Chevron

Chevron ENVIRONMENTAL PROTECTION

98 JUL 31 PM 2:32

July 29, 1998

Chevron Products Company
6001 Bollinger Canyon Road
Building I, Room 1110
PO Box 6004
San Ramon, CA 94583-0904

Philip R. Briggs
Project Manager
Site Assessment & Remediation
Phone 925 842-9136
Fax 925 842-8370

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

Re: Former Chevron Service Station # 9-1723
9757 San Leandro Blvd.
San Leandro, California

Dear Ms. Chu:

Enclosed is a copy of the Tier 2 RBCA Analysis and Closure Request, dated July 7, 1998, that was conducted by our consultant Cambria Environmental Technology, Inc. (Cambria) at the above noted site. The objective of the RBCA analysis was to address potential human health risks associated with residual petroleum hydrocarbons beneath the site.

To evaluate the risk associated with BTEX compounds in soil vapor beneath the site, soil vapor site-specific target levels (SSTLs) were calculated. Reevaluation of the risk associated with BTEX compounds in ground water using the most recent ground water monitoring data was also conducted.

As shown in the attached Closure Request report the current ground water concentrations beneath the site are less than the SSTL for benzene volatilization from ground water to indoor air. Also the soil vapor samples beneath the site, except for one sample, are less than the calculated Tier 2 SSTL for soil vapor. However, as noted in the report, this one sample that exceeded the SSTL may be anomalous.

As indicated by the Tier 2 RBCA, the risk associated with the site-specific ground water and soil vapor BTEX concentrations is less than the target risk level. Petroleum hydrocarbon concentrations in ground water are decreasing and therefore, the residual risk to human health is a minimum.

Based on the review of site conditions, Cambria believes this site should be classified as a low-risk ground water case. Their RBCA analysis indicates that petroleum hydrocarbons beneath the site present no significant risk to human health. The localized hydrocarbon concentrations are decreasing and low in the ground water. Therefore, no engineered

remedial action is necessary at the site and passive bioremediation is an acceptable remedial alternative for residual hydrocarbons beneath the site.

Chevron concurs with Cambria recommendation to discontinue ground water monitoring, abandoning site wells, and granting full closure of the site. This recommendation is based on the following:

- The UST's have been removed.
- SPH's have never been detected at the site.
- The site has been characterized and ground water monitoring data suggest that dissolved hydrocarbons are limited to the site vicinity and the plume is shrinking.
- The presence of residual hydrocarbons in ground water does not pose a significant health risk to future site occupants.

If you have any questions or comments, call Mr. Peter McKereghan, Cambria at (510) 420-0700 or me at (925) 842-9136.

Sincerely
CHEVRON PRODUCTS COMPANY

Philip R. Briggs
Site Assessment and Remediation Project Manager

Enclosure

Cc. Mr. Chuck Headlee
RWQWB- San Francisco Bay Region
2101 Webster Street, Suite 500
Oakland, CA 94612

Trustees of the Estate of Mr. Ron Hothem
Pacific American Management Co.
369 Broadway
San Francisco, CA 94133

Cc. (cont)

Dr. Eric J. McHuron, CEG, CEA
President
McHuron Geosciences
1670 8th Avenue
San Francisco, CA 94122

Mr. Peter F. McKereghan, C.H.G.
Cambria Environmental Technology, Inc.
1144 65th Street, Suite B
Oakland, CA 94608 (Less report)

Ms. Bette Owen, Chevron

Mr. Curtis Peck, Chevron
CRTC/RIC100/10-35

CAMBRIA

The 100,000 ppbV benzene detected is at 5' bgs Unless they are doing a basement, we can avg all SV sample collected from ≤3' bgs. Meet RMP (no basement no add'l risk evaluation)

July 7, 1998

Mr. Phil Briggs
Chevron Products Company
6001 Bollinger Canyon Road, Bldg. L
San Ramon, CA 94583-0804

Re: **Tier 2 RBCA Analysis and Closure Request**
Former Chevron Service Station 9-1723
9757 San Leandro Boulevard
Oakland, California

Dear Mr. Briggs:

This report presents the results of a Tier 2 risk-based corrective action (RBCA) analysis conducted by Cambria Environmental Technology, Inc., (Cambria) for the above-referenced site (Attachment A). The objective of the RBCA analysis was to address potential human health risks associated with residual petroleum hydrocarbons beneath the site. The site background and the results of our analysis are summarized below.

SITE BACKGROUND

The site is a former Chevron service station located in a primarily commercial and industrial area at 9759 San Leandro Boulevard in Oakland, California. The site is currently used for automobile and trailer parking. To date, ten ground water monitoring wells have been installed and twenty-nine soil borings have been drilled at the site, including six soil borings that were advanced in October 1997 to collect soil vapor samples. The results of the soil vapor sampling were presented in a Cambria report dated January 5, 1998, and are summarized in Attachment A.

CAMBRIA
ENVIRONMENTAL
TECHNOLOGY, INC.
1144 65TH STREET,
SUITE B
OAKLAND,
CA 94608
PH: (510) 420-0700
FAX: (510) 420-9170

Site Setting, Geology, and Hydrology: The site is essentially flat, approximately 25 feet (ft) above mean sea level, and is located about one-mile east of San Francisco Bay. Site stratigraphy is comprised primarily of alluvial plain and stream channel deposits of low-permeability clayey silt, silt, and sandy silts of low to moderate permeability, with occasional gravel lenses of moderate to high estimated permeability. Historically, depth to ground water has ranged from about 5 to 11 ft below ground surface (bgs), and is currently about 9 ft bgs. Ground water generally flows to the west beneath the site. Ground water monitoring data are presented in Attachment B.

Hydrocarbon Distribution in Soil: The highest hydrocarbon concentrations detected in soil samples collected during previous investigations were 1,800 parts per million (ppm) total petroleum hydrocarbons as gasoline (TPHg) and 99 ppm benzene. These samples were collected in the vicinity of the former underground storage tanks (USTs).

Hydrocarbon Distribution in Ground Water: Ground water has been gauged and analyzed since November 1993. TPHg and benzene have been detected in site wells in steadily decreasing concentrations over time. For example, the maximum benzene concentration was 2,000 ppb in well MW-8 on November 12, 1993, but decreased to 5.3 ppb in this well on May 1, 1998. The maximum benzene concentration detected during the most recent ground water monitoring event was 19 ppb in well MW-5 (Attachment B).

Hydrocarbon Distribution in Soil Vapor: To assess hydrocarbon concentrations in soil vapor near the former USTs, where the highest concentrations of hydrocarbons in soil and ground water have been detected, Cambria advanced six soil vapor borings and collected soil vapor samples. Boring locations and soil vapor concentrations are presented in Attachment A.

Benzene was detected in all soil vapor samples collected from borings SV-1 through SV-6. Borings SV-5 and SV-6 were advanced adjacent to borings SV-1 and SV-2. The highest benzene concentration reported was 100,000 parts per billion by volume (ppbv) in the soil vapor sample collected 5 ft bgs from SV-5. However, the benzene soil vapor concentration at 5 ft depth from adjacent boring SV-1 was 410 ppbv, and benzene concentration in two samples collected at 3 ft bgs from SV-1 were 96 and 94 ppbv, respectively . The second highest benzene concentration reported was 3,100 ppbv in SV-2 (SVD-2) at 8 ft bgs. Borings SV-1, SV-2, SV-5, and SV-6 were advanced in the location of the former USTs. Soil vapor benzene concentrations appear to be localized in the vicinity of the former USTs. Benzene concentrations detected in soil vapor samples from borings SV-3 and SV-4 were less than 5 ppbv (Attachment A).

RISK ASSESSMENT

Cambria's risk assessment followed the guidelines set forth by the American Society for Testing and Materials (E-1739-95)[1] and, in general, used input parameter values that were consistent with a RBCA analysis conducted by Chevron Research and Technology Company (CRTC) prior to collecting soil vapor data at the site. The results of CRTC's RBCA analysis are presented in Attachment C. This section presents a summary of the previous RBCA analysis, the results of our Tier 2 RBCA analysis, and a discussion of the soil vapor data. As shown in Attachment C, results of previous RBCA analysis indicate that BTEX compounds in ground water beneath the site do not pose a significant risk to occupants of an on-site building. Concentrations of petroleum hydrocarbons in ground water beneath the site have continued to decrease since this RBCA analysis was conducted, therefore this conclusion is still valid (Attachment B). However, historical BTEX soil concentrations exceeded the calculated site-specific target level (SSTL) of 0.45 mg/kg for the volatilization of benzene from subsurface soil to indoor air pathway. This SSTL is based on the theoretical partitioning between the sorbed and vapor phases of benzene in soil, which often results in an overestimation of actual soil vapor concentrations. Therefore, to more accurately assess the potential risk of on-site receptors to volatilized BTEX compounds beneath the site, Cambria collected soil vapor samples in October 1997 (Attachment A).

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1 **Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites**, E 1739-95 (Revised December 1996): American Society of Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428.

To evaluate the risk associated with BTEX compounds in soil vapor beneath the site, we calculated soil vapor SSTLs. We also reevaluated the risk associated with BTEX compounds in ground water using the most recent ground water monitoring data. In general, the input parameter values used in our Tier 2 RBCA analysis are consistent with the values used in the previous RBCA analysis (Attachment C). Specifically, Tier 2 input parameter values include:

- Depth to ground water, which was updated to reflect the shallow water table observed in February 1998 (5 ft bgs; Attachment B); and
- A cancer slope factor for benzene of 0.1 kg-day/mg to be consistent with Cal-EPA guidelines.

Table 1 - Conceptual Site Model for Risk Assessment

Item		Comment
Contaminant Source Media:	Soil and Ground Water	Hydrocarbons have been detected in soil, ground water, and soil vapor beneath the site.
Potential Chemicals of Concern (COC):	Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX)	All chemicals detected in representative samples.
Representative Source Concentrations in Ground Water (mg/L):	benzene: 0.046 toluene: 0.004 ethylbenzene: 0.007 xylenes: 0.011	Maximum average BTEX concentrations detected in ground water during the previous for quarters (July 1997 through May 1998) (Monitoring Well MW-8; Attachment B).
Representative Source Concentrations in Soil Vapor (mg/m^3):	benzene: 2.3 toluene: 0.22 ethylbenzene: 0.97 xylenes: 0.48	95% UCL of the mean of BTEX concentrations detected in soil vapor (Attachment A).
Target Carcinogenic Risk Level:	Commercial: $1x10^{-6}$	Conservative target risk level, considering a commercial receptor scenario on site.
Non-Carcinogenic Hazard Quotient:	1.0	Consistent with ASTM default value.
Benzene Slope Factor:	0.1 $(mg/kg/day)^{-1}$	Defined by Cal-EPA.

Selection of Representative Concentrations

COCs in Ground Water: For the representative COC concentrations in ground water, we calculated the mean BTEX concentrations detected during the previous four quarters (i.e. July 1997 through May 1998). In the case of non-detections, the concentration was assumed to be one-half of the detection limit value. As shown

in Attachment B, the highest ground water concentrations have been consistently detected in monitoring well MW-8.

COCs in Soil Vapor: For the representative COC concentrations in soil vapor, we calculated the 95% upper confidence level (UCL) of the mean BTEX concentrations detected in soil vapor during the October 1997 site investigation.

The conceptual site model (CSM) is summarized in Table 1 and results of the Tier 2 RBCA analysis are presented in Table 2.

Table 2 - Tier 2 Results

Exposure Scenario	Target Risk Level	Cal-EPA SSTL	COCC	Calculated Risk Level	Result
Benzene volatilization from ground water to indoor air	1E-05	0.59	0.046	8×10^{-7}	Site-specific source concentration is less than SSTL
Intrusion of benzene in soil vapor to outdoor air	1E-05	470	2.3	5×10^{-8}	Site-specific soil vapor concentration is less than soil vapor SSTL
Intrusion of benzene in soil vapor to indoor air	1E-05	19	2.3	1×10^{-6}	Site-specific soil vapor concentration is less than soil vapor SSTL

SSTL - Site-Specific Target Level
COCC - Chemical of Concern Concentration (Benzene)
Ground water concentrations are in mg/l, and soil vapor concentrations are mg/m^3

DISCUSSION

As shown in Table 2, current ground water concentrations beneath the site are less than the SSTL for benzene volatilization from ground water to indoor air. Similarly, with the exception of one sample, SV-5-5.0, all benzene concentrations in soil vapor samples collected beneath the site in October 1997 (Attachment A) are less than the calculated Tier 2 SSTL for soil vapor of 19 mg/m^3, which is equivalent to a concentration of about 5,800 ppbv benzene.

Benzene was detected at a concentration of 410 ppbv in the soil vapor sample collected at 5 ft depth from boring SV-1, which is less than 5 ft west of the SV-5 sample containing 100,000 ppbv benzene. In addition, benzene concentrations of 96 ppbv and 94 ppbv were detected in two samples collected at 3 ft depth from boring SV-1. Hence, the elevated level of benzene reported in sample SV-5-5.0 may be anomalous.

LOW RISK GROUND WATER CASE CRITERIA

The California Regional Water Quality Control Board - San Francisco Bay Region (RWQCB) released guidelines for clean-up of low risk ground water sites impacted by petroleum hydrocarbons. According to the RWQCB, a low-risk ground water site has the following characteristics:

- The leak has stopped and the hydrocarbon source has been removed;
- Ground water is less than 50 ft deep;
- The site is adequately characterized;
- The hydrocarbon plume is defined and stable or decreasing;
- No water wells or other sensitive receptors are likely to be impacted;
- No preferential pathways exist at the site;
- The site presents no significant risk to human health; and
- The site presents no significant risk to the environment.

The leak has stopped and the hydrocarbon source has been removed: Results of a ground-penetrating radar survey and subsequent soil boring investigation conducted in 1988 by Groundwater Technology, Inc., indicated that USTs were no longer present beneath the site.

Ground water is less than 50 ft deep: Historically, ground water depth has been between 5 and 11 ft bgs. The most recent average depth to ground water is at about 9 ft bgs (Attachment B).

The site is adequately characterized: The lateral and vertical extent of hydrocarbons in soil has been well-defined by the soil borings drilled around the former tank pit and across the site. To date, ten ground water monitoring wells have been installed and twenty-nine soil borings have been drilled at the site, including six soil borings that were advanced in October 1997 to collect soil vapor samples for this risk assessment (Attachment A). Decreasing hydrocarbon concentrations in ground water from on- and off-site monitoring wells indicate a shrinking plume (Attachment B).

The hydrocarbon plume is stable or decreasing: As discussed earlier, hydrocarbon concentrations are decreasing in the source area and perimeter wells, indicating a shrinking plume.

No water wells or other sensitive receptors are likely to be impacted: In May 1996, Flour Daniel GTI conducted a survey of water wells immediately southwest of the site. Two wells, P2 and P3, were identified within 250 ft downgradient (west) of the site (Attachment E). Well P2 is located about 100 ft west of the

former Chevron site and was reported to be completed to a depth of 602 ft and screened from 160 to 225 ft bgs (Groundwater Technology, Inc., 1988). As of 1996, this well was operative and on standby service for fire emergencies. Well P3 is located about 230 ft west of the site and, as of 1996, supplied water for industrial purposes. Two other wells were identified during a well survey conducted by Groundwater Technology, Inc., in 1988. Well L1 is located more than 500 ft north of the site and is completed to a depth of 950 ft. Well completion records indicate the gravel pack of this well extends from the ground surface to 950 ft bgs. Well J1 is located more than one-half mile west-northwest of the site and is completed to a depth of 448 ft. Well seal and construction details were not available for well J1 (Groundwater Technology, Inc., 1988). Results of the well surveys are presented in Attachment E.

With the exception of one suspect detection, no hydrocarbons have been detected in off-site monitoring well MW-9 since its installation in November 1993. Well MW-9 is located about 200 ft downgradient (west) of the source area (the former USTs), in the vicinity of well P2. Hydrocarbons have been detected in off-site monitoring well MW-2 and site perimeter monitoring well MW-6, which are also located downgradient of the site, however TPHg and benzene concentrations have been less than 400 and 20 ppb, respectively (Attachment B). Based on these data and that the industrial supply wells are screened in deeper water-bearing zones, it is not likely that an off-site water supply well would be impacted by the hydrocarbons beneath the site.

No preferential pathways exist at the site: No preferential lithologic pathways that would affect downgradient hydrocarbon migration have been identified at the site.

The site presents no significant risk to human health: As indicated by the Tier 2 RBCA, the risk associated with the site-specific ground water and soil vapor BTEX concentrations is less than the target risk level. Hydrocarbon concentrations in ground water are decreasing and, therefore, the residual risk to human health is a minimum.

The site presents no significant risk to the environment: No potential exposure pathways that would adversely impact surface water, wetlands, or other sensitive receptors have been identified in the vicinity of the site. Therefore, there is no risk to the environment.

CASE CLOSURE JUSTIFICATION AND RECOMMENDATIONS

Based on our review of site conditions, we believe this site should be classified as a low-risk ground water case. Cambria's ASTM RBCA analysis indicates that petroleum hydrocarbons beneath the site present no significant risk to human health. The localized hydrocarbon concentrations are decreasing, and the hydrocarbon concentrations in ground water are low. Therefore, no engineered remedial action is necessary at the site and passive bioremediation is an acceptable remedial alternative for residual hydrocarbons beneath the site.

Several ground water monitoring wells have not been monitored since August 1994 (MW-1, MW-4, MW-7, and MW-10). Among the wells that are currently monitored, hydrocarbons have generally been detected at low concentrations in wells MW-2, MW-5, MW-6, MW-8, and MW-9 (Attachment B). Therefore, Cambria recommends discontinuing ground water monitoring, abandoning site wells, and granting full closure of the site. This recommendation is supported by the following considerations:

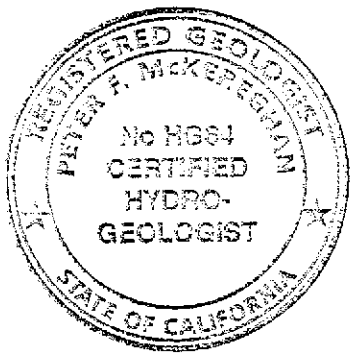
- The USTs have been removed;
- SPHs have never been detected at the site;
- The site has been characterized and ground water monitoring data suggest that dissolved hydrocarbons are limited to the site vicinity and the plume is shrinking;
- The presence of residual hydrocarbons in ground water do not pose a significant health risk to future site occupants.

CLOSING

We appreciate this opportunity to provide consulting services to Chevron Products Company and we look forward to working with you in the future. Please call if you have any questions or comments.

Sincerely,
Cambria Environmental Technology, Inc.

Peter F. McKereghan, C.H.G.
Principal Hydrogeologist



Attachments:
A - Soil Vapor Survey Results
B - Ground Water Monitoring Data
C - CRTC RBCA Analysis
D - Cambria Tier 2 RBCA Analysis
E - Well Survey Results

I:\9-1723 Oakland\RBCA\RBCA.wpd

Attachment A

Soil Vapor Survey Results

SOURCE: U.S.G.S. TOPOGRAPHIC QUADRANGLE
SAN LEANDRO, CALIFORNIA
7.5 MINUTE SERIES
1959, PHOTREVISED 1980

SITE LOCATION

SCALE 1:24,000

0 2,000 4,000

SCALE FEET

GROUNDWATER TECHNOLOGY

SITE LOCATION MAP

CLIENT: CHEVRON U.S.A. PRODUCTS CO. FORMER SERVICE STATION NO. 9-1723	FILE: 0080SL (1:1)	PROJECT NO.: 02070-0080	PM	PE/RG	
	REV.			FIGURE: 1	
LOCATION: 9757 SAN LEANDRO BOULEVARD OAKLAND, CALIFORNIA	DES. JF	DET. AJK	DATE: 11/21/94		

Table 1. Analytic Data for Soil Vapor Samples- Former Chevron Service Station 9-1723, 9757 San Leandro Boulevard, Oakland, California

Report and Map ID	Chain of Custody and Field ID	Date	Depth (ft)	Benzene	Toluene	Ethylbenzene	m, p -Xylenes	o- Xylene	Comments
				parts per billion by volume					
SV-1-3.0	SV-1-3.0	10/06/97	3.0	96	5.1	6.2	14	5.2	
SV-1-3.0(duplicate)	SV-1-3.0(duplicate)	10/06/97	3.0	94	5.6	6.3	14	5.4	Laboratory Duplicate
SV-1-5.0	SV-1-5.0	10/06/97	5.0	410	4.6	260	25	3.3	
SV-2-3.0	SV-2-3.0	10/06/97	3.0	970	12	190	410	82	
SV-2-5.0	SV-2-5.0	10/06/97	5.0	420	6.0	120	240	46	
SV-2-8.0**	SVD-2-8.0*	10/06/97	8.0	3,100	1,200	2,900	9,200	3,200	
SV-3-3.0	SV-3-3.0	10/06/97	3.0	4.9	5.6	6.4	21	8.2	
SV-3-5.0	SV-3-5.0	10/06/97	5.0	3.6	2.1	2.7	9.0	3.2	
SV-4-3.0	SV-4-3.0	10/06/97	3.0	1.8	4.8	6.0	23	8.4	
SV-4-5.0	SV-4-5.0	10/06/97	5.0	2.0	10	6.0	22	8.2	
SV-5-5.0	SVD-1-5.0*	10/06/97	5.0	100,000	1,500	4,600	1,200	<950	
SV-6-5.0	SVD-2-5.0*	10/06/97	5.0	580	120	490	2,200	980	

Abbreviations / Notes

Benzene, toluene, ethylbenzene, and xylenes by analytical method TO-14

average = 268.175

<x = not detected above x parts per billion by volume

Chain of Custody and field sample identifications were changed to more accurately represent the data.

*Incorrectly labeled during field operations

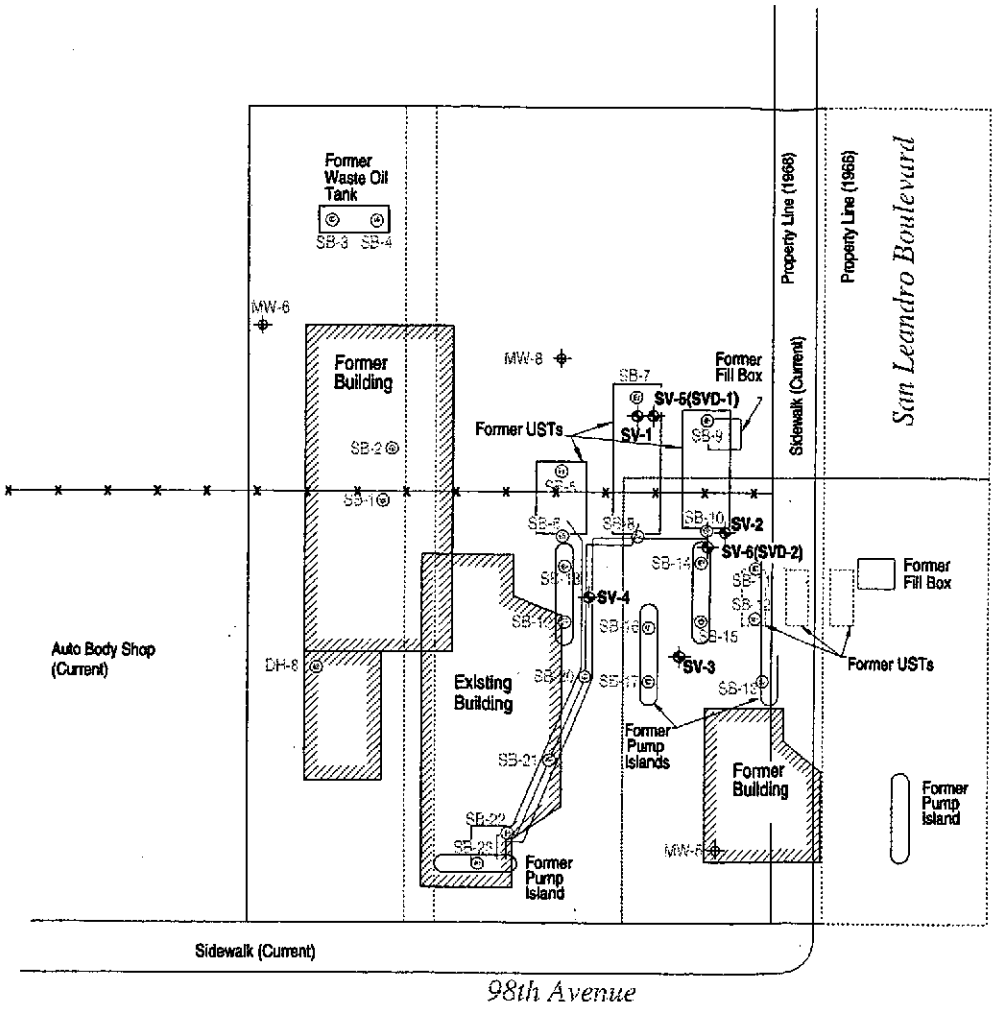
116 ppb – RWQCB – level – 10^{-5}

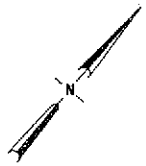
-SVD-2-8.0 corresponds to soil vapor location SV-2 at 8 ft.

-SVD-1-5.0 corresponds to soil vapor location SV-5 at 5 ft.

-SVD-2-5.0- corresponds to soil vapor location SV-6 at 5 ft.

** An additional soil vapor sample was taken at SV-2-8.0 and was not included in table due to sampling equipment failures during field sampling. The analytic results for this sample are inluded on page 8 of Attachment A.





EXPLANATION

MW-1 Monitoring Well Location

SV-1 Soil Vapor Sample Locations

SB-1 Soil Boring Location

0 12.5 25 50

Scale (ft)

CAMBRIA
Environmental Technology, Inc.

Former Chevron Service Station No. 9-1723
9757 San Leandro Boulevard
Oakland, California

F:\PROJECT\CHEVRON\9-1723\FIGURES\SOL-VPR.DWG

Soil Vapor Sample Locations

FIGURE
1

11/20/97

Attachment B

Ground Water Monitoring Results

Cumulative Table of Well Data and Analytical Results

Vertical Measurements are in feet. Analytical results are in parts per billion (ppb)

DATE	Well Head Elev.	Ground Water Elev.	Depth To Water	Notes	TPH-Gasoline	Benzene	Toluene	Ethyl-Benzene	Xylene	Lead	MTBE
MW-1											
11/02/93	20.92	10.68	10.24	--	--	--	--	--	--	--	--
02/10/94	20.92	--	--	--	--	--	--	--	--	--	--
05/12/94	20.92	--	--	--	--	--	--	--	--	--	--
08/26/94	20.92	--	--		--	--	--	--	--	--	--
NO LONGER MONITORED OR SAMPLED											
MW-2											
11/02/93	21.31	10.83	10.48	--	--	--	--	--	--	--	--
02/10/94	21.31	--	--	--	--	--	--	--	--	--	--
05/12/94	21.31	11.94	9.37	--	390	6.8	2.0	6.3	14	--	--
08/26/94	21.31	--	--	Sampled biannually	--	--	--	--	--	--	--
02/01/95	21.31	13.76	7.55	--	78	10	1.2	<0.5	0.51	--	--
08/02/95	21.31	11.53	9.78	--	100	3.5	<0.5	2.6	4.1	--	--
01/31/96	21.31	14.38	6.93	--	<50	<0.5	<0.5	<0.5	<0.5	--	<2.5
08/01/96	21.31	11.49	9.82	--	73	<0.5	<0.5	<0.5	<0.5	--	610
12/17/96	21.31	12.75	8.56	--	--	--	--	--	--	--	--
02/20/97	21.31	12.30	9.01	--	280	6.7	0.56	1.5	2.9	--	11
05/02/97	21.31	11.78	9.53	--	--	--	--	--	--	--	--
07/23/97	21.31	11.23	10.08	--	<50	<0.5	<0.5	<0.5	<0.5	--	<2.5
02/04/98	21.31	16.06	5.25	--	<50	1.1	<0.5	<0.5	<0.5	--	5.6
MW-4											
11/02/93	--	--	10.23	--	--	--	--	--	--	--	--
02/10/94	--	--	--	--	--	--	--	--	--	--	--
05/12/94	--	--	--	--	--	--	--	--	--	--	--
08/26/94	--	--	--		--	--	--	--	--	--	--
NO LONGER MONITORED OR SAMPLED											

Cumulative Table of Well Data and Analytical Results

Vertical Measurements are in feet. Analytical results are in parts per billion (ppb)

DATE	Well Head Elev.	Ground Water Elev.	Depth To Water	Notes	TPH-Gasoline	Benzene	Toluene	Ethyl-Benzene	Xylene	Lead	MTBE
MW-5											
11/02/93	21.84	11.15	10.69	--	790	43	3.4	22	12	<400	--
02/10/94	21.84	13.10	8.74	--	1400	52	3.0	50	40	--	--
05/12/94	21.84	12.40	9.44	--	1800	87	6.2	77	66	--	--
08/26/94	21.84	--	--	--	--	--	--	--	--	--	--
11/11/94	21.84	13.50	8.34	--	380	18	<1.0	18	11	--	--
02/01/95	21.84	14.32	7.52	--	570	36	0.59	21	11	--	--
05/18/95	21.84	12.87	8.97	--	590	29	1.0	16	9.8	--	--
08/02/95	21.84	11.98	9.86	--	210	9.2	<0.5	4.0	1.2	--	--
11/01/95	21.84	11.58	10.26	--	210	5.6	<0.5	1.9	<0.5	--	<2.5
01/31/96	21.84	14.72	7.12	--	1200	50	<5.0	19	29	--	<25
05/16/96	21.84	14.22	7.62	--	440	14	<0.5	17	8.6	--	11
08/01/96	21.84	11.86	9.98	--	58	1.4	<0.5	<0.5	<0.5	--	2.5
12/17/96	21.84	13.13	8.71	--	300	9.7	<0.5	11	6.3	--	6.9
02/20/97	21.84	12.81	9.03	--	350	6.7	<0.5	4.3	1.9	--	5.0
05/02/97	21.84	12.50	9.34	--	270	4.8	<0.5	3.5	1.3	--	7.3
07/23/97	21.84	11.70	10.14	--	290	3.4	<0.5	<0.5	<0.5	--	3.1
11/04/97	21.84	11.69	10.15	--	180	3.8	<0.5	1.5	<0.5	--	8.6
02/04/98	21.84	16.54	5.30	--	140	4.3	<0.5	8.5	<0.5	--	<2.5
05/01/98	21.84	12.77	9.07	--	1200	19	<1.0	9.7	1.7	--	25

Cumulative Table of Well Data and Analytical Results

Vertical Measurements are in feet. Analytical results are in parts per billion (ppb)

DATE	Well Head Elev.	Ground Water Elev.	Depth To Water	Notes	TPH-Gasoline	Benzene	Toluene	Ethyl-Benzene	Xylene	Lead	MTBE
MW-6											
11/02/93	21.71	10.93	10.78	--	300	19	1.8	2.5	5.0	<400	--
02/10/94	21.71	12.86	8.85	--	200	10	0.9	2.0	4.0	--	--
05/12/94	21.71	12.08	9.63	--	210	10	1.1	1.2	3.1	--	--
08/26/94	21.71	10.82	10.89	--	310	16	1.4	2.3	7.1	--	--
11/11/94	21.71	13.25	8.46	--	<50	1.3	<0.5	<0.5	1.0	--	--
02/01/95	21.71	14.02	7.69	--	<50	1.9	<0.5	<0.5	0.51	--	--
05/18/95	21.71	12.43	9.28	--	<50	8.2	<0.5	<0.5	<0.5	--	--
08/02/95	21.71	11.64	10.07	--	<50	2.3	<0.5	<0.5	<0.5	--	--
11/01/95	21.71	11.31	10.40	--	<50	<0.5	<0.5	<0.5	<0.5	--	<2.5
01/31/96	21.71	13.63	8.08	--	<50	0.98	<0.5	<0.5	<0.5	--	<2.5
05/16/96	21.71	13.91	7.80	--	<50	1.6	<0.5	<0.5	<0.5	--	<2.5
08/01/96	21.71	11.56	10.15	--	<50	0.82	<0.5	<0.5	<0.5	--	<2.5
12/17/96	21.71	13.26	8.45	--	63	2.6	<0.5	<0.5	<0.5	--	<2.5
02/20/97	21.71	--	--	Inaccessible	--	--	--	--	--	--	--
05/02/97	21.71	--	--	Inaccessible	--	--	--	--	--	--	--
05/29/97	21.71	11.72	9.99	--	120	1.8	<0.5	<0.5	<0.5	--	2.6
07/23/97	21.71	11.31	10.40	--	<50	<0.5	<0.5	<0.5	<0.5	--	<2.5
11/04/97	21.71	11.38	10.33	--	63	1.2	<0.5	<0.5	<0.5	--	<2.5
02/04/98	21.71	16.19	5.52	--	<50	<0.5	<0.5	<0.5	<0.5	--	<2.5
05/01/98	21.71	12.40	9.31	--	<50	<0.5	<0.5	<0.5	<0.5	--	<2.5

Cumulative Table of Well Data and Analytical Results

Vertical Measurements are in feet. Analytical results are in parts per billion (ppb)

DATE	Well Head Elev.	Ground Water Elev.	Depth To Water	Notes	TPH-Gasoline	Benzene	Toluene	Ethyl-Benzene	Xylene	Lead	MTBE
MW-7											
11/02/93	20.95	10.88	10.07	--	--	--	--	--	--	--	--
02/10/94	20.95	--	--	--	--	--	--	--	--	--	--
05/12/94	20.95	--	--	--	--	--	--	--	--	--	--
08/26/94	20.95	--	--	--		--	--	--	--	--	--
NO LONGER MONITORED OR SAMPLED											
MW-8											
11/02/93	21.84	11.02	10.82	--	15,000	2000	440	420	1400	<400	--
02/10/94	21.84	12.97	8.87	--	6500	1200	380	250	7900	--	--
05/12/94	21.84	12.19	9.65	--	30,000	1400	2900	800	3800	--	--
08/26/94	21.84	10.90	10.94	--	17,000	720	200	330	930	--	--
11/11/94	21.84	13.38	8.46	--	6800	250	170	190	650	--	--
02/01/95	21.84	14.36	7.48	--	330	68	2.8	2.7	4.3	--	--
05/18/95	21.84	12.54	9.30	--	540	120	12	11	23	--	--
08/02/95	21.84	11.73	10.11	--	1100	150	9.7	20	40	--	--
11/01/95	21.84	11.36	10.48	--	1700	120	15	16	39	--	<5.0
01/31/96	21.84	14.64	7.20	--	57	5.3	<0.5	<0.5	<0.5	--	<2.5
05/16/96	21.84	13.99	7.85	--	2100	260	43	56	130	--	64
08/01/96	21.84	11.59	10.25	--	1100	45	0.92	8.9	25	--	7.4
12/17/96	21.84	12.95	8.89	--	2000	280	30	51	88	--	22
02/20/97	21.84	--	--	Inaccessible	--	--	--	--	--	--	--
05/02/97	21.84	--	--	Inaccessible	--	--	--	--	--	--	--
05/29/97	21.84	11.79	10.05	--	3400	280	31	53	120	--	<50
07/23/97	21.84	11.48	10.36	--	760	20	2.2	2.6	5.0	--	9.7
11/04/97	21.84	11.49	10.35	--	1100	150	13	22	39	--	49
02/04/98	21.84	16.29	5.55	--	270	6.8	<0.5	3.3	<0.5	--	<2.5
05/01/98	21.84	12.62	9.22	--	190	5.3	<0.5	<0.5	0.75	--	2.8

Cumulative Table of Well Data and Analytical Results

Vertical Measurements are in feet. Analytical results are in parts per billion (ppb)

DATE	Well Head Elev.	Ground Water Elev.	Depth To Water	Notes	TPH-Gasoline	Benzene	Toluene	Ethyl-Benzene	Xylene	Lead	MTBE
MW-9											
11/02/93	20.55	10.53	10.02	--	--	--	--	--	--	--	--
02/10/94	20.55	--	--	--	--	--	--	--	--	--	--
05/12/94	20.55	11.60	8.95	--	<50	<0.5	<0.5	<0.5	<0.5	--	--
08/26/94	20.55	--	--	Sampled biannually	--	--	--	--	--	--	--
02/01/95	20.55	13.35	7.20	--	<50	<0.5	<0.5	<0.5	<0.5	--	--
08/02/95	20.55	11.22	9.33	--	<50	<0.5	<0.5	<0.5	<0.5	--	--
01/31/96	20.55	14.10	6.45	--	<50	<0.5	<0.5	<0.5	<0.5	--	<2.5
08/01/96	20.55	11.20	9.35	--	<50	<0.5	<0.5	<0.5	<0.5	--	<2.5
12/17/96	20.55	12.29	8.26	--	--	--	--	--	--	--	--
02/20/97	20.55	12.09	8.46	--	55*	1.1	<0.5	<0.5	<0.5	--	<2.5
05/02/97	20.55	11.45	9.10	--	--	--	--	--	--	--	--
07/23/97	20.55	10.95	9.60	--	<50	<0.5	<0.5	<0.5	<0.5	--	<2.5
02/04/98	20.55	15.51	5.04	--	<50	<0.5	<0.5	<0.5	<0.5	--	<2.5
MW-10											
11/02/93	21.25	10.93	10.32	--	--	--	--	--	--	--	--
02/10/94	21.25	--	--	--	--	--	--	--	--	--	--
05/12/94	21.25	--	--	--	--	--	--	--	--	--	--
08/26/94	21.25	--	--	--		--	--	--	--	--	--

NO LONGER MONITORED OR SAMPLED

* Chromatogram pattern indicates an unidentified hydrocarbon.

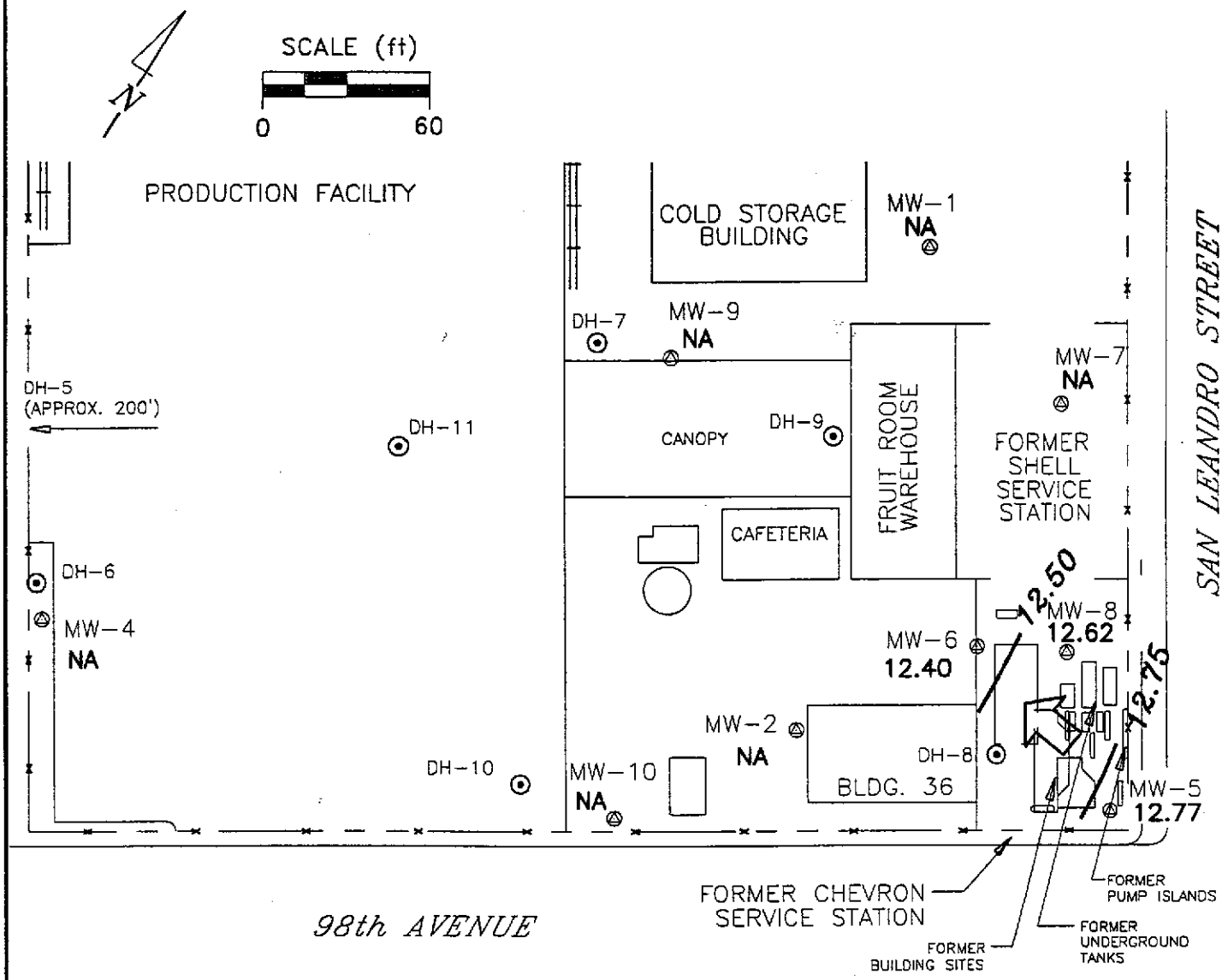
Cumulative Table of Well Data and Analytical Results

Vertical Measurements are in feet. Analytical results are in parts per billion (ppb)

DATE	Well Head Elev.	Ground Water Elev.	Depth To Water	Notes	TPH-Gasoline	Benzene	Toluene	Ethyl-Benzene	Xylene	Lead	MTBE
TRIP BLANK											
02/10/94	--	--	--	--	<50	<0.5	<0.5	<0.5	<0.5	--	--
05/12/94	--	--	--	--	<50	<0.5	<0.5	<0.5	<0.5	--	--
08/26/94	--	--	--	--	<50	<0.5	<0.5	<0.5	<0.5	--	--
11/11/94	--	--	--	--	<50	<0.5	<0.5	<0.5	<0.5	--	--
02/01/95	--	--	--	--	<50	<0.5	<0.5	<0.5	<0.5	--	--
05/18/95	--	--	--	--	<50	<0.5	<0.5	<0.5	<0.5	--	--
08/02/95	--	--	--	--	<50	<0.5	<0.5	<0.5	<0.5	--	--
11/01/95	--	--	--	--	<50	<0.5	<0.5	<0.5	<0.5	--	--
01/31/96	--	--	--	--	<50	<0.5	<0.5	<0.5	<0.5	--	<2.5
05/16/96	--	--	--	--	<50	<0.5	<0.5	<0.5	<0.5	--	<2.5
08/01/96	--	--	--	--	<50	<0.5	<0.5	<0.5	<0.5	--	<2.5
12/17/96	--	--	--	--	<50	<0.5	<0.5	<0.5	<0.5	--	<2.5
02/20/97	--	--	--	--	<50	<0.5	<0.5	<0.5	<0.5	--	<2.5
05/02/97	--	--	--	--	<50	<0.5	<0.5	<0.5	<0.5	--	<2.5
07/23/97	--	--	--	--	<50	<0.5	<0.5	<0.5	<0.5	--	<2.5
02/04/98	--	--	--	--	<50	<0.5	<0.5	<0.5	<0.5	--	<2.5
05/01/98	--	--	--	--	<50	<0.5	<0.5	<0.5	<0.5	--	<2.5

Note: Blaine Tech Services, Inc. began routine monitoring of the groundwater wells at this site on November 1, 1994.
Earlier field data and analytical results are drawn from the September 14, 1994 Groundwater Technology, Inc. report.

ABBREVIATIONS:
TPH = Total Petroleum Hydrocarbons
MTBE = Methyl t-Butyl Ether



EXPLANATION

- ⊙ MONITORING WELL
- ⊙ SOIL BORING
- 12.62 GROUNDWATER ELEVATION (FT, MSL)
- 12.50 GROUNDWATER ELEVATION CONTOUR (FT, MSL)
- NA DATA NOT AVAILABLE
- APPROXIMATE GROUNDWATER FLOW DIRECTION; APPROXIMATE GRADIENT = 0.005

REGISTERED GEOLOGIST
STEVEN E. KRCIK
No. 4975
STATE OF CALIFORNIA

Basemap from Geoconsultants, Inc.

PREPARED BY
RRM
engineering contracting firm

Former Chevron Station 9-1723
9757 San Leandro Street
Oakland, California

GROUNDWATER ELEVATION CONTOUR MAP,
MAY 1, 1998

FIGURE:
1
PROJECT:
DAC04

TABLE E-2
TIER 2 RBCA - POTENTIAL HEALTH RISKS VIA INHALATION OF INDOOR BENZENE VOLATILIZED FROM GROUND WATER INTO ON-SITE COMMERCIAL BUILDING

VOC Inhalation Equation: CDI (mg/kg-day) = C_a x IR x FC x EF x ED) / (BW x AT)

	RME		RME
CDI = Chronic Daily Intake (mg/kg-day)		BW_c = Body Weight (Carcinogenic Effects) (kg) =	70
C_a = Chemical Concentration in Air (mg/m^3)		BW_{nc} = Body Weight (Noncarcinogenic Effects) (kg) =	70
IR = Inhalation Rate (m^3/day) =	20	AT_c = Averaging Time (Carcinogenic Effects) (days) =	25,550
FC = Fraction from Contaminated Sou	1	AT_{nc} = Averaging Time (Noncarcinogenic Effects) (days) =	9,125
EF = Exposure Frequency (days/year)	250	TR = Target Excess Cancer Risk =	1E-05
ED = Exposure Duration (years) =	25	THI = Target Hazard Index =	1

Chemical	Concentration (mg/m^3)	Carcinogenic CDI (mg/kg-day)	Noncarcinogenic CDI (mg/kg-day)	Cal-EPA Slope Factor $(mg/kg\text{-}day)^{-1}$	Reference Dose mg/kg-day	Excess Cancer Risk	Hazard Quotient	RME - % Risk Contribution		1.00E-05 RBSL	HI = 1 RBSL
								Cancer	Hazard	mg/L	mg/L
Benzene	1.1E-04	7.7E-06	2.2E-05	1.0E-01	1.7E-03	8E-07	1.3E-02	100%	100%	5.94E-01	3.61E+00
Toluene	9.6E-06	6.7E-07	1.9E-06		1.1E-01		1.7E-05		0%		2.35E+02
Ethylbenzene	1.7E-05	1.2E-06	3.4E-06		2.9E-01		1.2E-05		0%		6.00E+02
Xylenes	2.4E-05	1.7E-06	4.8E-06		2.0E-01		2.4E-05		0%		4.59E+02
TOTAL						**8E-07**	**1.3E-02**	**100%**	**100%**		

Notes: Blank means no data available or not determined.
Excess cancer risk = Carcinogenic CDI x Slope factor.
Hazard quotient = Noncarcinogenic CDI / Reference dose.

these # are diffent from another table E-2 (attachment C)

TABLE E-4
POTENTIAL HEALTH RISKS VIA INHALATION OF AMBIENT BENZENE FROM SOIL GAS
ONSITE COMMERCIAL SCENARIO

VOC Inhalation Equation: CDI (mg/kg-day) = C_a x IR x FC x EF x ED) / (BW x AT)

	RME		RME
CDI = Chronic Daily Intake (mg/kg-day)		BW_c = Body Weight (Carcinogenic Effects) (kg) =	70
C_a = Chemical Concentration in Air (mg/m^3)		BW_{nc} = Body Weight (Noncarcinogenic Effects) (kg) =	70
IR = Inhalation Rate (m^3/day) =	2E+01	AT_c = Averaging Time (Carcinogenic Effects) (days) =	25,550
FC = Fraction from Contaminated Source =	1	AT_{nc} = Averaging Time (Noncarcinogenic Effects) (days) =	9,125
EF = Exposure Frequency (days/year) =	250	TR = Target Excess Cancer Risk =	1E-05
ED = Exposure Duration (years) =	25	THI = Target Hazard Index =	1

Chemical	Concentration (mg/m^3)	Carcinogenic CDI (mg/kg-day)	Noncarcinogenic CDI (mg/kg-day)	Cal-EPA Slope Factor $(mg/kg\text{-}day)^{-1}$	Reference Dose mg/kg-day	Excess Cancer Risk	Hazard Quotient	RME - % Risk Contribution		1.00E-05 RBSL* mg/m^3	HI = 1 RBSL* mg/m^3
								Cancer	Hazard		
Benzene	7.0E-06	4.9E-07	1.4E-06	1.0E-01	1.7E-03	5E-08	8.0E-04	100%	100%	4.73E+02	1.25E+03
Toluene	6.1E-07	4.2E-08	1.2E-07		1.1E-01		1.1E-06		0%		9.24E+05
Ethylbenzene	2.4E-06	1.7E-07	4.7E-07		2.9E-01		1.6E-06		0%		6.18E+05
Xylenes	1.1E-06	7.9E-08	2.2E-07		2.0E-01		1.1E-06		0%		9.09E+05
TOTAL						**5E-08**	**8.0E-04**	**100%**	**100%**		

Notes:
Commercial exposure parameters are the USEPA standard default values.
* RBSL for soil gas

These #s also different from Table E-4 in Attachment C

TABLE E-6
POTENTIAL HEALTH RISKS VIA INHALATION OF BENZENE MIGRATED INTO COMMERCIAL BUILDING VIA FOUNDATION CRACKS ESTIMATED FROM MEASURED SOIL GAS LEVELS

VOC Inhalation Equation: CDI (mg/kg-day) = C_a x IR x FC x EF x ED) / (BW x AT)

	RME		RME
CDI = Chronic Daily Intake (mg/kg-day)		BW_c = Body Weight (Carcinogenic Effects) (kg) =	70
C_a = Chemical Concentration in Air (mg/m^3)		BW_{nc} = Body Weight (Noncarcinogenic Effects) (kg) =	70
IR = Inhalation Rate (m^3/day) =	2E+01	AT_c = Averaging Time (Carcinogenic Effects) (days) =	25,550
FC = Fraction from Contaminated Source =	1	AT_{nc} = Averaging Time (Noncarcinogenic Effects) (days) =	9,125
EF = Exposure Frequency (days/year) =	250	TR = Target Excess Cancer Risk =	1E-05
ED = Exposure Duration (years) =	25	THI = Target Hazard Index =	1

Chemical	Concentration (mg/m^3)	Carcinogenic CDI (mg/kg-day)	Noncarcinogenic CDI (mg/kg-day)	Cal-EPA Slope Factor (mg/kg-day)$^{-1}$	Reference Dose mg/kg-day	Excess Cancer Risk	Hazard Quotient	RME - % Risk Contribution		1.00E-05 RBSL* mg/m^3	HI = 1 RBSL* mg/m^3
								Cancer	Hazard		
Benzene	1.7E-04	1.2E-05	3.4E-05	1.0E-01	1.7E-03	1E-06	2.0E-02	100%	100%	1.90E+01	1.16E+02
Toluene	7.7E-08	5.4E-09	1.5E-08		1.1E-01		1.4E-07		0%		1.62E+06
Ethylbenzene	2.5E-07	1.7E-08	4.9E-08		2.9E-01		1.7E-07		0%		5.80E+06
Xylenes	1.4E-07	9.5E-09	2.6E-08		2.0E-01		1.3E-07		0%		3.62E+06
TOTAL						**1E-06**	**2.0E-02**	**100%**	**100%**		

Notes: Blank means no data available or not determined.
Excess cancer risk = Carcinogenic CDI x Slope factor.
Hazard quotient = Noncarcinogenic CDI / Reference dose.
* RBSL for soil gas

Why are these conc different from next page

Attachment C

CRTC RBCA Analysis

RBCA

SUMMARY REPORT

❑ TIER 1 / ■ TIER 2 RBCA SITE EVALUATION

P R E P A R E D F O R

Former Chevron Station #9-1723
SITE NAME

9757 San Leandro Street, Oakland CA
LOCATION

Chevron Research and Technology Co.,
Curtis A. Peck, Lead Hydrogeologist
PREPARED BY

March 17, 1997
DATE ISSUED

REVIEWED BY _____

DATE _____

Site Name: Former Chevron Station #9-1723
Site Location: 9757 San Leandro St., Oakland CA
Date Completed: 3/7/97
Completed By: Curt Peck, CRTC Hydrogeologist

TIER 1 / TIER 2 RBCA REPORT INDEX

■ = ENCLOSED

		Tier 1	Tier 2
1.0 EXECUTIVE SUMMARY			
1.1 Tier 1 Executive Summary Checklist		☐	
1.2 Tier 2 Executive Summary Checklist	*		■
1.3 Executive Summary Discussion		☐	■ *(u)*
1.4 Baseline Exposure/Control Strategy Flowchart		☐	☐ *(u)*
2.0 SITE HISTORY			
2.1 Site Description		☐	☐ *(u)*
2.2 Site Ownership & Activity Record		☐	☐ *(u)*
2.3 Past Releases or Source Areas		☐	☐ *(u)*
2.4 Summary of Current & Completed Site Activities		☐	☐ *(u)*
2.5 Summary of Potential Near-Term Site Activities		☐	☐ *(u)*
3.0 SITE ASSESSMENT INFORMATION			
3.1 Regional Hydrogeologic Conditions		☐	☐ *(u)*
3.2 Hydrogeologic Site Conditions		☐	☐ *(u)*
3.3 Beneficial Use Summary		☐	☐ *(u)*
3.4 Well Inventory Survey		☐	☐ *(u)*
3.5 Ecological Assessment Summary		☐	☐ *(u)*
4.0 BASELINE EXPOSURE ASSESSMENT			
4.1 Site Classification Summary		☐	☐ *(u)*
4.2 Baseline Exposure Flowchart		☐	■ *(u)*
4.3 Tier 2 Exposure Factor Checklist		☐	☐ *(u)*
4.4 Tier 2 Exposure Pathway Screening	*		■
4.5 Tier 2 Exposure Scenarios & Risk Goals	*		■
5.0 SITE PARAMETERS			
5.1 Site Parameter Checklist for RBSLs		☐	■ *(u)*
5.2 Summary of Media Investigation and Chemical Analyses		☐	☐ *(u)*
5.3 Summary of Source Zone Characteristics		☐	☐ *(u)*
5.4 Surface Soil Concentration Data Summary		☐	☐ *(u)*
5.5 Subsurface Soil Concentration Data Summary		☐	■ *(u)*
5.6 Groundwater Concentration Data Summary		☐	■ *(u)*
5.7 Tier 2 Exposure Pathway Transport Parameters	*		■
6.0 TIER 1 RISK-BASED SCREENING LEVEL EVALUATION			
6.1 Tier 1 RBSL Evaluation: Surface Soil		☐	
6.2 Tier 1 RBSL Evaluation: Subsurface Soil		☐	
6.3 Tier 1 RBSL Evaluation: Groundwater		☐	

* = *Required for Tier 2 Evaluation only* *(u) = For Tier 2, update Tier 1 version as needed.*

Site Name: Former Chevron Station #9-1723 Date Completed: 3/7/97

Site Location: 9757 San Leandro St., CA Completed By: Curt Peck, CRTC

TIER 1 / TIER 2 REPORT INDEX *continued*

		■ = ENCLOSED	
		Tier 1	Tier 2
7.0 NATURAL ATTENUATION FACTORS			
7.1 Tier 2 NAF Calculation Methods & Results	*		
8.0 TIER 2 BASELINE RISK CALCULATION			
8.1 Tier 2 Exposure Concentration & Intake Calculation	*		■
8.2 Tier 2 Pathway Risk Calculation	*		■
8.3 Tier 2 Baseline Risk Summary Table	*		■
9.0 TIER 2 SSTL EVALUATION			
9.1 Surface Soil SSTL Values	*		☐
9.2 Subsurface Soil SSTL Values	*		■
9.3 Groundwater SSTL Values	*		■
10.0 TIER 1 / TIER 2 CORRECTIVE ACTION ASSESSMENT			
10.1 Exposure Control Flowchart		☐	☐ *(u)*
10.2 Soil Remediation Technology Screening Matrix		☐	☐ *(u)*
10.3 Groundwater Remediation Technology Screening Matrix		☐	☐ *(u)*
ATTACHMENTS			
Figure 1 Site Location Map		☐	■ *(u)*
Figure 2 Extended Site Map		☐	☐ *(u)*
Figure 3 Site Plan View		☐	■ *(u)*
Figure 4 Site Photos		☐	☐ *(u)*
Figure 5 Groundwater Elevation Map		☐	■ *(u)*
Figure 6 Geological Cross-Section(s)		☐	☐ *(u)*
Figure 7 Groundwater Plume Maps	*		■
Figure 8 Time Series Groundwater Data	*		■
APPENDICES			
Appendix A Chemical Analysis Data Tables		☐	■ *(u)*
Appendix B		☐	☐ *(u)*
(SPECIFY)			

* = *Required for Tier 2 Evaluation only* *(u) = For Tier 2, update Tier 1 version as needed.*

Site Name: Former Chevron Station #9-1723 | Date Completed: 3/7/97

Site Location: 9757 San Leandro, St., Oakland CA | Completed By: Curt Peck, CRTC | *Page 1 of 1*

TIER 2 EXECUTIVE SUMMARY CHECKLIST

TIER 2 SSTL CALCULATION METHOD (■ OR ● TO SELECT)

SSTL Calculation Option

- ☐ Option 1: Site-Specific Screening Levels
- ■ Option 2: Individual Constituent SSTL Values
- ☐ Option 3: Cumulative Constituent SSTL Values

NAF Calculation Method

- ☐ Fate and Transport Modeling:
  - ● RBCA Spreadsheet System
  - ○ Other Model(s)
- ☐ Empirical NAF Calculation

SITE DATA INVENTORY

Source Zone Investigation Complete:

- ☐ Surface Soil (e.g., ≤ 3 ft BGS)
- ■ Subsurface Soil (e.g., > 3 ft BGS)
- ■ Groundwater

Exposure Pathway Information Compiled:

- ■ Air Pathway
- ☐ Groundwater Pathway
- ☐ Soil Pathway
- ☐ Surface Water Pathway
- ☐ Land Use Classification (on-site and off-site)

TIER 1 WORKSHEETS 1.3 - 4.2 AND 5.2 - 5.6 HAVE BEEN UPDATED TO INCLUDE NEW TIER 2 INFORMATION.

TASKS COMPLETED

- ☐ Tier 1 Evaluation
- ☐ Tier 1 Interim Corrective Action
- ■ Tier 2 Evaluation
- ☐ Tier 2 Interim Corrective Action
- ☐ Tier 2 Final Corrective Action
- ☐ Tier 3 Evaluation

CURRENT SITE CLASSIFICATION

Classification No.	Scenario Description	Prescribed Interim Action	Date Implemented

TIER 2 CORRECTIVE ACTION CRITERIA

Affected Medium	Tier 2 SSTL Exceeded?		Applicable Excess Risk Limits (specify value)				Other Applicable Exposure Limit
	Yes	No	Indiv. Risk	Total Risk	Hazard Index	Hazard Quotient	*(specify, if any)*
• Surface Soil (≤ 3ft BGS)	☐	☐					
• Subsurface Soil (>3ft BGS	☐	■	10^{-5}	10^{-5}	1.0		
• Groundwater	☐	■	10^{-5}	10^{-5}	1.0		

PROPOSED ACTION

- ☐ ***No Action:*** Tier 2 SSTLs not exceeded. Apply for closure.
- ☐ ***Interim Corrective Action:*** Address principal, near-term risks sources.
- ■ ***Final Corrective Action:*** Remediate/control site to meet Tier 2 criteria.
- ☐ ***Tier 3 Evaluation:*** Improve baseline risk and SSTL estimates.

NOTE:

Rationale for proposed action documented on Worksheets 1.3 and 10.1-10.3.

ALL WORKSHEETS ENCLOSED IN THIS REPORT ARE IDENTIFIED ON THE TABLE OF CONTENTS FORM

Site Name: Former Chevron Station #9-1723 Date Completed: 3/17/97

Site Location: 9757 San Leandro St., Oakland CA Completed By: Curt Peck, CRTC

EXECUTIVE SUMMARY DISCUSSION

Instructions: ***Provide brief description of site history, hydrogeologic conditions, ecological assessment, possible exposure pathways, RBSL / SSTL results, and the scope of work for proposed corrective action activity. Address proposed methods, implementation schedule, cost, and anticipated risk reduction at or near the site.***

SITE DESCRIPTION AND HISTORY

• **Worksheets 2.1 - 2.5** • **Figures 1 - 4**

Briefly discuss site chronology, operations, features of potential concern, and future plans for site use.

N/A

SITE ASSESSMENT INFORMATION

GEOLOGIC AND HYDROGEOLOGIC SUMMARY

• **Worksheets 3.1 - 3.4** • **Figures 5 and 6**

Briefly describe regional site features, climate, vadose zone soils, and groundwater depth, quality, and use.

N/A

BASELINE EXPOSURE ASSESSMENT

COMPLETE EXPOSURE PATHWAYS AND APPLICABLE RECEPTORS

• **Worksheets 4.1 - 4.5**

Discuss current or potentially complete pathways for human or ecological exposure to site constituents.

There are no current complete exposure pathways. Potentially complete future exposure pathways include:
1) Onsite commercial worker inhalation of indoor air (Vapor intrusion to buildings from subsurface soil)
2) Onsite commercial worker inhalation of indoor air (Vapor intrusion to buildings from groundwater)

There are no identified complete ecological exposure pathways

ECOLOGICAL ASSESSMENT SUMMARY

• **Worksheet 3.5**

Discuss potentially sensitive ecological receptors and habitat in the vicinity of site, if any.

Potentially sensitive ecological receptors are not known.

Site Name: Former Chevron Station #9-1723 Date Completed: 3/17/97

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EXECUTIVE SUMMARY DISCUSSION Continued

TIER 1 RBSL OR TIER 2 SSTL EVALUATION

COMPARISON TO SOURCE MEDIA CONCENTRATIONS

- **Worksheets 5.1 - 5.7** • **Figures 7 and 8**

For complete pathways, compare representative source concentrations to applicable RBSL or SSTL values.

Calculated SSTL soil concentration at a 1 x 10^{-5} risk level for exposure to benzene vapors from soil was 0.45 mg/Kg. The calculated SSTL groundwater concentration at a 1 x 10^{-5} risk level for exposure to benzene vapors from groundwater was 6.7 mg/L. Representative arithmetic soil benzene concentration of 5.8 mg/Kg exceeded the SSTL for soil. The representative arithmetic groundwater benzene concentration of 0.137 mg.L was below the SSTL for groundwater.

Should be 0.137 mg/L

QUALITATIVE UNCERTAINTY ASSESSMENT

- **Worksheets 4.2, 4.4, and 5.1 - 5.7**

Discuss uncertainty / conservatism of the site data and calculation methods used in deriving RBSL or SSTL values.

The potential for human health or ecological exposure to hydrocarbon impacted soil, air and groundwater is minimal at this site because the calculated SSTL values maintain a degree of conservatism that would be protective of human health and the environment. The SSTL values were calculated for a 1 x 10^{-5} Target Risk (commercial worker) and it is very unlikely that this property would ever be residential. The vapor inhalation equations contained in this software package tend to err on the conservative side of default parameters and it is likely that generated values represent maximum expected risks. The arithmetic average of the soils data is highly biased by the 99 mg/Kg sample result in SB-10 and is one of the main reasons that the site exceeds the 1 x 10^{-5} Target Risk value.

PROPOSED CORRECTIVE ACTION

- **Worksheets 10.1 - 10.3**

Describe rationale for proposed action (i.e., no action, interim action, final action, or tier upgrade), considering site classification and land use. Discuss basis for remedy selection, if applicable.

Based on the results of this risk based site review, the vapors from benzene in the capillary zone of the site soils may pose a potential future health threat to future commercial workers at the site. Because excavation of the site is not warranted, it is recommended that the site have institutional controls placed on it to reduce the future commercial worker exposure to calculated benzene vapors from site soils. These controls may range from limiting development directly over the impacted soils to placement of a vapor barrier beneath any future site development. In addition, the groundwater monitoring data indicates a stable to shrinking BTEX plume and the residual groundwater contamination does not pose a health threat to potential future occupants through the vapor inhalation pathway. Additionally, natural attenuation of residual hydrocarbons will continue to decrease contaminant concentrations.

Continued groundwater monitoring on a semi-annual to annual basis of site wells MW-2, -5, -6, -8, -9 and MW-11 is recommended.

REFERENCE DOCUMENTS

- **Appendices**

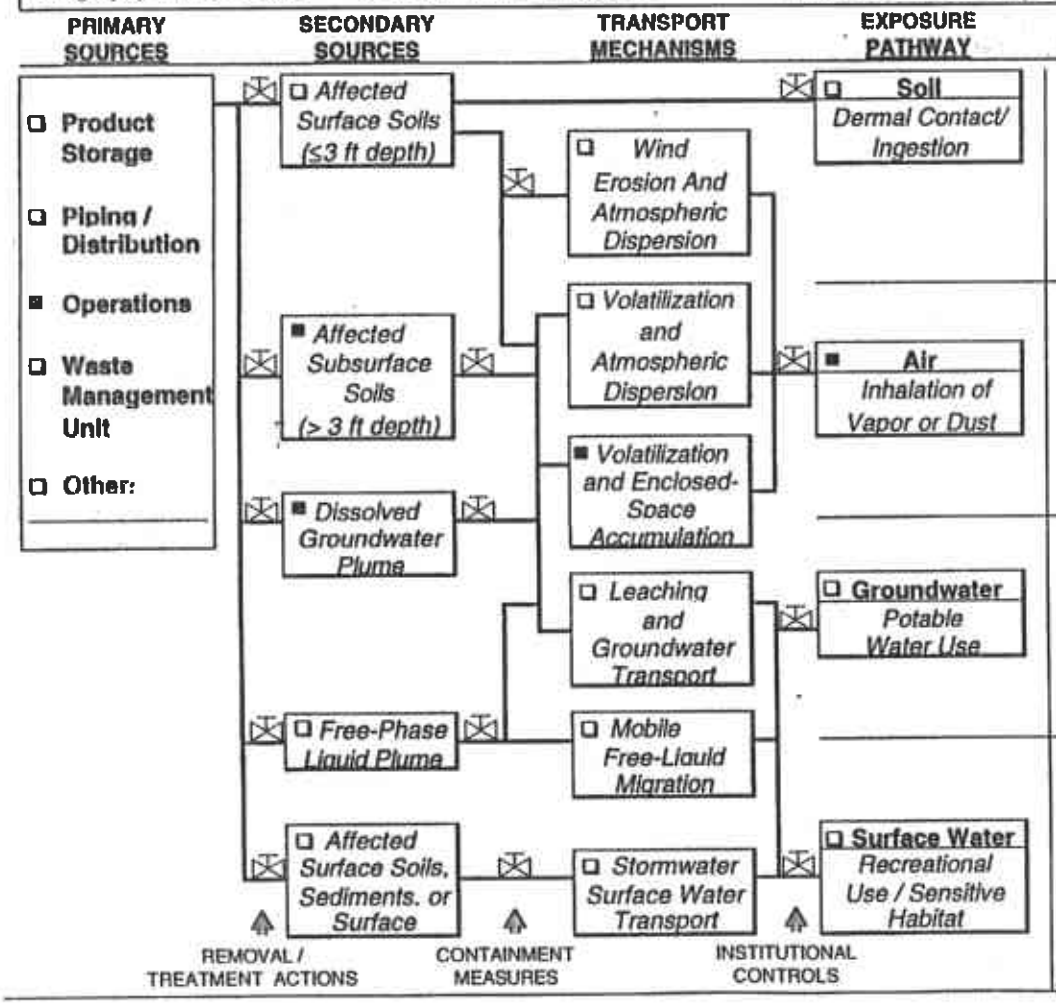
List the document sources for the data cited in this report.

1) Blaine Tech Groundwater Monitoring Reports - submitted 1/24/97
2) Fluor-Daniel GTI Soil Analytical Results - 5/15/96 Report
3) Fluor-Daniel GTI Soil Physical Parameter Results - 5/15/96 Report
4) Arithmetic Groundwater Concentration Calculations - C. Peck 3/97

Site Name: Former Chevron Station #9-1723 | Date Completed: 3/7/97
Site Location: 9757 San Leandro St., Oakland CA | Completed By: Curt Peck, CRTC

EXPOSURE CONTROL FLOWCHART

Instructions: *Identify remedial measures to be implemented to prevent exposure, as follows:* • *Step 1 – Baseline Exposure: Identify applicable sources, transport mechanisms, and receptors as shown on Worksheet 4.2 (■ = applicable to site).* • *Step 2 – Remedial Measures: Fill in shut-off valves (⋈) to indicate removal / treatment action, containment measure, or institutional controls to be used to "shut off" exposure pathway.* • *Step 3 – Remedial Technology Options: For each complete pathway, identify category of corrective measure to be applied and list possible technology options in space provided (see options list in RBCA Guidance Manual).*



POTENTIAL RECEPTORS	REMEDIAL ACTION TECHNOLOGY OPTIONS
Exposed Receptors *On-Site:* ☐ Residential ☐ Non-Resid. ☐ N/A ☐ Sensitive Habitat ☐ Recreation *Off-Site:* ☐ Residential ☐ Non-Resid. ☐ N/A ☐ Sensitive Habitat ☐ Recreation	☐ Complete Pathway: ○ Current ○ Potential ⋈ Action Required: ☐Yes ☐ No If yes, list technology options for ⋈:
Exposed Persons *On-Site:* ☐Residential ■ Non-Resid. ☐ N/A *Off-Site:* ☐Residential ☐ Non-Resid. ☐ N/A	☐ Complete Pathway: ○ Current ● Potential ⋈ Action Required: ☐Yes ■ No If yes, list technology options for ⋈:
Groundwater Users *On-Site:* ☐Residential ☐ Non-Resid. ☐ N/A *Off-Site:* ☐Residential ☐ Non-Resid. ☐ N/A	☐ Complete Pathway: ○ Current ○ Potential ⋈ Action Required: ☐Yes ☐ No If yes, list technology options for ⋈:
Surface Water Users *On-Site:* ☐ Residential ☐ Non-Resid. ☐ N/A ☐ Sensitive Habitat ☐ Recreation *Off-Site:* ☐ Residential ☐ Non-Resid. ☐ N/A ☐ Sensitive Habitat ☐ Recreation	☐ Complete Pathway: ○ Current ○ Potential ⋈ Action Required: ☐Yes ☐ No If yes, list technology options for ⋈:

(■ OR ● OR ⋈ TO SELECT)

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BASELINE EXPOSURE FLOWCHART

Instructions: *To characterize baseline exposure conditions, check boxes to identify applicable primary sources, secondary sources (affected media), potential transport mechanisms, and current or potential exposure pathways and receptors (■ = applicable to site). Identify types(s) of both on-site and off-site receptors, if applicable. Provide detailed information on complete pathways, exposure factors, and risk goals on Worksheets 4.3 - 4.5.*

PRIMARY SOURCES	SECONDARY SOURCES	TRANSPORT MECHANISMS	EXPOSURE PATHWAY	POTENTIAL RECEPTORS	COMPLETE PATHWAY?
☐ Product Storage ☐ Piping / Distribution ■ Operations ☐ Waste Management Unit ☐ Other:	☐ Affected Surface Soils (≤3 ft depth) ■ Affected Subsurface Soils (> 3 ft depth) ■ Dissolved Groundwater Plume ☐ Free-Phase Liquid Plume ☐ Affected Surface Soils, Sediments, or Surface Water	☐ Wind Erosion and Atmospheric Dispersion ☐ Volatilization and Atmospheric Dispersion ■ Volatilization and Enclosed-Space Accumulation ☐ Leaching and Groundwater Transport ☐ Mobile Free-Liquid Migration ☐ Stormwater/ Surface Water Transport	☐ Soil — Dermal Contact/ Ingestion ■ Air — Inhalation of Vapor or Dust ☐ Groundwater — Potable Water Use ☐ Surface Water — Recreational Use / Sensitive Habitat	**Exposed Receptors** On-Site: ☐ Residential ☐ Non-Resid. ■ N/A ☐ Sensitive Habitat ☐ Recreation Off-Site: ☐ Residential ☐ Non-Resid. ■ ☐ Sensitive Habitat ☐ Recreation	■ No ☐ Yes ○ Current ○ Potential ■ No ☐ Yes ○ Current ○ Potential
				Exposed Persons On-Site: ☐ Residential ■ Non-Resid. ☐ N/A Off-Site: ☐ Residential ☐ Non-Resid. ■ N/A	☐ No ■ Yes ○ Current ■ Potential ■ No ☐ Yes ○ Current ○ Potential
				Groundwater Users On-Site: ☐ Residential ☐ Non-Resid. ■ N/A Off-Site: ☐ Residential ☐ Non-Resid. ■ N/A	■ No ☐ Yes ○ Current ○ Potential ■ No ☐ Yes ○ Current ○ Potential
				Surface Water Users On-Site: ☐ Residential ☐ Non-Resid. ■ N/A ☐ Sensitive Habitat ☐ Recreation Off-Site: ☐ Residential ☐ Non-Resid. ■ N/A ☐ Sensitive Habitat ☐ Recreation	■ No ☐ Yes ○ Current ○ Potential ■ No ☐ Yes ○ Current ○ Potential

(■ OR ● TO SELECT)

MAKE ZAPF NOT ITALICS

Site Name: Former Chevron Station #9-1723 | Date Completed: 3/7/97

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TIER 2 EXPOSURE PATHWAY SCREENING

Instructions: *Exposure pathways screening involves the following steps:*

1) *Source Medium: Compare maximum constituent concentration in relevant source medium to applicable Tier 1 RBSL value for designated pathway.*

2) *Transport Mechanism: Transport is active at site if: a) relevant source medium is affected, b) exposure medium or receptor exists, and c) constituent transport from source to receptor could occur under current or anticipated future use.*

3) *Exposure Medium: For pathways under steady-state transport conditions (e.g., air), compare measured COC concentration at POE to applicable Tier 1 exposure limit for air, groundwater, or soil. Surface water concentrations should be compared to applicable state or federal water quality criteria.*

4) *Complete Pathway: For screening, pathway considered complete if "Yes" reported in Column A and either Column B or C.*

Notes:
RBSL = Risk-Based Screening Level
POE = Point of Exposure
COC = Constituent of Concern
NM = Not Measured

PATHWAY	A) SOURCE MEDIUM: Type	A) SOURCE MEDIUM: Pathway Tier 1 RBSL Exceeded?	B) TRANSPORT MECHANISM: Type	B) TRANSPORT MECHANISM: Active at Site?	C) EXPOSURE MEDIUM: Type	C) EXPOSURE MEDIUM: Exposure Limit Exceeded at POE?	COMPLETE PATHWAY? (Check if yes & specify status)
AIR EXPOSURE PATHWAYS	(■ TO SELECT)						
1) *Surface Soils:* Vapor Inhalation and Dust Ingestion	Surface Soil	☐ Yes ☐ No	Volatilization /Dust Transport	■ No ☐ Yes - Current ☐ Yes - Future	Ambient Air	■ NM ☐ No ☐ Yes	☐ Current ☐ Potential
2) *Subsurface Soils:* Volatilization to Ambient Air	Subsurface Soil	☐ Yes ☐ No	Volatilization	■ No ☐ Yes - Current ☐ Yes - Future	Ambient Air	■ NM ☐ No ☐ Yes	☐ Current ☐ Potential
3) *Subsurface Soils:* Volatilization to Enclosed Space	Subsurface Soil	☐ Yes ■ No	Volatilization	☐ No ☐ Yes - Current ■ Yes - Future	Indoor Air	☐ NM ■ No ☐ Yes	☐ Current ■ Potential
4) *Groundwater:* Volatilization to Ambient Air	Groundwater	☐ Yes ☐ No	Volatilization	■ No ☐ Yes - Current ☐ Yes - Future	Ambient Air	■ NM ☐ No ☐ Yes	☐ Current ☐ Potential
5) *Groundwater:* Volatilization to Enclosed Space	Groundwater	☐ Yes ■ No	Volatilization	☐ No ☐ Yes - Current ■ Yes - Future	Indoor Air	☐ NM ■ No ☐ Yes	☐ Current ■ Potential
GROUNDWATER EXPOSURE PATHWAYS							
6) *Soil:* Leaching to Groundwater: Ingestion	Surface or Subsurface Soils	☐ Yes ☐ No	Leaching /Groundwater Flow	■ No ☐ Yes - Current ☐ Yes - Future	Groundwater	■ NM ☐ No ☐ Yes	☐ Current ☐ Potential
7) *Dissolved or Free-Phase Groundwater Plume:* Ingestion	Groundwater	☐ Yes ☐ No	Groundwater Flow	■ No ☐ Yes - Current ☐ Yes - Future	Groundwater	■ NM ☐ No ☐ Yes	☐ Current ☐ Potential
SOIL EXPOSURE PATHWAY							
8) *Surface Soils:* Dermal Contact /Ingestion	Surface Soil	☐ Yes ☐ No	Direct Contact	☐ No ☐ Yes - Current ■ Yes - Future	Soil	■ NM ☐ No ☐ Yes	☐ Current ☐ Potential

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Site Location: 9757 San Leandro St., Oakland CA Completed By: Curt Peck, CRTC

TIER 2 EXPOSURE PATHWAY SCREENING *CONTINUED*

PATHWAY	A) SOURCE MEDIUM: Type	Pathway Tier 1 RBSL Exceeded?	B) TRANSPORT MECHANISM: Type	Active at Site?	C) EXPOSURE MEDIUM: Type	Exposure Limit Exceeded at POE?	COMPLETE PATHWAY? (Check if yes & specify status)
SURFACE WATER PATHWAYS							
9) *Soil:* Leaching to Groundwater /Discharge to Surface Water: Recreation or Fish	Surface or Subsurface Soils	☐ Yes ■ No	Leaching /Groundwater Flow	■ No ☐ Yes - Current ☐ Yes - Future	Surface Water	■ NM ☐ No ☐ Yes	☐ Current ☐ Potential
10) *Groundwater Plume:* Discharge to Surface Water: Recreation or Fish	Groundwater	☐ Yes ■ No	Groundwater Flow	■ No ☐ Yes - Current ☐ Yes - Future	Surface Water	■ NM ☐ No ☐ Yes	☐ Current ☐ Potential
11) *Soil :* Leaching to Stormwater / Discharge to Surface Water: Recreation or Fish	Surface Soils	☐ Yes ■ No	Overland Flow	■ No ☐ Yes - Current ☐ Yes - Future	Surface Water	■ NM ☐ No ☐ Yes	☐ Current ☐ Potential

Additional Information: ***Provide necessary background discussion for data provided above. Also, if ecological exposure pathway identified on Worksheet 3.5, identify relevant source medium, transport mechanism, exposure medium, and receptor type below.***

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TIER 2 EXPOSURE SCENARIOS AND RISK GOALS

Instructions: ***For each exposure pathway, indicate i) Point of Exposure (POE) location (on-site, off-site, or both), ii) applicable exposure scenario at each POE (residential or commercial / industrial), and iii) applicable risk goals. Distance from source corresponds to shortest lateral distance to applicable POE from point of maximum COC concentration in source medium along possible migration pathway. Provide exposure limit information if applicable (e.g., OSHA Limits, MCLs, etc.).*** *(■ TO SELECT)*

EXPOSURE PATHWAY	DISTANCE FROM SOURCE	EXPOSURE SCENARIO AT POE	TARGET RKSKS AT POE: Individual Constituent Effects — Indiv. Risk	Indiv. HQ	Cumulative Constituent Effects — Additive Risk	Additive HI	Other Exposure Limit (specify if applicable)
AIR EXPOSURE PATHWAYS		■ COMPLETE (provide data) ❑ NOT COMPLETE (skip to next pathway)					
■ On-Site POE	0 ft	❑ Residential / ■ Commercial /Industrial	10^{-5}	1.0			❑ PEL/TLV
❑ Off-Site POE	____ ft	❑ Residential / Commercial /Industrial					❑ PEL/TLV
GROUNDWATER EXPOSURE PATHWAYS		■ COMPLETE (provide data) ❑ NOT COMPLETE (skip to next pathway)					
■ On-Site POE	0 ft	❑ Residential / ❑ Commercial /Industrial					❑ MCL
❑ Off-Site POE	____ ft	❑ Residential / Commercial /Industrial					❑ MCL
SOIL EXPOSURE PATHWAY		❑ COMPLETE (provide data) ■ NOT COMPLETE (skip to next pathway)					
■ On-Site POE: (at source)		❑ Residential / ■ Commercial /Industrial	10^{-5}	1.0			❑ ____
❑ Off-Site POE (at source)		❑ Residential / Commercial /Industrial					❑ ____
SURFACE WATER EXPOSURE PATHWAYS		❑ COMPLETE (provide data) ■ NOT COMPLETE (skip to next pathway)					
❑ On-Site POE:	____ ft	❑ Recreational / Ecological *(specify exp. limit only)*					❑ ____
❑ Off-Site POE	____ ft	❑ Recreational / Ecological *(specify exp. limit only)*					❑ ____

ADDITIONAL INFORMATION:

If exposure limit is specified, provide reference for concentration limits to be applied to each COC (e.g., OSHA limits, water quality criteria, etc.):

Site Name: Former Chevron Station #9-1723 | Date Completed: 3/7/97

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SITE PARAMETER CHECKLIST FOR RISK-BASED SCREENING LEVELS

Instructions: *For Tier 1 evaluation (generic screening levels), review specified default parameters (*) to ensure values are conservative for site. For Tier 2 Option 1 SSTL calculation (site-specific screening levels), provide site-specific values for sensitive parameters (§). Indicate parameter value used in evaluation by completing check box (■).*

Note: * **Confirm conservatism of these values for Tier 1 evaluation.**

§ **Provide site-specific measurement or estimate for Tier 2 evaluation.**

	Soil Parameters	Default Value Used		Site-Specific Value Used		
	soil type	☐	sandy soil	■	sandy clay/ silt	*§
Θ_T	Soil porosity	☐	0.38 (dim)	■	0.42 ✓	§
Θ_{ws}	water content - vadose zone	☐	0.12 (dim)	■	0.133 ✓	§
Θ_{as}	air content - vadose zone (= Θ_T - Θ_{ws})	☐	0.26 (dim)	■	0.287 ✓	
Θ_{wcap}	water content - capillary fringe	☐	0.342 (dim)	■	0.378 ✓	
Θ_{acap}	air content - capillary fringe (= Θ_T - Θ_{wcap})	☐	0.038 (dim)	■	0.042 ✓	
ρ_c	Soil density	☐	1.7 g/cm^3	■	2.03 ✓	§
foc	mass fraction of organic carbon in soil	☐	0.01 (dim)	■	0.0014 ✓	§
Ls	Depth to contaminated soil	☐	100 cm	■	91 cm ✓	§
Lgw	Depth to groundwater	☐	300 cm	■	280 cm ✓	§
h_{cap}	capillary zone thickness	☐	5 cm	■	28 cm ✓	
hv	vadose zone thickness (= Lgw - hc)	☐	295 cm	■	252 cm ✓	
pH	Soil/water pH	■	6.5	☐		
	Groundwater Parameters					
I	Water infiltration rate	■	30 cm/yr	☐		§
V_{gw}	groundwater velocity	■	82.0 ft/yr	☐		*§
δ_{gw}	groundwater mixing zone depth	■	200 cm	☐		*§
DF	aquifer dilution factor (= 1 + V_{gw} δ_{gw}/ (IW))	■	12.1	☐		
	Surface Parameters					
U_{air}	Amb. air velocity in mixing zone	■	225 cm/s	☐		*§
δ_{air}	Mixing zone height	■	200 cm	☐		*§
A	Contaminated Area	■	2250000 cm^2	☐		
W	Width of Contaminated Area	■	1500 cm	☐		§
d	Thickness of Surficial Soils	■	100 cm	☐		§
Pe	Particulate areal emission rate	■	2.17E-10 g/cm^2-s	☐		§
	Building Parameters					
L_{crack}	Foundation crack thickness	■	15 cm	☐		
η	Foundation crack fraction	■	0.01 (dim)	☐		
Lb_r	Building Volume/Foundation Area Ratio (res.)	☐	200 cm	☐		
Lb_c	Building Volume/Foundation Area Ratio (com./ind.)	■	300 cm	☐		
ER_r	Building vapor volume exchange rate (res.)	■	12 dy^{-1}	☐		
ER_c	Building vapor volume exchange rate (com./ind.)	■	20 dy^{-1}	☐		

Discussion: *Provide rationale for default parameter revision; discuss additional site-specific features of note; etc.*

(continue on next page if needed)

RBCA SITE ASSESSMENT | **Tier 2 Worksheet 5.5** | **SCREEN 7.3 SUBSURFACE SOILS CONCENTRATION CALCULATOR**

Site Name: Former Chevron Station #9-1723 Completed By: Curt Peck
Site Location: 9757 San Leandro St., Oakland CA Date Completed: 2/27/1996

UC

TIER 2 SUBSURFACE SOIL CONCENTRATION DATA SUMMAR (e.g., >3 FT BGS)

CONSTITUENTS DETECTED		Analytical Method			Detected Concentrations			Calculated Distribution	Default Detection	Sample Name
CAS No.	Name	Typical Detection Limit (mg/kg)	No. of Samples	No. of Detects	Maximum Conc. (mg/kg)	Mean Conc. (mg/kg)	UCL on Mean Conc. (mg/kg)	of Data	Limit (mg/L)	Date Sampled
71-43-2	Benzene	6.0E-03	36	34	9.9E+01	5.7E-01	1.2E+00	Lognormal	0.005	
100-41-4	Ethylbenzene	6.0E-03	36	30	1.5E+02	6.7E-01	1.8E+00	Lognormal	0.005	
108-88-3	Toluene	5.0E-03	36	28	6.6E+01	2.0E-01	5.0E-01	Lognormal	0.005	
1330-20-7	Xylene (mixed isomers)	6.0E-03	36	34	2.5E+02	1.9E+00	4.9E+00	Lognormal	0.005	

Serial: g-303-ydx-938 Software: GSI RBCA Spreadsheet
Version: v 1.0

Soil concentrations used were from both 5' + 10' bgs.

10' bgs samples are below GWE.

:L Percentile

95% (must be 0.9 or 0.95)

Analytical Data (Up to 50 Data Points)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
SB-1-10	SB-2-10	SB-3-10	SB-4-10	SB-4-15	SB-5-10	SB-6-10	SB-7-5	SB-7-10	SB-8-5	SB-8-10	SB-8-15	SB-9-5	SB-9-15	SB-10-5	SB-10-10	SB-10-15	SB-11-5	SB-11-10	SB-12-5	SB-12-10	SB-13-10
4/2/96	4/1/96	4/1/96	4/1/96	4/1/96	4/1/96	4/4/96	4/1/96	4/1/96	4/4/96	4/4/96	4/4/96	4/1/96	4/1/96	4/4/96	4/4/96	4/8/96	4/4/96	4/4/96	4/3/96	4/3/96	4/3/96
1.4	0.18	0.54	0.59	0.091	2.4	0.57	2.2	1.3	1.6	4.8	0.0084	0.4	3.8	3.7	3.99	0.01	0.012	1.5	ND	1.1	1.0
0.9	0.78	2.3	0.14	0.029	10	0.42	7.7	7	ND	0.76	ND	0.14	17	9.9	150	ND	0.019	9.7	ND	19	7.4
0.44	0.12	0.66	0.52	0.030	1.4	ND	0.56	1.6	ND	1.1	ND	0.16	7.4	5.9	40	0.0051	0.04	ND	ND	4.1	0.81
28	0.59	8.0	1.1	0.23	4.2	2.3	7.6	27	0.70	2.11	0.042	0.82	89	53	210	0.016	0.058	3.2	ND	65	24

23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
SB-14-5	SB-14-10	SB-15-5	SB-15-10	SB-16-5	SB-16-10	SB-17-10	SB-18-10	SB-19-10	SB-20-10	SB-21-5	SB-22-5	SB-23-10	SB-25-10		
4/4/96	4/4/96	4/3/96	4/3/96	4/3/96	4/3/96	4/3/96	4/4/96	4/3/96	4/3/96	4/2/96	4/2/96	4/2/96	4/2/96		
0.066	6	0.011	17	0.15	0.2	4.9	19.6	2.8	3.8	ND	0.027	0.72	5.3		
0.007	16	ND	53	0.0059	28	36	9.8	1.1	37	ND	0.02	4.7	0.66		
0.05	28	0.009	66	ND	1.6	18	4.5	ND	1.5	ND	0.0091	0.47	0.20		
0.067	82	0.15	260	0.026	76	160	5.4	1.8	39.2	ND	0.015	0.39	4.6		

SCREEN 7.1 GROUNDWATER CONCENTRATION CALCULATOR

Site Name: Former Chevron Station #9-1723 Completed By: Curt Peck
Site Location: 9757 San Leandro St., Oakland C Date Completed: 2/27/1998

Choose

TIER 2 GROUNDWATER CONCENTRATION DATA SUMMARY

CONSTITUENTS DETECTED		Analytical Method			Detected Concentrations			Calculated Distribution of Data	Default Detection Limit (mg/L)
CAS No.	Name	Typical Detection Limit (mg/L)	No. of Samples	No. of Detects	Maximum Conc. (mg/L)	Mean Conc. (mg/L)	UCL on Mean Conc. (mg/L)		
71-43-2	Benzene	5.0E-04	38	37	2.0E+00	2.9E-02	5.5E-02	Lognormal	0.0005
100-41-4	Ethylbenzene	5.0E-04	38	28	8.0E-01	7.1E-03	1.4E-02	Lognormal	0.0005
108-88-3	Toluene	5.0E-04	38	23	2.9E+00	2.5E-03	5.1E-03	Lognormal	0.0005
1330-20-7	Xylene (mixed isomers)	5.0E-04	38	29	7.9E+00	1.0E-02	2.3E-02	Lognormal	0.0005

Well Name
Date Sampled

Serial: g-303-ydx-938

Software: GSI RBCA Spreadsheet
Version: v 1.0

UCL Percentile

95% (must be 0.9 or 0.95)

Analytical Data (Up to 50 Data Points)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
SB-11	SB-19	SB-22				MW-5	MW-5	MW-5	MW-5	MW-5	MW-5	MW-5	MW-5	MW-5	MW-5	MW-5	MW-5	MW-5	MW-5	MW-5	MW-5
4/4/88	4/3/96	4/2/96				11/2/93	2/10/94	5/12/94	11/11/94	2/1/95	5/18/95	8/2/95	11/1/95	1/31/96	5/16/96	8/1/96	11/2/95	2/10/94	5/12/94	8/26/94	11/11/94
0.01	0.17	0.4				0.043	0.052	0.057	0.018	0.036	0.029	0.0062	0.0056	0.05	0.014	0.0014	0.012	0.01	0.01	0.016	0.0018
0.18	0.031	0.11				0.022	0.05	0.077	0.016	0.021	0.016	0.004	0.0019	0.019	0.017	ND	0.0025	0.002	0.0012	0.0023	ND
0.007	0.03	ND				0.0034	0.003	0.0062	0.001	0.0006	0.001	ND	ND	ND	ND	ND	0.0018	0.0008	0.0011	0.0014	ND
0.41	0.034	0.077				0.012	0.04	0.048	0.011	0.011	0.0096	0.0012	ND	0.029	0.0066	ND	0.005	0.004	0.0031	0.0071	0.001

23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
MW-8	MW-8	MW-8	MW-8	MW-8	MW-8	MW-8	MW-8	MW-8	MW-8	MW-8	MW-8	MW-8	MW-8	MW-8	MW-8	MW-8	MW-8	MW-8		
2/1/95	5/16/95	8/2/95	11/7/95	1/31/96	5/16/96	8/1/96	11/2/93	2/10/94	5/12/94	8/24/94	11/11/94	2/1/95	5/16/95	8/2/95	11/1/95	1/31/96	5/16/96	8/1/96		
0.0019	0.0082	0.0023	ND	0.001	0.0016	0.0008	2	1.2	1.4	0.72	0.25	0.068	0.12	0.15	0.12	0.0053	0.26	0.46		
ND	ND	ND	ND	ND	ND	ND	0.42	0.26	0.8	0.33	0.19	0.0027	0.011	0.02	0.016	ND	0.056	0.0089		
ND	ND	ND	ND	ND	ND	ND	0.44	0.38	2.9	0.2	0.17	0.0028	0.012	0.0097	0.015	ND	0.043	0.0009		
0.0009	ND	ND	ND	ND	ND	ND	1.4	7.9	3.8	0.93	0.55	0.0043	0.023	0.04	0.039	ND	0.13	0.025		

Site Name: Former Chevron Station #9-1723 | Date Completed: 3/7/97

Site Location: 9757 San Leandro St., Oakland CA | Completed By: Curt Peck, CRTC | *Page 1 of 2*

TIER 2 EXPOSURE PATHWAY TRANSPORT PARAMETERS

Instructions: ***For complete exposure pathways, provide site-specific values for transport parameters. In absence of direct measurements, default values may be selected for some parameters, as shown below. If no default value shown, site-specific value must be provided.***

TRANSPORT PARAMETER		SITE-SPECIFIC VALUE (INPUT VALUE BELOW)	DEFAULT VALUE (■ TO SELECT)
AIR PARAMETERS			
δ_{air}	Air mixing zone height (cm)		■ 200
U_{air}	Ambient air velocity in mixing zone (cm/sec)		■ 225
Pe	Soil particulate areal emission rate (g/cm^2-sec)		■ 2.17E-10
σ_y	Transverse air dispersion coeff. (m)		■ 100
σ_z	Vertical air dispersion coeff. (m)		■ 10
GROUNDWATER PARAMETERS			
δ_{gw}	Groundwater mixing zone depth (cm)	150 cm	❑ 200
I	Water infiltration rate (cm/yr)	0.3	❑ 30
V_{gw}	Groundwater Darcy velocity (ft/yr)	100	
K	Saturated hydraulic conductivity (cm/sec)		
i_{grad}	Lateral groundwater flow gradient (dim)		
$(BC)_i$	Available biodegradation capacity of electron acceptors for constituent *i*		
x	Distance to POE from point of maximum COC concentration in groundwater (ft)	0	
α_x	Longitudinal groundwater dispersion coeff. (cm)		■ 10% of x
α_y	Transverse groundwater dispersion coeff. (cm)		■ 33% of α_x
α_z	Vertical groundwater dispersion coeff. (cm)		■ 5% of α_z
SOIL PARAMETERS			
h_{cap}	Capillary zone thickness (cm)	28 cm	❑ 5
h_v	Vadose zone thickness (cm)	252 cm	
ρ_s	Soil bulk density (g/cm^3)	2.03	❑ 1.7
foc_s	Fraction organic carbon in soil leaching zone (dir	0.0014	❑ 0.01
foc_{gw}	Fraction organic carbon in water-bearing unit (di	0.0014	❑ 0.001
Lgw	Depth to groundwater (cm)	280 cm	
Θ_T	Soil porosity (dim)	0.42	❑ 0.38
	Soil volumetric water content (dim)	0.133	
Θ_{wcap}	• Capillary zone	0.378	❑ 0.342
Θ_{ws}	• Vadose zone	0.133	❑ 0.12
Θ_{wcrack}	• Foundation crack	0.133	❑ 0.12

Site Name: Date Completed:

Site Location: Completed By:

TIER 2 EXPOSURE PATHWAY TRANSPORT PARAMETERS *CONTINUED*

	TRANSPORT PARAMETER	SITE-SPECIFIC VALUE (INPUT VALUE BELOW)	DEFAULT VALUE (■ TO SELECT)	
SOIL PARAMETERS (Continued)				
	Soil volumetric air content (dim)	0.287		
Θ_{acap}	•Capillary zone	0.042	❑ 0.038	
Θ_{as}	•Vadose zone	0.287	❑ 0.26	
Θ_{acrack}	•Foundation crack	0.287	❑ 0.26	
d	Thickness of surficial soil zone (cm)	91 cm	❑ 100 cm	
BUILDING PARAMETERS				
			Resid.	Comm/ Ind.
L_b	Building volume/area ratio (cm)		❑ 200	■ 300
ER	Building air exchange rate (dy^{-1})		❑ 12	■ 20
L_{crack}	Foundation crack thickness (cm)		■ 15	
η	Foundation crack fraction		■ 0.01	

Additional Information:

RBCA SITE ASSESSMENT

Tier 2 Worksheet 8.3

Site Name: Former Chevron Station #9-1723
Site Location: 9757 San Leandro St., Oakland CA

Completed By: Curt Peck
Date Completed: 2/27/1996

TIER 2 BASELINE RISK SUMMARY TABLE

	BASELINE CARCINOGENIC RISK					BASELINE TOXIC EFFECTS				
	Individual COC Risk		Cumulative COC Risk		Risk Limit(s) Exceeded?	Hazard Quotient		Hazard Index		Toxicity Limit(s) Exceeded?
EXPOSURE PATHWAY	Maximum Value	Target Risk	Total Value	Target Risk		Maximum Value	Applicable Limit	Total Value	Applicable Limit	
AIR EXPOSURE PATHWAYS										
Complete:	1.3E-4	1.0E-5	0.0E+0	N/A	■	0.0E+0	1.0E+0	0.0E+0	N/A	☐
GROUNDWATER EXPOSURE PATHWAYS										
Complete:	0.0E+0	1.0E-5	0.0E+0	N/A	☐	0.0E+0	1.0E+0	0.0E+0	N/A	☐
SOIL EXPOSURE PATHWAYS										
Complete:	0.0E+0	1.0E-5	0.0E+0	N/A	☐	0.0E+0	1.0E+0	0.0E+0	N/A	☐
CRITICAL EXPOSURE PATHWAY (Select Maximum Values From Complete Pathways)										
	1.3E-4	1.0E-5	0.0E+0	N/A	■	0.0E+0	1.0E+0	0.0E+0	N/A	☐

NOTE: Calculated Risk is for Arithmetic Average of Soil (5.8mg/Kg) and Groundwater (0.51 mg/L).

Serial: g-303-ydx-9
Software: GSI RBCA Spreadsheet
Version: v 1.0

RBCA TIER 1/TIER 2 EVALUATION

Output Table 1

Site Name: Former Chevron Station #9-1723 Former Chevron Station #9-1723b Identification: 9-1723rb
Site Location 9757 San Leandro St , Oakland 9757 San Leandro St , Oakland Date Completed 2/27/96
Completed By Curt Peck

Software: GSI RBCA Spreadsheet
Version: v 1.0

NOTE: values which differ from Tier 1 default values are shown in bold italics and underlined.

DEFAULT PARAMETERS

Exposure Parameter	Definition (Units)	Residential Adult	Residential (1-6yrs)	Residential (1-16 yrs)	Commercial/Industrial Chronic	Commercial/Industrial Constrctn
ATc	Averaging time for carcinogens (yr)	70				
ATn	Averaging time for non-carcinogens (yr)	30	6	16	25	1
BW	Body Weight (kg)	70	15	35	70	
ED	Exposure Duration (yr)	30	6	16	25	1
EF	Exposure Frequency (days/yr)	350			250	180
EF.Derm	Exposure Frequency for dermal exposure	350			250	
IRgw	Ingestion Rate of Water (l/day)	2			1	
IRs	Ingestion Rate of Soil (mg/day)	100	200		50	100
IRadj	Adjusted soil ing. rate (mg*yr/kg*d)	1.1E+02			9.4E+01	
IRa.in	Inhalation rate indoor (m^3/day)	15			20	
IRa.out	Inhalation rate outdoor (m^3/day)	20			20	***20***
SA	Skin surface area (dermal) (cm^2)	5.8E+03		2.0E+03	5.8E+03	5.8E+03
SAadj	Adjusted dermal area (cm^2*yr/kg)	2.1E+03			1.7E+03	
M	Soil to Skin adherence factor	1				
AAFs	Age adjustment on soil ingestion	FALSE			FALSE	
AAFd	Age adjustment on skin surface area	FALSE			FALSE	
tox	Use EPA tox data for air (or PEL based)	TRUE				
gwMCL?	Use MCL as exposure limit in groundwater?	FALSE				

Matrix of Exposed Persons to Complete Exposure Pathways		Residential	Commercial/Industrial Chronic	Commercial/Industrial Constrctn
Groundwater Pathways:				
GW.i	Groundwater Ingestion	FALSE	FALSE	
GW.v	Volatilization to Outdoor Air	FALSE	FALSE	
GW.b	Vapor Intrusion to Buildings	FALSE	TRUE	
Soil Pathways				
S.v	Volatiles from Subsurface Soils	FALSE	FALSE	
SS.v	Volatiles and Particulate Inhalation	FALSE	FALSE	FALSE
SS.d	Direct Ingestion and Dermal Contact	FALSE	TRUE	FALSE
S.l	Leaching to Groundwater from all Soils	FALSE	FALSE	
S.b	Intrusion to Buildings - Subsurface Soils	FALSE	TRUE	

Matrix of Receptor Distance and Location on- or off-site		Residential Distance	Residential On-Site	Commercial/Industrial Distance	Commercial/Industrial On-Site
GW	Groundwater receptor (cm)		FALSE		FALSE
S	Inhalation receptor (cm)		FALSE		FALSE

Matrix of Target Risks		Individual	Cumulative
TRab	Target Risk (class A&B carcinogens)	***1.0E-05***	
TRc	Target Risk (class C carcinogens)	1.0E-05	
THQ	Target Hazard Quotient	1.0E+00	
Opt	Calculation Option (1, 2, or 3)	2	
Tier	RBCA Tier	2	

Surface Parameters	Definition (Units)	Residential	Commercial/Industrial Chronic	Commercial/Industrial Construction
t	Exposure duration (yr)	30	25	1
A	Contaminated soil area (cm^2)	2.2E+06		1.0E+06
W	Length of affected soil parallel to wind (cm)	1.5E+03		1.0E+03
W.gw	Length of affected soil parallel to groundwater (cm	1.5E+03		
Uair	Ambient air velocity in mixing zone (cm/s)	2.3E+02		
delta	Air mixing zone height (cm)	2.0E+02		
Lss	Definition of surficial soils (cm)	***9.1E+01***		
Pe	Particulate areal emission rate (g/cm^2/s)	2.2E-10		

Groundwater	Definition (Units)	Value
delta.gw	Groundwater mixing zone depth (cm)	***1.5E+02***
I	Groundwater Infiltration rate (cm/yr)	***3.0E-01***
Ugw	Groundwater Darcy velocity (cm/yr)	***3.0E+03***
Ugw.tr	Groundwater Transport velocity (cm/yr)	***3.0E+02***
Ks	Saturated Hydraulic Conductivity(cm/s)	
grad	Groundwater Gradient (cm/cm)	
Sw	Width of groundwater source zone (cm)	
Sd	Depth of groundwater source zone (cm)	
BC	Biodegradation Capacity (mg/L)	
BIO?	Is Bioattenuation Considered	FALSE
phi.eff	Effective Porosity in Water-Bearing Unit	3.8E-01
foc.sat	Fraction organic carbon in water-bearing unit	***1.4E-03***

Soil	Definition (Units)	Value		
hc	Capillary zone thickness (cm)	***1.0E+02***		
hv	Vadose zone thickness (cm)	***2.8E+02***		
rho	Soil density (g/cm^3)	***2.03***		
foc	Fraction of organic carbon in vadose zone	***0.0014***		
phi	Soil porosity in vadose zone	***0.42***		
Lgw	Depth to groundwater (cm)	***3.9E+02***		
Ls	Depth to top of affected soil (cm)	***9.1E+01***		
Lsubs	Thickness of affected subsurface soils (cm)	***2.9E+02***		
pH	Soil/groundwater pH	6.5		
		capillary	vadose	foundation
phi.w	Volumetric water content	***0.378***	***0.133***	***0.133***
phi.a	Volumetric air content	***0.042***	***0.287***	***0.287***

Building	Definition (Units)	Residential	Commercial
Lb	Building volume/area ratio (cm)	2.0E+02	3.0E+02
ER	Building air exchange rate (s^-1)	1.4E-04	2.3E-04
Lcrk	Foundation crack thickness (cm)	1.5E+01	
eta	Foundation crack fraction	0.01	

Dispersive Transport Parameters	Definition (Units)	Residential	Commercial
Groundwater			
ax	Longitudinal dispersion coefficient (cm)		
ay	Transverse dispersion coefficient (cm)		
az	Vertical dispersion coefficient (cm)		
Vapor			
dcy	Transverse dispersion coefficient (cm)		
dcz	Vertical dispersion coefficient (cm)		

RBCA SITE ASSESSMENT | **Tier 2 Worksheet 8.3**

Site Name: Former Chevron Station #9-1723
Site Location: 9757 San Leandro St., Oakland CA

Completed By: Curt Peck
Date Completed: 2/27/1996

TIER 2 BASELINE RISK SUMMARY TABLE

	BASELINE CARCINOGENIC RISK					BASELINE TOXIC EFFECTS				
	Individual COC Risk		Cumulative COC Risk		Risk Limit(s) Exceeded?	Hazard Quotient		Hazard Index		Toxicity Limit(s) Exceeded?
EXPOSURE PATHWAY	Maximum Value	Target Risk	Total Value	Target Risk		Maximum Value	Applicable Limit	Total Value	Applicable Limit	
AIR EXPOSURE PATHWAYS										
Complete:	2.7E-5	1.0E-5	0.0E+0	N/A	■	0.0E+0	1.0E+0	0.0E+0	N/A	☐
GROUNDWATER EXPOSURE PATHWAYS										
Complete:	0.0E+0	1.0E-5	0.0E+0	N/A	☐	0.0E+0	1.0E+0	0.0E+0	N/A	☐
SOIL EXPOSURE PATHWAYS										
Complete:	0.0E+0	1.0E-5	0.0E+0	N/A	☐	0.0E+0	1.0E+0	0.0E+0	N/A	☐
CRITICAL EXPOSURE PATHWAY (Select Maximum Values From Complete Pathways)										
	2.7E-5	1.0E-5	0.0E+0	N/A	■	0.0E+0	1.0E+0	0.0E+0	N/A	☐

NOTE: Calculated Risk is for 95% UCL of Geometic Mean of Soil (1.2 mg/Kg) and Groundwater (0.055 mg/L).

Serial: g-303-ydx-93
Software: GSI RBCA Spreadsheet
Version: v 1.0

RBCA SITE ASSESSMENT | Input Screen 7

REPRESENTATIVE COC CONCENTRATIONS IN SOURCE MEDIA

(Complete the following table)

CONSTITUENT	Representative COC Concentration					
	in Groundwater		in Surface Soil		in Subsurface Soil	
	value (mg/L)	note	value (mg/kg)	note	value (mg/kg)	note
Benzene	5.1E-1	AVG			5.8E+0	AVG
Ethylbenzene	1.7E-1	AVG			1.1E+1	AVG
Toluene	3.2E-1	AVG			5.2E+0	AVG
Xylene (mixed isomers)	1.2E+0	AVG			3.2E+1	AVG

Site Name: Former Chevron Station #9-1723
Site Location: 9757 San Leandro St., Oakland CA

Completed By: Curt Peck
Date Completed: 2/27/1996

why wasn't UCL used for COC Conc.

RBCA SITE ASSESSMENT

Tier 2 Worksheet 9.2

Site Name: Former Chevron Station #9-1723
Site Location: 9757 San Leandro St., Oakland CA

Completed By: Curt Peck
Date Completed: 2/27/1996

SUBSURFACE SOIL SSTL VALUES (> 3 FT BGS)

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

☐ MCL exposure limit?
☐ PEL exposure limit?

Calculation Option: 2

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

CONSTITUENTS OF CONCERN		Representative Concentration		Soil Leaching to Groundwater			X	Soil Volatilization to Indoor Air		Soil Volatilization to Outdoor Air		Applicable SSTL	SSTL Exceeded ?	Required CRF
CAS No.	Name	(mg/kg)	Residential: (on-site)	Commercial: (on-site)	Regulatory(MCL): (on-site)		Residential: (on-site)	Commercial: (on-site)	Residential: (on-site)	Commercial: (on-site)	(mg/kg)	"■" If yes	Only If "yes" left
71-43-2	Benzene	5.6E+0	NA	NA	NA		NA	4.5E-1	NA	NA	4.5E-1	■	1.3E+01
100-41-4	Ethylbenzene	1.1E+1	NA	NA	NA		NA	>Res	NA	NA	>Res	☐	<1
108-88-3	Toluene	5.2E+0	NA	NA	NA		NA	5.3E+1	NA	NA	5.3E+1	☐	<1
1330-20-7	Xylene (mixed isomers)	3.2E+1	NA	NA	NA		NA	>Res	NA	NA	>Res	☐	<1

Software: GSI RBCA Spreadsheet
Version: v 1.0

Serial: g-303-ydx-938

RBCA SITE ASSESSMENT

Tier 2 Worksheet 9.3

Site Name: Former Chevron Station #9-1723
Site Location: 9757 San Leandro St., Oakland CA

Completed By: Curt Peck
Date Completed: 2/27/1996

GROUNDWATER SSTL VALUES

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

☐ MCL exposure limit?
☐ PEL exposure limit?

Calculation Option: 2

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

CONSTITUENTS OF CONCERN		Representative Concentration		Groundwater Ingestion			X	Groundwater Volatilization to Indoor Air		Groundwater Volatilization to Outdoor Air		Applicable SSTL	SSTL Exceeded ?	Required CRF
CAS No.	Name	(mg/L)	Residential: (on-site)	Commercial: (on-site)	Regulatory(MCL): (on-site)		Residential: (on-site)	Commercial: (on-site)	Residential (on-site)	Commercial: (on-site)	(mg/L	"■" If yes	Only if "yes" left	
71-43-2	Benzene	5.1E-1	NA	NA	NA		NA	6.7E+0	NA	NA	6.7E+0	☐	<1	
100-41-4	Ethylbenzene	1.7E-1	NA	NA	NA		NA	>Sol	NA	NA	>Sol	☐	<1	
108-88-3	Toluene	3.2E-1	NA	NA	NA		NA	>Sol	NA	NA	>Sol	☐	<1	
1330-20-7	Xylene (mixed isomers)	1.2E+0	NA	NA	NA		NA	>Sol	NA	NA	>Sol	☐	<1	

Software: GSI RBCA Spreadsheet
Version: v 1.0

Serial: g-303-ydx-938

Attachment D

Cambria Tier 2 RBCA Analysis

TABLE E-1

TIER 2 RBCA - ESTIMATION OF INDOOR AIR CONCENTRATION OF BENZENE VOLATILIZATION FROM GROUND WATER VIA FOUNDATION CRACKS

ONSITE PARKING STRUCTURE - COMMERCIAL SCENARIO

POINT OF EXPOSURE AT SOURCES	[redacted]	H (2)	D^{air}	D^{water}	D_{cap}^{eff} (3)	D_s^{eff} (4)	D_{ws}^{eff} (5)	D_{crack}^{eff} (6)	VF_{wesp} (1)	[redacted]
Mean concentration from well MW-8	mg/L	cm^3/cm^3	cm^2/s	cm^2/s	cm^2/s	cm^2/s	cm^2/s	cm^2/s	$(mg/m^3)/(mg/L)$	mg/m^3
Benzene	4.6E-02	2.20E-01	9.30E-02	1.10E-05	2.48E-05	8.3E-03	1.3E-04	8.3E-03	2.4E-03	[redacted]
Toluene	4.0E-03	2.60E-01	8.50E-02	9.40E-06	2.06E-05	7.5E-03	1.1E-04	7.5E-03	2.4E-03	9.56E-06
Ethylbenzene	7.0E-03	3.20E-01	7.60E-02	8.50E-06	1.71E-05	6.7E-03	9.2E-05	6.7E-03	2.5E-03	1.73E-05
Xylenes	1.1E-02	2.90E-01	7.20E-02	8.50E-06	1.71E-05	6.4E-03	9.2E-05	6.4E-03	2.2E-03	2.45E-05

Notes:

(1) VF_{wesp} = Volatilization factor from ground water to enclosed space vapor $(mg/m^3)/(mg/L)$

$$VF_{wesp} = \{H \times [(D_{ws}^{eff} / L_{GW}) / (ER \times L_B)] \times 1E{+}03\ (L/m^3)\} / \{1 + [(D_{ws}^{eff} / L_{GW}) / (ER \times L_B)] \times [(D_{ws}^{eff} / L_{GW}) / (D_{crack}^{eff} / L_{crack})\ \eta)]\}$$

(2) H = Henry's law constant (cm^3/cm^3) = Chemical-specific

(3) D_{ws}^{eff} = Effective diffusion between GW & soil surface (cm^2/s) =

$$D_{ws}^{eff} = (h_{cap} + h_v)\ [(h_{cap} / D_{cap}^{eff}) + (h_v / D_s^{eff}]^{-1}$$

h_{cap} = Thickness of capillary fringe (cm) = 28 0.9 feet

h_v = Thickness of vadose zone (cm) = 124

(4) D_{cap}^{eff} = Effective diffusion through capillary fringe (cm^2/s) = Chemical-specific

$$D_{cap}^{eff} = D^{air} \times (\theta_{acap}^{3.33} / \theta_T^{2}) + [D^{water} \times (1/H) \times (\theta_{wcap}^{3.33} / \theta_T^{2})$$

D^{air} = Diffusion coefficient in air (cm^2/s) = Chemical-specific

θ_{acap} = Volumetric air content in capillary fringe soil (cm^3/cm^3) = 0.042

θ_T = Total soil porosity (cm^3/cm^3) = 0.42

D^{water} = Diffusion coefficient in water (cm^2/s) = Chemical-specific

θ_{wcap} = Volumetric water content in capillary fringe soil (cm^3/cm^3) = 0.378

(5) D_s^{eff} = Effective diffusion in soil - vapor concentration (cm^2/s) = Chemical-specific

$$D_s^{eff} = D^{air} \times (\theta_{as}^{3.33} / \theta_T^{2}) + [D^{water} \times (1/H) \times (\theta_{ws}^{3.33} / \theta_T^{2})$$

θ_{as} = Volumetric air content in vadose zone soil (cm^3/cm^3) = 0.287

θ_{ws} = Volumetric water content in vadose zone soil (cm^3/cm^3) = 0.133

L_{GW} = Depth to ground water = $h_{cap} + h_v$ (cm) = 152 5 ft

ER = Enclosed space air exchange rate (1/s) = 0.00023 commercial

L_B = Height of room at foundation level, about 9 feet (cm) = 300 commercial

(6) D_{crack}^{eff} = Effective diffusion coefficient through cracks (cm^2/s) = D_s^{eff}

$$D_{crack}^{eff} = D^{air} \times (\theta_{acrack}^{3.33} / \theta_T^{2}) + [D^{water} \times (1/H) \times (\theta_{wcrack}^{3.33} / \theta_T^{2})$$

θ_{acrack} = Volumetric air content in vadose zone soil (cm^3/cm^3) = 0.287

θ_{wcrack} = Volumetric water content in vadose zone soil (cm^3/cm^3) = 0.133

L_{crack} = Thickness of foundation/wall (cm) = 15

η = Area fraction of cracks in foundation/wall (cm^2/cm^2) = 0.01

(7) C_{indoor} = $C_{gw} \times VF_{wesp}$

GW conc. used in equations accounting for attenuation, etc. resulting in predicted conc. in indoor air (C_{indoor}) the C_{indoor} becomes the representative concentration to be input into Table E2. (RBCA)

TABLE E-2
TIER 2 RBCA - POTENTIAL HEALTH RISKS VIA INHALATION OF INDOOR BENZENE VOLATILIZED FROM GROUND WATER INTO ON-SITE COMMERCIAL BUILDING

VOC Inhalation Equation: CDI (mg/kg-day) = C_a x IR x FC x EF x ED) / (BW x AT)

	RME		RME
CDI = Chronic Daily Intake (mg/kg-day)		BW_c = Body Weight (Carcinogenic Effects) (kg) =	70
C_a = Chemical Concentration in Air (mg/m^3)		BW_{nc} = Body Weight (Noncarcinogenic Effects) (kg) =	70
IR = Inhalation Rate (m^3/day) =	20	AT_c = Averaging Time (Carcinogenic Effects) (days) =	25,550
FC = Fraction from Contaminated Soil	1	AT_{nc} = Averaging Time (Noncarcinogenic Effects) (days) =	9,125
EF = Exposure Frequency (days/year) =	250	TR = Target Excess Cancer Risk =	1E-05
ED = Exposure Duration (years) =	25	THI = Target Hazard Index =	1

Chemical	Concentration (mg/m^3)	Carcinogenic CDI (mg/kg-day)	Noncarcinogenic CDI (mg/kg-day)	Cal-EPA Slope Factor $(mg/kg\text{-}day)^{-1}$	Reference Dose mg/kg-day	Excess Cancer Risk	Hazard Quotient	RME - % Risk Contribution		1.00E-05 RBSL	HI = 1 RBSL
								Cancer	Hazard	mg/L	mg/L
Benzene	1.1E-04	7.7E-06	2.2E-05	1.0E-01	1.7E-03	8E-07	1.3E-02	100%	100%	5.94E-01	3.61E+00
Toluene	9.6E-06	6.7E-07	1.9E-06		1.1E-01		1.7E-05		0%		2.54E+05
Ethylbenzene	1.7E-05	1.2E-06	3.4E-06		2.9E-01		1.2E-05		0%		7.50E+05
Xylenes	2.4E-05	1.7E-06	4.8E-06		2.0E-01		2.4E-05		0%		5.46E+05
TOTAL						**8E-07**	**1.3E-02**	**100%**	**100%**		

Notes: Blank means no data available or not determined.
Excess cancer risk = Carcinogenic CDI x Slope factor.
Hazard quotient = Noncarcinogenic CDI / Reference dose.

From previous page calculations

TABLE E-3

TIER 2 RBCA - AMBIENT AIR CONCENTRATIONS OF BENZENE FROM SOIL GAS - ONSITE COMMERCIAL SCENARIO

CHEMICAL	C_{soil}	$C_{soilgas}$	H (3)	k_{oc}	k_s	D^{air}	D^{water}	D_s^{eff} (4)	AA/SG Factor (1)	C_{indoor} (2)
	mg/kg	mg/m³	cm³/cm³	cm³/g	cm³/g	cm²/s	cm²/s	cm²/s	Unitless	mg/m³
Benzene	NA	2.3E+00	2.20E-01	3.80E+01	5E-02	9.30E-02	1.10E-05	8.3E-03	3.0E-06	7.0E-06
Toluene	NA	2.2E-01	2.60E-01	1.35E+02	2E-01	8.50E-02	9.40E-06	7.5E-03	2.8E-06	6.1E-07
Ethylbenzene	NA	9.7E-01	3.20E-01	1.29E+03	2E+00	7.60E-02	8.50E-06	6.7E-03	2.5E-06	2.4E-06
Xylenes	NA	4.8E-01	2.90E-01	2.40E+02	3E-01	7.20E-02	8.50E-06	6.4E-03	2.3E-06	1.1E-06

Notes:

VF_{samb} = ASTM Volatilization factor from subsurface soil to ambient air (mg/m³)/(mg/kg), using soil concentration (mg/kg) to estimate ambient air concentration (mg/m³).

$VF_{samb} = \{(H \times \rho_s) / (\theta_{ws} + [k_s \times \rho_s] + [H \times \theta_{as}])\} \times 1E+03\ (cm^3\text{-}kg/m^3\text{-}g) \times 1 / \{1 + ([U_{air} \times \delta_{air} \times L_s] / [D_s^{eff} \times W])\}$

The VF_{samb} has 2 factors:

a) The factor "$\{(H \times \rho_s) / (\theta_{ws} + [k_s \times \rho_s] + [H \times \theta_{as}])\}\ (g/cm^3) \times 10^3\ (cm^3\text{-}kg/m^3\text{-}g)$" (in unit of kg/m³) multiplied by C_{soil} (mg/kg) will give soil gas concentration (mg/m³) at source;

b) The rest of the VP_{samb} equation is the attenuation factor between ambient air concentration and soil gas concentration (AA/SG Factor) (unitless), equivalent to for ASTM default scenario.

(1) AA/SG Factor = $1 / \{1 + ([U_{air} \times \delta_{air} \times L_s] / [D_s^{eff} \times W])\}$

The product of Factor (a) and soil concentration can be replaced with the actually measured soil gas concentration at source.

(2) $C_{Ambient}$ = $C_{soilgas}$ x AA/SG Factor

(3)	H =	Henry's law constant (cm³/cm³) =	Chemical-specific
	ρ_s =	Soil bulk density (g/cm³) =	2
	θ_{as} =	Volumetric air content in vadose zone soil (cm³/cm³) =	0.287
	θ_{ws} =	Volumetric water content in vadose zone soil (cm³/cm³) =	0.133
	k_s =	Soil-water sorption coefficient (cm³/g) = $k_{oc} \times f_{oc}$ =	Chemical-specific
	k_{oc} =	Carbon-water sorption coefficient (cm³/g) =	Chemical-specific
	f_{oc} =	Fraction of organic carbon in soil (g/g) =	0.0014
(4)	D_s^{eff} =	Effective diffusion in soil - vapor concentration (cm²/s) =	Chemical-specific
		$D_s^{eff} = D^{air} \times (\theta_{as}^{3.33} / \theta_T^2) + [D^{water} \times (1/H) \times (\theta_{ws}^{3.33} / \theta_T^2)$	
	D^{air} =	Diffusion coefficient in air (cm²/s) =	Chemical-specific
	D^{water} =	Diffusion coefficient in water (cm²/s) =	Chemical-specific
	θ_T =	Total soil porosity (cm³/cm³) =	0.42
	U_{air} =	Wind speed in the mixing zone (cm/s) =	225
	δ_{air} =	Ambient air mixing zone height (cm) =	200
	L_s =	Depth to subsurface soil sources (cm)	91 Soil gas sample collected at 3 feet bgs
	W =	Width of source area perpendicular to wind direction (cm)	1500

Measured soil gas conc. are used and w/ attenuation factors accounted for, the predicted $C_{outdoor}$/ambient is derived. The $C_{ambient}$ is used in Table E-4 as the site specific conc.

TABLE E-4
POTENTIAL HEALTH RISKS VIA INHALATION OF AMBIENT BENZENE FROM SOIL GAS
ONSITE COMMERCIAL SCENARIO

VOC Inhalation Equation: CDI (mg/kg-day) = C_a x IR x FC x EF x ED) / (BW x AT)

	RME		RME
CDI = Chronic Daily Intake (mg/kg-day)		BW_c = Body Weight (Carcinogenic Effects) (kg) =	70
C_a = Chemical Concentration in Air (mg/m^3)		BW_{nc} = Body Weight (Noncarcinogenic Effects) (kg) =	70
IR = Inhalation Rate (m^3/day) =	2E+01	AT_c = Averaging Time (Carcinogenic Effects) (days) =	25,550
FC = Fraction from Contaminated Source =	1	AT_{nc} = Averaging Time (Noncarcinogenic Effects) (days) =	9,125
EF = Exposure Frequency (days/year) =	250	TR = Target Excess Cancer Risk =	1E-05
ED = Exposure Duration (years) =	25	THI = Target Hazard Index =	1

Chemical	Concentration (mg/m^3)	Carcinogenic CDI (mg/kg-day)	Noncarcinogenic CDI (mg/kg-day)	Cal-EPA Slope Factor $(mg/kg\text{-}day)^{-1}$	Reference Dose mg/kg-day	Excess Cancer Risk	Hazard Quotient	RME - % Risk Contribution		1.00E-05 RBSL* mg/m^3	HI = 1 RBSL* mg/m^3
								Cancer	Hazard		
Benzene	7.0E-06*	4.9E-07	1.4E-06	1.0E-01	1.7E-03	5E-08	8.0E-04	100%	100%	4.73E+02	1.25E+03
Toluene	6.1E-07	4.2E-08	1.2E-07		1.1E-01		1.1E-06		0%		2.54E+05
Ethylbenzene	2.4E-06	1.7E-07	4.7E-07		2.9E-01		1.6E-06		0%		7.50E+05
Xylenes	1.1E-06	7.9E-08	2.2E-07		2.0E-01		1.1E-06		0%		5.46E+05
TOTAL						**5E-08**	**8.0E-04**	**100%**	**100%**		

Notes:
Commercial exposure parameters are the USEPA standard default values.
* RBSL for soil gas

TABLE E-5
TIER 2 RBCA - INDOOR AIR CONCENTRATIONS OF BENZENE MIGRATED INTO COMMERCIAL BUILDINGS VIA FOUNDATION CRACKS ESTIMATED FROM MEASURED SOIL GAS LEVELS

CHEMICAL	C_{soil}	$C_{soilgas}$	H (3)	k_{oc}	k_s	D^{air}	D^{water}	D_s^{eff} (4)	D_{crack}^{eff} (5)	IA/SG Factor (1)	C_{indoor} (2)
	mg/kg	mg/m^3	cm^3/cm^3	cm^3/g	cm^3/g	cm^2/s	cm^2/s	cm^2/s	cm^2/s	Unitless	mg/m^3
Benzene	NA	2.3E+00	2.20E-01	3.80E+01	5E-02	9.30E-02	1.10E-05	8.3E-03	8.3E-03	7.5E-05	[illegible]
Toluene	NA	2.2E-01	2.60E-01	1.35E+02	2E-01	8.50E-02	9.40E-06	7.5E-03	3.6E-05	3.5E-07	7.7E-08
Ethylbenzene	NA	9.7E-01	3.20E-01	1.29E+03	2E+00	7.60E-02	8.50E-06	6.7E-03	2.6E-05	2.6E-07	2.5E-07
Xylenes	NA	4.8E-01	2.90E-01	2.40E+02	3E-01	7.20E-02	8.50E-06	6.4E-03	2.9E-05	2.8E-07	1.4E-07

Notes:

VF_{sesp} = ASTM Volatilization factor from subsurface soil to enclosed space vapor (mg/m^3)/(mg/kg), using soil concentration (mg/kg) to estimate indoor air concentration (mg/m^3).

$VF_{sesp} = \{((H \times \rho_s) / \theta_{ws} + (k_s \times \rho_s) + (H \times \theta_{as})) \times 1E{+}03\ (cm^3\text{-}kg/m^3\text{-}g) \times [(D_s^{eff} / L_s) / (ER \times L_B)]\} / \{1 + [(D_s^{eff} / L_s) / (ER \times L_B)] \times [(D_s^{eff} / L_s) / (D_{crack}^{eff} / L_{crack})\ \eta)]\}$

The VF_{sesp} has 2 factors:

1) The factor "$[(H \times \rho s) / \theta ws + (k_s \times \rho_s) + (H \times \theta_{as})]\ (g/cm^3) \times 10^3\ (cm^3\text{-}kg/m^3\text{-}g)$" (in unit of kg/m^3) multiplied by C_{soil} (mg/kg) will give soil gas concentration (mg/m^3) at source;

2) The rest of the VP_{sesp} equation is the attenuation factor between indoor air concentration and soil gas concentration (IA/SG Factor) (unitless), equivalent to for ASTM default scenario.

(1) IA/SG Factor = $\{[(D_s^{eff} / L_s) / (ER \times L_B)]\} / \{1 + [(D_s^{eff} / L_s) / (ER \times L_B)] \times [(D_s^{eff} / L_s) / (D_{crack}^{eff} / L_{crack})\ \eta)]\}$

The product of Factor (1) and soil concentration can be replaced with the actually measured soil gas concentration at source.

(2) C_{Indoor} = $C_{soilgas}$ x IA/SG Factor

(3)
- H = Henry's law constant (cm^3/cm^3) = Chemical-specific
- ρ_s = Soil bulk density (g/cm^3) = 2
- θ_{as} = Volumetric air content in vadose zone soil (cm^3/cm^3) = 0.287
- θ_{ws} = Volumetric water content in vadose zone soil (cm^3/cm^3) = 0.133
- k_s = Soil-water sorption coefficient (cm^3/g) = $k_{oc} \times f_{oc}$ = Chemical-specific
- k_{oc} = Carbon-water sorption coefficient (cm^3/g) = Chemical-specific
- f_{oc} = Fraction of organic carbon in soil (g/g) = 0.0014

(4) D_s^{eff} = Effective diffusion in soil - vapor concentration (cm^2/s) = Chemical-specific

$D_s^{eff} = D^{air} \times (\theta_{as}^{3.33} / \theta_T^{2}) + [D^{water} \times (1/H) \times (\theta_{ws}^{3.33} / \theta_T^{2})$

- D^{air} = Diffusion coefficient in air (cm^2/s) = Chemical-specific
- D^{water} = Diffusion coefficient in water (cm^2/s) = Chemical-specific
- θ_T = Total soil porosity (cm^3/cm^3) = 0.42
- L_s = Depth to subsurface soil sources (cm) = 91 Soil gas sample collected at 3 feet bgs
- ER = Enclosed space air exchange rate (1/s) = 0.00023 industrial
- L_B = Height of room at foundation level (cm) = 300

(5) D_{crack}^{eff} = Effective diffusion coefficient through cracks (cm^2/s) = D^{eff}

$D_{crack}^{eff} = D^{air} \times (\theta_{acrack}^{3.33} / \theta_T^{2}) + [D^{water} \times (1/H) \times (\theta_{wcrack}^{3.33} / \theta_T^{2})$

- θ_{acrack} = Volumetric air content in vadose zone soil (cm^3/cm^3) = 0.287
- θ_{wcrack} = Volumetric water content in vadose zone soil (cm^3/cm^3) = 0.133
- L_{crack} = Thickness of foundation/wall (cm) = 15
- η = Area fraction of cracks in foundation/wall (cm^2/cm^2) = 0.01

TABLE E-6
POTENTIAL HEALTH RISKS VIA INHALATION OF BENZENE MIGRATED INTO COMMERCIAL BUILDING VIA FOUNDATION CRACKS
ESTIMATED FROM MEASURED SOIL GAS LEVELS

VOC Inhalation Equation: CDI (mg/kg-day) = C_a x IR x FC x EF x ED) / (BW x AT)

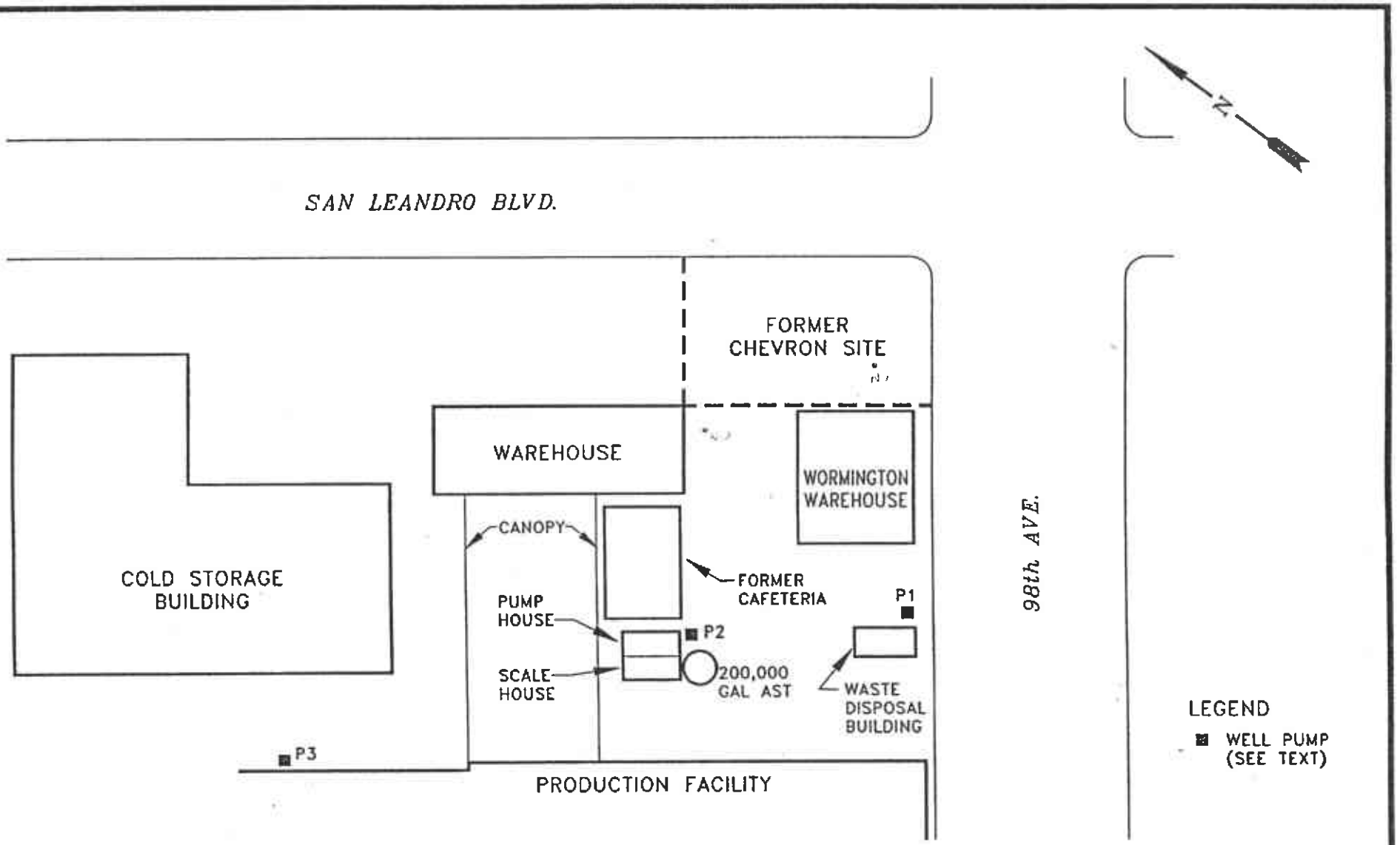
	RME		RME
CDI = Chronic Daily Intake (mg/kg-day)		BW_c = Body Weight (Carcinogenic Effects) (kg) =	70
C_a = Chemical Concentration in Air (mg/m^3)		BW_{nc} = Body Weight (Noncarcinogenic Effects) (kg) =	70
IR = Inhalation Rate (m^3/day) =	2E+01	AT_c = Averaging Time (Carcinogenic Effects) (days) =	25,550
FC = Fraction from Contaminated Source =	1	AT_{nc} = Averaging Time (Noncarcinogenic Effects) (days) =	9,125
EF = Exposure Frequency (days/year) =	250	TR = Target Excess Cancer Risk =	1E-05
ED = Exposure Duration (years) =	25	THI = Target Hazard Index =	1

Chemical	Concentration (mg/m^3)	Carcinogenic CDI (mg/kg-day)	Noncarcinogenic CDI (mg/kg-day)	Cal-EPA Slope Factor (mg/kg-day)$^{-1}$	Reference Dose mg/kg-day	Excess Cancer Risk	Hazard Quotient	RME - % Risk Contribution		1.00E-05 RBSL* mg/m^3	HI = 1 RBSL* mg/m^3
								Cancer	Hazard		
Benzene	1.7E-01	1.2E-05	3.4E-05	1.0E-01	1.7E-03	1E-06	2.0E-02	100%	100%	1.90E+01	8.69E-03
Toluene	7.7E-08	5.4E-09	1.5E-08		1.1E-01		1.4E-07		0%		9.36E+03
Ethylbenzene	2.5E-07	1.7E-08	4.9E-08		2.9E-01		1.7E-07		0%		2.76E+04
Xylenes	1.4E-07	9.5E-09	2.6E-08		2.0E-01		1.3E-07		0%		2.01E+04
TOTAL						**1E-06**	**2.0E-02**	**100%**	**100%**		

Notes: Blank means no data available or not determined.
Excess cancer risk = Carcinogenic CDI x Slope factor.
Hazard quotient = Noncarcinogenic CDI / Reference dose.
* RBSL for soil gas

Attachment E

Well Survey Results



GROUNDWATER TECHNOLOGY	0 FEET 60 SCALE	CLIENT: FORMER CHEVRON STATION # 9-1723	WELL PUMP LOCATIONS FORMER GERBER FACILITY	
FILE: WLFGF596	PROJECT NO.: 020700080	LOCATION: 9757 SAN LEANDRO BLVD. OAKLAND, CALIFORNIA	PM:	PE/RG: ZES 6/9/96
REV.: 1	DES.: BM / DET.: CY / DATE: 5/6/96			FIGURE: 3

1.0 INTRODUCTION

This report is submitted by Fluor Daniel GTI, Inc. (Fluor Daniel GTI) to summarize the methods and results of additional environmental assessment work conducted on April 1-4, and May 3, 1996, at the former Chevron Service Station Number 9-1723 located at 9757 San Leandro Boulevard, Oakland, California (Figure 1). All work was conducted in accordance with Groundwater Technology's *Work Plan for Additional Soil and Groundwater Assessment*, dated December 6, 1994, and the subsequent Addendum, dated February 22, 1996, approved by the Alameda County Health Care Services, Department of Environmental Health (DEH). This work included conducting a background review of the site and immediate vicinity, directing an underground utility locator service in determining if proposed boring locations were free of underground obstructions, determining the locations and status of water pumping wells on the former Gerber facility immediately adjacent the site, obtaining necessary permits, developing a health and safety plan for field activities, drilling and sampling twenty-three soil borings, obtaining "grab" groundwater samples from three of these borings, and preparation of this report.

2.0 ADDITIONAL ASSESSMENT WORK

2.1 Background Review/Permitting/Site-Specific Health and Safety Plan

Fluor Daniel GTI conducted a technical review of all relevant information available prior to proceeding with site assessment work. Chevron provided Fluor Daniel GTI with documentation of service station configuration for the years 1947, 1966 and 1968. This documentation was used to determine locations of soil borings in the present scope of work (Figure 2).

A soil boring permit was obtained from the Alameda County Flood Control and Water Conservation District, Zone 7 agency. A copy of this permit is included in Appendix A.

Following a complete review of site conditions, Fluor Daniel GTI prepared a site-specific *Health and Safety Plan* as required by the Occupational Safety and Health Administration (OSHA) Standard "Hazardous Waste Operations and Emergency Response" guidelines (29 CFR 1910.120). The document was reviewed and signed by all Fluor Daniel GTI personnel and subcontractors prior to commencement of work at the site.

2.2 Water Well Survey

On May 3, 1996, Fluor Daniel GTI conducted a field survey of water wells on the former Gerber facility immediately southwest of the site. A pump and two wells were identified within 250 feet hydrologically downgradient of the site (P1 and P2-3, respectively, as denoted on Figure 3). Based on field observations, pump P1 served to supply city water to a 200,000-gallon above-ground water storage

tank which was used to store process water at the former Gerber facility (Figure 3). P2 is an operative pumping well on standby status and is used to draw water from a well located in a pump house in the event of a fire emergency (R. Hothem, pers. communication, 1996). P3 is a currently operating pumping well used to extract water for industrial purposes (R. Hothem, pers. communication, 1996). Information on well construction and pumping rates is not available; however, a previous report by Groundwater Technology for the Gerber facility suggests well P2 may extend approximately 600 feet below ground surface (BGS) and be screened from 160 to 225 feet BGS (Groundwater Technology, Inc., 1988).

2.3 Soil Borings

On April 1-4, 1996, Fluor Daniel GTI supervised the drilling of soil borings SB-1 through SB-23 to depths of 5-15 feet BGS utilizing a truck-mounted drill rig equipped with 8-inch outside-diameter (O.D.) hollow-stem augers. All drilling equipment was steam cleaned prior to drilling each boring, and sampling equipment was washed in an Alconox (detergent) solution and rinsed with water between sampling intervals. All soil generated from the borings was placed on and covered with plastic sheeting. Soil and rinsate water were temporarily stored on site pending removal. On April 25, 1996, stockpiled soil and rinsate water were removed by Integrated Wastestream Management, Inc. of Milpitas and disposed of at Chevron contract disposal/recycling facilities..

2.4 Soil Sampling

Soil samples were collected from boreholes SB-1 through SB-23 at 5-foot intervals during drilling, beginning at approximately 5 feet BGS. Samples were collected using a 2.5-inch O.D. split-spoon sampler, lined with three 2-inch-diameter by 6-inch-long brass sample tubes. The sampler was driven 18 inches ahead of the augers at each sample point. Soil samples were field screened for hydrocarbon vapors using a photo-ionization detector (PID). Soil was logged using the Unified Soil Classification System by a Fluor Daniel GTI field geologist working under the supervision of a California registered geologist (Appendix B). One sample tube from each 5-foot interval was sealed, labeled and placed on ice in an insulated container for transport under chain-of-custody manifest to Sequoia Analytical (Sequoia), a California state-certified analytical lab in Sacramento.

Soil samples collected from each boring were selected for laboratory analyses on the basis of lithology, first occurrence of groundwater and PID readings. Samples were analyzed for benzene, toluene, ethylbenzene and total xylenes (BTEX), and total petroleum hydrocarbons-as-gasoline (TPH-G), using U.S. Environmental Protection Agency (EPA) methods 5030/8020/modified 8015. In addition, soil samples obtained from former hydraulic lift and waste-oil tank areas (borings SB1-4) were analyzed for total oil and grease via EPA method 418.1. The soil stockpile composite sample was also analyzed for halogenated volatile organics using EPA method 8010.

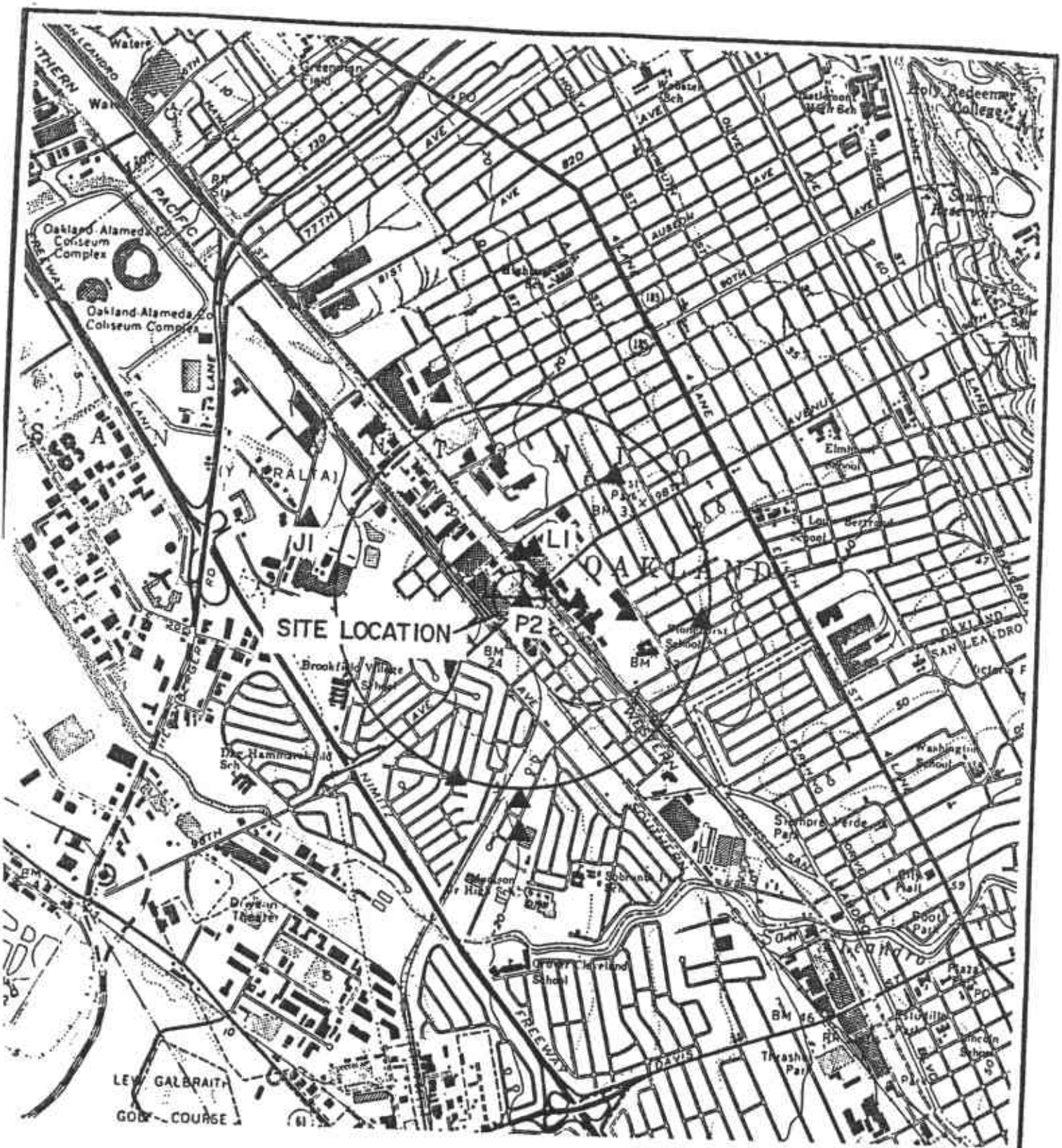
underground fuel-storage tanks still remained from the two service stations, which once occupied the southeast corner of the property.

WORK STEPS

RISK ASSESSMENT EVALUATION

A risk assessment was conducted by determining the locations and uses of groundwater wells within a one half mile radius of the site, identifying surface water bodies, and evaluating the hydrogeological setting. The risk assessment targets well construction and completion, well use (whether industrial, domestic, irrigation, or municipal), the distance of the wells from site, and their direction from site relative to the groundwater-gradient direction.

The well survey found a total of 9 wells within a one-half-mile radius of the site and five additional wells just beyond the one-half mile radius (Figure 3). Of the 14 wells identified, all are used for industrial purposes. Based on the available data, only three of the wells appear to be of concern. One of these three wells, (P2), installed by Gerber Products, is located on site and is completed to a depth of 602 feet. The well is screened from 160 to 225 feet below the ground surface. No sanitary seal information could be obtained on this well. A second well (L1) located upgradient from the site, is completed to a depth of 950 feet and the screen interval is unknown. This well is of concern because the records indicate that the gravel pack for the well extends from the surface to a depth of 950 feet. The third well (J1) is located just beyond one-half



LEGEND

▲ WELL LOCATION

FIGURE 3

WELL LOCATION MAP

1/2 MILE RADIUS

N

ERBER PRODUCTS
AKLAND, CALIFORNIA

0 MILES 1

GROUNDWATER TECHNOLOGY

mile downgradient from the site. J1 is completed to a depth of 448 feet, and the seal and construction details were not available.

The approximate rate at which groundwater movement occurs was calculated to determine the time that would be required for contaminated groundwater to impact nearby wells. The groundwater velocity (v) was determined by using the known hydraulic gradient (dh/dl) and assumed values for the hydraulic conductivity (K) and porosity (n) for the sandy-gravel and clay aquifer encountered beneath the site. The calculation for groundwater velocity is as follows:

$$v = \frac{K}{n}\frac{dh}{dl}$$

Where: K = 10 feet/day (assumed)
n = 30 percent = 0.3 (assumed)
$\frac{dh}{dl}$ = 0.002 (measured)

Substituting these values into the equation yields a groundwater velocity of 0.06 feet per day which equates to 24.3 feet per year.

The closest surface water body to the site is the San Francisco Bay (approximately 2 miles). It is unlikely that the contamination at the site will pose a threat to water quality in the bay. The site is characterized as a "B3" site by the California Regional Water Quality Control Board (CRWQCB) which means that the extent of groundwater impact is unknown in a limited groundwater use area.

PRP SURVEY

A survey was conducted from listed data published by the CRWQCB for other PRPs in the vicinity of the site. The published list stated locations of leaks reported in Alameda County. No other PRPs were identified in the vicinity of the site from the list. However, it should be noted that a property map of the site vicinity indicates that Standard Brands Company once occupied property directly upgradient from the site, across San Leandro Boulevard.

GROUND-PENETRATING RADAR (GPR) SURVEY

In order to locate, or confirm the absence of underground storage tanks at the locations of the two former gasoline stations, a GPR survey was conducted on May 12 and May 16, 1988. The GPR survey was conducted using Geophysical Survey Systems, Inc. (GSSI) SIR™ System-3 Subsurface Interface Radar equipment. A 300-megahertz transducer system was used to transmit and receive radar impulses providing the optimum configuration for locating underground tanks at this site.

During the two-day survey, 3,600 feet of radar transects were run over a grid pattern covering an area 290 feet by 70 feet in plan. Following review of the radar data collected on May 12, additional transects were run on May 16, 1988 to provide additional information regarding subsurface anomalies detected during the initial survey.

Analysis of radar data indicated the presence of several utility pipes at an approximate depth of 2- to 3-feet below the ground surface. Radar data from one area indicated a weak

anomaly resembling the type of anomalies created by underground fuel tanks and their associated fill material (Figure 4). The location and size of this anomaly appeared consistent with the location for underground tanks based on review of historic aerial photographs of the site. The boring for MW-8 was drilled at the location of the anomaly to determine if any tanks were, in fact, still present. Metal debris was discovered just beneath the asphalt surface and was underlain by native soil to completion depth at 20 feet. Based on this information, and further review of radar data, GTI has concluded that the existence of underground fuel tanks in the area surveyed is unlikely.

SOIL BORINGS AND SAMPLING

On May 18 and 19, 1988, four soil borings for installation of wells MW-5, MW-6, MW-7, and MW-8, were drilled in the southeast corner of the property in the vicinity of the two former gas stations (Figure 2). The boring locations were chosen after reviewing the results of the GPR survey and the Phase I Site Investigation. The borings were drilled with a truck-mounted drill rig using 7.5-inch, outside- diameter (O.D.), hollow-stem augers. The borings were completed to a depth of 20 feet so that data collected would be consistent with wells installed in the Phase I investigation (also 20 feet). A field geologist was present to maintain a complete lithologic log of each boring (Appendix I) and to collect soil samples. Photo-ionization detector (PID) readings were obtained at each sample point and noted on the drill logs. A PID is a field screening device which detects the presence of volatile organic compounds by the ionization of organic molecules via ultraviolet radiation. All excavated soil from the drilling was placed in metal drums, labeled, and stored on the site pending the results of laboratory analyses.