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Environmental & Occupational Health Services
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July 17, 2001

Michael Brown
Brown and Sullivan
1150 Marina Village Pkwy
Suite 102
Alameda, CA 94501
Fax (510) 521-7879

Re: Letter Amendment for
Beck Roofing Company, 21132 Meekland Avenue, Hayward, CA

Dear Mr. Brown:

Susan Hugo of the Alameda County Department of Environmental Health, called this week regarding the health risk assessment (HRA) prepared for the above referenced site last year. This letter responds to Ms. Hugo's inquiry regarding petroleum hydrocarbon compounds detected in 1999 grab groundwater samples.

According to Ms. Hugo, benzene was detected at concentrations from 110 micrograms per liter (ug/l) to 810 ug/l. The maximum detected concentration of 810 ug/l was collected from a worst case boring located within the former tank pit. It should be noted that grab groundwater analytical results are not generally considered representative of the water column, thus not as useful for predicting the risks associated with chronic exposure to contaminants volatilizing from groundwater.

As discussed in the risk assessment prepared for the subject property, volatilization of contaminants located in groundwater and the subsequent mass transport of these vapors into indoor spaces constitutes a potential inhalation exposure pathway. To evaluate the potential implications of the grab groundwater results for this pathway, the screening version of the Johnson and Ettinger Model (U.S. EPA 1998 Version 1.2) is used to calculate volatilization factor for the maximum benzene concentration. The volatilization factor (VF) relates the chemical concentration in groundwater to the indoor air concentration (exposure point concentration) of the chemical contaminant. The model is a one–dimensional analytical solution to convective and diffusive vapor transport into indoor air spaces and provides an attenuation coefficient that relates the vapor concentration in the indoor space to the vapor concentration at he source of contamination. Inputs to the model include chemical concentration in the groundwater, chemical properties of the contaminant, saturated and unsaturated soil properties, and the structural properties of the building.

Consistent with the prior HRA, exposure point calculations incorporate a depth to groundwater of 25 feet below ground surface (bgs), and a predominant soil type (diffusion path) of silty clays.

The model estimates an exposure point benzene concentration of 0.112 micrograms per cubic meter of air (ug/m3). Attached are the Data Entry Sheet and Intermediate Calculations Sheet that shows the results of the exposure point concentration calculation.

To estimate the potential risks associated with exposure to benzene at the exposure point concentration, the U.S EPA /Cal EPA inhalation exposure algorithm and the Cal EPA potency factor for benzene is used. For a residential exposure, the calculation assumes exposure for 30 years, six years as a child and 24 years as an adult. For an industrial receptor, the calculation assumes a 25-year exposure duration. The results of the risk calculations indicate that residential carcinogenic risks are approximated at 1.7×10^{-6}, and commercial risks are approximated at 7.8×10^{-7}. Risk calculation tables are attached.

Based on the model used and the assumptions incorporated therein, even for the worst-case scenario using data from the aforementioned grab water samples, risks appear to be within the acceptable range.

Please call me at (408) 292-3266 with questions.

Sincerely,

Daniel W. Hernandez, MPH, CIH
President

Attachments

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1.2
September, 1998

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
71432	810	Benzene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (°C)
15	762	SICL	15

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)	ENTER Vadose zone soil dry bulk density, ρ_b^V (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)
SICL			1.5	0.39	0.3

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	30	30	350

Used to calculate risk-based groundwater concentration.

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^v (cm^3/cm^3)	Vadose zon effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
747	0.090	0 701	2.62E-10	0.515	1.35E-10	133.93	0.39	0.001	0 389	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} ($atm \cdot m^3/mol$)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_v (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9 24E+05	4 16E-04	15	8,071	3.47E-03	1 47E-01	1 77E-04	1.99E-04	1.89E-05	7.34E-05

Diffusion path length, L_d (cm)	Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
747	15	1 19E+05	0.10	1.29E-01	1.99E-04	3.84E+02	1.03E+11	9 45E-07	1.12E-01	8.3E-06	NA

Carcinogenic Risk
Residential Inhalation

Child	IR	ABS	#/YR	ED	BW	AT	
carcinogen	10	1	350	6	6.67E-02	3.91E-05	0.054794521
non carcinogen	10	1	350	6	6.67E-02	4.57E-04	0.639269406
Adult							
carcinogen	20	1	350	24	1.43E-02	3.91E-05	0.093933464
noncarcinogen	20	1	350	24	1.43E-02	1.14E-04	0.273972603

Child Inhalation Chemical Name	air conc. mg/m3	CDI (mg/kg-day)	SF (kg-day/mg)	Risk	CDI (mg/kg-day)	RFD (mg/kg-day)	Hazard Quotient
benzene	0.000112	6.14E-06	0.1	6.14E-07	7.16E-05		

Adult Inhalation Chemical Name	air conc. mg/m3	CDI (mg/kg-day)	SF (kg-day/mg)	Risk	CDI (mg/kg-day)	RFD (mg/kg-day)	Hazard Quotient
benzene	0.000112	1.05205E-05	0.1	1.05E-06	3.06849E-05		
				1.67E-06			0