HARTCROWSER

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Earth and Environmental Technologies

December 13, 1996

Ms, Madhula Logan
Alameda County Department of Environmental Health
1131 Harbor Bay Parkway, Room 250
Alameda, CA 94502

Re: Derivation of Parameters for Risk Assessment
Grand Auto Supply
4240 East 14th Street
Oakland, California J-6077

Dear Ms. Logan:

Hart Crowser is pleased to respond to your request for additional discussion of the derivation of parameters used in the risk assessment for the Grand Auto store at 4240 East 14th Street in Oakland, California. Attached is a memorandum regarding the parameters that was prepared by our risk assessment group.

The memorandum mentions "a site west of Oakland" where soil test data was collected. The soil test data are from the publicly available *Remedial Investigation Report* for the Varian Associates, Inc. site at 611 Hansen Way in Palo Alto, California. The report is dated May 22, 1992, and was submitted to the Department of Toxic Substances Control. While this site is across the Bay from Oakland, the soils, geology, and stratigraphy are all quite similar to those at the Grand Auto site. Both sites are in the gently sloping Bay plain, approximately midway between the hills and the Bay margin. We believe that the soil test data from the Varian site provide a better approximation of actual conditions at the Grand Auto site than do the default RBCA values.

Please call me at (415) 391-1885 if you have any additional questions or need additional information.

Sincerely,

HART CROWSER, INC.

Jay A. Ach, R.G.
Senior Project Geologist

enclosure

cc: Ms. Lisa Robbins, PACCAR

Site Specific Parameters Derivation

The depth to groundwater was assumed to be 27 feet (upper value in the range reported by Hart Crowser, 1996). The depth to subsurface soil sources was assumed to be 8 feet, which is the location of the highest detected soil concentrations of chemicals of concern.

Parameter assumptions for total porosity, bulk density, and volumetric air and water contents were developed from laboratory soil test data collected from a site just west of Oakland, where soil types and depositional environment are similar to those at the Grand Auto site.

Total porosities of 39.7, 37.6, and 44.4 percent (average of 41 percent) were measured for three soil samples collected above the water table. The degree of saturation ($volume_{water}$ / $volume_{voids}$) was measured as 99.7, 82.8, and 95.3 percent, respectively, for those three samples. The high degree of saturation and proximity to the water table suggests the samples would represent capillary fringe conditions within these relatively fine-grained soils. Multiplying saturation by porosity provides estimates for volumetric water content of the capillary fringe (39.5, 31.1, and 42.3 percent, respectively; average of 38 percent). Subtracting 38 percent water content from 41 percent porosity leaves 3 percent volumetric air content for the capillary fringe.

Volumetric water content in the vadose zone above the capillary fringe was assumed to be 50 percent of that in the fringe (based on general information provided in Das, 1985), or 19 percent. Subtracting 19 percent water content from 41 percent porosity leaves 22 percent volumetric air content for the vadose zone soils. Volumetric water and air content in foundation and wall cracks was assumed to be the same as in the vadose soils.

Soil bulk density was measured as 103.5, 105.2, and 93.7 pcf in the three samples, with an average of 101 pcf or 1.6 g/cc. The thickness of the capillary fringe was estimated based on the type of soils (ea. fine-grained).

REFERENCES

Das, B.M., 1985. Principles of Geotechnical Engineering. PWS Publishers, Boston. 571 p.

Hart Crowser, Inc., 1996. Facility Closure Report, Grand Auto Supply, Oakland, California, February 16, 1996.

Table 3 - Soil, Building, Surface, and Subsurface Parameters Used in Generating Tier 1 RBSLs

Parameters	Definitions, Units	Residential	Commercial/Industrial
d	lower depth of sufficient soil zone, cm	100 cm	100 cm
D^{air}	diffusion coefficient in air, cm^2/sec	chemical-specific	chemical-specific
D^{wat}	diffusion coefficient in water, cm^2/sec	chemical-specific	chemical-specific
ER	enclosed-space air exchange rate, S^{-1}	0.00014 s^{-1}	0.00023 s^{-1}
f_{oc}	fraction of organic carbon in soil, g-C/g-soil	0.01	0.01
H	henry's law constant, (cm^3-H_2O)/(cm^3-air)	chemical-specific	chemical-specific
h_{cap}	thickness of capillary fringe, cm	100 cm	100 cm
h_v	thickness of vadose zone, cm	820.8 cm	820.8 cm
k_{oc}	carbon-water sorption coefficient, cm^3-H_2O/g-C	chemical-specific	chemical-specific
k_s	soil-water sorption coefficient, cm^3-H_2O/g-soil	f_{oc} x k_{oc}	f_{oc} x k_{oc}
L_B	enclosed-space volume/infiltration area ratio, cm	200 cm	300 cm
L_{crack}	enclosed-space foundation or wall thickness, cm	15 cm	15 cm
L_{GW}	depth to groundwater = h_{cap} + h_{vs} cm	920.8 cm	920.8 cm
L_s	depth to subsurface soil sources, cm	243.2 cm	243.2 cm
S	pure component solubility in water, mg/L-H_2O	chemical-specific	chemical-specific
U_{air}	wind speed above ground surface in ambient mixing zone, cm/sec	225 cm/sec	225 cm/sec
W	width of source area parallel to wind, or groundwater flow direction, cm	1500 cm	1500 cm
δ_{air}	ambient air mixing zone height, cm	200 cm	200 cm
η	areal fraction of cracks in foundations/walls, cm^2-cracks/cm^2-total area	0.01 cm^2-cracks/cm^2-total area	0.01 cm^2-cracks/cm^2-total area
θ_{acap}	volumetric air content in capillary fringe soils, cm^3-air/cm^3-soil	0.03 cm^3-air/cm^3-soil	0.03 cm^3-air/cm^3-soil
θ_{acrack}	volumetric air content in foundation/wall cracks, cm^3-air/cm^3 total volume	0.22 cm^3-air/cm^3 total volume	0.22 cm^3-air/cm^3 total volume
θ_{as}	volumetric air content in vadose zone soils, cm^3-air/cm^3-soil	0.22 cm^3-air/cm^3-soil	0.22 cm^3-air/cm^3-soil
θ_T	total soil porosity, cm^3/cm^3-soil	0.41 cm^3/cm^3-soil	0.41 cm^3/cm^3-soil
θ_{wcap}	volumetric water content in capillary fringe soils, cm^3-H_2O/cm^3-soil	0.38 cm^3-H_2O/cm^3-soil	0.38 cm^3-H_2O/cm^3-soil
θ_{wcrack}	volumetric water content in foundation/wall cracks, cm^3-H_2O/cm^3 total volume	0.19 cm^3-H_2O/cm^3 total volume	0.19 cm^3-H_2O/cm^3 total volume
θ_{ws}	volumetric water content in vadose zone soils, cm^3-H_2O/cm^3-soil	0.19 cm^3-H_2O/cm^3-soil	0.19 cm^3-H_2O/cm^3-soil
ρ_s	soil bulk density, g-soil/cm^3-soil	1.6 g/cm^3	1.6 g/cm^3
τ	averaging time for vapor flux, sec	7.88 x 10^8 sec	7.88 x 10^8 sec

Parameters derived for site-specific use are listed in bold type.