

SL-ADV  
Version 3.1; 02/04

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

YES

Reset to Defaults

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL SOIL CONCENTRATION (enter "X" in "YES" box and initial soil conc. below)

YES

**ENTER**  
Chemical  
CAS No.  
(numbers only,  
no dashes)

**ENTER**  
Initial  
soil  
conc.,  
 $C_0$   
(mg/kg)

Chemical

91203

Naphthalene

MORE  
↓

<b>ENTER</b> Average soil temperature, $T_s$ (°C)	<b>ENTER</b> Depth below grade to bottom of enclosed space floor, $L_f$ (cm)	<b>ENTER</b> Depth below grade to top of contamination, $L_t$ (cm)	<b>ENTER</b> Depth below grade to bottom of contamination, (enter value of 0 if value is unknown) $L_b$ (cm)	<b>ENTER</b> Totals must add up to value of $L_t$ (cell G28)			<b>ENTER</b> Soil stratum A SCS soil type (used to estimate soil vapor permeability)	<b>ENTER</b> User-defined stratum A soil vapor permeability, $k_v$ (cm <sup>2</sup> )
$T_s$ (°C)	$L_f$ (cm)	$L_t$ (cm)	$L_b$ (cm)	Thickness of soil stratum A, $h_A$ (cm)	Thickness of soil stratum B, (Enter value or 0) $h_B$ (cm)	Thickness of soil stratum C, (Enter value or 0) $h_C$ (cm)	OR	$k_v$ (cm <sup>2</sup> )
11	200	200	365	200	0	0	SL	

MORE  
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<b>ENTER</b> Stratum A SCS soil type Lookup Soil Parameters	<b>ENTER</b> Stratum A soil dry bulk density, $r_b^A$ (g/cm <sup>3</sup> )	<b>ENTER</b> Stratum A soil total porosity, $n^A$ (unitless)	<b>ENTER</b> Stratum A soil water-filled porosity, $q_w^A$ (cm <sup>3</sup> /cm <sup>3</sup> )	<b>ENTER</b> Stratum A soil organic carbon fraction, $f_{oc}^A$ (unitless)	<b>ENTER</b> Stratum B SCS soil type Lookup Soil Parameters	<b>ENTER</b> Stratum B soil dry bulk density, $r_b^B$ (g/cm <sup>3</sup> )	<b>ENTER</b> Stratum B soil total porosity, $n^B$ (unitless)	<b>ENTER</b> Stratum B soil water-filled porosity, $q_w^B$ (cm <sup>3</sup> /cm <sup>3</sup> )	<b>ENTER</b> Stratum B soil organic carbon fraction, $f_{oc}^B$ (unitless)	<b>ENTER</b> Stratum C SCS soil type Lookup Soil Parameters	<b>ENTER</b> Stratum C soil dry bulk density, $r_b^C$ (g/cm <sup>3</sup> )	<b>ENTER</b> Stratum C soil total porosity, $n^C$ (unitless)	<b>ENTER</b> Stratum C soil water-filled porosity, $q_w^C$ (cm <sup>3</sup> /cm <sup>3</sup> )	<b>ENTER</b> Stratum C soil organic carbon fraction, $f_{oc}^C$ (unitless)
SL	1.83	0.304	0.154	0.002										

MORE  
↓

<b>ENTER</b> Enclosed space floor thickness, $L_{crack}$ (cm)	<b>ENTER</b> Soil-bldg. pressure differential, DP (g/cm-s <sup>2</sup> )	<b>ENTER</b> Enclosed space floor length, $L_B$ (cm)	<b>ENTER</b> Enclosed space floor width, $W_B$ (cm)	<b>ENTER</b> Enclosed space height, $H_B$ (cm)	<b>ENTER</b> Floor-wall seam crack width, w (cm)	<b>ENTER</b> Indoor air exchange rate, ER (1/h)	<b>ENTER</b> Average vapor flow rate into bldg. OR Leave blank to calculate $Q_{soil}$ (L/m)
10	40	1000	1000	304.8	0.1	0.25	

<b>ENTER</b> Averaging time for carcinogens, $AT_C$ (yrs)	<b>ENTER</b> Averaging time for noncarcinogens, $AT_{NC}$ (yrs)	<b>ENTER</b> Exposure duration, ED (yrs)	<b>ENTER</b> Exposure frequency, EF (days/yr)	<b>ENTER</b> Target risk for carcinogens, TR (unitless)	<b>ENTER</b> Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	0.1

END

Used to calculate risk-based  
soil concentration.

CHEMICAL PROPERTIES SHEET

Diffusivity in air, $D_a$ ( $\text{cm}^2/\text{s}$ )	Diffusivity in water, $D_w$ ( $\text{cm}^2/\text{s}$ )	Henry's law constant at reference temperature, H ( $\text{atm}\cdot\text{m}^3/\text{mol}$ )	Henry's law constant reference temperature, $T_R$ ( $^\circ\text{C}$ )	Enthalpy of vaporization at the normal boiling point, $DH_{v,b}$ ( $\text{cal}/\text{mol}$ )	Normal boiling point, $T_B$ ( $^\circ\text{K}$ )	Critical temperature, $T_C$ ( $^\circ\text{K}$ )	Organic carbon partition coefficient, $K_{oc}$ ( $\text{cm}^3/\text{g}$ )	Pure component water solubility, S ( $\text{mg}/\text{L}$ )	Unit risk factor, URF ( $\text{mg}/\text{m}^3$ ) <sup>-1</sup>	Reference conc., RfC ( $\text{mg}/\text{m}^3$ )	Physical state at soil temperature, (S,L,G)
5.90E-02	7.50E-06	4.82E-04	25	10,373	491.14	748.40	2.00E+03	3.10E+01	0.0E+00	3.0E-03	S

**END**

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, t (sec)	Source-building separation, L <sub>T</sub> (cm)	Stratum A soil air-filled porosity, q <sub>a</sub> <sup>A</sup> (cm <sup>3</sup> /cm <sup>3</sup> )	Stratum B soil air-filled porosity, q <sub>a</sub> <sup>B</sup> (cm <sup>3</sup> /cm <sup>3</sup> )	Stratum C soil air-filled porosity, q <sub>a</sub> <sup>C</sup> (cm <sup>3</sup> /cm <sup>3</sup> )	Stratum A effective total fluid saturation, S <sub>se</sub> (cm <sup>3</sup> /cm <sup>3</sup> )	Stratum A soil intrinsic permeability, k <sub>i</sub> (cm <sup>2</sup> )	Stratum A soil relative air permeability, k <sub>rg</sub> (cm <sup>2</sup> )	Stratum A soil effective vapor permeability, k <sub>v</sub> (cm <sup>2</sup> )	Floor-wall seam perimeter, X <sub>crack</sub> (cm)	Initial soil concentration used, C <sub>R</sub> (ng/kg)	Bldg. ventilation rate, Q <sub>building</sub> (cm <sup>3</sup> /s)
9.46E+08	1	0.150	ERROR	ERROR	0.434	5.94E-09	0.720	4.28E-09	4,000	1.00E+00	2.12E+04

Area of enclosed space below grade, A <sub>B</sub> (cm <sup>2</sup> )	Crack-to-total area ratio, h (unitless)	Crack depth below grade, Z <sub>crack</sub> (cm)	Enthalpy of vaporization at ave. soil temperature, DH <sub>v,TS</sub> (cal/mol)	Henry's law constant at ave. soil temperature, H <sub>TS</sub> (atm-m <sup>3</sup> /mol)	Henry's law constant at ave. soil temperature, H <sub>TS</sub> (unitless)	Vapor viscosity at ave. soil temperature, η <sub>s</sub> (g/cm-s)	Stratum A effective diffusion coefficient, D <sup>eff</sup> <sub>A</sub> (cm <sup>2</sup> /s)	Stratum B effective diffusion coefficient, D <sup>eff</sup> <sub>B</sub> (cm <sup>2</sup> /s)	Stratum C effective diffusion coefficient, D <sup>eff</sup> <sub>C</sub> (cm <sup>2</sup> /s)	Total overall effective diffusion coefficient, D <sup>eff</sup> <sub>T</sub> (cm <sup>2</sup> /s)	Diffusion path length, L <sub>d</sub> (cm)	Convection path length, L <sub>p</sub> (cm)
1.80E+06	2.22E-04	200	12,902	1.65E-04	7.07E-03	1.76E-04	1.17E-03	0.00E+00	0.00E+00	1.17E-03	1	200

Soil-water partition coefficient, K <sub>d</sub> (cm <sup>3</sup> /g)	Source vapor conc., C <sub>source</sub> (ng/m <sup>3</sup> )	Crack radius, r <sub>crack</sub> (cm)	Average vapor flow rate into bldg., Q <sub>soil</sub> (cm <sup>3</sup> /s)	Crack effective diffusion coefficient, D <sup>crack</sup> (cm <sup>2</sup> /s)	Area of crack, A <sub>crack</sub> (cm <sup>2</sup> )	Exponent of equivalent Peclet number, exp(Pe <sup>1</sup> ) (unitless)	Infinite source indoor attenuation coefficient, a (unitless)	Infinite source bldg. conc., C <sub>building</sub> (ng/m <sup>3</sup> )	Finite source b term (unitless)	Finite source y term (sec) <sup>-1</sup>	Time for source depletion, t <sub>D</sub> (sec)	Exposure duration > time for source depletion (YES/NO)
4.00E+00	1.73E+00	0.10	2.95E+00	1.17E-03	4.00E+02	1.90E+27	NA	NA	7.17E+02	1.11E-06	1.19E+11	NO

Finite indoor attenuation coefficient, <a> (unitless)	Mass limit bldg. conc., C <sub>building</sub> (ng/m <sup>3</sup> )	Finite source bldg. conc., C <sub>building</sub> (ng/m <sup>3</sup> )	Final finite source bldg. conc., C <sub>building</sub> (ng/m <sup>3</sup> )	Unit risk factor, URF (mg/m <sup>3</sup> ) <sup>-1</sup>	Reference conc., RfC (mg/m <sup>3</sup> )
1.39E-04	NA	2.41E-04	2.41E-04	NA	3.0E-03

END

RESULTS SHEET

RISK-BASED SOIL CONCENTRATION CALCULATIONS:

Indoor exposure soil conc., carcinogen (ng/kg)	Indoor exposure soil conc., noncarcinogen (ng/kg)	Risk-based indoor exposure soil conc., (ng/kg)	Soil saturation conc., C <sub>sat</sub> (ng/kg)	Final indoor exposure soil conc., (ng/kg)
NA	1.30E+03	1.30E+03	1.27E+05	1.30E+03

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: The values of C<sub>source</sub> and C<sub>building</sub> on the INTERCALCS worksheet are based on unity and do not represent actual values.

SCROLL  
DOWN  
TO "END"

END