CAMBRIA

August 8, 2006

Mr. Don Hwang
Hazardous Materials Specialist
Local Oversight Program
Alameda Health Care Services, Environmental Health Services
1131 Harbor Bay Parkway, Suite 250
Alameda, California 94502-6577

Re: **Risk Assessment**
Allright Parking
1432 Harrison Street, Oakland, California 94612
Fuel Leak Case No. RO0000266
Cambria Project No. 540-1488

Dear Mr. Borsuk,

On behalf of Mr. Mark Borsuk, Cambria Environmental Technology, Inc. (Cambria) is pleased to present this *Risk Assessment* for the above referenced site.

Please call me at (510) 420-3307 or Mark Borsuk at (415) 922-4740 if you have any questions regarding this report or the project.

Sincerely,
Cambria Environmental Technology, Inc.

Mark Jonas, P.G.
Senior Project Manager

Attachment: *Risk Assessment.*

Report transferred to ACEH on August 8, 2006 via ftp site.

cc: Mr. Mark Borsuk, 1626 Vallejo Street, San Francisco, California 94123-5116

Cambria Environmental Technology, Inc.

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CAMBRIA

RISK ASSESSMENT

Allright Parking
1432 Harrison Street, Oakland, California
Fuel Leak Case No. RO0000266
Cambria Project No. 540-0188

August 8, 2006

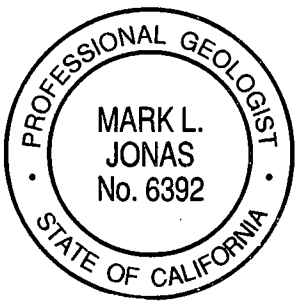
Prepared For:

Mr. Mark Borsuk
1626 Vallejo Street
San Francisco, California

Prepared By:

Cambria Environmental Technology, Inc.
5900 Hollis Street, Suite A
Emeryville, California 94608

Mark Jonas, P.G.
Senior Project Manager



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RISK ASSESSMENT

Allright Parking
1432 Harrison Street, Oakland, California

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Allright Parking
1432 Harrison Street, Oakland, California
Fuel Leak Case No. RO0000266
Cambria Project No. 540-0188

August 8, 2006

1.0 INTRODUCTION

On behalf of Mr. Mark Borsuk, Cambria Environmental Technology, Inc. (Cambria) is pleased to submit this *Risk Assessment* for the above referenced site. This report is in response to a Alameda County Health Care Services Agency, Environmental Health Services (ACEH) May 23, 2006 letter from Mr. Don Hwang approving Cambria April 6, 2006 *Risk Assessment Work Plan*. ACEH is the lead agency for this site. Presented in this *Risk Assessment* are the site background, previous investigations and activities, site characterization, Tier 1 risk analysis, and Tier 2 Risk-Based Corrective Action (RBCA) risk assessment.

2.0 SITE BACKGROUND

2.1. Site Description

The site is located at 1432 Harrison Street, in Oakland, California, as identified in Figure 1. It is currently operated as a commercial parking facility in downtown Oakland. The general area is mixed commercial and residential, but predominantly commercial. Prior to approximately 1988, the site was used to dispense gasoline from underground storage tanks (USTs), along with automobile repair and servicing. In 1993 the gasoline USTs were removed, along with the dispensers, associated piping, hydraulic lifts, and a sump. The site has a relatively flat topography and currently is paved with asphalt and concrete. Figure 2 presents an aerial photograph of the site and surrounding properties. Figure 3 provides a site map.

2.2. Previous Investigations and Activities

Environmental investigations and activities have been performed at the site since approximately 1990. The following provides groundwater and soil analytical results and sampling locations, along with a synopsis of previous environmental investigations and activities:

Analytical Results and Sampling Locations: Tables and figures in this report present groundwater and soil analytical results and sampling locations. Table 1 presents previous groundwater sampling results. Tables 2 and 3 provide soil results. Figure 4 presents relatively recent groundwater elevation data. Figures 5 and 6 present groundwater and soil sampling locations, respectively.

July 1990 through May 1993 - Soil Boring Investigations: In July and September 1990, Subsurface Consultants (SCI) of Oakland, California drilled six (6) soil borings near the gasoline USTs, the hydraulic lift area, and between these two areas. Soil samples were analyzed and petroleum hydrocarbons were detected. In January and February 1992, RGA Environmental Consulting of Emeryville, California drilled ten (10) soil borings and analyzed soil samples from various depths. In May 1993, Levine-Fricke, Inc. (Levine-Fricke) of Emeryville, California drilled two (2) soil borings near the gasoline UST area and analyzed soil samples down to a depth of 24.5 feet (ft) below ground surface (bgs).

December 1993 - Removal of USTs: In December 1993, Levine-Fricke removed two (2) underground storage tanks (USTs) from the site. The two (2) 1,000-gallon, single-walled, steel, gasoline USTs were located under the sidewalk on Harrison Street, with gasoline dispensers located about 20 ft east of the USTs. In addition, three hydraulic lifts, one vault, one washrack sump, and associated piping were reportedly excavated and removed from the site. A total of approximately 240 cubic yards of hydrocarbon-impacted soils were apparently removed from these areas. Levine-Fricke stated that "Excavation soil quality samples indicated that hydrocarbons were present in remaining soils in each area."

January 1994 – Installation of Monitoring Well: After filling the UST excavation, monitoring well MW-1 was installed by Levine-Fricke at the former gasoline tank area.

July 1994 - Subsurface Investigation: In July 1994, Levine-Fricke conducted a subsurface investigation to assess the extent of hydrocarbons in soil and groundwater. Two soil borings in Harrison Street were drilled and sampled. Two additional wells were installed: MW-2 in Harrison Street and MW-3 to the east in Alice Street.

July 1995 - Subsurface Investigation: In July 1995, Cambria conducted a subsurface investigation to further define the extent of hydrocarbons in soil and groundwater. Cambria drilled nine (9) soil borings to collect soil samples and three (3) boring to collect grab groundwater samples. Petroleum hydrocarbons were detected in both soil and groundwater.

August 1996 - Soil Vapor Extraction Test: In August 1996, Cambria conducted a soil vapor extraction test on existing groundwater monitoring wells MW-1 and MW-2. Results of the test suggested that the subsurface consists of moderate permeability materials such as sands and silty sands, and that soil vapor extraction could effectively remove hydrocarbons from the subsurface soils.

October 1996 Subsurface Investigation: In October 1996, Cambria conducted an additional subsurface investigation to further define the extent of hydrocarbons in soil and groundwater. Five (5) soil borings were drilled and three (3) of the borings were converted to monitoring wells MW-4,

MW-5, and MW-6. Two additional angled borings were drilled to assess the impact of hydrocarbons from two closed-in-place tanks located directly up-gradient of the site.

July 1999 – Coaxial Remediation Wells: In July 1999, Cambria installed four (4) coaxial remediation wells near the former gasoline USTs for vapor extraction and air sparging.

December 2001 – April 2005 Soil Vapor Extraction/Air Sparge Remediation: In December 2001, Cambria supervised the installation and initiated active remediation with a site-specific soil vapor extraction (VES) and air sparging (AS) system. Underground piping, well vaults, and a well manifold were installed by Accutite. The system ran under a Bay Area Air Quality Management District (BAAQMD) permit. System influent, mid-influent, and effluent vapor samples were collected and analyzed. On April 30, 2005 remediation using the VES/AS system ceased due to low influent vapor concentrations and hydrocarbon mass removal rates. During operation of the SVE/AS system, approximately 9,939 pounds of hydrocarbons were extracted from the site. On June 2, 2005, the SVE/AS system was removed from the property.

Groundwater Monitoring: Quarterly groundwater monitoring and sampling has been performed at the site since May 1994. Historical and recent groundwater analytical data are presented in Table 1.

3.0 SITE CHARACTERIZATION

3.1. Geology and Hydrogeology

3.1.1. Regional and Local Geology

The site is located in the Coast Range Physiographic Province, characterized by northwest-southeast trending valleys and ridges. This region lies between the Pacific Ocean to the west and the Great Valley to the east. The oldest known bedrock in the Coast Range Province is marine sedimentary and volcanic rocks that from the Franciscan Assemblage. Geologic formations in the San Francisco Bay Region range in age from Jurassic to recent Holocene.

The site is located to the west of the Oakland-Berkeley Hills on the East Bay Plain, which slopes gently to the west towards San Francisco Bay. The San Francisco Bay is located in a broad depression in the Franciscan bedrock resulting from an east-west expansion between the San Andreas and Hayward fault systems. Unconsolidated sediments in the East Bay Plain varying in thickness, with some areas up 1,000 feet thick. From oldest to youngest, the unconsolidated sediments are 1/ Santa Clara Formation, 2/ Alameda Formation, 3/ Temescal Formation, and 4/ artificial fill. The Early Pleistocene Santa Clara Formation consists of alluvial fan deposits inter-fingered with lake, swamp, river channel, and flood plain deposits, ranging from 300 to 600 feet thick. The Late

Pleistocene Alameda Formation was deposited primarily in an estuarine environment and consists of alluvial fan deposits bound by mud deposits on the top and bottom of the formation. The Alameda Formation ranges from 26 to 245 feet thick and is subdivided into the Yerba Buena Mud, San Antinio, Merritt, and Young Bay Mud Members. The Early Holocene Temescal Formation is an alluvial fan deposit consisting primarily of silts and clays with some gravel layers. The Temescal Formation ranges from 1 to 50 feet thick, thinning toward the bay. Below any sub-base and fill, shallow sand, silt, and clay at the site most likely are Temescal Formation.

The site lithology is heterogeneous consisting of interbedded lenses of silty sand, sand, and sandy silt to the maximum explored depth of 30 feet. Near the surface, fill includes gravel and concrete road base.

3.1.2. Regional and Local Hydrogeology

The site is located in the East Bay Plain Subbasin, Groundwater Basin No. 2-9.04 (DWR 2003). The East Bay Plain Subbasin is a northwest trending alluvial basin, bounded on the north by San Pablo Bay, on the east by the contact with Franciscan basement rock, and on the south by the Nile Cone Groundwater Basin. The East Bay Plain Subbasin extends beneath the San Francisco Bay to the west. The East Bay Plain Subbasin aquifer system consists of unconsolidated sediments of Quaternary age. These include the Santa Clara Formation, Alameda Formation, Temescal Formation, and artificial fill. In the project area most rainfall occurs between November and March. The average annual rainfall is approximately 23 inches.

Throughout most of the East Bay Plain, regional water level contours show that the direction of groundwater flow is generally east to west, towards San Francisco Bay, with some localized variation. Groundwater flow direction typically correlates to topography.

From 1860 to 1930 groundwater from the East Bay Plain was the major water supply of the East Bay, before Sierra water was imported into the area. By the late 1920's the groundwater supply was too small to meet the growing population and the wells often became contaminated by seepage or saltwater intrusion. By 1929, East Bay Municipal Utility District (EBMUD) provided imported water to East Bay communities via the Mokelumne Aqueduct. This high-quality, reliable supply soon eliminated the need for local groundwater wells. In 1996, the Regional Board reviewed General Plans for Oakland and other communities. They found that Oakland and most other cities did not have any plans to develop local groundwater resources for drinking water, due to existing or potential saltwater intrusion, contamination, or poor or limited quality (Regional Board 1999).

First water in various borings was typically encountered around 20 feet (ft) below ground surface (bgs). Groundwater levels in monitoring wells have historically ranged from approximately 18 to 21 ft

bgs, as presented in Table 1. Groundwater beneath the site apparently flows primarily towards the north, with some apparently localized flow to the south. Figure 4 present groundwater levels for December 2005. Any vertical hydraulic gradients are currently undefined.

3.2. Analytes in Soil and Groundwater

3.2.1. Hydrocarbons in Soil

Prior to active VES/AS remediation between 2001 and 2005, elevated concentrations of gasoline-range hydrocarbons were detected in the vadose zone (approximately <20 ft bgs) soil predominantly in the area of the former gasoline USTs and the former dispensers. Significant soil concentrations also appear to have existed below the vadose zone (>20 ft bgs), under saturated conditions. The vertical extent of hydrocarbons appears to significantly decrease by 30 ft bgs. Table 2 presents soil results for gasoline-range hydrocarbons. Soil sampling locations are presented in Figure 6. Current concentrations in soil are unknown, since active remediation removed approximately 10,000 gallons of hydrocarbons from the former gasoline USTs and dispenser areas.

Elevated concentrations of Total Petroleum Hydrocarbons as diesel (TPHd) and Oil & Grease (O&G) in soil were detected near the former hydraulic lift area. Table 3 presents TPHd and O&G results.

3.2.2. Other Analytes in Soil

Table 3 presents analytical results for Volatile Organic Compounds (VOCs), Polychlorinated Biphenyls (PCBs), and selected metals. No VOCs were detected. One, relatively low concentrations of PCB was detected at 0.245 mg/kg at the former hydraulic lift area. The other six soil samples analyzed for PCB were non-detect. Some elevated concentrations of metals were detected in soil; specifically mercury and possibly nickel were detected at concentrations above apparent background concentrations. Elevated concentrations of mercury were detected at the former hydraulic lift area. Apparently elevated concentrations of nickel were found at the former hydraulic lift area and near the former gasoline USTs. The original source or sources of these analytes are unknown.

3.2.3. Hydrocarbons in Groundwater

Elevated concentrations of gasoline-range hydrocarbons have been previously detected in the monitoring wells located at the former gasoline USTs (MW-1) and downgradient (MW-2, MW-4, and MW-5). Concentrations in MW-1 decreased significantly apparently due to active VEW/AS remediation, but some rebound may have occurred post-remediation. The downgradient extent, beyond MW-4 and MW-5, and cross-gradient extent to the southwest of Harrison Street is apparently undefined. These areas are very urbanized and subsurface characterization is difficult. To the east in Alice Street, cross-gradient well MW-3 and up-gradient well MW-6 did not have detectable

concentration of gasoline-range hydrocarbons (except for very low levels in MW-6 in July 2000). Table 1 presents analytical results of petroleum hydrocarbons in groundwater. Figure 5 presents groundwater sampling locations.

4.0 ASSESSMENT OF RISK

This section presents a Tier 1 and Tier 2 evaluation of potential risk. The overall objective for assessing risk is to be protective of human health and the environment. The following approach identifies potential exposure routes to receptors possibly impacted by concentrations in soil and groundwater, defines chemicals of potential concern, applies applicable Tier 1 screening criteria, and performs Tier 2 Risk-Based Corrective Action (RBCA) modeling. Tier 1 risk analysis is based on the use of "lookup tables" for screening criteria, specifically Regional Water Quality Control Board – San Francisco Bay Region (Regional Board) *Environmental Screening Levels* (Regional Board 2005). Tier 2 risk analysis uses the method presented in the ASTM (1998) *PS-104 - Standard Provisional Guide for Risk-Based Corrective Action.* RBCA risk modeling was performed with the aid of the Groundwater Services, Inc. (GSI) RBCA Took Kit Chemical Releases Software (Version 1.3b). Both Tier 1 and Tier 2 risk assessment can be overly conservative and actually impact to a potential receptor may be less.

Appendix B presents data tables and statistical analysis for the Tier 1 risk analysis. Appendix C presents Tier 2 data tables, statistical analysis, and RBCA risk assessment.

4.1. Potential Exposure Routes

The identification of potential exposure routes provides a basis for assessing risk. For an initial evaluation, potential exposure routes are identified and evaluated with respect to chemicals of potential concern and ESLs to determine if a potential risk exists.

Currently there are no known complete exposure pathways at the site: no buildings exist on the property and groundwater is currently not used for drinking water. Off-site there are paved roads and some buildings. Potential exposure pathways including:

- Vapor Inhalation,
- Direct Exposure to a Construction Worker, and
- Groundwater as a Drinking Water Resource.

The Tier 1 risk analysis compares these potential exposure pathways to environmental screening levels (Regional Board 2005) for chemicals of potential concern. The Tier 2 analysis models potential risk associated with vapor intrusion and direct exposure to a construction worker for benzene. Benzene typical drives risk for petroleum hydrocarbons.

4.2. Chemicals of Potential Concern

Selection of chemicals of potential concern (COPC) is based on concentrations and frequency of detection and metals in soil significantly above apparent background concentrations. Selection of a chemical as a COPC does not identify it as a significant risk and is only used to evaluate the potential for risk under a Tier 1 analysis. Tables 1 and 2 provide all known groundwater and soil analytical results for the site. Appendix A presents a City of Oakland survey of background metal concentrations. Appendix B presents tables of chemicals in groundwater for years 2005 and 2006, along with apparent vadose zone soil results sampled <20 feet bgs, including frequency of detection.

Total Petroleum Hydrocarbons as gasoline (TPHg), along with benzene, toluene, ethylbenzene, and xylenes (BTEX) were selected as COPC in soil and groundwater due to their concentrations and frequency of detection. Methyl tert-butyl ether (MTBE) was only detected rarely in groundwater and therefore was not identified as a COPC. Total Petroleum Hydrocarbons as diesel (TPHd) and Oil & Grease in soil were selected as COPC due to their frequency of detection and some apparently elevated concentrations. Polychlorinated biphenyls (PCBs) was not included as a COPC because it was only detected once out of seven (7) samples analyzed. Some concentrations of mercury and nickel are apparently above typical naturally-occurring background concentrations, when compared to background levels presented in Appendix A. Therefore, these were both identified as soil COPC. Selenium in soil was only slightly above apparently background concentrations and therefore was not included as a COPC. Based on characterization of the site, following are chemicals of potential concern for soil and groundwater:

Chemicals of potential concern in soil:

TPHg, benzene, toluene, ethylbenzene, xylenes, TPHd, Oil & Grease, mercury, and nickel.

Chemical of potential concern in groundwater:

TPHg, benzene, toluene, ethylbenzene, and xylenes.

These chemicals are evaluated with respect to Tier 1 environmental screening levels. Tier 2 potential risk is modeled with RBCA using benzene to represent risk associated with petroleum hydrocarbons.

4.3. Tier 1 Risk Assessment

This Tier 1 risk analysis is performed by comparing soil and groundwater concentrations to various Regional Board (2005) ESLs.

4.3.1. Summary of Soil Results and Environmental Screening Levels

Soil samples were collected from 1990 to 1999. Since then a significant amount of remediation has taken place between 2001 and 2005. Therefore, current concentrations of petroleum hydrocarbons are probably lower. Because the soil sampling results are relatively old and prior to remediation, any addition remedial in soil should be based on more current analytical results.

First water was typically found at 20 ft bgs. Therefore, the vadose zone is defined as unsaturated soil from the ground surface to < 20 ft bgs. The Regional Board (2005) in their ESL guidance states that "*soil refers to any unlithified material in the unsaturated zone that is situated above the capillary fringe of the shallowest saturated unit.*" Therefore soil samples collected at depths > 20 ft bgs may have been collected from the saturated zone and therefore ESLs do not apply. Representative maximum plausible values are represented by 95% upper confidence limit (UCL) concentrations in accordance with risk assessment recommendations by U.S. Environmental Protection Agency (EPA 1989). If the 95% UCL is not available due an insufficient data population, the maximum detected value is used. Summaries of soil results and ESLs for potential receptors are presented below:

Chemicals of Potential Concern in Soil and Environmental Screening Levels

The following Table 4-1 presents shallow soil < 3 m bgs results and ESLs for COPC:

Table 4-1
Chemicals of Potential Concern in Soil < 3 m bgs and Environmental Screening Levels

COPC in Soil	Frequency of Detected Concentrations	95% UCL Concentration (mg/kg)	Maximum Concentration (mg/kg)	Groundwater Protection ESL D.W. Resource[1] (mg/kg)	Residential ESL Vapor Intrusion Into Building[2] (mg/kg)	Commercial ESL Vapor Intrusion Into Building[3] (mg/kg)
TPHg	17/31 (55%)	407		**100**	NA[6]	NA[6]
Benzene	6/31 (19%)	0.9		**0.044**	**0.18**	**0.51**
Toluene	13/30 (43%)	17.8		**2.9**	130	310
Ethylbenzene	8/30 (27%)	8.8		**3.3**	390	390
Xylenes	12/30 (40%)	53.1		**2.3**	310	420
TPHd	6/7 (86%)		670	**100** / 1,000[5]	NA[6]	NA[6]
O&G[4]	4/8 (50%)		17,000	**1,000**	NA	NA
Mercury	5/6 (83%)		45.4	NA	NA[6]	NA[6]
Nickel	6/6 (100%)		329.2	NA	NA	NA

notes: ESL = Environmental Screening Level; UCL = Upper Confidence Limit; D.W. = Drinking Water; ND = Not Detected; NA = Not Available
1 = Table A-1 (RWQCB 2005), ESL, ≤3 m bgs, residential land use, current or potential drinking water source, for groundwater protection
2 = Table A-1 (RWQCB 2005), ESL, ≤3 m bgs, residential land use, vapor intrusion into building.
3 = Table A-2 (RWQCB 2005), ESL, ≤3 m bgs, commercial land use, vapor intrusion into building.
4 = TPH (residual fuels); Defined in HLA (1992) as "Heavy' petroleum hydrocarbons such as waste oil, mineral spirits, jet fuel, or fuel oil."
5 = TPH (middle distillates) / TPH (residual fuels); 6 = Recommends using soil gas

Exceeding an ESL is identified in bold on the table. Elevated concentrations of TPHg, BTEX, TPHd, and O&G in shallow soil (< 3 m bgs) exceed drinking water resource ESLs for groundwater protection. Elevated concentrations of benzene exceed both residential and commercial vapor intrusion ESLs. On-site soil gas is recommended by the Regional Board (2005) to evaluated vapor intrusion risk associated with TPHg, TPHd, and mercury. Benzene is the typical risk-driver for petroleum hydrocarbons with respect to vapor intrusion.

The following Table 4-2 presents deep soil >3 m bgs results and ESLs for COPC:

Table 4-2
Chemicals of Potential Concern in Soil > 3 m to < 20 ft bgs and Environmental Screening Levels

COPC in Soil	Frequency of Detected Concentrations	95% UCL Concentration (mg/kg)	Maximum Concentration (mg/kg)	Groundwater Protection ESL D.W. Resource[1] (mg/kg)	Residential ESL Vapor Intrusion Into Building[2] (mg/kg)	Commercial ESL Vapor Intrusion Into Building[3] (mg/kg)
TPHg	13/24 (54%)	1,104		**100**	NA[6]	NA[6]
Benzene	7/22 (32%)	10.2		**0.044**	**0.18**	**0.51**
Toluene	11/23 (48%)	91.7		**2.9**	130	310
Ethylbenzene	5/23 (22%)	21		**3.3**	390	390
Xylenes	9/23 (39%)	118		**2.3**	310	420
TPHd	5/8 (63%)		1,700	**100 / 1,000[5]**	NA[6]	NA[6]
O&G[4]	3/3 (100%)		6,300	**1,000**	NA	NA
Mercury	5/5 (100%)		35.5	NA	NA[6]	NA[6]
Nickel	5/5 (100%)		376	NA	NA	NA

notes: ESL = Environmental Screening Level; UCL = Upper Confidence Limit; D.W. = Drinking Water; ND = Not Detected; NA = Not Available
1 = Table C-1 (RWQCB 2005), ESL, >3 m bgs, residential land use, current or potential drinking water source, for groundwater protection.
2 = Table C-1 (RWQCB 2005), ESL, >3 m bgs, residential land use, vapor intrusion into building.
3 = Table C-2 (RWQCB 2005), ESL, >3 m bgs, commercial land use, vapor intrusion into building.
4 = TPH (residual fuels); Defined in HLA (1992) as "'Heavy' petroleum hydrocarbons such as waste oil, mineral spirits, jet fuel, or fuel oil."
5 = TPH (middle distillates) / TPH (residual fuels)
6 = Recommends using soil gas

Elevated concentrations of TPHg, BTEX, TPHd, and O&G in deeper soil (> 3 m and < 20 ft bgs) exceed drinking water resource ESLs for groundwater protection. Elevated concentrations of benzene exceed both residential and commercial vapor intrusion ESLs. On-site soil gas is recommended by the Regional Board (2005) to evaluated vapor intrusion risk associated with TPHg, TPHd, or mercury.

The following Table 4-3 presents ESLs for direct exposure to a construction/trench worker:

Table 4-3
Chemicals of Potential Concern in 0 to < 20 ft bgs Soil and Direct Exposure ESLs

COPC in Soil	Frequency of Detected Concentrations	95% UCL Concentration (mg/kg)	Maximum Concentration (mg/kg)	Direct Exposure ESL Construction/ Trench Worker[1] (mg/kg)
TPHg	30/56 (54%)	738.5		6,000
Benzene	13/54 (24%)	5.7		16
Toluene	25/53 (47%)	55.7		650
Ethylbenzene	13/53 (25%)	14.6		400

COPC in Soil	Frequency of Detected Concentrations	95% UCL Concentration (mg/kg)	Maximum Concentration (mg/kg)	Direct Exposure ESL Construction/ Trench Worker[1] (mg/kg)
Xylenes	21/53 (40%)	83.9		420
TPHd	11/15 (78%)	410		6,000 / 15,000
O&G[4]	7/11 (64%)		17,000	**15,000**
Mercury	10/11 (91%)		45.4	98
Nickel	11/11 (100%)		376	1,000

notes: ESL = Environmental Screening Level; D.W. = Drinking Water; ND = Not Detected; NA = Not Available
1 = Table K-3 (RWQCB 2005), ESL, construction/trench worker, direct exposure
2 = TPH (middle distillates) / TPH (residual fuels)

Direct exposure ESLs to a construction/trench worker in soils < 20 ft bgs were only exceeded by concentrations of O&G greater than 15,000 mg/kg. No other COPC exceed direct exposure to a construction/trench worker.

4.3.2. Summary of GW Results and Environmental Screening Levels

Groundwater has been sampled and analyzed since 1994 through 2006. To represent relatively recent and late-stage remediation conditions, only groundwater samples from 2005 through 2006 are considered for comparison with ESLs. VES/AS remediation ceased in April 2005. Table 1 presents groundwater data. Appendix B presents the 2005 and 2006 groundwater data set and statistical evaluation. Summaries of groundwater analytical results and potential ESLs are presented below:

Chemicals of Potential Concern in Groundwater and Environmental Screening Levels

The following Table 4-4 presents groundwater results and ESLs for chemicals of potential concern.

Table 4-4
Chemicals of Potential Concern in Groundwater and Environmental Screening Levels

COPC In GW	Frequency of Detection 2005-2006	2005-2006 95% UCL (ug/L)	ESL D.W. Resource[1] (ug/L)	CAL DHS Primary MCL[2] (ug/L)	Risk-Based Goal/Drinking Water Toxicity[3] (ug/L)	Res. / Com. Vapor Intrusion[4] (ug/L)
TPHg	21/25 (84%)	10,904	**100[5]**	NA	**210**	NA[6] / NA[6]
Benzene	21/25 (84%)	2,486	**1.0**	**1.0**	**0.35**	**1,900** / 6,400
Toluene	21/25 (84%)	143	**40[5]**	150	1,400	530,000$_{res./com.}$
Ethylbenzene	21/25 (84%)	246	**30[5]**	700	700	170,000$_{res./com.}$
Xylenes	21/25 (84%)	1,269	**20[5]**	1,800	1,400	160,000$_{res./com.}$

notes: ESL = Environmental Screening Level; D.W. = Drinking Water; ND = Not Detected; NA = Not Available; UCL = Upper Confidence Limit
CAL DHS MCL = California EPA Department of Health Services - Maximum Concentration Level
1 = Table F-1a (RWQCB 2005), ESL, groundwater screening level, current or potential drinking water source.
2 = California Department of Health Services (CA DHS) Maximum Contaminant Levels (MCLs
3 = Table F-3 (RWQCB 2005), ESL, drinking water screening levels for human toxicity.
4 = Table E-1a (RWQCB 2005), ESL, groundwater screening level, potential vapor intrusion, indoor air; low/moderate permeability soil, residential / commercial.
5 = (RWQCB 2005) Based on Taste and Odor Threshold (Table I-1)
6 = Recommends using soil gas.

Elevated concentrations of TPHg, benzene, toluene, ethylbenzene, and xylenes exceed ESLs for groundwater as a drinking water resource. Only benzene in groundwater exceeds the California Department of Health Services (CA DHS) Maximum Contaminant Level (MCL) for drinking water. TPHg and benzene exceed the risk-based goal based on drinking water toxicity. Only benzene exceeds the vapor intrusion ESL and only for residential. Apparently impacted groundwater is not currently used as a source of drinking water. Drinking water is currently supplied to the City of Oakland by EBMUD via the Mokelumne Aquifer.

4.4. Tier 2 Risk Assessment

The Tier 2 risk analysis was performed by comparing benzene in soil and groundwater concentrations for indoor and outdoor, commercial and residential vapor intrusion and potable water ingestion. Soil benzene concentrations are also analyzed for direct exposure for a subsurface construction worker. Tier 2 risk analysis uses the method presented in the ASTM (1998) *PS-104 - Standard Provisional Guide for Risk-Based Corrective Action.* Risk-Based Corrective Action (RBCA) risk modeling was performed using the Groundwater Services, Inc. (GSI) RBCA Took Kit Chemical Releases Software (Version 1.3b).

4.4.1. Tier 2 RBCA Modeling Runs

Risk pathways modeled with RBCA include vapor inhalation (indoor and outdoor, commercial and residential) and direct contact for a construction worker. Benzene in both soil and groundwater is used to determine vapor inhalation risk. Potential risk associated with impacted groundwater was already covered in the Tier 1 risk assessment. RBCA modeling runs are presented in Appendix B, along with soil and groundwater data sets. Four risk modeling runs were performed:

- RBCA Modeling Run One (Commercial Risk, Soil Source)
  - Benzene in soil at 95% UCL
  - Indoor air/vapor inhalation: Commercial receptor
  - Outdoor air/vapor inhalation: Commercial receptor
  - Soil dermal contact and ingestion: On-site construction worker
- RBCA Modeling Run Two (Commercial Risk, Groundwater Source)
  - Benzene in groundwater at 95% UCL
  - Indoor air/vapor inhalation: Commercial receptor
  - Outdoor air/vapor inhalation: Commercial receptor
- RBCA Modeling Run Three (Residential Risk, Soil Source)
  - Benzene in soil at 95% UCL
  - Indoor air/vapor inhalation: Residential receptor
  - Outdoor air/vapor inhalation: Residential receptor

- RBCA Modeling Run Four (Residential Risk, Groundwater Source)
  - Benzene in groundwater at 95% UCL
  - Indoor air/vapor inhalation: Residential receptor
  - Outdoor air/vapor inhalation: Residential receptor

4.4.2. Tier 2 RBCA Modeling Parameters

Parameters used for RBCA risk modeling were sites-specific when available and also based on default GSI RBCA (2000) and ASTM (1998) values, along with Oakland RBCA values (City of Oakland 2000). The following Table 4-5 presents the input values that are based on non-default values and supporting rationale:

Table 4-5
Risk-Based Corrective Action Input Parameters and Rationale

Parameter	Units	Default Value	Value Used RBCA Model	Rationale
Benzene in Soil	mg/kg	--	6.0	95% UCL of soil data collected from 0 to 20 ft bgs. See Table C2 (Appendix C).
Benzene in Groundwater	mg/L	--	2.4	95% UCL for 2005 and 2006 groundwater data. See Table C1 (Appendix C).
Target Carcinogenic Risk Level	--	--	1×10^{-5}	Consistent with Cal-EPA/DTSC policy (Proposition 65), ASTM (1995), and Oakland (2000) RBCA.
Non-Carcinogenic Hazard Quotient	--	1.0	1.0	Consistent with US EPA and ASTM default value.
Soil Type	--	--	Sandy Silt	Site-specific lithology.
Depth to subsurface soil sources	cm	100	100	Reasonable site-specific depth to top of source for UST.
Depth to groundwater	cm	300	610	Vadose zone defined by 20 ft bgs "first water" in boreholes.
Depth to top of affected soils	cm	0	100	Reasonable and data derived ~100 cm site-specific depth to top of source for UST.
Depth to base of affected soils	cm	300	610	20 ft based on source area soil data and groundwater depth.
Affected soil area	cm^2	$2x10^7$	$1x10^6$	Based on an assumed 40 ft x 40 ft source area.
Length of affected soil parallel to wind direction	cm	4,500	1,219	Based on 40 ft assumed source area.
Length of affected soil parallel to assumed groundwater flow direction	cm	4,500	1,219	Based on 40 ft assumed source area.
Groundwater plume width at source	cm	4,500	1,524	Approximately 50 ft based site-specific isopleths.
Hydraulic gradient	ft/ft	0.01	0.004	Based on December 20, 2005 site-specific groundwater data
Fraction of organic carbon (f_{oc}) in vadose zone	g/g	0.01	0.015	Oakland (2000) RBCA, Sandy Silt
Effective Porosity	Cm^3/cm^3	0.38	0.40	Oakland (2000) RBCA, Sandy Silt, total soil porosity
Volumetric water content Vadose Zone	Cm^3/cm^3	0.26	0.25	Oakland (2000) RBCA, Sandy Silt
Volumetric air content Vadose Zone	Cm^3/cm^3	0.17	0.15	Oakland (2000) RBCA, Sandy Silt

Parameter	Units	Default Value	Value Used RBCA Model	Rationale
Volumetric water content Capillary Fringe	Cm^3/cm^3	0.387	0.38	Oakland (2000) RBCA, Sandy Silt
Volumetric air content Capillary Fringe	Cm^3/cm^3	0.043	0.02	Oakland (2000) RBCA, Sandy Silt
Capillary Fringe thickness	cm	5	60.1	Oakland (2000) RBCA, Sandy Silt
Soil Bulk Density	g/cm^3	1.7	1.59	Oakland (2000) RBCA, Sandy Silt
Hydraulic conductivity (Horizontal)	cm/d	--	82	Oakland (2000) RBCA, Sandy Silt 3E+4 cm/yr
Hydraulic conductivity (Vertical)	cm/d	0.86	0.82	Two orders of magnitude less than horizontal hydraulic conductivity.
Air mixing zone height	cm	200	200	Oakland (2000) RBCA
Building air volume/floor area	Cm^3/cm^2	Res = 200 Com = 300	Res = 229 Com = 305	Oakland (2000) RBCA
Building air exchange rate	s^{-1}	Res = 0.0014, Com = 0.0023	Res = $5.6x\ 10^{-4}$ Com = $1.4x\ 10^{-3}$	Oakland (2000) RBCA
Foundation crack fraction	Cm^2/cm^2	0.01	0.001	Oakland (2000) RBCA

4.4.3. Tier 2 RBCA Modeling Results

RBCA modeling runs are presented in Appendix C. The following Tables 4-6 through 4-11 present a summary of results of the RBCA modeling runs. Tables 4-6 through 4-8 address potential commercial risk. Tables 4-9 through 4-11 address potential residential risk. The potential residential risk is hypothetical, due to a general lack of current residential receptors in the area.

Table 4-6
RBCA Modeling Run One – Commercial Risk, Soil Source

- RBCA Modeling Run One (Commercial Risk, Soil Source)
  - Benzene in soil at 95% UCL
  - Indoor air/vapor inhalation: Commercial receptor
  - Outdoor air/vapor inhalation: Commercial receptor
  - Soil dermal contact and ingestion: On-site construction worker

INDOOR AIR/VAPOR INHALATION – COMMERCIAL RECEPTOR						
Constituent	Carcinogenic Risk			Non-Carcinogenic Hazard Quotient		
	Risk	Target Risk	Exceed?	Risk	Target Risk	Exceed?
Benzene	$2.7(10)^{-6}$	$1.0(10)^{-5}$	No	$1.5(10)^{-1}$	1.0	No
OUTDOOR AIR/VAPOR INHALATION – COMMERCIAL RECEPTOR						
Constituent	Carcinogenic Risk			Non-Carcinogenic Hazard Quotient		
	Risk	Target Risk	Exceed?	Risk	Target Risk	Exceed?
Benzene	$3.4(10)^{-7}$	$1.0(10)^{-5}$	No	$1.9(10)^{-2}$	1.0	No
DIRECT EXPOSURE – CONSTRUCTION WORKER						
Constituent	Carcinogenic Risk			Non-Carcinogenic Hazard Quotient		
	Risk	Target Risk	Exceed?	Risk	Target Risk	Exceed?
Benzene	$7.4(10)^{-8}$	$1.0(10)^{-5}$	No	$5.8(10)^{-2}$	1.0	No

Table 4-7
RBCA Modeling Run Two – Commercial Risk, Groundwater Source

- RBCA Modeling Run Two(Commercial Risk, Groundwater Source)
  - Benzene in groundwater at 95% UCL
  - Indoor air/vapor inhalation: Commercial receptor
  - Outdoor air/vapor inhalation: Commercial receptor

INDOOR AIR/VAPOR INHALATION – COMMERCIAL RECEPTOR						
Constituent	Carcinogenic Risk			Non-Carcinogenic Hazard Quotient		
	Risk	Target Risk	Exceed?	Risk	Target Risk	Exceed?
Benzene	$3.3(10)^{-7}$	$1.0(10)^{-5}$	No	$1.9(10)^{-2}$	1.0	No
OUTDOOR AIR/VAPOR INHALATION – COMMERCIAL RECEPTOR						
Constituent	Carcinogenic Risk			Non-Carcinogenic Hazard Quotient		
	Risk	Target Risk	Exceed?	Risk	Target Risk	Exceed?
Benzene	$6.6(10)^{-9}$	$1.0(10)^{-5}$	No	$3.8(10)^{-4}$	1.0	No

The following Table 4-8 presents the sum of groundwater and soil vapor inhalation risk to a commercial receptor. This is an estimation of risk where both elevated concentrations in soil and groundwater are beneath a potential receptor. Carcinogenic risk is a summation. The summation of the Hazard Quotients (HQ) for specific routes calculates a Hazard Index (HI): $HI = \sum HQ$.

Table 4-8
Summation of Risk – Commercial, Groundwater and Soil Source

- RBCA Modeling Run One & Two (Sum of Risk, Commercial, Groundwater & Soil Sources)
  - Benzene in groundwater at 95% UCL
  - Benzene in soil at 95% UCL
  - Indoor air/vapor inhalation: Commercial receptor
  - Outdoor air/vapor inhalation: Commercial receptor

INDOOR AIR/VAPOR INHALATION – COMMERCIAL RECEPTOR						
Constituent	Carcinogenic Risk			Non-Carcinogenic Hazard Index		
	Risk	Target Risk	Exceed?	Risk	Target Risk	Exceed?
Benzene	$3.03(10)^{-6}$	$1.0(10)^{-5}$	No	$1.7(10)^{-1}$	1.0	No
OUTDOOR AIR/VAPOR INHALATION – COMMERCIAL RECEPTOR						
Constituent	Carcinogenic Risk			Non-Carcinogenic Hazard Index		
	Risk	Target Risk	Exceed?	Risk	Target Risk	Exceed?
Benzene	$3.5(10)^{-7}$	$1.0(10)^{-5}$	No	$1.94(10)^{-2}$	1.0	No

As identified in the RBCA modeling runs and summation of risks for a commercial receptor, 95% UCL concentrations of benzene do not poise a significant risk from soil and groundwater for indoor and outdoor inhalation. In addition, there is a not a significant risk from benzene for a construction work in soil. Please refer to Table 4-3 for potential risk to a construction work for O&G.

The following tables present the potential risk to a hypothetical residential receptor:

Table 4-9
RBCA Modeling Run Three – Residential Risk, Soil Source

- RBCA Modeling Run Three (Residential Risk, Soil Source)
  - Benzene in soil at 95% UCL
  - Indoor air/vapor inhalation: Residential receptor
  - Outdoor air/vapor inhalation: Residential receptor

INDOOR AIR/VAPOR INHALATION – RESIDENTIAL RECEPTOR						
Constituent	Carcinogenic Risk			Non-Carcinogenic Hazard Quotient		
	Risk	Target Risk	Exceed?	Risk	Target Risk	Exceed?
Benzene	**$1.5(10)^{-5}$**	**$1.0(10)^{-5}$**	**Yes**	$7.1(10)^{-1}$	1.0	No
OUTDOOR AIR/VAPOR INHALATION – RESIDENTIAL RECEPTOR						
Constituent	Carcinogenic Risk			Non-Carcinogenic Hazard Quotient		
	Risk	Target Risk	Exceed?	Risk	Target Risk	Exceed?
Benzene	$4.7(10)^{-7}$	$1.0(10)^{-5}$	No	$2.2(10)^{-2}$	1.0	No

Table 4-10
RBCA Modeling Run Four – Residential Risk, Groundwater Source

- RBCA Modeling Run Four (Residential Risk, Groundwater Source)
  - Benzene in groundwater at 95% UCL
  - Indoor air/vapor inhalation: Residential receptor
  - Outdoor air/vapor inhalation: Residential receptor

INDOOR AIR/VAPOR INHALATION – RESIDENTIAL RECEPTOR						
Constituent	Carcinogenic Risk			Non-Carcinogenic Hazard Quotient		
	Risk	Target Risk	Exceed?	Risk	Target Risk	Exceed?
Benzene	$1.8(10)^{-6}$	$1.0(10)^{-5}$	No	$8.7(10)^{-2}$	1.0	No
OUTDOOR AIR/VAPOR INHALATION – RESIDENTAL RECEPTOR						
Constituent	Carcinogenic Risk			Non-Carcinogenic Hazard Index		
	Risk	Target Risk	Exceed?	Risk	Target Risk	Exceed?
Benzene	$1.1(10)^{-8}$	$1.0(10)^{-5}$	No	$5.3(10)^{-4}$	1.0	No

The following Table 4-11 presents the sum of groundwater and soil vapor inhalation risk to a hypothetical residential receptor.

Table 4-11
Summation of Risk – Residential, Groundwater and Soil Source

- RBCA Modeling Run Three & Four (Sum of Risk, Residential, Groundwater & Soil Sources)
  - Benzene in groundwater at 95% UCL
  - Benzene in soil at 95% UCL
  - Indoor air/vapor inhalation: Residential receptor
  - Outdoor air/vapor inhalation: Residential receptor

INDOOR AIR/VAPOR INHALATION – RESIDENTIAL RECEPTOR						
Constituent	Carcinogenic Risk			Non-Carcinogenic Hazard Index		
	Risk	Target Risk	Exceed?	Risk	Target Risk	Exceed?
Benzene	**$1.68(10)^{-5}$**	**$1.0(10)^{-5}$**	**Yes**	$7.97(10)^{-1}$	1.0	No

- RBCA Modeling Run Three & Four (Sum of Risk, Residential, Groundwater & Soil Sources)
  - Benzene in groundwater at 95% UCL
  - Benzene in soil at 95% UCL
  - Indoor air/vapor inhalation: Residential receptor
  - Outdoor air/vapor inhalation: Residential receptor

OUTDOOR AIR/VAPOR INHALATION – RESIDENTIAL RECEPTOR						
Constituent	Carcinogenic Risk			Non-Carcinogenic Hazard Quotient		
	Risk	Target Risk	Exceed?	Risk	Target Risk	Exceed?
Benzene	$4.8(10)^{-7}$	$1.0(10)^{-5}$	No	$2.25(10)^{-2}$	1.0	No

As identified in the RBCA modeling runs for a residential receptor, 95% UCL concentrations of benzene do not poise a significant risk from groundwater for indoor and outdoor inhalation. Elevated soil concentrations may result in a potential risk to an indoor residential receptor. Currently, there is not a known indoor residential receptor above areas of known soil contamination. Elevated soil concentrations apparently do not poise a significant risk to a hypothetical outdoor residential receptor.

These analyses were based on soil concentrations from samples collected from 1990 to 1999, under pre-remediation conditions. Current concentrations may differ from earlier soil concentrations.

4.5. Summary of Potential Risk

4.5.1. Summary of Tier 1 Risk Assessment

Following is a summary of finding from the Tier 1 risk assessment:

- Elevated soil concentrations exceed TPHg, benzene, toluene, ethylbenzen, xylenes, TPHd, and O&G ESLs for groundwater protection for a drinking water source.
- Elevated soil concentrations of benzene exceed the residential ESL for indoor vapor intrusion.
- Benzene does not exceed the commercial ESL for indoor vapor intrusion.
- Benzene in soil does not exceed commercial and residential ESLs for outdoor vapor inhalation.
- Elevated soil concentrations of O&G exceed the ESL for subsurface direct exposure for a construction/trench worker. No other COPC exceed ESLs for direct exposure for a construction/trench worker.

Tier 1 risk assessment tends to be overly conservative and actual risk is probably less. In addition, application of Regional Board (2005) ESLs primarily defines conditions where further consideration is warranted and should not be considered as a "clean-up" level.

4.5.2. Summary of Tier 2 Risk Assessment

Following is a summary of finding from the Tier 2 RBCA risk assessment:

- No commercial significant risk for indoor or outdoor vapor inhalation from benzene in either soil and/or groundwater.
- No significant residential risk for outdoor vapor inhalation from benzene in soil and/or groundwater.
- Elevated concentrations of benzene in soil may result in indoor inhalation risk to a hypothetical residential receptor. No current indoor residential receptors apparently exist in areas with elevated concentrations of benzene in soil associated with the site.
- No significant risk for a construction worker from benzene in soil.

5.0 RECOMMENDATIONS

Estimation of Tier 1 and Tier 2 risk can be overly conservative. Soil data was collected prior to active VES/AS remediation and also may not represent current conditions. Following are some recommendations to consider:

- Collection and analysis of soil gas samples would provide a more representative characterization of potential risk from vapor intrusion.
- It is unlikely that groundwater below the site would be used for drinking water. Therefore, applying drinking water standards and risk analysis may be overly conservative.
- The potential for direct exposure of a construction/trench worker to soil apparently applies only to a few localized areas and depths with elevated concentrations of Oil & Grease greater than 15,000 mg/kg and can be documented to maintain worker safety.

6.0 REFERENCES

ASTM, 1998. *Standard Provisional Guide for Risk-Based Corrective Action.* PS-104.

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Groundwater Services, Inc., 2000. *RBCA Took Kit Chemical Releases Software Guidance Manual.*

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U.S. Environmental Protection Agency (EPA), 1989. *Risk Assessment Guidance for Superfund: Volume 1 – Human Health Evaluation Manual.* EPA/540/1-89/002.

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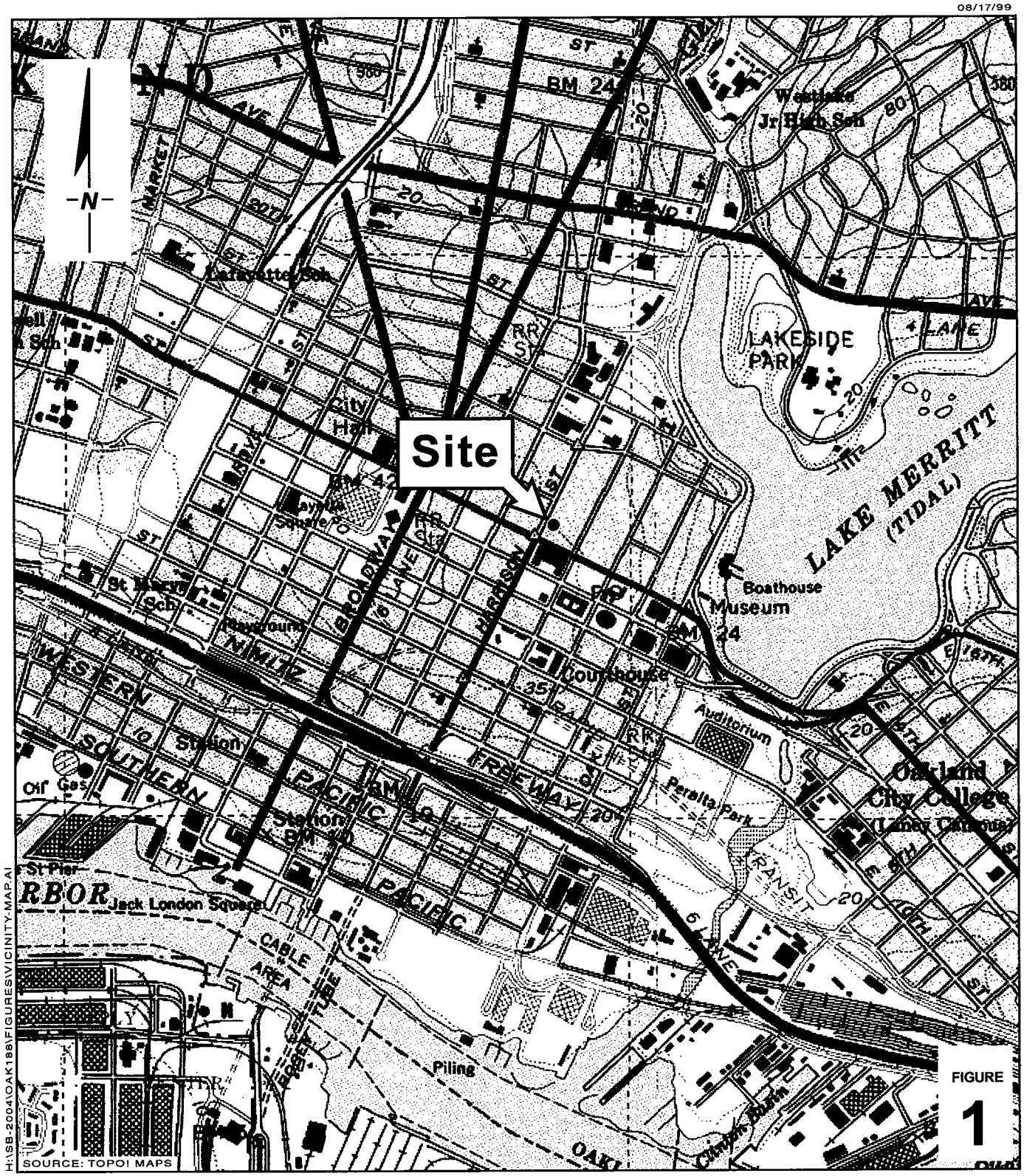
08/17/99



H:\SB-2004\OAK188\FIGURES\VICINITY-MAP.AI

FIGURE 1

0 1/8 1/4 1/2 1

SCALE 1:1/4 MILE

Borsuk
1432 Harrison Street
Oakland, California

Vicinity Map

CAMBRIA

07/31/06

H:\SB-2004\OAK188\FIGURES\AERIAL-MAP.AI

FIGURE
2

0 40 80
APPROXIMATE SCALE: 1" = 80'

Borsuk
1432 Harrison Street
Oakland, California

CAMBRIA

Aerial Map

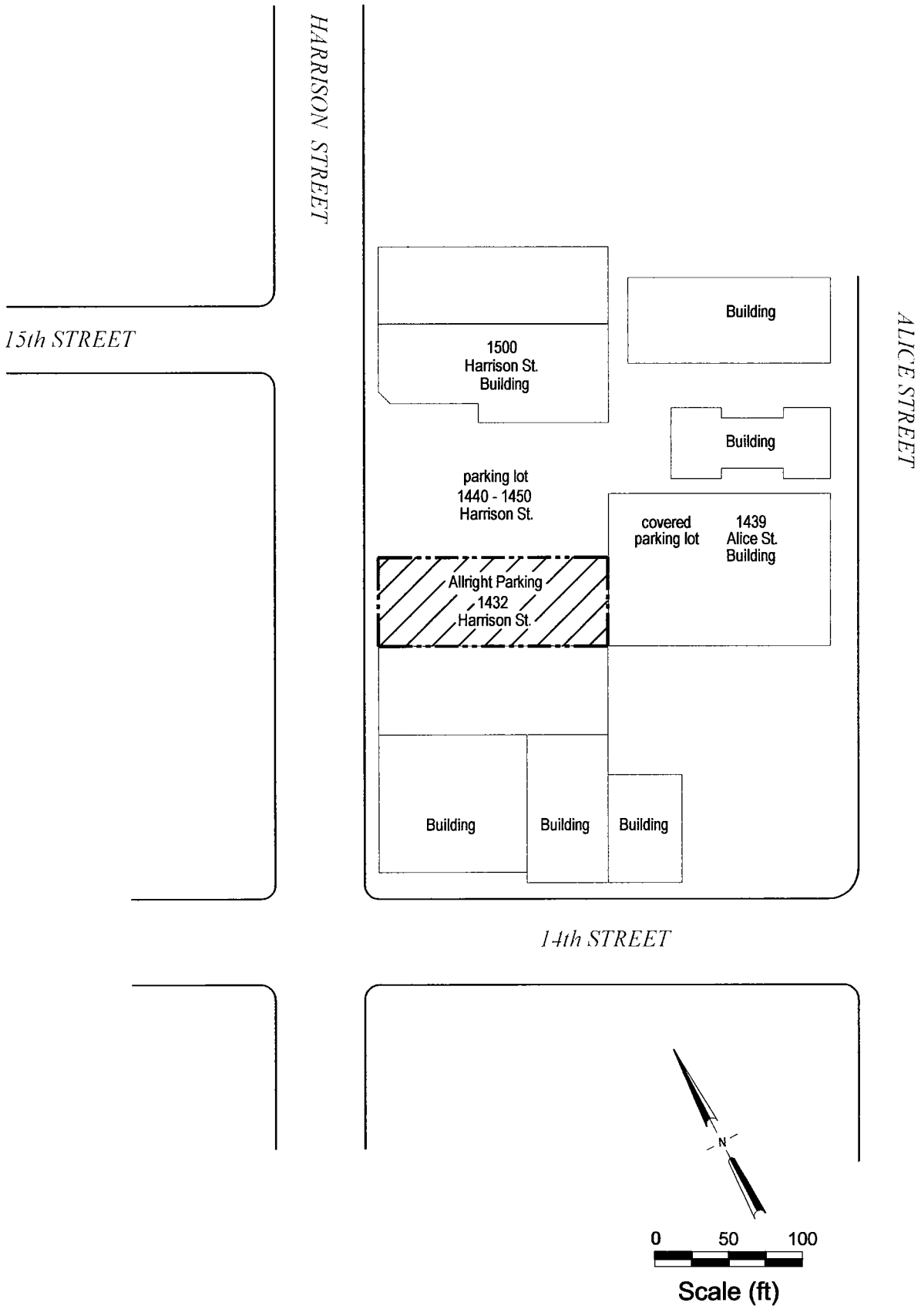


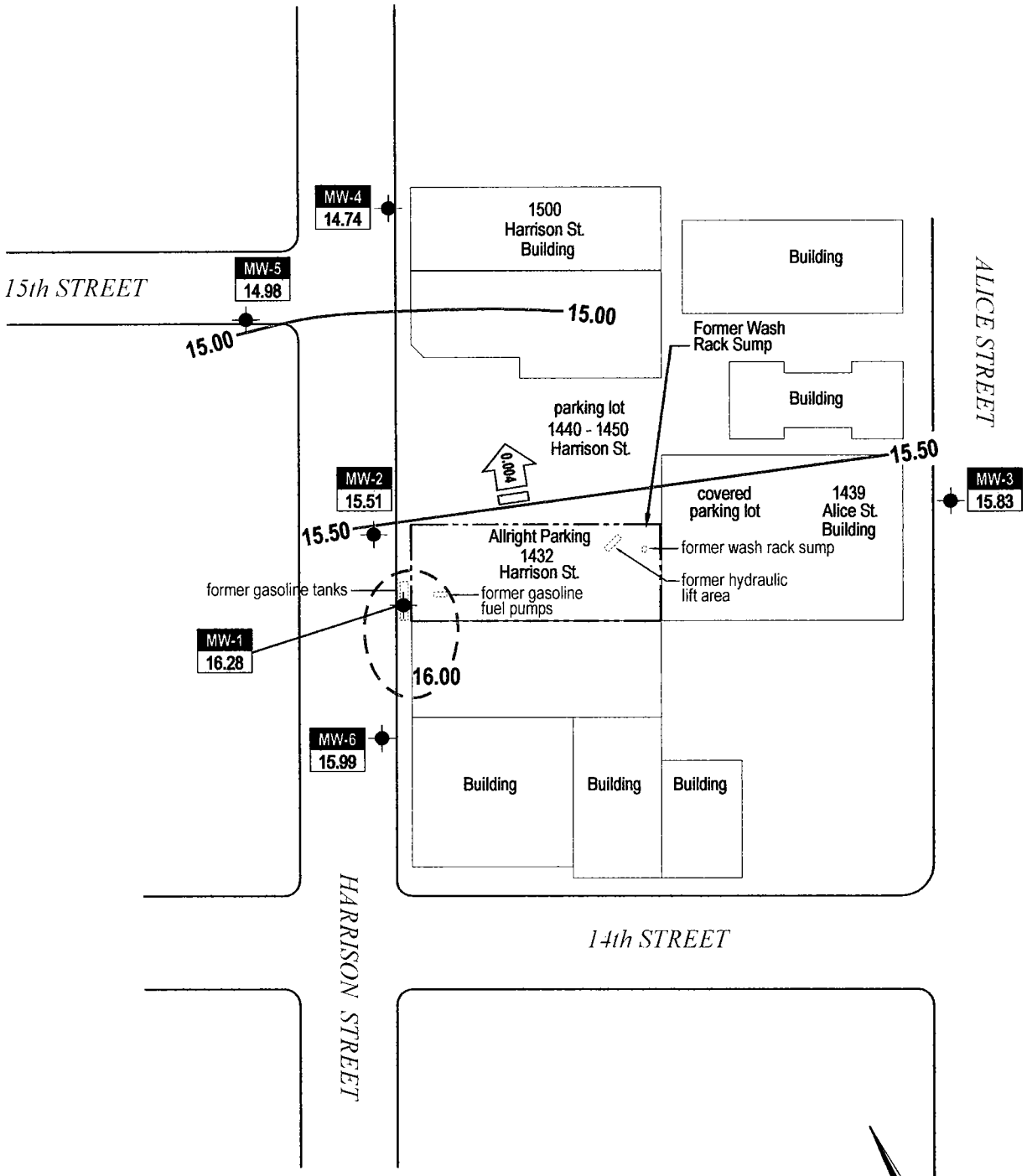
FIGURE
3

H:\BORSUK\FIGURES\BORSUK_SITEPLAN.DWG

Borsuk
1432 Harrison Street
Oakland, California

CAMBRIA

Site Plan



EXPLANATION

- Groundwater monitoring well
- 16.00 — Groundwater elevation contour, in feet above mean sea level (dashed where inferred)
- MW-1 / ELEV. — Well designation; Groundwater elevation, in feet above mean sea level
- 0.005 — Groundwater flow direction and gradient

FIGURE 4

H:\BORSUK\FIGURES\2005\BOUSUK_4Q05.DWG

Borsuk
1432 Harrison Street
Oakland, California

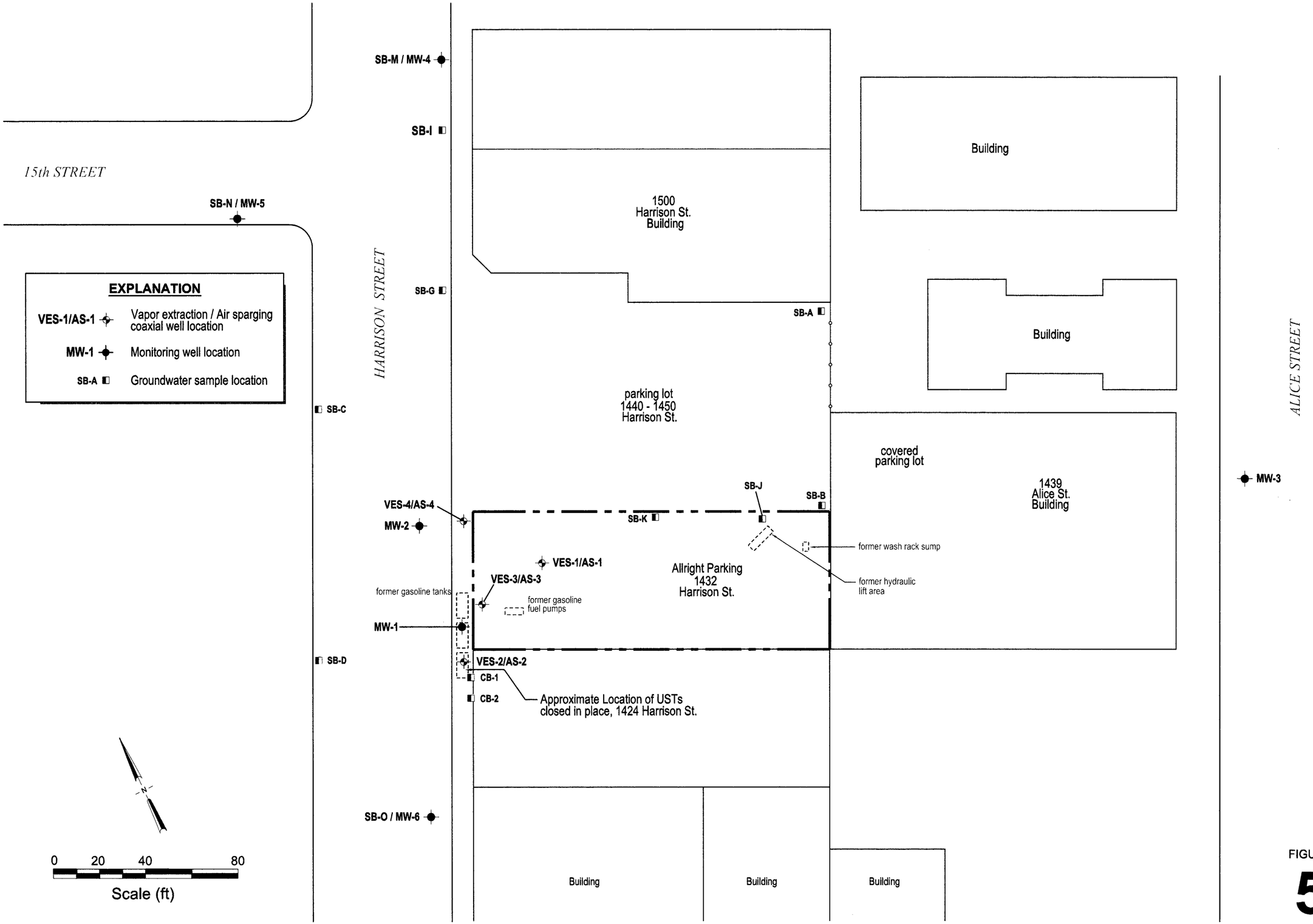
CAMBRIA

Groundwater Elevation Map

December 20, 2005

08/03/06

Groundwater Sampling Locations



FIGURE

5

Borsuk
1432 Harrison Street
Oakland, California

CAMBRIA

H:\SB-2004\OAK-188\FIGURES\BORSUK_GW-SAMP.DWG

08/02/08

Soil Sampling Locations

15th STREET

HARRISON STREET

ALICE STREET

SB-M / MW-4

SB-N / MW-5

SB-H

1500
Harrison St.
Building

Building

Building

parking lot
1440 - 1450
Harrison St.

covered
parking lot

1439
Alice St.
Building

Allright Parking
1432
Harrison St.

VES-4/AS-4
MW-2
SB-F
LFSB2
VES-1/AS-1
B19
VES-3/AS-3
B8
former gasoline tanks
2
B20
B17
B23
former gasoline
fuel pumps
B22
B7
B21
LFSB1
1
SB-L
VES-2/AS-2
B14
B5
B15
B16
B13
B4
former wash rack sump
former hydraulic
lift area
Approximate Location of USTs
closed in place, 1424 Harrison St.

GW-1

SB-O / MW-6

Building

Building

Building

EXPLANATION

VES-1/AS-1	Vapor extraction / Air sparging coaxial well location
MW-1	Monitoring well location
SB-H	Soil sample location

N

0 20 40 80

Scale (ft)

FIGURE

6

Borsuk
1432 Harrison Street
Oakland, California

CAMBRIA

H:\SB-2004\OAK-188\FIGURES\BORSUK_SOIL-SAMP.DWG

Table 1. Groundwater Elevations and Analytical Data - Allright Parking, 1432 Harrison Street, Oakland, California

Well ID Sample ID *TOC (ft amsl)*	Date	Depth to Groundwater (ft amsl)	SPH Thickness (feet)	Groundwater Elevation (feet)	TPHg	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	Notes
					←		(µg/L)			→	
SB-A	7/6/1995	~20	--	--	330	16	3.6	1.3	4.9	--	i,j
SB-B	7/7/1995	~20	--	--	450	55	3.1	5.1	5.0	--	a
SB-C	7/6/1995	~20	--	--	44,000	6,600	5,900	980	4,400	--	a
SB-D	7/6/1995	~20	--	--	70,000	7,400	10,000	1,600	7,200	--	a
SB-E	7/6/1995	~20	--	--	25,000	1,000	3,000	610	2,700	--	a
SB-G	7/7/1995	~20	--	--	84,000	9,400	16,000	2,200	9,900	--	a,b
SB-I	7/7/1995	~20	--	--	24,000	6,100	1,400	680	1,600	--	a
SB-J	7/7/1995	~20	--	--	960	110	66	8.7	71	--	a
SB-K	7/7/1995	~20	--	--	72,000	9,600	9,600	1,800	7,000	--	a
CB-1-W	7/22/1999	--	--	--	110,000	1,300	16,000	2,700	12,000	<3000*	a,b,c
CB-2-W	7/22/1999	--	--	--	4,700	21	13	170	76	<50*	a,c
MW-1	8/1/1994	--	--	--	170,000	35,000	51,000	2,400	13,000	--	--
34.95	12/21/1994	19.53	--	15.42	180,000	41,000	64,000	3,100	100,000	--	--
	3/13/1995	18.66	--	16.29	150,000	31,000	45,000	2,500	17,000	--	--
	6/27/1995	18.20	--	16.75	71,000	17,000	18,000	1,600	7,700	--	--
	7/7/1995	18.35	--	16.60	71,000	17,000	18,000	1,600	7,700	--	--
	9/28/1995	18.20	--	16.75	110,000	27,000	34,000	1,700	14,000	--	--
	12/20/1995	19.96	--	14.99	120,000	33,000	43,000	2,300	15,000	--	--
	3/26/1996	19.27	--	15.68	140,000	29,000	36,000	1,900	13,000	<200*	d
	6/20/1996	18.64	--	16.31	110,000	30,000	38,000	2,200	13,000	<200*	--
	9/26/1996	19.35	--	15.60	170,000	28,000	40,000	2,200	15,000	ND**	--
	10/28/1996	19.58	--	15.37	--	--	--	--	--	--	--
	12/12/1996	19.68	--	15.27	110,000	36,000	47,000	2,500	16,000	ND*	--
	3/31/1997	18.80	--	16.15	160,000	24,000	39,000	1,900	13,000	ND*	--
	6/27/1997	19.26	--	15.69	130,000	25,000	36,000	2,000	14,000	ND*	--
	9/9/1997	19.70	--	15.25	99,000	22,000	27,000	1,600	13,000	270*	--
	12/18/1997	19.25	--	15.70	160,000	30,000	44,000	2,200	15,000	ND***	--
	3/12/1998	17.52	--	17.43	190,000	20,000	49,000	2,500	18,000	ND***	--
	6/22/1998	18.63	--	16.32	90,000	19,000	40,000	2,100	16,000	--	--
	9/18/1998	18.60	--	16.35	190,000	29,000	48,000	2,400	17,000	--	--
	12/23/1998	19.18	--	15.77	140,000	24,000	44,000	2,000	8,200	--	--
	3/29/1999	18.52	--	16.43	181,000	22,200	40,100	1,844	12,200	--	--
	6/23/1999	18.60	--	16.35	80,000	20,000	33,000	1,600	11,000	--	--
	9/24/1999	19.05	--	15.90	117,000	15,100	20,700	1,550	11,800	--	--
	12/23/1999	19.95	--	15.00	186,000	25,900	39,000	1,990	12,400	--	--
	3/21/2000	18.48	--	16.47	210,000	35,000	42,000	2,200	13,000	<3,000	a
	7/3/2000	18.95	--	16.00	200,000	33,000	46,000	2,200	15,000	<200*	a
	9/7/2000	19.45	Sheen	15.50	--	--	--	--	--	--	--
	12/5/2000	19.90	--	15.05	220,000	42,000	57,000	2,700	17,000	<200	a
	3/6/2001	18.20	--	16.75	180,000	27,000	39,000	2,000	13,000	<1200 (<20)	a,l
	6/8/2001	20.14	--	14.81	170,000	28,000	40,000	1,900	13,000	<200	a
	8/27/2001	21.19	--	13.76	130,000	24,000	33,000	1,600	11,000	<350	a
	10/25/2001	21.74	--	13.21	160,000	22,000	28,000	1,500	10,000	<350	a
	3/1/2002	21.39	0.41	13.84[x]	--	--	--	--	--	--	--
	6/10/2002	22.30	--	12.65	210,000	30,000	51,000	3,100	22,000	<1,000*	a
34.96	9/3/2002	21.40	--	13.56	2,500,000	31,000	170,000	29,000	170,000	2,500,000	a
	12/22/2002	20.50	--	14.46	89,000	2,600	9,300	530	28,000	<1,700	a,m
	1/23/2003	18.57	--	16.39	130,000	600	1,600	<100	41,000	<50***	a,b,l
	6/12/2003	19.10	0.07	15.91[x]	--	--	--	--	--	--	--
	7/23/2003	19.42	0.07	15.59[x]	--	--	--	--	--	--	--
35.37#	12/22/2003	17.09	0.01	18.29[x]	--	--	--	--	--	--	--
	3/10/2004	13.82	--	21.55	22,000	190	250	<10	5,100	<100	a,c
	6/16/2004	14.75	--	20.62	2,700	23	160	13	520	<25	a
	9/27/2004	18.02	--	17.35	27,000	580	2,000	56	6,800	<10***	a,m
	12/22/2004	11.25	--	24.12	250	3.5	18	<0.5	47	<0.5***	a,m
	3/3/2005	14.42	--	20.95	320	5.2	13	3.2	46	<5.0	a
34.96##	6/9/2005	17.80	--	17.16	--	--	--	--	--	--	+
	9/9/2005	18.26	--	16.70	--	--	--	--	--	--	+
	12/20/2005	18.68	--	16.28	--	--	--	--	--	--	+
	3/26/2006	16.96	--	18.00	23,000	270	400	65	4,400	<50	a
	6/23/2006	**17.55**	**--**	**17.41**	**30,000**	**340**	**680**	**170**	**6,900**	**<500**	**a,m**
MW-2	8/1/1994	--	--	--	130,000	28,000	35,000	3,000	12,000	--	--
35.18	12/21/1994	19.91	--	15.27	200	140,000	200,000	3,500	22,000	--	--
	3/13/1995	19.15	--	16.03	500	9,200	23,000	7,000	36,000	--	--
	6/27/1995	18.74	--	16.44	120,000	23,000	30,000	2,700	13,000	--	--
	7/7/1995	18.80	--	16.38	120,000	23,000	30,000	2,700	13,000	--	--
	9/28/1995	19.30	--	15.88	110,000	23,000	29,000	2,500	11,000	--	--
	12/20/1995	20.24	--	14.94	83,000	980	1,800	2,200	10,000	--	--
	3/26/1996	19.69	--	15.49	150,000	23,000	32,000	2,800	12,000	<200*	d
	6/20/1996	19.20	--	15.98	94,000	15,000	23,000	2,400	12,000	<200*	--

Table 1. Groundwater Elevations and Analytical Data - Allright Parking, 1432 Harrison Street, Oakland, California

Well ID Sample ID *TOC (ft amsl)*	Date	Depth to Groundwater (ft amsl)	SPH Thickness (feet)	Groundwater Elevation (feet)	TPHg	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	Notes
					←		(µg/L)			→	
	9/26/1996	19.80	--	15.38	150,000	20,000	29,000	2,800	12,000	ND**	--
	10/28/1996	20.18	--	15.00	--	--	--	--	--	--	--
	12/12/1996	20.17	--	15.01	58,000	3,100	11,000	1,700	8,100	220*	--
	3/31/1997	19.67	--	15.51	38,000	6,000	7,900	690	3,300	ND*	--
	6/27/1997	19.68	--	15.50	62,000	13,000	16,000	1,300	6,000	ND*	--
	9/9/1997	20.20	--	14.98	81,000	16,000	18,000	1,800	8,600	ND***	--
	12/18/1997	19.80	--	15.38	110,000	18,000	26,000	2,200	9,500	ND***	--
	3/12/1998	18.07	--	17.11	120,000	16,000	26,000	2,200	9,400	ND***	--
	6/22/1998	18.29	--	16.89	38,000	9,800	9,500	1,500	6,000	--	--
	9/18/1998	19.09	--	16.09	68,000	12,000	16,000	1,400	5,900	--	--
	12/23/1998	19.67	--	15.51	180,000	16,000	22,000	2,200	8,300	--	--
	3/29/1999	18.97	--	16.21	16,600	1,380	1,920	373	1,840	--	--
	6/23/1999	18.25	--	16.93	41,000	10,000	9,400	1,100	5,000	--	--
	9/24/1999	19.60	--	15.58	40,600	4,880	3,490	1,090	4,560	--	--
	12/23/1999	20.21	--	14.97	61,900	6,710	9,320	1,150	5,360	--	--
	3/21/2000	18.93	--	16.25	98,000	14,000	21,000	1,600	6,900	<1600	a
	7/3/2000	19.38	--	15.80	140,000	18,000	33,000	2,600	11,000	<200*	a
MW-2	9/7/2000	19.83	--	15.35	110,000	17,000	21,000	2,200	9,700	<100***	a,l
Continued	12/5/2000	20.30	--	14.88	130,000	19,000	28,000	2,500	11,000	<200	a
	3/6/2001	19.57	--	15.61	32,000	3,400	3,400	580	2,500	<200	a
	6/8/2001	20.59	--	14.59	72,000	9,400	9,200	1,300	5,800	<200	a
	8/27/2001	21.79	--	13.39	110,000	17,000	28,000	2,600	11,000	<950	a
	10/25/2001	22.05	--	13.13	110,000	15,000	18,000	2,000	8,700	<350	a
	3/1/2002	21.80	--	13.38	3,100	370	180	62	330	<5.0*	a
	6/10/2002	22.83	--	12.35	7,800	2,000	1,100	76	570	<100*	a
35.21	9/3/2002	22.03	--	13.18	21,000	2,400	2,900	320	1,400	<500	a
	12/22/2002	22.70	--	12.51	630	48	56	19	82	<5.0	a
	1/23/2003	20.49	--	14.72	1,100	27	32	19	150	<25	a
	6/12/2003	21.03	--	14.18	10,000	2,100	1,600	150	660	<250	a
	7/23/2003	21.40	--	13.81	28,000	4,800	4,800	380	1,700	<500	a
	12/22/2003	19.33	--	15.88	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--
	3/10/2004	19.33	--	15.88	3,100	460	290	38	240	<50	a
	6/16/2004	19.90	--	15.31	9,100	1,600	1,200	220	830	<400	a
	9/27/2004	22.08	--	13.13	14,000	2,800	490	340	1,600	<350	a
	12/22/2004	21.74	--	13.47	1,100	300	28	22	71	<15	a
	3/3/2005	19.60	--	15.61	340	12	4.4	9.1	28	<10	a
	6/9/2005	18.65	--	16.56	240	22	2.7	6.4	27	<10	a
	9/9/2005	19.27	--	15.94	7,800	1,100	170	380	690	<160	a
	12/20/2005	19.70	--	15.51	150	10	1.9	2.8	10	<5.0	a
	3/26/2006	18.51	--	16.70	2,200	93	19	66	130	<50	a
	6/23/2006	**18.47**	**--**	**16.74**	**8,800**	**1,600**	**110**	**500**	**480**	**<500**	**a,m**
MW-3	8/1/1994	--	--	--	<50	<0.5	<0.5	<0.5	<2.0	--	
33.97	12/21/1994	18.82	--	15.15	<50	<0.5	<0.5	<0.5	<0.5	--	--
(annual sampling)	3/13/1995	17.86	--	16.11	<50	<0.5	<0.5	<0.5	<0.5	--	e
	7/7/1995	18.25	--	15.72	--	--	--	--	--	--	f,g
	9/28/1995	18.00	--	15.97	--	--	--	--	--	--	h
	12/20/1995	18.74	--	15.23	--	--	--	--	--	--	--
	3/26/1996	18.25	--	15.72	--	--	--	--	--	--	--
	6/20/1996	18.35	--	15.62	--	--	--	--	--	--	--
	9/26/1996	19.12	--	14.85	--	--	--	--	--	--	--
	10/28/1996	19.11	--	14.86	--	--	--	--	--	--	--
	12/12/1996	18.61	--	15.36	--	--	--	--	--	--	--
	3/31/1997	18.35	--	15.62	--	--	--	--	--	--	--
	6/27/1997	18.81	--	15.16	--	--	--	--	--	--	--
	9/9/1997	19.18	--	14.79	--	--	--	--	--	--	--
	12/18/1997	18.64	--	15.33	--	--	--	--	--	--	--
	3/12/1998	17.56	--	16.41	--	--	--	--	--	--	--
	6/22/1998	18.64	--	15.33	--	--	--	--	--	--	--
	9/18/1998	18.33	--	15.64	--	--	--	--	--	--	--
	12/23/1998	18.60	--	15.37	--	--	--	--	--	--	--
	3/29/1999	17.85	--	16.12	--	--	--	--	--	--	--
	6/23/1999	18.67	--	15.30	--	--	--	--	--	--	--
	9/24/1999	18.64	--	15.33	--	--	--	--	--	--	--
	12/23/1999	19.32	--	14.65	--	--	--	--	--	--	--
	3/21/2000	17.89	--	16.08	--	--	--	--	--	--	--
	7/3/2000	18.40	--	15.57	--	--	--	--	--	--	--
	9/7/2000	18.75	--	15.22	--	--	--	--	--	--	--
	12/5/2000	19.03	--	14.94	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--
	3/6/2001	18.12	--	15.85	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--
	6/8/2001	20.02	--	13.95	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--
	8/27/2001	21.09	--	12.88	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--
	10/25/2001	21.29	--	12.68	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--

Table 1. Groundwater Elevations and Analytical Data - Allright Parking, 1432 Harrison Street, Oakland, California

Well ID Sample ID *TOC (ft amsl)*	Date	Depth to Groundwater (ft amsl)	SPH Thickness (feet)	Groundwater Elevation (feet)	TPHg	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	Notes
					←		(µg/L)			→	
	3/1/2002	21.14	--	12.83	<50	<0.5	<0.5	<0.5	<0.5	<5.0*	--
	6/10/2002	21.99	--	11.98	<50	<0.5	<0.5	<0.5	<0.5	<5.0*	--
	9/3/2002	21.17	--	12.84	--	--	--	--	--	--	--
34.01	12/22/2002	21.94	--	12.07	--	--	--	--	--	--	--
	1/23/2003	20.08	--	13.93	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--
	6/12/2003	20.95	--	13.06	--	--	--	--	--	--	--
	7/23/2003	21.28	--	12.73	--	--	--	--	--	--	--
	12/22/2003	19.05	--	14.96	--	--	--	--	--	--	--
	3/10/2004	18.22	--	15.79	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--
	6/16/2004	18.82	--	15.19	--	--	--	--	--	--	--
	9/27/2004	21.03	--	12.98	--	--	--	--	--	--	--
	12/22/2004	20.69	--	13.32	--	--	--	--	--	--	--
	3/3/2005	17.94	--	16.07	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--
	6/9/2005	18.00	--	16.01	--	--	--	--	--	--	--
	9/9/2005	18.43	--	15.58	--	--	--	--	--	--	--
	12/20/2005	18.18	--	15.83	--	--	--	--	--	--	--
	3/26/2006	17.42	--	16.59	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--
	6/23/2006	**17.77**	**--**	**16.24**	**--**	**--**	**--**	**--**	**--**	**--**	**--**
MW-4	10/28/1996	19.32	--	14.43	10,000	3,900	420	400	360	<200*	n
33.75	12/12/1996	19.42	--	14.33	11,000	4,200	410	420	260	32*	--
	3/31/1997	18.67	--	15.08	ND	ND	ND	ND	ND	ND*	--
	6/27/1997	19.08	--	14.67	160	49	1.2	ND	5.9	ND*	--
	9/9/1997	19.33	--	14.42	7,400	5,000	410	230	470	33*	--
	12/18/1997	19.17	--	14.58	710	170	8.0	ND	39	ND***	--
	3/12/1998	17.68	--	16.07	1,300	410	21	ND	57	ND***	--
	6/22/1998	17.63	--	16.12	ND	ND	ND	ND	ND	--	--
	9/18/1998	18.58	--	15.17	ND	42	1.6	ND	4.8	--	--
	12/23/1998	19.01	--	14.74	1,900	1,000	76	50	120	--	--
	3/29/1999	18.35	--	15.40	ND	ND	ND	ND	ND	--	--
	6/23/1999	17.58	--	16.17	ND	ND	ND	ND	ND	--	--
	9/24/1999	19.05	--	14.70	9,150	3,270	131	34	537	--	--
	12/23/1999	19.41	--	14.34	12,200	5,360	275	424	592	--	--
	3/21/2000	18.42	--	15.33	45,000	16,000	1,100	1,400	1,900	1400* (<35)***	a,l
	7/3/2000	18.82	--	14.93	33,000	10,000	720	840	1,800	<200*	a
	9/7/2000	19.21	--	14.54	26,000	8,800	800	740	1,500	<50***	a,c,l
	12/5/2000	19.60	--	14.15	41,000	11,000	840	930	1,900	<200	a
	3/6/2001	18.24	--	15.51	1,100	400	5.7	<0.5	20	<5.0	a
	6/8/2001	20.91	--	12.84	92	19	<0.5	<0.5	1	<5.0	a
	8/27/2001	21.63	--	12.12	49,000	17,000	1700	1,700	3,200	<260	a
	10/25/2001	21.70	--	12.05	57,000	16,000	1,500	1,600	2,600	<300	a
	3/1/2002	21.53	--	12.22	400	140	2.3	<0.5	12	<5.0*	a
	6/10/2002	22.23	--	11.52	<50	2.5	<0.5	<0.5	<0.5	<5.0*	--
	9/3/2002	21.85	--	11.90	31,000	9,700	300	650	1,100	<1,000	a
	12/22/2002	22.39	--	11.36	35,000	13,000	310	1,100	1,800	<1,500	a
	1/23/2003	20.61	--	13.14	51,000	18,000	430	1,500	2,200	<5.0***	a,l
	6/12/2003	21.20	--	12.55	80	12	<0.5	<0.5	1.0	<10	a
	7/23/2003	21.51	--	12.24	20,000	7,600	100	65	660	<250	a
	12/22/2003	19.60	--	14.15	26,000	9,500	200	380	1,100	<150	a
	3/10/2004	18.81	--	14.94	14,000	4,800	150	320	530	<400	a
	6/16/2004	19.32	--	14.43	2,800	1,100	24	17	100	<50	a
	9/27/2004	21.45	--	12.30	45,000	16,000	260	1,700	2,000	<25***	a
	12/22/2004	21.15	--	12.60	29,000	10,000	160	890	1,200	<5.0***	a,j
	3/3/2005	18.60	--	15.15	18,000	6,400	98	500	610	<600	a
	6/9/2005	18.11	--	15.64	20,000	6,100	110	460	580	<500	a
	9/9/2005	18.65	--	15.10	17,000	6,400	100	470	730	<250	a
	12/20/2005	19.01	--	14.74	26,000	8,500	160	640	800	<120	a
	3/26/2006	17.84	--	15.91	1,900	700	22	49	85	<50	a
	6/23/2006	**17.96**	**--**	**15.79**	**12,000**	**3,400**	**130**	**370**	**510**	**260**	**a**
MW-5	10/28/1996	19.88	--	14.75	90	4.0	0.6	<0.50	<0.50	16*	
34.63	12/12/1996	20.09	--	14.54	230	5.6	0.9	ND	0.9	3.6*	n
	3/31/1997	19.24	--	15.39	90	3.1	ND	ND	ND	ND*	--
	6/27/1997	19.16	--	15.47	ND	ND	ND	ND	ND	ND*	--
	9/9/1997	19.93	--	14.70	ND	ND	ND	ND	ND	ND*	--
	12/18/1997	19.77	--	14.86	ND	ND	ND	ND	ND	ND***	--
	3/12/1998	19.77	--	14.86	79	2.3	ND	0.8	ND	ND*	--
	6/22/1998	18.08	--	16.55	ND	ND	ND	ND	ND	--	--
	9/18/1998	19.12	--	15.51	ND	ND	ND	ND	ND	--	--
	12/23/1998	19.60	--	15.03	ND	0.8	0.9	ND	ND	--	--
	3/29/1999	18.88	--	15.75	ND	ND	ND	ND	ND	--	--
	6/23/1999	18.05	--	16.58	ND	ND	ND	ND	ND	--	--
	9/24/1999	19.61	--	15.02	ND	ND	ND	ND	ND	--	--

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Well ID Sample ID *TOC (ft amsl)*	Date	Depth to Groundwater (ft amsl)	SPH Thickness (feet)	Groundwater Elevation (feet)	TPHg	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	Notes
					←		(µg/L)			→	
	12/23/1999	20.01	--	14.62	ND	ND	ND	ND	ND	--	--
	3/21/2000	19.05	--	15.58	140	<0.5	<0.5	<0.5	<0.5	<5.0	--
	7/3/2000	19.40	--	15.23	85	8.1	3.1	1.6	7.8	<5.0*	k
	9/7/2000	19.62	--	15.01	<50	<0.5	<0.5	<0.5	<0.5	<5.0*	a
	12/5/2000	20.25	--	14.38	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--
	3/6/2001	19.07	--	15.56	91	5.5	<0.5	<0.5	<0.5	<5.0	--
	6/8/2001	20.77	--	13.86	290	22.0	0.8	<0.5	<0.5	<5.0	--
	8/27/2001	21.33	--	13.30	660	24.0	2.2	1.3	4.0	<25	a
	10/25/2001	21.62	--	13.01	55	3.5	<0.5	<0.5	<0.5	<5.0	a
	3/1/2002	21.49	--	13.14	200	1.9	0.69	<0.5	<0.5	<5.0*	a
	6/10/2002	22.15	--	12.48	<50	<0.5	<0.5	<0.5	<0.5	<5.0*	a
	9/3/2002	21.50	--	13.13	60	1.9	<0.5	<0.5	0.77	<5.0	--
	12/22/2002	22.19	--	12.44	82	0.57	<0.5	0.68	<0.5	<5.0	a
	1/23/2003	20.27	--	14.36	<50	2.1	<0.5	<0.5	<0.5	<5.0	a
	6/12/2003	21.10	--	13.53	<50	0.88	<0.5	<0.5	<0.5	<5.0	--
	7/23/2003	21.47	--	13.16	<50	4.0	<0.5	<0.5	<0.5	<5.0	--
	12/22/2003	19.57	--	15.06	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--
	3/10/2004	19.61	--	15.02	990	200	2.9	4.0	20	<70	--
	6/16/2004	20.15	--	14.48	250	42	<0.5	0.88	<0.5	<35	a
	9/27/2004	22.14	--	12.49	1,600	140	4.8	45	18	<110	a
	12/22/2004	21.81	--	12.82	<50	5.3	<0.5	<0.5	0.66	<5.0	--
	3/3/2005	19.35	--	15.28	2,000	330	4.4	63	39	<150	a
MW-5	6/9/2005	18.73	--	15.90	250	42	1.4	14	3.2	<5.0	a
Continued	9/9/2005	19.30	--	15.33	2,000	390	5.0	71	38	<400	a
	12/20/2005	19.65	--	14.98	4,300	760	18	170	150	<35	a
	3/26/2006	18.58	--	16.05	1,600	460	3.3	35	32	<50	a
	6/23/2006	**18.57**	--	**16.06**	**1,900**	**500**	**3.9**	**81**	**56**	**<17**	**a**
MW-6	10/28/1996	20.02		15.87	<50	<0.50	<0.50	<0.50	<0.50	<2.0*	
35.89	12/12/1996	20.18	--	15.71	ND	ND	ND	ND	ND	ND*	n
(annual sampling)	3/31/1997	19.81	--	16.08	--	--	--	--	--	--	--
	6/27/1997	19.76	--	16.13	--	--	--	--	--	--	--
	9/9/1997	20.06	--	15.83	ND	ND	ND	ND	ND	ND*	--
	12/18/1997	19.90	--	15.99	ND	ND	ND	ND	ND	--	--
	3/12/1998	18.00	--	17.89	ND	ND	ND	ND	ND	ND*	--
	6/22/1998	18.43	--	17.46	ND	ND	ND	ND	ND	--	--
	9/18/1998	19.10	--	16.79	ND	ND	ND	ND	ND	--	--
	12/23/1998	19.61	--	16.28	ND	ND	ND	ND	ND	--	--
	3/29/1999	18.92	--	16.97	ND	ND	ND	ND	ND	--	--
	6/23/1999	18.41	--	17.48	ND	ND	ND	ND	ND	--	--
	9/24/1999	19.61	--	16.28	ND	ND	ND	ND	ND	--	--
	12/23/1999	20.30	--	15.59	ND	ND	ND	ND	ND	--	--
	3/21/2000	18.97	--	16.92	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--
	7/3/2000	19.46	--	16.43	59	5.1	2.3	1.1	5.3	<5.0*	--
	9/7/2000	19.95	--	15.94	<50	<0.5	<0.5	<0.5	<0.5	<5.0*	a
	12/5/2000	20.50	--	15.39	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--
	3/6/2001	19.54	--	16.35	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--
	6/8/2001	20.92	--	14.97	<50	<0.5	<0.5	<0.5	<0.5	<5.1	--
	8/27/2001	21.37	--	14.52	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--
	10/25/2001	21.59	--	14.30	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--
	3/1/2002	21.33	--	14.56	<50	<0.5	<0.5	<0.5	<0.5	<5.0*	--
	6/10/2002	21.97	--	13.92	<50	<0.5	<0.5	<0.5	<0.5	<5.0*	--
	9/3/2002	21.55	--	14.34	--	--	--	--	--	--	--
	12/22/2002	22.25	--	13.64	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--
	1/23/2003	20.47	--	15.42	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--
	6/12/2003	21.09	--	14.80	--	--	--	--	--	--	--
	7/23/2003	21.42	--	14.47	--	--	--	--	--	--	--
	12/22/2003	19.49	--	16.40	--	--	--	--	--	--	--
	3/10/2004	20.20	--	15.69	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--
	6/16/2004	20.73	--	15.16	--	--	--	--	--	--	--
	9/27/2004	22.88	--	13.01	--	--	--	--	--	--	--
	12/22/2004	22.53	--	13.36	--	--	--	--	--	--	--
	3/3/2005	19.87	--	16.02	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--
	6/9/2005	18.95	--	16.94	--	--	--	--	--	--	--
	9/9/2005	19.45	--	16.44	--	--	--	--	--	--	--
	12/20/2005	19.90	--	15.99	--	--	--	--	--	--	--
	3/26/2006	18.85	--	17.04	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--
	6/23/2006	**18.57**	--	**17.32**	--	--	--	--	--	--	--
Trip Blank	3/21/2000	--	--	--	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--
	9/7/2000	--	--	--	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--

Table 1. Groundwater Elevations and Analytical Data - Allright Parking, 1432 Harrison Street, Oakland, California

Well ID Sample ID *TOC (ft amsl)*	Date	Depth to Groundwater (ft amsl)	SPH Thickness (feet)	Groundwater Elevation (feet)	TPHg	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	Notes
					←		(µg/L)			→	

Abbreviations, Methods, & Notes

TOC = Top of casing elevation

ft amsl = feet above mean sea level

SPH = Separate-phase hydrocarbons

TPHg = Total petroleum hydrocarbons as gasoline by modified EPA Method SW8015C

Benzene, toluene, ethylbenzene, and xylenes by EPA Method SW8021B

MTBE = Methyl tert-butyl ether * = MTBE by EPA Method SW8021B

** = MTBE by EPA Method SW8240

*** = MTBE by EPA Method SW8260

µg/L = micrograms per liter, equivalent to parts per billion

-- = Not sampled, not analyzed, or not applicable

<n = Not detected in sample above n µg/L

ND = Not detected above laboratory detection limit

x = Groundwater elevation adjusted for SPH by the relation:

Groundwater Elevation = TOC Elevation - Depth to Groundwater + (0.7 x SPH thickness)

= The wellhead elevation was raised by 0.41 feet when well MW-1 was connected to the SVE system on October 31, 2003.

= The wellhead elevation was lowered by 0.41 feet when well MW-1 was disconnected from the SVE system on April 30. 2005.

+ = Well de-watered during purging, no measurable water to sample.

a = Unmodified or weakly modified gasoline is significant.

b = Lighter than water immiscible sheen is present.

c = Liquid sample that contains greater than ~2 vol. % sediment.

d = MTBE result confirmed by secondary column or GC/MS analysis.

e = Sample analyzed for purgeable hydrocarbons by EPA Method SW8010, no purgeable hydrocarbons were detected.

f = Sample analyzed for VOCs by EPA Method SW8240, no non-BTEX compounds were detected.

g = Sample analyzed for Total Petroleum Hydrocarbons as motor oil (TPHmo) by Modified EPA Method SW8015, no TPHmo was detected.

h = Analytic sampling discontinued. Approved by Alameda County Department of Environmental Health.

i = Lighter than gasoline range compounds are significant.

j = Gasoline range compounds having broad chromatographic peaks are significant.

k = No recognizable pattern.

l = Sample diluted due to high organic content.

m = Liquid sample that contains greater than ~1 vol. % sediment.

n = TOC well elevation was increased by 3 ft based on a benchmark discrepancy discovered during a well survey performed on September 11, 2002

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Table 2. Petroleum Hydrocarbon Soil Analytical Data - Allright Parking, 1432 Harrison Street, Oakland, California

Boring / Sample ID	Sample Depth (ft)	Sample Date	TPHg	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	Notes
			← (mg/kg) →						
1 / 1@20.0'	20	07/25/90	6,300	99	490	110	610	--	
2 / 2@18.5'	18.5	07/25/90	9,300	98	900	190	1,100	--	
B5 / B5@22.5'	22.5	09/17/90	110	0.024	0.21	0.069	1.3	--	
B7 / B7@13'	13	09/21/90	<1	<0.005	<0.005	<0.005	<0.005	--	
B7 / B7@20'	20	09/21/90	2,500	3.5	34	33	130	--	
B8 / B8@22.5'	22.5	09/21/90	1,200	2.3	38	18	89	--	
B13 / B13-5'	5	01/21/92	83.2	<0.005	0.068	1.23	<0.005	--	
B13 / B13-15'	15	01/21/92	135	--	0.71	--	8.85	--	
B14 / B14-5'	5	01/21/92	<1	<0.005	--	--	--	--	
B14 / B14-15'	15	01/21/92	2.5	--	--	<0.005	--	--	
B19 / B19-5'	5	02/03/92	2.5	<0.005	<0.005	<0.005	0.01	--	
B20 / B20-5'	5	02/03/92	2.1	<0.005	0.03	<0.005	0.01	--	
B20 / B20-15'	15	02/03/92	2.5	<0.005	0.034	<0.005	<0.005	--	
B21 / B21-5'	5	02/05/92	2.1	<0.005	0.02	<0.005	0.01	--	
B21 / B21-10'	10	02/05/92	1.9	<0.005	0.021	<0.005	0.026	--	
B21 / B21-15'	15	02/05/92	2	<0.005	0.03	<0.005	<0.005	--	
B22 / B22-5'	5	02/05/92	42.3	<0.005	0.113	<0.005	2.13	--	
B22 / B22-10'	10	02/05/92	1,540	0.987	11.7	1.67	2.88	--	
B23 / B23-5'	5	02/05/92	2.5	<0.005	0.027	<0.005	<0.005	--	
B23 / B23-10'	10	02/05/92	3.3	<0.005	0.034	<0.005	<0.005	--	
LFSB1 / LFSB1-4.0	4	05/22/93	0.5	<0.005	0.01	<0.005	<0.005	--	
LFSB1 / LFSB1-14.0	14	05/22/93	<0.2	0.020	<0.005	<0.005	<0.005	--	
LFSB1 / LFSB1-24.5	24.5	05/22/93	8,800	210	980	160	750	--	
LFSB2 / LFSB2-9.5	9.5	05/22/93	<0.2	<0.005	<0.005	<0.005	<0.005	--	
LFSB2 / LFSB2-19.5	19.5	05/22/93	1,000	<0.2	9.4	16	68	--	
LFSB2 / LFSB2-24.5	24.5	05/22/93	6,100	91	320	120	410	--	
Sump 5.5H (3)	5.5	11/29/93	<0.2	<0.005	<0.005	<0.005	<0.005	--	
Hoist 1-8H	8	11/29/93	<0.2	<0.005	<0.005	<0.005	<0.005	--	
Hoist 2-9.5WH (2)	9.5	11/29/93	0.3	<0.005	<0.005	<0.005	<0.005	--	
Hoist 2-11.5H	11.5	11/29/93	970	2.9	14	4.2	24	--	

Table 2. Petroleum Hydrocarbon Soil Analytical Data - Allright Parking, 1432 Harrison Street, Oakland, California

Boring / Sample ID	Sample Depth (ft)	Sample Date	TPHg	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	Notes
			← (mg/kg) →						
Hoist 2-9EH	9	11/29/93	<0.2	<0.005	<0.005	<0.005	<0.005	--	
E. Vault-6.5H	6.5	11/29/93	<0.2	<0.005	<0.005	<0.005	<0.005	--	
N. Vault-7H (4)	7	11/29/93	4.1	<0.005	<0.005	<0.005	23	--	
Vault-Base-9.5H (5)	9.5	11/29/93	380	0.05	0.69	0.22	2	--	
S. Tank-8FG	8	12/06/93	1,500	0.87	43	34	240	--	
S. Tank-8G	8	12/06/93	43	0.006	0.088	0.25	1.8	--	
N. Tank-7.5G	7.5	12/06/93	3,100	11	190	64	400	--	
N. Tank-8.5FG	8.5	12/06/93	<0.2	<0.005	<0.005	<0.005	<0.005	--	
PJ-2G	2	12/07/93	<0.2	<0.005	<0.005	<0.005	<0.005	--	
DSP-2G	2	12/07/93	<0.2	<0.005	<0.005	<0.005	<0.005	--	
E. Wall-3G	3	12/15/93	<0.2	<0.005	<0.005	<0.005	<0.005	--	
S.Wall-3G	3	12/15/93	<0.2	<0.005	<0.005	<0.005	<0.005	--	
N.Wall-3G	3	12/16/93	<0.2	<0.005	<0.005	<0.005	<0.005	--	
W.Wall-3-N	3	12/29/93	<0.2	<0.005	<0.005	<0.005	<0.005	--	
W.Wall-3-S	3	12/29/93	0.5	<0.005	<0.005	<0.005	<0.005	--	
MW-2 / MW-2-5'	5	07/30/94	<0.2	<0.005	<0.005	<0.005	<0.005	--	
MW-2 / MW-2-9.5'	9.5	07/30/94	<0.2	<0.005	<0.005	<0.005	<0.005	--	
MW-2 / MW-2-15'	15	07/30/94	<0.2	0.024	0.007	<0.005	<0.005	--	
GW-1 / GW-1-10'	10	07/30/94	<0.2	<0.005	<0.005	<0.005	<0.005	--	
GW-1 / GW-1-15'	15	07/30/94	<0.2	<0.005	<0.005	<0.005	<0.005	--	
SB-F / SB-F 20'	20.0	07/07/95	160	1.9	10	2.5	11	--	a
SB-H / SB-H 20'	20.0	07/07/95	350	4.0	16	5.3	25	--	a
SB-L / SB-L 20'	20.0	07/07/95	220	1.6	4.1	4.8	24	--	b,d
(MW-4) / SB-M 20.0'	20.0	10/02/96	<1.0	<0.005	<0.005	<0.005	<0.005	<0.05	
(MW-5) / SB-N 20.0'	20.0	10/02/96	<1.0	<0.005	<0.005	<0.005	<0.005	<0.05	
(MW-6) / SB-O 20.5'	20.5	10/03/96	<1.0	<0.005	<0.005	<0.005	<0.005	<0.05	
SB-P / SB-P 3.75'	3.75	10/03/96	3.8	<0.005	0.016	0.017	0.084	<0.05	
SB-P / SB-P 12.7'	12.7	10/03/96	1,500	0.55	14	25	100	2.0	b,d
SB-Q / SB-Q 3.75'	3.75	10/03/96	4.3	0.006	0.024	0.027	0.11	<0.02	g
SB-Q / SB-Q 9.6'	9.6	10/03/96	1,900	0.95	15	43	200	<1.4	b,d

Table 2. Petroleum Hydrocarbon Soil Analytical Data - Allright Parking, 1432 Harrison Street, Oakland, California

Boring / Sample ID	Sample Depth (ft)	Sample Date	TPHg	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	Notes
			(mg/kg)						
VES-1 / VES-1-16.5'	16.5	07/22/99	<1.0	<0.005	<0.005	<0.005	<0.005	<0.05	
VES-1 / VES-1-21.5'	21.5	07/22/99	5,600	59	400	75	370	<10	a
VES-1 / VES-1-30.5'	30.5	07/22/99	<1.0	<0.005	<0.005	<0.005	<0.005	<0.05	
VES-2 / VES-2-16.5'	16.5	07/22/99	2.2	<0.005	0.018	<0.005	0.050	<0.05	g
VES-2 / VES-2-26.5'	26.5	07/22/99	4,300	35	260	74	310	<10	a
VES-2 / VES-2-30.0'	30.0	07/22/99	<1.0	<0.005	<0.005	<0.005	<0.005	<0.05	
VES-3 / VES-3-15.5'	15.5	07/23/99	1.3	0.011	<0.005	<0.005	0.010	<0.05	a
VES-3 / VES-3-20.5'	20.5	07/23/99	2,100	<0.50	66	56	280	<10	b,j
VES-3 / VES-3-30.5'	30.5	07/23/99	1.4	0.062	0.25	0.039	0.16	<0.05	a
VES-4 / VES-4-16.5'	16.5	07/23/99	<1.0	<0.005	<0.005	<0.005	<0.005	<0.05	
VES-4 / VES-4-25.0'	25.0	07/23/99	7,600	150	490	170	640	32*	a
VES-4 / VES-4-30.0'	30.0	07/23/99	<1.0	<0.005	<0.005	<0.005	<0.005	<0.05	
CB-1 / CB-1-10.0'	10.0	07/23/99	<1.0	<0.005	<0.005	<0.005	<0.005	<0.05	
CB-1 / CB-1-16.0'	16.0	07/23/99	<1.0	<0.005	<0.005	<0.005	<0.005	<0.05	
CB-1 / CB-1-20.0'	20.0	07/23/99	<1.0	<0.005	<0.005	<0.005	<0.005	<0.05	
CB-1 / CB-1-24.0'	24.0	07/23/99	1,500	2.3	6.8	12	58	<2	a
CB-2 / CB-2-12.0'	12.0	07/23/99	<1.0	<0.005	<0.005	<0.005	<0.005	<0.05	
CB-2 / CB-2-15.0'	15.0	07/23/99	<1.0	<0.005	<0.005	<0.005	<0.005	<0.05	
CB-2 / CB-2-20.5'	20.5	07/23/99	4.2	<0.005	0.010	0.007	0.025	<0.05	j
CB-2 / CB-2-24.0'	24.0	07/23/99	4.8	0.006	<0.005	0.026	0.030	<0.05	j

Notes:

TPHg = Total purgeable petroleum hydrocarbons as gasoline by EPA method Modified 8015.

Benzene, toluene, ethylbenzene, xylenes (BTEX) by EPA method 8020.

MTBE = Methyl tert-butyl ether by modified EPA method 8020.

<n = not detected above n parts per million

a = unmodified or weakly modified gasoline is significant

b = heavier gasoline range compounds significant

d = gasoline range compounds having broad chromatographic peaks are significant; biologically altered gasoline

g = strongly aged gasoline or diesel range compounds are significant

j = no recognizable pattern

* = MTBE result not confirmed by EPA Method 8260 analysis.

1990 through 1994 data tabulated from Table 1 in Levine Fricke's September 1, 1994, *Soil and Groundwater Investigation Report*, Harrison Street Garage, 1432-1434 Harrison Street, Oakland, California.

Table 3. Other Soil Analytical Data - Allright Parking, 1432 Harrison Street, Oakland, California

Boring / Sample ID	Sample Depth (ft)	Sample Date	TPHd	Kerosene	Oil & Grease	PCBs	CL-HCs	VOCs	Pb	Hg	Ni	Se	Soluble Pb[1]
			◄ (mg/kg) ►										(mg/L)
2 / 2@18.5'	18.5	7/25/1990	--	--	--	--	--	--	--	--	--	--	0.21
B4 / B4@10'	10	9/17/1990	1,700	<100	6,300	--	--	--	--	--	--	--	--
B7 / B7@20'	20	9/21/1990	--	--	--	--	--	--	--	--	--	--	0.07
B13 / B13-5'	5	1/21/1992	1.63	--	--	0.245	--	ND	17.4	45.4	46.1	21.9	--
B13 / B13-15'	15	1/21/1992	<1	--	--	ND	--	ND	13.8	35.5	128.4	15.5	--
B14 / B14-5'	5	1/21/1992	<1	--	--	ND	--	ND	11.2	28.1	39.4	12.3	--
B14 / B14-15'	15	1/21/1992	17.3	--	--	ND	--	ND	13.2	32.8	376.2	15.3	--
B15 / B15-5'	5	1/30/1992	--	--	--	--	--	ND	26.6	29.4	56.6	9.02	--
B15 / B15-15'	15	1/30/1992	--	--	--	--	--	ND	16.7	33.2	72.3	15.5	--
B16 / B16-5'	5	1/30/1992	--	--	--	--	--	ND	14.3	44.9	60.3	15.2	--
B16 / B16-15'	15	1/30/1992	--	--	--	--	--	ND	10.2	34.7	48.4	8.81	--
B17 / B17-5'	5	2/3/1992	--	--	39.1	ND	--	ND	10.4	3.56	329.2	6.24[a]	--
B19 / B19-5'	5	2/3/1992	28	--	--	--	--	--	--	--	--	--	--
B20 / B20-5'	5	2/3/1992	24	--	--	--	--	--	--	--	--	--	--
B20 / B20-15'	15	2/3/1992	<1	--	35.2	ND	--	--	10.4	2.48	224.8	<7.5	--
B21 / B21-5'	5	2/5/1992	16.7	--	--	--	--	--	--	--	--	--	--
B21 / B21-10'	10	2/5/1992	15.7	--	--	--	--	--	--	--	--	--	--
B21 / B21-15'	15	2/5/1992	22.7	--	--	--	--	--	--	--	--	--	--
B22 / B22-5'	5	2/5/1992	670	--	--	--	--	--	--	--	--	--	--
B22 / B22-10'	10	2/5/1992	175	--	--	--	--	--	--	--	--	--	--
B23 / B23-5'	5	2/5/1992	26	--	--	--	--	--	--	--	--	--	--
B23 / B23-10'	10	2/5/1992	<1	--	--	--	--	--	--	--	--	--	--

Table 3. Other Soil Analytical Data - Allright Parking, 1432 Harrison Street, Oakland, California

Boring / Sample ID	Sample Depth (ft)	Sample Date	TPHd	Kerosene	Oil & Grease	PCBs	CL-HCs	VOCs	Pb	Hg	Ni	Se	Soluble Pb[1]
			← (mg/kg) →										(mg/L)
Sump 5.5H (3)	5.5	11/29/1993	--	--	<10	ND	--	--	2	<0.06	50	<2	--
Hoist 1-8H	8	11/29/1993	--	--	<10	--	--	--	--	--	--	--	--
Hoist 2-9.5WH (2)	9.5	11/29/1993	--	--	17,000	--	--	--	--	--	--	--	--
Hoist 2-11.5H	11.5	11/29/1993	--	--	5,100	--	--	--	--	--	--	--	--
Hoist 2-9EH	9	11/29/1993	--	--	<10	--	--	--	--	--	--	--	--
E. Vault-6.5H	6.5	11/29/1993	--	--	<10	--	--	--	--	--	--	--	--
N. Vault-7H (4)	7	11/29/1993	--	--	1,700	--	--	--	--	--	--	--	--
Vault-Base-9.5H (5)	9.5	11/29/1993	--	--	14,000	--	--	--	--	--	--	--	--
S. Tank-8FG	8	12/6/1993	--	--	--	--	--	--	4	--	--	--	<0.5[b]
S. Tank-8G	8	12/6/1993	--	--	--	--	--	--	4	--	--	--	<0.5[b]
N. Tank-7.5G	7.5	12/6/1993	--	--	--	--	--	--	8	--	--	--	1.9[b]
N. Tank-8.5FG	8.5	12/6/1993	--	--	--	--	--	--	4	--	--	--	<0.5[b]

Notes:

1 = Unknown extraction method

a = Report concentration is lower than the detection limit

b = Concentrations reported are Organic Lead by DHS Method

ND - Not detected above laboratory reporting limits

-- = Not analyzed

PCB's - Polychlorinated biphenyls

VOCs = Volatile organic carbons

CL-HCs = Chlorinated hydrocarbons

Pb - Lead

Hg = Mercury

Ni = Nickel

Se = Selenium

All Data tabulated from Table 1 in Levine Fricke's September 1, 1994, *Soil and Groundwater Investigation Report*, Harrison Street Garage, 1432-1434 Harrison Street, Oakland, California.

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Appendix A

City of Oakland
Survey of Background Metal Concentrations

City of Oakland
Survey of Background Metal Concentration Studies

Some naturally-occurring concentrations of metals in Oakland soils are higher than the thresholds calculated by risk-based models. In such cases, there is unlikely to be any real reduction in risk realized from remediation to the risk-based threshold since the observed concentrations are likely to represent ambient conditions. In Oakland, this is especially true of arsenic. The following table contains the results from background metal concentration studies conducted in locations that are relevant to Oakland's geology.

Background Metal Concentrations
(ppm in soil)

Source	Antimony	Arsenic	Beryllium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
Lawrence Berkeley National Laboratories[1]	5.5	19.1	1.0	2.7	99.6	69.4	16.1	0.4	119.8	5.6	1.8	27.1	106.1
-Colluvian &Fill	5.9	14.0	0.9	1.5	91.4	59.6	14.7	0.3	120.2	5.6	1.7	42.5	91.5
-Great Valley Group	6.3	31.0	1.0	3.2	59.0	99.7	21.5	0.6	69.7	4.8	2.2	8.7	135.9
-Moraga Formation	6.1	9.3	0.8	2.6	142.2	54.1	8.9	0.3	100.4	4.7	2.0	38.9	84.7
-Orinda Formation	5.2	17.8	1.1	3.3	95.2	66.9	14.8	0.3	144.3	7.0	1.9	19.8	98.3
-San Pablo Group	7.1	15.7	0.8	2.9	78.6	40.9	10.3	0.4	125.9	4.9	1.5	10.9	97.7
San Leandro, Ca[2]	<3-<15	1.8-5.9	<0.25-<1.30	<0.25-<1.30	24.8-43.0	11.8-68.0	3.3-10.4	<0.10	2.93-43.60	<0.25-<2.50	<0.50-<2.50	<0.50-<5.00	9.3-61.3
Union City, Ca[3]	5.0	6.92-9.34	0.5-0.81	0.5-1.30	46.5-112	28.2-60.1	19.8-148	0.1-0.36	32.4-60.6	0.5	0.5	5.0	97.1-474
Western U.S.[4]	--	1-50	--	0.1-0.7	1-1,000	2-100	20-100	0.01-0.3	5-500	--	--	--	10-300

Sources:

[1] Lawrence Berkeley National Laboratory Environmental Restoration Program, 1995. 500 samples were taken from 71 locations representing 5 geologic units at LBNL: Colluvian & Fill, Great Valley group, Moraga formation, Orinda formation and San Pablo group. Concentrations listed are Upper 95% Confidence Limits of data from 71 monitoring well borings.

[2] Chemical Testing on Background Soil Samples: Roberts Landing Development Site, San Leandro, CA, 1994.

[3] Site Wide Remedial Investigation: Pacific States Steel Corp. Union City, CA, 1992.

[4] USEPA (found in Remedial Investigation Report, Hercules Properties, Inc., 1991).

CAMBRIA

Appendix B

Tier 1 Risk Assessment Tables

CAMBRIA

Table B1. Tier 1 Risk Assessment Gasoline-Fraction Groundwater Data - Allright Parking, 1432 Harrison Street, Oakland, California

Well ID / Sample ID	Date	TPHg (ug/L)	Benzene (ug/L)	Toluene (ug/L)	Ethylbenzene (ug/L)	Xylenes (ug/L)		ND Value at 1/2 Detection Limit TPHg (ug/L)	Benzene (ug/L)	Toluene (ug/L)	Ethylbenzene (ug/L)	Xylenes (ug/L)
MW-1	3/3/2005	320	5.2	13	3.2	46		320	5.2	13	3.2	46
	3/26/2006	23,000	270	400	65	4,400		23,000	270	400	65	4,400
	6/23/2006	30,000	340	680	170	6,900		30,000	340	680	170	6,900
MW-2	3/3/2005	340	12	4.4	9.1	28		340	12	4.4	9.1	28
	6/9/2005	240	22	2.7	6.4	27		240	22	2.7	6.4	27
	9/9/2005	7,800	1,100	170	380	690		7,800	1,100	170	380	690
	12/20/2005	150	10	1.9	2.8	10		150	10	1.9	2.8	10
	3/26/2006	2,200	93	19	66	130		2,200	93	19	66	130
	6/23/2006	8,800	1,600	110	500	480		8,800	1,600	110	500	480
MW-3	3/3/2005	<50	<0.5	<0.5	<0.5	<0.5		25	0.25	0.25	0.25	0.25
	3/26/2006	<50	<0.5	<0.5	<0.5	<0.5		25	0.25	0.25	0.25	0.25
MW-4	3/3/2005	18,000	6,400	98	500	610		18,000	6,400	98	500	610
	6/9/2005	20,000	6,100	110	460	580		20,000	6,100	110	460	580
	9/9/2005	17,000	6,400	100	470	730		17,000	6,400	100	470	730
	12/20/2005	26,000	8,500	160	640	800		26,000	8,500	160	640	800
	3/26/2006	1,900	700	22	49	85		1,900	700	22	49	85
	6/23/2006	12,000	3,400	130	370	510		12,000	3,400	130	370	510
MW-5	3/3/2005	2,000	330	4.4	63	39		2,000	330	4.4	63	39
	6/9/2005	250	42	1.4	14	3.2		250	42	1.4	14	3.2
	9/9/2005	2,000	390	5.0	71	38		2,000	390	5.0	71	38
	12/20/2005	4,300	760	18	170	150		4,300	760	18	170	150
	3/26/2006	1,600	460	3.3	35	32		1,600	460	3.3	35	32
	6/23/2006	1,900	500	3.9	81	56		1,900	500	3.9	81	56
MW-6	3/3/2005	<50	<0.5	<0.5	<0.5	<0.5		25	0.25	0.25	0.25	0.25
	3/26/2006	<50	<0.5	<0.5	<0.5	<0.5		25	0.25	0.25	0.25	0.25
Frequency D/Total =		21/25 = 84%	21/25 = 84%	21/25 = 84%	21/25 = 84%	21/25 = 84%	Average =	7,196	1,497	82	165	654
							Max =	30,000	8,500	680	640	6,900
							Standard Dev.=	9,459	2,522	154	207	1,570
							95% UCL =	10,904	2,486	143	246	1,269

Notes:

TPHg = Total purgeable petroleum hydrocarbons as gasoline

UCL = Upper Confidence Limit

Table B2. Tier 1 Risk Assessment Gasoline-Fraction < 20' bgs Soil Data - Allright Parking, 1432 Harrison Street, Oakland, California

Boring / Sample ID	Sample Depth (ft)	Sample Date	TPHg (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Xylenes (mg/kg)	ND Value at 1/2 Detection Limit				
								TPHg (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Xylenes (mg/kg)
2 / 2@18.5'	18.5	07/25/90	9,300	98	900	190	1,100	9,300	98	900	190	1,100
B7 / B7@13'	13	09/21/90	<1	<0.005	<0.005	<0.005	<0.005	0.5	0.0025	0.0025	0.0025	0.0025
B13 / B13-5'	5	01/21/92	83.2	<0.005	0.068	1.23	<0.005	83.2	0.0025	0.068	1.23	0.0025
B13 / B13-15'	15	01/21/92	135	--	0.71	--	8.85	135		0.71		8.85
B14 / B14-5'	5	01/21/92	<1	<0.005	--	--	--	0.5	0.0025			
B14 / B14-15'	15	01/21/92	2.5	--	--	<0.005	--	2.5			0.0025	
B19 / B19-5'	5	02/03/92	2.5	<0.005	<0.005	<0.005	0.01	2.5	0.0025	0.0025	0.0025	0.01
B20 / B20-5'	5	02/03/92	2.1	<0.005	0.03	<0.005	0.01	2.1	0.0025	0.03	0.0025	0.01
B20 / B20-15'	15	02/03/92	2.5	<0.005	0.034	<0.005	<0.005	2.5	0.0025	0.034	0.0025	0.0025
B21 / B21-5'	5	02/05/92	2.1	<0.005	0.02	<0.005	0.01	2.1	0.0025	0.02	0.0025	0.01
B21 / B21-10'	10	02/05/92	1.9	<0.005	0.021	<0.005	0.026	1.9	0.0025	0.021	0.0025	0.026
B21 / B21-15'	15	02/05/92	2	<0.005	0.03	<0.005	<0.005	2	0.0025	0.03	0.0025	0.0025
B22 / B22-5'	5	02/05/92	42.3	<0.005	0.113	<0.005	2.13	42.3	0.0025	0.113	0.0025	2.13
B22 / B22-10'	10	02/05/92	1,540	0.987	11.7	1.67	2.88	1,540	0.987	11.7	1.67	2.88
B23 / B23-5'	5	02/05/92	2.5	<0.005	0.027	<0.005	<0.005	2.5	0.0025	0.027	0.0025	0.0025
B23 / B23-10'	10	02/05/92	3.3	<0.005	0.034	<0.005	<0.005	3.3	0.0025	0.034	0.0025	0.0025
LFSB1 / LFSB1-4.0	4	05/22/93	0.5	<0.005	0.01	<0.005	<0.005	0.5	0.0025	0.01	0.0025	0.0025
LFSB1 / LFSB1-14.0	14	05/22/93	<0.2	0.020	<0.005	<0.005	<0.005	0.1	0.020	0.0025	0.0025	0.0025
LFSB2 / LFSB2-9.5	9.5	05/22/93	<0.2	<0.005	<0.005	<0.005	<0.005	0.1	0.0025	0.0025	0.0025	0.0025
LFSB2 / LFSB2-19.5	19.5	05/22/93	1,000	<0.2	9.4	16	68	1,000	0.1	9.4	16	68
Sump 5.5H (3)	5.5	11/29/93	<0.2	<0.005	<0.005	<0.005	<0.005	0.1	0.0025	0.0025	0.0025	0.0025
Hoist 1-8H	8	11/29/93	<0.2	<0.005	<0.005	<0.005	<0.005	0.1	0.0025	0.0025	0.0025	0.0025
Hoist 2-9.5WH (2)	9.5	11/29/93	0.3	<0.005	<0.005	<0.005	<0.005	0.3	0.0025	0.0025	0.0025	0.0025
Hoist 2-11.5H	11.5	11/29/93	970	2.9	14	4.2	24	970	2.9	14	4.2	24
Hoist 2-9EH	9	11/29/93	<0.2	<0.005	<0.005	<0.005	<0.005	0.1	0.0025	0.0025	0.0025	0.0025
E. Vault-6.5H	6.5	11/29/93	<0.2	<0.005	<0.005	<0.005	<0.005	0.1	0.0025	0.0025	0.0025	0.0025
N. Vault-7H (4)	7	11/29/93	4.1	<0.005	<0.005	<0.005	23	4.1	0.0025	0.0025	0.0025	23
Vault-Base-9.5H (5)	9.5	11/29/93	380	0.05	0.69	0.22	2	380	0.05	0.69	0.22	2
S. Tank-8FG	8	12/06/93	1,500	0.87	43	34	240	1,500	0.87	43	34	240
S. Tank-8G	8	12/06/93	43	0.006	0.088	0.25	1.8	43	0.006	0.088	0.25	1.8
N. Tank-7.5G	7.5	12/06/93	3,100	11	190	64	400	3,100	11	190	64	400
N. Tank-8.5FG	8.5	12/06/93	<0.2	<0.005	<0.005	<0.005	<0.005	0.1	0.0025	0.0025	0.0025	0.0025
PJ-2G	2	12/07/93	<0.2	<0.005	<0.005	<0.005	<0.005	0.1	0.0025	0.0025	0.0025	0.0025
DSP-2G	2	12/07/93	<0.2	<0.005	<0.005	<0.005	<0.005	0.1	0.0025	0.0025	0.0025	0.0025
E. Wall-3G	3	12/15/93	<0.2	<0.005	<0.005	<0.005	<0.005	0.1	0.0025	0.0025	0.0025	0.0025
S.Wall-3G	3	12/15/93	<0.2	<0.005	<0.005	<0.005	<0.005	0.1	0.0025	0.0025	0.0025	0.0025
N.Wall-3G	3	12/16/93	<0.2	<0.005	<0.005	<0.005	<0.005	0.1	0.0025	0.0025	0.0025	0.0025
W.Wall-3-N	3	12/29/93	<0.2	<0.005	<0.005	<0.005	<0.005	0.1	0.0025	0.0025	0.0025	0.0025
W.Wall-3-S	3	12/29/93	0.5	<0.005	<0.005	<0.005	<0.005	0.5	0.0025	0.0025	0.0025	0.0025
MW-2 / MW-2-5'	5	07/30/94	<0.2	<0.005	<0.005	<0.005	<0.005	0.1	0.0025	0.0025	0.0025	0.0025
MW-2 / MW-2-9.5'	9.5	07/30/94	<0.2	<0.005	<0.005	<0.005	<0.005	0.1	0.0025	0.0025	0.0025	0.0025
MW-2 / MW-2-15'	15	07/30/94	<0.2	0.024	0.007	<0.005	<0.005	0.1	0.024	0.007	0.0025	0.0025
GW-1 / GW-1-10'	10	07/30/94	<0.2	<0.005	<0.005	<0.005	<0.005	0.1	0.0025	0.0025	0.0025	0.0025
GW-1 / GW-1-15'	15	07/30/94	<0.2	<0.005	<0.005	<0.005	<0.005	0.1	0.0025	0.0025	0.0025	0.0025
SB-P / SB-P 3.75'	3.75	10/03/96	3.8	<0.005	0.016	0.017	0.084	3.8	0.0025	0.016	0.017	0.084
SB-P / SB-P 12.7'	12.7	10/03/96	1,500	0.55	14	25	100	1,500	0.55	14	25	100

Table B2. Tier 1 Risk Assessment Gasoline-Fraction < 20' bgs Soil Data - Allright Parking, 1432 Harrison Street, Oakland, California

Boring / Sample ID	Sample Depth (ft)	Sample Date	TPHg (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Xylenes (mg/kg)		ND Value at 1/2 Detection Limit TPHg (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Xylenes (mg/kg)
SB-Q / SB-Q 3.75'	3.75	10/03/96	4.3	0.006	0.024	0.027	0.11		4.3	0.006	0.024	0.027	0.11
SB-Q / SB-Q 9.6'	9.6	10/03/96	1,900	0.95	15	43	200		1,900	0.95	15	43	200
VES-1 / VES-1-16.5'	16.5	07/22/99	<1.0	<0.005	<0.005	<0.005	<0.005		0.5	0.0025	0.0025	0.0025	0.0025
VES-2 / VES-2-16.5'	16.5	07/22/99	2.2	<0.005	0.018	<0.005	0.050		2.2	0.0025	0.018	0.0025	0.050
VES-3 / VES-3-15.5'	15.5	07/23/99	1.3	0.011	<0.005	<0.005	0.010		1.3	0.011	0.0025	0.0025	0.010
VES-4 / VES-4-16.5'	16.5	07/23/99	<1.0	<0.005	<0.005	<0.005	<0.005		0.5	0.0025	0.0025	0.0025	0.0025
CB-1 / CB-1-10.0'	10.0	07/23/99	<1.0	<0.005	<0.005	<0.005	<0.005		0.5	0.0025	0.0025	0.0025	0.0025
CB-1 / CB-1-16.0'	16.0	07/23/99	<1.0	<0.005	<0.005	<0.005	<0.005		0.5	0.0025	0.0025	0.0025	0.0025
CB-2 / CB-2-12.0'	12.0	07/23/99	<1.0	<0.005	<0.005	<0.005	<0.005		0.5	0.0025	0.0025	0.0025	0.0025
CB-2 / CB-2-15.0'	15.0	07/23/99	<1.0	<0.005	<0.005	<0.005	<0.005		0.5	0.0025	0.0025	0.0025	0.0025
	Frequency D/Total =		30/56 = 54%	13/54 = 24%	25/53 = 47%	13/53 = 25%	21/53 = 40%	Average =	384.6	2.1	22.2	7.0	40.2
								Max =	9,300	98	900	190	1,100
								Standard Dev.=	1,351	13	125	28	162
								95% UCL =	738.5	5.7	55.7	14.6	83.9

Notes:

TPHg = Total purgeable petroleum hydrocarbons as gasoline

Vadose zone soil defined as 0' to <20'.

UCL = Upper Confidence Limit

Table B3. Tier 1 Risk Assessment Gasoline-Fraction 0 to 3 m bgs Soil Data - Allright Parking, 1432 Harrison Street, Oakland, California

Boring / Sample ID	Sample Depth (ft)	Sample Date	TPHg (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Xylenes (mg/kg)		ND Value at 1/2 Detection Limit TPHg (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Xylenes (mg/kg)
B13 / B13-5'	5	01/21/92	83.2	<0.005	0.068	1.23	<0.005		83.2	0.0025	0.068	1.23	0.0025
B14 / B14-5'	5	01/21/92	<1	<0.005	--	--	--		0.5	0.0025			
B19 / B19-5'	5	02/03/92	2.5	<0.005	<0.005	<0.005	0.01		2.5	0.0025	0.0025	0.0025	0.01
B20 / B20-5'	5	02/03/92	2.1	<0.005	0.03	<0.005	0.01		2.1	0.0025	0.03	0.0025	0.01
B21 / B21-5'	5	02/05/92	2.1	<0.005	0.02	<0.005	0.01		2.1	0.0025	0.02	0.0025	0.01
B22 / B22-5'	5	02/05/92	42.3	<0.005	0.113	<0.005	2.13		42.3	0.0025	0.113	0.0025	2.13
B23 / B23-5'	5	02/05/92	2.5	<0.005	0.027	<0.005	<0.005		2.5	0.0025	0.027	0.0025	0.0025
LFSB1 / LFSB1-4.0	4	05/22/93	0.5	<0.005	0.01	<0.005	<0.005		0.5	0.0025	0.01	0.0025	0.0025
LFSB2 / LFSB2-9.5	9.5	05/22/93	<0.2	<0.005	<0.005	<0.005	<0.005		0.1	0.0025	0.0025	0.0025	0.0025
Sump 5.5H (3)	5.5	11/29/93	<0.2	<0.005	<0.005	<0.005	<0.005		0.1	0.0025	0.0025	0.0025	0.0025
Hoist 1-8H	8	11/29/93	<0.2	<0.005	<0.005	<0.005	<0.005		0.1	0.0025	0.0025	0.0025	0.0025
Hoist 2-9.5WH (2)	9.5	11/29/93	0.3	<0.005	<0.005	<0.005	<0.005		0.3	0.0025	0.0025	0.0025	0.0025
Hoist 2-9EH	9	11/29/93	<0.2	<0.005	<0.005	<0.005	<0.005		0.1	0.0025	0.0025	0.0025	0.0025
E. Vault-6.5H	6.5	11/29/93	<0.2	<0.005	<0.005	<0.005	<0.005		0.1	0.0025	0.0025	0.0025	0.0025
N. Vault-7H (4)	7	11/29/93	4.1	<0.005	<0.005	<0.005	23		4.1	0.0025	0.0025	0.0025	23
Vault-Base-9.5H (5)	9.5	11/29/93	380	0.05	0.69	0.22	2		380	0.05	0.69	0.22	2
S. Tank-8FG	8	12/06/93	1,500	0.87	43	34	240		1,500	0.87	43	34	240
S. Tank-8G	8	12/06/93	43	0.006	0.088	0.25	1.8		43	0.006	0.088	0.25	1.8
N. Tank-7.5G	7.5	12/06/93	3,100	11	190	64	400		3,100	11	190	64	400
N. Tank-8.5FG	8.5	12/06/93	<0.2	<0.005	<0.005	<0.005	<0.005		0.1	0.0025	0.0025	0.0025	0.0025
PJ-2G	2	12/07/93	<0.2	<0.005	<0.005	<0.005	<0.005		0.1	0.0025	0.0025	0.0025	0.0025
DSP-2G	2	12/07/93	<0.2	<0.005	<0.005	<0.005	<0.005		0.1	0.0025	0.0025	0.0025	0.0025
E. Wall-3G	3	12/15/93	<0.2	<0.005	<0.005	<0.005	<0.005		0.1	0.0025	0.0025	0.0025	0.0025
S.Wall-3G	3	12/15/93	<0.2	<0.005	<0.005	<0.005	<0.005		0.1	0.0025	0.0025	0.0025	0.0025
N.Wall-3G	3	12/16/93	<0.2	<0.005	<0.005	<0.005	<0.005		0.1	0.0025	0.0025	0.0025	0.0025
W.Wall-3-N	3	12/29/93	<0.2	<0.005	<0.005	<0.005	<0.005		0.1	0.0025	0.0025	0.0025	0.0025
W.Wall-3-S	3	12/29/93	0.5	<0.005	<0.005	<0.005	<0.005		0.5	0.0025	0.0025	0.0025	0.0025
MW-2 / MW-2-5'	5	07/30/94	<0.2	<0.005	<0.005	<0.005	<0.005		0.1	0.0025	0.0025	0.0025	0.0025
SB-P / SB-P 3.75'	3.75	10/03/96	3.8	<0.005	0.016	0.017	0.084		3.8	0.0025	0.016	0.017	0.084
SB-Q / SB-Q 3.75'	3.75	10/03/96	4.3	0.006	0.024	0.027	0.11		4.3	0.006	0.024	0.027	0.11
SB-Q / SB-Q 9.6'	9.6	10/03/96	1,900	0.95	15	43	200		1,900	0.95	15	43	200
	Frequency D/Total =		17/31 = 55%	6/31 = 19%	13/30 = 43%	8/30 = 27%	12/30 = 40%	Average =	228.2	0.4	8.3	4.8	29.0
								Max =	3,100	11	190	64	400
								Standard Dev.=	683	2	35	15	90
								95% UCL =	407.2	0.9	17.8	8.8	53.1

Notes:

TPHg = Total purgeable petroleum hydrocarbons as gasoline

3 meters = 9.84 feet

UCL = Upper Confidence Limit

Table B4. Tier 1 Risk Assessment Gasoline-Fraction > 3 m. to < 20' bgs Soil Data - Allright Parking, 1432 Harrison Street, Oakland, California

Boring / Sample ID	Sample Depth (ft)	Sample Date	TPHg (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Xylenes (mg/kg)		ND Value at 1/2 Detection Limit TPHg (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Xylenes (mg/kg)
2 / 2@18.5'	18.5	07/25/90	9,300	98	900	190	1,100		9,300	98	900	190	1,100
B7 / B7@13'	13	09/21/90	<1	<0.005	<0.005	<0.005	<0.005		0.5	0.0025	0.0025	0.0025	0.0025
B13 / B13-15'	15	01/21/92	135	--	0.71	--	8.85		135		0.71		8.85
B14 / B14-15'	15	01/21/92	2.5	--	--	<0.005	--		2.5			0.0025	
B20 / B20-15'	15	02/03/92	2.5	<0.005	0.034	<0.005	<0.005		2.5	0.0025	0.034	0.0025	0.0025
B21 / B21-10'	10	02/05/92	1.9	<0.005	0.021	<0.005	0.026		1.9	0.0025	0.021	0.0025	0.026
B21 / B21-15'	15	02/05/92	2	<0.005	0.03	<0.005	<0.005		2	0.0025	0.03	0.0025	0.0025
B22 / B22-10'	10	02/05/92	1,540	0.987	11.7	1.67	2.88		1,540	0.987	11.7	1.67	2.88
B23 / B23-10'	10	02/05/92	3.3	<0.005	0.034	<0.005	<0.005		3.3	0.0025	0.034	0.0025	0.0025
LFSB1 / LFSB1-14.0	14	05/22/93	<0.2	0.020	<0.005	<0.005	<0.005		0.1	0.020	0.0025	0.0025	0.0025
LFSB2 / LFSB2-19.5	19.5	05/22/93	1,000	<0.2	9.4	16	68		1,000	0.1	9.4	16	68
Hoist 2-11.5H	11.5	11/29/93	970	2.9	14	4.2	24		970	2.9	14	4.2	24
MW-2 / MW-2-15'	15	07/30/94	<0.2	0.024	0.007	<0.005	<0.005		0.1	0.024	0.007	0.0025	0.0025
GW-1 / GW-1-10'	10	07/30/94	<0.2	<0.005	<0.005	<0.005	<0.005		0.1	0.0025	0.0025	0.0025	0.0025
GW-1 / GW-1-15'	15	07/30/94	<0.2	<0.005	<0.005	<0.005	<0.005		0.1	0.0025	0.0025	0.0025	0.0025
SB-P / SB-P 12.7'	12.7	10/03/96	1,500	0.55	14	25	100		1,500	0.55	14	25	100
VES-1 / VES-1-16.5'	16.5	07/22/99	<1.0	<0.005	<0.005	<0.005	<0.005		0.5	0.0025	0.0025	0.0025	0.0025
VES-2 / VES-2-16.5'	16.5	07/22/99	2.2	<0.005	0.018	<0.005	0.050		2.2	0.0025	0.018	0.0025	0.050
VES-3 / VES-3-15.5'	15.5	07/23/99	1.3	0.011	<0.005	<0.005	0.010		1.3	0.011	0.0025	0.0025	0.010
VES-4 / VES-4-16.5'	16.5	07/23/99	<1.0	<0.005	<0.005	<0.005	<0.005		0.5	0.0025	0.0025	0.0025	0.0025
CB-1 / CB-1-10.0'	10.0	07/23/99	<1.0	<0.005	<0.005	<0.005	<0.005		0.5	0.0025	0.0025	0.0025	0.0025
CB-1 / CB-1-16.0'	16.0	07/23/99	<1.0	<0.005	<0.005	<0.005	<0.005		0.5	0.0025	0.0025	0.0025	0.0025
CB-2 / CB-2-12.0'	12.0	07/23/99	<1.0	<0.005	<0.005	<0.005	<0.005		0.5	0.0025	0.0025	0.0025	0.0025
CB-2 / CB-2-15.0'	15.0	07/23/99	<1.0	<0.005	<0.005	<0.005	<0.005		0.5	0.0025	0.0025	0.0025	0.0025
	Frequency D/Total =		13/24 = 54%	7/22 = 32%	11/23 = 48%	5/23 = 22%	9/23 = 39%	Average =	602.7	4.7	41.3	10.3	56.7
								Max =	9,300	98	900	190	1,100
								Standard Dev.=	1,915	21	187	40	229
								95% UCL =	1104.3	10.2	91.7	21.0	118.3

Notes:

TPHg = Total purgeable petroleum hydrocarbons as gasoline

Vadose zone soil defined as 0' to <20'.

UCL = Upper Confidence Limit

Table B5. Tier 1 Risk Assessment <20' bgs Other Soil Data - Allright Parking, 1432 Harrison Street, Oakland, California

Boring / Sample ID	Sample Depth (ft)	Sample Date	TPHd (mg/kg)	Oil & Grease (mg/kg)	PCBs (mg/kg)	Hg (mg/kg)	Ni (mg/kg)		ND Value at 1/2 Detection Limit TPHd (mg/kg)	Oil & Grease (mg/kg)	PCBs (mg/kg)	Hg (mg/kg)	Ni (mg/kg)
2 / 2@18.5'	18.5	7/25/1990	--	--	--	--	--						
B4 / B4@10'	10	9/17/1990	1,700	6,300	--	--	--		1,700	6,300			
B13 / B13-5'	5	1/21/1992	1.63	--	0.245	45.4	46.1		1.63		0.245	45.4	46.1
B13 / B13-15'	15	1/21/1992	<1	--	ND	35.5	128.4		0.5		0.025	35.5	128.4
B14 / B14-5'	5	1/21/1992	<1	--	ND	28.1	39.4		0.5		0.025	28.1	39.4
B14 / B14-15'	15	1/21/1992	17.3	--	ND	32.8	376.2		17.3		0.025	32.8	376.2
B15 / B15-5'	5	1/30/1992	--	--	--	29.4	56.6					29.4	56.6
B15 / B15-15'	15	1/30/1992	--	--	--	33.2	72.3					33.2	72.3
B16 / B16-5'	5	1/30/1992	--	--	--	44.9	60.3					44.9	60.3
B16 / B16-15'	15	1/30/1992	--	--	--	34.7	48.4					34.7	48.4
B17 / B17-5'	5	2/3/1992	--	39.1	ND	3.56	329.2			39.1	0.025	3.56	329.2
B19 / B19-5'	5	2/3/1992	28	--	--	--	--		28				
B20 / B20-5'	5	2/3/1992	24	--	--	--	--		24				
B20 / B20-15'	15	2/3/1992	<1	35.2	ND	2.48	224.8		0.5	35.2	0.025	2.48	224.8
B21 / B21-5'	5	2/5/1992	16.7	--	--	--	--		16.7				
B21 / B21-10'	10	2/5/1992	15.7	--	--	--	--		15.7				
B21 / B21-15'	15	2/5/1992	22.7	--	--	--	--		22.7				
B22 / B22-5'	5	2/5/1992	670	--	--	--	--		670				
B22 / B22-10'	10	2/5/1992	175	--	--	--	--		175				
B23 / B23-5'	5	2/5/1992	26	--	--	--	--		26				
B23 / B23-10'	10	2/5/1992	<1	--	--	--	--		0.5				
Sump 5.5H (3)	5.5	11/29/1993	--	<10	ND	<0.06	50			5	0.025	0.03	50
Hoist 1-8H	8	11/29/1993	--	<10	--	--	--			5			
Hoist 2-9.5WH (2)	9.5	11/29/1993	--	17,000	--	--	--			17,000			
Hoist 2-11.5H	11.5	11/29/1993	--	5,100	--	--	--			5,100			
Hoist 2-9EH	9	11/29/1993	--	<10	--	--	--			5			
E. Vault-6.5H	6.5	11/29/1993	--	<10	--	--	--			5			
N. Vault-7H (4)	7	11/29/1993	--	1,700	--	--	--			1,700			
Vault-Base-9.5H (5)	9.5	11/29/1993	--	14,000	--	--	--			14,000			
	Frequency D/Total =		11/15 = 78%	7/11 = 64%	1/7 = 14%	10/11 = 91%	11/11 = 100%	Average =	180	4,018	0.056	26.4	130.2
								Max =	1,700	17,000	0.245	45.4	376.2
								Standard Dev. =	454	6,132	0.083	16.6	122.9
								95% UCL =	409.75	NA	NA	NA	NA

Notes:

TPHg = Total purgeable petroleum hydrocarbons as gasoline

Vadose zone soil defined as 0' to <20'.

Assuming 0.05 mg/kg detection limit for PCBs.

95% Upper Confidence Limit (UCL) not appropriate due to insufficent population size (~<15).

Table B6. Tier 1 Risk Assessment 0 to 3m bgs Other Soil Data - Allright Parking, 1432 Harrison Street, Oakland, California

Boring / Sample ID	Sample Depth (ft)	Sample Date	TPHd (mg/kg)	Oil & Grease (mg/kg)	PCBs (mg/kg)	Hg (mg/kg)	Ni (mg/kg)		ND Value at 1/2 Detection Limit TPHd (mg/kg)	Oil & Grease (mg/kg)	PCBs (mg/kg)	Hg (mg/kg)	Ni (mg/kg)
B13 / B13-5'	5	1/21/1992	1.63	--	0.245	45.4	46.1		1.63		0.245	45.4	46.1
B14 / B14-5'	5	1/21/1992	<1	--	ND	28.1	39.4		0.5		0.025	28.1	39.4
B15 / B15-5'	5	1/30/1992	--	--	--	29.4	56.6					29.4	56.6
B16 / B16-5'	5	1/30/1992	--	--	--	44.9	60.3					44.9	60.3
B17 / B17-5'	5	2/3/1992	--	39.1	ND	3.56	329.2			39.1	0.025	3.56	329.2
B19 / B19-5'	5	2/3/1992	28	--	--	--	--		28				
B20 / B20-5'	5	2/3/1992	24	--	--	--	--		24				
B21 / B21-5'	5	2/5/1992	16.7	--	--	--	--		16.7				
B22 / B22-5'	5	2/5/1992	670	--	--	--	--		670				
B23 / B23-5'	5	2/5/1992	26	--	--	--	--		26				
Sump 5.5H (3)	5.5	11/29/1993	--	<10	ND	<0.06	50			5	0.025	0.03	50
Hoist 1-8H	8	11/29/1993	--	<10	--	--	--			5			
Hoist 2-9.5WH (2)	9.5	11/29/1993	--	17,000	--	--	--			17,000			
Hoist 2-9EH	9	11/29/1993	--	<10	--	--	--			5			
E. Vault-6.5H	6.5	11/29/1993	--	<10	--	--	--			5			
N. Vault-7H (4)	7	11/29/1993	--	1,700	--	--	--			1,700			
Vault-Base-9.5H (5)	9.5	11/29/1993	--	14,000	--	--	--			14,000			
	Frequency D/Total =		6/7 = 86%	4/8 = 50%	1/4 = 25%	5/6 = 83%	6/6 = 100%	Average =	110	4,095	0.080	25.2	96.9
								Max =	670	17,000	0.245	45.4	329.2
								Standard Dev. =	247	7,109	0.110	19.6	114.0
								95% UCL =	NA	NA	NA	NA	NA

Notes:

TPHg = Total purgeable petroleum hydrocarbons as gasoline

3 meters = 9.84 feet

Assuming 0.05 mg/kg detection limit for PCBs.

95% Upper Confidence Limit (UCL) not appropriate due to insufficent population size (~<15).

Table B7. Tier 1 Risk Assessment >3m to < 20' bgs Other Soil Data - Allright Parking, 1432 Harrison Street, Oakland, California

Boring / Sample ID	Sample Depth (ft)	Sample Date	TPHd (mg/kg)	Oil & Grease (mg/kg)	PCBs (mg/kg)	Hg (mg/kg)	Ni (mg/kg)		ND Value at 1/2 Detection Limit TPHd (mg/kg)	Oil & Grease (mg/kg)	PCBs (mg/kg)	Hg (mg/kg)	Ni (mg/kg)
2 / 2@18.5'	18.5	7/25/1990	--	--	--	--	--						
B4 / B4@10'	10	9/17/1990	1,700	6,300	--	--	--		1,700	6,300			
B13 / B13-15'	15	1/21/1992	<1	--	ND	35.5	128.4		0.5		ND	35.5	128.4
B14 / B14-15'	15	1/21/1992	17.3	--	ND	32.8	376.2		17.3		ND	32.8	376.2
B15 / B15-15'	15	1/30/1992	--	--	--	33.2	72.3					33.2	72.3
B16 / B16-15'	15	1/30/1992	--	--	--	34.7	48.4					34.7	48.4
B20 / B20-15'	15	2/3/1992	<1	35.2	ND	2.48	224.8		0.5	35.2	ND	2.48	224.8
B21 / B21-10'	10	2/5/1992	15.7	--	--	--	--		15.7				
B21 / B21-15'	15	2/5/1992	22.7	--	--	--	--		22.7				
B22 / B22-10'	10	2/5/1992	175	--	--	--	--		175				
B23 / B23-10'	10	2/5/1992	<1	--	--	--	--		0.5				
Hoist 2-11.5H	11.5	11/29/1993	--	5,100	--	--	--			5,100			
	Frequency D/Total =		5/8 = 63%	3/3 = 100%	0/3 = 0%	5/5 = 100%	5/5 = 100%	Average =	242	3,812	ND	27.7	170.0
								Max =	1,700	6,300	ND	35.5	376.2
								Standard Dev. =	592	3,325	NA	14.2	133.8
								95% UCL =	NA	NA	NA	NA	NA

Notes:

TPHg = Total purgeable petroleum hydrocarbons as gasoline

Vadose zone soil defined as 0' to <20'.

Assuming 0.05 mg/kg detection limit for PCBs.

95% Upper Confidence Limit (UCL) not appropriate due to insufficent population size (-<15).

CAMBRIA

Appendix C

Risk-Based Corrective Actions Modeling Runs

CAMBRIA

Table C1. RBCA Groundwater Data - Allright Parking, 1432 Harrison Street, Oakland, Californi

Well ID Sample ID	Date	Benzene ug/l	ND Value at 1/2 Detection Limit Benzene ug/l
MW-1	3/3/2005	5.2	5.2
	3/26/2006	270	270
	6/23/2006	340	340
MW-2	3/3/2005	12	12
	6/9/2005	22	22
	9/9/2005	1,100	1,100
	12/20/2005	10	10
	3/26/2006	93	93
	6/23/2006	1,600	1,600
MW-3	3/3/2005	<0.5	0.25
	3/26/2006	<0.5	0.25
MW-4	3/3/2005	6,400	6,400
	6/9/2005	6,100	6,100
	9/9/2005	6,400	6,400
	12/20/2005	8,500	8,500
	3/26/2006	700	700
	6/23/2006	3,400	3,400
MW-5	3/3/2005	330	330
	6/9/2005	42	42
	9/9/2005	390	390
	12/20/2005	760	760
	3/26/2006	460	460
	6/23/2006	500	500
MW-6	3/3/2005	<0.5	0.25
	3/26/2006	<0.5	0.25
Frequency D/Total =		21/25 = 84%	Average = 1,497.4
			Max = 8,500.0
			Standard Dev. = 2,521.9
			95% UCL = 2.4E+03

Notes

UCL = Upper Confidence Limit

CAMBRIA

Table C2. RBCA Gasoline-Fraction Soil Data - Allright Parking, 1432 Harrison Street, Oak

Boring / Sample ID	Sample Depth (ft)	Sample Date	Benzene (mg/kg)		ND Value at 1/2 Detection Limit Benzene (mg/kg)
2 / 2@18.5'	18.5	07/25/90	98		98
B7 / B7@13'	13	09/21/90	<0.005		0.0025
B13 / B13-5'	5	01/21/92	<0.005		0.0025
B13 / B13-15'	15	01/21/92	--		
B14 / B14-5'	5	01/21/92	<0.005		0.0025
B14 / B14-15'	15	01/21/92	--		
B19 / B19-5'	5	02/03/92	<0.005		0.0025
B20 / B20-5'	5	02/03/92	<0.005		0.0025
B20 / B20-15'	15	02/03/92	<0.005		0.0025
B21 / B21-5'	5	02/05/92	<0.005		0.0025
B21 / B21-10'	10	02/05/92	<0.005		0.0025
B21 / B21-15'	15	02/05/92	<0.005		0.0025
B22 / B22-5'	5	02/05/92	<0.005		0.0025
B22 / B22-10'	10	02/05/92	0.987		0.987
B23 / B23-5'	5	02/05/92	<0.005		0.0025
B23 / B23-10'	10	02/05/92	<0.005		0.0025
LFSB1 / LFSB1-4.0	4	05/22/93	<0.005		0.0025
LFSB1 / LFSB1-14.0	14	05/22/93	0.020		0.0025
LFSB2 / LFSB2-9.5	9.5	05/22/93	<0.005		0.0025
LFSB2 / LFSB2-19.5	19.5	05/22/93	<0.2		0.1
Sump 5.5H (3)	5.5	11/29/93	<0.005		0.0025
Hoist 1-8H	8	11/29/93	<0.005		0.0025
Hoist 2-9.5WH (2)	9.5	11/29/93	<0.005		0.0025
Hoist 2-11.5H	11.5	11/29/93	2.9		2.9
Hoist 2-9EH	9	11/29/93	<0.005		0.0025
E. Vault-6.5H	6.5	11/29/93	<0.005		0.0025
N. Vault-7H (4)	7	11/29/93	<0.005		0.0025
Vault-Base-9.5H (5)	9.5	11/29/93	0.05		0.05
S. Tank-8FG	8	12/06/93	0.87		0.87
S. Tank-8G	8	12/06/93	0.006		0.006
N. Tank-7.5G	7.5	12/06/93	11		11
N. Tank-8.5FG	8.5	12/06/93	<0.005		0.0025
MW-2 / MW-2-5'	5	07/30/94	<0.005		0.0025
MW-2 / MW-2-9.5'	9.5	07/30/94	<0.005		0.0025
MW-2 / MW-2-15'	15	07/30/94	0.024		0.024
GW-1 / GW-1-10'	10	07/30/94	<0.005		0.0025
GW-1 / GW-1-15'	15	07/30/94	<0.005		0.0025
SB-P / SB-P 3.75'	3.75	10/03/96	<0.005		0.0025
SB-P / SB-P 12.7	12.7	10/03/96	0.55		0.55
SB-Q / SB-Q 3.75	3.75	10/03/96	0.006		0.006
SB-Q / SB-Q 9.6	9.6	10/03/96	0.95		0.95
VES-1 / VES-1-16.5'	16.5	07/22/99	<0.005		0.0025
VES-2 / VES-2-16.5'	16.5	07/22/99	<0.005		0.0025
VES-3 / VES-3-15.5'	15.5	07/23/99	0.011		0.011
VES-4 / VES-4-16.5'	16.5	07/23/99	<0.005		0.0025
CB-1 / CB-1-10.0'	10.0	07/23/99	<0.005		0.0025
CB-1 / CB-1-16.0'	16.0	07/23/99	<0.005		0.0025
CB-2 / CB-2-12.0'	12.0	07/23/99	<0.005		0.0025
CB-2 / CB-2-15.0'	15.0	07/23/99	<0.005		0.0025
	Frequency D/Total =		13/47 = 26%	Average =	2.46
				Max =	98
				Standard Dev.=	14.3
				95% UCL =	6

Notes:

TPHg = Total purgeable petroleum hydrocarbons as gasoline by EPA method Modified 8015.

Benzene by EPA method 8020.

Removed samples from 2 and 3 ft bgs: RBCA soil source is defined as 3 to 20 ft bgs, also RBCA model limits data set to 5

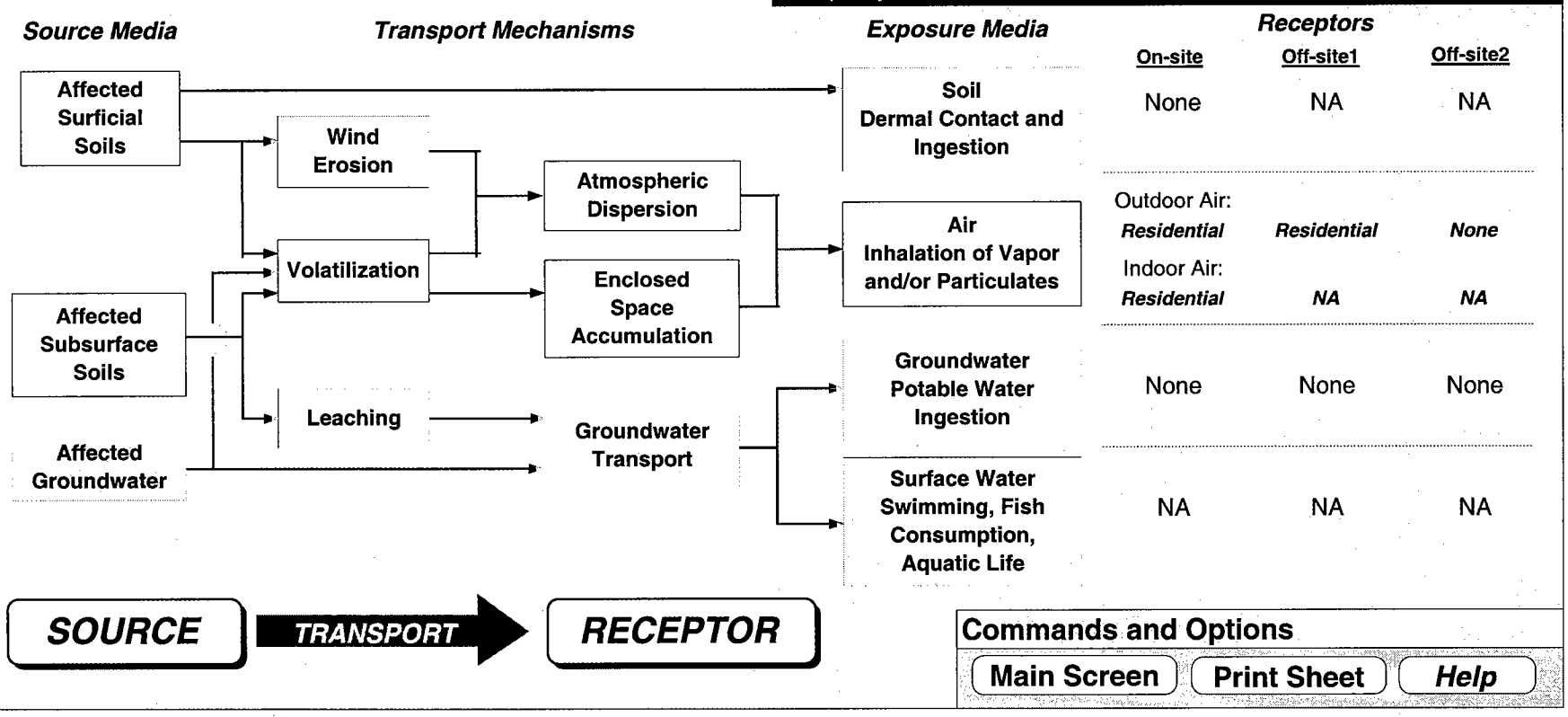
UCL = Upper Confidence Limit

Risk-Based Corrective Actions Modeling Run Three

- RBCA Modeling Run One (Residential Risk, Soil Source)
  - Benzene in soil at 95% UCL
  - Indoor air/vapor inhalation: Residential receptor
  - Outdoor air/vapor inhalation: Residential receptor

Exposure Pathway Flowchart

Site Name: Borsuk-Run 3 (Residential, Soil) Job ID: 540-0188
Location: 1432 Harrison St., Oakland, CA Date: 4-Aug-06
Compl. By: CH



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

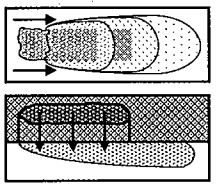
Commands and Options

Main Screen | Print Sheet | *Help*

Exposure Pathway Identification

Site Name: Borsuk-Run 3 (Residential, Soil)
Location: 1432 Harrison St., Oakland, CA
Compl. By: CH
Job ID: 540-0188 Date: 4-Aug-06

1. Groundwater Exposure



Groundwater Ingestion/ Surface Water Impact

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

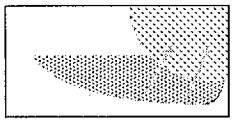
Source Media:

- ☐ Affected Groundwater
- ☐ Affected Soils Leaching to Groundwater

Distance to GW receptors (cm)

On-site	Off-site1	Off-site2
0	0	0
0	0	0

GW Discharge to Surface Water Exposure

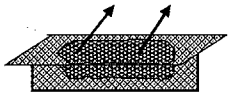


- ☐ Swimming
- ☐ Fish Consumption
- ☐ Aquatic Life Protection

Enter ALP Criteria

2. Surface Soil Exposure

Direct Ingestion and Dermal Contact



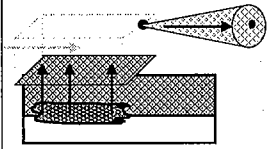
Receptor Type:	On-site
	None

No off-site receptors

Construction Worker ☐

3. Air Exposure

Volatilization and Particulates to Outdoor Air Inhalation

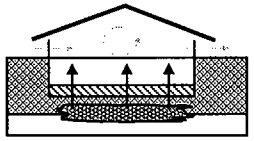


Receptor Type:	On-site	Off-site1	Off-site2
	Res.	Res.	None
	0	0	0

(cm)

Construction worker ☐

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



Volatilization to Indoor Air Inhalation

Receptor Type:	On-site
	Res.

No off-site receptors

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

4. Commands and Options

Main Screen | Print Sheet | Set Units | Help

■□ Exposure Factors & Target Risks | Exposure Flowchart

Site-Specific Soil Parameters

Site Name: Borsuk-Run 3 (Residential, Soil) | Job ID: 540-0188
Location: 1432 Harrison St., Oakland, CA | Date: 4-Aug-06
Compl. By: CH

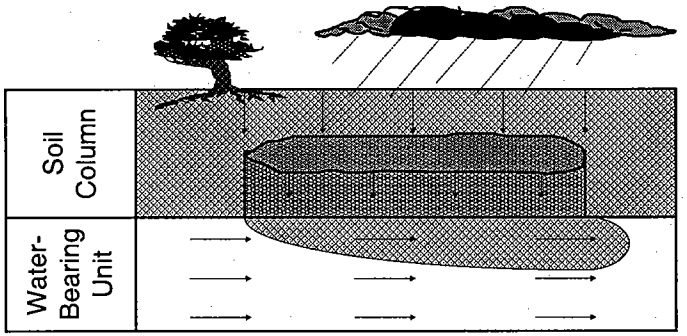
1. Soil Source Zone Characteristics

Hydrogeology

	General Case Construction	
Depth to water-bearing unit	610	(cm)
Capillary zone thickness	60.1	(cm)
Soil column thickness	549.9	(cm)

Affected Soil Zone

Depth to top of affected soils	100		(cm)
Depth to base of affected soils	610		(cm)
Affected soil area	1E+06	1E+06	(cm^2)
Length of affected soil parallel to assumed wind direction	1219	1219	(cm)
Length of affected soil parallel to assumed GW flow direction	1219		(cm)



2. Surface Soil Column

	Vadose Zone	Capillary Fringe	
Predominant USCS Soil Type			ults
or Calculate	*or*		
Total porosity	0.4		(-)
Volumetric water content	0.25	0.38	(-)
Volumetric air content	0.15	0.02	(-)
Dry bulk density	1.59		(kg/L)
Vertical hydraulic conductivity	8.2E-1		(cm/d)
Vapor permeability	1.0E-11		(cm^2)
Capillary zone thickness	6.0E+1		(cm)

Net Rainfall Infiltration

Net infiltration estimate		(in/yr)
or NA	*or*	
Average annual precipitation	0	(in/yr)

Partitioning Parameters

Fraction organic carbon	0.015	(-)
Soil/water pH	6.8	(-)

3. Commands and Options

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

Site-Specific Air Parameters

Site Name: Borsuk-Run 3 (Residential, Soil) Job ID: 540-0188
Location: 1432 Harrison St., Oakland, CA Date: 4-Aug-06
Compl. By: CH

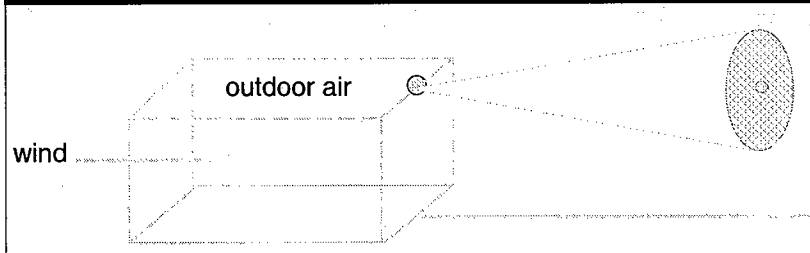
1. Outdoor Air Pathway

Dispersion in Air

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

Air Source Zone

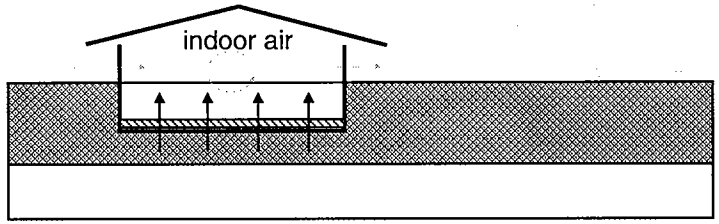
Air mixing zone height	200	(cm)
Ambient air velocity in mixing zone	225	(cm/s)
Areal particulate emission flux	6.9E-14	(g/cm^2/s)



2. Indoor Air Pathway

Building Parameters

	Residential	Commercial	
Building volume/area ratio	229	300	(cm)
Foundation area	700000	700000	(cm^2)
Foundation perimeter	3400	3400	(cm)
Building air exchange rate	5.6E-4	2.3E-4	(1/s)
Depth to bottom of foundation slab	15	15	(cm)
Convective air flow through cracks	0.0E+0	0.0E+0	(cm^3/s)
Foundation thickness	15		(cm)
Foundation crack fraction	0.001		(-)
Volumetric water content of cracks	0.12		(-)
Volumetric air content of cracks	0.26		(-)
Indoor/Outdoor differential pressure	0		(g/cm/s^2)



3. Commands and Options

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

CHEMICAL DATA FOR SELECTED COCs

Physical Property Data

Constituent	CAS Number	type	Molecular Weight (g/mole) MW	ref	Diffusion Coefficients in air (cm2/s) Dair	ref	in water (cm2/s) Dwat	ref	log (Koc) or log(Kd) (@ 20 - 25 C) log(L/kg) partition		ref	Henry's Law Constant (@ 20 - 25 C) (atm-m3) mol	(unitless)	ref	Vapor Pressure (@ 20 - 25 C) (mm Hg)	ref	Solubility (@ 20 - 25 C) (mg/L)	ref	acid pKa	base pKb	ref
Benzene	71-43-2	A	78.1	PS	8.80E-02	PS	9.80E-06	PS	1.77	Koc	PS	5.55E-03	2.29E-01	PS	9.52E+01	PS	1.75E+03	PS	-	-	-

Site Name: Borsuk-Run 3 (Residential, Soil)
Site Location: 1432 Harrison St., Oakland, CA

Completed By: CH
Date Completed: 4-Aug-06

Job ID: 540-0188

CHEMICAL DATA FOR SELECTED COCs

Toxicity Data

Constituent	Reference Dose (mg/kg/day) Oral RfD_oral	ref	Reference Dose (mg/kg/day) Dermal RfD_dermal	ref	Reference Conc. (mg/m3) Inhalation RfC_inhal	ref	Slope Factors 1/(mg/kg/day) Oral SF_oral	ref	Slope Factors 1/(mg/kg/day) Dermal SF_dermal	ref	Unit Risk Factor 1/(µg/m3) Inhalation URF_inhal	ref	EPA Weight of Evidence	Is Constituent Carcinogenic ?
Benzene	3.00E-03	R	-	-	5.95E-03	R	2.90E-02	PS	2.99E-02	TX	8.29E-06	PS	A	TRUE

Site Name: Borsuk-Run 3 (Resi

Site Location: 1432 Harrison

Miscellaneous Chemical Data

Constituent	Maximum Contaminant Level MCL (mg/L)	ref	Time-Weighted Average Workplace Criteria TWA (mg/m3)	ref	Aquatic Life Prot. Criteria AQL (mg/L)	ref	Biocon-centration Factor (L-wat/kg-fish)
Benzene	5.00E-03	52 FR 25690	3.25E+00	PS	-	-	12.6

Site Name: Borsuk-Run 3 (Resi

Site Location: 1432 Harrison

CHEMICAL DATA FOR SELECTED COCs

Miscellaneous Chemical Data

Constituent	Dermal Relative Absorp. Factor (unitless)	Water Dermal Permeability Data: Dermal Permeability Coeff. (cm/hr)	Lag time for Dermal Exposure (hr)	Critical Exposure Time (hr)	Relative Contr of Derm Perm Coeff (unitless)	Water/Skin Derm Adsorp Factor (cm/event)	ref	Detection Limits: Groundwater (mg/L)	ref	Soil (mg/kg)	ref	Half Life (First-Order Decay) (days): Saturated	Unsaturated	ref
Benzene	0.5	0.021	0.26	0.63	0.013	7.3E-2	D	0.002	S	0.005	S	720	720	H

Site Name: Borsuk-Run 3 (Resi

Site Location: 1432 Harrison

RBCA SITE ASSESSMENT

Input Parameter Summary

Site Name: Borsuk-Run 3 (Residential, Soil)
Site Location: 1432 Harrison St., Oakland, CA

Completed By: CH
Date Completed: 4-Aug-06

Job ID: 540-0188

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

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

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

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

Modeling Options	
RBCA tier	Tier 2
Outdoor air volatilization model	Surface & subsurface models
Indoor air volatilization model	Johnson & Ettinger model
Soil leaching model	NA
Use soil attenuation model (SAM) for leachate?	NA
Air dilution factor	User-specified ADF
Groundwater dilution-attenuation factor	NA

NOTE: NA = Not applicable

Surface Parameters		General	Construction	(Units)
A	Source zone area	1.5E+6	NA	(cm^2)
W	Length of source-zone area parallel to wind	1.2E+3	NA	(cm)
W_{gw}	Length of source-zone area parallel to GW flow	NA		(cm)
U_{air}	Ambient air velocity in mixing zone	2.3E+2		(cm/s)
δ_{air}	Air mixing zone height	2.0E+2		(cm)
P_a	Areal particulate emission rate	NA		(g/cm^2/s)
L_{ss}	Thickness of affected surface soils	1.0E+2		(cm)

Surface Soil Column Parameters		Value			(Units)
h_{cap}	Capillary zone thickness	NA			(cm)
h_v	Vadose zone thickness	NA			(cm)
ρ_s	Soil bulk density	1.6E+0			(g/cm^3)
f_{oc}	Fraction organic carbon	1.5E-2			(-)
θ_T	Soil total porosity	4.0E-1			(-)
K_{vs}	Vertical hydraulic conductivity	8.2E-1			(cm/d)
k_v	Vapor permeability	1.0E-11			(cm^2)
L_{gw}	Depth to groundwater	NA			(cm)
L_s	Depth to top of affected soils	1.0E+2			(cm)
L_{base}	Depth to base of affected soils	6.1E+2			(cm)
L_{subs}	Thickness of affected soils	5.1E+2			(cm)
pH	Soil/groundwater pH	6.8E+0			(-)
		capillary	vadose	foundation	
θ_w	Volumetric water content	0.38	0.25	0.12	(-)
θ_a	Volumetric air content	0.02	0.15	0.26	(-)

Building Parameters		Residential	Commercial	(Units)
L_b	Building volume/area ratio	2.29E+2	NA	(cm)
A_b	Foundation area	7.00E+5	NA	(cm^2)
X_{crk}	Foundation perimeter	3.40E+3	NA	(cm)
ER	Building air exchange rate	5.60E-4	NA	(1/s)
L_{crk}	Foundation thickness	1.50E+1	NA	(cm)
Z_{crk}	Depth to bottom of foundation slab	1.50E+1	NA	(cm)
η	Foundation crack fraction	1.00E-3	NA	(-)
dP	Indoor/outdoor differential pressure	0.00E+0	NA	(g/cm/s^2)
Q_s	Convective air flow through slab	0.00E+0	NA	(cm^3/s)

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

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

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

RBCA SITE ASSESSMENT | **User-Specified COC Data**

REPRESENTATIVE COC CONCENTRATIONS IN SOURCE MEDIA

CONSTITUENT	Representative COC Concentration			
	Groundwater		Soils (100 - 610 cm)	
	value (mg/L)	note	value (mg/kg)	note
Benzene			6.0E+0	

Site Name: Borsuk-Run 3 (Residential, Soil)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

Site Name: Borsuk-Run 3 (Residential, Soil)
Site Location: 1432 Harrison St., Oakland, CA

Completed By: CH
Date Completed: 4-Aug-06

TIER 2 SOIL CONCENTRATION DATA SUMMARY

CONSTITUENTS DETECTED		Analytical Method			Detected Concentrations		
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)
71-43-2	Benzene	5.0E-03	47	47	9.8E+01	2.5E+00	6.0E+00

RBCA SITE ASSESSMENT

Site Name: Borsuk-Run 3 (Residential, Soil)
Site Location: 1432 Harrison St., Oakland, CA

Completed By: CH
Date Completed: 4-Aug-06

TIER 2 GROUNDWATER CONCENTRATION DATA SUMMARY

CONSTITUENTS DETECTED		Analytical Method			Detected Concentrations		
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	#N/A	0	NA	NA	NA	NA

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

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

SURFACE SOILS (100 - 100 cm):
VAPOR INHALATION

	1) Source Medium	2) NAF Value (m^3/kg) Receptor				3) Exposure Medium Outdoor Air: POE Conc. (mg/m^3) (1) / (2)			
		On-site (0 cm)		Off-site 1 (0 cm)	Off-site 2 (0 cm)	On-site (0 cm)		Off-site 1 (0 cm)	Off-site 2 (0 cm)
Constituents of Concern	Soil Conc. (mg/kg)	Residential	Construction Worker	Residential	None	Residential	Construction Worker	Residential	None
Benzene	6.0E+0								

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

Site Name: Borsuk-Run 3 (Residential, Soil)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

SURFACE SOILS (100 - 100 cm):

VAPOR INHALATION (cont'd)

	4) Exposure Multiplier (EFxED)/(ATx365) (unitless)				5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4)			
	On-site (0 cm)		Off-site 1 (0 cm)	Off-site 2 (0 cm)	On-site (0 cm)		Off-site 1 (0 cm)	Off-site 2 (0 cm)
Constituents of Concern	Residential	Construction Worker	Residential	None	Residential	Construction Worker	Residential	None
Benzene								

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

Site Name: Borsuk-Run 3 (Residential, Soil)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

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

SUBSURFACE SOILS (100 - 610 cm):

VAPOR INHALATION

	1) Source Medium	2) NAF Value (m^3/kg) Receptor			3) Exposure Medium Outdoor Air: POE Conc. (mg/m^3) (1) / (2)		
Constituents of Concern	Soil Conc. (mg/kg)	On-site (0 cm) Residential	Off-site 1 (0 cm) Residential	Off-site 2 (0 cm) None	On-site (0 cm) Residential	Off-site 1 (0 cm) Residential	Off-site 2 (0 cm) None
Benzene	6.0E+0	4.3E+4	4.3E+4		1.4E-4	1.4E-4	

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

Site Name: Borsuk-Run 3 (Residential, Soil)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

SUBSURFACE SOILS (100 - 610 cm):

VAPOR INHALATION (cont'd)

Constituents of Concern	4) Exposure Multiplier (EFxED)/(ATx365) (unitless)			5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4)		
	On-site (0 cm) Residential	Off-site 1 (0 cm) Residential	Off-site 2 (0 cm) None	On-site (0 cm) Residential	Off-site 1 (0 cm) Residential	Off-site 2 (0 cm) None
Benzene	4.1E-1	4.1E-1		5.7E-5	5.7E-5	

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

Site Name: Borsuk-Run 3 (Residential, Soil)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

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

GROUNDWATER: VAPOR INHALATION

Exposure Concentration

Constituents of Concern	1) Source Medium	2) NAF Value (m^3/L) Receptor			3) Exposure Medium Outdoor Air: POE Conc. (mg/m^3) (1) / (2)		
	Groundwater Conc. (mg/L)	On-site (0 cm)	Off-site 1 (0 cm)	Off-site 2 (0 cm)	On-site (0 cm)	Off-site 1 (0 cm)	Off-site 2 (0 cm)
		None	None	None	None	None	None
Benzene							

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

Site Name: Borsuk-Run 3 (Residential, Soil)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

GROUNDWATER: VAPOR INHALATION (cont'd)

Constituents of Concern	4) Exposure Multiplier (EFxED)/(ATx365) (unitless)			5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4)		
	On-site (0 cm)	Off-site 1 (0 cm)	Off-site 2 (0 cm)	On-site (0 cm)	Off-site 1 (0 cm)	Off-site 2 (0 cm)
	None	None	None	None	None	None
Benzene						

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

Site Name: Borsuk-Run 3 (Residential, Soil)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

TOTAL PATHWAY EXPOSURE (mg/m^3)

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

	On-site (0 cm)		Off-site 1 (0 cm)	Off-site 2 (0 cm)
Constituents of Concern	Residential	Construction Worker	Residential	None
Benzene	5.7E-5		5.7E-5	

Site Name: Borsuk-Run 3 (Residential, Soil)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 PATHWAY RISK CALCULATION

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

CARCINOGENIC RISK

Constituents of Concern	(1) EPA Carcinogenic Classification	(2) Total Carcinogenic Exposure (mg/m^3)				(3) Inhalation Unit Risk Factor (µg/m^3)^-1	(4) Individual COC Risk (2) x (3) x 1000			
		On-site (0 cm)		Off-site 1 (0 cm)	Off-site 2 (0 cm)		On-site (0 cm)		Off-site 1 (0 cm)	Off-site 2 (0 cm)
		Residential	Construction Worker	Residential	None		Residential	Construction Worker	Residential	None
Benzene	A	5.7E-5		5.7E-5		8.3E-6	4.7E-7		4.7E-7	
Total Pathway Carcinogenic Risk =							**4.7E-7**		**4.7E-7**	

Site Name: Borsuk-Run 3 (Residential, Soil)
Site Location: 1432 Harrison St., Oakland, CA

Completed By: CH
Date Completed: 4-Aug-06

Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 PATHWAY RISK CALCULATION

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

TOXIC EFFECTS

Constituents of Concern	(5) Total Toxicant Exposure (mg/m^3)				(6) Inhalation Reference Conc. (mg/m^3)	(7) Individual COC Hazard Quotient (5) / (6)			
	On-site (0 cm)		Off-site 1 (0 cm)	Off-site 2 (0 cm)		On-site (0 cm)		Off-site 1 (0 cm)	Off-site 2 (0 cm)
	Residential	Construction Worker	Residential	None		Residential	Construction Worker	Residential	None
Benzene	1.3E-4		1.3E-4		6.0E-3	2.2E-2		2.2E-2	
Total Pathway Hazard Index =						**2.2E-2**		**2.2E-2**	

Site Name: Borsuk-Run 3 (Residential, Soil)
Site Location: 1432 Harrison St., Oakland, CA

Completed By: CH
Date Completed: 4-Aug-06

Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

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

SOILS (100 - 610 cm): VAPOR INTRUSION INTO ON-SITE BUILDINGS

Constituents of Concern	1) Source Medium Soil Conc. (mg/kg)	2) NAF Value (m^3/kg) Receptor Residential	3) Exposure Medium Indoor Air: POE Conc. (mg/m^3) (1) / (2) Residential	4) Exposure Multiplier (EFxED)/(ATx365) (unitless) Residential	5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4) Residential
Benzene	6.0E+0	1.4E+3	4.4E-3	4.1E-1	1.8E-3

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

Site Name: Borsuk-Run 3 (Residential, Soil)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

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

GROUNDWATER: VAPOR INTRUSION INTO ON-SITE BUILDINGS	Exposure Concentration				
	1) Source Medium	2) NAF Value (m^3/L) Receptor	3) Exposure Medium Indoor Air: POE Conc. (mg/m^3) (1) / (2)	4) Exposure Multiplier (EFxED)/(ATx365) (unitless)	5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4)
Constituents of Concern	Groundwater Conc. (mg/L)	None	None	None	None
Benzene					

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

Site Name: Borsuk-Run 3 (Residential, Soil)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

INDOOR AIR EXPOSURE PATHWAYS

Constituents of Concern	TOTAL PATHWAY EXPOSURE (mg/m^3) *(Sum average expsosure concentrations from soil and groundwater routes.)* Residential
Benzene	1.8E-3

Site Name: Borsuk-Run 3 (Residential, Soil)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 PATHWAY RISK CALCULATION

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

		CARCINOGENIC RISK		
Constituents of Concern	(1) EPA Carcinogenic Classification	(2) Total Carcinogenic Exposure (mg/m^3) Residential	(3) Inhalation Unit Risk Factor (µg/m^3)^-1	(4) Individual COC Risk (2) x (3) x 1000 Residential
Benzene	A	1.8E-3	8.3E-6	1.5E-5

Total Pathway Carcinogenic Risk = **1.5E-5**

Site Name: Borsuk-Run 3 (Residential, Soil)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 PATHWAY RISK CALCULATION

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

	TOXIC EFFECTS		
	(5) Total Toxicant Exposure (mg/m^3)	(6) Inhalation Reference Concentration (mg/m^3)	(7) Individual COC Hazard Quotient (5) / (6)
Constituents of Concern	Residential		Residential
Benzene	4.2E-3	6.0E-3	7.1E-1

Total Pathway Hazard Index = **7.1E-1**

Site Name: Borsuk-Run 3 (Residential, Soil)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

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

Site Name: Borsuk-Run 3 (Residential, Soil)
Site Location: 1432 Harrison St., Oakland, CA

Completed By: CH
Date Completed: 4-Aug-06

TIER 2 BASELINE RISK SUMMARY TABLE

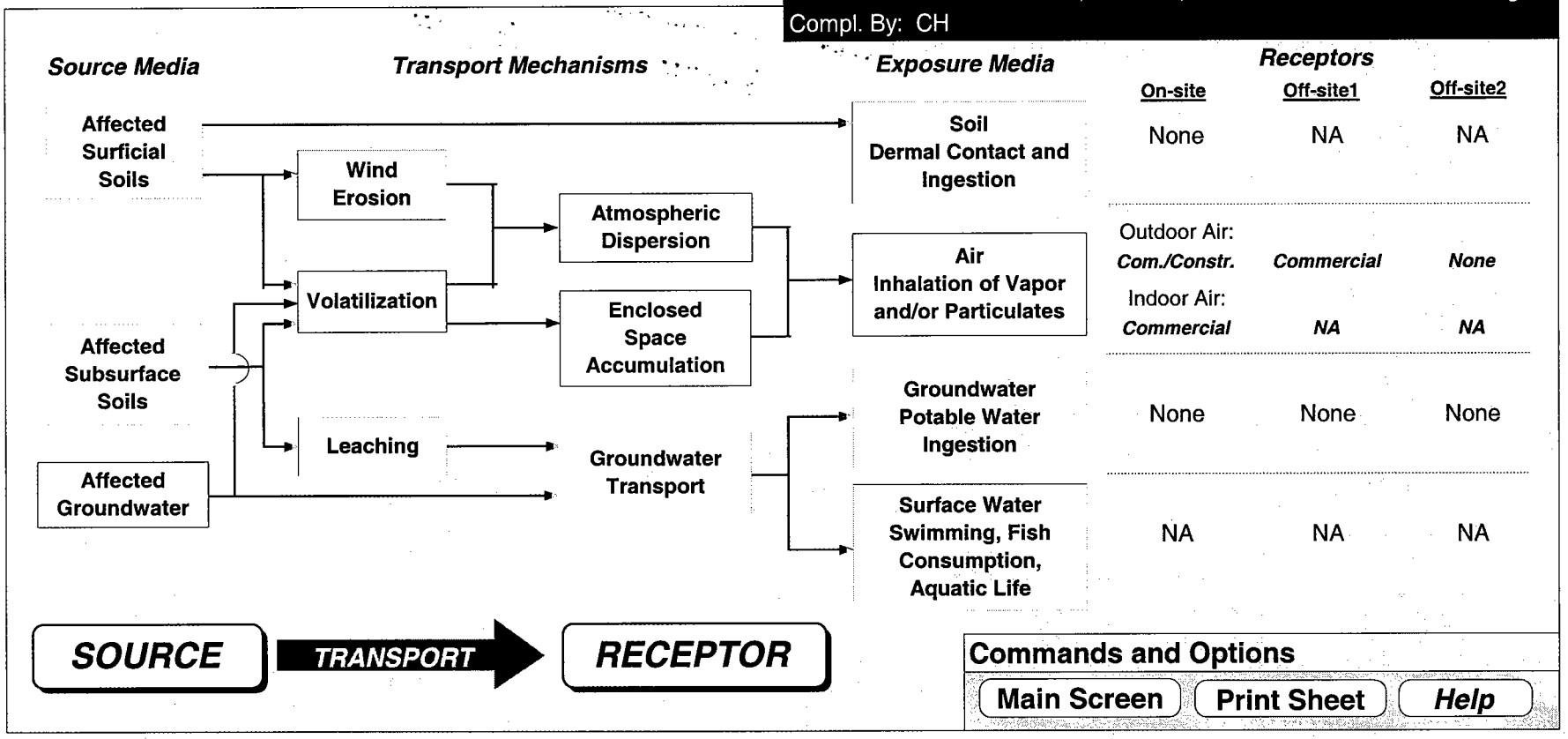
	BASELINE CARCINOGENIC RISK					BASELINE TOXIC EFFECTS				
	Individual COC Risk		Cumulative COC Risk		Risk	Hazard Quotient		Hazard Index		Toxicity
EXPOSURE PATHWAY	Maximum Value	Target Risk	Total Value	Target Risk	Limit(s) Exceeded?	Maximum Value	Applicable Limit	Total Value	Applicable Limit	Limit(s) Exceeded?
OUTDOOR AIR EXPOSURE PATHWAYS										
Complete:	4.7E-7	1.0E-5	4.7E-7	1.0E-5	☐	2.2E-2	1.0E+0	2.2E-2	1.0E+0	☐
INDOOR AIR EXPOSURE PATHWAYS										
Complete:	1.5E-5	1.0E-5	1.5E-5	1.0E-5	■	7.1E-1	1.0E+0	7.1E-1	1.0E+0	☐
SOIL EXPOSURE PATHWAYS										
Complete:	NA	NA	NA	NA	☐	NA	NA	NA	NA	☐
GROUNDWATER EXPOSURE PATHWAYS										
Complete:	NA	NA	NA	NA	☐	NA	NA	NA	NA	☐
SURFACE WATER EXPOSURE PATHWAYS										
Complete:	NA	NA	NA	NA	☐	NA	NA	NA	NA	☐
CRITICAL EXPOSURE PATHWAY (Maximum Values From Complete Pathways)										
	1.5E-5	***1.0E-5***	***1.5E-5***	***1.0E-5***	■	***7.1E-1***	***1.0E+0***	***7.1E-1***	***1.0E+0***	☐
	Indoor Air		***Indoor Air***			***Indoor Air***		***Indoor Air***		

Risk-Based Corrective Actions Modeling Run Two

- RBCA Modeling Run Two(Commercial Risk, Groundwater Source)
  - Benzene in groundwater at 95% UCL
  - Indoor air/vapor inhalation: Commercial receptor
  - Outdoor air/vapor inhalation: Commercial receptor

Exposure Pathway Flowchart

Site Name: Borsuk-Run 2 (Commercial, GW) Job ID: 540-0188
Location: 1432 Harrison St., Oakland, CA Date: 4-Aug-06
Compl. By: CH



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

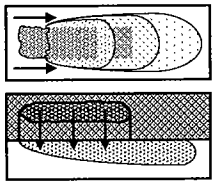
Commands and Options

Main Screen | Print Sheet | Help

Exposure Pathway Identification

Site Name: Borsuk-Run 2 (Commercial, GW)
Location: 1432 Harrison St., Oakland, CA
Compl. By: CH
Job ID: 540-0188 Date: 4-Aug-06

1. Groundwater Exposure



Groundwater Ingestion/ Surface Water Impact

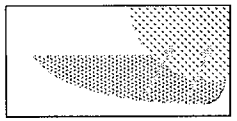
Receptor	None	None	None
Type:	On-site	Off-site1	Off-site2

Source Media:

Distance to GW receptors

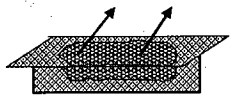
	On-site	Off-site1	Off-site2	
☐ Affected Groundwater	0	0	0	(cm)
☐ Affected Soils Leaching to Groundwater	0	0	0	(cm)

GW Discharge to Surface Water Exposure



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

2. Surface Soil Exposure

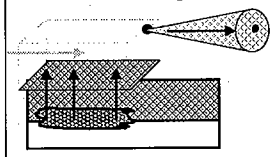


Direct Ingestion and Dermal Contact

Receptor: None
Type: On-site
No off-site receptors

Construction Worker ☐

3. Air Exposure

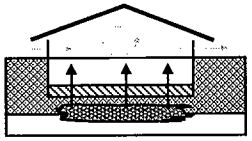


Volatilization and Particulates to Outdoor Air Inhalation

Receptor	Com.	Com.	None
Type:	On-site	Off-site1	Off-site2
	0	0	0 (cm)

Construction worker ☑

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



Volatilization to Indoor Air Inhalation

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

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

4. Commands and Options

Main Screen | Print Sheet | Set Units | *Help*

■ □ Exposure Factors & Target Risks | Exposure Flowchart

Site-Specific Soil Parameters

Site Name: Borsuk-Run 2 (Commercial, GW) | Job ID: 540-0188
Location: 1432 Harrison St., Oakland, CA | Date: 4-Aug-06
Compl. By: CH

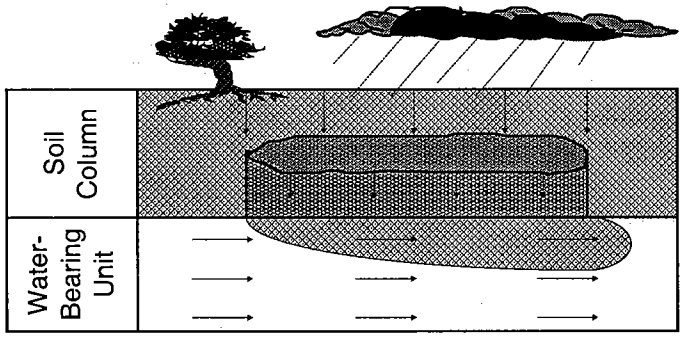
1. Soil Source Zone Characteristics

Hydrogeology

	General Case Construction	
Depth to water-bearing unit	610	(cm)
Capillary zone thickness	60.1	(cm)
Soil column thickness	549.9	(cm)

Affected Soil Zone

Depth to top of affected soils		(cm)
Depth to base of affected soils		(cm)
Affected soil area		(cm^2)
Length of affected soil parallel to assumed wind direction		(cm)
Length of affected soil parallel to assumed GW flow direction	1219	(cm)



2. Surface Soil Column

Predominant USCS Soil Type

or Calculate

	Vadose Zone	Capillary Fringe	
	Defaults		
	or		
Total porosity	0.4		(-)
Volumetric water content	0.25	0.38	(-)
Volumetric air content	0.15	0.02	(-)
Dry bulk density	1.59		(kg/L)
Vertical hydraulic conductivity	8.2E-1		(cm/d)
Vapor permeability	1.0E-11		(cm^2)
Capillary zone thickness	6.0E+1		(cm)

Net Rainfall Infiltration

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

Partitioning Parameters

Fraction organic carbon	0.015	(-)
Soil/water pH	6.8	(-)

3. Commands and Options

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

Site-Specific Groundwater Parameters

Site Name: Borsuk-Run 2 (Commercial, GW) Job ID: 540-0188
Location: 1432 Harrison St., Oakland, CA Date: 4-Aug-06
Compl. By: CH

1. Water-Bearing Unit

Hydrogeology

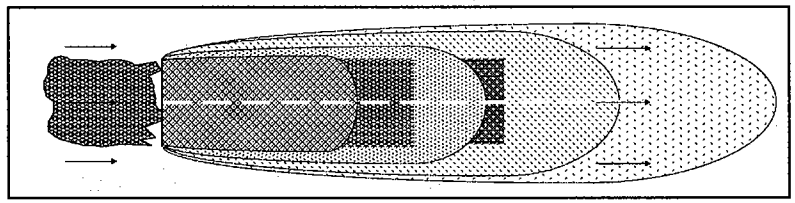
Groundwater Darcy velocity		(cm/d)
Groundwater seepage velocity		(cm/d)
or NA	or	
Hydraulic conductivity	0	(cm/d)
Hydraulic gradient	0	(-)
Effective porosity	0	(-)

Sorption

Fraction organic carbon--saturated zone	0	(-)
Groundwater pH	0	(-)

2. Groundwater Source Zone

Groundwater plume width at source	1524	(cm)
Plume (mixing zone) thickness at source	0	(cm)
or NA	or	
Saturated thickness	0	(cm)
Length of source zone		(cm)



3. Groundwater Dispersion

Model:

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

4. Groundwater Discharge to Surface Water

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

5. Commands and Options

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

Site-Specific Air Parameters

Site Name: Borsuk-Run 2 (Commercial, GW) Job ID: 540-0188
Location: 1432 Harrison St., Oakland, CA Date: 4-Aug-06
Compl. By: CH

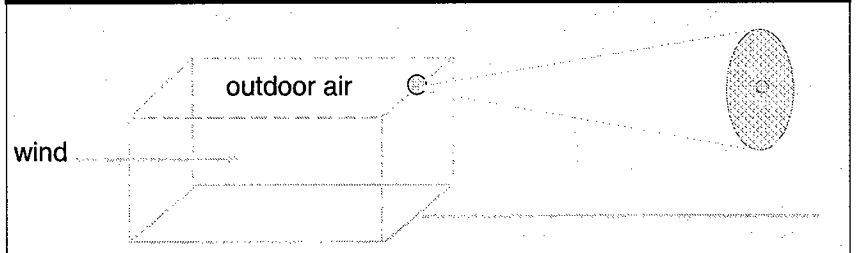
1. Outdoor Air Pathway

Dispersion in Air

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

Air Source Zone

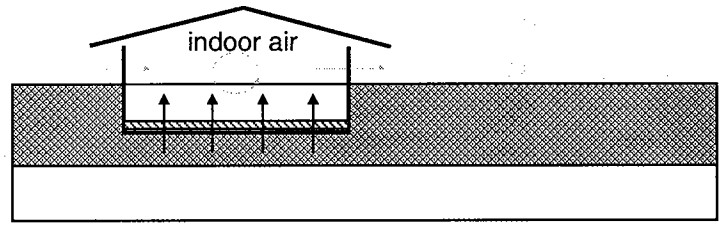
Air mixing zone height	200	(cm)
Ambient air velocity in mixing zone	225	(cm/s)
Areal particulate emission flux	6.9E-14	(g/cm^2/s)



2. Indoor Air Pathway

Building Parameters

	Residential	Commercial	
Building volume/area ratio	229	300	(cm)
Foundation area	700000	700000	(cm^2)
Foundation perimeter	3400	3400	(cm)
Building air exchange rate	5.6E-4	2.3E-4	(1/s)
Depth to bottom of foundation slab	15	15	(cm)
Convective air flow through cracks	0.0E+0	0.0E+0	(cm^3/s)
Foundation thickness	15		(cm)
Foundation crack fraction	0.001		(-)
Volumetric water content of cracks	0.12		(-)
Volumetric air content of cracks	0.26		(-)
Indoor/Outdoor differential pressure	0		(g/cm/s^2)



3. Commands and Options

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

CHEMICAL DATA FOR SELECTED COCs

Physical Property Data

Constituent	CAS Number	type	Molecular Weight (g/mole) MW	ref	Diffusion Coefficients in air (cm2/s) Dair	ref	Diffusion Coefficients in water (cm2/s) Dwat	ref	log (Koc) or log(Kd) (@ 20 - 25 C) log(L/kg) partition		ref	Henry's Law Constant (@ 20 - 25 C) (atm-m3) mol	(unitless)	ref	Vapor Pressure (@ 20 - 25 C) (mm Hg)	ref	Solubility (@ 20 - 25 C) (mg/L)	ref	acid pKa	base pKb	ref
Benzene	71-43-2	A	78.1	PS	8.80E-02	PS	9.80E-06	PS	1.77	Koc	PS	5.55E-03	2.29E-01	PS	9.52E+01	PS	1.75E+03	PS	-	-	-

Site Name: Borsuk-Run 2 (Commercial, GW)
Site Location: 1432 Harrison St., Oakland, CA

Completed By: CH
Date Completed: 4-Aug-06

Job ID: 540-0188

CHEMICAL DATA FOR SELECTED COCs

Toxicity Data

Constituent	Reference Dose (mg/kg/day) Oral RfD_oral	ref	Reference Dose (mg/kg/day) Dermal RfD_dermal	ref	Reference Conc. (mg/m3) Inhalation RfC_inhal	ref	Slope Factors 1/(mg/kg/day) Oral SF_oral	ref	Slope Factors 1/(mg/kg/day) Dermal SF_dermal	ref	Unit Risk Factor 1/(µg/m3) Inhalation URF_inhal	ref	EPA Weight of Evidence	Is Constituent Carcinogenic ?
Benzene	3.00E-03	R	-	-	5.95E-03	R	2.90E-02	PS	2.99E-02	TX	8.29E-06	PS	A	TRUE

Site Name: Borsuk-Run 2 (Com

Site Location: 1432 Harrison

Miscellaneous Chemical Data

Constituent	Maximum Contaminant Level MCL (mg/L)	ref	Time-Weighted Average Workplace Criteria TWA (mg/m3)	ref	Aquatic Life Prot. Criteria AQL (mg/L)	ref	Biocon-centration Factor (L-wat/kg-fish)
Benzene	5.00E-03	52 FR 25690	3.25E+00	PS	-	-	12.6

Site Name: Borsuk-Run 2 (Com

Site Location: 1432 Harrison

CHEMICAL DATA FOR SELECTED COCs

Miscellaneous Chemical Data

Constituent	Dermal Relative Absorp. Factor (unitless)	Water Dermal Permeability Data: Dermal Permeability Coeff. (cm/hr)	Lag time for Dermal Exposure (hr)	Critical Exposure Time (hr)	Relative Contr of Derm Perm Coeff (unitless)	Water/Skin Derm Adsorp Factor (cm/event)	ref	Detection Limits: Groundwater (mg/L)	ref	Soil (mg/kg)	ref	Half Life (First-Order Decay) (days): Saturated	Unsaturated	ref
Benzene	0.5	0.021	0.26	0.63	0.013	7.3E-2	D	0.002	S	0.005	S	720	720	H

Site Name: Borsuk-Run 2 (Com

Site Location: 1432 Harrison

RBCA SITE ASSESSMENT

Input Parameter Summary

Site Name: Borsuk-Run 2 (Commercial, GW)
Site Location: 1432 Harrison St., Oakland, CA

Completed By: CH
Date Completed: 4-Aug-06

Job ID: 540-0188

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

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

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

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

Modeling Options	
RBCA tier	Tier 2
Outdoor air volatilization model	Surface & subsurface models
Indoor air volatilization model	Johnson & Ettinger model
Soil leaching model	NA
Use soil attenuation model (SAM) for leachate?	NA
Air dilution factor	User-specified ADF
Groundwater dilution-attenuation factor	NA

NOTE: NA = Not applicable

Surface Parameters		General	Construction	(Units)
A	Source zone area	0.0E+0	0.0E+0	(cm^2)
W	Length of source-zone area parallel to wind	0.0E+0	0.0E+0	(cm)
W_{gw}	Length of source-zone area parallel to GW flow	NA		(cm)
U_{air}	Ambient air velocity in mixing zone	2.3E+2		(cm/s)
δ_{air}	Air mixing zone height	2.0E+2		(cm)
P_a	Areal particulate emission rate	NA		(g/cm^2/s)
L_{ss}	Thickness of affected surface soils	NA		(cm)

Surface Soil Column Parameters		Value			(Units)
h_{cap}	Capillary zone thickness	6.0E+1			(cm)
h_v	Vadose zone thickness	5.5E+2			(cm)
ρ_s	Soil bulk density	1.6E+0			(g/cm^3)
f_{oc}	Fraction organic carbon	1.5E-2			(-)
θ_T	Soil total porosity	4.0E-1			(-)
K_{vs}	Vertical hydraulic conductivity	8.2E-1			(cm/d)
k_v	Vapor permeability	1.0E-11			(cm^2)
L_{gw}	Depth to groundwater	6.1E+2			(cm)
L_s	Depth to top of affected soils	NA			(cm)
L_{base}	Depth to base of affected soils	NA			(cm)
L_{subs}	Thickness of affected soils	NA			(cm)
pH	Soil/groundwater pH	6.8E+0			(-)
		capillary	vadose	foundation	
θ_w	Volumetric water content	0.38	0.25	0.12	(-)
θ_a	Volumetric air content	0.02	0.15	0.26	(-)

Building Parameters		Residential	Commercial	(Units)
L_b	Building volume/area ratio	NA	3.05E+2	(cm)
A_b	Foundation area	NA	7.00E+5	(cm^2)
X_{crk}	Foundation perimeter	NA	3.40E+3	(cm)
ER	Building air exchange rate	NA	1.40E-3	(1/s)
L_{crk}	Foundation thickness	NA	1.50E+1	(cm)
Z_{crk}	Depth to bottom of foundation slab	NA	1.50E+1	(cm)
η	Foundation crack fraction	NA	1.00E-3	(-)
dP	Indoor/outdoor differential pressure	NA	0.00E+0	(g/cm/s^2)
Q_s	Convective air flow through slab	NA	0.00E+0	(cm^3/s)

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

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

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

RBCA SITE ASSESSMENT | **User-Specified COC Data**

REPRESENTATIVE COC CONCENTRATIONS IN SOURCE MEDIA

CONSTITUENT	Representative COC Concentration			
	Groundwater		Soils (0 - 0 cm)	
	value (mg/L)	note	value (mg/kg)	note
Benzene	2.4E+0			

Site Name: Borsuk-Run 2 (Commercial, GW)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

Site Name: Borsuk-Run 2 (Commercial, GW)
Site Location: 1432 Harrison St., Oakland, CA

Completed By: CH
Date Completed: 4-Aug-06

TIER 2 GROUNDWATER CONCENTRATION DATA SUMMARY

CONSTITUENTS DETECTED		Analytical Method			Detected Concentrations		
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	#N/A	25	25	8.5E+00	1.5E+00	2.4E+00

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

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

SURFACE SOILS (0 - 100 cm):
VAPOR AND DUST INHALATION

	1) Source Medium	2) NAF Value (m^3/kg) Receptor				3) Exposure Medium Outdoor Air: POE Conc. (mg/m^3) (1) / (2)			
		On-site (0 cm)		Off-site 1 (0 cm)	Off-site 2 (0 cm)	On-site (0 cm)		Off-site 1 (0 cm)	Off-site 2 (0 cm)
Constituents of Concern	Soil Conc. (mg/kg)	None	Construction Worker	None	None	None	Construction Worker	None	None
Benzene									

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

Site Name: Borsuk-Run 2 (Commercial, GW)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

SURFACE SOILS (0 - 100 cm):
VAPOR AND DUST INHALATION (cont'd)

	4) Exposure Multiplier (EFxED)/(ATx365) (unitless)				5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4)			
	On-site (0 cm)		Off-site 1 (0 cm)	Off-site 2 (0 cm)	On-site (0 cm)		Off-site 1 (0 cm)	Off-site 2 (0 cm)
Constituents of Concern	None	Construction Worker	None	None	None	Construction Worker	None	None
Benzene								

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

Site Name: Borsuk-Run 2 (Commercial, GW)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

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

SUBSURFACE SOILS (100 - 0 cm):

VAPOR INHALATION

	1) Source Medium	2) NAF Value (m^3/kg) Receptor			3) Exposure Medium Outdoor Air: POE Conc. (mg/m^3) (1) / (2)		
Constituents of Concern	Soil Conc. (mg/kg)	On-site (0 cm)	Off-site 1 (0 cm)	Off-site 2 (0 cm)	On-site (0 cm)	Off-site 1 (0 cm)	Off-site 2 (0 cm)
		None	None	None	None	None	None
Benzene							

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

Site Name: Borsuk-Run 2 (Commercial, GW)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

SUBSURFACE SOILS (100 - 0 cm):

VAPOR INHALATION (cont'd)

Constituents of Concern	4) Exposure Multiplier (EFxED)/(ATx365) (unitless)			5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4)		
	On-site (0 cm)	Off-site 1 (0 cm)	Off-site 2 (0 cm)	On-site (0 cm)	Off-site 1 (0 cm)	Off-site 2 (0 cm)
	None	None	None	None	None	None
Benzene						

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

Site Name: Borsuk-Run 2 (Commercial, GW)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

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

GROUNDWATER: VAPOR INHALATION

Exposure Concentration

	1) Source Medium	2) NAF Value (m^3/L) Receptor			3) Exposure Medium Outdoor Air: POE Conc. (mg/m^3) (1) / (2)		
Constituents of Concern	Groundwater Conc. (mg/L)	On-site (0 cm) Commercial	Off-site 1 (0 cm) Commercial	Off-site 2 (0 cm) None	On-site (0 cm) Commercial	Off-site 1 (0 cm) Commercial	Off-site 2 (0 cm) None
Benzene	2.4E+0	7.2E+5	7.2E+5		3.3E-6	3.3E-6	

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

Site Name: Borsuk-Run 2 (Commercial, GW)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

GROUNDWATER: VAPOR INHALATION (cont'd)

Constituents of Concern	4) Exposure Multiplier (EFxED)/(ATx365) (unitless)			5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4)		
	On-site (0 cm) Commercial	Off-site 1 (0 cm) Commercial	Off-site 2 (0 cm) None	On-site (0 cm) Commercial	Off-site 1 (0 cm) Commercial	Off-site 2 (0 cm) None
Benzene	2.4E-1	2.4E-1		8.0E-7	8.0E-7	

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

Site Name: Borsuk-Run 2 (Commercial, GW)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

TOTAL PATHWAY EXPOSURE (mg/m^3)

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

Constituents of Concern	On-site (0 cm) Commercial	On-site (0 cm) Construction Worker	Off-site 1 (0 cm) Commercial	Off-site 2 (0 cm) None
Benzene	8.0E-7		8.0E-7	

Site Name: Borsuk-Run 2 (Commercial, GW)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 PATHWAY RISK CALCULATION

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

CARCINOGENIC RISK

Constituents of Concern	(1) EPA Carcinogenic Classification	(2) Total Carcinogenic Exposure (mg/m^3)				(3) Inhalation Unit Risk Factor (µg/m^3)^-1	(4) Individual COC Risk (2) x (3) x 1000			
		On-site (0 cm)		Off-site 1 (0 cm)	Off-site 2 (0 cm)		On-site (0 cm)		Off-site 1 (0 cm)	Off-site 2 (0 cm)
		Commercial	Construction Worker	Commercial	None		Commercial	Construction Worker	Commercial	None
Benzene	A	8.0E-7		8.0E-7		8.3E-6	6.6E-9		6.6E-9	

Site Name: Borsuk-Run 2 (Commercial, GW)
Site Location: 1432 Harrison St., Oakland, CA

Completed By: CH
Date Completed: 4-Aug-06

Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 PATHWAY RISK CALCULATION

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

TOXIC EFFECTS

Constituents of Concern	(5) Total Toxicant Exposure (mg/m^3)				(6) Inhalation Reference Conc. (mg/m^3)	(7) Individual COC Hazard Quotient (5) / (6)			
	On-site (0 cm)		Off-site 1 (0 cm)	Off-site 2 (0 cm)		On-site (0 cm)		Off-site 1 (0 cm)	Off-site 2 (0 cm)
	Commercial	Construction Worker	Commercial	None		Commercial	Construction Worker	Commercial	None
Benzene	2.2E-6		2.2E-6		6.0E-3	3.8E-4		3.8E-4	

Site Name: Borsuk-Run 2 (Commercial, GW)
Site Location: 1432 Harrison St., Oakland, CA

Completed By: CH
Date Completed: 4-Aug-06

Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

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

SOILS : VAPOR INTRUSION INTO ON-SITE BUILDINGS

Constituents of Concern	1) Source Medium Soil Conc. (mg/kg)	2) NAF Value (m^3/kg) Receptor None	3) Exposure Medium Indoor Air: POE Conc. (mg/m^3) (1) / (2) None	4) Exposure Multiplier (EFxED)/(ATx365) (unitless) None	5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4) None
Benzene					

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

Site Name: Borsuk-Run 2 (Commercial, GW)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

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

GROUNDWATER: VAPOR INTRUSION INTO ON-SITE BUILDINGS

Exposure Concentration

Constituents of Concern	1) Source Medium Groundwater Conc. (mg/L)	2) NAF Value (m^3/L) Receptor Commercial	3) Exposure Medium Indoor Air: POE Conc. (mg/m^3) (1) / (2) Commercial	4) Exposure Multiplier (EFxED)/(ATx365) (unitless) Commercial	5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4) Commercial
Benzene	2.4E+0	1.5E+4	1.6E-4	2.4E-1	4.0E-5

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

Site Name: Borsuk-Run 2 (Commercial, GW)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

INDOOR AIR EXPOSURE PATHWAYS

Constituents of Concern	TOTAL PATHWAY EXPOSURE (mg/m^3) *(Sum average expsosure concentrations from soil and groundwater routes.)* Commercial
Benzene	4.0E-5

Site Name: Borsuk-Run 2 (Commercial, GW)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 PATHWAY RISK CALCULATION

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

CARCINOGENIC RISK

Constituents of Concern	(1) EPA Carcinogenic Classification	(2) Total Carcinogenic Exposure (mg/m^3) Commercial	(3) Inhalation Unit Risk Factor (µg/m^3)^-1	(4) Individual COC Risk (2) x (3) x 1000 Commercial
Benzene	A	4.0E-5	8.3E-6	3.3E-7

Site Name: Borsuk-Run 2 (Commercial, GW)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 PATHWAY RISK CALCULATION

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

	TOXIC EFFECTS		
	(5) Total Toxicant Exposure (mg/m^3)	(6) Inhalation Reference Concentration (mg/m^3)	(7) Individual COC Hazard Quotient (5) / (6)
Constituents of Concern	Commercial		Commercial
Benzene	1.1E-4	6.0E-3	1.9E-2

Site Name: Borsuk-Run 2 (Commercial, GW)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

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

Site Name: Borsuk-Run 2 (Commercial, GW)
Site Location: 1432 Harrison St., Oakland, CA

Completed By: CH
Date Completed: 4-Aug-06

TIER 2 BASELINE RISK SUMMARY TABLE

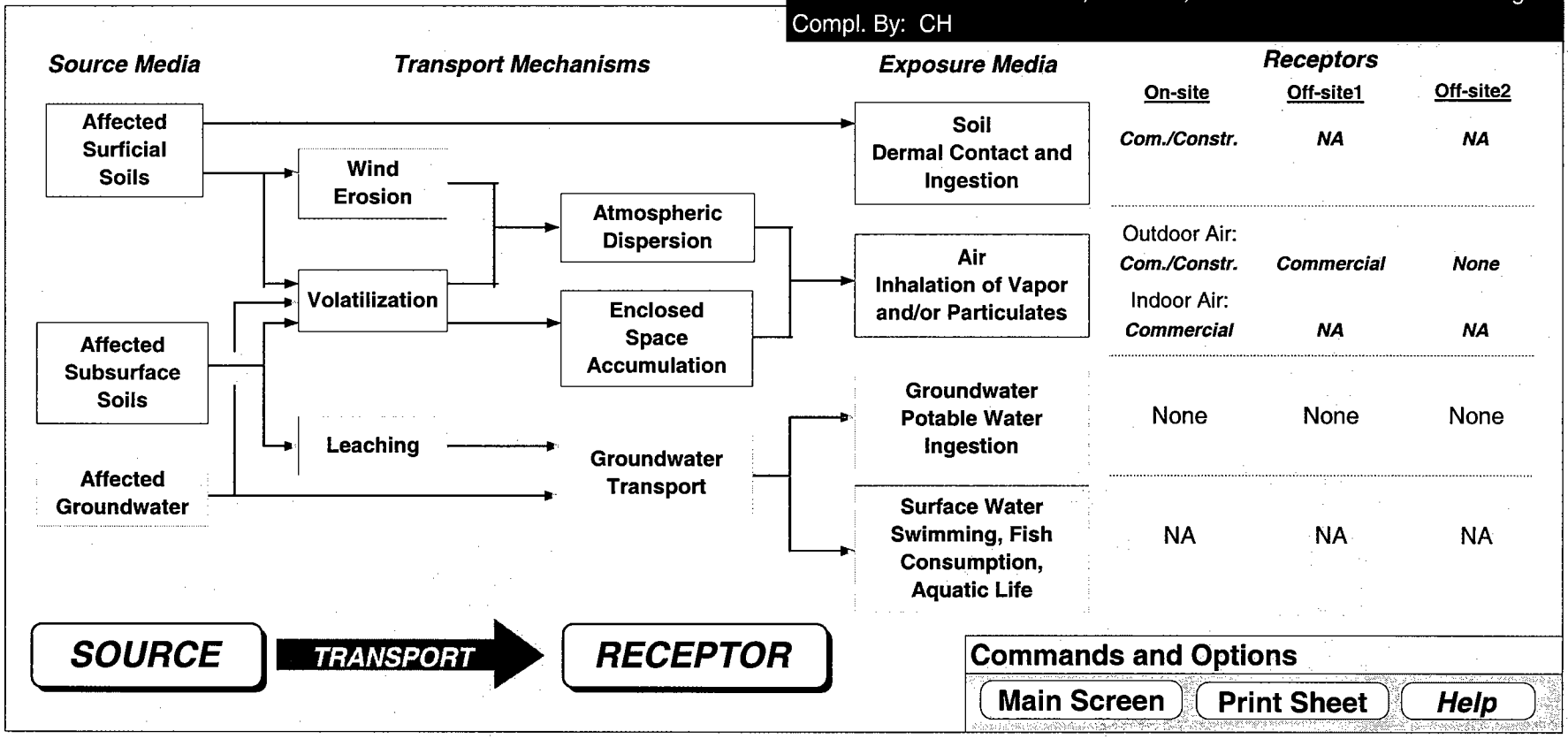
	BASELINE CARCINOGENIC RISK					BASELINE TOXIC EFFECTS				
	Individual COC Risk		Cumulative COC Risk		Risk	Hazard Quotient		Hazard Index		Toxicity
EXPOSURE PATHWAY	Maximum Value	Target Risk	Total Value	Target Risk	Limit(s) Exceeded?	Maximum Value	Applicable Limit	Total Value	Applicable Limit	Limit(s) Exceeded?
OUTDOOR AIR EXPOSURE PATHWAYS										
Complete:	6.6E-9	1.0E-5	6.6E-9	NA	☐	3.8E-4	1.0E+0	3.8E-4	NA	☐
INDOOR AIR EXPOSURE PATHWAYS										
Complete:	3.3E-7	1.0E-5	3.3E-7	NA	☐	1.9E-2	1.0E+0	1.9E-2	NA	☐
SOIL EXPOSURE PATHWAYS										
Complete:	NA	NA	NA	NA	☐	NA	NA	NA	NA	☐
GROUNDWATER EXPOSURE PATHWAYS										
Complete:	NA	NA	NA	NA	☐	NA	NA	NA	NA	☐
SURFACE WATER EXPOSURE PATHWAYS										
Complete:	NA	NA	NA	NA	☐	NA	NA	NA	NA	☐
CRITICAL EXPOSURE PATHWAY (Maximum Values From Complete Pathways)										
	3.3E-7	***1.0E-5***	***3.3E-7***	***NA***	☐	***1.9E-2***	***1.0E+0***	***1.9E-2***	***NA***	☐
	Indoor Air		***Indoor Air***			***Indoor Air***		***Indoor Air***		

Risk-Based Corrective Actions Modeling Run One

- RBCA Modeling Run One (Commercial Risk, Soil Source)
  - Benzene in soil at 95% UCL
  - Indoor air/vapor inhalation: Commercial receptor
  - Outdoor air/vapor inhalation: Commercial receptor
  - Soil dermal contact and ingestion: On-site construction worker

Exposure Pathway Flowchart

Site Name: Borsuk-Run 1 (Commercial, Soil) Job ID: 540-0188
Location: 1432 Harrison St., Oakland, CA Date: 4-Aug-06
Compl. By: CH



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

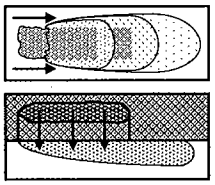
Commands and Options

Main Screen | Print Sheet | *Help*

Exposure Pathway Identification

Site Name: Borsuk-Run 1 (Commercial, Soil)
Location: 1432 Harrison St., Oakland, CA
Compl. By: CH
Job ID: 540-0188 Date: 4-Aug-06

1. Groundwater Exposure



Groundwater Ingestion/ Surface Water Impact

Receptor Type:	None / On-site	None / Off-site1	None / Off-site2

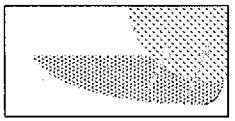
Source Media:

- ☐ Affected Groundwater
- ☐ Affected Soils Leaching to Groundwater

Distance to GW receptors

On-site	Off-site1	Off-site2	
0	0	0	(cm)
0	0	0	(cm)

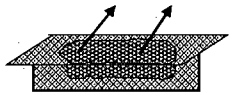
GW Discharge to Surface Water Exposure



- ☐ Swimming
- ☐ Fish Consumption
- ☐ Aquatic Life Protection

Enter ALP Criteria

2. Surface Soil Exposure

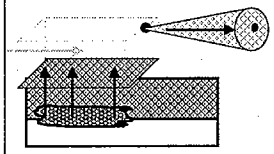


Direct Ingestion and Dermal Contact

Receptor Type:	Com. / On-site	No off-site receptors

Construction Worker ☑

3. Air Exposure

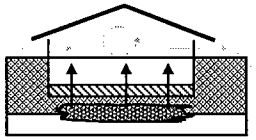


Volatilization and Particulates to Outdoor Air Inhalation

Receptor Type:	Com. / On-site	Com. / Off-site1	None / Off-site2
	0	0	0 (cm)

Construction worker ☑

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



Volatilization to Indoor Air Inhalation

Receptor Type:	Com. / On-site	No off-site receptors

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

4. Commands and Options

Main Screen | Print Sheet | Set Units | Help

■□ Exposure Factors & Target Risks | Exposure Flowchart

Site-Specific Soil Parameters

Site Name: Borsuk-Run 1 (Commercial, Soil) Job ID: 540-0188
Location: 1432 Harrison St., Oakland, CA Date: 4-Aug-06
Compl. By: CH

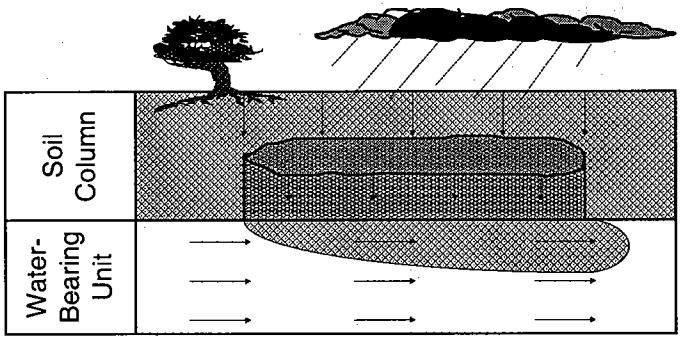
1. Soil Source Zone Characteristics

Hydrogeology

	General Case	Construction	
Depth to water-bearing unit	610		(cm)
Capillary zone thickness	60.1		(cm)
Soil column thickness	549.9		(cm)

Affected Soil Zone

Depth to top of affected soils	100		(cm)
Depth to base of affected soils	610		(cm)
Affected soil area	1E+06	1E+06	(cm^2)
Length of affected soil parallel to assumed wind direction	1219	1219	(cm)
Length of affected soil parallel to assumed GW flow direction	1219		(cm)



2. Surface Soil Column

	Vadose Zone	Capillary Fringe	
Predominant USCS Soil Type			ults
or Calculate	*or*		
Total porosity	0.4		(-)
Volumetric water content	0.25	0.38	(-)
Volumetric air content	0.15	0.02	(-)
Dry bulk density	1.59		(kg/L)
Vertical hydraulic conductivity	8.2E-1		(cm/d)
Vapor permeability	1.0E-11		(cm^2)
Capillary zone thickness	6.0E+1		(cm)

Net Rainfall Infiltration

Net infiltration estimate		(in/yr)
or NA	*or*	
Average annual precipitation	0	(in/yr)

Partitioning Parameters

Fraction organic carbon	0.015	(-)
Soil/water pH	6.8	(-)

3. Commands and Options

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

Site-Specific Air Parameters

Site Name: Borsuk-Run 1 (Commercial, Soil) Job ID: 540-0188
Location: 1432 Harrison St., Oakland, CA Date: 4-Aug-06
Compl. By: CH

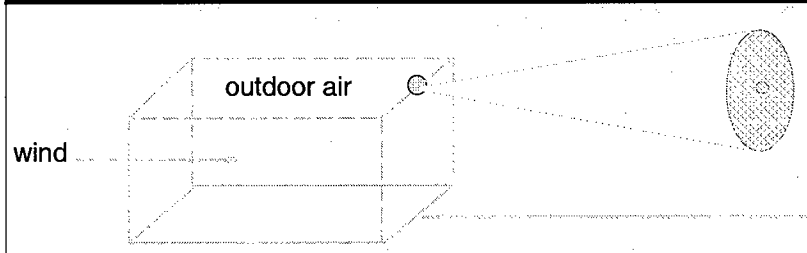
1. Outdoor Air Pathway

Dispersion in Air

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

Air Source Zone

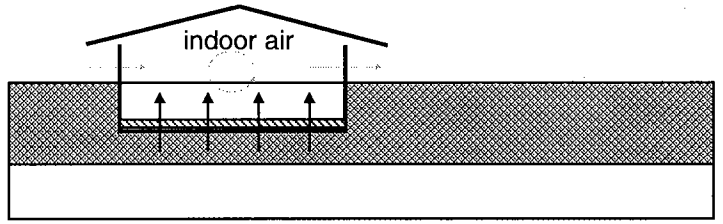
Air mixing zone height	200	(cm)
Ambient air velocity in mixing zone	225	(cm/s)
Areal particulate emission flux	6.9E-14	(g/cm^2/s)



2. Indoor Air Pathway

Building Parameters

	Residential	Commercial	
Building volume/area ratio	229	305	(cm)
Foundation area	700000	700000	(cm^2)
Foundation perimeter	3400	3400	(cm)
Building air exchange rate	5.6E-4	1.4E-3	(1/s)
Depth to bottom of foundation slab	15	15	(cm)
Convective air flow through cracks	0.0E+0	0.0E+0	(cm^3/s)
Foundation thickness	15		(cm)
Foundation crack fraction	0.001		(-)
Volumetric water content of cracks	0.12		(-)
Volumetric air content of cracks	0.26		(-)
Indoor/Outdoor differential pressure	0		(g/cm/s^2)



3. Commands and Options

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

CHEMICAL DATA FOR SELECTED COCs

Physical Property Data

Constituent	CAS Number	type	Molecular Weight (g/mole) MW	ref	Diffusion Coefficients in air (cm2/s) Dair	ref	in water (cm2/s) Dwat	ref	log (Koc) or log(Kd) (@ 20 - 25 C) log(L/kg) partition		ref	Henry's Law Constant (@ 20 - 25 C) (atm-m3) mol	(unitless)	ref	Vapor Pressure (@ 20 - 25 C) (mm Hg)	ref	Solubility (@ 20 - 25 C) (mg/L)	ref	acid pKa	base pKb	ref
Benzene	71-43-2	A	78.1	PS	8.80E-02	PS	9.80E-06	PS	1.77	Koc	PS	5.55E-03	2.29E-01	PS	9.52E+01	PS	1.75E+03	PS	-	-	-

Site Name: Borsuk-Run 1 (Commercial, Soil)
Site Location: 1432 Harrison St., Oakland, CA

Completed By: CH
Date Completed: 4-Aug-06

Job ID: 540-0188

CHEMICAL DATA FOR SELECTED COCs

Toxicity Data

	Reference Dose (mg/kg/day)				Reference Conc. (mg/m3)		Slope Factors 1/(mg/kg/day)				Unit Risk Factor 1/(µg/m3)			
Constituent	Oral RfD_oral	ref	Dermal (mg/kg/day) RfD_dermal	ref	Inhalation RfC_inhal	ref	Oral SF_oral	ref	Dermal 1/(mg/kg/day) SF_dermal	ref	Inhalation URF_inhal	ref	EPA Weight of Evidence	Is Constituent Carcinogenic ?
Benzene	3.00E-03	R	-	-	5.95E-03	R	2.90E-02	PS	2.99E-02	TX	8.29E-06	PS	A	TRUE

Site Name: Borsuk-Run 1 (Com

Site Location: 1432 Harrison

Miscellaneous Chemical Data

Constituent	Maximum Contaminant Level MCL (mg/L)	ref	Time-Weighted Average Workplace Criteria TWA (mg/m3)	ref	Aquatic Life Prot. Criteria AQL (mg/L)	ref	Biocon-centration Factor (L-wat/kg-fish)
Benzene	5.00E-03	52 FR 25690	3.25E+00	PS	-	-	12.6

Site Name: Borsuk-Run 1 (Com

Site Location: 1432 Harrison

CHEMICAL DATA FOR SELECTED COCs

Miscellaneous Chemical Data

Constituent	Dermal Relative Absorp. Factor (unitless)	Water Dermal Permeability Data: Dermal Permeability Coeff. (cm/hr)	Lag time for Dermal Exposure (hr)	Critical Exposure Time (hr)	Relative Contr of Derm Perm Coeff (unitless)	Water/Skin Derm Adsorp Factor (cm/event)	ref	Detection Limits: Groundwater (mg/L)	ref	Soil (mg/kg)	ref	Half Life (First-Order Decay) (days): Saturated	Unsaturated	ref
Benzene	0.5	0.021	0.26	0.63	0.013	7.3E-2	D	0.002	S	0.005	S	720	720	H

Site Name: Borsuk-Run 1 (Com

Site Location: 1432 Harrison

RBCA SITE ASSESSMENT

Input Parameter Summary

Site Name: Borsuk-Run 1 (Commercial, Soil)
Site Location: 1432 Harrison St., Oakland, CA

Completed By: CH
Date Completed: 4-Aug-06

Job ID: 540-0188

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

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

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

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

Modeling Options	
RBCA tier	Tier 2
Outdoor air volatilization model	Surface & subsurface models
Indoor air volatilization model	Johnson & Ettinger model
Soil leaching model	NA
Use soil attenuation model (SAM) for leachate?	NA
Air dilution factor	User-specified ADF
Groundwater dilution-attenuation factor	NA

NOTE: NA = Not applicable

Surface Parameters		General	Construction	(Units)
A	Source zone area	1.5E+6	1.5E+6	(cm^2)
W	Length of source-zone area parallel to wind	1.2E+3	1.2E+3	(cm)
W_{gw}	Length of source-zone area parallel to GW flow	NA		(cm)
U_{air}	Ambient air velocity in mixing zone	2.3E+2		(cm/s)
δ_{air}	Air mixing zone height	2.0E+2		(cm)
P_a	Areal particulate emission rate	NA		(g/cm^2/s)
L_{ss}	Thickness of affected surface soils	1.0E+2		(cm)

Surface Soil Column Parameters		Value			(Units)
h_{cap}	Capillary zone thickness	NA			(cm)
h_v	Vadose zone thickness	NA			(cm)
ρ_s	Soil bulk density	1.6E+0			(g/cm^3)
f_{oc}	Fraction organic carbon	1.5E-2			(-)
θ_T	Soil total porosity	4.0E-1			(-)
K_{vs}	Vertical hydraulic conductivity	8.2E-1			(cm/d)
k_v	Vapor permeability	1.0E-11			(cm^2)
L_{gw}	Depth to groundwater	NA			(cm)
L_s	Depth to top of affected soils	1.0E+2			(cm)
L_{base}	Depth to base of affected soils	6.1E+2			(cm)
L_{subs}	Thickness of affected soils	5.1E+2			(cm)
pH	Soil/groundwater pH	6.8E+0			(-)
		capillary	vadose	foundation	
θ_w	Volumetric water content	0.38	0.25	0.12	(-)
θ_a	Volumetric air content	0.02	0.15	0.26	(-)

Building Parameters		Residential	Commercial	(Units)
L_b	Building volume/area ratio	NA	3.05E+2	(cm)
A_b	Foundation area	NA	7.00E+5	(cm^2)
X_{crk}	Foundation perimeter	NA	3.40E+3	(cm)
ER	Building air exchange rate	NA	1.40E-3	(1/s)
L_{crk}	Foundation thickness	NA	1.50E+1	(cm)
Z_{crk}	Depth to bottom of foundation slab	NA	1.50E+1	(cm)
η	Foundation crack fraction	NA	1.00E-3	(-)
dP	Indoor/outdoor differential pressure	NA	0.00E+0	(g/cm/s^2)
Q_s	Convective air flow through slab	NA	0.00E+0	(cm^3/s)

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

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

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

RBCA SITE ASSESSMENT | **User-Specified COC Data**

REPRESENTATIVE COC CONCENTRATIONS IN SOURCE MEDIA

CONSTITUENT	Representative COC Concentration			
	Groundwater		Soils (100 - 610 cm)	
	value (mg/L)	note	value (mg/kg)	note
Benzene			6.0E+0	

Site Name: Borsuk-Run 1 (Commercial, Soil)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

Site Name: Borsuk-Run 1 (Commercial, Soil)
Site Location: 1432 Harrison St., Oakland, CA

Completed By: CH
Date Completed: 4-Aug-06

TIER 2 SOIL CONCENTRATION DATA SUMMARY

CONSTITUENTS DETECTED		Analytical Method			Detected Concentrations		
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)
71-43-2	Benzene	5.0E-03	47	47	9.8E+01	2.5E+00	6.0E+00

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

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

SURFACE SOILS (100 - 100 cm):

VAPOR INHALATION

	1) Source Medium	2) NAF Value (m^3/kg) Receptor				3) Exposure Medium Outdoor Air: POE Conc. (mg/m^3) (1) / (2)			
		On-site (0 cm)		Off-site 1 (0 cm)	Off-site 2 (0 cm)	On-site (0 cm)		Off-site 1 (0 cm)	Off-site 2 (0 cm)
Constituents of Concern	Soil Conc. (mg/kg)	Commercial	Construction Worker	Commercial	None	Commercial	Construction Worker	Commercial	None
Benzene	6.0E+0								

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

Site Name: Borsuk-Run 1 (Commercial, Soil)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

SURFACE SOILS (100 - 100 cm):

VAPOR INHALATION (cont'd)

Constituents of Concern	4) Exposure Multiplier (EFxED)/(ATx365) (unitless)				5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4)			
	On-site (0 cm)		Off-site 1 (0 cm)	Off-site 2 (0 cm)	On-site (0 cm)		Off-site 1 (0 cm)	Off-site 2 (0 cm)
	Commercial	Construction Worker	Commercial	None	Commercial	Construction Worker	Commercial	None
Benzene								

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

Site Name: Borsuk-Run 1 (Commercial, Soil)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

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

SUBSURFACE SOILS (100 - 610 cm):

VAPOR INHALATION

	1) Source Medium	2) NAF Value (m^3/kg) Receptor			3) Exposure Medium Outdoor Air: POE Conc. (mg/m^3) (1) / (2)		
Constituents of Concern	Soil Conc. (mg/kg)	On-site (0 cm) Commercial	Off-site 1 (0 cm) Commercial	Off-site 2 (0 cm) None	On-site (0 cm) Commercial	Off-site 1 (0 cm) Commercial	Off-site 2 (0 cm) None
Benzene	6.0E+0	3.6E+4	3.6E+4		1.7E-4	1.7E-4	

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

Site Name: Borsuk-Run 1 (Commercial, Soil)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

SUBSURFACE SOILS (100 - 610 cm):

VAPOR INHALATION (cont'd)

Constituents of Concern	4) Exposure Multiplier (EFxED)/(ATx365) (unitless)			5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4)		
	On-site (0 cm) Commercial	Off-site 1 (0 cm) Commercial	Off-site 2 (0 cm) None	On-site (0 cm) Commercial	Off-site 1 (0 cm) Commercial	Off-site 2 (0 cm) None
Benzene	2.4E-1	2.4E-1		4.1E-5	4.1E-5	

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

Site Name: Borsuk-Run 1 (Commercial, Soil)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

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

GROUNDWATER: VAPOR INHALATION

Exposure Concentration

	1) Source Medium	2) NAF Value (m^3/L) Receptor			3) Exposure Medium Outdoor Air: POE Conc. (mg/m^3) (1) / (2)		
Constituents of Concern	Groundwater Conc. (mg/L)	On-site (0 cm)	Off-site 1 (0 cm)	Off-site 2 (0 cm)	On-site (0 cm)	Off-site 1 (0 cm)	Off-site 2 (0 cm)
		None	None	None	None	None	None
Benzene							

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

Site Name: Borsuk-Run 1 (Commercial, Soil)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

GROUNDWATER: VAPOR

INHALATION (cont'd)

Constituents of Concern	4) Exposure Multiplier (EFxED)/(ATx365) (unitless)			5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4)		
	On-site (0 cm)	Off-site 1 (0 cm)	Off-site 2 (0 cm)	On-site (0 cm)	Off-site 1 (0 cm)	Off-site 2 (0 cm)
	None	None	None	None	None	None
Benzene						

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

Site Name: Borsuk-Run 1 (Commercial, Soil)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

TOTAL PATHWAY EXPOSURE (mg/m^3)

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

Constituents of Concern	On-site (0 cm) Commercial	On-site (0 cm) Construction Worker	Off-site 1 (0 cm) Commercial	Off-site 2 (0 cm) None
Benzene	4.1E-5		4.1E-5	

Site Name: Borsuk-Run 1 (Commercial, Soil)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 PATHWAY RISK CALCULATION

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

CARCINOGENIC RISK

Constituents of Concern	(1) EPA Carcinogenic Classification	(2) Total Carcinogenic Exposure (mg/m^3)				(3) Inhalation Unit Risk Factor (µg/m^3)^-1	(4) Individual COC Risk (2) x (3) x 1000			
		On-site (0 cm)		Off-site 1 (0 cm)	Off-site 2 (0 cm)		On-site (0 cm)		Off-site 1 (0 cm)	Off-site 2 (0 cm)
		Commercial	Construction Worker	Commercial	None		Commercial	Construction Worker	Commercial	None
Benzene	A	4.1E-5		4.1E-5		8.3E-6	3.4E-7		3.4E-7	

Site Name: Borsuk-Run 1 (Commercial, Soil)
Site Location: 1432 Harrison St., Oakland, CA

Completed By: CH
Date Completed: 4-Aug-06

Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 PATHWAY RISK CALCULATION

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

TOXIC EFFECTS

Constituents of Concern	(5) Total Toxicant Exposure (mg/m^3)				(6) Inhalation Reference Conc. (mg/m^3)	(7) Individual COC Hazard Quotient (5) / (6)			
	On-site (0 cm)		Off-site 1 (0 cm)	Off-site 2 (0 cm)		On-site (0 cm)		Off-site 1 (0 cm)	Off-site 2 (0 cm)
	Commercial	Construction Worker	Commercial	None		Commercial	Construction Worker	Commercial	None
Benzene	1.1E-4		1.1E-4		6.0E-3	1.9E-2		1.9E-2	

Site Name: Borsuk-Run 1 (Commercial, Soil)
Site Location: 1432 Harrison St., Oakland, CA

Completed By: CH
Date Completed: 4-Aug-06

Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

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

SOILS (100 - 610 cm): VAPOR INTRUSION INTO ON-SITE BUILDINGS

Constituents of Concern	1) Source Medium Soil Conc. (mg/kg)	2) NAF Value (m^3/kg) Receptor Commercial	3) Exposure Medium Indoor Air: POE Conc. (mg/m^3) (1) / (2) Commercial	4) Exposure Multiplier (EFxED)/(ATx365) (unitless) Commercial	5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4) Commercial
Benzene	6.0E+0	4.5E+3	1.3E-3	2.4E-1	3.2E-4

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

Site Name: Borsuk-Run 1 (Commercial, Soil)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

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

GROUNDWATER: VAPOR INTRUSION INTO ON-SITE BUILDINGS

Exposure Concentration

Constituents of Concern	1) Source Medium Groundwater Conc. (mg/L)	2) NAF Value (m^3/L) Receptor None	3) Exposure Medium Indoor Air: POE Conc. (mg/m^3) (1) / (2) None	4) Exposure Multiplier (EFxED)/(ATx365) (unitless) None	5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4) None
Benzene					

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

Site Name: Borsuk-Run 1 (Commercial, Soil)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

INDOOR AIR EXPOSURE PATHWAYS

Constituents of Concern	TOTAL PATHWAY EXPOSURE (mg/m^3) *(Sum average expsosure concentrations from soil and groundwater routes.)* Commercial
Benzene	3.2E-4

Site Name: Borsuk-Run 1 (Commercial, Soil)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 PATHWAY RISK CALCULATION

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

	CARCINOGENIC RISK			
Constituents of Concern	(1) EPA Carcinogenic Classification	(2) Total Carcinogenic Exposure (mg/m^3) Commercial	(3) Inhalation Unit Risk Factor (µg/m^3)^-1	(4) Individual COC Risk (2) x (3) x 1000 Commercial
Benzene	A	3.2E-4	8.3E-6	2.7E-6

Site Name: Borsuk-Run 1 (Commercial, Soil)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 PATHWAY RISK CALCULATION

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

	TOXIC EFFECTS		
	(5) Total Toxicant Exposure (mg/m^3)	(6) Inhalation Reference Concentration (mg/m^3)	(7) Individual COC Hazard Quotient (5) / (6)
Constituents of Concern	Commercial		Commercial
Benzene	9.0E-4	6.0E-3	1.5E-1

Site Name: Borsuk-Run 1 (Commercial, Soil)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

Site Name: Borsuk-Run 1 (Commercial, Soil) Site Location: 1432 Harrison St., Oakland, Completed By: CH Date Completed: 4-Aug-06 *1 OF 1*

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

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

SURFACE SOILS OR SEDIMENTS: ON-SITE INGESTION AND DERMAL CONTACT	1) Source/Exposure Medium	2) Exposure Multiplier (IR+SAxMxRAF)xEFxED/(BWxAT) (kg/kg/day)		3) Average Daily Intake Rate (mg/kg/day) (1) x (2)	
Constituents of Concern	Surface Soil Conc. (mg/kg)	Commercial	Construction Worker	Commercial	Construction Worker
Benzene	6.0E+0	1.0E-5	4.2E-7	6.2E-5	2.5E-6

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

Site Name: Borsuk-Run 1 (Commercial, Soil)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 PATHWAY RISK CALCULATION

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

CARCINOGENIC RISK

Constituents of Concern	(1) EPA Carcinogenic Classification	(2) Total Carcinogenic Intake Rate (mg/kg/day)				(3) Slope Factor (mg/kg/day)^-1		(4) Individual COC Risk	
		(a) via Ingestion	(b) via Dermal Contact	(c) via Ingestion	(d) via Dermal Contact	(a) Oral	(b) Dermal	(2a)x(3a) + (2b)x(3b)	(2c)x(3a) + (2d)x(3b)
		Commercial		Construction Worker				Commercial	Construction Worker
Benzene	A	1.0E-6	6.0E-5	6.0E-8	2.4E-6	2.9E-2	3.0E-2	1.8E-6	7.4E-8

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

Site Name: Borsuk-Run 1 (Commercial, Soil)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 PATHWAY RISK CALCULATION

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

TOXIC EFFECTS

Constituents of Concern	(5) Total Toxicant Intake Rate (mg/kg/day)				(6) Oral Reference Dose (mg/kg-day)		(7) Individual COC Hazard Quotient	
	(a) via Ingestion	(b) via Dermal Contact	(c) via Ingestion	(d) via Dermal Contact	(a) Oral	(b) Dermal	(5a)/(6a) + (5b)/(6b)	(5c)/(6a) + (5d)/(6b)
	Commercial		Construction Worker				Commercial	Construction Worker
Benzene	2.9E-6	1.7E-4	4.2E-6	1.7E-4	3.0E-3	3.0E-3*	5.7E-2	5.8E-2

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

Site Name: Borsuk-Run 1 (Commercial, Soil)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

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

Site Name: Borsuk-Run 1 (Commercial, Soil)
Site Location: 1432 Harrison St., Oakland, CA

Completed By: CH
Date Completed: 4-Aug-06

TIER 2 BASELINE RISK SUMMARY TABLE

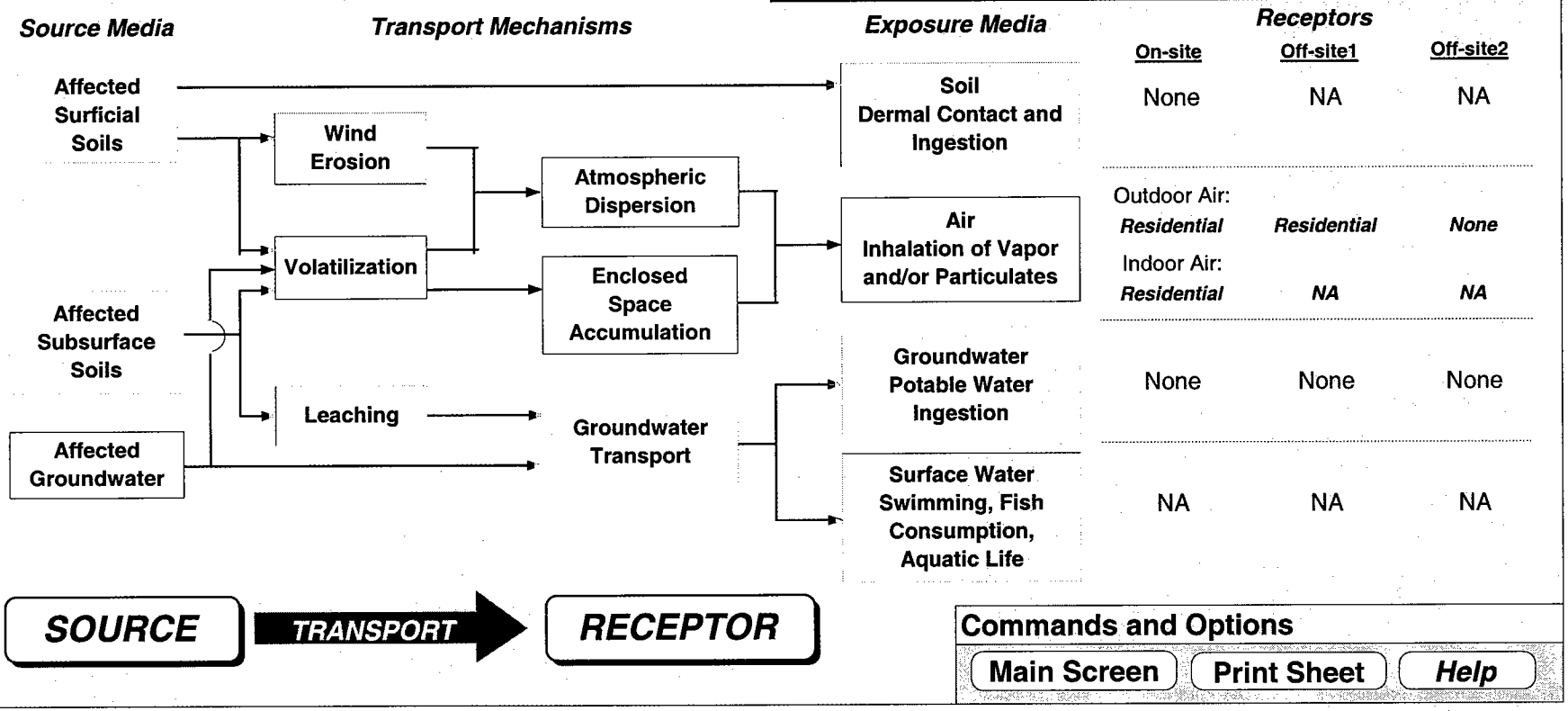
EXPOSURE PATHWAY	BASELINE CARCINOGENIC RISK: Individual COC Risk – Maximum Value	Individual COC Risk – Target Risk	Cumulative COC Risk – Total Value	Cumulative COC Risk – Target Risk	Risk Limit(s) Exceeded?	BASELINE TOXIC EFFECTS: Hazard Quotient – Maximum Value	Hazard Quotient – Applicable Limit	Hazard Index – Total Value	Hazard Index – Applicable Limit	Toxicity Limit(s) Exceeded?
OUTDOOR AIR EXPOSURE PATHWAYS										
Complete:	3.4E-7	1.0E-5	3.4E-7	NA	☐	1.9E-2	1.0E+0	1.9E-2	NA	☐
INDOOR AIR EXPOSURE PATHWAYS										
Complete:	2.7E-6	1.0E-5	2.7E-6	NA	☐	1.5E-1	1.0E+0	1.5E-1	NA	☐
SOIL EXPOSURE PATHWAYS (Construction Worker)										
Complete:	~~1.9E-6~~ 7.4E-8	1.0E-5	~~1.9E-6~~ 7.4E-8	NA	☐	5.8E-2	1.0E+0	5.8E-2	NA	☐
GROUNDWATER EXPOSURE PATHWAYS										
Complete:	NA	NA	NA	NA	☐	NA	NA	NA	NA	☐
SURFACE WATER EXPOSURE PATHWAYS										
Complete:	NA	NA	NA	NA	☐	NA	NA	NA	NA	☐
CRITICAL EXPOSURE PATHWAY (Maximum Values From Complete Pathways)										
	2.7E-6	***1.0E-5***	***2.7E-6***	***NA***	☐	***1.5E-1***	***1.0E+0***	***1.5E-1***	***NA***	☐
	Indoor Air		***Indoor Air***			***Indoor Air***		***Indoor Air***		

Risk-Based Corrective Actions Modeling Run Four

- RBCA Modeling Run Two(Residential Risk, Groundwater Source)
  - Benzene in groundwater at 95% UCL
  - Indoor air/vapor inhalation: Residential receptor
  - Outdoor air/vapor inhalation: Residential receptor

Exposure Pathway Flowchart

Site Name: Borsuk-Run 4 (Residential, GW) Job ID: 540-0188
Location: 1432 Harrison St., Oakland, CA Date: 4-Aug-06
Compl. By: CH



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

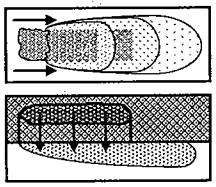
Commands and Options

Main Screen | Print Sheet | *Help*

Exposure Pathway Identification

Site Name: Borsuk-Run 4 (Residential, GW)
Location: 1432 Harrison St., Oakland, CA
Compl. By: CH
Job ID: 540-0188 Date: 4-Aug-06

1. Groundwater Exposure



Groundwater Ingestion/ Surface Water Impact

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

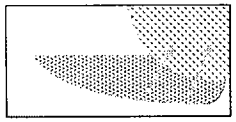
Source Media:

- ☐ Affected Groundwater
- ☐ Affected Soils Leaching to Groundwater

Distance to GW receptors

	0	0	0 (cm)
	On-site	Off-site1	Off-site2
	0	0	0 (cm)

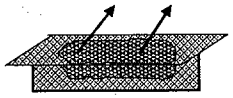
GW Discharge to Surface Water Exposure



- ☐ Swimming
- ☐ Fish Consumption
- ☐ Aquatic Life Protection

Enter ALP Criteria

2. Surface Soil Exposure

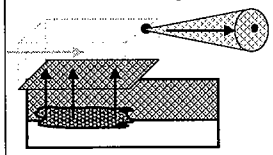


Direct Ingestion and Dermal Contact

Receptor	None	No off-site receptors
Type:	On-site	

Construction Worker ☐

3. Air Exposure

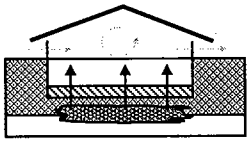


Volatilization and Particulates to Outdoor Air Inhalation

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

Construction worker ☐

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



Volatilization to Indoor Air Inhalation

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

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

4. Commands and Options

Main Screen | Print Sheet | Set Units | *Help*

■□ Exposure Factors & Target Risks | Exposure Flowchart

Site-Specific Groundwater Parameters

Site Name: Borsuk-Run 4 (Residential, GW) Job ID: 540-0188
Location: 1432 Harrison St., Oakland, CA Date: 4-Aug-06
Compl. By: CH

1. Water-Bearing Unit

Hydrogeology

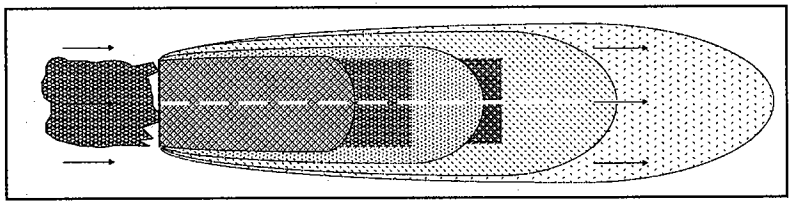
Groundwater Darcy velocity		(cm/d)
Groundwater seepage velocity		(cm/d)
or NA	↑ or	
Hydraulic conductivity	0	(cm/d)
Hydraulic gradient	0	(-)
Effective porosity	0	(-)

Sorption

Fraction organic carbon--saturated zone	0	(-)
Groundwater pH	0	(-)

2. Groundwater Source Zone

Groundwater plume width at source	1524	(cm)
Plume (mixing zone) thickness at source	0	(cm)
or NA	or	
Saturated thickness	0	(cm)
Length of source zone		(cm)



3. Groundwater Dispersion

Model:

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

4. Groundwater Discharge to Surface Water

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

5. Commands and Options

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

Site-Specific Air Parameters

Site Name: Borsuk-Run 4 (Residential, GW) Job ID: 540-0188
Location: 1432 Harrison St., Oakland, CA Date: 4-Aug-06
Compl. By: CH

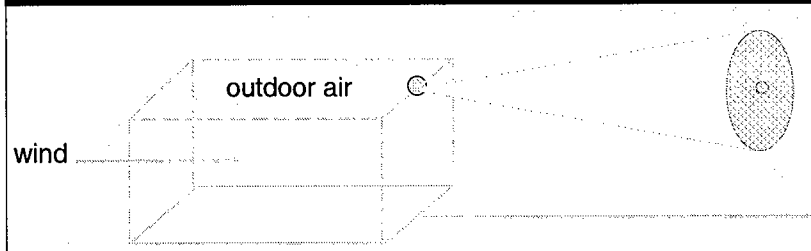
1. Outdoor Air Pathway

Dispersion in Air

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

Air Source Zone

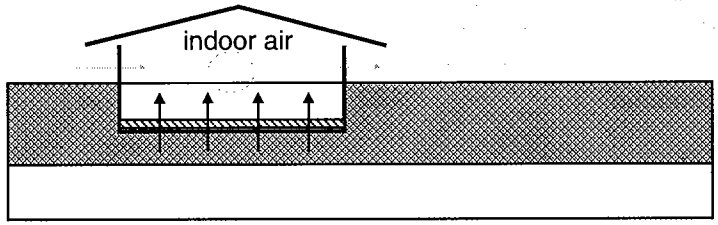
Air mixing zone height	200	(cm)
Ambient air velocity in mixing zone	225	(cm/s)
Areal particulate emission flux	6.9E-14	(g/cm^2/s)



2. Indoor Air Pathway

Building Parameters

	Residential	Commercial	
Building volume/area ratio	229	300	(cm)
Foundation area	700000	700000	(cm^2)
Foundation perimeter	3400	3400	(cm)
Building air exchange rate	5.6E-4	2.3E-4	(1/s)
Depth to bottom of foundation slab	15	15	(cm)
Convective air flow through cracks	0.0E+0	0.0E+0	(cm^3/s)
Foundation thickness	15		(cm)
Foundation crack fraction	0.001		(-)
Volumetric water content of cracks	0.12		(-)
Volumetric air content of cracks	0.26		(-)
Indoor/Outdoor differential pressure	0		(g/cm/s^2)



3. Commands and Options

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

CHEMICAL DATA FOR SELECTED COCs

Physical Property Data

Constituent	CAS Number	type	Molecular Weight (g/mole) MW	ref	Diffusion Coefficients in air (cm2/s) Dair	ref	Diffusion Coefficients in water (cm2/s) Dwat	ref	log (Koc) or log(Kd) (@ 20 - 25 C) log(L/kg) partition		ref	Henry's Law Constant (@ 20 - 25 C) (atm-m3/mol)	(unitless)	ref	Vapor Pressure (@ 20 - 25 C) (mm Hg)	ref	Solubility (@ 20 - 25 C) (mg/L)	ref	acid pKa	base pKb	ref
Benzene	71-43-2	A	78.1	PS	8.80E-02	PS	9.80E-06	PS	1.77	Koc	PS	5.55E-03	2.29E-01	PS	9.52E+01	PS	1.75E+03	PS	-	-	-

Site Name: Borsuk-Run 4 (Residential, GW)
Site Location: 1432 Harrison St., Oakland, CA

Completed By: CH
Date Completed: 4-Aug-06

Job ID: 540-0188

CHEMICAL DATA FOR SELECTED COCs

Toxicity Data

	Reference Dose (mg/kg/day)				Reference Conc. (mg/m3)		Slope Factors 1/(mg/kg/day)				Unit Risk Factor 1/(µg/m3)			
Constituent	Oral RfD_oral	ref	Dermal (mg/kg/day) RfD_dermal	ref	Inhalation RfC_Inhal	ref	Oral SF_oral	ref	Dermal 1/(mg/kg/day) SF_dermal	ref	Inhalation URF_Inhal	ref	EPA Weight of Evidence	Is Constituent Carcinogenic ?
Benzene	3.00E-03	R	-	-	5.95E-03	R	2.90E-02	PS	2.99E-02	TX	8.29E-06	PS	A	TRUE

Site Name: Borsuk-Run 4 (Resi

Site Location: 1432 Harrison

Miscellaneous Chemical Data

Constituent	Maximum Contaminant Level MCL (mg/L)	ref	Time-Weighted Average Workplace Criteria TWA (mg/m3)	ref	Aquatic Life Prot. Criteria AQL (mg/L)	ref	Biocon-centration Factor (L-wat/kg-fish)
Benzene	5.00E-03	52 FR 25690	3.25E+00	PS	-	-	12.6

Site Name: Borsuk-Run 4 (Resi

Site Location: 1432 Harrison

CHEMICAL DATA FOR SELECTED COCs

Miscellaneous Chemical Data

Constituent	Dermal Relative Absorp. Factor (unitless)	Water Dermal Permeability Data: Dermal Permeability Coeff. (cm/hr)	Lag time for Dermal Exposure (hr)	Critical Exposure Time (hr)	Relative Contr of Derm Perm Coeff (unitless)	Water/Skin Derm Adsorp Factor (cm/event)	ref	Detection Limits: Groundwater (mg/L)	ref	Soil (mg/kg)	ref	Half Life (First-Order Decay) (days): Saturated	Unsaturated	ref
Benzene	0.5	0.021	0.26	0.63	0.013	7.3E-2	D	0.002	S	0.005	S	720	720	H

Site Name: Borsuk-Run 4 (Resi

Site Location: 1432 Harrison

RBCA SITE ASSESSMENT

Input Parameter Summary

Site Name: Borsuk-Run 4 (Residential, GW)
Site Location: 1432 Harrison St., Oakland, CA

Completed By: CH
Date Completed: 4-Aug-06

Job ID: 540-0188

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

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

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

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

Modeling Options	
RBCA tier	Tier 2
Outdoor air volatilization model	Surface & subsurface models
Indoor air volatilization model	Johnson & Ettinger model
Soil leaching model	NA
Use soil attenuation model (SAM) for leachate?	NA
Air dilution factor	User-specified ADF
Groundwater dilution-attenuation factor	NA

NOTE: NA = Not applicable

Surface Parameters		General	Construction	(Units)
A	Source zone area	0.0E+0	NA	(cm^2)
W	Length of source-zone area parallel to wind	0.0E+0	NA	(cm)
W_{gw}	Length of source-zone area parallel to GW flow	NA		(cm)
U_{air}	Ambient air velocity in mixing zone	2.3E+2		(cm/s)
δ_{air}	Air mixing zone height	2.0E+2		(cm)
P_a	Areal particulate emission rate	NA		(g/cm^2/s)
L_{ss}	Thickness of affected surface soils	NA		(cm)

Surface Soil Column Parameters		Value			(Units)
h_{cap}	Capillary zone thickness	6.0E+1			(cm)
h_v	Vadose zone thickness	5.5E+2			(cm)
ρ_s	Soil bulk density	1.6E+0			(g/cm^3)
f_{oc}	Fraction organic carbon	1.5E-2			(-)
θ_T	Soil total porosity	4.0E-1			(-)
K_{vs}	Vertical hydraulic conductivity	8.2E-1			(cm/d)
k_v	Vapor permeability	1.0E-11			(cm^2)
L_{gw}	Depth to groundwater	6.1E+2			(cm)
L_s	Depth to top of affected soils	NA			(cm)
L_{base}	Depth to base of affected soils	NA			(cm)
L_{subs}	Thickness of affected soils	NA			(cm)
pH	Soil/groundwater pH	6.8E+0			(-)
		capillary	vadose	foundation	
θ_w	Volumetric water content	0.38	0.25	0.12	(-)
θ_a	Volumetric air content	0.02	0.15	0.26	(-)

Building Parameters		Residential	Commercial	(Units)
L_b	Building volume/area ratio	2.29E+2	NA	(cm)
A_b	Foundation area	7.00E+5	NA	(cm^2)
X_{crk}	Foundation perimeter	3.40E+3	NA	(cm)
ER	Building air exchange rate	5.60E-4	NA	(1/s)
L_{crk}	Foundation thickness	1.50E+1	NA	(cm)
Z_{crk}	Depth to bottom of foundation slab	1.50E+1	NA	(cm)
η	Foundation crack fraction	1.00E-3	NA	(-)
dP	Indoor/outdoor differential pressure	0.00E+0	NA	(g/cm/s^2)
Q_s	Convective air flow through slab	0.00E+0	NA	(cm^3/s)

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

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

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

RBCA SITE ASSESSMENT | **User-Specified COC Data**

REPRESENTATIVE COC CONCENTRATIONS IN SOURCE MEDIA

CONSTITUENT	Representative COC Concentration			
	Groundwater		Soils (0 - 0 cm)	
	value (mg/L)	note	value (mg/kg)	note
Benzene	2.4E+0			

Site Name: Borsuk-Run 4 (Residential, GW)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

Site Name: Borsuk-Run 4 (Residential, GW)
Site Location: 1432 Harrison St., Oakland, CA

Completed By: CH
Date Completed: 4-Aug-06

TIER 2 GROUNDWATER CONCENTRATION DATA SUMMARY

CONSTITUENTS DETECTED		Analytical Method			Detected Concentrations		
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	#N/A	25	25	8.5E+00	1.5E+00	2.4E+00

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

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

SURFACE SOILS (0 - 100 cm):
VAPOR AND DUST INHALATION

	1) Source Medium	2) NAF Value (m^3/kg) Receptor				3) Exposure Medium Outdoor Air: POE Conc. (mg/m^3) (1) / (2)			
		On-site (0 cm)		Off-site 1 (0 cm)	Off-site 2 (0 cm)	On-site (0 cm)		Off-site 1 (0 cm)	Off-site 2 (0 cm)
Constituents of Concern	Soil Conc. (mg/kg)	None	Construction Worker	None	None	None	Construction Worker	None	None
Benzene									

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

Site Name: Borsuk-Run 4 (Residential, GW)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
Job ID: 540-0188

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

SURFACE SOILS (0 - 100 cm):

VAPOR AND DUST INHALATION (cont'd)

Constituents of Concern	4) Exposure Multiplier (EFxED)/(ATx365) (unitless)				5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4)			
	On-site (0 cm)		Off-site 1 (0 cm)	Off-site 2 (0 cm)	On-site (0 cm)		Off-site 1 (0 cm)	Off-site 2 (0 cm)
	None	Construction Worker	None	None	None	Construction Worker	None	None
Benzene								

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

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RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

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

SUBSURFACE SOILS (100 - 0 cm):

VAPOR INHALATION

	1) Source Medium	2) NAF Value (m^3/kg) Receptor			3) Exposure Medium Outdoor Air: POE Conc. (mg/m^3) (1) / (2)		
Constituents of Concern	Soil Conc. (mg/kg)	On-site (0 cm)	Off-site 1 (0 cm)	Off-site 2 (0 cm)	On-site (0 cm)	Off-site 1 (0 cm)	Off-site 2 (0 cm)
		None	None	None	None	None	None
Benzene							

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

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RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

SUBSURFACE SOILS (100 - 0 cm):

VAPOR INHALATION (cont'd)

Constituents of Concern	4) Exposure Multiplier (EFxED)/(ATx365) (unitless)			5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4)		
	On-site (0 cm)	Off-site 1 (0 cm)	Off-site 2 (0 cm)	On-site (0 cm)	Off-site 1 (0 cm)	Off-site 2 (0 cm)
	None	None	None	None	None	None
Benzene						

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

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RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

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

GROUNDWATER: VAPOR INHALATION

Exposure Concentration

	1) Source Medium	2) NAF Value (m^3/L) Receptor			3) Exposure Medium Outdoor Air: POE Conc. (mg/m^3) (1) / (2)		
Constituents of Concern	Groundwater Conc. (mg/L)	On-site (0 cm) Residential	Off-site 1 (0 cm) Residential	Off-site 2 (0 cm) None	On-site (0 cm) Residential	Off-site 1 (0 cm) Residential	Off-site 2 (0 cm) None
Benzene	2.4E+0	7.2E+5	7.2E+5		3.3E-6	3.3E-6	

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

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RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

GROUNDWATER: VAPOR INHALATION (cont'd)

Constituents of Concern	4) Exposure Multiplier (EFxED)/(ATx365) (unitless)			5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4)		
	On-site (0 cm) Residential	Off-site 1 (0 cm) Residential	Off-site 2 (0 cm) None	On-site (0 cm) Residential	Off-site 1 (0 cm) Residential	Off-site 2 (0 cm) None
Benzene	4.1E-1	4.1E-1		1.3E-6	1.3E-6	

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

Site Name: Borsuk-Run 4 (Residential, GW)
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RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

TOTAL PATHWAY EXPOSURE (mg/m^3)

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

	On-site (0 cm)		Off-site 1 (0 cm)	Off-site 2 (0 cm)
Constituents of Concern	Residential	Construction Worker	Residential	None
Benzene	1.3E-6		1.3E-6	

Site Name: Borsuk-Run 4 (Residential, GW)
Site Location: 1432 Harrison St., Oakland, CA
Completed By: CH

Date Completed: 4-Aug-06
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RBCA SITE ASSESSMENT

TIER 2 PATHWAY RISK CALCULATION

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

CARCINOGENIC RISK

Constituents of Concern	(1) EPA Carcinogenic Classification	(2) Total Carcinogenic Exposure (mg/m^3)				(3) Inhalation Unit Risk Factor (µg/m^3)^-1	(4) Individual COC Risk (2) x (3) x 1000			
		On-site (0 cm)		Off-site 1 (0 cm)	Off-site 2 (0 cm)		On-site (0 cm)		Off-site 1 (0 cm)	Off-site 2 (0 cm)
		Residential	Construction Worker	Residential	None		Residential	Construction Worker	Residential	None
Benzene	A	1.3E-6		1.3E-6		8.3E-6	1.1E-8		1.1E-8	

Site Name: Borsuk-Run 4 (Residential, GW)
Site Location: 1432 Harrison St., Oakland, CA

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RBCA SITE ASSESSMENT

TIER 2 PATHWAY RISK CALCULATION

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

TOXIC EFFECTS

Constituents of Concern	(5) Total Toxicant Exposure (mg/m^3) On-site (0 cm) Residential	(5) Total Toxicant Exposure (mg/m^3) On-site (0 cm) Construction Worker	(5) Total Toxicant Exposure (mg/m^3) Off-site 1 (0 cm) Residential	(5) Total Toxicant Exposure (mg/m^3) Off-site 2 (0 cm) None	(6) Inhalation Reference Conc. (mg/m^3)	(7) Individual COC Hazard Quotient (5) / (6) On-site (0 cm) Residential	(7) Individual COC Hazard Quotient (5) / (6) On-site (0 cm) Construction Worker	(7) Individual COC Hazard Quotient (5) / (6) Off-site 1 (0 cm) Residential	(7) Individual COC Hazard Quotient (5) / (6) Off-site 2 (0 cm) None
Benzene	3.1E-6		3.1E-6		6.0E-3	5.3E-4		5.3E-4	

Site Name: Borsuk-Run 4 (Residential, GW)
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RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

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

SOILS : VAPOR INTRUSION INTO ON-SITE BUILDINGS

Constituents of Concern	1) Source Medium Soil Conc. (mg/kg)	2) NAF Value (m^3/kg) Receptor None	3) Exposure Medium Indoor Air: POE Conc. (mg/m^3) (1) / (2) None	4) Exposure Multiplier (EFxED)/(ATx365) (unitless) None	5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4) None
Benzene					

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

Site Name: Borsuk-Run 4 (Residential, GW)
Site Location: 1432 Harrison St., Oakland, CA
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Date Completed: 4-Aug-06
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RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

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

GROUNDWATER: VAPOR INTRUSION INTO ON-SITE BUILDINGS

Exposure Concentration

Constituents of Concern	1) Source Medium Groundwater Conc. (mg/L)	2) NAF Value (m^3/L) Receptor Residential	3) Exposure Medium Indoor Air: POE Conc. (mg/m^3) (1) / (2) Residential	4) Exposure Multiplier (EFxED)/(ATx365) (unitless) Residential	5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4) Residential
Benzene	2.4E+0	4.4E+3	5.4E-4	4.1E-1	2.2E-4

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

Site Name: Borsuk-Run 4 (Residential, GW)
Site Location: 1432 Harrison St., Oakland, CA
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Date Completed: 4-Aug-06
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RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

INDOOR AIR EXPOSURE PATHWAYS

Constituents of Concern	TOTAL PATHWAY EXPOSURE (mg/m^3) *(Sum average expsosure concentrations from soil and groundwater routes.)* Residential
Benzene	2.2E-4

Site Name: Borsuk-Run 4 (Residential, GW)
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RBCA SITE ASSESSMENT

TIER 2 PATHWAY RISK CALCULATION

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

	CARCINOGENIC RISK			
Constituents of Concern	(1) EPA Carcinogenic Classification	(2) Total Carcinogenic Exposure (mg/m^3) Residential	(3) Inhalation Unit Risk Factor (µg/m^3)^-1	(4) Individual COC Risk (2) x (3) x 1000 Residential
Benzene	A	2.2E-4	8.3E-6	1.8E-6

Site Name: Borsuk-Run 4 (Residential, GW)
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RBCA SITE ASSESSMENT

TIER 2 PATHWAY RISK CALCULATION

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

	TOXIC EFFECTS		
	(5) Total Toxicant Exposure (mg/m^3)	(6) Inhalation Reference Concentration (mg/m^3)	(7) Individual COC Hazard Quotient (5) / (6)
Constituents of Concern	Residential		Residential
Benzene	5.2E-4	6.0E-3	8.7E-2

Site Name: Borsuk-Run 4 (Residential, GW)
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RBCA SITE ASSESSMENT | **Baseline Risk Summary-All Pathways**

Site Name: Borsuk-Run 4 (Residential, GW)
Site Location: 1432 Harrison St., Oakland, CA

Completed By: CH
Date Completed: 4-Aug-06

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	
OUTDOOR AIR EXPOSURE PATHWAYS										
Complete:	1.1E-8	1.0E-5	1.1E-8	NA	☐	5.3E-4	1.0E+0	5.3E-4	NA	☐
INDOOR AIR EXPOSURE PATHWAYS										
Complete:	1.8E-6	1.0E-5	1.8E-6	NA	☐	8.7E-2	1.0E+0	8.7E-2	NA	☐
SOIL EXPOSURE PATHWAYS										
Complete:	NA	NA	NA	NA	☐	NA	NA	NA	NA	☐
GROUNDWATER EXPOSURE PATHWAYS										
Complete:	NA	NA	NA	NA	☐	NA	NA	NA	NA	☐
SURFACE WATER EXPOSURE PATHWAYS										
Complete:	NA	NA	NA	NA	☐	NA	NA	NA	NA	☐
CRITICAL EXPOSURE PATHWAY (Maximum Values From Complete Pathways)										
	1.8E-6	***1.0E-5***	***1.8E-6***	***NA***	☐	***8.7E-2***	***1.0E+0***	***8.7E-2***	***NA***	☐
	Indoor Air		***Indoor Air***			***Indoor Air***		***Indoor Air***		