



VAC

ENVIRONMENTAL PROTECTION

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August 20, 1997

Ms. Madhulla Logan
Alameda County Health Care Services
Department of Environmental Health
1131 Harbor Way Parkway, Suite 250
Alameda, CA 94502-6577

Most Recent RA

FINAL UPDATE

Subject: Risk Assessment & Threshold Limits
Former Chevron Service Station #9-4587
609 Oak Street
Oakland, CA

Dear Ms. Logan:

As per your request, and to clarify the information regarding the hand augered soil samples and resultant risk model, I am forwarding the following:

- 1) A revised soil sample table, with the addition of the results of the hand augered samples;
- 2) GSI-RBCA printouts for inhalation risk from benzene residual in subsurface soil, using the sample results included. The 1987 composite sample has been excluded and the four hand augered samples have been used with the three other vadose zone samples. The GSI software gives the option of utilizing the maximum concentration, the mean or the upper confidence limit mean of the sample set, but does not calculate the actual average. The representative concentration in the soil, shown as 0.27 mg/kg benzene, differs significantly from the average of 3.6 mg/kg. Both values, though, are below the 4.1 mg/kg SSTL derived to keep from exceeding a 10^{-5} risk.

given in Table 1 (150 ppm)

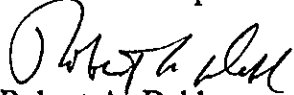
- 3) The GSI printout for site-specific parameters utilized for SSTL derivation. Modifications include the porosity value of 0.31 (as determined by PTS Laboratories on a sample from five feet below grade at DVE-3), building volume to area ratio of 450 for a typical commercial unit of 14 foot height and 8 foot drop ceilings, a building air exchange rate of two exchanges per hour (as per the Uniform Building Code), a reduction of the crack fraction to 0.005, and an exposure duration of 5.7 years for commercial (based on 8 hour workdays, 50 weeks per year over 25 years).



Utilizing this site specific data, the management plan threshold limits can be revised upward. Even with the more conservative risk basis of 10^{-6} for groundwater, an average of 720 ppb benzene (the SSTL calculated with the GSI software) in groundwater samples from the listed onsite wells of C-1, C-2 and CR-1 would require notification to Alameda County, resampling and, if initial results are confirmed, a reevaluation of site conditions and further activities.

If you have any questions or comments, please call me at (510) 351-8900.

Sincerely,
Terra Vac Corporation


Robert A. Dahl
Project Manager

cc: Phil Briggs, Chevron
30-0219.10

Table 1
Soil Sample Results, mg/kg
Chevron 9-4587, Oakland

Boring	Depth	Date	TPH-g	Benzene	Toluene	Ethylbenzene	Xylenes
87087T3#2&3	7	3/27/87	1300	150	430	na	270
C-4	10.5	9/19/90	<1	<0.05	<0.05	<0.05	<0.05
C-4	15.5	9/19/90	<1	<0.05	<0.05	<0.05	<0.05
C-5	10.5	9/19/90	<1	<0.05	<0.05	<0.05	<0.05
C-5	15.5	9/19/90	<1	<0.05	<0.05	<0.05	<0.05
C-6	9	9/19/90	<1	<0.05	<0.05	<0.05	<0.05
C-6	15	9/19/90	<1	<0.05	<0.05	<0.05	<0.05
*CR-1	5	9/19/90	<1	<0.05	<0.05	<0.05	<0.05
CR-1	10	9/19/90	<1	<0.05	<0.05	<0.05	<0.05
CR-1	15	9/19/90	<1	0.26	<0.05	<0.05	<0.05
C-7	9.5	1991	<1	<0.05	<0.05	<0.05	<0.05
C-7	15	1991	<1	<0.05	0.01	<0.05	<0.05
<i>Tank pull</i>							
SE	11.5	10/17/94	600	3.6	11	9	37
SW	9	10/17/94	18	0.093	0.16	0.36	1.2
ES	10	10/17/94	42	0.24	0.22	0.32	1.6
EN	11	10/17/94	2	0.27	0.12	0.023	0.12
NE	10.5	10/17/94	3700	27	200	69	400
NW	10.5	10/17/94	5	0.52	0.16	0.091	0.44
WN	10.5	10/17/94	40	0.2	0.12	0.8	2.4
P-1	3	10/17/94	1400	5	82	30	220
P-2	2.5	10/17/94	260	0.26	3	1.7	16
P-3	2.5	10/17/94	380	<0.1	15	5.9	39
P-4	2.5	10/17/94	410	0.36	4.4	2.3	33
P-5	2.5	10/17/94	<1	<0.005	<0.005	<0.005	<0.005
P-6	3	10/17/94	29	0.021	0.042	0.091	0.16
DVE-1	10.3	7/12/95	<1	0.31	0.098	0.025	0.12
DVE-2	14	7/11/95	7.6	1	0.032	0.43	1.3
DVE-3	10.2	7/10/95	<1	0.13	0.071	0.021	0.082
DVE-4	10.1	7/11/95	2.8	0.24	<0.005	0.1	0.16
DVE-5	18.8	7/11/95	5.6	0.045	0.055	0.26	1.3
DVSP1	15.5	7/11/95	8.5	4.2	<0.005	0.1	0.16
DVSP2	10.5	7/11/95	<1	0.066	<0.005	0.0096	<0.005
DVSP3	15.5	7/10/95	<1	0.012	0.0082	0.0074	0.045
*DVSP4	5.5	7/10/95	<1	<0.005	<0.005	<0.005	<0.005
DVSP5	10.5	7/12/95	700	15	8.3	25	140
SP6	9.7	12/20/95	11,000	160	1,300	300	1,600
SP6	14.7	12/20/95	4.4	0.81	0.22	0.24	0.56
*SP7	4.7	12/20/95	<1	<0.005	<0.005	<0.005	<0.005
SP7	9.3	12/20/95	1.2	<0.005	0.038	0.009	0.032
SP7	14.3	12/20/95	3.1	1.2	0.068	0.19	0.18
SP7	19.3	12/20/95	<1	<0.005	0.0086	<0.005	0.067
SP7	24.3	12/20/95	<1	<0.005	<0.005	<0.005	<0.005
*HA1-5	5	6/12/97	<1	<0.005	<0.005	<0.005	<0.005
*HA1-7	7	6/12/97	<1	<0.005	<0.005	<0.005	<0.005
*HA2-5	5	6/12/97	2800	23	210	60	330
*HA3-7	7	6/12/97	310	2.1	21	7.5	52

RBCA TIER 1/TIER 2 EVALUATION

Output Table 1

Site Name: Chevron 9-4587
Site Location: Oak Street, Oakland

Job Identification: 30-0219
Date Completed: 8/2/97
Completed By: R.A. Dahl

Software: GSI RBCA Spreadsheet
Version: v 1 0

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

DEFAULT PARAMETERS

Exposure Parameter	Definition (Units)	Residential		Commercial/Industrial		
		Adult	(1-6yrs)	(1-16 yrs)	Chronic	Constrctn
ATc	Averaging time for carcinogens (yr)	70				
ATn	Averaging time for non-carcinogens (yr)	30	6	16	25	1
BW	Body Weight (kg)	70	15	35	70	
ED	Exposure Duration (yr)	30	6	16	<u>5.7</u>	1
EF	Exposure Frequency (days/yr)	350			250	180
EF.Derm	Exposure Frequency for dermal exposure	350			250	
IRgw	Ingestion Rate of Water (l/day)	2			1	
IRs	Ingestion Rate of Soil (mg/day)	100	200		50	100
IRadj	Adjusted soil ing. rate (mg-yr/kg-d)	1.1E+02			8.0E+01	
IRa.in	Inhalation rate indoor (m ³ /day)	15			20	
IRa.out	Inhalation rate outdoor (m ³ /day)	20			20	10
SA	Skin surface area (dermal) (cm ²)	5.8E+03		2.0E+03	5.8E+03	5.8E+03
SAadj	Adjusted dermal area (cm ² -yr/kg)	2.1E+03			7.1E+01	
M	Soil to Skin adherence factor	1				
AAF.s	Age adjustment on soil ingestion	FALSE			FALSE	
AAF.d	Age adjustment on skin surface area	FALSE			FALSE	
tox	Use EPA tox data for air (or PEL based)	TRUE				
gwMCL?	Use MCL as exposure limit in groundwater?	TRUE				

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

Matrix of Receptor Distance and Location on- or off-site	Residential		Commercial/Industrial	
	Distance	On-Site	Distance	On-Site
GW	Groundwater receptor (cm)	3.0E+04	FALSE	3.0E+04
S	Inhalation receptor (cm)		FALSE	TRUE

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

Surface Parameters	Definition (Units)	Residential		Commercial/Industrial	
		Chronic	Construction	Chronic	Construction
t	Exposure duration (yr)	30		5.7	1
A	Contaminated soil area (cm ²)	<u>1.9E+06</u>			1.0E+06
W	Length of affected soil parallel to wind (cm)	<u>1.2E+03</u>			1.0E+03
W.gw	Length of affected soil parallel to groundwater (cm)	<u>1.4E+03</u>			
Uair	Ambient air velocity in mixing zone (cm/s)	2.3E+02			
delta	Air mixing zone height (cm)	2.0E+02			
Ls	Definition of surficial soils (cm)	<u>9.1E+01</u>			
Pe	Particulate areal emission rate (g/cm ² /s)	2.2E-10			

Groundwater Parameters	Definition (Units)	Value
delta.gw	Groundwater mixing zone depth (cm)	2.0E+02
I	Groundwater infiltration rate (cm/yr)	3.0E+01
Ugw	Groundwater Darcy velocity (cm/yr)	2.5E+03
Ugw.tr	Groundwater Transport velocity (cm/yr)	6.6E+03
Ks	Saturated Hydraulic Conductivity (cm/s)	
grad	Groundwater Gradient (cm/cm)	
Sw	Width of groundwater source zone (cm)	1.8E+03
Sd	Depth of groundwater source zone (cm)	3.0E+02
BC	Biodegradation Capacity (mg/L)	
BIO?	Is Bioattenuation Considered	TRUE
phi.eff	Effective Porosity in Water-Bearing Unit	3.8E-01
foc.sat	Fraction organic carbon in water-bearing unit	1.0E-03

Soil Parameters	Definition (Units)	Value
hc	Capillary zone thickness (cm)	<u>3.0E+00</u>
hv	Vadose zone thickness (cm)	<u>2.6E+02</u>
rho	Soil density (g/cm ³)	1.8
foc	Fraction of organic carbon in vadose zone	<u>0.02</u>
phi	Soil porosity in vadose zone	<u>0.31</u>
Lgw	Depth to groundwater (cm)	<u>2.6E+02</u>
Ls	Depth to top of affected soil (cm)	<u>7.6E+01</u>
Lsubs	Thickness of affected subsurface soils (cm)	<u>1.8E+02</u>
pH	Soil/groundwater pH	6.5
phi.w	Volumetric water content	<u>0.29</u>
phi.a	Volumetric air content	<u>0.02</u>

Building Parameters	Definition (Units)	Residential			Commercial		
		Chronic	Construction	Foundation	Chronic	Construction	Foundation
Lb	Building volume/area ratio (cm)	2.0E+02			<u>4.5E+02</u>		
ER	Building air exchange rate (s ⁻¹)	1.4E-04			<u>5.6E-04</u>		
Lcrk	Foundation crack thickness (cm)	1.5E+01					
eta	Foundation crack fraction	<u>0.005</u>					

Dispersive Transport Parameters	Definition (Units)	Residential		Commercial	
		Chronic	Construction	Chronic	Construction
Groundwater					
ax	Longitudinal dispersion coefficient (cm)	3.0E+03			
ay	Transverse dispersion coefficient (cm)	1.0E+03			
az	Vertical dispersion coefficient (cm)	1.5E+02			
Vapor					
dcy	Transverse dispersion coefficient (cm)				
dcz	Vertical dispersion coefficient (cm)				

RBCA SITE ASSESSMENT

Tier 2 Worksheet 9.2

Site Name: Chevron 9-4587
 Site Location: Oak Street, Oakland

Completed By: R.A. Dahl
 Date Completed: 8/2/1997

1 OF 1

**SUBSURFACE SOIL SSTL VALUES
 (> 3 FT BGS)**

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

MCL exposure limit?
 PEL exposure limit?

Calculation Option: 2

SSTL Results For Complete Exposure Pathways ("X" if Complete)

CONSTITUENTS OF CONCERN		Representative Concentration (mg/kg)	Soil Leaching to Groundwater			Soil Volatilization to Indoor Air		Soil Volatilization to Outdoor Air		Applicable SSTL (mg/kg)	SSTL Exceeded? "■" if yes	Required CRF Only if "yes" left
			Residential: (on-site)	Commercial: (on-site)	Regulatory(MCL): (on-site)	Residential: (on-site)	Commercial: (on-site)	Residential: (on-site)	Commercial: (on-site)			
71-43-2	Benzene	2.7E-1	NA	NA	NA	NA	4.1E+0	NA	1.3E+2	4.1E+0	<input type="checkbox"/>	<1

4.1 ppm Benzene

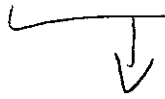
UCL Percentile

90% (must be 0.9 or 0.95)

Analytical Data (Up to 50 Data Points)

	1	2	3	4	5	6	7	8	9
	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Sample Name	VSP-7-4	DVSP-4	CR-1	na1-5	na1-7	na2-5	na2-7		
Date Sampled	12/20/95	7/10/95	9/10/90	6/12/97	6/12/97	6/12/97	6/12/97		
	0.0025	0.0025	0.025	0.0025	0.0025	23	21		

Above 2 feet



Soil samples averaged to get 3.6 ppm.

Choose UCL Percentile

90% (must be 0.9 or 0.95)

Analytical Data (Up to 50 Data Points)

	1	2	3	4	5	6	7	8	9
	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Well Name	c1	c1	c1	c2	c2	cr1	cr1	cr1	cr1
Date Sampled	9/13/96	3/26/96	12/19/96	9/13/96	12/19/96	3/26/96	6/10/96	9/13/96	12/19/96
	0.00085	0.022	0.00025	0.00025	0.00025	0.0026	0.038	0.0011	0.00086

30-0219

Groundwater samples

Table 2
Management Plan Threshold Limits
Former Chevron Station 9-4587
609 Oak Street
Oakland, CA

Well ID	Benzene Concentration Highest Observed (ppb)	Benzene Concentration 12/19/96 (ppb)	Benzene Concentration Threshold Limit (ppb)
C-1	11,000	<0.5	*720
C-2	8,200	<0.5	*720
C-5	330	4.2	100
CR-1	9400	0.9	*720
			*as average for onsite

✓

off site

RBCA SITE ASSESSMENT

Tier 2 Worksheet 9.3

Site Name: Chevron 9-4587
 Site Location: Oak Street, Oakland

Completed By: R.A. Dahl
 Date Completed: 8/2/1997

1 OF 1

GROUNDWATER SSTL VALUES

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

MCL exposure limit?
 PEL exposure limit?

Calculation Option: 2

SSTL Results For Complete Exposure Pathways ("X" if Complete)

CONSTITUENTS OF CONCERN		Representative Concentration	Groundwater Ingestion			Groundwater Volatilization to Indoor Air		Groundwater Volatilization to Outdoor Air		Applicable SSTL	SSTL Exceeded ?	Required CRF
CAS No.	Name	(mg/L)	Residential: 1000 feet	Commercial: (on-site)	Regulatory(MCL): 1000 feet	Residential: (on-site)	Commercial: (on-site)	Residential (on-site)	Commercial: (on-site)	(mg/L)	<input checked="" type="checkbox"/> "If yes"	Only if "yes" left
71-43-2	Benzene	3.5E-3	>Sol	NA	>Sol	NA	7.2E+0	NA	3.6E+2	7.2E+0	<input type="checkbox"/>	<1

Table 2
Management Plan Threshold Limits
Former Chevron Station 9-4587
609 Oak Street
Oakland, CA

Well ID	Benzene Concentration Highest Observed (ppb)	Benzene Concentration 12/19/96 (ppb)	Benzene Concentration Threshold Limit (ppb)
C-1	11,000	<0.5	*720
C-2	8,200	<0.5	*720
C-5	330	4.2	100
CR-1	9400	0.9	*720
			*as average for onsite