APPENDIX A

Johnson and Ettinger Spreadsheets

APPENDIX A

Johnson and Ettinger Spreadsheets

Monitoring Well MW-BW-53-A

Sampled September 9, 2004

Carbon Tetrachloride Trichloroethene Chloroform

Sampled September 15, 2005

Carbon Tetrachloride Trichloroethene Chloroform

Monitoring Well MW-BW-49-A

Sampled September 15, 2004

Carbon Tetrachloride
Chloroform
Sampled September 20, 2005
Carbon Tetrachloride

Soil Gas Location CTP-SGP-35 at 6 Feet BGS

Sampled June 18, 2004

Carbon Tetrachloride Chloroform Tetrachloroethene Trichloroethene DATA ENTRY SHEET
Carbon Tetrachloride
for Well MW-BW-53-A
ampled September 9, 200

			Sampled September		
GW-SCREEN Version 3.0; 04/03	CALCULATE RISK-	BASED GROUNDV	VATER CONCENTR	ATION (enter "X" in "YES" box	X) DTSC Vapor Intrusion Guidanc
Reset to Defaults	CALCUL ATE INCOM	YES	OR POMACTUAL CRO	UNDWATER CONCENTRAT	Interim Final 12/04 (last modified 1/21/05)
Donamo	(enter "X" in "YES" b				ION
		YES	Х		
	ENTER Chemical CAS No. (numbers only,	ENTER Initial groundwater conc., C _W			
	no dashes)	(μg/L)	Cł	nemical	
	56235	1.30E+01	Carbon	tetrachloride	
MORE	ENTER Depth	ENTER	ENTER	ENTER	
↓	below grade to bottom	Depth		Average soil/	ENTER Average vapor
	of enclosed space floor,	below grade to water table.	SCS soil type	groundwater temperature,	flow rate into bldg. (Leave blank to calculate)
	L _F	L _{WT}	directly above	T _S	Q _{soil}
	(cm)	(cm)	water table	(°C)	(L/m)

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vandose zone soil vapor permeability, k _v (cm ²)	ENTER Vadose zone SCS Soil type Lookup Soil Parameters	ENTER Vadose zone soil dry bulk density, ρ_b^V (g/cm³)	ENTER Vadose zone soil total porosity, n ^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^{\vee} (cm³/cm³)
	•					
S			S	1.66	0.375	0.054

MORE **↓**

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

Carbon Tetrachloride for Well MW-BW-53-A Sampled September 9, 2004

ABC

ABC				•		*				
Diffusivity in air,	Diffusivity in water,	Henry's law constant at reference temperature,	Henry's law constant reference temperature,	Enthalpy of vaporization at the normal boiling point,	Normal boiling point,	Critical temperature,	Organic carbon partition coefficient,	Pure component water solubility,	Unit risk factor,	Reference conc.,
D_a	D_w	Н	T_R	$\Delta H_{v,b}$	T_B	T_C	K _{oc}	S	URF	RfC
(cm ² /s)	(cm ² /s)	(atm-m ³ /mol)	(°C)	(cal/mol)	(°K)	(°K)	(cm ³ /g)	(mg/L)	$(\mu g/m^3)^{-1}$	(mg/m ³)
		-	-	-	•			•		
7.80E-02	8.80E-06	3.03E-02	25	7,127	349.90	556.60	1.74E+02	7.93E+02	4.2E-05	4.0E-02

INTERMEDIATE CALCULATIONS SHEET Carbon Tetrachloride for Well MW-BW-53-A

Sampled September 9, 2004

Source- building separation, L _T (cm)	Vadose zone soil air-filled porosity, $\theta_a^{\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $	Vadose zone effective total fluid saturation, S _{te} (cm³/cm³)	Vadose zone soil intrinsic permeability, k _i (cm ²)	Vadose zone soil relative air permeability, k _{rg} (cm²)	Vadose zone soil effective vapor permeability, k _v (cm ²)	Thickness of capillary zone, L _{cz} (cm)	Total porosity in capillary zone, n _{cz} (cm ³ /cm ³)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm ³ /cm ³)	Water-filled porosity in capillary zone, $\theta_{w,cz} = \frac{(cm^3/cm^3)}{cm^2}$	Floor- wall seam perimeter, X _{crack} (cm)	:
2915.96	0.321	0.003	1.01E-07	0.998	1.00E-07	17.05	0.375	0.122	0.253	4,000	
Bldg. ventilation rate, Q _{bullding} (cm ³ /s)	Area of enclosed space below grade, A _B (cm ²)	Crack- to-total area ratio, η (unitless)	Crack depth below grade, Z _{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, ΔH _{v,TS} (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m 3 /mol)	Henry's law constant at ave. groundwater temperature, H' _{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ _{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D ^{eff} _V (cm ² /s)	Capillary zone effective diffusion coefficient, D ^{eff} _{cz} (cm ² /s)	Total overall effective diffusion coefficient, D ^{eff} _T (cm ² /s)	
3.39E+04	1.00E+06	5.00E-03	15	7,778	2.21E-02	9.26E-01	1.78E-04	1.26E-02	5.00E-04	1.10E-02	
Diffusion path length,	Convection path length,	Source vapor conc.,	Crack radius,	Average vapor flow rate into bldg.,	Crack effective diffusion coefficient,	Area of crack,	Exponent of equivalent foundation Peclet number,	Infinite source indoor attenuation coefficient,	Infinite source bldg. conc.,	Unit risk factor,	Reference conc.,
L _d	L_{p}	C _{source}	r _{crack}	Q_{soil}	D ^{crack}	A _{crack}	exp(Pe ^t)	α	C_{building}	URF	RfC
(cm)	(cm)	(μg/m³)	(cm)	(cm ³ /s)	(cm ² /s)	(cm ²)	(unitless)	(unitless)	(µg/m³)	(μg/m³) ⁻¹	(mg/m ³)
2915.96	15	1.20E+04	1.25	8.33E+01	1.26E-02	5.00E+03	5.50E+05	1.07E-04	1.29E+00	4.2E-05	4.0E-02

RESULTS SHEET Carbon Tetrachloride for Well MW-BW-53-A Sampled September 9, 2004

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	7.93E+05	NA] [2.2E-05	3.1E-02

MESSAGE SUMMARY BELOW:

DATA ENTRY SHEET Trichloroethene for Well MW-BW-53-A Sampled September 9, 2004

Chemical

GW-SCREEN Version 3.0; 04/03 Reset to Defaults

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

YES OR DTSC

Vapor Intrusion Guidance Interim Final 12/04

(last modified 1/21/05)

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} no dashes) (μg/L)

79016	4.90E+00	Tric	hloroethylene
ENTER Depth	ENTER	ENTER	ENTER
below grade to bottom	Depth		Average soil/
of enclosed	below grade	SCS	groundwater
space floor, L _F	to water table, L _{WT}	soil type directly above	temperature, T _S
(cm)	(cm)	water table	(°C)
			-
15	2930.96	S	18

ENTER

Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil}

(L/m) 5

MORE

MORE 4

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vandose zone soil vapor permeability, k _v (cm ²)	ENTER Vadose zone SCS SOII type Lookup Soil Parameters	ENTER Vadose zone soil dry bulk density, Pb (g/cm³)	ENTER Vadose zone soil total porosity, n ^V (unitless)	ENTER Vadose zone soil water-filled porosity, $\theta_w^{\ V}$ (cm^3/cm^3)
S			S	1.66	0.375	0.054

MORE

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

Used to calculate risk-based groundwater concentration.

Trichloroethene for Well MW-BW-53-A Sampled September 9, 2004

ARC:

ABC						,				
Diffusivity in air,	Diffusivity in water.	Henry's law constant at reference temperature.	Henry's law constant reference temperature.	Enthalpy of vaporization at the normal boiling point,	Normal boiling point,	Critical temperature,	Organic carbon partition coefficient.	Pure component water solubility.	Unit risk factor,	Reference conc.,
Da	D_{w}	. H	T _R	$\Delta H_{v,b}$	T _B	T _C	K _{oc}	S	URF	RfC
(cm ² /s)	(cm ² /s)	(atm-m ³ /mol)	(°C)	(cal/mol)	(°K)	(°K)	(cm ³ /g)	(mg/L)	$(\mu g/m^3)^{-1}$	(mg/m ³)
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	6.0E-01

INTERMEDIATE CALCULATIONS SHEET

Trichloroethene for Well MW-BW-53-A Sampled September 9, 2004

Source- building separation, L _T (cm)	Vadose zone soil air-filled porosity, $\theta_a^{\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $	Vadose zone effective total fluid saturation, S _{te} (cm³/cm³)	Vadose zone soil intrinsic permeability, k _i (cm ²)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k _v (cm²)	Thickness of capillary zone, L _{cz} (cm)	Total porosity in capillary zone, n _{cz} (cm ³ /cm ³)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm ³ /cm ³)	Water-filled porosity in capillary zone, $\theta_{w,cz} = (cm^3/cm^3)$	Floor- wall seam perimeter, X _{crack} (cm)	
2915.96	0.321	0.003	1.01E-07	0.998	1.00E-07	17.05	0.375	0.122	0.253	4,000	j
Bldg. ventilation rate, Q _{building} (cm ³ /s)	Area of enclosed space below grade, A _B (cm ²)	Crack- to-total area ratio, η (unitless)	Crack depth below grade, Z _{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, ΔH _{v,TS} (cal/mol)	Henry's law constant at ave. groundwater temperature, H _{TS} (atm-m ³ /mol)	Henry's law constant at ave. groundwater temperature, H' _{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ _{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D ^{eff} _V (cm ² /s)	Capillary zone effective diffusion coefficient, D ^{eff} _{cz} (cm ² /s)	Total overall effective diffusion coefficient, Deff_T (cm²/s)	
3.39E+04	1.00E+06	5.00E-03	15	8,458	7.29E-03	3.05E-01	1.78E-04	1.28E-02	5.08E-04	1.12E-02	j
Diffusion path length, L _d	Convection path length,	Source vapor conc.,	Crack radius, r _{crack}	Average vapor flow rate into bldg., Q _{soil}	Crack effective diffusion coefficient, D ^{crack}	Area of crack, A _{crack}	Exponent of equivalent foundation Peclet number, exp(Pef)	Infinite source indoor attenuation coefficient,	Infinite source bldg. conc., C _{building}	Unit risk factor, URF	Reference conc., RfC
(cm)	(cm)	(µg/m³)	(cm)	(cm ³ /s)	(cm ² /s)	(cm ²)	(unitless)	(unitless)	(μg/m³)	(μg/m³) ⁻¹	(mg/m ³)
, ,	, ,	,, ,	` '	, ,	, ,	, ,	•		,, ,	,	
2915.96	15	1.49E+03	1.25	8.33E+01	1.28E-02	5.00E+03	4.65E+05	1.08E-04	1.62E-01	2.0E-06	6.0E-01

RESULTS SHEET Trichloroethene for Well MW-BW-53-A Sampled September 9, 2004

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

groundwater gr conc.,	exposure oundwater	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		1.3E-07	2.6E-04

MESSAGE SUMMARY BELOW:

DATA ENTRY SHEET Chloroform for Well MW-BW-53-A Sampled September 9, 2004

Chemical

GW-SCREEN Version 3.0; 04/03 CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

DTSC

Vapor Intrusion Guidance Interim Final 12/04

(last modified 1/21/05)

Reset to Defaults

YES OR

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

YES

ENTER ENTER Initial groundwater Chemical CAS No. conc., (numbers only, C_{W} no dashes) (μg/L)

(cm)

15

1.60E+00 67663 Chloroform **ENTER ENTER ENTER ENTER** Depth below grade Average to bottom Depth soil/ of enclosed below grade SCS groundwater to water table, temperature, space floor, soil type directly above L_F L_{WT} T_S

(cm)

2930.96

water table

S

ENTER

Average vapor flow rate into bldg. (Leave blank to calculate)

5

 \mathbf{Q}_{soil} (L/m)

MORE

MORE

Ψ

ENTER Vadose zone		ENTER User-defined	ENTER	ENTER	ENTER	ENTER
SCS soil type		vandose zone soil vapor	Vadose zone SCS	Vadose zone soil dry	Vadose zone soil total	Vadose zone soil water-filled
(used to estimate	OR	permeability,	soil type	bulk density,	porosity,	porosity,
soil vapor		k_v	Lookup Soil	$\rho_b^{\ V}$	n ^V	$\theta_{\mathbf{w}}^{\ \ V}$
permeability)		(cm ²)	Parameters	(g/cm ³)	(unitless)	(cm ³ /cm ³)
9			S	1 66	0.375	0.054

(°C)

18

MORE

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

Used to calculate risk-based groundwater concentration.

Chloroform for Well MW-BW-53-A Sampled September 9, 2004

ARC:

ABC				•		,				
Diffusivity in air,	Diffusivity in water,	Henry's law constant at reference temperature,	Henry's law constant reference temperature,	Enthalpy of vaporization at the normal boiling point,	Normal boiling point,	Critical temperature,	Organic carbon partition coefficient,	Pure component water solubility,	Unit risk factor,	Reference conc.,
Da	D_w	Н	T _R	$\Delta H_{v,b}$	T _B	T _C	K _{oc}	S	URF	RfC
(cm ² /s)	(cm ² /s)	(atm-m ³ /mol)	(°C)	(cal/mol)	(°K)	(°K)	(cm ³ /g)	(mg/L)	(μg/m ³) ⁻¹	(mg/m ³)
1.04E-01	1.00E-05	3.66E-03	25	6.988	334.32	536.40	3.98E+01	7.92E+03	5.3E-06	3.0E-01

INTERMEDIATE CALCULATIONS SHEET

Chloroform for Well MW-BW-53-A Sampled September 9, 2004

Source- building separation, L _T (cm)	Vadose zone soil air-filled porosity, $\theta_a^{\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $	Vadose zone effective total fluid saturation, S _{te} (cm³/cm³)	Vadose zone soil intrinsic permeability, k _i (cm ²)	Vadose zone soil relative air permeability, k _{rg} (cm²)	Vadose zone soil effective vapor permeability, k _v (cm²)	Thickness of capillary zone, L _{cz} (cm)	Total porosity in capillary zone, n _{cz} (cm ³ /cm ³)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm ³ /cm ³)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor- wall seam perimeter, X _{crack} (cm)	·
2915.96	0.321	0.003	1.01E-07	0.998	1.00E-07	17.05	0.375	0.122	0.253	4,000	
Bldg. ventilation rate, Q _{building} (cm ³ /s)	Area of enclosed space below grade, A _B (cm ²)	Crack- to-total area ratio, η (unitless)	Crack depth below grade, Z _{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H _{TS} (atm-m ³ /mol)	Henry's law constant at ave. groundwater temperature, H' _{TS} (unitless)	Vapor viscosity at ave. soil temperature,	Vadose zone effective diffusion coefficient, Deff (cm²/s)	Capillary zone effective diffusion coefficient, Deff cz (cm²/s)	Total overall effective diffusion coefficient, Deff_T (cm²/s)	
3.39E+04	1.00E+06	5.00E-03	15	7,471	2.70E-03	1.13E-01	1.78E-04	1.68E-02	6.73E-04	1.47E-02	
Diffusion path	Convection path	Source vapor	Crack	Average vapor flow rate	Crack effective diffusion	Area of	Exponent of equivalent foundation Peclet	Infinite source indoor attenuation	Infinite source bldg.	Unit risk	Reference
length,	length,	conc.,	radius,	into bldg.,	coefficient,	crack,	number,	coefficient,	conc.,	factor,	conc.,
L _d	L _p	C _{source}	r _{crack}	Q_{soil}	D ^{crack}	A _{crack}	exp(Pef)	α	C _{building}	URF	RfC
(cm)	(cm)	(μg/m ³)	(cm)	(cm ³ /s)	(cm ² /s)	(cm ²)	(unitless)	(unitless)	(μg/m ³)	$(\mu g/m^3)^{-1}$	(mg/m ³)
(311)	()	(1.5)	()	(= 1,5)	ζ=,σ/	(/	(2	(2	(1.5)	(F.O)	(5)
2915.96	15	1.81E+02	1.25	8.33E+01	1.68E-02	5.00E+03	2.02E+04	1.41E-04	2.55E-02	5.3E-06	3.0E-01

4/18/2006

8:47 PM

RESULTS SHEET Chloroform for Well MW-BW-53-A Sampled September 9, 2004

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

conc., conc., groundwater solubility, groundwater	risk from vapor intrusion to indoor air, carcinogen (unitless)	quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA NA NA 7.92E+06 NA	5.5E-08	8.1E-05

MESSAGE SUMMARY BELOW:

DATA ENTRY SHEET Carbon Tetrachloride for Well MW-BW-53-A Sampled September 15, 2005

GW-SCREEN CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box) DTSC Version 3.0; 04/03 **Vapor Intrusion Guidance** YES Interim Final 12/04 Reset to OR (last modified 1/21/05) Defaults CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below) YES **ENTER ENTER** Initial groundwater Chemical CAS No. conc., (numbers only, C_{W} no dashes) (μg/L) Chemical 7.60E+00 56235 Carbon tetrachloride **ENTER ENTER ENTER ENTER** MORE Depth Ψ

below grade Average to bottom Depth soil/ of enclosed below grade SCS groundwater to water table, space floor, soil type temperature, directly above T_{S} L_F L_{WT} (°C) water table (cm) (cm) 2930.96 15 S 18

ENTER Average vapor flow rate into bldg. (Leave blank to calculate) \mathbf{Q}_{soil} (L/m) 5

MORE

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vandose zone soil vapor permeability, k _v (cm ²)	ENTER Vadose zone SCS soil type Lookup Soil Parameters	ENTER Vadose zone soil dry bulk density, $\rho_b^{\ \ \nu}$ (g/cm³)	ENTER Vadose zone soil total porosity, n ^V (unitless)	ENTER Vadose zone soil water-filled porosity, $\theta_w^{\ V}$ (cm^3/cm^3)
S			S	1.66	0.375	0.054

MORE

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

Used to calculate risk-based groundwater concentration.

Carbon Tetrachloride for Well MW-BW-53-A Sampled September 15, 2005

ABC

ABC						-,				
Diffusivity in air,	Diffusivity in water,	Henry's law constant at reference temperature,	Henry's law constant reference temperature,	Enthalpy of vaporization at the normal boiling point,	Normal boiling point,	Critical temperature,	Organic carbon partition coefficient,	Pure component water solubility,	Unit risk factor,	Reference conc.,
Da	D_{w}	. H	T _R	$\Delta H_{v,b}$	T _B	T _C	K _{oc}	S	URF	RfC
(cm ² /s)	(cm ² /s)	(atm-m ³ /mol)	(°C)	(cal/mol)	(°K)	(°K)	(cm ³ /g)	(mg/L)	$(\mu g/m^3)^{-1}$	(mg/m ³)
7.80E-02	8.80E-06	3.03E-02	25	7,127	349.90	556.60	1.74E+02	7.93E+02	4.2E-05	4.0E-02

INTERMEDIATE CALCULATIONS SHEET Carbon Tetrachloride for Well MW-BW-53-A Sampled September 15, 2005

Source- building separation, L _T (cm)	Vadose zone soil air-filled porosity, $\theta_a^{\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $	Vadose zone effective total fluid saturation, S _{te} (cm³/cm³)	Vadose zone soil intrinsic permeability, k _i (cm ²)	Vadose zone soil relative air permeability, k_{rg} (cm ²)	Vadose zone soil effective vapor permeability, k _v (cm ²)	Thickness of capillary zone, L _{cz} (cm)	Total porosity in capillary zone, n _{cz} (cm ³ /cm ³)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm ³ /cm ³)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm ³ /cm ³)	Floor- wall seam perimeter, X _{crack} (cm)	
2915.96	0.321	0.003	1.01E-07	0.998	1.00E-07	17.05	0.375	0.122	0.253	4,000	l
Bldg. ventilation rate, Q _{building} (cm³/s)	Area of enclosed space below grade, A _B (cm ²)	Crack- to-total area ratio, η (unitless)	Crack depth below grade, Z _{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H _{TS} (atm-m³/mol)	Henry's law constant at ave. groundwater temperature, H' _{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ _{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D ^{eff} _V (cm ² /s)	Capillary zone effective diffusion coefficient, D ^{eff} _{cz} (cm ² /s)	Total overall effective diffusion coefficient, Deff_T (cm²/s)	
3.39E+04	1.00E+06	5.00E-03	15	7,778	2.21E-02	9.26E-01	1.78E-04	1.26E-02	5.00E-04	1.10E-02	
Diffusion path	Convection path	Source vapor	Crack	Average vapor flow rate	Crack effective diffusion	Area of	Exponent of equivalent foundation Peclet	Infinite source indoor attenuation	Infinite source bldg.	Unit risk	Reference
length,	length,	conc.,	radius,	into bldg.,	coefficient,	crack,	number,	coefficient,	conc.,	factor,	conc.,
L _d		C _{source}	r _{crack}	Q _{soil}	D ^{crack}	A _{crack}	exp(Pe ^f)	α	C _{building}	URF	RfC
_	L _p	(μg/m ³)		(cm ³ /s)	(cm ² /s)	(cm ²)		(unitless)	O _{building} (μg/m ³)	(μg/m ³) ⁻¹	-
(cm)	(cm)	(μg/111)	(cm)	(СП /5)	(СПТ /5)	(CIII)	(unitless)	(unitiess)	(μg/111-)	(μg/III)	(mg/m ³)
2915.96	15	7.04E+03	1.25	8.33E+01	1.26E-02	5.00E+03	5.50E+05	1.07E-04	7.52E-01	4.2E-05	4.0E-02

RESULTS SHEET Carbon Tetrachloride for Well MW-BW-53-A Sampled September 15, 2005

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	7.93E+05	NA	1.3E-05	1.8E-02

MESSAGE SUMMARY BELOW:

DATA ENTRY SHEET Trichloroethene for Well MW-BW-53-A Sampled September 15, 2005

Chemical

GW-SCREEN Version 3.0; 04/03 Reset to Defaults

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

OR

YES

 L_{WT}

(cm)

2930.96

DTSC **Vapor Intrusion Guidance**

Interim Final 12/04 (last modified 1/21/05)

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

YES

ENTER ENTER Initial groundwater Chemical CAS No. conc., (numbers only, C_{W} no dashes) (μg/L)

 L_F

(cm)

15

1.90E+00 79016 Trichloroethylene **ENTER ENTER ENTER ENTER** Depth below grade Average to bottom Depth soil/ of enclosed below grade SCS groundwater to water table, temperature, space floor, soil type

directly above

water table

S

ENTER

Average vapor flow rate into bldg. (Leave blank to calculate)

 \mathbf{Q}_{soil} (L/m) 5

MORE

MORE

Ψ

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vandose zone soil vapor permeability, k _v (cm ²)	ENTER Vadose zone SCS soil type Lookup Soil Parameters	ENTER Vadose zone soil dry bulk density, ρ_b^V (g/cm³)	ENTER Vadose zone soil total porosity, n ^V (unitless)	ENTER Vadose zone soil water-filled porosity, $\theta_{w}^{\ \ \ \ \ \ \ \ }$ (cm^{3}/cm^{3})
S			S	1.66	0.375	0.054

 T_S (°C)

18

MORE ¥

DTSC / HERD

Last Update: 11/1/03

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

Used to calculate risk-based groundwater concentration.

Trichloroethene for Well MW-BW-53-A Sampled September 15, 2005

 T_C

ABC

Diffusivity

in air,

 D_a

Diffusivity

in water,

 D_{w}

Н

 T_R

		- Cap.o.	a oop.o	000, 2000				
Henry's	Henry's	Enthalpy of	Marmal		Organic	Pure	l lait	
law constant	law constant	vaporization at	Normal		carbon	component	Unit	
at reference	reference	the normal	boiling	Critical	partition	water	risk	Reference
temperature,	temperature,	boiling point,	point,	temperature,	coefficient,	solubility,	factor,	conc.,

 K_{oc}

S

URF

RfC

(cm ² /s)	(cm ² /s)	(atm-m ³ /mol)	(°C)	(cal/mol)	(°K)	(°K)	(cm ³ /g)	(mg/L)	$(\mu g/m^3)^{-1}$	(mg/m ³)
7 90F-02	0.10F-06	1.03F-02	25	7 505	360.36	544.20	1.66F±02	1.47F±03	2.0F-06	6.0F-01

 T_B

 $\Delta H_{v,b}$

INTERMEDIATE CALCULATIONS SHEET

Trichloroethene for Well MW-BW-53-A Sampled September 15, 2005

Source- building separation, L _T (cm)	Vadose zone soil air-filled porosity, $\theta_a^{\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $	Vadose zone effective total fluid saturation, S _{te} (cm³/cm³)	Vadose zone soil intrinsic permeability, k _i (cm ²)	Vadose zone soil relative air permeability, k _{rg} (cm²)	Vadose zone soil effective vapor permeability, k _v (cm ²)	Thickness of capillary zone, L _{cz} (cm)	Total porosity in capillary zone, n _{cz} (cm ³ /cm ³)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm ³ /cm ³)	Water-filled porosity in capillary zone, $\theta_{w,cz} = \frac{(cm^3/cm^3)}{cm^2}$	Floor- wall seam perimeter, X _{crack} (cm)	
2915.96	0.321	0.003	1.01E-07	0.998	1.00E-07	17.05	0.375	0.122	0.253	4,000	
Bldg. ventilation rate, Q _{building} (cm³/s)	Area of enclosed space below grade, A _B (cm ²)	Crack- to-total area ratio, η (unitless)	Crack depth below grade, Z _{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H _{TS} (atm-m ³ /mol)	Henry's law constant at ave. groundwater temperature, H' _{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ _{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D ^{eff} _V (cm ² /s)	Capillary zone effective diffusion coefficient, Deff cz (cm²/s)	Total overall effective diffusion coefficient, Deff (cm²/s)	
3.39E+04	1.00E+06	5.00E-03	15	8,458	7.29E-03	3.05E-01	1.78E-04	1.28E-02	5.08E-04	1.12E-02	
Diffusion path length,	Convection path length,	Source vapor conc.,	Crack radius,	Average vapor flow rate into bldg.,	Crack effective diffusion coefficient,	Area of crack,	Exponent of equivalent foundation Peclet number,	Infinite source indoor attenuation coefficient,	Infinite source bldg. conc.,	Unit risk factor,	Reference conc.,
L_d	L_p	C _{source}	r _{crack}	Q_{soil}	D ^{crack}	A _{crack}	exp(Pe ^f)	α	C_{building}	URF	RfC
(cm)	(cm)	(μg/m³)	(cm)	(cm ³ /s)	(cm ² /s)	(cm ²)	(unitless)	(unitless)	(μg/m ³)	(μg/m³) ⁻¹	(mg/m ³)
2915.96	15	5.80E+02	1.25	8.33E+01	1.28E-02	5.00E+03	4.65E+05	1.08E-04	6.28E-02	2.0E-06	6.0E-01

RESULTS SHEET Trichloroethene for Well MW-BW-53-A Sampled September 15, 2005

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 5.2E-08 1.0E-04	NA	NA	NA	1.47E+06	NA] [5.2E-08	1.0E-04

MESSAGE SUMMARY BELOW:

DATA ENTRY SHEET Chloroform for Well MW-BW-53-A Sampled September 15, 2005

Chemical

GW-SCREEN Version 3.0; 04/03 CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

DTSC

Vapor Intrusion Guidance Interim Final 12/04

Reset to Defaults

OR

YES

2930.96

(last modified 1/21/05)

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

YES

ENTER ENTER Initial groundwater Chemical CAS No. conc., (numbers only, C_{W} no dashes) (μg/L)

15

7.30E-01 67663 Chloroform **ENTER ENTER ENTER ENTER** Depth below grade Average to bottom Depth soil/ of enclosed below grade SCS groundwater to water table, temperature, space floor, soil type directly above T_{S} L_F L_{WT} (°C) water table (cm) (cm)

S

ENTER

Average vapor flow rate into bldg. (Leave blank to calculate)

 \mathbf{Q}_{soil} (L/m) 5

MORE

MORE

Ψ

ENTER Vadose zone SCS Soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vandose zone soil vapor permeability, k _v (cm ²)	ENTER Vadose zone SCS soil type Lookup Soil Parameters	ENTER Vadose zone soil dry bulk density, ρ _b ^V (g/cm ³)	ENTER Vadose zone soil total porosity, n ^V (unitless)	ENTER Vadose zone soil water-filled porosity, $\theta_w^{\ V}$ (cm^3/cm^3)
S			S	1.66	0.375	0.054

18

MORE

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

Used to calculate risk-based groundwater concentration.

4/18/2006

8:46 PM

Chloroform for Well MW-BW-53-A Sampled September 15, 2005

ABC

ABC						•				
		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	$\Delta H_{v,b}$	T_B	T_C	K_{oc}	S	URF	RfC
(cm ² /s)	(cm ² /s)	(atm-m ³ /mol)	(°C)	(cal/mol)	(°K)	(°K)	(cm ³ /g)	(mg/L)	$(\mu g/m^3)^{-1}$	(mg/m ³)
1.04E-01	1.00E-05	3.66E-03	25	6,988	334.32	536.40	3.98E+01	7.92E+03	5.3E-06	3.0E-01

INTERMEDIATE CALCULATIONS SHEET

Chloroform for Well MW-BW-53-A Sampled September 15, 2005

Source- building separation, L _T (cm)	Vadose zone soil air-filled porosity, $\theta_a^{\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k _i (cm ²)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k _v (cm²)	Thickness of capillary zone, L _{cz} (cm)	Total porosity in capillary zone, n _{cz} (cm ³ /cm ³)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm ³ /cm ³)	Water-filled porosity in capillary zone, $\theta_{w,cz} = (cm^3/cm^3)$	Floor- wall seam perimeter, X _{crack} (cm)	ı
2915.96	0.321	0.003	1.01E-07	0.998	1.00E-07	17.05	0.375	0.122	0.253	4,000	
Bldg. ventilation rate, Q _{building} (cm ³ /s)	Area of enclosed space below grade, A _B (cm ²)	Crack- to-total area ratio, η (unitless)	Crack depth below grade, Z _{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H _{TS} (atm-m ³ /mol)	Henry's law constant at ave. groundwater temperature, H' _{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ _{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D ^{eff} _V (cm ² /s)	Capillary zone effective diffusion coefficient, D ^{eff} _{cz} (cm ² /s)	Total overall effective diffusion coefficient, Deff_T (cm²/s)	
3.39E+04	1.00E+06	5.00E-03	15	7,471	2.70E-03	1.13E-01	1.78E-04	1.68E-02	6.73E-04	1.47E-02	
$\begin{array}{c} \text{Diffusion} \\ \text{path} \\ \text{length}, \\ \text{L}_{\text{d}} \end{array}$	Convection path length,	Source vapor conc.,	Crack radius, r _{crack}	Average vapor flow rate into bldg., Q _{soil}	Crack effective diffusion coefficient, D ^{crack}	Area of crack, A _{crack}	Exponent of equivalent foundation Peclet number, exp(Pe ^f)	Infinite source indoor attenuation coefficient,	Infinite source bldg. conc., C _{building}	Unit risk factor, URF	Reference conc.,
(cm)	(cm)	(μg/m³)	(cm)	(cm ³ /s)	(cm ² /s)	(cm ²)	(unitless)	(unitless)	(μg/m³)	(μg/m³) ⁻¹	(mg/m ³)
2915.96	15	8.26E+01	1.25	8.33E+01	1.68E-02	5.00E+03	2.02E+04	1.41E-04	1.16E-02	5.3E-06	3.0E-01

RESULTS SHEET Chloroform for Well MW-BW-53-A Sampled September 15, 2005

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	7.92E+06	NA	2.5E-08	3.7E-05

MESSAGE SUMMARY BELOW:

DATA ENTRY SHEET Carbon Tetrachloride for Well MW-BW-49-A Impled September 15, 200

			Sampled September		
GW-SCREEN	CALCULATE RISK-	BASED GROUNDV	VATER CONCENT	RATION (enter "X" in "YES" box)	DTSC
Reset to Defaults	CALCULATE INCRE			OUNDWATER CONCENTRATION	Vapor Intrusion Guidano Interim Final 12/04 (last modified 1/21/05)
		YES	X		
	ENTER	ENTER Initial			
	Chemical CAS No.	groundwater			
	(numbers only,	conc., C _w			
	no dashes)	(μg/L)	(Chemical	
	56235	4.00E+00	Carbo	n tetrachloride	
MORE	ENTER Depth	ENTER	ENTER	ENTER	
₩	below grade			Average	ENTER
	to bottom	Depth		soil/	Average vapor
	of enclosed	below grade	SCS	groundwater	flow rate into bldg.
	space floor,	to water table,	soil type	temperature,	(Leave blank to calculate)
	L _F	L _{WT}	directly above	T _S	Q _{soil}
	(cm)	(cm)	water table	(°C)	(L/m)
	15	1066.8	S	18	5

MORE **↓**

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vandose zone soil vapor permeability, k _v (cm ²)	ENTER Vadose zone SCS Soil type Lookup Soil Parameters	ENTER Vadose zone soil dry bulk density,	ENTER Vadose zone soil total porosity, n ^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)
S			S	1.66	0.375	0.054

MORE Ψ **ENTER ENTER ENTER ENTER ENTER ENTER** Target Target hazard Averaging Averaging risk for quotient for time for time for Exposure Exposure carcinogens, noncarcinogens, carcinogens, noncarcinogens, duration, frequency, TR THQ ED EF AT_{C} AT_{NC} (unitless) (unitless) (yrs) (yrs) (yrs) (days/yr) 1.0E-06 70 30 30 350 Used to calculate risk-based groundwater concentration.

Carbon Tetrachloride for Well MW-BW-49-A Sampled September 15, 2004

ARC

ABC				Campio	a Coptoiii	JOI 10, 200 I				
		Henry's law constant	Henry's law constant	Enthalpy of vaporization at	Normal		Organic carbon	Pure component	Unit	
Diffusivity in air,	Diffusivity in water.	at reference temperature,	reference temperature.	the normal boiling point,	boiling point,	Critical temperature,	partition coefficient.	water solubility,	risk factor,	Reference conc.,
Da	D_w	Н	T _R	$\Delta H_{v,b}$	T _B	T _C	K _{oc}	S	URF	RfC
(cm ² /s)	(cm ² /s)	(atm-m ³ /mol)	(°C)	(cal/mol)	(°K)	(°K)	(cm ³ /g)	(mg/L)	$(\mu g/m^3)^{-1}$	(mg/m ³)
-										
7.80E-02	8.80E-06	3.03E-02	25	7,127	349.90	556.60	1.74E+02	7.93E+02	4.2E-05	4.0E-02

INTERMEDIATE CALCULATIONS SHEET Carbon Tetrachloride for Well MW-BW-49-A Sampled September 15, 2004

Source- building separation, L _T (cm)	Vadose zone soil air-filled porosity, $\theta_a^{\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $	Vadose zone effective total fluid saturation, S _{te} (cm³/cm³)	Vadose zone soil intrinsic permeability, k _i (cm ²)	Vadose zone soil relative air permeability, k_{rg} (cm ²)	Vadose zone soil effective vapor permeability, k _v (cm²)	Thickness of capillary zone, L _{cz} (cm)	Total porosity in capillary zone, n _{cz} (cm ³ /cm ³)	Air-filled porosity in capillary zone, θ _{a,cz} (cm³/cm³)	Water-filled porosity in capillary zone, $\theta_{w,cz} \\ (cm^3/cm^3)$	Floor- wall seam perimeter, X _{crack} (cm)	
1051.8	0.321	0.003	1.01E-07	0.998	1.00E-07	17.05	0.375	0.122	0.253	4,000	
Bldg. ventilation rate, Q _{building} (cm ³ /s)	Area of enclosed space below grade, A _B (cm ²)	Crack- to-total area ratio, η (unitless)	Crack depth below grade, Z _{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, ΔH _{v,TS} (cal/mol)	Henry's law constant at ave. groundwater temperature, H _{TS} (atm-m ³ /mol)	Henry's law constant at ave. groundwater temperature, H' _{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ _{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D ^{eff} _V (cm ² /s)	Capillary zone effective diffusion coefficient, D ^{eff} _{cz} (cm ² /s)	Total overall effective diffusion coefficient, Deff_T (cm²/s)	
3.39E+04	1.00E+06	5.00E-03	15	7,778	2.21E-02	9.26E-01	1.78E-04	1.26E-02	5.00E-04	9.06E-03	
Diffusion path length, L _d (cm)	Convection path length, Lp (cm)	Source vapor conc., C _{source} (μg/m ³)	Crack radius, r _{crack} (cm)	Average vapor flow rate into bldg., Q _{soil} (cm ³ /s)	Crack effective diffusion coefficient, D ^{crack} (cm ² /s)	Area of crack, A _{crack} (cm ²)	Exponent of equivalent foundation Peclet number, exp(Pef) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., C _{building} (μg/m ³)	Unit risk factor, URF (μg/m³) ⁻¹	Reference conc., RfC (mg/m ³)
1051.8	15	3.70E+03	1.25	8.33E+01	1.26E-02	5.00E+03	5.50E+05	2.30E-04	8.53E-01	4.2E-05	4.0E-02

RESULTS SHEET Carbon Tetrachloride for Well MW-BW-49-A Sampled September 15, 2004

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	7.93E+05	NA	1.5E-05	2.0E-02

MESSAGE SUMMARY BELOW:

DATA ENTRY SHEET Chloroform for Well MW-BW-49-A

Sampled September 15, 2004

GW-SCREEN Version 3.0; 04/03 CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

DTSC

Vapor Intrusion Guidance Interim Final 12/04

Reset to Defaults

OR

YES

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

Chemical

(last modified 1/21/05)

YES

ENTER	ENTER
	Initial
Chemical	groundwater
CAS No.	conc.,
(numbers only,	C_W
no dashes)	(ua/L)

67663	2.70E-01	(Chloroform
ENTER Depth	ENTER	ENTER	ENTER
below grade to bottom of enclosed space floor,	Depth below grade to water table,	SCS soil type	Average soil/ groundwater temperature,
L _F (cm)	L _{WT}	directly above water table	T _S
, ,			` '
15	1066.8	S	18

ENTER

Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)

5

MORE

MORE 4

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vandose zone soil vapor permeability, k _v (cm ²)	ENTER Vadose zone SCS soil type Lookup Soil Parameters	ENTER Vadose zone soil dry bulk density, ρ_b^V (g/cm³)	ENTER Vadose zone soil total porosity, n ^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_{w}^{V} (cm^{3}/cm^{3})
S			S	1.66	0.375	0.054

MORE

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

Used to calculate risk-based groundwater concentration.

Chloroform for Well MW-BW-49-A

ABC

Sampled September 15, 2004

7120		Hannia	Hannila	Entholmy of			Orașia	Dura		
Diffusivity in air,	Diffusivity in water,	Henry's law constant at reference temperature,	Henry's law constant reference temperature,	Enthalpy of vaporization at the normal boiling point,	Normal boiling point,	Critical temperature,	Organic carbon partition coefficient,	Pure component water solubility,	Unit risk factor,	Reference conc.,
D_a	D_{w}	Н	T_R	$\Delta H_{v,b}$	T_B	T_C	K _{oc}	S	URF	RfC
(cm ² /s)	(cm ² /s)	(atm-m ³ /mol)	(°C)	(cal/mol)	(°K)	(°K)	(cm ³ /g)	(mg/L)	$(\mu g/m^3)^{-1}$	(mg/m ³)
1.04E-01	1.00E-05	3.66E-03	25	6,988	334.32	536.40	3.98E+01	7.92E+03	5.3E-06	3.0E-01

INTERMEDIATE CALCULATIONS SHEET

Chloroform for Well MW-BW-49-A Sampled September 15, 2004

Source- building separation, L _T (cm)	Vadose zone soil air-filled porosity, $\theta_a^{\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $	Vadose zone effective total fluid saturation, S _{te} (cm³/cm³)	Vadose zone soil intrinsic permeability, k _i (cm ²)	Vadose zone soil relative air permeability, k_{rg} (cm ²)	Vadose zone soil effective vapor permeability, k _v (cm²)	Thickness of capillary zone, L _{cz} (cm)	Total porosity in capillary zone, n _{cz} (cm ³ /cm ³)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm ³ /cm ³)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor- wall seam perimeter, X _{crack} (cm)	-
1051.8	0.321	0.003	1.01E-07	0.998	1.00E-07	17.05	0.375	0.122	0.253	4,000	j
Bldg. ventilation rate, Q _{building} (cm³/s)	Area of enclosed space below grade, A _B (cm ²)	Crack- to-total area ratio, η (unitless)	Crack depth below grade, Z _{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H _{TS} (atm-m³/mol)	Henry's law constant at ave. groundwater temperature, H' _{TS} (unitless)	Vapor viscosity at ave. soil temperature, µ _{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, Deff (cm²/s)	Capillary zone effective diffusion coefficient, Deff cz (cm²/s)	Total overall effective diffusion coefficient, Deff_ (cm²/s)	
3.39E+04	1.00E+06	5.00E-03	15	7,471	2.70E-03	1.13E-01	1.78E-04	1.68E-02	6.73E-04	1.21E-02	1
Diffusion path	Convection path	Source vapor	Crack	Average vapor flow rate	Crack effective diffusion	Area of	Exponent of equivalent foundation Peclet	Infinite source indoor attenuation	Infinite source bldg.	Unit risk	Reference
length,	length,	conc.,	radius,	into bldg.,	coefficient,	crack,	number,	coefficient,	conc.,	factor,	conc.,
L _d	L _p	C _{source}	r _{crack}	Q _{soil}	D ^{crack}	A _{crack}	exp(Pe ^f)	α	C _{building}	URF	RfC
(cm)	(cm)	(μg/m ³)	(cm)	(cm ³ /s)	(cm ² /s)	(cm ²)	(unitless)	(unitless)	(μg/m ³)	(μg/m³) ⁻¹	(mg/m ³)
(CIII)	(CIII)	(μg/111)	(CIII)	(6111 /3)	(6111 73)	(OIII)	(uniness)	(uriniess)	(μg/111)	(μg/111)	(mg/m)
1051.8	15	3.06E+01	1.25	8.33E+01	1.68E-02	5.00E+03	2.02E+04	2.98E-04	9.12E-03	5.3E-06	3.0E-01

RESULTS SHEET Chloroform for Well MW-BW-49-A Sampled September 15, 2004

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	7.92E+06	NA	2.0E-08	2.9E-05

MESSAGE SUMMARY BELOW:

END

1 of 1

DATA ENTRY SHEET Carbon Tetrachloride for Well MW-BW-49-A Impled September 20, 200

		;	Sampled Septemb	er 20, 2005	
GW-SCREEN	CALCULATE RISK-	BASED GROUNDW	ATER CONCENT	RATION (enter "X" in "YES"	box) DTSC
Reset to Defaults	CALCULATE INCRE	Vapor Intrusion Guidance Interim Final 12/04 (last modified 1/21/05) ATION			
		YES	Х		
	ENTER Chemical CAS No. (numbers only,	ENTER Initial groundwater conc., C _w			
	no dashes)	(μg/L)		Chemical	
	56235	2.50E+00	Carbo	on tetrachloride	
MORE ₩	ENTER Depth below grade	ENTER	ENTER	ENTER Average	ENTER
	to bottom	Depth	SCS	soil/	Average vapor
	of enclosed space floor,	below grade to water table,	soil type	groundwater temperature,	flow rate into bldg. (Leave blank to calculate)
	L _F	L _{WT}	directly above	T _S	Q _{soil}
	(cm)	(cm)	water table	(°C)	(L/m)
	15	1066.8	S	18	5

MORE **↓**

ENTER Vadose zone SCS Soil type (used to estimate soil vapor	OR	ENTER User-defined vandose zone soil vapor permeability,	ENTER Vadose zone SCS soil type Lookup Soil Parameters	ENTER Vadose zone soil dry bulk density, ρ _b V	ENTER Vadose zone soil total porosity, nV	ENTER Vadose zone soil water-filled porosity, θ_w^V
permeability)		(cm ²)		(g/cm ³)	(unitless)	(cm ³ /cm ³)
S			S	1.66	0.375	0.054

MORE ¥ **ENTER ENTER ENTER ENTER ENTER ENTER** Target Target hazard Averaging Averaging risk for quotient for time for time for Exposure Exposure frequency, carcinogens, noncarcinogens, carcinogens, noncarcinogens, duration, TR THQ ED AT_{C} AT_{NC} (unitless) (unitless) (yrs) (yrs) (yrs) (days/yr) 1.0E-06 70 30 30 350 Used to calculate risk-based groundwater concentration.

Carbon Tetrachloride for Well MW-BW-49-A Sampled September 20, 2005

ABC				Sample	d Septemb	per 20, 2005				
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 _a	in water, D _w	temperature, H	temperature, T _R	boiling point, ∆H _{v.b}	point, T _B	temperature, T _C	coefficient, K _{oc}	solubility, S	factor, URF	conc., RfC
(cm ² /s)	(cm ² /s)	(atm-m ³ /mol)	(°C)	(cal/mol)	(°K)	(°K)	(cm ³ /g)	(mg/L)	(μg/m ³) ⁻¹	(mg/m ³)
										-
7.80E-02	8.80E-06	3.03E-02	25	7,127	349.90	556.60	1.74E+02	7.93E+02	4.2E-05	4.0E-02

INTERMEDIATE CALCULATIONS SHEET Carbon Tetrachloride for Well MW-BW-49-A

Sampled September 20, 2005

Source- building separation, L _T (cm)	Vadose zone soil air-filled porosity, $\theta_a^{\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k _i (cm ²)	Vadose zone soil relative air permeability, k _{rg} (cm²)	Vadose zone soil effective vapor permeability, k _v (cm²)	Thickness of capillary zone, L _{cz} (cm)	Total porosity in capillary zone, n _{cz} (cm ³ /cm ³)	Air-filled porosity in capillary zone, $\theta_{a,cz} \ (\text{cm}^3/\text{cm}^3)$	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor- wall seam perimeter, X _{crack} (cm)	
1051.8	0.321	0.003	1.01E-07	0.998	1.00E-07	17.05	0.375	0.122	0.253	4,000	
Bldg. ventilation rate, Q _{building} (cm ³ /s)	Area of enclosed space below grade, A _B (cm ²)	Crack- to-total area ratio, η (unitless)	Crack depth below grade, Z _{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, ΔH _{v,TS} (cal/mol)	Henry's law constant at ave. groundwater temperature, H _{TS} (atm-m ³ /mol)	Henry's law constant at ave. groundwater temperature, H' _{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ _{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D ^{eff} _V (cm ² /s)	Capillary zone effective diffusion coefficient, D ^{eff} _{cz} (cm ² /s)	Total overall effective diffusion coefficient, D ^{eff} T (cm ² /s)	
3.39E+04	1.00E+06	5.00E-03	15	7,778	2.21E-02	9.26E-01	1.78E-04	1.26E-02	5.00E-04	9.06E-03	
Diffusion path length, L _d (cm)	Convection path length, Lp (cm)	Source vapor conc., C _{source} (µg/m³)	Crack radius, r _{crack} (cm)	Average vapor flow rate into bldg., Q _{soil} (cm ³ /s)	Crack effective diffusion coefficient, D ^{crack} (cm ² /s)	Area of crack, A _{crack} (cm ²)	Exponent of equivalent foundation Peclet number, exp(Pe') (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., C _{building} (µg/m³)	Unit risk factor, URF (μg/m³) ⁻¹	Reference conc., RfC (mg/m³)
1051.8	15	2.31E+03	1.25	8.33E+01	1.26E-02	5.00E+03	5.50E+05	2.30E-04	5.33E-01	4.2E-05	4.0E-02

RESULTS SHEET Carbon Tetrachloride for Well MW-BW-49-A Sampled September 20, 2005

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	7.93E+05	NA	9.2E-06	1.3E-02

MESSAGE SUMMARY BELOW:

SG-SCREEN PA Version 2.0; 04/

> Reset to Defaults

DTSC

Vapor Intrusion Guidance Interim Final 12/04

	Soil	Gas Concentration	Interim Final 12/04	
ENTER	ENTER		ENTER	(last modified 1/21/05)
	Soil		Soil	
Chemical	gas	OR	gas	
CAS No.	conc.,		conc.,	
(numbers only,	C_g		C_g	
no dashes)	(μg/m³)	-	(ppmv)	Chemical
		1		
56235			5.40E-04	Carbon tetrachloride

MODE	ı
MORE	ı
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•	ı

ENTER Depth	ENTER	ENTER	ENTER		ENTER
below grade to bottom of enclosed space floor, L _F (15 or 200 cm)	Soil gas sampling depth below grade, L _s (cm)	Average soil temperature, T _S (°C)	Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	User-defined vadose zone soil vapor permeability, k _v (cm²)
15	182.88	18	S		

MORE	
→	

ENTER	ENTER	ENTER	ENTER	
Vandose zone	Vadose zone	Vadose zone	Vadose zone	
SCS	soil dry	soil total	soil water-filled	
soil type	bulk density,	porosity,	porosity,	
Lookup Soil	ρ_b^A	n [∨]	$\theta_{\mathbf{w}}^{\ \ V}$	
Parameters	(g/cm ³)	(unitless)	(cm ³ /cm ³)	
S	1.66	0.375	0.054	

ENTER

Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)



ENTER	ENTER	ENTER	ENTER
Averaging time for	Averaging time for	Exposure	Exposure
carcinogens,	noncarcinogens,	duration,	frequency,
AT _C	AT _{NC}	ED	EF
(yrs)	(yrs)	(yrs)	(days/yr)
70	30	30	350

Carbon Tetrachloride for CTP-SGP-35 Sampled June 18, 2004

Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T _R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T _B (°K)	Critical temperature, T _C (°K)	Unit risk factor, URF (µg/m³) ⁻¹	Reference conc., RfC (mg/m³)	Molecular weight, MW (g/mol)
7.80E-02	8.80E-06	3.03E-02	25	7,127	349.90	556.60	4.2E-05	4.0E-02	153.82

INTERMEDIATE CALCULATIONS SHEET Carbon Tetrachloride for CTP-SGP-35 Sampled June 18, 2004

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, $\theta_a^{\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k _i (cm ²)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k _v (cm ²)	Floor- wall seam perimeter, X _{crack} (cm)	Soil gas conc. (µg/m³)	Bldg. ventilation rate, Q _{building} (cm ³ /s)
167.88	0.321	0.003	1.01E-07	0.998	1.00E-07	4,000	3.48E+00	3.39E+04
Area of enclosed space below grade, A _B (cm ²)	Crack- to-total area ratio, η (unitless)	Crack depth below grade, Z _{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H _{TS} (atm-m ³ /mol)	Henry's law constant at ave. soil temperature, H' _{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ _{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D ^{eff} _v (cm ² /s)	Diffusion path length, L _d (cm)
1.00E+06	5.00E-03	15	7,778	2.21E-02	9.26E-01	1.78E-04	1.26E-02	167.88
Convection path length, Lp (cm)	Source vapor conc., C _{source} (µg/m ³)	Crack radius, r _{crack} (cm)	Average vapor flow rate into bldg., Q _{soil} (cm³/s)	Crack effective diffusion coefficient, D ^{crack} (cm ² /s)	Area of crack, A _{crack} (cm ²)	Exponent of equivalent foundation Peclet number, exp(Pe ^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., C _{building} (µg/m³)
15	3.48E+00	1.25	8.33E+01	1.26E-02	5.00E+03	5.50E+05	1.17E-03	4.05E-03

Unit	
risk	Reference
factor,	conc.,
URF	RfC
(μg/m ³) ⁻¹	(mg/m ³)
4.2E-05	4.0E-02
<u> </u>	•

RESULTS SHEET Carbon Tetrachloride for CTP-SGP-35 Sampled June 18, 2004

INCREMENTAL RISK CALCULATIONS:

Incremental	Hazard
risk from	quotient
vapor	from vapor
intrusion to	intrusion to
indoor air,	indoor air,
carcinogen	noncarcinogen
(unitless)	(unitless)
	<u> </u>
7.0E-08	9.7E-05

MESSAGE SUMMARY BELOW:

DATA ENTRY SHEET Chloroform for CTP-SGP-35 Sampled June 18, 2004

SG-SCREEN PA Version 2.0; 04/

> Reset to Defaults

DTSC

Vapor Intrusion Guidance Interim Final 12/04

	Soil	Gas Concentration	n Data	Interim Final 12/04
ENTER	ENTER		ENTER	(last modified 1/21/05)
	Soil		Soil	
Chemical	gas	OR	gas	
CAS No.	conc.,		conc.,	
(numbers only,	C_g		C_g	
no dashes)	(μg/m³)	_	(ppmv)	Chemical
67663		7	8.00E-05	Chloroform

MORE	ı
•	l

ENTER Depth	ENTER	ENTER	ENTER		ENTER
below grade to bottom of enclosed space floor, L _F (15 or 200 cm)	Soil gas sampling depth below grade, L _s (cm)	Average soil temperature, T _S (°C)	Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	User-defined vadose zone soil vapor permeability, k_v (cm^2)
					1
15	182.88	18	S		

MORE ↓	
¥	

ENTER	ENTER	ENTER	ENTER
Vandose zone	Vadose zone	Vadose zone	Vadose zone
SCS	soil dry	soil total	soil water-filled
soil type	bulk density,	porosity,	porosity,
Lookup Soil	$\rho_b^{\ A}$	n^V	$\theta_{\mathbf{w}}^{\ \ V}$
Parameters	(g/cm ³)	(unitless)	(cm ³ /cm ³)
S	1.66	0.375	0.054

ENTER

Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)



ENTER	ENTER	ENTER	ENTER
Averaging time for carcinogens,	Averaging time for noncarcinogens,	Exposure duration,	Exposure frequency,
AT _C	AT _{NC}	ED	EF
(yrs)	(yrs)	(yrs)	(days/yr)
70	30	30	350

Chloroform for CTP-SGP-35

Sampled June 18, 200	4
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Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T _R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T _B (°K)	Critical temperature, T _C (°K)	Unit risk factor, URF (µg/m³) ⁻¹	Reference conc., RfC (mg/m³)	Molecular weight, MW (g/mol)
1.04E-01	1.00E-05	3.66E-03	25	6,988	334.32	536.40	5.3E-06	3.0E-01	119.38

INTERMEDIATE CALCULATIONS SHEET Chloroform for CTP-SGP-35 Sampled June 18, 2004

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, $\theta_a^{\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $	Vadose zone effective total fluid saturation, $S_{te} = (cm^3/cm^3)$	Vadose zone soil intrinsic permeability, k _i (cm ²)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k _v (cm ²)	Floor- wall seam perimeter, X _{crack} (cm)	Soil gas conc. (µg/m³)	Bldg. ventilation rate, Q _{building} (cm ³ /s)
167.88	0.321	0.003	1.01E-07	0.998	1.00E-07	4,000	4.00E-01	3.39E+04
Area of enclosed space below grade, A _B (cm ²)	Crack- to-total area ratio, η (unitless)	Crack depth below grade, Z _{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H _{TS} (atm-m³/mol)	Henry's law constant at ave. soil temperature, H' _{TS} (unitless)	Vapor viscosity at ave. soil temperature, μτs (g/cm-s)	Vadose zone effective diffusion coefficient, D ^{eff} _V (cm ² /s)	Diffusion path length, L _d (cm)
1.00E+06	5.00E-03	15	7,471	2.70E-03	1.13E-01	1.78E-04	1.68E-02	167.88
Convection path length, Lp (cm)	Source vapor conc., C _{source} (μg/m ³)	Crack radius, r _{crack} (cm)	Average vapor flow rate into bldg., Q _{soil} (cm ³ /s)	Crack effective diffusion coefficient, D ^{crack} (cm ² /s)	Area of crack, A _{crack} (cm ²)	Exponent of equivalent foundation Peclet number, exp(Pe') (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	4.00E-01	1.25	8.33E+01	1.68E-02	5.00E+03	2.02E+04	1.34E-03	5.37E-04

Unit	
risk	Reference
factor,	conc.,
URF	RfC
(μg/m ³) ⁻¹	(mg/m ³)
5.3E-06	3.0E-01

RESULTS SHEET
Chloroform
for CTP-SGP-35
Sampled June 18, 2004

INCREMENTAL RISK CALCULATIONS:

Incremental	Hazard
risk from	quotient
vapor	from vapor
intrusion to	intrusion to
indoor air,	indoor air,
carcinogen	noncarcinogen
(unitless)	(unitless)
1.2E-09	1.7E-06

MESSAGE SUMMARY BELOW:

DATA ENTRY SHEET Tetrachloroethene for CTP-SGP-35 Sampled June 18, 2004

SG-SCREEN PA Version 2.0; 04/

> Reset to Defaults

DTSC

Vapor Intrusion Guidance Interim Final 12/04

	Soi	I Gas Concentration	n Data	Interim Final 12/04
ENTER	ENTER		ENTER	(last modified 1/21/05)
	Soil		Soil	
Chemical	gas	OR	gas	
CAS No.	conc.,		conc.,	
(numbers only,	C_g		C_g	
no dashes)	(μg/m³)	_	(ppmv)	Chemical
		_		
127184			1.20E-04	Tetrachloroethylene

MORE

ENTER Depth	ENTER	ENTER	ENTER		ENTER
below grade to bottom of enclosed space floor, L _F (15 or 200 cm)	Soil gas sampling depth below grade, L _s (cm)	Average soil temperature, T _S (°C)	Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	User-defined vadose zone soil vapor permeability, k _v (cm²)
15	182.88	18	S		

MORE	
→	

	ENIER	ENTER	ENTER	ENIEK
	Vandose zone	Vadose zone	Vadose zone	Vadose zone
	SCS	soil dry	soil total	soil water-filled
	soil type	bulk density,	porosity,	porosity,
	Lookup Soil	ρ_b^A	n^V	$\theta_w^{\ V}$
l	Parameters	(g/cm ³)	(unitless)	(cm ³ /cm ³)
ſ	S	1.66	0.375	0.054

ENTER

Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)



ENTER	ENTER	ENTER	ENTER
Averaging	Averaging	_	_
time for	time for	Exposure	Exposure
carcinogens,	noncarcinogens,	duration,	frequency,
AT_C	AT _{NC}	ED	EF
(yrs)	(yrs)	(yrs)	(days/yr)
70	30	30	350

Tetrachloroethene for CTP-SGP-35

Sampled June 18, 2004

Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T _R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T _B (°K)	Critical temperature, T _C (°K)	Unit risk factor, URF (µg/m³) ⁻¹	Reference conc., RfC (mg/m³)	Molecular weight, MW (g/mol)
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	5.9E-06	3.5E-02	165.83

INTERMEDIATE CALCULATIONS SHEET Tetrachloroethene for CTP-SGP-35 Sampled June 18, 2004

Source- building separation, L _T (cm)	Vadose zone soil air-filled porosity, $\theta_a^{\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $	Vadose zone effective total fluid saturation, Ste (cm³/cm³)	Vadose zone soil intrinsic permeability, k _i (cm ²)	Vadose zone soil relative air permeability, k_{rg} (cm ²)	Vadose zone soil effective vapor permeability, k _v (cm ²)	Floor- wall seam perimeter, X _{crack} (cm)	Soil gas conc. (µg/m³)	Bldg. ventilation rate, Q _{building} (cm³/s)
167.88	0.321	0.003	1.01E-07	0.998	1.00E-07	4,000	8.33E-01	3.39E+04
						7		
Area of enclosed space below grade, A _B (cm ²)	Crack- to-total area ratio, η (unitless)	Crack depth below grade, Z _{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H _{TS} (atm-m ³ /mol)	Henry's law constant at ave. soil temperature, H' _{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ _{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D ^{eff} _V (cm ² /s)	Diffusion path length, L _d (cm)
1.00E+06	5.00E-03	15	9,472	1.25E-02	5.23E-01	1.78E-04	1.16E-02	167.88
Convection path length, Lp (cm)	Source vapor conc., C _{source} (µg/m³)	Crack radius, r _{crack} (cm)	Average vapor flow rate into bldg., Q _{soil} (cm ³ /s)	Crack effective diffusion coefficient, D ^{crack} (cm ² /s)	Area of crack, A _{crack} (cm ²)	Exponent of equivalent foundation Peclet number, exp(Pe ^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., C _{building} (µg/m³)
15	8.33E-01	1.25	8.33E+01	1.16E-02	5.00E+03	1.65E+06	1.12E-03	9.30E-04

Unit	
risk	Reference
factor,	conc.,
URF	RfC
(μg/m ³) ⁻¹	(mg/m ³)
5.9E-06	3.5E-02

RESULTS SHEET Tetrachloroethene for CTP-SGP-35 Sampled June 18, 2004

INCREMENTAL RISK CALCULATIONS:

Incremental	Hazard
risk from	quotient
vapor	from vapor
intrusion to	intrusion to
indoor air,	indoor air,
carcinogen	noncarcinogen
(unitless)	(unitless)
2.3E-09	2.5E-05

MESSAGE SUMMARY BELOW:

DATA ENTRY SHEET Trichloroethene for CTP-SGP-35 Sampled June 18, 2004

SG-SCREEN PA Version 2.0; 04/

Reset to Defaults

DTSC

Vapor Intrusion Guidance Interim Final 12/04

Soil Gas Concentration Data				Interim Final 12/04		
ENTER	ENTER		ENTER	(last modified 1/21/05)		
	Soil		Soil			
Chemical	gas	OR	gas			
CAS No.	conc.,		conc.,			
(numbers only,	C_g		C_g			
no dashes)	(μg/m³)	_	(ppmv)	Chemical		
		_				
79016			1.50E-04	Trichloroethylene		



ENTER Depth	ENTER	ENTER	ENTER		ENTER
below grade to bottom of enclosed space floor, L _F (15 or 200 cm)	Soil gas sampling depth below grade, L _s (cm)	Average soil temperature, T _S (°C)	Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	User-defined vadose zone soil vapor permeability, k _v (cm²)
15	182.88	18	S		

MORE	
→	

ENTER	ENTER	ENTER	ENTER
Vandose zone	Vadose zone	Vadose zone	Vadose zone
SCS	soil dry	soil total	soil water-filled
soil type	bulk density,	porosity,	porosity,
Lookup Soil	ρ_b^A	n [∨]	$\theta_{\mathbf{w}}^{V}$
Parameters	(g/cm ³)	(unitless)	(cm ³ /cm ³)
S	1.66	0.375	0.054

ENTER

Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)



ENTER	ENTER	ENTER	ENTER	
Averaging	Averaging	_	_	
time for	time for	Exposure	Exposure	
carcinogens,	noncarcinogens,	duration,	frequency,	
AT_C	AT _{NC}	ED	EF	
(yrs)	(yrs)	(yrs)	(days/yr)	
70	30	30	350	

Trichloroethene for CTP-SGP-35 Sampled June 18, 2004

Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T _R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T _B (°K)	Critical temperature, T _C (°K)	Unit risk factor, URF (µg/m³) ⁻¹	Reference conc., RfC (mg/m ³)	Molecular weight, MW (g/mol)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	2.0E-06	6.0E-01	131.39

INTERMEDIATE CALCULATIONS SHEET Trichloroethene

for CTP-SGP-35 Sampled June 18, 2004

Source- building separation, L _T (cm)	Vadose zone soil air-filled porosity, θ _a ^V (cm ³ /cm ³)	Vadose zone effective total fluid saturation, $S_{te} \\ (cm^3/cm^3)$	Vadose zone soil intrinsic permeability, k _i (cm ²)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k _v (cm ²)	Floor- wall seam perimeter, X _{crack} (cm)	Soil gas conc. (µg/m³)	Bldg. ventilation rate, Q _{building} (cm ³ /s)
167.88	0.321	0.003	1.01E-07	0.998	1.00E-07	4,000	8.25E-01	3.39E+04
						,		
Area of enclosed space below grade, A _B (cm ²)	Crack- to-total area ratio, η (unitless)	Crack depth below grade, Z _{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H _{TS} (atm-m ³ /mol)	Henry's law constant at ave. soil temperature, H' _{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ _{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D ^{eff} _V (cm²/s)	Diffusion path length, L _d (cm)
1.00E+06	5.00E-03	15	8,458	7.29E-03	3.05E-01	1.78E-04	1.28E-02	167.88
Convection path length,	Source vapor conc., C _{source} (µg/m³)	Crack radius, r _{crack} (cm)	Average vapor flow rate into bldg., Q _{soil} (cm ³ /s)	Crack effective diffusion coefficient, D ^{crack} (cm ² /s)	Area of crack, A _{crack} (cm ²)	Exponent of equivalent foundation Peclet number, exp(Pe ^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., C _{building} (µg/m³)
15	8.25E-01	1.25	8.33E+01	1.28E-02	5.00E+03	4.65E+05	1.17E-03	9.68E-04

Unit	
risk	Reference
factor,	conc.,
URF	RfC
(μg/m³) ⁻¹	(mg/m ³)
2.0E-06	6.0E-01
•	

RESULTS SHEET Trichloroethene for CTP-SGP-35 Sampled June 18, 2004

INCREMENTAL RISK CALCULATIONS:

Incremental	Hazard
risk from	quotient
vapor	from vapor
intrusion to	intrusion to
indoor air,	indoor air,
carcinogen	noncarcinogen
(unitless)	(unitless)
8.0E-10	1.5E-06

MESSAGE SUMMARY BELOW: