The Johnson and Ettinger Model (USEPA 2004) is used to evaluate the inhalation of potential VOC vapor intrusion from groundwater into indoor air. The model and associated guidance can be found at: <a href="http://www.epa.gov/oswer/riskassessment/airmodel/johnson\_ettinger.htm">http://www.epa.gov/oswer/riskassessment/airmodel/johnson\_ettinger.htm</a>. The Johnson and Ettinger model incorporates both convective and diffusive mechanisms for estimating the transport of contaminant vapors emanating from either subsurface soils or groundwater into indoor air spaces located directly above the source of contamination. The Model considers a contaminant vapor source (Csource) located some distance (LT) below the floor of an enclosed building constructed with a basement or constructed slab-on-grade. The source of contamination is either a soil-incorporated volatile contaminant or a volatile contaminant in solution with groundwater below the top of the water table. For the Gude Landfill, volatile contaminants are present in groundwater only and subsurface soil is not considered. The rate of soil gas entry (Qsoil), or average vapor flow rate into the building, is a function solely of convection; however, the vapor concentration entering the structure may be limited by either convection or diffusion depending upon the magnitude of the source-building separation (LT) (USEPA 2004).

The Johnson and Ettinger model only evaluates a chemical if it is considered sufficiently toxic or volatile. A chemical is considered sufficiently toxic if the vapor concentration of the pure component poses an incremental lifetime cancer risk greater than  $10^{-6}$  or results in a non-cancer hazard index greater than one. A chemical is considered sufficiently volatile if its Henry's Law Constant is  $1 \times 10^{-5}$  atm-m<sup>3</sup>/mol or greater (USEPA 2004). It is assumed that if a chemical does not meet both of these criteria, it need not be further considered as part of the evaluation.

For groundwater, the Model considers the source of groundwater contamination as infinite. This is primarily because the source of groundwater contamination is located upgradient of the enclosed structure for which the indoor inhalation pathway is to be assessed; however, site-specific values for all other model parameters may be user-defined.

For human health, inhalation of VOCs from vapor intrusion is a complete pathway for residents within Derwood Station and the men's shelter. Three VOCs, dichlorodifluoromethane, TCE, and PCE, were reported in samples collected from the Derwood Station monitoring wells. For the men's shelter, the closest monitoring wells are MW—6 and OB01. Monitoring well MW-6 has the highest concentrations of VOCs; therefore, this monitoring well is used for in the assessment of vapor intrusion into the men's shelter.

For the J&E Model, the maximum detected concentrations of VOCs, the depth to groundwater at MW-9 (16.5 ft for Derwood Station) and MW-6 (16 ft bgs for the men's shelter), and the prevalent Soil Conservation Service (SCS) soil type (SL-silt loam) from boring logs were used as inputs to the model. Additionally, the average subsurface soil temperature is adjusted to reflect the location of the Gude Landfill. The average subsurface soil temperature is taken from the USEPA guidance *Fact Sheet, Correcting the Henry's Law Constant for Soil Temperature* (USEPA 2001). The Model also allows for the selection of either a basement or slab-on-grade. For buildings within the Derwood Station community, a basement is considered and a slab-on-grade for the men's shelter. These values are depicted in the Data Entry Sheets included in this Attachment.

Outputs of the Model are provided for each VOC detected within MW-6 and MW-9. Results of the Model and resulting risk calculations are provided in Results Sheet for each VOC. The

Model indicates that carcinogenic risks and non-carcinogenic hazards for all VOCs evaluated are well below levels of concern identified by MDE.

To aide in future monitoring of groundwater within the Derwood Station community, the Johnson and Ettinger Model is used to calculate groundwater VOC concentrations that will require additional evaluation if reported. Groundwater VOC concentrations are calculated for the seven VOCs that have historically been detected above the MCLs include: TCE, cis-1,2-dichloroethene, PCE, vinyl chloride, benzene, methylene chloride, and 1,2-dichloropropane. It is noted that only PCE and TCE were detected within the Derwood Station monitoring wells. Groundwater risk-based concentrations were developed that would result in human health risks equal to the MDE remedial action level of 10<sup>-5</sup> or 1.0 based upon the inhalation of VOCs within indoor air. The model evaluates long-term effects, so groundwater concentrations should be used only for screening purposes. The following presents theoretical, calculated groundwater concentrations that may present a concern for this pathway, the maximum reported concentration from monitoring wells within the Derwood Station community, and the maximum reported concentration from monitoring wells along the Landfill:

Chemical	Calculated Groundwater Concentration (µg/L = parts per billion [ppb])	Maximum Reported Groundwater Concentration (μg/L = ppb)
Benzene	118	2U (Derwood Station)
		8.3 (Gude Landfill)
Cis-1,2-Dichloroethene	2,000	2U (Derwood Station)
		210 (Gude Landfill)
1,2-Dichloropropane	191	2U (Derwood Station)
		13 (Gude Landfill)
Methylene Chloride	3,850	2U (Derwood Station)
		28 (Gude Landfill)
Tetrachloroethene (PCE)	68	14 (Derwood Station)
		58.5 (Gude Landfill)
Trichloroethene (TCE)	298	0.73 (Derwood Station)
l		92 (Gude Landfill)
Vinyl Chloride	16	2U (Derwood Station)
_		31.6 (Gude Landfill)

**Note:** Maximum reported groundwater concentrations are taken from the July and September 2010 sampling events

U = Chemical is non-detected

The groundwater concentrations represent a level at which an additional evaluation would be needed, not necessarily an immediate concern for human health. Additional evaluation could include additional groundwater investigation and calculation of human exposure to groundwater in a human health risk assessment.

## VAPOR INTRUSION MODEL DERWOOD STATION RESIDENTS

#### DICHLORODIFLUOROMETHANE VAPOR INTRUSION MODEL DATA ENTRY SHEET

GW-ADV Version 3.1; 02/04	CALCULATE RI	SK-BASED GROU	NDWATER CON	CENTRATION (	enter "X" in "YES" b	oox)						
Reset to Defaults		YES	OR	]								
) Delaults	CALCULATE IN	CREMENTAL RISH	KS FROM ACTUA	L GROUNDWA	TER CONCENTRA	ATION (enter "X" in "Y	'ES" box and initial gro	oundwater conc. b	pelow)			
		YES	Χ	]								
	ENTER  Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C <sub>W</sub> (µg/L)	=		Chemical							
	75718	5.50E+00	]	D	ichlorodifluorome	ethane						
	ENTER	ENTER Depth	ENTER	ENTER Totals mu	ENTER st add up to value o	ENTER of LwT (cell G28)	ENTER	ENTER	<b>ENTER</b> Soil		ENTER	1
MORE <b>↓</b>	Average soil/ groundwater temperature, T <sub>s</sub> (°C)	below grade to bottom of enclosed space floor, L <sub>F</sub> (cm)	Depth below grade to water table, L <sub>WT</sub> (cm)	Thickness of soil stratum A, h <sub>A</sub> (cm)	Thickness of soil stratum B, (Enter value or 0) h <sub>B</sub> (cm)	Thickness of soil stratum C, (Enter value or 0) h <sub>c</sub> (cm)	Soil stratum directly above water table, (Enter A, B, or C)	SCS soil type directly above water table	stratum A SCS soil type (used to estimate soil vapor permeability)	OR	User-defined stratum A soil vapor permeability, k <sub>v</sub> (cm <sup>2</sup> )	
	13	200	580	580			A	SL	SL			
MORE ↓	ENTER Stratum A SCS soil type Lookup Soil Parameters	ENTER Stratum A soil dry bulk density, $\rho_b^A$ (g/cm³)	ENTER Stratum A soil total porosity, n <sup>A</sup> (unitless)	ENTER Stratum A soil water-filled porosity, $\theta_w^A$ $(cm^3/cm^3)$	ENTER Stratum B SCS Soil type Lookup Soil Parameters	ENTER Stratum B soil dry bulk density, $\rho_{0}^{\ B}$ (g/cm³)	ENTER Stratum B soil total porosity, n <sup>B</sup> (unitless)	ENTER Stratum B soil water-filled porosity, $\theta_w^B$ $(cm^3/cm^3)$	ENTER Stratum C SCS Soil type Lookup Soil Parameters	ENTER Stratum C soil dry bulk density, Pb (g/cm³)	ENTER Stratum C soil total porosity, n <sup>C</sup> (unitless)	ENTER Stratum C soil water-filled porosity, $\theta_w^c$ $(cm^3/cm^3)$
	SL	1.62	0.387	0.103		1.5	0.43	0.215		1.5	0.43	Error
MORE ¥	ENTER Enclosed space floor thickness, L <sub>crack</sub> (cm)	ENTER  Soil-bldq. pressure differential, ΔP (g/cm-s²)	ENTER Enclosed space floor length, L <sub>B</sub> (cm)	ENTER Enclosed space floor width, W <sub>B</sub> (cm)	ENTER Enclosed space height, H <sub>B</sub> (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	L	ENTER Average vapor flow rate into bldq. OR eave blank to calcula Q <sub>soil</sub> (L/m)	te		
	10	40	1000	1000	366	0.1	0.25	]	5			
MORE	ENTER Averaging time for carcinogens, AT <sub>C</sub> (yrs)	ENTER Averaging time for noncarcinogens, AT <sub>NC</sub> (yrs)	ENTER  Exposure duration, ED (yrs)	ENTER  Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)						
	70	30	30	350	1.0E-06	1						
END						llate risk-based concentration.						

## DICHLORODIFLUOROMETHANE VAPOR INTRUSION MODEL CHEMICAL PROPERTIES SHEET

Diffusivity in air, D <sub>a</sub> (cm <sup>2</sup> /s)	Diffusivity in water, D <sub>w</sub> (cm <sup>2</sup> /s)	Henry's law constant at reference temperature, H (atm-m³/mol)	Henry's law constant reference temperature, T <sub>R</sub> (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T <sub>B</sub> (°K)	Critical temperature, T <sub>C</sub> (°K)	Organic carbon partition coefficient, K <sub>oc</sub> (cm³/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m³) <sup>-1</sup>	Reference conc., RfC (mg/m³)
6.65E-02	9.92E-06	3.42E-01	25	9,421	243.20	384.95	4.57E+02	2.80E+02	0.0E+00	2.0E-01

## DICHLORODIFLUOROMETHANE VAPOR INTRUSION MODEL INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source- building separation, L <sub>T</sub> (cm)	$\begin{array}{c} \text{Stratum A} \\ \text{soil} \\ \text{air-filled} \\ \text{porosity,} \\ \theta_a{}^A \\ \text{(cm}^3\text{/cm}^3) \end{array}$	Stratum B soil air-filled porosity, $\theta_a^{\ B}$ $(cm^3/cm^3)$	Stratum C soil air-filled porosity, $\theta_a^{\ c}$ (cm³/cm³)	Stratum A effective total fluid saturation, S <sub>te</sub> (cm³/cm³)	Stratum A soil intrinsic permeability, k <sub>l</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> )	Thickness of capillary zone, L <sub>cz</sub> (cm)	Total porosity in capillary zone, n <sub>cz</sub> (cm <sup>3</sup> /cm <sup>3</sup> )	Air-filled porosity in capillary zone, θ <sub>a,cz</sub> (cm³/cm³)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Floor- wall seam perimeter, X <sub>crack</sub> (cm)
9.46E+08	380	0.284	0.215	#VALUE!	0.184	5.96E-09	0.901	5.37E-09	25.00	0.387	0.067	0.320	4,000
Bldq. ventilation rate, Q <sub>building</sub> (cm <sup>3</sup> /s)	Area of enclosed space below grade, A <sub>B</sub> (cm <sup>2</sup> )	Crack- to-total area ratio, n (unitless)	Crack depth below grade, Z <sub>crack</sub> (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H <sub>TS</sub> (atm-m <sup>3</sup> /mol)	Henry's law constant at ave. groundwater temperature, H' <sub>TS</sub> (unitless)	Vapor viscosity at ave. soil temperature,	Stratum  A effective diffusion coefficient, Deff (cm²/s)	Stratum B effective diffusion coefficient, D <sup>eff</sup> (cm <sup>2</sup> /s)	Stratum C effective diffusion coefficient, D <sup>eff</sup> (cm <sup>2</sup> /s)	Capillary zone effective diffusion coefficient, D <sup>eff</sup> <sub>cz</sub> (cm <sup>2</sup> /s)	Total overall effective diffusion coefficient, Deff_ (cm²/s)	Diffusion path length, L <sub>d</sub> (cm)
2.54E+04	1.80E+06	2.22E-04	200	8,299	1.90E-01	8.10E+00	1.76E-04	6.71E-03	0.00E+00	0.00E+00	5.56E-05	7.57E-04	380
Convection path length, L <sub>p</sub> (cm)	Source vapor conc., C <sub>source</sub> (µg/m³)	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 foundation Peclet number, exp(Pef) (unitless)	Infinite source indoor attenuation coefficient, $\alpha$ (unitless)	Infinite source bldg. conc., C <sub>building</sub> (µg/m³)	Unit risk factor, URF (µg/m³)-1	Reference conc., RfC (mg/m³)			,
200	4.45E+04	0.10	8.33E+01	6.71E-03	4.00E+02	5.89E+134	1.35E-04	6.02E+00	NA	2.0E-01			

## DICHLORODIFLUOROMETHANE VAPOR INTRUSION MODEL RESULTS SHEET

#### RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

#### INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)	_	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
					_		
NA	NA	NA	2.80E+05	NA		NA	2.9E-02

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

SCROLL DOWN TO "END"

#### PCE VAPOR INTRUSION MODEL DATA ENTRY SHEET

GW-ADV Version 3.1; 02/04 Reset to Defaults		YES	OR	<u>.</u>	enter "X" in "YES" b		ES" box and initial gro	oundwater conc. L	pelow)			
	Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., Cw (µg/L)	]		<u>Chemical</u> Tetrachloroethy	lene						
MORE	ENTER  Average soil/ groundwater temperature,  Ts (°C)	ENTER Depth below grade to bottom of enclosed space floor, L <sub>F</sub> (cm)	Depth below grade to water table, LwT (cm)	Thickness of soil	ENTER st add up to value of Thickness of soil stratum B, (Enter value or 0) h <sub>B</sub> (cm)	ENTER  f LwT (cell G28)  Thickness  of soil  stratum C,	Soil stratum directly above water table, (Enter A, B, or C)	SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	User-defined stratum A soil vapor permeability, $k_V$ (cm²)	
	13	200	580	580			А	SL	SL			]
MORE	ENTER Stratum A SCS soil type Lookup Soil Parameters	ENTER Stratum A soil dry bulk density, $\rho_b^A$ (g/cm³)	ENTER Stratum A soil total porosity, n <sup>A</sup> (unitless)	ENTER Stratum A soil water-filled porosity, $\theta_w^A$ (cm³/cm³)	ENTER Stratum B SCS soil type Lookup Soil Parameters	ENTER Stratum B soil dry bulk density, $\rho_b^B$ (g/cm³)	ENTER Stratum B soil total porosity, n <sup>B</sup> (unitless)	ENTER Stratum B soil water-filled porosity, $\theta_w^B$ $(cm^3/cm^3)$	ENTER Stratum C SCS soil type Lookup Soil Parameters	ENTER Stratum C soil dry bulk density, $\rho_b^c$ (g/cm $^3$ )	ENTER Stratum C soil total porosity, n <sup>C</sup> (unitless)	ENTER Stratum C soil water-filled porosity, $\theta_w^C$ $(cm^3/cm^3)$
	SL	1.62	0.387	0.103		1.5	0.43	0.215		1.5	0.43	Error
MORE	ENTER Enclosed space floor thickness, Lcrack (cm)	ENTER Soil-bldq, pressure differential, ΔP (g/cm-s²)	ENTER Enclosed space floor length, L <sub>B</sub> (cm)	ENTER Enclosed space floor width, W <sub>B</sub> (cm)	ENTER  Enclosed space height, HB (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	L:	ENTER Average vapor flow rate into bldq. OR eave blank to calcula Q <sub>soil</sub> (L/m)	te		
	10	40	1000	1000	366	0.1	0.25	]	5			
MORE	ENTER Averaging time for carcinogens, ATc (yrs)	ENTER Averaging time for noncarcinogens, AT <sub>NC</sub> (yrs)	EXPOSURE duration, ED (yrs)	EXPOSURE frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)						
	70	30	30	350	1.0E-06	1						
END						late risk-based concentration.						

## PCE VAPOR INTRUSION MODEL CHEMICAL PROPERTIES SHEET

Diffusivity in air, D <sub>a</sub> (cm²/s)	Diffusivity in water, D <sub>w</sub> (cm <sup>2</sup> /s)	Henry's law constant at reference temperature, H (atm-m³/mol)	Henry's law constant reference temperature, T <sub>R</sub> (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T <sub>B</sub> (°K)	Critical temperature, T <sub>C</sub> (°K)	Organic carbon partition coefficient, K <sub>oc</sub> (cm³/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m³) <sup>-1</sup>	Reference conc., RfC (mg/m³)
				, , , , , , , , , , , , , , , , , , ,				\ /		
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	1.55E+02	2.00E+02	5.9E-06	2.7E-01

## PCE VAPOR INTRUSION MODEL INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source- building separation, L <sub>T</sub> (cm)	$\begin{array}{c} \text{Stratum A} \\ \text{soil} \\ \text{air-filled} \\ \text{porosity,} \\ \theta_a^{\ A} \\ \text{(cm}^3\text{/cm}^3) \end{array}$	Stratum B soil air-filled porosity, $\theta_a^{\ B}$ $(cm^3/cm^3)$	Stratum C soil air-filled porosity, $\theta_a^{\ C}$ $(cm^3/cm^3)$	Stratum A effective total fluid saturation, S <sub>te</sub> (cm³/cm³)	Stratum A soil intrinsic permeability, k <sub>i</sub> (cm²)	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> )	Thickness of capillary zone, L <sub>cz</sub> (cm)	Total porosity in capillary zone, n <sub>cz</sub> (cm³/cm³)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm³/cm³)	Floor- wall seam perimeter, X <sub>crack</sub> (cm)
9.46E+08	380	0.284	0.215	#VALUE!	0.184	5.96E-09	0.901	5.37E-09	25.00	0.387	0.067	0.320	4,000
Bldq. ventilation rate, Q <sub>bullding</sub> (cm <sup>3</sup> /s)	Area of enclosed space below grade, A <sub>B</sub> (cm <sup>2</sup> )	Crack- to-total area ratio, n (unitless)	Crack depth below grade, Z <sub>crack</sub> (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H <sub>TS</sub> (atm-m <sup>3</sup> /mol)	Henry's law constant at ave. groundwater temperature, H' <sub>TS</sub> (unitless)	Vapor viscosity at ave. soil temperature,	Stratum  A effective diffusion coefficient, D <sup>eff</sup> A (cm²/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> c (cm <sup>2</sup> /s)	Capillary zone effective diffusion coefficient, Deff cz (cm²/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)
2.54E+04	1.80E+06	2.22E-04	200	9,523	9.35E-03	3.98E-01	1.76E-04	7.27E-03	0.00E+00	0.00E+00	6.31E-05	8.54E-04	380
Convection path length, L <sub>p</sub> (cm)	Source vapor conc., C <sub>source</sub> (µg/m³)	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> (cm²)	Exponent of equivalent foundation Peclet number, exp(Pef) (unitless)	Infinite source indoor attenuation coefficient, $\alpha$ (unitless)	Infinite source bldg. conc., C <sub>building</sub> (µg/m³)	Unit risk factor, URF (µg/m³)-1	Reference conc., RfC (mg/m³)			
200	5.58E+03	0.10	8.33E+01	7.27E-03	4.00E+02	2.98E+124	1.52E-04	8.47E-01	5.9E-06	2.7E-01			

## PCE VAPOR INTRUSION MODEL RESULTS SHEET

#### RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

#### INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA	NA	2.00E+05	NA	2.1E-06	3.0E-03

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

SCROLL DOWN TO "END"

GW-ADV CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box) Version 3.1; 02/04 YES Reset to OR Defaults CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below) YES **ENTER ENTER** Initial Chemical groundwater CAS No. conc., (numbers only,  $C_{W}$ (µg/L) no dashes) Chemical 79016 7.30E-01 Trichloroethylene **ENTER ENTER ENTER ENTER ENTER** Totals must add up to value of LwT (cell G28) Depth Soil MORE Average below grade Thickness stratum A User-defined Thickness Ψ soil/ to bottom Depth Thickness of soil of soil Soil SCS stratum A aroundwater of enclosed below grade of soil stratum B. stratum C. stratum SCS soil type soil vapor temperature, space floor, to water table, stratum A, (Enter value or 0) (Enter value or 0) directly above soil type (used to estimate OR permeability,  $T_S$  $L_F$ LwT  $h_A$ hB hc water table, directly above soil vapor  $k_v$ (°C) (cm) (cm) (cm) (cm) (cm) (Enter A. B. or C.) water table permeability) (cm<sup>2</sup>) 200 580 580 **ENTER ENTER ENTER** MORE Stratum A Stratum A Stratum A Stratum A Stratum B Stratum B Stratum B Stratum B Stratum C Stratum C Stratum C Stratum C ¥ SCS soil dry soil water-filled SCS soil water-filled SCS soil total soil total soil dry soil total soil water-filled soil dry soil type bulk density, porosity, porosity, soil type bulk density, porosity, porosity, soil type bulk density, porosity, porosity, Lookup Soil n<sup>A</sup>  $\theta_{w}^{A}$ Lookup Soil  $\rho_b^B$  $\theta_{w}^{B}$ Lookup Soil n<sup>c</sup>  $\theta_{w}^{C}$  $\rho_b$  $\rho_b$ Parameters Parameters Parameters (cm<sup>3</sup>/cm<sup>3</sup> (cm<sup>3</sup>/cm<sup>3</sup>) (g/cm<sup>3</sup>) (unitless) (cm<sup>3</sup>/cm<sup>3</sup>) (g/cm<sup>3</sup>) (unitless) (g/cm<sup>3</sup>) (unitless) 1.62 0.387 0.103 0.43 0.215 0.43 Error **ENTER ENTER ENTER ENTER ENTER ENTER ENTER ENTER** MORE Enclosed Enclosed Enclosed Average vapor space Soil-bldg. space Enclosed Floor-wall Indoor flow rate into bldg. space floor pressure floor floor space seam crack air exchange OR thickness, differential, width, width, Leave blank to calculate length, height, rate,  $Q_{\text{soil}}$  $W_B$  $H_B$ ER L<sub>crack</sub> LB W  $(g/cm-s^2)$ (cm) (cm) (cm) (cm) (cm) (1/h)(L/m) 10 40 1000 1000 366 0.1 0.25 MORE **↓ ENTER ENTER ENTER ENTER ENTER ENTER** Averaging Averaging Target Target hazard time for time for Exposure Exposure risk for quotient for carcinogens, noncarcinogens, duration, frequency, carcinogens, noncarcinogens,  $AT_{C}$  $AT_{NC}$ ED EF TR THQ (unitless) (yrs) (yrs) (days/yr) (unitless) (vrs) 350 30 30 1.0F-06 Used to calculate risk-based END groundwater concentration

## TCE-VAPOR INTRUSION MODEL CHEMICAL PROPERTIES SHEET

Diffusivity in air, D <sub>a</sub> (cm <sup>2</sup> /s)	Diffusivity in water, D <sub>w</sub> (cm <sup>2</sup> /s)	Henry's law constant at reference temperature, H (atm-m <sup>3</sup> /mol)	Henry's law constant reference temperature, T <sub>R</sub> (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T <sub>B</sub> (°K)	Critical temperature, T <sub>C</sub> (°K)	Organic carbon partition coefficient, K <sub>oc</sub> (cm³/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m³)·1	Reference conc., RfC (mg/m³)
7 90F-02	9 10F-06	1.03E-02	25	7.505	360.36	544.20	1.66E+02	1.47E+03	1 1F-04	4.0E-02
7.700 02	7.10L 00	1.000 02	20	7,000	000.00	0 1 1.20	1.000102	, 2100	1.12 07	1.02 02

## TCE-VAPOR INTRUSION MODEL INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source- building separation, L <sub>T</sub> (cm)	$\begin{array}{c} \text{Stratum A} \\ \text{soil} \\ \text{air-filled} \\ \text{porosity,} \\ \theta_a{}^A \\ \text{(cm}^3\text{/cm}^3) \end{array}$	Stratum B soil air-filled porosity, $\theta_a^{\ B}$ $(cm^3/cm^3)$	Stratum C soil air-filled porosity, $\theta_a^{\ c}$ (cm³/cm³)	Stratum A effective total fluid saturation, S <sub>te</sub> (cm³/cm³)	Stratum A soil intrinsic permeability, k <sub>1</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> )	Thickness of capillary zone, L <sub>cz</sub> (cm)	Total porosity in capillary zone, n <sub>cz</sub> (cm <sup>3</sup> /cm <sup>3</sup> )	Air-filled porosity in capillary zone, θ <sub>a,cz</sub> (cm³/cm³)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Floor- wall seam perimeter, X <sub>crack</sub> (cm)
9.46E+08	380	0.284	0.215	#VALUE!	0.184	5.96E-09	0.901	5.37E-09	25.00	0.387	0.067	0.320	4,000
Bldq. ventilation rate, Q <sub>building</sub> (cm <sup>3</sup> /s)	Area of enclosed space below grade, A <sub>B</sub> (cm <sup>2</sup> )	Crack- to-total area ratio, n (unitless)	Crack depth below grade, Z <sub>crack</sub> (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H <sub>TS</sub> (atm-m³/mol)	Henry's law constant at ave. groundwater temperature, H' <sub>TS</sub> (unitless)	Vapor viscosity at ave. soil temperature,	Stratum  A effective diffusion coefficient, Deff (cm²/s)	Stratum B effective diffusion coefficient, D <sup>eff</sup> (cm <sup>2</sup> /s)	Stratum C effective diffusion coefficient, D <sup>eff</sup> (cm <sup>2</sup> /s)	Capillary zone effective diffusion coefficient, D <sup>eff</sup> <sub>cz</sub> (cm <sup>2</sup> /s)	Total overall effective diffusion coefficient, Deff (cm²/s)	Diffusion path length, L <sub>d</sub> (cm)
2.54E+04	1.80E+06	2.22E-04	200	8,520	5.62E-03	2.39E-01	1.76E-04	7.98E-03	0.00E+00	0.00E+00	7.16E-05	9.65E-04	380
Convection path length, L <sub>p</sub> (cm)	Source vapor conc., C <sub>source</sub> (µg/m³)	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> (cm²)	Exponent of equivalent foundation Peclet number, exp(Pe <sup>f</sup> ) (unitless)	Infinite source indoor attenuation coefficient, $\alpha$ (unitless)	Infinite source bldg. conc., C <sub>building</sub> (µg/m³)	Unit risk factor, URF (µg/m³)-1	Reference conc., RfC (mg/m³)			
200	1.75E+02	0.10	8.33E+01	7.98E-03	4.00E+02	2.78E+113	1.71E-04	2.98E-02	1.1E-04	4.0E-02			

#### TCE-VAPOR INTRUSION MODEL RESULTS SHEET

#### RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

#### INCREMENTAL RISK CALCULATIONS:

						11.10
	Indoor	Indoor	Risk-based	Pure	Final	r
	exposure	exposure	indoor	component	indoor	
	groundwater	groundwater	exposure	water	exposure	in
	conc.,	conc.,	groundwater	solubility,	groundwater	ir
	carcinogen	noncarcinogen	conc.,	S	conc.,	Ca
_	(μg/L)	(μg/L)	(μg/L)	(μg/L)	(μg/L)	(
ſ	NA	NA	NA	1.47E+06	NA	

Incremental Hazard risk from quotient vapor from vapor intrusion to intrusion to indoor air, indoor air, carcinogen noncarcinogen (unitless) (unitless) 1.3E-06 7.1E-04

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

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

# GROUNDWATER RISK-BASED CONCENTRATIONS VAPOR INTRUSION MODEL DERWOOD STATION RESIDENTS

#### 1,2-DICHLOROPROPANE GROUNDWATER RISK-BASED CONCENTRATION DATA ENTRY SHEET

GW-ADV Version 3.1; 02/04 Reset to Defaults		YES	×		enter "X" in "YES" b	,	'ES" box and initial gro	oundwater conc. b	pelow)			
	ENTER  Chemical CAS No. (numbers only, no dashes)	YES  ENTER Initial groundwater conc., C <sub>W</sub> (μg/L)			Chemical							
	78875 <b>ENTER</b>	ENTER	ENTER	ENTER	1,2-Dichloroprop	ENTER	ENTER	ENTER	ENTER		ENTER	1
MORE <b>↓</b>	Average soil/ groundwater temperature, T <sub>s</sub> (°C)	Depth below grade to bottom of enclosed space floor, L <sub>F</sub> (cm)	Depth below grade to water table, LwT (cm)	Totals mu Thickness of soil stratum A, h <sub>A</sub> (cm)	st add up to value of Thickness of soil stratum B, (Enter value or 0) h <sub>B</sub> (cm)	Thickness of soil stratum C,	Soil stratum directly above water table, (Enter A, B, or C)	SCS soil type directly above water table	Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	User-defined stratum A soil vapor permeability, k <sub>v</sub> (cm <sup>2</sup> )	
	13	200	580	580			А	SL	SL			
MORE	ENTER Stratum A SCS Soil type Lookup Soil Parameters	ENTER Stratum A soil dry bulk density, Pb (g/cm³)	ENTER Stratum A soil total porosity, n <sup>A</sup> (unitless)	ENTER Stratum A soil water-filled porosity, $\theta_w^A$ $(cm^3/cm^3)$	ENTER Stratum B SCS Soil type Lookup Soil Parameters	ENTER Stratum B soil dry bulk density, Pb (g/cm³)	ENTER Stratum B soil total porosity, n <sup>B</sup> (unitless)	ENTER Stratum B soil water-filled porosity, $\theta_w^B$ $(cm^3/cm^3)$	ENTER Stratum C SCS soil type Lookup Soil Parameters	ENTER Stratum C soil dry bulk density, $\rho_b^C$ (g/cm³)	ENTER Stratum C soil total porosity, n <sup>C</sup> (unitless)	ENTER Stratum C soil water-filled porosity, $\theta_w^{\ C}$ $(cm^3/cm^3)$
	SL	1.62	0.387	0.103		1.5	0.43	0.215		Error	Error	Error
MORE	ENTER Enclosed space floor thickness, L <sub>crack</sub> (cm)	ENTER  Soil-bldq. pressure differential, ΔP (g/cm-s²)	ENTER Enclosed space floor length, L <sub>B</sub> (cm)	ENTER Enclosed space floor width, W <sub>B</sub> (cm)	ENTER  Enclosed space height, H <sub>B</sub> (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	Le	ENTER Average vapor flow rate into bldq. OR eave blank to calcula Q <sub>soll</sub> (L/m)	te		
	10	40	1000	1000	366	0.1	0.25	· ]	5			
MORE ¥	ENTER Averaging time for carcinogens, AT <sub>C</sub> (yrs)	ENTER Averaging time for noncarcinogens, AT <sub>NC</sub> (yrs)	ENTER  Exposure duration, ED (yrs)	ENTER  Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)			•			
	70	30	30	350	1.0E-05	1						
END						late risk-based concentration.						

## 1,2-DICHLOROPROPANE GROUNDWATER RISK-BASED CONCENTRATION CHEMICAL PROPERTIES SHEET

		Henry's law constant	Henry's law constant	Enthalpy of vaporization at	Normal		Organic carbon	Pure component	Unit	
Diffusivity	Diffusivity	at reference	reference	the normal	boiling	Critical	partition	water	risk	Reference
in air,	in water,	temperature,	temperature,	boiling point,	point,	temperature,	coefficient,	solubility,	factor,	conc.,
$D_a$	$D_{w}$	Н	$T_R$	$\Delta H_{v,b}$	$T_B$	$T_{C}$	K <sub>oc</sub>	S	URF	RfC
(cm <sup>2</sup> /s)	(cm <sup>2</sup> /s)	(atm-m <sup>3</sup> /mol)	(°C)	(cal/mol)	(°K)	(°K)	(cm³/g)	(mg/L)	$(\mu g/m^3)^{-1}$	(mg/m <sup>3</sup> )
7.82E-02	8.73E-06	2.79E-03	25	7,590	369.52	572.00	4.37E+01	2.80E+03	1.0E-05	4.0E-03

## 1,2-DICHLOROPROPANE GROUNDWATER RISK-BASED CONCENTRATION INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source- building separation, L <sub>T</sub> (cm)	$\begin{array}{c} \text{Stratum A} \\ \text{soil} \\ \text{air-filled} \\ \text{porosity,} \\ \theta_a{}^A \\ \text{(cm}^3\text{/cm}^3) \end{array}$	Stratum B soil air-filled porosity, $\theta_a^{\ B}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Stratum C soil air-filled porosity, $\theta_a^{\ c}$ $(cm^3/cm^3)$	Stratum A effective total fluid saturation, S <sub>te</sub> (cm³/cm³)	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> )	Thickness of capillary zone, L <sub>cz</sub> (cm)	Total porosity in capillary zone, n <sub>cz</sub> (cm <sup>3</sup> /cm <sup>3</sup> )	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Floor- wall seam perimeter, X <sub>crack</sub> (cm)
9.46E+08	380	0.284	0.215	#VALUE!	0.184	5.96E-09	0.901	5.37E-09	25.00	0.387	0.067	0.320	4,000
Bldq. ventilation rate, Q <sub>building</sub> (cm³/s)	Area of enclosed space below grade,  A <sub>B</sub> (cm <sup>2</sup> )	Crack- to-total area ratio, n (unitless)	Crack depth below grade, Z <sub>crack</sub> (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H <sub>TS</sub> (atm-m <sup>3</sup> /mol)	Henry's law constant at ave. groundwater temperature, H' <sub>TS</sub> (unitless)	Vapor viscosity at ave. soil temperature,  µ <sub>TS</sub> (q/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)	Capillary zone effective diffusion coefficient, Deff cz (cm²/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)
2.54E+04	1.80E+06	2.22E-04	200	8,599	1.52E-03	6.47E-02	1.76E-04	7.90E-03	0.00E+00	0.00E+00	8.54E-05	1.13E-03	380
Convection path length, L <sub>p</sub> (cm)	Source vapor conc., C <sub>source</sub> (µg/m³)	Crack radius, r <sub>crack</sub> (cm)	Average vapor flow rate into bldg., $Q_{soil}$ (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> (cm²)	Exponent of equivalent foundation Peclet number, exp(Pef) (unitless)	Infinite source indoor attenuation coefficient, $\alpha$ (unitless)	Infinite source bldg. conc., Cbuilding (µg/m³)	Unit risk factor, URF (µg/m³)-1	Reference conc., RfC (mg/m³)			
200	6.47E+01	0.10	8.33E+01	7.90E-03	4.00E+02	3.98E+114	1.97E-04	1.28E-02	1.0E-05	4.0E-03	]		

#### 1,2-DICHLOROPROPANE GROUNDWATER RISK-BASED CONCENTRATION RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)	<u>.</u>	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)
1 91F+02	3.27F+02	1 91F+02	2.80F±06	1 91F±02	Ī	NA

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

MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"

#### BENZENE GROUNDWATER RISK-BASED CONCENTRATION DATA ENTRY SHEET

GW-ADV Version 3.1; 02/04 Reset to Defaults		YES	X OR	<u>.</u>	enter "X" in "YES" b		'ES" box and initial gro	oundwater conc. b	pelow)			
	ENTER  Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., Cw (µg/L)	: 1		Chemical							
	ENTER	ENTER	] ENTER	ENTER	Benzene ENTER	ENTER	ENTER	ENTER	ENTER		ENTER	1
MORE ↓	Average soil/ groundwater temperature, Ts (°C)	Depth below grade to bottom of enclosed space floor, L <sub>F</sub> (cm)	Depth below grade to water table, L <sub>WT</sub> (cm)	Totals mu Thickness of soil	st add up to value o Thickness of soil stratum B,		Soil stratum directly above water table, (Enter A, B, or C)	SCS soil type directly above water table	Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	User-defined stratum A soil vapor permeability, k <sub>v</sub> (cm <sup>2</sup> )	
	13	200	580	580			Α	SL	SL			j
MORE	ENTER Stratum A SCS Soil type Lookup Soil Parameters	ENTER Stratum A soil dry bulk density, Pb <sup>A</sup> (g/cm <sup>3</sup> )	ENTER Stratum A soil total porosity, n <sup>A</sup> (unitless)	ENTER Stratum A soil water-filled porosity, $\theta_w^A$ (cm³/cm³)	ENTER Stratum B SCS Soil type Lookup Soil Parameters	ENTER Stratum B soil dry bulk density, Pb (g/cm³)	ENTER Stratum B soil total porosity, n <sup>B</sup> (unitless)	ENTER Stratum B soil water-filled porosity, $\theta_w^B$ $(cm^3/cm^3)$	ENTER Stratum C SCS Soil type Lookup Soil Parameters	ENTER Stratum C soil dry bulk density, $\rho_b^{\ C}$ (g/cm³)	ENTER Stratum C soil total porosity, n <sup>C</sup> (unitless)	ENTER Stratum C soil water-filled porosity, $\theta_w^{\ C}$ $(cm^3/cm^3)$
	SL	1.62	0.387	0.103		1.5	0.43	0.215		Error	Error	Error
MORE <b>→</b>	ENTER Enclosed space floor thickness, L <sub>crack</sub> (cm)	Soil-bldg, pressure differential, $\Delta P$ (g/cm-s²)	ENTER Enclosed space floor length, L <sub>B</sub> (cm)	ENTER Enclosed space floor width, W <sub>B</sub> (cm)	ENTER  Enclosed space height, H <sub>B</sub> (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	Le	ENTER Average vapor flow rate into bldg. OR eave blank to calcula Osoll (L/m)	te		
	10	40	1000	1000	366	0.1	0.25		5			
MORE ↓	ENTER Averaging time for carcinogens, AT <sub>C</sub> (yrs)	ENTER Averaging time for noncarcinogens, AT <sub>NC</sub> (yrs)	ENTER  Exposure duration,  ED (yrs)	ENTER  Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Tarqet hazard quotient for noncarcinogens, THQ (unitless)						
	70	30	30	350	1.0E-05	1						
END						llate risk-based concentration.						

## BENZENE GROUNDWATER RISK-BASED CONCENTRATION CHEMICAL PROPERTIES SHEET

Diffusivity in air, D <sub>a</sub> (cm <sup>2</sup> /s)	Diffusivity in water, D <sub>w</sub> (cm <sup>2</sup> /s)	Henry's law constant at reference temperature, H (atm-m <sup>3</sup> /mol)	Henry's law constant reference temperature, T <sub>R</sub> (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T <sub>B</sub> (°K)	Critical temperature, T <sub>C</sub> (°K)	Organic carbon partition coefficient, $K_{oc}$ $(cm^3/g)$	Pure component water solubility, S (ma/L)	Unit risk factor, URF (µg/m³) <sup>-1</sup>	Reference conc., RfC (mg/m³)
		*		(50,,,,,,,		· · · · · · · · · · · · · · · · · · ·	, ,,	(,		, , ,
8.80E-02	9.80E-06	5.54E-03	25	7,342	353.24	562.16	5.89E+01	1.79E+03	7.8E-06	3.0E-02

## BENZENE GROUNDWATER RISK-BASED CONCENTRATION INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source- building separation, L <sub>T</sub> (cm)	$\begin{array}{c} \text{Stratum A} \\ \text{soil} \\ \text{air-filled} \\ \text{porosity,} \\ \theta_a^{\ A} \\ \text{(cm}^3\text{/cm}^3) \end{array}$	Stratum B soil air-filled porosity, $\theta_a^{\ B}$ (cm³/cm³)	Stratum C soil air-filled porosity, $\theta_a^{\ C}$ (cm³/cm³)	Stratum A effective total fluid saturation, S <sub>te</sub> (cm³/cm³)	Stratum A soil intrinsic permeability, k <sub>i</sub> (cm²)	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> )	Thickness of capillary zone, L <sub>cz</sub> (cm)	Total porosity in capillary zone, n <sub>cz</sub> (cm³/cm³)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Floor- wall seam perimeter, X <sub>crack</sub> (cm)
9.46E+08	380	0.284	0.215	#VALUE!	0.184	5.96E-09	0.901	5.37E-09	25.00	0.387	0.067	0.320	4,000
7.102.00								, 0.0,2 0,					17000
Bldq. ventilation rate, Q <sub>bullding</sub> (cm <sup>3</sup> /s)	Area of enclosed space below grade, A <sub>B</sub> (cm <sup>2</sup> )	Crack- to-total area ratio, n (unitless)	Crack depth below grade, Z <sub>crack</sub> (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H <sub>TS</sub> (atm-m³/mol)	Henry's law constant at ave. groundwater temperature, H' <sub>TS</sub> (unitless)	Vapor viscosity at ave. soil temperature,	Stratum  A effective diffusion coefficient, D <sup>eff</sup> <sub>A</sub> (cm <sup>2</sup> /s)	Stratum B effective diffusion coefficient, Deff B (cm²/s)	Stratum C effective diffusion coefficient, D <sup>eff</sup> C (cm <sup>2</sup> /s)	Capillary zone effective diffusion coefficient, D <sup>eff</sup> <sub>cz</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)
2.54E+04	1.80E+06	2.22E-04	200	8,091	3.12E-03	1.33E-01	1.76E-04	8.88E-03	0.00E+00	0.00E+00	8.44E-05	1.13E-03	380
Convection path length, L <sub>p</sub> (cm)	Source vapor conc., C <sub>source</sub> (µg/m³)	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> (cm²)	Exponent of equivalent foundation Peclet number, exp(Pef) (unitless)	Infinite source indoor attenuation coefficient, $\alpha$ (unitless)	Infinite source bldg. conc., C <sub>building</sub> (µg/m³)	Unit risk factor, URF (µg/m³)-1	Reference conc., RfC (mg/m³)			
200	1.33E+02	0.10	8.33E+01	8.88E-03	4.00E+02	6.92E+101	1.98E-04	2.63E-02	7.8E-06	3.0E-02			

#### BENZENE GROUNDWATER RISK-BASED CONCENTRATION **RESULTS SHEET**

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)	_	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
					<del>-</del> 		
1.18E+02	1.19E+03	1.18E+02	1.79E+06	1.18E+02	Ī	NA	NA

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

MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"

#### CIS-1,2-DICHLOROETHENE GROUNDWATER RISK-BASED CONCENTRATION DATA ENTRY SHEET

GW-ADV Version 3.1; 02/04 Reset to Defaults		YES	X OR	)	enter "X" in "YES" b	,	YES" box and initial gr	oundwater conc. I	pelow)			
	ENTER  Chemical CAS No. (numbers only, no dashes)	YES  ENTER Initial groundwater conc., Cw (μg/L)	=	ı 	Chemical							
	156592 ENTER	ENTER	ENTER	ENTER	is-1,2-Dichloroet	hylene ENTER	ENTER	ENTER	ENTER		ENTER	1
MORE ¥	Average soil/ groundwater temperature, Ts (°C)	Depth below grade to bottom of enclosed space floor, L <sub>F</sub> (cm)	Depth below grade to water table, L <sub>WT</sub> (cm)		st add up to value of Thickness of soil stratum B, (Enter value or 0) h <sub>B</sub> (cm)	of L <sub>WT</sub> (cell G28)  Thickness  of soil  stratum C,	Soil stratum directly above water table, (Enter A, B, or C)	SCS soil type directly above water table	Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	User-defined stratum A soil vapor permeability, k <sub>v</sub> (cm <sup>2</sup> )	
	13	200	580	580			А	SL	SL			
MORE V	ENTER Stratum A SCS soil type Lookup Soil ` Parameters ,	ENTER Stratum A soil dry bulk density, Pb A (g/cm3)	ENTER Stratum A soil total porosity, n <sup>A</sup> (unitless)	ENTER Stratum A soil water-filled porosity, $\theta_w^A$ (cm³/cm³)	ENTER Stratum B SCS Soil type Lookup Soil Parameters	ENTER Stratum B soil dry bulk density, Pb (g/cm³)	ENTER Stratum B soil total porosity, n <sup>B</sup> (unitless)	ENTER Stratum B soil water-filled porosity, $\theta_w^B$ $(cm^3/cm^3)$	ENTER Stratum C SCS Soil type Lookup Soil Parameters	ENTER Stratum C soil dry bulk density, $\rho_{b}^{C}$ (g/cm³)	ENTER Stratum C soil total porosity, n <sup>C</sup> (unitless)	ENTER Stratum C soil water-filled porosity, $\theta_w^{\ C}$ $(cm^3/cm^3)$
	SL	1.62	0.387	0.103		1.5	0.43	0.215		Error	Error	Error
MORE	ENTER Enclosed space floor thickness, L <sub>crack</sub> (cm)	ENTER  Soil-bldg. pressure differential, ΔP (g/cm-s²)	ENTER Enclosed space floor length, LB (cm)	ENTER Enclosed space floor width, W <sub>B</sub> (cm)	ENTER  Enclosed space height, H <sub>B</sub> (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	L	ENTER Average vapor flow rate into bldg. OR eave blank to calcula Q <sub>soil</sub> (L/m)	te		
	10	40	1000	1000	366	0.1	0.25	]	5			
MORE	ENTER Averaging time for carcinogens, AT <sub>c</sub> (yrs)	ENTER Averaging time for noncarcinogens, AT <sub>NC</sub> (yrs)	ENTER  Exposure duration, ED (yrs)	ENTER  Exposure frequency, EF (days/yr)	ENTER Tarqet risk for carcinogens, TR (unitless)	ENTER Tarqet hazard quotient for noncarcinogens, THQ (unitless)	[					
END						late risk-based concentration.						

## CIS-1,2-DICHLOROETHENE GROUNDWATER RISK-BASED CONCENTRATION CHEMICAL PROPERTIES SHEET

		Henry's	Henry's	Enthalpy of	Normal		Organic	Pure	Linit	
Diffusivity	Diffusivity	law constant at reference	law constant reference	vaporization at the normal	Normal boiling	Critical	carbon partition	component water	Unit risk	Reference
in air.	in water.	temperature.	temperature.	boiling point,	point.	temperature.	coefficient.	solubility.	factor.	conc.,
D <sub>a</sub>	D <sub>w</sub>	Н	T <sub>R</sub>	$\Delta H_{v,b}$	T <sub>B</sub>	T <sub>C</sub>	K <sub>oc</sub>	S	URF	RfC
(cm <sup>2</sup> /s)	(cm <sup>2</sup> /s)	(atm-m <sup>3</sup> /mol)	(°C)	(cal/mol)	(°K)	(°K)	(cm <sup>3</sup> /g)	(mg/L)	$(\mu g/m^3)^{-1}$	(mg/m <sup>3</sup> )
7.36E-02	1.13E-05	4.07E-03	25	7,192	333.65	544.00	3.55E+01	3.50E+03	0.0E+00	3.5E-02

## CIS-1,2-DICHLOROETHENE GROUNDWATER RISK-BASED CONCENTRATION INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source- building separation, L <sub>T</sub> (cm)	$Stratum A \\ soil \\ air-filled \\ porosity, \\ \theta_a{}^A \\ (cm^3/cm^3)$	Stratum B soil air-filled porosity, $\theta_a^{\ B}$ (cm³/cm³)	Stratum C soil air-filled porosity, $\theta_a^{\ C}$ $(cm^3/cm^3)$	Stratum A effective total fluid saturation, S <sub>te</sub> (cm <sup>3</sup> /cm <sup>3</sup> )	Stratum A soil intrinsic permeability, k <sub>l</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> )	Thickness of capillary zone, L <sub>cz</sub> (cm)	Total porosity in capillary zone, n <sub>cz</sub> (cm <sup>3</sup> /cm <sup>3</sup> )	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Floor- wall seam perimeter, X <sub>crack</sub> (cm)
9.46E+08	380	0.284	0.215	#VALUE!	0.184	5.96E-09	0.901	5.37E-09	25.00	0.387	0.067	0.320	4,000
Bldq. ventilation rate, Q <sub>building</sub> (cm <sup>3</sup> /s)	Area of enclosed space below grade,  A <sub>B</sub> (cm <sup>2</sup> )	Crack- to-total area ratio, n (unitless)	Crack depth below grade, Z <sub>crack</sub> (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H <sub>TS</sub> (atm-m <sup>3</sup> /mol)	Henry's law constant at ave. groundwater temperature, H' <sub>TS</sub> (unitless)	Vapor viscosity at ave. soil temperature,	Stratum A effective diffusion coefficient, D <sup>eff</sup> A (cm²/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> C (cm <sup>2</sup> /s)	Capillary zone effective diffusion coefficient, D <sup>eff</sup> <sub>CZ</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)
2.54E+04	1.80E+06	2.22E-04	200	7,704	2.36E-03	1.00E-01	1.76E-04	7.43E-03	0.00E+00	0.00E+00	7.82E-05	1.03E-03	380
Convection path length, L <sub>p</sub> (cm)	Source vapor conc., C <sub>source</sub> (µg/m³)	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> (cm²)	Exponent of equivalent foundation Peclet number, exp(Pef) (unitless)	Infinite source indoor attenuation coefficient, $\alpha$ (unitless)	Infinite source bldg. conc., C <sub>building</sub> (µg/m³)	Unit risk factor, URF (µg/m³)-1	Reference conc., RfC (mg/m³)	•		
200	1.00E+02	0.10	8.33E+01	7.43E-03	4.00E+02	5.79E+121	1.82E-04	1.83E-02	NA	3.5E-02	]		

#### CIS-1,2-DICHLOROETHENE GROUNDWATER RISK-BASED CONCENTRATION RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

=	Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)	·	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
ſ	NA	2.00E+03	2.00E+03	3.50E+06	2.00E+03	ľ	NA	NA

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

MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.



#### METHYLENE CHLORIDE GROUNDWATER RISK-BASED CONCENTRATION DATA ENTRY SHEET

GW-ADV Version 3.1; 02/04 Reset to Defaults		YES	× OR	)	enter "X" in "YES" b	,	YES" box and initial gro	oundwater conc. t	pelow)			
	ENTER  Chemical CAS No. (numbers only, no dashes)	YES  ENTER Initial groundwater conc., Cw (µg/L)		] 	Chemical							
	75092 <b>ENTER</b>	ENTER	ENTER	ENTER	Methylene chlo  ENTER	ride ENTER	ENTER	ENTER	ENTER		ENTER	1
MORE 🔱	Average soil/ groundwater temperature, Ts (°C)	Depth below grade to bottom of enclosed space floor, L <sub>F</sub> (cm)	Depth below grade to water table, L <sub>WT</sub> (cm)	Totals mu Thickness of soil stratum A, h <sub>A</sub> (cm)	EIVIER st add up to value o Thickness of soil stratum B, (Enter value or 0) h <sub>B</sub> (cm)	of L <sub>WT</sub> (cell G28)  Thickness  of soil  stratum C,	Soil stratum directly above water table, (Enter A, B, or C)	SCS soil type directly above water table	Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	User-defined stratum A soil vapor permeability, k <sub>v</sub> (cm <sup>2</sup> )	
	13	200	580	580			A	SL	SL			
MORE ¥	ENTER Stratum A SCS Soll type Lookup Soil Parameters	ENTER Stratum A soil dry bulk density, $\rho_b^A$ (g/cm³)	ENTER Stratum A soil total porosity, n <sup>A</sup> (unitless)	ENTER Stratum A soil water-filled porosity, $\theta_w^A$ $(cm^3/cm^3)$	ENTER Stratum B SCS Soil type Lookup Soil Parameters	ENTER Stratum B soil dry bulk density, $\rho_b^B$ (g/cm³)	ENTER Stratum B soil total porosity, nB (unitless)	ENTER Stratum B soil water-filled porosity, $\theta_w^B$ $(cm^3/cm^3)$	ENTER Stratum C SCS soil type Lookup Soil Parameters	ENTER Stratum C soil dry bulk density, $\rho_b^{C}$ (g/cm³)	ENTER Stratum C soil total porosity, n <sup>C</sup> (unitless)	ENTER Stratum C soil water-filled porosity, $\theta_w^{\ C}$ $(cm^3/cm^3)$
	SL	1.62	0.387	0.103		1.5	0.43	0.215		Error	Error	Error
MORE	ENTER Enclosed space floor thickness, L <sub>crack</sub> (cm)	ENTER  Soil-bldq. pressure differential, $\Delta P$ (g/cm-s <sup>2</sup> )	ENTER Enclosed space floor length, L <sub>B</sub> (cm)	ENTER Enclosed space floor width, W <sub>B</sub> (cm)	ENTER  Enclosed space height, H <sub>B</sub> (cm)	ENTER Floor-wall seam crack width, W (cm)	ENTER Indoor air exchange rate, ER (1/h)	L =	ENTER Average vapor flow rate into bldq. OR eave blank to calcula O <sub>soil</sub> (L/m)	te		
	10	40	1000	1000	366	0.1	0.25	]	5	[		
MORE	ENTER Averaging time for carcinogens, ATc (yrs)	ENTER Averaging time for noncarcinogens, AT <sub>NC</sub> (yrs)	ENTER  Exposure duration, ED (yrs)	ENTER  Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	: [					
END						late risk-based concentration.						

## METHYLENE CHLORIDE GROUNDWATER RISK-BASED CONCENTRATION CHEMICAL PROPERTIES SHEET

			Henry's law constant	Henry's law constant	Enthalpy of vaporization at	Normal		Organic carbon	Pure component	Unit	
Diffus	. ,	Diffusivity	at reference	reference	the normal	boiling	Critical	partition	water	risk	Reference
in ai	ir,	in water,	temperature,	temperature,	boiling point,	point,	temperature,	coefficient,	solubility,	factor,	conc.,
$D_a$	ı	$D_w$	Н	$T_R$	$\Delta H_{v,b}$	$T_B$	$T_{C}$	K <sub>oc</sub>	S	URF	RfC
(cm <sup>2</sup>	/s)	(cm <sup>2</sup> /s)	(atm-m <sup>3</sup> /mol)	(°C)	(cal/mol)	(°K)	(°K)	(cm <sup>3</sup> /g)	(mg/L)	(μg/m³) <sup>-1</sup>	(mg/m <sup>3</sup> )
1.01E	-01	1.17E-05	2.18E-03	25	6,706	313.00	510.00	1.17E+01	1.30E+04	4.7E-07	3.0E+00

## METHYLENE CHLORIDE GROUNDWATER RISK-BASED CONCENTRATION INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source- building separation, L <sub>T</sub> (cm)	Stratum A soil air-filled porosity, $\theta_a^A$ (cm³/cm³)	Stratum B soil air-filled porosity, $\theta_a^{\ B}$ (cm³/cm³)	Stratum C soil air-filled porosity, $\theta_a^{\ C}$ (cm³/cm³)	Stratum A effective total fluid saturation, S <sub>te</sub> (cm³/cm³)	Stratum A soil intrinsic permeability, k <sub>i</sub> (cm²)	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> )	Thickness of capillary zone, L <sub>cz</sub> (cm)	Total porosity in capillary zone, n <sub>cz</sub> (cm <sup>3</sup> /cm <sup>3</sup> )	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Floor- wall seam perimeter, X <sub>crack</sub> (cm)
9.46E+08	380	0.284	0.215	#VALUE!	0.184	5.96E-09	0.901	5.37E-09	25.00	0.387	0.067	0.320	4,000
7.102.00	000							0.07 = 07					1,000
Bldq. ventilation rate, Q <sub>buliding</sub> (cm <sup>3</sup> /s)	Area of enclosed space below grade, A <sub>B</sub> (cm <sup>2</sup> )	Crack- to-total area ratio, n (unitless)	Crack depth below grade, Z <sub>crack</sub> (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H <sub>TS</sub> (atm-m³/mol)	Henry's law constant at ave. groundwater temperature, H' <sub>TS</sub> (unitless)	Vapor viscosity at ave. soil temperature,	Stratum  A effective diffusion coefficient, Deff A (cm²/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> C (cm <sup>2</sup> /s)	Capillary zone effective diffusion coefficient, Deff cz (cm²/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)
2.54E+04	1.80E+06	2.22E-04	200	7,002	1.33E-03	5.67E-02	1.76E-04	1.02E-02	0.00E+00	0.00E+00	1.15E-04	1.51E-03	380
Convection path length, L <sub>p</sub> (cm)	Source vapor conc., C <sub>source</sub> (µg/m³)	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> (cm²)	Exponent of equivalent foundation Peclet number, exp(Pef) (unitless)	Infinite source indoor attenuation coefficient, $\alpha$ (unitless)	Infinite source bldg. conc., C <sub>building</sub> (µg/m³)	Unit risk factor, URF (µg/m³)-1	Reference conc., RfC (mg/m³)			
200	5.67E+01	0.10	8.33E+01	1.02E-02	4.00E+02	5.35E+88	2.59E-04	1.47E-02	4.7E-07	3.0E+00			

#### METHYLENE CHLORIDE GROUNDWATER RISK-BASED CONCENTRATION RESULTS SHEET

F	21	$\leq$	k	′.	F	3/	Δ,	S	F	Γ	)	(.	ì.	2	$\cap$	1(	1	Ν	lΓ	)	۱۸	V	Δ	П	П	F	F	>	C	(	7	Ν	10	`	F	Λ	ľ	ГΙ	R	2	Λ.	Τ	10	7	Ν	П	$\cap$	1	١I	$\cap$	1	Ш	,	Δ.	Τ	10	7	Ν	5	ş.	

#### INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)		Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
3.53E+03	2.14E+05	3.53E+03	1.30F+07	3.53F+03	· [	NA	NA

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

MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"

#### PCE GROUNDWATER RISK-BASED CONCENTRATION DATA ENTRY SHEET

GW-ADV Version 3.1; 02/04 Reset to Defaults		YES	X OR	<u>.</u>	enter "X" in "YES" b		ES" box and initial gro	oundwater conc. L	pelow)			
	Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., Cw (μg/L)	1		<u>Chemical</u>	lono						
	ENTER	ENTER	I ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER		ENTER	1
MORE	Average soil/ groundwater temperature, Ts (°C)	Depth below grade to bottom of enclosed space floor, L <sub>F</sub> (cm)	Depth below grade to water table, L <sub>WT</sub> (cm)	Thickness of soil	st add up to value of Thickness of soil stratum B, (Enter value or 0) h <sub>B</sub> (cm)	Thickness of soil stratum C,	Soil stratum directly above water table, (Enter A, B, or C)	SCS soil type directly above water table	Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	User-defined stratum A soil vapor permeability, k <sub>v</sub> (cm <sup>2</sup> )	
	13	200	580	580			А	SL	SL			
MORE	ENTER Stratum A SCS Soil type Lookup Soil Parameters	ENTER Stratum A soil dry bulk density, Pb (g/cm³)	ENTER Stratum A soil total porosity, n <sup>A</sup> (unitless)	ENTER Stratum A soil water-fillec porosity,	ENTER Stratum B SCS Soil type Lookup Soil Parameters	ENTER Stratum B soil dry bulk density, PbB (g/cm³)	ENTER Stratum B soil total porosity, n <sup>B</sup> (unitless)	ENTER Stratum B soil water-filled porosity, $\theta_w^B$ $(cm^3/cm^3)$	ENTER Stratum C SCS soil type Lookup Soil Parameters	ENTER Stratum C soil dry bulk density, $\rho_{\text{b}}^{\text{ C}}$ (g/cm³)	ENTER Stratum C soil total porosity, n <sup>C</sup> (unitless)	ENTER Stratum C soil water-filled porosity, $\theta_w^{\ C}$ $(cm^3/cm^3)$
	SL	1.62	0.387	0.103		1.5	0.43	0.215		Error	Error	Error
MORE ↓	ENTER Enclosed space floor thickness, L <sub>crack</sub> (cm)	Soil-bldq. pressure differential, ΔP (g/cm-s²)	ENTER Enclosed space floor length, L <sub>B</sub> (cm)	ENTER Enclosed space floor width, W <sub>B</sub> (cm)	ENTER  Enclosed space height, H <sub>B</sub> (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	L:	ENTER Average vapor flow rate into bldq. OR eave blank to calcular O <sub>soil</sub> (L/m)	re		
	10	40	1000	1000	366	0.1	0.25	]	5			
MORE ↓	ENTER Averaging time for carcinogens, AT <sub>c</sub> (yrs)	ENTER Averaging time for noncarcinogens, AT <sub>NC</sub> (yrs)	ENTER  Exposure duration, ED (yrs)	ENTER  Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Tarqet hazard quotient for noncarcinogens, THQ (unitless)						
	70	30	30	350	1.0E-05	1						
END						late risk-based concentration.						

## PCE GROUNDWATER RISK-BASED CONCENTRATION CHEMICAL PROPERTIES SHEET

		Henry's law constant	Henry's law constant	Enthalpy of vaporization at	Normal		Organic carbon	Pure component	Unit	
Diffusivity	Diffusivity	at reference	reference	the normal	boiling	Critical	partition	water	risk	Reference
in air,	in water,	temperature,	temperature,	boiling point,	point,	temperature,	coefficient,	solubility,	factor,	conc.,
$D_a$	$D_{w}$	Н	$T_R$	$\Delta H_{v,b}$	$T_B$	T <sub>C</sub>	K <sub>oc</sub>	S	URF	RfC
(cm <sup>2</sup> /s)	(cm <sup>2</sup> /s)	(atm-m <sup>3</sup> /mol)	(°C)	(cal/mol)	(°K)	(°K)	(cm <sup>3</sup> /g)	(mg/L)	$(\mu g/m^3)^{-1}$	(mg/m <sup>3</sup> )
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	1.55E+02	2.00E+02	5.9E-06	2.7E-01

## PCE GROUNDWATER RISK-BASED CONCENTRATION INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source- building separation, L <sub>T</sub> (cm)	$ \begin{array}{c} \text{Stratum A} \\ \text{soil} \\ \text{air-filled} \\ \text{porosity,} \\ \theta_a{}^A \\ \text{(cm}^3\text{/cm}^3) \end{array} $	Stratum B soil air-filled porosity, $\theta_a^{\ B}$ (cm³/cm³)	Stratum C soil air-filled porosity, $\theta_a^{\ C}$ $(cm^3/cm^3)$	Stratum A effective total fluid saturation, S <sub>te</sub> (cm <sup>3</sup> /cm <sup>3</sup> )	Stratum A soil intrinsic permeability, k <sub>l</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> )	Thickness of capillary zone, L <sub>cz</sub> (cm)	Total porosity in capillary zone, n <sub>cz</sub> (cm <sup>3</sup> /cm <sup>3</sup> )	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm³/cm³)	Floor- wall seam perimeter, X <sub>crack</sub> (cm)
9.46E+08	380	0.284	0.215	#VALUE!	0.184	5.96E-09	0.901	5.37E-09	25.00	0.387	0.067	0.320	4,000
Bldg. ventilation rate,	Area of enclosed space below grade,	Crack- to-total area ratio,	Crack depth below grade,	Enthalpy of vaporization at ave. groundwater temperature,	Henry's law constant at ave. groundwater temperature,	Henry's law constant at ave. groundwater temperature,	Vapor viscosity at ave. soil temperature,	Stratum A effective diffusion coefficient,	Stratum B effective diffusion coefficient,	Stratum C effective diffusion coefficient,	Capillary zone effective diffusion coefficient,	Total overall effective diffusion coefficient,	Diffusion path length,
Q <sub>building</sub> (cm <sup>3</sup> /s)	A <sub>B</sub> (cm <sup>2</sup> )	η (unitless)	Z <sub>crack</sub> (cm)	$\Delta H_{v,TS}$ (cal/mol)	H <sub>TS</sub> (atm-m³/mol)	H' <sub>TS</sub> (unitless)	μ <sub>TS</sub> (a/cm-s)	D <sup>eff</sup> <sub>A</sub> (cm <sup>2</sup> /s)	D <sup>eff</sup> <sub>B</sub> (cm <sup>2</sup> /s)	D <sup>eff</sup> <sub>C</sub> (cm <sup>2</sup> /s)	D <sup>eff</sup> <sub>cz</sub> (cm <sup>2</sup> /s)	D <sup>eff</sup> <sub>T</sub> (cm <sup>2</sup> /s)	L <sub>d</sub>
(CIII 73)	(CIII)	(unitiess)	(CIII)	(Cal/ITIOI)	(4(111-111-111101)	(uriitiess)	(Q/CITI-S)	(CIII 73)	(СПТ 73)	(СПТ 73)	(СП 73)	(СПТ 73)	(cm)
2.54E+04	1.80E+06	2.22E-04	200	9,523	9.35E-03	3.98E-01	1.76E-04	7.27E-03	0.00E+00	0.00E+00	6.31E-05	8.54E-04	380
Convection path length, L <sub>p</sub> (cm)	Source vapor conc., C <sub>source</sub> (µg/m³)	Crack radius, r <sub>crack</sub> (cm)	Average vapor flow rate into bldg., $Q_{soil}$ (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> (cm²)	Exponent of equivalent foundation Peclet number, exp(Pef) (unitless)	Infinite source indoor attenuation coefficient, $\alpha$ (unitless)	Infinite source bldg. conc., C <sub>building</sub> (µg/m³)	Unit risk factor, URF (µg/m³)-1	Reference conc., RfC (mg/m³)			
200	3.98E+02	0.10	8.33E+01	7.27E-03	4.00E+02	2.98E+124	1.52E-04	6.05E-02	5.9E-06	2.7E-01	]		

#### PCE GROUNDWATER RISK-BASED CONCENTRATION RESULTS SHEET

#### INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)	_	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
		•	•		_		
6.82E+01	4.65E+03	6.82E+01	2.00E+05	6.82E+01		NA	NA

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

MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"

### TCE GROUNDWATER RISK-BASED CONCENTRATION DATA ENTRY SHEET

GW-ADV Version 3.1; 02/04	CALCULATE RIS	SK-BASED GROU	NDWATER CON	CENTRATION (	enter "X" in "YES" b	ox)						
Reset to Defaults	CALCULATE IN	CREMENTAL RISK	OR KS FROM ACTUA	AL GROUNDWA	ATER CONCENTRA	ATION (enter "X" in "Y	'ES" box and initial gro	oundwater conc. b	pelow)			
		YES		]								
	ENTER  Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., Cw (µg/L)			Chemical							
	79016	-	<del>-</del> ]		Trichloroethyle	ene						
	ENTER	ENTER Depth	ENTER	ENTER Totals mu	ENTER st add up to value o	ENTER	ENTER	ENTER	ENTER Soil		ENTER	]
MORE <b>₩</b>	Average soil/ groundwater temperature, T <sub>s</sub> (°C)	below grade to bottom of enclosed space floor, L <sub>F</sub> (cm)	Depth below grade to water table, L <sub>WT</sub> (cm)	Thickness of soil stratum A, h <sub>A</sub> (cm)	Thickness of soil stratum B, (Enter value or 0) h <sub>B</sub> (cm)	Thickness of soil stratum C,	Soil stratum directly above water table, (Enter A, B, or C)	SCS soil type directly above water table	stratum A SCS soil type (used to estimate soil vapor permeability)	OR	User-defined stratum A soil vapor permeability, k <sub>v</sub> (cm <sup>2</sup> )	
	13	200	580	580			A	SL	SI			
MORE ↓	ENTER Stratum A SCS Soil type Lookup Soil Parameters	ENTER Stratum A soil dry bulk density, Pb^ (g/cm³)	ENTER Stratum A soil total porosity, n <sup>A</sup> (unitless)	ENTER Stratum A soil water-filled porosity, $\theta_w^A$ (cm³/cm³)	ENTER Stratum B SCS Soil type Lookup Soil Parameters	ENTER Stratum B soil dry bulk density, $\rho_b^B$ (g/cm³)	ENTER Stratum B soil total porosity, n <sup>B</sup> (unitless)	ENTER Stratum B soil water-filled porosity, $\theta_w^B$ $(cm^3/cm^3)$	ENTER Stratum C SCS Soil type Lookup Soil Parameters	ENTER Stratum C soil dry bulk density, $\rho_b^{\ C}$ (g/cm³)	ENTER Stratum C soil total porosity, n <sup>C</sup> (unitless)	ENTER Stratum C soil water-filled porosity, $\theta_w^C$ $(cm^3/cm^3)$
	SL	1.62	0.387	0.103		1.5	0.43	0.215		Error	Error	Error
MORE ↓	ENTER Enclosed space floor thickness, L <sub>crack</sub> (cm)	ENTER  Soil-bldq. pressure differential, ΔP (g/cm-s²)	ENTER Enclosed space floor length, L <sub>B</sub> (cm)	ENTER Enclosed space floor width, W <sub>B</sub> (cm)	ENTER  Enclosed space height, H <sub>B</sub> (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	L∙	ENTER Average vapor flow rate into bldq. OR eave blank to calcula Osoil (L/m)	te		
	10	40	1000	1000	366	0.1	0.25	]	5			
	· · · · · · · · · · · · · · · · · · ·											
MORE	ENTER Averaging time for carcinogens, AT <sub>C</sub> (yrs)	ENTER Averaging time for noncarcinogens, AT <sub>NC</sub> (yrs)	ENTER  Exposure duration, ED (yrs)	ENTER  Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)						
MORE ↓	Averaging time for carcinogens, AT <sub>c</sub>	Averaging time for noncarcinogens, AT <sub>NC</sub>	Exposure duration, ED	Exposure frequency, EF	Target risk for carcinogens, TR	Target hazard quotient for noncarcinogens, THQ						

### TCE GROUNDWATER RISK-BASED CONCENTRATION CHEMICAL PROPERTIES SHEET

Diffusivity in air, D <sub>a</sub> (cm <sup>2</sup> /s)	Diffusivity in water, D <sub>w</sub> (cm <sup>2</sup> /s)	Henry's law constant at reference temperature, H (atm-m³/mol)	Henry's law constant reference temperature, T <sub>R</sub> (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T <sub>B</sub> (°K)	Critical temperature, T <sub>C</sub> (°K)	Organic carbon partition coefficient, $K_{oc}$ $(cm^3/q)$	Pure component water solubility, S (ma/L)	Unit risk factor, URF (µg/m <sup>3</sup> )-1	Reference conc., RfC (mg/m <sup>3</sup> )
	, ,			(======================================				(***********		, , ,
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1.47E+03	2.0E-06	0.0E+00

### TCE GROUNDWATER RISK-BASED CONCENTRATION INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source- building separation, L <sub>T</sub> (cm)	$\begin{array}{c} \text{Stratum A} \\ \text{soil} \\ \text{air-filled} \\ \text{porosity,} \\ \theta_a{}^A \\ \text{(cm}^3\text{/cm}^3) \end{array}$	Stratum B soil air-filled porosity, $\theta_a^{\ B}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Stratum C soil air-filled porosity, $\theta_a^{\ c}$ $(cm^3/cm^3)$	Stratum A effective total fluid saturation, S <sub>te</sub> (cm³/cm³)	Stratum A soil intrinsic permeability, k <sub>I</sub> (cm <sup>2</sup> )	Stratum A soil relative air permeability, $k_{rg}$ (cm <sup>2</sup> )	Stratum A soil effective vapor permeability, k <sub>v</sub> (cm <sup>2</sup> )	Thickness of capillary zone, L <sub>cz</sub> (cm)	Total porosity in capillary zone, n <sub>cz</sub> (cm <sup>3</sup> /cm <sup>3</sup> )	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Water-filled porosity in capillary zone, $\theta_{\text{W,CZ}}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Floor- wall seam perimeter, X <sub>crack</sub> (cm)
9.46E+08	380	0.284	0.215	#VALUE!	0.184	5.96E-09	0.901	5.37E-09	25.00	0.387	0.067	0.320	4,000
Bldq. ventilation rate, Q <sub>building</sub> (cm³/s)	Area of enclosed space below grade,  AB (cm²)	Crack- to-total area ratio, n (unitless)	Crack depth below grade, Z <sub>crack</sub> (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H <sub>TS</sub> (atm-m <sup>3</sup> /mol)	Henry's law constant at ave. groundwater temperature, H' <sub>TS</sub> (unitless)	Vapor viscosity at ave. soil temperature,  µ <sub>TS</sub> (q/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)	Capillary zone effective diffusion coefficient, Deff cz (cm²/s)	Total overall effective diffusion coefficient, D <sup>eff</sup> <sub>T</sub> (cm <sup>2</sup> /s)	Diffusion path length,
2.54E+04	1.80E+06	2.22E-04	200	8,520	5.62E-03	2.39E-01	1.76E-04	7.98E-03	0.00E+00	0.00E+00	7.16E-05	9.65E-04	380
Convection path length, L <sub>p</sub> (cm)	Source vapor conc., C <sub>source</sub> (µg/m³)	Crack radius, r <sub>crack</sub> (cm)	Average vapor flow rate into bldg., $Q_{soil}$ (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> (cm²)	Exponent of equivalent foundation Peclet number, exp(Pef) (unitless)	Infinite source indoor attenuation coefficient, $\alpha$ (unitless)	Infinite source bldg. conc., Cbuilding (µg/m³)	Unit risk factor, URF (µg/m³)·1	Reference conc., RfC (mg/m³)	·		
200	2.39E+02	0.10	8.33E+01	7.98E-03	4.00E+02	2.78E+113	1.71E-04	4.08E-02	2.0E-06	NA	]		

### TCE GROUNDWATER RISK-BASED CONCENTRATION RESULTS SHEET

#### RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

#### INCREMENTAL RISK CALCULATIONS:

_	Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
	2.98E+02	NA	2.98E+02	1.47E+06	2.98E+02	NA	NA

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

MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"

### VINYL CHLORIDE GROUNDWATER RISK-BASED CONCENTRATION DATA ENTRY SHEET

GW-ADV Version 3.1; 02/04 Reset to Defaults		YES	X OR	)	enter "X" in "YES" b	,	/ES" box and initial gr	oundwater conc. t	pelow)			
	ENTER  Chemical CAS No. (numbers only, no dashes)	YES  ENTER Initial groundwater conc., Cw (µg/L)	-	ı 	Chemical							
MORE	75014  ENTER  Average soil/ groundwater temperature,    Ts (°C)	ENTER Depth below grade to bottom of enclosed space floor, L <sub>F</sub> (cm)	ENTER  Depth below grade to water table, LwT (cm)	ENTER	yl chloride (chloride)  ENTER  ist add up to value of  Thickness of soil  stratum B,  (Enter value or 0) h B (cm)	ENTER  f LwT (cell G28)  Thickness  of soil  stratum C,	ENTER  Soil  stratum directly above water table, (Enter A, B, or C)	SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER  User-defined stratum A soil vapor permeability, k, (cm²)	
MORE 🗸	ENTER Stratum A SCS Soil type Lookup Soil Parameters	ENTER Stratum A soil dry bulk density, Pb (g/cm³)	ENTER Stratum A soil total porosity, n^ (unitless)	ENTER Stratum A soil water-filled porosity, $\theta_w^A$ $(cm^3/cm^3)$	ENTER Stratum B SCS Soil type Lookup Soil Parameters	ENTER Stratum B soil dry bulk density, Pb (g/cm³)	ENTER Stratum B soil total porosity, nB (unitless)	ENTER Stratum B soil water-filled porosity, $\theta_w^B$ (cm <sup>3</sup> /cm <sup>3</sup> )	ENTER Stratum C SCS Soil type Lookup Soil Parameters	ENTER Stratum C soil dry bulk density, Pb (g/cm³)	ENTER Stratum C soil total porosity, n (unitless)	ENTER Stratum C soil water-filled porosity, $\theta_w^c$ $(cm^3/cm^3)$
MORE	SL  ENTER Enclosed space floor thickness, L <sub>crack</sub> (cm)	1.62  ENTER  Soil-bldq, pressure differential, ΔP (g/cm-s²)	ENTER Enclosed space floor length, L <sub>B</sub> (cm)	0.103  ENTER Enclosed space floor width, W <sub>B</sub> (cm)	ENTER Enclosed space height, H <sub>B</sub> (cm)	1.5  ENTER  Floor-wall seam crack width,  W (cm)	0.43  ENTER  Indoor air exchange rate, ER (1/h)	0.215	ENTER Average vapor flow rate into bldq. OR eave blank to calcula Q <sub>soil</sub> (L/m)	Error	Error	Error
MORE	ENTER Averaging time for carcinogens, ATc (yrs)	40  ENTER Averaging time for noncarcinogens, AT <sub>NC</sub> (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	366  ENTER  Target risk for carcinogens, TR (unitless)	0.1  ENTER Target hazard quotient for noncarcinogens, THQ (unitless)  1	0.25	]	5			

### VINYL CHLORIDE GROUNDWATER RISK-BASED CONCENTRATION CHEMICAL PROPERTIES SHEET

			Henry's law constant	Henry's law constant	Enthalpy of vaporization at	Normal		Organic carbon	Pure component	Unit	
D	iffusivity	Diffusivity	at reference	reference	the normal	boiling	Critical	partition	water	risk	Reference
	in air,	in water,	temperature,	temperature,	boiling point,	point,	temperature,	coefficient,	solubility,	factor,	conc.,
	$D_a$	$D_{w}$	Н	$T_R$	$\Delta H_{v,b}$	T <sub>B</sub>	$T_{C}$	K <sub>oc</sub>	S	URF	RfC
(	(cm²/s)	(cm <sup>2</sup> /s)	(atm-m <sup>3</sup> /mol)	(°C)	(cal/mol)	(°K)	(°K)	(cm <sup>3</sup> /g)	(mg/L)	$(\mu g/m^3)^{-1}$	(mg/m <sup>3</sup> )
											-
1.	.06E-01	1.23E-05	2.69E-02	25	5,250	259.25	432.00	1.86E+01	8.80E+03	8.8E-06	1.0E-01

### VINYL CHLORIDE GROUNDWATER RISK-BASED CONCENTRATION INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source- building separation, L <sub>T</sub> (cm)	Stratum A soil air-filled porosity, $\theta_a^A$ (cm³/cm³)	Stratum B soil air-filled porosity, $\theta_a^{\ B}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Stratum C soil air-filled porosity, $\theta_a^{\ C}$ (cm³/cm³)	Stratum A effective total fluid saturation, S <sub>te</sub> (cm³/cm³)	Stratum A soil intrinsic permeability, k <sub>i</sub> (cm²)	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> )	Thickness of capillary zone, L <sub>cz</sub> (cm)	Total porosity in capillary zone, n <sub>cz</sub> (cm <sup>3</sup> /cm <sup>3</sup> )	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Floor- wall seam perimeter, X <sub>crack</sub> (cm)
9.46E+08	380	0.284	0.215	#VALUE!	0.184	5.96E-09	0.901	5.37E-09	25.00	0.387	0.067	0.320	4,000
7.102.00	000							, 0.0, 2 0,					17000
Bldq. ventilation rate, Q <sub>buliding</sub> (cm <sup>3</sup> /s)	Area of enclosed space below grade, A <sub>B</sub> (cm <sup>2</sup> )	Crack- to-total area ratio, n (unitless)	Crack depth below grade, Z <sub>crack</sub> (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H <sub>TS</sub> (atm-m³/mol)	Henry's law constant at ave. groundwater temperature, H' <sub>TS</sub> (unitless)	Vapor viscosity at ave. soil temperature,  \$\mu_{TS}\$ (q/cm-s)	Stratum  A effective diffusion coefficient, D <sup>eff</sup> A (cm²/s)	Stratum B effective diffusion coefficient, Deff B (cm²/s)	Stratum C effective diffusion coefficient, D <sup>eff</sup> C (cm <sup>2</sup> /s)	Capillary zone effective diffusion coefficient, Deff cz (cm²/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)
2.54E+04	1.80E+06	2.22E-04	200	4,966	1.89E-02	8.07E-01	1.76E-04	1.07E-02	0.00E+00	0.00E+00	9.07E-05	1.23E-03	380
Convection path length, L <sub>p</sub> (cm)	Source vapor conc., C <sub>source</sub> (µg/m³)	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> (cm²)	Exponent of equivalent foundation Peclet number, exp(Pef) (unitless)	Infinite source indoor attenuation coefficient, $\alpha$ (unitless)	Infinite source bldg. conc., C <sub>building</sub> (µg/m³)	Unit risk factor, URF (µg/m³)-1	Reference conc., RfC (mg/m³)			
200	8.07E+02	0.10	8.33E+01	1.07E-02	4.00E+02	3.54E+84	2.14E-04	1.73E-01	8.8E-06	1.0E-01			

### VINYL CHLORIDE GROUNDWATER RISK-BASED CONCENTRATION RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

-	Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)	=	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
ſ	1.60E+01	6.03E+02	1.60E+01	8.80E+06	1.60E+01	Ī	NA	NA

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

MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"

# VAPOR INTRUSION MODEL MEN'S SHELTER

#### 1,1-DICHLOROETHANE-VAPOR INTRUSION MODEL MEN'S SHELTER DATA ENTRY SHEET

GW-ADV Version 3.1; 02/04	CALCULATE RIS	SK-BASED GROUI	NDWATER CON	CENTRATION (	enter "X" in "YES" b	oox)						
Reset to Defaults	CALCULATE INC	YES CREMENTAL RISK	OR	]	ATER CONCENTRA	ATION (enter "X" in "Y	/ES" box and initial gr	oundwater.concb	nelow)			
,		YES	Х	7					,			
	ENTER  Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C <sub>W</sub> (µg/L)			Chemical							
	75343	7.05E+00			1,1-Dichloroeth	nane						
	ENTER	ENTER Depth	ENTER	ENTER Totals mu	ENTER ast add up to value o	ENTER of L <sub>WT</sub> (cell G28)	ENTER	ENTER	ENTER Soil		ENTER	
MORE <b>↓</b>	Average soil/ groundwater temperature, T <sub>s</sub> (°C)	below grade to bottom of enclosed space floor, L <sub>F</sub> (cm)	Depth below grade to water table, L <sub>WT</sub> (cm)	Thickness of soil stratum A, h <sub>A</sub> (cm)	Thickness of soil stratum B,	Thickness of soil stratum C, (Enter value or 0) h <sub>C</sub> (cm)	Soil stratum directly above water table, (Enter A, B, or C)	SCS soil type directly above water table	stratum A SCS soil type (used to estimate soil vapor permeability)	OR	User-defined stratum A soil vapor permeability, k <sub>v</sub> (cm <sup>2</sup> )	
	13	15	488	488			А	SL	SL			
MORE ↓	ENTER Stratum A SCS soil type Lookup Soil Parameters	ENTER Stratum A soil dry bulk density, $\rho_b^A$ (g/cm³)	ENTER Stratum A soil total porosity, n^ (unitless)	ENTER Stratum A soil water-filled porosity, $\theta_w^A$ (cm³/cm³)	ENTER Stratum B SCS Soil type Lookup Soil Parameters	ENTER Stratum B soil dry bulk density, Pb B (g/cm³)	ENTER Stratum B soil total porosity, n <sup>B</sup> (unitless)	ENTER Stratum B soil water-filled porosity, $\theta_w^B$ $(cm^3/cm^3)$	ENTER Stratum C SCS Soil type Lookup Soil ` Parameters	ENTER Stratum C soil dry bulk density, Pb (g/cm³)	ENTER Stratum C soil total porosity, n <sup>C</sup> (unitless)	ENTER Stratum C soil water-filled porosity, $\theta_w^C$ $(cm^3/cm^3)$
	SL	1.62	0.387	0.103		1.5	0.43	0.215		Error	Error	Error
MORE 🔶	ENTER Enclosed space floor thickness, L <sub>crack</sub> (cm)	ENTER  Soil-bldq. pressure differential, ΔP (g/cm-s²)	ENTER Enclosed space floor length, L <sub>B</sub> (cm)	ENTER Enclosed space floor width, W <sub>B</sub> (cm)	ENTER  Enclosed space height, HB (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	Le	ENTER Average vapor flow rate into bldq. OR eave blank to calcular Q <sub>soil</sub> (L/m)	te		
	10	40	1000	1000	244	0.1	0.25	]	5			
MORE <b>↓</b>	ENTER Averaging time for carcinogens, AT <sub>C</sub> (yrs)	ENTER Averaging time for noncarcinogens, AT <sub>NC</sub> (yrs)	ENTER  Exposure duration, ED (yrs)	ENTER  Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)						
	70	1	11	350	1.0E-06	1						
END						ulate risk-based concentration.						

## 1,1-DICHLOROETHANE-VAPOR INTRUSION MODEL MEN'S SHELTER CHEMICAL PROPERTIES SHEET

		Henry's law constant	Henry's law constant	Enthalpy of	Normal		Organic carbon	Pure	Unit	
Diffusivity	Diffusivity	at reference	reference	vaporization at the normal	Normal boiling	Critical	partition	component water	risk	Reference
in air.	in water.	temperature.	temperature.	boiling point,	point.	temperature.	coefficient.	solubility.	factor.	conc.,
D <sub>a</sub>	D <sub>w</sub>	Н	T <sub>R</sub>	$\Delta H_{v,b}$	T <sub>B</sub>	T <sub>C</sub>	K <sub>oc</sub>	S	URF	RfC
(cm <sup>2</sup> /s)	(cm <sup>2</sup> /s)	(atm-m <sup>3</sup> /mol)	(°C)	(cal/mol)	(°K)	(°K)	(cm <sup>3</sup> /g)	(mg/L)	$(\mu g/m^3)^{-1}$	(mg/m <sup>3</sup> )
7.42E-02	1.05E-05	5.61E-03	25	6,895	330.55	523.00	3.16E+01	5.06E+03	0.0E+00	5.0E-01

## 1,1-DICHLOROETHANE-VAPOR INTRUSION MODEL MEN'S SHELTER INTERMEDIATE CALCULATIONS SHEET

Exposure duration,	Source- building separation, L <sub>T</sub> (cm)	$\begin{array}{c} \text{Stratum A} \\ \text{soil} \\ \text{air-filled} \\ \text{porosity,} \\ \theta_a{}^A \\ \text{(cm}^3\text{/cm}^3) \end{array}$	Stratum B soil air-filled porosity, $\theta_a^B$ (cm³/cm³)	Stratum C soil air-filled porosity, $\theta_a^{\ C}$ (cm³/cm³)	Stratum A effective total fluid saturation, S <sub>te</sub> (cm³/cm³)	Stratum A soil intrinsic permeability, k <sub>1</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> )	Thickness of capillary zone, L <sub>cz</sub> (cm)	Total porosity in capillary zone, n <sub>cz</sub> (cm <sup>3</sup> /cm <sup>3</sup> )	Air-filled porosity in capillary zone, θ <sub>a,cz</sub> (cm <sup>3</sup> /cm <sup>3</sup> )	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Floor- wall seam perimeter, X <sub>crack</sub> (cm)
3.15E+07	473	0.284	0.215	#VALUE!	0.184	5.96E-09	0.901	5.37E-09	25.00	0.387	0.067	0.320	4,000
Bldq. ventilation rate, O <sub>building</sub> (cm <sup>3</sup> /s)	Area of enclosed space below grade, A <sub>B</sub> (cm <sup>2</sup> )	Crack- to-total area ratio,     (unitless)	Crack depth below grade, Z <sub>crack</sub> (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H <sub>TS</sub> (atm-m³/mol)	Henry's law constant at ave. groundwater temperature, H' <sub>TS</sub> (unitless)	Vapor viscosity at ave. soil temperature,  µ <sub>TS</sub> (g/cm-s)	Stratum  A effective diffusion coefficient, D <sup>eff</sup> A (cm²/s)	Stratum B effective diffusion coefficient, D <sup>eff</sup> (cm <sup>2</sup> /s)	Stratum C effective diffusion coefficient, D <sup>eff</sup> (cm <sup>2</sup> /s)	Capillary zone effective diffusion coefficient, D <sup>eff</sup> <sub>cz</sub> (cm <sup>2</sup> /s)	Total overall effective diffusion coefficient, Deff (cm²/s)	Diffusion path length, L <sub>d</sub> (cm)
1.69E+04	1.06E+06	3.77E-04	15	7,417	3.32E-03	1.41E-01	1.76E-04	7.49E-03	0.00E+00	0.00E+00	7.30E-05	1.18E-03	473
Convection path length, L <sub>p</sub> (cm)	Source vapor conc., C <sub>source</sub> (µg/m³)	Crack radius, r <sub>crack</sub> (cm)	Average vapor flow rate into bldg., $Q_{soil}$ (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> (cm²)	Exponent of equivalent foundation Peclet number, exp(Pef) (unitless)	Infinite source indoor attenuation coefficient, a (unitless)	Infinite source bldg. conc., C <sub>building</sub> (µg/m³)	Unit risk factor, URF (µg/m³)-1	Reference conc., RfC (mg/m³)			
15	9.96E+02	0.10	8.33E+01	7.49E-03	4.00E+02	6.03E+120	1.51E-04	1.50E-01	NA	5.0E-01			

### 1,1-DICHLOROETHANE-VAPOR INTRUSION MODEL MEN'S SHELTER RESULTS SHEET

#### RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

#### INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)		Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
					-		
NA	NA	NA	5.06E+06	NA	Ī I	NA	2.9E-04

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

SCROLL DOWN TO "END"

#### 1,2-DICHLOROETHANE-VAPOR INTRUSION MODEL MEN'S SHELTER DATA ENTRY SHEET

GW-ADV Version 3.1; 02/04	CALCULATE RIS		NDWATER CON	CENTRATION (	enter "X" in "YES" b	00x)						
Reset to Defaults	CALCULATE INC	YES CREMENTAL RISK	OR (S FROM ACTUA	L GROUNDWA	TER CONCENTRA	ATION (enter "X" in "\	/ES" box and initial gr	oundwater conc. b	elow)			
		YES	Х	]								
	ENTER  Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., Cw (µg/L)	:		Chemical							
	107062	2.00E+00	]		1,2-Dichloroeth	nane						
MORE 🗸	ENTER  Average soil/	ENTER Depth below grade to bottom	<b>ENTER</b> Depth	ENTER Totals mu Thickness	ENTER st add up to value o Thickness of soil	ENTER of L <sub>WT</sub> (cell G28) Thickness of soil	<b>ENTER</b> Soil	ENTER	ENTER Soil stratum A SCS		ENTER User-defined stratum A	
	groundwater temperature, T <sub>s</sub> (°C)	of enclosed space floor, $L_F$ (cm)	below grade to water table,  L <sub>WT</sub> (cm)	of soil stratum A, h <sub>A</sub> (cm)	stratum B, (Enter value or 0) h <sub>B</sub> (cm)	stratum C,	stratum directly above water table, (Enter A. B. or C)	SCS soil type directly above water table	soil type (used to estimate soil vapor permeability)	OR	soil vapor permeability, k <sub>v</sub> (cm <sup>2</sup> )	
	13	15	488	488	(cm)	(citi)	A	SL	SI		(4 )	
MORE ↓	ENTER Stratum A SCS soil type Lookup Soil Parameters	ENTER Stratum A soil dry bulk density, Pb^ (g/cm³)	ENTER Stratum A soil total porosity, n <sup>A</sup> (unitless)	ENTER Stratum A soil water-filled porosity, $\theta_w^A$ (cm³/cm³)	ENTER Stratum B SCS Soil type Lookup Soil Parameters	ENTER Stratum B soil dry bulk density, Pb (g/cm³)	ENTER Stratum B soil total porosity, n <sup>B</sup> (unitless)	ENTER Stratum B soil water-filled porosity, $\theta_w^B$ $(cm^3/cm^3)$	ENTER Stratum C SCS Soil type Lookup Soil ` Parameters	ENTER Stratum C soil dry bulk density, $\rho_b^{\ C}$ (g/cm³)	ENTER Stratum C soil total porosity, n <sup>C</sup> (unitless)	ENTER Stratum C soil water-filled porosity, $\theta_w^C$ $(cm^3/cm^3)$
	SL	1.62	0.387	0.103		1.5	0.43	0.215		Error	Error	Error
MORE	ENTER Enclosed space floor thickness, L <sub>crack</sub> (cm)	ENTER Soil-bldq. pressure differential, ΔP (g/cm-s²)	ENTER Enclosed space floor length, L <sub>B</sub> (cm)	ENTER Enclosed space floor width, W <sub>B</sub> (cm)	ENTER  Enclosed space height, H <sub>B</sub> (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	Le	ENTER Average vapor flow rate into bldg. OR eave blank to calculat Q <sub>soil</sub> (L/m)	te		
	10	40	1000	1000	244	0.1	0.25	]	5			
MORE	ENTER Averaging time for carcinogens, AT <sub>c</sub> (yrs)	ENTER Averaging time for noncarcinogens, AT <sub>NC</sub> (yrs)	ENTER  Exposure duration, ED (yrs)	ENTER  Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)						
	70	1	1	350	1.0E-06	1						
END						ulate risk-based concentration.						

## 1,2-DICHLOROETHANE-VAPOR INTRUSION MODEL MEN'S SHELTER CHEMICAL PROPERTIES SHEET

Diffusivity	Diffusivity	Henry's law constant at reference	Henry's law constant reference	Enthalpy of vaporization at the normal	Normal boiling	Critical	Organic carbon partition	Pure component water	Unit risk	Reference
in air, D <sub>a</sub>	in water, D <sub>w</sub>	temperature, H	temperature, $T_{\text{R}}$	boiling point, $\Delta H_{v,b}$	point, T <sub>B</sub>	temperature, T <sub>C</sub>	coefficient, K <sub>oc</sub>	solubility, S	factor, URF	conc., RfC
(cm <sup>2</sup> /s)	(cm <sup>2</sup> /s)	(atm-m <sup>3</sup> /mol)	(°C)	(cal/mol)	(°K)	(°K)	(cm <sup>3</sup> /g)	(mg/L)	(μg/m <sup>3</sup> ) <sup>-1</sup>	(mg/m³)
1.04E-01	9.90E-06	9.77E-04	25	7,643	356.65	561.00	1.74E+01	8.52E+03	2.6E-05	0.0E+00

## 1,2-DICHLOROETHANE-VAPOR INTRUSION MODEL MEN'S SHELTER INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source- building separation, L <sub>T</sub> (cm)	$\begin{array}{c} \text{Stratum A} \\ \text{soil} \\ \text{air-filled} \\ \text{porosity,} \\ \theta_{\text{a}}{}^{\text{A}} \\ \text{(cm}^{3}\text{/cm}^{3}\text{)} \end{array}$	Stratum B soil air-filled porosity, $\theta_a^{\ B}$ (cm³/cm³)	Stratum C soil air-filled porosity, $\theta_a^{\ C}$ $(cm^3/cm^3)$	Stratum A effective total fluid saturation, S <sub>te</sub> (cm³/cm³)	Stratum A soil intrinsic permeability, k <sub>I</sub> (cm²)	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> )	Thickness of capillary zone, L <sub>cz</sub> (cm)	Total porosity in capillary zone, n <sub>cz</sub> (cm³/cm³)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm³/cm³)	Floor- wall seam perimeter, X <sub>crack</sub> (cm)
3.15E+07	473	0.284	0.215	#VALUE!	0.184	5.96E-09	0.901	5.37E-09	25.00	0.387	0.067	0.320	4,000
Bldq. ventilation rate, Q <sub>bullding</sub> (cm <sup>3</sup> /s)	Area of enclosed space below grade, A <sub>B</sub> (cm <sup>2</sup> )	Crack- to-total area ratio, n (unitless)	Crack depth below grade, Z <sub>crack</sub> (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H <sub>TS</sub> (atm-m <sup>3</sup> /mol)	Henry's law constant at ave. groundwater temperature, H' <sub>TS</sub> (unitless)	Vapor viscosity at ave. soil temperature,  µ <sub>TS</sub> (g/cm-s)	Stratum  A effective diffusion coefficient, D <sup>eff</sup> (cm²/s)	Stratum B effective diffusion coefficient, D <sup>eff</sup> (cm <sup>2</sup> /s)	Stratum C effective diffusion coefficient, D <sup>eff</sup> c (cm <sup>2</sup> /s)	Capillary zone effective diffusion coefficient, Deff cz (cm²/s)	Total overall effective diffusion coefficient, Deff_(cm^2/s)	Diffusion path length, L <sub>d</sub> (cm)
1.69E+04	1.06E+06	3.77E-04	15	8,490	5.35E-04	2.28E-02	1.76E-04	1.05E-02	0.00E+00	0.00E+00	1.52E-04	2.28E-03	473
Convection path length, L <sub>p</sub> (cm)	Source vapor conc., C <sub>source</sub> (µg/m³)	Crack radius, r <sub>crack</sub> (cm)	Average vapor flow rate into bldg., $Q_{soil}$ (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> (cm²)	Exponent of equivalent foundation Peclet number, exp(Pef) (unitless)	Infinite source indoor attenuation coefficient, a (unitless)	Infinite source bldg. conc., Cbuilding (µg/m³)	Unit risk factor, URF (µg/m³)-1	Reference conc., RfC (mg/m³)			
15	4.56E+01	0.10	8.33E+01	1.05E-02	4.00E+02	1.45E+86	2.84E-04	1.30E-02	2.6E-05	NA			

### 1,2-DICHLOROETHANE-VAPOR INTRUSION MODEL MEN'S SHELTER RESULTS SHEET

#### RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

#### INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)		Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
					- T		
NA	NA	NA	8.52E+06	NA	[	4.6E-09	NA

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

SCROLL DOWN TO "END"

#### 1,2-DICHLOROBENZENE-VAPOR INTRUSION MODEL MEN'S SHELTER DATA ENTRY SHEET

GW-ADV Version 3.1; 02/04	CALCULATE RIS	SK-BASED GROU	NDWATER CON	CENTRATION (	enter "X" in "YES" b	ox)						
Reset to Defaults	OALOU ATE IN	YES	OR		TED CONCENTRA	TION! / I IIVII! IIV	75011					
, Jonaine	CALCULATE INC			L GROUNDW <i>A</i>	TER CONCENTRA	TION (enter "X" in "Y	ES" box and initial gro	oundwater conc. t	pelow)			
		YES	Χ	J								
	ENTER	ENTER Initial										
	Chemical	groundwater										
	CAS No. (numbers only,	conc., C <sub>W</sub>										
	no dashes)	(μg/L)	<b>1</b>		Chemical							
	95501	1.00E+00	]		1,2-Dichloroben:	zene						
	ENTER	ENTER Depth	ENTER	ENTER Totals mu	ENTER st add up to value o	ENTER f L <sub>WT</sub> (cell G28)	ENTER	ENTER	ENTER Soil		ENTER	
MORE <b>↓</b>	Average soil/	below grade to bottom	Depth	Thickness	Thickness of soil	Thickness of soil	Soil		stratum A SCS		User-defined stratum A	
	groundwater	of enclosed	below grade	of soil	stratum B,	stratum C,	stratum	SCS	soil type		soil vapor	
	temperature, T <sub>s</sub>	space floor, L <sub>F</sub>	to water table, L <sub>WT</sub>	stratum A, h <sub>A</sub>	(Enter value or 0) h <sub>B</sub>	(Enter value or 0) h <sub>c</sub>	directly above water table,	soil type directly above	(used to estimate soil vapor	OR	permeability, k <sub>v</sub>	
	(°C)	(cm)	(cm)	(cm)	(cm)	(cm)	(Enter A, B, or C)	water table	permeability)	:	(cm <sup>2</sup> )	
	13	15	488	488			A	SL	SL			
						_						_
MORE	ENTER Stratum A	ENTER Stratum A	ENTER Stratum A	ENTER Stratum A	ENTER Stratum B	ENTER Stratum B	ENTER Stratum B	ENTER Stratum B	ENTER Stratum C	ENTER Stratum C	ENTER Stratum C	ENTER Stratum C
₩OKE Ψ	SCS	soil dry	soil total	soil water-filled	SCS	soil dry	soil total	soil water-filled	SCS	soil dry	soil total	soil water-filled
	soil type	bulk density,	porosity,	porosity,	soil type	bulk density,			soil type	bulk density,	porosity,	porosity,
	Lookup Soil						porosity, n <sup>B</sup>	porosity,				A C
	Lookup Soil Parameters	$\rho_b^A$ (g/cm <sup>3</sup> )	n <sup>A</sup> (unitless)	$\theta_w^A$ $(cm^3/cm^3)$	Lookup Soil Parameters	$\rho_b^B$ (g/cm <sup>3</sup> )	porosity, n <sup>B</sup> (unitless)	$\theta_{\rm w}^{\rm B}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Lookup Soil Parameters	$\rho_b^C$ (g/cm <sup>3</sup> )	n <sup>c</sup> (unitless)	$\theta_w^c$ (cm <sup>3</sup> /cm <sup>3</sup> )
		$\rho_b^A$	n <sup>A</sup>	$\Theta_w^A$	Lookup Soil `	$\rho_b^B$	n <sup>B</sup>	$\Theta_{w}^{B}$	Lookup Soil `	$\rho_b^{\ C}$	n <sup>c</sup>	
[MODE]	SL ENTER	ρ <sub>b</sub> <sup>A</sup> (g/cm³)	n <sup>A</sup> (unitless)  0.387  ENTER	θ <sub>w</sub> <sup>A</sup> (cm³/cm³)  0.103  ENTER	Lookup Soil `	ρ <sub>b</sub> <sup>B</sup> (g/cm <sup>3</sup> )	n <sup>B</sup> (unitless)	θ <sub>w</sub> <sup>B</sup> (cm³/cm³)	Lookup Soil Parameters	ρ <sub>b</sub> <sup>C</sup> (g/cm³)	n <sup>c</sup> (unitless)	(cm <sup>3</sup> /cm <sup>3</sup> )
MORE	Parameters	ρ <sub>b</sub> <sup>A</sup> (g/cm <sup>3</sup> )	n <sup>A</sup> (unitless) 0.387	θ <sub>w</sub> <sup>A</sup> (cm³/cm³)	Lookup Soil Parameters	ρ <sub>b</sub> <sup>B</sup> (g/cm <sup>3</sup> )	n <sup>B</sup> (unitless)  0.43	θ <sub>w</sub> <sup>B</sup> (cm³/cm³)	Lookup Soil Parameters	ρ <sub>b</sub> <sup>C</sup> (g/cm³)	n <sup>c</sup> (unitless)	(cm <sup>3</sup> /cm <sup>3</sup> )
	SL  ENTER Enclosed space floor	ρ <sub>b</sub> <sup>A</sup> (g/cm³)  1.62  ENTER  Soil-bldq, pressure	n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space floor	ew <sup>A</sup> (cm³/cm³)  0.103  ENTER Enclosed space floor	Lookup Soil Parameters  ENTER  Enclosed space	(g/cm³)  1.5  ENTER  Floor-wall seam crack	(unitless)  0.43  ENTER  Indoor air exchange	0,215	Lookup Soil Parameters  ENTER Average vapor flow rate into bldg. OR	ρ <sub>ь</sub> <sup>C</sup> (g/cm³)  Error	n <sup>c</sup> (unitless)	(cm <sup>3</sup> /cm <sup>3</sup> )
	SL  ENTER Enclosed space	ρ <sub>b</sub> <sup>A</sup> (g/cm³)  1.62  ENTER  Soil-bldq.	n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space	enter	Lookup Soil Parameters ENTER Enclosed	(g/cm³)  1.5  ENTER  Floor-wall	unitless)  0.43  ENTER Indoor	0,215	Lookup Soil Parameters  ENTER Average vapor flow rate into bldq.	ρ <sub>ь</sub> <sup>C</sup> (g/cm³)  Error	n <sup>c</sup> (unitless)	(cm <sup>3</sup> /cm <sup>3</sup> )
	SL  ENTER Enclosed space floor thickness,	P <sub>b</sub> <sup>A</sup> (g/cm³)  1.62  ENTER  Soil-bldq. pressure differential,	n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space floor length,	ew <sup>A</sup> (cm³/cm³)  0.103  ENTER Enclosed space floor width,	ENTER  Enclosed space height,	(g/cm³)  1.5  ENTER  Floor-wall seam crack width,	(unitless)  0.43  ENTER  Indoor air exchange rate,	0,215	Lookup Soil Parameters  ENTER  Average vapor flow rate into bldg.  OR eave blank to calcula	ρ <sub>ь</sub> <sup>C</sup> (g/cm³)  Error	n <sup>c</sup> (unitless)	(cm <sup>3</sup> /cm <sup>3</sup> )
	SL  ENTER Enclosed space floor thickness, L <sub>crack</sub>	P <sub>b</sub> <sup>A</sup> (g/cm³)  1.62  ENTER  Soil-bldq. pressure differential, ΔP	n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space floor length, L <sub>B</sub>	end of the state o	ENTER  Enclosed space height, H <sub>B</sub>	P <sub>b</sub> B (g/cm³)  1.5  ENTER  Floor-wall seam crack width, w	unitless)  0.43  ENTER  Indoor air exchange rate, ER	0,215	Lookup Soil Parameters  ENTER Average vapor flow rate into bldq. OR eave blank to calcula	ρ <sub>ь</sub> <sup>C</sup> (g/cm³)  Error	n <sup>c</sup> (unitless)	(cm <sup>3</sup> /cm <sup>3</sup> )
₩	SL  ENTER Enclosed space floor thickness, Lerack (cm)  10  ENTER	P <sub>b</sub> <sup>A</sup> (g/cm³)  1.62  ENTER  Soil-bldq. pressure differential, ΔP (g/cm·s²)  40  ENTER	n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space floor length, L <sub>B</sub> (cm)	end of the state o	ENTER  Enclosed space height, HB (cm)	PoB (g/cm³)  1.5  ENTER  Floor-wall seam crack width, w (cm)  0.1  ENTER	n <sup>B</sup> (unitless)  0.43  ENTER Indoor air exchange rate, ER (1/h)	0,215	Lookup Soil Parameters  ENTER Average vapor flow rate into bldq. OR eave blank to calcula Osoil (L/m)	ρ <sub>ь</sub> <sup>C</sup> (g/cm³)  Error	n <sup>c</sup> (unitless)	(cm <sup>3</sup> /cm <sup>3</sup> )
<b>.</b>	SL  ENTER Enclosed space floor thickness, Lerack (cm)  10  ENTER Averaging	P <sub>b</sub> <sup>A</sup> (g/cm³)  1.62  ENTER  Soil-bldq. pressure differential, ΔP (g/cm·s²)  40  ENTER  Averaging	n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space floor length, L <sub>B</sub> (cm)  1000  ENTER	ew A (cm³/cm³)  0.103  ENTER Enclosed Space floor width, WB (cm)  1000  ENTER	ENTER Enclosed space height, HB (cm) 244 ENTER Target	P <sub>b</sub> B (g/cm³)  1.5  ENTER  Floor-wall seam crack width, w (cm)  0.1  ENTER  Target hazard	n <sup>B</sup> (unitless)  0.43  ENTER Indoor air exchange rate, ER (1/h)	0,215	Lookup Soil Parameters  ENTER Average vapor flow rate into bldq. OR eave blank to calcula Osoil (L/m)	ρ <sub>ь</sub> <sup>C</sup> (g/cm³)  Error	n <sup>c</sup> (unitless)	(cm <sup>3</sup> /cm <sup>3</sup> )
₩	SL  ENTER Enclosed space floor thickness, L <sub>crack</sub> (cm)  10  ENTER Averaqinq time for carcinogens,	P <sub>b</sub> <sup>A</sup> (g/cm³)  1.62  ENTER  Soil-bldq. pressure differential, ΔP (g/cm·s²)  40  ENTER  Averaging time for noncarcinogens,	n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space floor length, L <sub>B</sub> (cm)  1000  ENTER  Exposure duration,	ew A (cm³/cm³)  0.103  ENTER Enclosed space floor width, Ws (cm)  1000  ENTER  Exposure frequency,	ENTER  Enclosed space height, H <sub>B</sub> (cm)  244  ENTER  Target risk for carcinogens,	P <sub>b</sub> B (g/cm³)  1.5  ENTER  Floor-wall seam crack width, w (cm)  0.1  ENTER  Target hazard quotient for noncarcinogens,	n <sup>B</sup> (unitless)  0.43  ENTER Indoor air exchange rate, ER (1/h)	0,215	Lookup Soil Parameters  ENTER Average vapor flow rate into bldq. OR eave blank to calcula Osoil (L/m)	ρ <sub>ь</sub> <sup>C</sup> (g/cm³)  Error	n <sup>c</sup> (unitless)	(cm <sup>3</sup> /cm <sup>3</sup> )
₩	SL  ENTER Enclosed space floor thickness, L <sub>crack</sub> (cm)  10  ENTER Averaging time for	P <sub>b</sub> <sup>A</sup> (g/cm³)  1.62  ENTER  Soil-bldq. pressure differential, ΔP (g/cm-s²)  40  ENTER  Averaging time for	n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space floor length, L <sub>B</sub> (cm)  1000  ENTER  Exposure	ew <sup>A</sup> (cm³/cm³)  0.103  ENTER Enclosed space floor width, WB (cm)  1000  ENTER  Exposure	ENTER Enclosed space height, HB (cm)  244 ENTER Target risk for	P <sub>b</sub> B (g/cm³)  1.5  ENTER  Floor-wall seam crack width, w (cm)  0.1  ENTER  Target hazard quotient for	n <sup>B</sup> (unitless)  0.43  ENTER Indoor air exchange rate, ER (1/h)	0,215	Lookup Soil Parameters  ENTER Average vapor flow rate into bldq. OR eave blank to calcula Osoil (L/m)	ρ <sub>ь</sub> <sup>C</sup> (g/cm³)  Error	n <sup>c</sup> (unitless)	(cm <sup>3</sup> /cm <sup>3</sup> )
₩	SL  ENTER Enclosed space floor thickness, L <sub>crack</sub> (cm)  10  ENTER Averaging time for carcinogens, AT <sub>c</sub> (yrs)	P <sub>b</sub> <sup>A</sup> (g/cm³)  1.62  ENTER  Soil-bldq. pressure differential, AP (g/cm-s²)  40  ENTER  Averaging time for noncarcinogens, AT <sub>NC</sub> (yrs)	n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space floor length, L <sub>B</sub> (cm)  1000  ENTER  Exposure duration, ED (yrs)	ew A (cm³/cm³)  0.103  ENTER Enclosed Space floor width, We (cm)  1000  ENTER  Exposure frequency, EF (days/yr)	ENTER  Enclosed space height, HB (cm)  244  ENTER  Target risk for carcinogens, TR (unitless)	P <sub>b</sub> B (g/cm³)  1.5  ENTER  Floor-wall seam crack width, w (cm)  0.1  ENTER  Target hazard quotient for noncarcinogens, THQ (unitless)	n <sup>B</sup> (unitless)  0.43  ENTER Indoor air exchange rate, ER (1/h)	0,215	Lookup Soil Parameters  ENTER Average vapor flow rate into bldq. OR eave blank to calcula Osoil (L/m)	ρ <sub>ь</sub> <sup>C</sup> (g/cm³)  Error	n <sup>c</sup> (unitless)	(cm <sup>3</sup> /cm <sup>3</sup> )
₩	SL  ENTER Enclosed space floor thickness, Lcrack (cm)  10  ENTER Averaging time for carcinogens, ATc	P <sub>b</sub> <sup>A</sup> (g/cm³)  1.62  ENTER  Soil-bldq. pressure differential, ΔP (g/cm-s²)  40  ENTER  Averaging time for noncarcinogens, AT <sub>NC</sub>	n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space floor length, L <sub>B</sub> (cm)  1000  ENTER  Exposure duration, ED	ew A (cm³/cm³)  0.103  ENTER Enclosed space floor width, WB (cm)  1000  ENTER  Exposure frequency, EF	ENTER  Enclosed space height, H <sub>B</sub> (cm)  244  ENTER  Target risk for carcinogens, TR (unitless)	P <sub>b</sub> B (g/cm³)  1.5  ENTER  Floor-wall seam crack width, w (cm)  0.1  ENTER  Tarqet hazard quotient for noncarcinogens, THQ	n <sup>B</sup> (unitless)  0.43  ENTER Indoor air exchange rate, ER (1/h)	0,215	Lookup Soil Parameters  ENTER Average vapor flow rate into bldq. OR eave blank to calcula Osoil (L/m)	ρ <sub>ь</sub> <sup>C</sup> (g/cm³)  Error	n <sup>c</sup> (unitless)	(cm <sup>3</sup> /cm <sup>3</sup> )

## 1,2-DICHLOROBENZENE-VAPOR INTRUSION MODEL MEN'S SHELTER CHEMICAL PROPERTIES SHEET

		Henry's	Henry's	Enthalpy of	Normal		Organic	Pure	Linit	
Diffusivity	Diffusivity	law constant at reference	law constant reference	vaporization at the normal	Normal boiling	Critical	carbon partition	component water	Unit risk	Reference
in air.	in water.	temperature.	temperature.	boiling point,	point.	temperature.	coefficient.	solubility.	factor.	conc.,
D <sub>a</sub>	D <sub>w</sub>	Н	T <sub>R</sub>	$\Delta H_{v,b}$	T <sub>B</sub>	T <sub>C</sub>	K <sub>oc</sub>	S	URF	RfC
(cm <sup>2</sup> /s)	(cm <sup>2</sup> /s)	(atm-m <sup>3</sup> /mol)	(°C)	(cal/mol)	(°K)	(°K)	(cm <sup>3</sup> /g)	(mg/L)	$(\mu g/m^3)^{-1}$	(mg/m <sup>3</sup> )
6.90E-02	7.90E-06	1.90E-03	25	9,700	453.57	705.00	6.17E+02	1.56E+02	0.0E+00	2.0E-01

#### 1,2-DICHLOROBENZENE-VAPOR INTRUSION MODEL MEN'S SHELTER INTERMEDIATE CALCULATIONS SHEET

Exposure duration,	Source- building separation, L <sub>T</sub> (cm)	$\begin{array}{c} \text{Stratum A} \\ \text{soil} \\ \text{air-filled} \\ \text{porosity,} \\ \theta_a{}^A \\ \text{(cm}^3\text{/cm}^3) \end{array}$	Stratum B soil air-filled porosity, $\theta_a^B$ (cm³/cm³)	Stratum C soil air-filled porosity, $\theta_a^{\ C}$ $(cm^3/cm^3)$	Stratum A effective total fluid saturation, S <sub>te</sub> (cm³/cm³)	Stratum A soil intrinsic permeability, k <sub>l</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> )	Thickness of capillary zone, L <sub>cz</sub> (cm)	Total porosity in capillary zone, n <sub>cz</sub> (cm <sup>3</sup> /cm <sup>3</sup> )	Air-filled porosity in capillary zone, θ <sub>a,cz</sub> (cm <sup>3</sup> /cm <sup>3</sup> )	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Floor- wall seam perimeter, X <sub>crack</sub> (cm)
3.15E+07	473	0.284	0.215	#VALUE!	0.184	5.96E-09	0.901	5.37E-09	25.00	0.387	0.067	0.320	4,000
Bldq. ventilation rate, O <sub>bulding</sub> (cm <sup>3</sup> /s)	Area of enclosed space below grade, A <sub>B</sub> (cm <sup>2</sup> )	Crack- to-total area ratio, n (unitless)	Crack depth below grade, Z <sub>crack</sub> (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H <sub>TS</sub> (atm-m³/mol)	Henry's law constant at ave. groundwater temperature, H' <sub>TS</sub> (unitless)	Vapor viscosity at ave. soil temperature,  µ <sub>TS</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> (cm <sup>2</sup> /s)	Stratum C effective diffusion coefficient, D <sup>eff</sup> (cm <sup>2</sup> /s)	Capillary zone effective diffusion coefficient, D <sup>eff</sup> <sub>cz</sub> (cm <sup>2</sup> /s)	Total overall effective diffusion coefficient, Deff (cm²/s)	Diffusion path length, L <sub>d</sub> (cm)
1.69E+04	1.06E+06	3.77E-04	15	11,657	8.30E-04	3.54E-02	1.76E-04	6.97E-03	0.00E+00	0.00E+00	9.10E-05	1.40E-03	473
Convection path length, L <sub>p</sub> (cm)	Source vapor conc., C <sub>source</sub> (µg/m³)	Crack radius, r <sub>crack</sub> (cm)	Average vapor flow rate into bldg., $Q_{soil}$ (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> (cm²)	Exponent of equivalent foundation Peclet number, exp(Pef) (unitless)	Infinite source indoor attenuation coefficient, a (unitless)	Infinite source bldg. conc., Cbuilding (µg/m³)	Unit risk factor, URF (µg/m³)-1	Reference conc., RfC (mg/m³)			
15	3.54E+01	0.10	8.33E+01	6.97E-03	4.00E+02	7.46E+129	1.78E-04	6.29E-03	NA	2.0E-01			

### 1,2-DICHLOROBENZENE-VAPOR INTRUSION MODEL MEN'S SHELTER RESULTS SHEET

#### RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

#### INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)		Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NIA	NIA.	NIA	1.5/5.05	NIA	- T	NIA	2.05.05
NA	NA	NA	1.56E+05	NA		NA	3.0E-05

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

SCROLL DOWN TO "END"

### CIS-1,2-DICHLOROETHENE-VAPOR INTRUSION MODEL MEN'S SHELTER DATA ENTRY SHEET

GW-ADV Version 3.1; 02/04	CALCULATE RIS	SK-BASED GROU	NDWATER CON	CENTRATION (	enter "X" in "YES" b	ox)						
Reset to Defaults	0.1.011.475.111	YES	OR	]		TIGN! /						
, Jonaine	CALCULATE INC			L GROUNDWA	TER CONCENTRA	TION (enter "X" in "Y	'ES" box and initial gro	oundwater conc. t	oelow)			
		YES	X	]								
	ENTER	ENTER Initial										
	Chemical	groundwater										
	CAS No. (numbers only,	conc., C <sub>w</sub>										
	no dashes)	(μg/L)	≣:		Chemical							
	156592	4.10E+01	]	Ci	s-1,2-Dichloroeth	nylene						
	ENTER	ENTER Depth	ENTER	ENTER Totals mu	ENTER st add up to value o	ENTER f LwT (cell G28)	ENTER	ENTER	ENTER Soil		ENTER	
MORE 🗸	Average	below grade	D 11	T1 : 1	Thickness	Thickness	C 1		stratum A		User-defined	
	soil/ groundwater	to bottom of enclosed	Depth below grade	Thickness of soil	of soil stratum B,	of soil stratum C,	Soil stratum	SCS	SCS soil type		stratum A soil vapor	
	temperature, T <sub>s</sub>	space floor, $L_{\scriptscriptstyle E}$	to water table, L <sub>wT</sub>	stratum A, h <sub>A</sub>	(Enter value or 0) h <sub>B</sub>	(Enter value or 0) h <sub>c</sub>	directly above water table,	soil type directly above	(used to estimate soil vapor	OR	permeability, k <sub>v</sub>	
	(°C)	(cm)	(cm)	(cm)	(cm)	(cm)	(Enter A, B, or C)	water table	permeability)		(cm <sup>2</sup> )	
	13	15	488	488			А	SL	SI	·		1
	- 13	13	400	400			Α	JL	JL		ı	4
	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
MORE	Stratum A SCS	Stratum A soil dry	Stratum A soil total	Stratum A soil water-filled	Stratum B SCS	Stratum B soil dry	Stratum B soil total	Stratum B soil water-filled	Stratum C SCS	Stratum C soil dry	Stratum C soil total	Stratum C soil water-filled
	soil type	bulk density,	porosity,	porosity,	soil type	bulk density,	porosity,	porosity,	soil type	bulk density,	porosity,	porosity,
	Lookup Soil Parameters	$\rho_b^A$	n <sup>A</sup>	$\theta_{w}^{A}$	Lookup Soil `				Lookup Soil `			$\theta_{\rm w}^{\ C}$
	( raiailleteis ,				Parameters	$\rho_b^B$	n <sup>B</sup>	$\theta_{w}^{B}$	Parameters	$\rho_b^{C}$	n <sup>c</sup>	
		(g/cm <sup>3</sup> )	(unitless)	(cm <sup>3</sup> /cm <sup>3</sup> )		(g/cm³)	(unitless)	(cm <sup>3</sup> /cm <sup>3</sup> )		(g/cm³)	(unitless)	(cm <sup>3</sup> /cm <sup>3</sup> )
	SL	(g/cm³)	(unitless)  0.387	(cm³/cm³)	Parameters	(g/cm³)	(unitless) 0.43		Parameters			
MORE	SL	(g/cm <sup>3</sup> )	(unitless)  0.387  ENTER	(cm³/cm³)  0.103  ENTER		(g/cm³)	(unitless)	(cm <sup>3</sup> /cm <sup>3</sup> )	Parameters ,  ENTER	(g/cm³)	(unitless)	(cm <sup>3</sup> /cm <sup>3</sup> )
MORE	SL ENTER Enclosed space	(g/cm³)  1.62  ENTER  Soil-bldq.	(unitless)  0.387  ENTER Enclosed space	(cm³/cm³)  0.103  ENTER Enclosed space	ENTER Enclosed	(g/cm³)  1.5  ENTER  Floor-wall	(unitless)  0.43  ENTER Indoor	(cm <sup>3</sup> /cm <sup>3</sup> )	ENTER Average vapor flow rate into bldq.	(g/cm³)	(unitless)	(cm <sup>3</sup> /cm <sup>3</sup> )
	SL  ENTER Enclosed	(g/cm³)  1.62  ENTER	(unitless)  0.387  ENTER Enclosed	(cm³/cm³)  0.103  ENTER Enclosed	Parameters	(g/cm³)  1.5  ENTER	(unitless)  0.43  ENTER	(cm <sup>3</sup> /cm <sup>3</sup> ) 0.215	ENTER Average vapor	(g/cm³) Error	(unitless)	(cm <sup>3</sup> /cm <sup>3</sup> )
	SL  ENTER Enclosed space floor thickness, L <sub>crack</sub>	(g/cm³)  1.62  ENTER  Soil-bldq, pressure differential, ΔP	(unitless)  0.387  ENTER Enclosed space floor length, LB	(cm³/cm³)  0.103  ENTER Enclosed space floor width, W <sub>B</sub>	ENTER Enclosed space height, H <sub>B</sub>	(g/cm³)  1.5  ENTER  Floor-wall seam crack width, w	(unitless)  0.43  ENTER Indoor air exchange rate, ER	(cm <sup>3</sup> /cm <sup>3</sup> ) 0.215	ENTER Average vapor flow rate into bldq. OR eave blank to calcula	(g/cm³) Error	(unitless)	(cm <sup>3</sup> /cm <sup>3</sup> )
	SL  ENTER Enclosed space floor thickness,	(g/cm³)  1.62  ENTER  Soil-bldq. pressure differential,	(unitless)  0.387  ENTER Enclosed space floor length,	(cm³/cm³)  0.103  ENTER Enclosed space floor width,	ENTER  Enclosed space height,	(g/cm³)  1.5  ENTER  Floor-wall seam crack width,	(unitless)  0.43  ENTER  Indoor air exchange rate,	(cm <sup>3</sup> /cm <sup>3</sup> ) 0.215	ENTER Average vapor flow rate into bldg. OR eave blank to calcula	(g/cm³) Error	(unitless)	(cm <sup>3</sup> /cm <sup>3</sup> )
	SL  ENTER Enclosed space floor thickness, L <sub>crack</sub>	(g/cm³)  1.62  ENTER  Soil-bldq, pressure differential, ΔP	(unitless)  0.387  ENTER Enclosed space floor length, LB	(cm³/cm³)  0.103  ENTER Enclosed space floor width, W <sub>B</sub>	ENTER Enclosed space height, H <sub>B</sub>	(g/cm³)  1.5  ENTER  Floor-wall seam crack width, w	(unitless)  0.43  ENTER Indoor air exchange rate, ER	(cm <sup>3</sup> /cm <sup>3</sup> ) 0.215	ENTER Average vapor flow rate into bldq. OR eave blank to calcula	(g/cm³) Error	(unitless)	(cm <sup>3</sup> /cm <sup>3</sup> )
₩	SL  ENTER Enclosed space floor thickness, Lerack (cm)  10  ENTER	(g/cm³)  1.62  ENTER  Soil-bldq, pressure differential, $\Delta P$ (g/cm-s²)  40  ENTER	(unitless)  0.387  ENTER Enclosed space floor length, L <sub>B</sub> (cm)	(cm³/cm³)  0.103  ENTER Enclosed space floor width, WB (cm)	ENTER Enclosed space height, HB (cm) 244 ENTER	(g/cm³)  1.5  ENTER  Floor-wall seam crack width, w (cm)  0.1  ENTER	(unitless)  0.43  ENTER Indoor air exchange rate, ER (1/h)	(cm <sup>3</sup> /cm <sup>3</sup> ) 0.215	ENTER Average vapor flow rate into bldq. OR eave blank to calcula Osoil (L/m)	(g/cm³) Error	(unitless)	(cm <sup>3</sup> /cm <sup>3</sup> )
<b>.</b>	SL  ENTER Enclosed space floor thickness, Lerack (cm)	(g/cm³)  1.62  ENTER  Soil-bldq. pressure differential, $\Delta P$ (g/cm-s²)	(unitless)  0.387  ENTER Enclosed space floor length, L <sub>B</sub> (cm)	(cm³/cm³)  0.103  ENTER Enclosed space floor width, W <sub>B</sub> (cm)	ENTER Enclosed space height, H <sub>B</sub> (cm)	(g/cm³)  1.5  ENTER  Floor-wall seam crack width, w (cm)	(unitless)  0.43  ENTER Indoor air exchange rate, ER (1/h)	(cm <sup>3</sup> /cm <sup>3</sup> ) 0.215	ENTER Average vapor flow rate into bldq. OR eave blank to calcula Osoil (L/m)	(g/cm³) Error	(unitless)	(cm <sup>3</sup> /cm <sup>3</sup> )
₩	SL  ENTER Enclosed space floor thickness, L <sub>crack</sub> (cm)  10  ENTER Averaging time for carcinogens,	(g/cm³)  1.62  ENTER  Soll-bldq. pressure differential,	(unitless)  0.387  ENTER Enclosed space floor length, L <sub>B</sub> (cm)  1000  ENTER  Exposure duration,	(cm³/cm³)  0.103  ENTER Enclosed space floor width, WB (cm)  1000  ENTER  Exposure frequency,	ENTER Enclosed space height, HB (cm)  244 ENTER Target risk for carcinogens,	(g/cm³)  1.5  ENTER  Floor-wall seam crack width, w (cm)  0.1  ENTER  Target hazard quotient for noncarcinogens,	(unitless)  0.43  ENTER Indoor air exchange rate, ER (1/h)	(cm <sup>3</sup> /cm <sup>3</sup> ) 0.215	ENTER Average vapor flow rate into bldq. OR eave blank to calcula Osoil (L/m)	(g/cm³) Error	(unitless)	(cm <sup>3</sup> /cm <sup>3</sup> )
₩	SL  ENTER Enclosed space floor thickness, L_crack (cm)  10  ENTER Averaging time for	(g/cm³)  1.62  ENTER  Soil-bldq. pressure differential, ΔP (g/cm-s²)  40  ENTER  Averaging time for	(unitless)  0.387  ENTER Enclosed space floor length, L <sub>B</sub> (cm)  1000  ENTER  Exposure	(cm³/cm³)  0.103  ENTER Enclosed space floor width, W <sub>B</sub> (cm)  1000  ENTER  Exposure	ENTER Enclosed space height, H <sub>B</sub> (cm)  244  ENTER Target risk for	(g/cm³)  1.5  ENTER  Floor-wall seam crack width, w (cm)  0.1  ENTER  Target hazard quotient for	(unitless)  0.43  ENTER Indoor air exchange rate, ER (1/h)	(cm <sup>3</sup> /cm <sup>3</sup> ) 0.215	ENTER Average vapor flow rate into bldq. OR eave blank to calcula Osoil (L/m)	(g/cm³) Error	(unitless)	(cm <sup>3</sup> /cm <sup>3</sup> )
₩	SL  ENTER Enclosed space floor thickness, L <sub>crack</sub> (cm)  10  ENTER Averaging time for carcinogens, ATc (yrs)	(g/cm³)  1.62  ENTER  Soil-bldq. pressure differential,	(unitless)  0.387  ENTER Enclosed space floor length, L <sub>B</sub> (cm)  1000  ENTER  Exposure duration, ED (yrs)	(cm³/cm³)  0.103  ENTER Enclosed space floor width, W <sub>B</sub> (cm)  1000  ENTER  Exposure frequency, EF (days/yr)	ENTER Enclosed space height, HB (cm)  244 ENTER Target risk for carcinogens, TR (unitless)	(g/cm³)  1.5  ENTER  Floor-wall seam crack width, w (cm)  0.1  ENTER  Tarqet hazard quotient for noncarcinogens, THQ (unitless)	(unitless)  0.43  ENTER Indoor air exchange rate, ER (1/h)	(cm <sup>3</sup> /cm <sup>3</sup> ) 0.215	ENTER Average vapor flow rate into bldq. OR eave blank to calcula Osoil (L/m)	(g/cm³) Error	(unitless)	(cm <sup>3</sup> /cm <sup>3</sup> )
₩	SL  ENTER Enclosed space floor thickness, Lerack (cm)  10  ENTER Averaging time for carcinogens, ATc	(g/cm³)  1.62  ENTER  Soil-bldq, pressure differential, $\Delta P$ (g/cm·s²)  40  ENTER  Averaging time for noncarcinogens, $\Delta T_{NC}$	(unitless)  0.387  ENTER Enclosed space floor length, L <sub>B</sub> (cm)  1000  ENTER  Exposure duration, ED	(cm³/cm³)  0.103  ENTER Enclosed space floor width, W <sub>B</sub> (cm)  1000  ENTER  Exposure frequency, EF	ENTER Enclosed space height, HB (cm)  244 ENTER Target risk for carcinogens, TR (unitless)	(g/cm³)  1.5  ENTER  Floor-wall seam crack width, w (cm)  0.1  ENTER  Tarqet hazard quotient for noncarcinogens, THQ	(unitless)  0.43  ENTER Indoor air exchange rate, ER (1/h)	(cm <sup>3</sup> /cm <sup>3</sup> ) 0.215	ENTER Average vapor flow rate into bldq. OR eave blank to calcula Osoil (L/m)	(g/cm³) Error	(unitless)	(cm <sup>3</sup> /cm <sup>3</sup> )

## CIS-1,2-DICHLOROETHENE-VAPOR INTRUSION MODEL MEN'S SHELTER CHEMICAL PROPERTIES SHEET

Diffusivity in air, Da	Diffusivity in water,	Henry's law constant at reference temperature, H	Henry's law constant reference temperature, T <sub>R</sub>	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$	Normal boiling point, T <sub>B</sub>	Critical temperature,	Organic carbon partition coefficient,	Pure component water solubility, S	Unit risk factor, URF	Reference conc.,
(cm <sup>2</sup> /s)	(cm <sup>2</sup> /s)	(atm-m <sup>3</sup> /mol)	(°C)	(cal/mol)	(°K)	(°K)	(cm <sup>3</sup> /g)	(mg/L)	$(\mu g/m^3)^{-1}$	(mg/m <sup>3</sup> )
7.36E-02	1.13E-05	4.07E-03	25	7,192	333.65	544.00	3.55E+01	3.50E+03	0.0E+00	3.5E-02

## CIS-1,2-DICHLOROETHENE-VAPOR INTRUSION MODEL MEN'S SHELTER INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source- building separation, L <sub>T</sub> (cm)	Stratum A soil air-filled porosity, $\theta_a^A$ (cm³/cm³)	Stratum B soil air-filled porosity, $\theta_a^{\ B}$ $(cm^3/cm^3)$	Stratum C soil air-filled porosity, $\theta_a{}^c$ (cm³/cm³)	Stratum A effective total fluid saturation, S <sub>te</sub> (cm³/cm³)	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> )	Thickness of capillary zone, L <sub>cz</sub> (cm)	Total porosity in capillary zone, n <sub>cz</sub> (cm <sup>3</sup> /cm <sup>3</sup> )	Air-filled porosity in capillary zone, θ <sub>a,cz</sub> (cm³/cm³)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm³/cm³)	Floor- wall seam perimeter, X <sub>crack</sub> (cm)
3.15E+07	473	0.284	0.215	#VALUE!	0.184	5.96E-09	0.901	5.37E-09	25.00	0.387	0.067	0.320	4,000
Bldq. ventilation rate, Q <sub>building</sub> (cm <sup>3</sup> /s)	Area of enclosed space below grade, A <sub>B</sub> (cm <sup>2</sup> )	Crack- to-total area ratio, n (unitless)	Crack depth below grade, Z <sub>crack</sub> (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H <sub>TS</sub> (atm-m <sup>3</sup> /mol)	Henry's law constant at ave. groundwater temperature, H' <sub>TS</sub> (unitless)	Vapor viscosity at ave. soil temperature,  µ <sub>TS</sub> (g/cm-s)	Stratum  A effective diffusion coefficient, D <sup>eff</sup> A (cm²/s)	Stratum B effective diffusion coefficient, D <sup>eff</sup> (cm <sup>2</sup> /s)	Stratum C effective diffusion coefficient, D <sup>eff</sup> (cm <sup>2</sup> /s)	Capillary zone effective diffusion coefficient, D <sup>eff</sup> <sub>cz</sub> (cm <sup>2</sup> /s)	Total overall effective diffusion coefficient, Deff (cm²/s)	Diffusion path length, L <sub>d</sub> (cm)
1.69E+04	1.06E+06	3.77E-04	15	7,704	2.36E-03	1.00E-01	1.76E-04	7.43E-03	0.00E+00	0.00E+00	7.82E-05	1.25E-03	473
Convection path length, L <sub>p</sub> (cm)	Source vapor conc., C <sub>source</sub> (µg/m³)	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 foundation Peclet number, exp(Pe <sup>f</sup> ) (unitless)	Infinite source indoor attenuation coefficient, $\alpha$ (unitless)	Infinite source bldg. conc., C <sub>building</sub> (µg/m³)	Unit risk factor, URF (µg/m³)-1	Reference conc., RfC (mg/m³)			
15	4.12E+03	0.10	8.33E+01	7.43E-03	4.00E+02	5.79E+121	1.59E-04	6.56E-01	NA	3.5E-02			

### CIS-1,2-DICHLOROETHENE-VAPOR INTRUSION MODEL MEN'S SHELTER RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)		Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA	NA	3.50E+06	NA	I	NA	1.8E-02

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

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.



#### 1,2-DICHLOROPROPANE-VAPOR INTRUSION MODEL MEN'S SHELTER DATA ENTRY SHEET

GW-ADV Version 3.1; 02/04	CALCULATE RIS	SK-BASED GROU	NDWATER CON	CENTRATION (	enter "X" in "YES" b	ox)						
Reset to Defaults	0.41.0111.475.101	YES	OR	]	TED 00110511TD	71011/						
, Jonatha ,	CALCULATE IN			L GROUNDWA	TER CONCENTRA	ATION (enter "X" in "Y	'ES" box and initial gro	oundwater conc. t	oelow)			
		YES	Х	j								
	ENTER	ENTER Initial										
	Chemical	groundwater										
	CAS No. (numbers only,	conc., C <sub>w</sub>										
	no dashes)	(µg/L)	≣		Chemical							
	78875	2.40E+00	]		1,2-Dichloroprop	oane						
	ENTER	ENTER Depth	ENTER	ENTER Totals mu	ENTER st add up to value o	ENTER of LwT (cell G28)	ENTER	ENTER	ENTER Soil		ENTER	]
MORE <b>↓</b>	Average soil/	below grade to bottom	Depth	Thickness	Thickness of soil	Thickness of soil	Soil		stratum A SCS		User-defined stratum A	
	groundwater	of enclosed	below grade	of soil	stratum B,	stratum C,	stratum	SCS	soil type	0.0	soil vapor	
	temperature, T <sub>s</sub>	space floor, L <sub>F</sub>	to water table, L <sub>wT</sub>	stratum A, h <sub>A</sub>	(Enter value or 0)	(Enter value or 0) h <sub>C</sub>	directly above water table,	soil type directly above	(used to estimate soil vapor	OR	permeability, k <sub>v</sub>	
	(°C)	(cm)	(cm)	(cm)	(cm)	(cm)	(Enter A, B, or C)	water table	permeability)		(cm <sup>2</sup> )	
	13	15	488	488			А	SL	SL			
MORE	ENTER Stratum A	ENTER Stratum A	ENTER Stratum A	ENTER Stratum A	ENTER Stratum B	ENTER Stratum B	ENTER Stratum B	ENTER Stratum B	ENTER Stratum C	ENTER Stratum C	ENTER Stratum C	ENTER Stratum C
₩ <b>J</b>	SCS	soil dry	soil total	soil water-filled	SCS	soil dry	soil total	soil water-filled	SCS	soil dry	soil total	soil water-filled
	soil type 'Lookup Soil `	bulk density, ρ <sub>b</sub> <sup>A</sup>	porosity, n <sup>A</sup>	porosity, $\theta_w^A$	soil type Lookup Soil	bulk density, ρ <sub>b</sub> <sup>B</sup>	porosity, n <sup>B</sup>	porosity, $\theta_w^{\ \ B}$	soil type ´Lookup Soil `	bulk density, ρ <sub>b</sub> <sup>C</sup>	porosity, n <sup>c</sup>	porosity, $\theta_w^C$
	Parameters	(g/cm <sup>3</sup> )	(unitless)	(cm³/cm³)	Parameters	(g/cm <sup>3</sup> )	(unitless)	(cm³/cm³)	Parameters	(g/cm <sup>3</sup> )	(unitless)	(cm³/cm³)
	SL	1.62	0.387	0.103		1.5	0.43	0.215		Error	Error	Error
MORE	ENTER Enclosed	ENTER	ENTER Enclosed	ENTER Enclosed	ENTER	ENTER	ENTER		ENTER Average vapor			
•	space floor	Soil-bldg. pressure	space floor	space floor	Enclosed space	Floor-wall seam crack	Indoor air exchange		flow rate into bldg. OR			
	thickness,	differential,	length,	width,	height,	width,	rate,	L	eave blank to calcula	te		
	L <sub>crack</sub>	$\Delta P$ (g/cm-s <sup>2</sup> )	L <sub>B</sub> (cm)	W <sub>B</sub> (cm)	H <sub>B</sub> (cm)	w (cm)	ER (1/h)		Q <sub>soil</sub> (L/m)			
	(cm)				X - /	, , , , , , , , , , , , , , , , , , ,		:				
	10	40	1000	1000	244	0.1	0.25	]	5			
MORE <b>→</b>	ENTER Averaging	ENTER Averaging	ENTER	ENTER	ENTER Target	ENTER Target hazard						
	time for	time for	Exposure	Exposure	risk for	quotient for						
	carcinogens, AT <sub>c</sub>	noncarcinogens, AT <sub>NC</sub>	duration, ED	frequency, EF	carcinogens, TR	noncarcinogens, THQ						
	(yrs)	(yrs)	(yrs)	(days/yr)	(unitless)	(unitless)						
	70	1	1	350	1.0E-06	1						
END						late risk-based concentration.						

## 1,2-DICHLOROPROPANE-VAPOR INTRUSION MODEL MEN'S SHELTER CHEMICAL PROPERTIES SHEET

		Henry's law constant	Henry's law constant	Enthalpy of vaporization at	Normal		Organic carbon	Pure component	Unit	
Diffusivity	Diffusivity	at reference	reference	the normal	boiling	Critical	partition	water	risk	Reference
in air,	in water,	temperature,	temperature,	boiling point,	point,	temperature,	coefficient,	solubility,	factor,	conc.,
$D_a$	$D_{w}$	Н	$T_R$	$\Delta H_{v,b}$	T <sub>B</sub>	$T_{C}$	K <sub>oc</sub>	S	URF	RfC
(cm <sup>2</sup> /s)	(cm <sup>2</sup> /s)	(atm-m <sup>3</sup> /mol)	(°C)	(cal/mol)	(°K)	(°K)	(cm <sup>3</sup> /g)	(mg/L)	(μg/m³) <sup>-1</sup>	(mg/m <sup>3</sup> )
7.82E-02	8.73E-06	2.79E-03	25	7,590	369.52	572.00	4.37E+01	2.80E+03	1.9E-05	4.0E-03

## 1,2-DICHLOROPROPANE-VAPOR INTRUSION MODEL MEN'S SHELTER INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source- building separation, L <sub>T</sub> (cm)	Stratum A soil air-filled porosity, $\theta_a^{\ A}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Stratum B soil air-filled porosity, $\theta_a^{\ B}$ (cm³/cm³)	Stratum C soil air-filled porosity, $\theta_a^{\ C}$ $(cm^3/cm^3)$	Stratum A effective total fluid saturation, S <sub>te</sub> (cm³/cm³)	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> )	Thickness of capillary zone, L <sub>cz</sub> (cm)	Total porosity in capillary zone, n <sub>cz</sub> (cm³/cm³)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Floor- wall seam perimeter, X <sub>crack</sub> (cm)
3.15E+07	473	0.284	0.215	#VALUE!	0.184	5.96E-09	0.901	5.37E-09	25.00	0.387	0.067	0.320	4.000
Bldq. ventilation rate, O <sub>building</sub> (cm <sup>3</sup> /s)	Area of enclosed space below grade,  A <sub>B</sub> (cm <sup>2</sup> )	Crack- to-total area ratio, n (unitless)	Crack depth below grade, Z <sub>crack</sub> (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H <sub>TS</sub> (atm-m <sup>3</sup> /mol)	Henry's law constant at ave. groundwater temperature, H' <sub>TS</sub> (unitless)	Vapor viscosity at ave. soil temperature,	Stratum  A effective diffusion coefficient, D <sup>eff</sup> A (cm²/s)	Stratum B effective diffusion coefficient, D <sup>eff</sup> (cm <sup>2</sup> /s)	Stratum C effective diffusion coefficient, D <sup>eff</sup> (cm <sup>2</sup> /s)	Capillary zone effective diffusion coefficient, Deff cz (cm²/s)	Total overall effective diffusion coefficient, Deff_ (cm^2/s)	Diffusion path length, L <sub>d</sub> (cm)
1.69E+04	1.06E+06	3.77E-04	15	8,599	1.52E-03	6.47E-02	1.76E-04	7.90E-03	0.00E+00	0.00E+00	8.54E-05	1.35E-03	473
Convection path length, L <sub>p</sub> (cm)	Source vapor conc., C <sub>source</sub> (µg/m³)	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 foundation Peclet number, exp(Pef) (unitless)	Infinite source indoor attenuation coefficient, $\alpha$ (unitless)	Infinite source bldg. conc., C <sub>building</sub> (µg/m³)	Unit risk factor, URF (µg/m³)-1	Reference conc., RfC (mg/m³)			
15	1.55E+02	0.10	8.33E+01	7.90E-03	4.00E+02	3.98E+114	1.73E-04	2.68E-02	1.9E-05	4.0E-03			

### 1,2-DICHLOROPROPANE-VAPOR INTRUSION MODEL MEN'S SHELTER RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

_	Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)		Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
		•	•		•	= -	•	•
	NA	NA	NA	2.80E+06	NA	I	7.1E-09	6.4E-03

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

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.



#### 1,4-DICHLOROBENZENE-VAPOR INTRUSION MODEL MEN'S SHELTER DATA ENTRY SHEET

GW-ADV Version 3.1; 02/04	CALCULATE RIS	SK-BASED GROUN	NDWATER CON	CENTRATION (	enter "X" in "YES" b	oox)						
Reset to Defaults	CALCULATE IN	PDEMENTAL DICK	OR		TED CONCENTO	\TION (optor "V" ip "\	'ES" box and initial gro	oundwater cana h	volou)			
,	CALCULATE INC			T GROUNDWA	TER CONCENTRA	ATION (enter X III )	ES DOX AND INITIAL GIV	oundwater conc. L	oelow)			
	ENTED	YES	X	J								
	ENTER	ENTER Initial										
	Chemical CAS No.	groundwater conc.,										
	(numbers only, no dashes)	C <sub>w</sub> (μg/L)			Chemical							
	106467	1.00E+01			1,4-Dichloroben	zene						
	ENTER	ENTER	ENTER	ENTER Totals mu	ENTER	ENTER	ENTER	ENTER	ENTER		ENTER	1
MORE <b>↓</b>	Average	Depth below grade			st add up to value o Thickness	Thickness			Soil stratum A		User-defined	
_ ↓	soil/ groundwater	to bottom of enclosed	Depth below grade	Thickness of soil	of soil stratum B,	of soil stratum C,	Soil stratum	SCS	SCS soil type		stratum A soil vapor	
	temperature, T <sub>s</sub>	space floor, L <sub>F</sub>	to water table, L <sub>wT</sub>	stratum A, h <sub>A</sub>	(Enter value or 0) h <sub>B</sub>	(Enter value or 0) h <sub>C</sub>	directly above water table,	soil type directly above	(used to estimate soil vapor	OR	permeability, k <sub>v</sub>	
	(°C)	(cm)	(cm)	(cm)	(cm)	(cm)	(Enter A, B, or C)	water table	permeability)		(cm <sup>2</sup> )	
	13	15	488	488			A	SL	SL			
				ENTER	ENTED	ENTED	ENTER	ENTED	ENTED	ENTED	ENTER	ENTED
MORE	ENTER Stratum A	ENTER Stratum A	ENTER Stratum A	ENTER Stratum A	ENTER Stratum B	ENTER Stratum B	ENTER Stratum B	ENTER Stratum B	ENTER Stratum C	ENTER Stratum C		ENTER Stratum C
MORE <b>↓</b>	Stratum A SCS	Stratum A soil dry	Stratum A soil total	Stratum A soil water-filled	Stratum B SCS	Stratum B soil dry	Stratum B soil total	Stratum B soil water-filled	Stratum C SCS	Stratum C soil dry	Stratum C soil total	Stratum C soil water-filled
MORE ¥	Stratum A SCS soil type 'Lookup Soil'	Stratum A soil dry bulk density,	Stratum A	Stratum A	Stratum B SCS soil type 'Lookup Soil'	Stratum B soil dry bulk density,	Stratum B	Stratum B	Stratum C SCS soil type 'Lookup Soil'	Stratum C soil dry bulk density,	Stratum C	Stratum C
MORE <b>↓</b>	Stratum A SCS soil type	Stratum A soil dry	Stratum A soil total porosity,	Stratum A soil water-filled porosity,	Stratum B SCS soil type	Stratum B soil dry	Stratum B soil total porosity,	Stratum B soil water-filled porosity,	Stratum C SCS soil type	Stratum C soil dry	Stratum C soil total porosity,	Stratum C soil water-filled porosity,
MORE <b>↓</b>	Stratum A SCS soil type 'Lookup Soil'	Stratum A soil dry bulk density, Pb <sup>A</sup>	Stratum A soil total porosity, n <sup>A</sup>	$\begin{array}{c} \text{Stratum A} \\ \text{soil water-filled} \\ \text{porosity,} \\ \theta_{\text{w}}^{\text{A}} \end{array}$	Stratum B SCS soil type 'Lookup Soil'	Stratum B soil dry bulk density, ${ ho_b}^B$	Stratum B soil total porosity, n <sup>B</sup>	Stratum B soil water-filled porosity, $\theta_w^{\ B}$	Stratum C SCS soil type 'Lookup Soil'	Stratum C soil dry bulk density, $\rho_b^{\ C}$	Stratum C soil total porosity, n <sup>c</sup>	$ \begin{array}{c} \text{Stratum C} \\ \text{soil water-filled} \\ \text{porosity,} \\ \theta_w^{\ C} \end{array} $
	Stratum A SCS SOII type Lookup Soil Parameters SL ENTER	Stratum A soil dry bulk density, $\rho_{\rm b}^{\ A}$ (g/cm <sup>3</sup> )	Stratum A soil total porosity, n <sup>A</sup> (unitless)  0.387  ENTER	Stratum A soil water-filled porosity,	Stratum B SCS soil type 'Lookup Soil'	Stratum B soil dry bulk density, $ ho_b^B$ (g/cm³)	Stratum B soil total porosity, n <sup>B</sup> (unitless)	Stratum B soil water-filled porosity, $\theta_w^B$ (cm³/cm³)	Stratum C SCS soil type Lookup Soil Parameters	Stratum C soil dry bulk density, ${ ho_b}^{ m C}$ (g/cm <sup>3</sup> )	Stratum C soil total porosity, n <sup>c</sup> (unitless)	Stratum C soil water-filled porosity, $\theta_w^c$ $(cm^3/cm^3)$
MORE WORE	Stratum A SCS soil type 'Lookup Soil 'Parameters' SL ENTER Enclosed space	Stratum A soil dry bulk density, \$\rho_b^A\$ (g/cm³)  1.62  ENTER  Soil-bldq.	Stratum A soil total porosity, n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space	Stratum A soil water-filled porosity,	Stratum B SCS soil type Lookup Soil Parameters  ENTER Enclosed	Stratum B soil dry bulk density, pb (g/cm³)  1.5  ENTER  Floor-wall	Stratum B soil total porosity, n <sup>B</sup> (unitless)  0.43  ENTER Indoor	Stratum B soil water-filled porosity, $\theta_w^B$ (cm³/cm³)	Stratum C SCS soil type 'Lookup Soil 'Parameters' Parameters' ENTER Average vapor flow rate into bldq.	Stratum C soil dry bulk density, ${ ho_b}^{ m C}$ (g/cm <sup>3</sup> )	Stratum C soil total porosity, n <sup>c</sup> (unitless)	Stratum C soil water-filled porosity, $\theta_w^c$ $(cm^3/cm^3)$
₩ORE	Stratum A SCS Soil type Lookup Soil Parameters SL ENTER Enclosed Space floor	Stratum A soil dry bulk density, p <sub>b</sub> <sup>A</sup> (g/cm³)  1.62  ENTER  Soil-bldq, pressure	Stratum A soil total porosity, n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space floor	Stratum A soil water-filled porosity, $\theta_w^A$ (cm³/cm³)  0.103  ENTER Enclosed space floor	Stratum B SCS soil type Lookup Soil Parameters ENTER Enclosed space	Stratum B soil dry bulk density, pb (g/cm³)  1.5  ENTER  Floor-wall seam crack	Stratum B soil total porosity, n <sup>B</sup> (unitless)  0.43  ENTER Indoor air exchange	Stratum B soil water-filled porosity,	Stratum C SCS soil type Lookup Soil 'Parameters' ENTER Average vapor flow rate into bldq. OR	Stratum C soil dry bulk density, $\rho_{\rm b}^{\ C}$ (g/cm³)	Stratum C soil total porosity, n <sup>c</sup> (unitless)	Stratum C soil water-filled porosity, $\theta_w^c$ $(cm^3/cm^3)$
₩ORE	Stratum A SCS soil type 'Lookup Soil 'Parameters' SL ENTER Enclosed space	Stratum A soil dry bulk density, \$\rho_b^A\$ (g/cm³)  1.62  ENTER  Soil-bldq.	Stratum A soil total porosity, n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space	Stratum A soil water-filled porosity,	Stratum B SCS soil type Lookup Soil Parameters  ENTER Enclosed	Stratum B soil dry bulk density, pb (g/cm³)  1.5  ENTER  Floor-wall	Stratum B soil total porosity, n <sup>B</sup> (unitless)  0.43  ENTER Indoor	Stratum B soil water-filled porosity,	Stratum C SCS soil type Lookup Soil Parameters  ENTER Average vapor flow rate into bldg. OR eave blank to calcula	Stratum C soil dry bulk density, $\rho_{\rm b}^{\ C}$ (g/cm³)	Stratum C soil total porosity, n <sup>c</sup> (unitless)	Stratum C soil water-filled porosity, $\theta_w^c$ $(cm^3/cm^3)$
₩ORE	Stratum A SCS Soil type 'Lookup Soil' Parameters  SL ENTER Enclosed Space floor thickness,	Stratum A soil dry bulk density, Po <sup>A</sup> (g/cm³)  1.62  ENTER  Soil-bldq. pressure differential,	Stratum A soil total porosity, n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space floor length,	Stratum A soil water-filled porosity, $\theta_w^A$ (cm³/cm³)  0.103  ENTER Enclosed space floor width,	Stratum B SCS soil type Lookup Soil Parameters  ENTER Enclosed space height,	Stratum B soil dry bulk density, Pb (g/cm³)  1.5  ENTER  Floor-wall seam crack width,	Stratum B soil total porosity, n <sup>B</sup> (unitless)  0.43  ENTER Indoor air exchange rate,	Stratum B soil water-filled porosity,	Stratum C SCS soil type Lookup Soil 'Parameters' ENTER Average vapor flow rate into bldq. OR	Stratum C soil dry bulk density, $\rho_{\rm b}^{\ C}$ (g/cm³)	Stratum C soil total porosity, n <sup>c</sup> (unitless)	Stratum C soil water-filled porosity, $\theta_w^c$ $(cm^3/cm^3)$
₩ORE	Stratum A SCS Soil type Lookup Soil 'ppe Lookup Soil 'Parameters SL  ENTER Enclosed space floor thickness, Lcrack	Stratum A soil dry bulk density, Pe <sup>A</sup> (g/cm³)  1.62  ENTER  Soil-blda. pressure differential, $\Delta P$	Stratum A soil total porosity, r^ (unitless)  0.387  ENTER Enclosed space floor length, L <sub>B</sub>	Stratum A soil water-filled porosity, $\theta_w^A$ , $(cm^3/cm^3)$ 0.103  ENTER Enclosed space floor width, $W_B$	Stratum B SCS soil type Lookup Soil Parameters  ENTER Enclosed space height, HB	Stratum B soil dry bulk density, Pb (g/cm³)  1.5  ENTER  Floor-wall seam crack width, W	Stratum B soil total porosity, n <sup>B</sup> (unitless)  0.43  ENTER Indoor air exchange rate, ER	Stratum B soil water-filled porosity,	Stratum C SCS soil type Lookup Soil Parameters  ENTER Average vapor flow rate into bldq. OR eave blank to calcula	Stratum C soil dry bulk density, $\rho_{\rm b}^{\ C}$ (g/cm³)	Stratum C soil total porosity, n <sup>c</sup> (unitless)	Stratum C soil water-filled porosity, $\theta_w^c$ $(cm^3/cm^3)$
MORE MORE	Stratum A SCS soil type 'Lookup Soil 'Parameters'  SL ENTER Enclosed space floor thickness, Lcrack (cm)	Stratum A soil dry bulk density, Pb (g/cm³)  1.62  ENTER  Soil-bldg. pressure differential, AP (g/cm-s²)	Stratum A soil total porosity, n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space floor length, L <sub>B</sub> (cm)	Stratum A soil water-filled porosity, $\theta_w^A$ (cm³/cm³)  0.103  ENTER Enclosed space floor width, W <sub>B</sub> (cm)	Stratum B SCS soil type Lookup Soil Parameters  ENTER  Enclosed space height, H <sub>B</sub> (cm)	Stratum B soil dry bulk density, Pb (g/cm³)  1.5  ENTER  Floor-wall seam crack width, W (cm)	Stratum B soil total porosity, n <sup>B</sup> (unitless)  0.43  ENTER Indoor air exchange rate, ER (1/h)	Stratum B soil water-filled porosity,	Stratum C SCS soil type Lookup Soil Parameters  ENTER Average vapor flow rate into bldq. OR eave blank to calcula Qsoil (L/m)	Stratum C soil dry bulk density, $\rho_{\rm b}^{\ C}$ (g/cm³)	Stratum C soil total porosity, n <sup>c</sup> (unitless)	Stratum C soil water-filled porosity, $\theta_w^c$ $(cm^3/cm^3)$
MORE V	Stratum A SCS soil type 'Lookup Soil 'Parameters'  SL ENTER Enclosed space floor thickness, Lcrack (cm)  10 ENTER Averaging	Stratum A soil dry bulk density, Po (g/cm³)  1.62  ENTER  Soil-bldg. pressure differential, AP (g/cm-s²)  40  ENTER  Averaging	Stratum A soil total porosity, n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space floor length, L <sub>B</sub> (cm)  1000  ENTER	Stratum A soil water-filled porosity, \$\theta_w^A\$ (cm³/cm³)  0.103  ENTER Enclosed space floor width, \$W_B\$ (cm)  1000  ENTER	Stratum B SCS soil type Lookup Soil Parameters  ENTER Enclosed space height, HB (cm)  244  ENTER Target	Stratum B soil dry bulk density, Pb (g/cm³)  1.5  ENTER  Floor-wall seam crack width, W (cm)  0.1  ENTER  Target hazard	Stratum B soil total porosity, n <sup>B</sup> (unitless)  0.43  ENTER Indoor air exchange rate, ER (1/h)	Stratum B soil water-filled porosity,	Stratum C SCS soil type Lookup Soil Parameters  ENTER Average vapor flow rate into bldq. OR eave blank to calcula Qsoil (L/m)	Stratum C soil dry bulk density, $\rho_{\rm b}^{\ C}$ (g/cm³)	Stratum C soil total porosity, n <sup>c</sup> (unitless)	Stratum C soil water-filled porosity, $\theta_w^c$ $(cm^3/cm^3)$
MORE MORE	Stratum A SCS Soil type Lookup Soil 'Perameters'  SL  ENTER Enclosed space floor thickness, Larack (cm)  10  ENTER	Stratum A soil dry bulk density, Pb <sup>A</sup> (g/cm³)  1.62  ENTER  Soil-bldq. pressure differential, $\Delta P$ (g/cm-s²)  40  ENTER	Stratum A soil total porosity, n^ (unitless)  0.387  ENTER Enclosed space floor length, L <sub>B</sub> (cm)	Stratum A soil water-filled porosity, $\theta_w^A$ (cm³/cm³)  0.103  ENTER Enclosed space floor width, $W_B$ (cm)	Stratum B SCS soil type Lookup Soil Parameters  ENTER Enclosed space height, HB (cm) 244 ENTER	Stratum B soil dry bulk density, Pb (g/cm³)  1.5  ENTER  Floor-wall seam crack width, W (cm)  0.1  ENTER	Stratum B soil total porosity, n <sup>B</sup> (unitless)  0.43  ENTER Indoor air exchange rate, ER (1/h)	Stratum B soil water-filled porosity,	Stratum C SCS soil type Lookup Soil Parameters  ENTER Average vapor flow rate into bldq. OR eave blank to calcula Qsoil (L/m)	Stratum C soil dry bulk density, $\rho_{\rm b}^{\ C}$ (g/cm³)	Stratum C soil total porosity, n <sup>c</sup> (unitless)	Stratum C soil water-filled porosity, $\theta_w^c$ $(cm^3/cm^3)$
MORE MORE	Stratum A SCS Soil type 'Lookup Soil 'Parameters'  SL  ENTER Enclosed space floor thickness, Lcrack (cm)  10  ENTER Averaging time for carcinogens, ATc	Stratum A soil dry bulk density, Pb A (g/cm³)  1.62  ENTER  Soil-blda. pressure differential, AP (g/cm-s²)  40  ENTER  Averaging time for noncarcinogens, AT <sub>NC</sub>	Stratum A soil total porosity, n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space floor length, L <sub>B</sub> (cm)  1000  ENTER  Exposure duration, ED	Stratum A soil water-filled porosity,	Stratum B SCS soil type Lookup Soil Parameters  ENTER Enclosed space height, HB (cm)  244  ENTER Target risk for carcinogens, TR	Stratum B soil dry bulk density, Pb (g/cm³)  1.5  ENTER  Floor-wall seam crack width, W (cm)  0.1  ENTER  Target hazard quotient for noncarcinogens, THQ	Stratum B soil total porosity, n <sup>B</sup> (unitless)  0.43  ENTER Indoor air exchange rate, ER (1/h)	Stratum B soil water-filled porosity,	Stratum C SCS soil type Lookup Soil Parameters  ENTER Average vapor flow rate into bldq. OR eave blank to calcula Qsoil (L/m)	Stratum C soil dry bulk density, $\rho_{\rm b}^{\ C}$ (g/cm³)	Stratum C soil total porosity, n <sup>c</sup> (unitless)	Stratum C soil water-filled porosity, $\theta_w^c$ $(cm^3/cm^3)$
MORE MORE	Stratum A SCS Soil type 'Lookup Soil 'Parameters'  SL  ENTER Enclosed space floor thickness, Lcrack (cm)  10  ENTER Averaging time for carcinogens,	Stratum A soil dry bulk density, Pe <sup>A</sup> (g/cm³)  1.62  ENTER  Soil-bidd, pressure differential, $\Delta P$ (g/cm-s²)  40  ENTER  Averaging time for noncarcinogens,	Stratum A soil total porosity, n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space floor length, L <sub>B</sub> (cm)  1000  ENTER  Exposure duration,	Stratum A soil water-filled porosity, $\theta_w^A$ (cm³/cm³)  0.103  ENTER Enclosed space floor width, W <sub>B</sub> (cm)  1000  ENTER  Exposure frequency,	Stratum B SCS soil type Lookup Soil Parameters  ENTER Enclosed space height, HB (cm)  244  ENTER Target risk for carcinogens,	Stratum B soil dry bulk density, Pb (g/cm³)  1.5  ENTER  Floor-wall seam crack width, W (cm)  0.1  ENTER  Tarqet hazard quotient for noncarcinogens,	Stratum B soil total porosity, n <sup>B</sup> (unitless)  0.43  ENTER Indoor air exchange rate, ER (1/h)	Stratum B soil water-filled porosity,	Stratum C SCS soil type Lookup Soil Parameters  ENTER Average vapor flow rate into bldq. OR eave blank to calcula Qsoil (L/m)	Stratum C soil dry bulk density, $\rho_{\rm b}^{\ C}$ (g/cm³)	Stratum C soil total porosity, n <sup>c</sup> (unitless)	Stratum C soil water-filled porosity, $\theta_w^c$ $(cm^3/cm^3)$
MORE MORE	Stratum A SCS Soil type 'Lookup Soil 'Parameters'  SL  ENTER Enclosed space floor thickness, Lcrack (cm)  10  ENTER Averaging time for carcinogens, ATc	Stratum A soil dry bulk density, Pb A (g/cm³)  1.62  ENTER  Soil-blda. pressure differential, AP (g/cm-s²)  40  ENTER  Averaging time for noncarcinogens, AT <sub>NC</sub>	Stratum A soil total porosity, n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space floor length, L <sub>B</sub> (cm)  1000  ENTER  Exposure duration, ED	Stratum A soil water-filled porosity,	Stratum B SCS soil type Lookup Soil Parameters  ENTER Enclosed space height, HB (cm)  244  ENTER Target risk for carcinogens, TR	Stratum B soil dry bulk density, Pb (g/cm³)  1.5  ENTER  Floor-wall seam crack width, W (cm)  0.1  ENTER  Target hazard quotient for noncarcinogens, THQ	Stratum B soil total porosity, n <sup>B</sup> (unitless)  0.43  ENTER Indoor air exchange rate, ER (1/h)	Stratum B soil water-filled porosity,	Stratum C SCS soil type Lookup Soil Parameters  ENTER Average vapor flow rate into bldq. OR eave blank to calcula Qsoil (L/m)	Stratum C soil dry bulk density, $\rho_{\rm b}^{\ C}$ (g/cm³)	Stratum C soil total porosity, n <sup>c</sup> (unitless)	Stratum C soil water-filled porosity, $\theta_w^c$ $(cm^3/cm^3)$

## 1,4-DICHLOROBENZENE-VAPOR INTRUSION MODEL MEN'S SHELTER CHEMICAL PROPERTIES SHEET

Diffusivity Diffusivity in air, in water,  Da Dw	temperature, H	Henry's law constant reference temperature, T <sub>R</sub>	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$	Normal boiling point,	Critical temperature,	Organic carbon partition coefficient,	Pure component water solubility, S	Unit risk factor, URF	Reference conc., RfC
(cm <sup>2</sup> /s) (cm <sup>2</sup> /s)	(atm-m <sup>3</sup> /mol)	(°C)	(cal/mol)	(°K)	(°K)	(cm³/g)	(mg/L)	(μg/m³) <sup>-1</sup>	(mg/m <sup>3</sup> )
6.90E-02 7.90E-06	2.39E-03	25	9,271	447.21	684.75	6.17E+02	7.90E+01	0.0E+00	8.0E-01

#### 1,4-DICHLOROBENZENE-VAPOR INTRUSION MODEL MEN'S SHELTER INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source- building separation, L <sub>T</sub> (cm)	Stratum A soil air-filled porosity, $\theta_a^{\ A}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Stratum B soil air-filled porosity, $\theta_a^{\ B}$ (cm³/cm³)	Stratum C soil air-filled porosity, $\theta_a^{\ C}$ $(cm^3/cm^3)$	Stratum A effective total fluid saturation, S <sub>te</sub> (cm³/cm³)	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> )	Thickness of capillary zone, L <sub>cz</sub> (cm)	Total porosity in capillary zone, n <sub>cz</sub> (cm³/cm³)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm³/cm³)	Floor- wall seam perimeter, X <sub>crack</sub> (cm)
3.15E+07	473	0.284	0.215	#VALUE!	0.184	5.96E-09	0.901	5.37E-09	25.00	0.387	0.067	0.320	4,000
Bldq. ventilation rate, Q <sub>building</sub> (cm <sup>3</sup> /s)	Area of enclosed space below grade, A <sub>B</sub> (cm <sup>2</sup> )	Crack- to-total area ratio, n (unitless)	Crack depth below grade, Z <sub>crack</sub> (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H <sub>TS</sub> (atm-m <sup>3</sup> /mol)	Henry's law constant at ave. groundwater temperature, H' <sub>TS</sub> (unitless)	Vapor viscosity at ave. soil temperature,	Stratum  A effective diffusion coefficient, D <sup>eff</sup> <sub>A</sub> (cm²/s)	Stratum B effective diffusion coefficient, D <sup>eff</sup> (cm <sup>2</sup> /s)	Stratum C effective diffusion coefficient, D <sup>eff</sup> (cm <sup>2</sup> /s)	Capillary zone effective diffusion coefficient, Deff cz (cm²/s)	Total overall effective diffusion coefficient, Deff_ (cm²/s)	Diffusion path length, L <sub>d</sub> (cm)
1.69E+04	1.06E+06	3.77E-04	15	11,212	1.08E-03	4.61E-02	1.76E-04	6.97E-03	0.00E+00	0.00E+00	8.32E-05	1.30E-03	473
Convection path length, L <sub>p</sub> (cm)	Source vapor conc., C <sub>source</sub> (µg/m³)	Crack radius, r <sub>crack</sub> (cm)	Average vapor flow rate into bldg., $Q_{soil}$ (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> (cm²)	Exponent of equivalent foundation Peclet number, exp(Pef) (unitless)	Infinite source indoor attenuation coefficient, a (unitless)	Infinite source bldg. conc., C <sub>building</sub> (µg/m³)	Unit risk factor, URF (µg/m³)-1	Reference conc., RfC (mg/m³)			
15	4.61E+02	0.10	8.33E+01	6.97E-03	4.00E+02	7.52E+129	1.66E-04	7.64E-02	NA	8.0E-01			

### 1,4-DICHLOROBENZENE-VAPOR INTRUSION MODEL MEN'S SHELTER RESULTS SHEET

#### RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

#### INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)	=	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA	NA	7.90E+04	NA	ı ı	NA	9.2E-05

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

SCROLL DOWN TO "END"

#### BENZENE-VAPOR INTRUSION MODEL MEN'S SHELTER DATA ENTRY SHEET

GW-ADV CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box) Version 3.1; 02/04 YES Reset to OR Defaults CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below) YES **ENTER ENTER** Initial Chemical groundwater CAS No. conc., (numbers only,  $C_{W}$ (µg/L) no dashes) Chemical 71432 1.00E+00 Benzene **ENTER ENTER ENTER ENTER ENTER** Totals must add up to value of LwT (cell G28) Depth Soil MORE Average below grade Thickness stratum A User-defined Thickness Ψ soil/ to bottom Depth Thickness of soil of soil Soil SCS stratum A aroundwater of enclosed below grade of soil stratum B. stratum C. stratum SCS soil type soil vapor temperature, space floor, to water table, stratum A, (Enter value or 0) (Enter value or 0) directly above soil type (used to estimate OR permeability,  $T_S$  $L_F$ LwT  $h_A$ hB  $h_{C}$ water table, directly above soil vapor  $k_v$ (°C) (cm) (cm) (cm) (cm) (cm) (Enter A. B. or C.) water table permeability) (cm<sup>2</sup>) 15 488 488 SI **ENTER ENTER ENTER** MORE Stratum A Stratum A Stratum A Stratum A Stratum B Stratum B Stratum B Stratum B Stratum C Stratum C Stratum C Stratum C SCS soil dry soil water-filled SCS soil water-filled SCS soil water-filled soil total soil total soil dry soil total soil dry soil type bulk density, porosity, porosity, soil type bulk density, porosity, porosity, soil type bulk density, porosity, porosity, Lookup Soil n<sup>A</sup>  $\theta_{w}^{A}$ Lookup Soil  $\rho_b^B$  $\theta_{w}^{B}$ Lookup Soil n<sup>c</sup>  $\theta_{w}^{C}$  $\rho_b$  $\rho_b$ Parameters Parameters Parameters (cm<sup>3</sup>/cm<sup>3</sup> (cm<sup>3</sup>/cm<sup>3</sup>) (g/cm<sup>3</sup>) (unitless) (cm<sup>3</sup>/cm<sup>3</sup>) (g/cm<sup>3</sup>) (unitless) (g/cm<sup>3</sup>) (unitless) 0.387 0.103 0.43 0.215 Error Error Error **ENTER ENTER ENTER ENTER ENTER ENTER ENTER ENTER** MORE **↓** Enclosed Enclosed Enclosed Average vapor space Soil-bldg. space Enclosed Floor-wall Indoor flow rate into bldg. space floor pressure floor floor space seam crack air exchange OR thickness, differential, width, height, width, Leave blank to calculate length, rate,  $Q_{\text{soil}}$  $W_B$ Нв ER L<sub>crack</sub> LB W  $(g/cm-s^2)$ (cm) (cm) (cm) (cm) (cm) (1/h)(L/m) 10 40 1000 1000 244 0.1 0.25 MORE **↓ ENTER ENTER ENTER ENTER ENTER ENTER** Averaging Averaging Target Target hazard time for time for Exposure Exposure risk for quotient for carcinogens, noncarcinogens, duration, frequency, carcinogens, noncarcinogens,  $AT_{C}$  $AT_{NC}$ ED EF TR THQ (unitless) (yrs) (yrs) (days/yr) (unitless) (vrs) 350 1.0F-06 Used to calculate risk-based END groundwater concentration.

#### BENZENE-VAPOR INTRUSION MODEL MEN'S SHELTER CHEMICAL PROPERTIES SHEET

			Henry's	Henry's	Enthalpy of			Organic	Pure		
			law constant	law constant	vaporization at	Normal		carbon	component	Unit	
	Diffusivity	Diffusivity	at reference	reference	the normal	boiling	Critical	partition	water	risk	Reference
	in air,	in water,	temperature,	temperature,	boiling point,	point,	temperature,	coefficient,	solubility,	factor,	conc.,
	$D_a$	$D_{w}$	Н	$T_R$	$\DeltaH_{v,b}$	T <sub>B</sub>	$T_{C}$	K <sub>oc</sub>	S	URF	RfC
	(cm <sup>2</sup> /s)	(cm <sup>2</sup> /s)	(atm-m <sup>3</sup> /mol)	(°C)	(cal/mol)	(°K)	(°K)	(cm³/g)	(mg/L)	(μg/m³) <sup>-1</sup>	(mg/m <sup>3</sup> )
-											-
	8.80E-02	9.80E-06	5.54E-03	25	7,342	353.24	562.16	5.89E+01	1.79E+03	7.8E-06	3.0E-02

#### BENZENE-VAPOR INTRUSION MODEL MEN'S SHELTER INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source- building separation, L <sub>T</sub> (cm)	$\begin{array}{c} \text{Stratum A} \\ \text{soil} \\ \text{air-filled} \\ \text{porosity,} \\ \theta_a^{\ A} \\ \text{(cm}^3\text{/cm}^3) \end{array}$	Stratum B soil air-filled porosity, $\theta_a^{\ B}$ (cm³/cm³)	Stratum C soil air-filled porosity, $\theta_a^{\ C}$ (cm³/cm³)	Stratum A effective total fluid saturation, S <sub>te</sub> (cm³/cm³)	Stratum A soil intrinsic permeability, k <sub>i</sub> (cm²)	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> )	Thickness of capillary zone, L <sub>cz</sub> (cm)	Total porosity in capillary zone, n <sub>cz</sub> (cm³/cm³)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Floor- wall seam perimeter, X <sub>crack</sub> (cm)
3.15E+07	473	0.284	0.215	#VALUE!	0.184	5.96E-09	0.901	5.37E-09	25.00	0.387	0.067	0.320	4,000
													.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
Bldq. ventilation rate, Q <sub>bullding</sub> (cm <sup>3</sup> /s)	Area of enclosed space below grade, A <sub>B</sub> (cm <sup>2</sup> )	Crack- to-total area ratio, n (unitless)	Crack depth below grade, Z <sub>crack</sub> (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H <sub>TS</sub> (atm-m <sup>3</sup> /mol)	Henry's law constant at ave. groundwater temperature, H' <sub>TS</sub> (unitless)	Vapor viscosity at ave. soil temperature,	Stratum  A effective diffusion coefficient, D <sup>eff</sup> A (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> C (cm <sup>2</sup> /s)	Capillary zone effective diffusion coefficient, Deff cz (cm²/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)
1.69E+04	1.06E+06	3.77E-04	15	8,091	3.12E-03	1.33E-01	1.76E-04	8.88E-03	0.00E+00	0.00E+00	8.44E-05	1.37E-03	473
Convection path length, L <sub>p</sub> (cm)	Source vapor conc., C <sub>source</sub> (µg/m³)	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> (cm²)	Exponent of equivalent foundation Peclet number, exp(Pef) (unitless)	Infinite source indoor attenuation coefficient, $\alpha$ (unitless)	Infinite source bldg. conc., C <sub>building</sub> (µg/m³)	Unit risk factor, URF (µg/m³)-1	Reference conc., RfC (mg/m³)			
15	1.33E+02	0.10	8.33E+01	8.88E-03	4.00E+02	6.92E+101	1.74E-04	2.32E-02	7.8E-06	3.0E-02			

#### BENZENE-VAPOR INTRUSION MODEL MEN'S SHELTER RESULTS SHEET

### RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

#### INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)		Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA	NA	1.79E+06	NA	I	2.5E-09	7.4E-04

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

SCROLL DOWN TO "END"

## CHLOROBENZENE-VAPOR INTRUSION MODEL MEN'S SHELTER DATA ENTRY SHEET

GW-ADV Version 3.1; 02/04	CALCULATE RIS	SK-BASED GROUI	NDWATER CON	CENTRATION (	enter "X" in "YES" b	oox)						
Reset to Defaults	CALCULATE INC	YES CREMENTAL RISK	OR	] AL GROUNDW <i>A</i>	ATER CONCENTRA	ATION (enter "X" in "Y	'ES" box and initial gr	oundwater conc. b	nelow)			
,		YES	X	7		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			,			
	ENTER  Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C <sub>W</sub> (µg/L)			Chemical							
	108907	7.00E+00			Chlorobenzer	ne						
	ENTER	ENTER Depth	ENTER	ENTER Totals mu	ENTER st add up to value o	ENTER of L <sub>WT</sub> (cell G28)	ENTER	ENTER	ENTER Soil		ENTER	
MORE 🔱	Average soil/ groundwater temperature, T <sub>s</sub> (°C)	below grade to bottom of enclosed space floor, L <sub>F</sub> (cm)	Depth below grade to water table, L <sub>WT</sub> (cm)	Thickness of soil stratum A, h <sub>A</sub> (cm)	Thickness of soil stratum B, (Enter value or 0) h <sub>B</sub> (cm)	Thickness of soil stratum C, (Enter value or 0) h <sub>C</sub> (cm)	Soil stratum directly above water table, (Enter A, B, or C)	SCS soil type directly above water table	stratum A SCS soil type (used to estimate soil vapor permeability)	OR	User-defined stratum A soil vapor permeability, k <sub>v</sub> (cm <sup>2</sup> )	
	13	15	488	488			А	SL	SL			
MORE ↓	ENTER Stratum A SCS soil type Lookup Soil Parameters	ENTER Stratum A soil dry bulk density, $\rho_b^A$ (g/cm³)	ENTER Stratum A soil total porosity, n^ (unitless)	ENTER Stratum A soil water-filled porosity, $\theta_w^A$ $(cm^3/cm^3)$	ENTER Stratum B SCS Soil type Lookup Soil Parameters	ENTER Stratum B soil dry bulk density, PbB (g/cm³)	ENTER Stratum B soil total porosity, n <sup>B</sup> (unitless)	ENTER Stratum B soil water-filled porosity, $\theta_w^B$ $(cm^3/cm^3)$	ENTER Stratum C SCS Soil type Lookup Soil Parameters	ENTER Stratum C soil dry bulk density, $\rho_b^C$ (g/cm <sup>3</sup> )	ENTER Stratum C soil total porosity, n <sup>C</sup> (unitless)	ENTER Stratum C soil water-filled porosity, $\theta_w^c$ $(cm^3/cm^3)$
	SL	1.62	0.387	0.103		1.5	0.43	0.215		Error	Error	Error
MORE 🔱	ENTER Enclosed space floor thickness, L <sub>crack</sub> (cm)	ENTER  Soil-bldq. pressure differential, ΔP (g/cm-s²)	ENTER Enclosed space floor length, L <sub>B</sub> (cm)	ENTER Enclosed space floor width, W <sub>B</sub> (cm)	ENTER  Enclosed space height, HB (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	Le	ENTER Average vapor flow rate into bldq. OR eave blank to calcular Q <sub>soil</sub> (L/m)	te		
	10	40	1000	1000	244	0.1	0.25	]	5			
MORE <b>↓</b>	ENTER Averaging time for carcinogens, AT <sub>C</sub> (yrs)	ENTER Averaging time for noncarcinogens, AT <sub>NC</sub> (yrs)	ENTER  Exposure duration, ED (yrs)	ENTER  Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)						
	70	1	1	350	1.0E-06	1						
END						ılate risk-based concentration.						

# CHLOROBENZENE-VAPOR INTRUSION MODEL MEN'S SHELTER CHEMICAL PROPERTIES SHEET

Diffusivity in air, D <sub>a</sub> (cm <sup>2</sup> /s)	Diffusivity in water, D <sub>w</sub> (cm <sup>2</sup> /s)	Henry's law constant at reference temperature, H (atm-m³/mol)	Henry's law constant reference temperature, T <sub>R</sub> (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T <sub>B</sub> (°K)	Critical temperature, T <sub>C</sub> (°K)	Organic carbon partition coefficient, $K_{oc}$ $(cm^3/q)$	Pure component water solubility, S (ma/L)	Unit risk factor, URF (µg/m³) <sup>-1</sup>	Reference conc., RfC (mg/m <sup>3</sup> )
	, ,	, , , , ,		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	· · · · · ·			\ .T /		, , ,
7.30E-02	8.70E-06	3.69E-03	25	8,410	404.87	632.40	2.19E+02	4.72E+02	0.0E+00	6.0E-02

# CHLOROBENZENE-VAPOR INTRUSION MODEL MEN'S SHELTER INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source- building separation, L <sub>T</sub> (cm)	Stratum A soil air-filled porosity, $\theta_a^A$ $(cm^3/cm^3)$	Stratum B soil air-filled porosity, $\theta_a^{\ B}$ (cm³/cm³)	Stratum C soil air-filled porosity, $\theta_a{}^c$ (cm³/cm³)	Stratum A effective total fluid saturation, S <sub>te</sub> (cm³/cm³)	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> )	Thickness of capillary zone, L <sub>cz</sub> (cm)	Total porosity in capillary zone, n <sub>cz</sub> (cm <sup>3</sup> /cm <sup>3</sup> )	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm³/cm³)	Floor- wall seam perimeter, X <sub>crack</sub> (cm)
3.15F+07	473	0.284	0.215	#VALUE!	0.184	5.96E-09	0.901	5.37F-09	25.00	0.387	0.067	0.320	4.000
002.07										0	0 111		<u>, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,</u>
Bldg. ventilation rate, Q <sub>building</sub> (cm <sup>3</sup> /s)	Area of enclosed space below grade, A <sub>B</sub> (cm <sup>2</sup> )	Crack- to-total area ratio, n	Crack depth below grade,	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$	Henry's law constant at ave. groundwater temperature, H <sub>TS</sub> (atm-m³/mol)	Henry's law constant at ave. groundwater temperature,	Vapor viscosity at ave. soil temperature, $\mu_{TS}$	Stratum  A  effective diffusion coefficient, Deff A (cm²/s)	Stratum B effective diffusion coefficient, D <sup>eff</sup> B (cm <sup>2</sup> /s)	Stratum C effective diffusion coefficient, D <sup>eff</sup> <sub>C</sub> (cm <sup>2</sup> /s)	Capillary zone effective diffusion coefficient, Deff cz (cm²/s)	Total overall effective diffusion coefficient, Deff_T (cm²/s)	Diffusion path length,
(CIII /S)	(CIII )	(unitless)	(cm)	(cal/mol)	(4(111-111 /11101)	(unitless)	(g/cm-s)	(CIII 7S)	(CIII /S)	(CIII 7S)	(CIII 7S)	(CIII 7S)	(cm)
1.69E+04	1.06E+06	3.77E-04	15	9,773	1.85E-03	7.87E-02	1.76E-04	7.37E-03	0.00E+00	0.00E+00	7.74E-05	1.23E-03	473
Convection path length, L <sub>p</sub> (cm)	Source vapor conc., C <sub>source</sub> (µg/m³)	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> (cm²)	Exponent of equivalent foundation Peclet number, exp(Pef) (unitless)	Infinite source indoor attenuation coefficient, $\alpha$ (unitless)	Infinite source bldg. conc., C <sub>building</sub> (µg/m³)	Unit risk factor, URF (µg/m³)-1	Reference conc., RfC (mg/m³)			
15	5.51E+02	0.10	8.33E+01	7.37E-03	4.00E+02	5.80E+122	1.58E-04	8.70E-02	NA	6.0E-02			

## CHLOROBENZENE-VAPOR INTRUSION MODEL MEN'S SHELTER RESULTS SHEET

### RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

#### INCREMENTAL RISK CALCULATIONS:

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

SCROLL DOWN TO "END"

### CHLOROETHANE-VAPOR INTRUSION MODEL MEN'S SHELTER DATA ENTRY SHEET

GW-ADV Version 3.1; 02/04	CALCULATE RIS	SK-BASED GROU	NDWATER CON	CENTRATION (	enter "X" in "YES" b	oox)						
Reset to		YES	OR	]								
Defaults	CALCULATE IN	CREMENTAL RISK	KS FROM ACTUA	AL GROUNDWA	ATER CONCENTRA	ATION (enter "X" in "Y	'ES" box and initial gro	oundwater conc. t	pelow)			
		YES	Χ									
	ENTER	ENTER Initial										
	Chemical CAS No.	groundwater conc.,										
	(numbers only, no dashes)	C <sub>W</sub> (µg/L)			Chemical							
	75003	1.33E+00	: 1	Chl	proethane (ethyl	oblorido)						
			]						ENTER		EUTED	-
	ENTER	ENTER Depth	ENTER	ENTER Totals mu	ENTER st add up to value o		ENTER	ENTER	ENTER Soil		ENTER	
MORE <b>↓</b>	Average soil/	below grade to bottom	Depth	Thickness	Thickness of soil	Thickness of soil	Soil		stratum A SCS		User-defined stratum A	
	groundwater temperature,	of enclosed space floor,	below grade to water table,	of soil stratum A,	stratum B, (Enter value or 0)	stratum C, (Enter value or 0)	stratum directly above	SCS soil type	soil type (used to estimate	OR	soil vapor permeability,	
	T <sub>s</sub> (°C)	L <sub>F</sub> (cm)	L <sub>WT</sub> (cm)	h <sub>A</sub> (cm)	h <sub>B</sub> (cm)	h <sub>c</sub> (cm)	water table, (Enter A, B, or C)	directly above water table	soil vapor permeability)		k <sub>v</sub> (cm <sup>2</sup> )	
					(CIII)	(CIII)					(CIII )	
	13	15	488	488			A	SL	SL			1
	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
HODE			0									
MORE <b>↓</b>	Stratum A SCS	Stratum A soil dry	Stratum A soil total	Stratum A soil water-filled	Stratum B SCS	Stratum B soil dry	Stratum B soil total	Stratum B soil water-filled	Stratum C SCS	Stratum C soil dry	Stratum C soil total	Stratum C soil water-filled
MORE 🔱	SCS soil type	Stratum A soil dry bulk density,	soil total porosity,	soil water-filled porosity,	SCS soil type	soil dry bulk density,	soil total porosity,	soil water-filled porosity,	SCS soil type	soil dry bulk density,	soil total porosity,	soil water-filled porosity,
MORE 🔶	SCS	Stratum A soil dry	soil total	soil water-filled	SCS	soil dry	soil total	soil water-filled	SCS	soil dry	soil total	soil water-filled
MORE ↓	SCS soil type ' Lookup Soil `	Stratum A soil dry bulk density, $ ho_b^A$	soil total porosity, n <sup>A</sup>	soil water-filled porosity, $\theta_{w}^{\ \ A}$	SCS soil type Lookup Soil	soil dry bulk density, ρ <sub>ь</sub> <sup>В</sup>	soil total porosity, n <sup>B</sup>	soil water-filled porosity, $\theta_w^B$	SCS soil type `Lookup Soil `	soil dry bulk density, $\rho_b^c$	soil total porosity, n <sup>c</sup>	soil water-filled porosity, $\theta_w^{\ C}$
MORE ↓	SCS soil type Lookup Soil ` Parameters	Stratum A soil dry bulk density, $ ho_b^A$ (g/cm³)	soil total porosity, n <sup>A</sup> (unitless)	soil water-filled porosity, θ <sub>w</sub> <sup>A</sup> (cm <sup>3</sup> /cm <sup>3</sup> )	SCS soil type Lookup Soil	soil dry bulk density, $ ho_b^B$ (g/cm <sup>3</sup> )	soil total porosity, n <sup>B</sup> (unitless)	soil water-filled porosity, $\theta_w^B$ (cm <sup>3</sup> /cm <sup>3</sup> )	SCS soil type `Lookup Soil `	soil dry bulk density, ${ ho_b}^C$ (g/cm³)	soil total porosity, n <sup>C</sup> (unitless)	soil water-filled porosity, $\theta_w^c$ $(cm^3/cm^3)$
MORE	SCS soil type Lookup Soil ` Parameters ,	Stratum A soil dry bulk density, Pb (g/cm³)	soil total porosity, n^ (unitless)  0.387  ENTER Enclosed	soil water-filled porosity, $\theta_w^A$ (cm³/cm³) 0.103	SCS soil type Lookup Soil Parameters	soil dry bulk density, p <sub>b</sub> <sup>B</sup> (g/cm³)  1.5  ENTER	soil total porosity, n <sup>B</sup> (unitless)  0.43  ENTER	soil water-filled porosity, $\theta_w^B$ (cm <sup>3</sup> /cm <sup>3</sup> )	SCS SOII type Lookup Soil ` Parameters  ENTER Average vapor	soil dry bulk density, ${ ho_b}^C$ (g/cm³)	soil total porosity, n <sup>C</sup> (unitless)	soil water-filled porosity, $\theta_w^c$ $(cm^3/cm^3)$
MORE	SCS Soil type Lookup Soil Parameters  SL  ENTER Enclosed Space floor	Stratum A soil dry bulk density, pb^ (g/cm³)  1.62 ENTER  Soil-bldq, pressure	soil total porosity, n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space floor	soil water-filled porosity, $\theta_w^A$ (cm³/cm³)  0.103  ENTER Enclosed space floor	SCS Soil type Lookup Soil Parameters  ENTER  Enclosed Space	soil dry bulk density, p <sub>b</sub> <sup>B</sup> (g/cm³)  1.5  ENTER  Floor-wall seam crack	soil total porosity, n <sup>B</sup> (unitless)  0.43  ENTER Indoor air exchange	soil water-filled porosity, $\theta_w^B$ $(cm^3/cm^3)$	SCS SOII type Lookup Soil Parameters ENTER Average vapor flow rate into bldq. OR	soil dry bulk density, \$\rho_b^C\$ (g/cm³)	soil total porosity, n <sup>C</sup> (unitless)	soil water-filled porosity, $\theta_w^c$ $(cm^3/cm^3)$
MORE	SCS soil type Lookup Soil Parameters  SL  ENTER Enclosed space floor thickness,	Stratum A soil dry bulk density, \$\rho_b^A\\ (g/cm^3)\$  1.62  ENTER  Soil-bldq.	soil total porosity, n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space floor length,	soil water-filled porosity, $\theta_w^A$ (cm³/cm³)  0.103  ENTER Enclosed space floor width,	SCS soil type Lookup Soil Parameters  ENTER  Enclosed space height,	soil dry bulk density, pb (g/cm³)  1.5  ENTER  Floor-wall seam crack width,	soil total porosity, n <sup>B</sup> (unitless)  0.43  ENTER  Indoor air exchange rate,	soil water-filled porosity, $\theta_w^B$ $(cm^3/cm^3)$	SCS soil type Lookup Soil Parameters  ENTER Average vapor flow rate into bldq. OR eave blank to calcula	soil dry bulk density, \$\rho_b^C\$ (g/cm³)	soil total porosity, n <sup>C</sup> (unitless)	soil water-filled porosity, $\theta_w^c$ $(cm^3/cm^3)$
MORE	SCS Soil type Lookup Soil Parameters  SL  ENTER Enclosed Space floor	Stratum A soil dry bulk density, Pb (g/cm³)  1.62  ENTER  Soil-bldq. pressure differential,	soil total porosity, n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space floor	soil water-filled porosity, $\theta_w^A$ (cm³/cm³)  0.103  ENTER Enclosed space floor	SCS Soil type Lookup Soil Parameters  ENTER  Enclosed Space	soil dry bulk density, p <sub>b</sub> <sup>B</sup> (g/cm³)  1.5  ENTER  Floor-wall seam crack	soil total porosity, n <sup>B</sup> (unitless)  0.43  ENTER Indoor air exchange	soil water-filled porosity, $\theta_w^B$ $(cm^3/cm^3)$	SCS SOII type Lookup Soil Parameters ENTER Average vapor flow rate into bldq. OR	soil dry bulk density, \$\rho_b^C\$ (g/cm³)	soil total porosity, n <sup>C</sup> (unitless)	soil water-filled porosity, $\theta_w^c$ $(cm^3/cm^3)$
MORE	SCS soil type (Lookup Soil Parameters)  SL  ENTER Enclosed space floor thickness, Lcrack	Stratum A soil dry bulk density, Pb (g/cm³)  1.62  ENTER  Soil-bldq, pressure differential, $\Delta P$	soil total porosity, n^ (unitless)  0.387  ENTER Enclosed space floor length, L <sub>B</sub>	soil water-filled porosity, $\theta_w^A$ (cm³/cm³)  0.103  ENTER Enclosed space floor width, $W_B$	SCS soil type Lookup Soil Parameters Parameters Enclosed space height, HB	soil dry bulk density, pb (g/cm³)  1.5  ENTER  Floor-wall seam crack width, w	soil total porosity, n <sup>B</sup> (unitless)  0.43  ENTER Indoor air exchange rate, ER	soil water-filled porosity, $\theta_w^B$ $(cm^3/cm^3)$	SCS soil type Lookup Soil Parameters  ENTER Average vapor flow rate into bldq. OR eave blank to calcula	soil dry bulk density, \$\rho_b^C\$ (g/cm³)	soil total porosity, n <sup>C</sup> (unitless)	soil water-filled porosity, $\theta_w^c$ $(cm^3/cm^3)$
MORE MORE	SCS soil type Lookup Soil Parameters  SL  ENTER Enclosed Space floor thickness, Lcrack (cm)	Stratum A soil dry bulk density, Pb (g/cm³)  1.62  ENTER  Soil-bldq. pressure differential, $\Delta P$ (g/cm-s²)	soil total porosity, n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space floor length, L <sub>B</sub> (cm)	soil water-filled porosity, $\theta_w^A$ (cm³/cm³)  0.103  ENTER Enclosed space floor width, $W_B$ (cm)	SCS soil type Lookup Soil parameters  ENTER  Enclosed space height, H <sub>B</sub> (cm)	soil dry bulk density, p <sub>b</sub> <sup>B</sup> (g/cm³)  1.5  ENTER  Floor-wall seam crack width, w (cm)	soil total porosity, n <sup>B</sup> (unitless)  0.43  ENTER Indoor air exchange rate, ER (1/h)	soil water-filled porosity, $\theta_w^B$ $(cm^3/cm^3)$	SCS soil type Lookup Soil Parameters  ENTER Average vapor flow rate into bldq. OR eave blank to calcula Q <sub>soil</sub> (L/m)	soil dry bulk density, \$\rho_b^C\$ (g/cm³)	soil total porosity, n <sup>C</sup> (unitless)	soil water-filled porosity, $\theta_w^c$ $(cm^3/cm^3)$
MORE	SCS Soil type Lookup Soil Parameters  SL ENTER Enclosed Space floor thickness, Lerack (cm)  10 ENTER Averaging	Stratum A soil dry bulk density, Pb (g/cm³)  1.62  ENTER  Soil-bldq. pressure differential, $\Delta P$ (g/cm-s²)  40  ENTER  Averaging	soil total porosity, n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space floor length, L <sub>B</sub> (cm)  1000  ENTER	soil water-filled porosity, $\theta_w^A$ (cm³/cm³)  0.103  ENTER Enclosed space floor width, $W_B$ (cm)  1000  ENTER	SCS soil type Lookup Soil parameters ENTER  ENTER  Enclosed space height, HB (cm)  244  ENTER  Target	soil dry bulk density, p <sub>b</sub> <sup>B</sup> (g/cm³)  1.5  ENTER  Floor-wall seam crack width, w (cm)  0.1  ENTER  Target hazard	soil total porosity, n <sup>B</sup> (unitless)  0.43  ENTER Indoor air exchange rate, ER (1/h)	soil water-filled porosity, $\theta_w^B$ $(cm^3/cm^3)$	SCS soil type Lookup Soil Parameters  ENTER Average vapor flow rate into bldq. OR eave blank to calcula Q <sub>soil</sub> (L/m)	soil dry bulk density, \$\rho_b^C\$ (g/cm³)	soil total porosity, n <sup>C</sup> (unitless)	soil water-filled porosity, $\theta_w^c$ $(cm^3/cm^3)$
MORE MORE	SCS soil type Lookup Soil Parameters  SL  ENTER Enclosed space floor thickness, Lerack (cm)  10  ENTER Averaging time for carcinogens,	Stratum A soil dry bulk density, Pb A (g/cm³)  1.62  ENTER  Soil-bldq. pressure differential, $\Delta P$ (g/cm-s²)  40  ENTER  Averaqinq time for noncarcinoqens,	soil total porosity, n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space floor length, L <sub>B</sub> (cm)  1000  ENTER  Exposure duration,	soil water-filled porosity, $\theta_w^A$ (cm³/cm³)  0.103  ENTER Enclosed space floor width, $W_B$ (cm)  1000  ENTER  Exposure frequency,	SCS soil type Lookup Soil parameters ENTER  Enclosed space height, HB (cm)  244  ENTER Target risk for carcinogens,	soil dry bulk density, pb (g/cm³)  1.5  ENTER  Floor-wall seam crack width, W (cm)  0.1  ENTER  Target hazard quotient for noncarcinogens,	soil total porosity, n <sup>B</sup> (unitless)  0.43  ENTER Indoor air exchange rate, ER (1/h)	soil water-filled porosity, $\theta_w^B$ $(cm^3/cm^3)$	SCS soil type Lookup Soil Parameters  ENTER Average vapor flow rate into bldq. OR eave blank to calcula Q <sub>soil</sub> (L/m)	soil dry bulk density, \$\rho_b^C\$ (g/cm³)	soil total porosity, n <sup>C</sup> (unitless)	soil water-filled porosity, $\theta_w^c$ $(cm^3/cm^3)$
MORE MORE	SCS soil type Lookup Soil Parameters  SL  ENTER Enclosed space floor thickness, Lerack (cm)  10  ENTER Averaging time for carcinogens, ATc	Stratum A soil dry bulk density, Pb A (g/cm³)  1.62  ENTER  Soil-bldq. pressure differential, AP (g/cm-s²)  40  ENTER  Averaging time for noncarcinogens, AT <sub>NC</sub>	soil total porosity, n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space floor length, L <sub>B</sub> (cm)  1000  ENTER  Exposure duration, ED	soil water-filled porosity, $\theta_w^A$ (cm³/cm³)  0.103  ENTER Enclosed space floor width, WB (cm)  1000  ENTER  Exposure frequency, EF	SCS soil type Lookup Soil parameters ENTER  ENTER  Enclosed space height, HB (cm)  244  ENTER  Target risk for carcinogens, TR	soil dry bulk density, pb (g/cm³)  1.5  ENTER  Floor-wall seam crack width, W (cm)  0.1  ENTER  Target hazard quotient for noncarcinogens, THQ	soil total porosity, n <sup>B</sup> (unitless)  0.43  ENTER Indoor air exchange rate, ER (1/h)	soil water-filled porosity, $\theta_w^B$ $(cm^3/cm^3)$	SCS soil type Lookup Soil Parameters  ENTER Average vapor flow rate into bldq. OR eave blank to calcula Q <sub>soil</sub> (L/m)	soil dry bulk density, \$\rho_b^C\$ (g/cm³)	soil total porosity, n <sup>C</sup> (unitless)	soil water-filled porosity, $\theta_w^c$ $(cm^3/cm^3)$
MORE MORE	SCS soil type (Lookup Soil ) Parameters    SL  ENTER Enclosed space floor thickness, Lcrack (cm)  10  ENTER Averaging time for carcinogens, ATc (yrs)	Stratum A soil dry bulk density, Pb (g/cm³)  1.62  ENTER  Soil-bldq. pressure differential, $\Delta P$ (g/cm-s²)  40  ENTER  Averaging time for noncarcinogens, $AT_{NC}$ (yrs)	soil total porosity, n^ (unitless)  0.387  ENTER Enclosed space floor length, L <sub>B</sub> (cm)  1000  ENTER  Exposure duration, ED (yrs)	soil water-filled porosity, $\theta_w^A$ (cm³/cm³)  0.103  ENTER Enclosed space floor width, $W_B$ (cm)  1000  ENTER  Exposure frequency, EF (days/yr)	SCS soil type Lookup Soil Type Lookup Soil Parameters  ENTER  Enclosed space height, HB (cm)  244  ENTER  Target risk for carcinogens, TR (unitless)	soil dry bulk density, pb (g/cm³)  1.5  ENTER  Floor-wall seam crack width, W (cm)  0.1  ENTER  Target hazard quotient for noncarcinogens,	soil total porosity, n <sup>B</sup> (unitless)  0.43  ENTER Indoor air exchange rate, ER (1/h)	soil water-filled porosity, $\theta_w^B$ $(cm^3/cm^3)$	SCS soil type Lookup Soil Parameters  ENTER Average vapor flow rate into bldq. OR eave blank to calcula Q <sub>soil</sub> (L/m)	soil dry bulk density, \$\rho_b^C\$ (g/cm³)	soil total porosity, n <sup>C</sup> (unitless)	soil water-filled porosity, $\theta_w^c$ $(cm^3/cm^3)$
MORE MORE	SCS soil type Lookup Soil Parameters  SL  ENTER Enclosed space floor thickness, Lerack (cm)  10  ENTER Averaging time for carcinogens, ATc	Stratum A soil dry bulk density, Pb A (g/cm³)  1.62  ENTER  Soil-bldq. pressure differential, AP (g/cm-s²)  40  ENTER  Averaging time for noncarcinogens, AT <sub>NC</sub>	soil total porosity, n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space floor length, L <sub>B</sub> (cm)  1000  ENTER  Exposure duration, ED	soil water-filled porosity, $\theta_w^A$ (cm³/cm³)  0.103  ENTER Enclosed space floor width, WB (cm)  1000  ENTER  Exposure frequency, EF	SCS soil type Lookup Soil parameters ENTER  ENTER  Enclosed space height, HB (cm)  244  ENTER  Target risk for carcinogens, TR	soil dry bulk density, pb (g/cm³)  1.5  ENTER  Floor-wall seam crack width, W (cm)  0.1  ENTER  Target hazard quotient for noncarcinogens, THQ	soil total porosity, n <sup>B</sup> (unitless)  0.43  ENTER Indoor air exchange rate, ER (1/h)	soil water-filled porosity, $\theta_w^B$ $(cm^3/cm^3)$	SCS soil type Lookup Soil Parameters  ENTER Average vapor flow rate into bldq. OR eave blank to calcula Q <sub>soil</sub> (L/m)	soil dry bulk density, \$\rho_b^C\$ (g/cm³)	soil total porosity, n <sup>C</sup> (unitless)	soil water-filled porosity, $\theta_w^c$ $(cm^3/cm^3)$

# CHLOROETHANE-VAPOR INTRUSION MODEL MEN'S SHELTER CHEMICAL PROPERTIES SHEET

Diffusivity in air, D <sub>a</sub> (cm <sup>2</sup> /s)	Diffusivity in water, D <sub>w</sub> (cm <sup>2</sup> /s)	Henry's law constant at reference temperature, H (atm-m³/mol)	Henry's law constant reference temperature, T <sub>R</sub> (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T <sub>B</sub> (°K)	Critical temperature, T <sub>C</sub> (°K)	Organic carbon partition coefficient, $K_{oc}$ $(cm^3/g)$	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m³) <sup>-1</sup>	Reference conc., RfC (mg/m³)
0.715.01	1 155 05	0.005.00	٥٤	, ,	205.20	4/0.40	4.405.00			0.05.00
2.71E-01	1.15E-05	8.80E-03	25	5,879	285.30	460.40	4.40E+00	5.68E+03	0.0E+00	9.0E-02

# CHLOROETHANE-VAPOR INTRUSION MODEL MEN'S SHELTER INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source- building separation, L <sub>T</sub> (cm)	$\begin{array}{c} \text{Stratum A} \\ \text{soil} \\ \text{air-filled} \\ \text{porosity,} \\ \theta_a^{\ A} \\ \text{(cm}^3\text{/cm}^3) \end{array}$	Stratum B soil air-filled porosity, $\theta_a^{\ B}$ (cm³/cm³)	Stratum C soil air-filled porosity, $\theta_a^{\ c}$ $(cm^3/cm^3)$	Stratum A effective total fluid saturation, S <sub>te</sub> (cm³/cm³)	Stratum A soil intrinsic permeability, k <sub>i</sub> (cm²)	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> )	Thickness of capillary zone, L <sub>cz</sub> (cm)	Total porosity in capillary zone, n <sub>cz</sub> (cm <sup>3</sup> /cm <sup>3</sup> )	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Floor- wall seam perimeter, X <sub>crack</sub> (cm)
3.15E+07	473	0.284	0.215	#VALUE!	0.184	5.96E-09	0.901	5.37E-09	25.00	0.387	0.067	0.320	4,000
Bldq. ventilation rate, Q <sub>buliding</sub> (cm <sup>3</sup> /s)	Area of enclosed space below grade, A <sub>B</sub> (cm <sup>2</sup> )	Crack- to-total area ratio, n (unitless)	Crack depth below grade, Z <sub>crack</sub> (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H <sub>TS</sub> (atm-m <sup>3</sup> /mol)	Henry's law constant at ave. groundwater temperature, H' <sub>TS</sub> (unitless)	Vapor viscosity at ave. soil temperature,	Stratum  A effective diffusion coefficient, D <sup>eff</sup> A (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> C (cm <sup>2</sup> /s)	Capillary zone effective diffusion coefficient, Deff cz (cm²/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)
1.69E+04	1.06E+06	3.77E-04	15	5,870	5.81E-03	2.47E-01	1.76E-04	2.74E-02	0.00E+00	0.00E+00	2.33E-04	3.82E-03	473
Convection path length, L <sub>p</sub> (cm)	Source vapor conc., C <sub>source</sub> (µg/m³)	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> (cm²)	Exponent of equivalent foundation Peclet number, exp(Pef) (unitless)	Infinite source indoor attenuation coefficient, $\alpha$ (unitless)	Infinite source bldg. conc., C <sub>building</sub> (µg/m³)	Unit risk factor, URF (µg/m³)-1	Reference conc., RfC (mg/m³)			
15	3.29E+02	0.10	8.33E+01	2.74E-02	4.00E+02	1.18E+33	4.59E-04	1.51E-01	NA	9.0E-02			

## CHLOROETHANE-VAPOR INTRUSION MODEL MEN'S SHELTER RESULTS SHEET

#### RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

#### INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)		Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
					_		
NA	NA	NA	5.68E+06	NA	Ī	NA	1.6E-03

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

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

# METHYLENE CHLORIDE-VAPOR INTRUSION MODEL MEN'S SHELTER DATA ENTRY SHEET

GW-ADV Version 3.1; 02/04	CALCULATE RIS	SK-BASED GROU	NDWATER CON	CENTRATION (	enter "X" in "YES" b	ox)						
Reset to		YES	OR	]								
Defaults	CALCULATE IN	CREMENTAL RISK	KS FROM ACTUA	L GROUNDWA	TER CONCENTRA	TION (enter "X" in "Y	ES" box and initial gro	oundwater conc. b	pelow)			
		YES	Χ	]								
	ENTER	ENTER Initial										
	Chemical CAS No.	groundwater conc.,										
	(numbers only,	$C_W$										
	no dashes)	(μg/L)	: 1		Chemical							
	75092	5.65E-01			Methylene chlo	ride						_
	ENTER	ENTER Depth	ENTER	ENTER Totals mu	ENTER st add up to value o	ENTER f LwT (cell G28)	ENTER	ENTER	ENTER Soil		ENTER	
MORE <b>↓</b>	Average soil/	below grade to bottom	Depth	Thickness	Thickness of soil	Thickness of soil	Soil		stratum A SCS		User-defined stratum A	
	groundwater temperature,	of enclosed space floor,	below grade to water table,	of soil stratum A,	stratum B, (Enter value or 0)	stratum C,	stratum directly above	SCS soil type	soil type (used to estimate	OR	soil vapor permeability,	
	Ts	L <sub>F</sub>	$L_{WT}$	h <sub>A</sub>	h <sub>B</sub>	h <sub>c</sub>	water table,	directly above	soil vapor	OK	k <sub>v</sub>	
	(°C)	(cm)	(cm)	(cm)	(cm)	(cm)	(Enter A, B, or C)	water table	permeability)		(cm²)	
	13	15	488	488			A	SL	SL			]
MORE 🗸	ENTER Stratum A SCS	ENTER Stratum A soil dry	ENTER Stratum A soil total	ENTER Stratum A soil water-filled porosity,	ENTER Stratum B SCS soil type	ENTER Stratum B soil dry bulk density,	ENTER Stratum B soil total porosity,	ENTER Stratum B soil water-filled porosity,	ENTER Stratum C SCS soil type	ENTER Stratum C soil dry bulk density,	ENTER Stratum C soil total porosity,	ENTER Stratum C soil water-filled porosity,
	Soil type Lookup Soil Parameters	bulk density, $ ho_{ m b}^{ m A}$ (g/cm $^{ m 3}$ )	porosity, n <sup>A</sup> (unitless)	$\theta_w^A$ $(cm^3/cm^3)$	Lookup Soil Parameters	$\rho_b^B$ (g/cm <sup>3</sup> )	n <sup>B</sup> (unitless)	$\theta_w^B$ (cm <sup>3</sup> /cm <sup>3</sup> )	Lookup Soil Parameters	ρ <sub>b</sub> <sup>C</sup> (g/cm³)	n <sup>c</sup> (unitless)	$\theta_w^c$ (cm <sup>3</sup> /cm <sup>3</sup> )
	Lookup Soil `	$\rho_b^A$	n <sup>A</sup>	$\theta_{w}^{A}$	Lookup Soil `	$\rho_b^B$	n <sup>B</sup>	$\Theta_{w}^{B}$	Lookup Soil `	$\rho_b^{\ C}$		
MORE	Lookup Soil Parameters	ρ <sub>b</sub> <sup>A</sup> (g/cm³)  1.62  ENTER	n <sup>A</sup> (unitless)	θ <sub>w</sub> <sup>A</sup> (cm³/cm³)  0.103  ENTER Enclosed	Lookup Soil Parameters ENTER	ρ <sub>b</sub> <sup>B</sup> (g/cm³)  1.5  ENTER	(unitless)  0.43  ENTER	θ <sub>w</sub> <sup>B</sup> (cm³/cm³)	Lookup Soil Parameters	ρ <sub>b</sub> <sup>C</sup> (g/cm³)	(unitless)	(cm³/cm³)
MORE ↓	Lookup Soil Parameters SL	ρ <sub>b</sub> <sup>A</sup> (g/cm <sup>3</sup> )	n <sup>A</sup> (unitless)  0.387  ENTER	θ <sub>w</sub> <sup>A</sup> (cm³/cm³)  0.103  ENTER	Lookup Soil Parameters	ρ <sub>b</sub> <sup>B</sup> (g/cm <sup>3</sup> )	n <sup>B</sup> (unitless)  0.43	θ <sub>w</sub> <sup>B</sup> (cm³/cm³)	Lookup Soil Parameters	ρ <sub>b</sub> <sup>C</sup> (g/cm³)	(unitless)	(cm³/cm³)
MORE ↓	Lookup Soil Parameters  SL  ENTER Enclosed space floor thickness,	ρ <sub>b</sub> <sup>A</sup> (g/cm³)  1.62  ENTER  Soil-bldq.	n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space floor length,	ew <sup>A</sup> (cm³/cm³)  0.103  ENTER Enclosed space floor width,	ENTER  Enclosed space height,	P <sub>b</sub> <sup>B</sup> (g/cm³)  1.5  ENTER  Floor-wall seam crack width,	(unitless)  0.43  ENTER  Indoor air exchange rate,	θ <sub>w</sub> <sup>B</sup> (cm <sup>3</sup> /cm <sup>3</sup> )	Lookup Soil Parameters  ENTER Average vapor flow rate into bldg. OR eave blank to calcula	ρ <sub>b</sub> <sup>C</sup> (g/cm³) Error	(unitless)	(cm³/cm³)
MORE ↓	Lookup Soil Parameters SL  SL  ENTER Enclosed space floor	ρ <sub>b</sub> <sup>A</sup> (g/cm³)  1.62  ENTER  Soil-bldq, pressure differential,	n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space floor	ew <sup>A</sup> (cm³/cm³)  0.103  ENTER Enclosed space floor	Lookup Soil Parameters  ENTER  Enclosed space	(g/cm³)  1.5  ENTER  Floor-wall seam crack	n <sup>B</sup> (unitless)  0.43  ENTER Indoor air exchange	θ <sub>w</sub> <sup>B</sup> (cm <sup>3</sup> /cm <sup>3</sup> )	Lookup Soil Parameters  ENTER Average vapor flow rate into bldq. OR	ρ <sub>b</sub> <sup>C</sup> (g/cm³) Error	(unitless)	(cm³/cm³)
MORE <b>↓</b>	Lookup Soil Parameters  SL  ENTER Enclosed space floor thickness, Lcrack	P <sub>b</sub> <sup>A</sup> (g/cm³)  1.62  ENTER  Soil-bldq. pressure differential, ΔP	n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space floor length, L <sub>B</sub>	end of the state o	ENTER  Enclosed space height, H <sub>B</sub>	P <sub>b</sub> B (g/cm³)  1.5  ENTER  Floor-wall seam crack width, w	n <sup>B</sup> (unitless)  0.43  ENTER Indoor air exchange rate, ER	θ <sub>w</sub> <sup>B</sup> (cm <sup>3</sup> /cm <sup>3</sup> )	Lookup Soil Parameters  ENTER Average vapor flow rate into bldq. OR eave blank to calcula	ρ <sub>b</sub> <sup>C</sup> (g/cm³) Error	(unitless)	(cm³/cm³)
MORE	Lookup Soil Parameters  SL  ENTER Enclosed space floor thickness, Lcrack (cm)  10  ENTER	P <sub>b</sub> <sup>A</sup> (g/cm³)  1.62  ENTER  Soil-bldq. pressure differential, ΔP (g/cm·s²)  40  ENTER	n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space floor length, L <sub>B</sub> (cm)	ew <sup>A</sup> (cm³/cm³)  0.103  ENTER Enclosed space floor width, W <sub>B</sub> (cm)	ENTER  Enclosed space height, HB (cm)	PoB (g/cm³)  1.5  ENTER  Floor-wall seam crack width, w (cm)  0.1  ENTER	n <sup>B</sup> (unitless)  0.43  ENTER Indoor air exchange rate, ER (1/h)	θ <sub>w</sub> <sup>B</sup> (cm <sup>3</sup> /cm <sup>3</sup> )	Lookup Soil Parameters  ENTER Average vapor flow rate into bldq. OR eave blank to calcula Osoil (L/m)	ρ <sub>b</sub> <sup>C</sup> (g/cm³) Error	(unitless)	(cm³/cm³)
	Lookup Soil Parameters  SL  ENTER Enclosed space floor thickness, Lcrack (cm)  10  ENTER Averaging time for	P <sub>b</sub> <sup>A</sup> (g/cm³)  1.62  ENTER  Soil-bldq. pressure differential, ΔP (g/cm-s²)  40  ENTER  Averaging time for	n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space floor length, L <sub>B</sub> (cm)  1000  ENTER  Exposure	ew A (cm³/cm³)  0.103  ENTER Enclosed space floor width, WB (cm)  1000  ENTER  Exposure	ENTER Enclosed space height, HB (cm)  244 ENTER Target risk for	P <sub>b</sub> B (g/cm³)  1.5  ENTER  Floor-wall seam crack width, w (cm)  0.1  ENTER  Tarqet hazard quotient for	n <sup>B</sup> (unitless)  0.43  ENTER Indoor air exchange rate, ER (1/h)	θ <sub>w</sub> <sup>B</sup> (cm <sup>3</sup> /cm <sup>3</sup> )	Lookup Soil Parameters  ENTER Average vapor flow rate into bldq. OR eave blank to calcula Osoil (L/m)	ρ <sub>b</sub> <sup>C</sup> (g/cm³) Error	(unitless)	(cm³/cm³)
MORE	Lookup Soil Parameters  SL  ENTER Enclosed space floor thickness, Lcrack (cm)  10  ENTER Averaging	P <sub>b</sub> <sup>A</sup> (g/cm³)  1.62  ENTER  Soil-bldq, pressure differential, $\Delta P$ (g/cm·s²)  40  ENTER  Averaging	n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space floor length, L <sub>B</sub> (cm)  1000  ENTER	ew A (cm³/cm³)  0.103  ENTER Enclosed Space floor width, WB (cm)  1000  ENTER	ENTER Enclosed space height, HB (cm)  244 ENTER Target	P <sub>b</sub> B (g/cm³)  1.5  ENTER  Floor-wall seam crack width, w (cm)  0.1  ENTER  Target hazard	n <sup>B</sup> (unitless)  0.43  ENTER Indoor air exchange rate, ER (1/h)	θ <sub>w</sub> <sup>B</sup> (cm <sup>3</sup> /cm <sup>3</sup> )	Lookup Soil Parameters  ENTER Average vapor flow rate into bldq. OR eave blank to calcula Osoil (L/m)	ρ <sub>b</sub> <sup>C</sup> (g/cm³) Error	(unitless)	(cm³/cm³)
MORE	Lookup Soil Parameters  SL  ENTER Enclosed space floor thickness, Lerack (cm)  10  ENTER Averaging time for carcinogens,	P <sub>b</sub> <sup>A</sup> (g/cm³)  1.62  ENTER  Soil-bldq. pressure differential, ΔP (g/cm·s²)  40  ENTER  Averaging time for noncarcinogens,	n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space floor length, L <sub>B</sub> (cm)  1000  ENTER  Exposure duration,	ew <sup>A</sup> (cm³/cm³)  0.103  ENTER Enclosed space floor width, W <sub>B</sub> (cm)  1000  ENTER  Exposure frequency,	ENTER  Enclosed space height, H <sub>B</sub> (cm)  244  ENTER  Target risk for carcinogens,	P <sub>b</sub> B (g/cm³)  1.5  ENTER  Floor-wall seam crack width, w (cm)  0.1  ENTER  Target hazard quotient for noncarcinogens,	n <sup>B</sup> (unitless)  0.43  ENTER Indoor air exchange rate, ER (1/h)	θ <sub>w</sub> <sup>B</sup> (cm <sup>3</sup> /cm <sup>3</sup> )	Lookup Soil Parameters  ENTER Average vapor flow rate into bldq. OR eave blank to calcula Osoil (L/m)	ρ <sub>b</sub> <sup>C</sup> (g/cm³) Error	(unitless)	(cm³/cm³)
MORE	Lookup Soil Parameters  SL  ENTER Enclosed space floor thickness, Lcrack (cm)  10  ENTER Averaging time for carcinogens, ATc	P <sub>b</sub> <sup>A</sup> (g/cm³)  1.62  ENTER  Soil-bldq. pressure differential, ΔP (g/cm-s²)  40  ENTER  Averaging time for noncarcinogens, AT <sub>NC</sub>	n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space floor length, L <sub>B</sub> (cm)  1000  ENTER  Exposure duration, ED	ew A (cm³/cm³)  0.103  ENTER Enclosed space floor width, WB (cm)  1000  ENTER  Exposure frequency, EF	ENTER  Enclosed space height, HB (cm)  244  ENTER  Target risk for carcinogens, TR	P <sub>b</sub> B (g/cm³)  1.5  ENTER  Floor-wall seam crack width, w (cm)  0.1  ENTER  Tarqet hazard quotient for noncarcinogens, THQ	n <sup>B</sup> (unitless)  0.43  ENTER Indoor air exchange rate, ER (1/h)	θ <sub>w</sub> <sup>B</sup> (cm <sup>3</sup> /cm <sup>3</sup> )	Lookup Soil Parameters  ENTER Average vapor flow rate into bldq. OR eave blank to calcula Osoil (L/m)	ρ <sub>b</sub> <sup>C</sup> (g/cm³) Error	(unitless)	(cm³/cm³)

# METHYLENE CHLORIDE-VAPOR INTRUSION MODEL MEN'S SHELTER CHEMICAL PROPERTIES SHEET

515	B100 1 11	Henry's law constant	Henry's law constant	Enthalpy of vaporization at	Normal		Organic carbon	Pure component	Unit	5.6
Diffusivity in air.	Diffusivity	at reference	reference	the normal	boiling point.	Critical	partition coefficient.	water solubility.	risk factor.	Reference
D <sub>a</sub>	in water, D <sub>w</sub>	temperature,	temperature, T <sub>R</sub>	boiling point, ΔH <sub>v.b</sub>	т -	temperature, T <sub>C</sub>	K <sub>oc</sub>	Solubility,	URF	conc., RfC
(cm <sup>2</sup> /s)	(cm <sup>2</sup> /s)	(atm-m <sup>3</sup> /mol)	(°C)	(cal/mol)	(°K)	(°K)	(cm³/g)	(mg/L)	(μg/m³) <sup>-1</sup>	(mg/m <sup>3</sup> )
1.01E-01	1.17E-05	2.18E-03	25	6,706	313.00	510.00	1.17E+01	1.30E+04	4.7E-07	1.0E+00

# METHYLENE CHLORIDE-VAPOR INTRUSION MODEL MEN'S SHELTER INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source- building separation, L <sub>T</sub> (cm)	$\begin{array}{c} \text{Stratum A} \\ \text{soil} \\ \text{air-filled} \\ \text{porosity,} \\ \theta_a{}^A \\ \text{(cm}^3\text{/cm}^3) \end{array}$	Stratum B soil air-filled porosity, $\theta_a^{\ B}$ $(cm^3/cm^3)$	Stratum C soil air-filled porosity, $\theta_a^{\ c}$ (cm³/cm³)	Stratum A effective total fluid saturation, S <sub>te</sub> (cm³/cm³)	Stratum A soil intrinsic permeability, k <sub>1</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> )	Thickness of capillary zone, L <sub>cz</sub> (cm)	Total porosity in capillary zone, n <sub>cz</sub> (cm <sup>3</sup> /cm <sup>3</sup> )	Air-filled porosity in capillary zone, θ <sub>a,cz</sub> (cm³/cm³)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Floor- wall seam perimeter, X <sub>crack</sub> (cm)
3.15E+07	473	0.284	0.215	#VALUE!	0.184	5.96E-09	0.901	5.37E-09	25.00	0.387	0.067	0.320	4,000
Bldq. ventilation rate, O <sub>building</sub> (cm <sup>3</sup> /s)	Area of enclosed space below grade, A <sub>B</sub> (cm <sup>2</sup> )	Crack- to-total area ratio, n (unitless)	Crack depth below grade, Z <sub>crack</sub> (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H <sub>TS</sub> (atm-m³/mol)	Henry's law constant at ave. groundwater temperature, H' <sub>TS</sub> (unitless)	Vapor viscosity at ave. soil temperature,	Stratum  A effective diffusion coefficient, Deff (cm²/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> C (cm <sup>2</sup> /s)	Capillary zone effective diffusion coefficient, D <sup>eff</sup> <sub>cz</sub> (cm <sup>2</sup> /s)	Total overall effective diffusion coefficient, Deff (cm²/s)	Diffusion path length, L <sub>d</sub> (cm)
1.69E+04	1.06E+06	3.77E-04	15	7,002	1.33E-03	5.67E-02	1.76E-04	1.02E-02	0.00E+00	0.00E+00	1.15E-04	1.81E-03	473
Convection path length, L <sub>p</sub> (cm)	Source vapor conc., C <sub>source</sub> (µg/m³)	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 foundation Peclet number, exp(Pef) (unitless)	Infinite source indoor attenuation coefficient, $\alpha$ (unitless)	Infinite source bldg. conc., C <sub>building</sub> (µg/m³)	Unit risk factor, URF (µg/m³)-1	Reference conc., RfC (mg/m³)			
15	3.20E+01	0.10	8.33E+01	1.02E-02	4.00E+02	5.35E+88	2.29E-04	7.32E-03	4.7E-07	1.0E+00			

## METHYLENE CHLORIDE-VAPOR INTRUSION MODEL MEN'S SHELTER RESULTS SHEET

### RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

#### INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)	_	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
					_		
NA	NA	NA	1.30E+07	NA	I	4.7E-11	7.0E-06

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

SCROLL DOWN TO "END"

### MTBE-VAPOR INTRUSION MODEL MEN'S SHELTER DATA ENTRY SHEET

GW-ADV Version 3.1; 02/04	CALCULATE RI	SK-BASED GROU	NDWATER CON	CENTRATION (	enter "X" in "YES" b	oox)						
Reset to Defaults	CALCULATE IN	YES CREMENTAL RISK	OR KS FROM ACTUA	L GROUNDW <i>A</i>	ATER CONCENTRA	ATION (enter "X" in "\	/ES" box and initial gro	oundwater conc. b	pelow)			
		YES	X	]								
	ENTER  Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., Cw (µg/L)	=		Chemical							
	1634044	5.07E+00	]		MTBE							
	ENTER	ENTER Donth	ENTER	ENTER Totals mu	ENTER st add up to value o	ENTER	ENTER	ENTER	ENTER Soil		ENTER	1
MORE <b>↓</b>	Average soil/ groundwater temperature, T <sub>s</sub> (°C)	Depth below grade to bottom of enclosed space floor, L <sub>F</sub> (cm)	Depth below grade to water table, L <sub>WT</sub> (cm)	Thickness of soil stratum A, h <sub>A</sub> (cm)	Thickness of soil stratum B, (Enter value or 0) h <sub>B</sub> (cm)	Thickness of soil stratum C, (Enter value or 0) h <sub>C</sub> (cm)	Soil stratum directly above water table, (Enter A, B, or C)	SCS soil type directly above water table	stratum A SCS soil type (used to estimate soil vapor permeability)	OR	User-defined stratum A soil vapor permeability, k <sub>v</sub> (cm <sup>2</sup> )	
	13	15	488	488			A	SL	SL			
MORE <b>→</b>	ENTER Stratum A SCS Soil type Lookup Soil Parameters	ENTER Stratum A soil dry bulk density, Pb (g/cm³)	ENTER Stratum A soil total porosity, n^ (unitless)	ENTER Stratum A soil water-filled porosity, $\theta_w^A$ (cm³/cm³)	ENTER Stratum B SCS Soil type Lookup Soil Parameters	ENTER Stratum B soil dry bulk density, PbB (g/cm³)	ENTER Stratum B soil total porosity, n <sup>B</sup> (unitless)	ENTER Stratum B soil water-filled porosity, $\theta_w^B$ $(cm^3/cm^3)$	ENTER Stratum C SCS Soil type Lookup Soil Parameters	ENTER Stratum C soil dry bulk density, $\rho_b^C$ (g/cm³)	ENTER Stratum C soil total porosity, n <sup>C</sup> (unitless)	ENTER Stratum C soil water-filled porosity, $\theta_w^c$ $(cm^3/cm^3)$
	SL	1.62	0.387	0.103		1.5	0.43	0.215		Error	Error	Error
MORE <b>→</b>	ENTER Enclosed space floor thickness, L <sub>crack</sub> (cm)	ENTER  Soil-bldq. pressure differential, ΔP (g/cm-s²)	ENTER Enclosed space floor length, LB (cm)	ENTER Enclosed space floor width, W <sub>B</sub> (cm)	ENTER  Enclosed space height, H <sub>B</sub> (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	Le	ENTER Average vapor flow rate into bldg. OR eave blank to calcula Osoil (L/m)	te		
	10	40	1000	1000	244	0.1	0.25	]	5			
MORE	ENTER Averaging time for carcinogens, AT <sub>c</sub> (yrs)	ENTER Averaging time for noncarcinogens, AT <sub>NC</sub> (yrs)	ENTER  Exposure duration, ED (yrs)	ENTER  Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	: 1					
		1	1	330		ılate risk-based	•					
						concentration.						

### MTBE-VAPOR INTRUSION MODEL MEN'S SHELTER CHEMICAL PROPERTIES SHEET

		Henry's law constant	Henry's law constant	Enthalpy of	Normal		Organic carbon	Pure	Unit	
Diffusiv	itv Diffusivity	at reference	reference	vaporization at the normal	Normal boiling	Critical	partition	component water	risk	Reference
in air.	., ,	temperature.	temperature.	boiling point,	point.	temperature.	coefficient.	solubility.	factor.	conc.,
Da	D <sub>w</sub>	Н	T <sub>R</sub>	$\Delta H_{v.b}$	T <sub>B</sub>	T <sub>C</sub>	K <sub>oc</sub>	S	URF	RfC
(cm <sup>2</sup> /s	s) (cm <sup>2</sup> /s)	(atm-m <sup>3</sup> /mol)	(°C)	(cal/mol)	(°K)	(°K)	(cm <sup>3</sup> /g)	(mg/L)	$(\mu g/m^3)^{-1}$	(mg/m <sup>3</sup> )
1.02E-0	01 1.05E-05	6.23E-04	25	6,678	328.30	497.10	7.26E+00	5.10E+04	2.6E-07	3.0E+00

### MTBE-VAPOR INTRUSION MODEL MEN'S SHELTER INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source- building separation, L <sub>T</sub> (cm)	Stratum A soil air-filled porosity, $\theta_a^A$ $(cm^3/cm^3)$	Stratum B soil air-filled porosity, $\theta_a^{\ B}$ $(cm^3/cm^3)$	Stratum C soil air-filled porosity, $\theta_a{}^c$ (cm³/cm³)	Stratum A effective total fluid saturation, S <sub>te</sub> (cm³/cm³)	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> )	Thickness of capillary zone, L <sub>cz</sub> (cm)	Total porosity in capillary zone, n <sub>cz</sub> (cm <sup>3</sup> /cm <sup>3</sup> )	Air-filled porosity in capillary zone, θ <sub>a,cz</sub> (cm³/cm³)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm³/cm³)	Floor- wall seam perimeter, X <sub>crack</sub> (cm)
3.15E+07	473	0.284	0.215	#VALUE!	0.184	5.96E-09	0.901	5.37E-09	25.00	0.387	0.067	0.320	4,000
Bldq. ventilation rate, Q <sub>bullding</sub> (cm <sup>3</sup> /s)	Area of enclosed space below grade, A <sub>B</sub> (cm <sup>2</sup> )	Crack- to-total area ratio, n (unitless)	Crack depth below grade, Z <sub>crack</sub> (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H <sub>TS</sub> (atm-m <sup>3</sup> /mol)	Henry's law constant at ave. groundwater temperature, H' <sub>TS</sub> (unitless)	Vapor viscosity at ave. soil temperature,	Stratum  A effective diffusion coefficient, Deff (cm²/s)	Stratum B effective diffusion coefficient, Deff B (cm <sup>2</sup> /s)	Stratum C effective diffusion coefficient, D <sup>eff</sup> c (cm <sup>2</sup> /s)	Capillary zone effective diffusion coefficient, D <sup>eff</sup> <sub>cz</sub> (cm <sup>2</sup> /s)	Total overall effective diffusion coefficient, Deff_(cm²/s)	Diffusion path length, L <sub>d</sub> (cm)
1.69E+04	1.06E+06	3.77E-04	15	7,256	3.73E-04	1.59E-02	1.76E-04	1.03E-02	0.00E+00	0.00E+00	1.84E-04	2.64E-03	473
Convection path length, L <sub>p</sub> (cm)	Source vapor conc., C <sub>source</sub> (µg/m³)	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 foundation Peclet number, exp(Pef) (unitless)	Infinite source indoor attenuation coefficient, $\alpha$ (unitless)	Infinite source bldg. conc., C <sub>building</sub> (µg/m³)	Unit risk factor, URF (µg/m³)-1	Reference conc., RfC (mg/m³)			_
15	8.05E+01	0.10	8.33E+01	1.03E-02	4.00E+02	3.18E+87	3.26E-04	2.63E-02	2.6E-07	3.0E+00			

#### MTBE-VAPOR INTRUSION MODEL MEN'S SHELTER RESULTS SHEET

### RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

#### INCREMENTAL RISK CALCULATIONS:

	Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)		risk from vapor intrusion to indoor air, carcinogen (unitless)	quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA NA NA 5.10F+07 NA 9.4E-11 8.	NΑ	NΙΔ	NΙΛ	E 10E . 07	NIA	- T	0 /E 11	8.4E-06

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

SCROLL DOWN TO "END"

### TCE-VAPOR INTRUSION MODEL MEN'S SHELTER DATA ENTRY SHEET

GW-ADV Version 3.1; 02/04	CALCULATE RIS		NDWATER CON	CENTRATION (	enter "X" in "YES" t	oox)						
Reset to Defaults	CALCULATE IN	YES CREMENTAL RISK	OR (S FROM ACTUA	L GROUNDWA	TER CONCENTRA	ATION (enter "X" in "Y	'ES" box and initial gro	oundwater conc. t	pelow)			
		YES	Χ	]								
	Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., Cw (µg/L)			Chemical							
	79016	2.00E+00	]		Trichloroethyle	ene						
MORE 🔶	ENTER  Average soil/ groundwater temperature,	ENTER Depth below grade to bottom of enclosed space floor,	Depth below grade to water table,	Thickness of soil stratum A,	ENTER st add up to value of Thickness of soil stratum B, (Enter value or 0)	Thickness of soil stratum C,	Soil stratum directly above	ENTER  SCS soil type	ENTER Soil stratum A SCS soil type (used to estimate	OR	User-defined stratum A soil vapor permeability,	
	T <sub>s</sub>	L <sub>F</sub> (cm)	L <sub>WT</sub> (cm)	h <sub>A</sub> (cm)	h <sub>B</sub> (cm)	h <sub>c</sub> (cm)	water table, (Enter A. B. or C)	directly above water table	soil vapor permeability)		k <sub>v</sub> (cm <sup>2</sup> )	
					(CIII)	(CIII)	, , , , , , , , , , , , , , , , , , , ,				(CIII )	
	13	15	488	488			A	SL	SL			J
MORE ↓	ENTER Stratum A SCS Soil type Lookup Soil Parameters	ENTER Stratum A soil dry bulk density, Pb (g/cm³)	ENTER Stratum A soil total porosity, n <sup>A</sup> (unitless)	ENTER Stratum A soil water-filled porosity, $\theta_w^A$ $(cm^3/cm^3)$	ENTER Stratum B SCS Soil type Lookup Soil Parameters	ENTER Stratum B soil dry bulk density, $\rho_b^{\ B}$ (g/cm³)	ENTER Stratum B soil total porosity, n <sup>B</sup> (unitless)	ENTER Stratum B soil water-filled porosity, $\theta_w^B$ $(cm^3/cm^3)$	ENTER Stratum C SCS Soil type Lookup Soil Parameters	ENTER Stratum C soil dry bulk density, $\rho_b^C$ (g/cm³)	ENTER Stratum C soil total porosity, n <sup>C</sup> (unitless)	ENTER Stratum C soil water-filled porosity, $\theta_w^C$ $(cm^3/cm^3)$
	SL	1.62	0.387	0.103		1.5	0.43	0.215		Error	Error	Error
MORE U	ENTER Enclosed space floor thickness, L <sub>crack</sub> (cm)	ENTER  Soil-bldq. pressure differential, ΔP (g/cm-s²)	ENTER Enclosed space floor length, L <sub>B</sub> (cm)	ENTER Enclosed space floor width, W <sub>B</sub> (cm)	ENTER Enclosed space height, H <sub>B</sub> (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	Lo =	ENTER Average vapor flow rate into bldg. OR eave blank to calculat O <sub>soil</sub> (L/m)	te		
	10	40	1000	1000	244	0.1	0.25	]	5			
MORE	ENTER Averaging time for carcinogens, AT <sub>c</sub> (yrs)	ENTER Averaging time for noncarcinogens, AT <sub>NC</sub> (yrs)	ENTER  Exposure duration, ED (yrs)	ENTER  Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)						
	70	1	1	350	1.0E-06	1						
END						ılate risk-based concentration.						

### TCE-VAPOR INTRUSION MODEL MEN'S SHELTER CHEMICAL PROPERTIES SHEET

		Henry's law constant	Henry's law constant	Enthalpy of vaporization at	Normal		Organic carbon	Pure component	Unit	
Diffusivity	Diffusivity	at reference	reference	the normal	boiling	Critical	partition	water	risk	Reference
in air,	in water,	temperature,	temperature,	boiling point,	point,	temperature,	coefficient,	solubility,	factor,	conc.,
$D_a$	$D_w$	Н	$T_R$	$\Delta H_{v,b}$	$T_B$	$T_{C}$	K <sub>oc</sub>	S	URF	RfC
(cm <sup>2</sup> /s)	(cm <sup>2</sup> /s)	(atm-m <sup>3</sup> /mol)	(°C)	(cal/mol)	(°K)	(°K)	(cm³/g)	(mg/L)	$(\mu g/m^3)^{-1}$	(mg/m <sup>3</sup> )
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1.47E+03	2.0E-06	0.0E+00

### TCE-VAPOR INTRUSION MODEL MEN'S SHELTER INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source- building separation, L <sub>T</sub> (cm)	Stratum A soil air-filled porosity, $\theta_a^A$ (cm³/cm³)	Stratum B soil air-filled porosity, $\theta_a^{\ B}$ $(cm^3/cm^3)$	Stratum C soil air-filled porosity, $\theta_a{}^c$ (cm³/cm³)	Stratum A effective total fluid saturation, S <sub>te</sub> (cm³/cm³)	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> )	Thickness of capillary zone, L <sub>cz</sub> (cm)	Total porosity in capillary zone, n <sub>cz</sub> (cm <sup>3</sup> /cm <sup>3</sup> )	Air-filled porosity in capillary zone, θ <sub>a,cz</sub> (cm³/cm³)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm³/cm³)	Floor- wall seam perimeter, X <sub>crack</sub> (cm)
3.15E+07	473	0.284	0.215	#VALUE!	0.184	5.96E-09	0.901	5.37E-09	25.00	0.387	0.067	0.320	4,000
Bldq. ventilation rate, O <sub>building</sub> (cm <sup>3</sup> /s)	Area of enclosed space below grade,  A <sub>B</sub> (cm <sup>2</sup> )	Crack- to-total area ratio, n (unitless)	Crack depth below grade, Z <sub>crack</sub> (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H <sub>TS</sub> (atm-m <sup>3</sup> /mol)	Henry's law constant at ave. groundwater temperature, H' <sub>TS</sub> (unitless)	Vapor viscosity at ave. soil temperature,  µ <sub>TS</sub> (g/cm-s)	Stratum  A effective diffusion coefficient, D <sup>eff</sup> A (cm²/s)	Stratum B effective diffusion coefficient, D <sup>eff</sup> (cm <sup>2</sup> /s)	Stratum C effective diffusion coefficient, D <sup>eff</sup> (cm <sup>2</sup> /s)	Capillary zone effective diffusion coefficient, D <sup>eff</sup> <sub>cz</sub> (cm <sup>2</sup> /s)	Total overall effective diffusion coefficient, Deff (cm²/s)	Diffusion path length, L <sub>d</sub> (cm)
1.69E+04	1.06E+06	3.77E-04	15	8,520	5.62E-03	2.39E-01	1.76E-04	7.98E-03	0.00E+00	0.00E+00	7.16E-05	1.17E-03	473
Convection path length, L <sub>p</sub> (cm)	Source vapor conc., C <sub>source</sub> (µg/m³)	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 foundation Peclet number, exp(Pef) (unitless)	Infinite source indoor attenuation coefficient, $\alpha$ (unitless)	Infinite source bldg. conc., C <sub>building</sub> (µg/m³)	Unit risk factor, URF (µg/m³)-1	Reference conc., RfC (mg/m³)			
15	4.79E+02	0.10	8.33E+01	7.98E-03	4.00E+02	2.78E+113	1.50E-04	7.16E-02	2.0E-06	NA			

#### TCE-VAPOR INTRUSION MODEL MEN'S SHELTER RESULTS SHEET

### RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

### INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)	_	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
					-		
NA	NA	NA	1.47E+06	NA	<u> </u>	2.0E-09	NA

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

SCROLL DOWN TO "END"

## TRANS-1,2-DICHLOROETHENE-VAPOR INTRUSION MODEL MEN'S SHELTER DATA ENTRY SHEET

GW-ADV Version 3.1; 02/04	CALCULATE RIS	SK-BASED GROUI	NDWATER CON	CENTRATION (	enter "X" in "YES" b	oox)						
Reset to Defaults	CALCULATE IN	YES CREMENTAL RISK	OR (S FROM ACTUA	] AL GROUNDW <i>A</i>	TER CONCENTRA	ATION (enter "X" in "\	YES" box and initial gro	oundwater conc. b	pelow)			
		YES	Χ	]								
	ENTER  Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C <sub>W</sub> (µg/L)	ı		Chemical		·					
	156605	3.00E+00		tra	ns-1,2-Dichloroe	ethylene						
	ENTER	ENTER Depth	ENTER	ENTER Totals mu	ENTER st add up to value o	ENTER of Lwt (cell G28)	ENTER	ENTER	ENTER Soil		ENTER	]
MORE 🔶	Average soil/ groundwater temperature, Ts (°C)	below grade to bottom of enclosed space floor, L <sub>F</sub> (cm)	Depth below grade to water table, L <sub>WT</sub> (cm)	Thickness of soil stratum A, h <sub>A</sub> (cm)	Thickness of soil stratum B, (Enter value or 0) h <sub>B</sub> (cm)	Thickness of soil stratum C, (Enter value or 0) hc (cm)	Soil stratum directly above water table, (Enter A, B, or C)	SCS soil type directly above water table	stratum A SCS soil type (used to estimate soil vapor permeability)	OR	User-defined stratum A soil vapor permeability, k <sub>v</sub> (cm <sup>2</sup> )	
	13	15	488	488			A	SL	SL			-
MORE 🔱	ENTER Stratum A SCS soil type Lookup Soil Parameters	ENTER Stratum A soil dry bulk density, Pb^A (g/cm³)	ENTER Stratum A soil total porosity, n <sup>A</sup> (unitless)	ENTER Stratum A soil water-filled porosity, $\theta_w^A$ $(cm^3/cm^3)$	ENTER Stratum B SCS Soil type Lookup Soil Parameters	ENTER Stratum B soil dry bulk density, Pb (g/cm³)	ENTER Stratum B soil total porosity, n <sup>B</sup> (unitless)	ENTER Stratum B soil water-filled porosity, $\theta_w^B$ $(cm^3/cm^3)$	ENTER Stratum C SCS Soil type Lookup Soil Parameters	ENTER Stratum C soil dry bulk density, $\rho_b^C$ (g/cm <sup>3</sup> )	ENTER Stratum C soil total porosity, n <sup>C</sup> (unitless)	ENTER Stratum C soil water-filled porosity, $\theta_w^c$ $(cm^3/cm^3)$
	SL	1.62	0.387	0.103		1.5	0.43	0.215		Error	Error	Error
MORE	ENTER Enclosed space floor thickness, L <sub>crack</sub> (cm)	ENTER  Soil-bldq, pressure differential, ΔP (g/cm-s²)	ENTER Enclosed space floor length, L <sub>B</sub> (cm)	ENTER Enclosed space floor width, W <sub>B</sub> (cm)	ENTER Enclosed space height, H <sub>B</sub> (cm)	ENTER Floor-wall seam crack width, W (cm)	ENTER Indoor air exchange rate, ER (1/h)	Le =	ENTER Average vapor flow rate into bldq. OR eave blank to calcula O <sub>soil</sub> (L/m)	te		
	10	40	1000	1000	244	0.1	0.25	]	5			
MORE	ENTER Averaging time for carcinogens, AT <sub>C</sub> (yrs)	ENTER Averaging time for noncarcinogens, AT <sub>NC</sub> (yrs)	ENTER  Exposure duration, ED (yrs)	ENTER  Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	·					
	70	1	1	350	1.0E-06	1						
END						llate risk-based concentration.						

# TRANS-1,2-DICHLOROETHENE-VAPOR INTRUSION MODEL MEN'S SHELTER CHEMICAL PROPERTIES SHEET

Diffusivity in air, D <sub>a</sub> (cm <sup>2</sup> /s)	Diffusivity in water, D <sub>w</sub> (cm <sup>2</sup> /s)	Henry's law constant at reference temperature, H (atm-m <sup>3</sup> /mol)	Henry's law constant reference temperature, T <sub>R</sub> (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T <sub>B</sub> (°K)	Critical temperature, T <sub>C</sub> (°K)	Organic carbon partition coefficient, $K_{oc}$ $(cm^3/g)$	Pure component water solubility, S (ma/L)	Unit risk factor, URF (µg/m³) <sup>-1</sup>	Reference conc., RfC (mg/m³)
, ,				(500,700,700)	, ,	· · · · · · · · · · · · · · · · · · ·	, ,,	(,	,, ,	, , ,
7.07E-02	1.19E-05	9.36E-03	25	6,717	320.85	516.50	5.25E+01	6.30E+03	0.0E+00	6.0E-02

# TRANS-1,2-DICHLOROETHENE-VAPOR INTRUSION MODEL MEN'S SHELTER INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source- building separation, L <sub>T</sub> (cm)	Stratum A soil air-filled porosity, $\theta_a^{\ A}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Stratum B soil air-filled porosity, $\theta_a^{\ B}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Stratum C soil air-filled porosity, $\theta_a^{\ C}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Stratum A effective total fluid saturation, S <sub>te</sub> (cm³/cm³)	Stratum A soil intrinsic permeability, k <sub>i</sub> (cm²)	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> )	Thickness of capillary zone, L <sub>cz</sub> (cm)	Total porosity in capillary zone, n <sub>cz</sub> (cm³/cm³)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Water-filled porosity in capillary zone, $\theta_{w,cz}$ $(cm^3/cm^3)$	Floor- wall seam perimeter, X <sub>crack</sub> (cm)
3.15F+07	473	0.284	0.215	#VALUE!	0.184	5.96E-09	0.901	5.37F-09	25.00	0.387	0.067	0.320	4.000
0.102107	170							0.072 07					1,000
Bldq. ventilation rate, Q <sub>bullding</sub> (cm <sup>3</sup> /s)	Area of enclosed space below grade, A <sub>B</sub> (cm <sup>2</sup> )	Crack- to-total area ratio,   (unitless)	Crack depth below grade, Z <sub>crack</sub> (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H <sub>TS</sub> (atm-m <sup>3</sup> /mol)	Henry's law constant at ave. groundwater temperature, H' <sub>TS</sub> (unitless)	Vapor viscosity at ave. soil temperature,	Stratum A effective diffusion coefficient, D <sup>eff</sup> <sub>A</sub> (cm <sup>2</sup> /s)	Stratum B effective diffusion coefficient, Deff B (cm²/s)	Stratum C effective diffusion coefficient, Deff C (cm²/s)	Capillary zone effective diffusion coefficient, Deff cz (cm²/s)	Total overall effective diffusion coefficient, $D^{eff}_{T}$ (cm <sup>2</sup> /s)	Diffusion path length, L <sub>d</sub> (cm)
1.69E+04	1.06E+06	3.77E-04	15	7,105	5.66E-03	2.41E-01	1.76E-04	7.14E-03	0.00E+00	0.00E+00	6.64E-05	1.08E-03	473
Convection path length, L <sub>p</sub> (cm)	Source vapor conc., C <sub>source</sub> (µg/m³)	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> (cm²)	Exponent of equivalent foundation Peclet number, exp(Pef) (unitless)	Infinite source indoor attenuation coefficient, $\alpha$ (unitless)	Infinite source bldg, conc., C <sub>building</sub> (µg/m³)	Unit risk factor, URF (µg/m³)-1	Reference conc., RfC (mg/m³)			-
15	7.23E+02	0.10	8.33E+01	7.14E-03	4.00E+02	5.77E+126	1.38E-04	1.00E-01	NA	6.0E-02			

## TRANS-1,2-DICHLOROETHENE-VAPOR INTRUSION MODEL MEN'S SHELTER RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA	NA	6.30E+06	NA	NA	1.6E-03

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

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.



### VINYL CHLORIDE-VAPOR INTRUSION MODEL MEN'S SHELTER DATA ENTRY SHEET

GW-ADV Version 3.1; 02/04	CALCULATE RIS	SK-BASED GROU	NDWATER CON	CENTRATION (	enter "X" in "YES" b	oox)						
Reset to		YES	OR	]								
Defaults	CALCULATE IN	CREMENTAL RISK	KS FROM ACTUA	L GROUNDWA	ATER CONCENTRA	ATION (enter "X" in "Y	'ES" box and initial gro	oundwater conc. I	pelow)			
		YES	Χ	]								
	ENTER	ENTER Initial										
	Chemical CAS No.	groundwater conc.,										
	(numbers only,	$C_W$			01							
	no dashes)	(μg/L)	=		Chemical							
	75014	8.58E+00		Vin	yl chloride (chlor	oethene)						_
	ENTER	ENTER Depth	ENTER	ENTER Totals mu	ENTER st add up to value o	ENTER of LwT (cell G28)	ENTER	ENTER	ENTER Soil		ENTER	
MORE <b>↓</b>	Average soil/	below grade to bottom	Depth	Thickness	Thickness of soil	Thickness of soil	Soil		stratum A SCS		User-defined stratum A	
	groundwater temperature,	of enclosed space floor,	below grade to water table,	of soil stratum A,	stratum B,	stratum C, (Enter value or 0)	stratum directly above	SCS soil type	soil type (used to estimate	OR	soil vapor permeability,	
	Ts	$L_F$	$L_{WT}$	h <sub>A</sub>	h <sub>B</sub>	h <sub>C</sub>	water table,	directly above	soil vapor	OK	k <sub>v</sub>	
	(°C)	(cm)	(cm)	(cm)	(cm)	(cm)	(Enter A, B, or C)	water table	permeability)		(cm²)	
	13	15	488	488			А	SL	SL			]
LMORE	ENTER	ENTER	ENTER	ENTER	ENTER Stratum B	ENTER Stratum B	ENTER Stratum B	ENTER Stratum B	ENTER Stratum C	ENTER Stratum C	ENTER Stratum C	ENTER Stratum C
MORE 🗡	Stratum A SCS soil type Lookup Soil Parameters	Stratum A soil dry bulk density, P <sub>b</sub> <sup>A</sup> (g/cm <sup>3</sup> )	Stratum A soil total porosity, n <sup>A</sup> (unitless)	Stratum A soil water-filled porosity, $\theta_w^A$ (cm <sup>3</sup> /cm <sup>3</sup> )		soil dry bulk density, $\rho_b^B$ (g/cm³)	soil total porosity, n <sup>B</sup> (unitless)	soil water-filled porosity, $\theta_w^B$ $(cm^3/cm^3)$	SCS soil type Lookup Soil Parameters	soil dry bulk density, $\rho_b^{\ C}$ (g/cm³)	soil total porosity, n <sup>c</sup> (unitless)	soil water-filled porosity, $\theta_w^c$ (cm³/cm³)
MORE. ↓	SCS soil type ' Lookup Soil `	soil dry bulk density, ${\rho_b}^A$	soil total porosity, n <sup>A</sup>	soil water-filled porosity, $\theta_{w}^{\ A}$	SCS soil type Lookup Soil	soil dry bulk density, ρ <sub>ь</sub> <sup>В</sup>	soil total porosity, n <sup>B</sup>	soil water-filled porosity, $\theta_w^{\ B}$	SCS soil type `Lookup Soil `	soil dry bulk density, $\rho_b^{C}$	soil total porosity, n <sup>c</sup>	soil water-filled porosity, $\theta_w^{\ C}$
<b>.</b>	SCS soil type Lookup Soil Parameters	soil dry bulk density, Pb <sup>A</sup> (g/cm <sup>3</sup> )	soil total porosity, n <sup>A</sup> (unitless)  0.387  ENTER	soil water-filled porosity, $\theta_w^A \\ (cm^3/cm^3)$ 0.103  ENTER	SCS soil type Lookup Soil	soil dry bulk density, $ ho_b^B$ (g/cm <sup>3</sup> )	soil total porosity, n <sup>B</sup> (unitless)	soil water-filled porosity, $\theta_w^B$ (cm <sup>3</sup> /cm <sup>3</sup> )	SCS soil type Lookup Soil Parameters	soil dry bulk density, ρ <sub>b</sub> <sup>C</sup> (g/cm³)	soil total porosity, n <sup>c</sup> (unitless)	soil water-filled porosity, $\theta_w^{\ C}$ $(cm^3/cm^3)$
MORE WORE	SCS soil type Lookup Soil Parameters	soil dry bulk density, Pb <sup>A</sup> (g/cm <sup>3</sup> )	soil total porosity, n <sup>A</sup> (unitless)	soil water-filled porosity, $\theta_w^A$ $(cm^3/cm^3)$	SCS soil type Lookup Soil Parameters	soil dry bulk density, $\rho_b{}^B$ (g/cm³)	soil total porosity, n <sup>B</sup> (unitless)	soil water-filled porosity, $\theta_w^B$ $(cm^3/cm^3)$	SCS soil type Lookup Soil Parameters  ENTER Average vapor flow rate into bldq. OR eave blank to calcula	soil dry bulk density, \$\rho_b^c\$ (g/cm³)	soil total porosity, n <sup>c</sup> (unitless)	soil water-filled porosity, $\theta_w^{\ C}$ $(cm^3/cm^3)$
MORE	SCS soil type Lookup Soil Parameters  SL  ENTER Enclosed space floor thickness,	soil dry bulk density, Pb <sup>A</sup> (g/cm³)  1.62  ENTER  Soil-blidq, pressure differential,	soil total porosity, n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space floor length,	soil water-filled porosity, $\theta_w^A$ (cm³/cm³)  0.103  ENTER Enclosed space floor width,	SCS soil type Lookup Soil Parameters  ENTER  Enclosed space height,	soil dry bulk density, pb (g/cm³)  1.5  ENTER  Floor-wall seam crack width,	soil total porosity, n <sup>B</sup> (unitless)  0.43  ENTER  Indoor air exchange rate,	soil water-filled porosity, $\theta_w^B$ $(cm^3/cm^3)$	SCS SOII type Lookup Soil Parameters ENTER Average vapor flow rate into bldq. OR	soil dry bulk density, \$\rho_b^c\$ (g/cm³)	soil total porosity, n <sup>c</sup> (unitless)	soil water-filled porosity, $\theta_w^{\ C}$ $(cm^3/cm^3)$
MORE	SCS soil type (Lookup Soil Parameters)  SL  ENTER Enclosed space floor thickness, Lcrack	soil dry bulk density, ρ <sub>b</sub> <sup>A</sup> (g/cm³)  1.62  ENTER  Soil-bldq, pressure differential, ΔP	soil total porosity, n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space floor length, L <sub>B</sub>	soil water-filled porosity, $\theta_w^A$ $(cm^3/cm^3)$ 0.103  ENTER Enclosed space floor width, $W_B$	SCS soil type Lookup Soil Parameters Parameters Enclosed space height, HB	soil dry bulk density, pb (g/cm³)  1.5  ENTER  Floor-wall seam crack width, w	soil total porosity, n <sup>B</sup> (unitless)  0.43  ENTER Indoor air exchange rate, ER	soil water-filled porosity, $\theta_w^B$ $(cm^3/cm^3)$	SCS soil type Lookup Soil Parameters  ENTER Average vapor flow rate into bldq. OR eave blank to calcula	soil dry bulk density, \$\rho_b^c\$ (g/cm³)	soil total porosity, n <sup>c</sup> (unitless)	soil water-filled porosity, $\theta_w^{\ C}$ $(cm^3/cm^3)$
MORE MORE	SCS soil type Lookup Soil Parameters  SL  ENTER Enclosed space floor thickness, Lerack (cm)  10  ENTER	soil dry bulk density, $\rho_b^A$ (g/cm³)  1.62  ENTER  Soil-bldq. pressure differential, $\Delta P$ (g/cm-s²)  40  ENTER	soil total porosity, n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space floor length, L <sub>B</sub> (cm)	soil water-filled porosity, $\theta_w^A$ (cm³/cm³)  0.103  ENTER Enclosed space floor width, $W_B$ (cm)	SCS soil type Lookup Soil parameters ENTER  ENTER  Enclosed space height, HB (cm)  244  ENTER	soil dry bulk density, pb (g/cm³)  1.5  ENTER  Floor-wall seam crack width, W (cm)  0.1  ENTER	soil total porosity, n <sup>B</sup> (unitless)  0.43  ENTER Indoor air exchange rate, ER (1/h)	soil water-filled porosity, $\theta_w^B$ $(cm^3/cm^3)$	SCS soil type Lookup Soil Parameters  ENTER Average vapor flow rate into bldq. OR eave blank to calcula Q <sub>soil</sub> (L/m)	soil dry bulk density, \$\rho_b^c\$ (g/cm³)	soil total porosity, n <sup>c</sup> (unitless)	soil water-filled porosity, $\theta_w^{\ C}$ $(cm^3/cm^3)$
MORE	SCS soil type Lookup Soil Parameters  SL  ENTER Enclosed space floor thickness, L_crack (cm)  10  ENTER Averaging time for	soil dry bulk density, Po A (g/cm³)  1.62  ENTER  Soil-bldq, pressure differential, AP (g/cm-s²)  40  ENTER  Averaging time for	soil total porosity, n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space floor length, L <sub>B</sub> (cm)  1000  ENTER Exposure	soil water-filled porosity, $\theta_w^A$ (cm³/cm³)  0.103  ENTER Enclosed space floor width, WB (cm)  1000  ENTER  Exposure	SCS soil type Lookup Soil Parameters  ENTER  Enclosed space height, H <sub>B</sub> (cm)  244  ENTER Target risk for	soil dry bulk density,	soil total porosity, n <sup>B</sup> (unitless)  0.43  ENTER Indoor air exchange rate, ER (1/h)	soil water-filled porosity, $\theta_w^B$ $(cm^3/cm^3)$	SCS soil type Lookup Soil Parameters  ENTER Average vapor flow rate into bldq. OR eave blank to calcula Q <sub>soil</sub> (L/m)	soil dry bulk density, \$\rho_b^c\$ (g/cm³)	soil total porosity, n <sup>c</sup> (unitless)	soil water-filled porosity, $\theta_w^{\ C}$ $(cm^3/cm^3)$
MORE MORE	SCS soil type Lookup Soil Parameters  SL  ENTER Enclosed space floor thickness, Lerack (cm)  10  ENTER Averaging time for carcinogens, ATc	soil dry bulk density,	soil total porosity, n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space floor length, L <sub>B</sub> (cm)  1000  ENTER  Exposure duration, ED	soil water-filled porosity, $\theta_w^A$ (cm³/cm³)  0.103  ENTER Enclosed space floor width, $W_B$ (cm)  1000  ENTER  Exposure frequency, EF	SCS soil type Lookup Soil parameters ENTER  ENTER  Enclosed space height, HB (cm)  244  ENTER  Target risk for carcinogens, TR	soil dry bulk density, pb (g/cm³)  1.5  ENTER  Floor-wall seam crack width, W (cm)  0.1  ENTER  Target hazard quotient for noncarcinogens, THQ	soil total porosity, n <sup>B</sup> (unitless)  0.43  ENTER Indoor air exchange rate, ER (1/h)	soil water-filled porosity, $\theta_w^B$ $(cm^3/cm^3)$	SCS soil type Lookup Soil Parameters  ENTER Average vapor flow rate into bldq. OR eave blank to calcula Q <sub>soil</sub> (L/m)	soil dry bulk density, \$\rho_b^c\$ (g/cm³)	soil total porosity, n <sup>c</sup> (unitless)	soil water-filled porosity, $\theta_w^{\ C}$ $(cm^3/cm^3)$
MORE MORE	SCS soil type Lookup Soil Parameters  SL  ENTER Enclosed space floor thickness, Lerack (cm)  10  ENTER Averaging time for carcinogens,	soil dry bulk density, Pb <sup>A</sup> (g/cm³)  1.62  ENTER  Soil-bldq, pressure differential, AP (g/cm-s²)  40  ENTER  Averaging time for noncarcinogens,	soil total porosity, n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space floor length, L <sub>B</sub> (cm)  1000  ENTER  Exposure duration,	soil water-filled porosity, $\theta_w^A$ $(cm^3/cm^3)$ 0.103  ENTER Enclosed space floor width, $W_B$ $(cm)$ 1000  ENTER  Exposure frequency,	SCS soil type Lookup Soil parameters ENTER  Enclosed space height, HB (cm)  244  ENTER Target risk for carcinogens,	soil dry bulk density, pb (g/cm³)  1.5  ENTER  Floor-wall seam crack width, W (cm)  0.1  ENTER  Target hazard quotient for noncarcinogens,	soil total porosity, n <sup>B</sup> (unitless)  0.43  ENTER Indoor air exchange rate, ER (1/h)	soil water-filled porosity, $\theta_w^B$ $(cm^3/cm^3)$	SCS soil type Lookup Soil Parameters  ENTER Average vapor flow rate into bldq. OR eave blank to calcula Q <sub>soil</sub> (L/m)	soil dry bulk density, \$\rho_b^c\$ (g/cm³)	soil total porosity, n <sup>c</sup> (unitless)	soil water-filled porosity, $\theta_w^{\ C}$ $(cm^3/cm^3)$
MORE MORE	SCS soil type Lookup Soil Parameters  SL  ENTER Enclosed space floor thickness, Lerack (cm)  10  ENTER Averaging time for carcinogens, ATc	soil dry bulk density,	soil total porosity, n <sup>A</sup> (unitless)  0.387  ENTER Enclosed space floor length, L <sub>B</sub> (cm)  1000  ENTER  Exposure duration, ED	soil water-filled porosity, $\theta_w^A$ (cm³/cm³)  0.103  ENTER Enclosed space floor width, $W_B$ (cm)  1000  ENTER  Exposure frequency, EF	SCS soil type Lookup Soil parameters ENTER  ENTER  Enclosed space height, HB (cm)  244  ENTER  Target risk for carcinogens, TR	soil dry bulk density, pb (g/cm³)  1.5  ENTER  Floor-wall seam crack width, W (cm)  0.1  ENTER  Target hazard quotient for noncarcinogens, THQ	soil total porosity, n <sup>B</sup> (unitless)  0.43  ENTER Indoor air exchange rate, ER (1/h)	soil water-filled porosity, $\theta_w^B$ $(cm^3/cm^3)$	SCS soil type Lookup Soil Parameters  ENTER Average vapor flow rate into bldq. OR eave blank to calcula Q <sub>soil</sub> (L/m)	soil dry bulk density, \$\rho_b^c\$ (g/cm³)	soil total porosity, n <sup>c</sup> (unitless)	soil water-filled porosity, $\theta_w^{\ C}$ $(cm^3/cm^3)$

# VINYL CHLORIDE-VAPOR INTRUSION MODEL MEN'S SHELTER CHEMICAL PROPERTIES SHEET

Diffusivity in air, D <sub>a</sub> (cm <sup>2</sup> /s)	Diffusivity in water, D <sub>w</sub> (cm <sup>2</sup> /s)	Henry's law constant at reference temperature, H (atm-m³/mol)	Henry's law constant reference temperature, T <sub>R</sub> (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T <sub>B</sub> (°K)	Critical temperature, T <sub>C</sub> (°K)	Organic carbon partition coefficient, K <sub>oc</sub> (cm <sup>3</sup> /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m <sup>3</sup> ) <sup>-1</sup>	Reference conc., RfC (mg/m³)
1.06E-01	1.23E-05	2.69E-02	25	5,250	259.25	432.00	1.86E+01	8.80E+03	8.8E-06	1.0E-01

# VINYL CHLORIDE-VAPOR INTRUSION MODEL MEN'S SHELTER INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source- building separation, L <sub>T</sub> (cm)	$\begin{array}{c} \text{Stratum A} \\ \text{soil} \\ \text{air-filled} \\ \text{porosity,} \\ \theta_a{}^A \\ \text{(cm}^3/\text{cm}^3) \end{array}$	Stratum B soil air-filled porosity, $\theta_a^{\ B}$ (cm³/cm³)	Stratum C soil air-filled porosity, $\theta_a^{\ C}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Stratum A effective total fluid saturation, S <sub>te</sub> (cm³/cm³)	Stratum A soil intrinsic permeability, k <sub>i</sub> (cm²)	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> )	Thickness of capillary zone, L <sub>cz</sub> (cm)	Total porosity in capillary zone, n <sub>cz</sub> (cm³/cm³)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm <sup>3</sup> /cm <sup>3</sup> )	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm³/cm³)	Floor- wall seam perimeter, X <sub>crack</sub> (cm)
3.15E+07	473	0.284	0.215	#VALUE!	0.184	5.96E-09	0.901	5.37E-09	25.00	0.387	0.067	0.320	4,000
Bldq. ventilation rate, O <sub>bullding</sub> (cm <sup>3</sup> /s)	Area of enclosed space below grade, A <sub>B</sub> (cm <sup>2</sup> )	Crack- to-total area ratio, n (unitless)	Crack depth below grade, Z <sub>crack</sub> (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H <sub>TS</sub> (atm-m <sup>3</sup> /mol)	Henry's law constant at ave. groundwater temperature, H' <sub>TS</sub> (unitless)	Vapor viscosity at ave. soil temperature,  µ <sub>TS</sub> (q/cm-s)	Stratum  A effective diffusion coefficient, D <sup>eff</sup> (cm²/s)	Stratum B effective diffusion coefficient, D <sup>eff</sup> (cm <sup>2</sup> /s)	Stratum C effective diffusion coefficient, D <sup>eff</sup> (cm <sup>2</sup> /s)	Capillary zone effective diffusion coefficient, D <sup>eff</sup> <sub>cz</sub> (cm <sup>2</sup> /s)	Total overall effective diffusion coefficient, Deff_ (cm²/s)	Diffusion path length, L <sub>d</sub> (cm)
1.69E+04	1.06E+06	3.77E-04	15	4,966	1.89E-02	8.07E-01	1.76E-04	1.07E-02	0.00E+00	0.00E+00	9.07E-05	1.49E-03	473
Convection path length, L <sub>p</sub> (cm)	Source vapor conc., C <sub>source</sub> (µg/m³)	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 foundation Peclet number, exp(Pef) (unitless)	Infinite source indoor attenuation coefficient, $\alpha$ (unitless)	Infinite source bldg. conc., C <sub>building</sub> (µg/m³)	Unit risk factor, URF (µg/m³) <sup>-1</sup>	Reference conc., RfC (mg/m³)			
15	6.92E+03	0.10	8.33E+01	1.07E-02	4.00E+02	3.54E+84	1.89E-04	1.31E+00	8.8E-06	1.0E-01			

## VINYL CHLORIDE-VAPOR INTRUSION MODEL MEN'S SHELTER RESULTS SHEET

### RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

#### INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)		Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
					=' =.		
NA	NA	NA	8.80E+06	NA		1.6E-07	1.3E-02

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

SCROLL DOWN TO "END"