CAMBRIA

January 20, 2004

Ms. Karen Streich
ChevronTexaco
P. O. Box 6004
San Ramon, California 94583

Re: **Comments on the December 1, 2003 ACEH Letter**
Former Texaco Station 211285
15595 Washington Avenue
San Lorenzo, California

Dear Ms. Streich:

As you requested, Cambria Environmental Technology, Inc. (Cambria) prepared these comments to the December 1, 2003 Alameda County Environmental Health Services (ACEH) letter to the State Water Resources Control Board (SWRCB). The ACEH was directed by the SWRCB to consider whether constituents released prior to Texaco's tenure at the site were contributing to the current need for remediation. The site background, as well as pertinent ACEH technical comments from their December 1, 2003 letter and our responses are presented below.

Site Background

The site was operated as an active service station from approximately 1964 through 1983 and from 1986 through to the present. From 1974 to 1983, the site was owned by the Calleri family, who operated a service station. Texaco owned the site from 1983 through 1986, but did not operate the facility and neither stored nor dispensed gasoline during that period. The site location is presented in Figure 1.

Texaco conducted a baseline assessment in 1986 to determine site conditions and identify potential environmental liabilities prior to selling the property to Mr. Bertram Kubo. Texaco drilled six borings and installed wells MW-1, MW-2 and MW-3 in three of the borings. A figure with boring and well locations is presented in Attachment A.

Because the investigation objectives were to screen the site for potential liabilities to support a property transaction and not for a regulated environmental investigation, 3-point composite soil samples were analyzed from each boring. No hydrocarbons were detected in soil at detection limits of 10 mg/kg total petroleum hydrocarbons as gasoline (TPHg), 0.5 mg/kg benzene and toluene, and 1.0 mg/kg xylene isomers in the six samples analyzed.

Cambria Environmental Technology, Inc.

5900 Hollis Street
Suite A
Emeryville, CA 94608
Tel (510) 420-0700
Fax (510) 420-9170

CAMBRIA

Groundwater samples were collected from the 3 borings and 3 wells to assess potential impacts to groundwater. No benzene, toluene or xylenes were detected in wells MW-2 and MW-3, or in borings SB-2 and SB-3 at detection limits of 0.05 ug/l. The groundwater sample from well MW-1 contained 82 ug/l xylenes and groundwater from boring SB-1 contained 220 ug/l benzene, 390 ug/l toluene and 680 ug/l xylenes. Analytical data for soil and groundwater from the 1986 investigation are presented in Attachment B.

There is a more recent oxygenated fuels release with high MTBE concentrations that post-dates Texaco's ownership of the site. The ACEH named ChevronTexaco as a secondary RP for the contamination that is present on the site due to the pre-1983 release.

ACEH Technical Comments and Discussion

The following are pertinent technical comments from the December 1, 2003 ACEH letter and our response to those comments.

Groundwater Analytical Data

The ACEH letter indicates that no soil or groundwater samples were collected from boring SB-3, located near the gasoline tanks that were in place during Texaco's tenure. This data was included in Attachment B of our October 1, 2003 on page 2 (soil data) and page 4 (groundwater data) of the August 28, 1986 Brown and Caldwell analytical report. A copy of this report is included in Attachment B to the current letter. No hydrocarbons were detected in soil or groundwater.

Lack of Depth-Discrete Soil Analytical Results

The ACEH letter indicates that the six 3-point composite soil samples collected near the 2nd generation tanks and dispensers cannot reliably represent soil contamination that may have been detected at discrete depths. The detection limit for the 3-point composite samples were 10 mg/kg TPHg, 0.5 mg/kg benzene and toluene, and 1.0 mg/kg xylene isomers. Based on these detection limits, it is correct to state that no discrete soil sample that comprised the 3-point composite sample contained more than 30 mg/kg TPHg, 1.5 mg/kg benzene and toluene and 3.0 mg/kg xylene isomers (three times the detection limit).

The ACEH letter also indicates that the odors noted on the boring logs indicate elevated hydrocarbon concentrations exist in soil. It is not uncommon for hydrocarbon odors to be

detected during drilling that are the result of relatively low hydrocarbon concentrations actually in soil. This appears to be the case at this site based on the site data. If there were elevated hydrocarbon concentrations detected in soil in the borings and wells, we would expect the composite soil samples to reflect this and we would expect elevated concentrations in groundwater due to dissolution. However, wells and borings wherein a "strong" hydrocarbon odor was noted in the logs did not contain elevated hydrocarbons concentrations in soil or groundwater. In fact, although a slight to strong hydrocarbon odor was noted in all six borings and wells, hydrocarbons were only detected in groundwater from two of the six.

Well MW-1 is a good example of how odor reported in soil and hydrocarbon concentrations in soil and groundwater have no correlation at this site. No hydrocarbons were detected in soil or groundwater from well MW-1 where a strong hydrocarbon odor was noted from 8 to 15 feet below grade (at and below the water table). If elevated hydrocarbon concentrations were in soil from 8 to 15 feet below grade, we would anticipate at least some indication of hydrocarbons in soil and groundwater analytical reports. The lack of hydrocarbon detections indicates that hydrocarbon odor comments noted on the boring logs do not indicate a significant hydrocarbon concentration in soil and these comments are not reliable indicators of site conditions. This lack of correlation is the reason most investigations and remediations are based on quantifiable analytical data instead of qualitative field observations.

Depth of Investigations

The ACEH letter points out the presence of a more permeable zone starting at depths of 20 to 25 feet below grade and its affect on MTBE migration from the more recent release. The occurrence of this more permeable zone may influence the migration of MTBE, however, we are unclear as to its relevance pertaining to the question of whether the low hydrocarbon concentrations resulting from releases prior to Texaco's tenure would contribute to the need for site remediation.

Vapor Migration Pathways

The ACEH letter indicates that vapor migration pathways that could affect human health were not evaluated. These pathways were evaluated in Cambria's October 1, 2003 letter wherein we compared site conditions in 1986 to current Environmental Screening Levels (ESLs) presented in *Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater* (July 2003, updated September 4, 2003) produced by the RWQCB. The evaluation compared hydrocarbon concentrations detected in groundwater to the ESL for the evaluation of potential indoor-air impacts (a copy of ESL Table E-1a upon which this analysis is based is included in

CAMBRIA

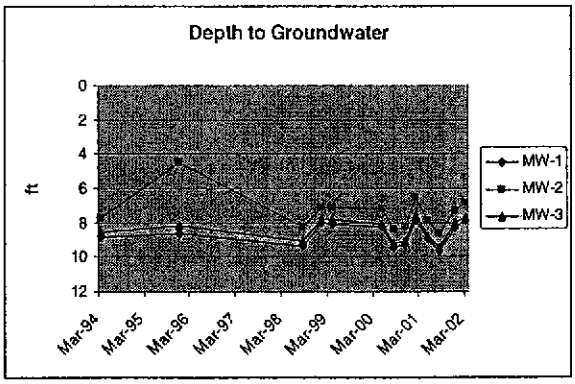
Attachment C). Table A below presents maximum hydrocarbon concentrations detected in groundwater in the 1986 investigation and corresponding ESLs for the conservative residential redevelopment scenario. Although not included in our original submittal, we have also included the commercial ESLs along with the residential ESLs in Table A below.

Table A – Hydrocarbon Concentrations and ESLs

Analyte	Maximum Detection (ug/l)	Residential ESL (ug/l)	Commercial ESL (ug/l)	Comments
Benzene	220	530 to 1,900	1,800 to 6,400	Below ESL
Toluene	390	500,000 to 530,000	500,000 to 530,000	Below ESL
Xylenes	680	150,000 to 160,000	150,000 to 160,000	Below ESL

ESL: *Groundwater Screening Levels for Evaluation of Potential Indoor-Air Impacts,* Table E-1a, residential and commercial land use scenario. Ranges based on high permeability soil (first number presented) and low/moderate permeability soil (second number presented).

It is important to note that these ESLs are based on a presumed 10 ft depth to groundwater. As indicated in the adjacent graph, groundwater at the site is about 8 feet below grade. Therefore, the ESLs are technically not applicable at this site. However, the concentrations detected in 1986 are sufficiently below the ESLs that they are unlikely to exceed current risk standards were a Tier 2 assessment conducted. It is also likely that benzene concentrations in groundwater would have degraded over the last 17 years and that current concentrations, and hence risk, would be lower.



No hydrocarbons were detected in soil so it is impossible to compare hydrocarbon concentrations in soil to ESLs. The fact that no hydrocarbons were detected in soil and only low concentrations were detected in groundwater indicates that there was no significant impact to soil from operations prior to cessation of initial operations in 1983.

CAMBRIA

Potential Impacts to Wells

The ACEH letter notes that an active irrigation well 330 ft southwest of the site has not been analyzed for hydrocarbons. We concur that this well could be at risk from the MTBE and other hydrocarbons currently detected at the site and it should be sampled. However, this well is not at risk from the low hydrocarbon concentrations in groundwater in 1986 from releases prior to Texaco's tenure at the site.

Attenuation Assessment

The ACEH letter correctly points out several factors that affect hydrocarbon attenuation including source depletion, lateral and vertical migration, and biodegradation. Other parameters affecting attenuation include sorption, chemical or abiotic reaction, and volatilization. It is the cumulative sum of these potential effects that result in natural attenuation of hydrocarbons.

We concur with the ACEH letter that it is difficult to predict attenuation rates for the previous low concentration benzene, toluene and xylenes plume based on attenuation rates for the high concentration oxygenated fuel release. In our October 1, 2003 letter, we were conservative in our approach by assuming that the benzene, toluene and xylenes detected in 1986 would attenuate no faster than the current TPHg and MTBE concentrations. We deemed this to be conservative because benzene, toluene and xylenes attenuation rates are typically far higher than MTBE attenuation rates. Regardless of the attenuation rate, it is apparent that current hydrocarbon concentrations are attenuating and that the processes by which these hydrocarbons are attenuating are likely to have occurred in the past as well. Therefore, the 220 ug/l benzene detected in 1986 is likely to be appreciably lower 17 years later. The TPHg concentration half-life calculated in our October 1, 2003 letter was 58 days in well MW-3, 90 days in well MW-2 and 267 days in well MW-1 based on the recent release. It is reasonable to assume that the more degradable benzene, toluene and xylenes detected in 1986 would degrade at a similar rate.

Additional Comments

The ACEH letter insinuates that there may be non-aqueous-phase liquid hydrocarbons (NAPL) in the subsurface from the pre-1986 release. However, there is no evidence of NAPL in the 1986 soil data (no hydrocarbons were detected) or in the groundwater data (maximum concentrations of 220 ug/l benzene, 390 ug/l toluene and 680 ug/l xylenes). Therefore, there is no evidence of NAPL from pre-1986 releases. We concur that there is evidence of NAPL from the more recent releases (e.g. sheens observed in wells, elevated hydrocarbon concentrations in groundwater).

CAMBRIA

Conclusions

The ACEH letter presented several arguments that point to the need for additional investigation at the site. We agree that additional investigation, and likely remediation, is required at the site. However, this need is driven by the presence of a high concentration oxygenated fuels release that occurred as a result of operations many years after Texaco's tenure at the site.

The ACEH states that based on their evaluation there is insufficient evidence to close the case on the pre-1986 fuels release. However, that was not question that the SWRCB requested be addressed. The SWRCB requested that the ACEH address whether the hydrocarbons detected in 1986 contribute to the need for remediation at the site. None of the arguments presented by the ACEH point to the need for remediation based on the 1986 data. In fact, comparing the concentrations detected in 1986 to current ESLs indicates that the concentrations detected in 1986 did not pose a risk to human health in 1986; and with natural attenuation, concentrations from the pre-1986 release would likely be near or below detection levels today. Therefore, there is no evidence that any remediation would be required at the site were it not for the more recent release of oxygenated fuels. In addition, none of the data collected in the 1986 investigation would preclude case closure were it not for the recent oxygenated fuels release.

We recommend once again that ChevronTexaco petition the SWRCB to review the ACEH's recent decision re-designating ChevronTexaco and the Calleri's as secondary RPs at the site. The secondary RP status assigned ChevronTexaco by the ACEH results in significant current and future liability that is unwarranted given the low concentrations of hydrocarbons detected in the groundwater attributable to pre-1986 site use.

Please contact me at (510) 420-3301 if you have any questions or comments.

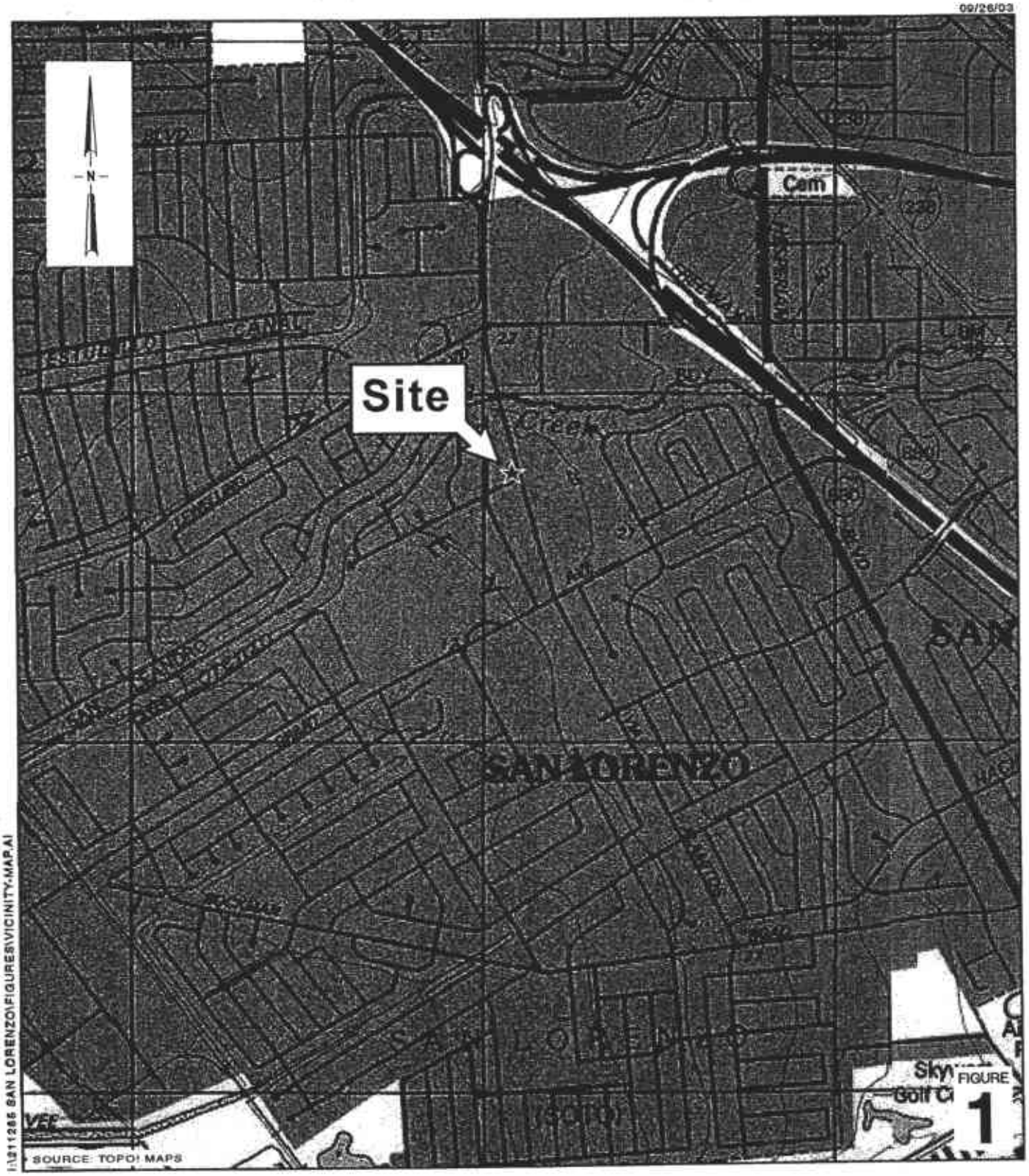
Sincerely,
Cambria Environmental Technology, Inc.

N. Scott MacLeod, RG
Principal Geologist

Attachments: A – Site Maps
B – Soil and Groundwater Analytical Data
C – ESL Table E-1a

I:\211285 San Lorenzo\Letter Responding to ACEH Technical Comments.doc

09/26/03



I:\211285 SAN LORENZO\FIGURES\VICINITY-MAP.AI

FIGURE 1

0 1/8 1/4 1/2 1

SCALE : 1" = 1/4 MILE

Chevron Service Station 211285

15595 Washington Avenue

San Lorenzo, California

CAMBRIA

Vicinity Map

CAMBRIA

ATTACMHENT A

Site Maps

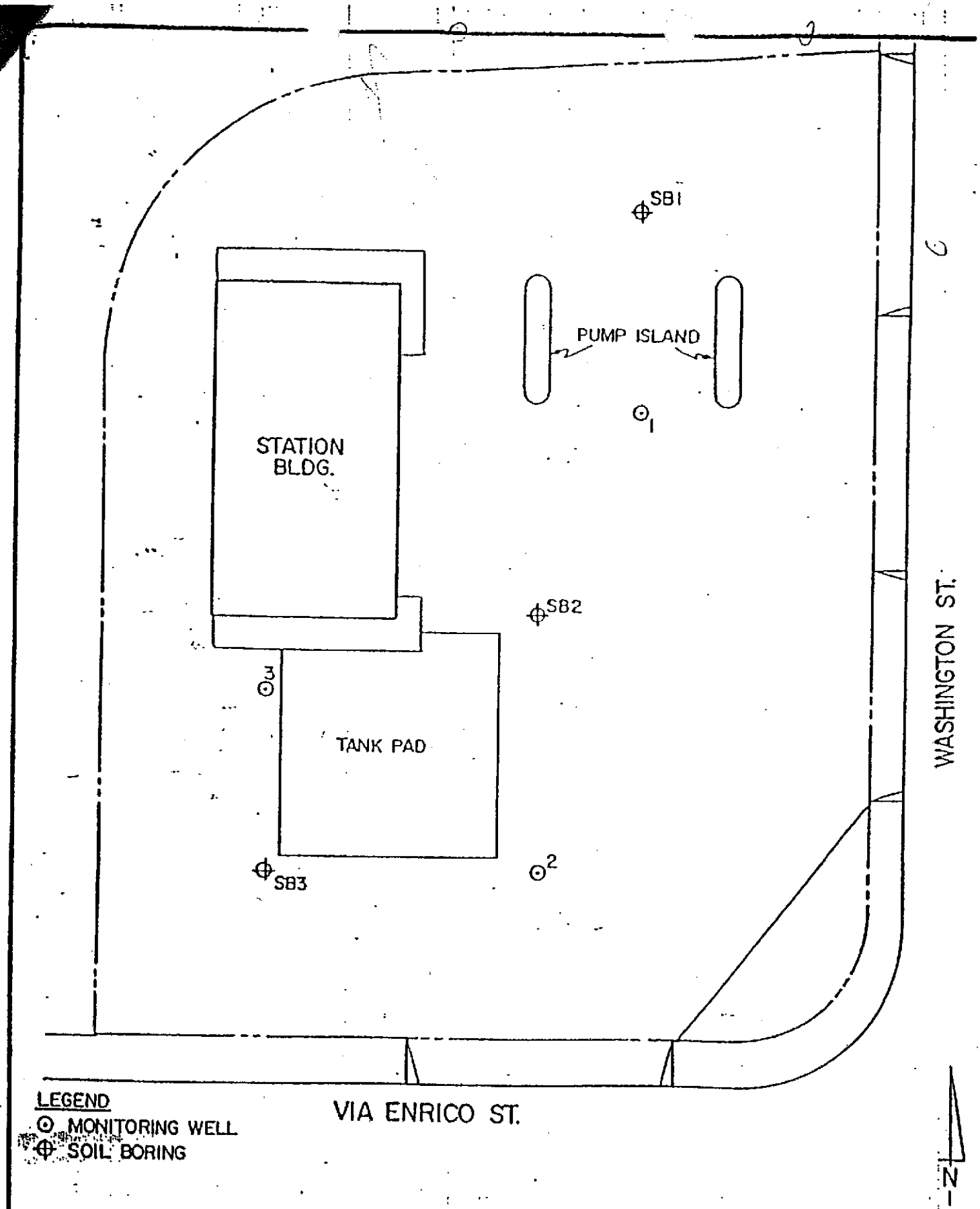


FIGURE 2
SITE PLAN

TEXACO USA
SAN LORENZO, CALIFORNIA

GROUNDWA
TECHNOLO

BROWN AND CALDWELL

ANALYTICAL LABORATORIES

RECEIVED
SEP 2 1986
Acct'd.

LOG NO: E86-08-202

Received: 11 AUG 86
Reported: 28 AUG 86

Ms. Amy Sager
Groundwater Technology
4080 Pike Lane, Suite D
Concord, California 94520

Purchase Order: 464

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION , SOIL SAMPLES	DATE SAMPLED
08-202-1	MW-1 Composite	08 AUG 86
08-202-2	MW-2 Composite	08 AUG 86
08-202-3	MW-3 Composite	08 AUG 86
08-202-4	SB-1 Composite	08 AUG 86
08-202-5	SB-2 Composite	08 AUG 86

PARAMETER	08-202-1	08-202-2	08-202-3	08-202-4	08-202-5
Lead, mg/kg	12	12	18	14	20
Nitric Acid Digestion, Date	08.18.86	08.18.86	08.18.86	08.18.86	08.18.86
Benzene,Toluene,Xylene Isomers					
Benzene, mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene, mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Total Xylene Isomers, mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
Total Fuel Hydrocarbons, mg/kg	<10	<10	<10	<10	<10

BROWN AND CALDWELL

ANALYTICAL LABORATORIES

LOG NO: E86-08-202

Received: 11 AUG 86
Reported: 28 AUG 86

Ms. Amy Sager
Groundwater Technology
4080 Pike Lane, Suite D
Concord, California 94520

Purchase Order: 464

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION , SOIL SAMPLES	DATE SAMPLED
08-202-6	SB-3 Composite	08 AUG 86

PARAMETER	08-202-6
Lead, mg/kg	12
Nitric Acid Digestion, Date	08.18.86
Benzene,Toluene,Xylene Isomers	
Benzene, mg/kg	<0.5
Toluene, mg/kg	<0.5
Total Xylene Isomers, mg/kg	<1.0
Total Fuel Hydrocarbons, mg/kg	<10

BROWN AND CALDWELL

ANALYTICAL LABORATORIES

LOG NO: E86-08-202

Received: 11 AUG 86
Reported: 28 AUG 86

Ms. Amy Sager
Groundwater Technology
4080 Pike Lane, Suite D
Concord, California 94520

Purchase Order: 464

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION , GROUND WATER SAMPLES	DATE SAMPLED
08-202-7	MW-1	08 AUG 86
08-202-8	MW-2	08 AUG 86
08-202-9	MW-3	08 AUG 86
08-202-10	SB-1	08 AUG 86
08-202-11	SB-2	08 AUG 86

PARAMETER	08-202-7	08-202-8	08-202-9	08-202-10	08-202-11
Benzene,Toluene,Xylene Isomers					
Benzene, mg/L	<0.05	<0.05	<0.05	0.22	<0.05
Toluene, mg/L	<0.05	<0.05	<0.05	0.39	<0.05
Total Xylene Isomers, mg/L	0.082	<0.05	<0.05	0.68	<0.05

BROWN AND CALDWELL BC
ANALYTICAL LABORATORIES

LOG NO: E86-08-202

Received: 11 AUG 86
Reported: 28 AUG 86

Ms. Amy Sager
Groundwater Technology
4080 Pike Lane, Suite D
Concord, California 94520

Purchase Order: 464

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION , GROUND WATER SAMPLES	DATE SAMPLED
08-202-12	SB-3	08 AUG 86

PARAMETER	08-202-12
Benzene,Toluene,Xylene Isomers	
Benzene, mg/L	<0.05
Toluene, mg/L	<0.05
Total Xylene Isomers, mg/L	<0.05

Linda Brack FOR
D. A. McLean, Laboratory Director

CAMBRIA

ATTACHMENT B

Soil and Groundwater Analytical Data

CAMBRIA

ATTACHMENT C

ESL Table E-1a

TABLE E-1a. GROUNDWATER SCREENING LEVELS FOR EVALUATION OF POTENTIAL INDOOR-AIR IMPACTS (volatile chemicals only)

CHEMICAL PARAMETER	Physical State		[1] Residential Land Use		Commercial/Industrial Land Use	
			Vadose-Zone Soil Type		Vadose-Zone Soil Type	
			[2] High Permeability	[3] Low/Moderate Permeability	[2] High Permeability	[3] Low/Moderate Permeability
			(ug/L)	(ug/L)	(ug/L)	(ug/L)
#ACENAPHTHENE	V	S	4.2E+03	4.2E+03	4.2E+03	4.2E+03
ACENAPHTHYLENE	V	S	(NV: Use soil gas)	(NV: Use soil gas)	(NV: Use soil gas)	(NV: Use soil gas)
#ACETONE	V	L	6.0E+06	7.9E+06	1.6E+07	2.2E+07
ALDRIN	NV	S				
#ANTHRACENE	V	S	4.3E+01	4.3E+01	4.3E+01	4.3E+01
ANTIMONY	NV	S				
ARSENIC	NV	S				
BARIUM	NV	S				
#BENZENE	V	L	5.3E+02	1.9E+03	1.6E+03	6.4E+03
BENZO(a)ANTHRACENE	NV	S				
BENZO(b)FLUORANTHENE	NV	S				
BENZO(k)FLUORANTHENE	NV	S				
BENZO(g,h,i)PERYLENE	NV	S				
BENZO(a)PYRENE	NV	S				
BERYLLIUM	NV	S				
BIPHENYL, 1,1-	V	S	(NV: Use soil gas)	(NV: Use soil gas)	(NV: Use soil gas)	(NV: Use soil gas)
BIS(2-CHLOROETHYL)ETHER	V	L	8.3E+01	8.3E+01	2.1E+02	2.8E+02
BIS(2-CHLOROISOPROPYL)ETHER	V	L	(NV: Use soil gas)	(NV: Use soil gas)	(NV: Use soil gas)	(NV: Use soil gas)
BIS(2-ETHYLHEXYL)PHTHALATE	NV	S				
BORON	NV	S				
BROMODICHLOROMETHANE	V	L	1.6E+02	3.1E+02	5.4E+02	1.0E+03
BROMOFORM	NV	S				
BROMOMETHANE	V	G	5.8E+02	2.0E+03	1.6E+03	5.7E+03
CADMIUM	NV	S				
CARBON TETRACHLORIDE	V	L	9.5E+00	4.0E+01	3.2E+01	1.4E+02
CHLORDANE	NV	S				
CHLOROANILINE, p-	NV	S				
CHLOROBENZENE	V	L	1.3E+04	4.3E+04	3.8E+04	1.2E+05
CHLOROETHANE	V	G	8.2E+02	3.3E+03	2.7E+03	1.1E+04
CHLOROFORM	V	L	3.4E+02	1.2E+03	1.1E+03	3.9E+03
CHLOROMETHANE	V	G	1.7E+02	7.5E+02	5.8E+02	2.5E+03
CHLOROPHENOL, 2-	V	L	5.5E+03	1.6E+04	1.5E+04	4.6E+04
CHROMIUM (Total)	NV	S				
CHROMIUM III	NV	S				
CHROMIUM VI	NV	S				
CHRYSENE	NV	S				
COBALT	NV	S				
COPPER	NV	S				

TABLE E-1a. GROUNDWATER SCREENING LEVELS FOR EVALUATION OF POTENTIAL INDOOR-AIR IMPACTS (volatile chemicals only)

CHEMICAL PARAMETER	Physical State		[1] Residential Land Use		Commercial/Industrial Land Use	
			Vadose-Zone Soil Type		Vadose-Zone Soil Type	
			[2] High Permeability	[3] Low/Moderate Permeability	[2] High Permeability	[3] Low/Moderate Permeability
			(ug/L)	(ug/L)	(ug/L)	(ug/L)
CYANIDE (Free)	NV	S				
DIBENZO(a,h)ANTHTRACENE	NV	S				
DIBROMOCHLOROMETHANE	V	S	1.8E+02	4.2E+02	6.1E+02	1.4E+03
1,2-DIBROMO-3-CHLOROPROPANE	V	L	(NV: Use soil gas)	(NV: Use soil gas)	(NV: Use soil gas)	(NV: Use soil gas)
DIBROMOETHANE, 1,2-	V	S	1.6E+02	2.6E+02	5.5E+02	8.6E+02
DICHLOROBENZENE, 1,2-	V	L	7.8E+04	1.6E+05	1.6E+05	1.6E+05
DICHLOROBENZENE, 1,3-	V	L	(NV: Use soil gas)	(NV: Use soil gas)	(NV: Use soil gas)	(NV: Use soil gas)
DICHLOROBENZENE, 1,4-	V	S	3.5E+02	1.0E+03	1.2E+03	3.4E+03
DICHLOROBENZIDINE, 3,3-	NV	S				
DICHLORODIPHENYLDICHLOROETHANE (DDD)	NV	S				
DICHLORODIPHENYLDICHLOROETHYLENE (DDE)	NV	S				
DICHLORODIPHENYLTRICHLOROETHANE (DDT)	NV	S				
DICHLOROETHANE, 1,1-	V	L	1.0E+03	3.6E+03	3.5E+03	1.2E+04
DICHLOROETHANE, 1,2-	V	L	2.0E+02	5.1E+02	6.9E+02	1.7E+03
DICHLOROETHYLENE, 1,1-	V	L	6.3E+03	2.7E+04	1.8E+04	7.5E+04
DICHLOROETHYLENE, Cis 1,2-	V	L	6.2E+03	2.0E+04	1.7E+04	5.5E+04
DICHLOROETHYLENE, Trans 1,2-	V	L	6.7E+03	2.5E+04	1.9E+04	6.9E+04
DICHLOROPHENOL, 2,4-	NV	S				
DICHLOROPROPANE, 1,2-	V	L	2.9E+02	8.9E+02	9.6E+02	3.0E+03
DICHLOROPROPENE, 1,3-	V	L	4.9E+01	2.0E+02	1.7E+02	6.6E+02
DIELDRIN	NV	S				
DIETHYLPHTHALATE	NV	S				
DIMETHYLPHTHALATE	NV	S				
#DIMETHYLPHENOL, 2,4-	V	S	2.8E+06	4.1E+06	8.0E+06	1.1E+07
DINITROPHENOL, 2,4-	NV	S				
DINITROTOLUENE, 2,4-	NV	S				
1,4 DIOXANE	NV	L				
DIOXIN (2,3,7,8-TCDD)	NV	S				
ENDOSULFAN	NV	S				
ENDRIN	NV	S				
#ETHYLBENZENE	V	L	1.4E+04	5.2E+04	4.7E+04	1.8E+05
FLUORANTHENE	NV	S				
#FLUORENE	V	S	1.9E+03	1.9E+03	1.9E+03	1.9E+03
HEPTACHLOR	NV	S				
HEPTACHLOR EPOXIDE	NV	S				
HEXACHLOROBENZENE	NV	S				
HEXACHLOROBUTADIENE	NV	S				
HEXACHLOROCYCLOHEXANE (gamma) LINDANE	NV	S				

TABLE E-1a. GROUNDWATER SCREENING LEVELS FOR EVALUATION OF POTENTIAL INDOOR-AIR IMPACTS (volatile chemicals only)

CHEMICAL PARAMETER	Physical State		[3]Residential Land Use		Commercial/Industrial Land Use	
			Vadose-Zone Soil Type		Vadose-Zone Soil Type	
			[4]High Permeability	[5]Low/Moderate Permeability	[4]High Permeability	[5]Low/Moderate Permeability
			(ug/L)	(ug/L)	(ug/L)	(ug/L)
HEXACHLOROETHANE	NV	S				
INDENO(1,2,3-cd)PYRENE	NV	S				
LEAD	NV	S				
MERCURY	NV	S				
METHOXYCHLOR	NV	S				
METHYLENE CHLORIDE	V	L	2.4E+03	7.2E+03	8.1E+03	2.4E+04
#METHYL ETHYL KETONE	V	L	5.5E+07	1.2E+08	1.5E+08	3.3E+08
#METHYL ISOBUTYL KETONE	V	L	3.1E+06	4.3E+06	8.7E+06	1.2E+07
METHYL MERCURY	NV	S				
#METHYLNAPHTHALENE (total 1- & 2-)	V	S	2.6E+04	2.6E+04	2.6E+04	2.6E+04
METHYL TERT BUTYL ETHER	V	L	2.4E+04	4.8E+04	8.0E+04	1.6E+05
MOLYBDENUM	NV	S				
#NAPHTHALENE	V	S	2.8E+04	3.1E+04	3.1E+04	3.1E+04
NICKEL	NV	S				
PENTACHLOROPHENOL	NV	S				
PERCHLORATE	NV	S				
PHENANTHRENE	V	S	(NV: Use soil gas)	(NV: Use soil gas)	(NV: Use soil gas)	(NV: Use soil gas)
PHENOL	NV	S				
POLYCHLORINATED BIPHENYLS (PCBs)	NV	S				
#PYRENE	V	S	1.4E+02	1.4E+02	1.4E+02	1.4E+02
SELENIUM	NV	S				
SILVER	NV	S				
#STYRENE	V	L	3.1E+05	3.1E+05	3.1E+05	3.1E+05
tert-BUTYL ALCOHOL			(NV: Use soil gas)	(NV: Use soil gas)	(NV: Use soil gas)	(NV: Use soil gas)
TETRACHLOROETHANE, 1,1,1,2-	V	L	(NV: Use soil gas)	(NV: Use soil gas)	(NV: Use soil gas)	(NV: Use soil gas)
TETRACHLOROETHANE, 1,1,2,2-	V	L	1.9E+02	3.1E+02	6.3E+02	1.0E+03
TETRACHLOROETHYLENE	V	L	1.3E+02	5.2E+02	4.3E+02	1.7E+03
THALLIUM	NV	S				
#TOLUENE	V	L	5.0E+05	5.3E+05	5.3E+05	5.3E+05
TOXAPHENE	NV	S				
TPH (gasolines)	V	L	(NV: Use soil gas)	(NV: Use soil gas)	(NV: Use soil gas)	(NV: Use soil gas)
TPH (middle distillates)	V	L	(NV: Use soil gas)	(NV: Use soil gas)	(NV: Use soil gas)	(NV: Use soil gas)
TPH (residual fuels)	NV	L/S				
TRICHLOROBENZENE, 1,2,4-	V	L	1.5E+05	2.6E+05	3.0E+05	3.0E+05
TRICHLOROETHANE, 1,1,1-	V	L	1.3E+05	5.2E+05	3.6E+05	1.3E+06
TRICHLOROETHANE, 1,1,2-	V	L	3.5E+02	8.0E+02	1.2E+03	2.7E+03
TRICHLOROETHYLENE	V	L	5.3E+02	2.1E+03	1.8E+03	6.9E+03
TRICHLOROPHENOL, 2,4,5-	V	S	8.2E+05	8.2E+05	1.2E+06	1.2E+06

TABLE E-1a. GROUNDWATER SCREENING LEVELS FOR EVALUATION OF POTENTIAL INDOOR-AIR IMPACTS (volatile chemicals only)

CHEMICAL PARAMETER	Physical State		[1] Residential Land Use		Commercial/Industrial Land Use	
			Vadose-Zone Soil Type		Vadose-Zone Soil Type	
			[2] High Permeability (ug/L)	[3] Low/Moderate Permeability (ug/L)	[2] High Permeability (ug/L)	[3] Low/Moderate Permeability (ug/L)
TRICHLOROPHENOL, 2,4,6-	NV	S				
VANADIUM	NV	S				
VINYL CHLORIDE	V	G	4.0E+00	1.7E+01	1.3E+01	5.7E+01
#XYLENES	V	L	1.5E+05	1.6E+05	1.6E+05	1.6E+05
ZINC	NV	S				

Notes:

1. "Residential" screening levels generally considered adequate for other sensitive uses (e.g., day-care centers, hospitals, etc.).
2. High permeability soil model: One meter dry sandy soil (92% sand, 5% silt, 3% clay) over one meter moist clayey loam (33% sand, 34% silt, 33% clay).
3. Low/Moderate permeability soil model: One meter dry loamy sand (83% sand, 11% silt, 6% clay) over one meter moist silt (7% sand, 87% silt, 6% clay).
4. For inclusion in Tier 1 screening levels, all groundwater assumed to potentially migrate under a residential area. Screening levels for protection of indoor air under a residential exposure scenario carried forward for use at both residential and commercial/industrial sites (see Table F series).

Screening levels calculated using spreadsheet provided with *User's Guide for the Johnson and Ettinger Indoor Air model (1991) for Subsurface Vapor Intrusion into Buildings* (USEPA 2001). Assumed vadose-zone thickness/depth to groundwater three meters. See Appendix 1 text for model details.
Physical state of chemical at ambient conditions (V - volatile, NV - nonvolatile, S -id, L - liquid, G - gas).
Chemical considered to be "volatile" if Henry's number (atm m3/mole) >0.00001 and molecular weight <200.
Dibromochloromethane, dibromochloropropane and pyrene considered volatile for purposes of modeling (USEPA 2002).
Target cancer risk = 1E-06, Target Hazard Quotient = 0.2
"#": Nonchlorinated VOCs (except MTBE) adjusted upwards by factor of ten to account for assumed biodegradation in vadose-zone prior to emision at surface.
NV: No value. Use soil gas data to evaluate potential indoor-air impact concerns.