$  and  $8 \times 10^{-8}$  for onsite adult and child residents, respectively. The potential noncancer hazard index (for total exposure to BTEX, and naphthalene) for onsite child residents was estimated to be 0.005. Only children were evaluated for noncancer effects because they are the most conservative potential receptors.

**Uncertainties:** Uncertainty, which includes natural variability and incertitude originating from a lack of understanding (i.e., relevant data) are inherent in the risk assessment process. Many of the variables used to estimate risks and hazards are standard default values and may not accurately describe future conditions or characteristics of the site. As default values tend to overestimate exposure, the impact of this uncertainty is to typically overestimate risks.

For example, prediction of indoor air vapor concentrations for buildings is an area of uncertainty. However, the air exposure models incorporated into SG-SCREEN are based on equations recommended by Cal-EPA DTSC and USEPA which provide a very conservative overestimate of actual risk for most cases. The degree to which this may impact the estimated risks and hazards was not quantified.

The actual dimensions and structural integrity of the proposed future onsite building foundation is not known. However, as stated previously, default model values tend to overestimate exposure and the impact of this uncertainty is to typically overestimate risks.

The degradability of volatile petroleum hydrocarbons was not considered and it is likely that risk and hazard estimates have been overestimated. Use of petroleum hydrocarbon soil vapor data to evaluate potential onsite indoor air exposures, without considering

natural attenuation mechanisms known to affect petroleum hydrocarbons, is likely to overestimate risks and hazards for residents. However, the degree to which this may impact risk and hazard estimates cannot be quantitatively determined.

Soil vapor samples were collected beneath the current asphalt pavement. With the exception of the area that is expected to be developed as a residential building, the entire site will be paved with asphalt. Essentially, the condition from which soil vapor samples were collected, e.g., beneath asphalt pavement, resembles that anticipated in the future. Therefore, the amount of oxygen available to degrade petroleum hydrocarbons in subsurface soil in the future is expected to be similar to the current conditions. It should be noted that the oxygen level in soil vapor at VP-1, VP-1R, and VP-5R, is fairly depleted.

Although Cal-EPA's OEHHA has established an inhalation toxicity criterion for naphthalene, e.g., an inhalation cancer slope factor, the USEPA's IRIS has not officially recognized it has a human carcinogen. The potential carcinogenicity of naphthalene is currently the subject of much scientific research and debate. Assuming that it is carcinogenic, as was done in this analysis, may overestimate the potential health risks.

As shown in Table 1, risks and hazards were estimated based on the maximum detected constituent concentration in soil vapor data, which were all collected from the 10 to 10.5 ft bgs depth interval. The maximum constituent concentrations in soil vapor collected from 5 to 5.5 ft bgs are much lower. For example the maximum concentration of benzene collected from 10 to 10.5 ft bgs is 2,600  $\mu\text{g}/\text{m}^3$ . Whereas, the maximum concentration of benzene collected from 5 to 5.5 ft bgs is 110  $\mu\text{g}/\text{m}^3$ . As a result, risk and hazard estimates are likely to be overestimated.

Risks and hazards were estimated based on current conditions at the site, i.e., it is a parking lot. In the future, the site is expected to be redeveloped as a multi-story building with a slab-on-grade building foundation. The degree to which this may impact risk and hazard estimates cannot be quantitatively determined.

Estimated excess lifetime cancer risks and noncancer hazards would be lower using soil vapor data collected within the footprint of the proposed future building, as maximum detected concentrations of COPCs are lower in these sample locations. Therefore, estimated risks and hazards presented in Table 5 are likely overestimated for future onsite residents.

Finally, this evaluation was based on use of the maximum detected soil vapor COPC concentrations as a source beneath a future onsite building. Typically, the 95 percent upper confidence limit (95UCL) of the mean soil vapor concentrations of the COPCs are also evaluated, because they are likely to be more representative estimates of the potential vapor source strength. For example, as shown in Table 1, the maximum detected concentration of benzene is 2,600  $\mu\text{g}/\text{m}^3$  and the 95UCL, calculated using the USEPA's (2009b) ProUCL software, is 713  $\text{g}/\text{m}^3$ . As such, this evaluation will tend to over predict risks and hazards.

**Conclusions:** Using the approach described in this evaluation, the estimated excess cancer risks for future onsite residents at the former Chevron Service Station Number 9-0020 do not exceed the established acceptable risk range, from  $1 \times 10^{-6}$  to  $1 \times 10^{-4}$ , as defined by Cal-EPA, USEPA and other regulatory agencies. Moreover, the estimated hazard index for future onsite residents is also below an acceptable level, of 1.0, for noncancer effects. These results indicate that potential health risks for future occupants of an onsite building exposed to potential vapors migrating from chemicals in soil vapor collected onsite are below levels of concern.

**References:**

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Conestoga-Rovers & Associates (CRA). 2007. Soil Vapor Survey Report. Soil Vapor Analytical Data and Physical Parameters Data Collected June 13, 2007, and Physical Parameters Data collected on April 27, 2007 for Chevron Station 9-0020 17<sup>th</sup> and Harrison Streets Oakland California.

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Johnson, P.C., R.A. Ettinger. 1991. Heuristic model for predicting the intrusion of contaminant vapors into buildings. *Environ. Sci. Technol.* 25(8): 1445-1452.

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USEPA (United States Environmental Protection Agency). 1991. Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors. Publication 9285.6-03. Office of Emergency and Remedial Response, Washington, D.C.

USEPA (United States Environmental Protection Agency). 1989. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual. OSWER Dir. 9285.7-01a.

DATA ENTRY SHEET

Table A-1. Maximum Benzene Soil Vapor Concentration

DTSC  
Vapor Intrusion Guidance  
Interim Final 12/04  
(last modified 2/4/09)

SG-SCREEN  
PA Version 2.0; 04/

Reset to  
Defaults

Soil Gas Concentration Data				
ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., $C_g$ ( $\mu\text{g}/\text{m}^3$ )	OR	ENTER Soil gas conc., $C_g$ (ppmv)	Chemical
71432	2.60E+03			Benzene

MORE  
↓

ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (15 or 200 cm)	ENTER Soil gas sampling depth below grade, $L_s$ (cm)	ENTER Average soil temperature, $T_s$ ( $^{\circ}\text{C}$ )	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, $k_v$ ( $\text{cm}^2$ )
15	152.4	24	S		

MORE  
↓

ENTER Vadose zone SCS soil type Lookup Soil Parameters	ENTER Vadose zone soil dry bulk density, $\rho_b^A$ ( $\text{g}/\text{cm}^3$ )	ENTER Vadose zone soil total porosity, $n^V$ (unitless)	ENTER Vadose zone soil water-filled porosity, $\theta_w^V$ ( $\text{cm}^3/\text{cm}^3$ )	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) $Q_{\text{soil}}$ (L/m)
S	1.83	0.324	0.279	5

MORE  
↓

ENTER Averaging time for carcinogens, $AT_C$ (yrs)	ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	25	25	250

END



CHEMICAL PROPERTIES SHEET

Diffusivity in air, $D_a$ ( $\text{cm}^2/\text{s}$ )	Diffusivity in water, $D_w$ ( $\text{cm}^2/\text{s}$ )	Henry's law constant at reference temperature, H ( $\text{atm}\cdot\text{m}^3/\text{mol}$ )	Henry's law constant reference temperature, $T_R$ ( $^{\circ}\text{C}$ )	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ ( $\text{cal}/\text{mol}$ )	Normal boiling point, $T_B$ ( $^{\circ}\text{K}$ )	Critical temperature, $T_C$ ( $^{\circ}\text{K}$ )	Unit risk factor, URF ( $\mu\text{g}/\text{m}^3$ ) <sup>-1</sup>	Reference conc., RfC ( $\text{mg}/\text{m}^3$ )	Molecular weight, MW ( $\text{g}/\text{mol}$ )
8.80E-02	9.80E-06	5.54E-03	25	7,342	353.24	562.16	2.9E-05	3.0E-02	78.11

END

INTERMEDIATE CALCULATIONS SHEET

**Table A-2. Maximum Benzene Soil Vapor Concentration**

Source- building separation, $L_T$ (cm)	Vadose zone soil air-filled porosity, $\theta_a^v$ ( $\text{cm}^3/\text{cm}^3$ )	Vadose zone effective total fluid saturation, $S_{1e}$ ( $\text{cm}^3/\text{cm}^3$ )	Vadose zone soil intrinsic permeability, $k_i$ ( $\text{cm}^2$ )	Vadose zone soil relative air permeability, $k_{rg}$ ( $\text{cm}^2$ )	Vadose zone soil effective vapor permeability, $k_v$ ( $\text{cm}^2$ )	Floor- wall seam perimeter, $X_{crack}$ (cm)	Soil gas conc., $C_{soil}$ ( $\mu\text{g}/\text{m}^3$ )	Bldg. ventilation rate, $Q_{building}$ ( $\text{cm}^3/\text{s}$ )
137.4	0.045	0.834	1.02E-07	0.055	5.62E-09	4,000	2.60E+03	3.39E+04

Area of enclosed space below grade, $A_B$ ( $\text{cm}^2$ )	Crack- to-total area ratio, $\eta$ (unitless)	Crack depth below grade, $Z_{crack}$ (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, $H_{TS}$ (atm- $\text{m}^3/\text{mol}$ )	Henry's law constant at ave. soil temperature, $H'_{TS}$ (unitless)	Vapor viscosity at ave. soil temperature, $\mu_{TS}$ (g/cm-s)	Vadose zone effective diffusion coefficient, $D_v^{eff}$ ( $\text{cm}^2/\text{s}$ )	Diffusion path length, $L_d$ (cm)
1.00E+06	5.00E-03	15	7,977	5.29E-03	2.17E-01	1.80E-04	3.36E-05	137.4

Convection path length, $L_p$ (cm)	Source vapor conc., $C_{source}$ ( $\mu\text{g}/\text{m}^3$ )	Crack radius, $r_{crack}$ (cm)	Average vapor flow rate into bldg., $Q_{soil}$ ( $\text{cm}^3/\text{s}$ )	Crack effective diffusion coefficient, $D^{crack}$ ( $\text{cm}^2/\text{s}$ )	Area of crack, $A_{crack}$ ( $\text{cm}^2$ )	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, $\alpha$ (unitless)	Infinite source bldg. conc., $C_{building}$ ( $\mu\text{g}/\text{m}^3$ )
15	2.60E+03	1.25	8.33E+01	3.36E-05	5.00E+03	#NUM!	7.19E-06	1.87E-02

Unit risk factor, URF ( $\mu\text{g}/\text{m}^3$ ) <sup>-1</sup>	Reference conc., RFC ( $\text{mg}/\text{m}^3$ )
2.9E-05	3.0E-02

**END**

RESULTS SHEET

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
1.3E-07	4.3E-04

MESSAGE SUMMARY BELOW:

END

VLOOKUP TABLES

SCS Soil Type	Soil Properties Lookup Table						Bulk Density				
	K <sub>s</sub> (cm/h)	α <sub>1</sub> (1/cm)	N (unitless)	M (unitless)	n (cm <sup>3</sup> /cm <sup>3</sup> )	θ <sub>r</sub> (cm <sup>3</sup> /cm <sup>3</sup> )	Mean Grain Diameter (cm)	(g/cm <sup>3</sup> )	θ <sub>w</sub> (cm <sup>3</sup> /cm <sup>3</sup> )	SCS Soil Name	
C	0.61	0.01496	1.253	0.2019	0.459	0.098	0.0092	1.43	0.215	Clay	
CL	0.34	0.01581	1.416	0.2938	0.442	0.079	0.016	1.48	0.168	Clay Loam	
L	0.50	0.01112	1.472	0.3207	0.399	0.061	0.020	1.59	0.148	Loam	
LS	4.38	0.03475	1.746	0.4273	0.390	0.049	0.040	1.62	0.076	Loamy Sand	
S	26.78	0.03524	3.177	0.6852	0.375	0.053	0.044	1.66	0.054	Sand	
SC	0.47	0.03342	1.208	0.1722	0.385	0.117	0.025	1.63	0.197	Sandy Clay	
SCL	0.55	0.02109	1.330	0.2481	0.384	0.063	0.029	1.63	0.146	Sandy Clay Loam	
SI	1.82	0.00658	1.679	0.4044	0.489	0.050	0.0046	1.35	0.167	Silt	
SIC	0.40	0.01622	1.321	0.2430	0.481	0.111	0.0039	1.38	0.216	Silty Clay	
SICL	0.46	0.00839	1.521	0.3425	0.482	0.090	0.0056	1.37	0.198	Silty Clay Loam	
SIL	0.76	0.00506	1.663	0.3987	0.439	0.065	0.011	1.49	0.180	Silt Loam	
SL	1.60	0.02667	1.449	0.3099	0.387	0.039	0.030	1.62	0.103	Sandy Loam	

CAS No.	Chemical	Chemical Properties Lookup Table						Henry's Law Constants					Enthalpy of Vaporization			CalEPA Toxicity Criteria in bold (last updated 2/4/09 DTSC/HERD)				Original EPA Values			
		Organic carbon partition coefficient, K <sub>oc</sub> (cm <sup>3</sup> /g)	Diffusivity in air, D <sub>a</sub> (cm <sup>2</sup> /s)	Diffusivity in water, D <sub>w</sub> (cm <sup>2</sup> /s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm·m <sup>3</sup> /mol)	Henry's law constant reference temperature, T <sub>R</sub> (°C)	Normal boiling point, T <sub>B</sub> (°K)	Critical temperature, T <sub>C</sub> (°K)	Enthalpy of vaporization at the normal boiling point, ΔH <sub>v,b</sub> (cal/mol)	Unit risk factor, URF (μg/m <sup>3</sup> ) <sup>-1</sup>	Reference conc., RfC (mg/m <sup>3</sup> )	Molecular weight, MW (g/mol)	URF extrapolated (X)	RfC extrapolated (X)	Unit risk factor, URF (μg/m <sup>3</sup> ) <sup>-1</sup>	Reference conc., RfC (mg/m <sup>3</sup> )	URF extrapolated (X)	RfC extrapolated (X)			
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.24E+00	3.03E-02	25	349.90	556.60	7,127	<b>4.2E-05</b>	<b>4.0E-02</b>	1.54E+02			1.5E-05	0.0E+00					
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	14,000	<b>3.4E-04</b>	7.0E-04	4.10E+02			1.0E-04	7.0E-04					
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	7.30E+00	5.73E-04	1.40E-05	25	596.55	839.36	15,000	<b>3.1E-04</b>	1.1E-03	2.91E+02	?	X	3.7E-04	1.1E-03	X	X			
60297	Ethyl ether	5.73E+00	7.82E-02	8.61E-06	5.68E+04	1.35E+00	3.29E-02	25	307.50	466.74	6,338	0.0E+00	7.0E-01	7.41E+01		X	0.0E+00	7.0E-01		X			
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.18E-04	1.51E-05	25	613.32	842.25	17,000	<b>4.6E-03</b>	1.8E-04	3.81E+02		X	4.6E-03	1.8E-04		X			
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.87E-05	25	329.20	508.10	6,955	0.0E+00	<b>3.1E+01</b>	5.81E+01		X	0.0E+00	3.5E-01		X			
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	<b>5.3E-06</b>	<b>3.0E-01</b>	1.19E+02			2.3E-05	0.0E+00					
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	<b>1.1E-05</b>	3.5E-03	2.37E+02		X	4.0E-06	3.5E-03		X			
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.79E+03	2.27E-01	5.54E-03	25	353.24	562.16	7,342	<b>2.9E-05</b>	<b>3.0E-02</b>	7.81E+01			7.8E-06	0.0E+00					
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	<b>5.0E+00</b>	1.33E+02			0.0E+00	2.2E+00					
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	1.00E-01	6.46E-04	1.58E-05	25	651.02	848.49	16,000	0.0E+00	1.8E-02	3.46E+02			0.0E+00	1.8E-02		X			
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.59E-04	2.09E-05	25	636.44	860.38	15,000	<b>9.7E-05</b>	0.0E+00	3.18E+02	?		9.7E-05	0.0E+00	X				
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.55E-01	6.22E-03	25	276.71	467.00	5,714	0.0E+00	<b>5.0E-03</b>	9.49E+01			0.0E+00	5.0E-03					
74873	Methyl chloride (chloromethane)	2.12E+00	1.26E-01	6.50E-06	5.33E+03	3.61E-01	8.80E-03	25	249.00	416.25	5,115	<b>1.8E-06</b>	9.0E-02	5.05E+01			1.0E-06	9.0E-02					
74908	Hydrogen cyanide	3.80E+00	1.93E-01	2.10E-05	1.00E+06	5.44E-03	1.33E-04	25	299.00	456.70	6,676	0.0E+00	<b>3.0E-03</b>	2.70E+01			0.0E+00	3.0E-03					
74953	Methylene bromide	1.26E+01	4.30E-02	8.44E-06	1.19E+04	3.52E-02	8.59E-04	25	370.00	583.00	7,868	0.0E+00	3.5E-02	1.74E+02		X	0.0E+00	3.5E-02		X			
75003	Chloroethane (ethyl chloride)	4.40E+00	2.71E-01	1.15E-05	5.68E+03	3.61E-01	8.80E-03	25	285.30	460.40	5,879	8.3E-07	<b>1.0E+01</b>	6.45E+01	?		8.3E-07	1.0E+01	X				
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-05	8.80E+03	1.10E+00	2.69E-02	25	259.25	432.00	5,250	<b>7.8E-05</b>	1.0E-01	6.25E+01			8.8E-06	1.0E-01					
75058	Acetonitrile	4.20E+00	1.28E-01	1.66E-05	1.00E+06	1.42E-03	3.45E-05	25	354.60	545.50	7,110	0.0E+00	6.0E-02	4.11E+01			0.0E+00	6.0E-02					
75070	Acetaldehyde	1.06E+00	1.24E-01	1.41E-05	1.00E+06	3.23E-03	7.87E-05	25	293.10	466.00	6,157	<b>2.7E-06</b>	<b>9.0E-03</b>	4.41E+01			2.2E-06	9.0E-03					
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.96E-02	2.18E-03	25	313.00	510.00	6,706	<b>1.0E-06</b>	<b>4.0E-01</b>	8.49E+01			4.7E-07	3.0E+00					
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	<b>7.0E-01</b>	7.61E+01			0.0E+00	7.0E-01					
75218	Ethylene oxide	1.33E+00	1.04E-01	1.45E-05	3.04E+05	2.27E-02	5.54E-04	25	283.60	469.00	6,104	<b>8.8E-05</b>	<b>3.0E-02</b>	4.41E+01			1.0E-04	0.0E+00					
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.41E-02	5.88E-04	25	422.35	696.00	9,479	1.1E-06	7.0E-02	2.53E+02		X	1.1E-06	7.0E-02		X			
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.54E-02	1.60E-03	25	363.15	585.85	7,800	<b>3.7E-05</b>	7.0E-02	1.64E+02	?	X	1.8E-05	7.0E-02	X	X			
75296	2-Chloropropane	9.14E+00	8.88E-02	1.01E-05	3.73E+03	5.93E-01	1.45E-02	25	308.70	485.00	6,286	0.0E+00	1.0E-01	7.85E+01		?	0.0E+00	1.0E-01					
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	<b>1.6E-06</b>	<b>7.0E-01</b>	9.90E+01		X	0.0E+00	5.0E-01					
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.60E-02	25	304.75	576.05	6,247	0.0E+00	<b>7.0E-02</b>	9.69E+01			0.0E+00	2.0E-01					
75456	Chlorodifluoromethane	4.79E+01	1.01E-01	1.28E-05	2.00E+00	1.10E+00	2.70E-02	25	232.40	369.30	4,836	0.0E+00	5.0E+01	8.65E+01			0.0E+00	5.0E+01					
75694	Trichlorofluoromethane	4.97E+02	8.70E-02	9.70E-06	1.10E+03	3.97E+00	9.68E-02	25	296.70	471.00	5,999	0.0E+00	7.0E-01	1.37E+02			0.0E+00	7.0E-01					
75718	Dichlorodifluoromethane	4.57E+02	6.65E-02	9.92E-06	2.80E+02	1.40E+01	3.42E-01	25	243.20	384.95	9,421	0.0E+00	2.0E-01	1.21E+02			0.0E+00	2.0E-01					
76131	1,1,2-Trichloro-1,2,2-trifluoroethane	1.11E+04	7.80E-02	8.20E-06	1.70E+02	1.97E+01	4.80E-01	25	320.70	487.30	6,463	0.0E+00	3.0E+01	1.87E+02			0.0E+00	3.0E+01					
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	6.05E+01	1.48E+00	25	603.69	846.31	13,000	<b>1.2E-03</b>	1.8E-03	3.73E+02		X	1.3E-03	1.8E-03		X			
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.10E+00	2.69E-02	25	512.15	746.00	10,931	0.0E+00	2.0E-04	2.73E+02			0.0E+00	2.0E-04					
78831	Isobutanol	2.59E+00	8.60E-02	9.30E-06	8.50E+04	4.83E-04	1.18E-05	25	381.04	547.78	10,936	0.0E+00	1.1E+00	7.41E+01		X	0.0E+00	1.1E+00		X			
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.79E-03	25	369.52	572.00	7,590	<b>1.0E-05</b>	4.0E-03	1.13E+02	?		1.9E-05	4.0E-03	X				
78933	Methylethylketone (2-butanone)	2.30E+00	8.08E-02	9.80E-06	2.23E+05	2.29E-03	5.58E-05	25	352.50	536.78	7,481	0.0E+00	5.0E+00	7.21E+01			0.0E+00	1.0E+00					
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.73E-02	9.11E-04	25	386.15	602.00	8,322	<b>1.6E-05</b>	1.4E-02	1.33E+02		X	1.6E-05	1.4E-02		X			
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.47E+03	4.21E-01	1.03E-02	25	360.36	544.20	7,505	<b>2.0E-06</b>	<b>6.0E-01</b>	1.31E+02	?		1.1E-04	4.0E-02	X				
79209	Methyl acetate	3.26E+00	1.04E-01	1.00E-05	2.00E+03	4.84E-03	1.18E-04	25	329.80	506.70	7,260	0.0E+00	3.5E+00	7.41E+01		X	0.0E+00	3.5E+00		X			
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.96E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	<b>5.8E-05</b>	<b>1.4E-02</b>	1.68E+02		X	5.8E-05	2.1E-01		X			
79469	2-Nitropropane	1.17E+01	9.23E-02	1.01E-05	1.70E+04	5.03E-03	1.23E-04	25	393.20	594.00	8,383	2.7E-03	2.0E-02	8.91E+01			2.7E-03	2.0E-02					
80626	Methylmethacrylate	6.98E+00	7.70E-02	8.60E-06	1.50E+04	1.38E-02	3.36E-04	25	373.50	567.00	8,975	0.0E+00	7.0E-01	1.00E+02			0.0E+00	7.0E-01					
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	3.57E+00	6.34E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01	1.54E+02		X	0.0E+00	2.1E-01		X			
86737	Fluorene	1.38E+04	3.63E-02	7.88E-06	1.98E+00	2.60E-03	6.34E-05	25	570.44	870.00	12,666	0.0E+00	1.4E-01	1.66E+02		X	0.0E+00	1.4E-01		X			
87683	Hexachloro-1,3-butadiene	5.37E+04	5.61E-02	6.16E-06	3.20E+00																		

VLOOKUP TABLES

Chemical Properties Lookup Table																	CalEPA Toxicity Criteria in bold (last updated 2/4/09 DTSC/HERD)			
CAS No.	Chemical	Organic carbon partition coefficient, $K_{oc}$ (cm <sup>3</sup> /g)	Diffusivity in air, $D_a$ (cm <sup>2</sup> /s)	Diffusivity in water, $D_w$ (cm <sup>2</sup> /s)	Pure component water solubility, S (mg/L)	Henry's law constant $H'$ (unitless)	Henry's law constant at reference temperature, H (atm-m <sup>3</sup> /mol)	Henry's law constant reference temperature, $T_R$ (°C)	Normal boiling point, $T_B$ (°K)	Critical temperature, $T_C$ (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF (µg/m <sup>3</sup> ) <sup>-1</sup>	Reference conc., RfC (mg/m <sup>3</sup> )	Molecular weight, MW (g/mol)	URF extrapolated (X)	RfC extrapolated (X)	Unit risk factor, URF (µg/m <sup>3</sup> ) <sup>-1</sup>	Reference conc., RfC (mg/m <sup>3</sup> )	URF extrapolated (X)	RfC extrapolated (X)
95501	1,2-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	1.56E+02	7.77E-02	1.90E-03	25	453.57	705.00	9,700	0.0E+00	2.0E-01	1.47E+02			0.0E+00	2.0E-01		
95578	2-Chlorophenol	3.88E+02	5.01E-02	9.46E-06	2.20E+04	1.60E-02	3.90E-04	25	447.53	675.00	9,572	0.0E+00	1.8E-02	1.29E+02		X	0.0E+00	1.8E-02		X
95636	1,2,4-Trimethylbenzene	1.35E+03	6.06E-02	7.92E-06	5.70E+01	2.52E-01	6.14E-03	25	442.30	649.17	9,369	0.0E+00	<b>7.0E-03</b>	1.20E+02			0.0E+00	6.0E-03		
96184	1,2,3-Trichloropropane	2.20E+01	7.10E-02	7.90E-06	1.75E+03	1.67E-02	4.08E-04	25	430.00	652.00	9,171	<b>2.0E-03</b>	<b>2.1E-02</b>	1.47E+02	X	X	5.7E-04	4.9E-03	X	
96333	Methyl acrylate	4.53E+00	9.76E-02	1.02E-05	6.00E+04	7.68E-03	1.87E-04	25	353.70	536.00	7,749	0.0E+00	1.1E-01	8.61E+01		X	0.0E+00	1.1E-01		X
97632	Ethylmethacrylate	2.95E+01	6.53E-02	8.37E-06	3.67E+03	3.44E-02	8.40E-04	25	390.00	571.00	10,957	0.0E+00	3.2E-01	1.14E+02		X	0.0E+00	3.2E-01		X
98066	tert-Butylbenzene	7.71E+02	5.65E-02	8.02E-06	2.95E+01	4.87E-01	1.19E-02	25	442.10	1220.00	8,980	0.0E+00	1.4E-01	1.34E+02		X	0.0E+00	1.4E-01		X
98828	Cumene	4.89E+02	6.50E-02	7.10E-06	6.13E+01	4.74E+01	1.16E+00	25	425.56	631.10	10,335	0.0E+00	4.0E-01	1.20E+02			0.0E+00	4.0E-01		
98862	Acetophenone	5.77E+01	6.00E-02	8.73E-06	6.13E+03	4.38E-04	1.07E-05	25	475.00	709.50	11,732	0.0E+00	3.5E-01	1.20E+02		X	0.0E+00	3.5E-01		X
98953	Nitrobenzene	6.46E+01	7.60E-02	8.60E-06	2.09E+03	9.82E-04	2.39E-05	25	483.95	719.00	10,566	0.0E+00	2.0E-03	1.23E+02			0.0E+00	2.0E-03		
100414	Ethylbenzene	3.63E+02	7.50E-02	7.80E-06	1.69E+02	3.22E-01	7.86E-03	25	409.34	617.20	8,501	<b>2.5E-06</b>	<b>1.0E+00</b>	1.06E+02			0.0E+00	1.0E+00		
100425	Styrene	7.76E+02	7.10E-02	8.00E-06	3.10E+02	1.12E-01	2.74E-03	25	418.31	636.00	8,737	0.0E+00	<b>9.0E-01</b>	1.04E+02			0.0E+00	1.0E+00		
100447	Benzylchloride	6.14E+01	7.50E-02	7.80E-06	5.25E+02	1.70E-02	4.14E-04	25	452.00	685.00	8,773	<b>4.9E-05</b>	<b>1.0E-03</b>	1.27E+02	?		4.9E-05	0.0E+00	X	
100527	Benzaldehyde	4.59E+01	7.21E-02	9.07E-06	3.30E+03	9.73E-04	2.37E-05	25	452.00	695.00	11,658	0.0E+00	3.5E-01	1.06E+02		X	0.0E+00	3.5E-01		X
103651	n-Propylbenzene	5.62E+02	6.01E-02	7.83E-06	6.00E+01	4.37E-01	1.07E-02	25	432.20	630.00	9,123	0.0E+00	1.4E-01	1.20E+02		X	0.0E+00	1.4E-01		X
104518	n-Butylbenzene	1.11E+03	5.70E-02	8.12E-06	2.00E+00	5.38E-01	1.31E-02	25	456.46	660.50	9,290	0.0E+00	1.4E-01	1.34E+02		X	0.0E+00	1.4E-01		X
106423	p-Xylene	3.89E+02	7.69E-02	8.44E-06	1.85E+02	3.13E-01	7.64E-03	25	411.52	616.20	8,525	0.0E+00	<b>1.0E-01</b>	1.06E+02		?	0.0E+00	1.0E-01		
106467	1,4-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	7.90E+01	9.82E-02	2.39E-03	25	447.21	684.75	9,271	<b>1.1E-05</b>	<b>8.0E-01</b>	1.47E+02			0.0E+00	8.0E-01		
106934	1,2-Dibromoethane (ethylene dibr	2.50E+01	2.17E-02	1.19E-05	4.18E+03	3.04E-02	7.41E-04	25	404.60	583.00	8,310	<b>7.1E-05</b>	<b>8.0E-04</b>	1.88E+02			6.0E-04	9.0E-03		
106990	1,3-Butadiene	1.91E+01	2.49E-01	1.08E-05	7.35E+02	3.01E+00	7.34E-02	25	268.60	425.00	5,370	<b>1.7E-04</b>	<b>2.0E-03</b>	5.41E+01			3.0E-05	0.0E+00		
107028	Acrolein	2.76E+00	1.05E-01	1.22E-05	2.13E+05	4.99E-03	1.22E-04	25	325.60	506.00	6,731	0.0E+00	<b>2.0E-05</b>	5.61E+01			0.0E+00	2.0E-05		
107062	1,2-Dichloroethane	1.74E+01	1.04E-01	9.90E-06	8.52E+03	4.00E-02	9.77E-04	25	356.65	561.00	7,643	<b>2.1E-05</b>	<b>4.0E-01</b>	9.90E+01			2.6E-05	0.0E+00		
107131	Acrylonitrile	5.90E+00	1.22E-01	1.34E-05	7.40E+04	4.21E-03	1.03E-04	25	350.30	519.00	7,786	<b>2.9E-04</b>	<b>2.0E-03</b>	5.31E+01			6.8E-05	2.0E-03		
108054	Vinyl acetate	5.25E+00	8.50E-02	9.20E-06	2.00E+04	2.09E-02	5.10E-04	25	345.65	519.13	7,800	0.0E+00	<b>2.0E-01</b>	8.61E+01			0.0E+00	2.0E-01		
108101	Methylisobutylketone (4-methyl-2-)	9.06E+00	7.50E-02	7.80E-06	1.90E+04	5.64E-03	1.38E-04	25	389.50	571.00	8,243	0.0E+00	<b>3.0E+00</b>	1.00E+02			0.0E+00	8.0E-02		
108383	m-Xylene	4.07E+02	7.00E-02	7.80E-06	1.61E+02	3.00E-01	7.32E-03	25	412.27	617.05	8,523	0.0E+00	<b>1.0E-01</b>	1.06E+02		?	0.0E+00	1.0E-01		
108678	1,3,5-Trimethylbenzene	1.35E+03	6.02E-02	8.67E-06	2.00E+00	2.41E-01	5.87E-03	25	437.89	637.25	9,321	0.0E+00	6.0E-03	1.20E+02			0.0E+00	6.0E-03		
108872	Methylcyclohexane	7.85E+01	7.35E-02	8.52E-06	1.40E+01	4.22E+00	1.03E-01	25	373.90	572.20	7,474	0.0E+00	3.0E+00	9.82E+01		?	0.0E+00	3.0E+00		
108883	Toluene	1.82E+02	8.70E-02	8.60E-06	5.26E+02	2.72E-01	6.62E-03	25	383.78	591.79	7,930	0.0E+00	<b>3.0E-01</b>	9.21E+01			0.0E+00	4.0E-01		
108907	Chlorobenzene	2.19E+02	7.30E-02	8.70E-06	4.72E+02	1.51E-01	3.69E-03	25	404.87	632.40	8,410	0.0E+00	<b>1.0E+00</b>	1.13E+02			0.0E+00	6.0E-02		
109693	1-Chlorobutane	1.72E+01	8.26E-02	1.00E-05	1.10E+03	6.93E-01	1.69E-02	25	351.60	542.00	7,263	0.0E+00	<b>1.4E-01</b>	9.26E+01		X	0.0E+00	1.4E+00		X
110009	Furan	1.86E+01	1.04E-01	1.22E-05	1.00E+04	2.21E-01	5.39E-03	25	304.60	490.20	6,477	0.0E+00	3.5E-03	6.81E+01		X	0.0E+00	3.5E-03		X
110543	Hexane	4.34E+01	2.00E-01	7.77E-06	1.24E+01	6.82E+01	1.66E+00	25	341.70	508.00	6,895	0.0E+00	<b>7.0E-01</b>	8.62E+01			0.0E+00	2.0E-01		
111444	Bis(2-chloroethyl)ether	1.55E+01	6.92E-02	7.53E-06	1.72E+04	7.36E-04	1.80E-05	25	451.15	659.79	10,803	<b>7.1E-04</b>	0.0E+00	1.43E+02			3.3E-04	0.0E+00		
115297	Endosulfan	2.14E+03	1.15E-02	4.55E-06	5.10E-01	4.58E-04	1.12E-05	25	674.43	942.94	14,000	0.0E+00	2.1E-02	4.07E+02		X	0.0E+00	2.1E-02		X
118741	Hexachlorobenzene	5.50E+04	5.42E-02	5.91E-06	5.00E-03	5.40E-02	1.32E-03	25	582.55	825.00	14,447	<b>5.1E-04</b>	2.8E-03	2.85E+02		X	4.6E-04	2.8E-03		X
120821	1,2,4-Trichlorobenzene	1.78E+03	3.00E-02	8.23E-06	4.88E+01	5.81E-02	1.42E-03	25	486.15	725.00	10,471	<b>0.0E+00</b>	<b>4.0E-03</b>	1.81E+02			0.0E+00	2.0E-01		
123739	Crotonaldehyde (2-butenal)	4.82E+00	9.56E-02	1.07E-05	3.69E+04	7.99E-04	1.95E-05	25	375.20	568.00	9	5.4E-04	0.0E+00	7.01E+01	X		5.4E-04	0.0E+00	X	
124481	Chlorodibromomethane	6.31E+01	1.96E-02	1.05E-05	2.60E+03	3.20E-02	7.81E-04	25	416.14	678.20	5,900	<b>2.7E-05</b>	7.0E-02	2.08E+02	?	X	2.4E-05	7.0E-02	X	X
126987	Methacrylonitrile	3.58E+01	1.12E-01	1.32E-05	2.54E+04	1.01E-02	2.46E-04	25	363.30	554.00	7,600	0.0E+00	7.0E-04	6.71E+01			0.0E+00	7.0E-04		
126998	2-Chloro-1,3-butadiene (chloropre)	6.73E+01	8.58E-02	1.03E-05	2.12E+03	4.91E-01	1.20E-02	25	332.40	525.00	8,075	0.0E+00	7.0E-03	8.85E+01			0.0E+00	7.0E-03		
127184	Tetrachloroethylene	1.55E+02	7.20E-02	8.20E-06	2.00E+02	7.53E-01	1.84E-02	25	394.40	620.20	8,288	<b>5.9E-06</b>	<b>3.5E-02</b>	1.66E+02			3.0E-06	0.0E+00		
129000	Pyrene	1.05E+05	2.72E-02	7.24E-06	1.35E+00	4.50E-04	1.10E-05	25	667.95	936	14370	0.0E+00	1.1E-01	2.02E+02		X	0.0E+00	1.1E-01		X
132649	Dibenzofuran	5.15E+03	2.38E-02	6.00E-06	3.10E+00	5.15E-04	1.26E-05	25	560	824	66400	0.0E+00	1.4E-02	1.68E+02		X	0.0E+00	1.4E-02		X
135988	sec-Butylbenzene	9.66E+02	5.70E-02	8.12E-06	3.94E+00	5.68E-01	1.39E-02	25	446.5	679	88730	0.0E+00	1.4E-01	1.34E+02		X	0.0E+00	1.4E-01		X
141786	Ethylacetate	6.44E+00	7.32E-02	9.70E-06	8.03E+04	5.64E-03	1.38E-04	25	350.26	523.3	7633.66	0.0E+00	3.2E+00	8.81E+01		X	0.0E+00	3.2E+00		X
156592	cis-1,2-Dichloroethylene	3.55E+01	7.36E-02	1.13E-05	3.50E+03	1.67E-01	4.07E-03	25	333.65	544	7192	0.0E+00	3.5E-02	9.69E+01		X	0.0E+00	3.5E-02		X
156605	trans-1,2-Dichloroethylene	5.25E+01	7.07E-02	1.19E-05	6.30E+03	3.84E-01	9.36E-03	25	320.85	516.5	6717	0.0E+00	<b>6.0E-02</b>	9.69E+01		X	0.0E+00	7.0E-02		X
205992	Benzo(b)fluoranthene	1.23E+06	2.26E-02	5.56E-06	1.50E-03	4.54E-03	1.11E-04	25	715.9	969.27	17000	<b>1.1E-04</b>	0.0E+00	2.52E+02	?		2.1E-04	0.0E+00	X	
218019	Chrysene	3.98E+05	2.48E-02	6.21E-06	6.30E-03	3.87E-03	9.44E-05	25	714.15	979	16455	<b>1.1E-05</b>	0.0E+00	2.28E+02	?		2.1E-06	0.0E+00	X	
309002	Aldrin	2.45E+06	1.32E-02	4.86E-06	1.70E-02	6.95E-03	1.70E-04	25	603.01	839.37	15000	<b>4.9E-03</b>	1.1E-04	3.65E+02		X	4.9E-03	1.1E-04		X
319846	alpha-HCH (alpha-BHC)	1.23E+03	1.42E-02	7.34E-06	2.00E+00	4.34E-04	1.06E-05	25	596.55	839.36	15000	<b>7.7E-04</b>	0.0E+00	2.91E+02			1.8E-03	0.0E+00		
541731	1,3-Dichlorobenzene	1.98E+03</																		

DATA ENTRY SHEET

Table A-3. Maximum Chloroform Soil Vapor Concentration

DTSC  
Vapor Intrusion Guidance  
Interim Final 12/04  
(last modified 2/4/09)

SG-SCREEN  
PA Version 2.0; 04

Reset to Defaults

Soil Gas Concentration Data				
ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., $C_g$ ( $\mu\text{g}/\text{m}^3$ )	OR	ENTER Soil gas conc., $C_g$ (ppmv)	Chemical
67663	1.00E+01			Chloroform

MORE  
↓

ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (15 or 200 cm)	ENTER Soil gas sampling depth below grade, $L_s$ (cm)	ENTER Average soil temperature, $T_s$ ( $^{\circ}\text{C}$ )	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, $k_v$ ( $\text{cm}^2$ )
15	152.4	24	S		

MORE  
↓

ENTER Vadose zone SCS soil type Lookup Soil Parameters	ENTER Vadose zone soil dry bulk density, $\rho_b^A$ ( $\text{g}/\text{cm}^3$ )	ENTER Vadose zone soil total porosity, $n^V$ (unitless)	ENTER Vadose zone soil water-filled porosity, $\theta_w^V$ ( $\text{cm}^3/\text{cm}^3$ )	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) $Q_{\text{soil}}$ (L/m)
S	1.83	0.324	0.279	5

MORE  
↓

ENTER Averaging time for carcinogens, $AT_C$ (yrs)	ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	25	25	250

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, $D_a$ ( $\text{cm}^2/\text{s}$ )	Diffusivity in water, $D_w$ ( $\text{cm}^2/\text{s}$ )	Henry's law constant at reference temperature, H ( $\text{atm}\cdot\text{m}^3/\text{mol}$ )	Henry's law constant reference temperature, $T_R$ ( $^\circ\text{C}$ )	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ ( $\text{cal}/\text{mol}$ )	Normal boiling point, $T_B$ ( $^\circ\text{K}$ )	Critical temperature, $T_C$ ( $^\circ\text{K}$ )	Unit risk factor, URF ( $\mu\text{g}/\text{m}^3$ ) <sup>-1</sup>	Reference conc., RfC ( $\text{mg}/\text{m}^3$ )	Molecular weight, MW ( $\text{g}/\text{mol}$ )
1.04E-01	1.00E-05	3.66E-03	25	6,988	334.32	536.40	5.3E-06	3.0E-01	119.38

END

INTERMEDIATE CALCULATIONS SHEET

**Table A-4. Maximum Chloroform Soil Vapor Concentration**

Source- building separation, $L_T$ (cm)	Vadose zone soil air-filled porosity, $\theta_a^v$ (cm <sup>3</sup> /cm <sup>3</sup> )	Vadose zone effective total fluid saturation, $S_{te}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Vadose zone soil intrinsic permeability, $k_i$ (cm <sup>2</sup> )	Vadose zone soil relative air permeability, $k_{rg}$ (cm <sup>2</sup> )	Vadose zone soil effective vapor permeability, $k_v$ (cm <sup>2</sup> )	Floor- wall seam perimeter, $X_{crack}$ (cm)	Soil gas conc., $C_{soil}$ (µg/m <sup>3</sup> )	Bldg. ventilation rate, $Q_{building}$ (cm <sup>3</sup> /s)
137.4	0.045	0.834	1.02E-07	0.055	5.62E-09	4,000	1.00E+01	3.39E+04

Area of enclosed space below grade, $A_B$ (cm <sup>2</sup> )	Crack- to-total area ratio, $\eta$ (unitless)	Crack depth below grade, $Z_{crack}$ (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, $H_{TS}$ (atm·m <sup>3</sup> /mol)	Henry's law constant at ave. soil temperature, $H'_{TS}$ (unitless)	Vapor viscosity at ave. soil temperature, $\mu_{TS}$ (g/cm-s)	Vadose zone effective diffusion coefficient, $D_v^{eff}$ (cm <sup>2</sup> /s)	Diffusion path length, $L_d$ (cm)
1.00E+06	5.00E-03	15	7,407	3.51E-03	1.44E-01	1.80E-04	4.19E-05	137.4

Convection path length, $L_p$ (cm)	Source vapor conc., $C_{source}$ (µg/m <sup>3</sup> )	Crack radius, $r_{crack}$ (cm)	Average vapor flow rate into bldg., $Q_{soil}$ (cm <sup>3</sup> /s)	Crack effective diffusion coefficient, $D^{crack}$ (cm <sup>2</sup> /s)	Area of crack, $A_{crack}$ (cm <sup>2</sup> )	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, $\alpha$ (unitless)	Infinite source bldg. conc., $C_{building}$ (µg/m <sup>3</sup> )
15	1.00E+01	1.25	8.33E+01	4.19E-05	5.00E+03	#NUM!	8.96E-06	8.96E-05

Unit risk factor, URF (µg/m <sup>3</sup> ) <sup>-1</sup>	Reference conc., RFC (mg/m <sup>3</sup> )
5.3E-06	3.0E-01

**END**



RESULTS SHEET

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
1.2E-10	2.0E-07

MESSAGE SUMMARY BELOW:

END

VLOOKUP TABLES

SCS Soil Type	Soil Properties Lookup Table						Bulk Density				
	K <sub>s</sub> (cm/h)	α <sub>1</sub> (1/cm)	N (unitless)	M (unitless)	n (cm <sup>3</sup> /cm <sup>3</sup> )	θ <sub>r</sub> (cm <sup>3</sup> /cm <sup>3</sup> )	Mean Grain Diameter (cm)	(g/cm <sup>3</sup> )	θ <sub>w</sub> (cm <sup>3</sup> /cm <sup>3</sup> )	SCS Soil Name	
C	0.61	0.01496	1.253	0.2019	0.459	0.098	0.0092	1.43	0.215	Clay	
CL	0.34	0.01581	1.416	0.2938	0.442	0.079	0.016	1.48	0.168	Clay Loam	
L	0.50	0.01112	1.472	0.3207	0.399	0.061	0.020	1.59	0.148	Loam	
LS	4.38	0.03475	1.746	0.4273	0.390	0.049	0.040	1.62	0.076	Loamy Sand	
S	26.78	0.03524	3.177	0.6852	0.375	0.053	0.044	1.66	0.054	Sand	
SC	0.47	0.03342	1.208	0.1722	0.385	0.117	0.025	1.63	0.197	Sandy Clay	
SCL	0.55	0.02109	1.330	0.2481	0.384	0.063	0.029	1.63	0.146	Sandy Clay Loam	
SI	1.82	0.00658	1.679	0.4044	0.489	0.050	0.0046	1.35	0.167	Silt	
SIC	0.40	0.01622	1.321	0.2430	0.481	0.111	0.0039	1.38	0.216	Silty Clay	
SICL	0.46	0.00839	1.521	0.3425	0.482	0.090	0.0056	1.37	0.198	Silty Clay Loam	
SIL	0.76	0.00506	1.663	0.3987	0.439	0.065	0.011	1.49	0.180	Silt Loam	
SL	1.60	0.02667	1.449	0.3099	0.387	0.039	0.030	1.62	0.103	Sandy Loam	

CAS No.	Chemical	Chemical Properties Lookup Table						CalEPA Toxicity Criteria in bold (last updated 2/4/09 DTSC/HERD)										Original EPA Values			
		Organic carbon partition coefficient, K <sub>oc</sub> (cm <sup>3</sup> /g)	Diffusivity in air, D <sub>a</sub> (cm <sup>2</sup> /s)	Diffusivity in water, D <sub>w</sub> (cm <sup>2</sup> /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H' (unitless)	Henry's law constant at reference temperature, H (atm·m <sup>3</sup> /mol)	Henry's law constant reference temperature, T <sub>R</sub> (°C)	Normal boiling point, T <sub>B</sub> (°K)	Critical temperature, T <sub>C</sub> (°K)	Enthalpy of vaporization at the normal boiling point, ΔH <sub>v,b</sub> (cal/mol)	Unit risk factor, URF (μg/m <sup>3</sup> ) <sup>-1</sup>	Reference conc., RfC (mg/m <sup>3</sup> )	Molecular weight, MW (g/mol)	URF extrapolated (X)	RfC extrapolated (X)	Unit risk factor, URF (μg/m <sup>3</sup> ) <sup>-1</sup>	Reference conc., RfC (mg/m <sup>3</sup> )	URF extrapolated (X)	RfC extrapolated (X)	
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.24E+00	3.03E-02	25	349.90	556.60	7,127	<b>4.2E-05</b>	<b>4.0E-02</b>	1.54E+02			1.5E-05	0.0E+00			
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	14,000	<b>3.4E-04</b>	7.0E-04	4.10E+02			1.0E-04	7.0E-04			
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	7.30E+00	5.73E-04	1.40E-05	25	596.55	839.36	15,000	<b>3.1E-04</b>	1.1E-03	2.91E+02	?	X	3.7E-04	1.1E-03	X	X	
60297	Ethyl ether	5.73E+00	7.82E-02	8.61E-06	5.68E+04	1.35E+00	3.29E-02	25	307.50	466.74	6,338	0.0E+00	7.0E-01	7.41E+01		X	0.0E+00	7.0E-01		X	
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.18E-04	1.51E-05	25	613.32	842.25	17,000	<b>4.6E-03</b>	1.8E-04	3.81E+02		X	4.6E-03	1.8E-04		X	
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.87E-05	25	329.20	508.10	6,955	0.0E+00	<b>3.1E+01</b>	5.81E+01		X	0.0E+00	3.5E-01		X	
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	<b>5.3E-06</b>	<b>3.0E-01</b>	1.19E+02			2.3E-05	0.0E+00			
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	<b>1.1E-05</b>	3.5E-03	2.37E+02		X	4.0E-06	3.5E-03		X	
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.79E+03	2.27E-01	5.54E-03	25	353.24	562.16	7,342	<b>2.9E-05</b>	<b>3.0E-02</b>	7.81E+01			7.8E-06	0.0E+00			
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	<b>5.0E+00</b>	1.33E+02			0.0E+00	2.2E+00			
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	1.00E-01	6.46E-04	1.58E-05	25	651.02	848.49	16,000	0.0E+00	1.8E-02	3.46E+02			0.0E+00	1.8E-02		X	
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.59E-04	2.09E-05	25	636.44	860.38	15,000	<b>9.7E-05</b>	0.0E+00	3.18E+02	?		9.7E-05	0.0E+00	X		
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.55E-01	6.22E-03	25	276.71	467.00	5,714	0.0E+00	<b>5.0E-03</b>	9.49E+01			0.0E+00	5.0E-03			
74873	Methyl chloride (chloromethane)	2.12E+00	1.26E-01	6.50E-06	5.33E+03	3.61E-01	8.80E-03	25	249.00	416.25	5,115	<b>1.8E-06</b>	9.0E-02	5.05E+01			1.0E-06	9.0E-02			
74908	Hydrogen cyanide	3.80E+00	1.93E-01	2.10E-05	1.00E+06	5.44E-03	1.33E-04	25	299.00	456.70	6,676	0.0E+00	<b>3.0E-03</b>	2.70E+01			0.0E+00	3.0E-03			
74953	Methylene bromide	1.26E+01	4.30E-02	8.44E-06	1.19E+04	3.52E-02	8.59E-04	25	370.00	583.00	7,868	0.0E+00	3.5E-02	1.74E+02		X	0.0E+00	3.5E-02		X	
75003	Chloroethane (ethyl chloride)	4.40E+00	2.71E-01	1.15E-05	5.68E+03	3.61E-01	8.80E-03	25	285.30	460.40	5,879	8.3E-07	<b>1.0E+01</b>	6.45E+01	?		8.3E-07	1.0E+01	X		
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-05	8.80E+03	1.10E+00	2.69E-02	25	259.25	432.00	5,250	<b>7.8E-05</b>	1.0E-01	6.25E+01			8.8E-06	1.0E-01			
75058	Acetonitrile	4.20E+00	1.28E-01	1.66E-05	1.00E+06	1.42E-03	3.45E-05	25	354.60	545.50	7,110	0.0E+00	6.0E-02	4.11E+01			0.0E+00	6.0E-02			
75070	Acetaldehyde	1.06E+00	1.24E-01	1.41E-05	1.00E+06	3.23E-03	7.87E-05	25	293.10	466.00	6,157	<b>2.7E-06</b>	<b>9.0E-03</b>	4.41E+01			2.2E-06	9.0E-03			
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.96E-02	2.18E-03	25	313.00	510.00	6,706	<b>1.0E-06</b>	<b>4.0E-01</b>	8.49E+01			4.7E-07	3.0E+00			
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	<b>7.0E-01</b>	7.61E+01			0.0E+00	7.0E-01			
75218	Ethylene oxide	1.33E+00	1.04E-01	1.45E-05	3.04E+05	2.27E-02	5.54E-04	25	283.60	469.00	6,104	<b>8.8E-05</b>	<b>3.0E-02</b>	4.41E+01			1.0E-04	0.0E+00			
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.41E-02	5.88E-04	25	422.35	696.00	9,479	1.1E-06	7.0E-02	2.53E+02		X	1.1E-06	7.0E-02		X	
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.54E-02	1.60E-03	25	363.15	585.85	7,800	<b>3.7E-05</b>	7.0E-02	1.64E+02	?	X	1.8E-05	7.0E-02	X	X	
75296	2-Chloropropane	9.14E+00	8.88E-02	1.01E-05	3.73E+03	5.93E-01	1.45E-02	25	308.70	485.00	6,286	0.0E+00	1.0E-01	7.85E+01		?	0.0E+00	1.0E-01			
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	<b>1.6E-06</b>	<b>7.0E-01</b>	9.90E+01		X	0.0E+00	5.0E-01			
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.60E-02	25	304.75	576.05	6,247	0.0E+00	<b>7.0E-02</b>	9.69E+01			0.0E+00	2.0E-01			
75456	Chlorodifluoromethane	4.79E+01	1.01E-01	1.28E-05	2.00E+00	1.10E+00	2.70E-02	25	232.40	369.30	4,836	0.0E+00	5.0E+01	8.65E+01			0.0E+00	5.0E+01			
75694	Trichlorofluoromethane	4.97E+02	8.70E-02	9.70E-06	1.10E+03	3.97E+00	9.68E-02	25	296.70	471.00	5,999	0.0E+00	7.0E-01	1.37E+02			0.0E+00	7.0E-01			
75718	Dichlorodifluoromethane	4.57E+02	6.65E-02	9.92E-06	2.80E+02	1.40E+01	3.42E-01	25	243.20	384.95	9,421	0.0E+00	2.0E-01	1.21E+02			0.0E+00	2.0E-01			
76131	1,1,2-Trichloro-1,2,2-trifluoroethane	1.11E+04	7.80E-02	8.20E-06	1.70E+02	1.97E+01	4.80E-01	25	320.70	487.30	6,463	0.0E+00	3.0E+01	1.87E+02			0.0E+00	3.0E+01			
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	6.05E+01	1.48E+00	25	603.69	846.31	13,000	<b>1.2E-03</b>	1.8E-03	3.73E+02		X	1.3E-03	1.8E-03		X	
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.10E+00	2.69E-02	25	512.15	746.00	10,931	0.0E+00	2.0E-04	2.73E+02			0.0E+00	2.0E-04			
78831	Isobutanol	2.59E+00	8.60E-02	9.30E-06	8.50E+04	4.83E-04	1.18E-05	25	381.04	547.78	10,936	0.0E+00	1.1E+00	7.41E+01		X	0.0E+00	1.1E+00		X	
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.79E-03	25	369.52	572.00	7,590	<b>1.0E-05</b>	4.0E-03	1.13E+02	?		1.9E-05	4.0E-03	X		
78933	Methylethylketone (2-butanone)	2.30E+00	8.08E-02	9.80E-06	2.23E+05	2.29E-03	5.58E-05	25	352.50	536.78	7,481	0.0E+00	5.0E+00	7.21E+01			0.0E+00	1.0E+00			
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.73E-02	9.11E-04	25	386.15	602.00	8,322	<b>1.6E-05</b>	1.4E-02	1.33E+02		X	1.6E-05	1.4E-02		X	
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.47E+03	4.21E-01	1.03E-02	25	360.36	544.20	7,505	<b>2.0E-06</b>	<b>6.0E-01</b>	1.31E+02	?		1.1E-04	4.0E-02	X		
79209	Methyl acetate	3.26E+00	1.04E-01	1.00E-05	2.00E+03	4.84E-03	1.18E-04	25	329.80	506.70	7,260	0.0E+00	3.5E+00	7.41E+01		X	0.0E+00	3.5E+00		X	
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.96E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	<b>5.8E-05</b>	<b>1.4E-02</b>	1.68E+02		X	5.8E-05	2.1E-01		X	
79469	2-Nitropropane	1.17E+01	9.23E-02	1.01E-05	1.70E+04	5.03E-03	1.23E-04	25	393.20	594.00	8,383	2.7E-03	2.0E-02	8.91E+01			2.7E-03	2.0E-02			
80626	Methylmethacrylate	6.98E+00	7.70E-02	8.60E-06	1.50E+04	1.38E-02	3.36E-04	25	373.50	567.00	8,975	0.0E+00	7.0E-01	1.00E+02			0.0E+00	7.0E-01			
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	3.57E+00	6.34E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01	1.54E+02		X	0.0E+00	2.1E-01		X	
86737	Fluorene	1.38E+04	3.63E-02	7.88E-06	1.98E+00	2.60E-03	6.34E-05	25	570.44	870.00	12,666	0.0E+00	1.4E-01	1.66E+02		X	0.0E+00	1.4E-01		X	
87683	Hexachloro-1,3-butadiene	5.37E+04	5.61E-02	6.16E-06	3.20E+00	3.33E-01	8.13E-03														

VLOOKUP TABLES

Chemical Properties Lookup Table																	CalEPA Toxicity Criteria in bold (last updated 2/4/09 DTSC/HERD)			
CAS No.	Chemical	Organic carbon partition coefficient, $K_{oc}$ ( $cm^3/g$ )	Diffusivity in air, $D_a$ ( $cm^2/s$ )	Diffusivity in water, $D_w$ ( $cm^2/s$ )	Pure component water solubility, S (mg/L)	Henry's law constant $H'$ (unitless)	Henry's law constant at reference temperature, H ( $atm\cdot m^3/mol$ )	Henry's law constant reference temperature, $T_R$ ( $^{\circ}C$ )	Normal boiling point, $T_B$ ( $^{\circ}K$ )	Critical temperature, $T_C$ ( $^{\circ}K$ )	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ( $\mu g/m^3$ ) <sup>-1</sup>	Reference conc., RfC ( $mg/m^3$ )	Molecular weight, MW (g/mol)	URF extrapolated (X)	RfC extrapolated (X)	Unit risk factor, URF ( $\mu g/m^3$ ) <sup>-1</sup>	Reference conc., RfC ( $mg/m^3$ )	URF extrapolated (X)	RfC extrapolated (X)
95501	1,2-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	1.56E+02	7.77E-02	1.90E-03	25	453.57	705.00	9,700	0.0E+00	2.0E-01	1.47E+02			0.0E+00	2.0E-01		
95578	2-Chlorophenol	3.88E+02	5.01E-02	9.46E-06	2.20E+04	1.60E-02	3.90E-04	25	447.53	675.00	9,572	0.0E+00	1.8E-02	1.29E+02		X	0.0E+00	1.8E-02		X
95636	1,2,4-Trimethylbenzene	1.35E+03	6.06E-02	7.92E-06	5.70E+01	2.52E-01	6.14E-03	25	442.30	649.17	9,369	0.0E+00	<b>7.0E-03</b>	1.20E+02			0.0E+00	6.0E-03		
96184	1,2,3-Trichloropropane	2.20E+01	7.10E-02	7.90E-06	1.75E+03	1.67E-02	4.08E-04	25	430.00	652.00	9,171	<b>2.0E-03</b>	<b>2.1E-02</b>	1.47E+02	X	X	5.7E-04	4.9E-03	X	
96333	Methyl acrylate	4.53E+00	9.76E-02	1.02E-05	6.00E+04	7.68E-03	1.87E-04	25	353.70	536.00	7,749	0.0E+00	1.1E-01	8.61E+01		X	0.0E+00	1.1E-01		X
97632	Ethylmethacrylate	2.95E+01	6.53E-02	8.37E-06	3.67E+03	3.44E-02	8.40E-04	25	390.00	571.00	10,957	0.0E+00	3.2E-01	1.14E+02		X	0.0E+00	3.2E-01		X
98066	tert-Butylbenzene	7.71E+02	5.65E-02	8.02E-06	2.95E+01	4.87E-01	1.19E-02	25	442.10	1220.00	8,980	0.0E+00	1.4E-01	1.34E+02		X	0.0E+00	1.4E-01		X
98828	Cumene	4.89E+02	6.50E-02	7.10E-06	6.13E+01	4.74E+01	1.16E+00	25	425.56	631.10	10,335	0.0E+00	4.0E-01	1.20E+02			0.0E+00	4.0E-01		
98862	Acetophenone	5.77E+01	6.00E-02	8.73E-06	6.13E+03	4.38E-04	1.07E-05	25	475.00	709.50	11,732	0.0E+00	3.5E-01	1.20E+02		X	0.0E+00	3.5E-01		X
98953	Nitrobenzene	6.46E+01	7.60E-02	8.60E-06	2.09E+03	9.82E-04	2.39E-05	25	483.95	719.00	10,566	0.0E+00	2.0E-03	1.23E+02			0.0E+00	2.0E-03		
100414	Ethylbenzene	3.63E+02	7.50E-02	7.80E-06	1.69E+02	3.22E-01	7.86E-03	25	409.34	617.20	8,501	<b>2.5E-06</b>	<b>1.0E+00</b>	1.06E+02			0.0E+00	1.0E+00		
100425	Styrene	7.76E+02	7.10E-02	8.00E-06	3.10E+02	1.12E-01	2.74E-03	25	418.31	636.00	8,737	0.0E+00	<b>9.0E-01</b>	1.04E+02			0.0E+00	1.0E+00		
100447	Benzylchloride	6.14E+01	7.50E-02	7.80E-06	5.25E+02	1.70E-02	4.14E-04	25	452.00	685.00	8,773	<b>4.9E-05</b>	<b>1.0E-03</b>	1.27E+02	?		4.9E-05	0.0E+00	X	
100527	Benzaldehyde	4.59E+01	7.21E-02	9.07E-06	3.30E+03	9.73E-04	2.37E-05	25	452.00	695.00	11,658	0.0E+00	3.5E-01	1.06E+02		X	0.0E+00	3.5E-01		X
103651	n-Propylbenzene	5.62E+02	6.01E-02	7.83E-06	6.00E+01	4.37E-01	1.07E-02	25	432.20	630.00	9,123	0.0E+00	1.4E-01	1.20E+02		X	0.0E+00	1.4E-01		X
104518	n-Butylbenzene	1.11E+03	5.70E-02	8.12E-06	2.00E+00	5.38E-01	1.31E-02	25	456.46	660.50	9,290	0.0E+00	1.4E-01	1.34E+02		X	0.0E+00	1.4E-01		X
106423	p-Xylene	3.89E+02	7.69E-02	8.44E-06	1.85E+02	3.13E-01	7.64E-03	25	411.52	616.20	8,525	0.0E+00	<b>1.0E-01</b>	1.06E+02		?	0.0E+00	1.0E-01		
106467	1,4-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	7.90E+01	9.82E-02	2.39E-03	25	447.21	684.75	9,271	<b>1.1E-05</b>	<b>8.0E-01</b>	1.47E+02			0.0E+00	8.0E-01		
106934	1,2-Dibromoethane (ethylene dibr	2.50E+01	2.17E-02	1.19E-05	4.18E+03	3.04E-02	7.41E-04	25	404.60	583.00	8,310	<b>7.1E-05</b>	<b>8.0E-04</b>	1.88E+02			6.0E-04	9.0E-03		
106990	1,3-Butadiene	1.91E+01	2.49E-01	1.08E-05	7.35E+02	3.01E+00	7.34E-02	25	268.60	425.00	5,370	<b>1.7E-04</b>	<b>2.0E-03</b>	5.41E+01			3.0E-05	0.0E+00		
107028	Acrolein	2.76E+00	1.05E-01	1.22E-05	2.13E+05	4.99E-03	1.22E-04	25	325.60	506.00	6,731	0.0E+00	<b>2.0E-05</b>	5.61E+01			0.0E+00	2.0E-05		
107062	1,2-Dichloroethane	1.74E+01	1.04E-01	9.90E-06	8.52E+03	4.00E-02	9.77E-04	25	356.65	561.00	7,643	<b>2.1E-05</b>	<b>4.0E-01</b>	9.90E+01			2.6E-05	0.0E+00		
107131	Acrylonitrile	5.90E+00	1.22E-01	1.34E-05	7.40E+04	4.21E-03	1.03E-04	25	350.30	519.00	7,786	<b>2.9E-04</b>	<b>2.0E-03</b>	5.31E+01			6.8E-05	2.0E-03		
108054	Vinyl acetate	5.25E+00	8.50E-02	9.20E-06	2.00E+04	2.09E-02	5.10E-04	25	345.65	519.13	7,800	0.0E+00	<b>2.0E-01</b>	8.61E+01			0.0E+00	2.0E-01		
108101	Methylisobutylketone (4-methyl-2-)	9.06E+00	7.50E-02	7.80E-06	1.90E+04	5.64E-03	1.38E-04	25	389.50	571.00	8,243	0.0E+00	<b>3.0E+00</b>	1.00E+02			0.0E+00	8.0E-02		
108383	m-Xylene	4.07E+02	7.00E-02	7.80E-06	1.61E+02	3.00E-01	7.32E-03	25	412.27	617.05	8,523	0.0E+00	<b>1.0E-01</b>	1.06E+02		?	0.0E+00	1.0E-01		
108678	1,3,5-Trimethylbenzene	1.35E+03	6.02E-02	8.67E-06	2.00E+00	2.41E-01	5.87E-03	25	437.89	637.25	9,321	0.0E+00	6.0E-03	1.20E+02			0.0E+00	6.0E-03		
108872	Methylcyclohexane	7.85E+01	7.35E-02	8.52E-06	1.40E+01	4.22E+00	1.03E-01	25	373.90	572.20	7,474	0.0E+00	3.0E+00	9.82E+01		?	0.0E+00	3.0E+00		
108883	Toluene	1.82E+02	8.70E-02	8.60E-06	5.26E+02	2.72E-01	6.62E-03	25	383.78	591.79	7,930	0.0E+00	<b>3.0E-01</b>	9.21E+01			0.0E+00	4.0E-01		
108907	Chlorobenzene	2.19E+02	7.30E-02	8.70E-06	4.72E+02	1.51E-01	3.69E-03	25	404.87	632.40	8,410	0.0E+00	<b>1.0E+00</b>	1.13E+02			0.0E+00	6.0E-02		
109693	1-Chlorobutane	1.72E+01	8.26E-02	1.00E-05	1.10E+03	6.93E-01	1.69E-02	25	351.60	542.00	7,263	0.0E+00	<b>1.4E-01</b>	9.26E+01		X	0.0E+00	1.4E+00		X
110009	Furan	1.86E+01	1.04E-01	1.22E-05	1.00E+04	2.21E-01	5.39E-03	25	304.60	490.20	6,477	0.0E+00	3.5E-03	6.81E+01		X	0.0E+00	3.5E-03		X
110543	Hexane	4.34E+01	2.00E-01	7.77E-06	1.24E+01	6.82E+01	1.66E+00	25	341.70	508.00	6,895	0.0E+00	<b>7.0E-01</b>	8.62E+01			0.0E+00	2.0E-01		
111444	Bis(2-chloroethyl)ether	1.55E+01	6.92E-02	7.53E-06	1.72E+04	7.36E-04	1.80E-05	25	451.15	659.79	10,803	<b>7.1E-04</b>	0.0E+00	1.43E+02			3.3E-04	0.0E+00		
115297	Endosulfan	2.14E+03	1.15E-02	4.55E-06	5.10E-01	4.58E-04	1.12E-05	25	674.43	942.94	14,000	0.0E+00	2.1E-02	4.07E+02		X	0.0E+00	2.1E-02		X
118741	Hexachlorobenzene	5.50E+04	5.42E-02	5.91E-06	5.00E-03	5.40E-02	1.32E-03	25	582.55	825.00	14,447	<b>5.1E-04</b>	2.8E-03	2.85E+02		X	4.6E-04	2.8E-03		X
120821	1,2,4-Trichlorobenzene	1.78E+03	3.00E-02	8.23E-06	4.88E+01	5.81E-02	1.42E-03	25	486.15	725.00	10,471	<b>0.0E+00</b>	<b>4.0E-03</b>	1.81E+02			0.0E+00	2.0E-01		
123739	Crotonaldehyde (2-butenal)	4.82E+00	9.56E-02	1.07E-05	3.69E+04	7.99E-04	1.95E-05	25	375.20	568.00	9	5.4E-04	0.0E+00	7.01E+01	X		5.4E-04	0.0E+00	X	
124481	Chlorodibromomethane	6.31E+01	1.96E-02	1.05E-05	2.60E+03	3.20E-02	7.81E-04	25	416.14	678.20	5,900	<b>2.7E-05</b>	7.0E-02	2.08E+02	?	X	2.4E-05	7.0E-02	X	X
126987	Methacrylonitrile	3.58E+01	1.12E-01	1.32E-05	2.54E+04	1.01E-02	2.46E-04	25	363.30	554.00	7,600	0.0E+00	7.0E-04	6.71E+01			0.0E+00	7.0E-04		
126998	2-Chloro-1,3-butadiene (chloropre)	6.73E+01	8.58E-02	1.03E-05	2.12E+03	4.91E-01	1.20E-02	25	332.40	525.00	8,075	0.0E+00	7.0E-03	8.85E+01			0.0E+00	7.0E-03		
127184	Tetrachloroethylene	1.55E+02	7.20E-02	8.20E-06	2.00E+02	7.53E-01	1.84E-02	25	394.40	620.20	8,288	<b>5.9E-06</b>	<b>3.5E-02</b>	1.66E+02			3.0E-06	0.0E+00		
129000	Pyrene	1.05E+05	2.72E-02	7.24E-06	1.35E+00	4.50E-04	1.10E-05	25	667.95	936	14370	0.0E+00	1.1E-01	2.02E+02		X	0.0E+00	1.1E-01		X
132649	Dibenzofuran	5.15E+03	2.38E-02	6.00E-06	3.10E+00	5.15E-04	1.26E-05	25	560	824	66400	0.0E+00	1.4E-02	1.68E+02		X	0.0E+00	1.4E-02		X
135988	sec-Butylbenzene	9.66E+02	5.70E-02	8.12E-06	3.94E+00	5.68E-01	1.39E-02	25	446.5	679	88730	0.0E+00	1.4E-01	1.34E+02		X	0.0E+00	1.4E-01		X
141786	Ethylacetate	6.44E+00	7.32E-02	9.70E-06	8.03E+04	5.64E-03	1.38E-04	25	350.26	523.3	7633.66	0.0E+00	3.2E+00	8.81E+01		X	0.0E+00	3.2E+00		X
156592	cis-1,2-Dichloroethylene	3.55E+01	7.36E-02	1.13E-05	3.50E+03	1.67E-01	4.07E-03	25	333.65	544	7192	0.0E+00	3.5E-02	9.69E+01		X	0.0E+00	3.5E-02		X
156605	trans-1,2-Dichloroethylene	5.25E+01	7.07E-02	1.19E-05	6.30E+03	3.84E-01	9.36E-03	25	320.85	516.5	6717	0.0E+00	<b>6.0E-02</b>	9.69E+01		X	0.0E+00	7.0E-02		X
205992	Benzo(b)fluoranthene	1.23E+06	2.26E-02	5.56E-06	1.50E-03	4.54E-03	1.11E-04	25	715.9	969.27	17000	<b>1.1E-04</b>	0.0E+00	2.52E+02	?		2.1E-04	0.0E+00	X	
218019	Chrysene	3.98E+05	2.48E-02	6.21E-06	6.30E-03	3.87E-03	9.44E-05	25	714.15	979	16455	<b>1.1E-05</b>	0.0E+00	2.28E+02	?		2.1E-06	0.0E+00	X	
309002	Aldrin	2.45E+06	1.32E-02	4.86E-06	1.70E-02	6.95E-03	1.70E-04	25	603.01	839.37	15000	<b>4.9E-03</b>	1.1E-04	3.65E+02		X	4.9E-03	1.1E-04		X
319846	alpha-HCH (alpha-BHC)	1.23E+03	1.42E-02	7.34E-06	2.00E+00	4.34E-04	1.06E-05	25	596.55	839.36	15000	<b>7.7E-04</b>	0.0E+00	2.91E+02			1.8E-03	0.0E+00		
541731																				

DATA ENTRY SHEET

Table A-5. Maximum Ethylbenzene Soil Vapor Concentration

DTSC  
Vapor Intrusion Guidance  
Interim Final 12/04  
(last modified 2/4/09)

SG-SCREEN  
PA Version 2.0; 04/

Reset to  
Defaults

Soil Gas Concentration Data				
ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., $C_g$ ( $\mu\text{g}/\text{m}^3$ )	OR	ENTER Soil gas conc., $C_g$ (ppmv)	Chemical
100414	4.80E+03			Ethylbenzene

MORE  
↓

ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (15 or 200 cm)	ENTER Soil gas sampling depth below grade, $L_s$ (cm)	ENTER Average soil temperature, $T_s$ ( $^{\circ}\text{C}$ )	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, $k_v$ ( $\text{cm}^2$ )
15	152.4	24	S		

MORE  
↓

ENTER Vadose zone SCS soil type Lookup Soil Parameters	ENTER Vadose zone soil dry bulk density, $\rho_b^A$ ( $\text{g}/\text{cm}^3$ )	ENTER Vadose zone soil total porosity, $n^V$ (unitless)	ENTER Vadose zone soil water-filled porosity, $\theta_w^V$ ( $\text{cm}^3/\text{cm}^3$ )	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) $Q_{\text{soil}}$ (L/m)
S	1.83	0.324	0.279	5

MORE  
↓

ENTER Averaging time for carcinogens, $AT_C$ (yrs)	ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	25	25	250

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, $D_a$ ( $\text{cm}^2/\text{s}$ )	Diffusivity in water, $D_w$ ( $\text{cm}^2/\text{s}$ )	Henry's law constant at reference temperature, H ( $\text{atm}\cdot\text{m}^3/\text{mol}$ )	Henry's law constant reference temperature, $T_R$ ( $^\circ\text{C}$ )	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ ( $\text{cal}/\text{mol}$ )	Normal boiling point, $T_B$ ( $^\circ\text{K}$ )	Critical temperature, $T_C$ ( $^\circ\text{K}$ )	Unit risk factor, URF ( $\mu\text{g}/\text{m}^3$ ) <sup>-1</sup>	Reference conc., RfC ( $\text{mg}/\text{m}^3$ )	Molecular weight, MW ( $\text{g}/\text{mol}$ )
7.50E-02	7.80E-06	7.86E-03	25	8,501	409.34	617.20	2.5E-06	1.0E+00	106.17

END

INTERMEDIATE CALCULATIONS SHEET

Table A-6. Maximum Ethylbenzene Soil Vapor Concentration

Source-building separation, $L_T$ (cm)	Vadose zone soil air-filled porosity, $\theta_a^v$ ( $\text{cm}^3/\text{cm}^3$ )	Vadose zone effective total fluid saturation, $S_{te}$ ( $\text{cm}^3/\text{cm}^3$ )	Vadose zone soil intrinsic permeability, $k_i$ ( $\text{cm}^2$ )	Vadose zone soil relative air permeability, $k_{rg}$ ( $\text{cm}^2$ )	Vadose zone soil effective vapor permeability, $k_v$ ( $\text{cm}^2$ )	Floor-wall seam perimeter, $X_{crack}$ (cm)	Soil gas conc., $(\mu\text{g}/\text{m}^3)$	Bldg. ventilation rate, $Q_{building}$ ( $\text{cm}^3/\text{s}$ )
137.4	0.045	0.834	1.02E-07	0.055	5.62E-09	4,000	4.80E+03	3.39E+04

Area of enclosed space below grade, $A_B$ ( $\text{cm}^2$ )	Crack-to-total area ratio, $\eta$ (unitless)	Crack depth below grade, $Z_{crack}$ (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, $H_{TS}$ (atm- $\text{m}^3/\text{mol}$ )	Henry's law constant at ave. soil temperature, $H'_{TS}$ (unitless)	Vapor viscosity at ave. soil temperature, $\mu_{TS}$ (g/cm-s)	Vadose zone effective diffusion coefficient, $D_v^{eff}$ ( $\text{cm}^2/\text{s}$ )	Diffusion path length, $L_d$ (cm)
1.00E+06	5.00E-03	15	9,994	7.43E-03	3.05E-01	1.80E-04	2.69E-05	137.4

Convection path length, $L_p$ (cm)	Source vapor conc., $C_{source}$ ( $\mu\text{g}/\text{m}^3$ )	Crack radius, $r_{crack}$ (cm)	Average vapor flow rate into bldg., $Q_{soil}$ ( $\text{cm}^3/\text{s}$ )	Crack effective diffusion coefficient, $D^{crack}$ ( $\text{cm}^2/\text{s}$ )	Area of crack, $A_{crack}$ ( $\text{cm}^2$ )	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, $\alpha$ (unitless)	Infinite source bldg. conc., $C_{building}$ ( $\mu\text{g}/\text{m}^3$ )
15	4.80E+03	1.25	8.33E+01	2.69E-05	5.00E+03	#NUM!	5.76E-06	2.76E-02

Unit risk factor, URF ( $\mu\text{g}/\text{m}^3$ ) <sup>-1</sup>	Reference conc., RFC ( $\text{mg}/\text{m}^3$ )
2.5E-06	1.0E+00

END

RESULTS SHEET

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
1.7E-08	1.9E-05

MESSAGE SUMMARY BELOW:

END

VLOOKUP TABLES

SCS Soil Type	Soil Properties Lookup Table							Bulk Density				SCS Soil Name
	K <sub>s</sub> (cm/h)	α <sub>1</sub> (1/cm)	N (unitless)	M (unitless)	n (cm <sup>3</sup> /cm <sup>3</sup> )	θ <sub>r</sub> (cm <sup>3</sup> /cm <sup>3</sup> )	Mean Grain Diameter (cm)	(g/cm <sup>3</sup> )	θ <sub>w</sub> (cm <sup>3</sup> /cm <sup>3</sup> )			
C	0.61	0.01496	1.253	0.2019	0.459	0.098	0.0092	1.43	0.215	Clay		
CL	0.34	0.01581	1.416	0.2938	0.442	0.079	0.016	1.48	0.168	Clay Loam		
L	0.50	0.01112	1.472	0.3207	0.399	0.061	0.020	1.59	0.148	Loam		
LS	4.38	0.03475	1.746	0.4273	0.390	0.049	0.040	1.62	0.076	Loamy Sand		
S	26.78	0.03524	3.177	0.6852	0.375	0.053	0.044	1.66	0.054	Sand		
SC	0.47	0.03342	1.208	0.1722	0.385	0.117	0.025	1.63	0.197	Sandy Clay		
SCL	0.55	0.02109	1.330	0.2481	0.384	0.063	0.029	1.63	0.146	Sandy Clay Loam		
SI	1.82	0.00658	1.679	0.4044	0.489	0.050	0.0046	1.35	0.167	Silt		
SIC	0.40	0.01622	1.321	0.2430	0.481	0.111	0.0039	1.38	0.216	Silty Clay		
SICL	0.46	0.00839	1.521	0.3425	0.482	0.090	0.0056	1.37	0.198	Silty Clay Loam		
SIL	0.76	0.00506	1.663	0.3987	0.439	0.065	0.011	1.49	0.180	Silt Loam		
SL	1.60	0.02667	1.449	0.3099	0.387	0.039	0.030	1.62	0.103	Sandy Loam		

Original EPA Values

CAS No.	Chemical	Chemical Properties Lookup Table						CalEPA Toxicity Criteria in bold (last updated 2/4/09 DTSC/HERD)										Original EPA Values			
		Organic carbon partition coefficient, K <sub>oc</sub> (cm <sup>3</sup> /g)	Diffusivity in air, D <sub>a</sub> (cm <sup>2</sup> /s)	Diffusivity in water, D <sub>w</sub> (cm <sup>2</sup> /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H' (unitless)	Henry's law constant at reference temperature, H (atm·m <sup>3</sup> /mol)	Henry's law constant reference temperature, T <sub>R</sub> (°C)	Normal boiling point, T <sub>B</sub> (°K)	Critical temperature, T <sub>C</sub> (°K)	Enthalpy of vaporization at the normal boiling point, ΔH <sub>v,b</sub> (cal/mol)	Unit risk factor, URF (μg/m <sup>3</sup> ) <sup>-1</sup>	Reference conc., RfC (mg/m <sup>3</sup> )	Molecular weight, MW (g/mol)	URF extrapolated (X)	RfC extrapolated (X)	Unit risk factor, URF (μg/m <sup>3</sup> ) <sup>-1</sup>	Reference conc., RfC (mg/m <sup>3</sup> )	URF extrapolated (X)	RfC extrapolated (X)	
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.24E+00	3.03E-02	25	349.90	556.60	7,127	<b>4.2E-05</b>	<b>4.0E-02</b>	1.54E+02			1.5E-05	0.0E+00			
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	14,000	<b>3.4E-04</b>	7.0E-04	4.10E+02			1.0E-04	7.0E-04			
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	7.30E+00	5.73E-04	1.40E-05	25	596.55	839.36	15,000	<b>3.1E-04</b>	1.1E-03	2.91E+02	?	X	3.7E-04	1.1E-03	X	X	
60297	Ethyl ether	5.73E+00	7.82E-02	8.61E-06	5.68E+04	1.35E+00	3.29E-02	25	307.50	466.74	6,338	0.0E+00	7.0E-01	7.41E+01		X	0.0E+00	7.0E-01		X	
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.18E-04	1.51E-05	25	613.32	842.25	17,000	<b>4.6E-03</b>	1.8E-04	3.81E+02		X	4.6E-03	1.8E-04		X	
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.87E-05	25	329.20	508.10	6,955	0.0E+00	<b>3.1E+01</b>	5.81E+01		X	0.0E+00	3.5E-01		X	
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	<b>5.3E-06</b>	<b>3.0E-01</b>	1.19E+02			2.3E-05	0.0E+00			
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	<b>1.1E-05</b>	3.5E-03	2.37E+02		X	4.0E-06	3.5E-03		X	
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.79E+03	2.27E-01	5.54E-03	25	353.24	562.16	7,342	<b>2.9E-05</b>	<b>3.0E-02</b>	7.81E+01			7.8E-06	0.0E+00			
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	<b>5.0E+00</b>	1.33E+02			0.0E+00	2.2E+00			
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	1.00E-01	6.46E-04	1.58E-05	25	651.02	848.49	16,000	0.0E+00	1.8E-02	3.46E+02		X	0.0E+00	1.8E-02		X	
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.59E-04	2.09E-05	25	636.44	860.38	15,000	<b>9.7E-05</b>	0.0E+00	3.18E+02	?		9.7E-05	0.0E+00	X		
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.55E-01	6.22E-03	25	276.71	467.00	5,714	0.0E+00	<b>5.0E-03</b>	9.49E+01			0.0E+00	5.0E-03			
74873	Methyl chloride (chloromethane)	2.12E+00	1.26E-01	6.50E-06	5.33E+03	3.61E-01	8.80E-03	25	249.00	416.25	5,115	<b>1.8E-06</b>	9.0E-02	5.05E+01			1.0E-06	9.0E-02			
74908	Hydrogen cyanide	3.80E+00	1.93E-01	2.10E-05	1.00E+06	5.44E-03	1.33E-04	25	299.00	456.70	6,676	0.0E+00	<b>3.0E-03</b>	2.70E+01			0.0E+00	3.0E-03			
74953	Methylene bromide	1.26E+01	4.30E-02	8.44E-06	1.19E+04	3.52E-02	8.59E-04	25	370.00	583.00	7,868	0.0E+00	3.5E-02	1.74E+02		X	0.0E+00	3.5E-02		X	
75003	Chloroethane (ethyl chloride)	4.40E+00	2.71E-01	1.15E-05	5.68E+03	3.61E-01	8.80E-03	25	285.30	460.40	5,879	8.3E-07	<b>1.0E+01</b>	6.45E+01	?		8.3E-07	1.0E+01	X		
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-05	8.80E+03	1.10E+00	2.69E-02	25	259.25	432.00	5,250	<b>7.8E-05</b>	1.0E-01	6.25E+01			8.8E-06	1.0E-01			
75058	Acetonitrile	4.20E+00	1.28E-01	1.66E-05	1.00E+06	1.42E-03	3.45E-05	25	354.60	545.50	7,110	0.0E+00	6.0E-02	4.11E+01			0.0E+00	6.0E-02			
75070	Acetaldehyde	1.06E+00	1.24E-01	1.41E-05	1.00E+06	3.23E-03	7.87E-05	25	293.10	466.00	6,157	<b>2.7E-06</b>	<b>9.0E-03</b>	4.41E+01			2.2E-06	9.0E-03			
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.96E-02	2.18E-03	25	313.00	510.00	6,706	<b>1.0E-06</b>	<b>4.0E-01</b>	8.49E+01			4.7E-07	3.0E+00			
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	<b>7.0E-01</b>	7.61E+01			0.0E+00	7.0E-01			
75218	Ethylene oxide	1.33E+00	1.04E-01	1.45E-05	3.04E+05	2.27E-02	5.54E-04	25	283.60	469.00	6,104	<b>8.8E-05</b>	<b>3.0E-02</b>	4.41E+01			1.0E-04	0.0E+00			
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.41E-02	5.88E-04	25	422.35	696.00	9,479	1.1E-06	7.0E-02	2.53E+02		X	1.1E-06	7.0E-02		X	
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.54E-02	1.60E-03	25	363.15	585.85	7,800	<b>3.7E-05</b>	7.0E-02	1.64E+02	?	X	1.8E-05	7.0E-02	X	X	
75296	2-Chloropropane	9.14E+00	8.88E-02	1.01E-05	3.73E+03	5.93E-01	1.45E-02	25	308.70	485.00	6,286	0.0E+00	1.0E-01	7.85E+01		?	0.0E+00	1.0E-01			
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	<b>1.6E-06</b>	<b>7.0E-01</b>	9.90E+01		X	0.0E+00	5.0E-01			
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.60E-02	25	304.75	576.05	6,247	0.0E+00	<b>7.0E-02</b>	9.69E+01			0.0E+00	2.0E-01			
75456	Chlorodifluoromethane	4.79E+01	1.01E-01	1.28E-05	2.00E+00	1.10E+00	2.70E-02	25	232.40	369.30	4,836	0.0E+00	5.0E+01	8.65E+01			0.0E+00	5.0E+01			
75694	Trichlorofluoromethane	4.97E+02	8.70E-02	9.70E-06	1.10E+03	3.97E+00	9.68E-02	25	296.70	471.00	5,999	0.0E+00	7.0E-01	1.37E+02			0.0E+00	7.0E-01			
75718	Dichlorodifluoromethane	4.57E+02	6.65E-02	9.92E-06	2.80E+02	1.40E+01	3.42E-01	25	243.20	384.95	9,421	0.0E+00	2.0E-01	1.21E+02			0.0E+00	2.0E-01			
76131	1,1,2-Trichloro-1,2,2-trifluoroethane	1.11E+04	7.80E-02	8.20E-06	1.70E+02	1.97E+01	4.80E-01	25	320.70	487.30	6,463	0.0E+00	3.0E+01	1.87E+02			0.0E+00	3.0E+01			
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	6.05E+01	1.48E+00	25	603.69	846.31	13,000	<b>1.2E-03</b>	1.8E-03	3.73E+02		X	1.3E-03	1.8E-03		X	
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.10E+00	2.69E-02	25	512.15	746.00	10,931	0.0E+00	2.0E-04	2.73E+02			0.0E+00	2.0E-04			
78831	Isobutanol	2.59E+00	8.60E-02	9.30E-06	8.50E+04	4.83E-04	1.18E-05	25	381.04	547.78	10,936	0.0E+00	1.1E+00	7.41E+01		X	0.0E+00	1.1E+00		X	
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.79E-03	25	369.52	572.00	7,590	<b>1.0E-05</b>	4.0E-03	1.13E+02	?		1.9E-05	4.0E-03	X		
78933	Methylethylketone (2-butanone)	2.30E+00	8.08E-02	9.80E-06	2.23E+05	2.29E-03	5.58E-05	25	352.50	536.78	7,481	0.0E+00	5.0E+00	7.21E+01			0.0E+00	1.0E+00			
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.73E-02	9.11E-04	25	386.15	602.00	8,322	<b>1.6E-05</b>	1.4E-02	1.33E+02		X	1.6E-05	1.4E-02		X	
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.47E+03	4.21E-01	1.03E-02	25	360.36	544.20	7,505	<b>2.0E-06</b>	<b>6.0E-01</b>	1.31E+02	?		1.1E-04	4.0E-02	X		
79209	Methyl acetate	3.26E+00	1.04E-01	1.00E-05	2.00E+03	4.84E-03	1.18E-04	25	329.80	506.70	7,260	0.0E+00	3.5E+00	7.41E+01		X	0.0E+00	3.5E+00		X	
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.96E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	<b>5.8E-05</b>	<b>1.4E-02</b>	1.68E+02		X	5.8E-05	2.1E-01		X	
79469	2-Nitropropane	1.17E+01	9.23E-02	1.01E-05	1.70E+04	5.03E-03	1.23E-04	25	393.20	594.00	8,383	2.7E-03	2.0E-02	8.91E+01			2.7E-03	2.0E-02			
80626	Methylmethacrylate	6.98E+00	7.70E-02	8.60E-06	1.50E+04	1.38E-02	3.36E-04	25	373.50	567.00	8,975	0.0E+00	7.0E-01	1.00E+02			0.0E+00	7.0E-01			
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	3.57E+00	6.34E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01	1.54E+02		X	0.0E+00	2.1E-01		X	
86737	Fluorene	1.38E+04	3.63E-02	7.88E-06	1.98E+00	2.60E-03	6.34E-05	25	570.44	870.00	12,666	0.0E+00	1.4E-01	1.66E+02		X	0.0E+00	1.4E-01		X	
87683	Hexachloro-1,3-butadiene	5.37E+04	5.61E-02	6.16E																	



VLOOKUP TABLES

Chemical Properties Lookup Table																	CalEPA Toxicity Criteria in bold (last updated 2/4/09 DTSC/HERD)			
CAS No.	Chemical	Organic carbon partition coefficient, $K_{oc}$ (cm <sup>3</sup> /g)	Diffusivity in air, $D_a$ (cm <sup>2</sup> /s)	Diffusivity in water, $D_w$ (cm <sup>2</sup> /s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m <sup>3</sup> /mol)	Henry's law constant reference temperature, $T_R$ (°C)	Normal boiling point, $T_B$ (°K)	Critical temperature, $T_C$ (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF (µg/m <sup>3</sup> ) <sup>-1</sup>	Reference conc., RfC (mg/m <sup>3</sup> )	Molecular weight, MW (g/mol)	URF extrapolated (X)	RfC extrapolated (X)	Unit risk factor, URF (µg/m <sup>3</sup> ) <sup>-1</sup>	Reference conc., RfC (mg/m <sup>3</sup> )	URF extrapolated (X)	RfC extrapolated (X)
95501	1,2-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	1.56E+02	7.77E-02	1.90E-03	25	453.57	705.00	9,700	0.0E+00	2.0E-01	1.47E+02			0.0E+00	2.0E-01		
95578	2-Chlorophenol	3.88E+02	5.01E-02	9.46E-06	2.20E+04	1.60E-02	3.90E-04	25	447.53	675.00	9,572	0.0E+00	1.8E-02	1.29E+02		X	0.0E+00	1.8E-02		X
95636	1,2,4-Trimethylbenzene	1.35E+03	6.06E-02	7.92E-06	5.70E+01	2.52E-01	6.14E-03	25	442.30	649.17	9,369	0.0E+00	<b>7.0E-03</b>	1.20E+02			0.0E+00	6.0E-03		
96184	<b>1,2,3-Trichloropropane</b>	2.20E+01	7.10E-02	7.90E-06	1.75E+03	1.67E-02	4.08E-04	25	430.00	652.00	9,171	<b>2.0E-03</b>	<b>2.1E-02</b>	1.47E+02	X	X	5.7E-04	4.9E-03	X	
96333	Methyl acrylate	4.53E+00	9.76E-02	1.02E-05	6.00E+04	7.68E-03	1.87E-04	25	353.70	536.00	7,749	0.0E+00	1.1E-01	8.61E+01		X	0.0E+00	1.1E-01		X
97632	Ethylmethacrylate	2.95E+01	6.53E-02	8.37E-06	3.67E+03	3.44E-02	8.40E-04	25	390.00	571.00	10,957	0.0E+00	3.2E-01	1.14E+02		X	0.0E+00	3.2E-01		X
98066	tert-Butylbenzene	7.71E+02	5.65E-02	8.02E-06	2.95E+01	4.87E-01	1.19E-02	25	442.10	1220.00	8,980	0.0E+00	1.4E-01	1.34E+02		X	0.0E+00	1.4E-01		X
98828	Cumene	4.89E+02	6.50E-02	7.10E-06	6.13E+01	4.74E+01	1.16E+00	25	425.56	631.10	10,335	0.0E+00	4.0E-01	1.20E+02			0.0E+00	4.0E-01		
98862	Acetophenone	5.77E+01	6.00E-02	8.73E-06	6.13E+03	4.38E-04	1.07E-05	25	475.00	709.50	11,732	0.0E+00	3.5E-01	1.20E+02		X	0.0E+00	3.5E-01		X
98953	Nitrobenzene	6.46E+01	7.60E-02	8.60E-06	2.09E+03	9.82E-04	2.39E-05	25	483.95	719.00	10,566	0.0E+00	2.0E-03	1.23E+02			0.0E+00	2.0E-03		
100414	<b>Ethylbenzene</b>	3.63E+02	7.50E-02	7.80E-06	1.69E+02	3.22E-01	7.86E-03	25	409.34	617.20	8,501	<b>2.5E-06</b>	<b>1.0E+00</b>	1.06E+02			0.0E+00	1.0E+00		
100425	Styrene	7.76E+02	7.10E-02	8.00E-06	3.10E+02	1.12E-01	2.74E-03	25	418.31	636.00	8,737	0.0E+00	<b>9.0E-01</b>	1.04E+02			0.0E+00	1.0E+00		
100447	<b>Benzylchloride</b>	6.14E+01	7.50E-02	7.80E-06	5.25E+02	1.70E-02	4.14E-04	25	452.00	685.00	8,773	<b>4.9E-05</b>	<b>1.0E-03</b>	1.27E+02	?		4.9E-05	0.0E+00	X	
100527	Benzaldehyde	4.59E+01	7.21E-02	9.07E-06	3.30E+03	9.73E-04	2.37E-05	25	452.00	695.00	11,658	0.0E+00	3.5E-01	1.06E+02		X	0.0E+00	3.5E-01		X
103651	n-Propylbenzene	5.62E+02	6.01E-02	7.83E-06	6.00E+01	4.37E-01	1.07E-02	25	432.20	630.00	9,123	0.0E+00	1.4E-01	1.20E+02		X	0.0E+00	1.4E-01		X
104518	n-Butylbenzene	1.11E+03	5.70E-02	8.12E-06	2.00E+00	5.38E-01	1.31E-02	25	456.46	660.50	9,290	0.0E+00	1.4E-01	1.34E+02		X	0.0E+00	1.4E-01		X
106423	p-Xylene	3.89E+02	7.69E-02	8.44E-06	1.85E+02	3.13E-01	7.64E-03	25	411.52	616.20	8,525	0.0E+00	<b>1.0E-01</b>	1.06E+02		?	0.0E+00	1.0E-01		
106467	<b>1,4-Dichlorobenzene</b>	6.17E+02	6.90E-02	7.90E-06	7.90E+01	9.82E-02	2.39E-03	25	447.21	684.75	9,271	<b>1.1E-05</b>	<b>8.0E-01</b>	1.47E+02			0.0E+00	8.0E-01		
106934	<b>1,2-Dibromoethane (ethylene dibr</b>	2.50E+01	2.17E-02	1.19E-05	4.18E+03	3.04E-02	7.41E-04	25	404.60	583.00	8,310	<b>7.1E-05</b>	<b>8.0E-04</b>	1.88E+02			6.0E-04	9.0E-03		
106990	<b>1,3-Butadiene</b>	1.91E+01	2.49E-01	1.08E-05	7.35E+02	3.01E+00	7.34E-02	25	268.60	425.00	5,370	<b>1.7E-04</b>	<b>2.0E-03</b>	5.41E+01			3.0E-05	0.0E+00		
107028	Acrolein	2.76E+00	1.05E-01	1.22E-05	2.13E+05	4.99E-03	1.22E-04	25	325.60	506.00	6,731	0.0E+00	<b>2.0E-05</b>	5.61E+01			0.0E+00	2.0E-05		
107062	<b>1,2-Dichloroethane</b>	1.74E+01	1.04E-01	9.90E-06	8.52E+03	4.00E-02	9.77E-04	25	356.65	561.00	7,643	<b>2.1E-05</b>	<b>4.0E-01</b>	9.90E+01			2.6E-05	0.0E+00		
107131	Acrylonitrile	5.90E+00	1.22E-01	1.34E-05	7.40E+04	4.21E-03	1.03E-04	25	350.30	519.00	7,786	<b>2.9E-04</b>	<b>2.0E-03</b>	5.31E+01			6.8E-05	2.0E-03		
108054	Vinyl acetate	5.25E+00	8.50E-02	9.20E-06	2.00E+04	2.09E-02	5.10E-04	25	345.65	519.13	7,800	0.0E+00	<b>2.0E-01</b>	8.61E+01			0.0E+00	2.0E-01		
108101	Methylisobutylketone (4-methyl-2- <b>i</b>	9.06E+00	7.50E-02	7.80E-06	1.90E+04	5.64E-03	1.38E-04	25	389.50	571.00	8,243	0.0E+00	<b>3.0E+00</b>	1.00E+02			0.0E+00	8.0E-02		
108383	m-Xylene	4.07E+02	7.00E-02	7.80E-06	1.61E+02	3.00E-01	7.32E-03	25	412.27	617.05	8,523	0.0E+00	<b>1.0E-01</b>	1.06E+02		?	0.0E+00	1.0E-01		
108678	1,3,5-Trimethylbenzene	1.35E+03	6.02E-02	8.67E-06	2.00E+00	2.41E-01	5.87E-03	25	437.89	637.25	9,321	0.0E+00	6.0E-03	1.20E+02			0.0E+00	6.0E-03		
108872	Methylcyclohexane	7.85E+01	7.35E-02	8.52E-06	1.40E+01	4.22E+00	1.03E-01	25	373.90	572.20	7,474	0.0E+00	3.0E+00	9.82E+01		?	0.0E+00	3.0E+00		
108883	Toluene	1.82E+02	8.70E-02	8.60E-06	5.26E+02	2.72E-01	6.62E-03	25	383.78	591.79	7,930	0.0E+00	<b>3.0E-01</b>	9.21E+01			0.0E+00	4.0E-01		
108907	Chlorobenzene	2.19E+02	7.30E-02	8.70E-06	4.72E+02	1.51E-01	3.69E-03	25	404.87	632.40	8,410	0.0E+00	<b>1.0E+00</b>	1.13E+02			0.0E+00	6.0E-02		
109693	1-Chlorobutane	1.72E+01	8.26E-02	1.00E-05	1.10E+03	6.93E-01	1.69E-02	25	351.60	542.00	7,263	0.0E+00	<b>1.4E-01</b>	9.26E+01		X	0.0E+00	1.4E+00		X
110009	Furan	1.86E+01	1.04E-01	1.22E-05	1.00E+04	2.21E-01	5.39E-03	25	304.60	490.20	6,477	0.0E+00	3.5E-03	6.81E+01		X	0.0E+00	3.5E-03		X
110543	Hexane	4.34E+01	2.00E-01	7.77E-06	1.24E+01	6.82E+01	1.66E+00	25	341.70	508.00	6,895	0.0E+00	<b>7.0E-01</b>	8.62E+01			0.0E+00	2.0E-01		
111444	<b>Bis(2-chloroethyl)ether</b>	1.55E+01	6.92E-02	7.53E-06	1.72E+04	7.36E-04	1.80E-05	25	451.15	659.79	10,803	<b>7.1E-04</b>	0.0E+00	1.43E+02			3.3E-04	0.0E+00		
115297	Endosulfan	2.14E+03	1.15E-02	4.55E-06	5.10E-01	4.58E-04	1.12E-05	25	674.43	942.94	14,000	0.0E+00	2.1E-02	4.07E+02		X	0.0E+00	2.1E-02		X
118741	<b>Hexachlorobenzene</b>	5.50E+04	5.42E-02	5.91E-06	5.00E-03	5.40E-02	1.32E-03	25	582.55	825.00	14,447	<b>5.1E-04</b>	2.8E-03	2.85E+02		X	4.6E-04	2.8E-03		X
120821	1,2,4-Trichlorobenzene	1.78E+03	3.00E-02	8.23E-06	4.88E+01	5.81E-02	1.42E-03	25	486.15	725.00	10,471	<b>0.0E+00</b>	<b>4.0E-03</b>	1.81E+02			0.0E+00	2.0E-01		
123739	<b>Crotonaldehyde (2-butenal)</b>	4.82E+00	9.56E-02	1.07E-05	3.69E+04	7.99E-04	1.95E-05	25	375.20	568.00	9	5.4E-04	0.0E+00	7.01E+01	X		5.4E-04	0.0E+00	X	
124481	<b>Chlorodibromomethane</b>	6.31E+01	1.96E-02	1.05E-05	2.60E+03	3.20E-02	7.81E-04	25	416.14	678.20	5,900	<b>2.7E-05</b>	7.0E-02	2.08E+02	?	X	2.4E-05	7.0E-02	X	X
126987	Methacrylonitrile	3.58E+01	1.12E-01	1.32E-05	2.54E+04	1.01E-02	2.46E-04	25	363.30	554.00	7,600	0.0E+00	7.0E-04	6.71E+01			0.0E+00	7.0E-04		
126998	2-Chloro-1,3-butadiene (chloropre <b>i</b>	6.73E+01	8.58E-02	1.03E-05	2.12E+03	4.91E-01	1.20E-02	25	332.40	525.00	8,075	0.0E+00	7.0E-03	8.85E+01			0.0E+00	7.0E-03		
127184	<b>Tetrachloroethylene</b>	1.55E+02	7.20E-02	8.20E-06	2.00E+02	7.53E-01	1.84E-02	25	394.40	620.20	8,288	<b>5.9E-06</b>	<b>3.5E-02</b>	1.66E+02			3.0E-06	0.0E+00		
129000	Pyrene	1.05E+05	2.72E-02	7.24E-06	1.35E+00	4.50E-04	1.10E-05	25	667.95	936	14370	0.0E+00	1.1E-01	2.02E+02		X	0.0E+00	1.1E-01		X
132649	Dibenzofuran	5.15E+03	2.38E-02	6.00E-06	3.10E+00	5.15E-04	1.26E-05	25	560	824	66400	0.0E+00	1.4E-02	1.68E+02		X	0.0E+00	1.4E-02		X
135988	sec-Butylbenzene	9.66E+02	5.70E-02	8.12E-06	3.94E+00	5.68E-01	1.39E-02	25	446.5	679	88730	0.0E+00	1.4E-01	1.34E+02		X	0.0E+00	1.4E-01		X
141786	Ethylacetate	6.44E+00	7.32E-02	9.70E-06	8.03E+04	5.64E-03	1.38E-04	25	350.26	523.3	7633.66	0.0E+00	3.2E+00	8.81E+01		X	0.0E+00	3.2E+00		X
156592	cis-1,2-Dichloroethylene	3.55E+01	7.36E-02	1.13E-05	3.50E+03	1.67E-01	4.07E-03	25	333.65	544	7192	0.0E+00	3.5E-02	9.69E+01		X	0.0E+00	3.5E-02		X
156605	trans-1,2-Dichloroethylene	5.25E+01	7.07E-02	1.19E-05	6.30E+03	3.84E-01	9.36E-03	25	320.85	516.5	6717	0.0E+00	<b>6.0E-02</b>	9.69E+01		X	0.0E+00	7.0E-02		X
205992	<b>Benzo(b)fluoranthene</b>	1.23E+06	2.26E-02	5.56E-06	1.50E-03	4.54E-03	1.11E-04	25	715.9	969.27	17000	<b>1.1E-04</b>	0.0E+00	2.52E+02	?		2.1E-04	0.0E+00	X	
218019	<b>Chrysene</b>	3.98E+05	2.48E-02	6.21E-06	6.30E-03	3.87E-03	9.44E-05	25	714.15	979	16455	<b>1.1E-05</b>	0.0E+00	2.28E+02	?		2.1E-06	0.0E+00	X	
309002	<b>Aldrin</b>	2.45E+06	1.32E-02	4.86E-06	1.70E-02	6.95E-03	1.70E-04	25	603.01	839.37	15000	<b>4.9E-03</b>	1.1E-04	3.65E+02		X	4.9E-03	1.1E-04		X
319846	<b>alpha-HCH (alpha-BHC)</b>	1.23E+03	1.42E-02	7.34E-06	2.00E+00	4.34E-04	1.06E-05	25	596.55	839.36	15000	<b>7.7E-04</b>	0.0E+00	2.91E+02			1.			

DATA ENTRY SHEET

Table A-7. Maximum Naphthalene Soil Vapor Concentration

DTSC  
Vapor Intrusion Guidance  
Interim Final 12/04  
(last modified 2/4/09)

SG-SCREEN  
PA Version 2.0; 04/

Reset to  
Defaults

Soil Gas Concentration Data				
ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., $C_g$ ( $\mu\text{g}/\text{m}^3$ )	OR	ENTER Soil gas conc., $C_g$ (ppmv)	Chemical
91203	7.40E+02			Naphthalene

MORE  
↓

ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (15 or 200 cm)	ENTER Soil gas sampling depth below grade, $L_s$ (cm)	ENTER Average soil temperature, $T_s$ ( $^{\circ}\text{C}$ )	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, $k_v$ ( $\text{cm}^2$ )
15	152.4	24	S		

MORE  
↓

ENTER Vadose zone SCS soil type Lookup Soil Parameters	ENTER Vadose zone soil dry bulk density, $\rho_b^A$ ( $\text{g}/\text{cm}^3$ )	ENTER Vadose zone soil total porosity, $n^V$ (unitless)	ENTER Vadose zone soil water-filled porosity, $\theta_w^V$ ( $\text{cm}^3/\text{cm}^3$ )	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) $Q_{\text{soil}}$ (L/m)
S	1.83	0.324	0.279	5

MORE  
↓

ENTER Averaging time for carcinogens, $AT_C$ (yrs)	ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	25	25	250

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, $D_a$ ( $\text{cm}^2/\text{s}$ )	Diffusivity in water, $D_w$ ( $\text{cm}^2/\text{s}$ )	Henry's law constant at reference temperature, H ( $\text{atm}\cdot\text{m}^3/\text{mol}$ )	Henry's law constant reference temperature, $T_R$ ( $^{\circ}\text{C}$ )	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ ( $\text{cal}/\text{mol}$ )	Normal boiling point, $T_B$ ( $^{\circ}\text{K}$ )	Critical temperature, $T_C$ ( $^{\circ}\text{K}$ )	Unit risk factor, URF ( $\mu\text{g}/\text{m}^3$ ) <sup>-1</sup>	Reference conc., RfC ( $\text{mg}/\text{m}^3$ )	Molecular weight, MW ( $\text{g}/\text{mol}$ )
5.90E-02	7.50E-06	4.82E-04	25	10,373	491.14	748.40	3.4E-05	3.0E-03	128.18

END

INTERMEDIATE CALCULATIONS SHEET

**Table A-8. Maximum Naphthalene Soil Vapor Concentration**

Source- building separation, $L_T$ (cm)	Vadose zone soil air-filled porosity, $\theta_a^v$ ( $\text{cm}^3/\text{cm}^3$ )	Vadose zone effective total fluid saturation, $S_{1e}$ ( $\text{cm}^3/\text{cm}^3$ )	Vadose zone soil intrinsic permeability, $k_i$ ( $\text{cm}^2$ )	Vadose zone soil relative air permeability, $k_{rg}$ ( $\text{cm}^2$ )	Vadose zone soil effective vapor permeability, $k_v$ ( $\text{cm}^2$ )	Floor- wall seam perimeter, $X_{crack}$ (cm)	Soil gas conc. ( $\mu\text{g}/\text{m}^3$ )	Bldg. ventilation rate, $Q_{building}$ ( $\text{cm}^3/\text{s}$ )
137.4	0.045	0.834	1.02E-07	0.055	5.62E-09	4,000	7.40E+02	3.39E+04

Area of enclosed space below grade, $A_B$ ( $\text{cm}^2$ )	Crack- to-total area ratio, $\eta$ (unitless)	Crack depth below grade, $Z_{crack}$ (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, $H_{TS}$ (atm- $\text{m}^3/\text{mol}$ )	Henry's law constant at ave. soil temperature, $H'_{TS}$ (unitless)	Vapor viscosity at ave. soil temperature, $\mu_{TS}$ (g/cm-s)	Vadose zone effective diffusion coefficient, $D_v^{eff}$ ( $\text{cm}^2/\text{s}$ )	Diffusion path length, $L_d$ (cm)
1.00E+06	5.00E-03	15	12,768	4.48E-04	1.84E-02	1.80E-04	7.38E-05	137.4

Convection path length, $L_p$ (cm)	Source vapor conc., $C_{source}$ ( $\mu\text{g}/\text{m}^3$ )	Crack radius, $r_{crack}$ (cm)	Average vapor flow rate into bldg., $Q_{soil}$ ( $\text{cm}^3/\text{s}$ )	Crack effective diffusion coefficient, $D^{crack}$ ( $\text{cm}^2/\text{s}$ )	Area of crack, $A_{crack}$ ( $\text{cm}^2$ )	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, $\alpha$ (unitless)	Infinite source bldg. conc., $C_{building}$ ( $\mu\text{g}/\text{m}^3$ )
15	7.40E+02	1.25	8.33E+01	7.38E-05	5.00E+03	#NUM!	1.58E-05	1.17E-02

Unit risk factor, URF ( $\mu\text{g}/\text{m}^3$ ) <sup>-1</sup>	Reference conc., RFC ( $\text{mg}/\text{m}^3$ )
3.4E-05	3.0E-03

**END**

RESULTS SHEET

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
9.7E-08	2.7E-03

MESSAGE SUMMARY BELOW:

END

VLOOKUP TABLES

Soil Properties Lookup Table										
SCS Soil Type	K <sub>s</sub> (cm/h)	α <sub>1</sub> (1/cm)	N (unitless)	M (unitless)	n (cm <sup>3</sup> /cm <sup>3</sup> )	θ <sub>r</sub> (cm <sup>3</sup> /cm <sup>3</sup> )	Mean Grain Diameter (cm)	Bulk Density (g/cm <sup>3</sup> )	θ <sub>w</sub> (cm <sup>3</sup> /cm <sup>3</sup> )	SCS Soil Name
C	0.61	0.01496	1.253	0.2019	0.459	0.098	0.0092	1.43	0.215	Clay
CL	0.34	0.01581	1.416	0.2938	0.442	0.079	0.016	1.48	0.168	Clay Loam
L	0.50	0.01112	1.472	0.3207	0.399	0.061	0.020	1.59	0.148	Loam
LS	4.38	0.03475	1.746	0.4273	0.390	0.049	0.040	1.62	0.076	Loamy Sand
S	26.78	0.03524	3.177	0.6852	0.375	0.053	0.044	1.66	0.054	Sand
SC	0.47	0.03342	1.208	0.1722	0.385	0.117	0.025	1.63	0.197	Sandy Clay
SCL	0.55	0.02109	1.330	0.2481	0.384	0.063	0.029	1.63	0.146	Sandy Clay Loam
SI	1.82	0.00658	1.679	0.4044	0.489	0.050	0.0046	1.35	0.167	Silt
SIC	0.40	0.01622	1.321	0.2430	0.481	0.111	0.0039	1.38	0.216	Silty Clay
SICL	0.46	0.00839	1.521	0.3425	0.482	0.090	0.0056	1.37	0.198	Silty Clay Loam
SIL	0.76	0.00506	1.663	0.3987	0.439	0.065	0.011	1.49	0.180	Silt Loam
SL	1.60	0.02667	1.449	0.3099	0.387	0.039	0.030	1.62	0.103	Sandy Loam

Chemical Properties Lookup Table													CalEPA Toxicity Criteria in bold (last updated 2/4/09 DTSC/HERD)				Original EPA Values			
CAS No.	Chemical	Organic carbon partition coefficient, K <sub>oc</sub>	Diffusivity in air, D <sub>a</sub>	Diffusivity in water, D <sub>w</sub>	Pure component solubility, S	Henry's law constant, H'	Henry's law constant at reference temperature, H	Henry's law constant reference temperature, T <sub>R</sub>	Normal boiling point, T <sub>B</sub>	Critical temperature, T <sub>C</sub>	Enthalpy of vaporization at the normal boiling point, ΔH <sub>v,b</sub>	Unit risk factor, URF	Reference conc., RfC	Molecular weight, MW	URF extrapolated (X)	RfC extrapolated (X)	Unit risk factor, URF	Reference conc., RfC	URF extrapolated (X)	RfC extrapolated (X)
		(cm <sup>3</sup> /g)	(cm <sup>2</sup> /s)	(cm <sup>2</sup> /s)	(mg/L)	(unitless)	(atm·m <sup>3</sup> /mol)	(°C)	(°K)	(°K)	(cal/mol)	(μg/m <sup>3</sup> ) <sup>-1</sup>	(mg/m <sup>3</sup> )	(g/mol)			(μg/m <sup>3</sup> ) <sup>-1</sup>	(mg/m <sup>3</sup> )		
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.24E+00	3.03E-02	25	349.90	556.60	7,127	<b>4.2E-05</b>	<b>4.0E-02</b>	1.54E+02			1.5E-05	0.0E+00		
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	14,000	<b>3.4E-04</b>	7.0E-04	4.10E+02			1.0E-04	7.0E-04		
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	7.30E+00	5.73E-04	1.40E-05	25	596.55	839.36	15,000	<b>3.1E-04</b>	1.1E-03	2.91E+02	?	X	3.7E-04	1.1E-03	X	X
60297	Ethyl ether	5.73E+00	7.82E-02	8.61E-06	5.68E+04	1.35E+00	3.29E-02	25	307.50	466.74	6,338	0.0E+00	7.0E-01	7.41E+01		X	0.0E+00	7.0E-01		X
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.18E-04	1.51E-05	25	613.32	842.25	17,000	<b>4.6E-03</b>	1.8E-04	3.81E+02		X	4.6E-03	1.8E-04		X
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.87E-05	25	329.20	508.10	6,955	0.0E+00	<b>3.1E+01</b>	5.81E+01		X	0.0E+00	3.5E-01		X
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	<b>5.3E-06</b>	<b>3.0E-01</b>	1.19E+02			2.3E-05	0.0E+00		
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	<b>1.1E-05</b>	3.5E-03	2.37E+02		X	4.0E-06	3.5E-03		X
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.79E+03	2.27E-01	5.54E-03	25	353.24	562.16	7,342	<b>2.9E-05</b>	<b>3.0E-02</b>	7.81E+01			7.8E-06	0.0E+00		
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	<b>5.0E+00</b>	1.33E+02			0.0E+00	2.2E+00		
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	1.00E-01	6.46E-04	1.58E-05	25	651.02	848.49	16,000	0.0E+00	1.8E-02	3.46E+02			0.0E+00	1.8E-02		X
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.59E-04	2.09E-05	25	636.44	860.38	15,000	<b>9.7E-05</b>	0.0E+00	3.18E+02	?		9.7E-05	0.0E+00	X	
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.55E-01	6.22E-03	25	276.71	467.00	5,714	0.0E+00	<b>5.0E-03</b>	9.49E+01			0.0E+00	5.0E-03		
74873	Methyl chloride (chloromethane)	2.12E+00	1.26E-01	6.50E-06	5.33E+03	3.61E-01	8.80E-03	25	249.00	416.25	5,115	<b>1.8E-06</b>	9.0E-02	5.05E+01			1.0E-06	9.0E-02		
74908	Hydrogen cyanide	3.80E+00	1.93E-01	2.10E-05	1.00E+06	5.44E-03	1.33E-04	25	299.00	456.70	6,676	0.0E+00	<b>3.0E-03</b>	2.70E+01			0.0E+00	3.0E-03		
74953	Methylene bromide	1.26E+01	4.30E-02	8.44E-06	1.19E+04	3.52E-02	8.59E-04	25	370.00	583.00	7,868	0.0E+00	3.5E-02	1.74E+02		X	0.0E+00	3.5E-02		X
75003	Chloroethane (ethyl chloride)	4.40E+00	2.71E-01	1.15E-05	5.68E+03	3.61E-01	8.80E-03	25	285.30	460.40	5,879	8.3E-07	<b>1.0E+01</b>	6.45E+01	?		8.3E-07	1.0E+01	X	
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-05	8.80E+03	1.10E+00	2.69E-02	25	259.25	432.00	5,250	<b>7.8E-05</b>	1.0E-01	6.25E+01			8.8E-06	1.0E-01		
75058	Acetonitrile	4.20E+00	1.28E-01	1.66E-05	1.00E+06	1.42E-03	3.45E-05	25	354.60	545.50	7,110	0.0E+00	6.0E-02	4.11E+01			0.0E+00	6.0E-02		
75070	Acetaldehyde	1.06E+00	1.24E-01	1.41E-05	1.00E+06	3.23E-03	7.87E-05	25	293.10	466.00	6,157	<b>2.7E-06</b>	<b>9.0E-03</b>	4.41E+01			2.2E-06	9.0E-03		
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.96E-02	2.18E-03	25	313.00	510.00	6,706	<b>1.0E-06</b>	<b>4.0E-01</b>	8.49E+01			4.7E-07	3.0E+00		
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	<b>7.0E-01</b>	7.61E+01			0.0E+00	7.0E-01		
75218	Ethylene oxide	1.33E+00	1.04E-01	1.45E-05	3.04E+05	2.27E-02	5.54E-04	25	283.60	469.00	6,104	<b>8.8E-05</b>	<b>3.0E-02</b>	4.41E+01			1.0E-04	0.0E+00		
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.41E-02	5.88E-04	25	422.35	696.00	9,479	1.1E-06	7.0E-02	2.53E+02		X	1.1E-06	7.0E-02		X
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.54E-02	1.60E-03	25	363.15	585.85	7,800	<b>3.7E-05</b>	7.0E-02	1.64E+02	?	X	1.8E-05	7.0E-02	X	X
75296	2-Chloropropane	9.14E+00	8.88E-02	1.01E-05	3.73E+03	5.93E-01	1.45E-02	25	308.70	485.00	6,286	0.0E+00	1.0E-01	7.85E+01		?	0.0E+00	1.0E-01		
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	<b>1.6E-06</b>	<b>7.0E-01</b>	9.90E+01		X	0.0E+00	5.0E-01		
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.60E-02	25	304.75	576.05	6,247	0.0E+00	<b>7.0E-02</b>	9.69E+01			0.0E+00	2.0E-01		
75456	Chlorodifluoromethane	4.79E+01	1.01E-01	1.28E-05	2.00E+00	1.10E+00	2.70E-02	25	232.40	369.30	4,836	0.0E+00	5.0E+01	8.65E+01			0.0E+00	5.0E+01		
75694	Trichlorofluoromethane	4.97E+02	8.70E-02	9.70E-06	1.10E+03	3.97E+00	9.68E-02	25	296.70	471.00	5,999	0.0E+00	7.0E-01	1.37E+02			0.0E+00	7.0E-01		
75718	Dichlorodifluoromethane	4.57E+02	6.65E-02	9.92E-06	2.80E+02	1.40E+01	3.42E-01	25	243.20	384.95	9,421	0.0E+00	2.0E-01	1.21E+02			0.0E+00	2.0E-01		
76131	1,1,2-Trichloro-1,2,2-trifluoroethane	1.11E+04	7.80E-02	8.20E-06	1.70E+02	1.97E+01	4.80E-01	25	320.70	487.30	6,463	0.0E+00	3.0E+01	1.87E+02			0.0E+00	3.0E+01		
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	6.05E+01	1.48E+00	25	603.69	846.31	13,000	<b>1.2E-03</b>	1.8E-03	3.73E+02		X	1.3E-03	1.8E-03		X
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.10E+00	2.69E-02	25	512.15	746.00	10,931	0.0E+00	2.0E-04	2.73E+02			0.0E+00	2.0E-04		
78831	Isobutanol	2.59E+00	8.60E-02	9.30E-06	8.50E+04	4.83E-04	1.18E-05	25	381.04	547.78	10,936	0.0E+00	1.1E+00	7.41E+01		X	0.0E+00	1.1E+00		X
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.79E-03	25	369.52	572.00	7,590	<b>1.0E-05</b>	4.0E-03	1.13E+02	?		1.9E-05	4.0E-03	X	
78933	Methylethylketone (2-butanone)	2.30E+00	8.08E-02	9.80E-06	2.23E+05	2.29E-03	5.58E-05	25	352.50	536.78	7,481	0.0E+00	5.0E+00	7.21E+01			0.0E+00	1.0E+00		
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.73E-02	9.11E-04	25	386.15	602.00	8,322	<b>1.6E-05</b>	1.4E-02	1.33E+02		X	1.6E-05	1.4E-02		X
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.47E+03	4.21E-01	1.03E-02	25	360.36	544.20	7,505	<b>2.0E-06</b>	<b>6.0E-01</b>	1.31E+02	?		1.1E-04	4.0E-02	X	
79209	Methyl acetate	3.26E+00	1.04E-01	1.00E-05	2.00E+03	4.84E-03	1.18E-04	25	329.80	506.70	7,260	0.0E+00	3.5E+00	7.41E+01		X	0.0E+00	3.5E+00		X
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.96E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	<b>5.8E-05</b>	<b>1.4E-02</b>	1.68E+02		X	5.8E-05	2.1E-01		X
79469	2-Nitropropane	1.17E+01	9.23E-02	1.01E-05	1.70E+04	5.03E-03	1.23E-04	25	393.20	594.00	8,383	2.7E-03	2.0E-02	8.91E+01			2.7E-03	2.0E-02		
80626	Methylmethacrylate	6.98E+00	7.70E-02	8.60E-06	1.50E+04	1.38E-02	3.36E-04	25	373.50	567.00	8,975	0.0E+00	7.0E-01	1.00E+02			0.0E+00	7.0E-01		
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	3.57E+00	6.34E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01	1.54E+02		X	0.0E+00	2.1E-01		X
86737	Fluorene	1.38E+04	3.63E-02	7.88E-06	1.98E+00	2.60E-03	6.34E-05	25	570.44	870.00	12,666	0.0E+00	1.4E-01	1.66E+02		X	0.0E+00	1.4E-01		X
87683	Hexachloro-1,3																			

VLOOKUP TABLES

Chemical Properties Lookup Table																	CalEPA Toxicity Criteria in bold (last updated 2/4/09 DTSC/HERD)			
CAS No.	Chemical	Organic carbon partition coefficient, $K_{oc}$ ( $cm^3/g$ )	Diffusivity in air, $D_a$ ( $cm^2/s$ )	Diffusivity in water, $D_w$ ( $cm^2/s$ )	Pure component water solubility, $S$ (mg/L)	Henry's law constant $H'$ (unitless)	Henry's law constant at reference temperature, $H$ ( $atm\cdot m^3/mol$ )	Henry's law constant reference temperature, $T_R$ ( $^{\circ}C$ )	Normal boiling point, $T_B$ ( $^{\circ}K$ )	Critical temperature, $T_C$ ( $^{\circ}K$ )	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ( $\mu g/m^3$ ) <sup>-1</sup>	Reference conc., RfC ( $mg/m^3$ )	Molecular weight, MW (g/mol)	URF extrapolated (X)	RfC extrapolated (X)	Unit risk factor, URF ( $\mu g/m^3$ ) <sup>-1</sup>	Reference conc., RfC ( $mg/m^3$ )	URF extrapolated (X)	RfC extrapolated (X)
95501	1,2-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	1.56E+02	7.77E-02	1.90E-03	25	453.57	705.00	9,700	0.0E+00	2.0E-01	1.47E+02			0.0E+00	2.0E-01		
95578	2-Chlorophenol	3.88E+02	5.01E-02	9.46E-06	2.20E+04	1.60E-02	3.90E-04	25	447.53	675.00	9,572	0.0E+00	1.8E-02	1.29E+02		X	0.0E+00	1.8E-02		X
95636	1,2,4-Trimethylbenzene	1.35E+03	6.06E-02	7.92E-06	5.70E+01	2.52E-01	6.14E-03	25	442.30	649.17	9,369	0.0E+00	<b>7.0E-03</b>	1.20E+02			0.0E+00	6.0E-03		
96184	1,2,3-Trichloropropane	2.20E+01	7.10E-02	7.90E-06	1.75E+03	1.67E-02	4.08E-04	25	430.00	652.00	9,171	<b>2.0E-03</b>	<b>2.1E-02</b>	1.47E+02	X	X	5.7E-04	4.9E-03	X	
96333	Methyl acrylate	4.53E+00	9.76E-02	1.02E-05	6.00E+04	7.68E-03	1.87E-04	25	353.70	536.00	7,749	0.0E+00	1.1E-01	8.61E+01		X	0.0E+00	1.1E-01		X
97632	Ethylmethacrylate	2.95E+01	6.53E-02	8.37E-06	3.67E+03	3.44E-02	8.40E-04	25	390.00	571.00	10,957	0.0E+00	3.2E-01	1.14E+02		X	0.0E+00	3.2E-01		X
98066	tert-Butylbenzene	7.71E+02	5.65E-02	8.02E-06	2.95E+01	4.87E-01	1.19E-02	25	442.10	1220.00	8,980	0.0E+00	1.4E-01	1.34E+02		X	0.0E+00	1.4E-01		X
98828	Cumene	4.89E+02	6.50E-02	7.10E-06	6.13E+01	4.74E+01	1.16E+00	25	425.56	631.10	10,335	0.0E+00	4.0E-01	1.20E+02			0.0E+00	4.0E-01		
98862	Acetophenone	5.77E+01	6.00E-02	8.73E-06	6.13E+03	4.38E-04	1.07E-05	25	475.00	709.50	11,732	0.0E+00	3.5E-01	1.20E+02		X	0.0E+00	3.5E-01		X
98953	Nitrobenzene	6.46E+01	7.60E-02	8.60E-06	2.09E+03	9.82E-04	2.39E-05	25	483.95	719.00	10,566	0.0E+00	2.0E-03	1.23E+02			0.0E+00	2.0E-03		
100414	Ethylbenzene	3.63E+02	7.50E-02	7.80E-06	1.69E+02	3.22E-01	7.86E-03	25	409.34	617.20	8,501	<b>2.5E-06</b>	<b>1.0E+00</b>	1.06E+02			0.0E+00	1.0E+00		
100425	Styrene	7.76E+02	7.10E-02	8.00E-06	3.10E+02	1.12E-01	2.74E-03	25	418.31	636.00	8,737	0.0E+00	<b>9.0E-01</b>	1.04E+02			0.0E+00	1.0E+00		
100447	Benzylchloride	6.14E+01	7.50E-02	7.80E-06	5.25E+02	1.70E-02	4.14E-04	25	452.00	685.00	8,773	<b>4.9E-05</b>	<b>1.0E-03</b>	1.27E+02	?		4.9E-05	0.0E+00	X	
100527	Benzaldehyde	4.59E+01	7.21E-02	9.07E-06	3.30E+03	9.73E-04	2.37E-05	25	452.00	695.00	11,658	0.0E+00	3.5E-01	1.06E+02		X	0.0E+00	3.5E-01		X
103651	n-Propylbenzene	5.62E+02	6.01E-02	7.83E-06	6.00E+01	4.37E-01	1.07E-02	25	432.20	630.00	9,123	0.0E+00	1.4E-01	1.20E+02		X	0.0E+00	1.4E-01		X
104518	n-Butylbenzene	1.11E+03	5.70E-02	8.12E-06	2.00E+00	5.38E-01	1.31E-02	25	456.46	660.50	9,290	0.0E+00	1.4E-01	1.34E+02		X	0.0E+00	1.4E-01		X
106423	p-Xylene	3.89E+02	7.69E-02	8.44E-06	1.85E+02	3.13E-01	7.64E-03	25	411.52	616.20	8,525	0.0E+00	<b>1.0E-01</b>	1.06E+02		?	0.0E+00	1.0E-01		
106467	1,4-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	7.90E+01	9.82E-02	2.39E-03	25	447.21	684.75	9,271	<b>1.1E-05</b>	<b>8.0E-01</b>	1.47E+02			0.0E+00	8.0E-01		
106934	1,2-Dibromoethane (ethylene dibr	2.50E+01	2.17E-02	1.19E-05	4.18E+03	3.04E-02	7.41E-04	25	404.60	583.00	8,310	<b>7.1E-05</b>	<b>8.0E-04</b>	1.88E+02			6.0E-04	9.0E-03		
106990	1,3-Butadiene	1.91E+01	2.49E-01	1.08E-05	7.35E+02	3.01E+00	7.34E-02	25	268.60	425.00	5,370	<b>1.7E-04</b>	<b>2.0E-03</b>	5.41E+01			3.0E-05	0.0E+00		
107028	Acrolein	2.76E+00	1.05E-01	1.22E-05	2.13E+05	4.99E-03	1.22E-04	25	325.60	506.00	6,731	0.0E+00	<b>2.0E-05</b>	5.61E+01			0.0E+00	2.0E-05		
107062	1,2-Dichloroethane	1.74E+01	1.04E-01	9.90E-06	8.52E+03	4.00E-02	9.77E-04	25	356.65	561.00	7,643	<b>2.1E-05</b>	<b>4.0E-01</b>	9.90E+01			2.6E-05	0.0E+00		
107131	Acrylonitrile	5.90E+00	1.22E-01	1.34E-05	7.40E+04	4.21E-03	1.03E-04	25	350.30	519.00	7,786	<b>2.9E-04</b>	<b>2.0E-03</b>	5.31E+01			6.8E-05	2.0E-03		
108054	Vinyl acetate	5.25E+00	8.50E-02	9.20E-06	2.00E+04	2.09E-02	5.10E-04	25	345.65	519.13	7,800	0.0E+00	<b>2.0E-01</b>	8.61E+01			0.0E+00	2.0E-01		
108101	Methylisobutylketone (4-methyl-2-)	9.06E+00	7.50E-02	7.80E-06	1.90E+04	5.64E-03	1.38E-04	25	389.50	571.00	8,243	0.0E+00	<b>3.0E+00</b>	1.00E+02			0.0E+00	8.0E-02		
108383	m-Xylene	4.07E+02	7.00E-02	7.80E-06	1.61E+02	3.00E-01	7.32E-03	25	412.27	617.05	8,523	0.0E+00	<b>1.0E-01</b>	1.06E+02		?	0.0E+00	1.0E-01		
108678	1,3,5-Trimethylbenzene	1.35E+03	6.02E-02	8.67E-06	2.00E+00	2.41E-01	5.87E-03	25	437.89	637.25	9,321	0.0E+00	6.0E-03	1.20E+02			0.0E+00	6.0E-03		
108872	Methylcyclohexane	7.85E+01	7.35E-02	8.52E-06	1.40E+01	4.22E+00	1.03E-01	25	373.90	572.20	7,474	0.0E+00	3.0E+00	9.82E+01		?	0.0E+00	3.0E+00		
108883	Toluene	1.82E+02	8.70E-02	8.60E-06	5.26E+02	2.72E-01	6.62E-03	25	383.78	591.79	7,930	0.0E+00	<b>3.0E-01</b>	9.21E+01			0.0E+00	4.0E-01		
108907	Chlorobenzene	2.19E+02	7.30E-02	8.70E-06	4.72E+02	1.51E-01	3.69E-03	25	404.87	632.40	8,410	0.0E+00	<b>1.0E+00</b>	1.13E+02			0.0E+00	6.0E-02		
109693	1-Chlorobutane	1.72E+01	8.26E-02	1.00E-05	1.10E+03	6.93E-01	1.69E-02	25	351.60	542.00	7,263	0.0E+00	<b>1.4E-01</b>	9.26E+01		X	0.0E+00	1.4E+00		X
110009	Furan	1.86E+01	1.04E-01	1.22E-05	1.00E+04	2.21E-01	5.39E-03	25	304.60	490.20	6,477	0.0E+00	3.5E-03	6.81E+01		X	0.0E+00	3.5E-03		X
110543	Hexane	4.34E+01	2.00E-01	7.77E-06	1.24E+01	6.82E+01	1.66E+00	25	341.70	508.00	6,895	0.0E+00	<b>7.0E-01</b>	8.62E+01			0.0E+00	2.0E-01		
111444	Bis(2-chloroethyl)ether	1.55E+01	6.92E-02	7.53E-06	1.72E+04	7.36E-04	1.80E-05	25	451.15	659.79	10,803	<b>7.1E-04</b>	0.0E+00	1.43E+02			3.3E-04	0.0E+00		
115297	Endosulfan	2.14E+03	1.15E-02	4.55E-06	5.10E-01	4.58E-04	1.12E-05	25	674.43	942.94	14,000	0.0E+00	2.1E-02	4.07E+02		X	0.0E+00	2.1E-02		X
118741	Hexachlorobenzene	5.50E+04	5.42E-02	5.91E-06	5.00E-03	5.40E-02	1.32E-03	25	582.55	825.00	14,447	<b>5.1E-04</b>	2.8E-03	2.85E+02		X	4.6E-04	2.8E-03		X
120821	1,2,4-Trichlorobenzene	1.78E+03	3.00E-02	8.23E-06	4.88E+01	5.81E-02	1.42E-03	25	486.15	725.00	10,471	<b>0.0E+00</b>	<b>4.0E-03</b>	1.81E+02			0.0E+00	2.0E-01		
123739	Crotonaldehyde (2-butenal)	4.82E+00	9.56E-02	1.07E-05	3.69E+04	7.99E-04	1.95E-05	25	375.20	568.00	9	5.4E-04	0.0E+00	7.01E+01	X		5.4E-04	0.0E+00	X	
124481	Chlorodibromomethane	6.31E+01	1.96E-02	1.05E-05	2.60E+03	3.20E-02	7.81E-04	25	416.14	678.20	5,900	<b>2.7E-05</b>	7.0E-02	2.08E+02	?	X	2.4E-05	7.0E-02	X	X
126987	Methacrylonitrile	3.58E+01	1.12E-01	1.32E-05	2.54E+04	1.01E-02	2.46E-04	25	363.30	554.00	7,600	0.0E+00	7.0E-04	6.71E+01			0.0E+00	7.0E-04		
126998	2-Chloro-1,3-butadiene (chloropre)	6.73E+01	8.58E-02	1.03E-05	2.12E+03	4.91E-01	1.20E-02	25	332.40	525.00	8,075	0.0E+00	7.0E-03	8.85E+01			0.0E+00	7.0E-03		
127184	Tetrachloroethylene	1.55E+02	7.20E-02	8.20E-06	2.00E+02	7.53E-01	1.84E-02	25	394.40	620.20	8,288	<b>5.9E-06</b>	<b>3.5E-02</b>	1.66E+02			3.0E-06	0.0E+00		
129000	Pyrene	1.05E+05	2.72E-02	7.24E-06	1.35E+00	4.50E-04	1.10E-05	25	667.95	936	14370	0.0E+00	1.1E-01	2.02E+02		X	0.0E+00	1.1E-01		X
132649	Dibenzofuran	5.15E+03	2.38E-02	6.00E-06	3.10E+00	5.15E-04	1.26E-05	25	560	824	66400	0.0E+00	1.4E-02	1.68E+02		X	0.0E+00	1.4E-02		X
135988	sec-Butylbenzene	9.66E+02	5.70E-02	8.12E-06	3.94E+00	5.68E-01	1.39E-02	25	446.5	679	88730	0.0E+00	1.4E-01	1.34E+02		X	0.0E+00	1.4E-01		X
141786	Ethylacetate	6.44E+00	7.32E-02	9.70E-06	8.03E+04	5.64E-03	1.38E-04	25	350.26	523.3	7633.66	0.0E+00	3.2E+00	8.81E+01		X	0.0E+00	3.2E+00		X
156592	cis-1,2-Dichloroethylene	3.55E+01	7.36E-02	1.13E-05	3.50E+03	1.67E-01	4.07E-03	25	333.65	544	7192	0.0E+00	3.5E-02	9.69E+01		X	0.0E+00	3.5E-02		X
156605	trans-1,2-Dichloroethylene	5.25E+01	7.07E-02	1.19E-05	6.30E+03	3.84E-01	9.36E-03	25	320.85	516.5	6717	0.0E+00	<b>6.0E-02</b>	9.69E+01		X	0.0E+00	7.0E-02		X
205992	Benzo(b)fluoranthene	1.23E+06	2.26E-02	5.56E-06	1.50E-03	4.54E-03	1.11E-04	25	715.9	969.27	17000	<b>1.1E-04</b>	0.0E+00	2.52E+02	?		2.1E-04	0.0E+00	X	
218019	Chrysene	3.98E+05	2.48E-02	6.21E-06	6.30E-03	3.87E-03	9.44E-05	25	714.15	979	16455	<b>1.1E-05</b>	0.0E+00	2.28E+02	?		2.1E-06	0.0E+00	X	
309002	Aldrin	2.45E+06	1.32E-02	4.86E-06	1.70E-02	6.95E-03	1.70E-04	25	603.01	839.37	15000	<b>4.9E-03</b>	1.1E-04	3.65E+02		X	4.9E-03	1.1E-04		X
319846	alpha-HCH (alpha-BHC)	1.23E+03	1.42E-02	7.34E-06	2.00E+00	4.34E-04	1.06E-05	25	596.55	839.36	15000	<b>7.7E-04</b>	0.0E+00	2.91E+02			1.8E-03	0.0E+00		

DATA ENTRY SHEET

Table A-9. Maximum Toluene Soil Vapor Concentration

DTSC  
Vapor Intrusion Guidance  
Interim Final 12/04  
(last modified 2/4/09)

SG-SCREEN  
PA Version 2.0; 04/

Reset to  
Defaults

Soil Gas Concentration Data				
ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., $C_g$ ( $\mu\text{g}/\text{m}^3$ )	OR	ENTER Soil gas conc., $C_g$ (ppmv)	Chemical
108883	2.00E+03			Toluene

MORE  
↓

ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (15 or 200 cm)	ENTER Soil gas sampling depth below grade, $L_s$ (cm)	ENTER Average soil temperature, $T_s$ ( $^{\circ}\text{C}$ )	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, $k_v$ ( $\text{cm}^2$ )
15	152.4	24	S		

MORE  
↓

ENTER Vadose zone SCS soil type Lookup Soil Parameters	ENTER Vadose zone soil dry bulk density, $\rho_b^A$ ( $\text{g}/\text{cm}^3$ )	ENTER Vadose zone soil total porosity, $n^V$ (unitless)	ENTER Vadose zone soil water-filled porosity, $\theta_w^V$ ( $\text{cm}^3/\text{cm}^3$ )	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) $Q_{\text{soil}}$ (L/m)
S	1.83	0.324	0.279	5

MORE  
↓

ENTER Averaging time for carcinogens, $AT_C$ (yrs)	ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	25	25	250

END



CHEMICAL PROPERTIES SHEET

Diffusivity in air, $D_a$ ( $\text{cm}^2/\text{s}$ )	Diffusivity in water, $D_w$ ( $\text{cm}^2/\text{s}$ )	Henry's law constant at reference temperature, H ( $\text{atm}\cdot\text{m}^3/\text{mol}$ )	Henry's law constant reference temperature, $T_R$ ( $^{\circ}\text{C}$ )	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ ( $\text{cal}/\text{mol}$ )	Normal boiling point, $T_B$ ( $^{\circ}\text{K}$ )	Critical temperature, $T_C$ ( $^{\circ}\text{K}$ )	Unit risk factor, URF ( $\mu\text{g}/\text{m}^3$ ) <sup>-1</sup>	Reference conc., RfC ( $\text{mg}/\text{m}^3$ )	Molecular weight, MW ( $\text{g}/\text{mol}$ )
8.70E-02	8.60E-06	6.62E-03	25	7,930	383.78	591.79	0.0E+00	3.0E-01	92.14

END

INTERMEDIATE CALCULATIONS SHEET

Table A-10. Maximum Toluene Soil Vapor Concentration

Source- building separation, $L_T$ (cm)	Vadose zone soil air-filled porosity, $\theta_a^v$ (cm <sup>3</sup> /cm <sup>3</sup> )	Vadose zone effective total fluid saturation, $S_{te}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Vadose zone soil intrinsic permeability, $k_i$ (cm <sup>2</sup> )	Vadose zone soil relative air permeability, $k_{rg}$ (cm <sup>2</sup> )	Vadose zone soil effective vapor permeability, $k_v$ (cm <sup>2</sup> )	Floor- wall seam perimeter, $X_{crack}$ (cm)	Soil gas conc., $C_{soil}$ (µg/m <sup>3</sup> )	Bldg. ventilation rate, $Q_{building}$ (cm <sup>3</sup> /s)
137.4	0.045	0.834	1.02E-07	0.055	5.62E-09	4,000	2.00E+03	3.39E+04

Area of enclosed space below grade, $A_B$ (cm <sup>2</sup> )	Crack- to-total area ratio, $\eta$ (unitless)	Crack depth below grade, $Z_{crack}$ (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, $H_{TS}$ (atm·m <sup>3</sup> /mol)	Henry's law constant at ave. soil temperature, $H'_{TS}$ (unitless)	Vapor viscosity at ave. soil temperature, $\mu_{TS}$ (g/cm-s)	Vadose zone effective diffusion coefficient, $D_v^{eff}$ (cm <sup>2</sup> /s)	Diffusion path length, $L_d$ (cm)
1.00E+06	5.00E-03	15	9,001	6.29E-03	2.58E-01	1.80E-04	3.17E-05	137.4

Convection path length, $L_p$ (cm)	Source vapor conc., $C_{source}$ (µg/m <sup>3</sup> )	Crack radius, $r_{crack}$ (cm)	Average vapor flow rate into bldg., $Q_{soil}$ (cm <sup>3</sup> /s)	Crack effective diffusion coefficient, $D^{crack}$ (cm <sup>2</sup> /s)	Area of crack, $A_{crack}$ (cm <sup>2</sup> )	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, $\alpha$ (unitless)	Infinite source bldg. conc., $C_{building}$ (µg/m <sup>3</sup> )
15	2.00E+03	1.25	8.33E+01	3.17E-05	5.00E+03	#NUM!	6.78E-06	1.36E-02

Unit risk factor, URF (µg/m <sup>3</sup> ) <sup>-1</sup>	Reference conc., RFC (mg/m <sup>3</sup> )
NA	3.0E-01

END

RESULTS SHEET

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
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NA	3.1E-05
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MESSAGE SUMMARY BELOW:

END

VLOOKUP TABLES

SCS Soil Type	Soil Properties Lookup Table						Bulk Density				
	K <sub>s</sub> (cm/h)	α <sub>1</sub> (1/cm)	N (unitless)	M (unitless)	n (cm <sup>3</sup> /cm <sup>3</sup> )	θ <sub>r</sub> (cm <sup>3</sup> /cm <sup>3</sup> )	Mean Grain Diameter (cm)	(g/cm <sup>3</sup> )	θ <sub>w</sub> (cm <sup>3</sup> /cm <sup>3</sup> )	SCS Soil Name	
C	0.61	0.01496	1.253	0.2019	0.459	0.098	0.0092	1.43	0.215	Clay	
CL	0.34	0.01581	1.416	0.2938	0.442	0.079	0.016	1.48	0.168	Clay Loam	
L	0.50	0.01112	1.472	0.3207	0.399	0.061	0.020	1.59	0.148	Loam	
LS	4.38	0.03475	1.746	0.4273	0.390	0.049	0.040	1.62	0.076	Loamy Sand	
S	26.78	0.03524	3.177	0.6852	0.375	0.053	0.044	1.66	0.054	Sand	
SC	0.47	0.03342	1.208	0.1722	0.385	0.117	0.025	1.63	0.197	Sandy Clay	
SCL	0.55	0.02109	1.330	0.2481	0.384	0.063	0.029	1.63	0.146	Sandy Clay Loam	
SI	1.82	0.00658	1.679	0.4044	0.489	0.050	0.0046	1.35	0.167	Silt	
SIC	0.40	0.01622	1.321	0.2430	0.481	0.111	0.0039	1.38	0.216	Silty Clay	
SICL	0.46	0.00839	1.521	0.3425	0.482	0.090	0.0056	1.37	0.198	Silty Clay Loam	
SIL	0.76	0.00506	1.663	0.3987	0.439	0.065	0.011	1.49	0.180	Silt Loam	
SL	1.60	0.02667	1.449	0.3099	0.387	0.039	0.030	1.62	0.103	Sandy Loam	

CAS No.	Chemical	Chemical Properties Lookup Table						Henry's Law Constants					Enthalpy of Vaporization			CalEPA Toxicity Criteria in bold (last updated 2/4/09 DTSC/HERD)				Original EPA Values			
		Organic carbon partition coefficient, K <sub>oc</sub> (cm <sup>3</sup> /g)	Diffusivity in air, D <sub>a</sub> (cm <sup>2</sup> /s)	Diffusivity in water, D <sub>w</sub> (cm <sup>2</sup> /s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm·m <sup>3</sup> /mol)	Henry's law constant reference temperature, T <sub>R</sub> (°C)	Normal boiling point, T <sub>B</sub> (°K)	Critical temperature, T <sub>C</sub> (°K)	Enthalpy of vaporization at the normal boiling point, ΔH <sub>v,b</sub> (cal/mol)	Unit risk factor, URF (μg/m <sup>3</sup> ) <sup>-1</sup>	Reference conc., RfC (mg/m <sup>3</sup> )	Molecular weight, MW (g/mol)	URF extrapolated (X)	RfC extrapolated (X)	Unit risk factor, URF (μg/m <sup>3</sup> ) <sup>-1</sup>	Reference conc., RfC (mg/m <sup>3</sup> )	URF extrapolated (X)	RfC extrapolated (X)			
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.24E+00	3.03E-02	25	349.90	556.60	7,127	<b>4.2E-05</b>	<b>4.0E-02</b>	1.54E+02			1.5E-05	0.0E+00					
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	14,000	<b>3.4E-04</b>	7.0E-04	4.10E+02			1.0E-04	7.0E-04					
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	7.30E+00	5.73E-04	1.40E-05	25	596.55	839.36	15,000	<b>3.1E-04</b>	1.1E-03	2.91E+02	?	X	3.7E-04	1.1E-03	X	X			
60297	Ethyl ether	5.73E+00	7.82E-02	8.61E-06	5.68E+04	1.35E+00	3.29E-02	25	307.50	466.74	6,338	0.0E+00	7.0E-01	7.41E+01		X	0.0E+00	7.0E-01		X			
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.18E-04	1.51E-05	25	613.32	842.25	17,000	<b>4.6E-03</b>	1.8E-04	3.81E+02		X	4.6E-03	1.8E-04		X			
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.87E-05	25	329.20	508.10	6,955	0.0E+00	<b>3.1E+01</b>	5.81E+01		X	0.0E+00	3.5E-01		X			
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	<b>5.3E-06</b>	<b>3.0E-01</b>	1.19E+02			2.3E-05	0.0E+00					
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	<b>1.1E-05</b>	3.5E-03	2.37E+02		X	4.0E-06	3.5E-03		X			
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.79E+03	2.27E-01	5.54E-03	25	353.24	562.16	7,342	<b>2.9E-05</b>	<b>3.0E-02</b>	7.81E+01			7.8E-06	0.0E+00					
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	<b>5.0E+00</b>	1.33E+02			0.0E+00	2.2E+00					
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	1.00E-01	6.46E-04	1.58E-05	25	651.02	848.49	16,000	0.0E+00	1.8E-02	3.46E+02			0.0E+00	1.8E-02		X			
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.59E-04	2.09E-05	25	636.44	860.38	15,000	<b>9.7E-05</b>	0.0E+00	3.18E+02	?		9.7E-05	0.0E+00	X				
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.55E-01	6.22E-03	25	276.71	467.00	5,714	0.0E+00	<b>5.0E-03</b>	9.49E+01			0.0E+00	5.0E-03					
74873	Methyl chloride (chloromethane)	2.12E+00	1.26E-01	6.50E-06	5.33E+03	3.61E-01	8.80E-03	25	249.00	416.25	5,115	<b>1.8E-06</b>	9.0E-02	5.05E+01			1.0E-06	9.0E-02					
74908	Hydrogen cyanide	3.80E+00	1.93E-01	2.10E-05	1.00E+06	5.44E-03	1.33E-04	25	299.00	456.70	6,676	0.0E+00	<b>3.0E-03</b>	2.70E+01			0.0E+00	3.0E-03					
74953	Methylene bromide	1.26E+01	4.30E-02	8.44E-06	1.19E+04	3.52E-02	8.59E-04	25	370.00	583.00	7,868	0.0E+00	3.5E-02	1.74E+02		X	0.0E+00	3.5E-02		X			
75003	Chloroethane (ethyl chloride)	4.40E+00	2.71E-01	1.15E-05	5.68E+03	3.61E-01	8.80E-03	25	285.30	460.40	5,879	8.3E-07	<b>1.0E+01</b>	6.45E+01	?		8.3E-07	1.0E+01	X				
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-05	8.80E+03	1.10E+00	2.69E-02	25	259.25	432.00	5,250	<b>7.8E-05</b>	1.0E-01	6.25E+01			8.8E-06	1.0E-01					
75058	Acetonitrile	4.20E+00	1.28E-01	1.66E-05	1.00E+06	1.42E-03	3.45E-05	25	354.60	545.50	7,110	0.0E+00	6.0E-02	4.11E+01			0.0E+00	6.0E-02					
75070	Acetaldehyde	1.06E+00	1.24E-01	1.41E-05	1.00E+06	3.23E-03	7.87E-05	25	293.10	466.00	6,157	<b>2.7E-06</b>	<b>9.0E-03</b>	4.41E+01			2.2E-06	9.0E-03					
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.96E-02	2.18E-03	25	313.00	510.00	6,706	<b>1.0E-06</b>	<b>4.0E-01</b>	8.49E+01			4.7E-07	3.0E+00					
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	<b>7.0E-01</b>	7.61E+01			0.0E+00	7.0E-01					
75218	Ethylene oxide	1.33E+00	1.04E-01	1.45E-05	3.04E+05	2.27E-02	5.54E-04	25	283.60	469.00	6,104	<b>8.8E-05</b>	<b>3.0E-02</b>	4.41E+01			1.0E-04	0.0E+00					
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.41E-02	5.88E-04	25	422.35	696.00	9,479	1.1E-06	7.0E-02	2.53E+02		X	1.1E-06	7.0E-02		X			
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.54E-02	1.60E-03	25	363.15	585.85	7,800	<b>3.7E-05</b>	7.0E-02	1.64E+02	?	X	1.8E-05	7.0E-02	X	X			
75296	2-Chloropropane	9.14E+00	8.88E-02	1.01E-05	3.73E+03	5.93E-01	1.45E-02	25	308.70	485.00	6,286	0.0E+00	1.0E-01	7.85E+01		?	0.0E+00	1.0E-01					
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	<b>1.6E-06</b>	<b>7.0E-01</b>	9.90E+01		X	0.0E+00	5.0E-01					
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.60E-02	25	304.75	576.05	6,247	0.0E+00	<b>7.0E-02</b>	9.69E+01			0.0E+00	2.0E-01					
75456	Chlorodifluoromethane	4.79E+01	1.01E-01	1.28E-05	2.00E+00	1.10E+00	2.70E-02	25	232.40	369.30	4,836	0.0E+00	5.0E+01	8.65E+01			0.0E+00	5.0E+01					
75694	Trichlorofluoromethane	4.97E+02	8.70E-02	9.70E-06	1.10E+03	3.97E+00	9.68E-02	25	296.70	471.00	5,999	0.0E+00	7.0E-01	1.37E+02			0.0E+00	7.0E-01					
75718	Dichlorodifluoromethane	4.57E+02	6.65E-02	9.92E-06	2.80E+02	1.40E+01	3.42E-01	25	243.20	384.95	9,421	0.0E+00	2.0E-01	1.21E+02			0.0E+00	2.0E-01					
76131	1,1,2-Trichloro-1,2,2-trifluoroethane	1.11E+04	7.80E-02	8.20E-06	1.70E+02	1.97E+01	4.80E-01	25	320.70	487.30	6,463	0.0E+00	3.0E+01	1.87E+02			0.0E+00	3.0E+01					
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	6.05E+01	1.48E+00	25	603.69	846.31	13,000	<b>1.2E-03</b>	1.8E-03	3.73E+02		X	1.3E-03	1.8E-03		X			
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.10E+00	2.69E-02	25	512.15	746.00	10,931	0.0E+00	2.0E-04	2.73E+02			0.0E+00	2.0E-04					
78831	Isobutanol	2.59E+00	8.60E-02	9.30E-06	8.50E+04	4.83E-04	1.18E-05	25	381.04	547.78	10,936	0.0E+00	1.1E+00	7.41E+01		X	0.0E+00	1.1E+00		X			
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.79E-03	25	369.52	572.00	7,590	<b>1.0E-05</b>	4.0E-03	1.13E+02	?		1.9E-05	4.0E-03	X				
78933	Methylethylketone (2-butanone)	2.30E+00	8.08E-02	9.80E-06	2.23E+05	2.29E-03	5.58E-05	25	352.50	536.78	7,481	0.0E+00	5.0E+00	7.21E+01			0.0E+00	1.0E+00					
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.73E-02	9.11E-04	25	386.15	602.00	8,322	<b>1.6E-05</b>	1.4E-02	1.33E+02		X	1.6E-05	1.4E-02		X			
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.47E+03	4.21E-01	1.03E-02	25	360.36	544.20	7,505	<b>2.0E-06</b>	<b>6.0E-01</b>	1.31E+02	?		1.1E-04	4.0E-02	X				
79209	Methyl acetate	3.26E+00	1.04E-01	1.00E-05	2.00E+03	4.84E-03	1.18E-04	25	329.80	506.70	7,260	0.0E+00	3.5E+00	7.41E+01		X	0.0E+00	3.5E+00		X			
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.96E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	<b>5.8E-05</b>	<b>1.4E-02</b>	1.68E+02		X	5.8E-05	2.1E-01		X			
79469	2-Nitropropane	1.17E+01	9.23E-02	1.01E-05	1.70E+04	5.03E-03	1.23E-04	25	393.20	594.00	8,383	2.7E-03	2.0E-02	8.91E+01			2.7E-03	2.0E-02					
80626	Methylmethacrylate	6.98E+00	7.70E-02	8.60E-06	1.50E+04	1.38E-02	3.36E-04	25	373.50	567.00	8,975	0.0E+00	7.0E-01	1.00E+02			0.0E+00	7.0E-01					
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	3.57E+00	6.34E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01	1.54E+02		X	0.0E+00	2.1E-01		X			
86737	Fluorene	1.38E+04	3.63E-02	7.88E-06	1.98E+00	2.60E-03	6.34E-05	25	570.44	870.00	12,666	0.0E+00	1.4E-01	1.66E+02		X	0.0E+00	1.4E-01		X			
87683	Hexachloro-1,3-butadiene	5.37E+04	5.61E-02	6.16E-06	3.20E+00																		

VLOOKUP TABLES

Chemical Properties Lookup Table																	CalEPA Toxicity Criteria in bold (last updated 2/4/09 DTSC/HERD)			
CAS No.	Chemical	Organic carbon partition coefficient, $K_{oc}$ ( $cm^3/g$ )	Diffusivity in air, $D_a$ ( $cm^2/s$ )	Diffusivity in water, $D_w$ ( $cm^2/s$ )	Pure component water solubility, $S$ (mg/L)	Henry's law constant $H'$ (unitless)	Henry's law constant at reference temperature, $H$ ( $atm \cdot m^3/mol$ )	Henry's law constant reference temperature, $T_R$ ( $^{\circ}C$ )	Normal boiling point, $T_B$ ( $^{\circ}K$ )	Critical temperature, $T_C$ ( $^{\circ}K$ )	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ( $\mu g/m^3$ ) <sup>-1</sup>	Reference conc., RfC ( $mg/m^3$ )	Molecular weight, MW (g/mol)	URF extrapolated (X)	RfC extrapolated (X)	Unit risk factor, URF ( $\mu g/m^3$ ) <sup>-1</sup>	Reference conc., RfC ( $mg/m^3$ )	URF extrapolated (X)	RfC extrapolated (X)
95501	1,2-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	1.56E+02	7.77E-02	1.90E-03	25	453.57	705.00	9,700	0.0E+00	2.0E-01	1.47E+02			0.0E+00	2.0E-01		
95578	2-Chlorophenol	3.88E+02	5.01E-02	9.46E-06	2.20E+04	1.60E-02	3.90E-04	25	447.53	675.00	9,572	0.0E+00	1.8E-02	1.29E+02		X	0.0E+00	1.8E-02		X
95636	1,2,4-Trimethylbenzene	1.35E+03	6.06E-02	7.92E-06	5.70E+01	2.52E-01	6.14E-03	25	442.30	649.17	9,369	0.0E+00	<b>7.0E-03</b>	1.20E+02			0.0E+00	6.0E-03		
96184	<b>1,2,3-Trichloropropane</b>	2.20E+01	7.10E-02	7.90E-06	1.75E+03	1.67E-02	4.08E-04	25	430.00	652.00	9,171	<b>2.0E-03</b>	<b>2.1E-02</b>	1.47E+02	X	X	5.7E-04	4.9E-03	X	
96333	Methyl acrylate	4.53E+00	9.76E-02	1.02E-05	6.00E+04	7.68E-03	1.87E-04	25	353.70	536.00	7,749	0.0E+00	1.1E-01	8.61E+01		X	0.0E+00	1.1E-01		X
97632	Ethylmethacrylate	2.95E+01	6.53E-02	8.37E-06	3.67E+03	3.44E-02	8.40E-04	25	390.00	571.00	10,957	0.0E+00	3.2E-01	1.14E+02		X	0.0E+00	3.2E-01		X
98066	tert-Butylbenzene	7.71E+02	5.65E-02	8.02E-06	2.95E+01	4.87E-01	1.19E-02	25	442.10	1220.00	8,980	0.0E+00	1.4E-01	1.34E+02		X	0.0E+00	1.4E-01		X
98828	Cumene	4.89E+02	6.50E-02	7.10E-06	6.13E+01	4.74E+01	1.16E+00	25	425.56	631.10	10,335	0.0E+00	4.0E-01	1.20E+02			0.0E+00	4.0E-01		
98862	Acetophenone	5.77E+01	6.00E-02	8.73E-06	6.13E+03	4.38E-04	1.07E-05	25	475.00	709.50	11,732	0.0E+00	3.5E-01	1.20E+02		X	0.0E+00	3.5E-01		X
98953	Nitrobenzene	6.46E+01	7.60E-02	8.60E-06	2.09E+03	9.82E-04	2.39E-05	25	483.95	719.00	10,566	0.0E+00	2.0E-03	1.23E+02			0.0E+00	2.0E-03		
100414	<b>Ethylbenzene</b>	3.63E+02	7.50E-02	7.80E-06	1.69E+02	3.22E-01	7.86E-03	25	409.34	617.20	8,501	<b>2.5E-06</b>	<b>1.0E+00</b>	1.06E+02			0.0E+00	1.0E+00		
100425	Styrene	7.76E+02	7.10E-02	8.00E-06	3.10E+02	1.12E-01	2.74E-03	25	418.31	636.00	8,737	0.0E+00	<b>9.0E-01</b>	1.04E+02			0.0E+00	1.0E+00		
100447	<b>Benzylchloride</b>	6.14E+01	7.50E-02	7.80E-06	5.25E+02	1.70E-02	4.14E-04	25	452.00	685.00	8,773	<b>4.9E-05</b>	<b>1.0E-03</b>	1.27E+02	?		4.9E-05	0.0E+00	X	
100527	Benzaldehyde	4.59E+01	7.21E-02	9.07E-06	3.30E+03	9.73E-04	2.37E-05	25	452.00	695.00	11,658	0.0E+00	3.5E-01	1.06E+02		X	0.0E+00	3.5E-01		X
103651	n-Propylbenzene	5.62E+02	6.01E-02	7.83E-06	6.00E+01	4.37E-01	1.07E-02	25	432.20	630.00	9,123	0.0E+00	1.4E-01	1.20E+02		X	0.0E+00	1.4E-01		X
104518	n-Butylbenzene	1.11E+03	5.70E-02	8.12E-06	2.00E+00	5.38E-01	1.31E-02	25	456.46	660.50	9,290	0.0E+00	1.4E-01	1.34E+02		X	0.0E+00	1.4E-01		X
106423	p-Xylene	3.89E+02	7.69E-02	8.44E-06	1.85E+02	3.13E-01	7.64E-03	25	411.52	616.20	8,525	0.0E+00	<b>1.0E-01</b>	1.06E+02		?	0.0E+00	1.0E-01		
106467	<b>1,4-Dichlorobenzene</b>	6.17E+02	6.90E-02	7.90E-06	7.90E+01	9.82E-02	2.39E-03	25	447.21	684.75	9,271	<b>1.1E-05</b>	<b>8.0E-01</b>	1.47E+02			0.0E+00	8.0E-01		
106934	<b>1,2-Dibromoethane (ethylene dibr</b>	2.50E+01	2.17E-02	1.19E-05	4.18E+03	3.04E-02	7.41E-04	25	404.60	583.00	8,310	<b>7.1E-05</b>	<b>8.0E-04</b>	1.88E+02			6.0E-04	9.0E-03		
106990	<b>1,3-Butadiene</b>	1.91E+01	2.49E-01	1.08E-05	7.35E+02	3.01E+00	7.34E-02	25	268.60	425.00	5,370	<b>1.7E-04</b>	<b>2.0E-03</b>	5.41E+01			3.0E-05	0.0E+00		
107028	Acrolein	2.76E+00	1.05E-01	1.22E-05	2.13E+05	4.99E-03	1.22E-04	25	325.60	506.00	6,731	0.0E+00	<b>2.0E-05</b>	5.61E+01			0.0E+00	2.0E-05		
107062	<b>1,2-Dichloroethane</b>	1.74E+01	1.04E-01	9.90E-06	8.52E+03	4.00E-02	9.77E-04	25	356.65	561.00	7,643	<b>2.1E-05</b>	<b>4.0E-01</b>	9.90E+01			2.6E-05	0.0E+00		
107131	Acrylonitrile	5.90E+00	1.22E-01	1.34E-05	7.40E+04	4.21E-03	1.03E-04	25	350.30	519.00	7,786	<b>2.9E-04</b>	<b>2.0E-03</b>	5.31E+01			6.8E-05	2.0E-03		
108054	Vinyl acetate	5.25E+00	8.50E-02	9.20E-06	2.00E+04	2.09E-02	5.10E-04	25	345.65	519.13	7,800	0.0E+00	<b>2.0E-01</b>	8.61E+01			0.0E+00	2.0E-01		
108101	Methylisobutylketone (4-methyl-2- <b>i</b>	9.06E+00	7.50E-02	7.80E-06	1.90E+04	5.64E-03	1.38E-04	25	389.50	571.00	8,243	0.0E+00	<b>3.0E+00</b>	1.00E+02			0.0E+00	8.0E-02		
108383	m-Xylene	4.07E+02	7.00E-02	7.80E-06	1.61E+02	3.00E-01	7.32E-03	25	412.27	617.05	8,523	0.0E+00	<b>1.0E-01</b>	1.06E+02		?	0.0E+00	1.0E-01		
108678	1,3,5-Trimethylbenzene	1.35E+03	6.02E-02	8.67E-06	2.00E+00	2.41E-01	5.87E-03	25	437.89	637.25	9,321	0.0E+00	6.0E-03	1.20E+02			0.0E+00	6.0E-03		
108872	Methylcyclohexane	7.85E+01	7.35E-02	8.52E-06	1.40E+01	4.22E+00	1.03E-01	25	373.90	572.20	7,474	0.0E+00	3.0E+00	9.82E+01		?	0.0E+00	3.0E+00		
108883	Toluene	1.82E+02	8.70E-02	8.60E-06	5.26E+02	2.72E-01	6.62E-03	25	383.78	591.79	7,930	0.0E+00	<b>3.0E-01</b>	9.21E+01			0.0E+00	4.0E-01		
108907	Chlorobenzene	2.19E+02	7.30E-02	8.70E-06	4.72E+02	1.51E-01	3.69E-03	25	404.87	632.40	8,410	0.0E+00	<b>1.0E+00</b>	1.13E+02			0.0E+00	6.0E-02		
109693	1-Chlorobutane	1.72E+01	8.26E-02	1.00E-05	1.10E+03	6.93E-01	1.69E-02	25	351.60	542.00	7,263	0.0E+00	<b>1.4E-01</b>	9.26E+01		X	0.0E+00	1.4E+00		X
110009	Furan	1.86E+01	1.04E-01	1.22E-05	1.00E+04	2.21E-01	5.39E-03	25	304.60	490.20	6,477	0.0E+00	3.5E-03	6.81E+01		X	0.0E+00	3.5E-03		X
110543	Hexane	4.34E+01	2.00E-01	7.77E-06	1.24E+01	6.82E+01	1.66E+00	25	341.70	508.00	6,895	0.0E+00	<b>7.0E-01</b>	8.62E+01			0.0E+00	2.0E-01		
111444	<b>Bis(2-chloroethyl)ether</b>	1.55E+01	6.92E-02	7.53E-06	1.72E+04	7.36E-04	1.80E-05	25	451.15	659.79	10,803	<b>7.1E-04</b>	0.0E+00	1.43E+02			3.3E-04	0.0E+00		
115297	Endosulfan	2.14E+03	1.15E-02	4.55E-06	5.10E-01	4.58E-04	1.12E-05	25	674.43	942.94	14,000	0.0E+00	2.1E-02	4.07E+02		X	0.0E+00	2.1E-02		X
118741	<b>Hexachlorobenzene</b>	5.50E+04	5.42E-02	5.91E-06	5.00E-03	5.40E-02	1.32E-03	25	582.55	825.00	14,447	<b>5.1E-04</b>	2.8E-03	2.85E+02		X	4.6E-04	2.8E-03		X
120821	1,2,4-Trichlorobenzene	1.78E+03	3.00E-02	8.23E-06	4.88E+01	5.81E-02	1.42E-03	25	486.15	725.00	10,471	<b>0.0E+00</b>	<b>4.0E-03</b>	1.81E+02			0.0E+00	2.0E-01		
123739	<b>Crotonaldehyde (2-butenal)</b>	4.82E+00	9.56E-02	1.07E-05	3.69E+04	7.99E-04	1.95E-05	25	375.20	568.00	9	5.4E-04	0.0E+00	7.01E+01	X		5.4E-04	0.0E+00	X	
124481	<b>Chlorodibromomethane</b>	6.31E+01	1.96E-02	1.05E-05	2.60E+03	3.20E-02	7.81E-04	25	416.14	678.20	5,900	<b>2.7E-05</b>	7.0E-02	2.08E+02	?	X	2.4E-05	7.0E-02	X	X
126987	Methacrylonitrile	3.58E+01	1.12E-01	1.32E-05	2.54E+04	1.01E-02	2.46E-04	25	363.30	554.00	7,600	0.0E+00	7.0E-04	6.71E+01			0.0E+00	7.0E-04		
126998	2-Chloro-1,3-butadiene (chloropre	6.73E+01	8.58E-02	1.03E-05	2.12E+03	4.91E-01	1.20E-02	25	332.40	525.00	8,075	0.0E+00	7.0E-03	8.85E+01			0.0E+00	7.0E-03		
127184	<b>Tetrachloroethylene</b>	1.55E+02	7.20E-02	8.20E-06	2.00E+02	7.53E-01	1.84E-02	25	394.40	620.20	8,288	<b>5.9E-06</b>	<b>3.5E-02</b>	1.66E+02			3.0E-06	0.0E+00		
129000	Pyrene	1.05E+05	2.72E-02	7.24E-06	1.35E+00	4.50E-04	1.10E-05	25	667.95	936	14370	0.0E+00	1.1E-01	2.02E+02		X	0.0E+00	1.1E-01		X
132649	Dibenzofuran	5.15E+03	2.38E-02	6.00E-06	3.10E+00	5.15E-04	1.26E-05	25	560	824	66400	0.0E+00	1.4E-02	1.68E+02		X	0.0E+00	1.4E-02		X
135988	sec-Butylbenzene	9.66E+02	5.70E-02	8.12E-06	3.94E+00	5.68E-01	1.39E-02	25	446.5	679	88730	0.0E+00	1.4E-01	1.34E+02		X	0.0E+00	1.4E-01		X
141786	Ethylacetate	6.44E+00	7.32E-02	9.70E-06	8.03E+04	5.64E-03	1.38E-04	25	350.26	523.3	7633.66	0.0E+00	3.2E+00	8.81E+01		X	0.0E+00	3.2E+00		X
156592	cis-1,2-Dichloroethylene	3.55E+01	7.36E-02	1.13E-05	3.50E+03	1.67E-01	4.07E-03	25	333.65	544	7192	0.0E+00	3.5E-02	9.69E+01		X	0.0E+00	3.5E-02		X
156605	trans-1,2-Dichloroethylene	5.25E+01	7.07E-02	1.19E-05	6.30E+03	3.84E-01	9.36E-03	25	320.85	516.5	6717	0.0E+00	<b>6.0E-02</b>	9.69E+01		X	0.0E+00	7.0E-02		X
205992	<b>Benzo(b)fluoranthene</b>	1.23E+06	2.26E-02	5.56E-06	1.50E-03	4.54E-03	1.11E-04	25	715.9	969.27	17000	<b>1.1E-04</b>	0.0E+00	2.52E+02	?		2.1E-04	0.0E+00	X	
218019	<b>Chrysene</b>	3.98E+05	2.48E-02	6.21E-06	6.30E-03	3.87E-03	9.44E-05	25	714.15	979	16455	<b>1.1E-05</b>	0.0E+00	2.28E+02	?		2.1E-06	0.0E+00	X	
309002	<b>Aldrin</b>	2.45E+06	1.32E-02	4.86E-06	1.70E-02	6.95E-03	1.70E-04	25	603.01	839.37	15000	<b>4.9E-03</b>	1.1E-04	3.65E+02		X	4.9E-03	1.1E-04		X
319846	<b>alpha-HCH (alpha-BHC)</b>	1.23E+03	1.42E-02	7.34E-06	2.00E+00	4.34E-04	1.06E-05	25	596.55	839.36	15000	<b>7.7E-04</b>								

DATA ENTRY SHEET

Table A-11. Maximum Xylenes Soil Vapor Concentration

DTSC  
Vapor Intrusion Guidance  
Interim Final 12/04  
(last modified 2/4/09)

SG-SCREEN  
PA Version 2.0; 04/

Reset to Defaults

Soil Gas Concentration Data				
ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., $C_g$ ( $\mu\text{g}/\text{m}^3$ )	OR	ENTER Soil gas conc., $C_g$ (ppmv)	Chemical
106423	5.00E+03			p-Xylene

MORE  
↓

ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (15 or 200 cm)	ENTER Soil gas sampling depth below grade, $L_s$ (cm)	ENTER Average soil temperature, $T_s$ ( $^{\circ}\text{C}$ )	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, $k_v$ ( $\text{cm}^2$ )
15	152.4	24	S		

MORE  
↓

ENTER Vadose zone SCS soil type Lookup Soil Parameters	ENTER Vadose zone soil dry bulk density, $\rho_b^A$ ( $\text{g}/\text{cm}^3$ )	ENTER Vadose zone soil total porosity, $n^V$ (unitless)	ENTER Vadose zone soil water-filled porosity, $\theta_w^V$ ( $\text{cm}^3/\text{cm}^3$ )	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) $Q_{\text{soil}}$ (L/m)
S	1.83	0.324	0.279	5

MORE  
↓

ENTER Averaging time for carcinogens, $AT_C$ (yrs)	ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	25	25	250

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, $D_a$ ( $\text{cm}^2/\text{s}$ )	Diffusivity in water, $D_w$ ( $\text{cm}^2/\text{s}$ )	Henry's law constant at reference temperature, H ( $\text{atm}\cdot\text{m}^3/\text{mol}$ )	Henry's law constant reference temperature, $T_R$ ( $^\circ\text{C}$ )	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ ( $\text{cal}/\text{mol}$ )	Normal boiling point, $T_B$ ( $^\circ\text{K}$ )	Critical temperature, $T_C$ ( $^\circ\text{K}$ )	Unit risk factor, URF ( $\mu\text{g}/\text{m}^3$ ) <sup>-1</sup>	Reference conc., RfC ( $\text{mg}/\text{m}^3$ )	Molecular weight, MW ( $\text{g}/\text{mol}$ )
7.69E-02	8.44E-06	7.64E-03	25	8,525	411.52	616.20	0.0E+00	1.0E-01	106.17

END

INTERMEDIATE CALCULATIONS SHEET

**Table A-12. Maximum Xylenes Soil Vapor Concentration**

Source-building separation, $L_T$ (cm)	Vadose zone soil air-filled porosity, $\theta_a^v$ (cm <sup>3</sup> /cm <sup>3</sup> )	Vadose zone effective total fluid saturation, $S_{te}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Vadose zone soil intrinsic permeability, $k_i$ (cm <sup>2</sup> )	Vadose zone soil relative air permeability, $k_{rg}$ (cm <sup>2</sup> )	Vadose zone soil effective vapor permeability, $k_v$ (cm <sup>2</sup> )	Floor-wall seam perimeter, $X_{crack}$ (cm)	Soil gas conc., ( $\mu\text{g}/\text{m}^3$ )	Bldg. ventilation rate, $Q_{building}$ (cm <sup>3</sup> /s)
137.4	0.045	0.834	1.02E-07	0.055	5.62E-09	4,000	5.00E+03	3.39E+04

Area of enclosed space below grade, $A_B$ (cm <sup>2</sup> )	Crack-to-total area ratio, $\eta$ (unitless)	Crack depth below grade, $Z_{crack}$ (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, $H_{TS}$ (atm·m <sup>3</sup> /mol)	Henry's law constant at ave. soil temperature, $H'_{TS}$ (unitless)	Vapor viscosity at ave. soil temperature, $\mu_{TS}$ (g/cm-s)	Vadose zone effective diffusion coefficient, $D_v^{eff}$ (cm <sup>2</sup> /s)	Diffusion path length, $L_d$ (cm)
1.00E+06	5.00E-03	15	10,083	7.22E-03	2.96E-01	1.80E-04	2.79E-05	137.4

Convection path length, $L_p$ (cm)	Source vapor conc., $C_{source}$ ( $\mu\text{g}/\text{m}^3$ )	Crack radius, $r_{crack}$ (cm)	Average vapor flow rate into bldg., $Q_{soil}$ (cm <sup>3</sup> /s)	Crack effective diffusion coefficient, $D^{crack}$ (cm <sup>2</sup> /s)	Area of crack, $A_{crack}$ (cm <sup>2</sup> )	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, $\alpha$ (unitless)	Infinite source bldg. conc., $C_{building}$ ( $\mu\text{g}/\text{m}^3$ )
15	5.00E+03	1.25	8.33E+01	2.79E-05	5.00E+03	#NUM!	5.97E-06	2.98E-02

Unit risk factor, URF ( $\mu\text{g}/\text{m}^3$ ) <sup>-1</sup>	Reference conc., RFC (mg/m <sup>3</sup> )
NA	1.0E-01

**END**



RESULTS SHEET

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
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NA	2.0E-04
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MESSAGE SUMMARY BELOW:

END

VLOOKUP TABLES

SCS Soil Type	Soil Properties Lookup Table						Bulk Density				
	K <sub>s</sub> (cm/h)	α <sub>1</sub> (1/cm)	N (unitless)	M (unitless)	n (cm <sup>3</sup> /cm <sup>3</sup> )	θ <sub>r</sub> (cm <sup>3</sup> /cm <sup>3</sup> )	Mean Grain Diameter (cm)	(g/cm <sup>3</sup> )	θ <sub>w</sub> (cm <sup>3</sup> /cm <sup>3</sup> )	SCS Soil Name	
C	0.61	0.01496	1.253	0.2019	0.459	0.098	0.0092	1.43	0.215	Clay	
CL	0.34	0.01581	1.416	0.2938	0.442	0.079	0.016	1.48	0.168	Clay Loam	
L	0.50	0.01112	1.472	0.3207	0.399	0.061	0.020	1.59	0.148	Loam	
LS	4.38	0.03475	1.746	0.4273	0.390	0.049	0.040	1.62	0.076	Loamy Sand	
S	26.78	0.03524	3.177	0.6852	0.375	0.053	0.044	1.66	0.054	Sand	
SC	0.47	0.03342	1.208	0.1722	0.385	0.117	0.025	1.63	0.197	Sandy Clay	
SCL	0.55	0.02109	1.330	0.2481	0.384	0.063	0.029	1.63	0.146	Sandy Clay Loam	
SI	1.82	0.00658	1.679	0.4044	0.489	0.050	0.0046	1.35	0.167	Silt	
SIC	0.40	0.01622	1.321	0.2430	0.481	0.111	0.0039	1.38	0.216	Silty Clay	
SICL	0.46	0.00839	1.521	0.3425	0.482	0.090	0.0056	1.37	0.198	Silty Clay Loam	
SIL	0.76	0.00506	1.663	0.3987	0.439	0.065	0.011	1.49	0.180	Silt Loam	
SL	1.60	0.02667	1.449	0.3099	0.387	0.039	0.030	1.62	0.103	Sandy Loam	

CAS No.	Chemical	Chemical Properties Lookup Table						Henry's Law Constants					Enthalpy of Vaporization				CalEPA Toxicity Criteria in bold (last updated 2/4/09 DTSC/HERD)				Original EPA Values			
		Organic carbon partition coefficient, K <sub>oc</sub> (cm <sup>3</sup> /g)	Diffusivity in air, D <sub>a</sub> (cm <sup>2</sup> /s)	Diffusivity in water, D <sub>w</sub> (cm <sup>2</sup> /s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m <sup>3</sup> /mol)	Henry's law constant reference temperature, T <sub>R</sub> (°C)	Normal boiling point, T <sub>B</sub> (°K)	Critical temperature, T <sub>C</sub> (°K)	Enthalpy of vaporization at the normal boiling point, ΔH <sub>v,b</sub> (cal/mol)	Unit risk factor, URF (μg/m <sup>3</sup> ) <sup>-1</sup>	Reference conc., RfC (mg/m <sup>3</sup> )	Molecular weight, MW (g/mol)	URF extrapolated (X)	RfC extrapolated (X)	Unit risk factor, URF (μg/m <sup>3</sup> ) <sup>-1</sup>	Reference conc., RfC (mg/m <sup>3</sup> )	URF extrapolated (X)	RfC extrapolated (X)				
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.24E+00	3.03E-02	25	349.90	556.60	7,127	<b>4.2E-05</b>	<b>4.0E-02</b>	1.54E+02			1.5E-05	0.0E+00						
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	14,000	<b>3.4E-04</b>	7.0E-04	4.10E+02			1.0E-04	7.0E-04						
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	7.30E+00	5.73E-04	1.40E-05	25	596.55	839.36	15,000	<b>3.1E-04</b>	1.1E-03	2.91E+02	?	X	3.7E-04	1.1E-03	X	X				
60297	Ethyl ether	5.73E+00	7.82E-02	8.61E-06	5.68E+04	1.35E+00	3.29E-02	25	307.50	466.74	6,338	0.0E+00	7.0E-01	7.41E+01		X	0.0E+00	7.0E-01		X				
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.18E-04	1.51E-05	25	613.32	842.25	17,000	<b>4.6E-03</b>	1.8E-04	3.81E+02		X	4.6E-03	1.8E-04		X				
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.87E-05	25	329.20	508.10	6,955	0.0E+00	<b>3.1E+01</b>	5.81E+01		X	0.0E+00	3.5E-01		X				
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	<b>5.3E-06</b>	<b>3.0E-01</b>	1.19E+02			2.3E-05	0.0E+00						
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	<b>1.1E-05</b>	3.5E-03	2.37E+02		X	4.0E-06	3.5E-03		X				
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.79E+03	2.27E-01	5.54E-03	25	353.24	562.16	7,342	<b>2.9E-05</b>	<b>3.0E-02</b>	7.81E+01			7.8E-06	0.0E+00						
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	<b>5.0E+00</b>	1.33E+02			0.0E+00	2.2E+00						
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	1.00E-01	6.46E-04	1.58E-05	25	651.02	848.49	16,000	0.0E+00	1.8E-02	3.46E+02			0.0E+00	1.8E-02		X				
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.59E-04	2.09E-05	25	636.44	860.38	15,000	<b>9.7E-05</b>	0.0E+00	3.18E+02	?		9.7E-05	0.0E+00	X					
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.55E-01	6.22E-03	25	276.71	467.00	5,714	0.0E+00	<b>5.0E-03</b>	9.49E+01			0.0E+00	5.0E-03						
74873	Methyl chloride (chloromethane)	2.12E+00	1.26E-01	6.50E-06	5.33E+03	3.61E-01	8.80E-03	25	249.00	416.25	5,115	<b>1.8E-06</b>	9.0E-02	5.05E+01			1.0E-06	9.0E-02						
74908	Hydrogen cyanide	3.80E+00	1.93E-01	2.10E-05	1.00E+06	5.44E-03	1.33E-04	25	299.00	456.70	6,676	0.0E+00	<b>3.0E-03</b>	2.70E+01			0.0E+00	3.0E-03						
74953	Methylene bromide	1.26E+01	4.30E-02	8.44E-06	1.19E+04	3.52E-02	8.59E-04	25	370.00	583.00	7,868	0.0E+00	3.5E-02	1.74E+02		X	0.0E+00	3.5E-02		X				
75003	Chloroethane (ethyl chloride)	4.40E+00	2.71E-01	1.15E-05	5.68E+03	3.61E-01	8.80E-03	25	285.30	460.40	5,879	8.3E-07	<b>1.0E+01</b>	6.45E+01	?		8.3E-07	1.0E+01	X					
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-05	8.80E+03	1.10E+00	2.69E-02	25	259.25	432.00	5,250	<b>7.8E-05</b>	1.0E-01	6.25E+01			8.8E-06	1.0E-01						
75058	Acetonitrile	4.20E+00	1.28E-01	1.66E-05	1.00E+06	1.42E-03	3.45E-05	25	354.60	545.50	7,110	0.0E+00	6.0E-02	4.11E+01			0.0E+00	6.0E-02						
75070	Acetaldehyde	1.06E+00	1.24E-01	1.41E-05	1.00E+06	3.23E-03	7.87E-05	25	293.10	466.00	6,157	<b>2.7E-06</b>	<b>9.0E-03</b>	4.41E+01			2.2E-06	9.0E-03						
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.96E-02	2.18E-03	25	313.00	510.00	6,706	<b>1.0E-06</b>	<b>4.0E-01</b>	8.49E+01			4.7E-07	3.0E+00						
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	<b>7.0E-01</b>	7.61E+01			0.0E+00	7.0E-01						
75218	Ethylene oxide	1.33E+00	1.04E-01	1.45E-05	3.04E+05	2.27E-02	5.54E-04	25	283.60	469.00	6,104	<b>8.8E-05</b>	<b>3.0E-02</b>	4.41E+01			1.0E-04	0.0E+00						
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.41E-02	5.88E-04	25	422.35	696.00	9,479	1.1E-06	7.0E-02	2.53E+02		X	1.1E-06	7.0E-02		X				
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.54E-02	1.60E-03	25	363.15	585.85	7,800	<b>3.7E-05</b>	7.0E-02	1.64E+02	?	X	1.8E-05	7.0E-02	X	X				
75296	2-Chloropropane	9.14E+00	8.88E-02	1.01E-05	3.73E+03	5.93E-01	1.45E-02	25	308.70	485.00	6,286	0.0E+00	1.0E-01	7.85E+01		?	0.0E+00	1.0E-01						
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	<b>1.6E-06</b>	<b>7.0E-01</b>	9.90E+01		X	0.0E+00	5.0E-01						
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.60E-02	25	304.75	576.05	6,247	0.0E+00	<b>7.0E-02</b>	9.69E+01			0.0E+00	2.0E-01						
75456	Chlorodifluoromethane	4.79E+01	1.01E-01	1.28E-05	2.00E+00	1.10E+00	2.70E-02	25	232.40	369.30	4,836	0.0E+00	5.0E+01	8.65E+01			0.0E+00	5.0E+01						
75694	Trichlorofluoromethane	4.97E+02	8.70E-02	9.70E-06	1.10E+03	3.97E+00	9.68E-02	25	296.70	471.00	5,999	0.0E+00	7.0E-01	1.37E+02			0.0E+00	7.0E-01						
75718	Dichlorodifluoromethane	4.57E+02	6.65E-02	9.92E-06	2.80E+02	1.40E+01	3.42E-01	25	243.20	384.95	9,421	0.0E+00	2.0E-01	1.21E+02			0.0E+00	2.0E-01						
76131	1,1,2-Trichloro-1,2,2-trifluoroethane	1.11E+04	7.80E-02	8.20E-06	1.70E+02	1.97E+01	4.80E-01	25	320.70	487.30	6,463	0.0E+00	3.0E+01	1.87E+02			0.0E+00	3.0E+01						
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	6.05E+01	1.48E+00	25	603.69	846.31	13,000	<b>1.2E-03</b>	1.8E-03	3.73E+02		X	1.3E-03	1.8E-03		X				
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.10E+00	2.69E-02	25	512.15	746.00	10,931	0.0E+00	2.0E-04	2.73E+02			0.0E+00	2.0E-04						
78831	Isobutanol	2.59E+00	8.60E-02	9.30E-06	8.50E+04	4.83E-04	1.18E-05	25	381.04	547.78	10,936	0.0E+00	1.1E+00	7.41E+01		X	0.0E+00	1.1E+00		X				
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.79E-03	25	369.52	572.00	7,590	<b>1.0E-05</b>	4.0E-03	1.13E+02	?		1.9E-05	4.0E-03	X					
78933	Methylethylketone (2-butanone)	2.30E+00	8.08E-02	9.80E-06	2.23E+05	2.29E-03	5.58E-05	25	352.50	536.78	7,481	0.0E+00	5.0E+00	7.21E+01			0.0E+00	1.0E+00						
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.73E-02	9.11E-04	25	386.15	602.00	8,322	<b>1.6E-05</b>	1.4E-02	1.33E+02		X	1.6E-05	1.4E-02		X				
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.47E+03	4.21E-01	1.03E-02	25	360.36	544.20	7,505	<b>2.0E-06</b>	<b>6.0E-01</b>	1.31E+02	?		1.1E-04	4.0E-02	X					
79209	Methyl acetate	3.26E+00	1.04E-01	1.00E-05	2.00E+03	4.84E-03	1.18E-04	25	329.80	506.70	7,260	0.0E+00	3.5E+00	7.41E+01		X	0.0E+00	3.5E+00		X				
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.96E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	<b>5.8E-05</b>	<b>1.4E-02</b>	1.68E+02		X	5.8E-05	2.1E-01		X				
79469	2-Nitropropane	1.17E+01	9.23E-02	1.01E-05	1.70E+04	5.03E-03	1.23E-04	25	393.20	594.00	8,383	2.7E-03	2.0E-02	8.91E+01			2.7E-03	2.0E-02						
80626	Methylmethacrylate	6.98E+00	7.70E-02	8.60E-06	1.50E+04	1.38E-02	3.36E-04	25	373.50	567.00	8,975	0.0E+00	7.0E-01	1.00E+02			0.0E+00	7.0E-01						
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	3.57E+00	6.34E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01	1.54E+02		X	0.0E+00	2.1E-01		X				
86737	Fluorene	1.38E+04	3.63E-02	7.88E-06	1.98E+00	2.60E-03	6.34E-05	25	570.44	870.00	12,666	0.0E+00	1.4E-01	1.66E+02		X	0.0E+00	1.4E-01		X				
87683	Hexachloro-1,3-butadiene	5.37E+04	5.61E-02	6.16E-06	3.20E+00																			

VLOOKUP TABLES

Chemical Properties Lookup Table																CalEPA Toxicity Criteria in bold (last updated 2/4/09 DTSC/HERD)				
CAS No.	Chemical	Organic carbon partition coefficient, $K_{oc}$ ( $\text{cm}^3/\text{g}$ )	Diffusivity in air, $D_a$ ( $\text{cm}^2/\text{s}$ )	Diffusivity in water, $D_w$ ( $\text{cm}^2/\text{s}$ )	Pure component water solubility, $S$ ( $\text{mg}/\text{L}$ )	Henry's law constant $H'$ (unitless)	Henry's law constant at reference temperature, $H$ ( $\text{atm}\cdot\text{m}^3/\text{mol}$ )	Henry's law constant reference temperature, $T_R$ ( $^\circ\text{C}$ )	Normal boiling point, $T_B$ ( $^\circ\text{K}$ )	Critical temperature, $T_C$ ( $^\circ\text{K}$ )	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ ( $\text{cal}/\text{mol}$ )	Unit risk factor, URF	Reference conc., RfC	Molecular weight, MW	URF extrapolated (X)	RfC extrapolated (X)	Unit risk factor, URF	Reference conc., RfC	URF extrapolated (X)	RfC extrapolated (X)
												( $\mu\text{g}/\text{m}^3$ ) <sup>-1</sup>	( $\text{mg}/\text{m}^3$ )	( $\text{g}/\text{mol}$ )			( $\mu\text{g}/\text{m}^3$ ) <sup>-1</sup>	( $\text{mg}/\text{m}^3$ )		
95501	1,2-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	1.56E+02	7.77E-02	1.90E-03	25	453.57	705.00	9,700	0.0E+00	2.0E-01	1.47E+02			0.0E+00	2.0E-01		
95578	2-Chlorophenol	3.88E+02	5.01E-02	9.46E-06	2.20E+04	1.60E-02	3.90E-04	25	447.53	675.00	9,572	0.0E+00	1.8E-02	1.29E+02		X	0.0E+00	1.8E-02		X
95636	1,2,4-Trimethylbenzene	1.35E+03	6.06E-02	7.92E-06	5.70E+01	2.52E-01	6.14E-03	25	442.30	649.17	9,369	0.0E+00	<b>7.0E-03</b>	1.20E+02			0.0E+00	6.0E-03		
96184	<b>1,2,3-Trichloropropane</b>	2.20E+01	7.10E-02	7.90E-06	1.75E+03	1.67E-02	4.08E-04	25	430.00	652.00	9,171	<b>2.0E-03</b>	<b>2.1E-02</b>	1.47E+02	X	X	5.7E-04	4.9E-03	X	
96333	Methyl acrylate	4.53E+00	9.76E-02	1.02E-05	6.00E+04	7.68E-03	1.87E-04	25	353.70	536.00	7,749	0.0E+00	1.1E-01	8.61E+01		X	0.0E+00	1.1E-01		X
97632	Ethylmethacrylate	2.95E+01	6.53E-02	8.37E-06	3.67E+03	3.44E-02	8.40E-04	25	390.00	571.00	10,957	0.0E+00	3.2E-01	1.14E+02		X	0.0E+00	3.2E-01		X
98066	tert-Butylbenzene	7.71E+02	5.65E-02	8.02E-06	2.95E+01	4.87E-01	1.19E-02	25	442.10	1220.00	8,980	0.0E+00	1.4E-01	1.34E+02		X	0.0E+00	1.4E-01		X
98828	Cumene	4.89E+02	6.50E-02	7.10E-06	6.13E+01	4.74E+01	1.16E+00	25	425.56	631.10	10,335	0.0E+00	4.0E-01	1.20E+02			0.0E+00	4.0E-01		
98862	Acetophenone	5.77E+01	6.00E-02	8.73E-06	6.13E+03	4.38E-04	1.07E-05	25	475.00	709.50	11,732	0.0E+00	3.5E-01	1.20E+02		X	0.0E+00	3.5E-01		X
98953	Nitrobenzene	6.46E+01	7.60E-02	8.60E-06	2.09E+03	9.82E-04	2.39E-05	25	483.95	719.00	10,566	0.0E+00	2.0E-03	1.23E+02			0.0E+00	2.0E-03		
100414	<b>Ethylbenzene</b>	3.63E+02	7.50E-02	7.80E-06	1.69E+02	3.22E-01	7.86E-03	25	409.34	617.20	8,501	<b>2.5E-06</b>	<b>1.0E+00</b>	1.06E+02			0.0E+00	1.0E+00		
100425	Styrene	7.76E+02	7.10E-02	8.00E-06	3.10E+02	1.12E-01	2.74E-03	25	418.31	636.00	8,737	0.0E+00	<b>9.0E-01</b>	1.04E+02			0.0E+00	1.0E+00		
100447	<b>Benzylchloride</b>	6.14E+01	7.50E-02	7.80E-06	5.25E+02	1.70E-02	4.14E-04	25	452.00	685.00	8,773	<b>4.9E-05</b>	<b>1.0E-03</b>	1.27E+02	?		4.9E-05	0.0E+00	X	
100527	Benzaldehyde	4.59E+01	7.21E-02	9.07E-06	3.30E+03	9.73E-04	2.37E-05	25	452.00	695.00	11,658	0.0E+00	3.5E-01	1.06E+02		X	0.0E+00	3.5E-01		X
103651	n-Propylbenzene	5.62E+02	6.01E-02	7.83E-06	6.00E+01	4.37E-01	1.07E-02	25	432.20	630.00	9,123	0.0E+00	1.4E-01	1.20E+02		X	0.0E+00	1.4E-01		X
104518	n-Butylbenzene	1.11E+03	5.70E-02	8.12E-06	2.00E+00	5.38E-01	1.31E-02	25	456.46	660.50	9,290	0.0E+00	1.4E-01	1.34E+02		X	0.0E+00	1.4E-01		X
106423	p-Xylene	3.89E+02	7.69E-02	8.44E-06	1.85E+02	3.13E-01	7.64E-03	25	411.52	616.20	8,525	0.0E+00	<b>1.0E-01</b>	1.06E+02		?	0.0E+00	1.0E-01		
106467	<b>1,4-Dichlorobenzene</b>	6.17E+02	6.90E-02	7.90E-06	7.90E+01	9.82E-02	2.39E-03	25	447.21	684.75	9,271	<b>1.1E-05</b>	<b>8.0E-01</b>	1.47E+02			0.0E+00	8.0E-01		
106934	<b>1,2-Dibromoethane (ethylene dibr</b>	2.50E+01	2.17E-02	1.19E-05	4.18E+03	3.04E-02	7.41E-04	25	404.60	583.00	8,310	<b>7.1E-05</b>	<b>8.0E-04</b>	1.88E+02			6.0E-04	9.0E-03		
106990	<b>1,3-Butadiene</b>	1.91E+01	2.49E-01	1.08E-05	7.35E+02	3.01E+00	7.34E-02	25	268.60	425.00	5,370	<b>1.7E-04</b>	<b>2.0E-03</b>	5.41E+01			3.0E-05	0.0E+00		
107028	Acrolein	2.76E+00	1.05E-01	1.22E-05	2.13E+05	4.99E-03	1.22E-04	25	325.60	506.00	6,731	0.0E+00	<b>2.0E-05</b>	5.61E+01			0.0E+00	2.0E-05		
107062	<b>1,2-Dichloroethane</b>	1.74E+01	1.04E-01	9.90E-06	8.52E+03	4.00E-02	9.77E-04	25	356.65	561.00	7,643	<b>2.1E-05</b>	<b>4.0E-01</b>	9.90E+01			2.6E-05	0.0E+00		
107131	<b>Acrylonitrile</b>	5.90E+00	1.22E-01	1.34E-05	7.40E+04	4.21E-03	1.03E-04	25	350.30	519.00	7,786	<b>2.9E-04</b>	<b>2.0E-03</b>	5.31E+01			6.8E-05	2.0E-03		
108054	Vinyl acetate	5.25E+00	8.50E-02	9.20E-06	2.00E+04	2.09E-02	5.10E-04	25	345.65	519.13	7,800	0.0E+00	<b>2.0E-01</b>	8.61E+01			0.0E+00	2.0E-01		
108101	Methylisobutylketone (4-methyl-2-p	9.06E+00	7.50E-02	7.80E-06	1.90E+04	5.64E-03	1.38E-04	25	389.50	571.00	8,243	0.0E+00	<b>3.0E+00</b>	1.00E+02			0.0E+00	8.0E-02		
108383	m-Xylene	4.07E+02	7.00E-02	7.80E-06	1.61E+02	3.00E-01	7.32E-03	25	412.27	617.05	8,523	0.0E+00	<b>1.0E-01</b>	1.06E+02		?	0.0E+00	1.0E-01		
108678	1,3,5-Trimethylbenzene	1.35E+03	6.02E-02	8.67E-06	2.00E+00	2.41E-01	5.87E-03	25	437.89	637.25	9,321	0.0E+00	6.0E-03	1.20E+02			0.0E+00	6.0E-03		
108872	Methylcyclohexane	7.85E+01	7.35E-02	8.52E-06	1.40E+01	4.22E+00	1.03E-01	25	373.90	572.20	7,474	0.0E+00	3.0E+00	9.82E+01		?	0.0E+00	3.0E+00		
108883	Toluene	1.82E+02	8.70E-02	8.60E-06	5.26E+02	2.72E-01	6.62E-03	25	383.78	591.79	7,930	0.0E+00	<b>3.0E-01</b>	9.21E+01			0.0E+00	4.0E-01		
108907	Chlorobenzene	2.19E+02	7.30E-02	8.70E-06	4.72E+02	1.51E-01	3.69E-03	25	404.87	632.40	8,410	0.0E+00	<b>1.0E+00</b>	1.13E+02			0.0E+00	6.0E-02		
109693	1-Chlorobutane	1.72E+01	8.26E-02	1.00E-05	1.10E+03	6.93E-01	1.69E-02	25	351.60	542.00	7,263	0.0E+00	<b>1.4E-01</b>	9.26E+01		X	0.0E+00	1.4E+00		X
110009	Furan	1.86E+01	1.04E-01	1.22E-05	1.00E+04	2.21E-01	5.39E-03	25	304.60	490.20	6,477	0.0E+00	3.5E-03	6.81E+01		X	0.0E+00	3.5E-03		X
110543	Hexane	4.34E+01	2.00E-01	7.77E-06	1.24E+01	6.82E+01	1.66E+00	25	341.70	508.00	6,895	0.0E+00	<b>7.0E-01</b>	8.62E+01			0.0E+00	2.0E-01		
111444	<b>Bis(2-chloroethyl)ether</b>	1.55E+01	6.92E-02	7.53E-06	1.72E+04	7.36E-04	1.80E-05	25	451.15	659.79	10,803	<b>7.1E-04</b>	0.0E+00	1.43E+02			3.3E-04	0.0E+00		
115297	Endosulfan	2.14E+03	1.15E-02	4.55E-06	5.10E-01	4.58E-04	1.12E-05	25	674.43	942.94	14,000	0.0E+00	2.1E-02	4.07E+02		X	0.0E+00	2.1E-02		X
118741	<b>Hexachlorobenzene</b>	5.50E+04	5.42E-02	5.91E-06	5.00E-03	5.40E-02	1.32E-03	25	582.55	825.00	14,447	<b>5.1E-04</b>	2.8E-03	2.85E+02		X	4.6E-04	2.8E-03		X
120821	1,2,4-Trichlorobenzene	1.78E+03	3.00E-02	8.23E-06	4.88E+01	5.81E-02	1.42E-03	25	486.15	725.00	10,471	<b>0.0E+00</b>	<b>4.0E-03</b>	1.81E+02			0.0E+00	2.0E-01		
123739	<b>Crotonaldehyde (2-butenal)</b>	4.82E+00	9.56E-02	1.07E-05	3.69E+04	7.99E-04	1.95E-05	25	375.20	568.00	9	5.4E-04	0.0E+00	7.01E+01	X		5.4E-04	0.0E+00	X	
124481	<b>Chlorodibromomethane</b>	6.31E+01	1.96E-02	1.05E-05	2.60E+03	3.20E-02	7.81E-04	25	416.14	678.20	5,900	<b>2.7E-05</b>	7.0E-02	2.08E+02	?	X	2.4E-05	7.0E-02	X	X
126987	Methacrylonitrile	3.58E+01	1.12E-01	1.32E-05	2.54E+04	1.01E-02	2.46E-04	25	363.30	554.00	7,600	0.0E+00	7.0E-04	6.71E+01			0.0E+00	7.0E-04		
126998	2-Chloro-1,3-butadiene (chloropre	6.73E+01	8.58E-02	1.03E-05	2.12E+03	4.91E-01	1.20E-02	25	332.40	525.00	8,075	0.0E+00	7.0E-03	8.85E+01			0.0E+00	7.0E-03		
127184	<b>Tetrachloroethylene</b>	1.55E+02	7.20E-02	8.20E-06	2.00E+02	7.53E-01	1.84E-02	25	394.40	620.20	8,288	<b>5.9E-06</b>	<b>3.5E-02</b>	1.66E+02			3.0E-06	0.0E+00		
129000	Pyrene	1.05E+05	2.72E-02	7.24E-06	1.35E+00	4.50E-04	1.10E-05	25	667.95	936	14370	0.0E+00	1.1E-01	2.02E+02		X	0.0E+00	1.1E-01		X
132649	Dibenzofuran	5.15E+03	2.38E-02	6.00E-06	3.10E+00	5.15E-04	1.26E-05	25	560	824	66400	0.0E+00	1.4E-02	1.68E+02		X	0.0E+00	1.4E-02		X
135988	sec-Butylbenzene	9.66E+02	5.70E-02	8.12E-06	3.94E+00	5.68E-01	1.39E-02	25	446.5	679	88730	0.0E+00	1.4E-01	1.34E+02		X	0.0E+00	1.4E-01		X
141786	Ethylacetate	6.44E+00	7.32E-02	9.70E-06	8.03E+04	5.64E-03	1.38E-04	25	350.26	523.3	7633.66	0.0E+00	3.2E+00	8.81E+01		X	0.0E+00	3.2E+00		X
156592	cis-1,2-Dichloroethylene	3.55E+01	7.36E-02	1.13E-05	3.50E+03	1.67E-01	4.07E-03	25	333.65	544	7192	0.0E+00	3.5E-02	9.69E+01		X	0.0E+00	3.5E-02		X
156605	trans-1,2-Dichloroethylene	5.25E+01	7.07E-02	1.19E-05	6.30E+03	3.84E-01	9.36E-03	25	320.85	516.5	6717	0.0E+00	<b>6.0E-02</b>	9.69E+01		X	0.0E+00	7.0E-02		X
205992	<b>Benzo(b)fluoranthene</b>	1.23E+06	2.26E-02	5.56E-06	1.50E-03	4.54E-03	1.11E-04	25	715.9	969.27	17000	<b>1.1E-04</b>	0.0E+00	2.52E+02	?		2.1E-04	0.0E+00	X	
218019	<b>Chrysene</b>	3.98E+05	2.48E-02	6.21E-06	6.30E-03	3.87E-03	9.44E-05	25	714.15	979	16455	<b>1.1E-05</b>	0.0E+00	2.28E+02	?		2.1E-06	0.0E+00	X	
309002	<b>Aldrin</b>	2.45E+06	1.32E-02	4.86E-06	1.70E-02	6.95E-03	1.70E-04	25	603.01	839.37	15000	<b>4.9E-03</b>	1.1E-04	3.65E+02		X	4.9E-03	1.1E-04		X
319846	<b>alpha-HCH (alpha-BHC)</b>	1.23E+03																		