



February 23, 1998

Mr. Charles A. Sumner, II  
Development Officer  
Prentiss Properties  
2485 Natomas Park Drive, Suite 350  
Sacramento, CA 95883

Subject: Risk Based Corrective Action Assessment for the Property located at 1750  
Webster Street, Oakland, California 94612.  
Alameda County Environmental Health Services Agency Site No. 4617.  
Versar Project No. Q98-1197

Dear Mr. Sumner:

This letter report summarizes the findings of the Risk Based Corrective Action (RBCA) assessment performed at the above referenced property (the Site). This RBCA Assessment was performed pursuant to your request in response to the letter dated February 19, 1998 from the Alameda County Health Care Services Agency, Department of Environmental Health Services.

### *Summary*

Environmental investigations completed at the Site and in the vicinity indicate that groundwater, present at an approximate depth of 20 feet below ground level, has been impacted by petroleum constituents. To date, the source (or sources) of these contaminants has not been identified, but data for the Site and surrounding properties indicates that they are not associated with historic use of the subject Site. Versar understands that Prentiss intends to develop the Site as an above ground, non-enclosed parking structure. Based on the available information, planned use of the Site, and the results of the RBCA assessment discussed herein, it is Versar's conclusion that the presence of petroleum constituents within the shallow groundwater does not represent a health concern that will restrict the development of the Site as a parking structure.

It should be noted that this area of Oakland, as well as numerous other areas within the downtown area, are known to be underlain by groundwater contaminated with petroleum constituents. At least eight properties within a one-half mile radius of the Site have exhibited elevated levels of petroleum hydrocarbons in soil and groundwater. Additionally, groundwater beneath a Chevron station located approximately 0.1 mile south and up gradient from the Site has been observed to contain up to 540 micrograms/liter (ug/L) of tetrachloroethene. The observed levels of contamination in groundwater have not limited development of these other properties, provided proper steps are taken in the design and construction of the proposed redevelopment.

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***RBCA Assessment***

Guidance used in development of this report includes the American Society for Testing Materials (ASTM) Standard Guide for Risk Based Corrective Action at Petroleum Release Sites (Designation E 1739-95) and Risk Assessment Guidance for Superfund (USEPA, 1989). Site documents used in the preparation of this report include:

- Environmental Assessment for Three Parcels Located in Oakland, California, Applied Geosciences Inc. (AGI), 1993;
- Results of a Geophysical Survey and Groundwater Investigation at Three Parcels Located on the Block Bounded by 19th Street, Harrison Street, 17th Street and Webster Street, Oakland, California, AGI, 1993.
- Results of a Geophysical Survey and Subsurface Investigation at a Parcel Located on the East Side of Webster Street Between 19th and 17th Street, Oakland California, AGI, 1993.
- Subsurface Investigation Report, 1721 Webster St. Cambria, 1996.
- Soil and Groundwater Investigation Report, Prentiss Properties Ltd. Inc., ATC Associates, 1998.

It is our understanding that groundwater beneath the Site has been impacted with petroleum constituents and that the soil has not been significantly impacted. For this reason, this RBCA assessment only evaluated groundwater. Specifically, this assessment develops Site Specific Target Levels (SSTLs) for chemicals detected in groundwater at the Site. As defined by the ASTM guidance, an SSTL is a risk based remedial target level derived for a chemical of concern under particular site conditions.

Except as noted in the attached tables, ASTM default parameters were used in the development of SSTL's for the Site. It is our understanding that the Site is planned for development as an above ground, non-enclosed parking structure. The SSTL's derived in this assessment were compared to concentrations of chemicals detected in groundwater to determine whether the existing groundwater conditions would pose a threat under indoor or outdoor



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exposure scenarios (Table 9). Our understanding of the future Site use would indicate that the future conditions at the Site will most likely be representative of outdoor exposures.

Benzene appears to be the chemical of greatest potential concern at the Site. The SSTL for benzene was determined to be 640 parts per million (ppm) under the outdoor exposure scenario. Currently, the highest concentration of benzene in Site groundwater is 10 ppm (ATC, 1998). Thus, it appears that groundwater at the Site is not of particular health concern under the proposed future land use. However, it is anticipated that any parking structure built on the Site would contain some environments which will be more representative of indoor exposures (i.e. - toll booth, maintenance closets). The SSTL derived for benzene in groundwater under the indoor exposure scenario was determined to be 1.1 ppm. Any potential exposure to indoor air in the proposed parking structure could be mitigated through engineering controls or by avoiding the construction of enclosed spaces on the ground floor of the structure.

### ***Conclusions and Recommendations***

Based on the available information, planned use of the Site, and the results of the RBCA assessment discussed herein, it is Versar's conclusion that the presence of petroleum constituents within the shallow groundwater does not represent a health concern that will restrict the development of the Site as a parking structure.

This RBCA Assessment was performed pursuant to your request in response to the letter dated February 19, 1998 from the Alameda County Health Care Services Agency, Department of Environmental Health Services. That letter requested that a number of things be done. This letter report addresses the requirements of Item 1 and Item 2. Versar concurs with the recommendation presented in Item 3, and requests that we be included in discussions with the engineering team selected to design the structure to ensure that the environmental conditions at the Site are understood and addressed, where necessary, in the design process. This may include the addition of engineering controls such as vapor barriers beneath any portions of the structure that are enclosed. In addition, Site work specifications will need to address the potential for worker contact with petroleum impacted material in the event building foundation or utility structures are extended to the water table. Based on the available data, it is not anticipated that either of these measures, if required, will significantly impact the overall design and construction costs associated with the planned garage. The costs to complete the additional investigations, including the installation and monitoring of three groundwater monitoring wells requested as part of Item 4, is



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estimated to range from \$12,000 to \$18,000. Item 5 will not be required unless the Item 4 investigations change the conclusions reached as part of earlier Site investigations. It is recommended that Prentiss forward the oversight deposit requested as part of Item 6 to Alameda County at your earliest convenience.

It is important to note that this RBCA assessment has been prepared under severe time constraints and should be used for screening purposes only. This RBCA assessment relies on the fact that the information provided to Versar is accurate and complete. Any change in understanding of the existing site conditions due to additional investigative activities will effect the results of this RBCA assessment.

Thank you for providing Versar with the opportunity to provide Prentiss Properties with our environmental consulting services. If you have any questions about this letter or the attached tables please call me at (510) 814-5926.

Sincerely,

A handwritten signature in black ink, appearing to read "S. E. Campbell", written over a horizontal line.

Steven E. Campbell, P.G., CHMM  
Vice President

Enclosure

**Table 1**  
**Chemical-Specific Toxicity Parameters**

Chemical	Cancer Slope Factors				Noncarcinogenic Reference Dose				Relative Absorption Factors	
	Oral SF (mg/kg-day) <sup>-1</sup>	Source	Inhalation SF (mg/kg-day) <sup>-1</sup>	Source	Oral RfD (mg/kg-day)	Source	Inhalation RfD (mg/kg-day)	Source	Oral (RAFo)	Dermal (RAFd)
Benzene (USEPA)	2.9E-02	IRIS	2.9E-02	IRIS	1.7E-03	USEPA IX	1.7E-03	USEPA IX	1	0.5
Benzene (California)	1.0E-01	OEHHA	1.0E-01	OEHHA	N/A	-	N/A	-	1	0.5
Toluene	N/A	-	N/A	-	2.0E-01	IRIS	1.1E-01	HEAST	1	0.5
Ethylbenzene	N/A	-	N/A	-	1.0E-01	IRIS	2.9E-01	IRIS	1	0.5
Xylenes, Mixed	N/A	-	N/A	-	2.0E+00	IRIS	2.0E-01	USEPA IX	1	0.5
Methyl tert butyl ether	N/A	-	N/A	-	5.0E-03		8.6E-01		1	0.5
Tetrachloroethene (PCE)	0.052	-	0.00203	USEPA IX	1.0E-02	USEPA IX	1.0E-02	USEPA IX	1	0.5
Trichloroethene (TCE)	0.011	USEPA IX	0.006	USEPA IX	6.0E-03	USEPA IX	6.0E-03	USEPA IX	1	0.5
1,2-Dichloroethene, cis	N/A	USEPA IX	N/A	USEPA IX	1.0E-02	USEPA IX	1.0E-02	USEPA IX	1	0.5

N/A: Toxicity criteria is not applicable; the chemical is not classified as a known or suspected human carcinogen.

Sources:

OEHHA: California Office of Health Hazard Assessment, *Memorandum: California Cancer Potency Factors: Update*. 1996.

IRIS: U.S. Environmental Protection Agency, *Integrated Risk Information System (IRIS)*, on-line service available through the National Library of Medicine.

HEAST: U.S. Environmental Protection Agency, *Health Effects Assessment Summary Table (HEAST) FY-1995 Annual*. May 1995.

USEPA IX: U.S. Environmental Protection Agency, *USEPA Region IX, Preliminary Remediation Goals (PRGs) 1996*. August 1, 1996.

Table 2

## Exposure Parameters for the Commercial/Industrial Scenario

Symbol	Parameter	Units	Commercial/Industrial		Comment(s)
			RME	Average	
ATc	Averaging Time for Carcinogens	years	70	70	Based on USEPA definition of averaging time for carcinogens (USEPA, 1990).
ATn	Averaging Time for Noncarcinogens	years	25	25	Based on USEPA definition of averaging time for noncarcinogens (USEPA, 1990).
ED	Exposure Duration	years	25	25	Default USEPA & DTSC value.
BW	Body Weight - Adult	kg	70	70	Default USEPA & DTSC value.
EF	Exposure Frequency	days/year	250	250	Default USEPA & DTSC value.
IRsoil	Soil Ingestion Rate	mg/day	50	50	Default USEPA & DTSC value.
IRair-indoor	Daily Indoor Inhalation Rate	m <sup>3</sup> /workday	20	20	Default DTSC value.
IRair-outdoor	Daily Outdoor Inhalation Rate	m <sup>3</sup> /workday	20	20	Default DTSC value.
IRw	Daily Water Ingestion Rate	L/day	0	0	Groundwater beneath the Site is not presently used as a drinking water source.
M	Soil-to-Skin Adherence Factor	mg/cm <sup>2</sup>	0.5	0.2	RME value is ASTM, USEPA & DTSC default value for RME case. It is on the high-side of adherence per DTSC (1992); Average value is DTSC (1992) recommended average value for adherence.
SA	Exposed Skin Surface Area	cm <sup>2</sup> /day	3160	2000	RME value is ASTM default value; Average case is USEPA (1989) value for outdoor exposures with soil adhering to head and hands.

**Table 3**  
**Site Parameters**  
**Commercial/Industrial Scenario**

Symbol	Parameter	Units	Commercial/Industrial		Comments on Parameter Values
			RME	Average	
d	Lower Depth of Surficial Soil Zone	cm	100	33	100cm, the ASTM default value, is approximately 3 ft. It is used to represent the depth of soil for a shallow excavation. The average case is 33cm (1 ft) which is the typical risk assessment definition of surface soil.
ER	Enclosed-Space Air Exchange Rate	1/s	2.3E-04	2.3E-04	ASTM Default value for Commercial/Industrial Scenario.
foc	Fraction of Organic Carbon in Capillary Fringe Soil	g-C/g-soil	0.007	0.01	ASTM Default value.
	Fraction of Organic Carbon in Vadose Zone Soil	g-C/g-soil	0.007	0.01	ASTM Default value.
	Fraction of Organic Carbon in Foundation/Wall Cracks	g-C/g-soil	0.01	0.01	ASTM Default value.
hcap	Thickness of Capillary Fringe	cm	5	5	Thickness of capillary fringe is 2 ft (61 cm), based on site-specific measurements; 5 cm is the ASTM default value.
hv	Thickness of Vadose Zone	cm	604.6	604.6	Depth of vadose zone is the difference between depth to groundwater (given below) and the height of the capillary fringe.
I	Infiltration Rate of Water Through Soil	cm/year	30	23	ASTM default value
LB	Enclosed-Space (Office) Volume/Infiltration Area Ratio	cm	213	213	A building height of 8 ft (213 cm) was used as a conservative estimate for a hypothetical office.
Lcrack	Enclosed-Space Foundation or Wall Thickness	cm	15	15	15 cm is the default value.
Lgw	Depth to Groundwater	cm	609.6	609.6	The ground water table is located at about 6 ft bgs (183 cm).
Ls	Depth to Subsurface Soil Source	cm	609.6	609.6	The shallower depth of the deeper subsurface source is approximately 3.5 ft bgs (106.75 cm), based on site-specific measurements.
Pe	Particulate Emission Rate	g/cm <sup>2</sup> -s	6.90E-14	6.90E-14	ASTM default value.
Uair	Wind Speed Above Ground Surface In Ambient Mixing Zone	cm/s	225	225	ASTM default value
Ugw	Ground Water Seepage Velocity	cm/yr	6900	6900	$U_{gw} = [(k) \times (i)] / N$ , where: k (hydraulic conductivity of sand) = $10^{-2}$ cm/s (Freeze and Cherry, 1979), N (total porosity of sand) = 32%, and i (site-specific surface gradient) = 0.007 (7/16/96 value).

**Table 3**  
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Symbol	Parameter	Units	Commercial/Industrial		Comments on Parameter Values
			RME	Average	
W-gw	Width of Source Area Parallel to Groundwater Flow Direction	cm	1075.76	1075.76	The distance across the groundwater plume where measured concentrations of VOCs have been near or above DHS MCLs. The width of the soil source parallel to groundwater flow is about 75 ft (2000 cm).
W-air	Width of Source Area Parallel to Wind Flow Direction	cm	1075.76	1075.76	Surface wind direction in San Jose is primarily in the SE direction (CARB 1984).
delta-air	Ambient Air Mixing Zone Height	cm	200	200	2-meters (200 cm) is approximately the top of the breathing zone; this is the ASTM default value.
delta-gw	Groundwater Mixing Zone Thickness	cm	200	200	200 cm is the ASTM default value.
nu	Areal Fraction of Cracks in Foundation/Wall	cm <sup>2</sup> -cracks/cm <sup>2</sup> total area	0.01	0.01	The ASTM default value of 1% (0.01) was used.
theta-acap	Volumetric Air Content in Capillary Fringe Soils	cm <sup>3</sup> -air/cm <sup>3</sup> -soil	0.38	0.38	ASTM default value
theta-acrack	Volumetric Air Content in Foundation/Wall cracks	cm <sup>3</sup> -air/cm <sup>3</sup> total volume	0.26	0.26	ASTM default value
theta-as	Volumetric Air Content in Vadose Zone Soil	cm <sup>3</sup> -air/cm <sup>3</sup> -soil	0.26	0.26	Calculated by subtracting the vadose zone volumetric water content from the total soil porosity of the vadose zone.
theta-Ts	Total Soil Porosity in Vadose Zone Soil	cm <sup>3</sup> /cm <sup>3</sup> -soil	0.32	0.32	Soil porosity for sand is 0.32 (Freeze and Cherry, 1979).
theta-Tcap	Total Soil Porosity in Capillary Fringe	cm <sup>3</sup> /cm <sup>3</sup> -soil	0.32	0.32	Soil porosity for sand is 0.32 (Freeze and Cherry, 1979).
theta-Tcrack	Total Porosity in Foundation	cm <sup>3</sup> /cm <sup>3</sup> -soil	0.13	0.13	Used most conservative porosity value from "Permeability of Concrete"( D. Whiting & A. Walitt).
theta-wcap	Volumetric Water Content in Capillary Fringe Soil	cm <sup>3</sup> -H2O/cm <sup>3</sup> -soil	0.342	0.342	The average moisture content mass percentage for the vadose zone is 21.5%, which converted to volumetric percentage equals 32.6%.
theta-wcrack	Volumetric Water Content in Foundation/Wall Crack	cm <sup>3</sup> -H2O/cm <sup>3</sup> -total volume	0.12	0.12	It has been assumed that about 1/2 of pore space is filled with water.
theta-ws	Volumetric Water Content in Vadose Zone Soil	cm <sup>3</sup> -H2O/cm <sup>3</sup> -soil	0.12	0.12	The average moisture content mass percentage for the vadose zone is 7%, which converted to volumetric percentage equals 9.4%.
rho-s-v	Soil Bulk Density of Vadose Zone Soil	g-soil/cm <sup>3</sup> -soil	1.7	1.7	ASTM Default



**Table 3**  
**Site Parameters**  
**Commercial/Industrial Scenario**

Symbol	Parameter	Units	Commercial/Industrial		Comments on Parameter Values
			RME	Average	
rho-s-cap	Soil Bulk Density of Capillary Fringe Soil	g-soil/cm <sup>3</sup> -soil	1.7	1.7	ASTM Default
tau	Averaging Time for Vapor Flux	s	7.88E+08	7.88E+08	Standard averaging time is 25 years, expressed in seconds.

**Table 4**  
**Chemical-Specific Physical Properties**

Chemical	Molecular Weight (MW)		Water Solubility (WS)		Vapor Pressure (VP)		Henry's Law Constant (H)*	
	g/mol	source	mg/L	source	mm Hg	source	unitless	source
Benzene (USEPA)	7.80E+01	EHRAV	1.75E+03	EHRAV	9.52E+01	EHRAV	5.5E-03	EHRAV
Benzene (California)	7.80E+01	EHRAV	1.75E+03	EHRAV	9.52E+01	EHRAV	5.5E-03	EHRAV
Toluene	9.22E+01	EHRAV	1.55E+03	EHRAV	2.84E+01	EHRAV	6.6E-03	EHRAV
Ethylbenzene	1.06E+02	EHRAV	1.53E+02	EHRAV	7.00E+00	EHRAV	8.4E-03	EHRAV
Xylenes, Mixed	1.06E+02	EHRAV	1.40E+06	EHRAV	8.82E+00	EHRAV	7.0E-03	EHRAV
Methyl tert butyl ether	8.82E+01	EHRAV	5.85E+05	EHRAV	2.50E+02	EHRAV	5.9E-04	EHRAV
Tetrachloroethene (PCE)	1.66E+02	EHRAV	1.08E+06	EHRAV	1.85E+01	EHRAV	2.3E-02	EHRAV
Trichloroethene (TCE)	1.31E+02	EHRAV	1.47E+03	EHRAV	7.43E+01	EHRAV	8.9E-03	EHRAV
1,2-Dichloroethene, cis	1.20E+02	EHRAV	5.00E+01	EHRAV	4.66E+00	EHRAV	1.5E-02	EHRAV

**Chemical-Specific Physical Properties**

Chemical	Diffusion Coefficient in Air (Dair)*		Diffusion Coefficient in Water (Dw)*		Carbon-Water Sorption Coefficient (koc)		Soil-Water Sorption Coefficient (ks)*	
	cm <sup>2</sup> /s	source	cm <sup>2</sup> /s	source	g H <sub>2</sub> O/g C	source	g H <sub>2</sub> O/g soil (RME/default foc)	g H <sub>2</sub> O/g soil (average foc)
Benzene (USEPA)	0.093	ASTM	0.00011	ASTM	6.50E+01	EHRAV	4.55E-01	6.50E-01
Benzene (California)	0.093	ASTM	0.00011	ASTM	6.50E+01	EHRAV	4.55E-01	6.50E-01
Toluene	0.085	ASTM	0.0000094	ASTM	1.20E+02	EHRAV	8.40E-01	1.20E+00
Ethylbenzene	0.076	ASTM	0.0000085	ASTM	2.20E+02	EHRAV	1.54E+00	2.20E+00
Xylenes, Mixed	0.072	ASTM	0.0000085	ASTM	2.38E+02	EHRAV	1.67E+00	2.38E+00
Methyl tert butyl ether	0.0792	ASTM	0.000941	ASTM	1.70E+01	EHRAV	1.19E-01	1.70E-01
Tetrachloroethene (PCE)	0.072	ASTM	0.0000082	ASTM	3.64E+02	EHRAV	2.55E+00	3.64E+00
Trichloroethene (TCE)	0.0818	ASTM	0.000105	ASTM	1.26E+02	EHRAV	8.82E-01	1.26E+00
1,2-Dichloroethene, cis	0.0736	ASTM	0.0000113	ASTM	2.70E+03	EHRAV	1.89E+01	2.70E+01

\*: Some or all of the values for this parameter have been calculated as follows:

Henry's Law Constant: If H was provided in units of moles/L-atm, it was converted to the unitless H by dividing by universal gas constant & temperature at 20 C (293 K) (value is 0.024)

Diffusivity in air (Dair) is estimated by the Fuller, Schettler, and Giddings method provided in Lyman, et al. (1982)

Diffusivity in Water: Calculated by the Hayduk & Laudie method in Lyman, et al. (1982), assumes a temperature of 16 C

Soil-Water Sorption Coefficient is calculated as the fraction of organic carbon (foc) times the Kow. FOC is from Table 2

Sources:

EHRAV - Electronic Handbook of Risk Assessment Values. 1996

**Table 5**  
**Effective Diffusion Coefficients and Soil Saturations Concentrations**

Chemical	Calculated Factors									
	Ds-eff (cm <sup>2</sup> /s)		Dcrack-eff (cm <sup>2</sup> /s)		Dcap-eff (cm <sup>2</sup> /s)		Dws-eff (cm <sup>2</sup> /s)		Csat (mg/kg)	
	RME	Average	RME	Average	RME	Average	RME	Average	RME	Average
Benzene (USEPA)	1.04E-02	1.04E-02	6.30E-02	6.30E-02	4.17E-02	4.17E-02	1.05E-02	1.05E-02	9.21E+02	9.21E+02
Benzene (California)	1.04E-02	1.04E-02	6.30E-02	6.30E-02	4.17E-02	4.17E-02	1.05E-02	1.05E-02	9.21E+02	9.21E+02
Toluene	9.37E-03	9.37E-03	5.67E-02	5.67E-02	3.35E-02	3.35E-02	9.42E-03	9.42E-03	1.41E+03	1.41E+03
Ethylbenzene	8.37E-03	8.37E-03	5.07E-02	5.07E-02	2.99E-02	2.99E-02	8.42E-03	8.42E-03	2.47E+02	2.47E+02
Xylenes, Mixed	7.93E-03	7.93E-03	4.81E-02	4.81E-02	2.84E-02	2.84E-02	7.98E-03	7.98E-03	2.43E+06	2.43E+06
Methyl tert butyl ether	2.22E-02	2.22E-02	1.34E-01	1.34E-01	4.70E-01	4.70E-01	2.23E-02	2.23E-02	1.11E+05	1.11E+05
Tetrachloroethene (PCE)	7.93E-03	7.93E-03	4.80E-02	4.80E-02	2.81E-02	2.81E-02	7.97E-03	7.97E-03	2.83E+06	2.83E+06
Trichloroethene (TCE)	9.10E-03	9.10E-03	5.51E-02	5.51E-02	3.51E-02	3.51E-02	9.16E-03	9.16E-03	1.40E+03	1.40E+03
1,2-Dichloroethene, cis	8.11E-03	8.11E-03	4.91E-02	4.91E-02	2.89E-02	2.89E-02	8.15E-03	8.15E-03	9.49E+02	9.49E+02

**Table 6**  
**Volatilization Factors (VFs)**

Chemical	Volatilization Factor											
	VFwesp [(mg/m <sup>3</sup> -air)/(mg/L- water)]		VFwamb [(mg/m <sup>3</sup> -air)/(mg/L- water)]		VFas [(mg/m <sup>3</sup> -air)/(mg/kg- soil)]		VFp [(mg/m <sup>3</sup> -air)/(mg/kg- soil)]		VF <sub>samb</sub> [(mg/m <sup>3</sup> -air)/(mg/kg- soil)]		VF <sub>sesp</sub> [(mg/m <sup>3</sup> - air)/(mg/kg-soil)]	
	RME	Average	RME	Average	RME	Average	RME	Average	RME	Average	RME	Average
Benzene (USEPA)	1.36E-03	1.36E-03	2.24E-06	2.24E-06	5.15E-06	1.70E-06	1.65E-12	1.65E-12	4.23E-06	4.23E-06	2.57E-03	2.57E-03
Benzene (California)	1.36E-03	1.36E-03	2.24E-06	2.24E-06	5.15E-06	1.70E-06	1.65E-12	1.65E-12	4.23E-06	4.23E-06	2.57E-03	2.57E-03
Toluene	1.48E-03	1.48E-03	2.44E-06	2.44E-06	5.15E-06	1.70E-06	1.65E-12	1.65E-12	2.66E-06	2.66E-06	1.61E-03	1.61E-03
Ethylbenzene	1.69E-03	1.69E-03	2.78E-06	2.78E-06	5.15E-06	1.70E-06	1.65E-12	1.65E-12	1.72E-06	1.72E-06	1.04E-03	1.04E-03
Xylenes, Mixed	1.34E-03	1.34E-03	2.20E-06	2.20E-06	5.15E-06	1.70E-06	1.65E-12	1.65E-12	1.26E-06	1.26E-06	7.65E-04	7.65E-04
Methyl tert butyl ether	3.11E-04	3.11E-04	5.14E-07	5.14E-07	5.15E-06	1.70E-06	1.65E-12	1.65E-12	2.69E-06	2.69E-06	1.63E-03	1.63E-03
Tetrachloroethene (PCE)	4.36E-03	4.36E-03	7.19E-06	7.19E-06	5.15E-06	1.70E-06	1.65E-12	1.65E-12	2.73E-06	2.73E-06	1.66E-03	1.66E-03
Trichloroethene (TCE)	1.94E-03	1.94E-03	3.20E-06	3.20E-06	5.15E-06	1.70E-06	1.65E-12	1.65E-12	3.33E-06	3.33E-06	2.02E-03	2.02E-03
1,2-Dichloroethene, cis	2.91E-03	2.91E-03	4.80E-06	4.80E-06	3.17E-06	1.70E-06	1.65E-12	1.65E-12	2.51E-07	2.51E-07	1.53E-04	1.53E-04

VFwesp = Volatilization factor from groundwater to an enclosed space

VFwamb = Volatilization factor from groundwater to ambient air

VFas = Volatilization factor from surface soil gas to ambient air as vapor

VFp = Emission factor for particulate emissions from surface soil.

VF<sub>samb</sub> = Volatilization factor from soil to ambient air

VF<sub>sesp</sub> = Volatilization factor from soil to an enclosed space

Table 7

Summary of RBCA SSTL's based on Carcinogenic Effects

Target Risk (TR)

1.0E-05

Chemical	Tier II SSTLs - Air				Tier II SSTL - Groundwater			
	AirOUT - Inh (ug/m <sup>3</sup> )		AirIN - Inh (ug/m <sup>3</sup> )		GW-OutAir (mg/L)		GW-InAir (mg/L)	
	RME	Average	RME	Average	RME	Average	RME	Average
Benzene (USEPA)	4.9E+00	4.9E+00	4.9E+00	4.9E+00	2.2E+03	2.2E+03	3.6E+00	3.6E+00
Benzene (California)	1.4E+00	1.4E+00	1.4E+00	1.4E+00	6.4E+02	6.4E+02	1.1E+00	1.1E+00
Toluene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ethylbenzene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Xylenes, Mixed	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Methyl tert butyl ether	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tetrachloroethene (PCE)	7.0E+01	7.0E+01	7.0E+01	7.0E+01	9.8E+03	9.8E+03	1.6E+01	1.6E+01
Trichloroethene (TCE)	2.4E+01	2.4E+01	2.4E+01	2.4E+01	7.5E+03	7.5E+03	1.2E+01	1.2E+01
1,2-Dichloroethene, cis	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 8

## Summary of RBCA SSTL's based on Non-Cancer Health Effects

Target Hazard Quotient (THQ): 1.0E+00

Chemical	Tier II SSTLs - Air				Tier II SSTLs - Groundwater			
	AirOUT - Inh (ug/m <sup>3</sup> )		AirIN - Inh (ug/m <sup>3</sup> )		GW-OutAir (mg/L)		GW-InAir (mg/L)	
	RME	Average	RME	Average	RME	Average	RME	Average
Benzene (USEPA)	8.7E+00	8.7E+00	8.7E+00	8.7E+00	3.9E+03	3.9E+03	6.4E+00	6.4E+00
Benzene (California)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Toluene	5.6E+02	5.6E+02	5.6E+02	5.6E+02	2.3E+05	2.3E+05	3.8E+02	3.8E+02
Ethylbenzene	1.5E+03	1.5E+03	1.5E+03	1.5E+03	5.3E+05	5.3E+05	8.8E+02	8.8E+02
Xylenes, Mixed	1.0E+03	1.0E+03	1.0E+03	1.0E+03	4.6E+05	4.6E+05	7.7E+02	7.7E+02
Methyl tert butyl ether	4.4E+03	4.4E+03	4.4E+03	4.4E+03	8.5E+06	8.5E+06	1.4E+04	1.4E+04
Tetrachloroethene (PCE)	5.1E+01	5.1E+01	5.1E+01	5.1E+01	7.1E+03	7.1E+03	1.2E+01	1.2E+01
Trichloroethene (TCE)	3.1E+01	3.1E+01	3.1E+01	3.1E+01	9.6E+03	9.6E+03	1.6E+01	1.6E+01
1,2-Dichloroethene, cis	5.1E+01	5.1E+01	5.1E+01	5.1E+01	1.1E+04	1.1E+04	1.8E+01	1.8E+01

Table 9

Summary of RBCA SSTLs for the Commercial/Industrial Scenario

SSTLs for Groundwater

Chemical	Volatilization to Outdoor Air (mg/L)		Volatilization to Indoor Air (mg/L) <sup>a</sup>		Site Conc. (mg/L)	
	RME	Average	RME	Average	RME	Average
Benzene (USEPA)	>S	>S	3.6E+00	3.6E+00	1.60E+04	9.41E+02
Benzene (California)	6.4E+02	6.4E+02	1.1E+00	1.1E+00	4.20E+03	2.47E+02
Toluene	>S	>S	3.8E+02	3.8E+02	1.74E-01	9.35E-04
Ethylbenzene	>S	>S	>S	>S	1.74E-01	9.35E-04
Xylenes, Mixed	4.6E+05	4.6E+05	7.7E+02	7.7E+02		
Methyl tert butyl ether	>S	>S	1.4E+04	1.4E+04		
Tetrachloroethene (PCE)	7.1E+03	7.1E+03	1.2E+01	1.2E+01		
Trichloroethene (TCE)	>S	>S	1.2E+01	1.2E+01	3.38E-01	9.92E-04
1,2-Dichloroethene, cis	>S	>S	1.8E+01	1.8E+01		

Notes and Abbreviations

a The lesser of the cancer and noncancer SSTLs are presented here.

>S: Calculated SSTL is greater than pure chemical solubility in water.

N/A: Not Applicable. Chemical not selected as a COI in this medium.